



École Doctorale d'Astronomie & Astrophysique  
d'Ile-de-France

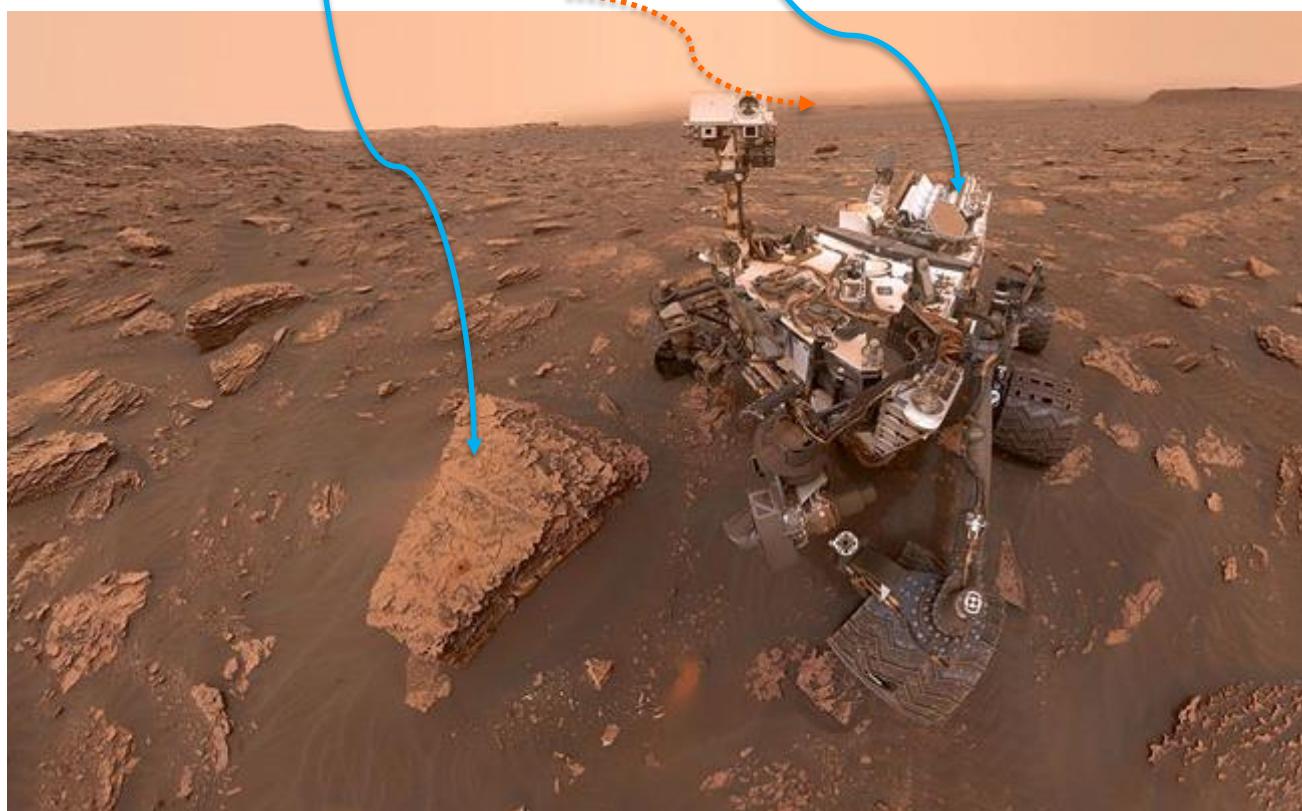
# Martian dust dynamics constrained by OMEGA/Mars Express

ELBERETH Conference 11/02/21

Yann Leseigneur

# Mars & dust

- Dust: **omnipresent**
  - Surface: dust cover (rover problems)
  - Atmosphere: **dust clouds** & **dust aerosols**



# Mars & dust

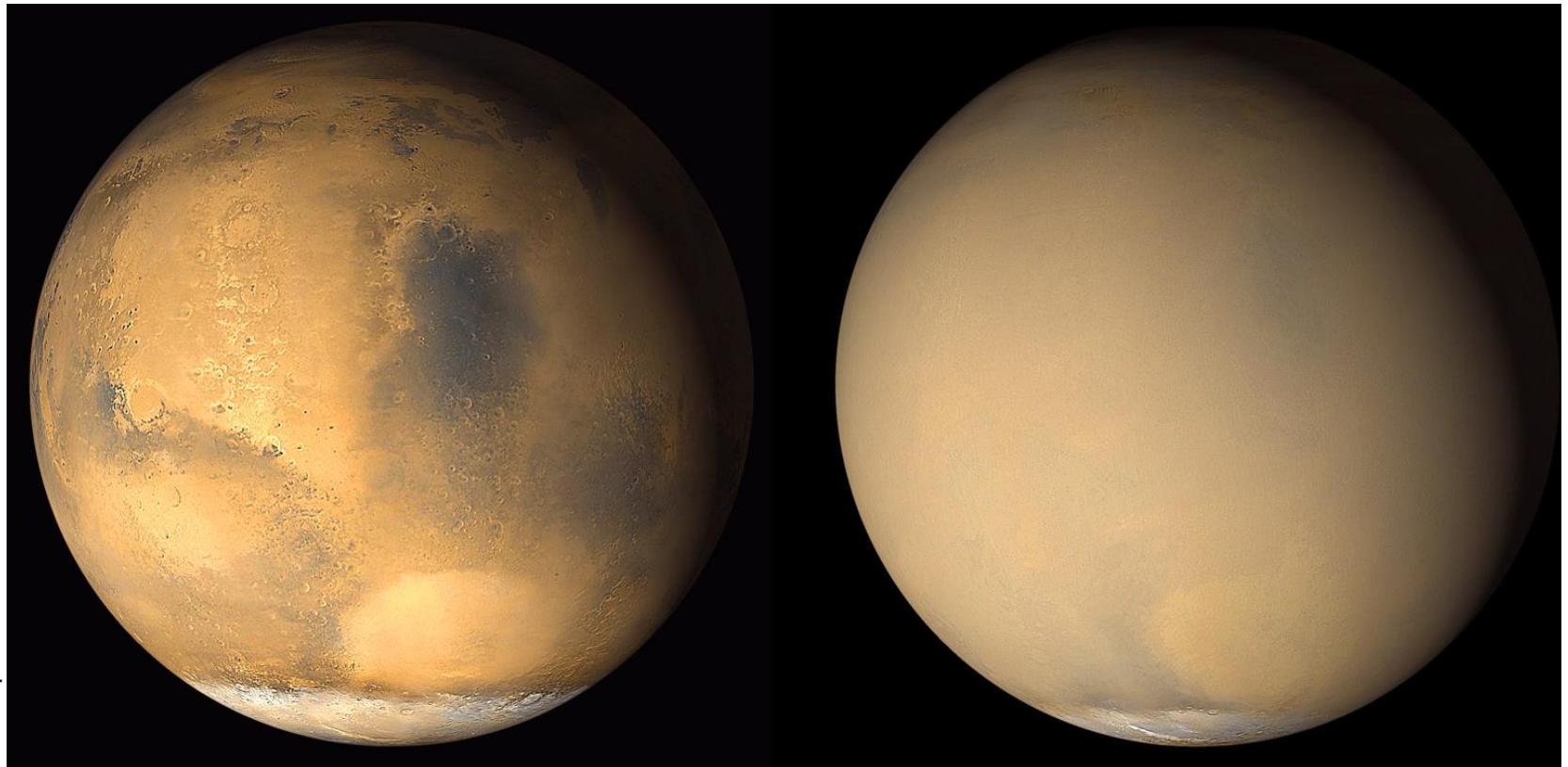
- Dust: **omnipresent**
  - Surface: dust cover (rover problems)
  - Atmosphere: **dust clouds** & **dust aerosols**
- Dust **dynamics**: lifting mechanisms?
  - Dust devils

NASA/JPL-Caltech/SSI



# Mars & dust

- Link between the **different length scales?**
  - From **global** ...



# Mars & dust

- Link between the different length scales?
  - From **global** ... to **regional** ...

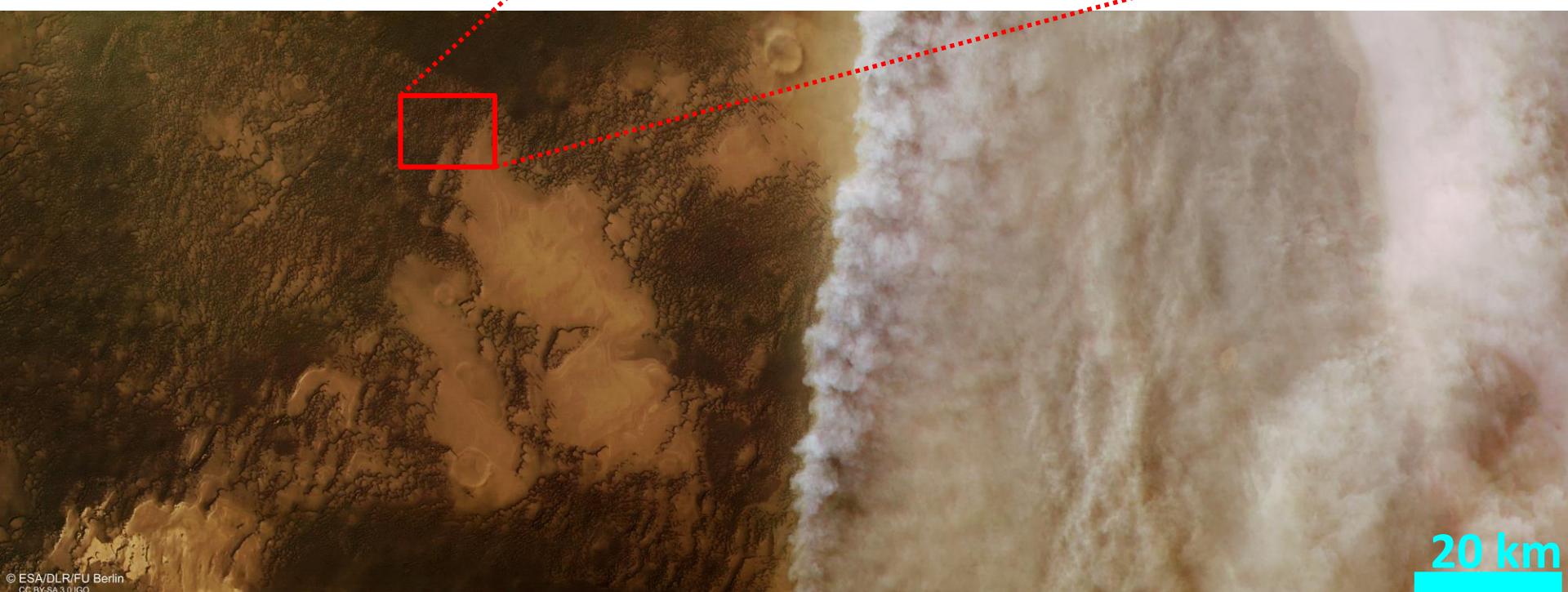


# Mars & dust

- Link between the **different length scales?**
  - From **global** ... to **regional** ... to **local**



*C. M. Dundas, 2020*



20 km

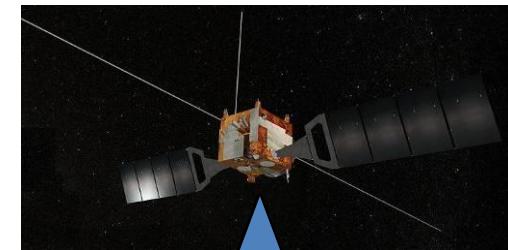
# Mars & dust

- Link between the different length scales?
  - From **global** ... to **regional** ... to **local**
- Slope flows (RSL):
  - Initially: associated with **liquid water** (2011/2015)
  - Now: link with **dust** (2020) → precise dust movement mechanisms **unknown**

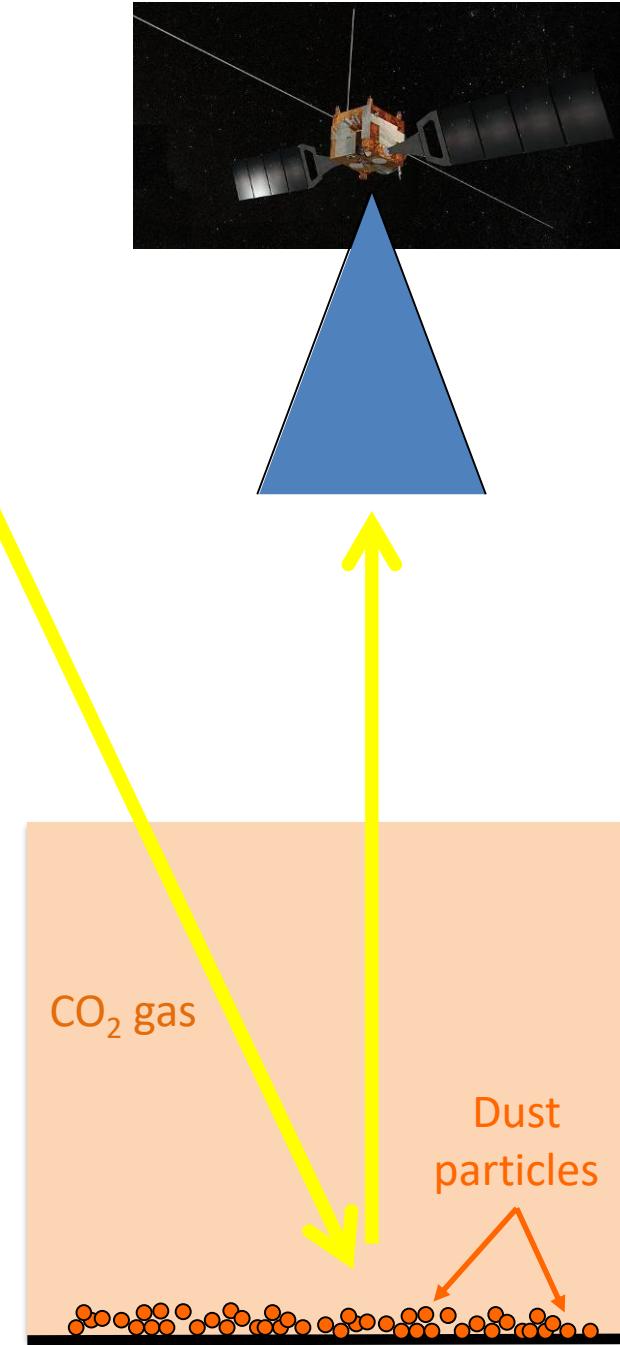
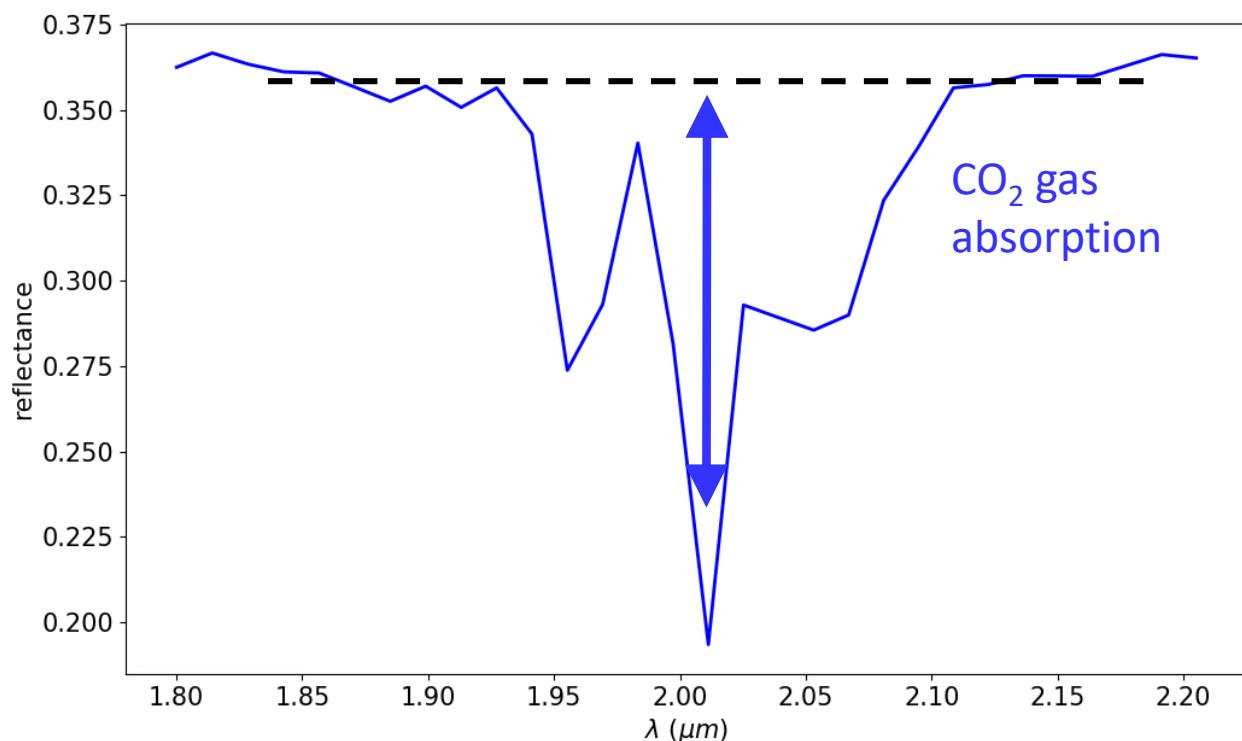


C. M. Dundas, 2020

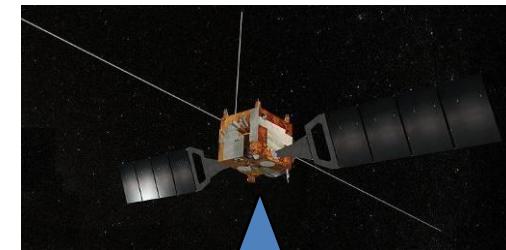
# Storm detection



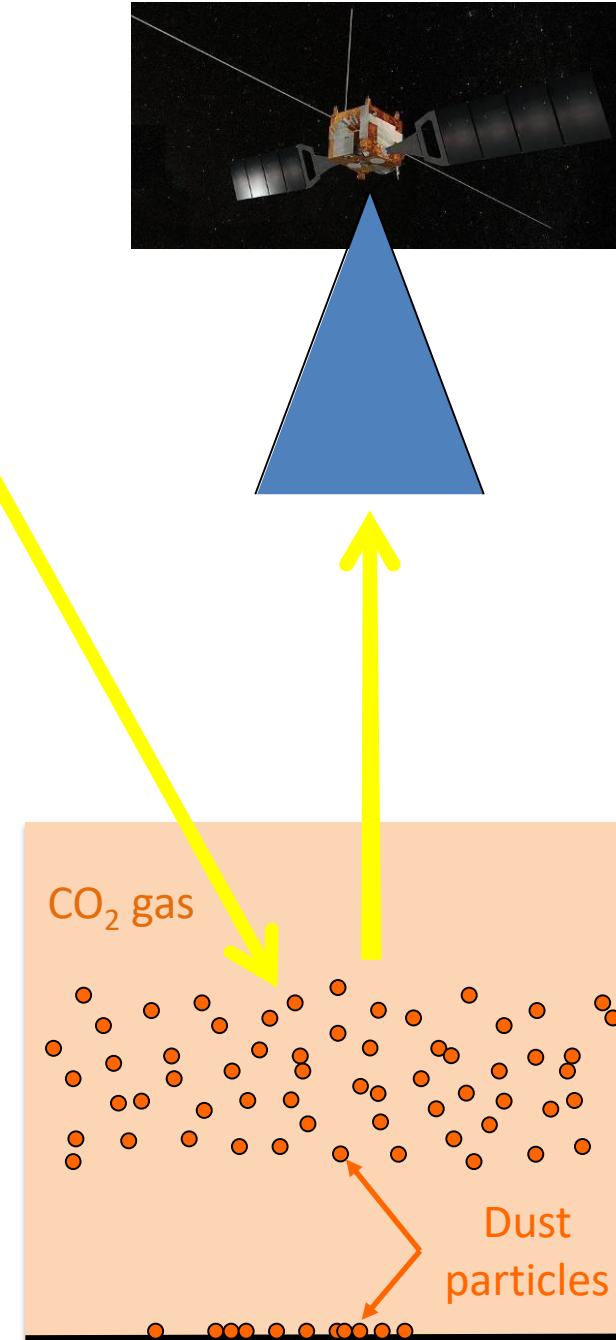
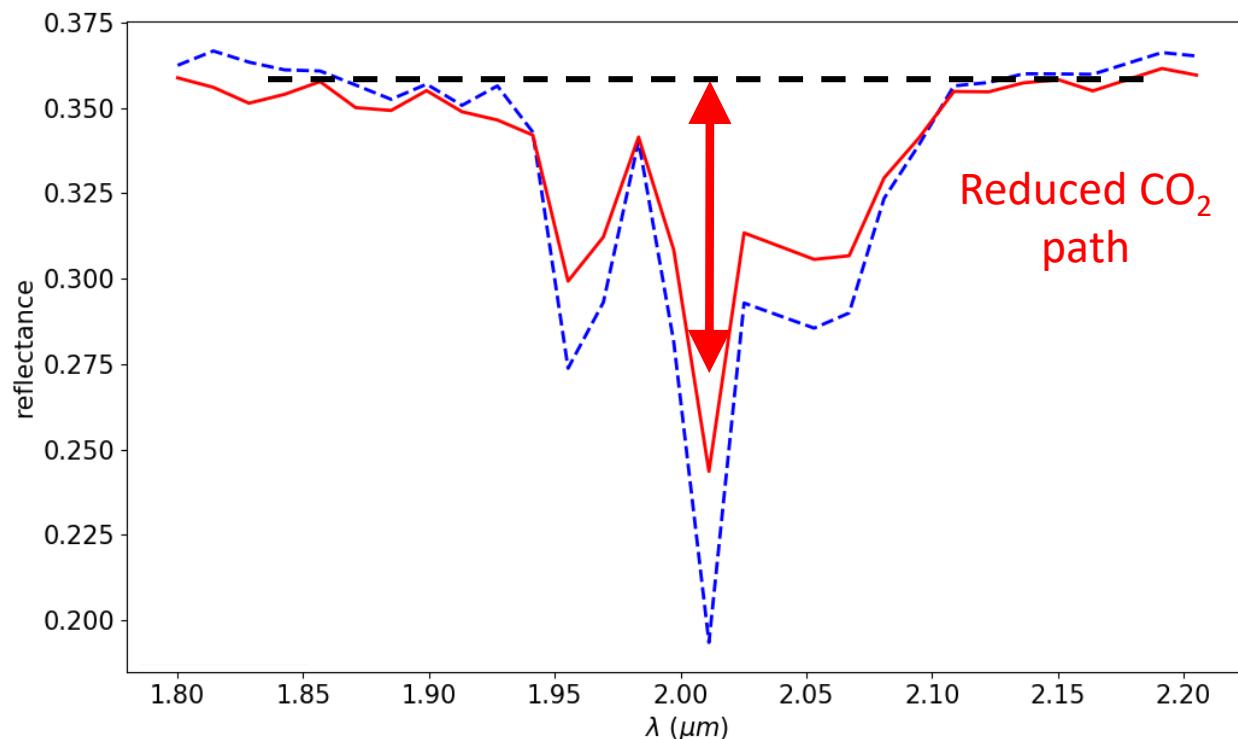
- Method principle: IR spectroscopy: 2  $\mu\text{m}$  CO<sub>2</sub> gas



# Storm detection

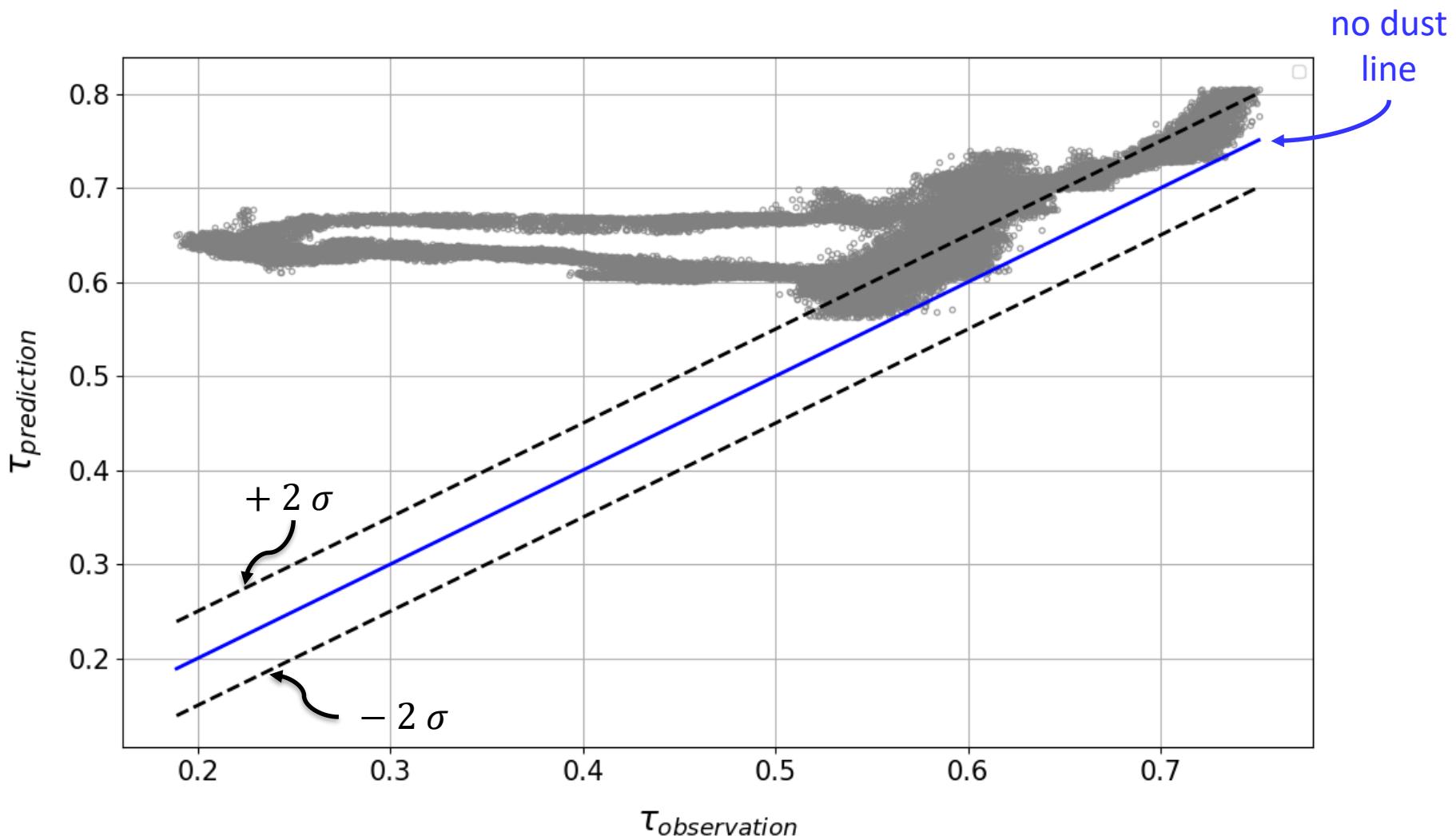


- Method principle: IR spectroscopy:  $2 \mu\text{m}$   $\text{CO}_2$  gas
  - Band **depth decrease**
  - Physical model: depth **prediction** (clear atmosphere)



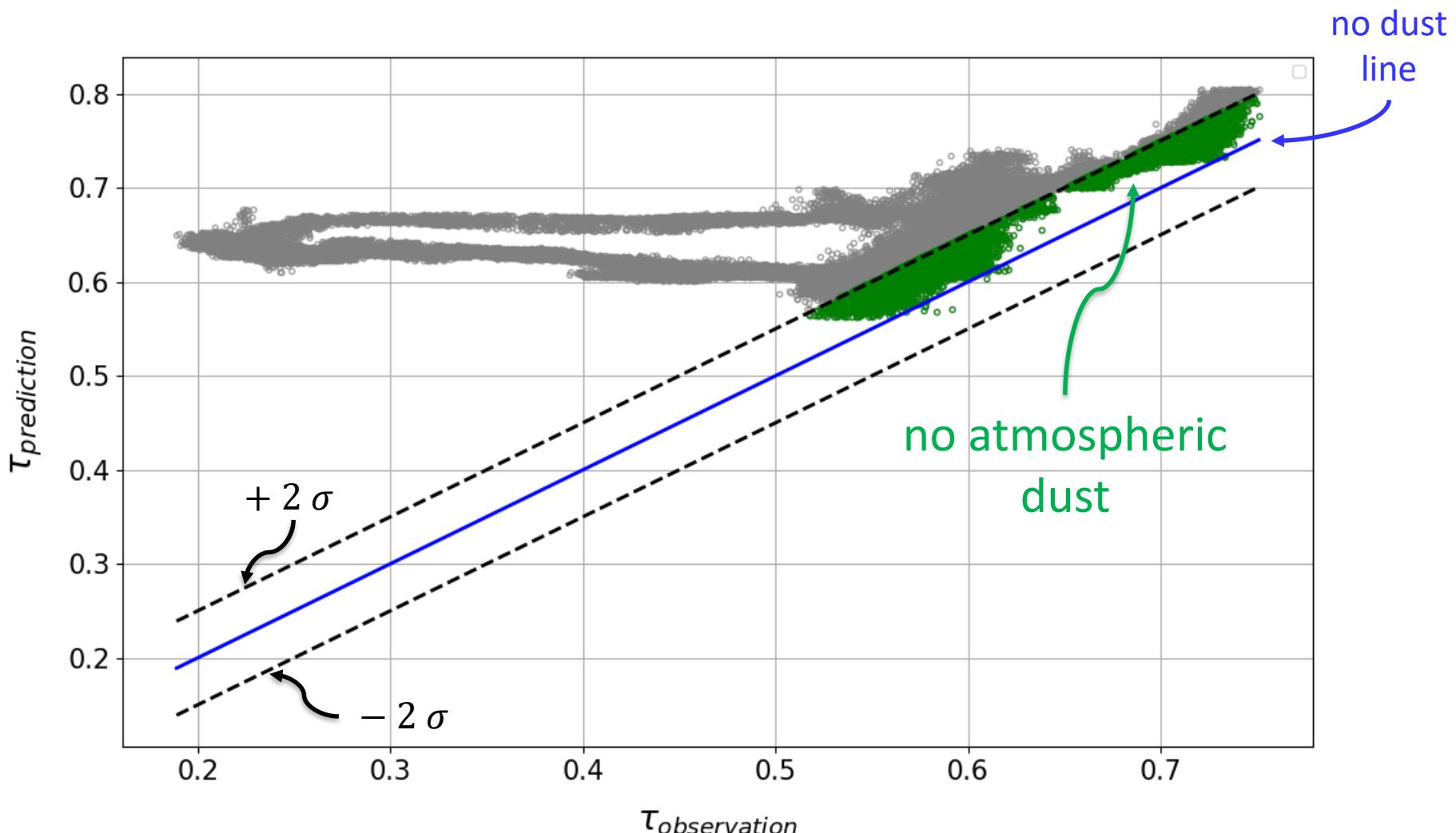
# Storm detection

- A detection:



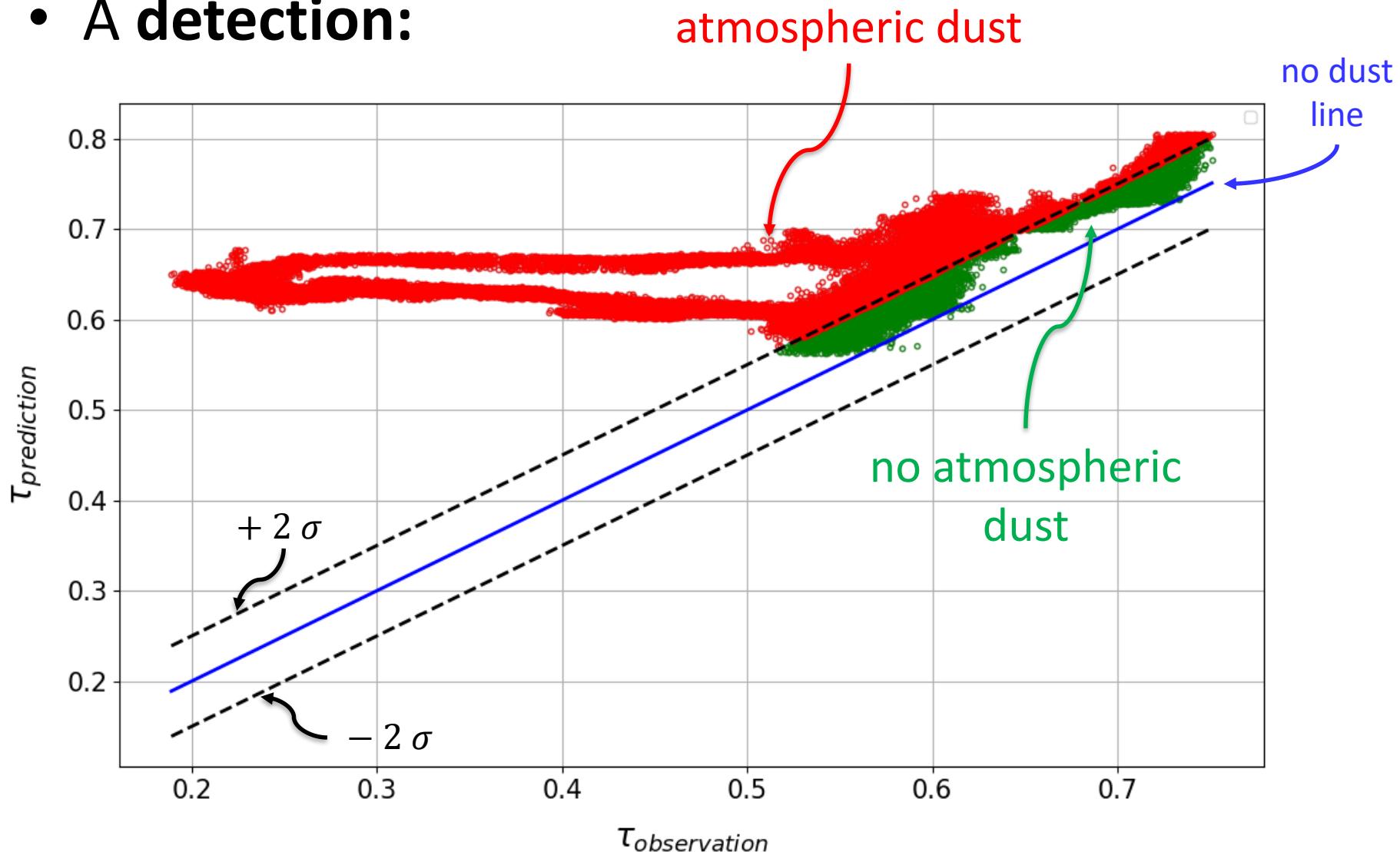
# Storm detection

- A detection:



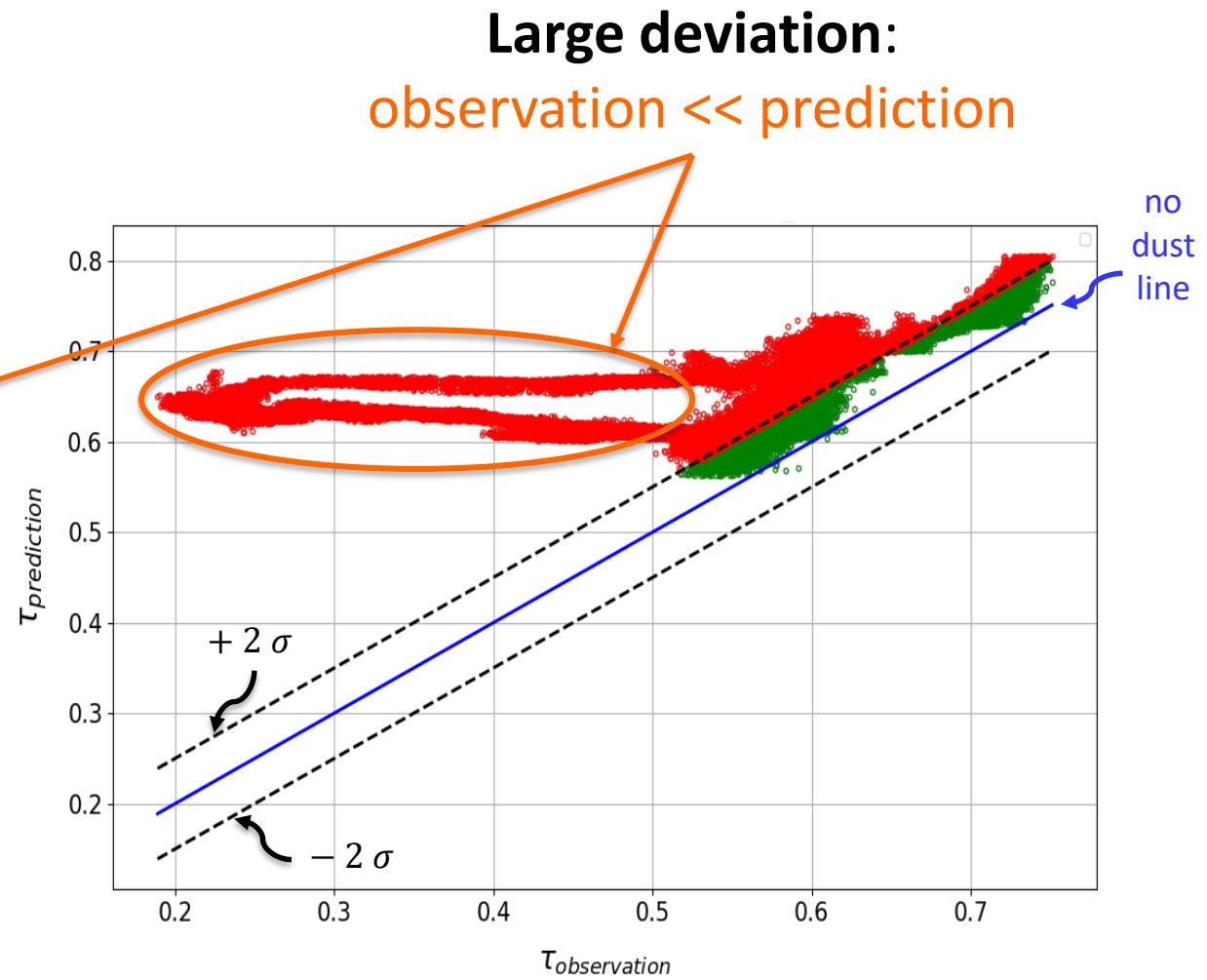
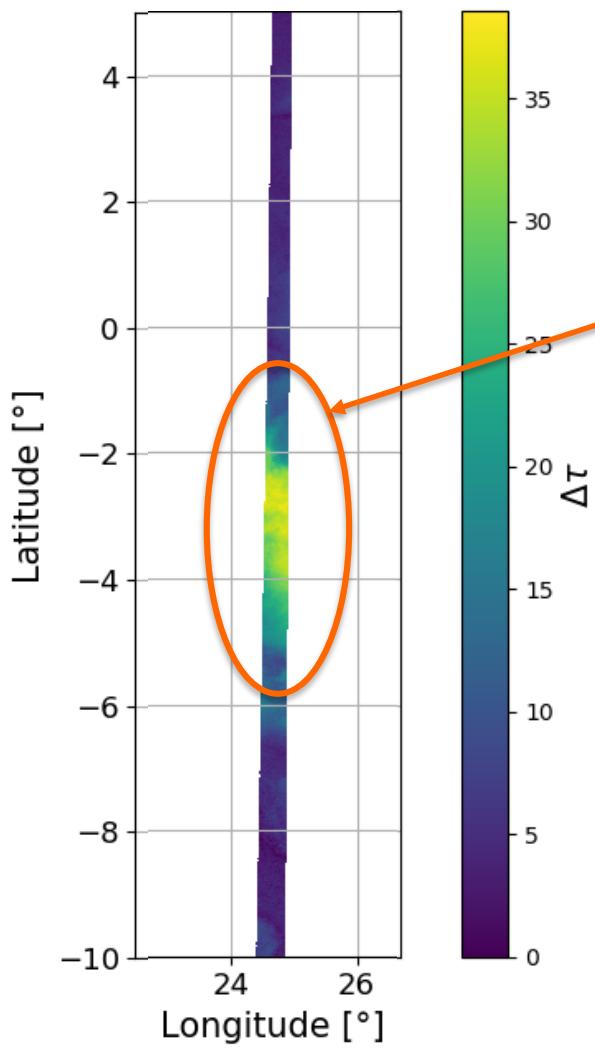
# Storm detection

- A detection:



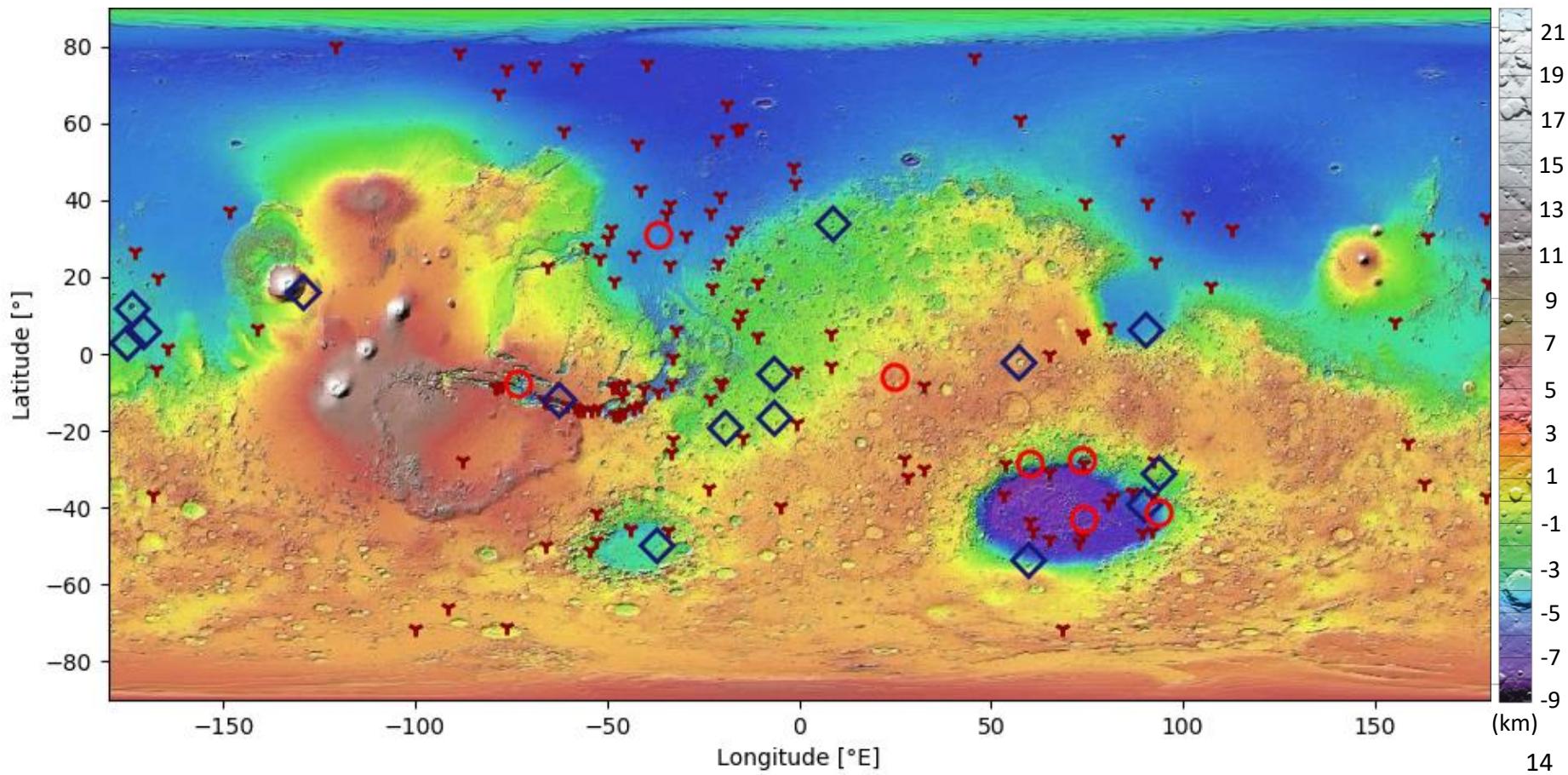
# Storm detection

- A detection:



# Storm detection

- Preliminary algorithm version: 10% dataset
- Spatial distribution:

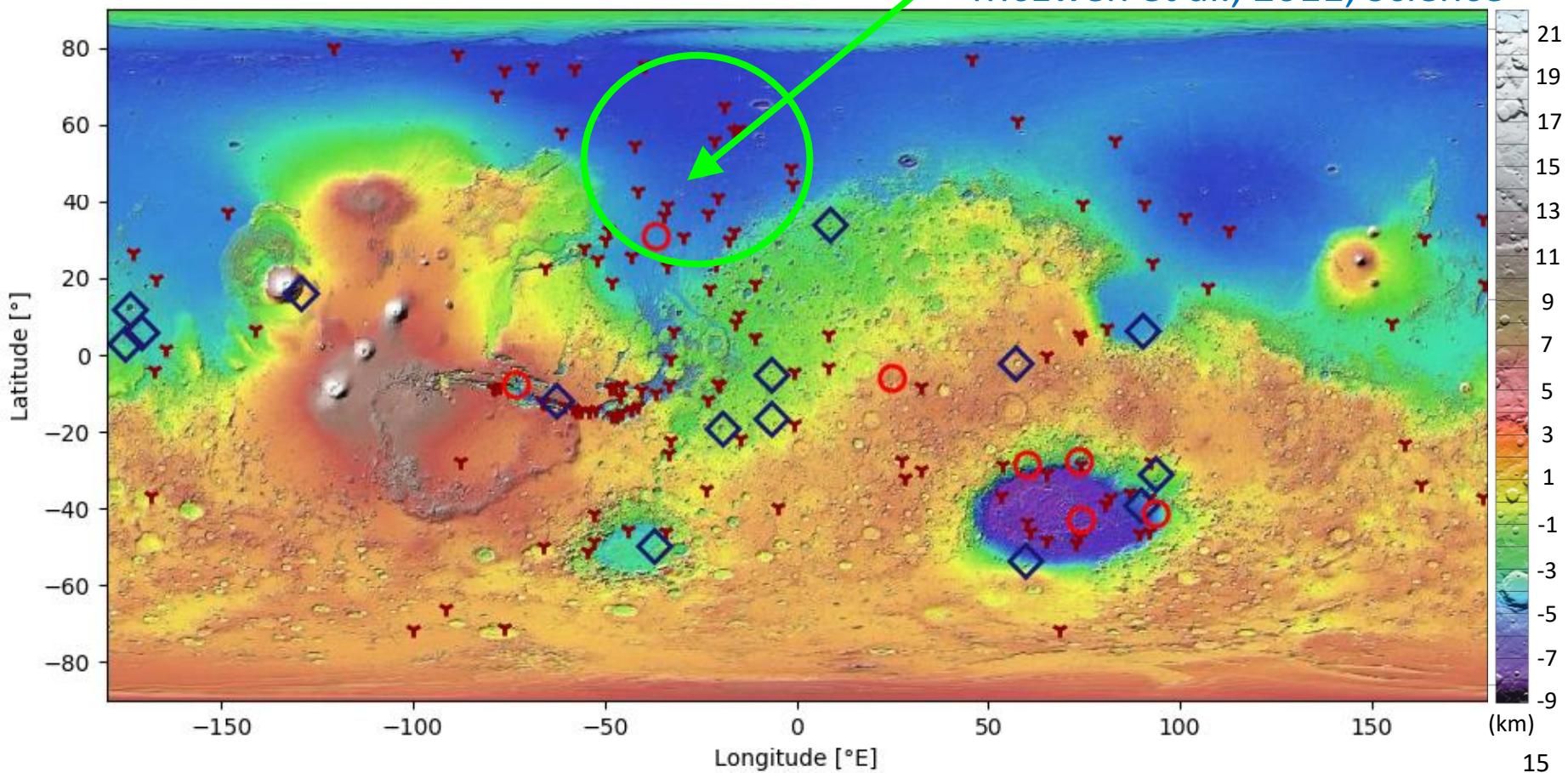


# Storm detection

- **Spatial distribution:** more dust storms where slope flows have been detected.



McEwen et al., 2011, Science



# Conclusion

- **New method** developed
- **Dust storms characterization** (spatial & temporal)
- Identify **connections**: dust storms & slopes flow





# Thanks for your attention!

