

Dust properties of the zodiacal dust bands observed with AKARI

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The zodiacal emission is the thermal emission from the interplanetary dust and the dominant diffuse radiation in the mid- to far-infrared (IR) wavelength region. It was found that there are many small-scale structures in the zodiacal emission distribution, such as dust band pairs at the ecliptic latitudes of $\pm 1.4^\circ$, $\pm 2.1^\circ$, and $\pm 10^\circ$, apart from a smooth background distribution. It has been proposed that recent disruption events among multi-kilometer bodies in the main asteroid belt, which would have occurred within the last several million years, may be major supply sources of dust particles.

The dust properties of the asteroidal dust bands at the far-IR wavelengths remain poorly known because the zodiacal emission rapidly becomes faint at longer far-IR wavelengths. We investigate the geometry of the small-scale dust-band structures in the far-IR all-sky maps observed with the Japanese infrared satellite AKARI. AKARI clearly detects the zodiacal dust-band structure at 65 and 90 μm bands. We derived the heliocentric distances of dust bands from the phase difference based on the AKARI 90 μm map: 1.86 au and 2.16 au for the $\pm 1.4^\circ$ and the $\pm 10^\circ$ bands, respectively. Although the heliocentric distances estimated with the AKARI far-IR data are consistent with that of previous studies, the results of the $\pm 1.4^\circ$ band is slightly larger than those derived in previous studies. This suggests that the larger grains at > 2 au are dominant for the $\pm 10^\circ$ band, while smaller dust grains at < 2 au contribute to the $\pm 1.4^\circ$ dust band. Since AKARI results are mainly based on the 90 μm and 140 μm band data, large dust particles at further heliocentric distances (> 2 au) contribute to the AKARI results more significantly than that in the previous results based on the observations at 25 μm and 60 μm .

We will show faint dust-band structures in the AKARI maps, in addition to major 3 bands, by using image-enhancing techniques, and discuss the dust properties of the zodiacal dust bands based on the far-IR observations.