SIMULTANEOUS SPATIALLY-RESOLVED NEAR-INFRARED SPECTRA OF PLUTO AND CHARON.

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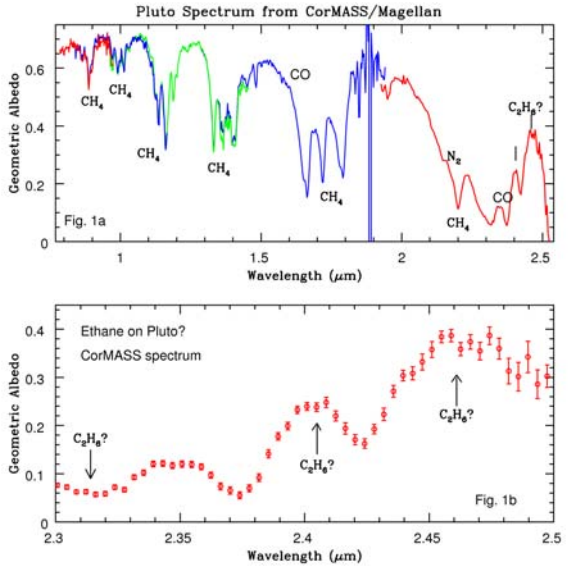
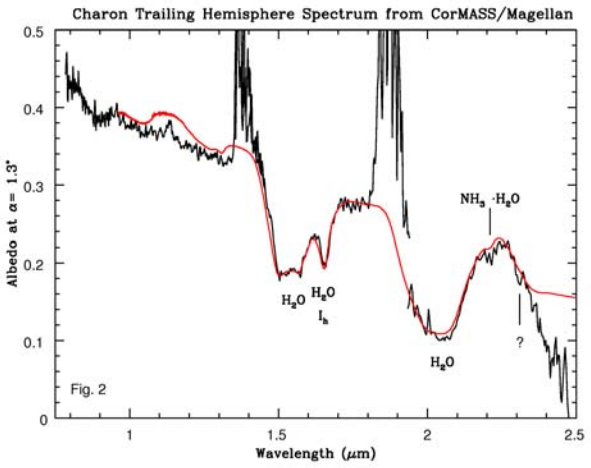
Introduction: We present near-infrared spectra 0.8 – 2.5 μm of Pluto (Fig. 1) and its satellite Charon (Fig. 2) obtained with the CorMASS [1] spectrometer while it was a visiting instrument at the 6.5-m Magellan telescope at Las Campanas, Chile in May 2005. Normally a difficult observation without adaptive optics, Pluto and Charon were spatially resolved in the CorMASS slit because they were near maximum elongation in their orbit (0.7") and Magellan had excellent seeing (0.4") at the time of data acquisition. Although the resolution ($R = \lambda/\Delta\lambda$) of these spectra ($R \sim 300$) does not exceed that of previously obtained spectra [2-4], the wavelength range covers the rarely observed region 0.8 – 1.3 μm. The phase angle at the time of these observations was 1.3° and the sub-Earth latitude on each body was -36°.



Pluto: Centered on longitude 123°, the spectrum of Pluto, obtained simultaneously in five orders (each displayed in a different color to show regions of overlap), includes the prominent absorption features of CH_4, CO, and N_2 ice. The positions of most methane bands are shifted, commensurate with methane diluted in solid N_2 [5]. Regions of noise near 1.8 μm are attributed to telluric absorption by atmospheric water vapor. Detail of CorMASS spectrum between 2.3 and 2.5 μm (Fig. 1b) shows the region where pure ethane (C_2H_6) has narrow absorptions at 2.314, 2.405, and 2.461 μm [5]. While possible absorptions can be seen at 2.405 and 2.461 μm (as reported by [6]), no absorption is evident at this spectral resolution at 2.314 μm.

Charon: Although Pluto and Charon were spatially resolved in the CorMASS slit, Charon's spectrum is minimally contaminated by flux from Pluto. To remove this contamination, we subtracted 2.5% of Pluto's flux from that of Charon. Centered on longitude 303°, the spectrum shows the trailing side of the satellite dominated by the features of crystalline H_2O ice I_h with prominent absorptions at 1.5, 1.65, and 2.0 μm. In addition, an absorption band at 2.21 μm clearly shows the presence of ammonia hydrate $NH_3{\cdot}H_2O$ on the trailing hemisphere of Charon. As it has been observed on the sub and anti-Pluto hemispheres [2] as well as the leading hemisphere [7], ammonia hydrate appears uniformly distributed on Charon's surface.



An absorption feature near 2.31 μm warrants further study as many silicates have absoptions near 2.3 μm and the strongest absorption band of pure ethane is at 2.314 μm [5].

Spectral modeling. We model the spectrum of Charon (red line in Fig. 2) using a Hapke model [8]

which is an areal mixture of 50 K crystalline H_2O ice particles 25 μm in diameter and ammonia hydrate (3% $NH_3.H_2O$) particles 600 μm in diameter. The best fit model indicates that ammonia hydrate covers 20% of the observed portion of Charon's surface.

References: [1] Wilson, J. C. et al. (2001) *PASP* 113, 227-239. [2] Cook, J. C. et al. (2006) *LPSC XXXVII.* [3] Dumas, C. et al. (2006) *BAAS* 38, 59.05. [4] Roe, H. G. (2006) *BAAS* 38, 31.07. [5] Quirico, E. and Schmitt, B. (1997) *Icarus* 127, 354-378. [6] Cruikshank, D. P. et al. (2006) *BAAS* 38, 21.03. [7] Dumas, C. et al. (2001) *AJ* 121, 1163-1170. [8] Hapke, B. (1993) *Theory of Reflectance and Emittance Spectroscopy*. Cambridge Univ. Press. New York.