Photometry of the Nucleus of Comet 103P/Hartley 2. Jian-Yang Li[1], S. Besse[1], and DIXI Science Team. [1]University of Maryland College Park, MD 20742, USA (jyli@astro.umd.edu).

Introduction: We performed disk-resolved photometric analysis of the nucleus of Hartley 2 using the data returned by the Deep Impact flyby spacecraft during its close flyby of Comet 103P/Hartley 2 [1]. Hartley 2 is the fifth cometary nucleus that has been spatially resolved by spacecraft from close distances, following comets 1P/Halley, 19P/Borrelly, 81P/Wild 2, and 9P/Tempel 1. The latter three are all Jupiter Family Comets (JFCs). Their nuclei display similar globally averaged photometric properties, yet substantial difference in their local photometric variations [2,3,4]. Multi-spectral data are only available for the nucleus of Tempel 1, the target of the Deep Impact primary mission. Using the same spacecraft and instruments as Deep Impact used, EPOXI provides us with another sample of JFCs to study the photometric properties of its nucleus, and to compare with other JFCs.

Data: We used all flyby images obtained with the CLEAR filters (equivalent wavelength 625 nm, sensitive between 300 and 1000 nm) from both the High-Resolution Instrument (HRI) and Medium-Resolution Instrument (MRI) with pixel scales less than 100 m/pixel, and down to 2 m/pixel for HRI and 7 m/pixel for MRI. These data cover a small range of phase angles from 79º to 93º. Color images from both broadband and narrowband filters covering 300 nm to 1000 nm wavelengths are available both pre-encounter and post-encounter at a pixel scale of ~15 m/pixel for HRI and ~70 m/pixel for MRI, and a phase angle of 85º for inbound and 93º for outbound. All images have average signal-to-noise higher than 200 on the nucleus.

Analysis: Following the methods used in [2,3,4], we measured the total brightness of the nucleus through all filters, constructed and modeled the disk-integrated phase function of the nucleus, measured the color of the nucleus, and fit the surface brightness distribution of the nucleus with Hapke's reflectance model [5,6] as well as Minnaert's model [7]. The shape model of Hartley 2 generated from DIXI flyby data [8] was used to calculate the scattering geometry on the nucleus in the disk-resolved images. We also analyzed the variations of phase functions from various surface terrain types using phase ratio maps within the phase angle coverage we have. Hartley 2's relatively bright dust coma in front of the nucleus along the line-of-sight of the Deep Impact spacecraft contributes a noticable amount to the flux measured from the nucleus. We therefore measured the average brightness of the coma in a two- (MRI) or four- (HRI) pixel annulus around the nucleus, and subtracted half of the surface brightness of the coma annulus from the total brightness of the nucleus to account for foreground coma. The contribution of foreground coma is about 15-20% of the brightness at the limb of the nucleus.

We will present the results of a detailed photometric analysis of Hartley 2's nucleus: report on the brightness of the nucleus, discuss the color, phase function, and photometric models of the nucleus of Hartley 2, and compare the photometric properties of this extremely active cometary nucleus with the nuclei of the other three JFCs that have been analyzed.

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