



**CHANDRA**  
SOURCE CATALOG

## Progress Report

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On behalf of the Chandra Source Catalog Project Team

Chandra Users' Committee Meeting

October 29, 2009

## Summary

- ***Released version 1.0.1 of the Chandra Source Catalog on July 21, 2009***
  - This patch release of the catalog includes a variability flag fix to release 1.0, but otherwise retains the same content as that release
- Released updates to the CSCview user interface to address novice user concerns
- Released IVOA compliant Simple Cone Search interface
- Released CSC Sky in Google Earth catalog image/FoV visualizer
- Completed primary statistical characterization of release 1.0
- Submitted catalog description paper for publication
  - Release 1 statistical characterization paper is currently in preparation
- Developed production system for release 1.1 (public HRC imaging and “catch-up” ACIS imaging observations)
  - Science evaluation of integration test underway
  - Characterization simulations underway
  - Expect to release version 1.1 in early 2010

## Science Highlights Since Last CUC Meeting

- Updated catalog to release 1.0.1 to fix a variability flag error
- Updated public web site with latest user documentation and threads
  - <http://cxc.cfa.harvard.edu/csc/>
- Documents and publications
  - 14 catalog-related posters presented at the Chandra 10 Years Symposium
  - Catalog description paper (Evans et al.) submitted to ApJS
  - Statistical characterization paper (Primini et al.) currently in advanced stage of preparation

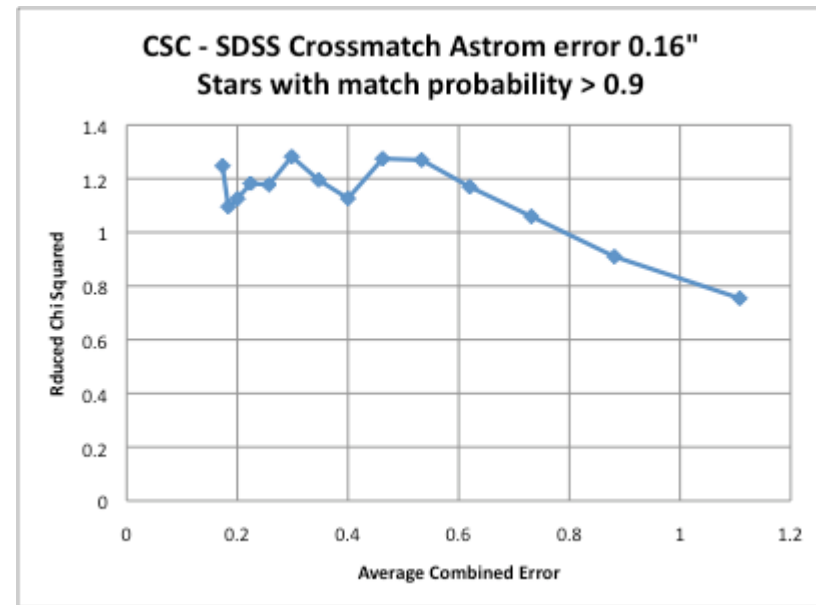
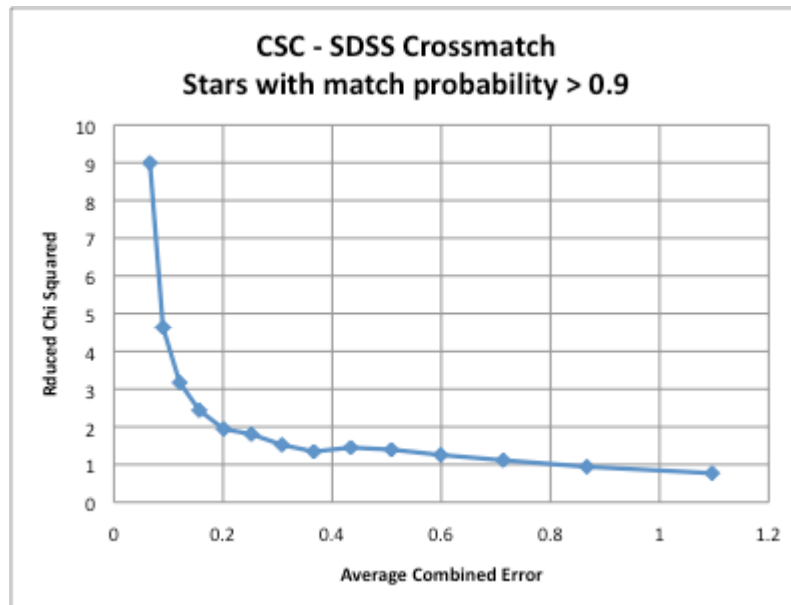
## Software Highlights Since Last CUC Meeting

- CAT 3.1 (Release system) build
  - Minor patches to maintain CSC operations
  - CAT 3.1.2/CSCview 1.0.2      May 21      CSCview novice user/ CSC SCS
  - CSC GoogleSky 1.0 Beta      Jun 26      First release of CSC Sky in Google Earth
  - CAT 3.1.4      Aug 20      Updated CSC SCS
  - CSC GoogleSky 1.0      ~Oct 26      Added all Chandra FoVs
- CAT 3.2 (CSC 1.1 Release system) integration test build
  - Integration test run completed
  - Test results being reviewed by science team

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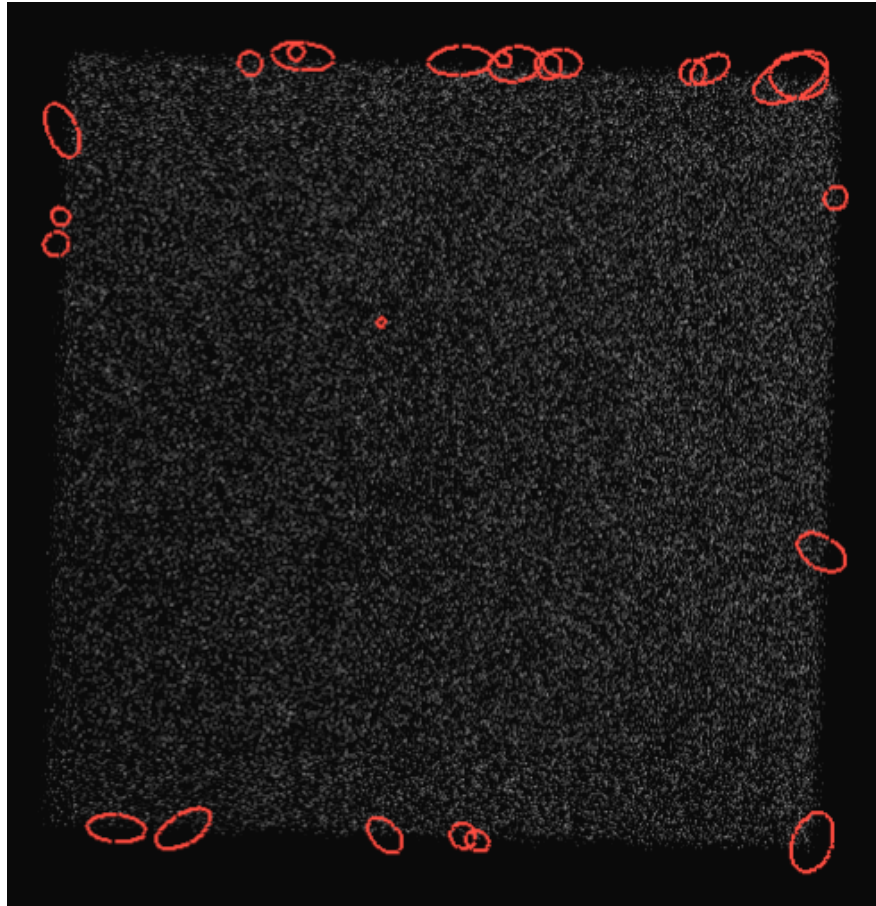
## Catalog Statistical Characterization

- Statistical properties of Release 1 are available on the catalog web site
  - <http://cxc.cfa.harvard.edu/csc/char.html>
- A paper describing the statistical properties is in preparation (Primini et al.)
- Characterization simulations for Release 1.1 are underway
  - Completed HRC blank sky simulations; currently running point source simulations



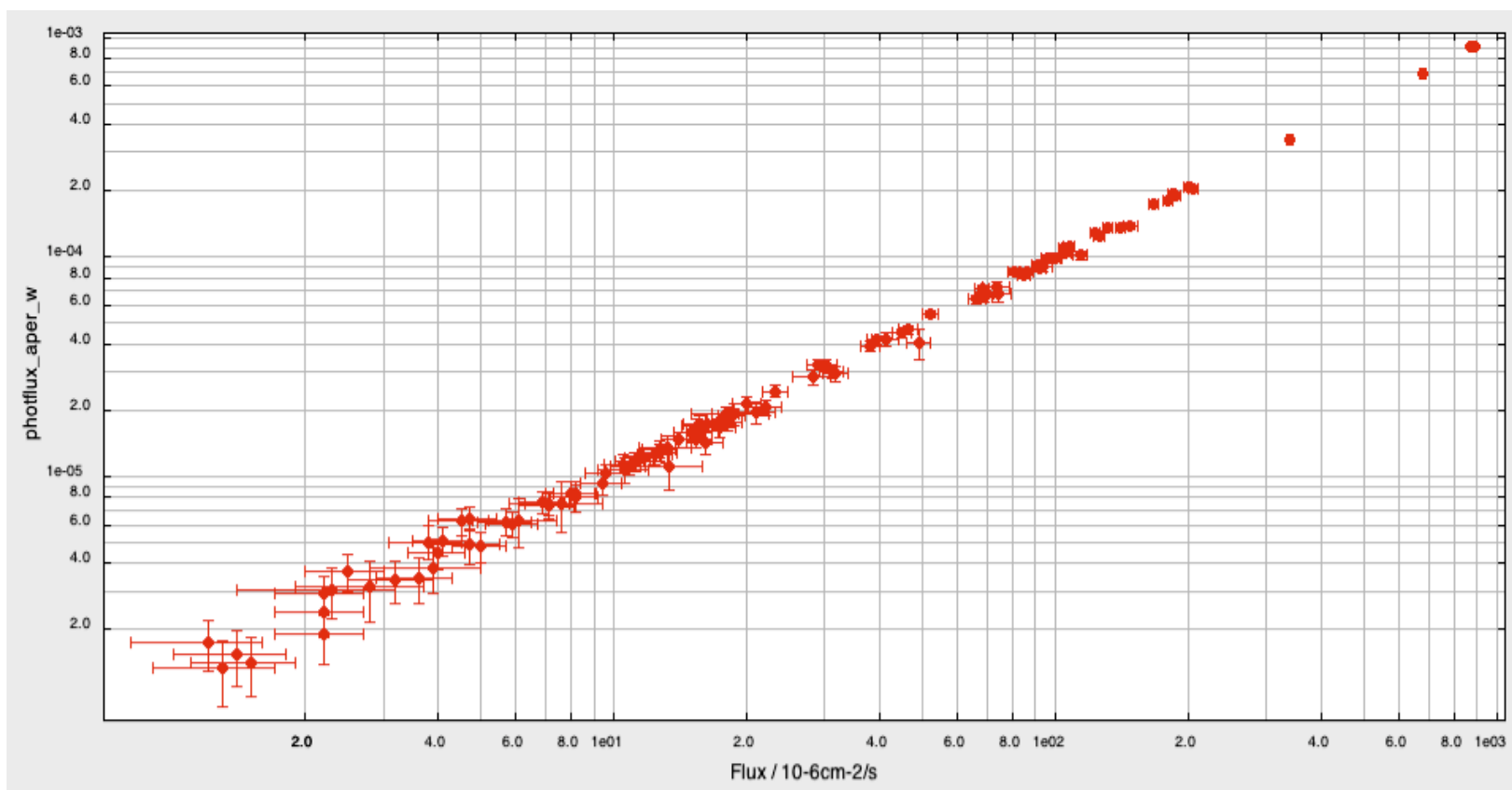
## Absolute Astrometric Uncertainty

- The CSC-SDSS DR7 cross-match was used to calibrate the absolute astrometric uncertainty for catalog sources
  - The left hand plot shows the comparison of source separation vs. CSC-SDSS combined error as a function of average combined error, derived from SDSS matches for 6300 sources
    - The rapid increase above  $\chi^2 \sim 1$  occurs because the intrinsic CSC position uncertainties underestimate the total error for small values of the average combined error (typically at small  $\theta$ )
    - Drop below reduced  $\chi^2 \sim 1$  is because CSC uncertainties are overestimated at large  $\theta$
  - The right hand plot is similar to the left hand side, with a radial absolute uncertainty of 0.16 arcsec ( $1\sigma$ ) added in quadrature to the intrinsic CSC position errors
    - This compares favorably with a value of 90% within 0.6 arcsec derived in 2007 from 318 ACIS sources



## HRC Blank Sky Simulations

- HRC-I false source rate is comparable to ACIS false source rate
- Image shows all detections from 5 blank-sky simulations superimposed on a single simulated image
  - The seed ObsId is a 50 ks M31 imaging observation
  - None of the detections shown would pass the catalog quality assurance and catalog inclusion filters



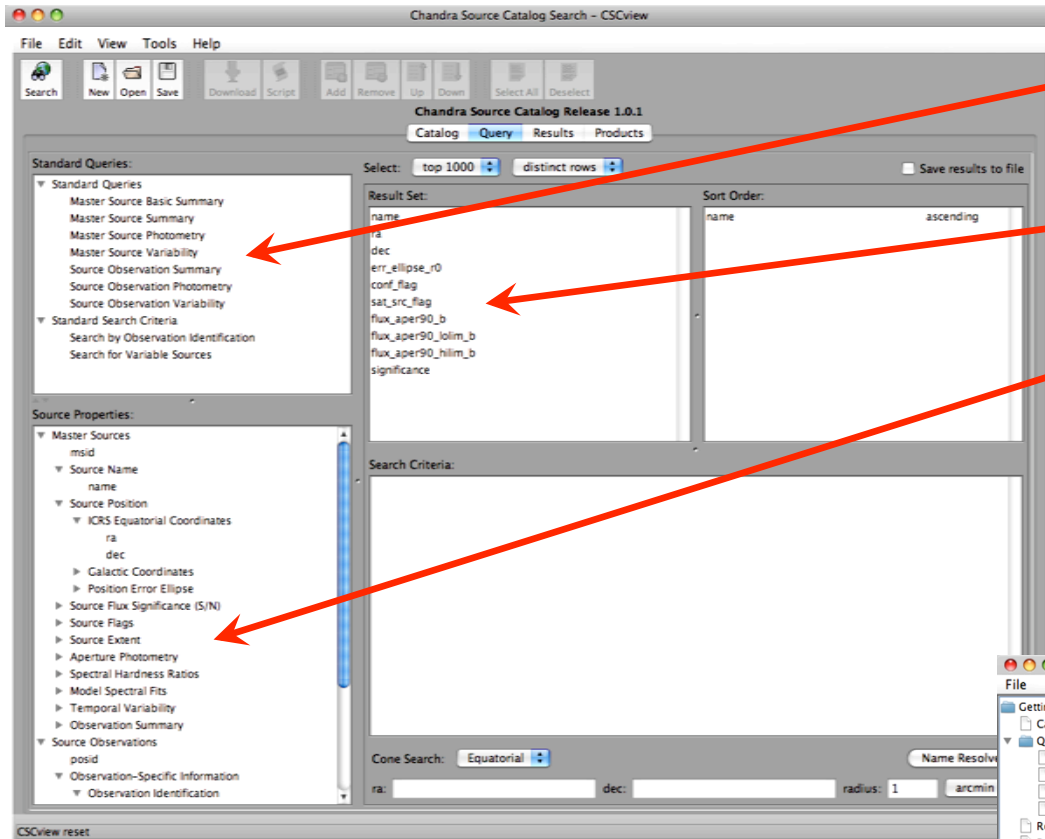
### HRC Aperture Photometry

- Comparison of HRC wide band aperture photon fluxes computed using CAT 3.2 integration test build with published values (Kaaret 2002 ApJ 578, 114) for ObsId 1912 (M31)

## CSCview

- Enhancements since last CUC meeting
  - Added pop-up “Getting Started” help that guides first-time users through making queries, as well as providing examples of more sophisticated usage
    - Can be disabled by users familiar with the interface
  - Added several new queries that support most common requests to the set of standard queries
    - Standard queries are now directly accessible from the main form
  - Provided a new default standard query, so new users won't get the dreaded “empty result set” error
- Tested the new version in-house with a group of scientists who had never previously used CSCview, observing how they interacted with the GUI
  - Test users had a wide range of computer experience and computer skills
  - They were able to successfully query the catalog using the updated version of CSCview
  - The tests identified some areas of commonly requested functionality, and areas where further improvements could be made to the interface
- Joined a collaborative effort with a UK AstroGrid group to develop an IVOA-standards driven standard astronomical catalog data mining interface based on CSCview
  - Additional interest in CSCview has also been expressed by other parties also





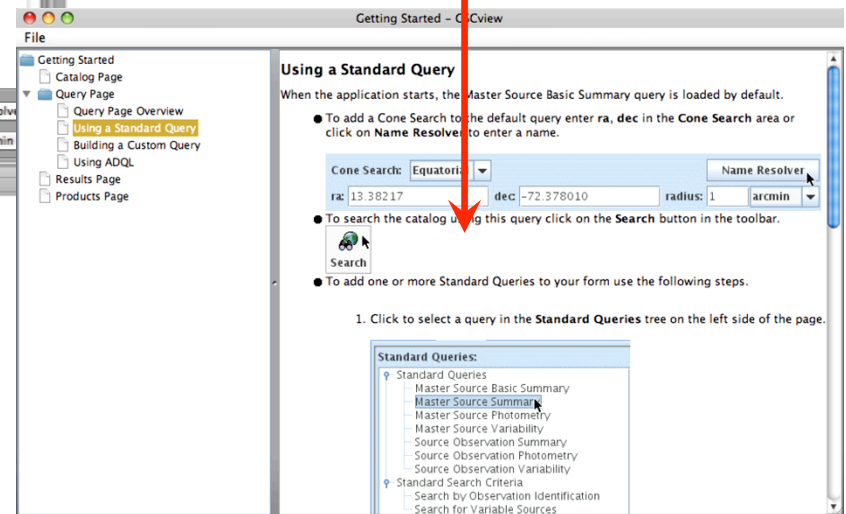
Enhanced set of Standard Queries addresses common user cases

Default standard query means new users won't get an "empty result set" error

Improved source properties hierarchies make it easier to identify properties of interest

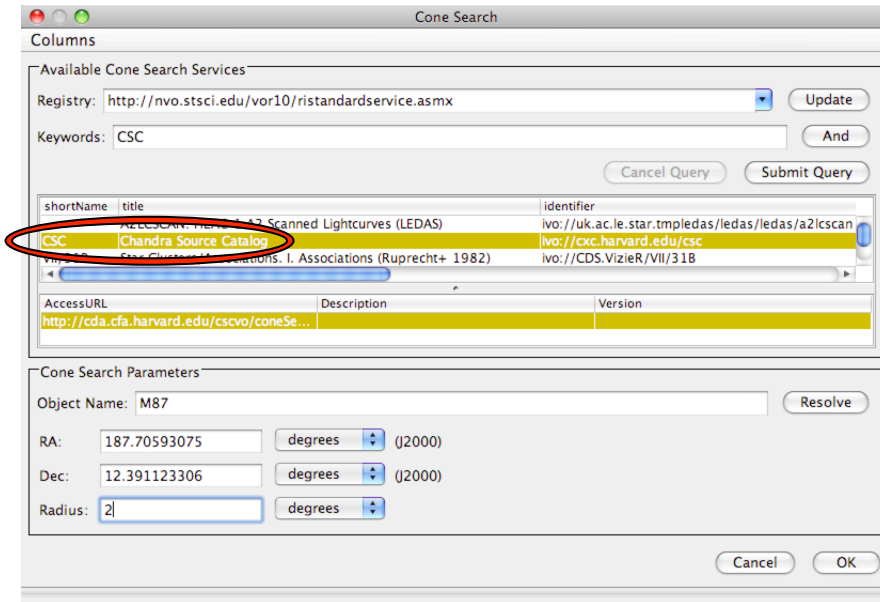
Pop-up "Getting Started" help leads new users through steps to perform both standard and custom queries and retrieve data files

CSCview 1.0.2 addresses usability issues for new and casual users

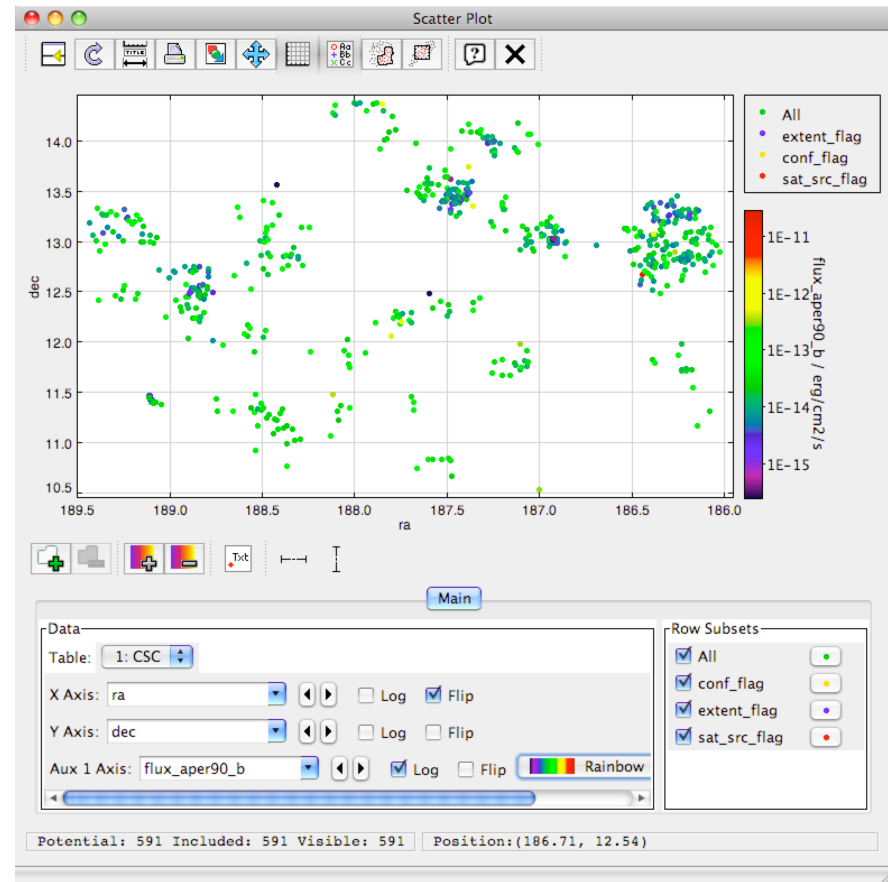


## CSC Simple Cone Search

- IVOA-compliant SCS interface is directly accessible through VO portals such as DataScope, or via VO aware applications such as TOPCAT
  - Returns results as a VOTable
  - Resource name is “CSC”



TOPCAT example cone search near M87



**NVO Data Discovery: DataScope**

Search a position for all known information

Use DataScope to find everything that's known about a given target or region of the sky. DataScope will query hundreds of VO-enabled data resources and organize the results for your viewing.

Position:

Use a target name (e.g., 3c273) or position (e.g., 10 10 10.1, 20 20 20.2)

Size:  (in degrees, max is 2)

Run query:

Skip cache?  Do not add to list of recent queries?

Some recent queries:

- m64 (0.25)
- m64 (0.25)
- 341.5383900..12.5887200 (0.00125)
- m64 (0.25)
- 01 22 06 .00 56 43 (0.1)

Positions may be entered in decimal (dd.f, sdd.f) or sexagesimal (hh mm ss.f, dd mm ss.f) notation or as targets recognized by NED or SIMBAD.

The Size should be entered in decimal degrees.

Use the Skip cache flag to ensure that you get the latest results from all services.

The Refresh registry flag queries the VO registry to get the latest services. The registry is normally queried every hour.

By default the last few queries anyone has made are shown at the bottom of the page but there is a checkbox to keep your query from being recorded on this list.

**NVO Portal: DataScope Response**

Data found(627) No data (5183) Errors(34) Waiting(L7) 99% complete

Position: 3C273 Resources/hits: 5861/336248 Cache age: 0.136 hours

Summary Resources Data Table No Data Still Processing Errors Help

Matching Resources

These resources had data in the specified region. Click on the

checkbox to select the data for download or analysis. name to view the catalog data and select files. ? to see the metadata for the resource.

When the number after the name is given as *nm/mm* you have selected *nm* of the *mm* files indexed in that resource. Click on the resource name to select files within such resources. Download selected resources from the Summary tab.

(4) Major Multiwavelength Services

(75) Images (Data in one or more FITS files)

(48) Lists of Observations (Data in one VOTable)

Catalogs of Objects (Data in one VOTable)

Surveys (70) Galaxies (70) Stars

Other objects

CSC (45) ?

M&GGamma-ray (3) ?  GRO/Piccolini (1) ?  Komers (2) ?  XMMOMOBJ (10566) ?

SDSSBHLGC (14) ?  FERMI/LASP (492) ?  HRASS/Opi (3) ?  RASS/SDSSAGN (1) ?

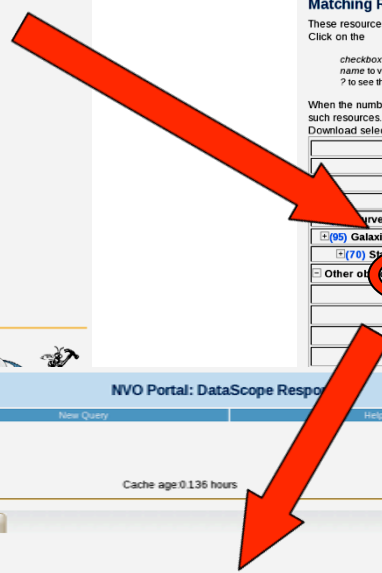
SDSSBALQSO2 (6) ?  X-ray (1721) ?  XTEMLCAT (1) ?  GCVS (1) ?  ROSAT/RLQ (1) ?

ROSAT/RQQ (1) ?  HB (4) ?  Stem (10) ?  CIO (299) ?  FUSE (2) ?

V254 (976) ?  V252 (6981) ?  V248 (2) ?  V256 (49) ?  V261 (L23) ?

V267 (L6384) ?  V291 (55) ?  XTE/ASM (1) ?

JApJS/I/48.30 (1) ?  JApJS/I/78/339 (3) ?  V138 (4) ?  V154 (208) ?  V196 (7) ?  V188 (1) ?  JAS-AS114/465 (4) ?  SDSSQSO cand (157) ?



Developed with the support of the National Science Foundation under Cooperative Agreement AST0122449 with the Johns Hopkins University

**NVO Portal: DataScope Response**

Hosted by the Astrophysics Science Division

HEASARC Director: Dr. Alan P. Smale, HEASARC Associate Director: Dr. Rogier A. Wind

Responsible NASA Official: Phil Newman

Data found(627) No data (5183) Errors(34) Waiting(L7) 99% complete

Position: 3C273 Resources/hits: 5861/336248 Cache age: 0.136 hours

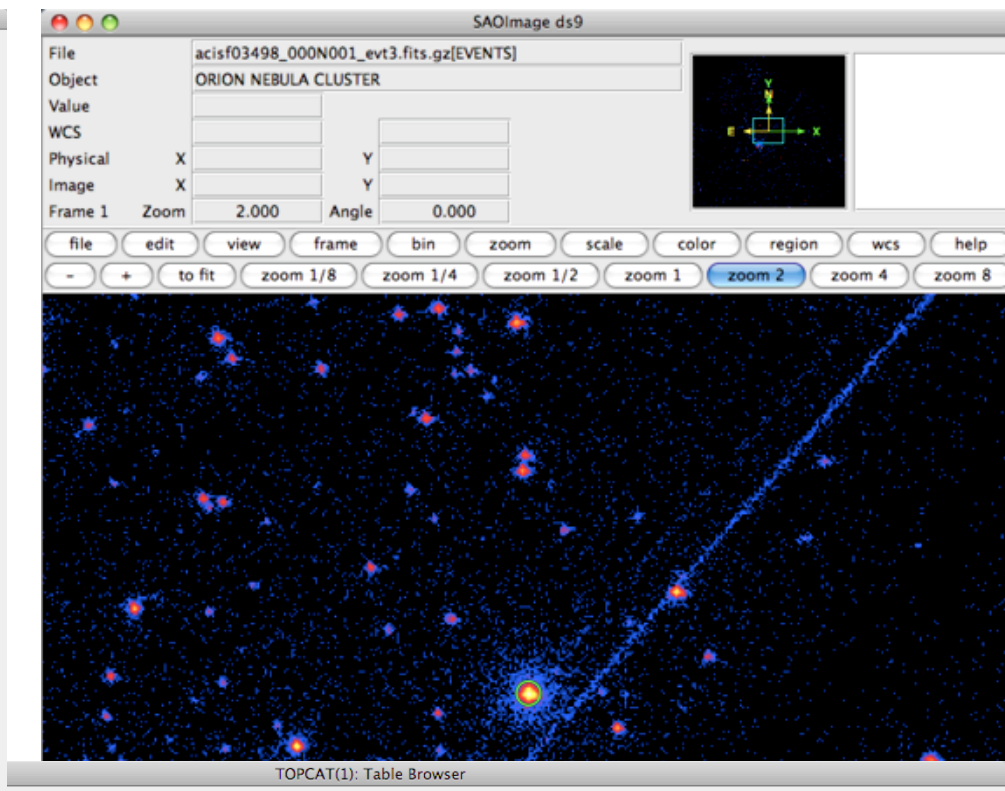
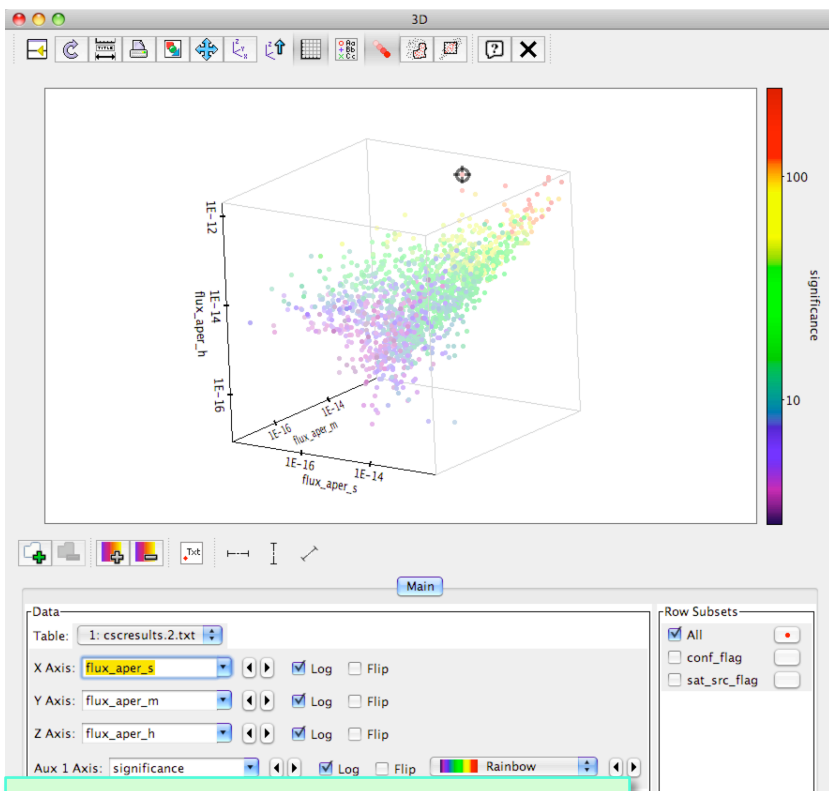
Summary Resources Data Table No Data Still Processing Errors Help

Data for Chandra Source Catalog

Quick Links: ASCII | MetaData | XML | VOTable | Overlay

<< First < Prev | 1-25 | Next > Last >>

name	ra	dec	err_ellipse_rl	err_ellipse_rt	err_ellipse_ang	conf_flag	extent_flag	sat_src_flag	flux_aper90_b	flux_aper90_hlrm_b	flux_aper90_loirm_b	significance	hard_fm	hard_ms	var_ints_index_b	var_ints_index_m
CXO J122830.6+014153	12 28 30.6	01 41 53.4	105.75697	105.75697	0.0	F	T	F	1.1579E-13	1.51609E-13	8.01142E-14	11.4164	-0.115234	-0.184434	0	-2147483648
CXO J122834.6+015032	12 28 34.7	01 50 32.0	10.9795	10.9795	0.0	F	F	F	9.19033E-14	1.17034E-13	5.66232E-14	7.49172	-0.190697	-0.262382	0	-2147483648
CXO J122837.2+015720	12 28 37.2	01 57 20.4	0.75902	0.75902	0.0	F	F	F	2.26442E-13	2.34498E-13	2.18468E-13	29.5121	-0.0678037	-0.55094	1.0	-2147483648
CXO J122853.5+015648	12 28 53.5	01 56 48.7	2.49291	2.49291	179.9999	F	F	F	9.748E-15	1.144E-14	8.077E-15	4.84874	0.0247739	-0.20042	0	0
CXO J122855.1+015555	12 28 55.1	01 55 55.4	2.81031	2.81031	180.0	F	F	F	8.771E-15	1.059E-14	6.939E-15	3.6819	0.0987237	-0.00918659	0	0
CXO J122856.3+010346	12 28 56.3	01 03 46.0	2.68922	2.68922	0.0	F	F	F	1.39374E-13	1.6714E-13	1.11896E-13	10.9822	-0.0757629	-0.653985	0	-2147483648
CXO J122857.1+015513	12 28 57.2	01 55 13.7	3.75019	3.75019	0.0	F	F	F	3.89185E-15	5.69419E-15	2.0891E-15	3.65197	0.0505915	-0.162298	0	-2147483648
CXO J122904.4+010745	12 29 04.4	01 07 45.6	31.9254	31.9254	90.0	F	F	F	7.01043E-14	1.17354E-13	2.24837E-14	7.17572	0.187086	-0.294589	0	-2147483648
CXO J122909.2+021511	12 29 09.2	02 15 11.8	7.05052	7.05052	90.0	F	F	F	2.22505E-15	5.11101E-15	0.0	3.08027	-0.0730622	-0.235055	0	-2147483648
CXO J122909.8+021320	12 29 09.8	02 13 20.9	4.76053	4.76053	0.0	F	F	F	2.38335E-14	2.86723E-14	1.8952E-14	5.16342	0.25526	-0.106403	0	-2147483648
CXO J122914.5+021119	12 29 14.5	02 11 19.9	4.20318	4.20318	0.0	F	F	F	8.18624E-15	1.09313E-14	5.45187E-15	4.091	0.271116	-0.36858	0	-2147483648
CXO J122920.8+021201	12 29 20.8	02 12 01.0	3.94617	3.94617	0.0	F	F	F	6.19165E-15	8.45557E-15	3.94442E-15	3.24287	-0.00599941	-0.232283	2	-2147483648
CXO J122921.1+021515	12 29 21.2	02 15 15.9	9.7254	9.7254	90.0	F	F	F	4.6285E-15	7.89225E-15	1.34746E-15	3.48234	-0.0292903	-0.145413	2	-2147483648
CXO J122925.5+021922	12 29 25.6	02 19 22.4	20.9754	20.9754	90.0	F	F	F	2.7833E-14	3.79829E-14	1.76018E-14	5.90481	0.0800321	0.364812	0	-2147483648
CXO J122926.7+021137	12 29 26.7	02 11 37.6	5.98367	5.98367	90.0	F	F	F	1.47107E-14	1.89276E-14	1.04823E-14	3.91476	0.23696	-0.320416	1	-2147483648
CXO J122930.4+020949	12 29 30.4	02 09 49.9	3.62682	3.62682	90.0	F	F	F	8.20198E-15	1.04931E-14	5.89371E-15	4.1808	-0.137265	0.257727	1	-2147483648
CXO J123111.4+020926	12 31 11.5	02 09 26.3	32.7561	32.7561	0.0	F	F	F	4.80183E-14	6.66212E-14	2.94635E-14	3.59681	0.150415	-0.760967	1	-2147483648
CXO J123111.9+012006	12 31 11.9	01 20 06.5	60.05059	60.05059	90.0	F	F	F	0.0	1.0616E-13	0.0	4.49012	0.103352	-0.578262	0	-2147483648
CXO J123121.8+012351	12 31 21.9	01 23 51.6	19.4628	19.4628	0.0	F	F	F	1.26626E-13	1.86194E-13	6.73728E-14	4.65975	-0.0447096	-0.59255	0	-2147483648
CXO J123125.0+020435	12 31 25.1	02 04 35.2	12.2374	12.2374	90.0	F	F	F	2.66016E-14	3.67899E-14	1.64977E-14	3.0404	0.276224	-0.252146	1	-2147483648
CXO J123128.6+013524	12 31 28.7	01 35 24.5	1.22546	1.22546	0.0	F	F	F	2.28048E-14	3.14956E-14	1.57478E-14	3.02053	0.205624	-0.0909162	1	-2147483648

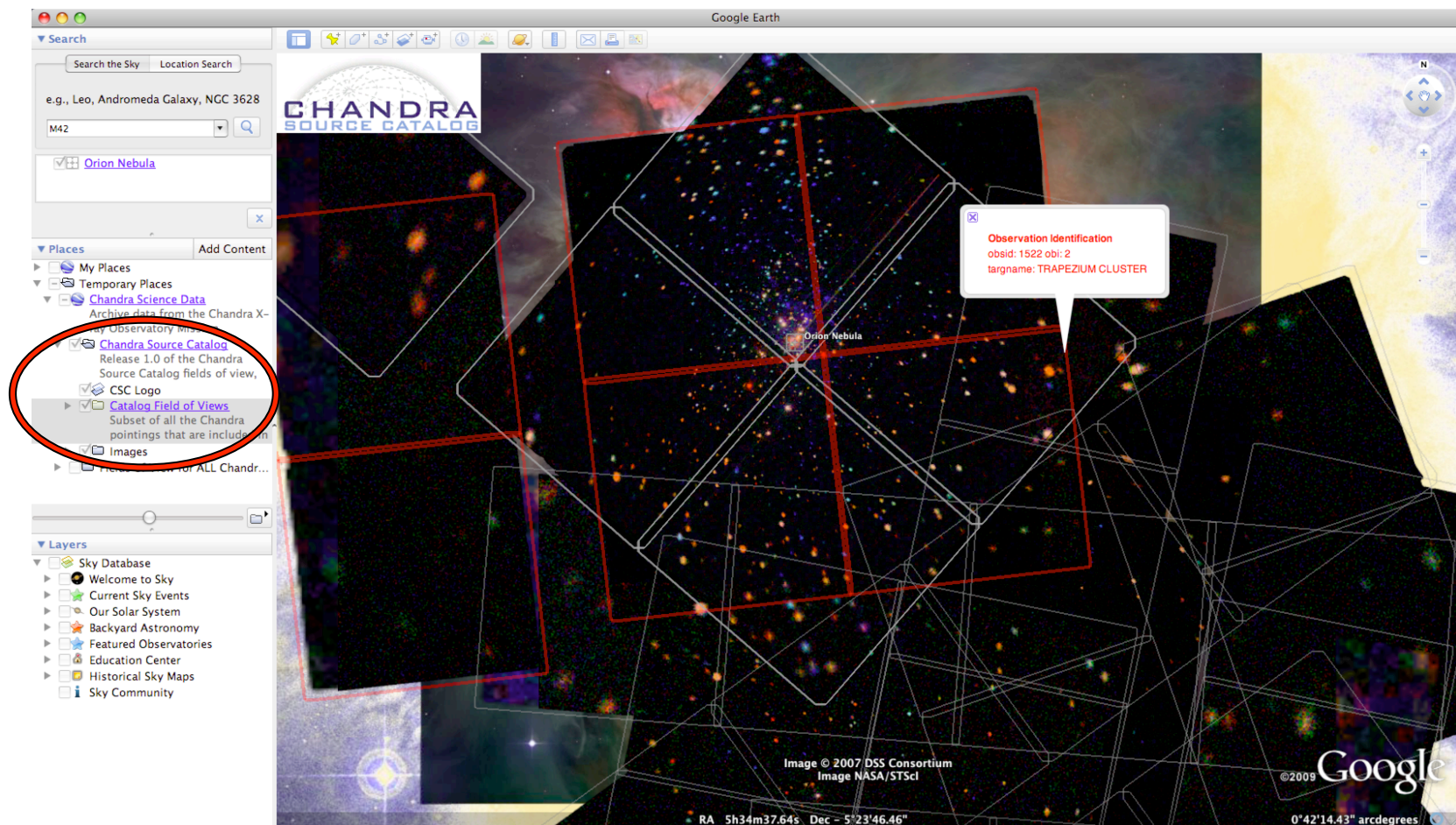


- TOPCAT can read a CSC data table or query the CSC directly via the SCS interface
  - The results can be displayed as a table, or the source properties can be plotted
- Selected sources can be communicated to/from other SAMP-enabled tools such as ds9

name	ra	dec	err_ellipse_r0	conf_flag	sat_src...	flux_aper90_b	flux_aper90_lo...	flux_aper90_hili...	significance	flux
CXO J053511.7-052155	05 35 11.78	-05 21 55.47	0.36	<input checked="" type="checkbox"/>	<input type="checkbox"/>	9.68700E-16	6.87000E-16	1.25000E-15	6.02	3
CXO J053511.7-052330	05 35 11.71	-05 23 30.46	0.46	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.92100E-15	3.10000E-15	4.75000E-15	4.36	4
CXO J053511.7-052333	05 35 11.73	-05 23 33.31	0.11	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.33600E-14	1.27300E-14	1.40000E-14	10.68	1
CXO J053511.7-052340	05 35 11.71	-05 23 40.25	0.07	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.44900E-14	1.40900E-14	1.49000E-14	20.27	1
CXO J053511.7-052512	05 35 11.72	-05 25 12.64	0.15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.79000E-14	1.68800E-14	1.89400E-14	9.49	1
CXO J053511.7-052730	05 35 11.79	-05 27 30.78	0.51	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.15400E-15	1.89600E-15	2.41500E-15	5.8	2
CXO J053511.8-051725	05 35 11.86	-05 17 25.66	0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.50600E-14	2.44100E-14	2.57200E-14	22.66	2
CXO J053511.8-051926	05 35 11.89	-05 19 26.03	0.09	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.02500E-13	1.01200E-13	1.03900E-13	38.22	1
CXO J053511.8-052001	05 35 11.89	-05 20 01.75	0.29	<input type="checkbox"/>	<input type="checkbox"/>	4.04900E-15	3.77100E-15	4.32900E-15	8.69	3
CXO J053511.8-052100	05 35 11.85	-05 21 00.09	0.08	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5.36500E-14	5.25800E-14	5.47300E-14	25.64	5
CXO J053511.8-052103	05 35 11.88	-05 21 03.19	0.06	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.66000E-13	1.64300E-13	1.67700E-13	46.55	1
CXO J053511.8-052149	05 35 11.80	-05 21 49.04	0.05	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.04600E-12	2.03900E-12	2.05300E-12	194.43	2
CXO J053511.8-053154	05 35 11.89	-05 31 54.94	0.2	<input type="checkbox"/>	<input type="checkbox"/>	9.27100E-14	9.16200E-14	9.38100E-14	47.72	9
CXO J053511.9-052032	05 35 11.97	-05 20 32.83	0.06	<input type="checkbox"/>	<input type="checkbox"/>	2.92600E-13	2.90500E-13	2.94800E-13	68.6	2
CXO J053511.9-052253	05 35 11.97	-05 22 53.92	0.25	<input type="checkbox"/>	<input type="checkbox"/>	8.11900E-15	7.23100E-15	9.01700E-15	8.45	8
CXO J053511.9-052845	05 35 11.94	-05 28 45.03	0.42	<input type="checkbox"/>	<input type="checkbox"/>	4.90000E-15	4.56100E-15	5.24300E-15	8.28	5
CXO J053511.9-052932	05 35 11.95	-05 29 32.27	0.47	<input type="checkbox"/>	<input type="checkbox"/>	3.11500E-15	2.81700E-15	3.41500E-15	11.32	4

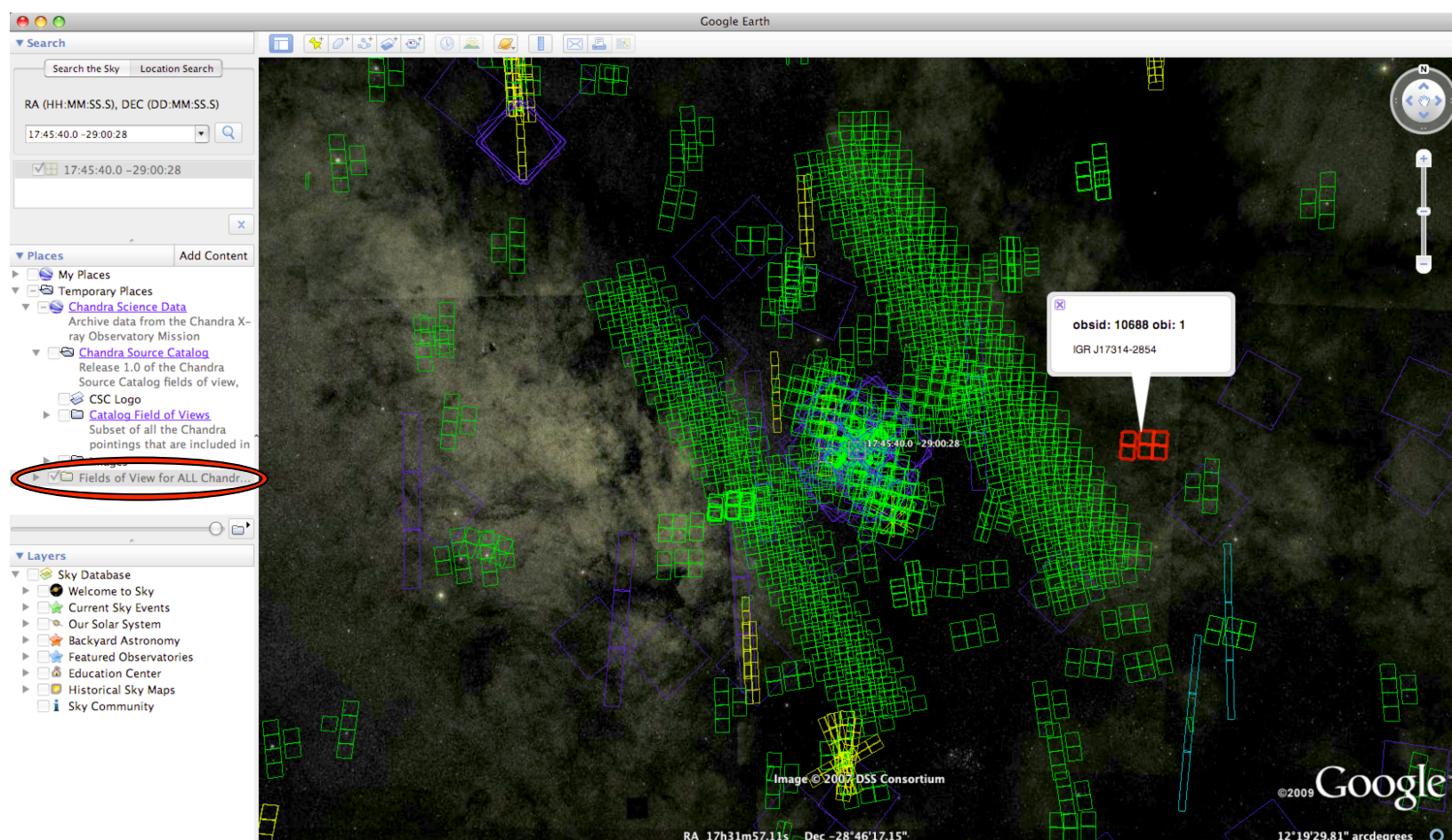
## CSC Sky in Google Earth

- CSC Sky in Google Earth displays fields of view (FoVs) and images of all observations included in the CSC
  - Displays images in Google Earth 5.0 or later, which is available on a wide variety of user platforms
  - Beta release (July 28) provided 3-color images of all observations included in CSC release 1, together with FoV boundaries
  - Display can be zoomed out to show all FoVs over a wide sky area, or zoomed in to display images with  $\sim$ arcsecond pixel scale
    - Display of images can be enabled/disabled at the single observation level
  - FoVs can be selected and basic information about observation is displayed
  - New release (week of October 26) can optionally display FoVs (but *not* images) for all completed Chandra observations
  - Next release will include pop-up balloons that display key data for each catalog master source
    - May eventually be able to retrieve data products via this interface also



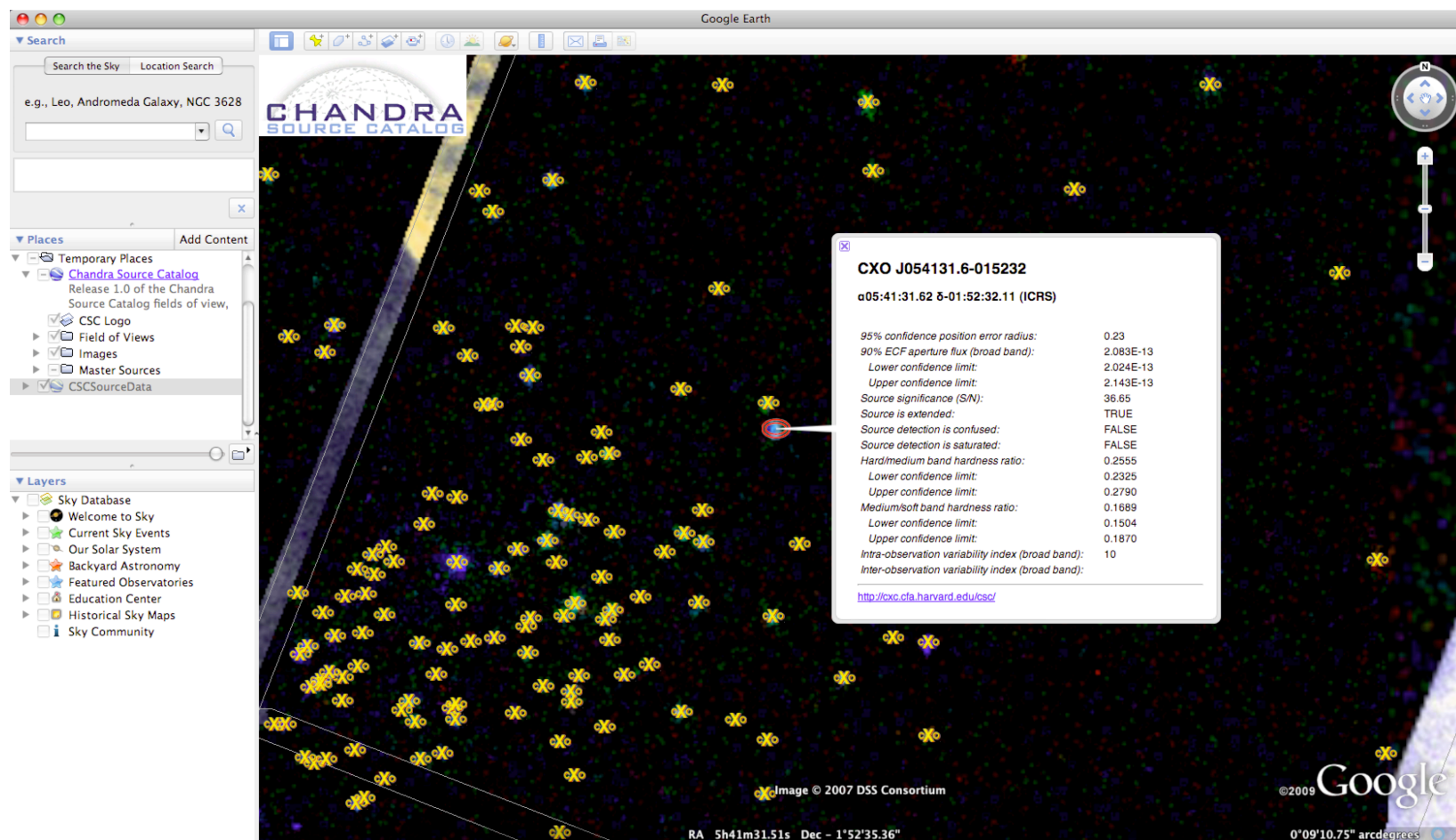
CSC Sky in Google Earth displays FoVs and images of all observations included in the CSC

- Zoom out to show all FoVs over a wide sky area, or zoom in to arcsecond scale
- FoV can be selected and basic information about observation is displayed



Latest release of CSC Sky in Google Earth optionally displays FoVs for all observations

- FoVs are color-coded (**ACIS imaging**, **ACIS spectroscopy**, **HRC imaging**, **HRC spectroscopy**)
- CSC and “All” FoVs can be displayed independently



- The next release of CSC Sky for Google Earth will include pop-up balloons that display the primary source properties for each master source
  - These balloons could be enhanced to display spectra, light-curves etc., and eventually may provide direct links to allow FITS data products to be retrieved also



## Additional Catalog Interfaces

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### CSC-SDSS Source Cross-Match

- Source position cross-match between CSC release 1.0 and SDSS DR 7
  - Collaborative effort with SDSS, who performed the source matching at JHU
    - Will be available from both CSC and SDSS web-sites
  - ~17,000 matches (~8,000 stars/9,000 galaxies, according to SDSS classification)
  - Should be available for use very soon

### Limiting Sensitivity Service

- Allows users to determine whether a position (or set of positions) is included in any of the fields of view that comprise the catalog, and determine the minimum flux required for a point source to be included in the catalog at that position
  - Downloadable user script has been available on the CSC website for ~4 months
    - Provides limited capabilities, some caveats (only provides ACIS broad band sensitivity, blocked by ~30 arcsec pixels)
  - Prototype web-based user interface (based on the script) developed
  - Should be available for use soon; makes use of upcoming CDA footprint service

### SIAP and SSAP

- IVOA Simple Image Access and Simple Spectral Access Protocols
  - SIAP will provide URL access to fluxed images from observations included in the catalog (similar to the existing CDA SIAP interface for observation images)
  - SSAP will provide URL access to PI spectra for individual catalog sources
  - SIAP will be available in the near term, followed by SSAP

NAME	OBJID	SEPARATION	PROBABILITY	RA	DEC	FLUX_APER90_B	FLUX_APER90_LOLIM_B	FLUX_APER90_HILIM_B	RA_SDSS	DEC_SDSS	R	ERR_R
string	int	float (arcsec)	float	string (hms)	string (dms)	float (erg cm <sup>-2</sup> s <sup>-1</sup> )	float (erg cm <sup>-2</sup> s <sup>-1</sup> )	float (erg cm <sup>-2</sup> s <sup>-1</sup> )	float (deg)	float (deg)	float (mag)	float
CXO J000230.7+004959	58773118727955083	0.133999	0.999112	00 02 30.71	+00 49 59.18	1.352e-13	1.241e-13	1.465e-13	0.627974	0.83307	18.118612	0.007233
CXO J001115.2+144601	587730773889974538	0.032566	0.999503	00 11 15.24	+14 46 01.84	2.341e-13	2.135e-13	2.549e-13	2.813485	14.767169	19.628693	0.016388
CXO J002025.2+154054	588290881639350397	0.119148	0.999255	00 20 25.22	+15 40 54.60	2.629e-13	2.53e-13	2.729e-13	5.105085	15.681865	17.429222	0.005358
CXO J002042.5+153409	587730774964699322	0.4933	0.958833	00 20 42.58	+15 34 09.33	7.214e-14	6.536e-14	7.899e-14	5.177554	15.56929	20.418751	0.027714
CXO J002207.4+002307	587731186743181881	0.307324	0.99287	00 22 07.47	+00 23 07.90	1.696e-14						
CXO J002209.9+001629	587731186743181377	0.058588	0.997874	00 22 09.96	+00 16 29.32	5.327e-14						
CXO J002211.8+001950	587731186743181929	0.06898	0.997182	00 22 11.87	+00 19 50.71	1.728e-14						
CXO J002222.8+001050	588015509271806427	0.203463	0.991555	00 22 22.83	+00 10 50.96	4.695e-14						
CXO J002231.7+002538	588015509808676921	0.182698	0.998249	00 22 31.74	+00 25 38.78	5.235e-14						
CXO J002235.9+001850	587731186743247121	0.211218	0.997755	00 22 35.97	+00 18 50.23	4.804e-14						
CXO J002244.4+001825	587731186743247017	0.188826	0.998351	00 22 44.46	+00 18 25.76	2.4e-13						
CXO J002245.3+002922	588015509808742800	0.374865	0.991518	00 22 45.34	+00 29 22.16	3.524e-14						
CXO J002253.2+001659	587731186743312489	0.195219	0.997308	00 22 53.27	+00 16 59.93	4.088e-14						
CXO J003704.1-010908	588015507662831743	0.175563	0.998555	00 37 04.10	-01 09 08.45	2.366e-13						
CXO J003711.2-011054	588015507662831763	0.135657	0.999087	00 37 11.25	-01 10 54.46	1.141e-13						
CXO J003937.6+005110	588015510347448342	0.035488	0.999317	00 39 37.60	+00 51 10.23	9.984e-14						
CXO J004038.0-093910	587727226768261235	0.305196	0.991539	00 40 38.01	-09 39 10.37	1.135e-13						
CXO J004217.8-093950	587727226768457868	0.337471	0.99088	00 42 17.80	-09 39 50.62	1.707e-13						
CXO J004341.4+005610	588015510347907192	0.134112	0.999067	00 43 41.49	+00 56 10.10	2.723e-13						
CXO J004350.2+005750	588015510347907565	0.217135	0.997832	00 43 50.25	+00 57 50.94	2.595e-13						
CXO J004508.1+143933	587724198276104317	0.065931	0.998165	00 45 08.18	+14 39 33.46	1.305e-13						
CXO J005104.8-010152	587731185135779968	0.146507	0.99893	00 51 04.86	-01 01 52.25	2.27e-13						
CXO J005905.5+000651	588015509275803698	0.132321	0.998595	00 59 05.51	+00 06 51.54	1.71e-12						
CXO J011431.0+002621	588015509814379094	0.136685	0.996324	01 14 31.01	+00 26 21.36	3.516e-14						
CXO J011515.7+001248	587731513142673426	0.213709	0.997919	01 15 15.78	+00 12 48.71	4.044e-14						
CXO J011522.1+001518	587731513142673682	0.349114	0.972347	01 15 22.17	+00 15 18.84	1.488e-13						
CXO J011537.7+002029	587731513142673569	0.372518	0.993439	01 15 37.71	+00 20 29.02	1.128e-13						
CXO J011544.8+001400	587731513142739062	0.325354	0.994877	01 15 44.85	+00 14 00.31	9.835e-14						
CXO J011835.2-005738	587731511532388622	0.309452	0.995604	01 18 35.24	-00 57 38.36	1.033e-13						
CXO J011847.6-010113	587731511532454097	0.129139	0.998959	01 18 47.67	-01 01 13.86	1.512e-14						
CXO J011853.6-010007	587731511532453955	0.176067	0.998587	01 18 53.61	-01 00 07.16	1.917e-14						
CXO J011853.9-010254	587731511532454195	0.161173	0.998815	01 18 53.90	-01 02 54.14	5.962e-14						
CXO J011901.6-005941	587731511532454210	0.135489	0.998935	01 19 01.61	-00 59 41.57	2.066e-14						
CXO J012250.2+004243	587731513680330851	0.371781	0.991061	01 22 50.25	+00 42 43.10	7.663e-12						
CXO J012341.4+004435	587731513680462055	0.212142	0.997546	01 23 41.46	+00 44 35.99	3.483e-13						
CXO J012351.9+004929	587731513680461866	0.46956	0.989821	01 23 51.91	+00 49 29.08	6.81e-14						
CXO J012555.4-011118	588015507668140303	0.281933	0.993594	01 25 55.42	-01 11 18.21	5.329e-14						
CXO J013408.3+002011	587731513144705291	0.09371	0.996551	01 34 08.32	+00 20 11.21	9.746e-14						
CXO J013418.1+001536	587731513144770582	0.08264	0.999443	01 34 18.19	+00 15 36.60	5.914e-13						

**Chandra Source Catalog/Sloan Digital Sky Survey**

**Cross-Match Catalog Query**

This page allows users to query the CSC-SDSS Cross-Match Catalog subject to search constraints and ordering specification. The results are returned as a HTML table, a tab-delimited ASCII file, or a fixed width ASCII file. The first two rows of the output table contain the column names and the column types (and units where applicable), unless the "Data Only" box is checked.

There are four steps:

- Select items to be returned (default: all)
- Specify selection criteria (default: all data)
- Specify how the table with results will be sorted (default: Name)
- Submit query

**Select items to be returned (default: all)**

[Check all](#) | [Uncheck all](#)

<p><b>Source identification and matching parameters</b></p> <p><input type="checkbox"/> NAME (CSC Name, string)</p> <p><input type="checkbox"/> NSID (CSC ID, int)</p> <p><input type="checkbox"/> OBJID (SDSS ID, int)</p> <p><input type="checkbox"/> SDSS_TYPE (3=Galaxy, 6=Star)</p> <p><input type="checkbox"/> SEPARATION (between CSC and SDSS positions (arcsec, float))</p> <p><input type="checkbox"/> BAYES_FAC (Bayes factor for match, float)</p> <p><input type="checkbox"/> PROBABILITY (Probability of correct match, float)</p> <p><b>SDSS parameters</b></p> <p><input type="checkbox"/> RA_SDSS (deg), DEC_SDSS (deg)</p> <p><input type="checkbox"/> RA (u magnitude), ERR_U (error in u magnitude)</p> <p><input type="checkbox"/> G (g magnitude), ERR_G (error in g magnitude)</p> <p><input type="checkbox"/> R (r magnitude), ERR_R (error in r magnitude)</p> <p><input type="checkbox"/> I (i magnitude), ERR_I (error in i magnitude)</p> <p><input type="checkbox"/> Z (z magnitude), ERR_Z (error in z magnitude)</p>	<p><b>CSC parameters</b></p> <p><input type="checkbox"/> SIGNIF_CANCE (Flux significance, float)</p> <p><input type="checkbox"/> RA (deg), DEC (deg)</p> <p><input type="checkbox"/> ERR_ELLIPSE_R0 (Position error, arcsec)</p> <p><input type="checkbox"/> GAL_L (deg), GAL_B (deg)</p> <p><input type="checkbox"/> CONF_FLAG (Confusion flag)</p> <p><input type="checkbox"/> EXTENT_FLAG (Extended source flag)</p> <p><input type="checkbox"/> MAJOR_AXIS_B (Decomvolved source size, arcsec), MAJOR_AXIS_ERR_B (arcsec)</p> <p><input type="checkbox"/> SAT_SRC_FLAG (Saturation/Flare-up flag)</p> <p><input type="checkbox"/> FLUX_APER90_B (B-band flux, erg cm<sup>-2</sup> s<sup>-1</sup>), FLUX_APER90_LOLIM_B, FLUX_APER90_HILIM_B (confidence limits)</p> <p><input type="checkbox"/> HARD_HM (Hardness ratio h-m band)</p> <p><input type="checkbox"/> HARD_LS (Hardness ratio l-s band)</p> <p><input type="checkbox"/> HARD_HS (Hardness ratio h-s band)</p> <p><input type="checkbox"/> VAR_INTRA_INDEX_B (Intra-observation variability index for B-band, int)</p> <p><input type="checkbox"/> VAR_INTER_INDEX_B (Inter-observation variability index for B-band, int)</p>
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**Enter Optional Selection Criteria (default: all data)**

Specify restrictions on the values of the parameters above (e.g. **SDSS\_TYPE=3** and **SEPARATION<=0.04** may be empty, meaning no restrictions); one may use relational operators (=, !=, >, <, BETWEEN), logical operators (OR, AND, NOT), combined with parentheses.

separation < 0.5 and significance > 10

**Additional optional selection criterion: Cone Search**

RA	Dec	Search Radius
<input type="text"/>	<input type="text"/>	<input type="text"/>
(decimal degrees)	(decimal degrees)	(arcmin)

**Enter the Order in Which the Output List is to Be Sorted (default: Name)**

(A comma-separated list of columns (see above) to sort on; may be empty)

**Output Format**

Data Only

tab-delimited  HTML table  fixed width

One can query the SDSS DR7 catalog through an SQL CLI at: <http://cas.sdss.org/astro7/en/help/download/sql/>

Or in one's browser: <http://cas.sdss.org/astro7/en/tools/search/sql.asp>

The table columns may be browsed at: <http://cas.sdss.org/astro7/en/help/browser/browser.asp>

After going to Views, one may want to look especially at Galaxy (SDSS type 3) and Star (SDSS type 6) and use the OBJID to identify the sources in the SDSS catalog.

Additional interfaces to the Chandra Source Catalog are available at: <http://cxc.harvard.edu/csc/>

The CSC-SDSS (DR7) source cross-match query prototype web-based user interface

## CSC Sensitivity Map Values (Broadband)

Enter RA and Dec. in degrees:

R.A.

Dec.

Choose a file to upload:

Note: Large files (> ~10,000 sources) may need to be split into multiple, smaller files if an upload error occurs.

## CSC Sensitivity Data for File: radec.txt

Healpix #	Input RA	Input Dec	Healpix RA	Healpix Dec	Sensitivity
21889	42.136322	89.401357	42.136329	89.401356	1.372809e-06
21890	42.967606	89.400383	42.967606	89.400383	4.980673e-06
22306	39.578599	89.394786	39.578599	89.394786	3.239705e-06
22307	40.404418	89.394201	40.404418	89.394201	6.428216e-06
22736	44.500478	89.389406	44.500478	89.389406	8.726818e-06
29587	46.652372	89.300946			

- Currently, a user can determine whether a position or list of positions is included in the catalog using a downloadable tool
  - Returns the ACIS broadband sensitivity in photons cm<sup>-2</sup> s<sup>-1</sup>
  - HEALpix size is 30 arcsec, so sources near the edges of a field may not be correctly reported

- Prototype web interface (left) will allow specification of (RA, Dec) or upload of a file containing a list of (RA, Dec) pairs
  - Results returned as a file or displayed as a table
  - Interim plan is to use the Chandra Data Archive footprint service to identify for the user any positions that are in the uncertain area (the CDA footprint service is currently under development)
  - Longer term plan is to provide a limiting sensitivity service for all energy bands, based on a significantly smaller pixel size

## Short Term Plans

- Catalog Releases
  - Release 1.1 (early 2010) extends release 1 to include public HRC-I imaging observations, and newly public ACIS observations, but otherwise retains the same limitations as release 1
- Public Interfaces
  - CSCview GUI
    - Additional output file formats for query results (*e.g.*, VOTable)
    - JPEG quick image display, spectral and lightcurve plots
    - Support for cross-matching with user supplied catalogs
    - IVOA SAMP interface for communications with other applications
  - CSC Sky in Google Earth
    - Next release will include pop-up balloons that display key data for each catalog master source
  - Web Services
    - Catalog limiting sensitivity/footprint services – preliminary; detail dependent on archive footprint
    - SIAP and SSAP
  - External Interfaces
    - Working with CDS Strasbourg to provide access to a subset of catalog master source properties through Vizier
      - » Expect to complete after version 1.1 is released
    - Inclusion of catalog sources in SIMBAD is evidently more complex
      - » Requires CDS to verify sources and cross-match with other SIMBAD catalogs
    - HEASARC Browse (?)

## Longer Term Plans

- Catalog releases
  - Catalog release 2
    - Co-add multiple observations of the same field that use the same instrument prior to source detection to achieve fainter limiting sensitivities
    - Improve background modeling, particularly in areas of extended emission
    - Improve aperture photometry in crowded fields
    - Improve extended source handling
  - Future releases
    - Simultaneous source detection across overlapping observations with different detectors and pointings (and thus very different local PSFs)
    - Detection and classification of very extended sources
- Detailed plans for release 2 are not fully established
  - Recently began a series of investigations and production experiments to evaluate methods for more robustly handling observation background, and reliably detecting sources from stacked data sets
    - Expect to report progress in these areas at the next CUC meeting