Investigation of silicate feature in zodiacal emission at various ecliptic latitudes with AKARI/IRC

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Interplanetary dust in our solar system originates from collisions of asteroids and/or sublimation of comets, and the spatial distribution depends on the type of origin [1][2]. Therefore, comparison of dust properties in different field is useful to investigate the evolutional history of the different types of planetesimals. In particular, if we know the thermal history of dust, we can specify the distance from the sun at which the dust had been incorporated into the original planetesimals, and the subsequent orbital history to the present distribution. This becomes a clue to understand the orbital history of the original planetesimals.

To trace the thermal history of dust, we focus on a silicate feature around 10 μm in zodiacal emission, which have been reported from mid-infrared space-based observations [3][4]. The shape of the feature depends on physical and chemical properties of the dust: grain size, olivine/pyroxene ratio, crystal/amorphous ratio, and Mg/Fe ratio and so on [5]. These properties reflect the physical and chemical environments that dust grains had experienced.

In this study, we use mid-infrared spectroscopic data of zodiacal emission at 74 different directions obtained with AKARI/IRC. We have carefully examined and subtracted artifacts including scattered light in the detector and ghost caused by the bright sources in the field of view, and successfully obtained the high S/N spectra in 5 - 12 μm with R $\sim$ 50. For each of these 74 spectra, we fit the continuum to diluted blackbody of a single temperature ($\tau B_\nu(T)$) and divided the observed spectra by the modeled continuum. As a result, we detected the silicate feature around 10 μm in all pointing data and recognized the variations in the shape and the strength of this feature among different ecliptic latitudes. We have also found that the dust temperature is higher at high ecliptic latitude than near ecliptic plane. We will present these results and talk about future works for more progressive discussion.

References

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