Solar occultation by space missions

Many observations available :

Titan, Saturn – VIMS/Cassini

Mars : Auguste/Phobos 2 – SPICAM/Mars Express

Venus : SPICAV/SOIR Venus Express

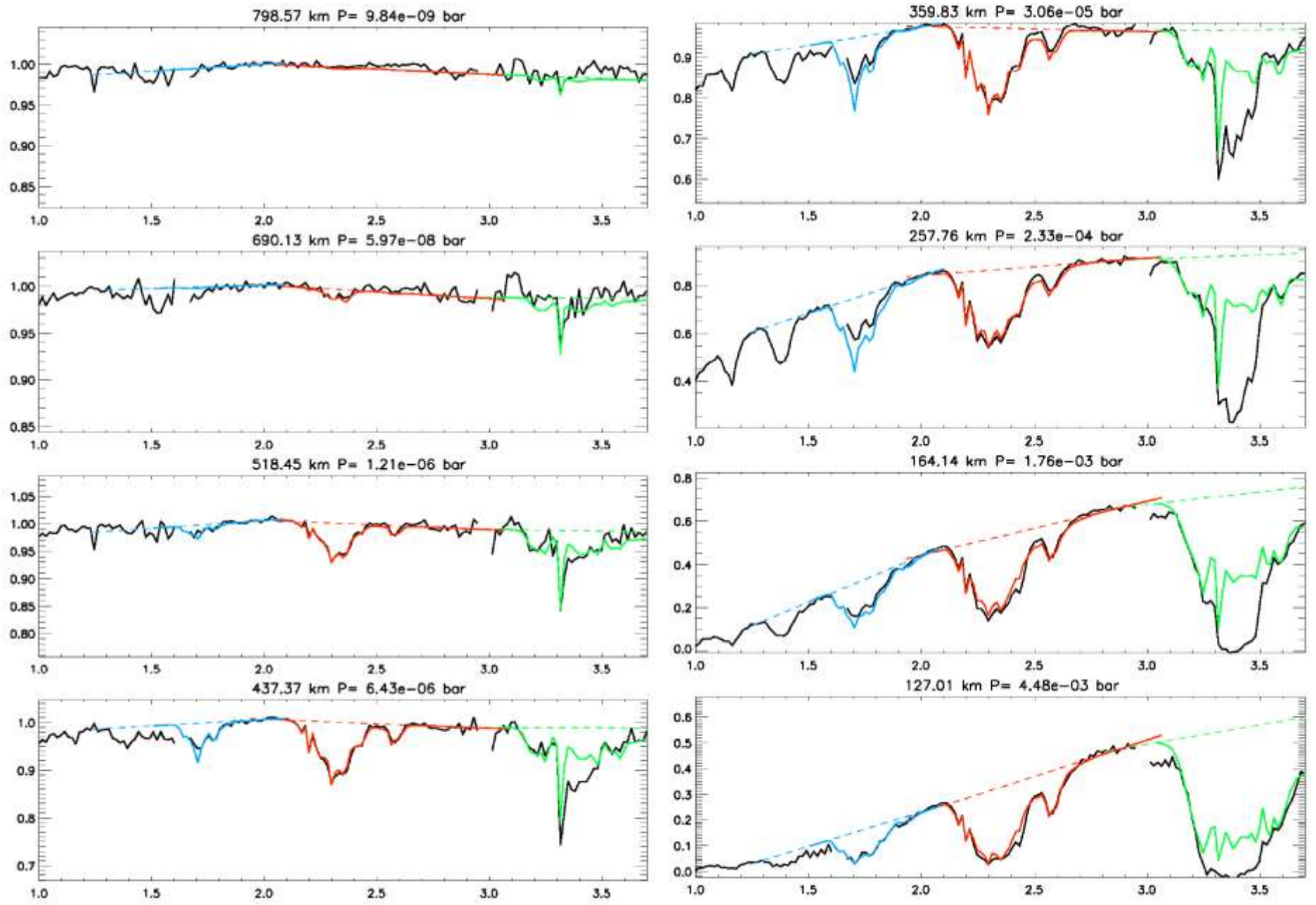
VIMS Titan occultation observations

Series of spectra

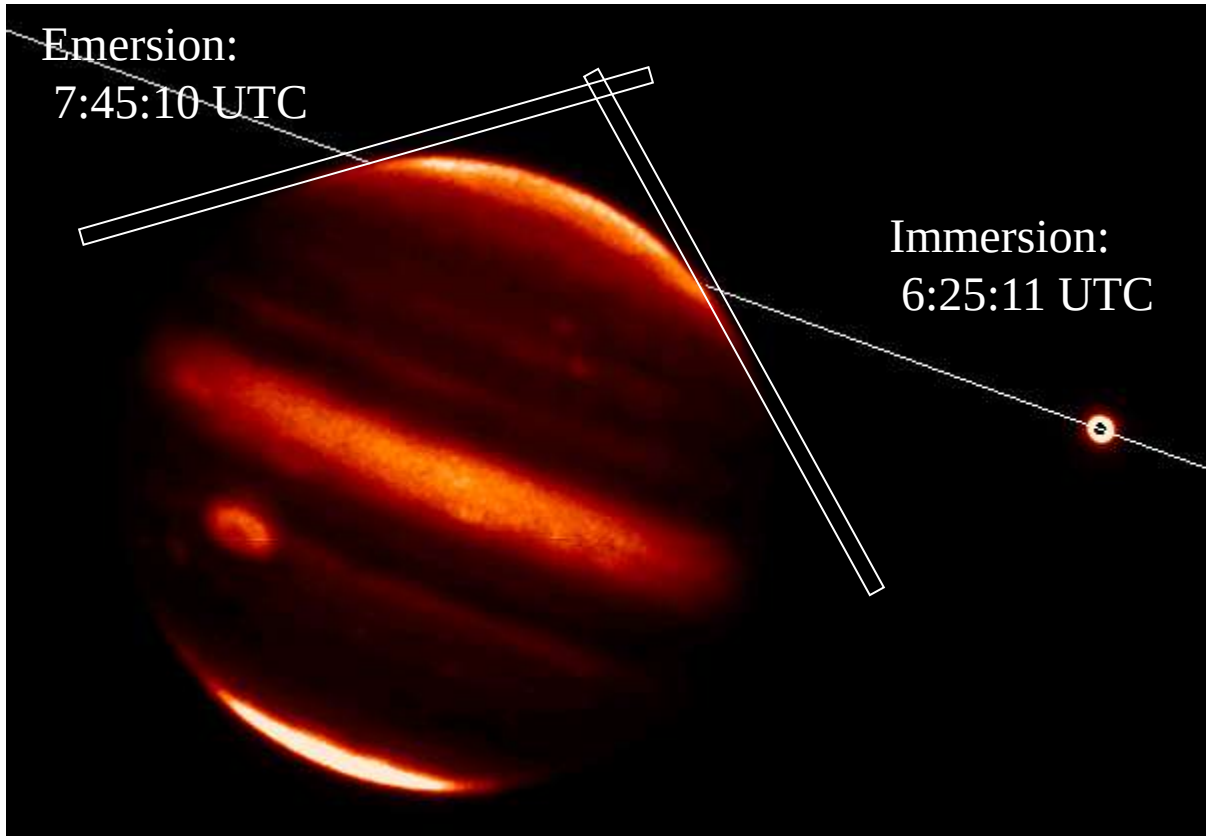
during Titan solar occultation

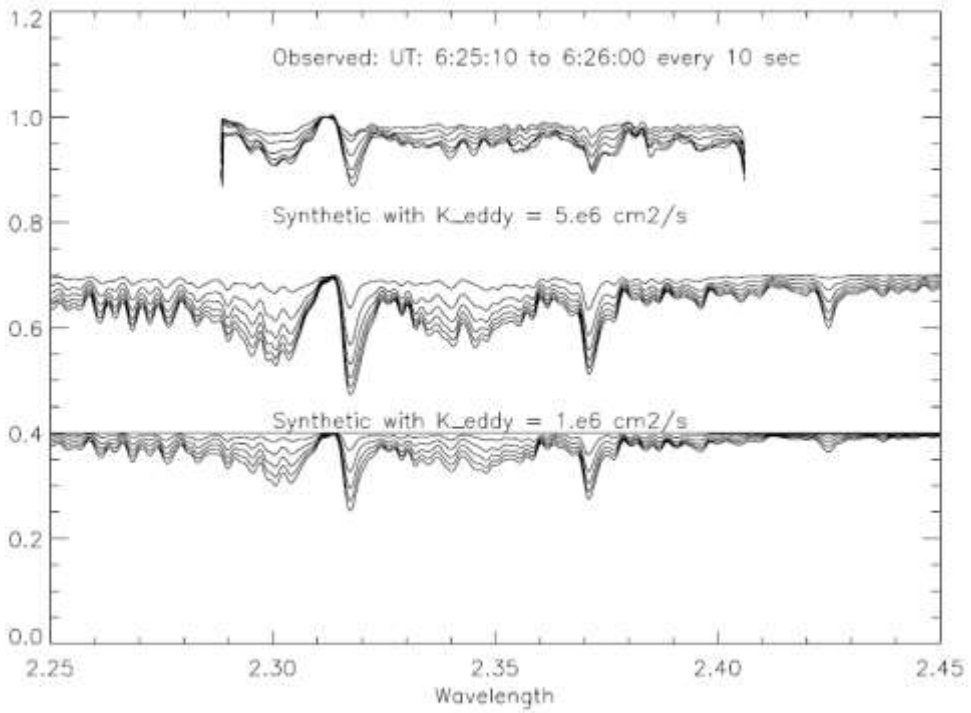
(15 January 2006)

Bellucci et al., Icarus, 2009



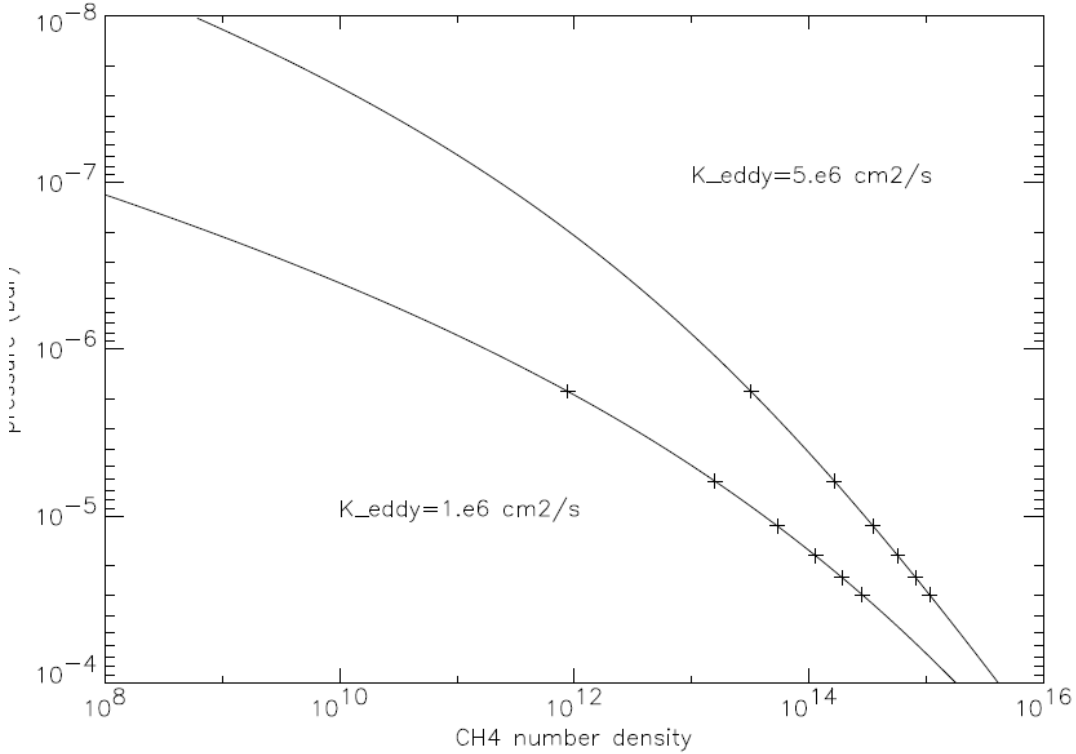
Occultation of Star HIP9369 by Jupiter
10 October 1999





CH_4 observations and simulations for different CH_4 profiles

CH_4 vertical profiles vs K_{eddy}



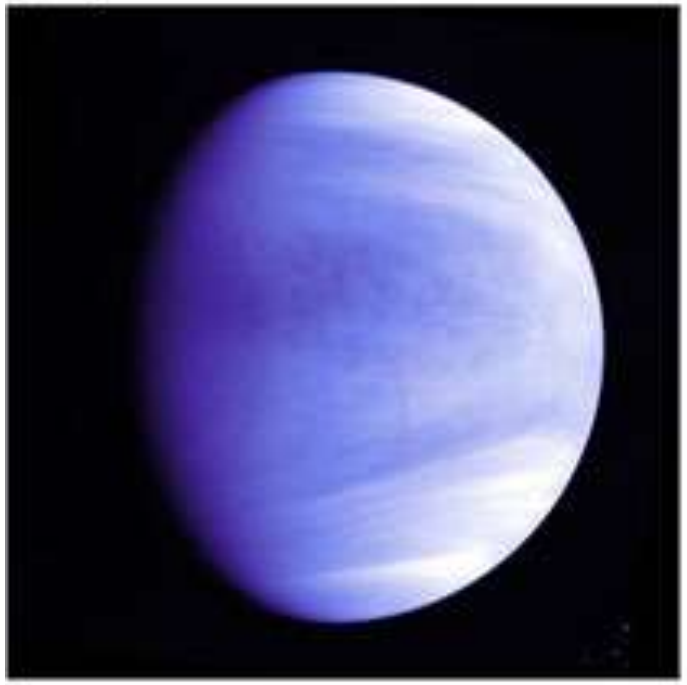
Lessons to learn from Solar System

1. Transits and occultations in the Solar System
2. Complexities in radiative transfer of planets : inhomogeneities, auroral effects and non-LTE phenomena in the upper atmospheres of giant planets

Inhomogeneities in planetary atmospheres

- **Spatial inhomogeneities : horizontal or vertical**

(a) UVI **0.33 µm**



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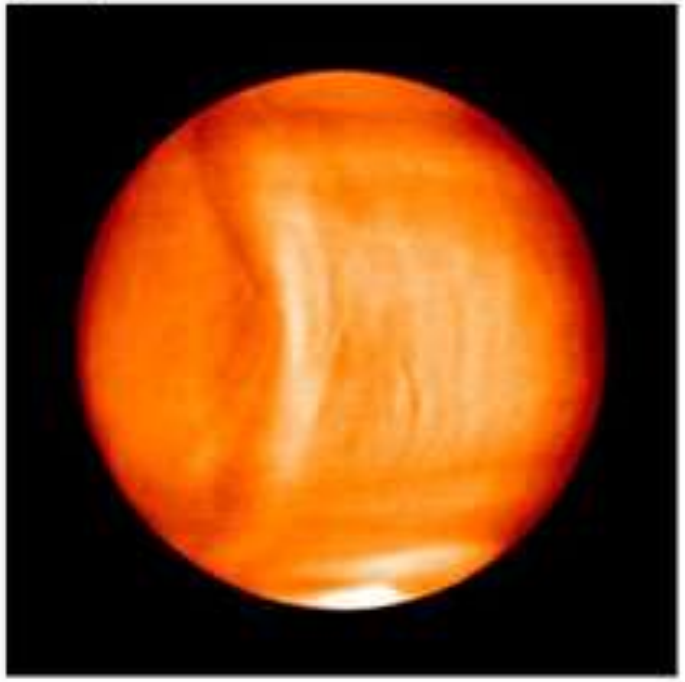
(b) LIR **8-12 µm**



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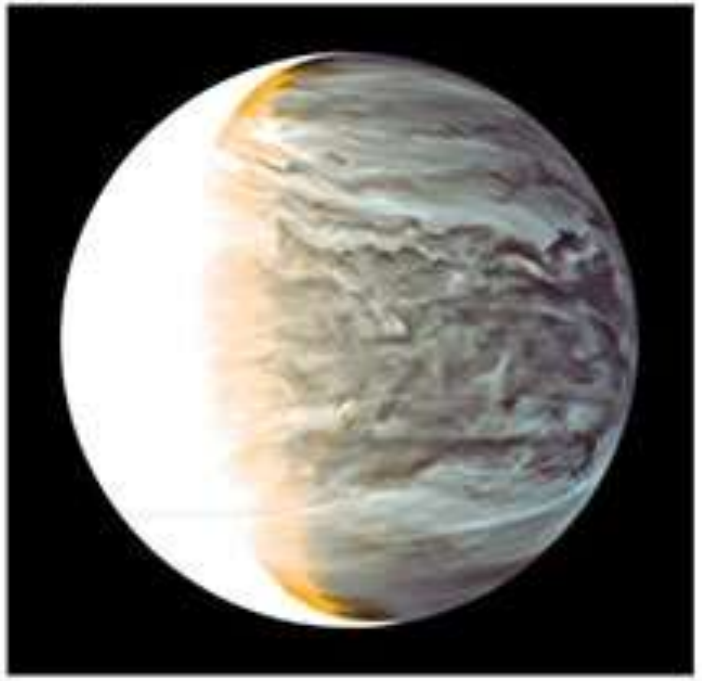
(c) IR2 **2 µm**



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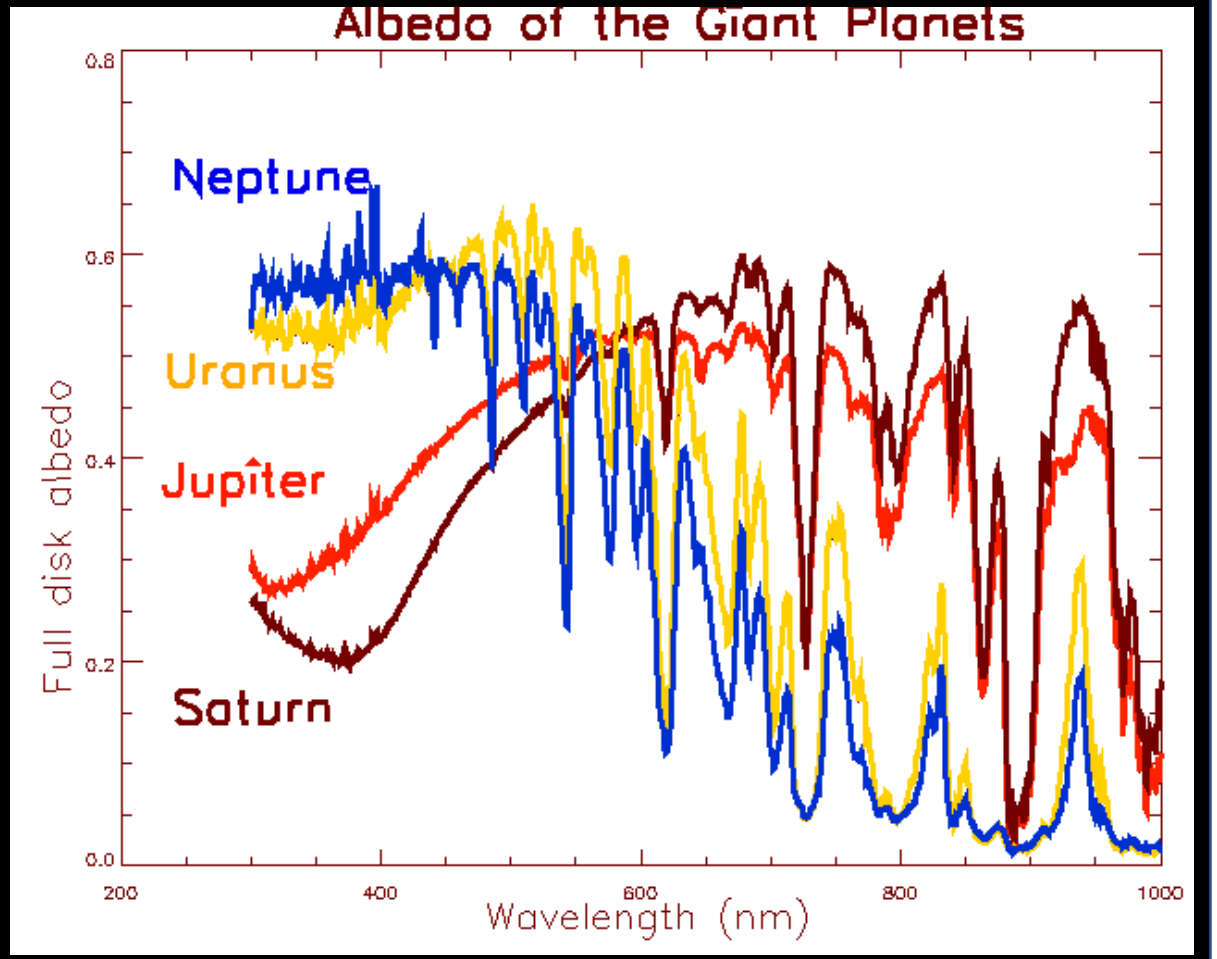
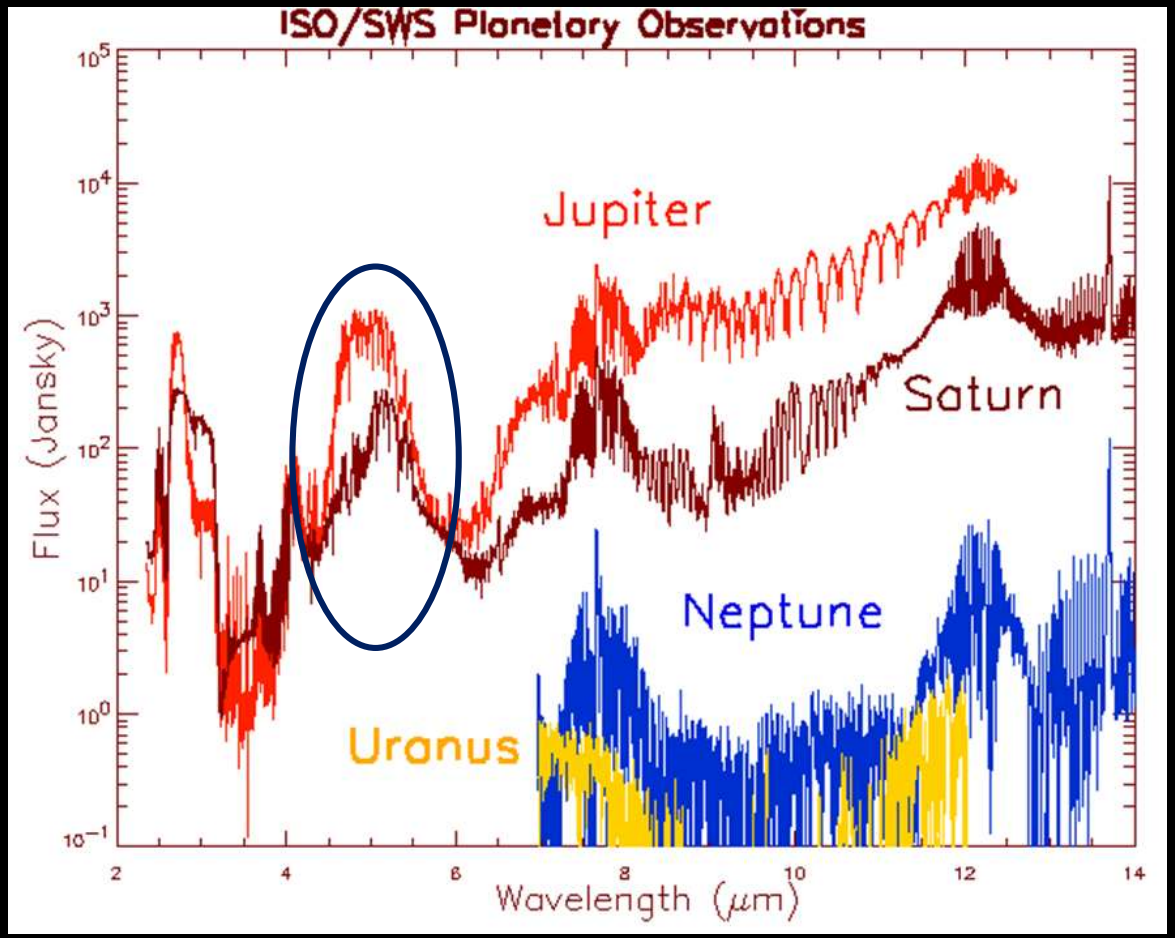
Jupiter

A. Simon (Goddard Space Flight Center), M. H. Wong (University of California, Berkeley) and the OPAL team. HST, 25 August 2020. Credit NASA, ESA

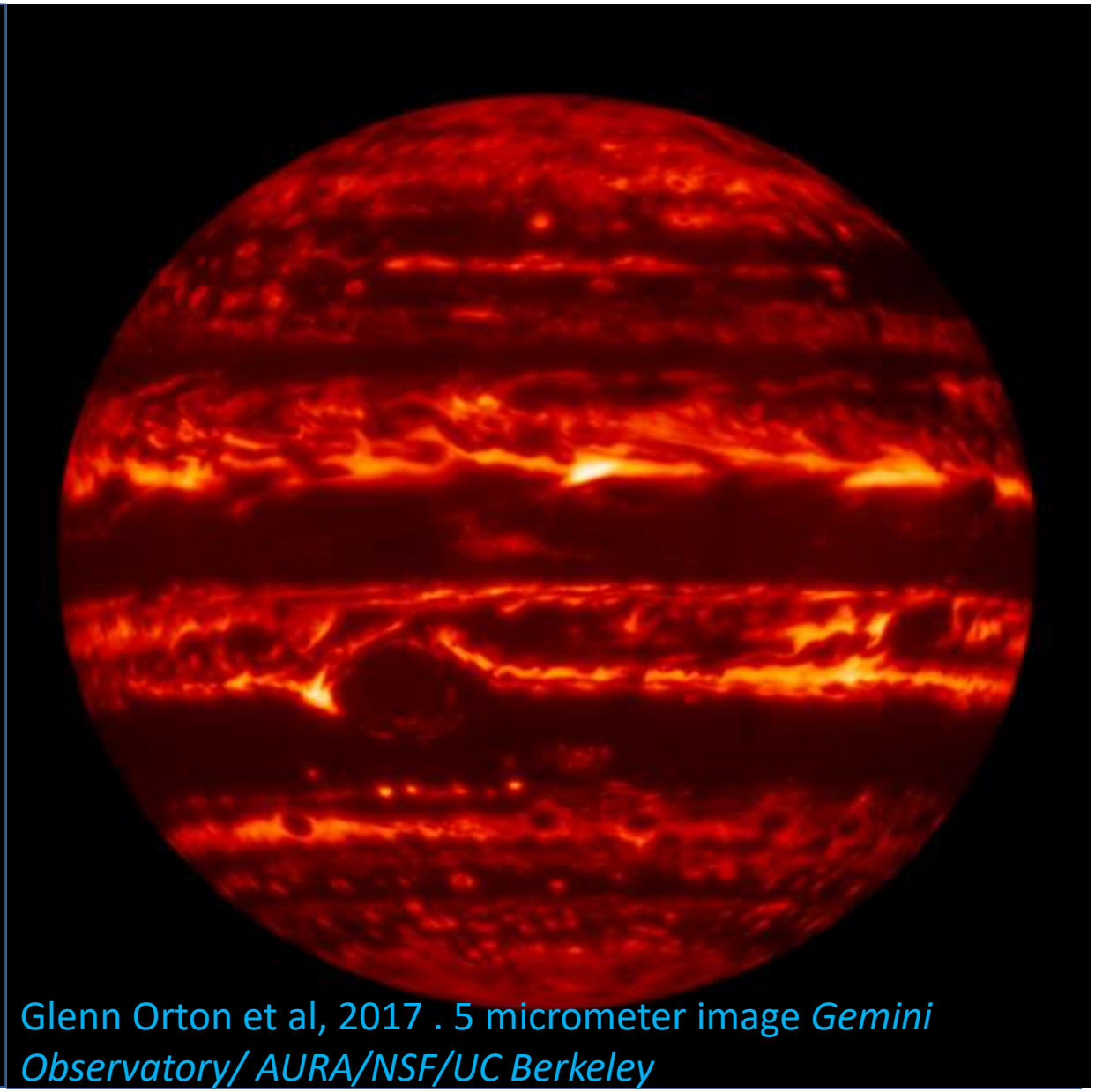


Karkoshka, Icarus, 1996

Jupiter in the infrared



ISO/SWS



Glenn Orton et al, 2017 . 5 micrometer image *Gemini Observatory/ AURA/NSF/UC Berkeley*

Auroral phenomena in giant planets

Importance of particle precipitations in a H_2/He atmosphere

H and H_2 UV emission :

- Lyman & Werner band for H2,
- Lyman alpha for H

Infrared emissions :

- H_3^+ emission in the ionosphere
- Infrared emissions : hydrocarbon emissions (CH_4 , C_2H_2 , …)

Dynamic phenomena

Heating of the thermosphere

The magnetosphere of Jupiter