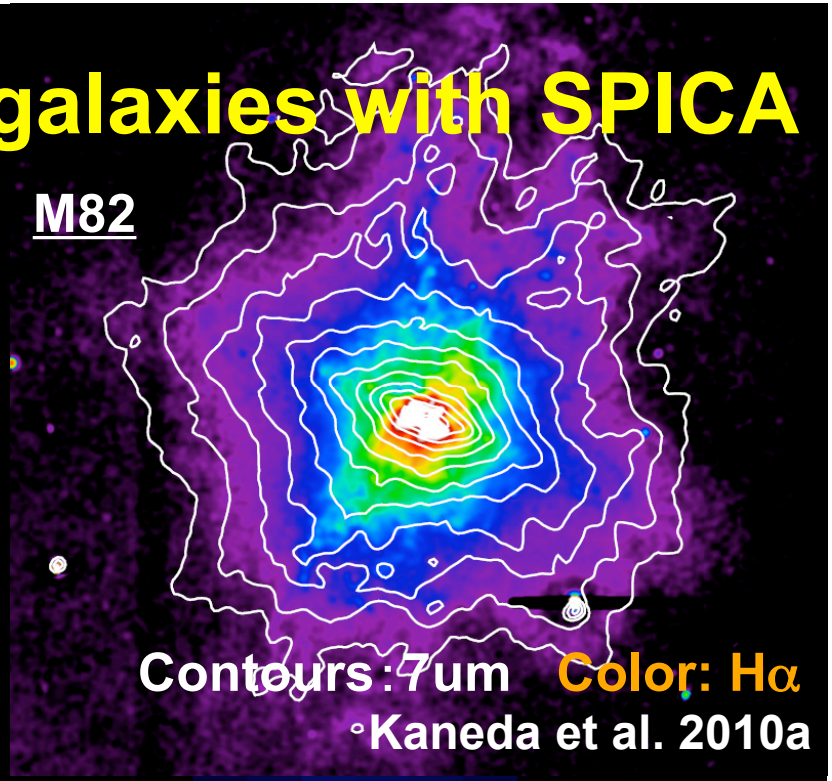
ISM in our Galaxy and nearby galaxies with SPICA

H. Kaneda (Nagoya Univ.)
@ SPICA Science Workshop 2010

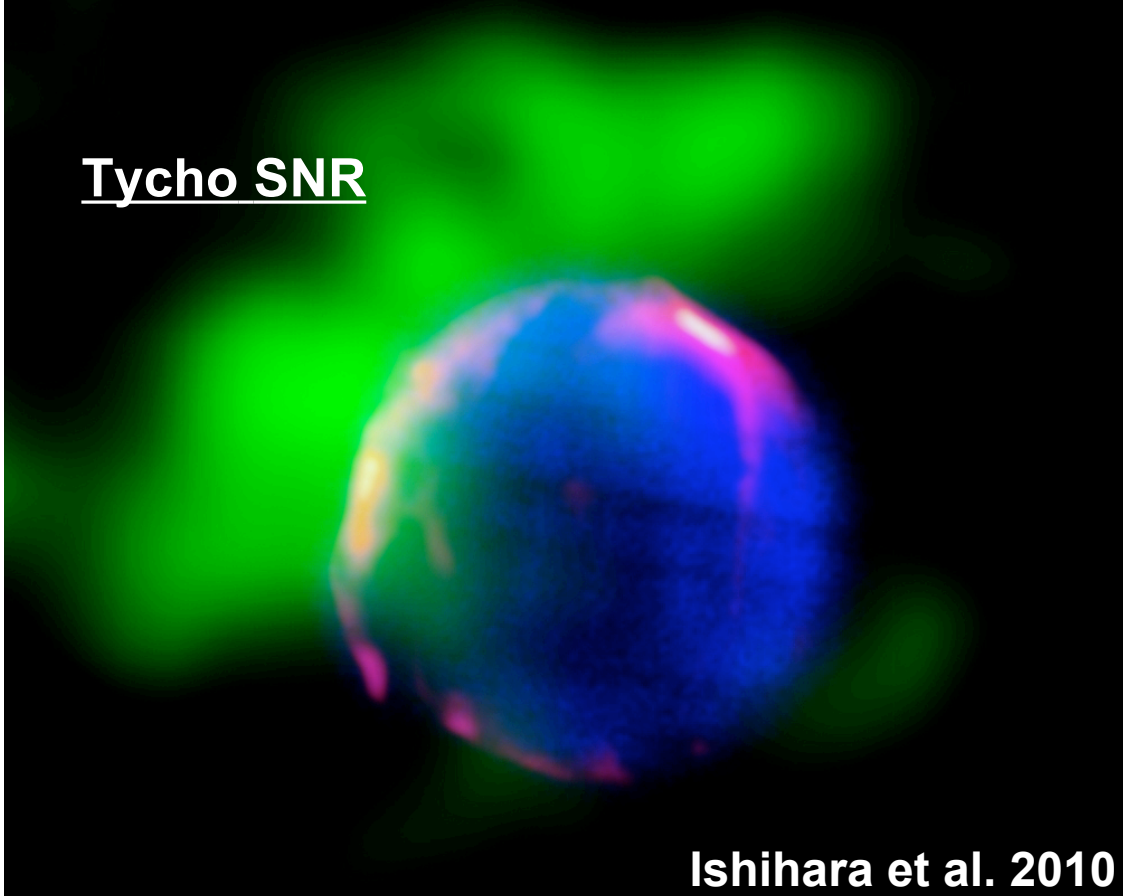
M82



Contours：7um Color: Hα

Kaneda et al. 2010a

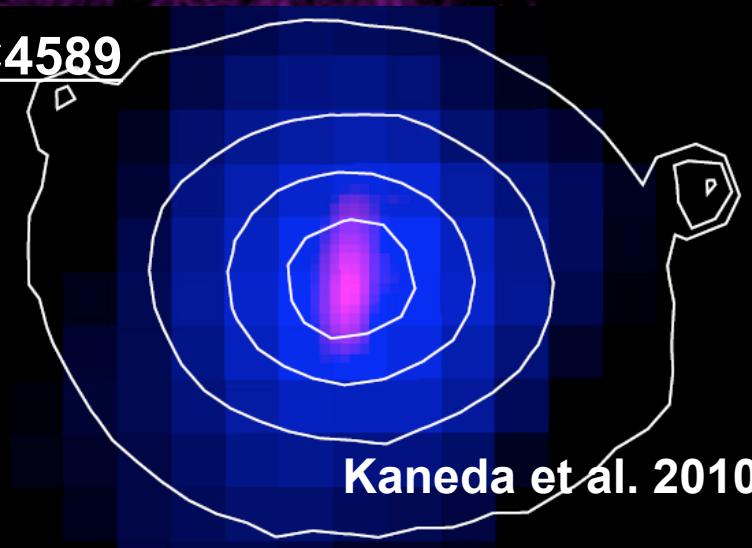
Tycho SNR



Ishihara et al. 2010

R：AKARI 18um (dust)
B：Suzaku X-ray (Fe, Si)
G：CO（CGPS）

NGC4589



Kaneda et al. 2010b

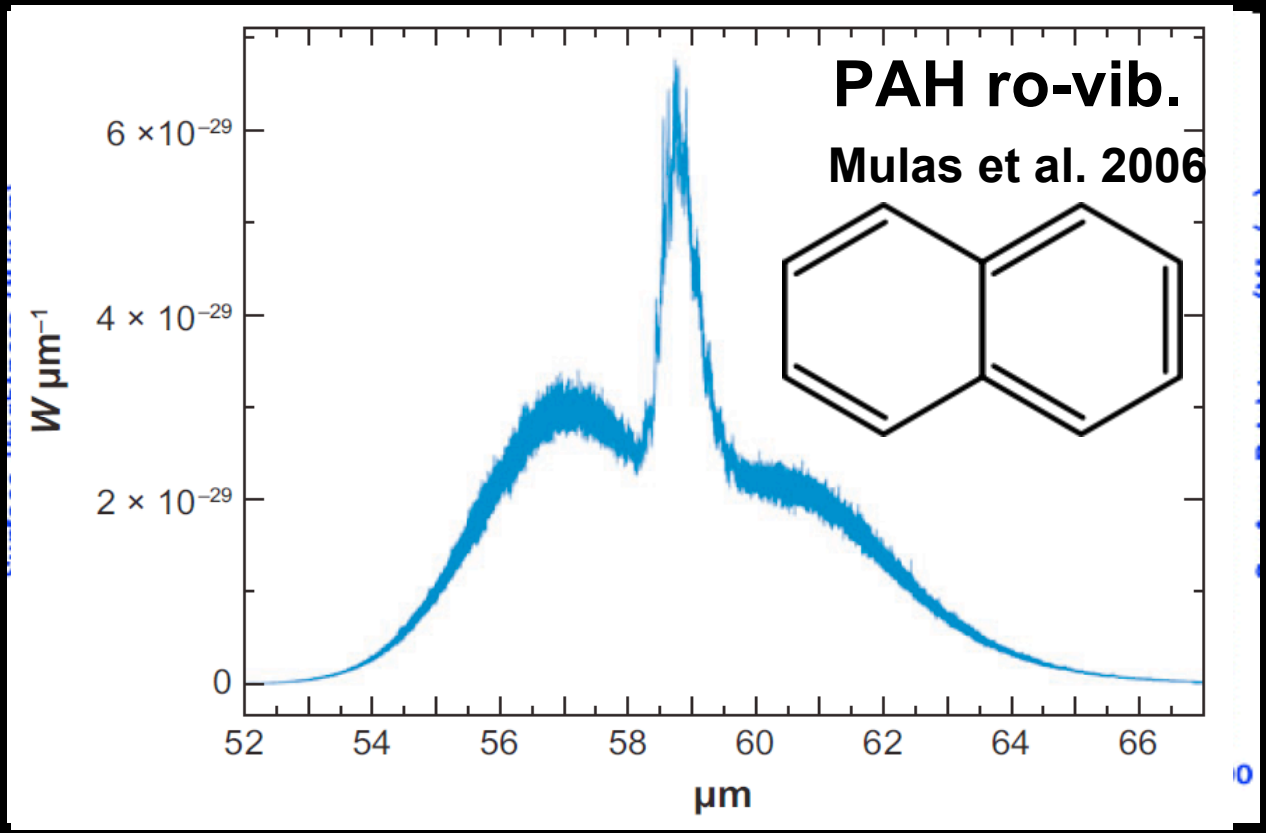
B：AKARI 90um (dust)
R：PAH 11.3um Contours：starlight

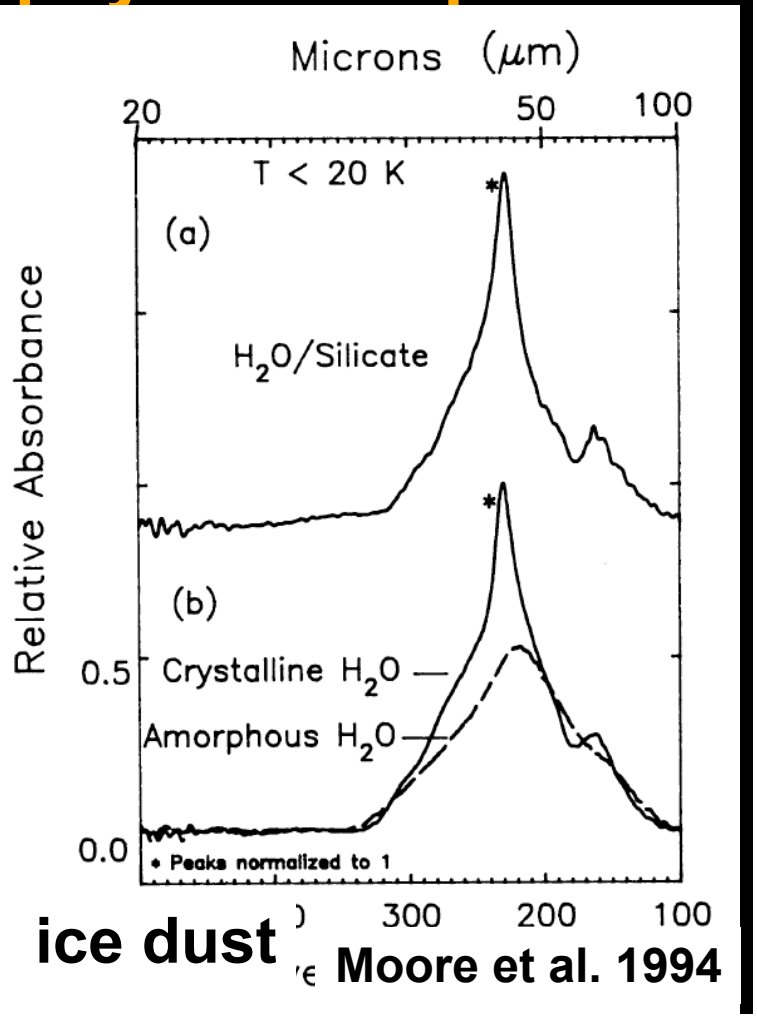
What will remain after Herschel and JWST?

Not so much about PAH molecules and thermal dust…

Uniqueness: cold telescope + new detector technology

15-60um: crucial for SPICA. – "Solid physics in space"



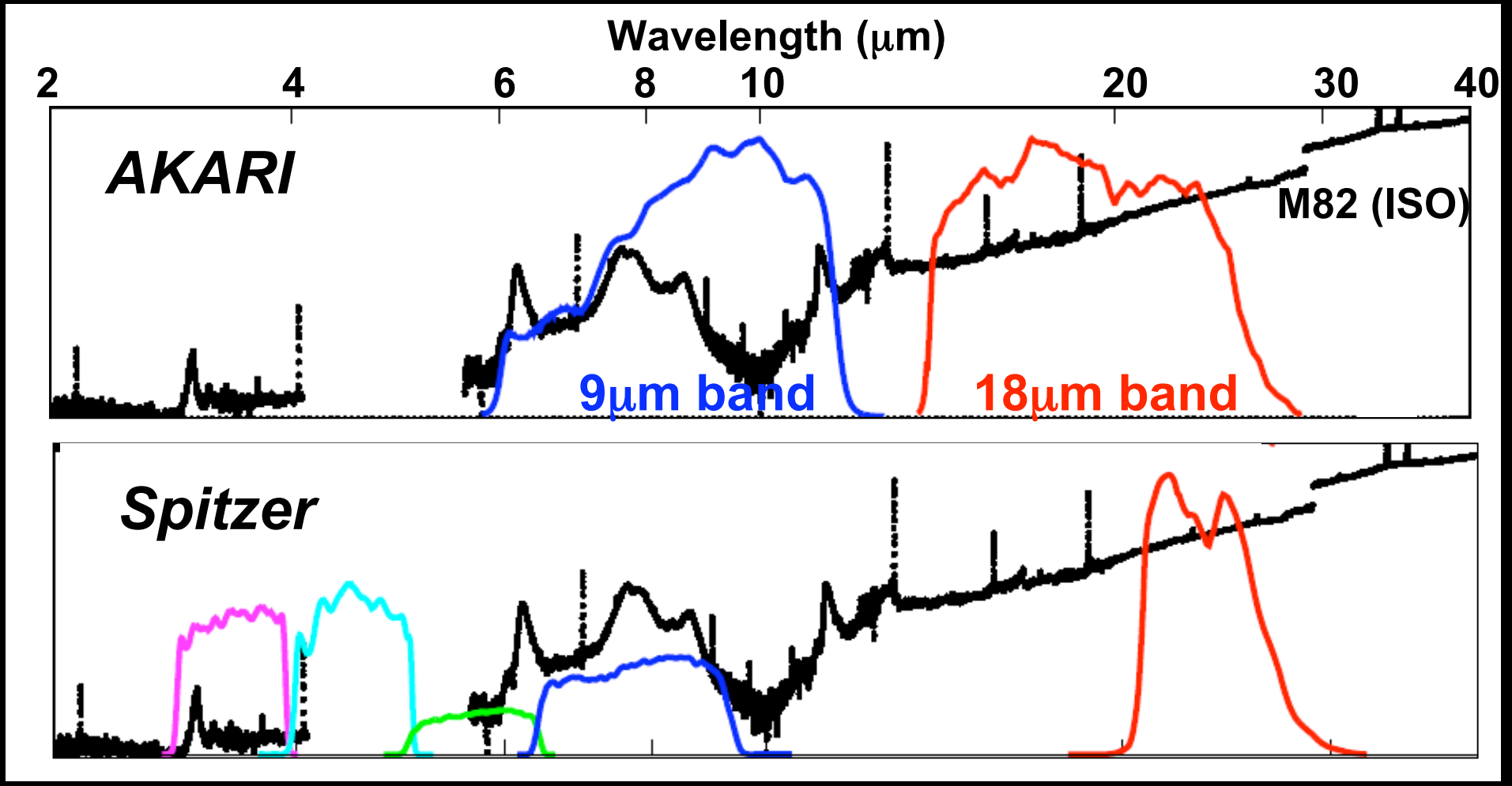


60-200um: Faint extended emission + dynamic ranges, Dust physics

ice dust

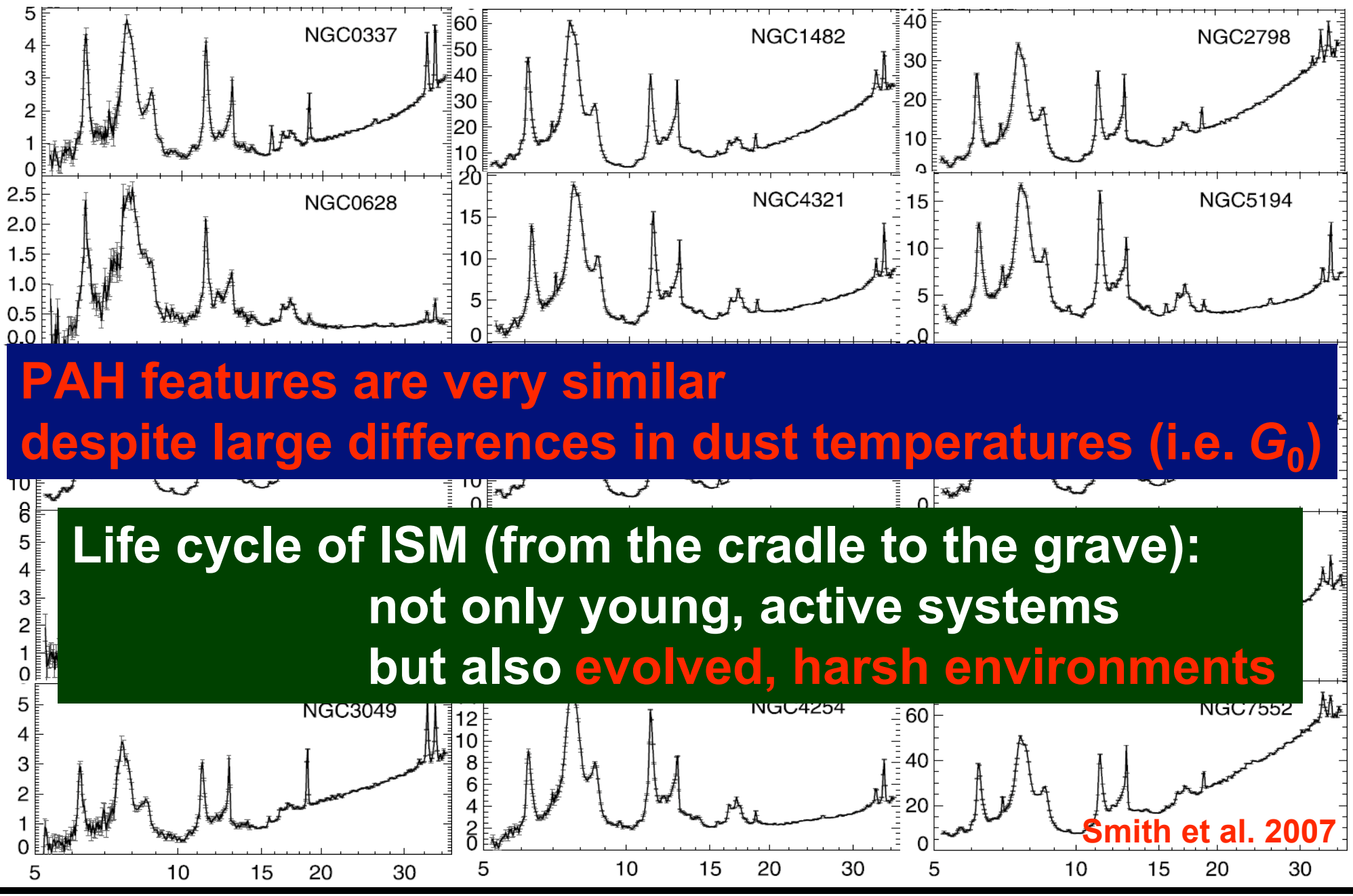
Moore et al. 1994

Typical mid-IR spectrum of ISM and filter bands



In young, active environments, PAH features and dust continuum are dominant in the mid IR. ⇒ relatively easy to get spectral information by multi-band photometry.

PAH emission in star-forming galaxies



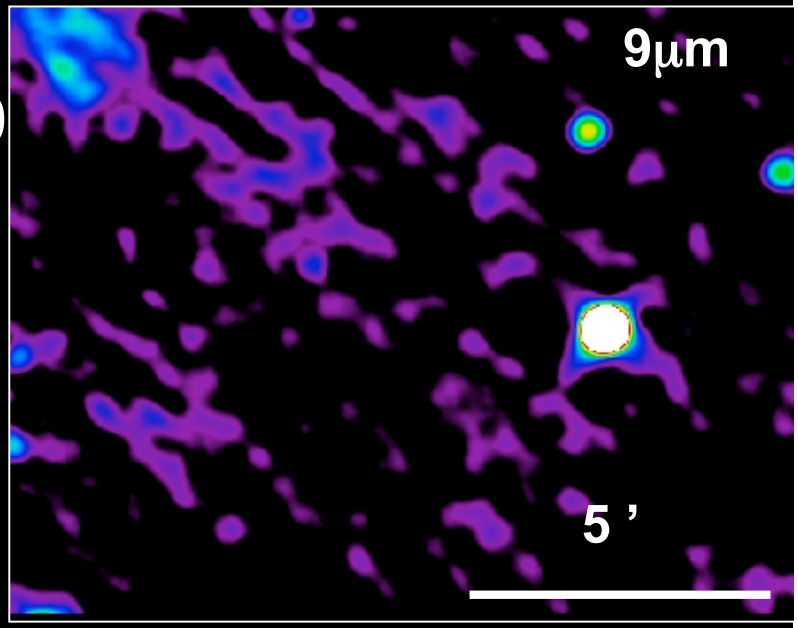
PAH features are very similar
despite large differences in dust temperatures (i.e. G_0)

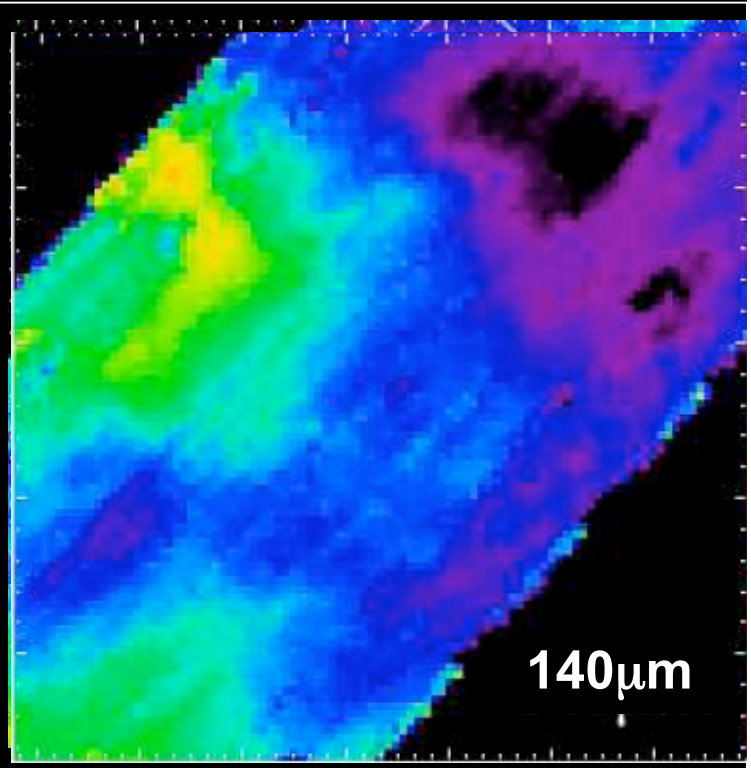
Life cycle of ISM (from the cradle to the grave):
not only young, active systems
but also evolved, harsh environments

Tycho's SNR with AKARI

Type Ia SN in 1572, Shock speeds: ~ 3000 km s^{-1}, Dust residence time in postshock plasma: 50 yr (T_e = 8x10^6 K, n_e = 10 cm^{-3})

Warren et al. 2005

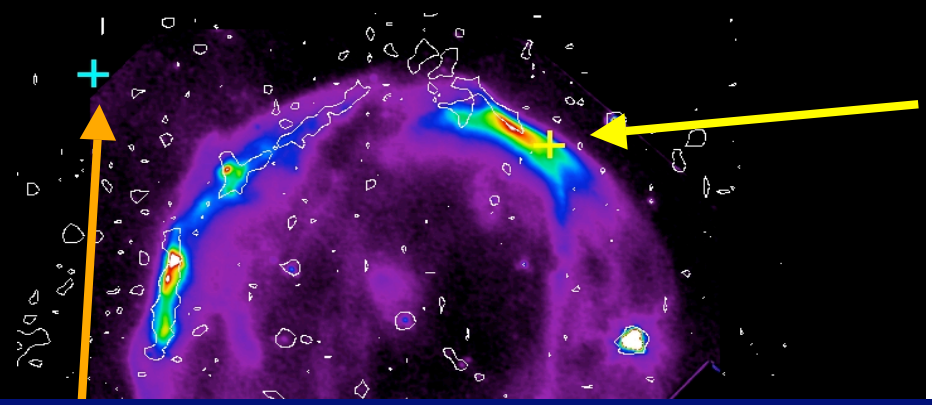


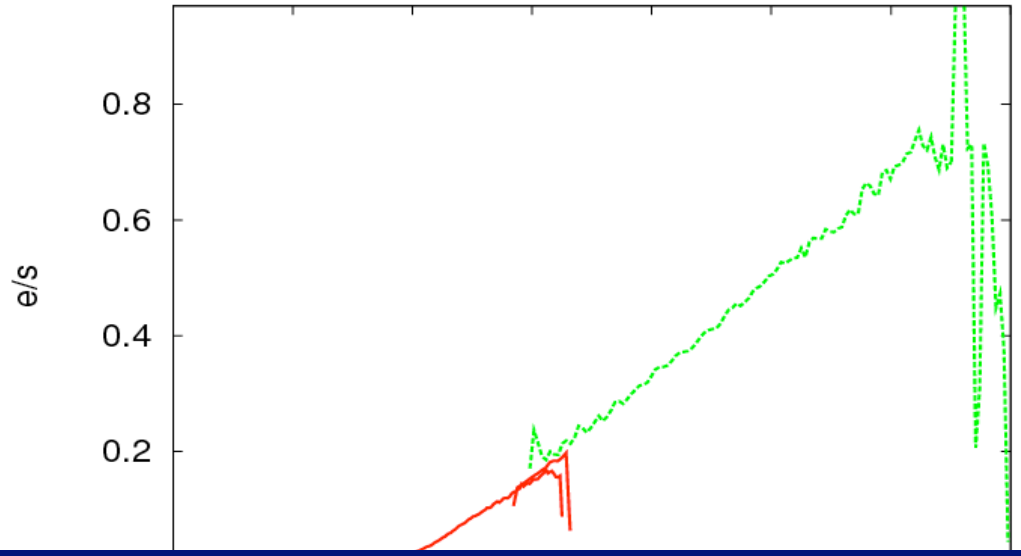


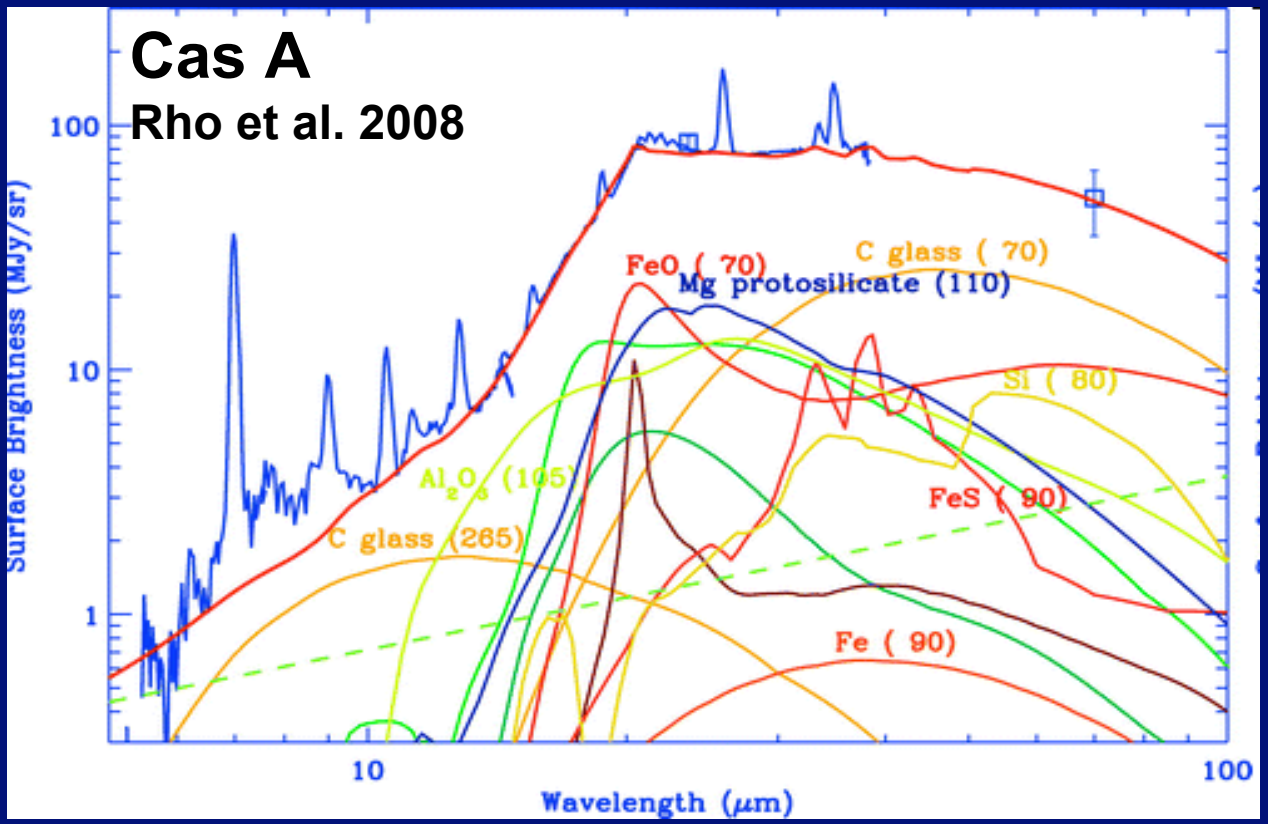
R：AKARI 18um (dust)
B：Suzaku X-ray (Fe, Si)
G：CO（CGPS）

Ishihara et al. 2010

Spitzer IRS spectra



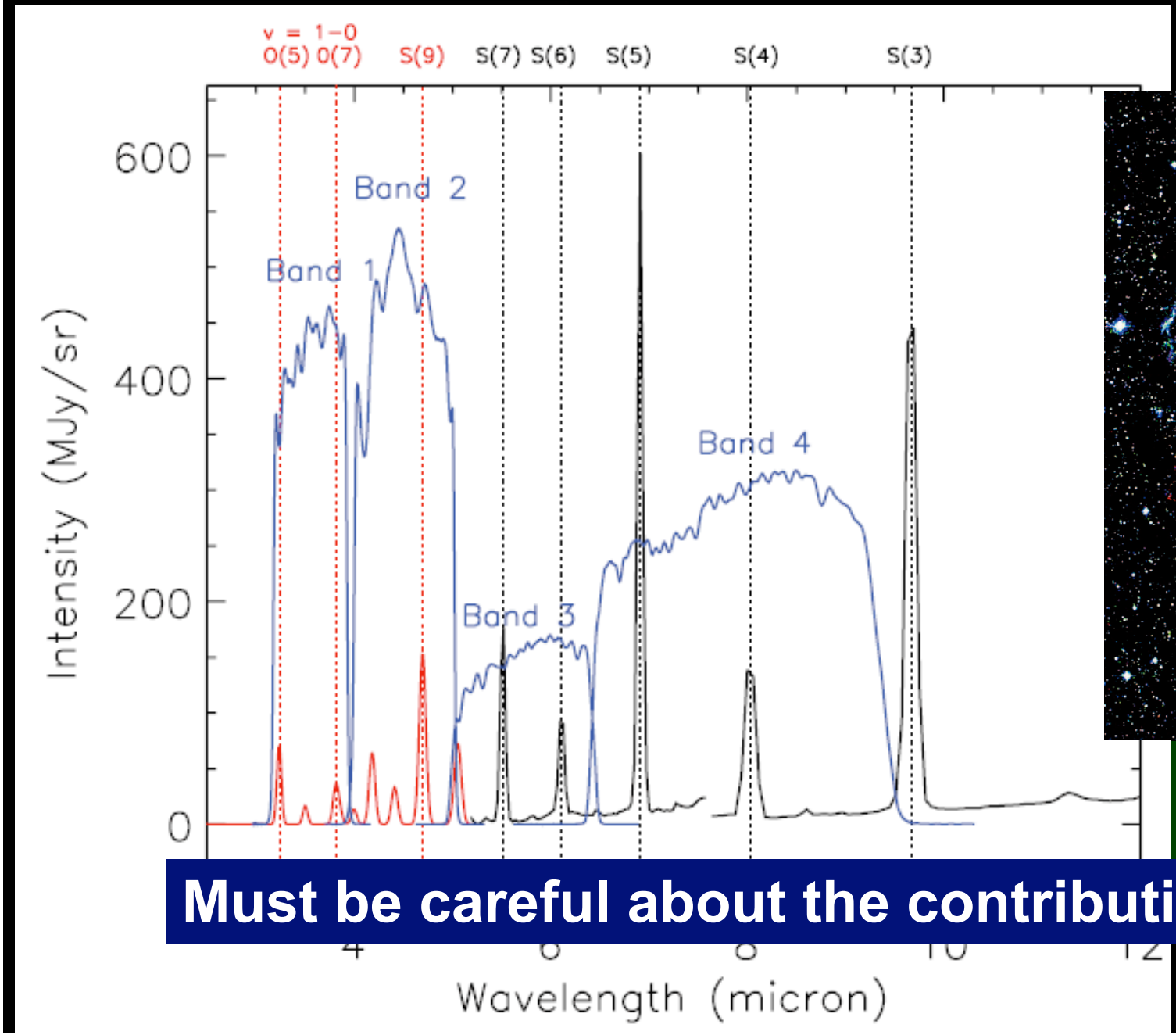


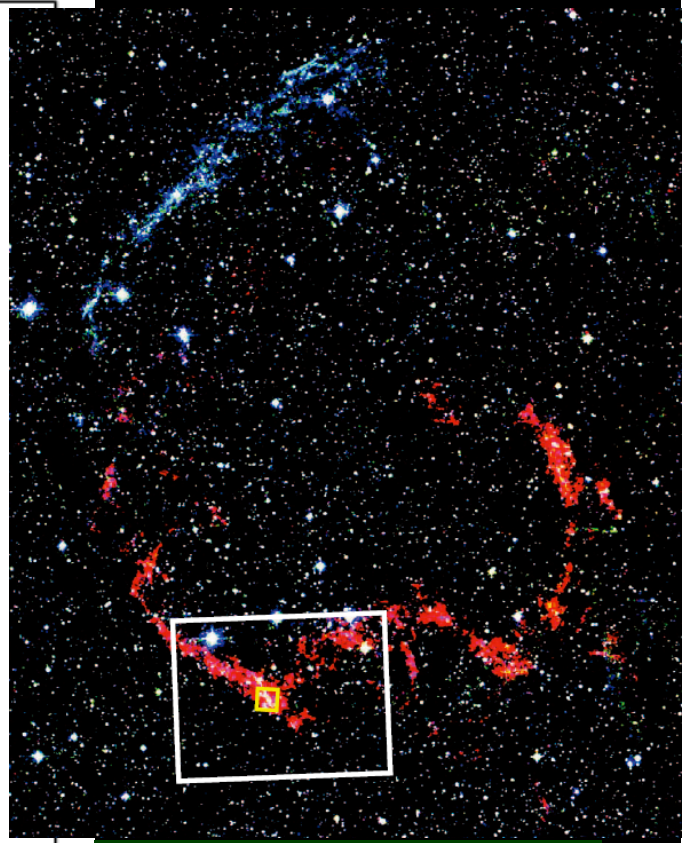


Tycho NW region:

- **Featureless continuum (No lines, No features)**
- **Fe + C (?)**

IC443 with Spitzer IRS and IRAC

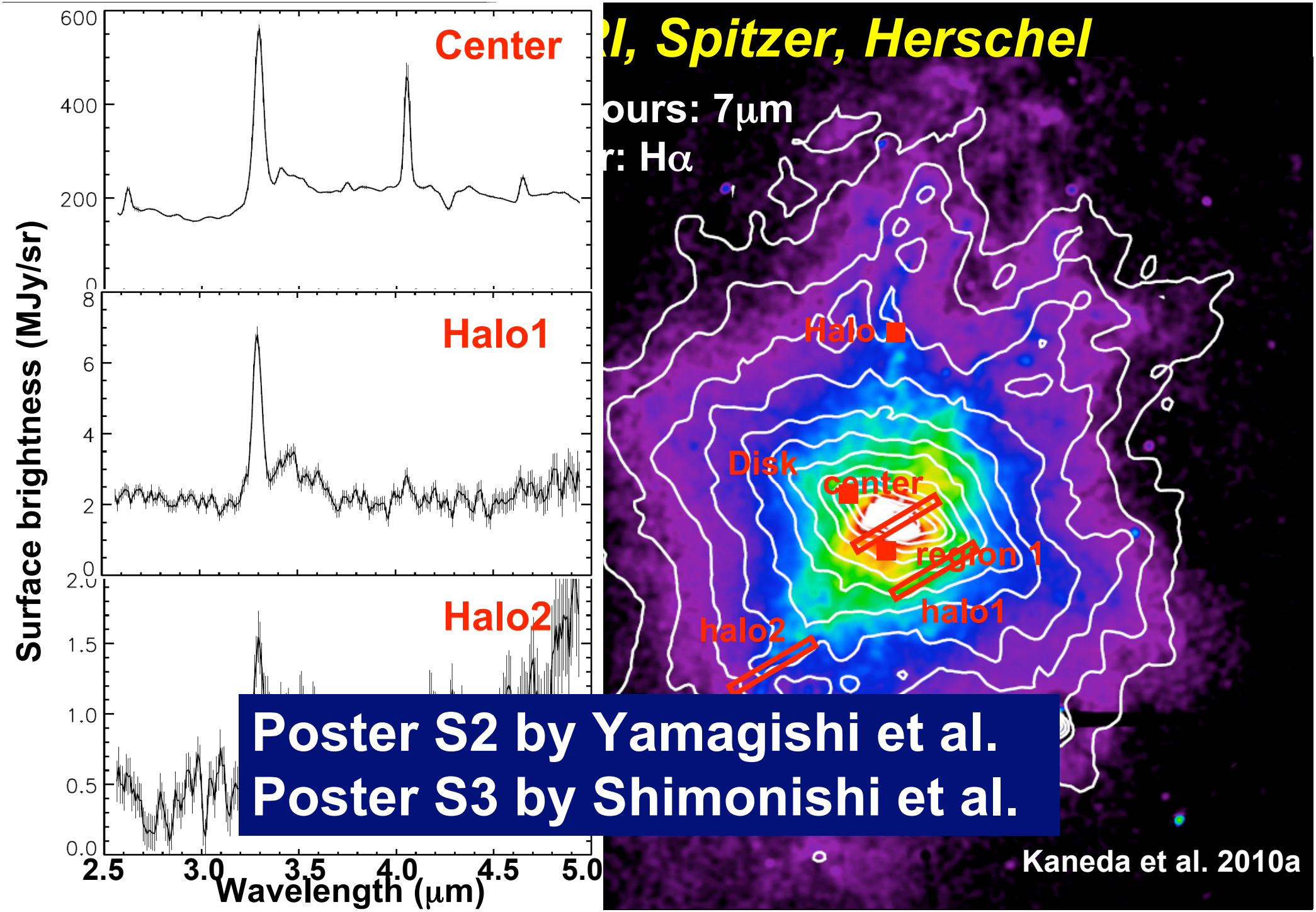




IRSF JHK
J: [FeII], Pβ

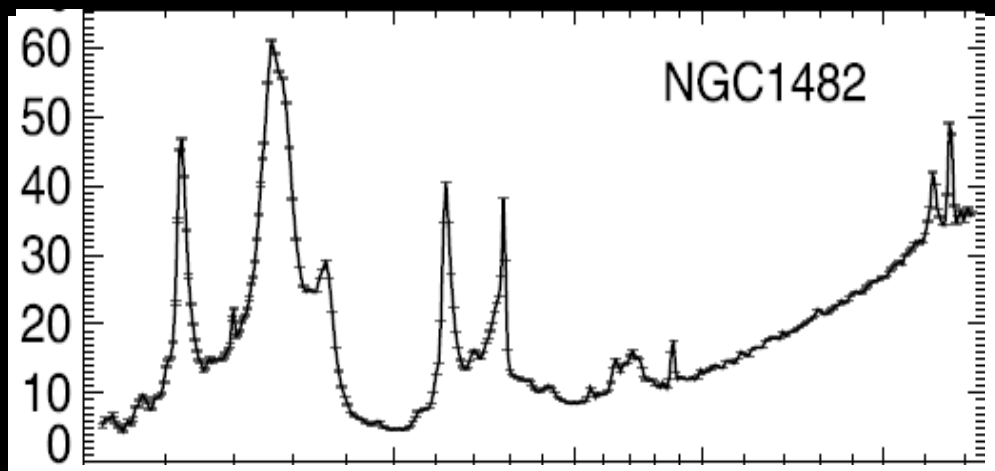
Must be careful about the contribution of H2 lines.

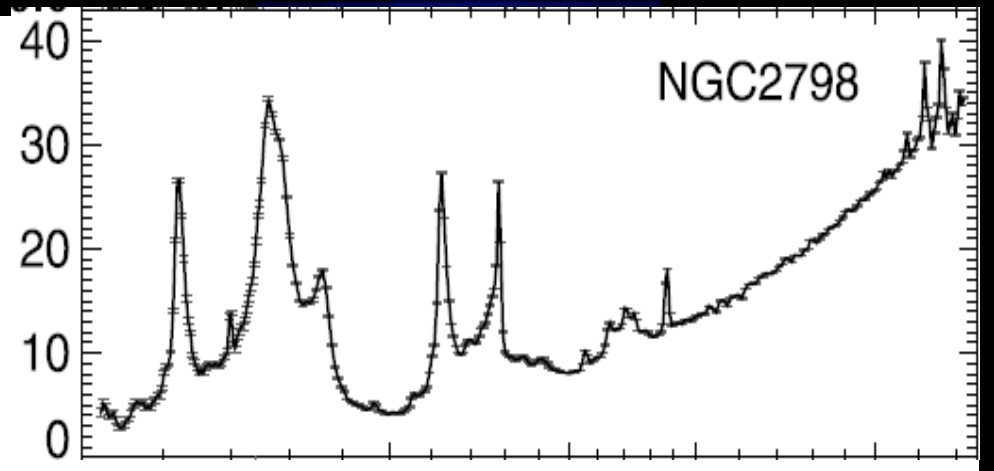
Neufeld & Yuan 2008

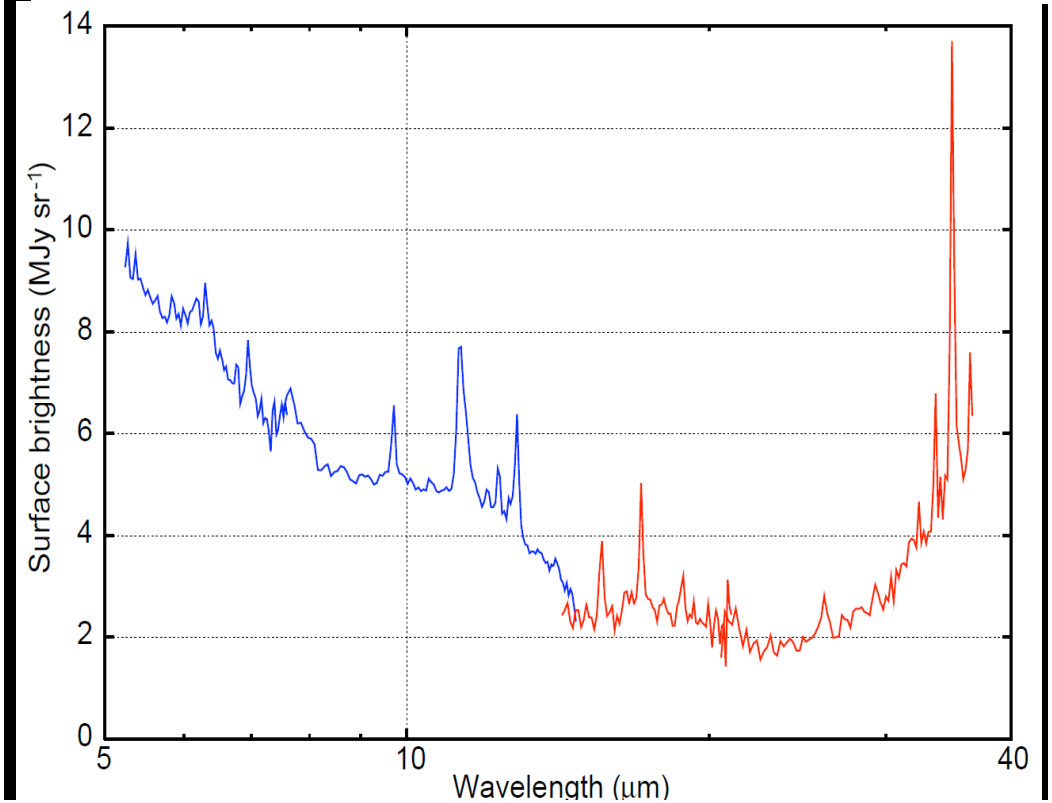


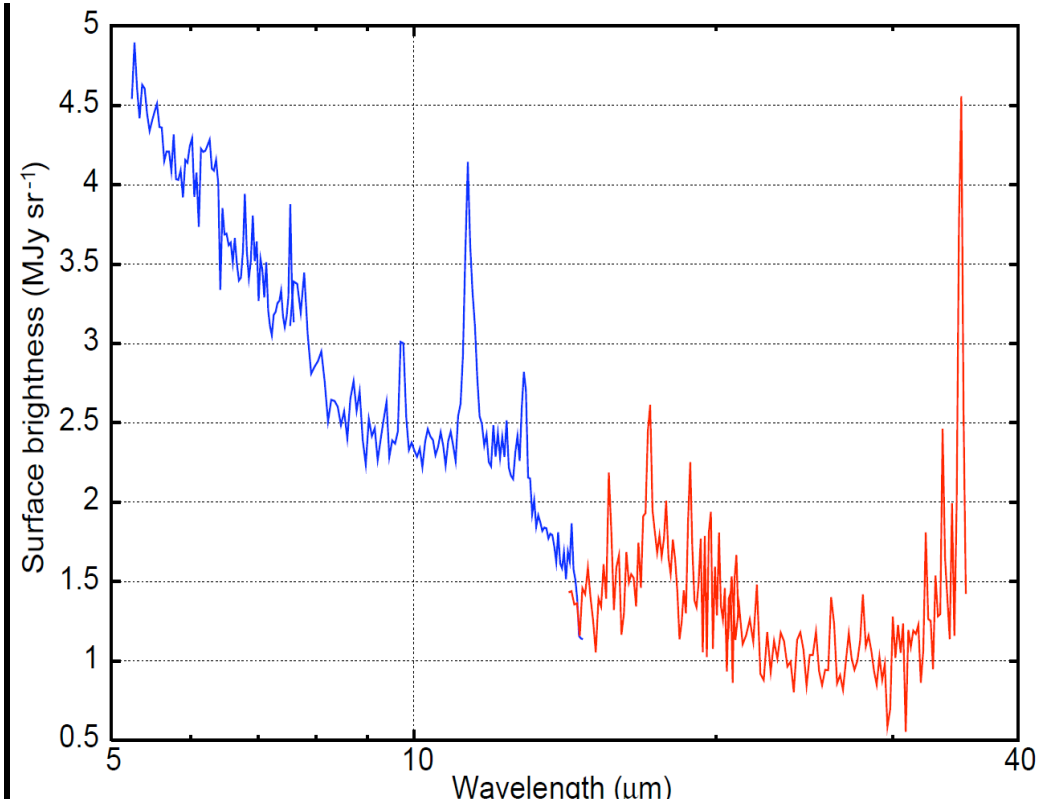
Poster S2 by Yamagishi et al.
Poster S3 by Shimonishi et al.

Elliptical galaxies with AKARI and Spitzer

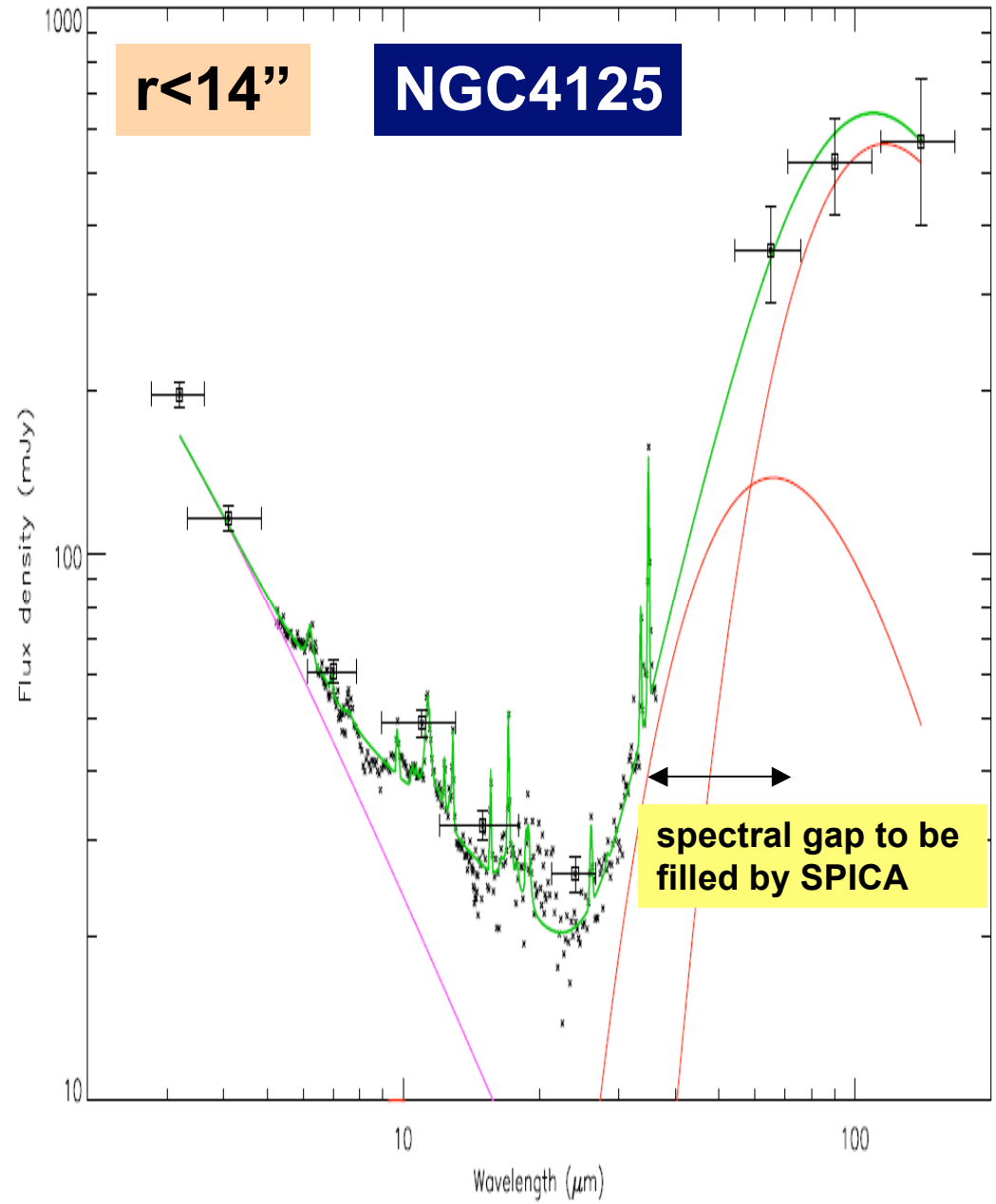


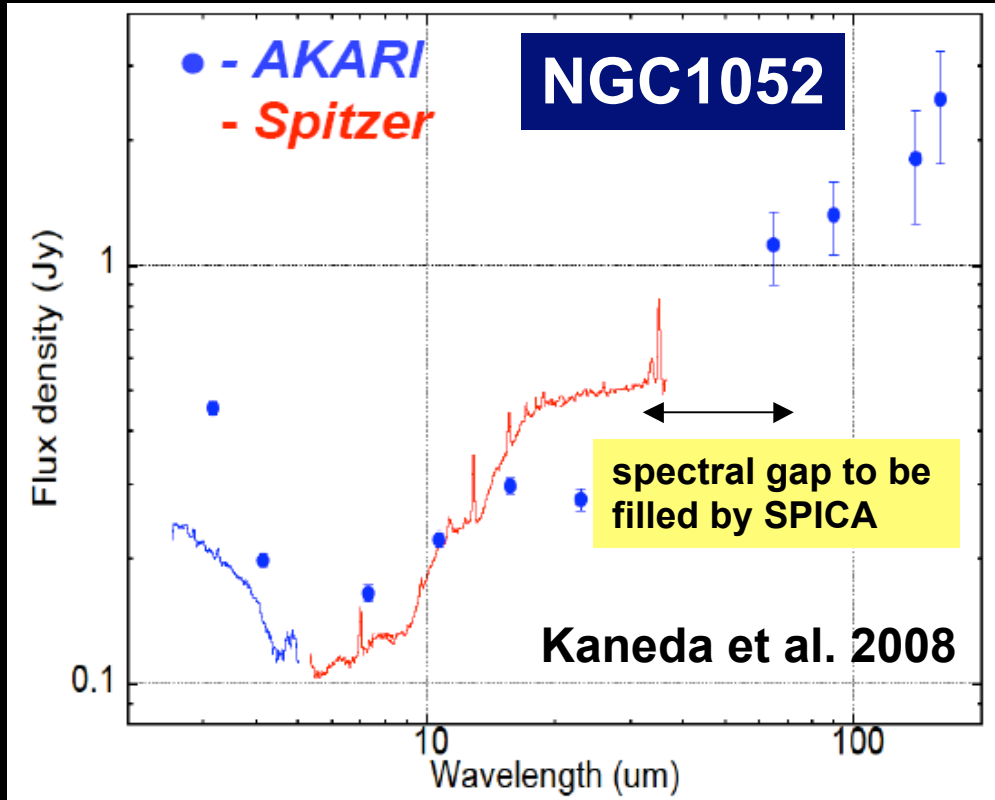


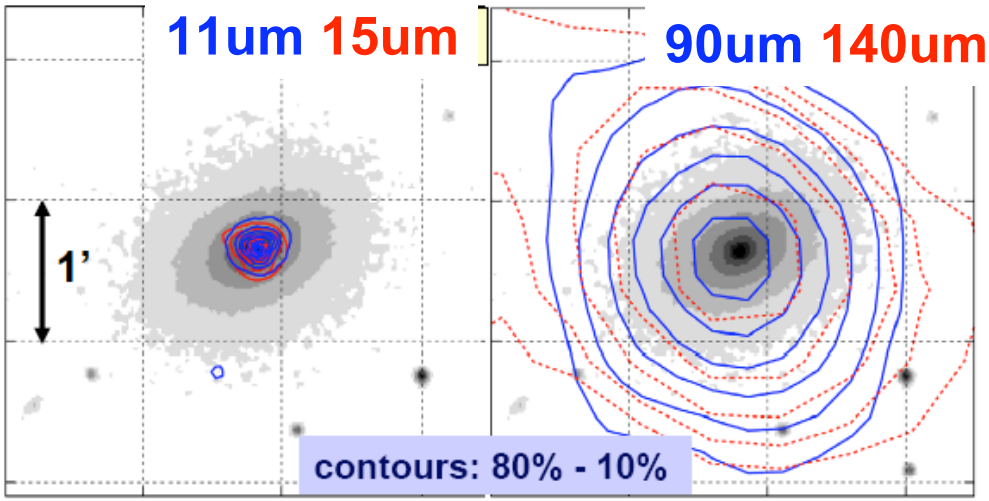




MIR-FIR SEDs of LINER ellipticals







Summary

SPICA uniqueness: 15-60um coverage thanks to cold telescope and new detector technology – solid materials

Requirements for SPICA

(1) MIR-FIR continuous spectral coverage is crucial for maximizing outputs from cold telescope; this makes SPICA unrivalled.

(2) MIR-FIR spectroscopic imaging capability with low resolution is essential for studies of dust features, PAH17um. (H2 and [SiII])