The Infrared Spectrum of Comet Hale-Bopp

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Abstract

Spectra of comet C/1995 O1 (Hale-Bopp) were observed at medium resolution with PHT-S and at high resolution with the long- and short-wavelength spectrometers of the Infrared Space Observatory on September-October 1996, when the comet was at about 3 AU from the Sun. For the first time, a high-resolution spectrum of a comet covering the entire 2.4 to 200 μm spectral range was obtained.

The vibrational bands of water, carbon dioxide and carbon monoxide are detected in emission with PHT-S, as expected from molecular fluorescence models. Relative production rates of 100:22:70 are derived for H_2O:CO_2:CO. H_2O is observed at high spectral resolution in the ν_3 group of bands around 2.7 μm and the ν_2 group around 6 μm with SWS, and in a couple of rotational lines near 180 μm with LWS. The rovibrational lines of the ν_3 band are observed with a high signal-to-noise ratio. This allows accurate determinations of the water rotational temperature and of its ortho-to-para ratio.

Longward of 6 μm, the spectrum is dominated by dust thermal continuum emission, upon which broad emission features are superimposed. The wavelengths of the emission peaks correspond to those of Mg-rich crystalline olivine (forsterite).

Highlights of these results were briefly reported in Crovisier *et al.* (1997). We will present the latest developments of their analysis.

References

Crovisier, J. *et al.* 1997. *Science* **275**, 1904.