ISOPHOT-related calibration work at Konkoly Observatory

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Herschel Calibration workshop
Leiden, 1-3 December 2004
ISO activities at Konkoly Observatory

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

- 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)
Road map: from mode to mode

- C100/C200 minimaps
- C100/C200 nodding
- C100/C200 1D scans
- C100/C200 sparse maps
- ON/OFF multifilter
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
Improvements in mini-map calibration

- **Transient correction**

- **Drift correction**

- **Flux reconstruction** using the 2D beam (measured)

- **Empirical photometric correction** (using secondary standards)
Improvements in mini-map calibration

- **Error budget**

  - **Faint level:** 14.5 mJy @ 60, 90 μm
  - 31 mJy @ 170 μm

  - **Bright level:** better than 7-9%

- **Quality flags**

  - **Additional checks:** source confusion in the beam; off-centre position; point / extended object;
Mini-map HPDPs produced so far

- 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

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 $\rightarrow$ Pseudo-AAP $\rightarrow$ Mini-map evaluation routines

Powerful tool for transforming different observing modes to mini-map scheme.
Improvements in sparse map calibration

- Error budget

  *Faint level*: 70 mJy @ 60 μm

  *Bright level*: better than 12%

- Additional checks: source confusion in the beam; off-centre position
PHT-S post-processing package

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

- 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.
**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 preceding observation corrected
- DIRBE-based zodiacal spectrum subtracted
- Position offset (DY=+1.0", DZ=-0.6") corrected
- Empirical photometric correction applied
Science highlights: IR sky background

Temperature of the zodiacal light

Fluctuation of the extragalactic bgd.

(Leinert, Ábrahám et al. 2002)

(Kiss et al. 2001)
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)
Science highlights: Vega-phenomenon

- 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
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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