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Supplement to

MIPAS IMK/IAA version 8 retrieval of methane and nitrous oxide

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Contents

S1 Overview

This document serves as reference for the definition of the representative atmospheres used for the calculation of methane and nitrous oxide error budgets, as listed in Tab. S1, and as collection of the respective error budgets for methane and notrous oxide retrievals for different measurement modes and periods:

- Nominal measurement mode (NOM) CH_4 errors for the FR period (V8H_CH4_61, 2002-2004), which are listed in tables S2–S35 and and depicted in figures S1–S34,
- Nominal measurement mode (NOM) CH_4 errors for the RR period (V8R_CH4_261, 2005-2012), which are listed in tables S36–S69 and depicted in figures S35–S68.
- Middle Atmosphere measurement mode (MA) CH_4 errors for the RR period (V8R_CH4_561, 2005-2012), which are listed in tables S70–S103 and depicted in figures S69–S102.
- Upper Atmosphere measurement mode (UA) CH_4 errors at low solar activity for the RR period (V8R_CH4_662, 2005-2012), which are listed in tables S104–S137 and depicted in figures S103–S136.
- Nominal measurement mode (NOM) N_2O errors for the FR period (V8H_N2O_61, 2002-2004), which are listed in tables S138–S171 and and depicted in figures S137–S170,
- Nominal measurement mode (NOM) N_2O errors for the RR period (V8R_N2O_261, 2005-2012), which are listed in tables S172–S205 and depicted in figures S171–S204.
- Middle Atmosphere measurement mode (MA) N_2O errors for the RR period (V8R_N2O_561, 2005-2012), which are listed in tables S206–S239 and depicted in figures S205–S238.
- Upper Atmosphere measurement mode (UA) N_2O errors at low solar activity for the RR period (V8R_N2O_662, 2005-2012), which are listed in tables S240–S273 and depicted in figures S239–S272.

In the plots, the errors are presented as relative errors in percent, regardless of whether they are additive or multiplicative errors. They were calculated with respect to the average gas profiles that were calculated from the single geolocations which contribute to the respective representative atmospheres.

Table S0. Labels and definitions of the representative atmospheric conditions which were used to calculate the error budget. Daytime atmospheres are defined by solar zenith angles $< 90°$. Nighttime atmospheres are defined by solar zenith angles $> 95°$ for NOM observations, $> 98°$ for MA observations, and $> 100°$ for UA observations.

representative atmosphere label	month(s) used	latitude range
Northern polar winter day	Jan, Feb	65°N – 90°N
Northern polar winter night	Jan, Feb	65°N – 90°N
Northern polar spring day	Apr	65°N – 90°N
Northern polar spring night	Apr	65°N – 90°N
Northern polar summer day	Jul, Aug	65°N – 90°N
Northern polar summer night	Jul, Aug	65°N – 90°N
Northern polar autumn day	Oct	65°N – 90°N
Northern polar autumn night	Oct	65°N – 90°N
Northern midlatitude winter day	Jan, Feb	40°N – 60°N
Northern midlatitude winter night	Jan, Feb	40°N – 60°N
Northern midlatitude spring day	Apr	40°N – 60°N
Northern midlatitude spring night	Apr	40°N – 60°N
Northern midlatitude summer day	Jul, Aug	40°N – 60°N
Northern midlatitude summer night	Jul, Aug	40°N – 60°N
Northern midlatitude autumn day	Oct	40°N – 60°N
Northern midlatitude autumn night	Oct	40°N – 60°N
Tropics day	Apr	20°S – 20°N
Tropics night	Apr	20°S – 20°N
Southern midlatitude winter day	Jul, Aug	40°S – 60°S
Southern midlatitude winter night	Jul, Aug	40°S – 60°S
Southern midlatitude spring day	Oct	40°S – 60°S
Southern midlatitude spring night	Oct	40°S – 60°S
Southern midlatitude summer day	Jan, Feb	40°S – 60°S
Southern midlatitude summer night	Jan, Feb	40°S – 60°S
Southern midlatitude autumn day	Apr	40°S – 60°S
Southern midlatitude autumn night	Apr	40°S – 60°S
Southern polar winter day	Jul, Aug	65°S – 90°S
Southern polar winter night	Jul, Aug	65°S – 90°S
Southern polar spring day	Oct	65°S – 90°S
Southern polar spring night	Oct	65°S – 90°S
Southern polar summer day	Jan, Feb	65°S – 90°S
Southern polar summer night	Jan, Feb	65°S – 90°S
Southern polar autumn day	Apr	65°S – 90°S
Southern polar autumn night	Apr	65°S – 90°S

S2 Methane error contribution profile plots and tabulated values for FR NOM data (V8H_CH4_61)

Table S1. Methane error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1703.54	25.61	11.15	1.50	25.12	62.87	253.64	38.68	72.17	149.18	232.70	276.41
12	1689.48	7.85	19.93	1.77	12.68	54.18	346.12	32.57	38.02	77.32	346.25	354.78
15	1546.57	11.61	46.55	5.17	15.48	71.62	293.79	46.95	47.49	113.99	292.37	313.80
18	1261.38	3.30	55.36	5.70	12.23	85.18	269.25	36.65	37.93	122.53	266.04	292.90
21	972.43	1.89	44.42	10.23	13.93	83.25	253.48	28.11	35.38	133.27	240.29	274.77
24	891.76	1.21	23.75	6.40	13.12	69.03	243.85	19.11	30.95	129.84	222.43	257.55
27	919.91	1.61	12.70	3.24	10.31	37.08	221.82	17.10	30.17	104.92	202.61	228.17
30	891.22	0.88	10.08	2.49	8.34	23.07	232.18	17.82	25.09	84.31	220.13	235.73
33	644.05	0.67	12.34	1.91	7.12	14.08	168.43	13.48	22.21	73.51	155.07	171.61
36	520.89	0.50	6.53	1.57	6.57	23.14	123.16	8.80	20.51	45.57	119.22	127.63
39	505.17	0.51	15.12	2.46	7.73	35.39	113.54	8.36	19.40	41.30	114.80	122.01
42	496.82	0.38	10.56	2.08	7.51	39.17	112.85	7.57	16.45	44.68	113.02	121.53
45	419.88	0.80	9.01	2.27	6.88	33.19	93.62	7.59	17.54	46.72	90.46	101.81
48	371.87	0.26	5.74	2.98	5.28	23.35	85.32	7.18	12.56	36.00	82.51	90.02
52	305.45	0.25	9.25	2.78	5.77	25.25	74.87	6.44	9.88	34.78	72.79	80.67
56	192.88	0.31	6.78	2.93	4.53	15.51	53.37	5.14	11.70	31.20	48.51	57.68
60	125.45	0.11	1.79	0.97	2.04	3.91	32.98	2.92	9.51	18.29	29.60	34.79
64	47.20	0.21	1.56	2.12	2.83	7.74	24.50	2.71	9.82	20.03	19.44	27.91
68	17.62	0.09	0.87	1.01	4.36	2.68	13.73	1.25	19.34	22.52	9.21	24.33

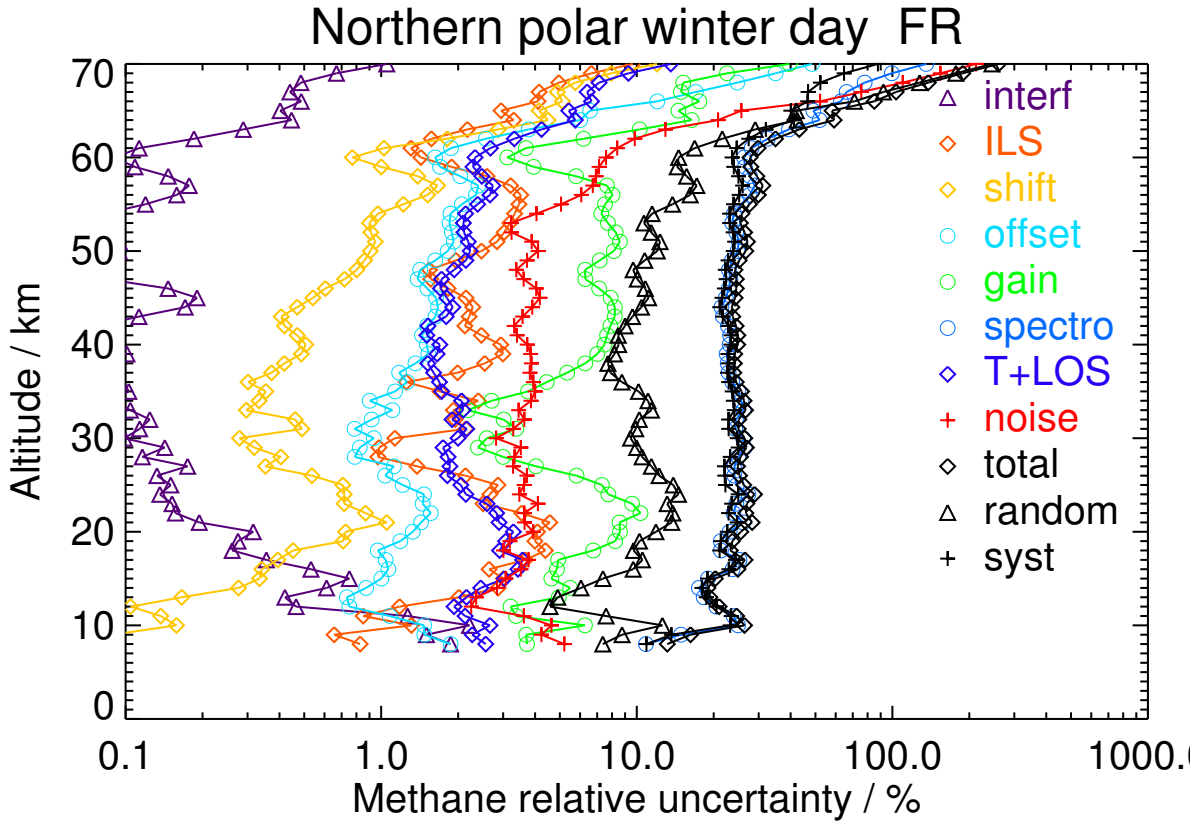

Figure S1. V8H_CH4_61 Northern polar winter day

Table S2. Methane error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1720.51	30.07	8.67	1.51	22.64	55.72	284.90	34.93	66.84	151.80	261.56	302.42
12	1716.84	13.54	39.45	2.95	15.56	71.48	352.73	39.15	44.31	90.96	356.00	367.44
15	1534.28	15.99	59.97	4.42	17.95	70.96	291.15	48.35	53.82	111.94	294.45	315.01
18	1227.13	4.04	55.19	5.60	13.02	68.73	277.16	42.56	41.82	122.84	270.69	297.26
21	886.53	3.78	39.15	6.84	12.26	55.70	229.38	25.41	38.79	124.22	210.20	244.16
24	827.44	1.29	29.98	5.47	9.71	34.67	228.38	17.22	34.40	111.46	208.42	236.35
27	775.47	2.09	9.28	2.75	8.73	24.98	222.31	14.84	31.73	133.43	183.41	226.82
30	735.55	0.91	10.87	1.43	7.62	11.59	218.71	13.84	26.77	110.23	192.11	221.49
33	563.72	0.92	8.87	1.55	6.54	16.75	147.81	10.74	21.68	63.74	137.03	151.12
36	457.74	0.59	8.86	1.28	5.45	21.36	110.52	6.99	17.49	37.29	108.37	114.61
39	377.61	0.47	12.02	1.48	4.84	21.04	86.37	5.57	14.81	31.99	85.44	91.23
42	376.38	0.41	7.93	1.56	3.77	16.91	88.00	4.78	13.27	32.08	85.32	91.15
45	367.66	0.86	12.36	1.60	5.07	23.77	79.39	5.87	15.87	42.36	74.44	85.65
48	331.72	0.32	5.29	2.06	2.75	12.20	75.87	4.65	9.92	33.95	70.08	77.88
52	257.99	0.21	5.17	1.58	3.11	10.81	61.78	4.32	9.56	25.22	58.71	63.89
56	200.97	0.38	4.56	3.66	5.24	19.04	52.84	5.19	12.27	33.90	47.38	58.25
60	173.53	0.17	1.53	1.38	2.78	5.28	41.53	4.47	12.17	18.49	39.89	43.96
64	117.17	0.33	1.78	2.15	3.79	10.19	40.23	4.65	14.04	22.73	38.03	44.31
68	77.60	0.28	2.09	1.70	6.50	10.91	33.59	4.44	28.07	35.02	29.63	45.88

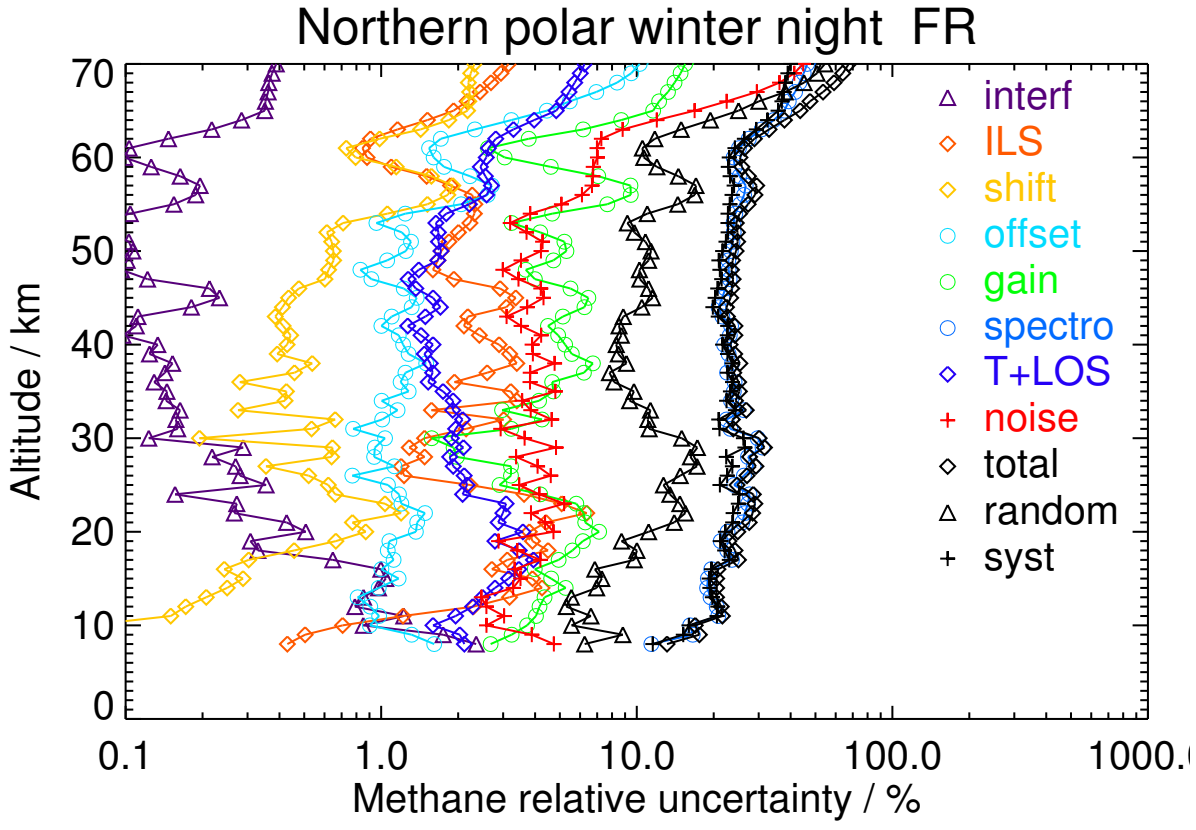

Figure S2. V8H_CH4_61 Northern polar winter night

Table S3. Methane error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1468.69	10.90	9.49	2.67	27.41	118.26	474.84	55.02	94.28	128.75	485.56	502.34
12	1707.67	4.32	23.66	1.36	12.73	110.88	298.52	35.66	39.77	74.59	315.34	324.04
15	1232.09	4.67	41.17	3.69	12.36	52.75	293.29	46.06	46.20	118.05	284.61	308.12
18	1068.03	2.09	66.18	5.16	10.77	75.96	224.91	38.44	34.43	124.71	219.08	252.08
21	853.67	1.26	49.32	9.30	10.85	67.83	220.30	26.27	32.97	130.56	201.25	239.89
24	963.03	1.13	38.70	8.89	8.20	44.51	233.98	20.15	32.73	104.22	221.33	244.64
27	875.36	0.98	17.87	4.90	6.51	20.31	222.68	17.20	30.95	84.08	211.11	227.24
30	838.56	1.17	32.65	2.85	5.74	21.14	198.14	16.91	27.44	66.04	193.63	204.59
33	764.11	0.65	12.84	3.95	5.22	19.06	166.46	12.95	23.12	52.74	161.86	170.24
36	692.48	0.51	11.73	3.02	5.12	25.09	143.86	9.45	19.72	41.70	142.26	148.24
39	537.89	0.64	18.74	4.34	5.09	24.98	116.56	7.98	18.01	41.03	115.37	122.45
42	421.21	0.43	17.32	3.52	4.48	23.18	93.39	5.27	13.71	36.49	92.06	99.03
45	324.57	1.02	17.33	3.92	5.03	24.02	94.27	6.56	20.29	39.94	93.09	101.30
48	292.91	0.47	6.45	4.54	5.45	32.74	72.75	7.28	14.31	43.47	69.46	81.94
52	164.68	0.16	4.37	1.76	2.79	12.88	42.83	2.62	6.35	23.18	39.25	45.58
56	150.57	0.30	7.33	3.28	3.89	17.17	33.55	3.75	10.78	28.45	28.65	40.38
60	107.82	0.10	2.83	1.80	1.43	4.45	28.68	2.31	5.51	11.95	27.35	29.85
64	20.80	0.48	3.02	5.53	4.68	18.35	35.60	4.43	10.02	18.85	37.83	42.26
68	43.97	0.09	0.45	0.47	2.35	2.14	9.69	0.81	9.90	11.46	8.47	14.25

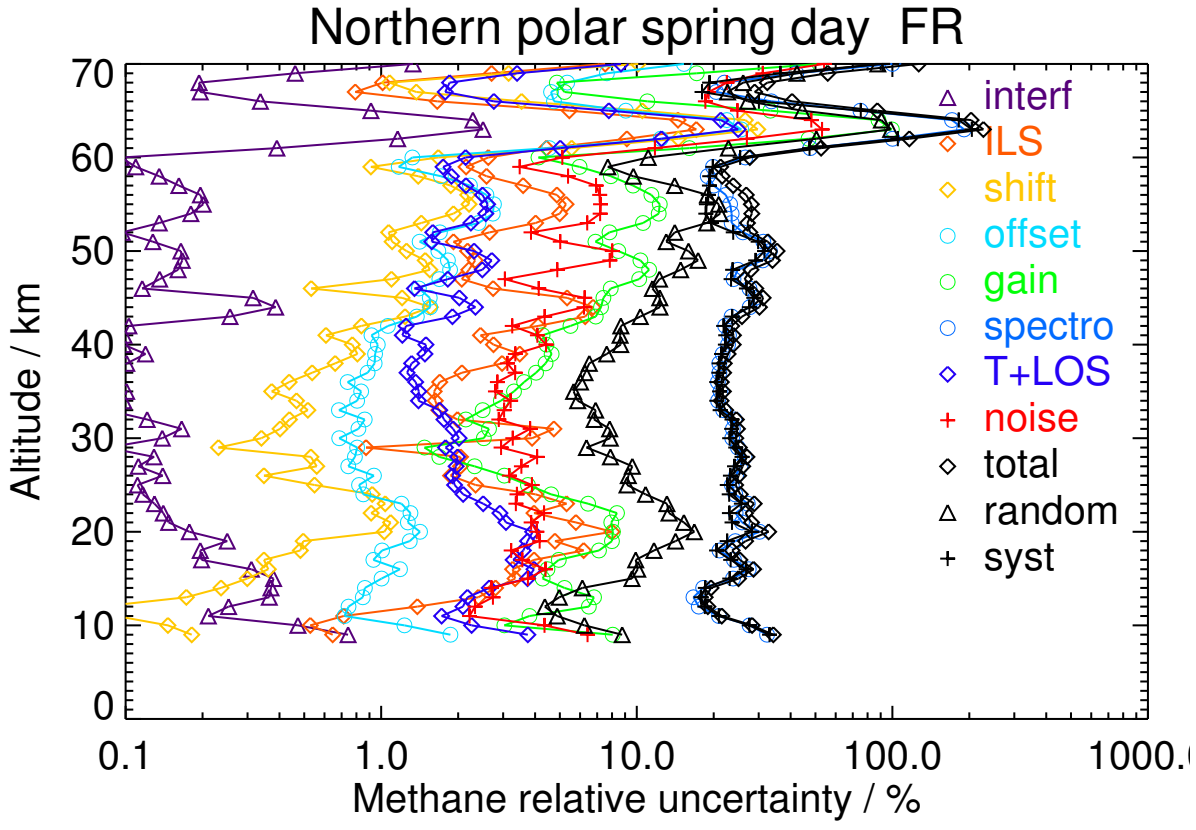

Figure S3. V8H_CH4_61 Northern polar spring day

Table S4. Methane error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1482.32	13.83	3.93	2.62	25.49	109.31	405.09	45.86	86.96	217.21	373.35	431.94
12	1670.88	3.78	18.98	1.57	11.57	97.14	310.12	34.08	37.75	72.96	321.53	329.70
15	1349.32	4.69	31.49	3.12	12.36	57.50	303.31	44.04	45.45	110.42	297.14	316.99
18	1126.54	1.80	41.09	4.64	11.18	72.67	223.81	32.25	34.18	104.87	220.04	243.76
21	872.62	1.38	47.63	12.70	9.69	50.19	236.42	23.47	30.94	133.08	211.52	249.90
24	1001.51	1.03	28.33	7.38	9.18	50.46	244.86	19.23	30.90	108.36	230.28	254.50
27	933.61	0.85	18.81	4.84	6.94	20.67	237.51	17.36	29.01	90.75	223.99	241.67
30	842.72	1.01	24.39	3.35	5.44	14.82	202.15	16.39	24.88	68.45	194.74	206.42
33	734.69	0.61	12.26	3.75	5.06	18.81	157.07	13.03	21.39	53.43	151.61	160.75
36	596.17	0.55	10.39	2.84	5.14	22.95	124.78	8.97	18.70	47.57	120.02	129.11
39	477.95	0.68	17.88	4.42	4.77	19.20	104.15	7.27	16.55	35.15	103.30	109.11
42	355.17	0.28	10.76	2.60	3.79	16.94	81.63	4.19	13.38	32.49	78.92	85.35
45	269.70	0.86	18.08	3.61	4.71	19.09	83.98	6.15	21.52	39.05	82.20	91.00
48	233.75	0.40	6.35	4.26	4.77	25.97	51.53	5.79	14.11	33.79	50.02	60.36
52	158.71	0.13	4.07	0.87	1.93	9.19	41.48	1.97	6.22	20.22	38.21	43.23
56	119.84	0.39	4.61	4.34	4.16	14.69	35.83	3.87	11.71	30.09	28.36	41.35
60	84.69	0.07	2.07	1.07	1.05	2.91	23.75	1.71	4.82	11.33	21.84	24.61
64	36.18	0.38	2.57	3.86	3.67	13.03	28.11	3.40	9.25	16.87	28.42	33.05
68	29.59	0.09	0.45	0.49	2.57	1.93	10.24	0.89	10.95	13.38	7.57	15.37

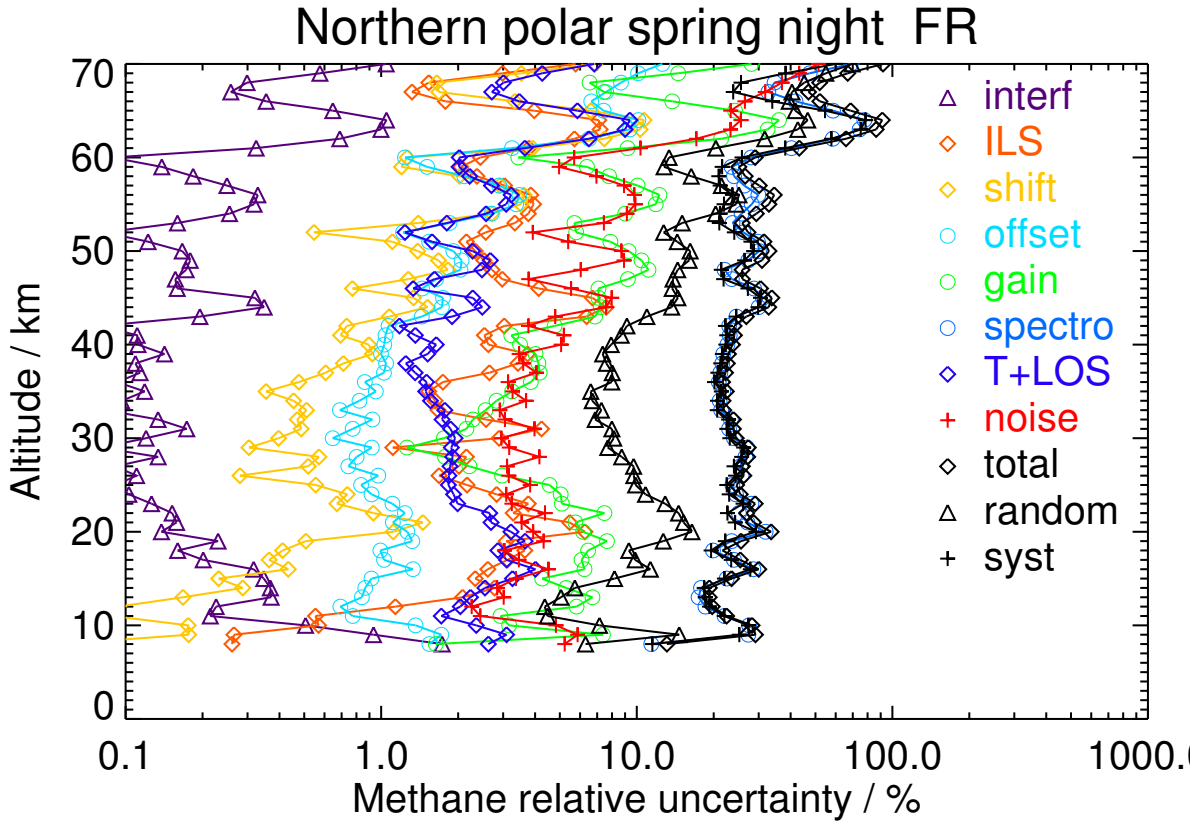

Figure S4. V8H_CH4_61 Northern polar spring night

Table S5. Methane error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1483.67	14.03	24.48	3.85	23.27	82.69	541.35	38.94	85.51	98.94	547.98	556.84
12	1719.14	4.23	17.28	1.85	12.34	62.74	402.75	28.21	42.16	104.65	397.79	411.33
15	1818.69	6.40	84.70	5.13	15.36	145.95	301.79	43.04	43.65	100.21	337.01	351.59
18	1518.70	1.63	45.50	3.05	11.08	93.13	341.80	38.13	36.91	101.06	346.85	361.28
21	1258.22	1.03	58.77	12.11	13.83	107.62	315.89	34.88	33.91	127.20	318.35	342.82
24	1160.48	0.98	26.06	4.84	10.79	66.70	285.40	23.56	32.07	83.74	285.12	297.17
27	1002.18	1.26	11.57	6.48	7.80	16.09	233.99	19.09	29.82	45.92	233.22	237.70
30	873.58	0.79	13.58	2.33	6.47	11.15	219.36	16.02	26.34	44.14	217.89	222.32
33	737.27	0.98	16.32	4.28	5.96	20.39	166.55	12.56	22.27	36.32	166.77	170.68
36	598.15	0.67	6.01	1.46	4.96	15.44	128.63	8.75	20.11	28.53	128.51	131.64
39	455.02	0.64	16.31	2.91	4.20	14.05	96.15	5.71	17.69	27.66	96.51	100.40
42	339.52	0.43	9.87	2.37	3.18	8.12	79.84	4.83	19.01	28.00	78.45	83.30
45	269.52	1.15	18.83	3.88	4.02	18.68	91.68	6.56	21.40	39.97	89.69	98.19
48	174.22	0.39	4.18	1.56	2.84	17.10	32.90	2.60	9.08	19.71	33.22	38.63
52	127.05	0.28	1.86	1.29	1.92	9.50	37.12	2.11	10.22	14.94	36.91	39.83
56	71.47	0.33	6.75	1.89	2.42	8.60	18.39	2.45	11.48	16.49	18.25	24.60
60	97.51	0.09	1.51	0.95	1.31	5.64	20.37	1.21	4.24	6.97	20.55	21.70
64	92.40	0.36	2.11	3.98	2.92	11.39	38.99	2.70	8.31	12.55	39.98	41.90
68	135.47	0.18	0.94	1.80	2.52	2.80	33.99	2.09	11.20	13.78	33.37	36.11

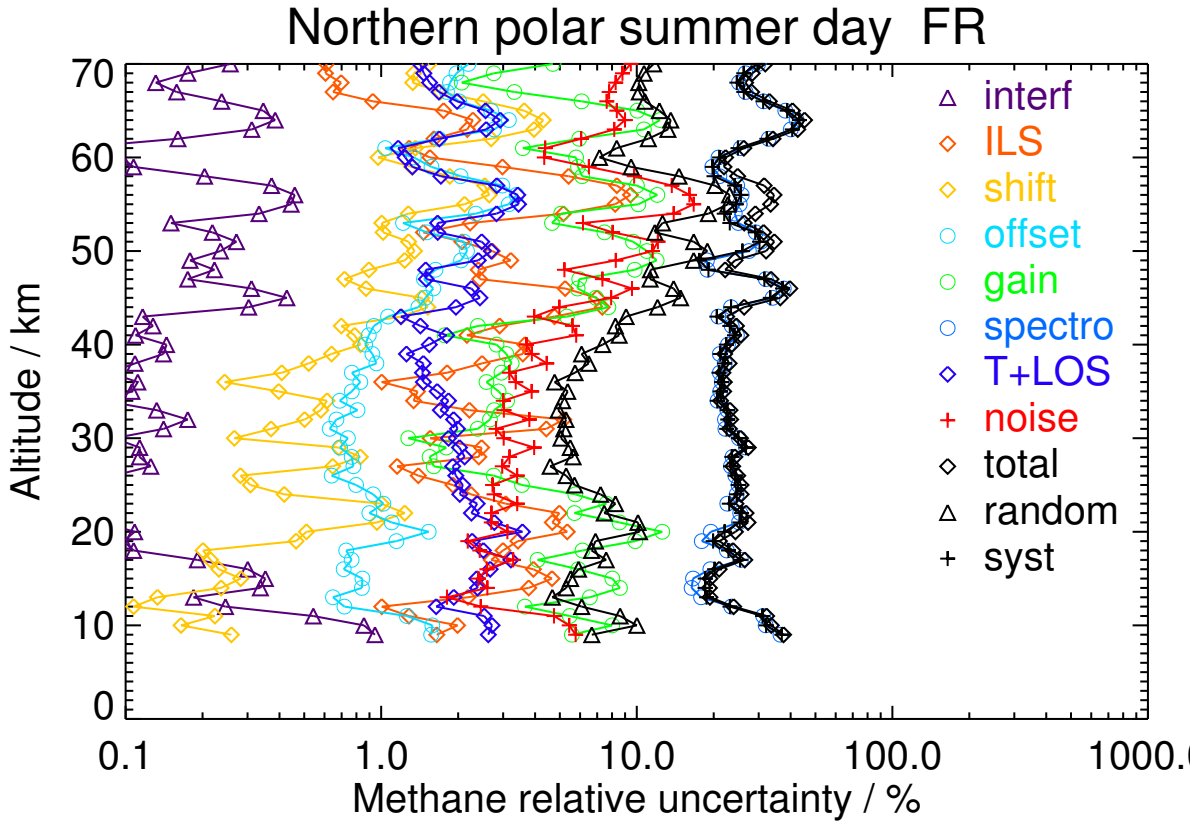

Figure S5. V8H_CH4_61 Northern polar summer day

Table S6. Methane error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1682.78	4.86	15.60	1.72	14.31	33.45	422.19	28.28	51.18	77.94	420.93	428.08
15	1829.03	6.41	72.26	3.73	14.46	125.23	296.89	37.83	42.37	95.06	321.72	335.47
18	1541.31	1.77	50.88	1.64	12.88	100.68	356.97	40.28	38.68	109.52	362.56	378.74
21	1285.91	1.26	33.10	7.37	13.64	99.29	306.82	33.68	36.55	103.33	311.65	328.33
24	1138.48	1.09	28.66	5.08	9.37	42.78	287.01	21.88	33.18	66.35	286.92	294.49
27	1006.12	1.35	9.72	3.89	8.13	13.34	238.65	19.22	31.37	43.72	238.22	242.20
30	828.93	0.85	8.69	2.16	6.96	7.88	220.94	16.35	27.83	39.02	220.28	223.71
33	667.11	1.14	16.86	3.45	6.28	18.02	156.54	12.20	22.98	31.18	157.70	160.75
36	554.33	0.72	5.93	1.58	5.19	13.52	125.08	8.49	21.03	28.97	124.77	128.09
39	424.77	0.45	15.66	3.05	4.51	18.00	92.99	6.01	19.28	27.46	94.34	98.25
42	257.77	0.47	10.70	1.95	3.67	6.57	74.57	5.77	21.11	27.22	73.98	78.83
45	200.07	0.61	18.78	2.31	4.11	21.89	61.16	6.17	21.68	32.30	63.72	71.44
48	117.27	0.16	1.09	1.08	1.23	4.45	25.29	1.32	6.60	11.88	23.81	26.61
52	100.21	0.20	1.16	1.16	1.88	7.71	26.06	1.56	8.58	11.92	26.05	28.65
56	89.06	0.26	3.61	1.67	2.19	7.20	26.24	2.09	10.29	15.52	25.11	29.52
60	121.66	0.08	1.66	1.10	1.42	5.15	26.80	1.75	5.16	11.02	25.68	27.94
64	127.99	0.43	0.99	3.06	2.73	9.26	49.30	2.71	8.52	13.03	49.44	51.13
68	171.35	0.28	2.53	2.20	3.64	4.20	48.20	3.86	16.38	19.30	47.71	51.46

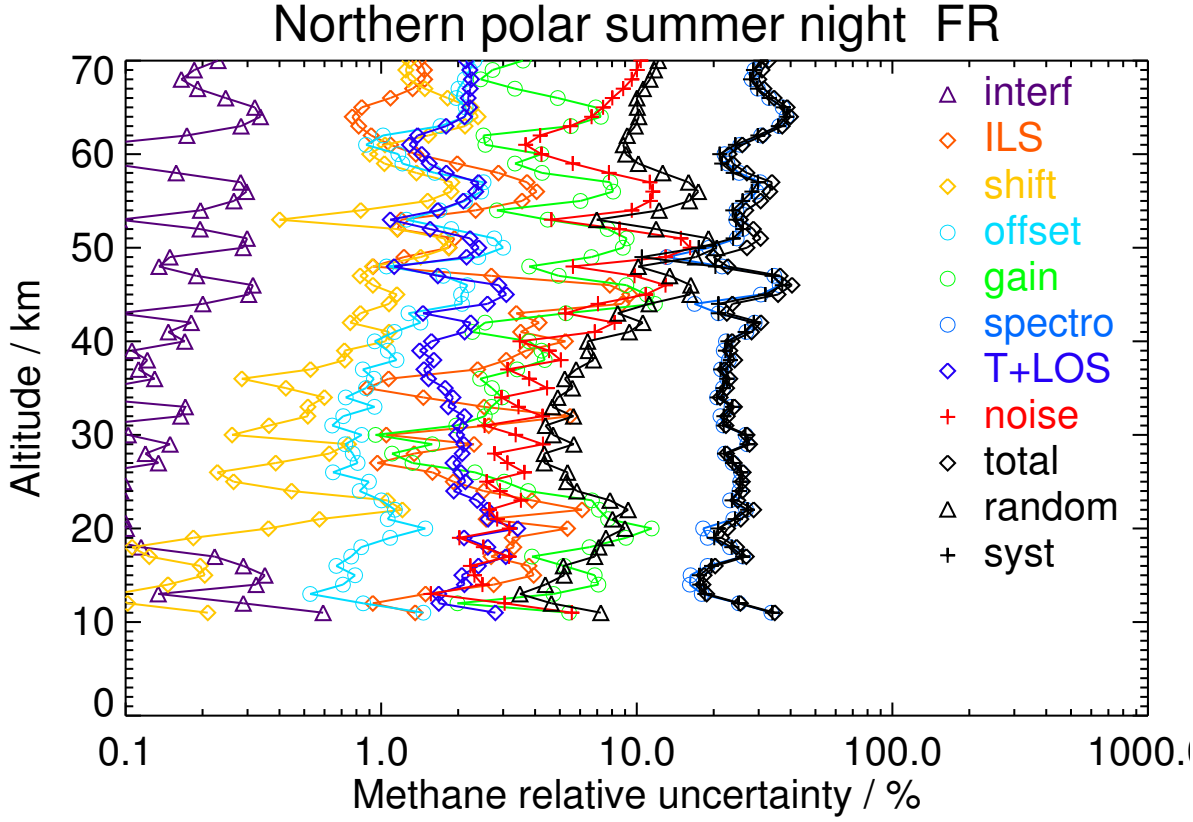

Figure S6. V8H_CH4_61 Northern polar summer night

Table S7. Methane error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1662.66	57.33	13.57	2.11	26.92	91.20	407.76	45.71	90.21	177.58	396.84	434.76
12	1736.73	23.77	24.29	2.51	14.62	78.44	388.11	31.74	49.64	113.89	385.56	402.03
15	1673.94	8.13	33.88	3.28	13.06	73.95	381.37	51.20	51.44	115.69	379.72	396.96
18	1626.56	3.87	119.74	8.24	14.38	136.46	305.45	70.28	49.82	153.22	332.41	366.02
21	1383.49	3.70	59.40	6.26	17.46	118.98	254.57	44.54	47.35	96.24	278.95	295.09
24	1196.60	1.40	24.34	10.64	13.99	86.79	244.64	26.28	41.29	74.30	255.26	265.86
27	936.08	0.99	14.24	6.28	8.92	43.77	214.37	19.24	37.25	59.78	215.35	223.49
30	732.59	0.99	8.44	2.60	7.30	20.62	178.73	17.04	33.15	53.41	176.17	184.09
33	522.52	0.41	7.80	1.76	6.11	12.20	130.47	13.04	27.42	44.18	127.45	134.89
36	326.79	0.27	6.65	1.90	4.83	8.39	82.83	7.46	22.75	38.20	78.21	87.04
39	186.78	0.29	6.28	1.25	3.47	9.44	49.94	4.33	17.96	34.66	42.14	54.56
42	100.96	0.25	4.42	1.21	2.71	8.04	38.74	3.04	14.70	33.29	26.66	42.65
45	142.18	0.23	4.58	0.77	3.13	12.07	35.45	3.68	10.53	25.63	30.01	39.47
48	190.65	0.15	4.34	1.58	3.35	13.77	49.87	3.39	9.24	25.46	46.45	52.97
52	209.34	0.19	5.88	1.14	3.17	11.05	50.13	2.90	10.46	19.47	49.19	52.91
56	160.68	0.18	5.57	1.75	2.54	6.94	40.97	2.78	7.99	19.66	38.11	42.88
60	118.92	0.10	1.53	0.82	2.01	3.57	29.64	2.00	8.02	15.64	26.87	31.09
64	65.27	0.17	1.35	1.18	2.01	4.79	24.85	2.02	7.00	16.16	20.97	26.47
68	40.62	0.11	0.80	0.74	4.10	4.04	17.17	1.36	17.42	21.40	13.27	25.19

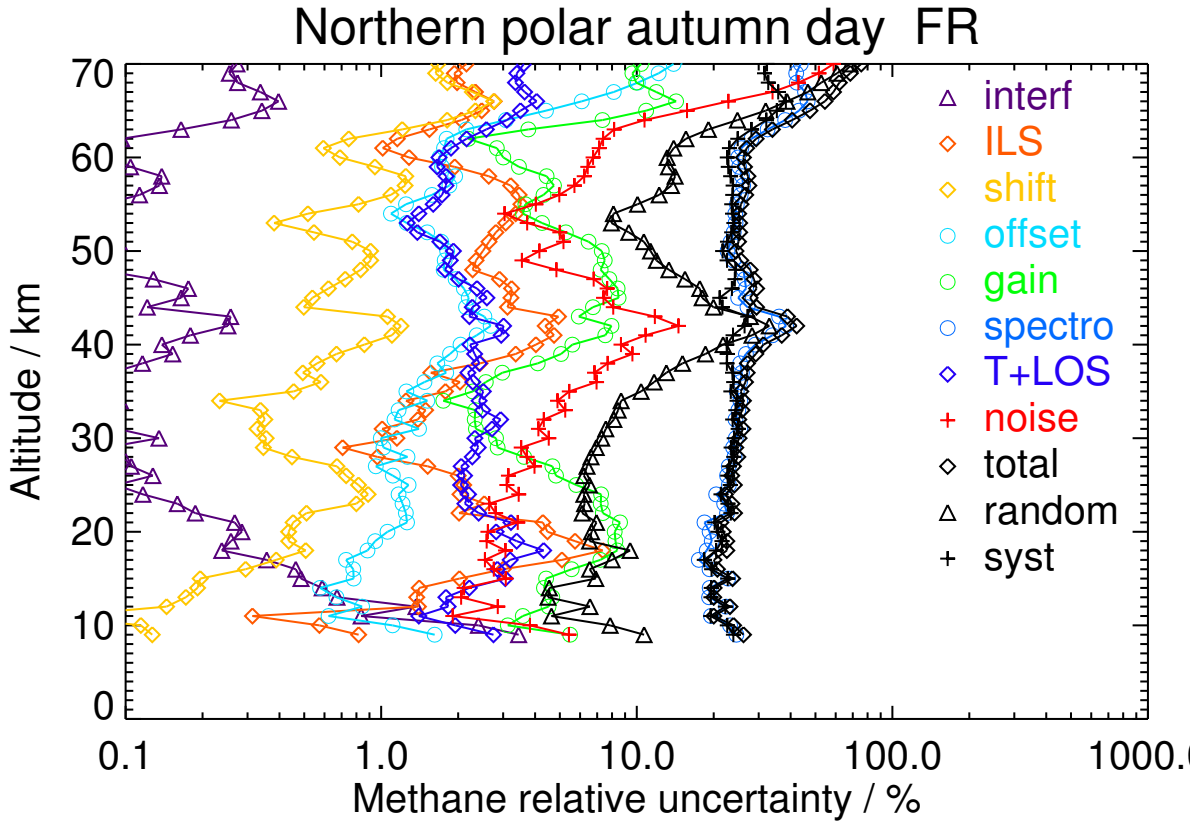

Figure S7. V8H_CH4_61 Northern polar autumn day

Table S8. Methane error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1679.29	68.89	14.11	2.30	27.52	95.18	438.83	47.60	94.50	165.86	437.07	467.48
12	1743.25	25.91	19.65	2.59	13.25	76.16	369.45	30.44	44.53	102.78	368.61	382.67
15	1531.94	8.06	33.55	3.37	12.69	56.16	353.46	50.62	50.86	108.90	350.34	366.88
18	1532.97	3.84	96.97	7.68	13.11	120.23	287.55	69.41	50.58	142.43	306.39	337.88
21	1401.98	4.45	61.79	6.26	17.95	120.05	274.43	43.57	45.33	99.37	296.65	312.85
24	1139.51	1.82	28.22	11.80	12.98	79.06	259.34	25.57	39.88	72.92	267.47	277.23
27	857.27	1.31	13.91	5.98	8.09	36.98	207.27	18.83	35.67	57.09	207.34	215.06
30	696.77	0.90	12.54	2.34	6.51	20.66	169.27	17.22	32.01	56.52	165.57	174.95
33	493.40	0.41	7.53	1.37	5.38	9.29	126.34	13.27	26.41	43.23	123.05	130.42
36	302.98	0.28	6.39	2.13	4.57	10.28	82.55	7.21	21.93	42.00	75.87	86.72
39	194.72	0.32	8.24	1.34	3.59	13.21	56.93	4.44	17.34	38.92	48.00	61.80
42	127.32	0.22	3.79	1.13	2.65	8.51	40.61	3.37	14.26	31.01	31.58	44.26
45	143.14	0.21	4.00	0.66	3.02	13.24	34.16	3.83	10.18	22.77	31.10	38.55
48	174.11	0.16	2.60	1.19	2.64	10.50	41.93	2.97	8.48	17.82	40.58	44.32
52	187.81	0.19	3.74	1.10	2.64	6.83	47.46	2.35	10.54	17.35	46.23	49.38
56	167.70	0.25	4.77	1.80	3.35	9.82	40.49	3.06	8.78	21.61	37.31	43.12
60	117.75	0.16	1.60	1.12	2.50	5.49	31.12	2.30	8.60	18.68	27.18	32.98
64	70.85	0.20	0.61	1.38	2.11	5.41	28.28	2.36	6.72	18.26	23.51	29.77
68	45.29	0.15	0.75	1.03	4.38	5.28	19.98	1.87	18.28	22.43	16.81	28.03

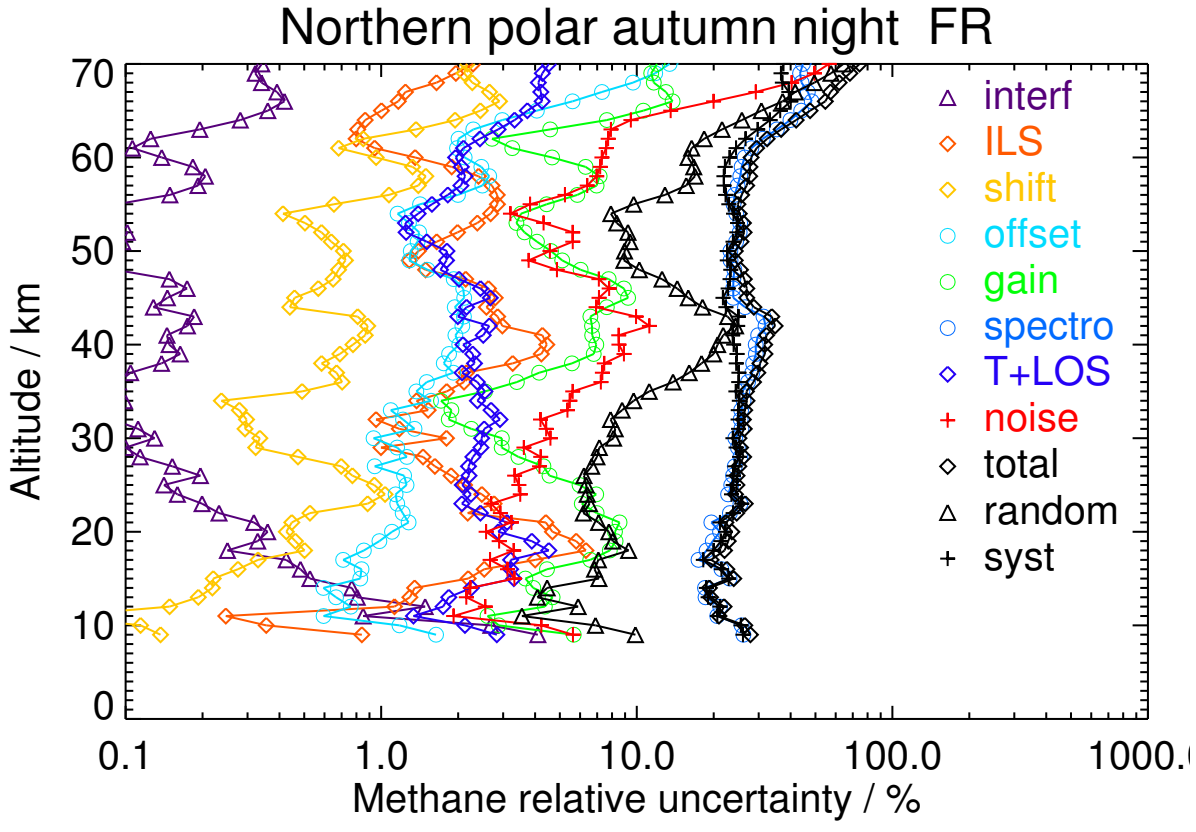

Figure S8. V8H_CH4_61 Northern polar autumn night

Table S9. Methane error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1791.17	22.02	2.59	0.52	23.52	45.04	228.08	38.90	71.66	116.24	219.62	248.48
12	1659.79	3.59	13.79	1.24	12.67	38.47	364.28	29.18	39.39	78.92	361.55	370.07
15	1578.68	5.37	51.59	6.03	14.36	63.91	313.87	41.12	44.87	102.38	314.25	330.51
18	1455.82	1.76	61.05	4.45	13.02	82.95	321.18	36.29	35.82	125.38	317.55	341.41
21	1269.47	1.46	51.80	11.24	15.07	88.68	322.32	29.09	33.21	121.13	319.48	341.68
24	1211.90	1.08	36.98	9.86	13.69	65.60	308.09	23.31	31.59	94.58	305.74	320.03
27	1094.83	1.13	14.91	2.69	11.04	29.45	255.79	20.81	31.13	76.13	249.51	260.87
30	1042.70	0.69	10.75	2.32	8.98	17.80	272.17	20.72	26.48	84.32	261.94	275.18
33	711.01	0.83	8.68	2.94	7.78	18.55	180.21	15.58	22.77	67.43	170.82	183.65
36	564.51	0.52	7.40	2.09	6.28	21.97	129.48	9.32	19.72	44.56	125.85	133.50
39	421.01	0.37	13.20	2.10	5.33	18.96	92.06	6.53	17.26	33.38	90.93	96.86
42	475.77	0.32	9.37	1.87	5.66	28.10	107.47	5.76	14.06	39.51	105.51	112.67
45	475.92	0.89	13.55	2.84	6.77	33.97	110.21	7.82	16.75	47.08	108.00	117.82
48	426.38	0.30	6.38	4.39	5.74	29.10	97.38	7.84	11.21	43.60	93.32	103.01
52	310.88	0.21	8.94	2.69	4.39	17.15	70.11	5.61	8.61	28.87	67.74	73.63
56	170.70	0.41	6.24	5.22	5.68	21.84	60.18	6.77	12.52	37.18	54.94	66.33
60	182.11	0.10	2.12	1.39	1.78	3.69	39.29	3.79	8.46	15.74	37.48	40.65
64	64.45	0.36	2.52	3.42	4.85	16.34	41.27	4.65	12.16	28.41	37.07	46.71
68	49.23	0.16	1.52	1.41	4.72	8.05	24.87	2.45	20.30	27.35	19.49	33.59

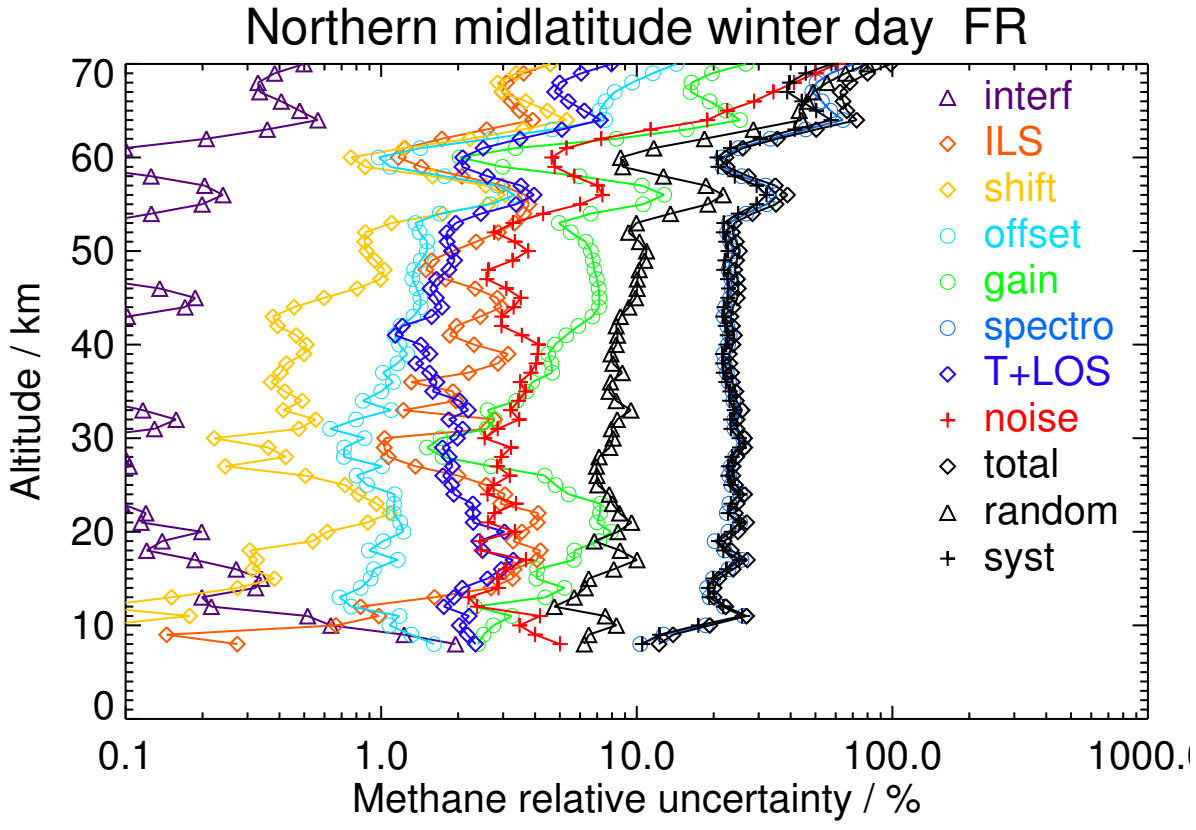

Figure S9. V8H_CH4_61 Northern midlatitude winter day

Table S10. Methane error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1718.86	24.53	5.91	1.26	24.43	50.44	290.17	38.75	79.18	156.79	266.77	309.44
12	1633.11	4.85	19.65	1.47	12.70	49.36	377.12	28.30	43.66	117.53	366.23	384.63
15	1522.66	5.34	49.26	6.02	14.10	70.35	311.68	36.94	45.17	127.53	303.19	328.92
18	1358.87	2.07	43.61	4.43	12.51	61.51	363.01	41.80	40.61	157.76	340.81	375.55
21	1249.45	2.28	37.54	6.20	11.52	65.01	323.61	30.79	36.64	113.07	316.29	335.90
24	1249.32	0.99	37.18	8.40	12.75	77.44	312.47	24.18	33.49	102.81	310.46	327.04
27	1216.92	0.98	22.89	2.10	10.13	48.11	279.81	18.57	31.20	76.47	276.97	287.33
30	1141.06	0.91	9.81	2.30	8.49	19.22	290.37	19.12	29.10	74.15	283.85	293.38
33	884.86	1.01	14.62	4.04	7.60	22.03	206.54	15.14	24.86	61.08	201.37	210.43
36	586.62	0.44	9.57	1.58	6.09	19.45	137.71	9.45	20.22	44.33	134.19	141.32
39	425.13	0.37	12.41	2.29	5.14	17.58	97.71	6.03	16.90	36.73	94.95	101.80
42	410.47	0.37	8.20	1.96	5.36	25.61	102.12	5.00	14.70	35.73	100.74	106.89
45	407.01	0.74	13.48	1.84	4.82	22.65	95.30	6.60	16.37	30.07	95.98	100.58
48	348.41	0.22	4.70	2.67	3.78	18.20	80.06	5.11	9.03	28.14	78.11	83.02
52	271.01	0.18	7.75	1.44	3.59	14.58	64.02	4.15	7.75	23.24	62.64	66.81
56	215.53	0.41	4.49	4.20	5.16	16.86	58.09	5.54	12.92	26.56	56.71	62.62
60	187.36	0.15	2.17	1.29	2.35	4.02	45.59	4.21	10.36	16.83	44.13	47.24
64	129.51	0.25	2.34	2.07	3.29	8.31	39.03	4.02	11.78	18.37	37.82	42.05
68	82.48	0.15	1.72	1.56	5.18	6.41	27.98	3.30	23.05	27.88	24.92	37.39

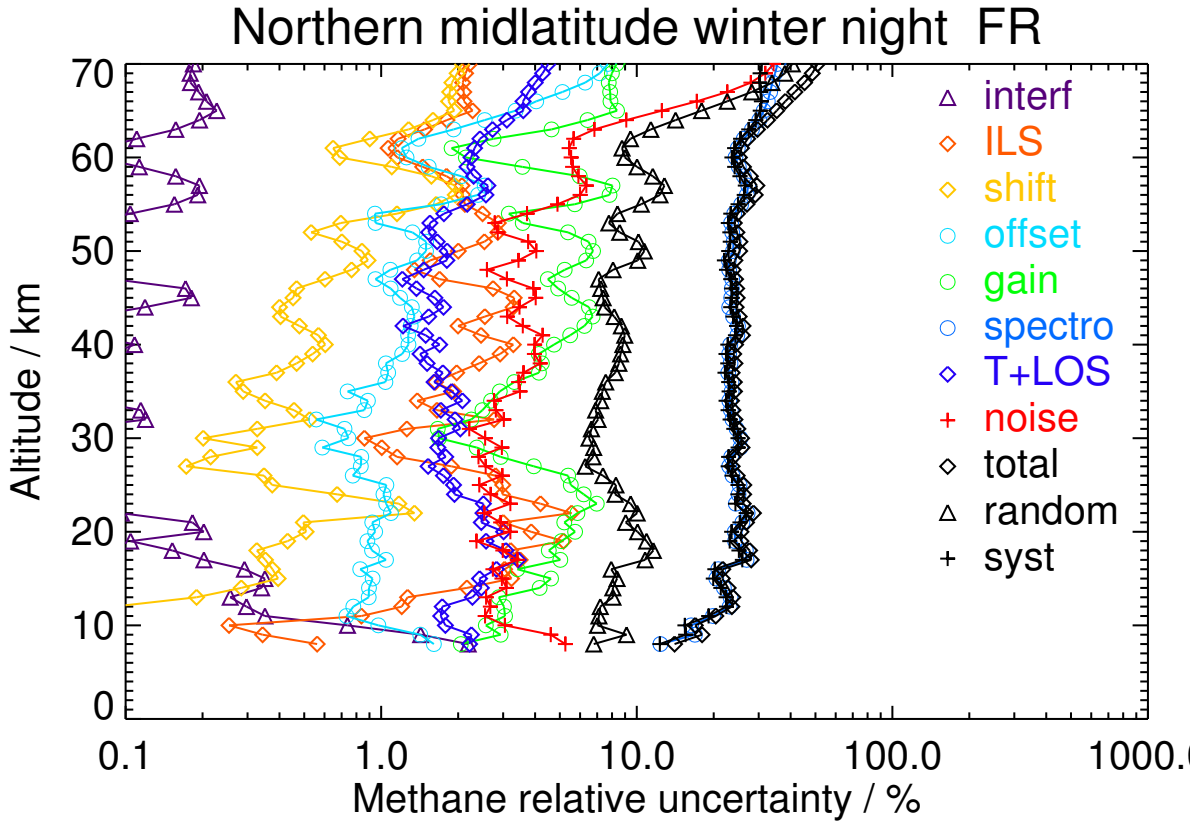

Figure S10. V8H_CH4_61 Northern midlatitude winter night

Table S11. Methane error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1441.39	12.80	17.28	2.31	29.00	122.43	412.24	50.10	96.57	137.53	423.28	445.06
12	1746.35	4.05	26.69	1.35	12.55	97.81	333.35	34.28	39.07	80.53	343.21	352.53
15	1572.31	4.23	42.12	3.24	13.12	55.65	351.20	47.24	46.80	105.71	348.80	364.47
18	1573.78	2.40	101.25	6.28	18.83	145.42	298.94	54.37	38.61	137.09	326.83	354.41
21	1209.87	2.10	46.76	12.82	16.18	97.86	267.54	31.54	35.83	125.70	265.05	293.35
24	1152.54	1.20	30.56	7.33	10.71	52.76	272.12	24.28	34.43	99.91	264.06	282.33
27	1030.76	1.12	15.55	5.45	8.04	17.37	248.32	20.27	32.69	70.61	242.48	252.55
30	907.29	1.44	31.81	3.47	6.51	21.01	226.52	19.57	29.55	60.98	224.41	232.55
33	814.31	0.89	19.28	4.88	6.10	22.90	174.33	14.80	25.06	46.35	173.34	179.43
36	695.15	0.67	6.98	3.27	5.35	21.42	143.72	10.05	21.61	44.84	140.57	147.55
39	568.41	0.63	10.30	4.72	5.08	15.72	122.49	8.02	19.77	42.39	118.59	125.94
42	476.90	0.36	16.72	2.65	5.09	25.19	107.59	6.07	13.51	40.28	105.44	112.88
45	432.53	0.77	19.14	2.07	6.42	36.80	120.94	6.77	16.65	46.09	120.80	129.29
48	391.98	0.43	13.73	5.21	6.82	43.08	100.28	9.37	15.91	54.48	97.71	111.87
52	229.98	0.19	6.60	2.45	3.18	13.68	53.10	4.13	8.67	28.28	48.57	56.21
56	176.19	0.30	7.44	3.39	3.36	14.41	39.15	4.13	10.90	27.74	34.42	44.21
60	105.45	0.17	2.86	3.43	2.76	9.49	34.85	3.54	7.49	16.61	33.54	37.43
64	37.72	0.31	1.94	4.54	4.48	18.26	30.65	3.95	8.12	18.20	32.68	37.41
68	46.81	0.13	0.90	0.94	2.45	4.83	14.33	1.33	10.04	13.28	12.75	18.41

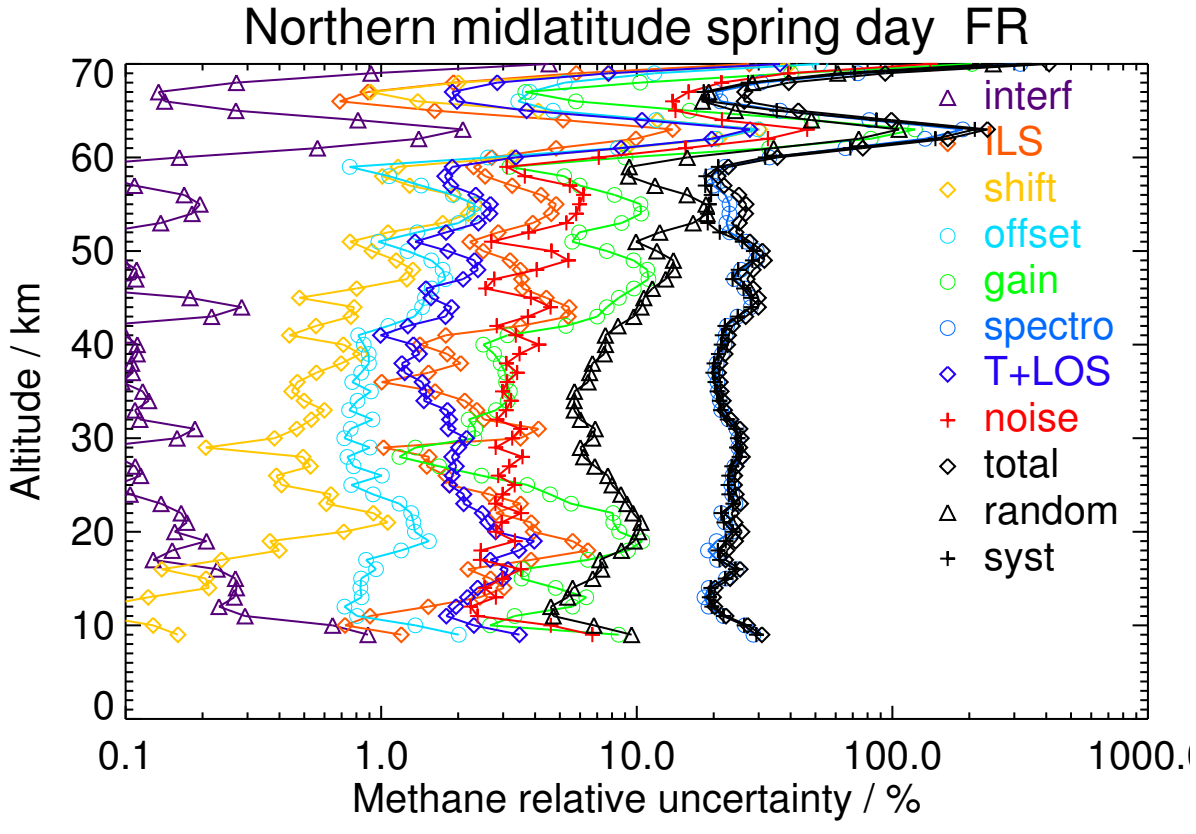

Figure S11. V8H_CH4_61 Northern midlatitude spring day

Table S12. Methane error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1570.98	13.29	12.27	3.39	27.30	67.74	513.48	50.86	94.51	112.08	517.96	529.95
12	1735.09	2.98	22.42	1.36	11.19	98.06	303.41	31.97	33.65	72.30	315.02	323.21
15	1591.03	4.72	50.72	3.18	13.14	75.39	321.82	45.76	44.93	108.38	323.10	340.79
18	1424.55	1.96	57.75	6.18	12.82	97.64	274.40	35.49	32.94	117.35	277.39	301.19
21	1146.16	2.07	60.31	13.57	14.58	85.53	282.40	28.58	33.05	136.19	272.89	304.99
24	1172.14	1.38	28.59	4.23	9.57	36.51	277.06	21.57	31.24	80.27	272.07	283.67
27	1121.05	1.29	15.17	7.38	8.06	16.27	272.04	20.80	30.27	51.92	270.69	275.63
30	1011.45	1.21	28.16	3.98	6.11	20.25	239.40	19.48	25.78	49.47	239.10	244.16
33	884.23	0.84	15.16	4.77	5.97	19.75	192.65	15.52	23.09	50.96	189.65	196.38
36	725.01	0.47	6.71	3.14	5.61	23.72	148.00	10.13	20.36	39.08	146.78	151.89
39	579.45	0.58	15.36	4.68	4.85	16.29	127.71	8.18	18.44	34.48	126.79	131.39
42	474.28	0.30	14.50	3.06	5.04	25.95	108.33	5.29	12.75	32.68	108.52	113.33
45	399.72	1.01	17.68	2.48	5.44	27.15	96.99	6.37	17.52	33.99	98.41	104.12
48	340.30	0.36	5.04	5.12	4.59	27.45	74.42	6.73	13.23	29.97	75.41	81.15
52	238.20	0.15	6.57	1.62	2.68	11.02	54.02	3.34	7.01	19.70	52.58	56.15
56	191.56	0.45	6.75	4.93	4.34	17.21	49.54	4.93	11.21	31.03	45.02	54.68
60	138.28	0.14	2.43	2.66	1.95	6.14	39.62	3.11	6.05	16.77	37.27	40.87
64	67.38	0.33	1.59	4.21	4.40	17.42	35.18	4.26	8.60	18.55	36.45	40.90
68	49.47	0.13	1.21	0.91	2.88	4.85	17.59	1.78	11.97	16.06	15.24	22.14

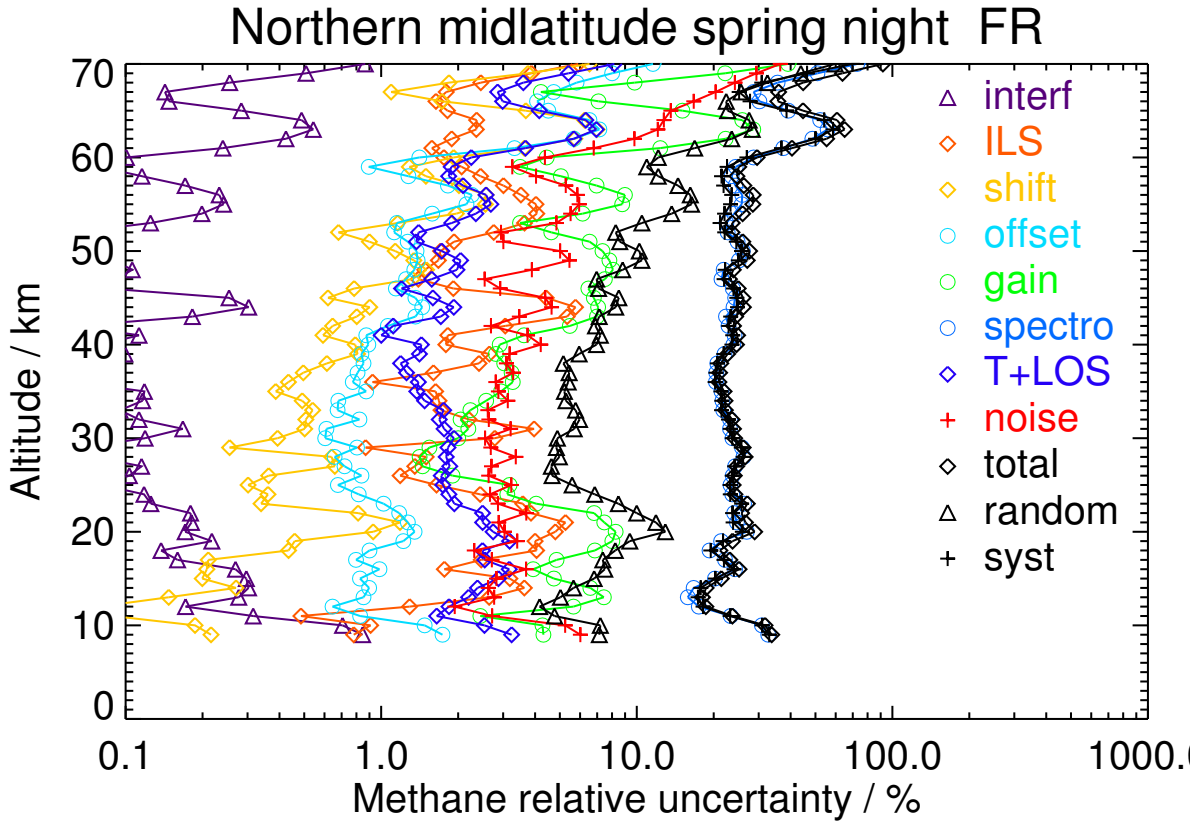

Figure S12. V8H_CH4_61 Northern midlatitude spring night

Table S13. Methane error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1773.55	5.43	31.62	1.34	14.27	70.88	405.90	34.42	43.00	86.48	408.13	417.19
15	1871.56	6.35	109.60	4.59	19.17	111.79	364.53	53.69	52.82	119.14	386.39	404.34
18	1677.58	2.63	30.85	3.96	13.65	76.17	368.34	38.84	41.52	94.60	370.03	381.93
21	1257.18	2.14	71.22	8.62	13.60	45.23	329.16	33.18	36.47	83.62	333.42	343.75
24	1143.28	1.56	38.72	4.02	11.08	21.17	284.76	23.34	31.95	52.65	286.30	291.10
27	1076.34	1.42	5.76	6.13	9.53	12.01	241.69	20.97	30.13	44.92	240.94	245.09
30	1017.06	0.65	11.72	2.81	7.55	16.74	251.31	19.25	25.07	42.85	250.61	254.24
33	794.80	0.97	10.16	4.33	6.61	15.27	184.04	14.57	21.27	38.06	182.99	186.91
36	682.99	0.69	7.64	2.36	5.41	14.07	148.44	10.05	19.15	32.81	147.36	150.97
39	551.37	0.71	17.14	3.08	4.50	12.90	111.75	6.91	16.14	27.42	111.96	115.27
42	431.64	0.31	14.28	2.76	4.32	23.04	110.50	4.35	14.38	37.51	108.58	114.87
45	354.42	1.04	23.32	3.01	6.23	36.09	109.13	7.72	21.20	46.47	110.25	119.64
48	264.71	0.36	4.95	3.17	4.30	27.25	62.52	4.80	11.15	40.74	56.50	69.66
52	213.46	0.18	3.58	1.32	2.80	13.50	56.69	2.64	5.80	27.97	51.73	58.81
56	172.62	0.39	5.06	3.49	3.17	12.33	50.06	4.06	11.55	26.01	46.68	53.44
60	190.86	0.12	3.44	2.64	1.28	3.80	46.42	2.93	5.62	18.32	43.53	47.23
64	161.22	0.26	1.07	2.79	3.54	12.51	51.29	2.96	9.66	18.58	50.65	53.95
68	167.89	0.16	1.83	1.73	3.66	4.92	44.20	2.96	16.47	21.45	42.64	47.73

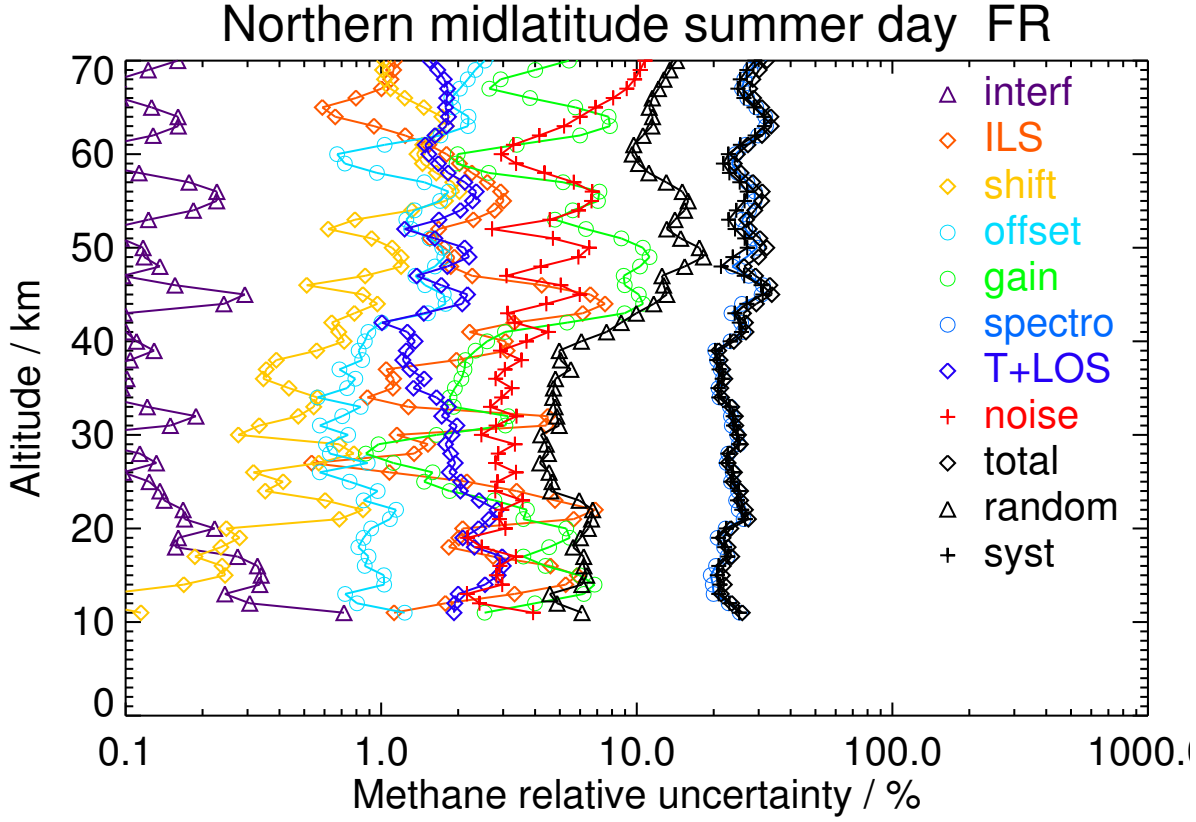

Figure S13. V8H_CH4_61 Northern midlatitude summer day

Table S14. Methane error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1791.40	7.53	20.34	1.09	16.51	46.52	421.02	34.65	51.11	86.10	420.20	428.93
15	1890.44	6.78	87.67	2.93	17.20	112.69	298.34	48.71	51.16	111.83	319.72	338.72
18	1599.47	3.32	32.69	3.08	12.63	55.32	348.62	40.40	43.53	92.44	347.60	359.68
21	1227.12	2.53	53.22	4.16	10.40	19.11	314.80	28.87	36.34	60.66	317.65	323.39
24	1096.50	1.62	36.78	1.78	9.47	17.55	273.06	21.92	32.49	47.03	275.03	279.02
27	1102.36	1.49	5.84	3.83	8.41	11.31	247.73	19.17	30.32	42.59	247.17	250.81
30	954.35	0.65	5.78	2.00	7.22	14.34	250.07	17.11	26.46	42.76	248.99	252.64
33	824.06	1.07	13.74	4.53	6.60	16.77	193.32	13.50	22.20	35.53	193.18	196.42
36	674.28	0.84	6.00	1.53	5.39	10.73	152.99	9.59	20.20	30.63	152.15	155.20
39	538.38	0.37	15.80	2.73	4.48	12.71	117.18	6.51	17.89	26.60	117.58	120.55
42	417.87	0.46	7.73	2.41	3.46	13.63	104.34	4.05	17.11	30.93	102.48	107.05
45	372.21	1.03	18.18	2.77	5.62	34.23	90.39	8.17	19.92	39.58	92.79	100.88
48	298.70	0.21	4.25	3.55	3.00	20.27	72.68	3.93	7.92	39.66	65.10	76.23
52	225.56	0.13	4.70	1.01	2.45	10.95	56.71	2.75	6.56	23.06	53.71	58.45
56	189.71	0.32	5.34	3.83	2.97	11.51	48.92	4.22	11.06	22.87	46.85	52.14
60	200.96	0.14	2.29	2.69	1.56	3.81	49.23	3.68	7.31	17.21	47.16	50.20
64	186.49	0.29	1.67	2.39	3.43	11.10	57.31	3.54	9.67	16.32	57.16	59.44
68	182.52	0.18	3.10	1.64	4.59	6.26	52.17	4.77	20.43	24.88	51.14	56.87

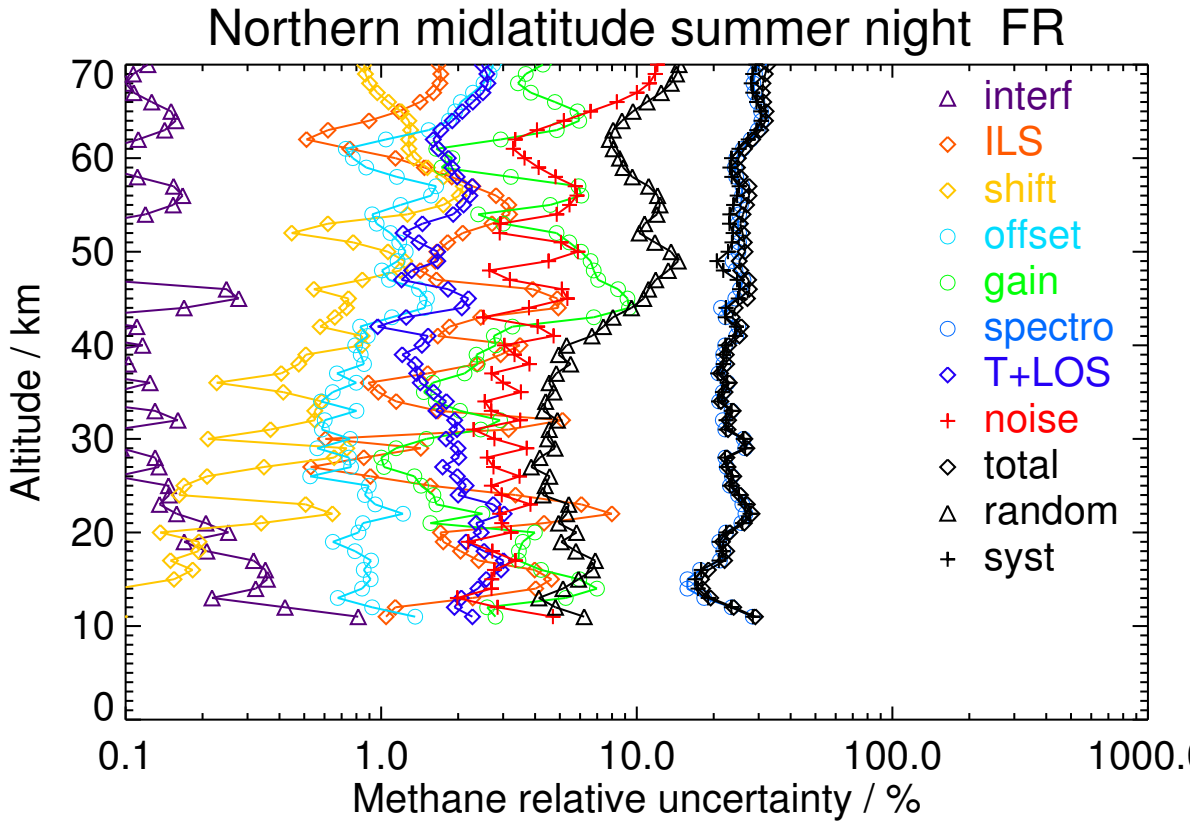

Figure S14. V8H_CH4_61 Northern midlatitude summer night

Table S15. Methane error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1821.12	8.29	38.44	1.50	21.32	50.56	428.91	37.92	62.07	103.30	427.96	440.25
15	1906.00	5.80	76.63	3.26	17.91	102.87	362.28	48.39	56.62	122.77	372.21	391.93
18	1599.35	3.43	106.27	3.69	16.23	101.20	332.26	59.30	47.06	172.04	329.17	371.41
21	1257.58	2.51	64.07	4.37	13.69	61.35	307.78	37.17	43.29	123.40	301.39	325.68
24	1099.64	1.20	54.78	4.52	9.25	26.76	274.79	23.73	37.87	67.25	277.15	285.19
27	1031.16	1.15	21.47	2.37	8.20	13.39	246.36	17.93	32.79	52.94	244.95	250.61
30	988.98	1.06	14.45	2.05	7.61	16.02	251.96	16.49	29.19	56.61	248.86	255.22
33	870.49	0.97	18.11	4.08	6.95	20.82	201.26	12.92	23.97	51.82	198.46	205.12
36	733.56	0.59	4.17	2.14	5.98	18.02	159.11	9.23	21.09	37.98	157.43	161.95
39	661.51	0.46	11.53	4.10	5.41	18.31	129.01	7.36	19.15	35.15	127.85	132.59
42	553.29	0.28	6.79	3.64	4.34	16.43	123.80	5.07	16.41	33.62	121.82	126.37
45	512.22	0.66	13.12	1.37	6.11	33.37	122.65	7.79	14.65	37.71	123.37	129.01
48	460.31	0.20	4.72	6.27	6.84	37.46	110.82	9.05	10.45	39.41	111.49	118.25
52	417.60	0.17	10.81	2.38	5.99	27.08	91.13	5.71	9.01	28.75	92.10	96.49
56	273.24	0.34	9.64	4.65	4.47	12.20	84.27	5.73	11.16	22.59	83.86	86.85
60	267.80	0.16	2.93	2.58	2.17	3.37	59.78	5.54	9.04	13.88	59.37	60.97
64	153.21	0.24	1.25	2.61	4.15	12.43	52.30	4.81	9.62	16.33	52.58	55.06
68	114.63	0.09	1.30	1.09	4.72	6.23	34.45	3.37	20.24	23.10	33.74	40.89

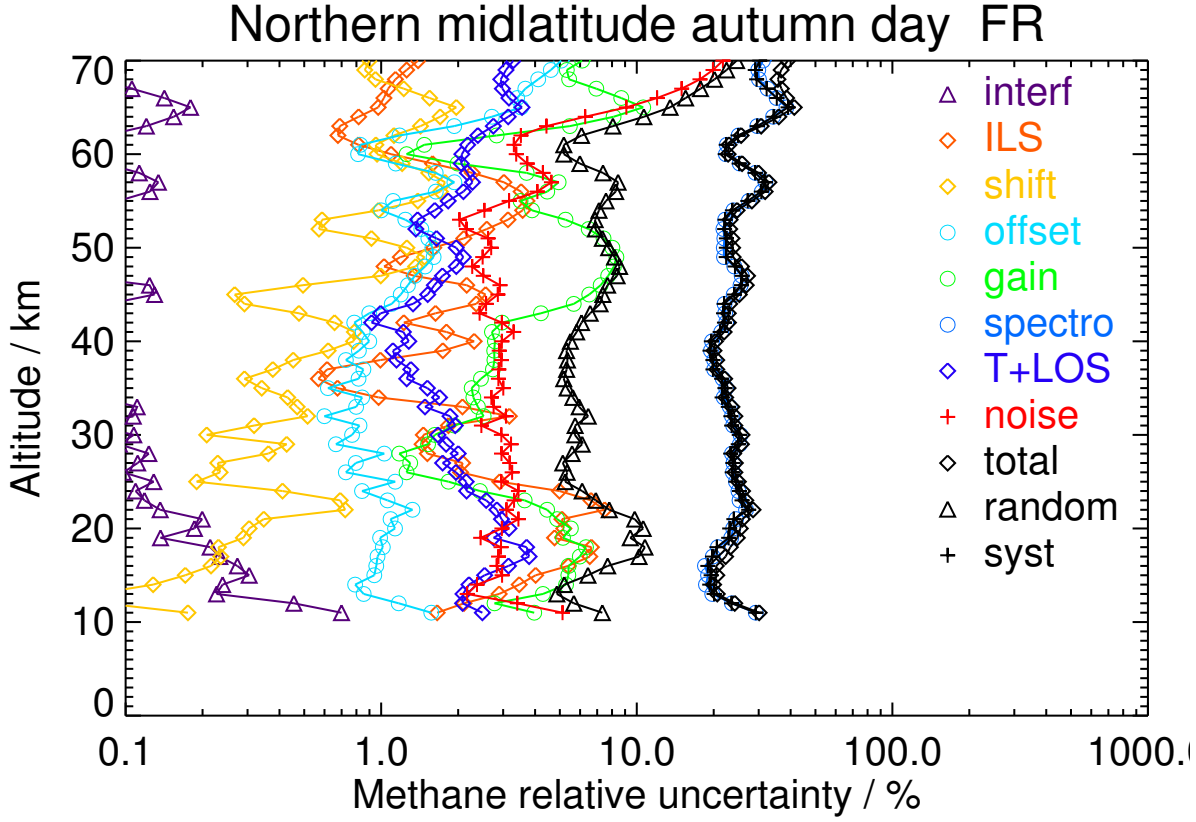

Figure S15. V8H_CH4_61 Northern midlatitude autumn day

Table S16. Methane error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1635.24	16.60	4.51	1.01	27.81	98.55	501.80	43.60	90.15	119.36	508.30	522.12
12	1810.93	5.72	27.32	2.26	16.53	94.26	395.73	34.50	48.44	126.57	392.51	412.41
15	1795.28	4.79	49.16	3.90	14.61	98.51	342.68	46.23	52.67	118.12	347.51	367.03
18	1680.03	2.66	117.99	5.80	16.95	130.45	329.15	61.03	46.50	174.43	339.22	381.44
21	1315.79	2.41	76.02	5.18	17.00	101.74	304.41	43.40	43.16	151.40	299.90	335.95
24	1176.88	1.09	61.32	8.38	11.89	60.41	282.31	27.11	38.44	93.44	284.26	299.22
27	1040.27	1.02	27.68	3.83	8.56	23.72	258.09	19.60	34.68	64.14	255.93	263.84
30	973.08	1.27	22.67	1.91	7.31	20.91	248.40	18.69	31.05	63.10	245.04	253.03
33	836.20	0.79	14.34	3.65	6.21	16.85	193.11	14.14	25.35	52.82	189.43	196.66
36	696.31	0.53	8.63	2.64	5.44	18.61	157.86	9.71	21.46	47.42	153.90	161.04
39	578.97	0.51	15.42	3.56	5.37	22.63	132.91	6.98	18.91	47.58	128.83	137.34
42	481.50	0.28	11.60	2.87	4.63	20.96	122.06	5.61	17.19	50.48	115.25	125.82
45	415.57	0.59	16.26	1.57	6.23	34.62	103.71	7.87	14.57	52.06	99.11	111.95
48	363.60	0.24	6.37	3.66	5.19	30.48	95.11	6.36	9.26	44.56	90.54	100.91
52	337.59	0.21	6.47	1.81	5.17	23.94	82.23	4.89	8.53	33.01	80.08	86.62
56	278.91	0.37	5.98	3.80	3.79	10.68	71.82	5.04	11.19	22.90	70.45	74.08
60	238.27	0.21	1.89	2.27	2.66	4.92	58.43	4.75	9.66	15.00	57.84	59.75
64	170.37	0.24	1.49	2.29	3.53	10.78	49.52	4.46	9.48	17.69	48.84	51.95
68	119.25	0.12	1.86	1.27	4.97	6.81	37.28	4.03	21.17	25.28	35.94	43.94

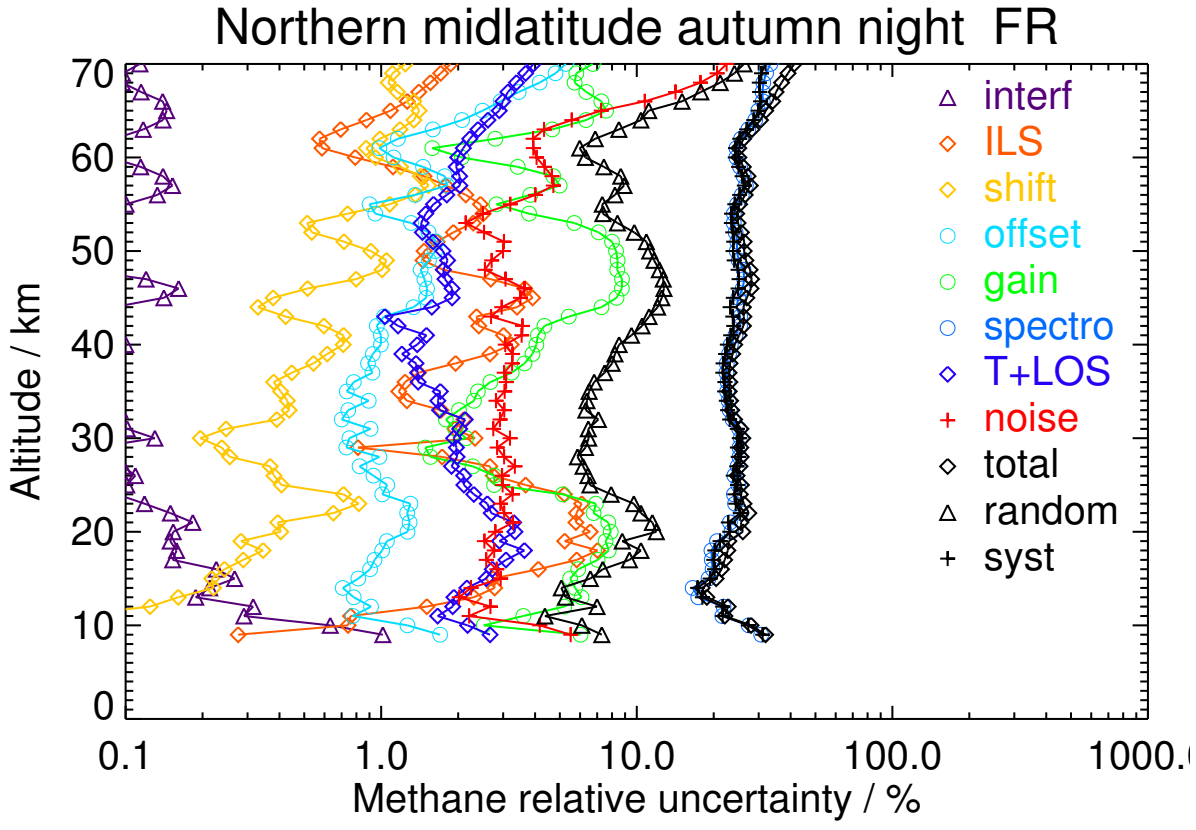

Figure S16. V8H_CH4_61 Northern midlatitude autumn night

Table S17. Methane error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1904.76	4.35	50.15	8.97	12.79	96.16	356.48	38.44	47.75	100.31	364.42	377.97
15	1890.71	10.30	115.31	13.27	21.87	66.73	358.81	60.05	60.95	109.09	377.72	393.16
18	1778.17	5.92	88.75	13.27	22.42	49.83	369.23	61.04	60.66	126.01	372.74	393.46
21	1620.31	2.81	31.56	5.81	19.57	24.18	379.91	42.07	48.36	81.59	379.20	387.87
24	1608.92	1.36	32.41	7.01	13.25	34.05	369.66	29.82	38.96	60.99	371.17	376.15
27	1467.06	1.10	18.31	7.59	9.97	20.19	352.29	26.25	35.44	59.06	351.38	356.31
30	1476.20	1.41	39.10	3.99	7.54	40.96	362.91	25.07	30.00	59.40	364.67	369.48
33	1324.19	1.54	28.02	7.17	6.95	32.28	284.82	19.92	26.88	51.64	285.49	290.12
36	1157.37	0.74	11.80	6.90	6.03	23.18	227.30	13.63	23.85	42.06	226.74	230.61
39	877.30	0.56	16.78	5.53	5.36	13.16	188.27	10.86	22.52	36.55	187.74	191.27
42	712.50	0.93	34.44	5.31	9.41	50.29	165.97	9.51	15.66	46.68	171.85	178.08
45	552.56	0.66	22.37	2.56	8.17	48.73	137.31	8.42	14.05	35.47	144.27	148.56
48	440.22	0.24	8.29	5.14	6.37	39.39	111.08	8.20	15.12	44.97	110.91	119.68
52	320.11	0.27	5.67	1.95	3.70	16.48	71.82	5.32	10.31	28.28	69.38	74.92
56	242.32	0.32	4.96	3.79	3.14	11.69	59.51	4.50	9.86	21.20	58.27	62.01
60	202.06	0.11	5.83	3.71	2.64	9.98	54.04	4.03	6.23	13.65	54.25	55.94
64	177.72	0.14	1.40	3.11	2.95	8.90	49.76	3.52	9.34	15.01	49.50	51.73
68	163.07	0.16	2.45	2.22	3.03	6.29	43.88	3.60	12.83	17.32	43.16	46.51

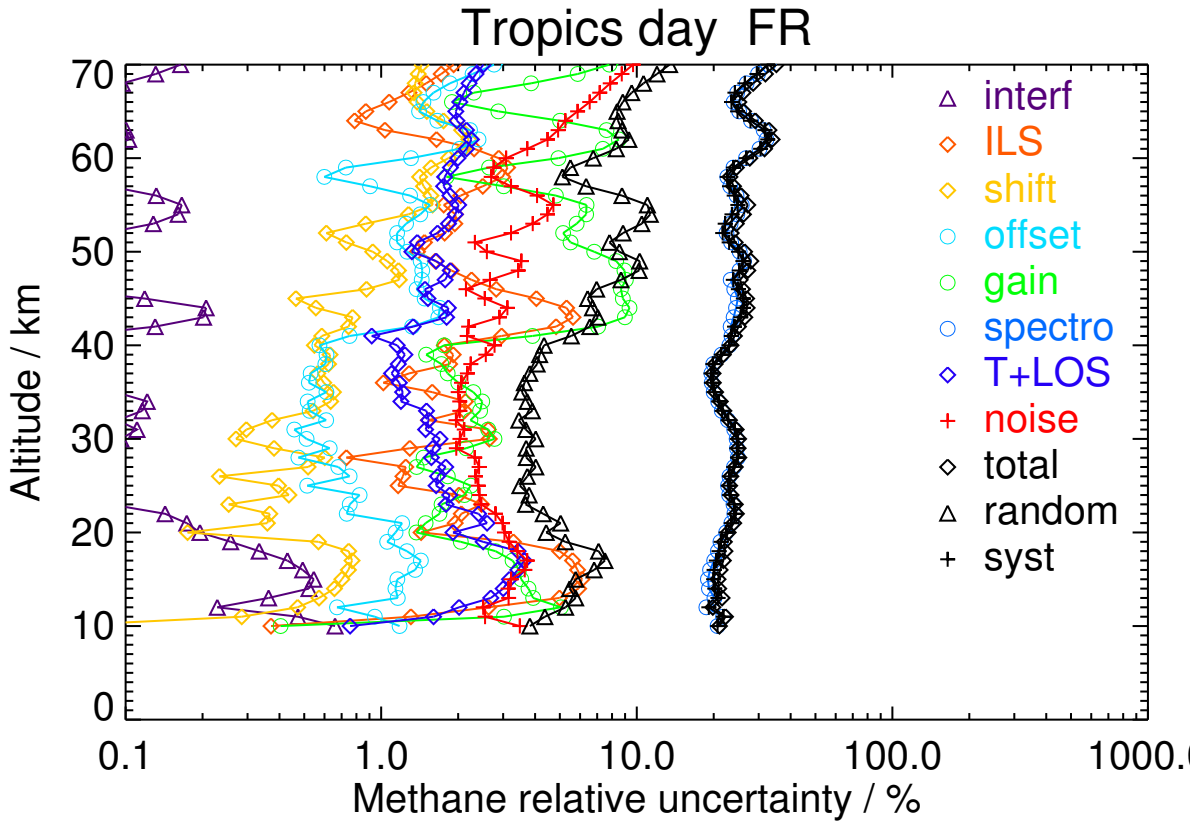

Figure S17. V8H_CH4_61 Tropics day

Table S18. Methane error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1907.14	5.67	13.47	5.14	10.87	112.17	332.93	32.20	50.18	102.53	341.79	356.84
15	1858.51	9.80	73.03	16.37	19.67	61.16	359.50	50.00	56.88	122.78	360.17	380.53
18	1840.00	6.38	65.59	16.94	23.51	51.36	386.78	56.51	61.45	116.79	388.26	405.45
21	1655.19	3.17	28.96	8.71	20.31	23.23	395.88	41.72	49.85	77.21	396.06	403.51
24	1638.57	1.43	16.56	6.74	13.68	33.32	375.42	30.27	39.03	58.82	376.22	380.79
27	1527.71	1.06	9.85	8.88	9.92	27.25	356.06	26.71	33.98	53.60	356.08	360.09
30	1536.44	1.39	40.69	4.37	7.38	41.76	374.65	25.98	28.49	53.98	377.37	381.21
33	1363.96	1.51	18.60	8.17	6.69	29.22	286.42	19.66	26.16	44.82	287.07	290.55
36	1215.49	0.70	14.13	6.45	6.54	27.60	234.74	14.02	23.26	40.37	235.07	238.51
39	906.40	0.57	22.31	5.04	5.67	14.42	191.11	11.47	21.64	35.25	191.42	194.64
42	688.11	0.40	23.97	4.56	6.65	39.52	159.37	7.35	14.21	36.82	162.79	166.90
45	534.21	0.87	18.31	2.79	8.19	48.53	129.16	9.19	16.61	32.09	137.04	140.75
48	404.92	0.31	9.31	5.08	5.46	34.23	95.31	7.31	13.94	41.44	94.49	103.18
52	283.91	0.15	8.60	1.99	2.04	6.91	64.80	4.99	8.60	16.51	64.46	66.54
56	230.91	0.25	9.10	3.55	2.50	9.80	53.34	5.03	9.86	19.96	52.61	56.27
60	201.14	0.10	3.06	3.63	2.06	6.37	50.85	3.76	6.15	10.96	50.84	52.01
64	179.12	0.20	2.50	3.60	4.12	13.81	50.89	4.05	9.54	14.52	52.09	54.07
68	165.73	0.16	2.05	1.78	3.34	6.23	42.90	4.04	14.15	16.46	42.94	45.98

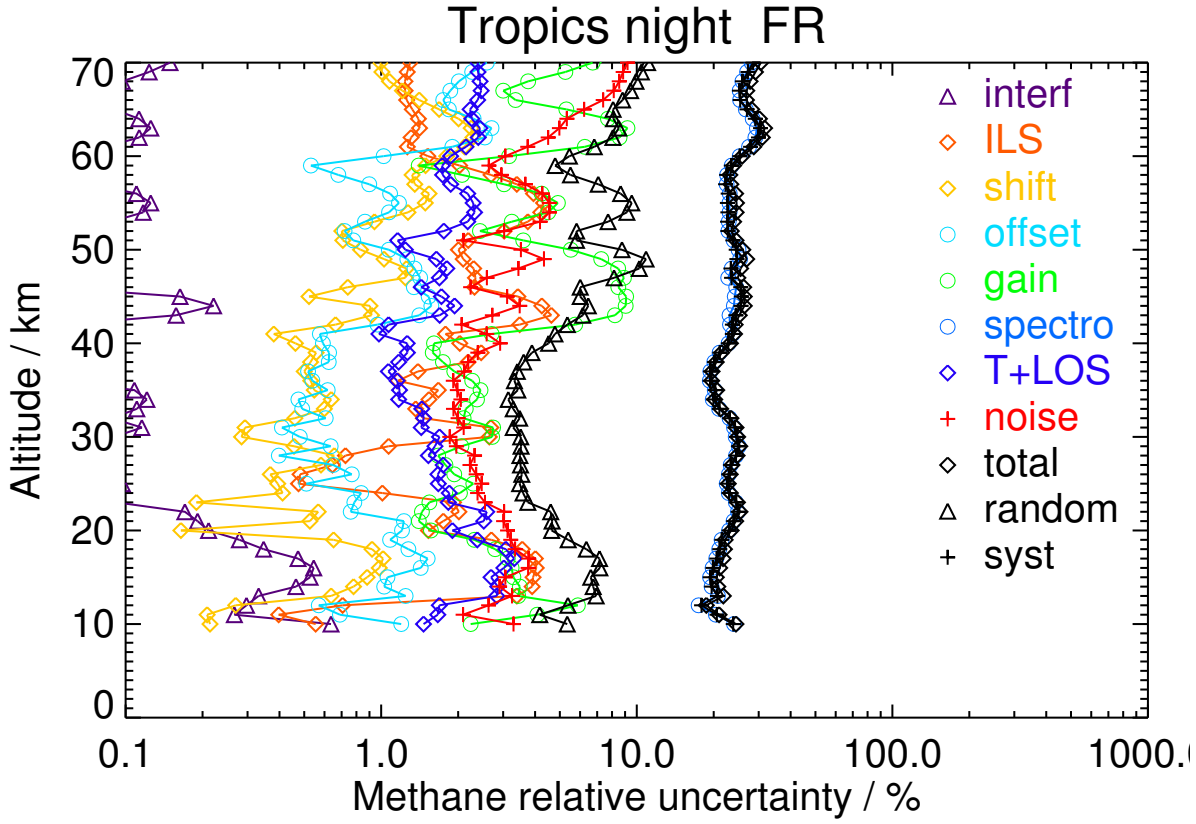

Figure S18. V8H_CH4_61 Tropics night

Table S19. Methane error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1724.83	10.04	13.65	1.81	24.80	60.22	430.23	46.28	75.45	116.96	428.70	444.37
12	1717.92	5.54	26.68	2.03	16.81	77.22	385.37	36.98	53.84	101.45	386.62	399.71
15	1621.34	3.56	38.33	3.77	13.88	64.48	361.68	45.18	52.46	109.43	359.83	376.10
18	1665.52	2.77	107.20	5.21	16.65	125.37	351.33	71.59	50.84	140.66	372.67	398.33
21	1501.19	3.20	38.91	6.42	16.94	104.22	339.72	41.16	46.07	102.05	348.61	363.24
24	1313.53	1.43	38.07	11.76	13.11	71.45	318.82	27.57	40.58	80.22	323.24	333.05
27	1197.31	1.10	18.56	6.23	10.75	39.56	297.62	25.23	38.08	72.83	295.68	304.52
30	1194.72	1.24	20.34	3.84	9.73	29.56	302.09	26.99	35.43	88.50	294.63	307.63
33	808.06	0.93	10.71	3.34	7.60	14.91	203.13	19.00	30.52	66.16	196.43	207.27
36	547.53	0.57	10.10	3.05	6.37	13.17	142.17	11.63	25.90	54.64	135.49	146.10
39	374.52	0.41	12.47	3.44	5.06	16.79	97.66	7.45	21.23	54.40	86.95	102.56
42	260.73	0.39	7.28	2.31	3.55	10.94	66.74	4.91	17.15	32.91	62.29	70.45
45	258.31	0.47	6.81	1.90	4.04	16.61	59.01	5.95	15.13	28.43	57.28	63.95
48	261.42	0.16	3.92	2.53	2.66	12.27	60.02	3.87	7.81	24.14	57.23	62.11
52	254.34	0.24	8.53	1.95	3.58	11.51	61.40	3.62	10.01	24.33	59.27	64.07
56	211.73	0.33	6.74	3.38	4.68	12.54	58.68	4.26	12.76	31.00	53.84	62.13
60	195.80	0.17	2.71	1.66	2.50	5.40	49.42	3.73	9.60	19.54	47.04	50.93
64	136.90	0.22	1.76	1.75	2.62	6.07	43.95	3.14	9.61	20.32	40.88	45.65
68	93.49	0.11	0.99	0.88	4.55	3.49	31.22	2.54	20.01	25.40	27.76	37.63

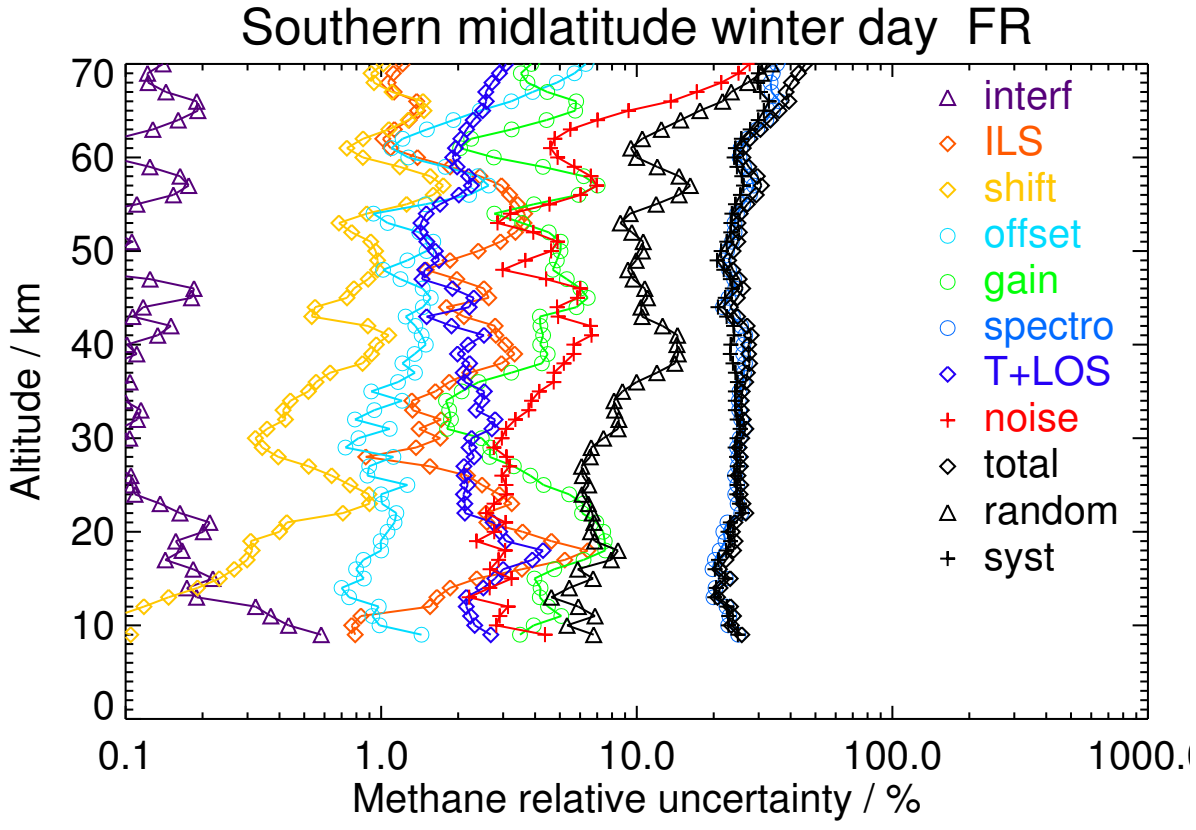

Figure S19. V8H_CH4_61 Southern midlatitude winter day

Table S20. Methane error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1720.73	17.64	8.11	1.54	24.54	61.46	288.49	37.02	68.11	158.23	262.60	306.59
12	1737.53	5.19	26.87	1.48	15.84	84.89	352.24	35.18	47.49	106.80	352.66	368.48
15	1673.54	4.91	62.76	5.21	15.73	81.14	339.26	42.95	48.10	129.67	336.55	360.67
18	1605.26	3.11	95.30	5.12	17.12	114.00	317.56	54.27	47.00	150.81	325.06	358.33
21	1326.57	2.25	39.09	4.76	13.66	68.74	302.53	33.14	42.05	107.59	298.80	317.58
24	1206.80	1.06	57.10	8.84	12.98	61.79	292.51	29.07	40.43	102.81	291.20	308.81
27	1118.49	1.10	22.80	3.67	10.67	30.92	272.69	22.57	38.37	88.41	264.82	279.19
30	1065.44	1.24	14.52	3.20	8.68	20.82	279.75	22.47	34.44	94.87	267.74	284.05
33	875.70	0.91	14.92	3.51	6.99	20.45	202.92	18.14	30.25	73.63	194.17	207.66
36	558.94	0.48	9.57	2.43	5.73	17.52	138.53	11.51	24.69	58.12	130.35	142.72
39	387.04	0.36	11.75	2.60	4.62	17.43	92.79	7.01	19.99	38.84	89.55	97.61
42	265.52	0.25	7.87	1.91	3.52	14.37	67.69	5.14	16.55	30.93	64.89	71.88
45	231.56	0.39	5.23	1.32	3.29	13.47	57.07	4.99	13.02	26.31	54.59	60.60
48	251.46	0.22	3.65	1.69	2.44	10.63	62.36	3.23	8.75	25.58	58.79	64.11
52	240.04	0.23	7.48	1.75	3.69	14.24	60.22	3.82	9.97	27.34	57.17	63.37
56	221.69	0.27	4.45	2.83	3.96	11.73	55.88	4.03	10.67	26.71	52.15	58.60
60	187.85	0.20	1.27	1.51	2.93	5.53	47.81	3.61	10.60	21.04	44.85	49.54
64	136.94	0.19	1.94	1.20	2.38	5.65	36.30	3.43	9.44	16.65	34.42	38.23
68	86.57	0.13	1.31	0.91	4.77	4.75	25.96	2.68	20.90	24.40	23.89	34.15

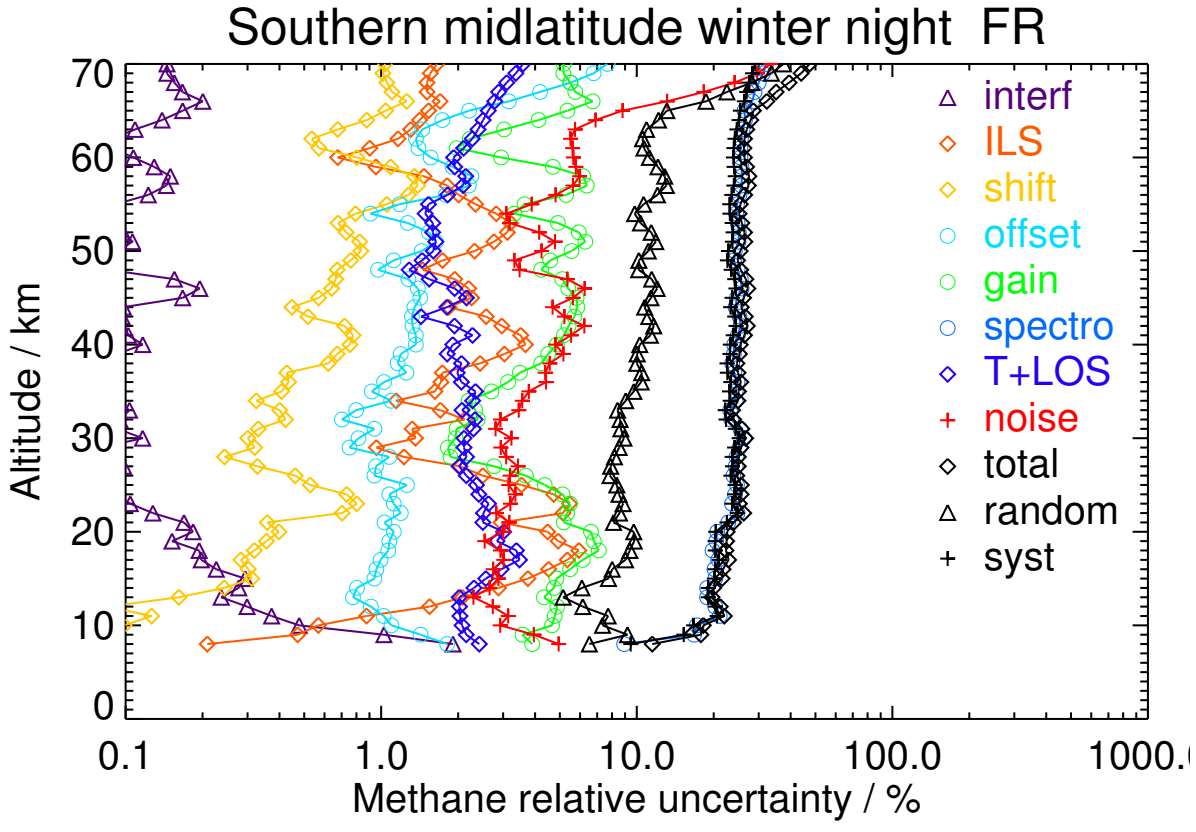

Figure S20. V8H_CH4_61 Southern midlatitude winter night

Table S21. Methane error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1571.14	14.98	13.82	2.82	24.62	93.60	421.03	49.81	79.98	172.72	407.56	442.64
12	1762.20	6.92	39.07	1.51	13.63	100.81	344.24	39.58	45.46	102.05	351.63	366.14
15	1528.02	6.05	52.14	3.86	16.62	92.64	399.99	55.65	54.50	179.78	381.27	421.53
18	1679.59	4.60	169.00	8.87	22.69	182.25	308.29	80.11	48.81	241.05	328.83	407.72
21	1278.86	3.02	78.57	7.73	15.21	97.82	301.16	42.59	43.58	160.70	290.91	332.35
24	1105.11	1.15	65.75	12.53	10.65	63.62	320.75	28.03	39.26	152.40	301.04	337.42
27	1036.04	1.46	42.44	4.28	9.04	41.50	302.87	21.22	36.54	134.86	280.99	311.68
30	1096.31	1.83	34.49	2.62	7.27	30.11	289.70	20.98	35.08	112.93	273.87	296.24
33	809.88	0.96	15.23	3.94	5.78	17.49	181.89	15.58	28.30	59.15	176.68	186.32
36	603.18	0.53	7.09	2.33	5.08	16.08	132.30	9.43	22.54	44.05	128.45	135.80
39	481.72	0.47	9.11	2.85	4.56	16.54	99.05	6.36	18.44	34.30	96.95	102.84
42	466.03	0.37	8.38	3.52	4.14	18.24	106.94	5.58	16.47	29.14	106.40	110.32
45	453.72	0.55	15.65	1.61	6.29	35.18	101.29	7.92	12.90	41.31	101.52	109.60
48	420.79	0.32	10.18	3.99	6.46	36.33	103.33	7.19	11.00	40.69	103.32	111.05
52	341.33	0.21	8.18	2.40	4.27	19.99	83.02	4.86	10.70	29.88	81.41	86.72
56	245.57	0.30	9.23	4.34	3.45	12.84	68.95	5.40	9.75	24.16	67.65	71.83
60	220.25	0.21	3.10	2.64	2.43	5.54	51.75	3.85	8.61	14.73	51.02	53.10
64	126.35	0.29	1.98	3.13	4.26	14.63	48.39	4.29	7.94	18.52	48.23	51.66
68	94.98	0.18	1.97	1.86	5.12	12.02	36.99	3.18	19.27	25.23	35.94	43.91

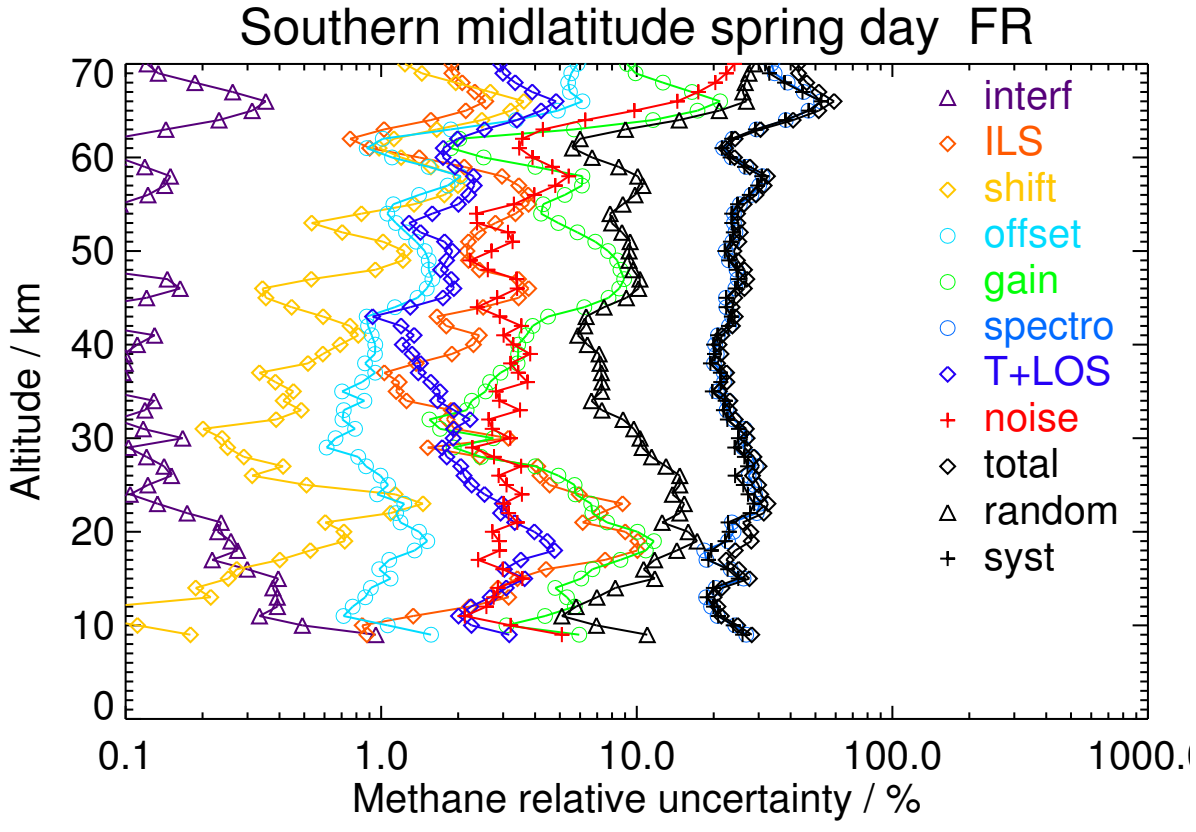

Figure S21. V8H_CH4_61 Southern midlatitude spring day

Table S22. Methane error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1540.68	16.54	21.61	3.28	26.99	108.97	411.94	53.23	87.62	184.39	399.45	439.95
12	1713.01	6.34	33.71	2.26	13.75	93.12	352.32	34.51	47.74	111.26	353.92	371.00
15	1603.28	4.77	60.57	4.21	16.45	110.71	442.82	61.99	55.67	175.51	434.13	468.26
18	1805.50	2.95	198.60	13.54	21.88	220.99	319.53	95.81	47.94	231.87	385.69	450.02
21	1568.42	3.13	95.88	6.97	23.12	178.93	316.45	56.24	44.42	166.01	345.72	383.51
24	1441.38	1.36	56.95	16.02	16.11	123.49	328.25	32.36	41.84	127.21	336.71	359.94
27	1356.32	1.18	37.32	6.72	8.97	48.74	328.94	25.38	39.17	80.02	328.44	338.04
30	1378.21	1.89	35.18	2.91	7.99	47.26	338.79	27.20	36.53	61.57	341.48	346.99
33	977.66	0.90	11.70	3.96	6.01	15.79	233.00	20.86	30.02	50.69	231.29	236.78
36	658.59	0.55	9.50	2.60	4.79	17.38	158.00	12.75	23.32	39.47	156.64	161.53
39	472.29	0.37	8.33	3.27	4.55	17.98	99.90	7.15	19.98	33.21	98.75	104.19
42	418.74	0.37	8.39	4.23	4.18	15.29	96.07	6.59	17.95	30.29	94.96	99.67
45	389.42	0.34	8.79	1.26	4.91	25.98	86.88	6.37	11.79	28.11	87.84	92.23
48	359.06	0.27	4.61	3.07	4.19	23.84	90.99	5.23	11.40	23.82	92.11	95.14
52	316.23	0.24	6.21	3.51	4.16	19.02	73.45	4.73	11.75	22.70	73.96	77.37
56	247.72	0.32	10.83	4.04	3.06	10.24	63.44	4.92	9.48	19.17	63.40	66.23
60	199.17	0.26	4.13	3.06	3.01	6.57	50.44	3.82	8.85	14.77	49.98	52.11
64	134.95	0.29	2.44	2.77	3.20	10.23	42.80	3.90	7.01	14.27	42.67	45.00
68	86.34	0.20	1.96	1.84	4.59	10.54	32.54	3.21	16.80	21.64	31.97	38.61

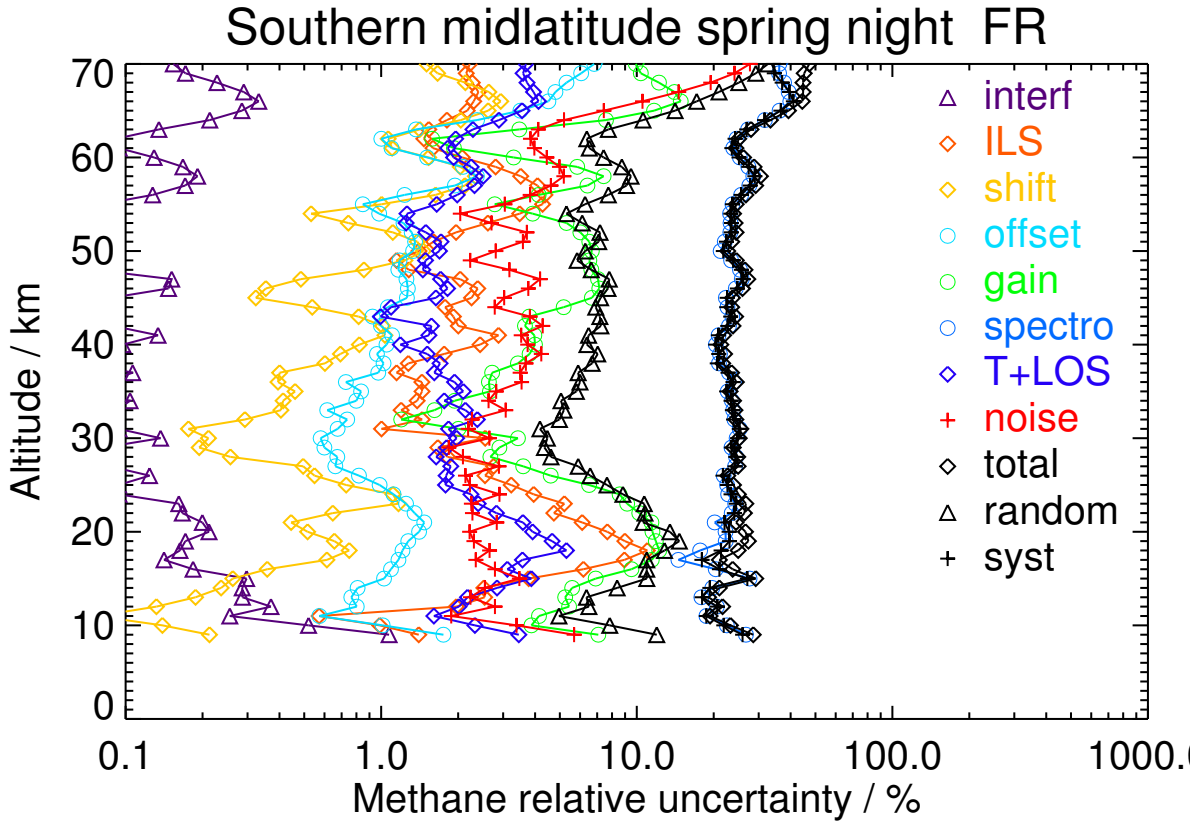

Figure S22. V8H_CH4_61 Southern midlatitude spring night

Table S23. Methane error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1719.49	28.08	11.80	1.55	22.70	61.72	339.21	35.24	75.37	185.54	304.65	356.71
12	1734.08	6.04	36.21	1.40	13.61	110.00	325.80	32.87	44.20	120.20	329.19	350.44
15	1674.16	6.90	62.10	3.22	14.56	91.12	331.70	43.83	49.94	135.81	329.28	356.18
18	1451.75	3.32	52.35	2.89	10.83	57.70	322.32	42.21	42.60	113.21	317.61	337.19
21	1140.79	2.11	72.60	3.98	10.69	39.95	294.10	33.41	40.69	73.04	301.55	310.27
24	1141.91	1.35	62.15	6.24	8.64	21.46	286.57	26.20	37.97	57.04	292.29	297.81
27	1046.88	1.27	34.27	4.45	7.38	13.68	255.89	19.93	35.26	55.77	255.83	261.84
30	1027.27	1.68	28.48	2.95	6.41	24.17	249.06	18.14	31.97	49.75	249.71	254.61
33	845.38	1.18	21.59	4.58	5.66	19.25	178.85	12.58	26.57	34.32	180.46	183.69
36	717.95	0.60	6.11	1.96	4.99	9.90	149.09	9.32	22.81	28.88	148.88	151.66
39	563.70	0.80	16.19	3.27	4.52	15.82	120.13	6.70	19.79	27.43	121.08	124.15
42	418.22	0.35	5.91	3.10	3.22	9.32	105.85	5.48	19.11	26.56	105.06	108.36
45	367.19	0.72	24.82	4.25	5.85	37.36	83.28	7.94	16.78	34.37	90.35	96.67
48	270.33	0.23	6.20	2.36	3.20	21.30	69.68	3.38	8.11	23.99	69.75	73.76
52	201.17	0.19	3.93	2.04	2.84	13.86	51.77	2.98	10.80	25.83	48.56	55.01
56	165.75	0.27	5.62	2.91	2.38	8.14	44.58	3.29	10.77	21.37	42.06	47.18
60	177.06	0.16	3.53	2.66	1.44	3.50	42.48	2.71	6.59	17.38	39.83	43.46
64	164.90	0.27	1.16	3.03	2.94	10.16	57.27	2.62	7.79	14.70	57.05	58.91
68	196.43	0.19	2.89	2.62	3.84	6.38	54.71	3.63	16.56	19.76	54.41	57.89

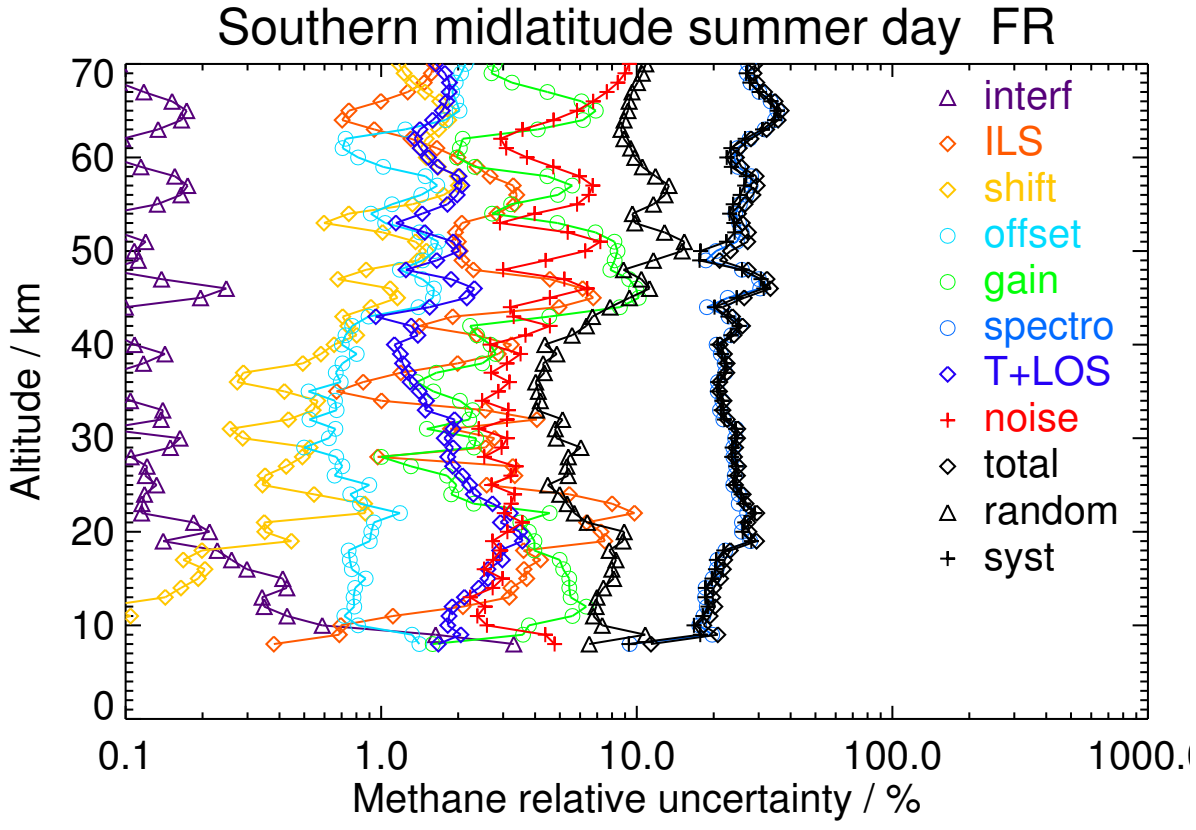

Figure S23. V8H_CH4_61 Southern midlatitude summer day

Table S24. Methane error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1717.87	29.72	14.89	1.82	22.51	64.43	331.56	34.49	69.65	186.26	295.04	348.91
12	1740.90	6.08	39.84	1.66	16.43	98.89	391.05	37.55	44.92	108.48	395.29	409.91
15	1801.29	6.19	103.78	4.85	18.50	137.07	369.56	54.46	52.91	133.65	392.99	415.09
18	1621.47	3.02	128.33	4.19	17.18	136.65	331.64	53.93	41.53	181.50	342.26	387.40
21	1241.11	2.31	70.11	6.92	11.08	45.60	291.16	30.29	37.78	101.58	289.78	307.07
24	1100.45	1.38	55.24	5.29	9.16	25.89	273.85	24.70	35.53	61.30	277.39	284.08
27	1087.19	1.38	32.45	5.40	7.99	17.70	254.17	20.65	34.04	60.11	253.05	260.09
30	992.91	1.51	26.15	3.09	6.60	22.21	253.09	18.74	30.94	50.44	253.09	258.06
33	854.29	1.16	24.52	4.50	5.80	20.45	187.02	13.53	26.06	37.26	188.48	192.13
36	709.58	0.73	5.96	1.60	4.99	9.64	152.54	9.42	22.69	28.91	152.29	155.01
39	586.63	0.71	15.18	2.60	4.45	13.04	124.22	7.06	20.39	27.79	124.71	127.77
42	433.33	0.41	7.73	3.58	3.52	15.69	115.77	5.81	19.06	29.24	115.22	118.87
45	354.91	0.74	22.82	3.82	5.66	37.22	91.92	7.84	17.66	36.67	97.12	103.81
48	253.37	0.25	7.24	2.22	2.87	18.73	67.19	3.08	9.35	22.99	67.08	70.91
52	187.83	0.19	3.72	2.09	2.71	13.09	47.83	2.76	11.54	22.07	46.24	51.24
56	146.76	0.29	5.52	3.41	2.98	13.86	38.56	3.87	11.69	19.59	38.69	43.37
60	164.84	0.15	2.90	2.66	1.35	3.18	39.22	2.65	6.28	16.89	36.43	40.15
64	167.26	0.28	1.42	2.60	2.75	10.74	48.69	2.53	7.16	15.00	48.32	50.60
68	177.02	0.17	1.63	2.12	3.32	5.86	46.58	3.74	14.47	17.22	46.36	49.45

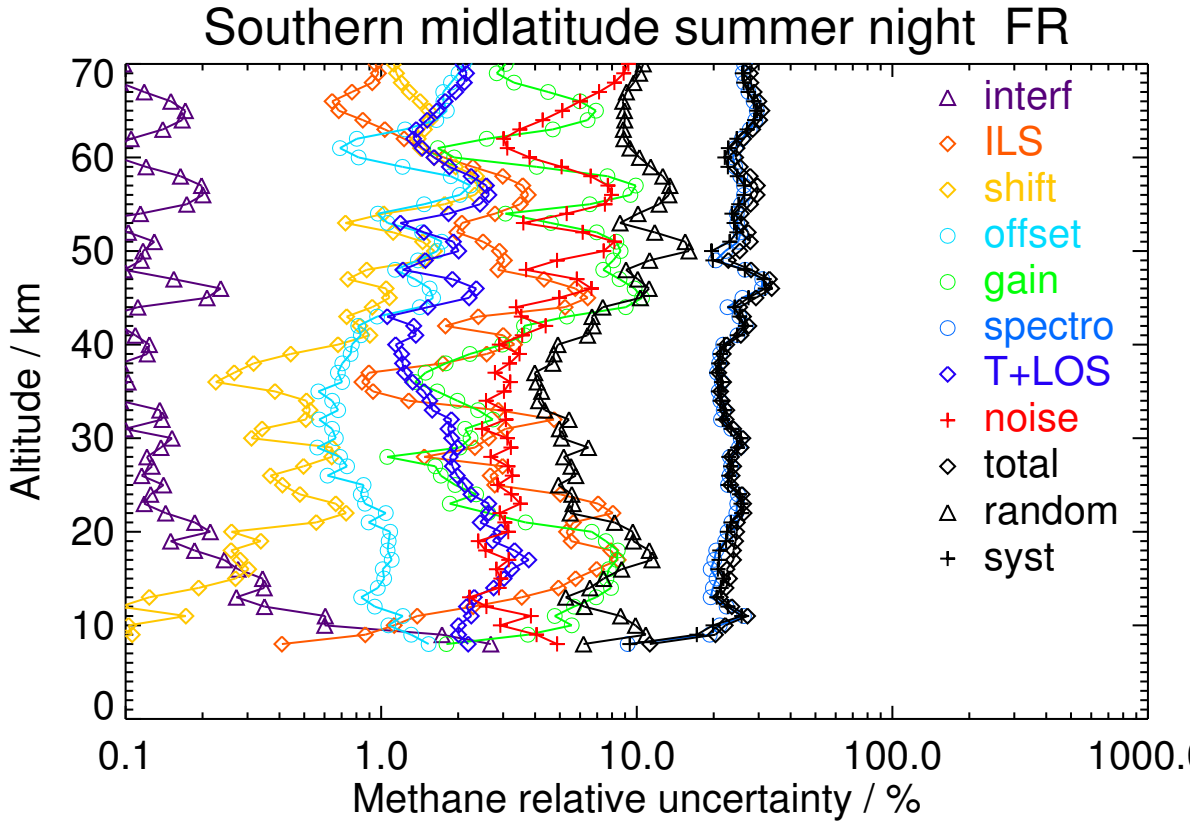

Figure S24. V8H_CH4_61 Southern midlatitude summer night

Table S25. Methane error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1782.34	4.07	30.41	1.47	12.74	92.12	340.86	32.88	36.38	81.38	348.65	358.03
15	1711.88	4.36	62.44	4.03	15.26	88.94	340.18	44.52	45.72	119.48	342.92	363.14
18	1606.85	1.83	54.48	4.46	19.67	136.79	319.51	35.66	35.91	125.72	333.06	356.00
21	1262.38	1.69	64.21	12.34	15.15	76.61	327.16	28.52	32.40	103.68	329.43	345.36
24	1170.47	1.28	29.90	2.97	13.03	53.92	282.75	23.34	31.07	79.41	281.31	292.30
27	1023.92	1.10	12.06	4.94	9.82	16.95	242.14	20.04	29.88	54.83	239.74	245.93
30	981.39	0.84	19.49	3.19	7.83	21.39	239.68	20.17	25.41	48.47	238.87	243.74
33	811.19	0.56	8.40	3.60	7.49	21.75	189.28	14.74	23.42	46.22	187.27	192.89
36	650.85	0.45	7.02	2.55	6.41	25.96	153.10	10.64	21.48	46.86	150.30	157.43
39	540.85	0.39	15.32	4.08	6.57	26.28	129.51	8.39	20.19	50.25	125.34	135.04
42	465.37	0.31	16.93	2.04	5.82	29.17	116.80	5.75	14.69	49.44	112.35	122.75
45	382.98	0.71	15.87	2.30	6.08	31.34	100.15	6.46	15.71	44.77	97.93	107.68
48	368.89	0.23	4.55	4.46	5.90	28.70	83.93	7.30	10.81	38.39	81.48	90.07
52	332.83	0.21	7.99	1.72	4.31	16.44	74.60	5.13	7.71	24.38	73.57	77.50
56	218.96	0.50	5.01	4.81	6.26	17.42	71.63	6.46	15.14	29.97	69.96	76.11
60	247.59	0.15	2.75	1.89	1.96	3.82	59.45	4.58	8.40	16.81	58.08	60.46
64	134.62	0.21	1.46	2.32	3.57	9.97	43.24	3.52	9.24	22.09	39.99	45.69
68	79.59	0.07	1.25	0.40	3.63	1.75	24.31	2.47	15.97	19.15	22.44	29.50

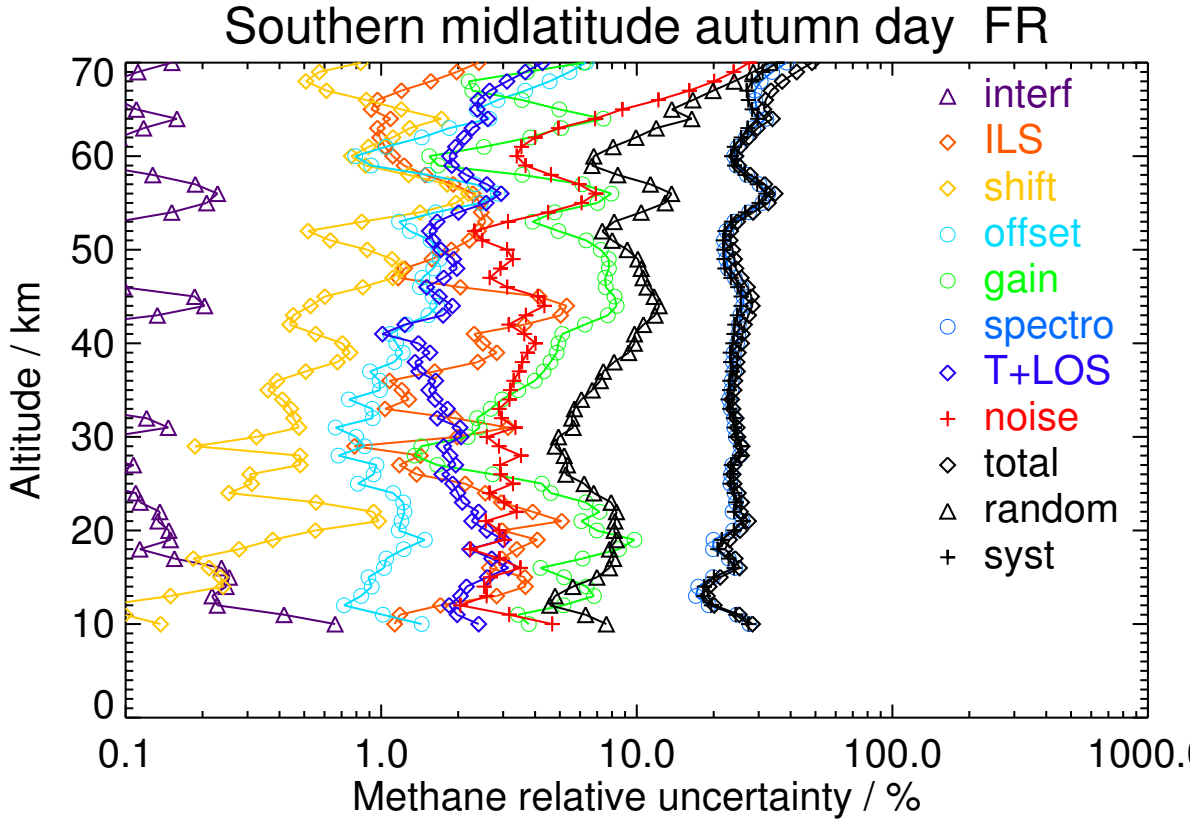

Figure S25. V8H_CH4_61 Southern midlatitude autumn day

Table S26. Methane error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1819.62	4.94	42.94	1.79	15.45	121.26	353.98	37.14	39.93	82.34	371.90	380.90
15	1769.79	4.90	57.28	3.53	14.20	74.16	358.43	45.64	46.60	96.81	363.83	376.49
18	1715.79	2.35	47.67	5.38	22.58	155.32	311.50	37.75	35.88	110.05	338.49	355.94
21	1259.34	1.88	75.59	13.31	16.37	78.67	314.08	31.97	34.00	107.36	318.83	336.42
24	1172.69	1.39	20.18	2.46	11.89	34.00	274.32	23.99	32.01	62.54	273.22	280.29
27	1031.80	1.23	11.98	5.78	9.37	15.01	236.01	20.30	29.76	48.91	234.73	239.77
30	987.22	0.82	20.90	3.44	7.54	22.59	231.90	19.68	24.91	48.72	231.14	236.22
33	804.90	0.55	8.50	3.98	7.12	18.33	173.61	14.73	22.64	44.74	171.30	177.05
36	703.98	0.51	6.13	2.15	6.25	21.21	143.78	10.22	21.41	46.78	139.93	147.54
39	580.40	0.60	16.05	4.42	5.66	16.65	115.49	7.96	19.01	44.98	111.02	119.79
42	471.14	0.29	10.06	2.29	5.06	22.76	111.09	4.92	13.97	45.46	105.57	114.94
45	437.34	0.72	13.03	1.63	5.79	30.73	111.12	7.59	17.45	43.74	109.30	117.73
48	357.56	0.27	4.96	5.05	5.23	27.63	86.55	6.36	10.84	42.45	81.78	92.14
52	311.18	0.13	10.26	1.34	3.74	14.48	70.75	4.49	7.15	23.06	69.82	73.53
56	271.89	0.46	6.03	5.27	6.02	19.01	73.99	6.48	12.82	28.73	72.92	78.37
60	244.38	0.16	2.56	2.46	2.06	4.36	59.59	4.74	8.04	17.56	58.01	60.61
64	166.43	0.20	2.49	2.27	3.70	10.55	46.24	4.39	9.51	20.09	44.50	48.83
68	91.19	0.09	1.96	0.63	3.69	3.58	29.34	3.10	16.26	22.05	26.06	34.14

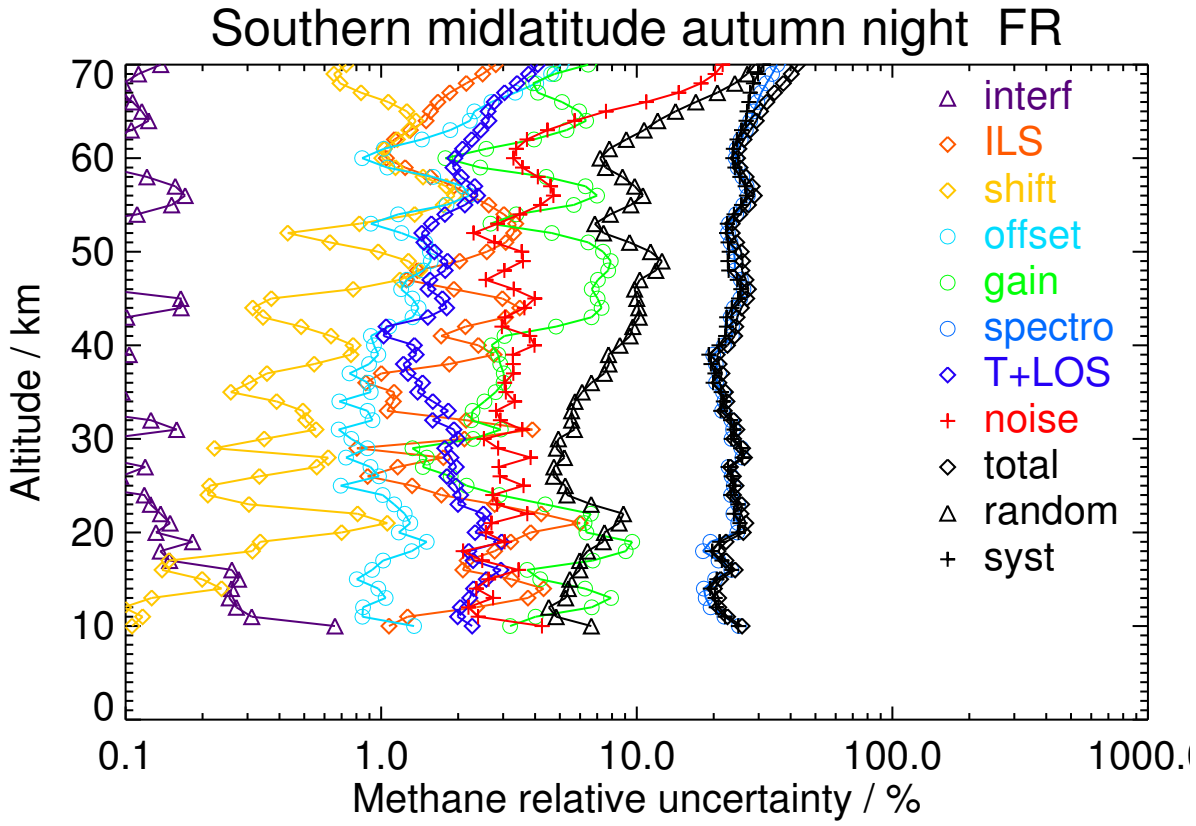

Figure S26. V8H_CH4_61 Southern midlatitude autumn night

Table S27. Methane error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1728.40	30.76	8.41	1.45	31.97	58.62	338.44	53.37	78.99	153.19	325.03	359.32
12	1724.98	11.68	12.74	3.07	26.54	70.68	376.69	63.00	67.94	113.90	378.83	395.59
15	1428.49	13.50	17.89	4.87	24.52	58.99	293.74	62.17	71.02	112.01	295.38	315.91
18	1145.75	5.20	21.27	5.92	18.49	49.68	281.88	46.10	51.55	92.96	280.93	295.91
21	1013.01	3.38	15.29	9.39	15.05	47.33	251.07	31.15	48.67	79.02	250.86	263.01
24	561.82	1.12	10.90	2.98	9.02	15.39	164.02	20.64	42.34	65.53	158.98	171.95
27	384.09	1.09	9.40	2.07	8.84	5.61	93.54	13.03	35.78	48.53	89.72	102.00
30	413.56	0.80	12.28	1.44	8.01	6.68	102.74	11.85	31.55	44.01	100.08	109.33
33	276.06	0.57	6.63	1.75	6.51	4.61	69.54	7.78	29.33	37.46	66.82	76.61
36	199.63	0.42	3.54	2.67	4.72	4.06	48.24	5.16	23.83	28.07	46.82	54.59
39	172.33	0.31	4.06	1.17	3.26	5.50	39.76	3.73	17.08	20.40	39.11	44.11
42	183.35	0.30	2.06	1.35	3.01	4.26	47.54	3.31	16.87	20.84	46.42	50.88
45	209.31	0.36	3.65	2.16	3.43	12.17	44.17	4.83	14.04	20.70	43.83	48.47
48	211.27	0.20	2.06	1.27	1.82	6.71	50.91	1.96	7.84	13.77	50.21	52.07
52	202.83	0.24	2.97	2.25	3.13	11.91	43.80	2.78	10.87	16.67	43.95	47.01
56	147.31	0.34	5.92	3.20	3.67	10.22	48.02	3.28	11.18	20.63	46.69	51.04
60	124.37	0.16	1.65	1.27	2.31	4.58	33.05	2.12	9.07	13.76	31.94	34.78
64	86.43	0.27	1.73	1.65	2.24	5.77	29.59	2.05	8.49	14.09	28.24	31.56
68	56.37	0.25	1.74	1.58	4.96	6.23	23.47	1.91	21.64	24.92	21.70	33.04

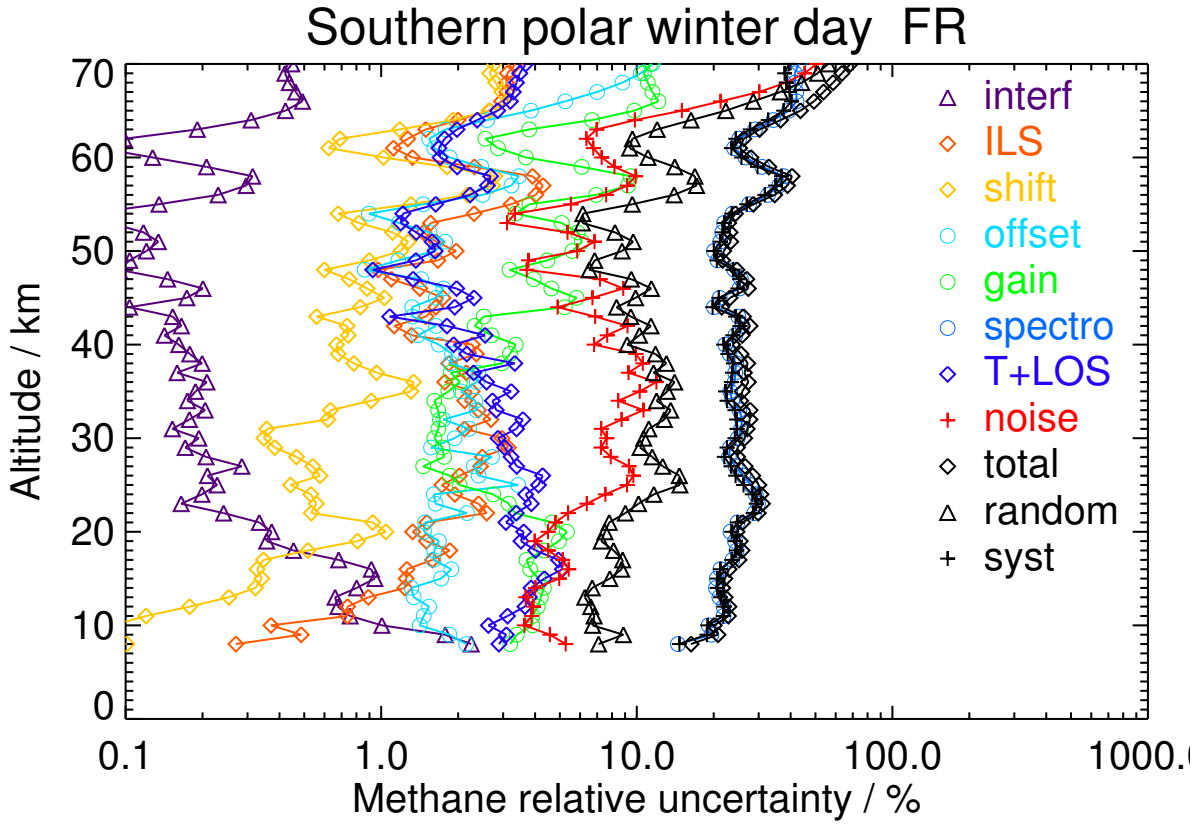

Figure S27. V8H_CH4_61 Southern polar winter day

Table S28. Methane error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1690.76	27.07	5.47	1.12	28.33	56.94	222.13	39.30	71.68	110.27	220.62	246.64
12	1722.99	9.80	20.73	2.26	20.49	57.42	310.91	47.30	53.24	94.20	311.62	325.55
15	1442.18	12.34	30.14	3.97	21.79	53.33	233.88	54.43	62.36	107.76	233.10	256.80
18	1163.56	4.53	23.28	4.36	16.62	41.48	237.68	37.40	46.79	84.88	235.49	250.32
21	1011.86	2.39	14.40	8.81	15.83	44.88	208.47	28.52	46.10	70.66	209.67	221.26
24	724.71	0.97	14.50	4.20	11.85	22.59	188.07	23.04	44.21	68.29	184.58	196.81
27	415.03	0.93	7.58	2.08	9.78	7.79	108.80	16.03	38.86	59.98	101.12	117.57
30	347.57	0.66	10.76	1.43	7.84	4.48	88.47	11.29	32.09	46.34	83.89	95.83
33	314.99	0.38	5.06	1.68	6.56	5.84	77.32	9.12	29.60	38.85	74.39	83.92
36	230.68	0.35	5.34	2.57	4.78	6.08	61.55	6.32	24.51	31.77	59.28	67.26
39	197.35	0.33	4.16	1.34	3.38	7.58	50.18	4.60	19.11	24.94	48.69	54.71
42	168.55	0.33	2.81	1.76	3.23	5.55	43.59	3.94	18.24	23.48	41.83	47.96
45	177.87	0.26	2.75	1.73	3.25	10.33	39.86	4.39	13.76	18.82	39.63	43.88
48	179.91	0.18	2.77	1.13	1.90	5.14	44.39	1.86	9.36	14.50	43.48	45.84
52	154.77	0.23	3.37	1.87	3.03	9.49	36.84	2.19	11.18	15.90	36.72	40.02
56	138.40	0.25	4.45	2.45	2.73	7.65	36.97	2.37	9.22	17.31	35.35	39.36
60	108.97	0.17	1.84	1.40	2.34	5.29	29.22	1.97	8.95	15.32	27.24	31.25
64	78.92	0.20	1.23	1.17	1.83	3.17	25.45	1.96	8.16	11.83	24.39	27.11
68	55.22	0.22	1.79	1.17	4.83	3.96	21.88	2.03	21.34	24.50	19.53	31.34

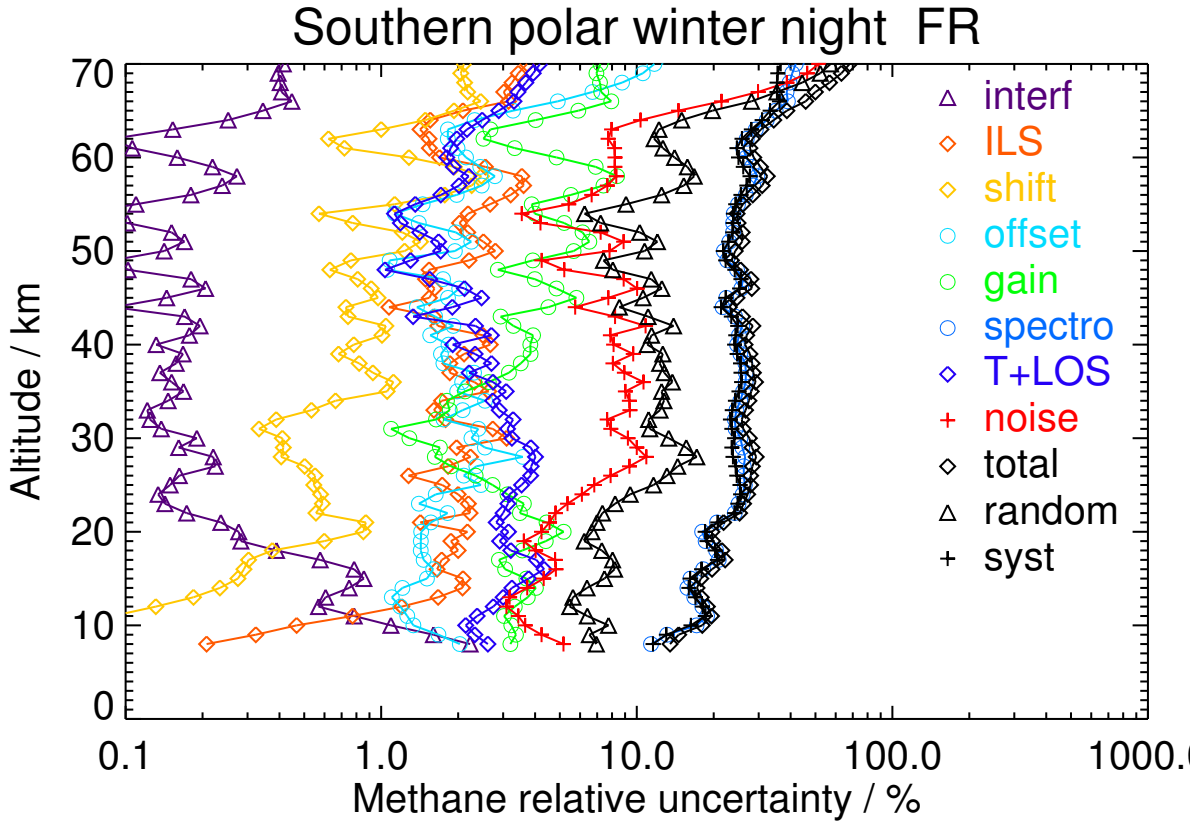

Figure S28. V8H_CH4_61 Southern polar winter night

Table S29. Methane error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1797.35	15.47	13.56	3.74	29.04	59.33	368.60	59.81	79.01	146.21	359.32	387.93
12	1816.55	14.84	83.35	6.86	22.11	75.34	305.56	69.67	65.62	111.98	321.51	340.46
15	1319.71	9.34	34.97	8.54	19.38	31.00	280.88	61.84	67.74	115.20	277.05	300.04
18	922.35	3.81	27.91	4.45	9.95	17.37	208.57	53.51	45.38	82.67	206.89	222.80
21	413.52	0.83	21.58	3.83	7.33	6.76	119.87	24.64	35.63	59.02	115.51	129.72
24	374.05	1.19	14.25	2.67	3.91	13.50	100.09	13.34	31.54	56.38	91.77	107.70
27	351.28	3.40	13.36	3.99	4.11	7.88	125.46	11.07	29.34	94.13	90.27	130.42
30	544.34	2.44	35.48	4.94	5.32	37.59	142.32	14.75	29.89	104.91	114.41	155.23
33	542.55	1.17	10.45	3.22	5.23	12.77	127.38	10.29	24.93	64.71	114.35	131.39
36	454.47	0.88	14.40	3.94	5.41	20.86	99.47	7.74	21.38	43.03	96.17	105.36
39	443.37	0.63	14.08	3.44	4.49	21.72	92.61	6.00	17.03	37.67	90.48	98.01
42	406.44	0.44	17.83	3.76	4.04	24.76	93.64	5.57	13.61	37.88	92.26	99.73
45	404.85	0.62	30.68	4.81	7.20	52.72	91.44	7.75	10.62	55.37	96.25	111.04
48	371.81	0.93	31.47	3.12	6.56	50.61	106.14	7.50	14.66	61.44	106.62	123.05
52	298.76	0.35	11.89	2.74	4.20	26.32	71.88	5.54	12.63	40.81	67.46	78.85
56	251.46	0.31	8.85	3.88	1.70	7.86	64.30	4.43	8.66	17.98	63.75	66.24
60	209.28	0.24	5.28	3.87	3.36	10.37	56.58	3.82	9.75	17.27	56.35	58.93
64	185.56	0.22	2.18	2.33	1.74	5.81	50.73	2.91	5.73	12.47	50.07	51.60
68	168.14	0.19	3.05	1.57	4.32	5.99	52.61	3.46	17.86	24.15	50.81	56.26

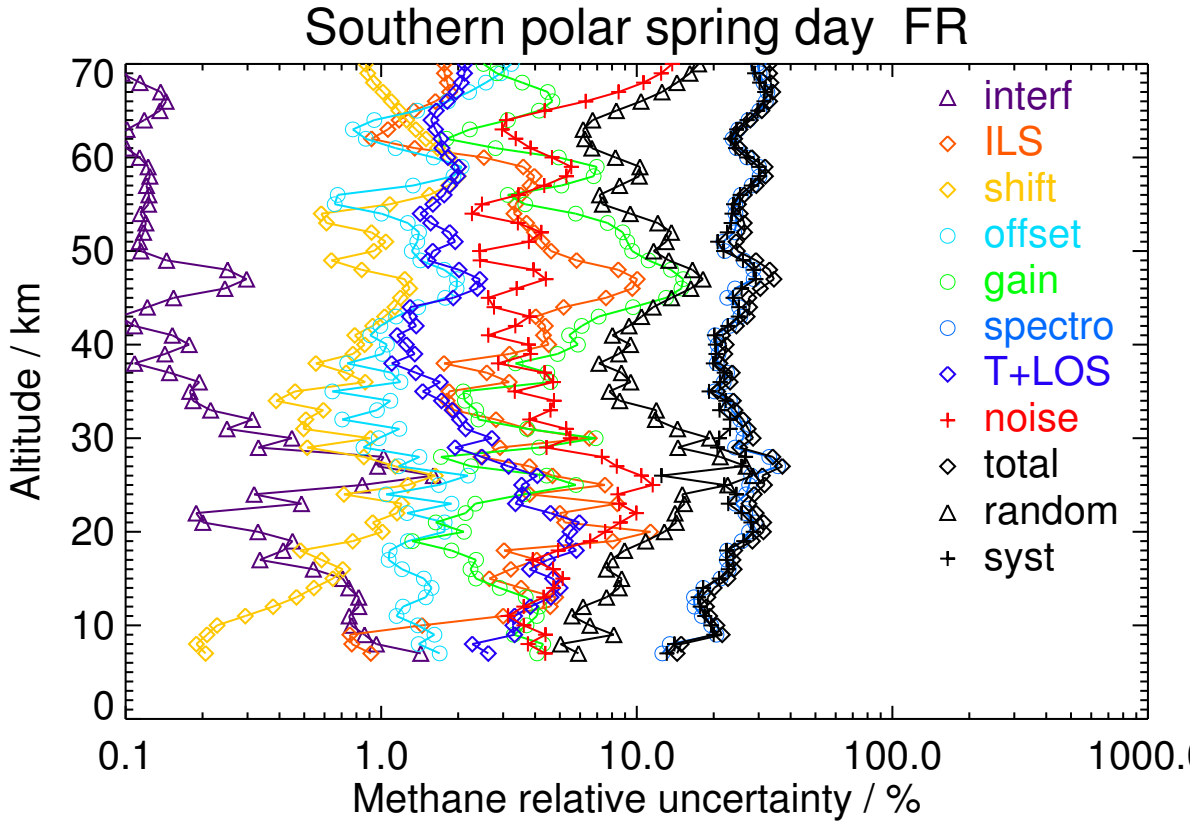

Figure S29. V8H_CH4_61 Southern polar spring day

Table S30. Methane error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1761.25	11.06	13.96	2.22	27.95	51.32	402.46	56.19	75.58	129.06	397.40	417.83
12	1787.98	8.98	83.24	7.60	18.55	79.85	300.54	55.37	57.31	126.16	307.48	332.35
15	1289.57	6.26	50.92	7.69	18.15	51.08	298.53	54.42	61.14	125.82	292.60	318.51
18	1032.05	3.85	40.18	7.26	12.23	43.20	217.62	57.44	49.19	108.15	212.32	238.28
21	771.05	1.49	55.78	8.18	9.68	24.22	193.04	32.52	43.02	94.69	187.27	209.85
24	677.11	1.05	50.21	9.23	7.26	50.51	210.74	20.70	38.36	151.45	169.07	226.98
27	624.46	3.86	29.99	6.78	6.81	29.32	203.82	17.22	36.36	133.46	164.97	212.19
30	602.15	1.62	30.18	4.50	6.67	25.33	179.51	17.09	31.81	113.74	149.04	187.48
33	551.20	1.54	19.06	3.69	6.63	14.50	144.56	13.57	28.45	76.01	129.41	150.08
36	446.51	0.81	10.08	2.76	5.54	18.11	110.81	8.46	23.15	49.30	104.52	115.57
39	414.26	0.66	16.62	2.95	5.05	25.69	102.32	6.68	18.87	44.74	99.19	108.82
42	392.04	0.59	14.75	3.12	5.09	26.49	99.22	6.60	16.50	40.94	97.15	105.43
45	362.45	0.40	11.08	2.00	4.47	27.30	78.08	5.50	11.74	34.27	77.34	84.59
48	328.12	0.55	10.76	2.10	4.59	25.85	82.37	4.30	12.28	39.23	78.90	88.11
52	301.50	0.31	6.19	2.41	3.55	15.27	69.14	4.43	12.78	26.38	67.51	72.48
56	239.49	0.32	7.51	4.37	2.85	11.73	59.15	4.50	9.61	18.92	58.94	61.90
60	186.56	0.27	3.58	3.71	3.75	10.93	47.85	3.74	9.96	16.85	47.74	50.63
64	143.46	0.25	2.48	2.29	2.20	7.14	40.86	3.09	6.84	14.82	39.67	42.35
68	98.53	0.23	2.71	1.96	4.77	9.88	35.77	3.41	18.53	24.11	34.42	42.02

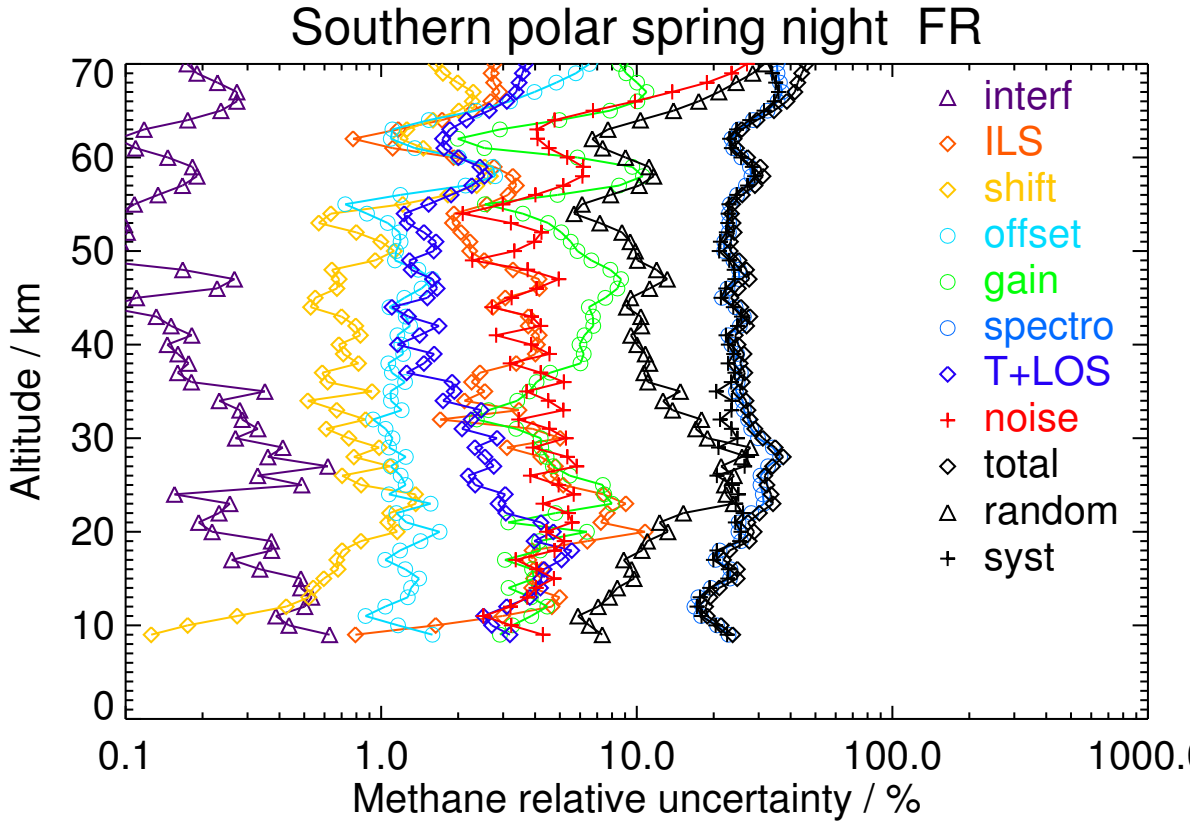

Figure S30. V8H_CH4_61 Southern polar spring night

Table S31. Methane error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1633.37	22.02	10.61	1.23	22.40	80.90	298.06	38.26	76.09	164.07	277.16	322.08
12	1682.41	3.54	23.11	1.59	10.43	65.17	343.54	24.38	37.58	71.12	346.22	353.45
15	1524.37	6.52	58.27	3.15	13.17	83.77	336.50	39.97	43.90	130.16	332.34	356.92
18	1298.59	2.25	56.76	3.11	11.67	61.27	306.42	43.30	41.22	107.17	305.14	323.41
21	1154.51	2.02	42.51	4.32	9.16	40.02	298.94	30.99	41.91	83.76	297.63	309.19
24	1132.88	1.08	59.51	11.57	7.84	32.44	297.34	26.93	41.61	76.72	299.62	309.29
27	961.75	0.93	54.00	5.74	8.29	34.61	257.33	22.62	40.28	61.26	262.33	269.38
30	917.73	2.30	32.09	3.79	6.16	14.50	228.18	20.57	37.26	53.90	228.62	234.89
33	798.29	1.18	35.05	3.64	5.38	22.21	166.92	14.31	30.81	40.32	170.75	175.44
36	672.96	0.85	10.26	1.97	5.00	14.17	146.23	9.87	25.18	36.97	145.21	149.84
39	508.98	0.79	15.89	2.90	4.69	18.52	116.80	7.69	22.63	29.55	118.18	121.82
42	350.61	0.42	8.33	3.09	3.21	7.56	94.40	6.64	21.19	27.56	93.76	97.73
45	290.44	0.46	22.96	4.79	4.70	29.76	51.62	5.76	14.87	25.93	60.86	66.16
48	181.84	0.31	5.48	0.99	2.48	11.91	66.13	2.84	12.76	22.99	64.77	68.73
52	153.86	0.40	4.00	1.95	3.38	14.11	40.45	3.22	18.24	24.61	40.04	47.00
56	72.77	0.30	5.31	1.62	2.32	8.12	22.31	2.78	12.56	16.18	22.44	27.66
60	95.85	0.22	3.25	1.32	1.46	3.43	21.12	1.42	6.68	10.89	20.00	22.77
64	111.35	0.31	1.03	2.82	1.85	7.27	38.88	1.68	5.93	10.42	38.82	40.19
68	150.25	0.25	1.49	2.75	2.74	6.12	42.84	2.37	10.95	13.80	42.72	44.89

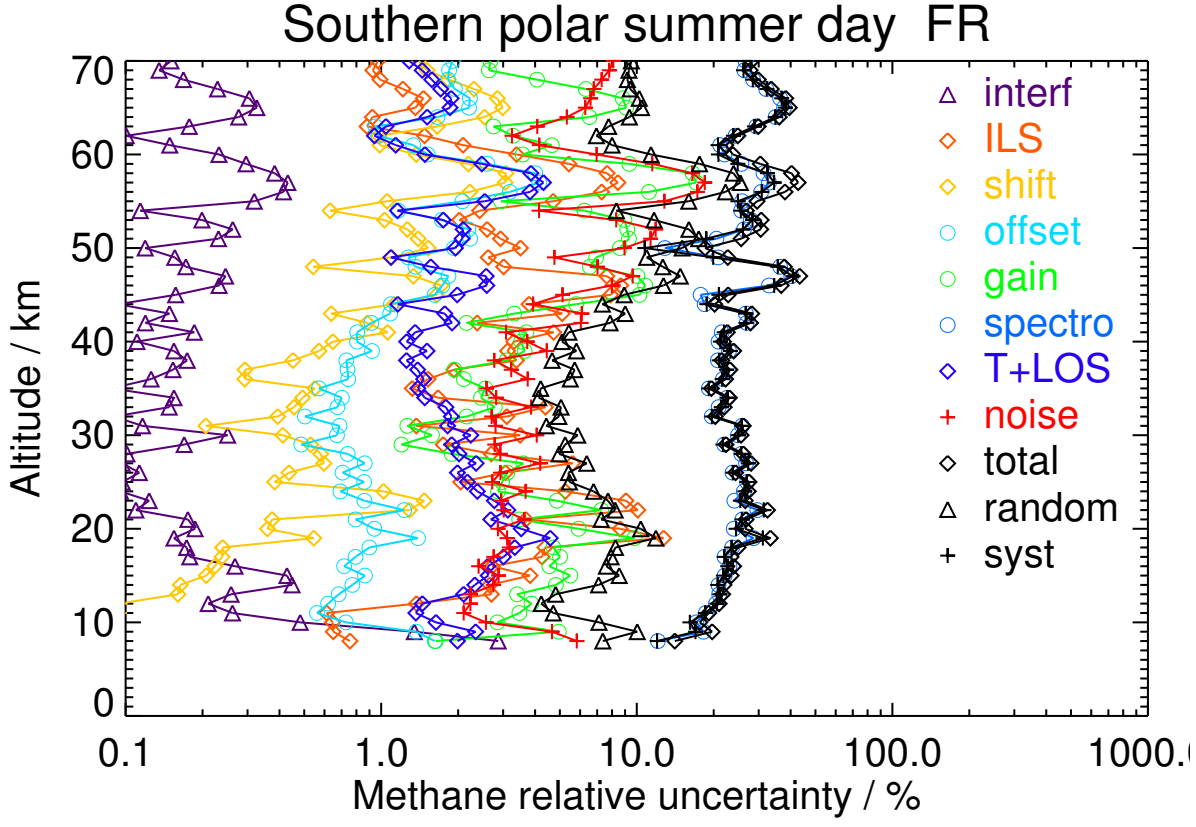

Figure S31. V8H_CH4_61 Southern polar summer day

Table S32. Methane error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1654.68	24.61	12.49	1.28	20.55	65.27	239.93	35.93	69.38	158.18	209.99	262.91
12	1703.28	2.60	16.59	1.26	10.24	56.09	356.76	25.76	31.13	71.11	356.92	363.93
15	1751.27	5.65	81.54	5.20	15.92	133.68	326.21	42.06	41.59	113.41	349.11	367.07
18	1480.37	1.62	43.46	4.21	11.34	89.32	336.53	34.92	33.50	98.13	340.56	354.42
21	1247.37	0.91	58.25	12.12	14.15	102.40	327.04	31.20	33.59	119.20	330.27	351.12
24	1129.10	0.89	34.20	4.31	10.41	51.49	292.84	22.50	32.35	76.24	292.31	302.09
27	953.12	1.44	24.91	3.65	8.91	25.21	230.43	18.79	30.96	54.03	229.87	236.14
30	872.38	1.06	13.12	2.46	7.66	23.96	222.68	16.07	28.22	72.15	215.05	226.83
33	735.82	1.20	18.66	3.49	7.03	28.36	161.63	12.51	25.27	50.62	159.92	167.74
36	568.91	0.63	7.98	1.32	5.31	12.94	126.56	8.84	22.73	28.81	126.66	129.90
39	389.33	0.57	12.24	2.71	4.60	15.56	84.77	5.99	21.07	25.77	86.15	89.92
42	222.20	0.42	8.47	1.73	3.62	6.30	69.59	5.03	21.36	25.69	69.22	73.83
45	189.62	0.51	16.45	1.96	4.39	23.24	46.13	5.34	18.80	25.48	51.91	57.83
48	110.66	0.22	2.06	0.98	1.22	4.54	32.45	1.19	6.51	12.95	30.93	33.53
52	83.50	0.20	1.31	1.31	2.11	7.64	21.10	1.52	9.39	13.85	20.25	24.54
56	105.69	0.24	4.45	1.72	2.05	6.18	28.86	1.73	9.27	14.45	27.90	31.42
60	171.47	0.15	2.98	1.84	1.48	4.27	41.56	2.26	6.16	15.49	39.54	42.46
64	171.55	0.44	1.69	2.76	2.62	8.22	50.00	2.52	7.56	13.35	49.70	51.47
68	157.94	0.28	1.42	1.75	3.42	5.00	43.20	3.50	15.00	17.08	43.05	46.31

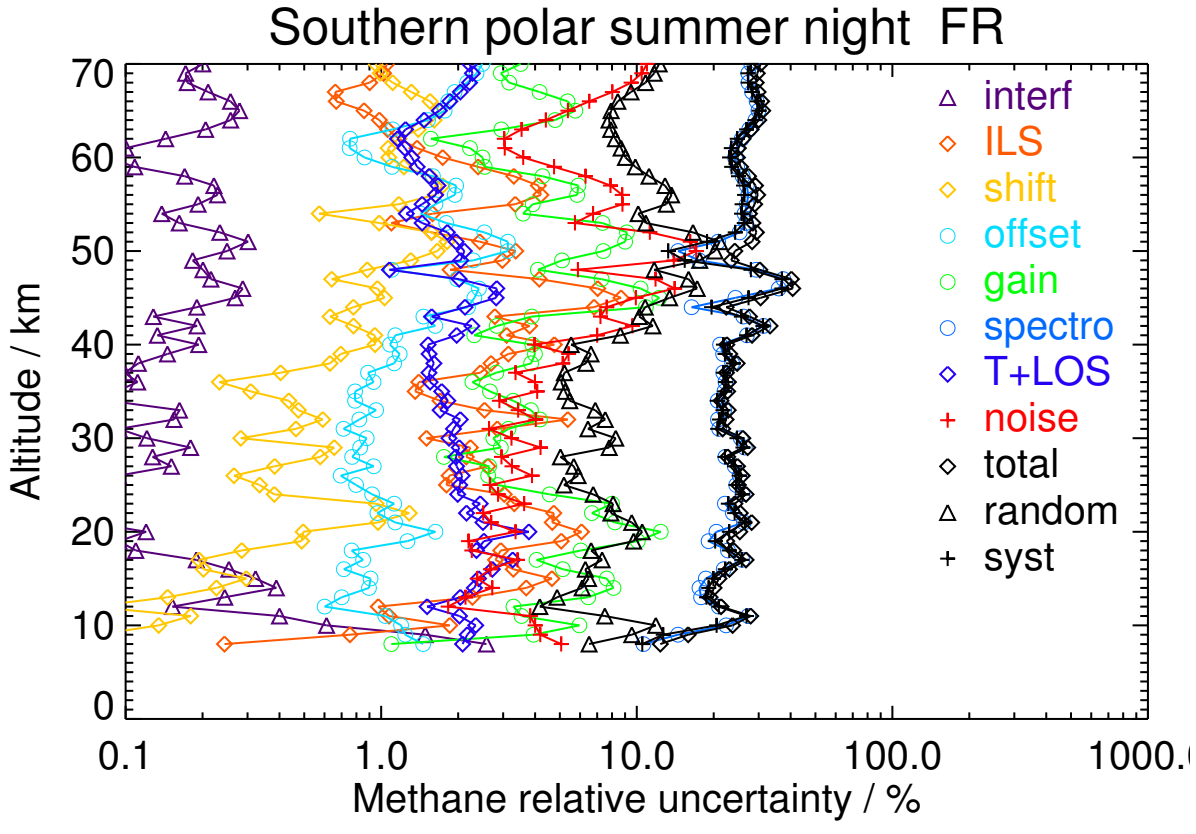

Figure S32. V8H_CH4_61 Southern polar summer night

Table S33. Methane error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1692.53	63.20	1.74	2.91	27.70	63.24	473.24	48.93	101.72	133.81	477.04	495.45
12	1754.13	4.44	17.17	1.92	10.38	88.19	323.61	30.75	35.37	60.37	333.89	339.30
15	1551.81	11.12	36.20	3.91	12.45	43.42	326.90	43.48	45.23	78.97	328.72	338.07
18	1375.14	3.14	25.26	5.47	13.21	100.18	272.31	32.26	37.02	64.31	288.65	295.73
21	1209.83	2.34	21.43	13.51	16.04	95.88	278.79	24.68	33.24	58.64	293.42	299.22
24	1038.03	1.66	21.52	5.09	13.71	58.61	245.34	21.51	32.33	53.42	250.92	256.54
27	807.87	1.27	8.18	1.88	10.38	18.62	190.45	18.58	31.10	46.21	189.67	195.22
30	666.81	0.51	5.27	2.54	7.89	12.14	166.35	17.65	25.18	39.71	165.18	169.88
33	428.21	0.46	9.71	1.88	6.24	11.79	111.89	11.35	21.64	34.80	110.37	115.73
36	224.36	0.30	4.99	1.77	4.23	9.39	61.01	5.74	17.40	29.57	57.60	64.75
39	123.40	0.26	5.49	1.52	2.96	6.30	31.72	3.21	13.23	19.65	29.77	35.67
42	88.25	0.23	3.09	0.73	2.28	3.58	22.77	1.64	11.06	14.14	21.71	25.91
45	109.63	0.39	4.59	1.08	2.93	5.96	27.58	2.58	15.41	18.83	26.77	32.73
48	163.88	0.14	1.31	1.57	2.24	7.20	36.12	3.09	7.99	12.58	35.79	37.94
52	221.36	0.15	5.06	0.75	2.38	7.71	51.49	2.42	6.12	10.43	51.73	52.78
56	209.78	0.25	5.24	2.17	4.18	11.56	46.64	3.11	10.19	17.75	46.44	49.72
60	167.32	0.07	1.65	0.81	1.45	4.56	42.42	2.67	6.47	12.32	41.51	43.30
64	91.92	0.24	1.36	1.65	2.63	4.17	32.70	2.49	9.58	15.73	30.81	34.59
68	44.72	0.10	0.52	0.50	3.80	1.18	16.79	1.53	16.84	19.26	14.60	24.17

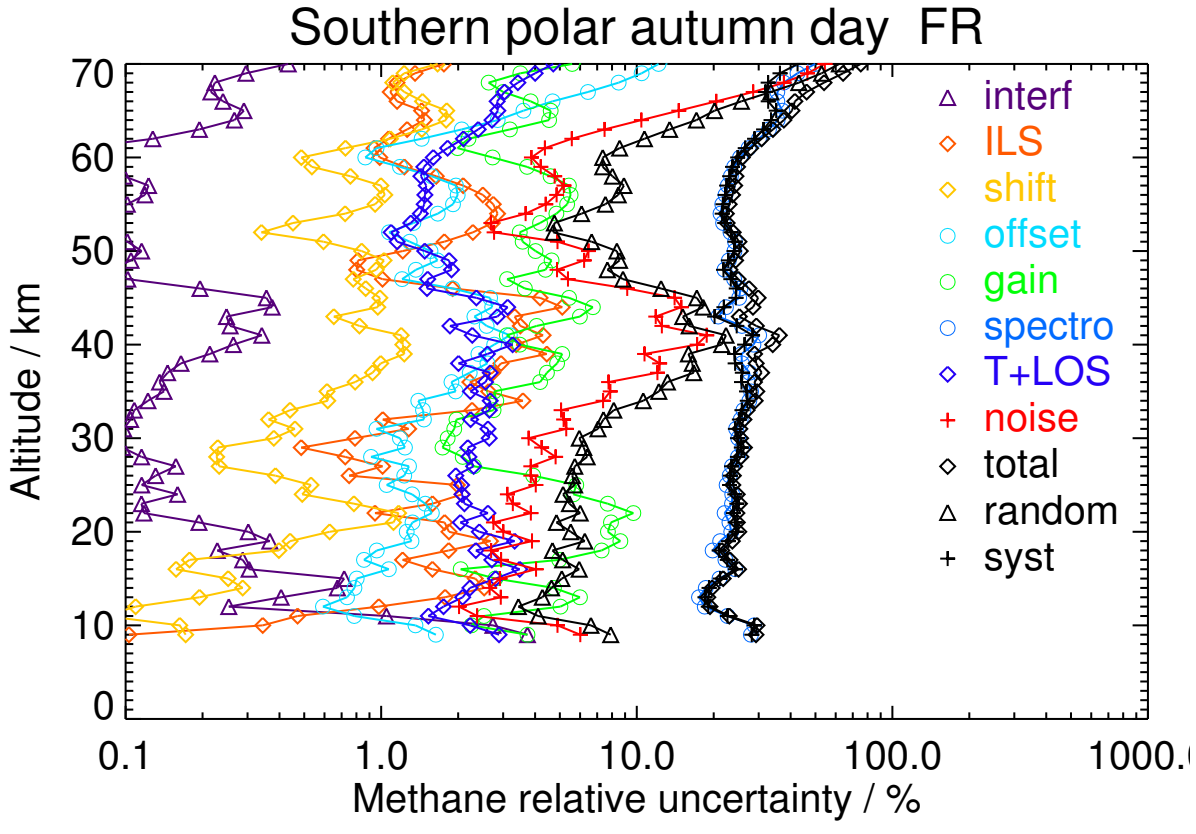

Figure S33. V8H_CH4_61 Southern polar autumn day

Table S34. Methane error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1706.65	31.30	1.76	1.79	23.34	52.79	292.35	35.58	71.94	164.17	263.20	310.20
12	1751.21	8.09	13.75	2.08	11.08	69.08	338.47	29.15	33.49	69.79	341.78	348.83
15	1623.13	11.35	47.95	6.21	13.74	66.63	308.03	43.91	46.14	88.52	313.36	325.62
18	1407.28	3.04	44.54	4.81	14.52	99.69	256.90	32.18	36.79	74.52	273.86	283.82
21	1205.42	2.13	23.44	10.36	16.68	93.70	260.21	25.86	34.38	70.68	272.55	281.56
24	1015.13	1.25	16.63	7.16	15.02	55.11	230.94	21.73	34.60	61.56	234.10	242.06
27	773.07	1.02	9.32	2.48	11.90	16.43	181.29	18.21	33.38	51.16	179.45	186.60
30	617.60	0.55	3.73	1.87	9.35	11.51	157.84	16.77	27.32	46.18	155.07	161.80
33	350.68	0.39	6.23	1.29	7.00	7.27	97.85	10.08	22.96	45.14	91.15	101.71
36	168.21	0.25	3.29	1.28	4.75	5.44	47.21	4.88	19.29	32.39	40.50	51.86
39	106.11	0.22	4.12	1.14	3.20	4.79	28.33	3.11	14.74	21.25	25.08	32.88
42	105.16	0.22	3.28	0.88	2.59	4.04	28.00	2.05	14.27	18.25	26.33	32.04
45	155.76	0.31	2.32	1.12	2.85	6.45	38.40	3.74	15.08	20.08	37.01	42.10
48	188.60	0.13	2.02	1.30	2.30	7.70	43.61	3.14	7.80	12.06	43.56	45.20
52	195.28	0.19	3.68	0.97	2.34	6.63	46.87	2.21	9.41	13.94	46.47	48.52
56	144.66	0.15	4.24	1.24	2.73	7.28	35.25	2.32	8.85	15.37	34.21	37.50
60	97.77	0.08	1.13	0.62	1.71	3.89	25.81	1.87	7.42	13.29	23.83	27.28
64	59.40	0.19	1.56	1.35	2.14	3.23	21.62	2.04	8.48	13.93	19.21	23.73
68	26.23	0.10	0.77	0.60	4.02	1.54	12.46	1.23	17.75	19.94	9.69	22.16

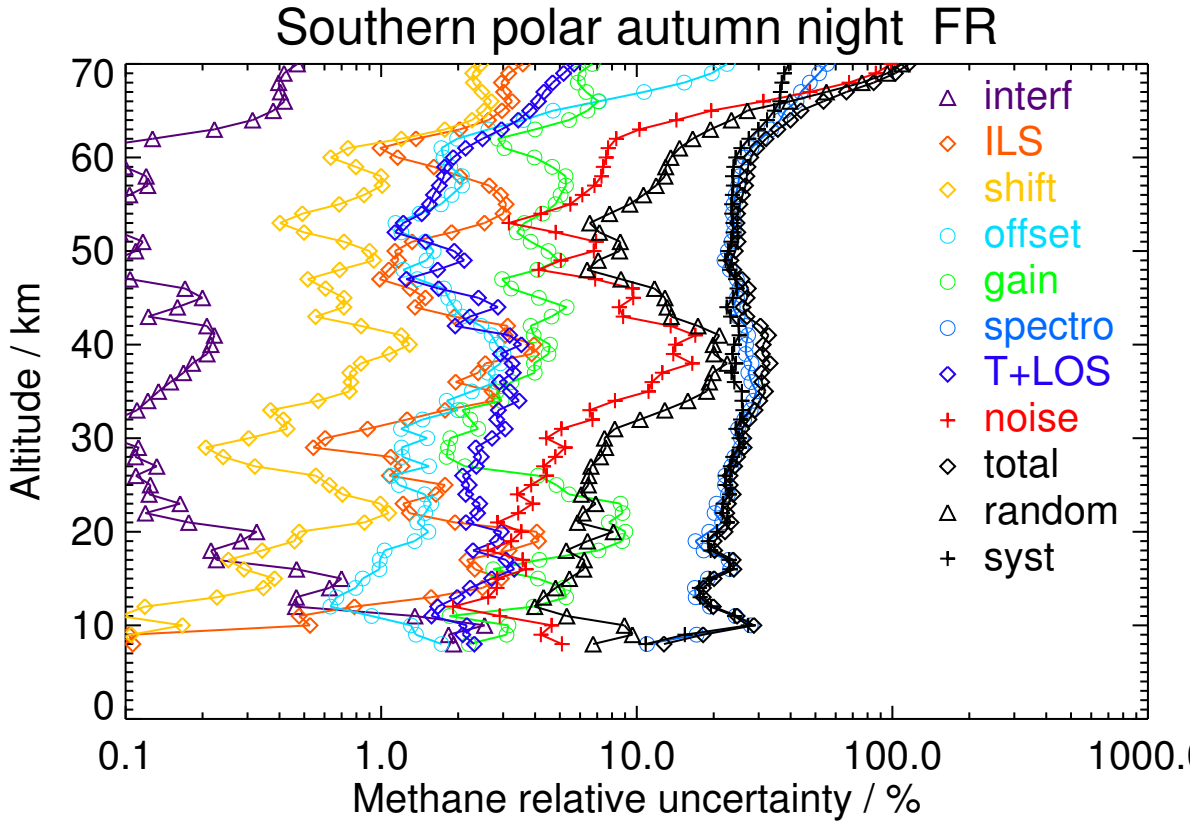

Figure S34. V8H_CH4_61 Southern polar autumn night

S3 Methane error contribution profile plots and tabulated values for RR NOM data (V8R_CH4_261)

Table S35. Methane error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
20	1304.99	4.31	91.74	5.61	5.11	42.13	333.05	30.71	35.28	112.03	332.90	351.25
30	998.64	1.04	13.69	1.77	6.17	23.65	241.49	19.71	24.51	80.37	231.60	245.15
40	357.18	1.09	8.44	1.00	5.56	9.98	74.54	6.76	25.90	32.28	73.73	80.48
50	204.56	0.52	2.54	0.39	3.67	14.04	47.46	4.81	15.37	18.28	48.94	52.24
60	117.92	0.17	0.60	0.24	1.64	1.74	28.84	3.13	14.62	16.28	28.21	32.58
70	5.44	0.32	2.54	0.31	5.88	3.75	12.43	0.97	27.52	29.16	10.86	31.11
30	998.64	1.04	13.69	1.77	6.17	23.65	241.49	19.71	24.51	80.37	231.60	245.15
33	752.37	0.84	5.42	2.24	3.54	12.14	186.70	16.19	23.06	53.19	181.71	189.33
36	496.70	1.07	8.38	1.89	3.12	14.90	120.10	8.47	20.13	39.25	116.91	123.32
39	378.01	1.13	8.29	1.16	3.14	11.62	80.90	6.21	20.27	30.62	79.21	84.92
42	328.90	1.02	7.67	1.19	3.20	10.01	66.48	5.54	20.42	26.69	65.78	70.99
45	274.32	0.71	5.29	1.21	3.32	14.27	59.38	4.85	18.57	26.76	58.51	64.34
48	244.39	0.80	4.46	0.76	4.67	22.12	52.68	5.91	17.29	22.54	55.97	60.34
52	183.52	0.26	1.38	0.43	2.48	7.07	42.88	3.97	12.96	15.78	42.80	45.62
56	164.48	0.23	1.11	0.42	1.63	2.96	38.84	3.87	12.74	14.50	38.58	41.22
60	117.92	0.17	0.60	0.24	1.64	1.74	28.84	3.13	14.62	16.28	28.21	32.58
64	53.07	0.26	1.49	0.20	2.97	2.02	16.84	1.81	17.14	18.74	15.64	24.41
68	12.46	0.32	2.19	0.27	5.40	3.56	12.66	1.08	24.70	26.47	10.85	28.61

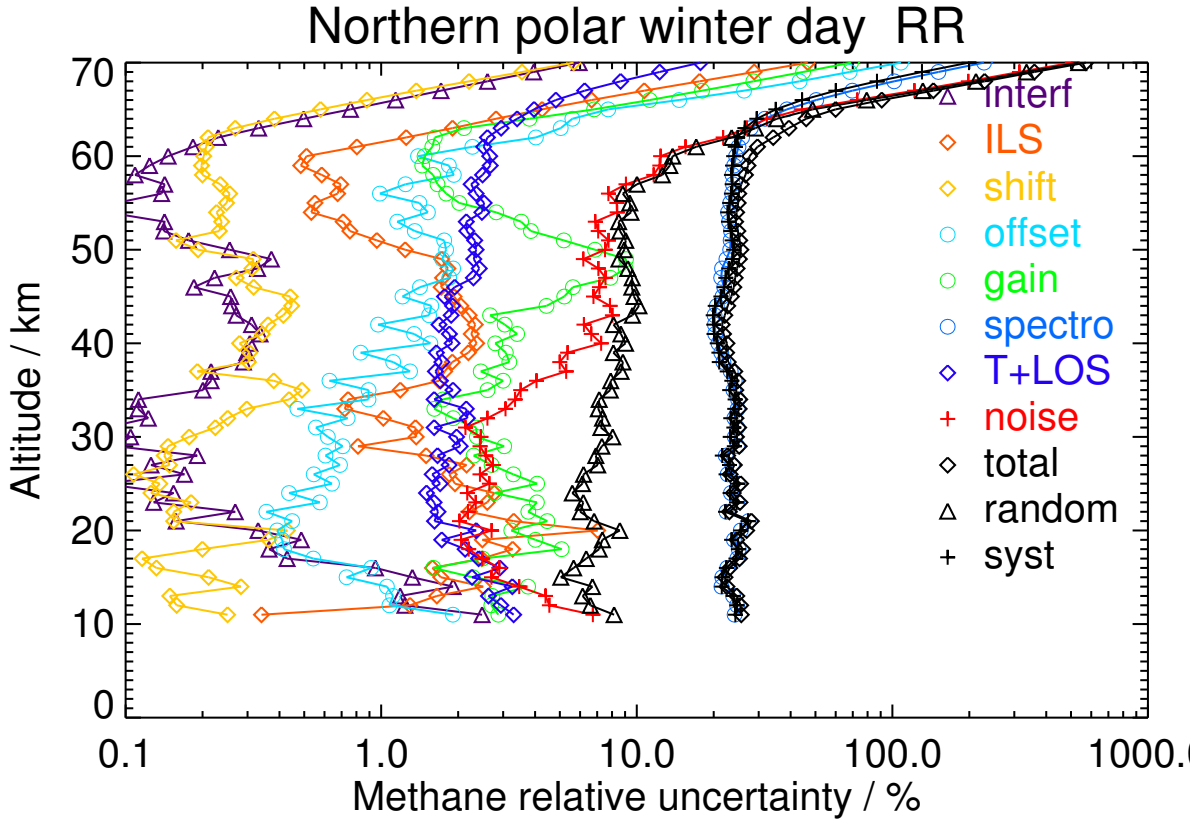

Figure S35. V8R_CH4_261 Northern polar winter day

Table S36. Methane error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1923.46	39.60	25.18	3.22	32.32	73.90	391.36	75.21	118.10	149.88	398.77	426.01
12	1792.23	22.84	34.25	2.99	18.80	51.22	403.16	50.66	81.95	109.44	405.62	420.12
15	1457.38	22.83	31.20	2.50	14.15	20.09	312.26	42.46	50.96	84.35	311.28	322.51
18	1303.36	5.87	18.95	4.24	6.57	34.66	327.82	31.47	35.28	78.82	324.26	333.71
21	1057.78	1.72	42.32	2.24	7.23	44.34	314.99	23.90	33.35	115.44	302.31	323.60
24	928.85	2.98	26.30	2.59	4.15	28.65	206.55	14.34	22.26	104.76	184.21	211.92
27	939.22	1.60	16.69	2.28	7.67	18.54	249.34	18.07	30.02	111.67	227.20	253.16
30	889.99	4.30	20.93	4.22	6.47	34.98	174.23	14.21	20.32	80.23	162.09	180.86
33	668.08	2.14	10.39	3.08	4.94	25.55	156.42	11.72	23.08	57.54	150.41	161.04
36	413.39	2.29	13.43	2.57	4.18	17.86	100.17	5.78	20.15	46.40	94.07	104.89
39	346.83	1.48	11.94	1.78	3.68	18.72	75.60	4.71	17.01	31.39	74.52	80.86
42	351.64	1.40	14.49	2.15	3.13	15.81	73.97	4.43	14.38	26.31	74.04	78.58
45	341.86	1.10	10.45	2.45	2.53	10.78	72.87	4.39	13.19	24.06	71.85	75.77
48	279.07	0.96	5.19	1.48	2.17	4.23	59.84	4.08	13.25	22.47	57.62	61.85
52	194.66	0.35	2.95	0.49	1.67	3.74	43.67	3.42	10.44	15.27	42.67	45.32
56	160.45	0.30	3.21	0.63	1.21	2.23	36.63	3.23	9.70	12.04	36.31	38.25
60	141.48	0.28	1.34	0.72	1.48	1.68	33.02	3.27	12.02	13.85	32.57	35.39
64	97.70	0.40	1.66	0.70	2.58	3.62	27.11	2.97	15.90	19.23	25.50	31.94
68	64.50	0.51	3.13	1.09	5.09	6.01	26.24	2.86	24.64	28.64	23.60	37.11

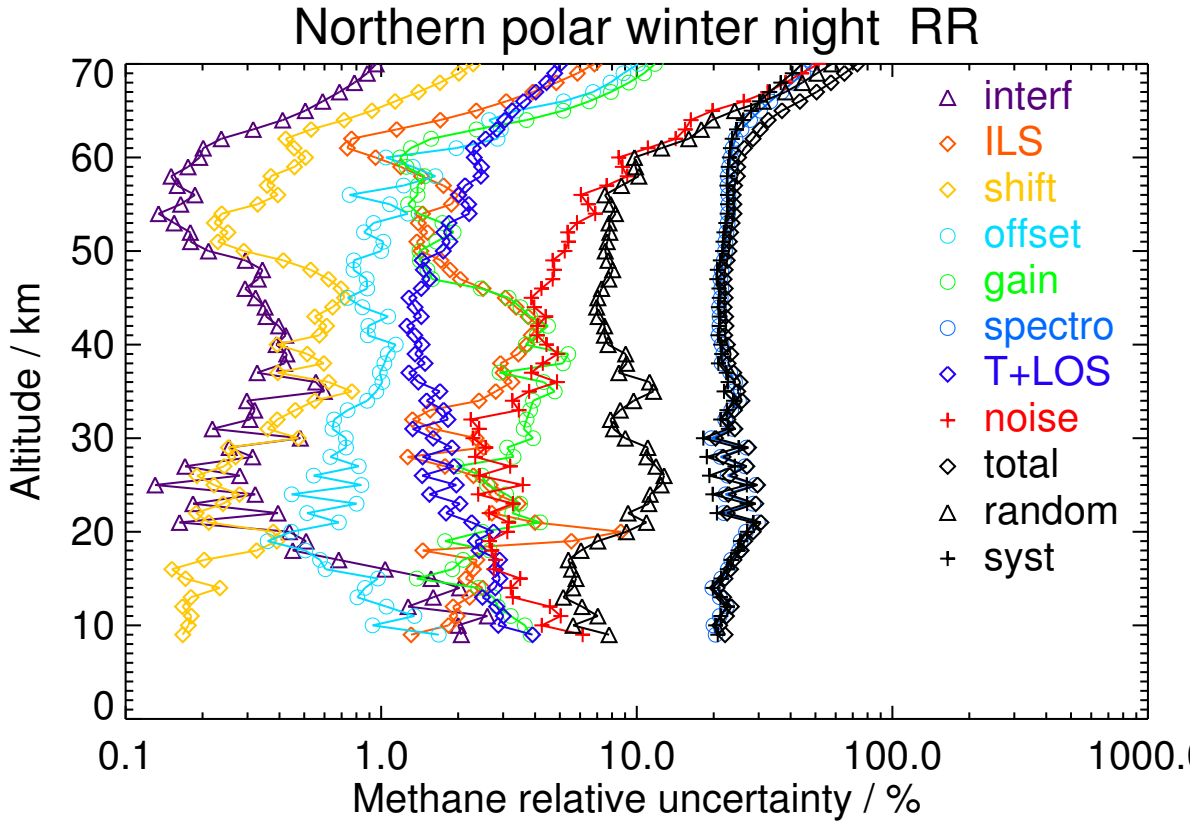

Figure S36. V8R_CH4_261 Northern polar winter night

Table S37. Methane error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1726.47	8.38	12.49	2.22	18.73	45.21	397.42	50.92	71.90	97.16	398.60	410.28
15	1508.07	5.78	24.98	2.26	12.53	47.45	294.46	44.93	47.42	77.83	296.63	306.67
18	1371.52	3.14	27.56	2.56	6.58	70.84	318.67	29.12	33.50	63.86	324.47	330.69
21	1180.83	1.19	23.08	2.13	6.07	52.00	280.92	24.08	33.59	52.61	284.85	289.66
24	1146.28	0.78	13.76	1.76	6.52	37.36	260.98	20.74	34.33	48.26	262.72	267.12
27	938.98	0.64	8.15	1.42	8.07	12.47	220.32	21.26	37.82	50.22	219.52	225.19
30	791.07	0.67	29.06	1.62	6.07	11.05	190.71	19.44	29.78	41.89	192.06	196.58
33	531.70	0.89	5.35	2.39	4.69	6.86	125.26	12.82	26.54	33.24	124.73	129.08
36	365.91	1.20	7.63	2.12	4.26	5.25	79.31	6.77	23.29	27.07	79.09	83.59
39	278.72	0.72	6.16	1.32	3.46	11.42	61.93	4.41	19.45	21.74	62.80	66.45
42	202.42	0.26	6.64	1.18	2.55	7.97	48.98	3.06	16.45	19.04	49.32	52.87
45	119.02	0.22	4.25	0.72	2.36	5.15	31.92	1.98	14.36	17.65	31.12	35.77
48	58.34	0.32	3.10	0.63	2.09	4.51	16.54	1.25	10.70	16.68	12.10	20.61
52	66.20	0.12	0.83	0.29	0.96	1.99	18.86	0.77	5.12	11.28	16.15	19.70
56	73.40	0.10	0.83	0.23	0.75	1.60	19.01	0.78	4.34	8.63	17.61	19.62
60	55.40	0.08	0.56	0.13	0.95	1.17	14.84	0.73	5.56	7.80	13.90	15.94
64	39.70	0.21	0.60	0.23	1.14	1.12	10.72	0.61	8.11	9.26	9.91	13.57
68	19.49	0.23	0.83	0.56	3.05	2.55	8.43	0.59	14.42	15.62	7.22	17.21

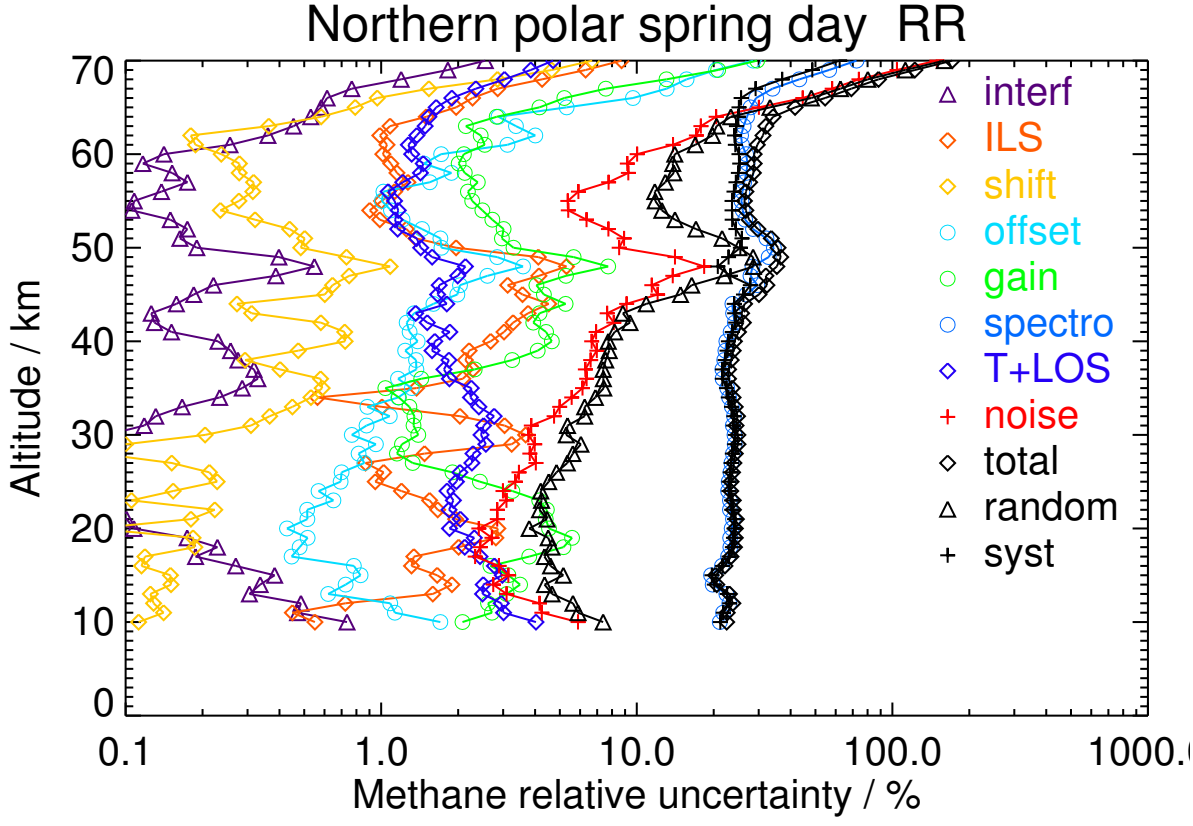

Figure S37. V8R_CH4_261 Northern polar spring day

Table S38. Methane error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1704.03	8.36	14.22	2.40	20.15	44.32	405.59	52.64	78.41	103.90	406.54	419.61
15	1628.79	5.34	18.16	2.27	13.41	38.30	337.88	42.92	46.48	75.75	338.29	346.66
18	1449.95	2.88	19.49	2.32	6.85	86.94	335.48	33.97	34.06	64.11	344.60	350.51
21	1243.22	1.19	12.35	2.43	7.42	70.52	304.39	25.17	35.85	54.14	311.17	315.84
24	1091.28	0.91	19.11	1.71	5.12	31.56	254.30	19.12	31.48	47.75	255.22	259.65
27	975.58	0.70	7.35	1.14	8.84	14.21	231.77	21.52	41.27	54.44	230.78	237.11
30	783.55	0.69	24.69	1.51	6.00	10.94	190.37	19.19	29.36	39.84	191.44	195.55
33	537.01	0.86	3.82	1.87	4.14	6.53	127.65	13.21	26.61	34.15	126.84	131.36
36	366.70	1.15	8.75	2.20	3.76	6.33	85.97	6.91	23.02	26.62	86.00	90.03
39	304.82	0.87	6.63	1.65	3.43	13.15	74.78	4.86	19.66	22.42	75.71	78.96
42	218.63	0.26	8.38	1.25	2.27	9.29	53.67	3.77	16.11	17.83	54.76	57.59
45	147.40	0.21	4.05	0.63	2.29	5.19	35.13	2.41	14.80	16.14	35.32	38.84
48	108.87	0.34	4.38	0.66	2.33	6.51	22.75	2.06	12.12	14.58	22.88	27.14
52	75.95	0.13	1.19	0.33	1.17	1.87	20.06	0.94	6.66	11.13	18.17	21.31
56	86.36	0.08	0.78	0.23	0.77	1.95	21.76	0.95	4.75	8.20	20.85	22.40
60	60.07	0.08	0.73	0.22	0.82	1.33	16.45	0.99	5.63	8.00	15.56	17.50
64	38.00	0.20	0.32	0.23	1.01	0.58	10.96	0.73	8.07	9.24	10.10	13.69
68	20.36	0.20	0.41	0.51	3.35	1.48	9.88	0.71	15.45	16.93	8.01	18.73

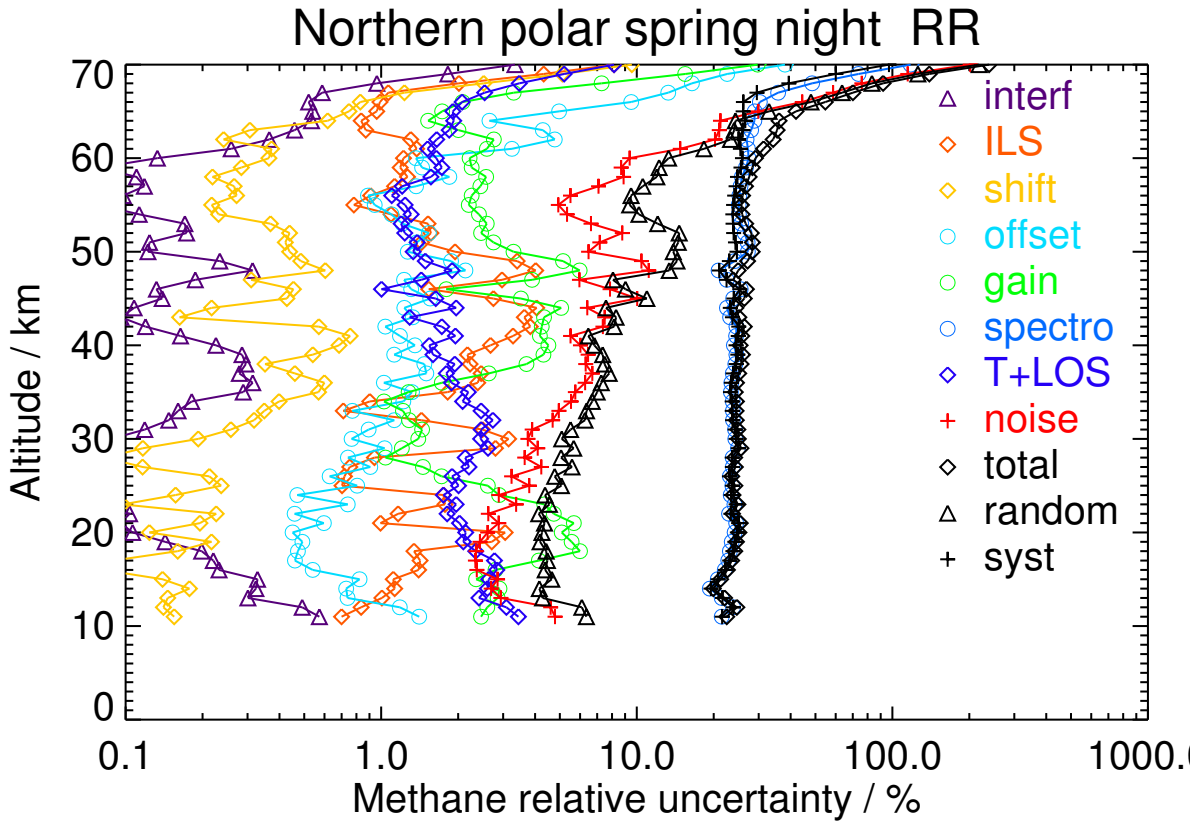

Figure S38. V8R_CH4_261 Northern polar spring night

Table S39. Methane error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1843.28	11.41	18.94	2.54	19.37	43.19	401.50	54.00	78.62	111.27	400.82	415.98
15	1757.82	9.09	51.44	4.33	12.80	59.26	344.74	47.54	48.50	91.81	348.50	360.39
18	1638.20	3.38	61.37	3.71	7.60	92.00	378.17	30.42	32.58	102.78	383.07	396.62
21	1286.91	2.05	53.65	5.10	7.74	30.78	343.57	29.63	34.96	73.01	344.56	352.21
24	1134.73	1.34	16.16	1.43	2.84	10.70	249.48	14.74	19.80	34.92	249.03	251.47
27	1074.14	0.78	11.67	4.00	8.13	9.69	256.29	21.73	34.20	44.35	256.26	260.07
30	916.97	0.72	45.92	1.90	3.88	24.93	171.86	12.51	19.05	28.17	178.92	181.12
33	708.47	1.03	7.51	2.50	3.72	18.44	142.19	9.68	22.32	28.11	142.96	145.70
36	499.66	1.91	18.33	3.25	3.66	10.45	109.70	5.67	22.54	25.95	111.23	114.22
39	317.43	1.31	8.22	1.71	3.05	11.57	69.96	3.19	20.38	22.62	70.88	74.40
42	242.87	0.60	7.51	1.29	2.37	9.44	55.77	2.28	17.19	19.60	56.39	59.70
45	176.99	0.40	4.23	0.74	2.41	6.55	50.93	2.01	16.97	20.67	50.26	54.35
48	116.86	0.31	8.97	0.95	2.53	10.41	27.32	2.20	14.88	20.74	27.18	34.19
52	77.80	0.23	3.53	0.28	1.76	3.93	19.00	1.02	10.80	16.18	15.75	22.58
56	72.43	0.12	1.33	0.31	0.96	1.78	18.00	0.67	5.91	8.02	17.35	19.12
60	68.62	0.17	0.68	0.27	0.86	0.63	17.43	0.70	4.55	5.83	17.10	18.07
64	72.74	0.25	1.13	0.24	0.80	0.92	19.64	0.80	6.17	7.07	19.43	20.67
68	97.44	0.54	2.22	1.08	1.92	3.30	27.70	1.24	10.37	11.75	27.55	29.95

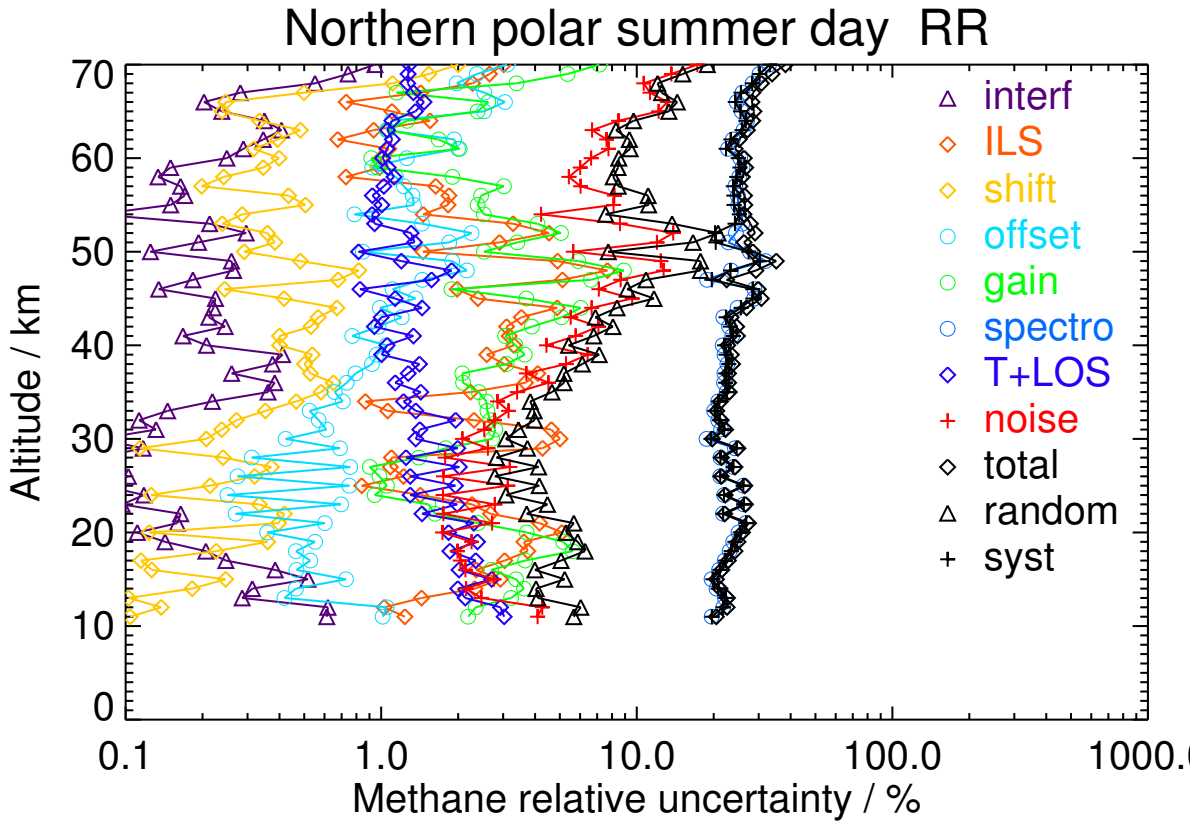

Figure S39. V8R_CH4_261 Northern polar summer day

Table S40. Methane error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
15	1841.87	6.03	33.34	1.72	26.62	20.83	428.98	89.31	78.34	127.97	429.02	447.70
18	1634.77	1.55	58.28	2.31	8.07	111.79	356.84	41.24	31.38	79.35	373.75	382.08
21	1347.15	1.28	31.34	3.32	7.87	75.16	344.22	28.89	31.63	72.11	349.04	356.41
24	1114.34	1.18	18.63	1.35	4.60	14.74	253.27	19.18	24.49	39.35	253.28	256.32
27	1028.79	0.64	13.90	2.68	7.20	12.11	249.39	21.09	31.36	42.17	249.49	253.02
30	839.76	0.93	32.92	2.13	4.86	20.38	169.09	16.22	21.09	34.06	172.25	175.58
33	590.09	0.98	5.83	1.82	3.68	15.37	131.73	12.62	23.77	29.62	132.24	135.52
36	370.82	1.69	13.70	2.42	3.73	11.63	84.28	5.87	24.04	27.01	85.62	89.78
39	231.98	0.64	7.39	0.89	2.80	10.73	55.44	3.49	21.89	24.46	56.08	61.19
42	156.86	0.45	8.40	0.76	2.51	6.48	41.44	2.58	18.84	21.28	41.78	46.89
45	86.61	0.24	3.47	0.28	2.59	4.79	20.63	1.58	16.69	18.98	19.71	27.36
48	79.30	0.23	2.87	0.41	1.97	4.32	19.72	1.31	11.40	14.38	18.57	23.48
52	77.51	0.08	0.95	0.22	1.09	1.63	19.16	0.82	6.79	9.63	18.06	20.46
56	92.53	0.12	0.58	0.36	0.79	2.15	23.52	1.10	5.05	10.26	21.91	24.20
60	119.11	0.20	0.88	0.42	0.92	2.46	32.38	1.61	5.76	14.46	29.72	33.05
64	170.73	0.48	1.35	0.73	1.47	2.18	44.71	2.40	8.60	14.60	43.30	45.69
68	178.15	0.79	1.15	1.65	3.86	2.84	51.63	3.62	18.83	23.75	49.98	55.33

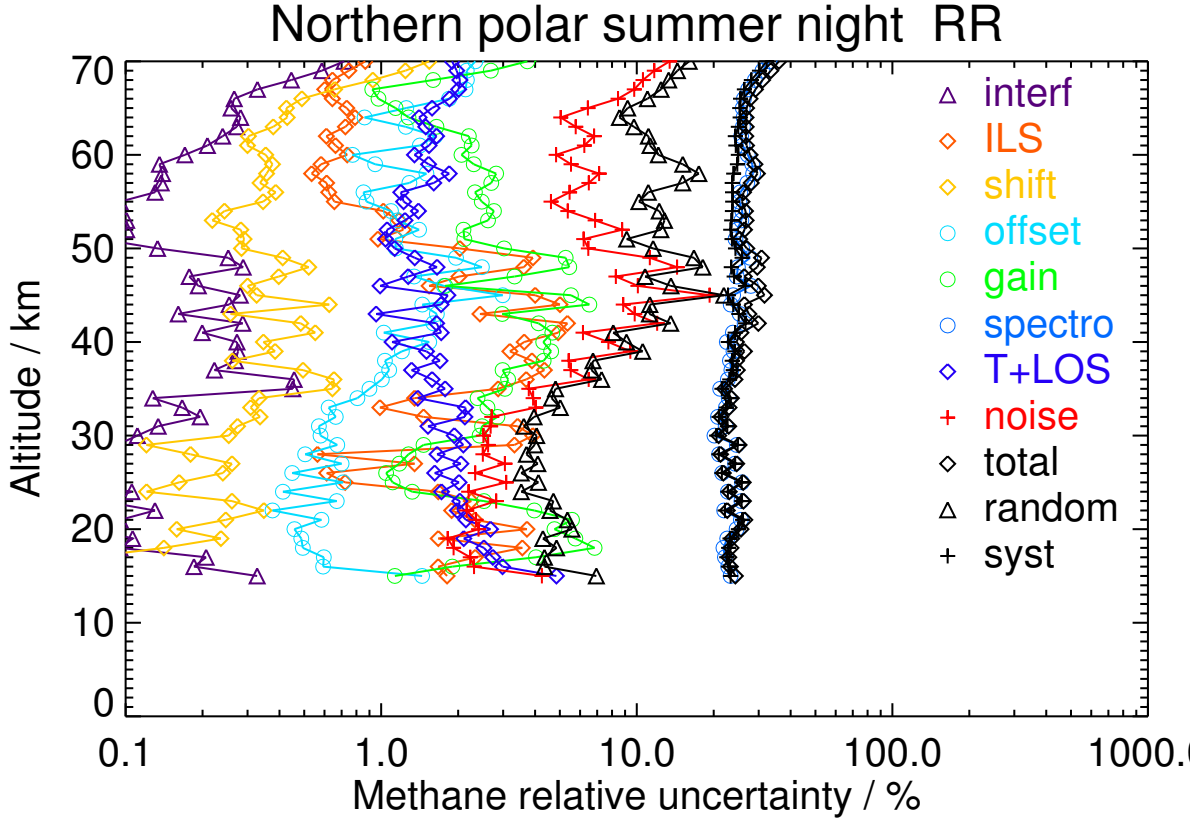

Figure S40. V8R_CH4_261 Northern polar summer night

Table S41. Methane error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
15	1625.29	13.39	17.25	3.10	15.79	33.74	335.37	44.70	57.19	83.25	335.68	345.85
18	1483.33	1.90	21.53	2.92	5.15	73.36	328.90	35.49	31.96	67.14	334.41	341.08
21	1202.93	1.31	26.56	1.40	7.05	70.23	289.32	24.12	33.02	65.44	294.60	301.78
24	1060.73	1.51	20.29	1.58	6.55	37.79	241.64	20.98	33.54	51.64	243.25	248.68
27	849.96	1.24	16.12	1.34	7.70	17.44	203.32	19.09	35.99	53.81	201.82	208.87
30	610.47	1.17	12.53	1.38	6.32	14.84	153.09	16.47	26.93	54.25	148.02	157.65
33	351.31	1.18	3.93	1.11	3.87	9.90	92.06	10.57	24.39	46.31	84.66	96.50
36	217.74	1.06	4.88	1.09	2.85	8.58	60.78	5.03	20.18	41.10	50.46	65.08
39	141.18	0.79	5.41	0.84	2.18	7.99	42.63	2.90	15.92	35.90	29.83	46.68
42	165.10	0.54	6.52	0.94	2.23	11.35	49.28	3.01	12.56	36.98	37.49	52.66
45	193.34	0.30	5.33	0.48	2.05	11.16	49.86	3.18	11.10	28.03	44.63	52.70
48	218.01	0.48	3.49	0.57	2.80	13.09	50.20	4.08	11.00	19.25	49.79	53.38
52	238.04	0.36	2.52	0.39	2.43	10.58	55.24	3.95	9.07	16.55	54.77	57.22
56	207.74	0.30	1.36	0.48	1.35	4.83	50.29	3.70	8.51	16.75	48.60	51.41
60	154.35	0.24	1.31	0.29	1.15	2.80	38.76	3.17	9.46	15.86	36.90	40.16
64	92.18	0.26	1.08	0.20	1.74	1.60	24.30	1.89	11.14	14.04	22.98	26.93
68	55.72	0.36	1.18	0.47	4.15	3.73	18.23	1.69	19.92	22.32	16.32	27.65

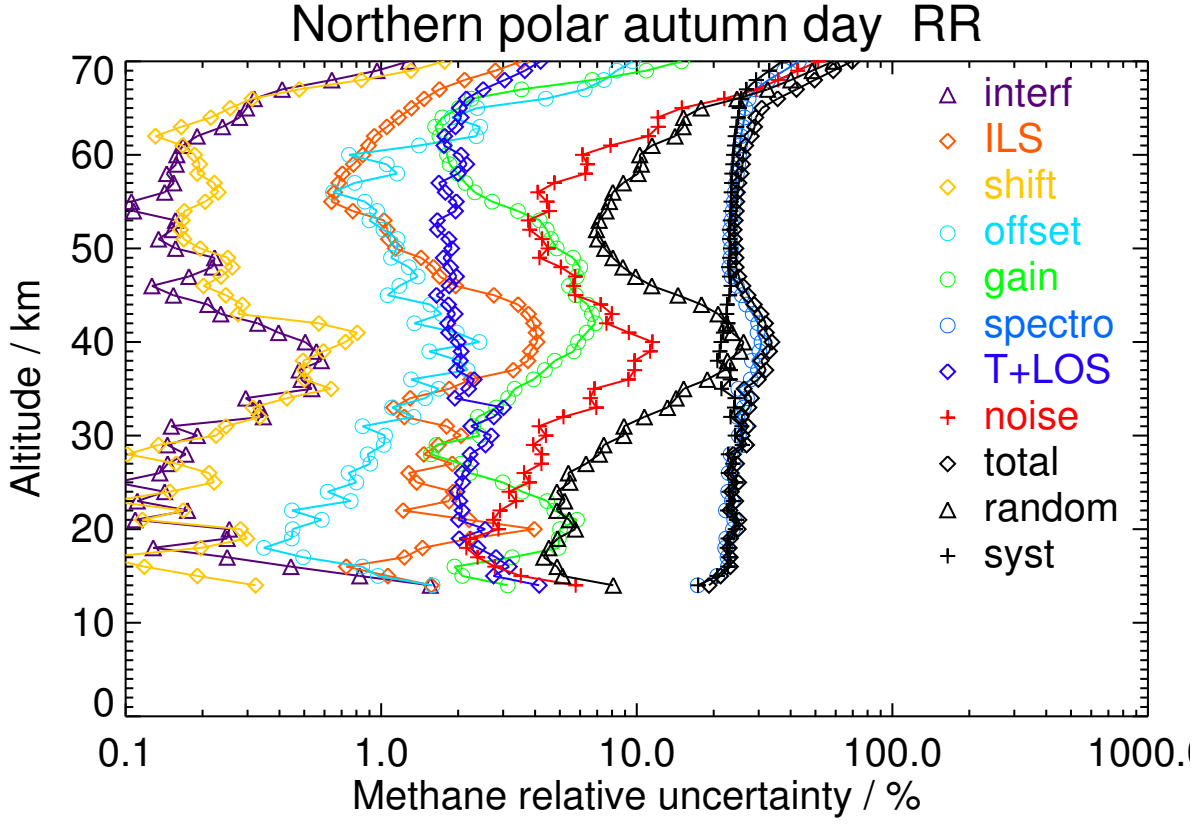

Figure S41. V8R_CH4_261 Northern polar autumn day

Table S42. Methane error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
15	1607.53	12.78	16.63	3.29	16.27	29.92	343.01	45.05	57.16	90.79	341.06	352.94
18	1444.75	2.08	22.89	3.27	6.14	79.97	344.88	34.66	32.89	66.97	351.72	358.04
21	1222.63	1.46	21.52	1.40	7.00	63.68	310.07	23.08	33.50	56.30	314.96	319.95
24	1038.56	1.86	20.65	1.36	6.20	34.59	247.24	20.01	32.10	49.94	248.45	253.42
27	818.56	1.47	14.15	1.28	7.71	16.48	205.54	18.67	36.59	58.09	202.72	210.88
30	580.08	1.69	13.19	1.99	5.99	17.29	146.08	15.21	25.83	53.19	141.15	150.84
33	401.45	1.48	4.01	2.46	3.73	16.57	112.48	10.04	23.71	70.59	92.97	116.73
36	285.76	1.26	6.08	1.51	2.95	8.69	86.28	5.55	21.44	63.97	62.98	89.77
39	214.44	1.48	7.52	1.51	2.41	9.03	69.11	3.79	17.64	56.79	44.99	72.46
42	194.75	0.97	8.32	1.36	2.48	12.23	60.98	3.44	13.55	47.67	43.24	64.36
45	188.97	0.26	5.00	0.50	1.98	9.56	51.75	3.09	11.25	30.27	44.93	54.17
48	205.26	0.29	5.19	0.60	2.51	11.86	51.26	3.95	10.09	22.51	49.12	54.03
52	220.89	0.28	3.41	0.39	2.05	9.00	51.72	3.47	7.97	14.21	51.44	53.37
56	204.59	0.22	1.88	0.54	1.31	6.02	50.20	3.45	7.77	15.56	48.90	51.32
60	152.72	0.09	1.40	0.25	1.15	3.81	39.77	3.09	8.90	16.44	37.66	41.09
64	102.47	0.25	0.97	0.41	1.84	1.70	30.49	2.18	11.12	18.01	27.23	32.64
68	79.35	0.34	1.64	1.06	4.26	3.19	29.07	2.43	20.55	26.76	24.27	36.13

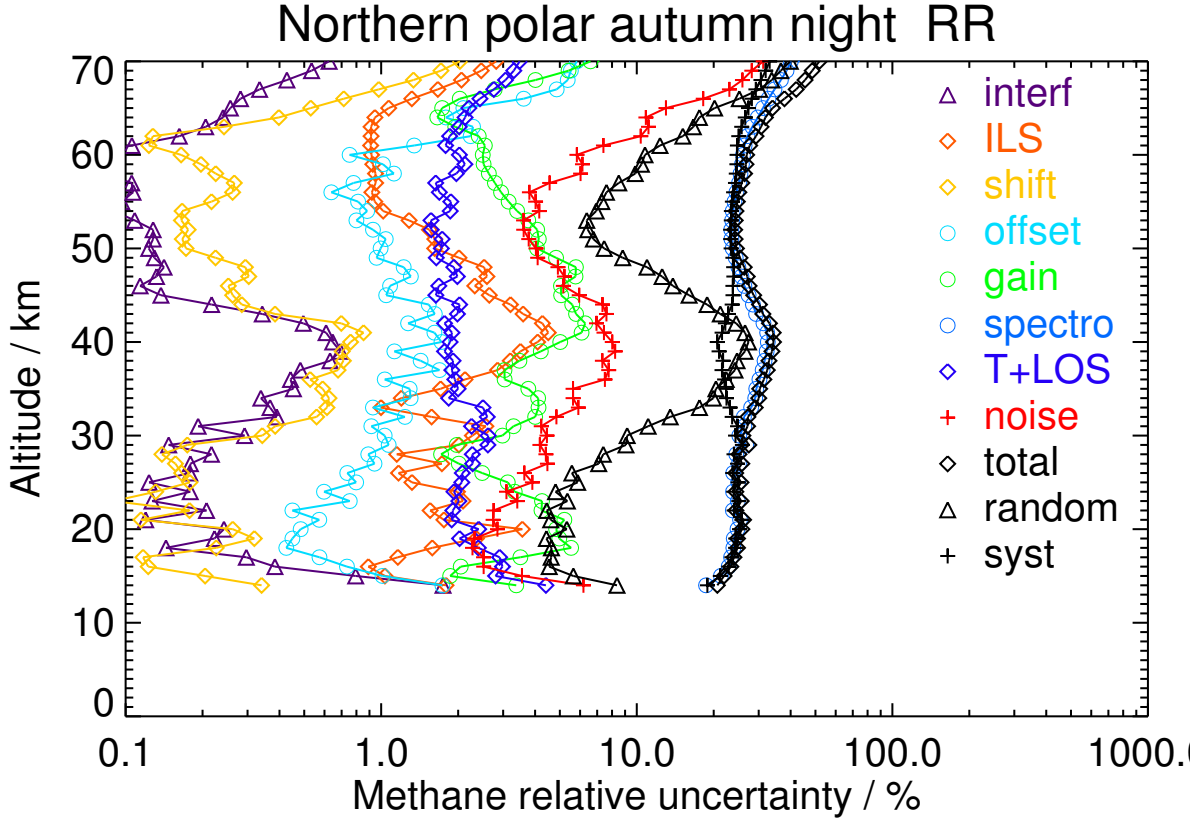

Figure S42. V8R_CH4_261 Northern polar autumn night

Table S43. Methane error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1771.39	11.84	17.03	2.37	22.35	40.10	398.81	52.43	90.91	115.01	399.22	415.46
15	1658.32	5.65	53.73	2.50	11.67	50.97	351.47	37.82	44.54	82.38	354.71	364.15
18	1608.30	3.36	53.99	3.04	11.29	103.58	385.27	39.97	37.02	96.98	394.70	406.44
21	1345.93	1.50	48.98	1.82	4.61	37.34	339.38	27.40	35.87	70.68	340.65	347.91
24	1289.13	1.26	36.02	1.91	6.04	27.02	311.54	21.44	30.36	67.96	309.66	317.03
27	1141.01	0.93	19.98	3.36	8.00	16.09	266.86	22.01	36.69	64.97	263.74	271.63
30	1155.91	1.07	47.51	2.65	6.12	28.86	262.06	19.31	24.58	59.59	263.13	269.79
33	1005.04	1.46	17.57	5.25	6.11	27.73	222.84	15.62	21.99	53.81	220.53	227.00
36	539.91	1.51	18.73	2.89	4.93	18.70	132.43	9.29	18.01	54.23	125.47	136.68
39	355.20	0.99	13.86	1.65	4.07	15.18	78.00	5.61	15.84	31.81	76.14	82.52
42	308.15	0.61	15.30	1.67	3.77	19.54	71.60	4.81	13.78	28.83	71.71	77.29
45	282.22	0.50	10.83	1.38	2.86	13.52	65.51	4.26	12.60	23.70	64.95	69.13
48	251.39	0.45	5.50	1.11	2.47	10.19	57.11	3.97	10.30	19.40	56.12	59.38
52	194.72	0.25	2.02	0.59	1.80	5.12	44.48	3.12	8.11	12.52	43.94	45.69
56	181.61	0.25	2.77	0.44	1.61	3.21	42.88	3.20	8.86	12.05	42.46	44.13
60	185.36	0.30	3.05	0.50	2.01	2.89	43.67	3.83	12.41	15.17	43.21	45.80
64	152.47	0.50	1.56	1.00	3.40	4.10	41.06	3.74	17.81	21.46	39.85	45.26
68	86.85	1.03	4.06	2.20	5.05	12.63	44.63	3.61	25.14	33.00	41.90	53.33

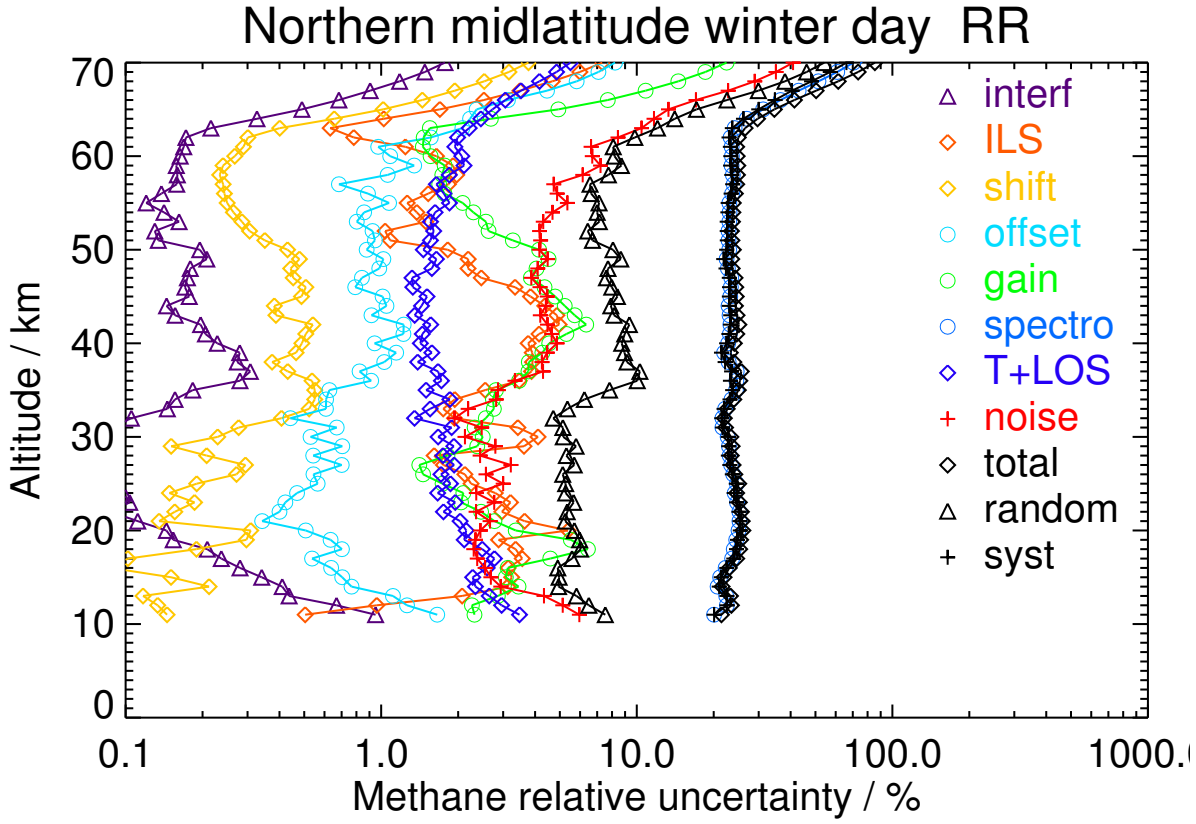

Figure S43. V8R_CH4_261 Northern midlatitude winter day

Table S44. Methane error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1855.06	10.10	27.38	2.04	23.62	53.02	424.54	55.25	89.48	117.88	426.18	442.18
15	1745.37	5.65	49.65	2.71	12.20	48.75	353.15	39.84	44.33	76.72	356.95	365.10
18	1614.13	2.85	47.85	3.22	9.50	84.45	366.32	36.66	34.91	95.39	370.39	382.47
21	1368.28	1.62	56.29	2.00	5.52	33.39	350.83	29.47	37.45	73.81	352.45	360.10
24	1296.39	1.20	33.40	1.27	6.10	18.34	317.93	21.56	31.37	60.38	316.82	322.52
27	1150.42	1.03	18.07	3.75	8.45	12.72	268.20	22.82	37.69	63.72	265.31	272.85
30	1114.08	1.12	49.05	1.69	5.72	22.20	255.05	18.54	23.45	56.06	256.39	262.45
33	938.76	1.58	10.63	5.93	5.62	22.73	210.52	14.01	21.06	54.01	206.73	213.67
36	547.02	1.66	16.35	2.53	4.92	13.64	127.02	8.81	17.61	51.82	119.67	130.41
39	357.96	0.86	14.16	1.73	3.86	15.34	80.87	5.23	14.37	29.54	79.72	85.02
42	303.18	0.57	12.27	1.68	3.45	16.56	71.52	4.40	12.21	26.17	70.98	75.65
45	301.96	0.43	12.27	1.56	2.74	15.26	71.63	4.21	10.80	26.26	70.49	75.22
48	249.62	0.34	4.45	1.15	1.90	7.56	56.78	3.31	8.48	16.86	55.72	58.21
52	180.09	0.28	2.57	0.53	1.46	3.32	40.93	2.75	6.90	10.83	40.41	41.84
56	171.03	0.28	2.83	0.29	1.47	1.95	39.32	3.00	8.24	10.31	39.12	40.46
60	168.61	0.32	2.92	0.58	2.01	2.42	39.53	3.72	12.37	14.34	39.28	41.81
64	151.36	0.47	1.83	1.20	3.55	3.44	40.37	3.83	18.16	22.28	38.82	44.76
68	120.10	0.81	5.24	2.41	4.58	9.61	41.95	3.67	24.66	31.10	39.51	50.28

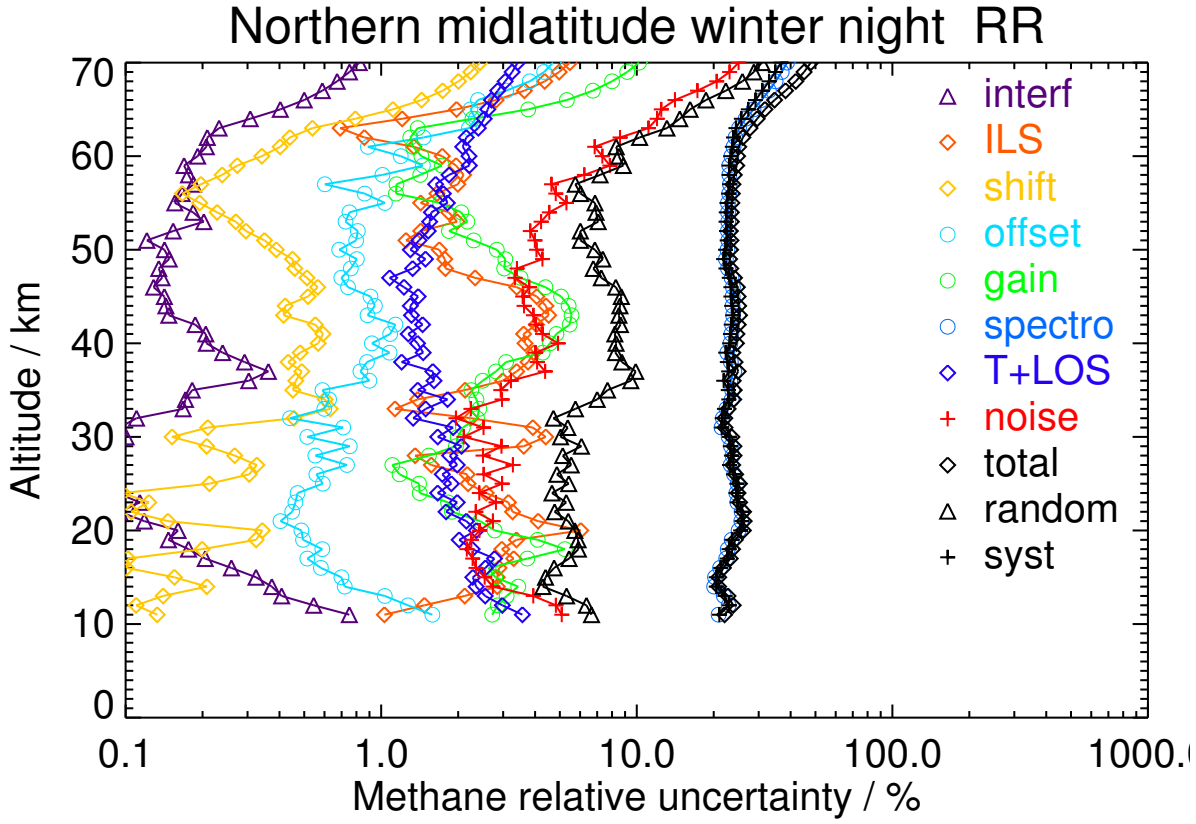

Figure S44. V8R_CH4_261 Northern midlatitude winter night

Table S45. Methane error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1796.90	8.00	18.14	2.01	12.70	55.69	416.30	46.35	61.43	92.13	417.61	427.66
15	1750.56	6.16	42.90	2.49	11.80	55.27	366.26	43.30	46.18	87.41	368.23	378.46
18	1628.81	3.32	57.36	3.80	12.23	123.82	362.25	42.31	38.41	97.16	379.27	391.52
21	1318.12	1.48	30.76	2.16	5.64	57.53	314.65	27.89	35.45	73.34	316.15	324.55
24	1163.23	1.01	18.96	2.15	7.09	19.70	282.98	22.88	36.35	55.10	282.29	287.62
27	1114.52	0.88	9.95	2.68	6.51	16.02	251.80	19.89	32.56	57.05	249.02	255.47
30	1021.05	1.02	39.99	2.58	7.19	22.66	243.12	21.12	29.11	65.96	241.30	250.15
33	750.46	1.12	9.17	2.36	5.40	18.11	165.83	14.10	23.17	48.24	162.35	169.36
36	476.08	1.60	9.08	2.43	4.38	10.97	105.70	7.56	19.29	40.42	100.99	108.78
39	386.99	1.24	7.62	1.93	3.75	12.93	85.03	5.09	16.54	31.94	82.18	88.17
42	358.98	0.69	14.40	1.85	3.31	17.94	86.25	4.67	13.59	30.73	85.12	90.50
45	285.97	0.38	9.59	1.12	2.72	15.96	72.99	4.13	11.30	31.80	69.40	76.34
48	282.17	0.52	7.23	1.43	2.72	15.77	69.99	4.28	9.52	27.95	67.36	72.93
52	211.29	0.34	2.74	0.57	1.44	5.01	49.66	3.21	7.39	15.94	48.08	50.65
56	168.01	0.27	1.26	0.60	1.18	1.88	39.94	2.99	7.00	11.61	39.05	40.74
60	126.48	0.23	0.99	0.37	1.22	1.30	30.40	2.45	8.31	11.11	29.66	31.68
64	84.79	0.30	0.81	0.34	2.07	1.70	21.69	1.82	11.33	12.83	21.11	24.70
68	35.99	0.46	1.66	0.85	4.01	6.73	18.29	1.62	19.27	21.12	18.09	27.81

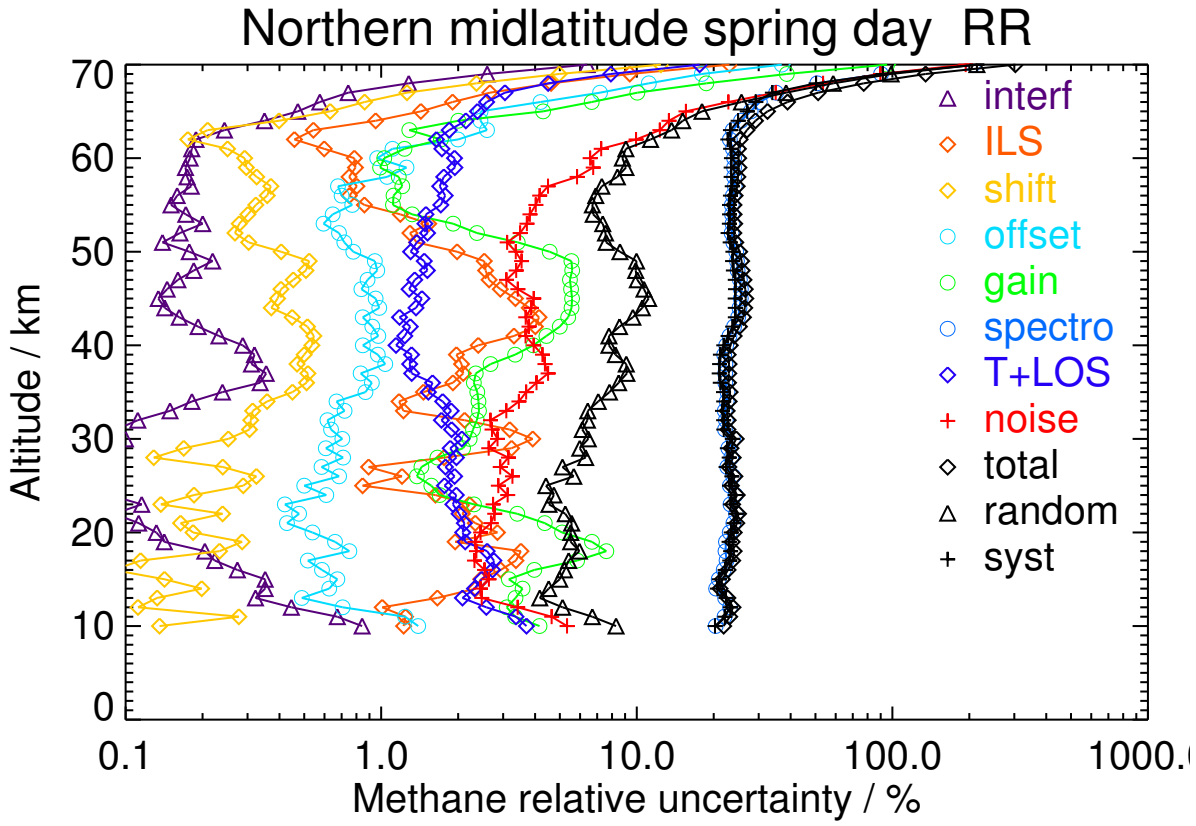

Figure S45. V8R_CH4_261 Northern midlatitude spring day

Table S46. Methane error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1831.94	8.71	15.87	2.08	16.42	52.67	406.14	49.46	68.65	93.40	408.36	418.91
15	1663.92	6.16	39.44	2.60	11.72	51.22	338.50	40.94	44.81	75.67	341.91	350.18
18	1579.18	3.39	46.13	3.19	10.51	107.01	359.58	35.55	35.90	91.41	370.41	381.52
21	1330.25	1.46	35.02	2.69	5.98	58.83	326.91	26.54	33.99	73.84	328.65	336.84
24	1176.24	1.09	16.97	2.10	6.36	28.61	279.96	21.87	34.62	55.96	279.42	284.96
27	1110.07	0.87	10.86	2.67	6.70	13.57	257.44	20.71	33.65	54.29	255.43	261.14
30	1005.99	0.77	39.82	2.08	6.61	17.70	235.50	20.68	27.93	49.40	237.01	242.11
33	740.02	1.47	9.04	3.13	5.29	16.88	165.80	12.94	22.54	42.54	163.59	169.03
36	492.56	1.64	12.39	2.56	4.69	12.52	113.83	7.82	19.32	42.22	109.32	117.19
39	382.28	1.19	10.60	1.86	3.86	12.93	85.73	5.28	16.35	33.23	82.70	89.13
42	342.26	0.59	12.59	1.69	3.33	17.96	82.76	4.76	13.15	33.41	80.15	86.83
45	262.88	0.35	8.01	1.06	2.38	13.73	65.34	3.85	10.58	31.06	60.76	68.24
48	243.51	0.30	4.98	0.86	2.04	10.20	57.37	3.43	8.09	20.59	55.48	59.18
52	203.90	0.21	1.58	0.56	1.46	5.46	47.18	2.96	6.73	13.18	46.27	48.11
56	172.24	0.25	1.41	0.57	1.30	2.46	41.46	2.93	7.08	11.25	40.75	42.28
60	138.98	0.27	1.00	0.49	1.60	1.95	34.72	2.83	9.29	11.81	34.18	36.16
64	86.17	0.28	0.52	0.38	2.61	1.06	23.24	2.01	12.99	14.32	22.73	26.86
68	48.06	0.45	1.22	0.96	4.02	5.64	20.97	1.90	19.80	22.21	19.81	29.76

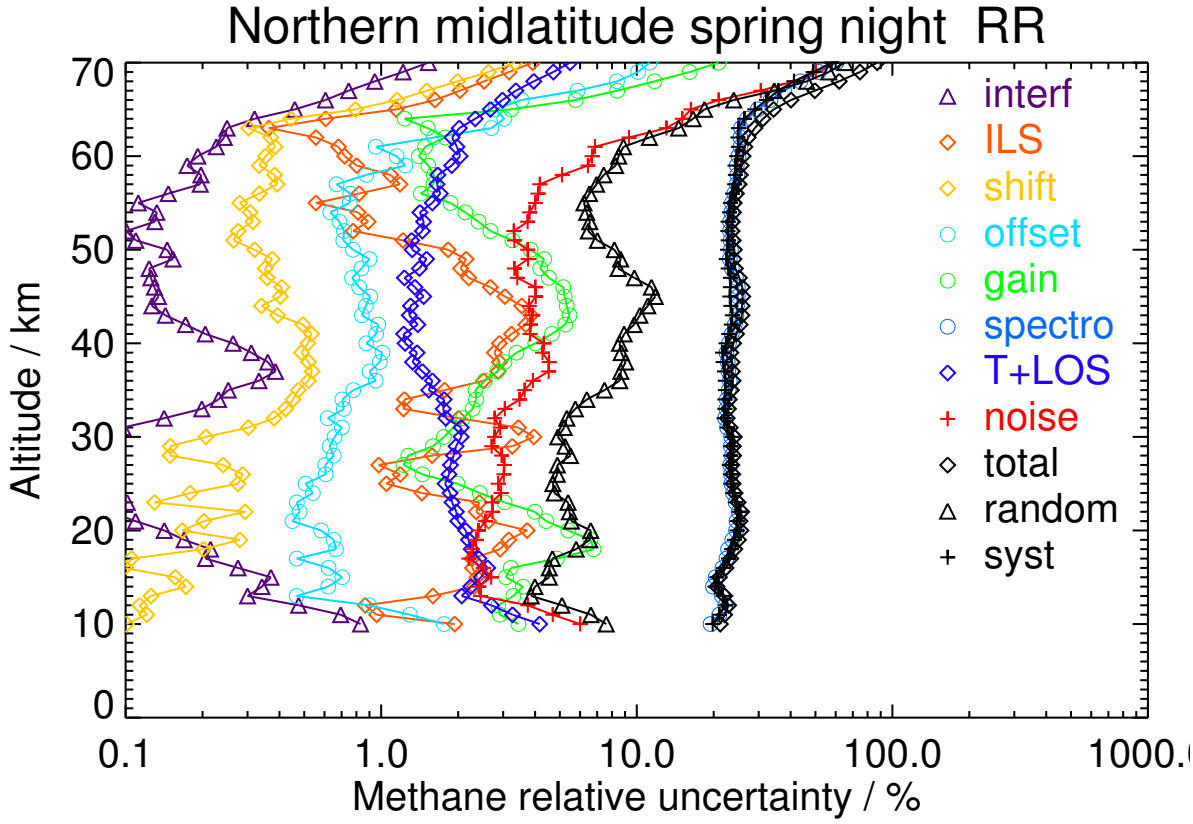

Figure S46. V8R_CH4_261 Northern midlatitude spring night

Table S47. Methane error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1979.46	7.43	26.08	1.73	11.51	73.08	432.96	47.32	53.54	74.11	439.63	445.84
15	1943.59	7.04	89.81	3.23	14.77	54.42	421.57	50.90	57.24	88.73	432.46	441.47
18	1862.12	4.25	35.11	2.62	13.59	61.33	439.47	53.12	48.06	88.00	442.40	451.07
21	1489.38	2.05	53.33	2.43	4.79	11.56	363.71	39.23	43.88	66.18	366.58	372.50
24	1255.82	1.10	17.57	0.84	4.83	20.51	303.57	20.30	30.02	42.95	303.93	306.96
27	1080.49	0.99	16.94	3.51	7.52	13.09	249.89	20.86	37.33	48.40	249.92	254.56
30	1132.70	1.15	46.85	1.45	5.42	23.63	263.35	17.98	23.79	35.89	267.84	270.24
33	918.77	0.84	8.97	4.13	5.72	22.90	191.57	13.37	22.02	36.44	191.55	194.98
36	742.26	2.19	9.51	3.76	5.20	16.92	153.07	9.22	18.82	31.73	152.59	155.86
39	511.21	1.91	15.26	2.50	4.21	15.77	110.90	6.29	15.81	27.67	111.05	114.45
42	413.41	0.88	17.70	3.02	4.01	22.58	98.50	5.37	13.17	28.79	99.62	103.70
45	362.97	0.53	18.50	1.63	3.31	22.98	92.92	5.03	11.51	34.35	92.17	98.37
48	279.19	0.41	8.50	1.49	2.42	13.66	71.65	4.04	9.30	35.33	65.24	74.19
52	275.75	0.46	3.43	1.19	1.87	6.76	67.59	3.91	7.75	29.63	61.87	68.60
56	240.66	0.48	3.44	0.73	1.43	2.55	59.65	4.16	8.08	26.40	54.45	60.51
60	216.66	0.38	4.43	0.68	1.52	2.41	51.64	4.38	10.35	19.53	49.39	53.11
64	221.89	0.46	1.72	0.70	2.93	2.38	54.24	4.24	15.19	21.52	52.40	56.65
68	212.21	0.68	5.47	1.59	4.68	8.29	57.38	3.84	25.07	30.01	56.21	63.71

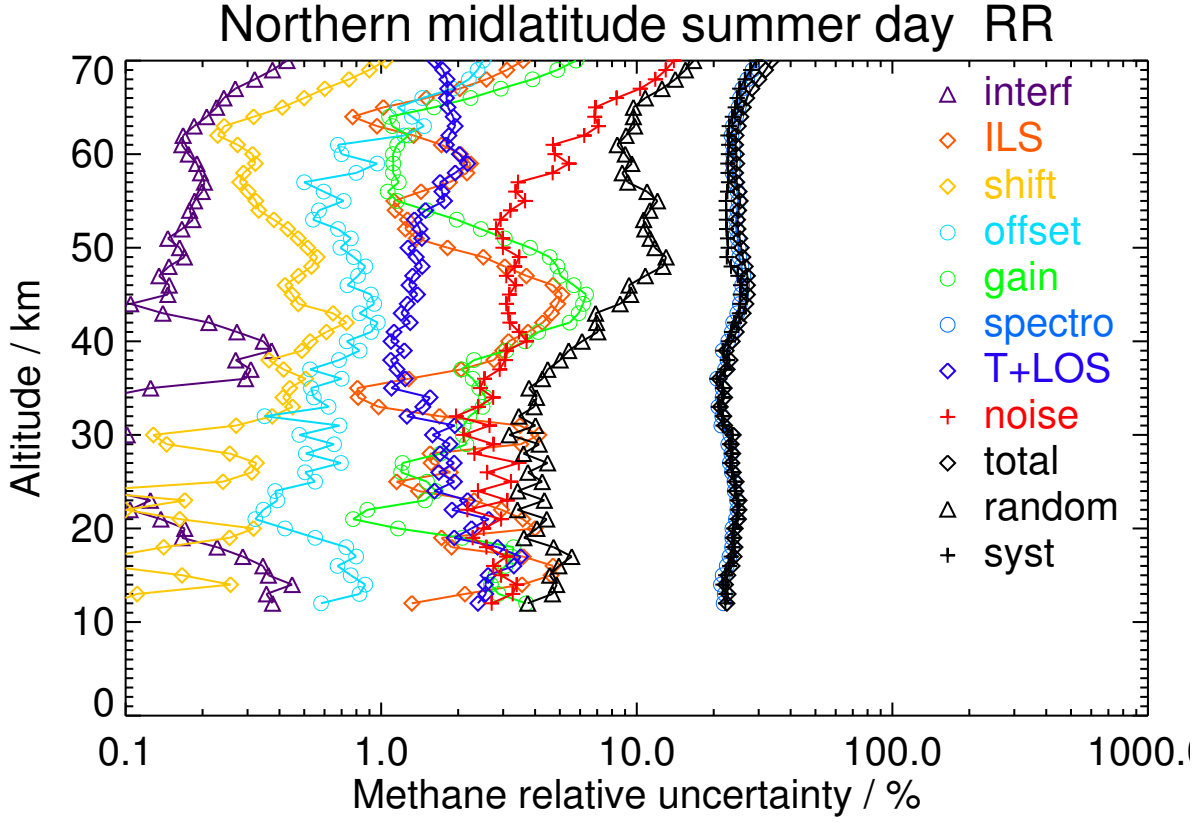

Figure S47. V8R_CH4_261 Northern midlatitude summer day

Table S48. Methane error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1989.61	9.64	22.62	1.98	20.12	74.83	413.27	62.22	81.39	115.87	417.70	433.48
15	1914.42	8.13	63.31	3.38	14.94	47.01	353.97	50.58	59.59	91.17	360.02	371.38
18	1763.36	4.15	27.83	2.65	6.94	34.15	384.60	37.99	41.32	74.49	384.10	391.25
21	1479.37	2.12	59.55	1.87	5.62	11.49	365.63	36.72	40.93	63.26	369.36	374.74
24	1258.32	1.10	21.43	1.06	5.49	19.78	307.32	22.50	31.97	46.55	307.72	311.22
27	1104.63	0.87	15.50	3.35	6.79	16.05	251.86	20.99	33.95	47.45	251.65	256.09
30	1093.54	1.14	44.49	1.57	5.52	20.52	249.59	19.22	24.27	38.57	253.38	256.30
33	899.75	1.14	14.31	4.04	5.40	19.37	188.47	14.32	21.71	40.67	187.53	191.89
36	722.27	2.22	14.37	3.60	4.93	12.65	153.35	9.95	19.16	35.43	152.10	156.17
39	472.12	1.78	13.57	2.65	3.96	11.31	103.11	6.65	16.54	31.02	101.61	106.24
42	389.90	0.79	13.03	2.06	3.44	17.29	88.32	5.12	13.18	31.70	86.49	92.12
45	340.87	0.46	10.13	1.32	2.84	18.20	80.03	4.80	10.92	29.33	78.31	83.62
48	325.79	0.39	7.20	1.70	2.45	14.68	76.33	4.39	8.82	29.57	72.98	78.74
52	267.15	0.39	3.87	1.41	1.73	7.10	66.69	4.03	7.87	32.47	59.51	67.80
56	215.73	0.31	2.31	0.69	1.42	2.75	53.09	4.07	7.99	21.26	49.62	53.98
60	212.27	0.34	3.46	0.55	1.65	2.84	52.11	4.28	10.35	19.37	49.89	53.52
64	187.98	0.40	1.17	0.66	2.85	2.14	50.19	4.03	14.46	21.52	47.92	52.53
68	184.32	0.65	3.94	1.77	4.42	7.79	53.75	4.50	23.67	28.80	52.33	59.74

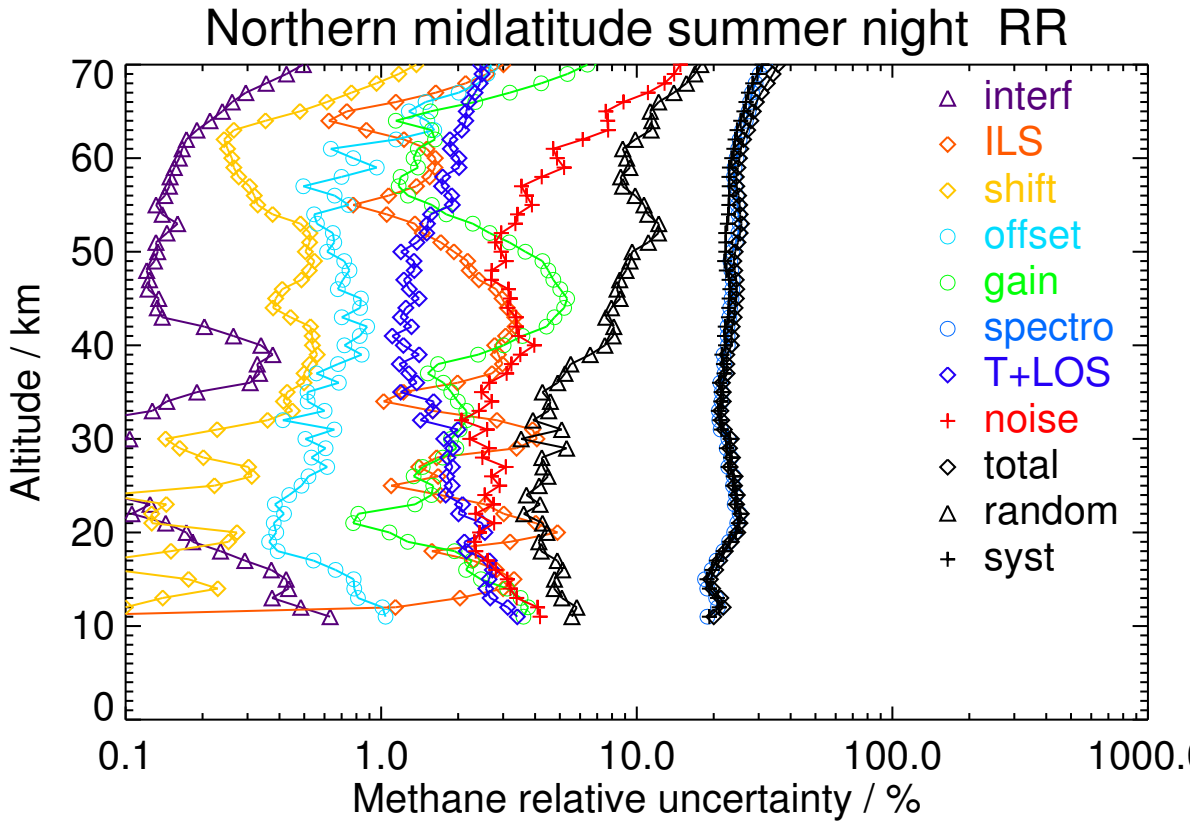

Figure S48. V8R_CH4_261 Northern midlatitude summer night

Table S49. Methane error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1915.65	6.24	25.02	1.43	11.14	67.91	408.48	42.94	50.29	68.62	414.64	420.28
15	1857.96	6.73	71.80	2.68	18.33	58.23	406.63	55.03	68.26	111.47	411.76	426.58
18	1789.51	2.84	29.60	2.73	9.44	62.68	415.69	41.77	39.96	76.33	418.60	425.50
21	1470.25	1.71	70.07	3.04	6.01	13.50	369.46	35.10	40.98	66.17	374.40	380.20
24	1238.53	1.12	29.55	1.72	5.66	14.79	301.38	21.44	30.94	48.80	301.65	305.57
27	1082.13	0.88	25.15	3.32	8.45	11.93	259.18	22.61	41.11	53.87	259.48	265.02
30	1080.83	0.95	42.10	1.01	5.89	20.36	250.83	19.25	27.15	42.20	253.90	257.38
33	948.92	0.79	14.18	4.49	7.19	20.98	204.63	14.70	27.61	44.52	203.92	208.72
36	878.11	1.93	7.62	3.41	6.71	18.71	183.45	11.10	25.00	40.07	182.39	186.74
39	673.92	2.33	14.48	3.79	5.83	15.55	139.40	8.38	22.96	41.33	137.21	143.30
42	627.97	1.55	18.53	2.82	5.44	23.40	130.31	7.30	20.35	36.78	130.48	135.57
45	492.58	0.49	19.15	1.49	4.57	27.87	113.89	7.29	16.69	34.39	115.27	120.29
48	412.56	0.56	13.75	2.34	4.03	21.60	93.58	7.06	13.61	25.36	95.01	98.34
52	346.00	0.40	4.18	1.57	2.66	9.31	76.18	6.03	11.02	18.72	75.67	77.95
56	296.41	0.42	3.20	0.78	1.90	2.52	66.73	6.24	11.07	14.77	66.46	68.08
60	257.11	0.42	3.45	0.55	1.96	2.11	59.53	6.00	13.11	16.34	59.20	61.42
64	213.35	0.41	1.09	0.60	3.12	2.42	51.52	4.91	16.13	20.50	50.35	54.37
68	136.62	0.44	2.95	0.86	4.46	5.64	42.74	3.95	23.29	27.36	41.20	49.46

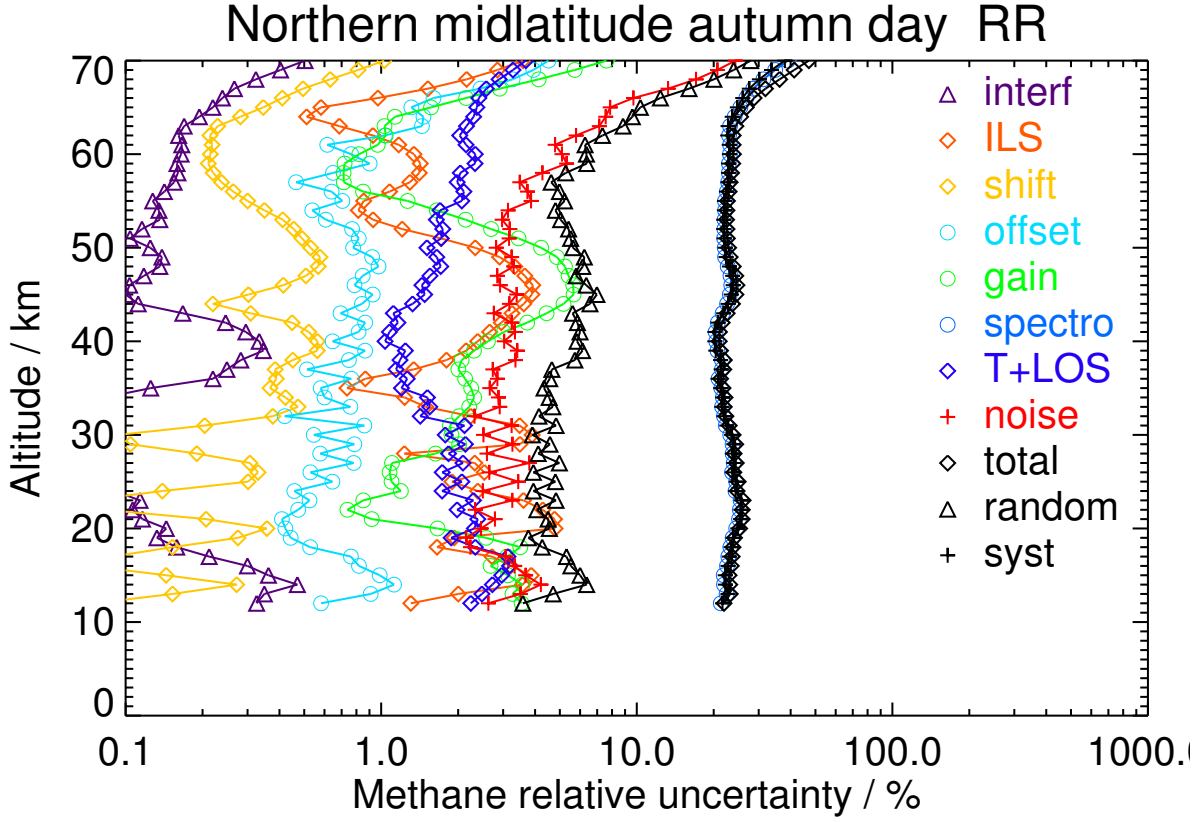

Figure S49. V8R_CH4_261 Northern midlatitude autumn day

Table S50. Methane error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1800.86	7.70	29.65	1.68	23.50	58.61	397.04	57.03	86.49	107.13	402.28	416.30
15	1877.60	6.13	59.23	2.09	18.93	54.32	380.71	56.57	66.92	105.56	385.15	399.35
18	1769.69	2.71	25.59	2.96	8.37	58.50	392.80	36.70	37.46	68.08	395.69	401.50
21	1446.90	1.66	51.13	2.37	6.04	35.92	359.78	32.24	40.32	75.18	361.12	368.86
24	1214.99	1.05	29.49	2.10	5.71	16.40	295.56	21.81	32.44	52.08	295.55	300.10
27	1083.36	0.86	23.31	2.89	7.95	13.05	258.18	21.89	38.55	56.05	257.42	263.45
30	1020.62	0.74	40.21	1.35	5.97	19.25	239.26	19.46	26.80	48.01	240.96	245.70
33	896.43	1.05	11.85	4.23	6.71	17.56	197.06	14.88	26.33	49.83	194.36	200.65
36	740.12	1.86	7.05	3.38	6.27	15.30	164.31	10.51	23.89	51.78	159.17	167.38
39	620.08	2.15	15.99	3.71	5.63	17.96	141.21	8.35	21.75	53.38	135.14	145.30
42	511.17	1.10	17.91	2.37	5.00	23.30	120.33	6.86	18.38	42.85	118.00	125.54
45	452.71	0.47	15.78	1.51	4.25	25.60	108.17	6.95	15.15	29.50	109.70	113.60
48	370.54	0.40	12.12	1.96	3.24	17.85	87.75	5.84	11.77	20.19	89.13	91.39
52	318.56	0.34	3.68	1.40	2.23	7.89	72.36	5.10	9.78	16.61	71.86	73.76
56	283.66	0.37	2.75	0.75	1.76	2.68	65.48	5.38	10.22	13.51	65.25	66.63
60	252.38	0.41	3.01	0.63	1.93	1.81	59.77	5.60	12.52	14.93	59.62	61.46
64	195.57	0.38	1.13	0.57	2.96	1.92	48.86	4.49	15.37	17.88	48.35	51.55
68	137.76	0.45	2.13	0.99	4.28	6.03	41.69	4.24	22.27	25.66	40.67	48.09

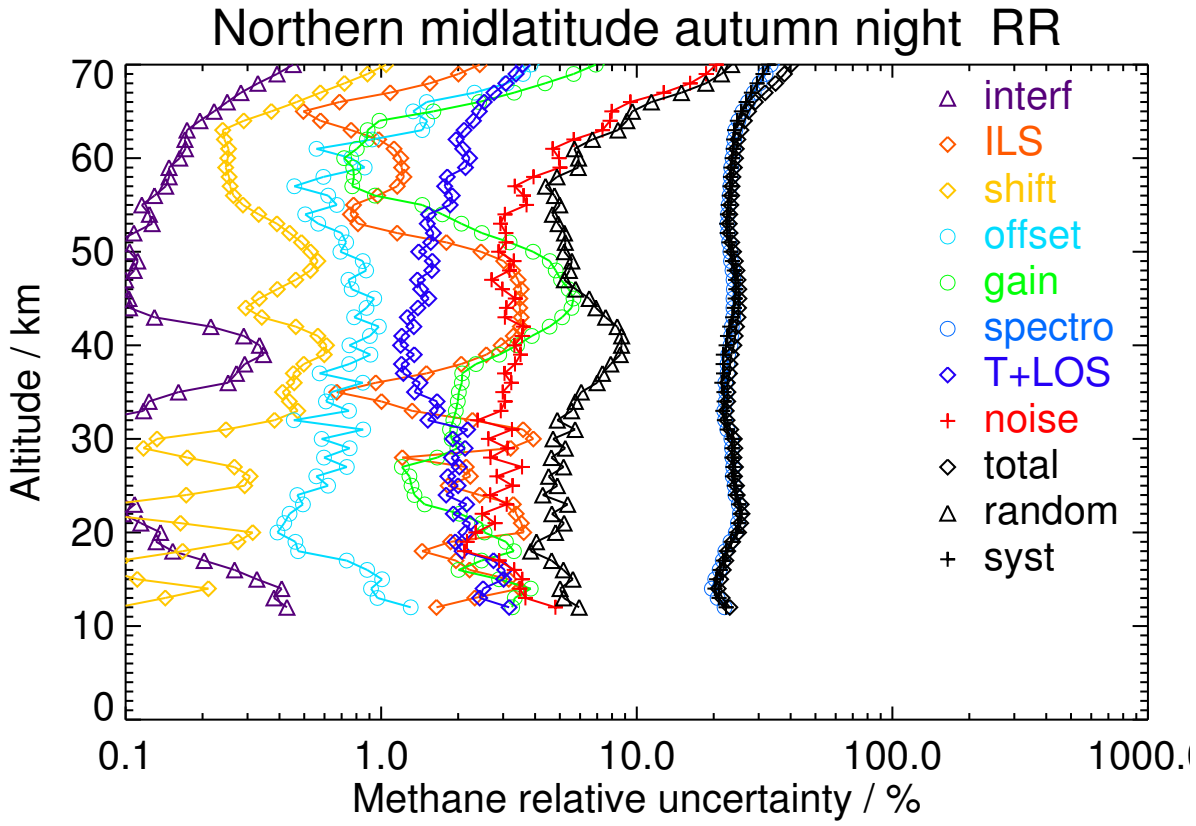

Figure S50. V8R_CH4_261 Northern midlatitude autumn night

Table S51. Methane error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1895.22	7.11	17.47	2.29	10.88	71.88	406.97	47.09	52.68	78.88	412.36	419.84
15	2062.95	9.46	103.32	2.77	16.50	79.99	412.04	72.11	63.41	112.24	428.77	443.22
18	1940.08	8.33	56.40	2.50	16.18	61.17	391.58	64.39	61.13	98.38	398.49	410.46
21	1668.41	4.47	34.62	1.52	5.33	19.04	395.51	46.60	48.24	76.08	395.92	403.16
24	1582.60	1.18	7.71	1.74	5.31	32.71	392.35	27.20	38.74	68.62	390.68	396.66
27	1503.16	1.40	10.71	2.49	5.95	21.36	349.78	26.80	38.95	55.35	349.48	353.83
30	1474.73	0.71	48.09	3.11	6.38	32.20	341.94	25.54	31.06	52.99	345.16	349.20
33	1367.62	0.78	12.11	2.46	6.94	32.09	286.44	19.76	29.21	49.61	286.47	290.73
36	1127.12	1.07	9.63	3.43	4.85	21.44	239.41	14.15	23.61	38.51	239.13	242.21
39	804.57	1.56	13.50	3.66	4.56	16.73	168.93	9.08	19.30	40.34	166.93	171.73
42	618.38	1.06	16.98	3.64	4.78	28.48	139.89	7.40	15.44	39.95	139.30	144.91
45	453.24	0.42	14.78	2.16	3.57	26.62	110.20	6.31	12.03	30.72	111.04	115.22
48	350.18	0.34	8.29	1.12	2.29	14.50	81.19	4.67	9.97	25.32	79.74	83.66
52	243.72	0.32	2.93	0.65	1.36	5.41	55.12	3.63	8.06	17.17	53.50	56.19
56	196.01	0.28	1.72	0.36	1.06	1.79	44.87	3.10	6.86	11.40	44.13	45.58
60	167.94	0.28	1.64	0.28	1.47	1.58	39.59	2.81	8.59	10.53	39.32	40.70
64	166.80	0.30	0.59	0.30	1.94	1.46	37.87	2.74	11.98	13.73	37.46	39.90
68	122.29	0.70	2.99	1.64	3.52	10.98	43.39	3.36	19.80	23.33	43.44	49.30

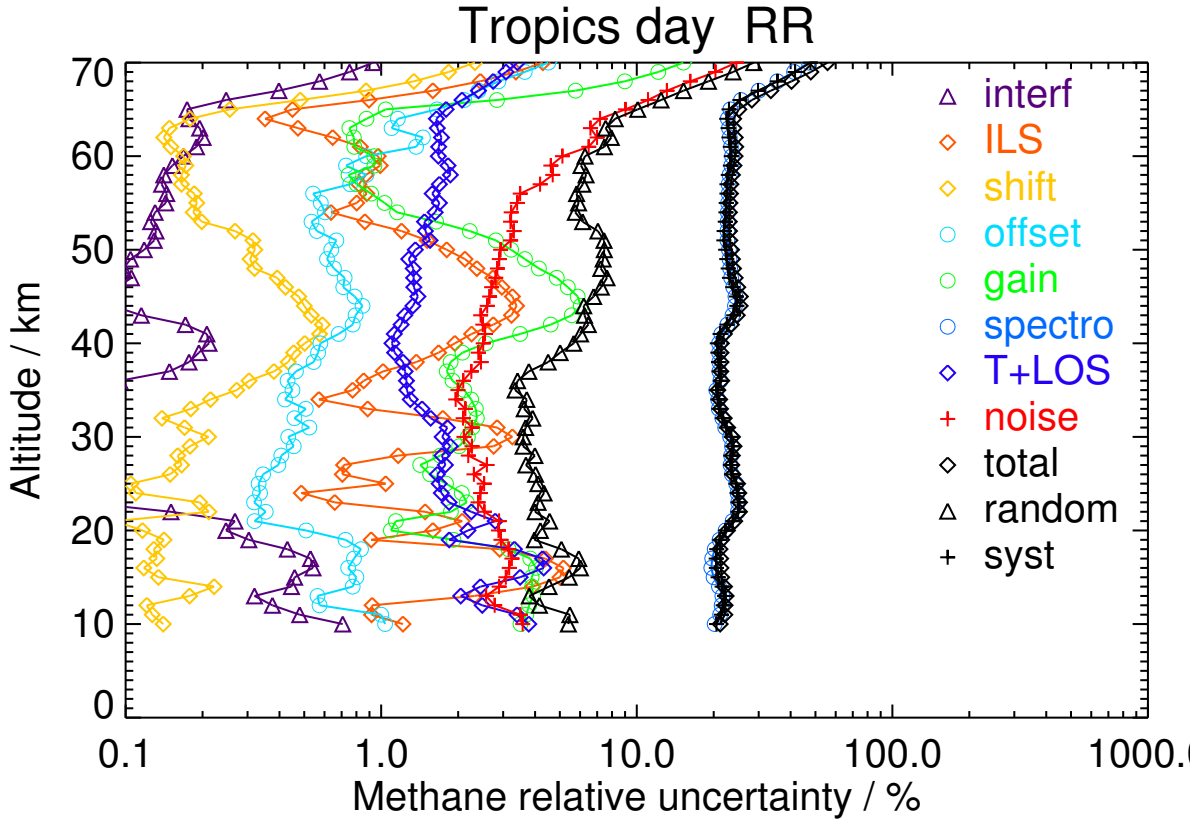

Figure S51. V8R_CH4_261 Tropics day

Table S52. Methane error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1898.05	8.00	16.11	2.08	12.48	71.82	406.88	51.94	57.92	85.39	412.25	421.00
15	2080.55	9.37	88.50	2.98	15.95	75.72	408.44	81.73	64.15	116.10	421.96	437.64
18	1922.82	8.56	54.92	2.48	15.77	54.58	397.15	68.36	62.66	102.54	402.66	415.51
21	1679.24	4.68	39.96	2.11	5.57	17.47	409.37	51.29	49.80	81.32	409.93	417.92
24	1604.56	1.11	8.88	1.08	4.30	36.35	382.44	29.06	38.83	64.80	381.88	387.34
27	1487.33	1.34	10.57	2.40	6.02	23.24	354.90	27.90	37.52	59.72	353.93	358.93
30	1486.02	0.69	51.62	2.38	6.43	30.20	342.93	28.24	32.16	53.11	346.75	350.79
33	1388.88	0.70	17.63	3.14	6.49	32.09	296.26	21.09	28.96	46.70	297.09	300.74
36	1109.31	1.08	16.18	4.16	5.01	20.75	234.17	14.91	24.19	40.02	234.05	237.44
39	808.31	1.54	15.81	3.74	4.81	15.58	166.48	9.92	20.23	36.35	165.63	169.57
42	592.12	0.85	17.06	2.88	4.52	28.07	134.96	7.46	15.29	34.59	135.71	140.05
45	422.35	0.38	12.38	1.72	3.24	23.46	101.20	6.03	12.11	26.25	102.23	105.55
48	313.20	0.29	7.45	1.36	2.34	14.22	72.85	4.64	9.91	20.89	72.50	75.45
52	224.30	0.27	1.60	0.59	1.30	4.24	50.41	3.48	7.93	13.08	49.67	51.37
56	181.35	0.25	1.57	0.40	0.99	1.63	41.44	2.94	6.63	9.47	41.07	42.15
60	163.41	0.27	1.66	0.29	1.26	1.48	38.45	2.87	8.18	10.45	38.09	39.50
64	154.10	0.33	0.79	0.34	1.81	1.81	37.00	2.99	11.49	13.26	36.63	38.96
68	120.94	0.80	2.60	1.88	3.62	12.19	42.77	3.98	19.98	23.71	43.07	49.16

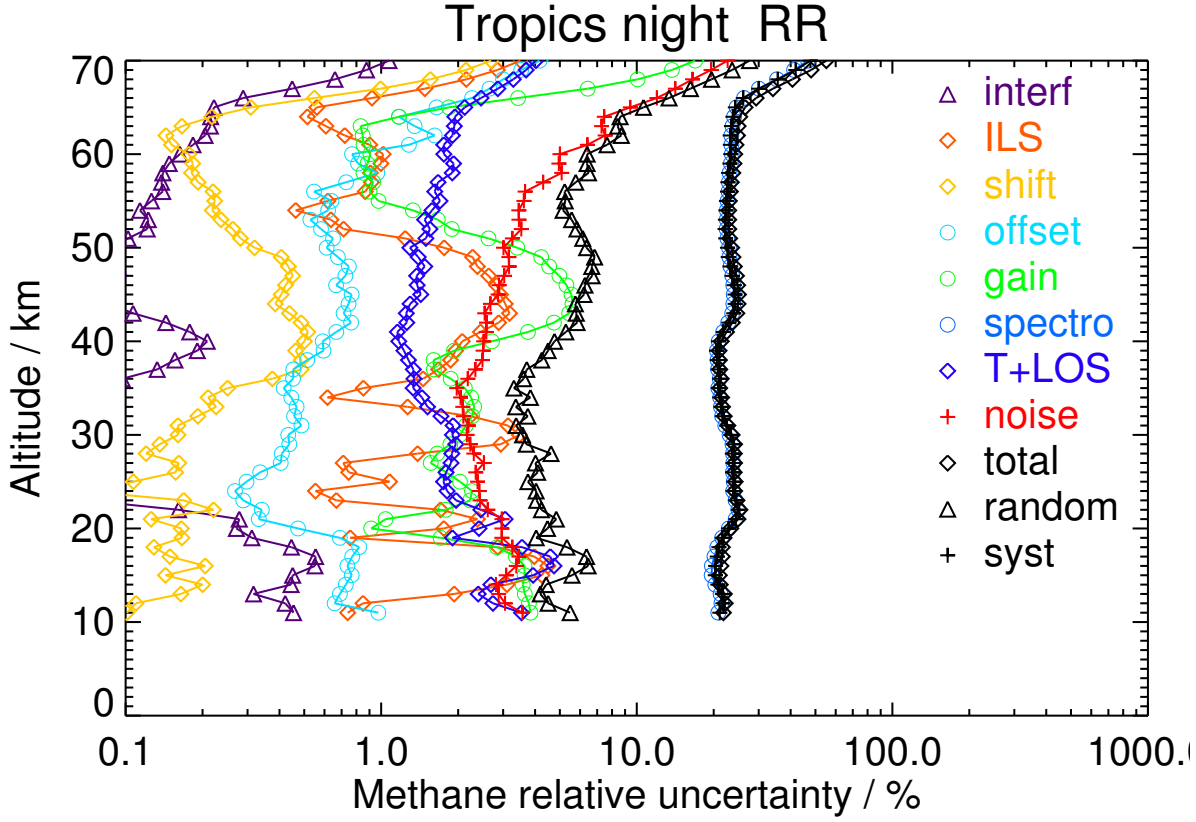

Figure S52. V8R_CH4_261 Tropics night

Table S53. Methane error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1898.98	21.83	12.35	3.60	28.28	81.31	370.63	64.08	111.95	232.83	328.41	402.57
12	1811.64	6.01	36.75	1.53	7.18	59.91	404.15	37.34	47.50	71.20	408.60	414.75
15	1699.72	5.05	23.11	2.83	12.13	42.05	360.23	44.61	48.20	79.84	360.81	369.54
18	1590.60	3.38	30.31	3.32	7.61	86.56	383.08	35.87	39.65	78.16	389.86	397.62
21	1371.13	1.43	22.49	1.70	6.01	69.32	352.68	27.68	39.05	65.57	357.39	363.36
24	1213.39	1.04	12.02	1.86	7.54	39.07	295.39	24.19	43.10	60.37	296.29	302.38
27	1061.30	0.87	8.96	0.75	7.83	20.65	260.17	23.80	43.25	74.38	255.27	265.88
30	951.93	0.90	34.90	3.01	9.01	14.99	241.68	24.46	42.19	96.38	230.29	249.64
33	810.18	1.29	9.73	3.16	7.82	12.98	203.07	18.31	38.75	85.06	190.19	208.35
36	689.45	1.79	19.19	2.74	8.16	13.59	164.27	13.44	36.00	67.13	156.80	170.56
39	452.25	1.24	18.62	2.23	6.60	16.59	116.79	9.74	28.56	52.75	111.54	123.38
42	247.77	0.52	7.81	1.12	4.04	10.61	62.75	5.62	19.35	31.60	59.46	67.34
45	162.80	0.17	2.86	0.49	2.47	7.19	39.34	3.45	12.39	18.42	37.95	42.18
48	152.20	0.15	2.38	0.38	1.74	5.55	35.59	2.40	7.60	13.61	34.42	37.02
52	154.39	0.12	1.30	0.28	1.44	4.73	36.56	2.31	6.27	11.82	35.61	37.52
56	149.53	0.10	1.41	0.35	1.37	3.81	37.27	2.47	7.43	12.67	36.17	38.33
60	134.44	0.12	1.50	0.27	1.79	2.88	34.62	2.41	10.43	14.34	33.48	36.42
64	105.67	0.19	0.80	0.20	2.81	1.92	28.07	1.79	13.61	16.16	26.97	31.44
68	83.99	0.22	1.87	0.69	4.29	1.68	26.07	1.75	21.23	24.18	23.96	34.04

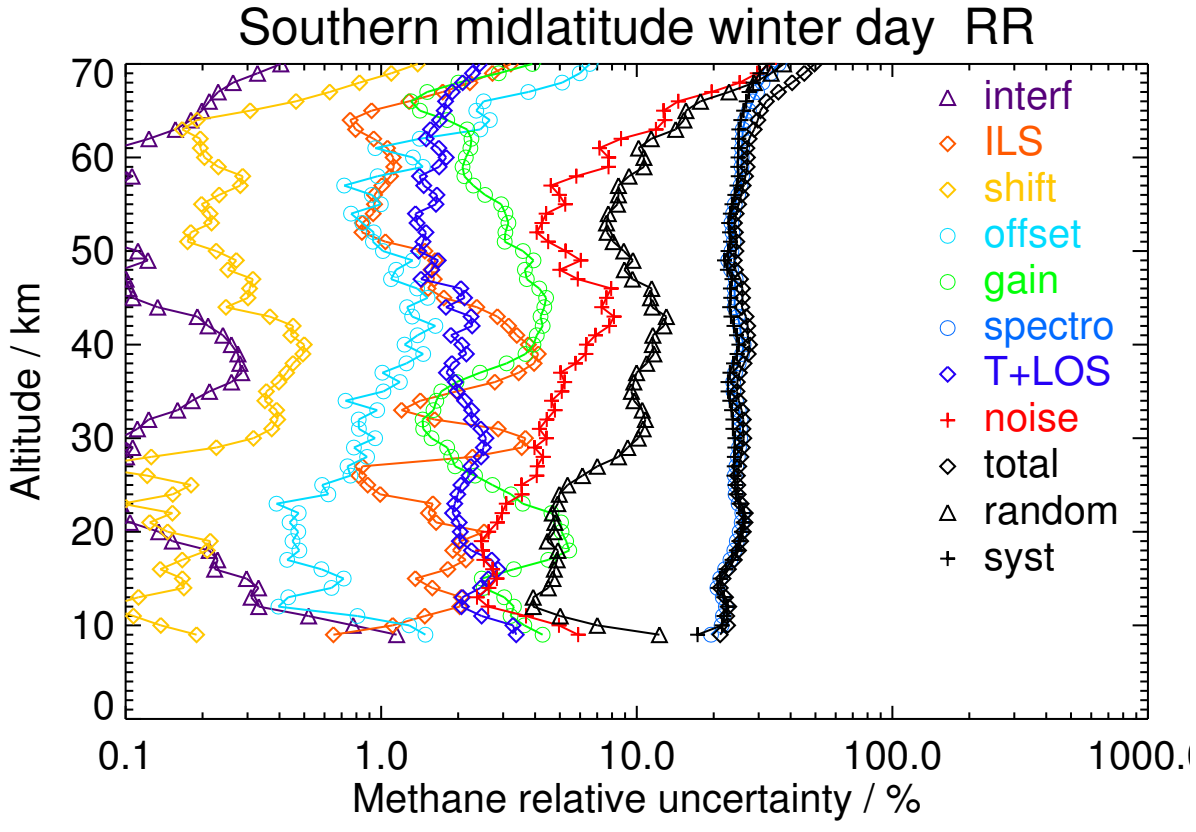

Figure S53. V8R_CH4_261 Southern midlatitude winter day

Table S54. Methane error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1710.21	18.92	6.42	1.77	27.51	57.44	312.98	63.28	101.44	164.32	299.51	341.63
12	1838.01	6.64	31.89	1.37	6.07	56.69	386.83	35.21	41.88	71.64	389.64	396.17
15	1693.73	5.62	26.39	2.36	11.71	50.80	348.11	41.47	46.88	84.25	348.50	358.54
18	1611.63	3.15	51.82	2.08	10.53	121.44	316.15	40.42	38.78	86.05	336.51	347.34
21	1346.50	1.36	16.48	2.01	7.57	79.55	287.78	28.80	39.13	70.43	294.75	303.05
24	1187.35	0.89	12.60	1.73	6.09	38.22	265.71	22.10	37.07	58.07	265.99	272.26
27	1065.99	0.80	10.65	1.27	9.14	19.23	252.26	24.91	47.00	68.35	249.72	258.91
30	881.67	0.76	29.59	1.94	6.23	14.07	229.53	22.58	34.67	80.03	221.60	235.61
33	758.81	0.88	9.84	2.85	7.21	9.87	184.84	15.67	35.87	76.60	173.45	189.61
36	631.95	1.78	13.44	2.47	7.54	16.21	142.46	10.70	32.25	56.94	136.80	148.18
39	455.90	1.32	13.84	2.21	6.02	15.21	95.95	8.04	25.93	38.29	94.56	102.02
42	266.64	0.39	6.85	0.62	3.86	14.20	62.50	4.84	17.21	26.62	61.49	67.00
45	161.44	0.18	3.53	0.45	2.27	6.89	39.59	2.99	11.84	18.06	38.15	42.21
48	142.92	0.14	2.12	0.37	1.64	4.68	34.69	2.28	8.16	13.32	33.57	36.12
52	141.77	0.12	1.33	0.32	1.57	4.37	34.95	2.46	7.59	13.21	33.68	36.18
56	140.70	0.13	1.19	0.36	1.73	3.27	34.74	2.62	9.19	13.69	33.56	36.25
60	120.42	0.14	1.00	0.29	2.20	2.12	29.74	2.28	11.50	13.72	29.06	32.13
64	99.07	0.19	0.60	0.25	2.93	1.50	24.58	1.82	14.44	16.17	23.79	28.77
68	76.34	0.23	1.47	0.54	4.15	2.27	21.06	1.89	21.22	23.03	19.80	30.37

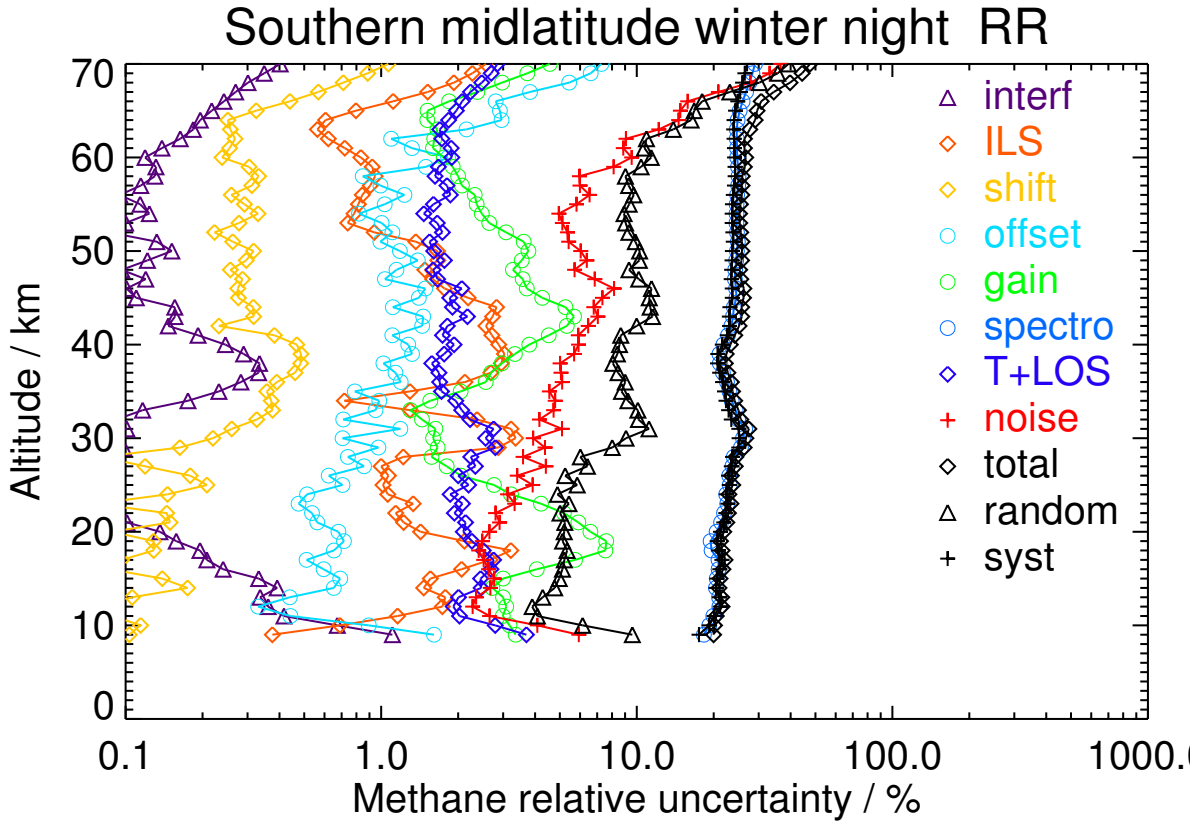

Figure S54. V8R_CH4_261 Southern midlatitude winter night

Table S55. Methane error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1894.55	23.04	23.26	2.44	24.50	63.49	366.89	61.62	96.35	143.31	364.50	391.66
12	1782.96	9.72	43.66	2.10	6.82	57.09	402.37	39.49	44.71	93.05	402.63	413.24
15	1652.68	8.52	38.80	3.49	12.78	44.01	364.79	45.51	50.02	103.60	361.39	375.95
18	1467.41	3.31	47.96	3.77	7.98	70.09	362.14	34.27	36.16	121.88	355.07	375.41
21	1235.31	1.54	36.89	2.77	5.21	50.73	333.52	27.72	37.44	111.54	323.94	342.60
24	1294.55	0.99	20.70	1.51	6.26	29.73	331.18	20.79	30.24	75.31	326.66	335.23
27	1268.64	1.01	17.67	3.66	6.76	18.63	298.75	21.52	33.31	68.48	294.71	302.56
30	1253.79	0.98	44.23	4.03	5.74	23.99	288.82	21.47	24.96	57.97	289.34	295.09
33	1048.12	1.35	12.86	3.17	5.94	24.03	224.47	16.19	23.51	51.95	222.02	228.02
36	666.59	1.85	18.61	3.26	5.30	14.99	144.74	10.32	19.90	44.00	141.88	148.55
39	450.35	1.48	15.17	2.17	4.56	15.78	95.76	6.36	16.98	29.51	95.58	100.03
42	359.23	0.80	12.90	1.39	3.78	17.25	81.22	4.64	14.36	24.01	82.02	85.47
45	277.66	0.36	6.40	0.82	2.82	14.85	63.25	4.03	11.95	16.22	64.55	66.56
48	271.74	0.34	5.32	1.06	2.77	14.42	62.73	4.26	9.20	15.09	63.68	65.44
52	272.15	0.27	2.42	0.85	2.19	9.91	62.07	4.12	8.25	13.50	62.17	63.62
56	241.38	0.26	1.52	0.72	1.70	5.30	56.15	4.29	8.91	12.21	56.00	57.31
60	221.30	0.35	1.23	0.57	2.02	2.80	52.98	4.37	11.61	14.00	52.71	54.54
64	191.43	0.36	0.83	0.50	3.08	1.67	45.93	3.63	15.27	17.70	45.35	48.68
68	118.59	0.49	2.96	1.02	4.13	6.56	38.50	2.87	21.45	24.37	37.78	44.96

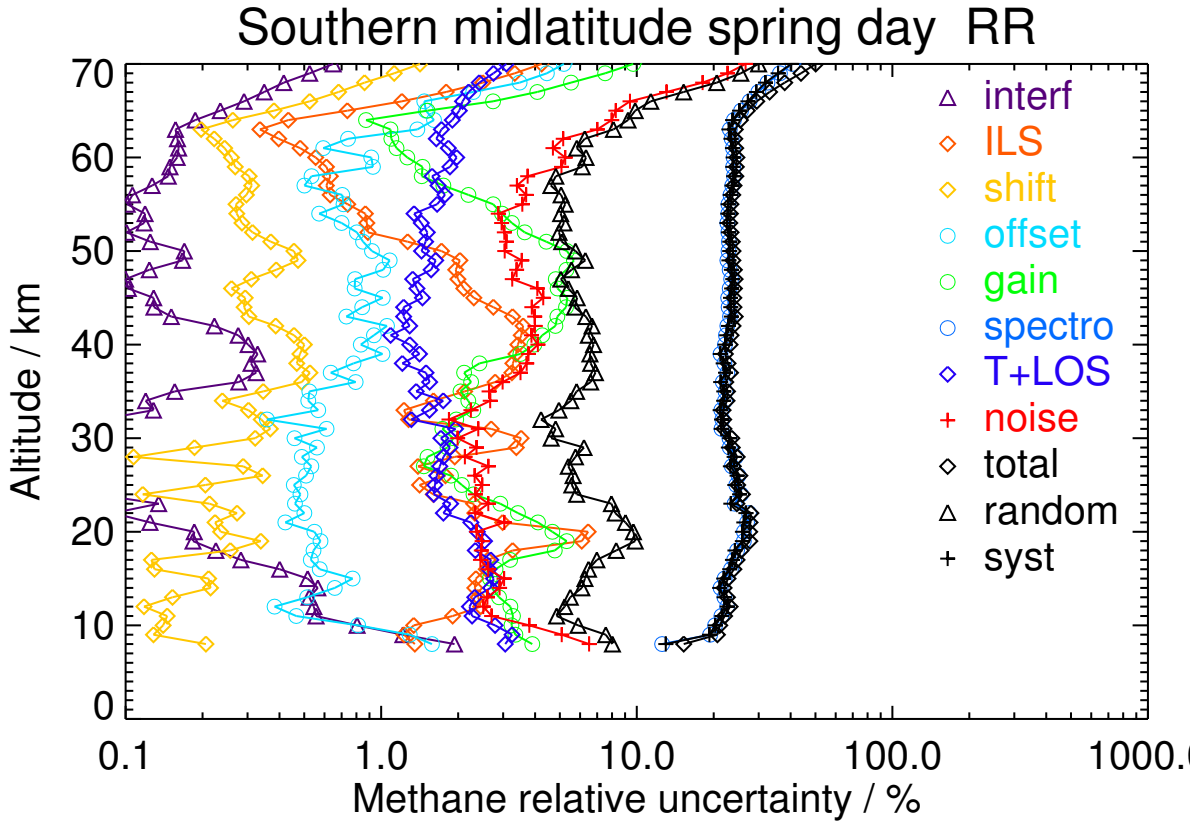

Figure S55. V8R_CH4_261 Southern midlatitude spring day

Table S56. Methane error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1838.74	17.11	24.63	2.40	24.19	58.75	333.72	63.80	92.82	147.25	327.59	359.17
12	1851.12	7.71	70.98	1.92	7.76	75.55	387.34	40.50	46.51	90.49	395.62	405.84
15	1683.67	7.14	67.17	2.39	13.36	61.39	351.18	45.92	50.09	107.45	353.44	369.41
18	1455.49	3.07	61.89	2.87	12.13	122.80	344.12	38.07	37.77	137.09	348.68	374.66
21	1123.30	1.55	37.58	1.90	6.07	64.46	285.17	26.33	37.07	112.49	276.31	298.33
24	1094.81	1.08	18.97	1.46	5.24	22.95	278.94	17.75	29.48	109.51	260.60	282.68
27	1064.51	1.14	17.09	2.67	6.62	15.25	258.36	18.76	33.28	104.02	240.77	262.28
30	1193.54	0.91	48.04	3.50	5.42	29.00	276.33	18.59	23.48	75.14	273.50	283.63
33	963.31	1.57	14.01	3.54	5.61	24.27	220.81	14.69	22.66	59.93	216.16	224.31
36	626.00	1.92	18.31	2.90	5.30	19.81	139.02	9.47	19.60	42.64	136.93	143.42
39	410.72	1.35	17.23	2.07	4.42	17.50	92.03	5.97	16.42	29.09	92.51	96.98
42	303.55	0.68	11.01	1.28	3.42	15.36	70.47	4.10	13.03	21.37	71.18	74.32
45	261.59	0.35	7.26	0.95	2.62	14.39	62.57	3.86	10.83	16.76	63.51	65.68
48	268.71	0.35	6.01	0.98	2.36	12.33	64.02	3.85	8.56	15.68	64.31	66.20
52	254.35	0.29	2.36	0.72	1.95	8.52	58.99	3.76	7.51	13.41	58.77	60.28
56	227.81	0.27	1.79	0.74	1.55	3.86	53.37	3.94	8.31	11.44	53.13	54.35
60	200.61	0.38	2.03	0.66	1.92	2.24	48.53	3.98	10.64	13.17	48.21	49.97
64	167.17	0.36	1.67	0.52	2.91	1.60	41.53	3.46	14.14	17.50	40.55	44.17
68	110.94	0.45	2.70	1.08	3.90	5.36	35.26	3.14	20.19	23.70	33.94	41.40

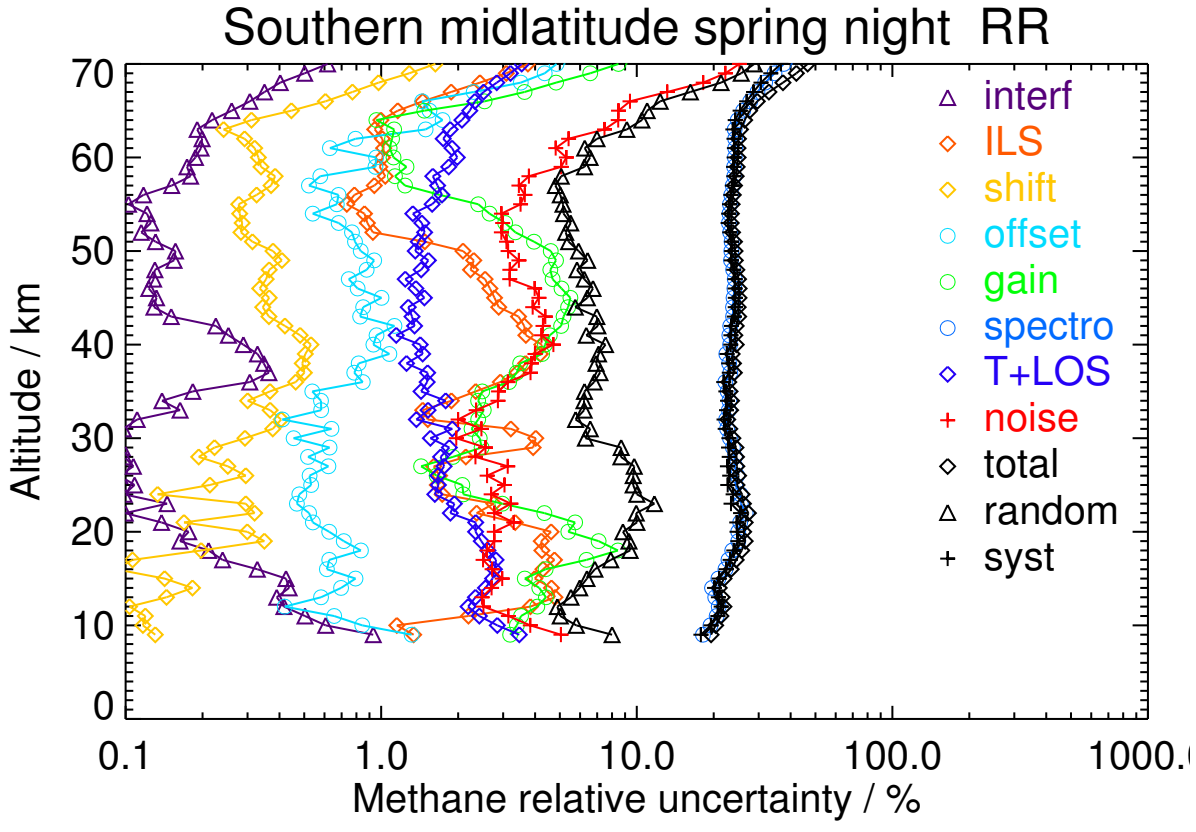

Figure S56. V8R_CH4_261 Southern midlatitude spring night

Table S57. Methane error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1669.50	24.04	30.74	2.87	23.22	54.76	279.49	55.32	91.41	164.42	259.93	307.57
12	1779.00	8.26	49.70	1.90	6.67	68.65	358.65	34.04	40.19	105.56	357.16	372.43
15	1772.10	7.86	92.05	3.11	12.09	81.63	352.87	41.29	46.20	134.03	354.61	379.09
18	1594.95	4.40	84.83	2.81	10.13	99.07	337.49	37.69	38.09	132.51	341.10	365.94
21	1280.92	1.82	54.79	2.19	5.04	16.88	338.01	30.31	36.28	83.07	336.01	346.13
24	1173.58	1.35	21.22	1.11	4.68	12.36	286.44	19.25	26.81	58.43	283.47	289.42
27	1063.43	0.91	12.34	3.03	7.21	12.59	250.64	20.92	33.66	51.37	249.25	254.49
30	979.40	1.32	45.19	1.59	4.13	19.12	211.07	14.27	19.63	41.44	214.13	218.11
33	869.51	1.23	7.53	3.18	5.10	20.10	177.68	10.98	19.88	32.56	177.55	180.51
36	689.63	2.36	14.74	2.99	4.63	13.43	141.79	8.07	17.80	25.33	142.40	144.63
39	529.02	1.76	13.79	2.67	3.85	12.97	109.71	5.97	15.08	27.90	109.11	112.62
42	358.61	0.67	10.91	1.79	3.21	15.45	80.57	4.07	12.03	22.34	80.78	83.82
45	280.30	0.46	6.44	1.44	2.43	14.72	66.47	3.22	9.81	23.42	65.14	69.22
48	186.57	0.29	5.37	0.99	1.49	8.77	49.86	1.89	7.42	20.54	47.24	51.51
52	138.76	0.12	1.79	0.35	0.96	3.61	33.06	1.46	4.75	9.93	32.19	33.69
56	114.45	0.07	0.56	0.28	1.03	2.03	26.96	1.46	4.90	6.18	26.84	27.54
60	124.46	0.22	1.13	0.40	1.54	1.39	29.98	1.89	7.40	9.15	29.65	31.03
64	142.80	0.34	1.93	0.35	2.62	1.70	35.37	2.25	11.72	12.97	35.20	37.51
68	169.41	0.67	2.77	1.34	3.95	5.74	48.63	2.88	19.47	21.67	48.38	53.02

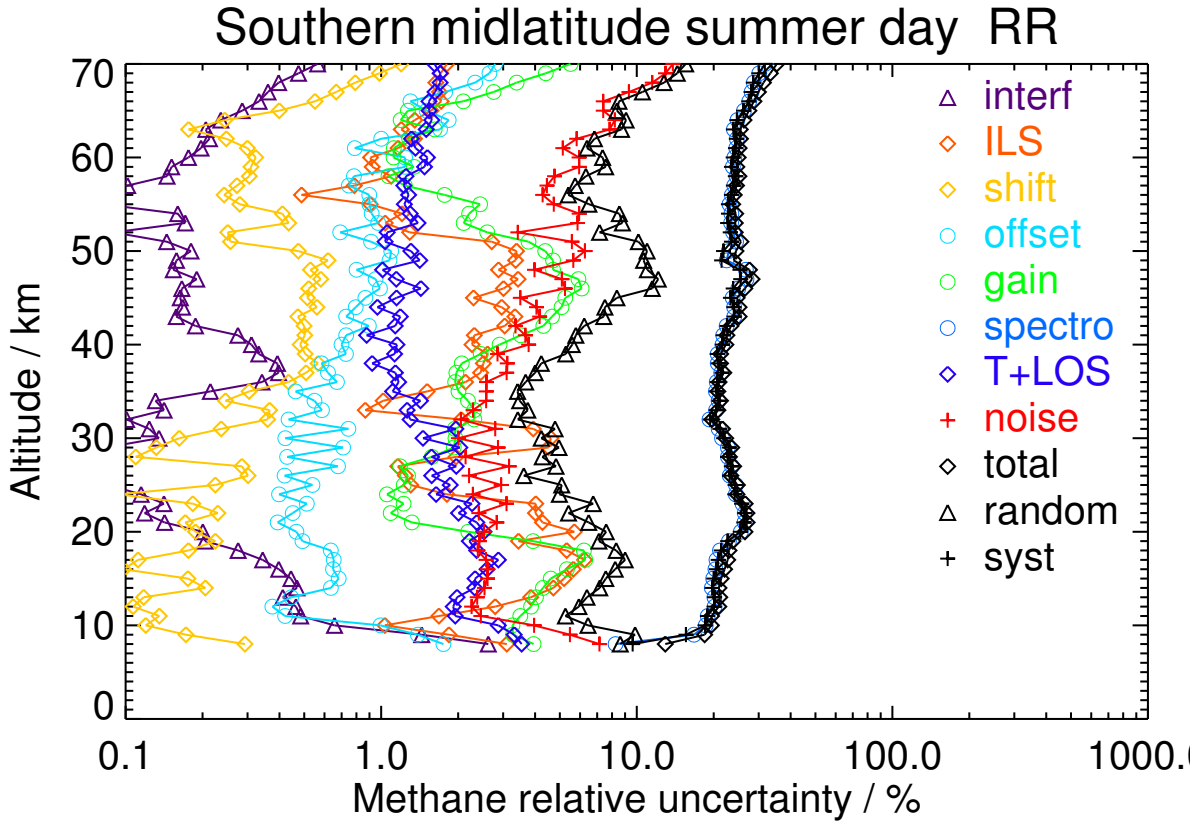

Figure S57. V8R_CH4_261 Southern midlatitude summer day

Table S58. Methane error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1707.92	23.71	36.14	2.31	22.99	41.38	284.82	59.32	91.14	182.51	252.50	311.55
12	1781.18	7.44	35.29	1.81	6.99	60.46	384.22	33.07	40.85	98.96	381.58	394.20
15	1715.11	7.77	67.47	3.34	12.25	69.39	374.87	40.22	45.82	97.00	380.03	392.21
18	1589.69	3.55	73.54	4.73	13.05	120.50	375.92	37.18	37.10	118.95	387.37	405.23
21	1219.59	1.77	32.09	3.09	4.41	34.72	310.89	25.78	35.03	84.82	305.97	317.51
24	1168.22	1.50	14.10	1.45	4.08	11.41	258.90	18.25	27.83	55.64	255.72	261.70
27	1044.23	0.85	11.04	3.26	7.23	11.42	251.05	20.24	33.60	50.78	249.60	254.72
30	974.68	1.15	47.83	2.16	4.42	20.69	205.45	14.38	20.63	42.39	209.26	213.51
33	861.76	1.26	9.18	3.36	4.85	21.61	181.90	10.47	19.84	30.29	182.38	184.88
36	704.74	2.19	16.53	2.89	4.53	14.73	149.24	7.99	18.24	29.71	149.36	152.29
39	518.90	1.58	16.16	2.48	3.84	14.51	113.08	5.39	14.80	27.48	113.03	116.32
42	377.19	0.57	13.55	1.94	3.53	19.69	92.20	3.98	12.02	26.30	92.51	96.17
45	247.61	0.49	6.04	1.52	2.12	12.92	65.05	2.70	9.48	24.36	62.82	67.38
48	175.17	0.26	3.62	0.80	1.35	6.37	46.10	1.58	7.48	18.25	43.67	47.33
52	119.79	0.12	1.31	0.30	0.91	2.57	28.76	1.35	4.82	8.79	28.00	29.35
56	110.31	0.12	0.92	0.31	0.99	1.44	26.26	1.40	4.80	8.12	25.54	26.80
60	110.52	0.23	1.36	0.40	1.44	1.12	26.07	1.71	6.86	8.26	25.82	27.11
64	128.01	0.35	1.67	0.34	2.37	1.39	30.73	2.10	10.60	11.65	30.59	32.73
68	148.43	0.68	1.85	1.28	3.59	6.41	40.30	3.06	17.48	20.12	39.92	44.70

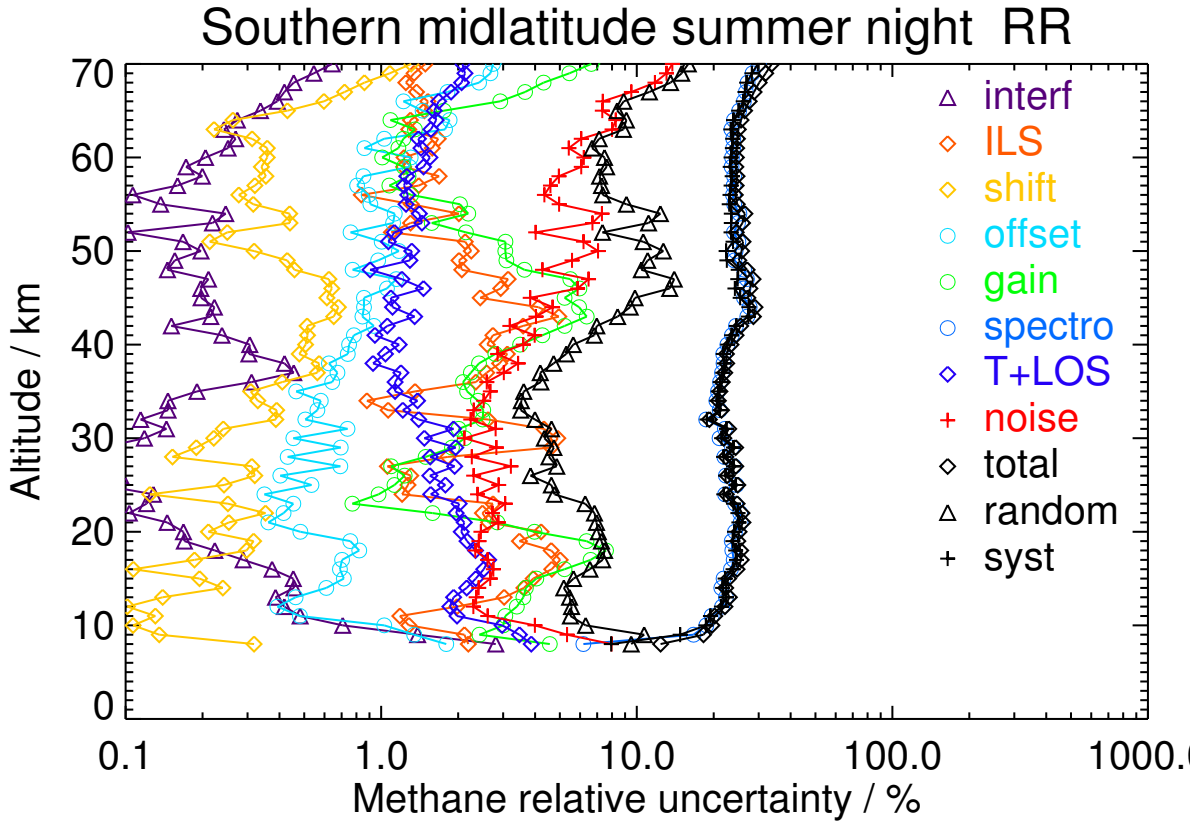

Figure S58. V8R_CH4_261 Southern midlatitude summer night

Table S59. Methane error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1751.93	16.59	12.65	2.46	25.77	61.65	348.78	66.02	90.45	128.32	350.18	372.96
12	1862.82	6.16	43.05	1.53	5.88	68.90	389.96	36.76	39.92	68.26	396.28	402.11
15	1775.10	5.78	51.37	2.42	13.08	69.17	370.54	45.58	47.53	88.91	375.99	386.36
18	1631.88	3.39	57.36	3.24	11.37	130.06	359.71	39.06	37.29	101.20	377.39	390.72
21	1319.51	1.36	32.44	2.74	7.14	80.39	319.11	30.40	36.83	86.72	322.75	334.20
24	1163.05	1.05	12.58	1.45	6.91	38.31	279.98	22.52	36.15	57.25	280.36	286.14
27	1014.39	0.99	8.68	1.48	6.58	17.06	236.45	20.14	33.37	51.14	235.00	240.50
30	874.21	0.63	27.84	2.43	6.96	15.62	211.64	19.81	28.59	48.19	211.54	216.96
33	763.02	1.09	8.55	2.52	6.67	17.11	174.60	13.91	26.22	50.39	171.01	178.28
36	548.79	1.50	15.62	1.94	5.87	18.06	134.99	9.02	22.77	58.02	126.76	139.40
39	462.15	1.44	16.78	2.01	5.27	19.95	113.79	7.24	20.80	58.27	103.69	118.94
42	370.98	0.81	14.79	1.06	4.62	21.55	96.25	5.79	17.96	51.95	87.34	101.62
45	345.66	0.37	9.45	1.00	3.95	22.04	89.33	5.92	15.50	46.87	81.54	94.05
48	317.20	0.41	6.48	1.08	3.72	19.12	81.49	5.88	12.58	39.02	75.72	85.19
52	305.85	0.35	2.13	0.70	2.97	12.32	70.82	6.11	11.23	22.52	69.55	73.10
56	294.77	0.33	1.74	0.67	2.26	6.99	68.35	6.39	12.18	18.00	67.79	70.14
60	230.02	0.31	1.02	0.45	2.25	3.43	55.58	5.24	13.40	19.14	54.29	57.57
64	137.30	0.26	1.22	0.31	3.14	1.38	35.63	3.16	15.77	19.41	34.13	39.27
68	60.35	0.23	1.82	0.46	4.22	2.94	22.37	2.04	21.16	23.62	20.60	31.34

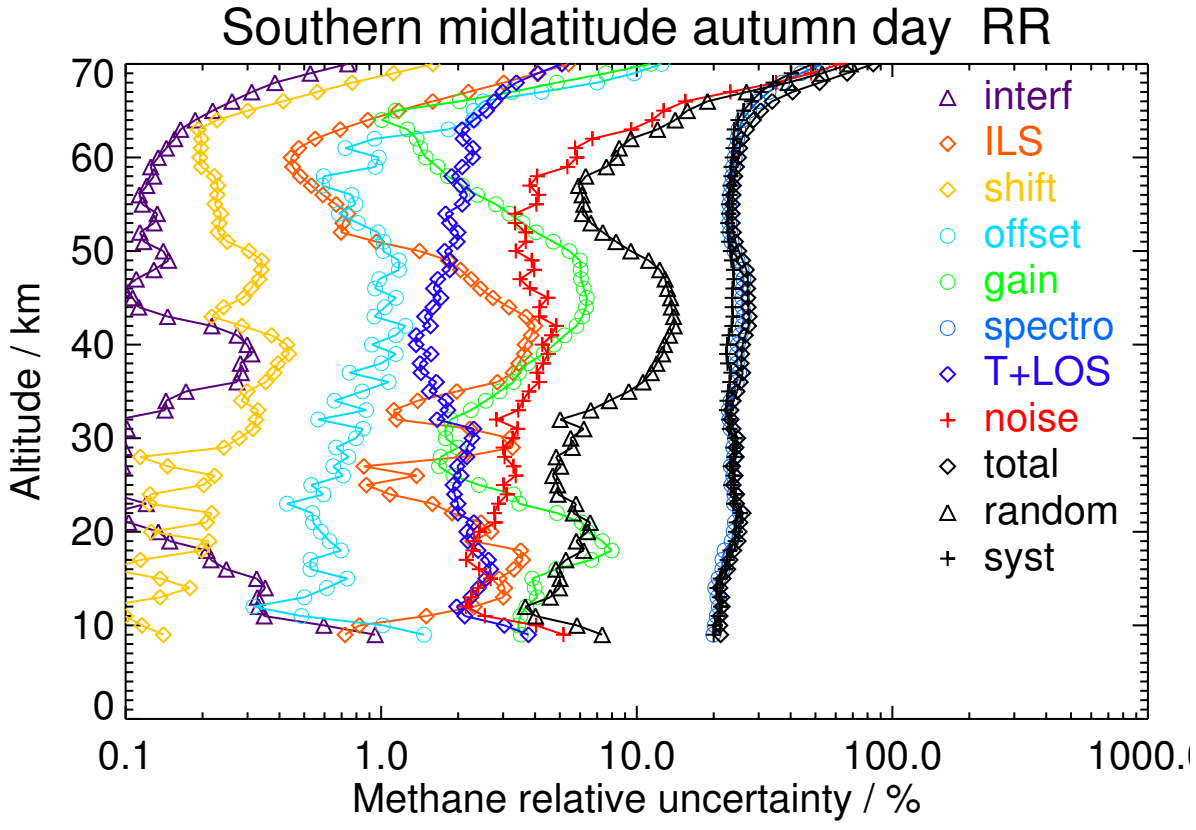

Figure S59. V8R_CH4_261 Southern midlatitude autumn day

Table S60. Methane error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1853.90	18.78	17.32	2.26	26.33	51.91	353.58	68.14	95.86	129.11	355.29	378.02
12	1860.35	6.43	50.19	1.36	5.93	75.72	409.73	36.53	40.37	77.31	416.17	423.29
15	1774.57	6.16	71.58	2.26	13.14	90.12	366.65	45.47	48.46	90.05	379.73	390.26
18	1622.12	3.16	71.65	3.49	11.84	135.66	344.37	40.63	36.76	91.67	369.98	381.17
21	1291.78	1.52	37.86	2.40	7.01	70.43	305.73	30.00	37.06	87.84	307.37	319.68
24	1125.80	1.16	16.49	1.76	5.26	20.84	260.72	20.01	30.25	52.26	259.42	264.63
27	999.83	0.84	15.70	2.51	8.51	12.66	243.23	21.78	39.05	58.84	241.21	248.28
30	882.03	0.68	34.52	2.33	4.67	16.70	200.66	16.39	23.27	47.93	200.69	206.34
33	751.09	1.02	6.21	2.52	6.00	15.72	166.86	11.77	24.11	45.95	163.64	169.97
36	572.37	1.38	10.33	1.87	6.01	14.83	127.86	8.08	22.49	51.56	120.95	131.48
39	491.76	1.65	14.65	2.26	5.36	16.21	111.39	6.63	20.46	55.82	101.33	115.69
42	420.69	1.02	13.78	1.52	4.63	20.18	101.45	5.53	17.46	50.49	93.28	106.06
45	346.08	0.39	8.20	1.03	3.69	19.73	89.88	5.43	14.58	47.38	80.91	93.76
48	324.94	0.45	5.81	1.29	3.19	15.91	81.40	5.16	11.40	36.14	75.99	84.15
52	294.19	0.36	1.94	0.78	2.55	9.30	67.54	5.52	11.06	21.74	65.87	69.37
56	283.11	0.47	2.10	0.73	2.34	4.74	63.75	6.07	12.41	17.79	63.02	65.49
60	225.61	0.40	1.32	0.48	2.61	2.42	52.97	5.22	14.03	17.64	52.28	55.18
64	136.10	0.29	0.97	0.36	3.25	1.45	34.93	3.39	16.34	19.84	33.45	38.89
68	67.60	0.28	1.94	0.48	4.01	3.84	23.48	2.44	20.92	24.10	21.18	32.09

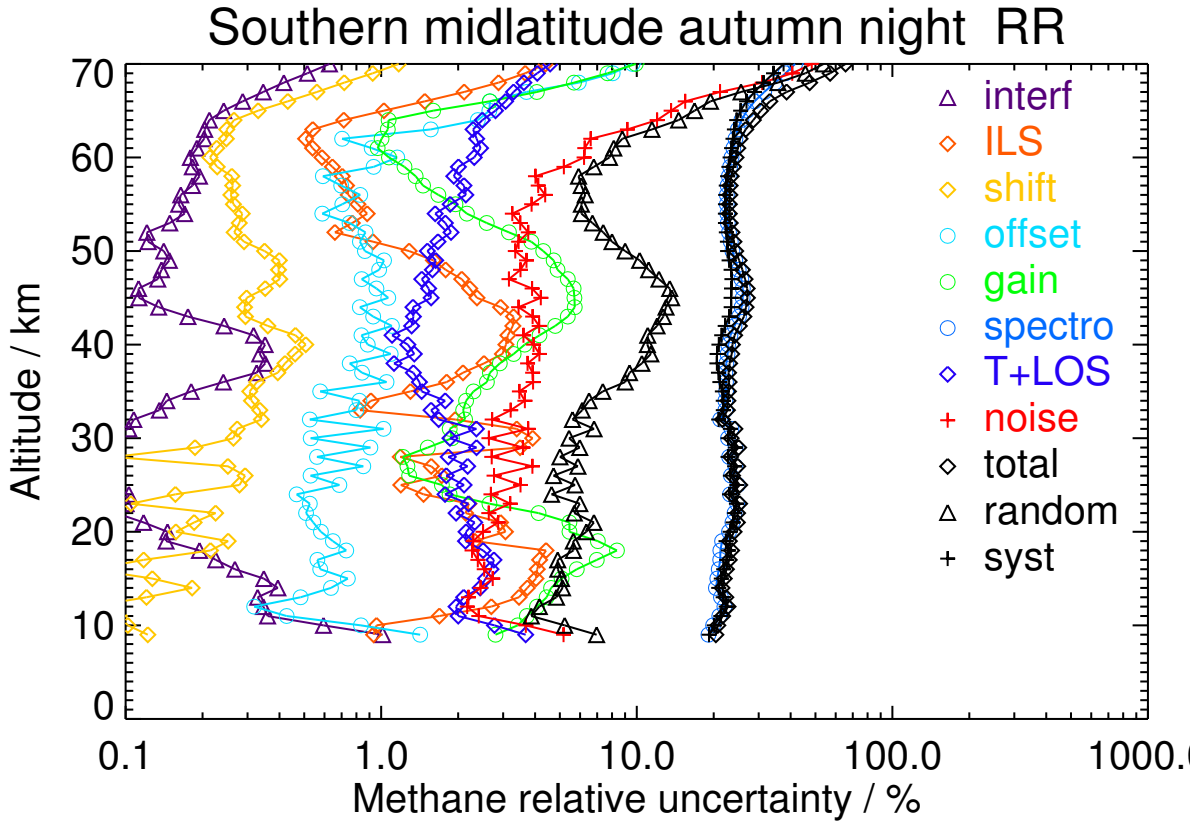

Figure S60. V8R_CH4_261 Southern midlatitude autumn night

Table S61. Methane error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1810.04	35.13	2.29	0.86	26.97	53.61	264.28	46.57	110.40	128.79	269.18	298.40
12	1789.07	12.00	34.82	2.31	11.43	58.32	406.36	44.92	58.32	83.04	410.54	418.85
15	1495.94	13.90	9.64	2.94	14.07	41.43	321.38	51.55	58.54	85.43	322.92	334.03
18	1273.25	3.97	22.83	3.47	8.78	56.12	334.97	33.19	40.92	66.62	338.11	344.61
21	966.45	1.70	19.20	1.18	6.18	29.92	261.86	22.93	39.09	63.33	260.62	268.20
24	659.44	1.09	12.09	2.23	8.56	10.69	178.43	22.20	50.06	80.11	169.58	187.55
27	487.20	1.14	8.16	0.80	6.08	5.33	115.12	13.94	36.13	62.02	105.08	122.01
30	531.93	1.41	17.82	2.21	8.80	6.54	127.35	15.34	39.27	50.22	126.17	135.80
33	328.93	2.04	6.31	2.49	6.31	4.67	85.64	10.70	30.95	50.35	77.35	92.29
36	216.24	1.44	4.88	1.53	4.56	4.96	55.93	6.25	24.12	40.71	46.53	61.83
39	198.65	0.79	4.00	0.78	3.41	5.68	48.23	4.67	17.93	25.10	45.83	52.25
42	189.61	0.32	3.18	1.11	2.56	6.54	44.83	4.12	12.81	17.61	44.06	47.45
45	205.12	0.21	4.05	0.75	2.08	7.27	47.40	3.50	9.66	14.77	46.99	49.26
48	192.32	0.19	3.67	0.53	1.67	6.45	43.65	2.84	7.32	12.56	43.21	45.00
52	166.01	0.14	2.23	0.48	1.35	4.49	38.54	2.31	5.70	9.38	38.24	39.37
56	144.92	0.10	2.04	0.31	1.10	3.25	35.66	2.06	6.21	8.83	35.39	36.48
60	129.49	0.08	1.15	0.33	1.46	2.74	33.00	2.16	9.29	11.89	32.40	34.51
64	101.88	0.22	0.73	0.48	2.87	1.82	28.15	1.86	14.26	16.60	27.12	31.80
68	90.71	0.41	1.03	1.53	4.71	3.97	29.07	2.10	23.62	25.80	27.99	38.07

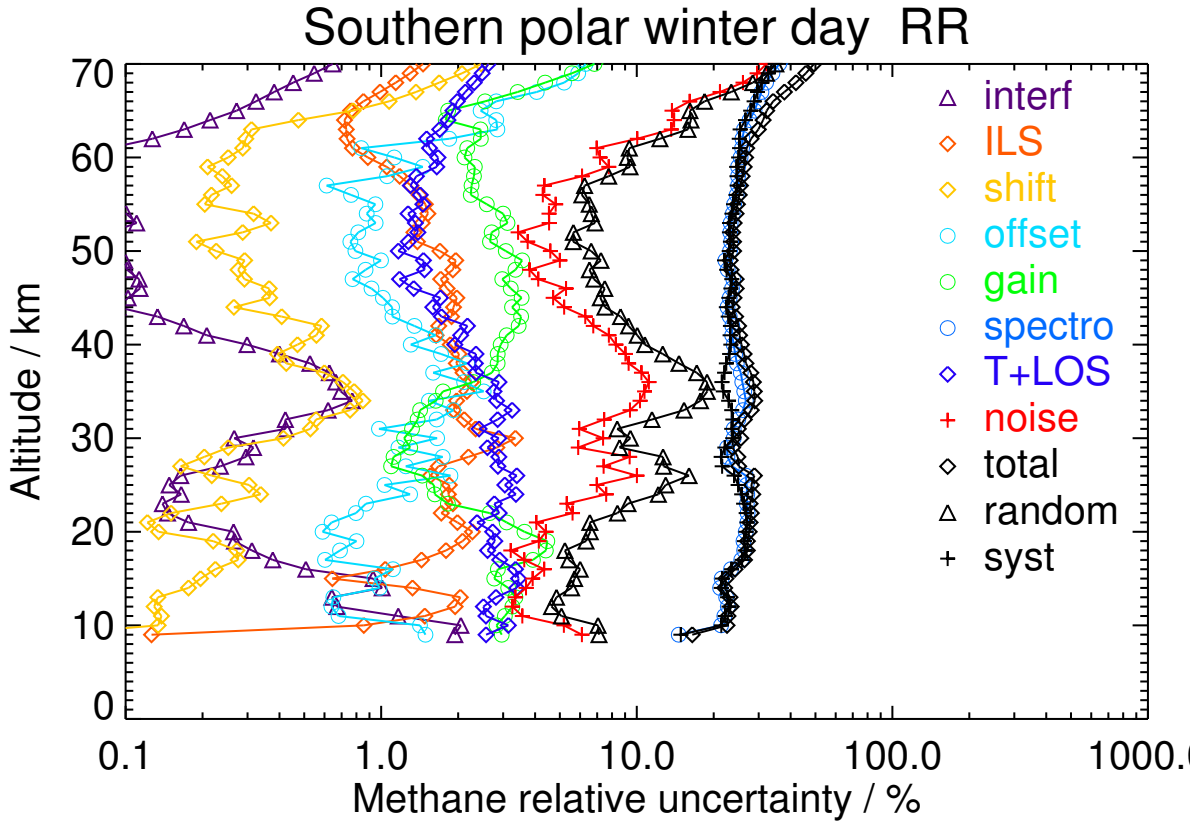

Figure S61. V8R_CH4_261 Southern polar winter day

Table S62. Methane error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1727.83	31.21	10.30	1.38	23.73	59.96	216.33	43.30	96.93	128.68	216.22	251.61
12	1818.69	9.21	39.10	1.43	8.34	61.45	348.70	41.97	47.96	72.44	354.78	362.10
15	1517.09	14.93	18.95	2.26	13.52	44.51	267.29	51.28	58.65	97.25	266.09	283.30
18	1245.13	3.82	15.19	2.28	8.82	47.44	262.87	35.45	42.49	73.51	263.33	273.39
21	987.54	2.53	20.06	1.07	5.79	27.19	234.13	25.53	41.79	60.50	233.96	241.65
24	736.69	1.04	12.53	2.28	9.04	16.04	190.60	23.12	49.96	72.92	185.86	199.65
27	466.63	1.18	8.88	1.10	6.24	6.68	118.98	14.65	36.01	62.93	108.96	125.83
30	458.50	1.01	13.21	1.86	8.43	10.75	117.66	13.58	36.45	54.84	112.77	125.39
33	343.46	1.94	6.35	2.13	6.46	9.23	89.91	10.45	28.12	45.62	84.13	95.70
36	215.92	1.14	4.71	1.34	4.91	6.74	59.09	6.10	21.95	38.10	51.52	64.07
39	187.21	0.67	3.43	0.85	3.68	8.04	48.94	4.64	16.72	26.55	45.64	52.80
42	183.05	0.35	4.62	1.18	2.74	7.91	46.18	4.02	12.41	20.97	44.23	48.95
45	184.62	0.24	4.27	0.70	2.05	7.44	44.55	3.21	9.20	16.56	43.40	46.46
48	178.92	0.18	2.54	0.30	1.53	5.63	42.01	2.37	6.79	12.61	41.21	43.10
52	154.78	0.20	2.38	0.38	1.30	4.85	37.98	2.14	5.56	9.74	37.60	38.84
56	139.54	0.12	1.55	0.37	1.21	3.18	34.29	2.14	6.75	9.00	34.04	35.21
60	116.88	0.12	0.91	0.30	1.67	2.34	29.40	2.14	10.16	12.17	28.87	31.33
64	103.25	0.21	0.98	0.31	2.89	1.41	26.00	1.90	14.00	16.00	25.12	29.78
68	79.67	0.43	1.75	1.34	4.57	5.01	23.98	2.27	22.32	25.14	22.29	33.60

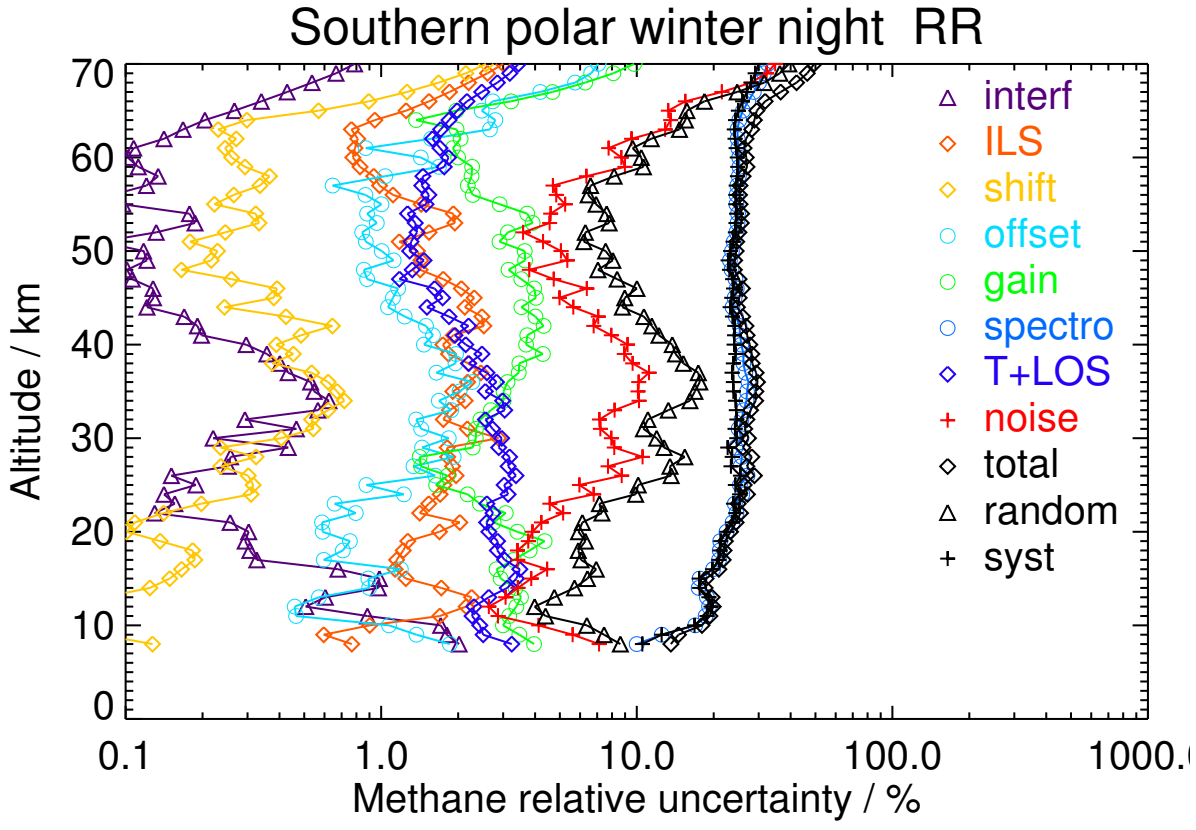

Figure S62. V8R_CH4_261 Southern polar winter night

Table S63. Methane error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1768.05	28.38	18.83	4.02	23.86	58.40	247.95	45.43	103.62	128.93	250.62	281.84
12	1732.25	11.73	53.92	4.18	8.59	52.59	418.74	50.10	51.40	114.44	416.29	431.74
15	1352.56	7.24	32.68	2.59	11.83	23.58	264.71	47.98	53.79	97.20	260.08	277.65
18	1233.34	2.08	25.72	3.40	7.53	37.63	291.08	33.42	32.85	87.23	285.42	298.45
21	997.34	1.28	26.33	3.12	4.46	32.56	285.86	18.83	26.09	121.65	264.08	290.75
24	951.93	0.79	19.58	1.67	6.66	18.21	290.83	18.42	32.38	153.42	251.39	294.51
27	842.46	1.32	8.69	3.05	3.24	14.84	220.73	11.81	18.72	126.22	183.30	222.55
30	898.34	1.09	34.07	3.74	6.13	26.44	231.37	17.06	24.51	118.76	205.50	237.35
33	749.52	1.41	13.16	2.84	4.46	18.07	171.78	14.00	21.72	78.64	156.60	175.23
36	547.51	1.26	9.29	3.43	3.72	11.35	120.16	8.51	20.24	46.48	114.03	123.14
39	383.96	1.15	14.18	2.18	3.04	13.18	82.13	5.17	16.76	29.27	81.15	86.27
42	305.94	0.74	10.84	1.55	2.45	11.95	65.75	3.93	12.94	21.07	65.81	69.10
45	281.76	0.35	7.85	0.98	2.28	13.33	63.23	3.67	10.59	16.47	64.02	66.11
48	286.65	0.46	8.19	1.19	2.43	15.14	64.40	4.28	8.99	21.36	63.98	67.45
52	267.49	0.34	4.89	0.81	1.92	8.52	59.31	3.78	7.17	14.27	58.99	60.70
56	251.53	0.28	2.99	0.88	1.30	4.49	57.99	3.87	7.26	10.93	57.82	58.84
60	221.90	0.34	1.92	0.75	1.42	2.89	53.55	4.12	9.28	12.39	53.22	54.64
64	188.73	0.38	1.35	0.64	2.52	1.73	47.06	3.44	12.51	15.37	46.46	48.93
68	151.84	0.47	2.29	1.25	4.27	5.48	43.80	3.42	21.27	24.52	42.86	49.38

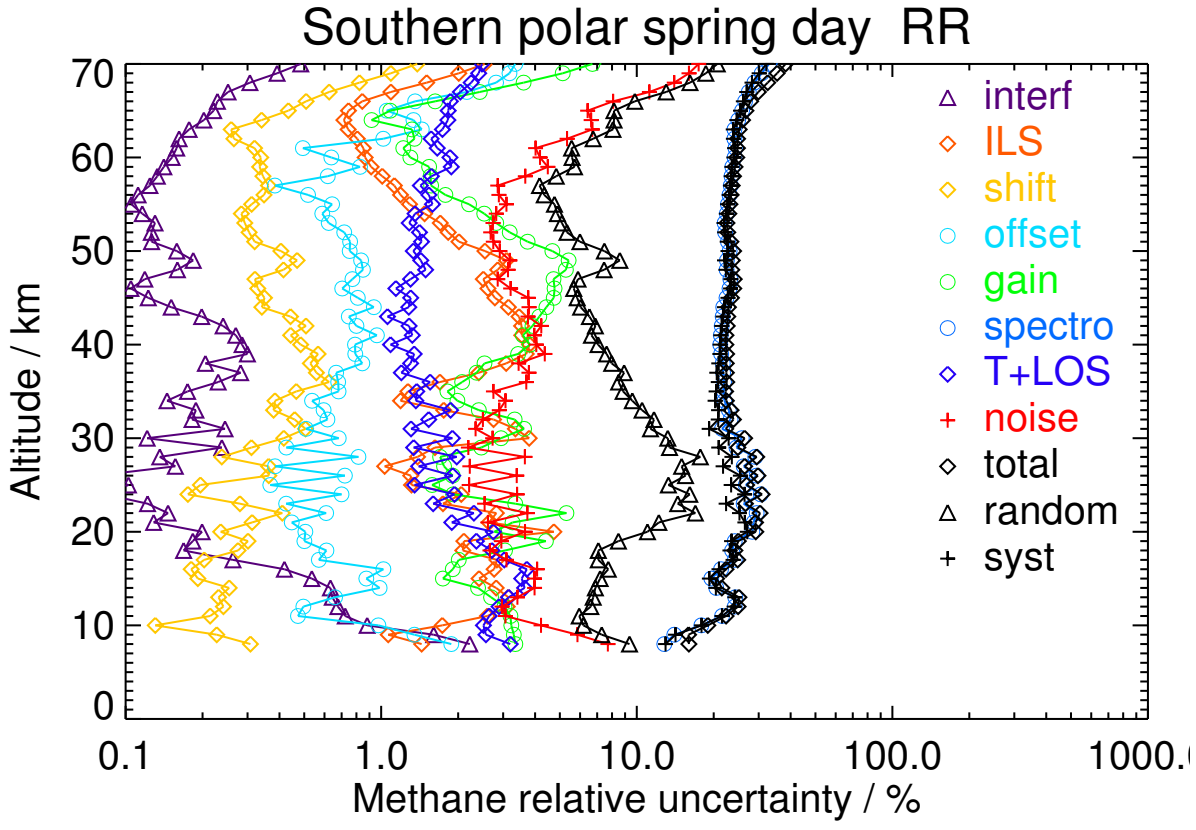

Figure S63. V8R_CH4_261 Southern polar spring day

Table S64. Methane error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1741.08	20.71	18.15	3.06	20.19	50.05	196.91	40.51	89.56	139.26	180.89	228.29
12	1699.11	7.72	32.32	2.67	7.91	37.61	367.09	38.97	45.61	121.32	355.28	375.43
15	1303.94	6.93	29.01	2.30	10.00	30.44	251.20	38.27	47.27	118.63	233.77	262.14
18	1203.67	1.86	32.57	3.52	6.54	44.23	286.54	29.21	29.91	86.50	281.86	294.84
21	1068.20	1.29	29.33	2.63	4.94	47.84	300.70	17.57	23.53	117.78	283.89	307.35
24	995.93	0.87	19.64	1.69	6.81	33.76	275.03	18.54	33.34	126.80	250.19	280.49
27	1042.79	1.21	11.82	2.35	3.54	24.92	247.79	13.41	19.37	116.30	221.83	250.47
30	997.60	0.88	34.40	3.68	6.73	30.72	264.42	19.16	26.07	121.89	241.45	270.47
33	816.08	1.18	10.03	3.07	4.61	27.86	207.60	15.17	21.51	91.14	190.76	211.42
36	546.94	1.35	14.70	3.02	3.70	19.28	139.37	8.46	19.14	55.06	132.07	143.09
39	404.46	0.89	18.58	1.97	3.55	23.32	98.22	5.56	16.66	36.61	97.57	104.22
42	330.85	0.65	14.46	1.80	3.05	20.98	79.58	4.38	13.48	27.54	80.23	84.83
45	274.22	0.38	9.00	1.20	2.74	19.32	69.09	3.89	11.35	23.60	69.45	73.35
48	277.71	0.40	8.42	1.51	3.14	22.73	71.65	4.36	9.65	27.09	71.49	76.45
52	270.32	0.39	3.43	0.74	2.00	10.27	63.28	3.66	7.77	15.64	62.89	64.81
56	247.06	0.38	2.34	0.84	1.37	4.76	57.75	3.98	7.87	12.48	57.34	58.68
60	207.93	0.37	1.21	0.61	1.43	2.45	50.41	4.20	9.66	14.52	49.51	51.59
64	166.13	0.38	1.15	0.50	2.46	1.72	41.87	3.43	12.63	16.43	40.81	43.99
68	135.66	0.54	3.21	1.32	4.29	6.79	39.58	3.95	21.69	25.01	38.78	46.15

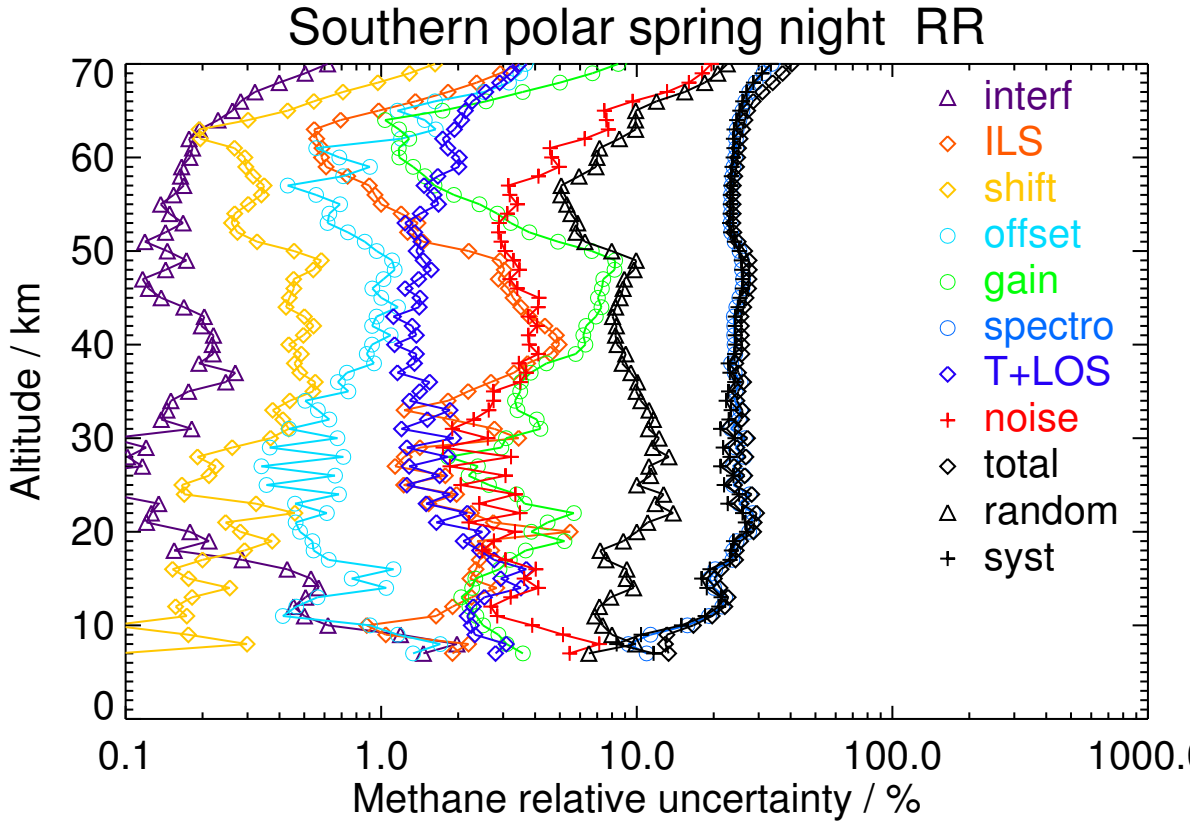

Figure S64. V8R_CH4_261 Southern polar spring night

Table S65. Methane error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1661.45	28.42	55.98	3.99	19.38	22.06	170.08	40.59	90.43	121.44	169.78	208.74
12	1745.99	5.40	36.69	1.73	6.35	46.10	388.18	31.71	36.17	70.81	389.27	395.66
15	1608.64	8.42	40.71	3.36	7.93	30.54	323.54	31.49	36.02	74.33	322.77	331.22
18	1453.60	2.45	56.19	5.33	5.58	34.46	370.13	26.04	27.01	61.23	372.92	377.91
21	1143.23	1.69	56.99	5.53	5.05	24.78	302.30	18.40	21.29	51.30	305.72	310.00
24	1155.06	0.88	27.76	1.56	7.93	14.74	314.16	21.29	32.28	48.87	314.42	318.19
27	1008.43	0.70	8.83	3.97	2.94	10.53	207.77	12.79	17.59	30.18	207.23	209.41
30	938.30	1.09	47.35	2.00	6.89	13.64	221.96	19.23	25.46	37.80	226.58	229.71
33	758.15	0.98	17.42	2.47	4.36	21.34	152.10	13.58	19.49	27.90	153.96	156.47
36	584.72	2.36	11.34	4.23	4.07	14.78	119.41	7.53	17.99	24.94	120.02	122.58
39	414.25	1.25	14.48	1.69	3.40	15.50	94.27	5.45	16.23	21.51	95.83	98.22
42	267.73	0.37	14.24	1.51	2.14	12.50	65.91	3.82	12.19	19.21	67.11	69.81
45	163.22	0.31	8.49	1.10	1.90	11.07	39.46	2.46	10.37	17.04	39.75	43.25
48	83.63	0.19	2.31	0.39	1.19	2.92	19.43	1.08	7.31	9.85	18.72	21.15
52	56.75	0.10	1.25	0.37	0.96	1.21	14.71	0.67	5.66	7.58	13.99	15.91
56	65.39	0.06	0.71	0.10	0.74	1.23	17.18	0.74	3.83	6.67	16.39	17.69
60	104.53	0.21	0.80	0.53	0.86	1.72	30.12	1.26	4.78	16.48	25.78	30.60
64	103.72	0.35	1.13	0.44	1.72	1.66	29.24	1.41	7.64	14.95	26.44	30.38
68	114.61	0.43	2.15	0.88	3.55	1.77	33.44	1.81	15.55	19.00	31.99	37.20

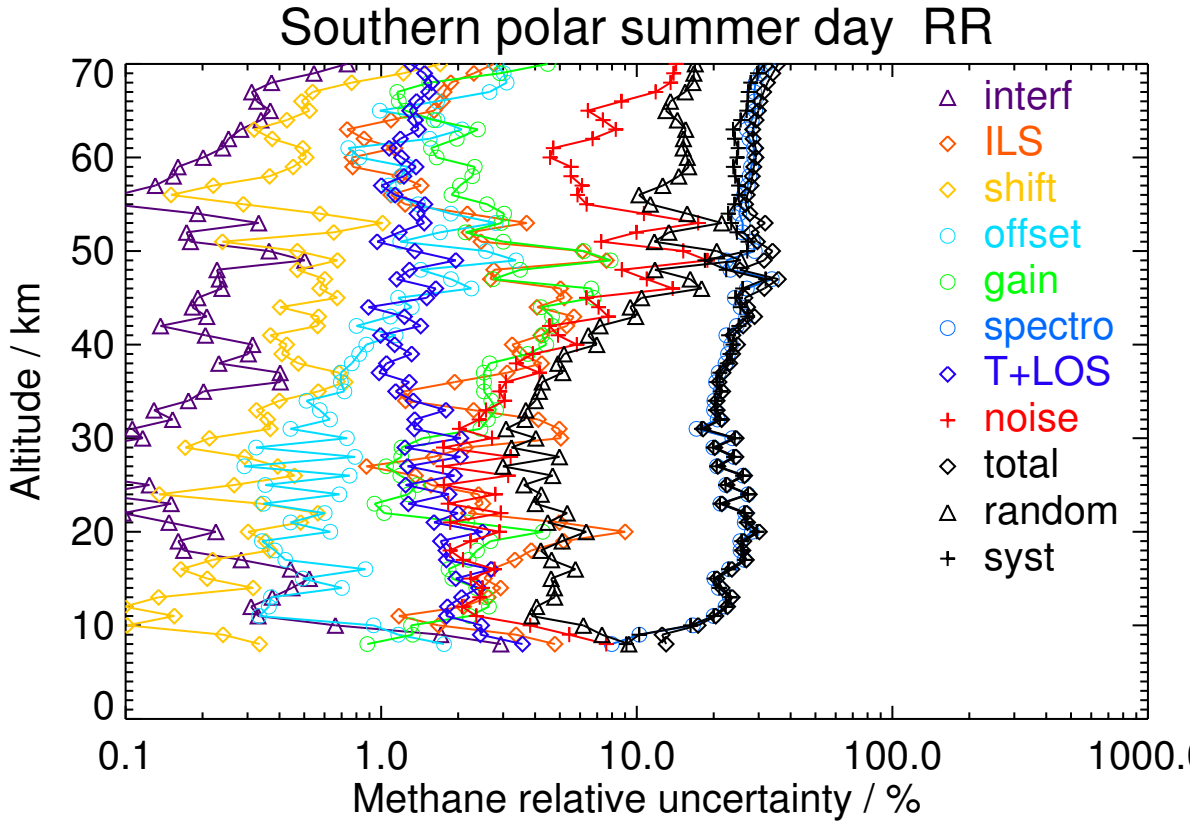

Figure S65. V8R_CH4_261 Southern polar summer day

Table S66. Methane error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1714.68	23.71	33.17	2.74	21.68	38.12	254.33	49.95	90.37	163.98	228.14	280.96
12	1759.22	6.39	35.99	1.68	6.30	50.44	382.16	34.18	40.26	74.51	383.68	390.85
15	1661.62	7.61	91.80	3.50	12.09	88.81	332.69	42.92	43.59	113.20	343.72	361.88
18	1526.14	3.17	53.58	5.73	10.98	112.21	352.73	30.40	32.87	91.31	365.66	376.89
21	1184.97	1.65	42.94	4.15	4.25	36.43	296.18	23.91	31.83	65.65	296.99	304.16
24	1136.63	0.72	15.73	1.16	7.82	18.87	301.52	21.68	32.69	47.04	301.50	305.15
27	976.40	0.84	9.50	3.36	3.96	9.19	198.43	14.13	21.52	30.66	198.24	200.60
30	894.71	1.36	46.36	1.79	6.54	14.09	216.43	17.08	23.50	34.64	221.09	223.79
33	718.12	1.75	7.18	3.40	4.86	22.46	139.14	10.77	17.48	25.22	140.50	142.75
36	515.08	2.51	16.91	2.88	4.49	17.23	105.27	6.85	15.31	21.86	107.25	109.46
39	359.08	0.92	15.09	1.25	3.15	14.71	81.04	4.91	12.65	19.88	82.54	84.90
42	194.95	0.42	10.83	1.68	2.20	12.32	49.27	2.88	9.25	17.39	49.96	52.90
45	117.49	0.32	2.89	0.72	1.33	6.29	31.62	1.60	7.47	12.82	30.73	33.29
48	73.05	0.11	1.49	0.26	0.93	1.60	19.26	0.80	5.99	7.41	18.93	20.33
52	54.96	0.06	0.71	0.24	0.76	1.27	13.49	0.59	3.84	4.95	13.25	14.14
56	66.06	0.06	0.58	0.17	0.78	1.00	17.07	0.90	3.90	6.56	16.32	17.59
60	116.40	0.27	0.90	0.56	1.16	1.97	30.77	1.60	6.20	15.19	27.63	31.53
64	122.98	0.38	0.83	0.51	2.26	1.87	31.75	1.94	9.76	13.54	30.55	33.42
68	146.34	0.66	0.85	1.38	4.03	2.89	39.77	2.99	18.38	20.54	39.16	44.22

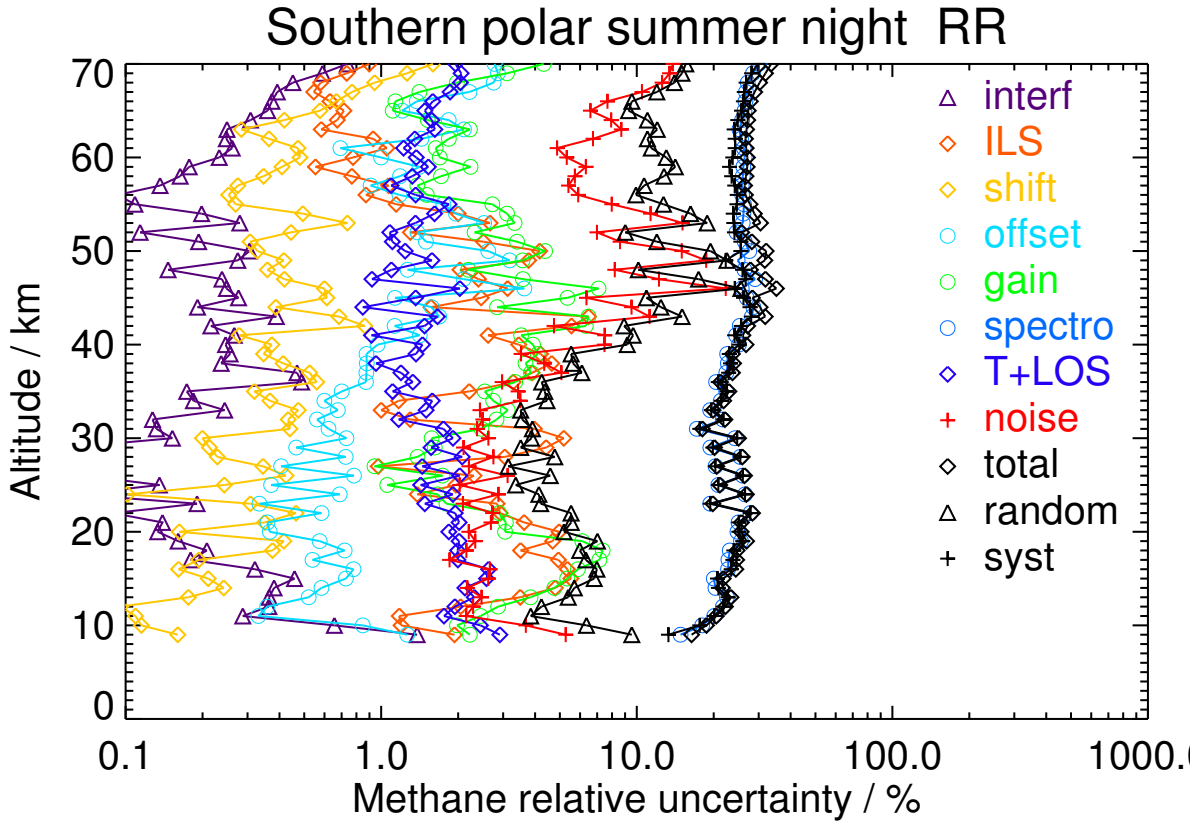

Figure S66. V8R_CH4_261 Southern polar summer night

Table S67. Methane error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	1802.40	9.82	41.08	1.61	5.72	55.81	390.19	33.68	36.21	56.97	395.45	399.54
15	1658.54	16.15	39.00	2.30	9.87	46.08	336.66	39.24	43.21	68.00	340.78	347.49
18	1464.13	7.07	27.17	4.60	6.27	75.76	346.54	27.77	31.46	56.33	353.93	358.39
21	1195.32	1.62	23.31	2.47	5.28	64.43	291.74	19.52	28.62	44.96	298.36	301.73
24	1065.32	1.48	9.45	2.14	8.73	43.88	252.43	24.09	43.01	55.10	255.37	261.24
27	866.97	1.40	8.26	0.91	5.02	17.43	202.70	17.45	30.52	40.65	202.66	206.70
30	667.87	0.98	14.71	2.04	8.82	9.11	170.40	19.98	35.95	49.34	169.34	176.38
33	428.95	1.67	4.96	1.56	6.00	8.17	109.38	13.71	28.54	40.61	107.00	114.45
36	191.99	0.89	6.55	0.85	3.99	7.71	51.57	6.76	22.14	30.46	48.86	57.57
39	80.41	0.59	3.72	0.81	2.63	4.31	22.32	3.22	16.47	22.16	18.15	28.64
42	69.54	0.29	1.67	0.49	2.22	3.27	19.51	2.10	13.00	17.69	16.11	23.93
45	92.77	0.13	1.27	0.28	2.01	3.87	23.60	2.10	10.75	15.63	21.28	26.41
48	158.39	0.18	1.68	0.17	2.27	7.14	36.86	3.15	9.25	14.35	36.15	38.90
52	210.70	0.22	1.70	0.16	2.03	7.90	47.52	3.59	7.59	11.76	47.54	48.97
56	182.69	0.11	2.02	0.22	1.46	5.45	44.49	3.25	8.01	12.73	43.91	45.71
60	122.59	0.04	1.51	0.13	1.61	3.17	32.02	2.52	10.40	13.79	31.06	33.99
64	64.87	0.17	0.77	0.11	2.79	1.37	18.45	1.39	13.73	15.64	17.23	23.27
68	31.88	0.17	0.82	0.46	4.47	0.87	13.68	1.06	21.16	22.84	11.65	25.64

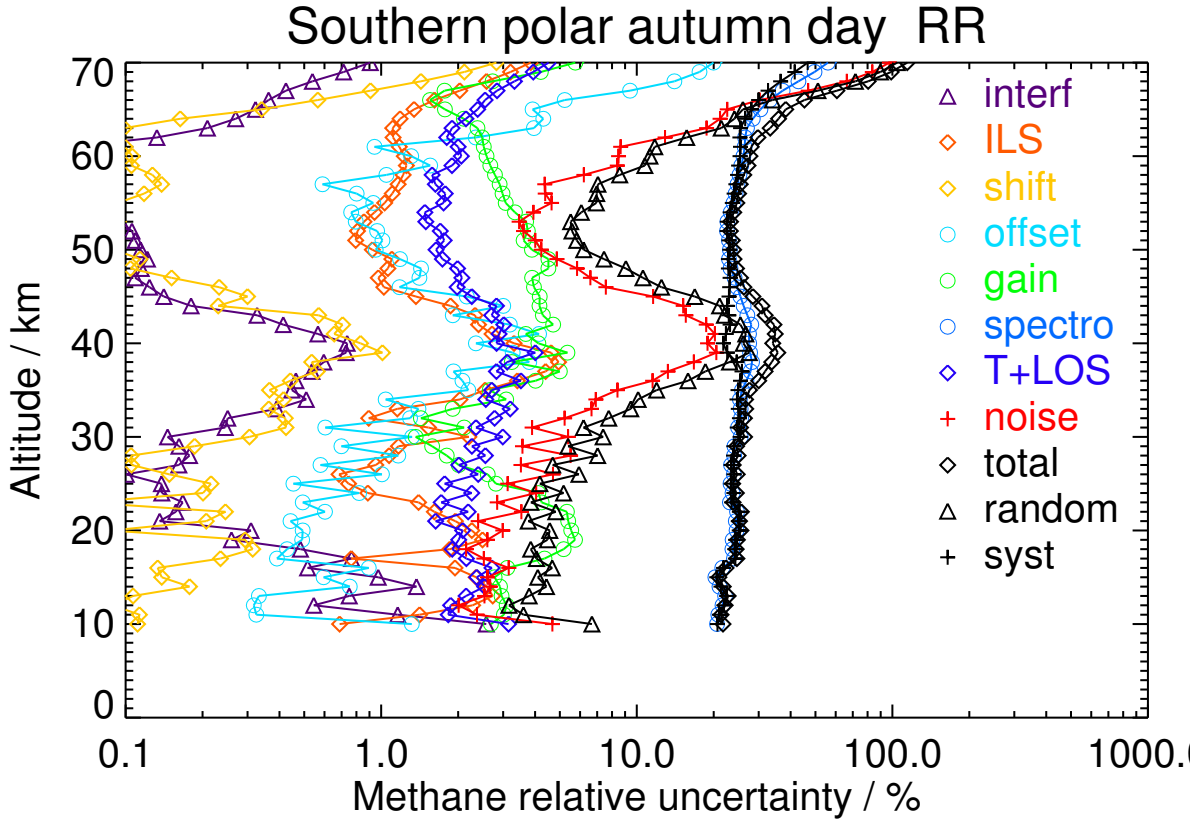

Figure S67. V8R_CH4_261 Southern polar autumn day

Table S68. Methane error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	1832.48	33.80	14.24	2.29	24.14	57.38	308.89	52.58	92.91	158.28	294.94	334.72
12	1766.14	9.57	39.15	1.56	5.91	62.32	387.13	36.03	39.65	66.99	392.17	397.85
15	1604.44	12.25	32.90	2.21	11.50	59.69	314.37	42.45	46.60	78.63	318.67	328.22
18	1383.84	6.07	22.16	2.91	8.23	93.24	292.98	30.98	33.55	65.38	304.87	311.80
21	1138.28	2.04	17.68	2.35	6.01	65.24	257.84	21.41	31.22	51.58	264.32	269.31
24	1016.33	1.33	13.95	2.11	8.83	38.77	237.93	24.40	43.89	60.59	239.26	246.81
27	795.27	1.21	9.58	0.90	5.08	13.68	186.09	17.44	30.62	42.02	185.51	190.21
30	595.02	0.89	8.85	1.16	8.58	9.27	159.52	18.75	34.43	48.60	157.67	164.99
33	324.63	1.58	6.16	1.39	5.83	12.21	84.65	11.30	26.06	40.70	80.88	90.54
36	132.26	0.74	5.32	0.91	3.70	6.37	37.71	5.15	19.59	27.81	33.80	43.77
39	59.49	0.37	2.34	0.75	2.59	6.16	17.28	2.46	14.66	19.84	13.29	23.88
42	64.35	0.20	1.62	0.43	2.06	2.71	16.71	1.95	11.82	14.87	14.70	20.91
45	115.55	0.14	0.98	0.30	2.14	5.39	28.52	2.47	10.53	15.06	27.17	31.07
48	175.25	0.18	1.69	0.13	2.30	8.02	40.31	3.53	9.14	12.49	40.46	42.34
52	194.81	0.21	1.80	0.22	1.87	7.75	45.40	3.42	7.34	11.79	45.33	46.84
56	145.90	0.11	1.88	0.24	1.31	4.16	36.80	2.72	7.36	12.65	35.75	37.92
60	96.87	0.05	1.23	0.13	1.51	2.62	26.45	2.07	9.41	14.77	24.19	28.34
64	47.38	0.17	0.63	0.08	2.67	1.02	14.15	1.17	12.96	14.91	12.49	19.45
68	26.13	0.16	0.73	0.40	4.39	0.81	10.37	1.02	20.73	21.99	8.68	23.64

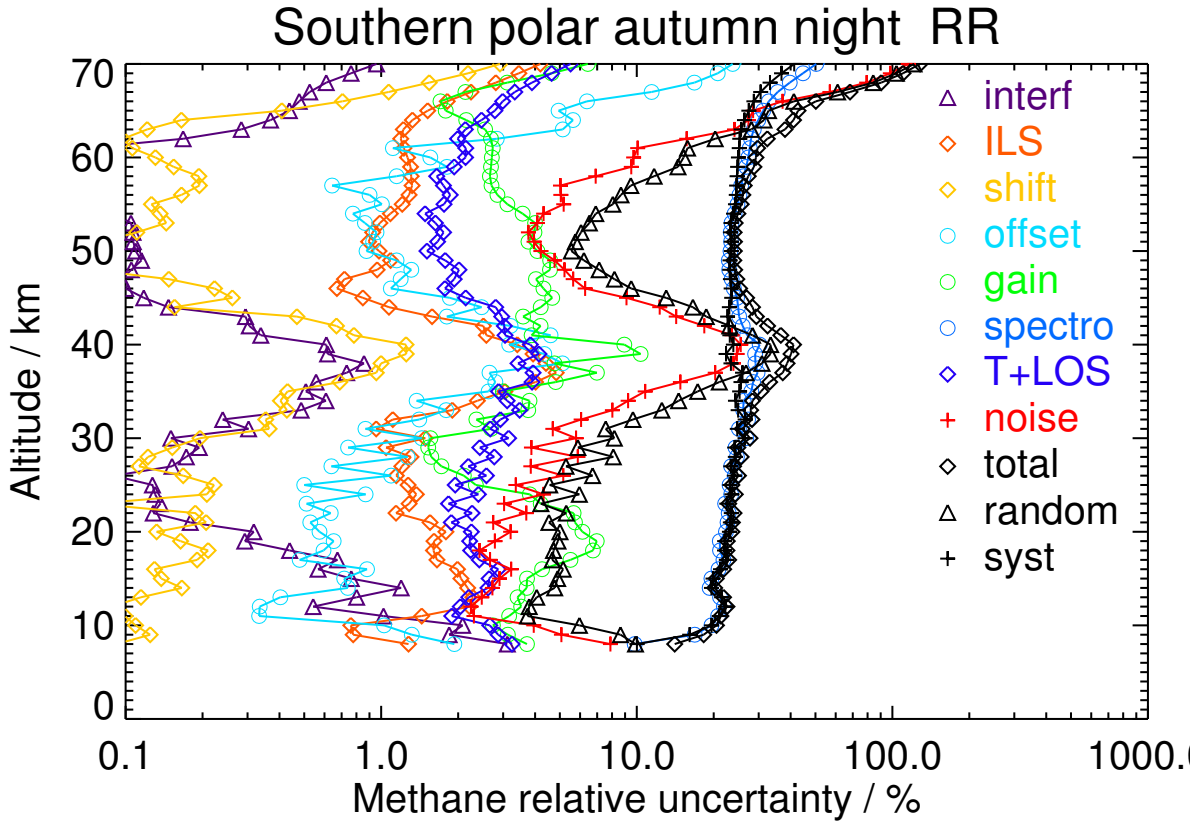

Figure S68. V8R_CH4_261 Southern polar autumn night

S4 Methane error contribution profile plots and tabulated values for RR MA data (V8R_CH4_561)

Table S69. Methane error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	1026.40	0.14	3.01	10.92	4.47	13.68	99.50	221.72	18.30	29.03	77.91	233.46	246.12
35	554.29	0.13	2.19	11.71	1.28	4.66	22.91	139.22	9.62	21.84	51.76	134.02	143.67
40	348.69	0.15	1.44	6.71	0.90	5.73	10.33	73.04	6.35	27.52	33.05	72.30	79.49
45	266.34	0.25	0.64	4.04	0.31	2.75	11.21	53.67	5.06	18.68	22.68	53.76	58.35
50	158.11	0.33	0.18	1.30	0.08	2.44	4.60	34.96	3.79	14.17	15.91	34.82	38.29
55	139.49	0.38	0.05	0.85	0.08	2.47	3.08	32.67	3.46	14.73	15.76	32.63	36.23
60	74.68	0.22	0.07	0.88	0.05	1.69	1.37	19.63	2.08	14.46	15.73	18.90	24.59
65	25.50	0.10	0.13	0.44	0.09	1.85	0.45	8.92	0.91	17.95	18.77	7.35	20.16
70	15.64	0.13	0.19	0.44	0.16	3.23	0.89	6.76	0.72	22.80	23.46	5.22	24.03
74	-4.87	0.18	0.28	0.71	0.21	6.97	1.31	6.29	0.61	32.83	33.84	4.85	34.19
80	-14.86	0.27	0.45	1.08	0.24	11.74	2.40	7.20	0.47	45.28	47.02	6.02	47.40
84	-9.12	0.18	0.27	0.77	0.14	8.41	1.54	4.23	0.19	30.74	31.96	3.88	32.19

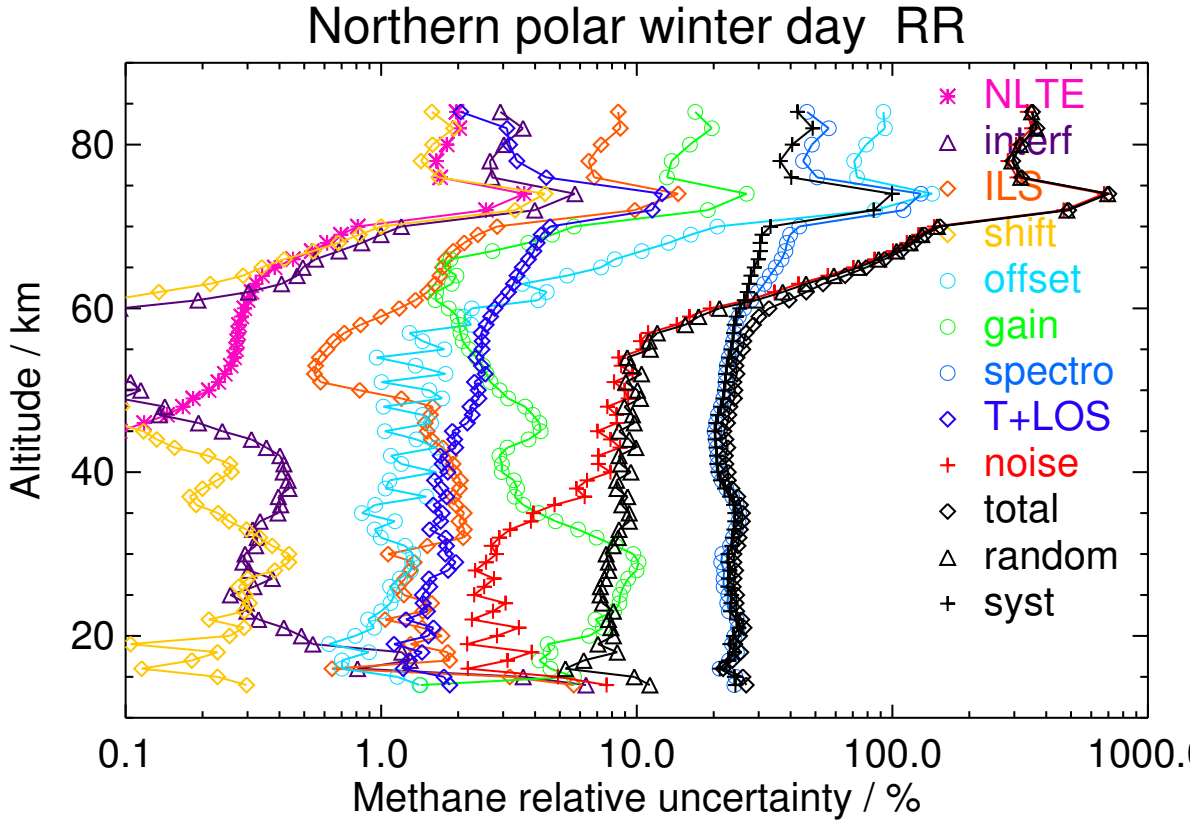

Figure S69. V8R_CH4_561 Northern polar winter day

Table S70. Methane error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	510.74	0.09	1.40	6.09	2.73	10.22	66.80	163.48	11.96	27.16	119.70	133.76	179.50
35	373.83	0.08	2.33	7.46	1.09	5.32	22.87	105.68	7.20	24.48	63.88	91.39	111.50
40	244.09	0.09	1.07	6.25	0.96	5.06	12.85	64.79	5.45	23.13	38.04	59.56	70.67
45	182.36	0.14	0.46	3.68	0.28	2.31	7.97	45.50	3.66	15.39	23.66	42.93	49.02
50	146.79	0.19	0.12	1.48	0.11	2.02	5.06	34.74	2.96	11.27	13.28	34.61	37.07
55	122.99	0.23	0.05	1.21	0.07	1.99	2.60	29.39	2.69	11.89	13.26	29.13	32.01
60	74.30	0.26	0.07	1.19	0.04	2.05	1.44	19.06	1.68	13.18	14.41	18.44	23.40
65	38.23	0.28	0.10	0.66	0.11	1.59	0.74	12.12	1.03	16.10	17.36	10.45	20.26
70	30.35	0.30	0.12	0.34	0.30	3.04	0.85	10.84	1.02	21.72	22.97	8.56	24.51
74	8.71	0.40	0.28	0.82	0.89	6.67	1.50	10.82	1.06	32.77	34.27	8.13	35.22
80	-7.18	0.64	0.54	1.72	1.77	10.58	3.32	11.39	0.99	43.18	45.32	8.43	46.10
84	-2.99	0.54	0.20	0.91	0.27	8.14	1.04	3.81	0.24	30.68	31.89	2.72	32.01

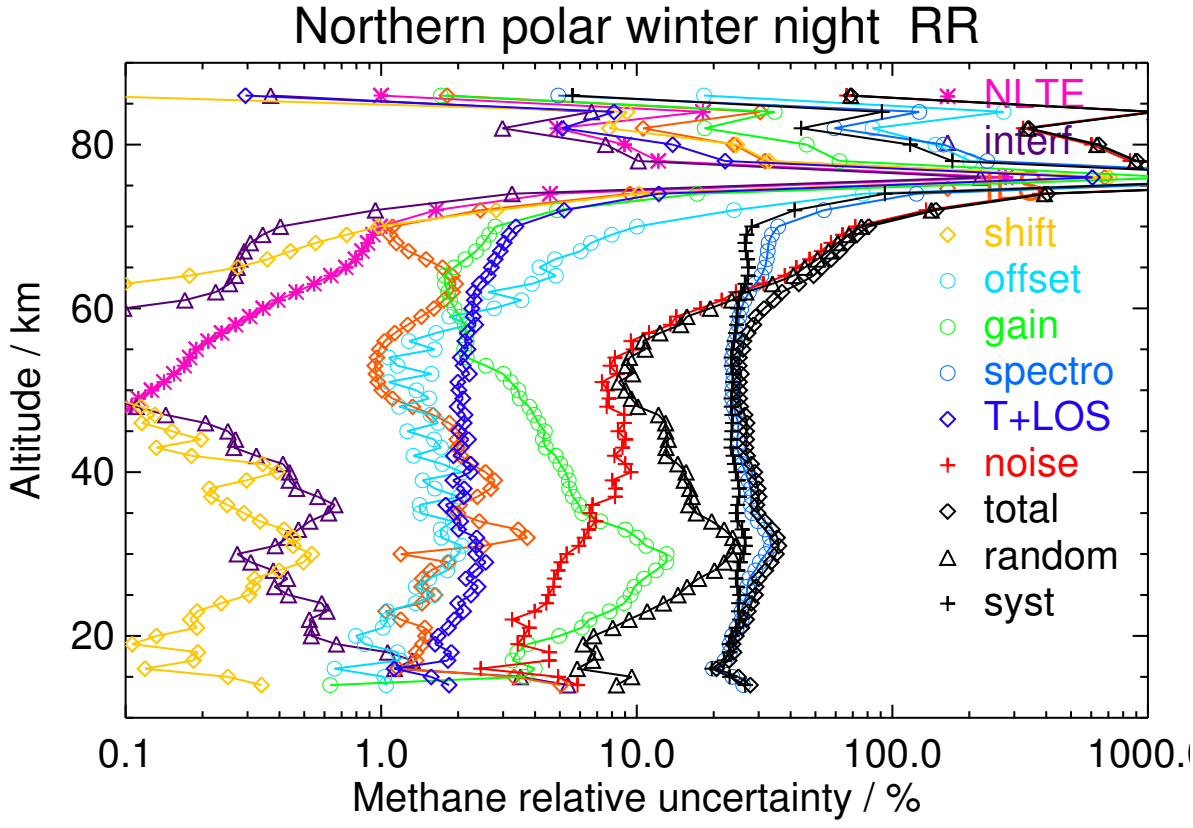

Figure S70. V8R_CH4_561 Northern polar winter night

Table S71. Methane error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	762.85	0.03	0.89	11.66	2.03	6.66	14.50	187.09	15.52	27.28	39.61	186.58	190.74
35	390.19	0.06	0.71	4.19	1.27	4.31	10.17	92.07	8.91	24.79	30.30	91.62	96.50
40	259.34	0.11	0.73	3.18	1.45	3.14	6.17	56.19	4.25	14.07	17.13	56.04	58.60
45	141.42	0.10	0.30	2.37	0.32	1.91	3.63	34.57	1.66	11.04	17.23	32.34	36.64
50	95.87	0.14	0.13	1.11	0.15	1.25	2.47	27.33	1.26	7.35	17.94	22.12	28.48
55	95.05	0.16	0.05	1.13	0.10	1.17	1.70	25.36	1.50	5.66	13.22	22.55	26.14
60	78.56	0.19	0.09	1.13	0.07	2.35	1.40	21.46	1.31	9.24	13.89	19.07	23.59
65	50.53	0.14	0.11	0.53	0.09	0.74	0.77	13.93	0.93	10.74	12.62	12.35	17.66
70	27.50	0.15	0.19	1.02	0.39	1.98	1.55	9.67	0.78	18.04	18.98	8.17	20.67
74	1.99	0.53	0.75	3.53	1.85	4.75	7.19	16.31	1.17	29.04	31.84	13.72	34.67
80	-20.46	0.99	1.54	6.31	4.26	9.20	13.43	29.74	1.38	43.73	48.97	26.95	55.90
84	-14.33	0.66	1.04	4.12	2.97	6.51	8.96	20.12	0.59	29.05	32.10	19.20	37.40

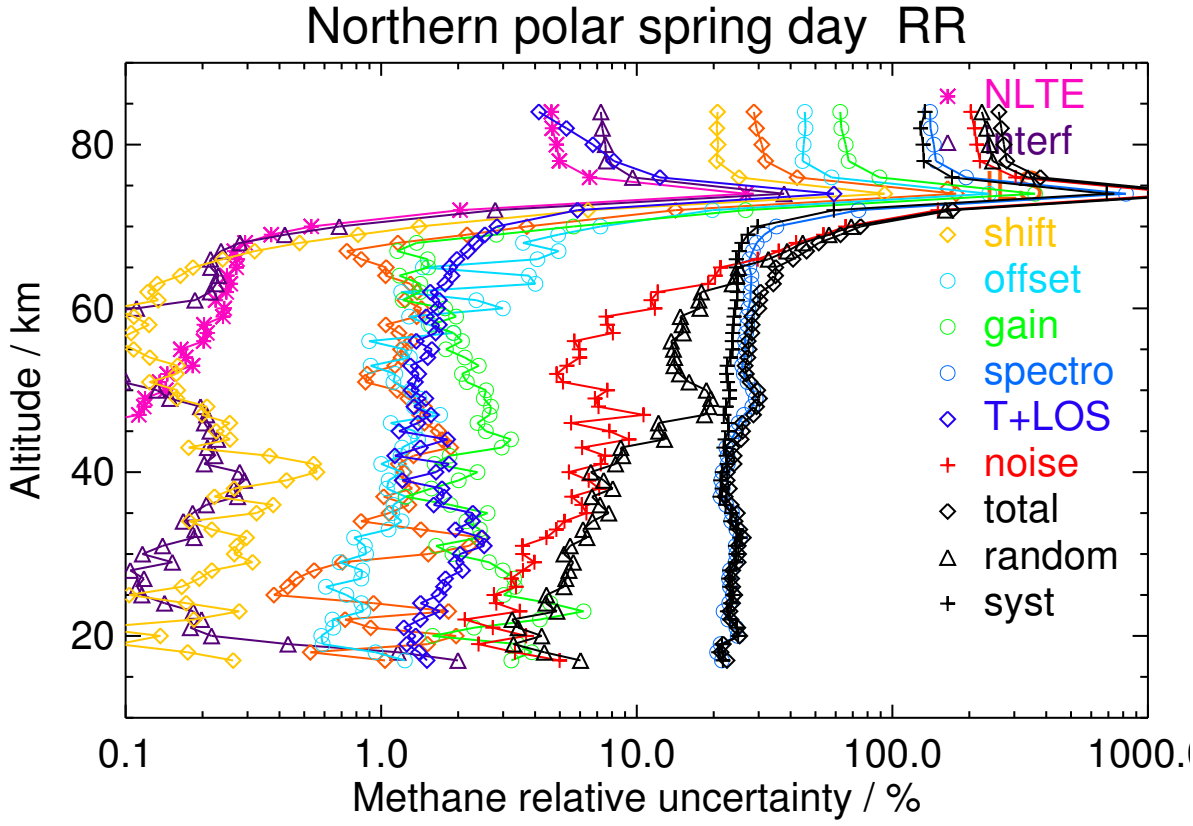

Figure S71. V8R_CH4_561 Northern polar spring day

Table S72. Methane error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	777.97	0.02	0.79	11.22	2.10	6.28	10.93	191.65	15.11	26.48	40.66	190.52	194.81
35	432.97	0.03	0.71	2.98	1.31	4.22	10.42	102.38	9.29	23.33	29.25	101.95	106.06
40	300.81	0.08	0.83	2.62	1.65	3.44	6.60	65.70	4.79	14.91	18.12	65.57	68.03
45	168.49	0.08	0.36	2.81	0.35	1.91	4.63	39.80	1.98	11.37	17.33	38.08	41.84
50	119.84	0.10	0.11	1.37	0.09	1.28	2.90	31.00	1.60	7.68	17.17	27.20	32.16
55	108.88	0.13	0.04	1.37	0.09	1.39	2.06	27.42	1.86	6.43	12.17	25.62	28.37
60	74.59	0.13	0.10	1.20	0.08	2.34	1.30	20.36	1.36	9.60	13.18	18.53	22.74
65	48.26	0.11	0.12	0.71	0.11	0.91	0.73	13.07	1.04	11.51	12.92	11.80	17.50
70	21.03	0.12	0.22	1.06	0.51	2.07	1.68	9.81	0.91	18.91	19.84	8.35	21.52
74	-1.14	0.30	0.68	2.87	1.81	5.20	5.62	15.46	1.43	30.48	32.19	14.29	35.22
80	-26.79	0.58	1.45	5.21	4.21	9.09	10.91	28.66	1.88	43.54	46.70	28.10	54.50
84	-19.11	0.38	0.96	3.35	2.86	6.39	7.84	20.02	0.86	28.47	30.85	19.57	36.53

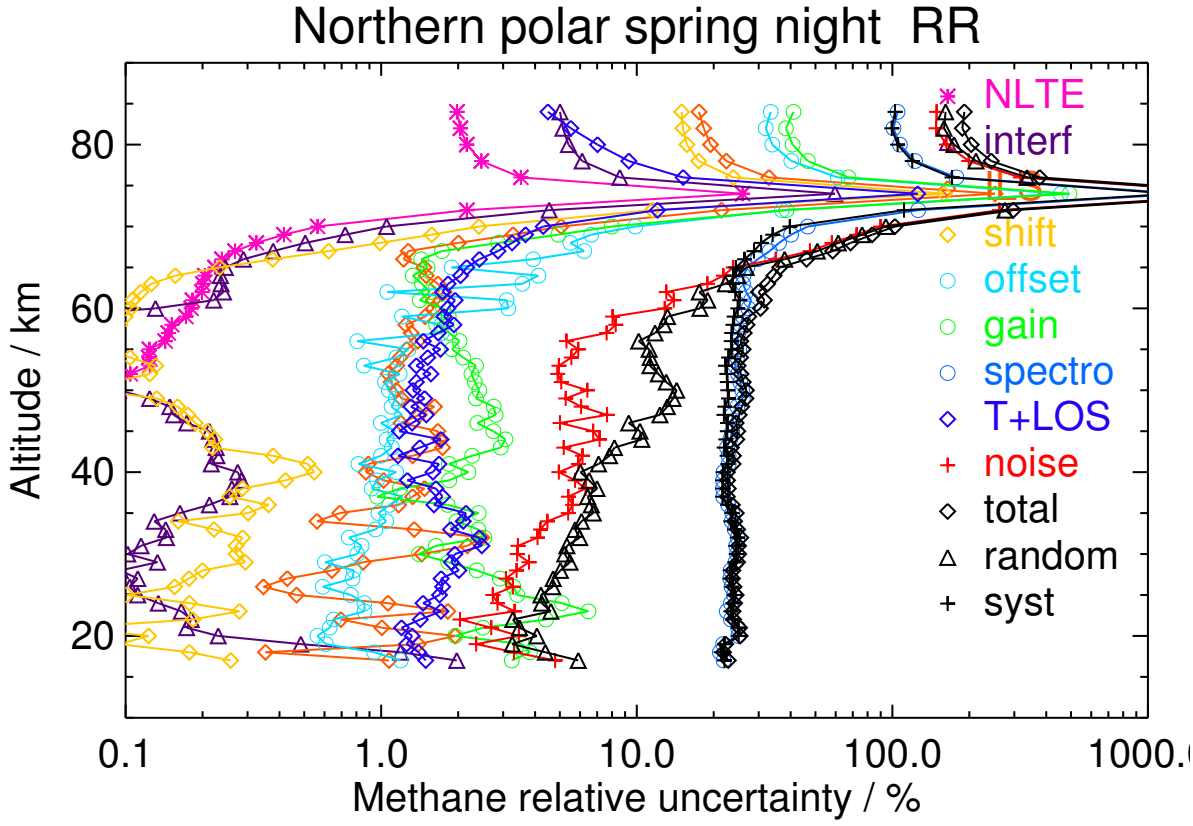

Figure S72. V8R_CH4_561 Northern polar spring night

Table S73. Methane error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	871.16	0.03	1.03	17.08	2.01	7.13	31.30	234.27	13.42	26.68	36.11	236.21	238.96
35	529.33	0.03	0.71	5.54	1.86	4.76	9.57	129.01	9.87	23.92	28.33	129.07	132.14
40	255.61	0.06	0.69	1.93	0.97	2.81	4.87	51.29	3.37	12.95	15.35	51.10	53.36
45	134.47	0.05	0.27	2.58	0.49	2.22	3.71	30.14	1.33	13.78	15.29	29.86	33.55
50	72.79	0.04	0.11	0.89	0.17	1.81	1.01	17.13	0.88	10.74	11.73	16.65	20.37
55	56.04	0.05	0.04	0.71	0.05	0.97	0.83	13.85	0.73	4.47	5.46	13.58	14.64
60	67.58	0.10	0.09	0.79	0.11	1.79	1.14	18.01	0.93	6.40	10.72	16.02	19.27
65	62.84	0.11	0.13	0.69	0.09	0.70	1.12	16.24	0.91	8.04	9.78	15.36	18.21
70	70.02	0.19	0.14	1.30	0.36	2.34	0.80	17.84	1.15	16.74	17.84	17.02	24.65
74	54.56	0.76	1.04	3.52	2.02	2.74	6.06	25.83	0.74	25.53	27.13	25.41	37.17
80	20.67	1.27	2.59	3.73	7.82	6.24	12.94	47.78	0.23	39.53	42.89	47.92	64.31
84	5.38	0.80	1.76	1.93	5.96	5.30	8.46	32.78	0.22	30.84	32.77	33.08	46.57

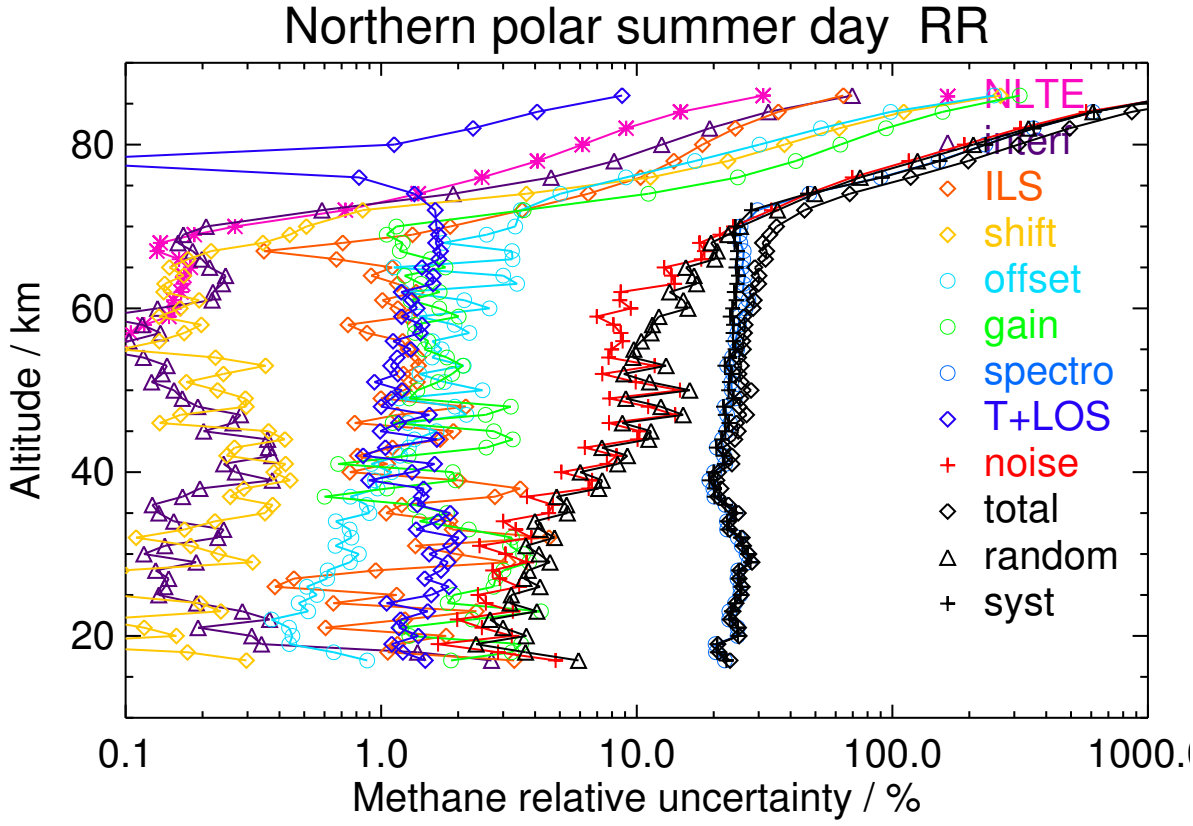

Figure S73. V8R_CH4_561 Northern polar summer day

Table S74. Methane error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	794.31	0.02	1.18	4.86	2.86	7.07	25.67	204.49	13.03	27.19	37.86	205.03	208.49
35	402.52	0.02	0.63	3.68	1.34	4.41	11.55	97.30	8.52	23.12	27.27	97.47	101.21
40	185.72	0.05	0.66	1.60	0.80	2.71	3.79	39.13	2.72	12.89	15.83	38.46	41.59
45	83.53	0.04	0.18	1.97	0.30	1.79	2.84	20.08	1.03	11.07	14.00	18.61	23.29
50	67.24	0.03	0.08	0.62	0.09	1.08	1.04	16.42	0.78	6.61	8.94	15.38	17.79
55	82.53	0.09	0.09	0.71	0.14	1.34	1.48	21.69	1.45	6.38	12.61	18.93	22.75
60	167.97	0.25	0.17	1.95	0.18	2.70	2.92	40.19	3.06	10.48	17.62	38.00	41.88
65	167.45	0.19	0.18	1.13	0.21	2.14	2.37	40.89	3.33	13.01	15.84	40.17	43.17
70	149.99	0.46	0.44	1.89	0.79	3.17	1.08	39.81	3.51	20.94	22.93	39.06	45.29
74	98.97	1.12	1.26	2.53	2.51	5.25	5.71	41.99	2.42	31.75	34.04	41.16	53.41
80	25.41	1.20	1.93	2.39	4.71	8.51	9.31	41.05	0.45	44.02	46.09	41.12	61.77
84	3.30	0.66	1.18	1.20	3.36	5.93	5.89	24.55	0.01	28.84	30.23	24.60	38.97

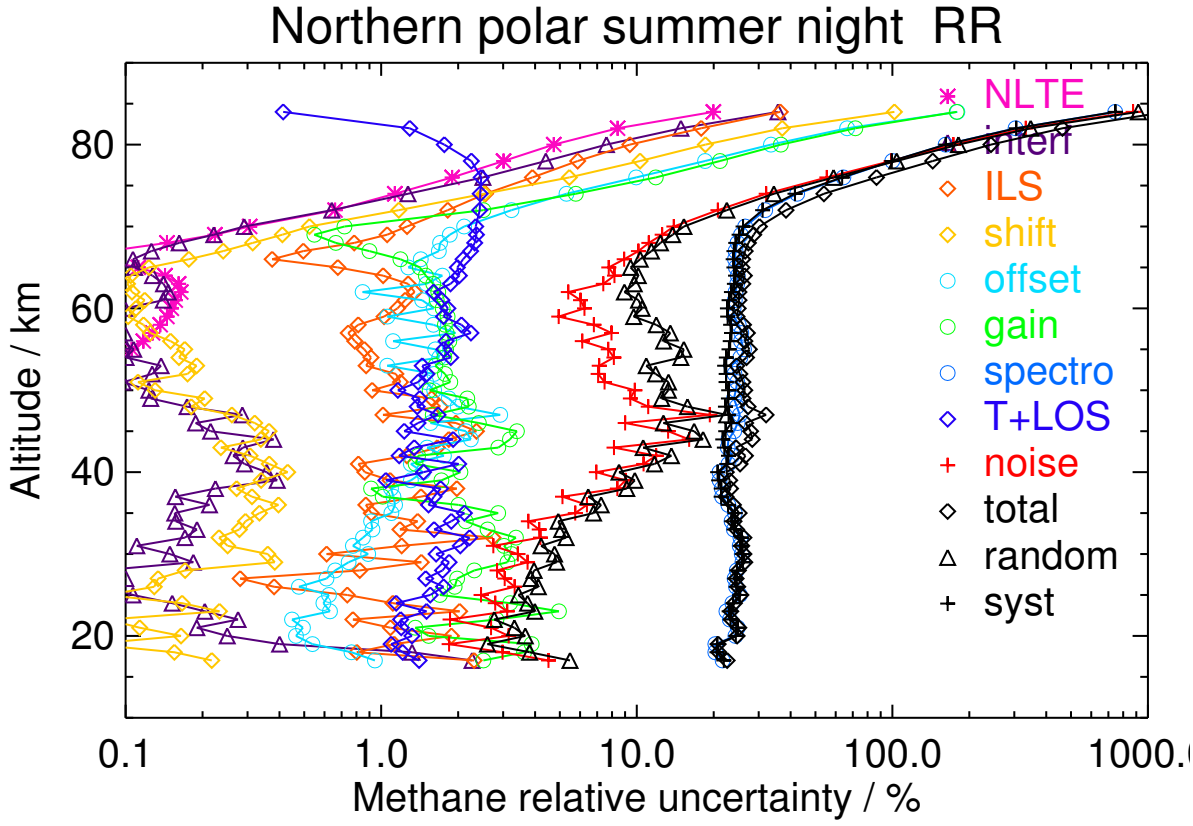

Figure S74. V8R_CH4_561 Northern polar summer night

Table S75. Methane error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	643.19	0.04	1.55	5.86	1.62	5.71	12.10	166.66	12.49	25.77	53.60	161.06	169.74
35	240.68	0.04	1.51	2.67	0.82	3.57	11.80	75.36	7.11	21.96	51.13	61.31	79.84
40	131.51	0.10	0.69	2.56	0.65	2.83	3.26	45.01	2.68	13.38	38.52	27.47	47.31
45	115.98	0.14	0.40	1.24	0.23	1.63	3.88	32.88	2.20	9.62	23.78	25.15	34.61
50	184.18	0.32	0.22	1.11	0.12	1.52	4.16	42.32	3.04	8.29	13.25	41.41	43.47
55	214.48	0.53	0.08	2.21	0.13	2.21	4.70	49.66	4.35	11.07	13.91	49.46	51.38
60	182.49	0.57	0.13	2.42	0.11	2.72	3.25	44.14	3.45	12.49	15.08	43.74	46.26
65	103.63	0.41	0.12	1.37	0.12	1.32	1.55	26.80	2.27	13.81	15.69	25.96	30.34
70	47.12	0.24	0.15	0.45	0.29	2.50	0.89	14.44	1.40	19.60	20.56	13.40	24.54
74	13.20	0.47	0.54	1.40	0.95	5.70	4.14	12.15	1.63	31.69	33.19	10.30	34.75
80	-6.23	1.01	1.21	3.28	2.28	9.40	9.01	16.84	2.28	43.63	46.33	15.27	48.79
84	-19.07	0.54	0.78	2.39	0.80	7.05	9.05	19.83	1.13	28.73	34.02	14.20	36.86

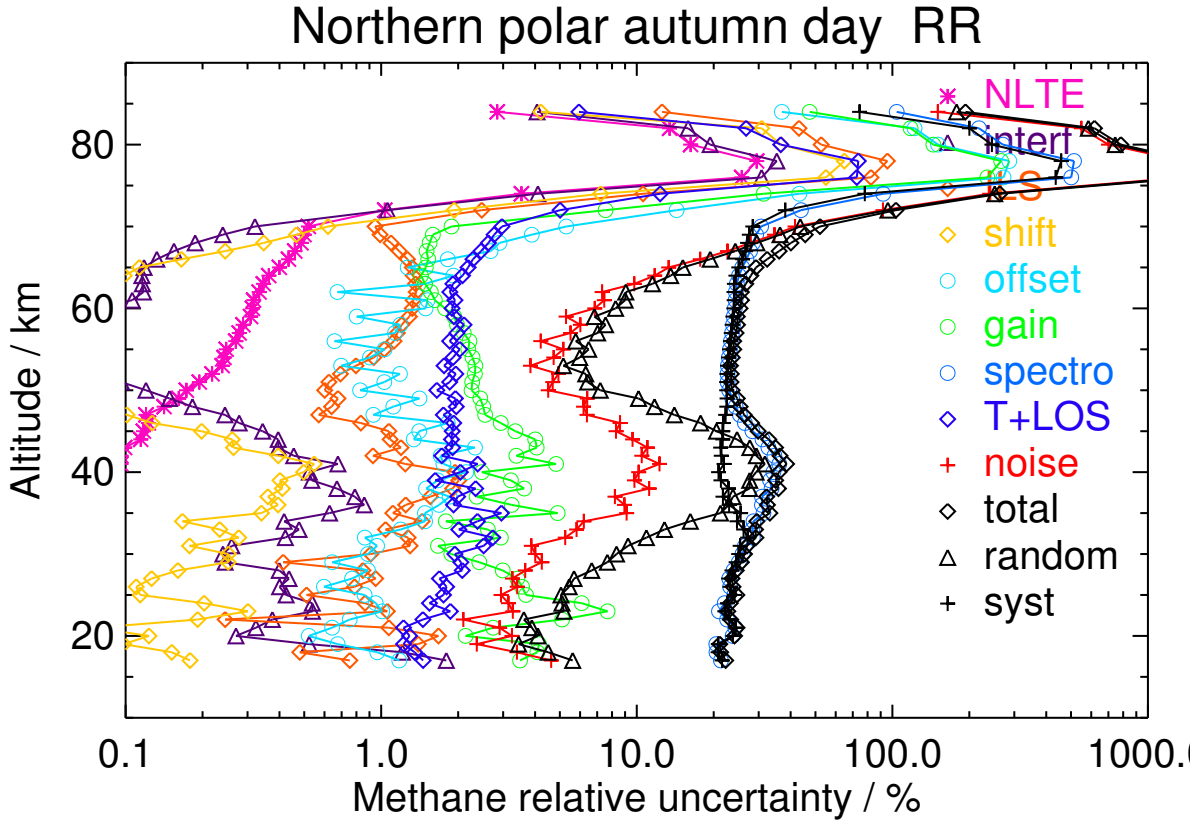

Figure S75. V8R_CH4_561 Northern polar autumn day

Table S76. Methane error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	540.35	0.06	1.28	1.86	1.18	5.01	10.44	140.68	11.47	25.57	35.19	139.56	143.93
35	165.22	0.04	1.31	2.45	0.50	2.99	6.43	43.85	5.89	20.47	25.08	42.49	49.34
40	58.93	0.05	0.55	1.09	0.42	2.89	1.49	14.99	1.88	14.32	16.18	13.56	21.11
45	102.06	0.06	0.32	0.73	0.21	1.36	2.06	23.72	2.26	9.81	13.43	22.14	25.89
50	176.03	0.23	0.18	1.42	0.10	1.60	3.76	39.19	2.98	8.34	10.25	39.09	40.41
55	192.85	0.39	0.07	2.06	0.10	2.22	3.99	44.32	4.02	10.88	13.14	44.17	46.09
60	169.21	0.50	0.10	2.74	0.07	2.30	3.05	40.70	3.17	11.24	13.99	40.25	42.61
65	89.54	0.39	0.12	1.47	0.09	1.62	1.35	23.40	2.24	14.19	15.71	22.67	27.58
70	39.44	0.27	0.14	0.44	0.33	2.58	0.57	13.85	1.50	20.00	21.00	12.67	24.53
74	9.58	0.26	0.31	0.60	0.85	6.15	1.37	12.82	1.62	32.71	34.12	10.64	35.74
80	-7.35	0.64	0.77	2.02	2.24	9.41	3.88	16.96	2.46	43.29	45.22	15.39	47.76
84	23.95	0.18	0.23	0.20	0.73	7.37	0.65	8.44	0.86	29.52	30.46	8.42	31.60

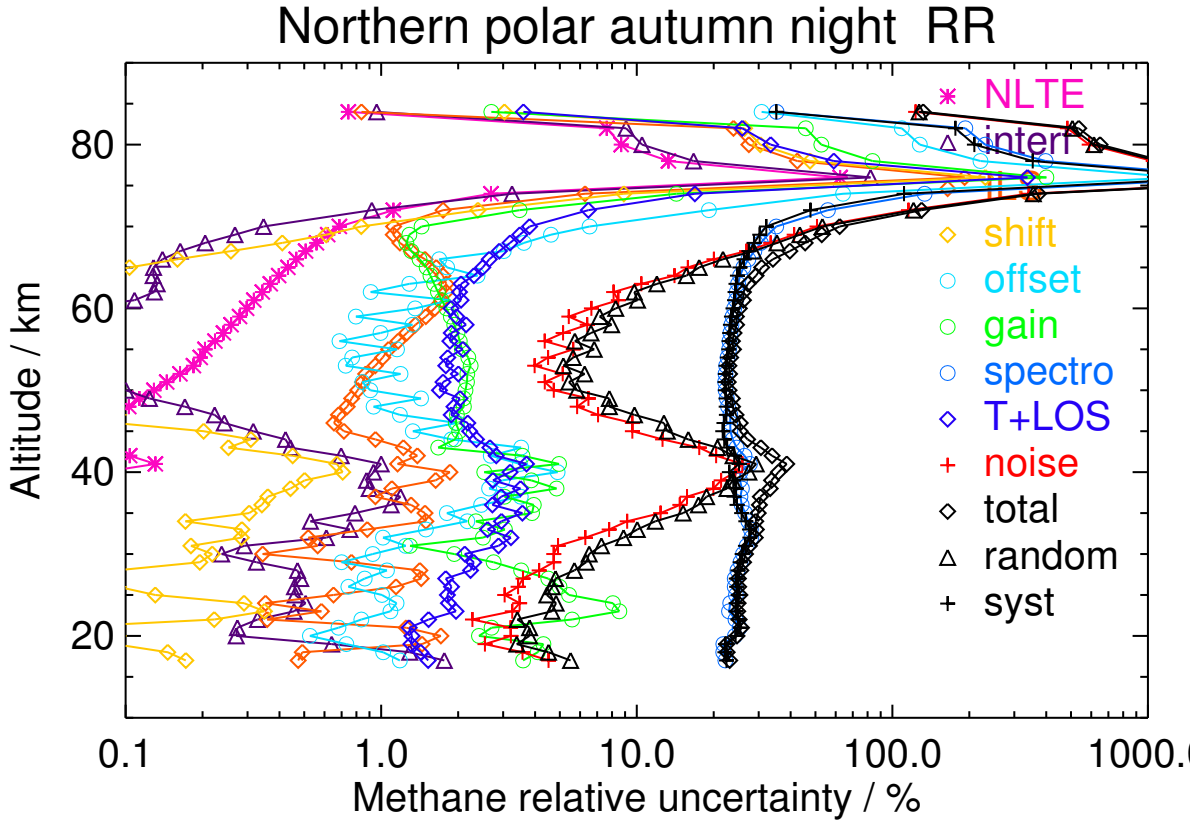

Figure S76. V8R_CH4_561 Northern polar autumn night

Table S77. Methane error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	916.98	0.06	5.11	19.77	1.38	7.21	29.88	231.56	16.65	30.15	69.35	226.63	237.00
35	577.41	0.11	2.24	9.29	1.44	4.40	11.77	140.97	9.48	20.16	42.50	137.16	143.60
40	357.43	0.14	1.84	2.78	1.16	4.66	5.32	72.61	5.15	20.17	26.07	71.33	75.95
45	295.44	0.28	1.21	3.18	0.39	1.82	6.98	63.42	3.62	12.24	18.83	62.41	65.19
50	177.64	0.32	0.42	1.39	0.19	1.58	4.27	39.60	3.03	8.78	12.84	38.89	40.95
55	154.17	0.35	0.08	1.47	0.10	2.14	3.18	35.90	3.06	10.17	11.66	35.82	37.67
60	125.13	0.31	0.11	1.53	0.11	1.99	1.99	30.58	2.32	10.70	12.51	30.15	32.64
65	66.87	0.18	0.19	0.74	0.15	1.97	0.91	17.80	1.59	14.47	15.96	16.72	23.11
70	29.24	0.19	0.55	0.62	0.43	2.13	2.31	10.63	1.25	19.94	20.77	9.57	22.87
74	-0.50	0.45	1.17	1.33	0.97	5.51	5.54	13.77	1.47	30.84	32.68	11.83	34.76
80	-30.62	0.61	1.67	1.47	1.53	10.29	7.81	18.50	1.55	44.62	46.54	18.57	50.11
84	-20.00	0.36	1.12	1.03	0.90	7.74	5.24	12.25	0.67	30.85	32.29	12.25	34.53

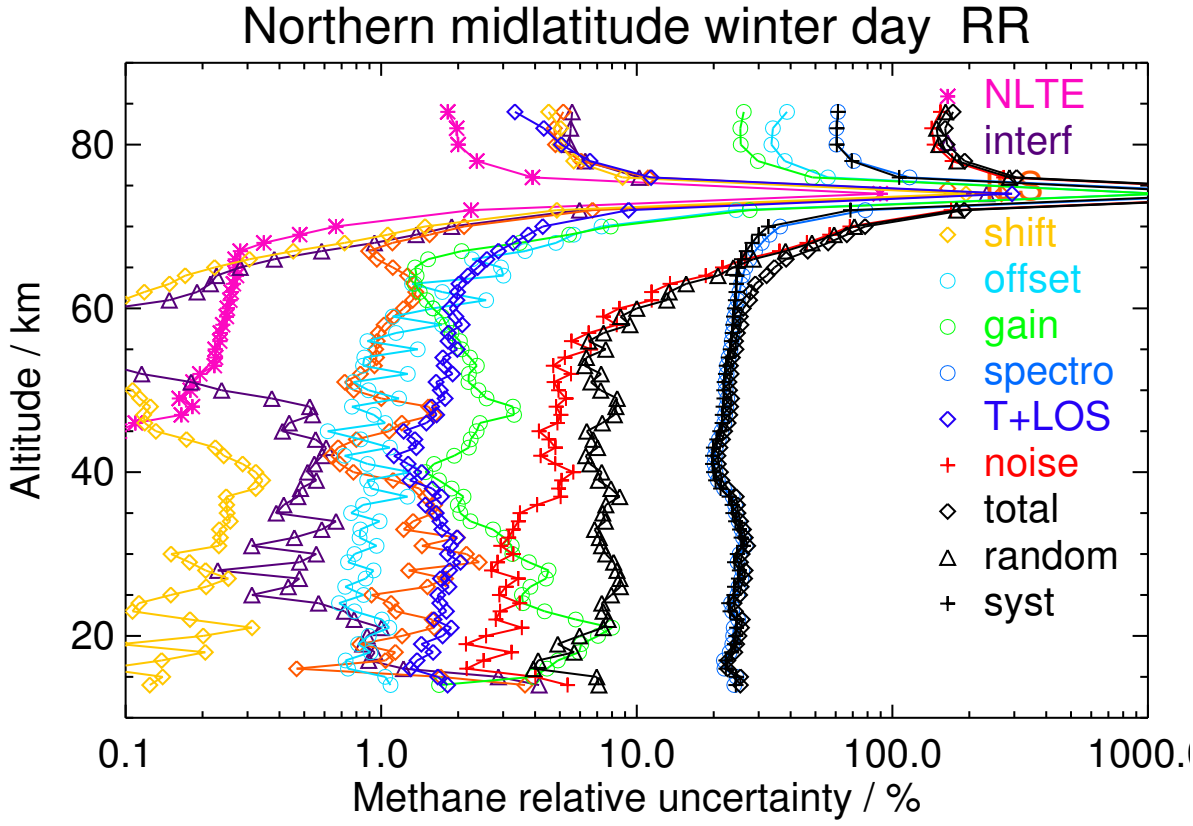

Figure S77. V8R_CH4_561 Northern midlatitude winter day

Table S78. Methane error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	981.05	0.04	3.37	22.95	3.00	8.85	53.60	243.28	20.27	28.37	76.51	240.93	252.79
35	569.50	0.04	2.32	5.44	1.63	5.31	12.37	137.27	9.79	21.73	43.18	133.28	140.10
40	383.49	0.11	2.19	3.11	1.23	3.78	9.94	86.63	5.53	18.94	26.10	85.69	89.58
45	331.68	0.19	1.30	4.17	0.48	2.42	11.22	79.01	4.74	12.76	24.51	77.32	81.11
50	200.62	0.17	0.33	2.31	0.20	2.04	5.10	46.52	3.56	9.59	15.23	45.53	48.01
55	160.79	0.21	0.11	1.66	0.11	1.62	3.57	37.52	3.17	9.52	11.65	37.30	39.07
60	130.12	0.19	0.10	1.55	0.13	1.82	2.16	32.10	2.94	11.76	13.81	31.58	34.46
65	72.90	0.14	0.21	0.93	0.24	1.87	0.91	19.67	1.99	15.85	17.22	18.74	25.44
70	33.32	0.17	0.29	0.54	0.44	2.52	1.97	13.28	1.53	20.53	21.94	11.38	24.72
74	10.58	0.29	0.71	1.06	1.06	5.96	4.48	14.67	1.65	31.59	33.65	11.90	35.69
80	-16.44	0.44	1.39	2.04	1.77	10.49	9.25	22.75	1.95	44.77	47.91	20.88	52.26
84	-17.28	0.26	0.90	1.30	1.11	7.51	5.84	14.50	0.78	29.83	31.94	13.22	34.57

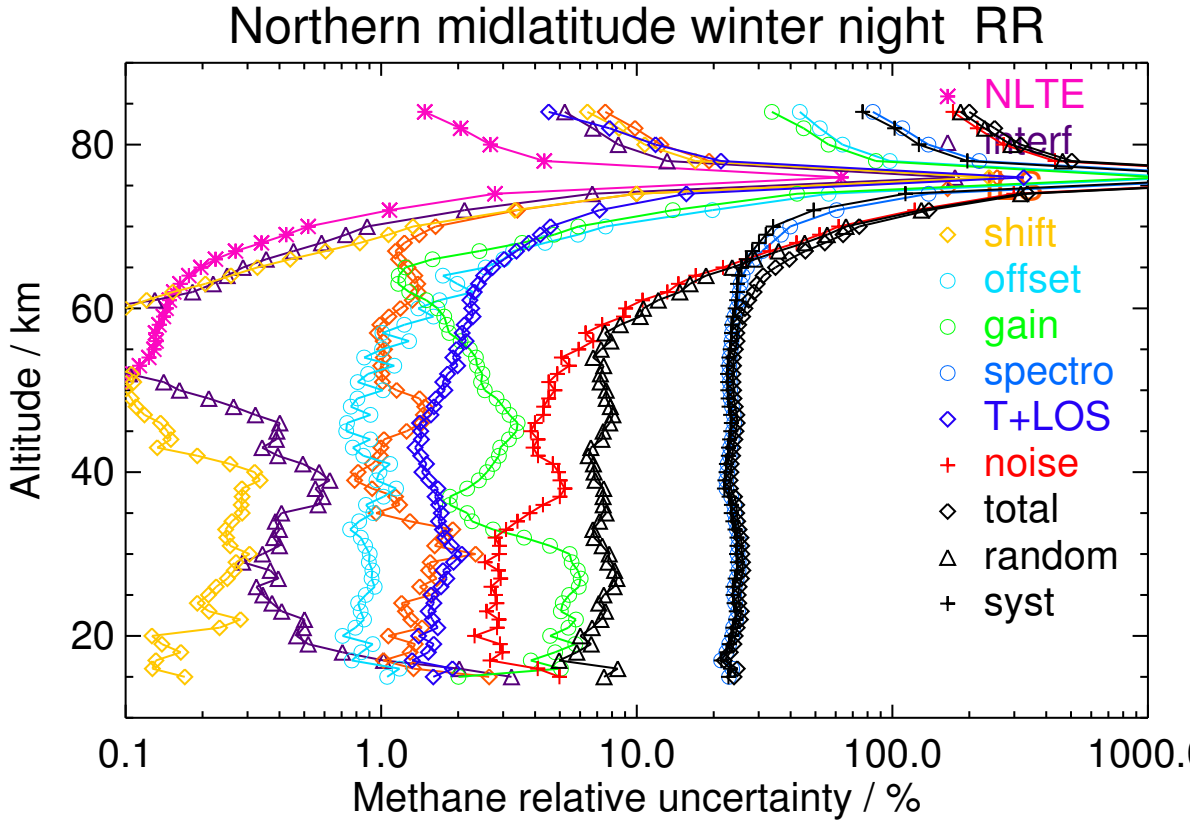

Figure S78. V8R_CH4_561 Northern midlatitude winter night

Table S79. Methane error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	962.44	0.05	2.06	9.16	2.73	7.39	21.00	249.89	17.10	25.79	52.09	247.55	252.97
35	567.37	0.12	2.37	3.14	1.88	4.49	10.85	137.80	10.08	22.35	45.59	132.92	140.52
40	405.84	0.17	1.79	4.86	1.43	3.09	7.73	85.86	5.22	14.17	31.54	81.87	87.74
45	305.20	0.27	1.32	1.93	0.57	2.50	7.48	69.31	3.66	11.34	26.08	65.83	70.80
50	249.45	0.39	0.59	2.58	0.24	1.53	6.47	56.27	3.47	8.59	17.35	54.80	57.48
55	194.75	0.38	0.10	2.30	0.17	1.48	4.26	44.90	3.49	7.51	12.78	44.12	45.94
60	140.97	0.29	0.11	1.61	0.12	2.74	2.18	34.10	2.79	11.40	13.46	33.68	36.27
65	79.27	0.14	0.16	0.62	0.13	1.00	0.89	20.37	1.66	12.30	13.50	19.72	23.90
70	33.67	0.18	0.33	1.07	0.30	2.02	2.08	11.57	1.20	18.48	19.38	10.54	22.06
74	-7.79	0.75	1.45	4.08	1.61	4.94	10.07	22.09	2.15	29.39	31.95	21.98	38.78
80	-36.65	1.62	3.21	7.82	4.52	9.32	22.29	47.08	3.45	42.85	47.40	49.95	68.87
84	-24.80	0.98	1.97	4.54	2.80	6.67	13.42	28.82	1.40	28.80	31.33	30.64	43.82

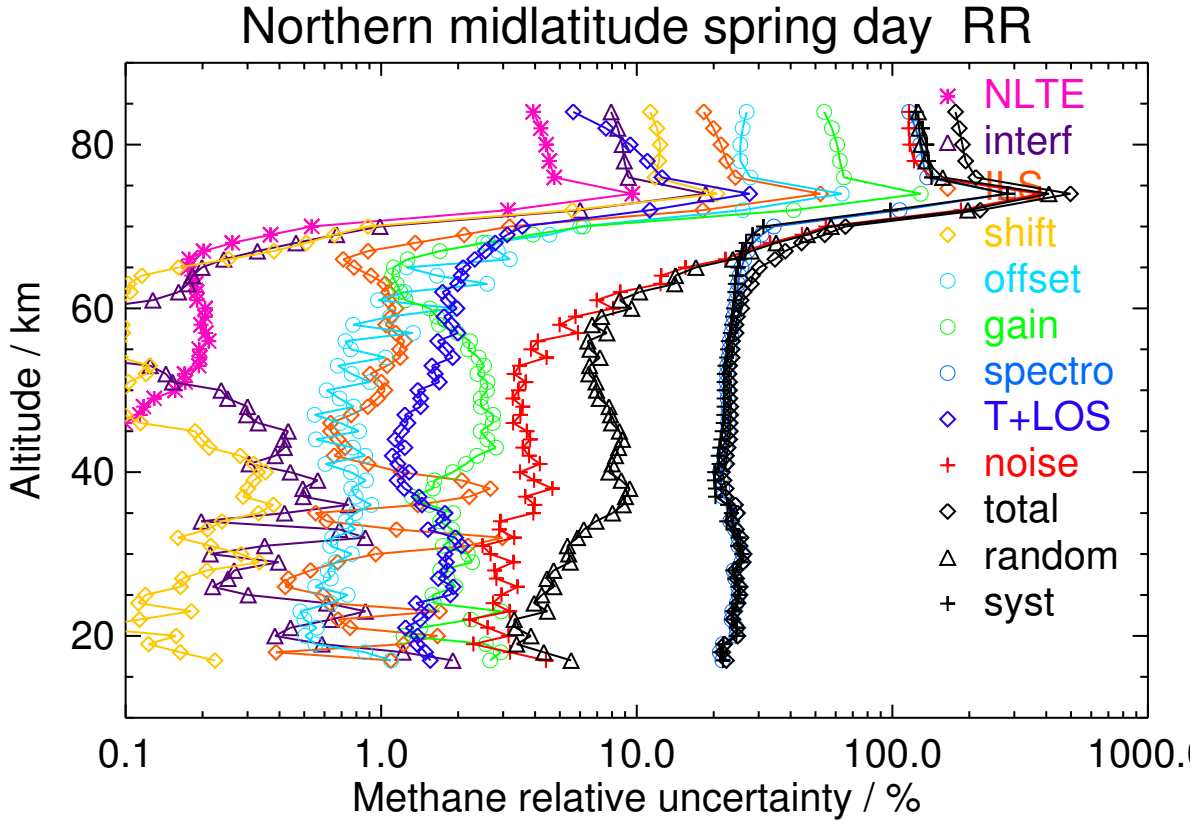

Figure S79. V8R_CH4_561 Northern midlatitude spring day

Table S80. Methane error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	965.86	0.01	2.19	8.07	2.59	6.42	14.33	243.37	16.72	26.42	47.17	241.46	246.03
35	537.85	0.04	1.66	3.34	1.60	4.27	8.64	131.71	10.38	22.31	42.55	127.48	134.40
40	378.14	0.07	2.30	3.55	1.60	3.39	7.92	82.27	5.35	14.73	30.45	78.62	84.31
45	226.41	0.09	1.31	2.25	0.50	1.94	5.99	54.19	2.69	10.06	25.75	49.27	55.60
50	201.99	0.16	0.48	2.41	0.16	1.45	5.21	47.06	2.78	8.33	19.70	44.04	48.24
55	161.73	0.18	0.08	1.93	0.14	1.56	3.38	38.53	2.99	7.62	14.51	36.87	39.62
60	121.02	0.17	0.12	1.69	0.09	2.65	1.99	29.83	2.33	11.02	14.16	28.81	32.11
65	64.13	0.11	0.14	0.84	0.12	0.91	1.04	16.62	1.48	12.12	13.28	15.86	20.68
70	29.83	0.13	0.36	1.10	0.40	2.14	2.07	11.57	1.20	18.92	19.76	10.62	22.44
74	3.66	0.41	1.31	3.46	1.86	5.06	7.92	20.95	2.20	30.35	32.30	20.66	38.35
80	-17.90	0.78	2.48	5.99	4.31	9.02	14.64	36.79	2.75	43.56	46.81	37.75	60.13
84	-20.34	0.48	1.59	3.54	2.84	6.42	9.32	23.74	1.16	28.66	30.72	24.37	39.21

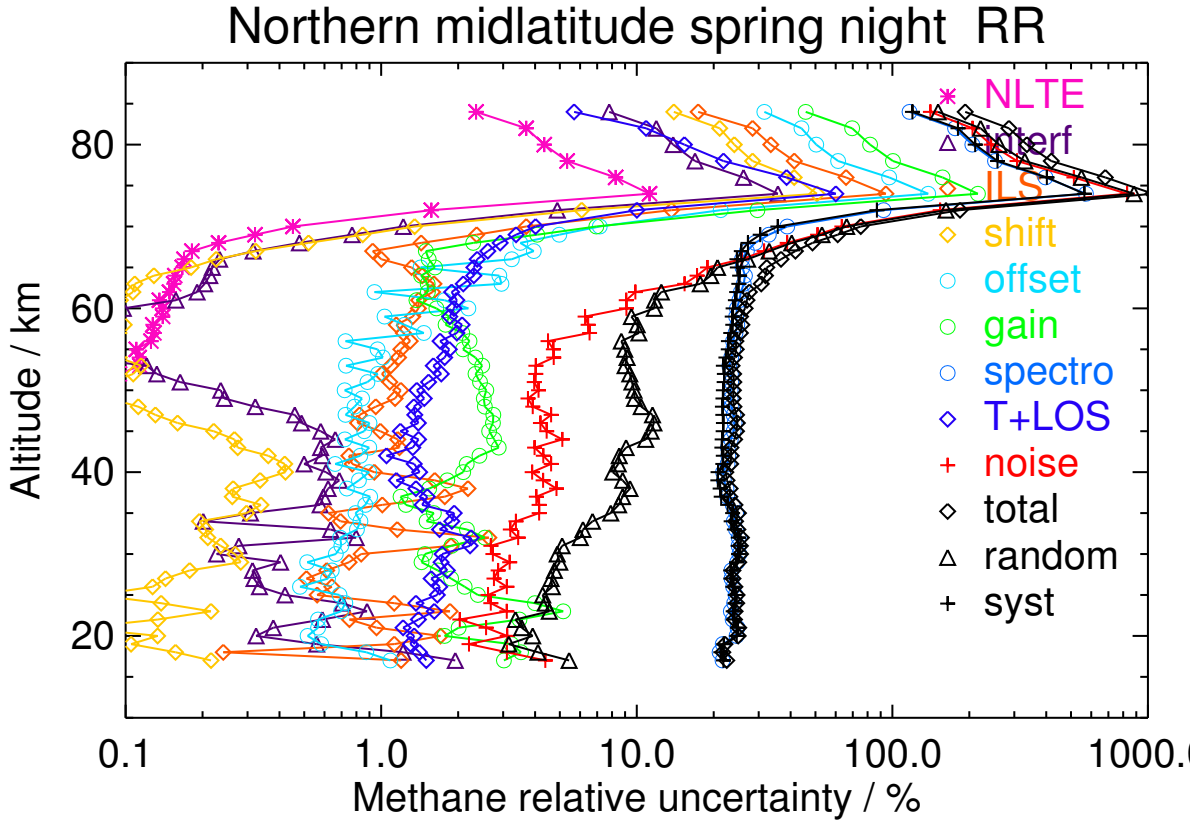

Figure S80. V8R_CH4_561 Northern midlatitude spring night

Table S81. Methane error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	901.12	0.02	2.64	6.13	2.28	7.35	29.48	230.19	14.41	25.45	37.47	231.12	234.13
35	541.88	0.06	3.21	4.47	2.01	5.02	11.79	131.13	10.41	23.95	32.20	130.54	134.45
40	271.13	0.09	1.33	1.83	0.79	2.50	4.86	55.18	3.73	11.27	16.75	54.23	56.76
45	167.49	0.09	0.92	1.43	0.35	1.75	3.40	38.40	1.65	9.26	16.43	36.21	39.76
50	110.98	0.12	0.59	1.47	0.15	1.18	2.36	27.80	1.67	8.20	15.61	24.68	29.20
55	176.58	0.28	0.38	1.18	0.29	1.42	3.35	44.48	2.80	6.54	21.62	39.71	45.21
60	204.76	0.40	0.25	1.84	0.31	2.85	3.57	50.85	3.69	11.16	22.93	47.15	52.43
65	142.97	0.24	0.26	0.64	0.23	1.60	1.57	36.29	2.52	12.12	16.45	34.72	38.42
70	127.08	0.59	0.58	1.93	0.52	2.59	1.66	32.22	2.33	19.14	21.72	30.85	37.73
74	90.31	1.60	1.41	2.14	1.76	4.21	6.55	31.22	1.73	28.83	31.25	30.08	43.38
80	61.63	2.48	2.33	2.85	4.39	8.21	11.81	36.01	0.30	42.61	45.86	35.41	57.95
84	26.75	1.45	1.51	1.77	3.13	6.10	7.54	22.66	0.09	28.87	30.95	22.38	38.19

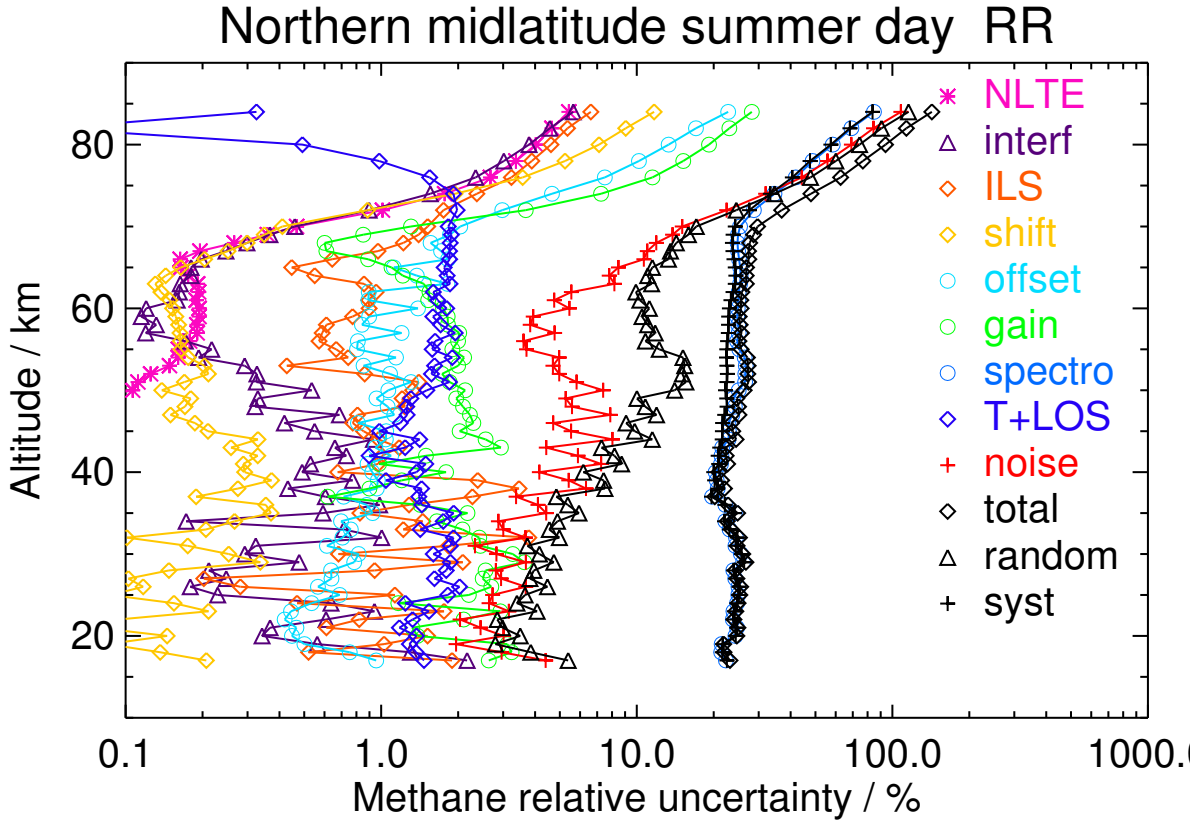

Figure S81. V8R_CH4_561 Northern midlatitude summer day

Table S82. Methane error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	946.10	0.03	4.38	8.84	2.14	6.49	19.54	250.78	14.30	26.03	39.82	250.43	253.57
35	572.84	0.02	2.67	4.46	2.07	4.49	5.63	137.23	10.36	23.28	32.85	135.96	139.88
40	279.96	0.04	1.75	1.98	0.93	2.63	5.21	58.84	3.89	11.72	20.64	56.83	60.47
45	175.64	0.06	1.08	1.82	0.47	1.80	4.34	42.10	1.75	10.02	20.68	38.41	43.62
50	116.75	0.07	0.54	1.33	0.21	1.12	2.36	28.85	1.67	7.59	16.28	25.23	30.02
55	189.99	0.17	0.39	1.24	0.32	1.69	3.83	46.64	3.40	7.27	22.78	41.71	47.53
60	197.59	0.17	0.22	2.26	0.31	2.70	3.59	49.14	3.68	10.47	21.10	46.02	50.63
65	137.93	0.16	0.18	0.71	0.21	1.59	1.83	35.01	2.87	12.29	16.00	33.70	37.31
70	102.61	0.79	0.67	2.32	0.54	2.34	2.75	30.85	2.67	20.16	22.13	29.92	37.21
74	66.88	1.45	2.30	3.39	3.61	4.32	10.54	40.45	2.36	28.71	32.03	40.02	51.26
80	29.11	1.62	2.78	3.69	6.12	8.17	10.87	39.67	0.52	43.18	46.25	39.32	60.70
84	8.21	0.83	1.65	2.62	3.96	5.96	5.97	22.64	0.02	28.87	30.53	22.60	37.99

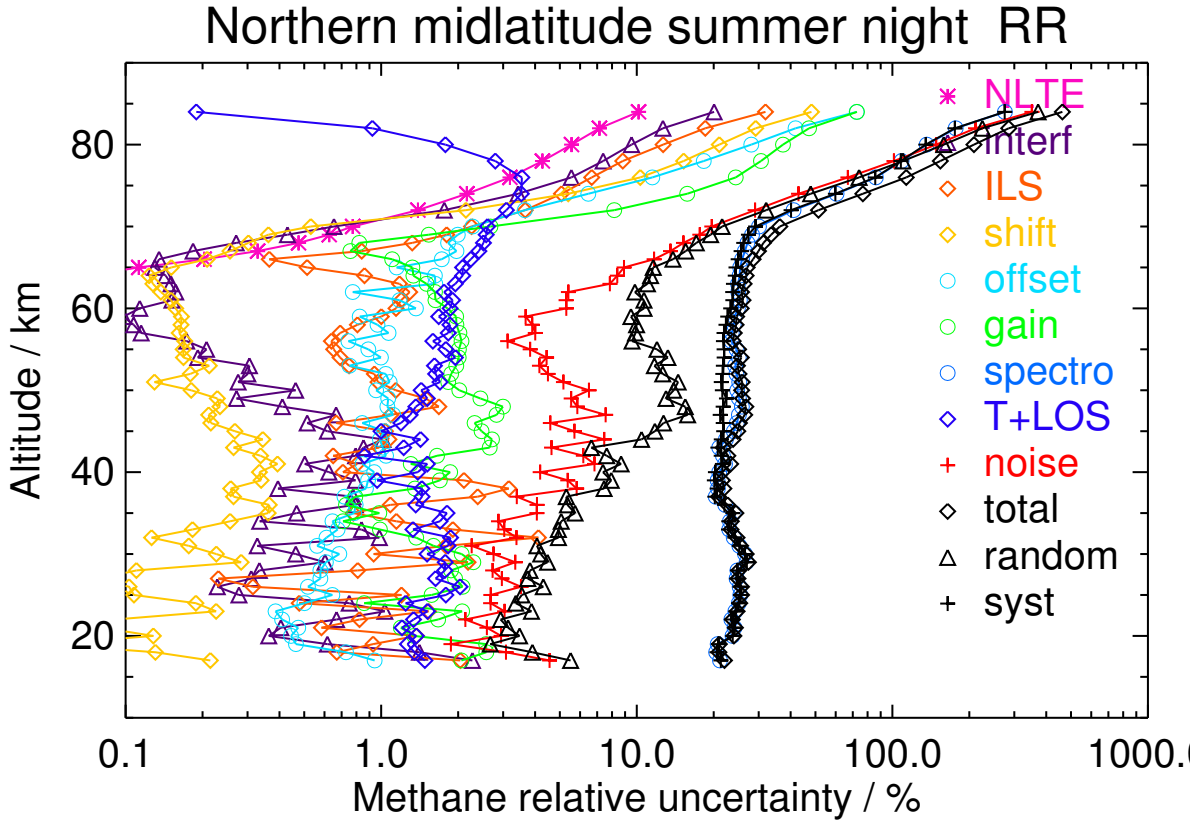

Figure S82. V8R_CH4_561 Northern midlatitude summer night

Table S83. Methane error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	888.59	0.03	3.54	7.84	2.49	6.95	22.14	229.69	16.12	26.79	63.31	224.38	233.14
35	660.85	0.14	6.26	4.95	1.32	4.23	11.30	167.29	10.38	21.75	64.81	156.77	169.64
40	515.19	0.22	2.26	8.01	1.66	4.29	8.11	116.40	7.02	19.65	58.39	103.59	118.91
45	353.37	0.31	1.46	1.93	0.75	2.64	8.70	78.83	4.53	13.59	34.19	73.07	80.67
50	301.62	0.47	0.72	1.78	0.17	1.85	6.88	66.34	4.59	10.09	20.83	64.38	67.67
55	280.28	0.62	0.21	2.23	0.24	2.38	6.10	62.54	5.75	11.76	16.22	62.19	64.27
60	246.56	0.61	0.19	2.70	0.20	3.26	4.31	57.76	5.18	14.04	16.58	57.64	59.98
65	161.90	0.35	0.23	1.18	0.19	1.50	1.72	39.81	3.57	14.26	16.20	39.31	42.52
70	89.43	0.42	0.40	0.84	0.37	2.68	2.11	25.25	2.60	19.66	21.48	24.13	32.31
74	51.05	1.22	3.92	2.34	1.52	5.53	8.66	24.59	3.56	31.84	34.43	24.00	41.97
80	14.80	1.97	12.14	4.92	3.02	9.92	16.48	33.07	4.12	43.74	49.00	34.30	59.81
84	1.79	1.04	1.11	2.24	1.58	7.17	8.77	19.00	1.66	29.11	31.06	19.62	36.74

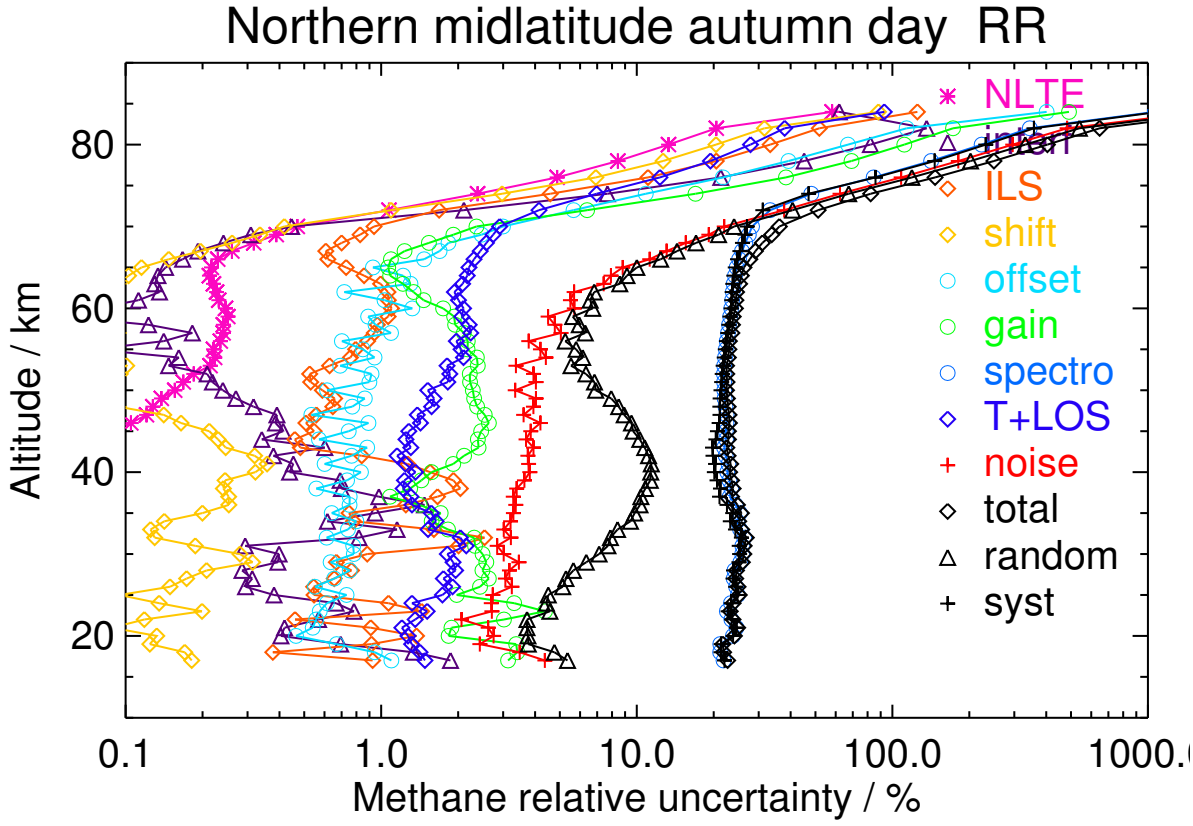

Figure S83. V8R_CH4_561 Northern midlatitude autumn day

Table S84. Methane error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	944.65	0.03	1.93	9.03	2.41	6.60	20.02	236.72	15.98	26.28	54.09	233.65	239.83
35	765.93	0.05	2.47	4.98	1.61	4.67	14.32	187.95	12.13	22.03	57.19	181.52	190.31
40	533.99	0.12	1.81	4.86	1.53	4.71	8.78	122.11	7.89	21.29	51.79	113.46	124.72
45	360.48	0.17	1.18	3.45	0.46	2.73	11.44	84.68	5.16	14.35	33.26	80.31	86.92
50	316.43	0.26	0.63	2.52	0.25	2.24	7.98	70.81	5.36	11.39	20.26	69.55	72.44
55	287.66	0.37	0.21	2.66	0.23	2.65	6.57	63.92	6.57	13.33	16.85	63.87	66.06
60	248.55	0.38	0.19	3.21	0.18	3.19	4.50	57.68	5.67	14.48	16.71	57.70	60.08
65	164.11	0.27	0.25	1.87	0.21	1.89	1.89	40.21	4.14	15.64	17.81	39.65	43.47
70	92.73	0.43	0.53	1.16	0.54	3.07	3.64	27.39	3.39	21.51	24.21	25.75	35.34
74	39.40	0.72	1.09	2.52	1.21	6.35	8.30	25.72	3.81	33.65	36.42	24.50	43.89
80	-6.42	1.00	1.82	4.94	2.48	10.28	14.61	32.18	3.91	43.99	48.79	30.98	57.80
84	-6.35	0.43	0.81	1.80	1.08	7.40	6.27	15.14	1.28	28.99	31.00	14.48	34.22

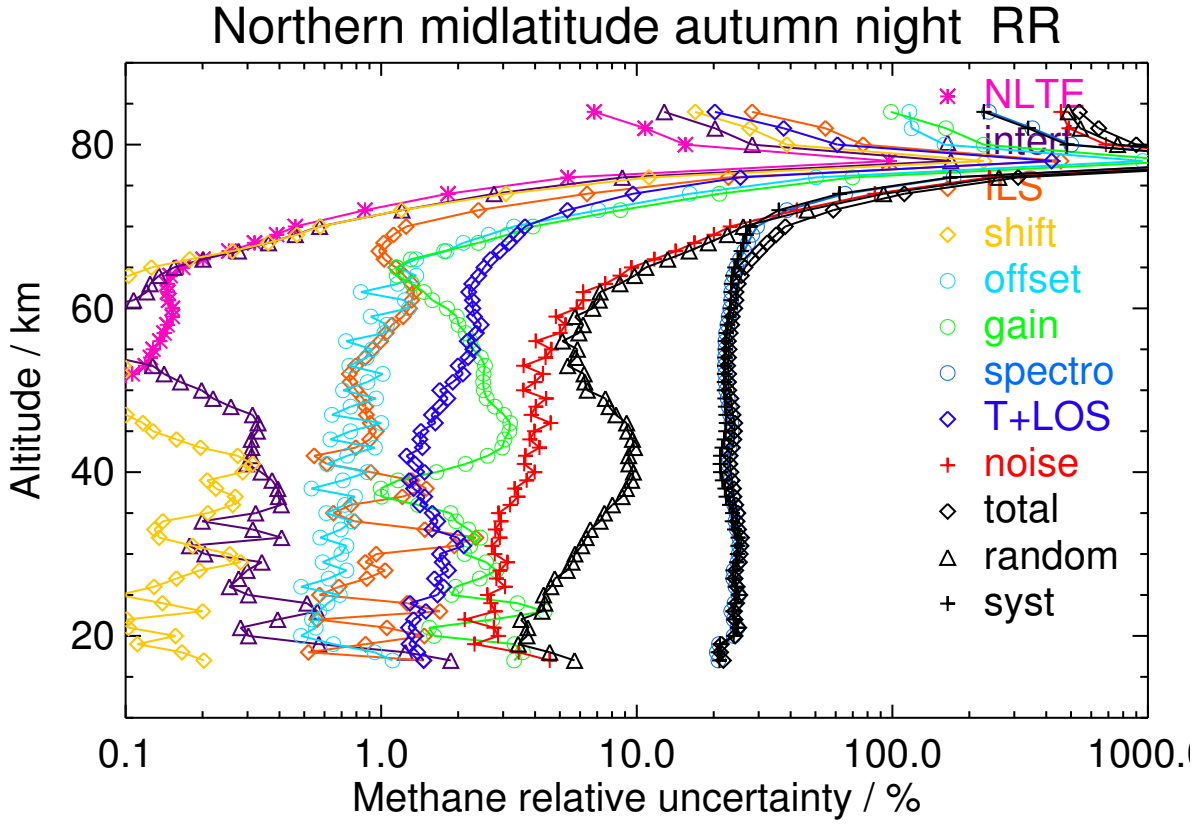

Figure S84. V8R_CH4_561 Northern midlatitude autumn night

Table S85. Methane error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	1465.29	0.04	4.11	14.73	2.37	6.55	7.44	366.26	21.49	28.87	44.88	365.74	368.49
35	1241.32	0.18	4.42	5.01	2.78	4.95	9.37	288.42	16.06	24.58	39.95	287.43	290.19
40	713.48	0.28	3.05	10.49	1.69	3.76	14.04	143.31	8.73	18.37	34.86	141.67	145.89
45	428.15	0.31	1.65	2.51	1.00	2.85	10.13	89.27	4.81	12.58	22.36	88.16	90.95
50	297.95	0.37	0.67	2.89	0.32	1.54	7.18	65.03	3.98	9.00	15.79	64.34	66.25
55	203.17	0.32	0.14	2.00	0.24	1.28	3.98	45.99	3.45	7.39	10.85	45.67	46.94
60	158.49	0.26	0.12	1.29	0.17	2.60	2.25	37.82	3.12	11.52	13.03	37.64	39.83
65	130.76	0.19	0.21	0.60	0.18	1.61	0.98	32.03	2.65	13.68	14.56	31.81	34.99
70	97.46	0.52	0.29	0.91	0.37	2.37	1.35	24.89	2.72	19.06	20.03	24.44	31.60
74	51.95	1.30	1.06	1.06	1.61	4.75	8.08	26.84	3.20	30.07	31.92	26.65	41.58
80	6.16	1.73	1.81	1.69	2.99	9.76	13.98	36.55	2.45	44.12	46.81	37.49	59.98
84	-3.67	0.98	1.08	1.08	1.69	7.45	7.87	21.43	0.83	30.49	32.05	22.05	38.91

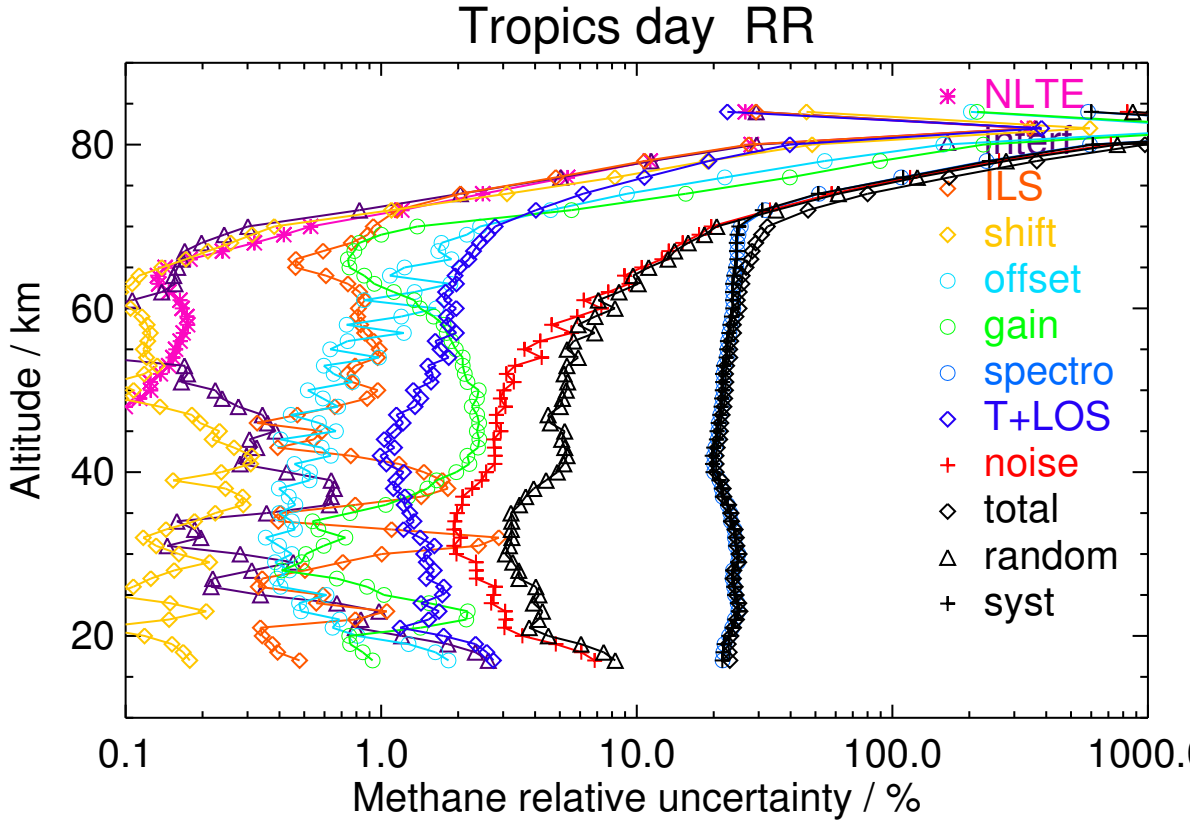

Figure S85. V8R_CH4_561 Tropics day

Table S86. Methane error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	1460.93	0.01	4.74	16.98	2.88	6.16	7.94	365.15	20.56	28.93	47.08	364.41	367.44
35	1235.27	0.06	4.45	7.60	2.74	5.06	9.51	289.56	16.43	24.56	41.75	288.40	291.40
40	728.09	0.09	3.48	10.91	1.67	4.16	12.50	146.75	9.15	19.20	37.71	144.47	149.31
45	428.67	0.13	1.59	2.25	1.05	2.47	9.79	90.08	4.37	11.89	20.38	89.27	91.57
50	288.35	0.18	0.70	2.81	0.32	1.58	6.74	62.80	4.08	9.18	16.93	61.76	64.04
55	206.78	0.15	0.15	2.16	0.26	1.64	3.98	46.75	3.87	8.30	12.13	46.32	47.88
60	171.23	0.11	0.17	1.71	0.18	2.90	2.54	40.23	3.44	12.17	14.12	39.96	42.38
65	141.48	0.25	0.19	0.64	0.16	1.65	1.32	34.37	3.13	13.92	15.45	33.93	37.28
70	105.96	0.92	0.75	1.86	1.02	2.43	5.17	31.15	3.54	21.22	22.91	30.76	38.36
74	55.09	1.36	1.64	2.55	2.81	5.47	12.01	36.55	3.92	31.70	34.47	36.89	50.48
80	-1.59	1.16	1.69	2.72	2.67	10.40	11.26	32.18	2.31	44.85	47.44	32.48	57.50
84	-8.42	0.62	0.90	1.55	1.21	8.11	5.47	16.62	0.80	31.11	32.74	16.54	36.68

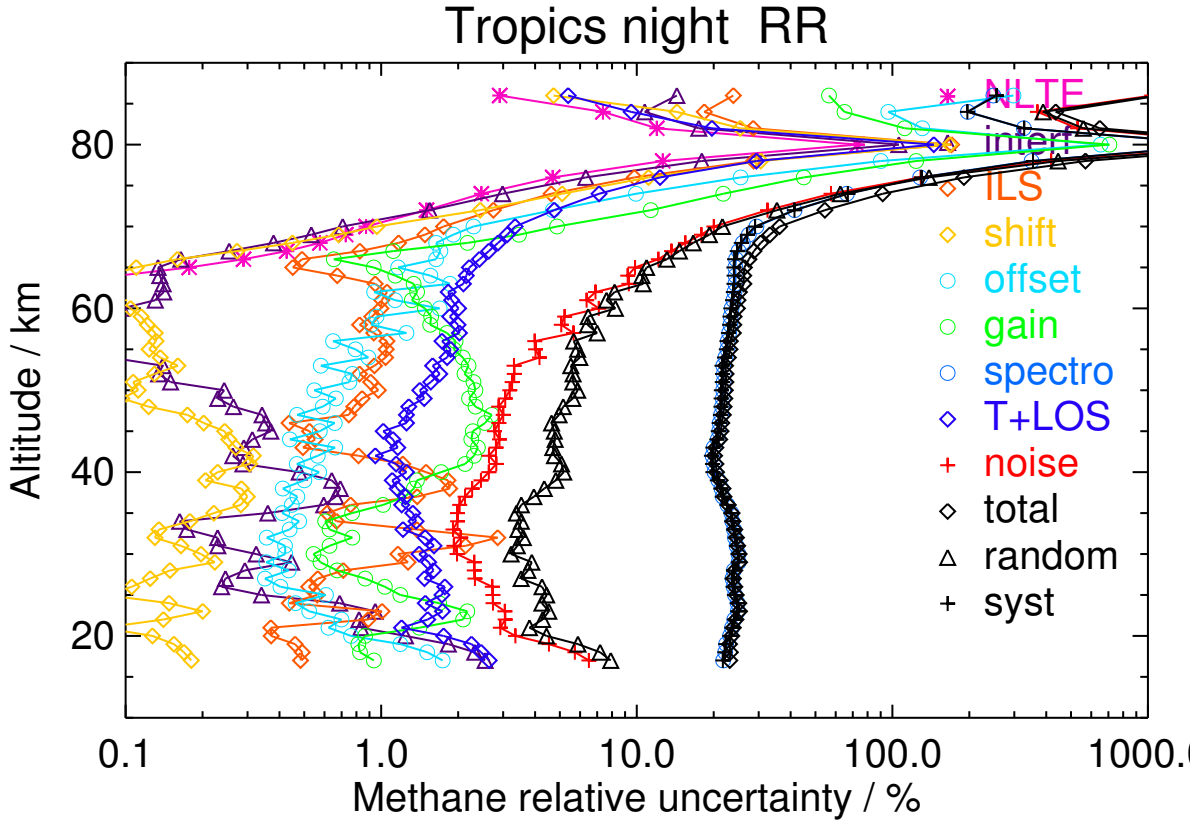

Figure S86. V8R_CH4_561 Tropics night

Table S87. Methane error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	1205.12	0.05	6.49	23.97	2.69	7.94	47.67	299.64	23.68	33.66	96.11	291.90	307.31
35	759.40	0.07	2.92	8.74	2.36	5.78	20.55	191.68	15.07	22.67	66.02	183.49	195.01
40	251.34	0.07	2.43	3.68	1.25	3.63	3.71	58.14	4.66	16.68	28.76	53.86	61.06
45	245.28	0.20	1.20	2.03	0.38	1.66	5.81	53.51	3.40	11.05	17.66	52.23	55.13
50	253.06	0.41	0.43	2.42	0.22	2.08	6.47	57.24	3.91	9.55	18.38	55.66	58.62
55	215.71	0.48	0.15	1.98	0.25	2.44	5.01	49.74	4.57	11.89	16.87	48.86	51.69
60	173.25	0.45	0.12	1.94	0.16	1.90	3.00	41.76	3.52	11.06	14.19	41.16	43.54
65	142.48	0.36	0.22	0.98	0.29	2.47	1.37	35.40	3.46	16.01	18.65	34.38	39.12
70	108.29	0.78	0.61	1.27	0.94	3.09	3.05	30.88	3.62	21.84	25.08	28.92	38.28
74	76.25	1.41	1.32	2.89	1.94	6.42	7.41	29.33	3.67	34.32	37.73	27.21	46.52
80	21.23	1.52	1.68	3.20	2.63	10.05	9.62	24.99	2.50	44.44	47.49	23.80	53.12
84	3.42	0.95	0.95	2.10	1.12	7.63	4.87	12.84	0.93	29.88	31.66	12.08	33.88

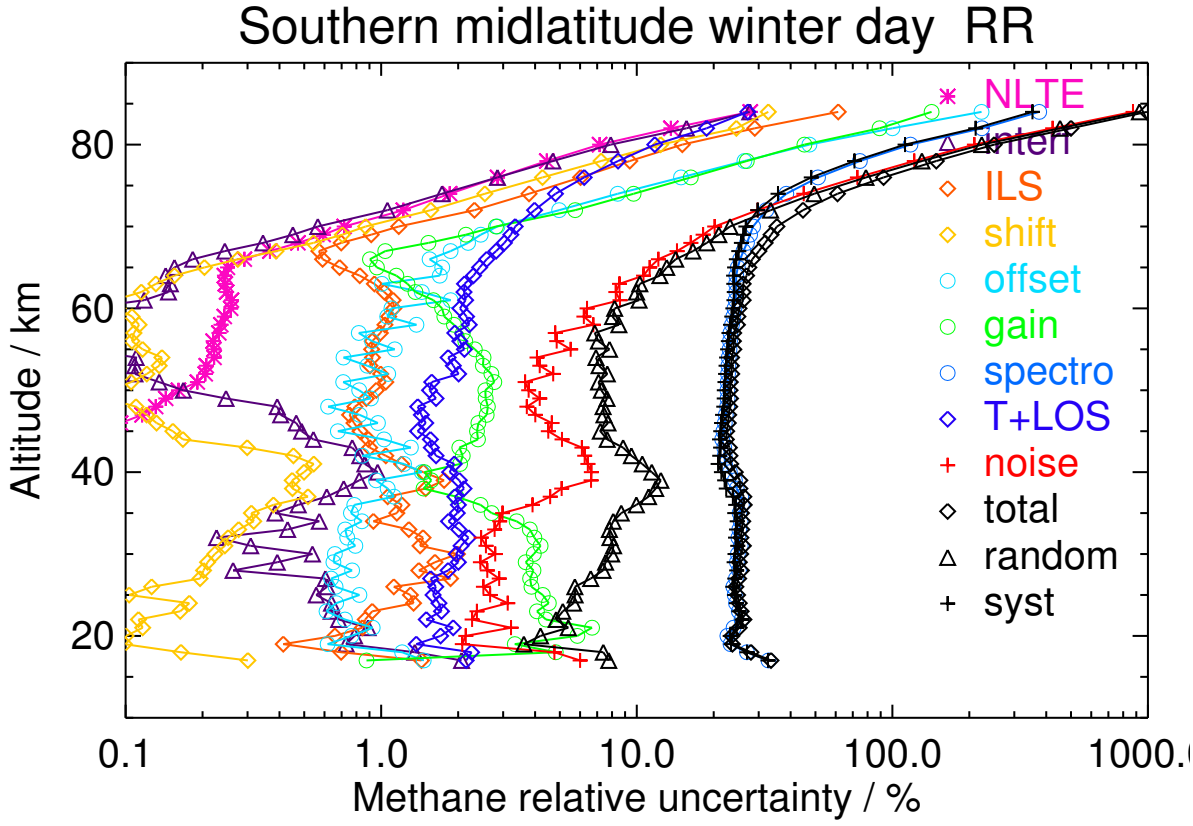

Figure S87. V8R_CH4_561 Southern midlatitude winter day

Table S88. Methane error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	958.27	0.04	4.30	16.86	2.34	7.36	31.41	243.65	20.11	33.03	95.72	230.32	249.42
35	635.31	0.06	2.80	6.96	2.17	5.73	14.72	164.20	13.78	26.47	72.22	151.49	167.82
40	216.68	0.06	2.14	2.94	1.31	3.85	3.87	52.65	4.59	18.66	26.59	49.79	56.44
45	202.41	0.12	0.88	1.70	0.39	1.81	5.60	48.65	3.30	11.86	20.89	46.04	50.56
50	212.77	0.21	0.32	2.32	0.28	1.75	5.22	50.18	3.14	8.40	17.15	48.38	51.33
55	188.02	0.29	0.10	1.90	0.22	2.19	4.18	44.85	3.85	10.98	15.90	43.82	46.61
60	158.15	0.35	0.13	1.95	0.17	1.94	2.69	38.96	3.10	11.14	14.26	38.25	40.82
65	129.87	0.44	0.24	1.13	0.44	2.30	1.53	32.89	3.15	16.17	19.08	31.60	36.91
70	96.48	0.58	0.50	0.98	1.02	3.28	2.81	27.74	3.18	22.42	25.49	25.57	36.10
74	62.34	0.73	1.07	2.10	1.92	6.73	6.73	24.63	3.27	34.80	37.83	22.32	43.92
80	11.92	0.77	1.58	3.19	2.84	9.95	10.03	21.34	2.29	43.99	47.48	19.04	51.15
84	-15.29	0.42	1.04	2.52	1.11	7.84	6.16	11.37	0.83	29.97	32.21	9.94	33.71

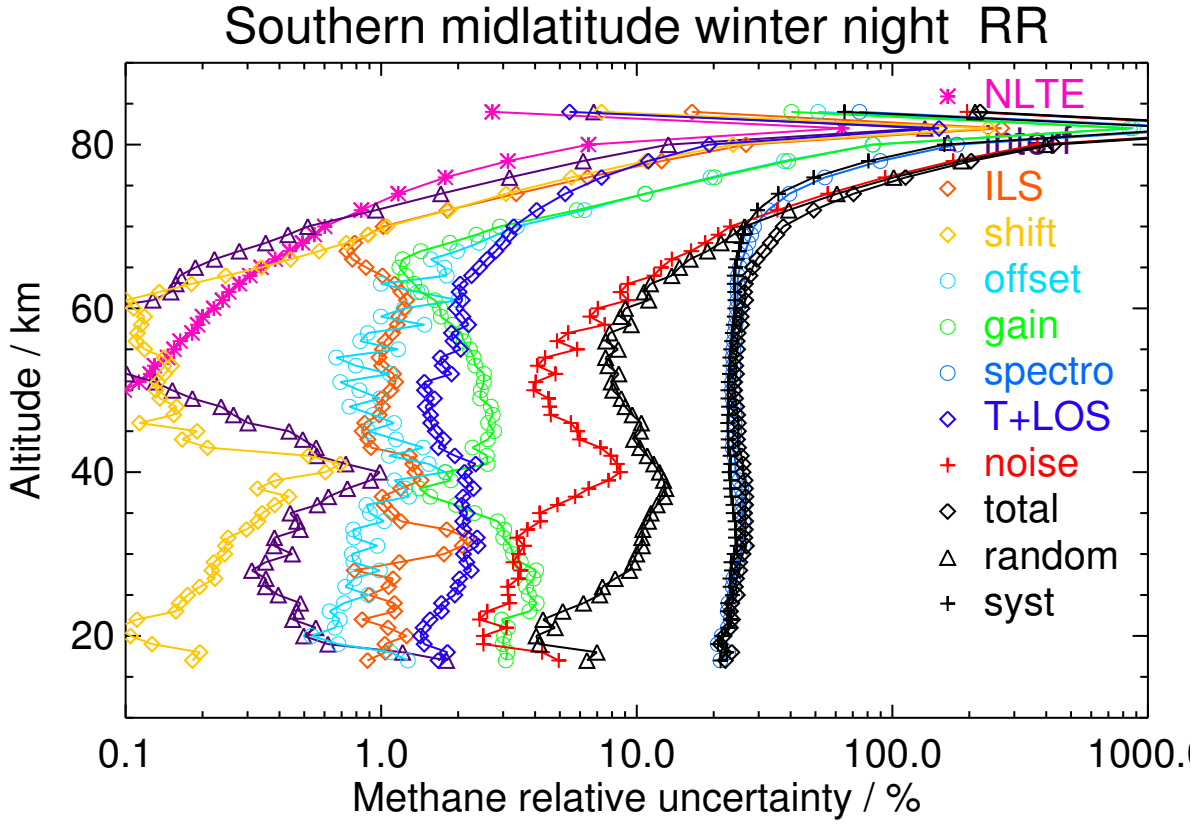

Figure S88. V8R_CH4_561 Southern midlatitude winter night

Table S89. Methane error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	1178.92	0.04	4.50	34.00	3.04	7.87	37.36	313.98	20.18	32.05	93.45	306.48	320.41
35	706.98	0.06	2.34	6.62	2.39	5.03	17.54	174.86	12.98	19.07	51.86	169.72	177.47
40	366.98	0.14	1.68	3.62	1.28	3.68	6.61	77.08	5.42	16.52	25.12	75.42	79.49
45	253.49	0.23	1.24	2.56	0.41	1.36	4.97	53.97	3.39	10.81	13.97	53.68	55.46
50	266.20	0.35	0.55	2.31	0.24	2.10	5.42	57.90	3.99	9.45	11.79	57.95	59.14
55	236.76	0.46	0.24	2.04	0.24	2.21	4.58	52.86	4.57	10.49	12.58	52.89	54.37
60	213.05	0.50	0.14	2.72	0.16	1.91	3.71	49.95	3.80	9.92	12.47	49.78	51.32
65	162.80	0.29	0.22	1.28	0.20	2.31	1.66	39.73	3.20	14.39	17.04	38.93	42.50
70	93.05	0.31	0.36	0.74	0.47	2.25	2.00	26.69	2.50	19.52	21.26	25.64	33.31
74	34.51	1.00	1.28	1.82	1.88	5.20	9.33	24.49	2.78	30.83	33.04	24.30	41.01
80	-16.01	1.56	2.32	3.15	3.82	9.46	17.04	33.46	3.19	43.49	46.38	35.80	58.59
84	-14.27	0.93	1.47	2.07	2.45	6.72	10.54	20.92	1.34	28.86	30.69	22.36	37.97

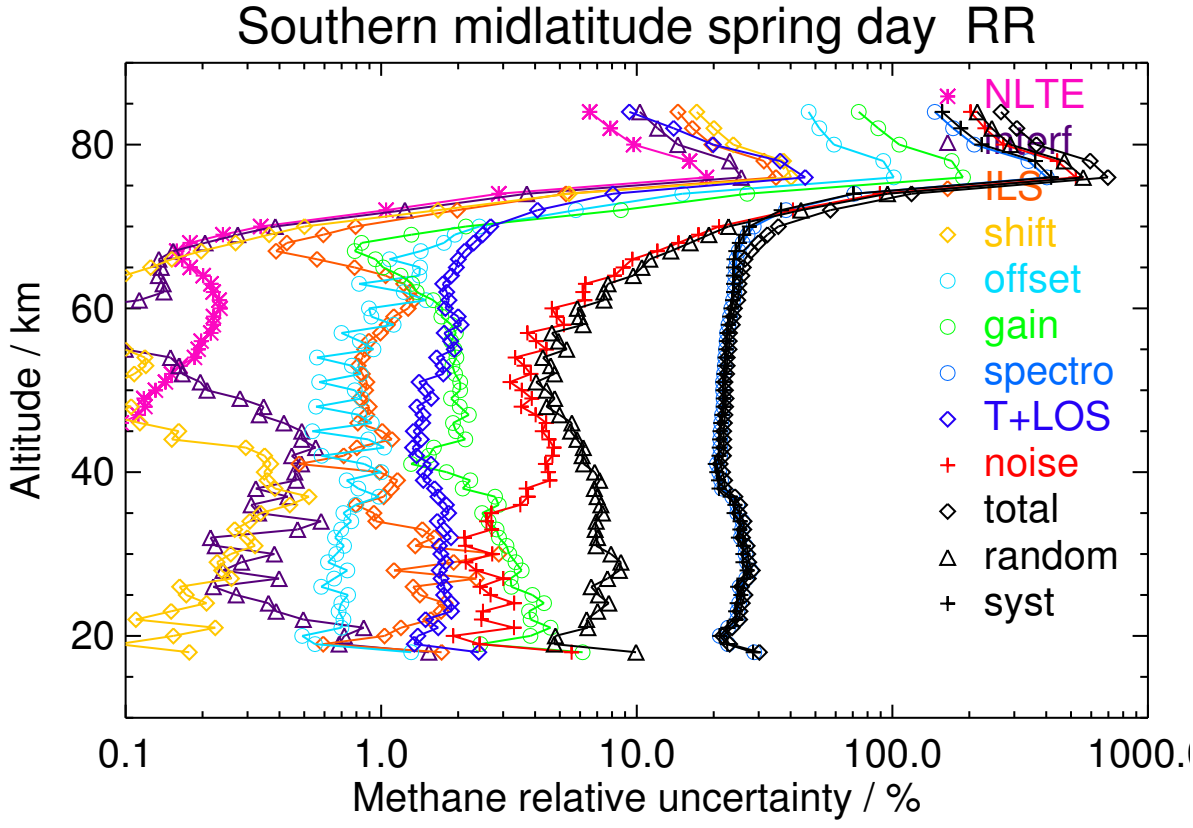

Figure S89. V8R_CH4_561 Southern midlatitude spring day

Table S90. Methane error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	1158.47	0.02	4.12	11.09	3.47	8.46	44.51	292.64	19.05	29.83	92.64	283.75	298.49
35	782.99	0.04	2.92	8.53	2.73	5.48	25.03	189.68	13.20	20.92	62.64	182.79	193.22
40	371.72	0.06	1.49	4.42	1.10	3.94	6.92	77.37	5.83	16.79	23.47	76.40	79.93
45	255.09	0.10	1.18	2.09	0.42	1.60	5.21	54.25	3.30	10.68	13.40	54.07	55.71
50	261.98	0.18	0.56	2.02	0.21	1.78	5.15	56.95	3.88	9.00	11.97	56.83	58.08
55	248.65	0.28	0.19	2.25	0.27	2.38	5.07	55.19	5.17	11.38	13.71	55.23	56.91
60	217.12	0.28	0.17	2.71	0.17	2.36	3.64	50.81	4.26	11.22	13.75	50.62	52.46
65	146.58	0.16	0.25	1.37	0.20	1.99	1.29	36.61	3.55	14.73	17.34	35.74	39.72
70	75.57	0.39	0.50	0.95	0.54	2.39	3.02	24.25	2.70	20.26	22.80	22.41	31.97
74	23.61	0.72	1.10	1.86	1.53	5.40	8.18	23.17	3.06	31.35	33.64	22.37	40.40
80	-12.89	0.93	1.90	3.38	3.15	9.35	14.56	31.23	3.21	43.49	46.08	32.86	56.59
84	-10.15	0.56	1.28	2.54	2.11	6.66	9.45	20.40	1.29	28.53	30.57	21.06	37.12

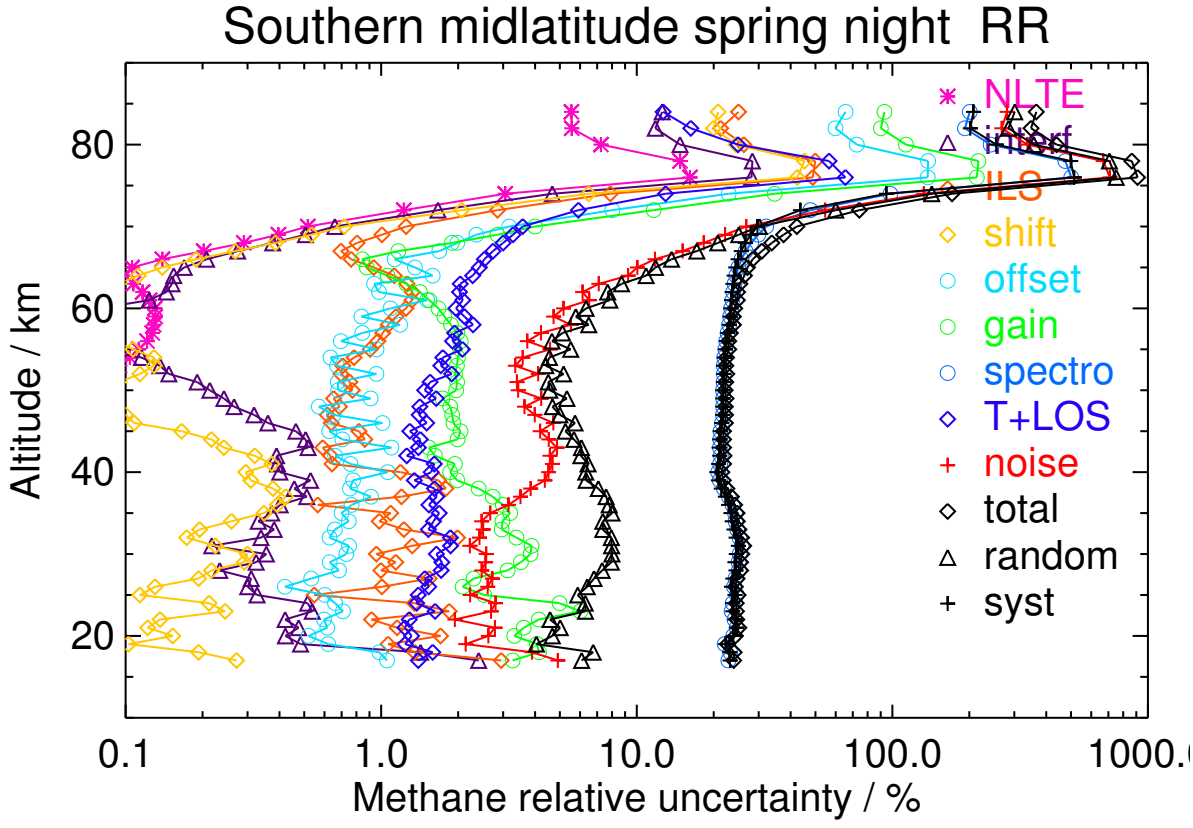

Figure S90. V8R_CH4_561 Southern midlatitude spring night

Table S91. Methane error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	954.71	0.04	6.38	19.59	2.20	6.92	19.10	254.45	16.38	24.10	41.59	254.37	257.75
35	722.71	0.07	4.16	4.90	1.56	4.43	5.85	164.83	9.43	21.37	29.08	164.21	166.77
40	427.84	0.12	2.02	4.42	1.53	2.79	7.96	90.12	5.26	14.34	28.90	87.27	91.93
45	253.73	0.17	2.00	1.65	0.77	2.49	5.98	61.22	2.93	11.71	30.20	55.06	62.80
50	182.05	0.21	0.76	1.71	0.20	1.43	4.25	46.99	2.39	8.25	26.80	39.84	48.01
55	201.66	0.39	0.39	1.30	0.34	1.73	4.67	52.60	3.38	7.01	29.21	44.74	53.43
60	218.88	0.43	0.22	2.42	0.31	3.02	4.08	53.54	4.38	11.40	21.41	50.88	55.20
65	179.32	0.28	0.22	1.08	0.25	2.09	2.17	43.35	3.39	12.64	15.39	42.71	45.39
70	136.66	0.61	0.38	1.10	0.47	3.08	0.98	36.11	2.75	19.19	21.30	35.20	41.14
74	91.10	1.54	1.49	3.07	1.83	4.60	4.89	33.54	1.70	29.32	31.98	32.06	45.28
80	35.91	2.12	3.36	7.38	4.91	8.77	11.49	42.19	0.07	42.90	46.95	41.47	62.64
84	14.07	1.23	2.21	4.90	3.23	6.65	7.31	26.68	0.10	29.29	31.99	26.17	41.33

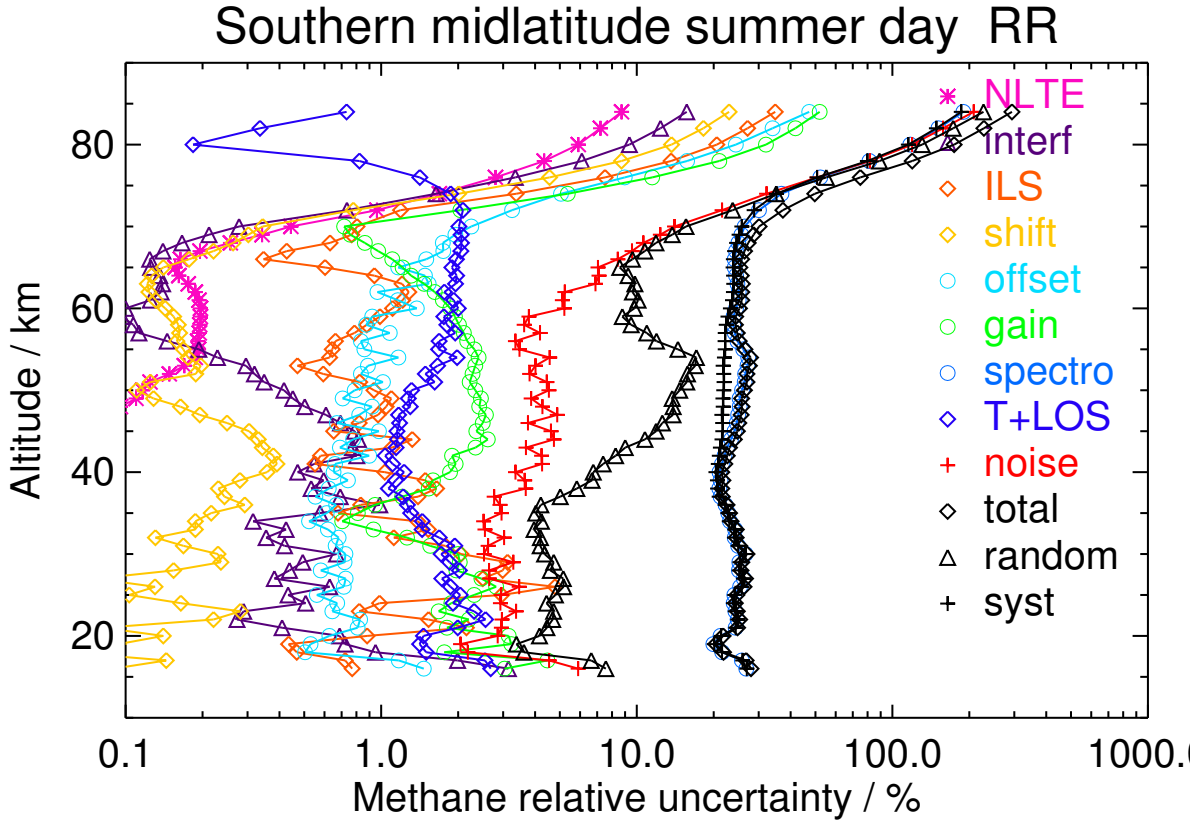

Figure S91. V8R_CH4_561 Southern midlatitude summer day

Table S92. Methane error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	930.12	0.01	5.35	23.70	2.45	7.53	28.02	240.81	16.19	26.50	46.17	241.37	245.75
35	701.80	0.04	4.82	5.10	1.69	4.54	6.47	161.56	10.07	21.49	30.18	160.84	163.65
40	393.02	0.06	1.95	5.88	1.33	2.91	7.63	78.75	4.58	13.61	23.63	77.17	80.71
45	218.74	0.07	1.46	3.10	0.71	2.29	5.35	50.57	2.32	12.21	25.15	46.10	52.52
50	155.26	0.10	0.67	1.26	0.18	1.32	2.90	41.31	1.88	7.79	25.20	33.88	42.22
55	158.49	0.14	0.27	1.71	0.32	1.61	3.79	41.82	2.71	6.90	23.09	35.93	42.71
60	165.39	0.14	0.24	1.83	0.26	2.55	2.90	42.57	3.11	9.98	19.89	39.29	44.04
65	166.26	0.11	0.29	1.19	0.25	2.03	1.78	39.83	3.30	12.48	15.87	38.86	41.98
70	145.43	0.80	0.70	1.39	0.66	2.73	1.64	36.15	3.58	19.81	21.97	35.26	41.54
74	99.94	1.67	1.91	2.27	2.10	4.58	6.94	35.59	2.60	29.76	32.78	34.19	47.37
80	40.38	1.88	2.58	5.56	3.77	9.35	9.23	35.41	0.34	44.28	47.65	34.25	58.68
84	11.89	1.03	1.61	3.89	2.42	7.10	5.61	21.33	0.03	30.30	32.28	20.92	38.46

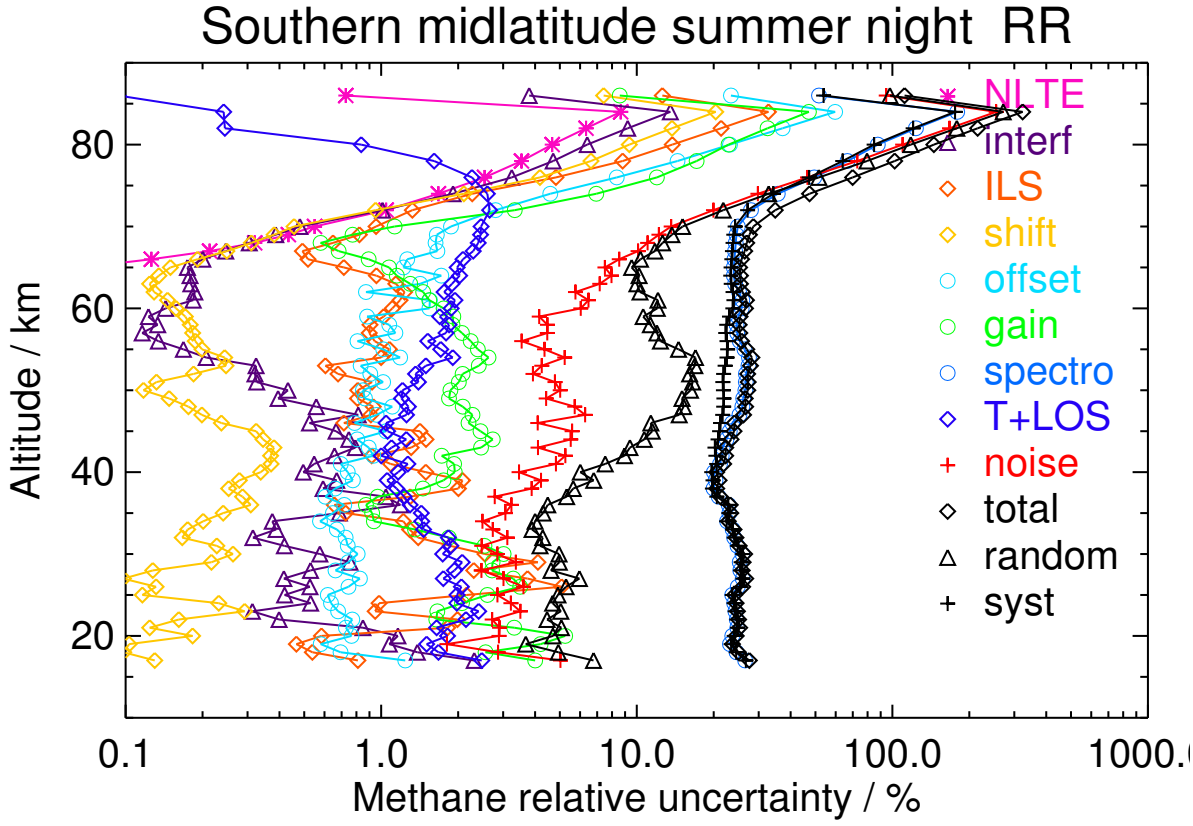

Figure S92. V8R_CH4_561 Southern midlatitude summer night

Table S93. Methane error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	961.59	0.03	3.91	23.68	2.35	6.78	22.42	236.57	20.23	31.52	53.74	235.81	241.86
35	700.44	0.06	1.90	5.17	1.17	4.72	13.57	166.04	11.60	20.10	48.28	161.29	168.37
40	561.95	0.26	1.71	4.73	1.56	4.85	9.75	123.69	8.05	22.27	43.71	118.73	126.52
45	442.62	0.42	1.64	3.41	0.52	2.40	12.31	99.00	5.76	14.05	28.57	96.89	101.01
50	356.38	0.57	0.87	2.65	0.35	2.81	8.74	80.11	5.87	12.98	20.04	79.45	81.93
55	323.39	0.79	0.28	2.32	0.29	3.08	7.85	72.07	7.37	14.53	17.79	72.26	74.41
60	263.56	0.63	0.17	2.93	0.21	2.50	4.61	61.40	5.93	13.11	15.28	61.48	63.35
65	158.20	0.27	0.24	1.74	0.23	2.18	1.55	39.11	4.10	15.87	18.02	38.52	42.53
70	69.45	0.27	0.27	0.70	0.30	2.70	1.46	21.82	2.39	20.18	21.51	20.90	29.99
74	41.21	0.85	0.83	1.09	0.85	6.07	6.03	18.73	2.57	32.44	34.21	17.77	38.55
80	20.47	1.53	1.73	2.22	2.17	10.03	13.04	27.57	3.34	43.75	46.80	27.95	54.51
84	2.77	0.99	1.28	1.73	1.49	7.15	9.33	19.47	1.67	28.66	30.69	20.19	36.73

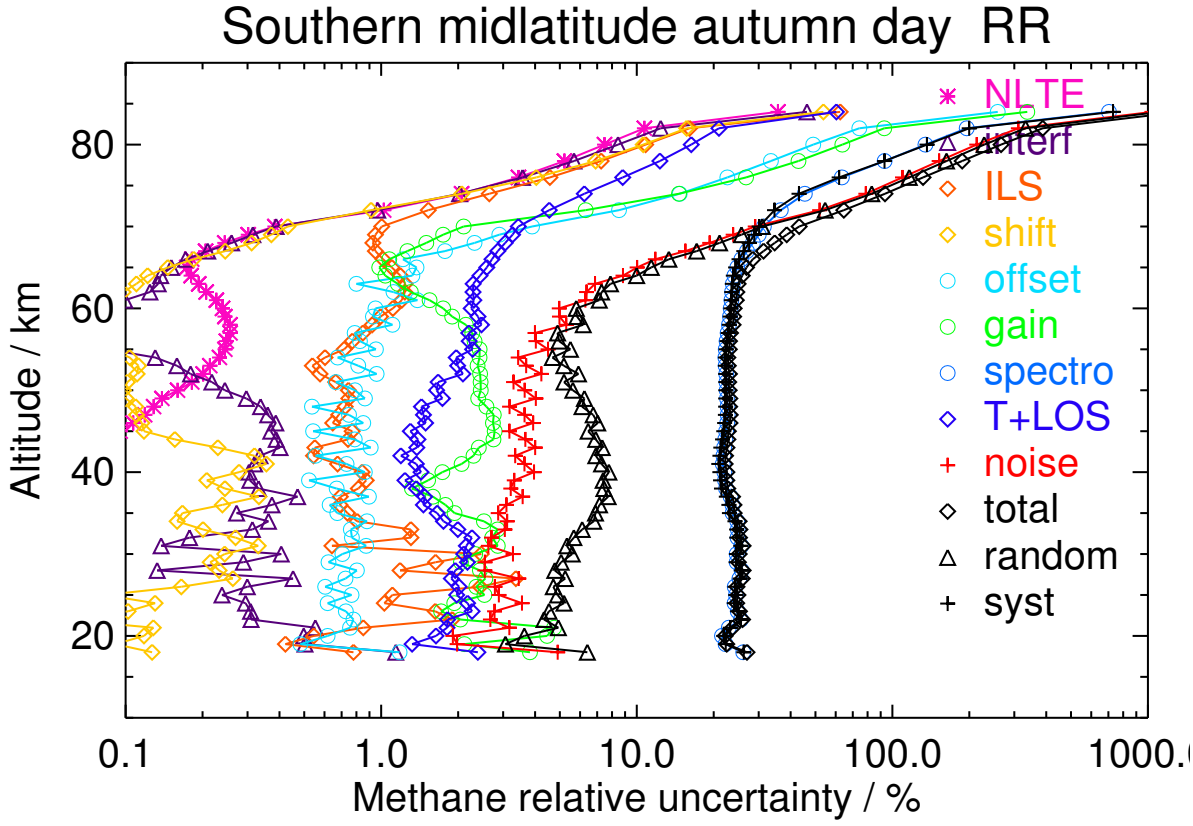

Figure S93. V8R_CH4_561 Southern midlatitude autumn day

Table S94. Methane error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	907.47	0.01	4.70	22.54	2.24	7.19	27.26	235.25	19.95	31.38	50.61	235.57	240.95
35	644.44	0.04	2.46	3.88	1.05	4.50	13.24	152.84	11.05	19.69	40.55	149.81	155.21
40	462.56	0.09	1.56	4.93	1.27	4.56	6.77	99.41	6.79	20.39	37.36	95.09	102.17
45	394.76	0.14	1.59	1.96	0.70	1.94	8.03	84.68	4.83	13.05	29.71	80.97	86.25
50	339.86	0.26	0.83	2.28	0.22	2.55	7.36	73.11	5.60	12.11	19.25	72.25	74.77
55	318.62	0.42	0.18	2.62	0.26	3.09	7.92	69.74	7.66	14.97	18.80	69.81	72.30
60	257.29	0.34	0.18	3.17	0.19	2.49	4.48	60.01	6.20	13.73	17.27	59.72	62.16
65	141.55	0.18	0.25	1.65	0.18	2.17	1.55	35.86	3.88	16.03	18.65	34.93	39.60
70	67.31	0.24	0.37	0.55	0.34	2.71	1.76	20.59	2.50	20.56	22.31	19.14	29.39
74	25.19	0.51	0.97	1.18	1.03	6.14	6.34	17.40	2.77	32.65	34.51	16.33	38.18
80	-13.88	0.82	2.02	2.47	2.38	9.79	13.65	26.52	3.56	43.11	46.00	27.51	53.60
84	-0.45	0.16	0.85	0.91	1.01	7.08	5.15	12.11	1.01	28.18	29.19	13.00	31.95

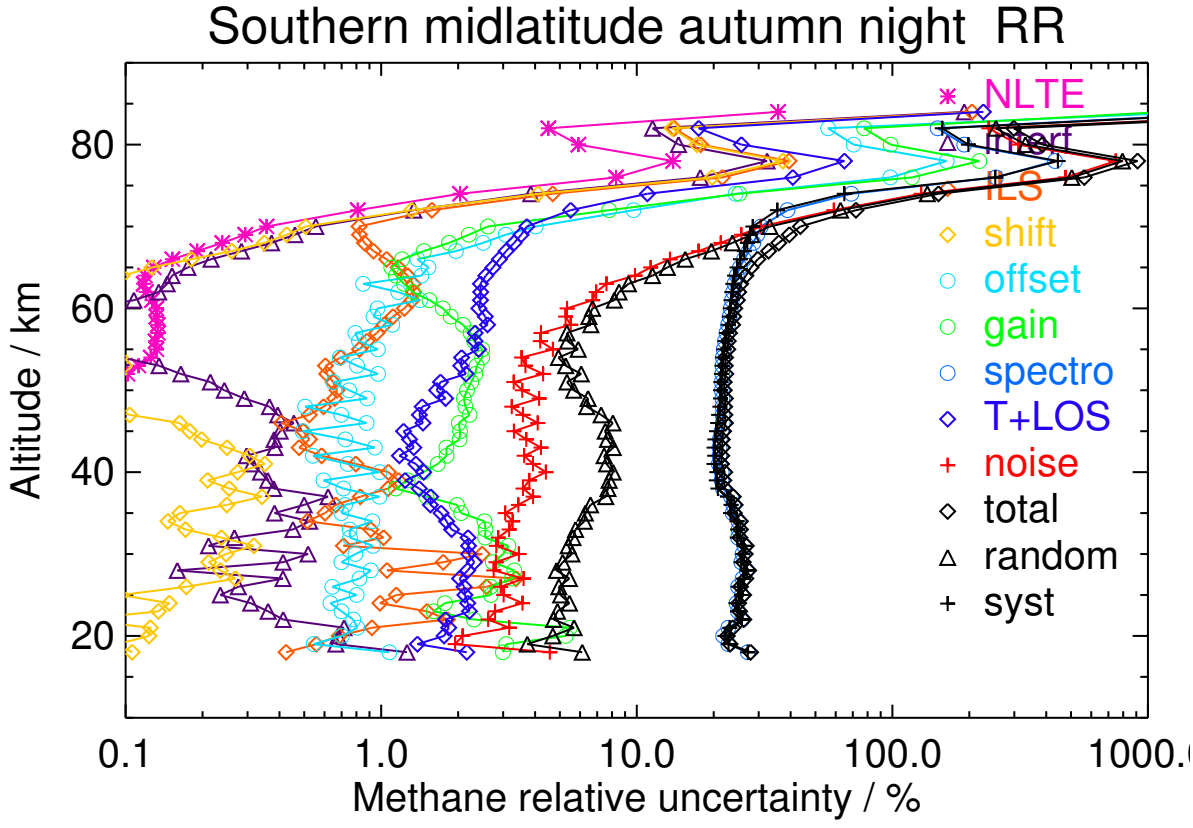

Figure S94. V8R_CH4_561 Southern midlatitude autumn night

Table S95. Methane error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	447.95	0.06	5.33	10.59	2.82	4.79	5.93	107.20	13.83	31.06	44.12	104.44	113.38
35	197.20	0.10	2.74	7.09	2.11	4.40	3.20	49.40	5.54	20.58	30.99	45.01	54.65
40	210.09	0.09	1.40	2.93	1.13	2.88	5.81	49.86	3.34	13.96	19.50	48.64	52.40
45	242.65	0.19	0.79	2.19	0.54	1.87	6.40	56.90	3.31	11.05	20.34	54.83	58.48
50	231.53	0.29	0.22	2.50	0.30	1.79	5.09	53.05	3.26	7.84	14.25	52.14	54.05
55	198.34	0.41	0.09	2.26	0.27	1.76	4.18	46.06	3.27	8.98	14.01	45.19	47.31
60	179.11	0.51	0.07	2.82	0.14	1.54	3.17	43.54	3.18	9.98	15.54	42.24	45.01
65	128.64	0.39	0.16	1.09	0.36	2.57	1.15	34.74	3.02	16.89	20.15	33.24	38.87
70	93.70	0.90	0.55	1.62	2.03	3.13	4.05	34.10	3.04	22.81	26.93	31.64	41.55
74	50.34	1.51	1.05	3.76	3.97	6.58	8.71	34.81	3.07	34.84	38.99	32.66	50.87
80	11.70	1.44	1.05	4.22	3.86	10.31	9.26	25.77	1.84	44.37	48.03	23.59	53.51
84	3.78	0.49	0.40	1.14	1.10	8.00	3.20	7.55	0.51	30.15	31.57	6.83	32.30

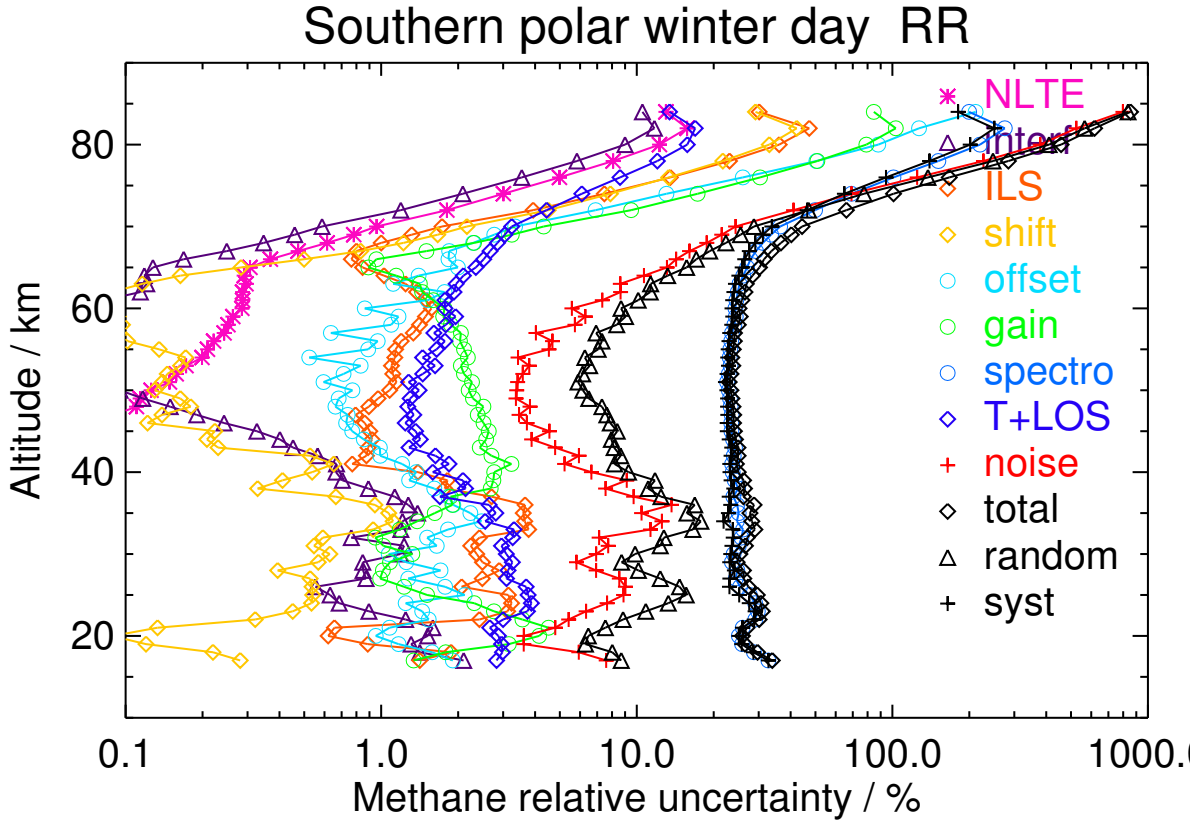

Figure S95. V8R_CH4_561 Southern polar winter day

Table S96. Methane error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	454.85	0.05	5.03	12.67	2.87	5.11	5.07	114.22	13.73	31.02	44.78	111.52	120.18
35	197.92	0.09	2.45	5.43	1.66	4.65	2.94	53.25	5.82	20.56	36.78	44.80	57.97
40	193.95	0.09	1.07	2.13	0.93	2.60	5.19	45.88	3.04	13.82	17.99	44.97	48.43
45	223.25	0.16	0.71	2.66	0.63	1.83	6.46	54.16	3.02	10.82	21.56	51.45	55.79
50	209.23	0.22	0.23	2.19	0.32	1.68	4.39	50.04	2.95	7.59	16.00	48.39	50.97
55	179.41	0.32	0.12	1.94	0.32	1.58	3.60	43.76	2.87	8.40	14.55	42.45	44.87
60	161.30	0.40	0.09	2.14	0.21	1.31	2.59	40.82	2.86	9.53	15.75	39.12	42.17
65	123.79	0.43	0.19	0.97	0.42	2.52	1.37	31.80	2.85	16.08	19.51	30.11	35.88
70	86.12	0.67	0.51	1.61	1.64	2.93	3.77	26.28	3.26	21.78	24.57	24.51	34.71
74	44.70	1.01	0.97	3.39	3.37	6.40	8.02	23.69	3.76	34.78	37.61	22.37	43.76
80	3.83	1.18	1.33	5.31	4.60	9.36	11.81	21.05	3.30	42.70	46.12	20.72	50.56
84	-12.96	0.51	0.56	1.30	1.18	8.06	3.24	8.12	1.13	30.41	31.96	7.06	32.73

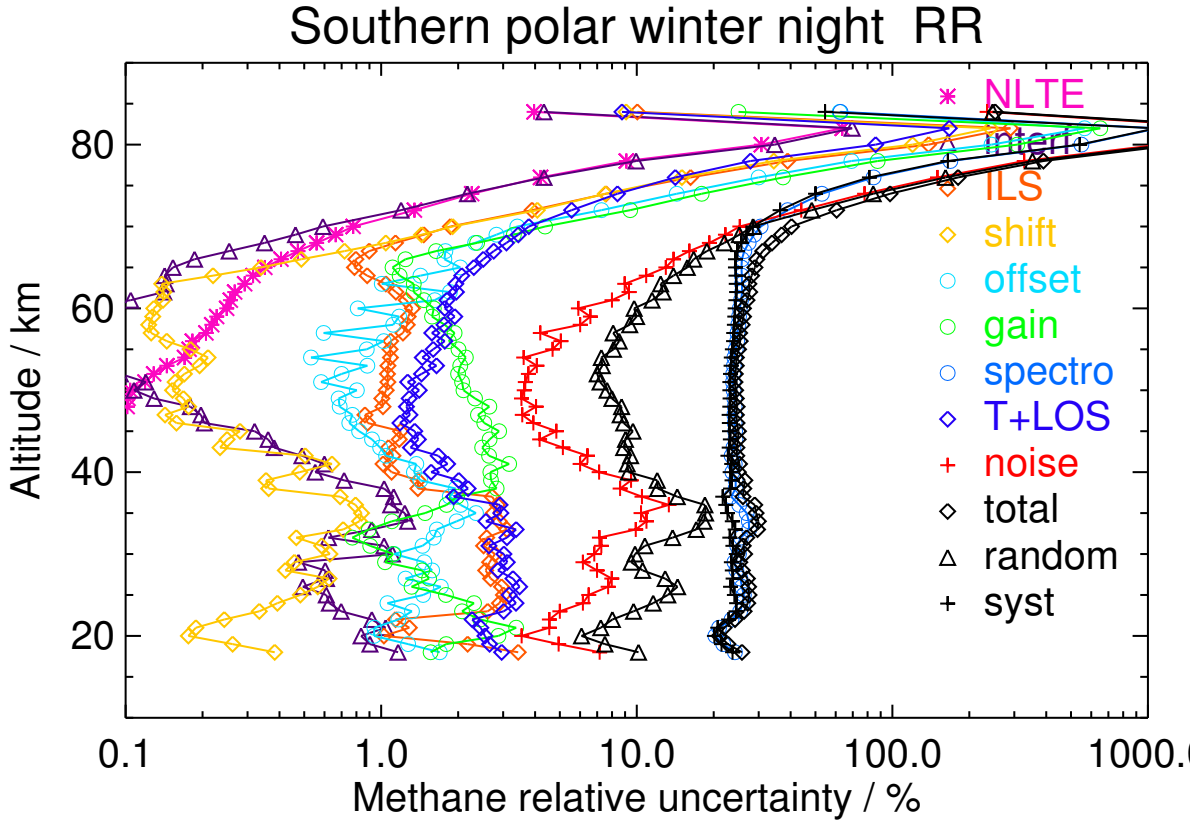

Figure S96. V8R_CH4_561 Southern polar winter night

Table S97. Methane error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	690.52	0.08	3.10	37.42	3.62	7.73	50.87	196.45	11.66	35.10	135.02	160.62	209.83
35	537.91	0.04	1.71	7.49	2.15	3.39	13.18	114.79	6.77	15.48	45.82	107.75	117.09
40	315.43	0.07	0.78	6.82	1.24	2.66	7.81	66.64	3.62	11.79	21.91	65.04	68.63
45	264.72	0.15	0.52	4.49	0.83	1.53	7.24	58.26	3.15	10.03	17.93	57.09	59.84
50	270.41	0.26	0.29	4.30	0.55	1.98	6.97	60.23	3.85	8.57	15.82	59.48	61.55
55	237.47	0.31	0.16	2.46	0.40	1.81	4.76	53.11	4.00	8.74	11.05	53.13	54.27
60	210.18	0.32	0.10	2.62	0.22	1.54	3.54	49.30	3.65	8.86	10.90	49.24	50.44
65	168.28	0.22	0.17	1.10	0.22	2.73	1.85	41.37	3.36	14.60	16.65	40.88	44.14
70	121.18	0.82	0.18	1.37	0.53	2.24	1.08	31.76	2.76	19.21	20.48	31.22	37.34
74	63.06	1.68	0.68	2.43	2.61	4.44	5.71	27.68	2.41	30.09	32.39	26.39	41.78
80	3.42	1.92	1.22	4.53	5.31	8.95	10.10	31.11	1.74	43.74	47.67	29.12	55.86
84	-3.83	1.09	0.68	2.79	3.04	7.06	5.76	18.16	0.57	30.76	32.92	17.16	37.12

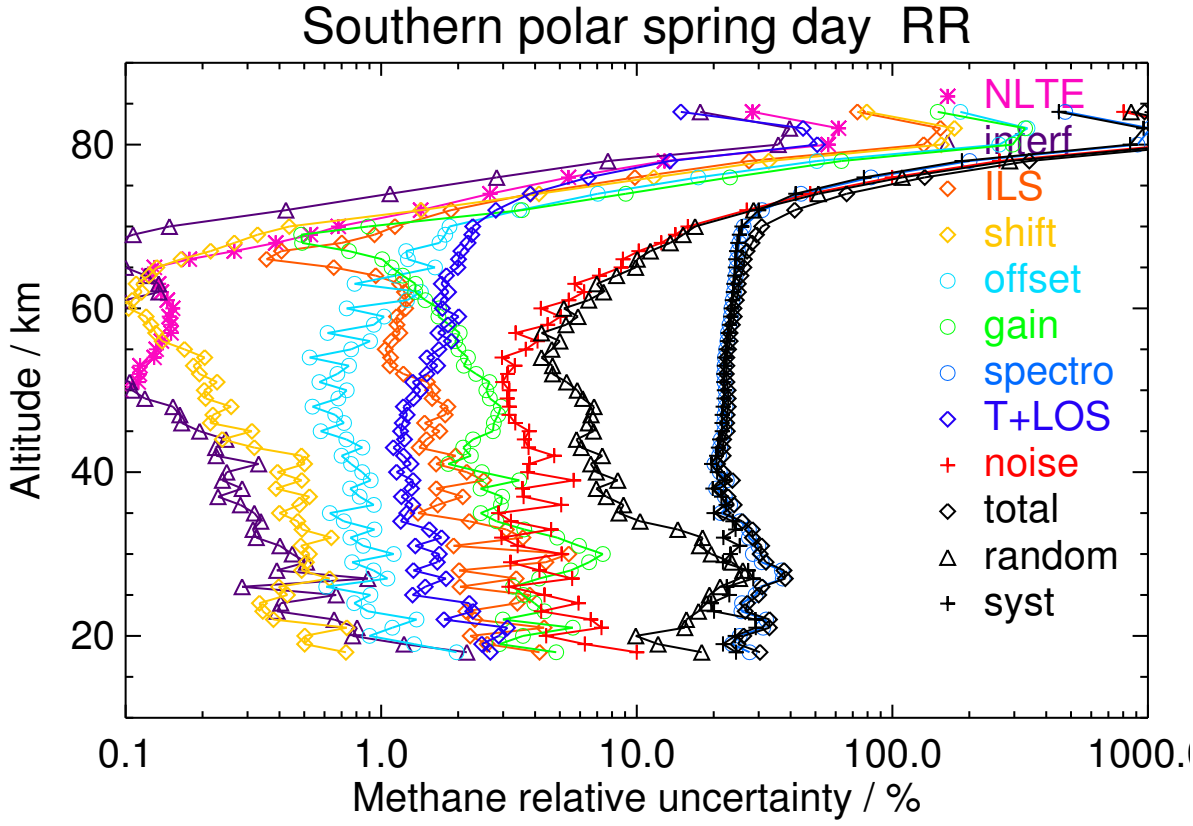

Figure S97. V8R_CH4_561 Southern polar spring day

Table S98. Methane error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	793.01	0.05	2.96	35.67	3.67	8.42	62.49	208.36	11.37	33.37	140.08	174.08	223.44
35	475.68	0.03	2.38	8.91	2.49	3.64	15.17	109.13	7.05	16.51	53.75	98.37	112.10
40	315.58	0.07	0.86	6.51	1.23	2.98	10.64	67.81	3.94	12.20	23.87	66.02	70.20
45	256.54	0.10	0.64	3.14	0.56	1.52	6.66	56.96	3.05	10.11	14.70	56.54	58.42
50	264.53	0.16	0.32	2.38	0.38	1.81	5.38	58.58	3.66	8.47	12.12	58.38	59.62
55	245.93	0.20	0.16	2.11	0.36	2.10	4.85	55.26	4.55	10.15	12.46	55.27	56.66
60	214.53	0.17	0.12	2.54	0.20	1.77	3.49	50.58	4.11	10.06	12.26	50.48	51.94
65	171.45	0.27	0.20	1.13	0.24	2.57	1.61	41.28	3.84	15.31	16.83	40.99	44.32
70	105.10	0.79	0.31	1.23	0.65	2.26	2.29	29.40	3.43	20.45	21.91	28.77	36.16
74	46.64	1.26	0.77	2.61	2.05	5.18	7.50	26.86	3.43	31.41	33.79	25.97	42.62
80	0.24	1.33	1.22	5.02	3.64	9.67	10.80	30.33	2.54	44.56	48.04	29.25	56.25
84	-5.88	0.74	0.73	3.02	2.22	7.27	6.17	17.91	0.92	30.34	32.42	17.25	36.72

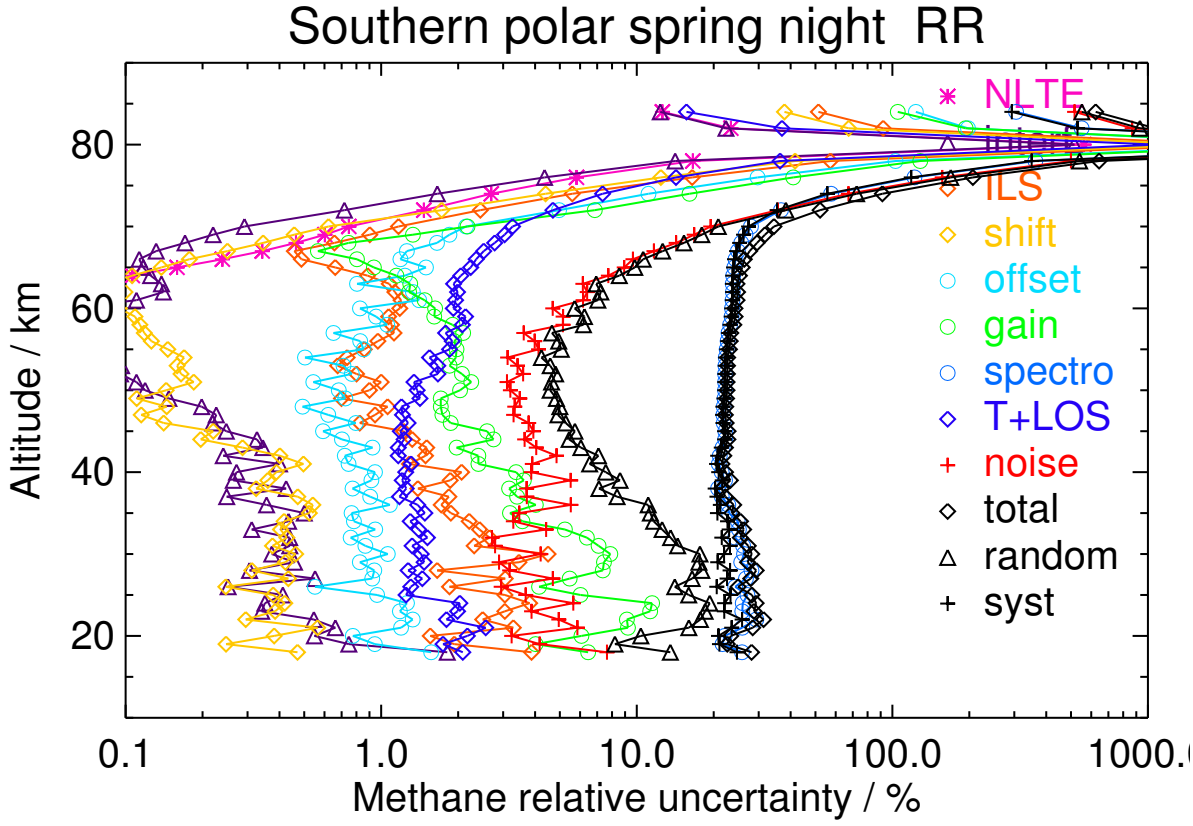

Figure S98. V8R_CH4_561 Southern polar spring night

Table S99. Methane error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	930.86	0.03	1.91	43.32	1.16	8.75	49.44	252.44	19.74	33.07	54.52	258.14	263.84
35	648.39	0.06	1.26	5.59	0.96	3.88	10.33	139.62	9.24	18.02	26.49	139.13	141.63
40	405.07	0.11	0.98	4.83	1.34	3.00	9.46	79.31	3.65	17.14	23.18	78.64	81.98
45	179.60	0.12	0.56	4.69	0.79	2.32	6.08	38.95	2.77	15.74	19.59	38.13	42.87
50	82.79	0.03	0.10	0.71	0.17	1.12	0.88	20.31	0.90	6.74	8.83	19.58	21.48
55	74.53	0.06	0.09	0.65	0.20	1.01	1.05	17.51	0.93	4.50	6.65	16.91	18.17
60	97.80	0.13	0.06	1.16	0.17	1.08	1.53	23.66	1.19	4.94	8.48	22.77	24.30
65	108.63	0.15	0.16	1.12	0.17	2.25	1.34	27.07	1.68	9.92	12.39	26.25	29.02
70	110.32	0.31	0.12	1.30	0.43	2.05	1.15	27.77	1.51	14.87	16.82	26.82	31.66
74	102.10	1.44	0.68	2.51	1.34	3.39	3.83	32.09	1.01	25.69	27.98	30.73	41.56
80	79.70	3.11	1.88	3.91	6.71	6.69	9.19	48.31	0.42	38.79	42.17	47.57	63.57
84	52.74	2.29	1.28	4.98	5.53	6.21	5.66	32.67	0.39	31.92	34.07	32.53	47.11

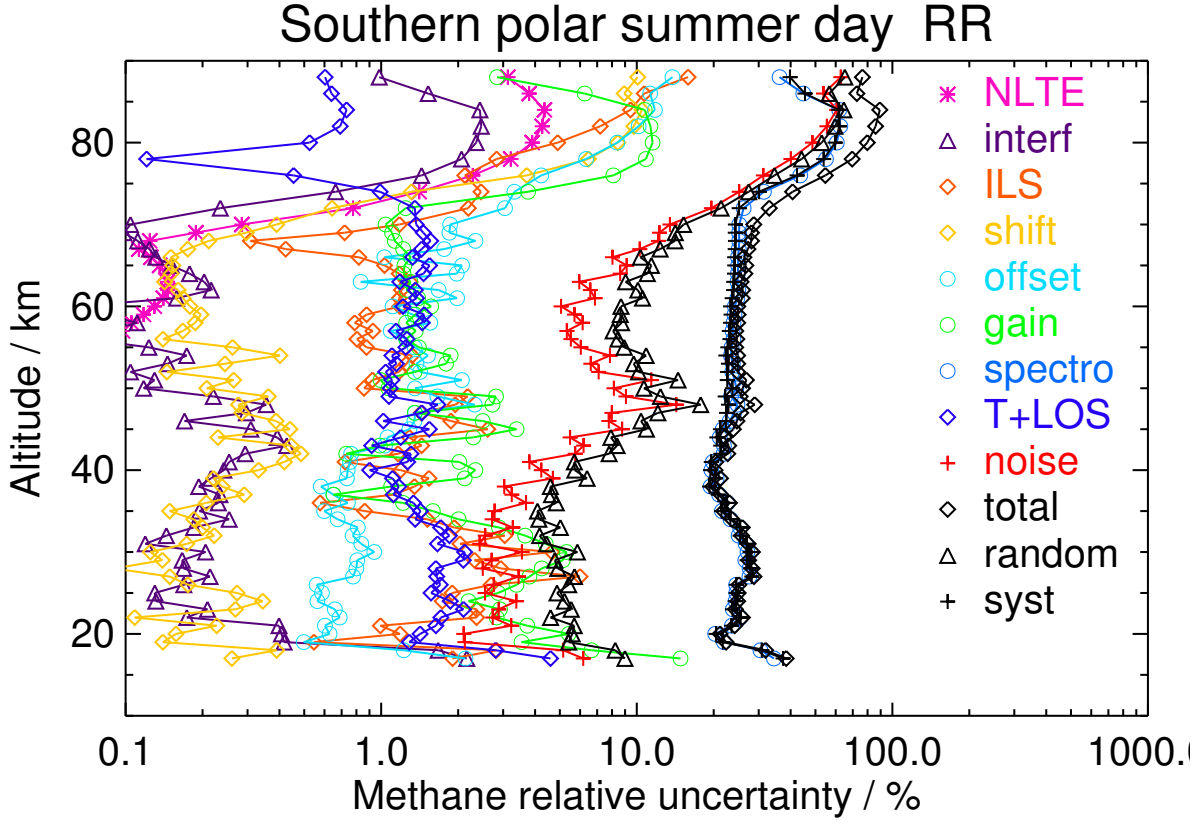

Figure S99. V8R_CH4_561 Southern polar summer day

Table S100. Methane error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	855.21	<0.01	4.20	26.23	1.66	9.32	51.51	227.79	21.11	32.63	49.53	233.22	238.42
35	548.37	0.02	2.04	3.15	1.03	4.52	13.25	123.07	9.22	18.45	27.93	122.48	125.63
40	240.44	0.04	2.23	2.52	1.19	3.17	3.41	51.79	2.84	17.49	22.40	50.30	55.06
45	83.82	0.05	1.13	2.22	0.39	2.55	2.77	22.50	1.66	16.14	19.69	20.05	28.11
50	55.44	0.03	0.20	1.05	0.11	1.28	1.12	13.40	0.69	6.46	7.43	13.07	15.03
55	73.82	0.06	0.11	0.55	0.11	1.34	1.03	17.79	1.22	5.94	7.95	17.12	18.88
60	92.28	0.12	0.09	1.06	0.10	1.44	1.49	23.19	1.58	7.41	10.13	22.32	24.51
65	137.04	0.13	0.23	0.78	0.18	2.51	1.60	32.82	2.69	13.38	15.26	32.25	35.68
70	128.41	0.39	0.56	1.07	0.64	2.65	1.17	32.63	2.95	19.43	20.69	32.14	38.23
74	91.87	1.16	2.13	1.65	2.81	4.67	8.12	39.62	2.24	30.12	32.43	39.18	50.86
80	32.95	1.46	2.68	2.19	4.64	8.86	11.67	45.65	0.31	44.37	46.75	46.01	65.59
84	4.07	0.77	1.58	1.85	3.06	6.34	7.37	28.40	0.03	28.98	30.64	28.61	41.92

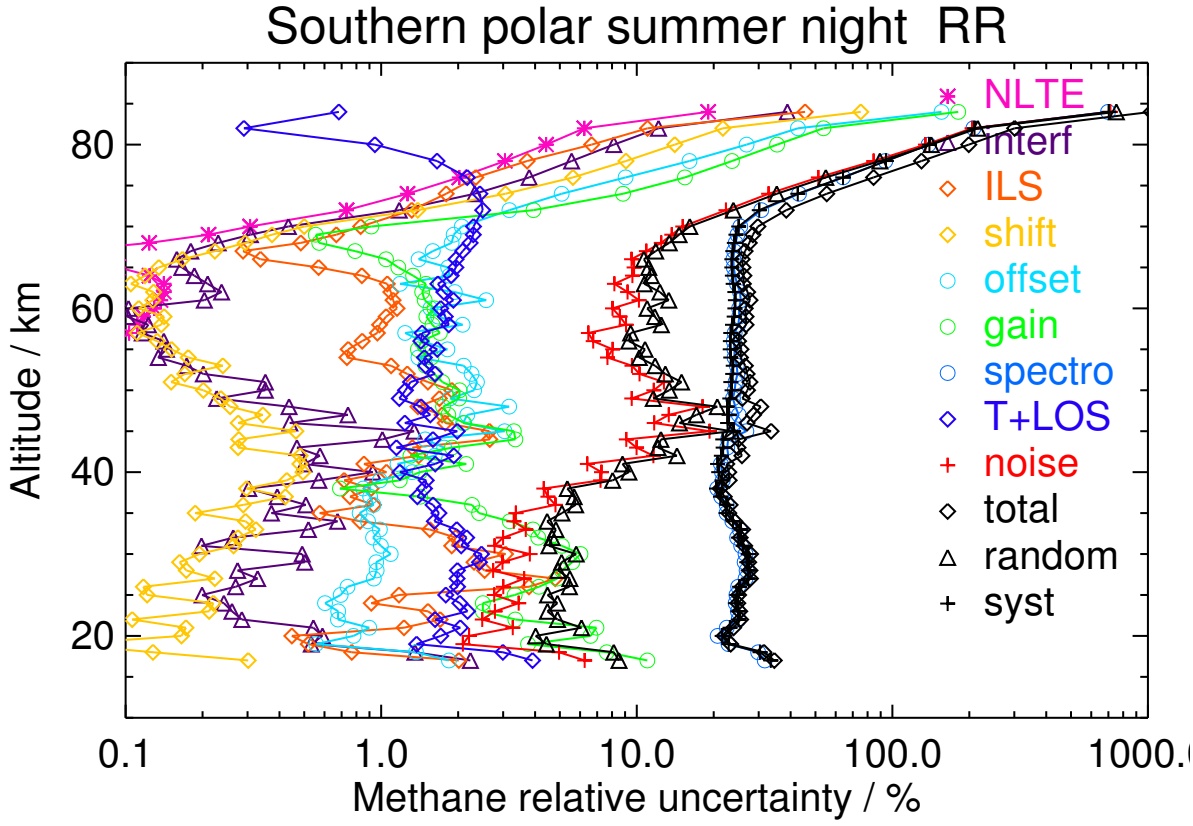

Figure S100. V8R_CH4_561 Southern polar summer night

Table S101. Methane error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	707.93	0.08	1.53	9.72	1.19	5.44	26.58	178.83	18.00	30.43	50.07	177.65	184.57
35	289.81	0.06	1.49	4.66	0.81	4.59	5.37	77.26	8.06	19.86	36.09	72.11	80.64
40	82.49	0.05	0.52	1.86	0.36	2.29	2.96	21.14	2.07	13.24	16.70	19.11	25.38
45	76.27	0.10	0.28	0.81	0.38	1.29	2.40	19.59	1.93	9.80	13.49	17.61	22.18
50	178.13	0.32	0.18	1.54	0.12	2.40	3.74	40.88	3.36	10.40	15.70	39.58	42.58
55	210.81	0.55	0.09	2.34	0.13	1.80	4.34	48.06	3.71	9.60	13.77	47.47	49.43
60	153.02	0.52	0.05	2.55	0.07	1.27	2.80	37.54	3.13	10.68	14.29	36.68	39.37
65	84.87	0.36	0.12	1.30	0.14	2.37	1.26	23.42	1.98	16.11	18.48	21.90	28.66
70	53.41	0.16	0.18	0.43	0.51	2.83	0.59	17.34	1.71	21.28	22.47	16.14	27.67
74	23.50	0.21	0.30	0.50	0.92	6.59	0.99	14.70	1.63	33.82	34.95	13.65	37.52
80	-8.41	0.41	0.44	0.68	1.37	10.37	1.76	12.45	1.29	44.30	45.85	11.41	47.24
84	-0.15	0.31	0.28	0.34	0.91	7.34	1.39	7.91	0.63	29.00	30.12	7.33	31.00

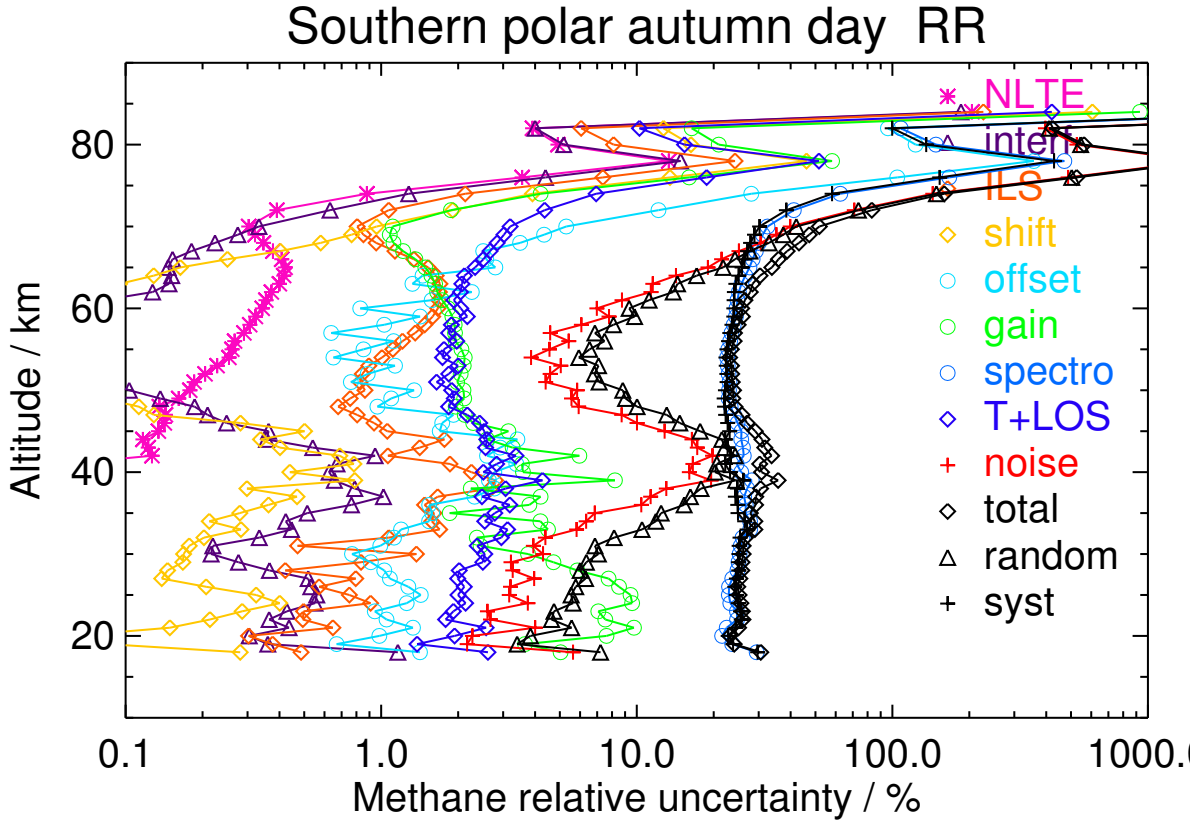

Figure S101. V8R_CH4_561 Southern polar autumn day

Table S102. Methane error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	645.79	0.06	2.49	7.61	1.13	5.29	17.55	173.23	18.61	30.79	48.14	171.43	178.06
35	222.66	0.06	1.40	4.33	0.87	4.25	5.45	58.62	6.74	18.55	32.28	53.41	62.41
40	66.43	0.04	0.47	1.29	0.31	2.27	2.50	16.89	1.88	12.79	15.87	14.63	21.58
45	103.21	0.08	0.29	0.79	0.38	1.24	1.73	24.75	2.19	9.59	12.97	23.38	26.74
50	182.78	0.24	0.21	1.30	0.15	2.36	3.56	42.45	3.43	10.43	14.49	41.63	44.08
55	198.54	0.43	0.09	2.21	0.13	1.71	4.17	47.19	3.69	9.90	14.96	46.27	48.63
60	131.47	0.41	0.06	2.13	0.07	1.22	2.47	33.90	2.88	10.56	15.89	32.08	35.80
65	60.97	0.26	0.14	1.02	0.13	2.29	0.82	18.13	1.69	16.05	18.38	16.08	24.42
70	33.33	0.20	0.17	0.33	0.34	2.91	0.77	11.14	1.37	20.86	21.78	9.80	23.88
74	17.04	0.26	0.45	0.51	0.99	6.80	2.55	10.56	1.86	34.61	35.82	9.16	36.97
80	-1.16	0.46	0.82	1.09	1.88	9.83	4.74	11.34	2.22	43.34	45.11	10.07	46.22
84	38.62	0.16	0.79	0.20	0.80	7.20	4.36	7.38	1.45	28.87	29.82	8.53	31.02

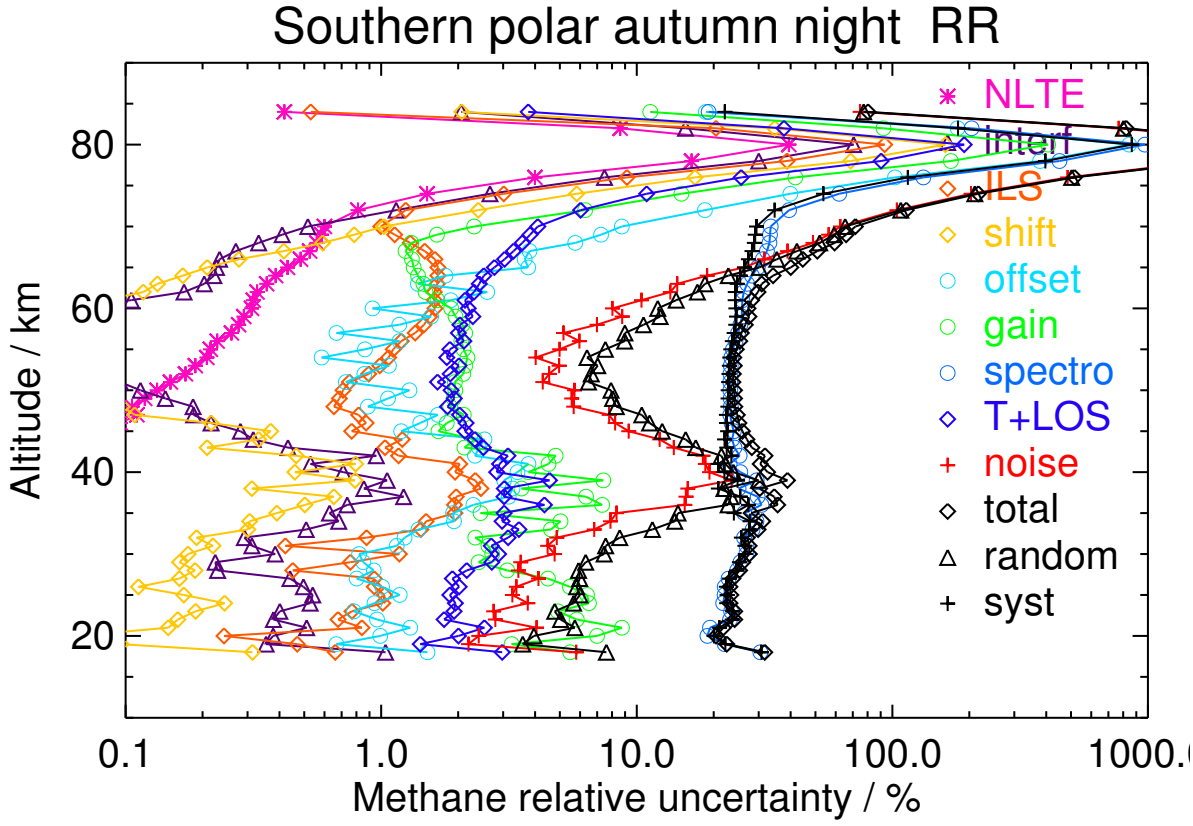

Figure S102. V8R_CH4_561 Southern polar autumn night

S5 Methane error contribution profile plots and tabulated values for RR UA data (V8R_CH4_662)

Table S103. Methane error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	350.53	0.21	0.42	6.17	0.20	5.64	13.64	70.58	7.32	29.21	32.23	71.46	78.39
45	221.62	0.27	0.07	2.56	0.22	2.10	7.51	43.80	4.13	13.19	14.94	44.20	46.66
50	148.63	0.31	0.03	0.86	0.10	1.61	3.74	32.40	2.86	10.72	11.58	32.50	34.50
55	107.75	0.30	0.03	1.00	0.05	1.44	2.30	26.59	2.43	10.84	13.14	25.81	28.96
60	41.24	0.15	<0.01	0.76	0.02	1.14	0.79	12.02	0.98	7.49	9.55	10.63	14.29
65	20.45	0.09	0.02	0.44	0.02	1.36	0.30	5.96	0.47	7.14	7.78	5.32	9.43
70	14.35	0.09	0.01	0.28	0.02	1.76	0.17	3.88	0.31	8.08	8.37	3.67	9.14
74	16.11	0.25	0.02	0.30	0.03	3.48	0.19	4.35	0.31	15.94	16.46	3.80	16.89
80	24.12	0.74	0.02	0.44	0.04	6.22	0.29	6.08	0.37	28.24	29.17	4.82	29.56

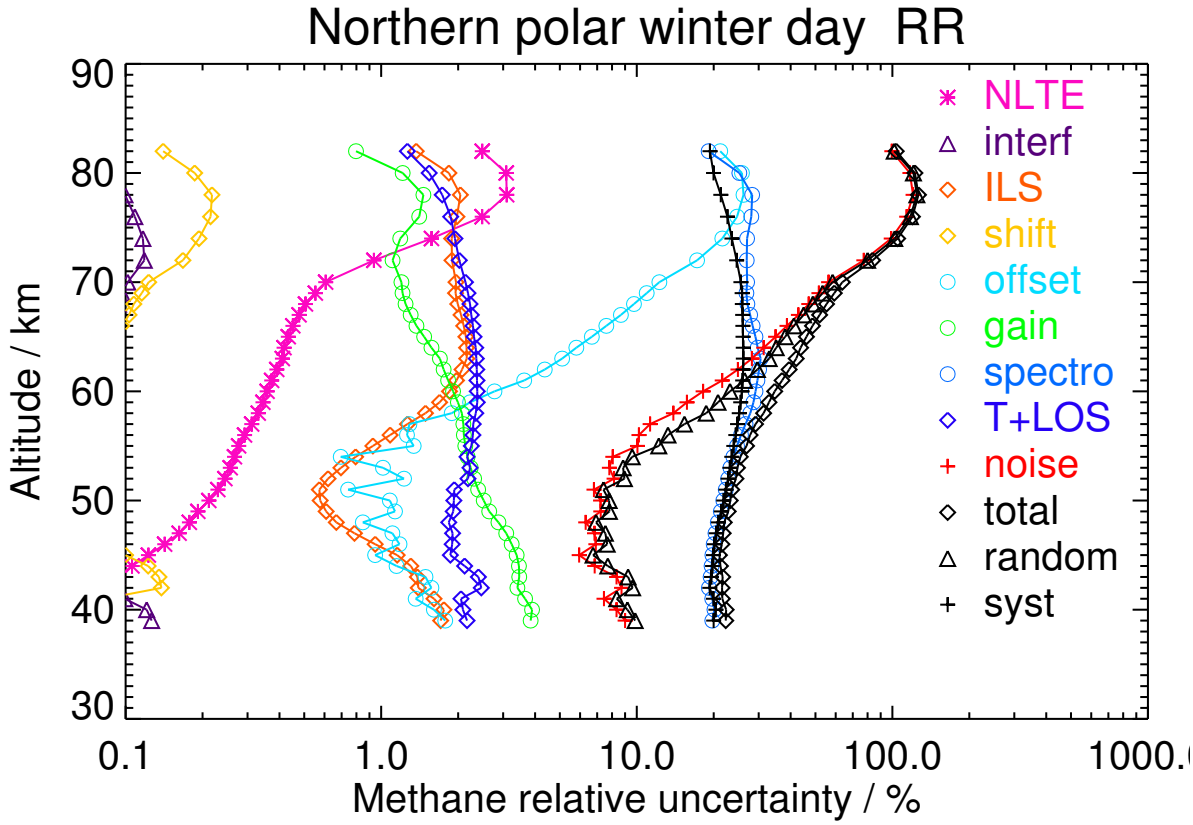

Figure S103. V8R_CH4_662 Northern polar winter day

Table S104. Methane error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	138.23	0.13	0.03	1.96	0.23	0.88	4.24	32.05	1.81	4.71	6.08	32.22	32.79
50	138.40	0.17	0.04	1.22	0.17	1.03	2.56	32.90	1.92	6.35	7.91	32.75	33.70
55	119.72	0.28	0.02	1.50	0.11	1.40	2.09	28.71	2.06	8.35	9.53	28.57	30.11
60	83.15	0.32	0.01	1.67	0.08	1.16	1.35	20.58	1.51	8.31	9.53	20.25	22.38
65	56.87	0.36	0.04	1.29	0.08	1.63	0.77	14.79	1.16	11.38	12.42	14.16	18.84
70	35.19	0.28	0.06	0.52	0.15	2.70	0.26	10.03	0.95	15.85	16.58	9.25	18.98
74	28.11	0.29	0.15	0.51	0.50	4.07	1.63	12.41	1.06	23.95	26.02	8.46	27.36
80	158.00	3.39	0.53	1.49	2.31	22.92	4.48	74.26	8.96	139.51	151.14	52.72	160.07

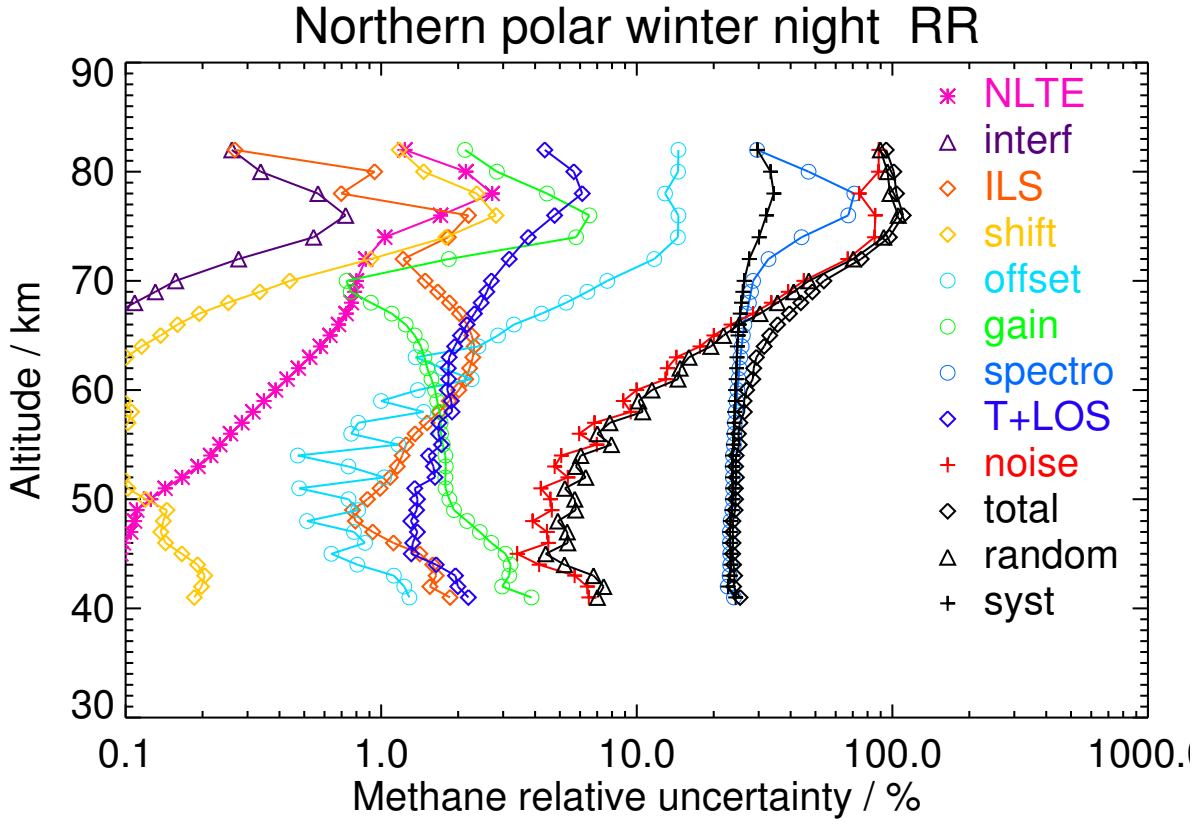

Figure S104. V8R_CH4_662 Northern polar winter night

Table S105. Methane error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	153.86	0.12	0.08	3.23	0.24	0.77	5.17	38.12	1.29	3.82	13.66	36.34	38.82
50	117.62	0.15	0.05	1.43	0.17	0.69	2.55	30.42	1.35	3.81	13.84	27.56	30.84
55	120.39	0.25	0.05	2.16	0.17	1.33	2.94	29.17	2.02	5.93	10.74	28.10	30.08
60	92.61	0.28	0.05	2.68	0.14	1.52	2.39	23.46	1.61	6.85	11.23	22.11	24.80
65	65.26	0.17	0.03	2.06	0.08	1.24	0.98	17.19	1.27	9.88	11.79	16.20	20.04
70	36.29	0.13	0.11	0.53	0.28	1.80	1.18	10.47	0.88	13.75	14.44	9.80	17.45
74	35.05	0.89	0.42	2.84	1.20	3.40	5.38	16.52	1.46	24.69	27.92	12.48	30.59
80	46.79	1.56	0.79	5.33	2.36	7.49	9.31	22.53	1.62	50.23	53.14	19.73	56.69
84	43.76	1.03	0.56	3.29	1.68	6.30	5.59	15.85	0.69	35.83	36.45	17.12	40.27

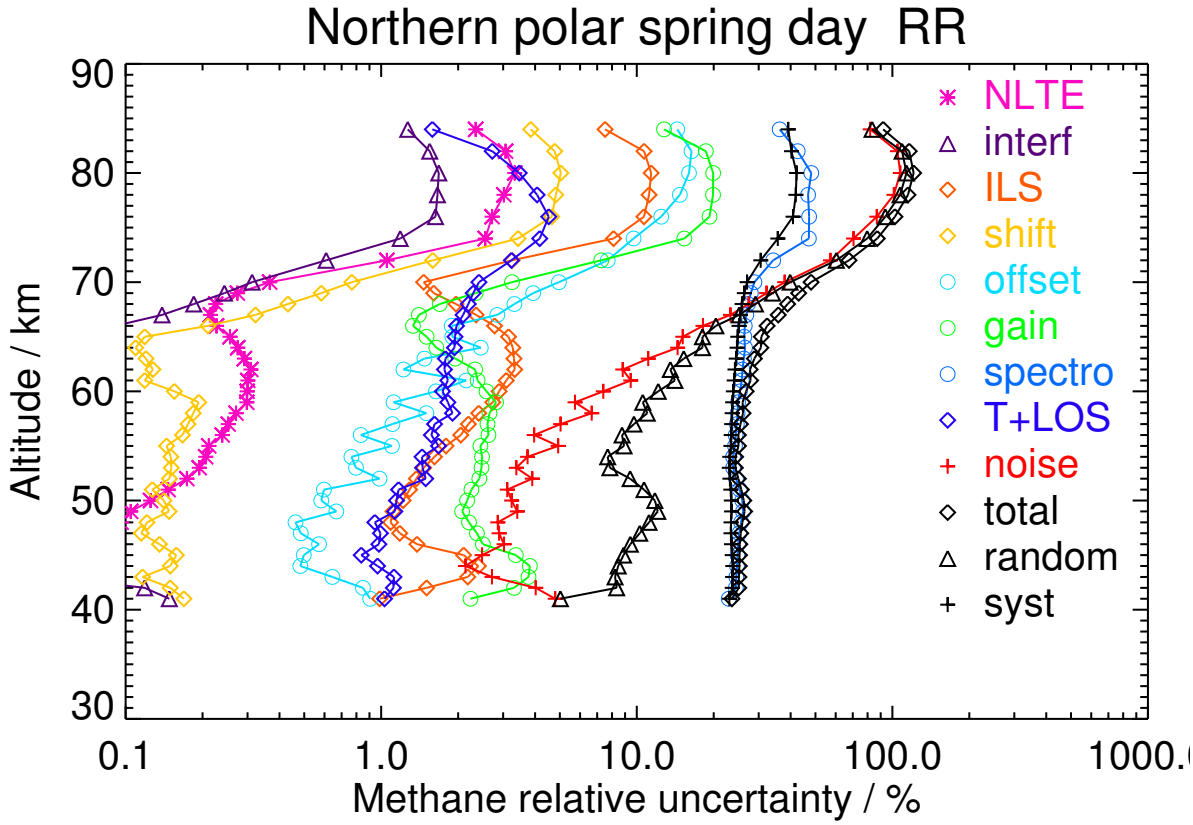

Figure S105. V8R_CH4_662 Northern polar spring day

Table S106. Methane error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	280.72	0.09	0.31	5.13	0.40	2.30	9.70	65.58	3.18	9.40	10.36	66.47	67.27
45	176.42	0.09	0.08	3.37	0.27	0.93	5.54	42.55	1.62	5.02	11.75	41.75	43.37
50	150.29	0.10	0.15	1.50	0.24	0.79	2.28	39.56	1.89	5.40	19.38	35.07	40.07
55	114.72	0.22	0.07	2.39	0.21	1.33	3.33	28.31	2.10	6.16	13.26	26.20	29.37
60	67.86	0.15	0.04	1.98	0.10	1.06	1.62	17.31	1.23	6.25	9.35	16.14	18.65
65	39.62	0.08	0.05	1.06	0.09	1.09	0.41	10.97	0.76	8.00	9.39	9.96	13.69
70	25.57	0.08	0.11	0.40	0.29	1.63	1.19	8.56	0.72	10.84	11.86	7.42	13.99
74	23.39	0.32	0.26	1.61	0.72	3.09	3.22	10.51	1.12	20.03	21.46	8.70	23.16
80	28.20	0.75	0.48	3.14	1.30	5.06	5.47	12.83	1.05	31.78	33.78	10.13	35.27

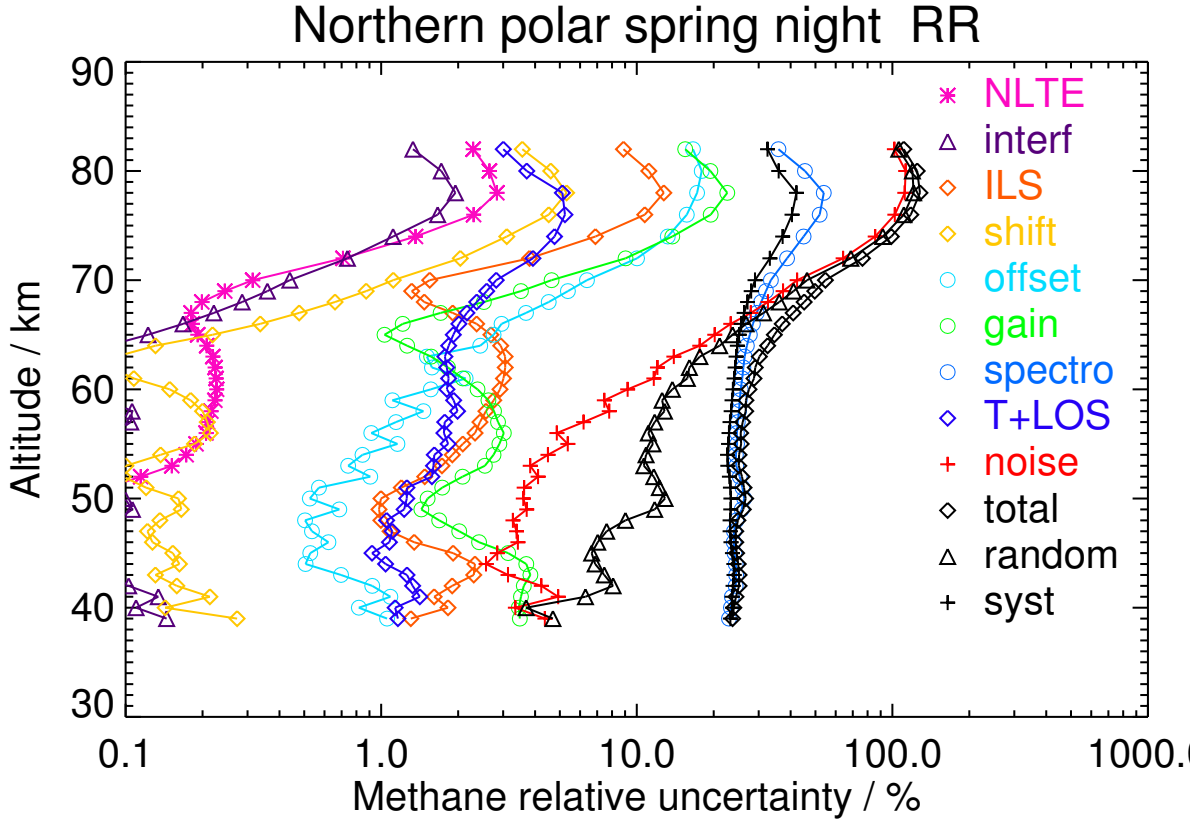

Figure S106. V8R_CH4_662 Northern polar spring night

Table S107. Methane error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	131.13	0.06	0.10	2.15	0.35	0.59	3.18	30.96	0.88	3.48	4.96	31.02	31.41
50	75.16	0.04	0.05	0.73	0.12	0.27	0.88	18.10	0.61	2.40	4.11	17.84	18.31
55	57.10	0.05	0.01	0.81	0.07	0.54	0.83	13.76	0.66	2.90	4.10	13.53	14.14
60	64.20	0.09	0.03	1.25	0.13	1.04	1.16	15.66	0.92	4.38	6.46	15.09	16.41
65	81.77	0.16	0.05	3.04	0.11	1.31	1.79	21.42	1.43	8.59	12.84	19.59	23.43
70	78.92	0.22	0.13	1.31	0.23	2.93	1.02	21.76	1.72	21.92	24.24	19.52	31.12
74	62.47	0.86	0.60	3.97	1.13	2.52	4.23	21.34	0.93	32.63	34.11	20.00	39.54
80	70.96	2.58	0.92	5.02	2.68	7.54	6.30	24.70	0.57	54.69	56.44	23.49	61.14
84	69.35	4.54	1.03	4.84	3.70	8.94	7.27	26.06	0.81	63.08	66.15	21.77	69.64

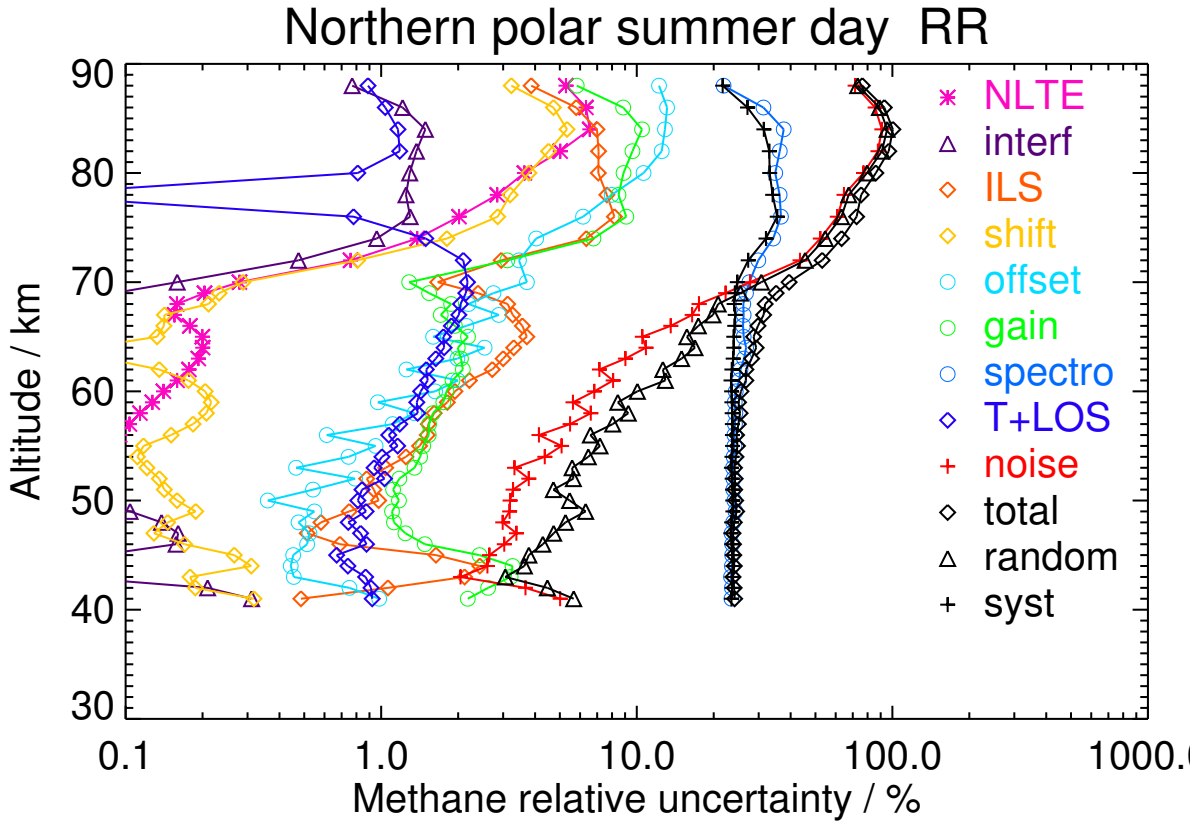

Figure S107. V8R_CH4_662 Northern polar summer day

Table S108. Methane error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	113.05	0.04	0.04	2.50	0.26	0.58	3.44	26.76	0.86	3.16	6.88	26.42	27.30
50	65.94	0.03	0.02	0.72	0.07	0.35	0.97	15.57	0.64	2.60	4.18	15.28	15.84
55	109.86	0.11	0.02	1.37	0.17	1.29	2.06	28.11	1.87	5.73	15.77	24.21	28.89
60	149.17	0.20	0.07	3.67	0.17	2.31	3.06	35.47	3.18	8.83	17.09	32.89	37.07
65	153.17	0.18	0.08	5.58	0.19	2.84	2.96	36.20	4.06	16.22	19.78	35.31	40.47
70	127.62	0.62	0.21	1.17	0.42	4.80	1.18	35.90	4.73	36.59	39.69	33.17	51.73
74	87.73	1.45	0.80	4.87	1.75	5.32	6.41	35.69	3.15	51.21	53.33	34.08	63.29
80	66.24	3.34	0.90	5.40	2.51	8.55	7.68	32.00	0.71	64.72	67.61	28.67	73.43
84	93.15	9.12	1.60	10.01	4.87	12.21	13.16	56.33	0.06	85.71	98.50	36.71	105.12

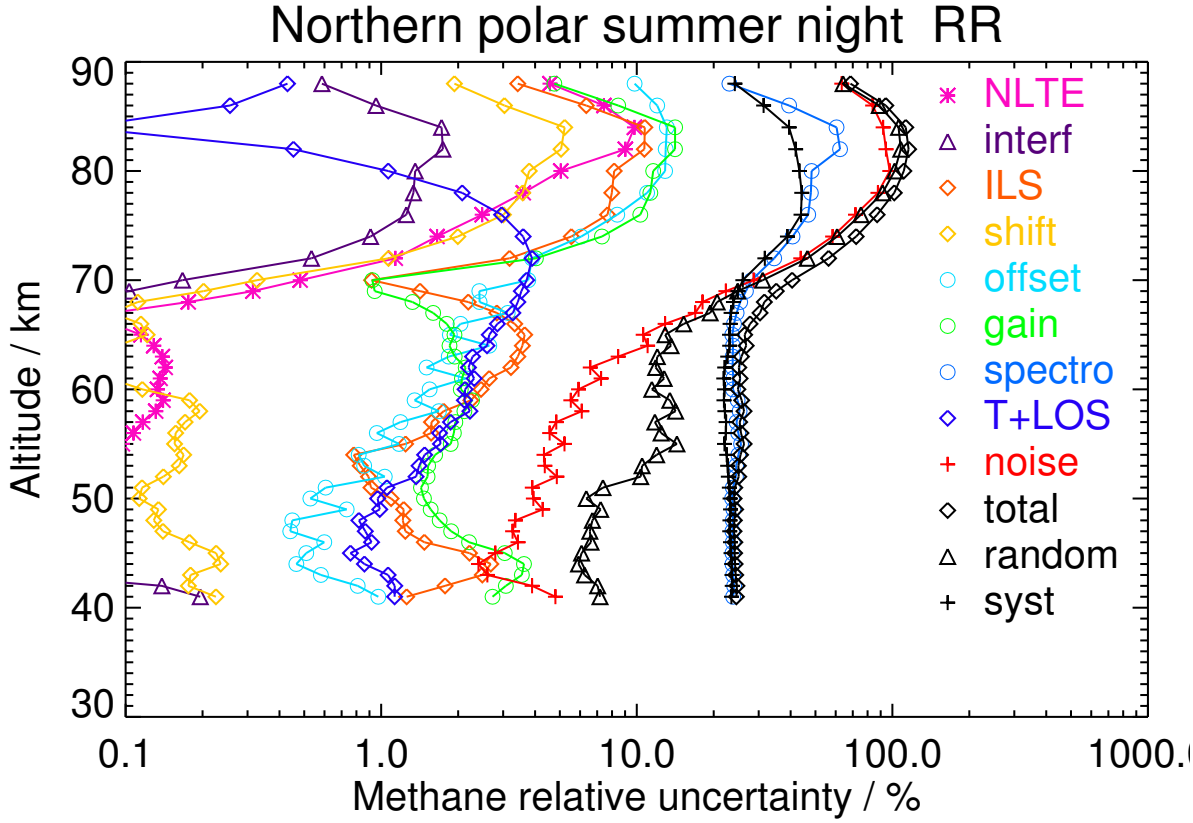

Figure S108. V8R_CH4_662 Northern polar summer night

Table S109. Methane error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	80.15	0.07	0.03	0.66	0.12	0.64	2.25	18.97	1.18	4.00	7.14	18.23	19.58
50	148.58	0.23	0.03	0.92	0.15	1.45	3.24	35.09	2.42	7.94	12.39	34.07	36.25
55	187.87	0.49	0.03	2.08	0.15	2.26	3.93	43.92	3.94	11.32	13.77	43.68	45.80
60	170.48	0.64	0.03	3.69	0.10	2.58	3.33	41.62	3.57	12.47	16.39	40.78	43.95
65	113.37	0.51	0.04	3.15	0.07	2.17	1.81	30.32	2.85	16.26	20.20	28.32	34.79
70	56.72	0.20	0.09	0.86	0.24	2.96	0.47	17.92	1.82	20.76	23.05	15.30	27.66
74	32.99	0.27	0.15	0.56	0.42	4.38	1.57	11.19	1.32	28.70	29.61	9.80	31.19
80	31.07	0.25	0.15	0.71	0.48	6.53	1.93	10.78	1.02	38.34	39.50	8.61	40.43

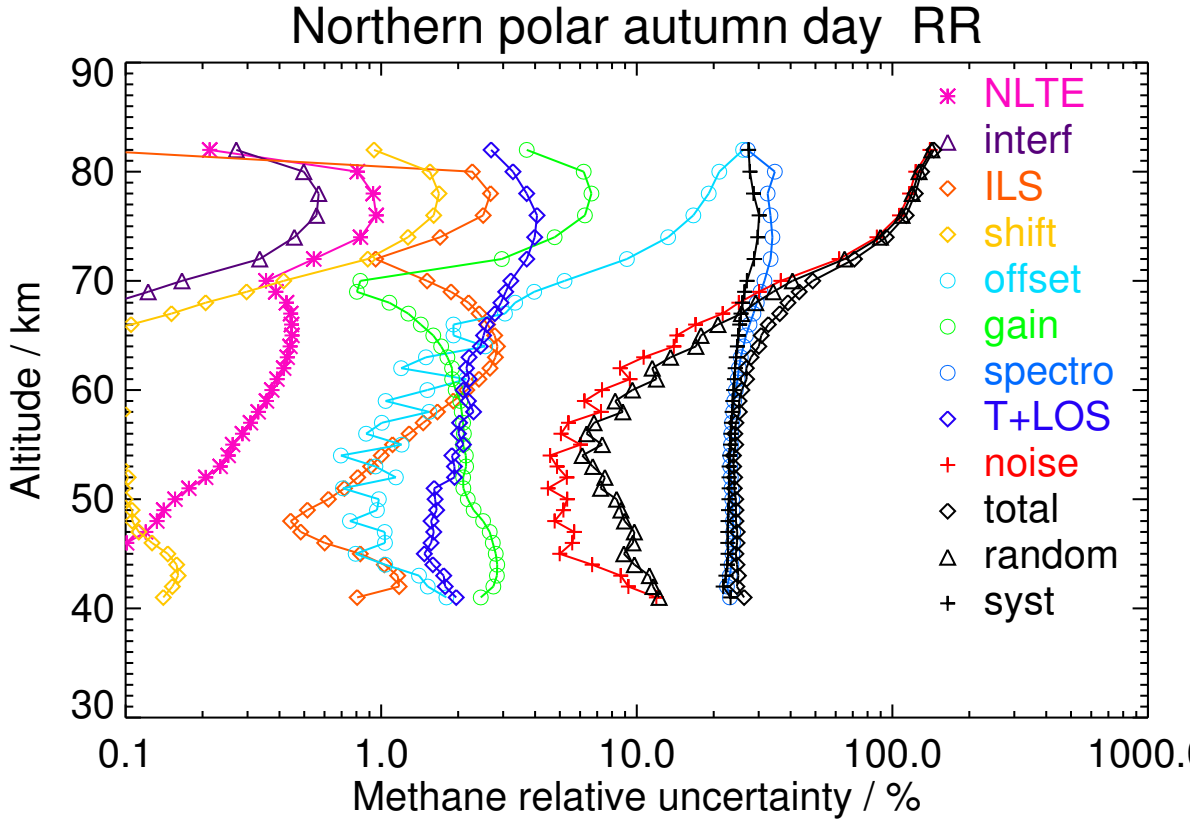

Figure S109. V8R_CH4_662 Northern polar autumn day

Table S110. Methane error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	171.69	0.12	0.08	2.20	0.28	1.38	5.78	42.06	2.93	7.46	16.54	40.00	43.28
50	203.59	0.22	0.08	1.75	0.22	1.80	4.45	47.44	3.66	10.43	14.23	46.87	48.98
55	143.18	0.26	0.03	1.79	0.16	1.59	2.71	35.47	2.86	9.31	14.68	33.92	36.96
60	97.43	0.30	0.01	2.07	0.09	1.22	1.74	25.18	1.85	8.51	12.78	23.57	26.81
65	64.12	0.31	0.03	1.62	0.05	1.63	1.06	17.15	1.37	11.52	13.56	15.85	20.86
70	45.96	0.39	0.13	1.11	0.37	2.44	2.18	15.58	1.55	16.95	19.75	12.43	23.34
74	45.90	0.66	0.18	0.92	0.57	5.38	2.79	18.19	2.45	35.47	38.08	13.55	40.41
80	46.12	0.69	0.34	1.11	1.18	8.04	5.32	19.50	2.86	49.86	52.46	14.80	54.50

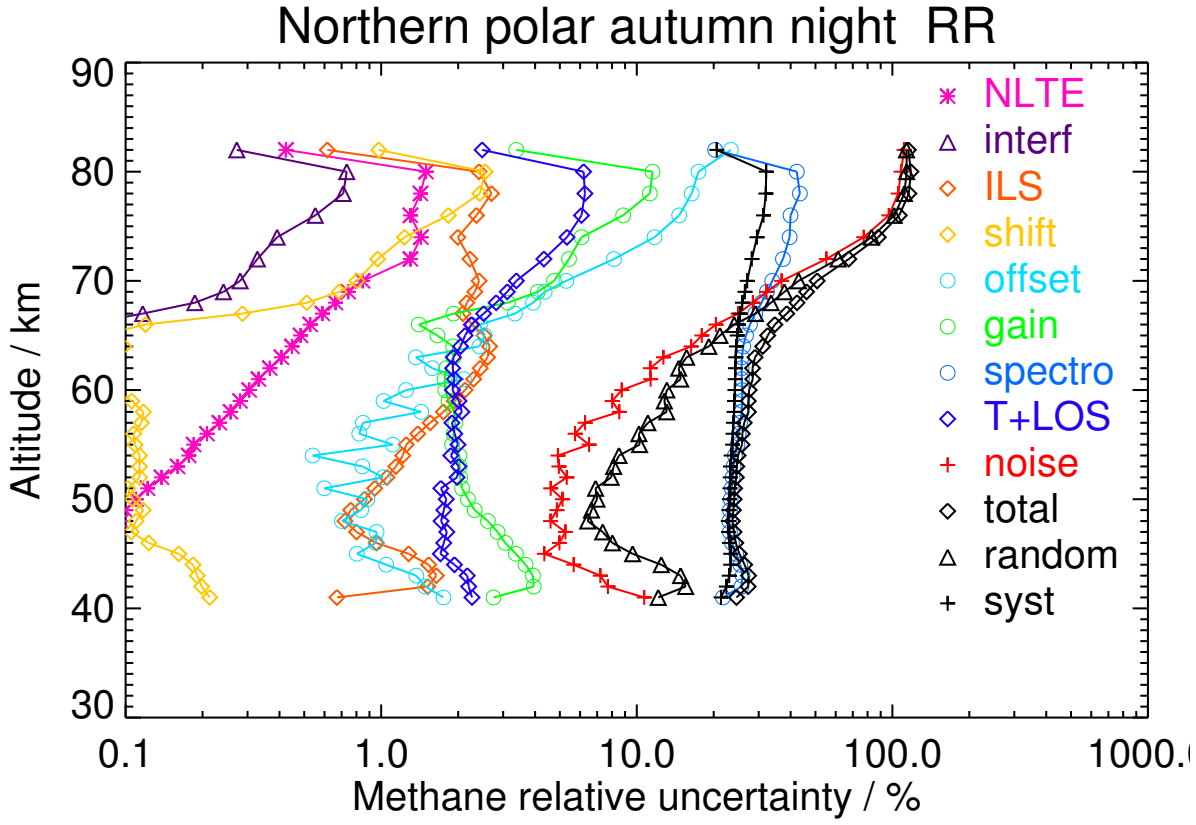

Figure S110. V8R_CH4_662 Northern polar autumn night

Table S111. Methane error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	436.99	0.33	0.98	5.39	0.58	4.64	14.78	95.19	5.61	18.52	26.96	94.75	98.51
45	282.60	0.28	0.36	4.15	0.35	1.63	8.75	65.64	2.94	8.80	20.19	63.91	67.02
50	177.47	0.29	0.10	1.91	0.18	1.33	4.07	40.71	2.67	6.89	10.98	40.16	41.64
55	151.36	0.42	0.10	2.44	0.20	2.05	4.31	35.12	3.11	9.16	11.61	34.95	36.82
60	122.21	0.39	0.07	3.05	0.15	2.05	3.21	29.89	2.66	10.09	13.48	29.06	32.03
65	66.34	0.15	0.05	1.87	0.13	1.82	0.77	18.97	1.68	12.15	15.48	16.67	22.75
70	33.88	0.22	0.09	0.62	0.22	2.16	1.01	11.00	1.11	13.84	15.46	9.01	17.89
74	24.29	0.46	0.15	0.88	0.37	3.57	2.30	8.19	1.11	21.42	22.34	6.85	23.37
80	39.85	1.93	0.36	1.78	1.01	7.41	6.63	17.65	2.36	45.95	48.34	14.09	50.36
84	38.87	1.20	0.16	0.31	0.55	6.71	3.03	9.27	1.19	37.48	38.10	9.81	39.35

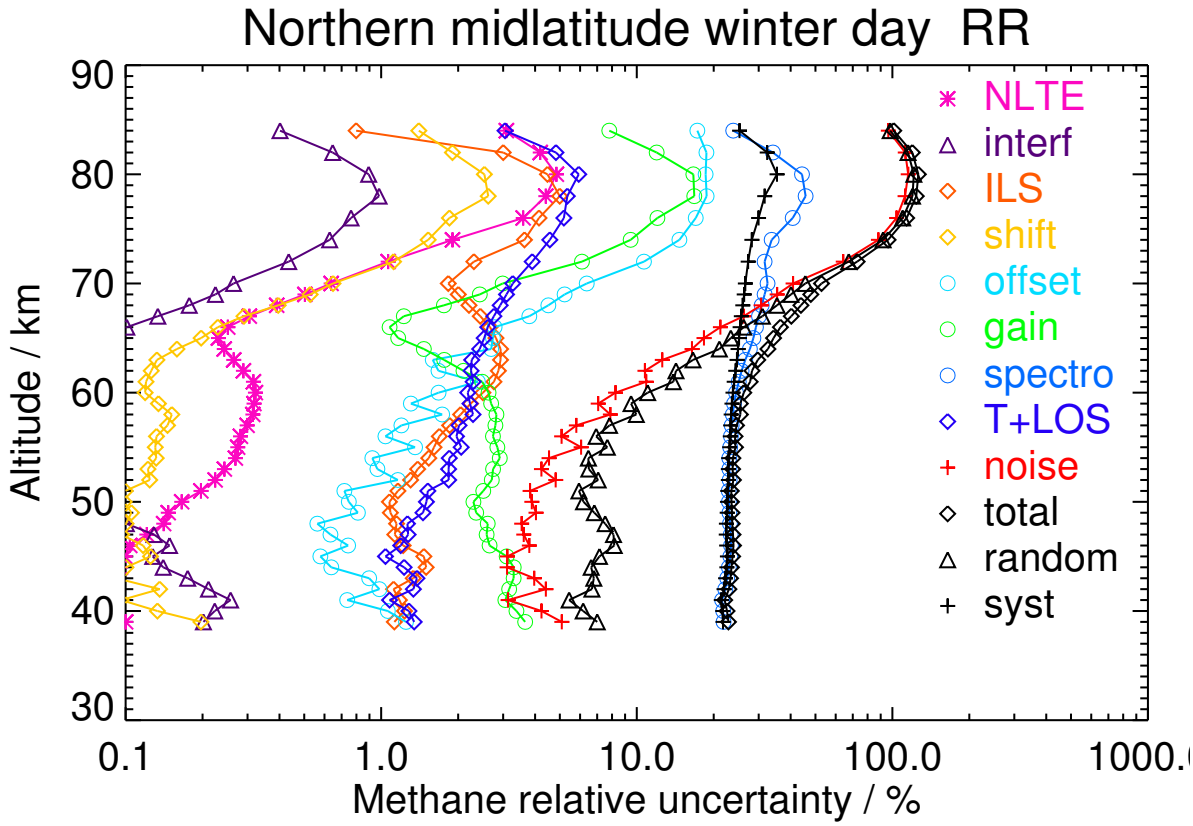

Figure S111. V8R_CH4_662 Northern midlatitude winter day

Table S112. Methane error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	373.77	0.25	0.70	6.94	0.53	5.57	19.56	94.52	6.77	21.65	28.26	95.46	99.56
45	276.97	0.17	0.19	4.73	0.27	2.39	12.73	71.39	4.05	10.90	27.73	68.21	73.63
50	181.75	0.18	0.09	2.47	0.19	1.75	5.92	44.07	3.24	8.83	16.29	42.54	45.55
55	164.64	0.28	0.09	2.33	0.16	2.23	4.79	37.94	3.92	11.38	13.56	37.87	40.22
60	134.84	0.27	0.05	2.68	0.13	2.13	2.69	32.62	3.35	12.81	14.66	32.30	35.47
65	86.73	0.27	0.05	2.24	0.11	2.14	1.21	22.60	2.41	15.96	17.64	21.71	27.97
70	47.21	0.25	0.08	0.91	0.17	2.96	0.94	13.35	1.61	18.94	20.01	12.23	23.45
74	33.42	0.29	0.12	0.51	0.33	4.70	1.70	11.48	1.53	28.22	29.57	9.03	30.92
80	28.80	0.70	0.04	0.71	0.16	6.20	0.87	7.81	0.77	33.81	34.71	6.30	35.28

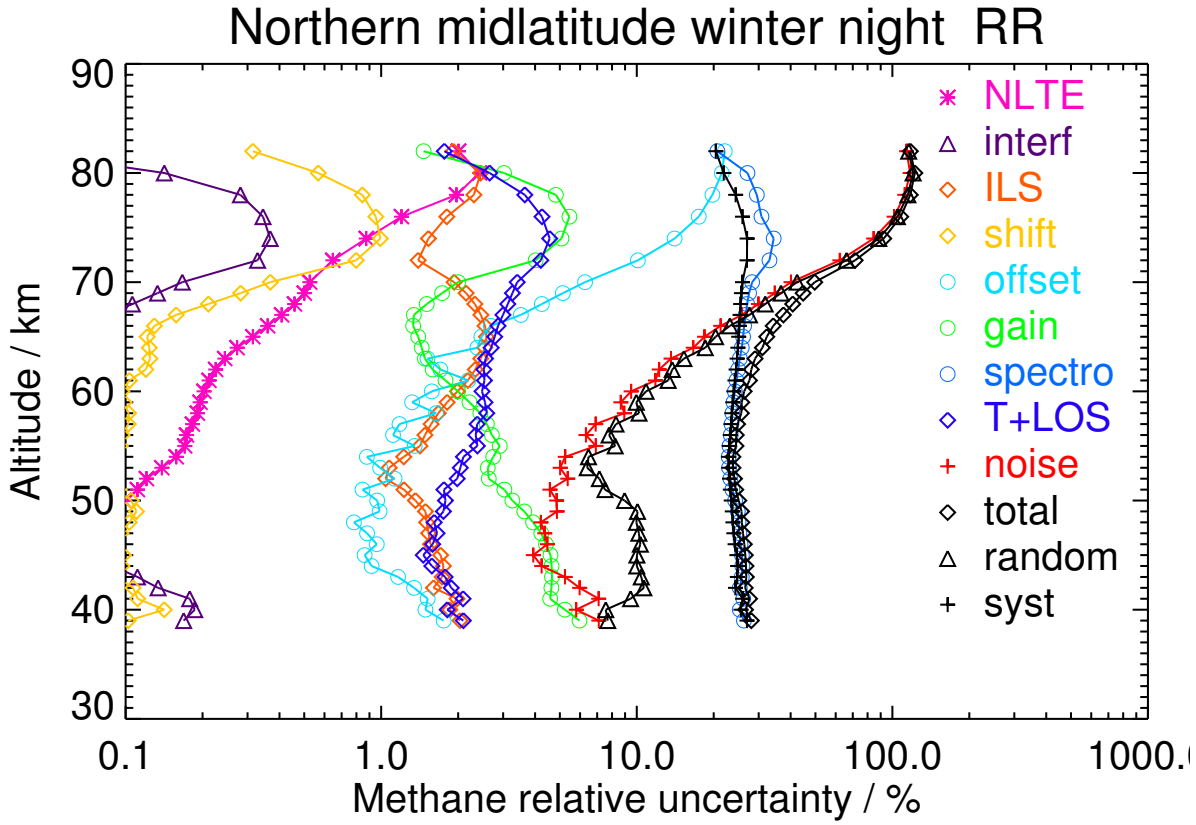

Figure S112. V8R_CH4_662 Northern midlatitude winter night

Table S113. Methane error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	245.88	0.30	0.22	4.74	0.31	1.61	10.01	63.55	2.52	6.64	28.85	58.16	64.92
50	200.48	0.38	0.15	3.11	0.29	1.66	6.53	49.58	3.12	6.89	21.43	45.95	50.70
55	164.03	0.45	0.13	3.52	0.28	2.11	5.44	38.60	3.46	8.07	14.95	37.29	40.18
60	113.86	0.35	0.07	3.29	0.17	2.09	3.25	27.80	2.37	9.01	12.67	26.93	29.76
65	66.83	0.15	0.03	2.04	0.07	1.24	1.08	17.46	1.39	10.45	12.12	16.61	20.56
70	39.47	0.24	0.11	0.56	0.27	1.83	1.50	11.84	1.11	14.62	15.65	10.78	19.00
74	40.84	1.15	0.34	2.56	0.93	3.99	5.90	17.44	2.19	28.74	31.49	14.25	34.57
80	61.91	4.21	1.26	9.29	3.99	9.86	20.22	37.94	3.85	63.28	72.17	29.63	78.02

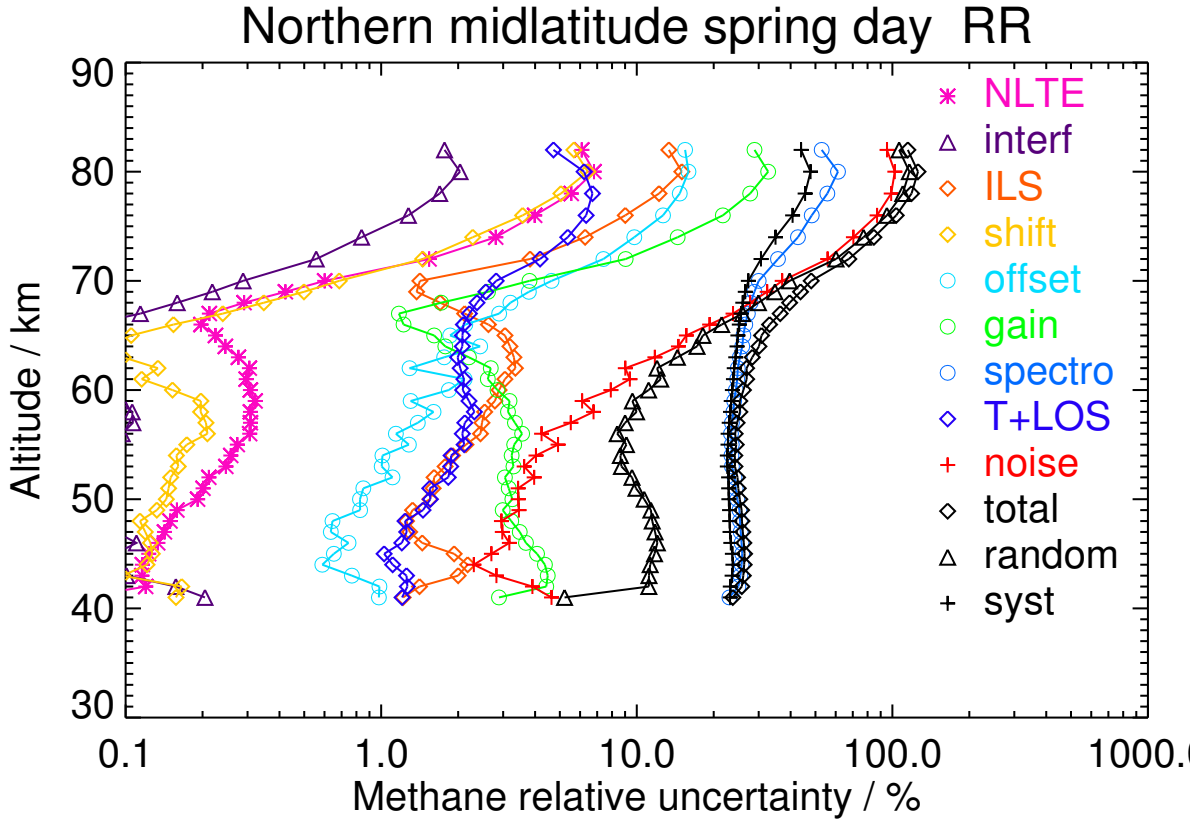

Figure S113. V8R_CH4_662 Northern midlatitude spring day

Table S114. Methane error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	540.88	0.06	1.39	4.28	1.12	4.34	15.84	126.12	5.88	19.20	20.84	127.15	128.85
45	278.09	0.11	0.34	4.08	0.32	1.47	8.73	66.40	2.52	7.16	24.86	62.80	67.54
50	240.96	0.18	0.17	2.58	0.20	1.60	5.89	55.78	3.57	7.33	19.38	53.35	56.76
55	200.47	0.33	0.20	4.73	0.45	2.79	8.02	44.60	4.92	9.60	16.59	43.87	46.91
60	142.31	0.23	0.10	4.02	0.24	2.42	4.22	32.81	3.31	9.95	13.36	32.37	35.02
65	86.72	0.09	0.07	2.35	0.17	1.82	0.99	22.57	2.22	13.22	15.03	21.76	26.44
70	39.81	0.30	0.19	0.75	0.54	2.25	2.79	13.68	1.83	16.35	17.33	13.08	21.71
74	22.62	0.41	0.26	1.76	0.77	3.03	4.22	10.50	1.78	20.14	21.13	10.16	23.45
80	22.84	0.49	0.28	2.03	0.85	4.23	4.79	9.35	1.47	25.79	26.43	10.10	28.29

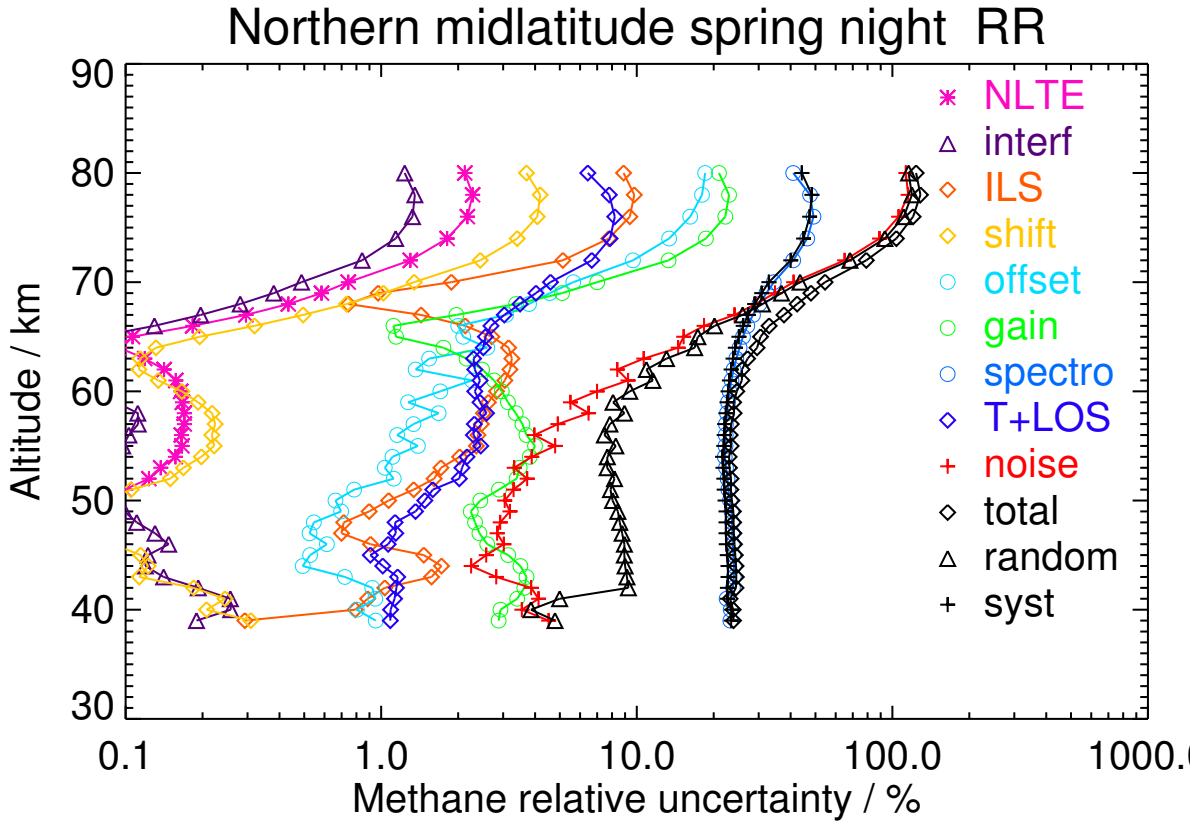

Figure S114. V8R_CH4_662 Northern midlatitude spring night

Table S115. Methane error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	224.35	0.19	0.20	3.75	0.37	1.23	7.80	56.36	1.96	5.81	19.84	53.82	57.36
50	147.79	0.17	0.13	1.48	0.22	0.84	3.00	37.71	1.80	5.13	16.75	34.39	38.26
55	203.55	0.42	0.07	3.38	0.46	2.70	6.00	52.72	4.45	9.44	29.02	45.85	54.26
60	169.02	0.50	0.10	4.59	0.24	3.43	4.87	41.52	4.14	11.31	19.32	39.41	43.89
65	183.87	0.50	0.08	5.33	0.21	4.02	4.07	44.90	5.30	19.84	25.21	43.17	49.99
70	125.35	0.71	0.18	1.44	0.55	4.55	1.95	33.51	3.96	35.63	37.97	31.53	49.35
74	89.87	1.86	0.37	2.20	1.09	5.49	4.73	27.52	2.40	51.94	53.36	26.01	59.36
80	82.64	8.54	1.05	6.45	3.86	9.96	13.53	41.57	0.52	72.47	80.39	30.52	85.99
84	247.72	50.55	1.61	7.59	7.39	29.59	20.23	120.87	1.09	190.84	221.46	77.09	234.49

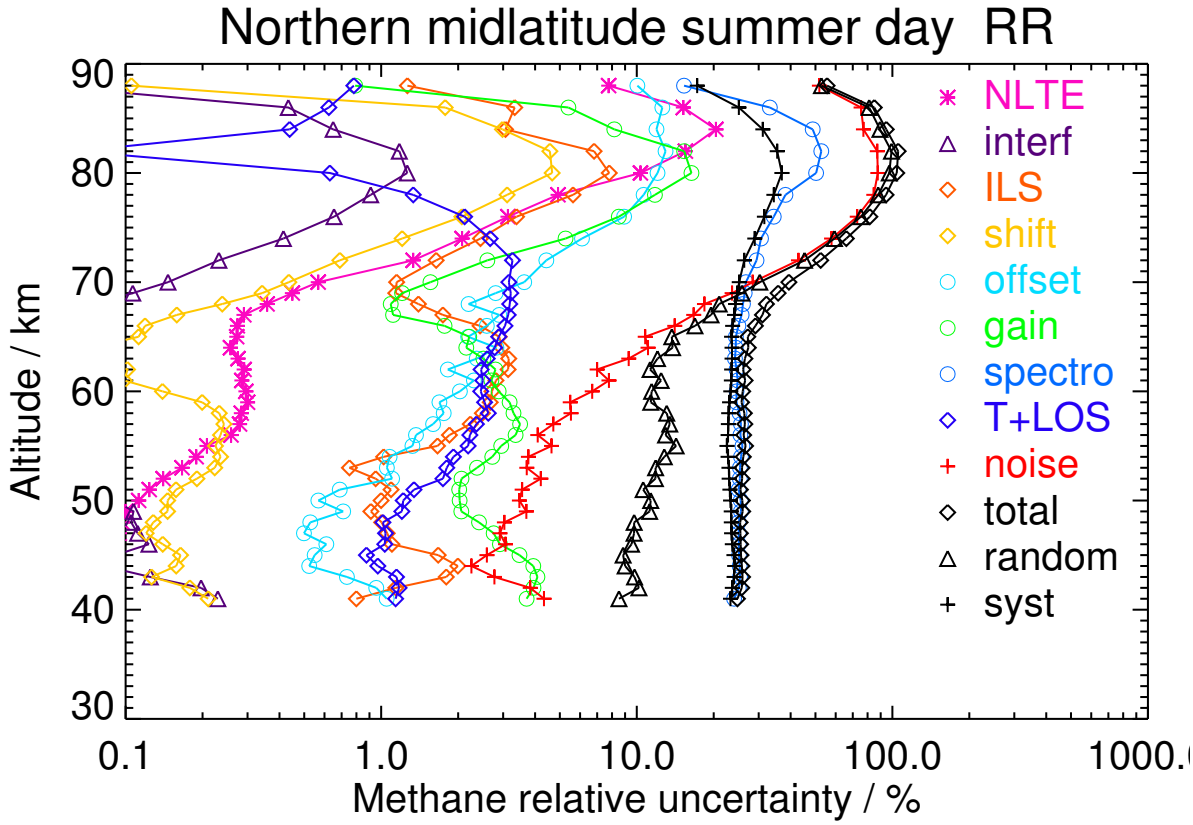

Figure S115. V8R_CH4_662 Northern midlatitude summer day

Table S116. Methane error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	210.43	0.08	0.23	2.86	0.24	1.20	6.50	50.81	1.84	5.45	20.28	47.49	51.64
50	187.37	0.13	0.15	1.88	0.25	1.23	4.74	48.56	2.56	6.36	26.23	41.76	49.32
55	229.78	0.22	0.14	4.27	0.52	3.15	7.72	56.86	5.39	10.89	32.76	48.95	58.90
60	267.65	0.22	0.15	7.58	0.33	5.26	7.85	59.97	7.69	16.66	27.58	57.61	63.87
65	177.66	0.34	0.07	5.78	0.19	3.70	3.80	43.37	6.04	20.95	26.86	41.19	49.18
70	166.03	1.39	0.36	2.42	1.00	5.56	4.35	48.12	7.48	47.20	50.73	45.65	68.25
74	101.77	2.32	0.61	4.15	1.91	6.56	7.33	38.45	4.43	61.30	63.71	36.33	73.34
80	69.70	2.61	0.42	2.43	1.83	10.91	5.29	25.74	0.70	76.75	78.61	23.18	81.95
84	52.67	1.74	0.33	2.20	1.53	8.48	4.01	17.92	0.02	51.89	53.85	14.57	55.79

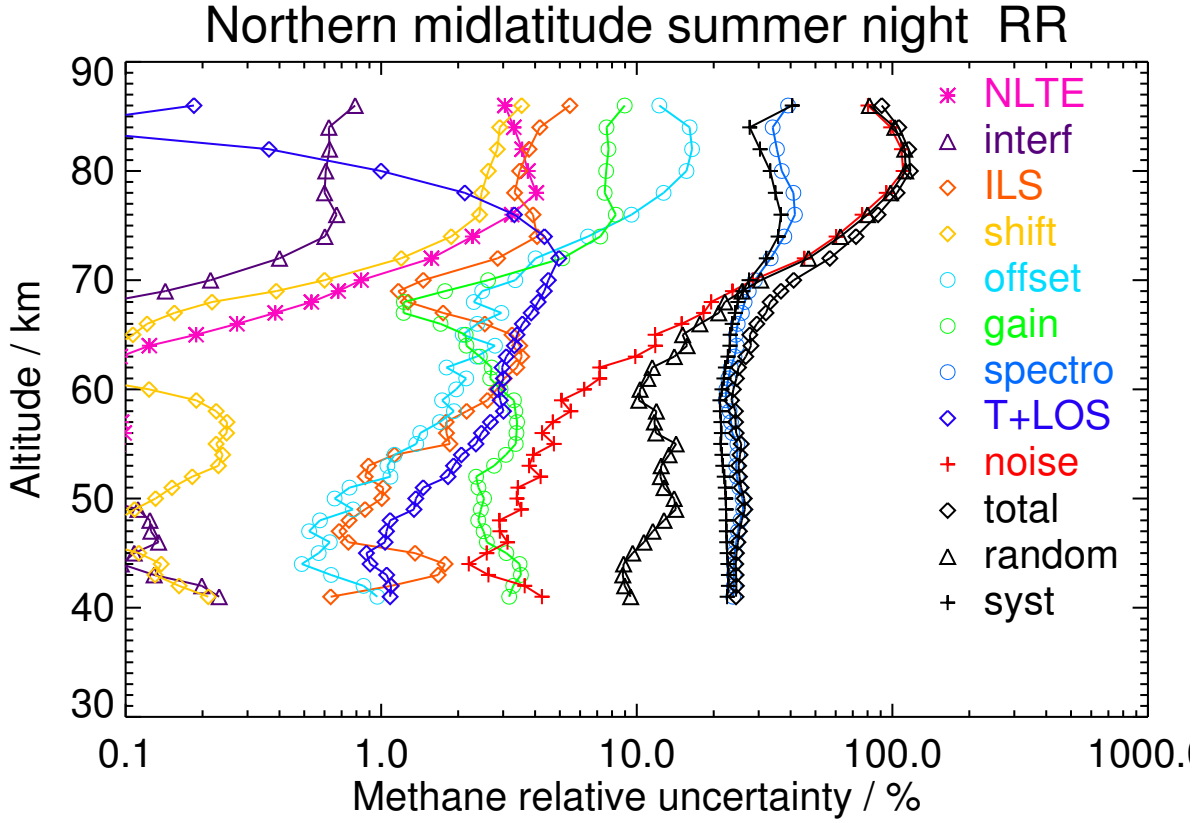

Figure S116. V8R_CH4_662 Northern midlatitude summer night

Table S117. Methane error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	344.37	0.33	0.42	4.08	0.25	2.20	11.80	83.57	3.82	10.27	34.70	77.85	85.23
50	311.22	0.44	0.28	2.01	0.32	2.13	6.34	71.54	5.03	12.44	23.32	69.31	73.13
55	282.33	0.85	0.13	4.07	0.35	3.90	8.55	62.62	7.44	15.01	19.76	62.59	65.63
60	225.87	0.81	0.10	6.10	0.21	4.57	6.56	51.85	6.26	16.23	19.91	51.92	55.61
65	178.00	0.47	0.04	4.89	0.12	3.28	3.31	44.91	5.87	21.81	27.02	42.93	50.72
70	97.10	0.60	0.16	1.22	0.45	3.96	2.62	28.24	4.42	30.72	33.33	25.97	42.25
74	67.72	1.82	0.40	3.09	1.21	6.06	7.87	28.24	4.99	47.13	51.54	22.37	56.19
80	43.71	1.77	0.37	3.03	1.19	7.37	7.82	17.47	3.24	47.85	49.80	15.98	52.30

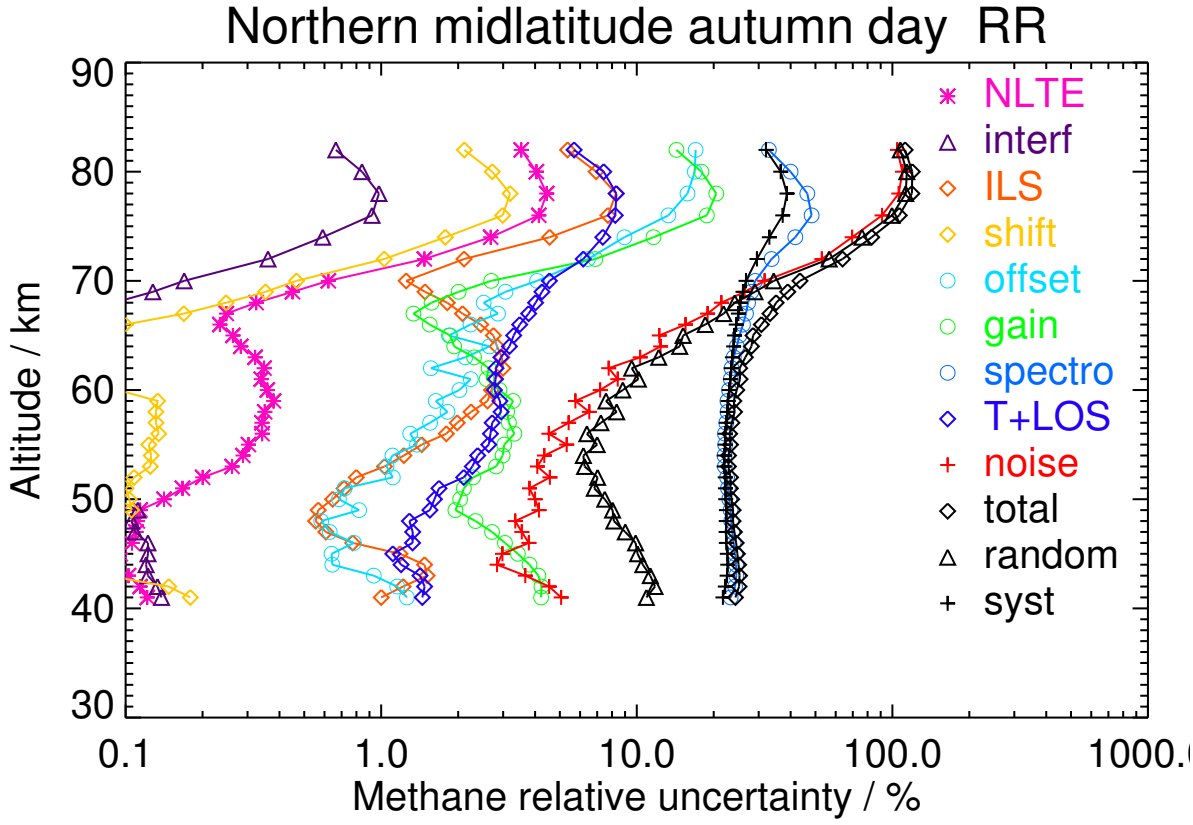

Figure S117. V8R_CH4_662 Northern midlatitude autumn day

Table S118. Methane error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	295.22	0.15	0.36	4.60	0.29	1.96	11.87	80.18	3.45	9.20	41.96	70.22	81.80
50	240.12	0.22	0.16	2.49	0.21	2.04	6.63	57.79	4.20	10.23	23.01	54.65	59.29
55	250.30	0.40	0.09	3.86	0.28	3.39	7.63	56.65	6.50	14.08	21.77	55.33	59.46
60	224.77	0.46	0.10	5.87	0.19	4.11	6.29	51.77	6.62	16.25	22.75	50.61	55.49
65	166.66	0.28	0.06	5.15	0.20	3.51	3.26	42.45	5.63	21.90	27.66	39.97	48.61
70	86.12	0.59	0.21	1.61	0.56	3.53	3.35	26.92	4.04	28.97	32.11	24.01	40.10
74	55.14	1.30	0.39	2.80	1.22	5.87	7.49	26.28	4.21	42.47	47.34	19.31	51.13
80	47.98	1.12	0.26	1.46	0.82	8.39	4.93	17.15	2.83	54.55	56.09	15.18	58.11

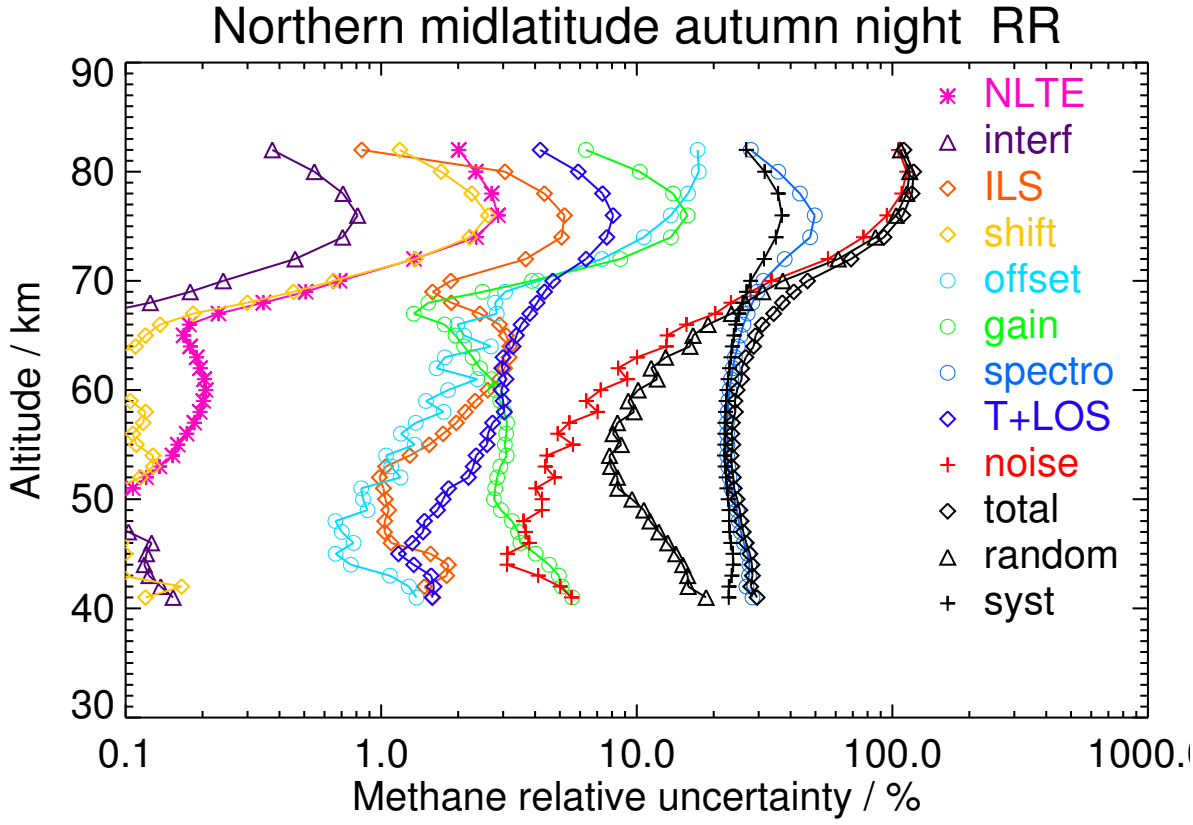

Figure S118. V8R_CH4_662 Northern midlatitude autumn night

Table S119. Methane error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	627.43	0.59	0.81	3.34	2.05	6.44	24.02	144.60	6.44	31.18	42.56	144.04	150.19
45	436.54	0.30	0.70	6.01	0.65	2.33	12.80	101.75	3.98	12.63	23.45	100.92	103.60
50	291.63	0.47	0.24	3.87	0.35	2.17	8.32	66.49	4.60	9.24	17.05	65.78	67.95
55	205.94	0.56	0.17	4.66	0.46	2.84	7.70	46.09	4.84	9.36	13.90	46.17	48.21
60	167.68	0.49	0.13	4.82	0.30	3.26	5.32	38.23	4.15	11.29	13.48	38.56	40.85
65	138.44	0.30	0.05	4.23	0.15	2.86	2.86	33.10	3.71	17.20	18.44	33.16	37.94
70	97.84	0.67	0.17	0.91	0.46	3.54	2.10	26.49	4.07	28.27	29.79	25.47	39.19
74	71.28	2.01	0.46	3.15	1.42	5.93	7.88	27.26	5.30	47.66	50.65	24.31	56.18
80	32.59	1.11	0.28	1.83	0.90	4.57	5.13	11.35	1.82	31.07	32.08	11.01	33.91

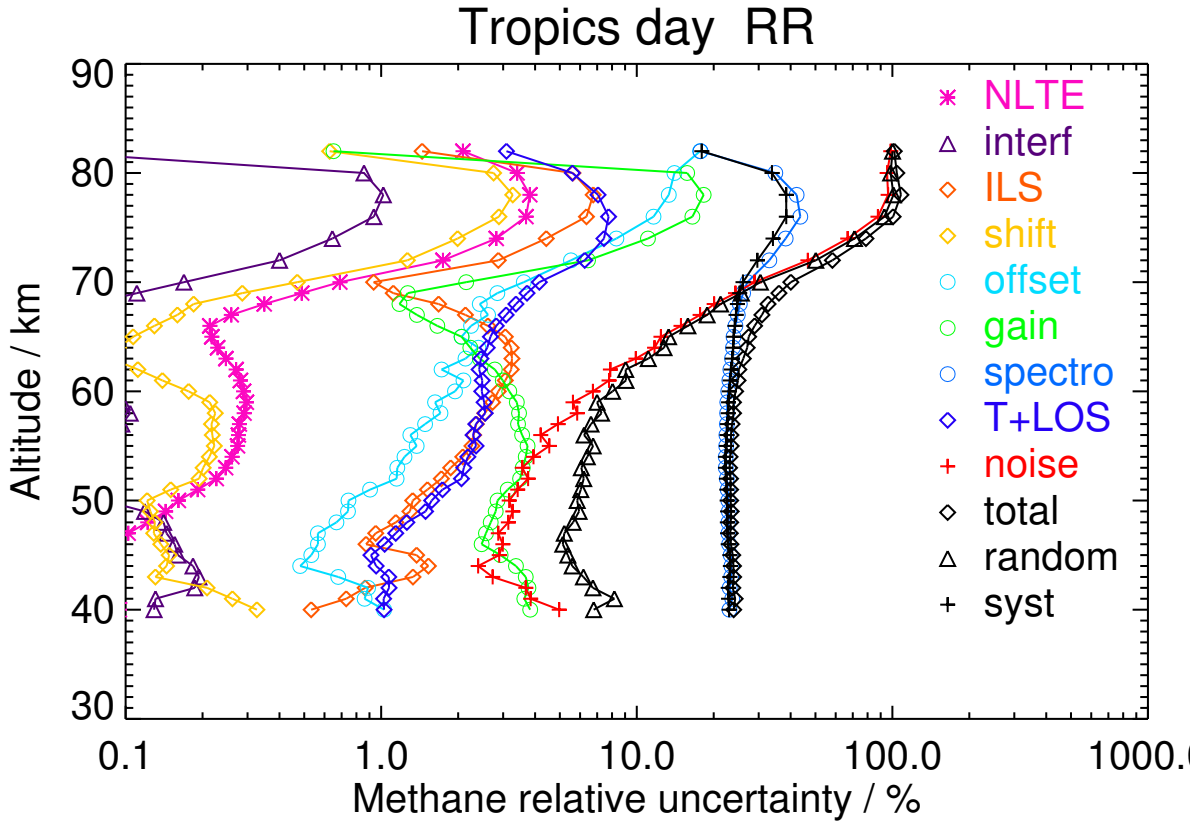

Figure S119. V8R_CH4_662 Tropics day

Table S120. Methane error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	448.33	0.17	0.47	7.17	0.61	2.32	14.81	104.89	4.33	12.27	21.08	104.90	107.00
50	299.42	0.21	0.20	4.32	0.33	2.31	8.54	68.63	4.96	9.32	16.98	68.05	70.14
55	218.45	0.23	0.15	5.19	0.41	2.95	7.81	49.26	5.22	10.21	14.41	49.47	51.53
60	172.76	0.15	0.10	5.28	0.24	2.86	5.01	39.55	4.22	10.64	12.97	39.85	41.91
65	143.20	0.24	0.04	4.65	0.16	3.39	2.76	34.49	4.35	18.68	20.80	34.14	39.98
70	99.86	1.17	0.45	2.93	1.25	3.60	7.38	30.89	5.26	31.38	33.59	30.29	45.23
74	64.66	2.16	0.79	5.75	2.73	6.02	13.44	31.28	6.68	46.59	50.98	29.28	58.79
80	73.01	3.79	0.40	1.32	1.80	10.54	6.70	26.08	7.08	71.80	73.87	24.60	77.85

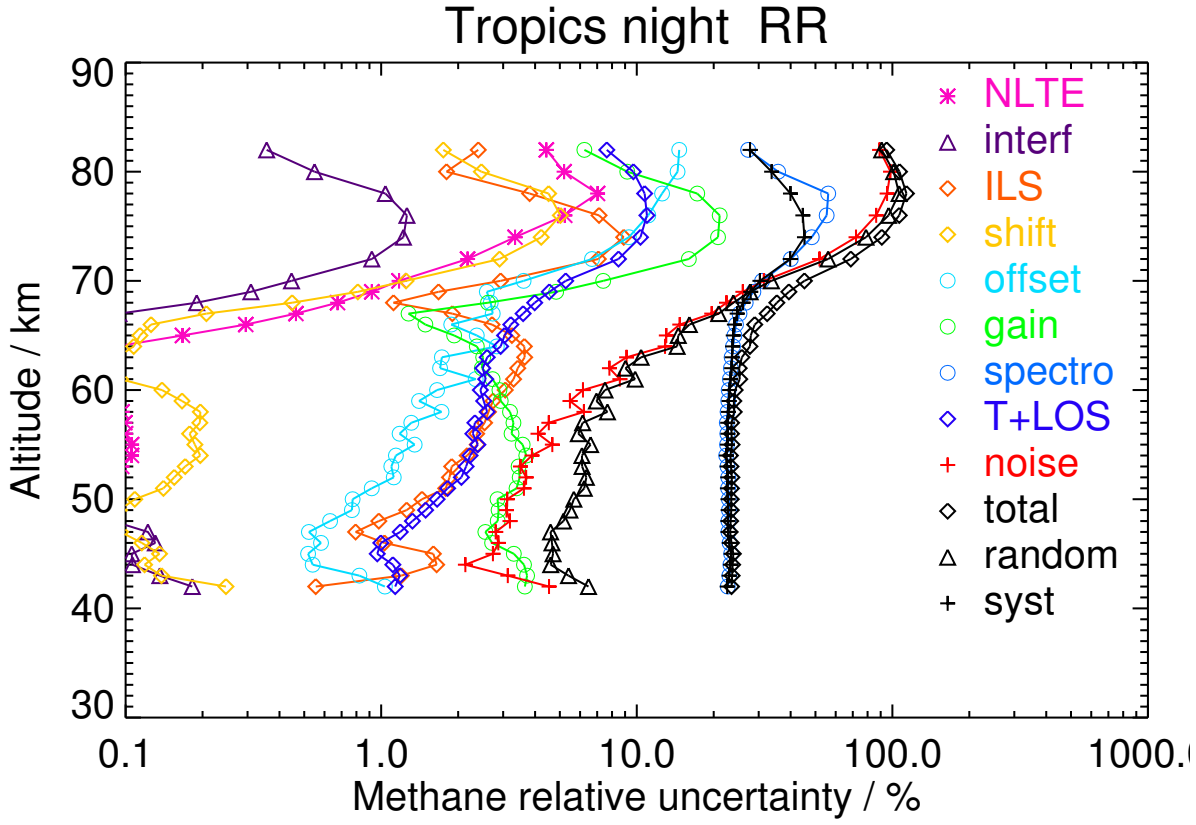

Figure S120. V8R_CH4_662 Tropics night

Table S121. Methane error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	182.34	0.20	0.07	2.49	0.22	1.06	6.14	41.93	2.15	5.29	13.63	40.62	42.85
50	196.97	0.33	0.08	1.69	0.22	1.70	4.62	45.34	3.03	8.38	14.30	44.25	46.50
55	178.21	0.57	0.09	2.70	0.24	2.16	5.16	39.92	4.02	10.85	14.00	39.63	42.03
60	160.29	0.56	0.06	3.34	0.14	2.04	3.50	37.35	3.95	12.53	15.21	36.94	39.95
65	116.28	0.43	0.06	2.98	0.17	2.90	1.89	28.95	3.17	18.99	20.68	28.32	35.07
70	68.55	0.34	0.13	0.99	0.39	3.30	1.57	20.32	2.45	25.17	26.69	18.84	32.67
74	45.67	0.61	0.28	1.71	1.08	5.50	3.77	19.37	2.07	38.05	40.36	15.73	43.32
80	39.15	0.68	0.29	2.34	1.17	7.02	4.27	15.01	1.42	43.43	44.90	13.13	46.78

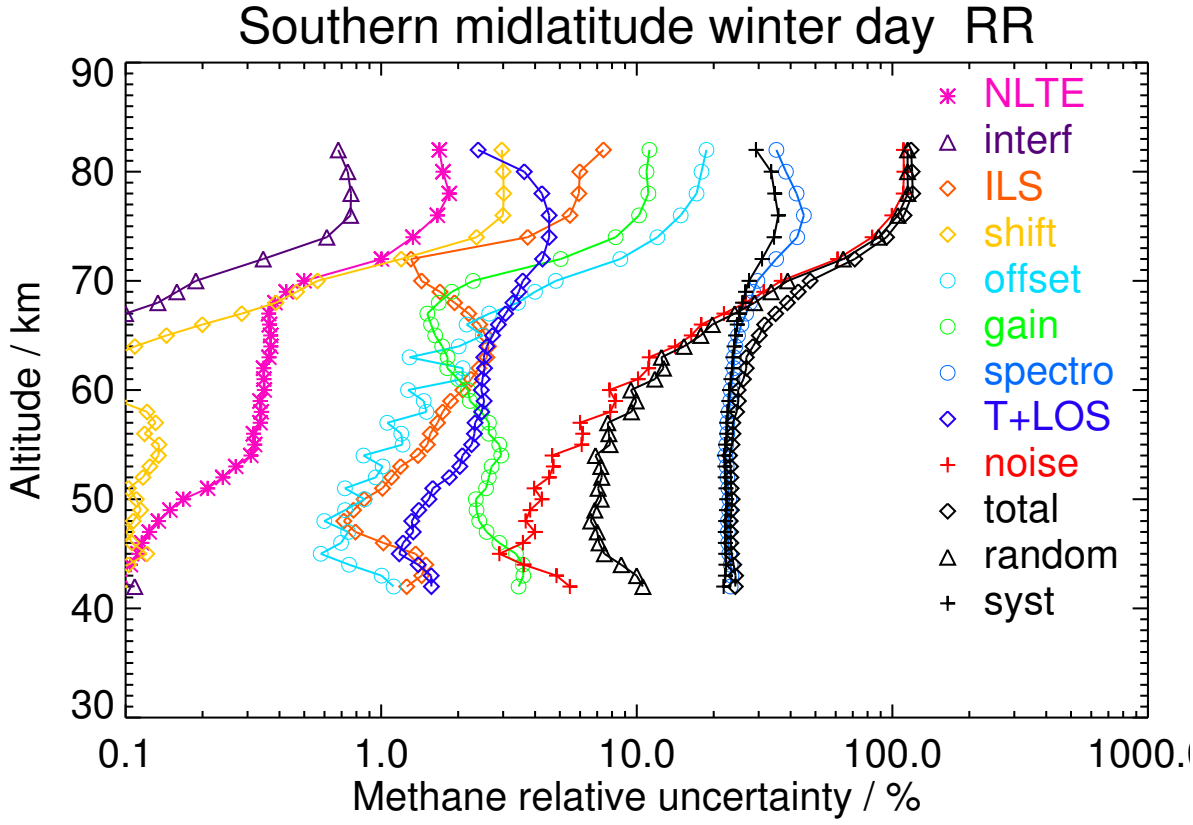

Figure S121. V8R_CH4_662 Southern midlatitude winter day

Table S122. Methane error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	198.38	0.15	0.09	2.57	0.27	1.38	7.48	48.02	2.57	6.51	13.32	47.35	49.19
50	214.64	0.26	0.08	2.28	0.22	1.91	6.58	51.70	3.75	9.19	16.79	50.42	53.14
55	182.38	0.36	0.09	2.72	0.20	2.42	5.45	44.03	4.32	11.71	16.16	43.32	46.24
60	154.39	0.40	0.05	3.48	0.13	2.21	3.36	38.22	3.59	12.28	15.03	37.77	40.65
65	124.87	0.42	0.09	2.84	0.27	2.68	1.62	33.46	3.70	20.10	23.60	31.59	39.44
70	81.11	0.50	0.18	1.12	0.58	3.79	2.91	22.61	3.37	29.02	30.68	21.17	37.27
74	50.56	0.50	0.28	1.20	0.91	6.22	4.63	16.27	2.86	44.05	45.57	14.12	47.71
80	39.48	0.42	0.27	1.53	0.83	6.25	4.67	11.59	1.85	41.86	42.86	10.83	44.21

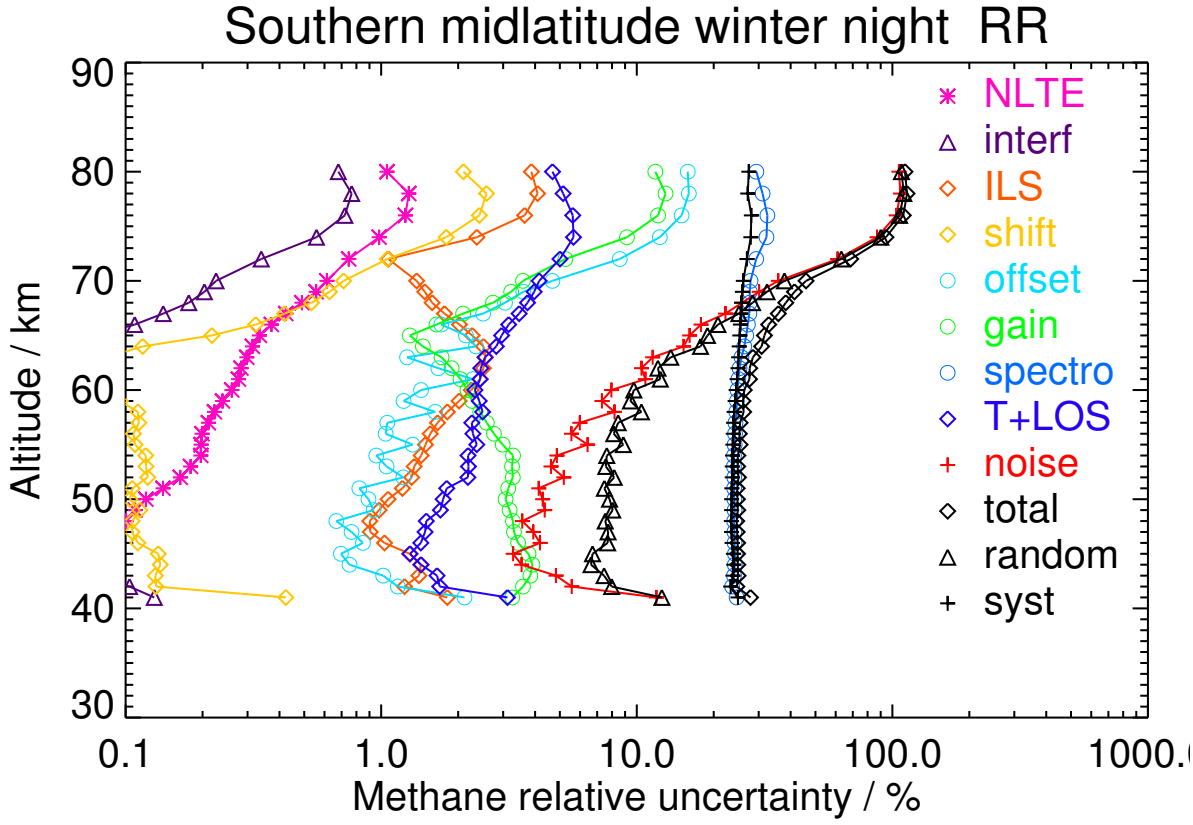

Figure S122. V8R_CH4_662 Southern midlatitude winter night

Table S123. Methane error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	262.78	0.24	0.21	3.43	0.28	1.42	8.33	60.75	2.66	6.77	10.95	60.89	61.86
50	270.91	0.37	0.21	2.34	0.29	2.06	6.00	62.27	4.12	9.77	13.80	62.01	63.53
55	241.72	0.66	0.09	3.97	0.34	2.98	6.97	53.37	5.50	10.96	14.40	53.53	55.43
60	212.92	0.75	0.14	5.93	0.33	3.31	6.31	47.34	5.46	11.96	15.23	47.63	50.01
65	160.71	0.43	0.03	5.11	0.17	3.70	2.81	38.66	4.29	20.04	21.98	38.46	44.30
70	86.66	0.50	0.16	1.09	0.50	2.98	2.33	25.33	3.09	27.03	28.64	24.04	37.39
74	48.81	1.14	0.35	3.13	1.11	4.95	6.39	19.49	3.09	37.77	39.34	18.61	43.52
80	35.28	1.62	0.51	5.03	1.79	5.79	9.14	18.23	2.34	36.83	39.72	16.29	42.93

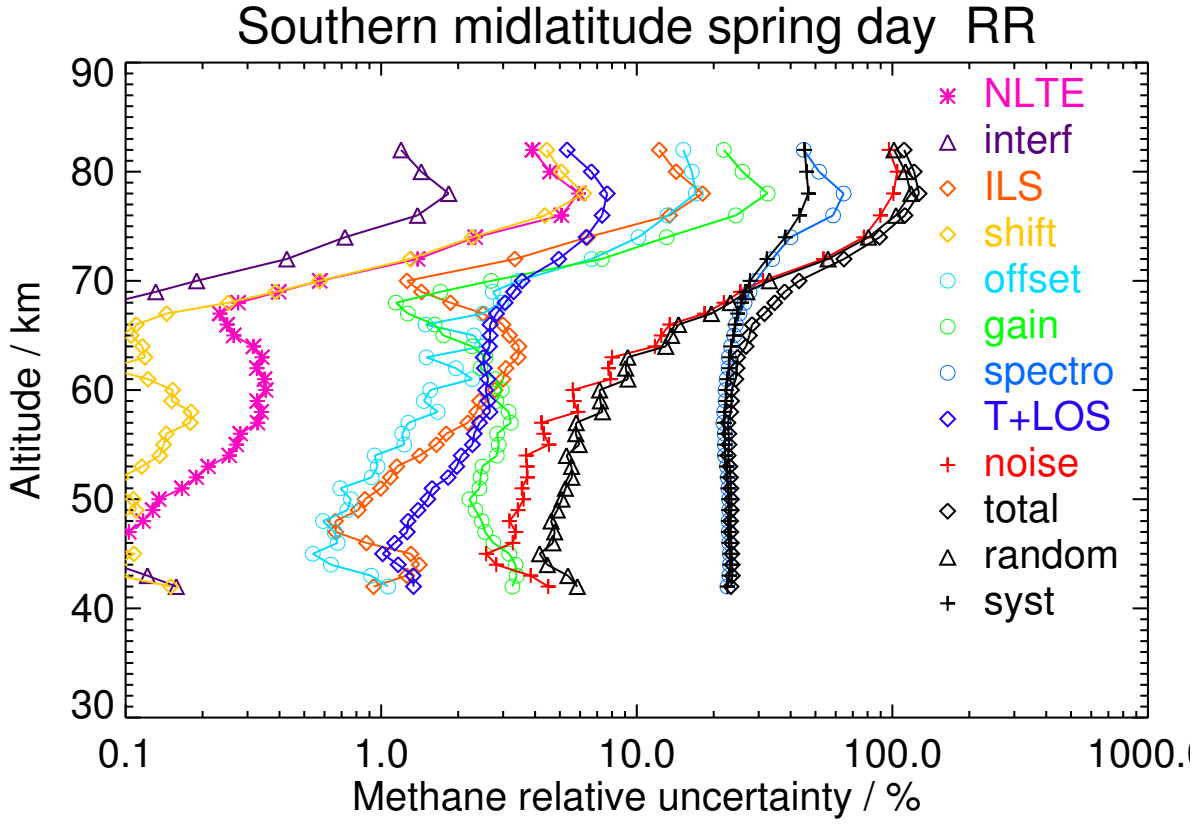

Figure S123. V8R_CH4_662 Southern midlatitude spring day

Table S124. Methane error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	260.93	0.12	0.17	3.82	0.30	1.40	8.71	60.85	2.60	6.51	9.33	61.29	62.00
50	255.58	0.19	0.19	2.40	0.28	1.75	5.69	58.32	3.77	8.62	11.88	58.22	59.42
55	242.49	0.39	0.12	4.65	0.37	3.12	7.57	53.78	5.86	11.38	14.38	54.21	56.08
60	214.48	0.42	0.15	6.62	0.31	3.61	6.50	48.11	5.81	12.56	15.32	48.69	51.04
65	166.07	0.25	0.05	5.87	0.21	3.58	3.25	40.64	5.15	19.69	23.09	39.88	46.09
70	86.97	0.55	0.20	0.99	0.58	3.09	2.83	26.25	3.85	27.98	30.28	24.27	38.81
74	52.11	0.96	0.38	3.37	1.15	4.94	6.63	21.29	3.91	38.39	40.65	19.28	45.00
80	43.07	1.89	0.50	4.78	1.94	6.53	8.94	22.24	3.08	44.79	48.36	18.02	51.61
84	32.51	0.76	0.27	2.79	1.10	5.81	4.96	13.03	1.21	33.28	33.84	14.20	36.70

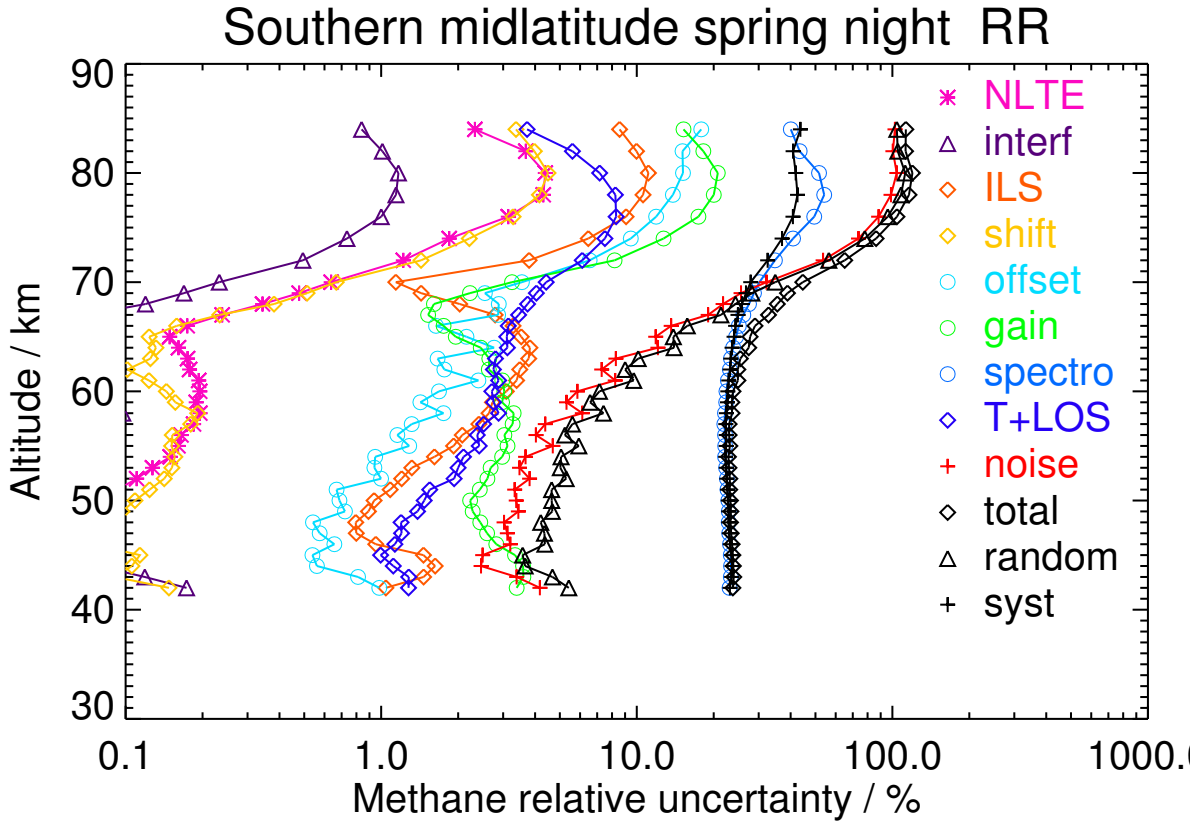

Figure S124. V8R_CH4_662 Southern midlatitude spring night

Table S125. Methane error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	206.61	0.17	0.16	4.49	0.41	1.15	7.11	49.43	1.73	5.66	18.16	47.12	50.50
50	132.21	0.13	0.10	1.70	0.13	0.80	2.53	32.87	1.51	4.21	14.11	30.19	33.33
55	152.08	0.34	0.07	2.00	0.45	2.01	4.17	39.33	2.93	6.32	22.15	33.63	40.27
60	178.23	0.52	0.17	6.01	0.37	3.01	5.75	41.77	4.13	9.22	19.94	39.09	43.88
65	128.82	0.26	0.03	4.26	0.12	3.34	2.22	32.04	3.33	16.06	19.55	30.78	36.46
70	108.09	0.52	0.11	1.38	0.33	3.38	1.43	28.59	3.21	29.48	31.26	27.11	41.38
74	95.16	1.91	0.46	3.09	1.28	6.22	4.74	32.89	2.49	50.19	52.94	29.66	60.69
80	70.98	3.91	0.99	6.74	3.27	9.47	10.61	35.38	0.10	69.00	72.50	32.13	79.30
84	67.66	4.18	0.90	5.74	3.19	10.32	9.13	28.60	0.22	67.88	70.59	26.37	75.35

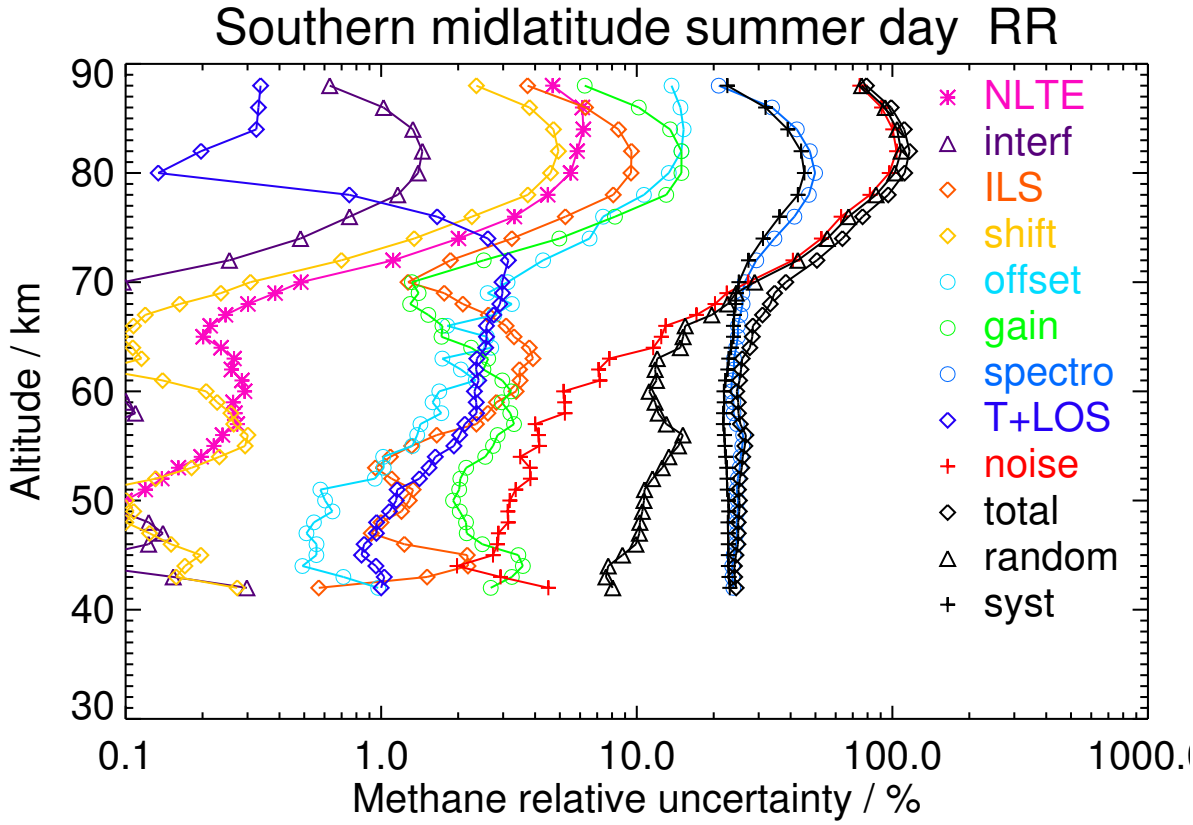

Figure S125. V8R_CH4_662 Southern midlatitude summer day

Table S126. Methane error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	268.32	0.12	0.23	5.09	0.49	1.58	10.45	69.71	2.48	7.02	31.76	63.59	71.08
50	202.24	0.19	0.10	3.49	0.60	2.10	8.45	56.84	3.25	6.50	34.16	46.96	58.07
55	179.43	0.19	0.16	4.63	0.56	2.94	8.25	46.70	4.37	8.26	26.84	40.58	48.65
60	170.93	0.14	0.13	5.29	0.28	3.06	5.42	40.65	4.43	10.08	17.02	39.38	42.90
65	172.43	0.23	0.05	5.75	0.21	4.33	3.19	42.93	5.49	21.08	25.75	41.43	48.78
70	125.76	0.93	0.26	1.63	0.64	3.74	2.92	34.80	5.34	35.56	38.47	32.41	50.30
74	104.59	2.44	0.67	4.13	1.86	6.97	8.11	36.18	4.46	59.21	62.89	31.95	70.54
80	61.69	2.71	0.48	2.42	1.55	10.17	5.98	20.94	0.40	67.80	69.50	18.98	72.04
84	55.31	2.34	0.34	1.75	1.19	9.72	4.06	14.37	0.05	57.10	58.30	13.78	59.91

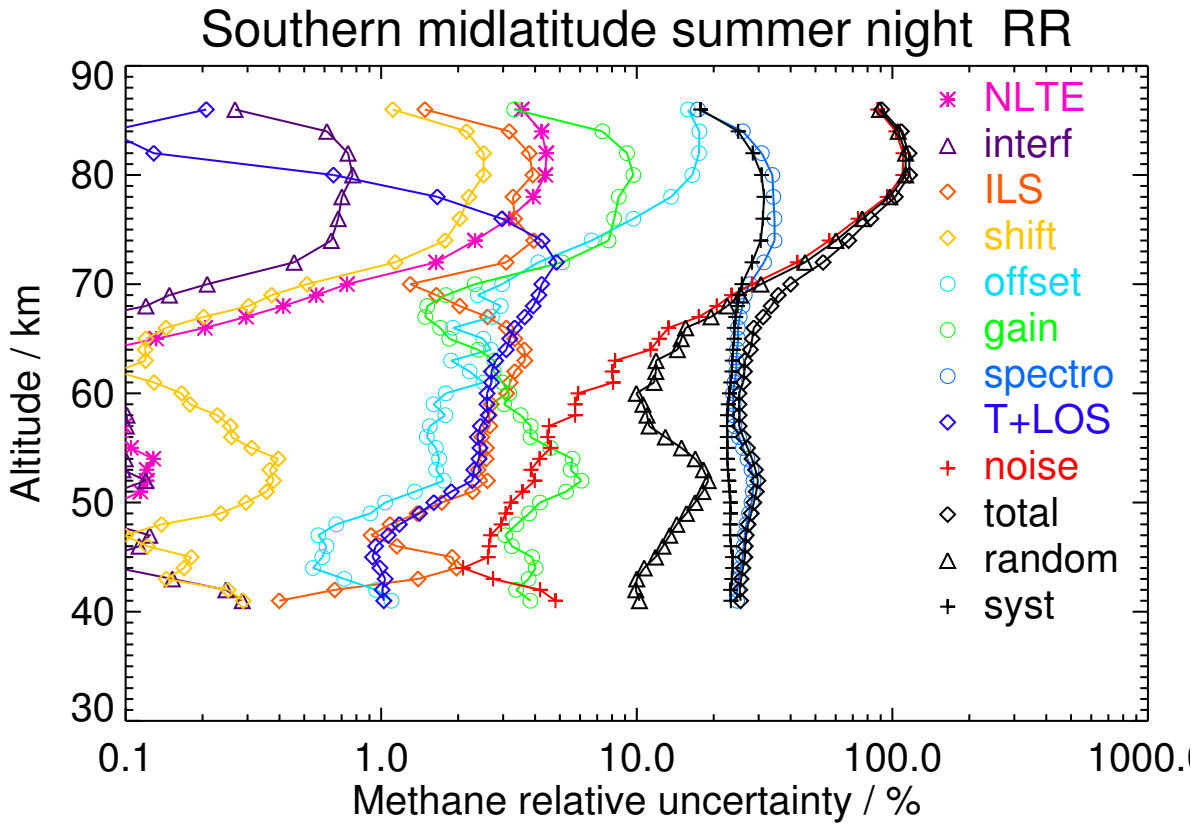

Figure S126. V8R_CH4_662 Southern midlatitude summer night

Table S127. Methane error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	306.08	0.40	0.27	4.56	0.30	2.18	13.67	82.30	4.11	9.81	41.94	73.08	84.26
50	292.80	0.58	0.15	2.50	0.30	3.00	8.60	70.07	5.59	13.83	26.73	67.14	72.27
55	283.20	1.03	0.12	3.52	0.27	3.88	9.91	63.31	8.05	15.49	21.52	63.06	66.63
60	230.78	0.91	0.11	5.14	0.21	3.37	7.00	53.50	7.46	16.57	21.32	53.16	57.27
65	124.32	0.36	0.05	3.64	0.15	3.28	2.17	33.03	3.96	19.79	23.83	30.98	39.08
70	46.44	0.22	0.07	1.11	0.19	2.57	1.48	13.09	1.57	17.76	18.82	12.04	22.34
74	39.85	1.23	0.18	1.26	0.50	4.59	3.89	17.54	2.17	30.89	34.28	11.44	36.14
80	40.91	1.42	0.32	2.77	1.13	6.72	7.49	15.24	3.08	43.56	44.90	15.34	47.45

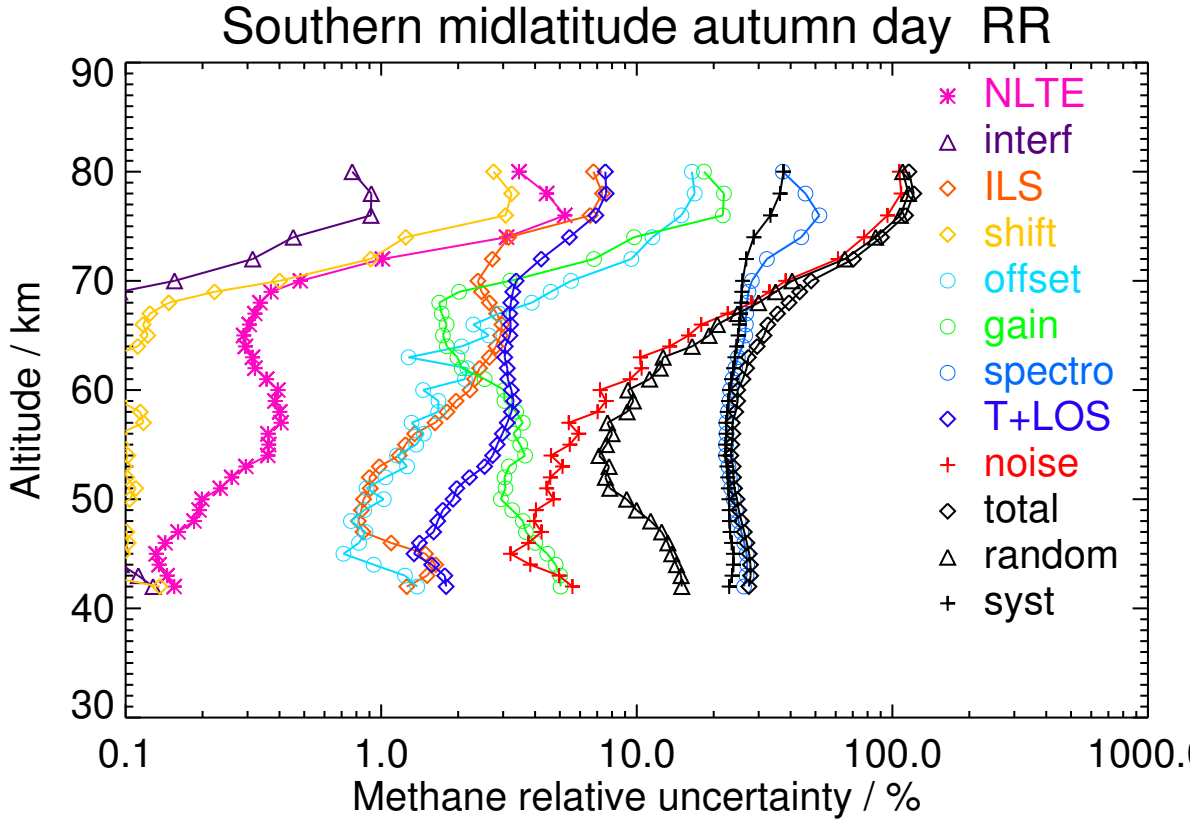

Figure S127. V8R_CH4_662 Southern midlatitude autumn day

Table S128. Methane error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	402.04	0.18	0.36	5.55	0.31	2.35	15.07	96.15	4.70	11.10	38.02	90.60	98.25
50	349.56	0.28	0.20	2.71	0.27	3.16	9.21	79.22	6.48	14.37	25.32	77.36	81.40
55	309.98	0.53	0.17	4.97	0.32	4.61	11.72	67.57	9.64	17.51	22.66	68.08	71.76
60	256.62	0.41	0.15	6.54	0.24	4.20	8.17	58.18	9.20	18.84	23.51	58.30	62.86
65	142.44	0.35	0.11	3.81	0.30	3.60	2.08	37.51	5.20	23.27	26.92	35.81	44.80
70	55.90	0.24	0.09	1.04	0.22	3.09	1.51	16.02	2.41	21.81	22.87	15.11	27.41
74	35.53	0.48	0.21	1.54	0.59	4.69	4.37	13.08	2.39	30.97	32.61	10.79	34.35
80	34.40	0.75	0.32	2.57	0.94	5.86	7.39	11.85	2.91	35.86	37.41	11.50	39.14

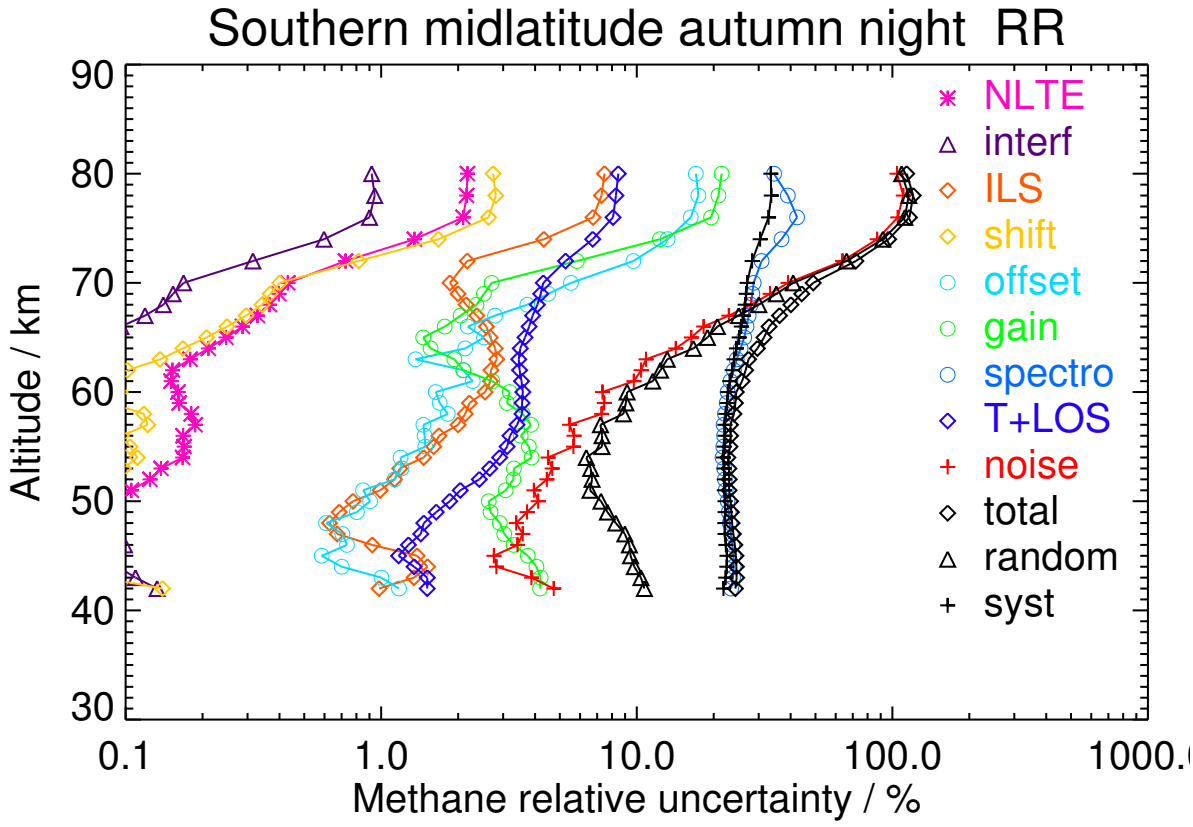

Figure S128. V8R_CH4_662 Southern midlatitude autumn night

Table S129. Methane error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	195.99	0.21	0.07	2.78	0.38	1.08	5.56	45.35	2.35	5.19	9.67	45.12	46.15
50	171.05	0.24	0.07	2.09	0.29	1.16	3.39	40.42	2.29	6.11	8.87	40.19	41.16
55	141.72	0.40	0.06	2.41	0.24	1.16	3.08	32.59	2.17	6.90	9.04	32.40	33.64
60	116.49	0.45	0.04	2.85	0.14	1.05	2.13	27.58	2.09	8.67	10.50	27.28	29.23
65	82.13	0.43	0.03	2.24	0.11	2.08	1.21	20.52	1.62	14.32	15.48	20.00	25.29
70	50.45	0.22	0.11	0.68	0.45	2.69	1.22	15.72	1.34	19.61	20.76	14.55	25.36
74	47.85	0.48	0.31	2.39	1.35	5.17	4.08	24.05	2.01	36.71	40.73	17.94	44.51
80	217.34	14.53	2.11	9.42	9.33	19.63	20.42	171.87	11.11	148.18	211.76	89.28	229.81
84	258.41	7.28	0.40	1.82	1.94	29.27	3.08	65.18	9.23	210.90	213.13	65.68	223.02

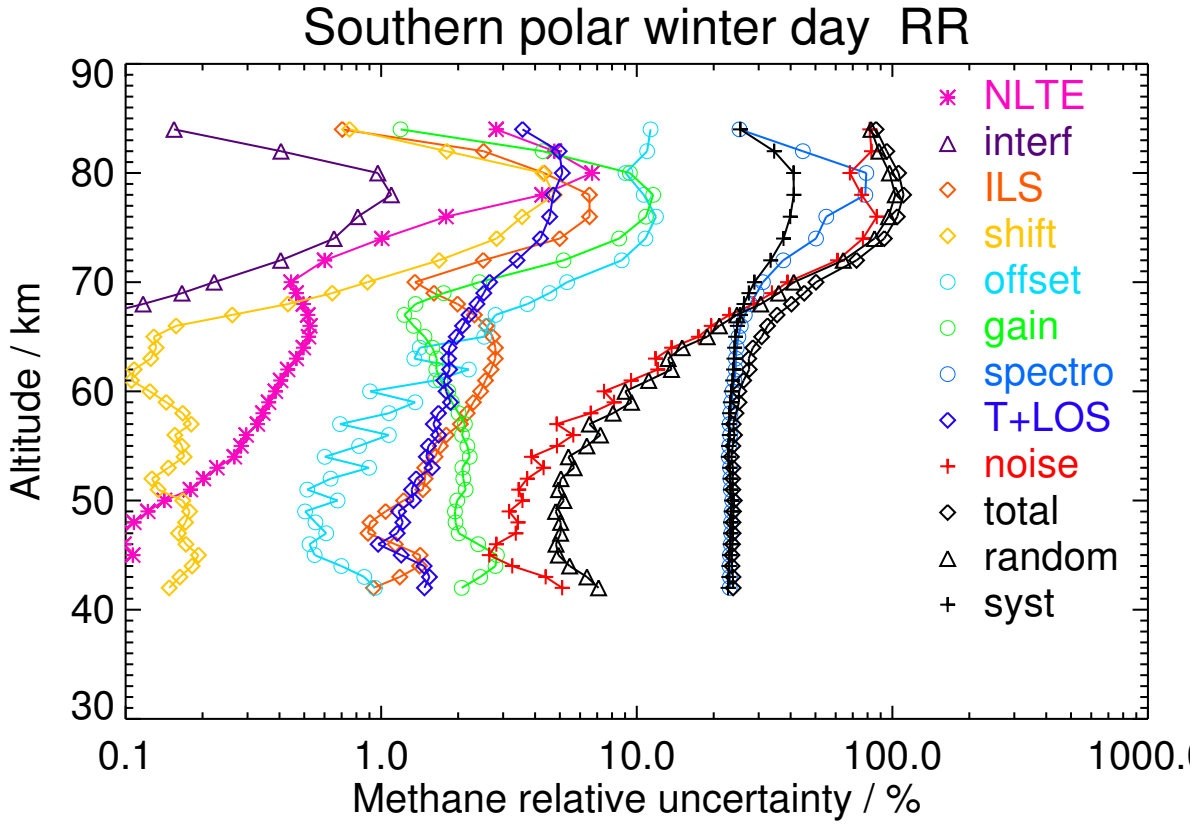

Figure S129. V8R_CH4_662 Southern polar winter day

Table S130. Methane error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	128.79	0.15	0.04	1.68	0.21	0.72	3.46	29.66	1.67	3.94	5.79	29.66	30.22
50	122.94	0.18	0.04	1.08	0.13	1.01	2.44	29.69	1.72	6.19	8.46	29.32	30.51
55	102.04	0.28	0.02	1.40	0.11	0.99	1.84	25.54	1.56	7.12	9.99	24.73	26.68
60	82.54	0.38	0.02	1.84	0.09	0.90	1.40	21.06	1.40	8.13	10.10	20.40	22.76
65	54.27	0.41	0.04	1.24	0.05	1.55	0.76	14.81	1.07	11.25	12.65	13.84	18.75
70	39.64	0.40	0.10	0.49	0.35	2.75	0.70	12.53	1.11	17.16	18.47	10.97	21.48
74	33.87	0.47	0.17	0.98	0.69	4.99	1.58	12.44	1.32	31.31	32.60	10.14	34.14
80	25.49	0.27	0.06	0.07	0.23	4.86	0.46	5.59	0.82	27.62	28.06	5.62	28.61

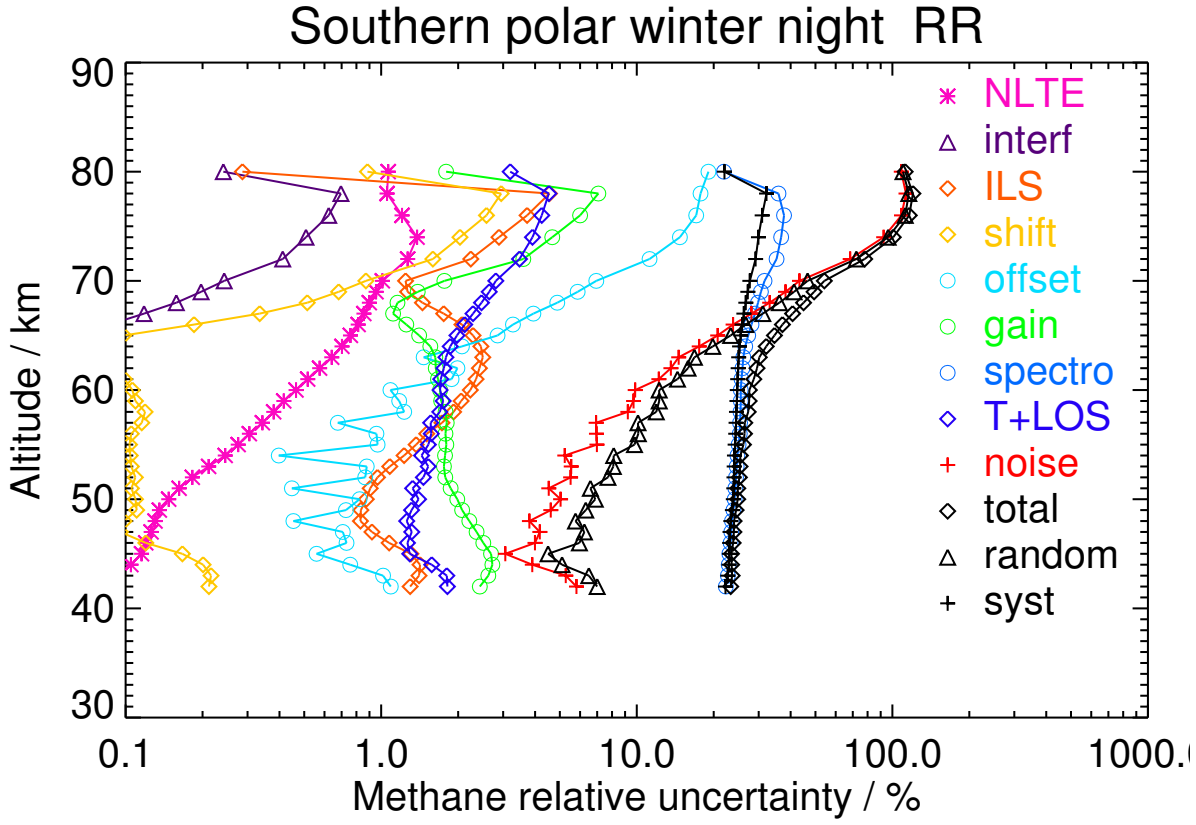

Figure S130. V8R_CH4_662 Southern polar winter night

Table S131. Methane error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	234.96	0.15	0.09	3.72	0.30	1.13	7.17	53.44	2.10	5.28	7.38	53.85	54.35
50	238.69	0.21	0.16	2.52	0.32	1.42	4.61	54.14	3.02	6.60	8.90	54.17	54.89
55	223.80	0.35	0.07	4.25	0.45	2.26	5.83	49.32	4.06	8.08	9.93	49.73	50.71
60	210.07	0.42	0.15	6.70	0.47	2.92	6.33	46.05	4.65	9.21	11.28	46.84	48.17
65	195.58	0.30	0.06	7.51	0.23	4.92	4.30	45.64	4.98	19.96	21.94	46.09	51.05
70	146.62	0.81	0.10	2.69	0.42	4.09	2.26	37.63	4.76	34.23	36.25	36.42	51.39
74	96.53	2.42	0.40	4.29	1.72	5.98	6.66	34.08	4.20	52.94	55.15	32.38	63.95
80	62.31	4.16	0.56	6.08	2.79	7.85	9.49	30.16	2.46	57.95	61.93	25.54	66.99
84	128.09	22.43	0.53	5.11	3.60	14.36	8.96	61.00	3.76	93.37	108.39	39.17	115.25

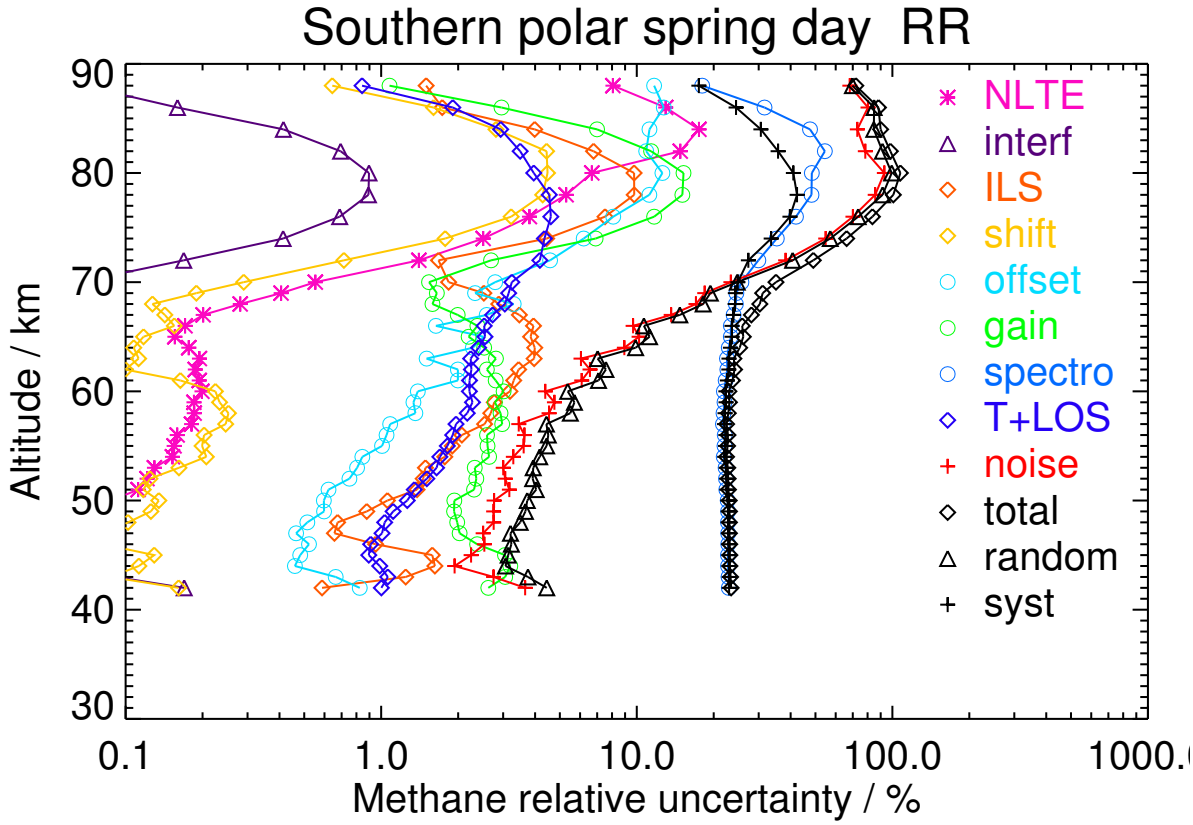

Figure S131. V8R_CH4_662 Southern polar spring day

Table S132. Methane error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	265.66	0.15	0.13	4.01	0.37	1.53	10.14	64.17	2.87	6.57	10.20	64.70	65.50
50	267.20	0.20	0.20	2.98	0.44	1.81	6.51	62.69	3.92	8.48	13.52	62.37	63.81
55	248.80	0.33	0.13	4.57	0.46	3.18	8.45	56.32	5.84	11.63	15.86	56.51	58.69
60	216.73	0.33	0.14	6.47	0.34	3.49	6.97	50.16	6.10	13.05	17.36	50.25	53.17
65	160.58	0.43	0.07	4.95	0.28	3.99	2.42	40.40	5.19	22.54	25.63	39.46	47.05
70	85.84	0.83	0.20	1.03	0.66	3.16	3.41	24.83	3.96	28.69	30.31	23.67	38.46
74	47.77	1.17	0.29	2.29	1.08	5.10	5.74	17.47	3.26	37.68	39.36	15.92	42.46
80	44.18	2.43	0.57	5.45	2.57	7.34	11.48	19.45	2.70	48.06	51.70	15.83	54.07
84	51.96	1.97	0.42	4.10	1.95	6.39	8.65	12.90	1.72	40.87	41.48	16.10	44.50

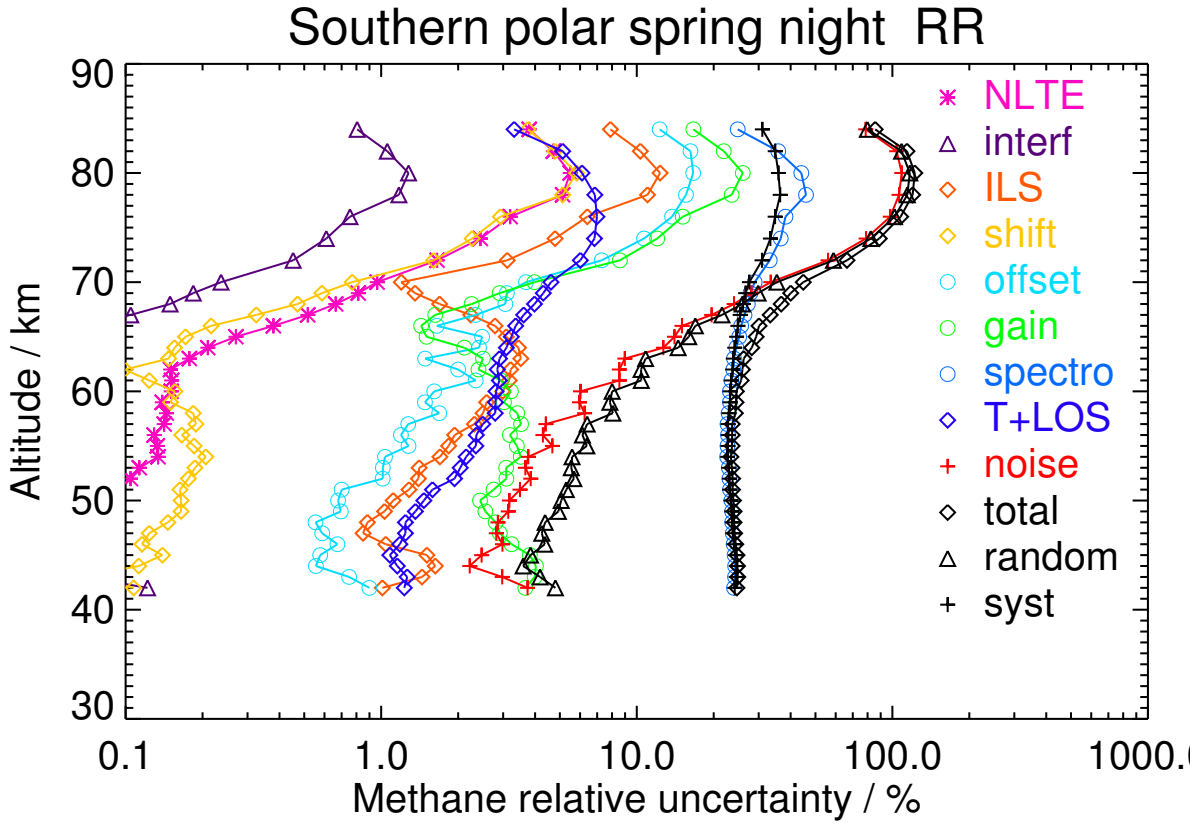

Figure S132. V8R_CH4_662 Southern polar spring night

Table S133. Methane error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	209.26	0.16	0.16	6.05	0.73	1.20	7.28	49.04	1.67	7.07	8.77	49.72	50.49
50	95.95	0.05	0.06	0.80	0.14	0.43	0.96	22.59	0.82	2.64	3.27	22.56	22.80
55	91.96	0.06	0.03	1.16	0.13	0.73	1.38	21.28	1.05	3.16	4.09	21.24	21.63
60	109.18	0.09	0.06	2.58	0.33	1.19	2.22	24.96	1.69	4.31	5.93	24.94	25.64
65	131.79	0.15	0.06	4.57	0.09	3.32	2.65	31.18	2.54	11.89	13.44	31.28	34.05
70	149.79	0.58	0.15	5.16	0.41	4.97	3.28	36.23	3.35	28.42	30.50	35.55	46.84
74	120.51	1.64	0.44	4.53	1.11	7.31	3.94	36.26	2.03	53.11	55.60	33.80	65.06
80	132.15	6.56	0.95	7.39	3.81	8.50	8.07	45.24	1.06	78.66	81.20	43.51	92.12
84	131.99	12.08	0.75	4.51	4.68	14.89	6.68	43.22	1.74	102.19	106.11	38.85	113.00

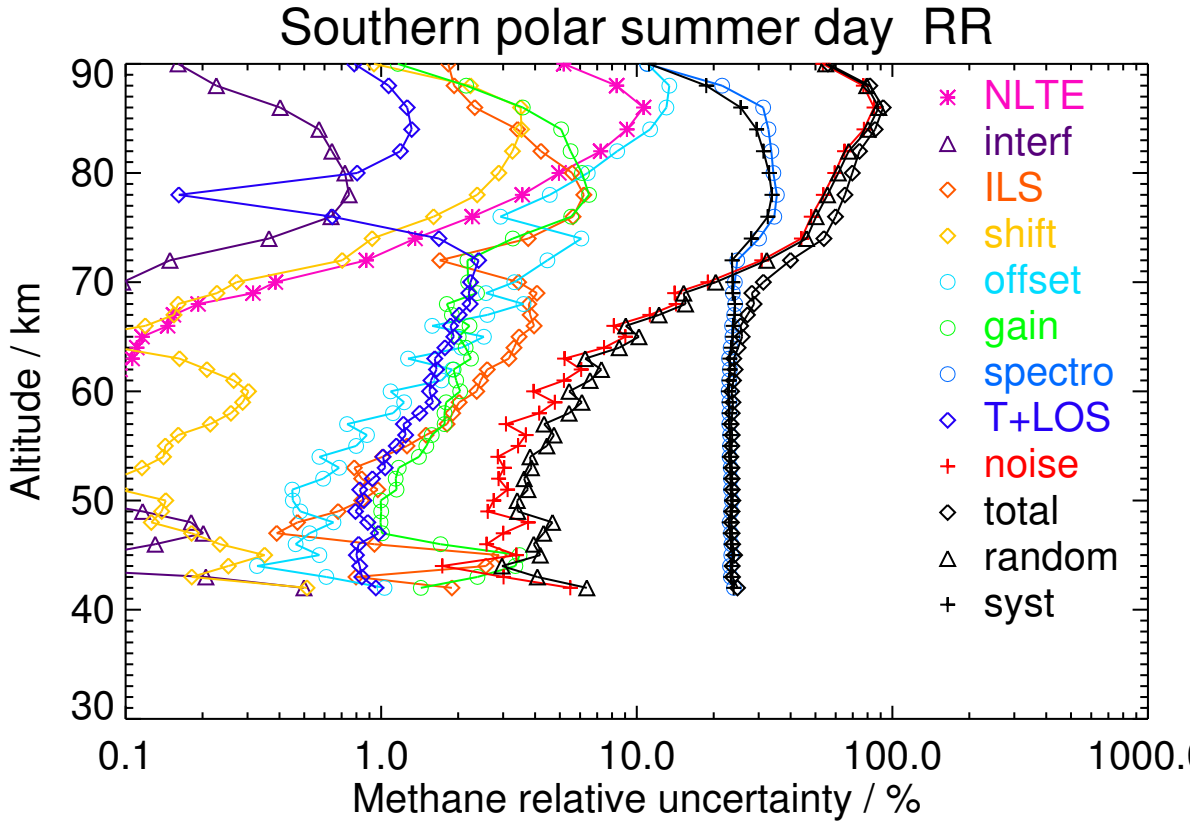

Figure S133. V8R_CH4_662 Southern polar summer day

Table S134. Methane error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	93.69	0.04	0.03	2.43	0.18	0.52	3.28	21.84	0.70	2.49	3.83	22.04	22.37
50	57.73	0.03	0.01	0.74	0.06	0.47	0.97	13.95	0.55	2.55	3.54	13.80	14.25
55	67.42	0.05	0.02	0.76	0.08	0.72	1.10	16.40	0.94	3.95	5.77	15.95	16.96
60	96.20	0.13	0.06	2.51	0.11	1.33	2.09	25.14	1.84	6.82	13.22	22.80	26.36
65	144.78	0.14	0.04	4.63	0.15	4.00	2.42	35.79	3.85	18.72	22.17	34.61	41.11
70	123.59	0.44	0.19	1.63	0.38	3.23	1.12	31.46	4.48	33.42	34.48	30.86	46.27
74	102.05	1.73	0.82	3.81	1.74	6.42	5.30	33.55	3.60	58.55	60.82	30.94	68.24
80	93.71	5.99	1.07	4.30	2.54	11.69	6.96	38.44	0.62	82.60	87.98	28.44	92.46
84	99.82	7.08	0.99	4.09	2.41	14.66	6.71	34.17	0.09	94.43	98.63	26.28	102.07

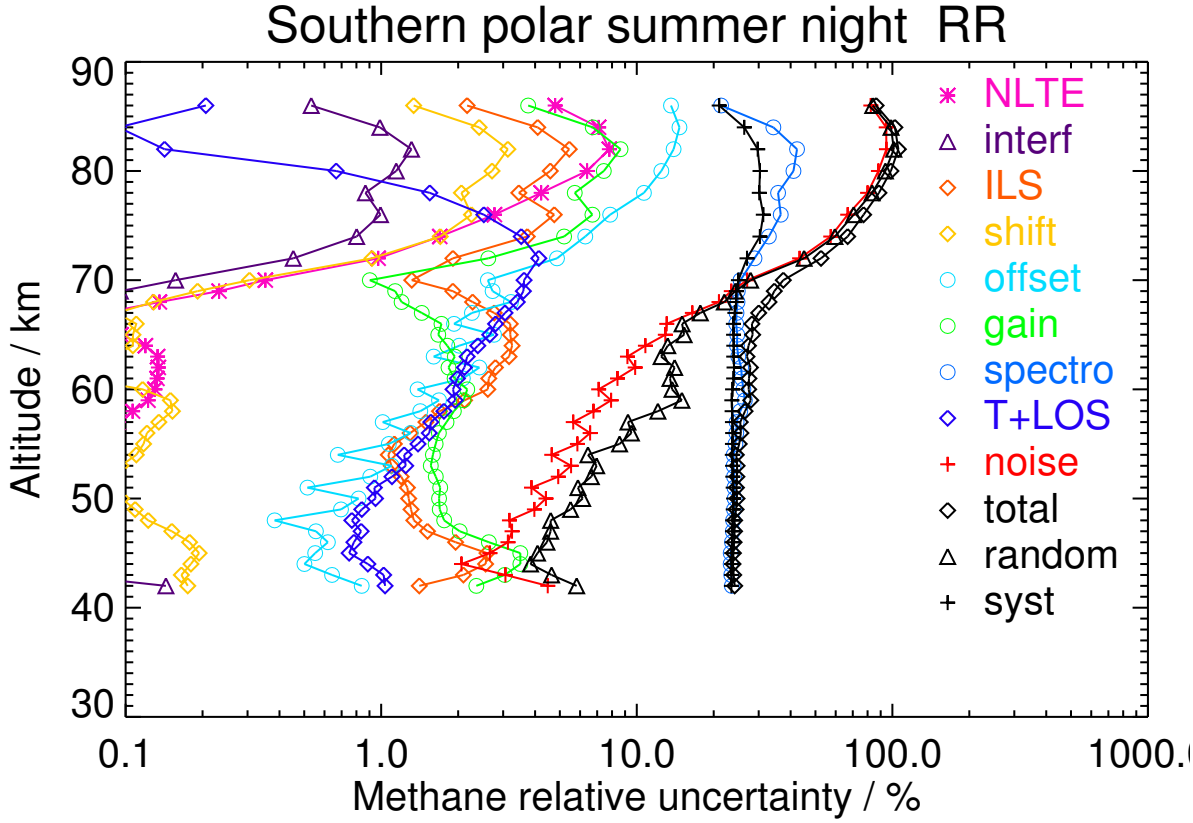

Figure S134. V8R_CH4_662 Southern polar summer night

Table S135. Methane error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	86.21	0.07	0.03	0.89	0.15	0.81	2.57	21.12	1.45	5.14	9.70	19.71	21.97
50	154.95	0.23	0.04	1.08	0.19	1.51	3.08	35.99	2.60	8.21	12.05	35.18	37.18
55	197.82	0.49	0.04	2.25	0.23	1.54	3.65	45.34	3.64	9.58	12.38	45.04	46.71
60	149.27	0.55	0.03	3.35	0.10	1.62	2.75	36.13	3.20	10.96	15.59	34.84	38.17
65	85.25	0.37	0.04	2.29	0.08	2.24	1.12	22.65	2.09	15.46	17.57	21.44	27.72
70	42.57	0.18	0.06	0.72	0.18	2.68	0.36	12.86	1.26	17.84	18.78	11.85	22.21
74	36.29	0.33	0.11	0.45	0.42	4.48	0.77	18.28	1.48	27.85	31.79	11.05	33.66
80	50.94	0.18	0.15	0.30	0.62	8.22	1.53	19.88	1.94	51.06	53.14	15.91	55.47

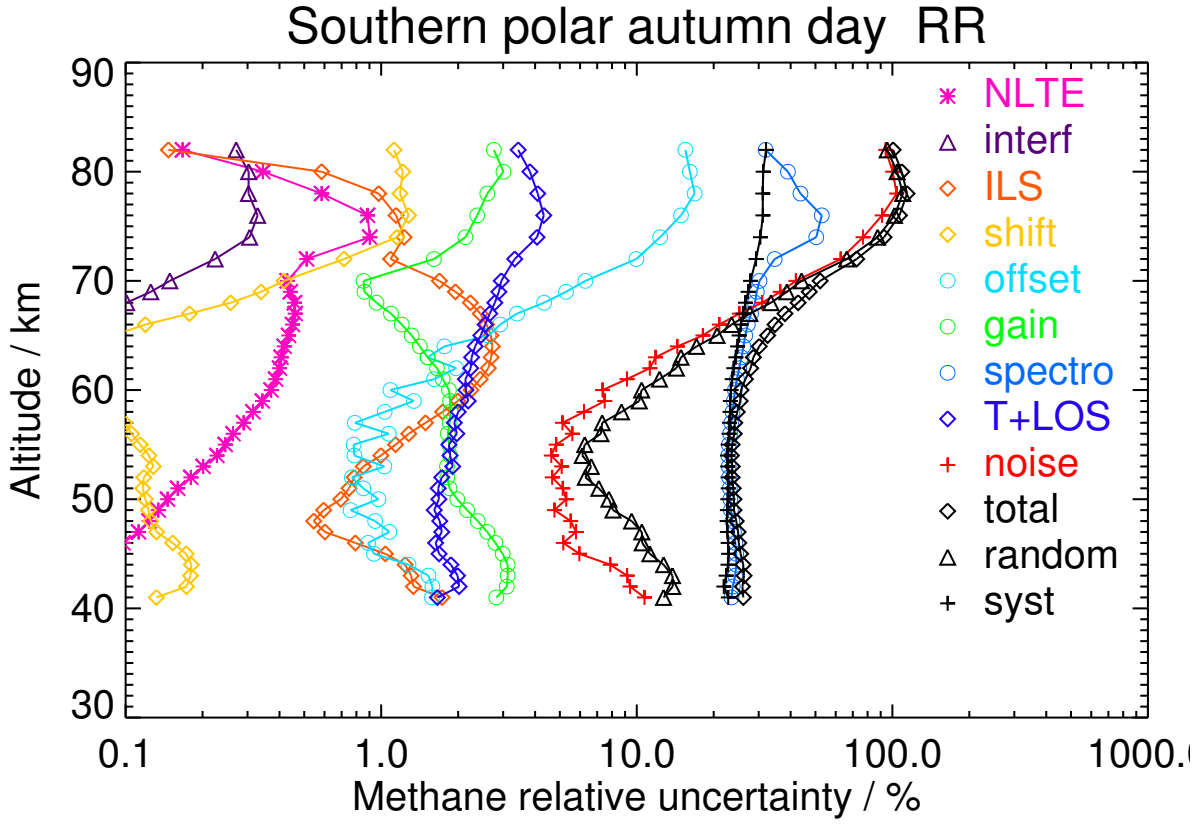

Figure S135. V8R_CH4_662 Southern polar autumn day

Table S136. Methane error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	111.77	0.09	0.03	0.90	0.20	1.02	3.22	26.35	2.12	5.52	8.53	25.86	27.23
50	192.83	0.24	0.03	1.80	0.22	1.88	4.28	44.79	3.37	9.70	11.42	44.79	46.23
55	148.98	0.32	0.02	1.96	0.13	1.17	2.97	36.18	2.77	8.53	11.14	35.77	37.47
60	80.84	0.29	0.02	1.99	0.06	0.85	1.74	22.18	1.74	7.62	12.44	20.15	23.68
65	40.75	0.20	0.04	1.10	0.06	1.48	0.47	12.01	0.96	9.69	11.56	10.45	15.58
70	21.14	0.10	0.05	0.34	0.11	1.84	0.29	6.26	0.62	10.43	10.96	5.66	12.33
74	23.01	0.16	0.09	0.13	0.27	3.91	0.85	7.66	0.88	22.11	22.88	6.40	23.76
80	33.71	0.29	0.17	0.46	0.56	7.58	1.91	11.53	1.35	42.07	43.39	9.14	44.34

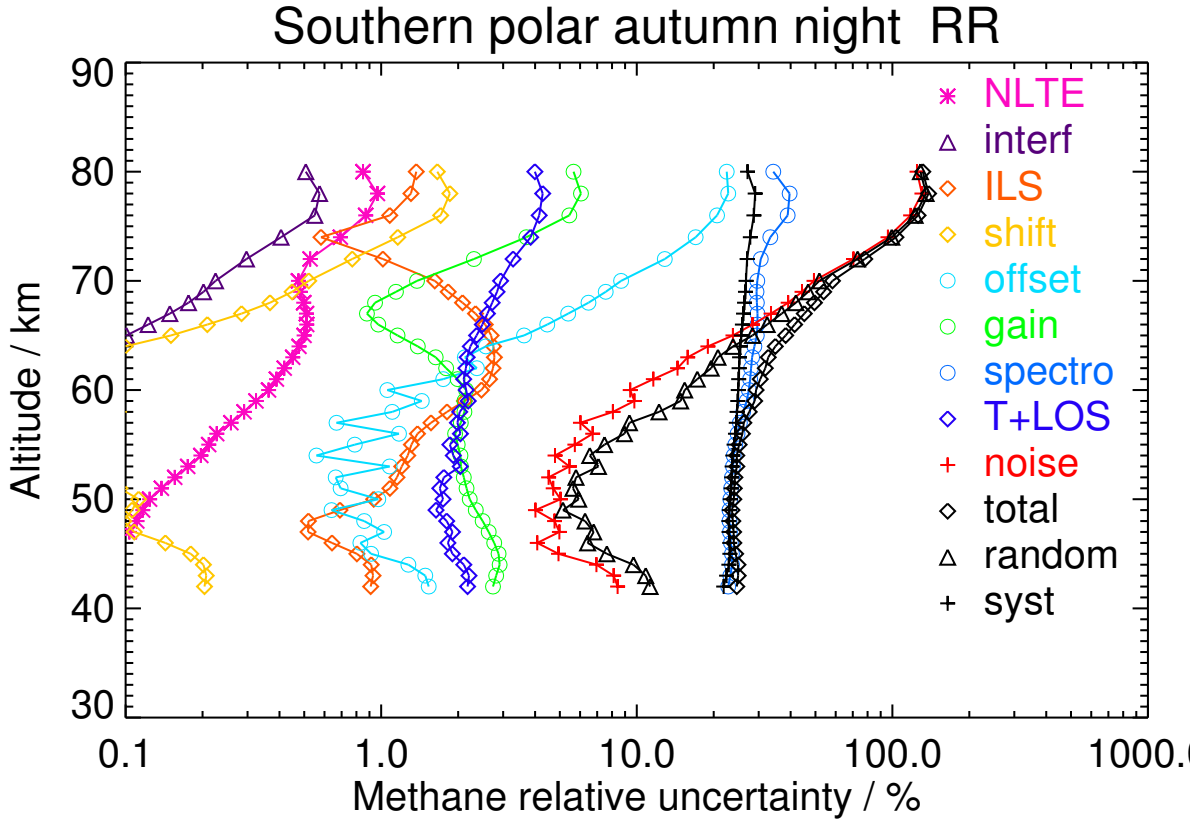

Figure S136. V8R_CH4_662 Southern polar autumn night

S6 Nitrous oxide error contribution profile plots and tabulated values for FR NOM data (V8H_N2O_61)

Table S137. Nitrous oxide error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	305.738	4.077	2.073	0.221	3.024	10.454	11.937	4.645	7.799	12.146	14.724	19.087
12	289.425	1.369	3.335	0.292	1.917	9.353	12.213	3.786	5.461	9.516	14.388	17.250
15	254.523	1.176	6.006	0.526	1.867	11.209	15.015	5.352	5.340	12.420	17.181	21.200
18	180.530	0.414	8.877	0.901	1.610	13.304	16.303	4.713	3.989	16.146	17.395	23.733
21	115.179	0.223	5.021	1.123	1.793	13.044	13.851	3.336	3.475	14.928	13.860	20.370
24	97.868	0.136	2.771	0.818	1.365	8.950	10.408	1.968	2.887	10.823	9.682	14.521
27	88.944	0.129	1.144	0.377	0.828	4.373	9.541	1.551	2.510	7.369	8.167	11.001
30	69.800	0.067	1.045	0.212	0.490	2.414	9.017	1.405	1.863	5.724	7.823	9.693
33	36.200	0.041	1.352	0.170	0.291	1.367	6.000	0.800	1.335	4.408	4.776	6.499
36	16.777	0.023	0.690	0.059	0.201	0.936	2.636	0.347	0.988	2.411	1.905	3.072
39	12.765	0.017	0.468	0.062	0.171	0.935	0.920	0.191	0.775	1.145	1.140	1.615
42	11.956	0.013	0.293	0.057	0.144	0.878	0.732	0.138	0.585	0.921	0.965	1.334
45	9.387	0.016	0.188	0.045	0.106	0.663	0.627	0.124	0.562	0.846	0.706	1.101
48	6.274	0.009	0.134	0.031	0.096	0.286	0.546	0.079	0.645	0.759	0.505	0.911
52	2.882	0.007	0.151	0.020	0.098	0.171	0.349	0.052	0.747	0.804	0.312	0.863
56	1.156	0.030	0.267	0.046	0.106	0.298	0.310	0.053	0.781	0.930	0.140	0.940
60	0.796	0.031	0.311	0.035	0.235	0.361	0.327	0.039	1.586	1.696	0.178	1.705
64	0.346	0.040	0.439	0.052	0.263	0.538	0.475	0.052	1.643	1.835	0.339	1.867
68	0.391	0.021	0.107	0.035	0.285	0.316	0.165	0.043	1.719	1.772	0.197	1.783

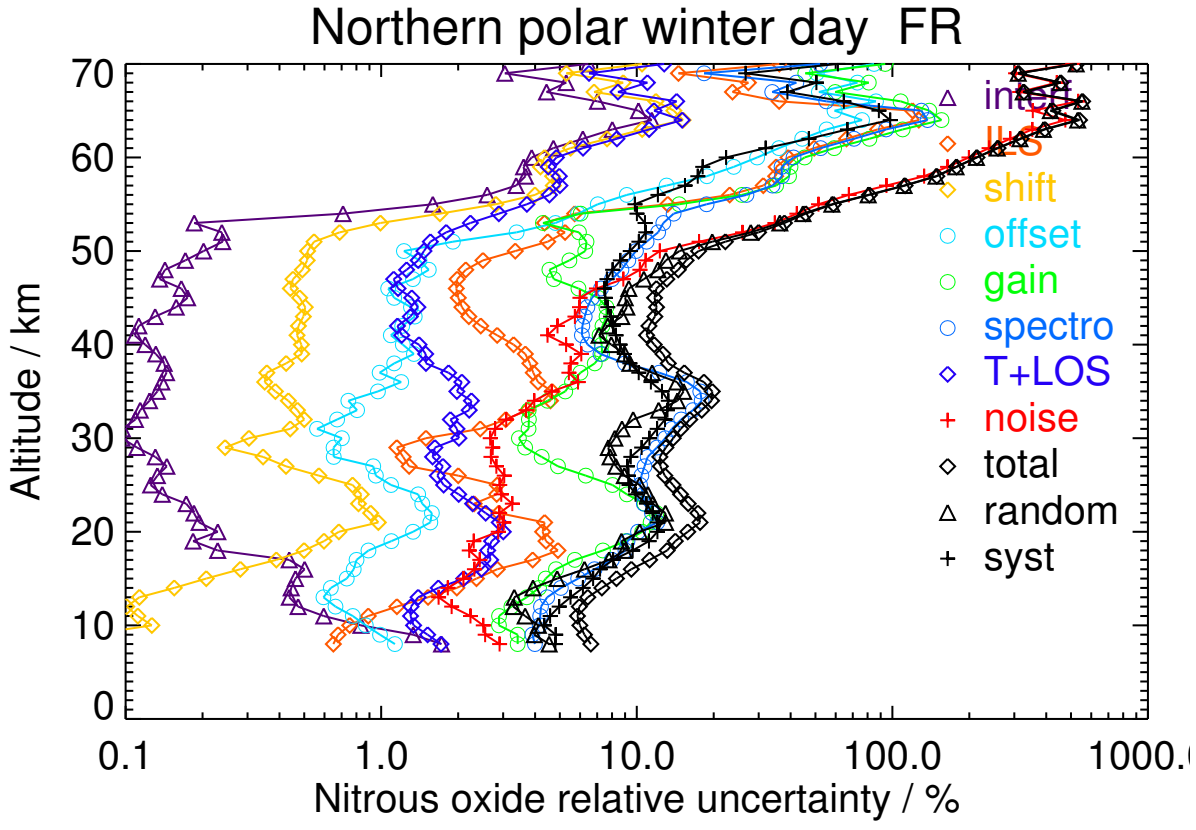

Figure S137. V8H_N2O_61 Northern polar winter day

Table S138. Nitrous oxide error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	310.316	2.598	2.802	0.285	2.743	10.391	11.967	4.083	7.120	10.559	15.141	18.459
12	293.945	2.096	6.450	0.422	2.231	12.526	12.057	4.696	5.958	11.670	16.577	20.273
15	250.905	2.370	7.406	0.426	2.119	11.041	12.663	5.839	6.161	12.052	16.559	20.480
18	171.572	0.923	7.722	0.786	1.476	9.824	15.904	5.491	4.364	14.834	15.552	21.492
21	93.711	0.347	5.532	0.845	1.280	8.075	13.902	2.895	3.768	12.896	12.158	17.723
24	80.538	0.125	4.427	0.776	0.940	4.209	10.942	1.819	3.078	11.170	6.825	13.090
27	73.593	0.141	1.676	0.390	0.649	2.408	10.201	1.346	2.381	8.338	7.156	10.988
30	48.460	0.082	0.775	0.123	0.374	1.529	7.465	1.034	1.490	5.667	5.477	7.882
33	23.951	0.039	1.116	0.101	0.236	1.267	3.824	0.508	0.933	3.149	2.960	4.321
36	10.386	0.023	0.459	0.023	0.118	0.608	1.454	0.195	0.628	1.320	1.183	1.772
39	6.813	0.014	0.216	0.026	0.089	0.393	0.442	0.089	0.482	0.629	0.500	0.803
42	7.116	0.012	0.144	0.022	0.067	0.354	0.428	0.066	0.359	0.545	0.413	0.684
45	6.653	0.018	0.150	0.026	0.070	0.410	0.396	0.083	0.399	0.625	0.359	0.721
48	5.395	0.010	0.126	0.026	0.083	0.320	0.423	0.057	0.512	0.670	0.348	0.755
52	2.848	0.014	0.206	0.027	0.092	0.255	0.390	0.060	0.658	0.759	0.360	0.840
56	0.639	0.043	0.239	0.055	0.129	0.480	0.325	0.088	0.762	0.939	0.347	1.001
60	0.058	0.059	0.396	0.076	0.277	0.739	0.467	0.119	1.733	1.915	0.597	2.006
64	-0.455	0.070	0.511	0.071	0.286	0.965	0.616	0.105	1.697	2.000	0.744	2.134
68	0.343	0.033	0.116	0.047	0.250	0.239	0.167	0.053	1.578	1.620	0.185	1.630

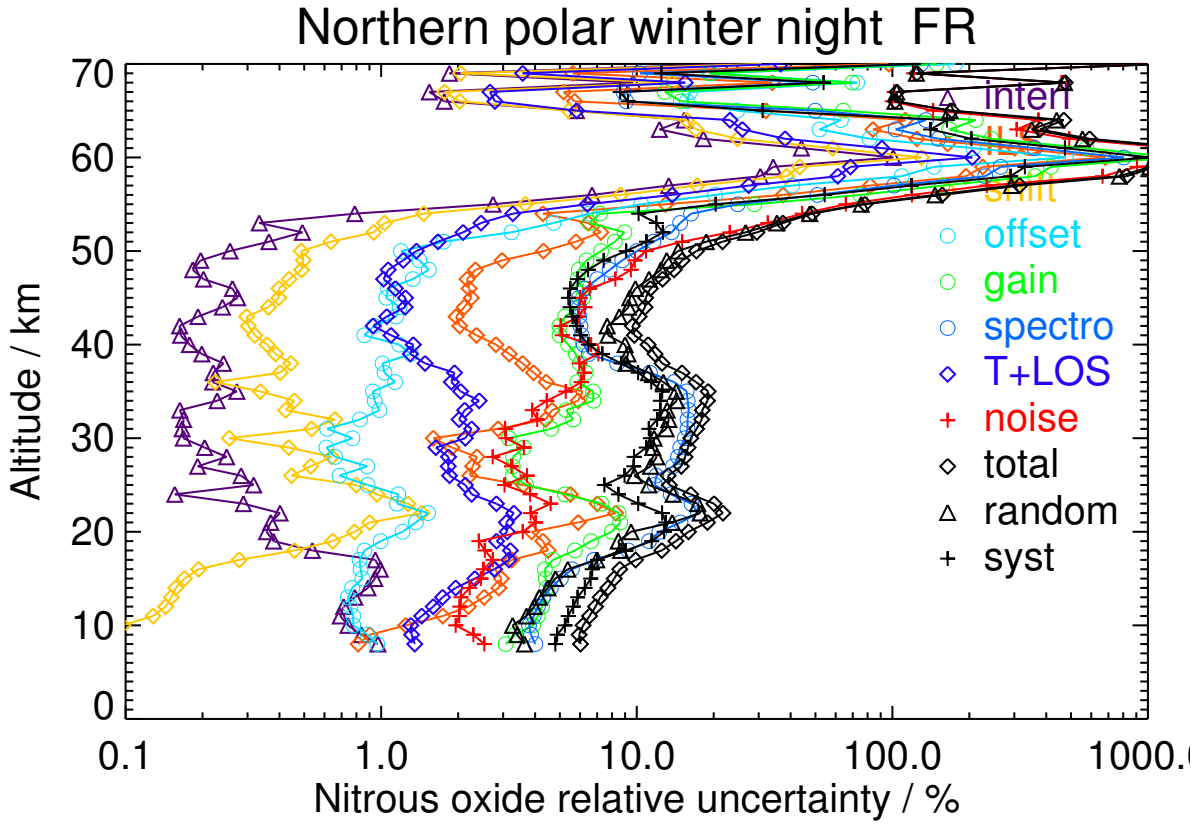

Figure S138. V8H_N2O_61 Northern polar winter night

Table S139. Nitrous oxide error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	274.843	1.807	0.964	0.508	2.395	4.478	12.053	3.256	7.639	9.673	12.284	15.635
12	276.864	0.737	2.980	0.199	1.550	11.127	12.544	3.522	4.205	7.656	16.263	17.975
15	200.878	0.615	4.107	0.287	1.409	7.463	16.210	5.187	4.641	10.837	16.395	19.653
18	130.363	0.130	7.009	0.547	1.155	9.513	11.777	3.879	3.133	12.675	12.008	17.460
21	103.014	0.170	6.099	1.046	1.349	10.116	11.668	2.954	3.090	13.524	10.677	17.230
24	102.582	0.121	4.378	0.953	0.815	5.550	10.938	1.931	2.915	9.895	9.247	13.543
27	85.993	0.081	1.276	0.412	0.456	2.370	9.684	1.403	2.462	6.200	8.426	10.461
30	59.829	0.052	0.974	0.202	0.274	1.244	6.404	1.076	1.729	3.967	5.660	6.912
33	47.009	0.039	0.900	0.300	0.277	1.803	4.051	0.696	1.186	2.832	3.809	4.746
36	31.828	0.036	1.228	0.208	0.241	1.963	3.186	0.443	0.819	1.983	3.542	4.059
39	16.072	0.021	0.904	0.146	0.148	1.257	1.791	0.274	0.554	1.516	1.932	2.456
42	8.139	0.009	0.535	0.074	0.081	0.628	0.909	0.126	0.342	0.916	0.902	1.285
45	4.477	0.013	0.331	0.041	0.048	0.355	0.507	0.074	0.280	0.512	0.565	0.763
48	2.003	0.005	0.053	0.022	0.034	0.086	0.207	0.045	0.254	0.301	0.175	0.349
52	0.742	0.003	0.028	0.006	0.054	0.027	0.066	0.016	0.331	0.342	0.038	0.344
56	0.818	0.011	0.164	0.038	0.065	0.172	0.136	0.034	0.485	0.515	0.228	0.563
60	0.372	0.003	0.036	0.012	0.114	0.030	0.066	0.014	0.775	0.786	0.051	0.788
64	-0.595	0.025	0.177	0.043	0.212	0.276	0.279	0.044	1.249	1.290	0.359	1.339
68	-0.568	0.028	0.214	0.052	0.308	0.297	0.323	0.046	1.738	1.788	0.406	1.833

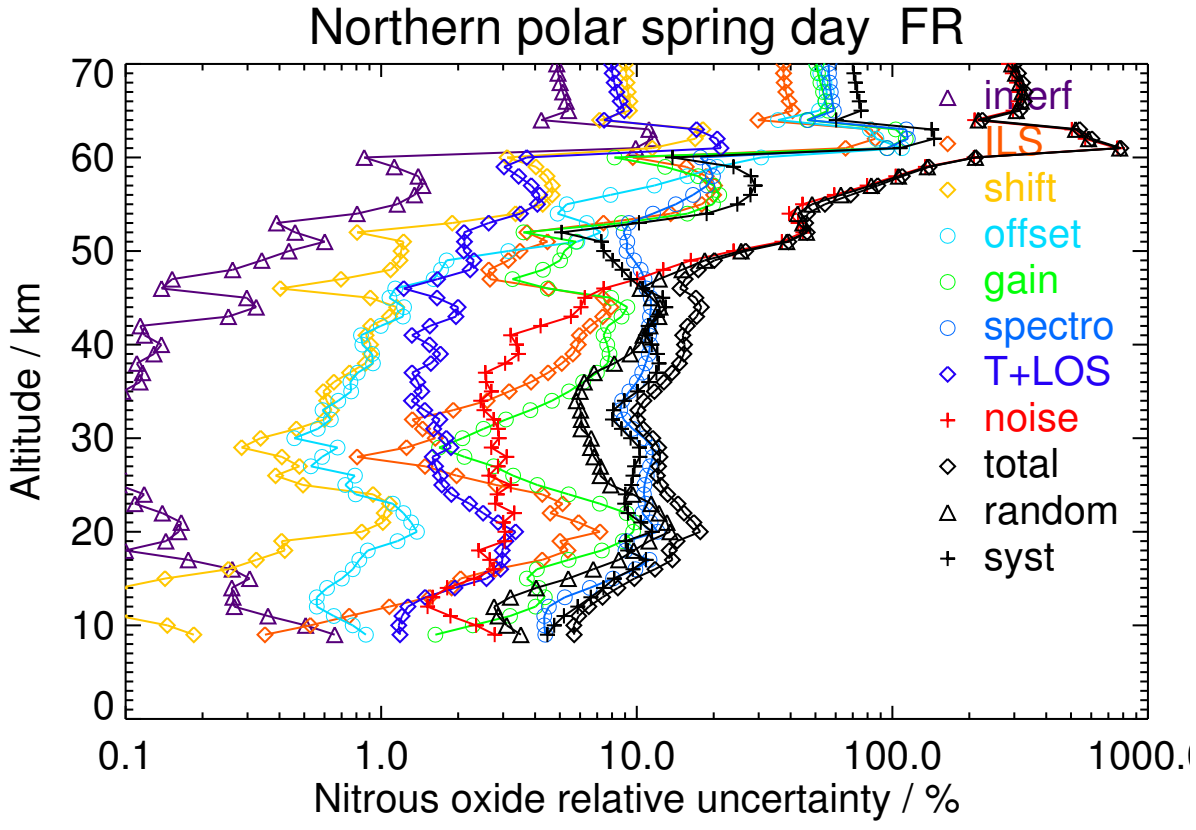

Figure S139. V8H_N2O_61 Northern polar spring day

Table S140. Nitrous oxide error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	277.346	2.109	1.342	0.410	2.448	5.831	13.001	3.524	7.763	10.729	13.154	16.974
12	274.631	0.835	2.858	0.206	1.619	10.583	12.341	3.623	4.665	8.433	15.478	17.627
15	219.047	0.676	4.712	0.331	1.642	9.604	15.930	5.424	5.271	12.842	16.241	20.705
18	149.624	0.170	5.366	0.431	1.437	10.113	14.794	3.851	3.573	12.976	14.541	19.489
21	109.399	0.155	6.101	1.439	1.162	7.879	14.137	2.544	2.919	13.496	11.639	17.821
24	112.750	0.102	3.553	0.764	0.923	6.285	10.823	1.887	2.739	9.589	9.478	13.482
27	92.163	0.076	1.443	0.385	0.547	2.318	11.137	1.515	2.369	6.978	9.548	11.826
30	64.177	0.052	0.755	0.220	0.289	1.034	7.008	1.229	1.701	4.023	6.254	7.436
33	44.138	0.041	0.848	0.309	0.264	1.720	4.330	0.775	1.197	2.760	4.124	4.962
36	24.991	0.033	1.090	0.204	0.238	1.822	2.787	0.423	0.794	2.182	2.902	3.631
39	13.128	0.017	0.762	0.128	0.138	1.080	1.515	0.226	0.518	1.421	1.541	2.096
42	6.029	0.007	0.325	0.050	0.056	0.369	0.714	0.098	0.296	0.679	0.627	0.924
45	3.012	0.012	0.214	0.028	0.035	0.196	0.355	0.060	0.266	0.397	0.359	0.535
48	1.590	0.005	0.057	0.018	0.035	0.077	0.153	0.035	0.249	0.288	0.119	0.312
52	0.763	0.004	0.032	0.008	0.055	0.031	0.069	0.015	0.343	0.355	0.038	0.357
56	0.834	0.011	0.157	0.042	0.068	0.170	0.132	0.041	0.496	0.535	0.197	0.570
60	0.420	0.003	0.031	0.010	0.125	0.033	0.076	0.016	0.859	0.871	0.055	0.873
64	-0.481	0.025	0.155	0.047	0.208	0.271	0.244	0.049	1.226	1.266	0.325	1.307
68	-0.465	0.026	0.170	0.053	0.306	0.277	0.261	0.046	1.712	1.761	0.319	1.790

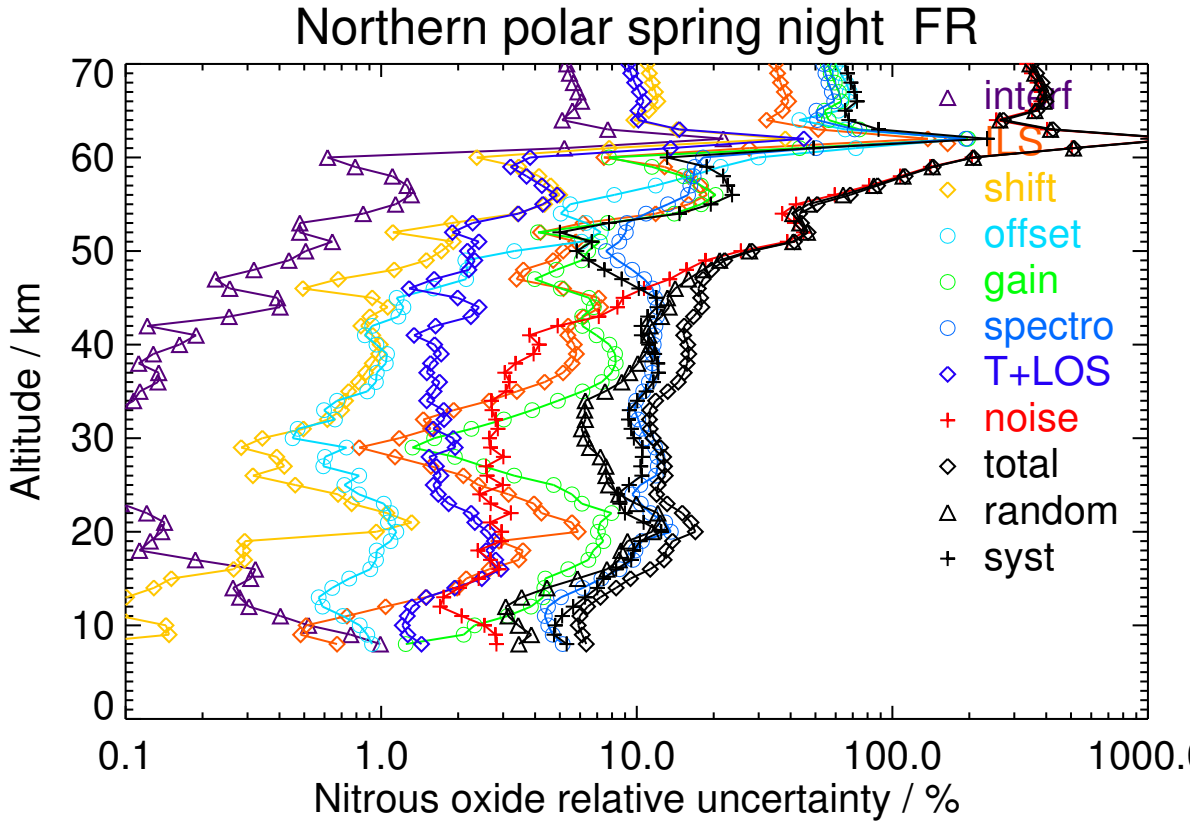

Figure S140. V8H_N2O_61 Northern polar spring night

Table S141. Nitrous oxide error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	298.878	1.217	0.369	0.407	1.817	10.590	16.335	3.085	5.539	7.039	19.358	20.598
12	308.776	0.866	4.270	0.418	1.817	12.270	14.131	3.672	5.284	9.950	17.751	20.349
15	308.530	0.652	10.772	0.530	2.035	19.938	14.548	5.455	5.003	11.282	25.643	28.015
18	254.724	0.214	8.993	0.591	1.950	18.965	17.895	4.905	4.124	14.908	24.162	28.391
21	192.614	0.158	7.630	1.458	2.092	18.191	18.987	4.463	3.479	16.868	22.442	28.075
24	151.084	0.106	3.528	0.651	1.194	8.550	15.144	2.836	3.080	9.773	15.452	18.284
27	107.571	0.076	2.012	0.794	0.706	2.073	11.859	2.023	2.519	4.071	11.999	12.671
30	71.853	0.062	0.608	0.123	0.378	0.974	7.395	1.421	1.750	2.696	7.347	7.826
33	41.702	0.034	0.878	0.317	0.236	1.575	4.244	0.784	1.136	1.781	4.489	4.829
36	20.469	0.039	0.833	0.137	0.130	0.931	2.138	0.350	0.693	1.102	2.357	2.602
39	9.567	0.012	0.583	0.073	0.060	0.430	0.985	0.165	0.373	0.705	1.084	1.293
42	4.416	0.010	0.260	0.026	0.032	0.152	0.476	0.063	0.222	0.472	0.386	0.610
45	2.328	0.019	0.249	0.028	0.035	0.132	0.268	0.065	0.284	0.370	0.318	0.488
48	0.448	0.007	0.030	0.020	0.030	0.021	0.085	0.024	0.202	0.216	0.069	0.226
52	0.221	0.004	0.033	0.009	0.042	0.017	0.028	0.012	0.266	0.272	0.029	0.273
56	0.322	0.007	0.099	0.027	0.035	0.043	0.059	0.024	0.306	0.317	0.105	0.333
60	0.192	0.007	0.086	0.026	0.112	0.032	0.081	0.018	0.727	0.738	0.114	0.746
64	-0.773	0.023	0.130	0.042	0.145	0.114	0.153	0.031	0.908	0.925	0.215	0.950
68	-1.281	0.033	0.180	0.064	0.270	0.174	0.247	0.043	1.554	1.583	0.337	1.618

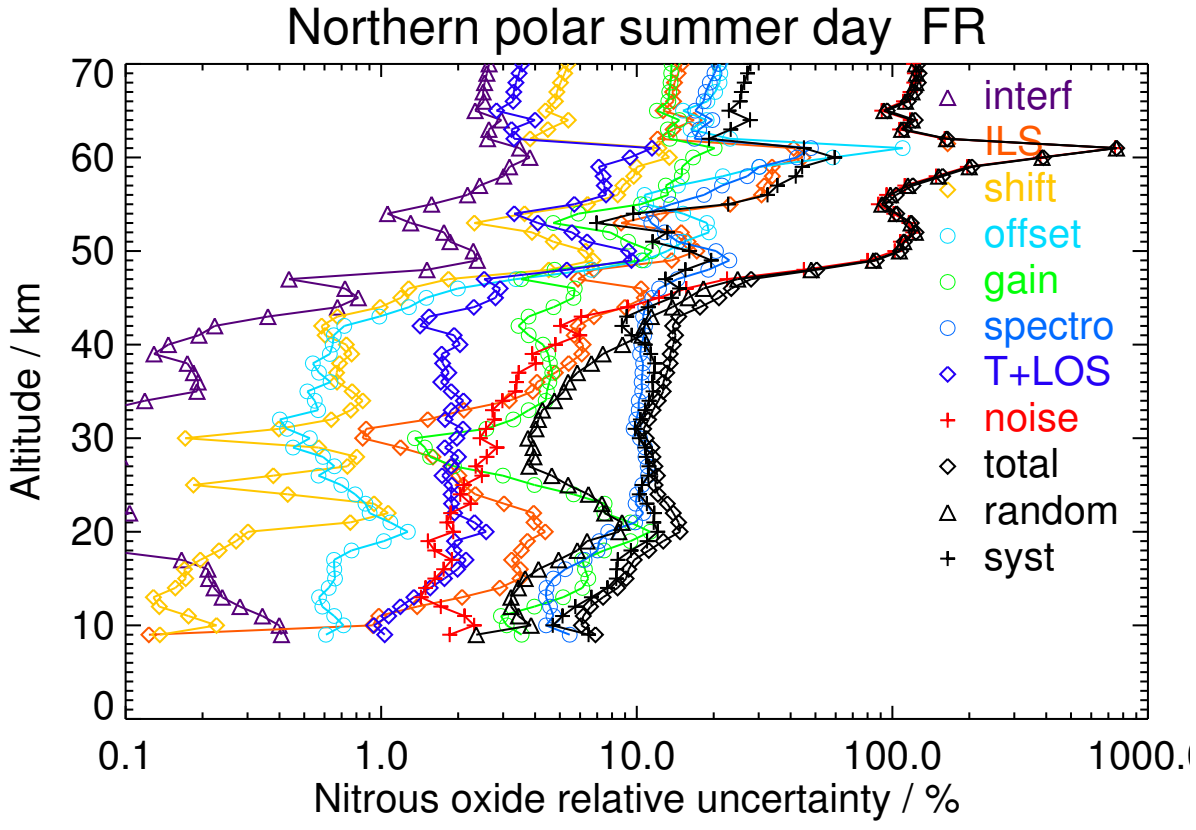

Figure S141. V8H_N2O_61 Northern polar summer day

Table S142. Nitrous oxide error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	307.190	0.910	4.031	0.385	1.922	10.245	13.246	3.576	5.778	9.415	16.090	18.642
15	309.057	0.621	9.134	0.331	1.800	16.638	13.542	4.571	4.526	10.732	21.761	24.264
18	260.482	0.230	9.411	0.314	2.099	18.911	17.396	5.113	4.212	15.286	23.741	28.236
21	194.991	0.161	5.467	1.122	2.045	16.479	17.834	4.373	3.765	14.362	21.260	25.656
24	148.127	0.108	4.081	0.658	1.010	5.791	16.017	2.759	3.155	7.784	16.284	18.049
27	105.698	0.069	1.799	0.624	0.727	1.952	12.212	2.051	2.572	3.957	12.340	12.959
30	62.464	0.057	0.767	0.157	0.391	0.765	7.676	1.397	1.691	2.432	7.693	8.068
33	30.010	0.019	0.745	0.218	0.197	1.053	3.312	0.639	1.002	1.452	3.467	3.759
36	15.176	0.029	0.707	0.120	0.116	0.753	1.644	0.258	0.607	1.019	1.787	2.058
39	6.623	0.005	0.390	0.038	0.047	0.260	0.838	0.132	0.323	0.525	0.879	1.023
42	1.865	0.011	0.075	0.021	0.035	0.054	0.244	0.055	0.217	0.287	0.194	0.347
45	1.002	0.013	0.145	0.027	0.034	0.095	0.100	0.059	0.265	0.290	0.177	0.340
48	0.326	0.005	0.020	0.009	0.031	0.017	0.049	0.015	0.203	0.210	0.041	0.214
52	0.040	0.004	0.035	0.009	0.048	0.020	0.032	0.015	0.312	0.318	0.031	0.320
56	0.318	0.006	0.086	0.023	0.034	0.049	0.051	0.029	0.311	0.321	0.093	0.334
60	0.584	0.006	0.102	0.023	0.131	0.035	0.089	0.024	0.867	0.880	0.125	0.889
64	-0.518	0.025	0.149	0.040	0.154	0.119	0.157	0.041	0.986	1.004	0.230	1.030
68	-1.035	0.035	0.230	0.063	0.246	0.164	0.247	0.057	1.434	1.463	0.356	1.506

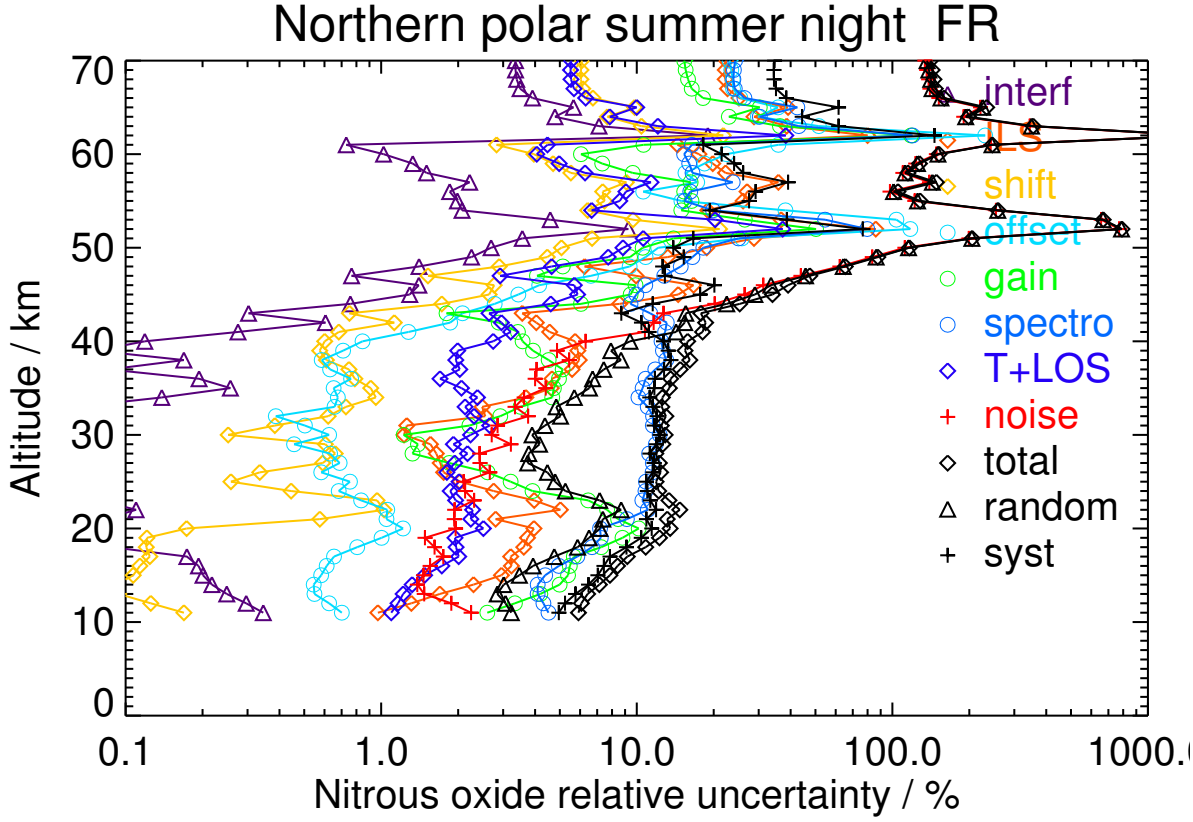

Figure S142. V8H_N2O_61 Northern polar summer night

Table S143. Nitrous oxide error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	300.091	2.677	1.419	0.495	2.587	6.572	12.427	2.908	7.840	10.733	12.979	16.842
12	309.373	1.516	4.099	0.440	1.893	12.195	13.514	3.703	5.202	9.640	17.380	19.874
15	297.117	1.416	7.237	0.631	1.916	16.119	14.756	5.866	5.556	11.246	21.791	24.521
18	265.093	0.617	18.663	1.300	2.122	22.559	13.612	8.864	5.260	17.400	29.198	33.990
21	200.175	0.470	8.633	0.752	2.286	17.765	13.103	5.813	4.609	11.445	22.178	24.957
24	139.496	0.179	3.183	1.251	1.366	9.673	15.047	2.883	3.815	7.576	17.293	18.880
27	86.367	0.108	1.455	0.756	0.708	4.954	10.985	1.796	3.123	5.399	11.500	12.704
30	41.234	0.039	1.436	0.202	0.312	1.738	7.076	1.166	2.039	3.821	6.797	7.798
33	13.305	0.039	0.674	0.123	0.187	0.768	2.588	0.547	1.172	2.124	2.225	3.077
36	4.927	0.016	0.308	0.047	0.099	0.434	0.848	0.182	0.610	0.972	0.689	1.191
39	1.918	0.007	0.254	0.031	0.048	0.276	0.549	0.068	0.369	0.716	0.271	0.766
42	0.552	0.004	0.109	0.021	0.034	0.129	0.273	0.046	0.318	0.444	0.102	0.456
45	0.551	0.003	0.052	0.017	0.058	0.130	0.133	0.045	0.400	0.438	0.105	0.451
48	0.393	0.002	0.022	0.012	0.069	0.085	0.063	0.018	0.501	0.516	0.039	0.518
52	0.563	0.003	0.043	0.011	0.058	0.046	0.058	0.015	0.546	0.555	0.037	0.556
56	0.870	0.004	0.037	0.016	0.087	0.099	0.058	0.029	0.654	0.666	0.085	0.672
60	1.112	0.006	0.053	0.015	0.205	0.081	0.068	0.034	1.249	1.270	0.075	1.272
64	0.744	0.011	0.080	0.014	0.248	0.097	0.117	0.035	1.483	1.511	0.089	1.514
68	0.585	0.010	0.049	0.015	0.262	0.112	0.090	0.034	1.535	1.561	0.117	1.565

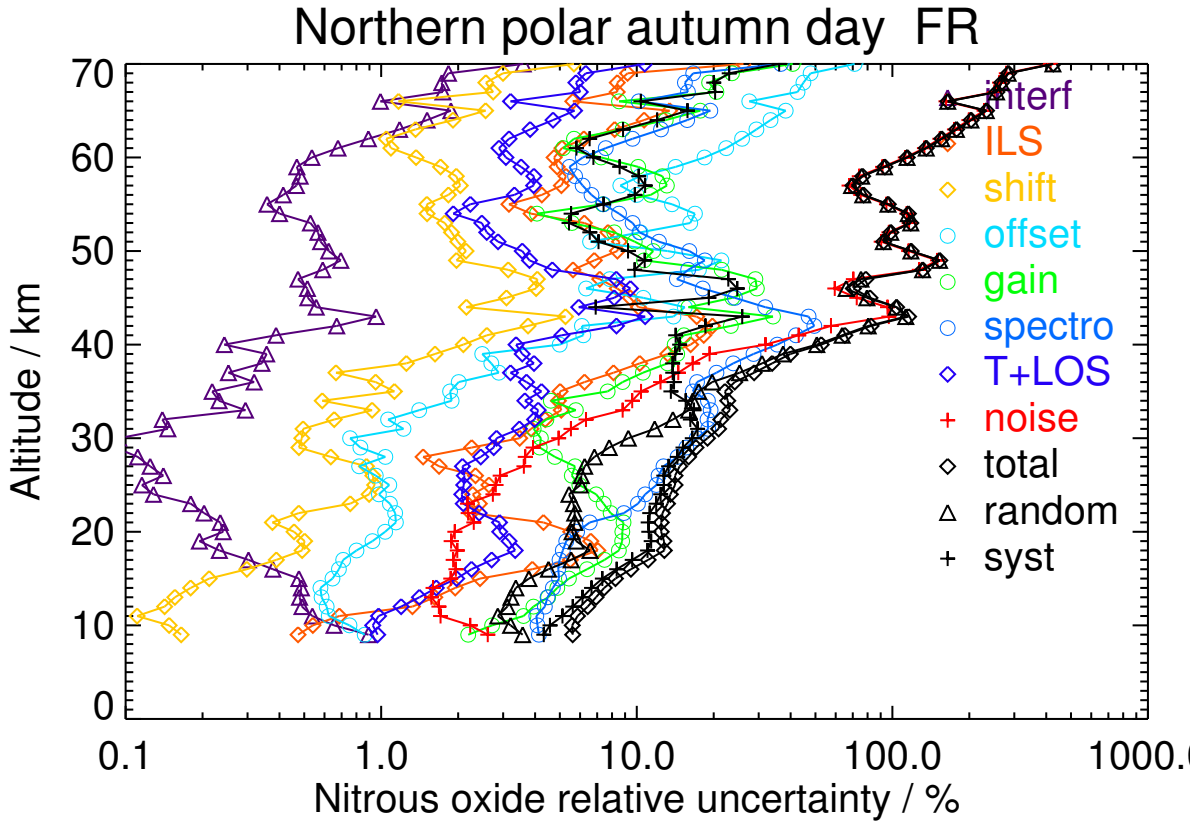

Figure S143. V8H_N2O_61 Northern polar autumn day

Table S144. Nitrous oxide error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	303.017	2.101	0.846	0.510	2.569	3.830	12.362	2.786	8.071	9.579	12.674	15.887
12	303.267	1.703	3.172	0.430	1.779	10.812	12.856	3.525	4.846	7.849	16.517	18.287
15	276.965	1.538	5.960	0.585	1.748	13.738	13.869	5.820	5.509	9.933	19.696	22.059
18	243.935	0.683	16.283	1.127	1.869	20.537	12.056	8.827	5.329	15.707	26.403	30.721
21	189.299	0.562	8.123	0.742	2.103	15.715	13.704	5.466	4.375	11.711	20.442	23.559
24	121.909	0.212	4.017	1.347	1.110	7.551	16.021	2.658	3.701	7.073	17.426	18.807
27	69.968	0.120	1.440	0.652	0.554	3.775	9.671	1.582	2.930	4.589	10.031	11.031
30	32.197	0.039	1.276	0.184	0.258	1.632	5.615	0.930	1.853	3.642	5.193	6.342
33	12.120	0.035	0.648	0.115	0.171	0.785	2.439	0.467	1.094	2.075	2.035	2.906
36	3.815	0.016	0.301	0.060	0.106	0.486	0.776	0.161	0.591	1.019	0.530	1.149
39	2.113	0.008	0.242	0.035	0.051	0.300	0.485	0.063	0.359	0.671	0.264	0.721
42	0.858	0.004	0.108	0.023	0.034	0.153	0.270	0.043	0.314	0.445	0.108	0.458
45	0.885	0.003	0.052	0.020	0.059	0.139	0.129	0.041	0.393	0.431	0.114	0.446
48	0.921	0.003	0.039	0.014	0.068	0.085	0.079	0.023	0.503	0.517	0.074	0.523
52	0.895	0.004	0.031	0.015	0.058	0.081	0.059	0.024	0.540	0.552	0.043	0.554
56	1.140	0.004	0.063	0.022	0.093	0.137	0.073	0.039	0.674	0.688	0.138	0.702
60	1.002	0.007	0.087	0.027	0.202	0.142	0.086	0.050	1.210	1.235	0.138	1.243
64	0.771	0.013	0.077	0.015	0.254	0.117	0.102	0.038	1.484	1.513	0.094	1.516
68	0.985	0.009	0.066	0.012	0.257	0.111	0.088	0.035	1.492	1.518	0.109	1.522

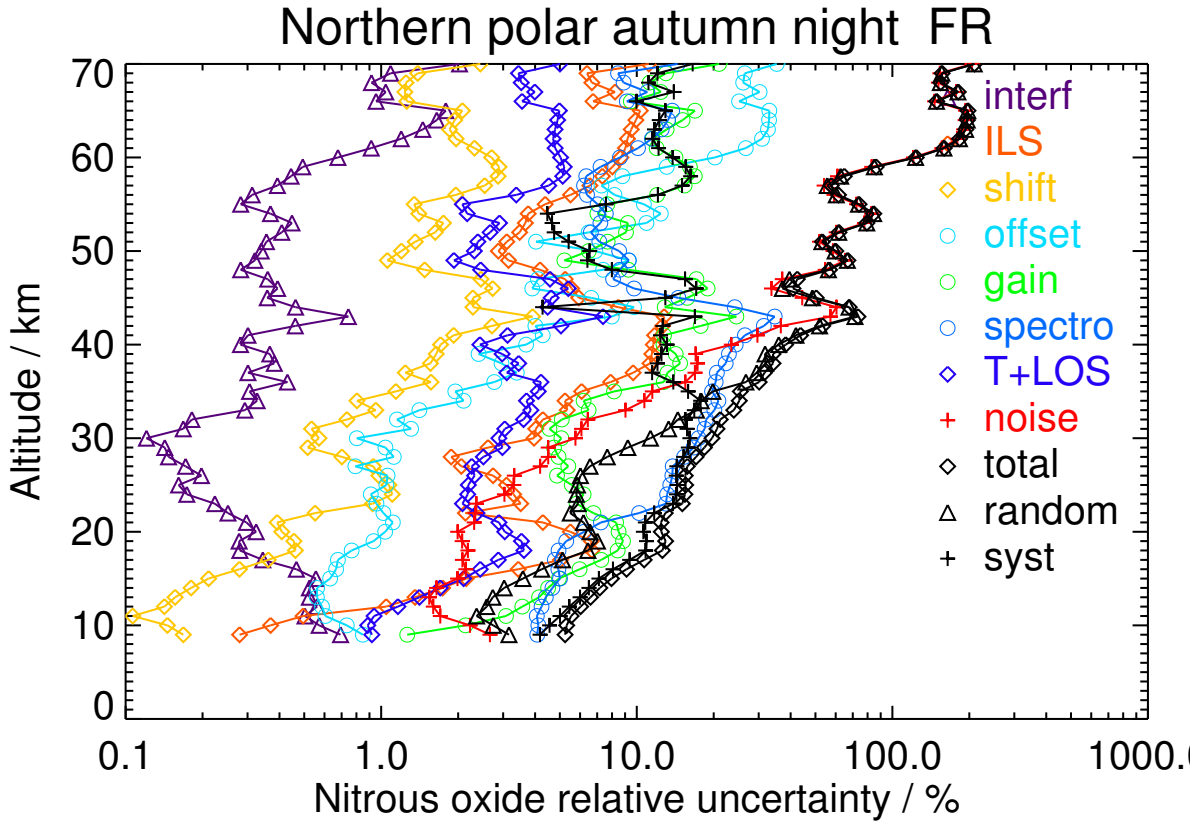

Figure S144. V8H_N2O_61 Northern polar autumn night

Table S145. Nitrous oxide error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	301.070	4.926	1.024	0.243	2.811	3.441	13.268	4.321	8.529	11.451	13.470	17.680
12	290.294	0.949	2.998	0.342	1.869	7.089	13.260	3.427	5.732	9.681	13.801	16.858
15	270.864	0.621	7.489	0.648	1.806	10.350	15.953	4.784	5.287	13.349	17.159	21.740
18	232.726	0.294	9.361	0.728	1.827	13.257	18.939	4.624	4.125	17.388	19.028	25.776
21	185.796	0.246	6.848	1.422	2.091	14.452	18.658	3.948	3.616	15.228	20.176	25.278
24	155.451	0.133	4.880	1.374	1.543	9.510	16.381	2.887	3.320	10.880	16.966	20.155
27	119.954	0.106	1.383	0.329	0.920	3.491	12.270	2.210	2.934	6.483	11.708	13.383
30	90.003	0.078	0.925	0.191	0.577	1.888	11.691	1.962	2.150	6.155	10.586	12.245
33	39.889	0.041	1.239	0.227	0.354	1.665	6.067	1.017	1.430	4.025	5.308	6.661
36	20.441	0.034	0.811	0.091	0.212	1.125	2.599	0.392	0.927	1.900	2.477	3.122
39	9.762	0.018	0.444	0.054	0.125	0.618	0.985	0.169	0.654	1.106	0.896	1.423
42	10.545	0.009	0.329	0.038	0.114	0.648	0.555	0.114	0.456	0.761	0.701	1.035
45	10.719	0.013	0.293	0.053	0.099	0.651	0.605	0.140	0.441	0.685	0.796	1.050
48	7.351	0.010	0.172	0.040	0.078	0.318	0.679	0.085	0.489	0.673	0.626	0.919
52	2.540	0.006	0.150	0.023	0.087	0.098	0.374	0.054	0.625	0.687	0.318	0.757
56	0.733	0.019	0.081	0.034	0.083	0.104	0.170	0.052	0.690	0.722	0.105	0.730
60	0.487	0.019	0.129	0.023	0.214	0.113	0.136	0.036	1.514	1.540	0.119	1.545
64	-0.119	0.025	0.117	0.035	0.227	0.220	0.178	0.039	1.490	1.524	0.215	1.539
68	-0.528	0.021	0.080	0.036	0.275	0.238	0.170	0.037	1.657	1.693	0.223	1.707

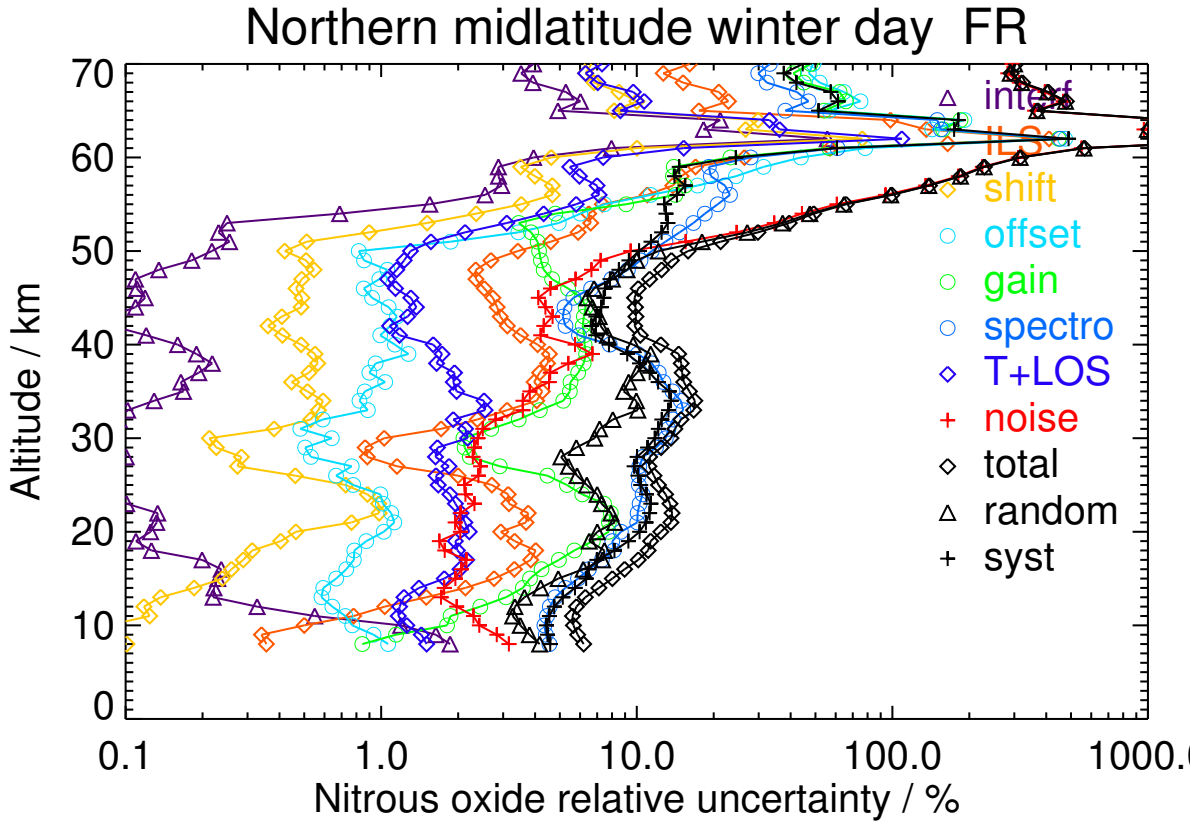

Figure S145. V8H_N2O_61 Northern midlatitude winter day

Table S146. Nitrous oxide error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	296.782	4.141	0.907	0.355	2.758	3.720	14.742	3.990	8.590	12.634	13.673	18.617
12	286.485	1.369	2.430	0.314	1.585	6.212	17.973	3.081	5.289	13.018	15.493	20.236
15	259.431	0.521	5.386	0.591	1.763	7.854	19.968	4.437	5.237	15.547	17.278	23.244
18	219.446	0.256	6.210	0.586	1.431	8.354	24.492	4.635	4.155	20.157	18.523	27.376
21	182.653	0.170	7.407	1.052	1.475	10.161	19.582	3.856	3.600	15.552	18.189	23.931
24	159.201	0.115	4.904	1.158	1.427	10.076	15.728	2.916	3.257	11.915	15.921	19.886
27	141.663	0.105	2.150	0.283	0.917	5.577	13.509	2.149	2.819	8.127	12.870	15.222
30	111.196	0.092	1.036	0.194	0.544	2.370	13.786	1.905	2.196	7.569	12.176	14.337
33	56.693	0.039	1.521	0.274	0.338	2.005	8.017	1.117	1.448	4.392	7.405	8.610
36	20.869	0.033	1.053	0.089	0.194	1.197	3.481	0.432	0.865	2.353	3.179	3.955
39	8.707	0.015	0.486	0.070	0.103	0.522	1.392	0.147	0.563	1.456	0.826	1.674
42	7.821	0.010	0.196	0.036	0.073	0.398	0.596	0.089	0.358	0.677	0.488	0.834
45	7.540	0.015	0.215	0.053	0.094	0.556	0.491	0.122	0.413	0.664	0.594	0.891
48	5.211	0.008	0.135	0.020	0.073	0.212	0.439	0.061	0.433	0.545	0.395	0.673
52	2.492	0.009	0.157	0.024	0.081	0.147	0.300	0.044	0.583	0.639	0.279	0.697
56	0.718	0.025	0.102	0.032	0.090	0.167	0.192	0.051	0.635	0.693	0.106	0.701
60	0.445	0.033	0.179	0.038	0.236	0.179	0.208	0.045	1.587	1.631	0.162	1.639
64	-0.396	0.040	0.234	0.057	0.250	0.322	0.296	0.079	1.616	1.673	0.362	1.712
68	-0.672	0.024	0.094	0.038	0.259	0.313	0.157	0.064	1.616	1.651	0.296	1.678

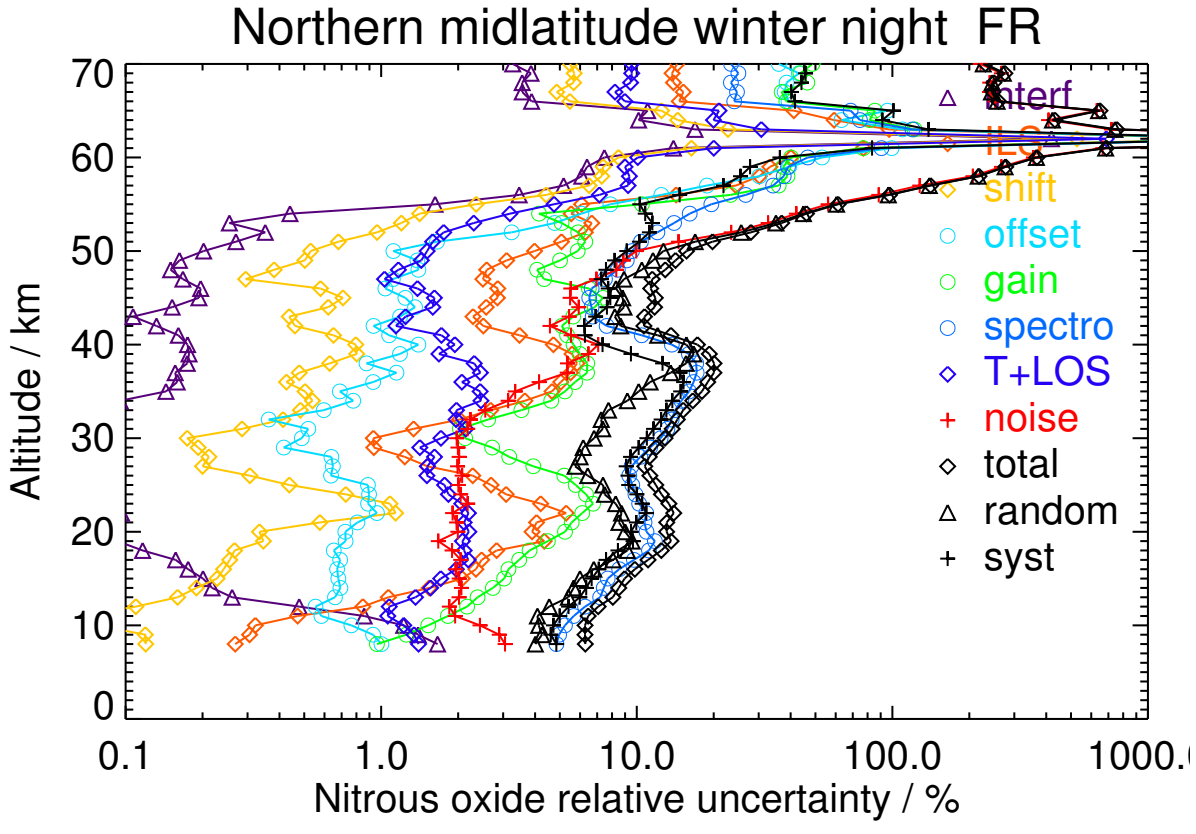

Figure S146. V8H_N2O_61 Northern midlatitude winter night

Table S147. Nitrous oxide error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	273.252	2.206	1.303	0.527	2.527	4.242	10.211	3.088	8.052	10.106	10.379	14.487
12	296.069	0.826	4.086	0.247	1.938	12.181	12.043	3.941	5.165	9.243	16.474	18.890
15	278.103	0.814	7.008	0.441	1.902	12.535	14.079	5.601	5.578	12.160	17.987	21.712
18	246.044	0.401	13.624	0.761	2.683	21.739	17.343	6.902	4.293	18.138	26.533	32.140
21	174.194	0.327	6.149	1.624	2.392	16.451	17.124	4.075	3.650	16.113	19.505	25.300
24	144.065	0.152	4.139	0.862	1.107	6.714	15.072	2.585	3.294	9.824	14.573	17.575
27	110.913	0.114	1.528	0.499	0.671	2.428	13.070	1.963	2.848	6.700	12.117	13.846
30	73.531	0.075	0.896	0.242	0.359	1.208	8.133	1.505	2.093	4.096	7.647	8.675
33	50.706	0.067	0.646	0.321	0.295	1.616	4.633	0.937	1.466	2.678	4.533	5.265
36	32.346	0.054	1.170	0.214	0.232	1.581	2.792	0.460	0.948	1.752	3.132	3.589
39	19.196	0.027	1.069	0.141	0.137	1.062	1.814	0.263	0.634	1.277	2.108	2.464
42	9.468	0.016	0.550	0.041	0.072	0.461	0.913	0.134	0.387	0.726	0.998	1.234
45	5.817	0.013	0.275	0.021	0.034	0.217	0.518	0.058	0.277	0.414	0.549	0.688
48	3.435	0.008	0.091	0.019	0.029	0.090	0.267	0.044	0.263	0.320	0.240	0.400
52	1.552	0.003	0.063	0.010	0.052	0.039	0.119	0.024	0.329	0.344	0.115	0.362
56	1.004	0.009	0.120	0.030	0.075	0.079	0.124	0.025	0.566	0.582	0.159	0.603
60	0.219	0.006	0.049	0.008	0.110	0.048	0.077	0.016	0.770	0.783	0.047	0.784
64	-0.676	0.036	0.394	0.065	0.233	0.345	0.477	0.048	1.366	1.495	0.442	1.559
68	-1.004	0.040	0.449	0.077	0.309	0.390	0.546	0.053	1.757	1.894	0.510	1.961

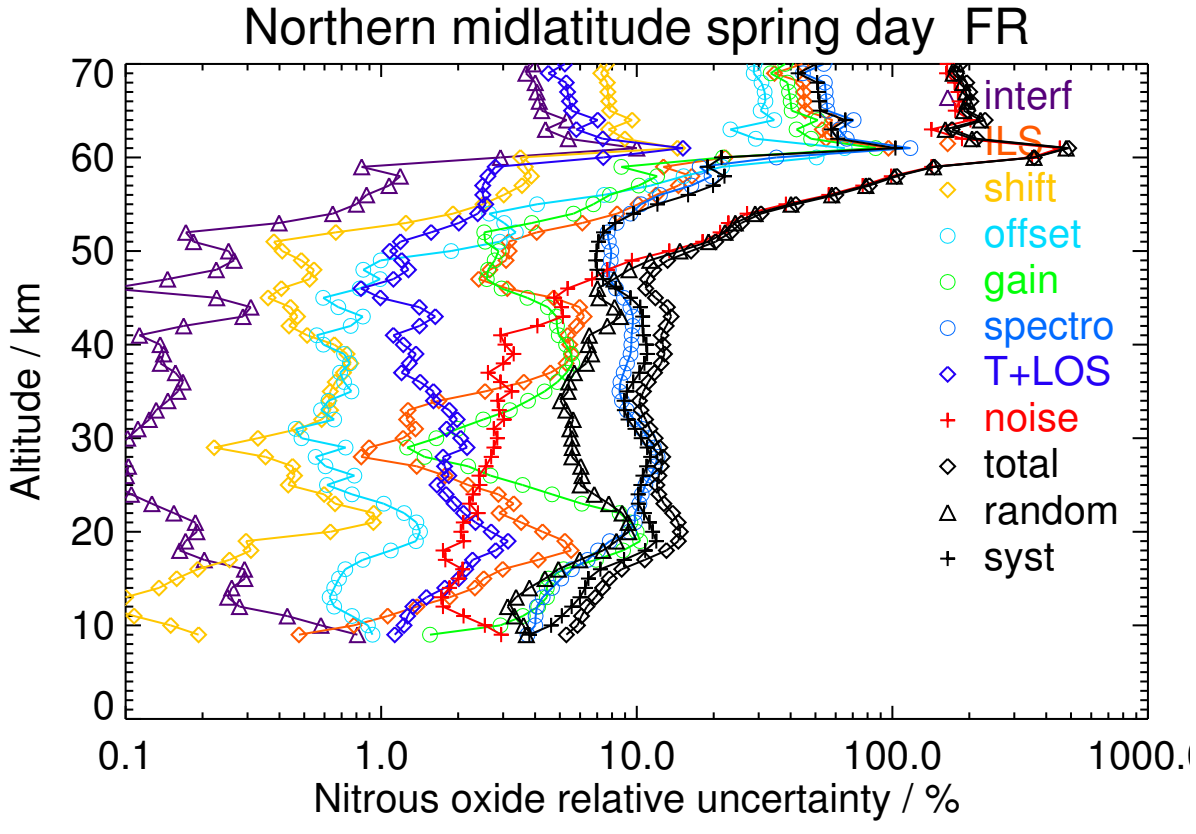

Figure S147. V8H_N2O_61 Northern midlatitude spring day

Table S148. Nitrous oxide error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	287.091	1.978	0.180	0.445	2.370	6.426	11.659	3.063	7.045	8.389	13.252	15.685
12	293.629	0.789	4.111	0.262	1.837	12.948	11.683	3.777	4.874	8.798	16.903	19.055
15	270.668	0.796	6.835	0.363	1.858	13.129	13.948	5.310	5.366	11.850	18.287	21.790
18	216.620	0.271	8.126	0.594	1.811	14.875	16.635	4.451	3.518	15.271	19.149	24.493
21	164.124	0.297	7.853	1.718	2.044	13.704	17.349	3.646	3.492	17.162	16.989	24.149
24	147.846	0.155	3.915	0.473	0.999	5.088	13.808	2.433	3.090	8.991	12.951	15.767
27	126.428	0.128	1.302	0.705	0.701	2.028	13.413	2.079	2.727	4.686	13.286	14.088
30	87.384	0.083	0.659	0.309	0.386	1.563	8.914	1.611	2.048	3.857	8.632	9.454
33	63.108	0.077	1.099	0.361	0.331	1.741	6.308	1.085	1.571	3.606	5.909	6.923
36	35.218	0.059	1.149	0.226	0.263	1.806	3.454	0.534	1.004	2.008	3.728	4.234
39	19.953	0.031	0.932	0.169	0.160	1.152	1.907	0.289	0.647	1.303	2.166	2.527
42	9.336	0.015	0.538	0.064	0.075	0.516	0.966	0.126	0.353	0.766	1.026	1.280
45	5.565	0.017	0.307	0.027	0.041	0.282	0.516	0.068	0.286	0.460	0.563	0.727
48	3.324	0.006	0.050	0.028	0.031	0.071	0.217	0.043	0.257	0.289	0.202	0.353
52	1.718	0.003	0.065	0.010	0.055	0.044	0.125	0.021	0.344	0.358	0.125	0.379
56	1.113	0.009	0.099	0.028	0.065	0.076	0.108	0.025	0.524	0.537	0.135	0.554
60	0.471	0.005	0.024	0.009	0.122	0.023	0.065	0.016	0.852	0.862	0.049	0.864
64	-0.375	0.031	0.163	0.054	0.221	0.217	0.282	0.039	1.322	1.362	0.319	1.398
68	-0.802	0.034	0.181	0.064	0.298	0.248	0.313	0.043	1.714	1.758	0.366	1.796

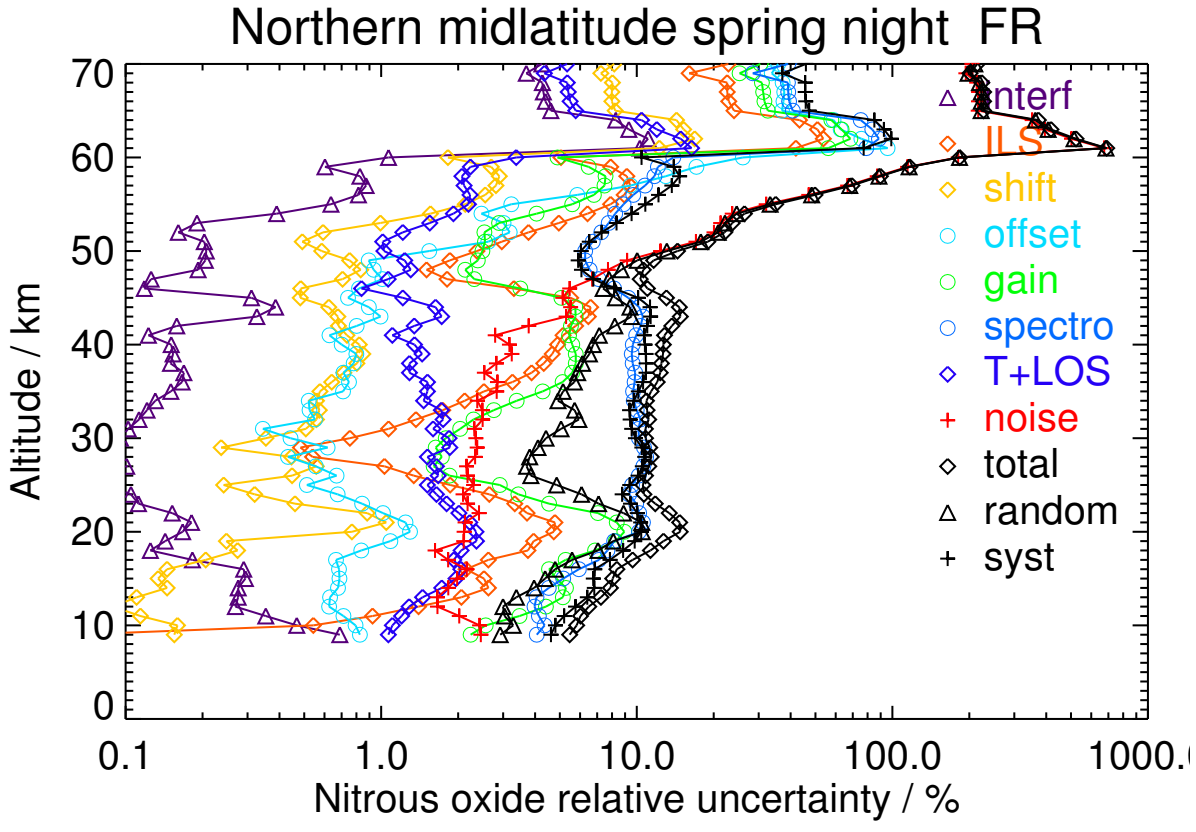

Figure S148. V8H_N2O_61 Northern midlatitude spring night

Table S149. Nitrous oxide error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	324.358	1.148	8.758	0.309	2.413	14.596	13.898	4.589	6.487	12.135	20.149	23.521
15	327.560	1.020	14.460	0.464	2.679	16.337	15.378	6.767	7.266	15.177	24.272	28.626
18	289.895	0.706	6.486	0.571	1.939	13.503	19.410	5.047	5.102	13.658	21.695	25.636
21	202.203	0.326	11.102	1.118	1.776	7.705	24.840	4.454	4.138	11.634	26.567	29.003
24	159.014	0.170	6.286	0.639	1.241	3.329	17.272	3.250	3.394	6.571	18.160	19.313
27	127.874	0.124	1.877	0.841	0.853	1.707	12.746	2.440	2.851	4.545	12.798	13.581
30	91.231	0.086	0.405	0.279	0.490	1.593	10.211	1.925	2.021	3.403	10.173	10.727
33	49.341	0.055	1.003	0.342	0.290	1.302	4.885	1.046	1.371	2.104	5.031	5.453
36	30.162	0.038	1.226	0.202	0.214	1.411	2.862	0.469	0.863	1.365	3.298	3.569
39	15.033	0.019	0.873	0.103	0.116	0.919	1.618	0.247	0.503	0.965	1.906	2.137
42	6.416	0.009	0.316	0.037	0.052	0.373	0.686	0.083	0.245	0.529	0.708	0.883
45	3.235	0.012	0.194	0.013	0.036	0.231	0.356	0.069	0.272	0.436	0.328	0.546
48	1.672	0.006	0.061	0.023	0.034	0.084	0.183	0.034	0.233	0.298	0.114	0.319
52	1.396	0.004	0.053	0.009	0.052	0.056	0.115	0.014	0.326	0.350	0.078	0.358
56	0.957	0.009	0.066	0.020	0.050	0.066	0.108	0.022	0.422	0.441	0.084	0.449
60	0.645	0.005	0.049	0.015	0.127	0.037	0.093	0.021	0.884	0.896	0.081	0.900
64	-1.515	0.045	0.244	0.074	0.194	0.355	0.444	0.062	1.174	1.216	0.575	1.345
68	-2.398	0.054	0.295	0.097	0.277	0.442	0.565	0.073	1.591	1.638	0.737	1.796

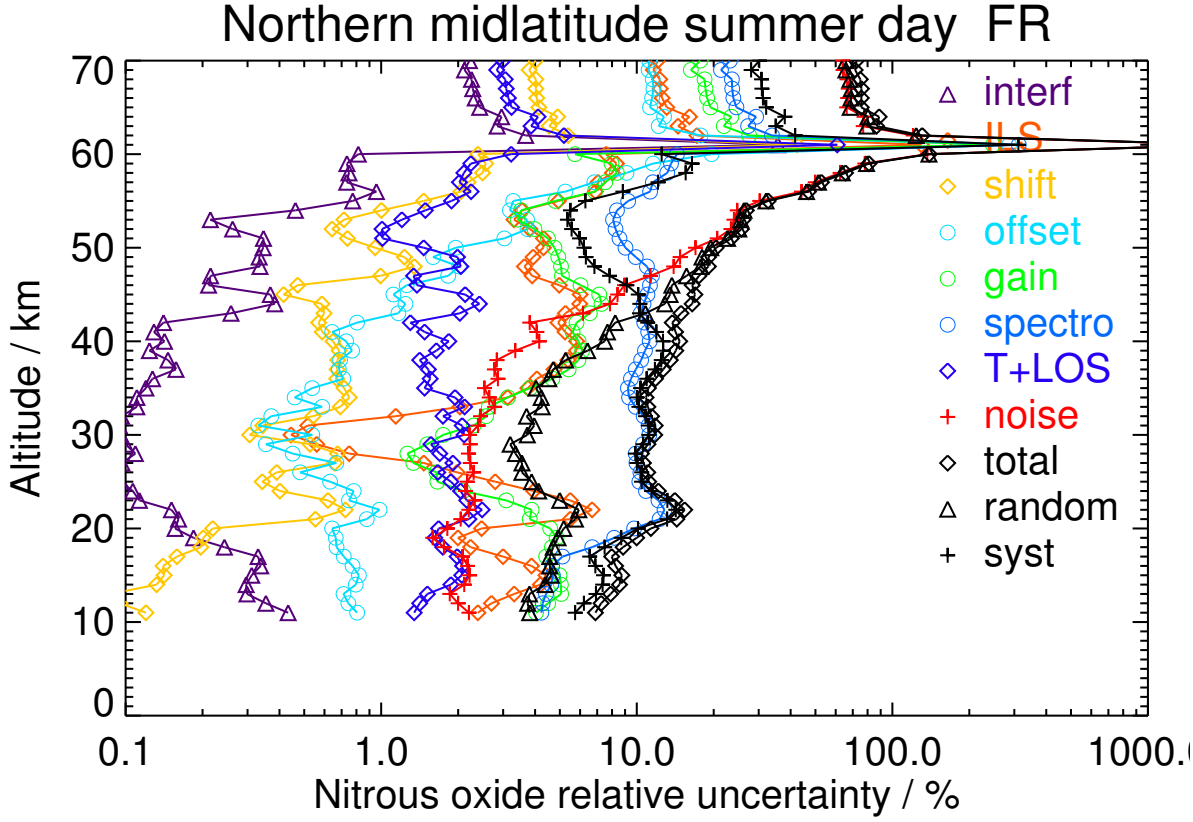

Figure S149. V8H_N2O_61 Northern midlatitude summer day

Table S150. Nitrous oxide error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	321.032	1.237	6.139	0.303	2.472	12.113	12.284	4.666	6.900	11.432	16.784	20.308
15	321.694	0.978	9.842	0.155	2.101	14.145	13.423	5.640	6.107	13.198	19.427	23.487
18	273.812	0.628	5.145	0.330	1.472	8.748	19.129	4.966	5.004	12.354	19.200	22.832
21	194.118	0.286	9.944	0.625	1.296	2.834	24.039	4.036	3.906	7.290	25.794	26.804
24	151.936	0.163	6.211	0.329	1.094	2.751	16.942	3.195	3.312	5.631	17.999	18.859
27	126.456	0.117	1.769	0.668	0.744	1.437	13.436	2.300	2.745	4.206	13.486	14.127
30	83.408	0.083	0.308	0.127	0.440	1.538	9.226	1.694	1.915	3.179	9.178	9.713
33	49.115	0.055	0.924	0.340	0.268	1.152	4.843	0.902	1.328	2.002	4.939	5.329
36	26.689	0.043	0.959	0.129	0.159	0.989	2.704	0.409	0.845	1.213	2.943	3.183
39	13.688	0.024	0.591	0.087	0.088	0.649	1.276	0.194	0.489	0.769	1.449	1.640
42	7.167	0.011	0.251	0.040	0.046	0.332	0.566	0.070	0.252	0.465	0.592	0.752
45	5.022	0.017	0.249	0.020	0.047	0.316	0.386	0.075	0.304	0.453	0.455	0.642
48	3.774	0.008	0.145	0.039	0.045	0.231	0.372	0.038	0.263	0.467	0.261	0.536
52	1.885	0.005	0.093	0.014	0.056	0.077	0.210	0.025	0.378	0.428	0.150	0.454
56	1.048	0.011	0.062	0.024	0.045	0.055	0.119	0.028	0.399	0.419	0.090	0.429
60	1.257	0.005	0.049	0.015	0.156	0.030	0.088	0.019	1.081	1.094	0.082	1.097
64	0.072	0.038	0.171	0.061	0.180	0.219	0.280	0.043	1.169	1.193	0.372	1.250
68	-0.434	0.048	0.228	0.084	0.240	0.290	0.374	0.053	1.428	1.460	0.504	1.544

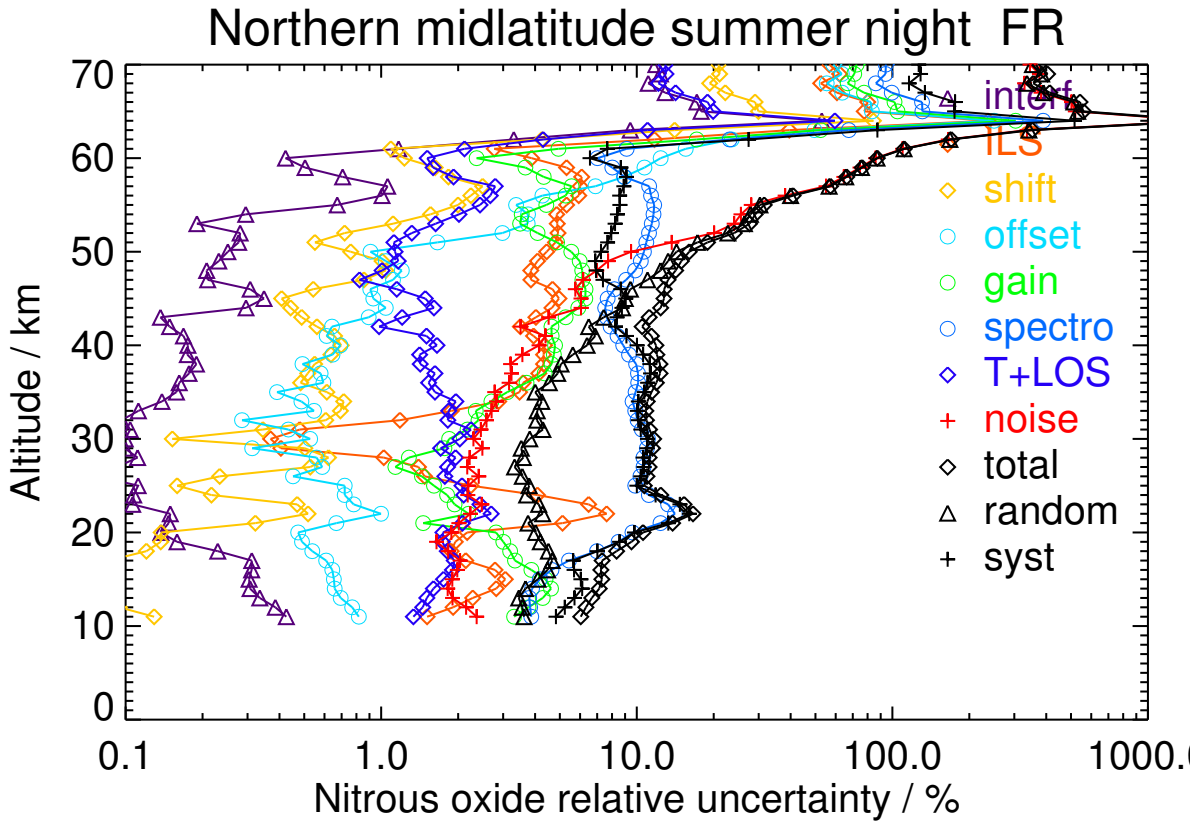

Figure S150. V8H_N2O_61 Northern midlatitude summer night

Table S151. Nitrous oxide error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	329.761	1.181	9.979	0.245	2.901	13.423	14.562	5.434	7.468	14.832	19.157	24.227
15	327.229	1.062	13.716	0.303	2.595	15.984	16.023	6.652	6.572	16.997	22.514	28.209
18	271.923	0.652	15.359	0.492	2.262	16.042	17.839	7.184	5.092	22.878	19.272	29.914
21	191.734	0.301	11.240	0.776	1.809	10.117	27.204	5.024	4.293	17.826	26.431	31.881
24	138.949	0.118	8.068	0.562	1.139	4.011	18.018	3.025	3.551	8.044	19.092	20.718
27	112.199	0.094	2.031	0.304	0.740	1.505	12.399	1.965	2.829	5.003	12.150	13.140
30	83.644	0.077	0.723	0.133	0.453	1.306	9.454	1.527	2.090	4.324	8.935	9.926
33	51.952	0.055	0.868	0.241	0.287	1.372	5.677	0.904	1.505	3.306	5.212	6.172
36	33.025	0.047	0.933	0.150	0.241	1.430	3.095	0.444	1.088	2.047	3.125	3.736
39	23.614	0.034	0.965	0.192	0.212	1.418	1.855	0.279	0.710	1.394	2.259	2.654
42	15.459	0.014	0.735	0.122	0.126	0.974	1.294	0.169	0.428	0.980	1.564	1.845
45	9.040	0.020	0.474	0.041	0.092	0.625	0.895	0.135	0.462	0.837	0.979	1.288
48	4.833	0.005	0.138	0.037	0.062	0.168	0.469	0.055	0.377	0.513	0.394	0.646
52	3.477	0.008	0.126	0.019	0.066	0.109	0.254	0.034	0.482	0.501	0.283	0.575
56	1.527	0.013	0.047	0.022	0.061	0.049	0.148	0.037	0.502	0.518	0.130	0.534
60	0.282	0.014	0.054	0.011	0.203	0.048	0.088	0.025	1.348	1.366	0.076	1.368
64	-0.940	0.029	0.144	0.040	0.215	0.213	0.240	0.054	1.413	1.437	0.324	1.473
68	-1.239	0.033	0.163	0.054	0.244	0.278	0.300	0.064	1.506	1.536	0.410	1.590

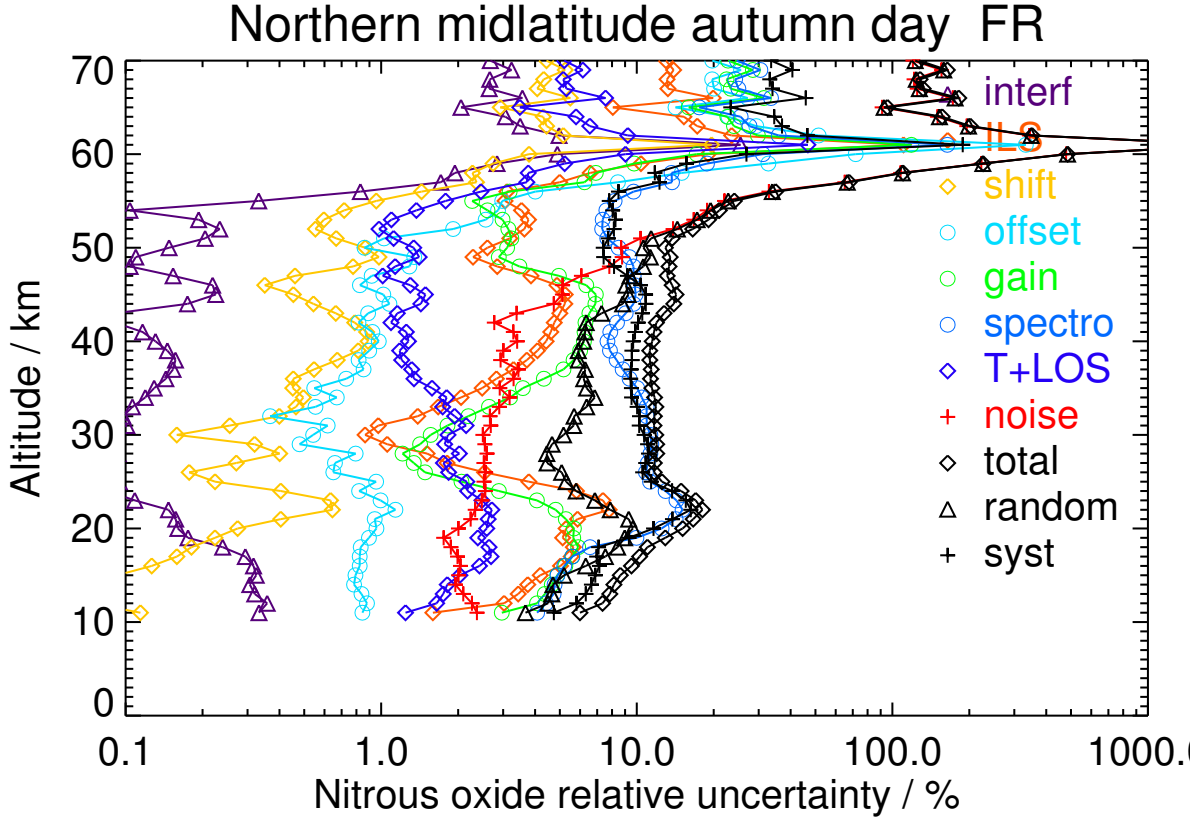

Figure S151. V8H_N2O_61 Northern midlatitude autumn day

Table S152. Nitrous oxide error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	305.986	1.784	3.312	0.507	2.684	11.972	11.897	3.304	7.279	11.435	15.480	19.246
12	323.099	0.843	5.993	0.422	2.354	14.695	12.709	4.260	5.684	10.935	18.727	21.686
15	317.796	0.784	10.103	0.560	2.264	17.443	13.366	5.787	5.872	13.311	21.950	25.671
18	278.058	0.462	16.349	0.783	2.359	19.570	15.949	7.529	5.221	20.819	23.697	31.543
21	202.219	0.325	12.053	0.826	2.257	15.135	21.675	5.770	4.359	21.077	21.403	30.039
24	150.996	0.157	9.126	0.995	1.409	7.513	18.341	3.347	3.570	11.571	19.214	22.429
27	118.141	0.101	2.159	0.352	0.741	2.712	14.348	2.058	2.883	6.186	13.887	15.203
30	76.288	0.064	1.042	0.159	0.373	1.478	9.308	1.493	2.009	4.448	8.750	9.815
33	49.085	0.048	0.979	0.230	0.251	1.611	5.526	0.882	1.367	3.359	5.057	6.071
36	28.568	0.042	1.127	0.159	0.193	1.422	3.304	0.444	0.897	2.445	3.049	3.909
39	18.159	0.027	0.894	0.127	0.145	1.138	1.944	0.238	0.591	1.631	1.912	2.513
42	11.585	0.013	0.611	0.081	0.101	0.778	1.146	0.156	0.431	1.107	1.138	1.587
45	7.123	0.015	0.385	0.040	0.076	0.463	0.729	0.120	0.428	0.749	0.734	1.049
48	3.753	0.004	0.126	0.025	0.057	0.136	0.365	0.045	0.373	0.474	0.297	0.559
52	2.819	0.008	0.137	0.017	0.063	0.131	0.222	0.033	0.479	0.518	0.228	0.566
56	1.585	0.010	0.061	0.021	0.066	0.097	0.130	0.038	0.511	0.534	0.109	0.545
60	0.544	0.016	0.096	0.016	0.209	0.113	0.116	0.030	1.317	1.345	0.086	1.347
64	-0.318	0.027	0.145	0.036	0.233	0.222	0.210	0.047	1.450	1.486	0.261	1.509
68	-0.643	0.025	0.140	0.040	0.251	0.237	0.219	0.047	1.517	1.555	0.272	1.578

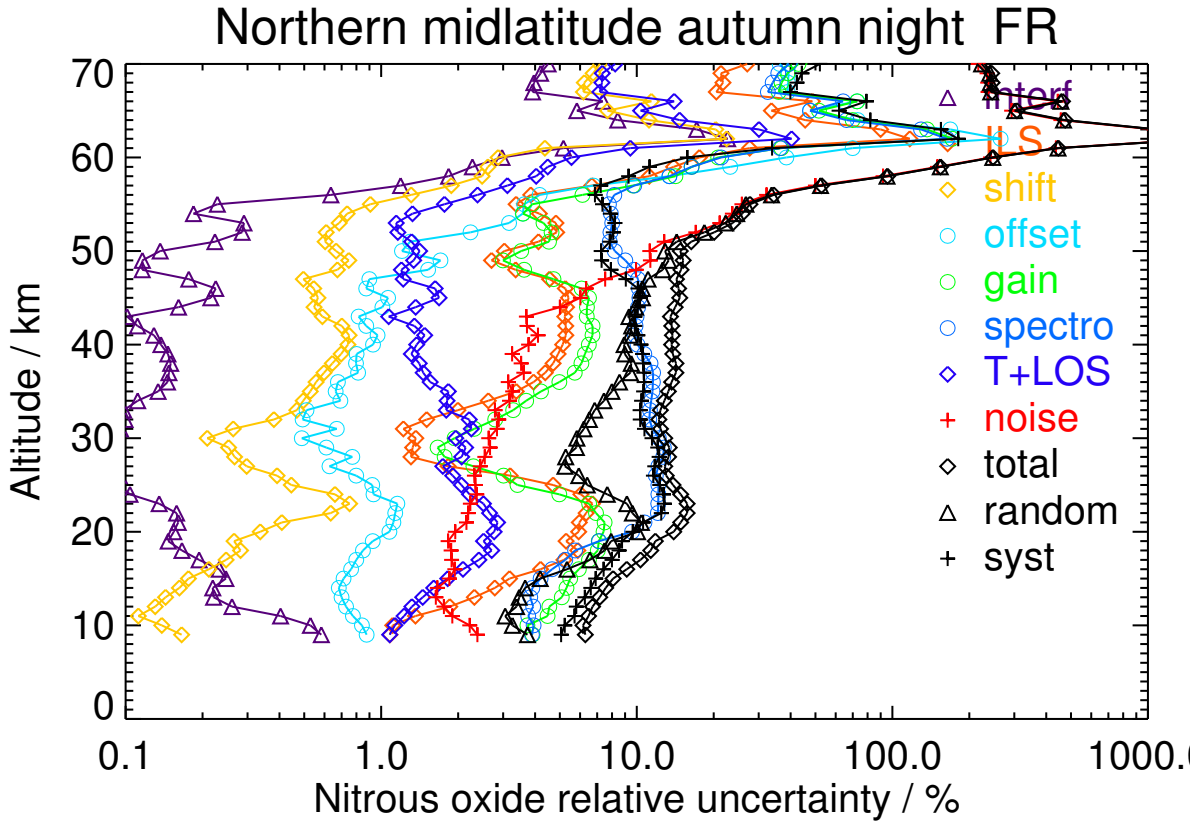

Figure S152. V8H_N2O_61 Northern midlatitude autumn night

Table S153. Nitrous oxide error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	339.045	1.133	11.457	1.384	2.415	13.349	17.333	5.042	7.605	14.154	22.402	26.499
15	342.644	1.590	17.717	2.232	3.521	10.696	23.521	8.735	9.470	16.961	29.661	34.167
18	320.546	1.160	12.006	1.824	3.118	7.629	16.328	7.478	8.009	15.747	18.854	24.564
21	284.343	0.519	4.141	0.527	2.369	3.881	21.962	5.072	6.481	9.823	22.180	24.258
24	270.109	0.192	6.618	0.832	1.233	5.271	24.586	3.695	4.500	6.970	25.761	26.687
27	236.494	0.111	2.021	0.884	0.902	4.368	22.989	3.148	3.697	5.996	23.257	24.018
30	196.282	0.088	2.024	0.507	0.565	4.212	19.044	2.548	2.775	5.326	19.259	19.982
33	142.918	0.073	1.232	0.710	0.449	3.178	12.808	1.739	2.148	3.869	13.001	13.565
36	90.103	0.068	2.490	0.570	0.409	2.850	7.447	0.917	1.336	2.450	8.179	8.538
39	49.489	0.057	2.347	0.350	0.324	2.614	4.446	0.501	0.800	1.415	5.588	5.765
42	24.588	0.019	1.667	0.202	0.246	1.997	2.718	0.308	0.610	1.291	3.613	3.837
45	10.332	0.010	0.595	0.023	0.075	0.695	1.262	0.119	0.340	0.704	1.439	1.602
48	3.989	0.008	0.094	0.068	0.047	0.163	0.425	0.079	0.298	0.443	0.349	0.564
52	2.479	0.003	0.084	0.015	0.051	0.093	0.160	0.034	0.318	0.343	0.169	0.382
56	1.360	0.009	0.118	0.029	0.092	0.164	0.197	0.037	0.642	0.673	0.224	0.709
60	0.209	0.011	0.048	0.013	0.114	0.126	0.149	0.032	0.801	0.823	0.141	0.835
64	-1.210	0.038	0.201	0.071	0.248	0.490	0.544	0.093	1.468	1.516	0.715	1.676
68	-1.455	0.043	0.229	0.084	0.306	0.560	0.629	0.104	1.770	1.824	0.826	2.002

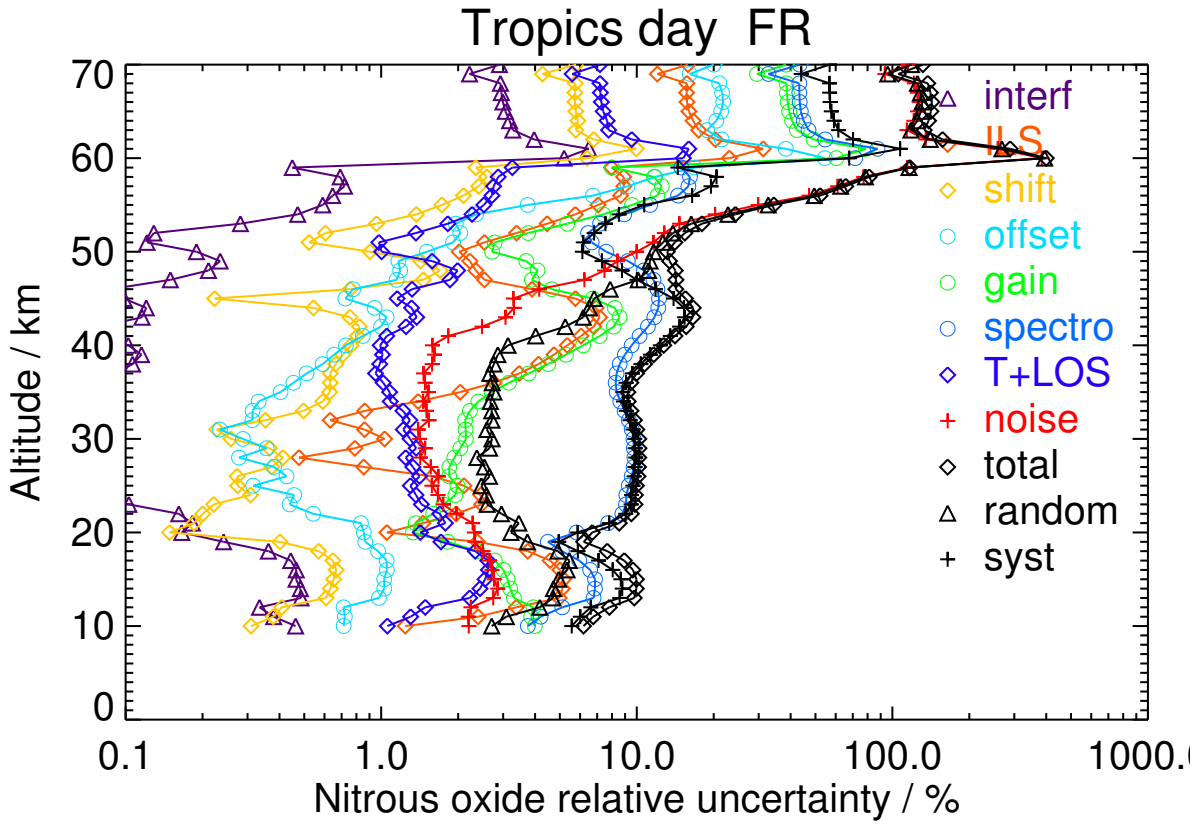

Figure S153. V8H_N2O_61 Tropics day

Table S154. Nitrous oxide error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	338.906	1.175	3.068	0.928	2.022	15.548	14.909	4.132	7.181	11.083	20.629	23.418
15	339.080	1.625	12.064	2.845	3.370	10.229	18.782	7.564	9.005	19.311	19.759	27.628
18	327.831	1.294	8.719	2.363	3.322	8.160	16.584	6.937	8.320	16.126	17.123	23.521
21	298.023	0.587	4.520	0.711	2.417	4.182	24.741	5.079	6.816	10.032	25.066	26.999
24	275.612	0.223	4.471	0.628	1.247	5.098	24.461	3.812	4.628	6.841	25.209	26.121
27	248.078	0.116	0.796	1.025	0.905	4.999	21.788	3.175	3.719	5.751	22.205	22.937
30	213.112	0.092	1.613	0.620	0.599	4.441	20.258	2.760	2.836	4.993	20.596	21.192
33	155.545	0.081	1.662	0.793	0.451	3.201	13.213	1.818	2.259	3.675	13.541	14.030
36	99.971	0.076	2.552	0.554	0.444	3.046	7.674	0.960	1.431	2.408	8.506	8.840
39	54.845	0.066	2.253	0.368	0.319	2.591	4.597	0.550	0.877	1.437	5.672	5.851
42	26.277	0.016	1.544	0.215	0.222	1.929	2.734	0.289	0.583	1.076	3.597	3.755
45	11.233	0.016	0.691	0.045	0.094	0.831	1.364	0.135	0.394	0.681	1.658	1.793
48	3.931	0.009	0.113	0.078	0.049	0.167	0.419	0.086	0.304	0.434	0.369	0.570
52	2.450	0.003	0.068	0.013	0.055	0.075	0.136	0.029	0.336	0.354	0.142	0.381
56	1.411	0.008	0.130	0.034	0.075	0.187	0.197	0.036	0.530	0.555	0.267	0.616
60	0.275	0.006	0.019	0.008	0.110	0.054	0.082	0.023	0.781	0.792	0.079	0.796
64	-1.056	0.042	0.238	0.088	0.233	0.591	0.653	0.108	1.360	1.427	0.849	1.660
68	-1.251	0.048	0.271	0.106	0.301	0.687	0.769	0.125	1.724	1.799	0.996	2.056

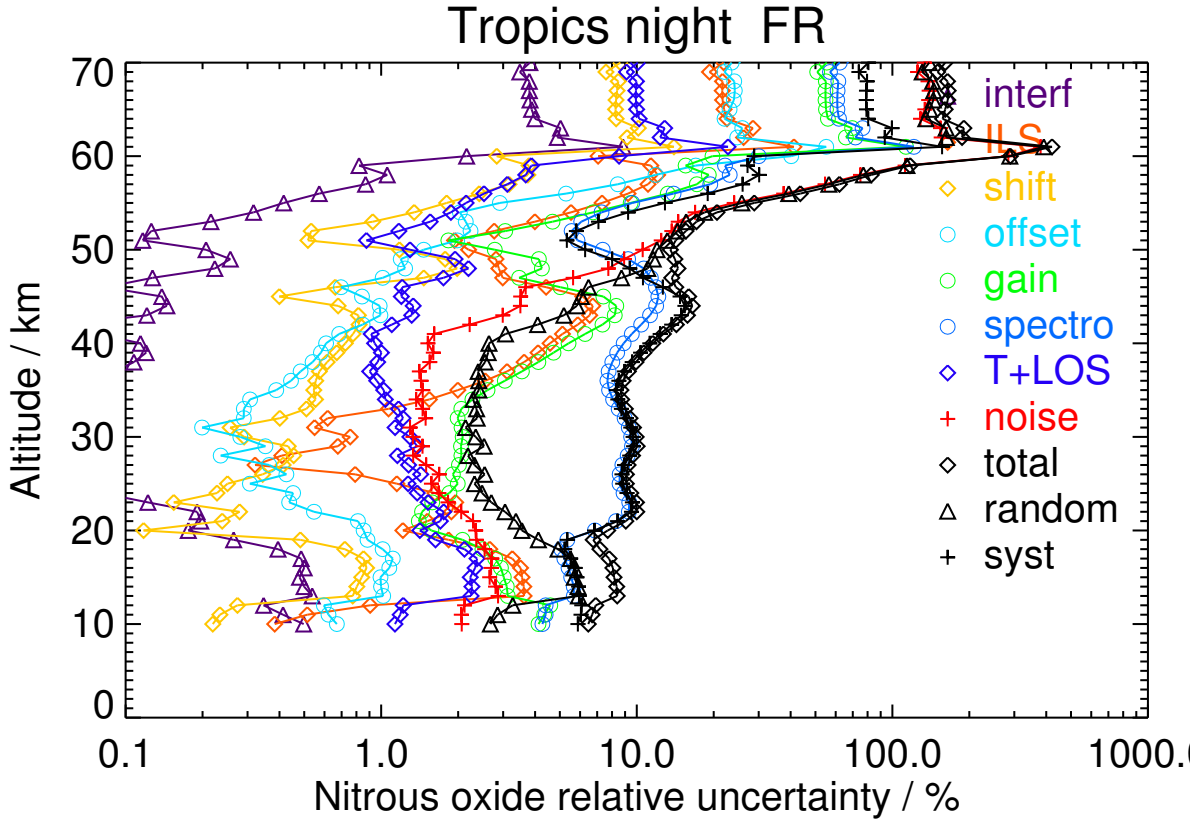

Figure S154. V8H_N2O_61 Tropics night

Table S155. Nitrous oxide error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	317.458	2.966	2.464	0.341	3.085	11.436	12.508	4.663	8.069	11.606	16.245	19.965
12	302.769	0.692	4.838	0.365	2.291	11.664	12.666	4.600	6.119	10.081	16.814	19.605
15	293.801	0.667	8.686	0.558	1.963	13.524	13.690	5.982	5.687	11.310	19.763	22.771
18	277.230	0.480	16.436	0.893	2.368	20.529	14.634	9.558	5.582	17.798	26.798	32.170
21	232.914	0.431	5.328	0.987	2.196	16.013	20.403	5.574	4.703	11.979	24.834	27.573
24	171.451	0.220	6.214	1.504	1.350	8.797	21.298	3.301	4.101	9.482	22.617	24.525
27	142.070	0.144	2.111	0.697	0.862	4.730	15.355	2.590	3.536	6.751	15.411	16.825
30	110.185	0.096	1.261	0.363	0.522	2.715	14.781	2.291	2.739	6.682	13.999	15.512
33	45.146	0.045	1.892	0.219	0.292	1.196	8.031	1.270	1.685	4.420	7.386	8.608
36	17.891	0.032	0.885	0.115	0.161	0.828	2.994	0.457	0.945	2.293	2.513	3.402
39	7.097	0.011	0.412	0.072	0.066	0.381	1.347	0.182	0.535	1.137	1.080	1.568
42	2.650	0.008	0.146	0.037	0.048	0.225	0.384	0.085	0.331	0.535	0.232	0.583
45	2.329	0.009	0.131	0.054	0.079	0.399	0.156	0.093	0.370	0.543	0.246	0.596
48	1.899	0.003	0.046	0.012	0.064	0.076	0.153	0.023	0.428	0.453	0.118	0.468
52	1.671	0.007	0.100	0.017	0.073	0.076	0.135	0.027	0.544	0.568	0.113	0.580
56	1.078	0.013	0.100	0.026	0.082	0.119	0.102	0.042	0.575	0.606	0.089	0.612
60	0.452	0.019	0.110	0.027	0.212	0.089	0.105	0.036	1.368	1.395	0.061	1.396
64	-0.232	0.022	0.107	0.033	0.237	0.120	0.115	0.038	1.488	1.516	0.109	1.520
68	-0.257	0.015	0.059	0.024	0.257	0.158	0.089	0.037	1.536	1.564	0.135	1.570

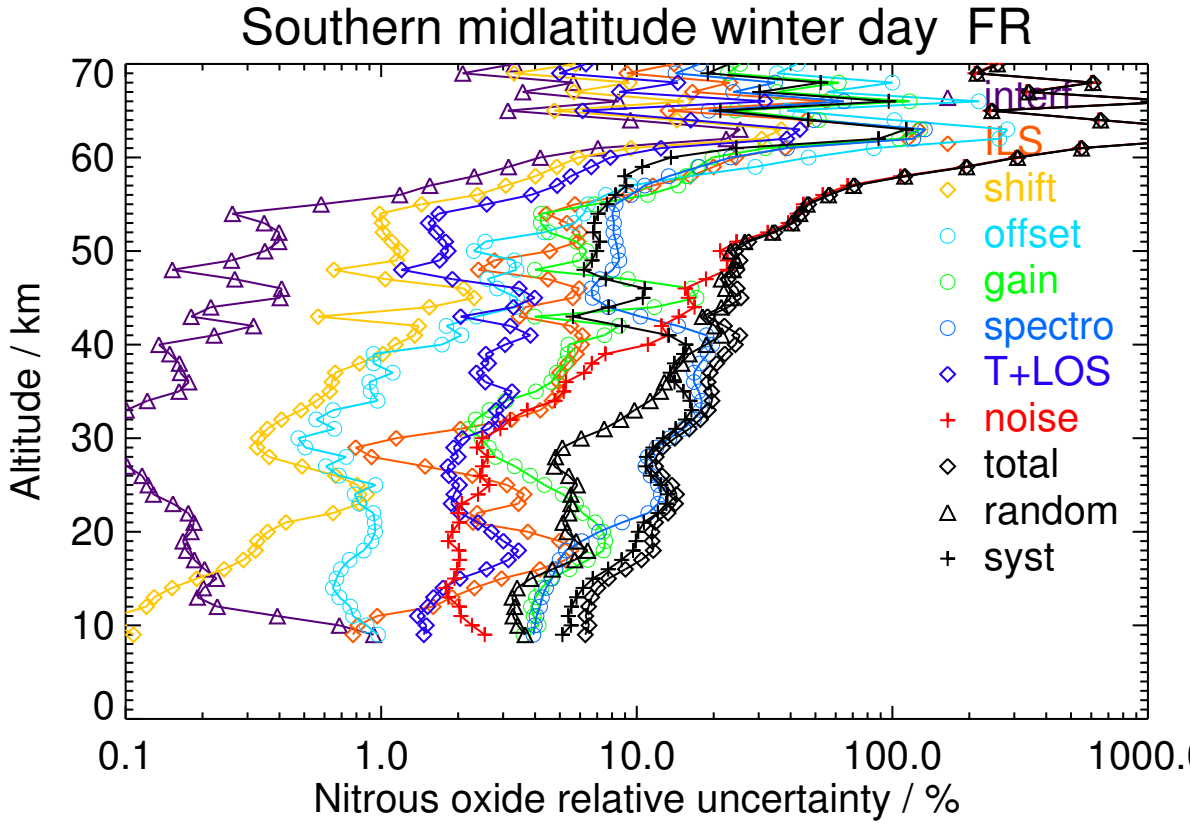

Figure S155. V8H_N2O_61 Southern midlatitude winter day

Table S156. Nitrous oxide error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	316.750	3.351	2.314	0.272	3.126	13.029	12.300	5.013	7.787	12.820	16.398	20.815
12	310.582	0.906	5.447	0.318	2.199	13.010	12.204	4.152	5.763	11.188	16.700	20.101
15	296.612	0.783	10.355	0.650	2.097	14.043	14.084	5.431	5.483	15.308	18.261	23.828
18	263.151	0.541	13.564	0.810	2.289	17.137	15.738	6.919	5.250	19.682	20.483	28.407
21	199.536	0.311	7.504	0.777	1.734	10.939	19.982	4.524	4.331	15.075	19.772	24.864
24	149.576	0.128	7.804	1.129	1.427	7.927	18.029	3.488	3.971	12.039	18.306	21.910
27	127.558	0.101	2.203	0.339	0.909	3.894	13.356	2.405	3.316	7.462	12.667	14.701
30	102.206	0.084	1.288	0.319	0.505	2.628	12.618	1.998	2.456	6.748	11.516	13.348
33	49.977	0.045	1.676	0.204	0.261	1.739	7.774	1.189	1.575	4.707	6.936	8.383
36	19.874	0.029	0.997	0.105	0.166	1.112	3.457	0.481	0.904	2.763	2.763	3.908
39	8.613	0.011	0.529	0.097	0.079	0.635	1.492	0.206	0.512	1.294	1.247	1.797
42	2.873	0.006	0.158	0.031	0.040	0.146	0.496	0.093	0.342	0.539	0.360	0.648
45	2.022	0.004	0.064	0.015	0.054	0.112	0.160	0.065	0.366	0.412	0.117	0.429
48	1.905	0.004	0.041	0.011	0.062	0.057	0.116	0.020	0.420	0.438	0.086	0.447
52	1.930	0.010	0.109	0.020	0.066	0.107	0.153	0.028	0.521	0.547	0.156	0.569
56	1.228	0.020	0.080	0.025	0.086	0.116	0.127	0.038	0.608	0.640	0.073	0.645
60	0.721	0.028	0.131	0.030	0.235	0.138	0.144	0.042	1.434	1.469	0.114	1.474
64	0.212	0.026	0.120	0.032	0.268	0.173	0.153	0.047	1.634	1.669	0.168	1.677
68	0.054	0.024	0.110	0.026	0.264	0.169	0.157	0.040	1.615	1.648	0.170	1.657

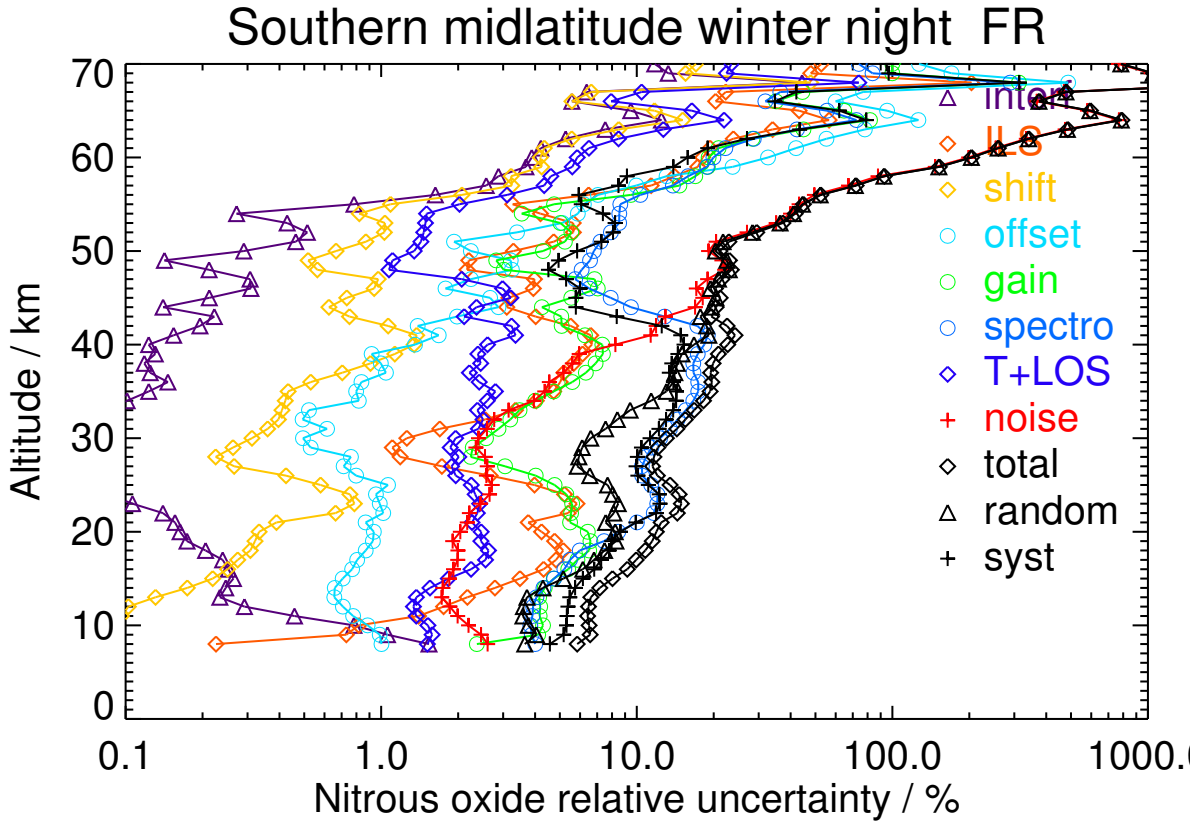

Figure S156. V8H_N2O_61 Southern midlatitude winter night

Table S157. Nitrous oxide error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	288.307	3.389	1.985	0.467	2.533	6.812	13.327	3.812	7.782	11.573	13.682	17.921
12	302.168	1.210	5.694	0.268	2.033	13.451	13.678	4.512	5.580	13.168	16.858	21.392
15	280.625	1.133	10.322	0.463	2.415	16.732	16.998	6.345	6.151	21.389	17.417	27.584
18	259.269	0.668	22.177	1.266	3.190	25.874	18.698	9.353	5.132	32.027	24.722	40.459
21	182.433	0.352	12.609	1.140	2.043	15.501	21.077	5.395	4.105	22.506	19.712	29.918
24	140.118	0.147	10.070	1.548	1.403	9.776	17.459	3.263	3.432	15.915	16.592	22.991
27	133.851	0.130	4.138	0.360	0.971	5.366	15.314	2.220	2.799	11.008	13.157	17.155
30	100.567	0.097	1.636	0.226	0.451	2.135	12.974	1.662	2.149	6.943	11.619	13.536
33	42.536	0.047	1.438	0.154	0.220	0.970	6.155	1.062	1.288	3.656	5.512	6.614
36	20.695	0.042	0.708	0.117	0.141	0.962	2.081	0.385	0.753	1.682	1.918	2.551
39	13.863	0.022	0.525	0.089	0.105	0.759	1.169	0.178	0.475	1.011	1.214	1.580
42	10.759	0.013	0.399	0.094	0.097	0.687	0.729	0.143	0.386	0.752	0.886	1.162
45	7.537	0.017	0.253	0.082	0.117	0.736	0.576	0.141	0.393	0.803	0.698	1.064
48	5.020	0.006	0.138	0.019	0.061	0.331	0.410	0.055	0.319	0.498	0.397	0.637
52	2.733	0.008	0.110	0.019	0.045	0.130	0.240	0.033	0.366	0.411	0.234	0.473
56	1.144	0.008	0.049	0.018	0.055	0.063	0.126	0.033	0.411	0.430	0.104	0.442
60	0.705	0.017	0.071	0.018	0.188	0.122	0.094	0.027	1.099	1.124	0.098	1.129
64	-0.229	0.031	0.135	0.046	0.220	0.329	0.217	0.053	1.297	1.345	0.320	1.382
68	-0.239	0.038	0.131	0.064	0.230	0.285	0.216	0.052	1.372	1.406	0.337	1.445

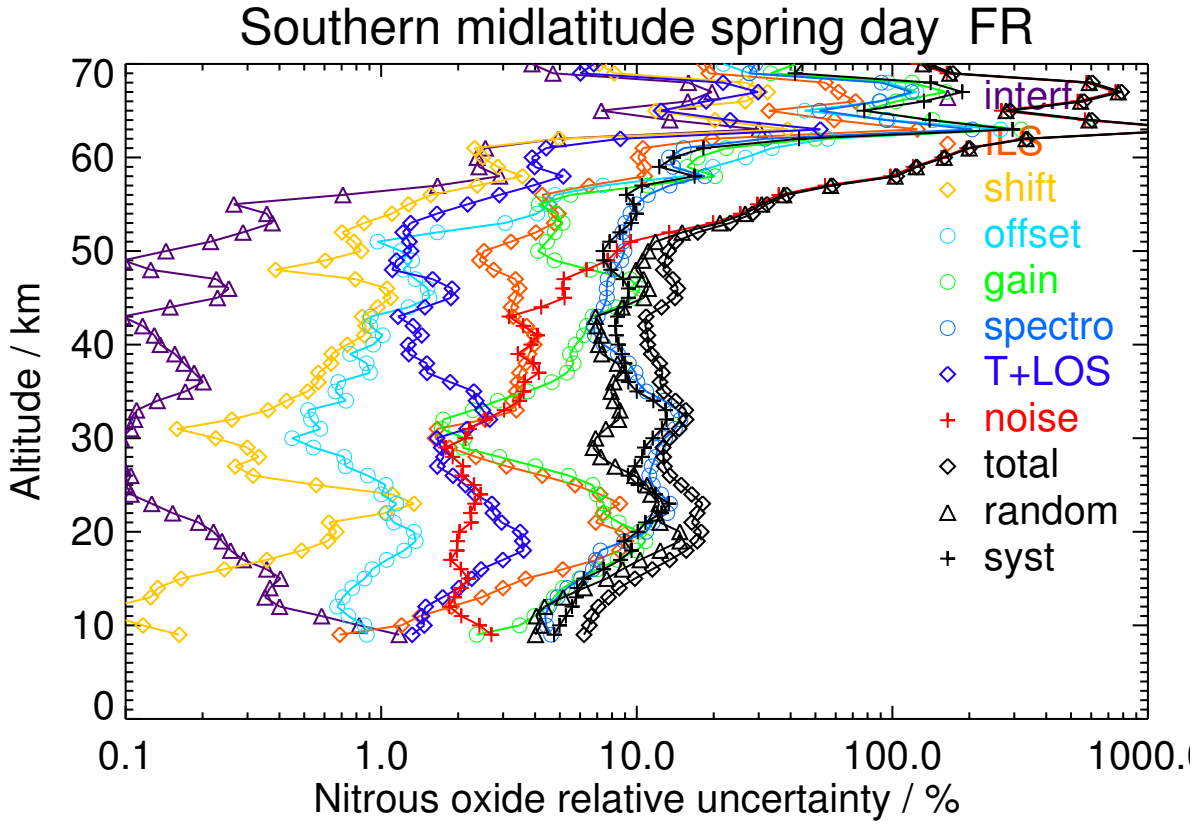

Figure S157. V8H_N2O_61 Southern midlatitude spring day

Table S158. Nitrous oxide error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	287.350	2.678	2.682	0.553	2.658	9.125	12.787	3.852	8.167	13.808	12.625	18.709
12	304.079	0.768	7.740	0.434	1.993	15.801	12.644	4.118	5.223	14.532	17.529	22.769
15	293.887	0.726	14.337	0.778	2.647	22.852	15.701	6.892	6.144	22.734	23.470	32.675
18	287.332	0.389	27.748	1.952	3.231	33.079	14.099	11.621	5.143	28.752	37.579	47.316
21	237.493	0.392	14.035	0.859	3.184	26.878	18.306	7.481	4.238	23.422	28.122	36.599
24	195.372	0.216	7.758	2.028	1.867	15.414	18.724	3.538	3.667	15.333	21.140	26.115
27	183.470	0.123	3.276	0.673	0.902	7.002	15.988	2.446	2.984	8.500	16.103	18.209
30	143.229	0.102	1.815	0.348	0.474	3.801	16.234	2.088	2.363	5.383	16.205	17.076
33	63.517	0.045	2.320	0.196	0.286	1.172	9.612	1.582	1.519	3.988	9.389	10.201
36	22.389	0.046	0.913	0.101	0.135	0.675	3.007	0.620	0.878	1.939	2.786	3.394
39	12.973	0.021	0.457	0.110	0.104	0.691	1.052	0.227	0.539	0.875	1.180	1.469
42	9.566	0.010	0.346	0.107	0.115	0.743	0.683	0.168	0.458	0.741	0.923	1.184
45	6.496	0.015	0.234	0.075	0.110	0.679	0.523	0.133	0.401	0.742	0.660	0.993
48	4.299	0.008	0.137	0.042	0.066	0.413	0.333	0.068	0.315	0.497	0.405	0.641
52	2.516	0.005	0.071	0.017	0.039	0.099	0.185	0.030	0.347	0.370	0.189	0.415
56	1.422	0.005	0.054	0.015	0.058	0.056	0.116	0.028	0.425	0.439	0.111	0.453
60	0.360	0.013	0.062	0.015	0.181	0.154	0.082	0.029	1.012	1.040	0.106	1.045
64	-0.416	0.022	0.056	0.029	0.219	0.275	0.124	0.044	1.241	1.278	0.228	1.298
68	-0.549	0.025	0.082	0.040	0.230	0.261	0.135	0.050	1.340	1.372	0.253	1.395

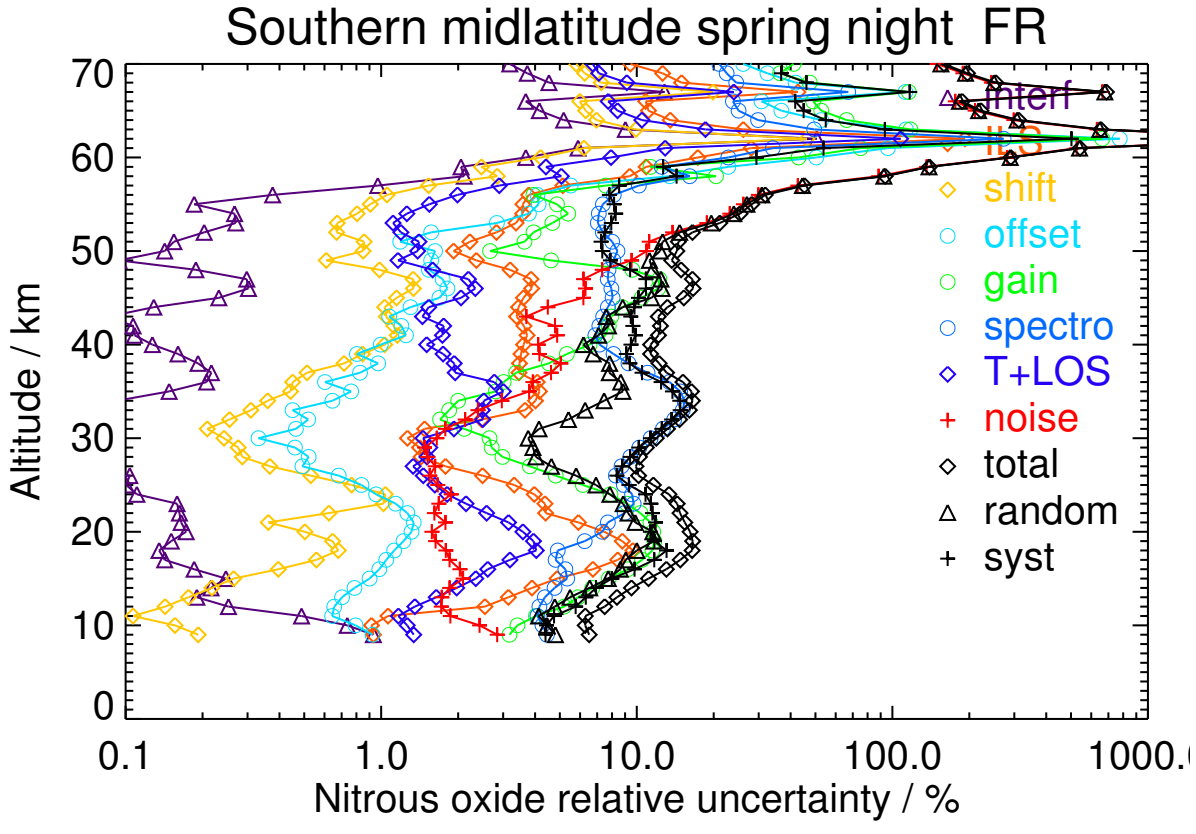

Figure S158. V8H_N2O_61 Southern midlatitude spring night

Table S159. Nitrous oxide error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	302.880	3.034	2.424	0.405	2.562	10.548	12.346	3.787	7.702	13.226	13.573	18.951
12	306.947	1.176	5.158	0.235	1.847	14.841	12.318	3.838	5.055	12.882	16.666	21.065
15	290.469	0.964	8.109	0.319	1.822	13.309	15.740	4.915	5.351	16.307	16.789	23.405
18	237.155	0.434	6.379	0.319	1.206	7.659	19.407	4.777	4.273	12.756	18.871	22.778
21	171.845	0.204	14.675	0.709	1.404	6.835	22.943	5.090	3.943	9.039	27.400	28.852
24	144.424	0.130	10.496	0.756	1.045	3.634	17.376	3.303	3.413	6.038	20.324	21.202
27	115.997	0.089	1.908	0.499	0.570	1.437	11.805	1.931	2.707	3.857	11.909	12.518
30	81.552	0.089	0.668	0.246	0.303	1.580	7.741	1.282	1.874	2.644	7.822	8.257
33	51.826	0.058	0.696	0.273	0.190	1.000	4.420	0.769	1.218	1.629	4.534	4.817
36	29.344	0.050	1.132	0.199	0.150	1.096	2.358	0.357	0.736	0.953	2.805	2.962
39	16.999	0.015	0.894	0.118	0.088	0.874	1.478	0.189	0.441	0.631	1.898	2.000
42	8.068	0.010	0.370	0.038	0.039	0.345	0.746	0.102	0.308	0.471	0.836	0.960
45	3.419	0.015	0.160	0.021	0.036	0.114	0.327	0.084	0.292	0.355	0.338	0.490
48	1.714	0.004	0.038	0.016	0.032	0.048	0.135	0.021	0.208	0.226	0.127	0.259
52	0.916	0.007	0.057	0.012	0.044	0.046	0.083	0.015	0.298	0.319	0.046	0.322
56	0.648	0.009	0.074	0.018	0.035	0.041	0.078	0.017	0.297	0.312	0.077	0.322
60	0.786	0.009	0.118	0.030	0.139	0.042	0.117	0.021	0.871	0.885	0.157	0.899
64	-0.428	0.034	0.146	0.056	0.146	0.236	0.286	0.039	0.958	0.980	0.377	1.050
68	-0.954	0.051	0.246	0.095	0.232	0.355	0.460	0.055	1.373	1.407	0.610	1.533

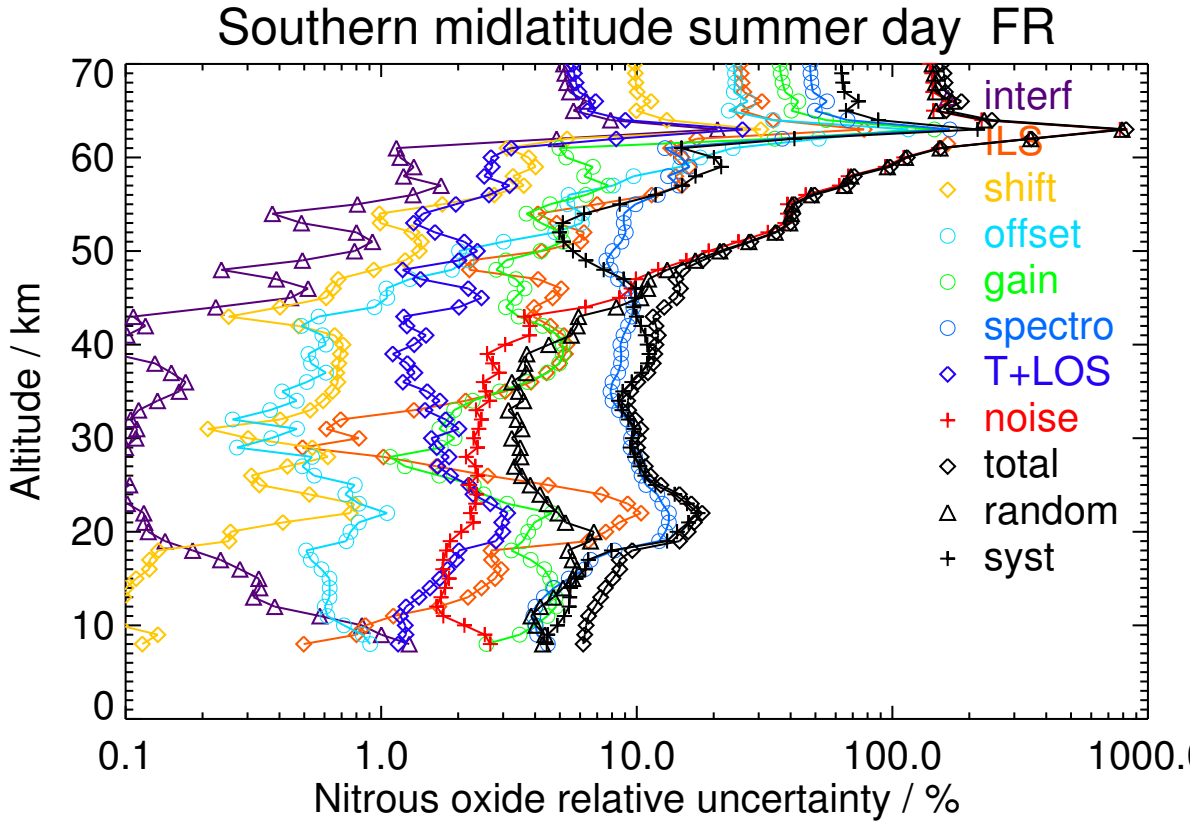

Figure S159. V8H_N2O_61 Southern midlatitude summer day

Table S160. Nitrous oxide error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	304.454	3.253	4.184	0.281	3.091	18.564	14.450	4.662	7.390	16.870	19.568	25.836
12	315.691	1.165	9.589	0.331	2.642	17.803	13.967	5.319	6.330	13.577	22.281	26.092
15	317.927	1.068	17.073	0.527	2.814	22.501	15.636	6.995	6.511	17.167	29.124	33.807
18	271.123	0.583	18.317	0.590	2.572	21.603	19.123	6.844	4.829	23.796	26.060	35.289
21	192.761	0.298	11.626	0.918	1.386	7.877	23.177	4.008	3.817	13.350	24.283	27.711
24	138.123	0.127	8.884	0.683	1.078	3.870	15.811	3.079	3.379	6.787	17.898	19.142
27	119.231	0.101	2.231	0.641	0.644	1.624	11.859	1.985	2.762	4.251	11.941	12.675
30	82.018	0.091	0.621	0.242	0.333	1.726	8.135	1.379	1.952	2.730	8.245	8.685
33	53.445	0.060	0.727	0.308	0.219	1.287	4.561	0.817	1.283	1.718	4.742	5.044
36	30.218	0.054	1.106	0.192	0.155	1.108	2.490	0.396	0.792	1.040	2.901	3.082
39	17.712	0.019	0.935	0.118	0.089	0.840	1.517	0.204	0.468	0.660	1.931	2.040
42	8.095	0.013	0.416	0.038	0.045	0.355	0.805	0.111	0.329	0.479	0.918	1.035
45	3.128	0.013	0.154	0.023	0.037	0.106	0.322	0.085	0.290	0.364	0.315	0.482
48	1.562	0.004	0.034	0.015	0.030	0.033	0.108	0.020	0.199	0.210	0.103	0.234
52	0.924	0.006	0.050	0.011	0.041	0.043	0.066	0.013	0.279	0.289	0.071	0.298
56	0.260	0.010	0.039	0.012	0.033	0.036	0.055	0.014	0.296	0.306	0.038	0.308
60	0.528	0.008	0.075	0.028	0.129	0.054	0.102	0.014	0.804	0.818	0.119	0.827
64	-0.698	0.032	0.154	0.055	0.140	0.192	0.279	0.032	0.912	0.936	0.344	0.997
68	-1.294	0.047	0.233	0.092	0.238	0.303	0.441	0.049	1.422	1.456	0.559	1.560

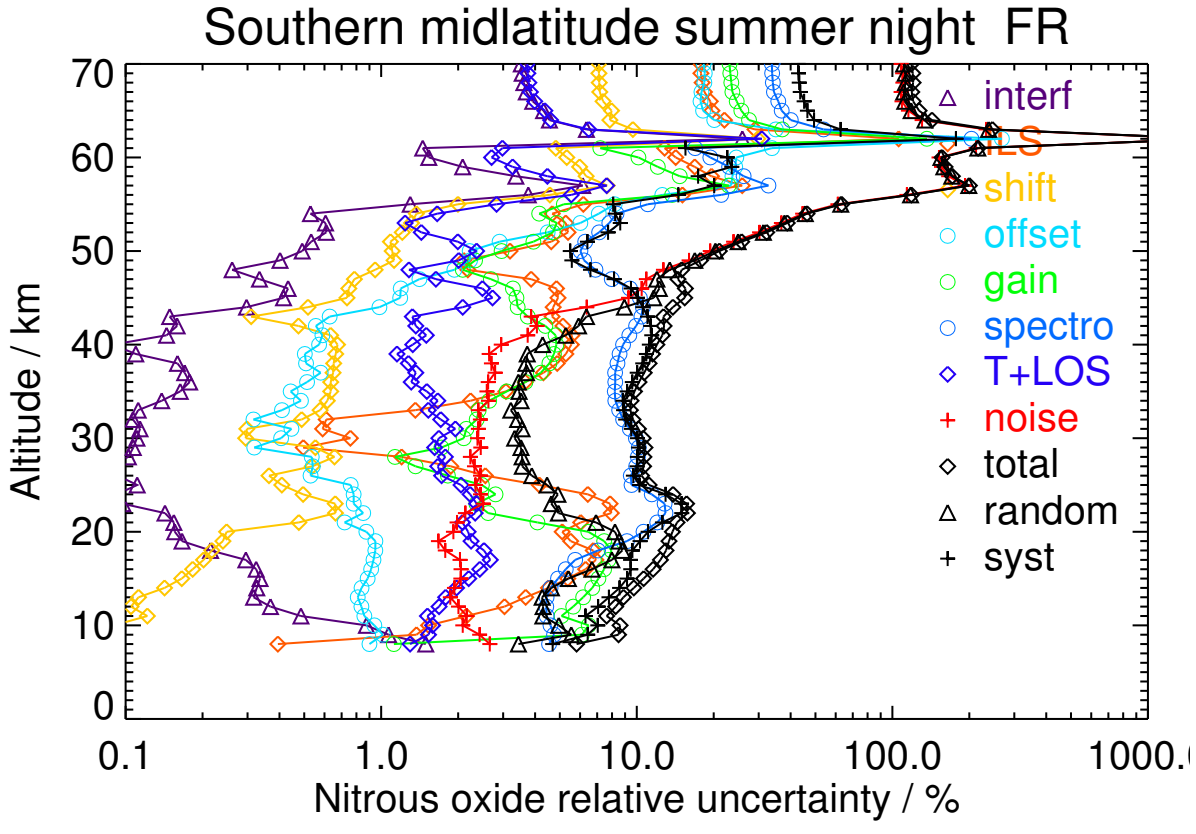

Figure S160. V8H_N2O_61 Southern midlatitude summer night

Table S161. Nitrous oxide error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	314.527	0.863	5.447	0.324	2.188	13.274	12.590	3.960	5.604	10.323	17.622	20.423
15	303.224	0.685	9.620	0.506	2.256	15.580	14.508	5.458	5.767	14.359	20.210	24.792
18	263.133	0.265	9.092	0.604	2.830	20.515	19.083	4.988	4.467	18.207	24.279	30.348
21	192.936	0.282	8.422	1.510	2.204	13.414	22.398	3.892	3.601	15.169	23.617	28.069
24	144.939	0.149	4.107	0.445	1.465	7.249	15.858	2.862	3.247	9.842	15.656	18.493
27	108.978	0.109	1.255	0.489	0.810	2.076	12.214	1.993	2.730	5.193	11.850	12.938
30	72.283	0.056	1.138	0.204	0.453	1.603	8.743	1.579	2.009	3.648	8.589	9.332
33	44.399	0.041	1.221	0.234	0.367	1.877	5.171	0.849	1.442	2.931	5.115	5.895
36	24.109	0.032	0.939	0.129	0.235	1.495	3.431	0.432	0.994	2.548	3.105	4.017
39	15.114	0.023	0.620	0.134	0.189	1.158	1.556	0.230	0.699	1.557	1.522	2.177
42	10.473	0.008	0.551	0.069	0.123	0.837	1.127	0.130	0.463	1.176	1.069	1.589
45	6.323	0.010	0.369	0.031	0.066	0.507	0.710	0.095	0.372	0.753	0.695	1.025
48	3.481	0.005	0.105	0.034	0.055	0.158	0.358	0.054	0.380	0.484	0.285	0.562
52	2.545	0.003	0.086	0.013	0.080	0.092	0.178	0.028	0.550	0.571	0.177	0.598
56	1.599	0.012	0.072	0.026	0.081	0.181	0.113	0.042	0.652	0.690	0.094	0.696
60	1.184	0.008	0.035	0.010	0.190	0.043	0.076	0.023	1.335	1.350	0.061	1.352
64	0.702	0.015	0.070	0.021	0.224	0.137	0.121	0.030	1.438	1.464	0.124	1.469
68	0.466	0.018	0.080	0.027	0.283	0.209	0.141	0.036	1.670	1.703	0.202	1.715

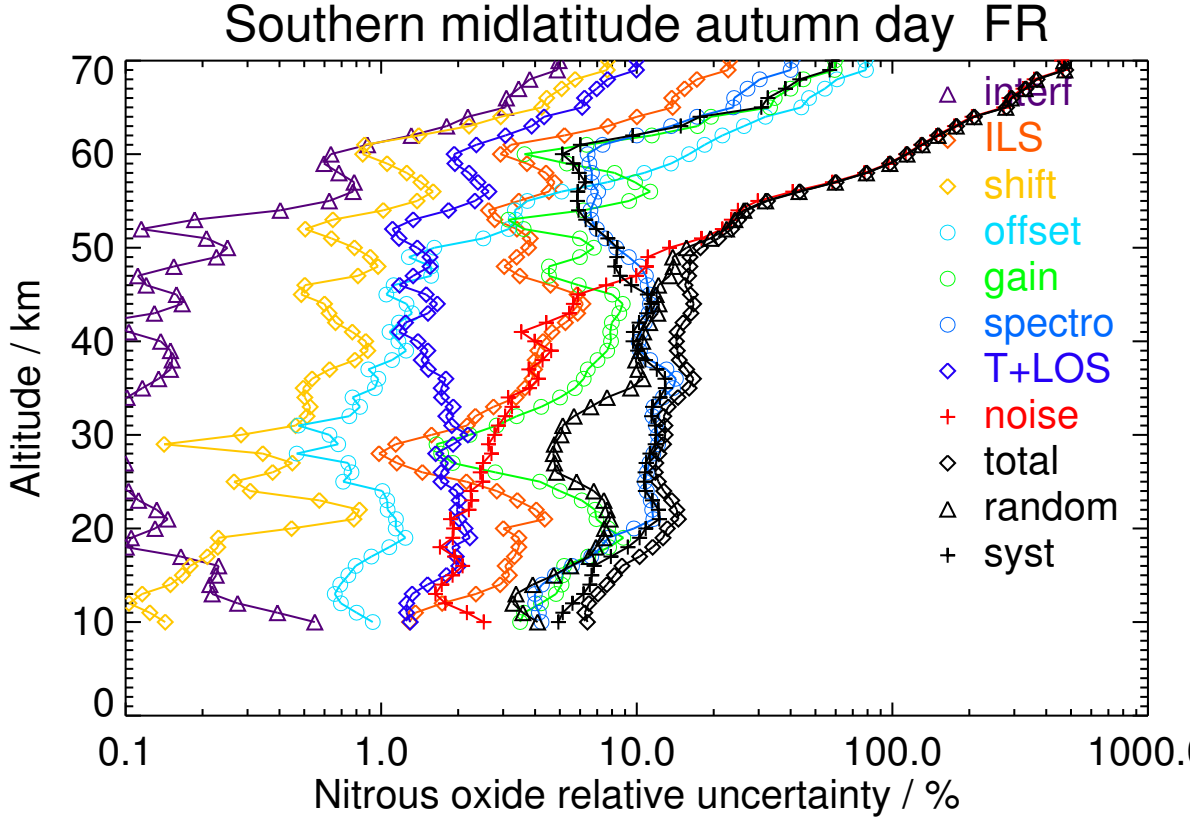

Figure S161. V8H_N2O_61 Southern midlatitude autumn day

Table S162. Nitrous oxide error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	323.693	0.999	7.442	0.285	2.500	16.506	13.111	4.264	5.747	10.771	21.029	23.627
15	319.088	0.935	10.023	0.417	2.522	16.897	14.259	5.617	5.826	11.536	23.003	25.734
18	281.480	0.489	7.421	0.527	3.091	22.159	18.810	4.857	4.383	13.708	27.657	30.868
21	197.515	0.289	9.648	1.654	2.256	13.059	24.844	4.184	3.787	15.198	26.261	30.341
24	151.670	0.142	3.341	0.279	1.373	4.938	16.357	2.988	3.338	8.006	16.157	18.032
27	113.607	0.116	1.250	0.599	0.797	1.863	12.260	2.145	2.776	4.585	12.151	12.987
30	74.630	0.065	0.891	0.215	0.454	1.666	8.547	1.671	2.049	3.939	8.267	9.158
33	44.985	0.053	0.903	0.259	0.348	1.552	4.327	0.865	1.491	2.597	4.286	5.011
36	30.474	0.043	0.938	0.158	0.269	1.577	2.996	0.432	1.049	2.225	2.962	3.705
39	19.985	0.031	0.908	0.165	0.187	1.201	1.792	0.252	0.717	1.657	1.836	2.473
42	12.517	0.014	0.718	0.089	0.125	0.881	1.248	0.136	0.451	1.278	1.209	1.759
45	8.013	0.016	0.444	0.028	0.071	0.547	0.818	0.107	0.389	0.846	0.787	1.155
48	4.243	0.008	0.132	0.054	0.059	0.164	0.452	0.055	0.383	0.524	0.361	0.636
52	2.737	0.004	0.107	0.015	0.078	0.079	0.214	0.030	0.527	0.551	0.210	0.590
56	1.558	0.014	0.084	0.024	0.068	0.100	0.143	0.040	0.586	0.615	0.095	0.622
60	1.233	0.009	0.053	0.011	0.180	0.039	0.096	0.026	1.257	1.274	0.073	1.276
64	0.207	0.018	0.069	0.024	0.204	0.155	0.175	0.038	1.328	1.356	0.171	1.367
68	-0.297	0.025	0.096	0.041	0.272	0.268	0.252	0.052	1.622	1.666	0.284	1.690

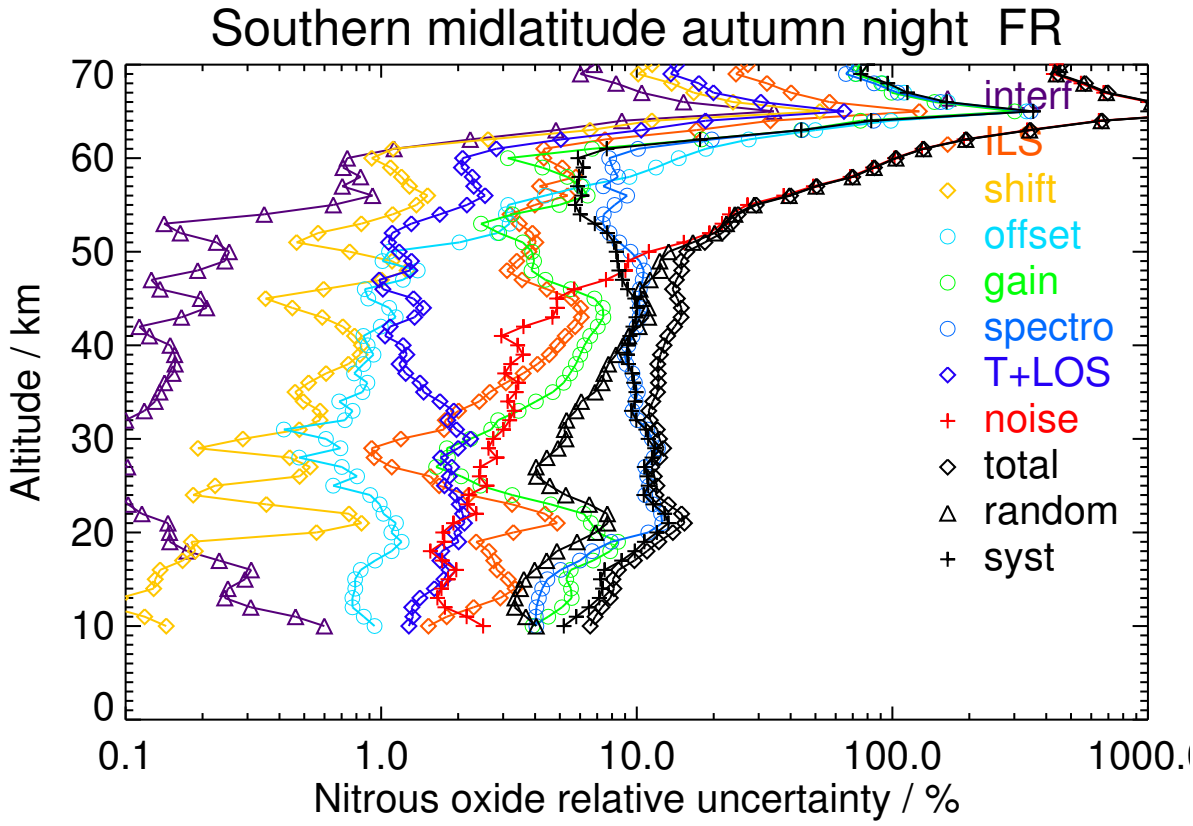

Figure S162. V8H_N2O_61 Southern midlatitude autumn night

Table S163. Nitrous oxide error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	319.250	2.198	1.371	0.324	4.161	12.202	13.473	6.961	9.816	13.959	17.450	22.346
12	287.849	1.862	1.981	0.465	3.697	10.966	12.502	7.439	9.774	14.544	15.400	21.182
15	228.073	2.115	2.050	0.543	2.983	8.726	12.347	7.475	8.504	13.266	14.095	19.356
18	144.134	1.280	2.718	0.725	2.002	6.659	15.603	6.012	5.646	10.475	16.114	19.219
21	83.476	0.333	1.491	0.816	1.227	4.504	15.267	3.108	4.696	7.761	15.144	17.017
24	28.290	0.089	1.280	0.233	0.545	1.180	7.832	1.412	3.542	5.752	6.797	8.904
27	11.978	0.058	0.506	0.149	0.403	0.465	1.900	0.629	2.167	2.786	1.264	3.060
30	10.261	0.055	0.383	0.104	0.271	0.405	1.525	0.381	1.488	1.889	1.232	2.255
33	4.376	0.029	0.268	0.070	0.147	0.366	0.736	0.181	0.843	1.025	0.682	1.232
36	1.560	0.008	0.132	0.053	0.086	0.284	0.253	0.066	0.426	0.563	0.204	0.598
39	0.814	0.003	0.033	0.012	0.040	0.049	0.059	0.021	0.288	0.300	0.045	0.303
42	0.834	0.003	0.018	0.007	0.028	0.030	0.053	0.014	0.232	0.239	0.038	0.242
45	1.206	0.004	0.030	0.011	0.039	0.042	0.068	0.018	0.294	0.304	0.053	0.309
48	1.068	0.003	0.023	0.005	0.058	0.018	0.059	0.009	0.395	0.402	0.052	0.405
52	1.130	0.004	0.043	0.015	0.065	0.022	0.055	0.012	0.507	0.513	0.062	0.516
56	0.968	0.005	0.025	0.015	0.074	0.038	0.062	0.017	0.555	0.563	0.054	0.566
60	0.945	0.008	0.038	0.013	0.219	0.033	0.061	0.023	1.378	1.397	0.051	1.398
64	0.809	0.010	0.044	0.017	0.254	0.027	0.067	0.026	1.571	1.594	0.049	1.594
68	0.353	0.009	0.030	0.013	0.254	0.024	0.046	0.023	1.544	1.565	0.034	1.566

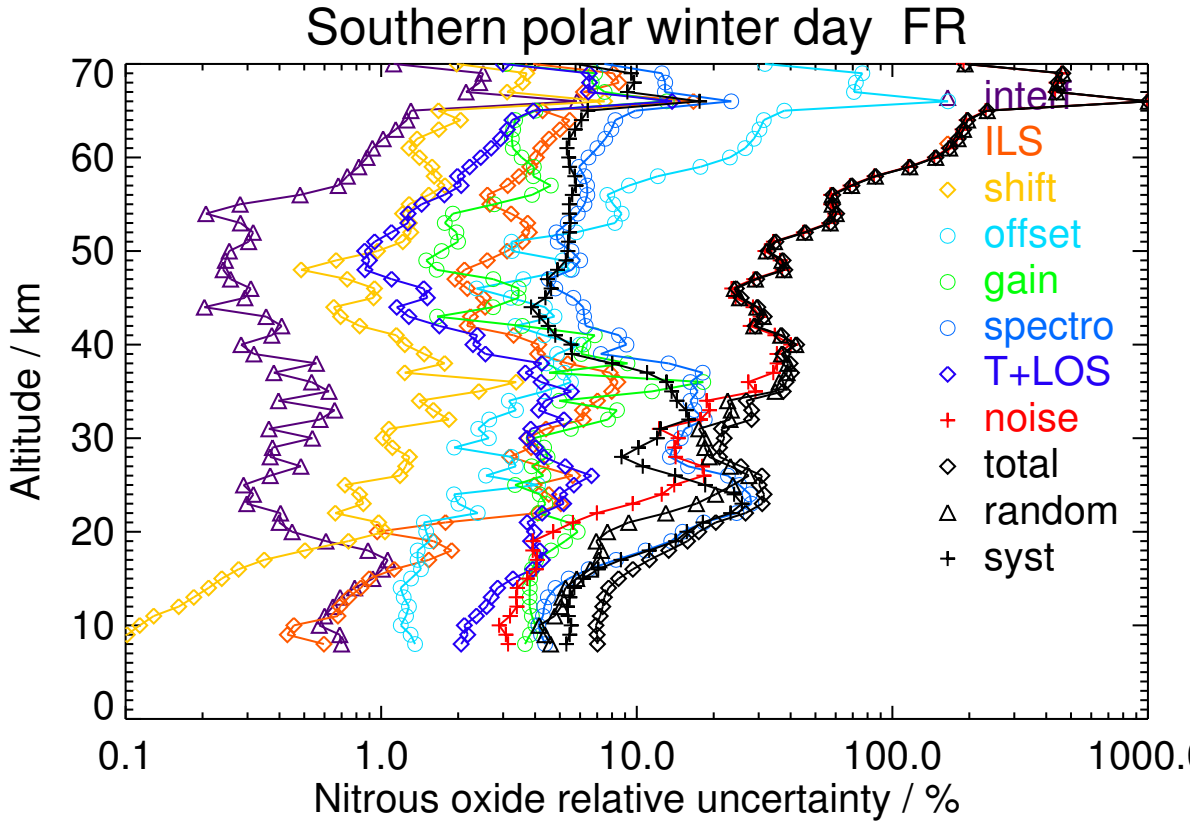

Figure S163. V8H_N2O_61 Southern polar winter day

Table S164. Nitrous oxide error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	312.334	2.047	1.507	0.207	3.625	10.391	11.287	5.654	8.422	12.410	14.279	18.918
12	288.842	1.540	2.978	0.254	2.887	9.574	11.011	5.637	7.575	11.930	13.393	17.936
15	228.767	1.690	3.293	0.362	2.611	7.361	9.704	6.324	7.348	12.105	10.792	16.217
18	153.031	0.999	2.469	0.492	1.796	5.385	11.872	4.820	5.052	9.456	11.825	15.141
21	95.611	0.284	1.410	0.828	1.402	4.377	11.101	3.000	4.610	6.925	11.376	13.318
24	43.602	0.102	1.774	0.360	0.773	1.906	8.668	1.788	3.862	5.432	8.441	10.038
27	14.020	0.054	0.921	0.196	0.428	0.812	3.734	0.903	2.381	3.486	3.164	4.708
30	7.093	0.046	0.368	0.118	0.253	0.552	1.201	0.398	1.433	1.947	0.620	2.043
33	6.042	0.030	0.301	0.092	0.175	0.440	0.918	0.229	0.972	1.233	0.803	1.472
36	2.611	0.010	0.166	0.038	0.084	0.215	0.413	0.095	0.542	0.655	0.355	0.745
39	1.196	0.003	0.073	0.018	0.042	0.070	0.164	0.039	0.347	0.385	0.115	0.402
42	0.680	0.003	0.034	0.014	0.034	0.070	0.094	0.034	0.275	0.292	0.088	0.305
45	0.845	0.003	0.035	0.018	0.052	0.104	0.094	0.038	0.342	0.367	0.085	0.377
48	0.627	0.002	0.025	0.007	0.063	0.025	0.053	0.012	0.439	0.447	0.040	0.449
52	0.960	0.003	0.032	0.015	0.061	0.047	0.048	0.018	0.500	0.507	0.053	0.510
56	1.109	0.003	0.022	0.013	0.076	0.057	0.061	0.020	0.567	0.575	0.064	0.579
60	1.189	0.007	0.026	0.012	0.213	0.053	0.070	0.027	1.332	1.351	0.071	1.353
64	0.796	0.008	0.032	0.010	0.258	0.031	0.078	0.029	1.565	1.587	0.067	1.589
68	0.810	0.006	0.015	0.007	0.262	0.025	0.073	0.023	1.575	1.598	0.064	1.599

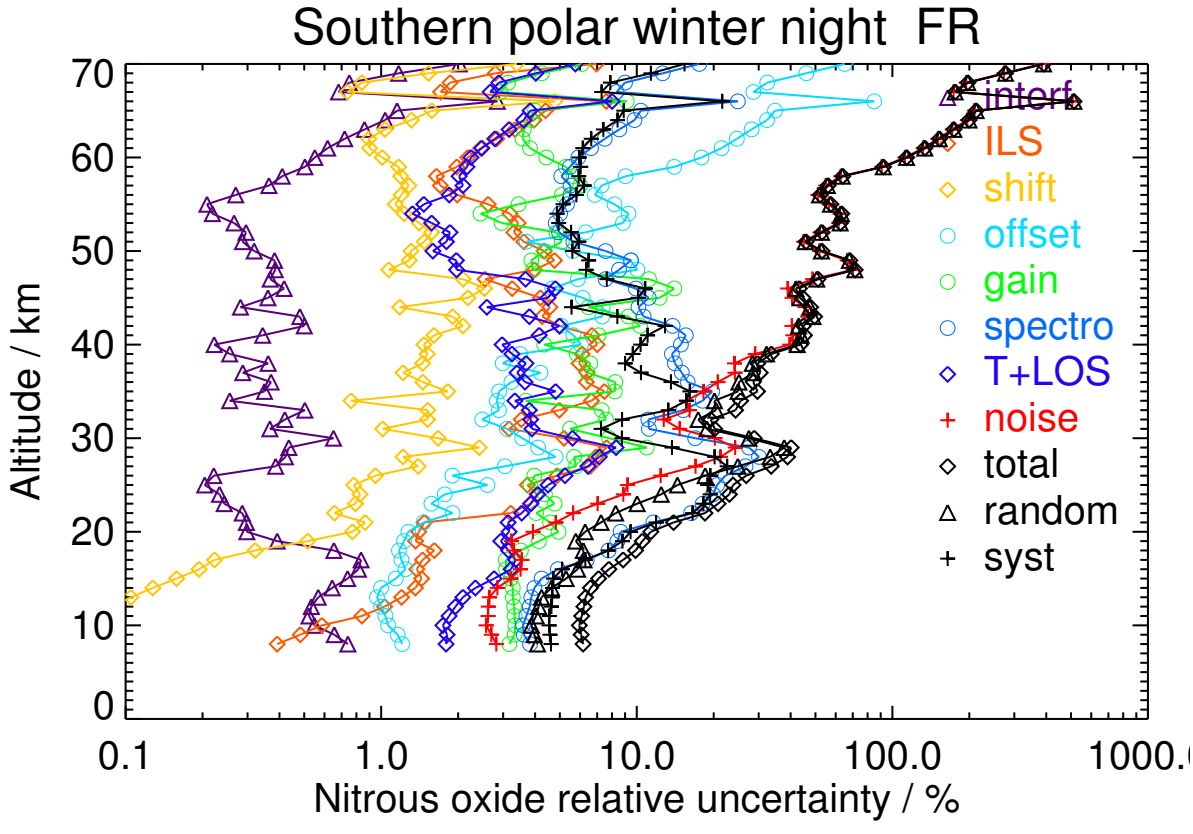

Figure S164. V8H_N2O_61 Southern polar winter night

Table S165. Nitrous oxide error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	308.136	3.694	5.068	0.552	3.826	10.250	11.171	7.330	10.685	15.089	14.979	21.261
12	286.765	2.329	6.498	0.813	2.856	9.068	10.935	7.566	8.752	13.382	14.596	19.802
15	201.366	1.533	5.279	0.862	1.911	4.875	16.201	6.967	7.111	12.320	16.376	20.493
18	94.035	0.346	3.997	0.763	0.948	2.552	15.824	6.186	4.136	8.779	15.900	18.162
21	12.184	0.083	2.075	0.261	0.393	0.699	4.154	1.343	2.930	4.962	2.837	5.716
24	10.932	0.116	2.160	0.171	0.312	1.131	3.238	0.680	2.438	4.005	2.633	4.793
27	18.878	0.130	1.642	0.186	0.353	0.909	3.278	0.496	2.208	4.268	1.163	4.424
30	22.906	0.085	1.357	0.134	0.255	1.975	3.565	0.371	1.687	4.186	2.000	4.640
33	16.204	0.034	0.542	0.091	0.141	0.534	1.747	0.225	0.940	1.763	1.219	2.144
36	11.243	0.020	0.406	0.071	0.072	0.453	0.669	0.123	0.521	0.771	0.721	1.055
39	9.817	0.013	0.342	0.056	0.049	0.445	0.521	0.079	0.327	0.548	0.636	0.840
42	7.056	0.008	0.308	0.034	0.037	0.307	0.443	0.066	0.275	0.498	0.469	0.684
45	5.147	0.008	0.233	0.025	0.036	0.249	0.345	0.047	0.242	0.403	0.368	0.546
48	3.439	0.010	0.180	0.020	0.033	0.170	0.235	0.029	0.232	0.344	0.232	0.415
52	2.212	0.009	0.133	0.024	0.031	0.112	0.149	0.021	0.262	0.303	0.176	0.351
56	1.146	0.007	0.063	0.014	0.053	0.056	0.107	0.022	0.362	0.379	0.096	0.391
60	0.336	0.027	0.181	0.039	0.149	0.163	0.146	0.024	0.822	0.873	0.140	0.884
64	-0.540	0.037	0.411	0.065	0.202	0.333	0.319	0.041	1.131	1.192	0.537	1.307
68	-2.279	0.065	0.926	0.137	0.211	0.748	0.729	0.082	1.208	1.443	1.183	1.866

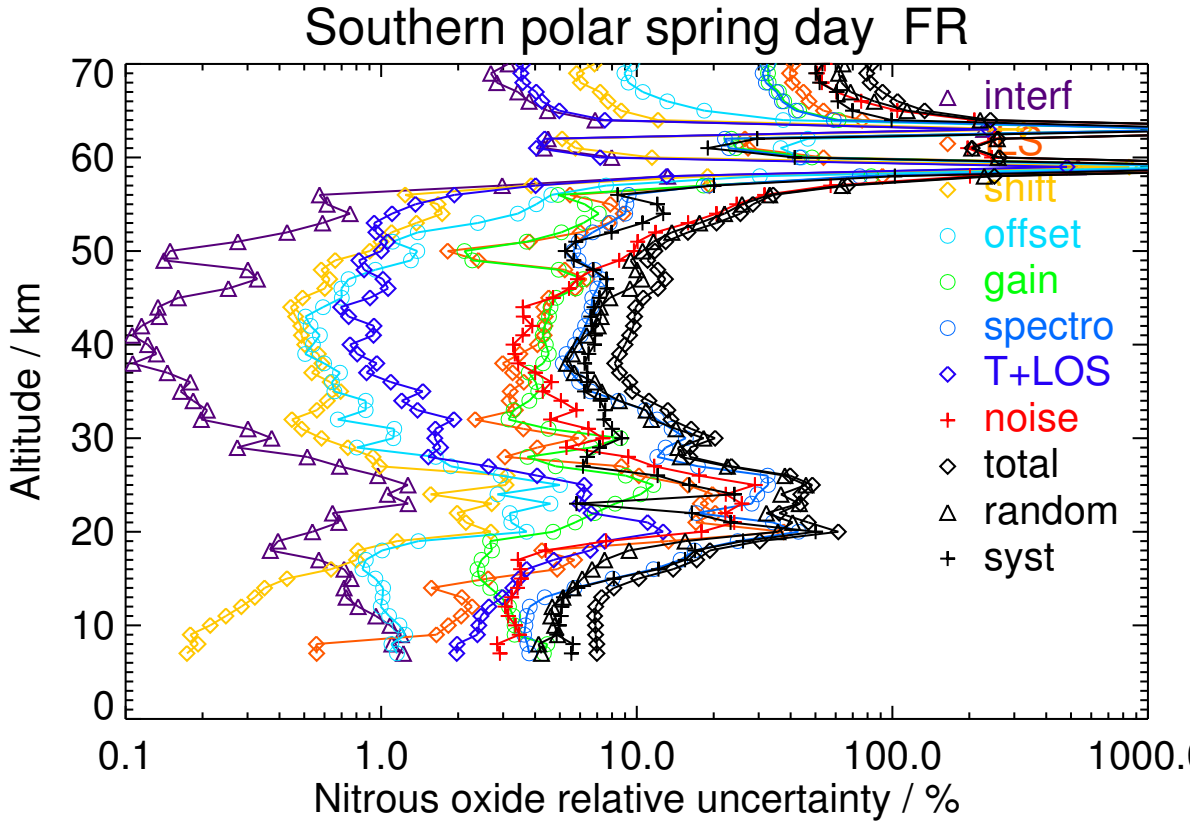

Figure S165. V8H_N2O_61 Southern polar spring day

Table S166. Nitrous oxide error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	310.302	2.695	5.595	0.601	3.691	9.404	12.151	6.284	9.671	14.979	14.045	20.534
12	289.061	1.438	7.598	0.883	2.415	8.722	12.142	6.014	7.127	13.870	13.583	19.413
15	209.435	1.279	5.772	1.033	1.951	6.345	14.618	6.675	6.352	13.674	13.846	19.460
18	121.684	0.371	3.360	0.959	1.309	4.839	13.046	6.785	4.597	10.646	12.709	16.578
21	67.831	0.124	7.233	0.774	0.884	4.117	10.272	2.552	3.675	10.303	9.489	14.007
24	64.608	0.119	7.057	0.957	0.921	7.044	9.156	1.651	3.032	12.179	6.974	14.034
27	60.062	0.113	2.987	0.478	0.647	3.449	9.668	1.188	2.662	8.974	6.550	11.111
30	41.332	0.143	1.327	0.315	0.362	2.258	7.357	0.802	1.908	6.910	4.215	8.095
33	20.906	0.080	1.092	0.152	0.200	1.079	3.774	0.469	1.142	3.412	2.560	4.266
36	11.618	0.038	0.519	0.093	0.125	0.821	1.361	0.193	0.586	1.460	1.035	1.790
39	8.504	0.015	0.386	0.040	0.072	0.523	0.757	0.092	0.358	0.783	0.726	1.068
42	6.650	0.010	0.193	0.035	0.061	0.409	0.443	0.069	0.305	0.550	0.448	0.709
45	4.964	0.009	0.096	0.020	0.040	0.165	0.325	0.046	0.271	0.362	0.297	0.468
48	3.559	0.012	0.083	0.018	0.045	0.170	0.217	0.035	0.272	0.356	0.185	0.401
52	2.597	0.009	0.115	0.023	0.041	0.124	0.176	0.025	0.318	0.356	0.192	0.405
56	1.350	0.010	0.055	0.017	0.061	0.067	0.142	0.028	0.424	0.447	0.110	0.461
60	0.229	0.023	0.096	0.026	0.179	0.223	0.142	0.029	0.972	1.017	0.152	1.028
64	-0.537	0.032	0.259	0.056	0.232	0.332	0.250	0.044	1.286	1.351	0.358	1.398
68	-1.245	0.054	0.637	0.123	0.213	0.463	0.501	0.057	1.256	1.437	0.673	1.586

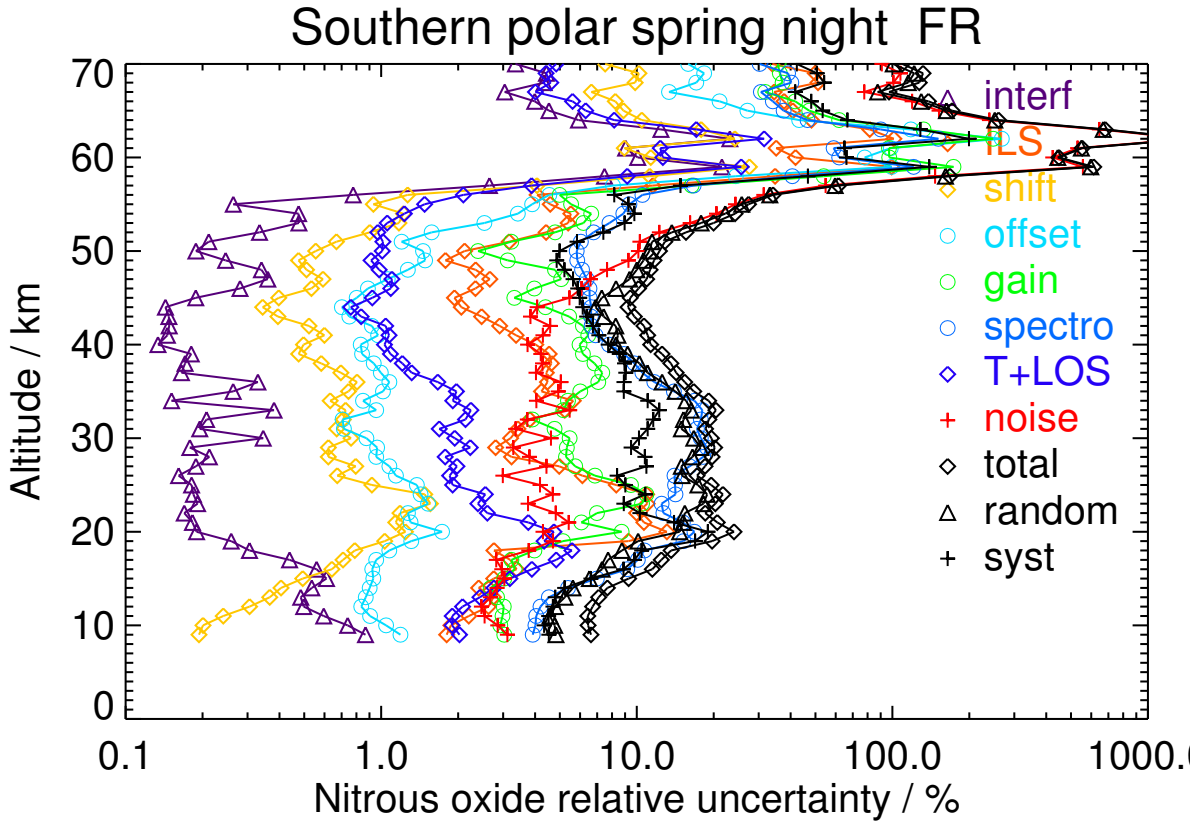

Figure S166. V8H_N2O_61 Southern polar spring night

Table S167. Nitrous oxide error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	289.788	2.233	1.292	0.575	2.367	5.389	12.161	3.149	7.830	10.926	11.889	16.147
12	291.719	0.838	3.393	0.254	1.326	9.828	14.054	2.565	4.093	10.012	15.206	18.206
15	264.804	0.522	6.377	0.309	1.504	10.927	18.130	4.203	4.335	14.478	17.839	22.975
18	212.192	0.276	6.911	0.310	1.420	8.871	18.975	4.788	4.053	11.045	20.151	22.979
21	163.077	0.123	12.117	0.690	1.115	7.266	19.459	4.071	3.898	10.528	22.382	24.735
24	133.088	0.073	9.097	1.269	0.818	4.328	15.997	2.851	3.556	7.717	17.914	19.505
27	100.304	0.049	2.628	0.459	0.655	3.075	11.260	1.849	3.004	4.126	11.799	12.499
30	71.687	0.067	0.490	0.317	0.248	1.237	6.345	1.067	2.061	2.562	6.404	6.898
33	47.130	0.030	0.478	0.250	0.172	1.482	3.781	0.702	1.206	1.588	4.030	4.331
36	27.077	0.055	1.289	0.215	0.120	1.048	2.242	0.355	0.718	1.019	2.730	2.914
39	13.101	0.012	0.858	0.073	0.044	0.532	1.392	0.194	0.460	0.628	1.679	1.792
42	4.707	0.009	0.191	0.021	0.038	0.133	0.439	0.117	0.341	0.410	0.460	0.616
45	2.196	0.009	0.132	0.019	0.030	0.054	0.163	0.067	0.249	0.275	0.197	0.339
48	0.868	0.005	0.057	0.009	0.027	0.034	0.083	0.015	0.183	0.196	0.087	0.214
52	0.276	0.006	0.043	0.010	0.038	0.022	0.038	0.015	0.241	0.250	0.031	0.252
56	0.147	0.005	0.054	0.013	0.031	0.018	0.035	0.012	0.237	0.243	0.052	0.249
60	0.369	0.012	0.158	0.037	0.119	0.042	0.128	0.027	0.660	0.676	0.195	0.704
64	-0.553	0.021	0.106	0.032	0.110	0.112	0.158	0.024	0.687	0.700	0.211	0.731
68	-1.094	0.040	0.258	0.079	0.226	0.205	0.358	0.041	1.332	1.358	0.475	1.439

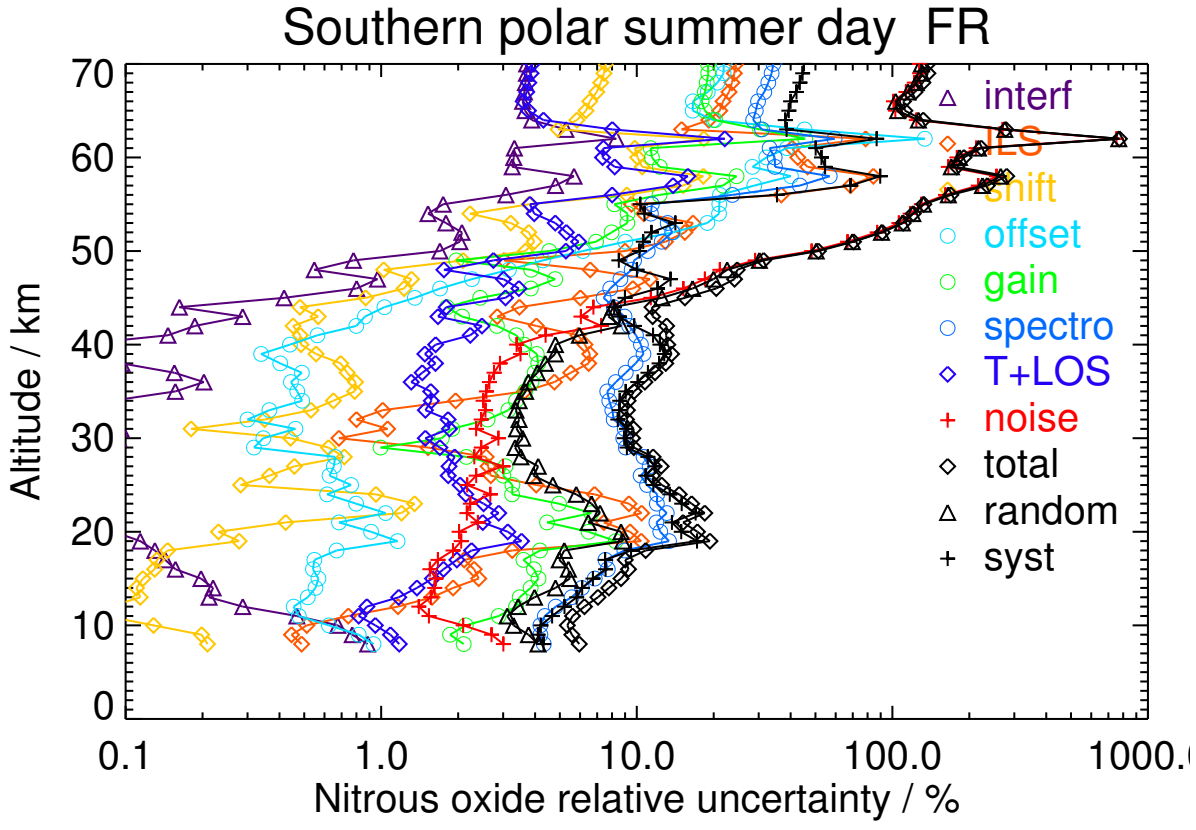

Figure S167. V8H_N2O_61 Southern polar summer day

Table S168. Nitrous oxide error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	298.750	2.524	1.892	0.473	2.395	3.161	14.586	4.175	8.055	10.175	14.745	17.915
12	301.867	0.823	3.751	0.373	1.643	10.270	13.472	3.211	4.692	8.453	16.292	18.355
15	297.664	0.588	10.497	0.531	2.058	18.537	15.246	5.162	4.858	12.914	23.971	27.228
18	241.748	0.209	7.248	0.519	1.893	17.202	18.804	4.249	3.617	13.863	23.343	27.149
21	185.634	0.134	8.281	1.522	2.141	17.381	19.321	4.257	3.454	17.078	22.120	27.946
24	133.891	0.073	3.970	0.464	1.063	6.507	14.679	2.615	3.056	8.271	14.923	17.062
27	92.363	0.059	2.244	0.540	0.778	2.668	10.654	1.814	2.490	3.738	11.050	11.665
30	63.138	0.064	0.656	0.207	0.456	2.206	6.318	1.188	1.698	3.263	6.254	7.054
33	36.833	0.021	0.859	0.264	0.276	1.833	3.720	0.647	1.104	1.804	4.058	4.441
36	16.030	0.039	0.859	0.100	0.103	0.660	1.926	0.283	0.646	0.867	2.157	2.324
39	5.515	0.010	0.316	0.021	0.044	0.168	0.678	0.117	0.324	0.399	0.741	0.842
42	1.456	0.009	0.050	0.015	0.032	0.030	0.159	0.049	0.231	0.253	0.148	0.293
45	0.802	0.010	0.121	0.019	0.032	0.048	0.074	0.046	0.255	0.268	0.138	0.302
48	0.208	0.003	0.018	0.005	0.031	0.008	0.033	0.010	0.202	0.206	0.027	0.208
52	0.106	0.003	0.029	0.007	0.044	0.012	0.029	0.009	0.297	0.304	0.012	0.304
56	0.333	0.004	0.048	0.013	0.030	0.021	0.028	0.014	0.288	0.294	0.042	0.297
60	0.958	0.005	0.089	0.024	0.131	0.030	0.094	0.020	0.840	0.853	0.117	0.861
64	-0.041	0.020	0.121	0.029	0.146	0.081	0.142	0.031	0.937	0.953	0.190	0.971
68	-0.727	0.031	0.207	0.054	0.237	0.135	0.246	0.048	1.395	1.421	0.335	1.460

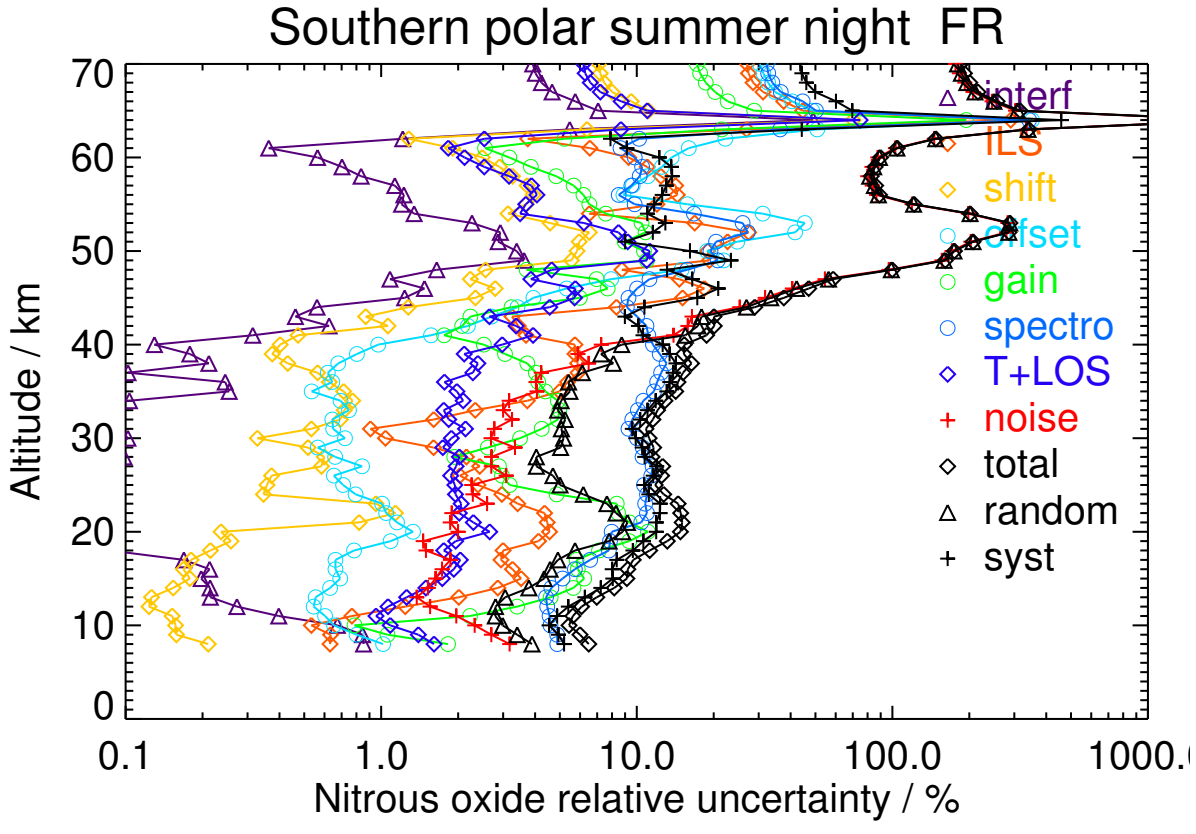

Figure S168. V8H_N2O_61 Southern polar summer night

Table S169. Nitrous oxide error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	291.221	1.730	0.624	0.481	2.679	4.933	12.802	3.025	8.096	9.390	13.621	16.544
12	300.992	1.553	3.605	0.335	1.732	11.275	12.430	3.590	4.659	7.342	16.759	18.296
15	269.927	1.658	6.638	0.602	1.811	11.272	13.969	5.775	5.805	9.626	18.629	20.969
18	215.349	0.478	5.253	0.752	1.814	15.584	16.405	4.640	4.374	8.579	22.599	24.172
21	153.012	0.452	2.419	1.549	1.954	12.944	17.122	3.238	3.572	6.874	21.189	22.276
24	103.378	0.190	2.020	0.625	1.243	6.315	12.119	2.143	3.175	5.410	13.349	14.404
27	58.292	0.106	1.159	0.185	0.665	1.886	8.634	1.530	2.495	3.773	8.617	9.407
30	25.935	0.037	0.792	0.166	0.322	1.073	4.469	0.937	1.542	2.495	4.350	5.014
33	8.101	0.030	0.389	0.117	0.178	0.834	1.611	0.373	0.862	1.392	1.560	2.091
36	1.853	0.015	0.091	0.040	0.083	0.270	0.395	0.110	0.489	0.659	0.253	0.706
39	0.417	0.005	0.045	0.015	0.051	0.099	0.151	0.036	0.350	0.386	0.111	0.402
42	0.011	0.004	0.022	0.020	0.051	0.128	0.048	0.031	0.299	0.326	0.081	0.336
45	0.661	0.005	0.029	0.040	0.058	0.284	0.061	0.075	0.308	0.342	0.271	0.437
48	0.276	0.003	0.018	0.013	0.053	0.081	0.052	0.023	0.390	0.398	0.083	0.407
52	0.496	0.003	0.021	0.017	0.082	0.102	0.049	0.029	0.567	0.578	0.093	0.585
56	1.111	0.006	0.043	0.053	0.087	0.346	0.066	0.088	0.548	0.582	0.324	0.666
60	0.577	0.002	0.036	0.021	0.176	0.097	0.061	0.031	1.235	1.250	0.097	1.253
64	0.358	0.006	0.023	0.013	0.201	0.092	0.050	0.024	1.305	1.324	0.051	1.325
68	0.317	0.008	0.020	0.018	0.264	0.146	0.049	0.031	1.546	1.572	0.116	1.576

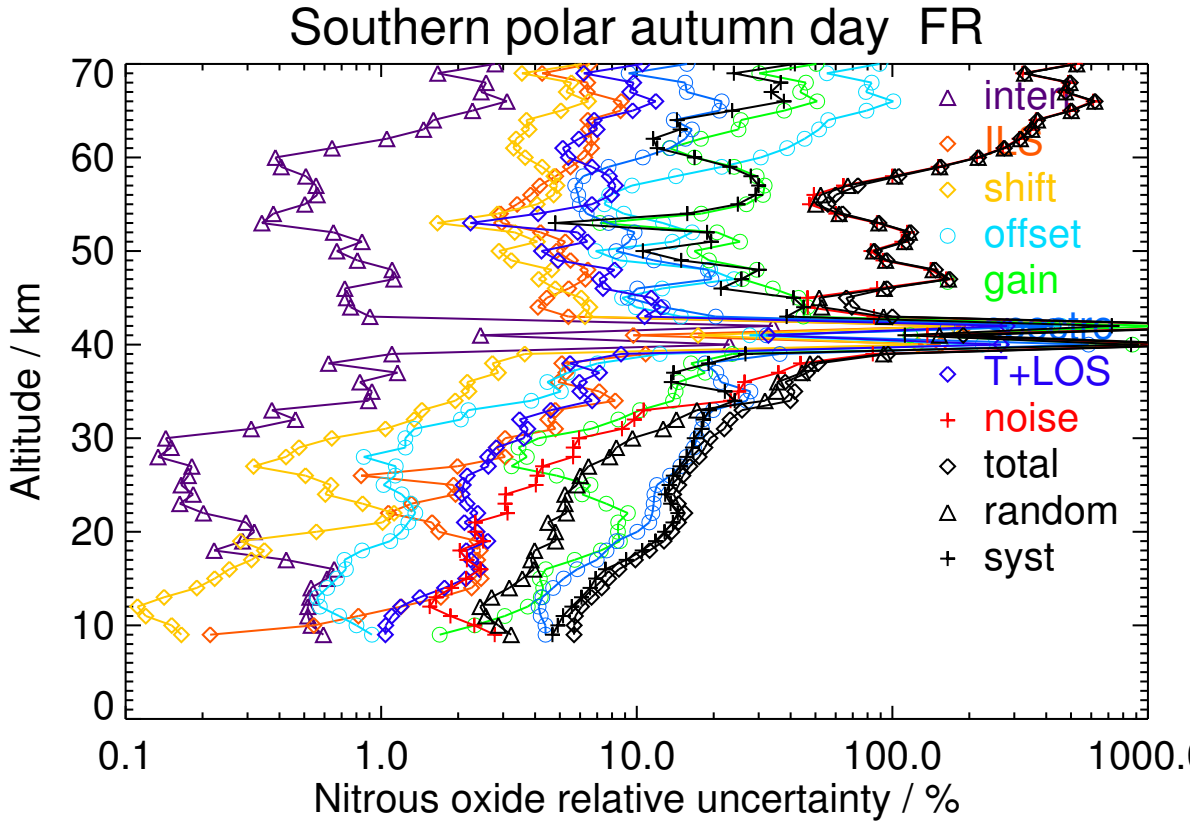

Figure S169. V8H_N2O_61 Southern polar autumn day

Table S170. Nitrous oxide error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	315.645	2.076	0.602	0.283	2.783	5.662	13.289	3.897	8.028	10.382	13.893	17.343
12	301.664	1.510	3.535	0.419	1.799	10.025	12.865	3.497	4.834	7.781	16.102	17.883
15	277.716	1.489	7.863	0.855	1.926	12.115	13.037	5.798	6.006	10.334	18.658	21.329
18	217.395	0.581	8.007	0.812	1.954	14.886	13.175	4.710	4.596	9.595	20.380	22.526
21	152.266	0.414	2.902	1.217	2.038	12.518	14.678	3.392	3.814	8.478	18.454	20.309
24	97.725	0.148	2.150	0.863	1.292	5.483	11.622	2.214	3.399	5.917	12.395	13.735
27	52.293	0.088	1.016	0.242	0.721	1.831	7.970	1.431	2.538	3.826	7.896	8.774
30	22.098	0.048	0.681	0.151	0.381	1.251	4.039	0.820	1.639	2.889	3.678	4.677
33	5.970	0.030	0.313	0.093	0.182	0.666	1.436	0.299	0.846	1.520	1.069	1.858
36	1.022	0.009	0.080	0.024	0.090	0.178	0.316	0.073	0.497	0.608	0.169	0.631
39	0.427	0.003	0.040	0.014	0.062	0.087	0.131	0.030	0.401	0.433	0.070	0.438
42	0.114	0.003	0.020	0.017	0.046	0.123	0.059	0.036	0.315	0.331	0.110	0.349
45	0.577	0.003	0.024	0.024	0.044	0.184	0.081	0.053	0.346	0.366	0.179	0.408
48	0.365	0.002	0.018	0.008	0.070	0.044	0.049	0.014	0.485	0.493	0.049	0.495
52	0.724	0.002	0.021	0.012	0.073	0.062	0.045	0.020	0.579	0.588	0.037	0.589
56	0.991	0.003	0.046	0.030	0.077	0.198	0.069	0.057	0.575	0.592	0.190	0.622
60	0.485	0.002	0.030	0.017	0.193	0.089	0.049	0.032	1.303	1.319	0.084	1.322
64	0.227	0.006	0.027	0.014	0.220	0.123	0.075	0.034	1.419	1.441	0.092	1.444
68	0.288	0.007	0.028	0.019	0.259	0.167	0.076	0.040	1.550	1.577	0.138	1.583

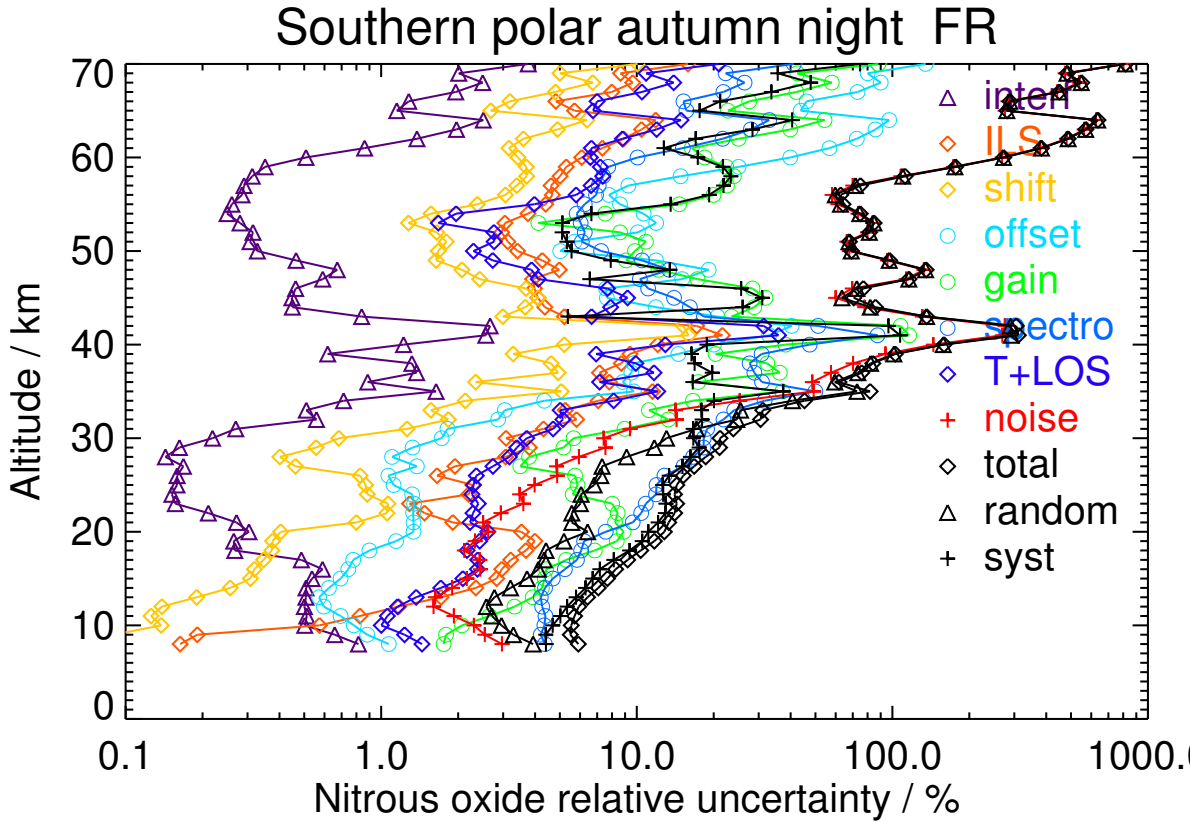

Figure S170. V8H_N2O_61 Southern polar autumn night

S7 Nitrous oxide error contribution profile plots and tabulated values for RR NOM data (V8R_N2O_261)

Table S171. Nitrous oxide error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	277.970	4.890	5.064	0.291	2.126	8.187	15.971	5.355	9.911	14.849	16.813	22.431
15	249.137	4.292	4.621	0.302	1.096	6.098	17.419	3.810	4.613	9.964	17.837	20.432
18	196.645	0.809	5.797	0.456	0.772	10.233	18.928	3.557	3.041	12.322	19.187	22.803
21	186.107	0.479	6.573	0.276	0.694	8.175	20.017	2.589	3.062	11.267	20.016	22.969
24	156.460	0.371	4.588	0.257	0.576	5.763	16.152	2.077	2.879	7.707	16.398	18.119
27	125.933	0.191	3.103	0.268	0.575	4.024	13.341	1.906	2.894	7.093	12.881	14.705
30	88.711	0.140	1.107	0.226	0.349	2.096	10.277	1.417	1.995	5.625	9.261	10.835
33	51.224	0.105	0.654	0.231	0.181	1.131	6.987	0.963	1.597	3.684	6.366	7.355
36	19.387	0.063	0.615	0.107	0.117	0.755	2.919	0.369	1.121	2.177	2.480	3.300
39	10.444	0.036	0.302	0.046	0.084	0.321	1.145	0.158	0.877	1.249	0.866	1.520
42	6.363	0.020	0.171	0.022	0.059	0.137	0.556	0.087	0.789	0.842	0.532	0.996
45	3.676	0.014	0.102	0.020	0.049	0.089	0.355	0.051	0.775	0.796	0.342	0.867
48	1.537	0.015	0.110	0.023	0.084	0.139	0.228	0.040	0.884	0.899	0.256	0.935
52	0.261	0.017	0.056	0.020	0.100	0.088	0.091	0.020	1.047	1.056	0.107	1.061
56	0.400	0.018	0.058	0.013	0.177	0.086	0.050	0.019	1.405	1.420	0.067	1.421
60	-0.125	0.021	0.090	0.037	0.321	0.299	0.108	0.041	1.828	1.867	0.268	1.886
64	-0.518	0.027	0.108	0.052	0.410	0.445	0.172	0.050	1.990	2.054	0.393	2.091
68	-2.039	0.022	0.082	0.021	0.407	0.231	0.126	0.033	1.880	1.927	0.256	1.944

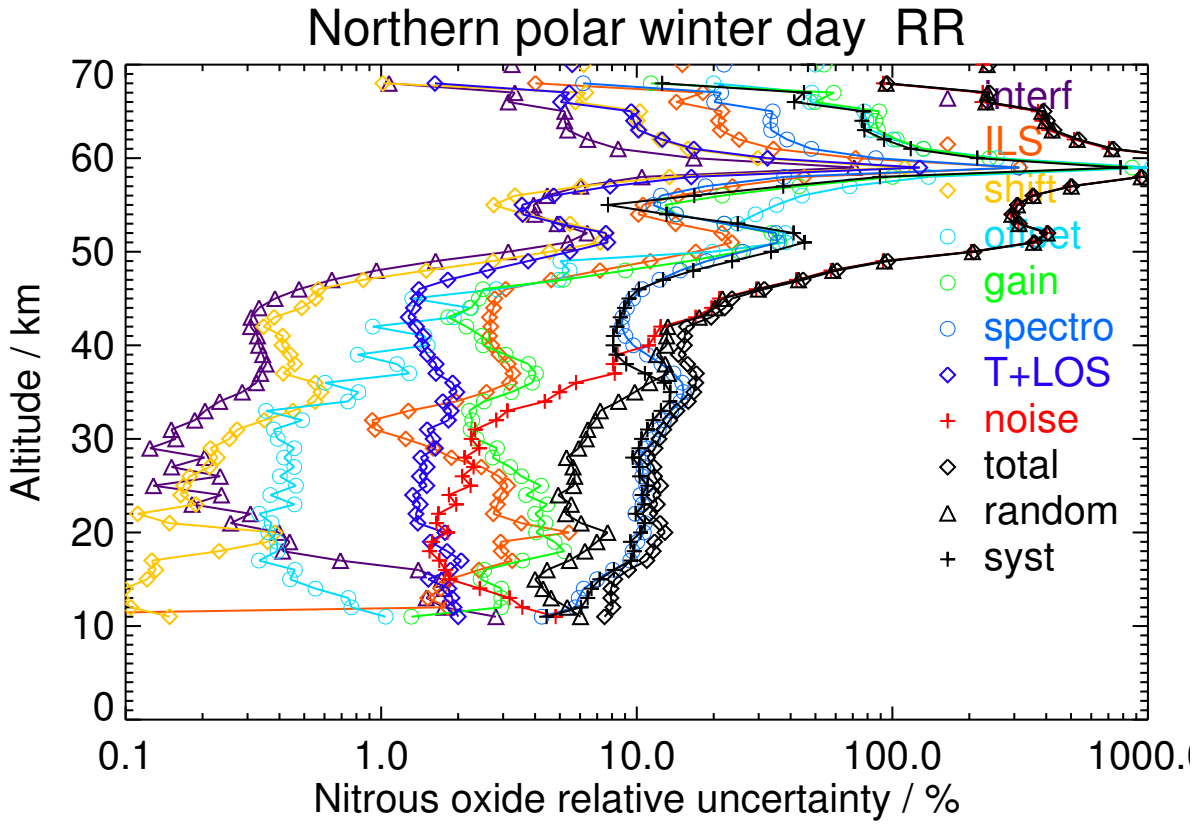

Figure S171. V8R_N2O_261 Northern polar winter day

Table S172. Nitrous oxide error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	356.970	4.995	7.817	0.295	2.862	13.260	11.835	6.115	12.350	15.162	19.242	24.498
12	297.831	4.770	5.993	0.293	2.250	7.874	13.904	5.618	9.985	14.247	15.729	21.222
15	251.655	4.423	5.933	0.393	1.358	4.517	16.380	4.911	5.505	11.047	16.670	19.998
18	188.096	0.925	4.237	0.644	0.809	4.562	21.292	4.201	3.730	8.106	21.444	22.925
21	128.956	0.408	7.853	0.333	0.861	6.330	16.667	2.745	3.388	13.017	15.169	19.989
24	105.731	0.635	3.975	0.385	0.423	3.103	11.231	1.453	2.214	7.974	9.784	12.622
27	95.221	0.236	1.945	0.279	0.619	2.542	10.653	1.622	2.753	7.891	8.498	11.596
30	77.777	0.289	1.420	0.589	0.404	3.297	7.753	1.011	1.540	5.943	6.454	8.774
33	38.561	0.147	1.352	0.449	0.232	2.185	5.666	0.718	1.199	3.547	5.324	6.398
36	12.070	0.068	0.623	0.125	0.094	0.683	1.950	0.215	0.683	1.824	1.369	2.280
39	8.415	0.037	0.320	0.056	0.068	0.353	0.728	0.088	0.521	0.845	0.577	1.023
42	7.119	0.026	0.295	0.053	0.053	0.227	0.395	0.058	0.484	0.581	0.449	0.734
45	6.503	0.024	0.166	0.058	0.046	0.157	0.369	0.049	0.521	0.582	0.359	0.684
48	3.958	0.026	0.070	0.057	0.060	0.180	0.346	0.050	0.636	0.699	0.288	0.756
52	1.058	0.017	0.050	0.018	0.058	0.090	0.175	0.028	0.771	0.788	0.136	0.800
56	0.043	0.021	0.080	0.022	0.121	0.085	0.074	0.017	1.103	1.116	0.076	1.118
60	-0.301	0.069	0.387	0.134	0.252	0.579	0.349	0.063	1.580	1.695	0.568	1.787
64	-0.795	0.118	0.674	0.241	0.354	0.938	0.608	0.103	1.827	2.072	0.978	2.291
68	0.420	0.164	1.050	0.325	0.340	0.355	0.809	0.073	1.698	1.874	1.228	2.240

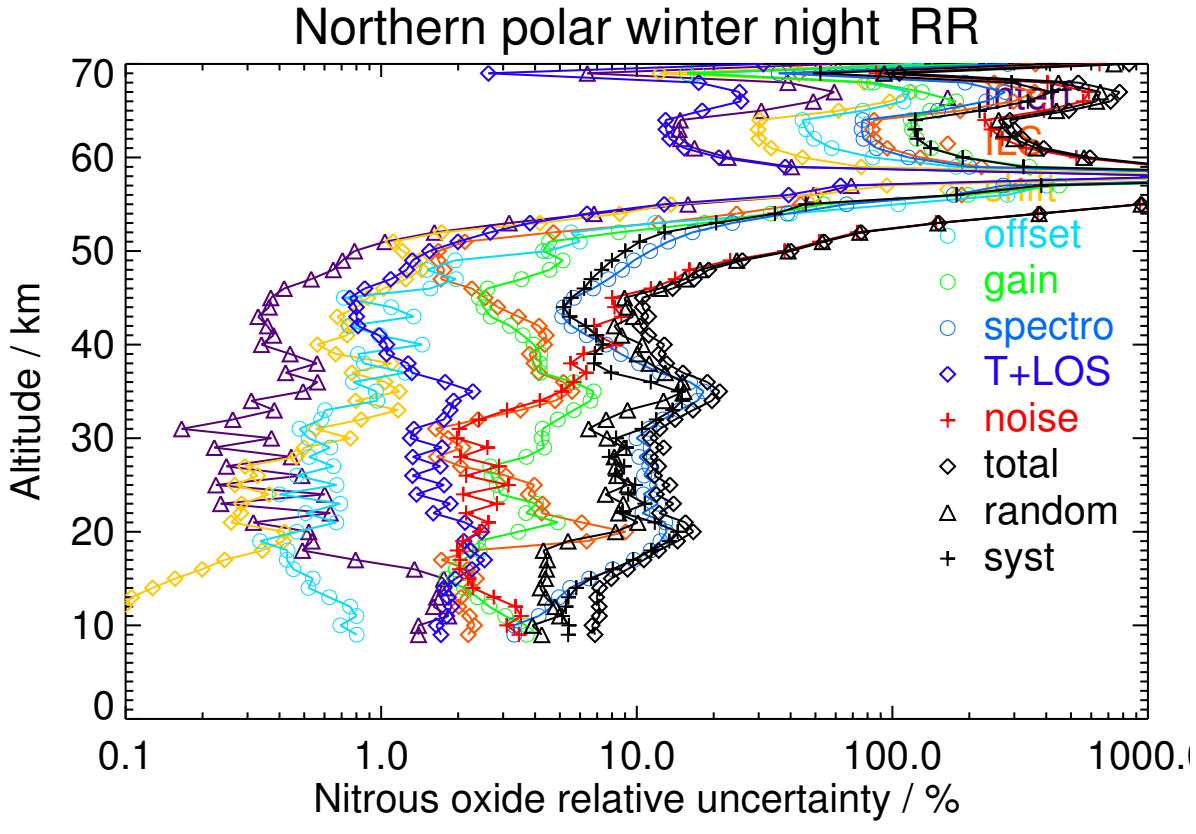

Figure S172. V8R_N2O_261 Northern polar winter night

Table S173. Nitrous oxide error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	292.308	1.324	2.820	0.254	1.988	8.839	15.396	5.169	8.752	11.069	17.598	20.789
15	253.321	0.715	4.251	0.198	1.242	7.858	15.256	4.819	4.904	7.826	17.340	19.024
18	210.678	0.125	3.260	0.398	0.765	10.883	19.808	3.935	3.583	7.538	22.219	23.463
21	156.880	0.169	3.145	0.273	0.698	7.495	15.952	2.619	3.641	5.608	17.601	18.473
24	141.579	0.098	2.820	0.318	0.636	5.688	13.596	2.293	3.625	5.156	14.747	15.622
27	98.988	0.085	1.549	0.302	0.535	1.910	12.655	2.012	3.334	4.356	12.759	13.482
30	58.077	0.045	0.326	0.257	0.294	0.835	7.874	1.339	2.386	3.206	7.756	8.393
33	26.455	0.064	0.515	0.197	0.201	0.863	3.865	0.642	1.659	1.946	3.926	4.381
36	10.049	0.039	0.391	0.063	0.123	0.531	1.345	0.211	0.901	1.010	1.449	1.767
39	3.982	0.009	0.180	0.018	0.055	0.105	0.465	0.068	0.492	0.517	0.493	0.714
42	1.118	0.009	0.067	0.009	0.039	0.034	0.195	0.029	0.378	0.390	0.192	0.435
45	0.114	0.011	0.014	0.004	0.035	0.030	0.050	0.011	0.363	0.369	0.026	0.370
48	0.768	0.012	0.020	0.006	0.041	0.041	0.049	0.011	0.419	0.423	0.049	0.426
52	0.327	0.013	0.018	0.004	0.039	0.013	0.051	0.007	0.532	0.535	0.038	0.537
56	0.033	0.015	0.014	0.007	0.064	0.033	0.032	0.009	0.770	0.773	0.035	0.774
60	0.117	0.011	0.015	0.006	0.131	0.020	0.035	0.008	1.045	1.054	0.022	1.054
64	-0.033	0.022	0.043	0.007	0.275	0.071	0.040	0.014	1.479	1.506	0.070	1.508
68	-0.251	0.022	0.048	0.008	0.316	0.104	0.043	0.019	1.595	1.627	0.103	1.631

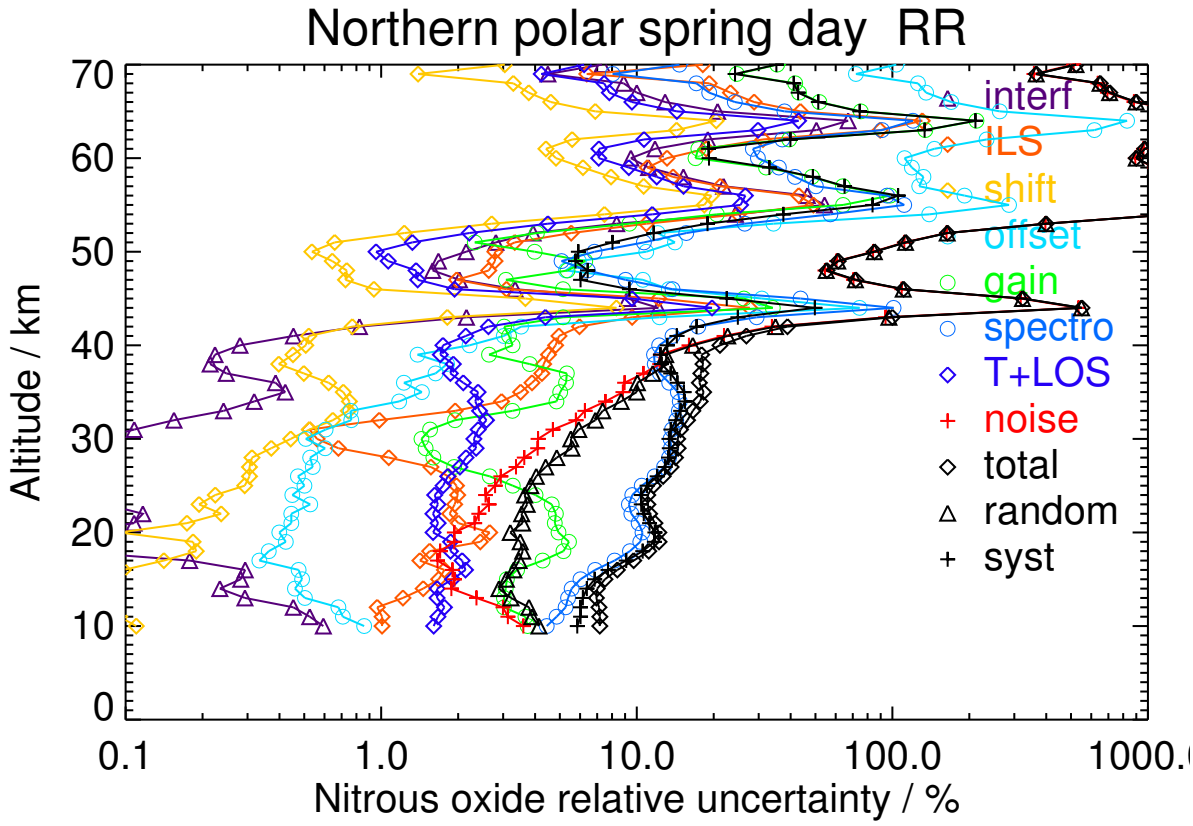

Figure S173. V8R_N2O_261 Northern polar spring day

Table S174. Nitrous oxide error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	295.732	1.155	2.009	0.285	2.098	8.143	15.813	5.203	8.856	11.106	17.560	20.778
15	273.340	0.767	4.069	0.206	1.270	7.609	16.438	4.850	4.815	7.629	18.314	19.840
18	227.161	0.099	2.658	0.414	0.929	13.057	20.847	4.756	3.676	8.036	24.181	25.482
21	167.758	0.152	2.073	0.304	0.904	9.658	17.327	2.838	3.908	6.082	19.623	20.544
24	134.154	0.109	2.944	0.312	0.562	5.116	14.202	2.142	3.402	4.843	15.155	15.910
27	101.115	0.083	1.404	0.293	0.564	2.061	12.766	1.978	3.545	4.755	12.785	13.641
30	56.248	0.042	0.547	0.230	0.291	0.939	8.198	1.290	2.298	3.167	8.090	8.688
33	27.478	0.060	0.706	0.181	0.181	0.929	3.958	0.626	1.645	1.934	4.056	4.494
36	10.478	0.042	0.476	0.066	0.109	0.597	1.584	0.222	0.883	0.990	1.720	1.984
39	4.248	0.010	0.182	0.017	0.039	0.120	0.417	0.067	0.478	0.497	0.457	0.675
42	1.956	0.010	0.084	0.009	0.025	0.068	0.242	0.034	0.363	0.372	0.257	0.452
45	0.117	0.010	0.017	0.007	0.024	0.041	0.069	0.017	0.353	0.358	0.061	0.363
48	0.365	0.013	0.017	0.009	0.044	0.067	0.040	0.015	0.425	0.430	0.066	0.435
52	0.301	0.014	0.018	0.005	0.038	0.018	0.044	0.007	0.534	0.537	0.031	0.538
56	0.164	0.016	0.015	0.008	0.065	0.050	0.037	0.011	0.795	0.799	0.050	0.800
60	0.217	0.011	0.021	0.008	0.143	0.036	0.041	0.011	1.098	1.108	0.037	1.109
64	-0.333	0.020	0.034	0.007	0.288	0.074	0.039	0.017	1.534	1.562	0.070	1.564
68	-0.421	0.020	0.037	0.007	0.324	0.111	0.044	0.021	1.621	1.655	0.110	1.658

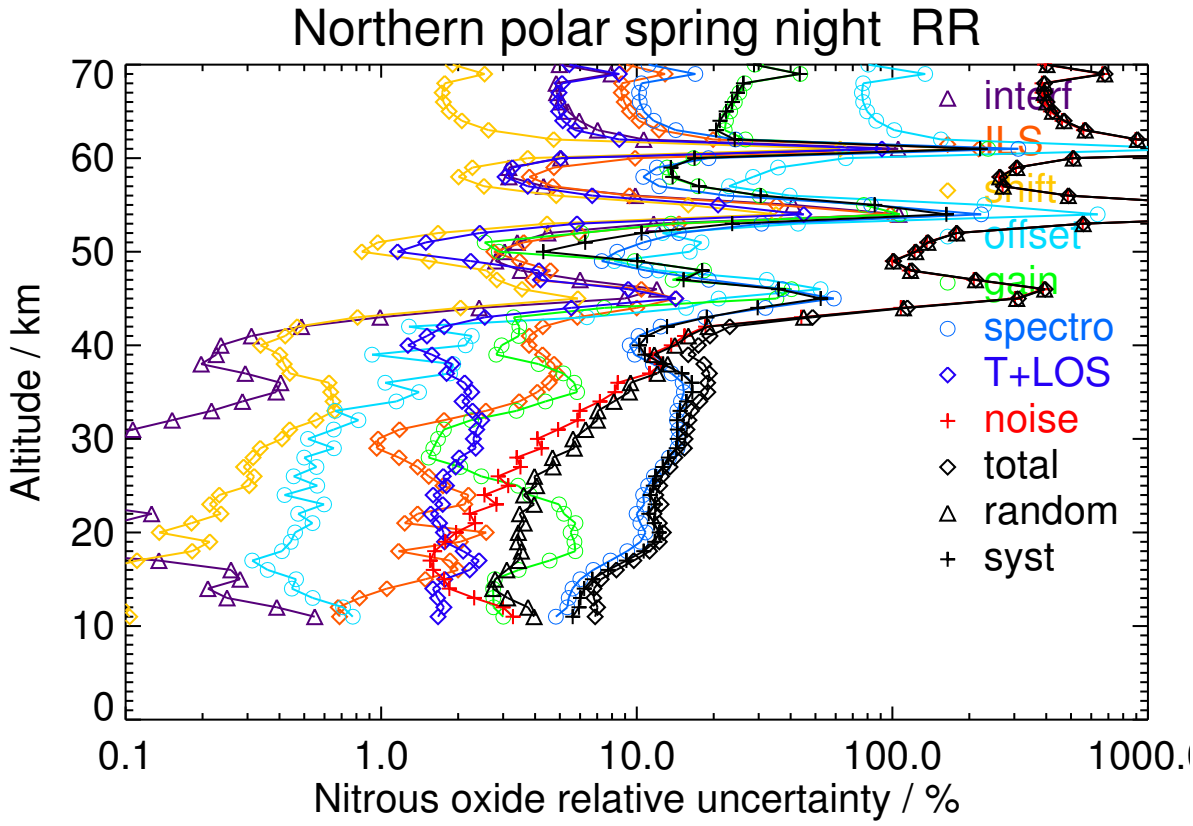

Figure S174. V8R_N2O_261 Northern polar spring night

Table S175. Nitrous oxide error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	314.330	1.981	4.003	0.424	1.843	9.818	13.607	4.606	8.970	11.506	16.564	20.168
15	307.380	0.782	7.406	0.292	1.103	10.153	16.171	4.364	4.721	8.831	19.613	21.510
18	274.962	0.333	8.770	0.645	1.191	15.479	21.582	4.177	3.448	14.710	24.438	28.523
21	200.239	0.291	9.223	0.648	0.831	5.330	23.243	3.525	3.836	9.411	24.361	26.116
24	150.198	0.167	2.622	0.209	0.404	1.212	13.641	1.870	2.427	3.867	13.751	14.285
27	129.040	0.120	0.571	0.573	0.629	1.488	11.747	2.176	3.361	4.296	11.784	12.542
30	85.012	0.078	0.814	0.596	0.274	2.745	8.254	1.085	1.483	2.307	8.650	8.953
33	45.519	0.045	1.542	0.382	0.144	1.859	4.580	0.630	1.070	1.542	5.113	5.340
36	18.501	0.118	1.152	0.079	0.074	0.775	2.340	0.261	0.644	0.843	2.684	2.813
39	5.643	0.026	0.328	0.079	0.036	0.148	0.681	0.089	0.346	0.421	0.743	0.854
42	2.087	0.009	0.069	0.015	0.020	0.030	0.189	0.032	0.224	0.248	0.177	0.305
45	0.866	0.008	0.018	0.007	0.020	0.010	0.077	0.016	0.206	0.211	0.069	0.223
48	0.288	0.009	0.029	0.012	0.018	0.009	0.040	0.013	0.237	0.240	0.038	0.243
52	0.128	0.010	0.014	0.004	0.015	0.007	0.022	0.005	0.294	0.296	0.011	0.296
56	0.061	0.015	0.026	0.012	0.034	0.010	0.027	0.005	0.456	0.459	0.032	0.460
60	-0.165	0.011	0.030	0.016	0.068	0.017	0.035	0.007	0.661	0.665	0.040	0.666
64	-0.280	0.037	0.098	0.031	0.182	0.077	0.111	0.011	1.087	1.104	0.161	1.116
68	-0.148	0.053	0.222	0.079	0.251	0.109	0.233	0.018	1.434	1.461	0.334	1.499

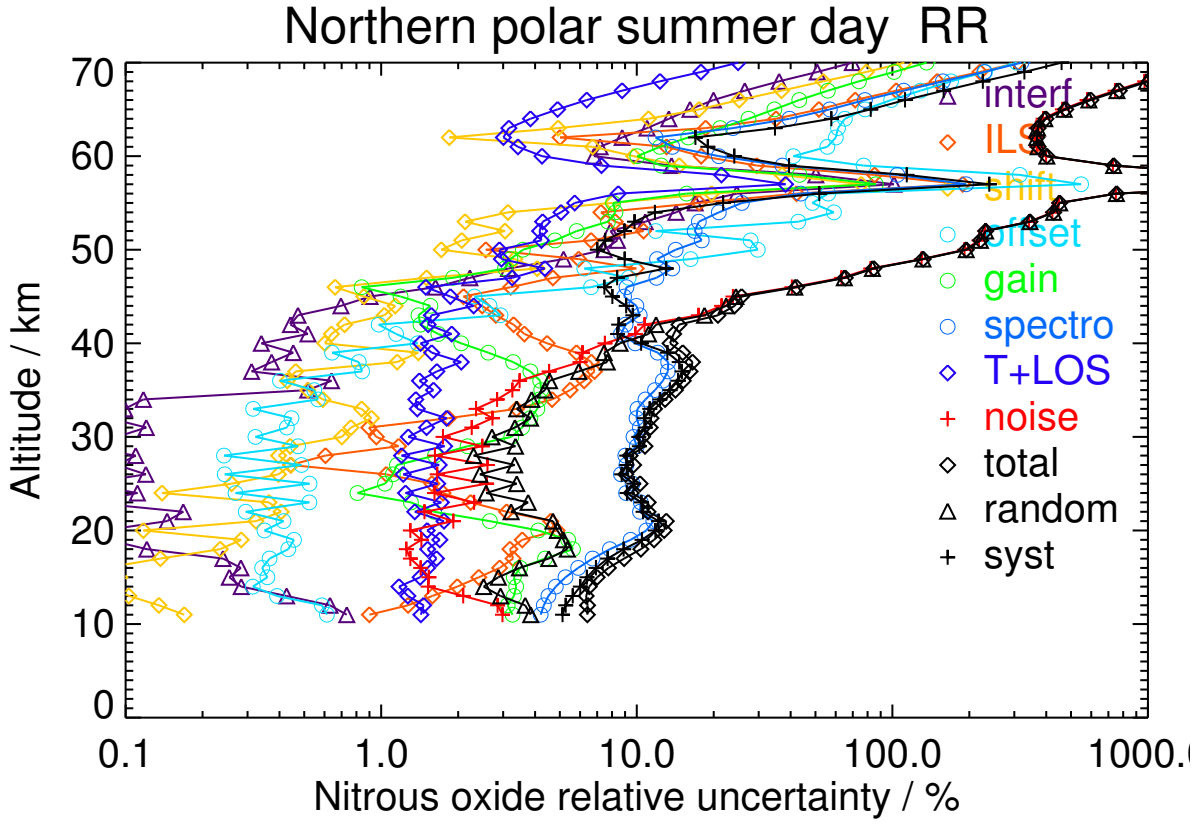

Figure S175. V8R_N2O_261 Northern polar summer day

Table S176. Nitrous oxide error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
15	309.561	1.110	8.728	0.179	2.416	7.575	19.564	10.202	7.745	13.808	22.289	26.219
18	278.569	0.229	8.114	0.426	1.320	18.639	20.303	5.779	3.151	11.526	27.164	29.508
21	203.980	0.187	5.019	0.434	1.004	11.861	22.206	3.655	3.609	10.287	24.099	26.203
24	144.815	0.139	2.482	0.214	0.522	2.337	13.819	2.268	2.797	4.663	13.934	14.693
27	118.134	0.094	1.264	0.369	0.544	1.656	12.483	2.095	3.123	4.171	12.544	13.220
30	66.892	0.044	0.530	0.341	0.293	2.385	8.030	1.258	1.730	2.540	8.293	8.674
33	27.539	0.054	1.040	0.195	0.149	1.427	3.620	0.688	1.194	1.531	3.980	4.265
36	7.810	0.043	0.466	0.125	0.069	0.277	1.251	0.203	0.653	0.767	1.327	1.533
39	2.240	0.018	0.138	0.025	0.028	0.055	0.258	0.056	0.332	0.365	0.265	0.451
42	0.683	0.010	0.025	0.011	0.020	0.023	0.094	0.021	0.236	0.244	0.085	0.258
45	0.217	0.008	0.011	0.006	0.016	0.022	0.028	0.010	0.235	0.238	0.021	0.239
48	0.285	0.011	0.020	0.013	0.026	0.034	0.033	0.010	0.293	0.297	0.036	0.300
52	0.038	0.014	0.009	0.003	0.022	0.008	0.026	0.005	0.386	0.388	0.012	0.388
56	0.409	0.019	0.016	0.012	0.045	0.037	0.036	0.008	0.617	0.620	0.041	0.622
60	0.188	0.014	0.013	0.008	0.115	0.022	0.039	0.009	0.929	0.937	0.030	0.937
64	-0.360	0.031	0.041	0.027	0.257	0.198	0.096	0.029	1.458	1.484	0.206	1.498
68	-0.267	0.039	0.085	0.056	0.282	0.266	0.163	0.038	1.536	1.569	0.298	1.597

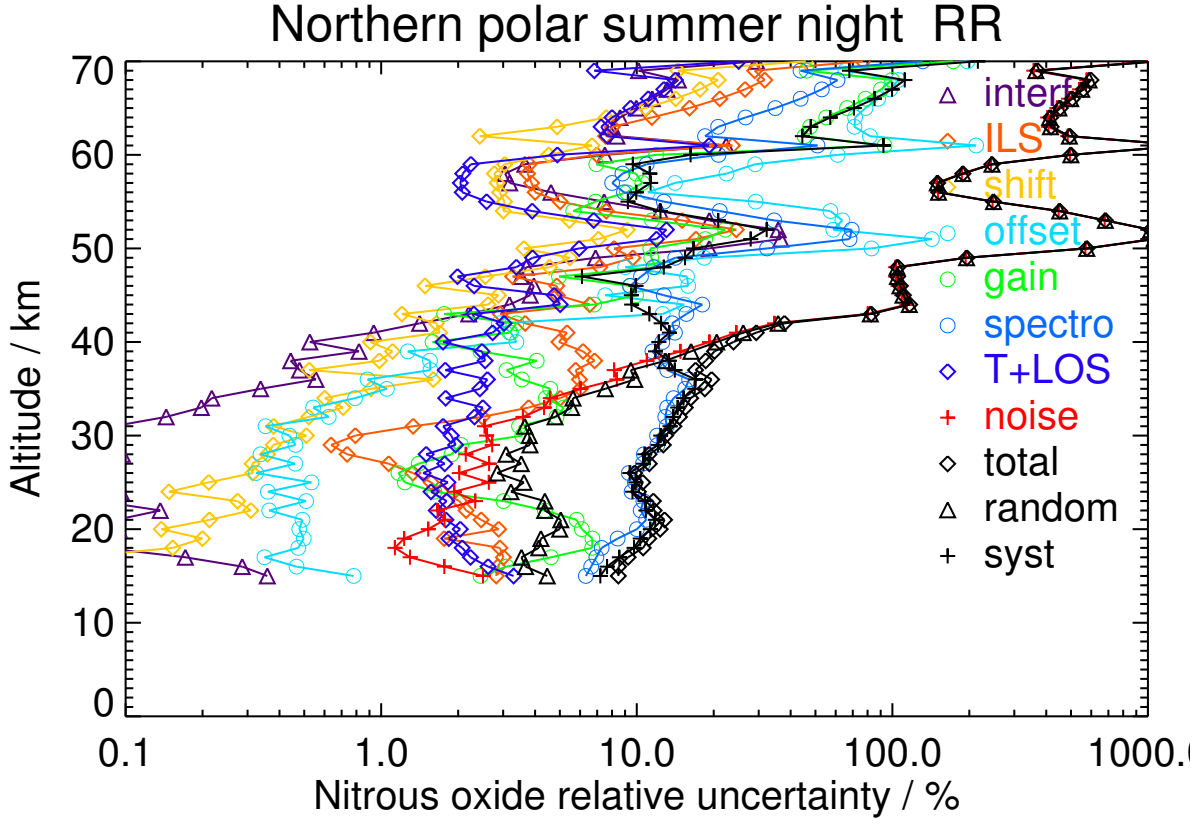

Figure S176. V8R_N2O_261 Northern polar summer night

Table S177. Nitrous oxide error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
15	280.757	2.866	2.806	0.199	1.838	6.452	17.130	5.639	7.503	10.457	18.258	21.040
18	237.518	0.564	2.951	0.484	0.758	11.689	21.160	5.027	3.369	8.800	23.524	25.116
21	168.289	0.319	4.015	0.210	0.915	10.710	18.682	2.975	3.740	8.747	20.668	22.443
24	123.662	0.229	3.319	0.249	0.646	5.484	13.534	2.281	3.443	5.867	14.402	15.551
27	76.738	0.115	2.498	0.167	0.526	2.273	11.438	1.712	3.054	5.339	11.239	12.442
30	30.126	0.063	0.681	0.134	0.356	1.791	5.590	0.977	1.857	4.048	4.805	6.282
33	8.602	0.048	0.373	0.068	0.177	0.685	1.900	0.389	1.247	2.069	1.298	2.442
36	3.115	0.026	0.246	0.032	0.070	0.468	0.714	0.114	0.628	1.034	0.364	1.097
39	2.141	0.014	0.161	0.018	0.046	0.275	0.366	0.044	0.490	0.671	0.173	0.693
42	2.076	0.010	0.114	0.014	0.028	0.165	0.268	0.025	0.471	0.560	0.150	0.580
45	1.506	0.012	0.059	0.009	0.026	0.066	0.232	0.017	0.526	0.570	0.119	0.583
48	0.717	0.015	0.025	0.007	0.063	0.054	0.108	0.019	0.655	0.665	0.077	0.670
52	0.809	0.018	0.021	0.009	0.064	0.050	0.065	0.014	0.801	0.807	0.056	0.809
56	0.724	0.020	0.020	0.010	0.099	0.064	0.069	0.017	1.077	1.084	0.069	1.086
60	-0.101	0.015	0.027	0.008	0.197	0.049	0.049	0.015	1.380	1.396	0.033	1.396
64	-0.599	0.022	0.058	0.013	0.322	0.163	0.056	0.029	1.728	1.763	0.137	1.768
68	-0.668	0.024	0.067	0.017	0.336	0.207	0.064	0.035	1.698	1.737	0.178	1.746

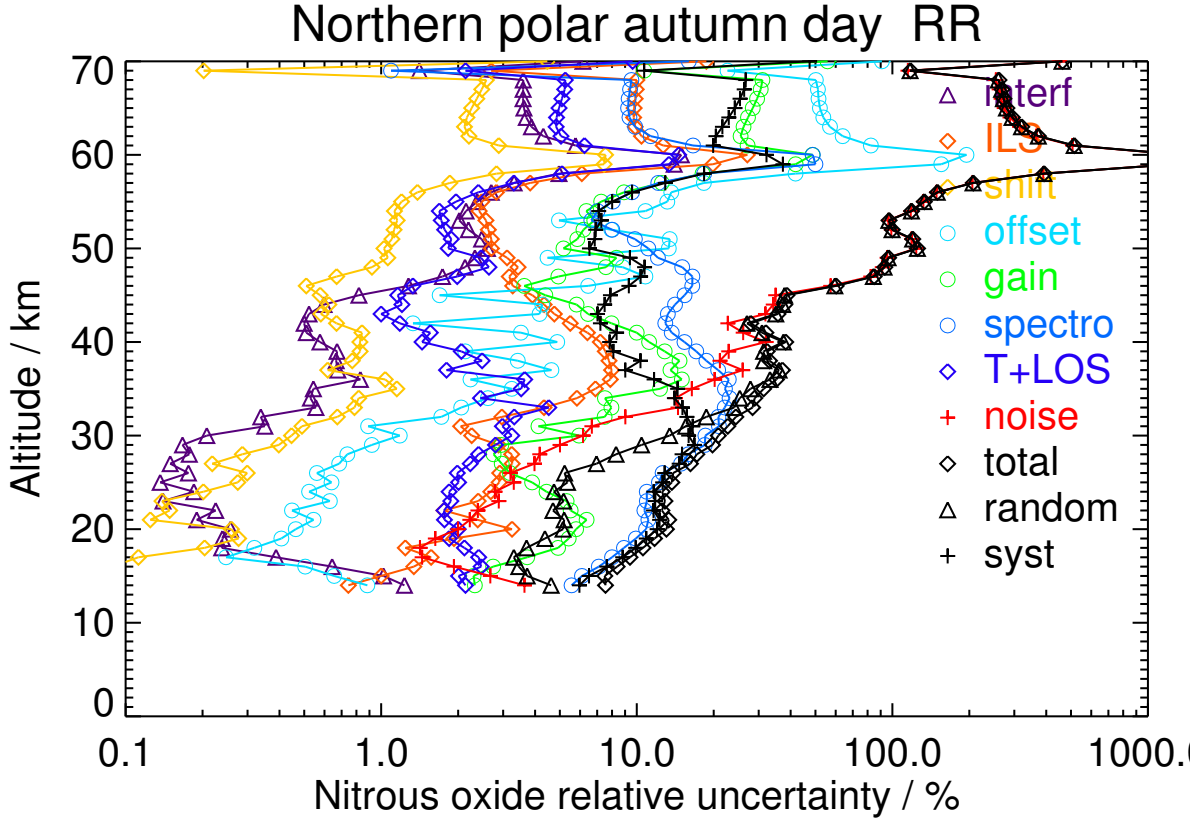

Figure S177. V8R_N2O_261 Northern polar autumn day

Table S178. Nitrous oxide error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
15	275.688	3.118	2.609	0.263	1.874	6.134	17.998	5.848	7.315	10.771	18.798	21.665
18	231.823	0.612	2.327	0.545	0.831	12.031	22.358	4.962	3.567	8.051	24.979	26.244
21	169.711	0.331	3.707	0.203	0.836	9.101	19.640	2.798	3.767	7.526	21.179	22.476
24	121.672	0.313	3.438	0.233	0.619	5.277	14.808	2.221	3.349	5.821	15.548	16.602
27	69.227	0.128	2.140	0.181	0.523	2.130	11.463	1.610	3.028	5.313	11.153	12.353
30	27.878	0.066	0.600	0.187	0.338	2.010	4.405	0.813	1.718	3.353	4.041	5.251
33	20.534	0.065	0.608	0.286	0.227	2.055	3.136	0.387	1.253	3.580	1.861	4.035
36	13.088	0.052	1.012	0.195	0.113	1.241	2.626	0.180	0.731	2.876	1.345	3.175
39	7.512	0.037	0.765	0.072	0.081	0.680	1.594	0.099	0.580	1.805	0.831	1.987
42	4.060	0.019	0.402	0.034	0.044	0.330	0.925	0.056	0.512	1.081	0.478	1.181
45	1.620	0.013	0.093	0.021	0.027	0.067	0.350	0.027	0.506	0.605	0.165	0.628
48	1.197	0.015	0.032	0.010	0.062	0.078	0.104	0.024	0.613	0.625	0.091	0.632
52	0.990	0.018	0.034	0.010	0.059	0.044	0.085	0.014	0.723	0.729	0.077	0.733
56	0.423	0.020	0.037	0.015	0.094	0.078	0.067	0.018	1.018	1.026	0.082	1.029
60	0.549	0.014	0.035	0.013	0.192	0.077	0.057	0.022	1.339	1.355	0.070	1.357
64	0.433	0.021	0.102	0.029	0.317	0.081	0.109	0.023	1.711	1.748	0.059	1.749
68	-0.285	0.018	0.078	0.018	0.335	0.087	0.076	0.022	1.688	1.725	0.075	1.727

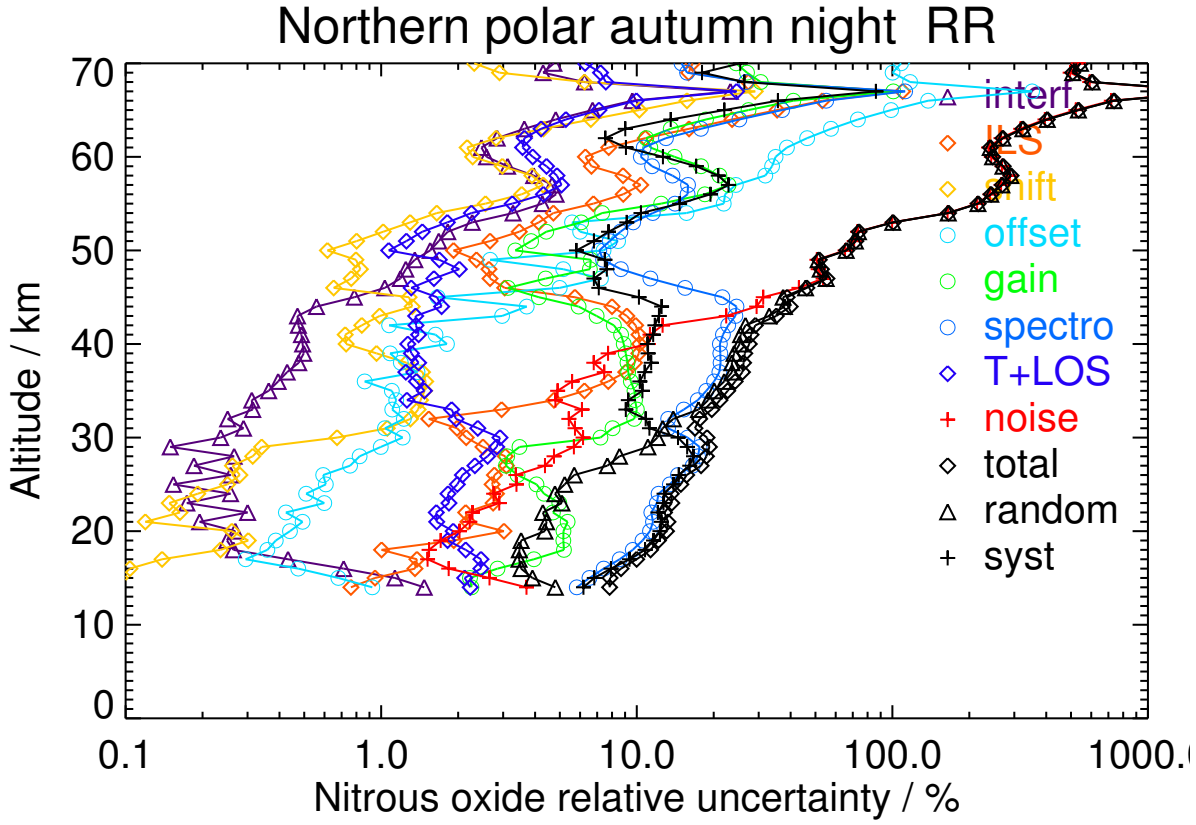

Figure S178. V8R_N2O_261 Northern polar autumn night

Table S179. Nitrous oxide error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	298.156	1.653	3.711	0.201	2.210	7.875	13.159	4.825	9.962	12.106	15.250	19.471
15	290.074	0.977	9.642	0.162	1.380	10.329	15.343	4.439	5.252	9.749	19.753	22.028
18	263.462	0.381	9.144	0.490	1.726	17.119	23.324	5.574	4.164	13.865	27.933	31.184
21	207.522	0.259	8.192	0.337	0.699	6.614	21.918	3.335	3.796	9.403	23.001	24.849
24	183.492	0.242	6.520	0.282	0.758	4.045	20.234	2.738	3.361	8.316	20.460	22.086
27	130.396	0.158	2.646	0.474	0.633	2.264	13.781	2.170	3.265	6.874	13.069	14.767
30	112.650	0.092	1.699	0.597	0.451	3.396	10.350	1.596	2.237	5.076	10.193	11.386
33	73.858	0.069	2.355	0.522	0.301	2.710	9.591	1.108	1.636	4.215	9.559	10.448
36	20.317	0.056	1.325	0.167	0.167	1.040	3.922	0.438	0.949	2.725	3.456	4.401
39	6.961	0.026	0.426	0.049	0.098	0.287	1.113	0.141	0.579	1.122	0.781	1.368
42	3.921	0.012	0.198	0.037	0.073	0.118	0.387	0.056	0.472	0.579	0.317	0.660
45	3.366	0.012	0.156	0.027	0.076	0.083	0.301	0.034	0.531	0.593	0.245	0.642
48	1.683	0.015	0.054	0.017	0.086	0.034	0.223	0.025	0.591	0.620	0.168	0.642
52	0.385	0.017	0.037	0.014	0.092	0.020	0.088	0.012	0.750	0.760	0.061	0.762
56	0.150	0.018	0.035	0.019	0.124	0.030	0.054	0.009	1.064	1.073	0.044	1.074
60	-0.408	0.038	0.246	0.080	0.228	0.095	0.235	0.026	1.520	1.555	0.282	1.580
64	-0.665	0.068	0.437	0.170	0.330	0.229	0.497	0.053	1.789	1.859	0.616	1.959
68	-0.890	0.018	0.028	0.025	0.357	0.259	0.131	0.031	1.712	1.752	0.272	1.773

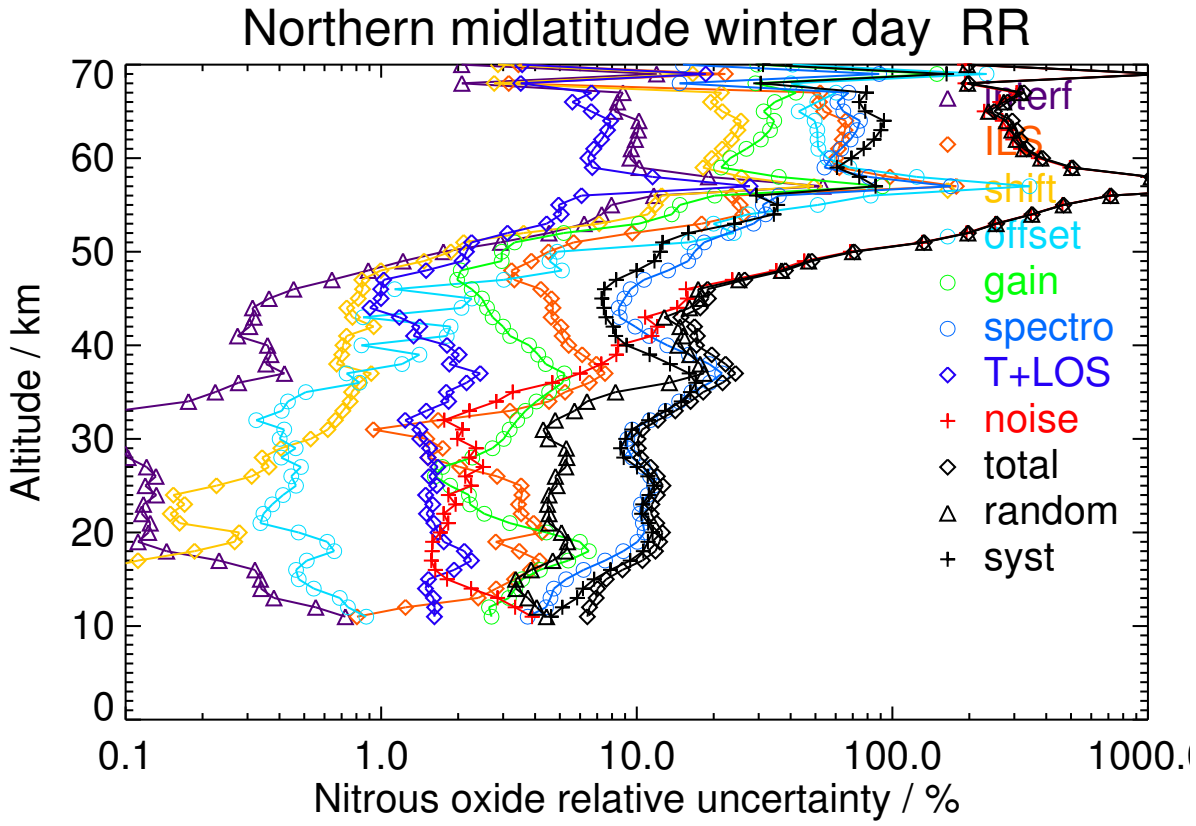

Figure S179. V8R_N2O_261 Northern midlatitude winter day

Table S180. Nitrous oxide error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	306.925	1.454	5.904	0.208	2.342	9.991	14.578	5.151	9.453	11.796	18.209	21.696
15	305.030	0.986	8.824	0.235	1.371	9.418	16.421	4.738	5.118	10.000	19.691	22.085
18	263.702	0.387	7.640	0.542	1.433	13.344	21.392	4.870	3.885	13.583	23.470	27.117
21	211.730	0.338	10.208	0.360	0.860	5.688	21.893	3.722	4.007	9.855	23.444	25.432
24	185.458	0.252	6.442	0.283	0.783	3.098	20.004	2.748	3.490	7.818	20.264	21.720
27	135.030	0.172	2.510	0.535	0.685	2.038	15.416	2.320	3.363	6.588	14.905	16.296
30	102.213	0.091	1.538	0.453	0.395	2.394	9.850	1.537	2.177	5.338	9.171	10.611
33	68.180	0.084	1.756	0.601	0.294	2.312	8.319	0.998	1.583	3.285	8.414	9.032
36	21.108	0.062	1.412	0.177	0.173	1.001	3.758	0.420	0.926	2.681	3.321	4.268
39	6.976	0.021	0.523	0.053	0.098	0.348	1.052	0.124	0.526	1.057	0.830	1.344
42	4.368	0.012	0.237	0.035	0.076	0.162	0.450	0.057	0.438	0.629	0.303	0.698
45	4.037	0.013	0.167	0.034	0.076	0.113	0.333	0.035	0.481	0.559	0.281	0.625
48	2.381	0.016	0.055	0.018	0.082	0.038	0.278	0.028	0.530	0.570	0.214	0.609
52	0.418	0.018	0.028	0.013	0.093	0.011	0.084	0.012	0.713	0.721	0.070	0.725
56	0.212	0.017	0.035	0.018	0.125	0.022	0.052	0.010	1.039	1.049	0.035	1.049
60	0.177	0.048	0.276	0.096	0.224	0.093	0.263	0.032	1.505	1.538	0.339	1.575
64	-0.091	0.086	0.509	0.209	0.329	0.234	0.582	0.062	1.773	1.861	0.705	1.990
68	0.418	0.026	0.086	0.035	0.340	0.125	0.129	0.020	1.662	1.701	0.162	1.709

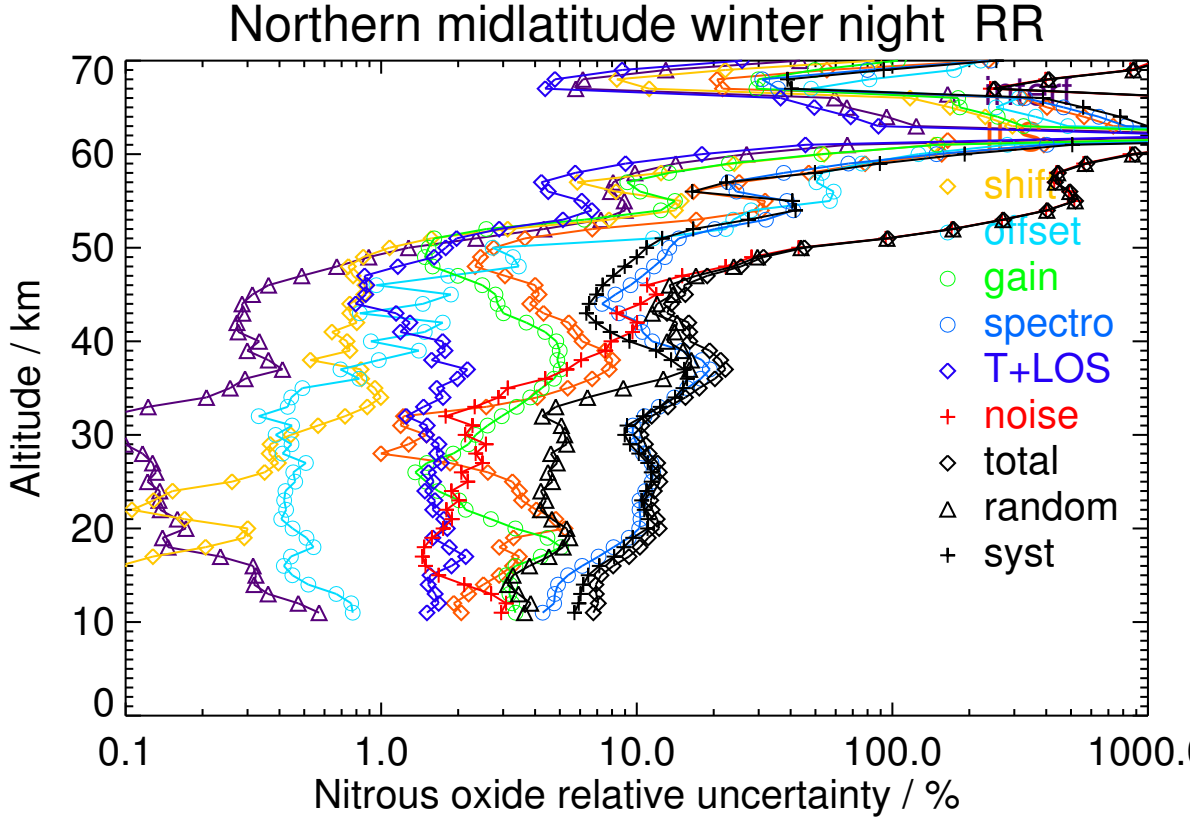

Figure S180. V8R_N2O_261 Northern midlatitude winter night

Table S181. Nitrous oxide error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	311.038	1.578	4.299	0.328	1.799	10.536	14.729	4.555	8.226	10.766	18.021	20.992
15	301.139	1.041	8.135	0.221	1.327	11.526	16.661	4.908	5.002	9.109	21.110	22.992
18	266.946	0.383	9.113	0.556	1.927	20.844	22.224	6.112	4.311	13.679	29.739	32.734
21	199.487	0.267	5.298	0.252	0.901	10.413	21.341	3.437	3.807	10.784	22.425	24.883
24	155.993	0.180	3.321	0.335	0.763	3.335	15.703	2.655	3.842	6.375	15.831	17.066
27	136.277	0.171	1.334	0.443	0.540	2.577	13.062	2.065	3.115	5.884	12.605	13.911
30	100.867	0.088	0.822	0.592	0.402	2.956	11.668	1.726	2.515	5.769	11.050	12.465
33	52.120	0.081	1.746	0.355	0.244	1.816	7.125	0.935	1.631	4.103	6.633	7.800
36	17.366	0.057	1.103	0.132	0.148	0.840	2.679	0.332	0.915	1.847	2.584	3.176
39	8.258	0.032	0.516	0.052	0.088	0.453	1.047	0.109	0.546	1.155	0.746	1.375
42	5.430	0.013	0.281	0.051	0.065	0.238	0.581	0.057	0.439	0.652	0.501	0.822
45	3.153	0.012	0.086	0.022	0.059	0.082	0.287	0.032	0.442	0.497	0.224	0.545
48	2.536	0.016	0.045	0.016	0.071	0.058	0.195	0.021	0.489	0.517	0.148	0.537
52	1.150	0.018	0.036	0.009	0.075	0.022	0.125	0.016	0.627	0.639	0.094	0.645
56	0.570	0.018	0.022	0.012	0.097	0.024	0.068	0.010	0.933	0.940	0.051	0.941
60	0.093	0.020	0.078	0.020	0.168	0.039	0.074	0.012	1.258	1.272	0.080	1.275
64	-0.152	0.041	0.178	0.064	0.301	0.155	0.205	0.024	1.649	1.688	0.251	1.707
68	-0.367	0.046	0.196	0.068	0.322	0.173	0.217	0.027	1.653	1.697	0.284	1.720

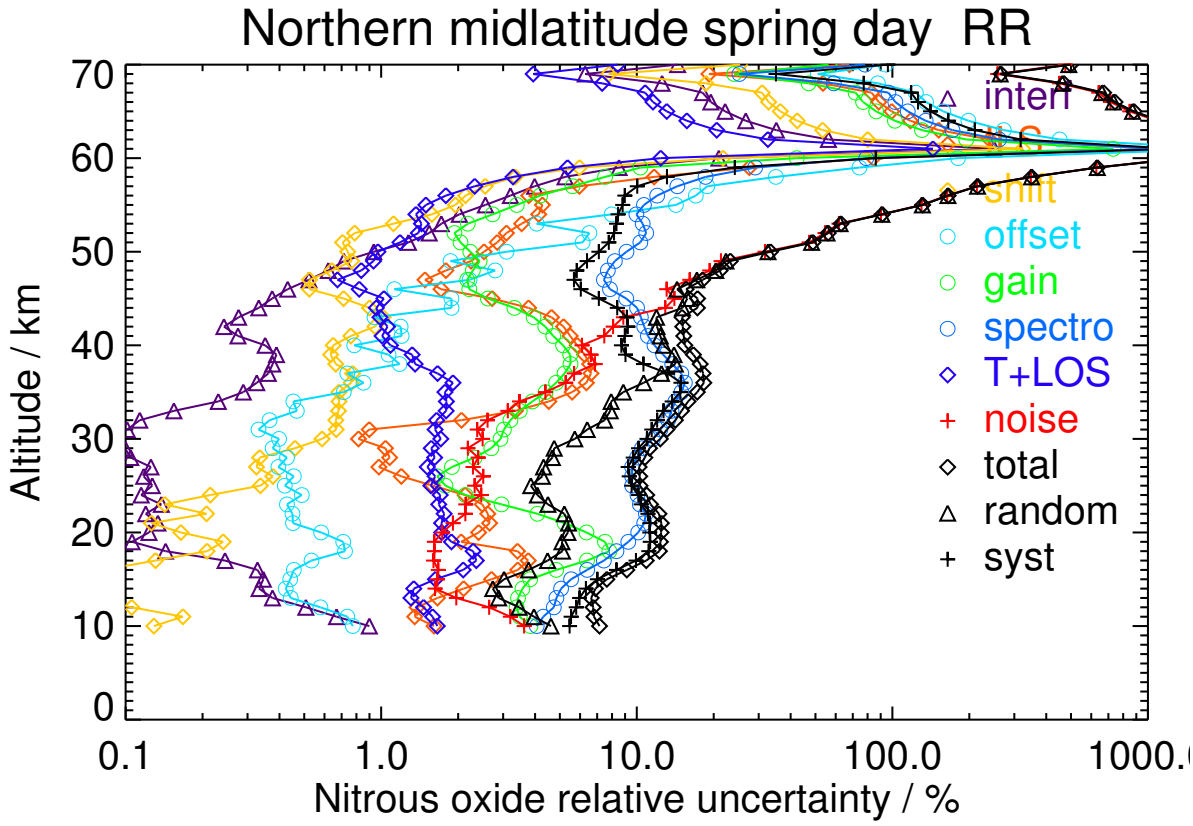

Figure S181. V8R_N2O_261 Northern midlatitude spring day

Table S182. Nitrous oxide error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	311.288	1.528	4.385	0.274	1.931	10.319	14.243	4.743	8.513	10.755	17.720	20.728
15	289.071	0.957	6.851	0.212	1.242	10.167	15.660	4.489	4.659	8.123	19.337	20.973
18	257.225	0.277	7.547	0.475	1.651	17.887	20.693	4.923	4.007	13.747	25.680	29.128
21	199.948	0.281	6.372	0.337	0.960	10.047	21.309	3.318	3.692	10.614	22.555	24.927
24	156.668	0.195	2.854	0.348	0.705	4.581	15.007	2.487	3.663	6.816	15.104	16.571
27	134.607	0.161	1.195	0.472	0.505	2.094	14.016	2.081	3.171	5.201	13.788	14.736
30	90.682	0.082	0.775	0.514	0.356	1.959	10.696	1.609	2.412	4.130	10.516	11.299
33	48.542	0.078	1.570	0.359	0.252	1.847	5.925	0.807	1.598	2.508	6.172	6.662
36	18.832	0.058	1.093	0.159	0.166	0.931	2.739	0.325	0.964	1.895	2.658	3.264
39	8.498	0.033	0.511	0.065	0.098	0.478	1.034	0.112	0.570	1.087	0.854	1.383
42	5.575	0.014	0.282	0.057	0.071	0.266	0.587	0.054	0.446	0.691	0.476	0.840
45	3.244	0.012	0.097	0.023	0.066	0.092	0.332	0.033	0.453	0.528	0.247	0.583
48	2.328	0.016	0.039	0.012	0.072	0.047	0.188	0.020	0.491	0.519	0.128	0.535
52	1.440	0.019	0.032	0.009	0.086	0.023	0.116	0.014	0.662	0.672	0.098	0.679
56	0.531	0.017	0.030	0.014	0.109	0.031	0.067	0.011	0.963	0.971	0.061	0.973
60	0.553	0.020	0.084	0.019	0.171	0.030	0.074	0.013	1.274	1.289	0.077	1.291
64	-0.059	0.039	0.184	0.059	0.300	0.146	0.190	0.024	1.654	1.693	0.238	1.710
68	-0.334	0.045	0.214	0.071	0.326	0.170	0.225	0.024	1.664	1.711	0.283	1.735

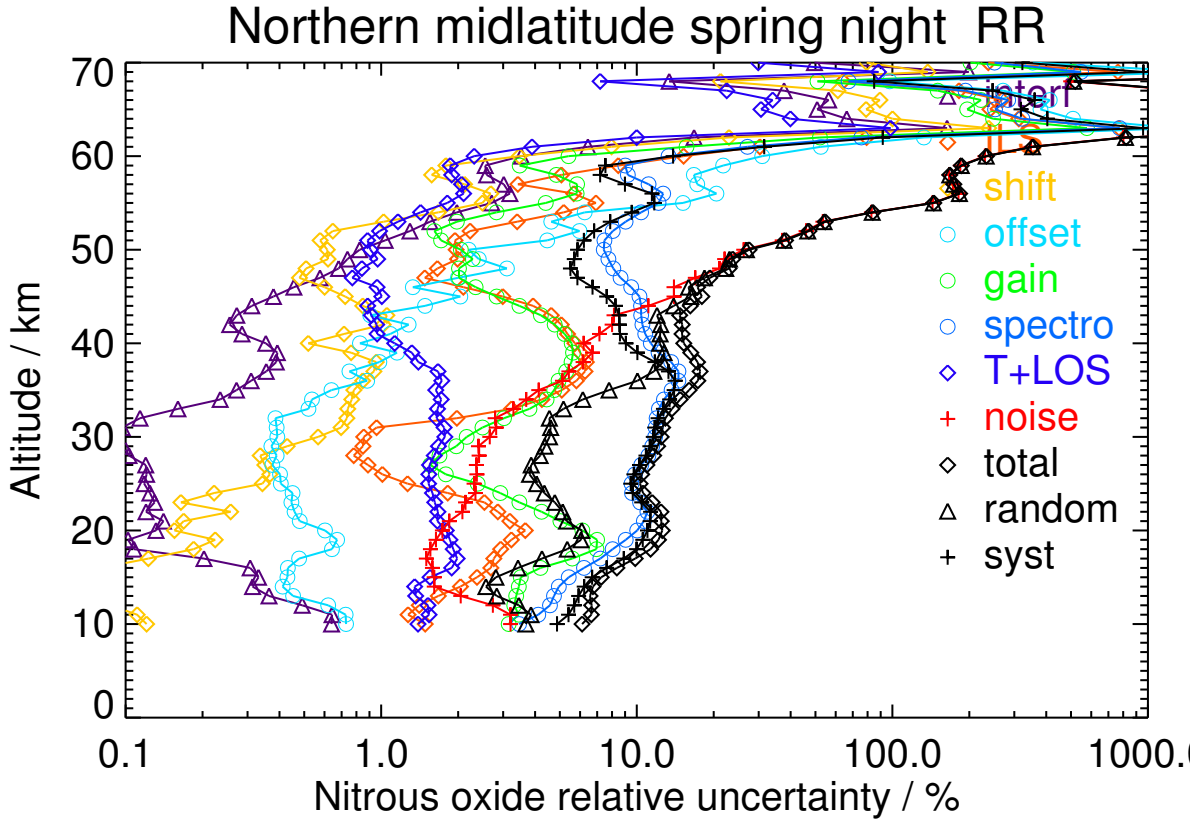

Figure S182. V8R_N2O_261 Northern midlatitude spring night

Table S183. Nitrous oxide error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	360.365	2.013	12.340	0.186	2.196	15.622	15.123	5.350	8.781	11.107	24.825	27.197
15	347.376	1.450	14.319	0.173	2.125	11.152	16.259	7.574	7.518	11.908	23.927	26.726
18	321.453	1.286	6.535	0.459	2.238	10.168	23.259	7.385	6.014	12.038	25.292	28.011
21	244.405	0.516	10.045	0.406	0.696	2.147	24.463	5.161	4.964	8.418	26.178	27.498
24	180.784	0.245	4.213	0.121	0.566	2.839	18.499	2.647	3.476	5.130	19.005	19.685
27	139.331	0.177	1.578	0.510	0.539	2.274	12.087	2.107	3.391	4.463	12.262	13.049
30	120.974	0.104	1.415	0.608	0.353	2.687	11.859	1.638	2.345	3.325	12.144	12.591
33	69.882	0.070	1.971	0.623	0.269	2.060	7.830	0.960	1.751	2.782	8.134	8.596
36	36.690	0.099	1.512	0.248	0.210	1.452	4.104	0.467	1.154	1.569	4.521	4.785
39	15.283	0.045	0.806	0.106	0.123	0.705	1.966	0.215	0.728	1.011	2.143	2.370
42	6.788	0.014	0.332	0.065	0.081	0.270	0.668	0.085	0.500	0.686	0.653	0.948
45	4.996	0.013	0.194	0.048	0.071	0.160	0.420	0.048	0.468	0.572	0.376	0.685
48	3.257	0.016	0.109	0.036	0.075	0.100	0.269	0.034	0.489	0.542	0.218	0.584
52	2.940	0.018	0.053	0.019	0.078	0.056	0.226	0.027	0.601	0.638	0.141	0.653
56	1.979	0.020	0.039	0.022	0.097	0.051	0.184	0.024	0.886	0.900	0.151	0.913
60	0.516	0.030	0.129	0.039	0.169	0.062	0.127	0.020	1.276	1.292	0.159	1.302
64	-0.432	0.076	0.359	0.150	0.291	0.277	0.421	0.034	1.677	1.718	0.598	1.819
68	-0.514	0.080	0.390	0.192	0.292	0.351	0.558	0.039	1.617	1.663	0.753	1.825

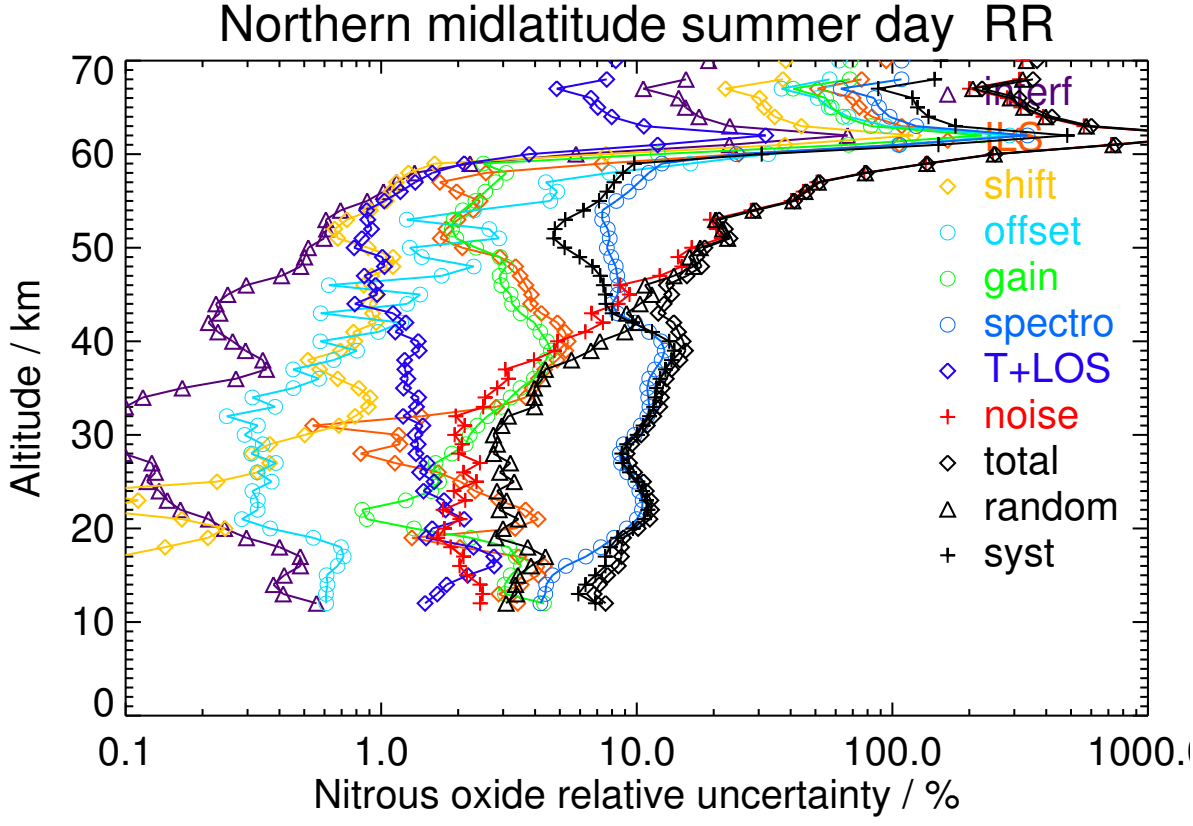

Figure S183. V8R_N2O_261 Northern midlatitude summer day

Table S184. Nitrous oxide error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	338.464	2.035	5.770	0.250	2.383	11.591	14.389	6.609	10.195	13.659	18.590	23.069
15	334.018	1.384	8.782	0.154	1.811	8.183	13.934	6.299	7.428	12.401	16.869	20.936
18	302.007	0.997	5.411	0.517	1.008	4.774	20.713	4.591	5.040	9.997	20.734	23.018
21	242.122	0.532	11.420	0.388	0.880	1.991	24.884	4.994	4.621	7.869	27.188	28.303
24	181.383	0.230	4.431	0.148	0.606	2.759	19.020	2.912	3.613	5.368	19.550	20.273
27	139.442	0.179	1.530	0.528	0.511	2.262	12.844	2.177	3.183	4.408	12.978	13.706
30	109.158	0.116	1.244	0.670	0.365	2.152	10.774	1.672	2.351	3.415	10.933	11.454
33	65.111	0.085	1.618	0.632	0.271	1.845	6.669	0.935	1.695	2.844	6.829	7.397
36	35.085	0.099	1.472	0.315	0.195	1.225	3.874	0.476	1.132	1.797	4.135	4.508
39	13.901	0.050	0.675	0.093	0.118	0.625	1.619	0.200	0.714	0.972	1.760	2.010
42	7.759	0.016	0.381	0.058	0.082	0.331	0.733	0.080	0.506	0.800	0.651	1.031
45	5.496	0.013	0.191	0.046	0.072	0.175	0.422	0.045	0.470	0.579	0.374	0.690
48	4.746	0.017	0.102	0.037	0.076	0.122	0.322	0.038	0.479	0.552	0.249	0.605
52	3.534	0.019	0.090	0.026	0.082	0.082	0.293	0.033	0.616	0.665	0.216	0.699
56	1.642	0.019	0.044	0.020	0.102	0.045	0.186	0.026	0.906	0.923	0.138	0.933
60	1.028	0.025	0.107	0.023	0.167	0.032	0.113	0.020	1.252	1.268	0.118	1.274
64	0.609	0.068	0.328	0.106	0.288	0.175	0.301	0.029	1.655	1.693	0.449	1.751
68	-0.043	0.077	0.354	0.131	0.296	0.209	0.365	0.027	1.608	1.650	0.525	1.731

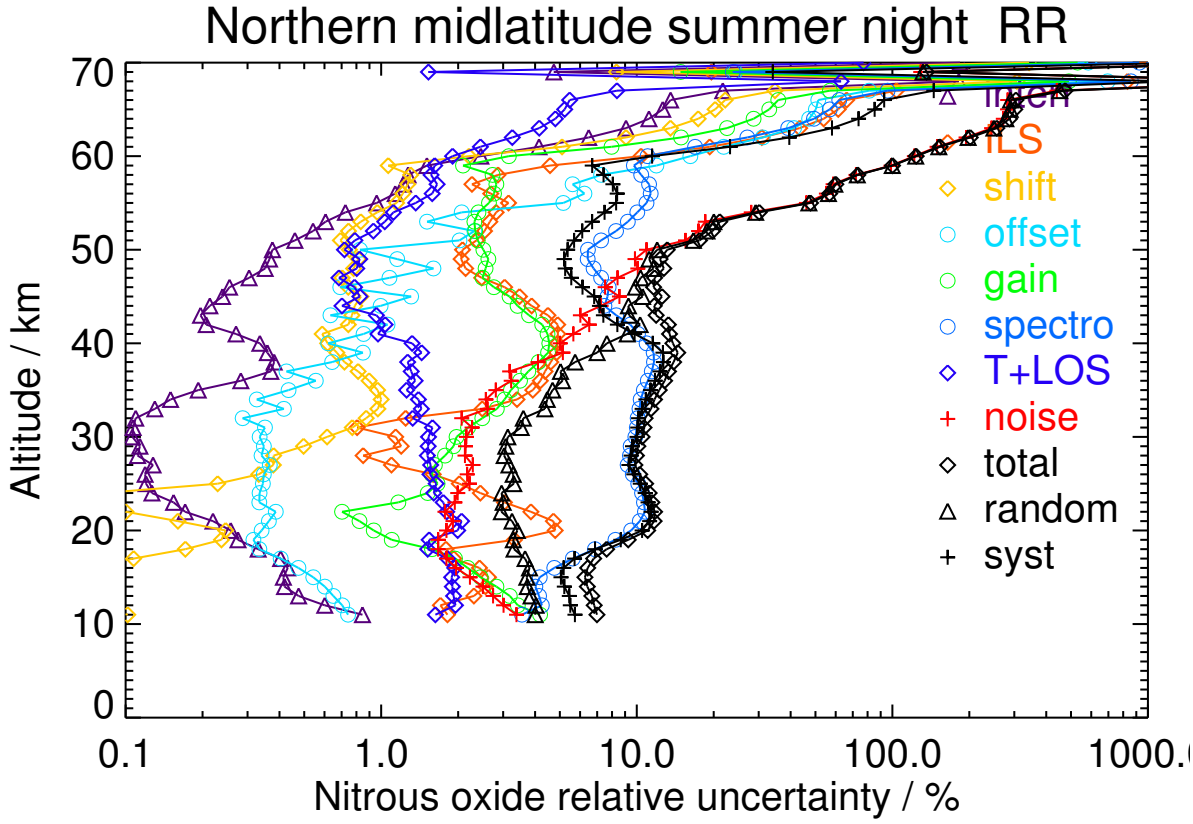

Figure S184. V8R_N2O_261 Northern midlatitude summer night

Table S185. Nitrous oxide error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	344.158	1.574	8.281	0.154	2.119	14.636	13.921	4.762	7.906	9.996	21.653	23.849
15	327.134	1.237	11.649	0.147	2.262	11.293	16.102	7.628	8.388	13.232	21.969	25.647
18	310.971	0.778	4.328	0.455	1.520	10.296	23.201	5.717	4.908	10.278	24.846	26.888
21	238.969	0.407	12.142	0.521	0.918	2.618	26.319	4.673	4.565	7.984	28.761	29.848
24	180.451	0.239	6.245	0.306	0.811	1.951	19.489	2.888	3.563	6.077	20.188	21.083
27	137.469	0.158	2.947	0.515	0.627	1.991	14.675	2.316	3.665	5.186	14.852	15.732
30	104.144	0.095	0.924	0.521	0.352	1.957	10.650	1.588	2.500	3.717	10.652	11.282
33	73.126	0.079	0.977	0.641	0.317	1.788	7.327	0.896	2.066	3.353	7.224	7.964
36	48.746	0.097	1.399	0.411	0.264	1.654	4.752	0.517	1.511	2.323	4.967	5.484
39	28.920	0.086	1.198	0.171	0.203	1.358	2.781	0.297	1.104	1.728	3.068	3.521
42	19.480	0.037	0.934	0.105	0.143	0.903	1.852	0.190	0.861	1.374	2.010	2.435
45	8.943	0.017	0.494	0.083	0.098	0.304	1.016	0.105	0.696	0.861	1.068	1.371
48	4.770	0.017	0.178	0.034	0.094	0.085	0.408	0.052	0.650	0.707	0.375	0.800
52	3.057	0.020	0.070	0.019	0.098	0.042	0.227	0.030	0.793	0.809	0.210	0.836
56	1.246	0.020	0.030	0.017	0.115	0.029	0.138	0.020	1.079	1.089	0.117	1.096
60	0.534	0.025	0.105	0.027	0.196	0.050	0.098	0.018	1.424	1.440	0.129	1.446
64	-0.075	0.048	0.217	0.079	0.314	0.165	0.232	0.028	1.760	1.796	0.328	1.826
68	-0.509	0.045	0.194	0.075	0.325	0.173	0.222	0.025	1.706	1.744	0.313	1.772

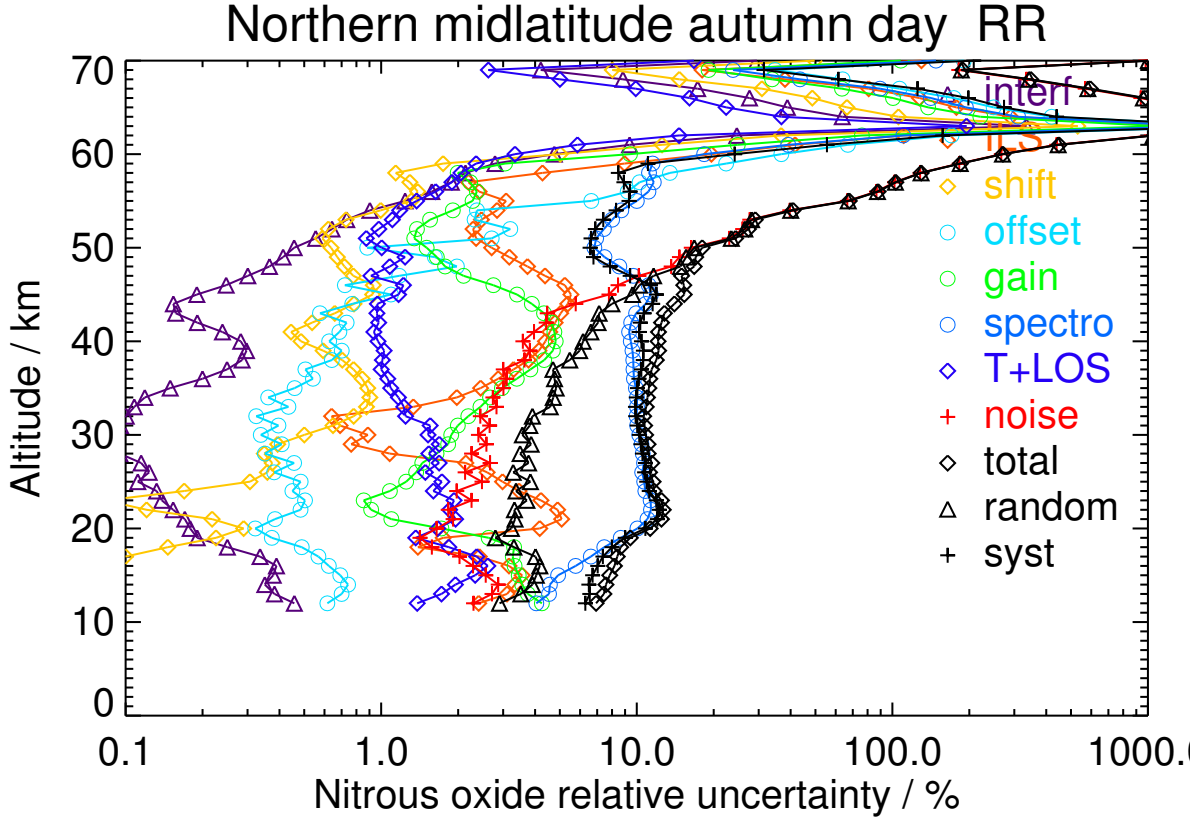

Figure S185. V8R_N2O_261 Northern midlatitude autumn day

Table S186. Nitrous oxide error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	324.141	1.252	12.150	0.086	2.559	14.851	14.028	5.902	9.476	11.862	23.601	26.414
15	328.441	1.083	10.240	0.136	2.056	10.552	15.242	7.332	7.489	12.447	20.220	23.744
18	305.189	0.691	3.935	0.489	1.383	10.192	21.057	4.944	4.467	9.762	22.682	24.693
21	232.770	0.391	8.725	0.439	0.922	7.039	24.555	4.134	4.355	10.120	25.758	27.675
24	171.535	0.216	5.832	0.338	0.714	2.397	18.822	2.783	3.628	6.914	19.178	20.386
27	132.679	0.149	3.078	0.494	0.572	2.266	14.269	2.193	3.466	5.401	14.369	15.350
30	95.384	0.090	1.082	0.512	0.359	2.040	10.767	1.557	2.436	4.281	10.568	11.402
33	63.857	0.086	0.962	0.610	0.313	1.647	7.117	0.895	1.958	3.786	6.713	7.708
36	38.945	0.087	1.161	0.410	0.245	1.452	4.386	0.466	1.380	2.778	4.163	5.005
39	23.661	0.071	1.114	0.158	0.180	1.215	2.767	0.257	0.975	2.220	2.553	3.384
42	14.068	0.030	0.816	0.081	0.121	0.727	1.596	0.142	0.743	1.409	1.534	2.082
45	8.363	0.015	0.397	0.065	0.092	0.263	0.782	0.078	0.638	0.811	0.778	1.124
48	4.694	0.018	0.183	0.031	0.089	0.088	0.402	0.045	0.602	0.639	0.410	0.759
52	2.650	0.020	0.064	0.015	0.096	0.037	0.175	0.024	0.751	0.763	0.172	0.782
56	1.664	0.018	0.035	0.016	0.114	0.034	0.130	0.019	1.044	1.053	0.120	1.060
60	0.450	0.021	0.070	0.012	0.181	0.029	0.075	0.016	1.359	1.373	0.082	1.375
64	-0.088	0.038	0.156	0.045	0.305	0.131	0.147	0.022	1.713	1.745	0.226	1.759
68	-0.225	0.043	0.184	0.057	0.321	0.152	0.176	0.024	1.686	1.723	0.269	1.744

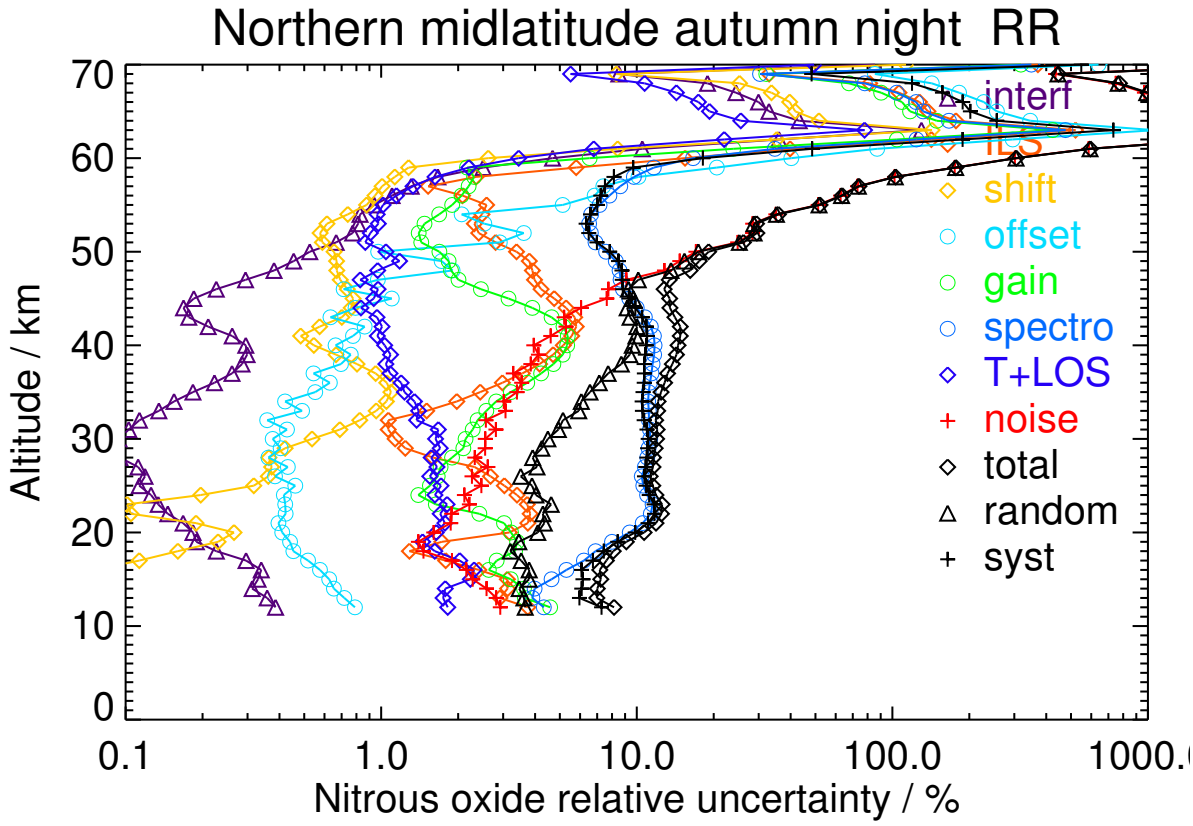

Figure S186. V8R_N2O_261 Northern midlatitude autumn night

Table S187. Nitrous oxide error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	353.476	1.312	6.679	0.104	2.112	13.970	16.827	5.927	8.282	11.445	22.402	25.156
15	362.531	1.682	13.452	0.347	2.462	13.507	15.378	10.299	8.534	14.881	23.798	28.068
18	335.991	1.387	7.641	0.262	2.417	8.962	17.210	8.399	7.747	12.611	20.352	23.943
21	292.704	0.811	5.958	0.256	0.855	3.871	23.017	5.916	6.093	9.396	23.781	25.570
24	266.547	0.216	1.451	0.263	0.676	5.495	24.578	3.357	4.244	7.147	24.802	25.811
27	252.712	0.171	0.881	0.297	0.651	4.409	21.062	3.184	3.926	5.919	21.328	22.134
30	213.922	0.113	1.503	0.651	0.537	4.490	18.259	2.713	3.018	4.805	18.706	19.313
33	161.269	0.136	3.249	1.262	0.417	3.720	13.920	1.705	2.261	4.534	14.402	15.099
36	87.610	0.130	2.726	0.924	0.250	2.506	8.661	0.978	1.475	3.083	9.126	9.633
39	38.916	0.109	1.359	0.336	0.184	1.614	4.056	0.422	0.957	1.880	4.315	4.707
42	18.972	0.045	0.700	0.137	0.119	0.918	2.137	0.208	0.659	1.495	2.043	2.532
45	6.802	0.017	0.181	0.080	0.069	0.224	0.757	0.092	0.495	0.625	0.728	0.960
48	4.097	0.016	0.081	0.016	0.062	0.096	0.291	0.045	0.492	0.524	0.273	0.591
52	1.170	0.016	0.044	0.014	0.048	0.028	0.169	0.026	0.561	0.572	0.151	0.591
56	0.377	0.019	0.061	0.028	0.072	0.038	0.080	0.010	0.777	0.783	0.089	0.788
60	-0.027	0.024	0.111	0.035	0.154	0.071	0.113	0.013	1.121	1.135	0.159	1.146
64	-0.587	0.071	0.454	0.187	0.287	0.324	0.530	0.044	1.609	1.663	0.736	1.818
68	-0.809	0.084	0.570	0.237	0.309	0.402	0.664	0.056	1.623	1.703	0.908	1.930

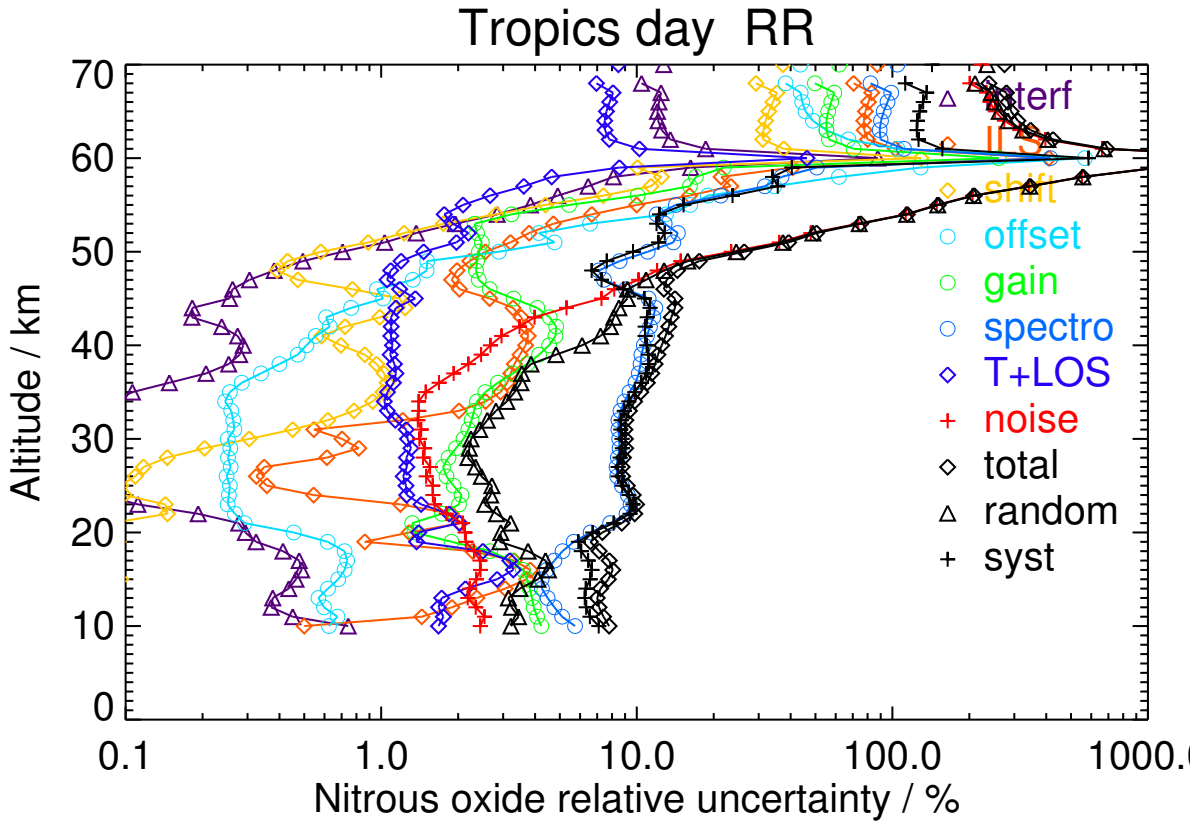

Figure S187. V8R_N2O_261 Tropics day

Table S188. Nitrous oxide error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	354.034	1.376	6.005	0.081	2.092	14.059	17.448	6.279	8.554	11.678	22.818	25.633
15	363.436	1.793	12.141	0.289	2.446	12.790	15.628	11.592	8.871	15.735	23.020	27.885
18	338.685	1.276	6.946	0.298	2.324	8.062	17.173	8.843	7.866	12.686	19.860	23.566
21	293.073	0.838	6.344	0.377	0.875	3.662	24.871	6.368	6.287	9.725	25.678	27.458
24	267.762	0.183	1.240	0.156	0.580	6.093	22.811	3.589	4.240	6.855	23.308	24.296
27	247.522	0.150	1.009	0.248	0.660	4.563	21.556	3.360	3.826	5.943	21.855	22.648
30	214.694	0.097	2.003	0.565	0.517	4.213	17.964	2.967	3.051	4.952	18.402	19.057
33	164.095	0.114	3.271	1.108	0.405	3.802	14.363	1.847	2.264	4.247	14.945	15.536
36	87.405	0.125	3.364	0.943	0.252	2.490	8.721	1.036	1.517	3.109	9.394	9.895
39	40.410	0.109	1.625	0.278	0.188	1.645	4.141	0.464	0.991	1.782	4.543	4.880
42	17.814	0.037	0.695	0.155	0.115	0.886	2.127	0.212	0.663	1.368	2.108	2.513
45	6.334	0.015	0.120	0.053	0.075	0.154	0.693	0.087	0.506	0.619	0.639	0.890
48	3.421	0.015	0.066	0.017	0.070	0.078	0.251	0.042	0.512	0.527	0.255	0.586
52	1.057	0.016	0.032	0.011	0.054	0.021	0.132	0.022	0.563	0.573	0.108	0.583
56	0.443	0.019	0.052	0.026	0.073	0.035	0.081	0.011	0.773	0.779	0.088	0.784
60	-0.302	0.023	0.107	0.033	0.152	0.068	0.109	0.012	1.127	1.140	0.152	1.150
64	-0.888	0.067	0.446	0.182	0.284	0.322	0.521	0.044	1.616	1.663	0.736	1.819
68	-1.088	0.084	0.603	0.253	0.304	0.428	0.712	0.060	1.624	1.693	0.996	1.964

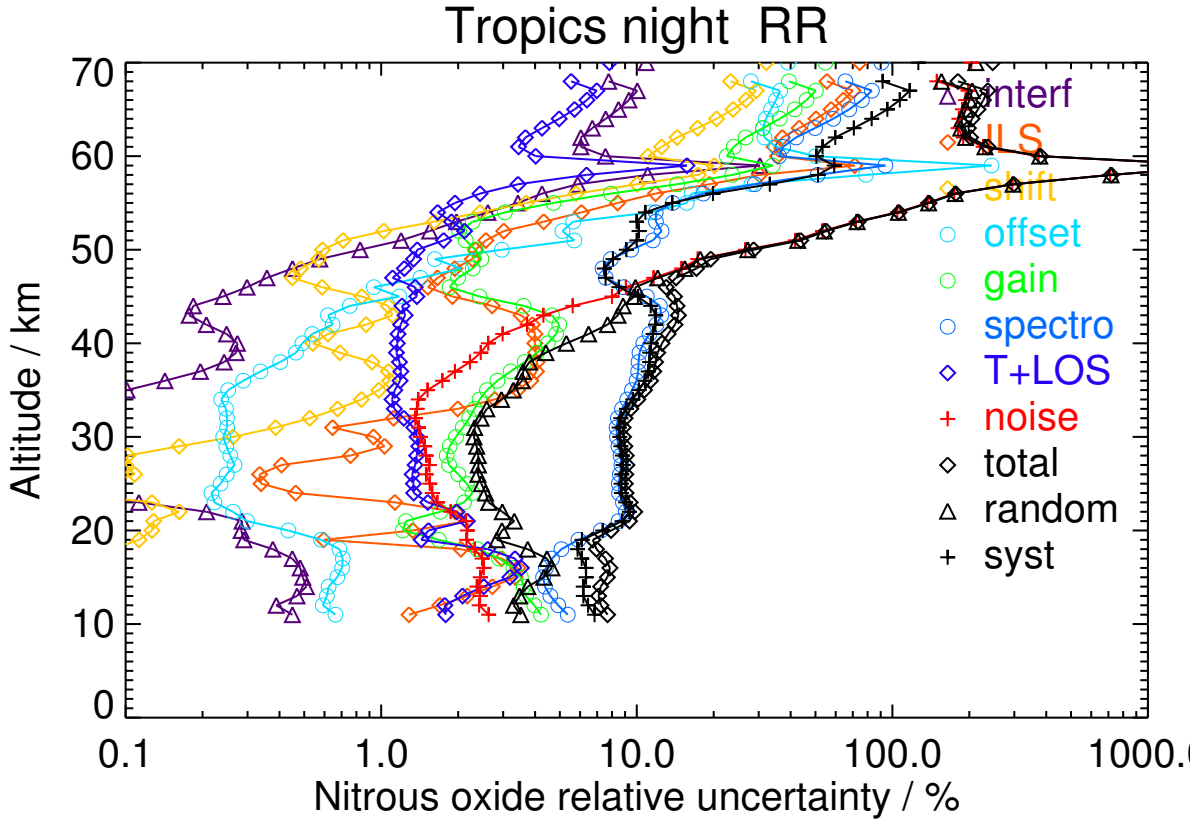

Figure S188. V8R_N2O_261 Tropics night

Table S189. Nitrous oxide error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	342.298	4.523	3.460	0.381	2.959	12.739	15.390	6.545	12.340	15.332	20.013	25.211
12	314.411	1.162	5.076	0.248	1.484	10.409	13.236	4.091	7.058	9.356	17.086	19.480
15	298.225	0.843	5.271	0.303	1.395	8.953	16.663	5.198	5.347	9.166	18.972	21.071
18	265.215	0.320	4.914	0.543	1.081	14.052	23.286	5.105	4.513	10.503	26.487	28.493
21	209.178	0.250	3.819	0.175	0.917	10.320	23.087	3.325	4.251	7.792	24.969	26.156
24	159.128	0.176	2.754	0.332	0.826	5.899	19.135	2.811	4.476	6.540	19.862	20.911
27	108.601	0.115	1.358	0.299	0.568	2.858	14.064	2.182	3.744	6.132	13.763	15.067
30	77.165	0.064	0.632	0.395	0.419	1.911	10.676	1.536	3.137	6.855	9.142	11.427
33	56.813	0.071	1.808	0.295	0.331	1.674	8.444	0.947	2.456	5.847	7.094	9.193
36	30.438	0.071	1.639	0.097	0.266	1.378	5.114	0.543	1.748	3.564	4.634	5.846
39	10.750	0.031	0.692	0.049	0.138	0.584	2.218	0.228	1.012	1.717	1.972	2.615
42	2.084	0.012	0.154	0.017	0.083	0.102	0.601	0.064	0.674	0.831	0.413	0.928
45	0.912	0.011	0.035	0.008	0.080	0.037	0.147	0.018	0.658	0.678	0.065	0.681
48	0.450	0.016	0.021	0.005	0.088	0.013	0.075	0.010	0.679	0.687	0.050	0.689
52	-0.002	0.019	0.022	0.007	0.098	0.013	0.046	0.008	0.848	0.855	0.021	0.856
56	0.424	0.016	0.039	0.013	0.115	0.037	0.061	0.012	1.130	1.138	0.044	1.139
60	0.185	0.013	0.043	0.011	0.183	0.027	0.050	0.012	1.369	1.383	0.030	1.383
64	-0.258	0.016	0.064	0.013	0.306	0.068	0.069	0.016	1.697	1.728	0.056	1.729
68	-0.269	0.017	0.071	0.013	0.326	0.070	0.072	0.017	1.672	1.706	0.068	1.708

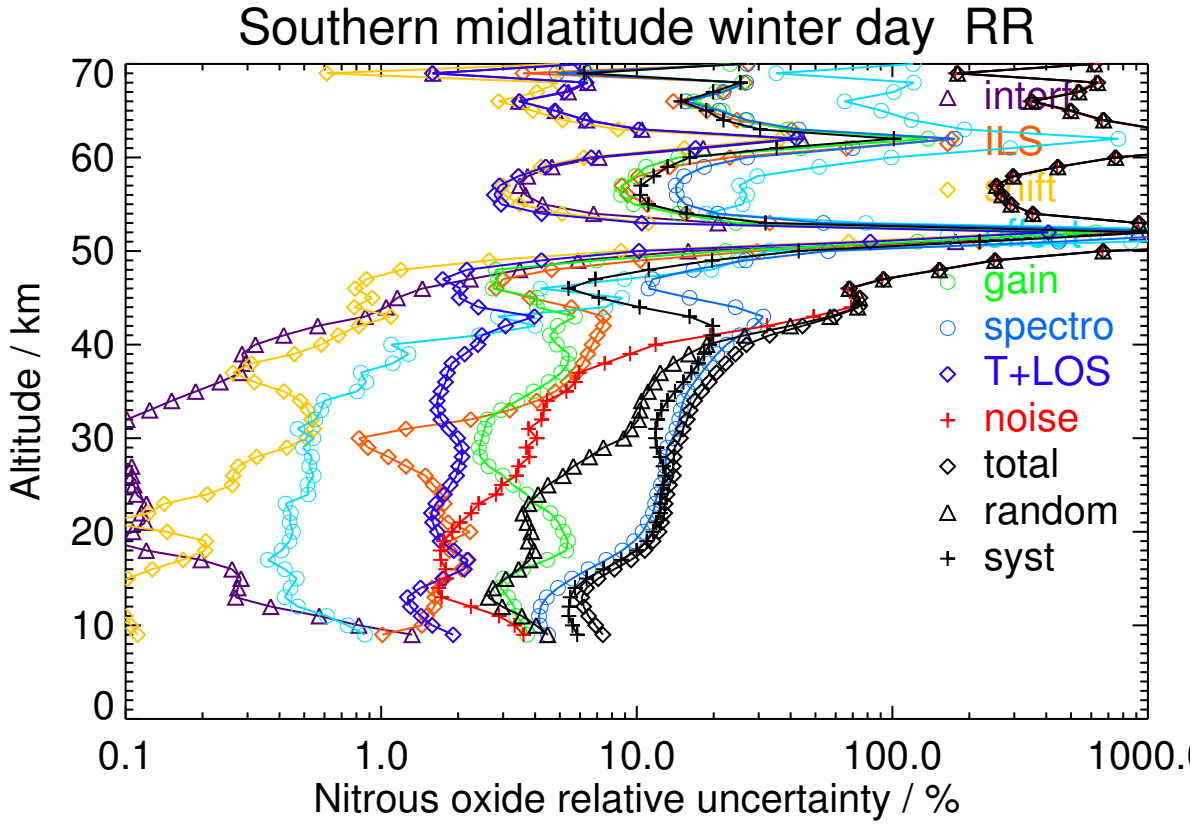

Figure S189. V8R_N2O_261 Southern midlatitude winter day

Table S190. Nitrous oxide error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	310.415	3.303	2.015	0.374	2.439	9.117	12.569	4.865	10.667	12.917	15.257	19.990
12	312.027	1.037	4.665	0.306	1.194	10.233	12.381	3.200	5.367	8.256	15.914	17.928
15	296.511	0.910	5.989	0.232	1.383	10.537	15.317	4.709	5.080	9.506	18.491	20.792
18	265.315	0.318	9.052	0.286	1.678	19.779	17.094	5.941	4.479	11.849	26.140	28.700
21	206.084	0.243	2.490	0.251	1.235	13.316	18.726	3.548	4.230	8.966	22.044	23.797
24	150.941	0.161	2.567	0.309	0.754	5.737	16.160	2.600	3.906	6.743	16.670	17.982
27	105.715	0.102	1.866	0.270	0.636	2.550	13.337	2.277	3.914	6.201	13.054	14.451
30	65.308	0.065	0.654	0.316	0.356	1.659	8.908	1.520	2.746	5.067	8.182	9.624
33	46.593	0.072	0.978	0.334	0.292	0.884	6.133	0.810	2.341	4.689	4.869	6.760
36	27.162	0.073	1.052	0.140	0.267	1.333	3.345	0.442	1.584	2.625	3.159	4.108
39	11.649	0.029	0.562	0.048	0.146	0.680	1.691	0.209	0.956	1.423	1.610	2.149
42	2.840	0.010	0.151	0.018	0.090	0.133	0.581	0.069	0.683	0.769	0.516	0.926
45	0.622	0.012	0.028	0.006	0.086	0.022	0.150	0.018	0.699	0.719	0.062	0.721
48	0.379	0.016	0.014	0.005	0.083	0.014	0.060	0.009	0.725	0.732	0.028	0.733
52	0.312	0.019	0.019	0.007	0.100	0.018	0.046	0.009	0.957	0.964	0.026	0.964
56	0.349	0.016	0.019	0.008	0.113	0.035	0.040	0.012	1.171	1.178	0.033	1.178
60	-0.224	0.016	0.040	0.008	0.190	0.030	0.040	0.012	1.371	1.385	0.022	1.385
64	-0.811	0.020	0.059	0.017	0.310	0.074	0.059	0.018	1.708	1.738	0.070	1.740
68	-0.835	0.018	0.042	0.010	0.331	0.091	0.041	0.019	1.688	1.722	0.085	1.724

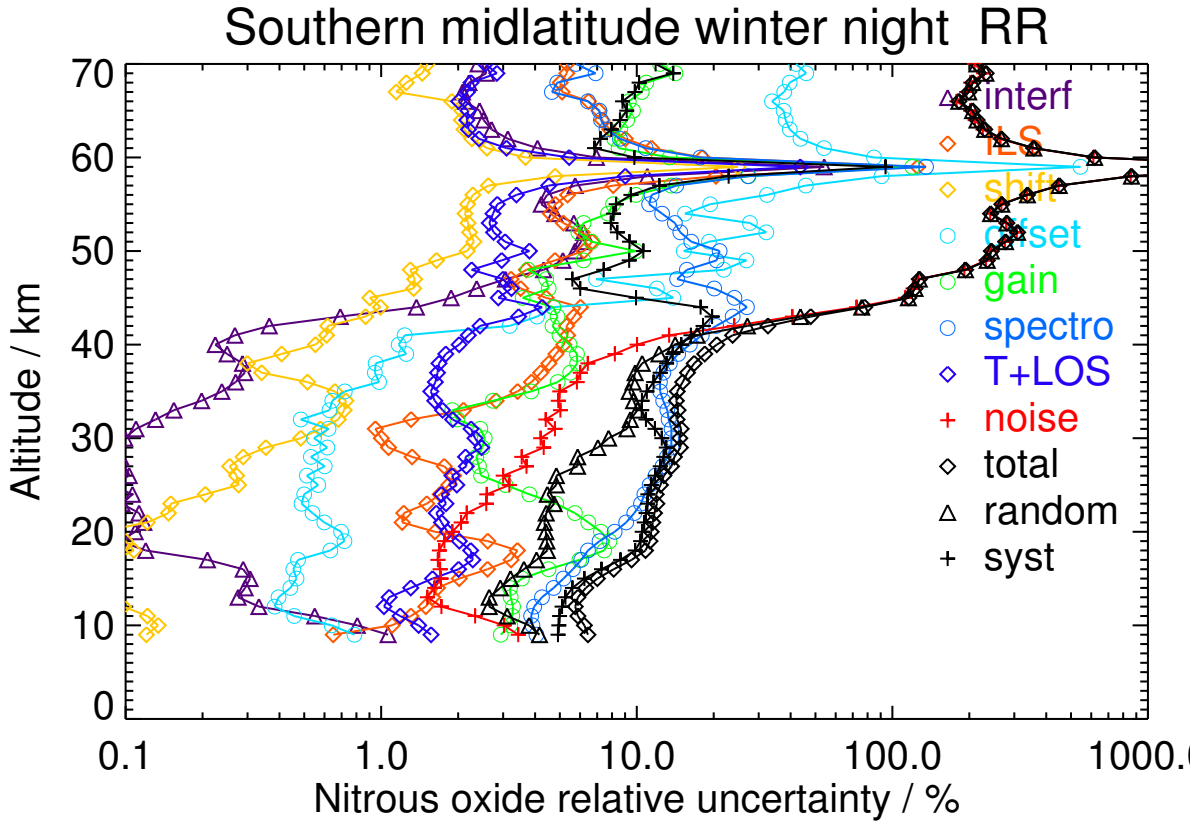

Figure S190. V8R_N2O_261 Southern midlatitude winter night

Table S191. Nitrous oxide error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	309.480	5.107	4.745	0.479	2.357	9.179	15.008	5.237	11.161	15.473	16.627	22.713
12	304.384	1.787	6.668	0.476	1.321	8.879	14.555	3.909	5.999	11.972	15.756	19.788
15	284.134	1.426	7.188	0.448	1.371	7.585	18.861	5.092	5.730	13.628	18.495	22.974
18	230.137	0.449	9.830	0.577	1.157	11.155	22.468	4.731	4.037	16.578	22.172	27.685
21	170.194	0.273	7.135	0.363	0.817	7.865	19.077	3.201	3.746	14.082	17.422	22.402
24	171.304	0.194	3.405	0.241	0.766	4.938	14.920	2.407	3.361	8.516	14.277	16.624
27	167.006	0.183	1.525	0.444	0.540	2.920	14.456	2.163	3.180	5.831	14.182	15.334
30	140.147	0.122	1.323	0.678	0.413	3.404	13.589	1.961	2.438	5.710	13.260	14.437
33	88.137	0.090	2.855	0.454	0.316	3.121	10.342	1.229	1.845	3.886	10.723	11.405
36	29.364	0.073	1.772	0.188	0.201	1.420	4.598	0.544	1.179	2.577	4.628	5.297
39	11.298	0.031	0.529	0.061	0.137	0.740	1.235	0.168	0.720	1.067	1.336	1.710
42	6.742	0.014	0.214	0.046	0.092	0.376	0.671	0.077	0.540	0.694	0.681	0.973
45	2.639	0.012	0.032	0.014	0.079	0.100	0.282	0.038	0.511	0.541	0.259	0.600
48	2.161	0.016	0.029	0.009	0.079	0.057	0.111	0.015	0.521	0.533	0.104	0.543
52	1.501	0.019	0.031	0.010	0.093	0.039	0.119	0.015	0.708	0.718	0.107	0.726
56	0.547	0.015	0.045	0.019	0.115	0.074	0.081	0.015	1.002	1.011	0.095	1.016
60	-0.032	0.019	0.088	0.020	0.170	0.071	0.068	0.013	1.293	1.307	0.098	1.311
64	-0.267	0.045	0.268	0.086	0.292	0.413	0.239	0.047	1.660	1.722	0.430	1.775
68	-0.496	0.051	0.308	0.104	0.319	0.532	0.273	0.056	1.660	1.754	0.499	1.824

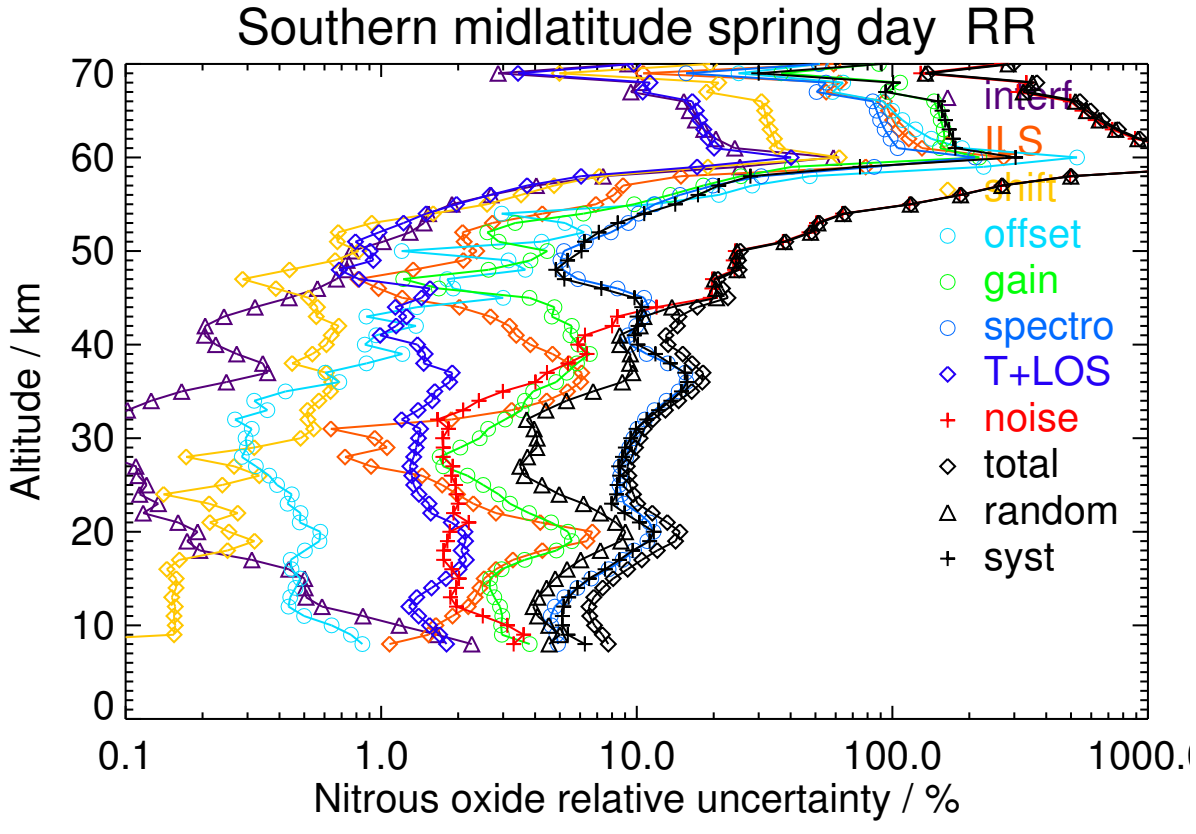

Figure S191. V8R_N2O_261 Southern midlatitude spring day

Table S192. Nitrous oxide error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	314.018	3.682	6.231	0.320	2.466	11.182	11.780	5.209	10.731	14.508	15.944	21.557
12	316.116	1.520	9.825	0.278	1.494	12.617	12.410	4.258	6.296	10.756	18.880	21.729
15	289.011	1.263	11.964	0.229	1.541	11.747	14.926	5.482	5.312	12.791	20.065	23.795
18	228.069	0.401	10.179	0.493	1.721	19.266	21.750	5.443	4.010	19.425	24.891	31.574
21	145.821	0.225	6.185	0.268	0.911	9.809	17.208	2.930	3.664	13.767	16.249	21.297
24	137.896	0.211	3.020	0.247	0.601	3.779	14.200	1.946	3.091	10.303	11.519	15.455
27	134.160	0.185	2.143	0.463	0.575	2.857	12.475	1.878	3.062	8.511	10.461	13.486
30	132.066	0.100	1.631	0.679	0.413	4.155	13.317	1.689	2.190	5.954	13.043	14.337
33	74.414	0.080	2.840	0.443	0.282	2.794	10.198	1.135	1.715	4.916	10.011	11.153
36	23.415	0.067	1.502	0.127	0.196	1.353	3.716	0.442	1.077	2.204	3.802	4.394
39	9.785	0.026	0.503	0.070	0.116	0.522	1.089	0.140	0.639	0.907	1.156	1.469
42	4.513	0.012	0.196	0.035	0.080	0.193	0.469	0.057	0.474	0.542	0.488	0.729
45	2.667	0.012	0.042	0.015	0.075	0.076	0.181	0.026	0.483	0.501	0.172	0.530
48	2.118	0.016	0.027	0.010	0.076	0.040	0.121	0.014	0.507	0.517	0.115	0.529
52	1.539	0.020	0.030	0.010	0.092	0.033	0.098	0.012	0.695	0.703	0.093	0.709
56	0.911	0.015	0.053	0.020	0.112	0.046	0.090	0.013	0.988	0.997	0.093	1.001
60	0.202	0.019	0.092	0.022	0.160	0.035	0.070	0.012	1.240	1.254	0.082	1.256
64	-0.186	0.044	0.367	0.102	0.281	0.249	0.291	0.033	1.608	1.674	0.396	1.720
68	-0.092	0.054	0.493	0.142	0.309	0.312	0.397	0.042	1.636	1.739	0.520	1.815

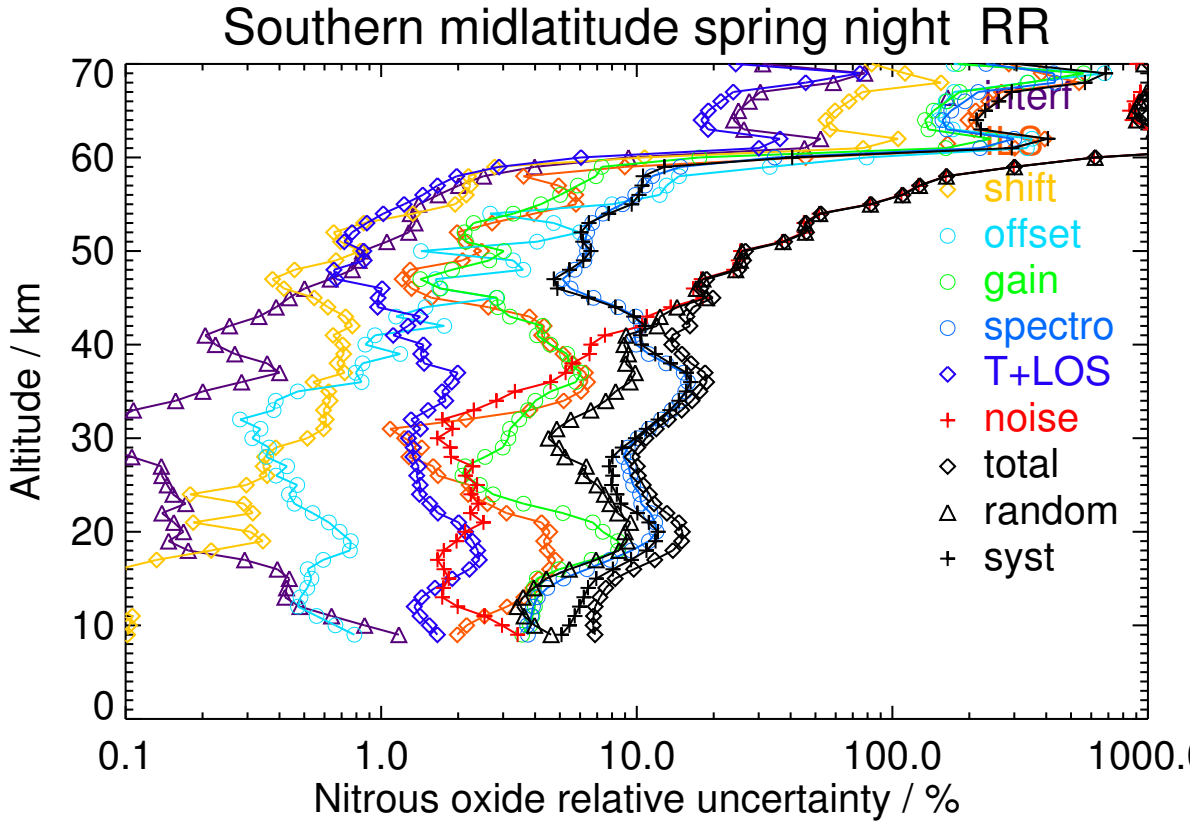

Figure S192. V8R_N2O_261 Southern midlatitude spring night

Table S193. Nitrous oxide error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	306.766	4.761	2.899	0.450	2.209	8.303	14.907	4.878	9.946	13.640	16.247	21.214
12	308.927	1.606	7.718	0.324	1.108	11.791	13.474	3.220	4.972	11.160	17.164	20.473
15	303.757	1.325	14.497	0.516	1.548	13.277	16.480	4.983	5.386	18.946	18.903	26.764
18	254.656	0.807	11.808	0.518	1.443	14.042	18.119	4.877	4.610	17.367	20.281	26.701
21	200.220	0.396	10.444	0.335	0.807	2.802	22.656	3.979	3.951	10.284	23.597	25.740
24	167.600	0.252	4.594	0.156	0.614	1.893	16.482	2.530	3.071	6.743	16.346	17.682
27	124.274	0.176	1.386	0.498	0.550	2.014	13.605	2.207	3.124	5.053	13.444	14.363
30	78.409	0.107	1.258	0.633	0.263	1.599	7.062	1.156	1.815	2.875	7.131	7.689
33	53.315	0.085	1.611	0.554	0.261	1.480	4.315	0.666	1.507	1.957	4.762	5.148
36	29.402	0.084	1.405	0.171	0.183	1.140	2.834	0.360	0.986	1.260	3.300	3.532
39	14.344	0.033	0.727	0.096	0.108	0.598	1.500	0.177	0.582	0.807	1.696	1.878
42	5.622	0.012	0.180	0.043	0.067	0.180	0.620	0.073	0.382	0.538	0.563	0.779
45	2.712	0.010	0.030	0.020	0.058	0.054	0.238	0.032	0.352	0.387	0.200	0.435
48	0.930	0.014	0.016	0.007	0.056	0.020	0.142	0.017	0.350	0.369	0.104	0.383
52	0.182	0.017	0.011	0.005	0.073	0.009	0.040	0.007	0.509	0.516	0.018	0.516
56	0.031	0.014	0.044	0.017	0.101	0.012	0.038	0.007	0.786	0.793	0.050	0.795
60	0.204	0.015	0.040	0.014	0.139	0.015	0.045	0.008	1.059	1.070	0.024	1.070
64	-0.392	0.057	0.280	0.094	0.253	0.132	0.259	0.018	1.439	1.474	0.369	1.520
68	-0.408	0.074	0.381	0.130	0.286	0.168	0.362	0.025	1.530	1.569	0.538	1.659

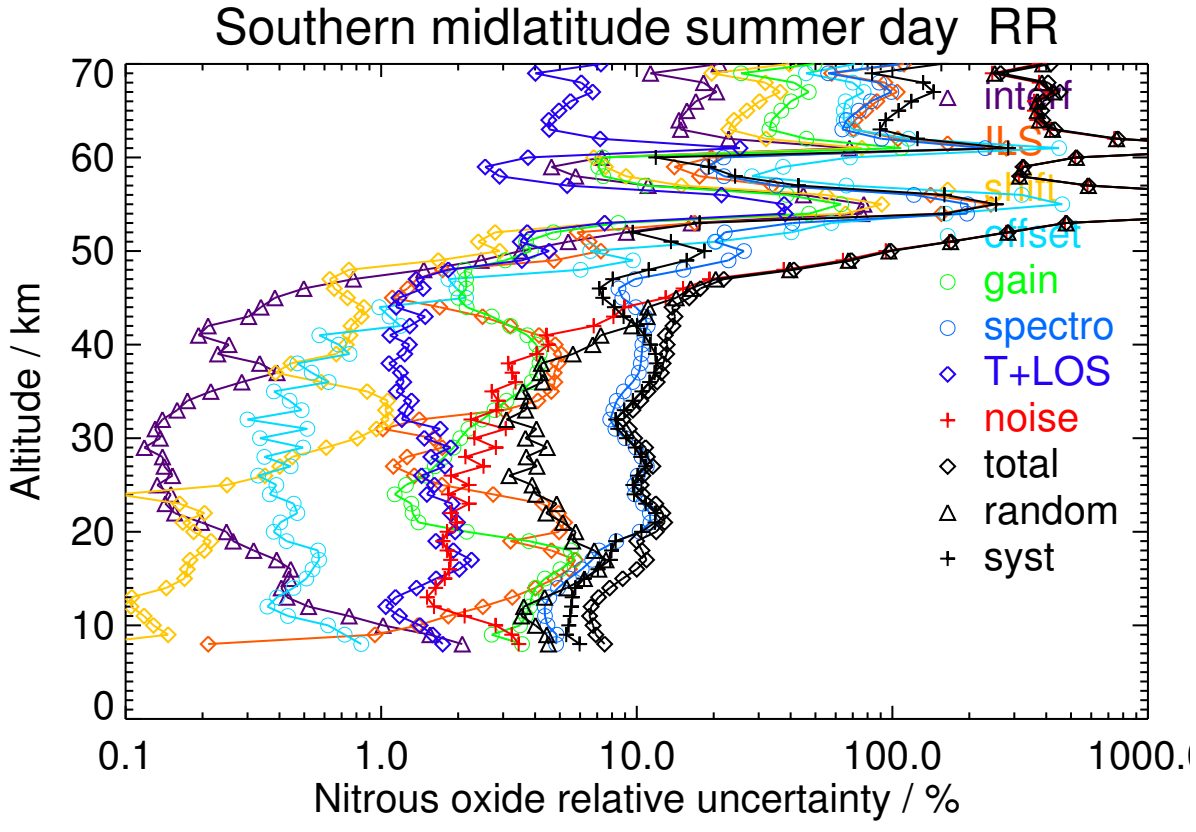

Figure S193. V8R_N2O_261 Southern midlatitude summer day

Table S194. Nitrous oxide error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	313.327	4.380	2.563	0.425	2.092	7.540	13.768	4.579	9.511	12.831	14.950	19.701
12	311.900	1.377	6.035	0.280	1.092	11.040	13.567	2.998	4.831	7.748	17.829	19.439
15	293.682	1.317	11.109	0.387	1.486	13.078	16.609	4.590	5.110	11.681	22.025	24.931
18	263.172	0.731	11.439	0.766	2.134	20.258	22.084	5.326	4.400	16.348	28.550	32.899
21	195.227	0.310	6.068	0.456	0.613	6.569	23.515	3.162	3.794	10.547	23.383	25.652
24	165.659	0.290	3.308	0.237	0.528	1.455	14.734	2.289	3.063	6.142	14.404	15.659
27	118.632	0.166	1.120	0.512	0.534	1.673	13.006	2.076	3.117	4.469	12.955	13.704
30	79.588	0.111	1.263	0.683	0.267	1.711	7.127	1.147	1.806	2.702	7.290	7.775
33	54.120	0.082	1.591	0.554	0.251	1.651	4.492	0.655	1.474	1.902	4.980	5.330
36	29.537	0.081	1.584	0.181	0.177	1.184	2.987	0.370	0.952	1.231	3.526	3.734
39	12.947	0.031	0.707	0.090	0.098	0.532	1.383	0.155	0.528	0.750	1.567	1.737
42	5.744	0.011	0.225	0.054	0.064	0.159	0.581	0.066	0.349	0.493	0.551	0.740
45	2.132	0.010	0.028	0.017	0.057	0.039	0.228	0.032	0.329	0.362	0.191	0.409
48	1.000	0.013	0.019	0.007	0.056	0.021	0.106	0.013	0.338	0.353	0.069	0.360
52	0.163	0.017	0.014	0.006	0.074	0.008	0.044	0.008	0.495	0.502	0.024	0.503
56	0.126	0.015	0.037	0.014	0.099	0.014	0.035	0.006	0.756	0.763	0.042	0.765
60	-0.286	0.015	0.033	0.012	0.132	0.016	0.033	0.006	1.014	1.023	0.019	1.024
64	-0.711	0.049	0.244	0.078	0.239	0.120	0.230	0.015	1.357	1.388	0.328	1.426
68	-0.906	0.073	0.395	0.135	0.279	0.176	0.380	0.026	1.497	1.539	0.553	1.636

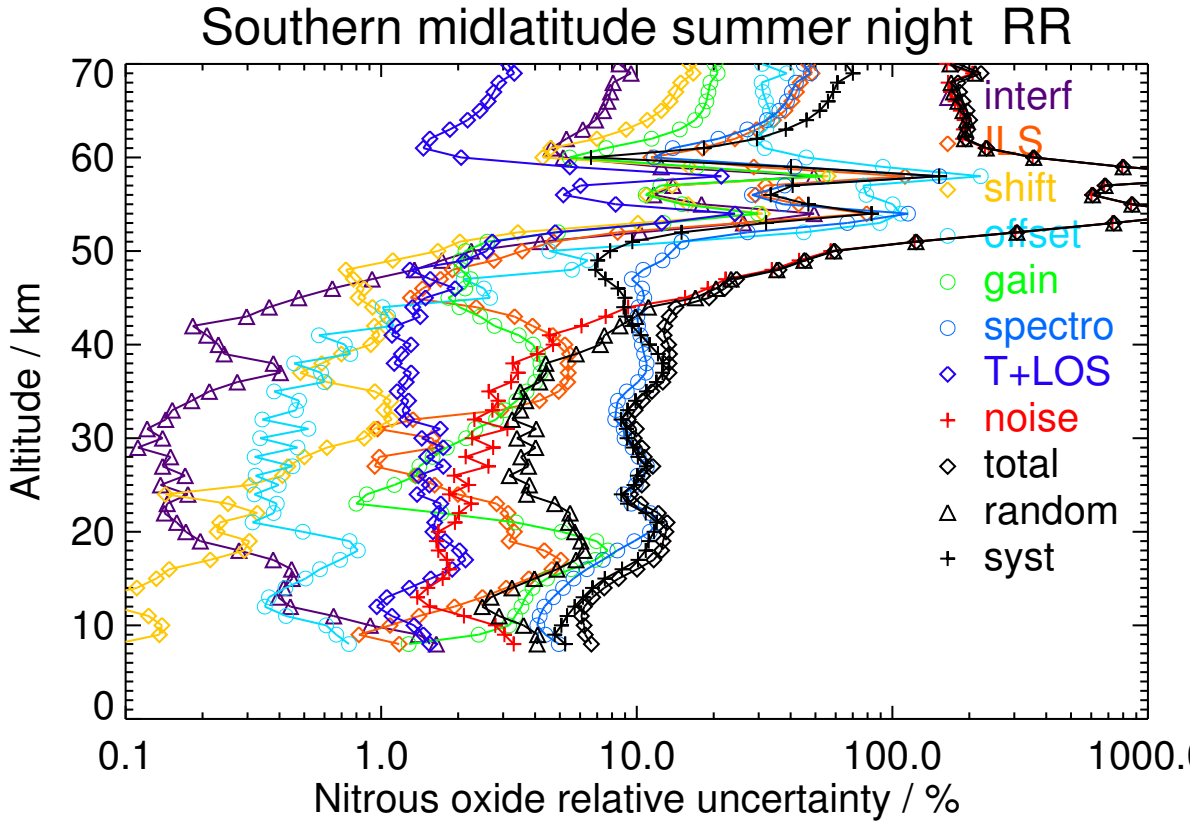

Figure S194. V8R_N2O_261 Southern midlatitude summer night

Table S195. Nitrous oxide error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	313.316	3.401	3.298	0.430	2.283	11.001	12.879	4.670	10.164	12.714	16.679	20.973
12	318.161	0.988	6.977	0.250	1.179	12.556	13.119	3.670	5.184	8.344	18.750	20.523
15	309.010	0.928	10.462	0.230	1.532	13.499	15.317	5.435	5.172	10.946	21.587	24.204
18	273.866	0.305	9.964	0.475	1.832	21.388	20.019	5.697	4.231	14.771	28.167	31.805
21	205.309	0.271	5.240	0.330	1.093	12.527	21.708	3.718	3.896	11.985	23.289	26.192
24	152.843	0.172	2.210	0.283	0.748	6.082	17.246	2.686	3.797	7.146	17.622	19.016
27	104.994	0.111	1.389	0.303	0.458	2.596	12.313	1.896	2.925	4.629	12.301	13.143
30	61.560	0.054	0.627	0.325	0.345	1.680	8.103	1.237	2.313	3.965	7.762	8.716
33	34.829	0.063	1.160	0.224	0.281	1.439	4.565	0.615	1.712	2.910	4.385	5.263
36	17.696	0.049	0.999	0.123	0.191	1.099	2.611	0.268	1.067	2.358	2.173	3.207
39	11.299	0.041	0.707	0.038	0.136	0.796	1.570	0.144	0.762	1.649	1.225	2.054
42	7.239	0.020	0.389	0.042	0.100	0.468	0.932	0.076	0.651	1.080	0.717	1.296
45	4.721	0.014	0.118	0.030	0.091	0.187	0.488	0.045	0.653	0.764	0.377	0.852
48	3.303	0.017	0.056	0.014	0.096	0.089	0.278	0.032	0.689	0.722	0.231	0.758
52	1.942	0.020	0.038	0.012	0.106	0.062	0.161	0.023	0.896	0.909	0.141	0.920
56	1.399	0.016	0.023	0.013	0.126	0.075	0.107	0.020	1.184	1.193	0.106	1.198
60	0.576	0.020	0.073	0.019	0.207	0.056	0.083	0.019	1.443	1.462	0.060	1.463
64	-0.657	0.029	0.109	0.034	0.329	0.167	0.105	0.028	1.765	1.804	0.154	1.810
68	-1.131	0.025	0.074	0.024	0.351	0.221	0.090	0.032	1.740	1.781	0.203	1.793

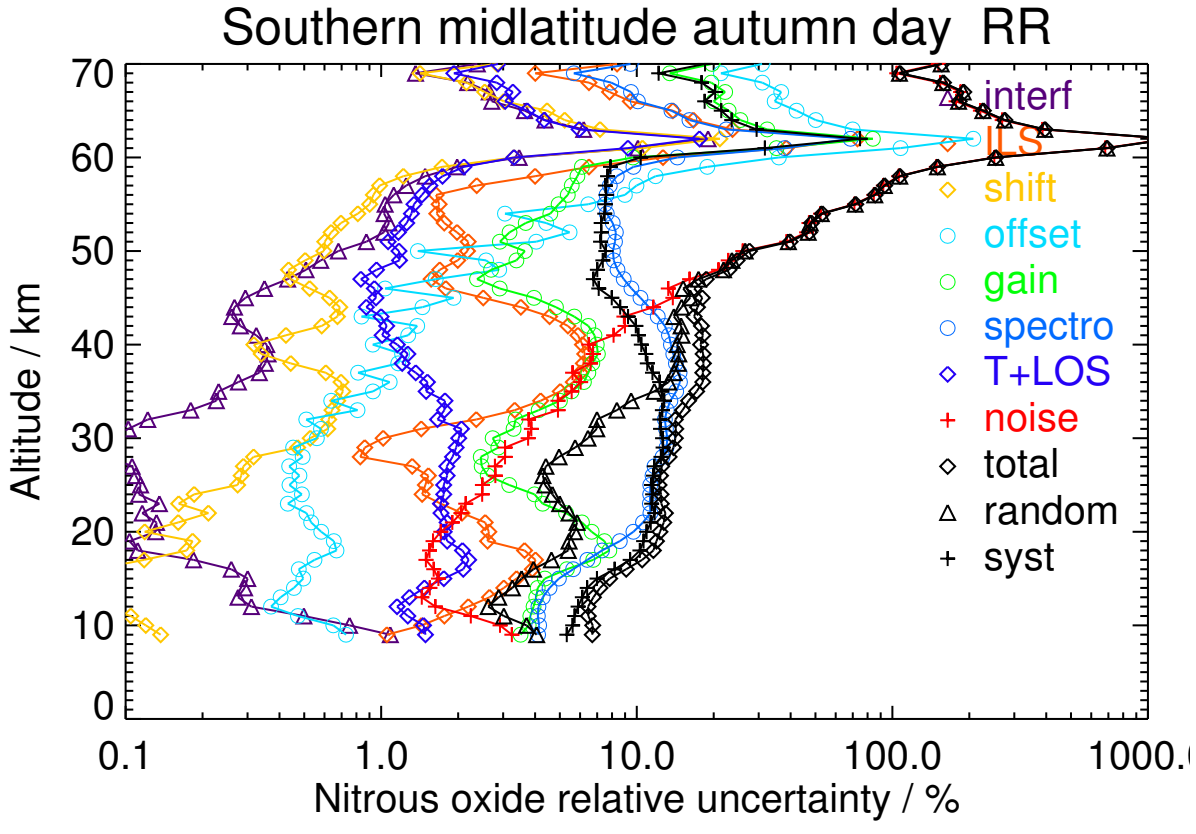

Figure S195. V8R_N2O_261 Southern midlatitude autumn day

Table S196. Nitrous oxide error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	311.848	3.391	2.343	0.510	2.243	8.820	11.877	4.169	10.315	12.294	14.620	19.102
12	320.248	1.079	8.021	0.234	1.177	13.525	13.211	3.400	4.909	8.588	19.655	21.449
15	309.600	1.093	12.888	0.237	1.646	16.134	15.455	5.631	5.465	10.743	24.807	27.034
18	272.216	0.369	11.951	0.486	1.910	22.179	20.106	5.899	4.263	13.449	30.251	33.106
21	200.913	0.277	6.334	0.305	1.127	11.605	21.452	3.754	3.984	12.535	22.567	25.815
24	149.954	0.195	3.263	0.298	0.693	3.576	15.766	2.474	3.249	6.328	15.787	17.008
27	104.465	0.115	1.958	0.309	0.602	1.706	12.962	2.083	3.339	5.698	12.579	13.810
30	61.180	0.060	0.542	0.394	0.229	1.512	7.463	1.109	1.878	3.797	6.987	7.952
33	35.868	0.059	0.954	0.283	0.261	1.138	4.533	0.562	1.647	3.162	3.991	5.092
36	19.327	0.054	0.914	0.192	0.212	1.040	2.336	0.264	1.140	2.175	2.024	2.971
39	14.523	0.054	0.792	0.103	0.159	0.921	1.618	0.153	0.807	1.756	1.313	2.193
42	9.510	0.026	0.511	0.058	0.116	0.604	1.160	0.092	0.673	1.272	0.912	1.565
45	5.432	0.014	0.142	0.046	0.096	0.220	0.619	0.050	0.661	0.838	0.448	0.950
48	3.672	0.018	0.061	0.018	0.088	0.087	0.306	0.029	0.655	0.701	0.229	0.737
52	2.379	0.021	0.049	0.014	0.106	0.052	0.182	0.023	0.905	0.919	0.155	0.932
56	1.517	0.017	0.034	0.013	0.123	0.058	0.118	0.020	1.169	1.179	0.108	1.184
60	0.425	0.025	0.093	0.027	0.207	0.061	0.092	0.018	1.434	1.453	0.099	1.457
64	-0.438	0.040	0.160	0.061	0.324	0.180	0.171	0.031	1.761	1.802	0.224	1.816
68	-0.548	0.040	0.176	0.070	0.344	0.214	0.202	0.034	1.735	1.785	0.257	1.804

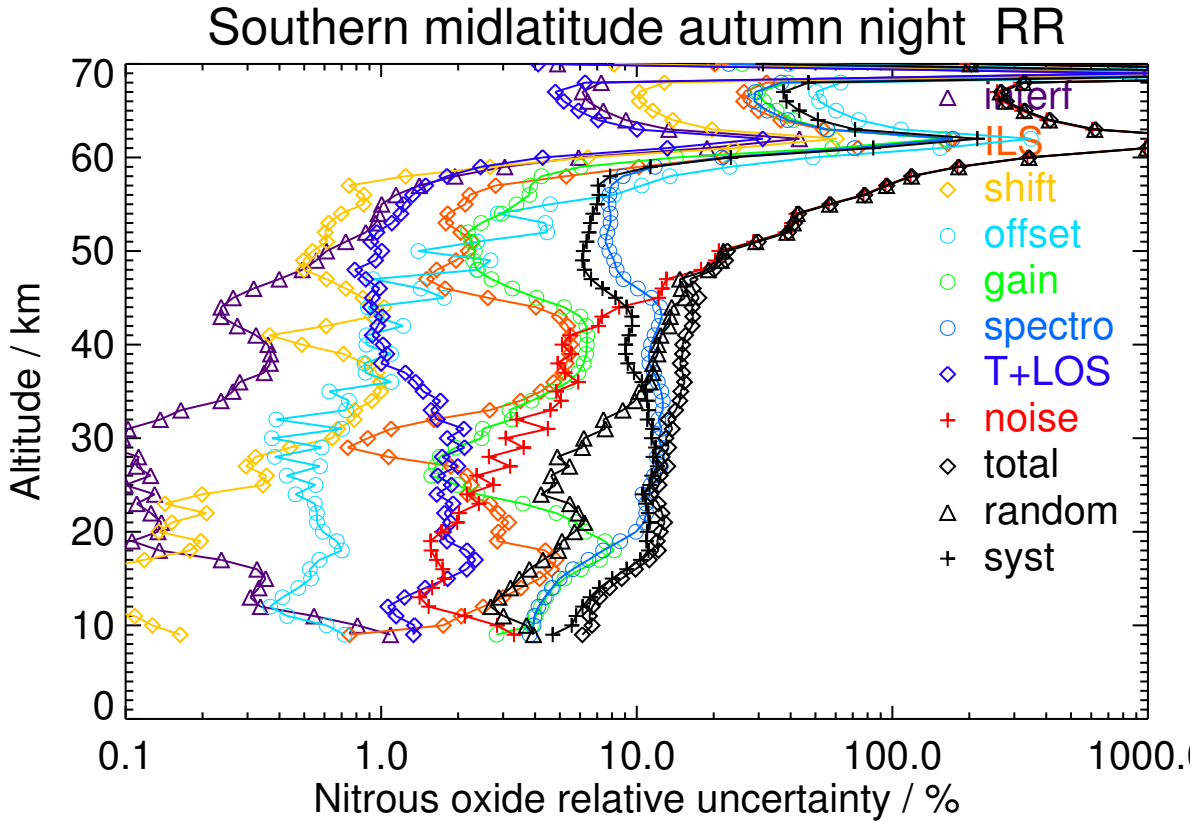

Figure S196. V8R_N2O_261 Southern midlatitude autumn night

Table S197. Nitrous oxide error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	332.445	2.870	2.538	0.210	2.983	10.470	13.910	5.832	11.240	13.524	17.441	22.070
12	306.248	3.383	4.251	0.196	2.130	9.454	12.754	5.470	8.737	11.613	16.048	19.809
15	253.092	3.048	1.806	0.403	1.993	7.784	16.439	6.166	7.001	10.609	17.945	20.847
18	182.169	0.911	4.768	0.588	1.181	8.262	24.401	4.575	4.644	7.981	25.841	27.046
21	93.238	0.319	3.977	0.257	0.758	3.907	17.003	2.379	3.797	6.977	17.097	18.466
24	43.262	0.105	2.276	0.216	0.667	1.306	9.006	1.606	3.995	6.871	7.735	10.345
27	20.080	0.077	0.892	0.094	0.277	0.587	4.355	0.630	2.349	4.574	2.279	5.110
30	17.132	0.060	0.298	0.089	0.382	0.525	2.190	0.492	2.371	2.764	1.882	3.344
33	7.862	0.042	0.292	0.062	0.233	0.426	1.378	0.261	1.455	1.709	1.222	2.101
36	2.758	0.021	0.192	0.024	0.106	0.314	0.678	0.095	0.733	1.019	0.338	1.074
39	1.776	0.010	0.110	0.011	0.054	0.117	0.374	0.034	0.472	0.609	0.148	0.627
42	1.165	0.010	0.041	0.005	0.052	0.019	0.122	0.015	0.457	0.472	0.076	0.478
45	1.218	0.013	0.027	0.005	0.064	0.019	0.079	0.010	0.534	0.542	0.056	0.545
48	0.950	0.019	0.027	0.006	0.085	0.017	0.084	0.011	0.631	0.641	0.059	0.643
52	0.594	0.019	0.025	0.006	0.093	0.013	0.066	0.010	0.787	0.796	0.037	0.796
56	0.380	0.016	0.021	0.008	0.115	0.018	0.045	0.010	1.062	1.069	0.032	1.069
60	0.519	0.014	0.035	0.012	0.200	0.023	0.045	0.011	1.411	1.426	0.033	1.426
64	0.743	0.017	0.074	0.015	0.321	0.025	0.047	0.013	1.747	1.778	0.059	1.779
68	0.472	0.014	0.058	0.013	0.334	0.025	0.039	0.013	1.699	1.732	0.048	1.733

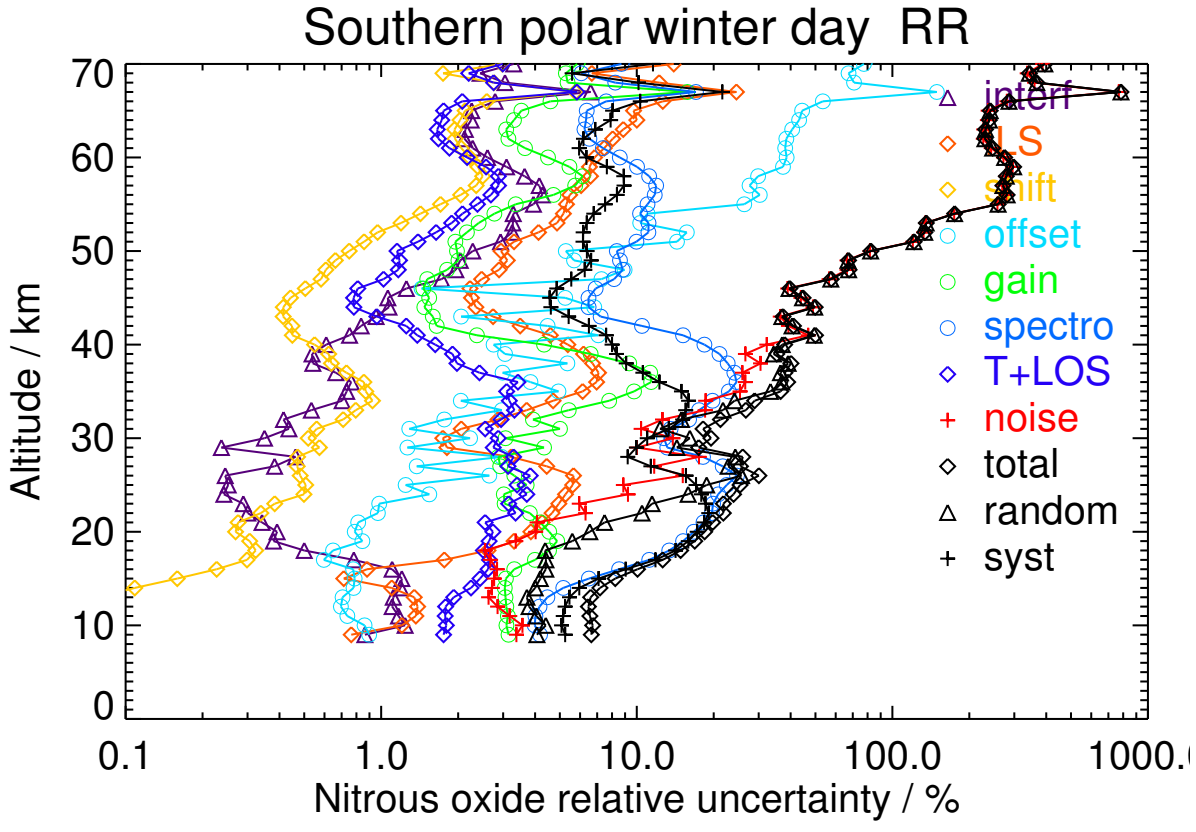

Figure S197. V8R_N2O_261 Southern polar winter day

Table S198. Nitrous oxide error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	330.718	3.165	2.610	0.209	2.735	10.435	12.544	5.593	10.337	13.180	15.969	20.706
12	304.584	2.611	5.147	0.115	1.670	10.719	10.746	4.547	6.474	9.735	15.307	18.140
15	252.246	2.338	3.340	0.224	1.891	7.727	11.978	5.930	6.708	11.176	13.367	17.424
18	178.037	0.713	2.627	0.375	1.092	6.783	15.022	4.731	4.521	8.756	15.702	17.979
21	98.176	0.358	3.443	0.233	0.766	3.881	13.439	2.806	4.177	6.380	13.889	15.284
24	51.433	0.103	2.419	0.232	0.713	2.071	9.089	1.863	4.110	5.854	8.911	10.662
27	18.126	0.077	1.001	0.109	0.328	1.066	4.146	0.749	2.309	4.140	2.864	5.035
30	14.054	0.065	0.396	0.109	0.336	0.484	1.955	0.456	2.189	2.629	1.558	3.056
33	8.055	0.042	0.276	0.066	0.212	0.498	1.343	0.252	1.294	1.588	1.181	1.979
36	2.751	0.017	0.159	0.023	0.123	0.265	0.528	0.092	0.742	0.905	0.361	0.975
39	1.731	0.010	0.081	0.009	0.076	0.170	0.264	0.040	0.517	0.599	0.148	0.617
42	1.041	0.010	0.046	0.006	0.067	0.046	0.135	0.018	0.510	0.530	0.076	0.536
45	0.935	0.013	0.020	0.004	0.075	0.023	0.074	0.011	0.581	0.589	0.048	0.591
48	0.667	0.019	0.015	0.005	0.086	0.029	0.052	0.010	0.636	0.644	0.035	0.645
52	0.845	0.020	0.016	0.007	0.099	0.040	0.053	0.012	0.831	0.839	0.040	0.840
56	0.280	0.018	0.023	0.008	0.116	0.044	0.045	0.014	1.100	1.108	0.034	1.108
60	-0.008	0.015	0.034	0.010	0.193	0.033	0.040	0.012	1.390	1.404	0.026	1.404
64	-0.364	0.018	0.069	0.013	0.319	0.036	0.043	0.013	1.739	1.770	0.050	1.770
68	-0.433	0.017	0.055	0.011	0.336	0.046	0.038	0.015	1.700	1.734	0.050	1.735

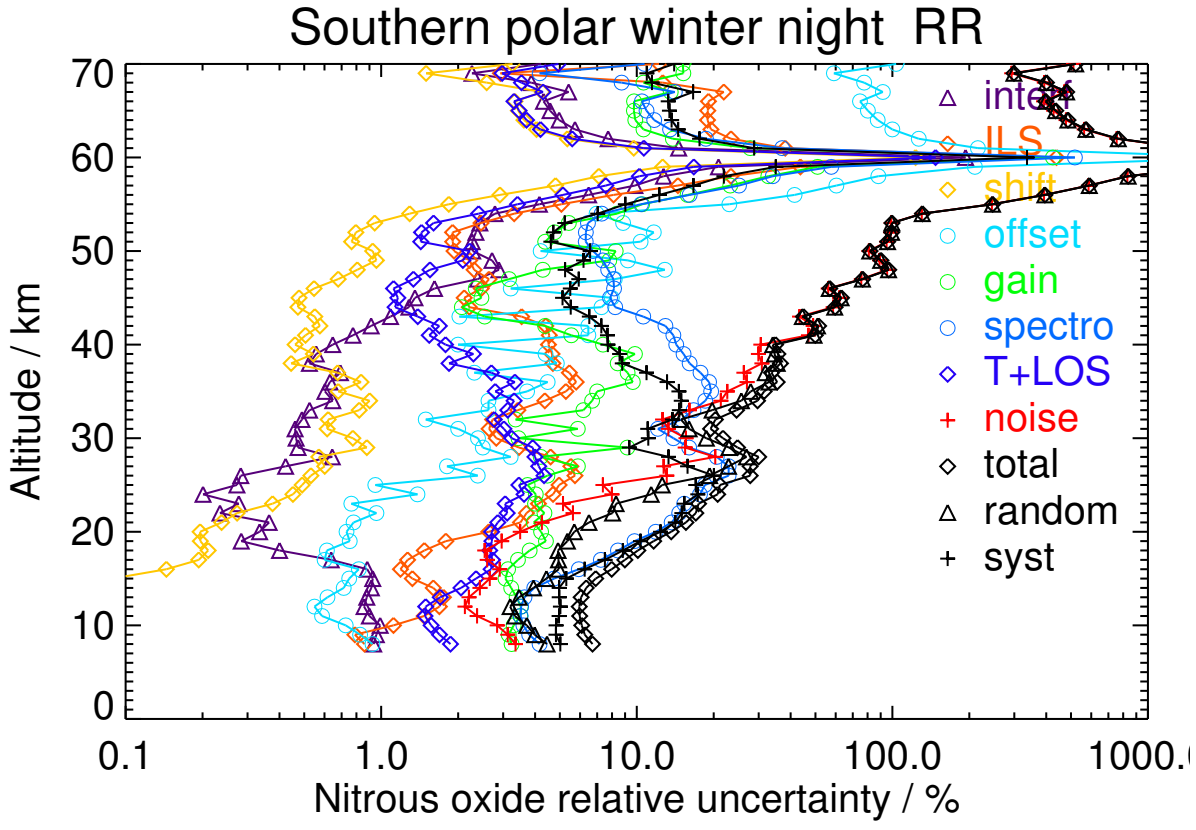

Figure S198. V8R_N2O_261 Southern polar winter night

Table S199. Nitrous oxide error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	327.618	5.382	3.541	0.331	2.687	9.296	16.710	6.218	11.122	15.261	18.545	24.017
12	289.163	2.776	6.375	0.568	1.600	8.358	16.593	5.407	6.981	13.311	17.239	21.780
15	228.985	1.188	4.415	0.563	1.601	4.618	15.547	5.959	6.398	11.726	15.026	19.060
18	166.758	0.366	4.308	0.465	0.794	5.384	18.557	4.251	3.465	10.149	17.887	20.566
21	117.948	0.197	3.887	0.419	0.540	5.045	13.703	2.000	2.548	9.388	12.297	15.471
24	107.660	0.102	2.010	0.263	0.547	2.360	11.837	1.679	2.942	9.061	8.914	12.711
27	98.715	0.124	1.153	0.343	0.300	2.134	9.921	1.163	1.752	7.178	7.578	10.438
30	86.066	0.058	0.558	0.555	0.387	3.903	8.896	1.278	1.854	6.586	7.540	10.011
33	51.847	0.078	0.884	0.394	0.186	2.333	6.796	0.864	1.241	4.971	5.495	7.409
36	20.120	0.065	1.077	0.154	0.110	0.821	3.091	0.356	0.776	2.405	2.525	3.487
39	8.349	0.022	0.473	0.063	0.076	0.549	1.011	0.132	0.483	0.961	0.941	1.345
42	4.244	0.013	0.191	0.025	0.046	0.165	0.414	0.056	0.368	0.478	0.385	0.614
45	2.838	0.011	0.060	0.014	0.048	0.083	0.172	0.027	0.379	0.398	0.169	0.433
48	2.315	0.016	0.033	0.011	0.066	0.057	0.126	0.018	0.450	0.461	0.126	0.477
52	1.558	0.018	0.028	0.009	0.073	0.032	0.093	0.012	0.575	0.582	0.088	0.589
56	1.098	0.020	0.045	0.020	0.096	0.071	0.096	0.014	0.858	0.869	0.092	0.873
60	0.606	0.019	0.070	0.010	0.151	0.055	0.065	0.014	1.192	1.204	0.079	1.207
64	-0.152	0.050	0.302	0.082	0.279	0.434	0.230	0.045	1.591	1.660	0.444	1.718
68	-0.186	0.064	0.409	0.118	0.298	0.507	0.327	0.055	1.608	1.699	0.582	1.796

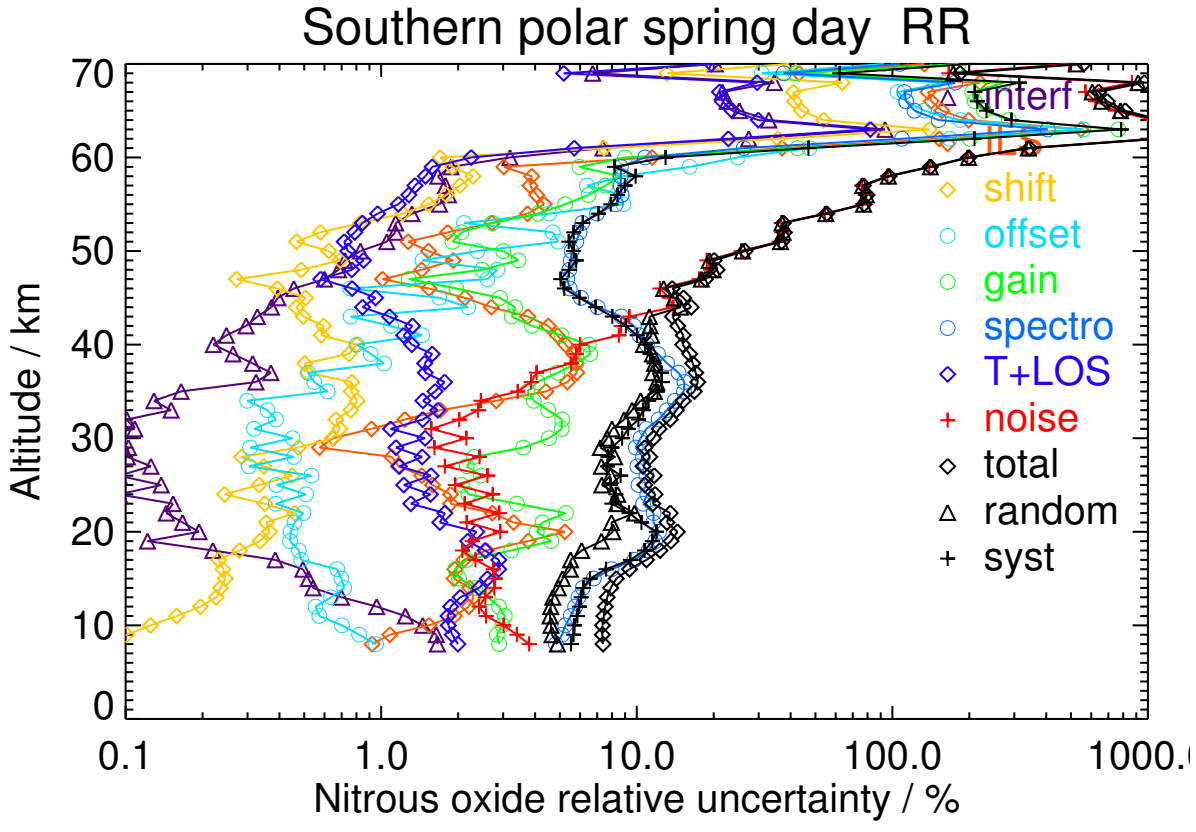

Figure S199. V8R_N2O_261 Southern polar spring day

Table S200. Nitrous oxide error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	316.580	4.230	2.047	0.374	2.252	7.688	21.075	5.041	9.710	20.413	15.283	25.500
12	275.991	1.655	4.543	0.563	1.296	6.077	18.759	3.776	6.004	16.689	13.639	21.553
15	215.578	1.051	5.044	0.655	1.394	5.396	17.687	4.831	5.851	15.703	13.486	20.699
18	164.308	0.349	4.552	0.544	0.834	6.667	16.490	3.622	3.197	11.074	15.456	19.014
21	132.617	0.197	4.548	0.376	0.672	7.397	16.081	2.092	2.585	11.107	14.910	18.592
24	116.520	0.099	2.656	0.290	0.610	5.002	12.071	1.837	3.137	10.563	8.939	13.837
27	130.035	0.133	1.271	0.348	0.339	3.685	13.216	1.405	2.009	8.954	10.768	14.004
30	96.531	0.065	1.054	0.494	0.431	4.101	12.424	1.556	2.095	9.235	9.708	13.399
33	55.563	0.053	1.484	0.363	0.256	3.031	8.713	1.002	1.321	6.478	6.949	9.500
36	18.240	0.063	1.100	0.158	0.125	1.294	3.132	0.367	0.763	2.491	2.692	3.668
39	9.380	0.027	0.426	0.063	0.076	0.525	0.904	0.133	0.497	0.902	0.857	1.245
42	5.775	0.016	0.276	0.035	0.053	0.293	0.619	0.072	0.403	0.617	0.580	0.847
45	2.773	0.012	0.074	0.015	0.050	0.065	0.256	0.038	0.405	0.446	0.212	0.493
48	2.321	0.015	0.040	0.016	0.068	0.091	0.138	0.020	0.463	0.480	0.135	0.499
52	1.691	0.018	0.027	0.009	0.072	0.038	0.110	0.014	0.582	0.591	0.100	0.599
56	1.206	0.021	0.037	0.020	0.096	0.081	0.111	0.015	0.887	0.898	0.109	0.904
60	0.709	0.021	0.112	0.038	0.158	0.120	0.116	0.017	1.225	1.246	0.129	1.253
64	0.040	0.046	0.349	0.131	0.283	0.518	0.415	0.052	1.620	1.709	0.607	1.814
68	-0.172	0.056	0.419	0.143	0.300	0.696	0.501	0.067	1.608	1.736	0.775	1.901

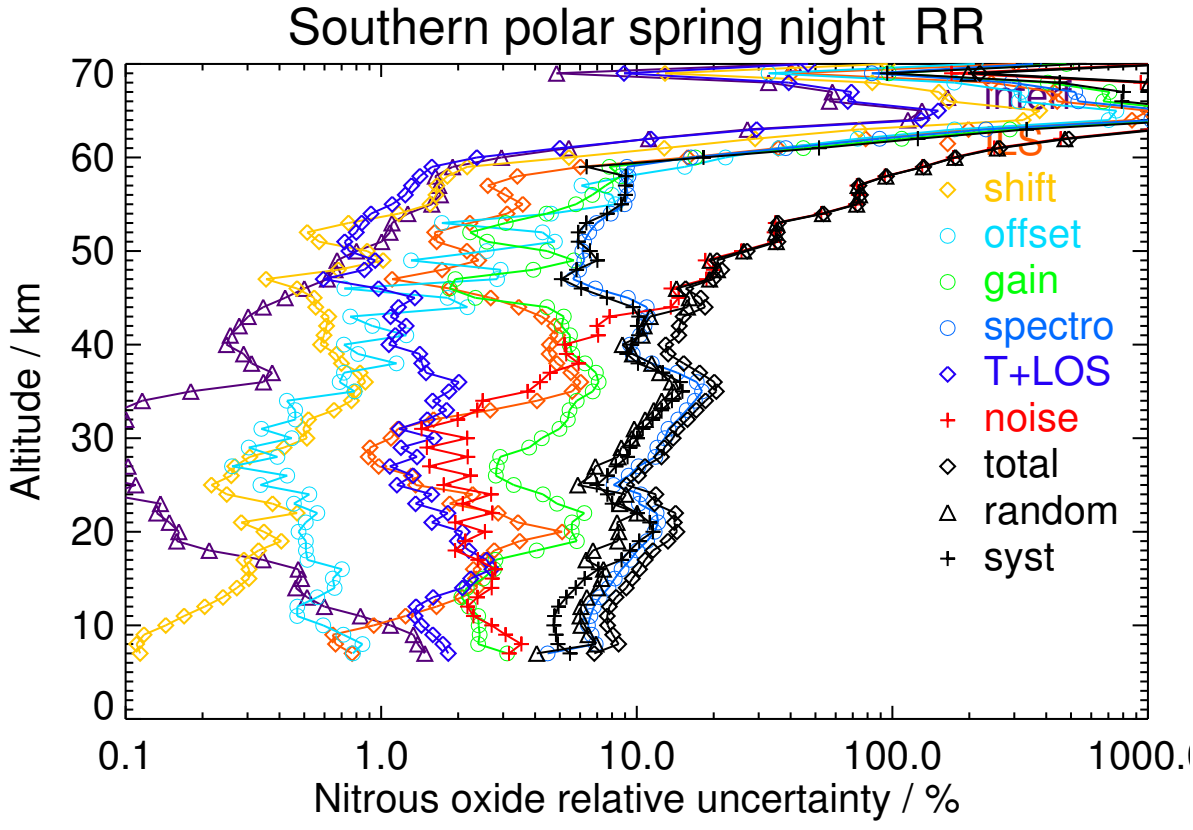

Figure S200. V8R_N2O_261 Southern polar spring night

Table S201. Nitrous oxide error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	312.502	3.313	7.233	0.433	1.914	3.065	14.716	4.035	9.482	11.582	16.283	19.982
12	298.177	0.950	5.173	0.488	0.880	7.237	14.357	2.622	4.528	8.906	15.337	17.736
15	277.644	0.768	5.908	0.430	1.001	5.204	16.872	3.393	4.071	9.535	16.900	19.404
18	238.402	0.195	10.544	0.763	0.647	5.493	23.895	3.157	2.923	7.682	25.939	27.053
21	171.747	0.243	9.877	0.809	0.821	4.372	19.441	2.641	2.616	6.092	21.742	22.579
24	150.561	0.095	3.823	0.275	0.783	1.926	15.639	2.430	3.457	5.134	15.972	16.777
27	103.171	0.120	1.150	0.491	0.277	1.436	10.057	1.352	1.860	2.865	10.096	10.495
30	71.617	0.045	0.741	0.416	0.418	1.058	7.015	1.377	2.236	2.884	7.057	7.623
33	41.077	0.051	0.889	0.407	0.231	1.746	4.056	0.734	1.319	1.763	4.437	4.774
36	19.294	0.085	0.902	0.155	0.136	0.889	2.120	0.294	0.745	0.966	2.420	2.606
39	7.937	0.023	0.534	0.070	0.065	0.342	0.960	0.125	0.425	0.660	1.046	1.236
42	2.153	0.012	0.164	0.028	0.040	0.037	0.303	0.050	0.279	0.344	0.291	0.450
45	0.813	0.008	0.020	0.010	0.039	0.019	0.077	0.020	0.271	0.280	0.059	0.287
48	0.136	0.011	0.016	0.008	0.049	0.007	0.047	0.010	0.297	0.304	0.034	0.306
52	0.029	0.014	0.006	0.004	0.056	0.007	0.019	0.005	0.380	0.384	0.011	0.385
56	-0.049	0.014	0.021	0.009	0.078	0.008	0.031	0.007	0.608	0.614	0.025	0.615
60	-0.019	0.014	0.019	0.014	0.115	0.014	0.039	0.008	0.910	0.918	0.029	0.918
64	-0.152	0.032	0.088	0.033	0.232	0.094	0.117	0.013	1.279	1.302	0.165	1.313
68	-0.190	0.048	0.196	0.083	0.269	0.138	0.238	0.022	1.454	1.484	0.329	1.520

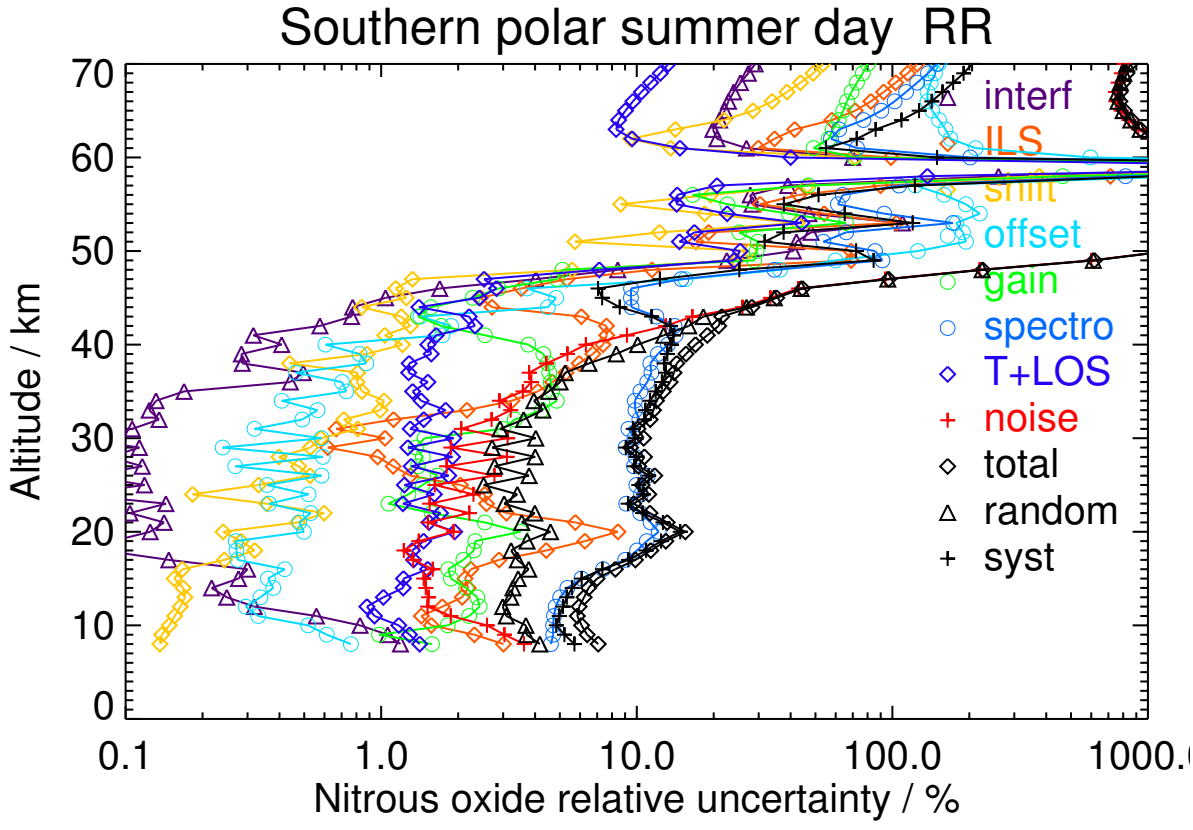

Figure S201. V8R_N2O_261 Southern polar summer day

Table S202. Nitrous oxide error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	307.762	3.471	4.124	0.474	2.036	4.800	12.494	3.851	9.755	12.773	12.626	17.960
12	300.155	0.989	6.688	0.356	0.923	10.524	13.482	2.736	4.391	8.459	17.159	19.131
15	285.883	0.825	14.744	0.394	1.389	15.318	15.178	4.622	4.556	13.982	23.060	26.968
18	253.771	0.258	8.896	0.852	1.621	19.256	21.381	3.963	3.426	13.677	27.402	30.626
21	182.280	0.182	7.451	0.545	0.622	5.961	20.334	2.876	3.228	8.437	21.278	22.890
24	150.501	0.108	4.090	0.236	0.860	2.993	16.937	2.606	3.531	5.626	17.348	18.238
27	96.075	0.129	1.040	0.472	0.310	1.266	9.478	1.418	2.022	2.854	9.529	9.948
30	63.677	0.047	0.930	0.396	0.372	1.255	6.569	1.182	2.055	2.756	6.627	7.177
33	35.290	0.080	1.581	0.268	0.246	1.696	3.841	0.587	1.239	1.633	4.414	4.706
36	13.326	0.038	0.817	0.105	0.127	0.565	1.711	0.231	0.655	0.873	1.914	2.104
39	5.394	0.012	0.328	0.041	0.060	0.161	0.649	0.087	0.359	0.442	0.708	0.835
42	1.009	0.008	0.052	0.020	0.043	0.021	0.189	0.035	0.269	0.289	0.176	0.338
45	0.443	0.008	0.016	0.006	0.044	0.010	0.042	0.012	0.287	0.293	0.024	0.294
48	0.058	0.013	0.007	0.006	0.055	0.006	0.032	0.006	0.335	0.341	0.024	0.342
52	-0.018	0.016	0.007	0.004	0.069	0.008	0.022	0.005	0.469	0.474	0.013	0.475
56	0.072	0.013	0.022	0.010	0.094	0.010	0.031	0.006	0.736	0.743	0.027	0.743
60	-0.036	0.014	0.015	0.008	0.132	0.011	0.030	0.007	1.031	1.040	0.018	1.040
64	0.001	0.034	0.095	0.042	0.254	0.107	0.140	0.014	1.402	1.427	0.190	1.440
68	0.007	0.049	0.182	0.082	0.284	0.140	0.241	0.022	1.513	1.545	0.318	1.578

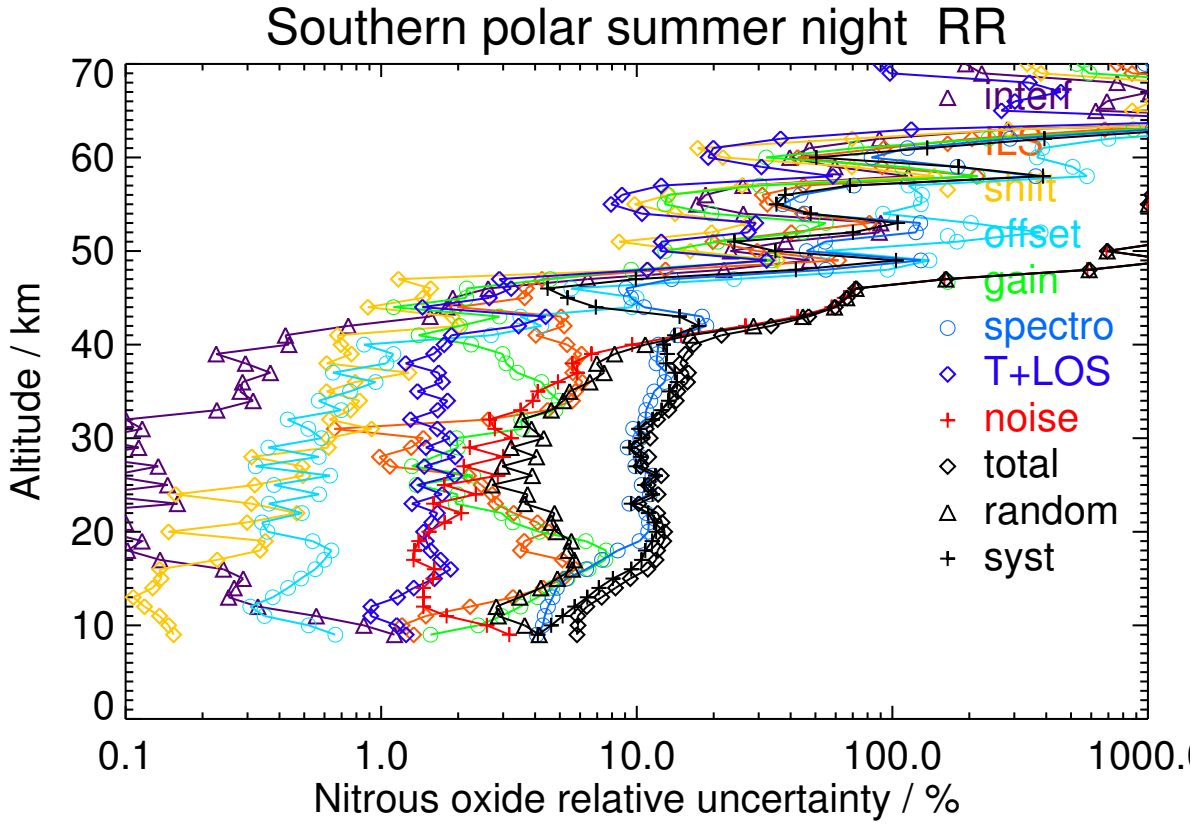

Figure S202. V8R_N2O_261 Southern polar summer night

Table S203. Nitrous oxide error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
12	309.987	4.628	6.199	0.192	1.028	9.890	13.770	3.264	4.816	8.215	17.740	19.550
15	285.655	3.768	6.804	0.297	1.352	8.277	15.778	4.808	5.233	8.803	18.785	20.745
18	239.379	0.325	2.849	0.709	0.870	11.586	22.128	3.868	3.729	7.125	24.728	25.734
21	171.486	0.343	3.724	0.285	0.790	9.778	20.683	2.555	3.368	5.764	22.864	23.579
24	116.691	0.130	2.764	0.296	0.754	6.016	14.485	2.539	4.179	5.778	15.647	16.680
27	64.207	0.111	1.480	0.136	0.302	1.747	9.731	1.382	2.558	3.505	9.809	10.417
30	26.898	0.039	0.353	0.113	0.398	0.777	4.585	0.885	2.381	2.836	4.509	5.327
33	8.813	0.046	0.246	0.068	0.242	0.675	1.779	0.374	1.455	1.788	1.675	2.450
36	1.139	0.016	0.109	0.030	0.084	0.289	0.363	0.098	0.653	0.756	0.314	0.819
39	0.210	0.010	0.031	0.011	0.038	0.103	0.102	0.029	0.446	0.471	0.037	0.473
42	0.167	0.008	0.018	0.004	0.046	0.024	0.061	0.010	0.496	0.502	0.019	0.503
45	0.206	0.011	0.010	0.003	0.067	0.019	0.043	0.007	0.617	0.622	0.016	0.623
48	0.408	0.015	0.017	0.006	0.095	0.045	0.052	0.011	0.739	0.747	0.044	0.749
52	0.512	0.019	0.021	0.008	0.099	0.043	0.070	0.012	0.886	0.894	0.053	0.895
56	0.123	0.015	0.021	0.011	0.121	0.070	0.053	0.017	1.161	1.169	0.070	1.171
60	0.642	0.012	0.027	0.011	0.210	0.065	0.058	0.018	1.447	1.463	0.067	1.465
64	0.142	0.013	0.030	0.008	0.336	0.062	0.054	0.017	1.771	1.804	0.045	1.805
68	-0.523	0.013	0.031	0.006	0.356	0.098	0.050	0.019	1.738	1.776	0.075	1.778

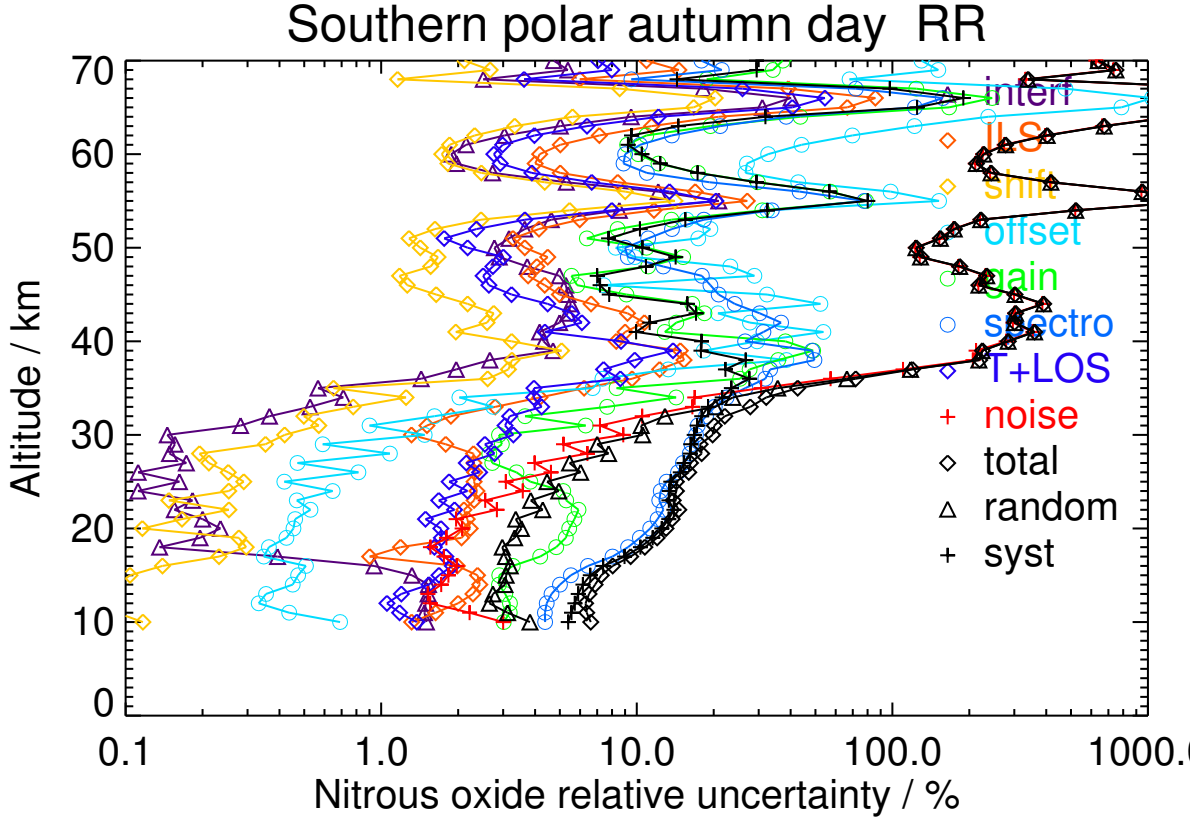

Figure S203. V8R_N2O_261 Southern polar autumn day

Table S204. Nitrous oxide error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
9	316.825	3.678	3.261	0.362	2.276	9.970	13.591	4.499	10.039	13.141	16.184	20.847
12	309.142	3.930	5.851	0.164	1.103	10.770	13.361	3.409	4.732	8.290	17.627	19.479
15	278.013	2.974	6.770	0.276	1.493	10.414	15.285	5.290	5.457	9.554	19.119	21.373
18	220.204	0.393	3.373	0.439	1.175	14.166	18.248	4.314	3.847	8.585	22.505	24.087
21	151.590	0.346	2.762	0.305	0.876	10.022	16.416	2.629	3.487	6.587	18.821	19.940
24	101.342	0.096	2.943	0.266	0.762	5.019	12.511	2.441	4.144	5.753	13.456	14.634
27	52.323	0.100	1.467	0.124	0.309	1.461	8.085	1.294	2.413	3.273	8.159	8.791
30	19.293	0.057	0.440	0.072	0.373	0.705	3.680	0.705	2.113	2.607	3.543	4.399
33	5.190	0.027	0.222	0.045	0.207	0.719	1.175	0.241	1.159	1.552	0.993	1.842
36	0.599	0.010	0.074	0.015	0.081	0.175	0.261	0.074	0.585	0.662	0.145	0.677
39	0.234	0.007	0.021	0.007	0.047	0.088	0.074	0.023	0.451	0.465	0.054	0.469
42	0.103	0.009	0.015	0.004	0.055	0.029	0.051	0.010	0.517	0.523	0.025	0.523
45	0.159	0.012	0.007	0.004	0.072	0.028	0.040	0.008	0.638	0.644	0.028	0.644
48	0.715	0.017	0.016	0.006	0.096	0.051	0.061	0.013	0.751	0.760	0.051	0.762
52	0.464	0.020	0.019	0.008	0.103	0.063	0.062	0.015	0.908	0.917	0.062	0.919
56	0.341	0.016	0.016	0.010	0.119	0.095	0.050	0.021	1.152	1.161	0.087	1.164
60	0.203	0.012	0.019	0.008	0.195	0.060	0.042	0.015	1.388	1.403	0.047	1.403
64	-0.435	0.014	0.036	0.006	0.322	0.135	0.046	0.024	1.725	1.758	0.098	1.761
68	-0.454	0.014	0.040	0.005	0.343	0.140	0.038	0.025	1.704	1.741	0.114	1.745

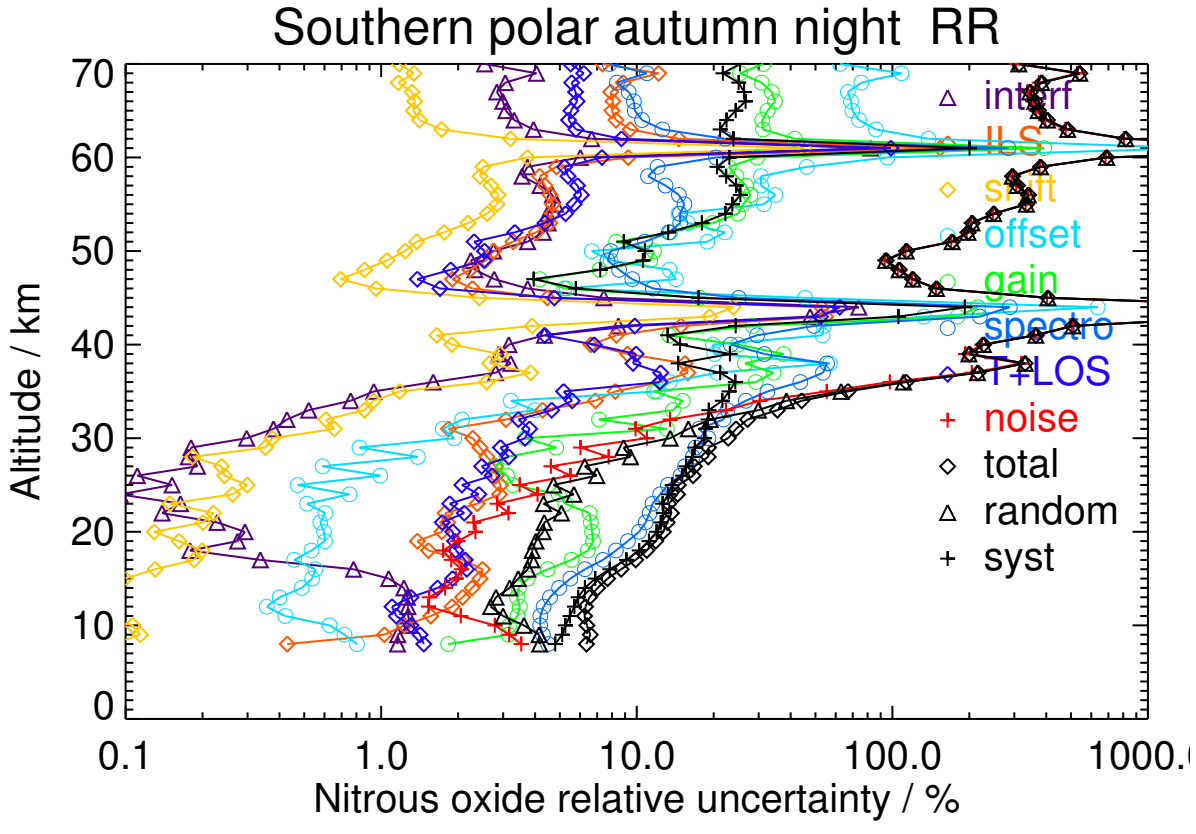

Figure S204. V8R_N2O_261 Southern polar autumn night

S8 Nitrous oxide error contribution profile plots and tabulated values for RR MA data (V8R_N2O_561)

Table S205. Nitrous oxide error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	93.802	<0.001	0.216	1.998	0.343	0.994	8.294	11.719	1.437	2.168	5.927	13.524	14.766
35	27.866	<0.001	0.080	0.740	0.064	0.187	1.038	4.353	0.496	1.419	2.608	4.009	4.783
40	7.630	<0.001	0.023	0.134	0.017	0.136	0.209	0.758	0.104	1.017	1.115	0.675	1.304
45	3.606	<0.001	0.014	0.076	0.012	0.052	0.121	0.388	0.047	0.858	0.873	0.387	0.955
50	0.227	<0.001	0.017	0.041	0.013	0.078	0.067	0.093	0.017	1.025	1.030	0.097	1.035
55	0.666	<0.001	0.017	0.012	0.005	0.165	0.028	0.052	0.012	1.337	1.349	0.029	1.349
60	0.468	<0.001	0.017	0.046	0.014	0.337	0.105	0.055	0.019	1.716	1.751	0.092	1.754
65	0.205	<0.001	0.016	0.054	0.017	0.332	0.104	0.049	0.017	1.478	1.517	0.097	1.520

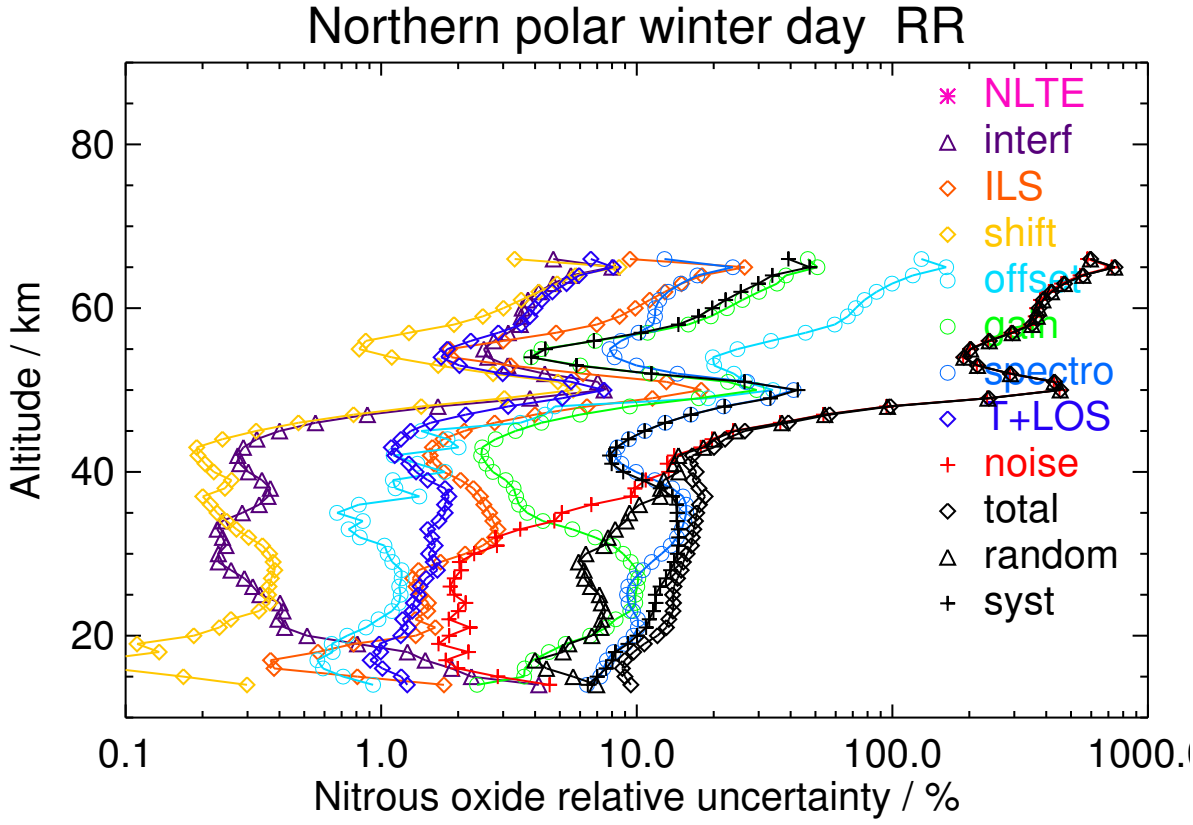

Figure S205. V8R_N2O_561 Northern polar winter day

Table S206. Nitrous oxide error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	35.026	<0.001	0.110	1.137	0.176	0.572	4.668	7.901	0.621	1.477	7.423	5.775	9.405
35	12.720	<0.001	0.051	0.406	0.037	0.149	0.807	2.706	0.216	1.023	2.565	1.636	3.043
40	3.464	<0.001	0.019	0.095	0.012	0.114	0.113	0.706	0.055	0.838	1.031	0.420	1.113
45	1.225	<0.001	0.013	0.023	0.007	0.052	0.064	0.182	0.019	0.733	0.751	0.114	0.760
50	0.384	<0.001	0.017	0.019	0.006	0.071	0.029	0.080	0.012	0.901	0.907	0.044	0.908
55	0.480	<0.001	0.016	0.020	0.010	0.133	0.078	0.052	0.014	1.204	1.215	0.047	1.216
60	0.518	<0.001	0.011	0.027	0.011	0.269	0.084	0.050	0.015	1.492	1.519	0.051	1.519
65	0.107	<0.001	0.011	0.026	0.007	0.302	0.047	0.035	0.010	1.428	1.460	0.024	1.461
70	0.805	<0.001	0.007	0.002	0.002	0.233	0.009	0.021	0.004	1.019	1.045	0.023	1.046

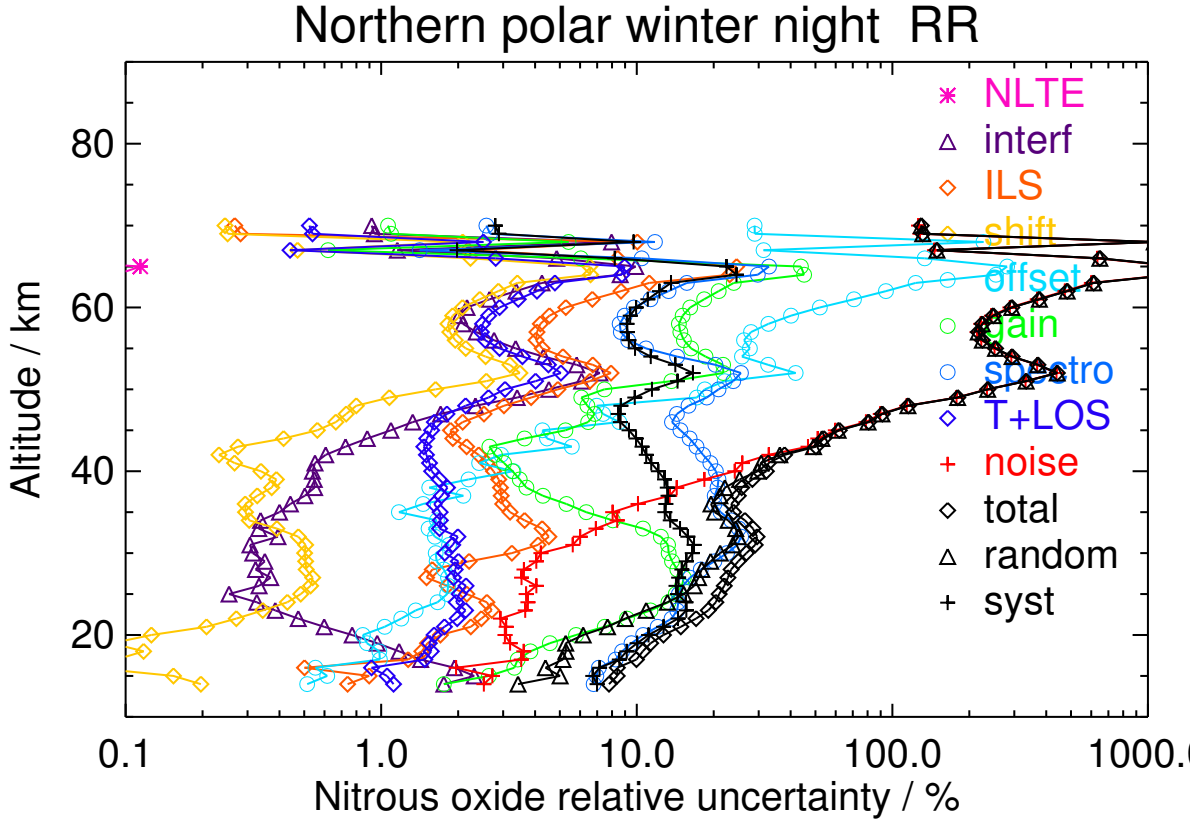

Figure S206. V8R_N2O_561 Northern polar winter night

Table S207. Nitrous oxide error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	56.373	<0.001	0.079	0.967	0.264	0.433	1.561	7.191	1.233	2.132	3.325	7.097	7.837
35	12.630	<0.001	0.069	0.350	0.053	0.123	0.220	1.703	0.316	1.013	1.151	1.702	2.055
40	3.008	<0.001	0.011	0.058	0.009	0.079	0.067	0.301	0.046	0.470	0.495	0.287	0.573
45	0.577	<0.001	0.011	0.015	0.004	0.055	0.018	0.075	0.010	0.433	0.443	0.027	0.444
50	0.568	<0.001	0.016	0.021	0.004	0.026	0.015	0.065	0.009	0.498	0.502	0.044	0.504
55	0.323	<0.001	0.017	0.017	0.006	0.090	0.010	0.038	0.007	0.881	0.887	0.024	0.887
60	0.845	<0.001	0.012	0.029	0.005	0.138	0.021	0.052	0.010	1.071	1.081	0.041	1.082
65	1.266	<0.001	0.023	0.098	0.011	0.249	0.028	0.054	0.012	1.332	1.358	0.083	1.361
70	0.829	<0.001	0.010	0.005	0.002	0.218	0.006	0.020	0.005	1.011	1.034	0.021	1.035

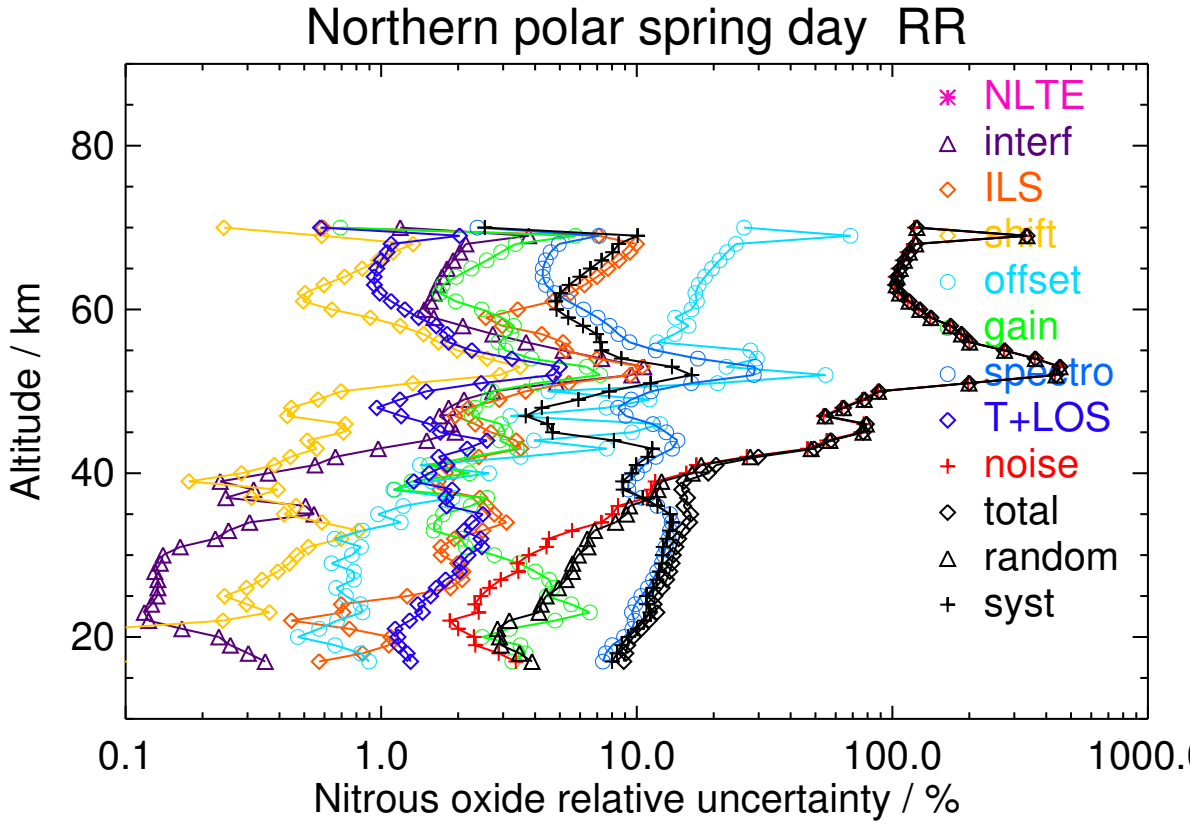

Figure S207. V8R_N2O_561 Northern polar spring day

Table S208. Nitrous oxide error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	57.928	<0.001	0.077	0.954	0.266	0.412	1.209	7.252	1.206	2.071	3.182	7.129	7.807
35	15.353	<0.001	0.077	0.435	0.057	0.124	0.200	2.091	0.347	1.008	1.166	2.099	2.401
40	3.814	<0.001	0.012	0.056	0.010	0.082	0.077	0.320	0.050	0.473	0.504	0.300	0.587
45	0.707	<0.001	0.011	0.022	0.005	0.053	0.026	0.104	0.013	0.427	0.439	0.069	0.445
50	0.603	<0.001	0.016	0.017	0.004	0.032	0.013	0.068	0.008	0.511	0.516	0.032	0.517
55	0.300	<0.001	0.017	0.021	0.007	0.092	0.013	0.046	0.008	0.903	0.909	0.030	0.909
60	0.371	<0.001	0.013	0.029	0.006	0.146	0.020	0.040	0.009	1.097	1.107	0.028	1.108
65	0.258	<0.001	0.022	0.090	0.011	0.255	0.022	0.040	0.008	1.345	1.371	0.070	1.373

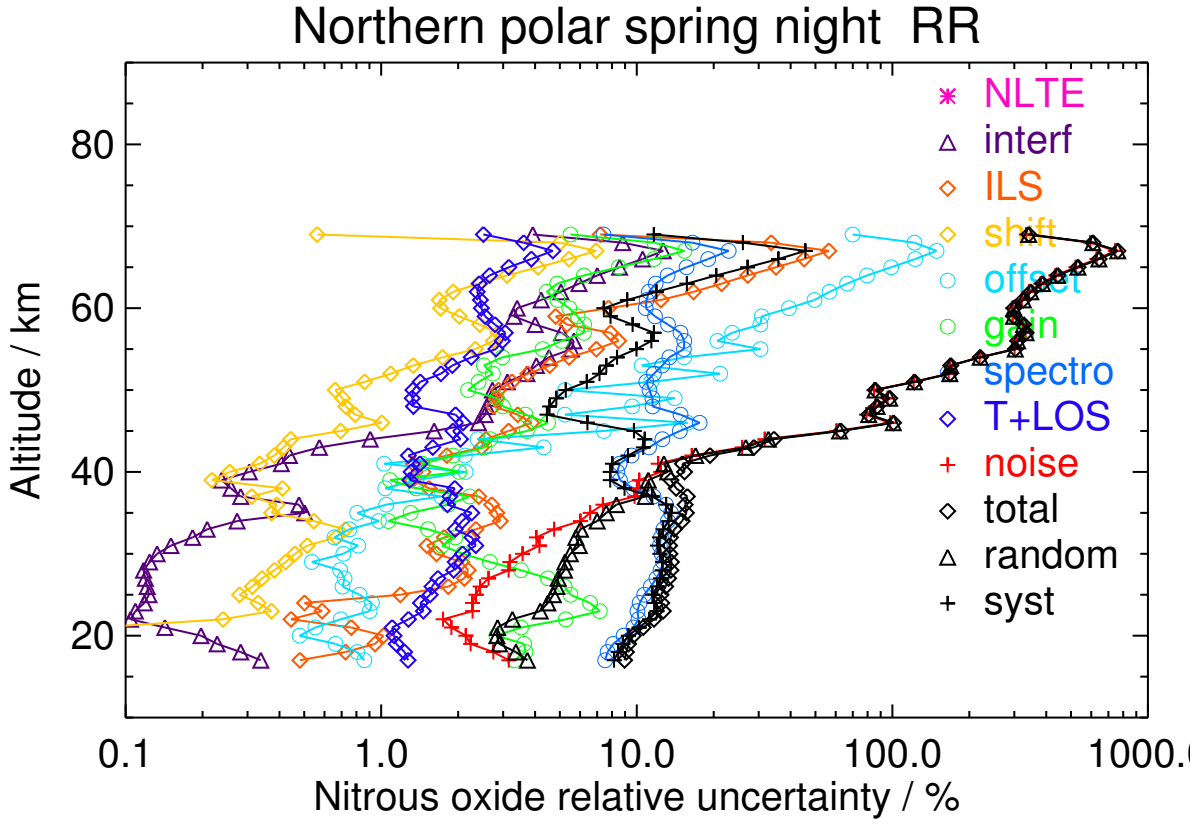

Figure S208. V8R_N2O_561 Northern polar spring night

Table S209. Nitrous oxide error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	77.152	<0.001	0.143	1.021	0.233	0.631	3.399	7.833	1.419	1.640	2.478	8.543	8.895
35	21.723	<0.001	0.137	0.455	0.196	0.150	0.436	2.347	0.414	0.829	1.049	2.397	2.617
40	3.076	<0.001	0.021	0.012	0.014	0.056	0.064	0.307	0.056	0.308	0.338	0.293	0.447
45	0.545	<0.001	0.009	0.015	0.006	0.038	0.013	0.055	0.011	0.270	0.275	0.050	0.279
50	0.164	<0.001	0.013	0.007	0.003	0.018	0.009	0.027	0.006	0.318	0.320	0.012	0.321
55	-0.032	<0.001	0.020	0.010	0.004	0.091	0.007	0.032	0.008	0.688	0.695	0.012	0.695
60	0.404	<0.001	0.011	0.022	0.012	0.094	0.018	0.047	0.010	0.838	0.844	0.039	0.845
65	1.162	<0.001	0.032	0.118	0.025	0.192	0.051	0.077	0.014	1.151	1.168	0.143	1.177
70	0.802	<0.001	0.030	0.144	0.035	0.175	0.065	0.084	0.014	0.933	0.951	0.176	0.967

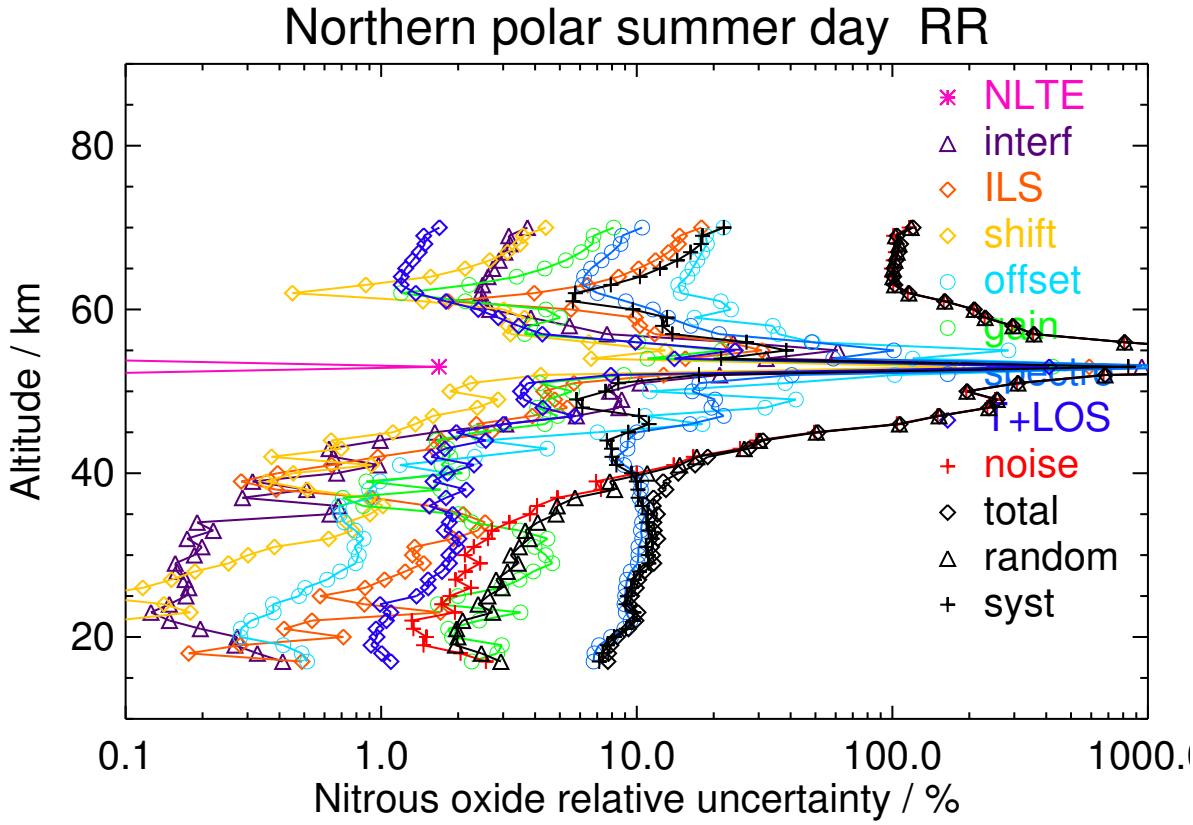

Figure S209. V8R_N2O_561 Northern polar summer day

Table S210. Nitrous oxide error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	61.379	<0.001	0.102	1.075	0.291	0.547	2.423	7.377	1.227	1.621	2.370	7.769	8.122
35	10.084	<0.001	0.055	0.283	0.071	0.131	0.418	1.543	0.289	0.798	0.954	1.572	1.839
40	1.077	<0.001	0.011	0.010	0.011	0.056	0.044	0.140	0.026	0.325	0.338	0.130	0.362
45	0.220	<0.001	0.009	0.011	0.003	0.048	0.013	0.034	0.007	0.352	0.357	0.022	0.357
50	0.117	<0.001	0.015	0.007	0.003	0.024	0.008	0.027	0.005	0.435	0.437	0.009	0.437
55	0.095	<0.001	0.020	0.014	0.006	0.094	0.014	0.040	0.008	0.851	0.857	0.027	0.858
60	0.377	<0.001	0.014	0.014	0.009	0.132	0.012	0.045	0.009	1.024	1.033	0.029	1.034
65	0.061	<0.001	0.024	0.097	0.013	0.241	0.101	0.051	0.021	1.320	1.343	0.143	1.351

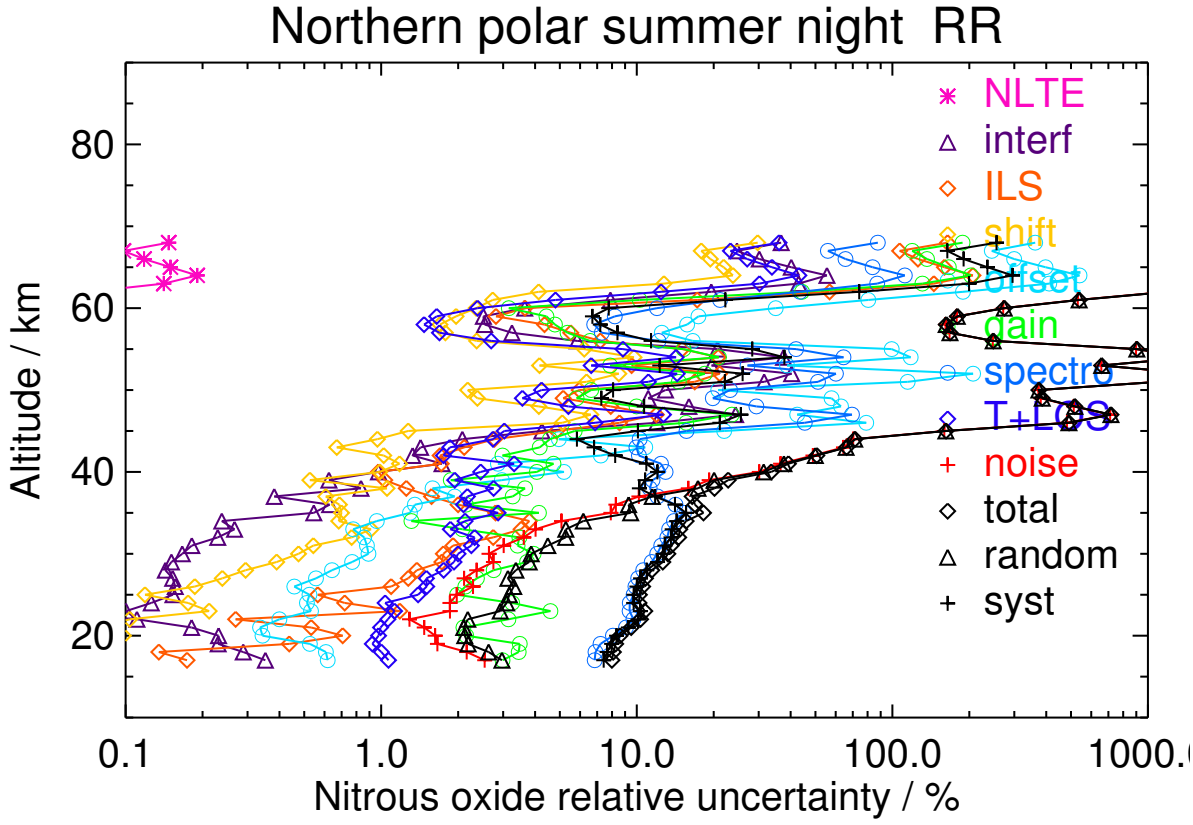

Figure S210. V8R_N2O_561 Northern polar summer night

Table S211. Nitrous oxide error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	35.758	<0.001	0.149	1.068	0.194	0.305	0.955	6.073	0.849	1.625	3.197	5.677	6.515
35	5.031	<0.001	0.068	0.174	0.075	0.096	0.408	1.191	0.167	0.725	1.354	0.597	1.479
40	2.360	<0.001	0.021	0.104	0.033	0.087	0.168	0.635	0.039	0.560	0.849	0.213	0.876
45	0.909	<0.001	0.012	0.049	0.006	0.057	0.053	0.217	0.015	0.573	0.615	0.081	0.620
50	0.715	<0.001	0.018	0.023	0.006	0.045	0.022	0.075	0.011	0.700	0.705	0.037	0.706
55	0.726	<0.001	0.020	0.022	0.009	0.085	0.030	0.070	0.013	1.032	1.038	0.046	1.039
60	0.847	<0.001	0.015	0.035	0.012	0.198	0.032	0.061	0.014	1.301	1.318	0.044	1.319
65	0.488	<0.001	0.015	0.049	0.010	0.280	0.056	0.048	0.015	1.419	1.448	0.066	1.450
70	-0.100	<0.001	0.009	0.019	0.003	0.218	0.027	0.020	0.008	1.015	1.038	0.035	1.038

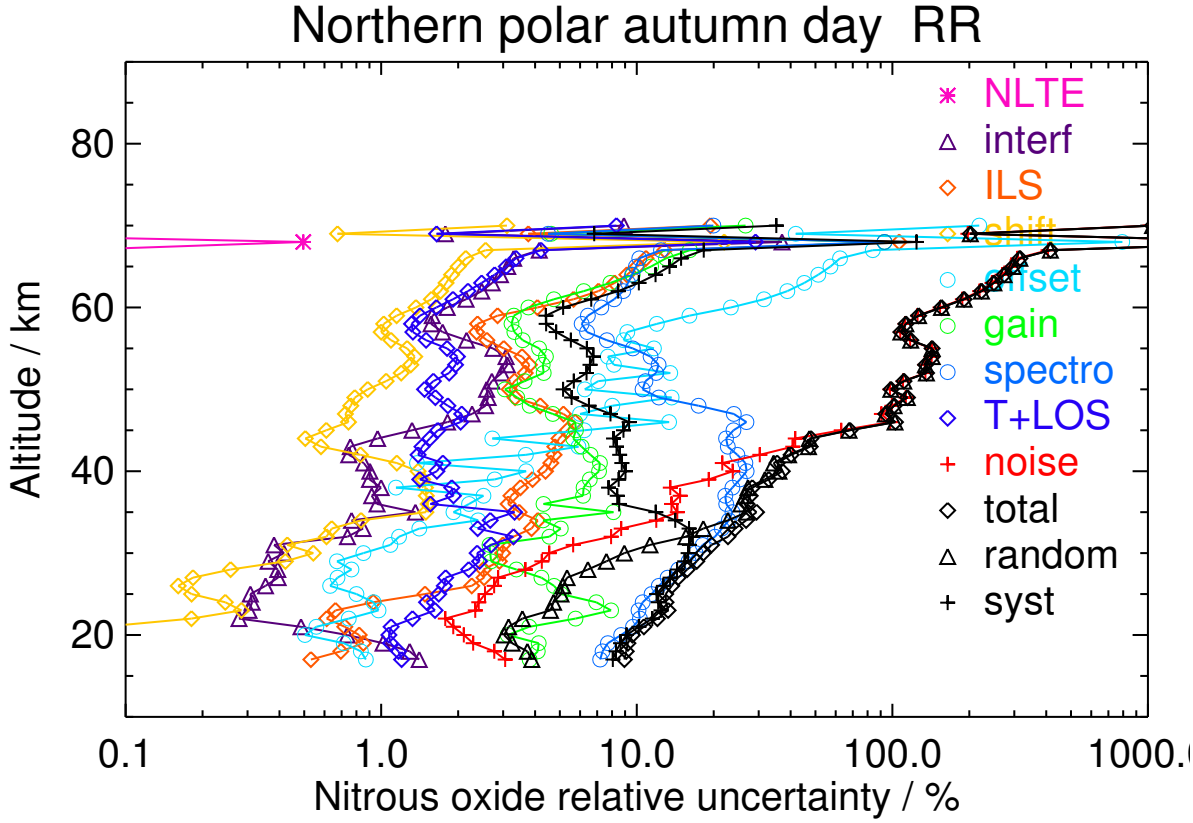

Figure S211. V8R_N2O_561 Northern polar autumn day

Table S212. Nitrous oxide error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	23.026	<0.001	0.093	1.071	0.147	0.247	0.826	4.796	0.690	1.555	2.156	4.814	5.274
35	1.006	<0.001	0.036	0.080	0.028	0.073	0.230	0.289	0.096	0.611	0.704	0.192	0.730
40	0.008	<0.001	0.008	0.011	0.002	0.090	0.020	0.052	0.009	0.576	0.585	0.012	0.585
45	0.086	<0.001	0.011	0.008	0.004	0.041	0.020	0.032	0.006	0.558	0.561	0.019	0.561
50	0.658	<0.001	0.018	0.013	0.006	0.058	0.021	0.053	0.008	0.729	0.733	0.032	0.734
55	0.701	<0.001	0.019	0.023	0.009	0.081	0.032	0.055	0.011	1.034	1.039	0.049	1.040
60	0.462	<0.001	0.013	0.011	0.010	0.191	0.035	0.049	0.013	1.263	1.278	0.044	1.279
65	0.208	<0.001	0.013	0.024	0.006	0.277	0.025	0.032	0.009	1.407	1.434	0.028	1.435
70	-0.485	<0.001	0.008	0.021	0.003	0.214	0.017	0.008	0.004	0.971	0.994	0.025	0.994

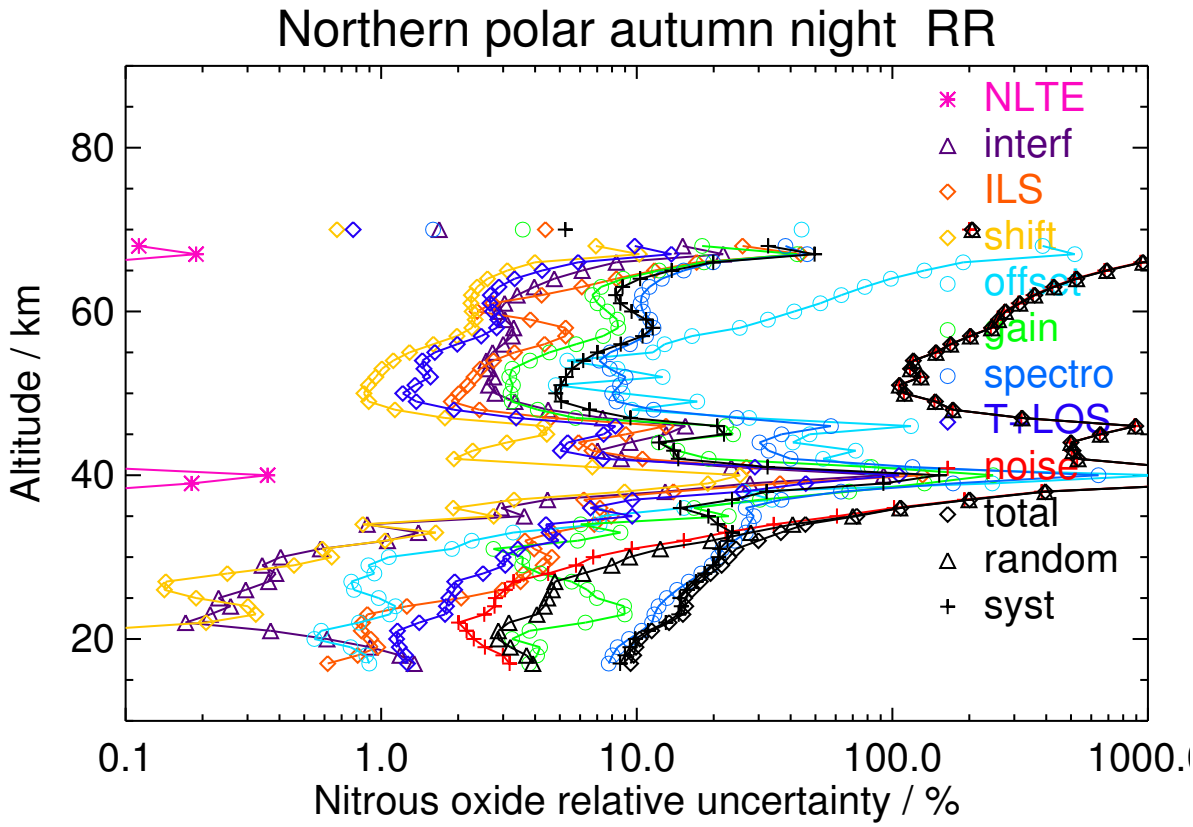

Figure S212. V8R_N2O_561 Northern polar autumn night

Table S213. Nitrous oxide error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	80.332	<0.001	0.199	1.653	0.256	0.616	3.213	9.627	1.383	2.038	5.062	9.310	10.597
35	30.810	<0.001	0.137	0.467	0.167	0.182	0.384	3.881	0.492	1.215	2.175	3.534	4.150
40	7.964	<0.001	0.030	0.122	0.029	0.126	0.166	0.636	0.092	0.778	0.892	0.531	1.038
45	4.441	<0.001	0.014	0.081	0.013	0.039	0.098	0.456	0.043	0.555	0.593	0.429	0.732
50	0.515	<0.001	0.016	0.025	0.007	0.060	0.020	0.088	0.014	0.692	0.700	0.042	0.702
55	0.351	<0.001	0.015	0.022	0.011	0.087	0.022	0.055	0.009	1.032	1.038	0.036	1.038
60	-0.081	<0.001	0.021	0.046	0.008	0.210	0.045	0.051	0.012	1.329	1.347	0.056	1.348
65	-0.108	<0.001	0.038	0.088	0.023	0.286	0.089	0.068	0.017	1.421	1.452	0.119	1.457
70	1.172	<0.001	0.030	0.061	0.016	0.235	0.016	0.062	0.010	1.040	1.068	0.067	1.071

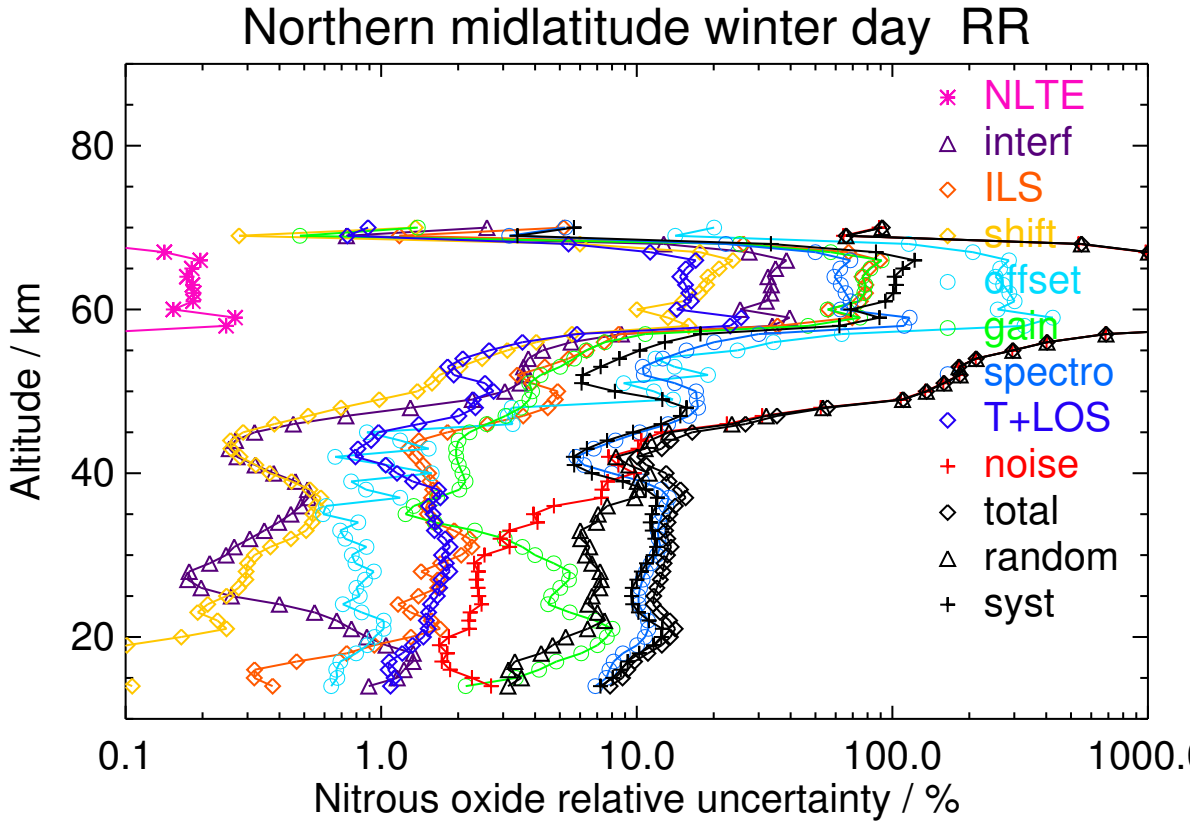

Figure S213. V8R_N2O_561 Northern midlatitude winter day

Table S214. Nitrous oxide error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	87.428	<0.001	0.194	2.037	0.329	0.708	5.001	10.471	1.498	2.059	6.343	10.281	12.081
35	29.281	<0.001	0.148	0.784	0.197	0.249	0.887	4.424	0.527	1.390	2.555	4.096	4.827
40	8.187	<0.001	0.031	0.131	0.034	0.080	0.183	0.638	0.091	0.667	0.810	0.513	0.959
45	5.153	<0.001	0.015	0.092	0.014	0.061	0.097	0.477	0.051	0.556	0.601	0.447	0.749
50	1.055	<0.001	0.017	0.038	0.006	0.085	0.033	0.154	0.018	0.752	0.769	0.091	0.774
55	0.442	<0.001	0.016	0.026	0.011	0.066	0.041	0.065	0.011	0.960	0.964	0.059	0.966
60	-0.024	<0.001	0.020	0.068	0.009	0.214	0.045	0.048	0.012	1.349	1.368	0.053	1.369
65	0.065	<0.001	0.031	0.110	0.017	0.291	0.093	0.059	0.015	1.422	1.455	0.121	1.460
70	0.110	<0.001	0.030	0.092	0.015	0.233	0.031	0.043	0.007	1.016	1.043	0.104	1.048

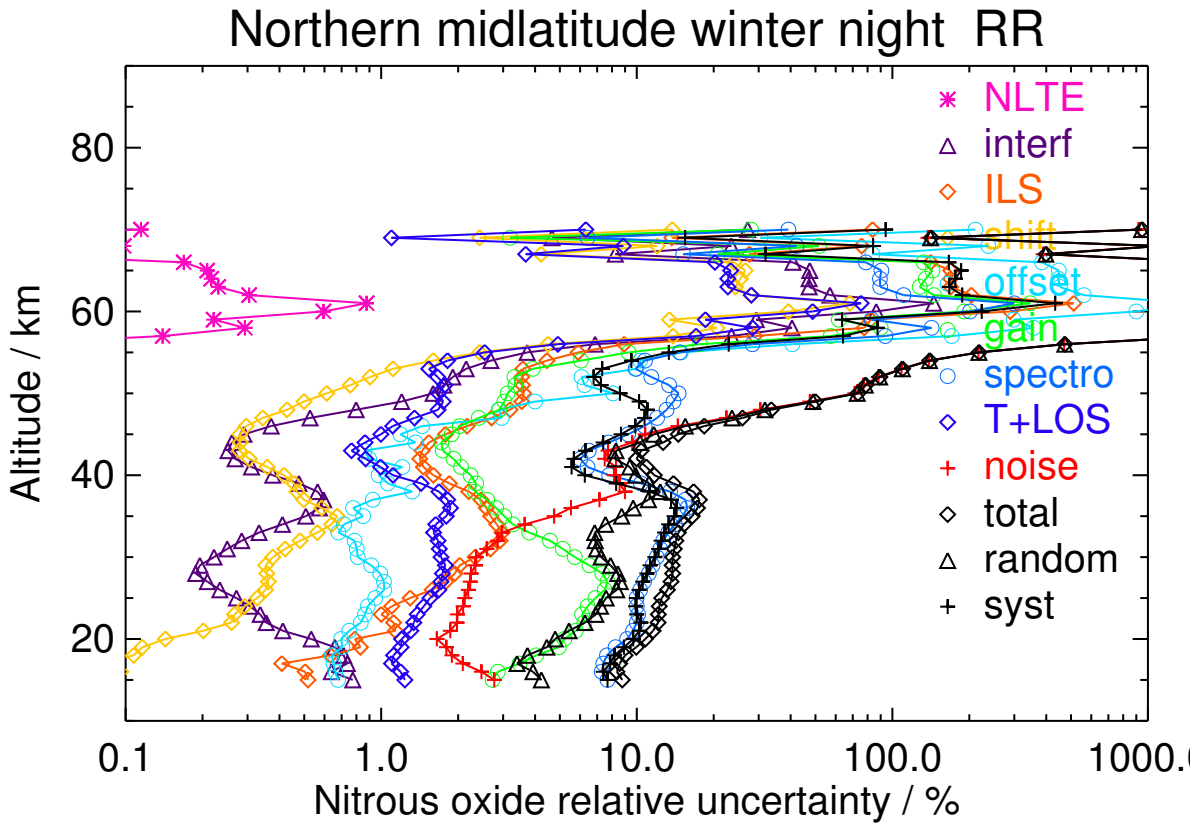

Figure S214. V8R_N2O_561 Northern midlatitude winter night

Table S215. Nitrous oxide error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	89.615	<0.001	0.205	0.945	0.358	0.656	2.164	9.372	1.713	2.143	3.600	9.411	10.076
35	27.108	<0.001	0.161	0.496	0.225	0.169	0.555	3.164	0.477	0.987	1.601	3.051	3.445
40	9.691	<0.001	0.049	0.064	0.098	0.088	0.223	0.839	0.104	0.553	0.840	0.623	1.046
45	4.253	<0.001	0.014	0.059	0.013	0.078	0.081	0.327	0.033	0.514	0.568	0.257	0.624
50	2.242	<0.001	0.017	0.045	0.006	0.019	0.039	0.170	0.020	0.521	0.534	0.143	0.552
55	1.088	<0.001	0.019	0.039	0.011	0.076	0.022	0.100	0.015	0.861	0.867	0.088	0.871
60	0.242	<0.001	0.018	0.054	0.009	0.157	0.017	0.049	0.010	1.163	1.175	0.055	1.176
65	0.712	<0.001	0.046	0.180	0.036	0.259	0.077	0.095	0.016	1.366	1.394	0.197	1.408
70	-1.031	<0.001	0.024	0.085	0.014	0.213	0.040	0.040	0.006	0.988	1.011	0.102	1.016

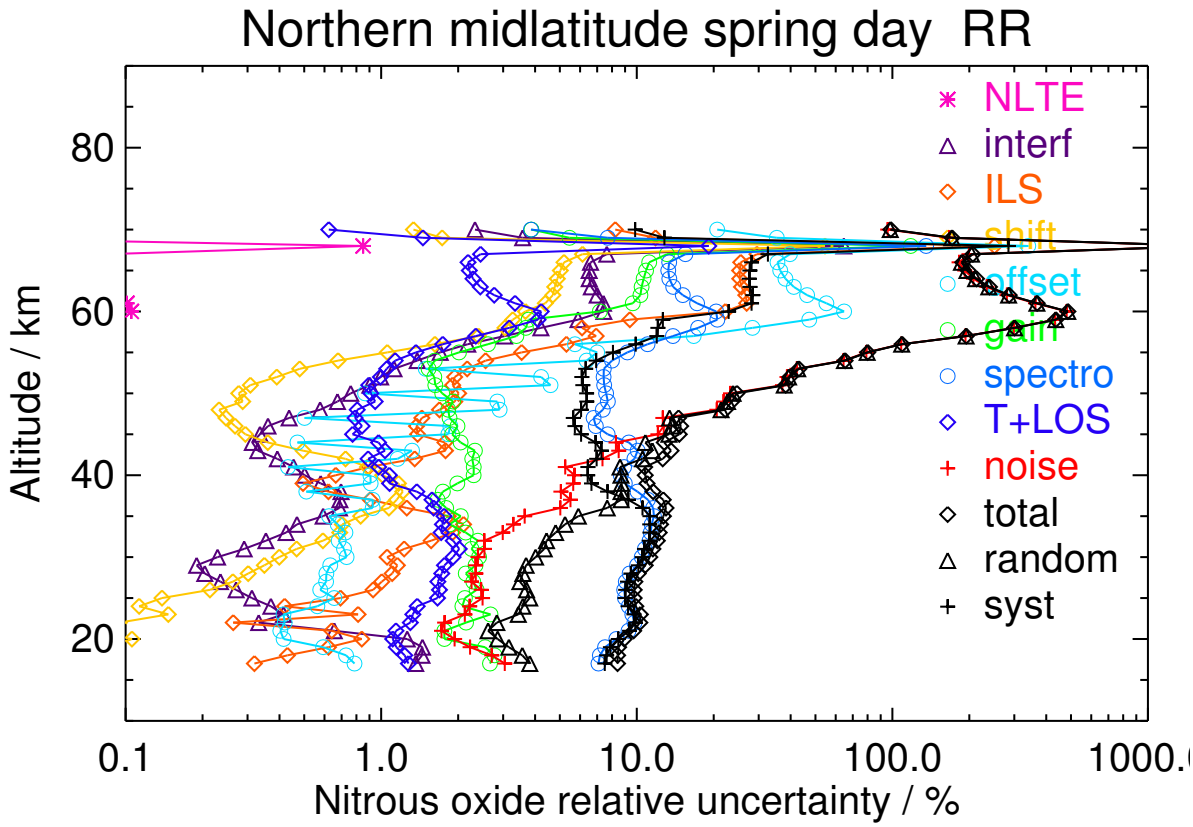

Figure S215. V8R_N2O_561 Northern midlatitude spring day

Table S216. Nitrous oxide error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	86.958	<0.001	0.190	1.216	0.354	0.535	1.587	9.428	1.592	2.140	3.286	9.469	10.023
35	23.578	<0.001	0.155	0.502	0.207	0.154	0.278	2.919	0.461	1.022	1.562	2.785	3.193
40	7.832	<0.001	0.044	0.052	0.097	0.091	0.226	0.747	0.089	0.536	0.794	0.544	0.962
45	2.372	<0.001	0.013	0.055	0.010	0.060	0.074	0.266	0.023	0.450	0.508	0.168	0.535
50	1.466	<0.001	0.017	0.036	0.005	0.026	0.030	0.130	0.014	0.512	0.523	0.098	0.532
55	0.817	<0.001	0.018	0.025	0.009	0.088	0.017	0.077	0.012	0.899	0.906	0.045	0.907
60	0.489	<0.001	0.016	0.041	0.008	0.154	0.015	0.055	0.011	1.138	1.150	0.044	1.151
65	0.271	<0.001	0.037	0.126	0.027	0.259	0.046	0.073	0.012	1.360	1.389	0.116	1.394

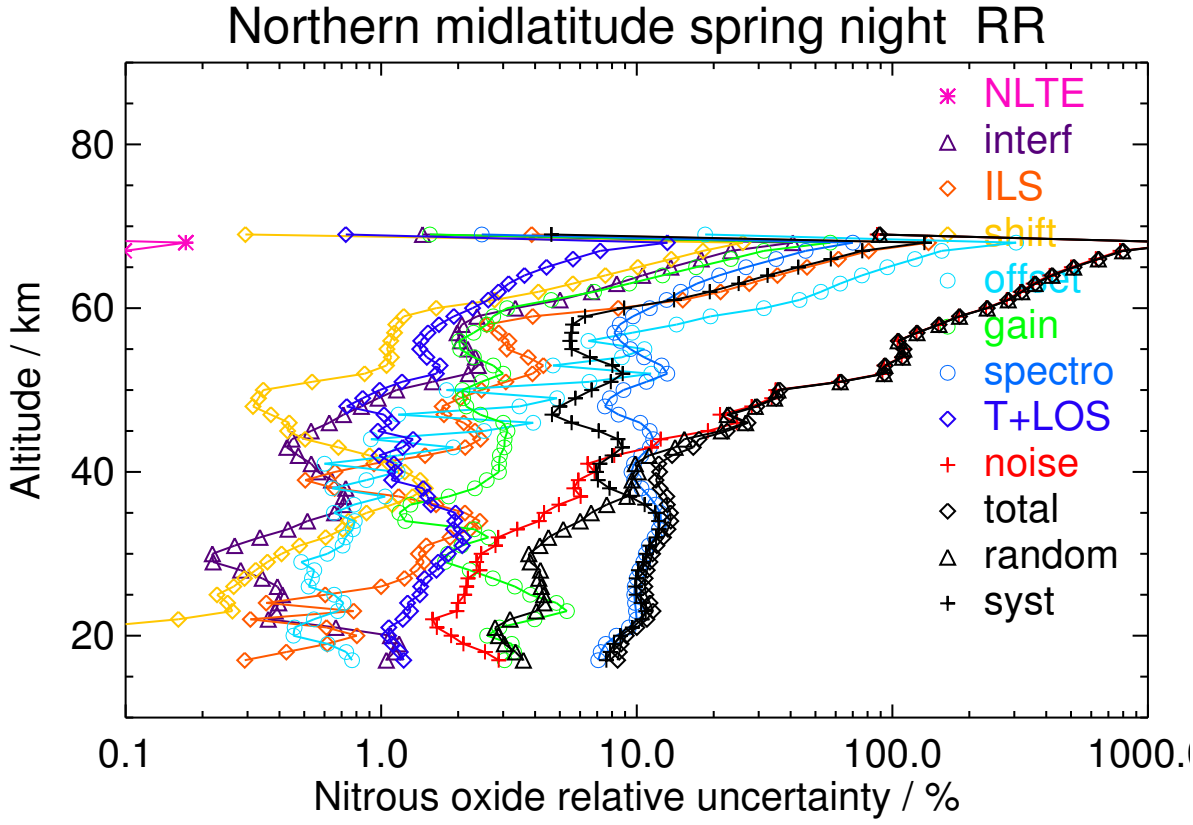

Figure S216. V8R_N2O_561 Northern midlatitude spring night

Table S217. Nitrous oxide error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	80.160	<0.001	0.176	1.008	0.271	0.627	2.930	7.729	1.494	1.753	2.771	8.214	8.669
35	22.005	<0.001	0.148	0.474	0.195	0.140	0.328	2.517	0.418	0.841	1.191	2.492	2.762
40	3.336	<0.001	0.019	0.021	0.013	0.061	0.069	0.360	0.061	0.357	0.399	0.333	0.520
45	1.288	<0.001	0.010	0.022	0.005	0.059	0.028	0.131	0.012	0.375	0.394	0.087	0.403
50	0.441	<0.001	0.015	0.013	0.004	0.014	0.010	0.063	0.008	0.413	0.419	0.021	0.419
55	1.001	<0.001	0.019	0.029	0.009	0.080	0.026	0.108	0.012	0.766	0.777	0.049	0.779
60	1.251	<0.001	0.016	0.036	0.008	0.131	0.012	0.079	0.014	1.045	1.055	0.060	1.057
65	0.896	<0.001	0.056	0.196	0.038	0.235	0.101	0.106	0.021	1.311	1.336	0.234	1.356

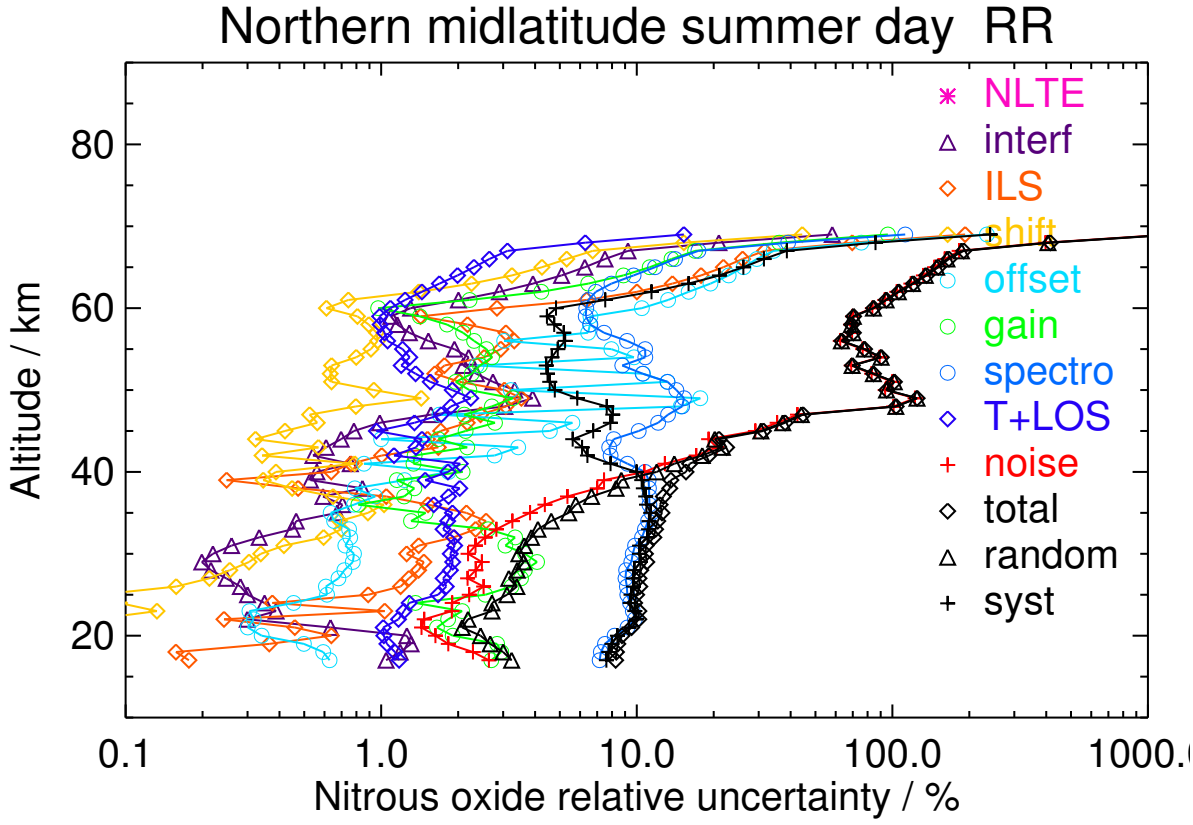

Figure S217. V8R_N2O_561 Northern midlatitude summer day

Table S218. Nitrous oxide error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	84.798	<0.001	0.187	0.996	0.267	0.598	2.336	8.690	1.524	1.752	2.736	8.963	9.371
35	22.942	<0.001	0.169	0.466	0.226	0.129	0.177	2.599	0.416	0.848	1.235	2.543	2.827
40	3.433	<0.001	0.023	0.017	0.029	0.062	0.077	0.421	0.062	0.353	0.442	0.349	0.563
45	1.248	<0.001	0.011	0.016	0.011	0.049	0.035	0.113	0.013	0.334	0.353	0.062	0.359
50	0.434	<0.001	0.015	0.023	0.005	0.018	0.019	0.103	0.009	0.389	0.403	0.026	0.404
55	1.584	<0.001	0.019	0.026	0.008	0.090	0.022	0.089	0.012	0.791	0.800	0.059	0.802
60	1.358	<0.001	0.015	0.027	0.010	0.125	0.017	0.092	0.013	0.994	1.004	0.071	1.007
65	0.692	<0.001	0.058	0.192	0.035	0.231	0.054	0.095	0.016	1.299	1.322	0.215	1.340

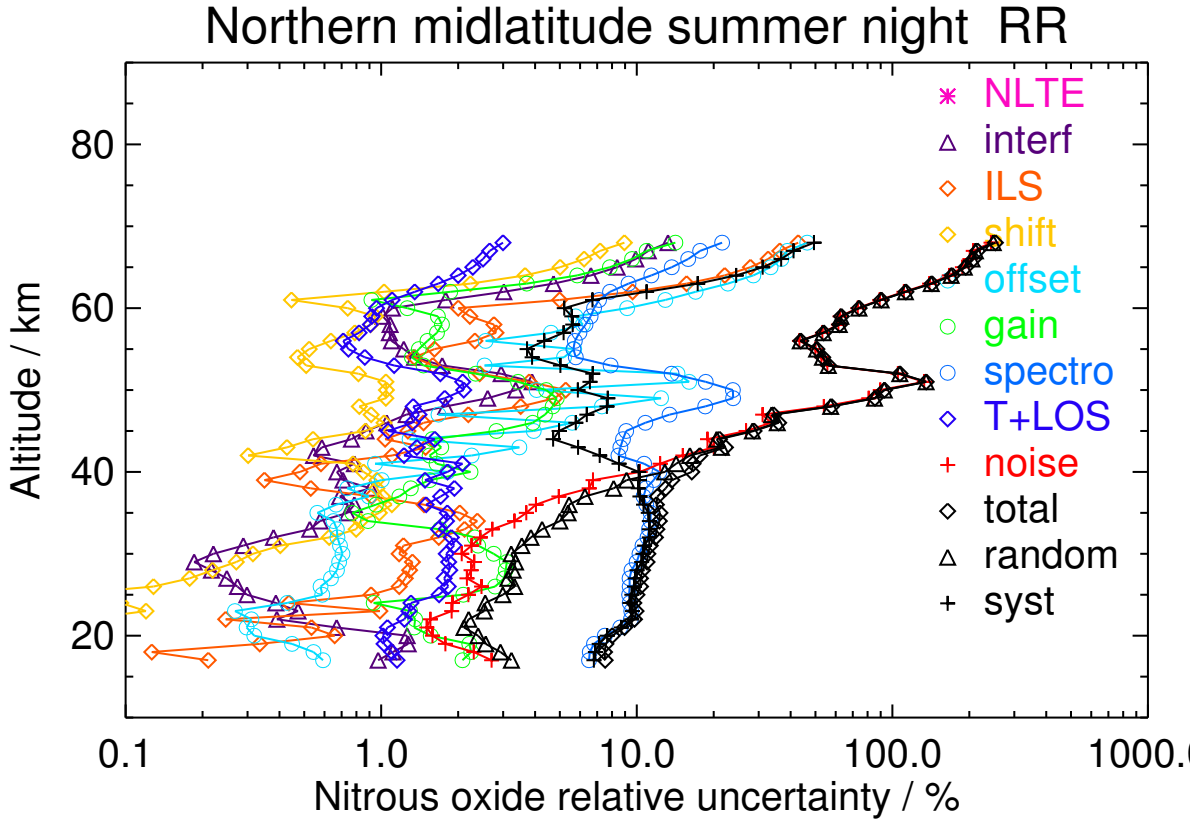

Figure S218. V8R_N2O_561 Northern midlatitude summer night

Table S219. Nitrous oxide error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	74.802	<0.001	0.168	1.026	0.305	0.572	2.265	8.466	1.467	2.094	4.078	8.260	9.211
35	35.309	<0.001	0.166	0.488	0.252	0.188	0.547	3.617	0.480	1.179	2.504	3.016	3.920
40	18.643	<0.001	0.083	0.207	0.218	0.128	0.382	1.769	0.204	0.871	1.478	1.416	2.047
45	6.662	<0.001	0.018	0.140	0.027	0.069	0.166	0.710	0.066	0.610	0.787	0.561	0.966
50	3.158	<0.001	0.018	0.057	0.007	0.033	0.053	0.201	0.029	0.642	0.655	0.181	0.679
55	1.662	<0.001	0.020	0.040	0.012	0.082	0.033	0.118	0.018	0.983	0.990	0.105	0.996
60	0.716	<0.001	0.023	0.072	0.013	0.188	0.030	0.073	0.016	1.286	1.302	0.082	1.305
65	-0.004	<0.001	0.041	0.168	0.040	0.270	0.085	0.102	0.019	1.400	1.432	0.180	1.443
70	-0.157	<0.001	0.016	0.064	0.009	0.215	0.052	0.037	0.011	1.005	1.029	0.076	1.032

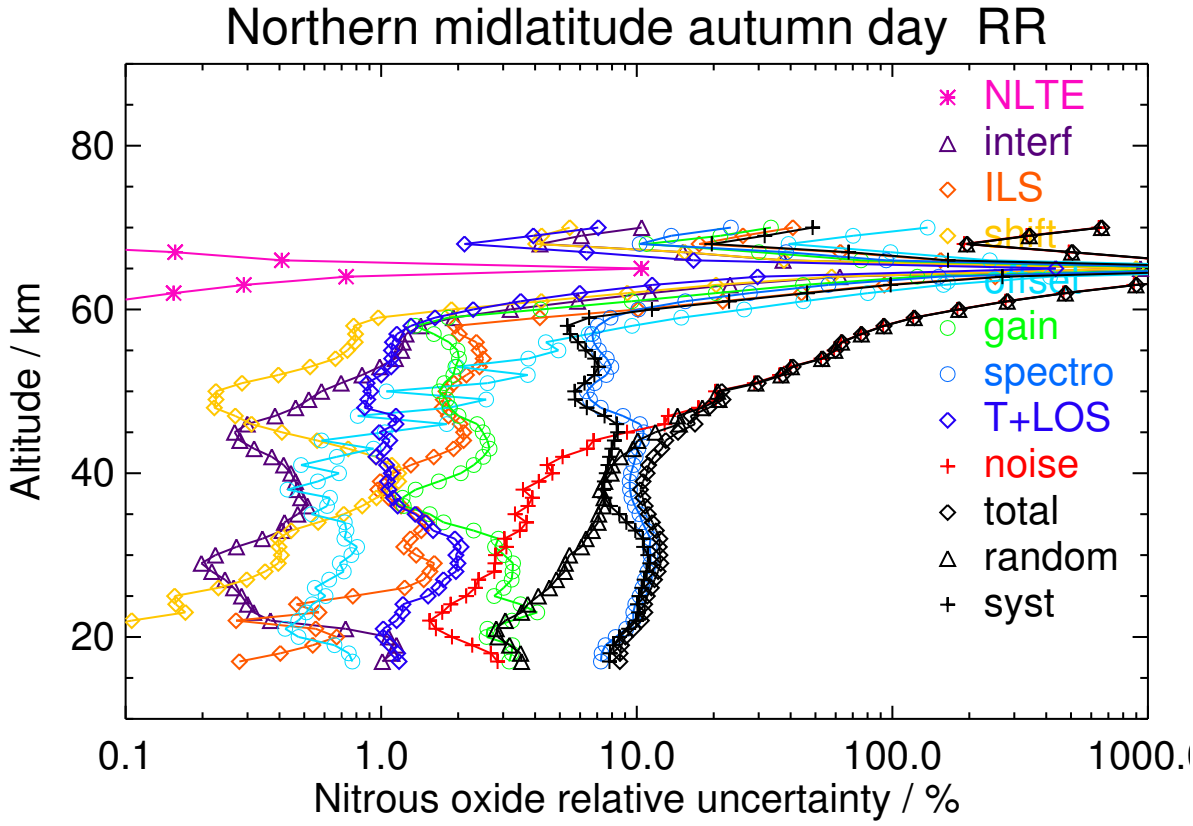

Figure S219. V8R_N2O_561 Northern midlatitude autumn day

Table S220. Nitrous oxide error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	83.306	<0.001	0.206	1.057	0.300	0.537	2.063	9.145	1.467	2.135	4.272	8.825	9.805
35	40.049	<0.001	0.173	0.680	0.246	0.212	0.657	4.406	0.579	1.290	2.471	4.042	4.737
40	16.893	<0.001	0.073	0.241	0.155	0.131	0.405	1.736	0.198	0.900	1.495	1.378	2.033
45	6.631	<0.001	0.017	0.144	0.018	0.060	0.156	0.708	0.066	0.613	0.780	0.567	0.964
50	3.360	<0.001	0.019	0.057	0.007	0.044	0.056	0.215	0.030	0.673	0.689	0.184	0.713
55	1.662	<0.001	0.020	0.040	0.011	0.086	0.036	0.137	0.020	1.015	1.022	0.125	1.029
60	1.068	<0.001	0.020	0.052	0.008	0.201	0.029	0.067	0.016	1.317	1.334	0.068	1.336
65	0.443	<0.001	0.031	0.120	0.025	0.275	0.086	0.072	0.017	1.412	1.442	0.135	1.449
70	-0.356	<0.001	0.009	0.019	0.006	0.212	0.009	0.003	0.004	0.989	1.011	0.021	1.012

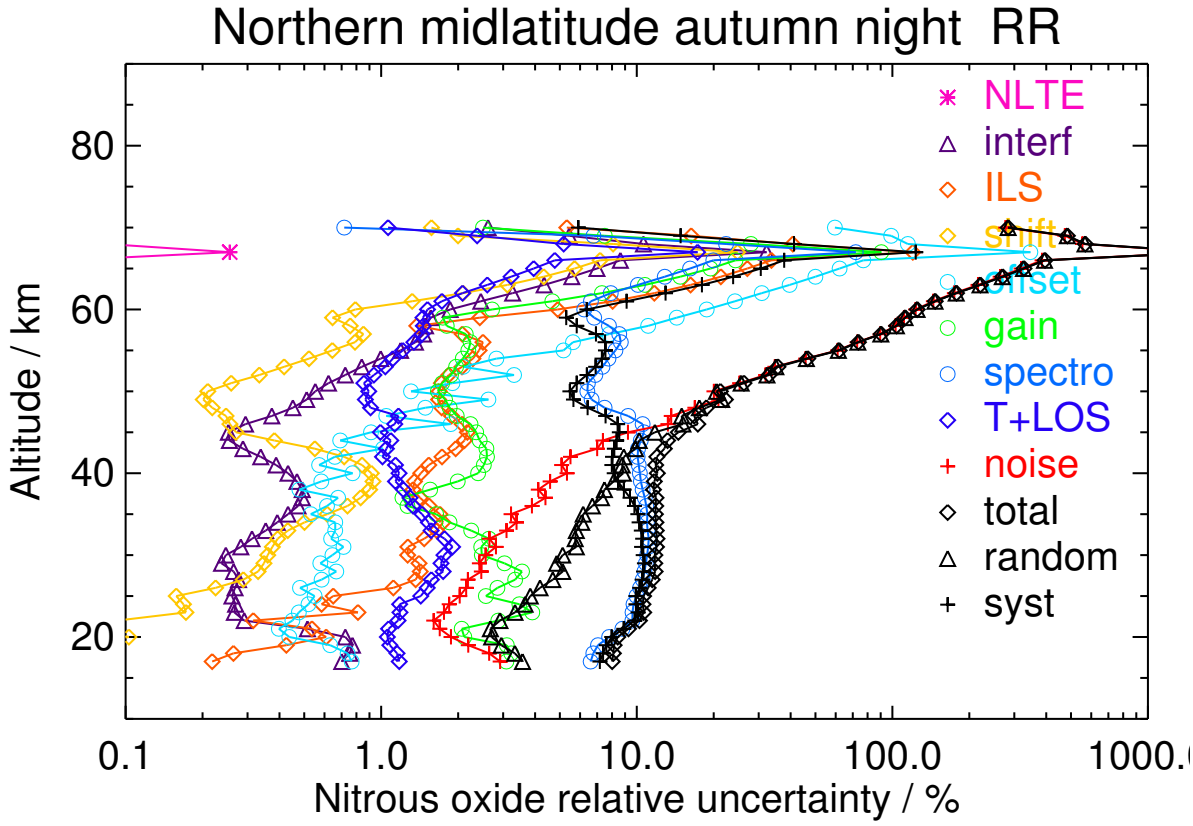

Figure S220. V8R_N2O_561 Northern midlatitude autumn night

Table S221. Nitrous oxide error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	209.724	<0.001	0.714	1.588	0.508	0.842	1.075	17.896	2.646	3.101	4.833	17.851	18.494
35	112.049	<0.001	0.458	0.705	0.550	0.457	0.523	9.851	1.259	1.771	2.821	9.763	10.162
40	29.770	<0.001	0.153	0.077	0.396	0.140	0.552	2.719	0.356	0.923	1.352	2.656	2.981
45	7.649	<0.001	0.018	0.115	0.035	0.083	0.168	0.616	0.068	0.536	0.645	0.553	0.849
50	2.716	<0.001	0.017	0.065	0.008	0.025	0.051	0.232	0.033	0.511	0.524	0.224	0.569
55	0.748	<0.001	0.019	0.043	0.015	0.067	0.016	0.085	0.013	0.801	0.807	0.070	0.810
60	0.385	<0.001	0.025	0.100	0.019	0.152	0.034	0.075	0.012	1.149	1.161	0.111	1.166
65	-0.030	<0.001	0.079	0.321	0.083	0.253	0.124	0.213	0.024	1.363	1.394	0.397	1.449

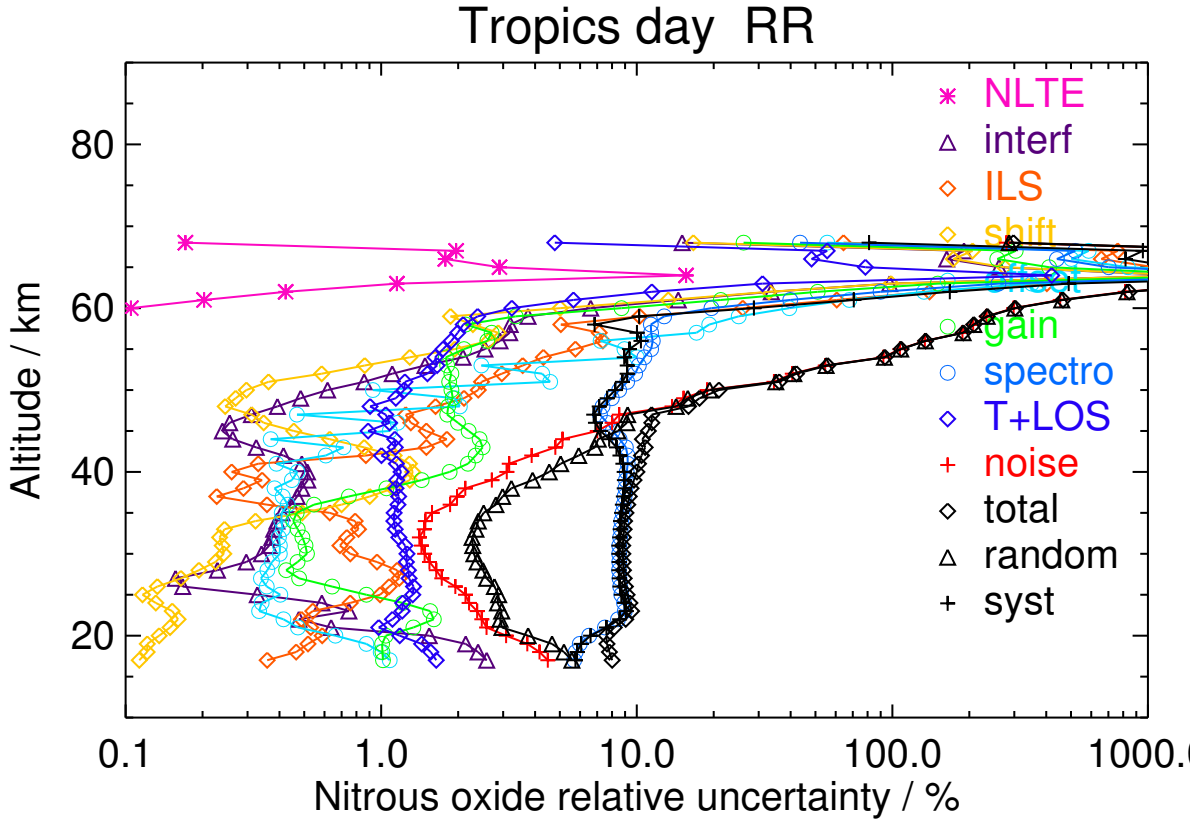

Figure S221. V8R_N2O_561 Tropics day

Table S222. Nitrous oxide error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	206.827	<0.001	0.795	1.548	0.513	0.777	1.041	17.736	2.558	3.009	4.764	17.676	18.307
35	109.988	<0.001	0.446	0.725	0.518	0.430	0.575	9.588	1.212	1.739	2.767	9.501	9.896
40	31.938	<0.001	0.159	0.110	0.443	0.154	0.589	2.819	0.368	0.972	1.399	2.771	3.104
45	7.481	<0.001	0.018	0.125	0.035	0.062	0.167	0.620	0.074	0.482	0.565	0.594	0.820
50	2.527	<0.001	0.017	0.062	0.007	0.025	0.046	0.211	0.034	0.494	0.506	0.202	0.545
55	0.583	<0.001	0.019	0.036	0.013	0.084	0.015	0.067	0.010	0.844	0.851	0.058	0.852
60	0.634	<0.001	0.023	0.085	0.017	0.155	0.026	0.071	0.012	1.131	1.143	0.096	1.147
65	0.297	<0.001	0.077	0.310	0.083	0.247	0.121	0.212	0.024	1.355	1.385	0.387	1.438

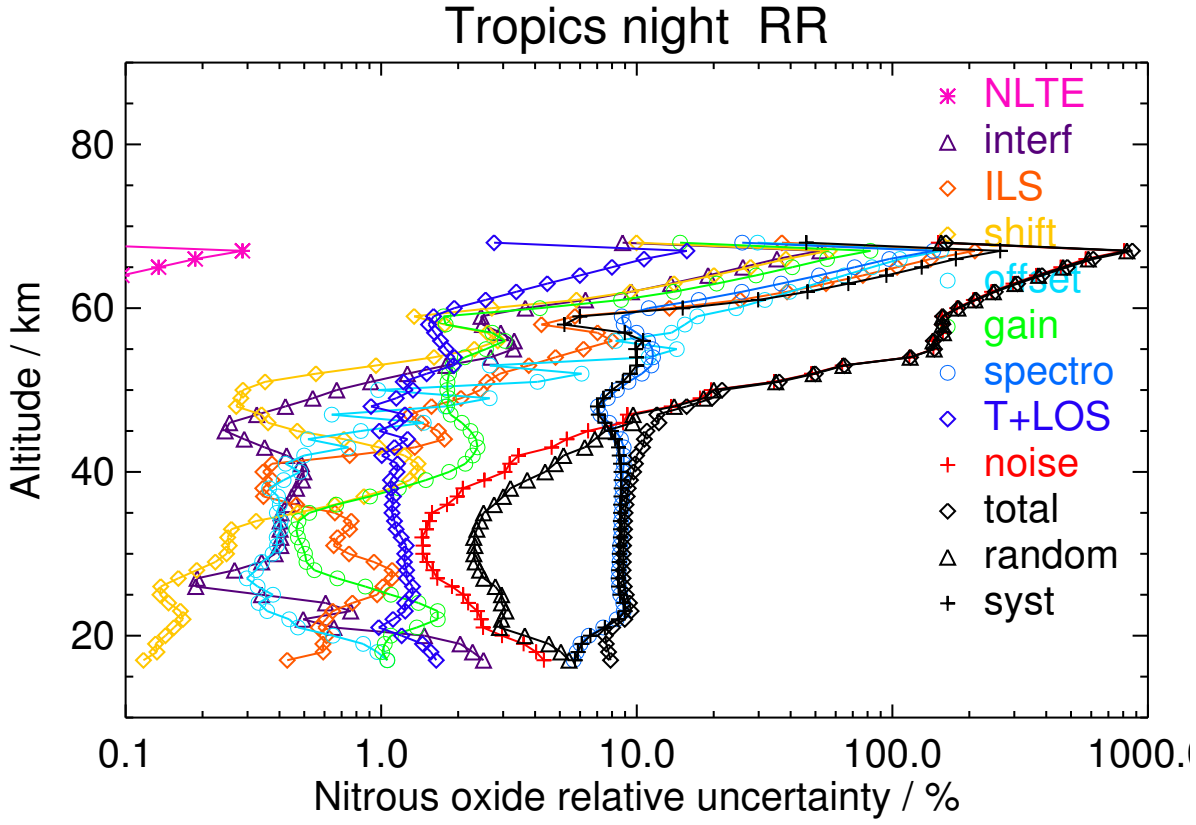

Figure S222. V8R_N2O_561 Tropics night

Table S223. Nitrous oxide error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	123.947	<0.001	0.300	2.113	0.489	0.927	6.352	13.369	2.133	2.438	8.620	12.685	15.337
35	38.718	<0.001	0.146	1.359	0.235	0.329	1.845	6.365	0.822	1.334	3.834	5.805	6.957
40	3.303	<0.001	0.017	0.142	0.013	0.090	0.130	0.766	0.062	0.565	0.897	0.388	0.977
45	2.434	<0.001	0.012	0.028	0.006	0.020	0.046	0.146	0.022	0.440	0.457	0.101	0.468
50	2.132	<0.001	0.017	0.041	0.007	0.077	0.042	0.173	0.018	0.693	0.710	0.130	0.721
55	0.914	<0.001	0.017	0.031	0.010	0.076	0.027	0.086	0.014	1.010	1.016	0.071	1.018
60	0.979	<0.001	0.025	0.084	0.012	0.205	0.060	0.063	0.016	1.330	1.349	0.072	1.351
65	0.799	<0.001	0.047	0.157	0.028	0.273	0.164	0.085	0.024	1.398	1.436	0.172	1.446

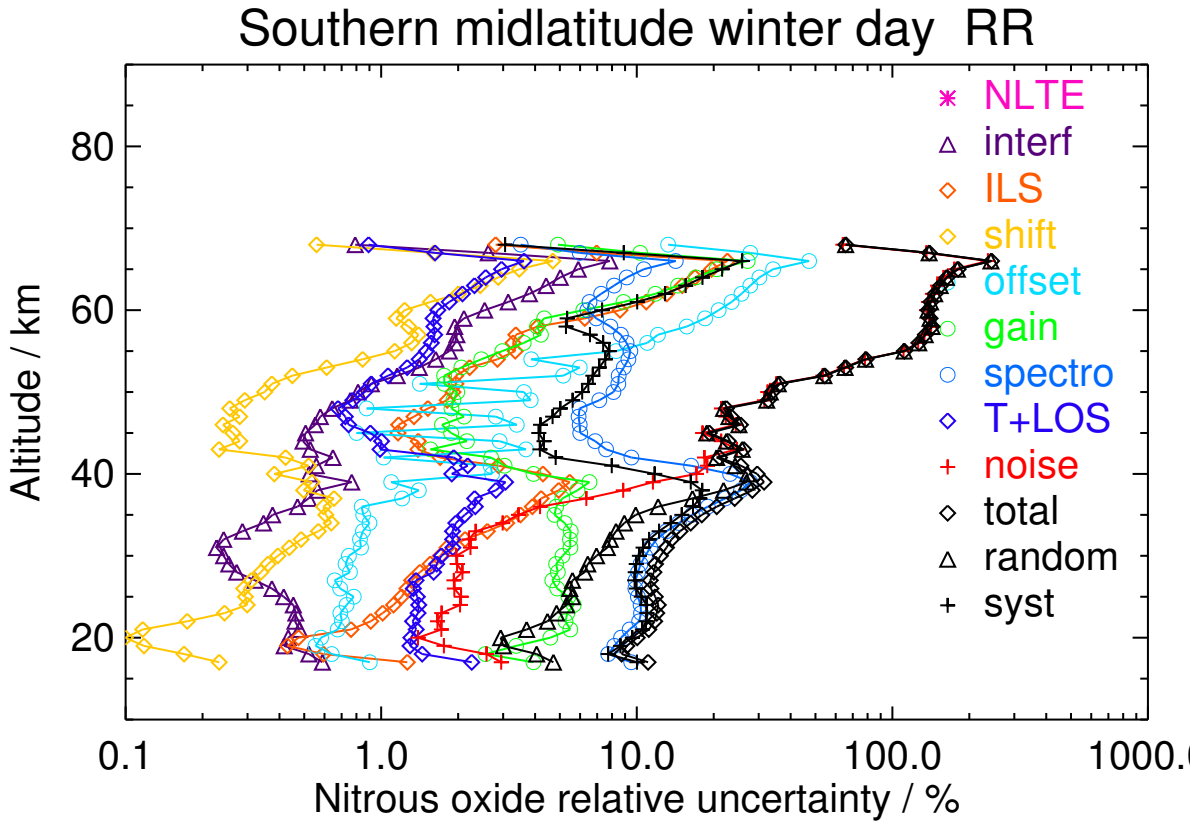

Figure S223. V8R_N2O_561 Southern midlatitude winter day

Table S224. Nitrous oxide error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	84.126	<0.001	0.241	1.190	0.299	0.604	3.277	9.835	1.594	2.453	6.387	8.784	10.861
35	29.462	<0.001	0.126	0.917	0.174	0.253	0.914	4.591	0.640	1.395	3.019	4.013	5.022
40	2.383	<0.001	0.014	0.122	0.012	0.095	0.084	0.575	0.061	0.610	0.782	0.355	0.859
45	1.624	<0.001	0.012	0.025	0.005	0.023	0.029	0.115	0.017	0.467	0.479	0.069	0.484
50	1.391	<0.001	0.018	0.029	0.006	0.070	0.030	0.112	0.013	0.668	0.678	0.073	0.682
55	0.696	<0.001	0.018	0.027	0.009	0.080	0.024	0.077	0.012	0.999	1.004	0.053	1.006
60	0.359	<0.001	0.019	0.065	0.010	0.198	0.036	0.052	0.013	1.296	1.314	0.051	1.315
65	0.128	<0.001	0.030	0.128	0.017	0.268	0.088	0.053	0.015	1.387	1.418	0.110	1.422

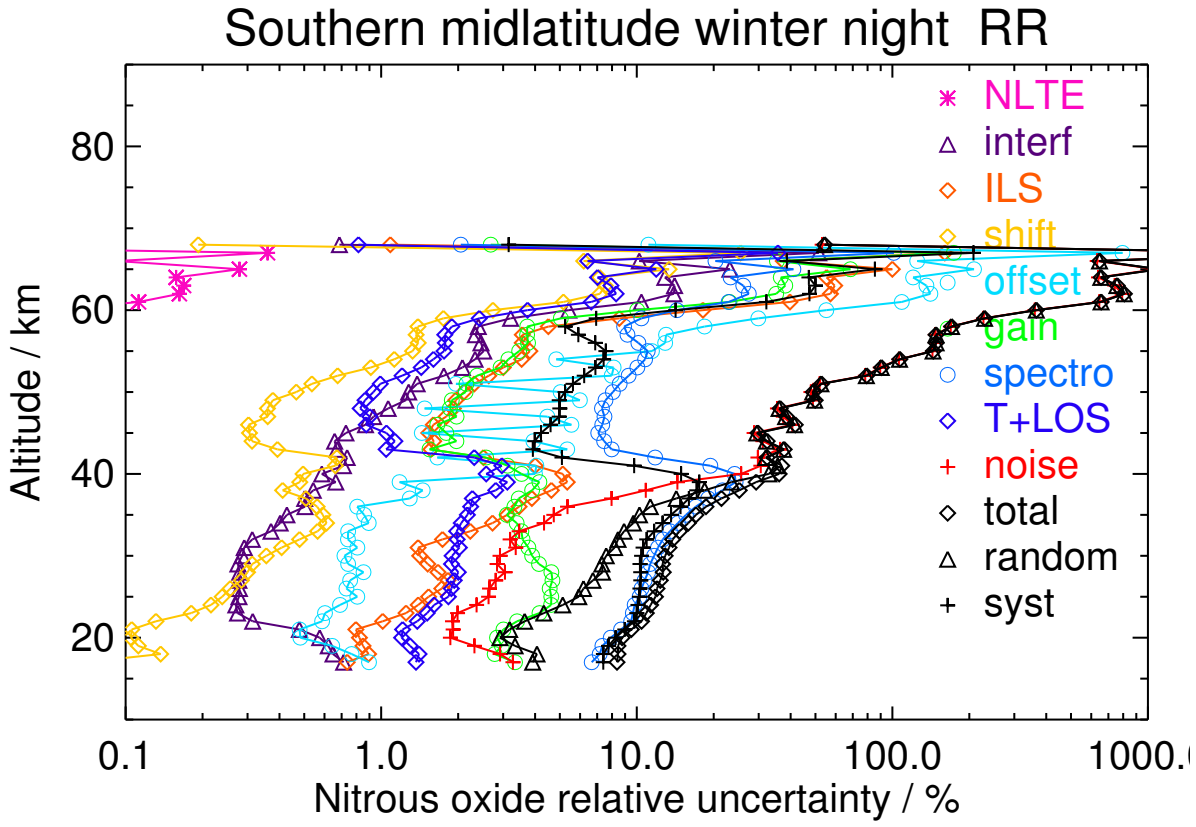

Figure S224. V8R_N2O_561 Southern midlatitude winter night

Table S225. Nitrous oxide error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	127.069	<0.001	0.334	1.485	0.419	0.817	4.483	13.024	1.939	2.100	6.384	12.661	14.179
35	35.487	<0.001	0.163	1.066	0.223	0.230	0.641	5.119	0.689	1.141	2.581	4.796	5.446
40	7.673	<0.001	0.029	0.074	0.026	0.091	0.090	0.696	0.096	0.584	0.678	0.631	0.926
45	2.575	<0.001	0.012	0.044	0.004	0.017	0.039	0.200	0.032	0.408	0.422	0.181	0.460
50	2.158	<0.001	0.017	0.034	0.007	0.079	0.038	0.130	0.015	0.634	0.644	0.115	0.654
55	0.831	<0.001	0.016	0.035	0.012	0.073	0.041	0.071	0.012	0.906	0.912	0.067	0.914
60	1.120	<0.001	0.020	0.056	0.011	0.157	0.065	0.067	0.015	1.158	1.173	0.064	1.174
65	0.488	<0.001	0.048	0.169	0.033	0.256	0.227	0.095	0.031	1.368	1.404	0.241	1.425

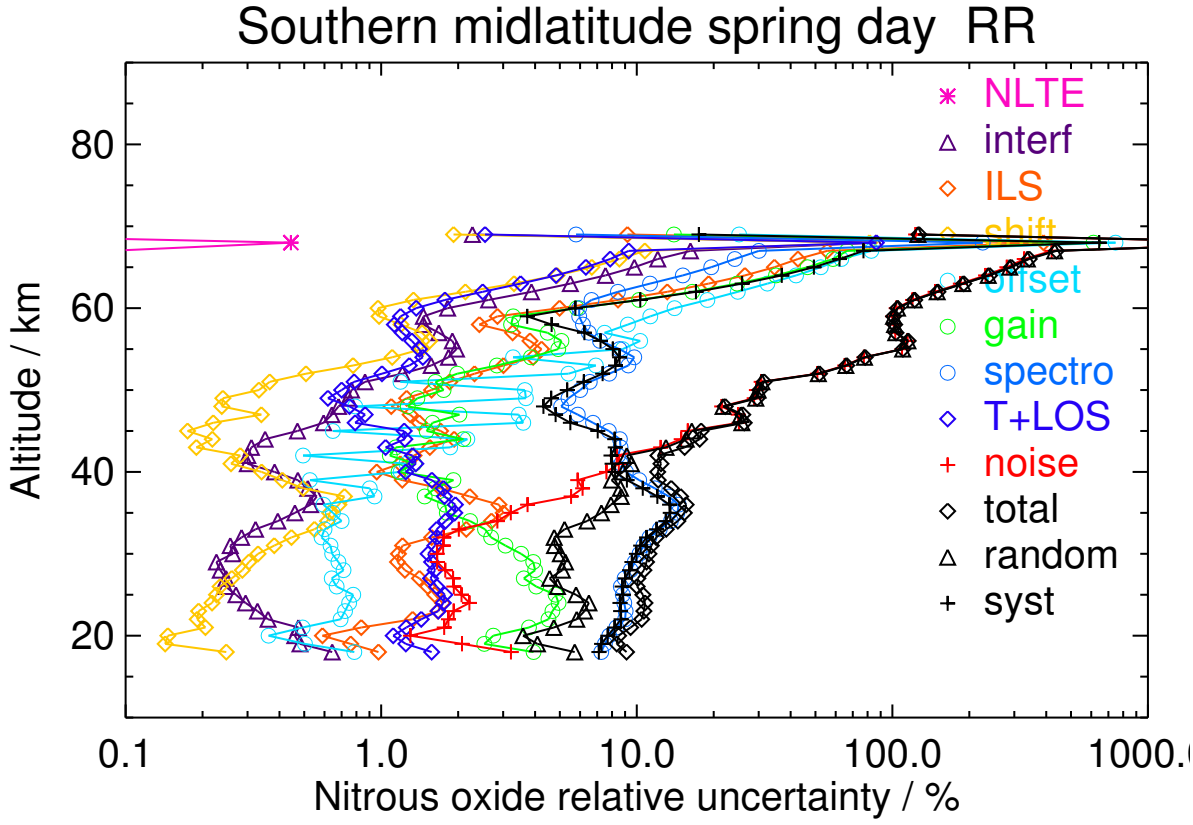

Figure S225. V8R_N2O_561 Southern midlatitude spring day

Table S226. Nitrous oxide error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	127.074	<0.001	0.276	1.876	0.450	0.876	5.139	11.562	1.929	2.264	6.164	11.641	13.172
35	43.191	<0.001	0.164	1.141	0.271	0.289	1.366	5.644	0.762	1.158	2.950	5.331	6.093
40	8.228	<0.001	0.030	0.069	0.029	0.103	0.098	0.764	0.111	0.626	0.736	0.688	1.007
45	2.827	<0.001	0.012	0.047	0.006	0.029	0.053	0.211	0.029	0.419	0.433	0.200	0.477
50	1.857	<0.001	0.017	0.034	0.007	0.057	0.036	0.117	0.014	0.573	0.581	0.105	0.591
55	1.033	<0.001	0.018	0.039	0.011	0.087	0.040	0.092	0.014	0.935	0.942	0.083	0.945
60	0.232	<0.001	0.019	0.058	0.007	0.161	0.053	0.053	0.013	1.165	1.178	0.067	1.180
65	-0.227	<0.001	0.040	0.172	0.031	0.258	0.221	0.108	0.026	1.368	1.404	0.245	1.425
70	0.479	<0.001	0.018	0.069	0.014	0.208	0.077	0.042	0.012	0.998	1.021	0.106	1.026

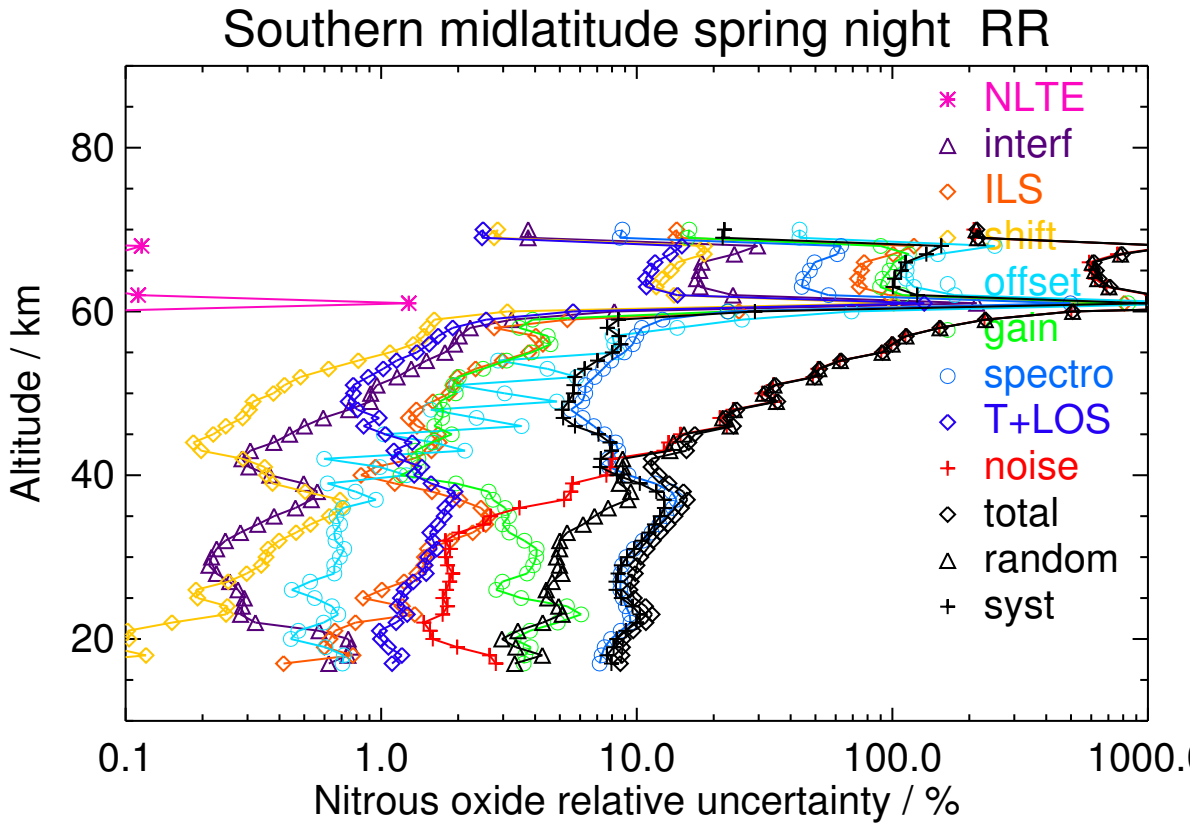

Figure S226. V8R_N2O_561 Southern midlatitude spring night

Table S227. Nitrous oxide error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	76.370	<0.001	0.228	0.995	0.274	0.563	2.026	7.829	1.422	1.753	2.864	7.983	8.481
35	30.334	<0.001	0.197	0.483	0.407	0.152	0.248	2.757	0.389	0.929	1.220	2.765	3.022
40	8.012	<0.001	0.045	0.032	0.087	0.067	0.181	0.699	0.102	0.448	0.556	0.662	0.864
45	2.960	<0.001	0.015	0.039	0.018	0.071	0.080	0.228	0.026	0.422	0.463	0.174	0.494
50	1.354	<0.001	0.013	0.032	0.005	0.033	0.037	0.125	0.014	0.455	0.470	0.073	0.476
55	1.532	<0.001	0.014	0.044	0.012	0.080	0.034	0.134	0.016	0.781	0.795	0.078	0.798
60	1.384	<0.001	0.023	0.069	0.011	0.142	0.012	0.104	0.018	1.073	1.087	0.086	1.090
65	0.797	<0.001	0.077	0.241	0.053	0.249	0.077	0.136	0.018	1.333	1.363	0.271	1.389
70	0.691	<0.001	0.061	0.187	0.046	0.190	0.052	0.116	0.009	0.953	0.975	0.226	1.000

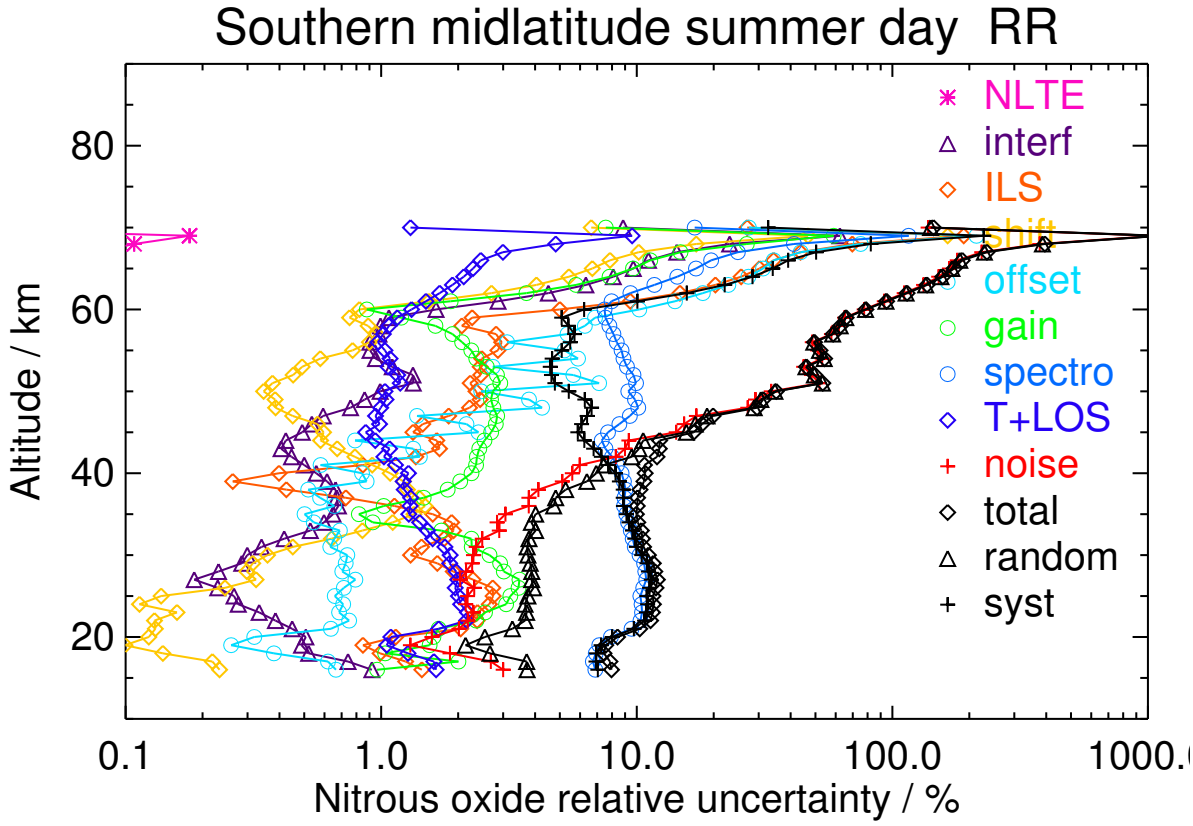

Figure S227. V8R_N2O_561 Southern midlatitude summer day

Table S228. Nitrous oxide error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	72.836	<0.001	0.197	1.256	0.276	0.614	2.715	6.981	1.390	1.718	2.894	7.395	7.941
35	31.008	<0.001	0.183	0.527	0.402	0.163	0.308	2.657	0.417	0.902	1.216	2.676	2.939
40	7.078	<0.001	0.038	0.025	0.076	0.071	0.137	0.653	0.099	0.406	0.506	0.614	0.796
45	2.033	<0.001	0.012	0.039	0.013	0.052	0.059	0.191	0.022	0.346	0.381	0.140	0.406
50	0.991	<0.001	0.013	0.028	0.005	0.027	0.037	0.106	0.011	0.404	0.419	0.048	0.421
55	1.016	<0.001	0.014	0.030	0.009	0.094	0.027	0.116	0.013	0.790	0.803	0.050	0.805
60	0.840	<0.001	0.018	0.048	0.009	0.122	0.013	0.084	0.014	0.981	0.992	0.056	0.994
65	0.064	<0.001	0.075	0.236	0.055	0.235	0.088	0.138	0.016	1.291	1.318	0.275	1.346
70	0.313	<0.001	0.072	0.228	0.056	0.191	0.067	0.140	0.011	0.954	0.978	0.273	1.016

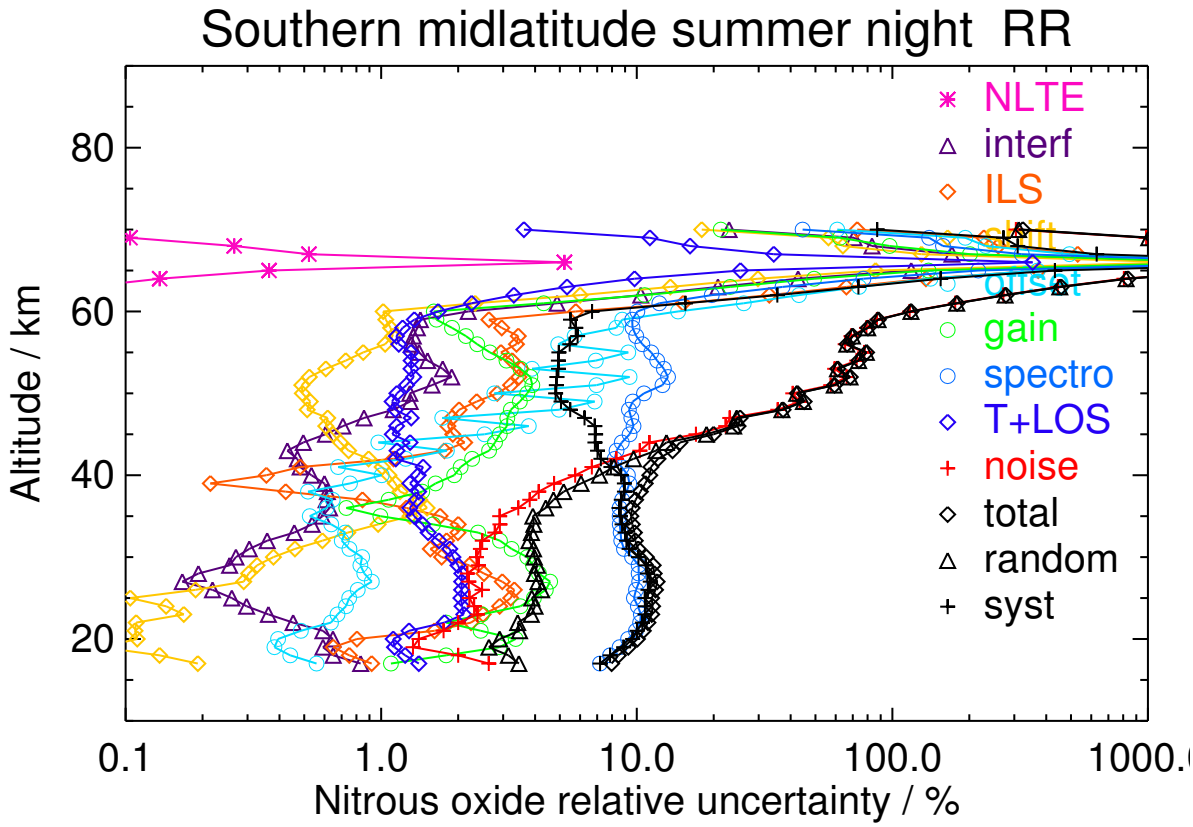

Figure S228. V8R_N2O_561 Southern midlatitude summer night

Table S229. Nitrous oxide error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	73.471	<0.001	0.205	1.855	0.355	0.544	2.233	9.100	1.495	1.845	3.819	9.097	9.867
35	26.978	<0.001	0.160	0.624	0.231	0.207	0.580	3.089	0.436	1.167	2.192	2.671	3.455
40	14.884	<0.001	0.068	0.214	0.134	0.129	0.251	1.341	0.169	0.868	1.277	1.047	1.651
45	7.896	<0.001	0.019	0.145	0.018	0.036	0.170	0.638	0.070	0.572	0.692	0.558	0.890
50	3.693	<0.001	0.018	0.072	0.009	0.079	0.072	0.271	0.037	0.727	0.749	0.243	0.788
55	2.134	<0.001	0.017	0.041	0.012	0.083	0.044	0.153	0.023	1.031	1.038	0.146	1.048
60	1.255	<0.001	0.028	0.086	0.013	0.216	0.050	0.083	0.020	1.367	1.387	0.107	1.391
65	0.659	<0.001	0.041	0.145	0.029	0.285	0.098	0.081	0.021	1.428	1.460	0.171	1.470
70	0.437	<0.001	0.015	0.027	0.005	0.245	0.065	0.026	0.013	1.067	1.095	0.074	1.097

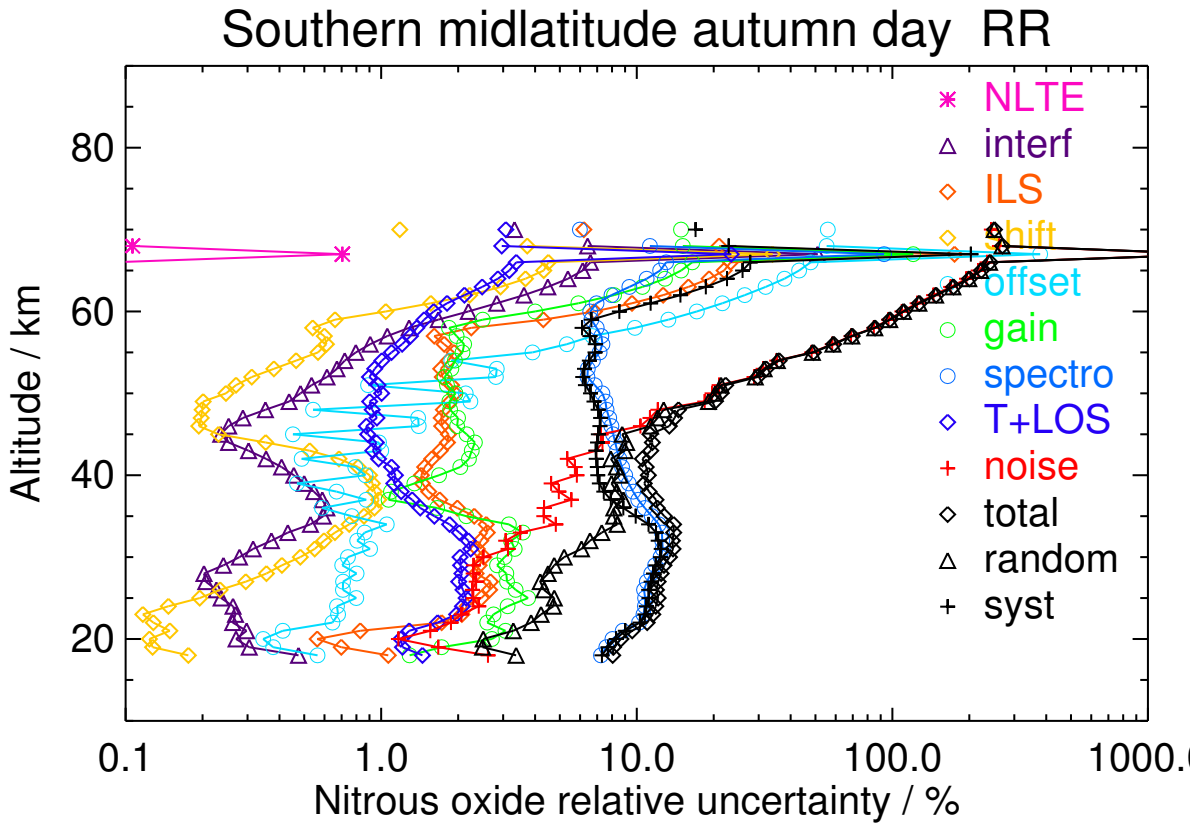

Figure S229. V8R_N2O_561 Southern midlatitude autumn day

Table S230. Nitrous oxide error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	65.363	<0.001	0.167	1.529	0.307	0.564	2.510	8.005	1.491	1.847	3.526	8.146	8.877
35	22.874	<0.001	0.130	0.520	0.210	0.165	0.380	2.567	0.384	1.069	1.754	2.304	2.896
40	10.054	<0.001	0.049	0.116	0.103	0.119	0.170	0.780	0.117	0.757	0.917	0.652	1.125
45	6.542	<0.001	0.018	0.107	0.021	0.029	0.122	0.467	0.053	0.521	0.608	0.387	0.721
50	3.619	<0.001	0.017	0.067	0.008	0.077	0.067	0.255	0.034	0.708	0.732	0.219	0.764
55	2.158	<0.001	0.017	0.040	0.011	0.083	0.037	0.146	0.022	1.035	1.041	0.136	1.050
60	0.866	<0.001	0.029	0.085	0.014	0.209	0.067	0.081	0.020	1.352	1.371	0.109	1.375
65	0.294	<0.001	0.042	0.134	0.027	0.285	0.116	0.073	0.023	1.437	1.469	0.169	1.478
70	0.671	<0.001	0.018	0.036	0.010	0.226	0.097	0.033	0.016	1.036	1.062	0.095	1.066

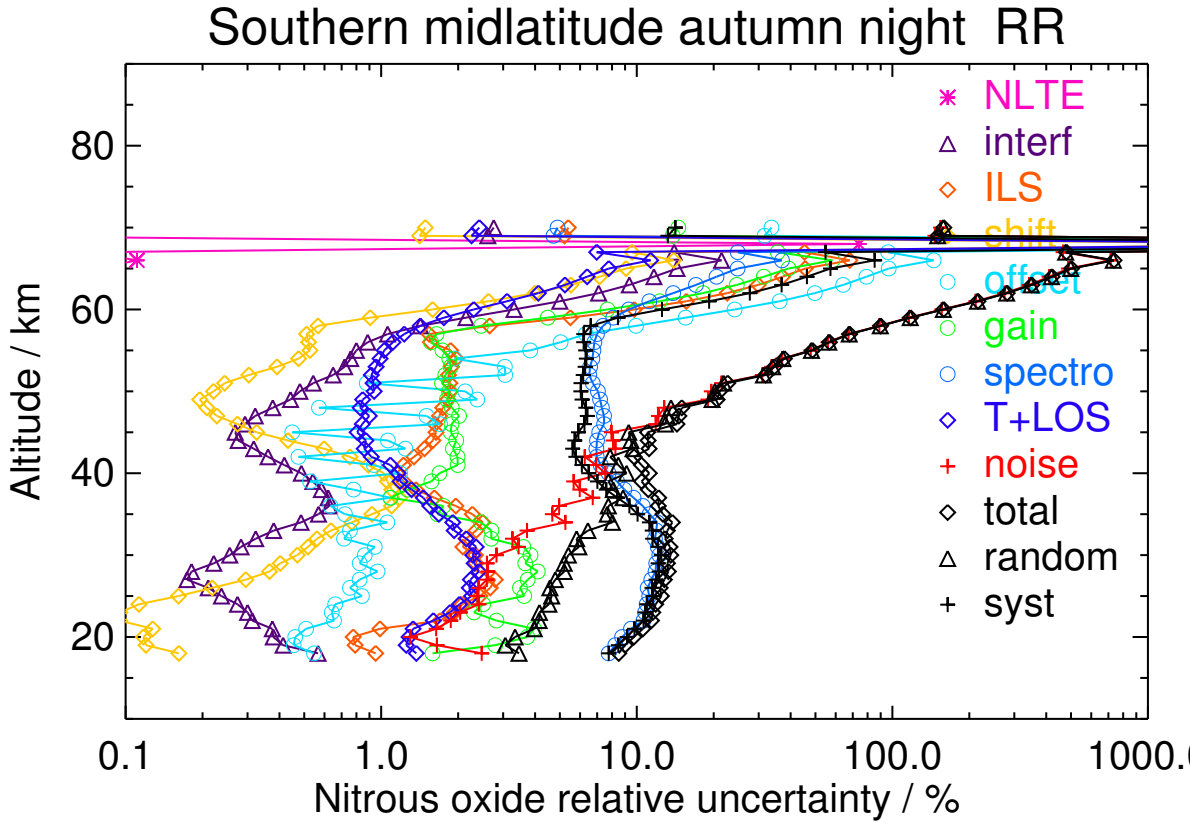

Figure S230. V8R_N2O_561 Southern midlatitude autumn night

Table S231. Nitrous oxide error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	14.387	<0.001	0.267	0.402	0.231	0.276	0.830	1.598	0.458	1.553	1.966	1.537	2.495
35	2.883	<0.001	0.060	0.189	0.048	0.109	0.242	0.550	0.125	0.646	0.862	0.323	0.921
40	1.329	<0.001	0.011	0.021	0.006	0.070	0.022	0.102	0.014	0.439	0.455	0.048	0.457
45	1.835	<0.001	0.014	0.028	0.005	0.020	0.021	0.095	0.011	0.396	0.402	0.076	0.409
50	1.320	<0.001	0.018	0.032	0.006	0.091	0.020	0.102	0.013	0.719	0.730	0.070	0.733
55	1.042	<0.001	0.015	0.030	0.009	0.059	0.013	0.064	0.011	0.898	0.902	0.050	0.903
60	0.292	<0.001	0.019	0.093	0.016	0.203	0.013	0.054	0.011	1.336	1.354	0.071	1.356
65	-0.017	<0.001	0.030	0.187	0.016	0.263	0.019	0.038	0.009	1.374	1.405	0.153	1.413

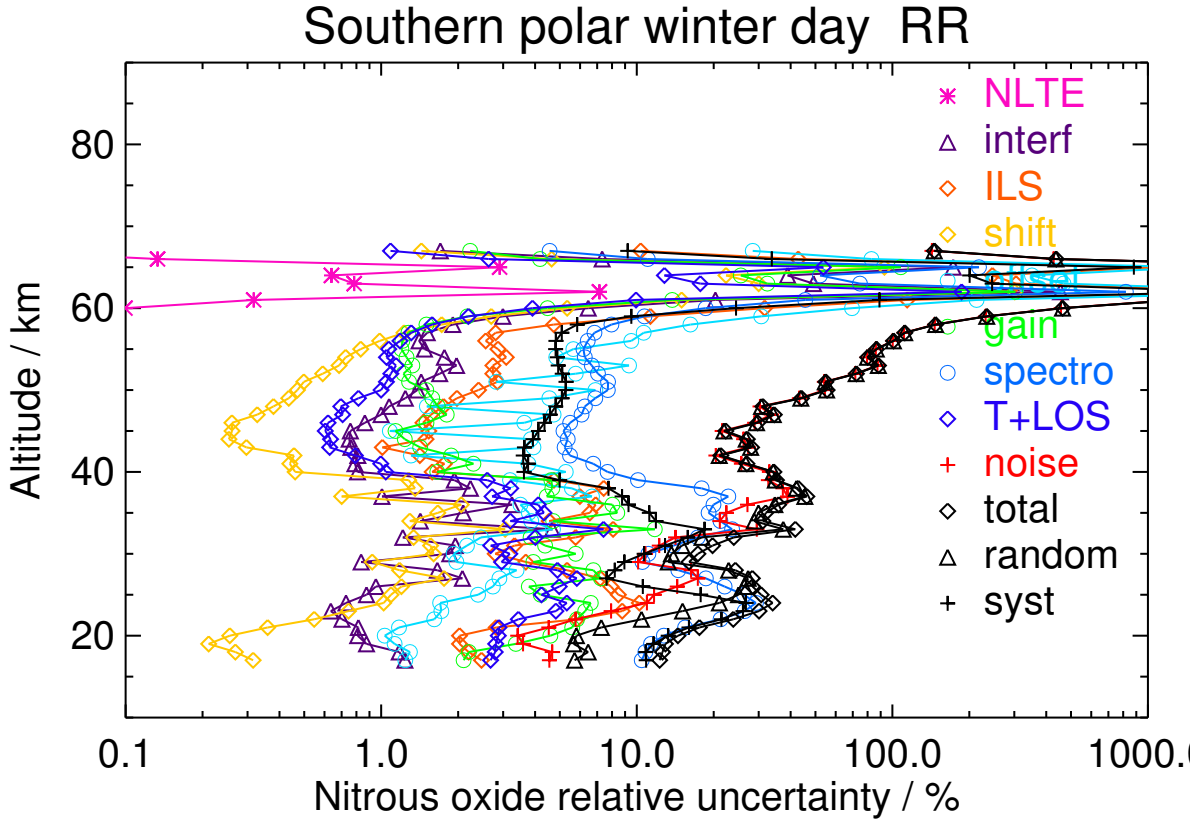

Figure S231. V8R_N2O_561 Southern polar winter day

Table S232. Nitrous oxide error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	14.679	<0.001	0.172	0.375	0.213	0.222	0.355	1.701	0.456	1.603	1.845	1.630	2.462
35	2.471	<0.001	0.036	0.158	0.033	0.116	0.183	0.599	0.096	0.693	0.911	0.306	0.961
40	1.332	<0.001	0.010	0.033	0.005	0.064	0.028	0.130	0.015	0.437	0.457	0.073	0.463
45	1.840	<0.001	0.013	0.024	0.004	0.023	0.029	0.096	0.009	0.402	0.410	0.071	0.416
50	1.077	<0.001	0.019	0.031	0.006	0.093	0.019	0.098	0.014	0.719	0.730	0.068	0.733
55	0.799	<0.001	0.015	0.028	0.008	0.051	0.011	0.052	0.010	0.873	0.876	0.042	0.877
60	0.357	<0.001	0.020	0.091	0.012	0.181	0.017	0.041	0.010	1.261	1.277	0.063	1.278
65	-0.117	<0.001	0.035	0.203	0.015	0.261	0.036	0.034	0.010	1.381	1.413	0.154	1.421

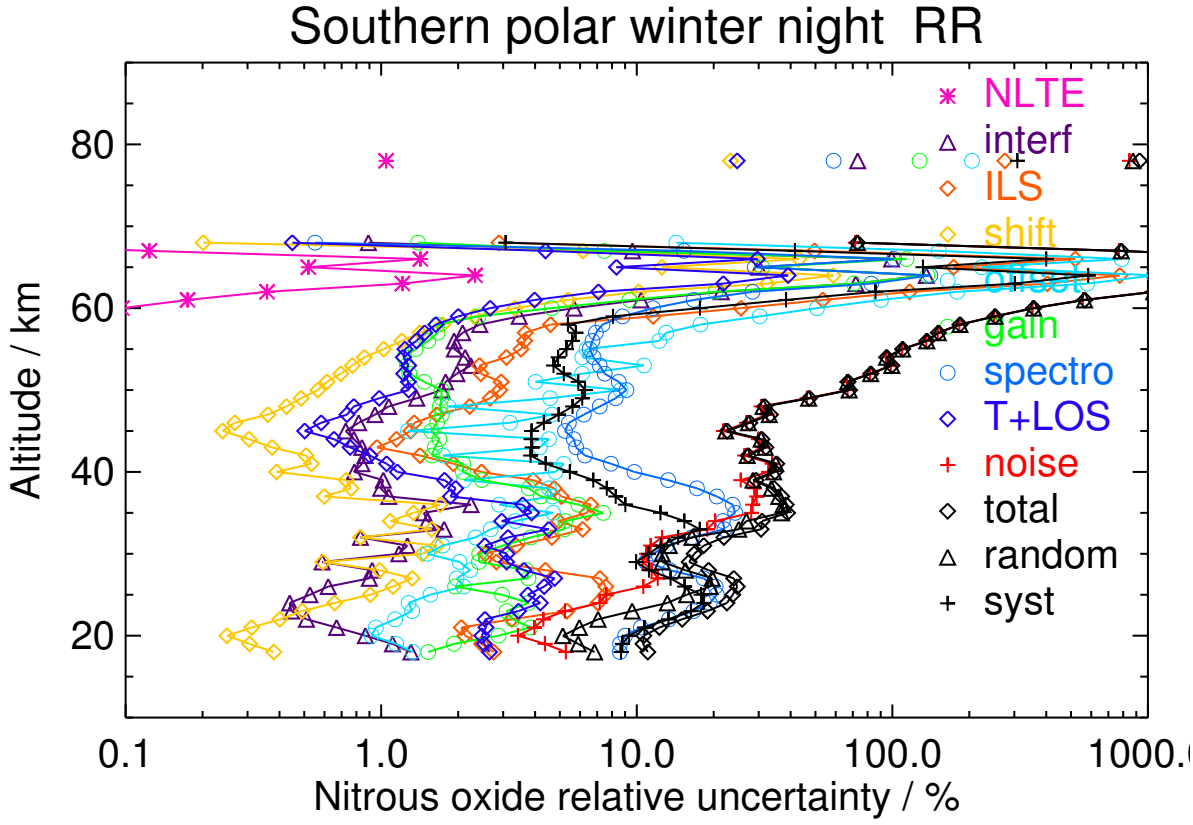

Figure S232. V8R_N2O_561 Southern polar winter night

Table S233. Nitrous oxide error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	49.744	<0.001	0.261	1.974	0.542	0.461	3.773	7.543	0.645	1.860	7.365	5.024	8.915
35	17.422	<0.001	0.076	0.456	0.128	0.112	0.451	1.866	0.237	0.661	1.464	1.509	2.102
40	5.769	<0.001	0.017	0.039	0.030	0.066	0.065	0.430	0.056	0.389	0.457	0.376	0.592
45	2.627	<0.001	0.013	0.042	0.011	0.017	0.037	0.147	0.023	0.324	0.338	0.129	0.362
50	1.940	<0.001	0.017	0.039	0.007	0.087	0.031	0.130	0.016	0.605	0.616	0.117	0.627
55	1.123	<0.001	0.015	0.043	0.012	0.056	0.026	0.086	0.013	0.795	0.800	0.074	0.804
60	0.428	<0.001	0.021	0.081	0.014	0.133	0.032	0.068	0.012	1.082	1.093	0.079	1.096
65	0.899	<0.001	0.062	0.376	0.078	0.239	0.187	0.183	0.026	1.341	1.377	0.427	1.441

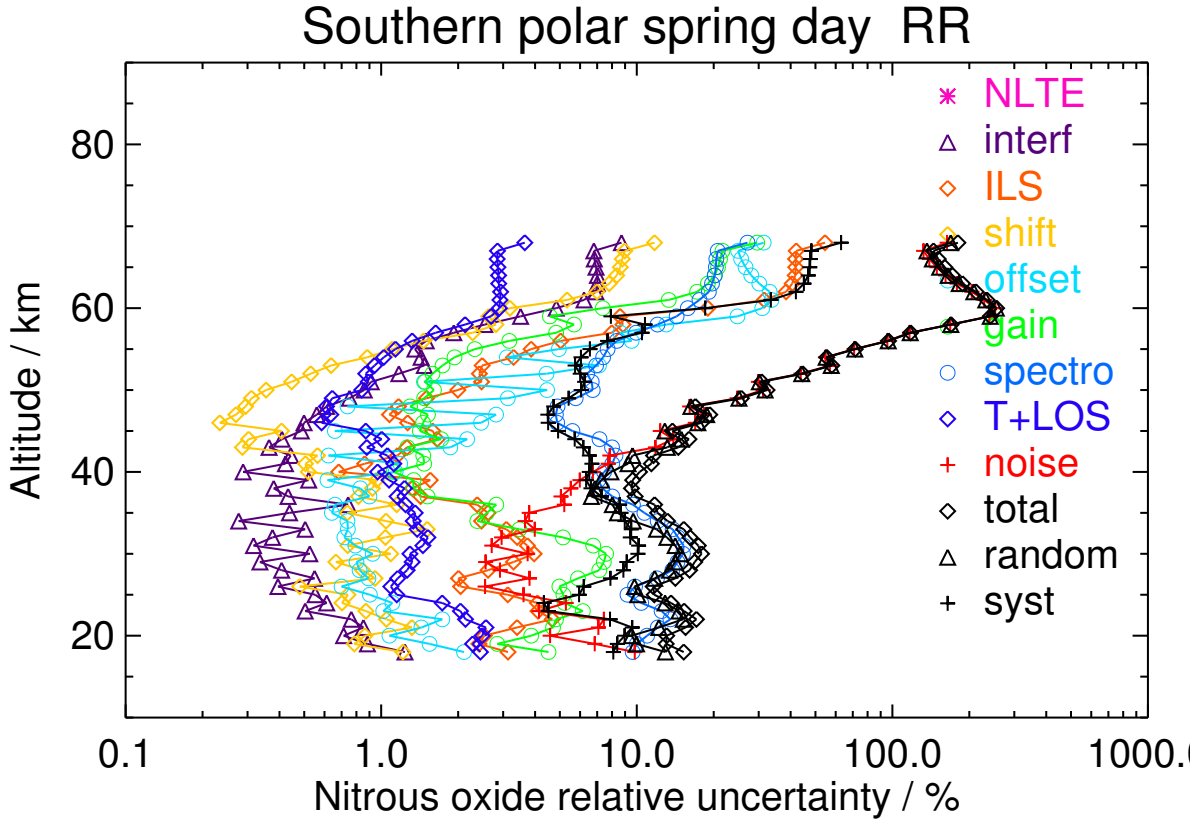

Figure S233. V8R_N2O_561 Southern polar spring day

Table S234. Nitrous oxide error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	66.450	<0.001	0.280	2.144	0.470	0.623	5.928	7.947	0.758	1.731	8.095	6.451	10.351
35	15.368	<0.001	0.080	0.622	0.137	0.124	0.522	2.419	0.279	0.662	2.026	1.721	2.658
40	5.624	<0.001	0.016	0.029	0.020	0.074	0.091	0.449	0.058	0.419	0.492	0.391	0.629
45	2.662	<0.001	0.012	0.042	0.009	0.018	0.049	0.154	0.021	0.333	0.347	0.139	0.374
50	1.793	<0.001	0.016	0.039	0.008	0.078	0.044	0.115	0.014	0.586	0.596	0.102	0.605
55	1.152	<0.001	0.015	0.047	0.013	0.067	0.039	0.095	0.013	0.855	0.861	0.088	0.866
60	0.791	<0.001	0.021	0.105	0.017	0.148	0.072	0.082	0.014	1.132	1.146	0.111	1.152
65	0.097	<0.001	0.047	0.350	0.069	0.250	0.245	0.207	0.027	1.363	1.409	0.412	1.468

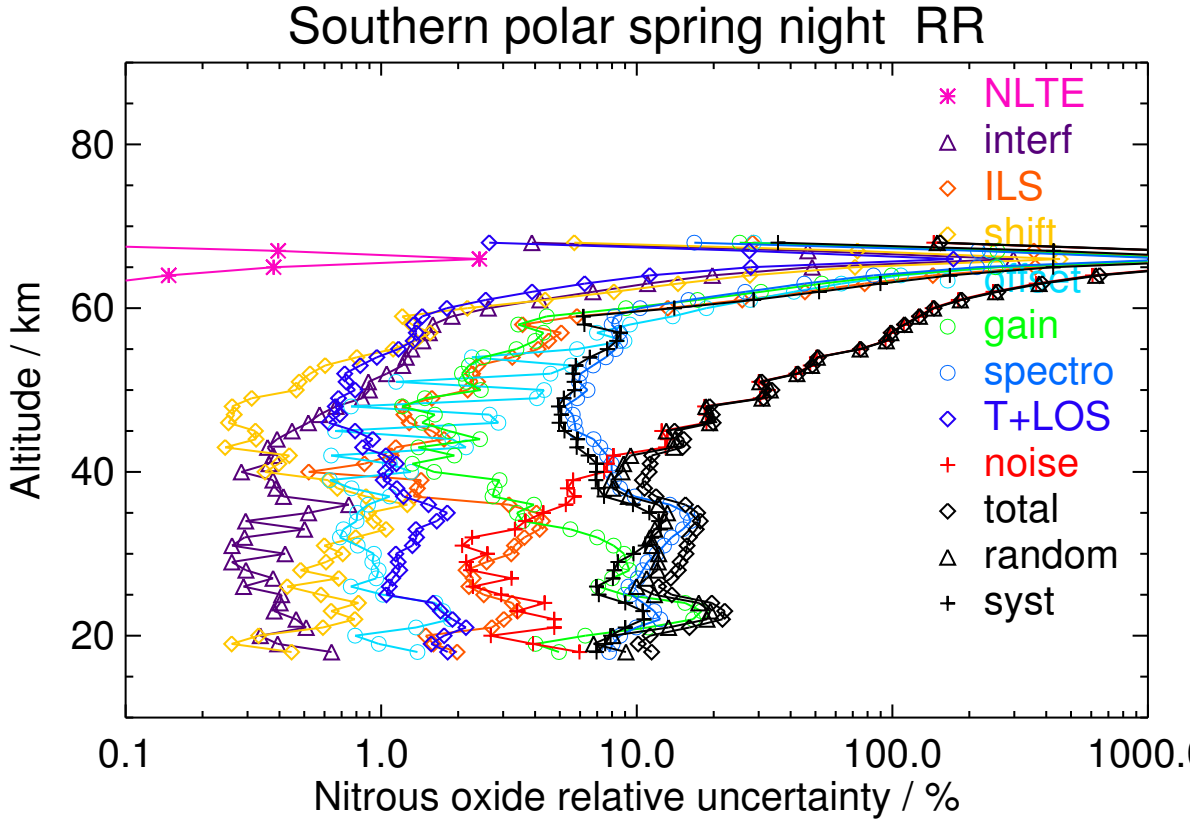

Figure S234. V8R_N2O_561 Southern polar spring night

Table S235. Nitrous oxide error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	73.175	<0.001	0.112	1.211	0.247	0.729	4.531	6.894	1.429	1.672	2.907	8.156	8.658
35	29.042	<0.001	0.087	0.636	0.316	0.217	0.885	2.480	0.469	0.865	1.191	2.654	2.909
40	7.541	<0.001	0.026	0.046	0.079	0.057	0.049	0.612	0.089	0.336	0.416	0.580	0.714
45	1.231	<0.001	0.009	0.037	0.007	0.027	0.026	0.111	0.028	0.263	0.273	0.105	0.292
50	0.111	<0.001	0.013	0.009	0.005	0.060	0.008	0.029	0.006	0.388	0.394	0.009	0.395
55	0.033	<0.001	0.013	0.009	0.004	0.071	0.007	0.026	0.007	0.609	0.614	0.012	0.614
60	0.303	<0.001	0.012	0.033	0.016	0.073	0.015	0.040	0.008	0.788	0.792	0.042	0.793
65	0.814	<0.001	0.036	0.153	0.032	0.183	0.079	0.085	0.013	1.091	1.109	0.182	1.124
70	0.430	<0.001	0.039	0.213	0.053	0.182	0.084	0.123	0.012	0.949	0.971	0.252	1.003

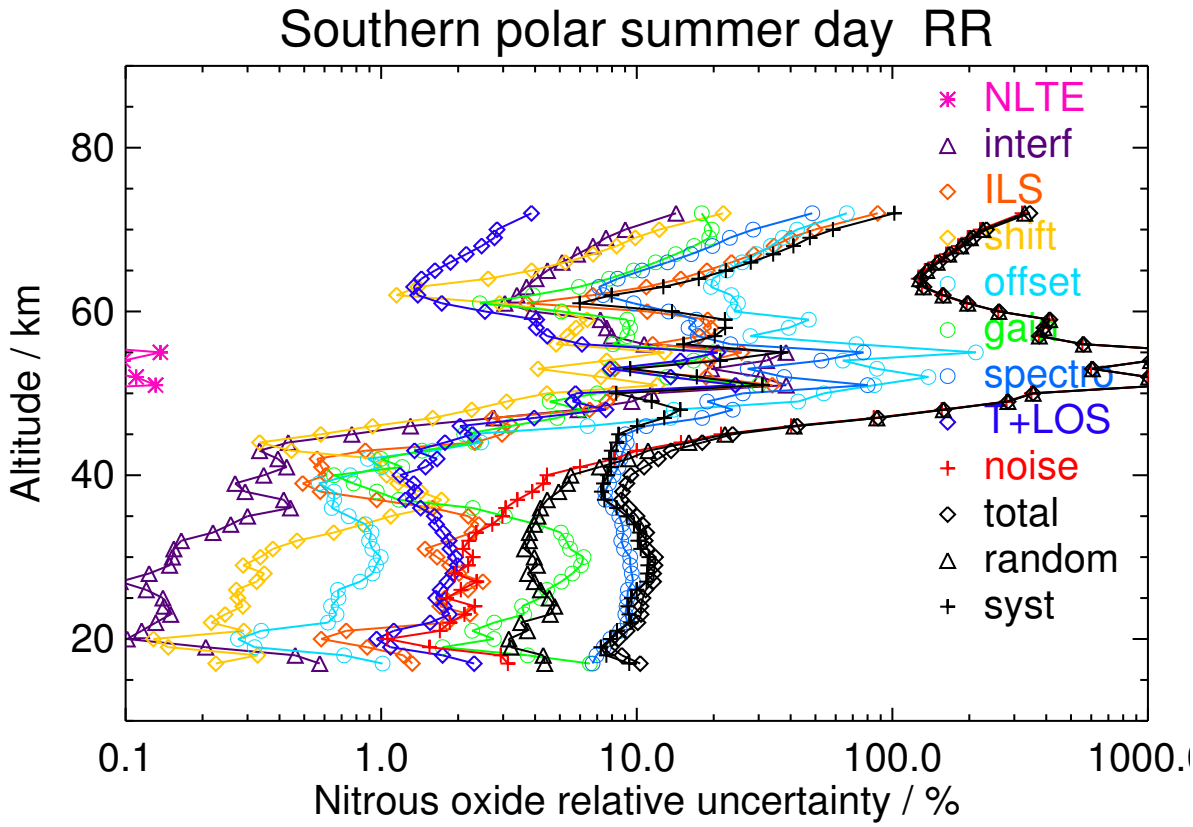

Figure S235. V8R_N2O_561 Southern polar summer day

Table S236. Nitrous oxide error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	56.428	<0.001	0.104	1.280	0.249	0.707	4.303	6.013	1.403	1.649	2.755	7.347	7.847
35	16.503	<0.001	0.091	0.506	0.122	0.145	0.337	1.827	0.307	0.751	0.909	1.893	2.100
40	2.281	<0.001	0.013	0.017	0.008	0.057	0.058	0.267	0.043	0.313	0.331	0.261	0.422
45	0.260	<0.001	0.009	0.013	0.004	0.026	0.020	0.036	0.010	0.287	0.291	0.020	0.292
50	0.037	<0.001	0.014	0.009	0.003	0.069	0.008	0.030	0.005	0.503	0.509	0.011	0.509
55	-0.042	<0.001	0.014	0.015	0.006	0.071	0.013	0.034	0.007	0.762	0.767	0.020	0.767
60	-0.101	<0.001	0.014	0.017	0.005	0.119	0.015	0.031	0.007	0.991	0.999	0.021	0.999
65	-0.398	<0.001	0.037	0.111	0.030	0.242	0.155	0.081	0.024	1.300	1.325	0.199	1.340
70	-0.124	<0.001	0.041	0.122	0.035	0.194	0.142	0.094	0.021	0.949	0.971	0.207	0.993

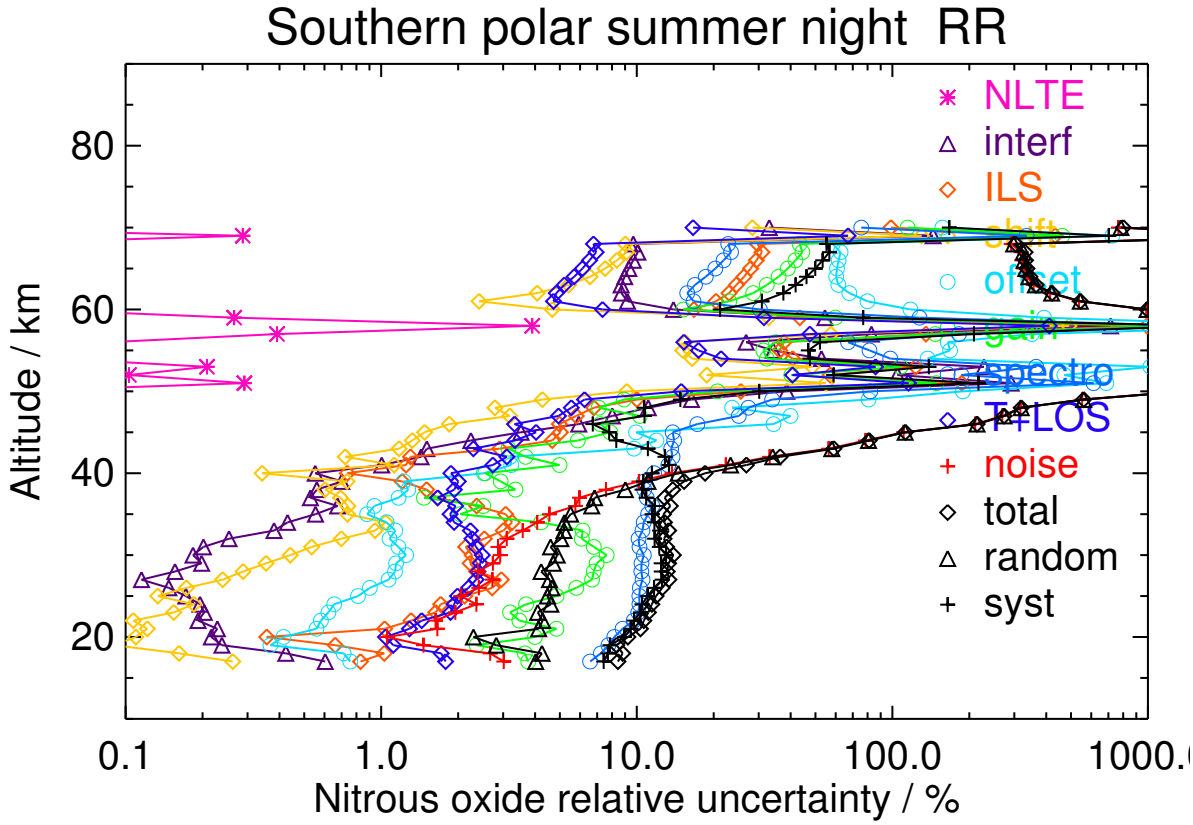

Figure S236. V8R_N2O_561 Southern polar summer night

Table S237. Nitrous oxide error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	32.446	<0.001	0.094	1.167	0.108	0.266	1.898	5.817	0.895	1.661	3.094	5.734	6.516
35	3.729	<0.001	0.022	0.196	0.018	0.134	0.266	0.871	0.142	0.761	0.995	0.704	1.219
40	0.042	<0.001	0.008	0.010	0.004	0.084	0.037	0.044	0.011	0.571	0.579	0.023	0.580
45	0.035	<0.001	0.012	0.010	0.003	0.029	0.011	0.047	0.007	0.540	0.543	0.011	0.543
50	1.046	<0.001	0.018	0.014	0.007	0.099	0.038	0.071	0.013	0.865	0.873	0.047	0.875
55	0.709	<0.001	0.016	0.025	0.011	0.059	0.052	0.068	0.015	0.970	0.974	0.066	0.976
60	0.333	<0.001	0.013	0.012	0.011	0.216	0.045	0.048	0.014	1.377	1.395	0.047	1.396
65	0.046	<0.001	0.012	0.022	0.006	0.283	0.062	0.033	0.014	1.424	1.454	0.040	1.454

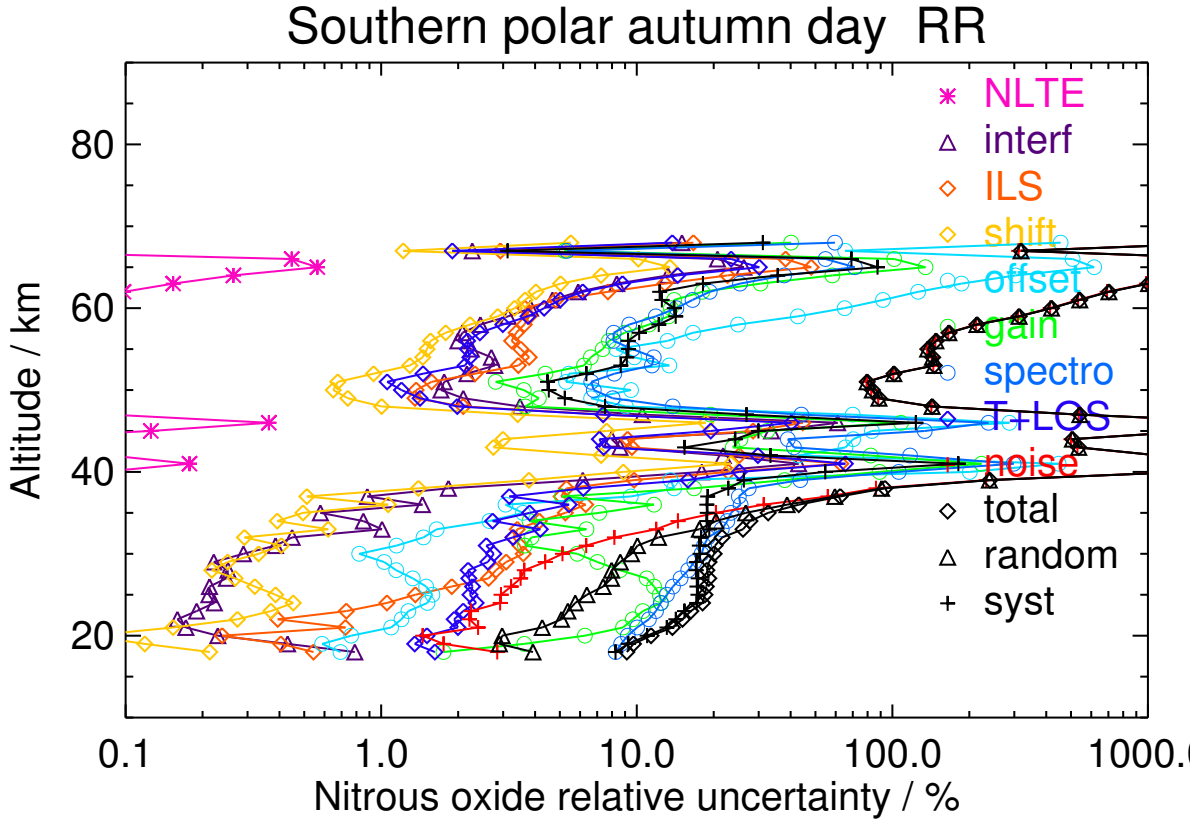

Figure S237. V8R_N2O_561 Southern polar autumn day

Table S238. Nitrous oxide error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
30	24.587	<0.001	0.117	0.914	0.122	0.280	1.265	4.600	0.840	1.647	2.773	4.408	5.208
35	1.919	<0.001	0.023	0.159	0.018	0.118	0.256	0.624	0.118	0.686	0.876	0.462	0.990
40	0.180	<0.001	0.008	0.010	0.003	0.085	0.027	0.058	0.011	0.595	0.604	0.027	0.604
45	0.184	<0.001	0.012	0.010	0.003	0.029	0.016	0.049	0.008	0.555	0.558	0.018	0.558
50	0.686	<0.001	0.018	0.014	0.006	0.096	0.030	0.057	0.011	0.866	0.873	0.036	0.874
55	0.940	<0.001	0.016	0.017	0.010	0.061	0.045	0.062	0.016	0.994	0.998	0.056	0.999
60	0.600	<0.001	0.013	0.012	0.008	0.212	0.033	0.058	0.014	1.361	1.378	0.040	1.379
65	0.058	<0.001	0.013	0.019	0.005	0.283	0.088	0.041	0.021	1.427	1.457	0.074	1.459

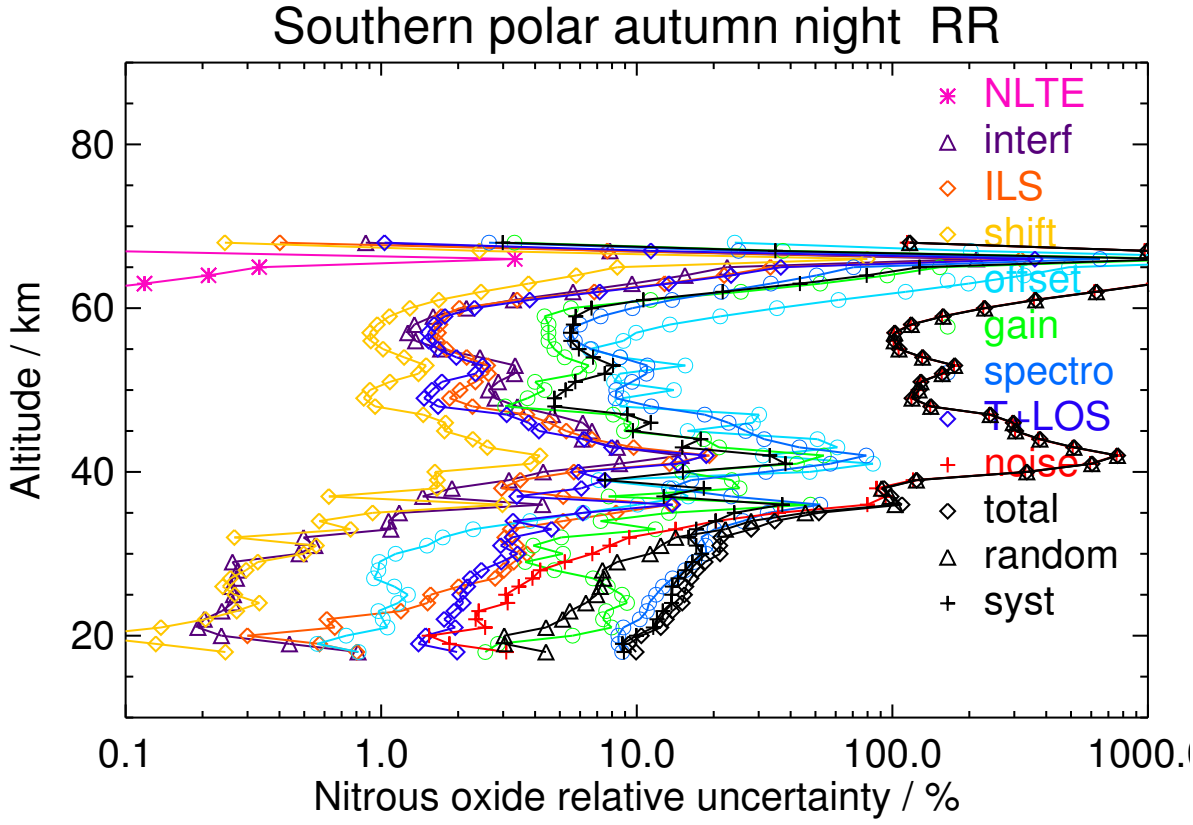

Figure S238. V8R_N2O_561 Southern polar autumn night

S9 Nitrous oxide error contribution profile plots and tabulated values for RR UA data (V8R_N2O_662)

Table S239. Nitrous oxide error budget for Northern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	6.874	<0.001	0.024	0.152	0.011	0.145	0.154	0.686	0.109	1.180	1.202	0.706	1.394
45	1.744	<0.001	0.015	0.049	0.005	0.063	0.033	0.213	0.037	0.529	0.541	0.204	0.578
50	0.522	<0.001	0.007	0.012	0.003	0.054	0.008	0.047	0.008	0.353	0.358	0.046	0.361
55	0.761	<0.001	0.010	0.011	0.005	0.120	0.012	0.043	0.007	0.708	0.719	0.040	0.720
60	2.526	<0.001	0.020	0.032	0.009	0.451	0.046	0.132	0.037	2.477	2.519	0.123	2.522
65	5.001	<0.001	0.026	0.083	0.012	1.169	0.104	0.292	0.111	6.005	6.121	0.286	6.128
70	5.085	<0.001	0.023	0.090	0.011	1.459	0.107	0.294	0.116	7.207	7.356	0.280	7.361
74	4.619	<0.001	0.015	0.058	0.009	1.361	0.067	0.188	0.107	6.308	6.454	0.208	6.458

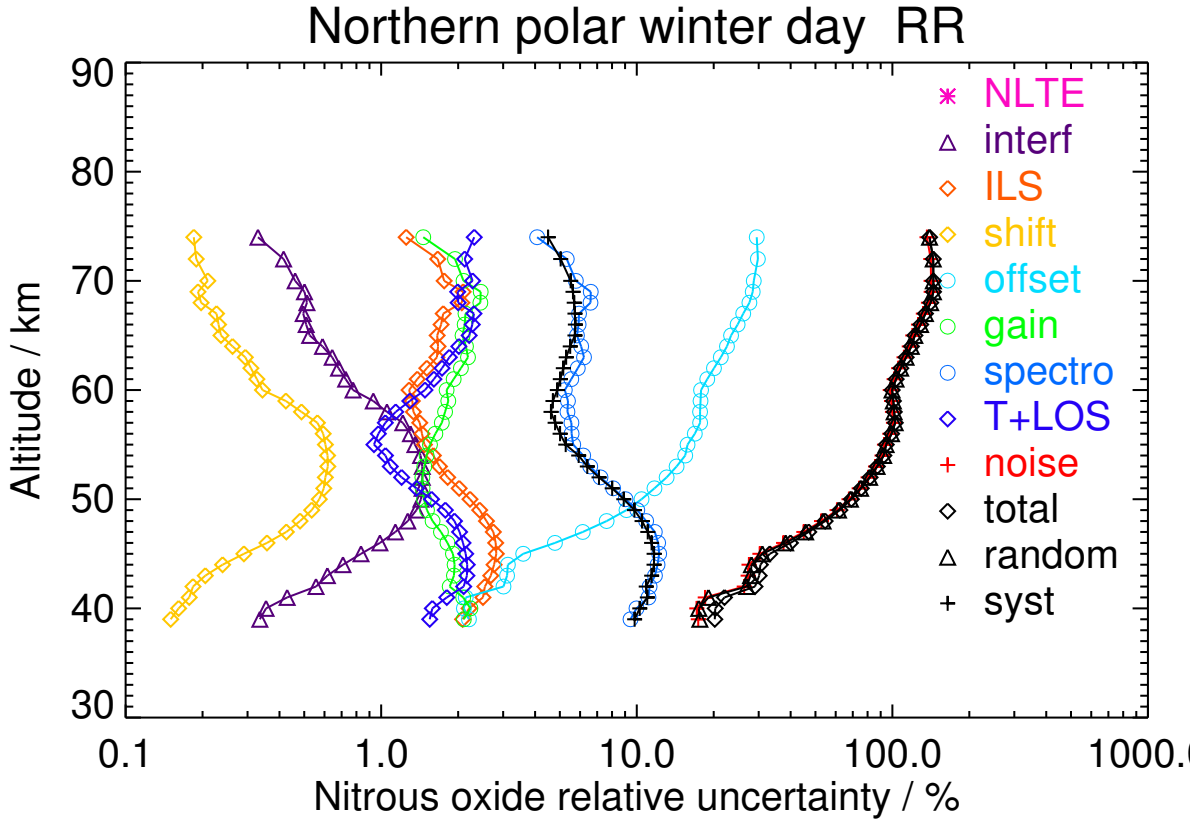

Figure S239. V8R_N2O_662 Northern polar winter day

Table S240. Nitrous oxide error budget for Northern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.313	<0.001	0.007	0.004	0.003	0.020	0.002	0.013	0.003	0.179	0.180	0.011	0.181
50	0.266	<0.001	0.008	0.004	0.004	0.030	0.003	0.012	0.002	0.198	0.201	0.011	0.201
55	0.374	<0.001	0.009	0.005	0.006	0.058	0.004	0.017	0.002	0.331	0.337	0.015	0.337
60	0.909	<0.001	0.013	0.010	0.009	0.141	0.007	0.049	0.007	0.816	0.829	0.036	0.830
65	6.779	<0.001	0.020	0.112	0.012	0.547	0.099	0.313	0.087	3.448	3.503	0.215	3.510
70	7.663	<0.001	0.017	0.076	0.010	0.687	0.075	0.216	0.116	5.079	5.129	0.195	5.132
74	25.061	0.001	0.035	0.243	0.048	2.873	0.237	0.728	0.654	21.410	21.612	0.802	21.627

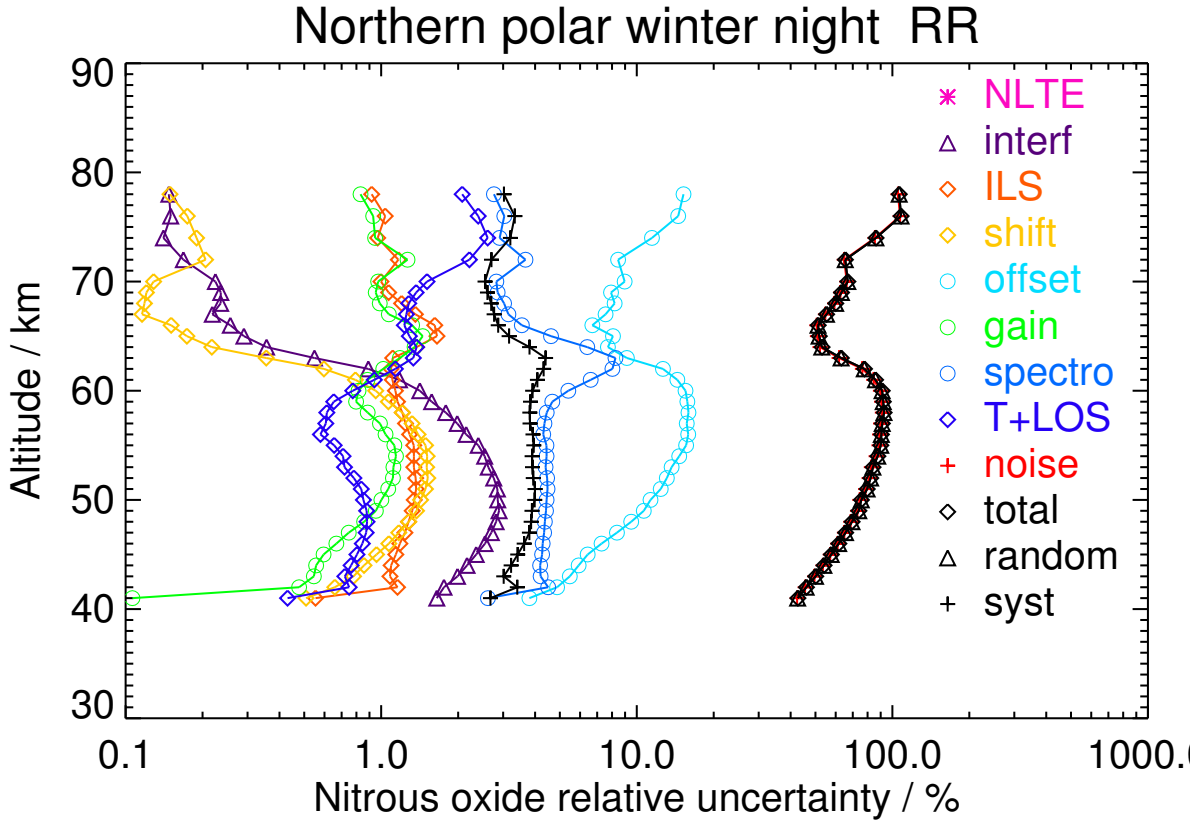

Figure S240. V8R_N2O_662 Northern polar winter night

Table S241. Nitrous oxide error budget for Northern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.845	<0.001	0.007	0.030	0.005	0.013	0.027	0.105	0.009	0.152	0.180	0.058	0.190
50	0.517	<0.001	0.008	0.010	0.004	0.018	0.007	0.037	0.003	0.175	0.179	0.023	0.180
55	0.319	<0.001	0.007	0.005	0.004	0.033	0.003	0.020	0.003	0.224	0.227	0.015	0.228
60	0.511	<0.001	0.009	0.004	0.006	0.073	0.004	0.026	0.003	0.439	0.445	0.018	0.446
65	1.366	<0.001	0.017	0.019	0.013	0.274	0.013	0.062	0.013	1.554	1.578	0.053	1.579
70	2.341	<0.001	0.024	0.059	0.020	0.564	0.022	0.087	0.029	3.014	3.067	0.103	3.069

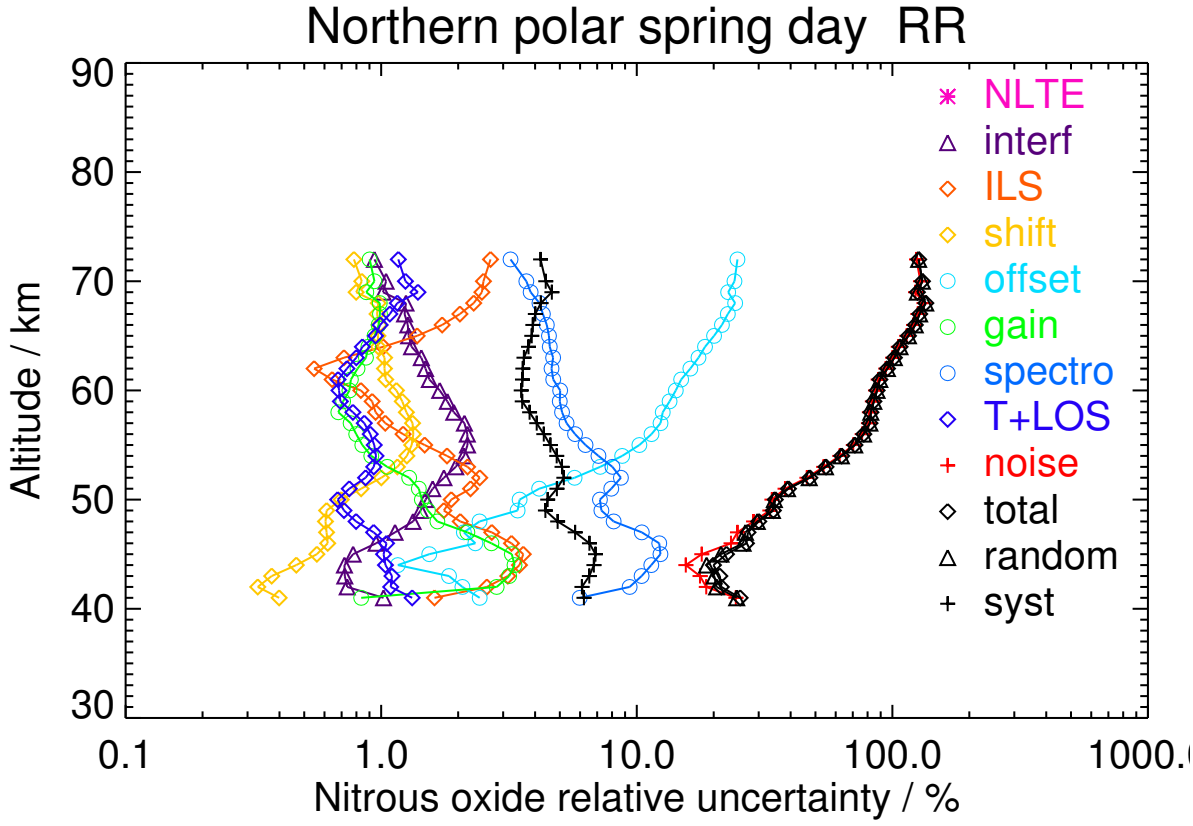

Figure S241. V8R_N2O_662 Northern polar spring day

Table S242. Nitrous oxide error budget for Northern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	3.346	<0.001	0.010	0.065	0.006	0.040	0.064	0.300	0.045	0.317	0.323	0.313	0.450
45	1.192	<0.001	0.009	0.037	0.006	0.021	0.023	0.128	0.016	0.225	0.240	0.108	0.264
50	0.781	<0.001	0.008	0.016	0.004	0.021	0.017	0.068	0.006	0.209	0.219	0.037	0.222
55	0.526	<0.001	0.008	0.013	0.005	0.041	0.006	0.046	0.005	0.307	0.312	0.030	0.314
60	0.480	<0.001	0.007	0.003	0.005	0.073	0.004	0.026	0.004	0.463	0.469	0.020	0.469
65	0.750	<0.001	0.014	0.009	0.008	0.199	0.006	0.031	0.005	1.137	1.155	0.026	1.155

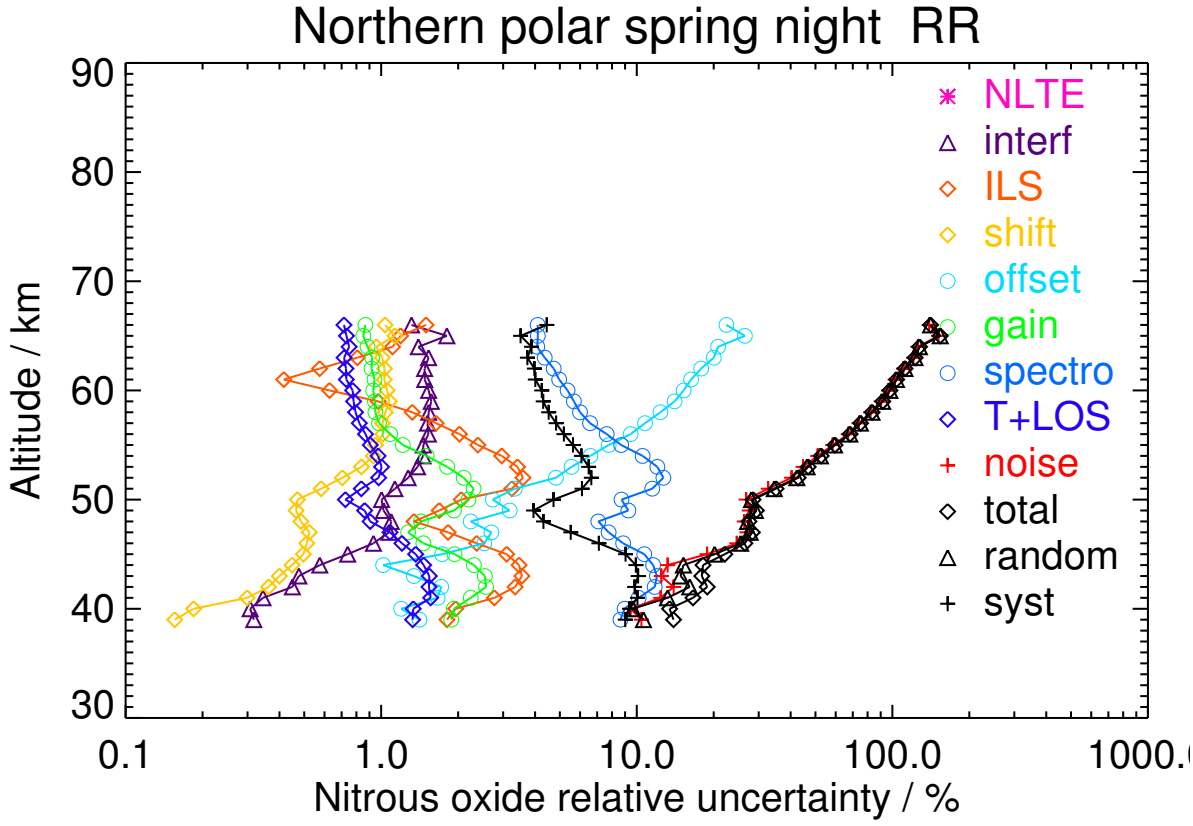

Figure S242. V8R_N2O_662 Northern polar spring night

Table S243. Nitrous oxide error budget for Northern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.568	<0.001	0.005	0.010	0.003	0.010	0.007	0.044	0.008	0.111	0.112	0.044	0.120
50	0.128	<0.001	0.004	0.002	0.002	0.010	0.002	0.007	0.002	0.073	0.074	0.008	0.074
55	0.112	<0.001	0.004	0.001	0.002	0.015	0.003	0.005	0.002	0.095	0.097	0.005	0.097
60	0.190	<0.001	0.006	0.002	0.003	0.037	0.004	0.007	0.003	0.217	0.220	0.008	0.221
65	0.505	<0.001	0.013	0.015	0.008	0.125	0.006	0.017	0.006	0.701	0.712	0.023	0.712
70	1.168	<0.001	0.027	0.044	0.016	0.339	0.009	0.038	0.013	1.809	1.841	0.059	1.842

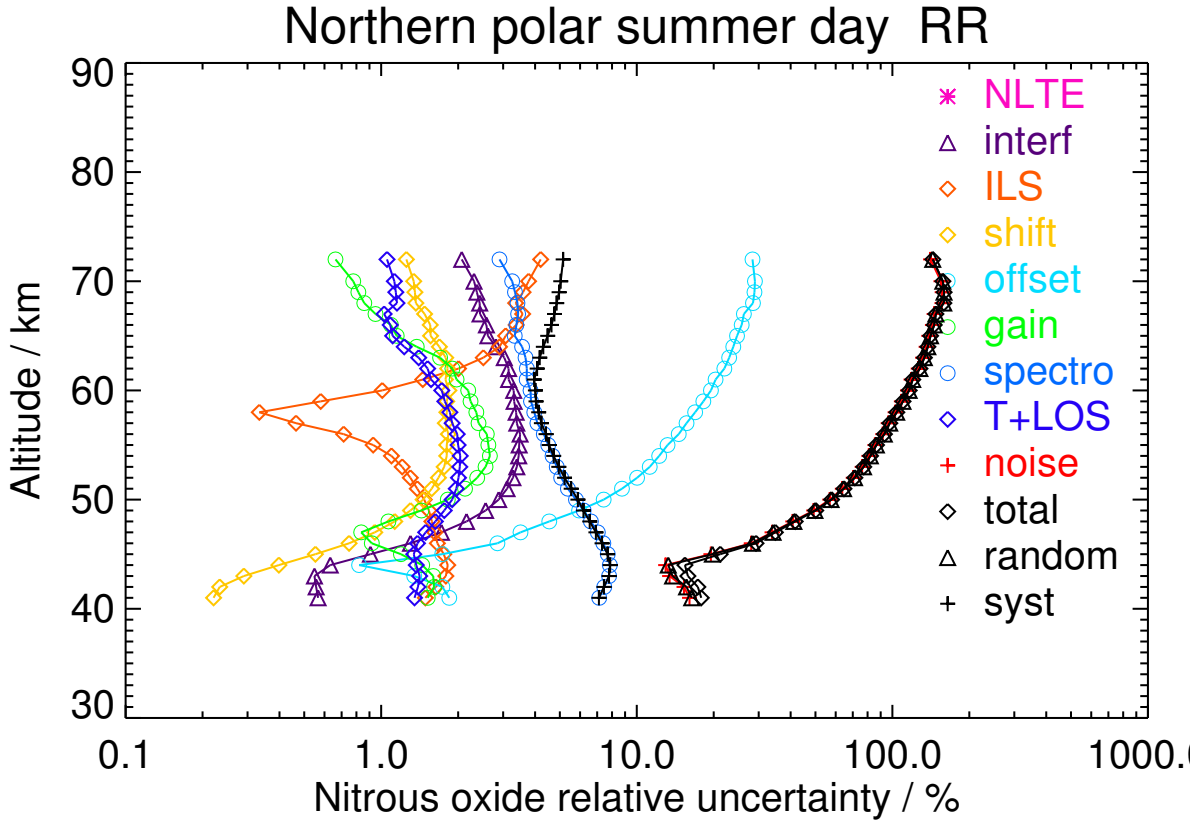

Figure S243. V8R_N2O_662 Northern polar summer day

Table S244. Nitrous oxide error budget for Northern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.408	<0.001	0.005	0.008	0.002	0.008	0.004	0.034	0.005	0.104	0.106	0.030	0.110
50	0.201	<0.001	0.005	0.003	0.002	0.011	0.002	0.010	0.002	0.104	0.105	0.009	0.105
55	0.374	<0.001	0.008	0.005	0.004	0.029	0.004	0.020	0.003	0.216	0.218	0.013	0.219
60	0.599	<0.001	0.011	0.003	0.007	0.075	0.004	0.027	0.004	0.467	0.473	0.021	0.474
65	1.574	<0.001	0.021	0.023	0.015	0.268	0.022	0.094	0.023	1.577	1.601	0.068	1.603
70	6.160	<0.001	0.058	0.132	0.046	1.364	0.096	0.328	0.173	7.716	7.839	0.340	7.846
74	6.269	<0.001	0.037	0.149	0.034	1.451	0.097	0.269	0.190	7.800	7.936	0.322	7.943

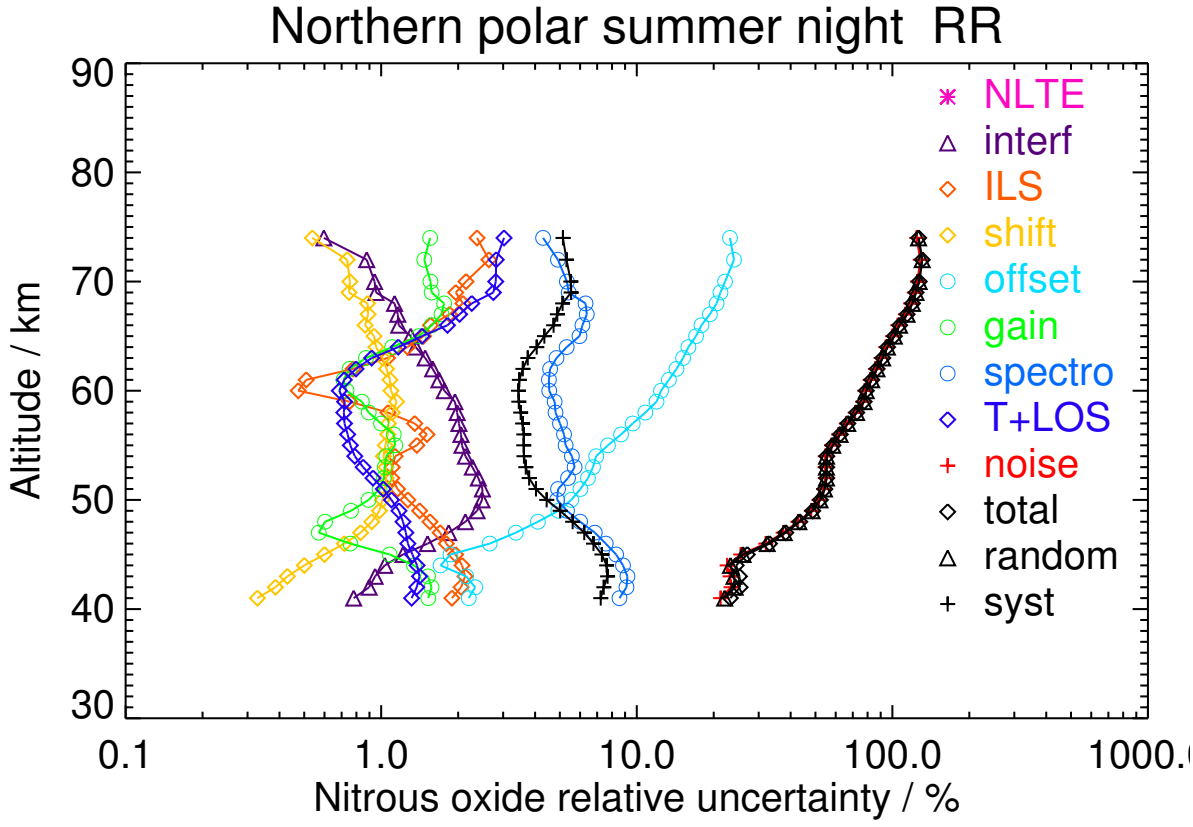

Figure S244. V8R_N2O_662 Northern polar summer night

Table S245. Nitrous oxide error budget for Northern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.274	<0.001	0.006	0.002	0.002	0.015	0.002	0.010	0.002	0.147	0.148	0.008	0.149
50	0.299	<0.001	0.008	0.004	0.004	0.029	0.003	0.015	0.002	0.196	0.198	0.012	0.199
55	0.339	<0.001	0.009	0.004	0.006	0.055	0.003	0.016	0.002	0.317	0.322	0.014	0.322
60	0.480	<0.001	0.011	0.004	0.007	0.103	0.003	0.020	0.003	0.559	0.569	0.018	0.569
65	1.148	<0.001	0.019	0.005	0.014	0.309	0.008	0.047	0.008	1.640	1.669	0.043	1.670
70	1.520	<0.001	0.018	0.002	0.014	0.426	0.011	0.052	0.011	2.179	2.220	0.053	2.221

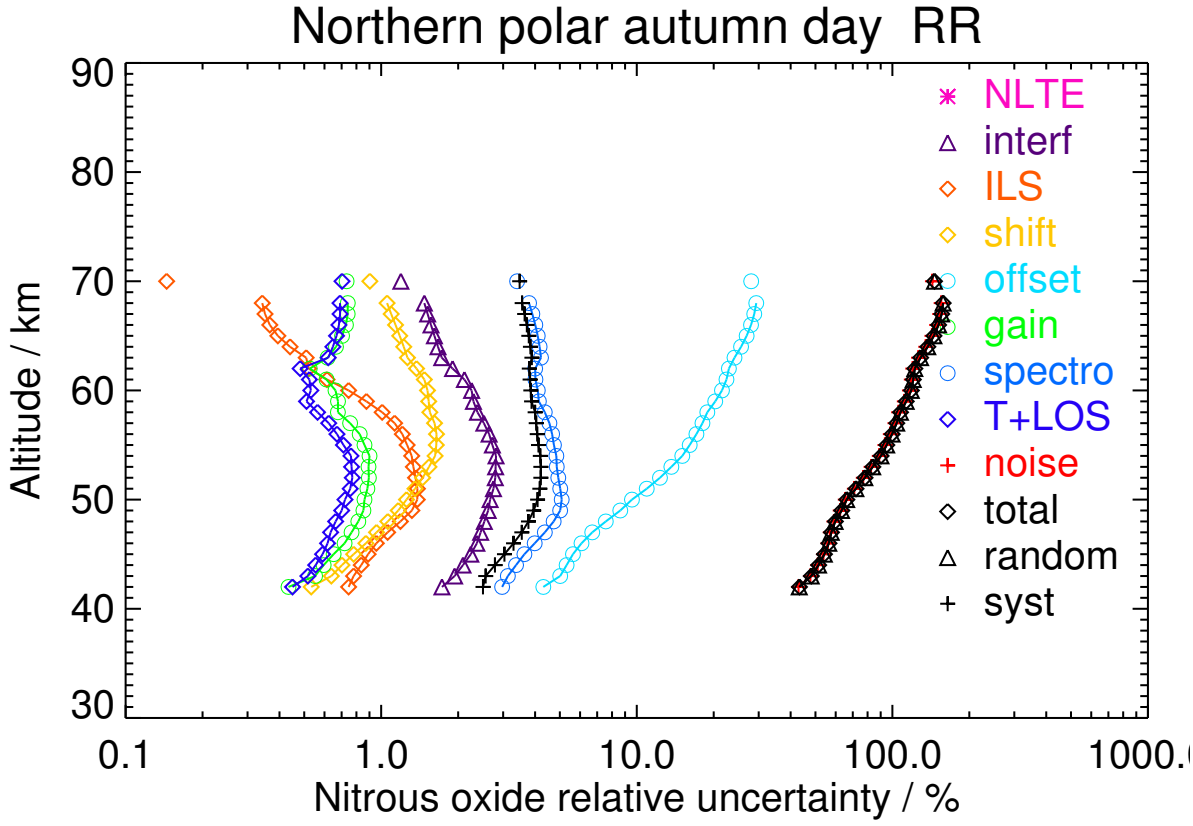

Figure S245. V8R_N2O_662 Northern polar autumn day

Table S246. Nitrous oxide error budget for Northern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.854	<0.001	0.010	0.038	0.005	0.022	0.032	0.125	0.007	0.266	0.295	0.052	0.299
50	0.644	<0.001	0.011	0.011	0.005	0.037	0.007	0.043	0.004	0.316	0.321	0.030	0.322
55	0.576	<0.001	0.010	0.008	0.006	0.064	0.004	0.028	0.003	0.419	0.425	0.025	0.425
60	0.850	<0.001	0.010	0.009	0.007	0.126	0.008	0.038	0.004	0.759	0.769	0.034	0.770
65	1.294	<0.001	0.012	0.012	0.008	0.253	0.016	0.055	0.010	1.477	1.499	0.049	1.500
70	3.669	<0.001	0.025	0.041	0.009	0.810	0.060	0.184	0.046	4.796	4.866	0.155	4.868
74	4.125	<0.001	0.022	0.028	0.007	0.955	0.051	0.146	0.054	4.925	5.017	0.157	5.020

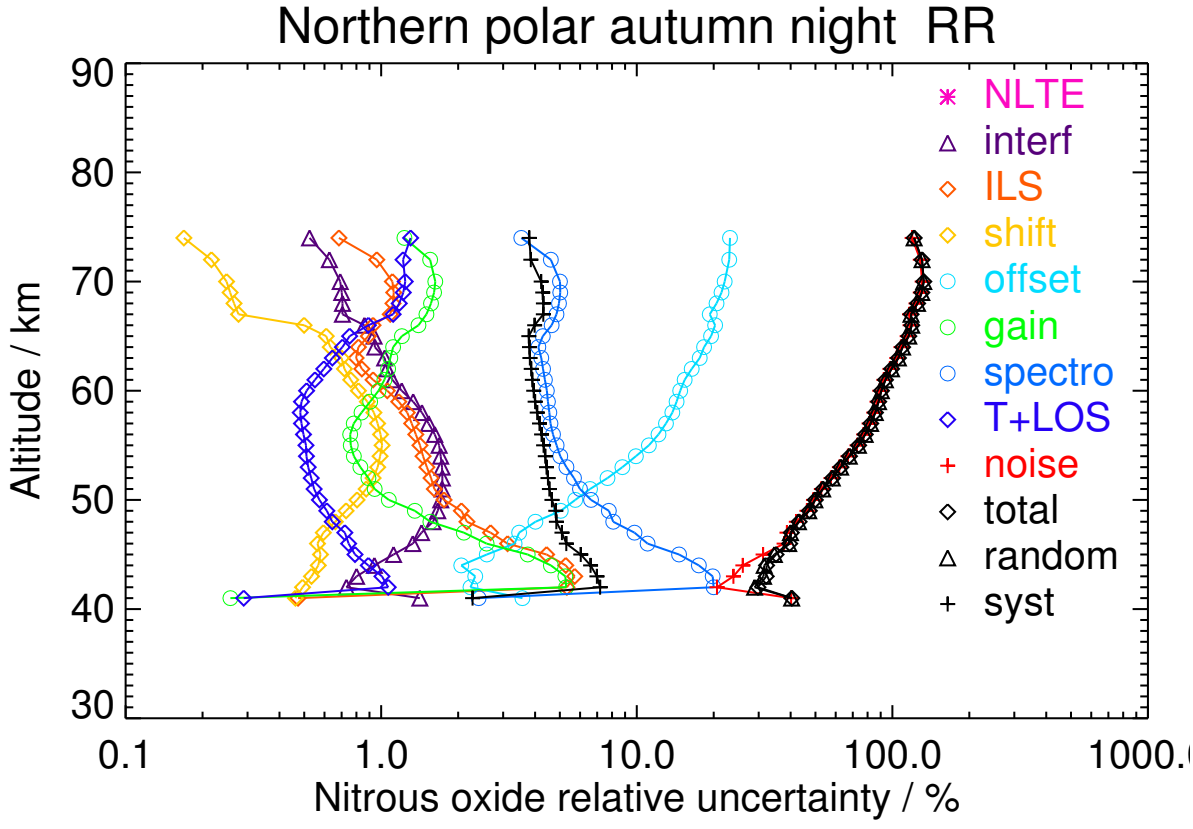

Figure S246. V8R_N2O_662 Northern polar autumn night

Table S247. Nitrous oxide error budget for Northern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	9.945	<0.001	0.032	0.174	0.015	0.134	0.266	0.591	0.105	0.831	0.892	0.613	1.083
45	3.548	<0.001	0.015	0.094	0.012	0.039	0.089	0.365	0.045	0.435	0.481	0.335	0.586
50	0.743	<0.001	0.009	0.021	0.004	0.033	0.013	0.089	0.009	0.277	0.286	0.066	0.294
55	0.408	<0.001	0.007	0.006	0.004	0.047	0.003	0.032	0.004	0.305	0.310	0.025	0.311
60	0.543	<0.001	0.009	0.012	0.006	0.101	0.002	0.030	0.004	0.588	0.597	0.026	0.598
65	1.536	<0.001	0.029	0.077	0.009	0.410	0.017	0.067	0.021	2.254	2.291	0.103	2.294
70	2.684	0.001	0.054	0.189	0.009	0.828	0.044	0.107	0.043	4.234	4.315	0.222	4.320

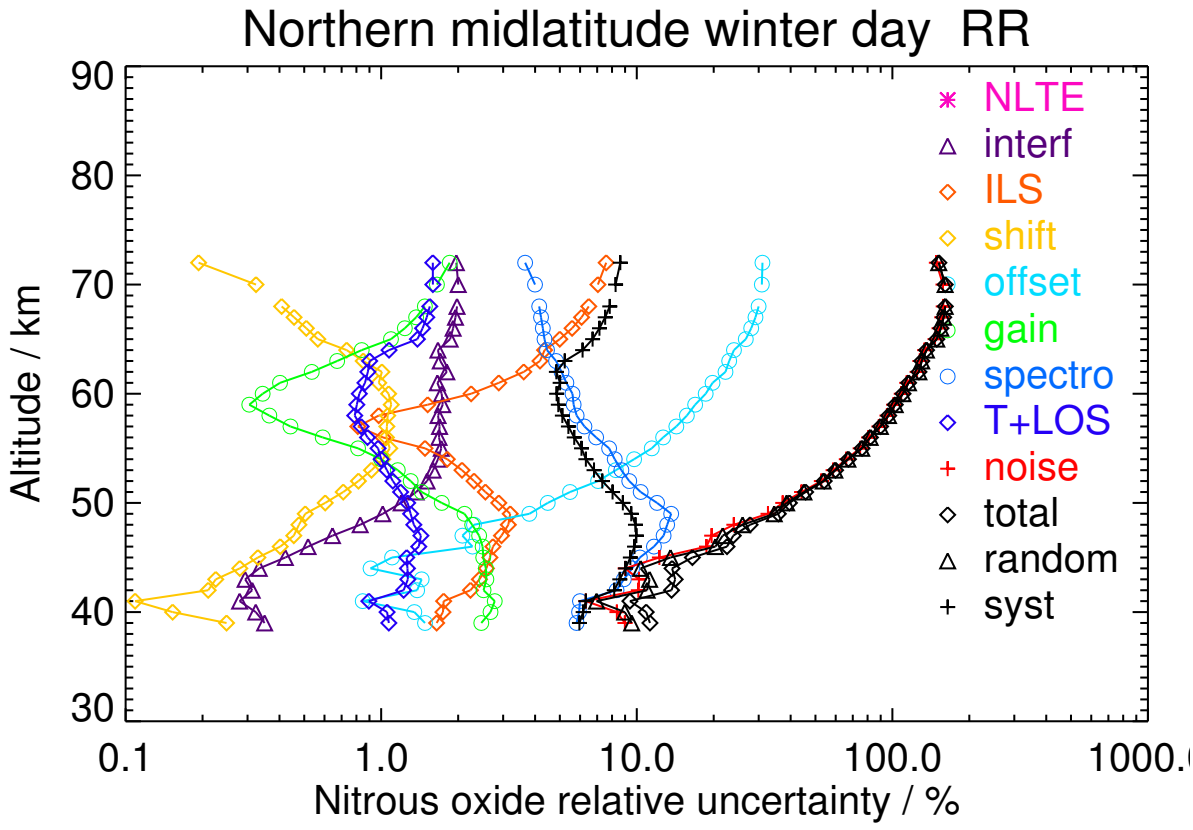

Figure S247. V8R_N2O_662 Northern midlatitude winter day

Table S248. Nitrous oxide error budget for Northern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	8.913	<0.001	0.032	0.195	0.017	0.155	0.241	0.799	0.107	1.020	1.110	0.761	1.346
45	3.619	<0.001	0.014	0.110	0.012	0.050	0.121	0.411	0.039	0.470	0.557	0.333	0.648
50	0.936	<0.001	0.010	0.035	0.005	0.039	0.022	0.140	0.013	0.324	0.345	0.094	0.358
55	0.470	<0.001	0.009	0.008	0.005	0.060	0.003	0.037	0.005	0.380	0.386	0.030	0.387
60	0.750	<0.001	0.012	0.008	0.008	0.138	0.006	0.034	0.005	0.771	0.784	0.028	0.784
65	1.807	<0.001	0.019	0.018	0.012	0.418	0.025	0.092	0.023	2.256	2.295	0.074	2.296
70	2.620	<0.001	0.028	0.030	0.016	0.813	0.033	0.125	0.037	4.102	4.183	0.099	4.184
74	3.498	<0.001	0.028	0.024	0.015	1.084	0.034	0.127	0.047	4.961	5.079	0.113	5.080

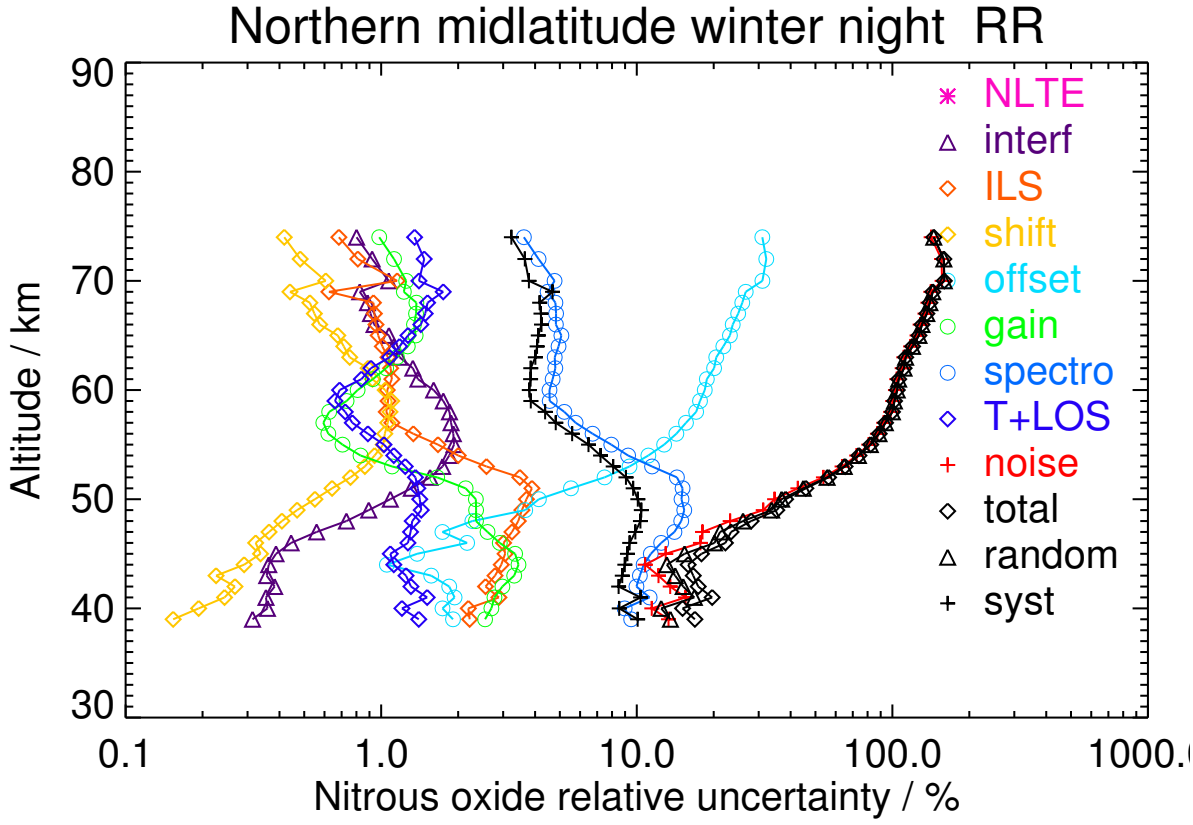

Figure S248. V8R_N2O_662 Northern midlatitude winter night

Table S249. Nitrous oxide error budget for Northern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	2.994	<0.001	0.011	0.098	0.014	0.034	0.105	0.324	0.025	0.297	0.408	0.224	0.465
50	1.380	<0.001	0.011	0.033	0.005	0.024	0.027	0.123	0.011	0.300	0.317	0.087	0.329
55	0.596	<0.001	0.009	0.011	0.005	0.044	0.006	0.048	0.006	0.336	0.341	0.036	0.343
60	0.525	<0.001	0.008	0.004	0.006	0.078	0.003	0.028	0.004	0.495	0.502	0.023	0.502
65	0.907	<0.001	0.013	0.025	0.010	0.203	0.006	0.035	0.007	1.153	1.171	0.037	1.172
70	1.425	<0.001	0.026	0.043	0.022	0.451	0.008	0.046	0.014	2.319	2.363	0.063	2.364

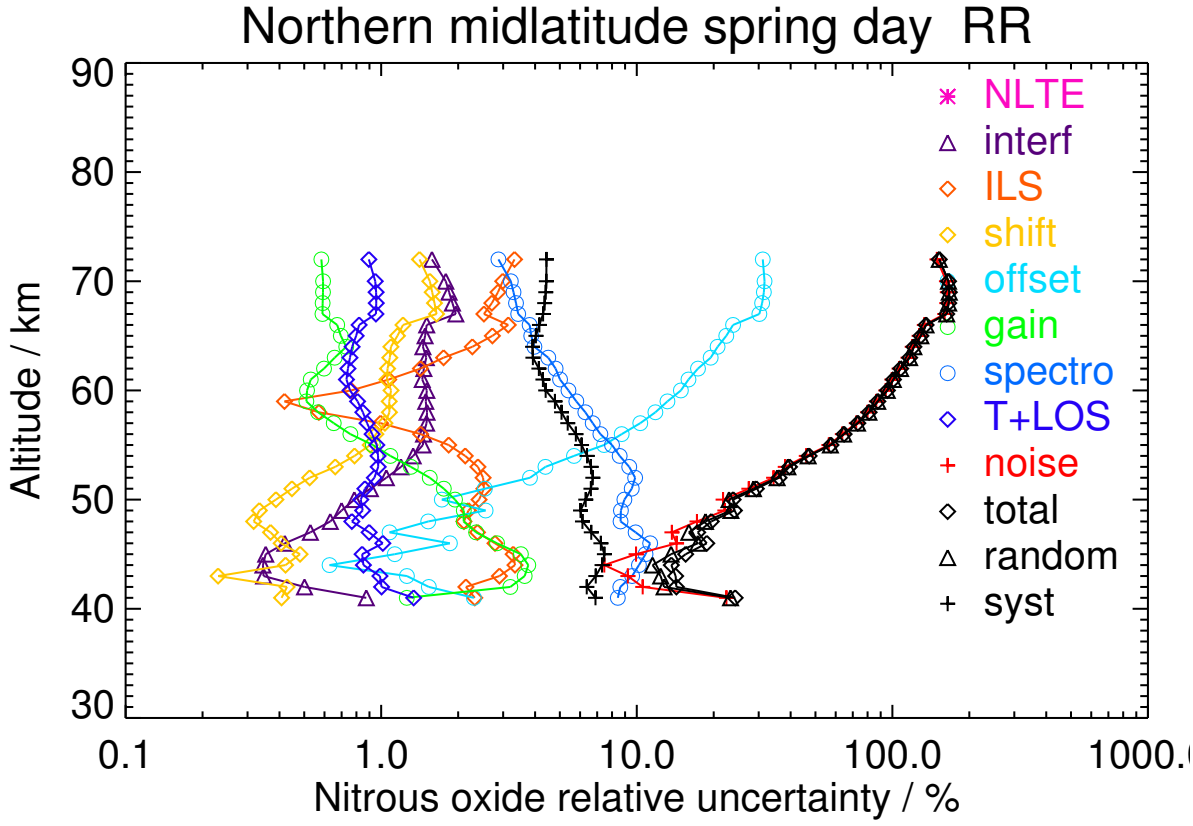

Figure S249. V8R_N2O_662 Northern midlatitude spring day

Table S250. Nitrous oxide error budget for Northern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	12.832	<0.001	0.039	0.264	0.014	0.145	0.372	0.970	0.141	0.883	0.909	1.070	1.404
45	3.535	<0.001	0.011	0.093	0.014	0.034	0.096	0.298	0.027	0.312	0.386	0.239	0.454
50	2.021	<0.001	0.013	0.039	0.006	0.029	0.034	0.150	0.014	0.368	0.385	0.116	0.402
55	1.027	<0.001	0.011	0.016	0.006	0.051	0.010	0.070	0.009	0.457	0.462	0.060	0.465
60	0.677	<0.001	0.008	0.004	0.006	0.079	0.005	0.039	0.006	0.535	0.541	0.033	0.542
65	1.701	<0.001	0.019	0.068	0.014	0.306	0.015	0.076	0.022	1.914	1.940	0.085	1.942
70	3.226	<0.001	0.043	0.325	0.039	0.790	0.026	0.132	0.062	4.411	4.489	0.254	4.496
74	7.133	0.002	0.100	0.806	0.096	2.003	0.050	0.243	0.166	9.785	9.990	0.843	10.026

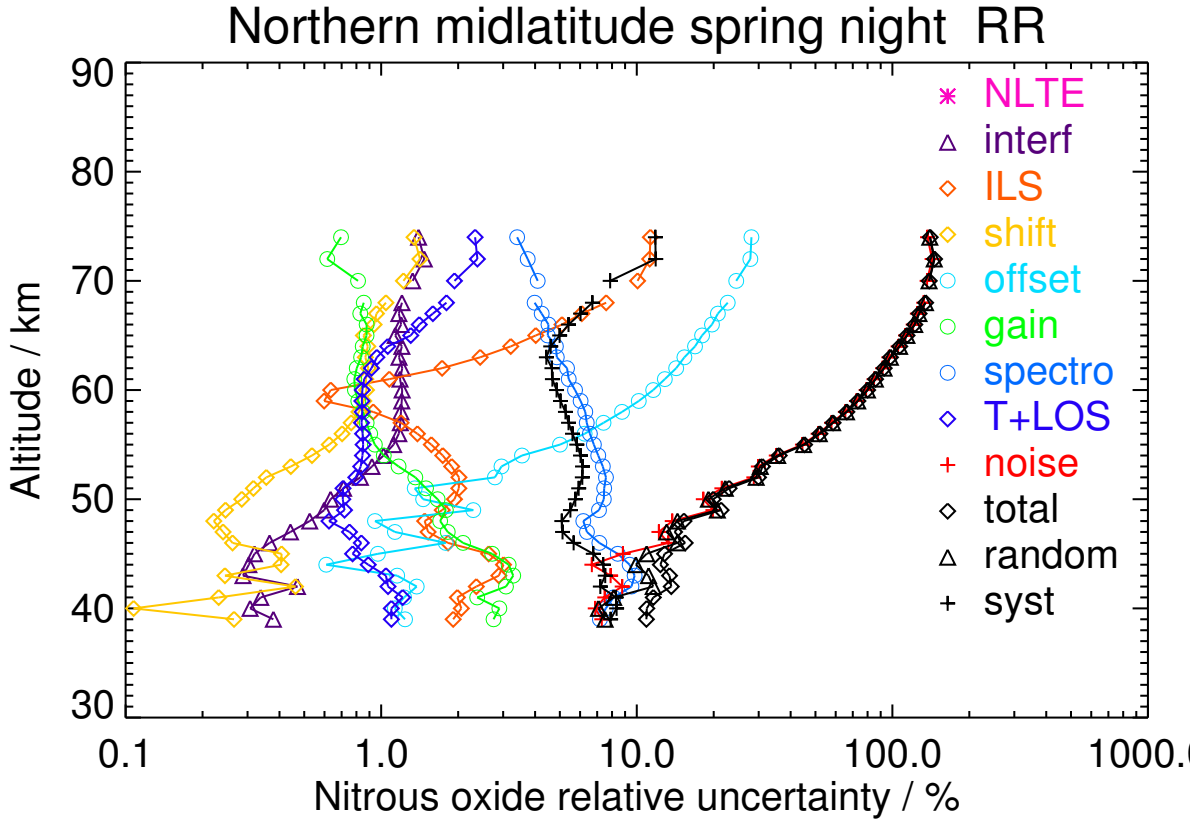

Figure S250. V8R_N2O_662 Northern midlatitude spring night

Table S251. Nitrous oxide error budget for Northern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	2.181	<0.001	0.009	0.057	0.009	0.024	0.056	0.211	0.019	0.253	0.303	0.157	0.341
50	1.024	<0.001	0.010	0.020	0.004	0.019	0.015	0.074	0.007	0.268	0.275	0.053	0.280
55	1.185	<0.001	0.013	0.016	0.006	0.046	0.013	0.064	0.007	0.449	0.454	0.048	0.456
60	1.031	<0.001	0.011	0.009	0.009	0.103	0.008	0.059	0.008	0.715	0.724	0.046	0.725
65	1.553	<0.001	0.018	0.075	0.015	0.266	0.010	0.072	0.018	1.684	1.706	0.088	1.709

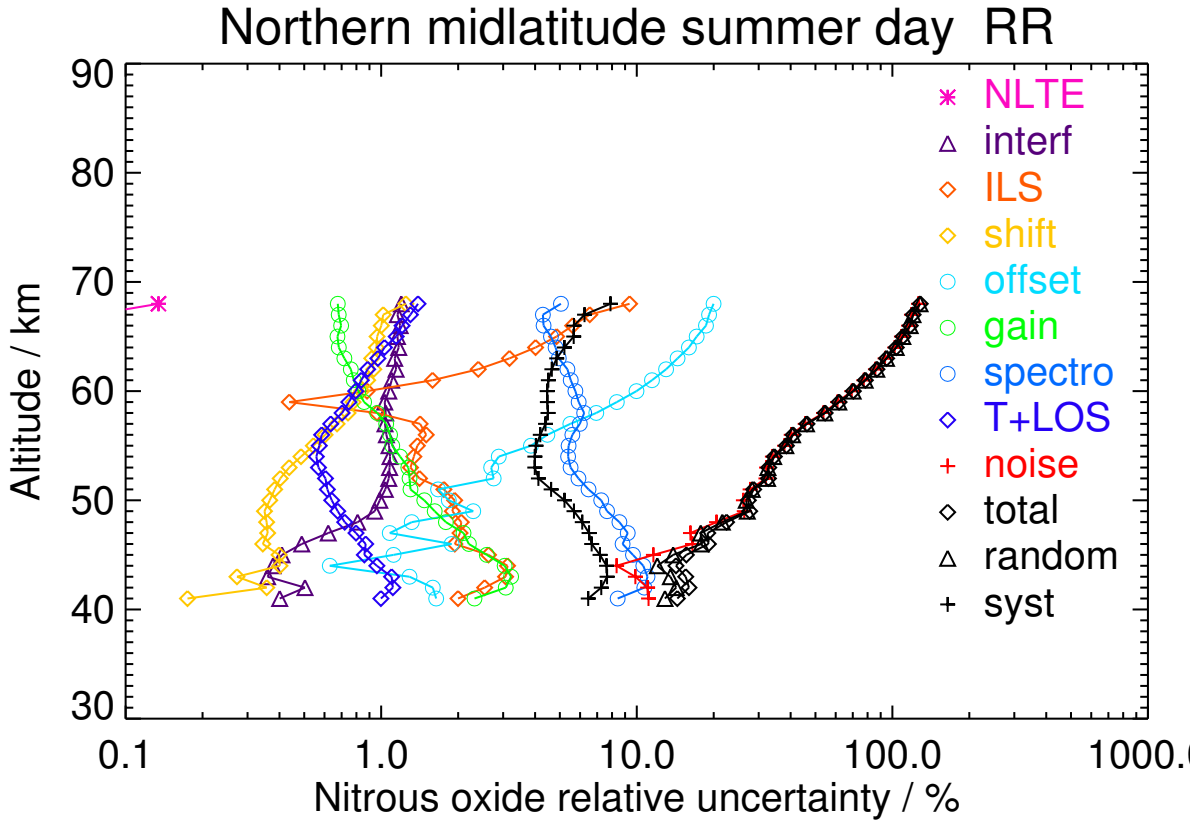

Figure S251. V8R_N2O_662 Northern midlatitude summer day

Table S252. Nitrous oxide error budget for Northern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	2.045	<0.001	0.008	0.040	0.005	0.025	0.057	0.143	0.014	0.228	0.256	0.113	0.280
50	1.694	<0.001	0.012	0.035	0.005	0.021	0.035	0.154	0.012	0.330	0.360	0.078	0.369
55	1.826	<0.001	0.015	0.027	0.006	0.052	0.024	0.110	0.013	0.583	0.593	0.070	0.597
60	1.779	<0.001	0.013	0.011	0.010	0.128	0.018	0.099	0.016	0.958	0.969	0.076	0.972
65	1.968	<0.001	0.018	0.077	0.015	0.286	0.019	0.092	0.026	1.887	1.910	0.104	1.913
70	3.698	<0.001	0.036	0.227	0.038	0.757	0.052	0.196	0.082	4.675	4.741	0.233	4.746

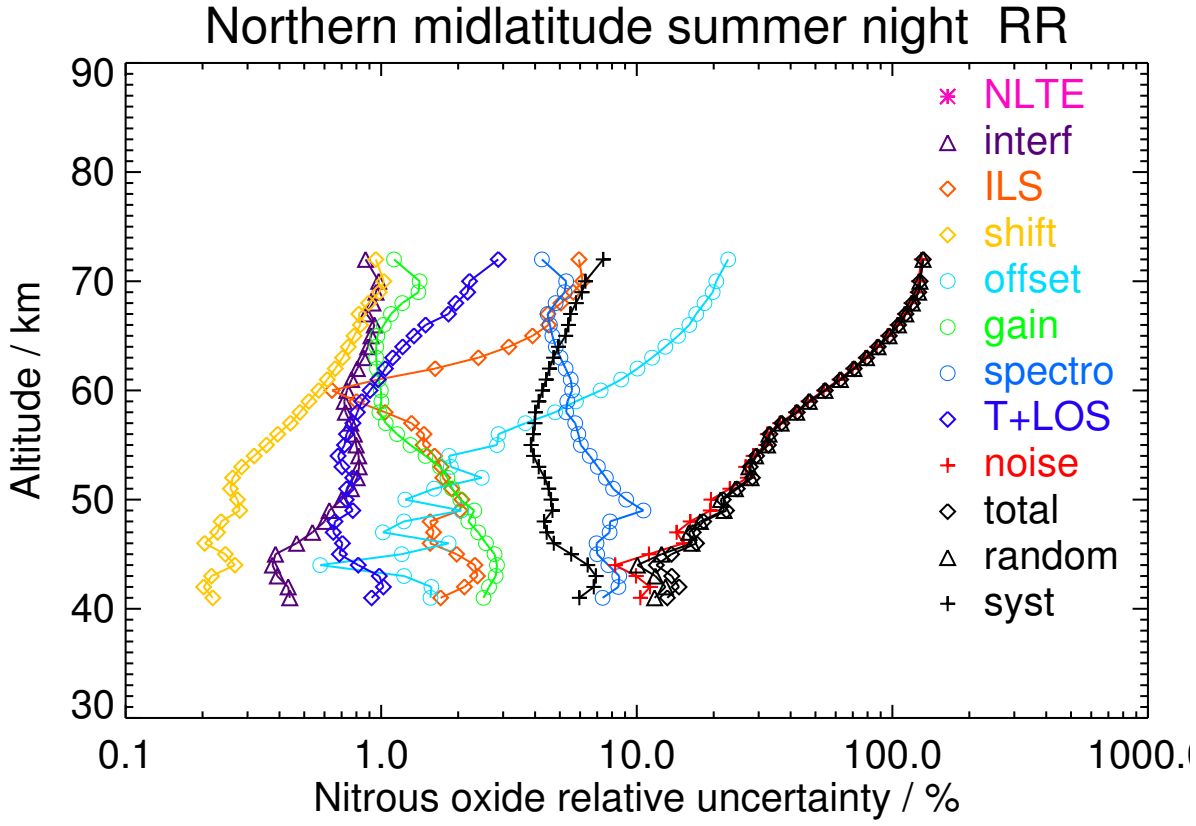

Figure S252. V8R_N2O_662 Northern midlatitude summer night

Table S253. Nitrous oxide error budget for Northern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	5.654	<0.001	0.016	0.126	0.017	0.061	0.155	0.432	0.042	0.524	0.601	0.381	0.712
50	2.978	<0.001	0.016	0.056	0.007	0.038	0.050	0.218	0.027	0.559	0.574	0.194	0.606
55	1.477	<0.001	0.014	0.025	0.008	0.075	0.016	0.104	0.014	0.668	0.675	0.091	0.681
60	1.222	<0.001	0.012	0.009	0.009	0.135	0.011	0.065	0.011	0.914	0.925	0.055	0.927
65	2.797	<0.001	0.028	0.110	0.021	0.498	0.024	0.139	0.049	3.030	3.073	0.147	3.076
70	3.672	<0.001	0.038	0.189	0.029	0.886	0.028	0.166	0.077	5.009	5.089	0.215	5.094

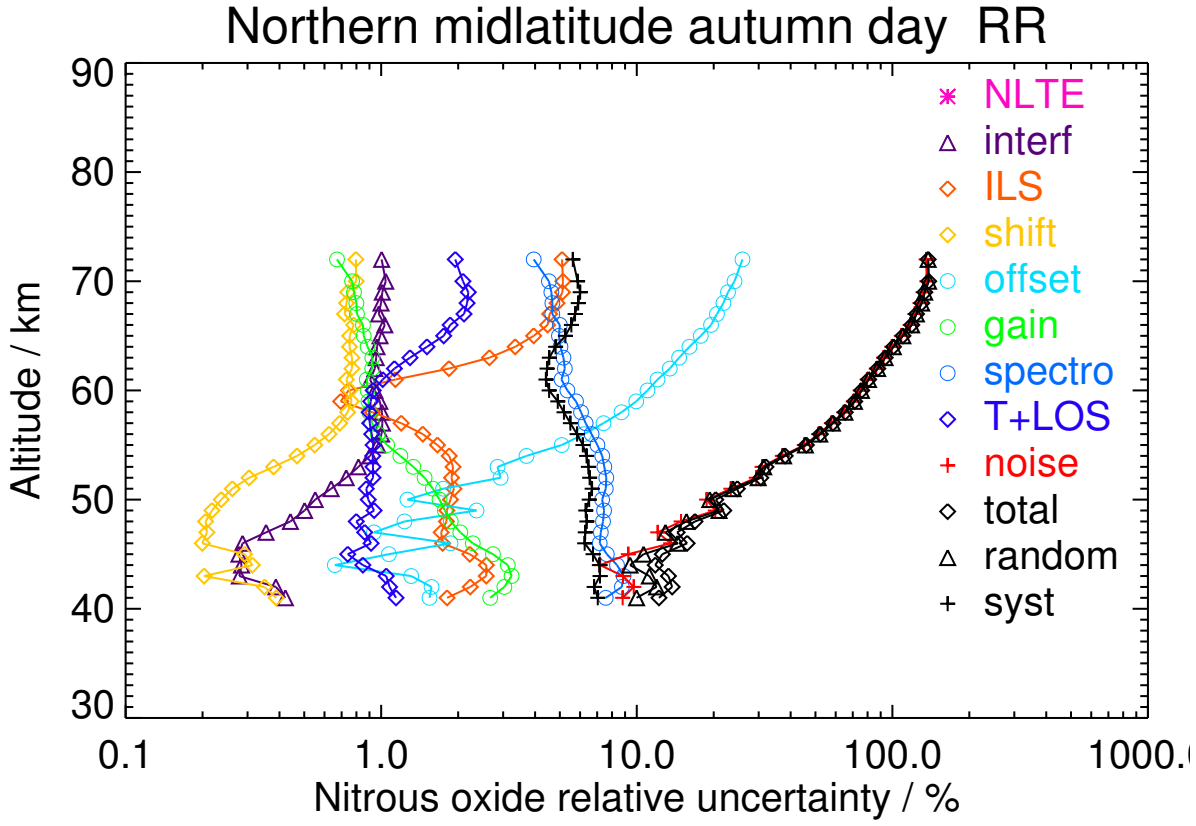

Figure S253. V8R_N2O_662 Northern midlatitude autumn day

Table S254. Nitrous oxide error budget for Northern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	4.921	<0.001	0.018	0.184	0.036	0.054	0.208	0.586	0.047	0.486	0.689	0.434	0.815
50	1.730	<0.001	0.013	0.042	0.006	0.037	0.032	0.159	0.016	0.426	0.442	0.126	0.460
55	1.092	<0.001	0.013	0.017	0.007	0.067	0.011	0.070	0.008	0.549	0.555	0.060	0.558
60	1.037	<0.001	0.012	0.006	0.008	0.124	0.009	0.053	0.008	0.833	0.843	0.044	0.844
65	2.514	<0.001	0.017	0.038	0.012	0.340	0.049	0.163	0.039	2.183	2.215	0.095	2.217
70	4.474	<0.001	0.023	0.024	0.014	0.807	0.051	0.176	0.084	5.033	5.099	0.167	5.101
74	3.949	<0.001	0.016	0.017	0.003	0.788	0.026	0.110	0.074	4.294	4.366	0.114	4.368

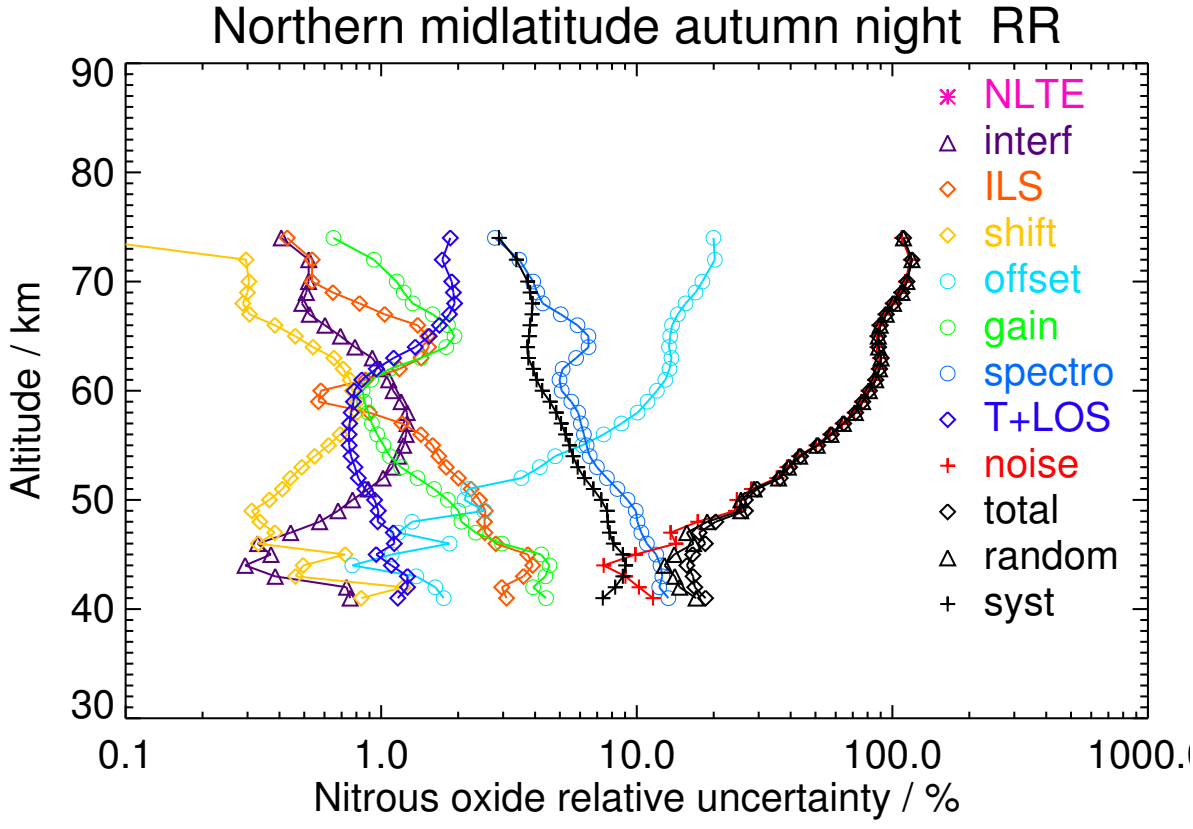

Figure S254. V8R_N2O_662 Northern midlatitude autumn night

Table S255. Nitrous oxide error budget for Tropics day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
40	24.915	0.001	0.189	0.634	0.545	0.306	0.824	2.705	0.324	1.831	2.721	2.210	3.505
45	7.792	<0.001	0.027	0.213	0.059	0.092	0.217	0.669	0.080	0.630	0.735	0.645	0.978
50	2.183	<0.001	0.014	0.050	0.009	0.039	0.035	0.201	0.025	0.432	0.443	0.190	0.483
55	0.560	<0.001	0.008	0.008	0.005	0.042	0.003	0.043	0.007	0.325	0.328	0.040	0.330
60	0.530	<0.001	0.008	0.011	0.006	0.076	0.003	0.029	0.005	0.494	0.499	0.029	0.500
65	1.153	<0.001	0.019	0.071	0.013	0.244	0.007	0.073	0.020	1.433	1.456	0.079	1.458
70	6.742	0.002	0.113	0.558	0.063	1.994	0.028	0.410	0.273	10.720	10.908	0.692	10.930
74	10.259	0.004	0.163	0.952	0.070	3.433	0.047	0.565	0.446	16.550	16.909	1.108	16.945

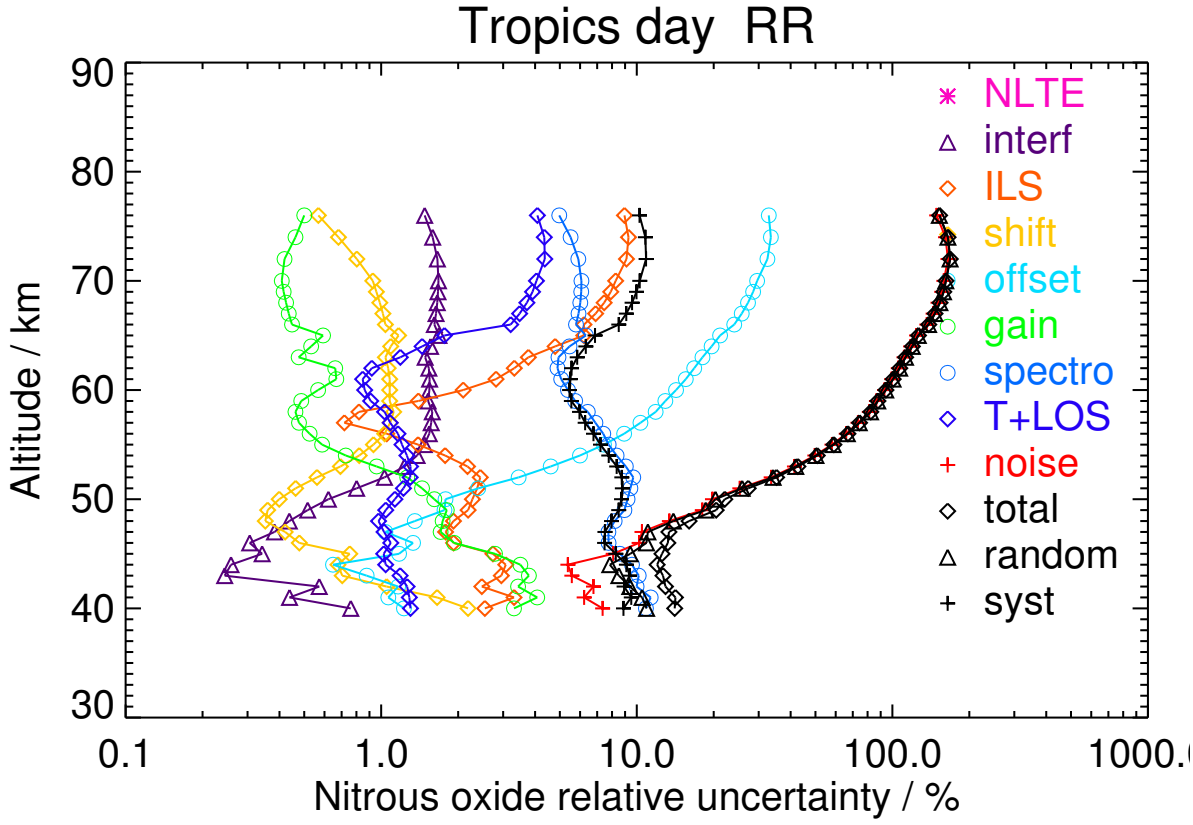

Figure S255. V8R_N2O_662 Tropics day

Table S256. Nitrous oxide error budget for Tropics night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	8.181	<0.001	0.033	0.264	0.066	0.078	0.255	0.690	0.082	0.615	0.707	0.713	1.004
50	2.491	<0.001	0.013	0.065	0.010	0.043	0.046	0.238	0.026	0.432	0.454	0.216	0.502
55	0.687	<0.001	0.009	0.014	0.005	0.043	0.006	0.058	0.008	0.359	0.363	0.051	0.366
60	0.692	<0.001	0.008	0.008	0.007	0.077	0.005	0.040	0.006	0.534	0.540	0.030	0.541
65	2.761	<0.001	0.031	0.137	0.015	0.403	0.015	0.141	0.045	2.582	2.616	0.156	2.621
70	3.612	0.001	0.048	0.322	0.018	0.717	0.051	0.147	0.079	4.286	4.349	0.329	4.362

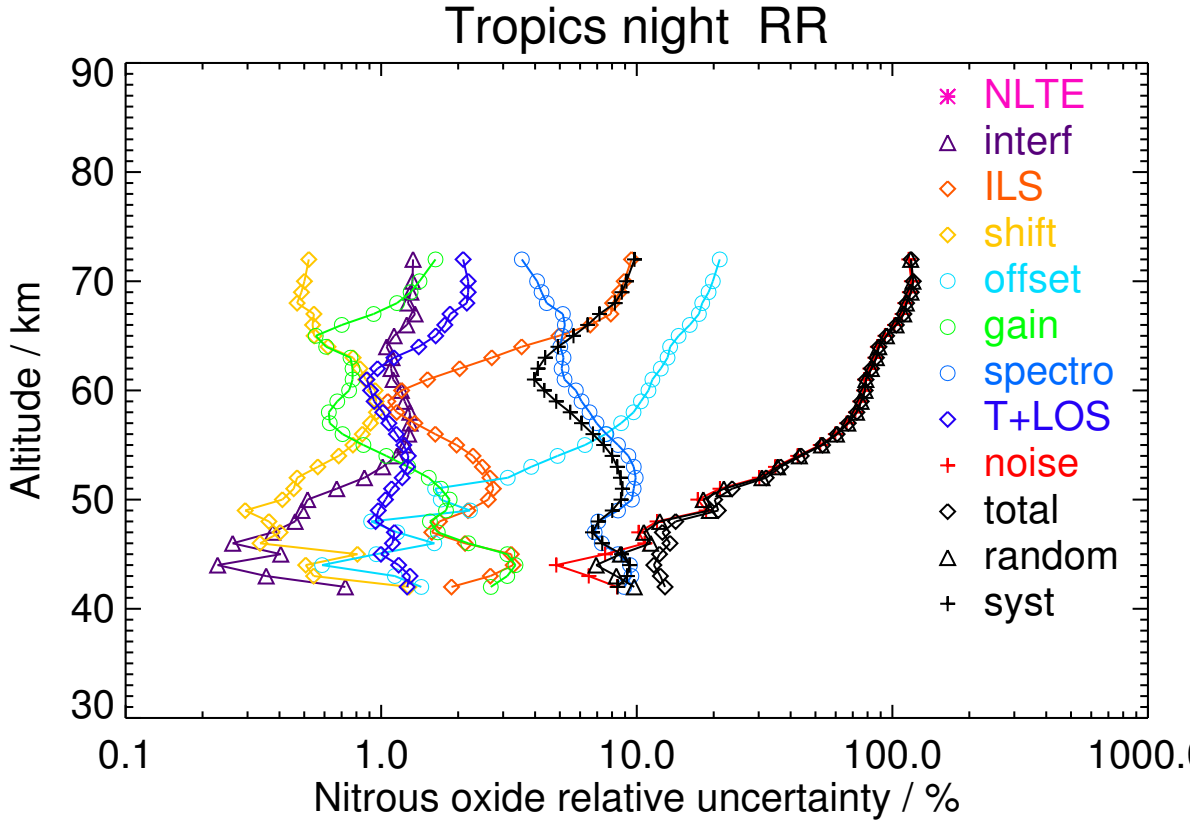

Figure S256. V8R_N2O_662 Tropics night

Table S257. Nitrous oxide error budget for Southern midlatitude winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	1.038	<0.001	0.010	0.026	0.004	0.015	0.021	0.093	0.009	0.239	0.252	0.060	0.259
50	1.060	<0.001	0.012	0.017	0.006	0.035	0.012	0.070	0.006	0.366	0.371	0.051	0.375
55	0.695	<0.001	0.010	0.008	0.006	0.066	0.005	0.037	0.005	0.468	0.473	0.033	0.474
60	0.827	<0.001	0.010	0.006	0.008	0.131	0.007	0.038	0.006	0.825	0.835	0.033	0.836
65	1.894	<0.001	0.020	0.024	0.017	0.436	0.031	0.103	0.025	2.486	2.525	0.083	2.526
70	4.604	0.001	0.046	0.088	0.036	1.369	0.065	0.217	0.082	7.377	7.504	0.224	7.507

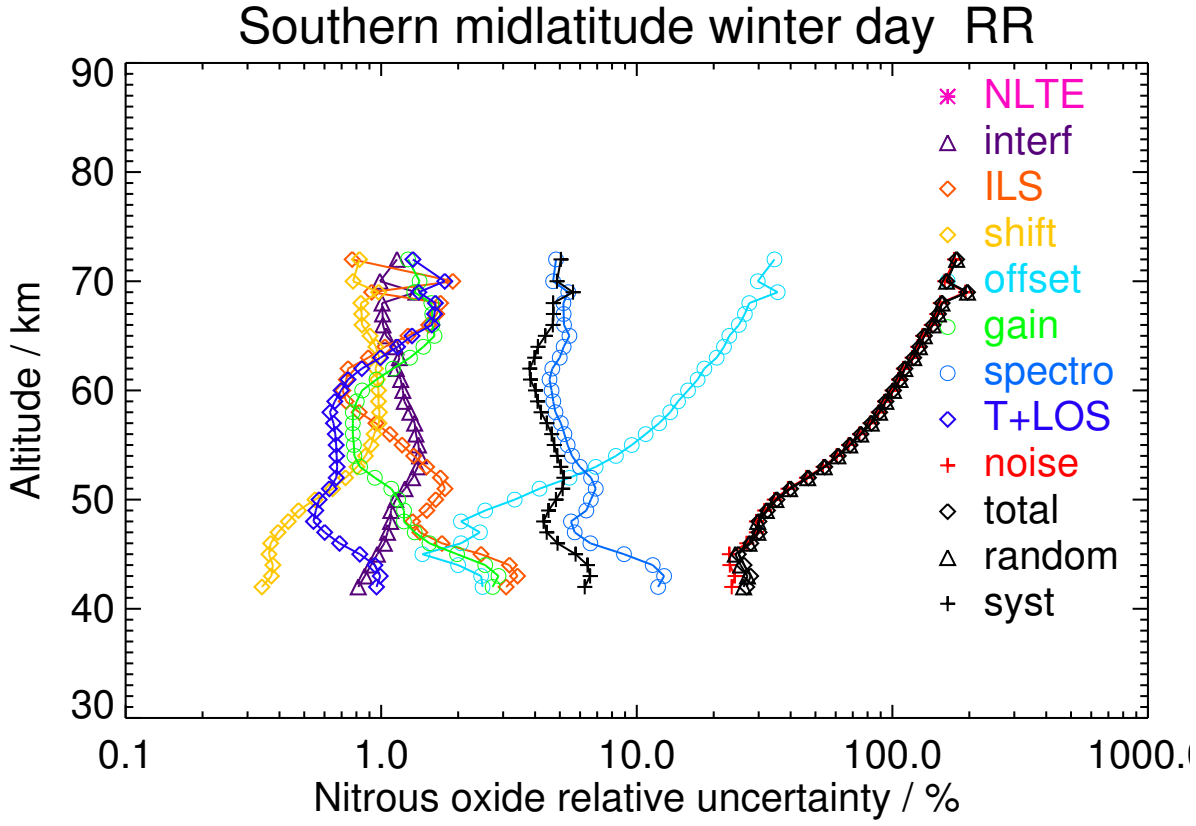

Figure S257. V8R_N2O_662 Southern midlatitude winter day

Table S258. Nitrous oxide error budget for Southern midlatitude winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	1.349	<0.001	0.011	0.023	0.004	0.017	0.023	0.087	0.009	0.264	0.272	0.070	0.281
50	1.192	<0.001	0.012	0.022	0.006	0.035	0.016	0.085	0.008	0.399	0.406	0.064	0.411
55	0.929	<0.001	0.010	0.014	0.006	0.067	0.012	0.057	0.007	0.518	0.524	0.045	0.526
60	1.232	<0.001	0.011	0.011	0.009	0.157	0.013	0.062	0.011	1.015	1.028	0.051	1.029
65	2.218	<0.001	0.017	0.057	0.016	0.415	0.029	0.102	0.030	2.522	2.557	0.088	2.559
70	5.672	<0.001	0.030	0.034	0.026	1.339	0.073	0.210	0.121	7.893	8.007	0.225	8.010
74	3.443	<0.001	0.015	0.023	0.013	0.829	0.035	0.101	0.061	4.287	4.367	0.109	4.368

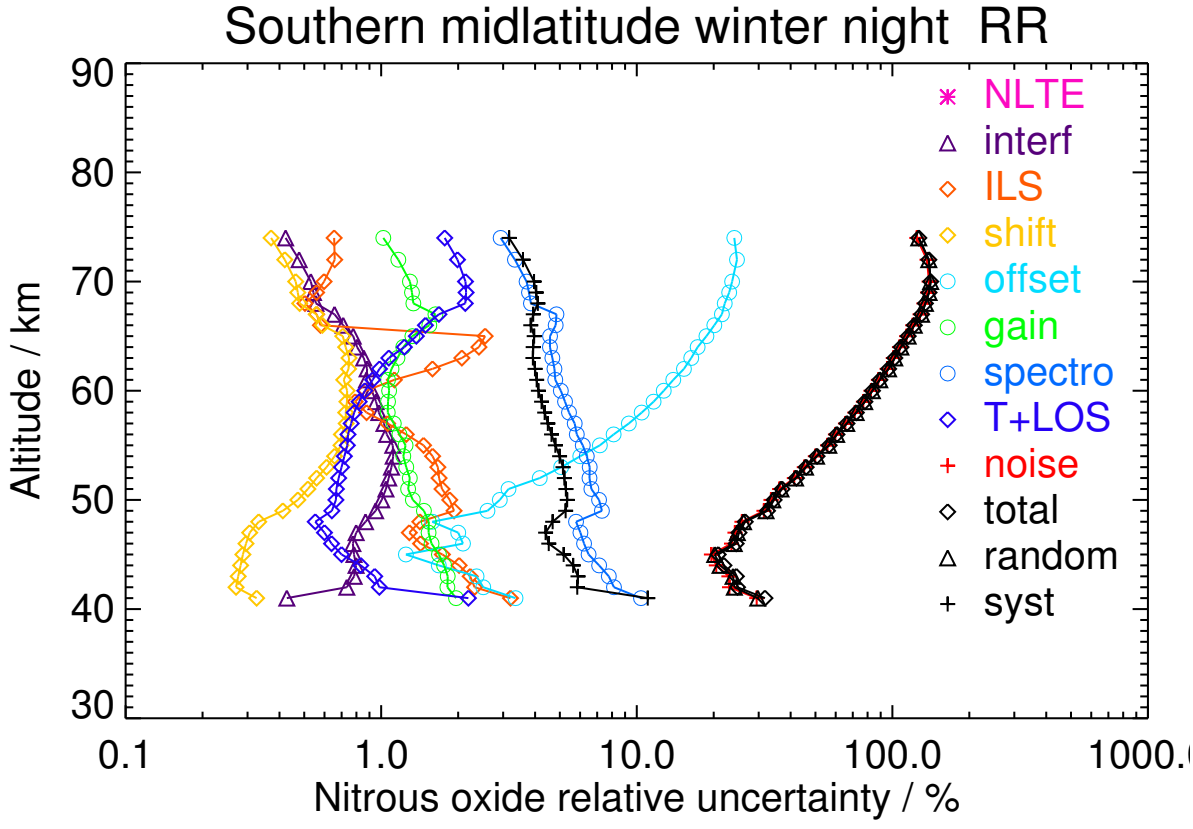

Figure S258. V8R_N2O_662 Southern midlatitude winter night

Table S259. Nitrous oxide error budget for Southern midlatitude spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	2.688	<0.001	0.011	0.049	0.006	0.019	0.051	0.168	0.019	0.281	0.293	0.166	0.336
50	1.876	<0.001	0.014	0.030	0.006	0.041	0.024	0.120	0.012	0.467	0.473	0.110	0.486
55	1.073	<0.001	0.010	0.016	0.007	0.053	0.010	0.067	0.008	0.483	0.488	0.059	0.491
60	0.846	<0.001	0.009	0.004	0.008	0.098	0.006	0.044	0.006	0.686	0.694	0.039	0.695
65	1.725	<0.001	0.016	0.035	0.016	0.286	0.021	0.082	0.021	1.789	1.813	0.074	1.815
70	4.005	<0.001	0.031	0.114	0.030	0.876	0.045	0.173	0.077	5.159	5.234	0.197	5.238
74	5.976	<0.001	0.034	0.195	0.031	1.427	0.051	0.206	0.134	7.761	7.892	0.288	7.898

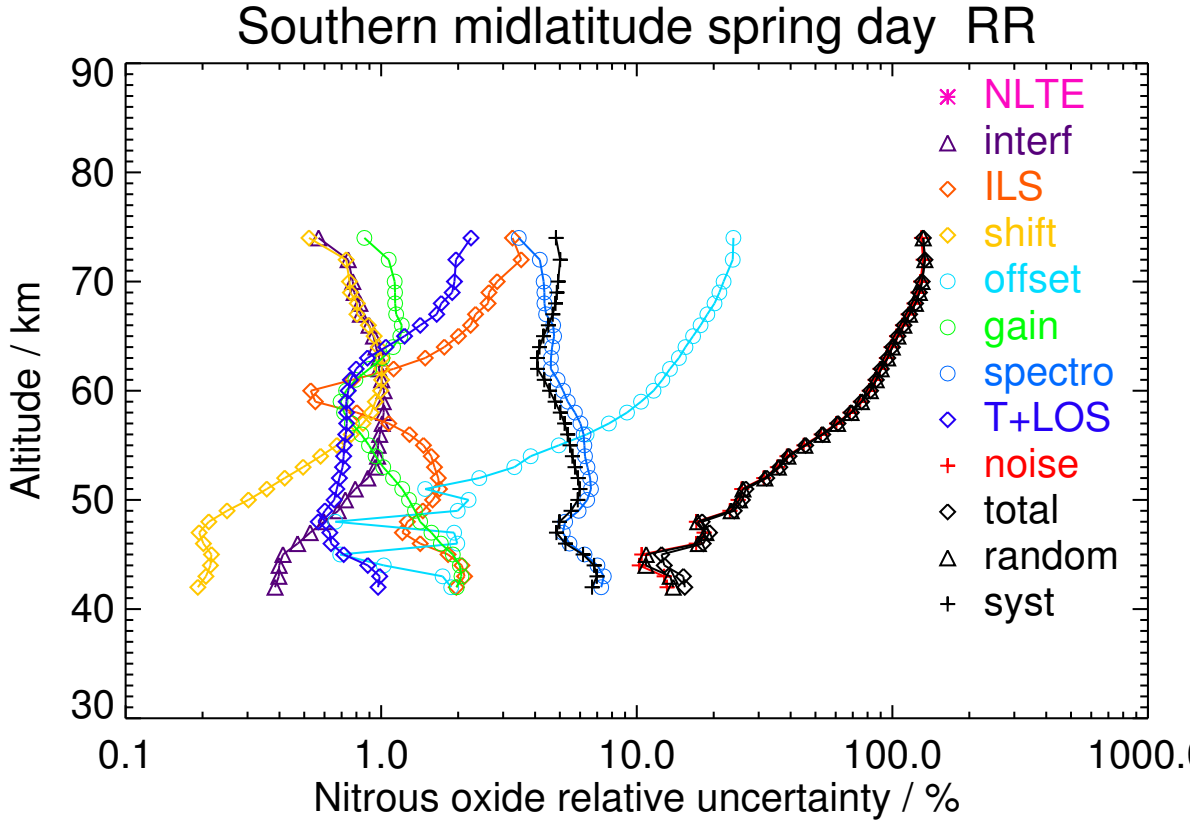

Figure S259. V8R_N2O_662 Southern midlatitude spring day

Table S260. Nitrous oxide error budget for Southern midlatitude spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	2.630	<0.001	0.011	0.050	0.006	0.024	0.048	0.170	0.019	0.288	0.299	0.169	0.343
50	1.617	<0.001	0.013	0.025	0.005	0.032	0.018	0.092	0.009	0.404	0.407	0.089	0.417
55	1.032	<0.001	0.011	0.015	0.007	0.055	0.008	0.057	0.007	0.482	0.486	0.053	0.489
60	0.738	<0.001	0.008	0.007	0.008	0.089	0.007	0.042	0.006	0.600	0.607	0.035	0.608
65	1.108	<0.001	0.010	0.030	0.010	0.193	0.009	0.046	0.010	1.236	1.251	0.051	1.252

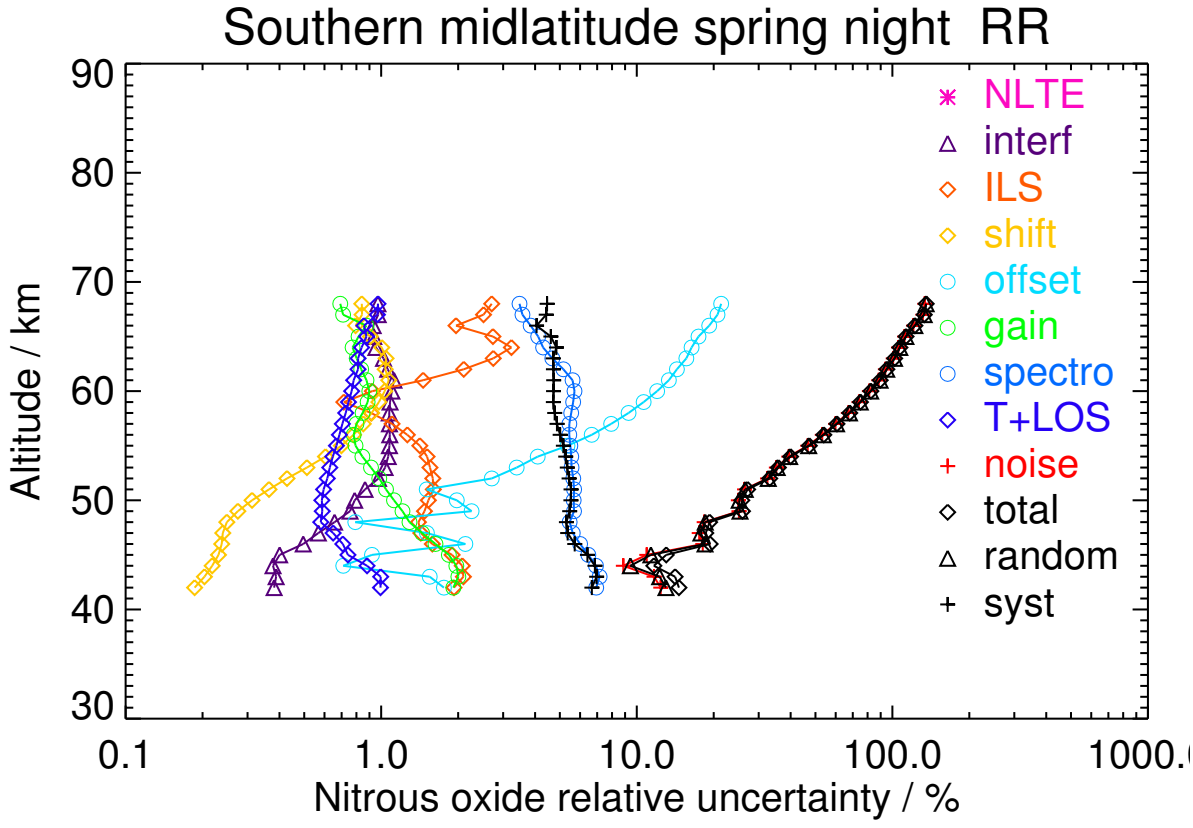

Figure S260. V8R_N2O_662 Southern midlatitude spring night

Table S261. Nitrous oxide error budget for Southern midlatitude summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	1.650	<0.001	0.008	0.050	0.007	0.017	0.043	0.161	0.019	0.193	0.224	0.136	0.261
50	0.512	<0.001	0.006	0.010	0.003	0.017	0.007	0.036	0.004	0.172	0.176	0.027	0.178
55	0.810	<0.001	0.008	0.012	0.005	0.034	0.011	0.053	0.006	0.310	0.316	0.028	0.317
60	0.904	<0.001	0.009	0.008	0.008	0.088	0.009	0.050	0.007	0.594	0.602	0.036	0.603
65	1.919	<0.001	0.023	0.126	0.023	0.313	0.024	0.127	0.035	1.930	1.961	0.111	1.964
70	7.336	0.004	0.104	0.991	0.102	1.657	0.075	0.619	0.307	9.345	9.538	0.755	9.568
74	10.434	0.005	0.128	1.113	0.121	2.701	0.045	0.547	0.471	13.440	13.718	1.241	13.774

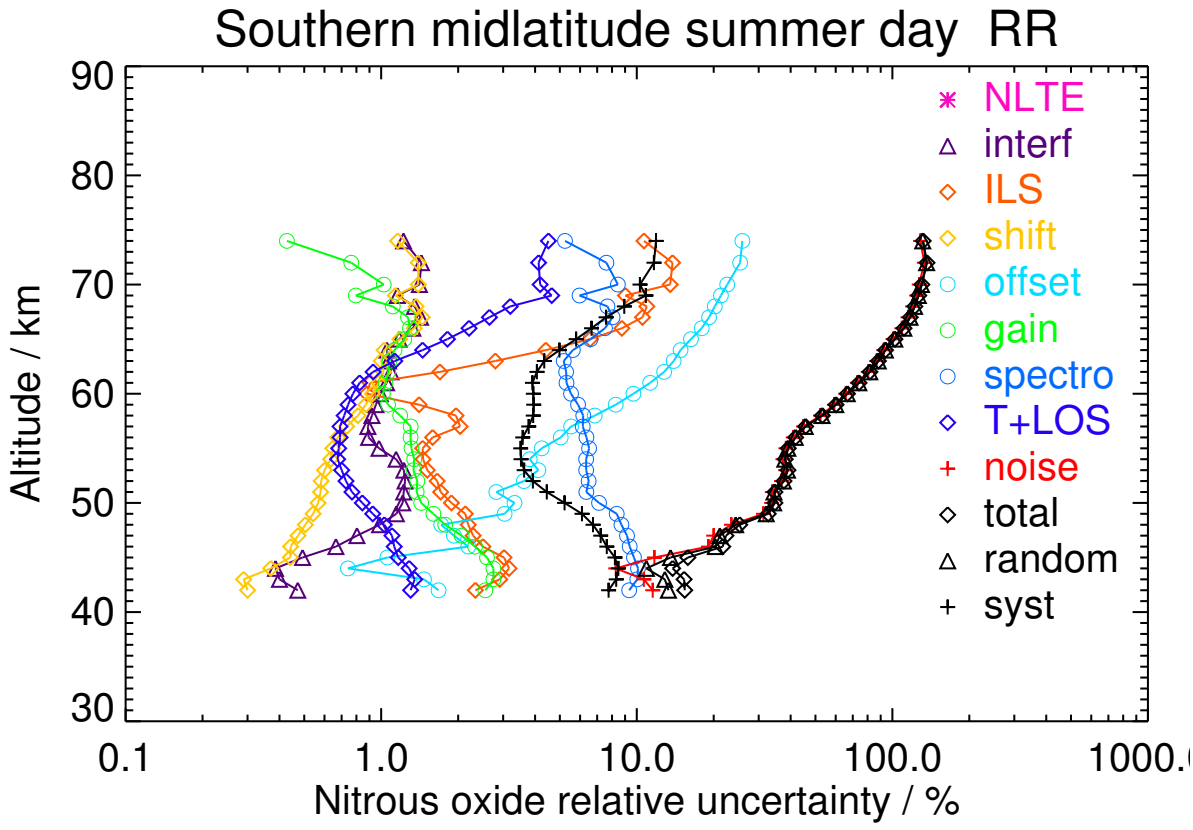

Figure S261. V8R_N2O_662 Southern midlatitude summer day

Table S262. Nitrous oxide error budget for Southern midlatitude summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	3.202	<0.001	0.012	0.097	0.020	0.030	0.117	0.277	0.026	0.263	0.350	0.220	0.414
50	2.049	<0.001	0.010	0.045	0.007	0.038	0.071	0.211	0.020	0.318	0.381	0.096	0.393
55	1.395	<0.001	0.009	0.041	0.006	0.050	0.025	0.162	0.015	0.454	0.479	0.089	0.487
60	0.908	<0.001	0.010	0.009	0.008	0.096	0.007	0.060	0.009	0.640	0.649	0.046	0.650
65	1.099	<0.001	0.014	0.046	0.011	0.200	0.007	0.057	0.012	1.203	1.220	0.063	1.222
70	1.566	<0.001	0.027	0.052	0.021	0.417	0.009	0.056	0.017	2.075	2.117	0.077	2.118

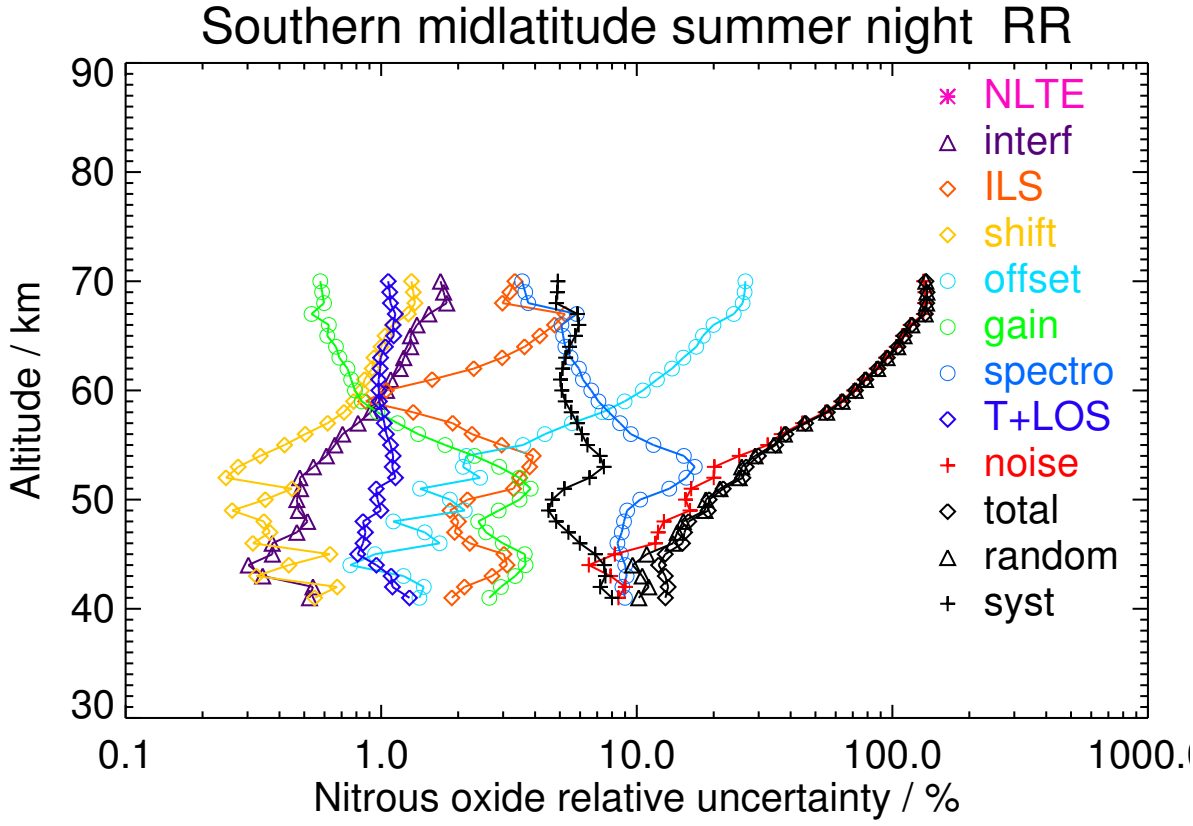

Figure S262. V8R_N2O_662 Southern midlatitude summer night

Table S263. Nitrous oxide error budget for Southern midlatitude autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	4.560	<0.001	0.017	0.126	0.016	0.036	0.165	0.423	0.038	0.449	0.563	0.330	0.653
50	2.344	<0.001	0.014	0.056	0.007	0.057	0.042	0.215	0.022	0.587	0.608	0.174	0.633
55	1.407	<0.001	0.012	0.019	0.008	0.084	0.014	0.091	0.012	0.701	0.708	0.082	0.713
60	1.219	<0.001	0.011	0.009	0.010	0.159	0.010	0.064	0.012	1.035	1.048	0.056	1.050
65	2.380	<0.001	0.024	0.092	0.016	0.446	0.022	0.141	0.043	2.661	2.702	0.108	2.704
70	5.259	0.002	0.057	0.310	0.024	1.238	0.035	0.340	0.156	7.161	7.278	0.302	7.284
74	6.424	0.002	0.061	0.303	0.016	1.638	0.018	0.288	0.219	8.320	8.483	0.418	8.493

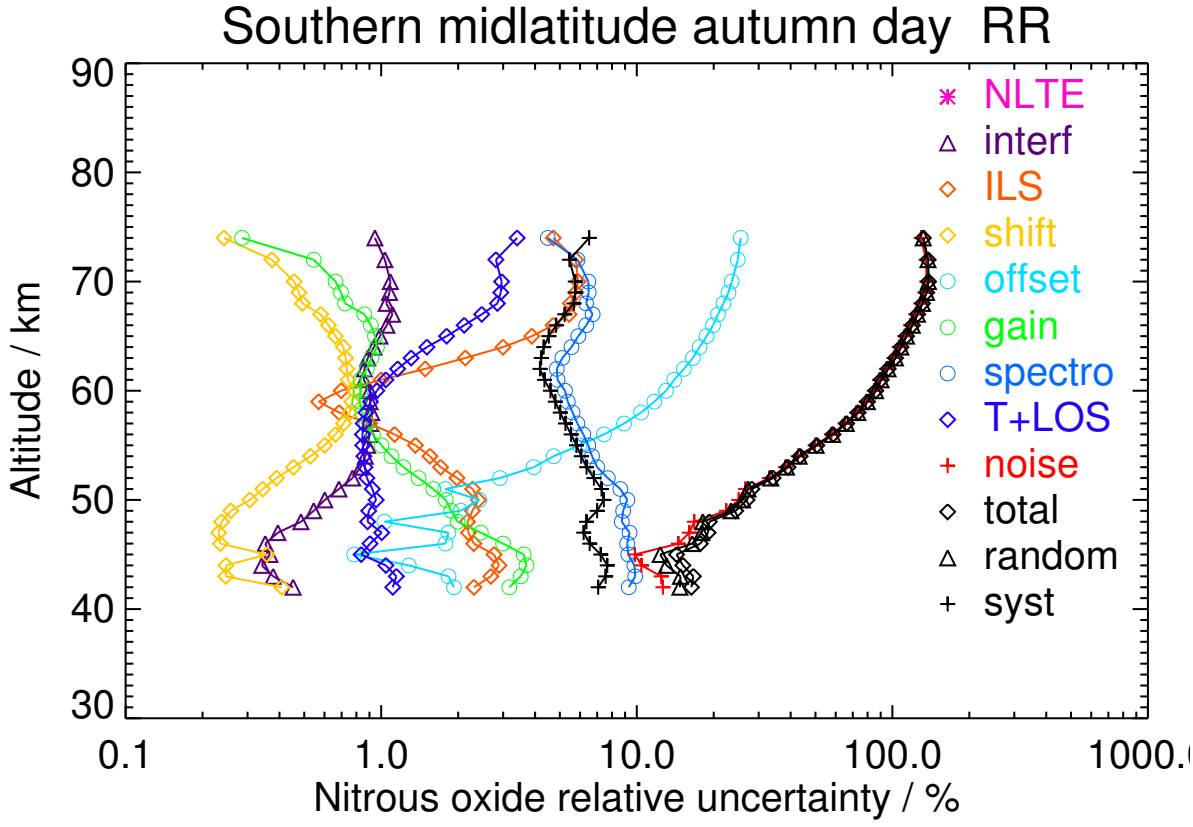

Figure S263. V8R_N2O_662 Southern midlatitude autumn day

Table S264. Nitrous oxide error budget for Southern midlatitude autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	7.016	<0.001	0.022	0.190	0.031	0.057	0.230	0.579	0.059	0.552	0.684	0.519	0.859
50	3.264	<0.001	0.016	0.069	0.008	0.068	0.055	0.261	0.030	0.667	0.688	0.230	0.726
55	1.755	<0.001	0.013	0.024	0.008	0.086	0.018	0.117	0.017	0.752	0.759	0.106	0.767
60	1.149	<0.001	0.010	0.011	0.008	0.142	0.008	0.067	0.012	0.961	0.972	0.062	0.974
65	1.457	<0.001	0.013	0.035	0.011	0.289	0.011	0.071	0.018	1.775	1.799	0.069	1.800
70	3.268	<0.001	0.032	0.114	0.023	0.925	0.029	0.133	0.056	5.164	5.247	0.167	5.249

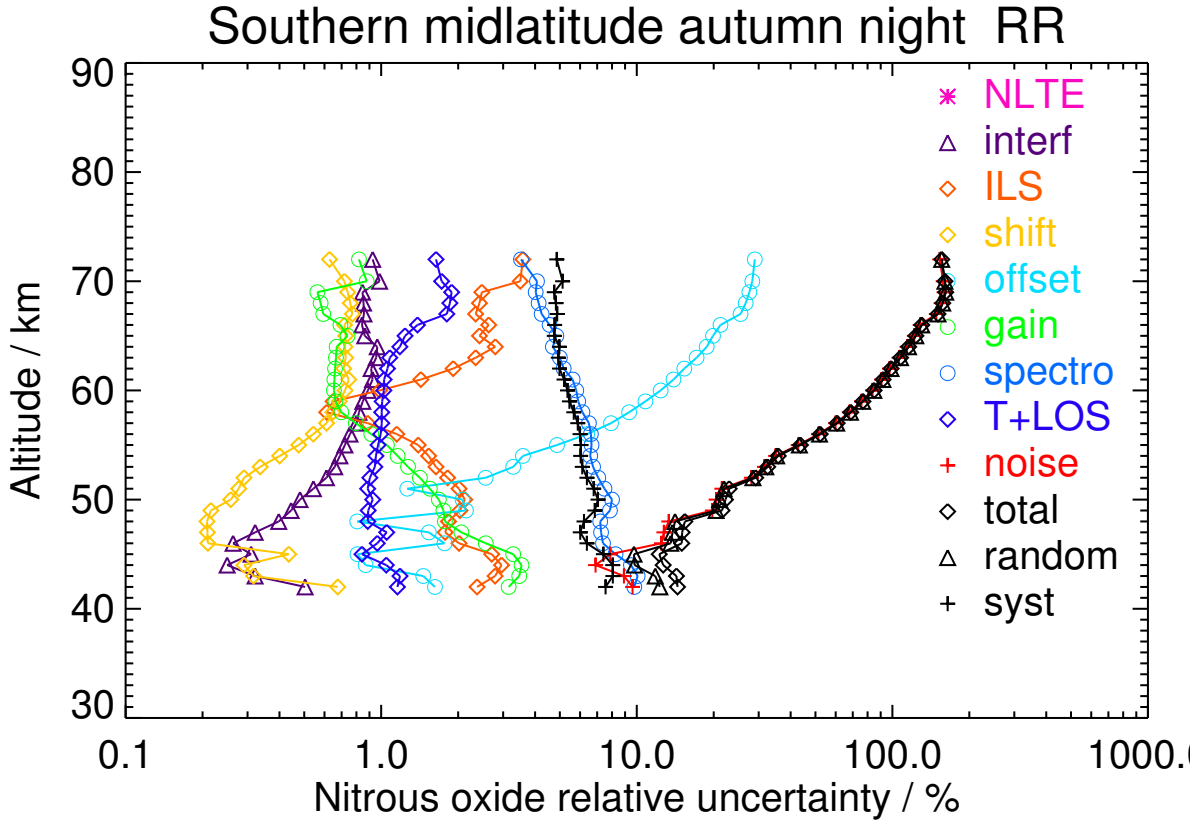

Figure S264. V8R_N2O_662 Southern midlatitude autumn night

Table S265. Nitrous oxide error budget for Southern polar winter day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	1.110	<0.001	0.013	0.013	0.004	0.018	0.011	0.052	0.006	0.297	0.299	0.047	0.303
50	0.743	<0.001	0.010	0.010	0.006	0.027	0.005	0.034	0.005	0.300	0.302	0.033	0.304
55	0.639	<0.001	0.008	0.008	0.006	0.056	0.004	0.028	0.004	0.405	0.410	0.025	0.410
60	0.872	<0.001	0.009	0.009	0.007	0.122	0.008	0.036	0.005	0.772	0.782	0.032	0.783
65	1.629	<0.001	0.015	0.007	0.014	0.333	0.018	0.066	0.014	2.020	2.048	0.059	2.049
70	3.167	0.001	0.023	0.022	0.019	0.797	0.045	0.127	0.039	4.677	4.745	0.118	4.747

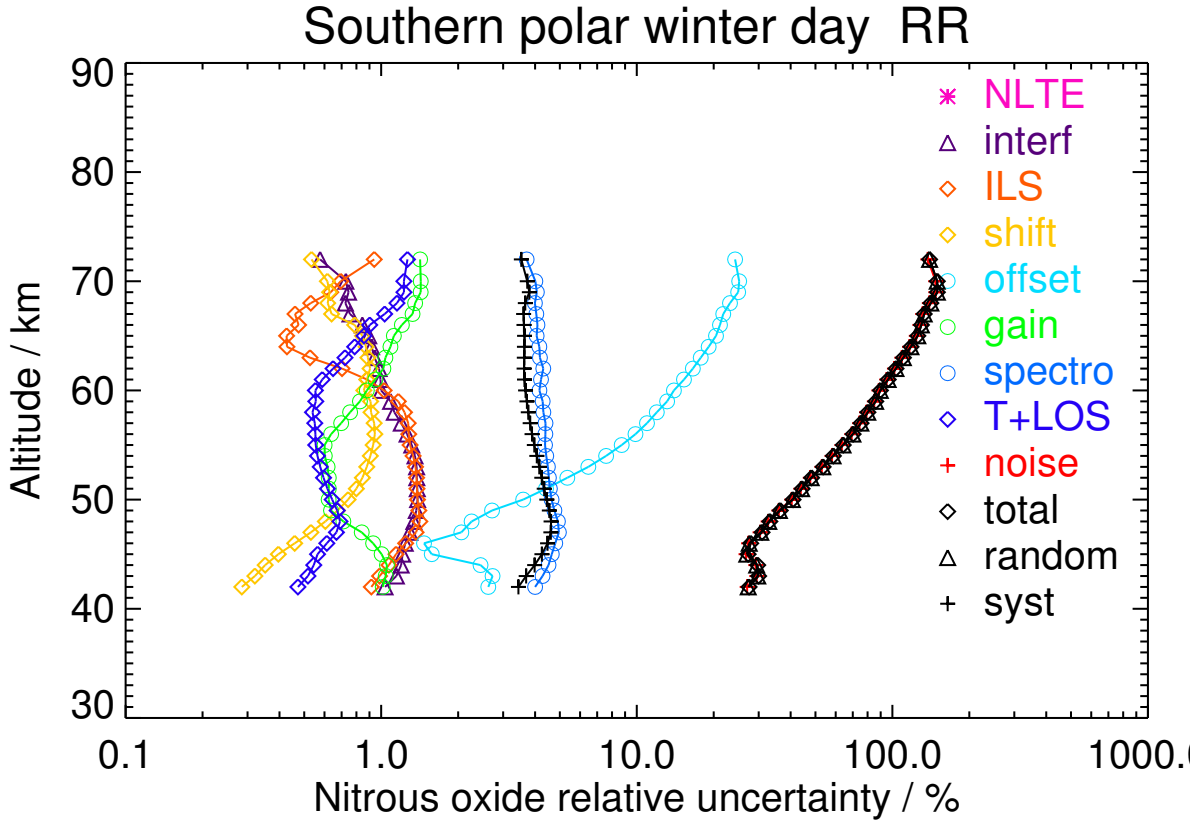

Figure S265. V8R_N2O_662 Southern polar winter day

Table S266. Nitrous oxide error budget for Southern polar winter night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.383	<0.001	0.009	0.004	0.003	0.020	0.002	0.015	0.002	0.203	0.204	0.012	0.205
50	0.366	<0.001	0.009	0.004	0.004	0.034	0.003	0.017	0.003	0.242	0.244	0.014	0.245
55	0.422	<0.001	0.008	0.005	0.005	0.061	0.004	0.020	0.003	0.374	0.379	0.017	0.379
60	0.698	<0.001	0.010	0.009	0.007	0.122	0.006	0.034	0.004	0.698	0.709	0.027	0.709
65	3.214	<0.001	0.028	0.040	0.018	0.654	0.034	0.150	0.032	3.641	3.700	0.149	3.703

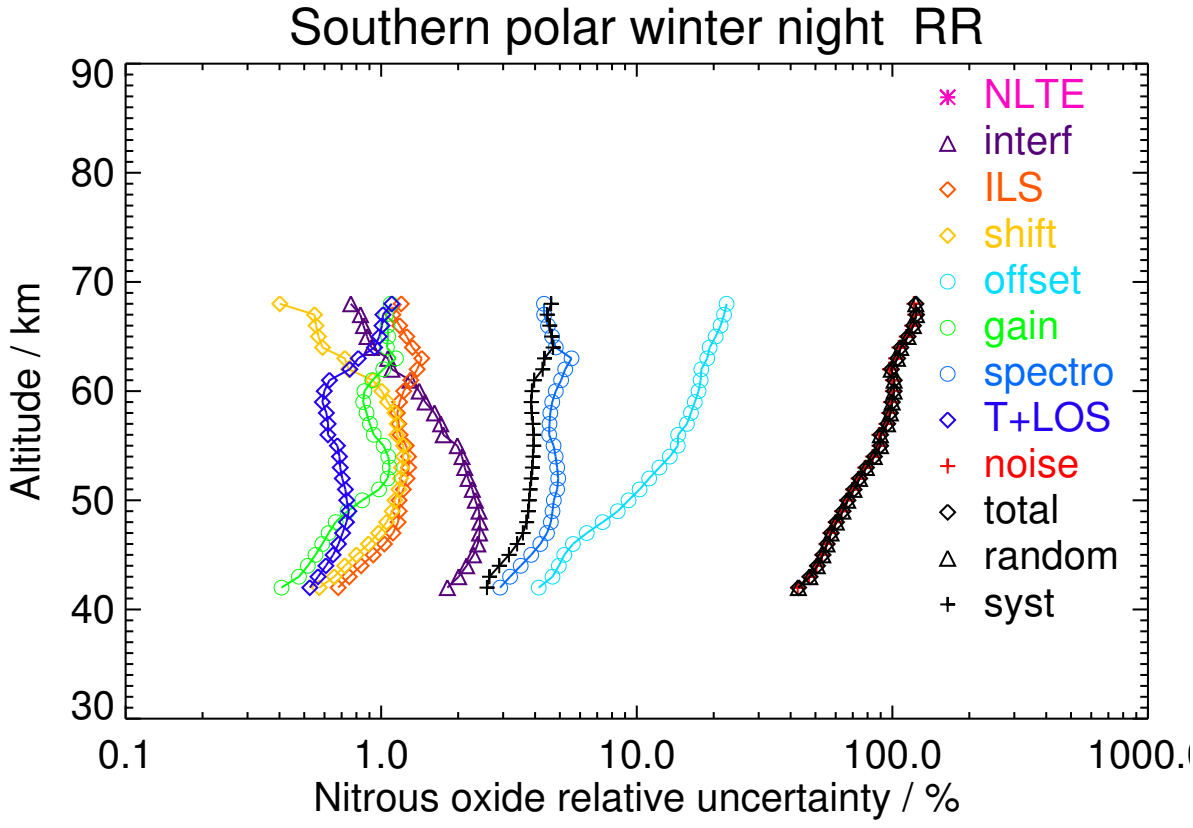

Figure S266. V8R_N2O_662 Southern polar winter night

Table S267. Nitrous oxide error budget for Southern polar spring day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	1.883	<0.001	0.009	0.032	0.005	0.013	0.029	0.102	0.013	0.199	0.205	0.103	0.229
50	1.229	<0.001	0.011	0.019	0.005	0.027	0.011	0.066	0.007	0.327	0.330	0.064	0.336
55	0.693	<0.001	0.009	0.010	0.007	0.039	0.003	0.037	0.006	0.337	0.340	0.035	0.342
60	0.465	<0.001	0.007	0.006	0.007	0.060	0.002	0.022	0.004	0.410	0.415	0.021	0.415
65	1.327	<0.001	0.017	0.062	0.021	0.229	0.008	0.061	0.015	1.448	1.467	0.074	1.469
70	3.583	0.002	0.040	0.310	0.062	0.774	0.028	0.189	0.073	4.519	4.590	0.316	4.600
74	6.671	0.008	0.066	0.854	0.122	1.681	0.047	0.293	0.165	8.885	9.059	0.758	9.090

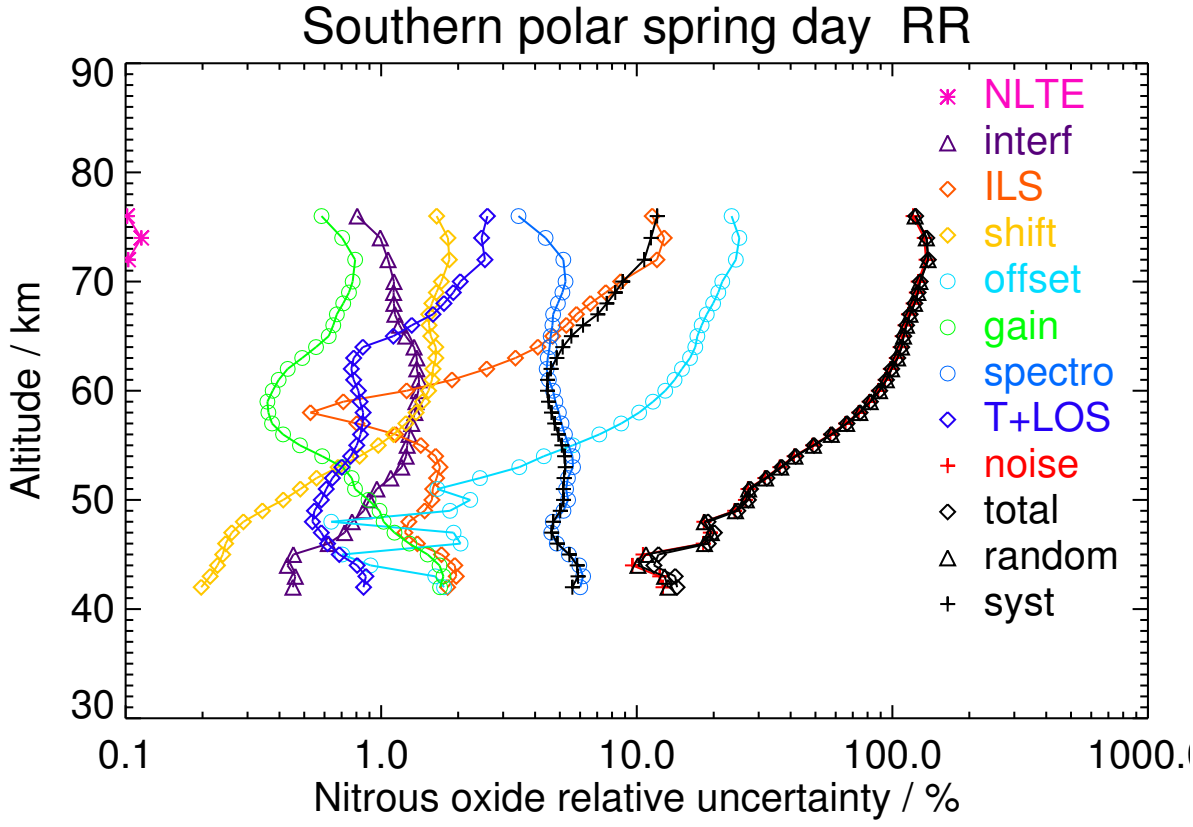

Figure S267. V8R_N2O_662 Southern polar spring day

Table S268. Nitrous oxide error budget for Southern polar spring night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	2.681	<0.001	0.011	0.046	0.006	0.021	0.049	0.158	0.015	0.271	0.284	0.151	0.322
50	1.836	<0.001	0.013	0.030	0.005	0.038	0.024	0.106	0.011	0.439	0.444	0.099	0.455
55	1.169	<0.001	0.011	0.017	0.008	0.056	0.010	0.067	0.008	0.519	0.523	0.060	0.527
60	0.912	<0.001	0.009	0.010	0.009	0.106	0.007	0.048	0.008	0.726	0.734	0.040	0.736
65	1.784	<0.001	0.018	0.074	0.020	0.322	0.016	0.085	0.026	1.990	2.018	0.090	2.020
70	6.426	<0.001	0.049	0.290	0.053	1.487	0.049	0.268	0.176	8.637	8.766	0.398	8.775

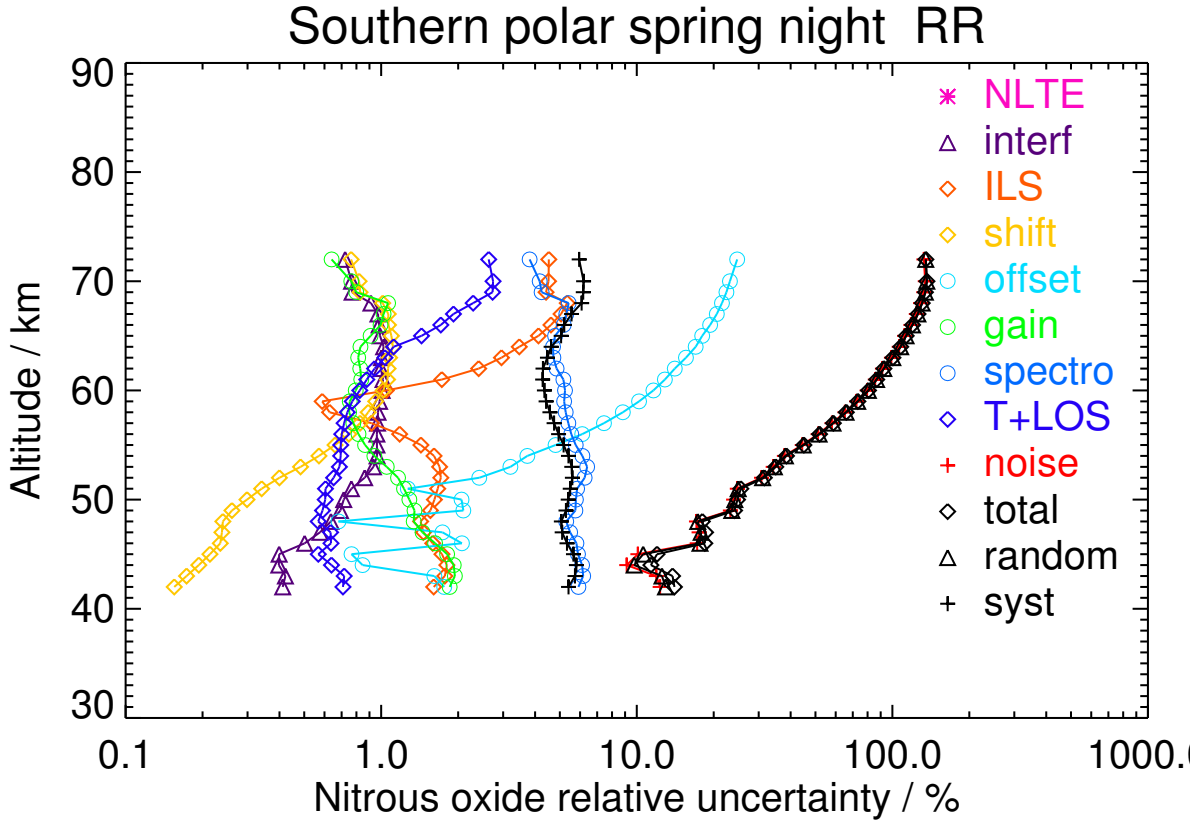

Figure S268. V8R_N2O_662 Southern polar spring night

Table S269. Nitrous oxide error budget for Southern polar summer day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	1.470	<0.001	0.008	0.041	0.008	0.020	0.033	0.128	0.023	0.197	0.201	0.136	0.243
50	0.173	<0.001	0.004	0.003	0.002	0.010	0.003	0.011	0.003	0.081	0.082	0.011	0.082
55	0.091	<0.001	0.003	<0.001	0.002	0.012	0.003	0.005	0.002	0.078	0.079	0.005	0.079
60	0.134	<0.001	0.004	0.003	0.003	0.024	0.004	0.006	0.003	0.147	0.149	0.006	0.149
65	0.675	<0.001	0.013	0.019	0.010	0.091	0.008	0.040	0.009	0.597	0.605	0.031	0.606
70	2.275	<0.001	0.028	0.129	0.028	0.343	0.027	0.141	0.040	1.984	2.019	0.138	2.024
74	6.448	0.002	0.059	0.655	0.085	1.427	0.032	0.226	0.178	8.119	8.246	0.694	8.275

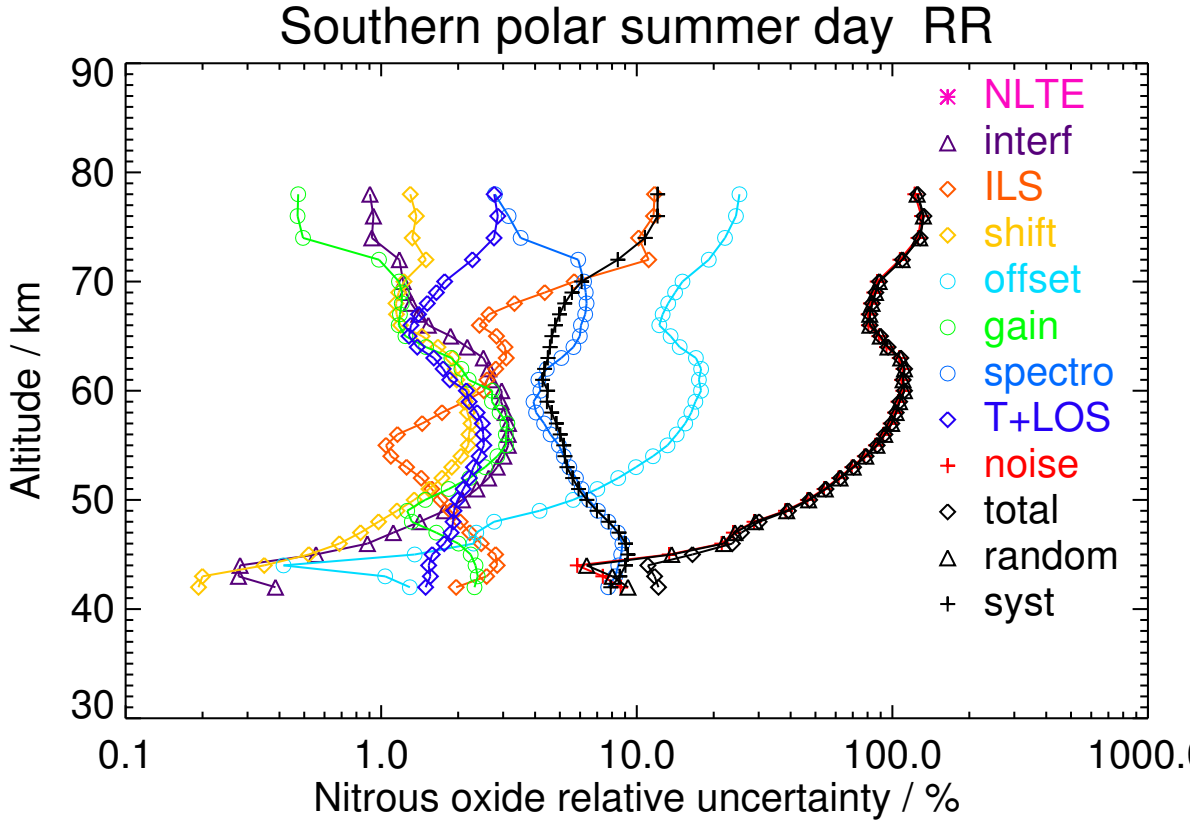

Figure S269. V8R_N2O_662 Southern polar summer day

Table S270. Nitrous oxide error budget for Southern polar summer night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.279	<0.001	0.005	0.007	0.002	0.010	0.002	0.024	0.005	0.091	0.093	0.021	0.095
50	0.123	<0.001	0.004	0.002	0.002	0.012	0.002	0.007	0.002	0.078	0.080	0.007	0.080
55	0.178	<0.001	0.005	0.002	0.003	0.027	0.003	0.008	0.002	0.157	0.160	0.008	0.160
60	0.290	<0.001	0.008	<0.001	0.005	0.060	0.004	0.012	0.003	0.329	0.334	0.011	0.334
65	1.713	<0.001	0.026	0.020	0.019	0.367	0.009	0.068	0.019	1.948	1.983	0.072	1.984
70	2.178	<0.001	0.027	0.035	0.021	0.553	0.013	0.077	0.027	2.827	2.881	0.086	2.882

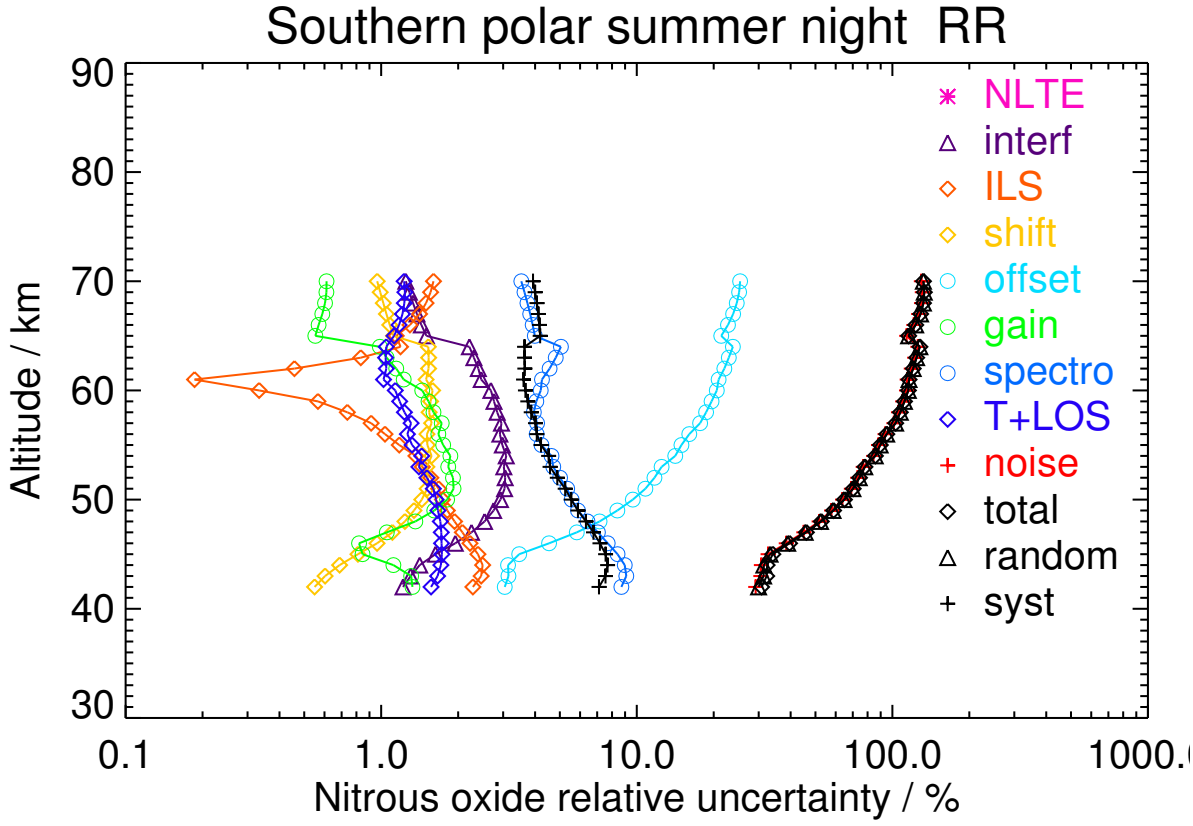

Figure S270. V8R_N2O_662 Southern polar summer night

Table S271. Nitrous oxide error budget for Southern polar autumn day. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.321	<0.001	0.006	0.005	0.002	0.015	0.004	0.020	0.002	0.159	0.161	0.011	0.162
50	0.351	<0.001	0.008	0.004	0.004	0.029	0.003	0.017	0.002	0.221	0.223	0.013	0.224
55	0.472	<0.001	0.009	0.007	0.006	0.062	0.004	0.022	0.003	0.374	0.380	0.018	0.380
60	0.695	<0.001	0.011	0.008	0.009	0.132	0.006	0.031	0.005	0.739	0.751	0.027	0.752
65	2.298	<0.001	0.021	0.024	0.018	0.505	0.033	0.115	0.028	2.799	2.845	0.098	2.847
70	2.631	<0.001	0.021	0.024	0.017	0.685	0.037	0.118	0.036	3.644	3.708	0.106	3.710

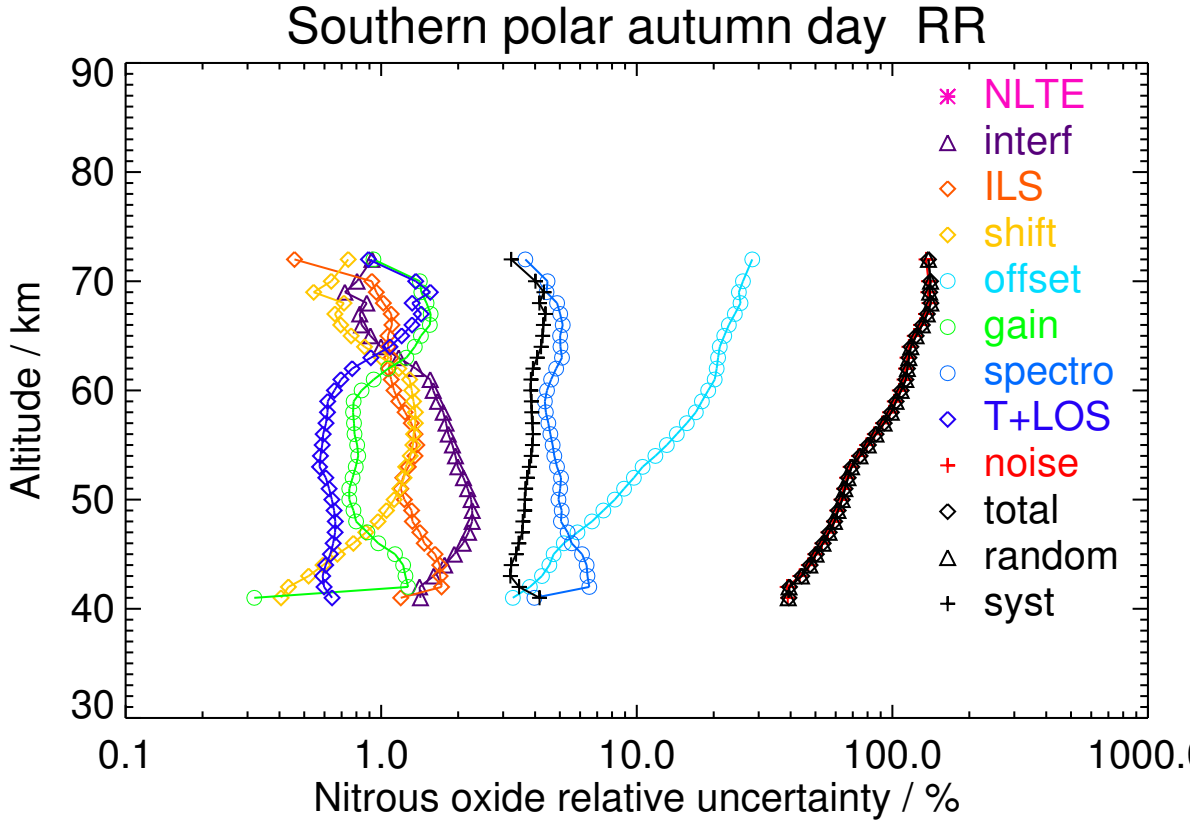

Figure S271. V8R_N2O_662 Southern polar autumn day

Table S272. Nitrous oxide error budget for Southern polar autumn night. All uncertainties are 1σ.

altitude (km)	mean target (ppbv)	NLTE (ppbv)	interf (ppbv)	ILS (ppbv)	shift (ppbv)	offset (ppbv)	gain (ppbv)	spectro (ppbv)	T+LOS (ppbv)	noise (ppbv)	random (ppbv)	syst (ppbv)	total (ppbv)
45	0.396	<0.001	0.008	0.003	0.003	0.019	0.002	0.014	0.002	0.205	0.206	0.012	0.206
50	0.444	<0.001	0.009	0.005	0.005	0.035	0.004	0.021	0.003	0.269	0.272	0.017	0.273
55	0.507	<0.001	0.009	0.007	0.006	0.067	0.004	0.025	0.003	0.410	0.416	0.021	0.417
60	0.727	<0.001	0.010	0.010	0.007	0.128	0.006	0.035	0.004	0.723	0.734	0.029	0.735
65	1.913	<0.001	0.015	0.025	0.009	0.371	0.023	0.081	0.017	2.095	2.128	0.076	2.129
70	2.487	<0.001	0.016	0.019	0.008	0.598	0.026	0.081	0.025	3.257	3.312	0.087	3.313

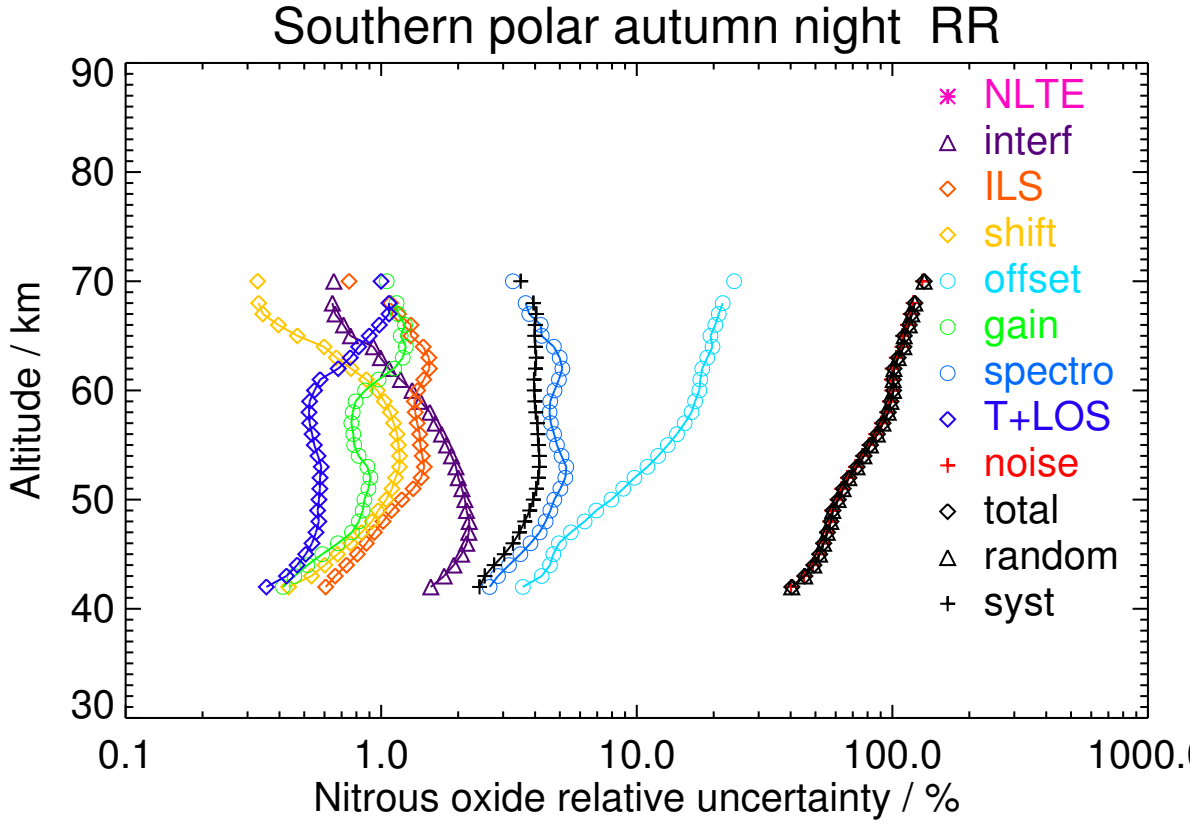

Figure S272. V8R_N2O_662 Southern polar autumn night