

IMAGING POLARIMETRY of 103P/HARTLEY and 10 COMETS/NUCLEI. R. Furusho¹, T. Shinoda², and J. Watanabe³, ¹23-1-402 Nishikujo-Nandencho, Minami-ku, Kyoto-city, Kyoto, Japan (email: reiko7505@world.odn.ne.jp), ²Wednesday Seminar on Cometary Physics, ³National Astronomical Observatory of Japan.

Introduction: Polarimetry could provide valuable information on the physical properties of cometary dust grains. We present results of the imaging polarimetry of 103P/Hartley and 10 other comets/nuclei by using the “Polarimetric Imager for COMets” [1] in optical domain during these 8 years.

Observations and Results: The Polarimetric Imager for COMets (PICO) had been developed by the end of 2003. We have performed the imaging polarimetry of 9P/Tempel, as a ground-based observation of NASA Deep Impact mission, by the PICO attached to the Lulin One-meter Telescope (LOT) at Lulin Observatory, Tiwan, on July 2005 [2]. Since 2006, we started polarimetry of comets by using PICO mounted on the 0.5-m reflector at Mitaka, National Astronomical Observatory of Japan. Gunn's *i*-band (broad-band) filter (its bandpass is about 686 nm to 837 nm) was used for all observations, except for a few, to obtain linear polarization caused by cometary dust grains. A Kron-Cousins I-band filter was used for C/2001 Q4 (NEAT), the most early observations of the PICO. Two dust continuum (narrow-band) filters, the green-continuum (526.1/7.6 nm) and the red-continuum (714.5/5.2 nm), were used for 17P/Holmes, as well as *i*-band filter. Up to now, we have observed 103P/Hartley and 10 other comets/nuclei.

The linear polarization degrees of all observed comets, averaged in the aperture as a function of its phase angle, were summarized in Figure 1. All obtained linear polarization seems to be in good agreement with the same phase curve and consistent to the

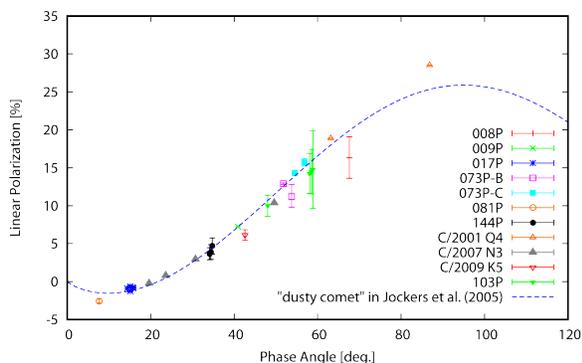


Figure 1. Phase angle dependence of linear polarization for 103P/Hartley and 10 other comets/nuclei observed by using PICO. The dash-curve is an empirical fit function for “dusty comet” in Jockers *et al.* (2005).

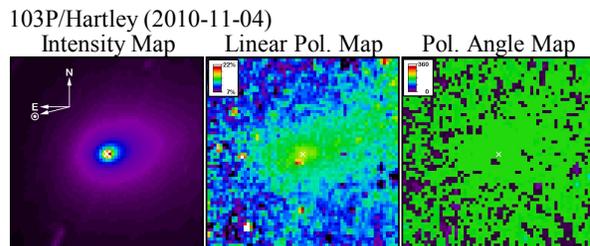


Figure 2. An example of imaging polarimetry — the results of 103P/Hartley observed on Nov. 4, 2010. It was a simultaneous observation of the EPOXI flyby. Left panel is the intensity map, center panel is the linear polarization map, and right panel is the polarization position angle map. North is up, East is left, projected sunward direction is about P.A. 104 deg., and white x-mark denotes the optical center of the comet for each panel. Field of view is 64.6 arcsec² with pixel scale of 1.64 arcsec/pix, thus, distance at the comet is 185.94 km/pix.

previous study. For comparison, the fit curve for “dusty comet” reported in Jockers *et al.* [3] is also plotted in Figure 1.

An example of the results of imaging polarimetry of comet — intensity, linear polarization and polarization position angle maps of comet 103P/Hartley obtained on 4 November, 2010, are shown in Figure 2. It was the simultaneous observation of the EPOXI flyby. Gradual condensation feature with higher polarization in the circumnucleus region is recognized in the linear polarization map. In other words, the polarization decreases with the distance from the optical center to the outer rim of the coma.

References: [1] Ikeda Y. *et al.* (2007) *PASJ*, 59, 1017–1025. [2] Furusho R. *et al.* (2007) *Icarus*, 190, 454–458. [3] Jockers *et al.* (2005) *A&A*, 441, 773–782.