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Large Grains in the Coma of 103P/Hartley 2

M.S. Kelley (1), D. Bodewits (1), C.M. Lisse (2), D. Lindler (3), B. Hermalyn (4), 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
(2) The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD, USA
(3) Sigma Space Corporation, Lanham, MD, USA
(4) Department of Geological Sciences, Brown University, Providence, RI, USA

Abstract

The *Deep Impact* spacecraft flew by comet 103P/Hartley 2 on 4 November 2010 at a closest approach distance of 694 km (A'Hearn et al., 2011). Images taken with the CCD cameras of the Medium Resolution Instrument (MRI) and High Resolution Instrument (HRI-VIS) at a spacecraft-comet range closer than $\approx$ 5000 km are scattered with spots and streaks on a bright background (the comet coma) (Fig. 1). These spots and streaks are not constant from frame-to-frame, they do not match the spatial or photometric signature of the background star field, and the spots have the same shape as the point spread functions (PSFs) of each instrument. In particular, the sources in the HRI-VIS images all have the same shape as the out of focus PSF, and after deconvolution (Lindler et al., 2007) they appear as point sources. We therefore interpret these spots and streaks as individual grains or grain aggregates surrounding the comet. As sources are not resolved they must be smaller than the FWHM of an HRI deconvolved PSF ($\approx$ 3 m at 700 km). Of order 10^4 point sources can be identified in any single MRI image taken within a spacecraft range of 800 km. Assuming an icy composition, we estimate the grains to range from $\sim$ 1 to $\sim$ 10 cm in radius. Smaller grains are difficult to detect due to their faintness and great numbers. We present an analysis of these point sources, discuss their size and spatial distributions, compare them to the diffuse coma, and argue that they have icy compositions.

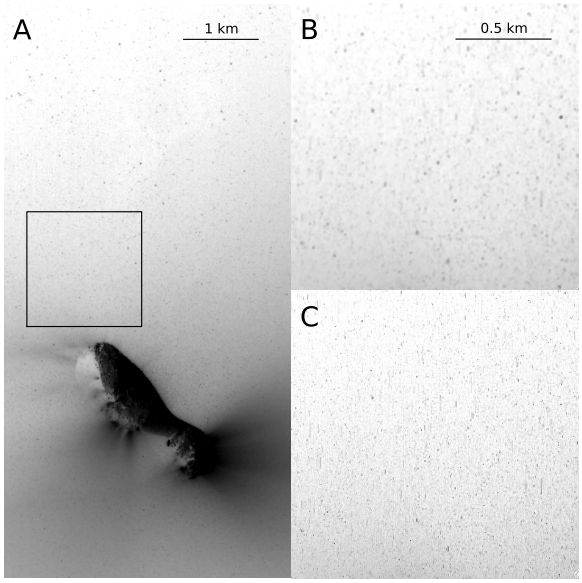

Figure 1: A) An MRI image taken 30 s after closest approach, at a range of 800 km from the nucleus (Sun to the right). A black box marks the approximate location of panels B and C. B) An HRI-VIS image taken 3.5 s before the MRI image in panel A. C) A deconvolved version of panel B.

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