Key Science with SPICA: Planet Formation and Detection

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in Far-Infrared Astronomy from Space: A Community Workshop about the Future

Star and Planet Formation / Recycling of Matter / Exoplanet Detection

Observations of Protoplanetary Disks
- Direct observations of the regions whose scale is comparable to the Solar system size (<< 30 AU).
- SPICA will be also equipped with high spectral resolution (R~30000) spectrometer which can trace the emission lines very close to the central star.

Observations of Solar System Objects
- Determination of size distribution and albedo of small asteroids and EKOs (Edgeworth-Kuiper Belt Objects).
- By covering wide wavelengths, 5-200 μm, these critical parameters are well derived.

Where were the planetesimals formed and was the planet formation stopped?
→ providing basic information for planetary formation.

Observations of Debris Disks
AKARI has detected several new 24 micron excess sources from its all-sky IRC data.

SPICA Key Science ~Global Understanding of Planets and their Formation~

SPICA enables 10-100 times deeper surveys and ~5 times higher spatial resolution studies.
→ How common is the Solar system?

Direct Detection and Spectroscopy of Exoplanets
SUBARU coronagraph:
- Covering near-infrared wavelengths.
- Suitable for detecting young and outer planets.
- Covering mid-infrared wavelengths.
- Benefit from less contrast due to thermal emission.
- Making use of the state-of-the-art coronagraph and wavefront correction with cold MEMS.

Targeting dozens of nearby stars!
Spectroscopy for atmospheric studies (also with transit spectroscopy)
Comparison with our Solar system planets.

Space/Ground-based telescope sensitivity and SEDs of small objects in the Solar system.

The predicted photometric emission for an AU (Ugas-like) star on a 10 μm baseline.
The photometric sensitivity of SPICA, JWST, MIRI and Herschel PACS are shown for comparison along with example disk excesses. A G2 (Solar type) star at 2 kpc would look like an A0 star at 8 kpc.

(from ESA-CV/SPICA document)