



Status and scientific potential of the ISOCAM parallel mode survey

Stephan Ott

HERSCHEL Science Centre, RSSD, ESA

Ralf Siebenmorgen

ESO

Norbert Schartel

XMM Operations Centre, RSSD, ESA

Thúy Võ

ISO Data Centre, RSSD, ESA



Outline

- ❖ **Overview of the ISOCAM parallel survey**
- ❖ **Status of the point source catalogue**
- ❖ **Description of the point source catalogue**
- ❖ **A glimpse of the scientific potential : Some multi-wavelength cross-correlations**
- ❖ **Conclusions**



Overview of the ISOCAM parallel survey

- ❖ **ISOCAM continuously took data in prime or in parallel mode during 19 hours of each revolution**
- ❖ **ISOCAM Parallel : ISOCAM accumulates 12 images on board and transmits these with 1/24th of its normal telemetry rate**
- ❖ **Time per pointing varies from less than 25 seconds to over 6.1 hours**
- ❖ **ISOCAM observes serendipitously the sky, 12' to 17' away from the prime target**
- ❖ **ISOCAM parallel vs. IRAS**
 - ❖ up to 500 times higher sensitivity
 - ❖ 50 times higher spatial resolution



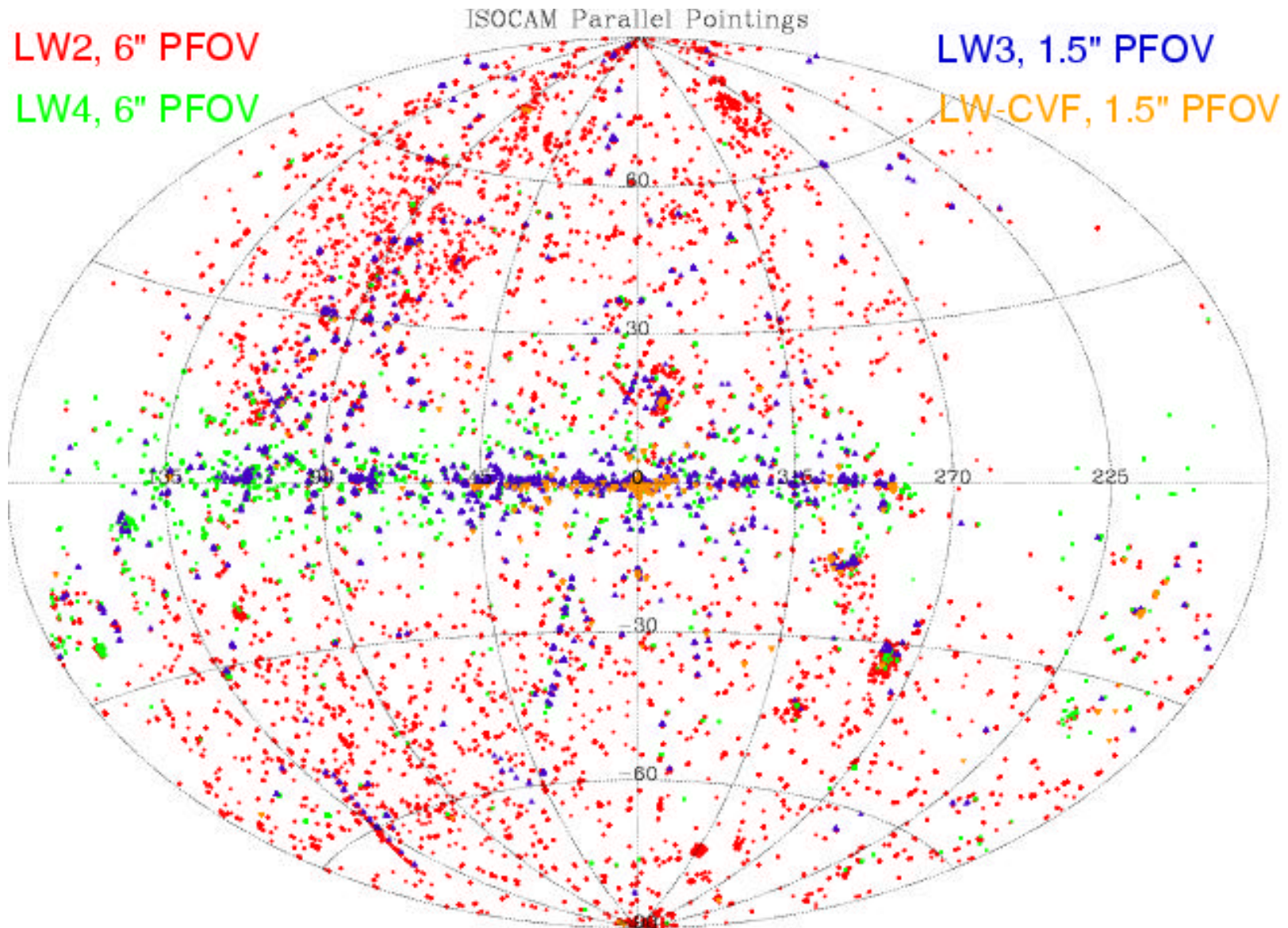
Overview of the ISOCAM parallel survey

- Overall 9700 hours, taken mainly at 6.7mm with 6" PFOV
- Serendipitous "survey" covers 42 square degree
- Order of magnitude longer and larger than ELAIS

# of pointings	PFOV	wavelength	Filter	duration	area covered
24036	6"	5 – 8.5 μ m	LW2	3971 hours	32.5 sq. deg
6203	6"	5.5 – 6.5 μ m	LW4	1292 hours	9.4 sq. deg
5108	1.5"	12 – 18 μ m	LW3	1032 hours	0.6 sq. deg
1686	1.5"	14.9 – 15.1 μ m	CVF	374 hours	0.2 sq. deg










Overview of the ISOCAM parallel survey



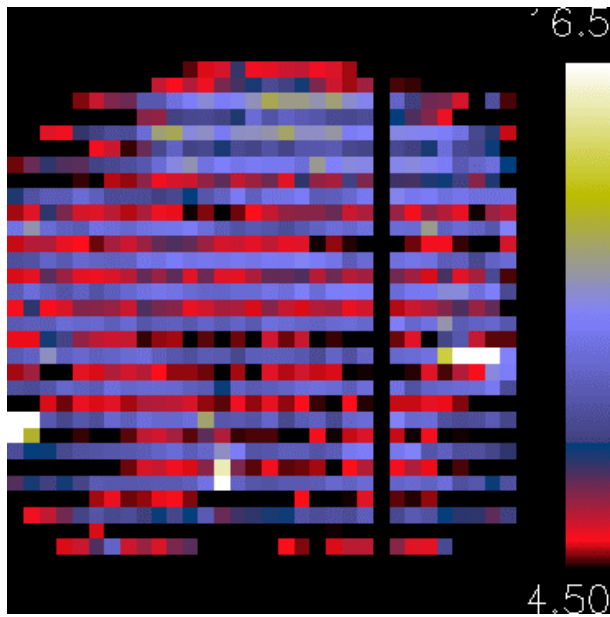


Status of the point source catalogue

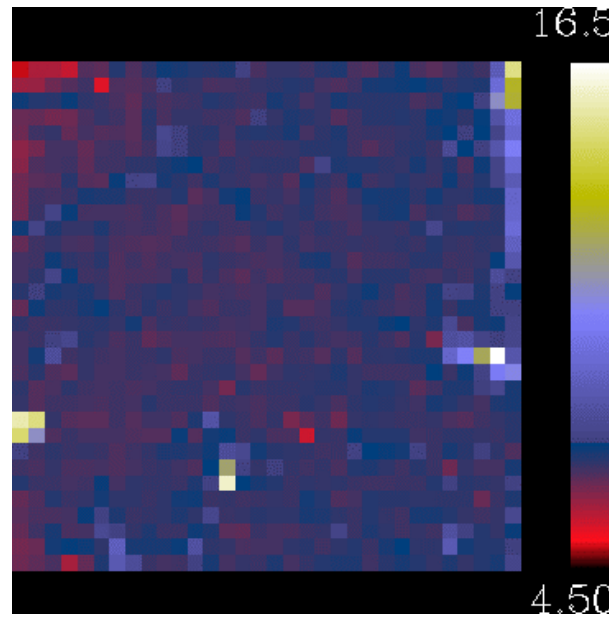
-  **Generation of calibrated exposures**
-  **Point source extraction**
-  **Eye-balling of source candidates**
-  **Simulations**
-  **Statistical cleaning of source candidates**
-  **Merging of multiply detected sources into unique sources**
-  **Catalogue publication**



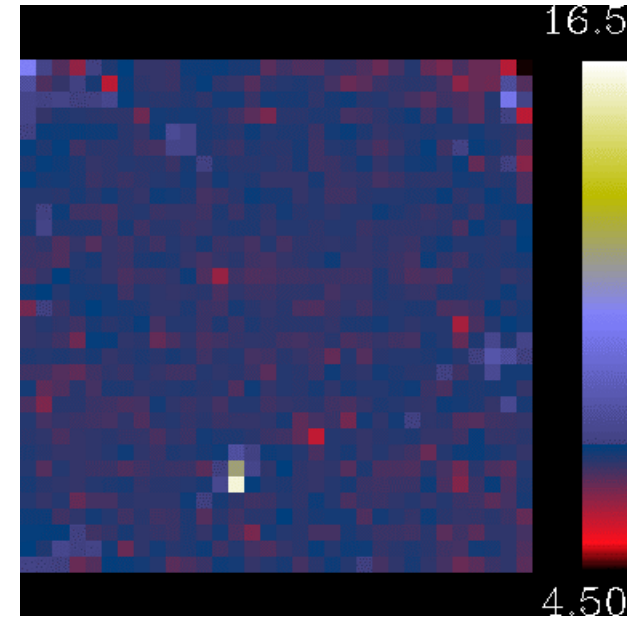
Data reduction



Raw image



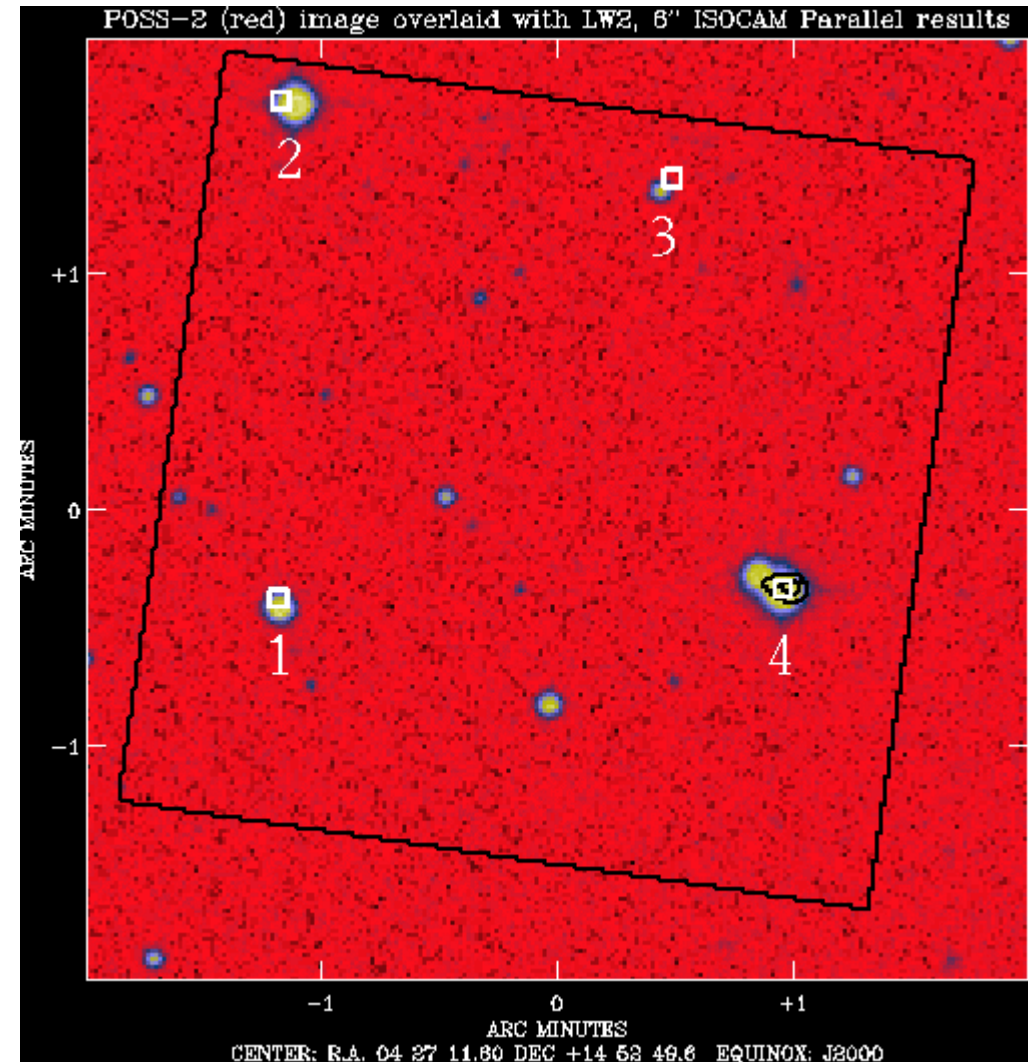
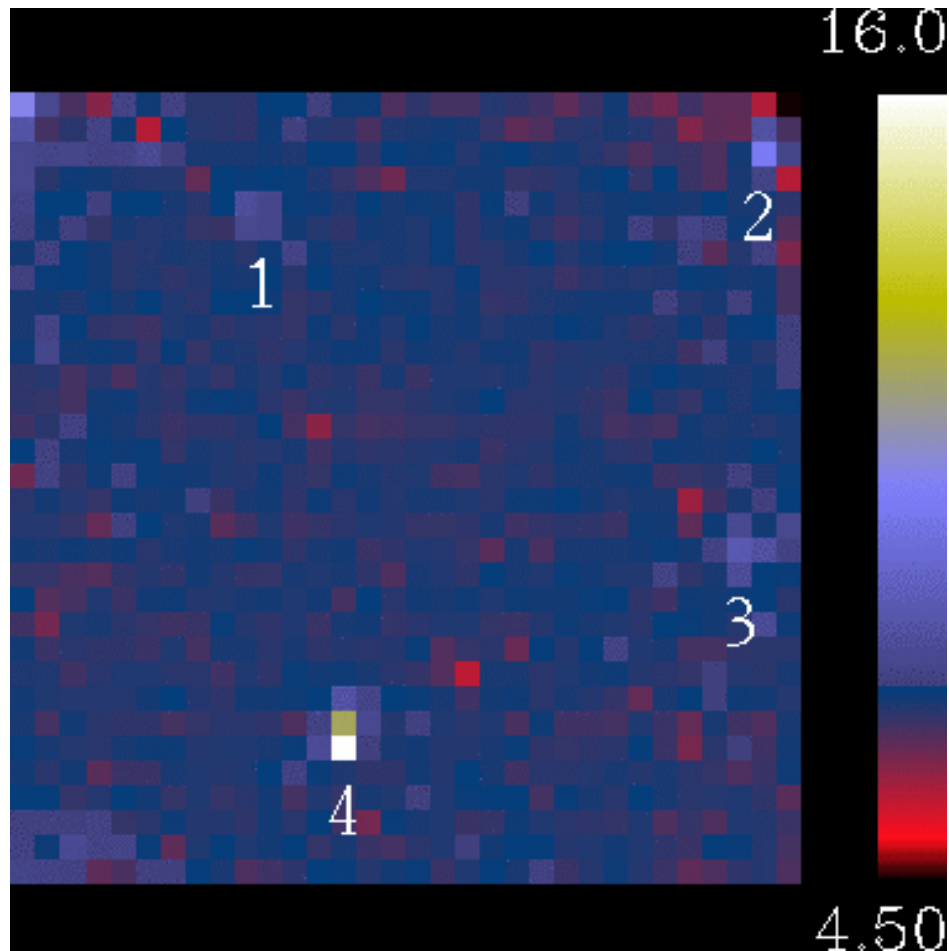
Standard Processing



Parallel processing



Verification of data reduction



The 4 detected sources have a flux between 2.5 and 19.5 mJy

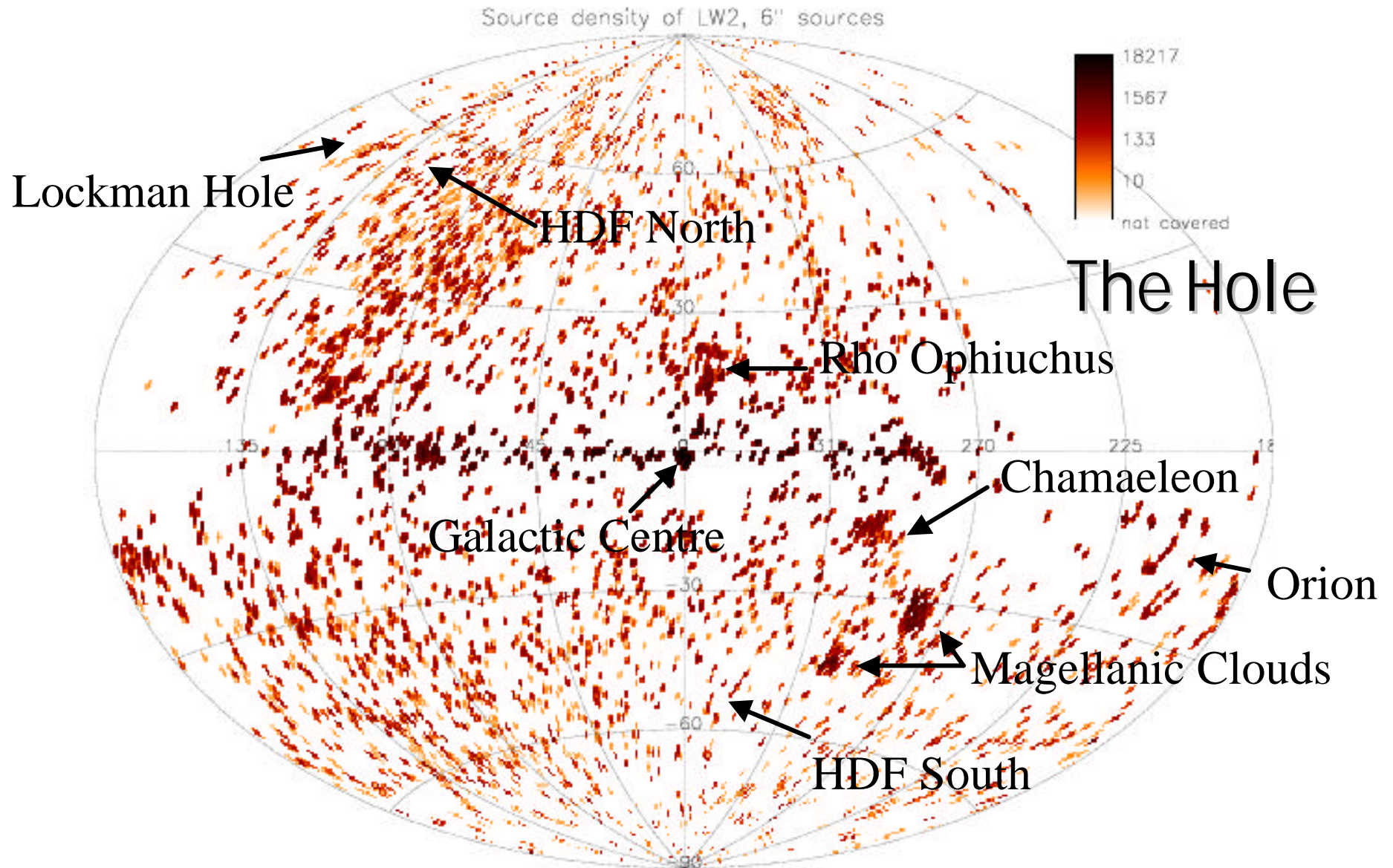


Description of the catalogue

- ❖ **30000 unique point sources, the vast majority being new detections in the mid-infrared**
- ❖ **detections down to 0.5 mJy, median flux outside the galactic plane 2.5 mJy**
- ❖ **30 square degrees mapped completely down to 4 mJy**
- ❖ **0.4 square degrees mapped completely down to 1.0 mJy**

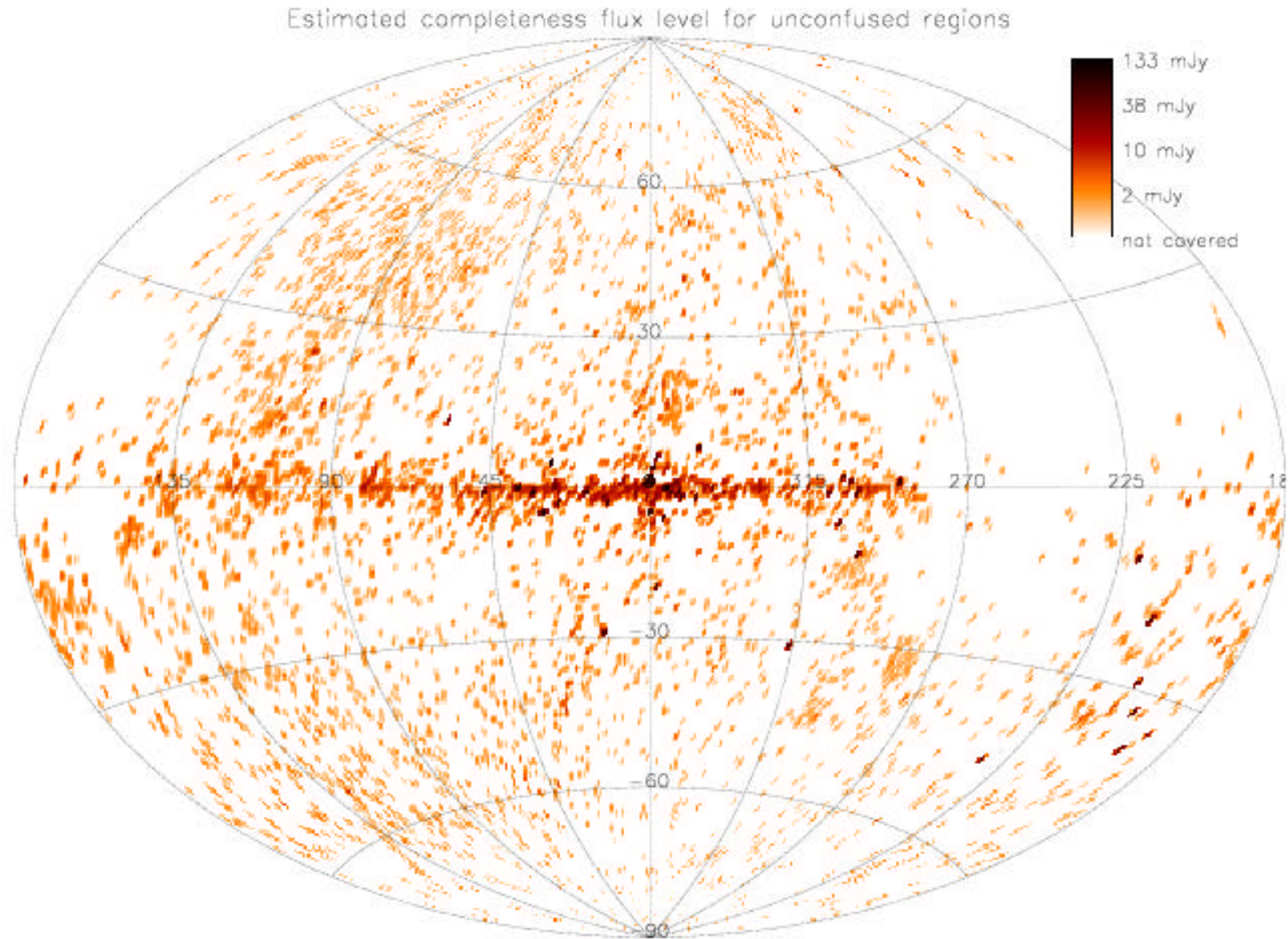


Source density of LW2, 6" PFOV





Estimated completeness





First multi-wavelength cross-correlations

- ❖ **Subset comprised of 2300 hours of data, 9600 pointings, covering 14 square degree LW2, 6" PFOV observations**
 - ❖ outside the galactic plane
 - ❖ at least 8 readouts
 - ❖ no crowded regions
 - ❖ only first pointings of a tracking observation included
- ❖ **Median completeness flux level of 1.6 mJy**
- ❖ **7200 detections with median flux of 2.2 mJy**
- ❖ **4500 unique sources, 80% stars and 20% galaxies**
- ❖ **99% of detections have optical or near-infrared counterpart**

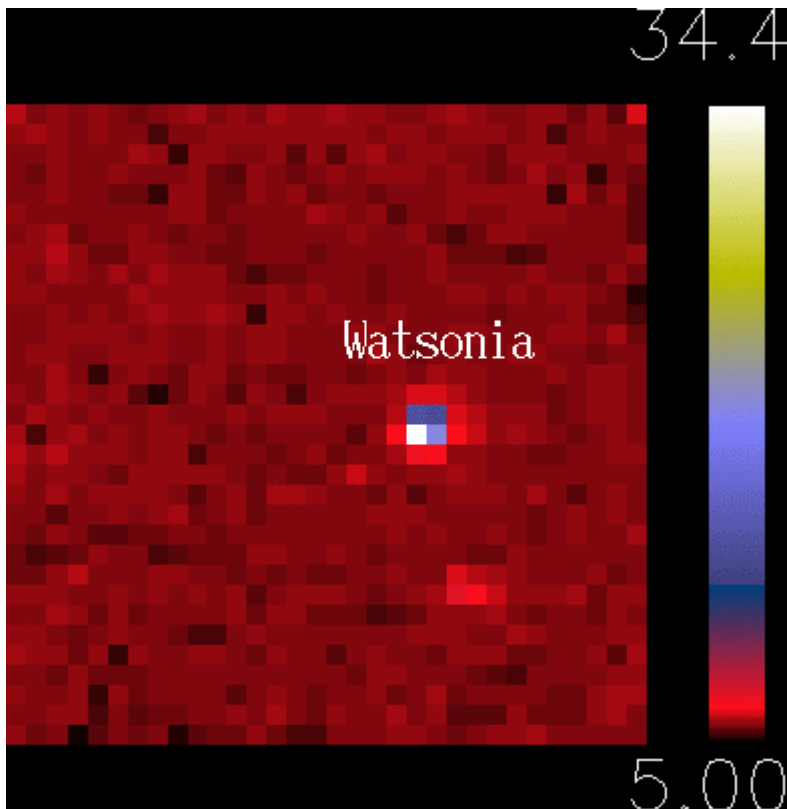


First multi-wavelength cross-correlations

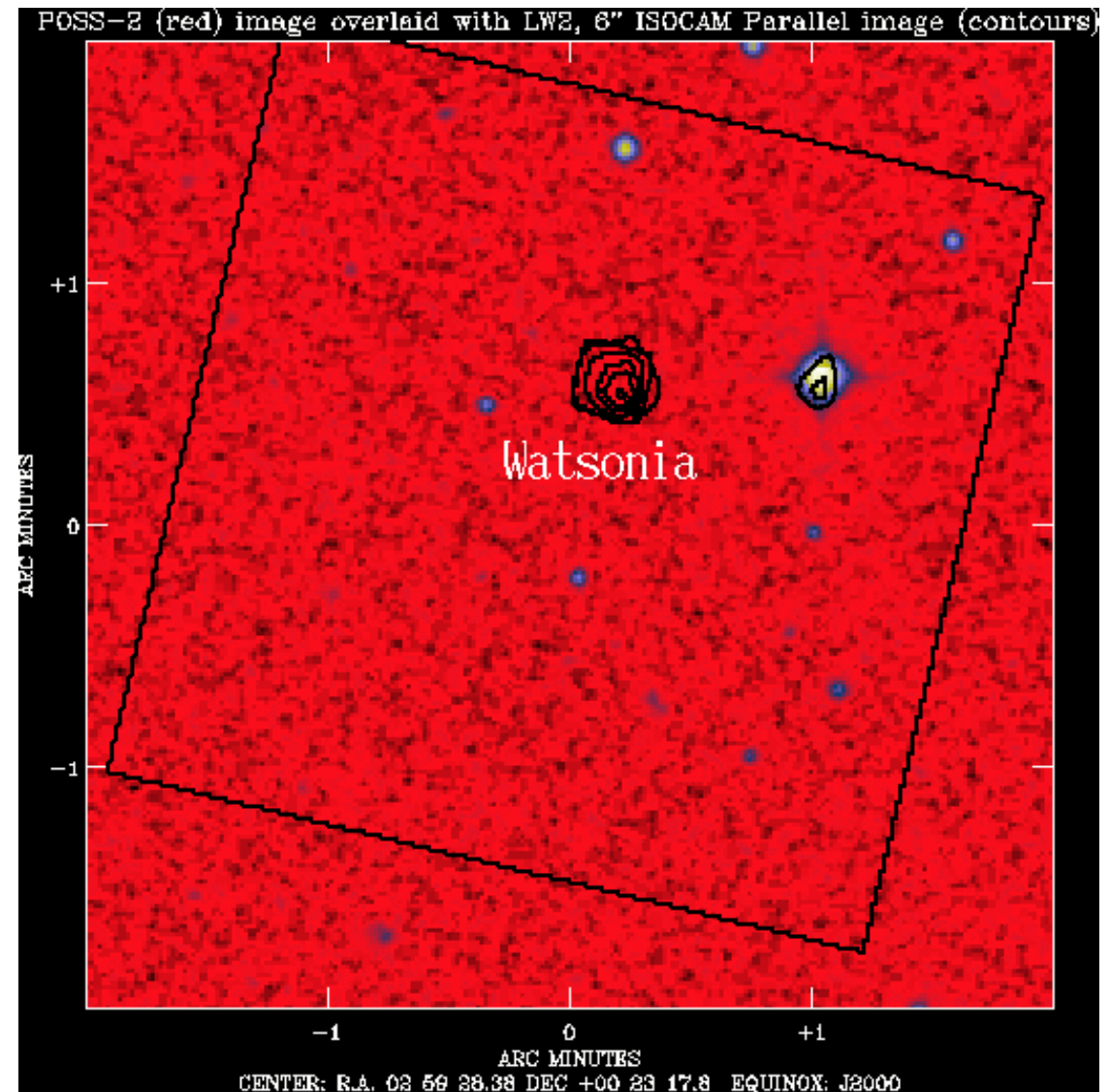
- ✦ **First infrared detection of the asteroid *Watsonia***
- ✦ **Cross-correlation of a sub-sample of sources outside the galactic plane yielded:**
 - ✦ 2MASS : 3500 stars, 1000 galaxies plus 2 object classes with IR excess
 - ✦ IRAS : 50% of sources expected in IRAS FS and PS catalogue found: IRAS sources without ISOCAM parallel counterpart are extended sources, sources with higher IRAS astrometric uncertainty or IRAS upper limit detections at 12 μ m
 - ✦ ROSAT : 20 matches with bright and faint source catalogue
 - ✦ Tycho 2 : 500 matches with stars
 - ✦ PGC : 168 matches with principal galaxies
 - ✦ Detection of 10 AGNs/QSOs with a red-shift up to 2.4
- ✦ **7mm source counts down to 2 mJy: The first, *preliminary*, result yields 40 sources/square degree, already within a factor 2 of the ELAIS results**



First infrared detection of asteroid Watsonia



The ISOCAM parallel flux of Watsonia is 57 mJy, in good agreement with the predictions of 54 ± 6 mJy

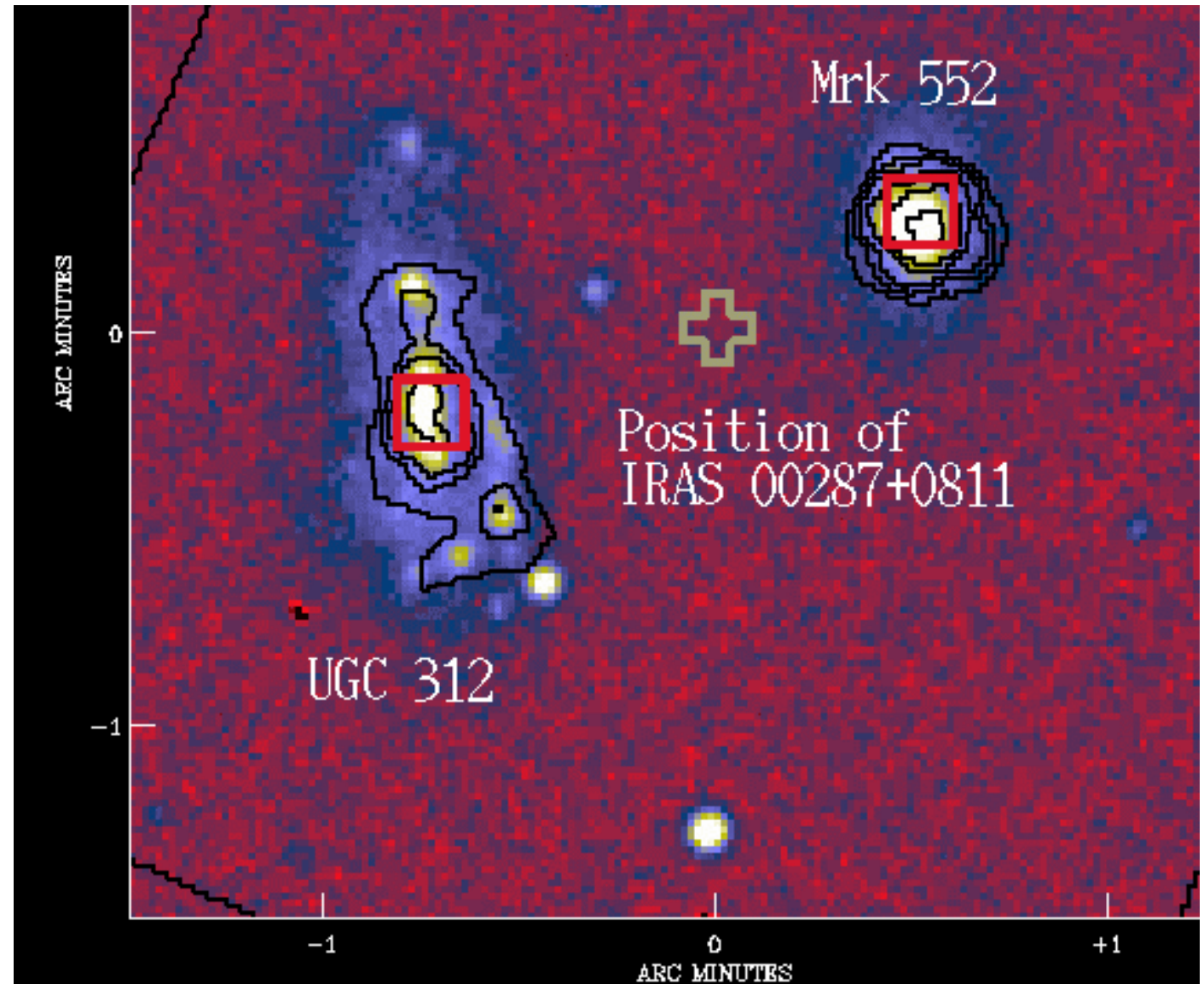




IRAS sources without close counterpart

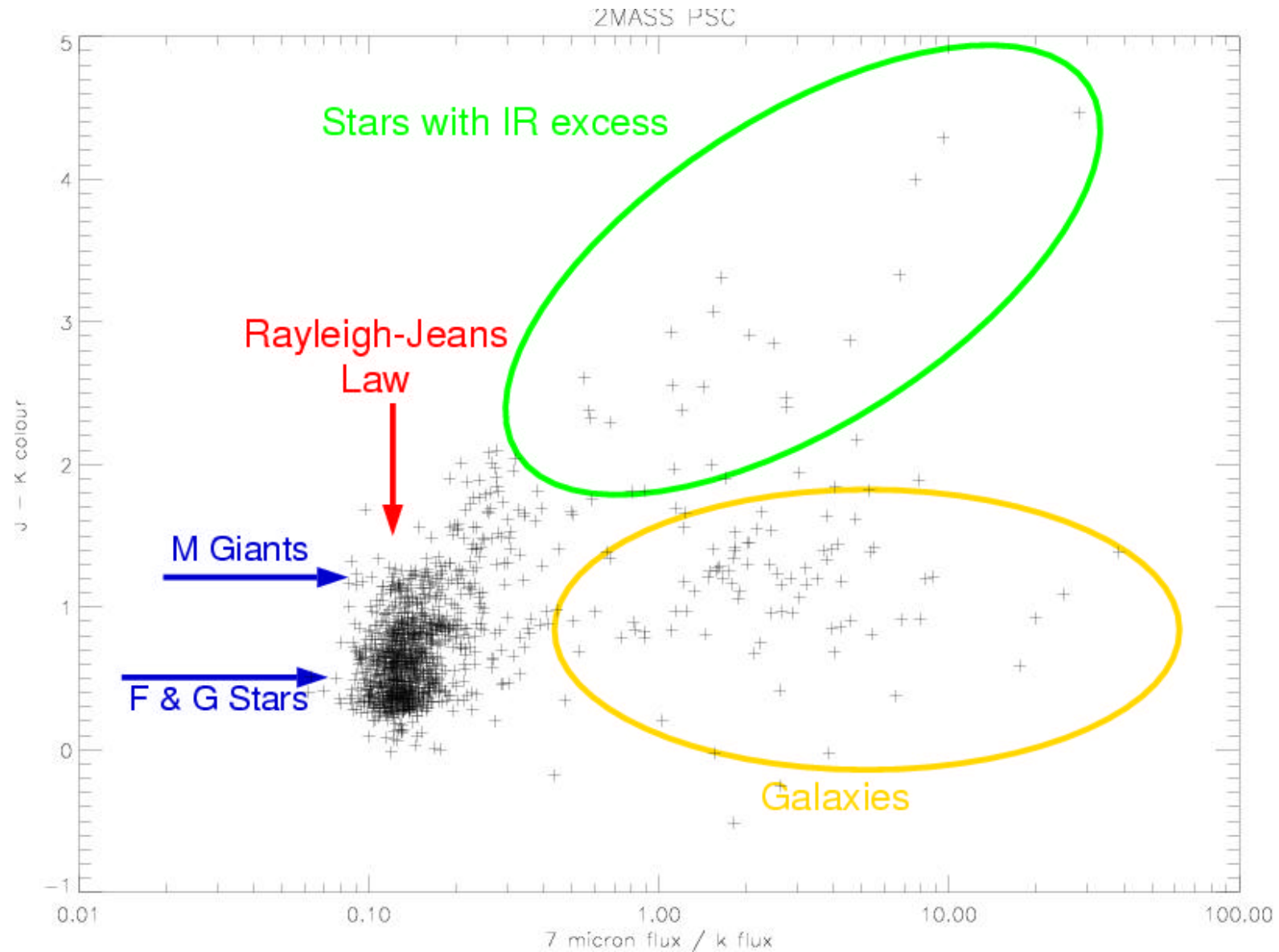
**ISOCAM parallel
resolves
confused IRAS
source:**

**IRAS 00287+0811
has a distance of
40'' between two
ISOCAM parallel
detections**



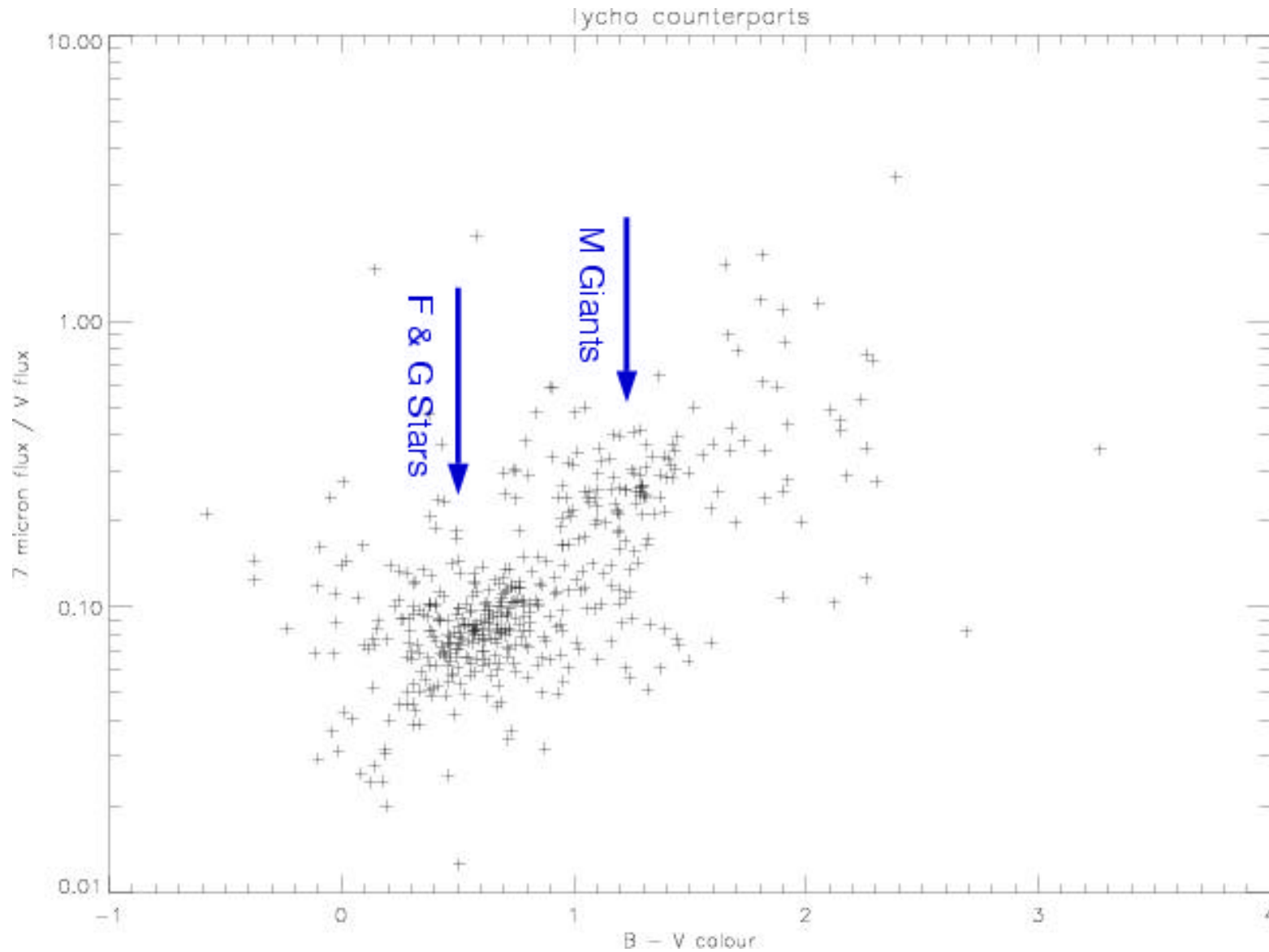


Cross-correlations with 2MASS



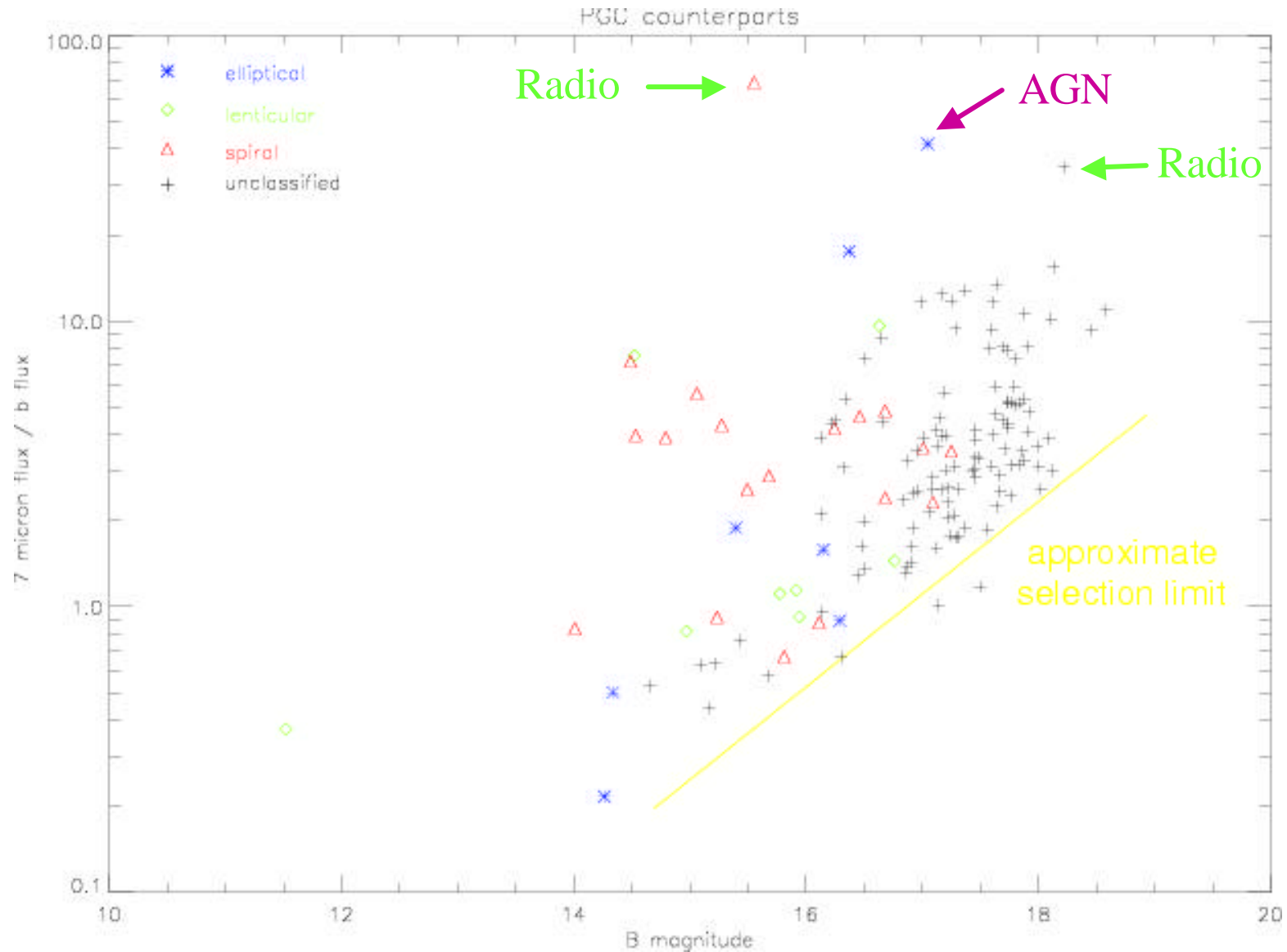


Cross-correlation with Tycho 2 catalogue



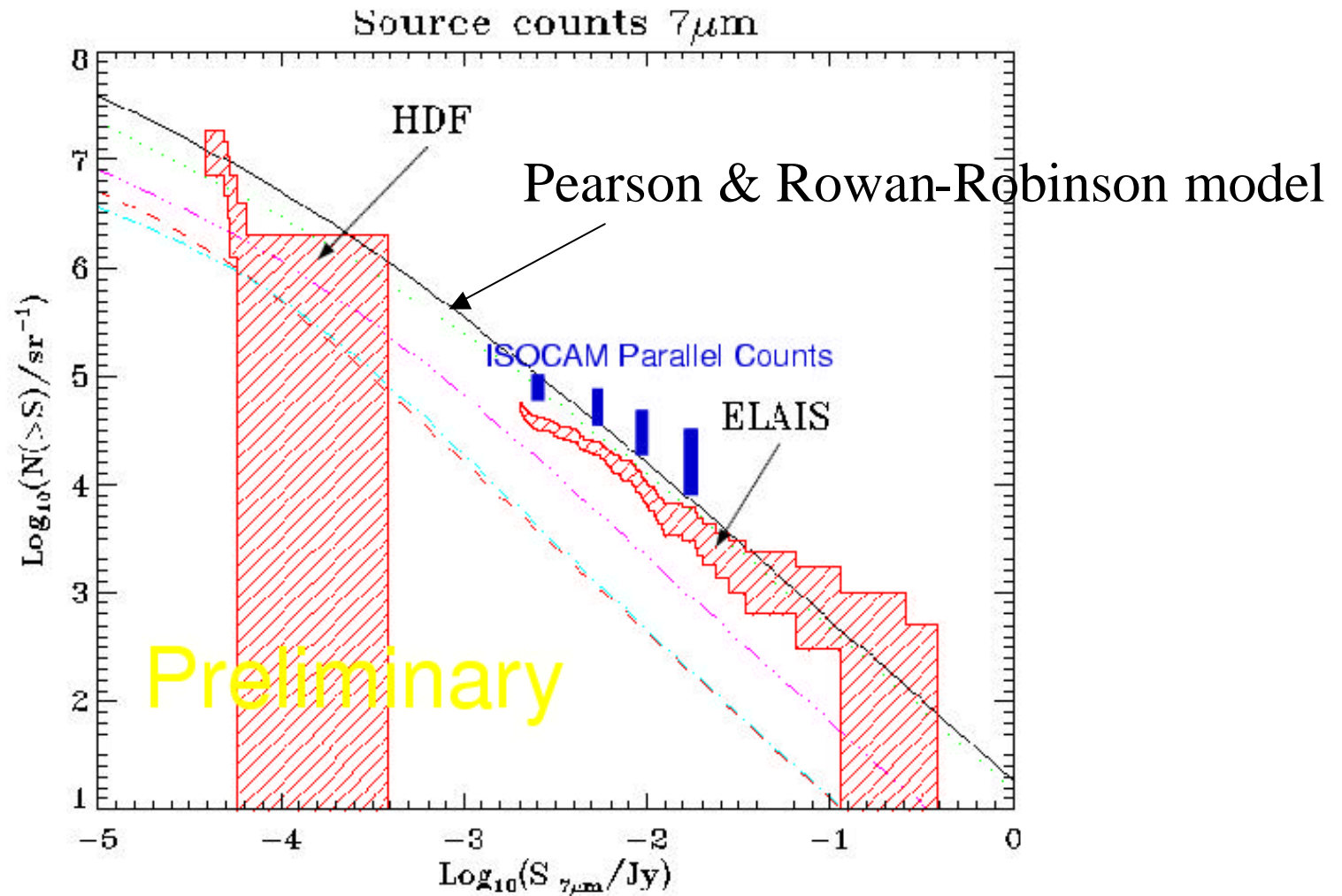


Cross-correlation with Principal Galaxies










ISOCAM Parallel source counts



Result is in agreement with ELAIS LW2 counts



Current projects using ISOCAM Parallel Data

 T. Müller	Solar System Objects
 S. Ott	LW2 (7mm) source counts
 N. Schartel	AGNs
 R. Siebenmorgen	Radio sources
 R. Siebenmorgen	Infra-red excess stars



Conclusions

- ❖ **Algorithms were developed to calibrate the ISOCAM parallel data and to extract point sources**
- ❖ **Simulations and visible inspections confirmed the validity of the data processing**
- ❖ **42 square degrees of the infrared sky were mapped to an unprecedented depth and positional accuracy, with high reliability and excellent flux accuracy**
- ❖ **Already the first data-mining promises exciting discoveries in the mid-infrared for many astronomical areas**
- ❖ **Preparation for point source catalogue well under way; cleaning and merging are expected to be completed in August**
- ❖ **ISOCAM parallel images and the point source catalogue will be released to the community end 2002**



**A gold-mine of data is
waiting for you!**



**Take the nuggets and
publish them!**