

COS-GTO: Sleuthing the Source of Distant Cometary Activity

Principal Investigator: Dr. James C. Green

Institution: University of Colorado at Boulder

Electronic Mail: jgreen@origins.colorado.edu

Scientific Category: SOLAR SYSTEM

Scientific Keywords: SURFACES OF PLANETS/MOONS/OTHER, CHEMICAL ABUNDANCES,
KUIPER BELT OBJECTS, ASTEROIDS, COMETS

Abstract

We plan far-UV observations to probe the causes of cometary activity beyond 3 AU. Distant comets and Centaurs often show cometary activity and outbursts well beyond this radius, the boundary of the sublimation zone of water. Super-volatiles (most likely CO, but possibly CH₄, N₂, or S₂) are suspected to be responsible (Stern 1989), but have never been detected in distant comets in the UV. G140L spectra of active bodies will cover important CO emission bands as well as emission lines of other species, e.g. S I and C I, and broad dust emission. We plan two observations: comet 29P/Schwassmann-Wachmann (SW1) at 6AU, whose outbursts are too short to capture as a TOO, but which also shows persistent cometary activity in quiescence; and TOO observations of 2060 Chiron in outburst. For SW1, radio observations suggest $Q_{CO} \sim 2 \times 10^{28} \text{ s}^{-1}$ in quiescence, which yields 2.5R average brightness at 1510Å within 1". 3 orbits with COS would accumulate >100 counts, or S/N ~10 in the band. We will stagger 3 observations of 1 orbit each, at roughly one month intervals, in order to improve the chances of catching SW1 in outburst. (One month is the approximate time for an outburst to progress and decay; spacing observations in this manner will ensure that outburst activity is not well correlated from one observation to the next.) In the case of active centaur Chiron, past modeling (e.g. Silva 2001) and radio observations (Womack & Stern 1997) suggest $Q_{CO} > 10^{28} \text{ s}^{-1}$. Assuming a body at 9 AU with a CO source rate $Q_{CO} = 2 \times 10^{29} \text{ s}^{-1}$ yields about 8R average brightness of 1510Å CO emission within a 1" radius. 3 orbits with COS would accumulate >350 counts, or S/N ~19, in this few-angstrom-wide band.

Investigators:

	Investigator	Institution	Country
PI	Dr. James C. Green	University of Colorado at Boulder	USA/CO
CoI#&	Dr. Cynthia Froning	University of Colorado at Boulder	USA/CO

Number of investigators: 2

Admin CoI: Dr. Cynthia Froning

& Contact CoI: Dr. Cynthia Froning

Target Summary:

Target	RA	Dec	Magnitude
2060-CHIRON			V = 16.0 +/- 1.0, 8R at 1510A
29P-SW1			V = 18.0 +/- 5.0, 1.5R at 1510A

Observing Summary:

Target	Config Mode and Spectral Elements	Flags	Orbits
2060-CHIRON	COS/FUV Spectroscopic G140L		3
29P-SW1	COS/FUV Spectroscopic G140L		3

Total prime orbits: 6

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