INFRARED SPACE OBSERVATORY esa

SUPERSPECTRA PROJECT

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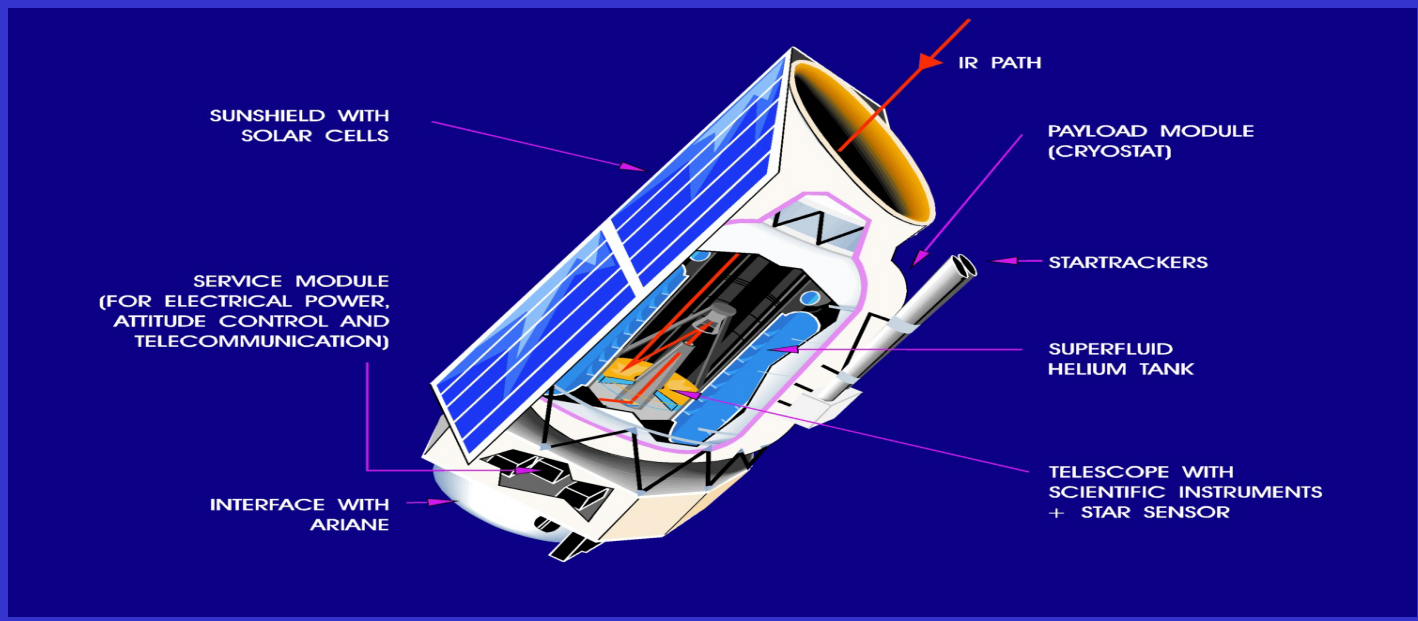
What is it about?

- ISO main characteristics, and its data
- What is Superspectra project?: Combining spectra...
- What is done
- What is left to do
- Conclusion

ISO MAIN CHARACTERISTICS, AND ITS DATA

- Infrared Space Observatory (ISO), 0.6 m telescope
- ESA project, ISAS, NASA contributions
- Operational between November 1995-May 1998
- 4 instruments observatory for infrared astronomy:
  - Photometry and imaging from 2.5-240 μm
  - Full spectroscopic coverage (low-high resolution) from 2.5-200 μm
- 30000 observations (~ 6000 objects), 1340 refereed ISO papers to date.
- Now in 'Active Archive Phase' (2002-December 2006).



ISO MAIN CHARACTERISTICS, AND ITS DATA

SWS: Short-Wave Spectrometer, 2.38-45.2 μm, R ~1000-2500

Different observation modes:

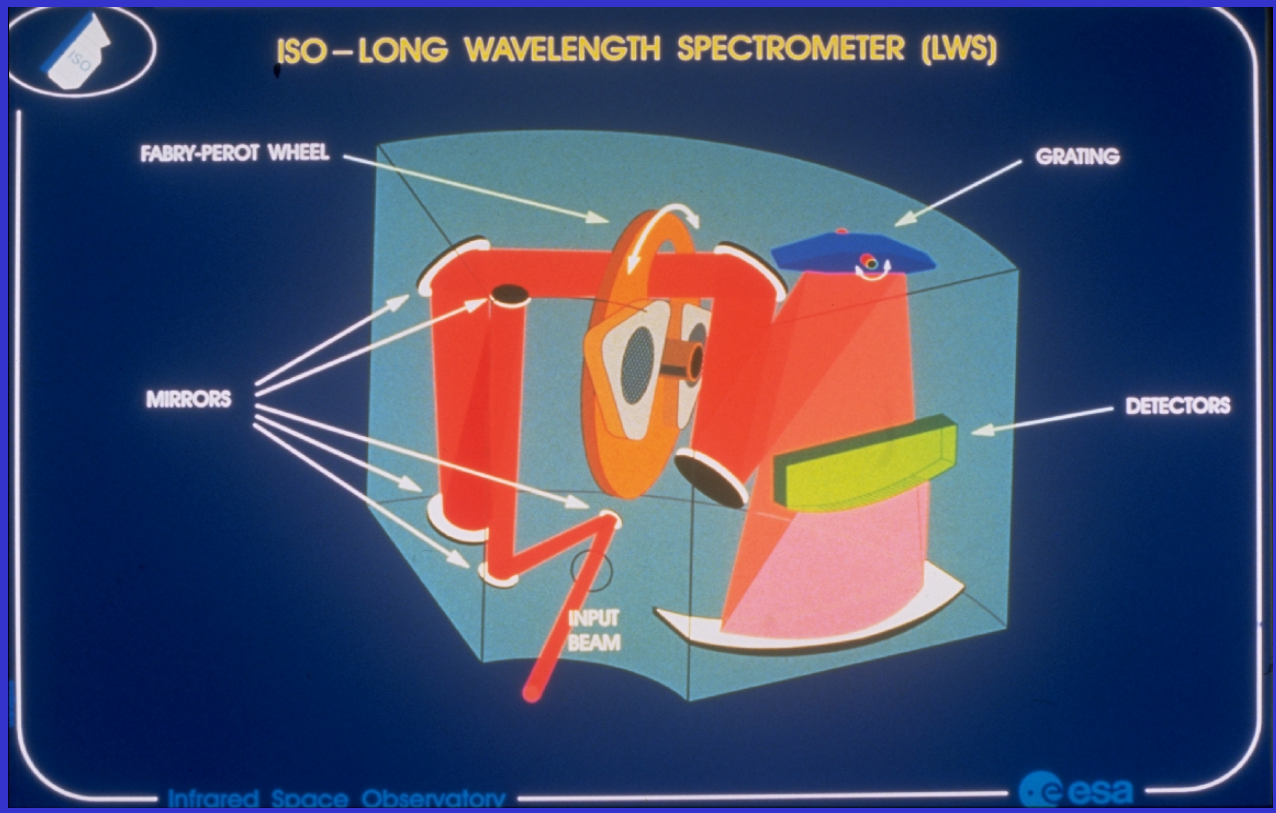
- SWS01:low-resolution full-wavelength grating scan, 12 spectral bands, 12 detectors each band, 2 scan directions per detector ⇒1 full-scan SWS01 spectrum = Σ 288 individual spectra
- Other modes (SWS02, SWS06, SWS99...): individual spectral lines, calibration data...

ISO MAIN CHARACTERISTICS, AND ITS DATA

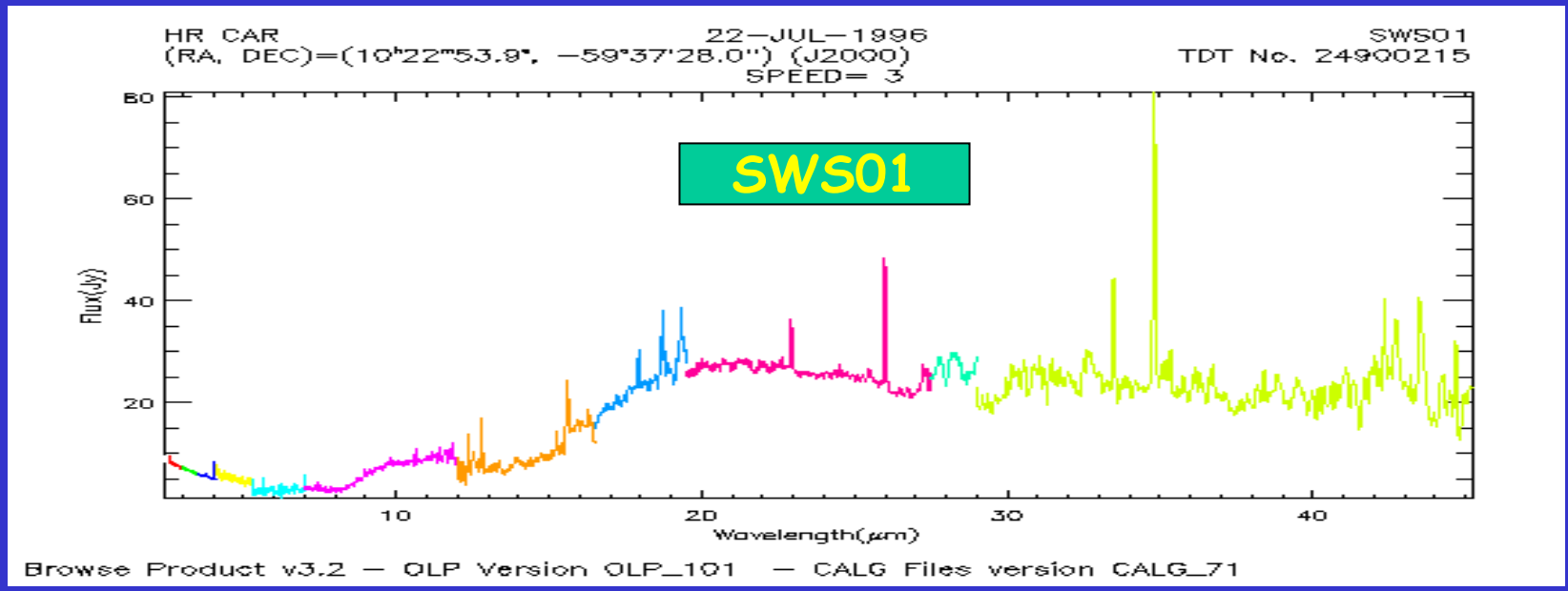
LWS: Long-Wave Spectrometer, 43-196.7 μm, R ~200

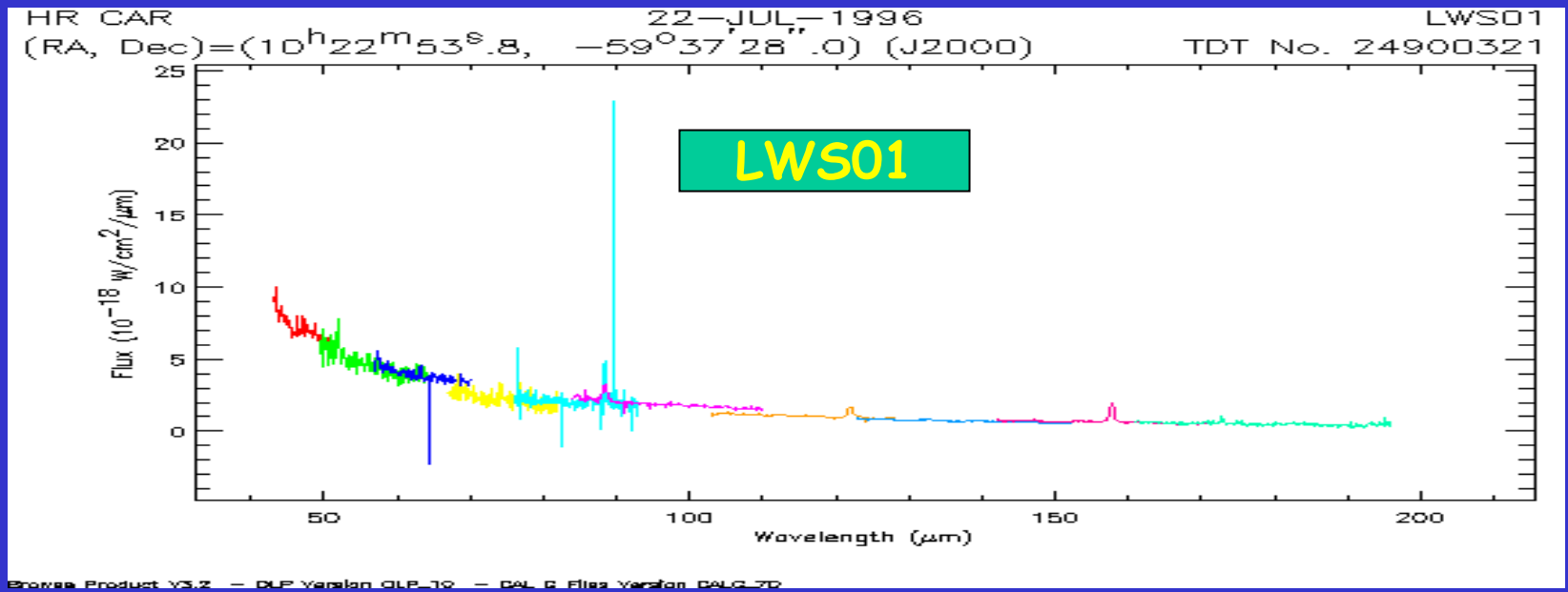
Different observation modes:

- LWS01: full LWS range (or user-specified range of wavelengths), 1 full-scan LWS01 spectrum= Σ 10 individual spectra (10 detectors)
- Other modes (LWS02, LWS06, LWS99...):different resolution in different wavelenghts ranges, calibration data...



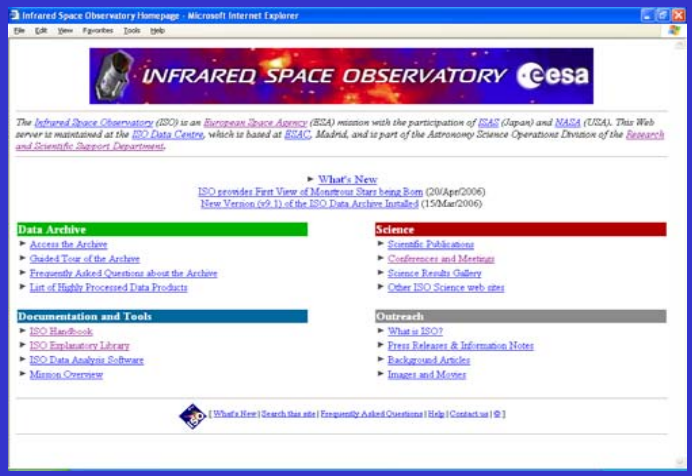
ISO MAIN CHARACTERISTICS, AND ITS DATA





ISO MAIN CHARACTERISTICS, AND ITS DATA

- ISO data is stored at ISO Data Archive (iso.esac.esa.int/ida/index.html)



IDA

- **Raw data:** lowest level products

- **Basic science data** : best starting point for data reduction

- **Fully processed data** : final products,automatic pipeline

- **HPDP : Highly Processed Data Products:** highest level products, reduced 'by hand', atlas, catalogues..

WHAT IS SUPERSPECTRA PROJECT?

- MAIN GOAL:

  Put together as an HPDP an atlas of ISO spectroscopic data (SWS01+LWS01) to be published in IDA and as an ESA-SP.

Prioritary attention to:

1) Combined SWS01 and LWS01 measurements of individual sources.

2) Mean SWS01 spectra derived from repeated observations of the same source

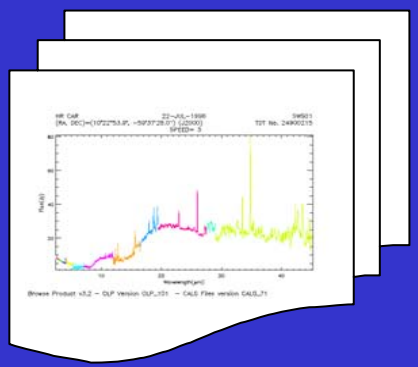
3) Mean LWS01 spectra derived from repeated observations of the same source

WHAT IS SUPERSPECTRA PROJECT?

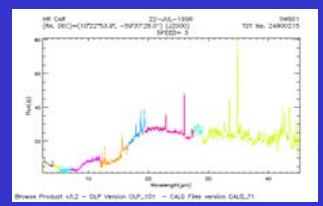
- MAIN MOTIVATIONS:

1) Provide complete spectroscopic coverage of astronomical sources from 2 to 200 μm: ISO is the only facility capable of this, to date.

2) Provide mean spectra with extremely high S/N ratio for those sources for which there are repeated SWS01/LWS01 measurements in IDA:



$(S/N)_{superspectra} > (S/N)_{individual\ spectrum}$



WHAT IS DONE

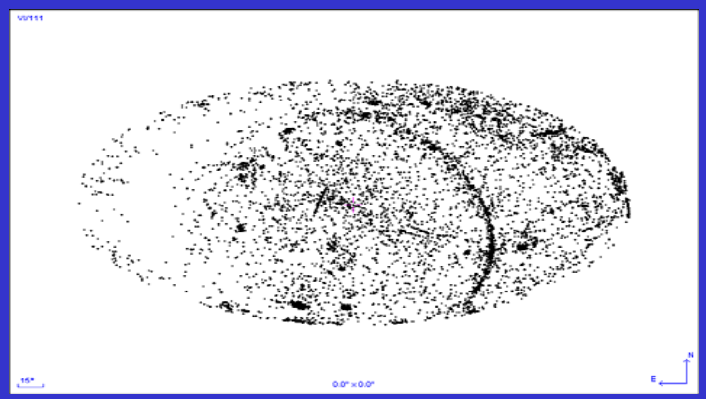
1) Inventory SWS01 repeated:

TOOLS:

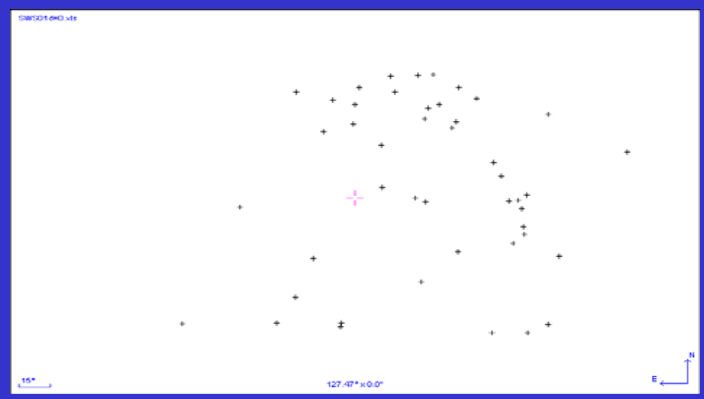
- IDA (iso.esac.esa.int)
- AVO software (www.euro-vo.org)
- SIMBAD (simbad.u-strasbg.fr), EXCEL
- Sloan's SWS01 catalogue (HPDP from IDA)

RESULTS:

- 161 sources (~ 3% total ISO sources)
- 419 observations (~ 33% total SWS01 observations)
- Ex: R-Cas, 8 SWS01 observations



SWS01 repeated



WHAT IS DONE

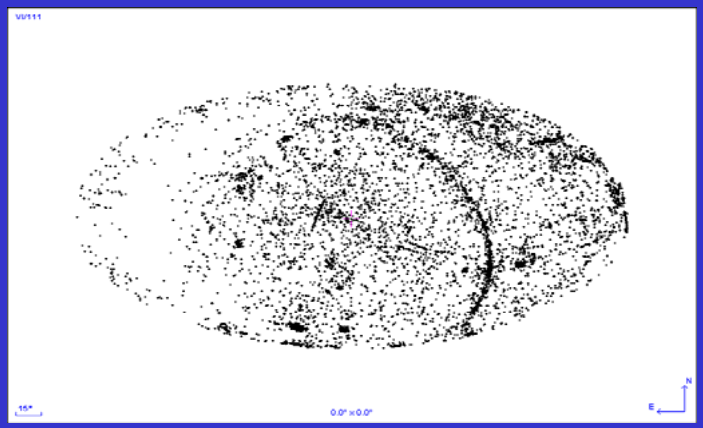
2) Inventory LWS01 repeated:

TOOLS:

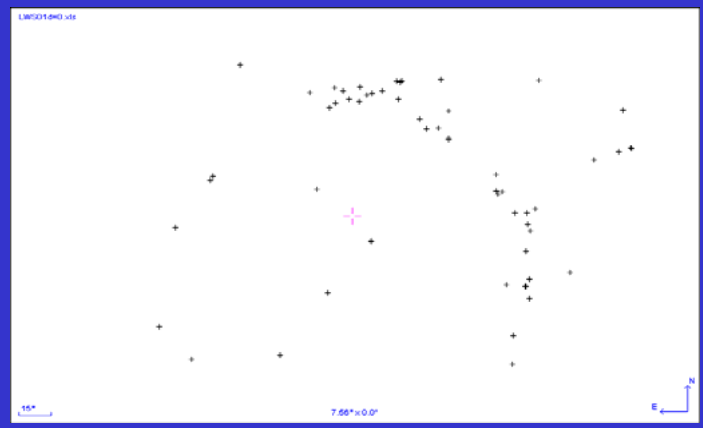
- IDA
- AVO
- SIMBAD , EXCEL

RESULTS:

- 158+9 (SSO) = 167 sources (~ 3% total ISO sources)
- 669+69 (SSO) = 738 observations (~ 41% total LWS01 observations)
- Ex: Mars, 10 LWS01 observations



LWS01 repeated



WHAT IS DONE

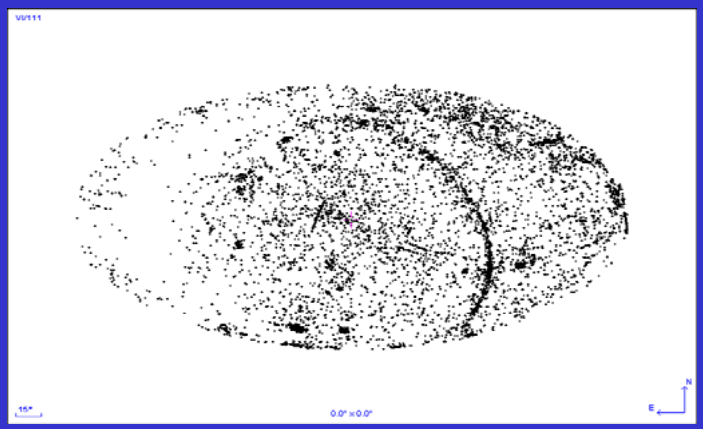
3) Inventory SWS01/LWS01 combined:

TOOLS:

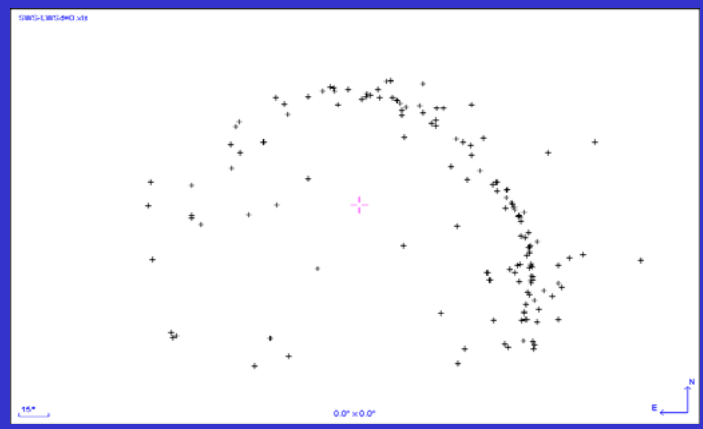
- IDA
- AVO
- EXCEL

RESULTS:

- 363 sources (~ 6% total ISO sources)
- 521 (SWS01) + 789 (LWS01) = 1310 observations
- Ex: S184, 3 SWS01 + 4 LWS01 observations



SWS01/LWS01



WHAT IS DONE

4) Inventories Documentation:

- How to make them, tools, internet links, comparison with SWS01 inventory derived from Sloan's atlas, HPDPs related, results..

5) Jumps between bands reasons investigated:

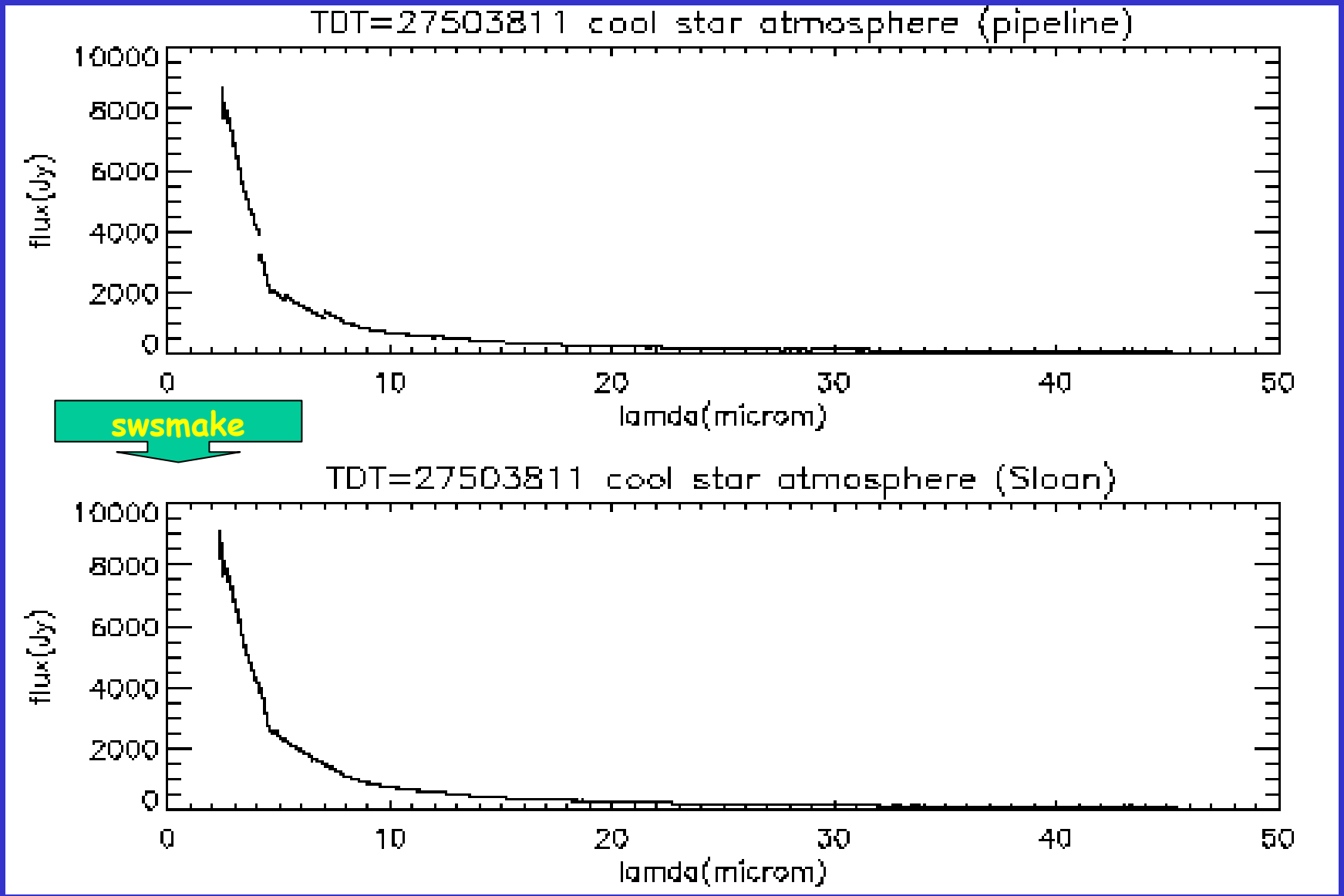
- Aperture vary from band to band (extended sources)
- Size of PSF $\leftrightarrow$ size of aperture (point sources)
- Others (drift in the telescope pointing during a scan, PSF(λ) ...)

6) Sloan's IDL software checked:

- 'swsmake' removes jumps between SWS01 bands.
- Modify swsmake to apply it with LWS01?

WHAT IS DONE

6) Sloan's IDL software checked, example:



WHAT IS DONE

7) LWS01 superspectra and its documentation started: Combining spectra with ISAP (ISO Spectroscopic Analysis Package, IDL)

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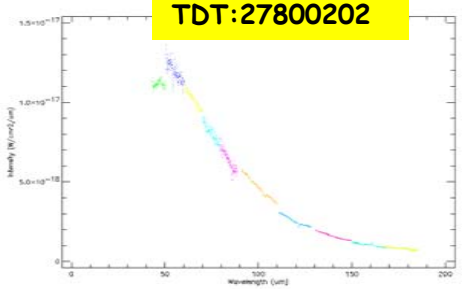

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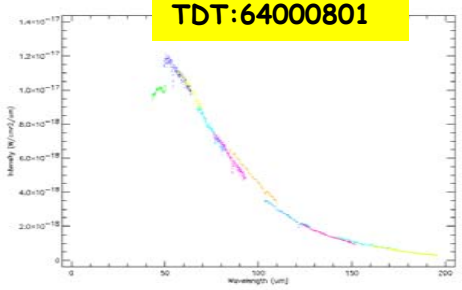

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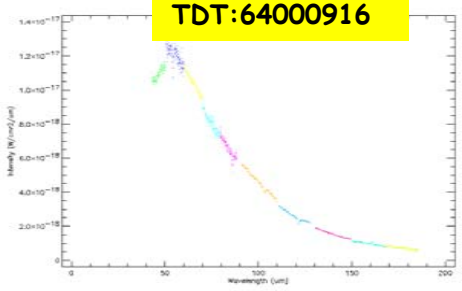
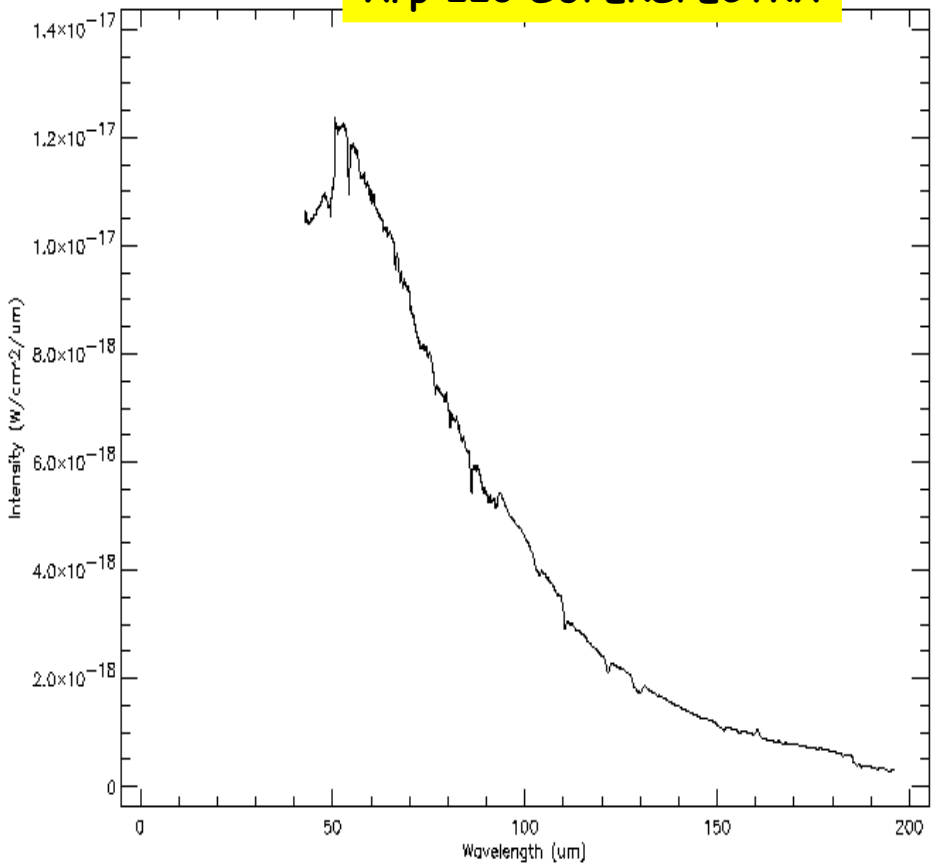


Arp 220 SUPERSPECTRA



WHAT IS LEFT TO DO

1) SWS01 superspectra and its documentation:
   ISAP, waiting for Hormuth's data, apply and modify swsmake?

2) Combine SWS01/LWS01 and its documentation:
   ISAP

3) Modify original inventories:
   Final inventories will contain only useful data to derive superspectra.

4) Ingest results in IDA as an HPDP, publish as an ESA-SP

CONCLUSION

1) ISO:

The only facility, to date, capable to provide complete spectroscopic coverage from 2- 200 μm.

2) IDA:

Individual SWS01 and LWS01 spectra stored, measured for different sources

3) For some sources, SUPERSPECTRA PROJECT Offers to the scientific community:

- Complete spectra covering the full range.
- Highest S/N ratio SWS01 spectra
- Highest S/N ratio LWS01 spectra

} Available in IDA as an HPDP atlas

- ACKNOWLEDGEMENTS:

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