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Problems and Solutions in the Analysis of Spitzer IRS Observations of Uranus and Neptune: Results for Temperature Structure and Composition

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Mid-infrared spectra of the disks of Uranus and Neptune were obtained with Spitzer's very sensitive Infrared Spectrometer (IRS). The IRS covered the wavelength range of 5 to 21.5 μm with a resolving power of $\sim$90 and of 10 to 36.5 μm with a resolving power of $\sim$600, although there were problems with the high-resolution modes at the longest wavelengths. The spectra do not resolve the disks of either planet, but they are nonetheless replete with information about the global-mean temperature structure and composition of both planets. This presentation will concentrate on the approaches used to derive temperatures and compositions. Derivation of an average temperature profile will be demonstrated principally using spectra of Uranus, using the collision-induced absorption "continuum" and quadrupole lines of molecular hydrogen. Derivation of composition will be demonstrated princially using spectra of Neptune, covering features arising from methyl, methane, acetylene, ethyene, ethane, diacetylene, methylacetylene, and carbon dioxide. The benefits of recent improvements in spectroscopic parameters will be demonstrated, and the need for improvements in others outlined.