A Catalog and Archive of Chandra High-Resolution X-Ray Spectra

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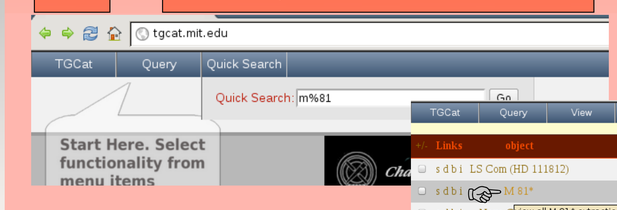
Abstract: The Chandra Transmission Grating Data Archive and Catalog (*TGCat*; http://tgcat.mit.edu/) provides easy access to analysis-ready high-resolution X-ray spectra. The web interface makes it easy to find observations of a particular object, type of object, type of observation, and to quickly assess the quality and potential usefulness of the spectra from pre-computed summary plots. An interacitve plotter provides the ability to visualize spectra (possibly combined over multiple observations) in a variety of flux units against a choice of wavelength or energy axes; any plot so created can be downloaded as an ASCII table. For detailed analysis, the data files themselves can be retrieved. The query results themselves can be saved as ASCII or Virtual Observatory tables. Portable reprocessing scripts used to create the archive and which use the CXC's and other publicly available software are also available.

Instead of enumerating all the great features of *TGCat*, we will instead walk through one example which will demonstrate many of the capabilities. We will:

1. search for M 81 observations;
2. look for long-term variability;
3. examine the preview products for one observation;
4. make a heavily binned plot of flux in mJy vs frequency (summed over all 15 observations) suitable for use in an multi-band view of the energy distribution (e.g., for combination with radio data);
5. look for spectral features at high resolution (summed over all 15 observations).

For some purposes, the interactive plot data are sufficient (an ASCII table can be downloaded). For detailed analysis, data products can be downloaded (individually, or as a package). But for a quick or low-fidelity look, ***we won't make you download and manage 135 files*** (15 spectral files + 15*4 effective areas + 15*4 response matrices (LSFs)), ***or install and learn new software!***

1a Use the "Quick Search" and enter "M%81" (the "%" is a wild-card)

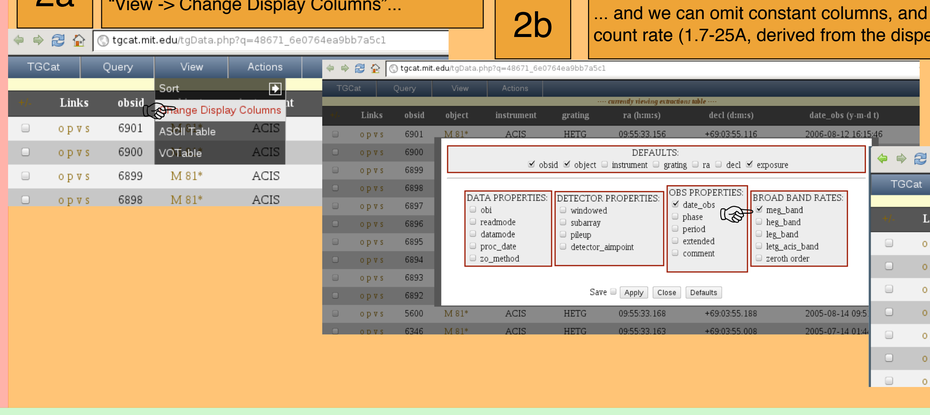


1b The "source table" shows 3 matches, the 2nd is M 81*, and it has 15 extractions (same as observations, usually). Click on the "object", to get the ...

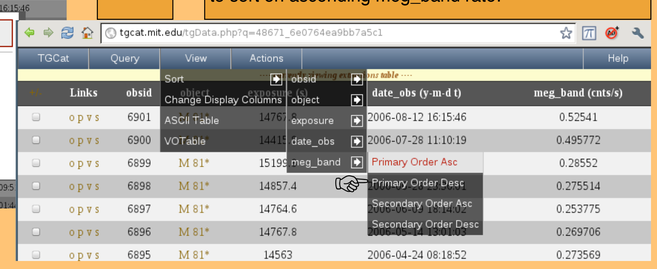
1c ... Extractions Table, showing details for all 15 observations (in this case, all HETG/ACIS).

2a We can change the tabulated info by selecting "View -> Change Display Columns"...

2b ... and we can omit constant columns, and add the "meg_band" count rate (1.7-25A, derived from the dispersed spectrum):

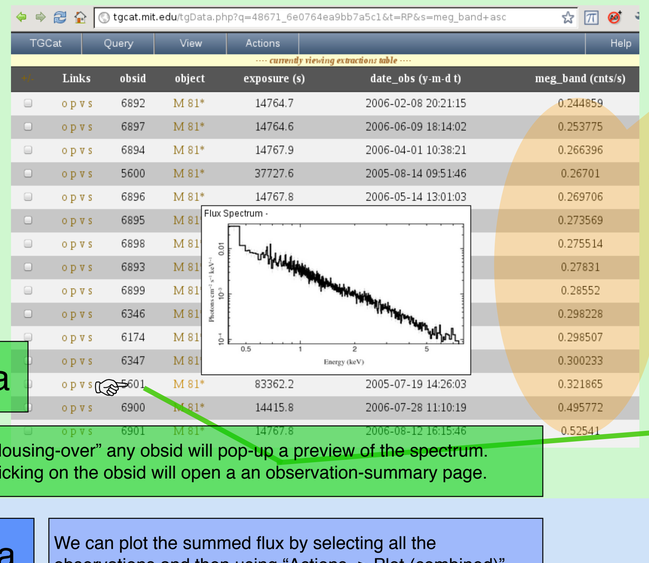


2c ... and finally choose a primary-sort column and order, to sort on ascending meg_band rate:

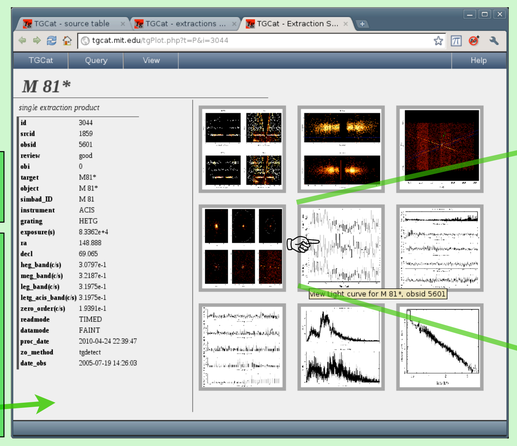


2d The source is variable on a long-term time scale, by at least a factor of two.

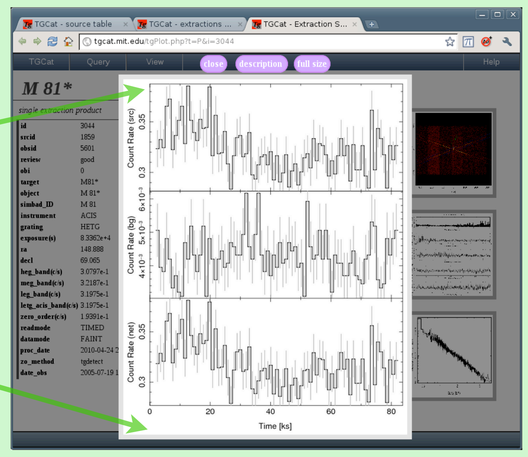
3a "Mousing-over" any obsid will pop-up a preview of the spectrum. Clicking on the obsid will open a an observation-summary page.



3b The preview shows field images, spectra (counts and photon flux), extraction details, and light curves. Clicking any thumbnail opens a full-sized image, such as shown for the light-curve, revealing ...

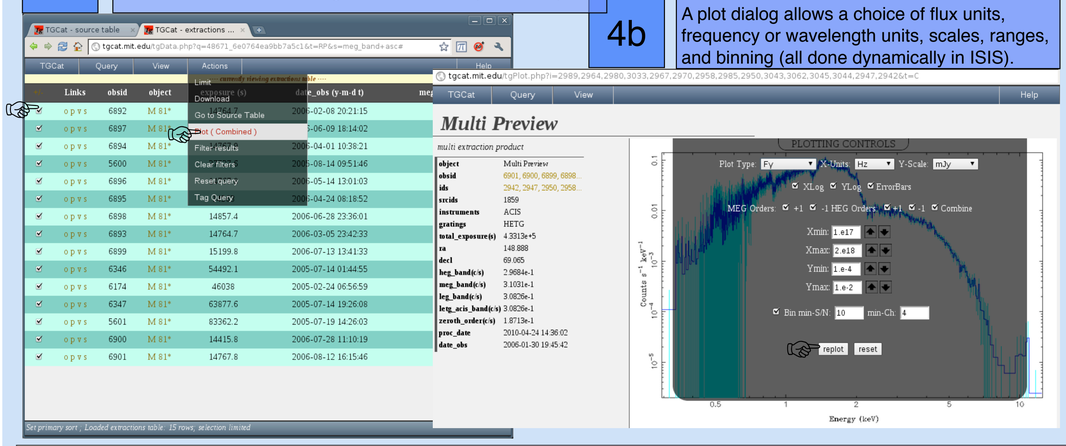


3c ... significant variability within the observation. (top is total, middle is background, bottom is net count rate)

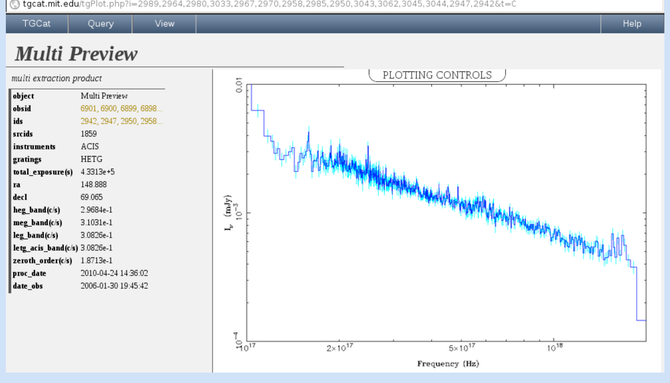


4a We can plot the summed flux by selecting all the observations and then using "Actions -> Plot (combined)".

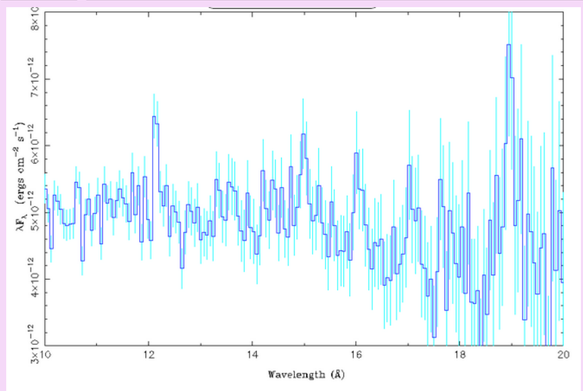
4b A plot dialog allows a choice of flux units, frequency or wavelength units, scales, ranges, and binning (all done dynamically in ISIS).



4c This is a result showing the flux in mJy vs frequency binned to a S/N>=5. The corresponding ASCII table can be downloaded with a click (as can the ISIS script which loaded, combined, fluxed, and plotted the data)



5 With different choices in the plot dialog, we can look for detail at high-resolution. Here we definitely see emission lines (due to Ne X, Fe XVII, and O VIII).



Notes/references: For more about *TGCat*, see Huenemoerder et al (2010) AJ,141,129.
ISIS is the spectral analysis system used for data analysis and plotting in *TGCat*; see http://space.mit.edu/cxc/isis, and Houck and Denicola (2000) ASP Conf, 216, 591.
ISIS is also used as *TGCat*'s scripting language to drive *CIAO* reprocessing programs;
for more about *CIAO*, see Fruscione et al. (2006) SPIE, 6720, 60,and http://cxc.harvard.edu.

A more detailed analysis of the *Chandra*/HETGS M 81* data can be found in Nowak et al, (2010) MmSAI, 81,414.

ISIS CIAO Powered by MySQL php

Related Catalog Projects:
CSC X-Atlas BiRD HotGAS MAST

NVO SCSSIA