Latitudinal variations in the temperature and composition of Saturn's upper troposphere from Cassini/CIRS

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The Cassini Composite Infrared Spectrometer (CIRS, Flasar *et al.*, 2004) has been used to derive the meridional variation of temperature, phosphine (PH_3) and ammonia (NH_3) abundance in Saturn's upper troposphere (0.8 to 0.1 atm). Since orbital insertion in July 2004, CIRS has recorded thousands of spectra in both the far (10 - 600 cm^{-1}) and mid (600 - 1400 cm^{-1}) infrared, at a variety of apodized spectral resolutions (0.5 - 15.0 cm^{-1}) and viewing geometries, covering both hemispheres of the gas giant.

We use a non-linear optimal estimation retrieval code (Irwin *et al.*, 2004) to derive vertical profiles of temperature, composition and aerosol abundance. The abundances of NH_3 and PH_3 are retrieved from rotational lines in the 10 - 200 cm^{-1} region, and the ν_4 fundamental of PH_3 at 1070 - 1200 cm^{-1}.

Latitudinal temperature variations at the 0.25 atm are shown to occur on the same scale as the prograde and retrograde jets in Saturn's atmosphere (Porco *et al.*, 2005). The distribution of phosphine, a disequilibrium species in Saturn's cold upper troposphere (Orton *et al.*, 2000, 2001), may be used as a tracer for the upwelling of constituent-rich air from deeper within the atmosphere. Elevated abundances of PH_3 at polar and equatorial latitudes; correlations of PH_3 and NH_3 with the belt-zone temperature structure; deviations of parahydrogen fraction from local thermochemical equilibrium at the equator and evidence for atmospheric heating by aerosols at 0.25 atm will also be presented.

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