# Mesospheric water vapor at the Venus terminator from SOIR/VEx

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# Introduction: Venus water

- Water is key-species
  - Sulfur cycle, aerosols cycle (Parkinson et al., 2015)

- First mesospheric $H_2O$ profiles long term survey
  - Only values at cloud top or integrated columns in the literature (e.g. Cottini et al., 2015, Encrenaz et al., 2012, 2013, 2016, Gurwell et al., 2007, Fedorova et al., 2016)
  - Or preliminary results (Bertaux et al., 2007, Fedorova et al., 2008)
- Literature reports large variability (time and space)

- SOIR also detected HDO, not discussed here (ongoing)

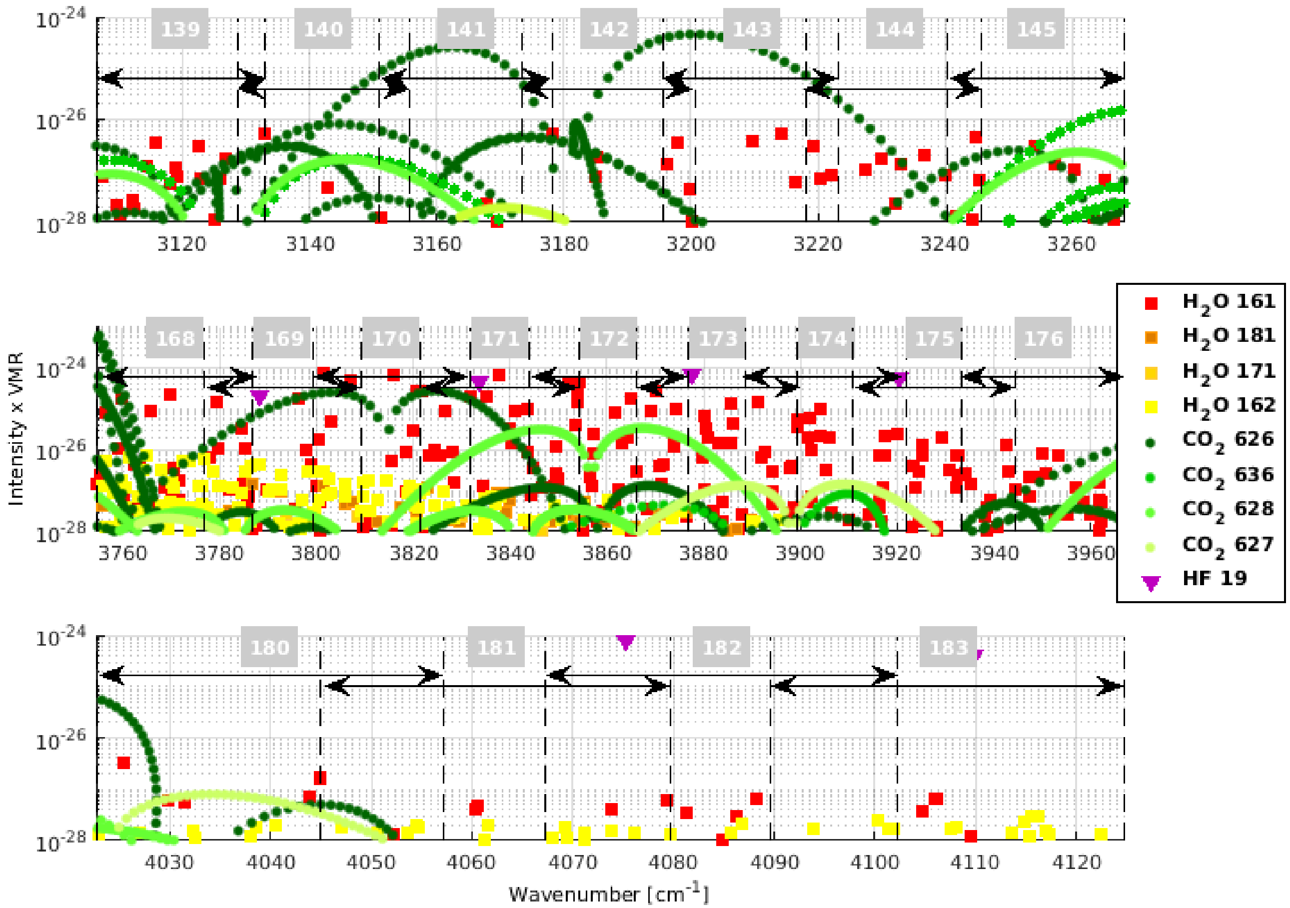
# Introduction: SOIR/VEx

- SOIR/VEx was an infrared spectrometer
  - Echelle grating spectrometer, very high orders (101 to 194)
  - Sensitive in the 2.2 - 4.4 µm (2200 - 4400 $cm^{-1}$)
  - Spectral sampling (0.06 – 0.12 $cm^{-1}$)
  - Spectral resolution (0.11 – 0.21 $cm^{-1}$)

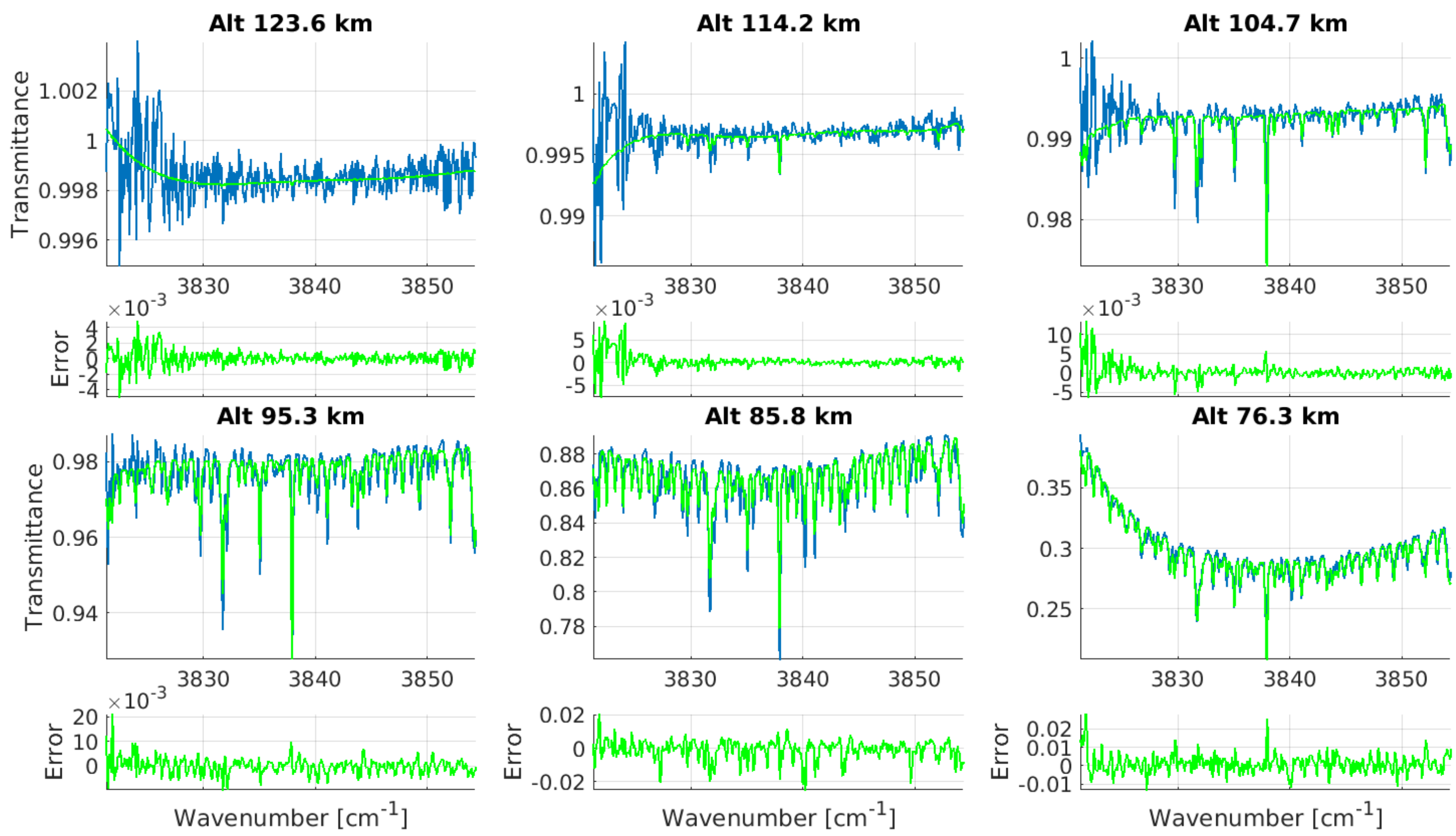
- SOIR/VEx performed solar occultations
  - Terminator (6AM and 6PM), all latitudes are covered

- Four spectral regions measured simultaneously
  - SOIR detected $CO_2$, CO, $H_2O$/HDO, HCl, HF, $SO_2$ and aerosols

# Spectroscopy

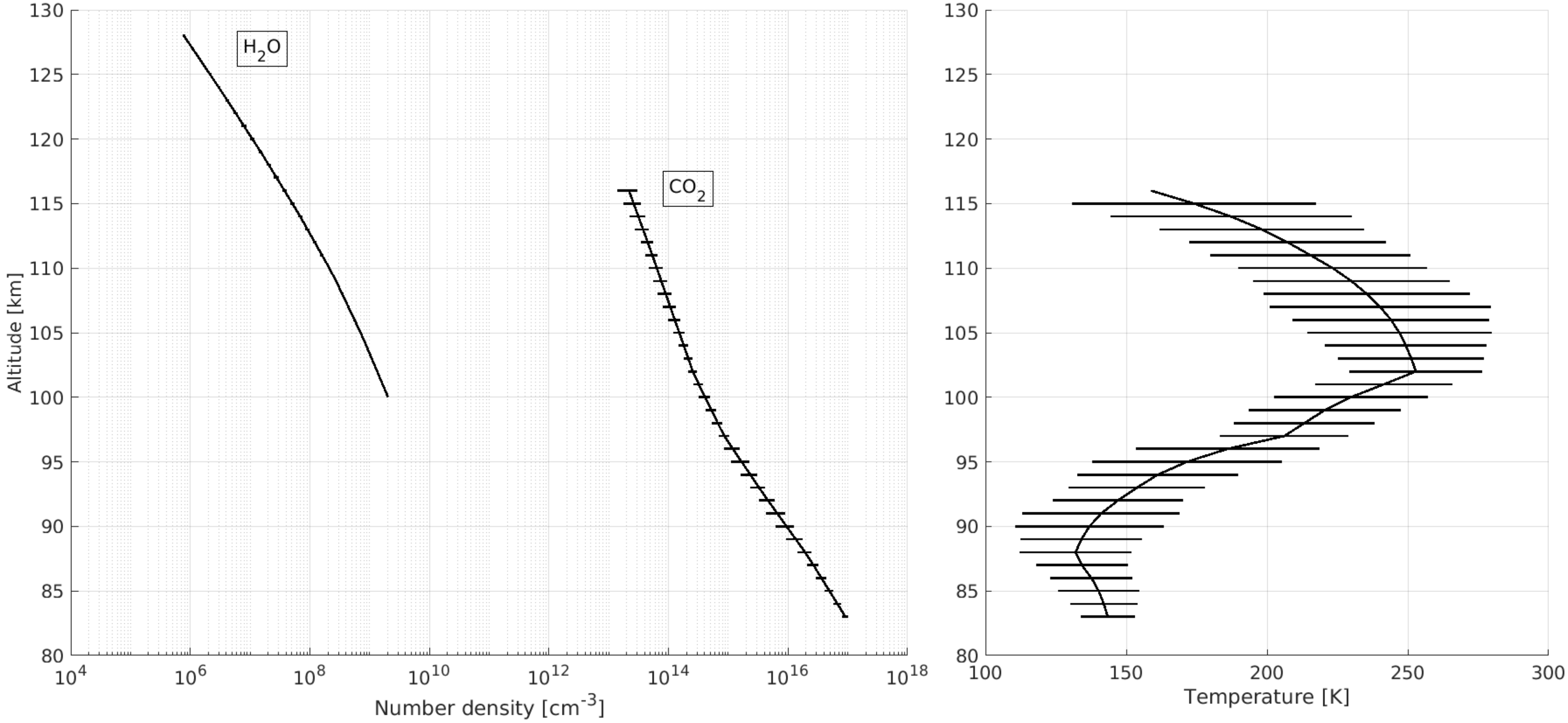


# Example of retrieval




Orbit 1029.1 order 171 bin 1: 65°N, 125°E, 6AM, 13/02/2009

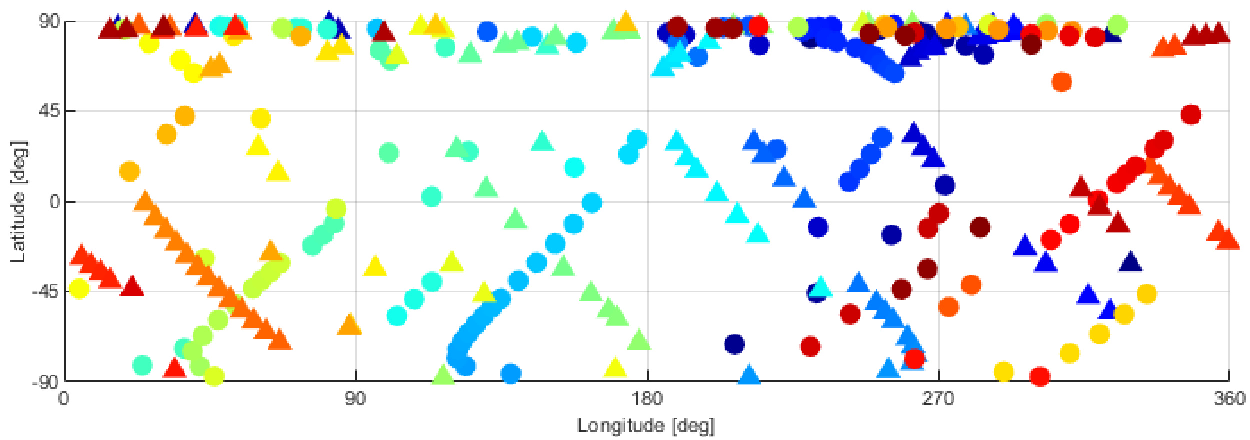
# Example of retrieval

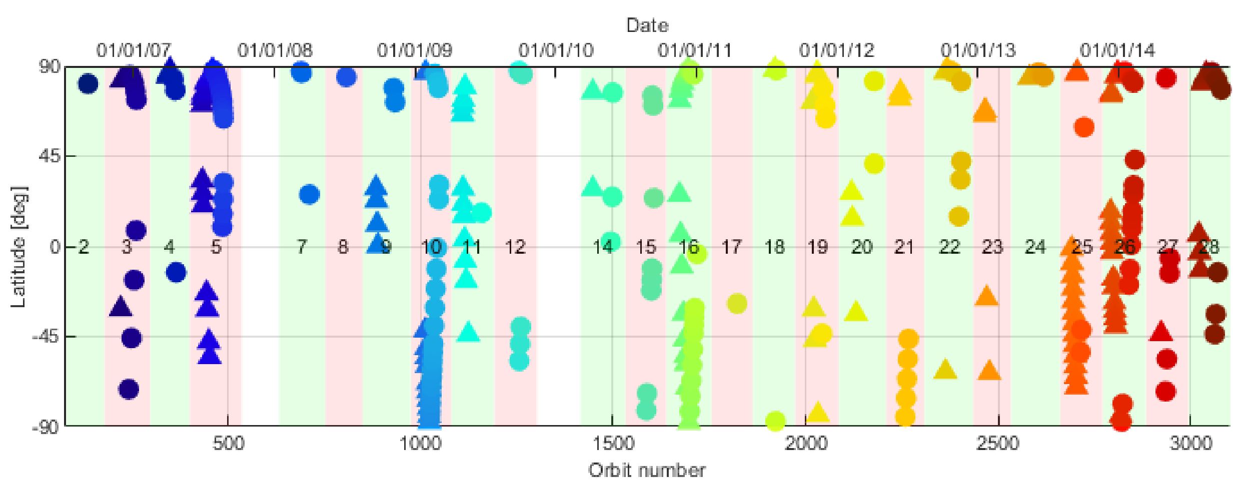



Orbit 1029.1 order 171 bin 1: 65°N, 125°E, 6AM, 13/02/2009

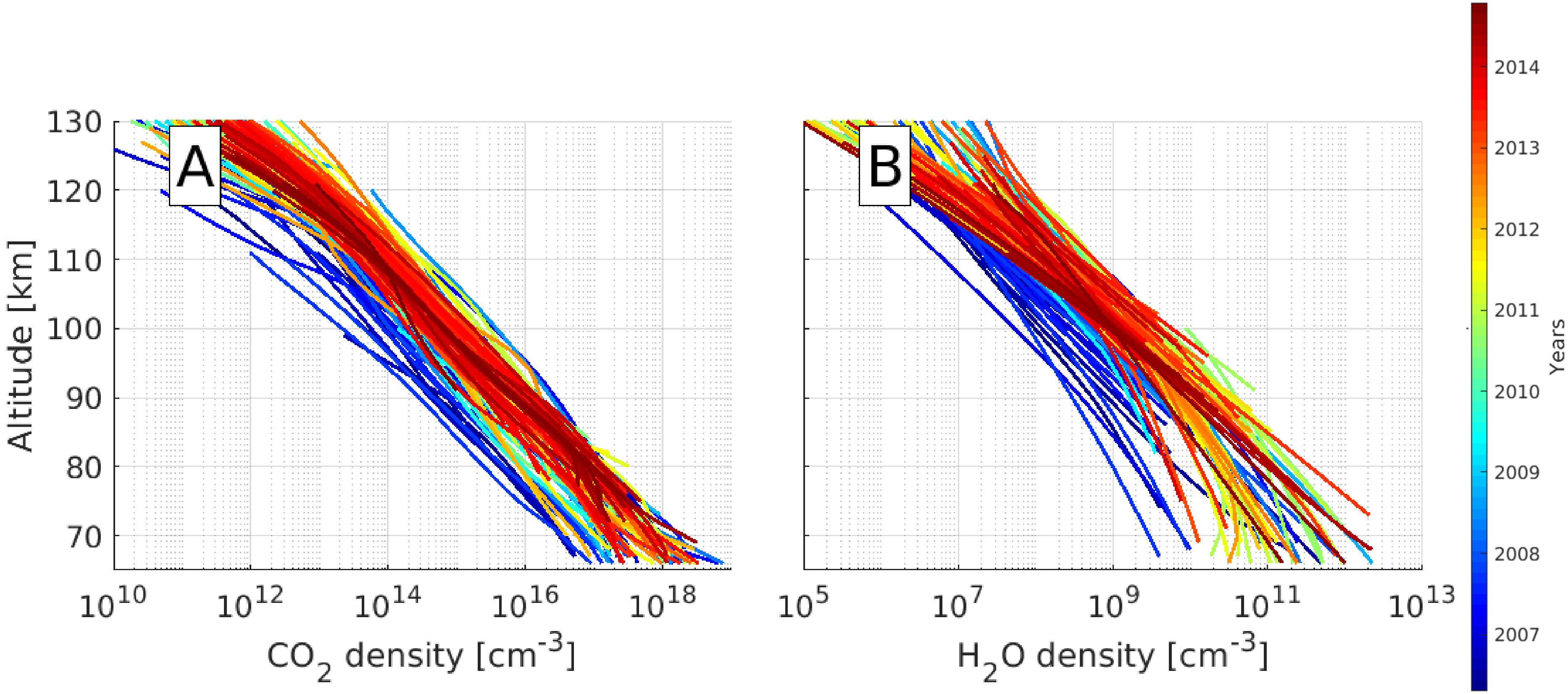
# Coverage

287 observations
Circles = AM
Triangles = PM

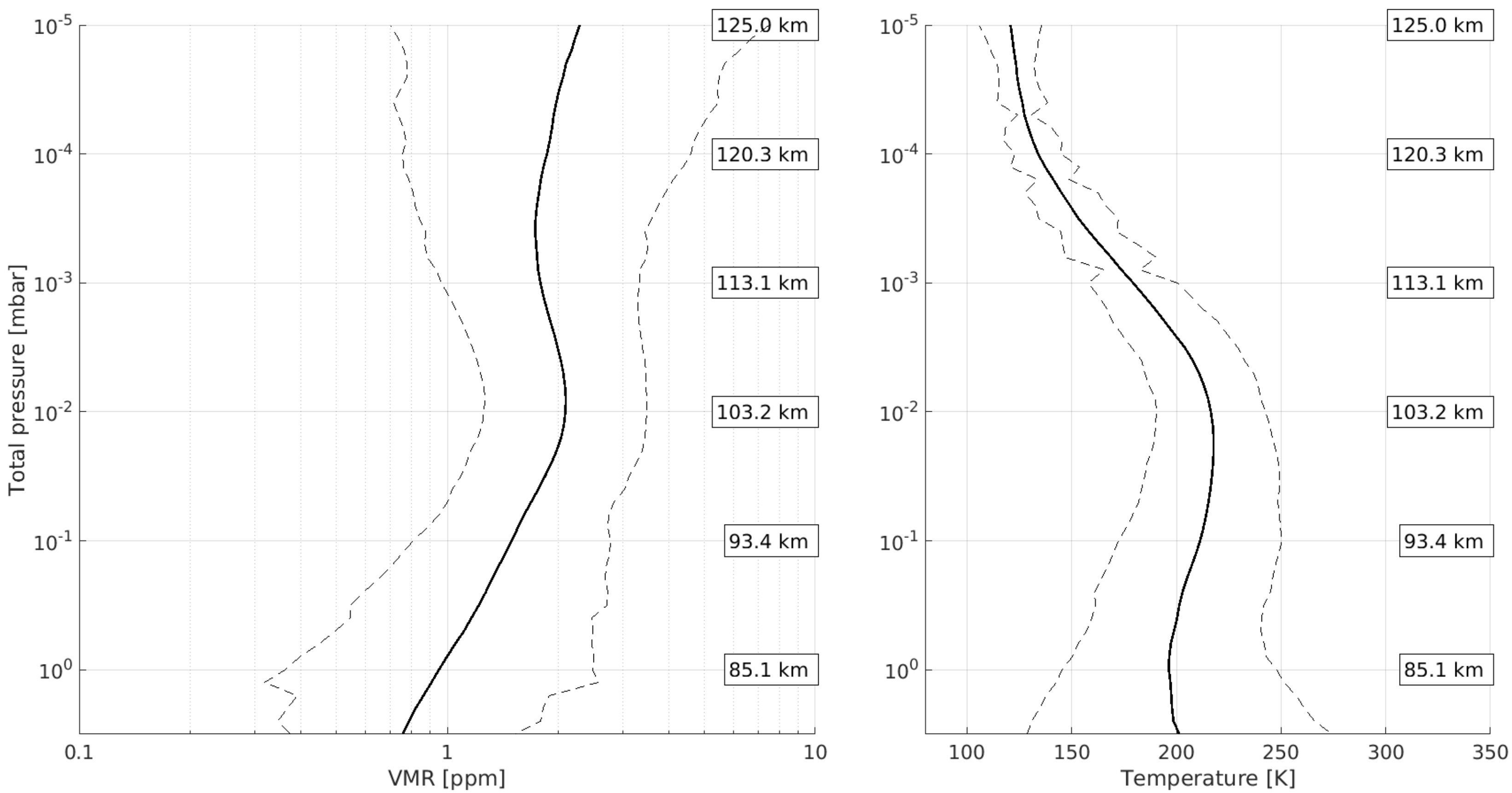


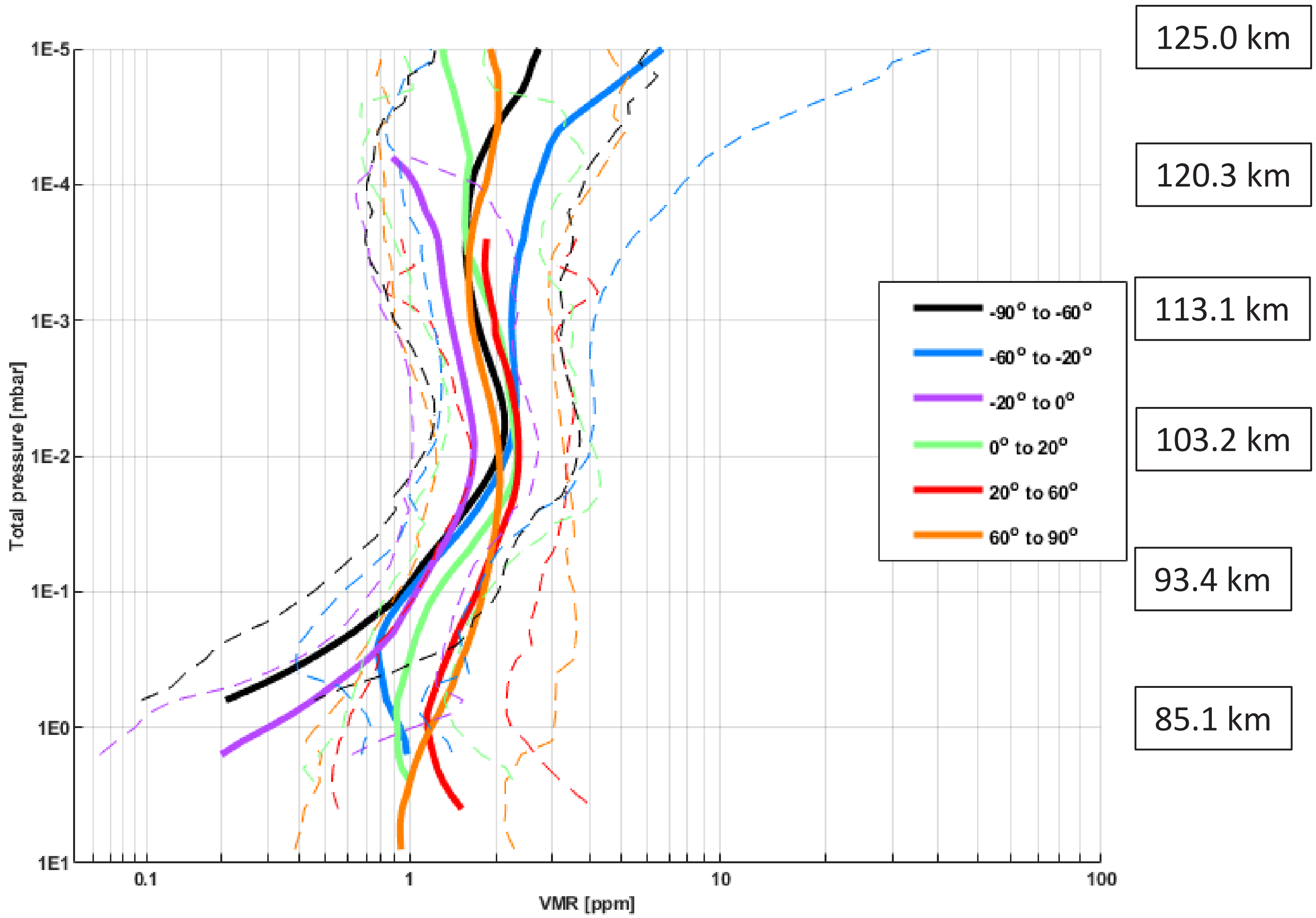
# $CO_2$ and $H_2O$ dataset



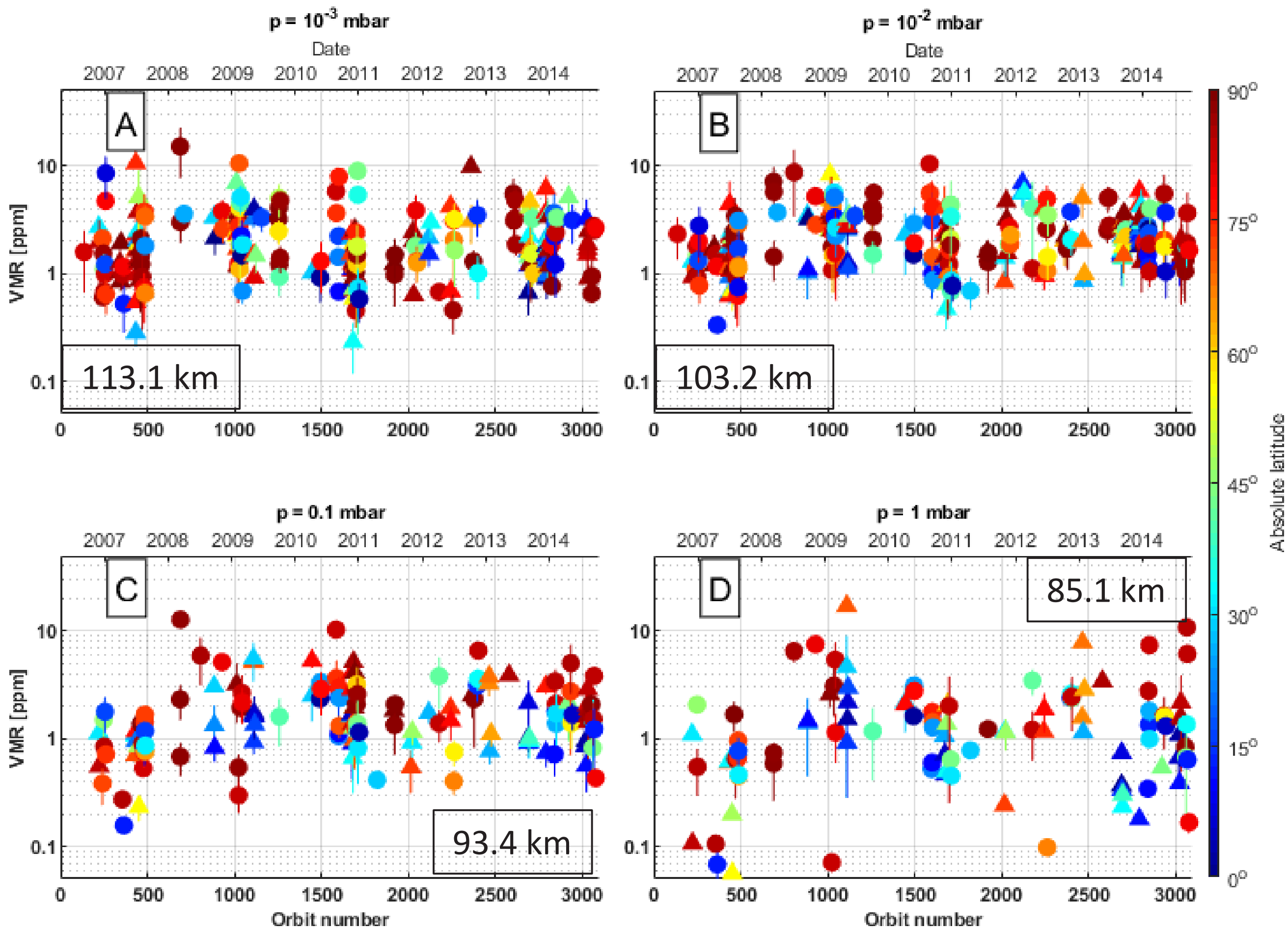
# Mean mixing ratio and temperature



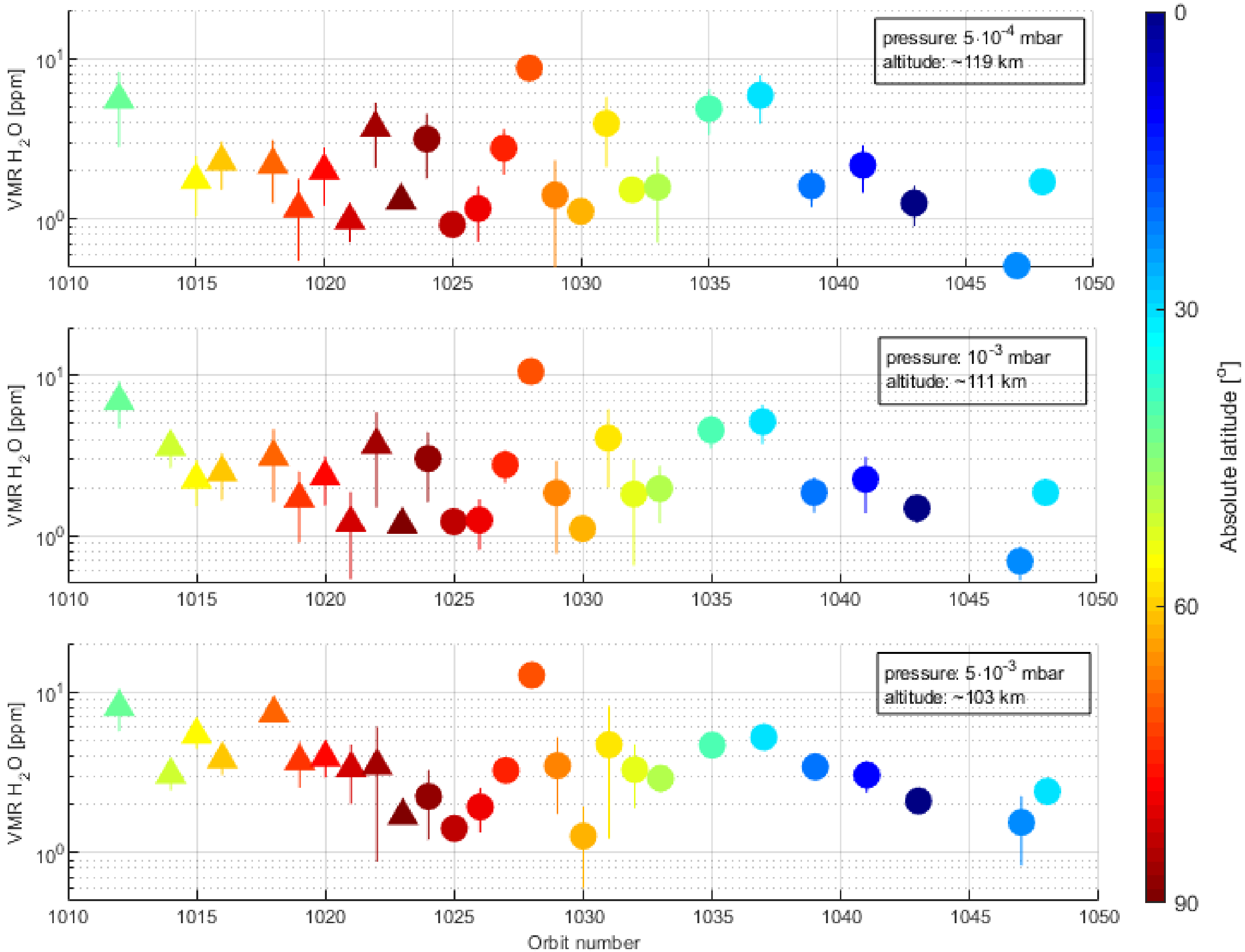
# Latitude dependence of mixing ratio



# Long term variability



# Short term variability



# Conclusions and future work

- SOIR measured $H_2O$ and $CO_2$ simultaneously over 7 years
- Mesospheric observations (75 – 125 km) at the terminator
- Dataset shows a very large variability
  - No long term, LST, latitude dependency, only day to day
- Work just published at *Icarus*: "**SOIR/VEx observations of water vapor at the terminator in the Venus mesosphere**", Chamberlain S., et al.

- D/H ratio from $HDO/H_2O$ to be published this year

- Correlations with $SO_2$, HCl and temperature to be studied

THANK YOU!

MORE INFO?

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