

Supplementary Material

Flights Table

#	Location Lat/Lon/Alt	Launch Date Sonde Telemetry	ID	CFH	COBALD ECC	Comment
1	Dhulikhel (27.62°N, 85.54°E, 1.53 km asl)	2017-0803-193618 RS41-SGP N1231083 MW41 2.6.0	KU004	2L4608	407 2Z23304	ice2 disqualified, suspected issue with ice film (sudden jumps in reflectivity)
2	Dhulikhel	2017-0804-181842 RS41-SGP M2150158 MW41 2.6.0	KU005	2L3105	/ 2Z24833	contamination in stratosphere (Jorge et al., 2021)
3	Dhulikhel	2017-0805-180925 RS41-SGP M2150161 MW41 2.6.0	KU006	2L4804	/ 2Z24835	
4	Dhulikhel	2017-0806-184452 RS41-SGP M2150058 MW41 2.6.0	KU009	2L4802	/ 2Z24836	contamination in stratosphere (Jorge et al., 2021)
5	Dhulikhel	2017-0807-164514 RS41-SGP L4010085 MW41 2.6.0	KU010	2L4805	/ 2Z23303	
6	Dhulikhel	2017-0809-164921 RS41-SGP M2150135 MW41 2.6.0	KU016	2L4817	/ 2Z24832	
7	Dhulikhel	2017-0810-162905 RS41-SGP M2910579 MW41 2.6.0	KU020	2L5819	/ 2Z21360	ice1 disqualified, suspected electronic interference (large scatter in U_m and/or T_m) ice2 disqualified, suspected issue with ice film (sudden jumps in reflectivity)

8	Dhulikhel	2017-0812-165315 RS41-SGP M2910614 MW41 2.6.0	KU028	2L5901	/ /	contamination in stratosphere (Jorge et al., 2021) ice2 disqualified, suspected contamination already in UT (see also Jorge et al., 2021)
9	Lindenberg (52.21°N, 14.12°E, 0.11 km asl)	2016-0310-225428 RS41-SGP L1810106 MW41 2.2.1	LI177	2L3410	329 6A	
10	Lindenberg	2016-0412-230433 RS41-SGP L1810201 MW41 2.2.1	LI179	2L3411	317 6A27198	
11	Lindenberg	2016-0509-230241 RS41-SGP L2140145 MW41 2.2.1	LI181	2L4125	316 6A27194	
12	Lindenberg	2016-0524-225443 RS41-SGP L2130396 MW41 2.2.1	LI182	2L4124	330 6A	
13	Lindenberg	2016-0620-224858 RS41-SGP L2210016 MW41 2.2.1	LI184	2L4322	327 6A24934	CFH CodeVersion (FW) 6.31 instead of 6.44
14	Lindenberg	2016-0824-225100 RS41-SGP L4150434 MW41 2.2.1	LI189	2L4123	313 6A24930	
15	Lindenberg	2016-1017-233051 RS41-SGP L4150053 MW41 2.4.0	LI193	2L4123	332 6A24914	
16	Lindenberg	2016-1123-013454 RS41-SGP M3010873 MW41 2.5.0	LI195	2L4123	310 6A24915	ice2 disqualified, suspected electronic interference (large scatter in U_m and/or T_m) FLASH-B on separate

						balloon/telemetry
17	Lindenberg	2016-1215-224907 RS41-SGP M3021294 MW41 2.5.0	LI197	2L4319	331 6A24917	FLASH-B on separate balloon/telemetry
18	Lindenberg	2017-0313-225417 RS41-SGP M3021177 MW41 2.6.0	LI202	2L4824	335 6A25756	with FLASH-B
19	Lindenberg	2017-0404-230657 RS41-SGP M5120052 MW41 2.6.0	LI204	2L4824	307 6A25705	ice2 disqualified, suspected issue with ice film (sudden jumps in reflectivity)
20	Lindenberg	2017-0426-225644 RS41-SGP M3021164 MW41 2.6.0	LI205	2L4805	308 6A28584	ice2 not formed before tropopause
21	Lindenberg	2017-0517-225625 RS41-SGP N1320827 MW41 2.6.0	LI207	2L4805	328 6A27142	
22	Lindenberg	2017-0713-225908 RS41-SGP N1240466 MW41 2.6.0	LI211	2L5221	251 6A27145	
23	Lindenberg	2017-0823-224605 RS41-SGP N1250508 MW41 2.6.0	LI214	2L5025	320 6A27175	
24	Lindenberg	2017-0921-230719 RS41-SGP N1320473 MW41 2.6.0	LI216	2L5025	324 6A25698	
25	Lindenberg	2017-1018-230326 RS41-SGP N1230981 MW41 2.6.0	LI218	2L5025	322 6A25677	
26	Lindenberg	2017-1122-225803 RS41-SGP N3610074 MW41 2.6.0	LI220	2L4123	142 6A25734	

27	Lindenberg	2017-1213-012935 RS41-SGP N1230976 MW41 2.6.0	LI222	2L4123	142 6A25674	ice2 not formed before tropopause
28	Lindenberg	2018-0130-225943 RS41-SGP N3450039 MW41 2.6.0	LI224	2L5802	314 6A25678	
29	Lindenberg	2018-0213-230051 RS41-SGP N3450052 MW41 2.6.0	LI225	2L4806	221 6A25671	
30	Lindenberg	2018-0320-225918 RS41-SGP N3610105 MW41 2.6.0	LI228	2L5724	315 6A25740	
31	Lindenberg	2018-0419-230315 RS41-SGP N3620534 MW41 2.6.0	LI230	2L5404	311 6A27171	
32	Lindenberg	2018-0508-225243 RS41-SGP N3650142 MW41 2.6.0	LI231	2L5404	318 6A27179	
33	Lindenberg	2018-0614-225802 RS41-SGP N4220205 MW41 2.6.0	LI233	2L5405	321 6A27174	
34	Lindenberg	2018-0702-224539 RS41-SGP N4140431 MW41 2.6.0	LI235	2L5109	323 6A27172	
35	Lindenberg	2018-0725-020459 RS41-SGP N3450409 MW41 2.6.0	LI236- PCFH	2L5225	309 6A27150	PCFH on separate balloon/telemetry
36	Lindenberg	2018-0807-233126 RS41-SGP N4220213 MW41 2.6.0	LI237	2L5725	321 6A27173	ice2 not formed before tropopause
37	Lindenberg	2018-0911-230724 RS41-SGP N1330373 MW41 2.6.0	LI239	2L5223	247 6A27146	

38	Lindenberg	2018-1008-225428 RS41-SGP N3450345 MW41 2.6.0	LI241	2L5403	200 6A28550	
39	Lindenberg	2018-1108-215536 RS41-SGP N4230671 MW41 2.6.0	LI243	2L5109	334 6A28554	ice2 disqualified, suspected electronic interference (large scatter in U_m and/or T_m) FLASH-B on separate balloon/teleme- try
40	Lindenberg	2018-1115-225242 RS41-SGP N4230671 MW41 2.6.0	LI244	2L5109	317 6A28553	FLASH-B on separate balloon/teleme- try
41	Lindenberg	2018-1212-165531 RS41-SGP N4230683 MW41 2.6.0	LI246- PCFH	2L5225	/ 6A28556	with PCFH COBALD 321 with second PCFH on separate balloon/telemetry (RS41-SGP N4230642, MW41 2.6.0)
42	Lindenberg	2018-1213-224808 RS41-SGP N4120605 MW41 2.6.0	LI247- PCFH	2L5401	309 6A28552	with PCFH FLASH-B on separate balloon/teleme- try
43	Lindenberg	2019-0129-224937 RS41-SGP N4230684 MW41 2.6.0	LI249	2L5401	333 6A28547	FLASH-B on separate balloon/teleme- try
44	Lindenberg	2019-0214-224606 RS41-SGP N4120862 MW41 2.6.0	LI250	2L5223	334 6A28633	FLASH-B on separate balloon/teleme- try
45	Lindenberg	2019-0401-192403 RS41-SGP N4040977 MW41 2.6.0	LI254	2L5414	317 6A28588	SKYDEW on separate balloon/teleme- try
46	Lindenberg	2019-0507-230037 RS41-SGP N4040956 MW41 2.11.0	LI258	2L5413	323 6A28593	

47	Lindenberg	2019-1111-194522 RS41-SGP N4140423 MW41 2.11.0	LI270-PCFH	2L5709	98 /	with PCFH second PCFH on separate balloon/telemetry FLASH-B on separate balloon/telemetry
48	Lindenberg	2019-1114-165619 RS41-SGP N4130711 MW41 2.11.0	LI271-PCFH	2L5710	322 /	with PCFH second PCFH on separate balloon/telemetry FLASH-B on separate balloon/telemetry
49	Nainital (29.36°N, 79.46°E, 1.81 km a.s.l.)	2016-0805-172327 RS41-SGP M2220114 MW41 2.3.0	NT003	2L4706	426 2Z26202	Flight discarded in Section 6.2 (suspected instrumental issue with RS41) ice2 disqualified, suspected contamination already in UT (this work)
50	Nainital	2016-0806-175640 RS41-SGP M2150142 MW41 2.3.0	NT004	2L4607	424 2Z29725	
51	Nainital	2016-0808-162950 RS41-SGP M2220112 MW41 2.3.0	NT005	2L4702	423 2Z29577	
52	Nainital	2016-0811-185812 RS41-SGP M2150060 MW41 2.3.0	NT007	2L4604	421 2Z29727	contamination in stratosphere (Jorge et al., 2021) ice2 disqualified, suspected contamination already in UT (see also Jorge et al., 2021)

53	Nainital	2016-0812-161956 RS41-SGP M2150162 MW41 2.3.0	NT009	2L4703	417 2Z29735	
54	Nainital	2016-0815-165308 RS41-SGP M2150133 MW41 2.3.0	NT011	2L4707	411 2Z29742	contamination in stratosphere (Jorge et al., 2021) ice2 disqualified, suspected contamination already in UT (see also Jorge et al., 2021)
55	Nainital	2016-0816-182642 RS41-SGP M2150157 MW41 2.3.0	NT013	2L4621	339 2Z29736	only liquid layer (early burst)
56	Nainital	2016-0817-152947 RS41-SGP M2150144 MW41 2.3.0	NT015	2L4612	425 2Z29584	
57	Nainital	2016-0818-160401 RS41-SGP M2150141 MW41 2.3.0	NT017	2L4709	428 2Z29715	
58	Nainital	2016-0819-172849 RS41-SGP M2220113 MW41 2.3.0	NT018	2L5108	410 2Z29729	
59	Nainital	2016-0821-155047 RS41-SGP M2150074 MW41 2.3.0	NT023	2L4712	409 2Z29736	
60	Nainital	2016-0823-163310 RS41-SGP M2150143 MW41 2.3.0	NT025	2L4710	340 2Z29724	
61	Nainital	2016-0826-181759 RS41-SGP M2220109 MW41 2.3.0	NT027	2L4713	414 2Z29726	ice2 disqualified, suspected electronic interference (large scatter in U_m and/or T_m)
62	Nainital	2016-0828-161051 RS41-SGP M2150139 MW41 2.3.0	NT028	2L4609	408 2Z29723	

63	Nainital	2016-0830-154419 RS41-SGP M2150134 MW41 2.3.0	NT029	2L4603	420 2Z29731	contamination in stratosphere (Jorge et al., 2021).
64	Nainital	2016-1108-185019 RS41-SGP M2220111 MW41 2.3.0	NT031	2L5110	418 2Z24831	
65	Nainital	2016-1110-144350 RS41-SGP M2150138 MW41 2.3.0	NT033	2L4708	416 2Z21260	
66	Nainital	2016-1111-153634 RS41-SGP M2150140 MW41 2.3.0	NT034	2L3809	413 2Z21364	Flight discarded in Section 6.2 (suspected instrumental issue with CFH)
67	Ny-Alesund (78.92°N, 11.92°E, 0.02 km asl)	2020-0208-164950 RS41-SGP P1040630 MW41 2.11.0	NA052- PCFH	2L6222	620 6A34990	with PCFH
68	Ny-Alesund	2020-0217-203731 RS41-SGP P1130424 MW41 2.11.0	NA053- PCFH	2L6221	621 6A34994	no liquid layer (frost on mirror at launch) with PCFH
69	Ny-Alesund	2020-0221-190958 RS41-SGP P0940864 MW41 2.11.0	NA054- PCFH	2L6220	617 6A35354	no liquid layer (frost on mirror at launch) with PCFH FLASH-B on separate balloon/telemetry (RS41-SGP P1130447, MW41 2.11.0)
70	Ny-Alesund	2020-0226-191613 RS41-SGP P1130442 MW41 2.11.0	NA055- PCFH	2L6722	619 6A35356	no liquid layer (frost on mirror at launch) with PCFH

E-1	Lindenberg	2014-0520-225119 IMet1-RSB 14246 Strato 9.54	LI133	2L3407	205 2Z7378	CFH CodeVersion (FW) 6.40 instead of 6.44
E-2	Dhulikhel	2017-0811-115104 RS41-SGP L4150443 MW41 2.6.0	KU024	2L5917	/ 2Z23305	Launched 1h before sunset, considered as daytime flight
E-3	Lindenberg	2021-1007-180851 RS41-SGP S2330258 MW41 2.15.0	LI304-PCFH	2L6711	322 6A35222	PCFH on separate balloon/telemetry FLASH-B on separate balloon/telemetry (RS41-SGP S2330252, MW41 2.15.0)
E-4	Maïdo Observatory (-21.08°N, 55.38°E, 2.16 km asl)	2022-0122-210033 IMet1-RSB 14246 Strato 9.66	LM031	2L7812	574 Z38481	
E-5	Lindenberg	2023-0718-210609 RS41-SGP V1021230 MW41 2.15.0	LSD006	SKYDEW S/N 20570	329 6A40261	SKYDEW CodeVersion (FW) 1.0

Table S1. Flights Table.