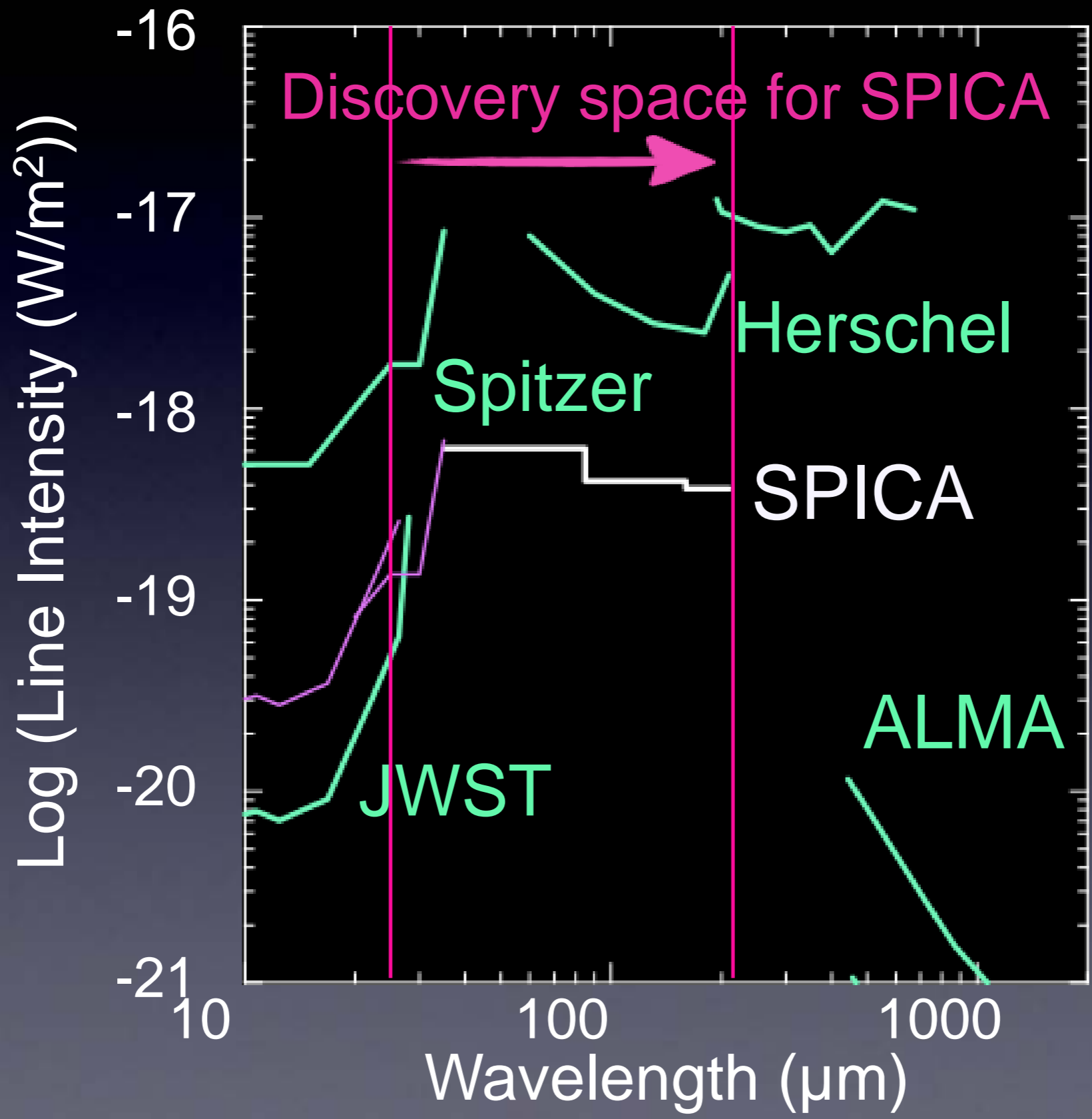




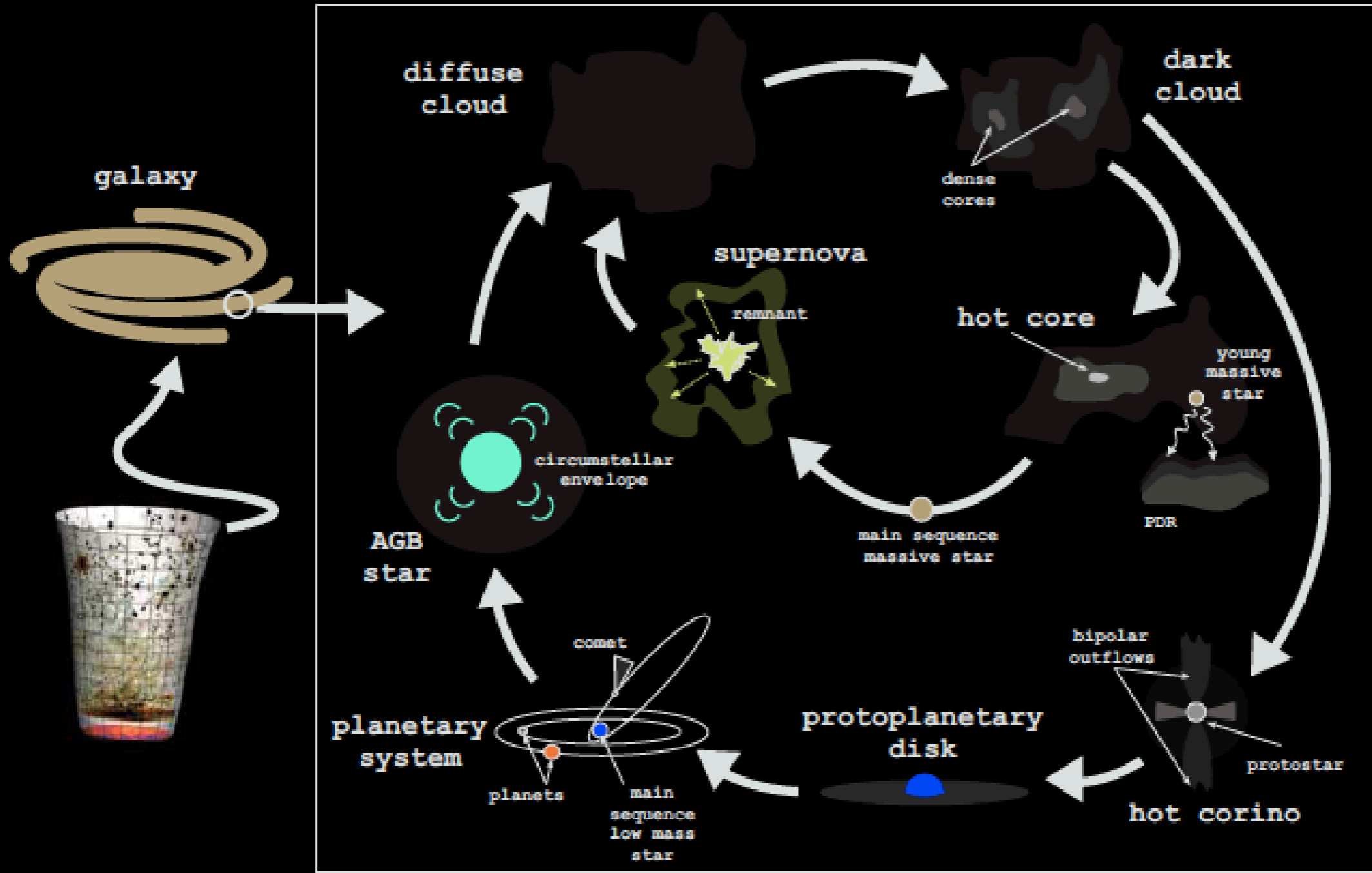
宇宙の物質循環: 「あかい」からSPICAへ

尾中 敬 (東京大学)





Material metempsychosis



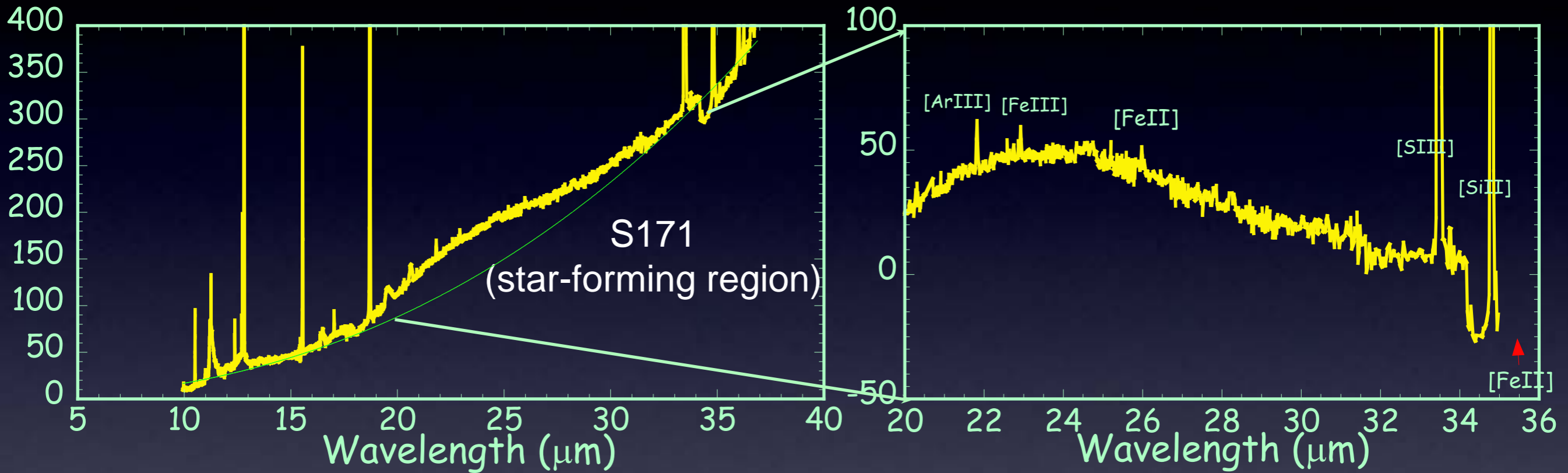
Agúndez (2009)
thesis

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

MIR spectroscopy of dust & gas

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



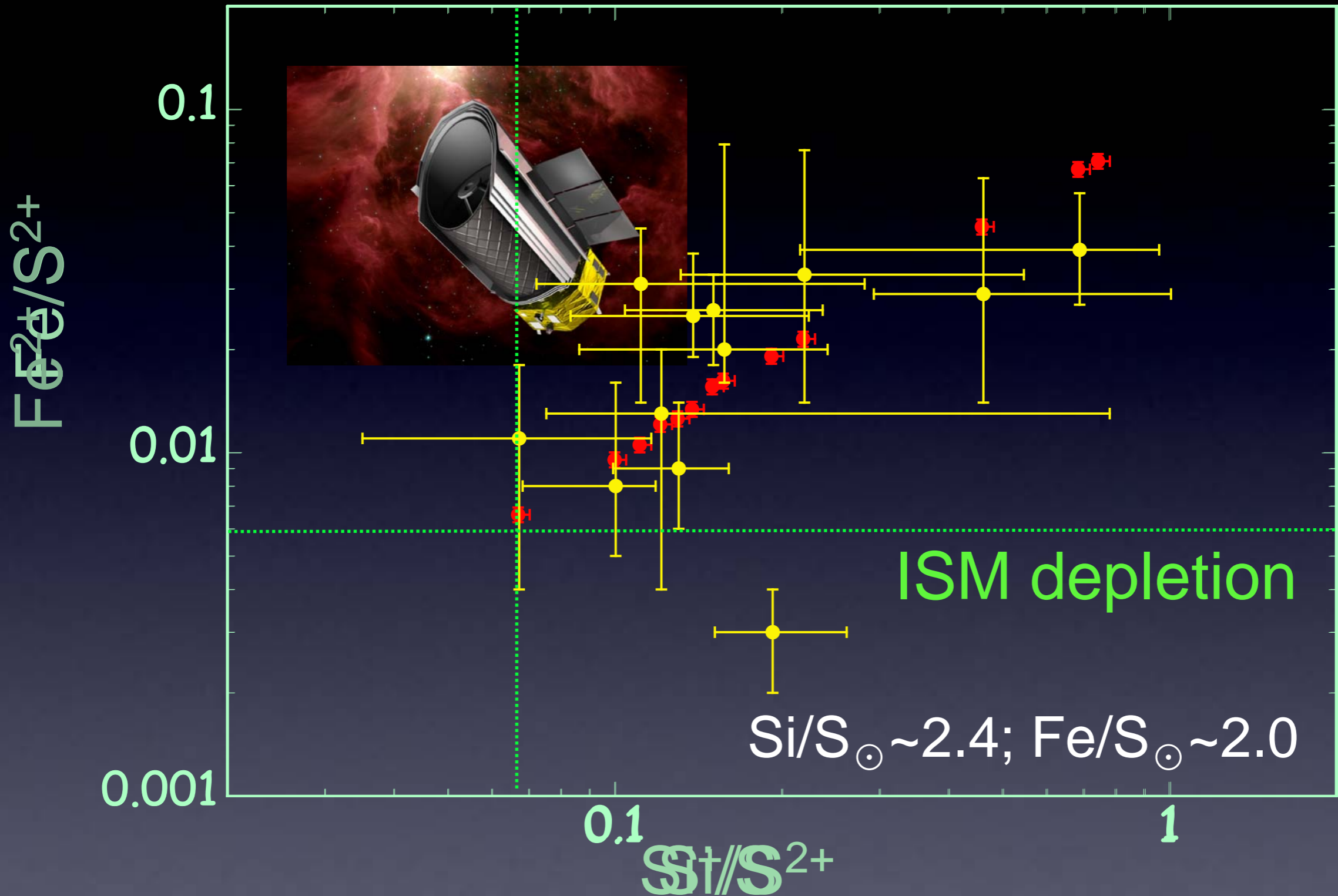
Okada et al. (2008)

- FeII
- _____ 87.38μm
 - _____ 51.30μm
 - _____ 35.35μm
 - _____ **25.99μm**
 - _____

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



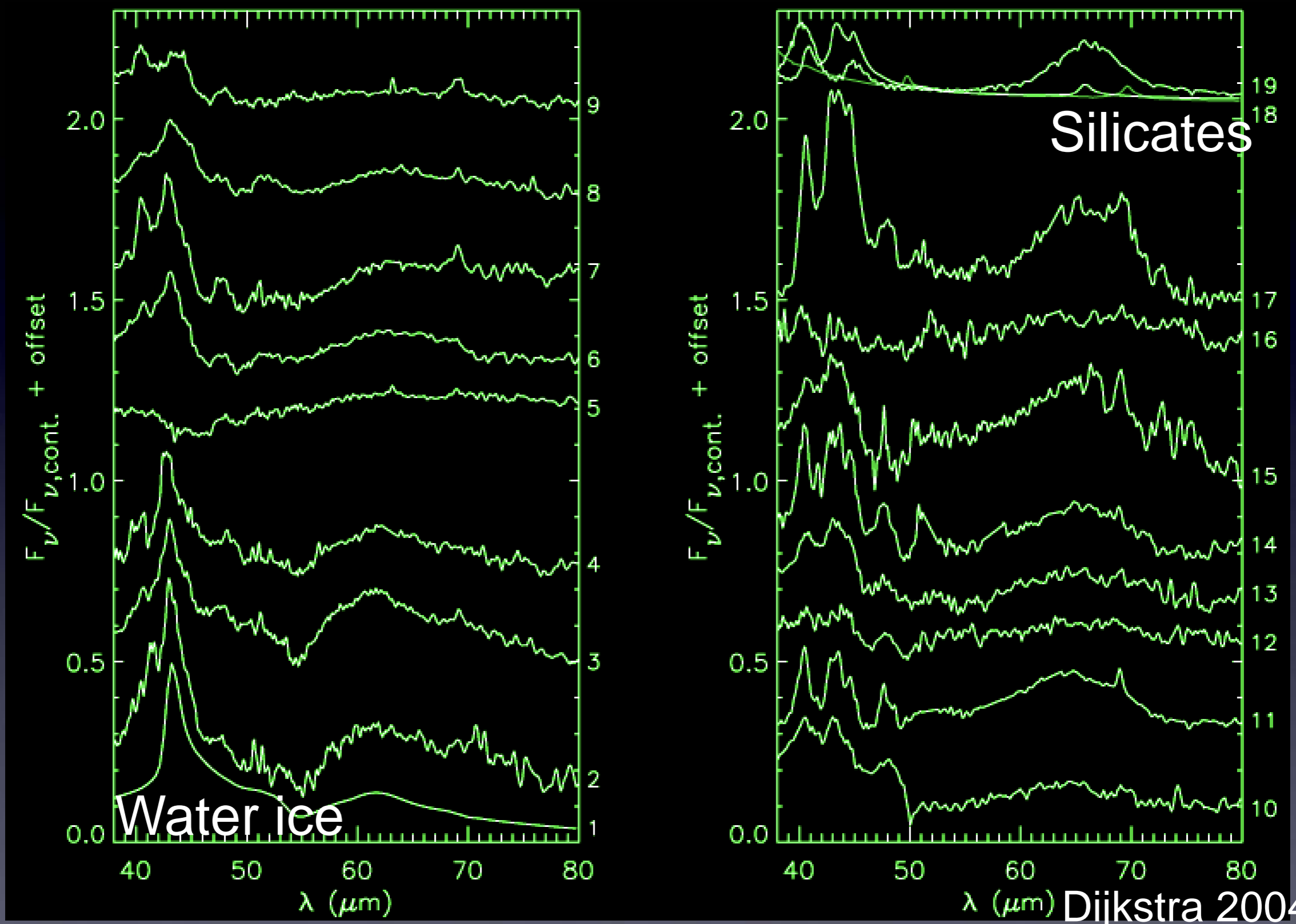
Si & Fe gas abundance



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



Dust features in 40–80 μm



Dijkstra 2004 thesis

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 (0.1 Msun)

Young SNe are too thick to estimate dust mass

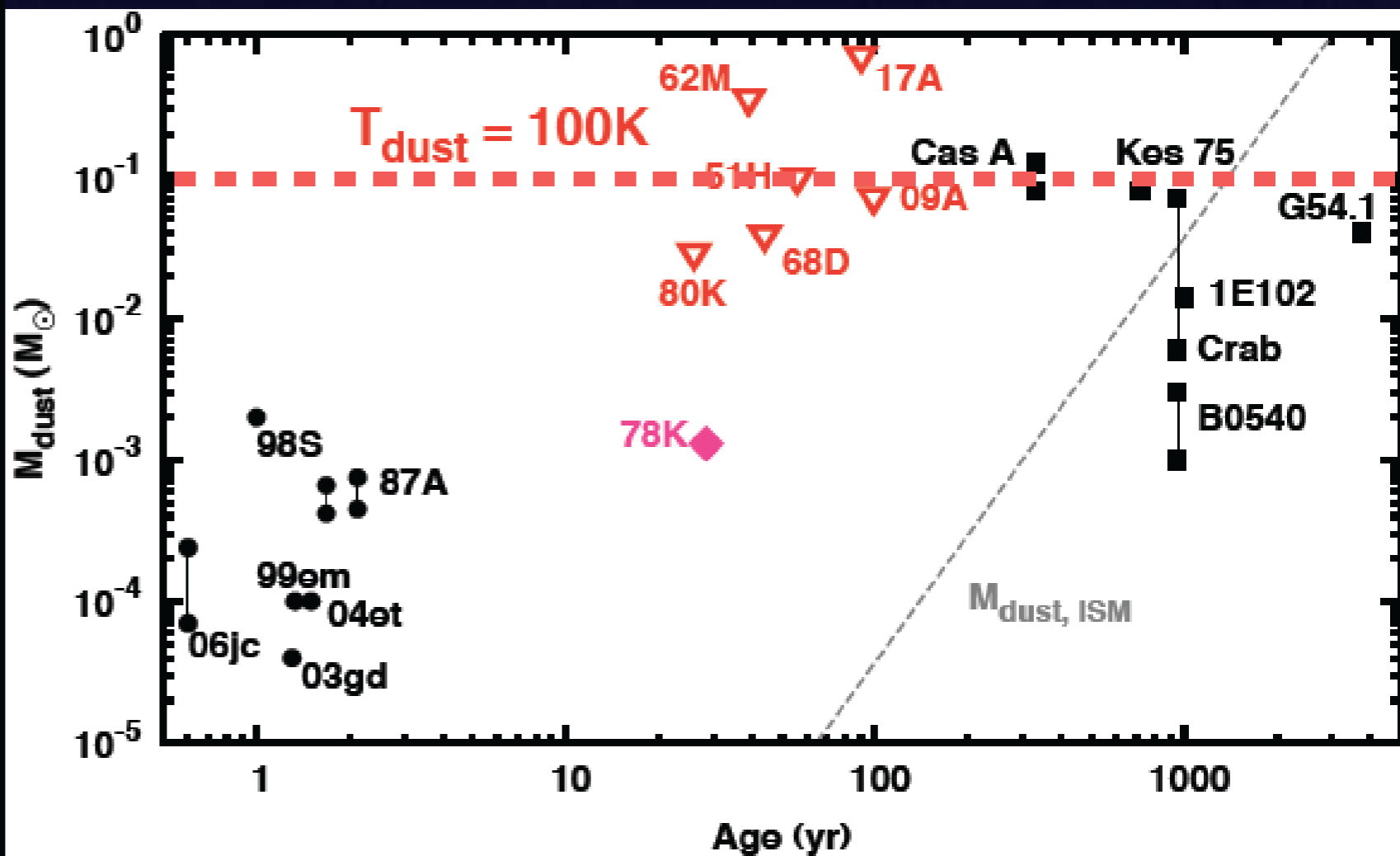
SNRs are contaminated by the interstellar dust contribution

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

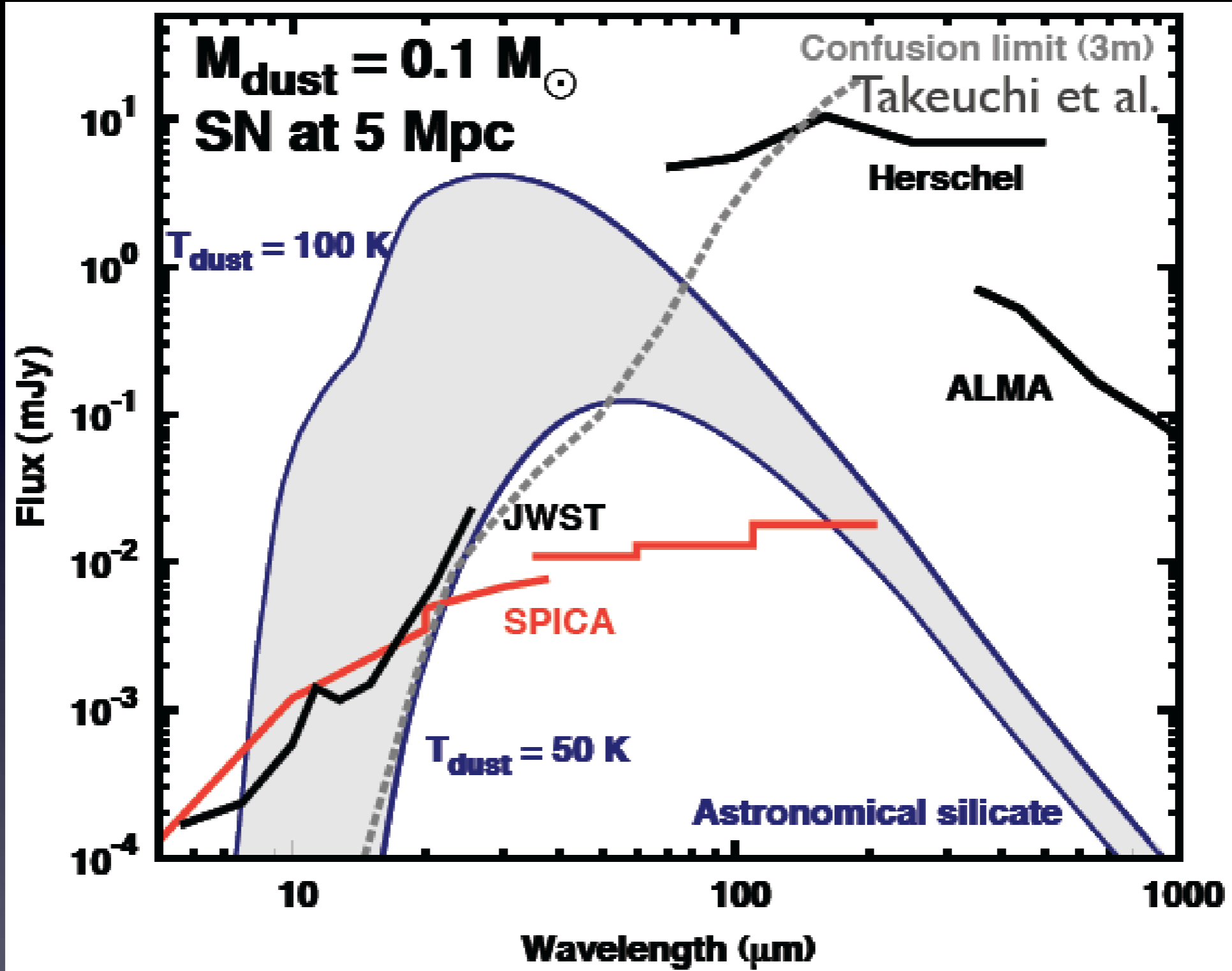
Cool dust in SNe eludes detection with current facilities



SN 1978K
in NGC 1313

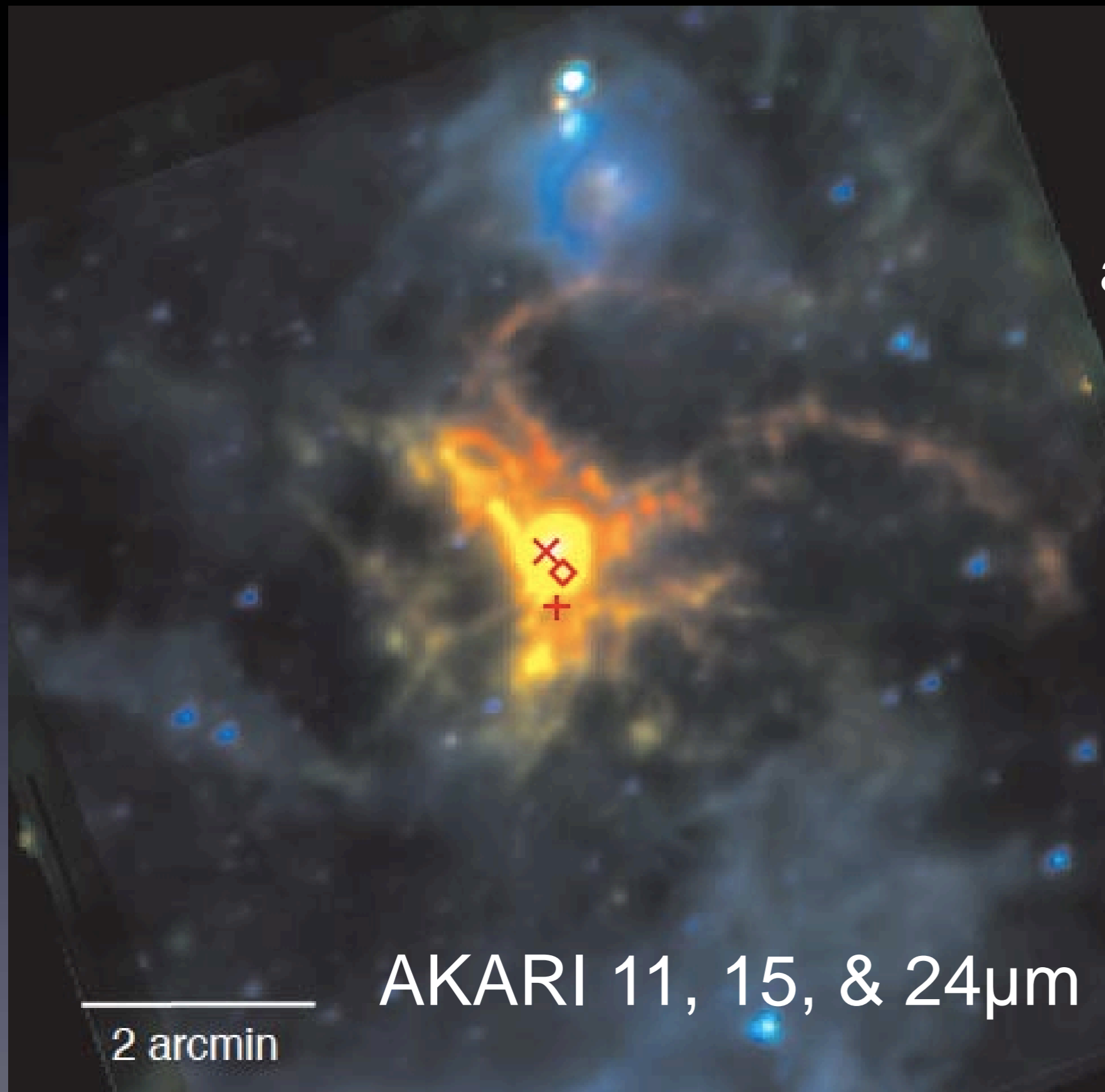


SPiCA can detect cool dust in SNe



SPiCA can elucidate dust formation in SNe
+ dust formation in the early Universe

IRAS 15099-5856 (SNR MSH15-52)



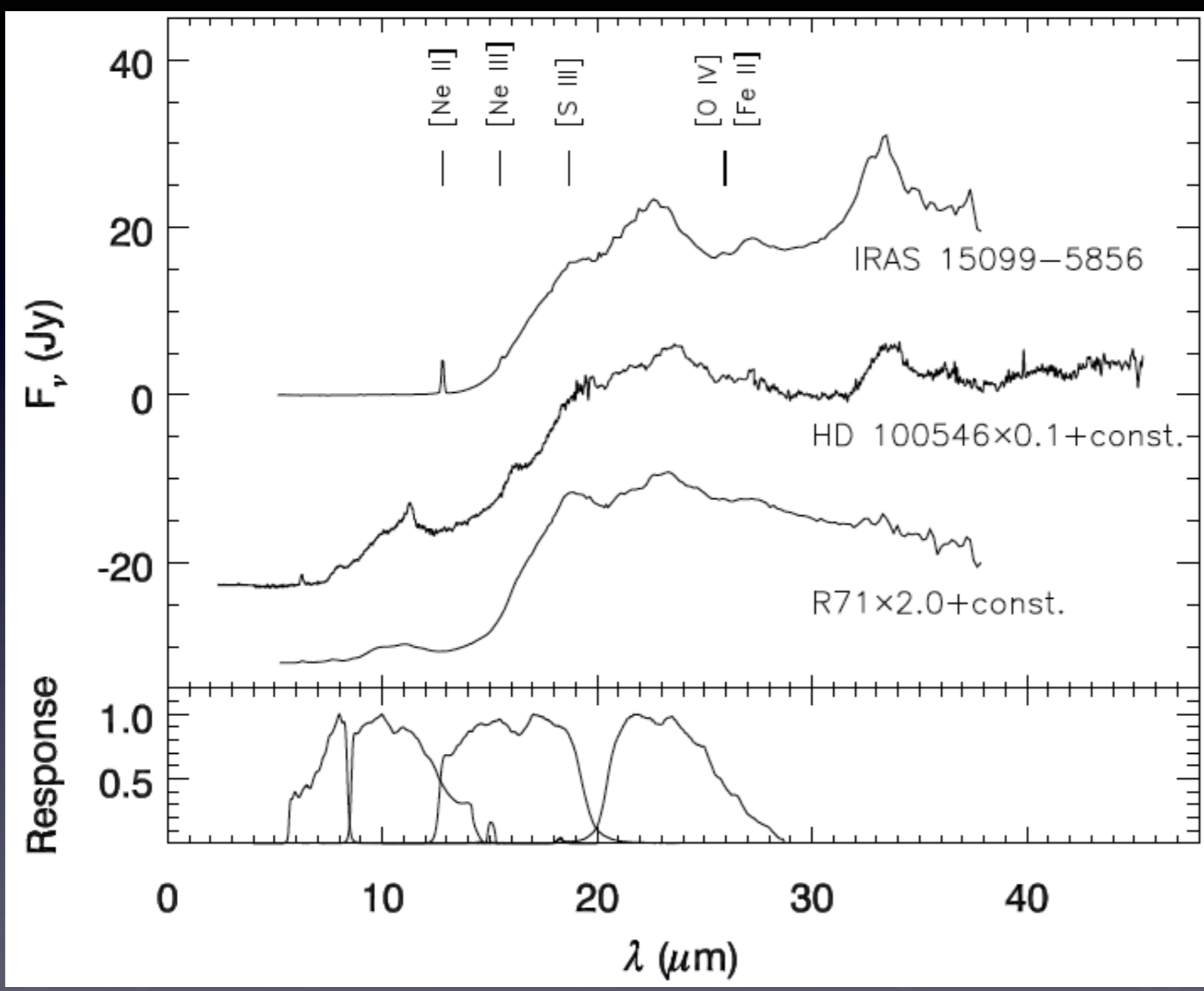
Very extended MIR emission ($>10\mu\text{m}$) associated with a SNR detected by AKARI

- X: IR peak
- ◇: O star
- +: pulsar

AKARI 11, 15, & 24 μm

2 arcmin

Prominent crystalline silicate features



Similarity with young star and SN progenitor

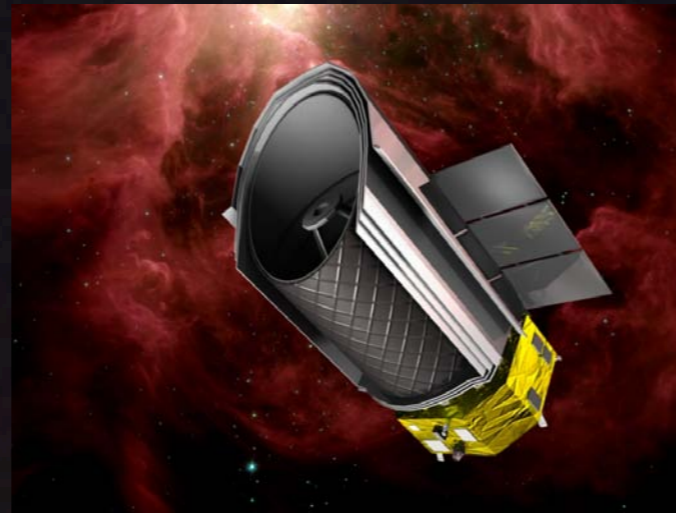
First detection of crystalline silicates associated with SNR

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

SPiCA's wide FoV is significant for the survey of these studies

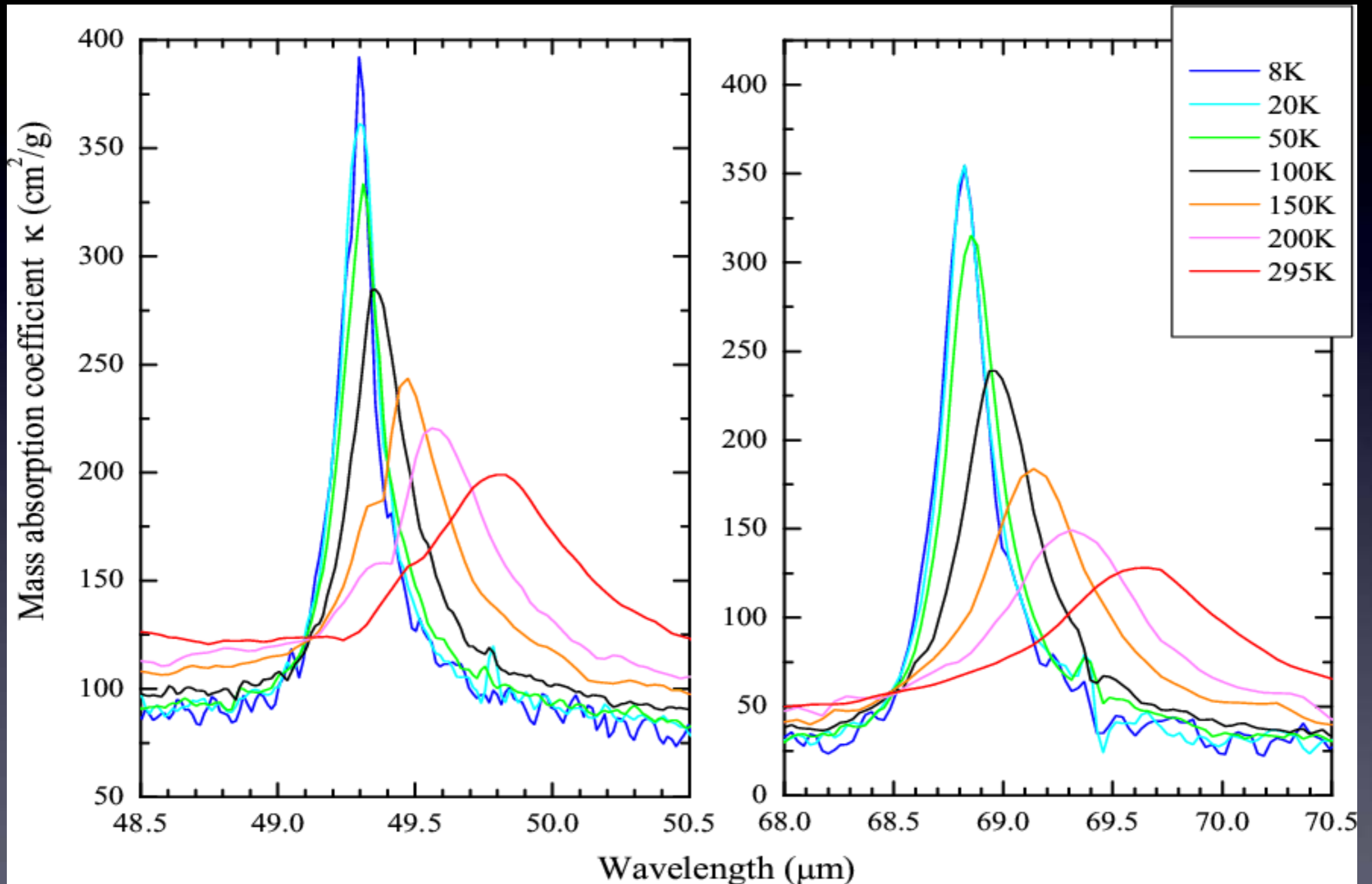


Thank you for your attention





Temperature dependence of forsterite bands at 49 and 69 μm



Koike et al. 2006



Chandra image of B1509-58

