# Debris disks and Zodiacal light studies with SPICA

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Dust supply and chemical processes observed in extrasolar debris disks and the zodiacal cloud of our solar system are important clues for understanding the late stages of the planetary-system formation.

The evolution of debris disks has been conventionally explained by the steady state collisional cascade model. Statistical studies and mineralogy based on the AKARI exploration indicate importance of investigating non-steady processes such as Giant Impact or Late Heavy Bombardment, which might be related to the orbital evolution of planets and origin of life. However, there remain phenomena which cannot be simply explained by the steady-state or non-steady processes described above.

Through the analyses of the AKARI mid-IR all-sky survey data, various non-steady dust-supply and trapping processes are indicated for the zodiacal cloud: temporal variation of the dust component trapped in the planet’ s resonant orbits, transient events in the dust-bands formation, large amount of dust supply by comets in the inner region of the solar system, and transportation of small grains by a coronal mass ejection, etc. These processes might be clues for understanding the dust processing in debris disks.

However, we do not have solid evidence yet whether our solar system is typical or special one, while current debris disks samples are too dusty to be compared with our solar system. Large area surveys with SPICA (Space Infrared Telescope for Cosmology and Astrophysics) provide us with a large amount of dust bands sample of debris disks in the fingerprint wavelength region of minerals. Properties of minerals in the system give us information on the current physical state of the region and past events occurred in the system. Accurate continuum spectra obtained with SPICA enable us to study extrasolar zodiacal clouds comparable to our solar system level. We will be able to study, for the first time, the evolution of our solar system in the framework of debris disks studies.

SPICA is an ESA-JAXA joint mission for infrared astrophysics. The main goal of the mission is to make significant contribution to answer the essential questions; how the universe has evolved to the current state of being rich in metals and cosmic dust, and how our solar system involving life has formed and developed. Thanks to the cryogenic telescope and the cutting-edge sensor technique, SPICA will realize sensitivity two orders of magnitude better than that in the previous missions such as Herschel. SPICA was selected as one of three candidates for ESA Cosmic Vision M5 mission from 25 proposals in May 2018, and it is currently under conceptual design. The final selection of M5 will be in mid 2021, and the launch is expected to be late 2020's. We will present the SPICA science cases for the debris disks and zodiacal light as well as the current status of the SPICA project.

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