

ISO Far-Infrared Spectroscopic Observations of Jupiter

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We present the far-infrared spectrum of Jupiter that was measured with the Short and Long Wavelength Spectrometers (SWS and LWS) aboard the Infrared Space Observatory (ISO). The region between 30 and 45 μm was observed in grating mode, where the SWS provides a spectral resolution of 1000 - 1600, depending on wavelength. For longer waves up to 197 μm the LWS-FP (Fabry-Perot) was used to achieve a resolution of several thousand. The observations were made between 23 and 26 May 1997 during ISO's revolutions 554, 556 and 557.

The Jovian spectrum in the far-infrared is compared to an atmospheric radiative transfer model using expected values for the constituent vertical concentration profiles. Rotational transitions of ammonia and phosphine are responsible for the absorption features observed: Strong ammonia absorption manifolds are obvious against the background continuum slope, appearing at 39, 42, 46, 51, 56, 63, 72, 84, 100, 125 and 168 μm in both the data and the model. Also PH_3 absorption features are clearly present; we found them at the expected wavelengths of 113, 141, 161 and, somewhat spurious, 188 μm . This is the first time that most of these far-infrared features have been detected. The ISO observations are therefore of great value for the preparation of the planned submillimeter studies of the atmospheres of the Jovian planets with FIRST.