THE CHANDRA SOURCE CATALOG: SOURCE PROPERTIES AND DATA PRODUCTS

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The Chandra Source Catalog (CSC) is breaking new ground in several areas. There are two aspects that are of particular interest to the users: its evolution and its contents.
- The CSC will be a living catalog that becomes richer, bigger, and better in time while still remembering its state at each point in time. This means that users will be able to take full advantage of new additions to the catalog, while retaining the ability to back-track and return to what was extracted in the past.
- The CSC sheds the limitations of flat-table catalogs. Its sources will be characterized by a large number of properties, as usual, but each source will also be associated with its own specific data products, allowing users to perform mini custom analysis on the sources.

Source properties fall in the spatial (position, extent), photometric (fluxes, count rates), spectral (hardness ratios, standard spectral fits), and temporal (variability probabilities) domains, and are all accompanied by error estimates. Data products cover the same coordinate space and include event lists, images, spectra, and light curves. In addition, the catalog contains data products covering complete observations: event lists, background images, exposure maps, etc. The tables below give details, by subject area, on most of the information available from the catalog. Some data product examples are shown as well. Color keys and energy band definitions are provided below and in the box to the right. Neighboring posters explain how the master source list is generated from the per-observation source detections.

Energy band definitions:

CSC Energy Bands

Instrument	Band	Lower Limit (keV)	Upper Limit (keV)
ACIS	b	0.5	7.0
ACIS	u	0.2	0.5
ACIS	s	0.5	1.2
ACIS	m	1.2	2.0
ACIS	h	2.0	7.0
HRC	w	0.1	10.0

Source Flags
Various quick-reference and warning flags

Source Flags

Property / Data Product	Each band
Significance	
Detect significance	✔
Flux significance	✔
Extent	O
Confusion	O
Variability	O
Hardness ratio variability	
Streak source	O
Saturated source	O
Pile-up	
Chip edge	
Multi-chip	
Dither warning	
Manual include	
Manual Region	
Manual match	

O: separate values for each band only in per-observation sources

Photometry
Photometric parameters derived from the source region apertures, as well as apertures covering 90% of the PSF

Photometric Information

Property Data Product	Each band	Confidence limits	Also at 90% PSF	Background
Aperture	✔		✔	✔
Counts in aperture	✔		✔	✔
Source counts in aperture	✔		✔	
Source rate in aperture	✔	✔	✔	
Photon flux	✔	✔	✔	
Aperture flux	✔	✔	✔	
Power Law flux	✔	✔	✔	
Black Body flux	✔	✔	✔	

Keys
In the tables individual source items are color coded, indicating in which table they may be found, or whether they are data products.

Red: Properties for per-observation sources
Blue: Properties for Master List sources
Black: Properties in both source lists
Magenta: Data product

Space
Position and size of the source

Spatial properties

Property Data Product	Each band	Error	Background
RA, Dec	O	E	
Galactic *l, b*	O		
Focal plane θ, φ			
Observed size	✔	✔	
PSF size	✔	✔	
Deconvolved size	O	✔	
Region			✔
Image	✔		
PSF Image	✔		
Exposure map	✔		

O: separate values for each band only in per-observation sources
E: error ellipse

Source image with source and background regions

PSF image

Spectrum
Spectral fits, hardness ratios, spectral files

Spectral Information

Property Data Product	Confidence limits	Also at 90% PSF
Power Law fit	✔	
Black Body fit	✔	
N_H (Galactic)		
Hardness ratios	✔	
Spectrum		✔
ARF (auxiliary response)		
RMF (redistribution matrix)		

Time
Variability probabilities for single and multiple observations

Variability Information

Property Data Product	Each band	Error	Background
Intra variability index	✔		
Intra variability sigma	✔		
Intra variability mean/min/max	✔		
GL variability probability	✔		
KP variability probability	✔		
KS variability probability	✔		
Inter variability index			
Inter variability probability			
Inter variability sigma			
Light curve	✔	✔	✔

Intra: within a single observation
Inter: across multiple observations

Observation
In formation on the observation(s) where the source was detected

Observation Information

Property / Data Product	Background
Number ACIS observation	
Number HRC observation	
Exposure time ACIS	
Exposure time HRC	
ObsId	
Observation Interval	
...etc.	
Event List	
Field of view	
Image	✔
Exposure map	
Sensitivity map	
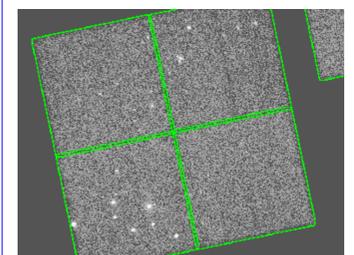
Full-field image with ACIS footprint
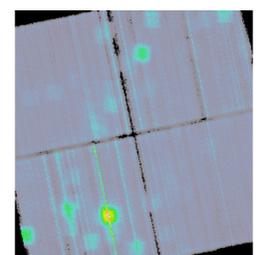
Background image
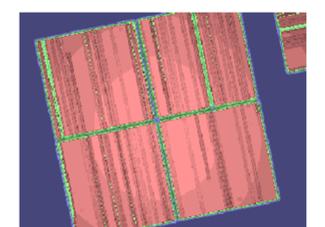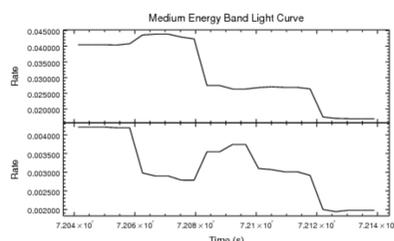
Source and background regions light curves

Full-field color image

Exposure map