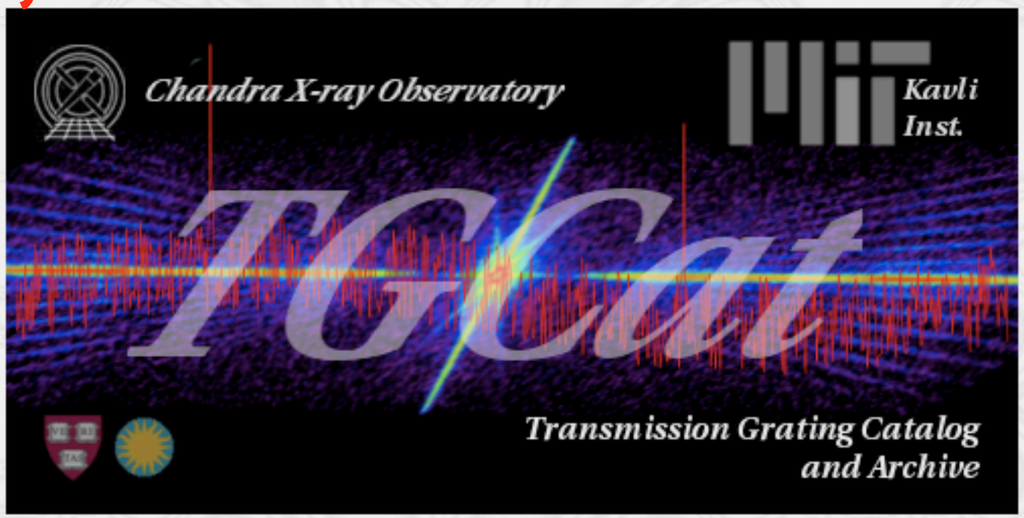
TGCat : Chandra Gratings Catalog and Archive

http://spacebase-alpha.mit.edu/tgcat/

Wikipedia (en)

Now Playing ...



Query | About | Trends and Stats

Software | Help

βeta

Done

TGCat: http://spacebase-alpha.mit.edu/tgcat

Credits:

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Goals & Contents of the Catalog

- Make all grating observations more accessible and visible (~800 obsids; ACIS-S, HRC-S; HETG and LETG; ACIS CC mode).
- Provide analysis-ready counts spectra and response files;
- Provide associated summary products (field images; spectral images; counts and flux plots; light curves; summary tables);
- Provide a web interface for searching, browsing, plotting, and downloading catalog products;
- Start with a *simple* catalog and enhance per user requests;
- Provide scripts for easy reprocessing or customized extraction;

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Heritage, Motivation

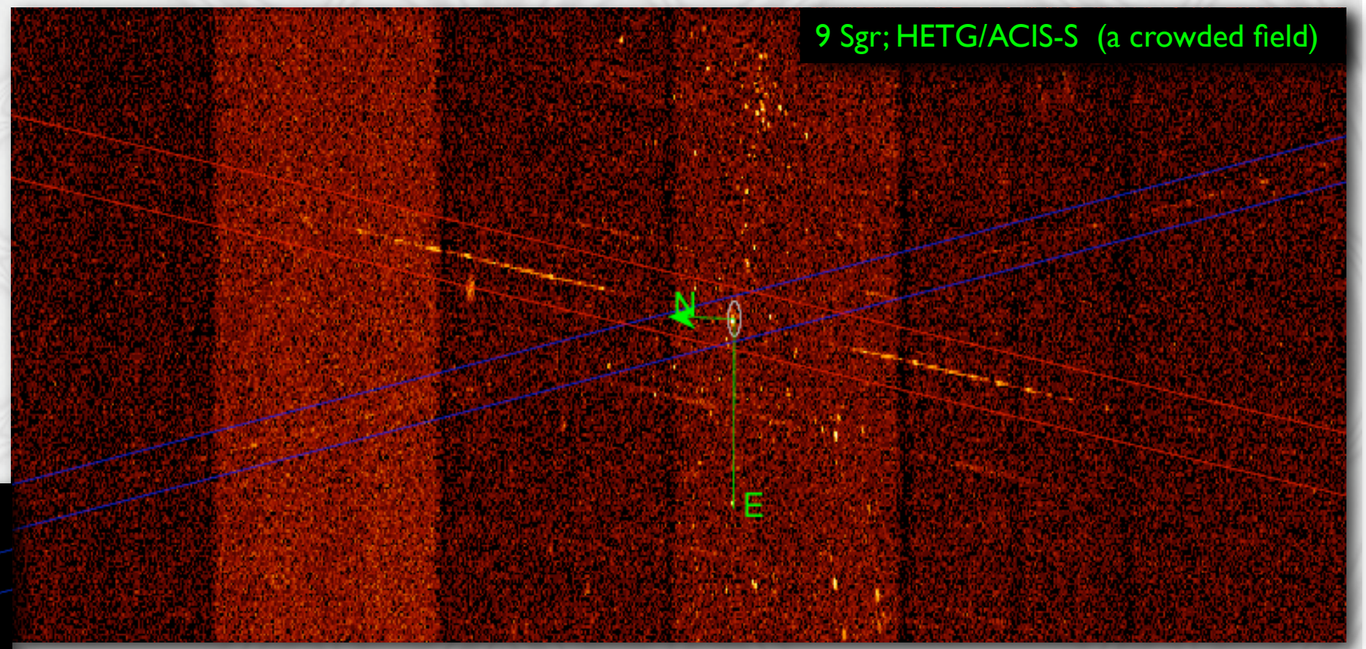
Other spectral catalogs, which we used for guidance:

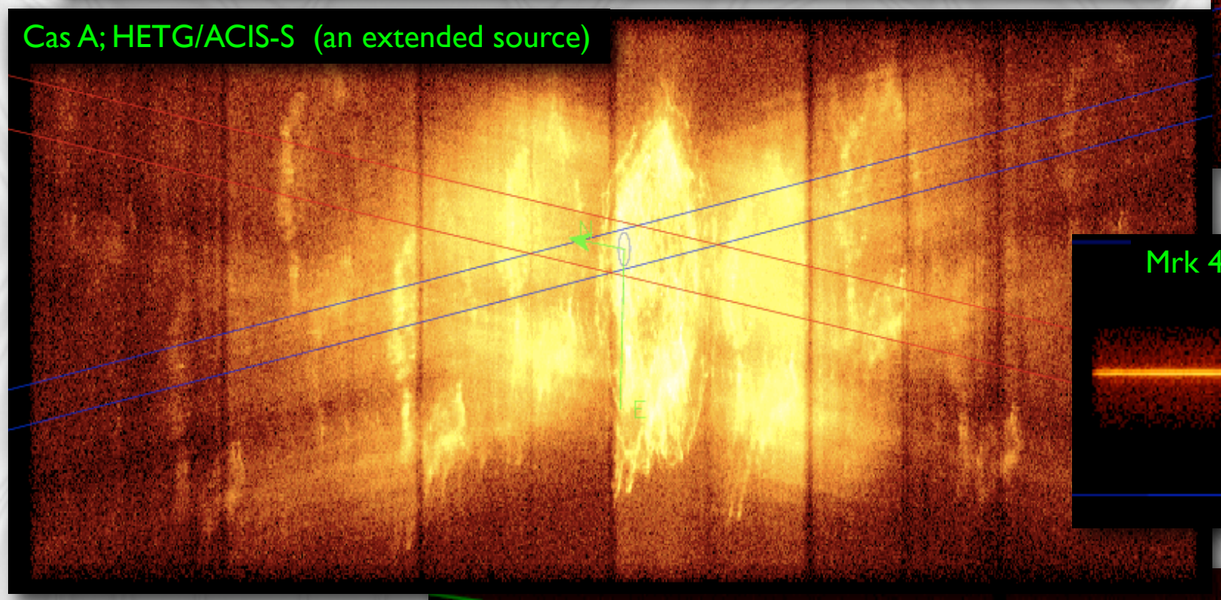
- BiRD: XMM/RGS spectral browser (http://xmm.esac.esa.int/BiRD/)
- HotGas: database of Active Galactic Nuclei (http://hotgas.pha.jhu.edu)
- X-Atlas: HETGS stellar spectra (http://cxc.harvard.edu/XATLAS/), (and since expanded to all point sources).

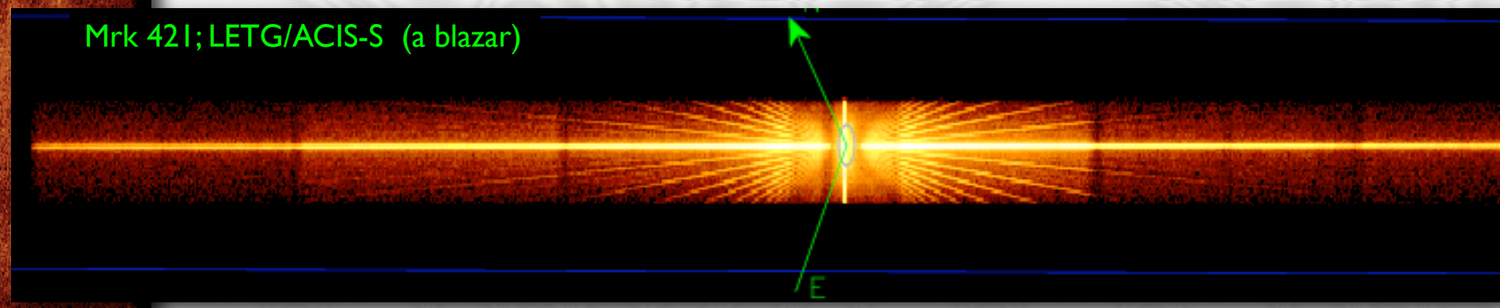
BiRD is browse-only - no data download. But it is simple.
X-Atlas and HotGas are research-topic oriented, with many model-dependent derived products. HotGas is AGN specific, uses CIAO standard products, has some modeling. X-atlas is quite complex, with many derived quantities and both standard and custom products.

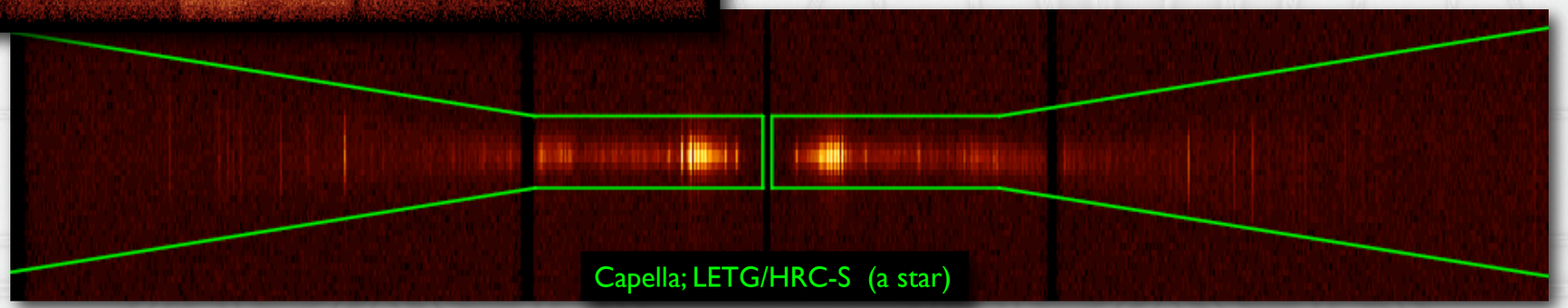
We include nearly all HETG and LETG observations using ACIS-S or HRC-S (extended sources, crowded fields, CC-mode, blocked zero order).

A few examples from TGCat summary products:





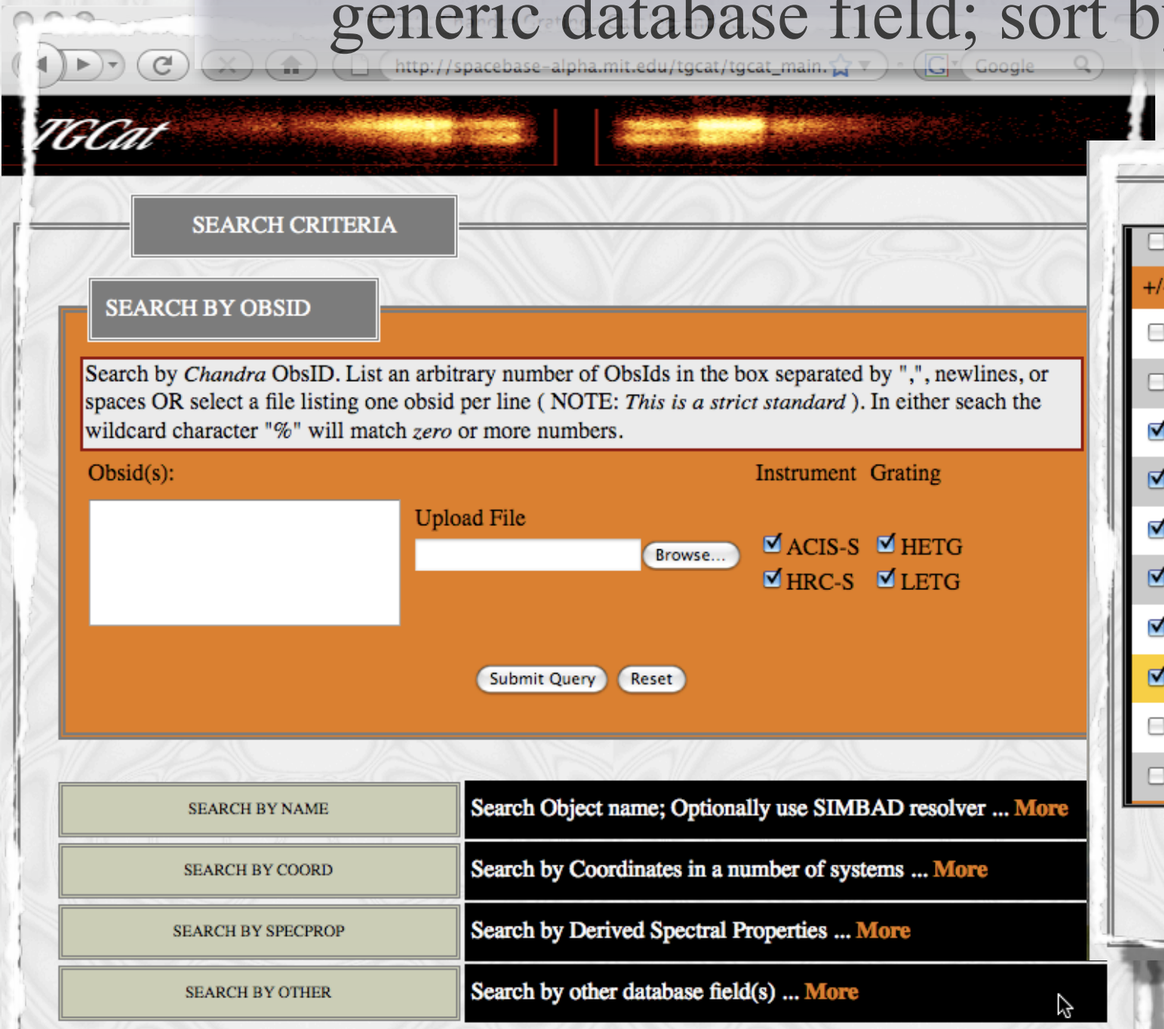




TGCat: http://spacebase-alpha.mit.edu/tgcat

Features of the Catalog

- Flexible web interface: query by name, coordinate, property, or generic database field; sort by column value; package for download;



More Features ...

- Accurate zeroth order position determination if piled, or blocked;

Summary plots page example for a blocked zeroth order case

available plots:

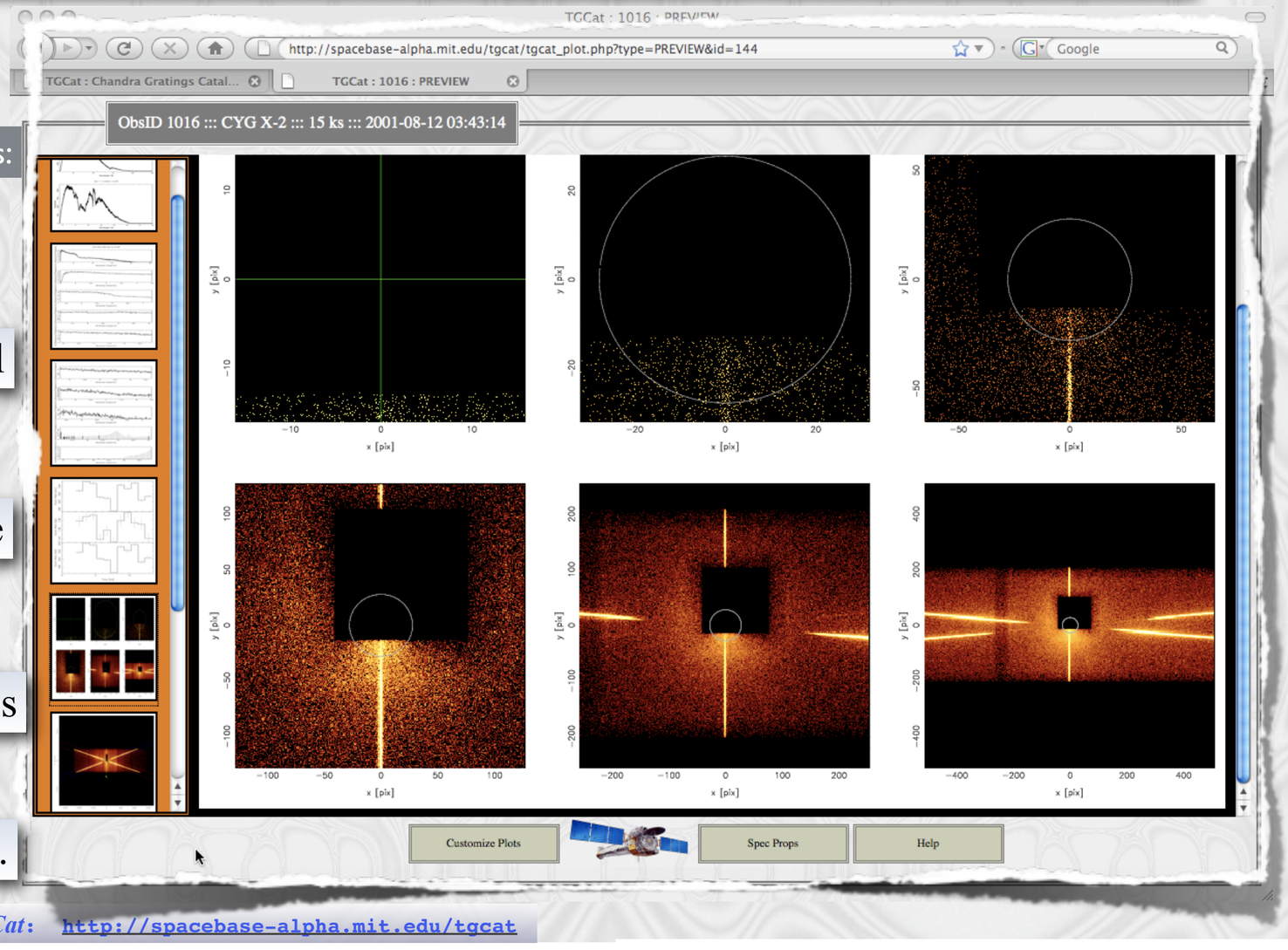
counts

flux, detail

light curve

field images

and more...



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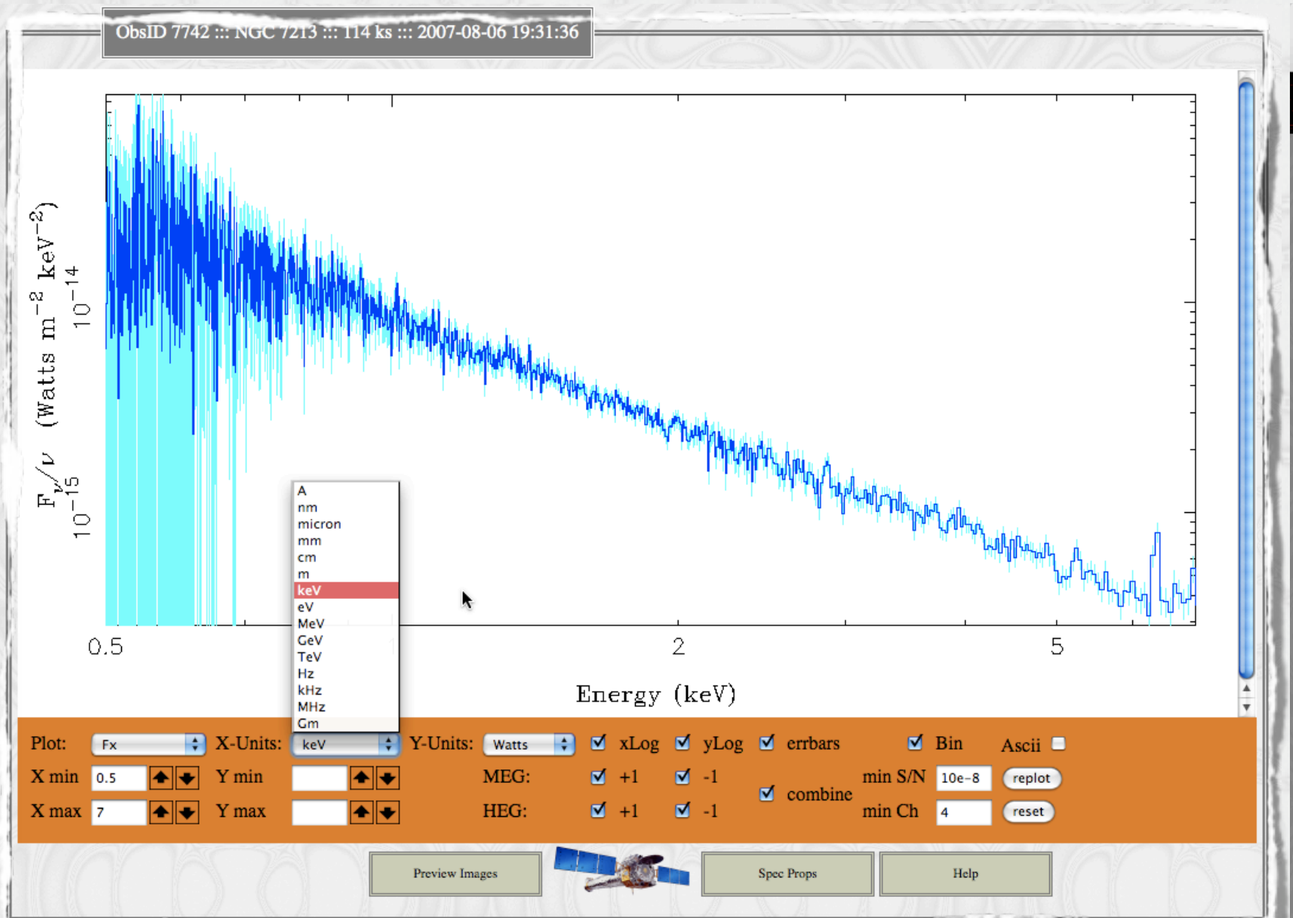
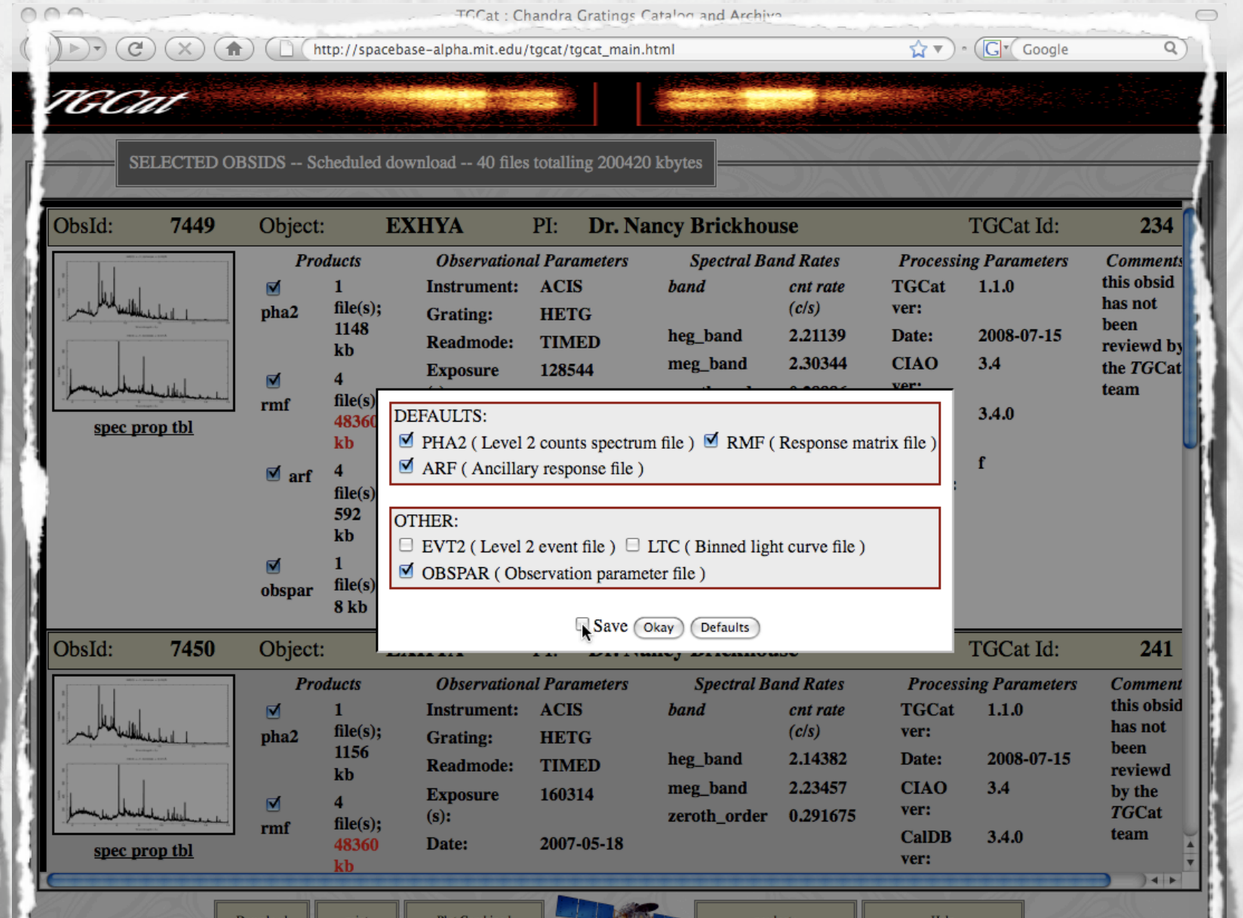
More Features ...

- Interactive plotting; flexible units and scales; ability to dynamically bin and combine orders or spectra (via ISIS scripts)





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More Features ...

- Some *simple* derived properties: count rates in bands; fluxes in bands (if ACIS)
- Extensible MySQL database as backbone
- Software: ISIS/S-Lang scripts which set up and run CIAO tools and make summary plots and tables is also available to users.

Fewer Features ...

- No modeling or fitting;
- No color ratios, color-color plots;
- No spectral comparisons

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Future Enhancements

- The initial release of the catalog is deliberately provided with minimal features. We hope that use by the community will lead to definition of valuable additions.

- Planned enhancements: object class search; high-level convenience functions for the scripts (time-slicing; extraction widths)

- Possible enhancements: organization by sequence number instead of obsid, with multiple obsids combined; crowded field extractions; extended source extractions; serendipitous source extractions

Schedule

- Alpha release complete; software, database, web interface, custom sorting and search functions all complete; approximately 500 observations in catalog
- Beta release: Fall 2008; make available to group of internal and external high resolution researchers for review (ready NOW)
- Expand documentation: general help; usage threads; support for proposal planning. Add more examples to software reference manual.
- Evaluation of comments: Nov 2008; update, test Nov-Dec.
- Formal Verification & Validation: start after beta review (procedures are in place)
- Release: Early 2009 (Jan-Feb, in time for proposal planning support)

Current work

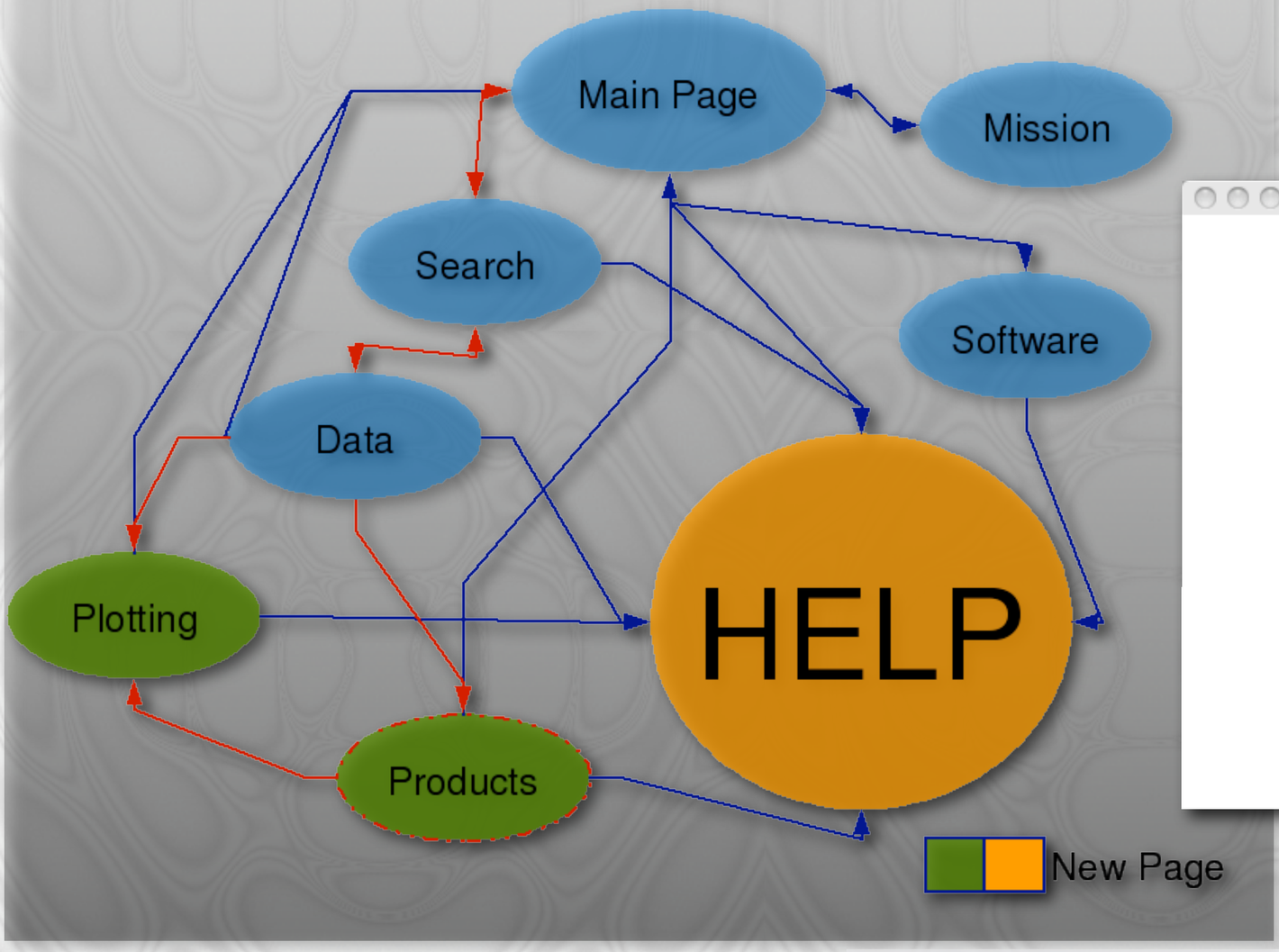
- Scrubbing interfaces - download dialog; combined observation plotting; uniform “pop-up” thumbnail plot.
- Scrubbing source list - human review necessary for zero order method, object class assignments, principle object name, additional source extraction, extended source extraction.
- Documentation: web interface, usage threads;
- Documentation: reprocessing software - examples of customized processing

What we need from beta-test

- Use/review of interface (navigation, presentation, clarity, responsiveness)
- Review of products: convenience, usefulness, quality;
- Derived products: what would be useful? is flux/counts/rates in bands table of use? Are there quantities needed to search for “interesting” observations?
- Usage scenarios - can you do what you need to do? e.g., “Was X observed? If so, get the data.” vs “Are there any observations with property Y? If so, list their basic information.” vs ???
- Reprocessing software - usage, convenience.

Appendices

TGCat Navigation, Help Contents



TGCat : HELP Page

HELP TOPICS

	Page Descriptions:	HowTo:
General Help:	Search	Search by Name
Intro	Results	Search by Coord
Navigating around	Plotting/Summary	Search by Obsid
Glossary	Products	Search by Field
	Software	Change Display Columns

Plot Customization:

Help Contents (many entries to be written)

TGCat: http://spacebase-alpha.mit.edu/tgcat

Processing, Database Details

The Chandra archive is the primary repository - we obtain ~5 files per ObsID for reprocessing.

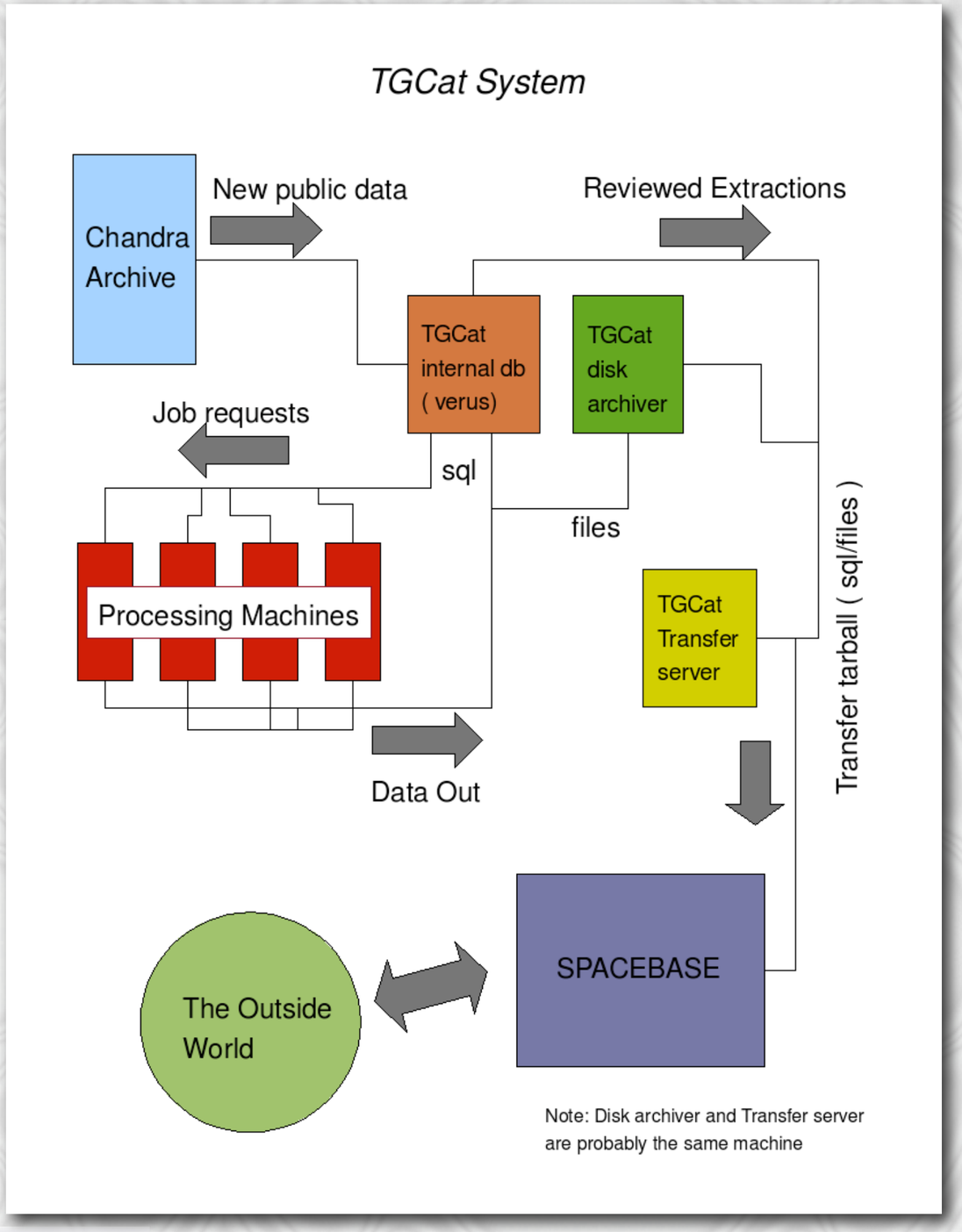
Processing is managed by a local server running MySQL.

ISIS/S-Lang scripts run CIAO tools to reprocess on local network.

Secondary data products are stored locally, and transferred to the public server.

Data will be queued and processed at some interval TBD as new observations become public.

We estimate < 1TB storage for the secondary products, and about 2-4 weeks to produce all products for ~800 obsids.



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Some Software Details

Processing scripts are written in ISIS/S-Lang. The scripts set up and call CIAO tools and read the resulting products to make summary plots and tables. The same scripts used for generating the catalog are available to users; documentation is linked from the TGCat pages (http://space.mit.edu/cxc/analysis/tgcat/index.html)

High level scripts are analogous to `acis_extract` for end-to-end processing. Low-level functions are available for customization, but still with some convenience in built-in knowledge of typical grating tool parameters.

All tgcat software is non-proprietary.

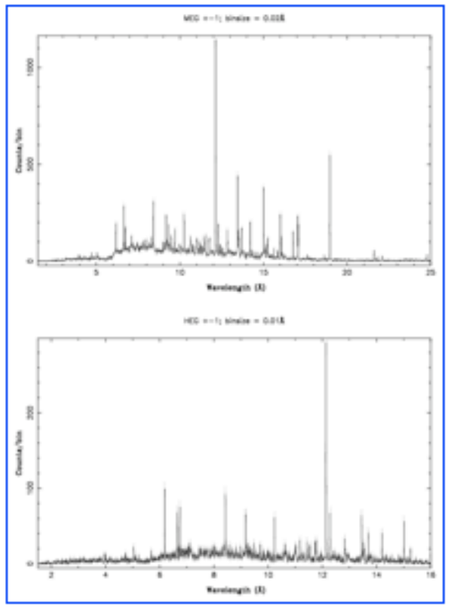
```
> download_obsid 16     # slsh script; requires some modules (pcre, curl); retrieves files from cdaftp site.
> setup_obsdir obs_16   # shell script;  sets up links required by tgcat ISIS scripts.
> isis                  # start isis in a ciao-configured shell
isis> require( "tgcat" );    % load the scripts
isis> run_cfg( "obs_16", 1); % run the pipeline using the configuration read from a header, use findzo
isis> exit;
> display obs_16/summary*.ps &
```

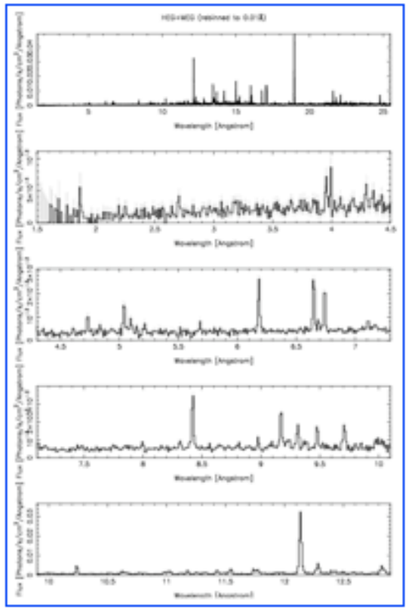
...and in 10-15 minutes you get a pha file (spectrum), responses (grating ARFs and RMFs), light curves, and quick-look summary plots.

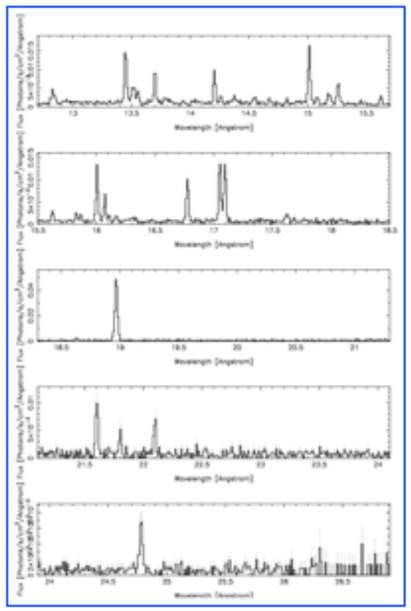
Summary Product Details

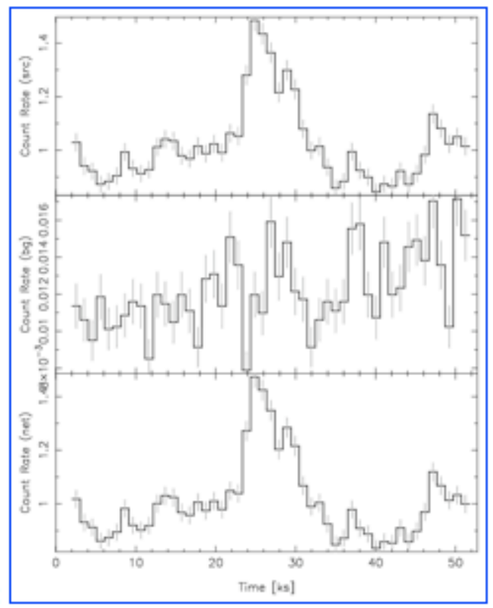
Summary plots made for an ACIS/HETG observation. Similar plots are made for LETG/HRC-S, but without flux or order-sorting. Some are more useful for the user, some for V&V.

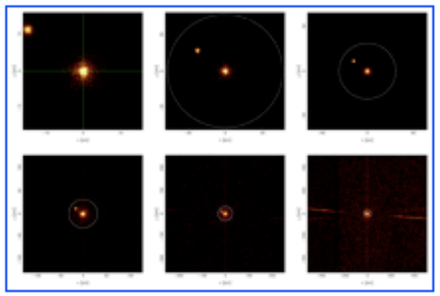
These plots are for ObsID 16, AB Dor, a coronally active star.

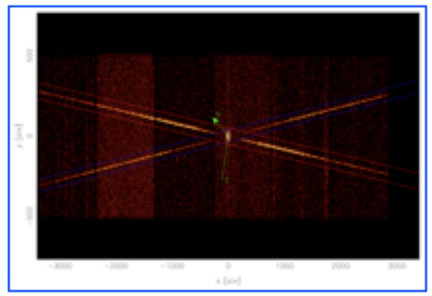
1: 

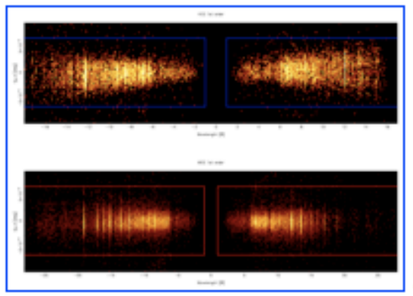
2: 

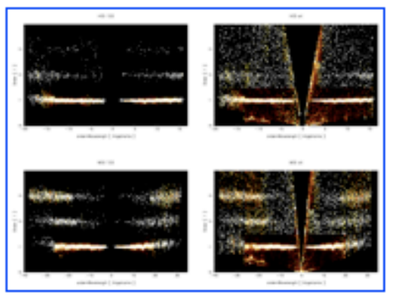
3: 

4: 

5: 

6: 

7: 

8: 

1. Counts Spectrum for MEG (top) and HEG (bottom), combined first orders.
2. Flux spectrum, combined HEG and MEG first orders. Top panel is broad band, following panels are narrow spectral regions.
3. Flux spectrum (continued)
4. Light curve of dispersed photons. Top is source region, middle is background region (usually negligible for HETGS), and bottom is net rate.
5. Central field images in sky coordinates (north up, east left), zooming out in factors of 2.
6. Full field image in rotated sky coordinates.
7. Spectral coordinates image; top is HEG, bottom is MEG; -1 order on the left, +1 on the right.
8. Order sorting image; top is HEG, bottom is MEG. Left is as-order-sorted by the CALDB order-sorting table (osip), and right shows all photons for the source region. (Sometimes CTI or gain calibration is poor, and this is to see if we clipped the spectrum).

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Summary Product Details

Some derived products are tabulated in a FITS table and made accessible to database queries. These are fluxes (if ACIS was the detector) and rates in bands, and in the zero order. Here is an example file's contents (some rows deleted for presentation).

(Note: fluxes are not possible with HRC-S as a detector.)

fv: Binary Table of summary_fprops.fits[1] in /pirx/d0/dph/Data/tgcat_products/obs_3/

File Edit Tools Help

Select / All / Invert	label	wmid	wlo	whi	count_rate	err_count_rate	photon_flux	err_photon_flux	energy_flux	err_energy_flux	flag
	14A	D	D	D	D	D	D	D	D	D	J
		A	A	A	counts/s	counts/s	photons/cm^2/s	photons/cm^2/s	ergs/cm^2/s	ergs/cm^2/s	
	Modify	Modify	Modify	Modify	Modify	Modify	Modify	Modify	Modify	Modify	Modify
1	heg_band	8.350	1.700	15.000	8.044E-01	4.032E-03	8.458E-03	5.076E-05	2.745E-11	2.299E-13	0
2	meg_band	13.350	1.700	25.000	8.274E-01	4.089E-03	9.837E-03	7.137E-05	2.900E-11	2.356E-13	0
3	letgs_band	81.000	2.000	160.000	8.234E-01	4.079E-03	9.732E-03	9.218E-05	2.699E-11	1.877E-13	1
4	letg_acis_band	26.000	2.000	50.000	8.234E-01	4.079E-03	9.732E-03	9.218E-05	2.699E-11	1.877E-13	1
5	c	1.750	1.700	1.800	2.425E-04	7.001E-05	1.715E-05	4.979E-06	1.931E-13	5.616E-14	0
6	Fe25	1.850	1.800	1.900	2.748E-03	2.357E-04	1.362E-04	1.171E-05	1.453E-12	1.250E-13	0
7	FeK	1.950	1.900	2.000	1.112E-03	1.499E-04	4.216E-05	5.699E-06	4.280E-13	5.793E-14	0
8	c	2.500	2.000	3.000	2.700E-02	7.387E-04	4.773E-04	1.343E-05	3.777E-12	1.101E-13	0
9	c	5.700	5.400	6.000	2.461E-02	7.053E-04	3.545E-04	1.049E-05	1.235E-12	3.684E-14	0
10	Si14	6.175	6.100	6.250	3.442E-02	8.340E-04	2.167E-04	5.251E-06	6.965E-13	1.688E-14	0
11	c	6.425	6.300	6.550	2.556E-02	7.188E-04	1.523E-04	4.283E-06	4.702E-13	1.322E-14	0
12	Si13	6.700	6.600	6.800	4.616E-02	9.658E-04	2.713E-04	5.710E-06	8.052E-13	1.696E-14	0
13	c	7.800	7.400	8.200	9.017E-02	1.350E-03	4.782E-04	7.166E-06	1.217E-12	1.826E-14	0
14	Mg12	8.400	8.350	8.450	2.478E-02	7.076E-04	1.372E-04	3.919E-06	3.239E-13	9.250E-15	0
15	c	8.800	8.500	9.100	5.079E-02	1.013E-03	3.449E-04	6.943E-06	7.783E-13	1.563E-14	0
16	Mg11	9.250	9.100	9.400	2.795E-02	7.516E-04	2.227E-04	5.997E-06	4.787E-13	1.290E-14	0
17	Ne9	13.600	13.400	13.800	8.650E-03	4.181E-04	2.636E-04	1.275E-05	3.862E-13	1.867E-14	0
18	Fe17	15.000	14.950	15.050	4.891E-03	3.144E-04	1.664E-04	1.070E-05	2.203E-13	1.416E-14	0
19	c	14.925	14.900	14.950	7.477E-04	1.229E-04	2.483E-05	4.081E-06	3.303E-14	5.430E-15	0
20	O8	18.975	18.900	19.050	1.475E-03	1.727E-04	1.313E-04	1.537E-05	1.375E-13	1.609E-14	0
21	c	20.200	19.200	21.200	7.679E-04	1.246E-04	9.007E-05	1.483E-05	8.940E-14	1.465E-14	0
22	zeroth_order	-1.000	-1.000	-1.000	3.176E-01	2.534E-03	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00	0

Go to: Edit cell: