

# **Supplemental information for: Atmospheric Distribution of HCN from Satellite Observations and 3-D Model Simulations**

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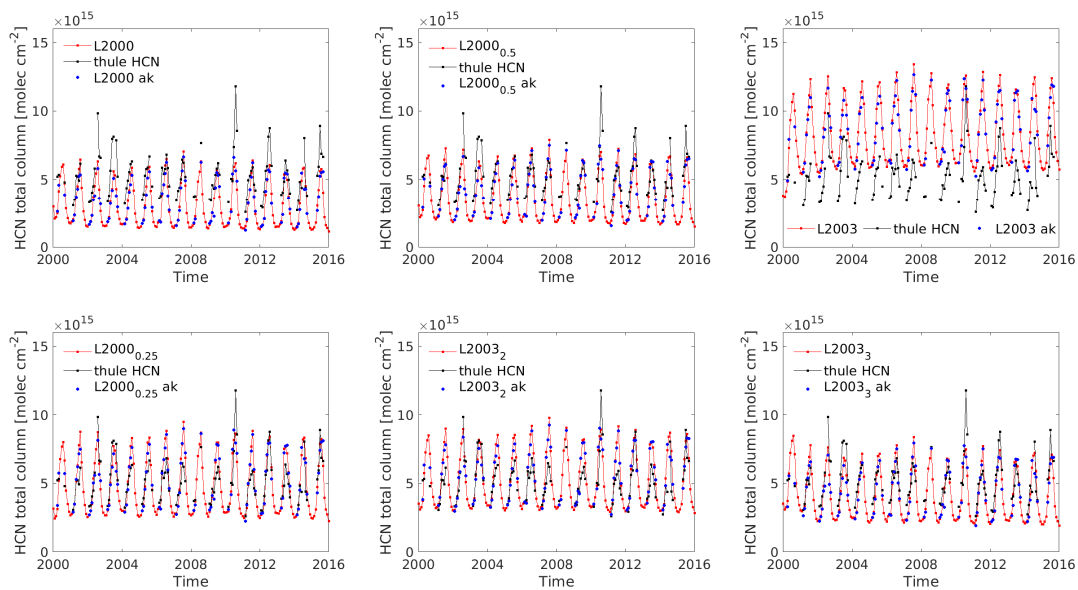
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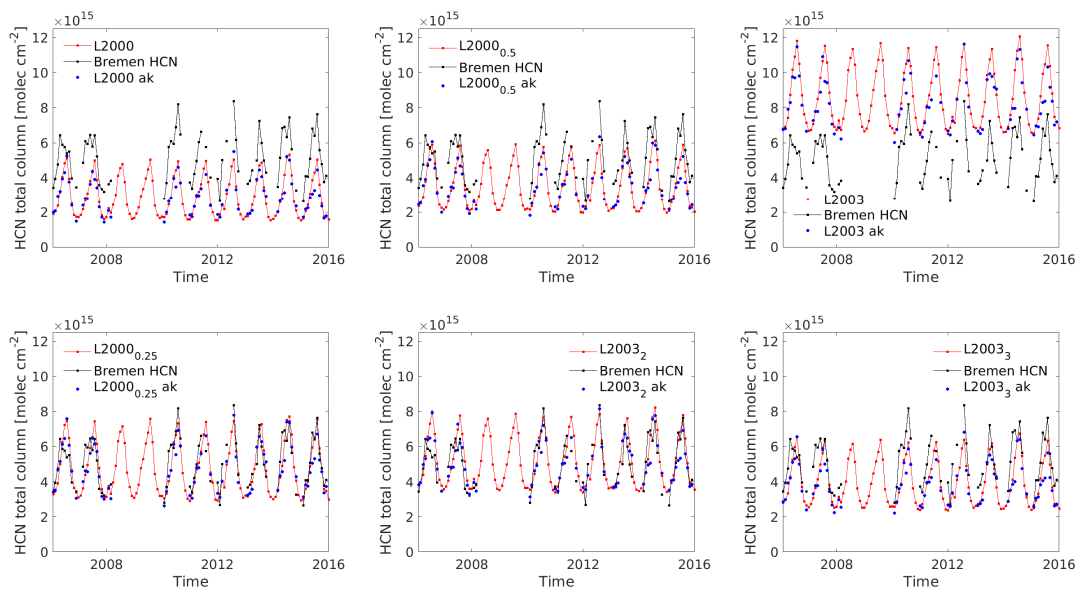
## **1 Supplementary section**

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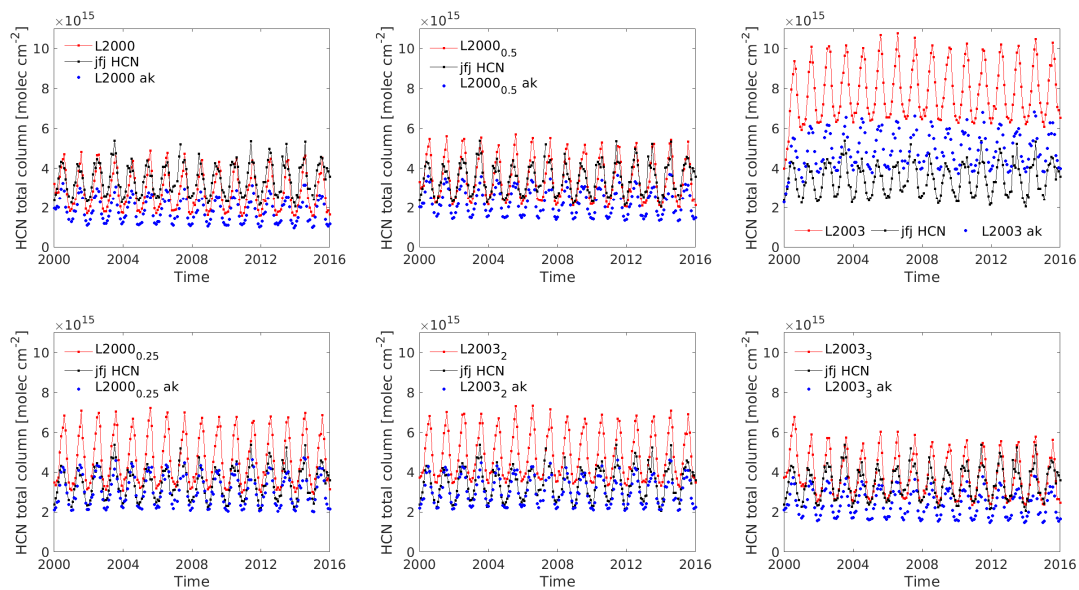
1. Figures S1 to S4
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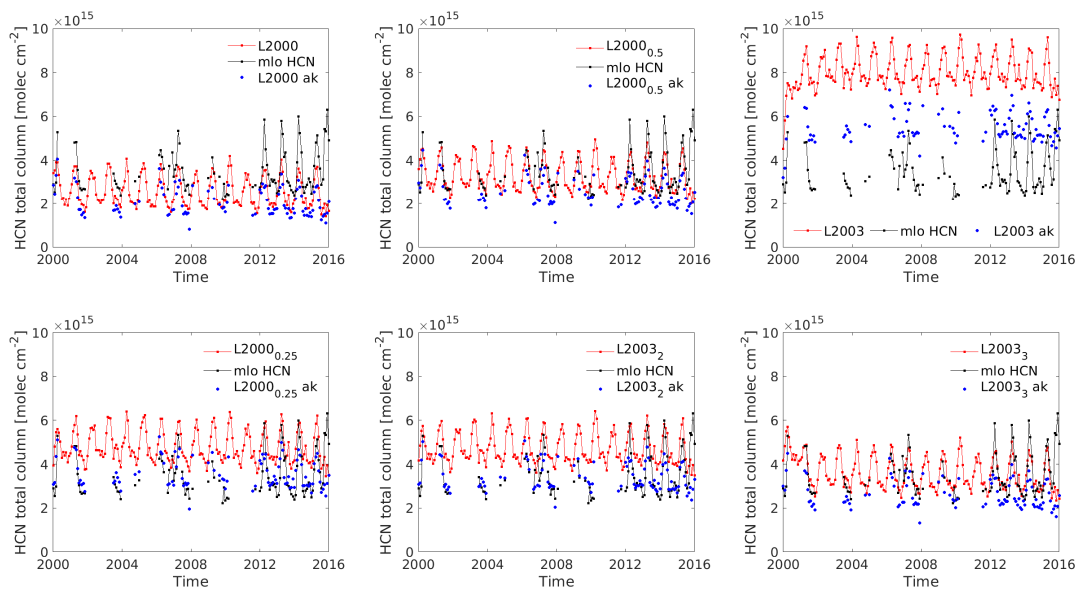
**Figure S1.** HCN total column time series (molecules  $\text{cm}^{-2}$ ) measured at Thule ( $76.5^\circ$  N,  $68.7^\circ$  W) NDACC station and modelled at the same location for 6 different model tracers (see main paper Table 3). Each panel shows the NDACC observations (black dots and line) and results from one model tracer without (red dots and line) or with (blue dots) the FTIR averaging kernels applied.



**Figure S2.** HCN total column time series (molecules  $\text{cm}^{-2}$ ) measured at Bremen ( $53.1^\circ$  N,  $8.8^\circ$  E) NDACC station and modelled at the same location for 6 different model tracers (see main paper Table 3). Each panel shows the NDACC observations (black dots and line) and results from one model tracer without (red dots and line) or with (blue dots) the FTIR averaging kernels applied.



**Figure S3.** HCN total column time series (molecules  $\text{cm}^{-2}$ ) measured at Jungfraujoch ( $46.6^\circ \text{ N}$ ,  $8.0^\circ \text{ E}$ ) NDACC station and modelled at the same location for 6 different model tracers (see main paper Table 3). Each panel shows the NDACC observations (black dots and line) and results from one model tracer without (red dots and line) or with (blue dots) the FTIR averaging kernels applied.



**Figure S4.** HCN total column time series (molecules cm<sup>-2</sup>) measured at Mauna Loa (19.5° N, 155.6° W) NDACC station and modelled at the same location for 6 different model tracers (see main paper Table 3). Each panel shows the NDACC observations (black dots and line) and results from one model tracer without (red dots and line) or with (blue dots) the FTIR averaging kernels applied.

**Table S1.** Root Mean Square Error (RMSE) between the six TOMCAT model HCN tracers and FTIR measurements at four NDACC station locations.

	$RMSE_{Bremen}$ $10^{15}$ [molec/cm <sup>2</sup> ]	$RMSE_{Jungfraujoch}$ $10^{15}$ [molec/cm <sup>2</sup> ]	$RMSE_{MaunaLoa}$ $10^{15}$ [molec/cm <sup>2</sup> ]	$RMSE_{Thule}$ $10^{15}$ [molec/cm <sup>2</sup> ]
L2000	2.3121	1.6261	1.6443	1.9297
L2000 <sub>0.5</sub>	1.7074	1.2220	1.2377	1.4505
L2003	3.2794	1.5499	2.1820	3.8029
L2000 <sub>0.25</sub>	0.8505	0.5402	0.8130	1.2199
L2003 <sub>2</sub>	0.8291	0.5388	0.8303	1.2964
L2003 <sub>3</sub>	1.4041	1.1034	1.1910	1.2301

**Table S2.** Coefficient of determination ( $R^2$ ) between the model HCN tracers at four NDACC station locations and FTIR measurements.

	$R^2_{Bremen}$	$R^2_{Jungfraujoch}$	$R^2_{MaunaLoa}$	$R^2_{Thule}$
L2000	-1.8189	-3.2000	-1.8349	-0.3984
L2000 <sub>0.5</sub>	-0.5373	-1.3717	-0.6064	0.2098
L2003	-4.6711	-2.8154	-3.9923	-4.4313
L2000 <sub>0.25</sub>	0.6186	0.5366	0.3069	0.4411
L2003 <sub>2</sub>	0.6375	0.5389	0.2772	0.3689
L2003 <sub>3</sub>	-0.0397	-0.9339	-0.4875	0.4317