Hubble Space Telescope

Cycle 17 GTO/COS Proposal

COS-GTO: Search for Hydrocarbons and Nitriles in Pluto's Atmosphere

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Scientific Category: SOLAR SYSTEM

Scientific Keywords: PLANETARY ATMOSPHERES, SURFACES OF PLANETS/MOONS/OTHER, CHEMICAL ABUNDANCES, KUIPER BELT OBJECTS

Abstract

We will use ten HST orbits with COS to provide spectra from 2080-2480Å and 2800-3200Å covering absorption bands of the hydrocarbon diacetylene (C4H2) and the nitrile cyanoacetylene (HC3N). Methane is highly abundant in Pluto's atmosphere, and methane photolysis is the starting point for a series of chemical processes that should result in the production of hydrocarbons and nitriles. Photochemical modeling of Pluto's atmosphere has suggested that detectable abundances of various hydrocarbons and nitriles should occur on Pluto (Krasnopolsky and Cruikshank 1999, Summers et al. 1997). However, analysis by Krasnopolsky (2001) of 40 orbits of archival HST/FOS data in the mid-UV (1800- 3300Å) has only produced upper limits on abundances of C4H2, C6H2, HC3N, and C4N2. Measured 2 sigma upper limits for C4H2 and HC3N are somewhat below the values computed in these largely unconstrained models. The measurement uncertainties are smaller than the predicted abundances, but of the same order. By reducing the uncertainties by a factor of a few to several, we hope to detect the presence of these compounds, or to provide more restrictive abundance limits. Such measurements will provide valuable new data on the nature and chemistry of the Plutonian atmosphere. In 5 orbits with COS, we can improve the S/N by at least a factor of 3 over the accumulated archival data, and reduce the error bars on measured equivalent widths by the same factor.

Investigators:

	Investigator	Institution	Country
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Number of investigators: 2

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Target Summary:

Target	RA	Dec	Magnitude
PLUTO			V = 13.5 +/- 0.5, F(2300)=4E-16

Observing Summary:

Target	Config Mode and Spectral Elements	Flags	Orbits
PLUTO	COS/NUV Spectroscopic G230L		5

Total prime orbits: 5

This is a COS GTO project, no scientific justification is needed.