High-Level Data Products

INTEGRAL Archive at HEASARC

US-IUC, 2007 November 27

Katja Pottschmidt (CRESST/UMBC/GSFC)

on behalf of

INTEGRAL GOF @ NASA's GSFC

MAGNET collaboration
(GSFC/UCSD/FAU/IAAT/ISDC/ESAC/Southampton)

Integral: Archive

http://heasarc.gsfc.nasa.gov/docs/integral/inthp_archive.html

INTEGRAL GOF

GODDARD SPACE FLIGHT CENTER

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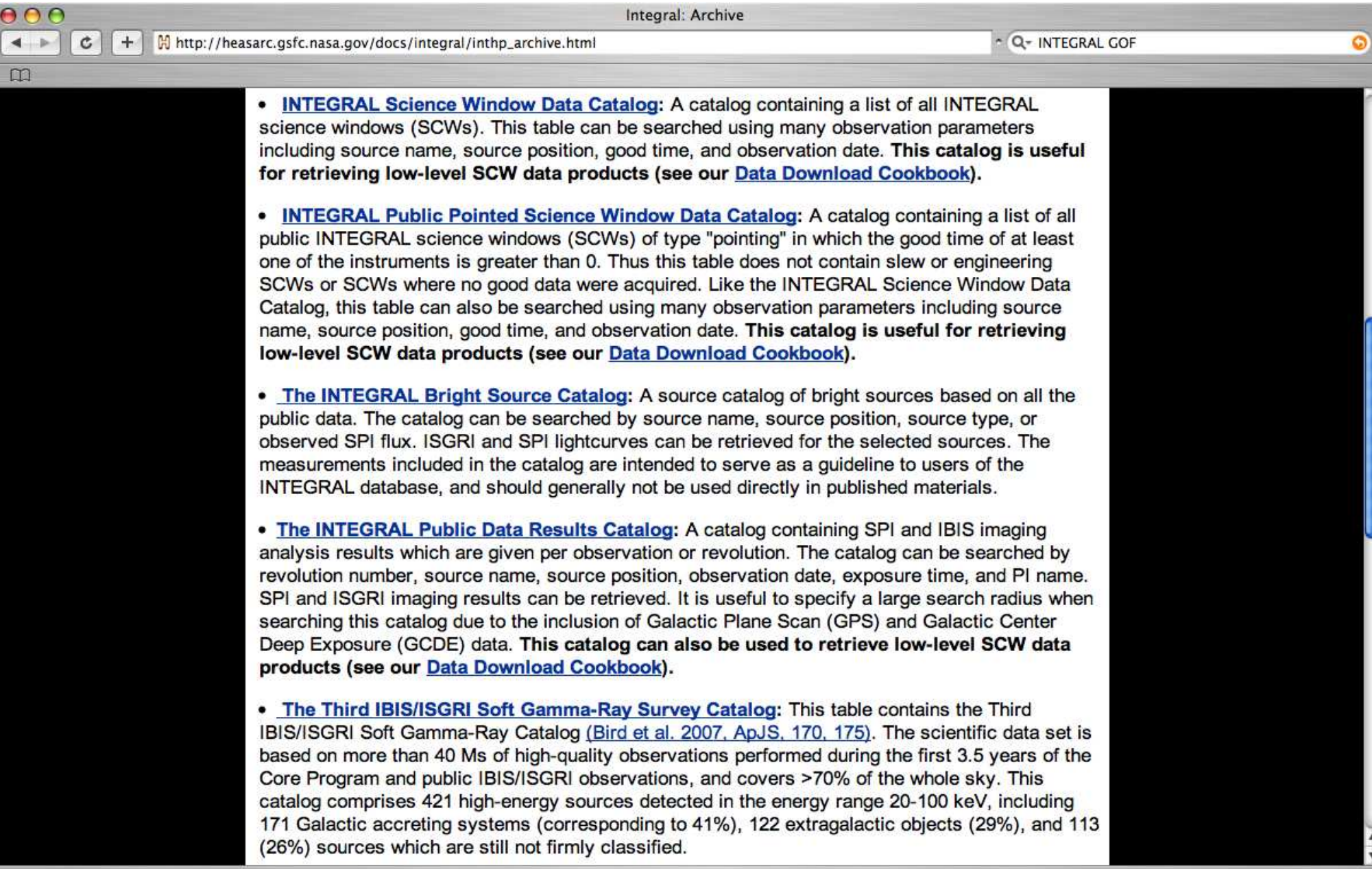
INTEGRAL Public Data Archive

The HEASARC mirror of the INTEGRAL Public Data Archive at the ISDC has been open since September 2004. The HEASARC archive was created to facilitate ease of data distribution for U.S.-based researchers. The HEASARC Browse facility is the preferred interface to the archive at both sites. Typical INTEGRAL data sets are large, probably of the order of several GB per observation, so please plan carefully before downloading. The download procedure as well as helpful hints for selecting data are discussed in our Data Download Cookbook.

Archive Contents

The following tables are included in the HEASARC INTEGRAL archive and are searchable using the Browse interface.

- **INTEGRAL Science Window Data Catalog**: A catalog containing a list of all INTEGRAL



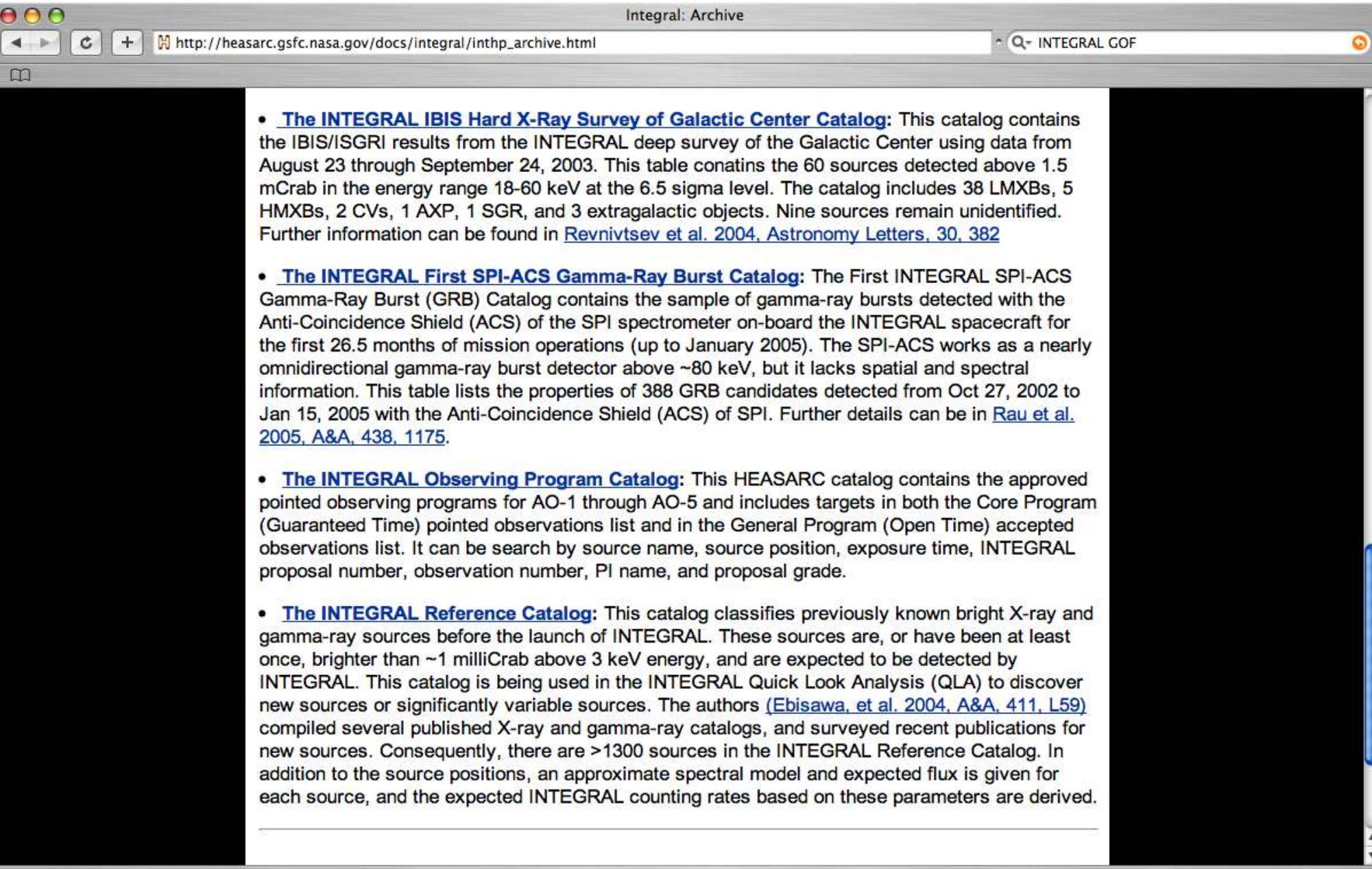
- **INTEGRAL Science Window Data Catalog**: A catalog containing a list of all INTEGRAL science windows (SCWs). This table can be searched using many observation parameters including source name, source position, good time, and observation date. **This catalog is useful for retrieving low-level SCW data products (see our Data Download Cookbook).**

- **INTEGRAL Public Pointed Science Window Data Catalog**: A catalog containing a list of all public INTEGRAL science windows (SCWs) of type "pointing" in which the good time of at least one of the instruments is greater than 0. Thus this table does not contain slew or engineering SCWs or SCWs where no good data were acquired. Like the INTEGRAL Science Window Data Catalog, this table can also be searched using many observation parameters including source name, source position, good time, and observation date. **This catalog is useful for retrieving low-level SCW data products (see our Data Download Cookbook).**

- **The INTEGRAL Bright Source Catalog**: A source catalog of bright sources based on all the public data. The catalog can be searched by source name, source position, source type, or observed SPI flux. ISGRI and SPI lightcurves can be retrieved for the selected sources. The measurements included in the catalog are intended to serve as a guideline to users of the INTEGRAL database, and should generally not be used directly in published materials.

- **The INTEGRAL Public Data Results Catalog**: A catalog containing SPI and IBIS imaging analysis results which are given per observation or revolution. The catalog can be searched by revolution number, source name, source position, observation date, exposure time, and PI name. SPI and ISGRI imaging results can be retrieved. It is useful to specify a large search radius when searching this catalog due to the inclusion of Galactic Plane Scan (GPS) and Galactic Center Deep Exposure (GCDE) data. **This catalog can also be used to retrieve low-level SCW data products (see our Data Download Cookbook).**

- **The Third IBIS/ISGRI Soft Gamma-Ray Survey Catalog**: This table contains the Third IBIS/ISGRI Soft Gamma-Ray Catalog (Bird et al. 2007, ApJS, 170, 175). The scientific data set is based on more than 40 Ms of high-quality observations performed during the first 3.5 years of the Core Program and public IBIS/ISGRI observations, and covers >70% of the whole sky. This catalog comprises 421 high-energy sources detected in the energy range 20-100 keV, including 171 Galactic accreting systems (corresponding to 41%), 122 extragalactic objects (29%), and 113 (26%) sources which are still not firmly classified.


Integral: Archive
http://heasarc.gsfc.nasa.gov/docs/integral/inthp_archive.html
INTEGRAL GOF
• The INTEGRAL IBIS Hard X-Ray Survey of Galactic Center Catalog: This catalog contains the IBIS/ISGRI results from the INTEGRAL deep survey of the Galactic Center using data from August 23 through September 24, 2003. This table conatins the 60 sources detected above 1.5 mCrab in the energy range 18-60 keV at the 6.5 sigma level. The catalog includes 38 LMXBs, 5 HMXBs, 2 CVs, 1 AXP, 1 SGR, and 3 extragalactic objects. Nine sources remain unidentified. Further information can be found in Revnivtsev et al. 2004, Astronomy Letters, 30, 382
• The INTEGRAL First SPI-ACS Gamma-Ray Burst Catalog: The First INTEGRAL SPI-ACS Gamma-Ray Burst (GRB) Catalog contains the sample of gamma-ray bursts detected with the Anti-Coincidence Shield (ACS) of the SPI spectrometer on-board the INTEGRAL spacecraft for the first 26.5 months of mission operations (up to January 2005). The SPI-ACS works as a nearly omnidirectional gamma-ray burst detector above ~80 keV, but it lacks spatial and spectral information. This table lists the properties of 388 GRB candidates detected from Oct 27, 2002 to Jan 15, 2005 with the Anti-Coincidence Shield (ACS) of SPI. Further details can be in Rau et al. 2005, A&A, 438, 1175.
• The INTEGRAL Observing Program Catalog: This HEASARC catalog contains the approved pointed observing programs for AO-1 through AO-5 and includes targets in both the Core Program (Guaranteed Time) pointed observations list and in the General Program (Open Time) accepted observations list. It can be search by source name, source position, exposure time, INTEGRAL proposal number, observation number, PI name, and proposal grade.
• The INTEGRAL Reference Catalog: This catalog classifies previously known bright X-ray and gamma-ray sources before the launch of INTEGRAL. These sources are, or have been at least once, brighter than ~1 milliCrab above 3 keV energy, and are expected to be detected by INTEGRAL. This catalog is being used in the INTEGRAL Quick Look Analysis (QLA) to discover new sources or significantly variable sources. The authors (Ebisawa, et al. 2004, A&A, 411, L59) compiled several published X-ray and gamma-ray catalogs, and surveyed recent publications for new sources. Consequently, there are >1300 sources in the INTEGRAL Reference Catalog. In addition to the source positions, an approximate spectral model and expected flux is given for each source, and the expected INTEGRAL counting rates based on these parameters are derived.

INTEGRAL Bright Source Catalog

http://heasarc.gsfc.nasa.gov/docs/integral/INTEGRAL_bright_sources.html

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INTEGRAL Bright Source Catalog

Here we present a compilation of the brightest sources seen by INTEGRAL in the 22-40 keV and 40 - 80 keV energy bands derived from publicly available data. **This is a "quick-look" data compilation rather than a rigorous analysis, and it does not comprise a complete flux limited sample**. ISGRI analysis has been performed at the INTEGRAL Science Data Centre. SPI analysis was done at NASA's INTEGRAL Guest Observer Facility. Apparent flux variations of non-variable sources are a result of short exposure times and/or far off-axis position.

INTEGRAL/SPI fluxes are based on the assumption that f[20-40keV] = 0.1788 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 are based on all measurements with at least 1 sigma significance.

In contrast to the SPI fluxes, the ISGRI flux values are based on single science window measurements (usually 2000 sec long) and only include those values with at least 1.5 sigma significance. In ISGRI the Crab has a count rate of 97.3 counts/sec (22 - 40 keV) and 64.4 counts/sec (40 - 80 keV), respectively. For more information on sources seen by ISGRI, see also Bird et al. 2007, ApJS, 170, 175

Note! These are preliminary results, and are intended as only a rough guide to those pursuing in-depth follow-up analyses.

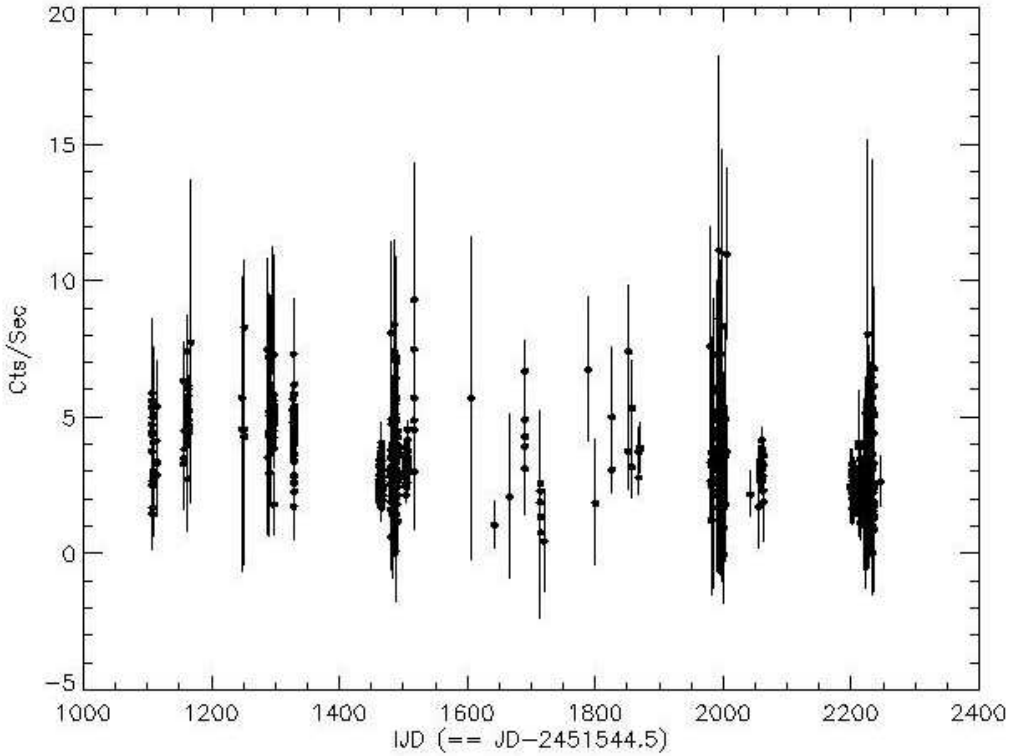
(Last updated 6/12/07)

INTEGRAL Bright Source Catalog

Source	Type	RA (J2000.0)	DEC (J2000.0)	ISGRI Detections >1.5 sigma	ISGRI Average Flux 22-40 keV (cts/s)	ISGRI Average Flux 40-80 keV (cts/s)	ISGRI Results	SPI Average Flux 20-40 keV (mCrab)	SPI Highest Flux 20-40 keV (mCrab)	SPI Lowest Flux 20-40 keV (mCrab)	SPI Lightcurve	Comments
IGR J00234+6141	CV	00 22 58	+61 41 08	717	0.791 ± 0.021	0.549 ± 0.018	X					
V709 Cas	CV	00 28 49	+59 17 22	1291	0.882 ± 0.014	0.581 ± 0.013	X	15 ± 7		4 ± 2	X	
IGR J00291+5934	LMXB	00 29 03	+59 34 19	761	1.225 ± 0.019	0.864 ± 0.018	X	43 ± 4	53 ± 11	32 ± 2	X	msec pulsar,

Cen_A_22-40keV.jpg 640×480 pixels

http://heasarc.gsfc.nasa.gov/FTP/integral/high_level/isgri_lc/Cen_A/Cen_A_22-40keV.jpg



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http://heasarc.gsfc.nasa.gov/FTP/integral/high_level/isgri_lc/Cen_A/Cen_A_22-40keV.txt

Google

These ISGRI results are based on analysis done at
the INTEGRAL Science Data Center (ISDC)
IJD == JD - 2451544.5

IJD	Rate	Sigma
1106.749	4.754	3.870
1106.775	3.768	1.884
1107.016	5.607	1.650
1107.043	4.475	1.305
1107.283	5.904	1.513
1107.310	4.360	1.550
1107.524	1.481	1.344
1107.550	5.379	1.588
1107.820	2.527	1.301
1107.847	2.695	1.687
1108.103	5.027	1.923
1108.344	5.153	1.620
1108.371	1.699	1.300
1108.611	2.897	1.545
1108.638	3.030	1.259
1108.864	5.557	1.661
1108.907	4.091	3.467
1114.108	4.150	1.445
1114.135	3.330	1.522
1114.376	5.409	1.653
1114.617	2.902	1.510
1114.654	3.396	0.889
1156.470	3.321	1.420
1156.497	6.339	1.433
1157.704	4.517	2.028
1157.715	3.854	1.720
1157.725	3.509	1.864
1161.473	6.135	0.838
1161.483	4.377	0.792
1161.510	5.247	0.387
1161.554	4.099	0.378
1161.593	4.822	0.282

http://heasarc.gsfc.nasa.gov/FTP/integral/high_level/logs/SPI_Cen_A.dat

http://heasarc.gsfc.nasa.gov/FTP/integral/high_level/logs/SPI_Cen_A.dat

Google

INTEGRAL/SPI results for Cen_A

Analysis performed by V. Beckmann (Volker.Beckmann@obs.unige.ch) at ISDC

rev. : revolution number
flux : 20 - 40 keV flux in photons/cm**2/sec; 1 Crab = 0.1788 ph/cm**2/sec
error : 20 - 40 keV flux error in photons/cm**2/sec
sigma : significance of the detection
logfile: SPIROS logfile these results were taken from

rev.	flux	error	sigma	logfile
32	0.008138	0.004521	1.8	rev32_SN1006_results.txt
46	0.029700	0.006187	4.8	rev46_GPS_results.txt
48	0.008884	0.000588	15.1	rev48_CenA_results.txt
49	0.007391	0.000725	10.2	rev49_CenA_results.txt
83	0.135700	0.056542	2.4	rev83_GPS_results.txt
91	0.009831	0.004469	2.2	rev91_Cen_results.txt
91	0.008649	0.006653	1.3	rev91_GPS_results.txt
104	0.008636	0.000543	15.9	rev104_IC_results.txt
149	0.005588	0.000430	13.0	rev149_CenA_results.txt
149	0.004020	0.001340	3.0	rev149_NGC4945_results.txt
150	0.004193	0.000559	7.5	rev150_NGC4945_results.txt
155	0.005563	0.001426	3.9	rev155_SN1006_results.txt
156	0.005016	0.001393	3.6	rev156_SN1006_results.txt
157	0.016640	0.007235	2.3	rev157_GPS_results.txt
157	0.007426	0.001727	4.3	rev157_SN1006_results.txt
163	0.006356	0.000410	15.5	rev163_CenA_results.txt
167	0.010830	0.009845	1.1	rev167_GCDE_results.txt
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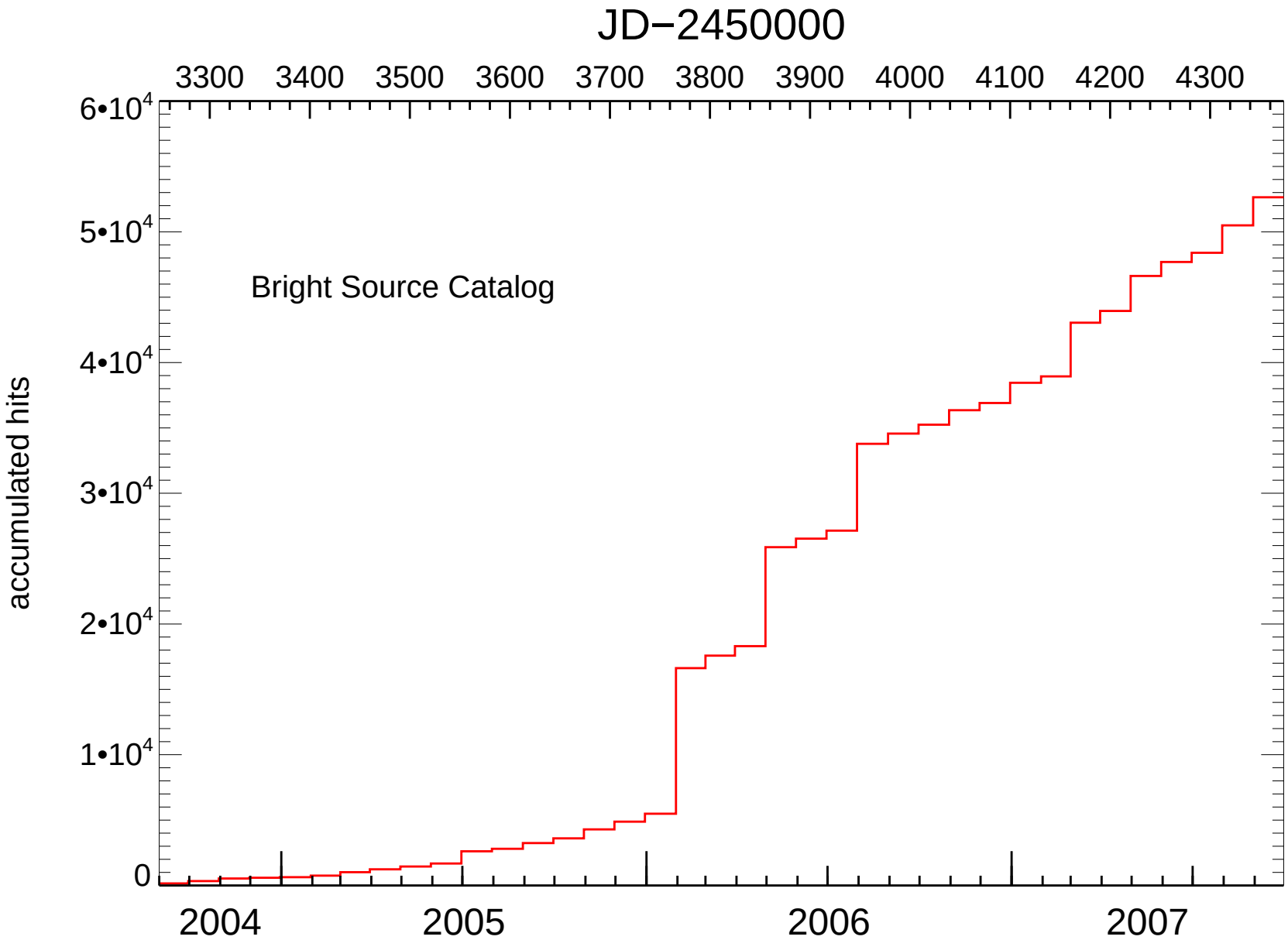
176	0.014120	0.007422	1.9	rev176_PSR_results.txt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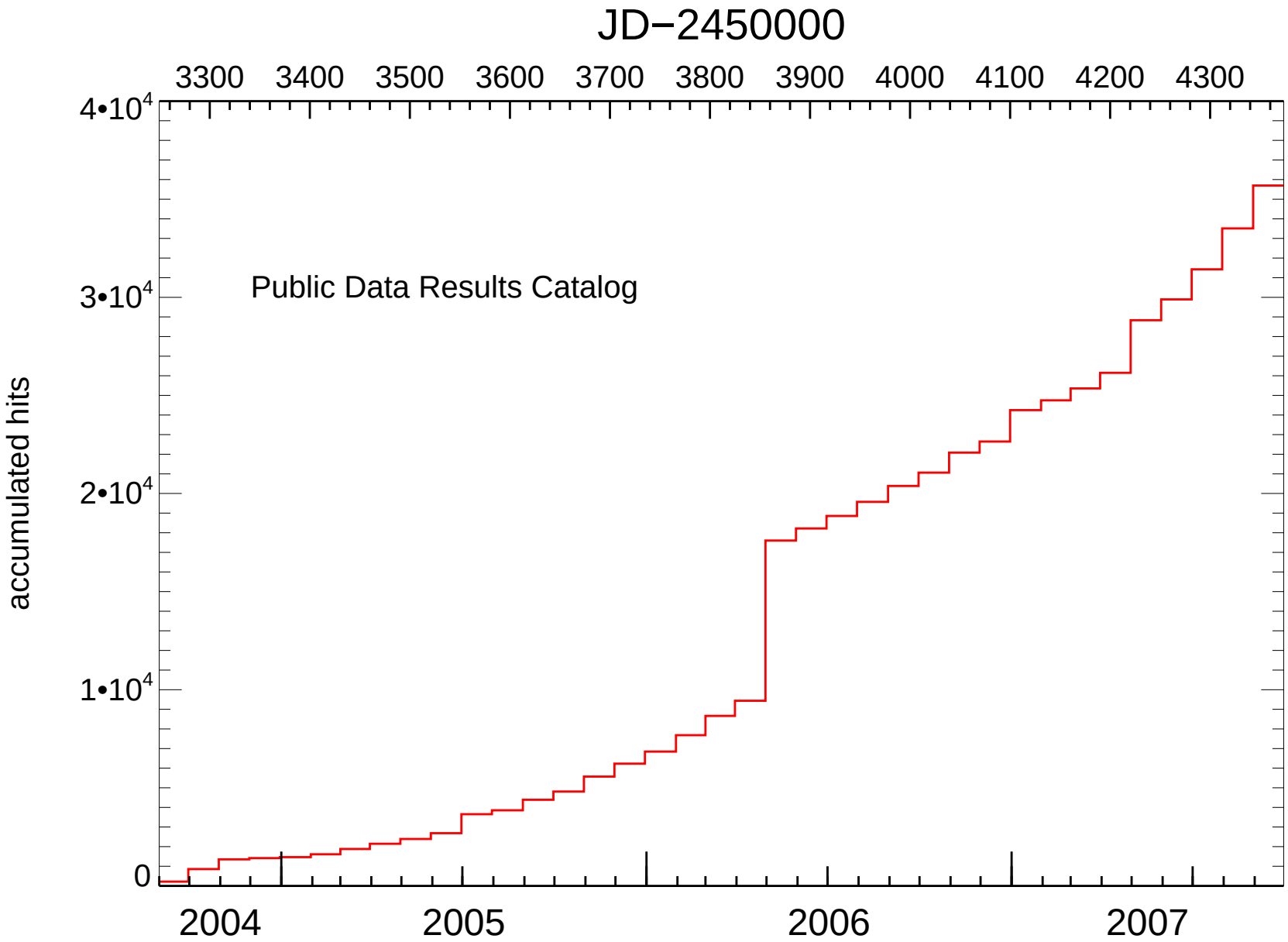
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
6•10^4
5•10^4
4•10^4
3•10^4
2•10^4
1•10^4
0
accumulated hits
Bright Source Catalog
2004
2005
2006
2007


JD−2450000
3300
3400
3500
3600
3700
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3900
4000
4100
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4300
4•10^4
3•10^4
2•10^4
1•10^4
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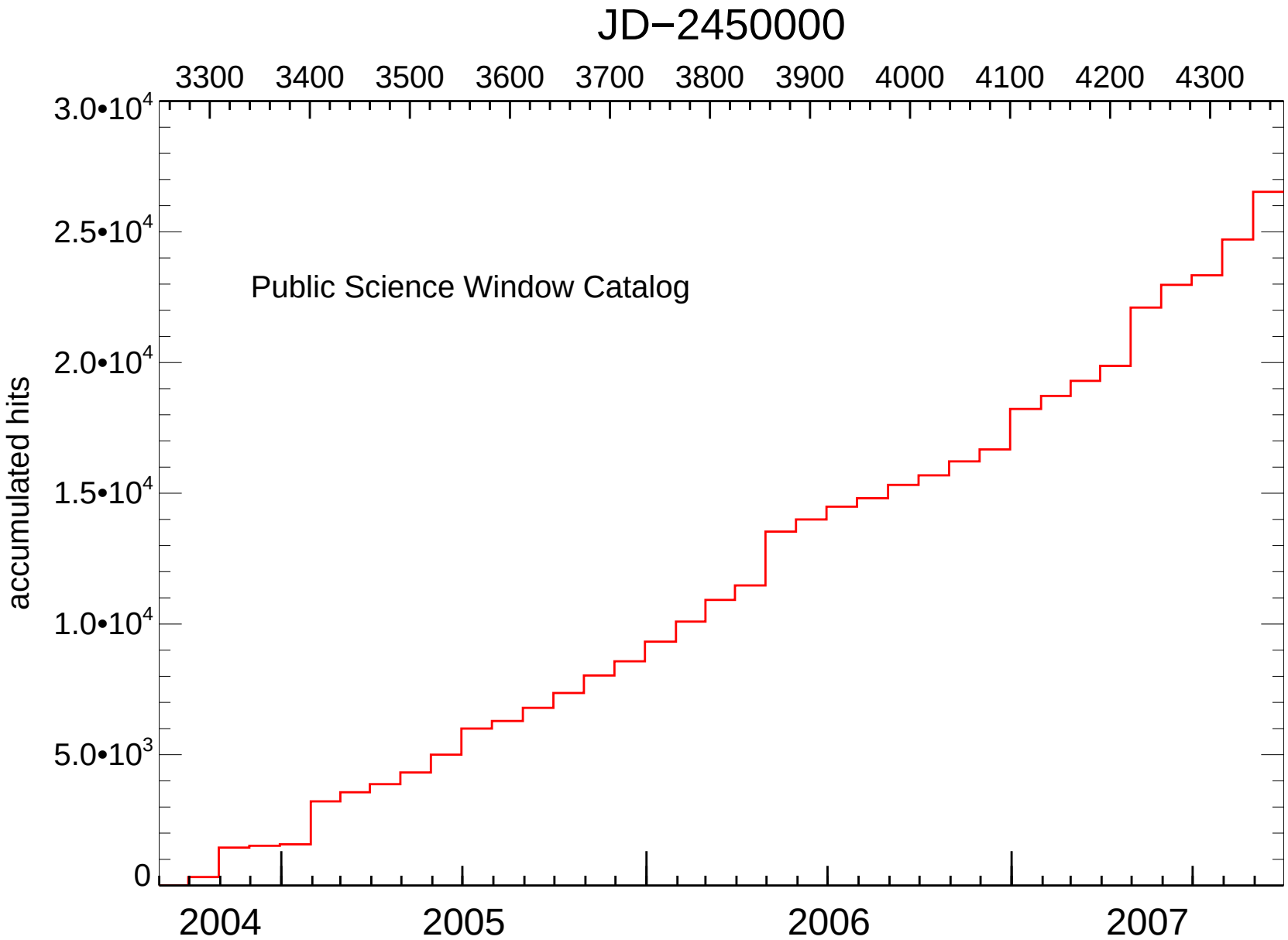
accumulated hits
Public Data Results Catalog
2004
2005
2006
2007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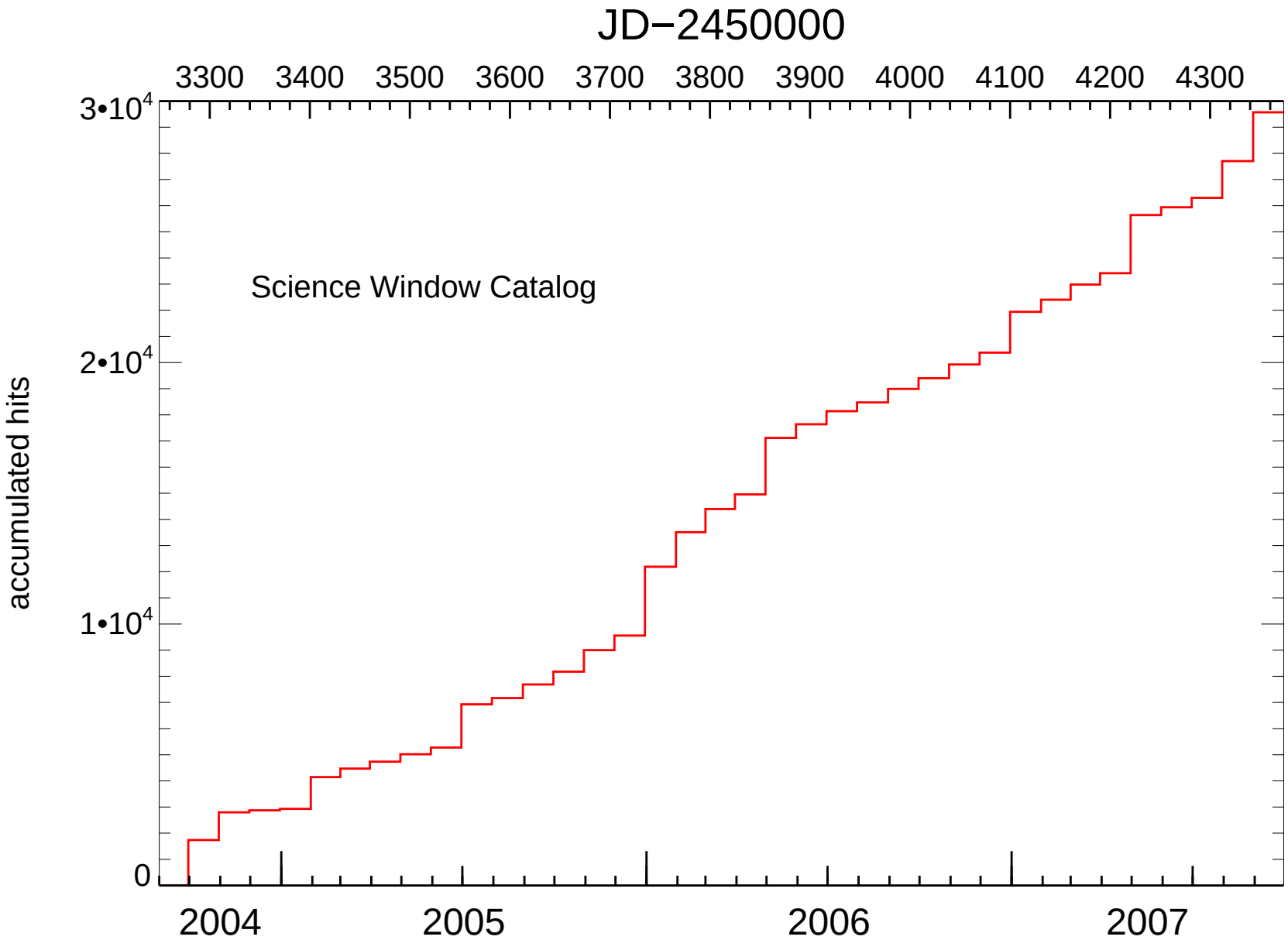
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
3.0•10^4
2.5•10^4
2.0•10^4
1.5•10^4
1.0•10^4
5.0•10^3
0
accumulated hits
Public Science Window Catalog
2004
2005
2006
2007


JD−2450000
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
3•10^4
2•10^4
1•10^4
0
accumulated hits
Science Window Catalog
2004
2005
2006
2007

Bright Source Catalog

- re-processing with OSA 7.0 at the ISDC started
- re-definition of energy bands (>10)
- to be completed end of January ⇒ new BSC

New Data Format

- long term archive, first version end of March 2008
- store for each science window and sky pixel:
  ⇒ intensity, uncertainty, exposure, . . .
- ISDC plans to provide FTOOLS-like tools (“mosaic_pick”)
- GOF plans to mirror & enhance

Contributed High-Level Products

- add results of (US) *INTEGRAL* projects to GOF web site
- e.g., pulsar monitoring, cyclotron line studies
  ⇒ Core and Public Data, MAGNET collaboration & friends
  ⇒ being updated to OSA 7, plan to integrate *Swift*

Accreting Pulsating Neutron Stars

http://pulsar.sternwarte.uni-erlangen.de/gps/targettable.cgi

Joern Wilms

Accreting Pulsating Neutron Stars

As part of INTEGRAL's guaranteed time program, from 2003 Jan to 2006 Aug INTEGRAL scanned parts of the Galactic plane every fortnight (the INTEGRAL "Galactic Plane Survey", GPS). These WWW-pages contain up to date information of basic observational data from all pulsating accreting neutron stars from the GPS scans, which is made available within days of the consolidated INTEGRAL data becoming available at the INTEGRAL Science Data Centre. At the moment source fluxes on a INTEGRAL Science Window basis are shown for the JEM-X and IBIS instruments and selected energy bands for all Science Windows where a source has been detected. All data reduction was performed with INTEGRAL OSA 5.1. We plan to add pulse profiles and pulse period information in the next few months.

The pages also contain basic scientific information about the sources monitored, including literature references and links to data from the RXTE All Sky Monitor and the BATSE experiment on the Compton Gamma Ray observatory, where available.

The following table contains our current source sample, click on the source name to access the information. Click on the column title to sort the table.

Source Name	l (deg)	b (deg)	P_{spin} (s)	P_{orb} (d)
GRO J1744-28	0.05	+0.3	0.467	11.76
GX 1+4	1.94	+4.79	120.	
AX J1820.5-1434	16.47	+0.07	152.26	
XTE J1855-026	31.09	-2.14	361.	6.1
XTE J1906+090	42.59	+0.89	89.17	
4U 1907+097	43.74	+0.48	440.4	8.38
SAX J2103.5+4545	87.12	+0.68	358.61	12.68
3A 0114+650	125.71	+2.56	9828.	11.6
4U 0115+634	125.92	+1.03	3.61	24.3
RX J0440.9+4431	159.85	-1.27	202.5	
A0535+262	181.5	-2.64	103.5	110.3

Pulsating Neutron Stars: Vela X-1

http://pulsar.sternwarte.uni-erlangen.de/gps/velax1/

Joern Wilms

VELA X-1

HTML 4.01

HMXB Start Page

General
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Companion
Period Evolution
Spectrum
Pulse Profile

- Profile 1
- Profile 2

Flux
JEM-X1

- 4.96-12.16keV
- 12.16-20.5keV

JEM-X2

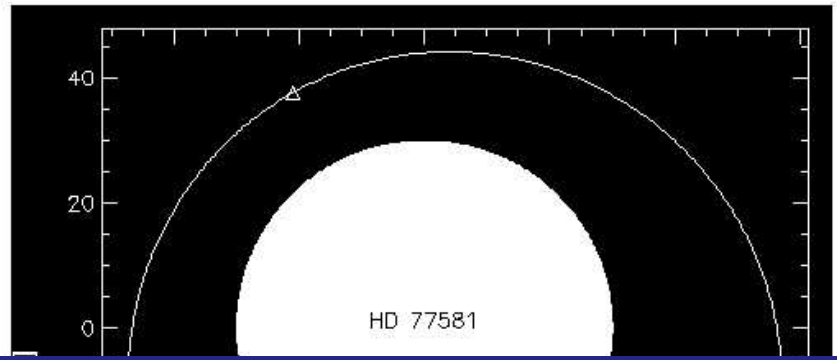
- 4.96-12.16keV
- 12.16-20.5keV

Ibis

- 20-40keV
- 40-60keV
- 60-80keV
- 80-100keV
- 100-200keV

Other Names	4U0900-40		
INTEGRAL source ID	J090206.9-403317		
External database entries	Simbad, ADS, ISDC		
Discovery	Chodil et al. (1967)		
Dominant Accretion Type	Wind-Accretor		
Position RA, DEC	09h 02m 06.86s 135.528583deg	-40d 33m 16.9s -40.554694deg	Perryman et al. (1997)
Position l,b	263.06	3.93	
Distance	2.0 kpc		Nagase (1989)
Typical Flux	0.1 Crab	Energy Range	2 - 10 keV

Neutron Star Mass	1.4 Msun +0.2 -0.2	Stickland et al. (1997)
Neutron Star Luminosity	4×10^{36} erg/s	Nagase et al. (1986)



Pulsating Neutron Stars: Vela X-1

http://pulsar.sternwarte.uni-erlangen.de/gps/velax1/

Joern Wilms

VELA X-1

HTML 4.01

HMXB Start Page

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Ibis

- 20-40keV
- 40-60keV
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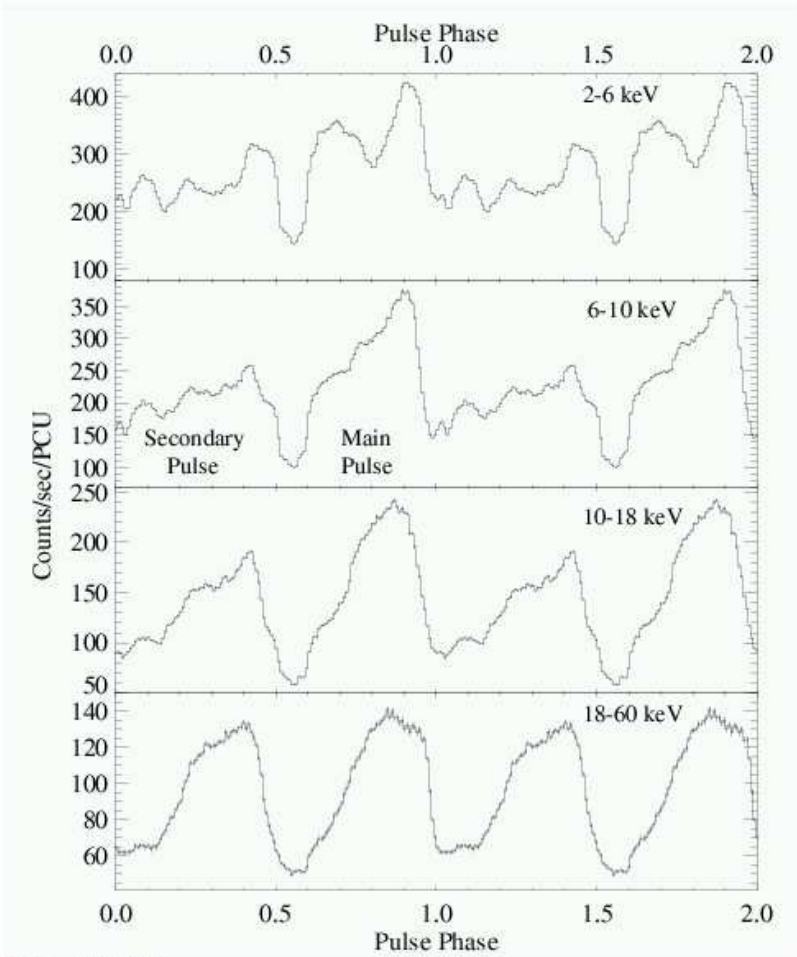
Pulse Profile 2 (Kreykenbohm et al. (2002))



MJD: 50835.4

Pulsating Neutron Stars: Vela X-1

http://pulsar.sternwarte.uni-erlangen.de/gps/velax1/

Joern Wilms

VELA X-1

- Profile 1
- Profile 2

Flux
JEM-X1

- 4.96-12.16keV
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JEM-X2

- 4.96-12.16keV
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Ibis

- 20-40keV
- 40-60keV
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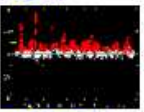
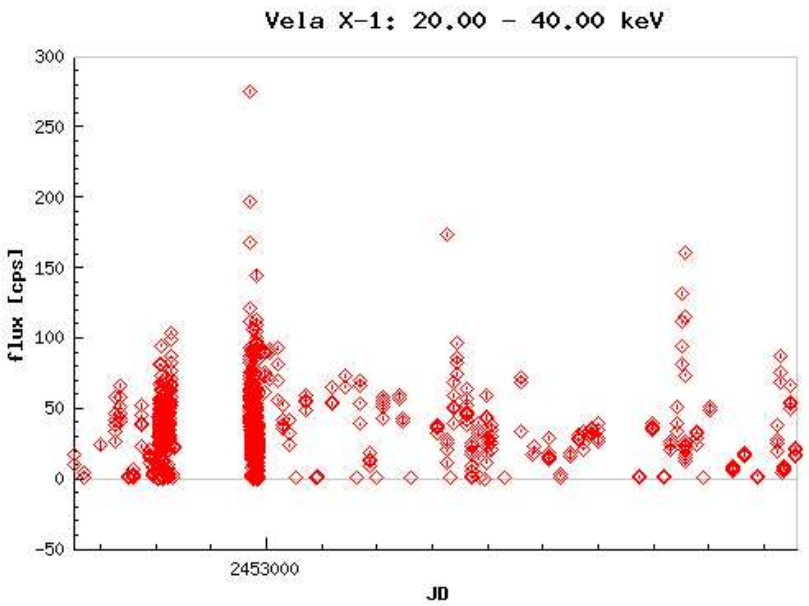
- 80-100keV
- 100-200keV

Correlations
Hardness Ratio
ASM



BATSE

IBIS FLUX EVOLUTION FOR ENERGY BAND 1 / *HTML* / *ASCII* / *Plot* / *ScW List*



Period of time:

from 2452650.98 to 2453957.83 JD

angdist from 0.14 to 14.79 deg

Reset Submit

Correlate data from selected time interval

Last modification date: Fri Nov 23 22:42:41 2007

Recent *INTEGRAL* results

V 0332+53

- confirmation of complex shape of fundamental line
- confirmation of third line feature at 75 keV

A 0535+26

- first simult. line detection at 50 keV and 100 keV

4U 1907+09

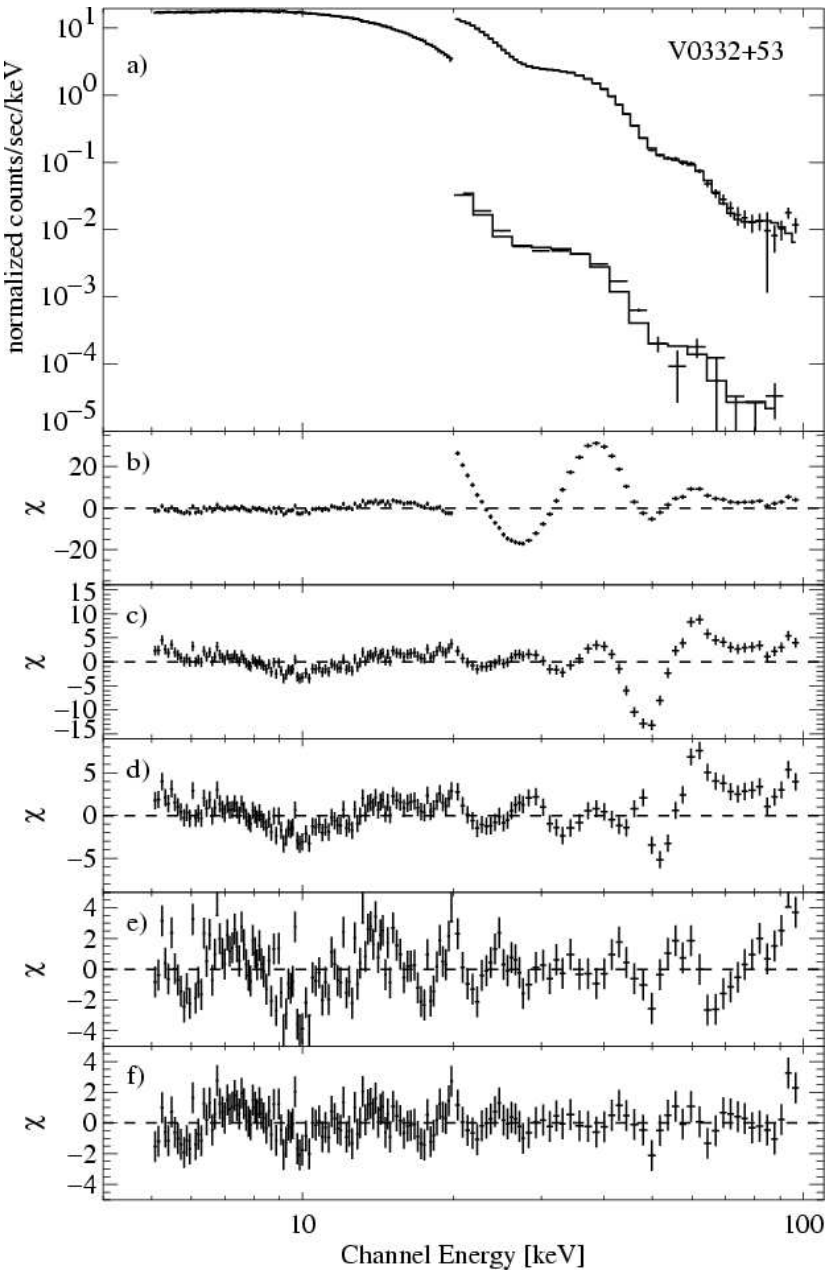
- archive ⇒ detection of lines in 20 mCrab source
- observation of a torque reversal

Model Input

- ratios of line energies ⇒ accretion column geometry
- luminosity dependence of line energy ⇒ geometry
- line shapes ⇒ new physical models

MXB 0656−072

- first detection of current outburst



V 0332+53

Kreykenbohm et al., 2005
A&A, 433, L45

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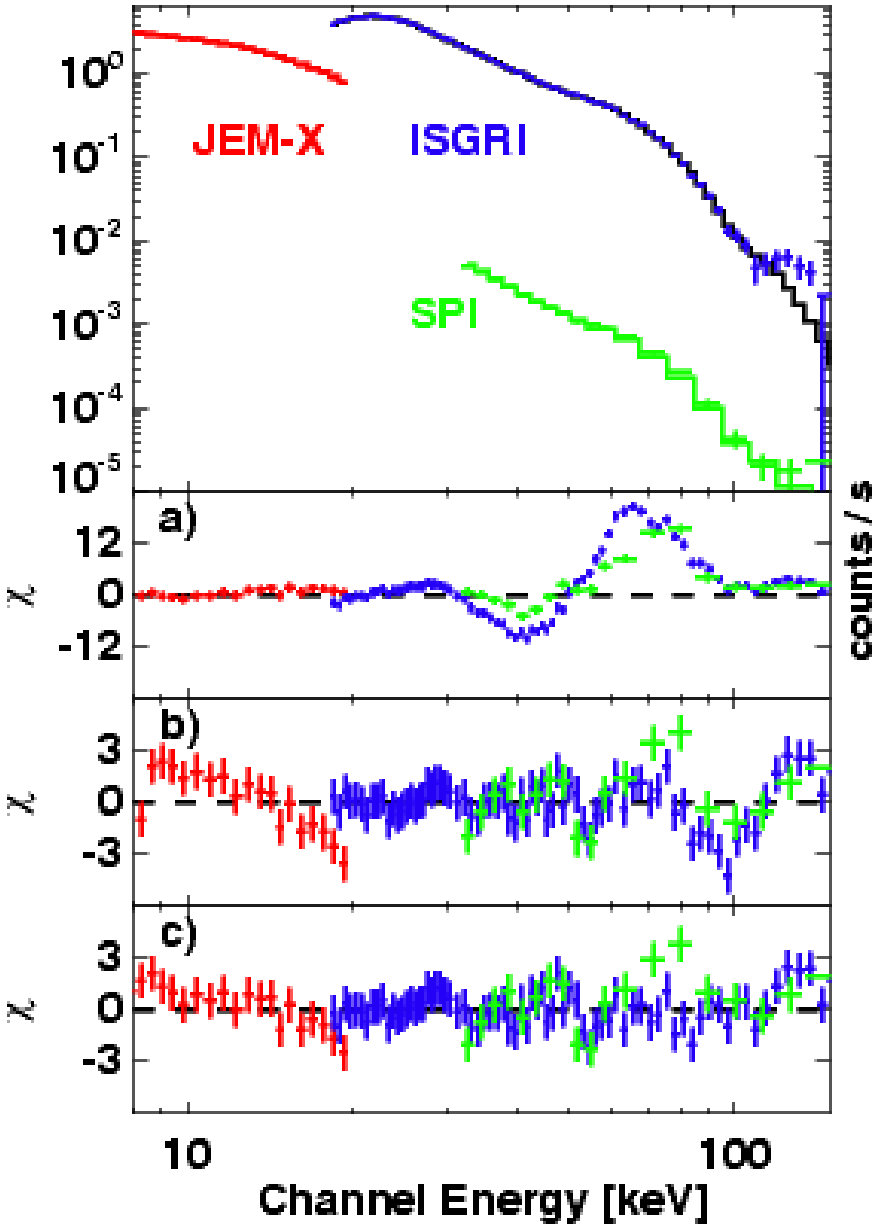

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Caballero et al., 2007
A&A, 465, L21

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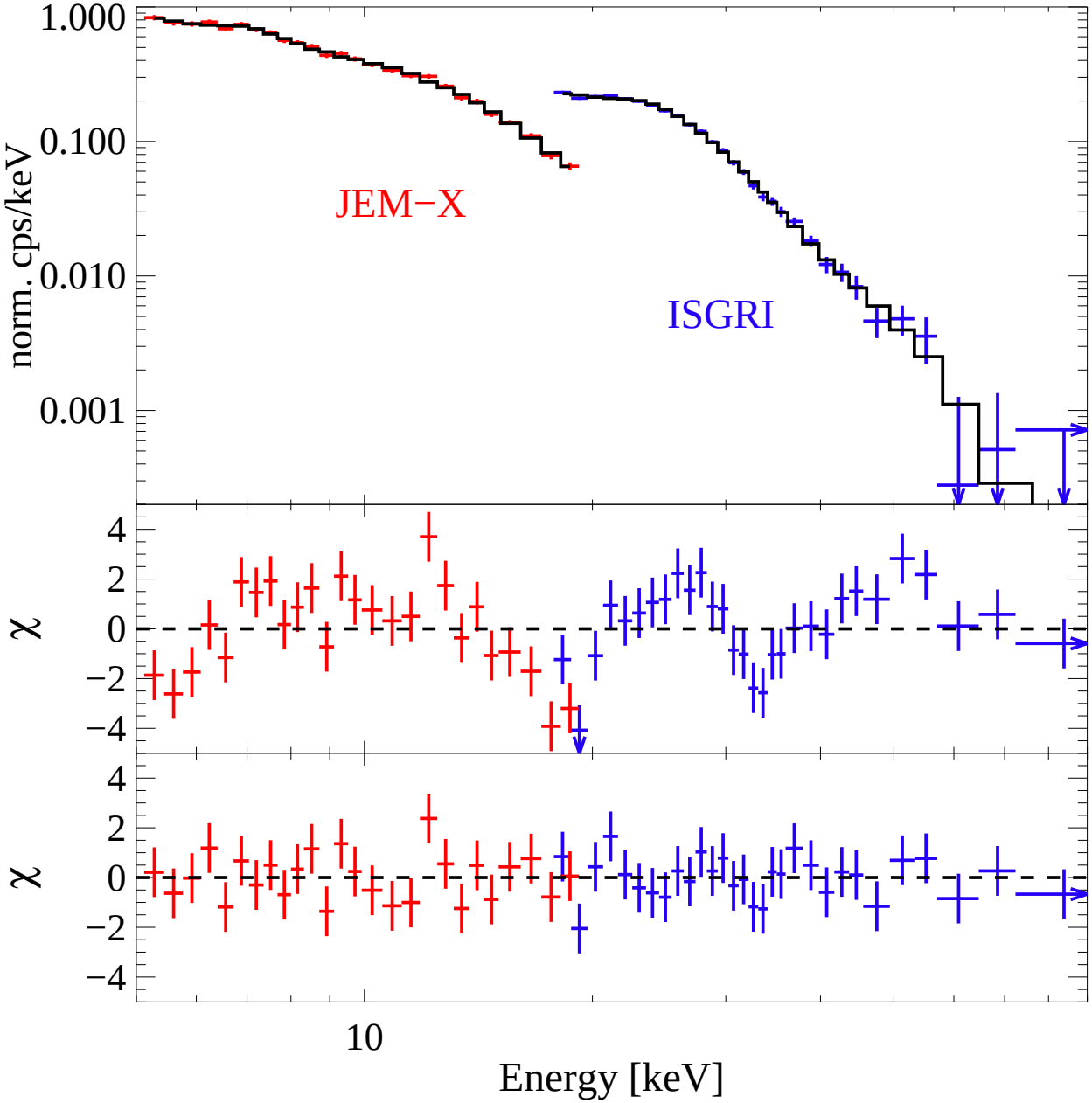
- ratios of line energies ⇒ accretion column geometry
- luminosity dependence of line energy ⇒ geometry
- line shapes ⇒ new physical models

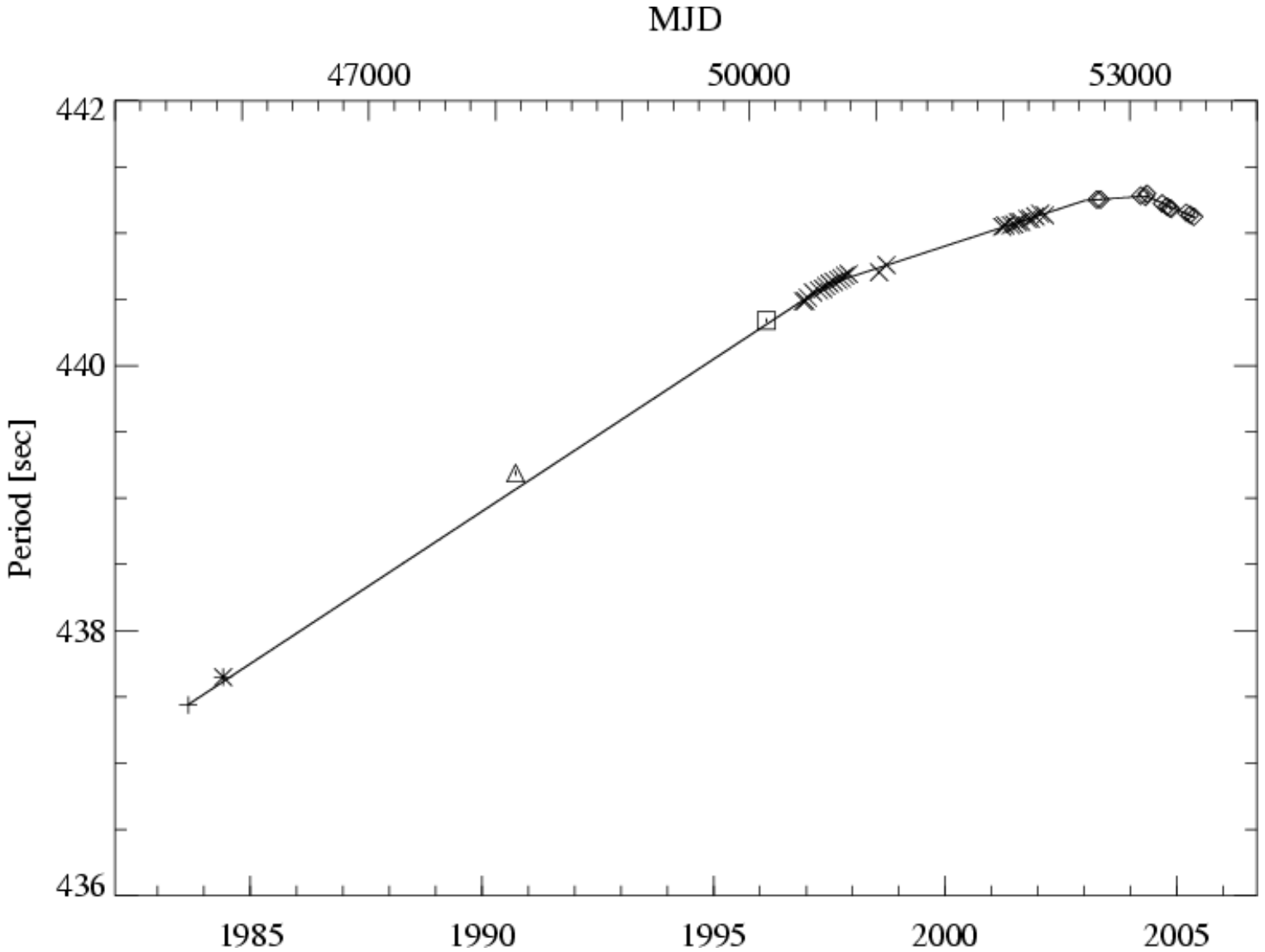
MXB 0656−072

- first detection of current outburst



4U 1907+09

Fritz et al., 2006
A&A, 458, 885



4U 1907+09

Fritz et al., 2006, A&A, 458, 885

Recent *INTEGRAL* results

V 0332+53

- confirmation of complex shape of fundamental line
- confirmation of third line feature at 75 keV

A 0535+26

- first simult. line detection at 50 keV and 100 keV

4U 1907+09

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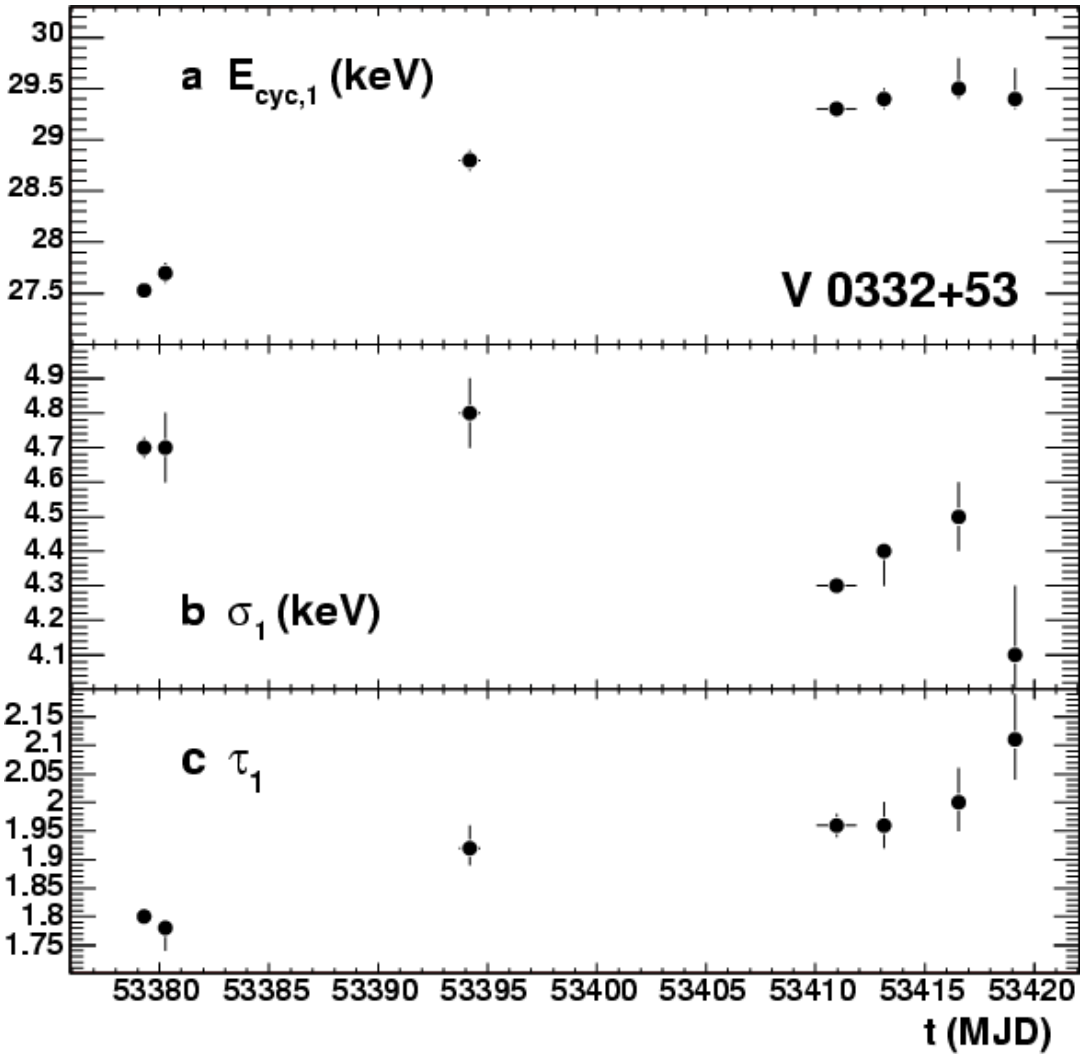
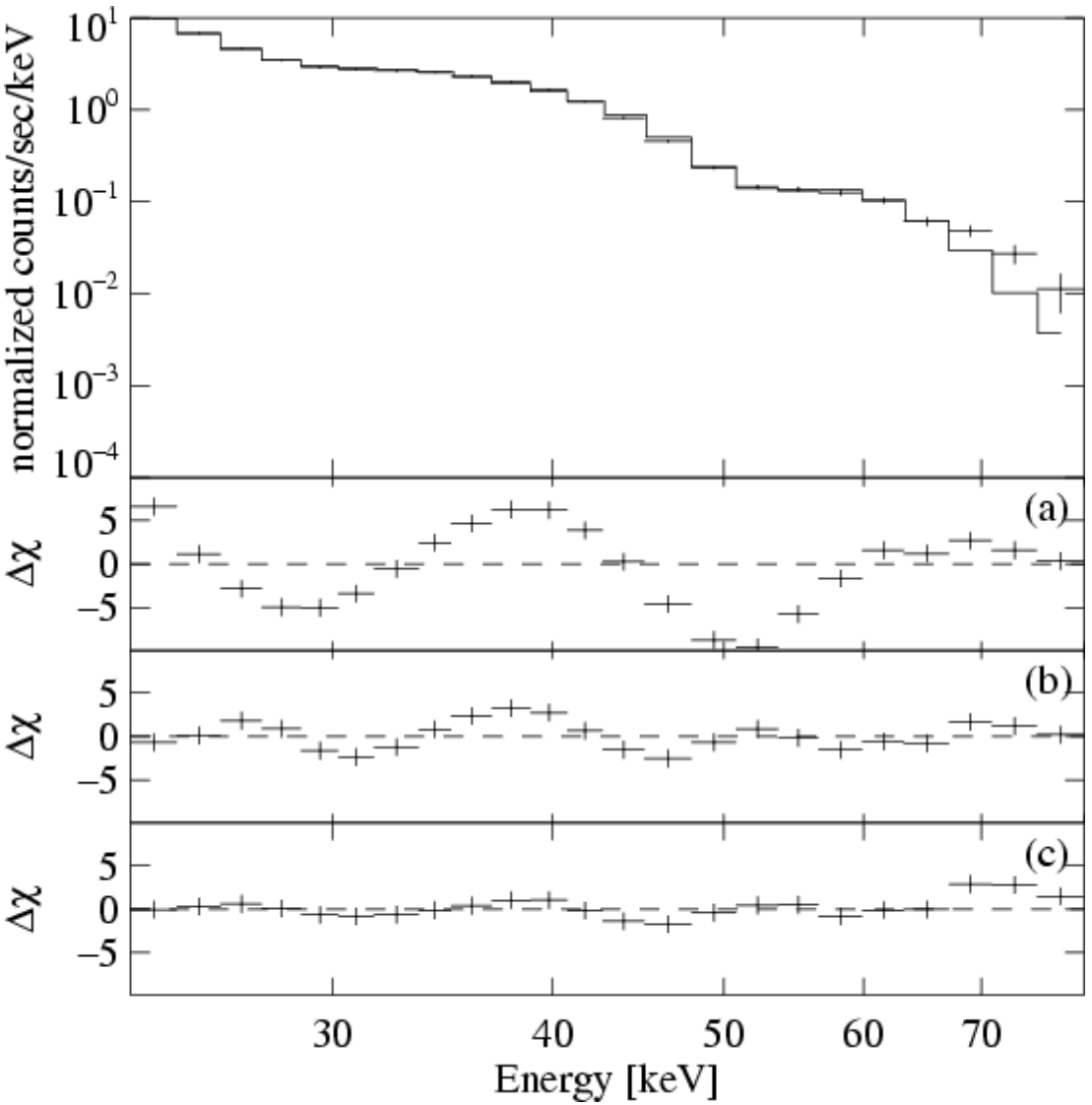


V 0332+53

Mowlavi et al., 2006
A&A, 451, 187

Tsygankov et al., 2006
MNRAS, 371, 19



V 0332+53

Schönherr et al., 2007
A&A, 472, 353

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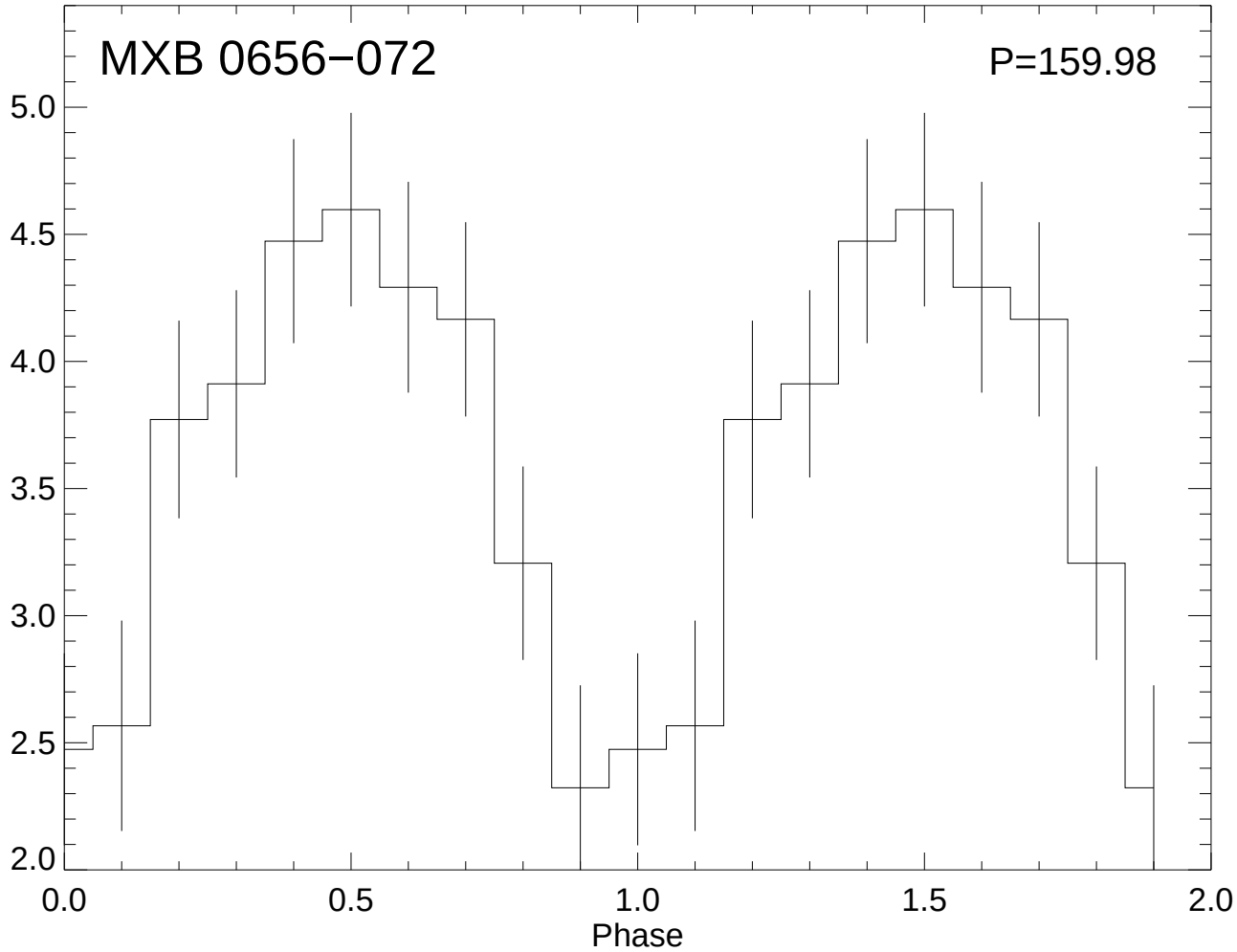

2007 November 10–12 50 mCrab @ 20–40 keV

Kreykenbohm et al., 2007, ATEL 1281