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Spectroscopy of Pluto, 380-930 nm at six longitudes

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We have obtained spectra of the Pluto-Charon pair (unresolved) in the wavelength range 380-930 nm with resolution ~450 at six roughly equally spaced longitudes. The data were taken in May and June, 2014, with the 4.2-m Isaac Newton Telescope at Roque de Los Muchachos Observatory in the Canary Islands, using the ACAM (auxiliary-port camera) in spectrometer mode, and using two solar analog stars. The new spectra clearly show absorption bands of solid CH_4 at 620, 728, and 850-910 nm, which were known from earlier work. The 620-nm CH_4 band is intrinsically very weak, and its appearance indicates a long optical pathlength through the ice. This is especially true if it arises from CH_4 dissolved in N_2 ice. Earlier work (Owen et al. *Science 261*, 745, 1993) on the near-infrared spectrum of Pluto (1-2.5 μm) has shown that the CH_4 bands are shifted to shorter wavelengths because the CH_4 occurs as a solute in beta-phase crystalline N_2. The optical pathlength through the N_2 crystals must be on the order of several cm to produce the N_2 band observed at 2.15 μm. The new spectra exhibit a pronounced red slope across the entire wavelength range; the slope is variable with longitude, and differs in a small but significant way from that measured at comparable longitudes by Grundy & Fink (*Icarus 124*, 329, 1996) in their 15-year study of Pluto's spectrum (500-1000 nm). The new spectra will provide an independent means for calibrating the color filter bands on the Multispectral Visible Imaging Camera (MVIC) (Reuter et al. *Space Sci. Rev. 140, 129*, 2008) on the New Horizons spacecraft, which will encounter the Pluto-Charon system in mid-2015. They will also form the basis of modeling the spectrum of Pluto at different longitudes to help establish the nature of the non-ice component(s) of Pluto's surface. It is presumed that the non-ice component is the source of the yellow-red coloration of Pluto, which is known to be variable across the surface.