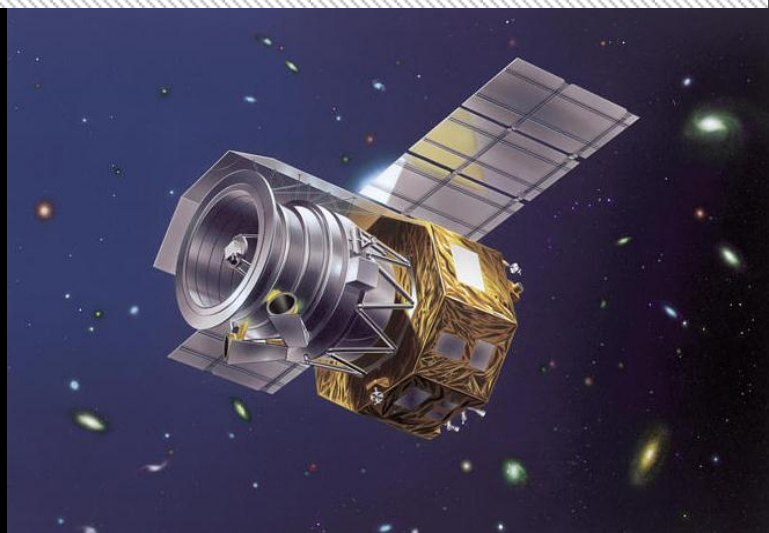
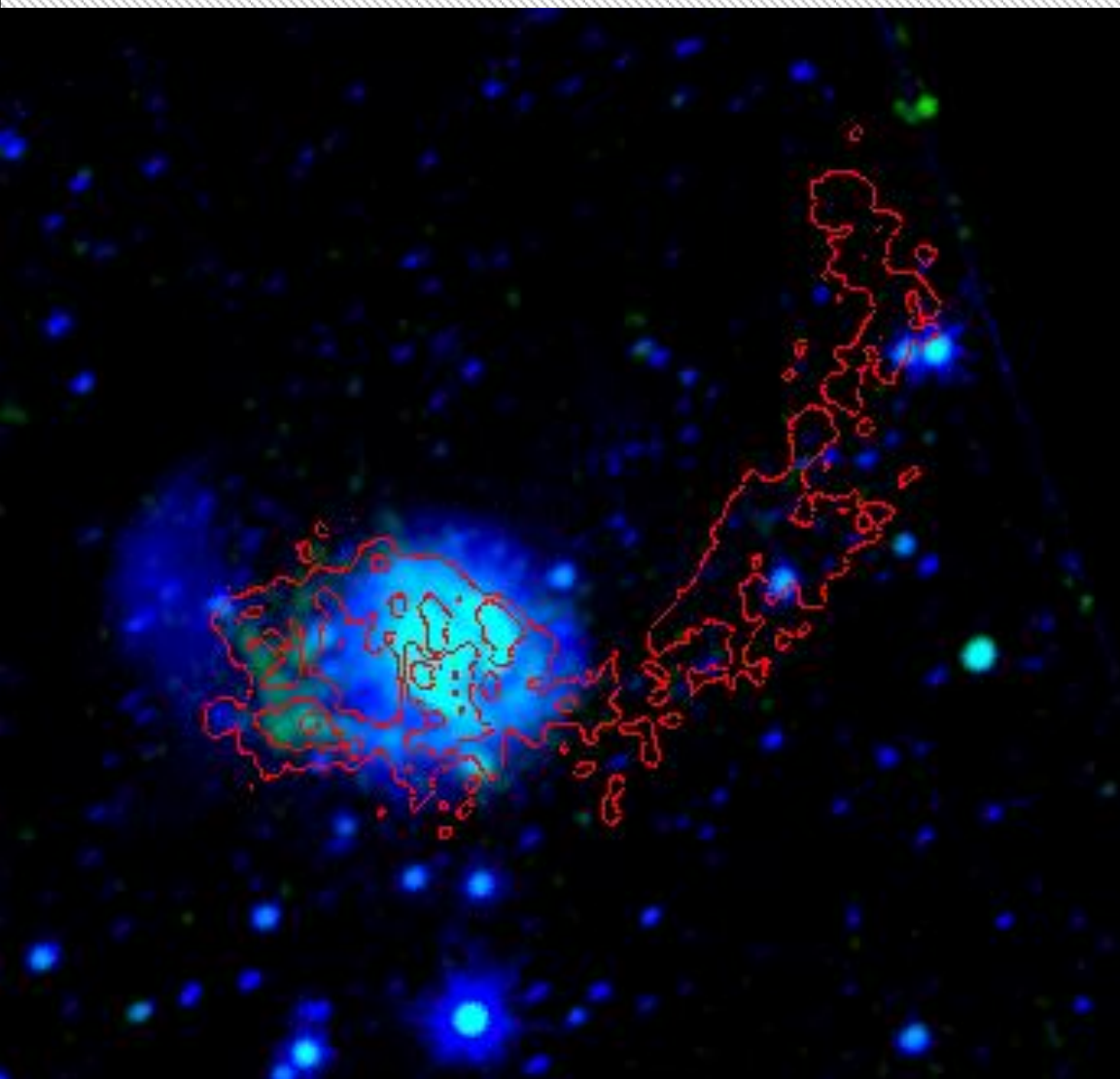


「あかり」IRCによる特異銀河NGC 2782の 近・中間赤外線撮像観測



Tomohiko Nakamura
(University of Tokyo)

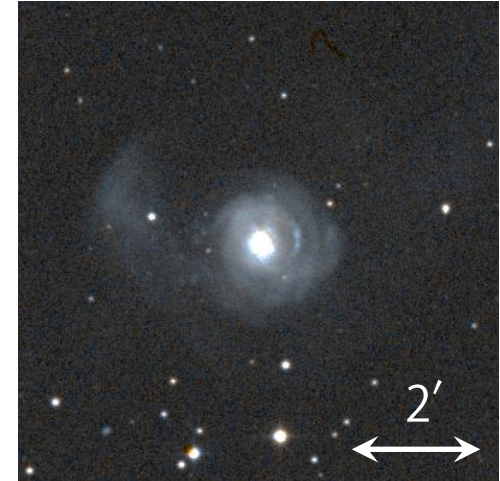
NGC 2782

- Merger remnant (Smith+99)
 - Distance: 34 Mpc
 - mass ratio of 0.25, occurring ~ 200 Myr ago

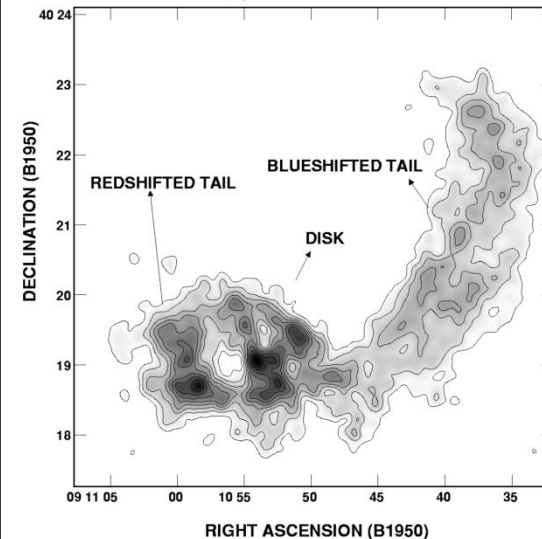
- Eastern side
 - tidal tail formed by a stellar component
 - Dwarf galaxy in formation and Molecular gas

- Western side
 - prominent tidal tail detected in H I
 - No molecular gas

Optical (DSS image)



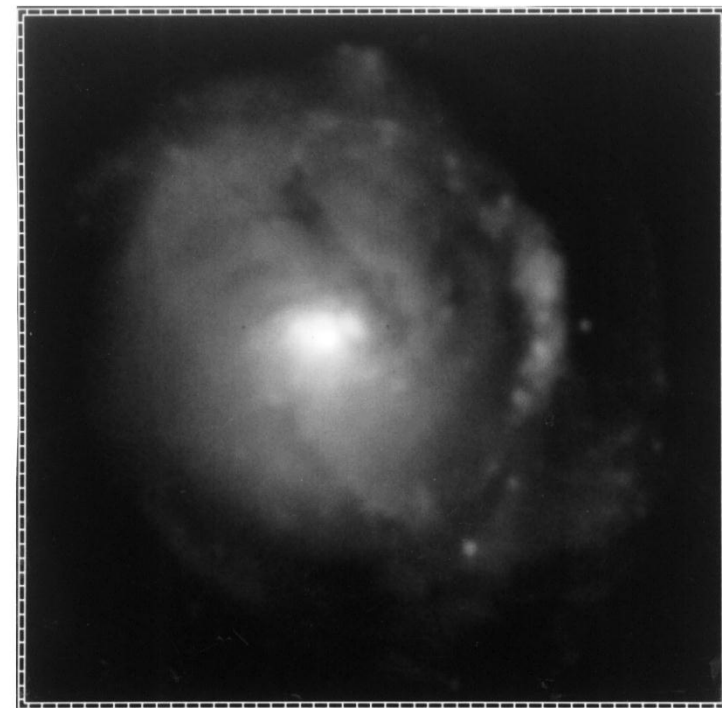
H I 21cm (Jogee+94)



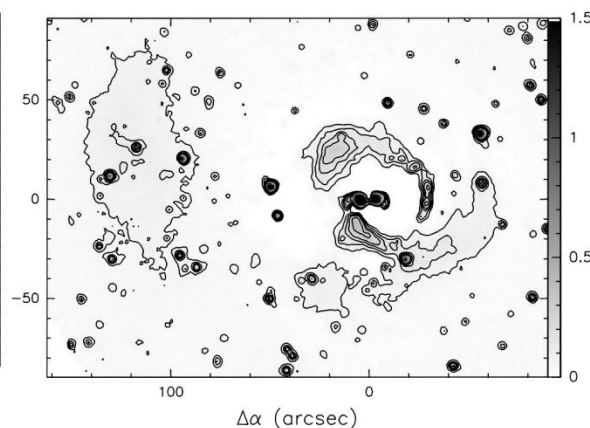
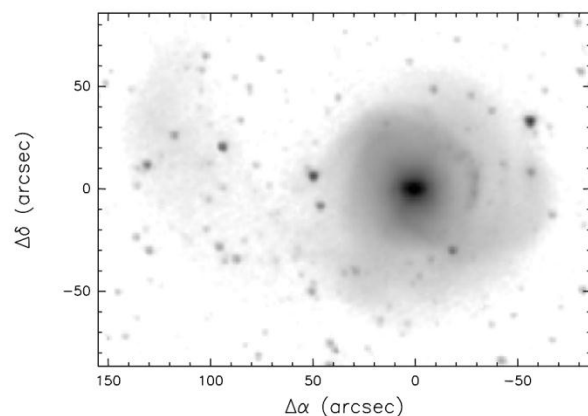
NGC 2782: dust distribution

- Two straight dust lanes
- Massive nuclear starbursts
 - Nuclear bars transport gas inward very efficiently
 - Optically-hidden AGN

Investigate dust distribution with AKARI/IRC



WIYN B-band image
(Jogee+99)



Bulge-to-disk decomposition
(IRAC 3.6 μ m; Hunt+08)

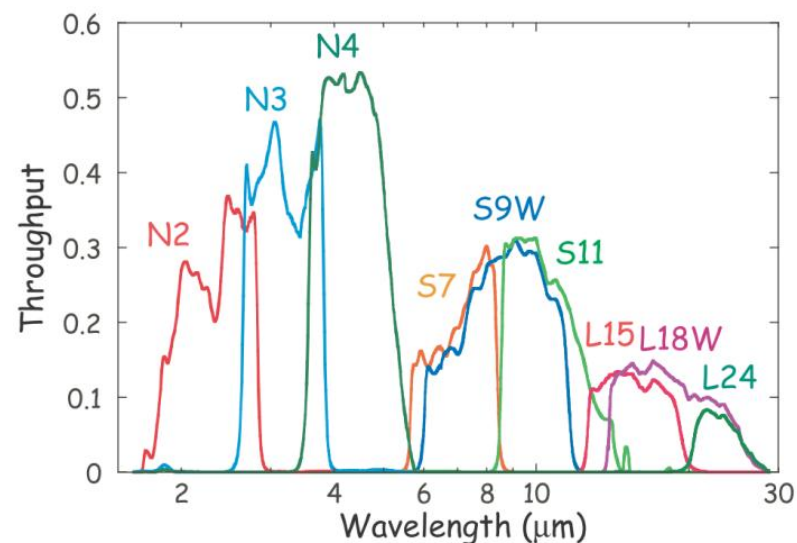
Observation

- AKARI ISMGN Survey
(PI: Kaneda-san)
 - Nearby Galaxies

- InfraRed Camera (IRC)
 - NIR 2 filters / MIR 4 filters

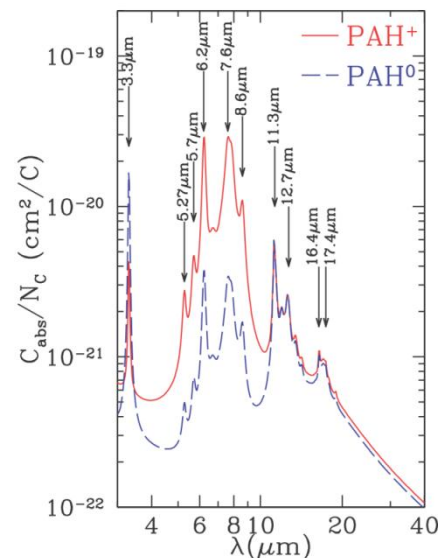
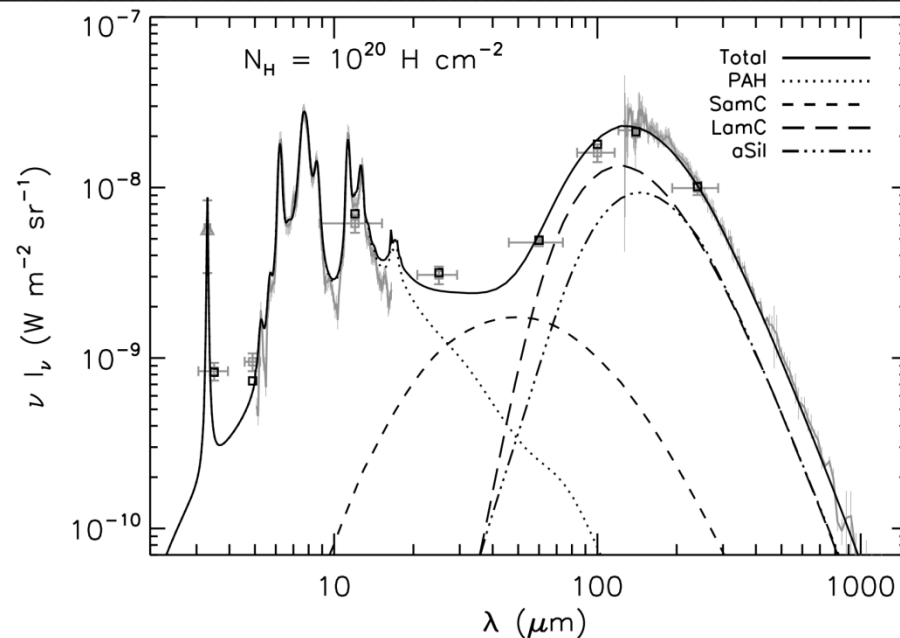


Filters	Obs. date	Frames
N3, N4	2006/10/31	4
S7, S11	2006/10/31	12
L15, L24	2007/04/29	9



Observation

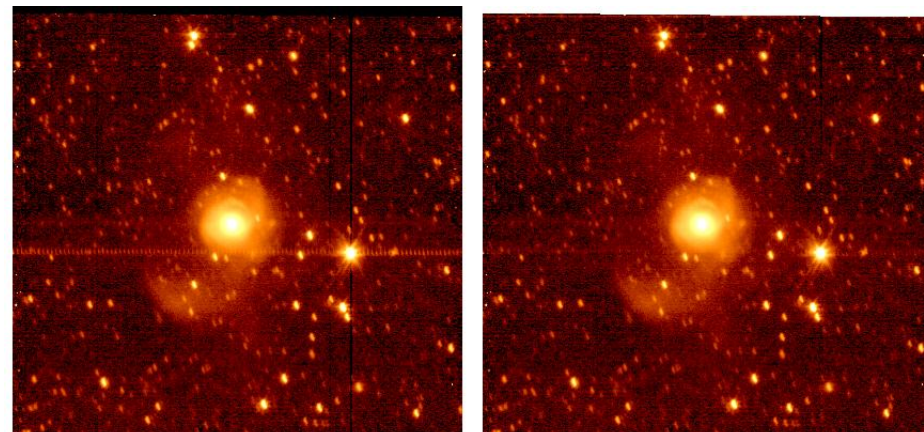
- NIR: stellar photosphere (+ PAH)
- MIR: PAH (Polycyclic Aromatic Hydrocarbon) + small dust grain
 - S7: (ionized) PAH
 - S11: PAH
 - L15: PAH + hot dust
 - L24: warm dust



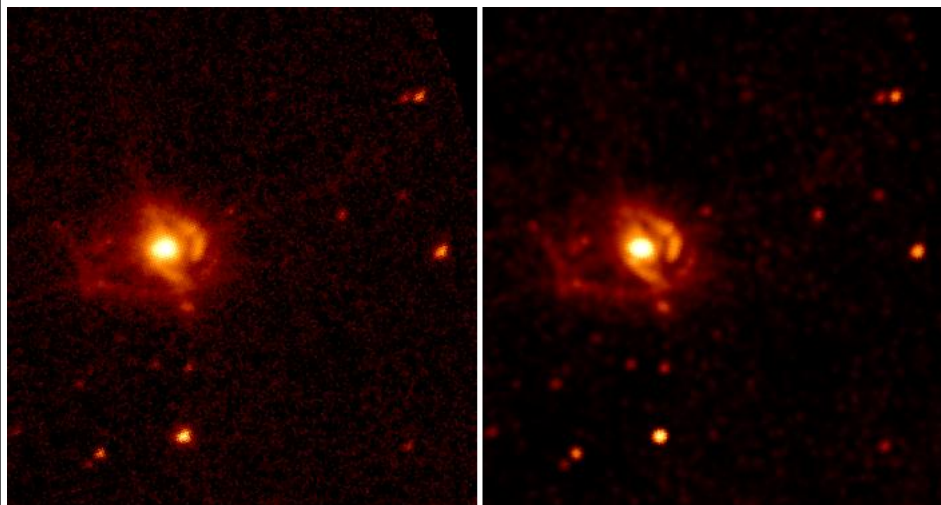
Data Reduction

- IRC imaging pipeline
- NIR Images
 - removed arrays anomalies
- MIR Images
 - WCS added by WISE catalog
 - PSF correction
 - Wavelet-Lucy deconvolution
 - Adjusted FWHM ~ 7 pix
- Flux conversion (Tanabe+08)

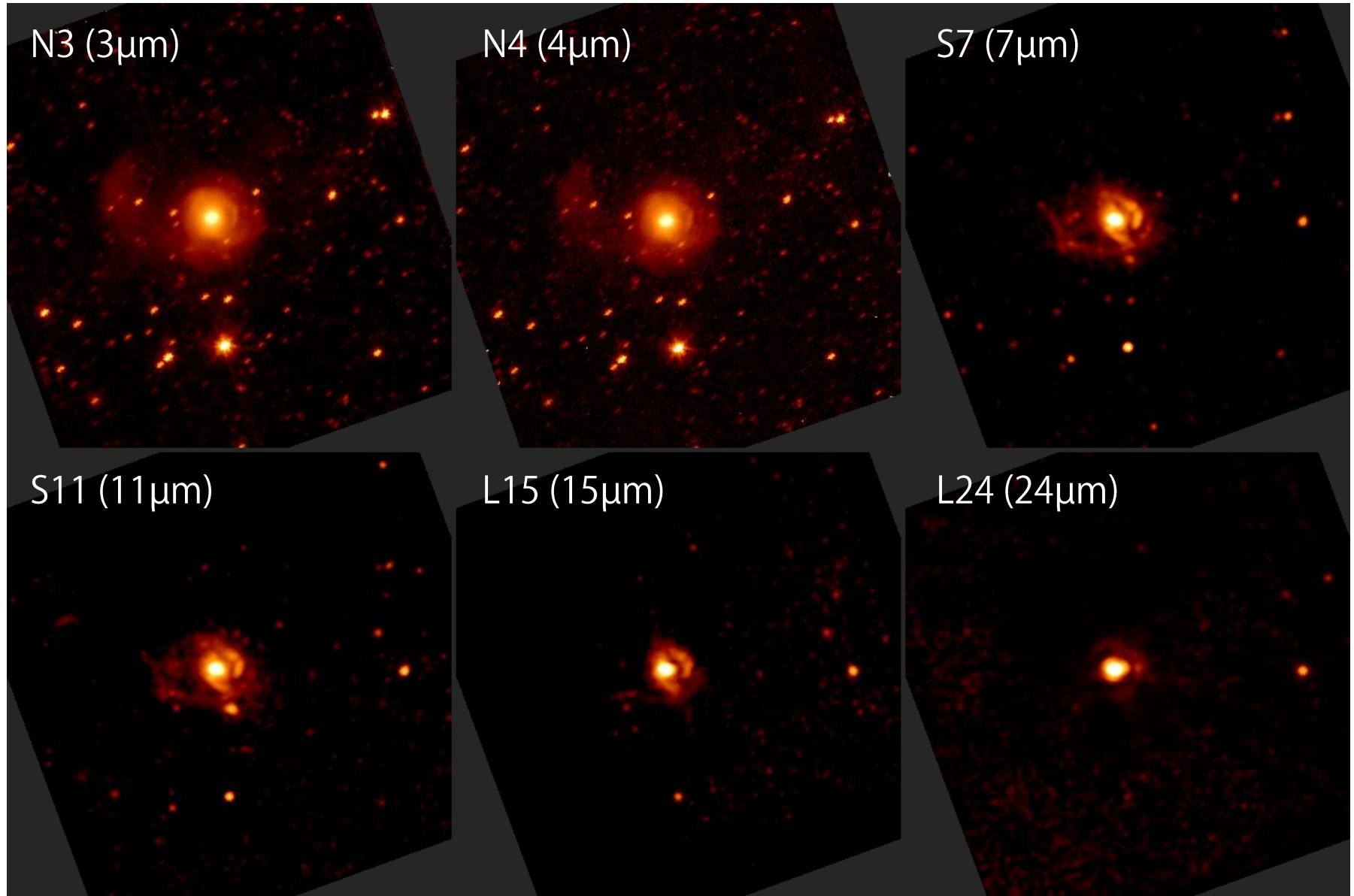
NIR arrays anomalies



PSF correction for MIR images

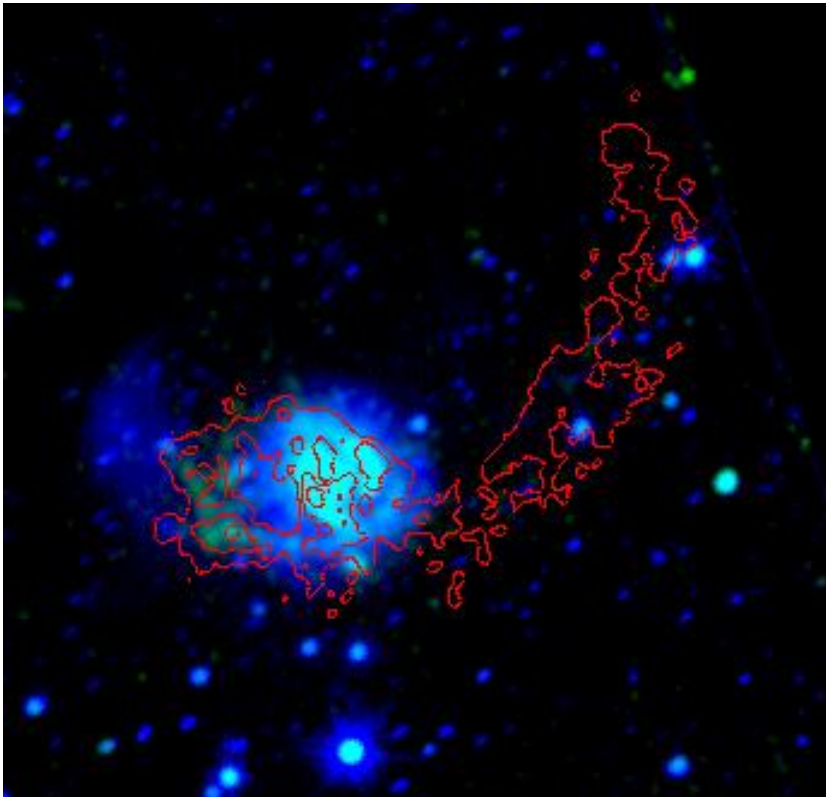


Results

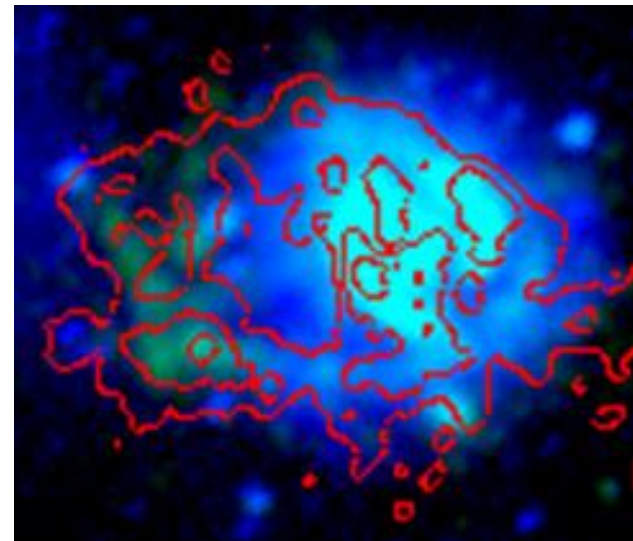


Morphology: PAH component

- Extended to the eastern tail
- Correlated with the dense H I region



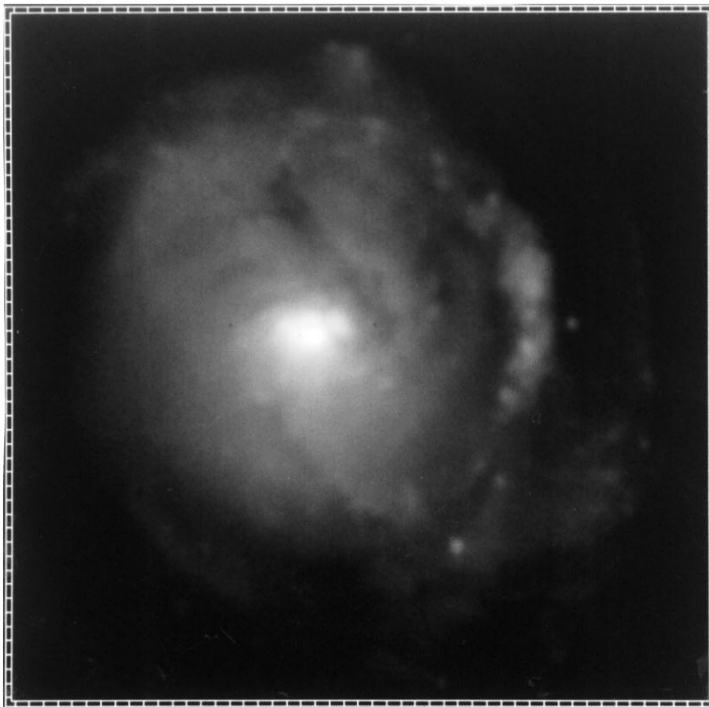
3 μ m (AKARI/IRC N3)
7 μ m (AKARI/IRC S7)
H I 21cm (VLA; Jogee+94)



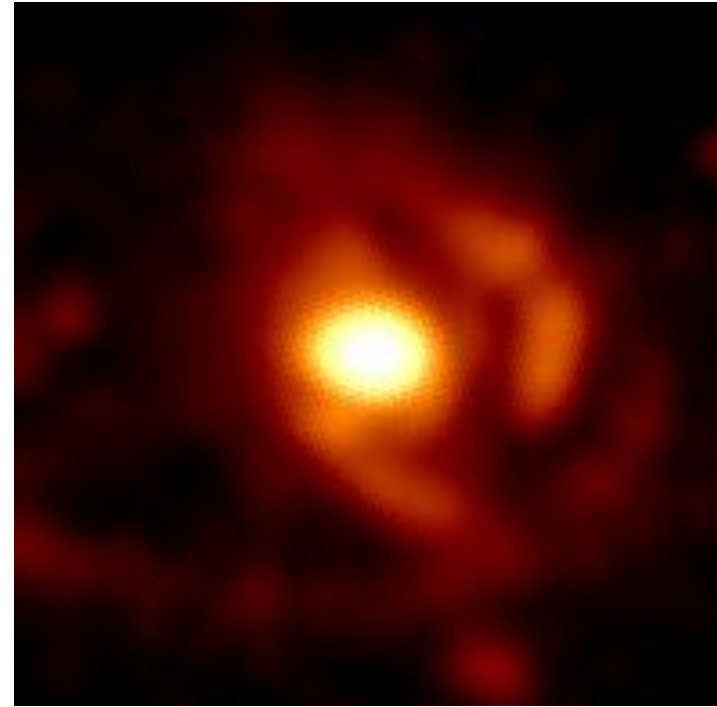
Morphology: dust lanes

- Correlated to PAH and CO distribution (not warm dust)
- Similar results in NGC 4589 (Kaneda+10)
 - The PAHs may be created through grain surface chemistry in the same manner as molecular gas formation

WIYN B-band image (Jogee+99)



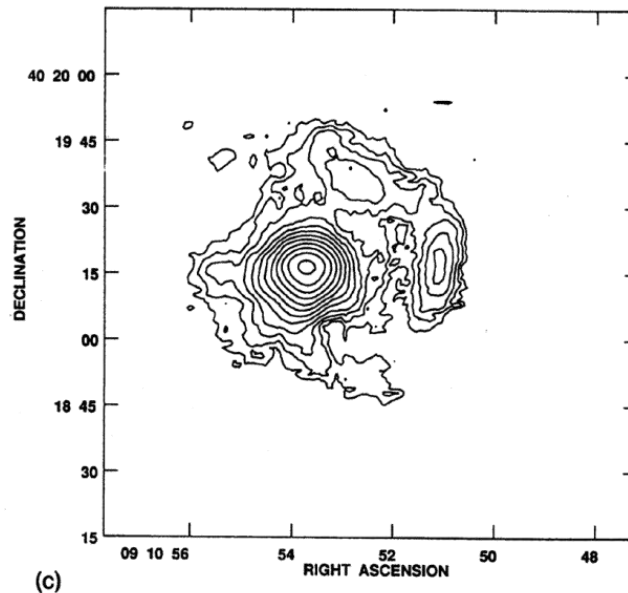
AKARI S7 image



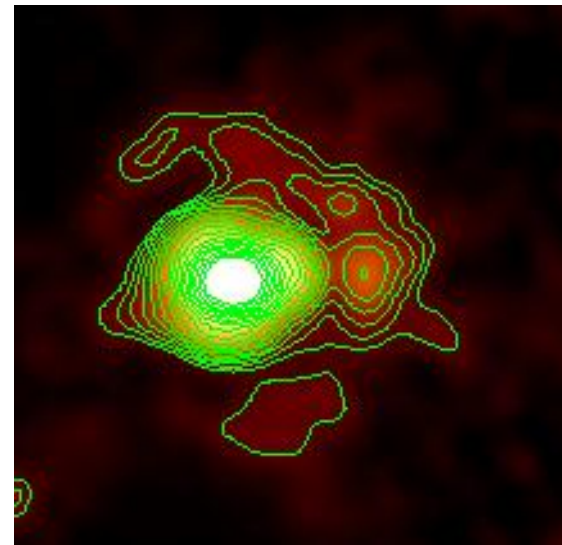
Morphology: warm dust

- Mainly concentrated in the central region
- Same morphology as the $H\alpha$ image
 - Dust heating occurs in hard radiation fields

$H\alpha$ image (Smith+94)



L24 image



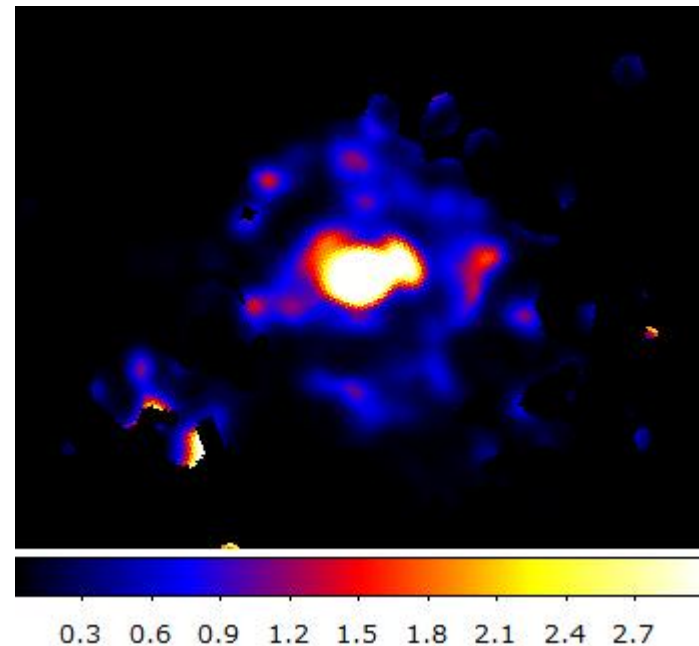
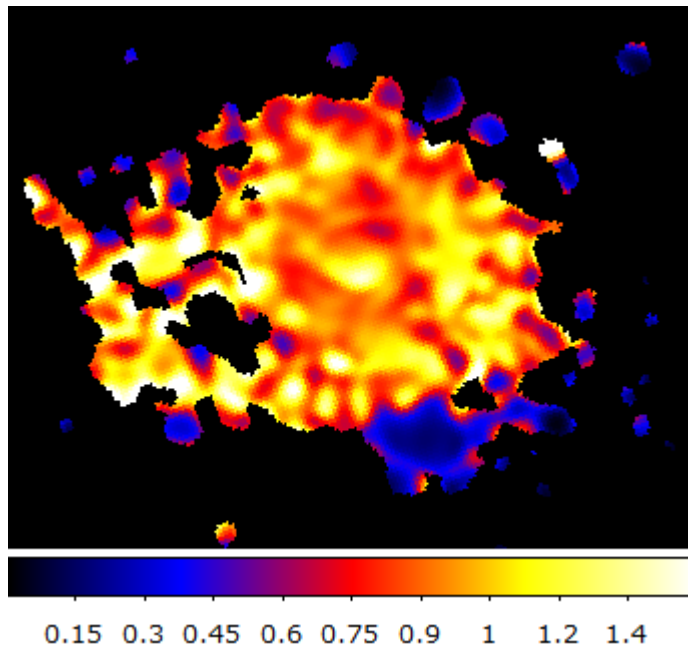
Color Maps

■ S7/S11

- PAH ionization indicator
- No global trend
-> PAH property is uniform

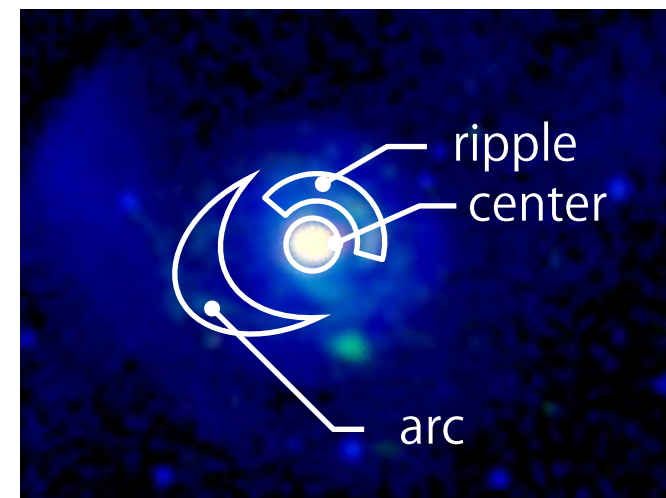
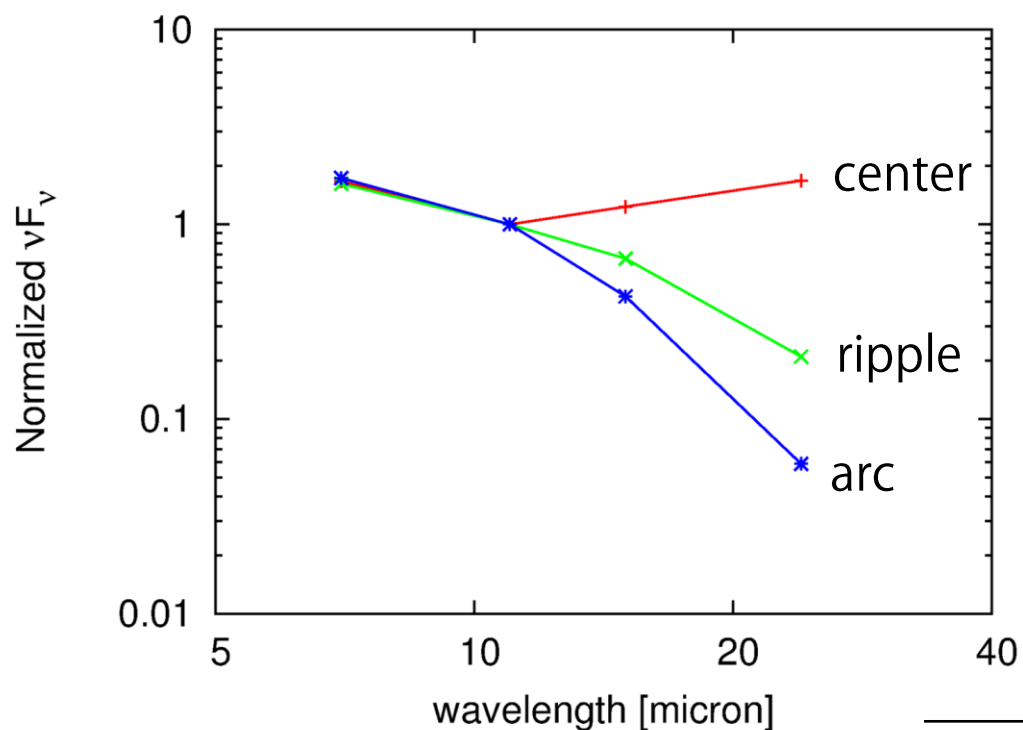
■ L24/S11

- Tracing warm dust
- High value only in the central region



Spectral Energy Distributions

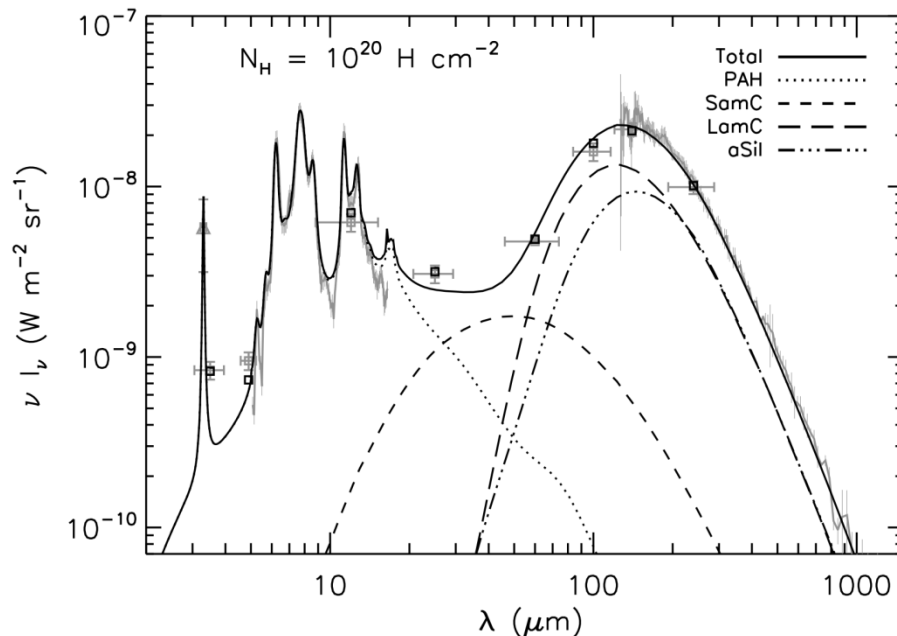
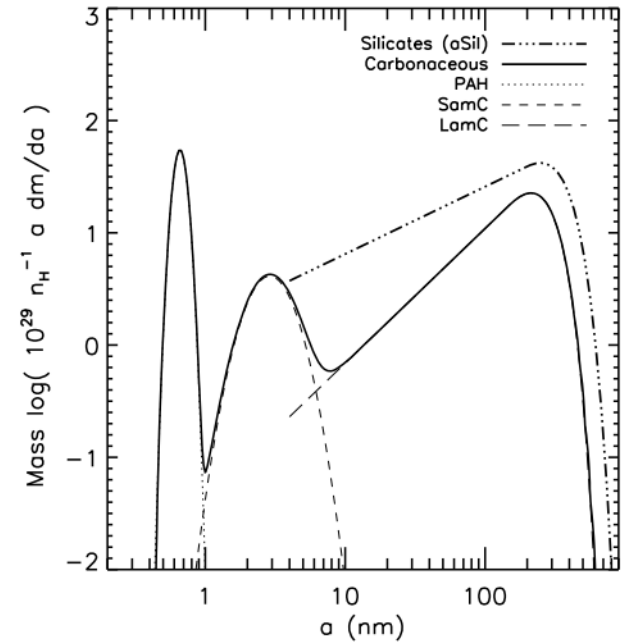
- Selected regions: center/ripple/arc



	S7	S11	L15	L24
center	390 ± 1	368 ± 1	619 ± 3	1349 ± 5
ripple	33.9 ± 1.3	33.0 ± 1.5	30.0 ± 3.4	15.0 ± 5.9
arc	11.1 ± 1.6	10.1 ± 1.9	5.9 ± 4.2	1.3 ± 7.4

Dust Model

- DUSTEM code (Compiègne+10)
- DHGL (Diffuse interstellar medium at high-galactic latitude) model
 - PAH (polycyclic aromatic hydrocarbons)
 - Amorphous carbon (small, large)
 - Amorphous silicates



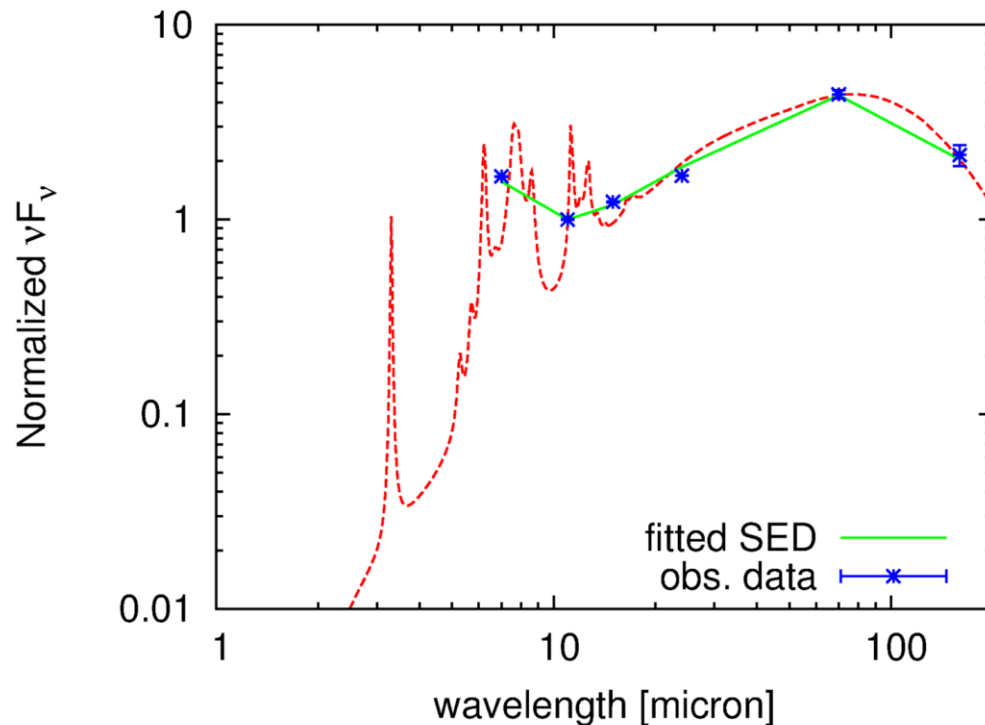
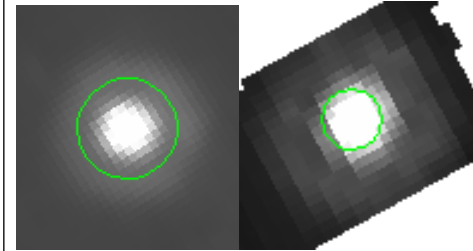
	σ	a_0 (nm)	Y (M/M_H)	$f_{M_{tot}}$		
PAH	0.1	0.64	7.8×10^{-4}	7.7%		
SamC	0.35	2.0	1.65×10^{-4}	1.6%		
	α	a_{min} (nm)	a_c, a_t (nm)	γ	Y (M/M_H)	$f_{M_{tot}}$
LamC	-2.8	4.0	150	2.0	1.45×10^{-3}	14.2%
aSil	-3.4	4.0	200	2.0	7.8×10^{-3}	76.5%
TOTAL					10.2×10^{-3}	

(Compiègne+10)

SED fitting: central region

- Variables: mass fraction of PAH and small amorphous carbon, interstellar radiation field
- Including Spitzer/MIPS photometric data
 - Assuming all emission from the central region

Spitzer/MIPS
Ch2(70 μ m) Ch3(160 μ m)

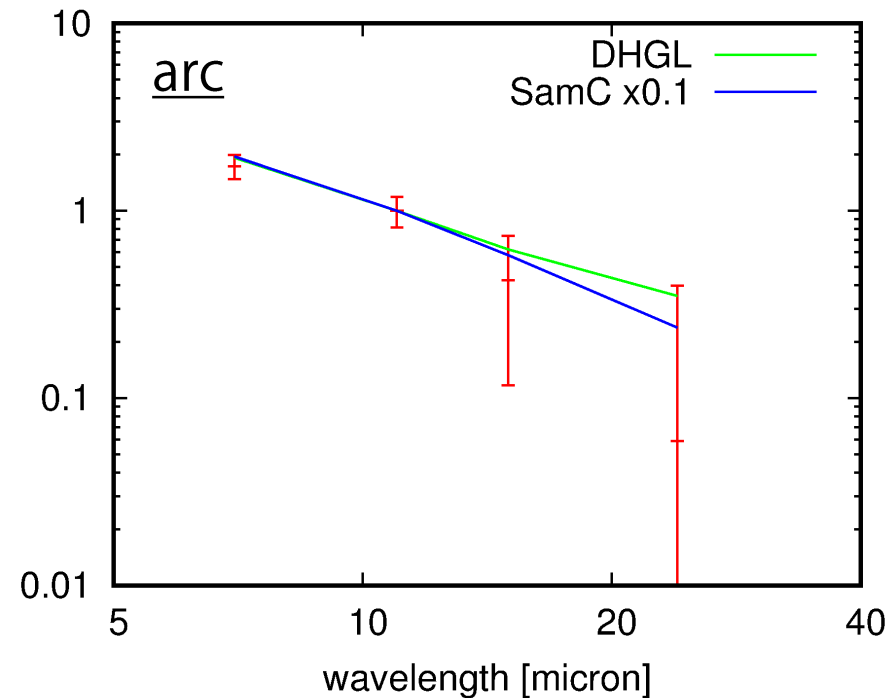
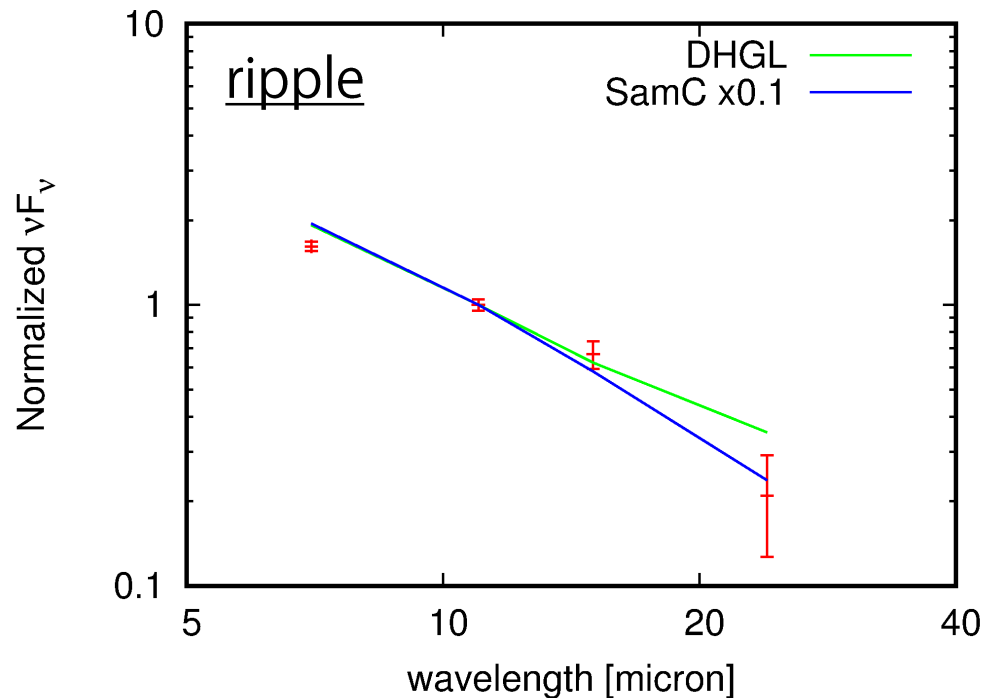


High small dust fraction
-> dust destruction?

	NGC 2782	DHGL
PAH (M/M _d)	6.2 %	7.7 %
SamC (M/M _d)	21 %	1.6 %
ISRF	5.0	1.0

SED fitting: ripple, arc

- Fraction of small particle is substantially low
- Dust particles except PAHs may have been stripped?



Summary

- NGC 2782 observations with AKARI/IRC
- Newly found PAH distributions which correlated to dense H I gas region
- S7/S11 map indicates that the PAH property is uniform in the galaxy
- Small particle fraction is high in the central region
 - Dust destruction has occurred?
- Whereas small particle fraction is low in the “arc” region
 - Dust particles except PAHs have been stripped?
- Future Works
 - Spitzer/MIPS imaging data