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Introduction: Following the Infrared Astronomical Satellite (IRAS) and the Diffuse Infrared Background Experiment (DIRBE) on-board the Cosmic Background Explorer (COBE), AKARI, the first Japanese space infrared mission, surveyed the whole sky. From its pointed and scanning observations at the mid-infrared wavelengths, we retrieved the fine-, small-, and global-scale properties of the zodiacal emission and the interplanetary dust cloud.

Fine-Scale Fluctuation: The fluctuation of the mid-infrared sky brightness at a few arcminutes scale was estimated with the power-spectrum method. The fluctuation was measured using the 10 pointed AKARI Infrared Camera (IRC) observations towards the north ecliptic pole. At the wavelengths from 9 to 24 µm, the residual fluctuation was detected after subtracting the contributions of the photon and shot noises and the Galactic cirrus from the fluctuation in the sky brightness. The residual fluctuation was minimal at the wavelength of 18 µm and ~0.02% of the sky brightness. We take it as the upper limit of the fluctuation of the zodiacal scattered light and thermal emission [1].

Asteroidal Dust Bands: The AKARI all-sky survey at the wavelength of 18 µm is optimal to study the properties of the asteroidal dust bands. We extracted the band features from the 18 µm all-sky brightness map using the Fourier filtering method [2]. From the filtered map, we isolated 3 band pairs and 4 partial bands out of which one partial band is newly discovered and the others confirm the IRAS [3] and COBE/DIRBE [2] observations. Three new properties of the dust bands were revealed by our analysis: i) the longitudinal variation of not only the brightness [2] but also the thickness of the γ (10º-latitude) band pair, ii) the longitudinal parallax effect of partial bands, and iii) the parallel pairing of the northern and the southern partial bands. We propose that the four partial bands compose a group and originated from a single source.

Zodiacal Dust Cloud: The 9 µm all-sky survey brightness maps were examined to investigate the zodiacal cloud or, so-called, the smooth cloud [4]. In the maps, two general features of the cloud were apparent: i) the wobbling of the maximum brightness latitude caused by the obliquity of the cloud's symmetry plane with respect to the ecliptic and ii) the brighter low-latitude region in the trailing direction than in the leading direction due to the resonant dust blob [5, 6]. We analyzed the ecliptic pole brightness from the all-sky survey. From the difference between the two pole brightness, we derived the inclination and the ascending node longitude of the symmetry plane, which are roughly consistent with those from the COBE/DIRBE observations [4]. The average pole brightness indicates that there is asymmetry in the distribution of the interplanetary dust particles, e.g., offset of the cloud center from the Sun [4, 7, 8].

Conclusions: AKARI confirmed the previously known and speculated properties of the zodiacal emission and the interplanetary dust cloud over scales ranging from sub-arcminute to the whole sky. The zodiacal emission is smooth from sub-arcminute to arcminute scales. The AKARI all-sky survey at the two mid-infrared wavelengths resolved several band structures including one new band and the features of the zodiacal cloud.

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