NEPTUNE'S 28–185 MICRON SPECTRUM FROM THE ISO LONG AND SHORT WAVELENGTH SPECTROMETERS

G. Orton (1), M. Burgdorf (2), G. Davis (3), S. Sidher (4), H. Feuchtgruber (5), M. Griffin (6), B. Swinyard (4)

(1) Jet Propulsion Laboratory, Caltech, (2), IPAC, Caltech, (3) Joint Astronomy Centre, (4) Rutherford-Appleton Laboratory, (5) MPI Extraterrestrische Physik, (6) Cardiff University

Neptune was observed by the Infrared Space Observatory (ISO) Long Wavelength Spectrometer (LWS) between 46 and 185 μm. At wavelengths shorter than 130 μm the accuracy of these measurements is $\leq$ 0.3 K, making Neptune a highly reliable calibrator in the far infrared. These measurements were combined with ISO Short Wavelength Spectrometer (SWS) observations between 28 and 43 μm to determine a disk-averaged temperature profile and derive several physical quantities. The combined spectra are best matched by a He/H_2 mass ratio of 0.27$\pm$0.04, if the mixing ratio of CH_4 in the deep troposphere is assumed to be 2%. This value is consistent with one derived by combining the observations of the Voyager-2 IRIS and radio occultation experiments. The disk-averaged *para- vs ortho*-H_2 ratio is found to be no more than 2% different from its equilibrium value for the mean temperature. The composite spectrum is best fit by invoking a CH_4 ice condensate cloud. For a particle size distribution of 10%, the mode size of uncontaminated particles must be between 10 and 40 μm. The composite spectra are relatively insensitive to the vertical distribution of the cloud, but the particle scale height to gas scale height ratio must be greater than 0.05. The best models are consistent with an effective temperature of 59.5 $\pm$ 0.5 K, a value consistent with one derived by the Voyager IRIS experiment. Tighter constraints on Neptune's globally averaged physical and chemical properties should be elucidated from observations by the Space Infrared Telescope Facility (SIRTF).