



*Supplement of*

## **Exploring the inorganic composition of the Asian Tropopause Aerosol Layer using medium-duration balloon flights**

**Hazel Vernier et al.**

*Correspondence to:* Hazel Vernier (hazel.vernier@cnrs-orleans.fr)

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## SUPPLEMENTARY FIGURES:

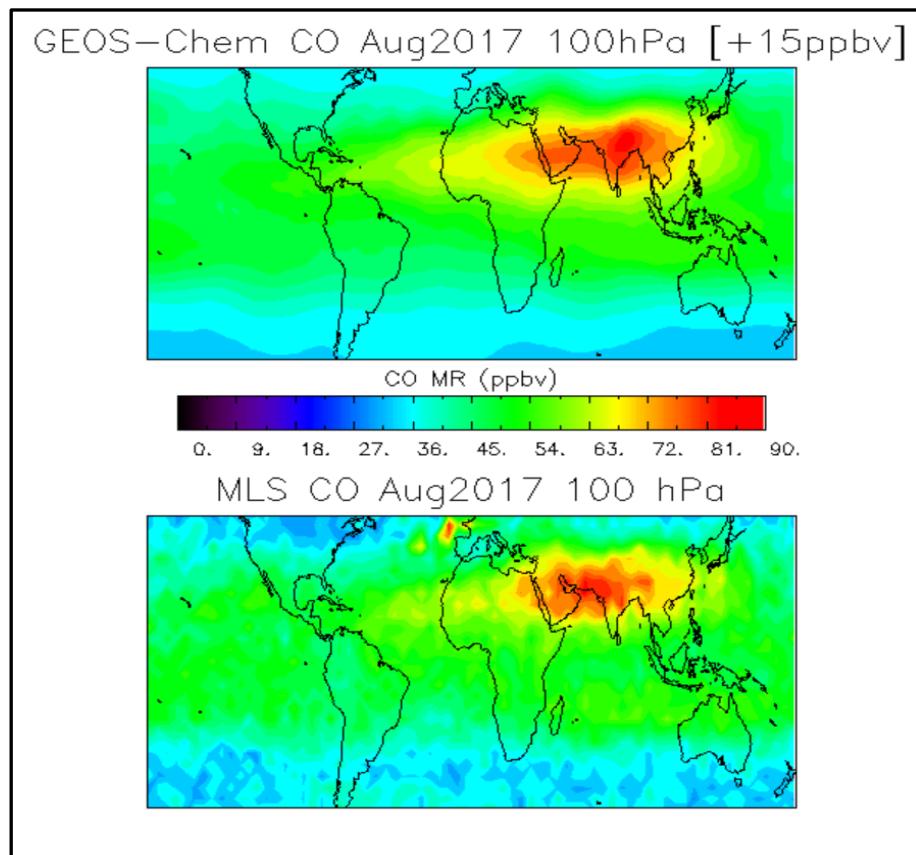


Fig. S1 Maps of Carbon monoxide (CO) for GEOS-Chem (above) and Microwave Limb Sounder (below) at 100 hPa for August 2017. An offset of +15ppbv is added to GEOS-Chem to make the comparison with MLS easier. The general patterns between MLS and GEOS-Chem are very similar with a maximum of CO associated with the Summer Asian Monsoon extending up to the Arabic Peninsula. However, the maximum of CO simulated by GOES-Chem is located over Eastern India while MLS maximum is shifted to Western China and Pakistan.

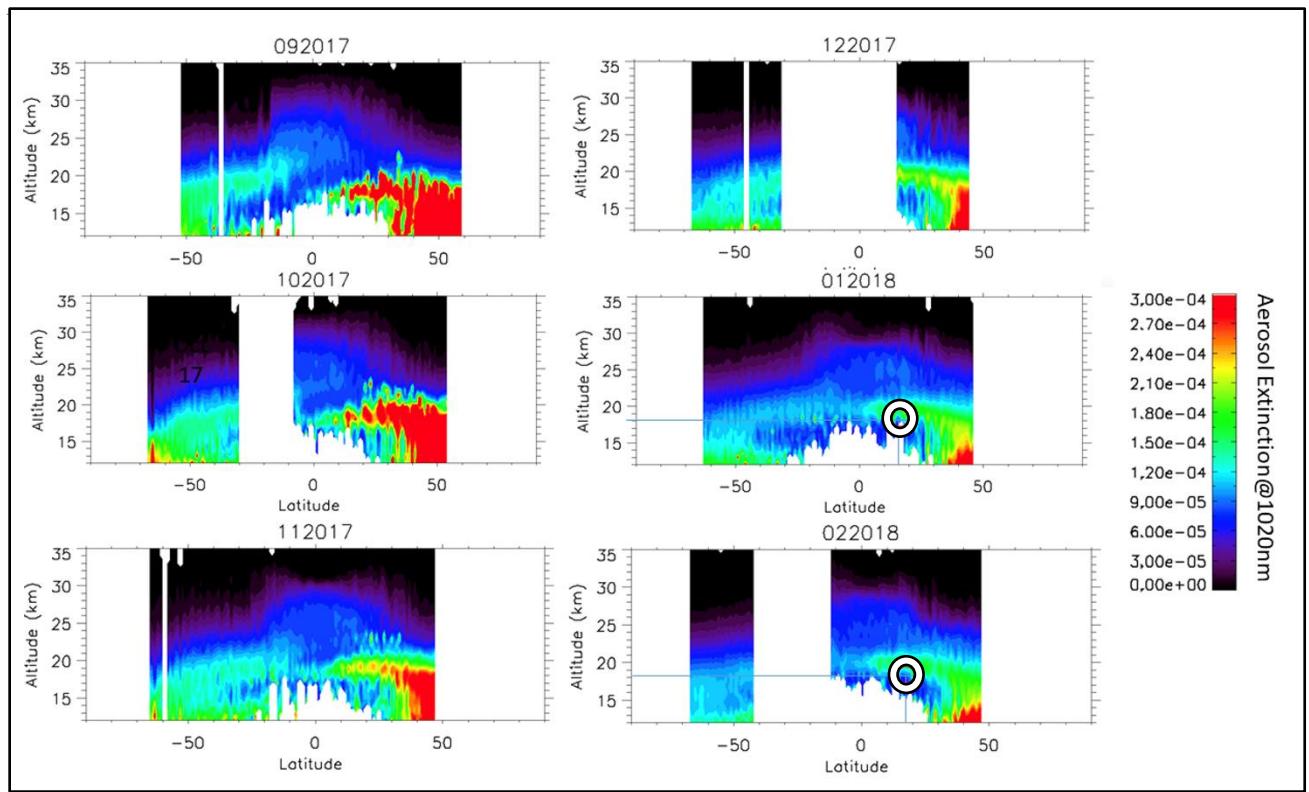


Figure S2. Zonal mean aerosol extinction at 1020 nm derived from the SAGE III/ISS V051 data products between September 2017 and February 2018. Ice clouds in the troposphere have been removed using a threshold of color ratio (521nm/1020nm) below 2 (Vernier et al., 2015). Increase of aerosol extinction between 10-50°N and 13-21 km is observed from September 2017 to the end of 2017 as a result of the Pacific Northwest Canadian PyroCbs which injected smoke in the Upper Troposphere and Lower Stratosphere in August 2017. A residual of the smoke plume is still detected up to February 2018. The white rings show the location of the balloon flight at the bottom of the aged smoke plume.

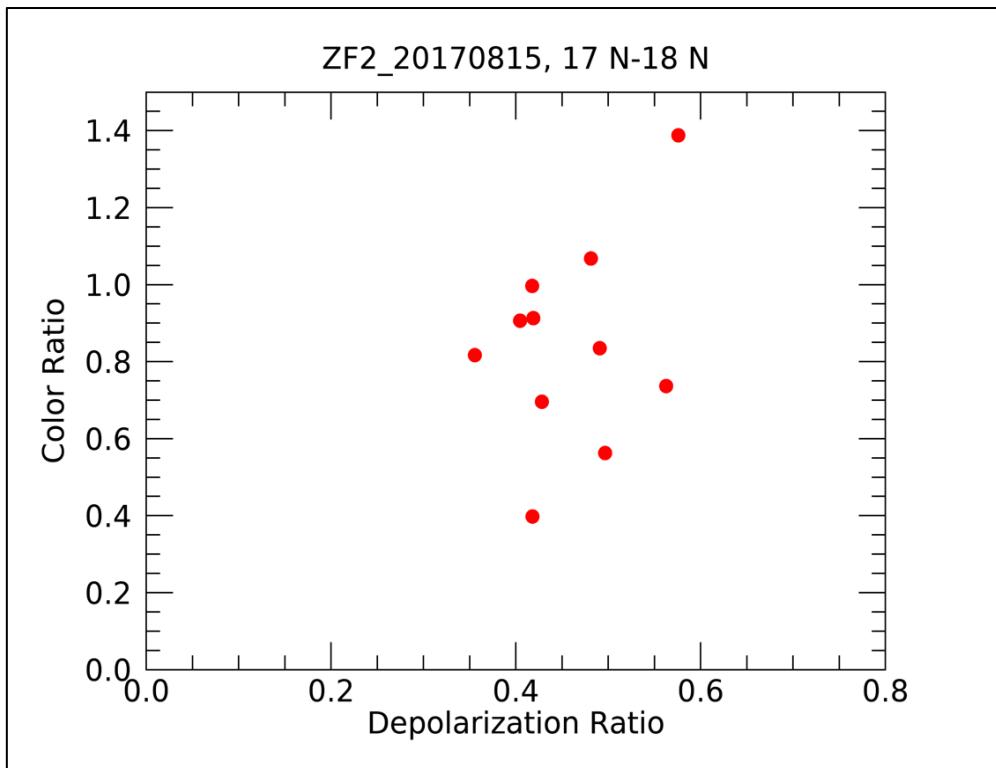


Figure S3. Cirrus cloud layer properties using CALIOP L2V4.2 Cloud Layer product for August 15<sup>th</sup> 2017 between 17.12°N and 17.92°N corresponding to the profiles shown in Fig.4. Depolarization ratio versus color ratio plot for these layers which indicates the presence of aspherical large particles consistent with the properties of sub-visible cirrus clouds (mean AOD~0.03+/-0.02).