

「あかり」中間赤外線分光観測による異なる母天体起源の惑星間塵の性質比較

Comparison of grain properties in interplanetary dust from different types of parent bodies by mid-infrared spectroscopic observations with AKARI

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Interplanetary dust (IPD) diffusely distributes in interplanetary space and is thought to be recently supplied from the inside of primordial planetesimals like asteroids or comets. The IPD's grain properties, such as compositions and crystal morphologies, depend on the types of parent bodies and can give us the information on the environment in the proto-solar system. The properties can be investigated in terms of silicate features around 10 μm seen in the zodiacal emission spectra. Since the IPD originating from different types of the parent bodies have different spatial distributions, it is important to survey the silicate features at various sky directions. For example, the asteroidal IPD locally distributes at low specific ecliptic latitudes and observed as band structures near the ecliptic plane. On the other hand, because of the variety of comets' inclinations, the cometary IPD distributes more globally than the asteroidal IPD does. The IPD from the Jupiter Family Comets (JFCs) can form the dust cloud with a broad distribution in ecliptic latitudes around the ecliptic plane, while the IPD from the Oort Cloud Comets (OCCs) is expected to distribute isotropically.

We obtained the high signal-to-noise zodiacal emission spectra at 74 different directions of the sky by using the mid-infrared slit-spectroscopic data obtained with the Infrared Camera on board the Japanese AKARI satellite. They exhibit the excess emission feature at the 9-12 μm range and even some sharp peaks. In order to identify the constituents, we compared the shape of spectral features with absorption coefficients of 4 types of candidate materials: amorphous with olivine composition, amorphous with pyroxene composition, forsterite (Mg_2SiO_4 , one of olivine crystals), and ortho-enstatite (MgSiO_3 , one of pyroxene crystals).

The IPD was found to typically include small silicate crystals, especially enstatite grains with extreme crystal morphologies. We also found that the shape of spectral features slightly changes depending on the sky directions. As the result of the investigation into peak wavelengths and the excess strength of each peak, the IPD at the higher ecliptic latitudes seems to have lower olivine/(olivine+pyroxene) ratio. At the sky directions toward the asteroidal dust band structures, the feature shapes show a difference which cannot be explained only by the difference in the olivine/(olivine+pyroxene) ratio and may indicate contamination of the hydrated minerals.

We will present the results of the grain properties of the IPD originating from some types of the parent bodies, and give the implications for the environment in the proto-solar system.

