

The logo features a stylized, semi-circular background composed of a grid of dashed lines, resembling a celestial map or a data visualization. The word "CHANDRA" is written in a large, bold, dark blue sans-serif font across the top. Below it, the words "SOURCE CATALOG" are written in a smaller, light blue sans-serif font.

**CHANDRA**  
SOURCE CATALOG

**Jonathan McDowell**

After 18 years Chandra has observed about 1% of sky

CSC1.1 (2010) 106,586 sources

Wavelet detect on single observations, no co-adding

Public data to end of 2009

Fields with large extended sources omitted

Published as Evans et al 2010 ApJS 189, 37

Primini et al 2011 ApJS 194,37

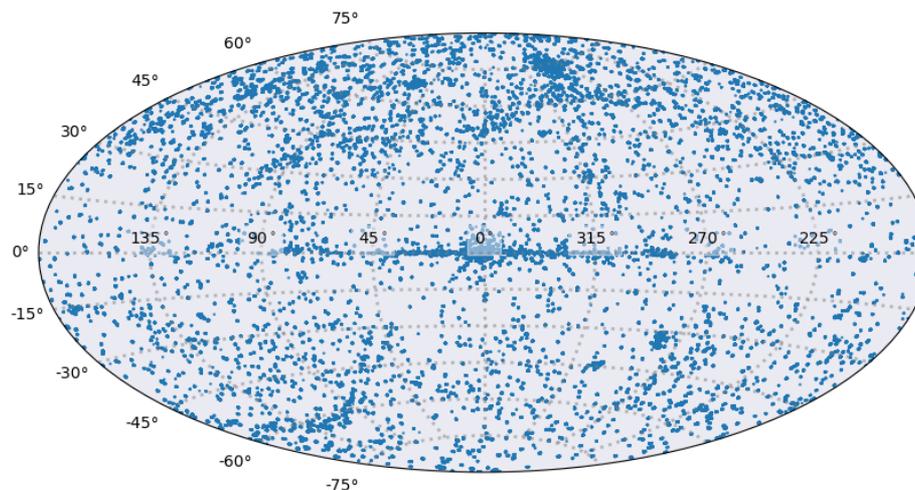
CSC2.0 (2017/18) 315,887 sources (TBR)

Wavelet + Max Likelihood detect on co-added observations

Public data to end of 2014

Fields whose aimpoint is within 1' are combined into 'stacks'

Overlapping stacks are processed together



## Current Release

- Catalog version: 1.1; Released: 2010 Aug 10
  - 106,586 master sources
  - 158,071 source detections
  - 5,110 observations with at least one detected source
- Subset of master source properties are available via HEASARC Browse, NED, and VizieR services
  - Usage statistics reported below do not include accesses via these services

## Usage Statistics

Release 1.1	Reporting Period 2015 Sep 01 – 2016 Mar 31	
	Number	% Non-CfA
<b>CSCview catalog browser initializations</b>	112 /month	92%
<b>CSCview catalog browser properties searches</b>	229 /month	93%
<b>Command-line (CLI) searches</b>	1865 /month*	65%
<b>VO cone searches</b>	6501 /month	~100%
<b>CSC Sky in Google Earth</b>	582 visits/month	

\* Excludes 20K searches (~ all non-CfA) from 2016 March

CSC:

5 bands

u 0.2–0.5 keV  
s 0.5-1.2 keV  
m 1.2-2.0 keV  
h 2.0-7.0 keV  
b 0.5-7.0 keV

2 apertures:

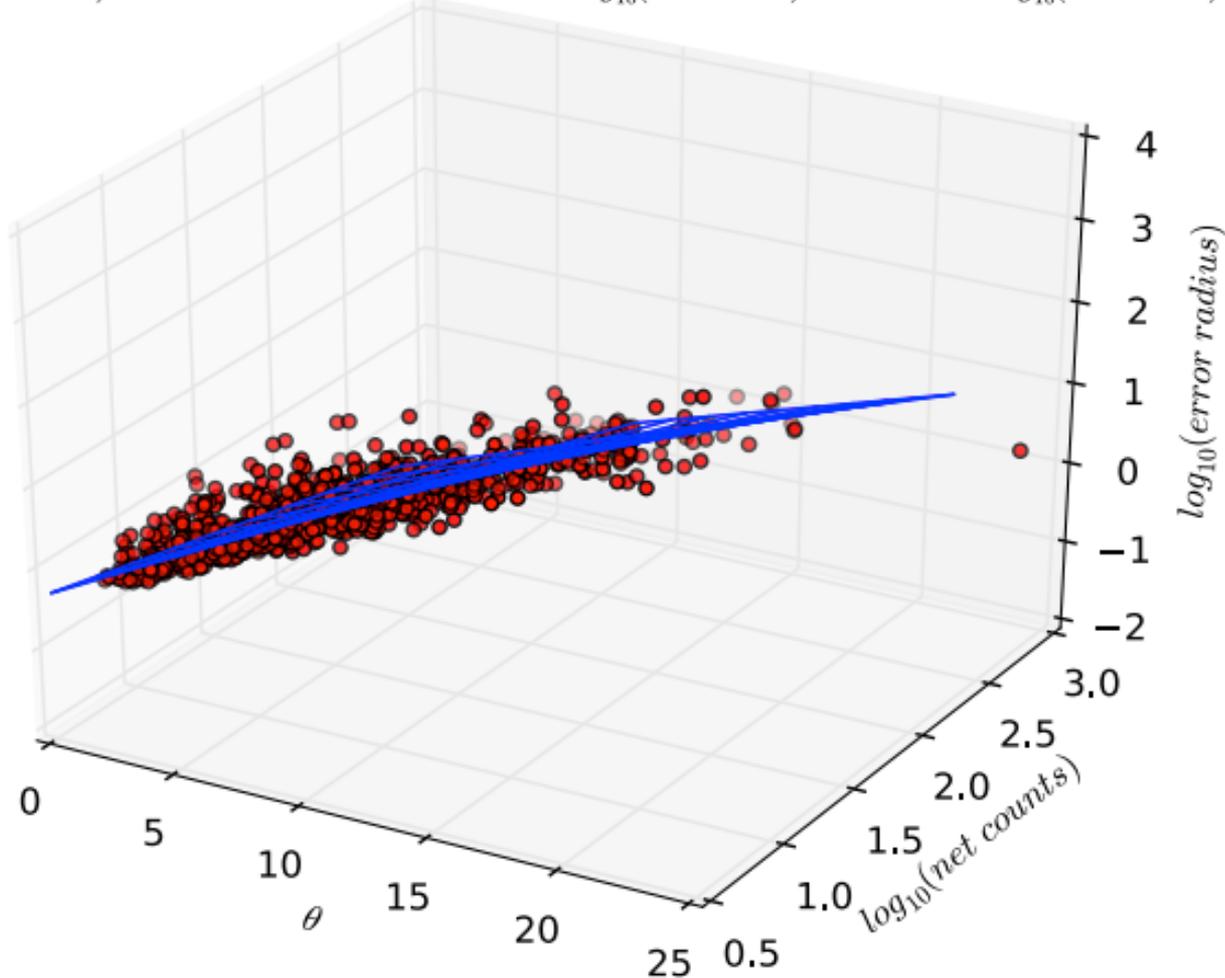
- detection aperture determined by wavelet detect
- aperture containing 90% of flux

3 flux methods:

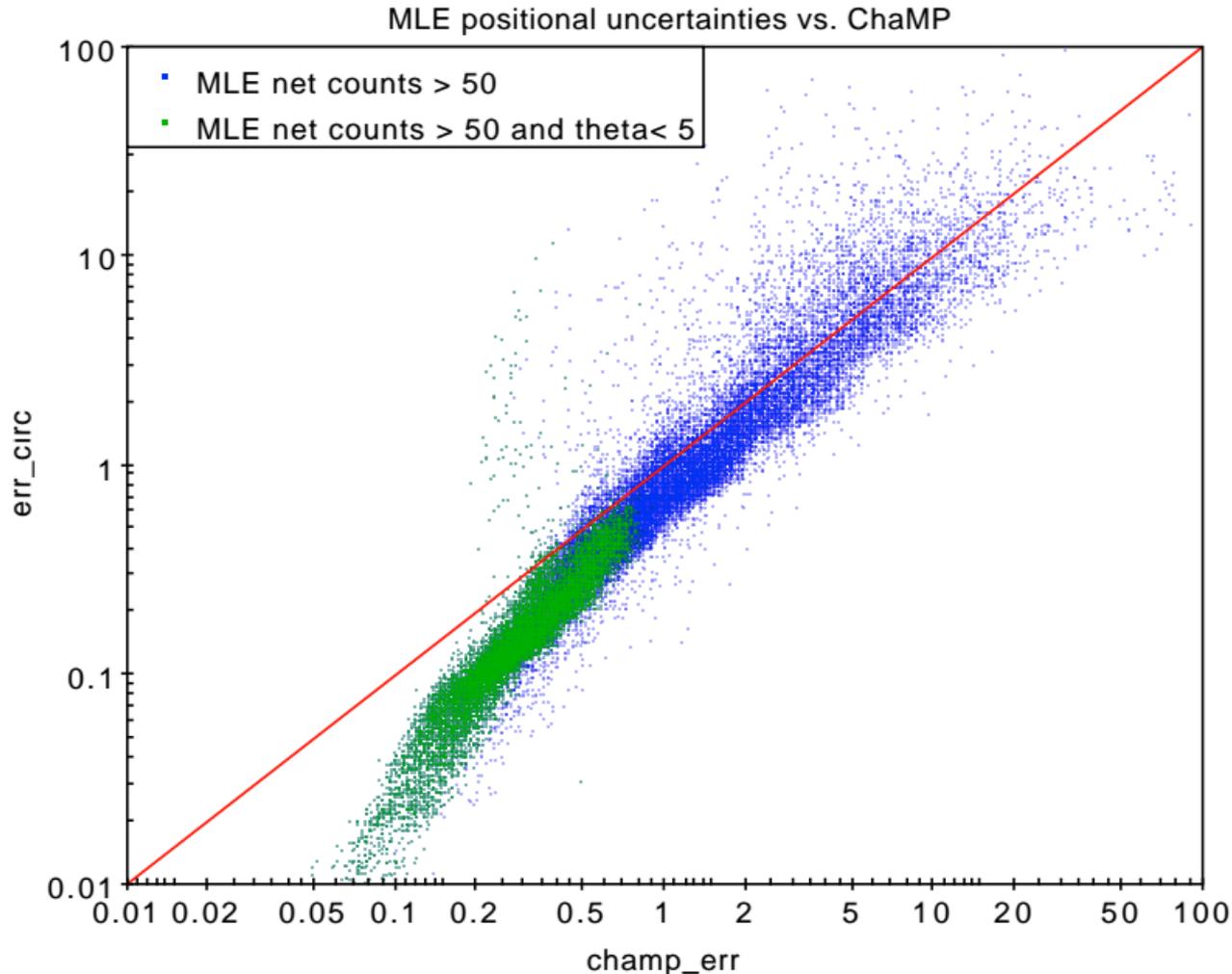
- spectral fits (if  $> 150$  net counts)
- power law fit with normalization free
- model-independent flux using ARF but ignoring RMF

# Radial Position Error Approximation

$$\log_{10}(\text{error radius}) = -0.031 + 0.173 \times \theta + -0.526 \times \log_{10}(\text{net counts}) + -0.023 \times \theta \times \log_{10}(\text{net counts})$$

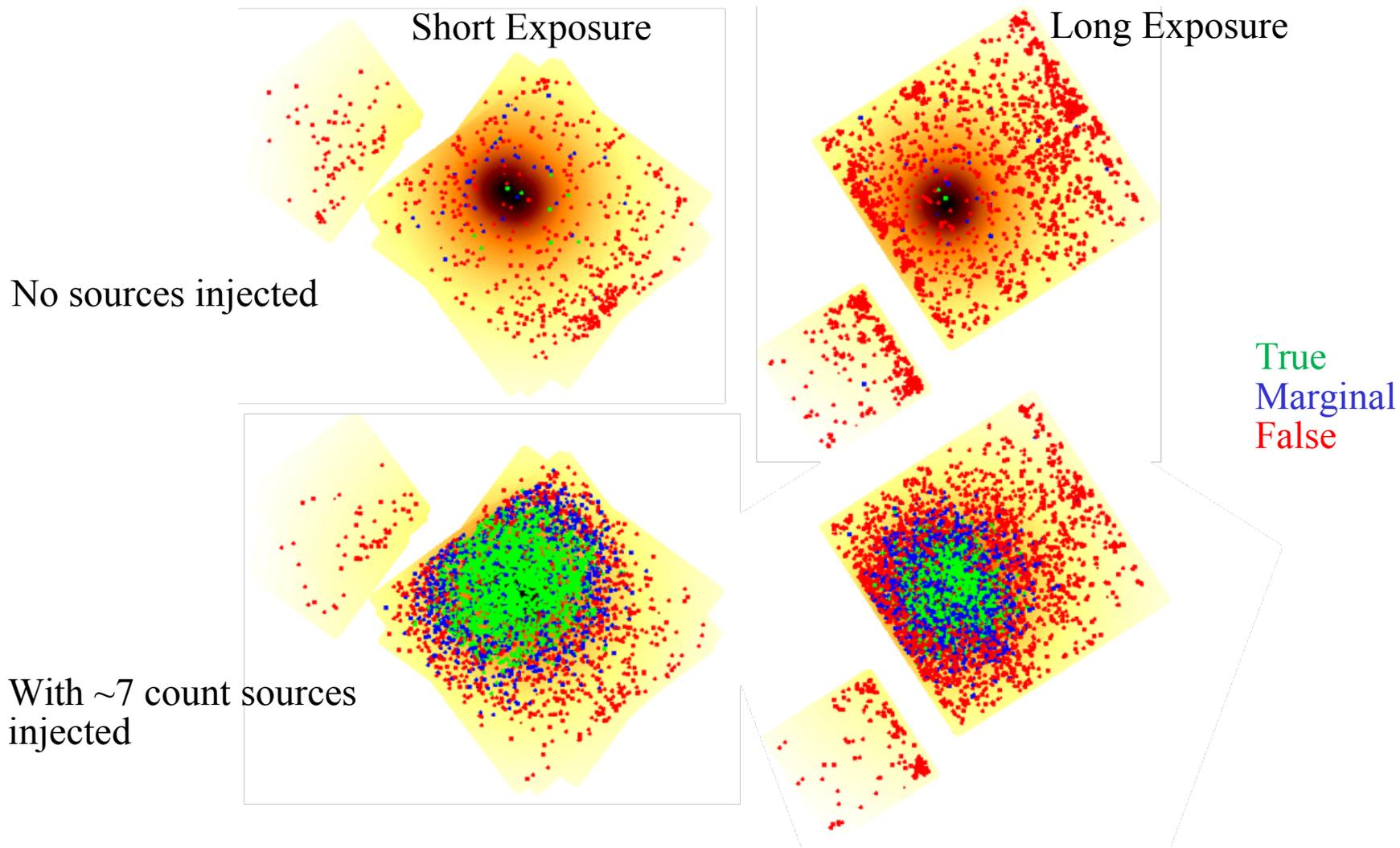


A radial (circular) position error approximation is used when the MCMC draws indicate that the error ellipse is not well defined. For sources with well-defined error ellipses, the radial position error surface is a good fit the geometric mean ellipse parameters. Only a small fraction of the data points are shown.

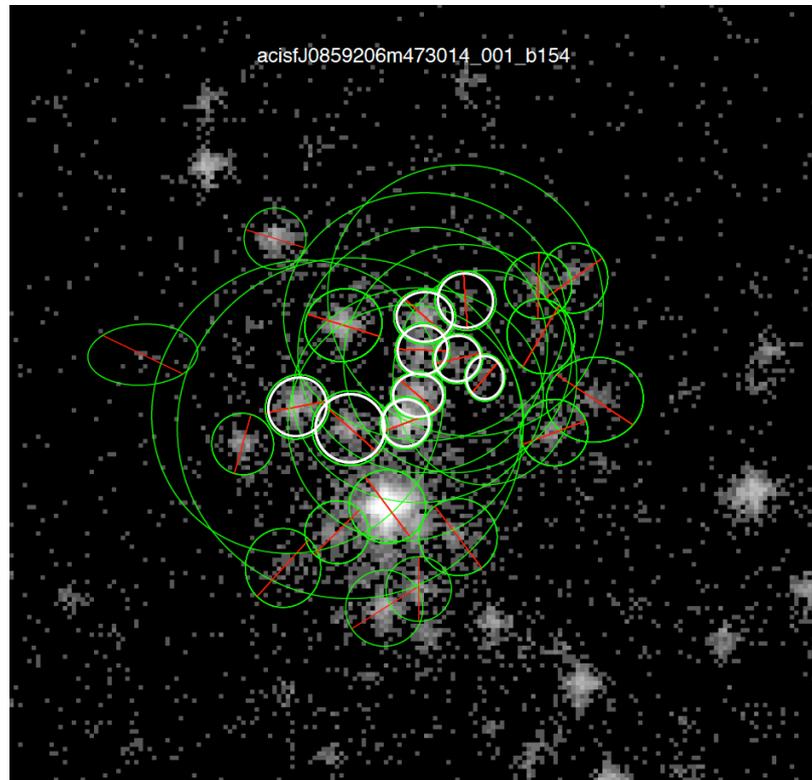


CSC2 internal position errors are smaller than the ChaMP errors used in CSC1 for sources with  $\geq 50$  net counts and  $\theta \lesssim 5$  arcmin

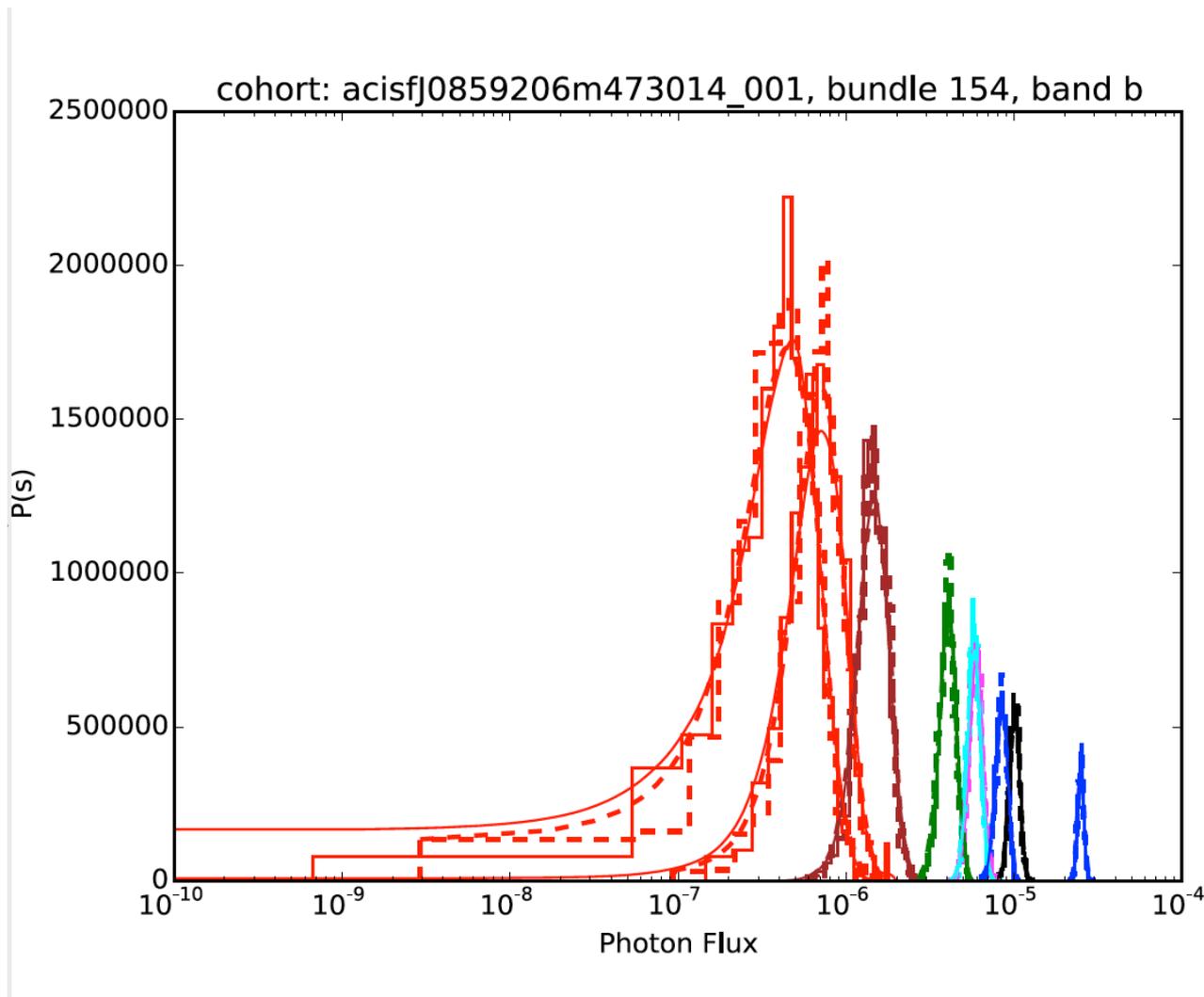
This plot does not include the absolute catalog astrometric position uncertainty ( $\sim 0.16$  arcsec for CSC1)



Detections from multiple simulations overlaid on PSF map

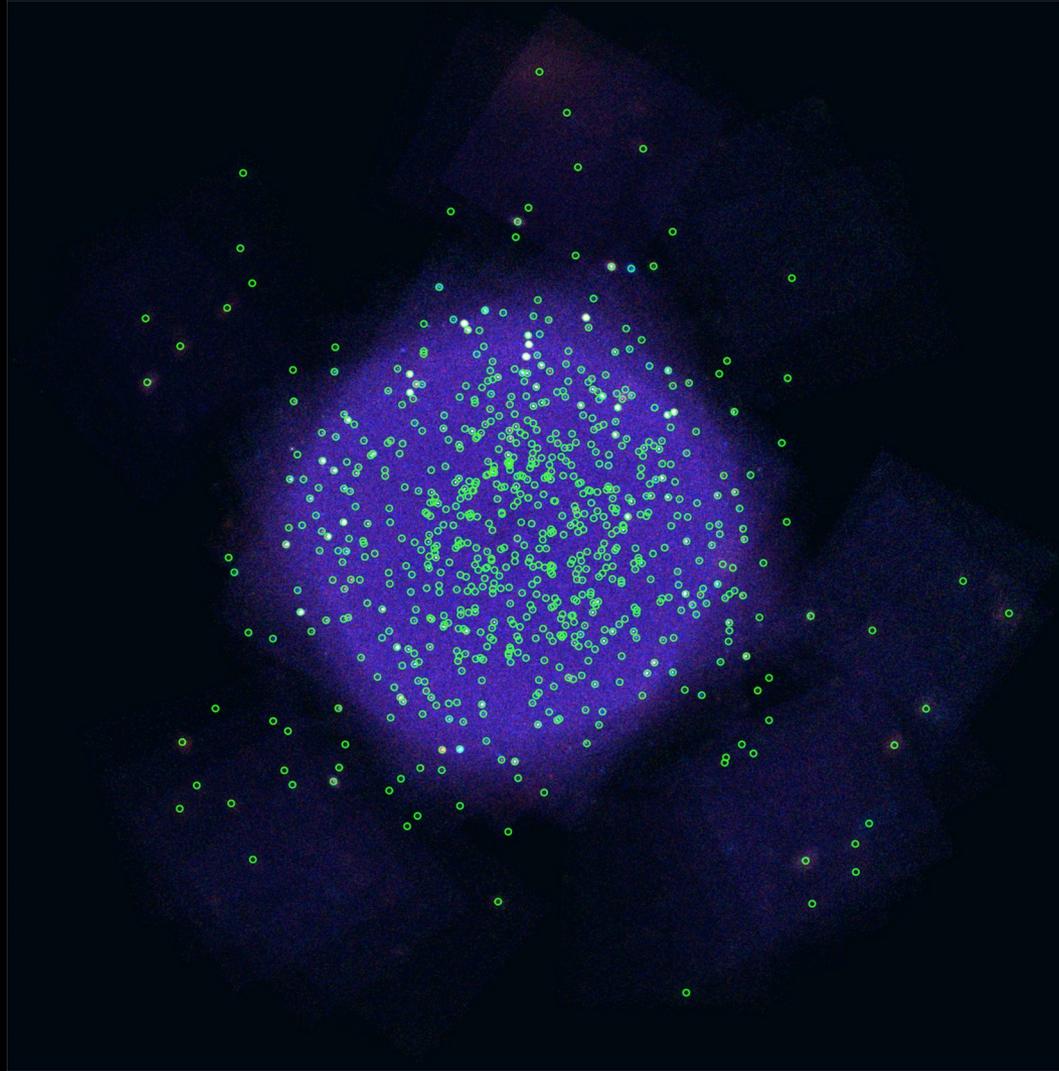


- Simultaneous photometry estimation in crowded field
  - Based on Primini, F. A.; Kashyap, V. L. 2014, ApJ, 796, 24
- Algorithm checked against simulations
- Pipeline results verified against published algorithm



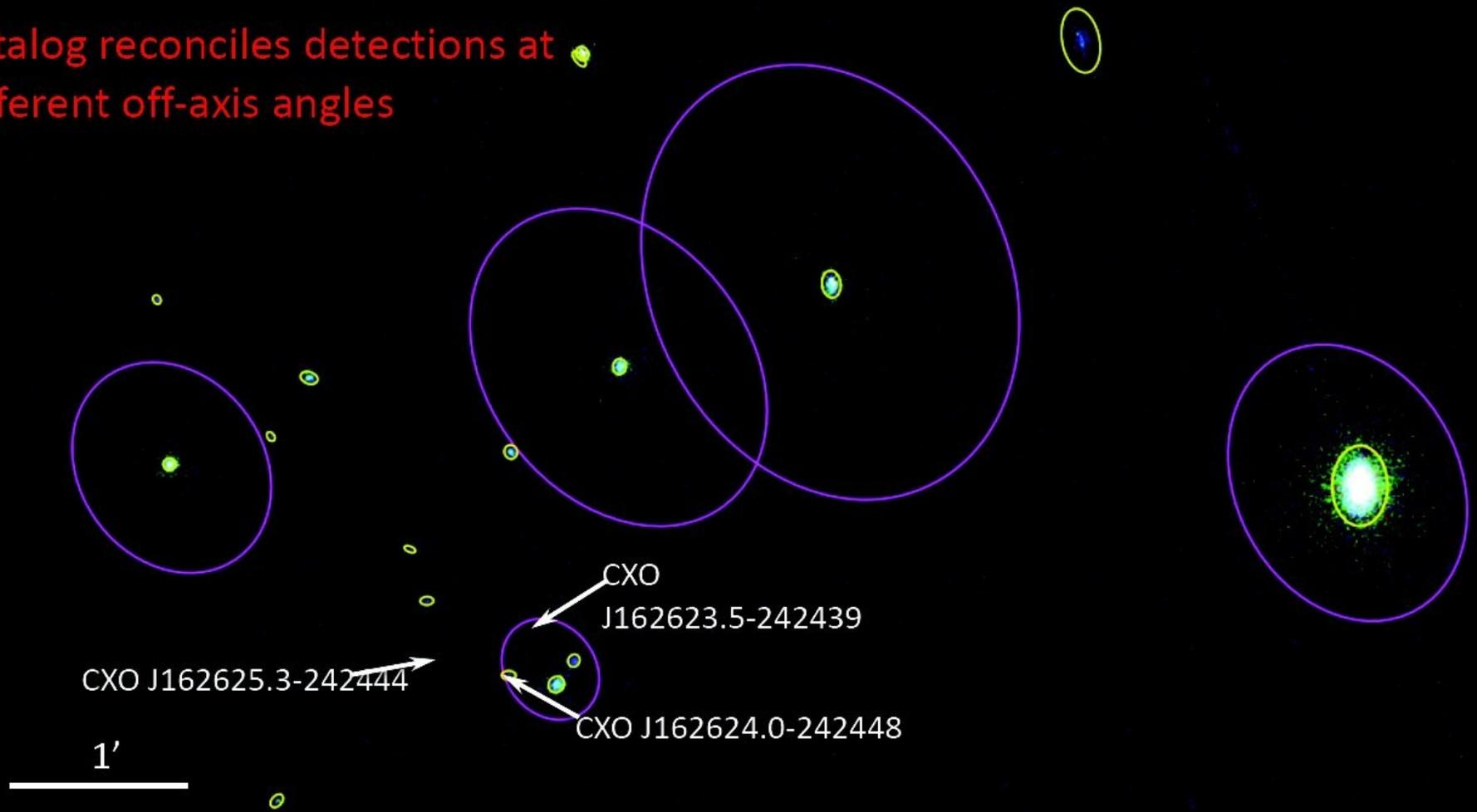
*Chandra Deep Field South (81 ObsId – 5.8 Ms)*

~1000 Preliminary detections



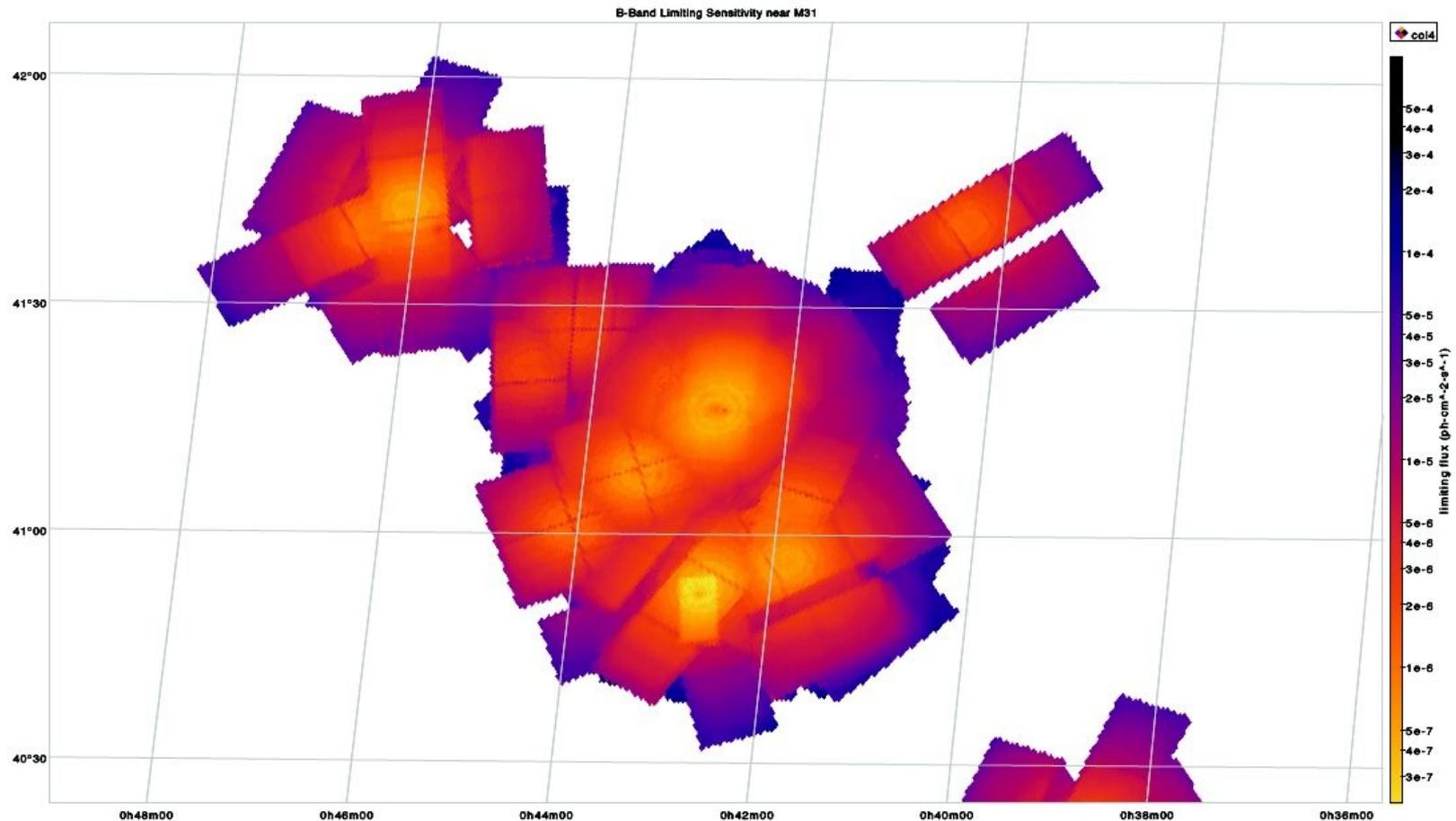
Multiple sources on-axis may be confused in the same field off-axis

Catalog reconciles detections at different off-axis angles

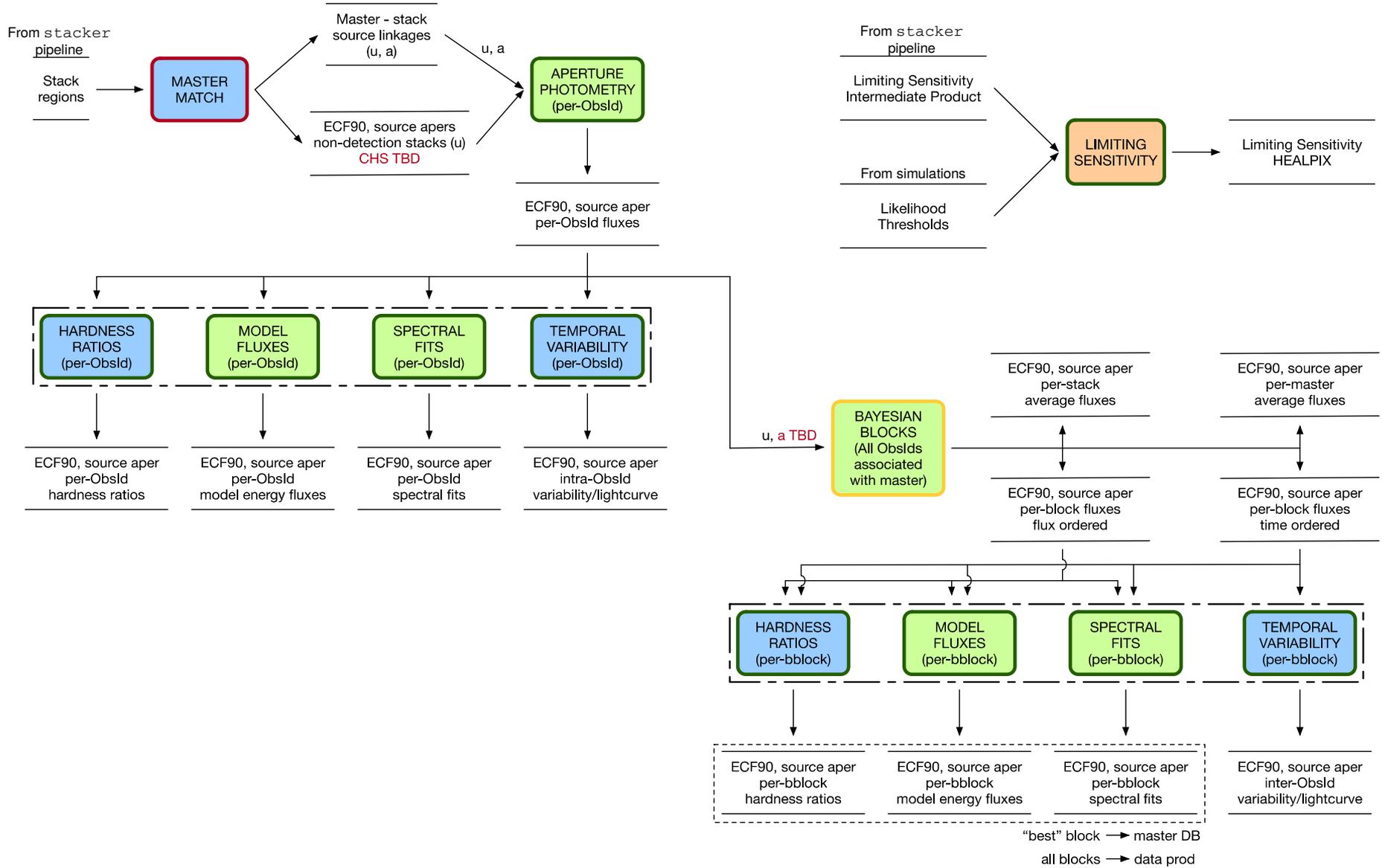


# Limiting Sensitivity Map

- For an observed)portion of the sky, we provide our best estimate of the *lowest value of the flux that would have been detectable* as a source in our catalog

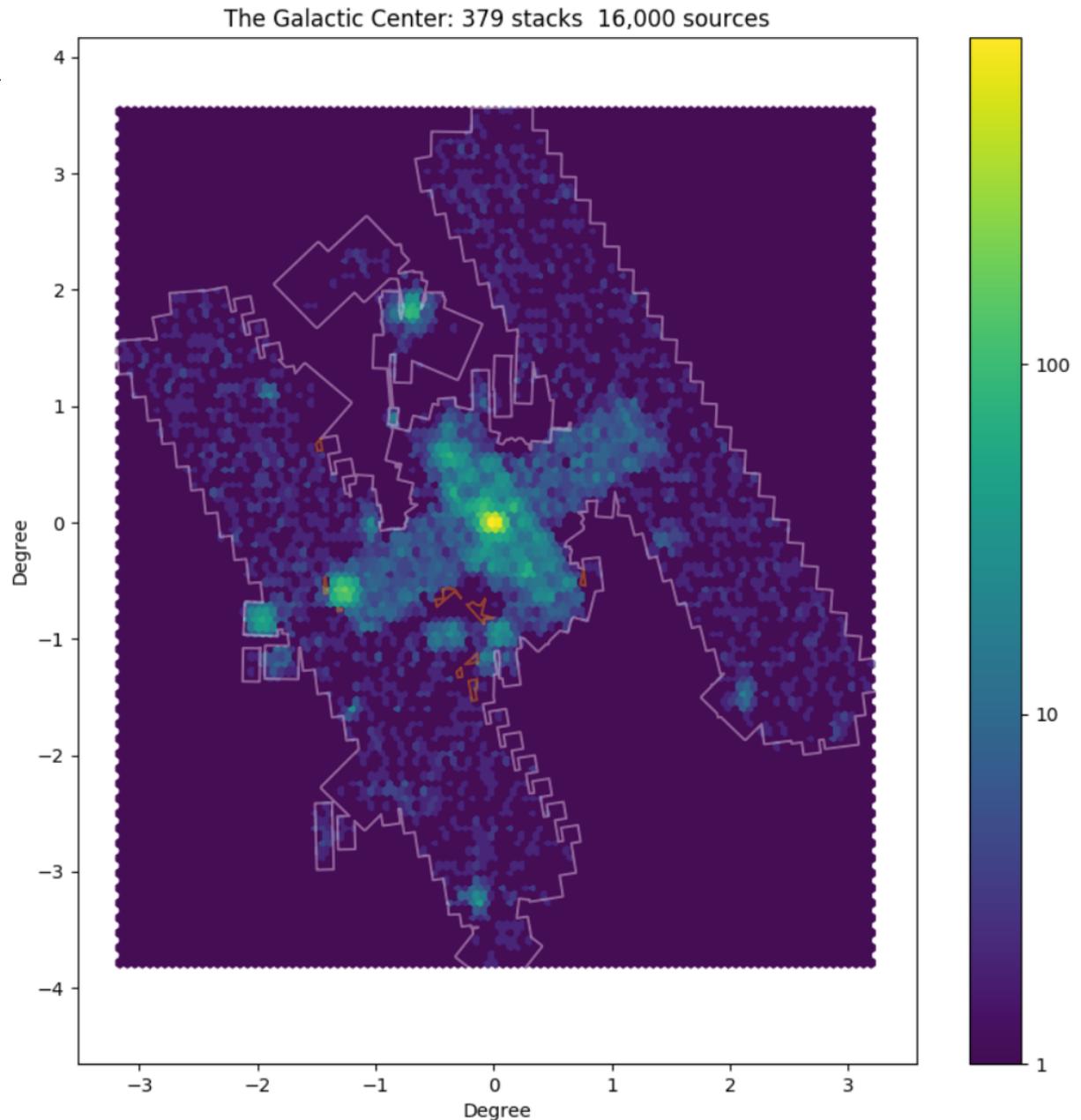


(Preliminary Map for CSC v2; F. Primini, priv. comm.)



# Sgr A\* Region Source Density

- Sgr A\* stacks detections included in pd2
- Map shows detection density (number of detections per pixel)



# How to get the data (1): CSC2 preliminary detections FITS table, available now at [cxc.cfa.harvard.edu/csc2/preliminary](http://cxc.cfa.harvard.edu/csc2/preliminary)



CHANDRA  
X-RAY OBSERVATORY

Last modified: 21 March 2017

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**CSC v2 Homepage >**  
[CSC 2.0 pd2 preliminary detections list \(September 2017\)](#) **NEW**  
[CSC 2.0 pd1 preliminary detections list \(March 2017\)](#)  
[CSC 2.0 pd0 preliminary detections list \(August 2015\)](#)  
**CSC v1 Homepage**

## Chandra Source Catalog Release 2.0 Preliminary Detections List

### Note

This is a work in progress! Be sure to [read the caveats](#) prior to using these data! The Spring 2016 CXC Newsletter article provides more information on the [state of version 2 of the Chandra Source Catalog](#).

### Contents

- [Data Access](#)
- [Column definitions](#)
- [Caveats](#)

### Data Access

The March 2017 release of the data is available at:

- [preliminary\\_detlist.fits.gz](#) (53.4 Mb compressed and 124.4 Mb uncompressed)

It contains the results of Maximum Likelihood Estimator (MLE) fits to the candidate source detections. The [column definitions](#) and [Caveats](#) for this file can be found below. The file contains 362182 detections, with 279549 labelled as SRC\_QUALITY = 'TRUE' and 82633 (23%) with SRC\_QUALITY = 'MARGINAL'. When split by EXT\_SRC\_CLASS, there are 358382 detections with a value of 'POINT', 3183 (0.9%) with 'EXTENDED', and 617 (0.2%) with 'POSSIBLE'. The breakdown by EBAND—the energy band corresponding to the measured values—there are 271687 broad band ('b'), 395 ultra-soft ('u'), 26995 soft ('s'), 26524 medium ('m'), 31297 hard ('h'), and 5284 wide (HRC) band ('w') rows; the [band definitions](#) are the same as in release 1. There are 354 detections with STREAK\_SRC\_FLAG = True.

### Column Definitions

```
unix% dmlist preliminary_detlist.fits blocks
-----
Dataset: preliminary_detlist.fits
-----
Block Name          Type          Dimensions
-----
Block 1:             Null
Block 2: DETLIST    Table         48 cols x 362182 rows
```

### DETLIST HDU: PRELIMINARY DETECTIONS LIST

Column name	Units	Comment	Example	Data type	FITS format	Notes
DETECT_ID		Stack_id.component	'acisfJ0123456p012345_001.0001'	string	29A	
LIKELIHOOD		Highest source log likelihood	100.0	double	1D	Highest source likelihood
SRC_QUALITY		Preliminary source quality	'TRUE'	string	8A	Values are 'TRUE' or 'MARGINAL' and are based on comparison of likelihood with draft catalog.

# How to get the data (2):

CSC1 site [cxc.cfa.harvard.edu/csc/](http://cxc.cfa.harvard.edu/csc/)

Search the CSC website



CHANDRA SOURCE CATALOG

- CSC Release 2
  - Home page
- CSC Data Access:
  - CSCView
  - CSCview Help
  - Command-line Interface
- CSC Sky in Google Earth
- CSC-SDSS Cross-match Catalog
- CSC Sensitivity Map Service

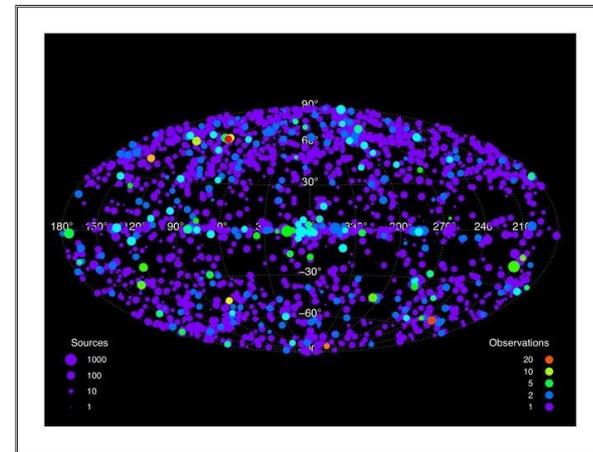
- [CSC Homepage](#)
- [About the Catalog](#)
  - [Catalog Organization](#)
  - [Catalog Release Views and Database Access Views](#)
  - [Catalog Statistical Characterization](#)
  - [Schedule and Status](#)
  - [Caveats and Limitations](#)
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- [Catalog Columns](#)
  - [Master Sources Table: alphabetical | by context](#)
  - [Source Observations Table: alphabetical | by context](#)
- [Column Descriptions](#)
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## The Chandra Source Catalog

[Click here for information about CSC Release 2](#)

Release 1.1: Point and compact source catalog

[What's New?](#) | [Watch Out](#)



The locations of observations included in the CSC, in Galactic coordinates (click the image for equatorial coordinates). The size of each symbol is proportional to the logarithm of the number of sources detected in the field, while the color encodes the number of closely-located observations.

The Chandra Source Catalog (CSC) is ultimately intended to be the definitive catalog of X-ray sources detected by the Chandra X-ray Observatory. To achieve that goal, the catalog will be released to the user community in a series of increments with increasing capability. **The first official release of the CSC includes information about sources detected in public ACIS and HRC imaging observations from roughly the first eight years of the Chandra mission. Only point sources, and compact sources, with observed spatial extents < 30 arcseconds, are included. Highly extended sources, and sources located in selected fields containing bright, highly extended sources, are excluded from the first release.**

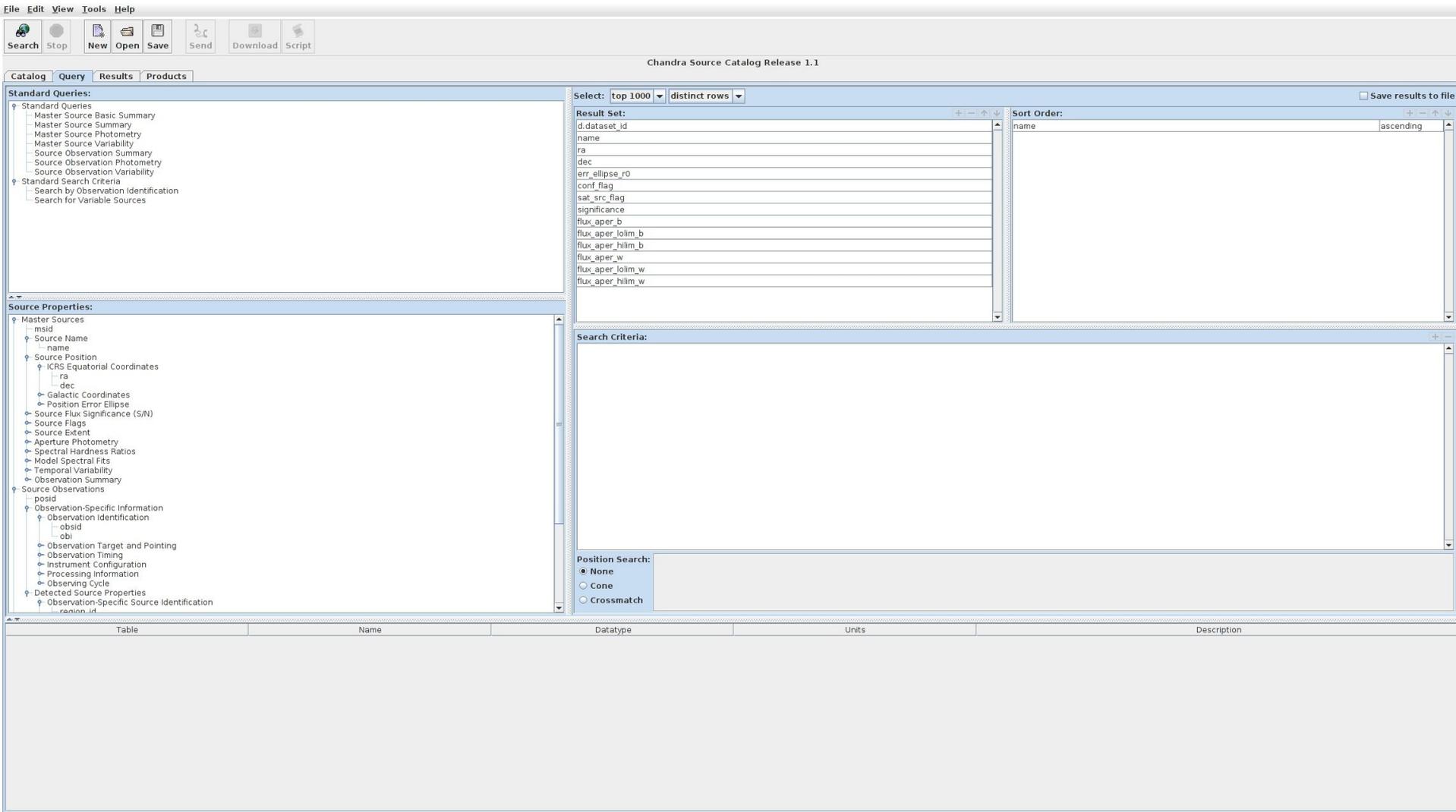
The CSC contains positions and multi-band count rates for the sources, as well as derived spatial, spectral, and temporal calibrated source properties that may be compared with data obtained by other telescopes. The CSC also includes associated [data products](#) for each source, including images, photon event lists, light curves, and spectra.

Each distinct source on the sky (i.e., object at a specific RA and Dec) is recorded in a single "master source" table entry and one or more "source observation" table entries. The individual source entries contain the properties of a single detection from a single observation. The master source entry is the best estimate of all the properties of a source, based on the data extracted from the individual source entries. The [Catalog Organization page](#) contains further details.

**The current version of the catalog is release 1.1. This version includes the information contained in release 1.0.1, plus point and compact source data extracted from HRC imaging observations, and catch-up ACIS observations released publicly prior to the end of 2009. A new version of [CSCview](#) is also available with this release.**

**The CSC-SDSS Cross-match Catalog, the CSC Sensitivity Map Service, and the CSC interface to Sky in Google Earth have been updated as of 24 November 2010 to access release 1.1.**

## CSCView java application: java -jar cscview.jar



The screenshot shows the CSCView application interface. At the top is a menu bar with 'File', 'Edit', 'View', 'Tools', and 'Help'. Below it is a toolbar with icons for 'Search', 'Stop', 'New', 'Open', 'Save', 'Send', 'Download', and 'Script'. The main window title is 'Chandra Source Catalog Release 1.1'. Below the title bar are tabs for 'Catalog', 'Query', 'Results', and 'Products'. The 'Query' tab is active.

The interface is divided into several panels:

- Standard Queries:** A list of queries including 'Master Source Basic Summary', 'Master Source Summary', 'Master Source Photometry', 'Master Source Variability', 'Source Observation Summary', 'Source Observation Photometry', 'Source Observation Variability', 'Standard Search Criteria', 'Search by Observation Identification', and 'Search for Variable Sources'.
- Source Properties:** A tree view showing hierarchical properties for sources, including 'Master Sources', 'Source Name', 'Source Position', 'ICRS Equatorial Coordinates', 'Galactic Coordinates', 'Position Error Ellipse', 'Source Flux Significance (S/N)', 'Source Flags', 'Source Extent', 'Aperture Photometry', 'Spectral Hardness Ratios', 'Model Spectral Fits', 'Temporal Variability', 'Observation Summary', 'Source Observations', 'Observation-Specific Information', and 'Detected Source Properties'.
- Select:** A dropdown menu set to 'top 1000' and 'distinct rows'.
- Result Set:** A list of column names including 'd.dataset\_id', 'name', 'ra', 'dec', 'err\_ellipse\_r0', 'conf\_flag', 'sat\_src\_flag', 'significance', 'flux\_aper\_b', 'flux\_aper\_lolim\_b', 'flux\_aper\_hilim\_b', 'flux\_aper\_w', 'flux\_aper\_lolim\_w', and 'flux\_aper\_hilim\_w'.
- Sort Order:** A dropdown menu set to 'ascending'.
- Search Criteria:** A large empty text area for defining search criteria.
- Position Search:** Radio buttons for 'None' (selected), 'Cone', and 'Crossmatch'.

At the bottom, there is a table header with columns: 'Table', 'Name', 'Datatype', 'Units', and 'Description'. The table body is currently empty.

The status bar at the bottom left reads 'CSCView loaded'.

## Other Source Catalogs

- Chandra Orion Ultra-deep Point Source Catalog (COUP)
  - <http://heasarc.gsfc.nasa.gov/w3browse/chandra/coup.html>
- Chandra Multi-wavelength Project (CHAMP)
  - <http://heasarc.gsfc.nasa.gov/w3browse/chandra/champpsc.html>
- Bootes Field X-ray Point Source Catalog (XBOOTES)
  - <http://heasarc.gsfc.nasa.gov/w3browse/all/xbootes.html>
- Catalog of AGN in the XMM-Newton Archive (CAIXA):
  - <https://heasarc.gsfc.nasa.gov/W3Browse/all/caixa.html>
- And many more! Typically, these are *specialty* catalogs, can tailor their methods to their science. CSC & 3XMM must work *everywhere*.