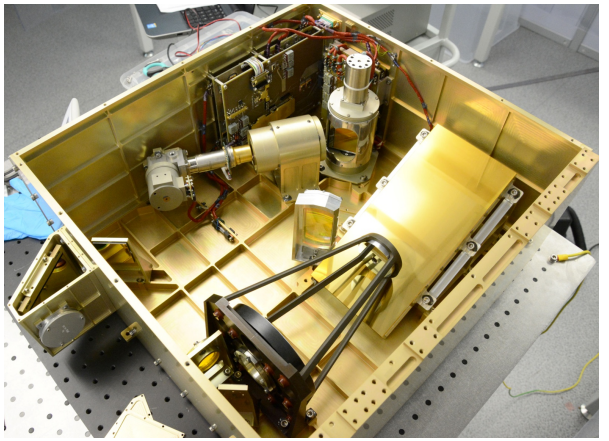
Monitoring of Martian water ice clouds over one Martian Year with ACS-MIR/TGO

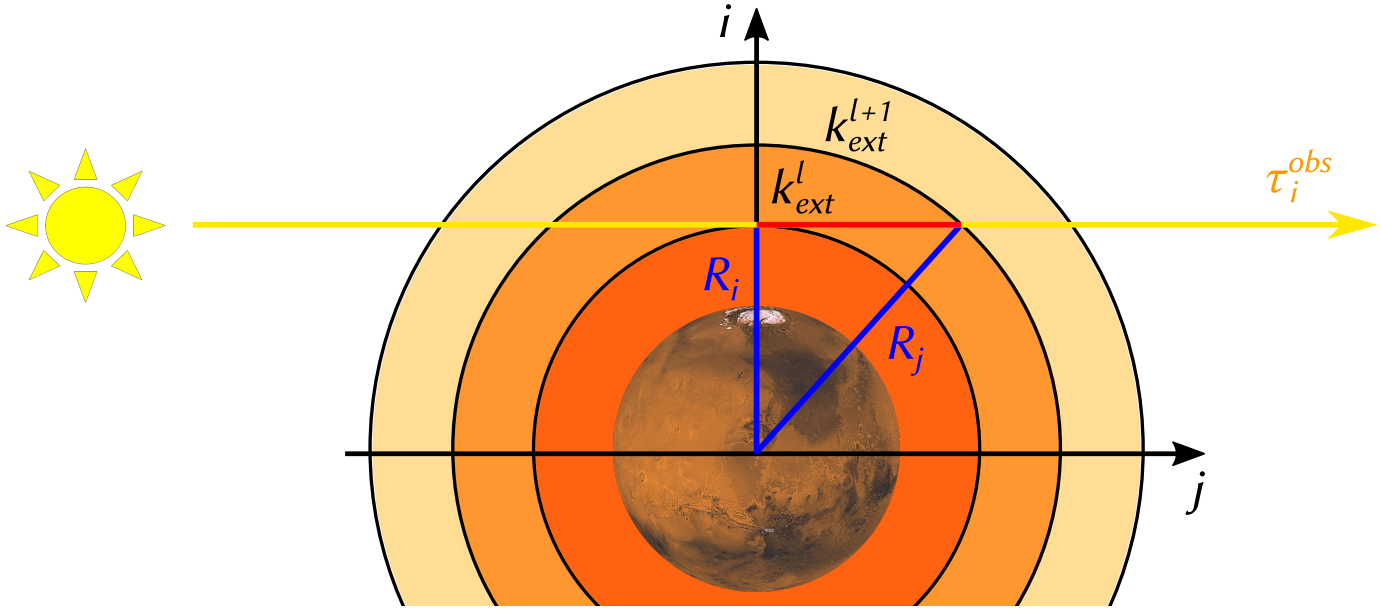
Aurélien Stcherbinine, F. Montmessin, M. Vincendon, M. Wolff, O. Korablev, A. Fedorova, A. Trokhimovskiy, G. Lacombe, L. Baggio, A. Irbah, A. Braude

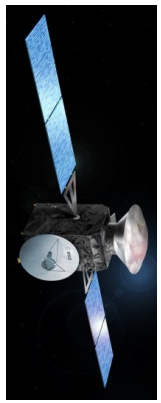
EGU General Assembly – Vienna, 24 May 2022

The ExoMars TGO/ACS-MIR channel

- Solar Occultation measurements
- Position 12 observations
  $\rightarrow \lambda = 3.1 - 3.45$ µm
- Transmissions computed through division by data acquired at 120 km

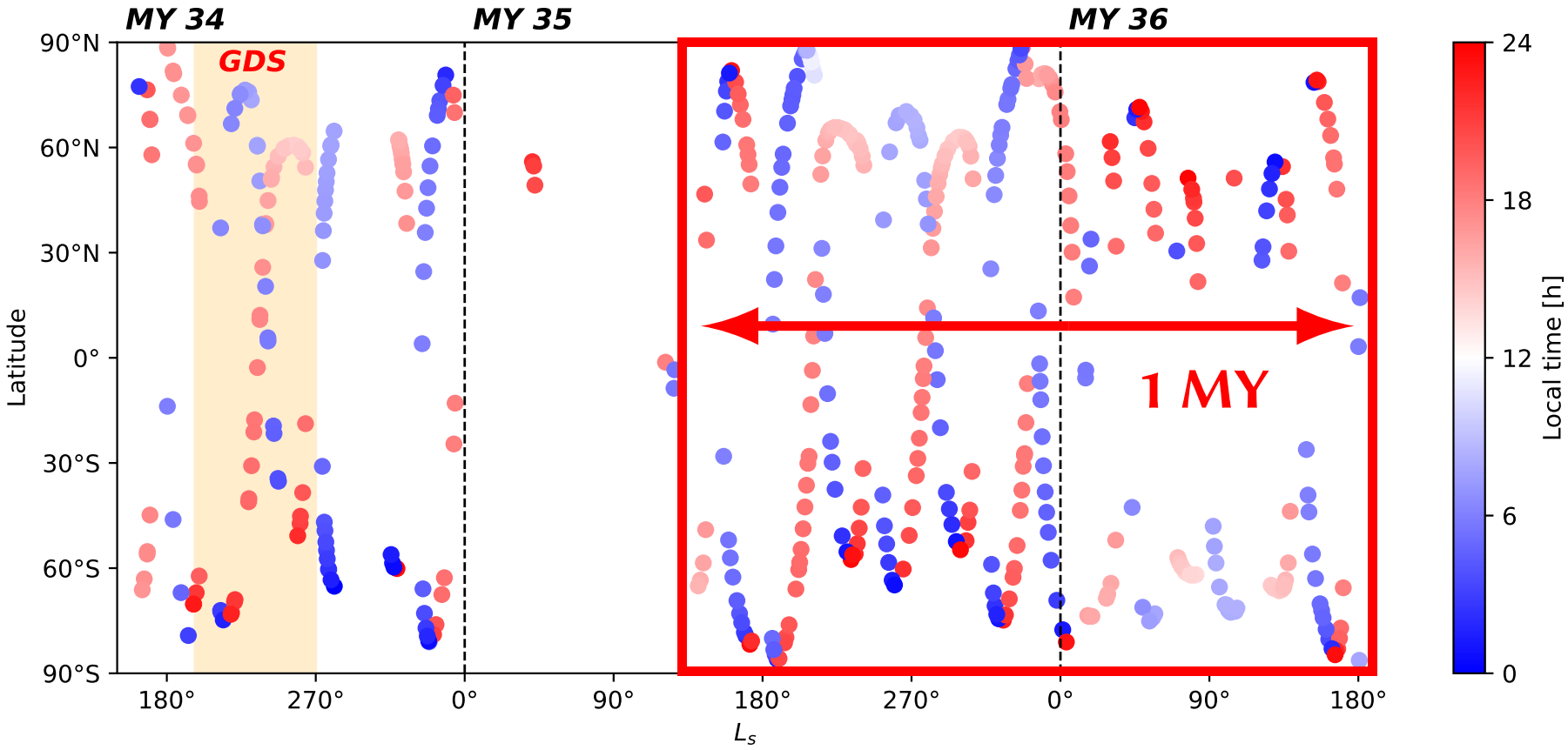






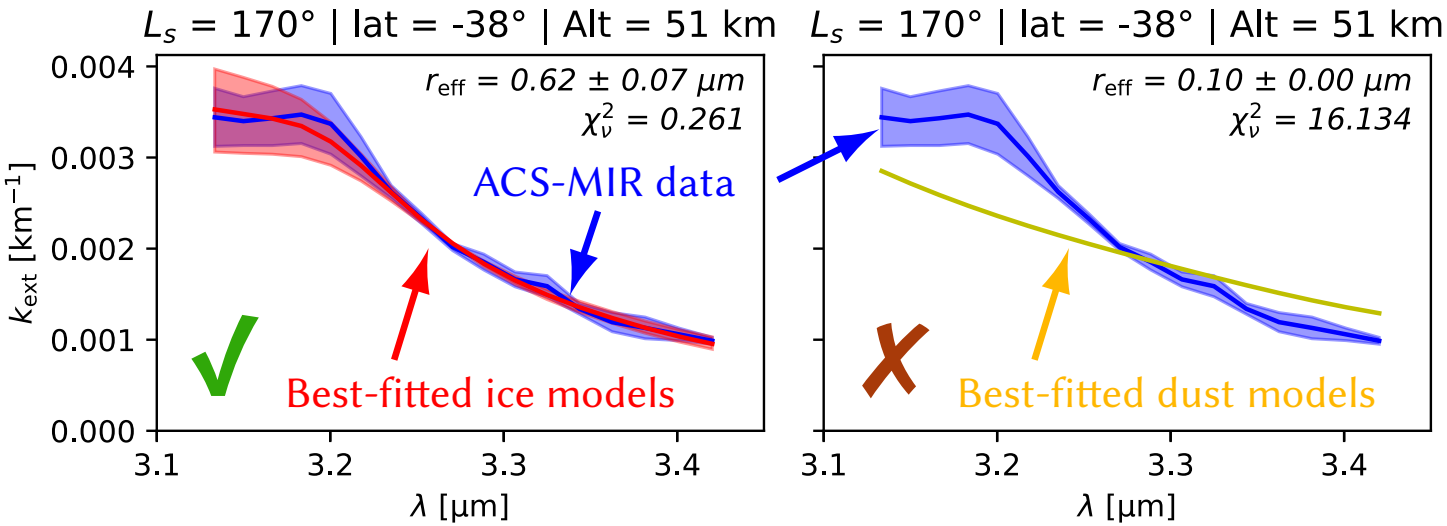
$$\tau_i^{\text{obs}} = \sum_{j=i+1}^{N-1} \left(\sqrt{R_{j+1}^2 + R_j^2} - \sqrt{R_j^2 + R_{j-1}^2} \right) k_{\text{ext}}^j$$

The ACS-MIR dataset

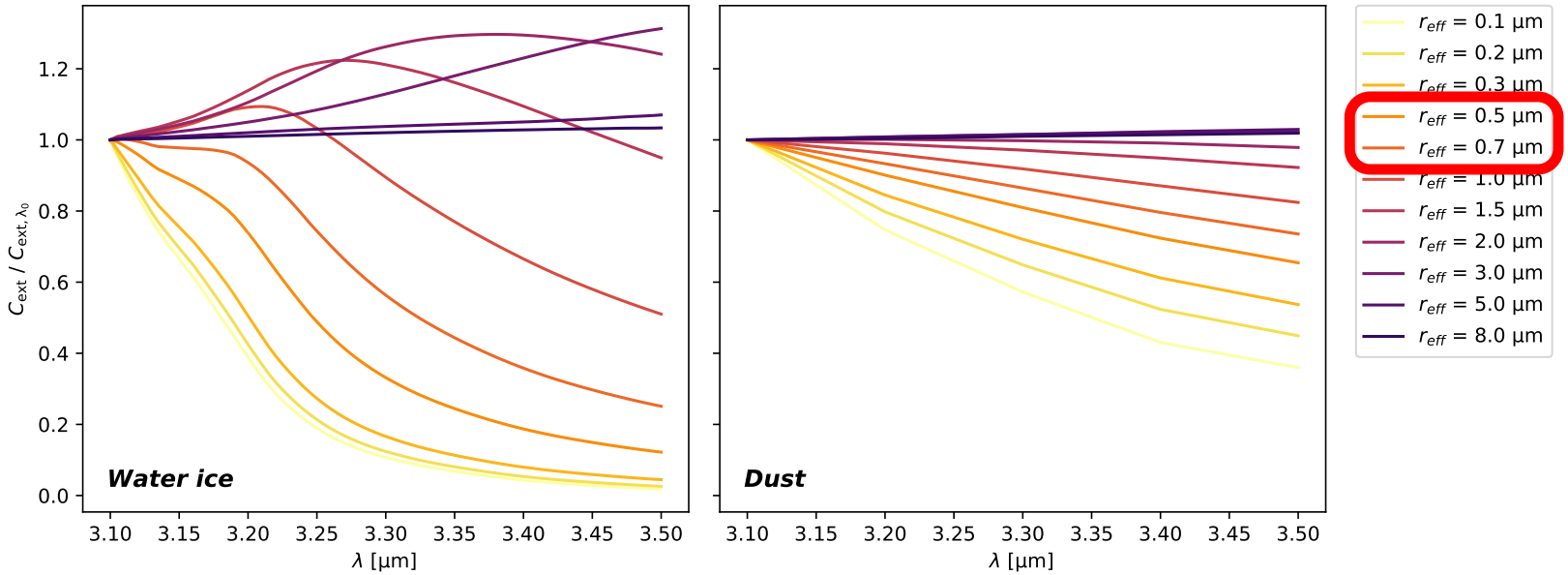


- Spatial and temporal distribution of the 514 ACS-MIR position 12 used in this study (April 2018 – February 2022).

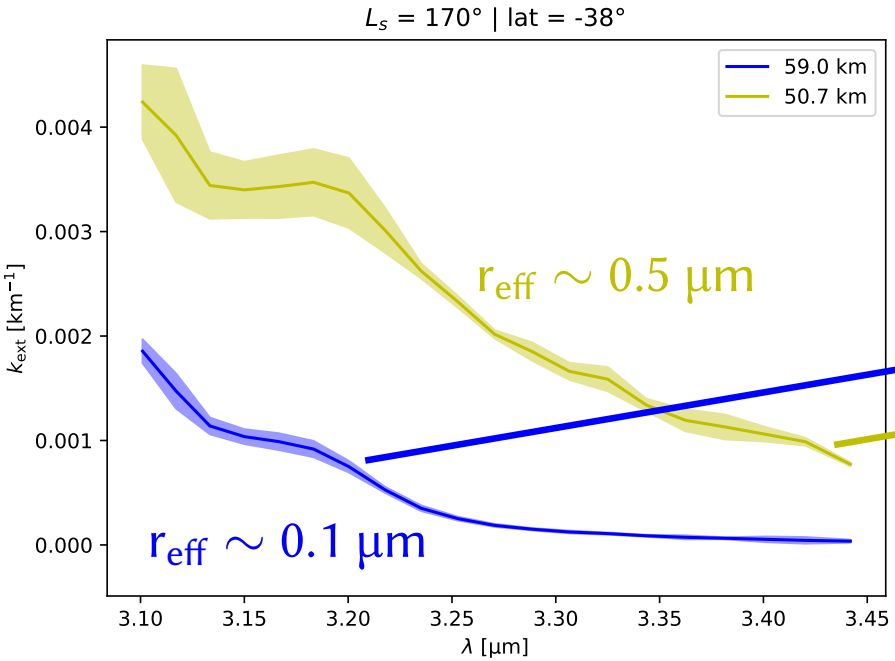
Water ice cloud identification & Particle size retrieving



MODELS

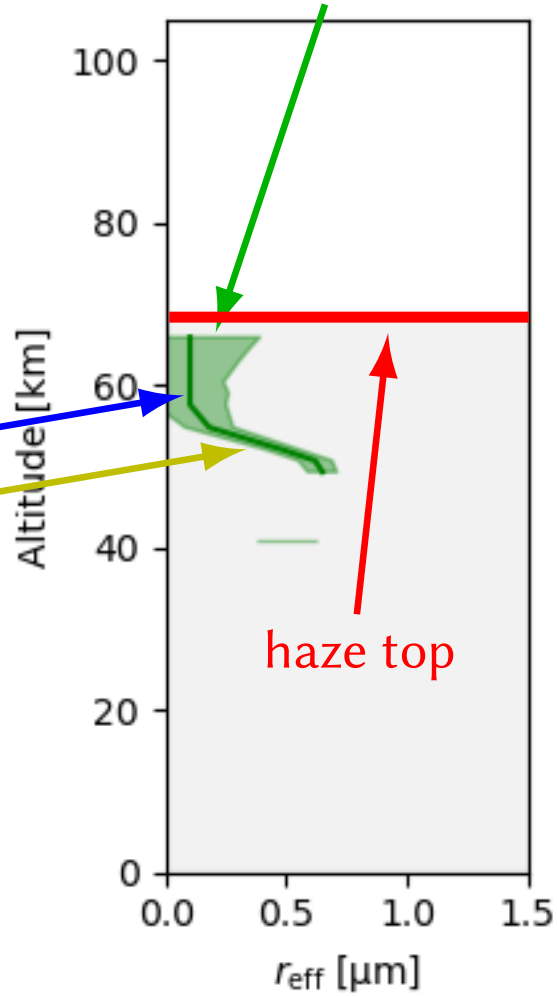


Clouds vertical profiles



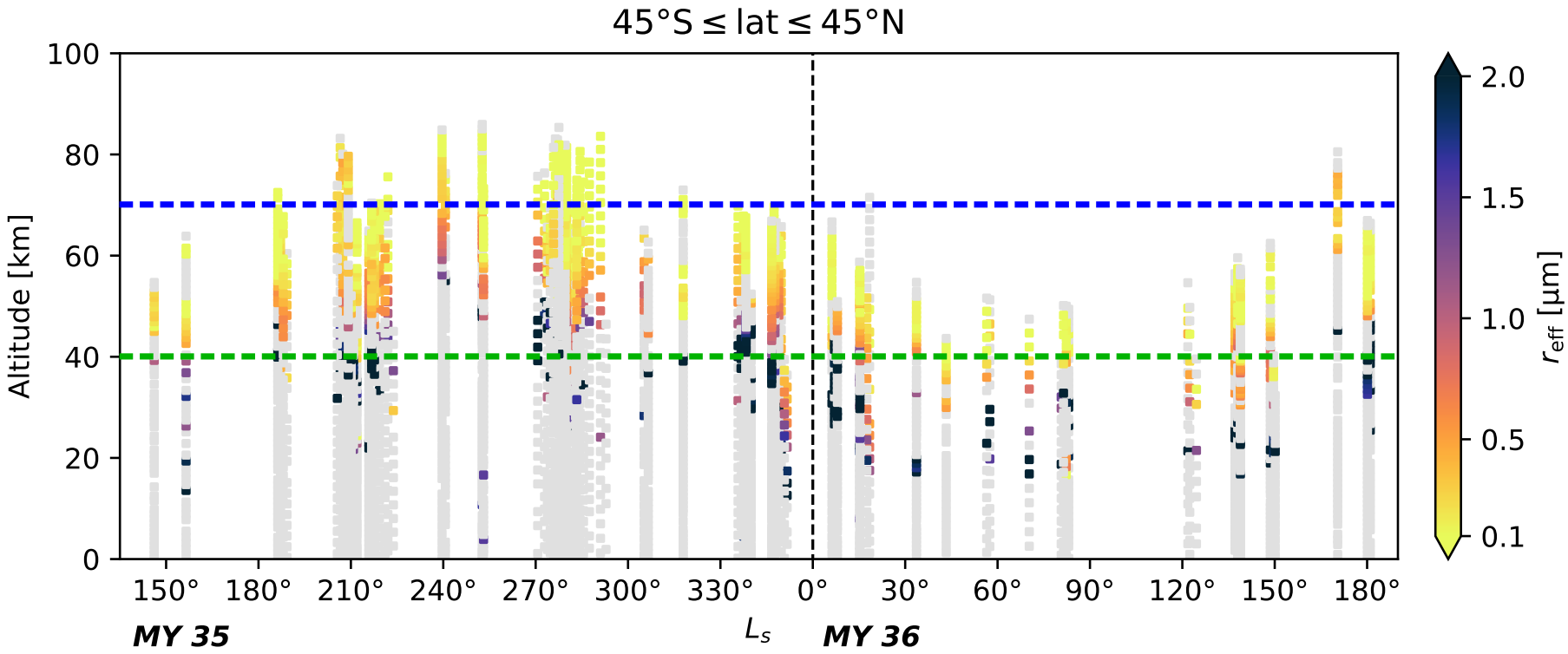
Several spectra at various altitudes

Detected water ice cloud



r_{eff} vertical profile

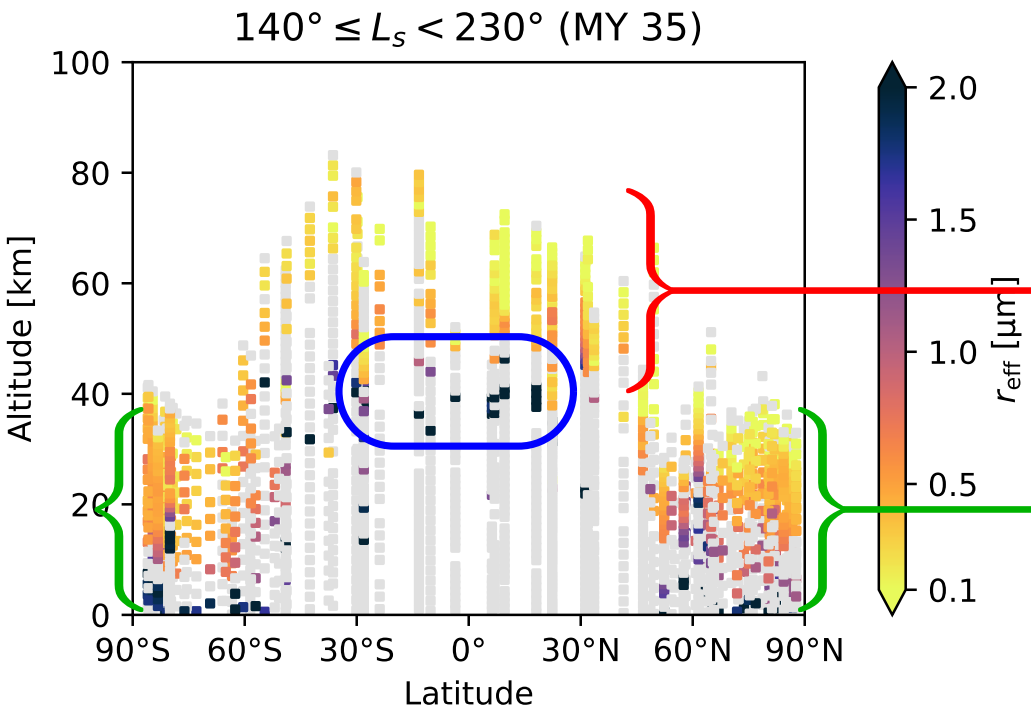
Seasonal variations – Midlatitudes



∼ 70 km around aphelion ∼ 40 km around perihelion

- Altitude of the water ice clouds varies by 30 km over the year.

Latitudinal variations



Clouds between 40 and 80 km under mid-latitudes.

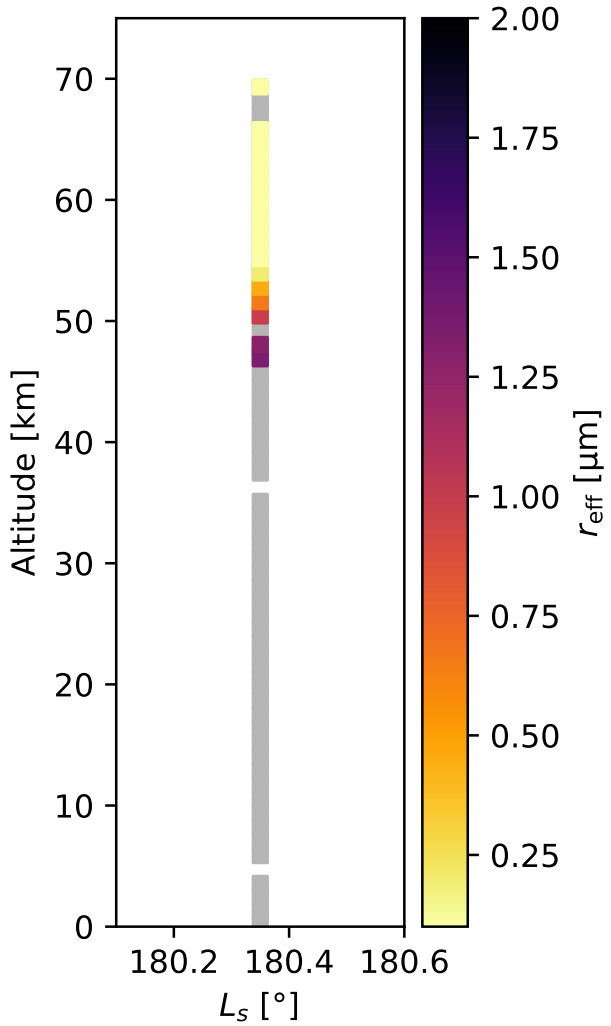
Clouds between 0 and 40 km under polar latitudes.

Large particles at high altitude around the equator

- Altitude of the water ice clouds varies by 40 km with the latitude.

Summary

- Extension of the methodology previously developed for the MY 34 GDS (*Stcherbinine et al., 2020*) to a **whole Martian Year**.
- Observation of **seasonal** and **latitudinal trend** in haze top and water ice clouds altitudes.
- Presence of large-grained water ice clouds at high altitude under equatorial latitudes outside GDS.
- **Quasi-systematic** presence of water ice clouds in our profiles (morning & evening clouds).



Contact

@ aurelien.stcherbinine@nau.edu

 aurelien.stcherbinine.net

 @Astrorelien