# *Supplement of*
# "On the discrepancy of HCl processing in the dark polar vortices"

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**Supplementary figures**

This supplement includes additional figures that support details underpinning the findings of the paper but are not necessary for the general understanding. Figures S1 to S3 show the model results from WACCM and TOMCAT/SLIMCAT in the same style than the CLaMS results in Fig. 2 of the paper. Figure S4 shows the comparison between the chemistry modules of CLaMS and TOMCAT/SLIMCAT calculated in box model mode along a representative example trajectory. Figure S5 shows absorption cross sections and derived photolysis rates of particulate $HNO_3$ used in the simulations described in Section 6.2.

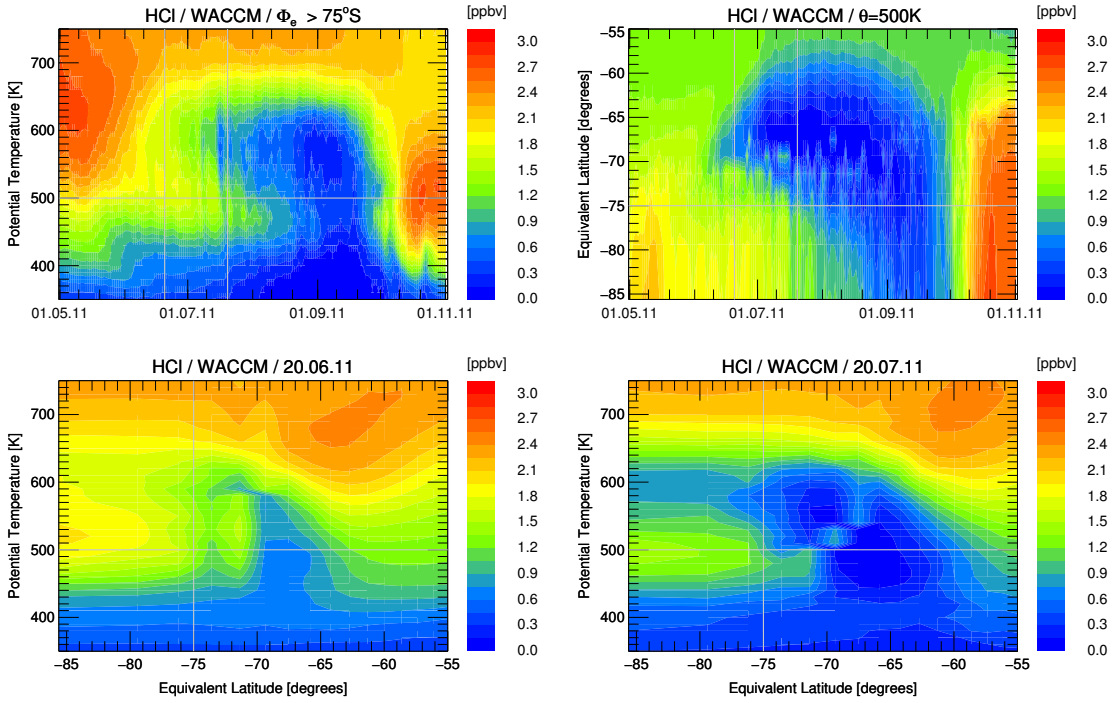


**Figure S1.** Depiction of HCl mixing ratio from the WACCM simulation averaged in equivalent latitude/potential temperature space. The top left panel shows the vortex core average for equivalent latitudes pole-ward of 75°S as a function of time and potential temperature. The top right panel shows the development on the 500 K potential temperature level. The bottom two panels show a snapshot of this average on 20 June and 20 July 2011. Grey lines on the panels indicate the cuts or borders displayed in the other panels of this figure (as in Figs. 2 and 3 of the main paper).

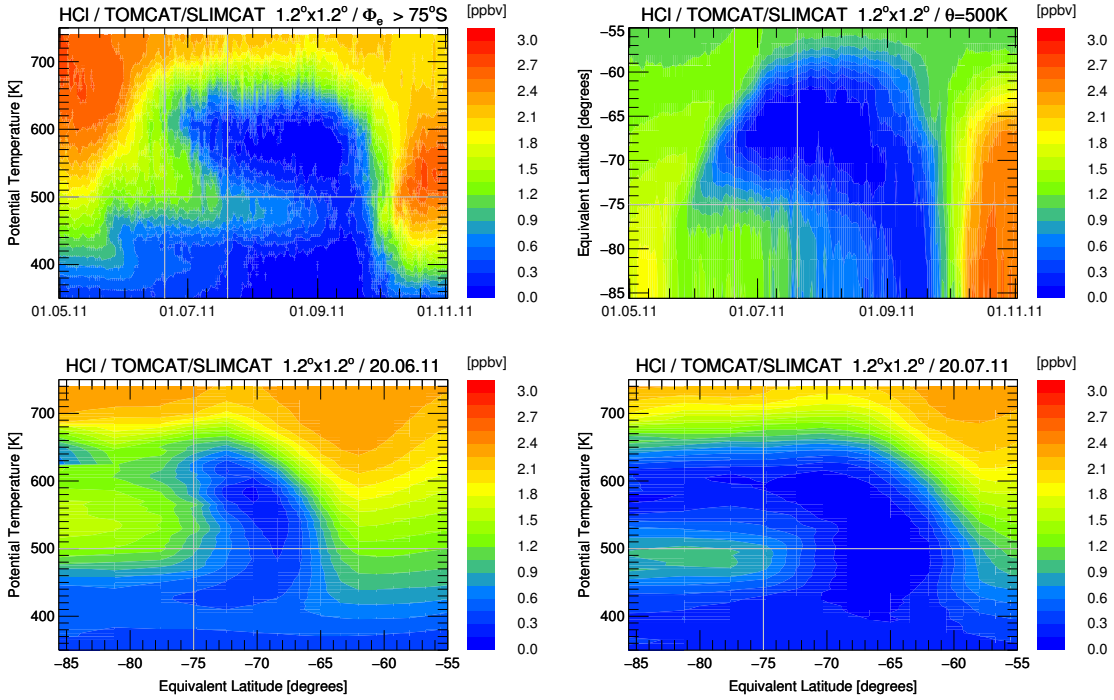


**Figure S2.** As Fig. S1 but for TOMCAT/SLIMCAT high resolution ($1.2^\circ \times 1.2^\circ$) simulation results.

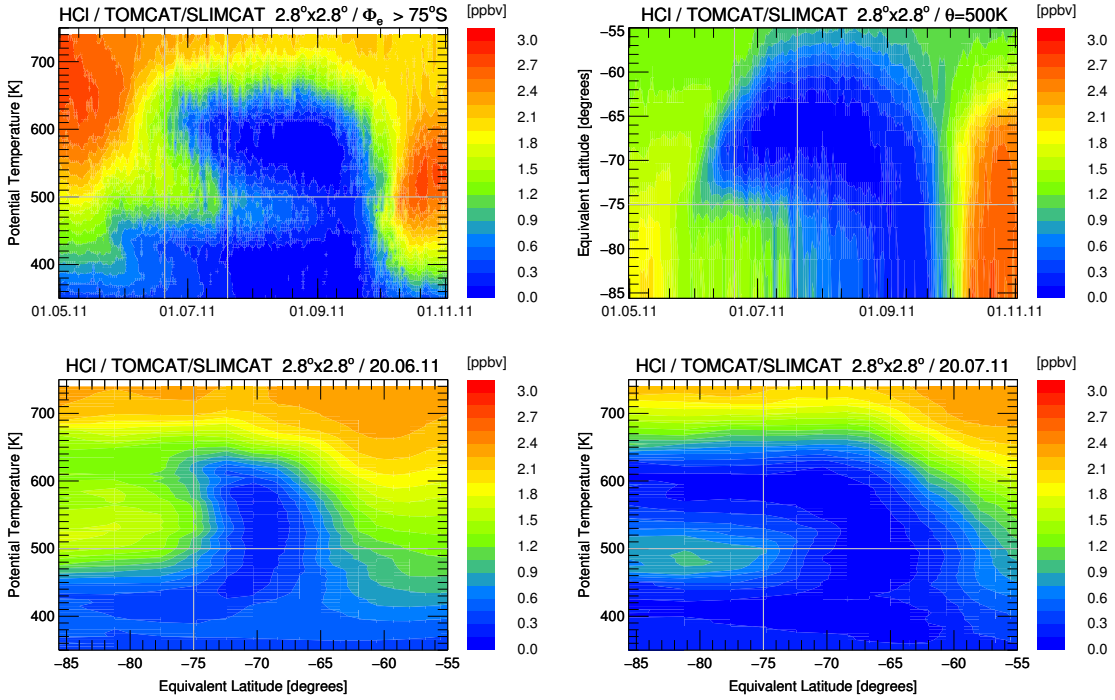


**Figure S3.** As Fig. S1 but for TOMCAT/SLIMCAT low resolution ($2.8^\circ \times 2.8^\circ$) simulation results.

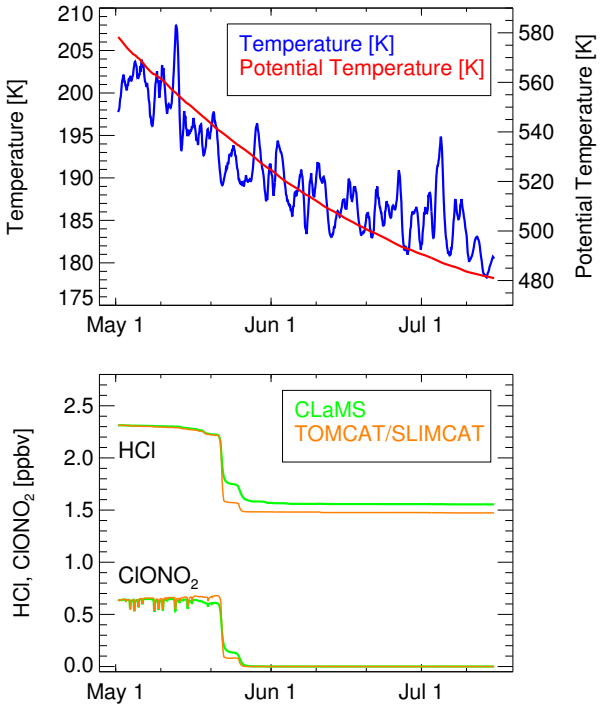


**Figure S4.** Box model comparison of the chemistry modules of CLaMS and TOMCAT/SLIMCAT. Simulations are performed along a single air parcel trajectory with approximately average ozone loss and HCl depletion between early May and mid July. The top panel shows temperature (blue) and potential temperature (red) along the selected trajectory and the bottom panel shows HCl and $ClONO_2$ mixing ratios for CLaMS (green lines) and TOMCAT/SLIMCAT (orange lines).

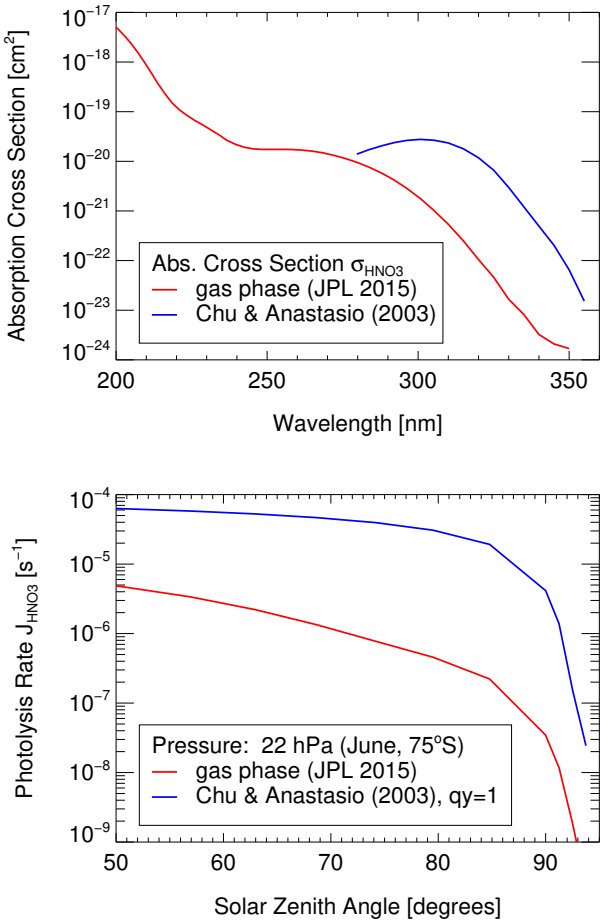


**Figure S5.** Absorption cross sections and derived photolysis rates used for the simulation of particulate $HNO_3$ photolysis presented in section 6.2. The upper panel shows the absorption cross section of the gas-phase photolysis (red line) and the estimate for the bulk phase after Chu and Anastasio (2003) as a blue line. The lower panel shows the corresponding photolysis rate as function of solar zenith angle (assuming quantum yield 1.0) derived for the 22 hPa pressure level for 75°S in June.