

「あかり」中間赤外線全天サーベイ による活動銀河核探査

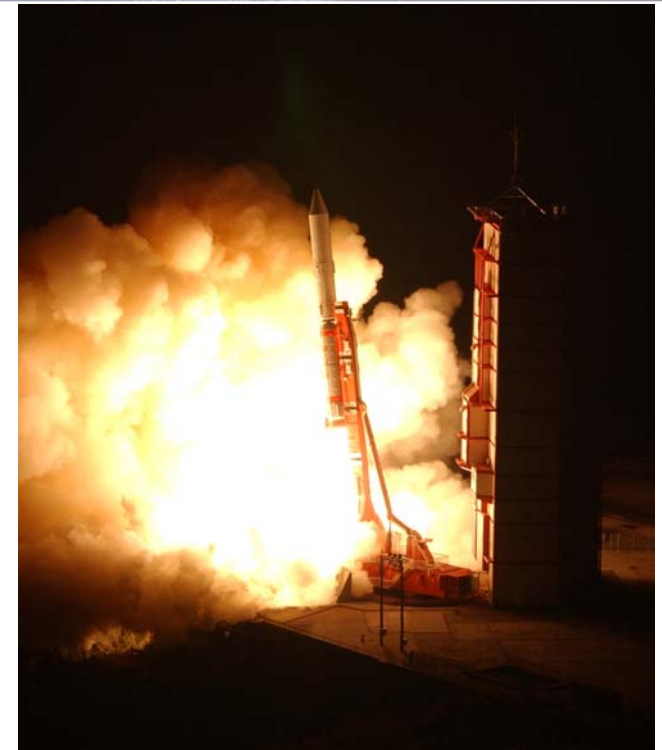
大藪進喜
(ISAS/JAXA)

Outline

- About AKARI
- AKARI Mid-infrared All-Sky Survey
- Search for Active Galactic Nuclei

The AKARI diary

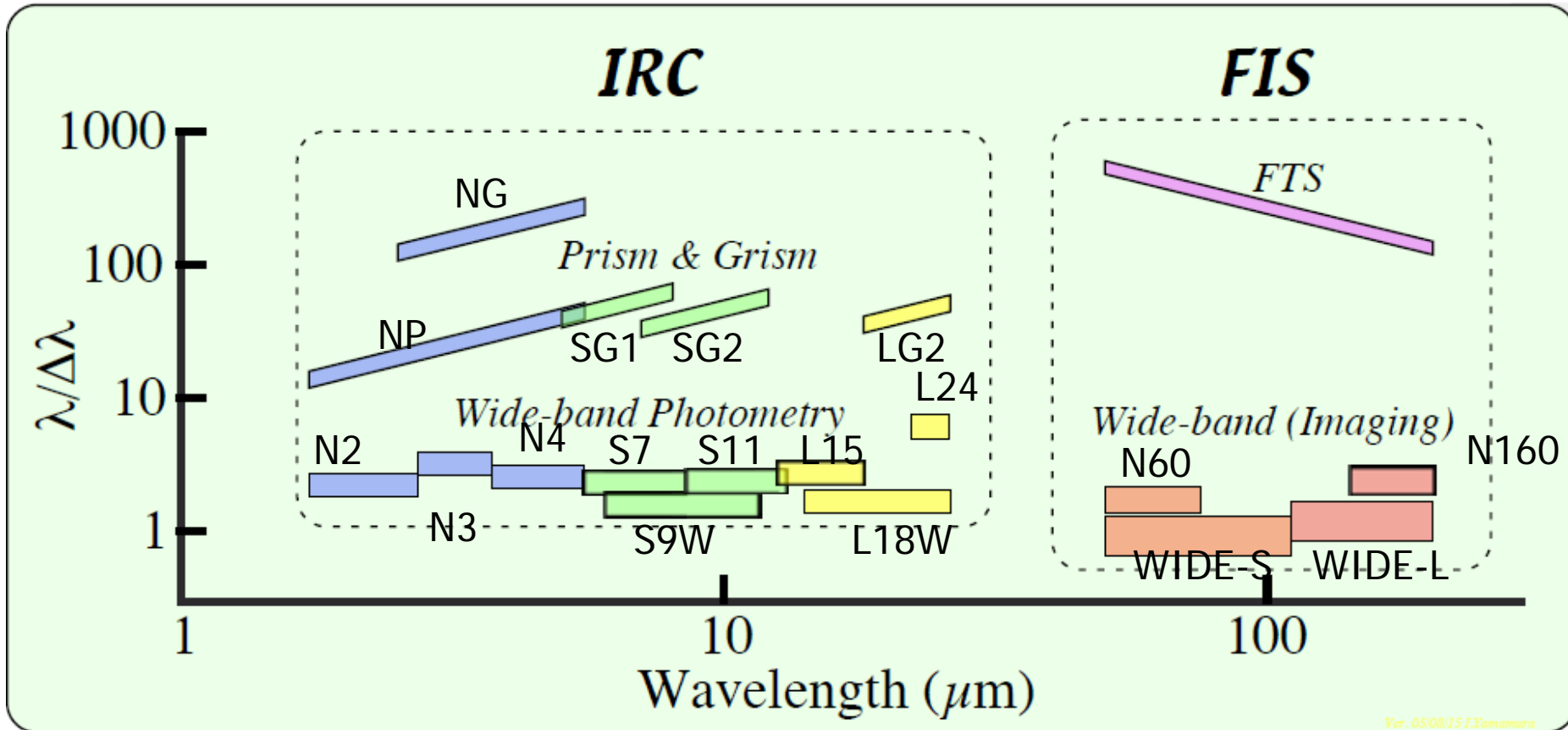
- Launch
 - 21 Feb. 2006(UT)
- Aperture lid released
 - 13 Apr. 2006
- First half year (Phase 1)
 - We concentrated All Sky Survey
- After the first half year
 - Combination with All Sky Survey and pointed observations. (Phase 2)
- Helium was run out of on 2007 Autumn.
- After run out of Helium, near-infrared camera is operated with mechanical cooler (Phase 3).



The capabilities of AKARI

- The 68cm telescope outer space
- On the Solar synchronized orbit
 - 700 km altitude
- Liquid helium with mechanical coolers
 - Makes a telescope ~6K.
- Two Scientific Instrument
 - Far-infrared Surveyor (FIS)
 - Far-infrared Imaging and Fourier Transform Spectrometer
 - Infrared Camera (IRC)
 - Near- and mid-infrared imaging and spectroscopic disperser
- The main mission is All Sky Survey in the infrared.

Photometric & Spectroscopic Capabilities



AKARI MIR All-Sky Survey

9ミクロン

※ Zodiacal light was removed with a simple way in this map.
The star atlas was made by Nagoya City Museum using
Stellar Navigator (Astro. Arts Co.).

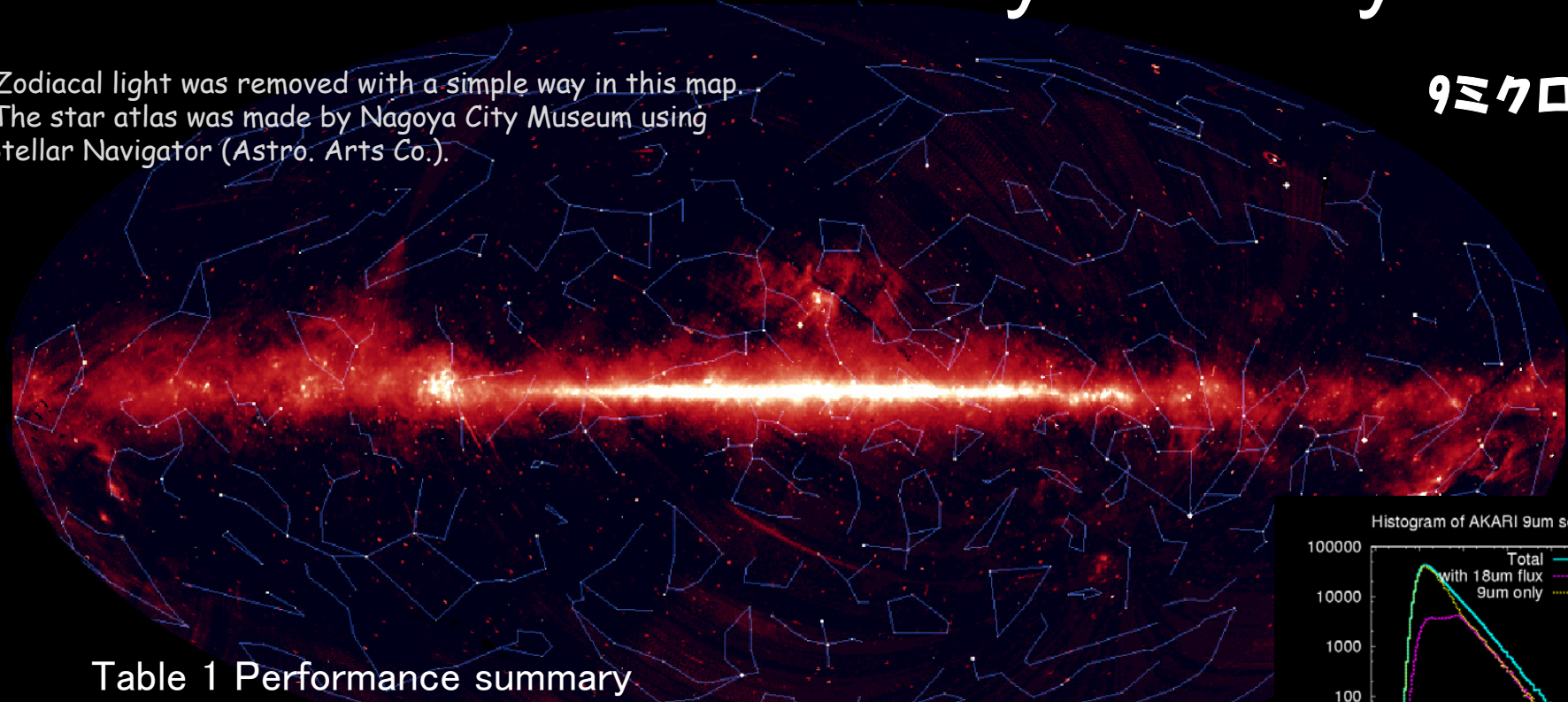
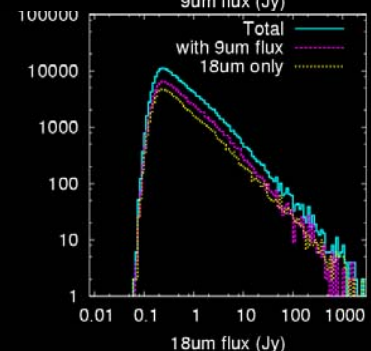
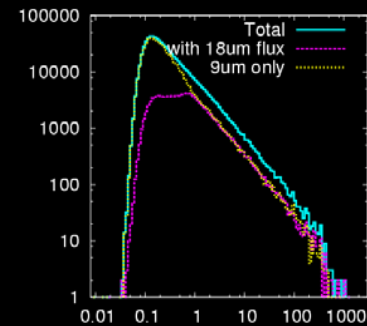


Table 1 Performance summary

Channel	S9W	L18W
Wave coverage	6—12 μ m	14—26 μ m
Detection limit (5σ)	50 mJy	120 mJy
Saturation (80% linearity)	< 300 Jy	
Spatial resolution	< 9.4''	

Histogram of AKARI 9 μ m sources

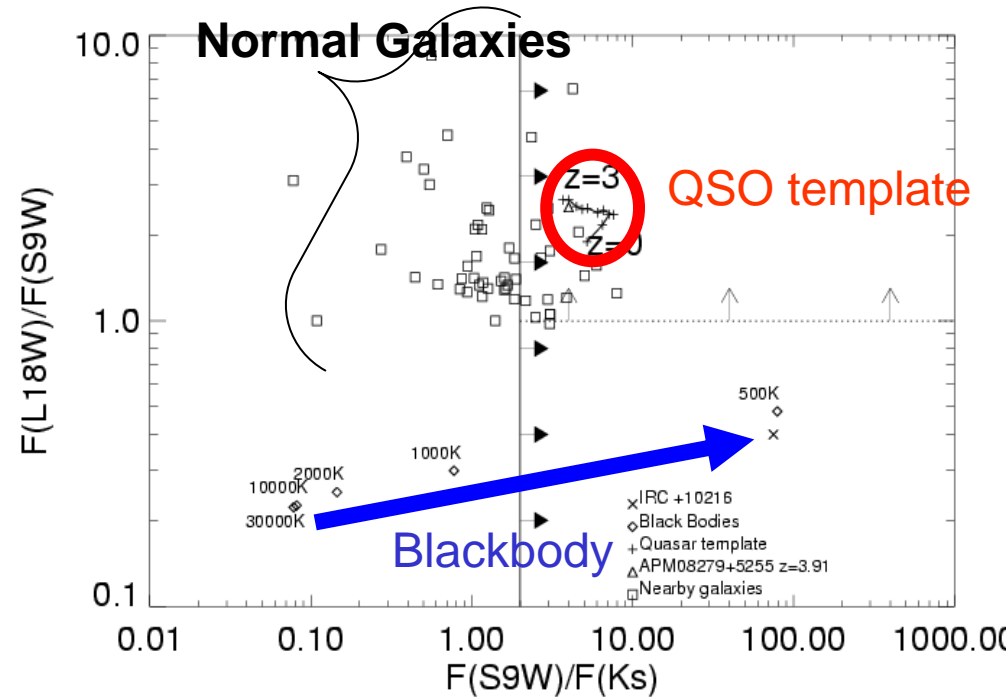
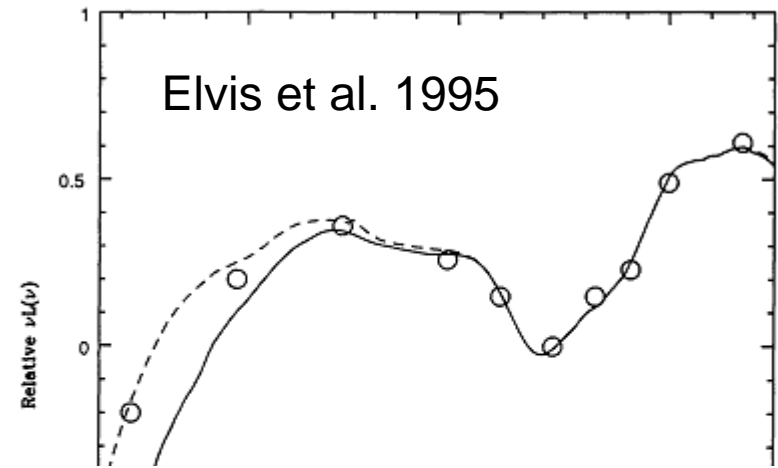


全天サーベイによる活動銀河核探査

- 中間赤外線での利点
 - 活動銀河核中心に付随するダストーラスの放射を直接受けられる。
 - さらに塵に覆われていようとも検出できる。
 - IRAS 12ミクロンによる探査。(Rush et al. 1993)
 - IRAS ~ 300 mJy at $12 \mu\text{m}$ 、「あかり」50 mJy at $9 \mu\text{m}$
 - ISOCAMパラレルサーベイ (Haas et al. 2003, Leipski et al. 2005)
 - ISOCAMのパラレルサーベイもわずか10平方度
- 科学的目標
 - 近傍の活動銀河核の種族分布
 - 近傍の塵に覆われた活動銀河核のX-ray背景放射への貢献
 - 近傍宇宙におけるブラックホールによる重力エネルギーの総量

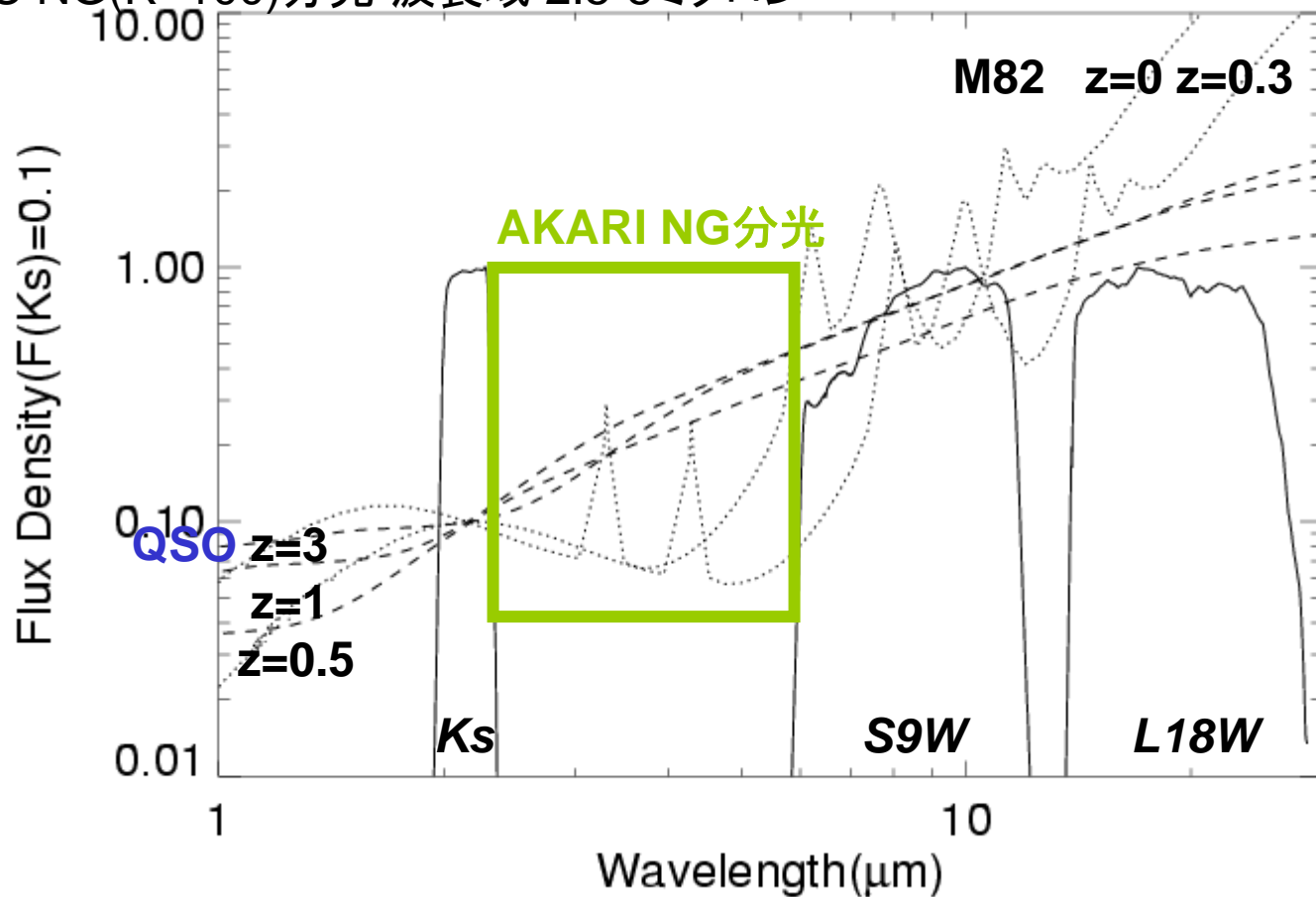
天体セレクション

- 中間赤外線カタログ RC1(2009年10月版)
 - $|b| < 30$ 、LMC、SMCの領域を排除
 - 2MASSと比較
- 中間赤外線超過
 - $F(9\mu\text{m})/F(\text{Ks}) > 2$
- およそ1200候補天体
 - 有名天体や、広がった天体
 - まれる。



天体セレクションその2

- コンタミ源としてM82のようなPAH強い銀河
 - AKARIの分光フォローアップが必要
 - AKARI Phase3(Post Helium mission)
 - IRC NG(R~100)分光 波長域 2.5-5ミクロン



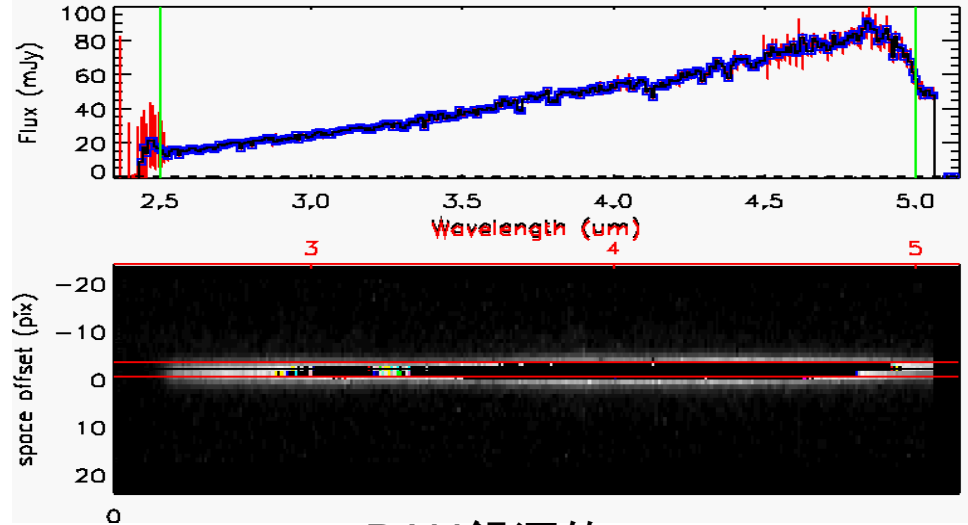
Result (その1)

- MSAGNでの観測、65天体が解析済み

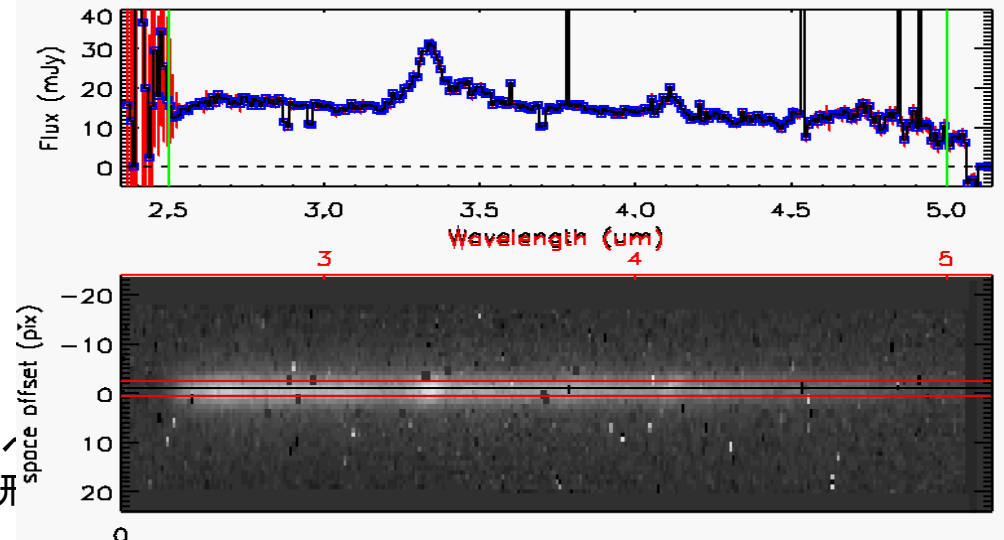
- 日々進行中

- AGN的 45天体
- PAH銀河 14天体
- 赤い星 6天体

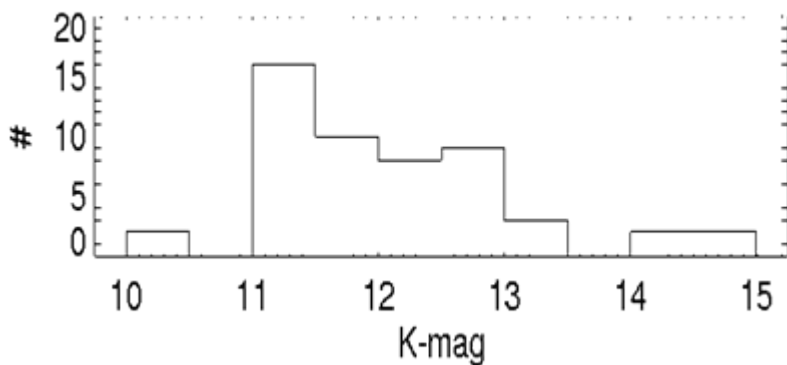
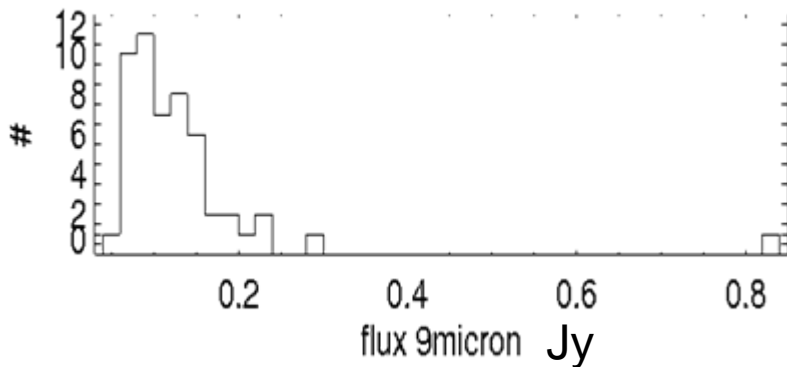
AGN的



PAH銀河的

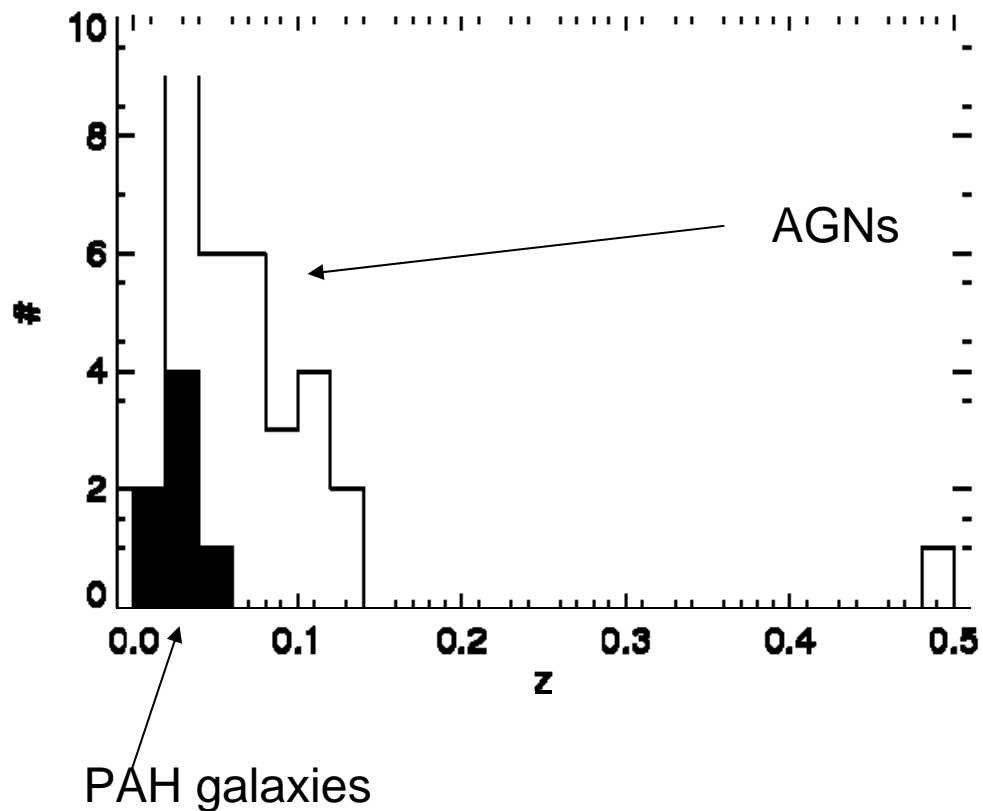


Result(その2)



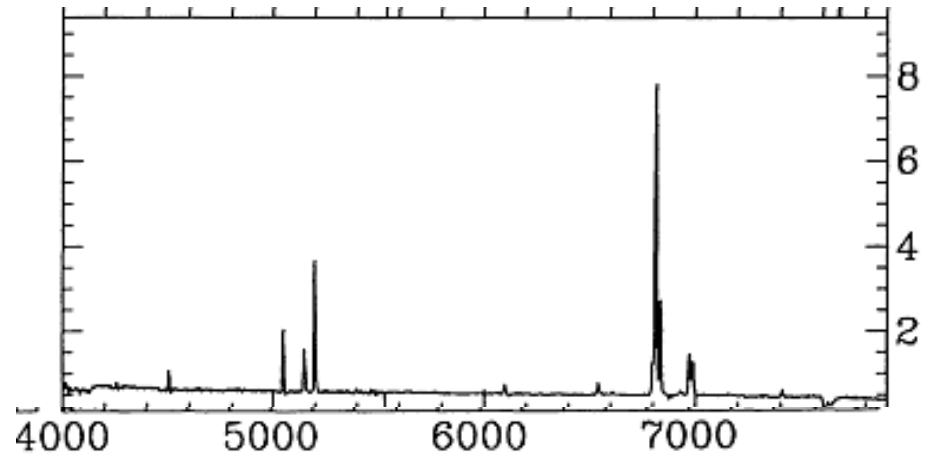
Redshift distribution

33 sources whose optical redshift is available

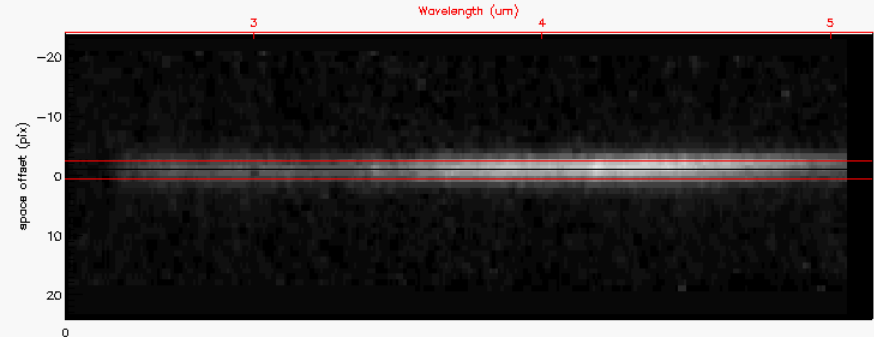
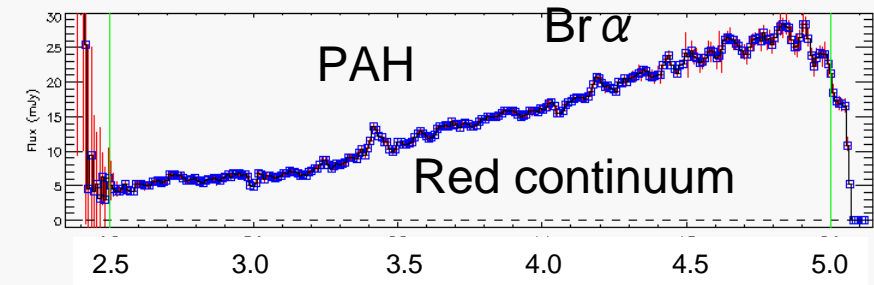


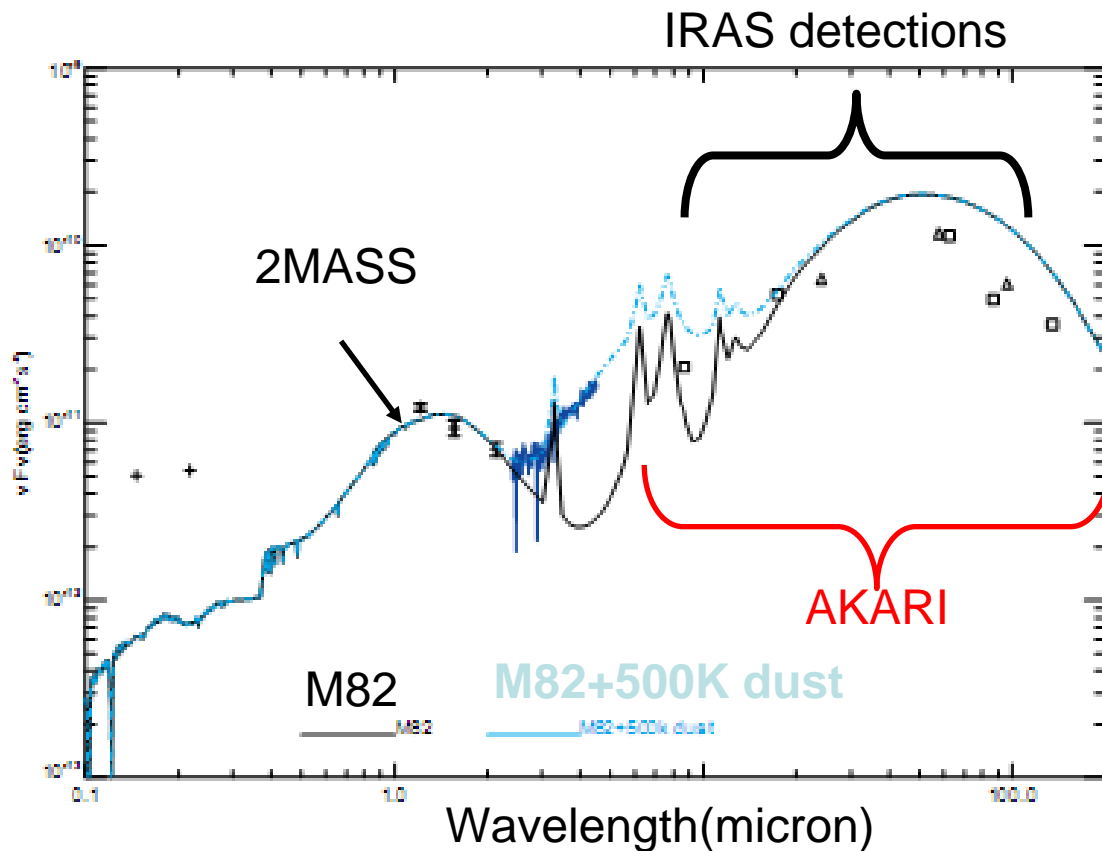
Discovery of new dusty Active Galactic Nuclei

- A galaxy with $L_{\text{IR}} \sim 10^{11.3} L_{\text{sun}}$ at a redshift $z \sim 0.04$.
- No evidences of AGN before AKARI
 - An optical spectrum shows HII galaxy features.
 - 2MASS color is not as red as that of AGN.
- Red NIR/MIR color is confirmed with the NIR spectrum taken with AKARI in Phase3.



Kim et al. 1995



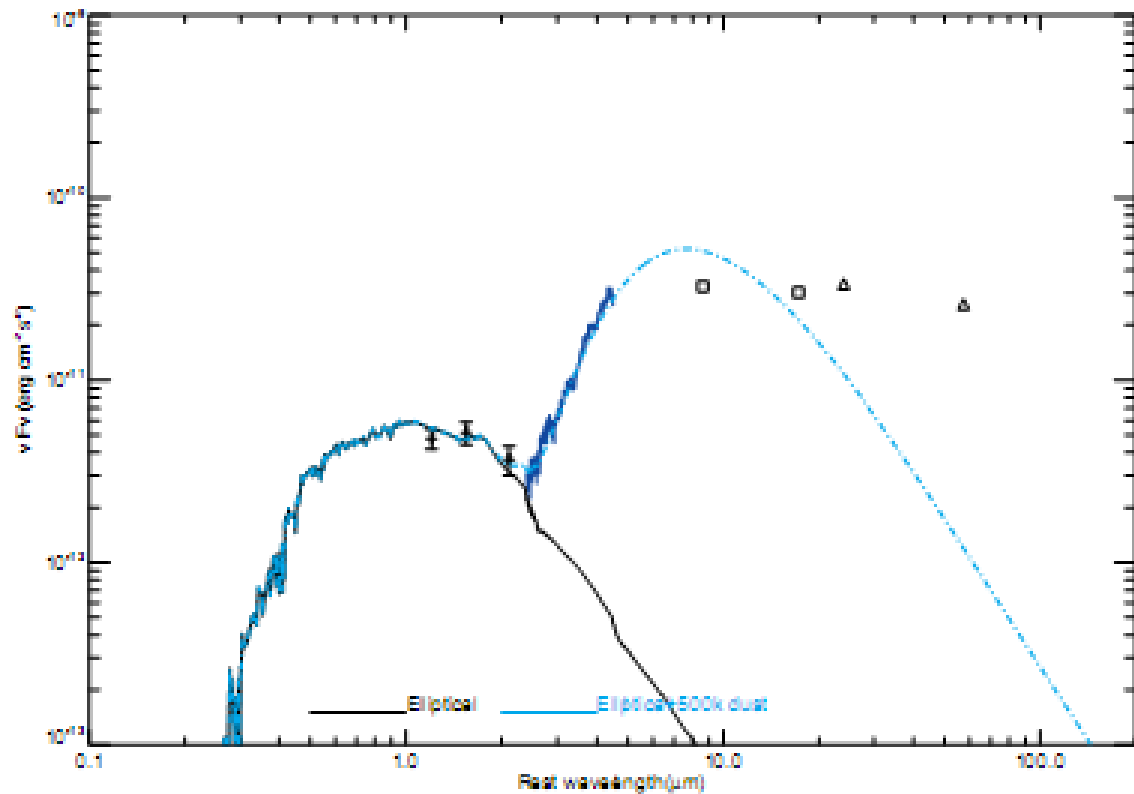
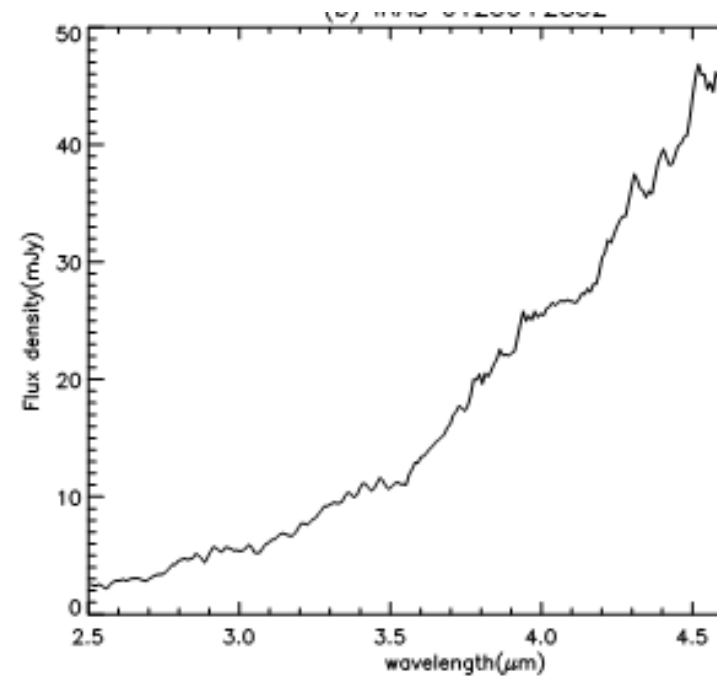


Indicating the exist of hot dust → AGN, but a central engine is completely obscured.

Surprisingly, we miss this kind of AGNs in nearby universe.

- We are interested in the number density and the contribution of these sources to the Hard X-ray background.

もう一つ



- $L_{\text{IR}} \sim 10^{11} L_{\text{sun}}$
- A dusty AGN is in this galaxy
- We have two dusty AGNs (probably one more...) in our 26 AGNs which have optical and AKARI spectra.

Summary

- 「あかり」は、中間赤外線ですべて全天サーベイを行った。
- 「あかり」中間赤外線全天サーベイのソースをもとに活動銀河核の探査を行っている。
- 「あかり」を用いて近赤外線分光によるfollow-upプログラムを実行中である。
 - 興味深い天体が見つかってきた。
- ミリ波分光観測は申請中、X線観測は検討中