PHOTOMETRIC ANALYSIS OF THE NUCLEUS OF COMET 81P/WILD 2 FROM STARDUST NAVCAM DATA. Jian-Yang Li, M.F. A'Hearn, T.L. Farnham, L.A. McFadden, Department of Astronomy, University of Maryland, College Park, MD 20742, USA (jyli@astro.umd.edu).

Introduction: Comet 81P/Wild 2 is one of the three Jupiter Family Comets (JFC) that have their nucleus directly imaged by spacecraft from close distances. The photometric properties of the nuclei of two other such comets, 19P/Borrelly and 9P/Tempel 1, have been studied in detail from disk-resolved images, and show typical photometric properties of cometary nuclei, but very different photometric variations between these two dynamically similar comets [1,2]. Wild 2 is believed to have a different dynamical history as it has been in its current orbit for only several revolutions [3]. The 72 disk-resolved images of the nucleus of Wild 2 returned from the Stardust encounter, with pixel scales up to 14 m and phase angles from 11° to 102°, make an excellent dataset for studying the photometric properties of this cometary nucleus, and for comparing with Tempel 1 and Borrelly.

Phase Function: The disk-integrated phase function of the nucleus of Wild 2 is measured from all images with pixel scale <100m. After normalizing the measurements to a spherical shape with the equivalent radius of the nucleus of Wild 2, its phase function was fit with a linear slope of 0.0513 mag/deg. A Hapke fitting resulted in an asymmetry factor (g) of single-term particle phase function of -0.53, and a single-scattering albedo (w) of 0.034. Compared with other cometary nuclei, Wild 2 has a steep phase slope, and a typical albedo.

Disk-Resolved Photometry: We focused on 14 images with pixel scales <30m for disk-resolved analysis and study of the photometric variations of the nucleus of Wild 2. The shape model of the nucleus of Wild 2 [4] was used in the analysis. The I/F data extracted from images were binned into 5° incidence angle (i), emission angle (e), and phase angle (α) grids, and all data points with i and e greater than 75° were disregarded. Assuming B_0=1.0 and h=0.01, the three other Hapke parameters are modeled: w=0.035, g=-0.53, θ=27°, in good agreement with the value found from disk-integrated phase function. The modeled geometric albedo is 0.061, and Bond albedo 0.011. The modeled root mean square (RMS) of ~11% indicates a good fit and small photometric variations across the surface of the nucleus of Wild 2. Minnaert model for disk-resolved data at each particular phase angle returned Minneart k of 0.54 at zero phase angle, and a linear slope of about 0.0035/deg. Compared with other cometary nuclei, Wild 2 has similar albedo, but a phase function with steeper phase slope.

Photometric Variations: Using the modeled photometric parameters, the limb-darkening profile of the nucleus was removed to construct the albedo map of the surface of Wild 2's nucleus. Overall the range of albedo variation on Wild 2 is comparable with that observed on Tempel 1 [1], with both being much smaller than that of Borrelly [2]. Regional albedo variation is evident in several images, but not consistently shown in all albedo maps at different phase angles.

Phase ratio maps are also constructed from five pairs of images. Variations of phase ratio are seen, but are attributed to varying limb darkening profiles of the surface as viewed from different aspects. They are not likely caused by variations of photometric properties such as particle phase function or surface roughness. The variation of photometric properties on the nucleus of Wild 2 is likely smaller than 10%, making its surface the most uniform compared with Tempel 1 and Borrelly.

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References: [1] Li, J.-Y. et al., (2007) *Icarus* 187, 41. [2] Li, J.-Y. et al. (2007) *Icarus* 188, 195-211. [3] Sekanina, Z., Yeomans, D.K. (1985) *AJ* 90, 2335. [4] Kirk, R.L. (2005), 36th LPSC, abstract #2244.