Modelling the SO_2 variability

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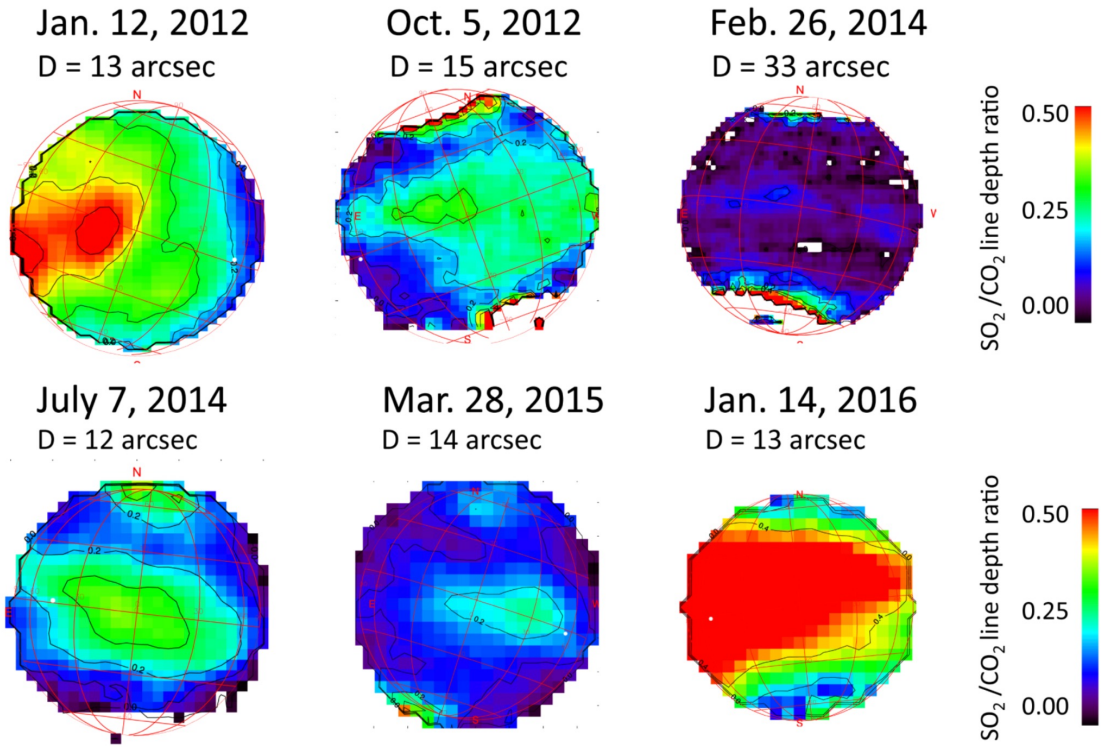
SO_2 observed from TEXES

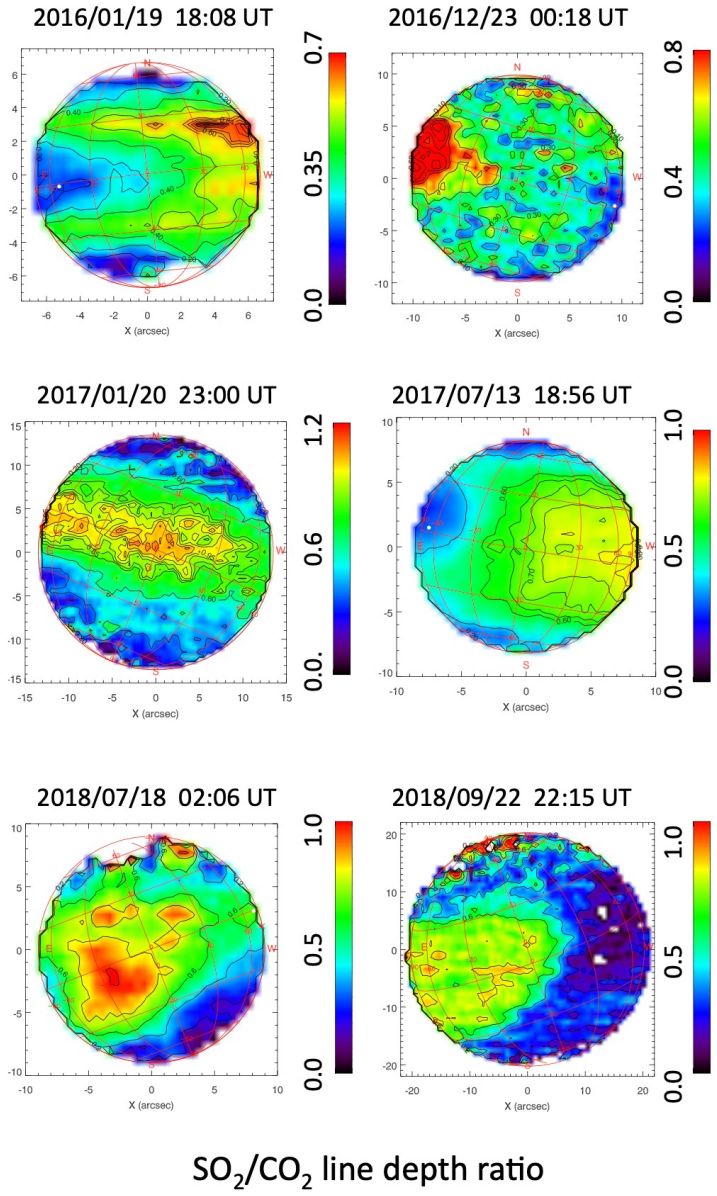
(cloud top 62 km)

2012-2016



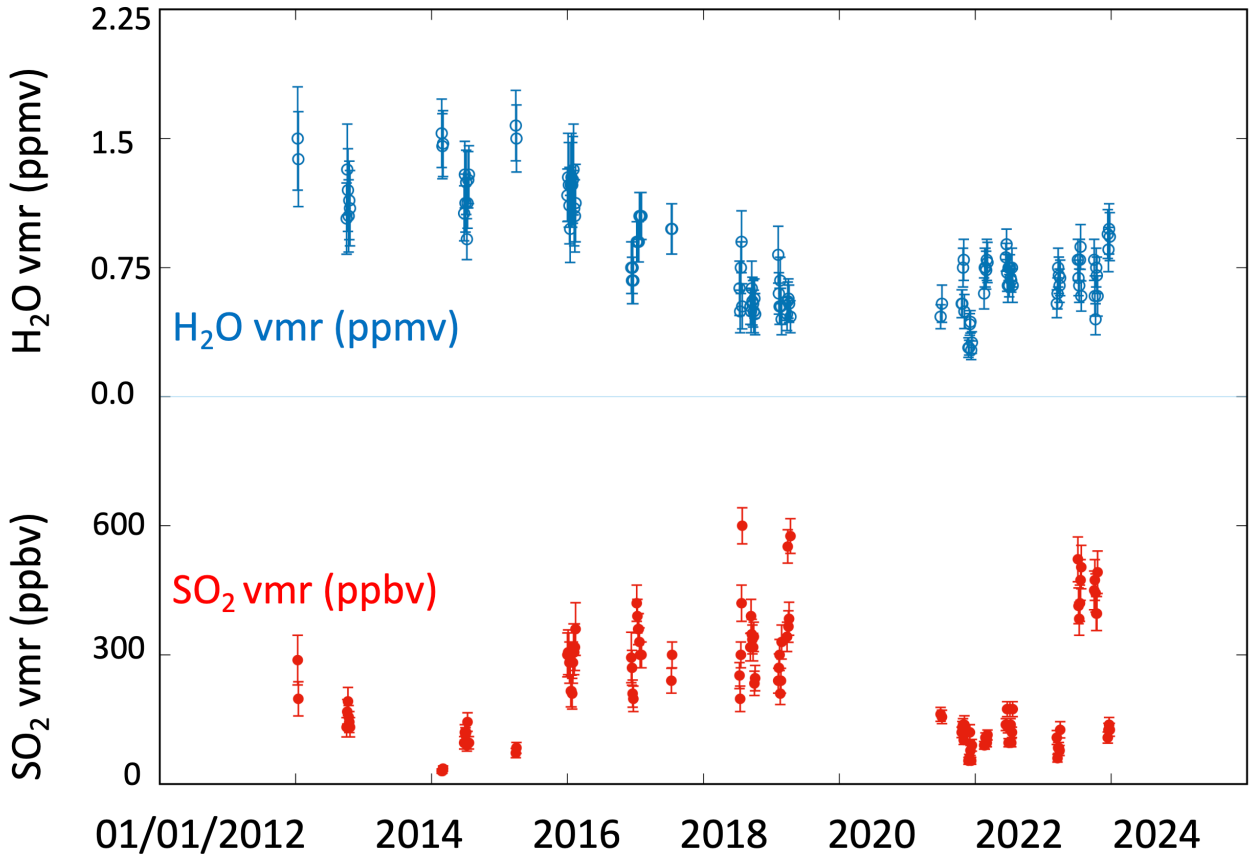
Encrenaz et al., 2016

2016-2018



Encrenaz et al., 2019

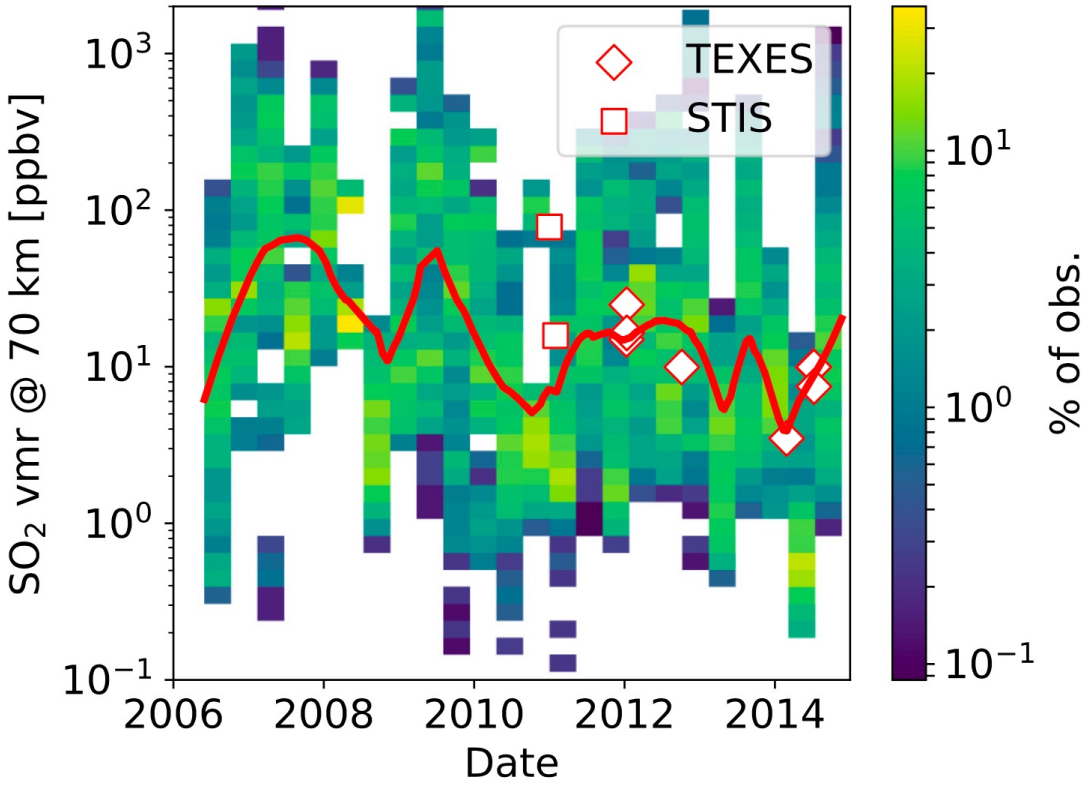
SO_2 observed from TEXES

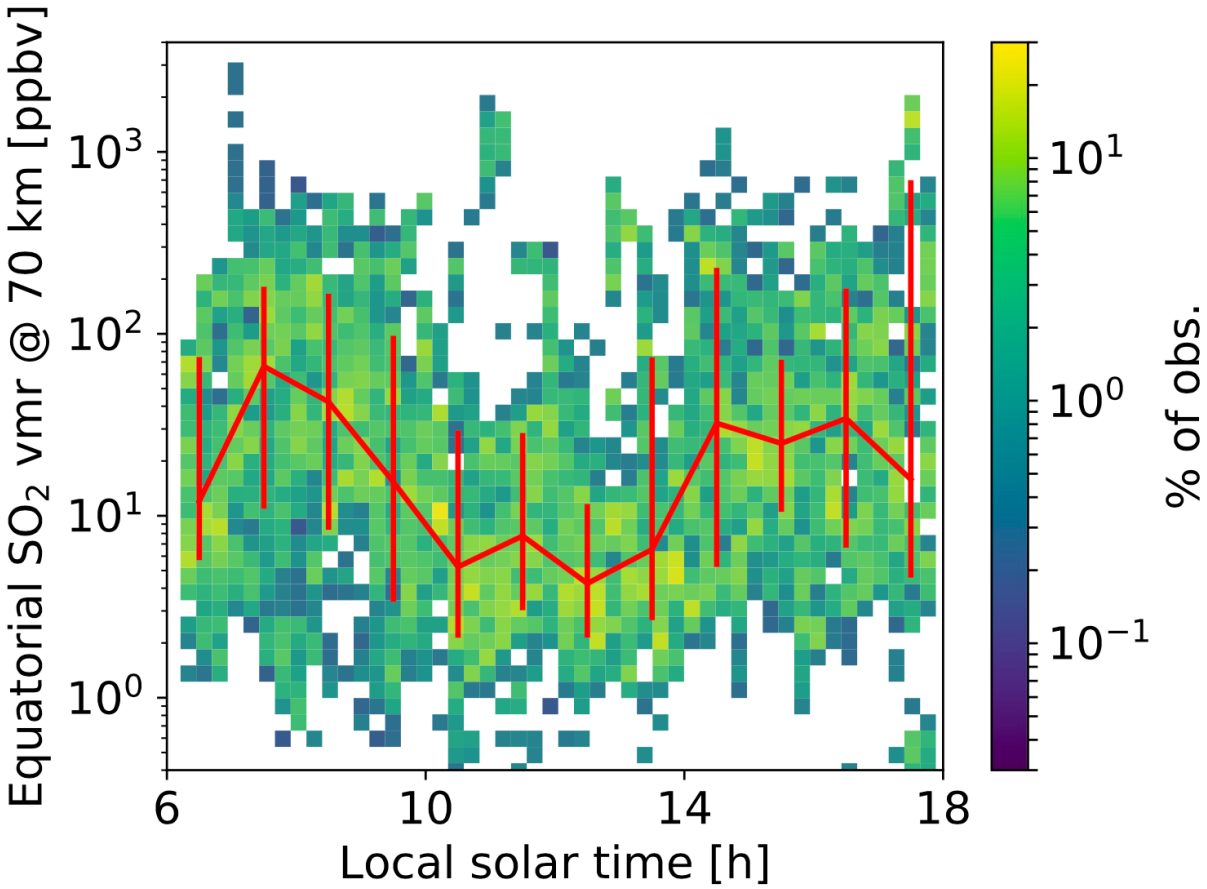


Encrenaz et al., EGU, 2024

SO_2 from SPICAV

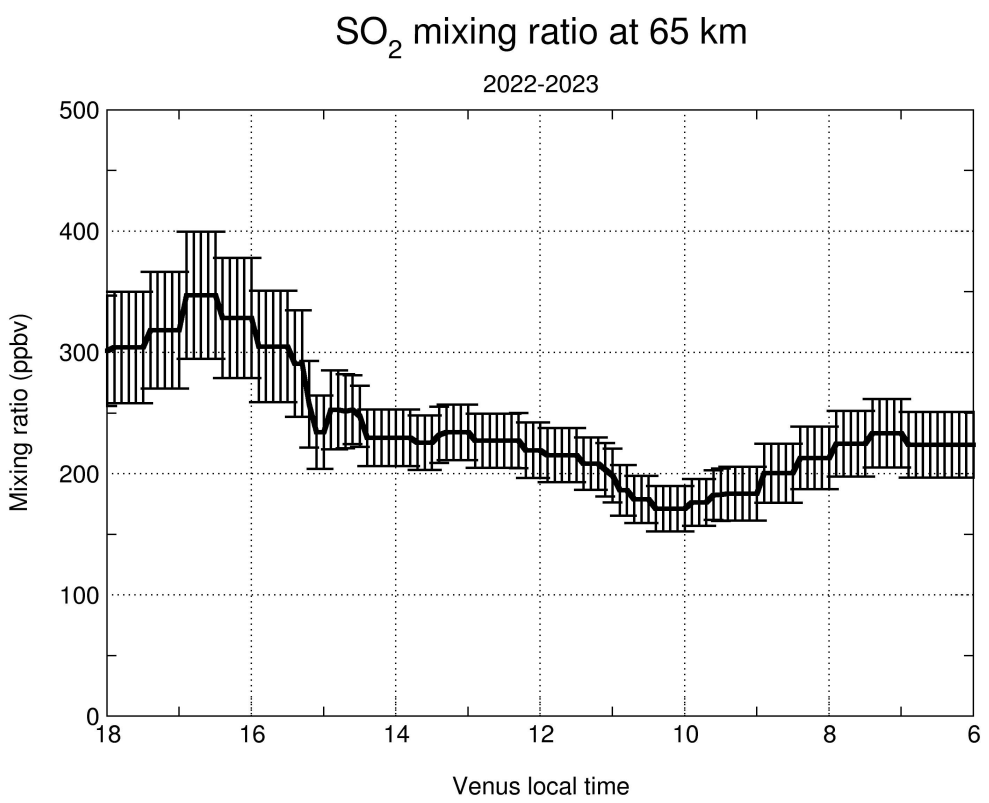
(cloud top 70 km)



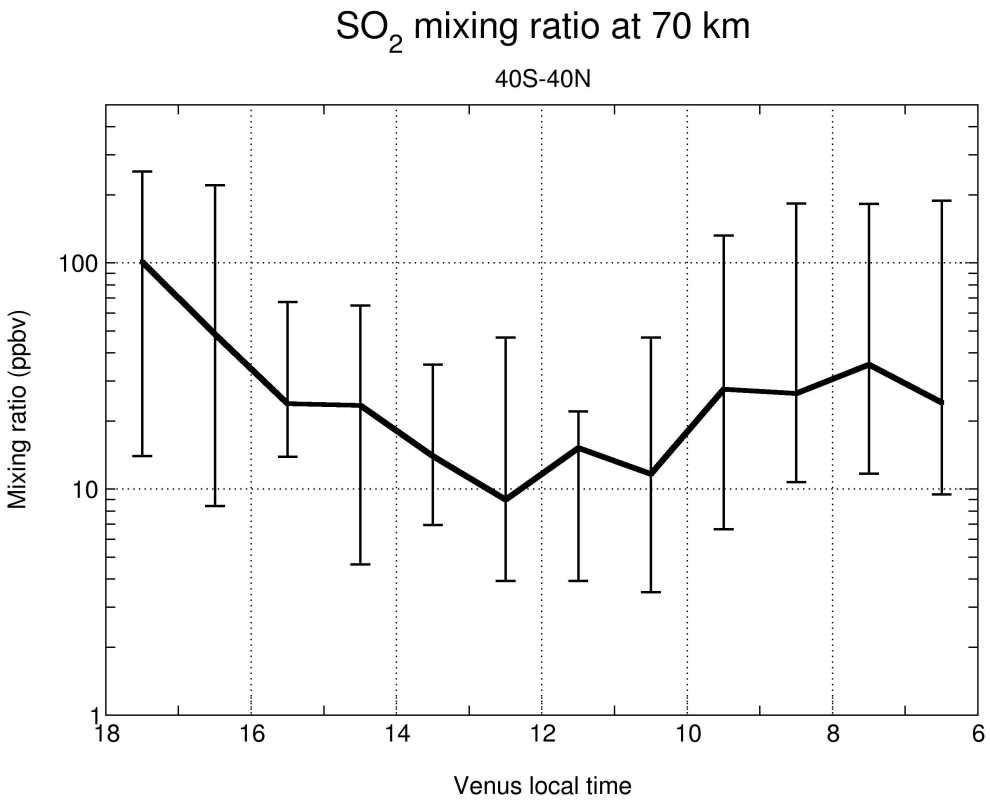


Marcq et al., 2020

SO_2 diurnal cycle



TEXES, 62 km (2022-2023)

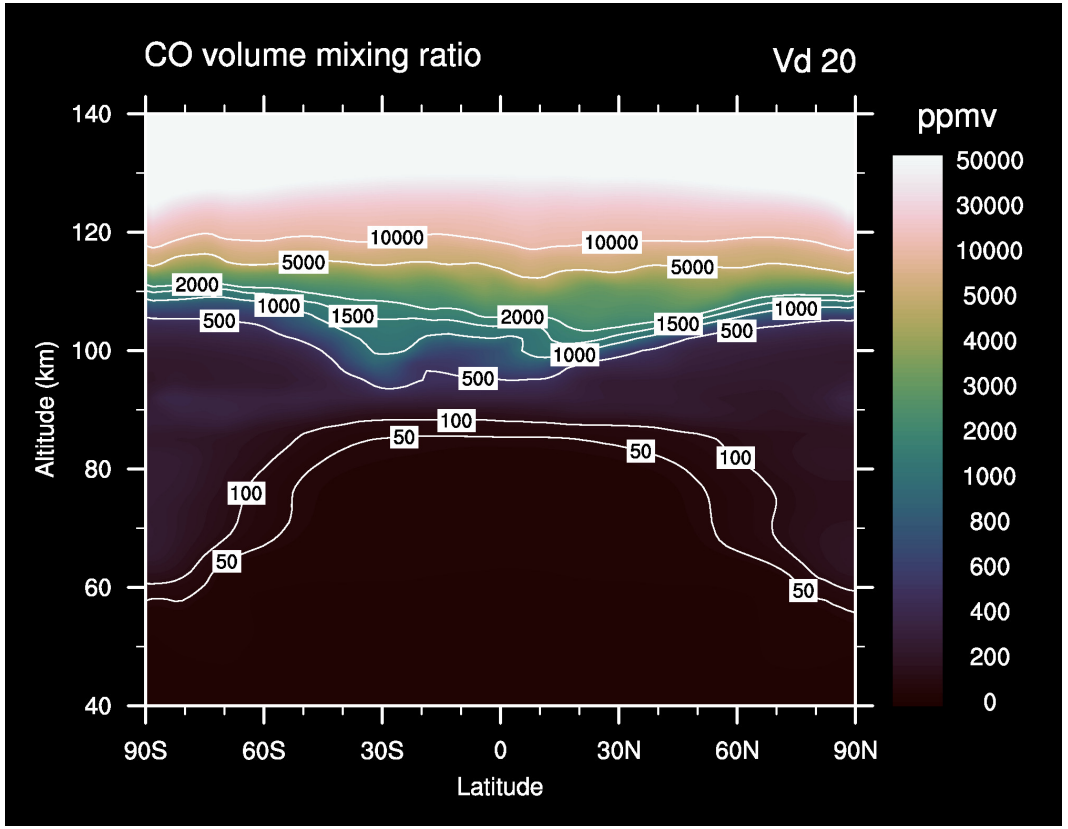


SPICAV, 70 km (2006-2014)

Venus PCM with photochemistry

- **Photochemical package described in Stolzenbach et al. (2023)**
  - adapted from Mars photochemical model (Lefèvre et al., 2008)
  - comprehensive chemistry of CO_x, HO_x, O_x, S_x, Cl_x
  - 35 chemical species
  - ASIS solver (Cariolle et al., 2017)
  - H_2SO_4-H_2O aerosols at equilibrium, 3 modes, fixed radius (Knollenberg and Hunten, 1980)
  - Tracking of the condensed phase: aerosol number density, composition, sedimentation rate

- **Recent improvements**
  - Doubled horizontal resolution (3.75°x1.875°)
  - Extension to the thermosphere (150 km, Gilli et al., 2021)
  - On-line photolysis
  - Addition of nitrogen chemistry (N. Streel)
  - 40 species

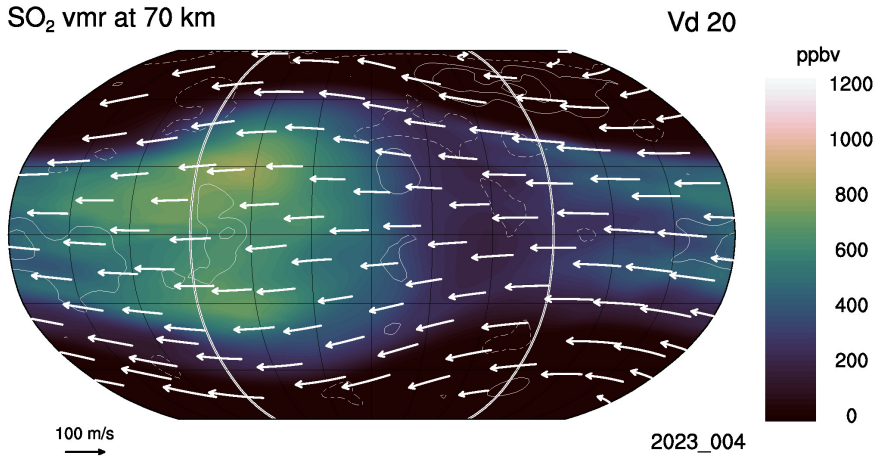


Experimental setup

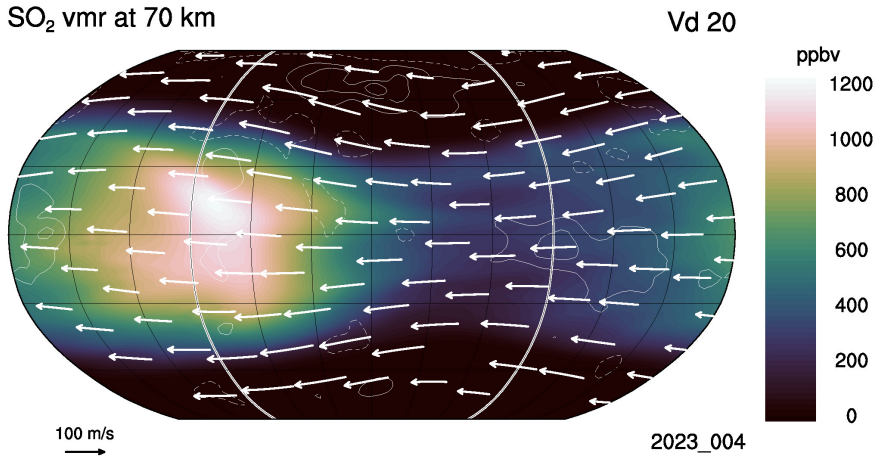
- SO_2 initialised to 10 ppmv from the surface up to 40 km
- 6 Venus-day simulation

SO_2 at 70 km

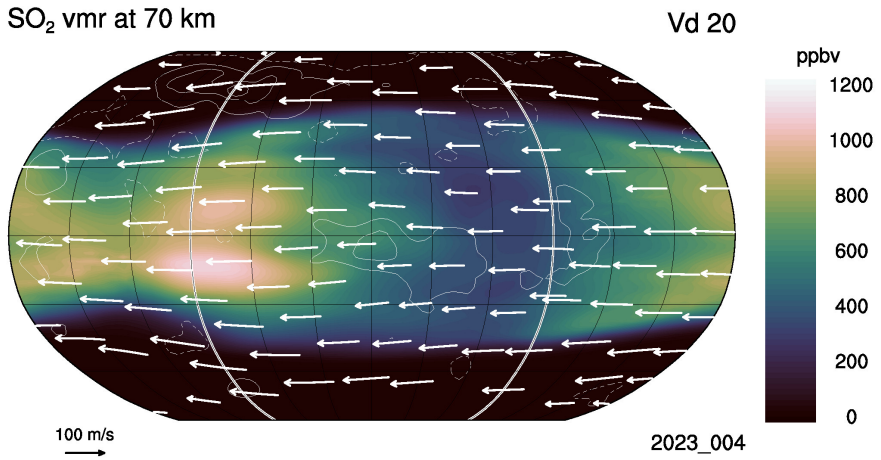
Day 18.25



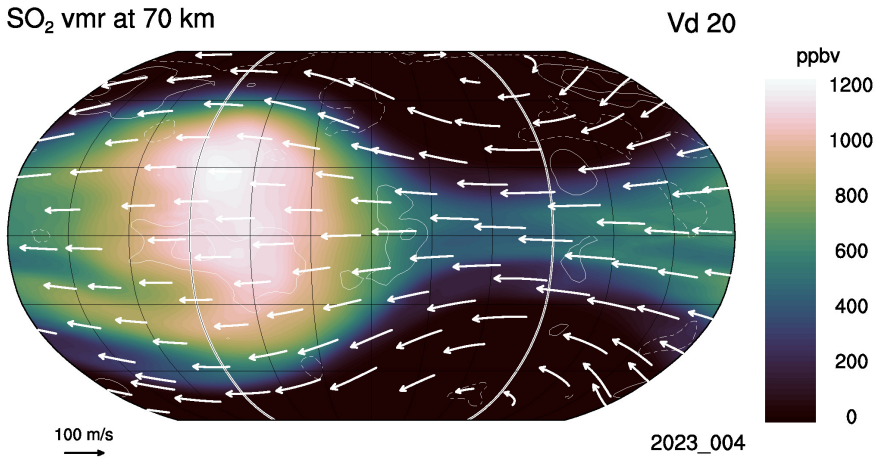
Day 18.50



Day 18.75



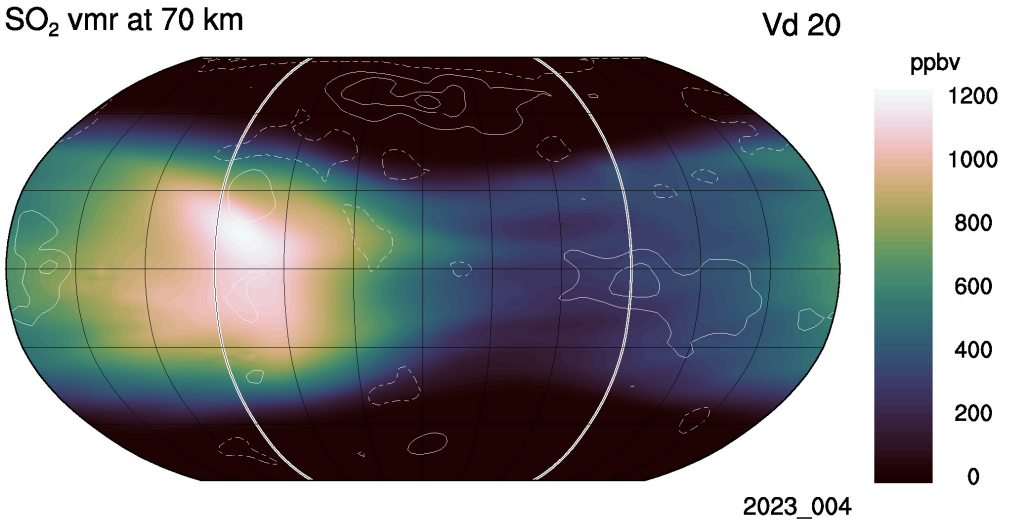
Day 19.00

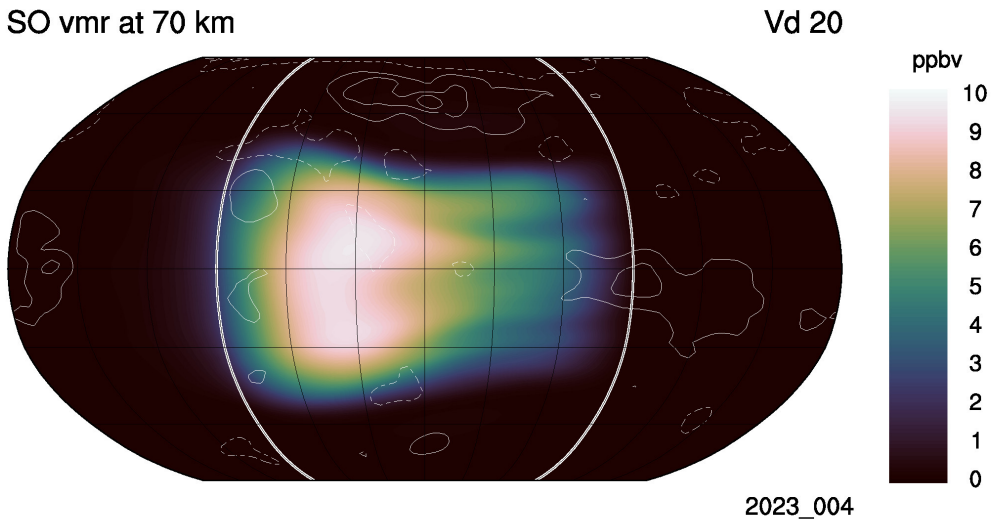


SO_2 and SO at 70 km

$SO_2 + h\nu \longrightarrow SO + O$

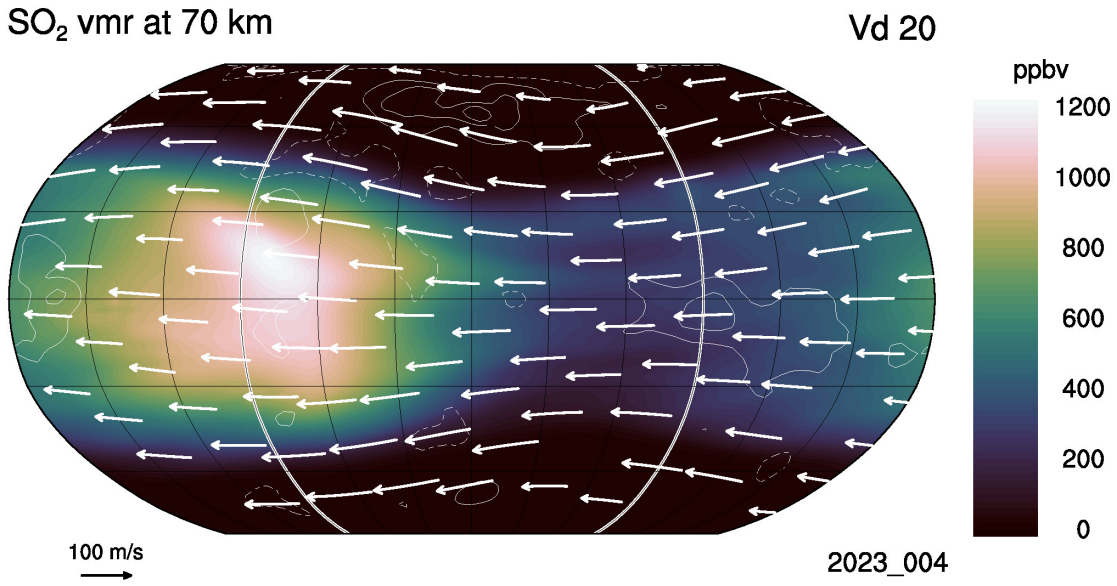
$SO + O + M \longrightarrow SO_2 + M$

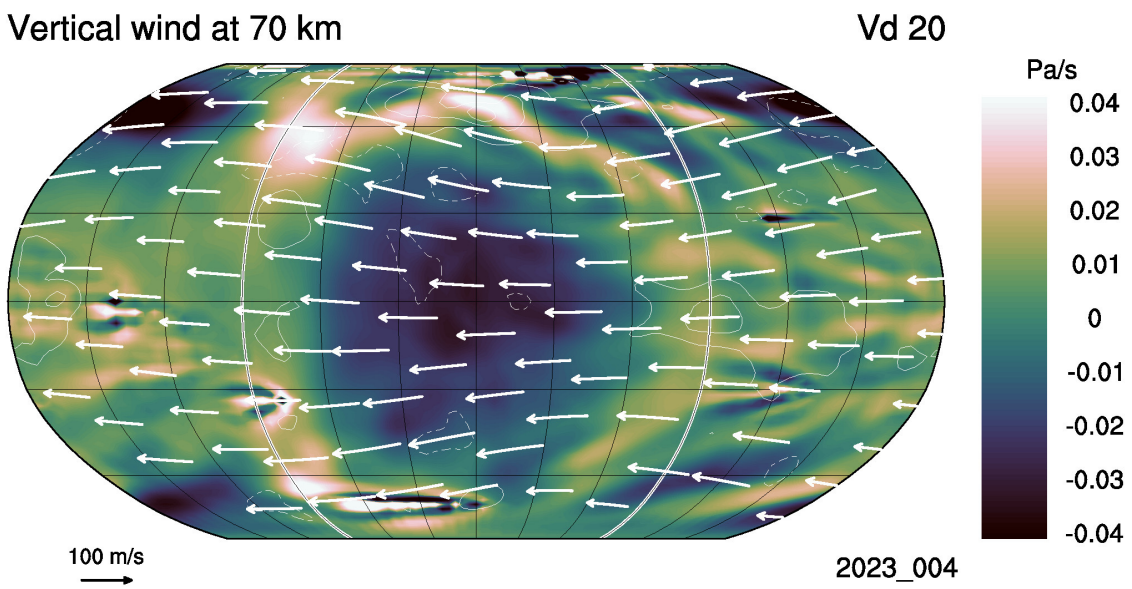




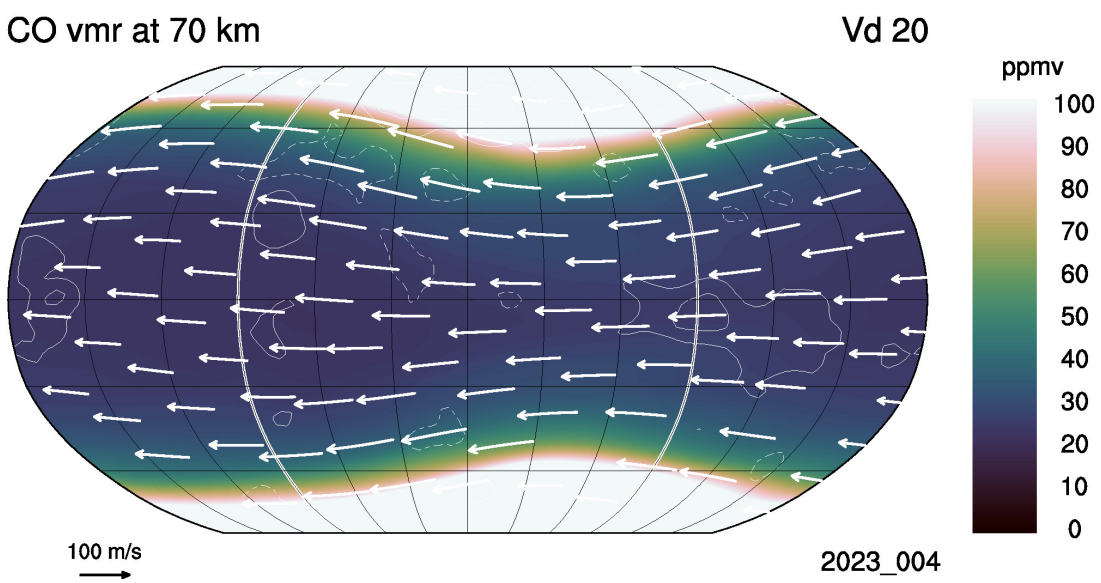
100 times less SO than SO_2

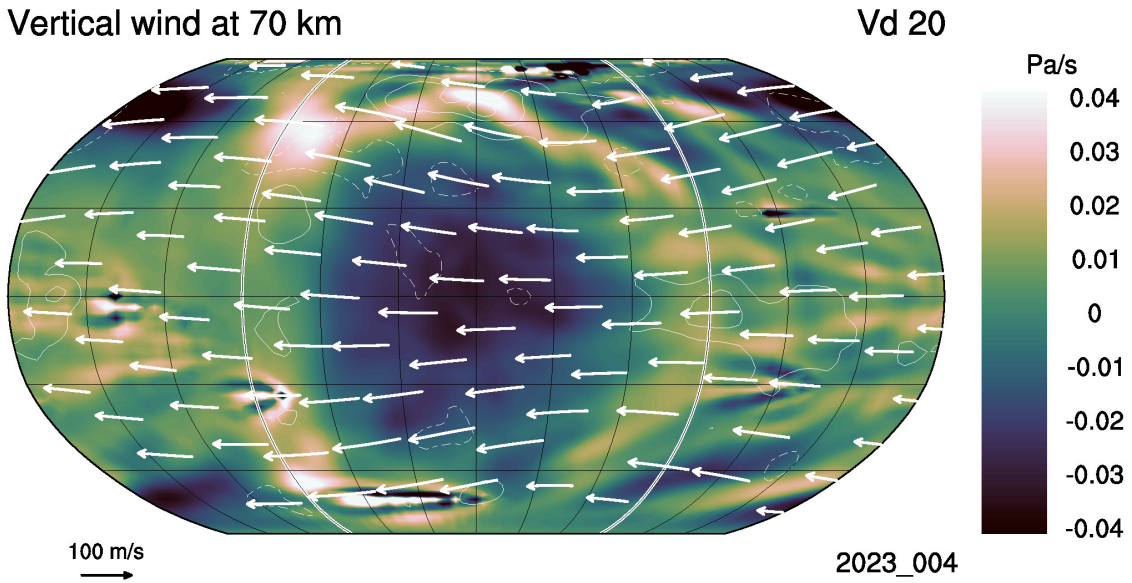
SO_2 and vertical wind at 70 km





CO and vertical wind at 70 km





To be continued…

Paper in preparation for 2024