

ORTIS - ORbiter Terahertz Infrared Sounder

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Abstract

Accurate measurement of the temperature, composition and dynamics of Jupiter's atmosphere is one of the main scientific goals of ESA's and NASA's Outer Planet Mission proposals. Infrared remote sounding provides a powerful tool for achieving these objectives and was used by Voyager/IRIS and Cassini/CIRS, but is insensitive to some altitudes and gases. The sub-millimetre wavelength (terahertz) region of the electromagnetic spectrum, which has not been significantly exploited to date in the discipline of planetary science, provides unique spectral information over a range of atmospheric pressures and, when combined with infrared data, is a powerful in situ planetary atmospheric sounder.

We will describe a novel low mass and low power consumption combined terahertz/IR instrument proposed for inclusion on the Jupiter Ganymede Orbiter that will greatly improve our understanding of the atmosphere of Jupiter. Through the combination of high spectral resolution 2.2THz spectroscopy ($R=10^6$) and low-spectral resolution IR radiometry, the entire temperature profile of the Jovian atmosphere from 0.6 to 10^{-3} bar can be evaluated (filling in the currently unmeasured levels between 0.1 and 0.01 bar). In addition, the tropospheric and stratospheric composition can be determined (especially water vapour) and observations of the Doppler shifting of sub-millimetre lines can also be used to measure horizontal wind speeds.

Oral presentation preferred.