宇宙の物質循環：「あかり」からSPICAへ

尾 中 敬（東京大学）

Discovery space for SPICA

Log (Line Intensity (W/m²))

Wavelength (µm)

Herschel
Spitzer
SPICA
JWST
ALMA
Still unknown issues in the material metempsychosis in the universe

**dust composition & formation** in the Universe

Simultaneous spectroscopy of gas and dust; Where is Fe?

Dust associated in supernova explosions
Present studies of metal abundance in the gas phase (Fe, O, ...) are severely limited by sensitivity and spectral coverage.

Observations of multi-level transitions useful in deriving the gas density and accurate estimate of abundance.

Fell

87.38µm

51.30µm

35.35µm

25.99µm

Okada et al. (2008)
SPICA’s high sensitivity and wide spectral coverage enable us to investigate relative gas abundance variation and dust features, which can unambiguously identify the dust composition.
Plenty of dust features in the SPICA spectral range, significant for the study of ice & silicate mineralogy
Dust in Supernovae

Detected dust mass is far smaller than predictions (0.1Msun)

Young SNe are too thick to estimate dust mass

SNRs are contaminated by the interstellar dust contribution

Search for dust emission in SNe of 10-100 yr old

Cool dust in SNe eludes detection with current facilities
SPICA can detect cool dust in SNe

SPICA can elucidate dust formation in SNe
+ dust formation in the early Universe
IRAS 15099-5856 (SNR MSH 15-52)

Very extended MIR emission (>10µm) associated with a SNR detected by AKARI

X: IR peak
◇: O star
+: pulsar

Koo et al. 2011
Prominent crystalline silicate features

Similarity with young star and SN progenitor

First detection of crystalline silicates associated with SNR

Rare phenomena or universal?
suggesting crystalline silicates in the early Universe

SPICA’s wide FoV is significant for the survey of these studies
Thank you for your attention
Temperature dependence of forsterite bands at 49 and 69\(\mu\)m

Koike et al. 2006
Chandra image of B1509–58

Gaensler et al. 2002