



# AKARI Mid-Infrared All-Sky Survey: A New PAH Emission Map

A full-sky map of the Milky Way galaxy showing polycyclic aromatic hydrocarbon (PAH) emission. The map is presented in a Mollweide projection, with the galactic plane running horizontally across the center. The emission is visualized using a color scale where blue represents lower intensity and yellow/green represents higher intensity. A prominent, bright yellow-green band follows the galactic plane, indicating high concentrations of PAHs. Numerous smaller, discrete yellow-green spots are scattered throughout the map, representing individual star-forming regions or other localized sources of PAH emission. The background of the map is a deep blue, indicating low emission levels.

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and AKARI/IRC team



# AKARI Mission



JAXA + ESA , UK, NL, & Korea collaboration

70cm SiC mirror  
180L LHe + cryocoolers  
on a 700km sun-synchronous  
polar orbit similar to IRAS  
18 month cold mission  
(2006.2-2007.8)

All-sky survey at 9, 18, 65, 90, 140,  
& 160 $\mu$ m to surpass IRAS

+

Pointing observations  
of imaging and spectroscopy in  
2-180 $\mu$ m

Warm mission  
(NIR: 2-5 $\mu$ m) until 2011 May

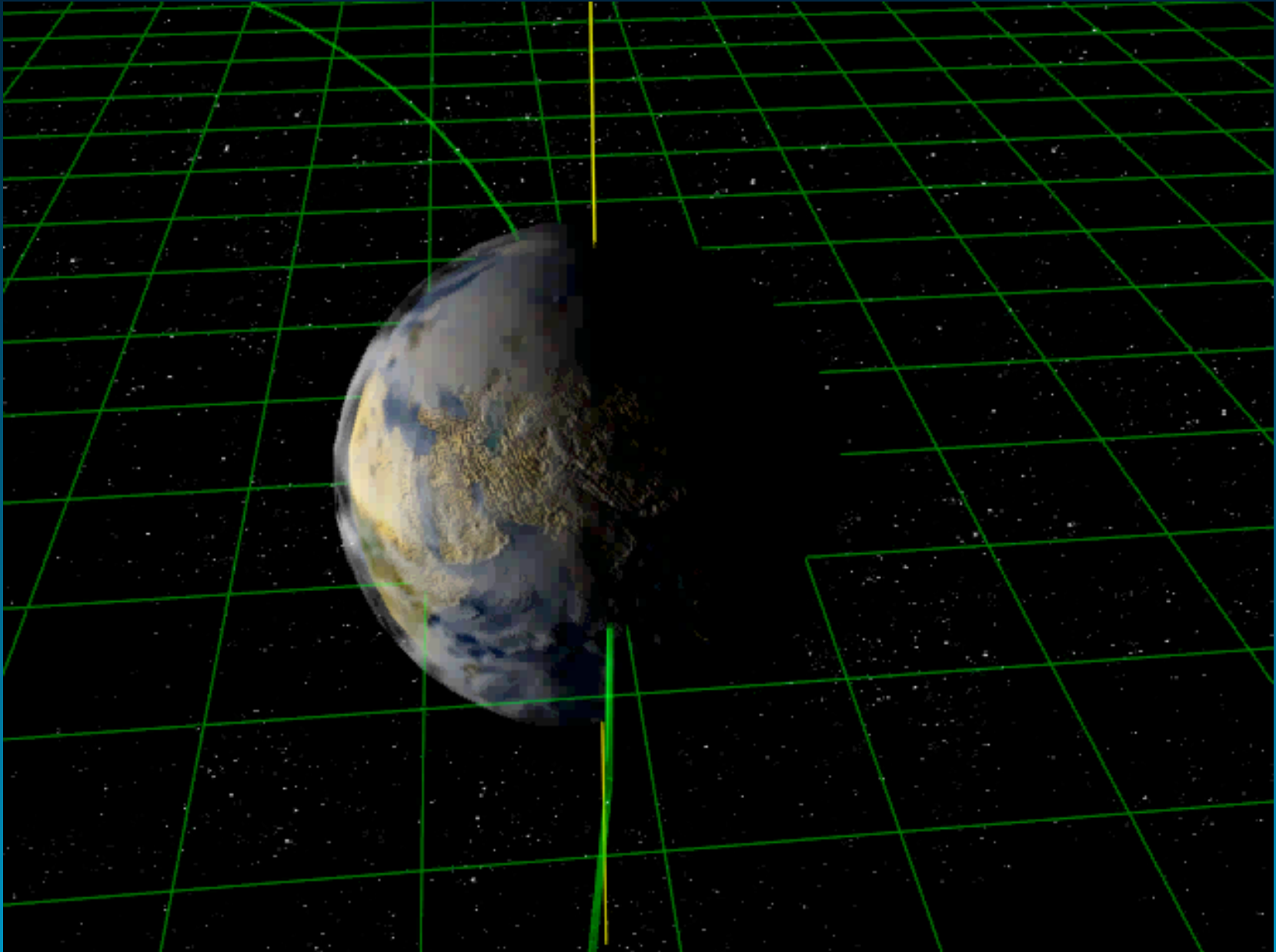




# All-sky observations of AKARI

Flying along the day-night line and observing the sky  
in the direction opposite to the earth center

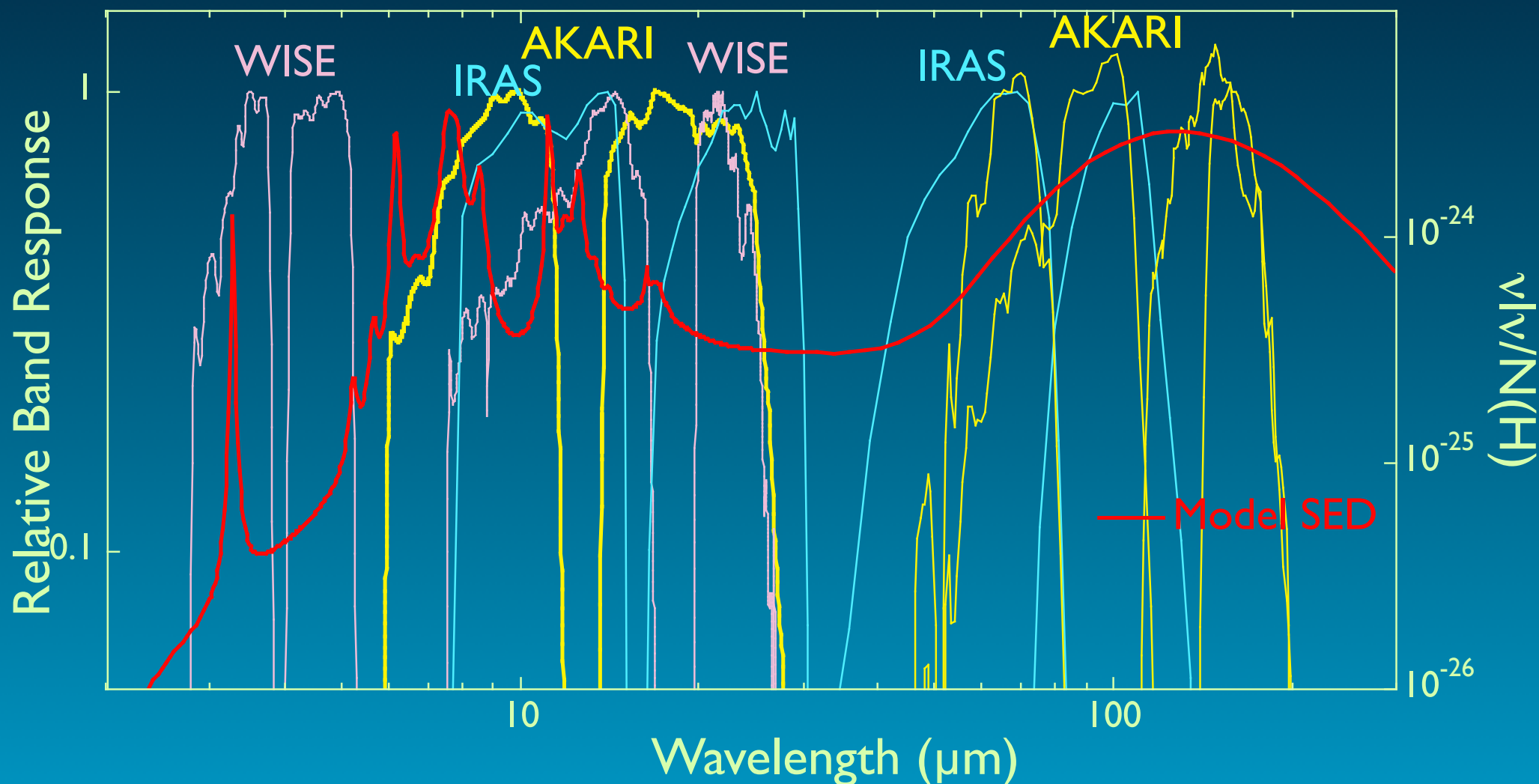
Sun



# Filter response

AKARI 9 $\mu$ m covers major PAH bands efficiently  
AKARI FIS bands have 4 photometric points and cover  $\lambda > 100\mu$ m

models from DUSTEM (<http://www.ias.u-psud.fr/DUSTEM/>)







# FIS all-sky maps

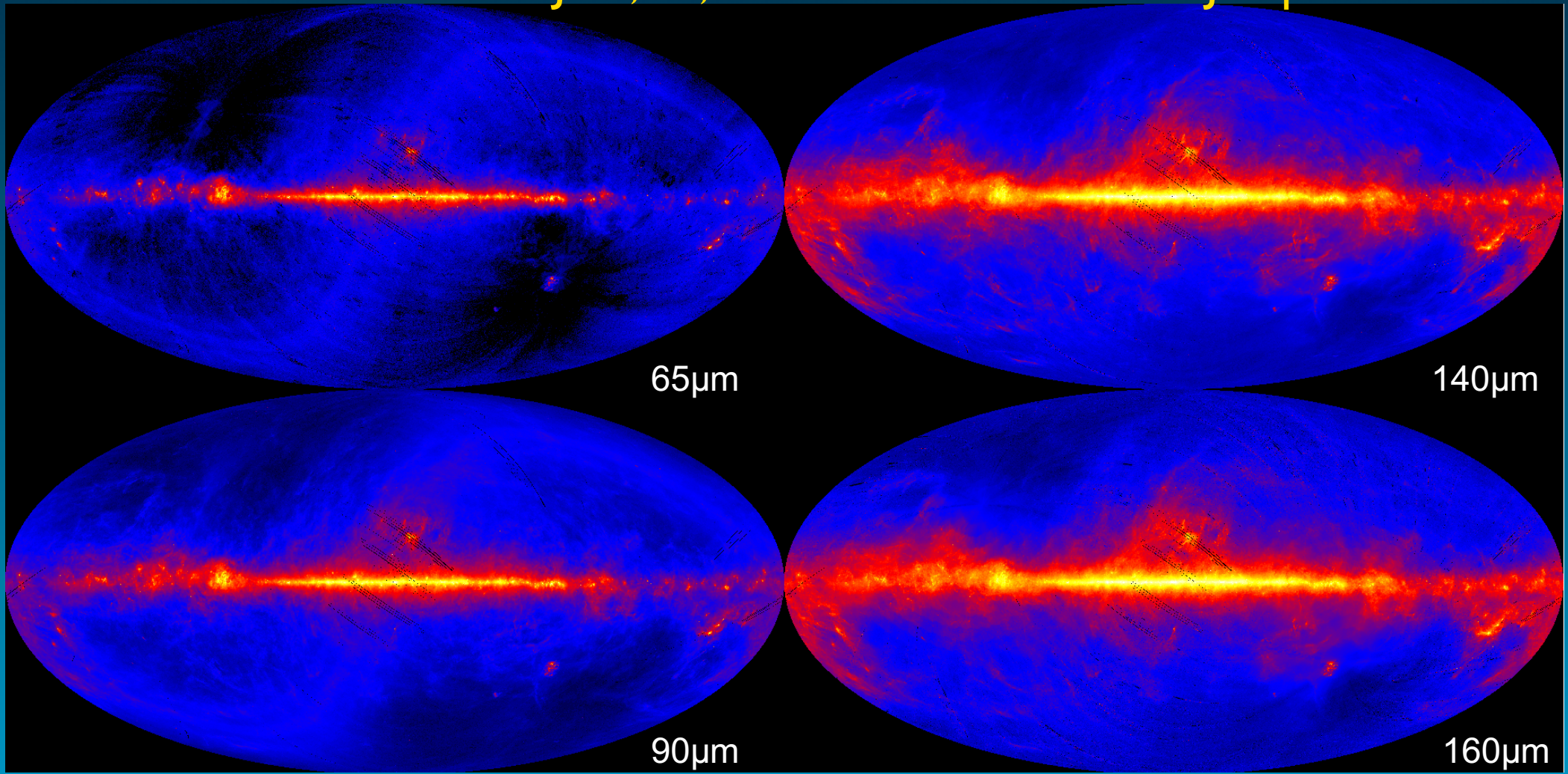
Maps at 65, 90, 140, and 160 $\mu$ m

1'-1.5' resolution & smooth zodiacal light subtracted

Released to the public 2014 December

<http://www.ir.isas.jaxa.jp/AKARI/Archive/>

Doi et al. 2015 PASJ 67, 50; Ootsubo et al. 2016 PASJ in press



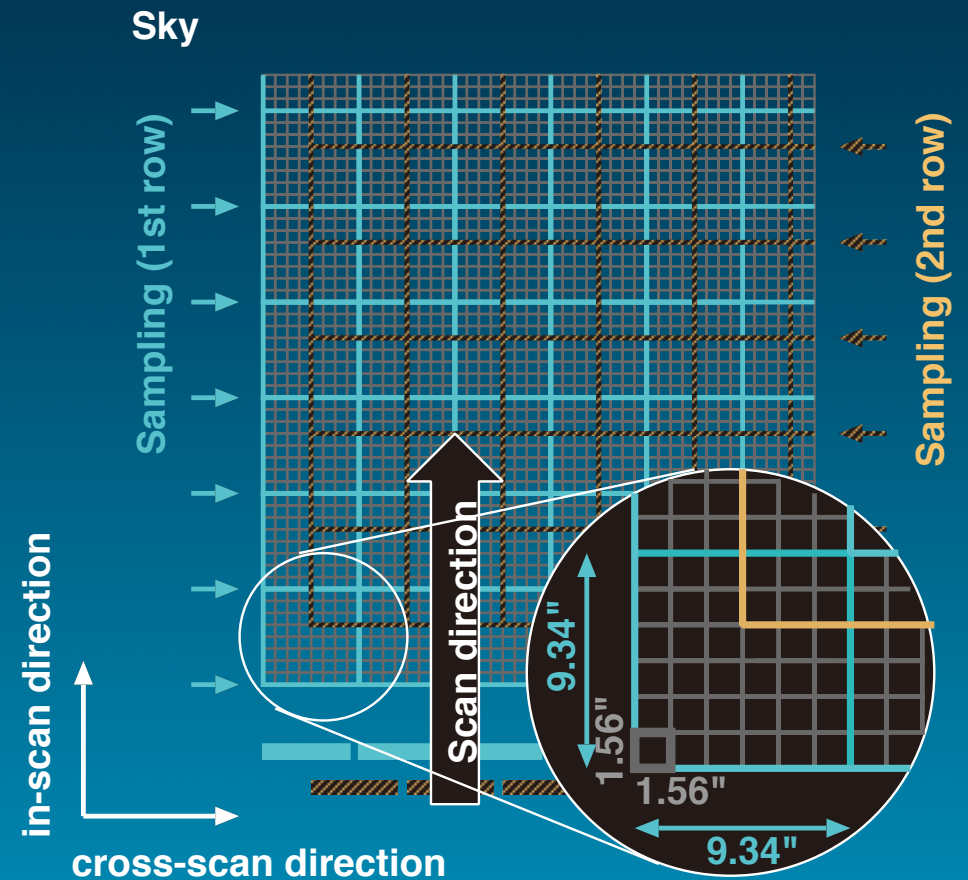
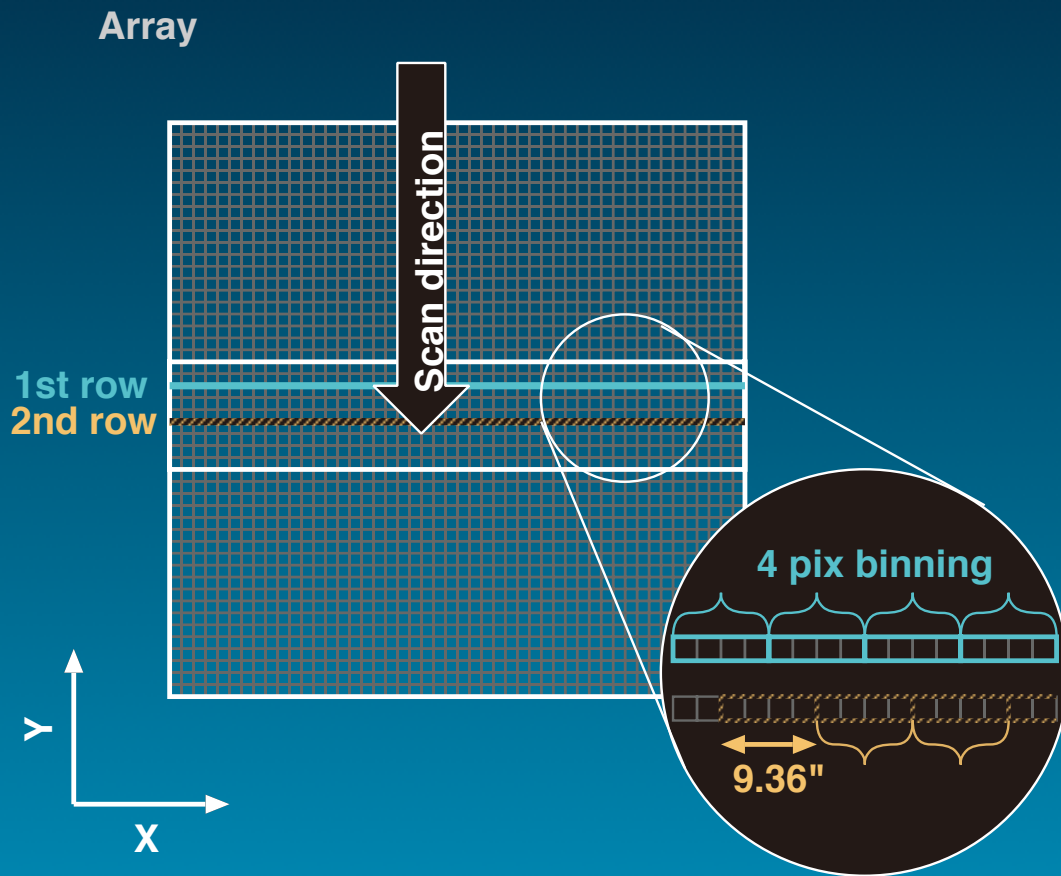
# IRC all-sky observations

Ishihara+ 2006 PASP 118, 324; 2010 A&A, 514, 1

Only two rows of the detector array were read with 2-pixel shift

Combined 4 pixel data to reduce the data production rate

1 pix =  $9.36'' \times 9.36''$ , but information of  $4.86''$  may be recoverable



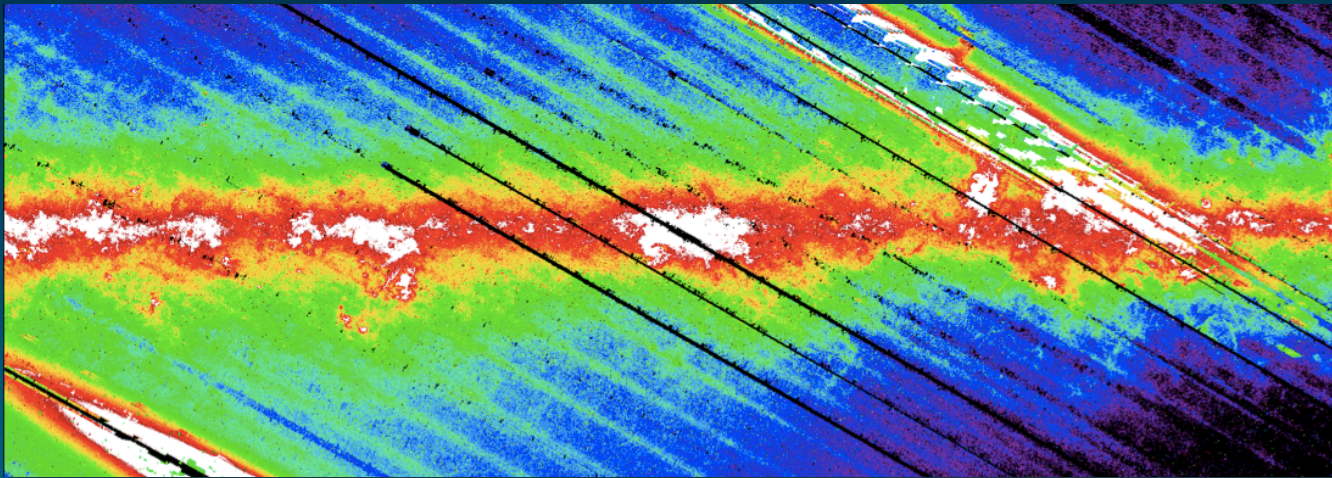




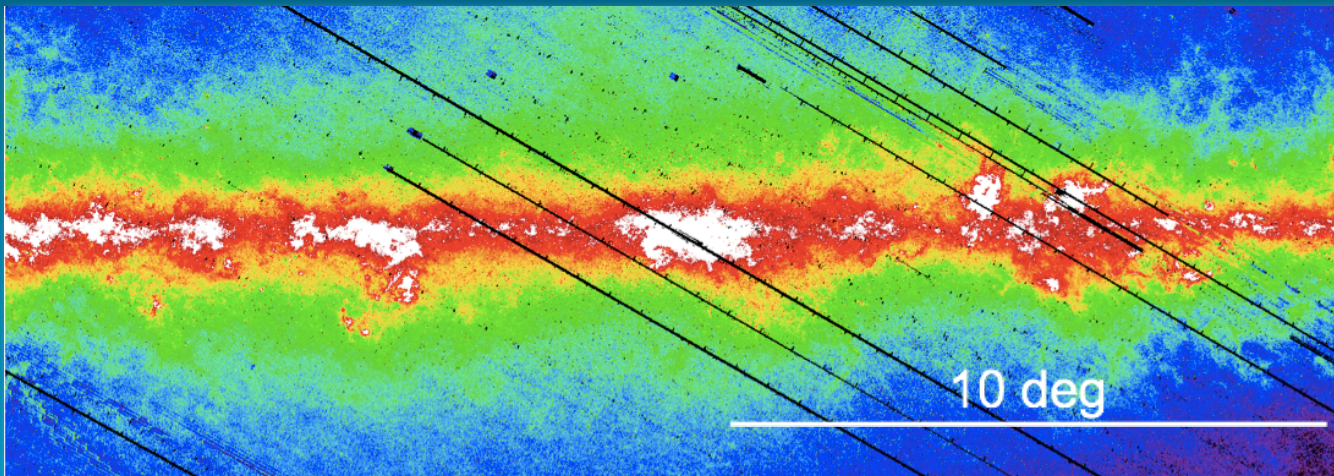
# Revised IRC all-sky survey maps



Correction of cosmic-ray effects  
Scattered light correction/rejection  
Reset anomaly correction



revised process

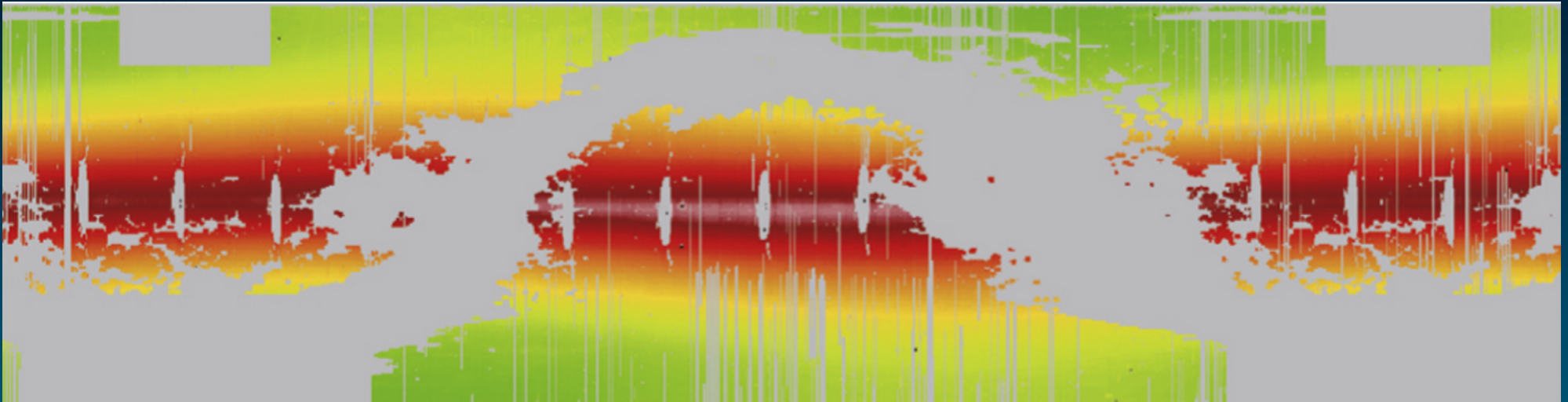




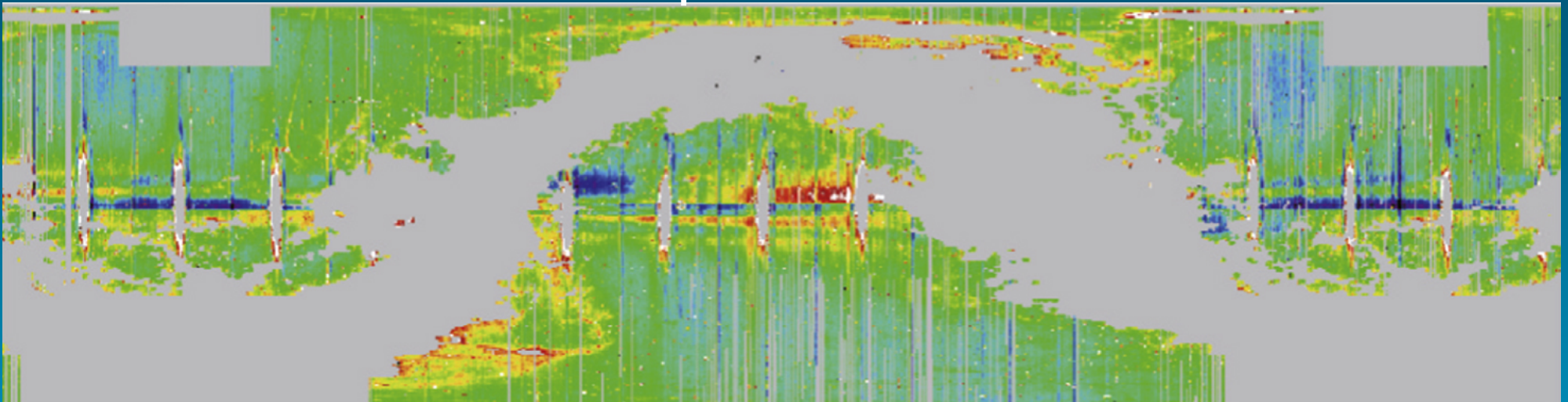
# Zodiacal light subtraction

Kondo et al. 2016 AJ 151 71

9 $\mu$ m original data



After subtraction of improved zodiacal model emission



0

200

400

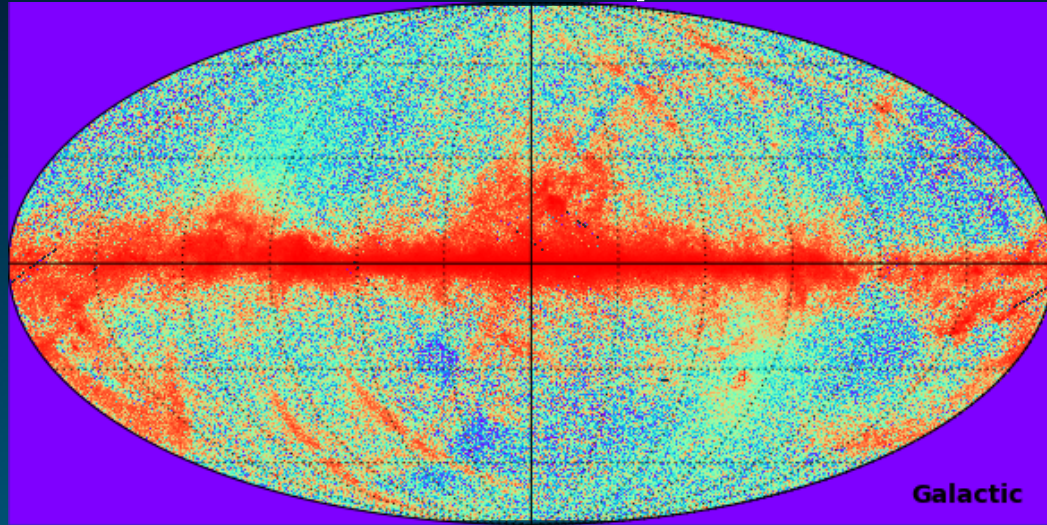
JD - 2006 April 24



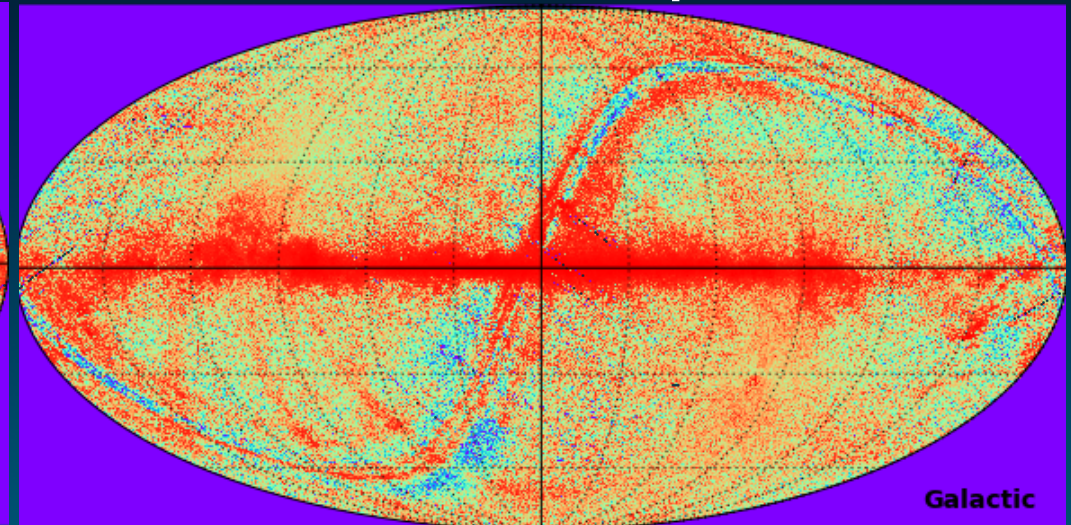


# Mid-IR all-sky maps (zodi-subtracted)

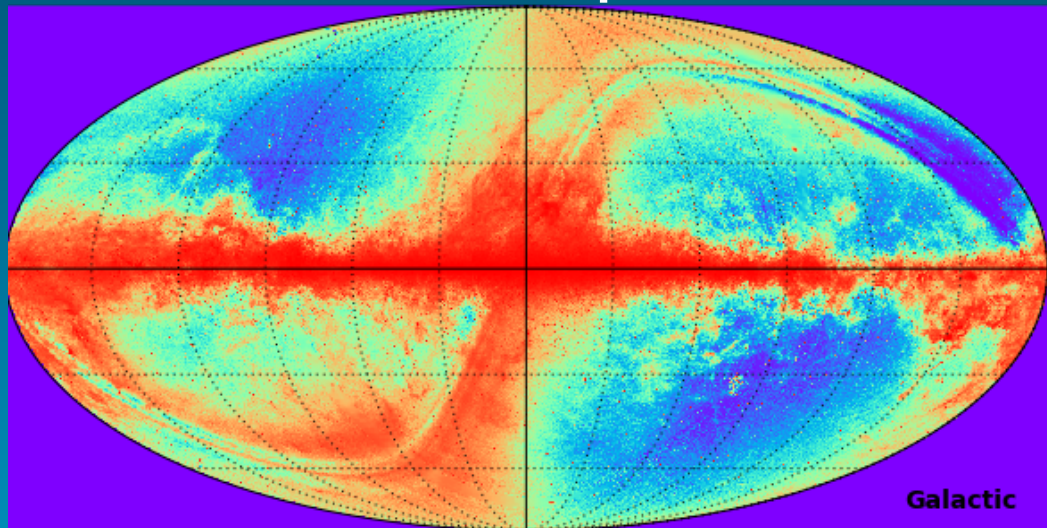
AKARI 9 $\mu$ m



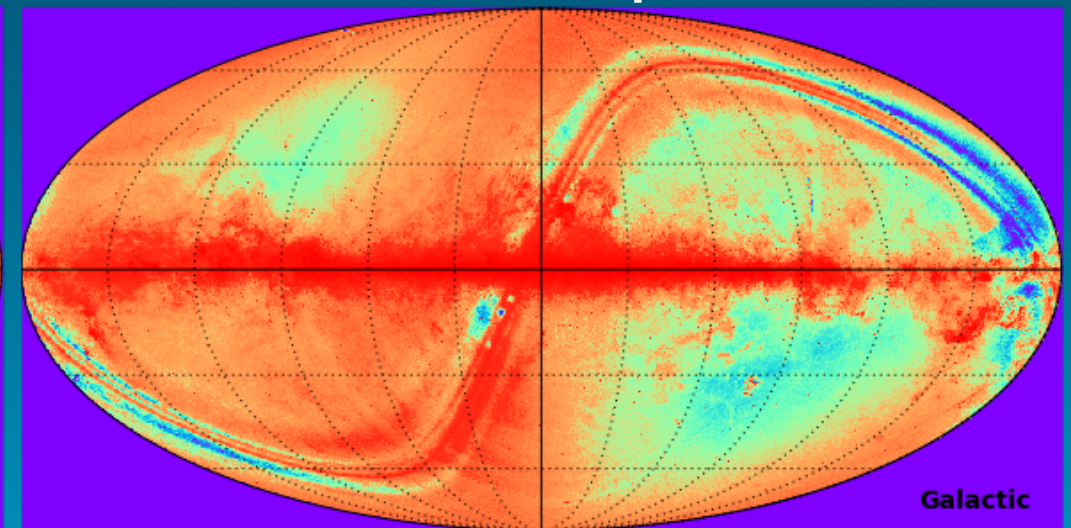
AKARI 18 $\mu$ m



IRAS 12 $\mu$ m



IRAS 25 $\mu$ m



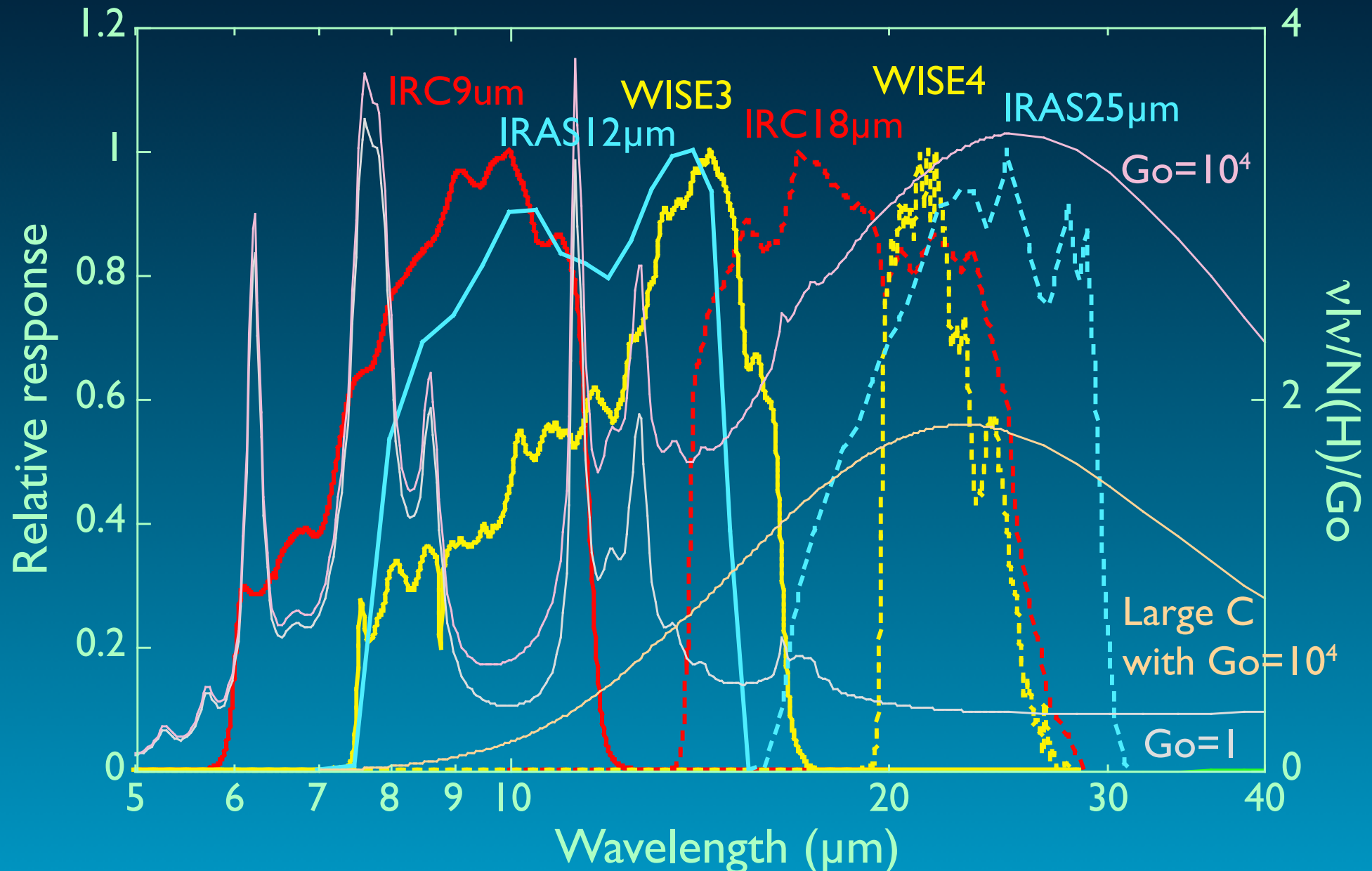
Ishihara+ in prep.





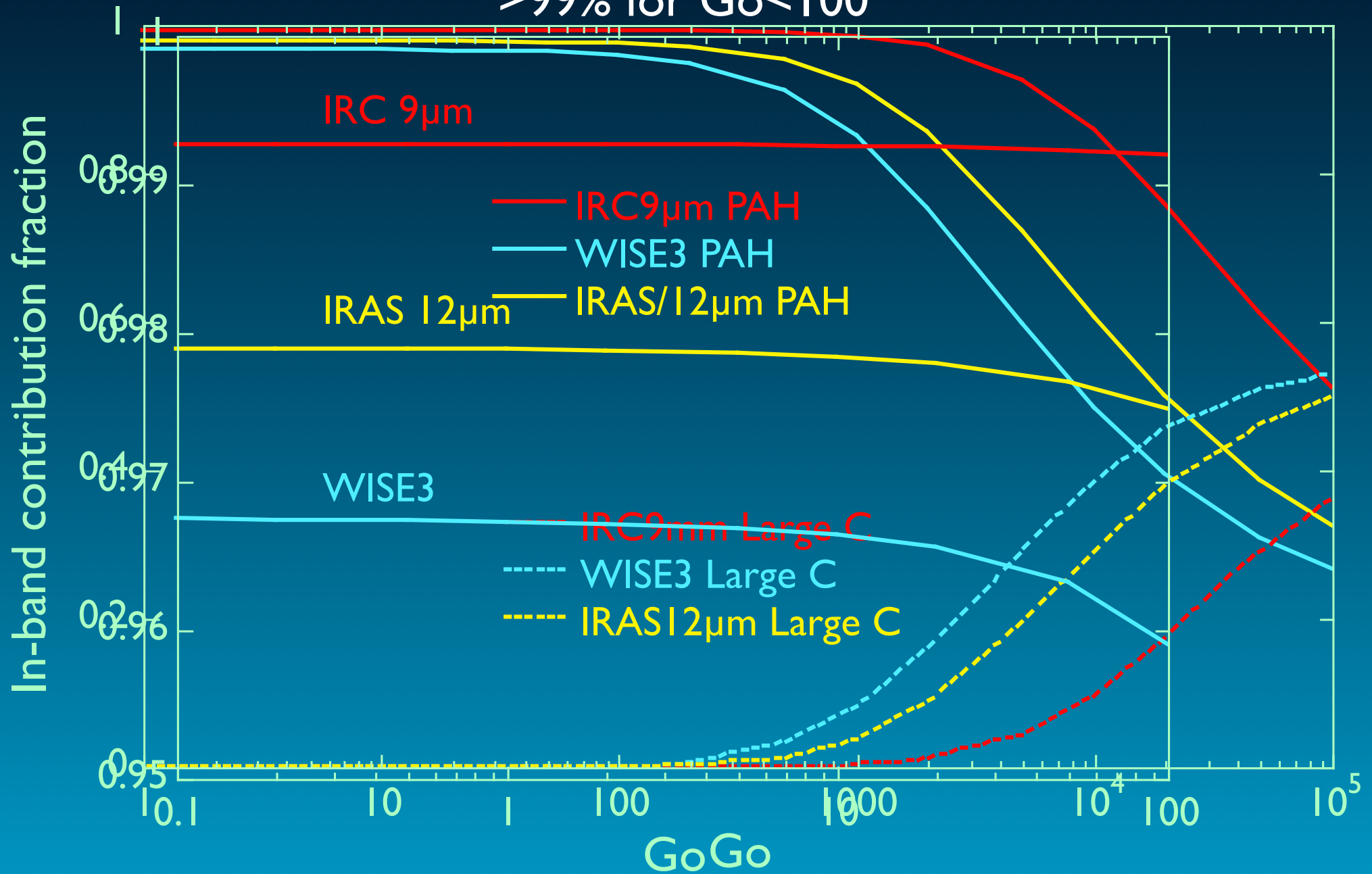
# Band response of MIR surveys

IRC9 $\mu$ m collects most PAH emission incl. 6.2 & 7.7 $\mu$ m  
and is less effected thermal emission from large C at higher Go



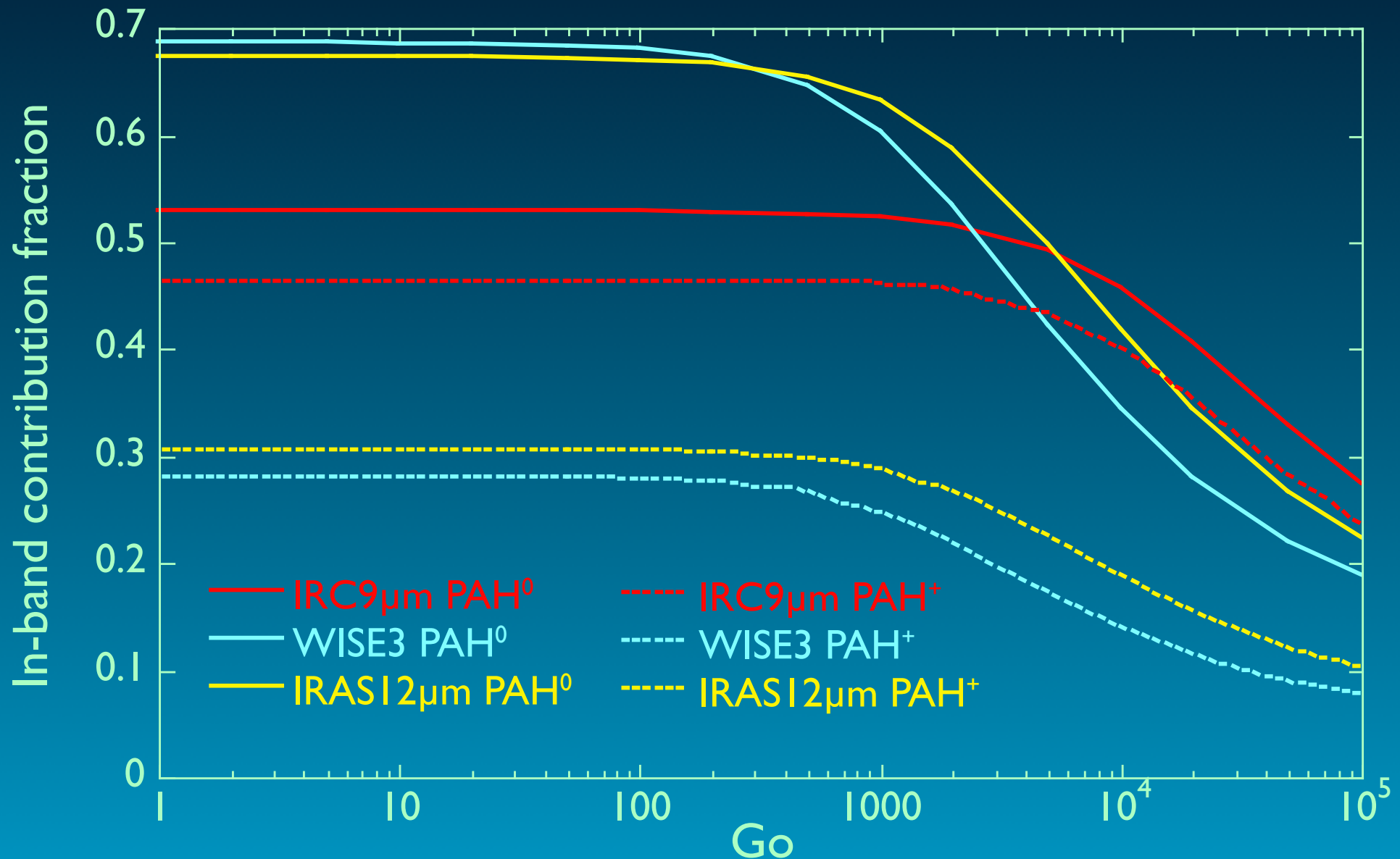
# PAH contribution

IRC9 $\mu$ m band traces PAH emission (>90%) for  $Go < 10^4$   
>99% for  $Go < 100$



# PAH<sup>0</sup> and PAH<sup>+</sup>

IRC9 $\mu$ m has equal contributions from neutral and ionized PAH  
Neutral PAH contribution dominates in WISE 3 and IRAS 12 $\mu$ m







# Summary

IRC 9 $\mu$ m data provides a new PAH map

IRC 9 $\mu$ m band collect most of major PAH emission  
(6.2, 7.7, 8.6, and 11.3 $\mu$ m bands)


>99% of IRC 9 $\mu$ m band is contributed by PAH emission for  
 $G_0 < 100$  and >90% for  $G_0 < 10^4$

Neutral and ionized PAH have equal contributions

Less affected by small C and thermal emission of large dust

Revised IRC all-sky maps internally being reviewed  
released to the public soon (<1 yr)





Thank you for your attention