CONTOUR Imaging of OH in the Coma

Objectives in proposal:

To determine source regions of H_2O, the dominant coma species, and the relationship between water vaporization and dust ejection from the nucleus. Additionally, to correlate remote observations with *in situ* mass spectrometer measurements of the density of water and its dissociation products.

Rationale:

OH **fluorescence** in the $A - X$ (0,0) band at 3085 Å is used as a surrogate for H_2O in space (ultraviolet) and ground-based (ultraviolet, radio) observations of comets. Near the nucleus (within 50 – 100 km, depending on the heliocentric velocity of the comet), **prompt emission** of the OH (0,0) band from dissociative excitation of H_2O by solar extreme ultraviolet radiation dominates fluorescence and provides a direct tracer for H_2O escaping from the nucleus (J.-L. Bertaux, *Astron. Astrophys.* **160**, L7, 1986). At the known H_2O production rates for the CONTOUR targets, optical depth effects that would attenuate the prompt emission are negligible.

CONTOUR Imaging of OH in the Coma (2)

Additional consideration:

Recent HST observations using the Space Telescope Imaging Spectrograph (STIS), with $0.''025$ resolution along the slit (18 km for a comet at a geocentric distance of 1 AU), have shown that the OH emission is not centered at the same position as the optocenter of the dust coma (with the nucleus unresolved also at the optocenter). Examples for comet Hale-Bopp on two separate dates post-perihelion are shown in the figures from H. A. Weaver *et al.* (*Icarus*, in press). The magnitude of the offset is ~ 3200 km in these data. The effect is also seen in STIS spectra of comet Hartley 2, observed in January 1998, and most recently, comet Lee (June 7, 1999). The interpretation given by the authors is that the observed asymmetry results from the superposition of OH derived from asymmetric outflow of water from the nucleus. However, an icy grain halo, often postulated as a source of a large fraction of the water in the coma, cannot be ruled out with the data in hand.

Requirements:

Observation of low surface brightness emission (5 – 10 kilorayleighs) near the bright limb of the nucleus through a narrowband (~ 50 Å) filter. The contribution of dust reflected sunlight is expected to be much less than the OH emission (for comet Encke) so the principal problem will be instrumentally scattered light.