COMPOSITIONAL ANALYSIS OF TITAN'S ATMOSPHERE USING SPITZER INFRARED SPECTROGRAPH DATA

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Saturn's moon Titan exhibits the most complex and diverse atmospheric chemistry of any body in the solar system other than the Earth. Photochemistry in the upper atmosphere starts with methane and nitrogen and produces a rich array of hydrocarbons and nitriles, and also some oxygen compounds due to an external oxygen source from Enceladus. Since the 1970s, infrared spectroscopy has been the primarily mechanism for probing the composition of the neutral atmosphere, using ground-based telescopes, visiting spacecraft such as Voyager and Cassini, and space-based observatories including the Infrared Space Observatory (ISO) and Herschel. We present for first time infrared spectra from the Spitzer space telescope (2004-2009) in both the short wavelength-low resolution channels (SL, $R \sim 60-127$, 5.13 to 14.29 microns) and short wavelength-high resolution channels (SH, $R \sim 600$, 9.89 to 19.51 microns) showing the emissions of CH4, C2H4, C2H2, C2H6, HCN, CO2, HC3N, C3H4 and C4H2. We compare the results obtained for Titan from Spitzer to those of ISO, Herschel and Cassini CIRS, and comment on the effect of spectral resolution on retrieved information content. We conclude by recommending gaps in current spectroscopic knowledge of molecular bands that could be addressed by theoretical and laboratory study to aid future astronomical studies of Titan.