Cold Spots on Saturn

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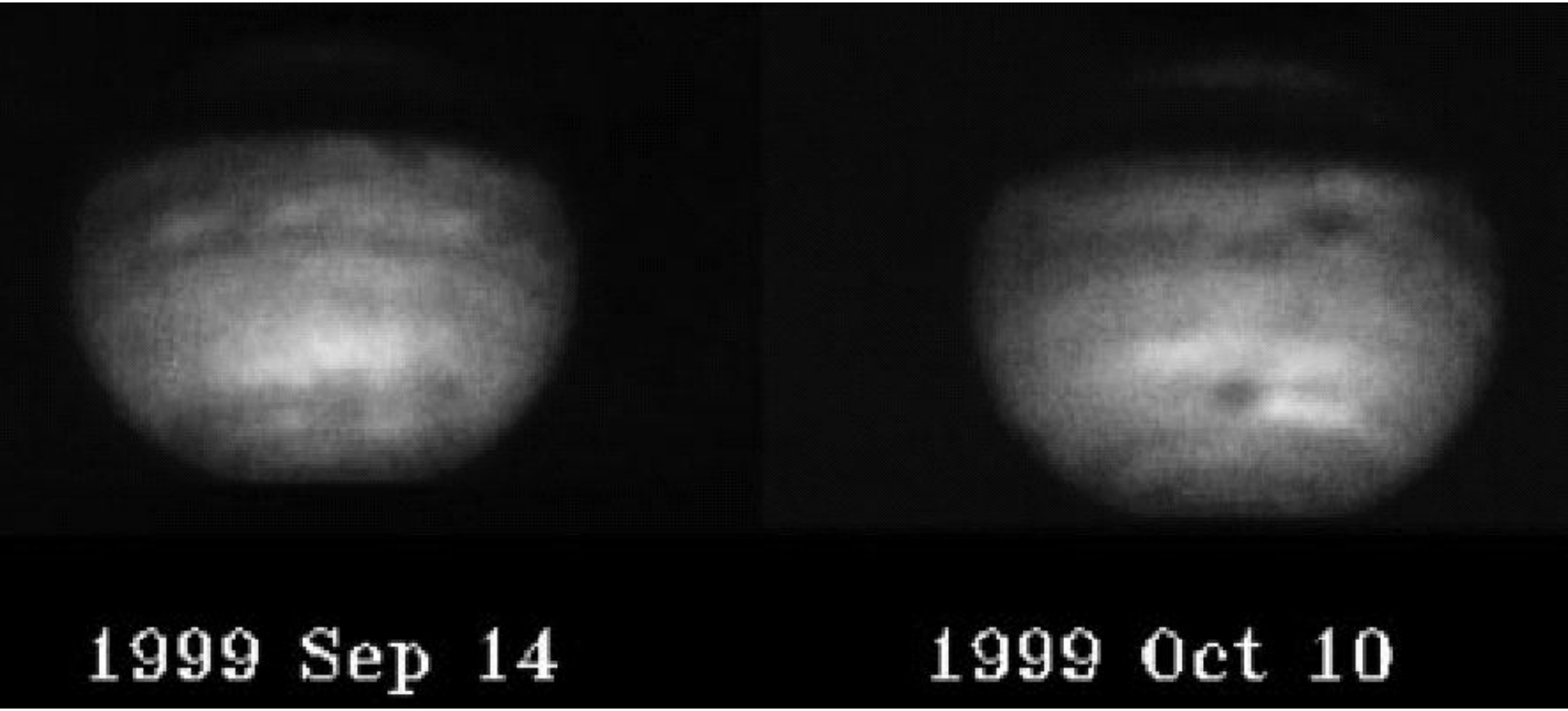
P.A. Yanamandra-Fisher et al. 2001, Icarus, 150, 189.

The 5 micron region is an atmosphere window that is relatively free of gaseous absorption on Earth, Jupiter, and Saturn.

In the case of Jupiter this allows the deep atmosphere to be probe. Openings in the clouds appear as “hot spots” in the atmosphere of Jupiter where heat from the deep atmosphere of Jupiter can be observed.

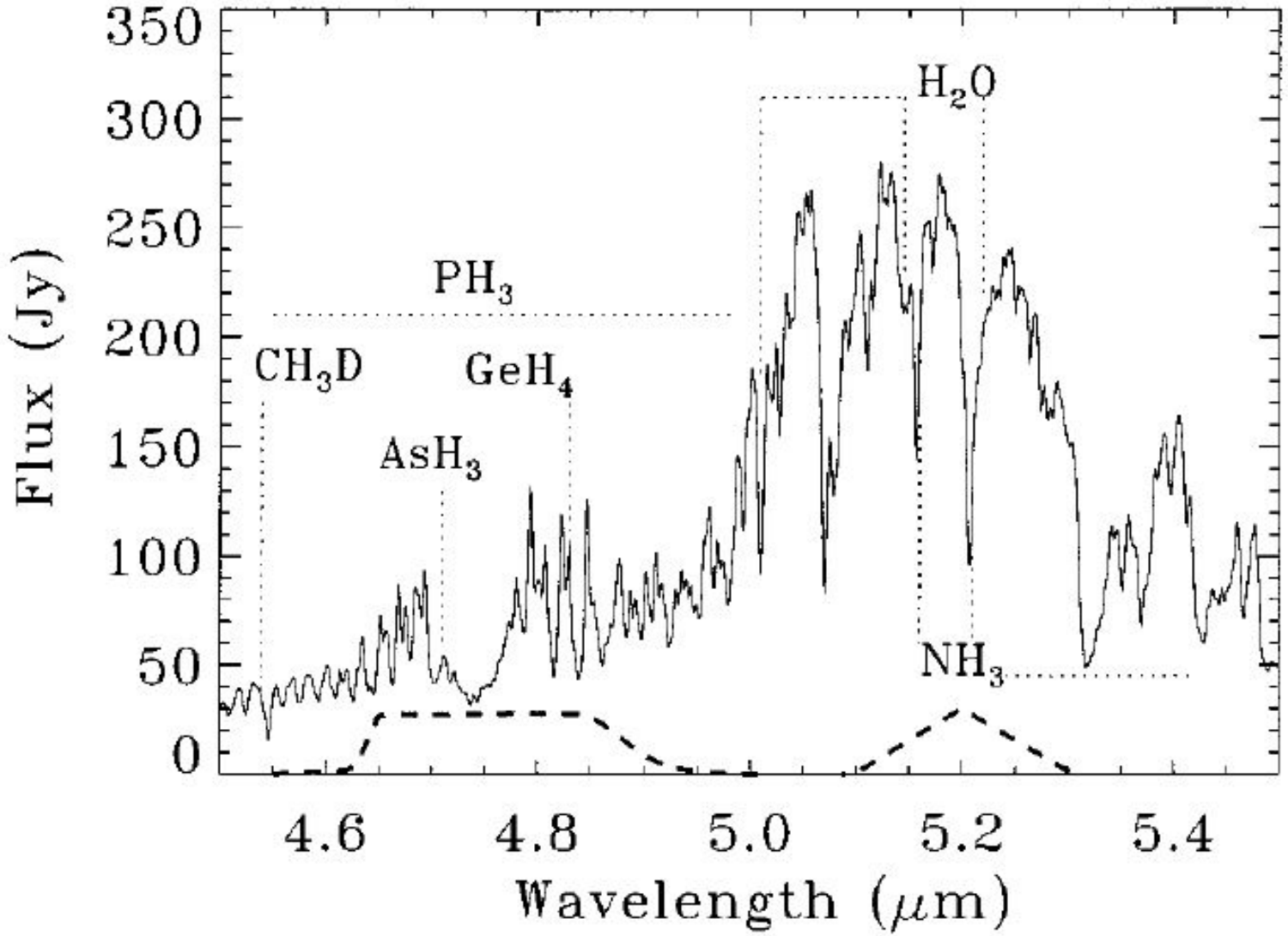
Saturn on the other hand has a larger contribution from reflected sunlight at 5 microns. To minimize the reflected light component, images were made of Saturn at 5.2 microns using a narrow-band filter in NSFCAM. These images, shown in the next slide, show unexpected dark spots that are colder than the surrounding areas by up to 10 K.



Images of Saturn at 5.2 microns taken with NSFCAM.

The spectrum of Saturn at 5 microns shows that at 5.2 microns there is much less absorption from phosphine (PH_3). Thus it is possible to see deeper into the atmosphere at 5.2 microns. Simple modeling indicates that variations in a cloud layer at about 1.5 bar can explain the observations. The cold spots are interpreted as being regions of higher opacity at the 1.5 bar level.

The implications of this discovery is that the 5.2 micron region is a place where cloud dynamics at the 1.5 bar level can be studied. This will provide a fruitful spectral region to study with the Visible/Near Infrared Mapping Spectrometer (VIMS) on Cassini.



5 micron spectrum of Saturn. PH_3 absorbs strongly at 4.55-5.0 microns and NH_3 at 5.25-5.4 microns. The filter bandpass at 5.2 micron is shown by the triangular dashed curve.