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ISOPHOT-related calibration work at Konkoly Observatory

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Herschel Calibration workshop
Leiden, 1-3 December 2004

ISO activities at Konkoly Observatory

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- **Mid-2001** : ISOPHOT group established via ESA's PRODEX programme
- **Today** : 4 scientists, 1 PhD student, 3 graduate students
- **2002-06** : Contract with the ISO DC to produce HPDPs (7 man-year)
- **2004** : 2 Spitzer GO proposals accepted
- **2004-07** : Contribution to the Herschel/PACS calibration (8 man-year)

Our goals:

(with MPIA)

- collect ISOPHOT calibration knowledge
- maintain and develop ISOPHOT data reduction skills (PIA)
- help and collaborate with people working on ISOPHOT data
- encourage students to use ISOPHOT

http://www.kisag.konkoly.hu

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Konkoly strategy to produce *Highly Processed Data Products* for the ISO Archive

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- Select and process well-defined homogeneous ISOPHOT data sets (not necessarily a complete AOT!)
- Utilize science observations of normal stars as secondary standards
- Develop dedicated correction algorithms
- Empirical photometric correction as the final step of processing
- Proceed from one data set to the next one, adapt correction algorithms, use lessons learnt → homogenization of modes
- Produce easy-to-use photometric catalogues (foreseen to be linked to the VO), and atlases (far-IR maps, PHT-S spectrophotometry)

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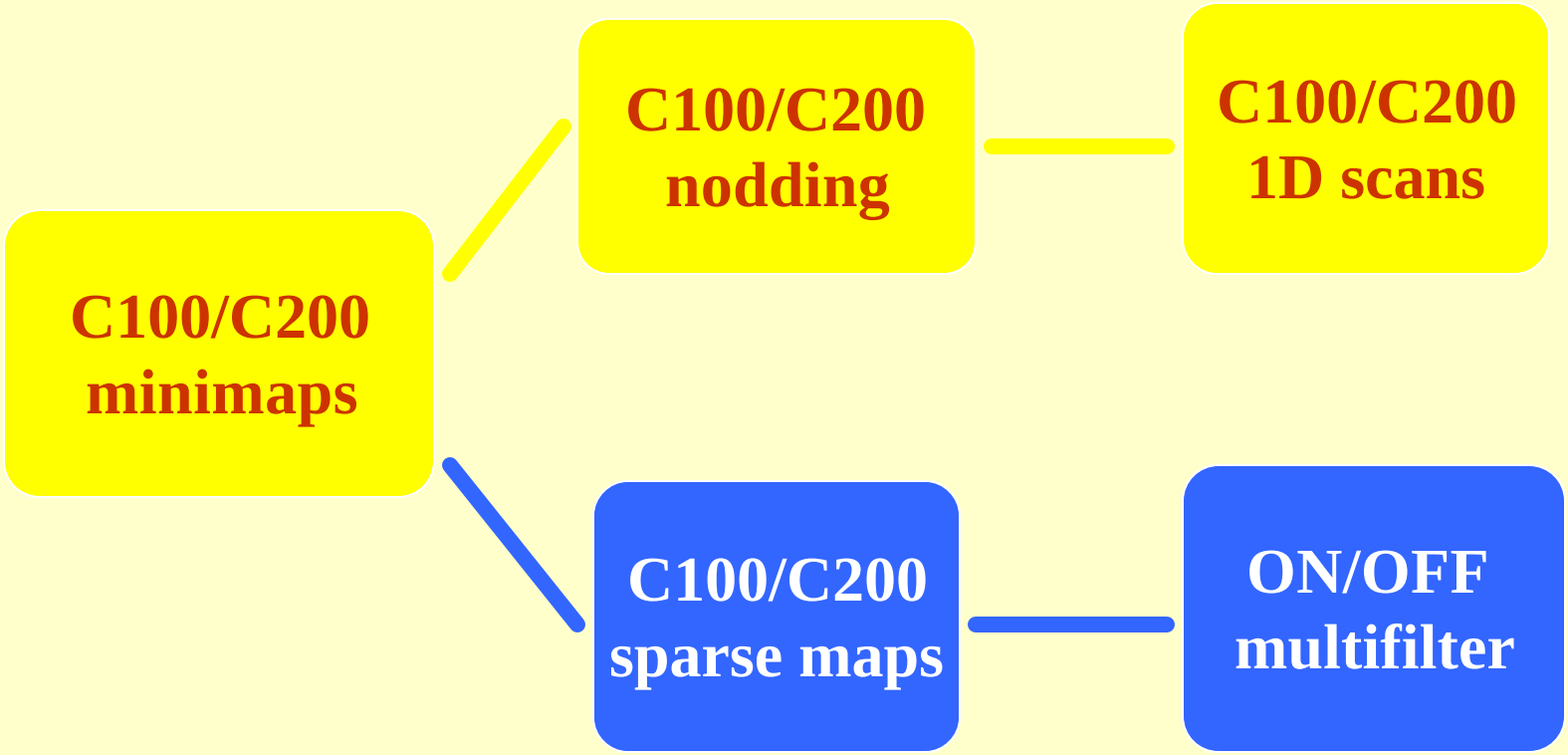
Road map: from mode to mode



Processing of far-infrared mini-maps

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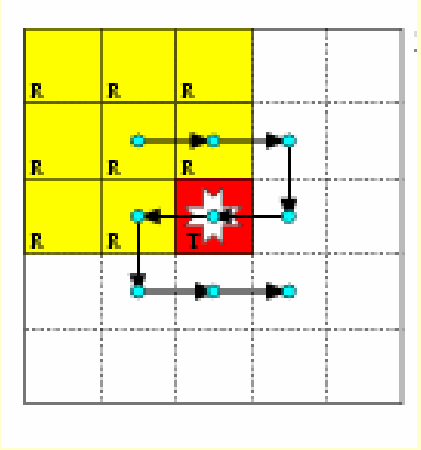
Mini-maps:

- The most efficient observing mode of ISOPHOT
- Each pixel provides independent photometric results
- ISOPHOT was calibrated in “mini-map mode”
- AOT P22



~1380 TDTNUMs
~360 h total time

In OLP10.0 the mode is scientifically validated.
Open issues:

- complicated flux extraction for point sources
- aperture photometry is inaccurate at faint level
- improving signal processing
- individual problems

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Improvements in mini-map calibration

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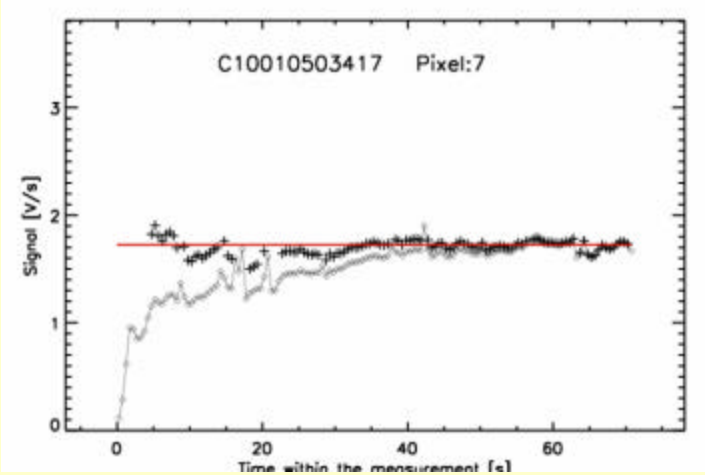
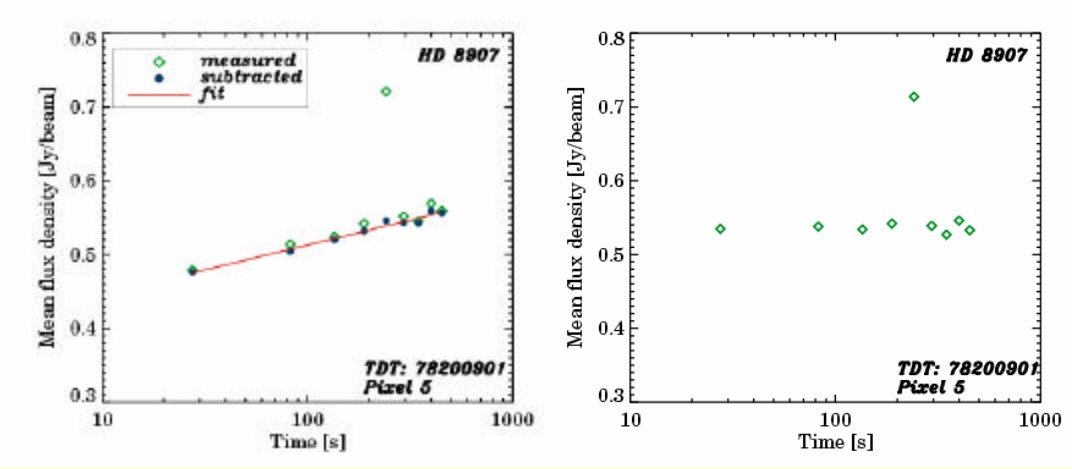
Transient correction



Drift correction



- **Flux reconstruction** using the 2D beam (measured)
- **Empirical photometric correction** (using secondary standards)

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Improvements in mini-map calibration

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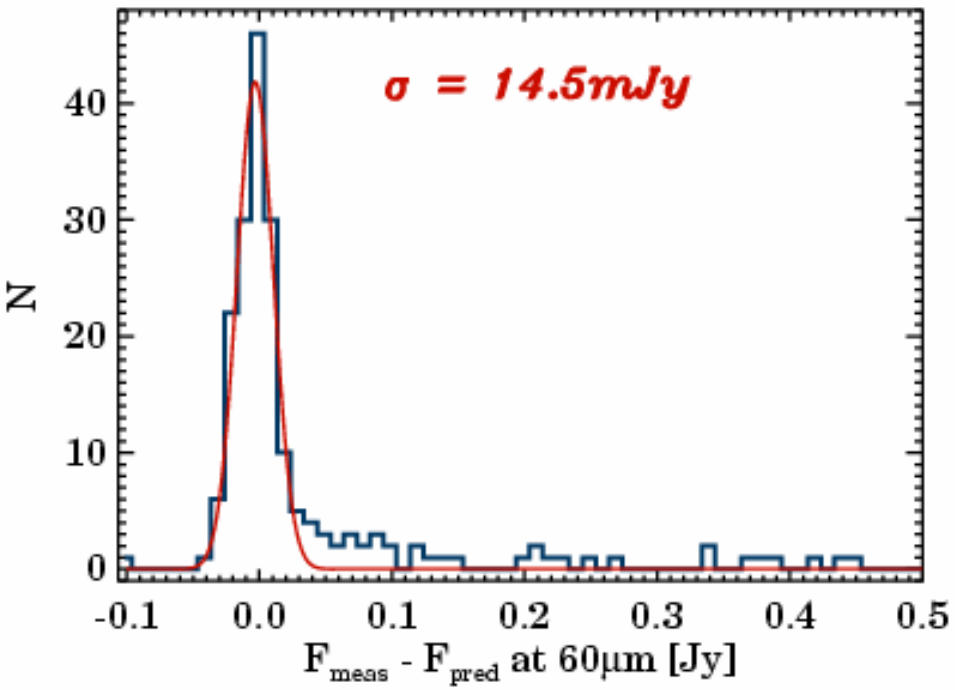
❑ **Error budget**

Faint level: 14.5 mJy @ 60, 90 mm
31 mJy @ 170 mm
Bright level: better than 7-9%



❑ **Quality flags**

❑ **Additional checks: source confusion in the beam; off-centre position; point / extended object;**

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Mini-map HPDPs produced so far

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- Catalogue of normal stars – 555 meas. – 229 objects
- Catalogue of solar-system objects – 168 meas. – 11 objects
- Catalogue of evolved stars – 53 meas. – 50 objects
- Catalogue of miscellaneous far-infrared objects – 49 meas. – 48 objects
- Catalogue of extragalactic objects – 818 meas. – 336 objects

You can find them in the ISO Data Archive

Processing of far-IR sparse maps

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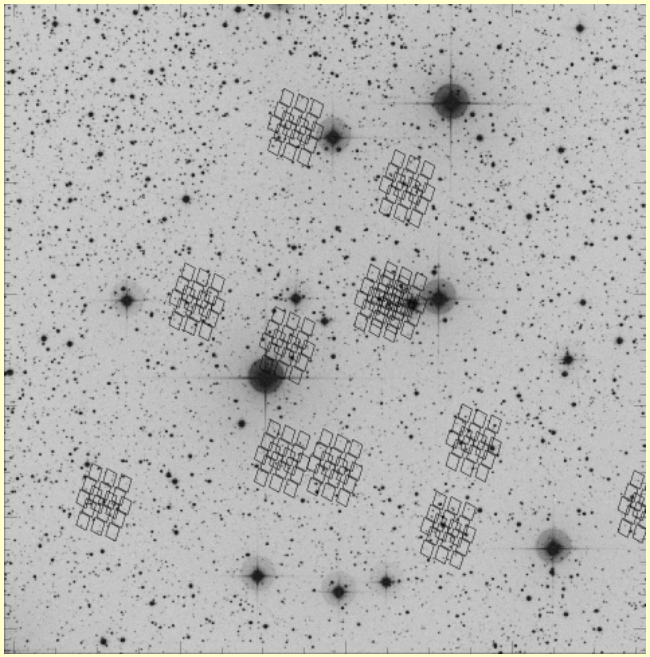
Sparse maps:

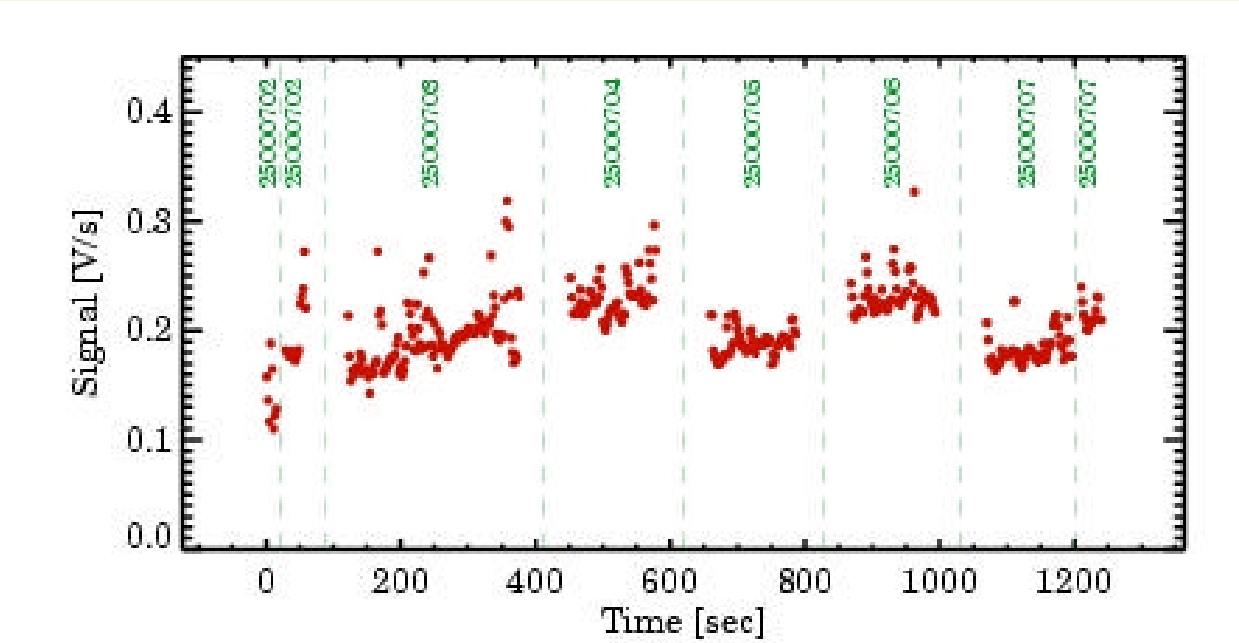
- ❑ AOT P37, P38, P39
- ❑ C100: only Pixel 5 measures the source
- ❑ C200: source at the centre of array
- ❑ separated OFF positions



- 2839 ISOPHOT sparse map observations, 105.5 h total time
- Solar system objects: 0%, Extragalactic objects: 39%, Normal stars: 19%, Evolved stars: 11%, YSO: 9%, ELAIS survey: 9%, Miscellaneous: 13%
- in the normal star catalogue: 507 TDT of 147 stars, 210 different flux values

Similar processing improvements as in mini-maps (*but* IRAS-based drift correction; in situ flat-field).

Pseudo-AAP format for sparse maps



Sequence of TDTNUMs ⇒ **Pseudo-AAP** ⇒ **Mini-map evaluation routines**

Powerful tool for transforming different observing modes to mini-map scheme.

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Improvements in sparse map calibration

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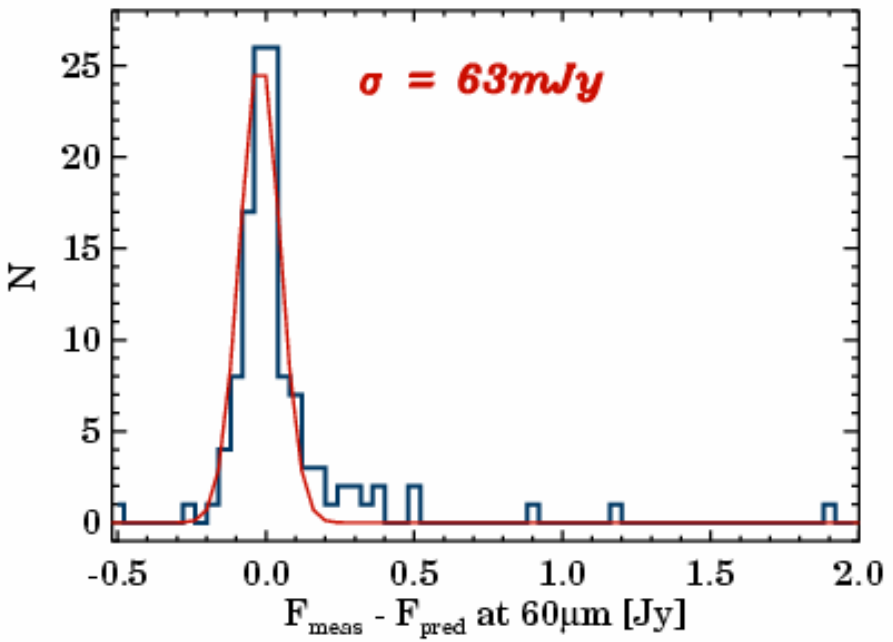
- **Error budget**

Faint level: 70 mJy @ 60 mm

Bright level: better than 12 %



- **Additional checks: source confusion in the beam; off-centre position**

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PHT-S post-processing package

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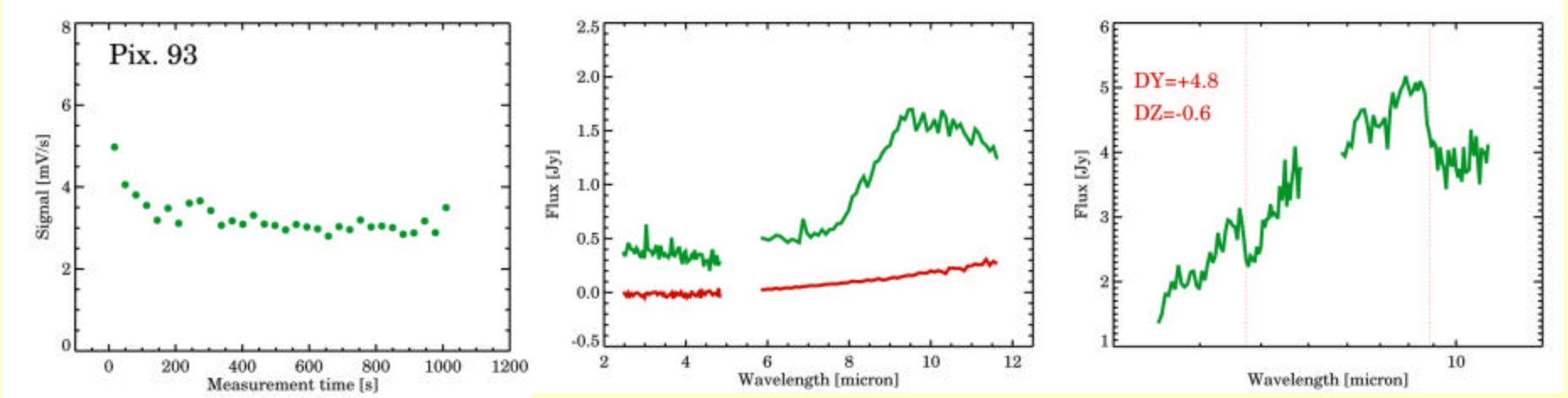
Most PHT-S spectra in the Legacy Archive are OK, but some individual cases require post-processing:



Memory from preceeding meas. *Background subtraction* *Off-centre position*

- Corrections can be made with our IDL-based package.
- We check for too low/high detector temperature.
- Empirical photometric correction is applied at the end of the processing scheme.
- Error estimate from an ensemble of 42 normal star observations.

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PHT-S atlas of young stars

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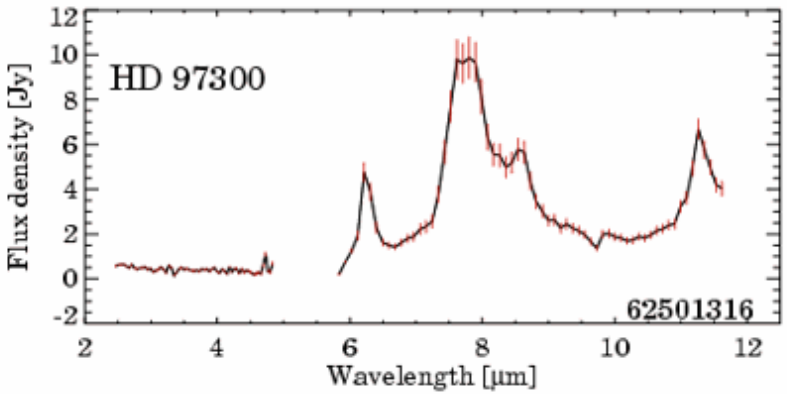
ISOPHOT-S Spectrophotometric Atlas of Young Stellar Objects

HD 97300

Type:
Herbig Ae/Be star
Observation:
ISO 62501316
Date 02-Aug-1997
Position (2MASS):
RA(2000): 11 09 50.03
DEC(2000): -76 36 47.7
External links:
Simbad
IRAS 11082-7620
Additional ISO spectra:
07901912 (PHT-S)
14100945 (SWS)



Data Reduction Log:

- Standard processing to AAP with PIA V10.0
- Memory from preceeding observation corrected
- DIRBE-based zodiacal spectrum subtracted
- Position offset (DY=+1.0", DZ=-0.6") corrected
- Empirical photometric correction applied

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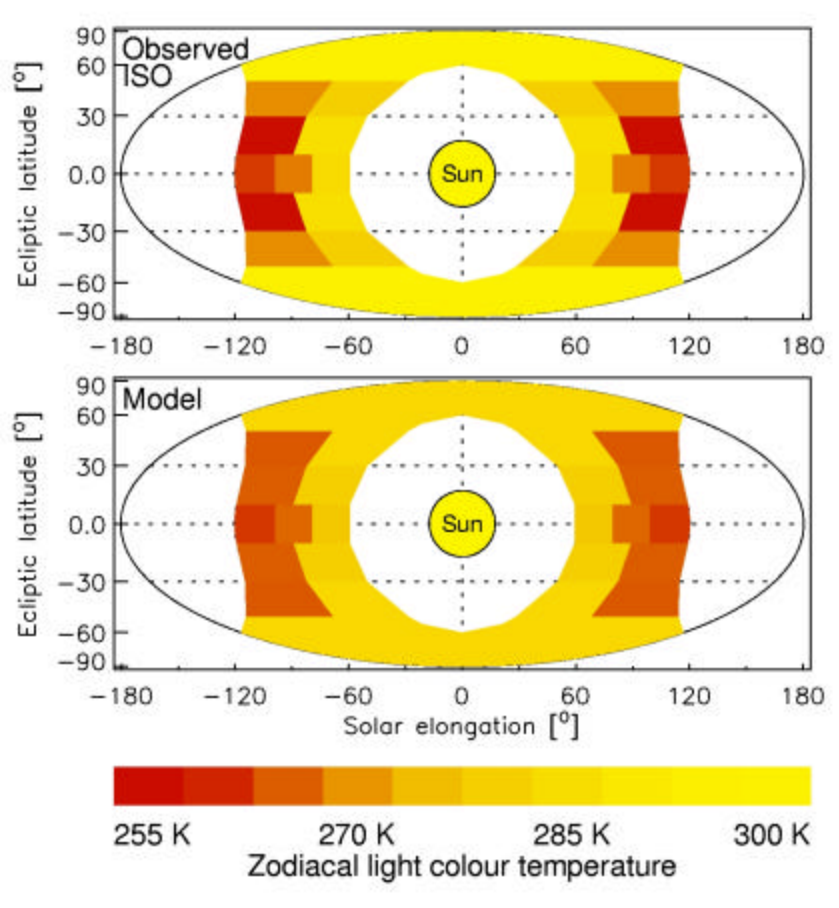
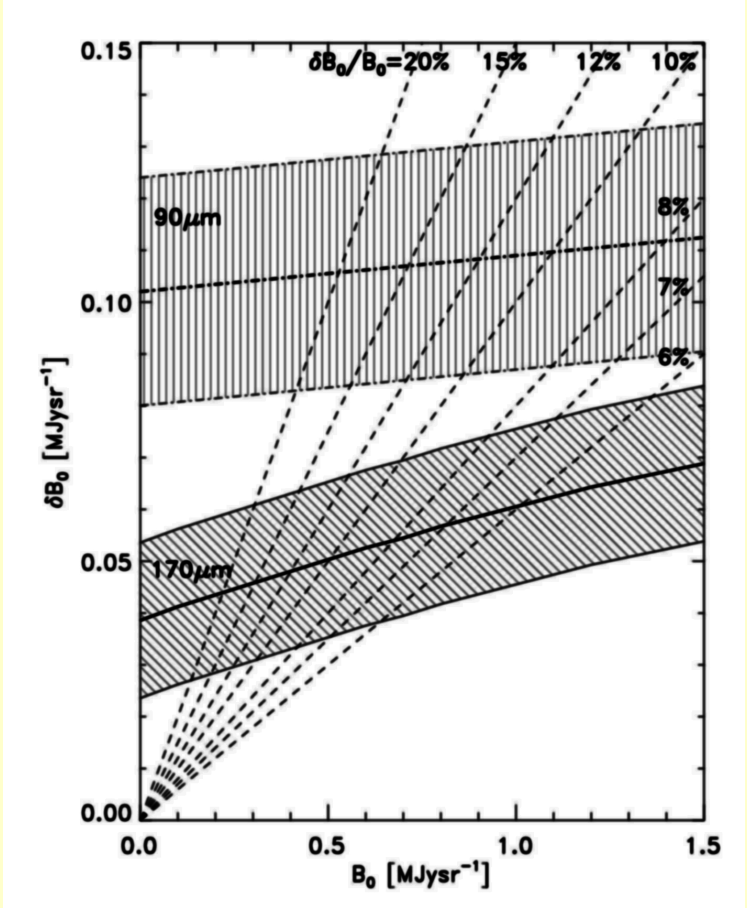
Science highlights: IR sky background

Temperature of the zodiacal light



(Leinert, Ábrahám et al. 2002)

Fluctuation of the extragalactic bgd.



(Kiss et al. 2001)

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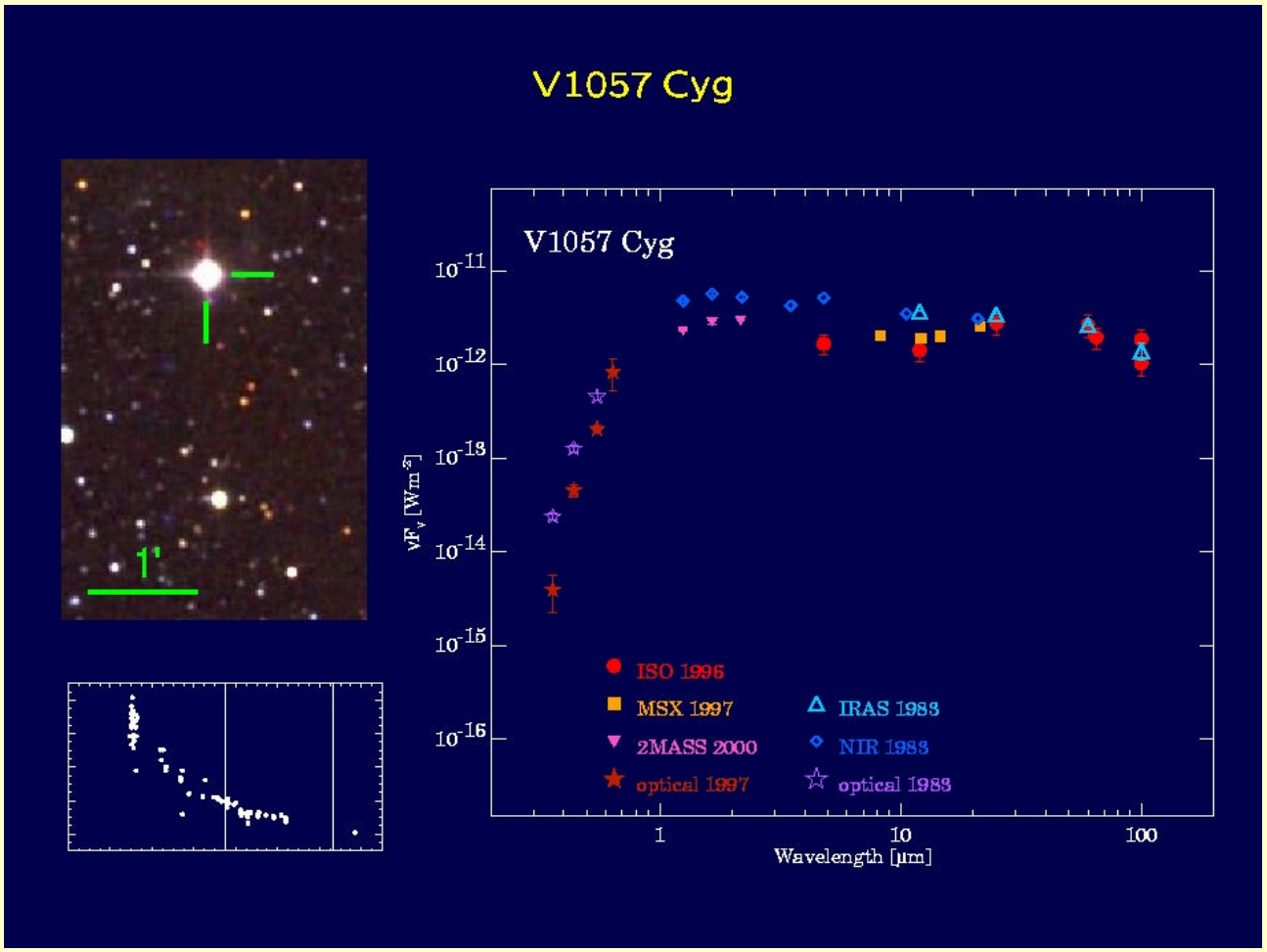
Science highlights: FU Orionis stars



First study of the temporal variation of FU Ori-type eruptive YSOs in the infrared.

Results: contradiction with present models to explain the origin of far-IR emission.

(Ábrahám et al. 2004)

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Science highlights: Vega-phenomenon

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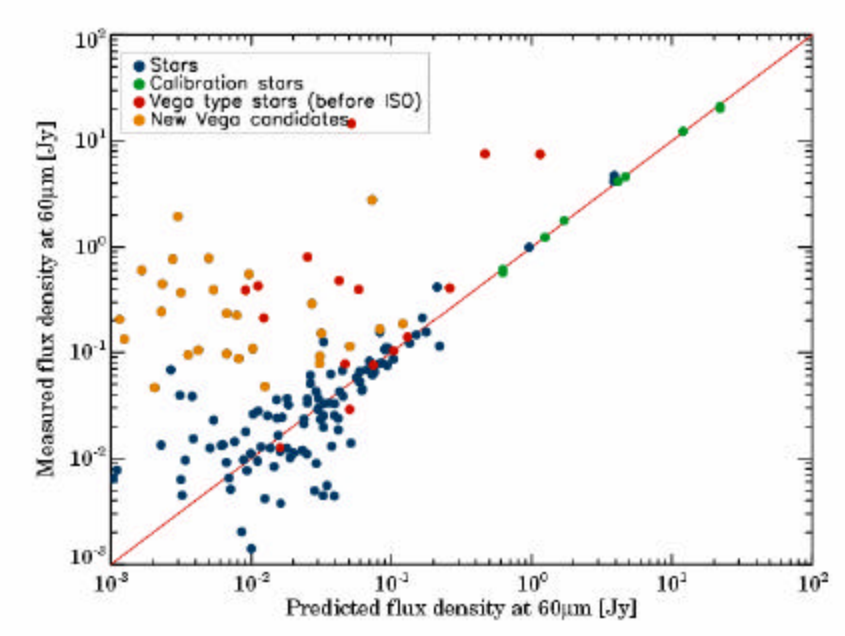
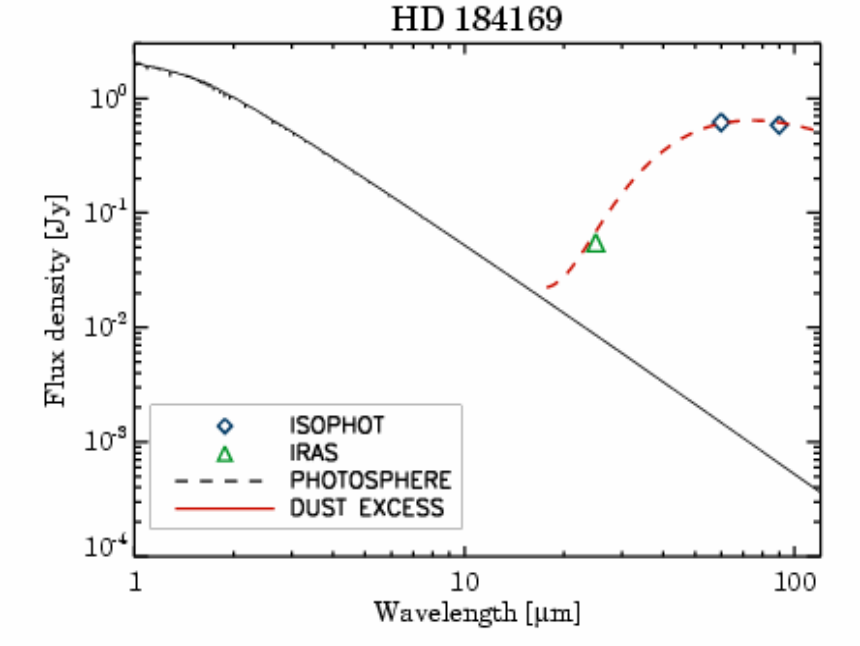
- Several ISOPHOT key-programmes were devoted to Vega-phen.
- No unified homogeneous catalogue was produced
- We are creating such a catalogue based on mini-map and sparse map observations





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Outlook

- **Future HPDP plans: C100/C200 nodding, 1D scan, ON- OFF; P1/P2/P3 ON-OFF**
- **Updated versions of the existing HPDP catalogues**
- **Pseudo-AAP utilized everywhere for homogenization of processing**
- **Calibration of absolute surface brightness photometry**

Thank you for your attention!

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