

AKARI All-sky Survey Catalogues

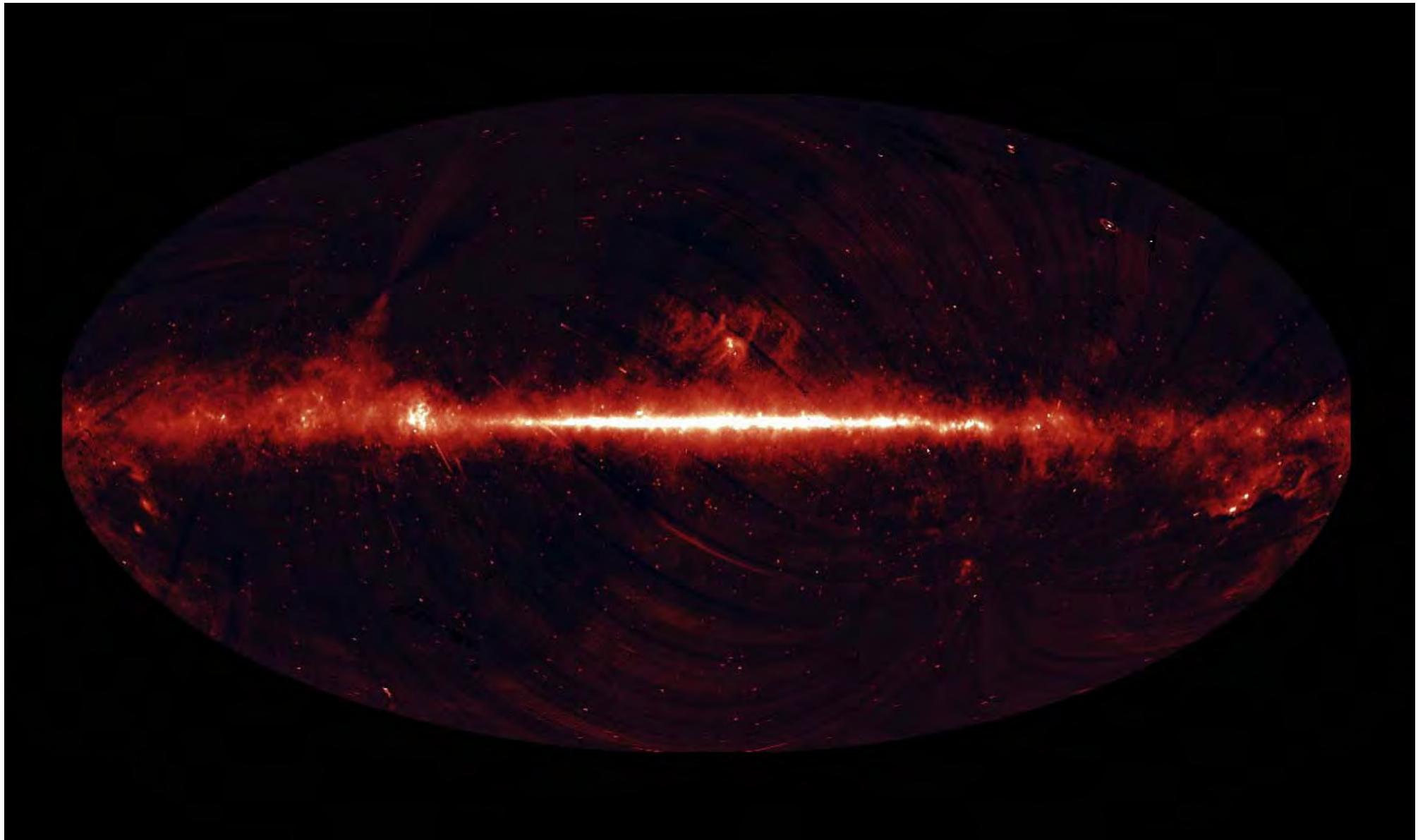
Alberto Salama & Angelo Cassatella

Outline

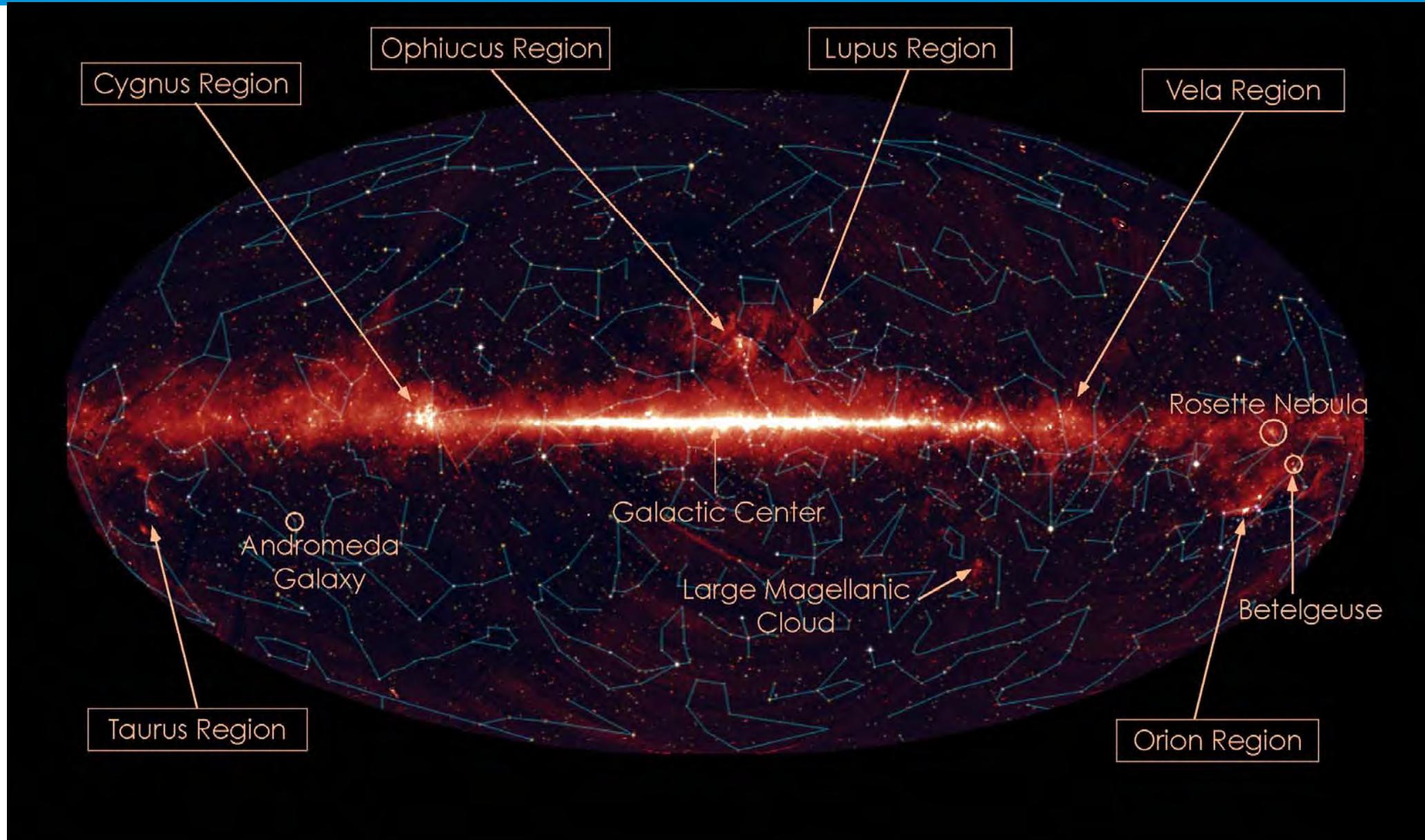


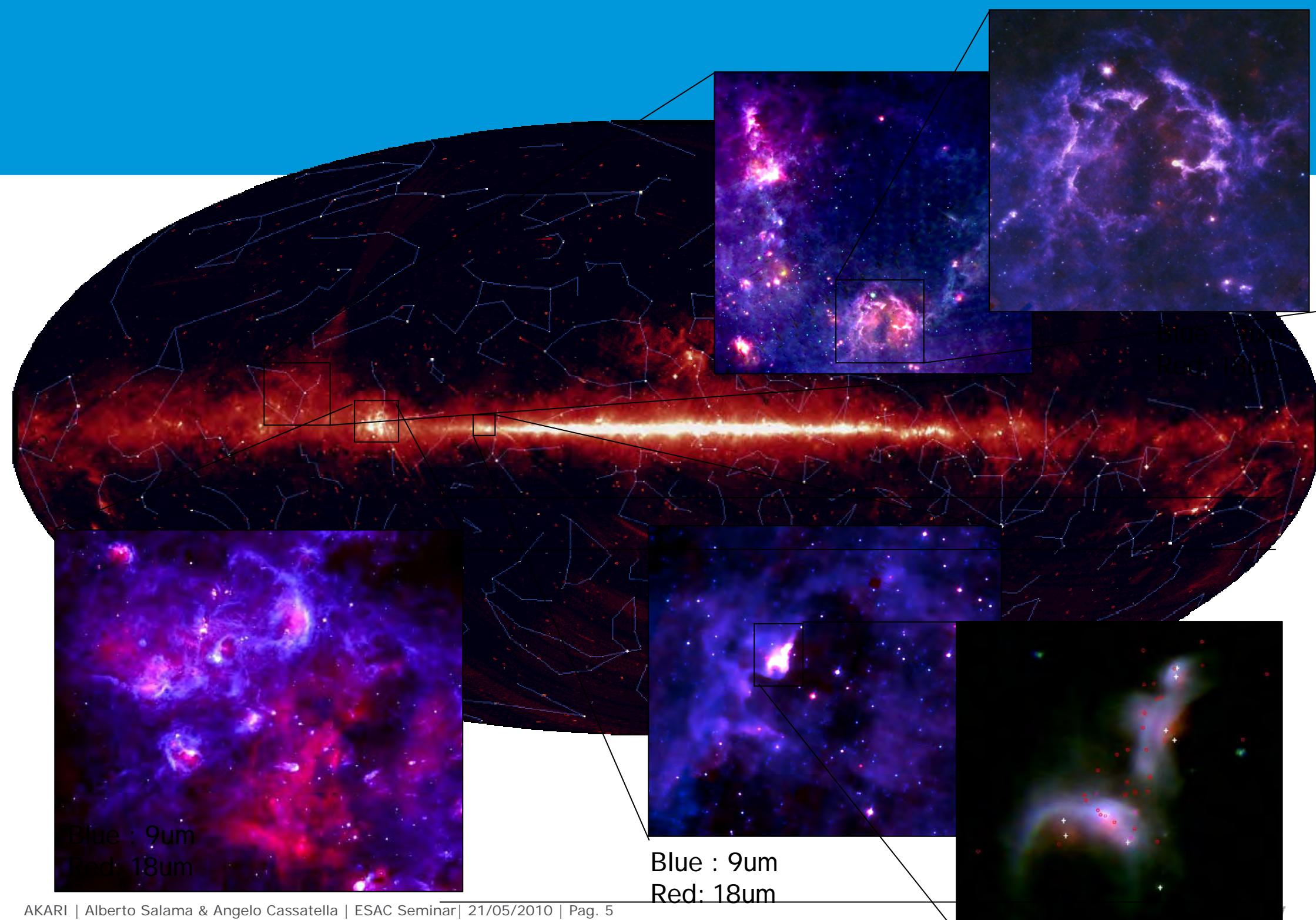
- Introduction
- Mission Overview
- ESA contribution
- The All-sky Survey Catalogues
- Science highlights from the literature
- Science with AKARI at ESAC

All-sky Survey Image (9 micron)

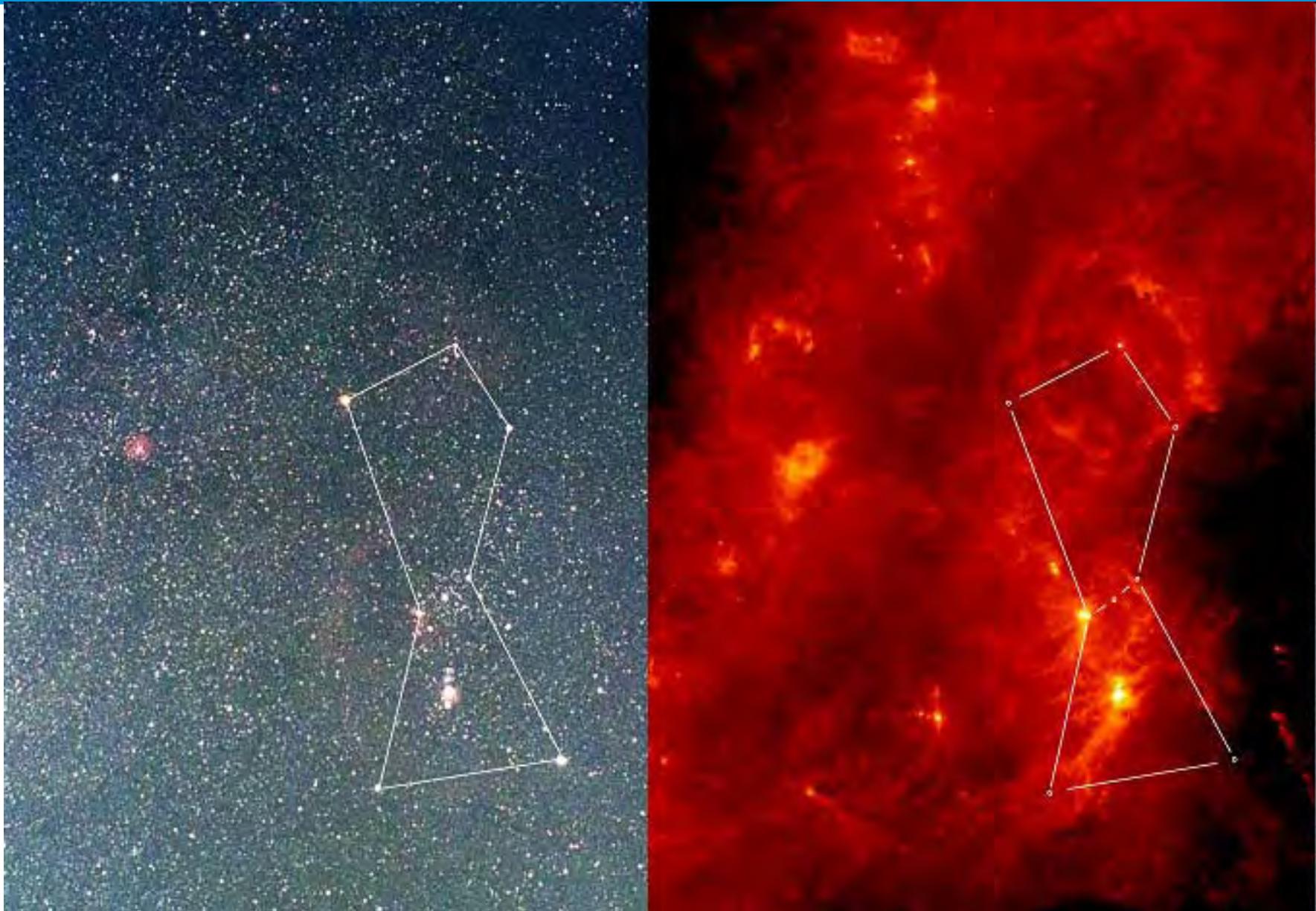


All-sky Survey Image (9 micron)

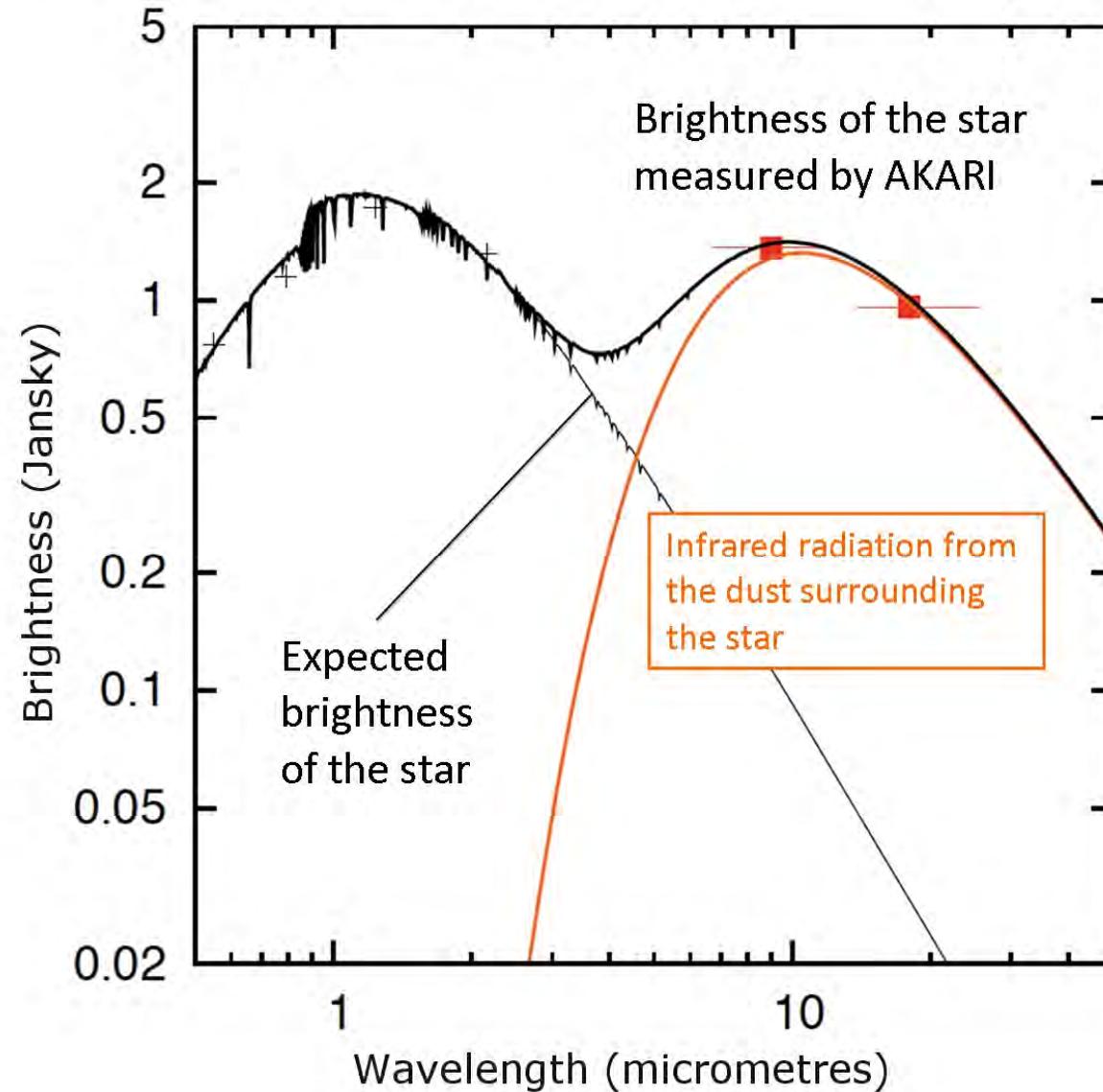




Orion (140 micron)



Star with infrared excess

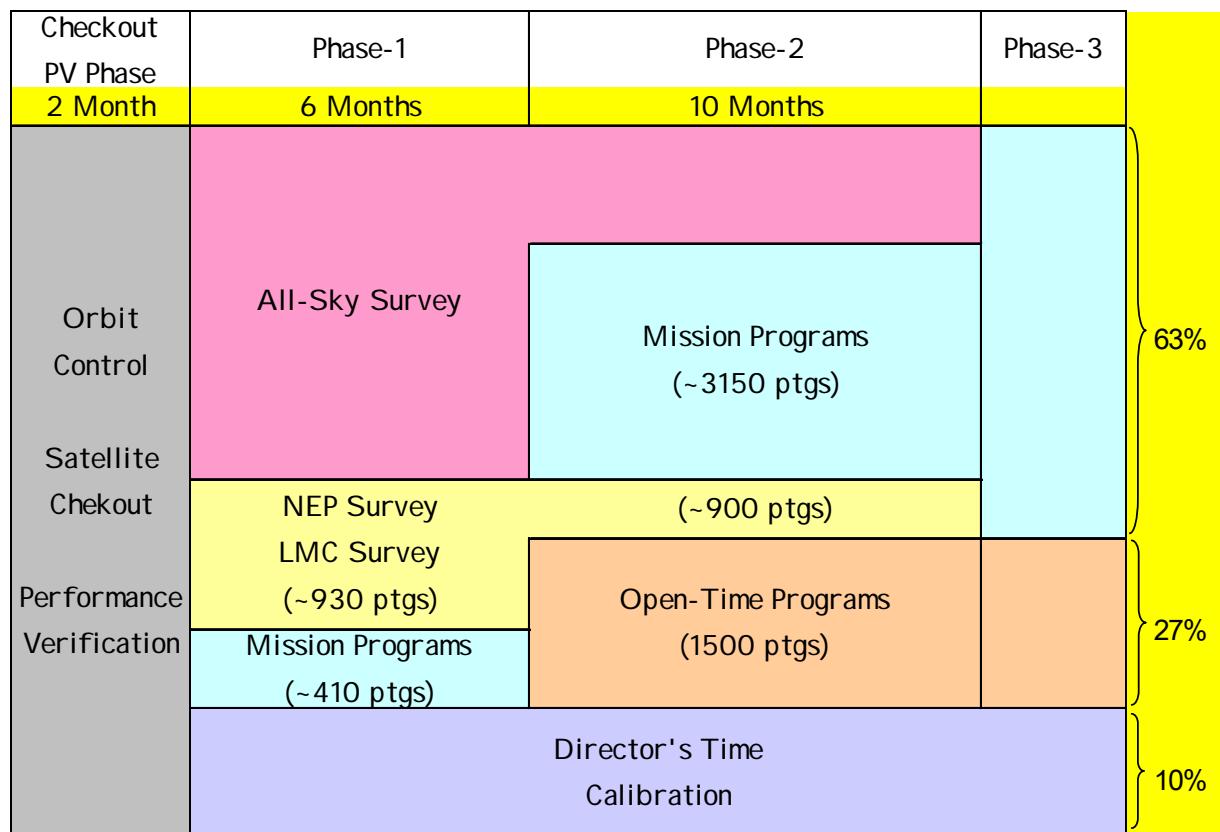


Mission Overview

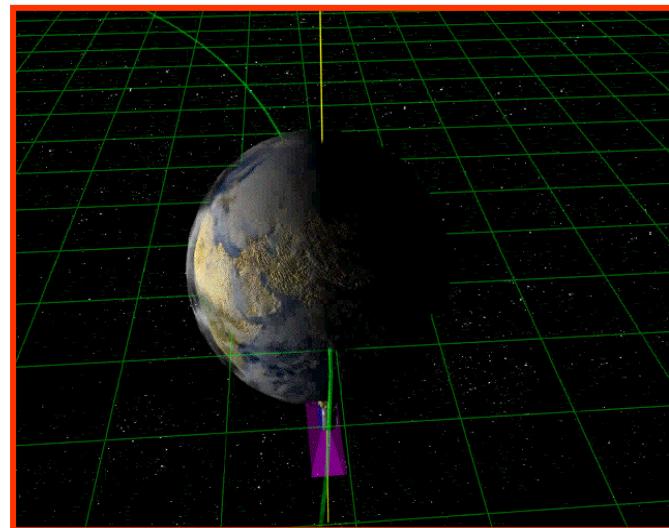


- JAXA-led project, international collaboration
- Sky survey at IR wavelengths (25 yrs after IRAS)
 - Also partly an observatory (thousands of pointed observations)
- ESA contribution
 - set up by Martin Kessler in 1999, approved by SPC in 2000 "*to accelerate the production of the sky catalogues, which will be extremely valuable in the preparation and exploitation of the FIRST and Planck missions*".
 - Tracking support and pointing reconstruction for survey, in return for 10% of pointed observations
 - ESOC:
 - Tracking support (Kiruna), during survey (ended in Oct 07)
 - ESAC:
 - Community support
 - Pointing reconstruction
- About 4M EUR, used in 2003-2010
- Two instruments, IRC (2-26 μm) and FIS(45-180 μm)
 - 13 bands, photometry and spectroscopy

Mission Phases

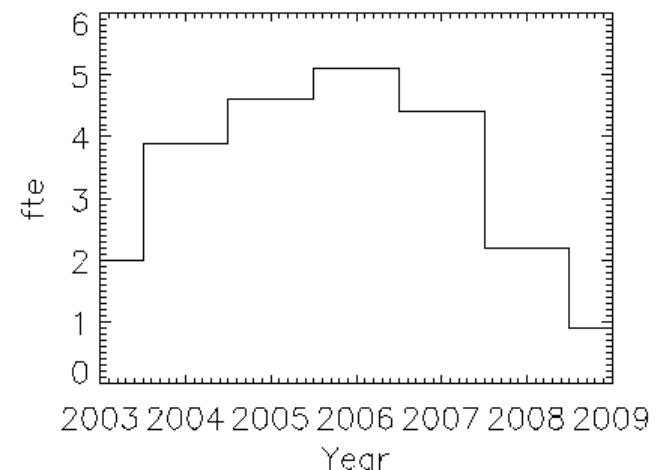


Launch	22 Feb 2006
Phase 1 (Mainly survey)	8 May 2006
Phase 2 (Mainly Pointed Observations)	8 Nov 2006
Helium depletion	26 Aug 2007
Phase 3 (Post-He - only NIR detector)	1 Jun 2008



SOC Elements Description

- AKARI tasks at ESAC performed by ISO Data Centre during last phase of ISO (Active Archive Phase), from 2003-2006, then by smaller dedicated team until today, as most people moved to Herschel
- Pointing Reconstruction (improving position accuracy X10)
- IRC Survey Catalogue generation, validation, documentation
- User Support
 - 3 AO's (total=1200 observations!)
 - Proposal technical feasibility
 - Additional AO tools and documentation
 - TAC formation and aid
 - Close monitoring of observing programmes implementation
 - Scheduling is an issue for the low-earth orbit satellite
 - Additional operational constraints arose during the mission
 - Web, Helpdesk
 - Data reduction documentation (Instrument Data User Manuals: 200 pages)
 - Initially for Open Time users, then valid for the world as data become public
 - Workshops at ESAC (with Japanese experts attendance)
 - Observation planning in September 2005
 - Hands-on data reduction in September 2007
 - Outreach



Team snapshots

➤ In 2007

- User Support (2 fte)
 - A. Salama (ISO and AKARI Project Scientist and User Support)
 - R. Lorente (ISOCAM and IRC expert, also ramping up on Herschel)
 - E. Verdugo (ISOPHOT and FIS expert, also ramping up on Herschel)
 - C. Pearson (with AKARI since 1997, collocated at ISAS)
- Pointing Reconstruction (2 fte)
 - P. Garcia-Lario (Pointing reconstruction & Herschel Observatory scientist)
 - C. Stephenson (software engineer)
 - C. Alfageme (software engineer, also partly on User Support)

➤ In 2009 (1 fte)

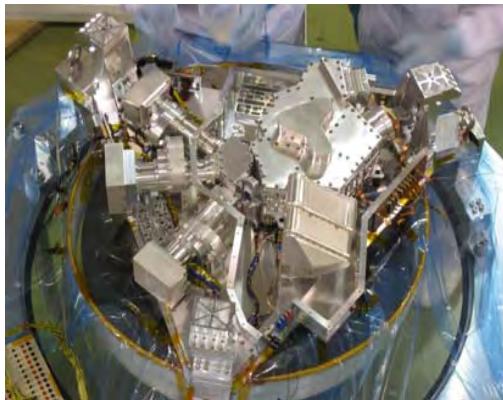
- A. Salama
- C. Alfageme
- N. Cox
- A. Cassatella

Focal Plane Instruments



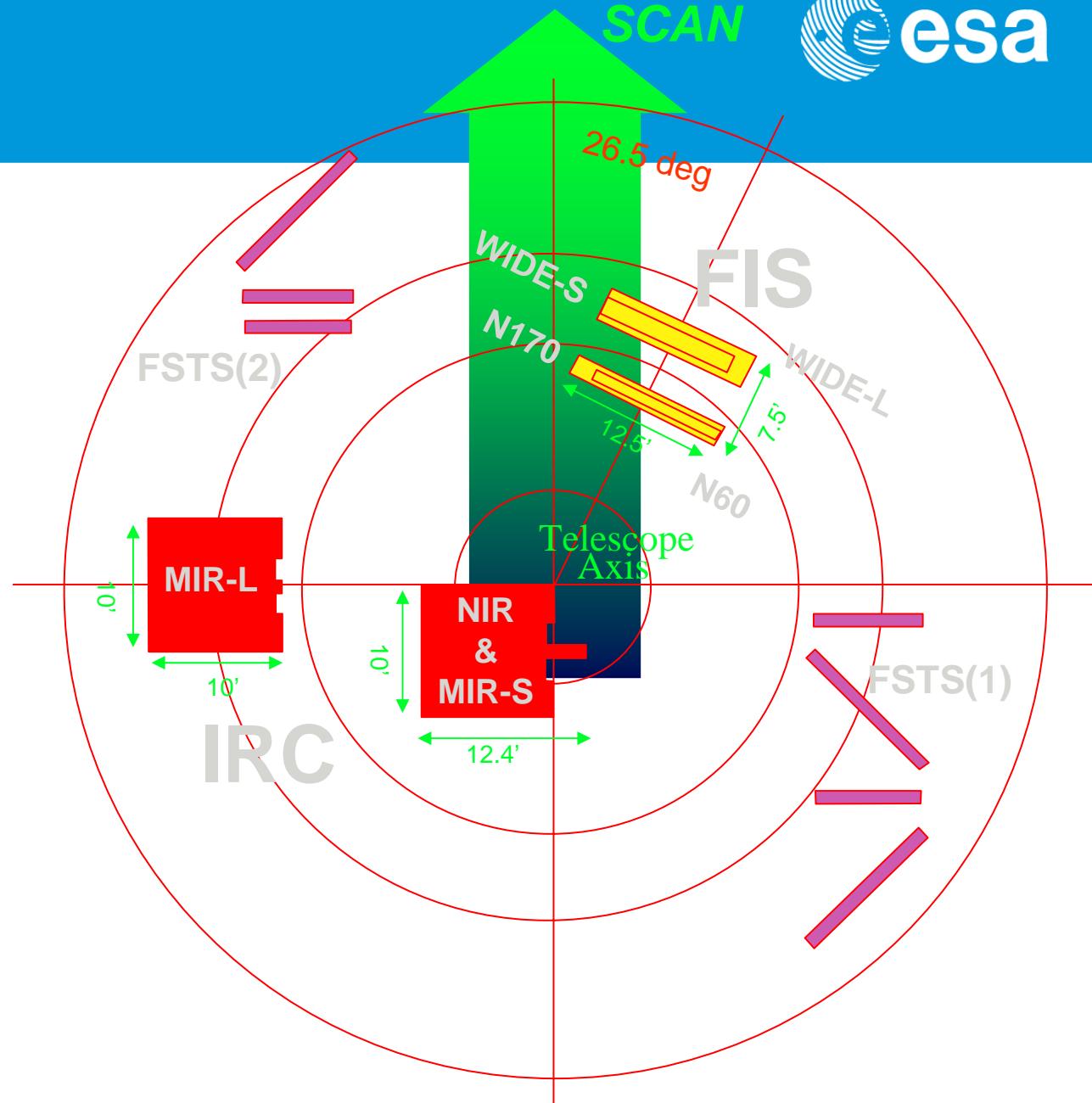
FIS (Far-Infrared Surveyor)

- 50 – 180 μm (4 photometric bands)
- All-Sky Survey (4 bands)
- Deep imaging and spectroscopy

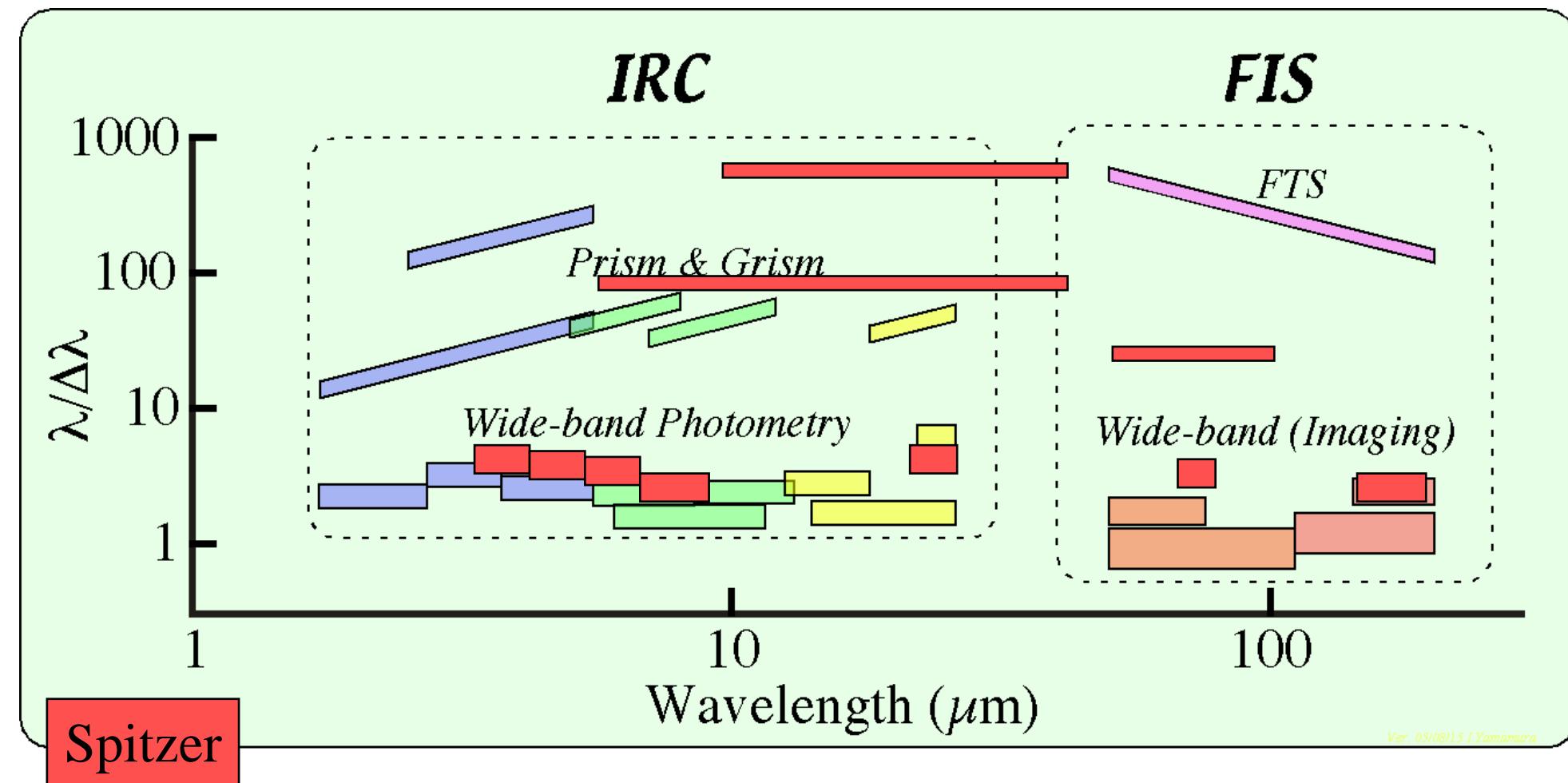


IRC (Infrared Camera)

- 1.7 – 26 μm (9 bands, 3 cameras)
- All-Sky Survey in 2 bands
- Imaging and spectroscopy



Photometric & Spectroscopic Capabilities



Detector sizes

AKARI

IRC

10'

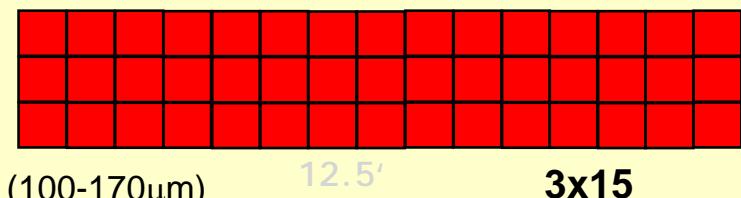
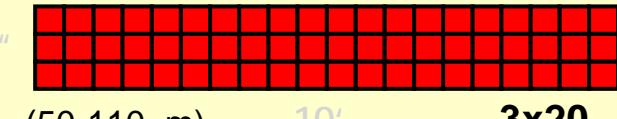
512x412 (NIR)

256x256 (MIR)

(2-26 μ m)



FIS



ISO

ISOCAM

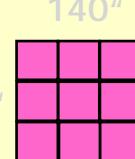
3'

32x32



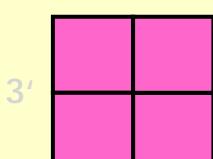
ISOPHOT

140''



C-100 (100 μ m)

3'



C-200 (200 μ m)

SPIZER

IRAC

5'

256x256

(3.6-8 μ m)



MIPS

5'

128x128

(24 μ m)



32x32

(70 μ m)



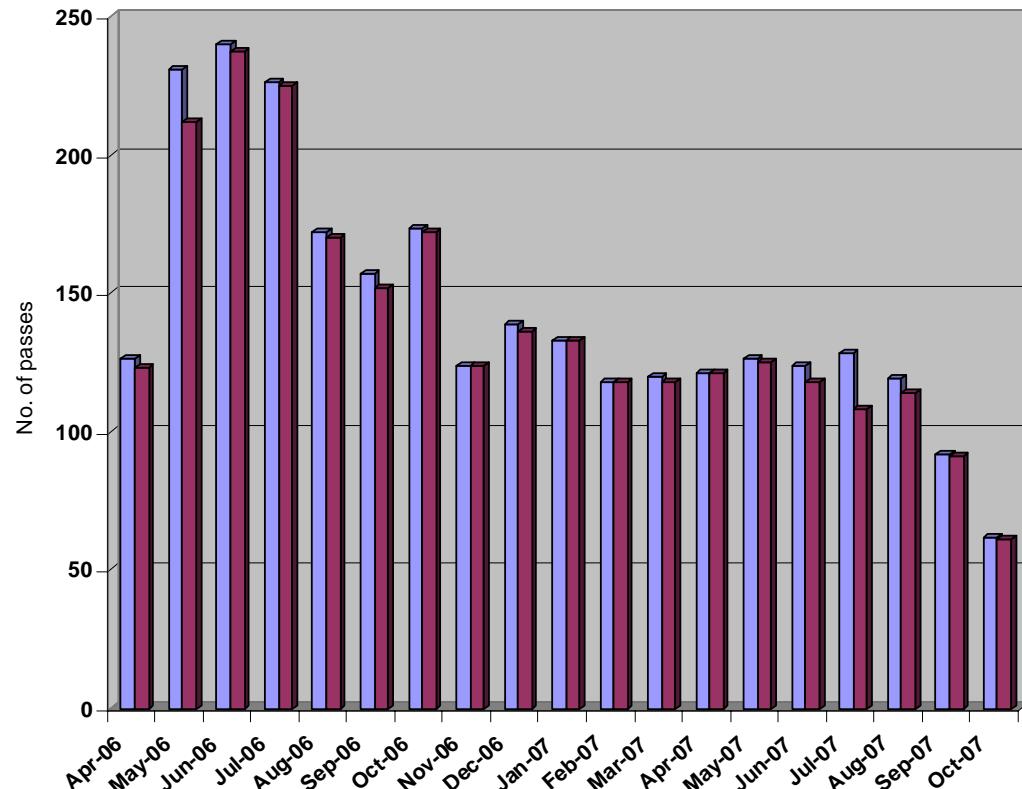
ESOC Ground station support



- Ground station (downlink) support with the Kiruna Antenna
 - in the X-band
 - for several passes per day.

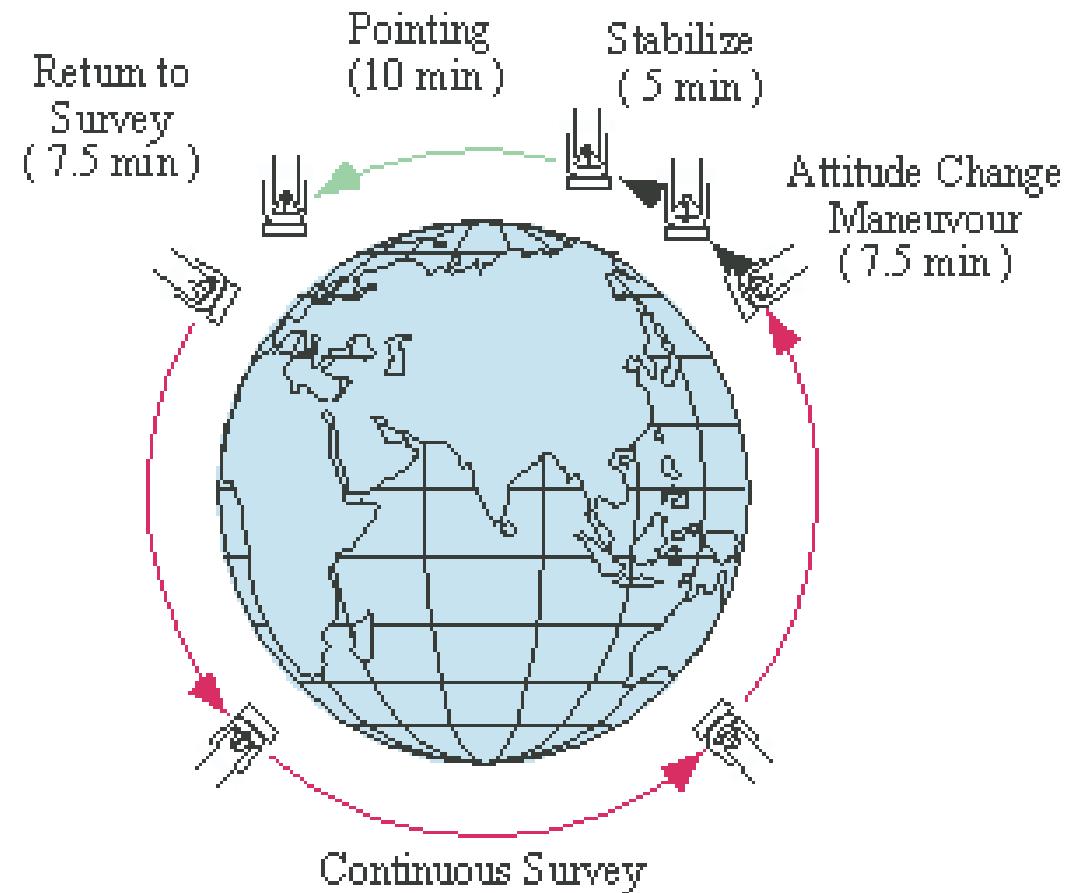
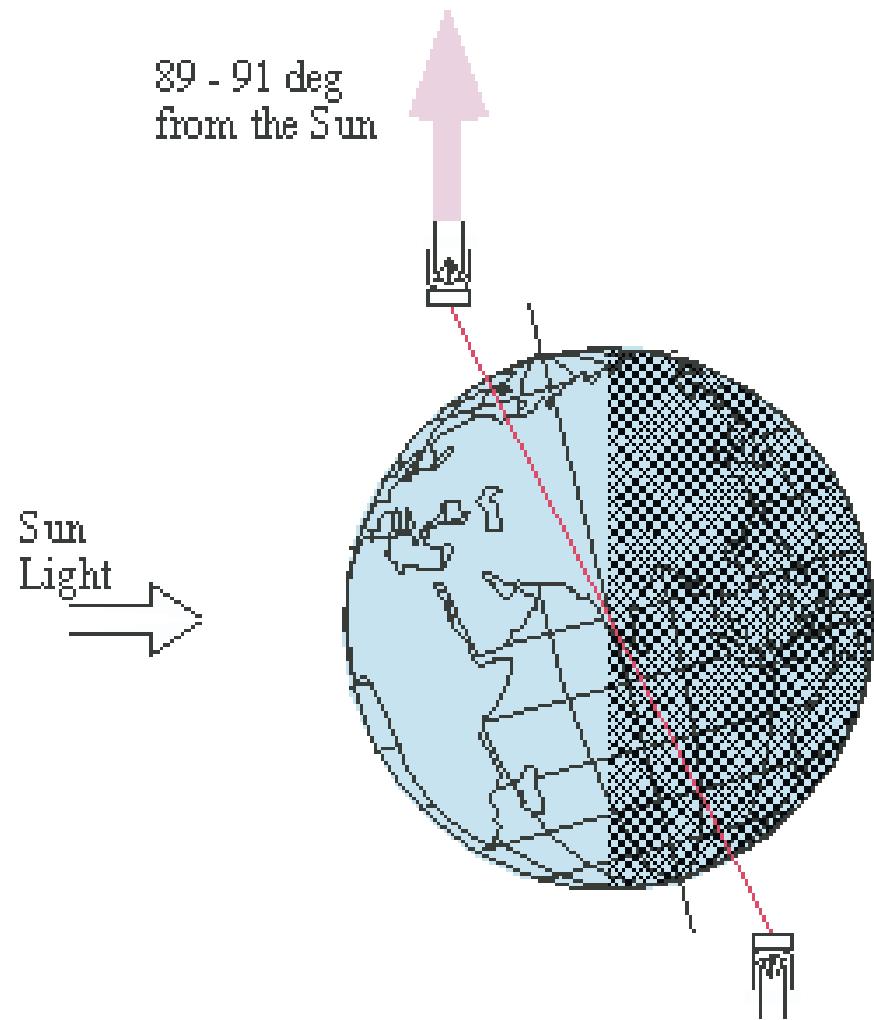


Requested (blue) and Successful (red) passes per month



The rate is 97% overall
(vs. 95% required).

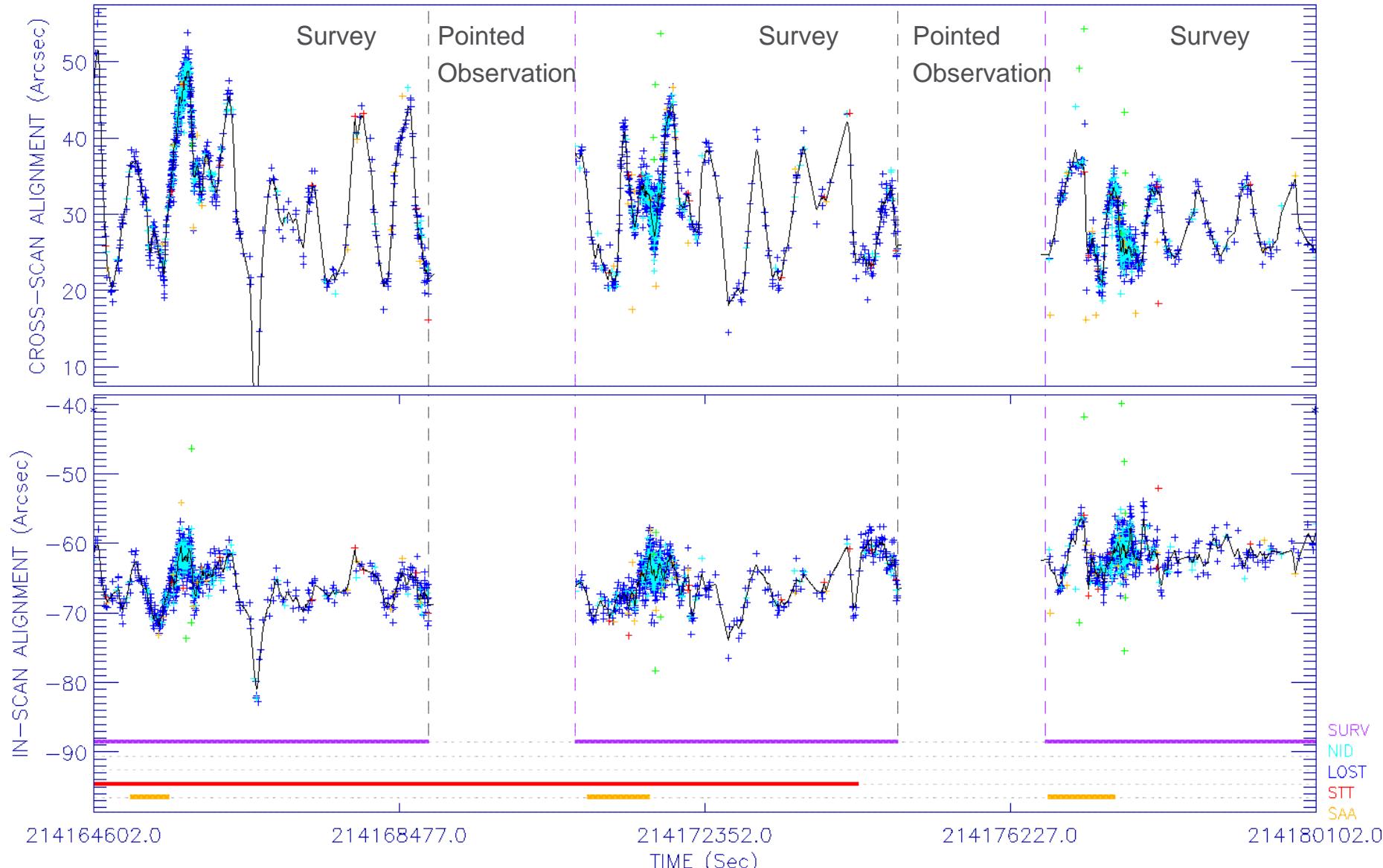
Survey mode and pointed mode



ESAC Pointing Reconstruction



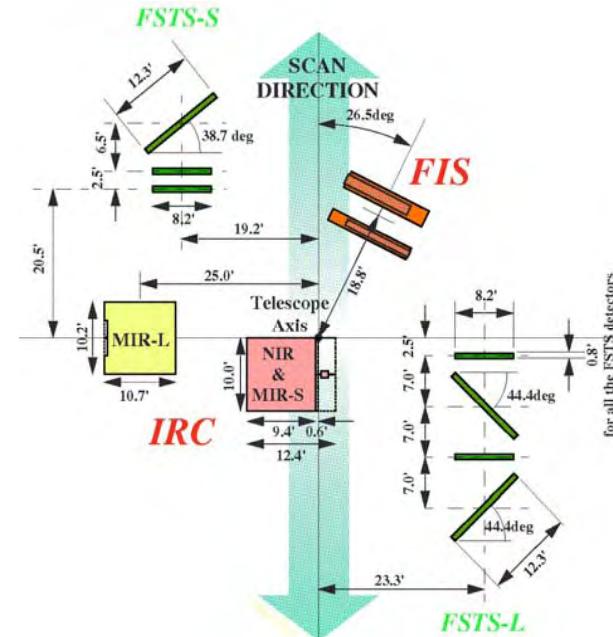
2006/10/14–18:10:01 <→ 2006/10/14–22:28:22



PRESA Input Reference Catalogues

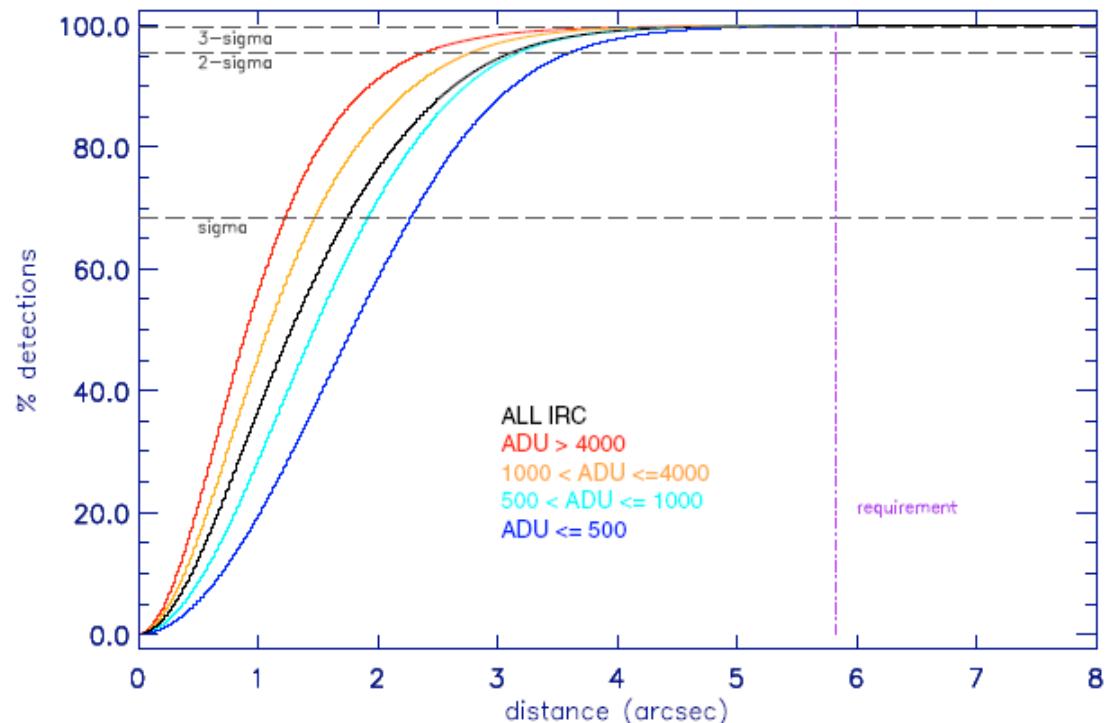


- Actually a collection of two completely independent astrometric catalogues constructed to support AKARI pointing reconstruction
 - FSTS Reference Catalogue (2,862,152 sources)
 - IRC Reference Catalogue (670,995 sources)
- Containing astrometric information (+proper motion if known) and photometric information (predictions or real measurements)

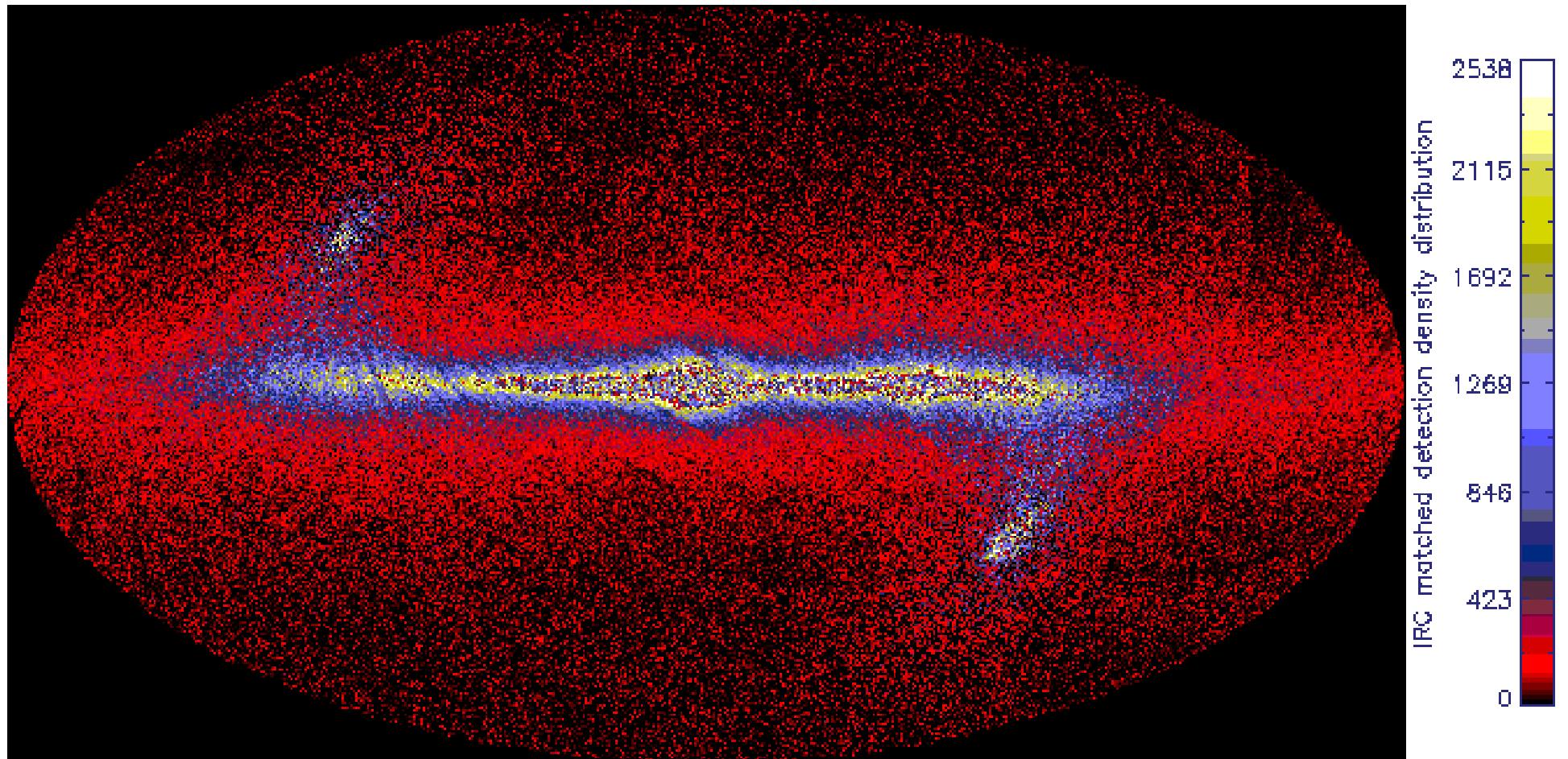


Accuracy evaluation

1. Run the pointing reconstruction software with randomly selected sources amounting to half of the catalogue
2. Determine the positions of the sources from the other half catalogue, which thus result unmatched.
3. Calculate distance between the two quantities



Matched detections



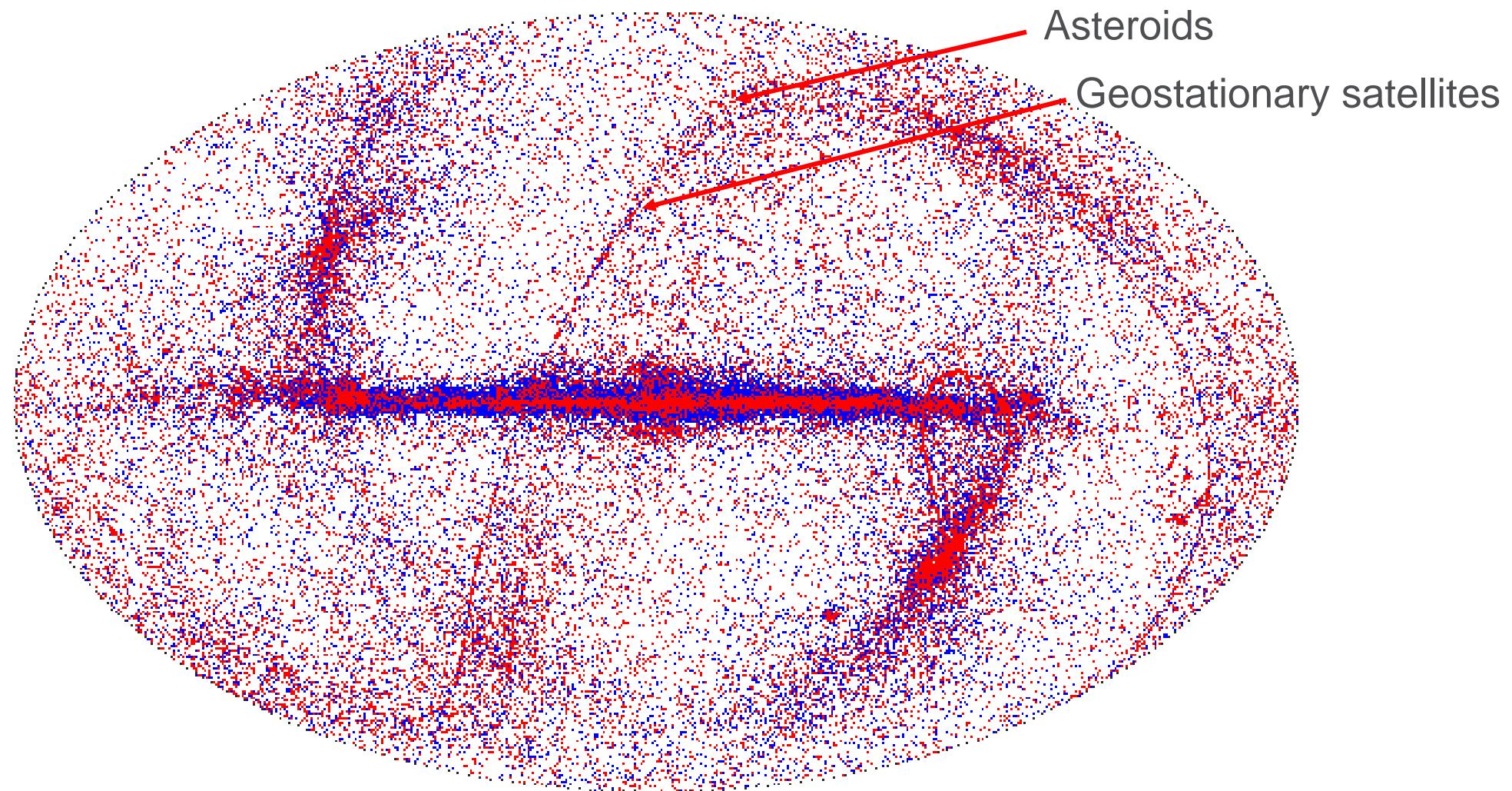
90% matches of the 6 millions events over the mission

Unmatched detections 1st scan



AKARI first scan unmatched:

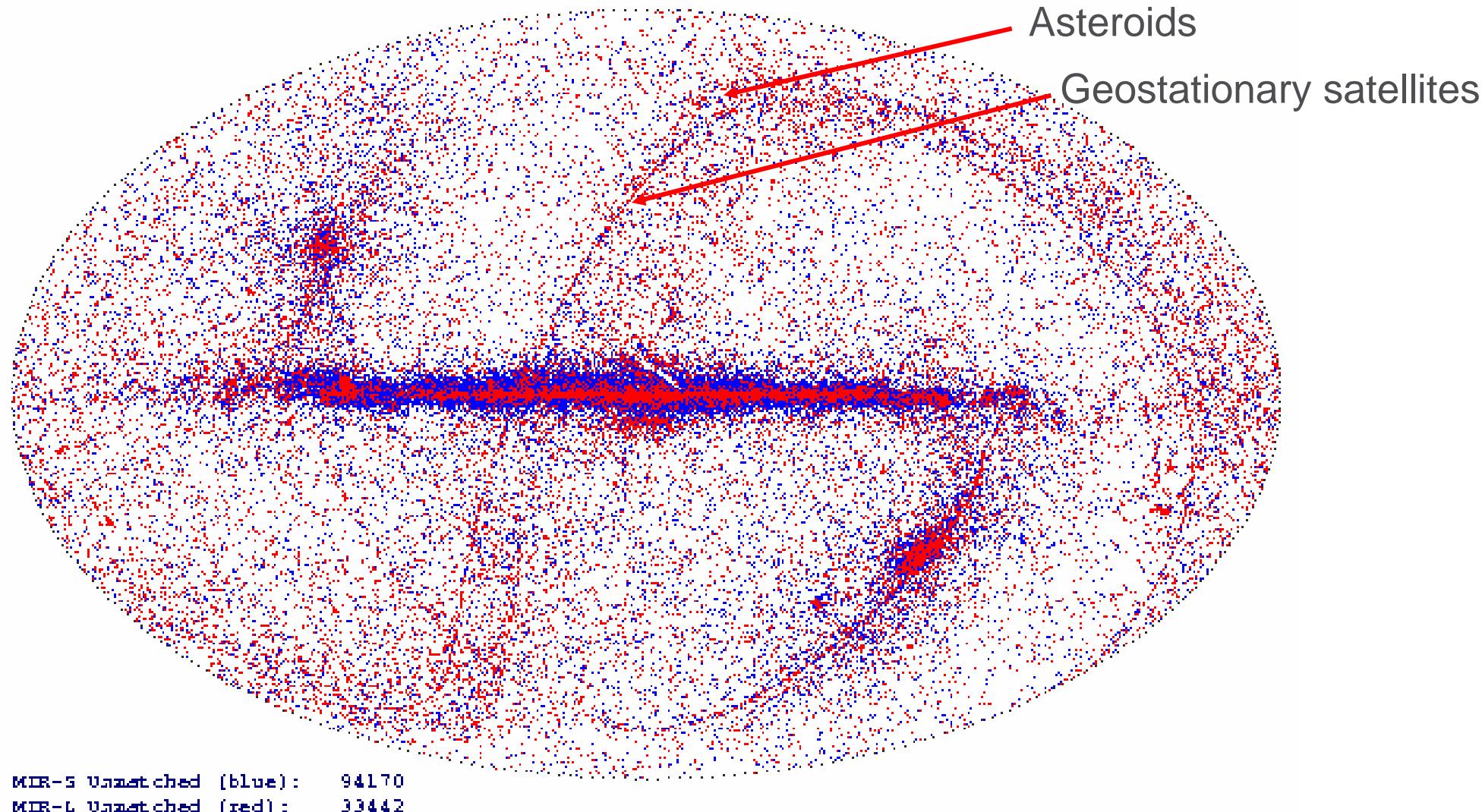
162669 det.



Unmatched detections 2nd scan



AKARI second scan unmatched: 127597 det.



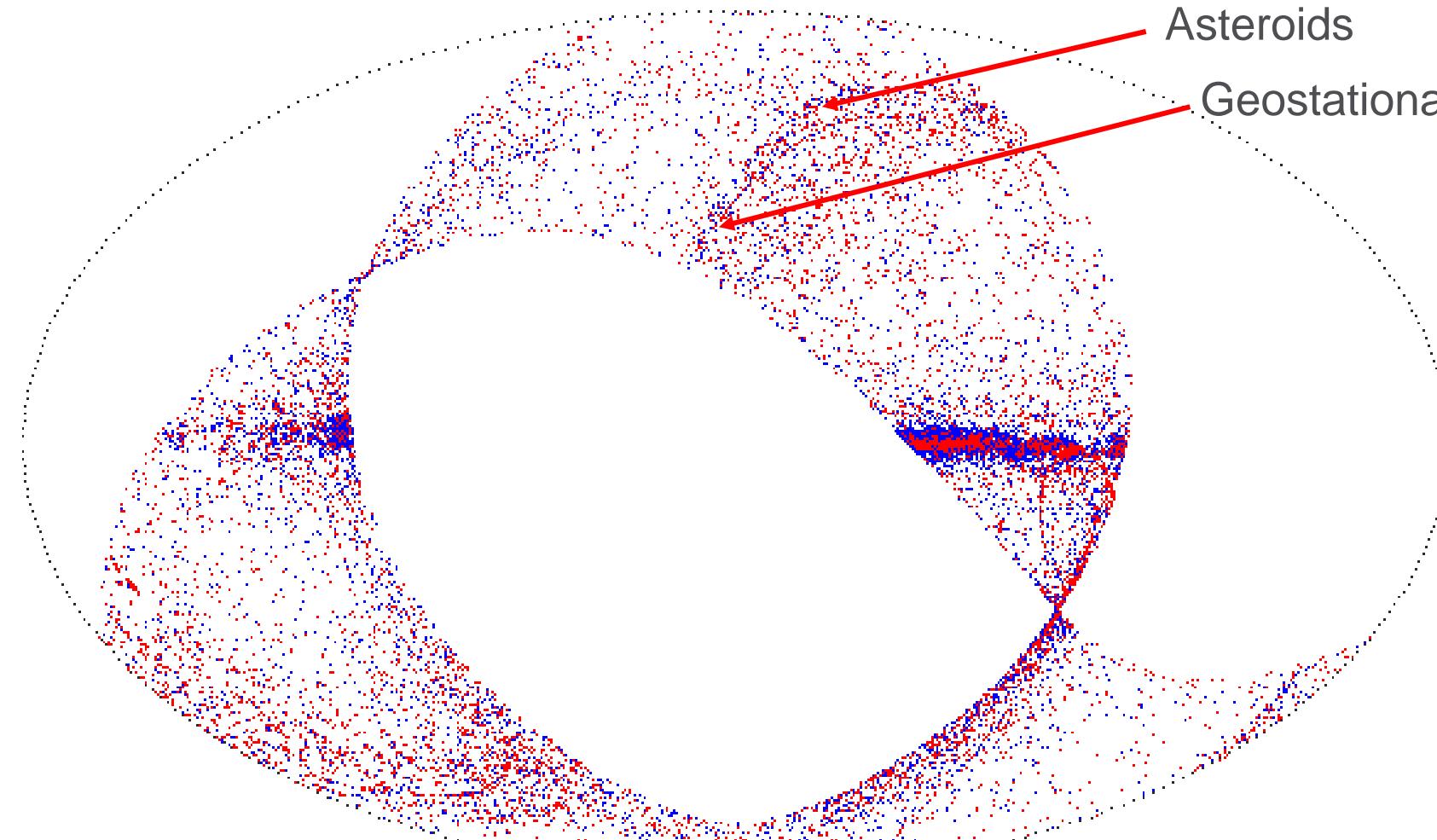
Unmatched detections 3rd scan



AKARI third scan unmatched: 28954 det.

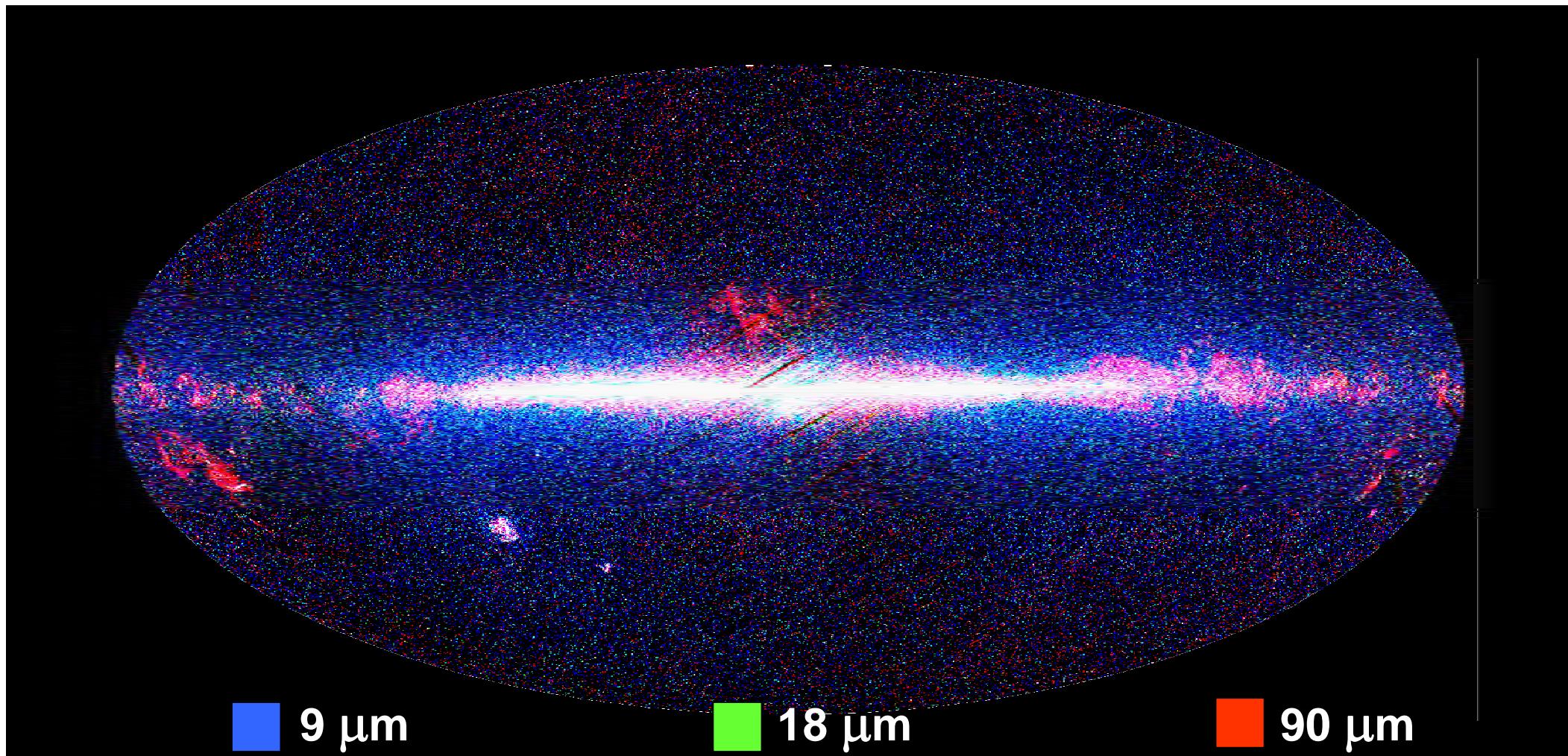
Asteroids

Geostationary satellites



MIR-S Unmatched (blue): 18473

MIR-L Unmatched (red): 10481



IRC Point Source Catalogue (9,18 μm): 870,973 sources
FIS Bright Source Catalogue (65,90,140,160 μm): 427,071 sources

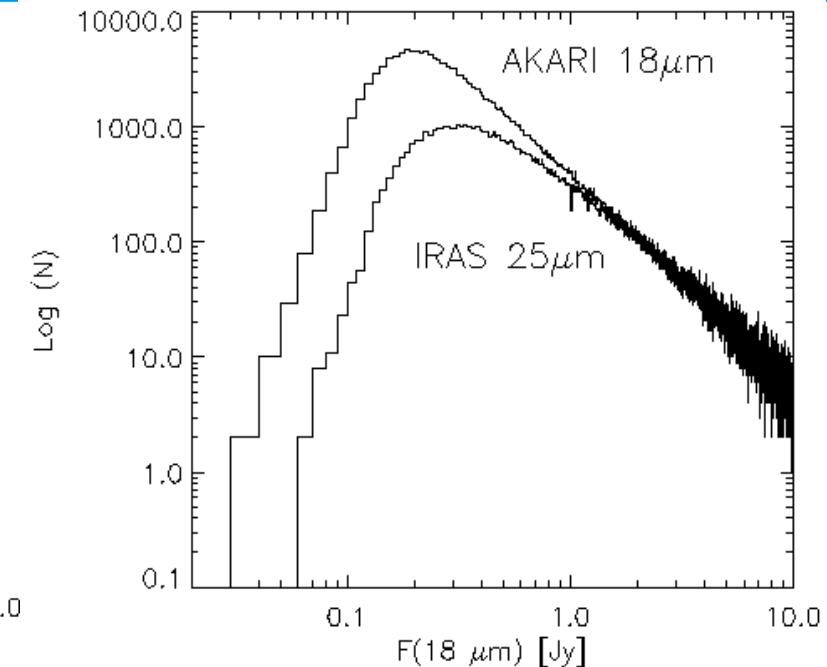
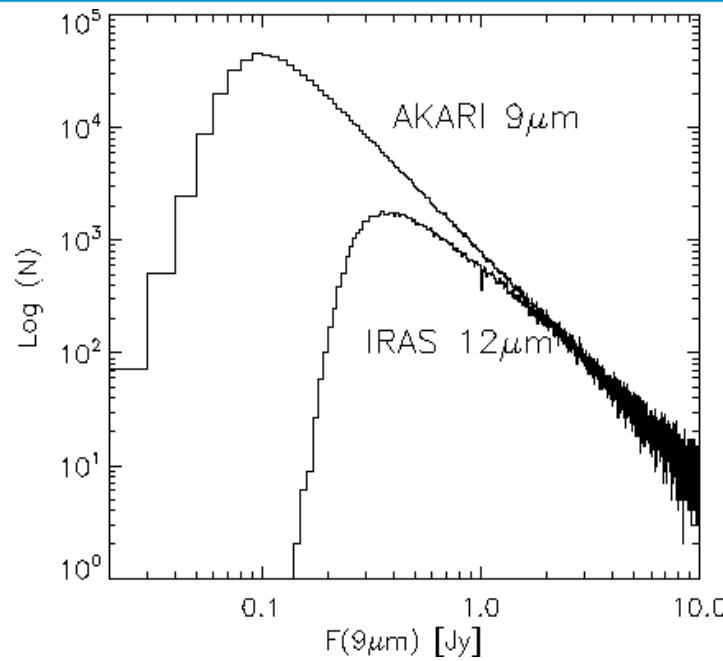
Catalogues derivation

- FIS Catalogue
 - Main output of the AKARI mission
 - Pipeline developed by a consortium including Imperial College University of London, Open University, University of Kent, Sussex University, and SRON-Groningen with University of Groningen and Seoul National University, Korea.
- IRC Catalogue
 - Two MIR bands added later in the development phase
 - Catalogue derivation in the hand of one Japanese post-doc, no public schedule
 - ESAC supported the catalogue production with parallel derivation and validation

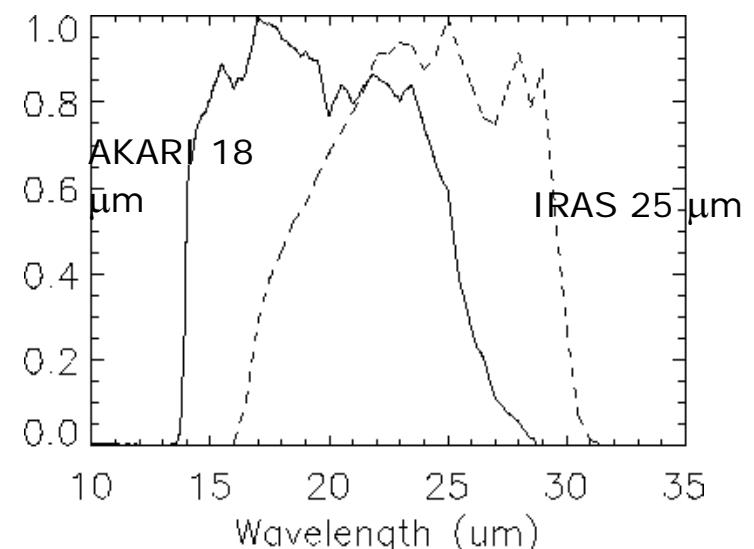
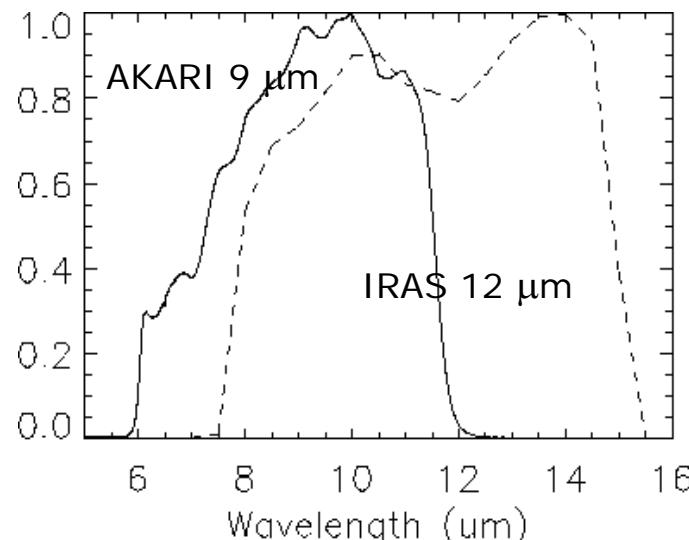
AKARI Survey Catalogues Sensitivities (vs IRAS)



Differential Source counts



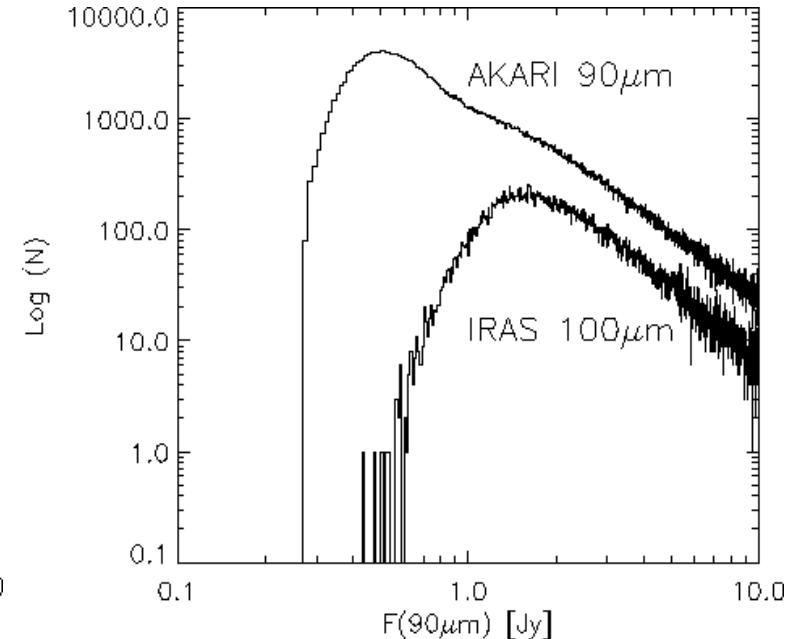
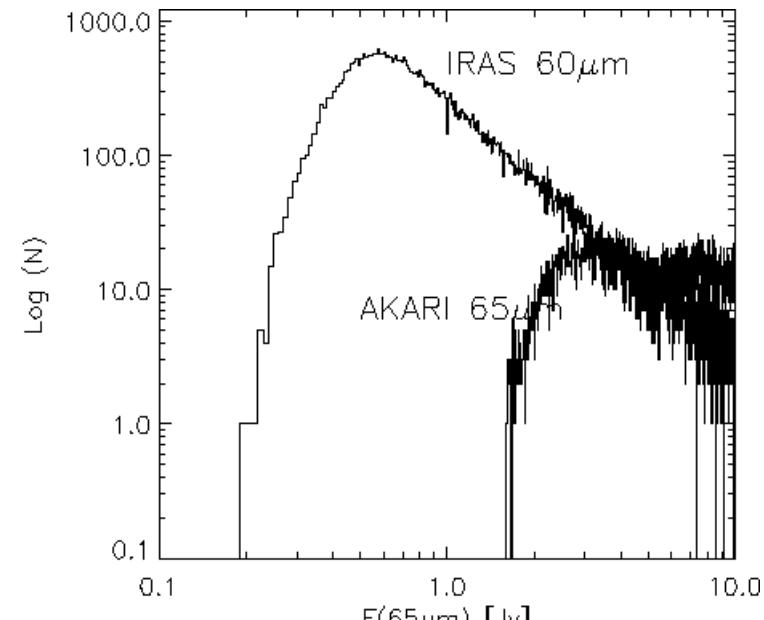
System Transmissions (RSFR)



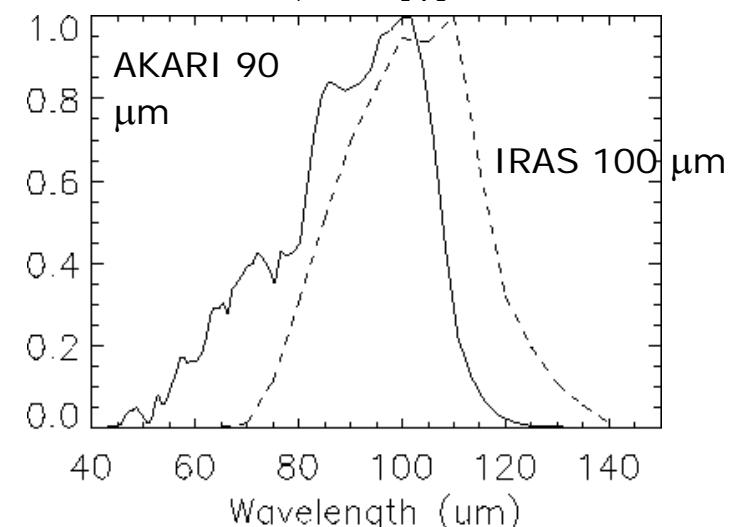
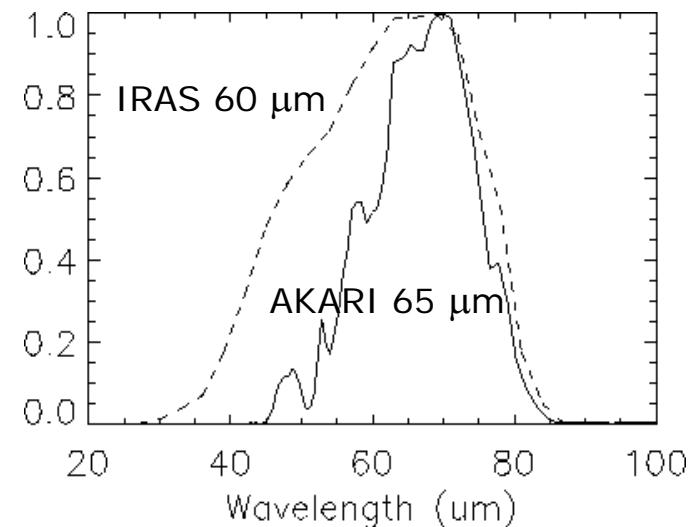
AKARI Survey Catalogues Sensitivities (vs IRAS)



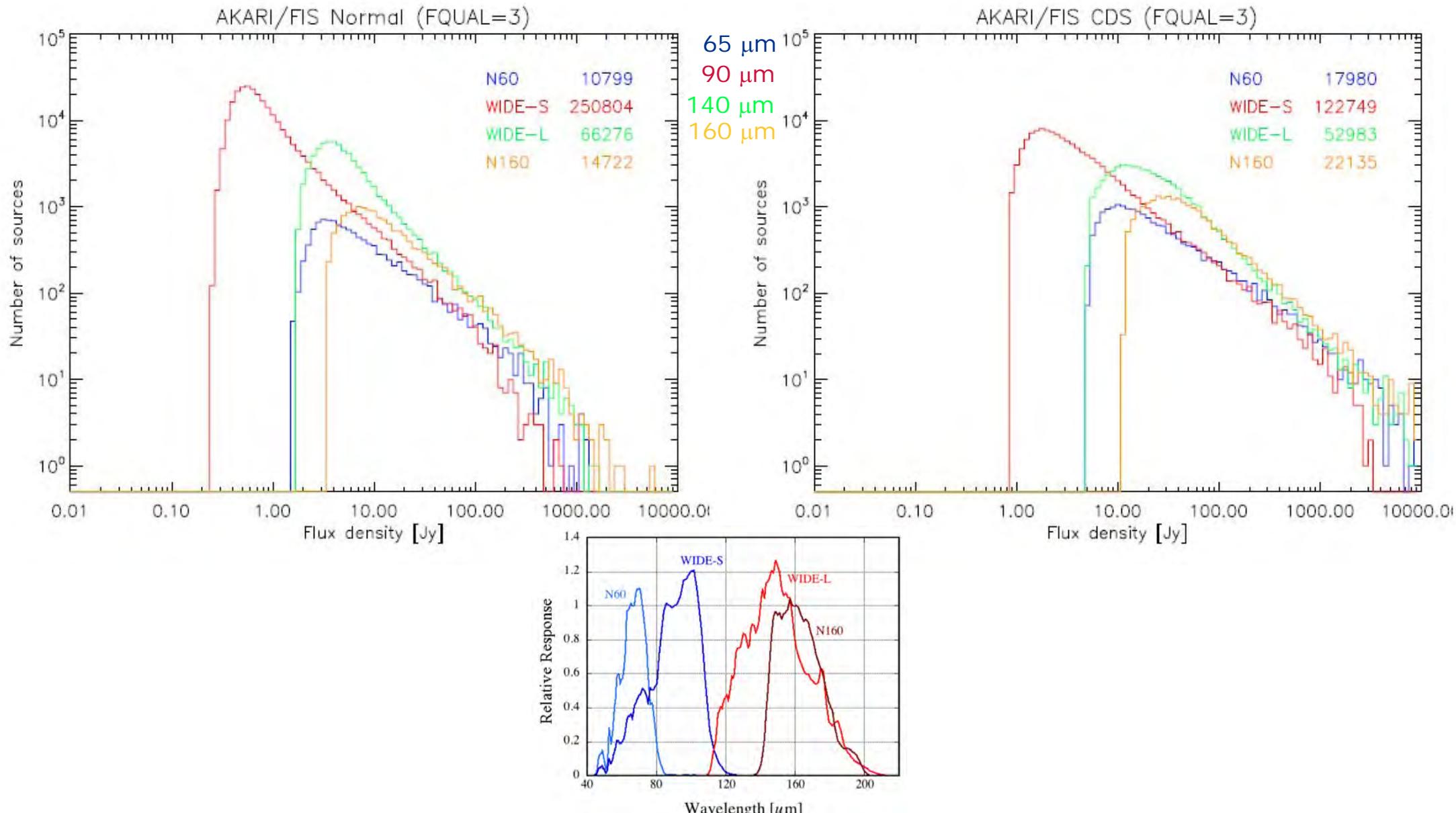
Differential
Source counts



System
Transmissions
(RSFR)



AKARI Survey Catalogues Sensitivities (vs IRAS)



Key numbers



	IRC PSC V1		FIS BSC V1			
Band	9 μm	18 μm	65 μm	90 μm	140 μm	160 μm
Number of sources	844,649	194,551	29,336	373,819	117,994	36,646
	870,973		427,071			
Detection Limit	50 mJy	130 mJy	3.2 Jy	0.55 Jy	3.8 Jy	7.5 Jy
Flux Uncertainty	5~20 %	7~20 %	20 %			
Spatial Resolution	~7 arcsec		~48 arcsec (source extraction)			
Position Uncertainty	1~3 arcsec		~ 6 arcsec			

FIS Bright Source Catalogue: 427.071 sources @ 25, 60, 60 and 160 um

MIR Point Source Catalogue: 870.973 sources @ 9, and 18 um

There are only 24700 common sources within 20"

- The MIR PSC contains mostly "Normal" stars which are not detectable in the FIS survey (they behave approx. as BB and fall below the FIS sensitivity limit)
- The FIS BSC contains very many "Galaxies" and stars with infrared excess.

Next foreseen releases



FIS Bright Source Catalogue V2: Upgraded version
FIS Faint Source Catalogue V1 : Fainter detection limit

Expected in a few months

The ISAS Catalogue server



DARTS/Akari at ISAS/JAXA

Data Archives and Transmission System
DARTS

- Astrophysics
- Solar Physics
- Solar-Terrestrial Physics
- Lunar and Planetary Science

AKARI	SUZAKU	HALCA	ASCA	IRTS	GINGA	TENMA	JUDO
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Instruments

Pointing Data Archives

- Observation log
- Query
- Tables
- Data
- FTP
- HTTP

Catalog Archives (CAS)

- Search Tools
- Radial Search
- Rectangular Search
- Object Cross-ID
- SQL Search
- Command Line Tool
- Visual Tools
- Explore
- Image List

Database Documents

- SQL Schema
- Tables
- Views
- Functions

Help

- SQL Tutorial
- SQL General Reference
- Query Limits
- Web API

Data Archives (DAS)

Links

JUDO

Radial Search

This page provides an easy interface to search FIS or IRC objects within a radius(arcmins) of a point. The point (lon,lat) can be set by J2000, B1950, Ecliptic or Galactic coordinates.

Coordinate conditions:

<input checked="" type="radio"/> Coordinate	<input type="radio"/> J2000	longitude* [deg or 'hh:mm:ss.ss']	266.0
<input checked="" type="radio"/> Object Name	Name to identify by SIMBAD(e.g., MI01, NGC4900, etc.)		
Radius	10	arcmins	<input type="button" value=""/>

* [±]12:34:56°, [±]12 34 56.78° and [±]12 34.56° styles are also allowed.

Instruments and Quality:

	Enable?	Min	Max
<input checked="" type="radio"/> FIS	<input type="checkbox"/>	3	fQual_65
	<input type="checkbox"/>	3	fQual_90
	<input type="checkbox"/>	3	fQual_140
	<input type="checkbox"/>	3	fQual_160
<input checked="" type="radio"/> IRC			

Note: Qualities are connected by 'AND'.

Database: Columns: all digest Rows: all max 10

Format: HTML TEXT delimiter:

You can select version of FIS and IRC catalogs by Database selector. Default setting is for latest version of catalog set.

A table [FisObjAll, IrcObjAll] or a view [IrcObj, IrcObj] is selected, when you select 'all' or 'digest' on the Columns section, respectively. Distance column is appended to selected columns.

This SQL call is equivalent to using this page with a default setting:

```
SELECT o.*, n.distance
FROM fGetNearbyObjCell('Fis', 'j2000', 266.0, -28.0, 10) n, FisObj o
WHERE n.objID = o.objID AND
      0 < o.fQual_65 AND o.fQual_65 <= 3 AND
      0 < o.fQual_90 AND o.fQual_90 <= 3 AND
      0 < o.fQual_140 AND o.fQual_140 <= 3 AND
      0 < o.fQual_160 AND o.fQual_160 <= 3
ORDER BY n.distance
LIMIT 10
```

There are also functions for B1950, Ecliptic and Galactic coordinates. [SQL functions page](#) describes them. For the selections with more complex conditions, use [SQL Search page](#).

See the [SQL schema page](#) to find out more about structure or function of the SQL.

Send questions or comments to "darts-admin AT ML.isas.jaxa.jp".
DARTS is maintained by C-SODA (former PLAIN center) at ISAS, JAXA in Japan.
Last Modified: Friday, 11-Dec-2009 00:33:18 JST

DARTS/Akari at ISAS/JAXA

AKARI-FIS-b2.0 J1208113+025244

Database=EDR2, Instrument=FIS, objID=2080170
Requested coordinate: Lon=182.0450708, Lat=2.8797240 (J2000)

ra	182.04711396 [12:08:11.31]	dec	2.87884015 [+02:52:43.8]
ra1950	181.40690347 [12:05:37.66]	dec1950	3.15710646 [+03:09:25.6]
lambda	180.73211670 [12:02:55.71]	beta	3.45536160 [+03:27:19.3]
b	277.97755824 [18:31:54.61]		63.63536744 [+63:38:07.3]
var	0	extended	0
nNeighbours	1	cirrus	0

	FIS image	IRC image	Optical image (SDSS)	
Under construction	Under construction			
SkyView IRIS (100μ,60μ,25μ)	SkyView 2MASS (K,H,J)	SkyView DSS2 (IR,R,B)		
Zoom : <input type="button" value="+"/> <input type="button" value="-"/>	Image scale : <input type="button" value="1.0"/> *pix	<input checked="" type="checkbox"/> Draw grid	<input type="checkbox"/> Invert image	<input type="button" value="update"/>
flux_65	flux_90	flux_140	flux_160	
4.55963	6.36688	6.82651	4.61554	
fErr_65	fErr_90	fErr_140	fErr_160	
0	0	0	0	
fQual_65	fQual_90	fQual_140	fQual_160	
3	3	3	1	
flags_65	flags_90	flags_140	flags_160	
0	0	0	0	
nScanC_65	nScanC_90	nScanC_140	nScanC_160	
4	4	6	4	
nScanP_65	nScanP_90	nScanP_140	nScanP_160	
4	4	7	6	

Search other catalogs on the CAS database

<input type="radio"/> FIS	<input type="radio"/> IRC		
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External links

SDSS search	NED search	SIMBAD search	ADS search
SkyView DSS	SkyView DSS1 Blue	SkyView DSS1 Red	

The Catalogues are in Vizier, Aladin, Topcat...



Catalogue Selection Page - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://Vizier.u-strasbg.fr/cgi-bin/VizieR-3

Most Visited TeamCal CSG ISO AKARI web AKARI Livelink BepiC Livelink CCT ADS IRC cat Pub submission AKARI PSC

AKARI ESA Helpdesk - Powered By Kay... Catalogue Selection Page (Untitled)

ASTRONOMIQUE DE STRASBOURG

Catalogue Selection Page

Tokyo, Japan · IUCAA, India · CADC, Canada · Cambridge, UK · CfA Harvard, USA · UKIRT-Hawaii, USA · INASAN, Russia · Beijing Obs., China

II/298 AKARI/FIS All-Sky Survey Point Source Catalogues (ISAS/JAXA, 2010) ReadMe Similar Catalogues

1.II/298.fis AKARI/FIS All-Sky Survey Bright Source Catalogue (Version 1.0) (full documentation) (427071 rows)

Query Setup (usage)

Maximum Entries per table: 50 Output layout: HTML Table Output Order: $\odot + \odot -$ Reset All

Query by Position on the Sky (Adapt Form to use a List of targets)

Target Name (resolved by Simbad) or Position: J2000 Target dimension: 2 arcmin Submit Query

Position in: Sexagesimal, or Decimal: Radius or Box size

Output preferences for Position:

Compute: x,y Position Galactic J2000 B1950 Ecl.J2000 none

r and x,y are the distance to the Target; Position is in the same coordinate system as Target.

Sort by:

Query by Constraints applied on Columns

Show	Sort	Column	Constraint	Explain (UCD)
<input type="checkbox"/>	<input type="radio"/>	objID		[3000001/3427071] Object ID (meta.id) (ID_NUMBER)
<input checked="" type="checkbox"/>	<input type="radio"/>	objName	(char)	AKARI source name (HHMMSSs+DDMMSS) (Note 2) (meta.id.meta.main) (ID_MAIN:1)
<input checked="" type="checkbox"/>	<input type="radio"/>	S65	Jy	(n) Flux density in N60 (Note 1) (phot.flux.density.em.IR.30-60um) (PHOT_FLUX_IR_60)

Done One active download (5 minutes remaining)

Vizier interface

Surveys Missions

Mission Astronomy

AKARI AGN

ANS Abundances

ASCA Ages

BepiC/Sky Associations

Search Catalogues Cancel Search

Description

AKARI mid-IR all-sky Survey (ISAS/JAXA, 2010)

FIS All-Sky Survey Point Source Catalogues (ISAS/JAXA, 2010)

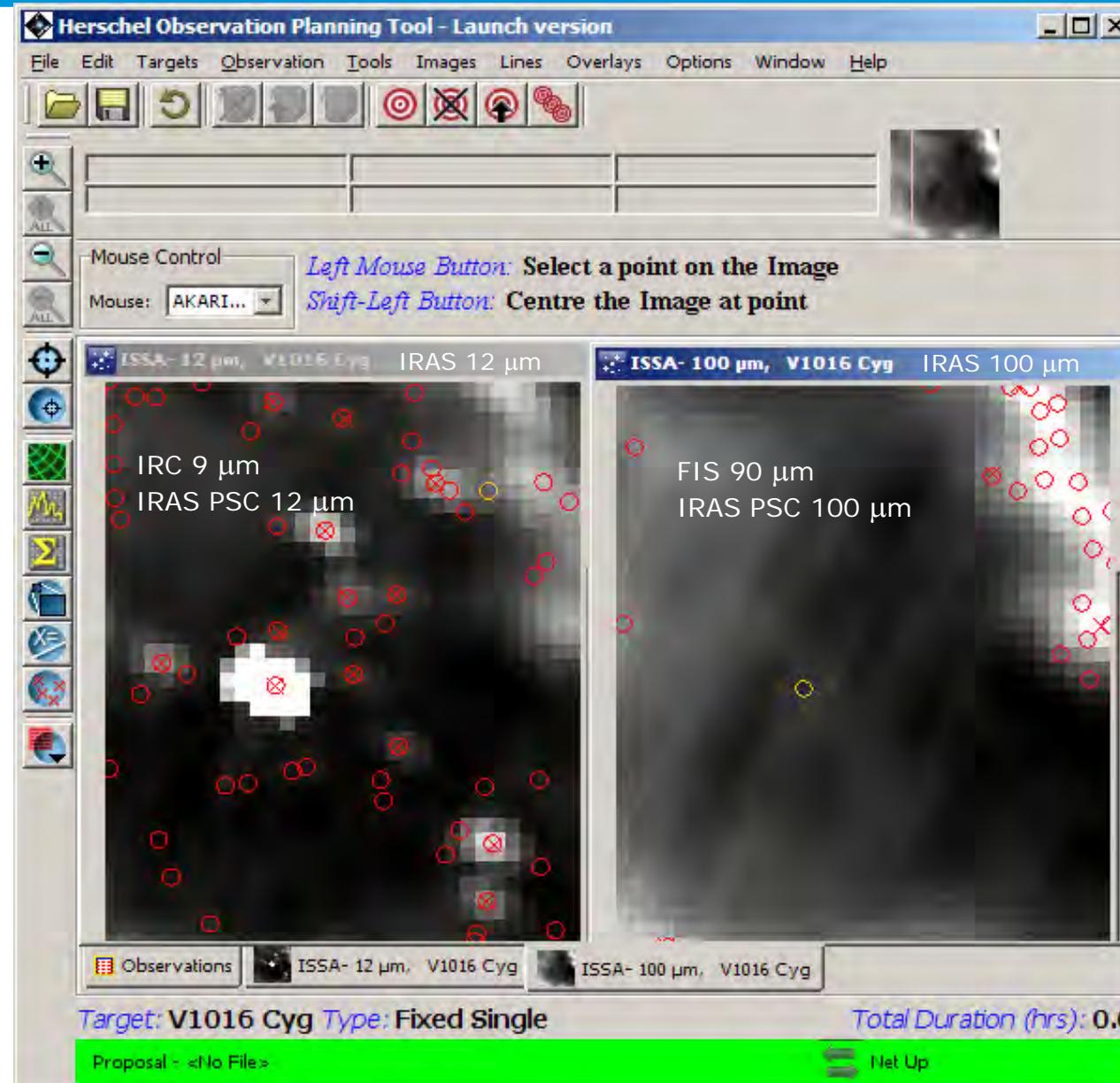
Cancel OK

Row Subsets

V1.fits degrees degrees

Cancel Load New T... Presentation1 ESLAB2010... PCAT Spherical Plot Presentation1 ESLAB2010...

Catalogues in HSPOT



AKARI-fis

Controls Hide All Show All Names Colour... Make Target... Save Table...

On	Hi.	Shape	Tgt. Name	RA	Dec	flux 65	flux 90	flux 140	flux 160
✓	□	●	1954583+401051	19h54m58.30s	+40d10m51.4s	1.470380	3.79490	9.747070	10.074400
✓	□	●	1953558+393310	19h53m55.82s	+39d33m10.0s	0.723823	2.133560	8.722580	8.357320
✓	□	●	1954239+400733	19h54m23.94s	+40d07m32.9s	0.787313	3.306690	7.816260	7.555170
✓	□	●	1955160+402029	19h55m15.97s	+40d20m28.8s	0.440633	2.533030	5.977420	6.977770
✓	□	●	1954407+401037	19h54m40.69s	+40d10m36.8s	0.741766	1.918840	6.010910	6.541180
✓	□	●	1953534+395718	19h53m53.45s	+39d57m18.4s	0.444364	1.665860	5.184980	6.496080
✓	□	●	1952069+393955	19h52m06.93s	+39d39m54.8s	0.760189	1.663830	5.540960	6.281720
✓	□	●	1954394+400703	19h54m39.39s	+40d07m02.7s	0.487818	2.284420	4.499900	6.269280
✓	□	●	1953106+393929	19h53m10.57s	+39d39m28.7s	1.116210	1.456710	6.200590	6.102710
✓	□	●	1953091+401526	19h53m09.12s	+40d15m26.1s	0.637143	2.902290	6.289820	6.099640
✓	□	●	1953153+400220	19h53m15.26s	+40d02m20.1s	0.532190	1.908870	4.168360	5.910590
✓	□	●	1955056+402023	19h55m05.58s	+40d20m22.9s	0.512441	2.266880	6.491790	5.672890
✓	□	●	1952106+393412	19h52m10.59s	+39d34m12.0s	0.530581	2.181720	8.680930	5.491140
✓	□	●	1954223+400204	19h54m22.28s	+40d02m04.3s	0.886658	1.972340	6.139850	5.161590

Done Help

O : AKARI
X : IRAS PSC
sources overlaid
on IRAS/ISSA
images

AKARI Catalogues for Herschel mission planning



MILTS: Mission Inspector and long Term Scheduler

Herschel Mission Inspector and Long-Term Scheduler (MILTS) Beta_0.9 updated on Wed May 12 09:12:49 CEST 2010

AKARI-FIS-V1 J2256157+620208

Database=DR1, Instrument=FIS, objID=3013921 [Get all data](#)

ra	344.06558827 [22:56:15.74]	dec	62.03547054 [+62:02:07.7]
ra1950	343.57014829 [22:54:16.84]	dec1950	61.76816484 [+61:46.05.4]
lambda	27.34888077 [01:49:23.73]	beta	59.49261856 [+59:29:33.4]
b	109.86921325 [07:19:28.61]		2.12072292 [+02:07:14.6]

FIS image IRC image SDSS i,r,g (SDSS CAS)

Under construction Under construction

IRIS 100 μ ,60 μ ,25 μ (SkyView) 2MASS K,H,J (SkyView) DSS2 IR,R,B (SkyView)

Under construction

Zoom : Image scale : "pix Draw grid Invert image

flux_65	flux_90	flux_140	flux_160
6375.83	8603.77	7456.13	10029.3
fErr_65	fErr_90	fErr_140	fErr_160
450.355		401.774	1295.15

AKARI-CAS Explore Tool

Input form:

Database : DR1 Instrument : FIS Search radius : 1.0 arcmins Coordinate system : J2000 Longitude [deg or hh:mm:ss.ss] : Latitude [deg or [+/-]dd:mm:ss.s] : Name to identify by SIMBAD (e.g., M101, NGC4900, etc.) : ObjID:

submit

You can select version of FIS and IRC catalogs by Database selector.

SDSS i,r,g image is provided by SDSS SkyServer of the SDSS project.

SkyView has been developed by HEASARC at the NASA / GSFC Astrophysics Science Division.

AKARI - InfraRed Imaging Surveyor - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.scops.esa.int/index.php?project=ASTRO&page=index

Most Visited TeamCal CSG ISO AKARI web AKARI Livelink BepiC Livelink CCT ADS IRC cat Pub submission AKARI PSC

AKARI - InfraRed Imaging Surveyor

Research & Science Home ESA Public Web Site Sci-Tech Portal AKARI European Space Agency 20-May-2010 20:10:11

Astrophysics Missions Planetary Exploration Missions Solar Terrestrial Science Missions Fundamental Physics Missions Science Faculty

AKARI

All-Sky Survey Catalogues Public Release (30 March 2010)

A&A Special Issue (3 May 2010)



New results from AKARI: (Click here for details)

AKARI (formerly ASTRO-F), is the first Japanese satellite dedicated to infrared astronomy, from the Institute of Space and Astronautical Science (ISAS) of the Japanese Aerospace Exploration Agency (JAXA). Its main objective is to perform an all-sky survey with better spatial resolution and wider wavelength coverage than IRAS, mapping the entire sky in six infrared bands from 9 to 180 micron.

AKARI operated with a 68.5 cm-diameter telescope cooled down to 6K and observed in the wavelength range 2-180 μ m from a sun-synchronous polar orbit at 700 km altitude. It was successfully launched at 21:28 (UT) on 21 February 2006 by an M-V rocket from the Uchinoura Space Center (USC), Japan. AKARI ran out of its on-board supply of cryogen, liquid Helium at 08:32:40 (UT) on August 26th, 2007, after successful operation and observations that began on May 8th, 2006, achieving the expected lifetime of 550 days. More than 94% of the sky was covered in survey mode.

AKARI also performed more than 5,000 pointed observations over the wavelength range 2-180 μ m in 13 bands, providing comprehensive multi-wavelength photometric and spectroscopic coverage of a wide variety of astronomical sources: nearby solar system objects, zodiacal light, brown dwarfs, young stars, debris disks and evolved stars in our Galaxy and in other galaxies of the Local Group. It will also probe galaxy evolution and the large scale structure in the Universe out to great distances. An extensive and dedicated coverage of two high-visibility regions, the Large Magellanic Cloud and the North Ecliptic Polar region has also been performed.

AKARI is now in its Post-Helium phase, where imaging and spectroscopic capabilities are available in the 1.8 to 5.5 micron wavelength range. The AO for Open Time observations for the first year in this phase opened on 12 May 2008 and closed on 4 July 2008. The successful programmes from this Call have started on 15 October 2008. A Call for the 2nd year of operations opened on 27 May 2009 and closed on 6 July. The successful programmes from this Call have started on 15 October 2009.

ESA is collaborating with JAXA/ISAS in order to increase the scientific output of the mission by capturing all of the possible data (providing tracking support from the ESA ground station in Kiruna in the cold phase) and to accelerate the production of the sky catalogues, which will be extremely valuable in the exploitation of the Herschel and Planck missions, in return for 10% of the observing opportunities in the non-survey parts of the mission, distributed to European scientists, via the traditional route of Calls for Proposals, followed by peer-review. ESAC provides attitude reconstruction for the survey data and support to European users for the pointed observations. The latter activity is maintained via this Web site. Other institutes collaborate in the AKARI mission. A consortium including Imperial College University of London, Open University, University of Kent, Sussex University, and SRON-Groningen with University of Groningen participates in the data reduction of the All-Sky Survey. Seoul National University representing the Korean community also joins the data reduction activity.

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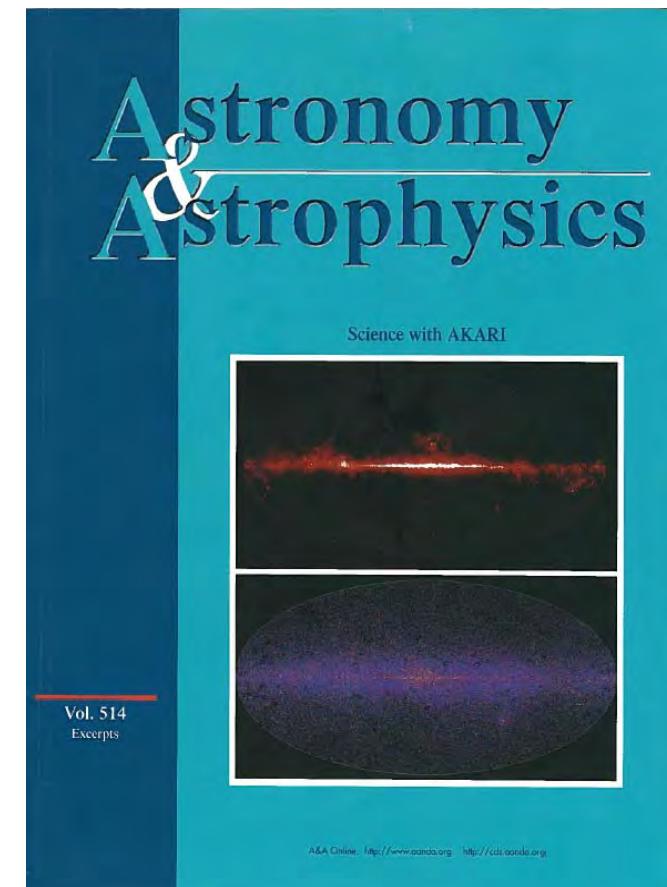
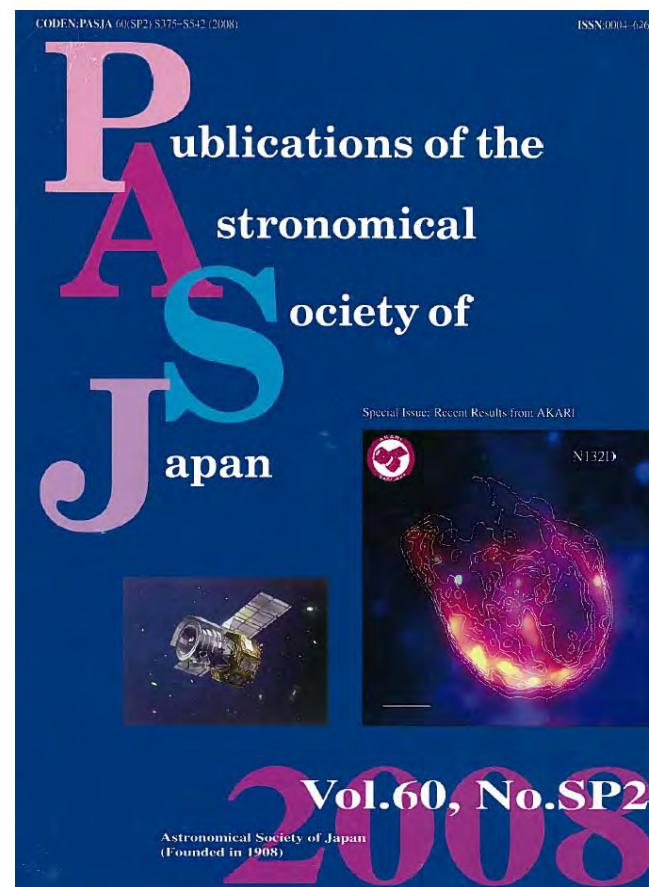
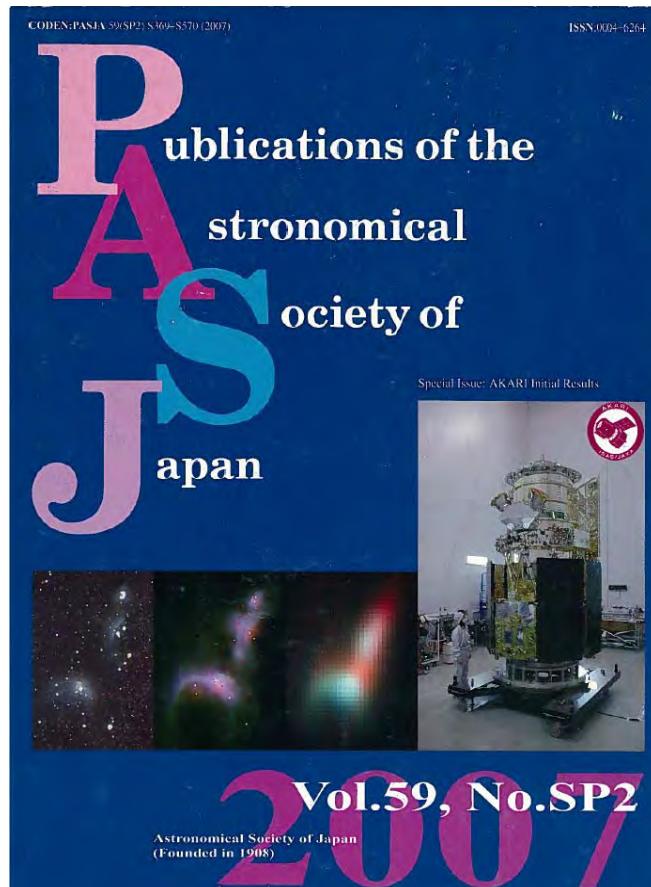
This page was first created on 10 March, 2005 and was last updated on 3 May, 2010.

Done

AKARI refereed publications

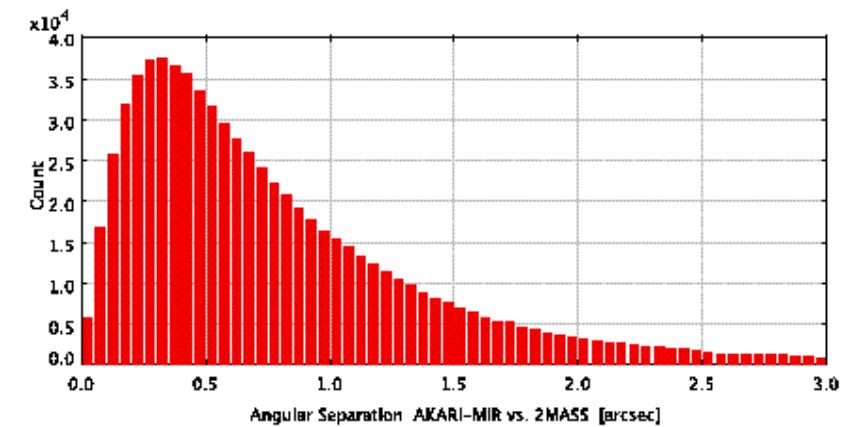
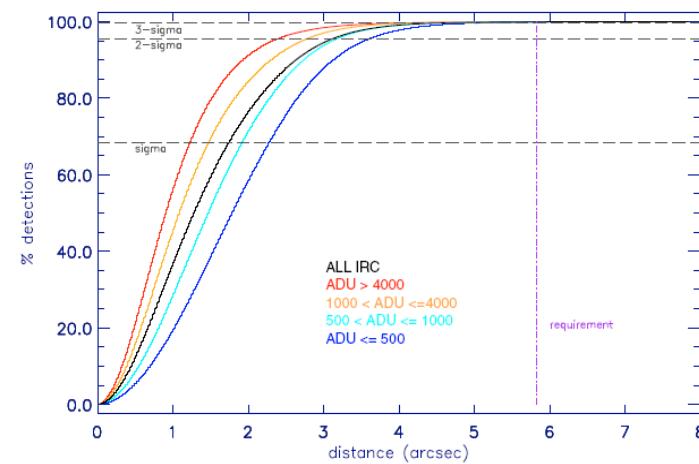
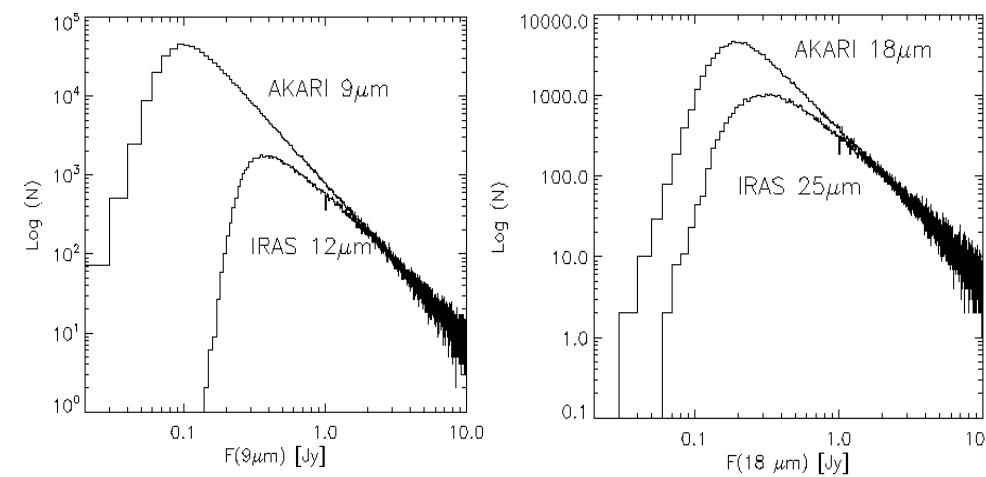
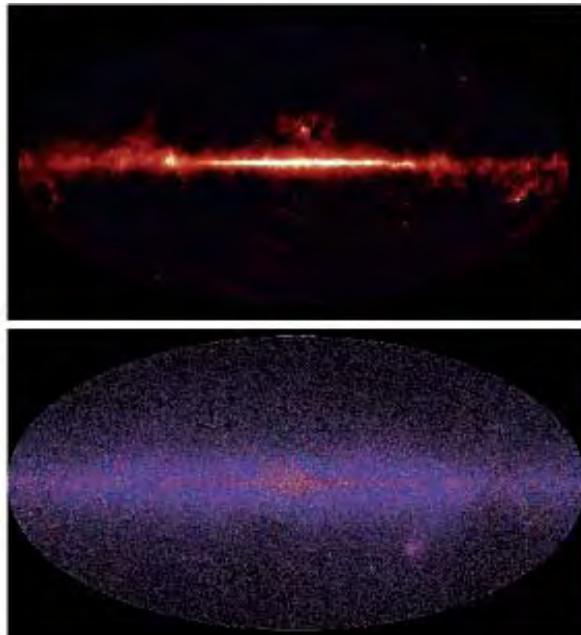


- About 100 papers in total, 24% with European participation
- 2 PASJ Special Issues, 1 A&A Special Issue



The AKARI/IRC mid-infrared all-sky survey*

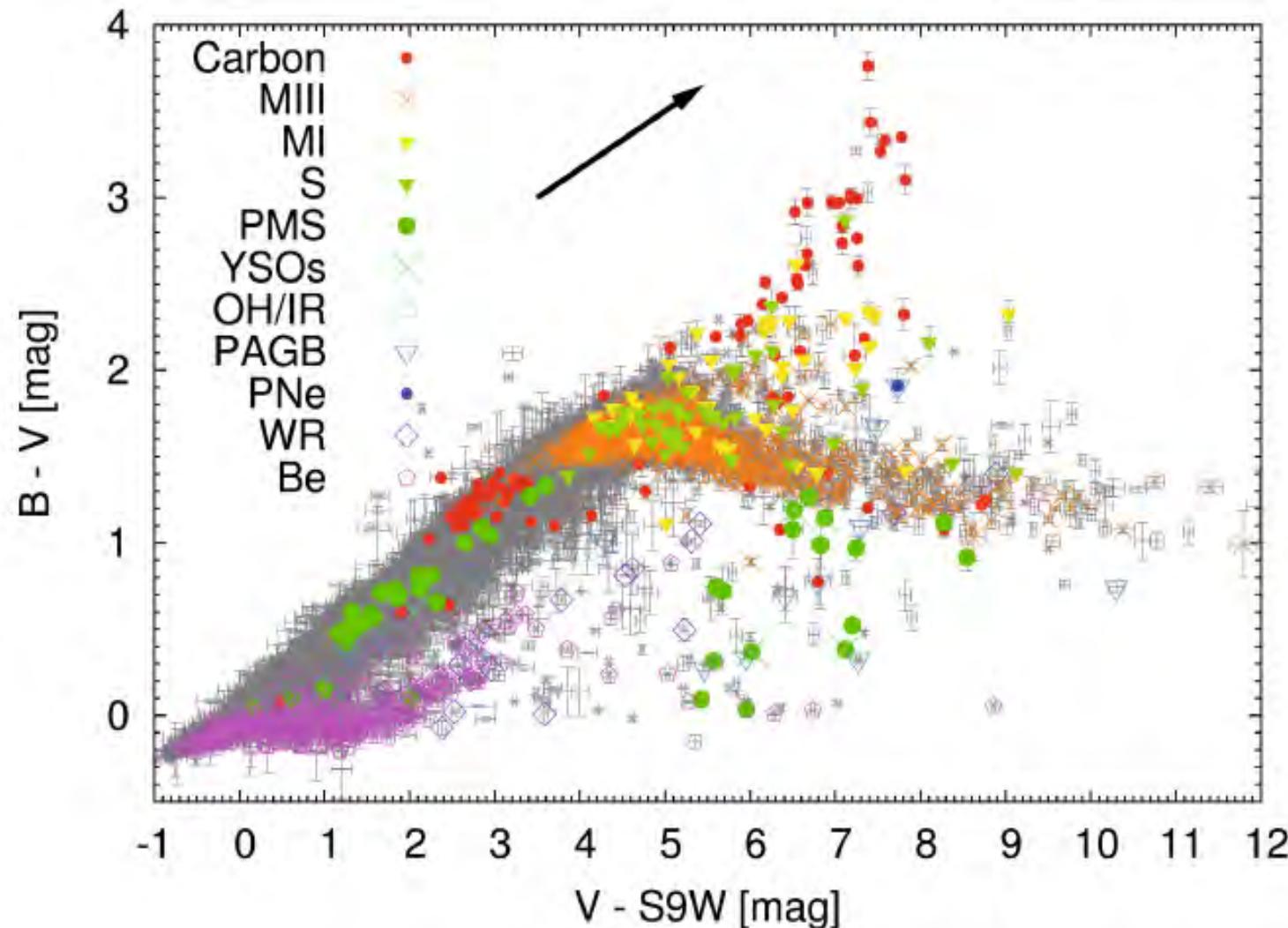
D. Ishihara^{1,2}, T. Onaka², H. Kataza³, A. Salama⁴, C. Alfageme^{4,**}, A. Cassatella^{4,5,6}, N. Cox^{4,***}, P. García-Lario⁴, C. Stephenson^{4,†}, M. Cohen⁷, N. Fujishiro^{3,8,‡}, H. Fujiwara², S. Hasegawa³, Y. Ita⁹, W. Kim^{3,2,§}, H. Matsuhara³, H. Murakami³, T. G. Müller¹⁰, T. Nakagawa³, Y. Ohyama¹¹, S. Oyabu³, J. Pyo¹², I. Sakon², H. Shibai¹³, S. Takita³, T. Tanabé¹⁴, K. Uemizu³, M. Ueno³, F. Usui³, T. Wada³, H. Watarai¹⁵, I. Yamamura³, and C. Yamauchi³



AKARI's infrared view on nearby stars

Using AKARI infrared camera all-sky survey, 2MASS, and Hipparcos catalogs*

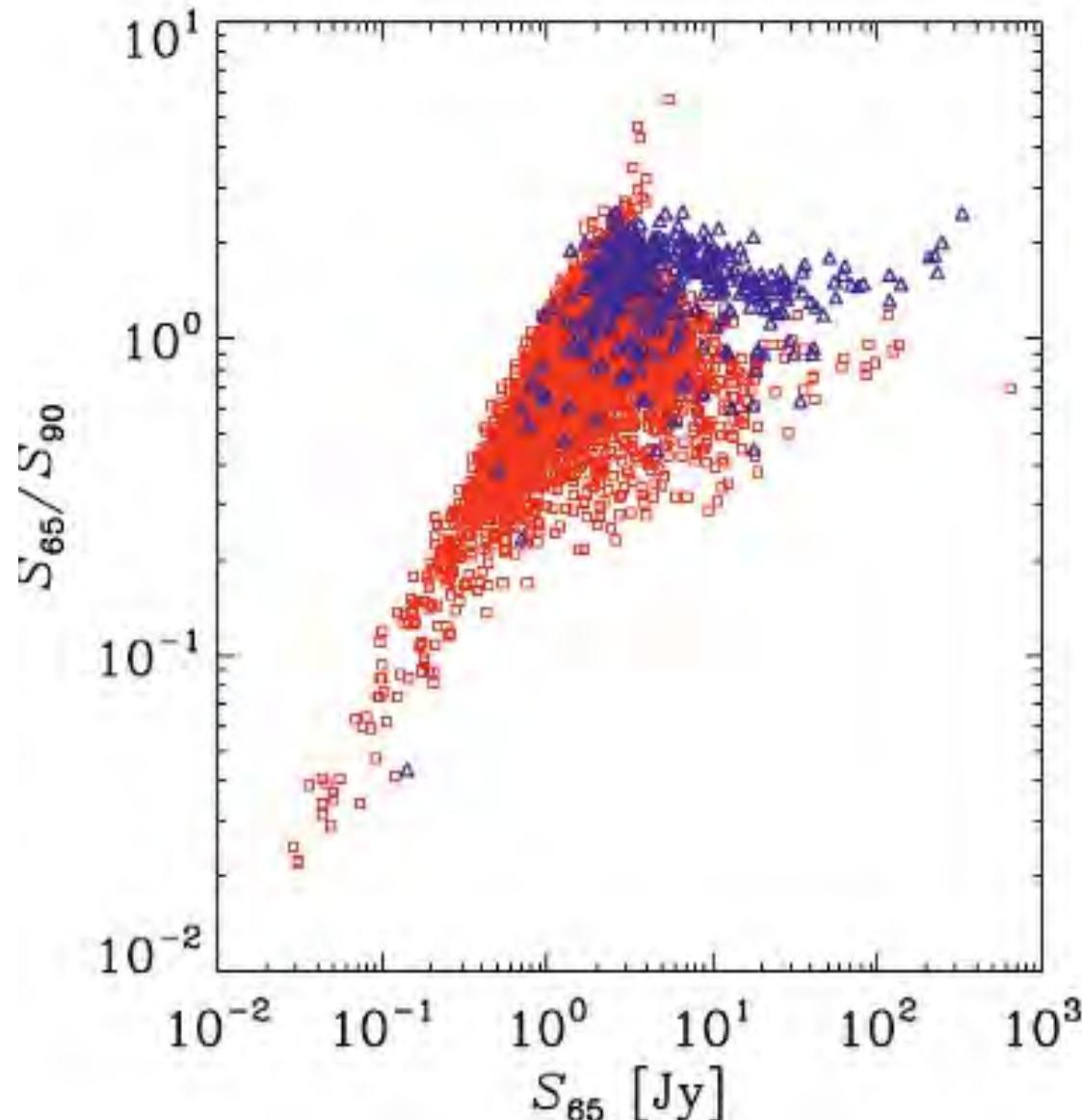
Y. Ita^{1,2}, M. Matsuura^{3,4}, D. Ishihara⁵, S. Oyabu², S. Takita², H. Kataza², I. Yamamura², N. Matsunaga⁶, T. Tanabe⁶, Y. Nakada⁶, H. Fujiwara⁷, T. Wada², T. Onaka⁷, and H. Matsuura²



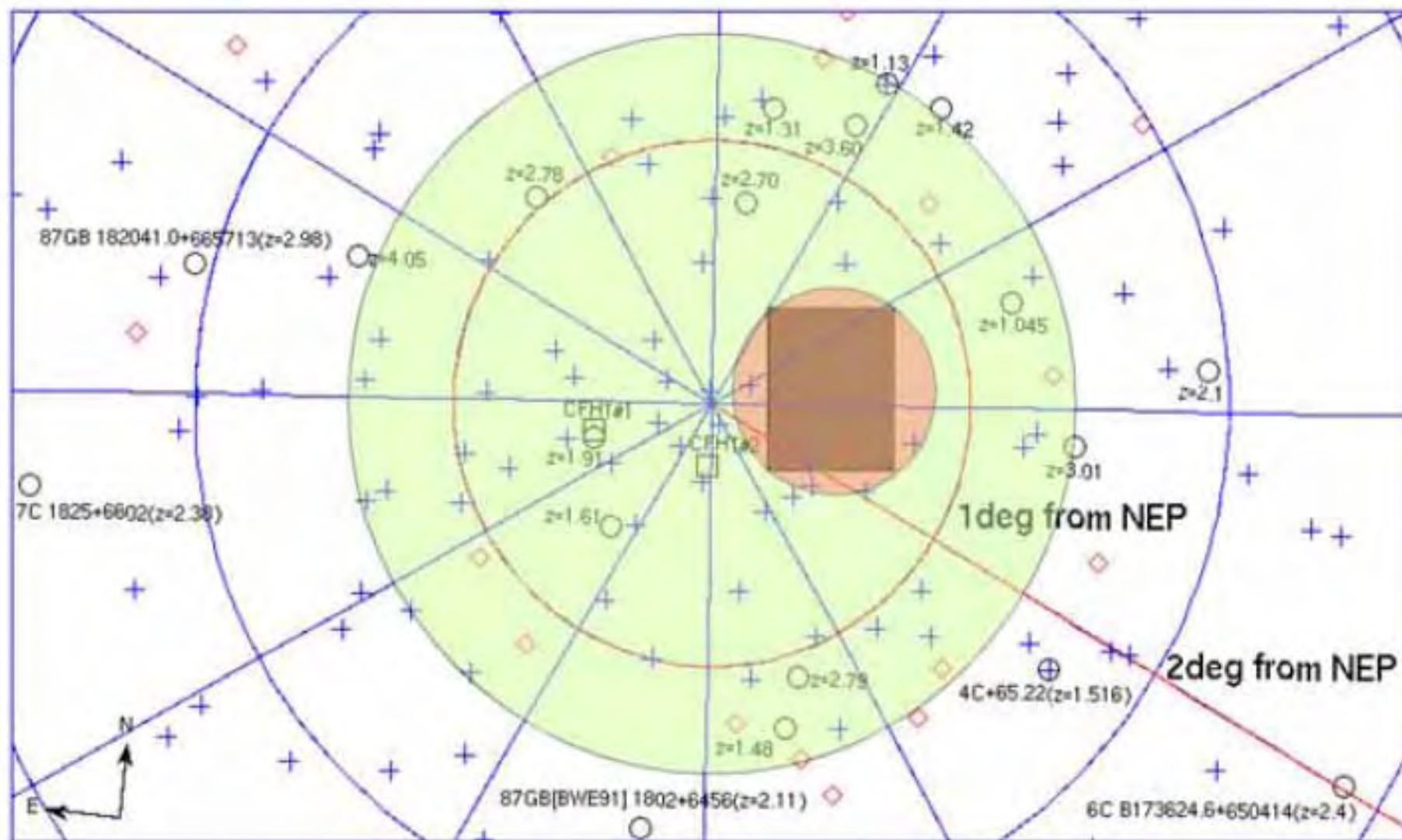
Star-galaxy separation by far-infrared color-color diagrams
for the AKARI FIS all-sky survey
(bright source catalog version β -1)^{*,**}



A. Pollo^{1,2}, P. Rybka², and T. T. Takeuchi³



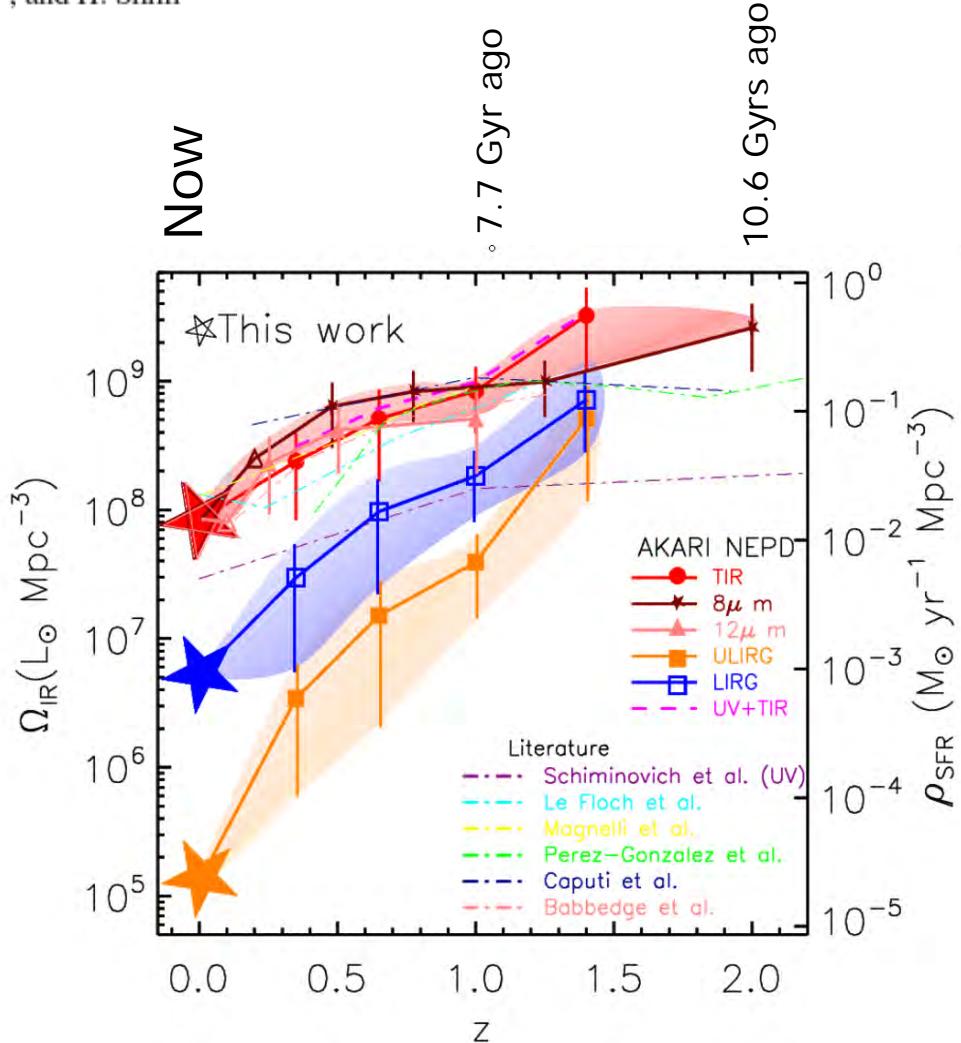
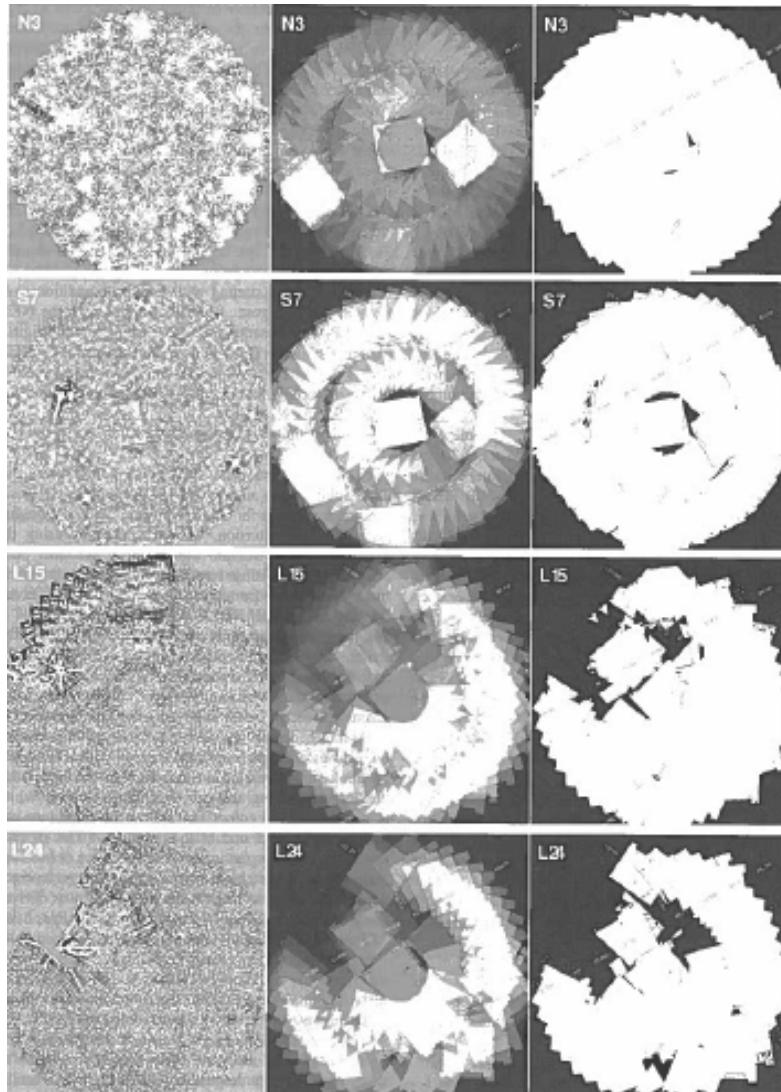
THE NEP Deep Surveys



Evolution of infrared luminosity functions of galaxies in the AKARI NEP-deep field

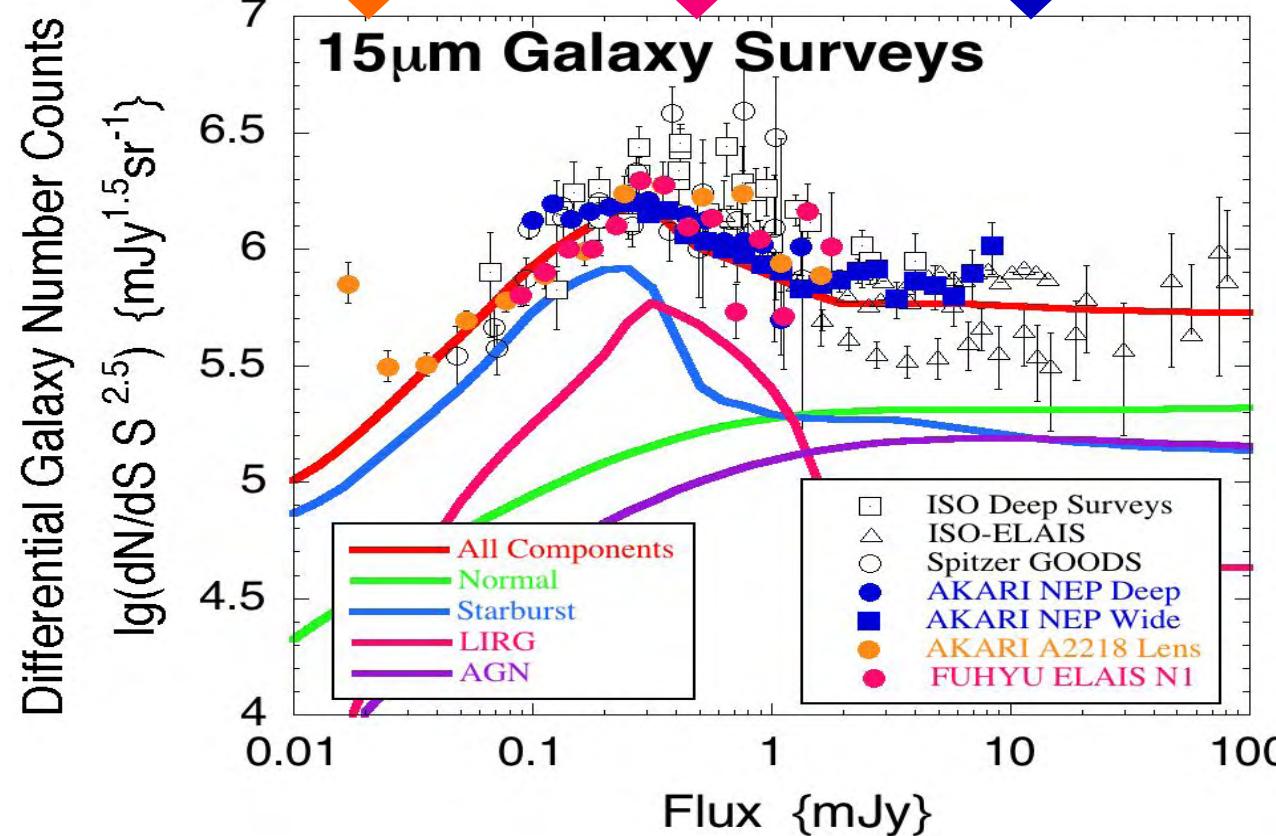
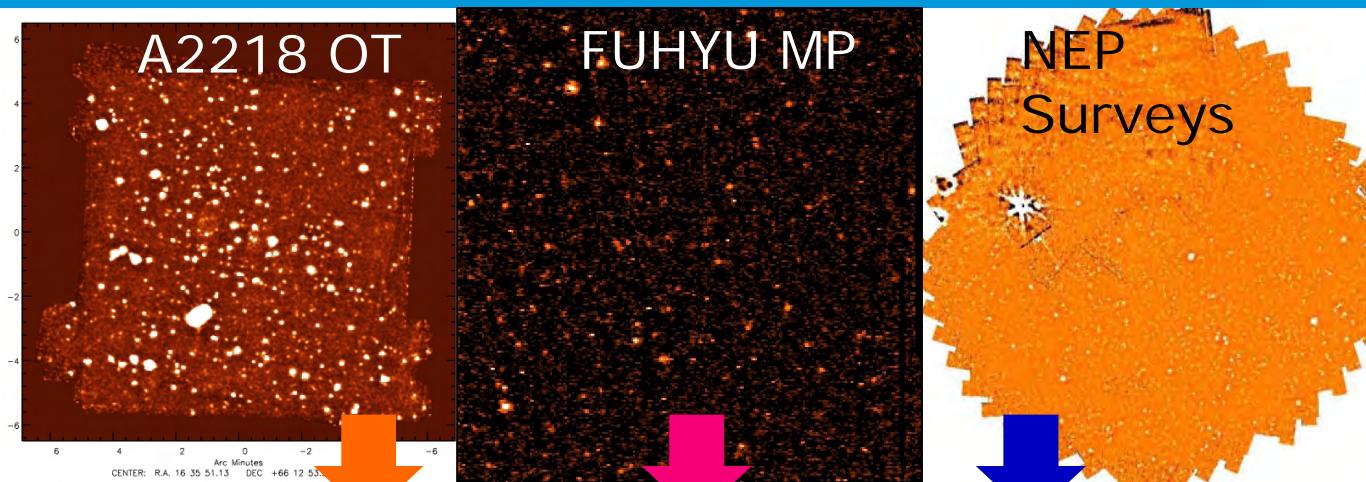
Revealing the cosmic star formation history hidden by dust^{★,★★}

T. Goto^{1,2,★★★}, T. Takagi³, H. Matsuhara³, T. T. Takeuchi⁴, C. Pearson^{5,6,7}, T. Wada³, T. Nakagawa³, O. Ilbert⁸, E. Le Floc'h⁹, S. Oyabu³, Y. Ohyama¹⁰, M. Malkan¹¹, H. M. Lee¹², M. G. Lee¹², H. Inami^{3,13,14}, N. Hwang², H. Hanami¹⁵, M. Im¹², K. Imai¹⁶, T. Ishigaki¹⁷, S. Serjeant⁷, and H. Shim¹²



Source counts at 15 microns from the AKARI NEP survey

C. P. Pearson^{1,2,7}, S. Oyabu³, T. Wada³, H. Matsuura³, H. M. Lee⁴, S. J. Kim⁴, T. Takagi³, T. Goto^{5,6}, M. S. Im⁴, S. Serjeant⁷, M. G. Lee⁴, J. W. Ko⁴, G. J. White⁷, and O. Ohyama⁸



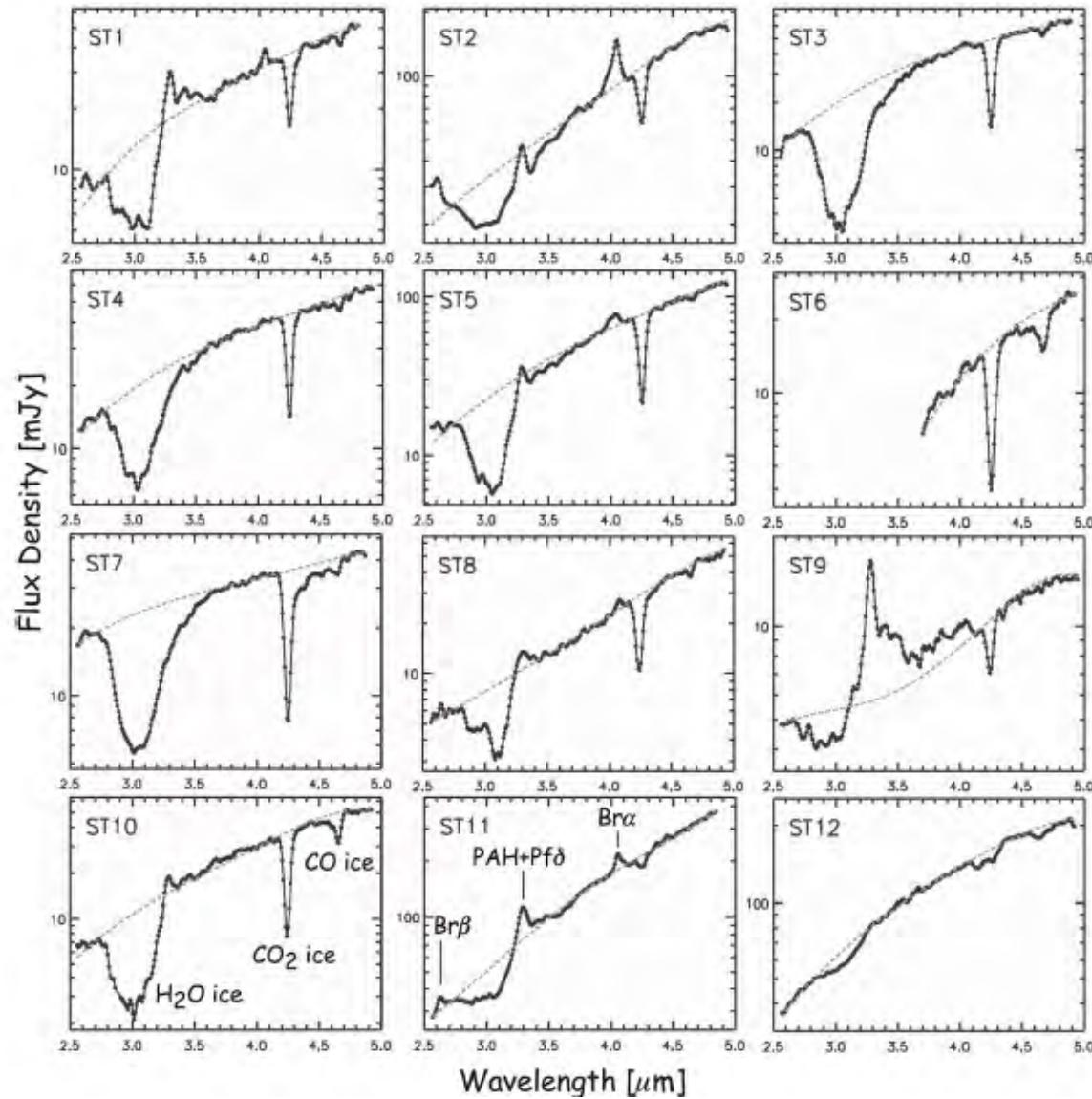
- Source counts in 15 micron band
 - Exhibit strong evolution
 - Agree with ISO, Spitzer
 - Extends previous counts to both brighter and fainter flux levels

AKARI galaxy counts point to the emergence of a population of luminous infrared galaxies that dominate the galaxy counts & star formation history of the Universe at faint flux levels

Spectroscopic observations of ices around embedded young stellar objects in the Large Magellanic Cloud with AKARI



T. Shimonishi¹, T. Onaka¹, D. Kato¹, I. Sakon¹, Y. Ita², A. Kawamura³, and H. Kaneda³

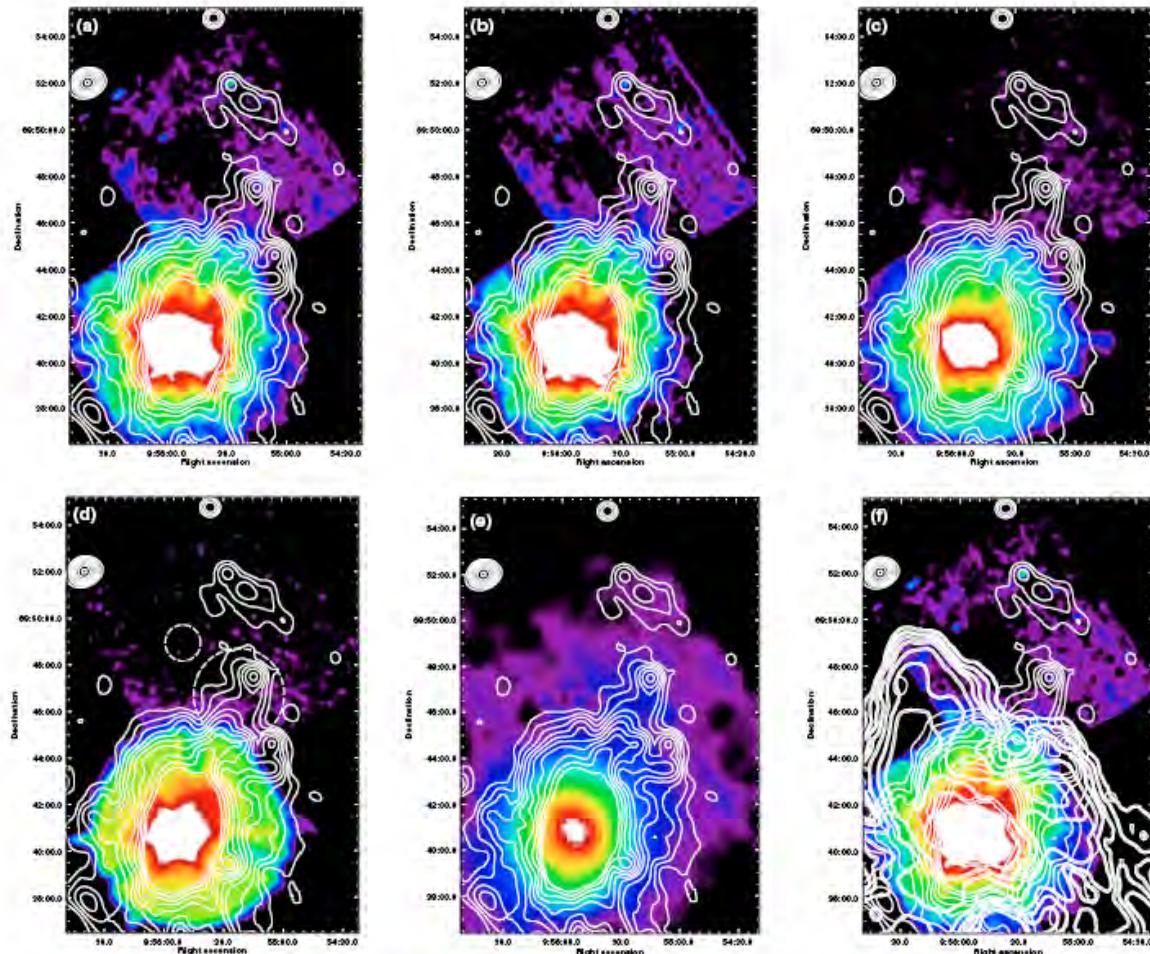


Large-scale distributions of mid- and far-infrared emission from the center to the halo of M 82 revealed with AKARI

H. Kaneda¹, D. Ishihara¹, T. Suzuki², N. Ikeda³, T. Onaka⁴, M. Yamagishi¹, Y. Ohyama⁵, T. Wada³, and A. Yasuda¹



A&A 514, A14 (2010)



Distribution of dust and PAHs

Fig. 3. Low-level MIR and FIR images of M 82 including the Cap region in the a) S7, b) S11, c) L15, d) L24, e) N160 bands, overlaid on the XMM/Newton X-ray (0.2–10 keV) contour map on a logarithmic scale. f) The H I contour map of M 82 in the thick lines, taken from Yun et al. (1994), is superposed on the panel a) image. The color scales of the MIR and FIR images are logarithmically scaled from 0.2% to 0.0007% of the peak surface brightness for all the panels except e) and from 80% to 0.1% for the panel e). The two circular apertures are shown in panel d), where the larger one is used to obtain the flux densities from the halo ($d \leq 4'$) regions and the smaller one to estimate the background level and its fluctuation from the darkest nearby blank sky.

Galactic Planetary Nebulae in the AKARI Far-Infrared Surveyor Bright Source Catalog



Nick Cox,¹ Arturo Manchado,^{2,3} Pedro García-Lario,¹ Ryszard Szczerba⁴

- study of all known Galactic PNe
- SEDs provide information on cold dust

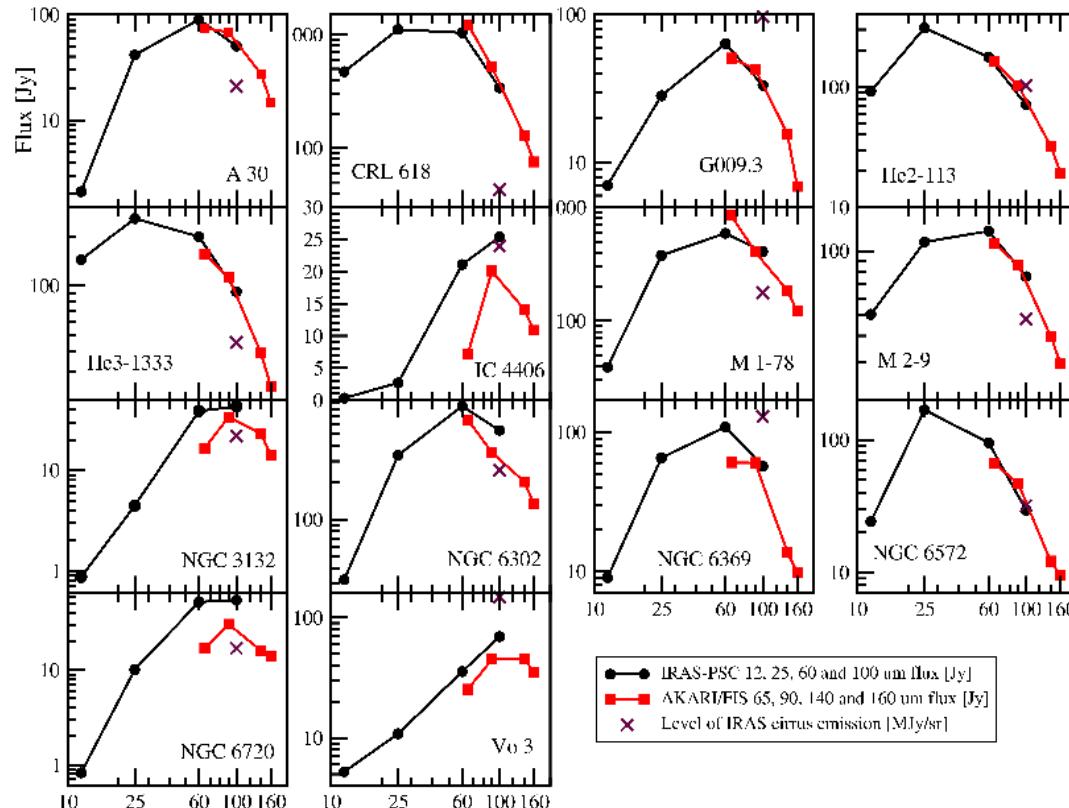
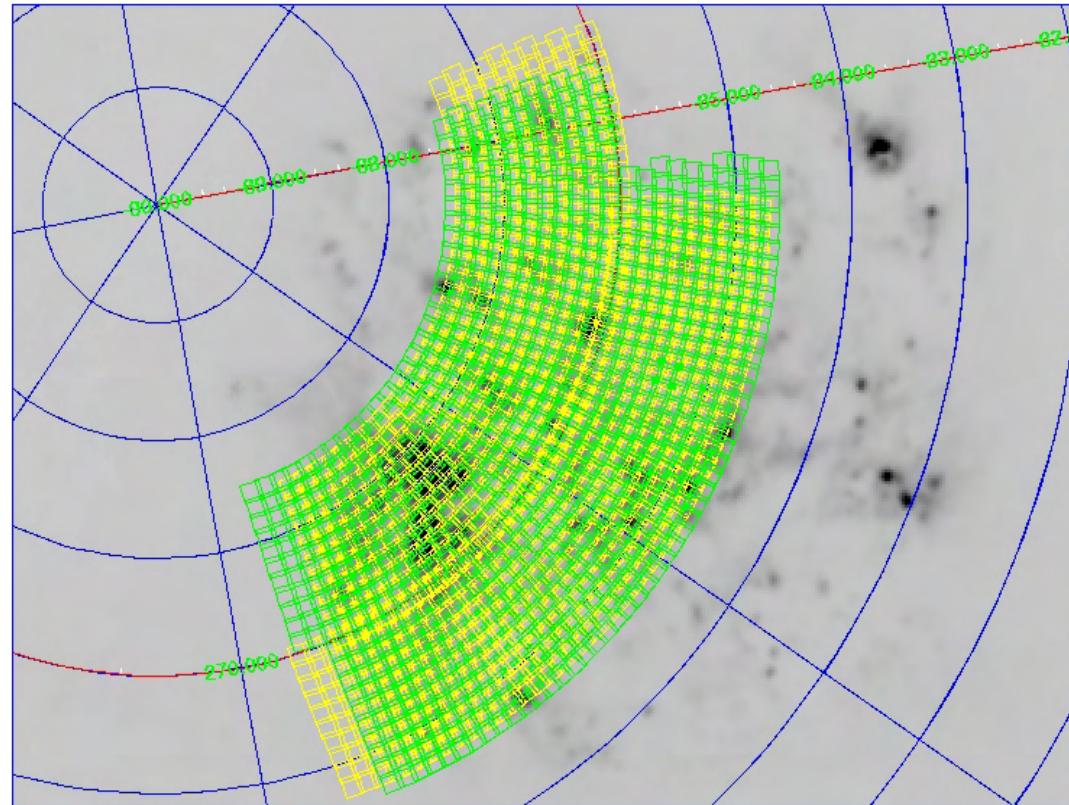


Figure 5. IRAS+AKARI spectral energy distribution of the 14 PNe detected in all bands. The cirrus emission values from IRAS (at 100 μ m in MJy/sr) are also indicated (crosses).

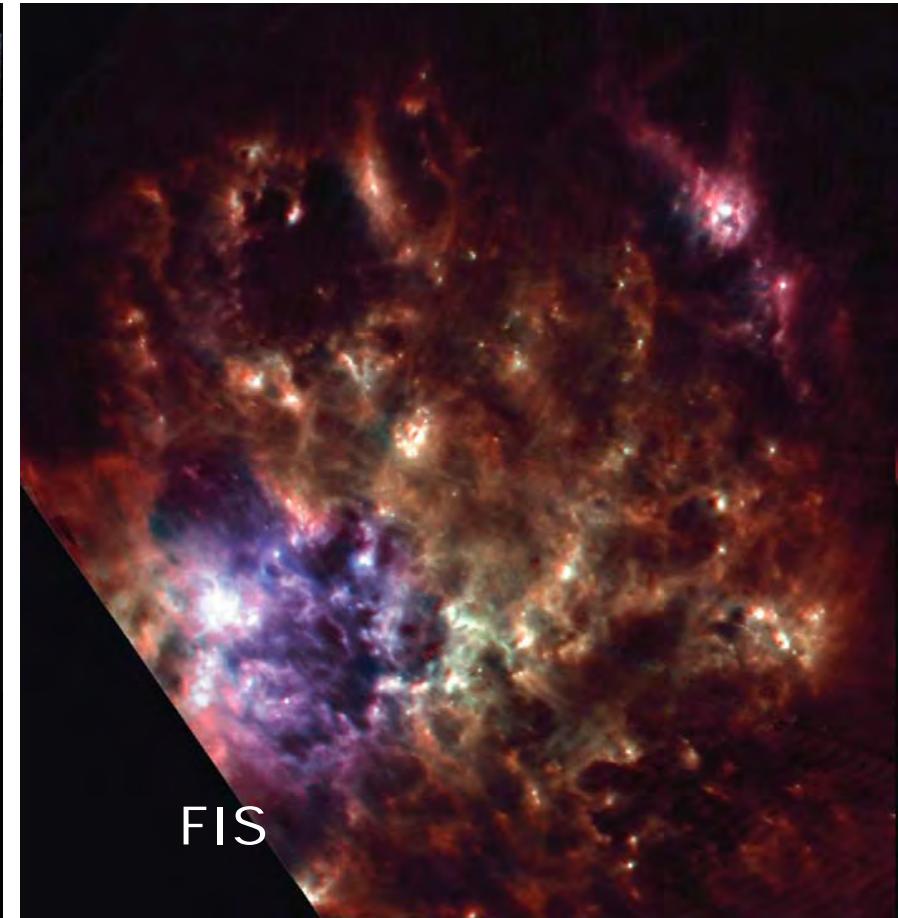
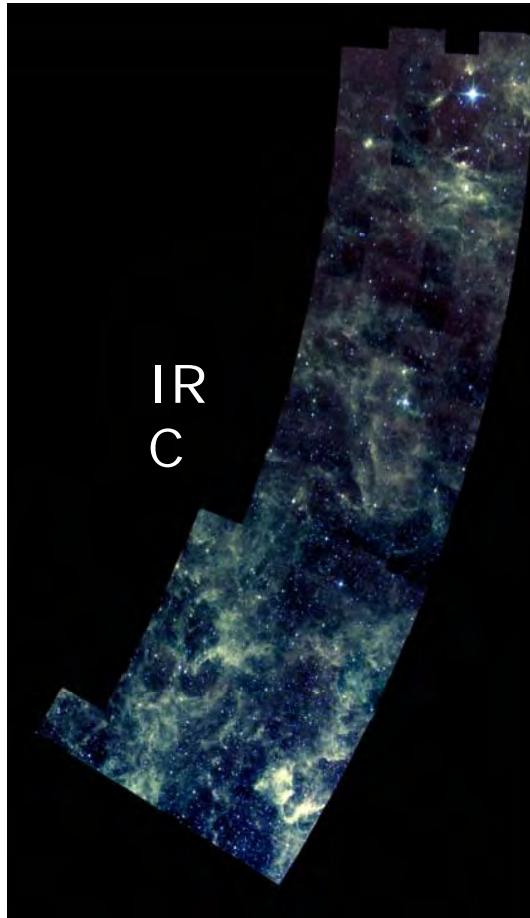
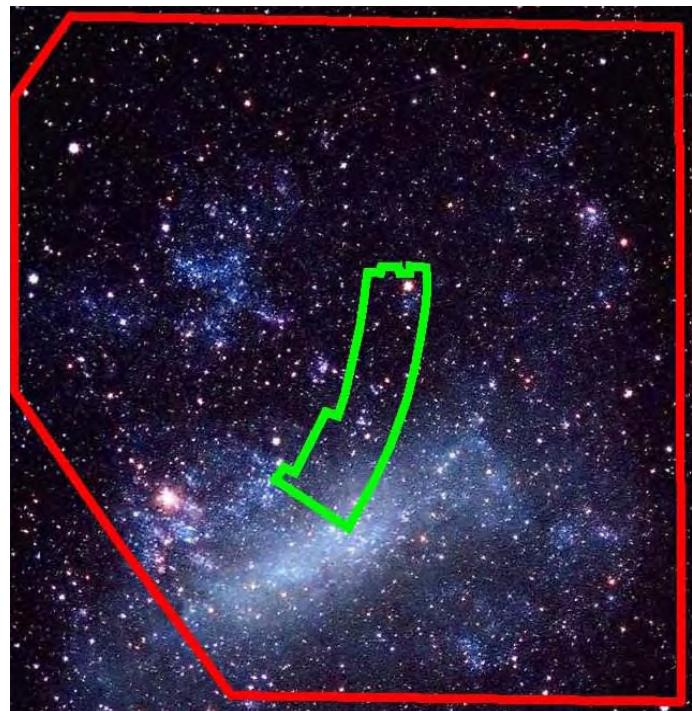
From "AKARI: a light to illuminate the dusty Universe"
Proceedings (Conference held in Tokyo in Feb 2009)

The LMC Survey

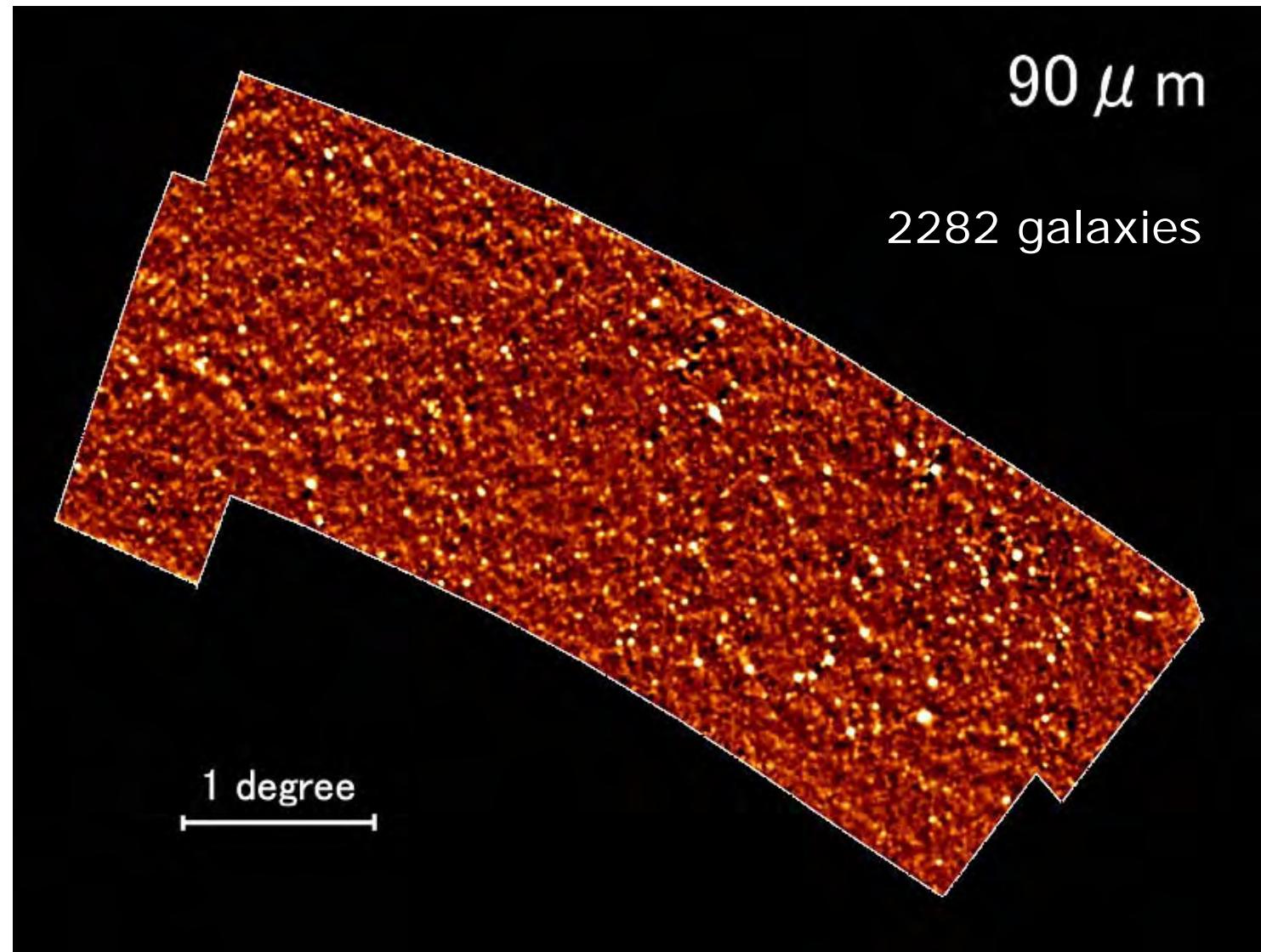


~15deg² prism + 5 filters (NP, N3, S7, S11, L15, L24)
+ spectroscopy (MIR-FIR) at selected areas
~900 pointing observations

The LMC Survey



Infrared primordial galaxies



Generations of stars forming



IC 1396



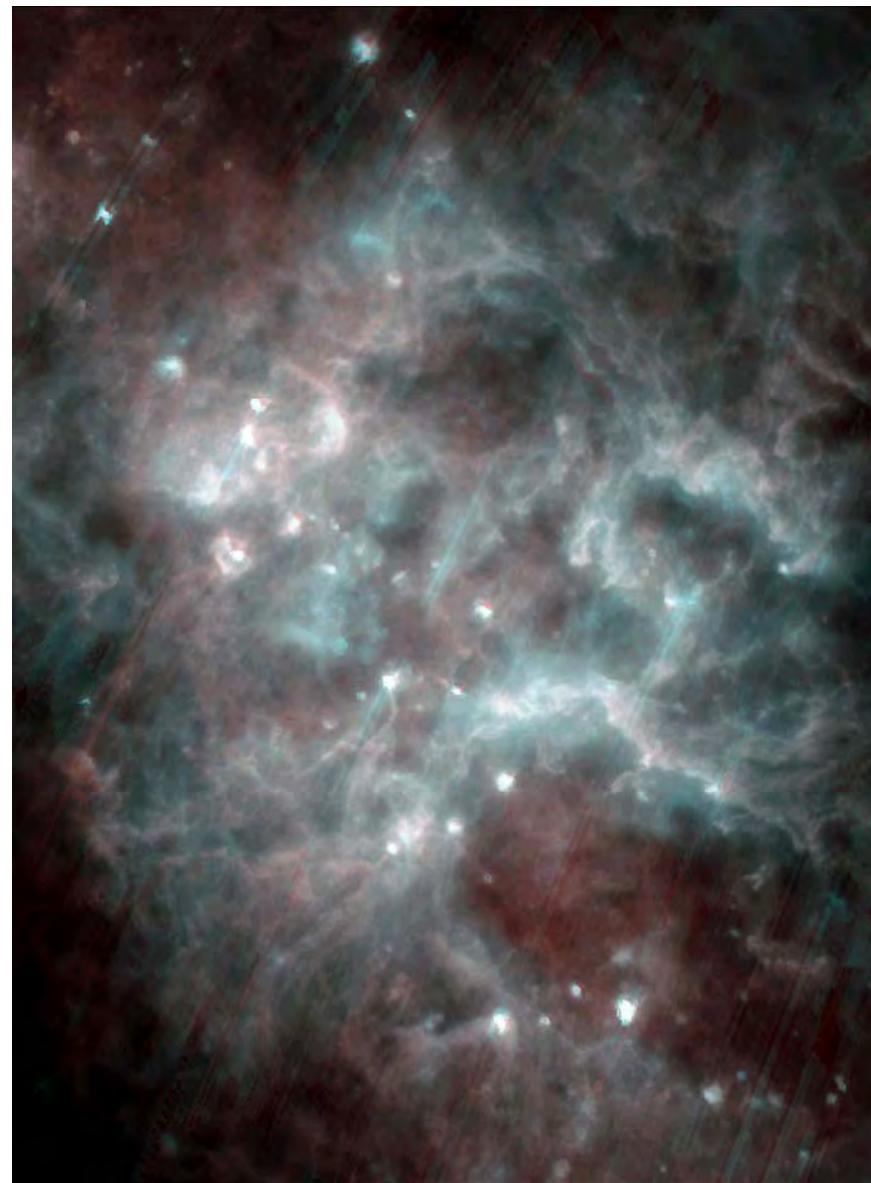
Visible

Infrared (9, 18 μm)

Cygnus-X Star forming region nebula

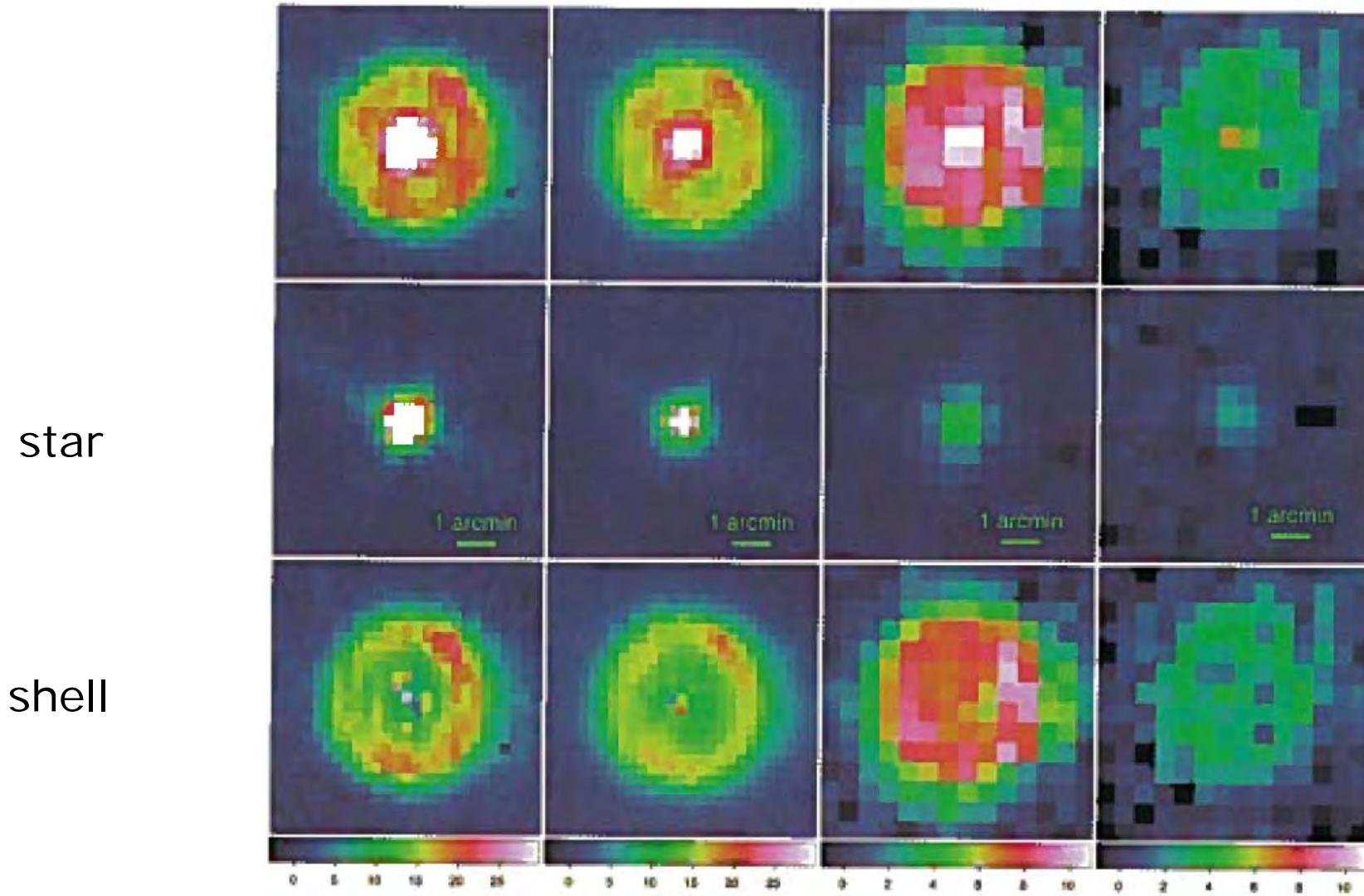


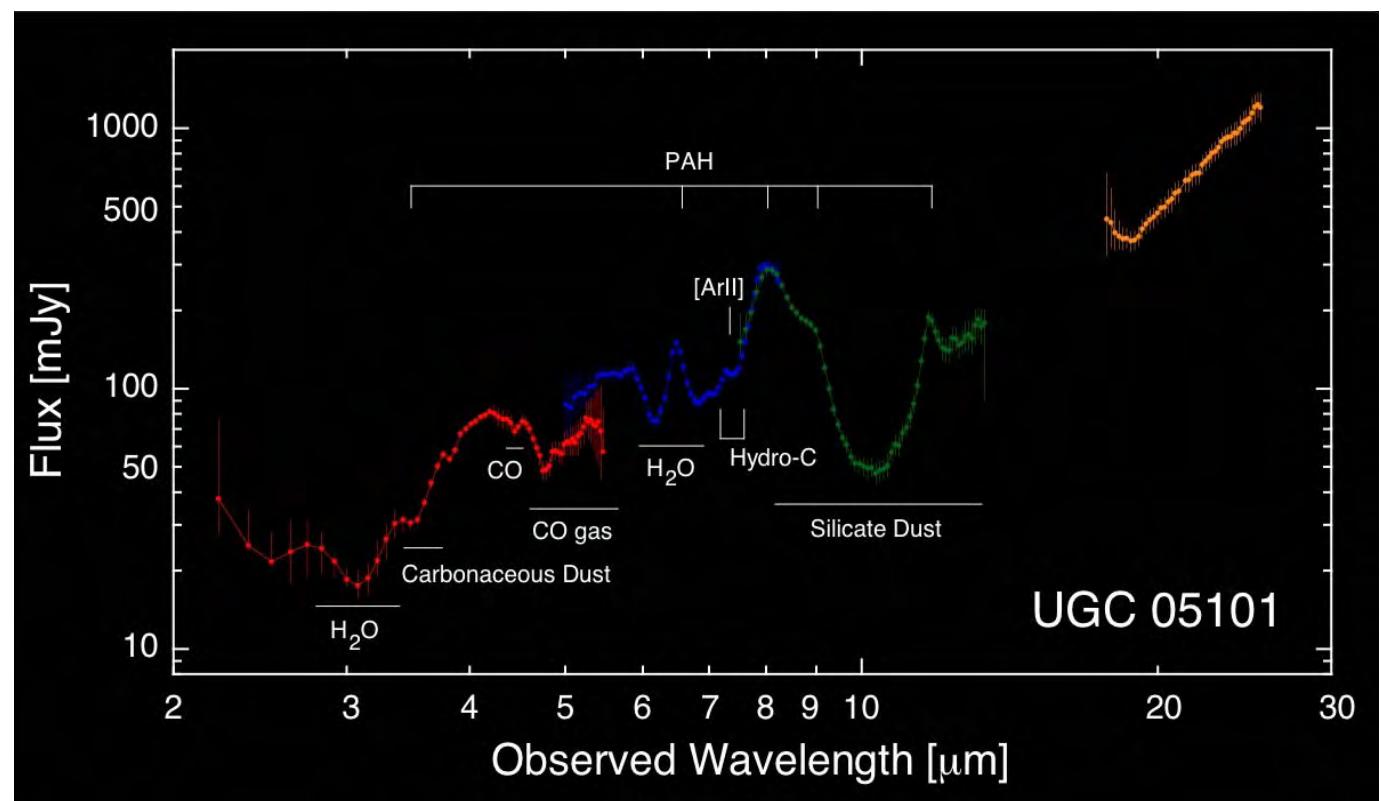
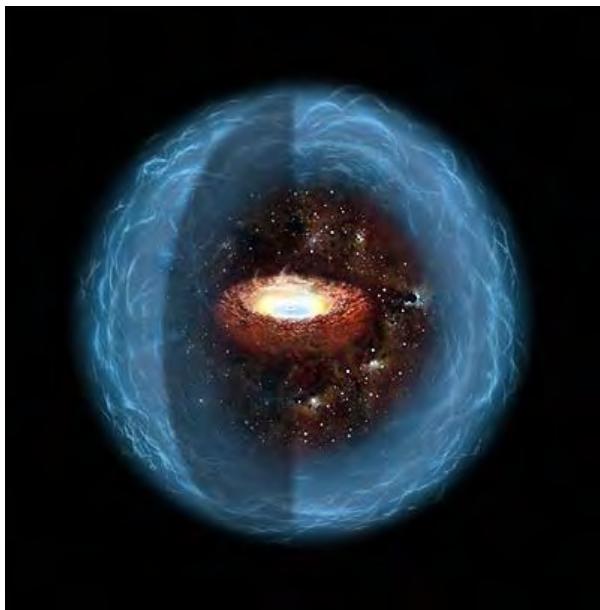
➤ 90, 140 μm



Imaging a debris disk

- U Hydrae, AGB star, Mass loss





Science with AKARI at ESAC

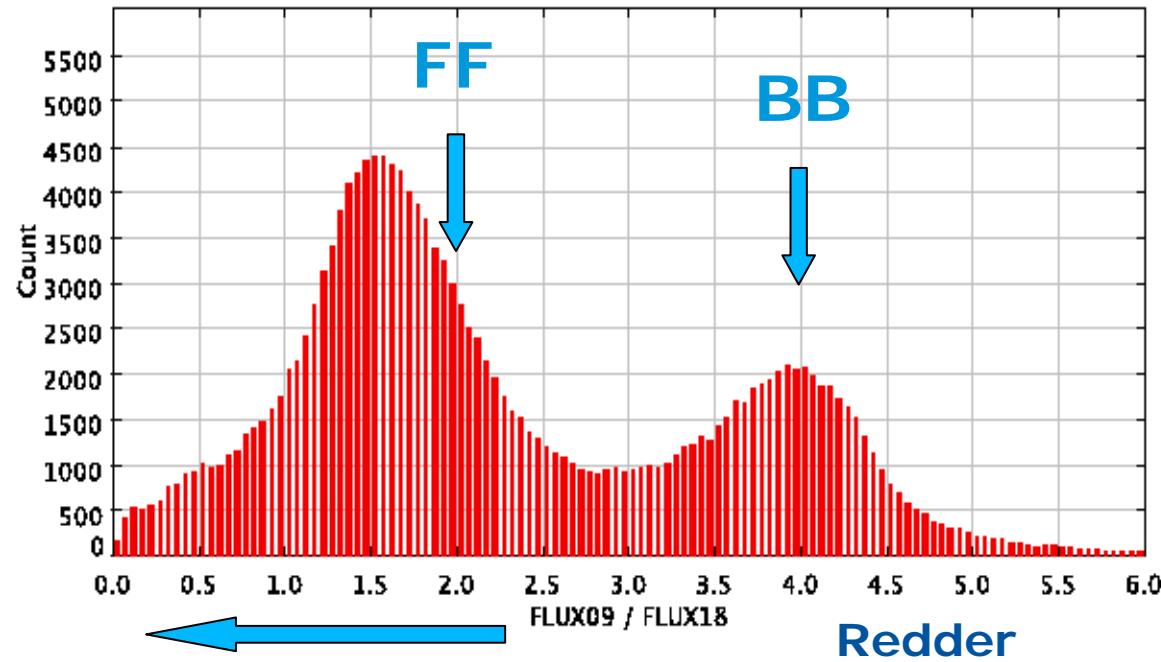
(A. Cassatella, R. González-Riestra, M. Santos-Lleò, A. Salama et al.)



What we can learn from:

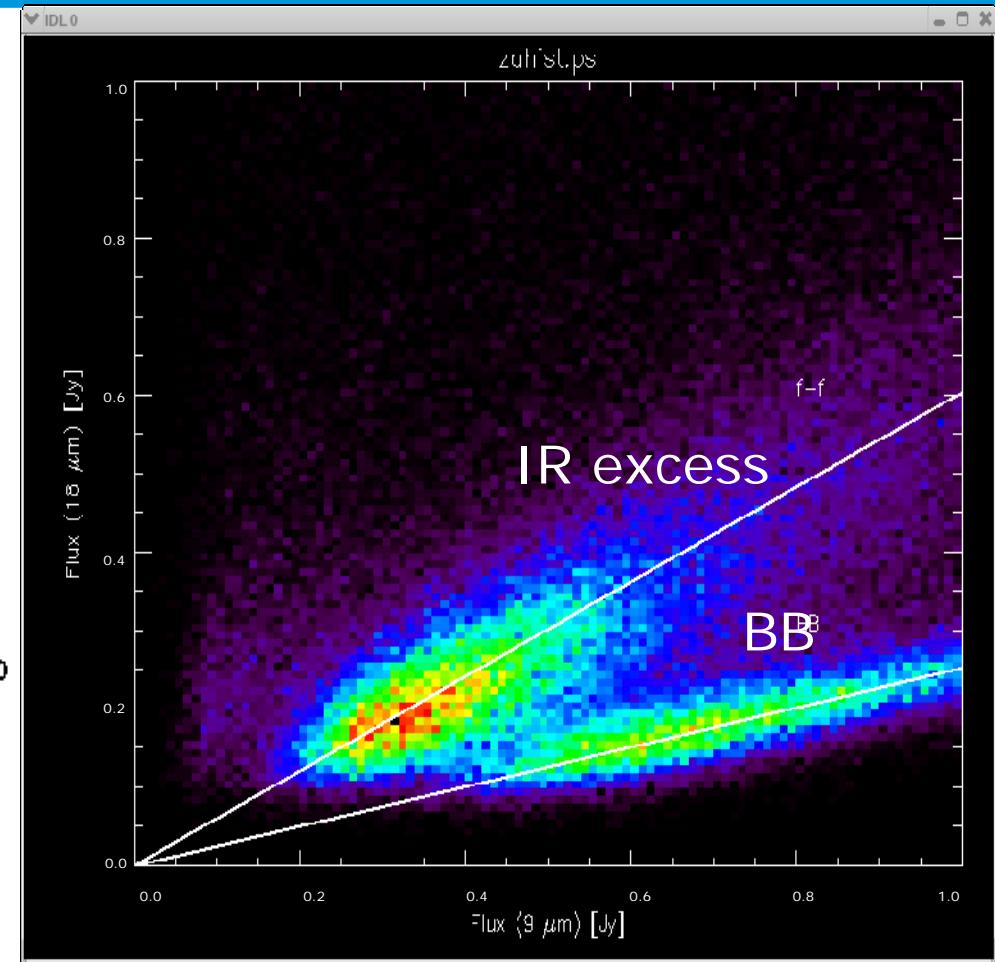
- AKARI/MIR FLUX-FLUX CORRELATIONS (9 & 18 μ m)
- CROSS CORRELATION WITH XMM-OM and XMM-EPIC DATA
- CROSS CORRELATION WITH AKARI/FIS

AKARI /MIR: two population of sources



Total: **N = 870 973 sources**
@ 9 μm N=844 649 (97%)
@18 μm N=194 551 (22%)

Both bands: N= 168 227 (19%)



IR excess: Comparison with 2MASS colours



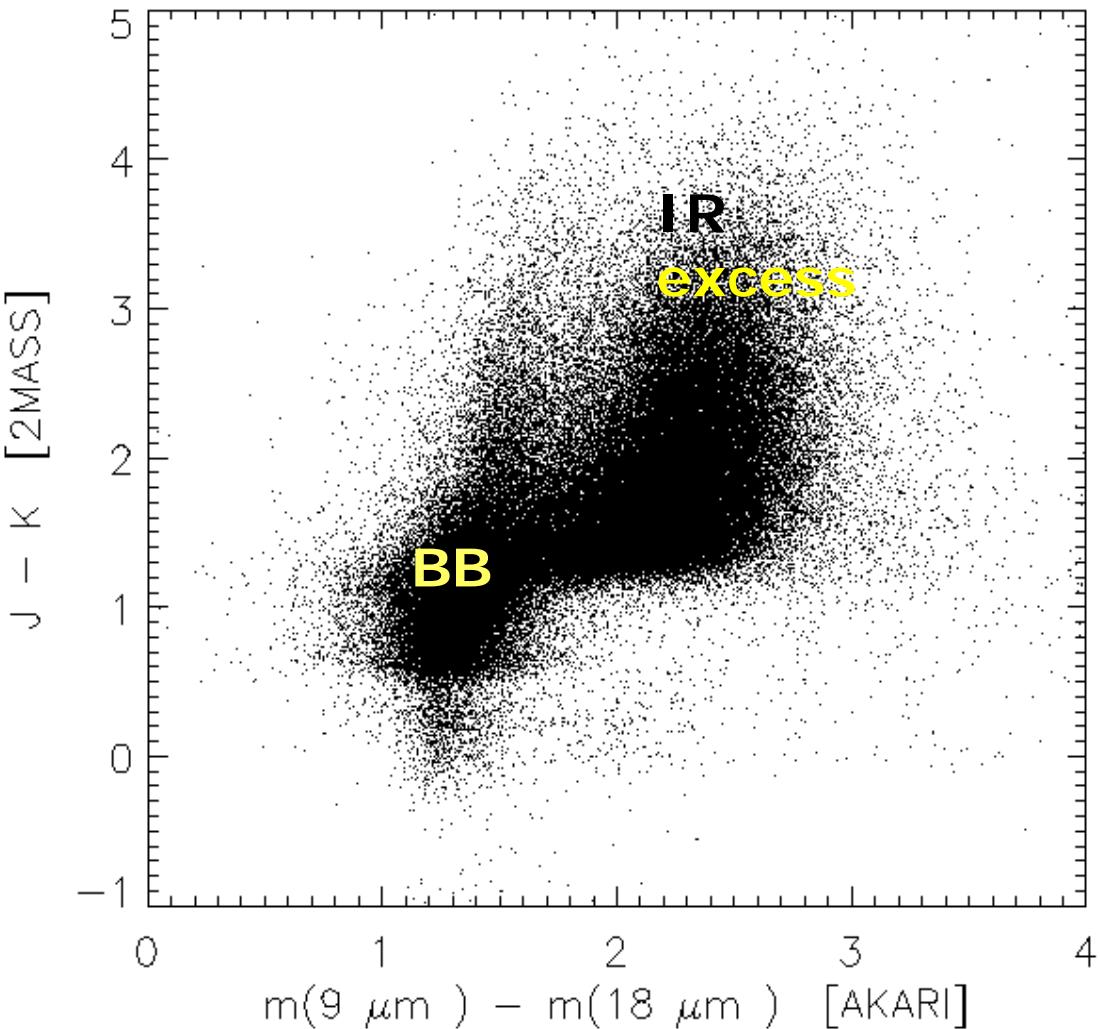
The reddest objects $J-K > 1.5$

A) galaxies

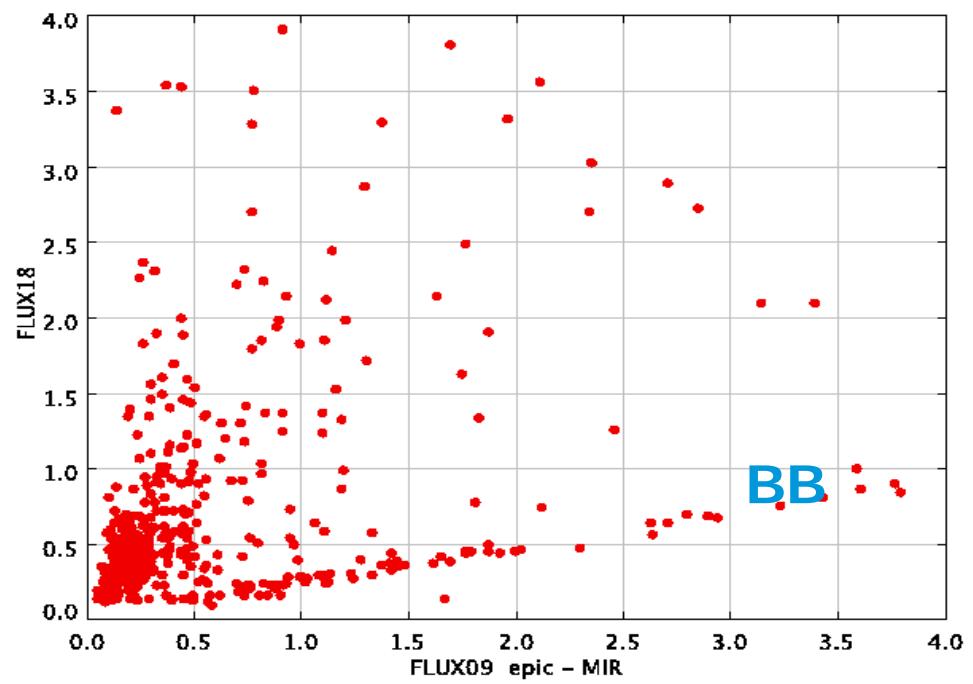
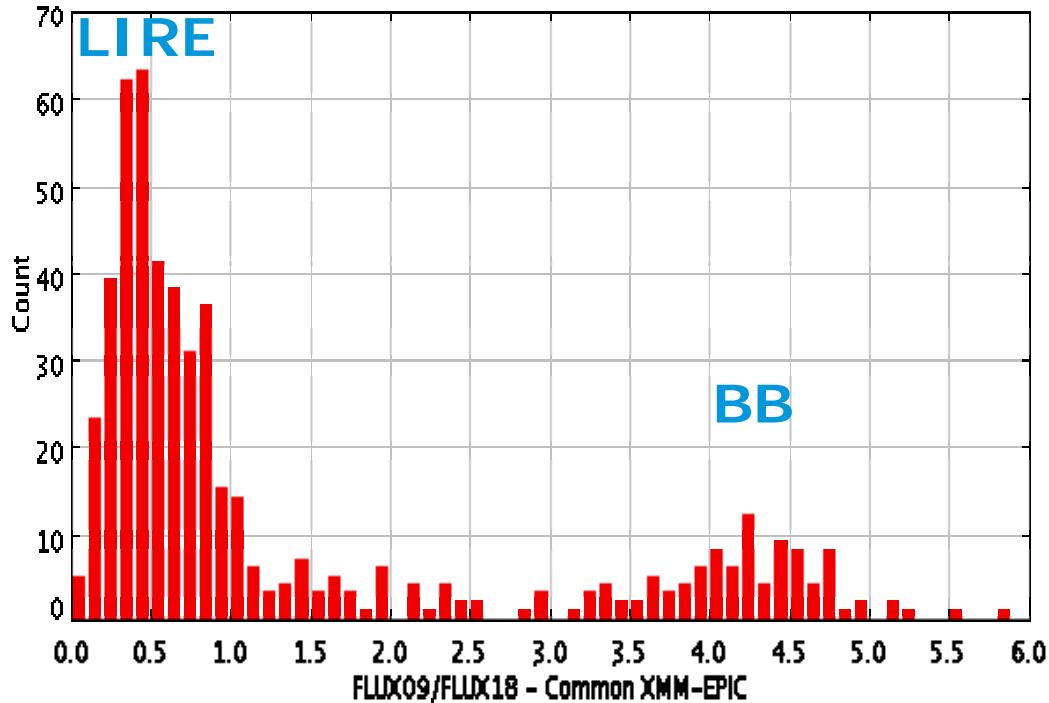
- light dominated by red bulge & core stars
- redshift
- dust absorption in Galactic plane

B) stars with

- 100-400 K dust
- large mass loss



AKARI/MIR vs. XMM/EPIC: a third population of X-ray sources with large IR excess



AKARI MIR

No. Sources = 870 973
2 bands @ 9 μ m & 18 μ m

XMM EPIC

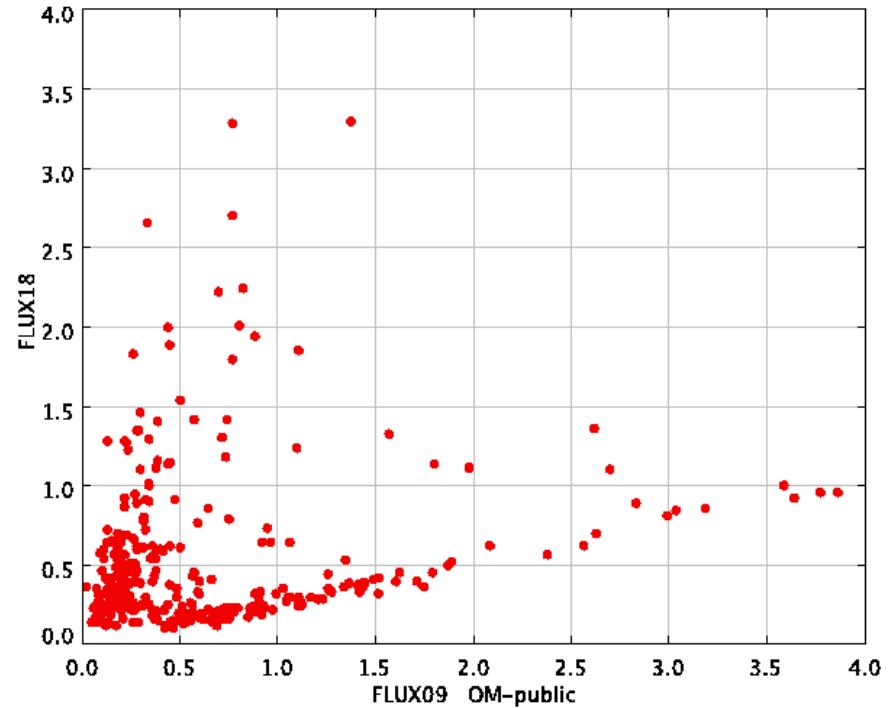
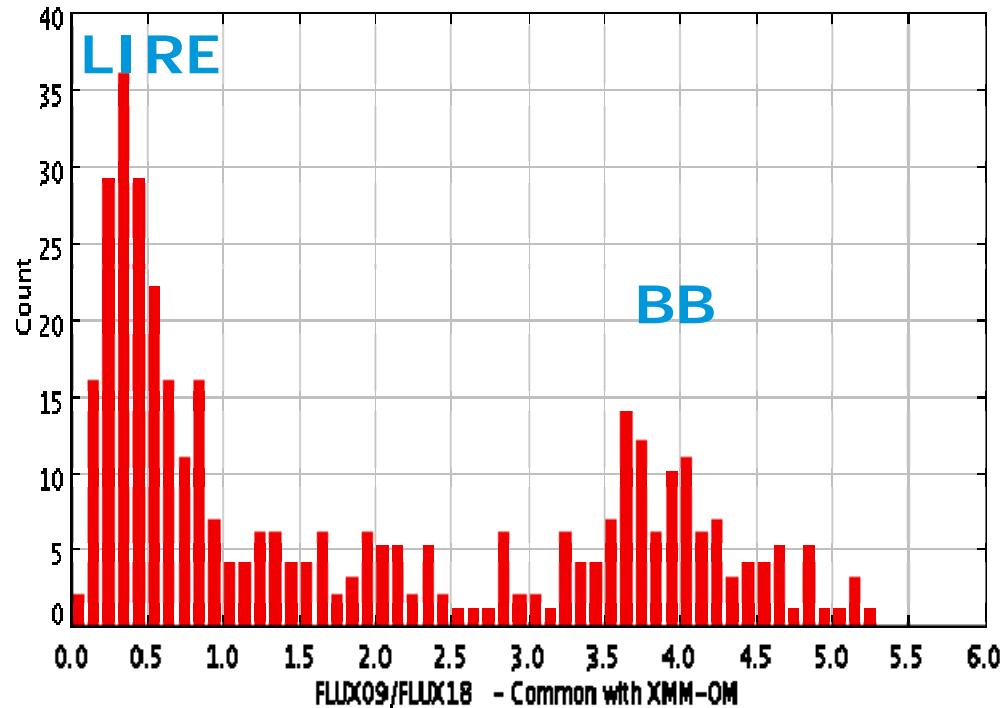
No. Sources= 221 012
8 bands 0.2 to 4.5 KeV

Common sources: 1174 ($r = 5''$)

Large IR excess: AKARI/MIR vs. XMM/OM



Common sources: 1321 ($r = 5''$)



XMM OM

No. Sources = 753 578

6 bands:

1894 Å (N= 119805)

3275 Å U (N= 177569)

2205 Å (N= 145210)

4050 Å B (N= 81119)

2675 Å (N= 618266)

5235 Å V (N= 78160)

Cross correlating AKARI MIR & FIS catalogues with XMM EPIC, OM and RGS catalogues



FIS catalogue: 427.071 sources @ 25, 60, 60 and 160 um

MIR catalogue: 870.973 sources @ 9, and 18 um

Also observed with XMM EPIC: 1174

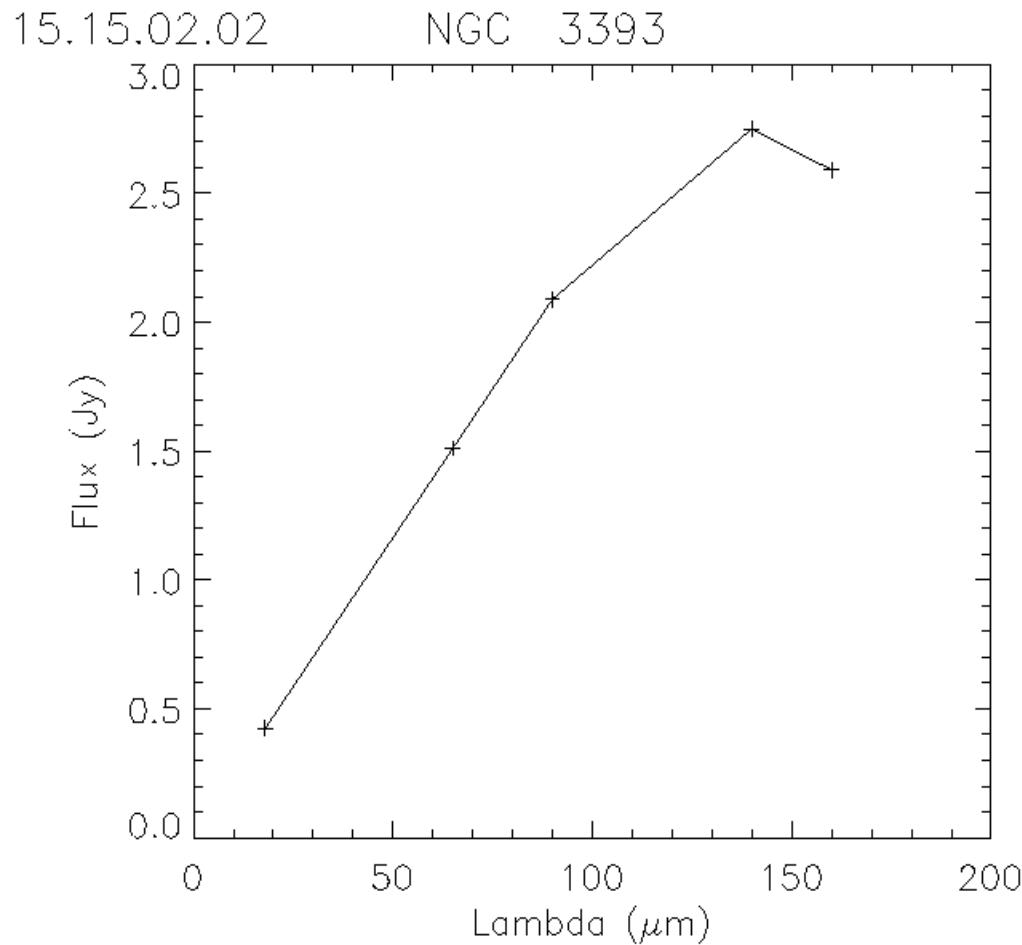
Also observed with XMM OM: 1321

Also observed with XMM RGS: 305

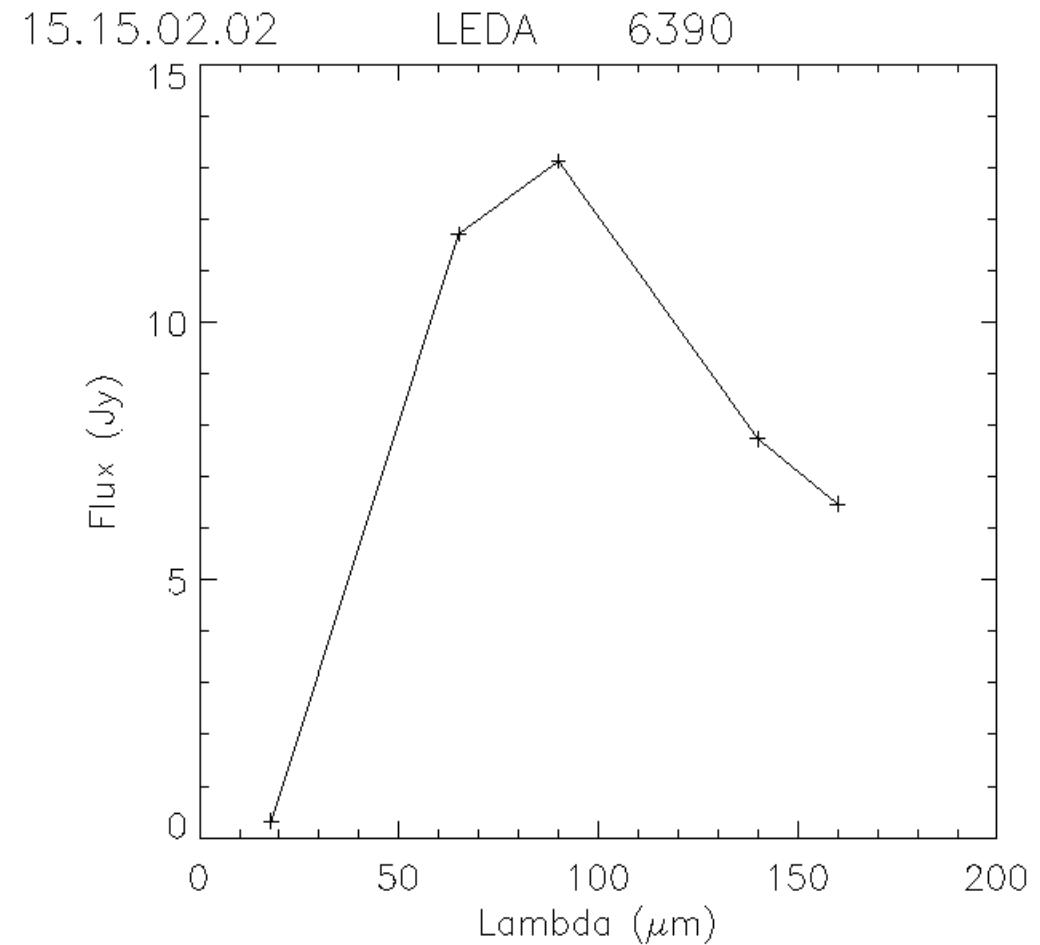
Examples of sources common to the AKARI/MIR, AKARI/FIS & XMM/RGS catalogues.... Looking for correlations



Seyfert 2



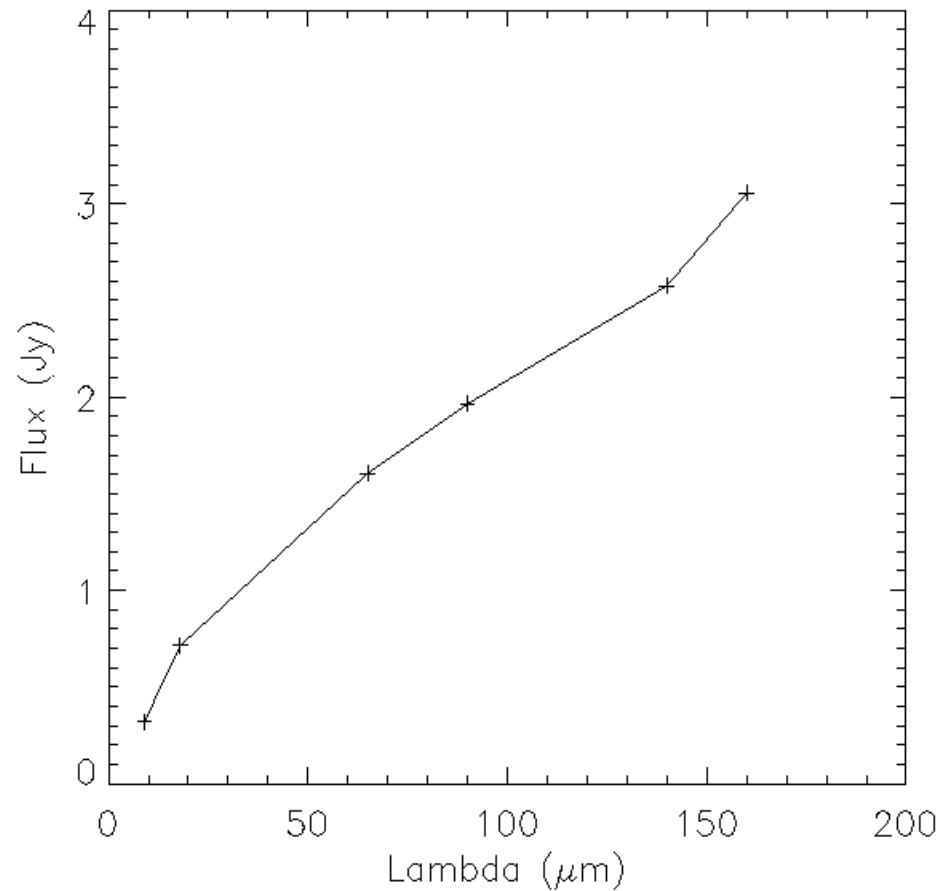
Seyfert 2



Seyfert 1

15.15.02.01

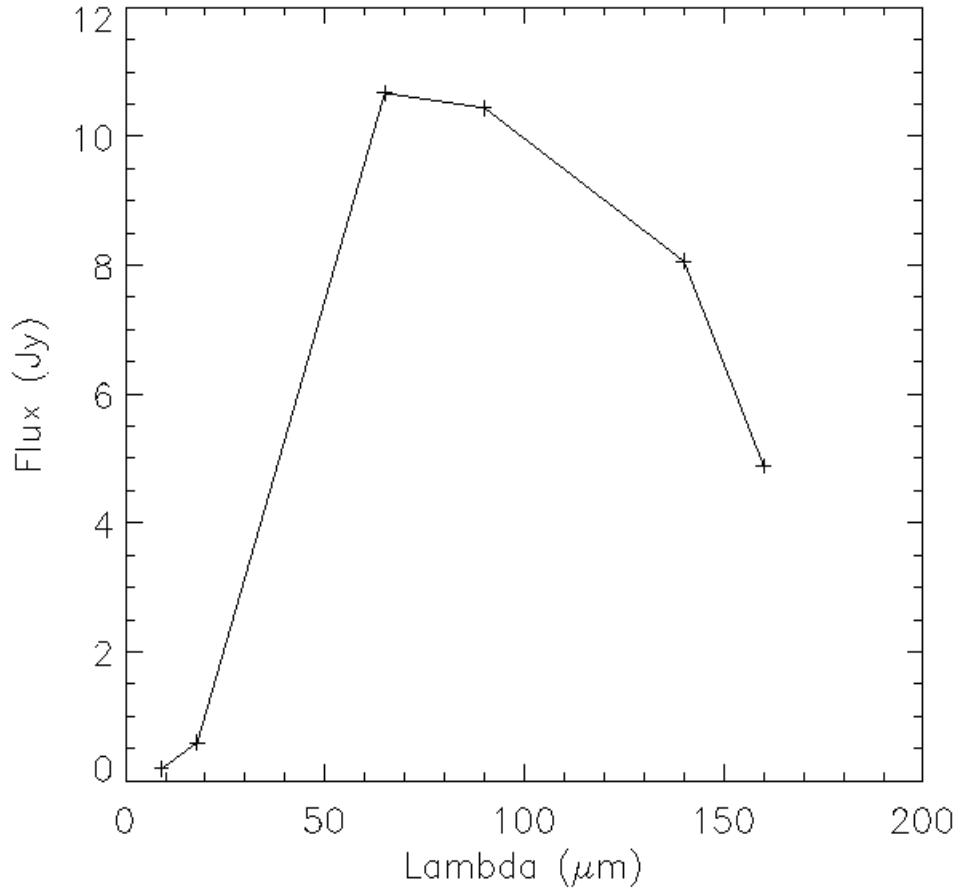
QSO B0050+124



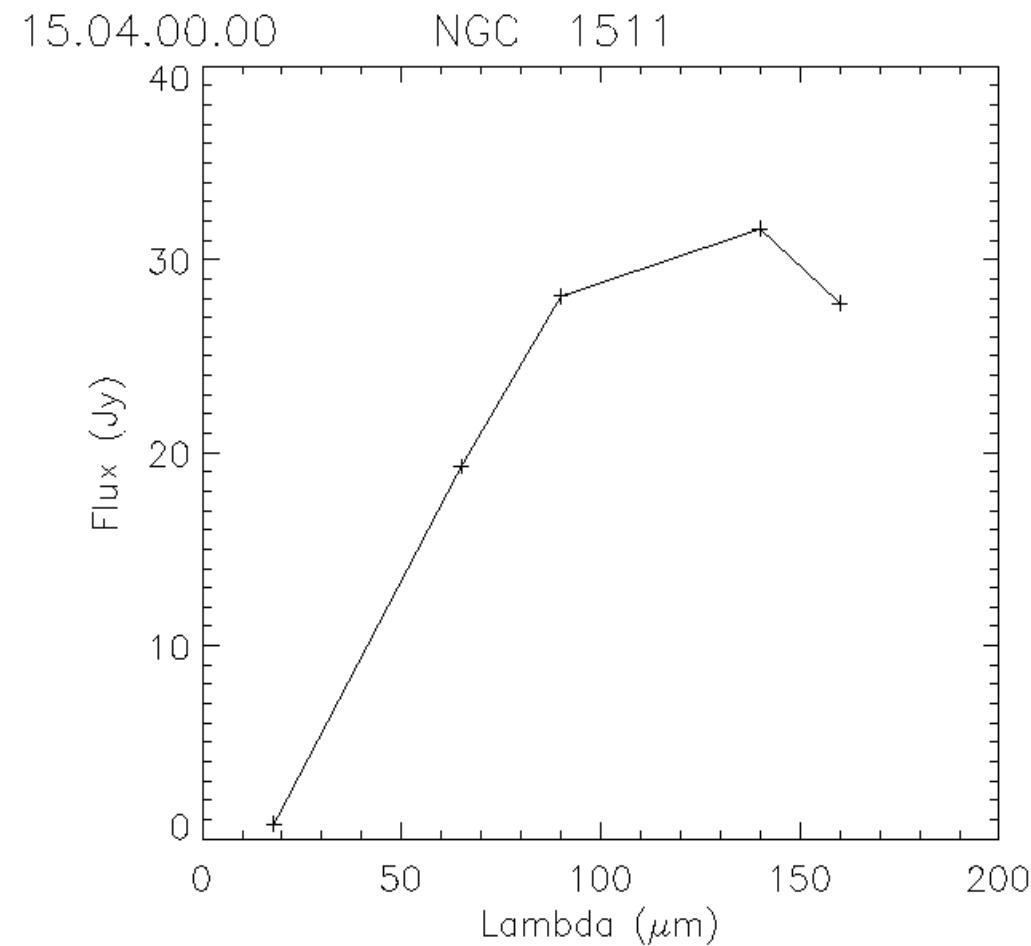
Liner

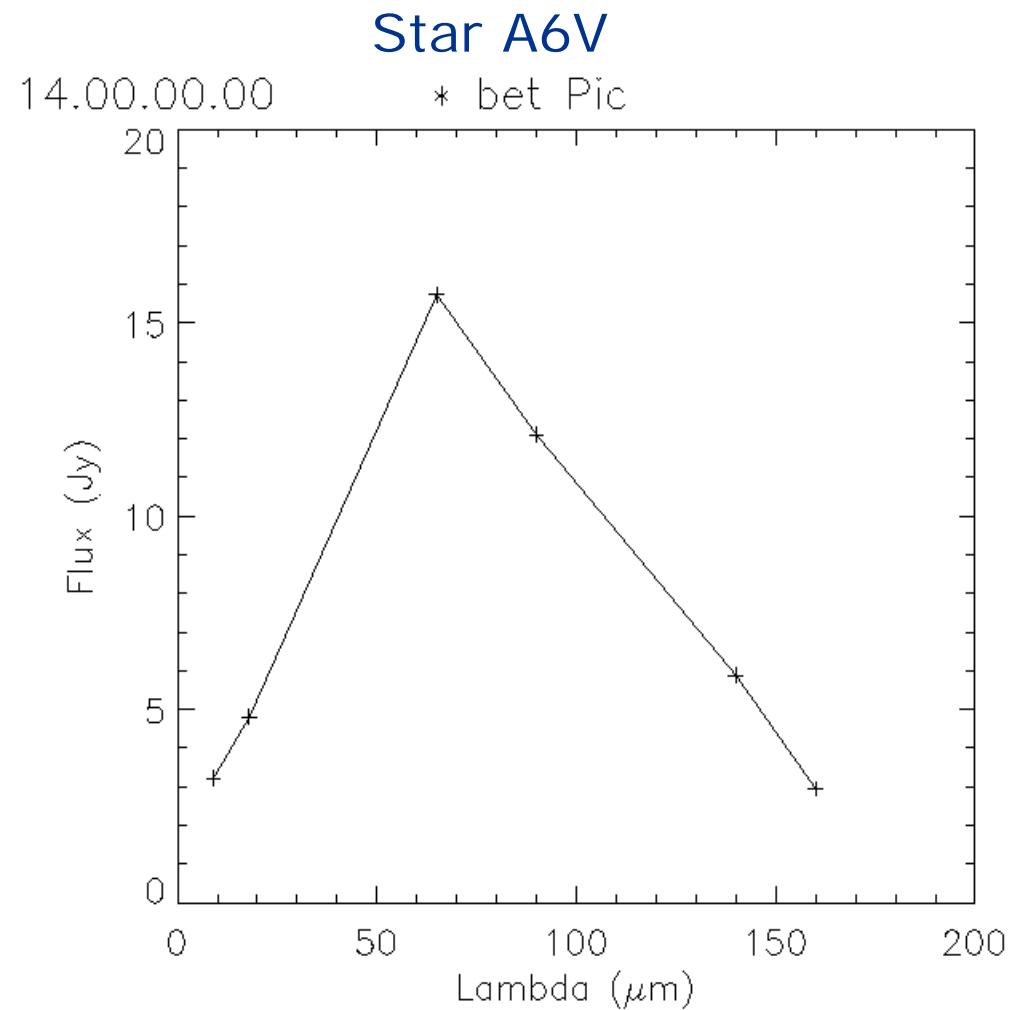
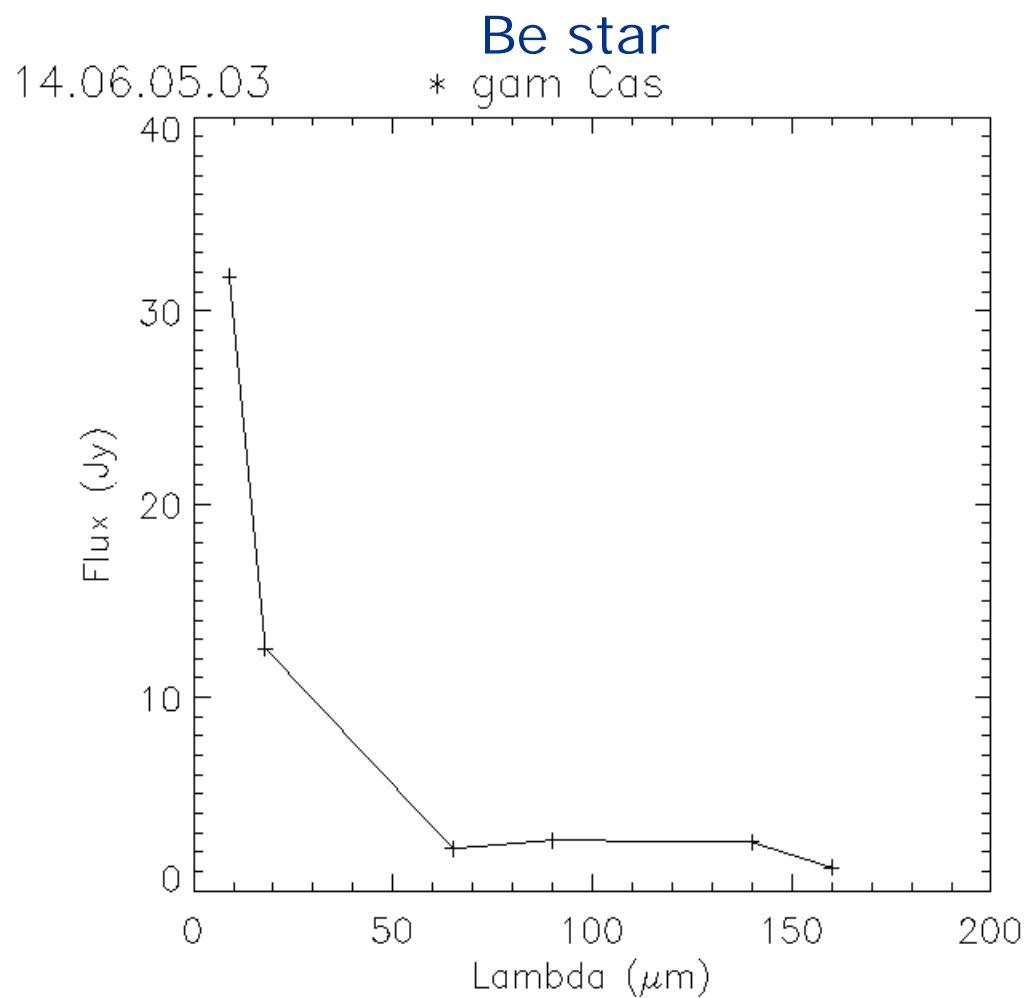
15.15.01.00

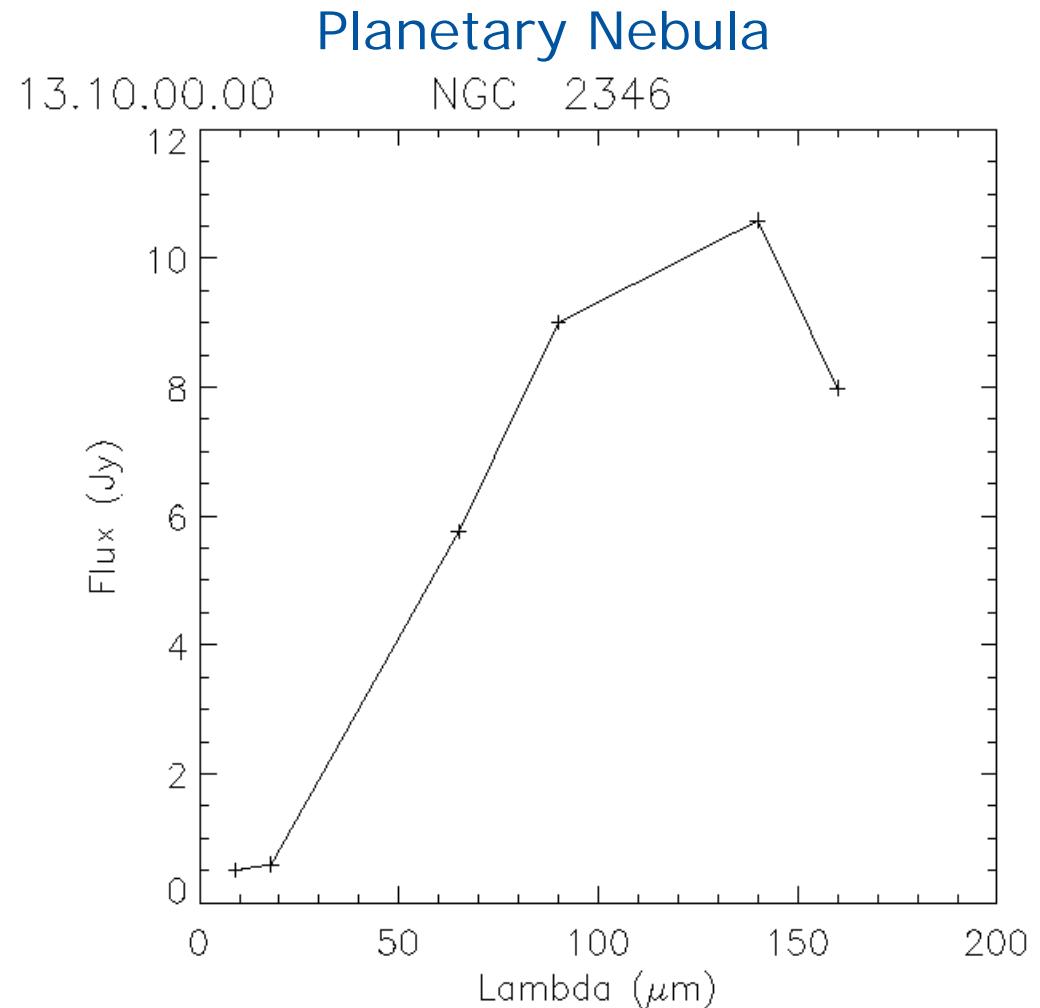
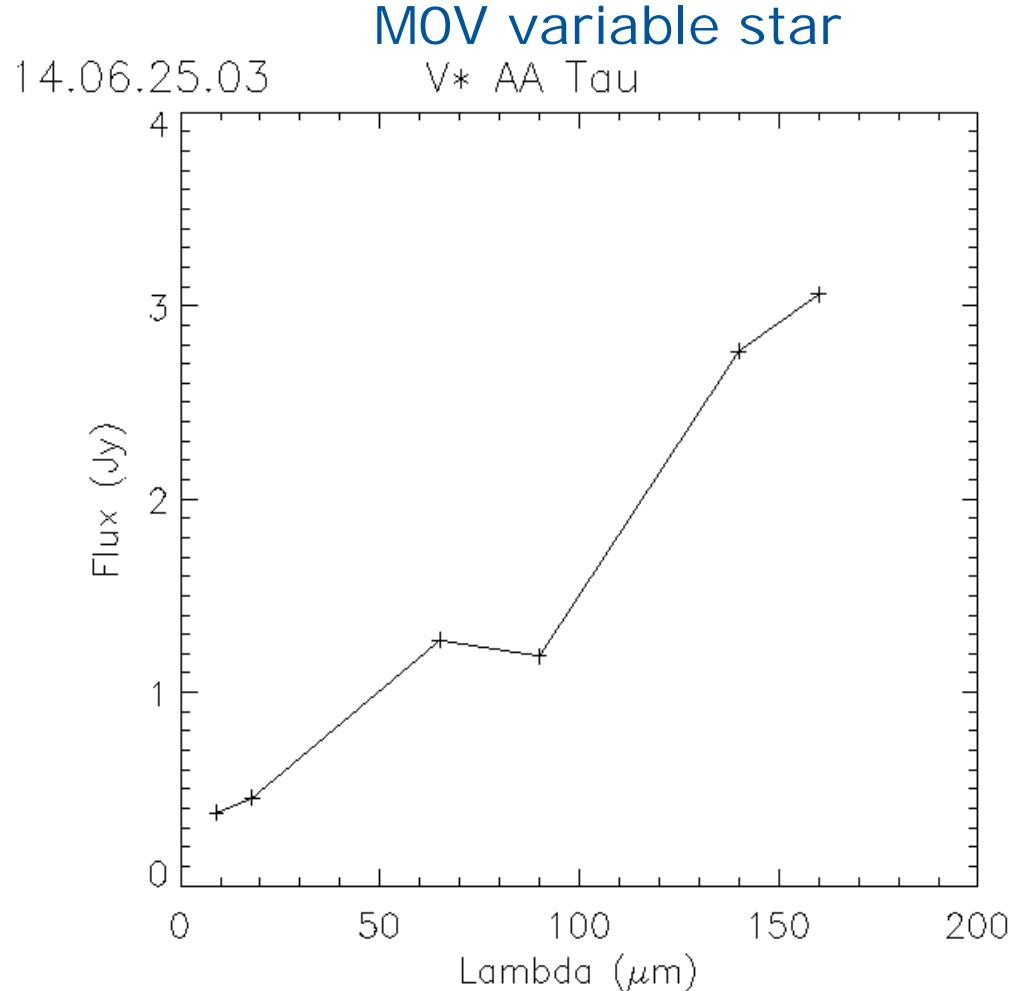
IRAS F01173+1405



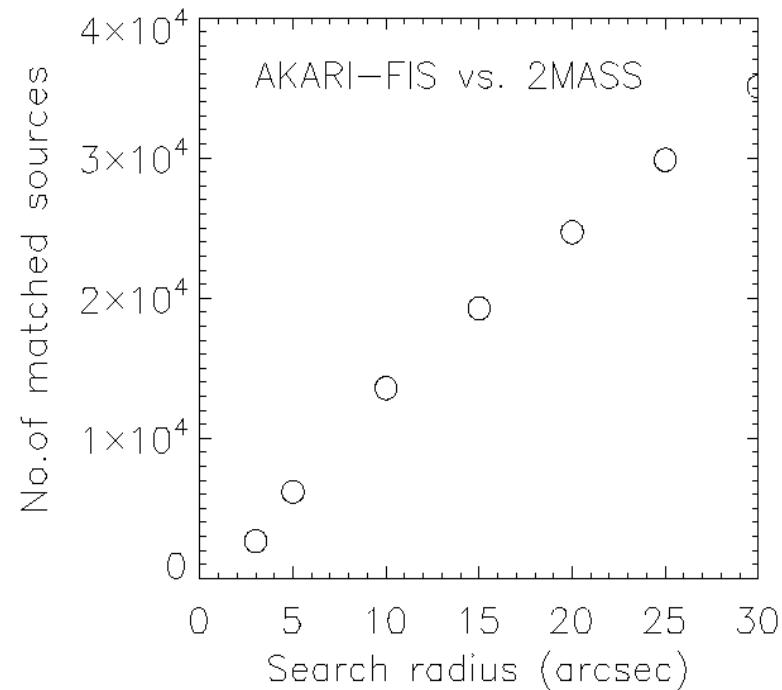
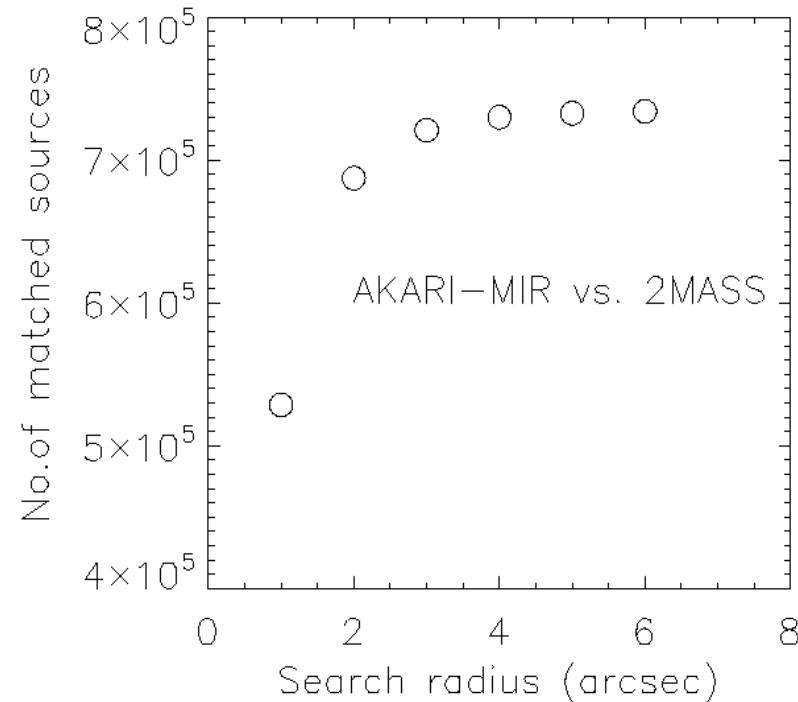
Galaxy in a pair







AKARI /MIR & AKARI/FIS versus 2MASS: Same sources are seen ?



Cross correlation of AKARI/MIR with 2MASS (J, H, K) saturates within 2-3 times the instrumental PFS → mostly the same objects are seen.
Cross correlation of AKARI/FIS with 2MASS (J, H, K) does not saturate → presence of a large population of FIR sources not seen in the mid infrared.

Any correlation between E(B-V) (dust absorption) and Infrared Excess (dust emission)?



**Area of the 2200 Å dust
absorption bump ~ E(B-V)**

XMM – OM

No. Sources = 753 578

6 bands peaking at:

1894 Å	N= 119805
2205 Å	N= 145210
2675 Å	N= 618266
3275 Å	U N= 177569
4050 Å	B N= 81119
5235 Å	V N= 78160

**No. Common to AKARI-MIR :
1321 sources (r = 5")**

