High-Resolution Map of Zodiacal Dust Bands by WIZARD Measurements H. Yang[1], M. Ishiguro[1], F. Usui[2] and M. Ueno[2], [1]Seoul National University (hongu@astro.snu.ac.kr), [2]Institute of Space and Astronautical Science/Japan Aerospace Exploration Agency

Introduction: Interplanetary dust particles are observable as zodiacal light, which is the sunlight scattered by the interplanetary dust particles. Continuous or recent origins of interplanetary dust particles should exist because interplanetary dust particles are eroded by Poynting-Robertson photon drag and mutual collisions among dust particles. However, the origins are still in question. The small-scale structures in the zodiacal light provided a clue to study their origins. Asteroidal debris were detected as band-like structures (dust bands)[1], and the cometary large particles were detected as narrow trails (dust trails)[2].

However, little is confirmative about the detailed origins and mineralogical compositions about the dust bands because of the lack of observational data, particularly in the optical wavelength. Up to now, most observational data about dust bands were obtained by spaceborne mid-infrared instruments. The observed areas by spaceborne observations were limited about solar elongation 90 degree. Although Ishiguro et al. (1999) succeeded in detecting dust bands in optical wavelength [3], the observed coverage of sky was limited at the two narrow regions. One region was between solar elongation angle of 75 degree and 90 degree, and the other was between solar elongation angle of 165 degree and 180 degree. In this research, we made optical observation of zodiacal light and extracted the dust band components in wide sky coverage with high spatial resolution.

Observations and Data Reduction: We performed CCD observations at Mauna Kea, Hawaii, with an instruments, WIZARD (Wide-field Imager of Zodiacal light with ARray Detector), developed for zodiacal light observations by ourselves [4]. We analyzed data taken on November 12, 2004. After the data reduction, such as mapping, flat fielding and subtraction of airglow emissions, we succeeded in the construction of the zodiacal light map with the spatial resolution of 3' in the solar elongation between 45 degree and 180 degree (Figure 1). This is the highest resolution map in the visible wavelength so far. The zodiacal light cones appear on both sides. And the Gegenschein exists at the center of the map, i.e. at the anti-solar direction. In addition to these structures, it is clear that band-like structures appear near the ecliptic plane. We extracted the band structures using wavelet filter, and obtained the map (Figure 2). We shall discuss the similarities and the differences between our optical dust bands and infrared dust bands from IRAS [5] and COBE/DIRBE [6].

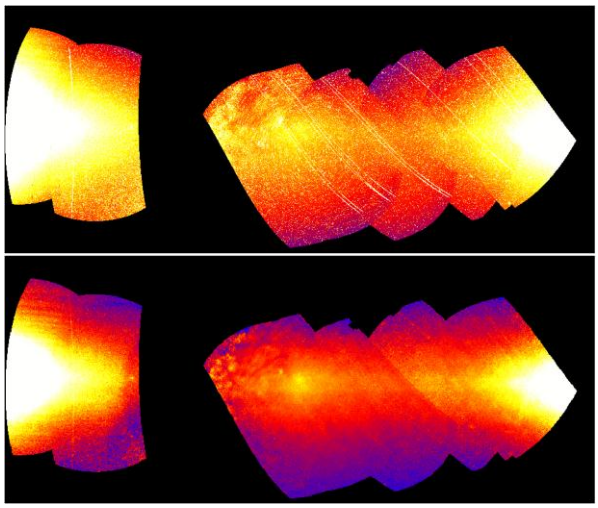

Figure 1, Top is the data combined before the subtraction of contaminations. Bottom is the zodiacal light map after data reduction. Horizontal direction is heliocentric ecliptic longitude, and vertical direction is ecliptic latitude. Right part is the evening side, and left part is the morning side.

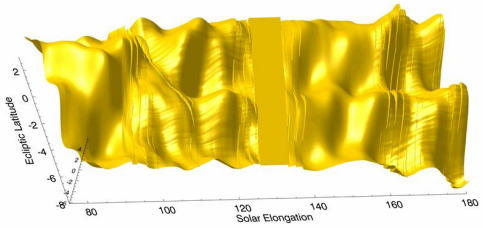

Figure 2, 2-degree dust band extracted from the map in Figure 1.

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