Comparison of High-resolution 3-micron Spectra of Jupiter, Saturn, and Titan

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We present a comparison of the high-resolution 3-micron spectra of Jupiter, Saturn, and Titan. This wavelength range approximately between the K and L bands contains important spectral signatures of numerous organic molecules in the planetary atmospheres, but it has been difficult to be investigated compared with the adjacent bands due to strong telluric absorption. This band, however, has many narrow atmospheric windows between strong telluric absorption lines, which can be seen through with high-resolution spectroscopy. We present spectral similarity and difference between the two giant planets and Titan. The spectral range is of particular interest, because fluorescent and/or auroral emissions of certain molecules formed at high stratospheres have been observed; and the emissions are useful to probe high-altitude atmospheres, which cannot be probed easily from other wavelength ranges. We compare the derived mixing ratios of molecules and opacities of haze with previous results obtained from other wavelengths. We suggest future high-resolution observations in this spectral range, including the addition of Uranus and Neptune, and searches for additional trace molecules.