DISTRIBUTION OF VOLATILE ICES ON HYPERION. J. B. Dalton[1] and D. P. Cruikshank[2], [1]Carl Sagan Center, SETI Institute, 515 N. Whisman Road, Mountain View CA 94043. dalton at carlsagancenter.org, [2] NASA Ames Research Center, Mail Stop 245-6, Moffett Field, CA, 94035. Dale.P.Cruikshank at nasa.gov.

Introduction: Compositional mapping of the surface of Hyperion using Cassini VIMS observations indicate a heterogenous surface dominated by water ice but with substantial additional materials. Abundant carbon dioxide, as evidenced by a spectral absorption at ~4.25 microns, persists throughout the satellite. Localized deposits of low-albedo material exhibit spectral absorptions indicative of C-H and C-N bonds. The host materials for these features are not yet known but are suggested to occur on other Saturnian satellites [1,2]. Additional smaller absorption features suggest organic matter, possibly including polycyclic aromatic hydrocarbons (PAHs).

Band Depth Mapping of Cassini Observations: Two Cassini VIMS observations of moderate spatial resolution and four observations of high spatial resolution were selected for analysis based upon the presence of large contiguous regions of low-albedo material. Band depth maps were created for spectral absorption features of water (2.0 microns), CO_2 (4.25 microns) and C-N (2.42 microns). These were overlaid upon calibrated ISS images to determine correspondence with geologic units. The most prominent morphologic features on the surface of Hyperion are irregular to subcircular topographic lows containing the low-albedo material [3]. While absorption due to water ice was clearly strongest in the bright surface regions away from these features, some water ice was present in all VIMS spectra. Absorption due to CO_2 varied throughout the observations; while strong in the low-albedo material, the CO_2 absorption at 4.25 microns was also observed to vary in intensity throughout the bright icy regions. These variations are not linked to morphologic or topographic variations, though occasional enhancements are seen in the immediate vicinity of small impacts. This indicates a heterogeneous distribution of CO_2 within the water ice that makes up most of the surface [4]. This may be due either to exogenic influences (e.g. implantation, radiolysis) or a result of endogenic formation and/or emplacement. The C-N feature, by contrast, was found to be strongest in the low-albedo material and weak or absent elsewhere.

Weak Absorption Features: Additional absorption features observed in the 3- to 5-micron spectral range are suggestive of additional, possibly organic components. A feature occurring at 3.28 microns matches generic absorption characteristics of PAHs [4,5] but, though several channels wide, lies just above the 1-σ detection threshold. Other features which take up several VIMS channels occur longward of 4 microns but have not yet been positively identified. As with carbon dioxide, the strengths of these absorption features do not appear closely correlated with surface morphology or geologic units other than the topographic lows containing the low-albedo material.

Conclusion: Compositional analysis of Cassini VIMS observations indicate heterogeneous distributions of materials over the surface of Hyperion. Some materials, notably those exhibiting C-N and C-H absorption, are highly concentrated in the low-albedo materials which tend to be concentrated in topographic lows. However it appears that volatile ices, notable CO_2, are also distributed heterogeneously throughout the bright icy terrains as well. This has implications for the formation and subsequent evolution of Hyperion.

References: [1] Clark, R. N., et al. (2005) *Nature 435*, 66-67. [2] Brown, R.H. et al., (2006) *Science 311*, 1425-1428. [3] Thomas, P. et al., *Science, submitted*. [4] Cruikshank D.P. et al., *Science, submitted*. [5] Bernstein M.P. et al. (2005) *Ap. J. 161*, 53-64.