ICY GRAINS IN COMET 103P/HARTLEY 2. J. M. Sunshine[1], L. M. Feaga[1] O. Groussin[2], S. Besse[1], S. Protopapa[1], F. Merlin[3,4,5], T. L. Farnham[1], M. F. A'Hearn[1], and the DIXI Science Team, [1]Department of Astronomy, University of Maryland, College Park, MD, USA (jess@astro.umd.edu), [2]Laboratoire d'Astrophysique de Marseille, [3]Paris University 7, [4]LESIA, [5]Observatoire de Paris.

Introduction: The Deep Impact eXtended Investigation (DIXI) to comet 103P/Hartley 2 provided a unique opportunity to explore a second Jupiter Family Comet (JFC) with the same instruments used at 9P/Tempel 1; two multispectral visible imagers and a 1-5 μm infrared spectrometer (MRI, HRI-VIS, and HRI-IR [1]). The spectrometer was used to observe the compositional heterogeneity of the comet for several weeks before and after closest approach (~700 km) with spatial scales up to 7 m/pixel. Preliminary results on the distribution of solids, particularly ice grains, are presented here and those on gas are discussed by [2, 3].

Water Ice: Strong water ice absorptions at 1.5, 2 and 3 μm are observed in the coma of Hartley 2 (Figure 1). Comparing the relative strengths of the ice absorptions in Hartley 2 with those in lab spectra of various size grains indicates that the cometary ice is of order 1 μm. Thus individual particle clumps seen in visible images [4] are likely fluffy aggregates of fine icy grains. Preliminary modeling suggests that substantial refractory grains also are present in the coma, but not in thermal equilibrium with the ice and thus that the ice grains are pure. The spatial distribution of icy grains, shown in Figure 2, is strongly correlated with the CO_2-rich jets (particularly sunward), thereby revealing that CO_2 is dragging the icy grains from the nucleus directly into the coma. These ice grains then sublime, thus explaining the enhanced water activity of Hartley 2 given its small size relative to other JFCs.

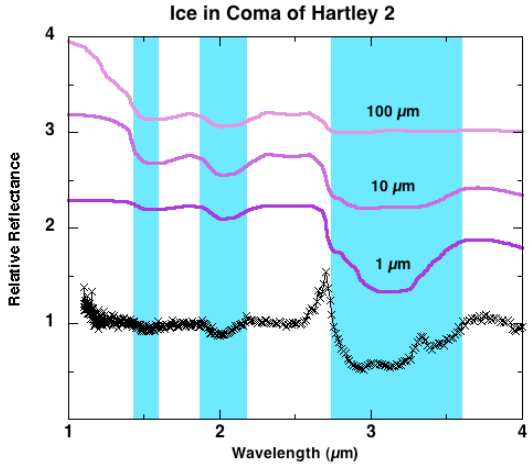

Figure 1: The spectrum of Hartley 2's coma (black) is dominated by water ice absorptions (blue regions) shown in comparison to lab spectra of various size grains of pure ice (purple; offset for clarity). (Emission peaks near 2.7 and 3.4 μm are due to water vapor and hydrocarbons, respectively [2].)

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References: [1] A'Hearn, M. F., *et al*. (2011), *LPSC 42*; [2] Feaga, L. M., *et al.*, (2011), *LSPC 42*; [3] Farnham, T. L., *et al.*, (2011), *LSPC 42*; [4] Hermalyn *et al.*, (2011), *LPSC 42*.

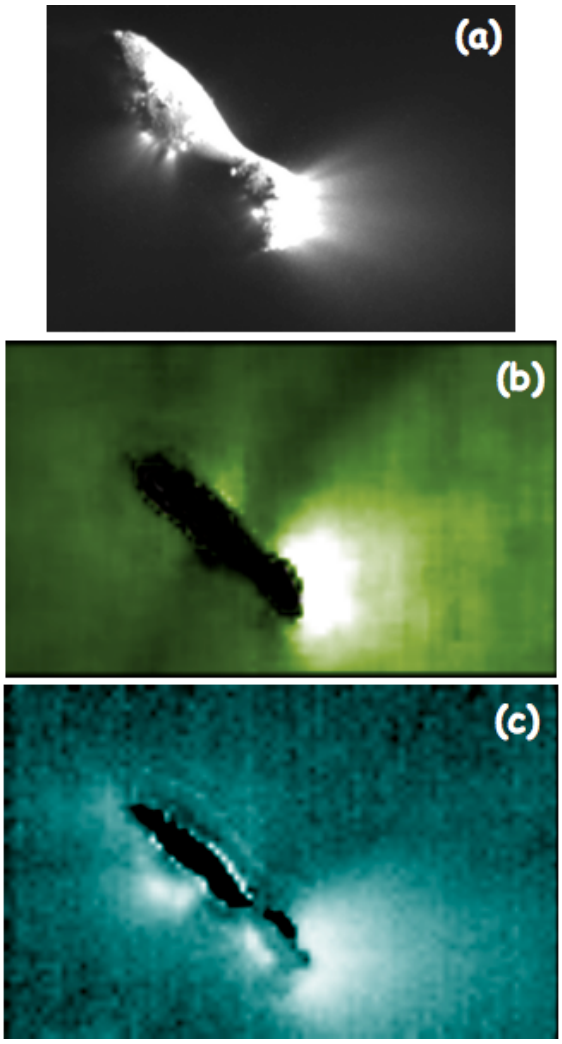

Figure 2: Distribution of materials in the innermost coma of Hartley 2 (Sun is to the right). (a) MRI visible image stretched to enhance dust and ice in the coma; Spatial correlations in the relative abundances of (b) CO_2 vapor and (c) water ice reveal that the CO_2 is dragging sub-surface water ice into the coma. (In both cases white is relatively more abundant).