

# Supporting Information for “NASA GEOS Composition Forecast (GEOS-CF) system version 1: Evaluation of the stratospheric composition against independent observations”

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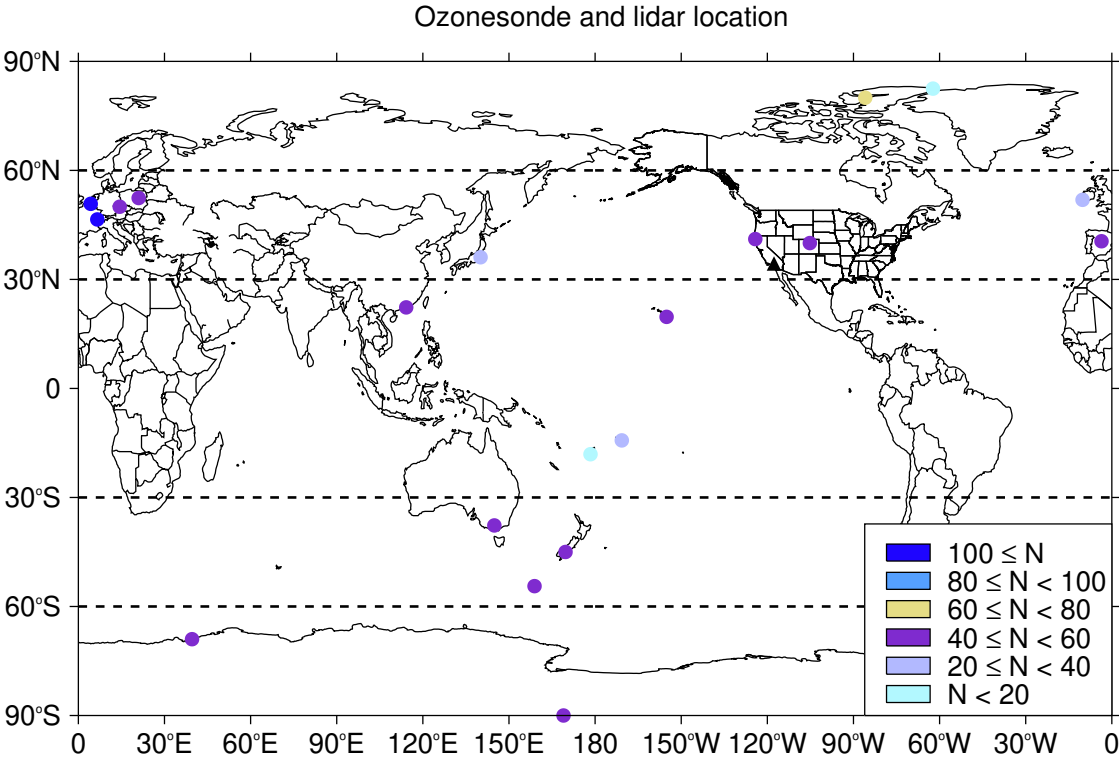
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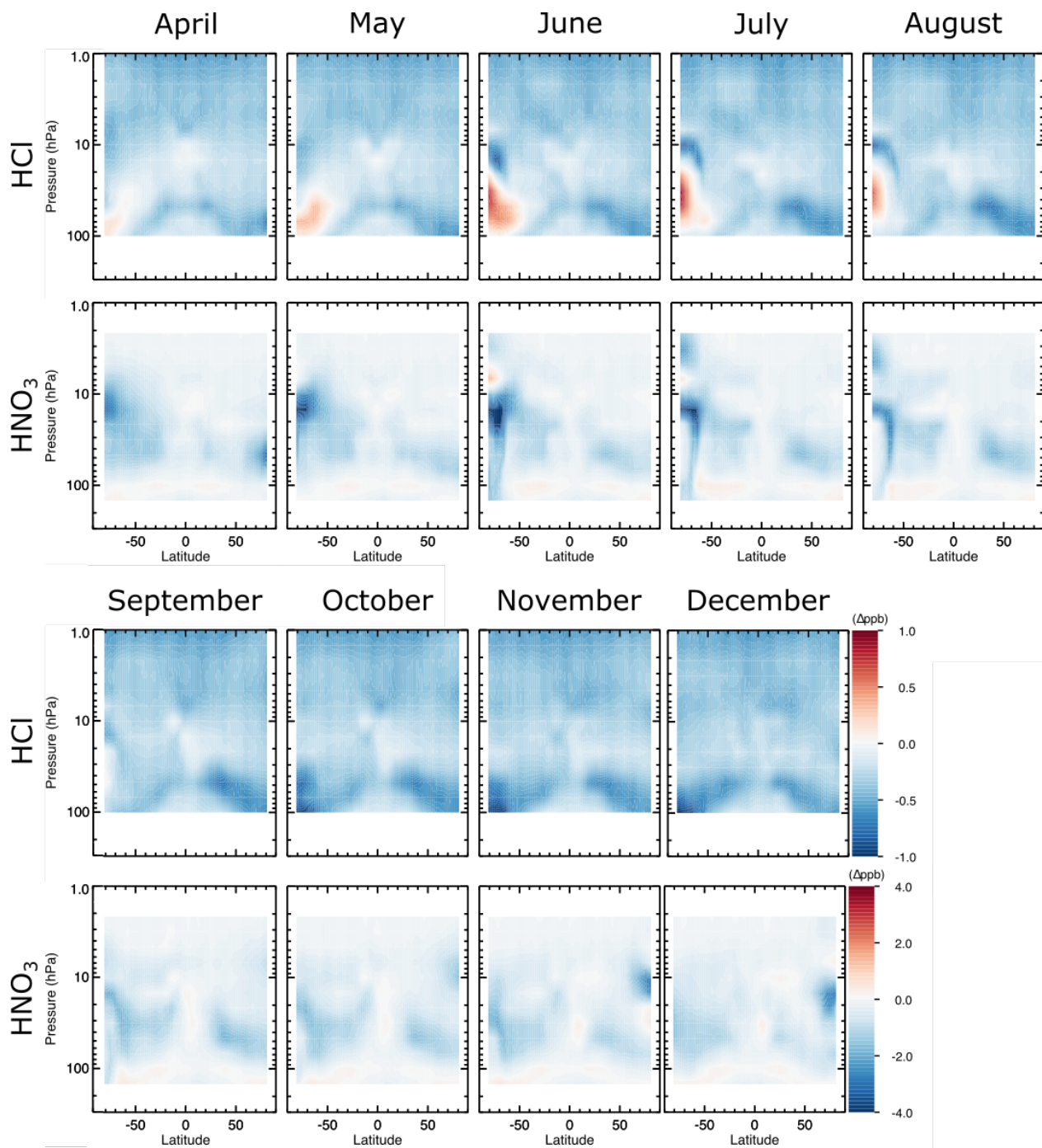
## Contents of this file

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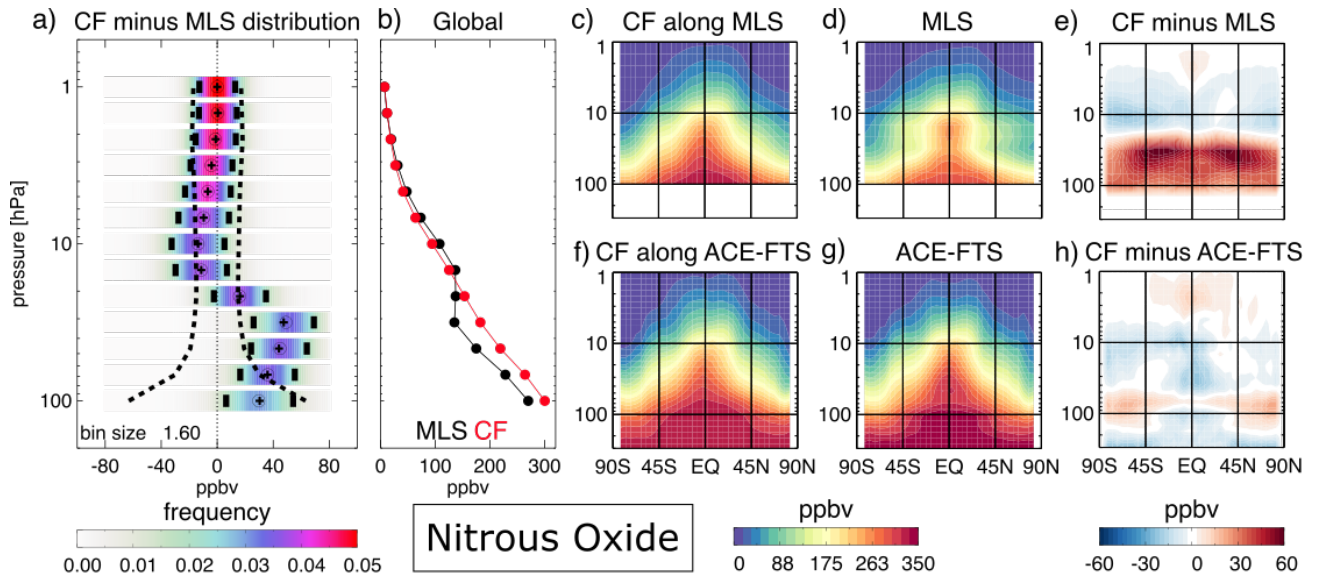
1. Supplementary Figures S1 to S5



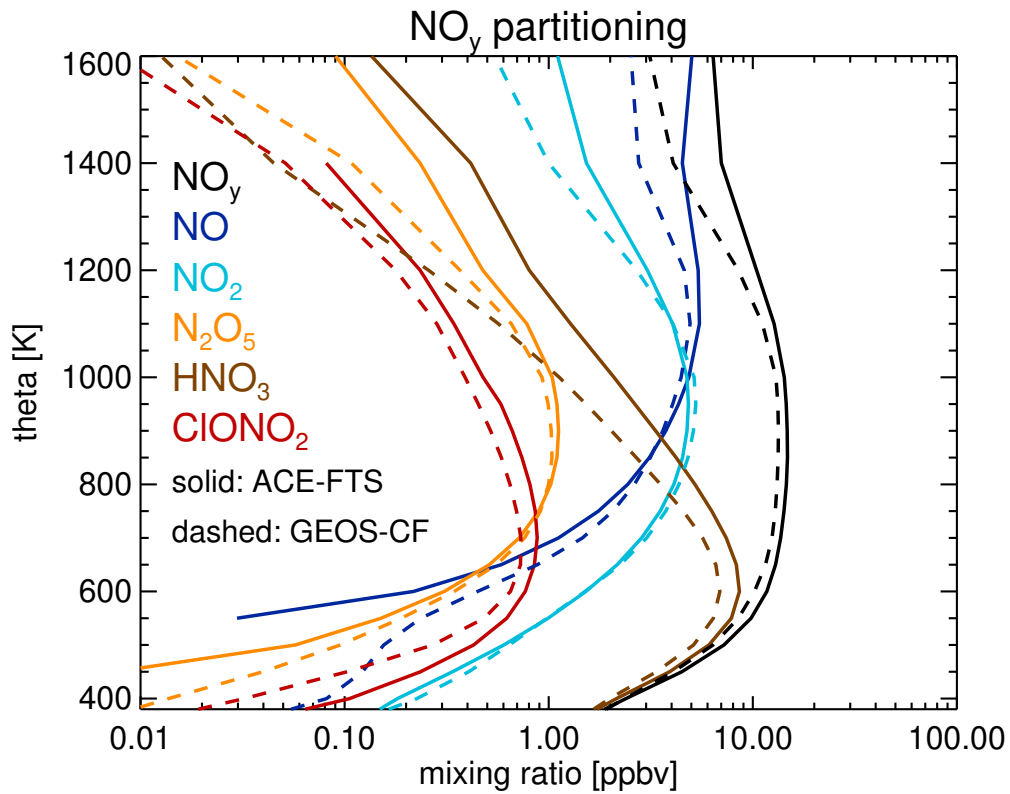
**Figure S1.** Ozonesonde locations colored by the number of launches in 2020 used in this study (see Table 2). Location of the NASA JPL Table Mountain Facility tropospheric O<sub>3</sub> lidar (TMTOL; 34.38 °N, 117.68 °W) is indicated as black triangle.



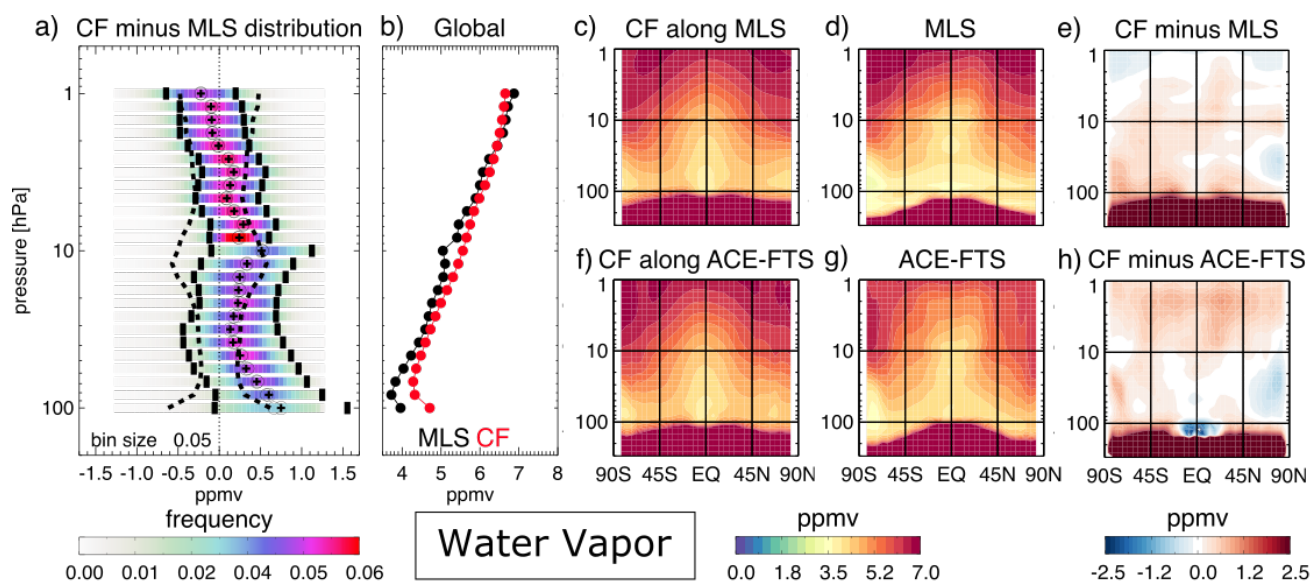
**Figure S2.** Zonal differences of monthly mean distributions for GEOS-CF minus MLS for HCl and HNO<sub>3</sub> for April to December 2020.



**Figure S3.** Similar to Figure 7 but for  $\text{N}_2\text{O}$ .



**Figure S4.** Cosine-weighted averages of  $\text{NO}_y$  and its components observed by ACE-FTS –  $\text{NO}$  (dark blue),  $\text{NO}_2$  (cyan),  $\text{N}_2\text{O}_5$  (orange),  $\text{HNO}_3$  (brown), and  $\text{ClONO}_2$  (red) – for ACE-FTS measurements (solid lines) and for matched GEOS-CF gridpoints (dashed lines).



**Figure S5.** Similar to Figure 7 but for water vapor.