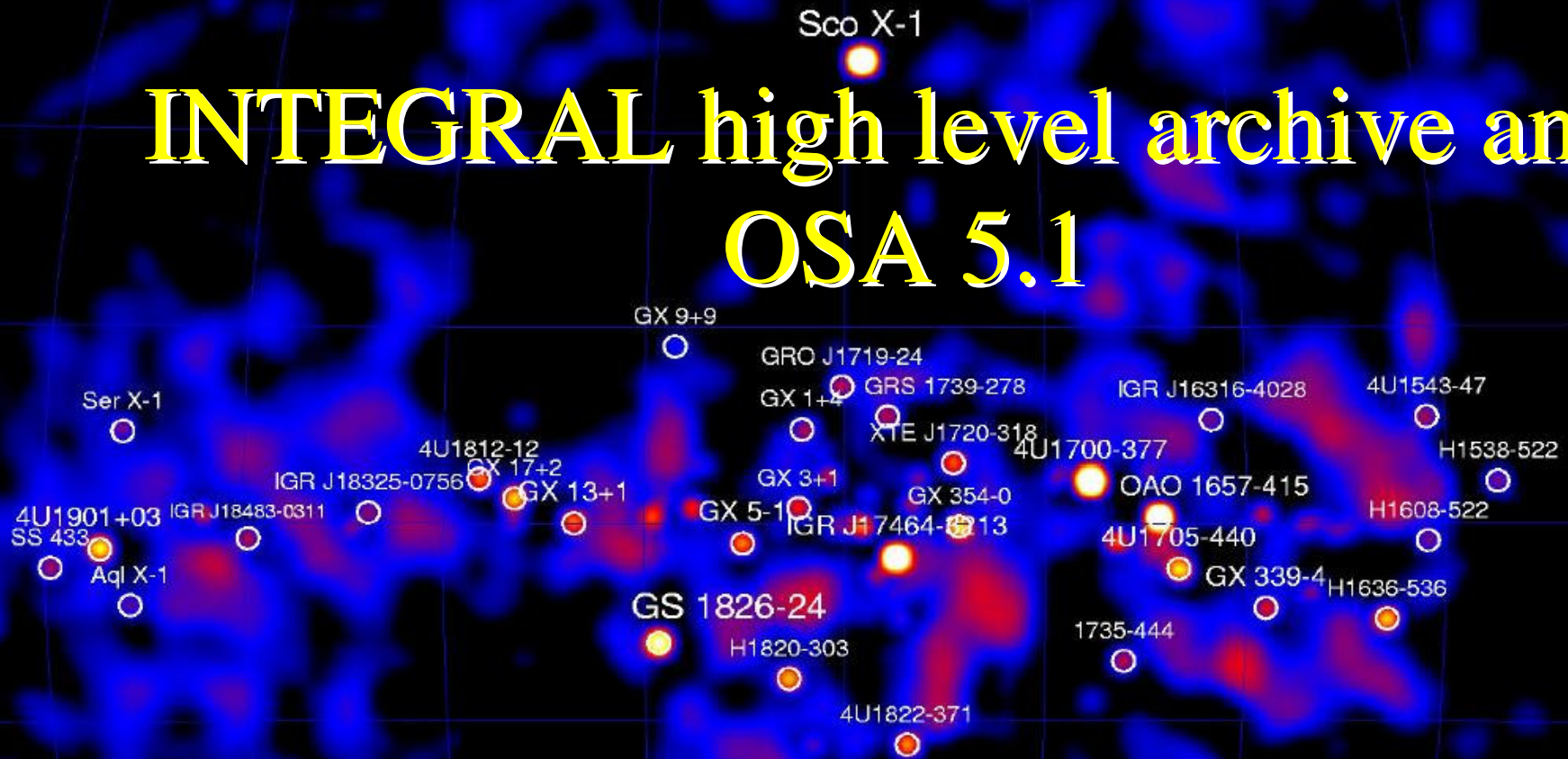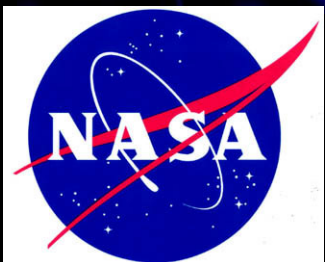# INTEGRAL high level archive and OSA 5.1

Volker Beckmann

Exploration of the Universe Division, NASA Goddard Space Flight Center

C. Shrader, S. Sturner, B. Teegarden, K. Watanabe

INTEGRAL User's Committee Meeting, February 21st, 2006

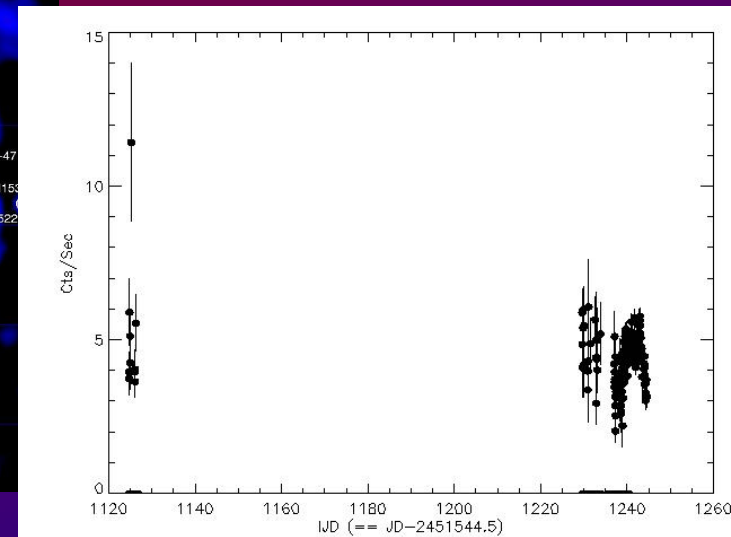# INTEGRAL Activities at GSFC

- providing high-level data products through HEASARC

- INTEGRAL Bright Source Catalog and

- INTEGRAL public data results

- INTEGRAL Source Results

- INTEGRAL AGN Catalog

- New software release OSA 5.1: improvements for JEM-X and ISGRI analysis

# HEASARC and INTEGRAL/GOF

- download previews and download the data
- get help with the analysis
- HEASARC as a known portal to high-energy data
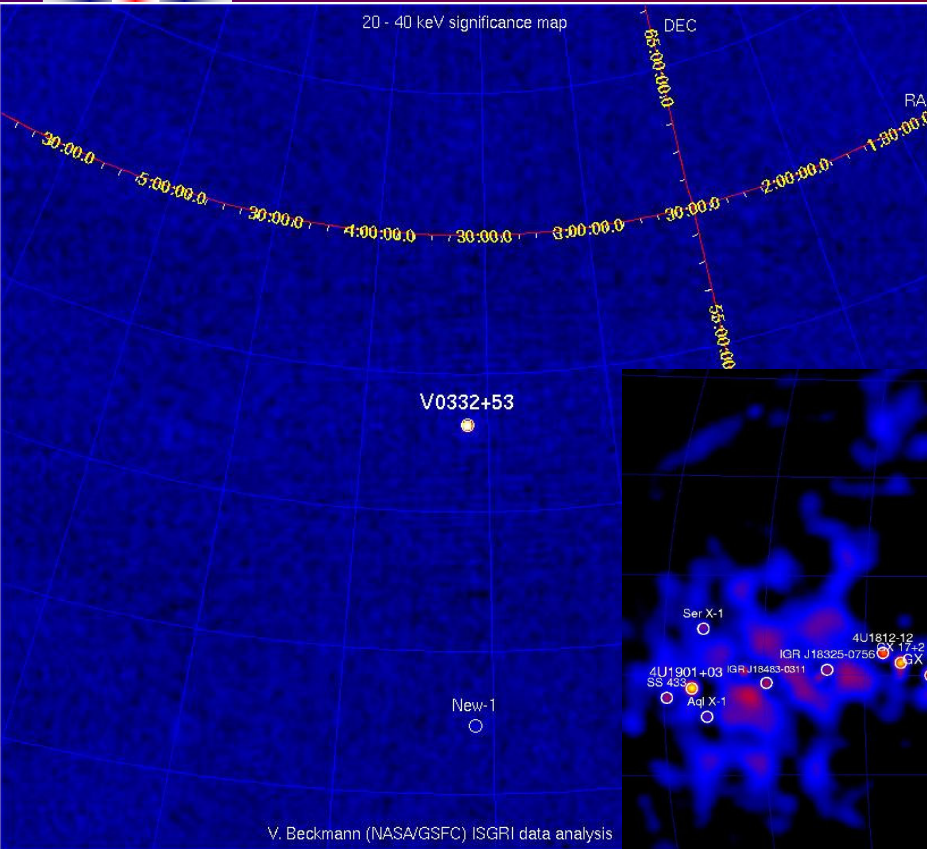
ISGRI images (8 energy bands)
SPI images
ISGRI lightcurves (23-40-80 keV)
available in FITS and JPEG



V. Beckmann (NASA/GSFC) ISGRI data analysis

GODDARD SPACE FLIGHT CENTER
esa European Space Agency

INTEGRAL Helpdesk
INTEGRAL What's New
HEASARC Site Map
NASA Homepage

Search the INTEGRAL site: enter search text

HEASARC Quick Links
---Quick Links---

| HEASARC HOME | INTEGRAL HOME | ARCHIVE | DATA ANALYSIS | PROPOSALS & TOOLS | EDUCATION & PUBLIC INFO |

INTEGRAL U.S. Guest Observer Facility

EXO 1747-214
4U 1724-307
GX 3+1   GX 9+1   GX 17+2
GX 13+1

IBIS OMC SPI JEM-X

| ABOUT INTEGRAL | GOF SERVICES | STAFF | USER'S COMMITTEE | RELATED SITES |

| SPI: | News! | User Manuals | Data | IRFs and RMFs | Documents & Links | ISDC SPI page | FAQs | Contact |

## SPI analysis at the INTEGRAL Guest Observer Facility

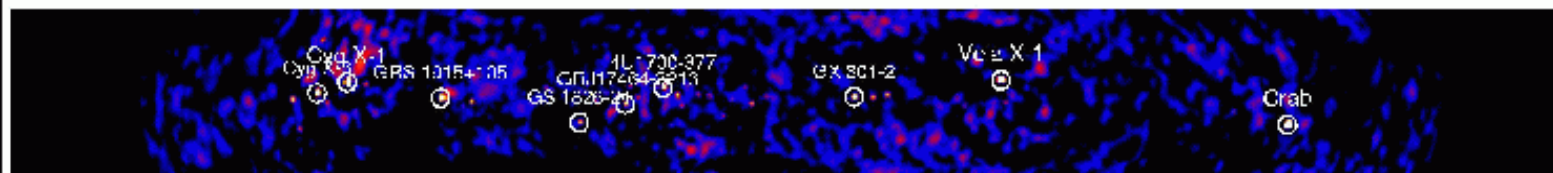**last update: January 18, 2006**

NEW  The first INTEGRAL AGN Catalog

OSA 5.1 installed here at GSFC. Learn how to use it

INTEGRAL Bright Source Catalog and INTEGRAL Public Data Results

In-flight data and the SPI core program analysis

Cyg X-1   GRS 1915+105   Cr.J1704-2213   4U 700-377   GX 301-2   Vela X 1
GS 1826-   Crab

SPIROS significance map of the Galactic plane (20 - 40 keV)

These pages provide information about INTEGRAL/SPI data analysis done at NASA Goddard Space Flight Center. On the top you find the navigation buttons.

- Please read the News page to get to know the latest changes.
- The Online User Manuals are all you need to read to process SPI data.
- Data which you can use for running your analysis can be found on the Data page.
- IRFs and RMFs are needed to extract images and spectra from the SPI data. You find a list of available response files and download them on this page.
- Documentation is sometimes difficult to find. Here is a list of the relevant documents and links to SPI related sites: Documentation & Links. You find here descriptions of the DAL packets as well as links to the IT, ISDAG, ISDC, and more useful documents.
- In case you have a question - please look into the Frequently asked questions list. Perhaps you find the answer there!

# HEASARC and INTEGRAL/GOF

- analysis of public data
- results of 600 observations in the archive:
  "INTEGRAL public data results"
- ISGRI and SPI lightcurves
  for 140 bright sources:
"INTEGRAL Bright Source Catalog"

- "INTEGRAL Source Results":
  ISGRI fluxes in 2 energy bands (23-40, 40-80 keV) based
  on OSA 5.1 analysis per science window (for ~200 sources)

- "INTEGRAL AGN Catalog" - detailed information about
  68 AGN

Main Search Form > **Search Results** > Choose Data Products

Images generated by *SkyView*
Click on image to see full *SkyView* image
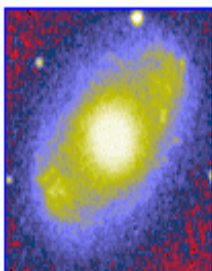
DSS Optical image, 2.83'
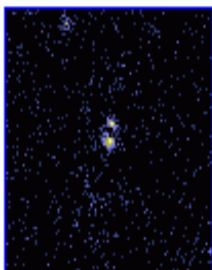
RASS X-ray image, 75.0'

Images centered on requested position

**Search was based on:**

| | |
|---|---|
| Object/Coordinates: | NGC 4151 |
| | resolved by SIMBAD (local cache) to [ 12 10 32.73, +39 24 19.6 ] |
| Coord. System: | Equatorial, equinox 2000 |
| Maximum Rows: | 1000 |
| Search Radius: | Default    arc minutes |

Reissue Query          Save Query To File

Redisplay | as | Text Table

Printer-Friendly Version

Save All Objects To File

Reset

🔵 **Browse Tip**: Do you know how to estimate the number of random matches in a cross-correlation? Learn more on this topic or See all tips

## Table Name/Row Count Summary
Click on table name to view search results

| | | | |
|---|---|---|---|
| INTEGRAL IBIS Hard X-Ray Survey of Galactic Center (intgccat) | 0 | First IBIS/ISGRI Soft Gamma-Ray Galactic Plane Survey Catalog (ibisgpscat) | 0 |
| INTEGRAL Bright Source Catalog (intbsc) | 1 | INTEGRAL Science Window Data (intscw) | 206 |
| INTEGRAL Public Pointed Science Window Data (intscwpub) | 150 | INTEGRAL Public Data Results Catalog (intpublic) | 11 |
| INTEGRAL Reference Catalog (intrefcat) | 1 | INTEGRAL Observing Program (integralao) | 4 |

# INTEGRAL Public Data Results Catalog (intpublic)
Search radius used: 600.00 '

| Select ☑ All | Related Links | Services | rev ⇩⇧ | start time ⇩⇧ | end time ⇩⇧ | exposure ⇩⇧ [s] | name ⇩⇧ | ra ⇩⇧ | dec ⇩⇧ | dither pattern ⇩⇧ | pi lname ⇩⇧ | pno ⇩⇧ | Search Offset ['] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 🔍 ☑ | AO | O R N S D X | 75 | 2003-05-25 21:03:01 | 2003-05-28 11:31:36 | 222657 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120050 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 75 | 2003-05-25 21:03:01 | 2003-05-28 11:31:36 | 222657 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120114 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 75 | 2003-05-25 21:03:01 | 2003-05-28 11:31:36 | 222657 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120259 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 74 | 2003-05-24 01:32:42 | 2003-05-25 11:43:29 | 121378 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120050 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 74 | 2003-05-24 01:32:42 | 2003-05-25 11:43:29 | 121378 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120114 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 74 | 2003-05-24 01:32:42 | 2003-05-25 11:43:29 | 121378 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120259 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 74 | 2003-05-23 07:58:04 | 2003-05-24 01:16:13 | 59189 | NGC 4736 | 12 50 53.10 | +41 07 13.6 | 5x5 | Della-Ceca | 0120068 | 472.768 |
| 🔍 ☑ | AO | O R N S D X | 76 | 2003-05-28 20:51:29 | 2003-05-29 12:11:20 | 54602 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120050 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 76 | 2003-05-28 20:51:29 | 2003-05-29 12:11:20 | 54602 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120114 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 76 | 2003-05-28 20:51:29 | 2003-05-29 12:11:20 | 54602 | NGC 4151 | 12 10 32.60 | +39 24 20.6 | Staring | Amalgamated | 0120259 | 0.030 |
| 🔍 ☑ | AO | O R N S D X | 73 | 2003-05-21 23:24:57 | 2003-05-22 11:34:27 | 40820 | NGC 4736 | 12 50 53.10 | +41 07 13.6 | 5x5 | Della-Ceca | 0120068 | 472.768 |

11 rows retrieved from intpublic

## Are you interested in data products?

1. **Select the checkboxes for the rows of interest above,**
2. **un-check any data products you are not interested in:**

**Data Products** available for intpublic

☑ All
☑ FITS Results Maps (fits)
☑ JPEG Images (jpgs)
☑ SPI Analysis Results (results)
☑ Science Window Lists (scwlists)

3. **then click a button below.**

## Further Actions:

Do you want to [ Plot ] your intpublic results? (help)

Do you want to [ Cross-correlate ] your intpublic results with another catalog or table? (help)

Do you want to [ Display ] all the columns for the rows selected above?

Do you want to query other services for the rows selected? (help)

Services:
- NED
- SIMBAD
- SkyView:ROSAT All-Sky
- SkyView:DSS

# INTEGRAL Bright Source Catalog (intbsc)
Search radius used: 15.00 '

| Select ☐ All | Related Links | Services | name ⇩⇧ | source type ⇩⇧ | ra ⇩⇧ | dec ⇩⇧ | isgri detections ⇩⇧ | spi avg flux ⇩⇧ [mCrab] | spi avg flux error ⇩⇧ [mCrab] | spi high flux ⇩⇧ [mCrab] | spi high flux error ⇩⇧ [mCrab] | spi low flux ⇩⇧ [mCrab] | spi low flux error ⇩⇧ [mCrab] | spi remarks ⇩⇧ | Search Offset ['] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 🔍 ☑ | Ref | O R N S D X | NGC 4151 | Sy 1.5 | 12 10 33.0 | +39 24 21 | 157 | 28 | 3 | 35 | 4 | 6 | 2 | | 0.057 |

1 row retrieved from intbsc

**Browse Home**                     Data Products for selected rows                Tip Archive   **Hera**

**Choose Data Products** > Retrieve Data Products

---

- Do you want to view a data product? Click on its hyperlinked data format.
- Do you want to retrieve data products in a tarfile? Check the boxes beside each product and click one of the butto
  the bottom of the page.

☑ Select all products for all rows

**INTEGRAL Public Data Results Catalog (intpublic)**   FTOOLS

| rev | start_time | end_time | exposure | name | ra | dec | dither_pattern | pi_lname | pno |
|-----|------------|----------|----------|------|-----|-----|----------------|----------|-----|
| 74 | 2003-05-23 07:58:04 | 2003-05-24 01:16:13 | 59189 | NGC 4736 | 12 50 53.10 | +41 07 13.6 | 5x5 | Della-Ceca | 0120068 |

☐ Select all products in this row

**FITS Results Maps**
☑ ISGRI Results Map (rev74_NGC4736_ISGRI.fits.gz)          FITS   5522 kB
☑ SPI Significance Map 20-40 keV (rev74_NGC4736_SPI.fits.gz)   FITS   679 kB
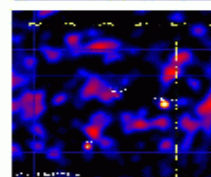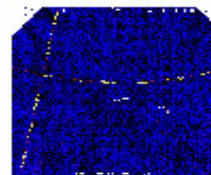
**Science Window Lists**
☑ Science Window List (dolsrev74_NGC4736_cons.txt)        ASCII   1 kB

**SPI Analysis Results**
☑ SPI Analysis Results (rev74_NGC4736_results.txt)        ASCII   6 kB

**JPEG Images**

☑ ISGRI Significance Image 20-40 keV (rev74_NGC4736_ISGRI.jpg) JPEG   125 kB

☑ SPI Significance Image 20-40 keV (rev74_NGC4736_cons.jpg)   JPEG   62 kB

TAR selected products   Create Download Script   Reset

Save to Hera | What is Hera?

# INTEGRAL Bright Source Catalog

Here we present the (apparently) brightest sources seen by INTEGRAL in the 20-40 keV energy band **in public data**. This is **not a flux limited sample**. All results are from consolidated data in the 20 - 40 keV energy band. ISGRI analysis has been performed by Paizis & Chernyakova at the INTEGRAL Science Data Centre, SPI analysis was done at INTEGRAL Guest Observer Facility. Apparent flux variations of non-variable sources are based on short exposure times and/or far off-axis position. INTEGRAL/SPI fluxes are based on the assumption that f[20-40keV] = 0.1783 ph/cm**2/sec corresponds to 1 Crab. *Highest flux* measurements require at least a 3 sigma significance. *Lowest flux* represents the lowest *measured* flux with at least 1 sigma significance. The average fluxes is are weighted means of all measurements with at least 1 sigma significance (if not mentioned different).

In ISGRI the Crab has a count rate of 99 counts/sec (20 - 40 keV) and 40 counts/sec (40 - 60 keV), respectively (determined for revolution 102 on-axis staring observation). For more information on sources seen by ISGRI, see also Bird et al. 2005, ApJ accepted. For the AGN seen by INTEGRAL there is a special INTEGRAL AGN page

You can **download the catalog in fits format here** and use it as an input catalog (GNRL-REFR-CAT) in your analysis (note that the flux values in this catalog are the same as in the original ISDC reference catalog).

Download the Bright Source Catalog on your PalmOS® or Pocket PC® PDA

**Note! These are preliminary results, and should only give a rough guide of what INTEGRAL can do with respect to point sources**

## INTEGRAL Bright Source Catalog

| Source | Type | RA (J2000.0) | DEC (J2000.0) | ISGRI detections | ISGRI results | SPI average flux [mCrab] | SPI highest flux [mCrab] | SPI lowest flux [mCrab] | SPI lightcurve | Remarks on SPI analysis |
|---|---|---|---|---|---|---|---|---|---|---|
| V709 Cas | CV | 00 28 49 | +59 17 22 | | | 4 ± 2 | | 4 ± 2 | X | |
| IGR J00370+6122 | HMXB | 00 37 06 | +61 22 00 | | | 8 ± 2 | 8 ± 2 | 8 ± 2 | X | |
| Gam Cas | Be Star | 00 56 43 | +60 43 00 | | | 8 ± 1 | 11 ± 3 | 5 ± 2 | X | |
| SMC X-1 | HMXB | 01 17 05 | -73 26 36 | 35 | X | 23 ± 3 | 23 ± 3 | 22 ± 5 | X | |
| 3A 0114+650 | HMXB | 01 18 03 | +65 17 30 | | | 13 ± 1 | 23 ± 3 | 6 ± 3 | X | |
| 4U 0115+634 | HMXB | 01 18 32 | +63 44 24 | 6 | X | 11 ± 3 | 53 ± 13 | 4 ± 3 | X | |
| RX J0146.9+6121 | XRB | 01 47 00 | +61 21 24 | | | 13 ± 2 | 18 ± 4 | 9 ± 4 | X | |
| NGC 1275 | Sy2 | 03 19 48 | +41 30 42 | | | 16 ± 3 | 15 ± 3 | 10 ± 10 | X | |
| EXO 0331+530 | HMXB | 03 35 00 | +53 10 24 | | | 290 ± 2 | 707 ± 6 | 29 ± 26 | X | V0332+53 |
| X Per | HMXB | 03 55 23 | +31 02 45 | 91 | X | | | | X | |

# INTEGRAL Public Data Results

Scientific analysis for SPI and IBIS/ISGRI has been performed at NASA's INTEGRAL Guest Observer Facility and for some ISGRI data by Paizis, Rodriguez, Chernyakova et al. at the INTEGRAL Science Data Centre. For ISGRI check the header of the FITS files to see which software version was used. For SPI look into the analysis results ASCII file.

Scientific results:
I = ISGRI significance JPEG image 20 - 40 keV (if not mentioned different on the map)
F = ISGRI results maps (intensity, error, significance, and exposure map) as a gzipped fits file (20,40,60,80,100,150,200,400 keV bands for most of the fits files)
S = SPI significance image 20 - 40 keV (JPEG)
F2 = SPI significance map 20 - 40 keV (gzipped fits file)
L = SPI analysis results (ASCII file)
W = list of science windows (Note! If the entries end on "swg_prp.fits[1]", the list is for revision 1 data. When it ends on "swg.fits[1]", it was created for revision 2)

| Rev# | Start Time (UTC) | End Time (UTC) | Exposure Time (s) | Source | RA (J2000) [hr:min:sec] | DEC (J2000) [deg:arcmin:arcsec] | Dither Pattern | PI | Proposal | Scientific Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 370 | 2005-10-26 15:33:17 | 2005-10-26 19:34:03 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 369 | 2005-10-23 17:30:00 | 2005-10-23 21:24:58 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 368 | 2005-10-19 03:39:12 | 2005-10-19 07:41:06 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 367 | 2005-10-15 08:13:38 | 2005-10-15 11:55:14 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 366 | 2005-10-12 08:20:17 | 2005-10-12 12:01:53 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 365 | 2005-10-10 20:30:00 | 2005-10-11 00:11:36 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 364 | 2005-10-06 08:44:28 | 2005-10-06 09:14:28 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 363 | 2005-10-03 08:58:55 | 2005-10-03 12:40:31 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 362 | 2005-09-30 09:14:24 | 2005-09-30 12:56:00 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 361 | 2005-09-28 22:42:06 | 2005-09-29 02:23:42 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 360 | 2005-09-26 19:32:00 | 2005-09-26 23:31:23 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 359 | 2005-09-23 00:41:00 | 2005-09-23 04:22:36 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |
| 358 | 2005-09-20 | 2005-09-20 | 12600 | Gal. Bulge region | 17:45:36.0 | -28:56:00.0 | HEX | Kuulkers | 0320109 | I W |

640 entries

public data

rev. 19-288 + public ToO Crab obser-vations etc.

input from PIs (Galactic Bulge project - rev. 370)

## INTEGRAL AGN Catalog

Beckmann, Gehrels, Shrader, Soldi 2006, "The First INTEGRAL AGN Catalog", ApJ accepted

**Sources marked with an asterisk (\*) are new entries and not included in the paper**

Here we present the AGN seen by INTEGRAL in the 20-40 keV energy band **in public data**. This is **not a flux limited sample**. Analysis has been performed at the INTEGRAL Guest Observer Facility at NASA/GSFC. Science window lists are for 10 degrees and 5 degrees extraction radius. INTEGRAL/SPI fluxes are based on the assumption that f[20-40keV] = 0.1790 ph/cm**2/sec corresponds to 1 Crab. Average fluxes have been extracted from combined data.

In ISGRI the Crab has a count rate of 99 counts/sec (20 - 40 keV) and 40 counts/sec (40 - 60 keV), respectively (determined for revolution 102 on-axis staring observation). The 2-10 keV fluxes have been extracted from JEM-X2 spectral model fitting.

You can download the catalog in fits format here and use it as an input catalog (GNRL-REFR-CAT) in your analysis (note that the flux values in this catalog are the same as in the original ISDC reference catalog).

Results shown here have been extracted using the OSA 5 version from July 2005. For SPI the reduction software SPIROS version 9.2 has been applied. For JEM-X still OSA 4.2 has been used, as it provides better spectral extraction results.

Intrinsic $N_H$ (corrected for Galactic absorption) references:

[L]: Lutz et al. 2004, [B]: Beckmann, Gehrels, Shrader, Soldi 2006, ApJ accepted, [B1]: Beckmann et al. 2004, [B2]: Beckmann et al. 2005, [T]: Tartarus database, [Y]: Young, Wilson, Terashima, et al. 2002, [M]: Matsumoto, Nava, Maddox et al. 2004, [Le]: Levenson, Weaver & Heckman 2001, [S]: Sazonov & Revnivtsev 2004, [S2]: Sazonov et al. 2005, [D05]: Donato, Sambruna, Gliozzi 2005

Details on some objects which were not detected in the INTEGRAL data can be found on the page about AGN not detected by INTEGRAL.

### INTEGRAL AGN Catalog

| Source | Type | RA (J2000.0) | DEC (J2000.0) | SCW 10° | SCW 5° | ISGRI results | SPI average flux [mCrab] | ISGRI image | SPI image [20-40 keV] | SPI analysis [20-40 keV] | f [2-10 keV] $10^{-11}$ ecs | NH [$10^{22}$ cm$^{-2}$] | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| \* 1ES 0033+595 | BL Lac | 00 35 52.6 | +59 50 05 | X | X | FITS | 0.0 | JPG FITS | JPG FITS | X | | 0.36 ± 0.08 [D05] | Bassani et al. 2006; z=0.086 |
| NGC 788 | Sy 1/2 | 02 01 06.4 | -06 48 56 | X | X | FITS | 0.0 | JPG FITS | JPG FITS | X | -- | > 150 [T] | |
| NGC 1068 | Sy 2 | 02 42 40.7 | -00 00 48 | X | X | FITS | 0.0 | JPG FITS | JPG FITS | X | -- | < 0.02 [T] | M77 |
| \* QSO B0241+62 | Sy 1 | 02 44 57.7 | +62 28 06.5 | X | X | FITS | 3.1 ± 4.6 | JPG FITS | JPG FITS | X | | 1.5 ± 0.3 [L] | Bird et al. 2006; z=0.044 |
| \* NGC 1142 | Sy 2 | 02 55 12.3 | -00 11 01.7 | X | -- | FITS | 3.9 ± 1.6 | JPG FITS | JPG FITS | X | -- | ? | Virani et al. 2005; z=0.028847 |
| NGC 1275 | Sy 2 | 03 19 48.1 | +41 30 42 | X | X | FITS | 0.0 | JPG FITS | JPG FITS | X | 2.34 ± 0.03 | 3.74 [B] | |
| 3C 111 | Sy 1 | 04 18 21.3 | +38 01 36 | X | X | FITS | 0.4 ± 3.6 | JPG FITS | JPG FITS | X | -- | 0.634 [T] | |
| \* UGC 3142 | Sy 1 | 04 43 46.8 | +28 58 19 | X | X | FITS | 23.9 ± | JPG FITS | JPG FITS | X | | ? | Bassani et al. 2006; |

# INTEGRAL AGN Catalog  on-line

# Usage of INTEGRAL high level results
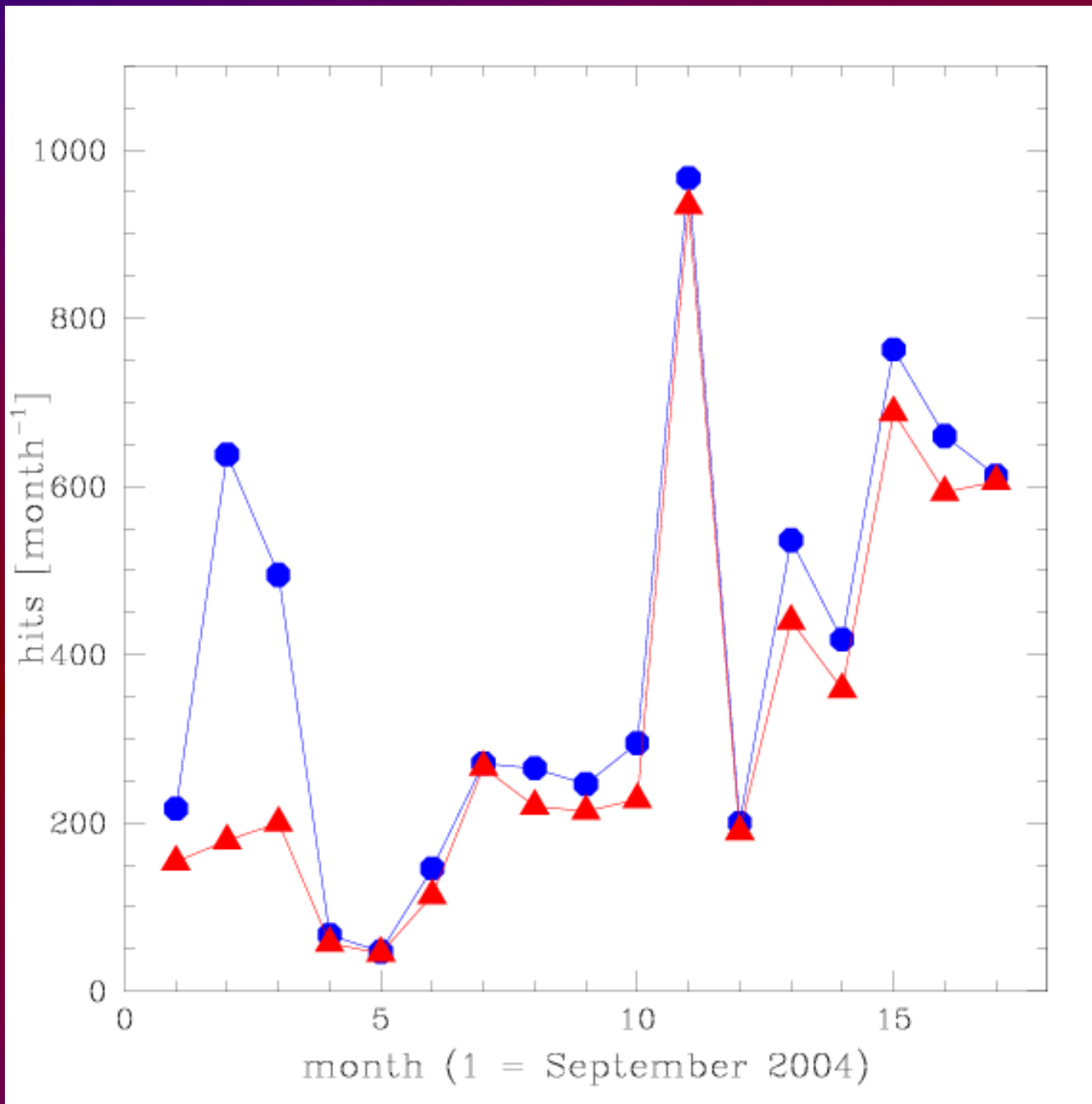
# OSA 5.1

- OSA 5.1: released on November 24, 2005
- available through INTEGRAL GOF pages
- SaveAs, Load, Reset in GUI
- ISGRI: ii_shadow_build noisy pixel handling (especially for observations with a bright source in the PCFoV), module switches handled correctly. Combination of spectra with different ARF possible in spe_pick.
- JEM-X: correct gain fitting in j_cor_gain (better than 3%)

Cen A JEM-X2 spectrum

JEM-X spectrum OSA 5.0

Cen A JEM-X2 spectrum
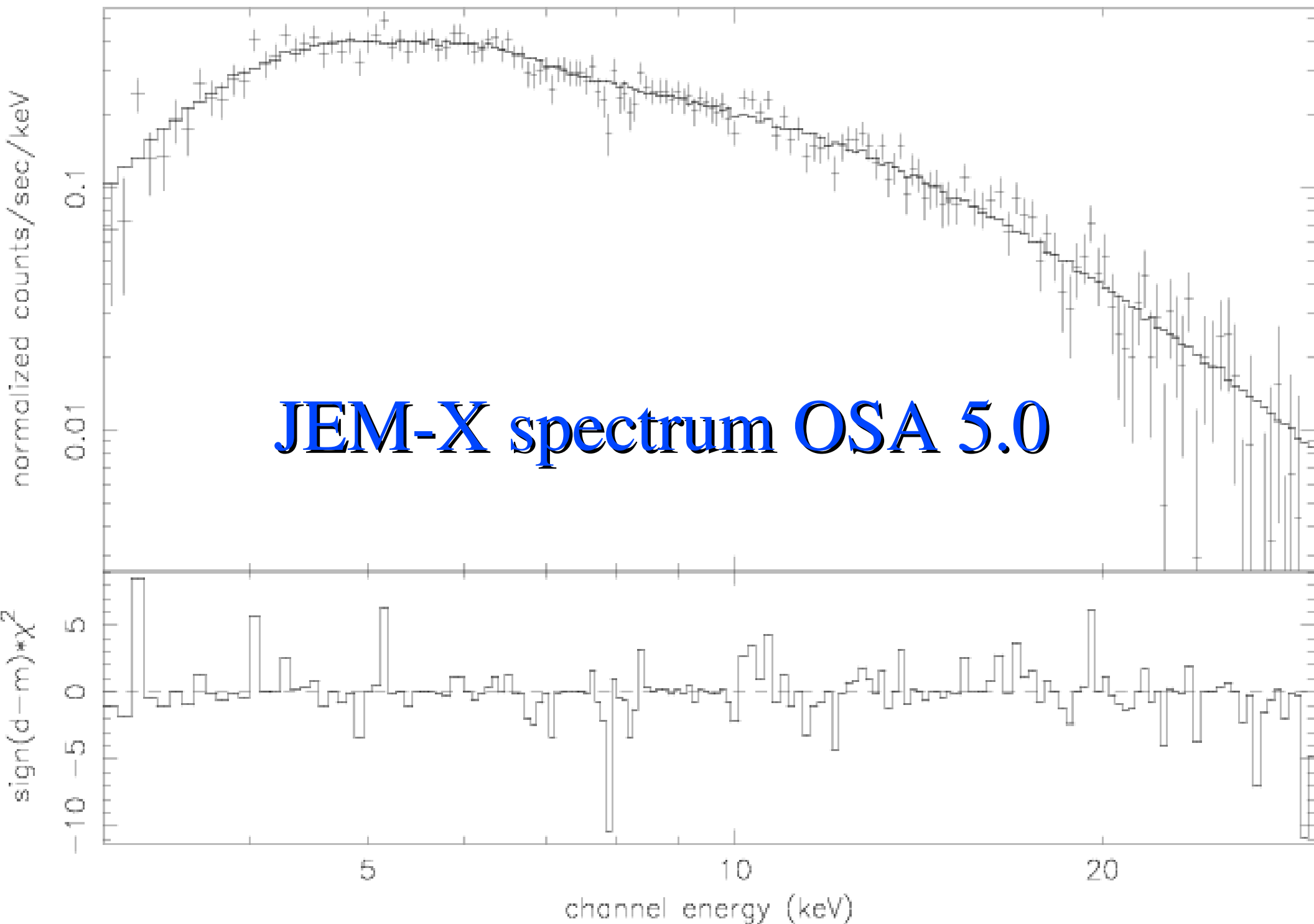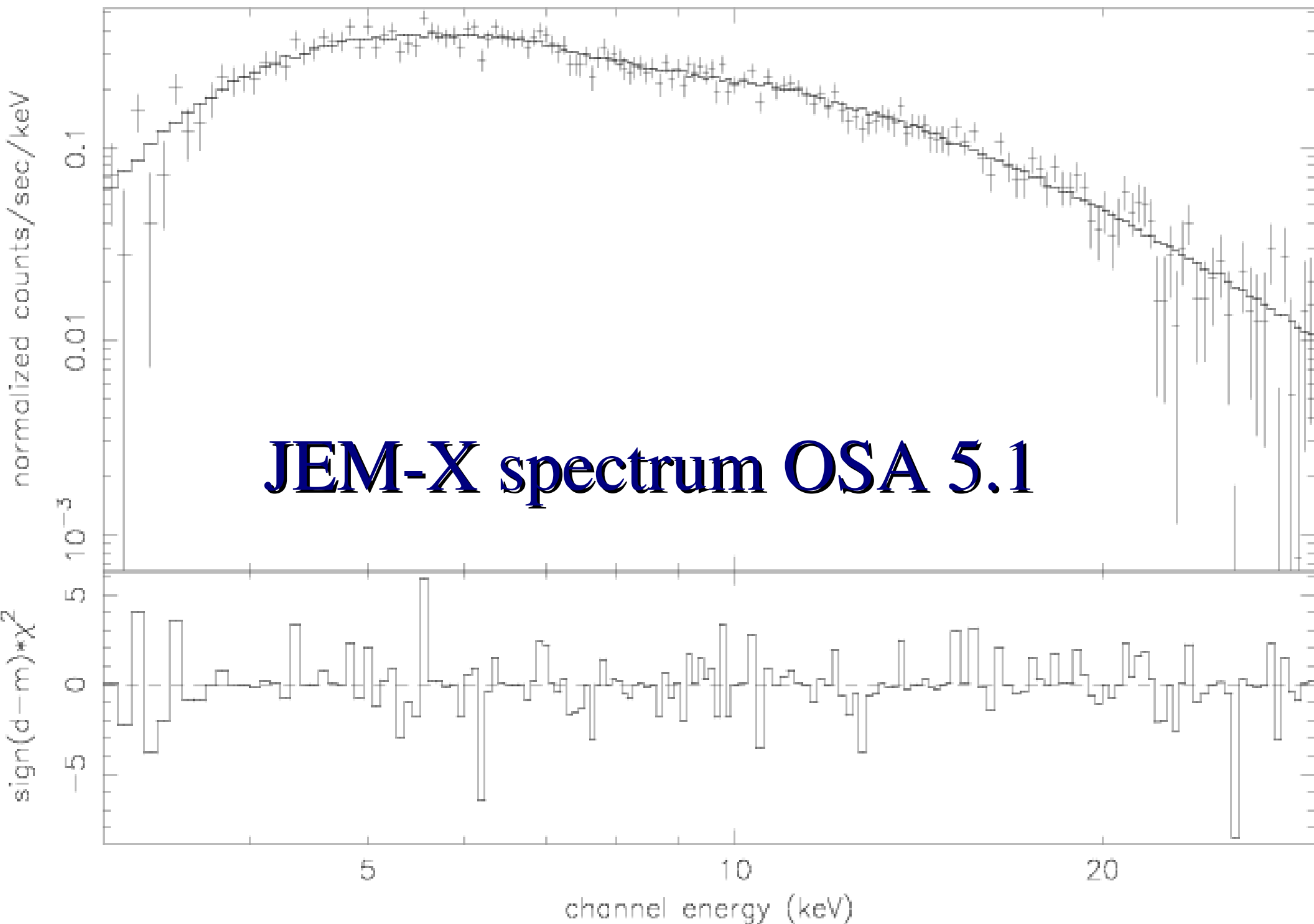
# JEM-X OSA 5 --> OSA 5.1

Cen A absorbed single power law + Gaussian 6.4 keV line, 160 d.o.f.

- OSA 5:
Gamma = 2.07 +0.10 -.10
NH = 11.4 +2.2 -2.1
red. Chi^2= 1.21, f(3-10) = 2.93E-10 ecs

- OSA 5.1:
Gamma = 1.96 +0.08 -0.09
NH = 17.6 +2.2 -2.3
red. Chi^2= 1.05, f(3-10) = 2.94E-10 ecs

# Conclusion

- HEASARC archive:
- get information about ~130 sources
- get information about 640 observations
- get the data, software, and documentation
- get help from the INTEGRAL GOF if necessary
- increased request for INTEGRAL high level products through HEASARC

- OSA 5.1 improvements:
some bug fixes, easy to re-use GUI parameters