Homework – and other housekeeping matters

- Homework is due at *3:30PM Wednesday* (of the week following a class) instead of Monday.
- Turn in to the Astronomy Mail Room (*CSS 1204*) that closes at 4:30.
- Alternatively, turn in to us in our office or in class.
- Homework will be returned the following Monday (two weeks after it is handed out), so late homework (with a 20%/ day penalty) must be in before class on that day.
- The lowest HW score will be dropped.
- HW solutions will be posted on the website after all of the assignments are completed.
- This information is on the updated syllabus – see e-mail attachment, class website.
- The website also has all lecture notes, labs, and assignments.

High Energy Databases and Catalogs

Accessing Public Data on the Web

- Sources: facility/mission sites, dedicated archives, links from electronic journal articles

- Content: raw and/or processed data, auxiliary data (e.g., calibration), reduction and analysis tools, data products (images, spectra), catalogs

Accessing Public Data on the Web

Usage:

(1) Read documentation (manuals, help files, tutorials).

(2) Identify the object(s) or region(s) of interest.

(3) ID the type of data required (including wavelength regime).

(4) Download what you need.

NASA/IPAC Extragalactic Database (NED)

NED is build around a master list of *extragalactic* objects searchable by name or region. Collected are…

- Source names

- Positions and their Coordinates

- Redshifts and radial velocities

- Optical diameters and magnitudes

- Images from (ground-based) optical and IR all-sky
  surveys

- Spectra

- Bibliographic references

NED is a good starting point if one is interested in a particular extragalactic object.

NASA/IPAC EXTRAGALACTIC DATABASE

Latest updates to NED content and interface (September 2010)

Over 760,000 new data entries
Additions to Level5, including M. Cignoni and Monica Tosi (2010)
Spectra from R. Giovanelli et al (2004)
Compilation of Distances: NED-D complete download available
Galaxy Morphology: 16,274 entries from The ESO/Uppsala survey of the ESO(B) Atlas
New features in the *Classifications by Object Name* service

OBJECTS	DATA	LITERATURE	TOOLS	INFO
By Name	Images By Object Name or By Region	References by Object Name	Coordinate Transformation & Extinction Calculator	Introduction Latest News/Updates
Near Name	Photometry & SEDs	References by Author Name	Velocity Calculator	Features FAQ
Near Position	Spectra	Text Search	Cosmology Calculators	Overview (pdf)
IAU Format	Redshifts	Knowledgebase LEVEL 5	Extinction-Law Calculators	Source List
By Parameters (All-Sky)	Redshift-Independent Distances	Galaxy Distance Tabulations (NED-D)	Skyplot	Web Links
By Classifications *Types, Attributes*	Classifications by Object Name	Abstracts	X/Y offset to RA/DEC	Glossary & Lexicon
By Refcode	Positions	Thesis Abstracts	Batch Job Submission	Team
Object Notes	Diameters		Pick Up Batch Job Results	Contact Us or Comment

NASA/IPAC Extragalactic Database (NED)

NED has five broad sections

- Objects
- Data
- Literature
- Tools
- Info – check out the intro, FAQ, overview

NASA/IPAC Extragalactic Database (NED)

In addition to "static" data, NED also provides

- Calculators and other tools.
- Coordinate transformations
- Extinction calculator
- Cosmology calculators
- Plotting tools
- Batch jobs
- Much more…

NASA/IPAC EXTRAGALACTIC DATABASE

Date and Time of the Query: 2010-09-13 T09:21:36 PDT
Help | Comment | NED Home

You have selected the following parameters to search on:

Parameters for Distances and Cosmology: H_o = 73.0; Ω_{matter} = 0.27; Ω_{vacuum} = 0.73;
Derived Quantities use a Redshift corrected to a Reference Frame defined by the 3K CMB

NED results for object NGC 4649

1 objects found in NED.   Skyplot(first 100)

SOURCE LIST

Row No.	Object Name (* => Essential Note)	EquJ2000.0 RA	DEC	Object Type	Velocity/Redshift km/s	z	Qual	Mag./ Filter	Separ. arcmin	Refs	Notes	Number Phot	Posn
1	MESSIER 060	12h43m40.0s	+11d33m10s	G	1117	0.003726		9.81	...	614	12	101	5

Detailed information for each object

Object No. 1 - MESSIER 060

INDEX for MESSIER 060

Essential Data (jump to sub-section of this query report):

Essential Note
Cross-IDs
Coordinates
Basic Data
Quantities Derived from Redshift
Redshift-Independent Distances [NEW]
Classifications [NEW]
Foreground Galactic Extinction
External Services

Detailed Data (NED queries):

Images
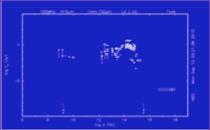
Spectra
Redshift-Independent Distances
614 Reference(s)
5 Position data point(s)
13 Redshift data point(s)
11 diameter data point(s)
12 Note(s)
1 Association(s)
101 Photometric data point(s) and SED
UGC data
RC3 data

ESSENTIAL NOTE for MESSIER 060 (Back to INDEX)

N/A

CROSS-IDENTIFICATIONS for MESSIER 060 (Back to INDEX)

Object Names	Type	Object Names	Type
MESSIER 060	G	HOLM 448A	G
NGC 4649	G	PGC 042831	G
UGC 07898	G	RBS 1150	XrayS
ARP 116 NED02	G	UZC J124339.7+113307	G
VV 206a	G	RGB J1243+115	RadioS
VCC 1978	G	CXOU J124340.0+113311	XrayS
CGCG 071-016	G	RX J1243.6+1133	XrayS
CGCG 1241.1+1150	G	1RXS J124340.6+113309	XrayS

Data "Archives"

- Sites where data are stored are sometimes called archives.
- Often, after some proprietary period (say, one year) the data become publicly accessible, and may be downloaded.

Why analyze archival data?

Re-analysis -- new methods, calibration

New focus --

- part of a uniform sample
- look for some new phenomenon discovered elsewhere
- look for variability compared to data elsewhen
- look for counterparts to sources at other wavelengths

Questions to Consider

- What documentation is available?
- What files do I need?
- Is the data preprocessed?
- Is the data calibrated?
- What format is the data in?
- What software do I need to use the data?
- Who do I acknowledge when I publish the data?

High Energy Astrophysics Science Archive Research Center (HEASARC)

Access to other NASA archives, such as NED

The interface to the HEASARC archive Is called **Browse**.

One commonly searches by object name or position. One may specify a search radius, as well as the missions and catalogs to be queried.

Images generated by *SkyView*
Click on image to see full *SkyView* image

Search was based on:

Object/Coordinates:	NGC 5813
	resolved by SIMBAD (local cache) to [15 01 11.27, +01 42 07.1]
Coord. System:	Equatorial, equinox 2000
Maximum Rows:	(no limit)
Search Radius:	Default arc minutes

(Reissue Query)
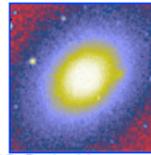
DSS Optical image, 2.83'

RASS X-ray image, 75.0'
Images centered on requested position

How to use the information on this page

Select box to view, click View Selected Tables button.	Table name. Click for info about table.	Number of rows in this table that satisfy selection criteria. Click to see results for this table.
□ INTEGRAL Public Pointed Science Window Data		27

(View Selected Tables) (Reset)

Active HEASARC Missions

□ ASCA	□ ASCA Proposals	1	□ ASCA Master Catalog	1
□ CHANDRA	☑ Chandra Observations	6	□ Chandra XAssist Source List	25

If no mission or catalog is selected, one gets a list of all of the possible selections with entries located on the sky within the search radius. From among these, we choose to view the table of observations from the *Chandra* X-ray Observatory.

This returns one table -- the master database of all completed and planned *Chandra* observations -- in this instance, which leads us to…

Images generated by *SkyView*
Click on image to see full *SkyView* image

Search was based on:
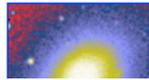
Object/Co

Coord. Sy

Maximum

Search R

Main Search Form — Browse Query Results

Query Information | Query Results | Data Products Retrieval | Help

Data Products: Click checkbox to add row to Data Product Retrieval List

Chandra Observations (chanmaster) Bulletin Note
Search radius used: 21.00 '

Select □All	Related Links	Services	obsid	status	name	ra	dec	time	detector	grating	exposure [s]	type	pi	public date	Search Offset ['] from (target)
🔍□	ASCA ROSAT RXTE XMM	O R N S D H	12951	unobserved	NGC5813	15 01 06.80	+01 40 44.7	2011-09-08	ACIS-S	NONE	160000	GO	Randall		1.770 (NGC 5813)
🔍□	ASCA ROSAT RXTE XMM	O R N S D H	12952	unobserved	NGC5813	15 01 06.80	+01 40 44.7	2011-09-10	ACIS-S	NONE	160000	GO	Randall		1.770 (NGC 5813)
🔍□	ASCA ROSAT RXTE XMM	O R N S D H	12953	unobserved	NGC5813	15 01 06.80	+01 40 44.7	2011-09-13	ACIS-S	NONE	160000	GO	Randall		1.770 (NGC 5813)
🔍☑	ASCA ROSAT RXTE XMM	O R N S D H F	9517	archived	NGC5813	15 01 07.01	+01 41 01.9	2008-06-05 20:18:39	ACIS-S	NONE	100060	GO	Forman	2009-06-09	1.521 (NGC 5813)
🔍□	ASCA ROSAT RXTE XMM	O R N S D H B F	5907	archived	NGC5813	15 01 11.30	+01 42 07.1	2005-04-02 06:44:19	ACIS-S	NONE	49040	GO	Sarazin	2006-04-05	0.009 (NGC 5813)
🔍□	ASCA ROSAT RXTE XMM	O R N S D H	12954	unobserved	NGC5813	15 01 06.80	+01 40 44.7	2011-09-17	ACIS-S	NONE	20000	GO	Randall		1.770 (NGC 5813)

6 rows retrieved from chanmaster

These are available

Data Product Retrieval

- Select the checkboxes for the rows of interest above,
- Un-check any data products below you are not interested in
- Select the Data Product Retrieval tab for retrieval options

Data Products available for chanmaster
- □ All
- □ Chandra Proposal Abstracts (abstracts)
- □ Events Lists (events)
- ☑ FITS and JPEG Images (images)
- □ Miscellaneous Files (misc)
- □ Orbit and Aspect Files (orbit)
- □ Processing Summary Files (psumm)

Show current rows selected for Data Products Retrieval

Further Actions:

Do you want to (Plot) your chanmaster results? (help)

Do you want to (Cross-correlate) your chanmaster results with another catalog or table? (help)

…the list of observations, from which we select the longest and most recently archived observation

We can now preview the data and retrieve the requested FITS files….

...and create a single *tar* file containing all of these files.

The tarfile with the requested data is now available for downloading.

In the directory where the data was downloaded (here ``loew''), unpack the tarfile.
Move the image fits file back to the original directory and uncompress it, deleting unneeded subdirectories. (Alternatively, cd 9517/primary, and work in that directory).

```
loew% tar -xvf w3browse-172321.tar
9517/primary/acisf09517N001_cntr_img2.fits.gz
loew% mv 9517/primary/acisf09517N001_cntr_img2.fits.gz .
loew% ls 9517
primary
loew% ls 9517/primary
loew% rm -r -i 9517
examine files in directory 9517? y
examine files in directory 9517/primary? y
remove 9517/primary? y
remove 9517? Y
loew% ls 9517
ls: 9517: No such file or directory
loew% rm -i w3browse-172321.tar
remove w3browse-172321.tar? y
loew% gunzip acisf09517N001_cntr_img2.fits.gz
loew% ls *.fits
acisf09517N001_cntr_img2.fits
ds9 acisf09517N001_cntr_img2.fits &
```

Steps leading from the download to opening the image FITS file with ds9 -- a combination of UNIX practice and "tidying" up.

Overlaying X-ray contours on an optical image – step-by-step

See, also, http://cxc.harvard.edu/ciao/threads/ds9/.
(which has a link to ds9 manuals)

The example shown utilizes *Chandra* X-ray, and DSS optical, images of the NGC 5813 elliptical galaxy. While the optical photons originate in stars in the galaxy, the diffuse X-rays are emitted by 8 million K hot interstellar gas. The structure in the hot gas is attributed to outbursts from the an active galactic nuclei in the galactic center. For more details, see http://arxiv.org/abs/1006.4379.
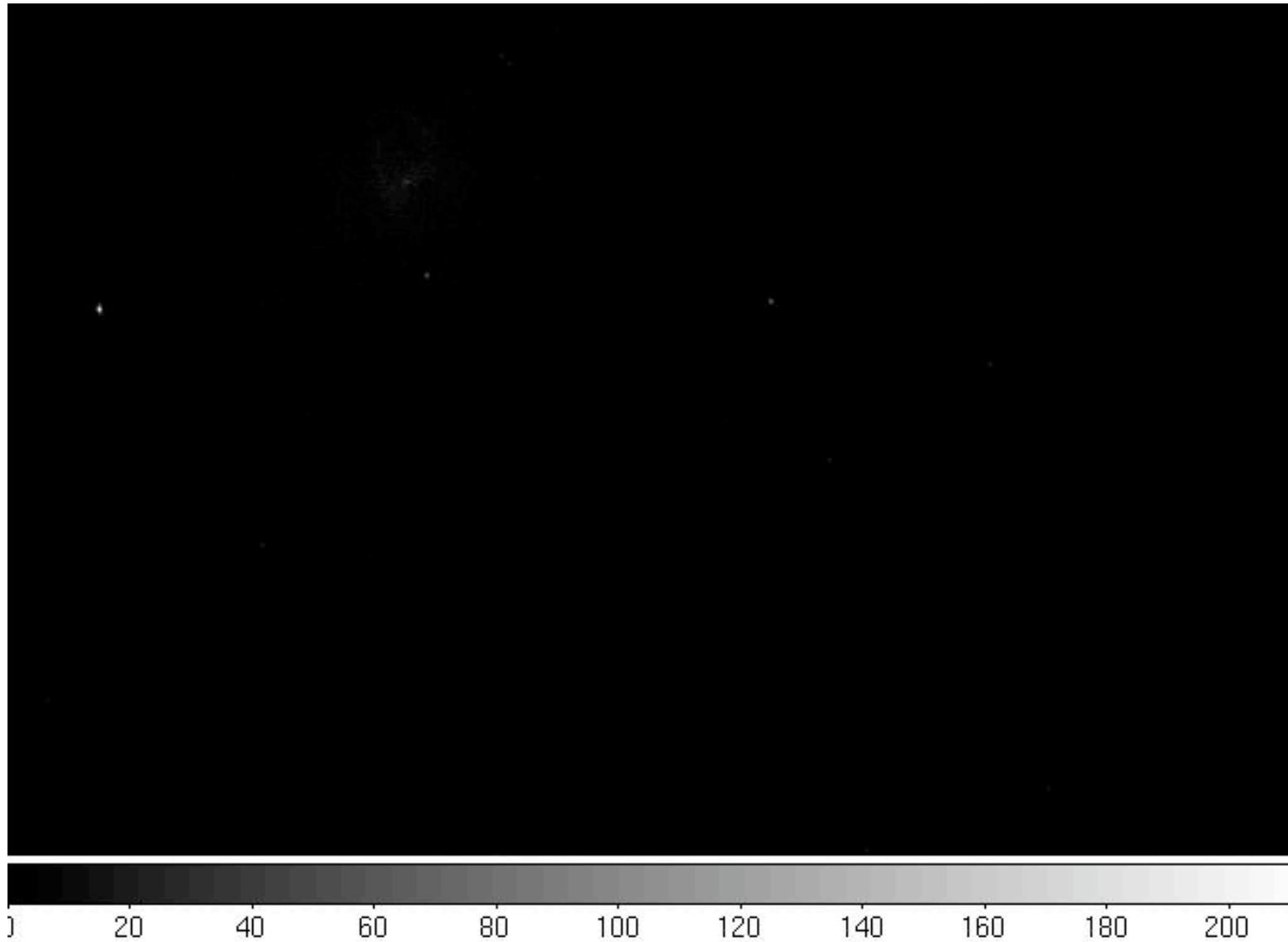
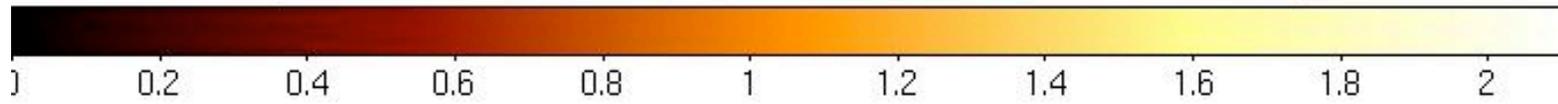Chandra X-ray image of the NGC 5813 elliptical galaxy
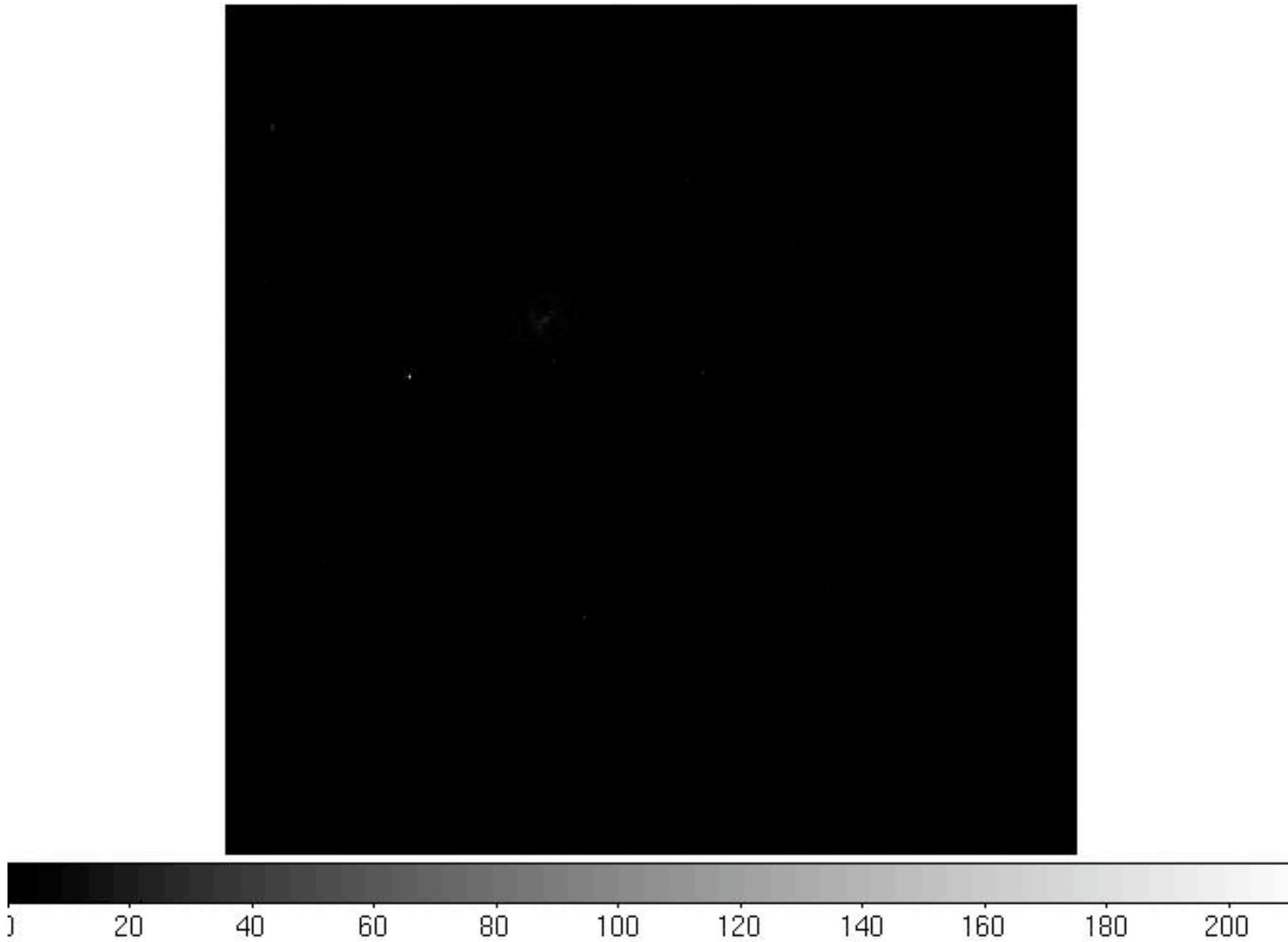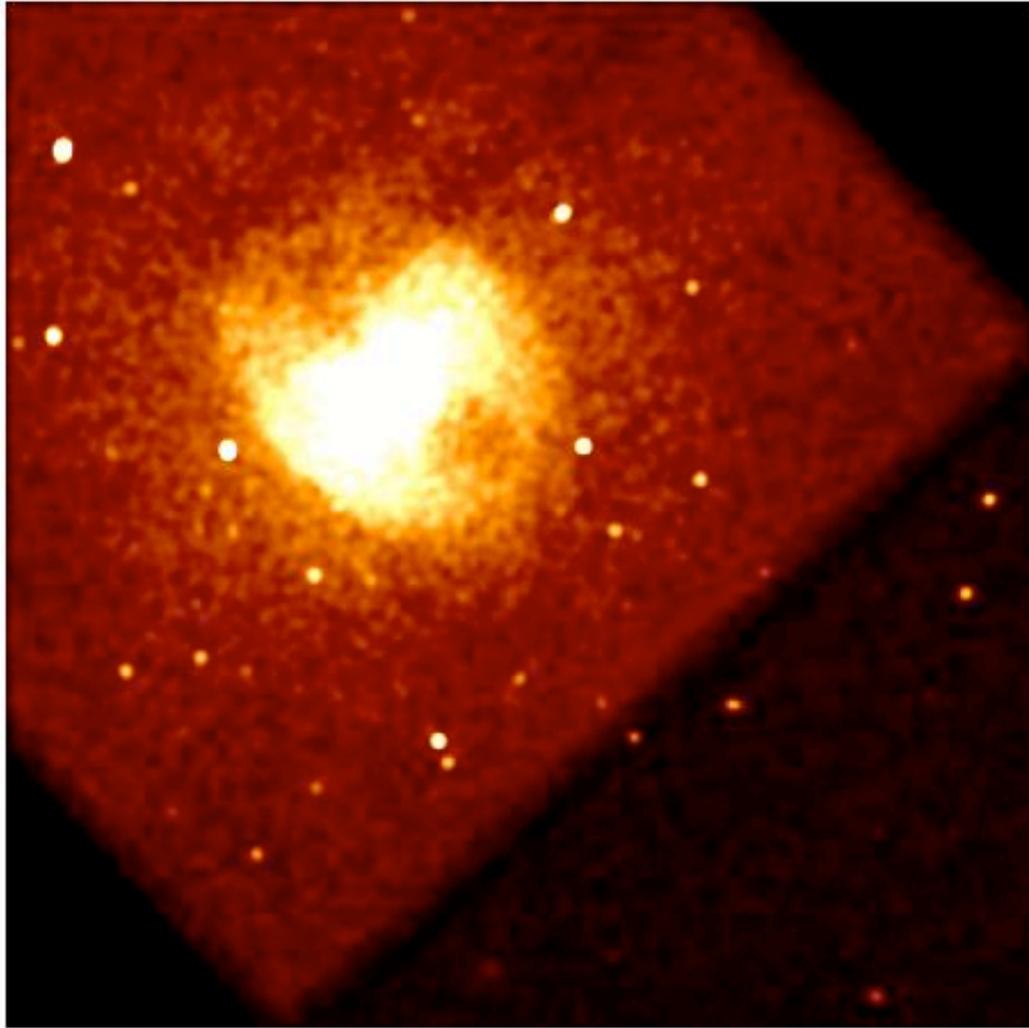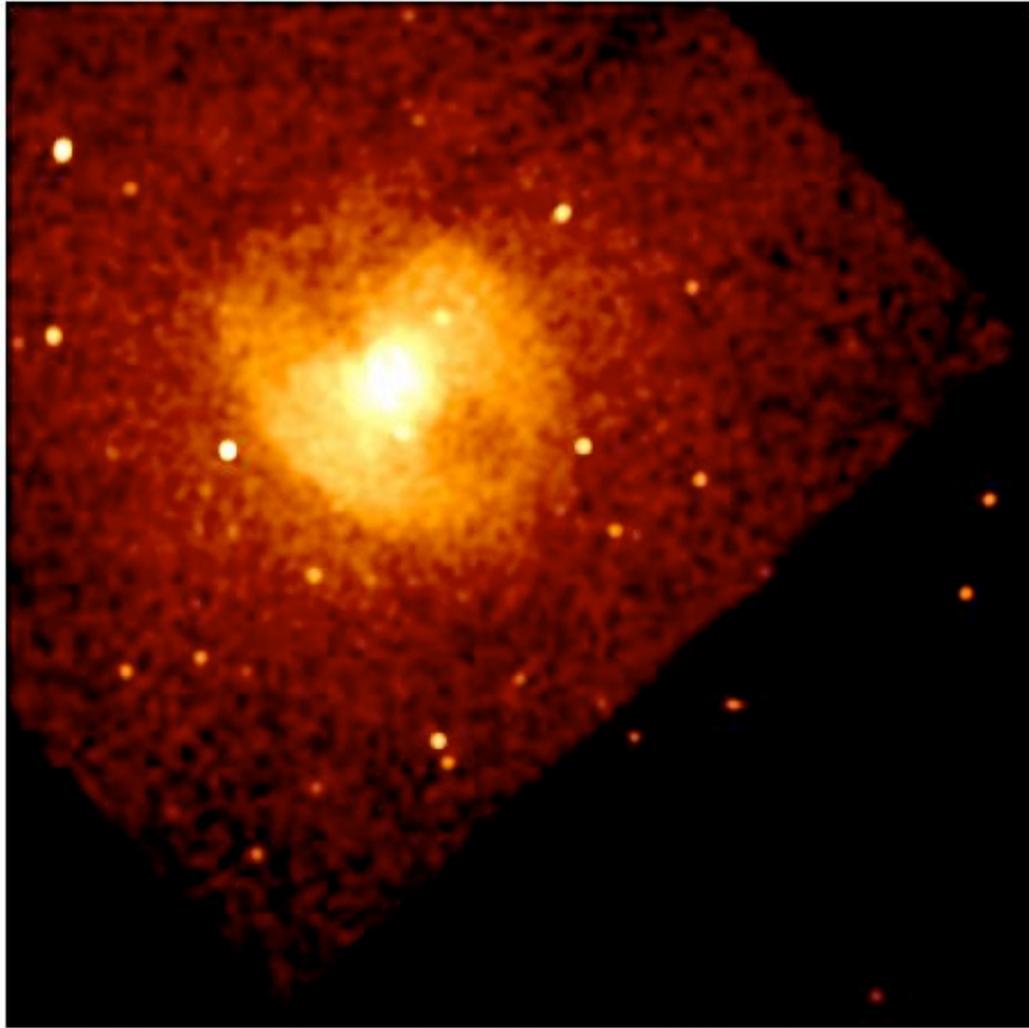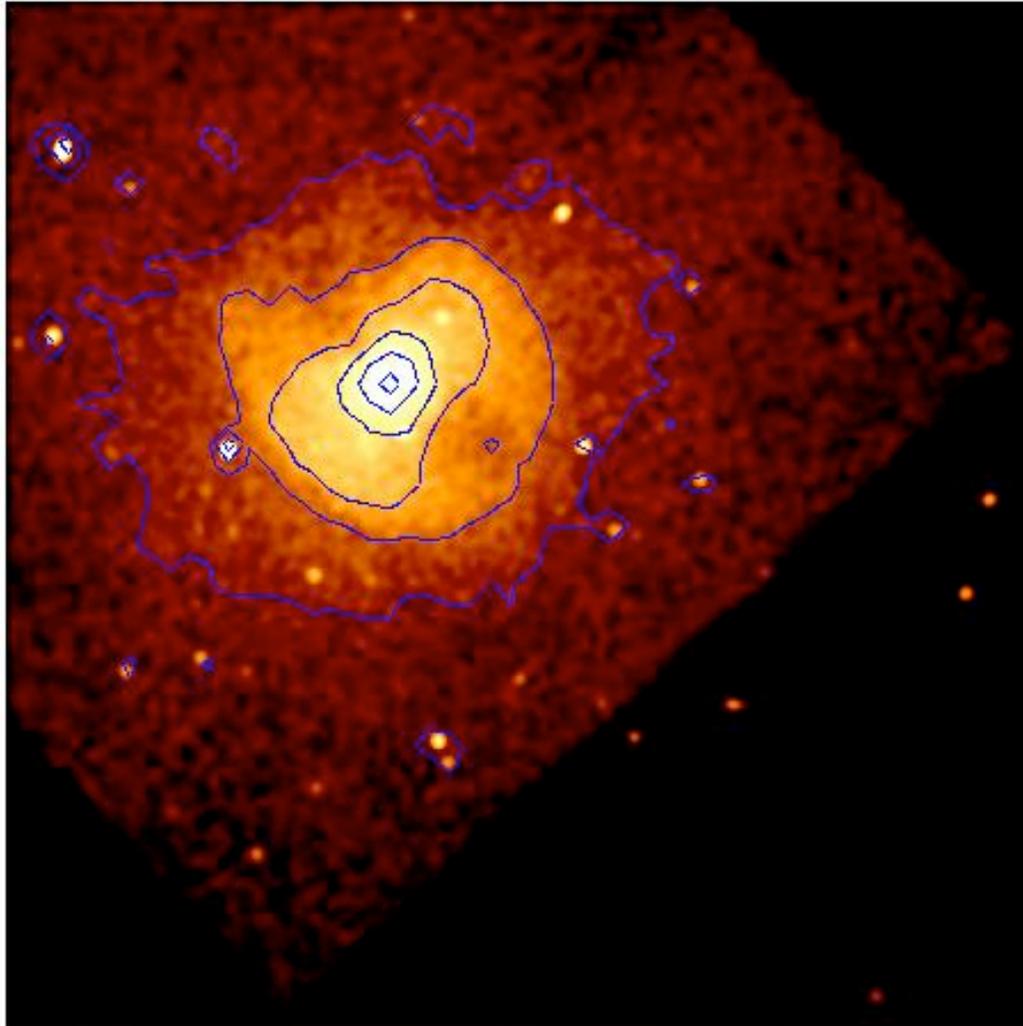
zoom to fit
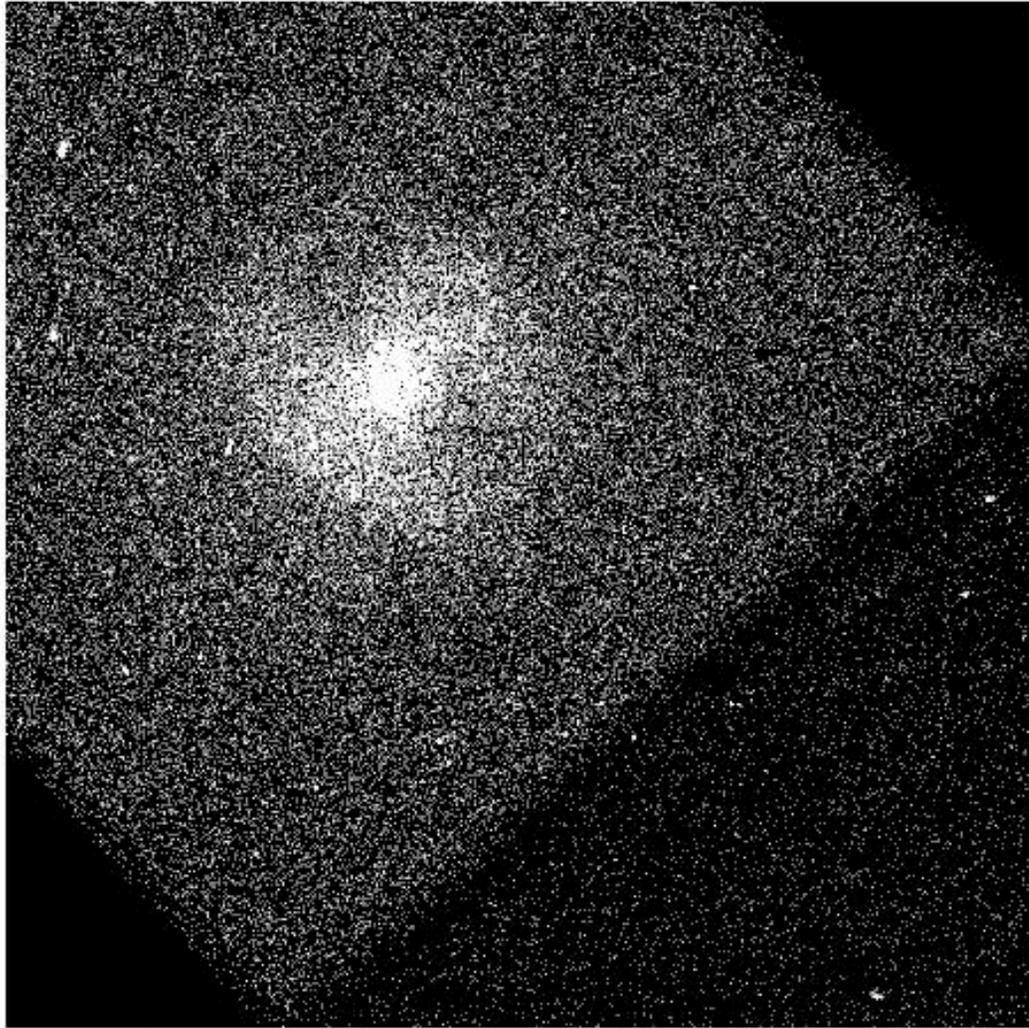
rescale colors using *zscale*
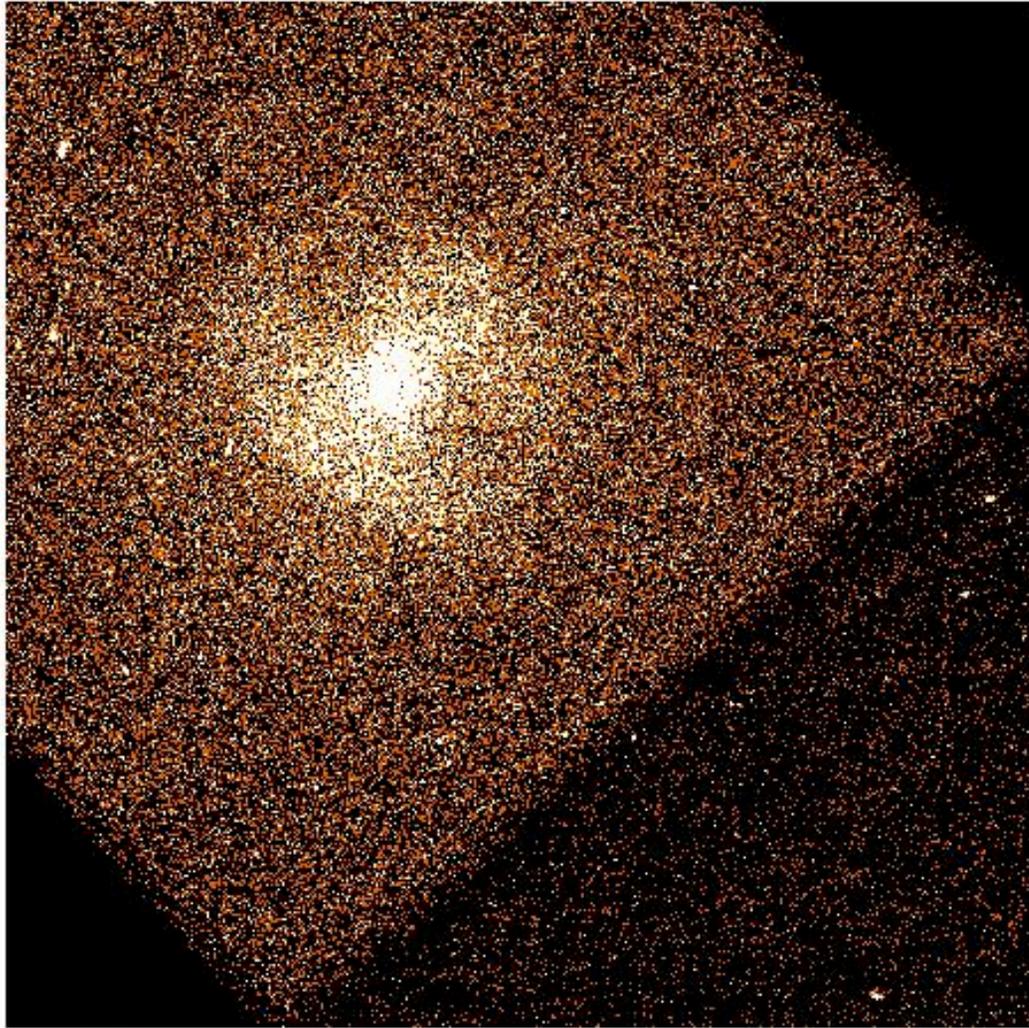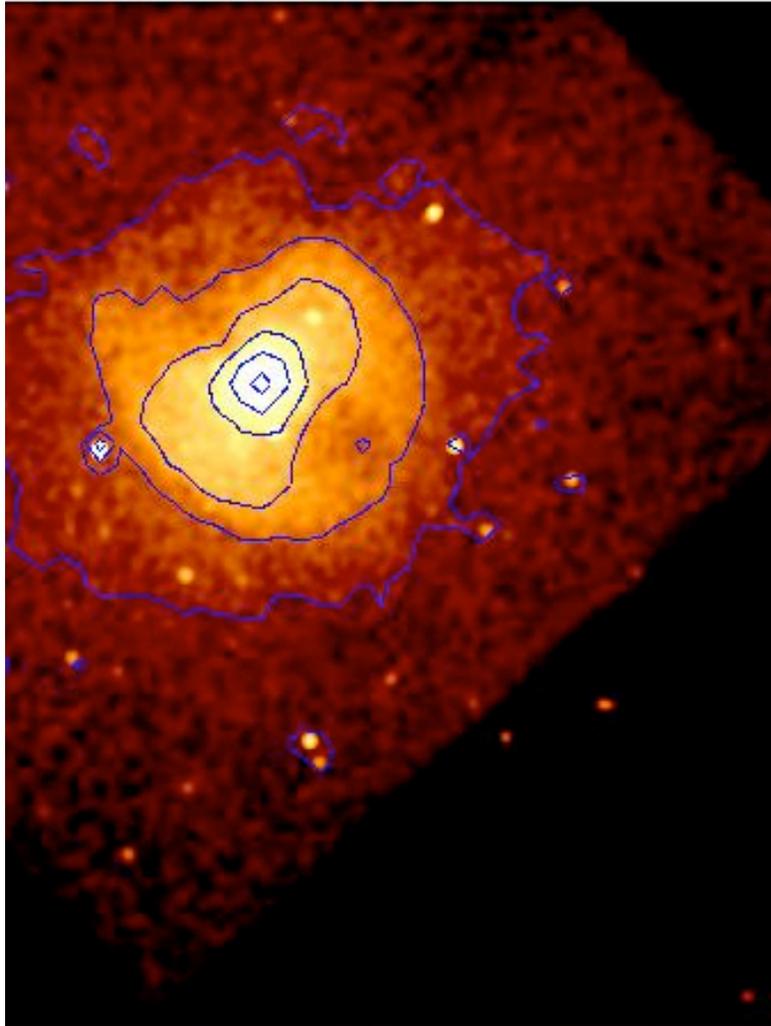
change *color*
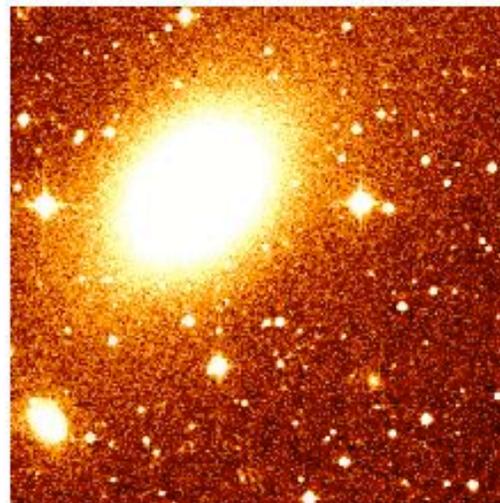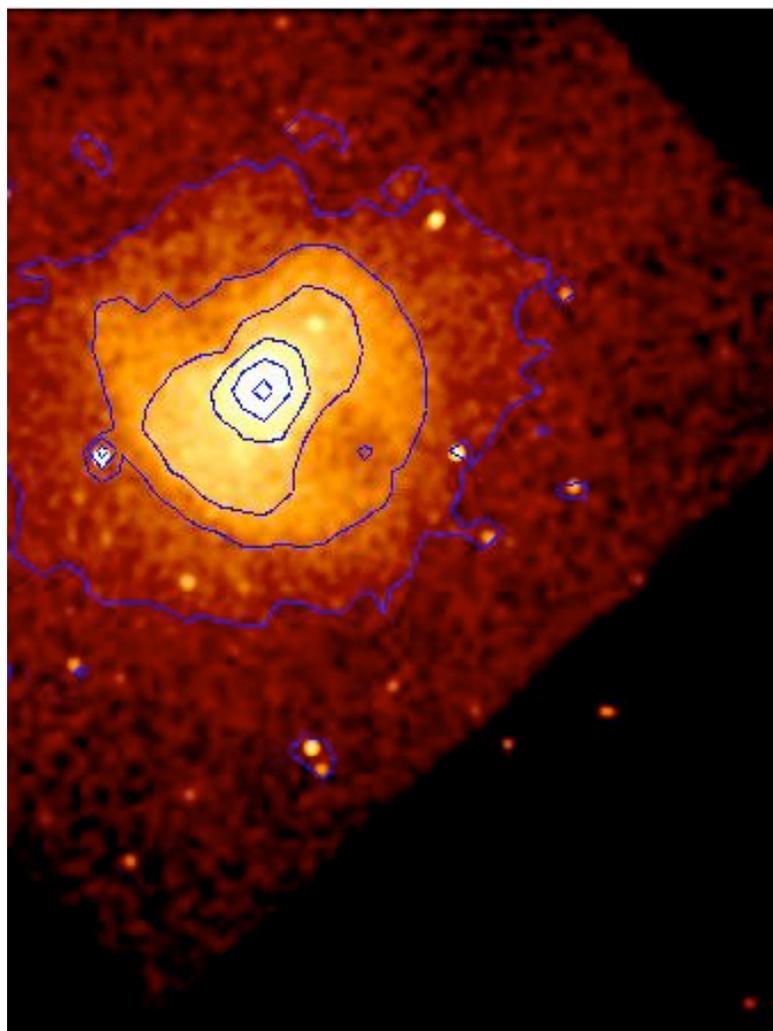
smooth [*analysis –> smooth parameters*]

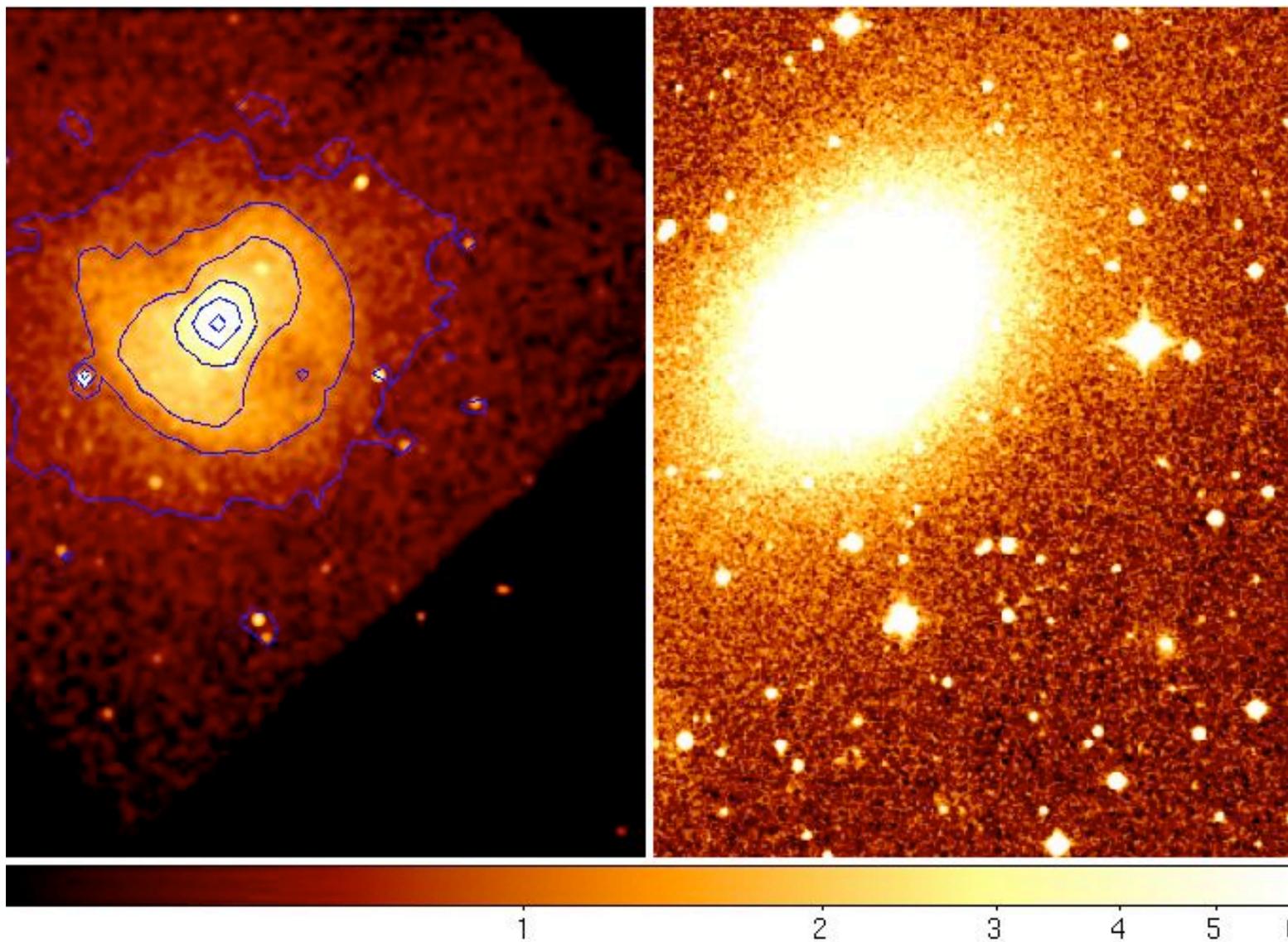*rescale* colors

x-ray contours [*analysis –> contour parameters*]
save these in a file [*analysis –> contour parameters –> file –> save contours*]

Load DSS optical image [*analysis –> image servers –> STSCI-DSS I/II*] (automatically tiled)

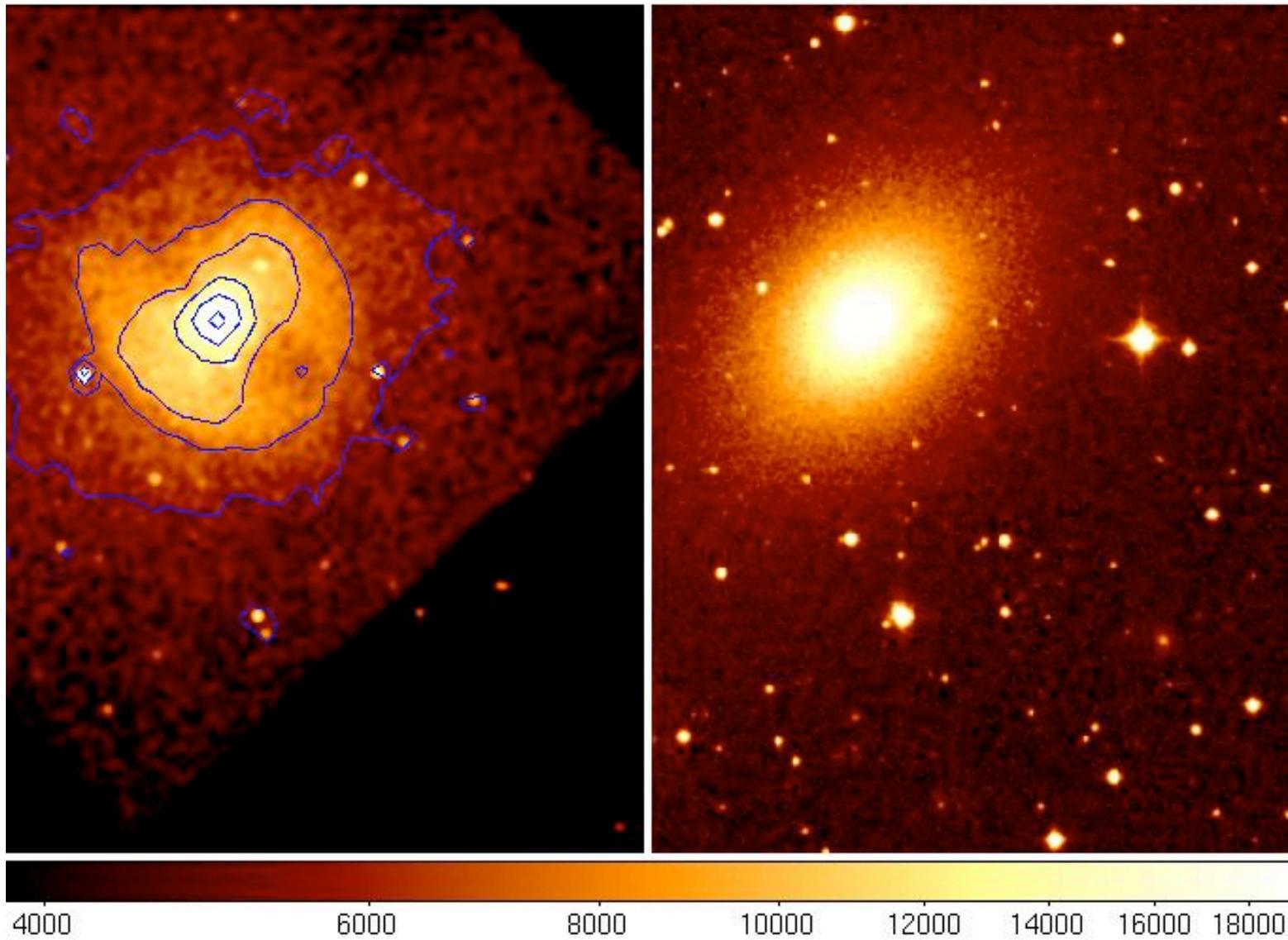re*scale* colors in optical image

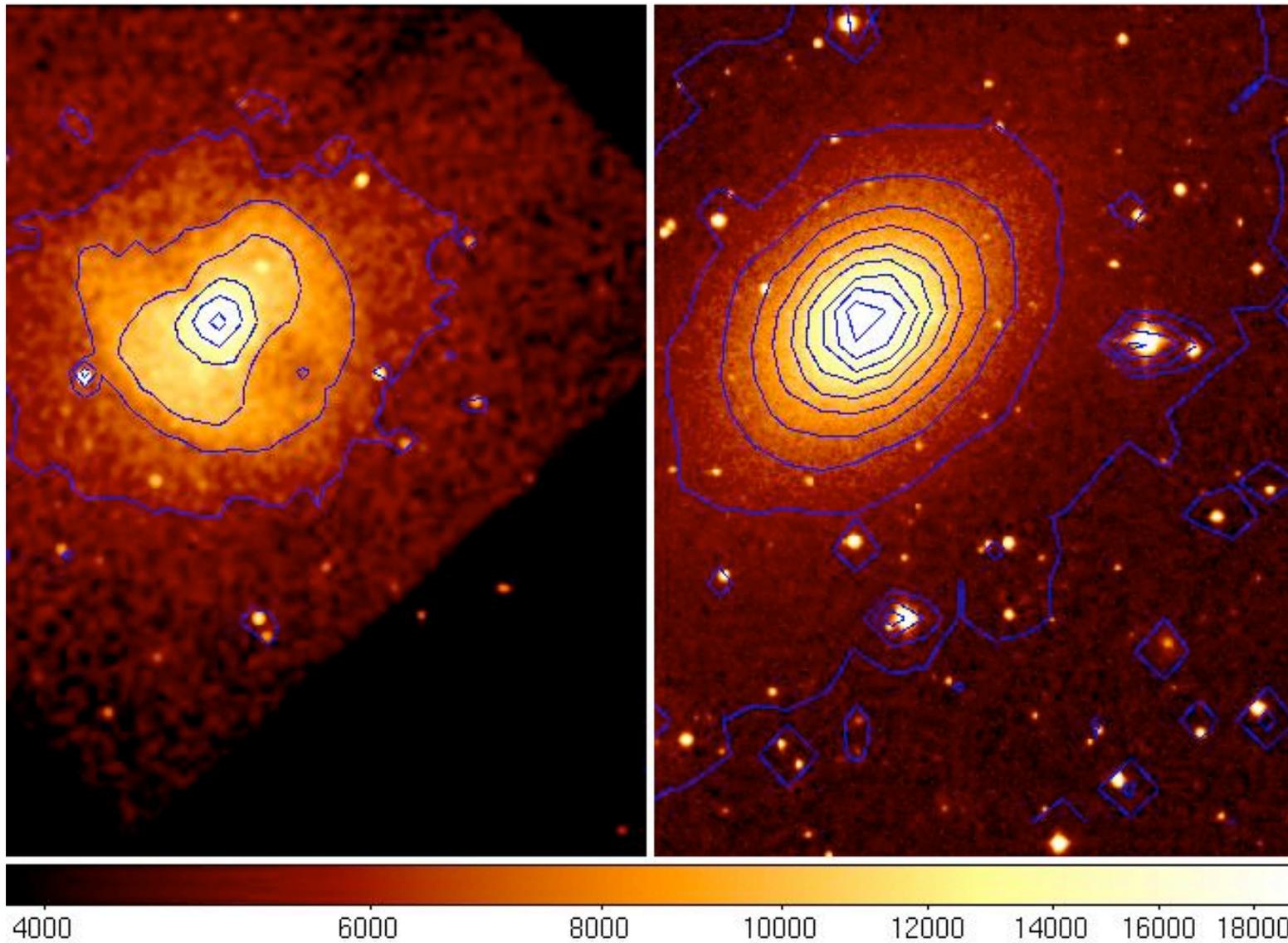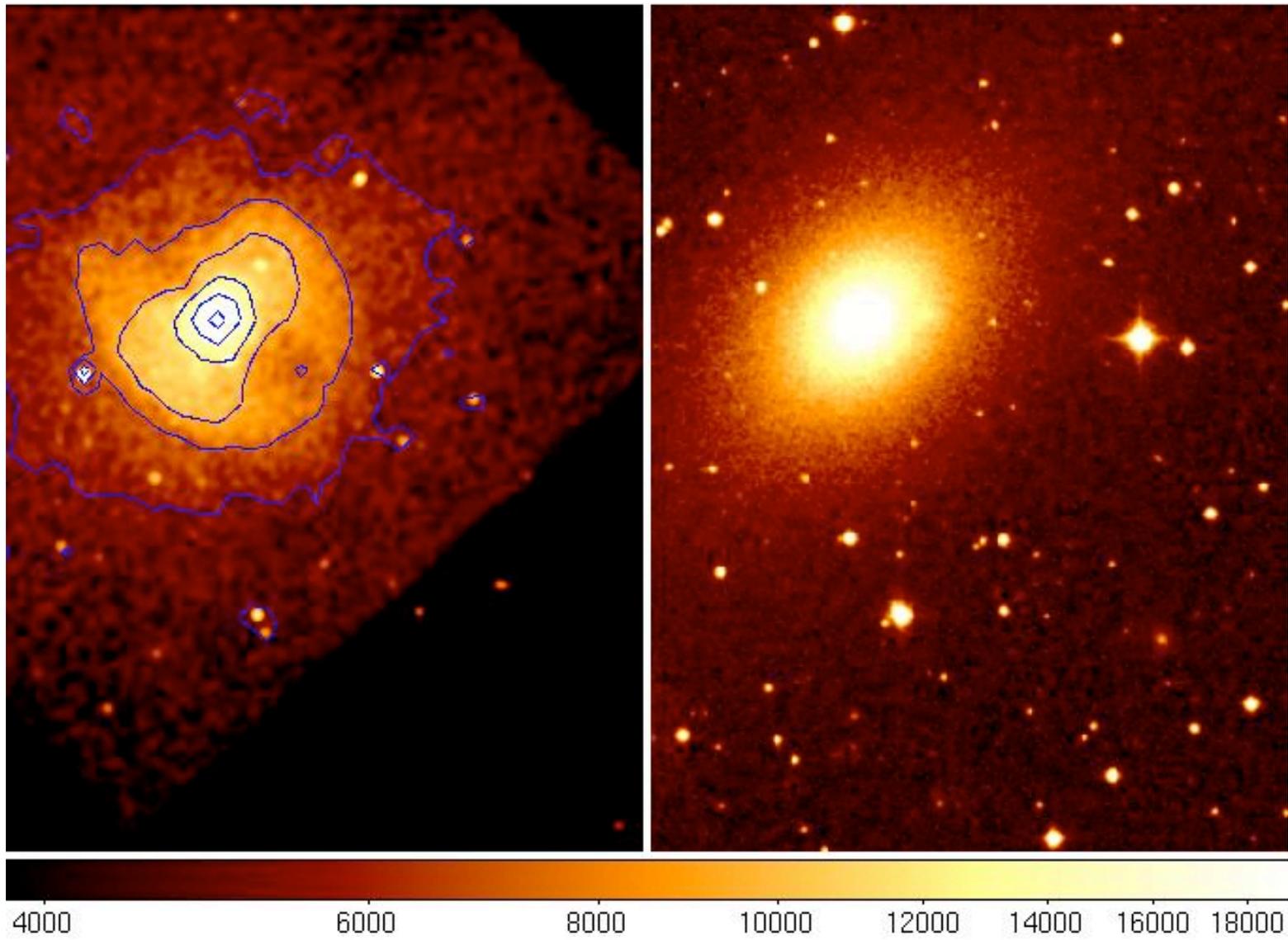WCS-align images
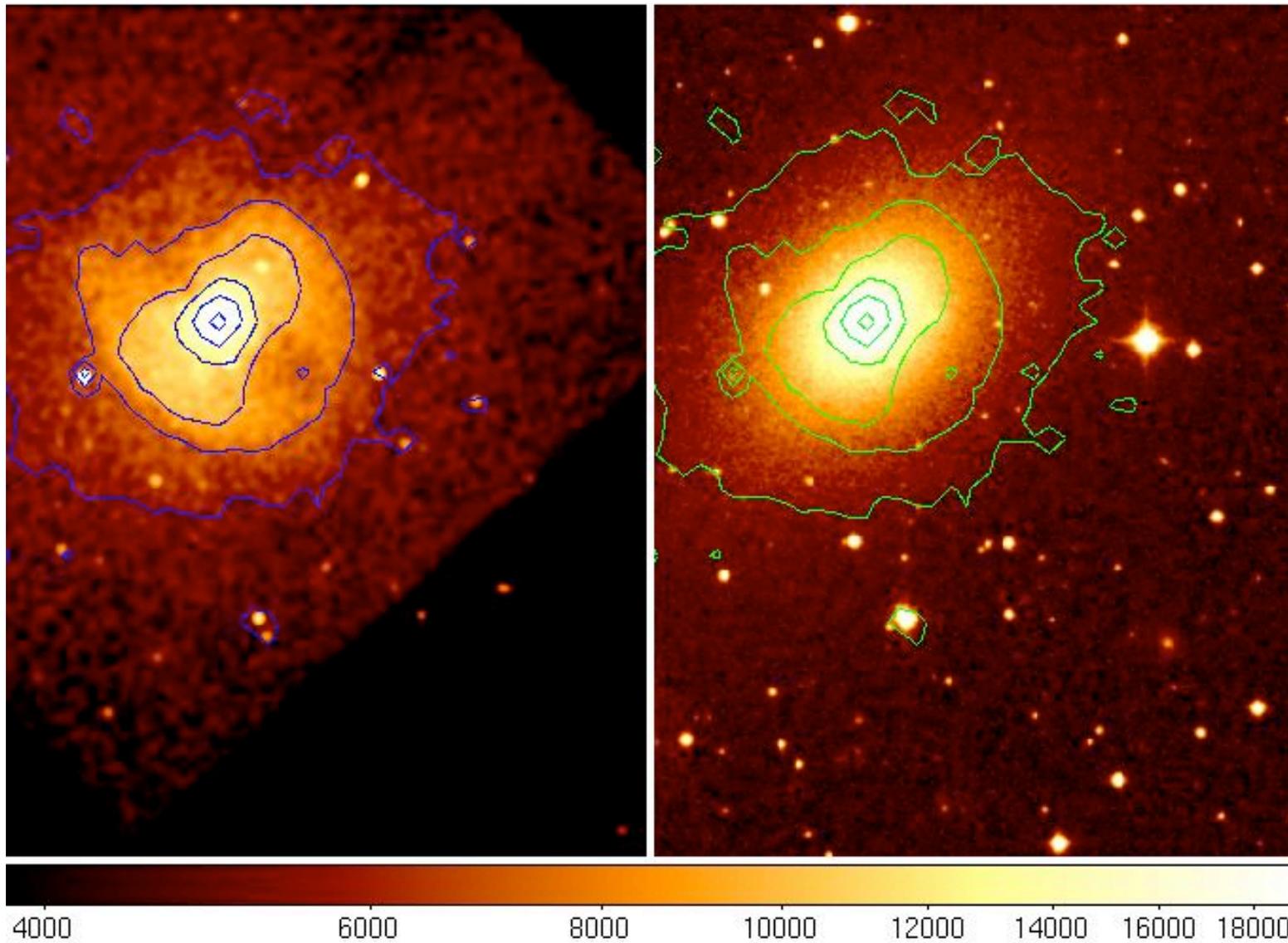[*Frame –> Match Frames –> WCS*]

rescale *colors* in optical image
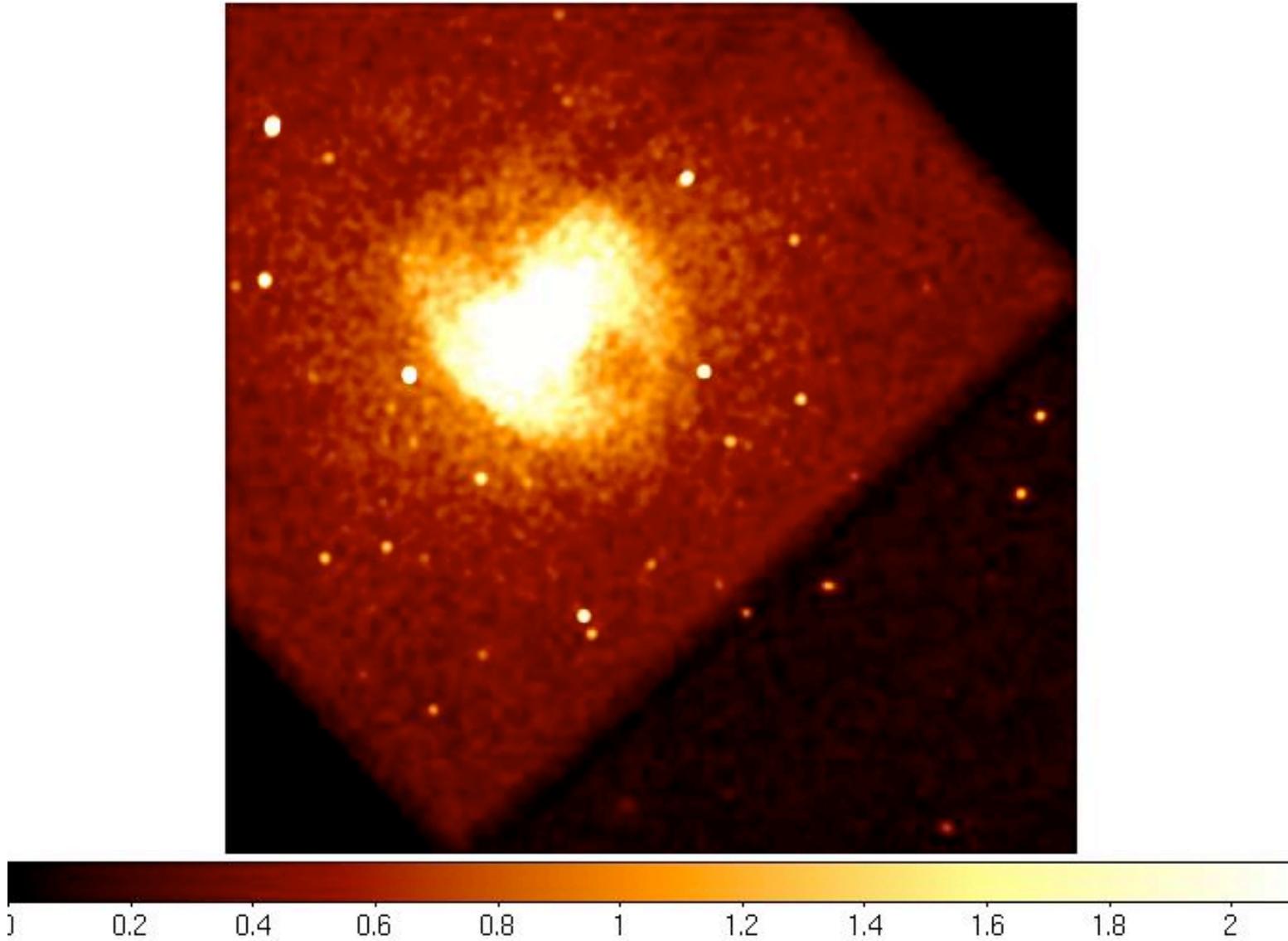
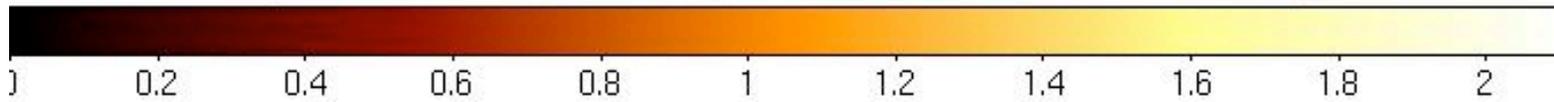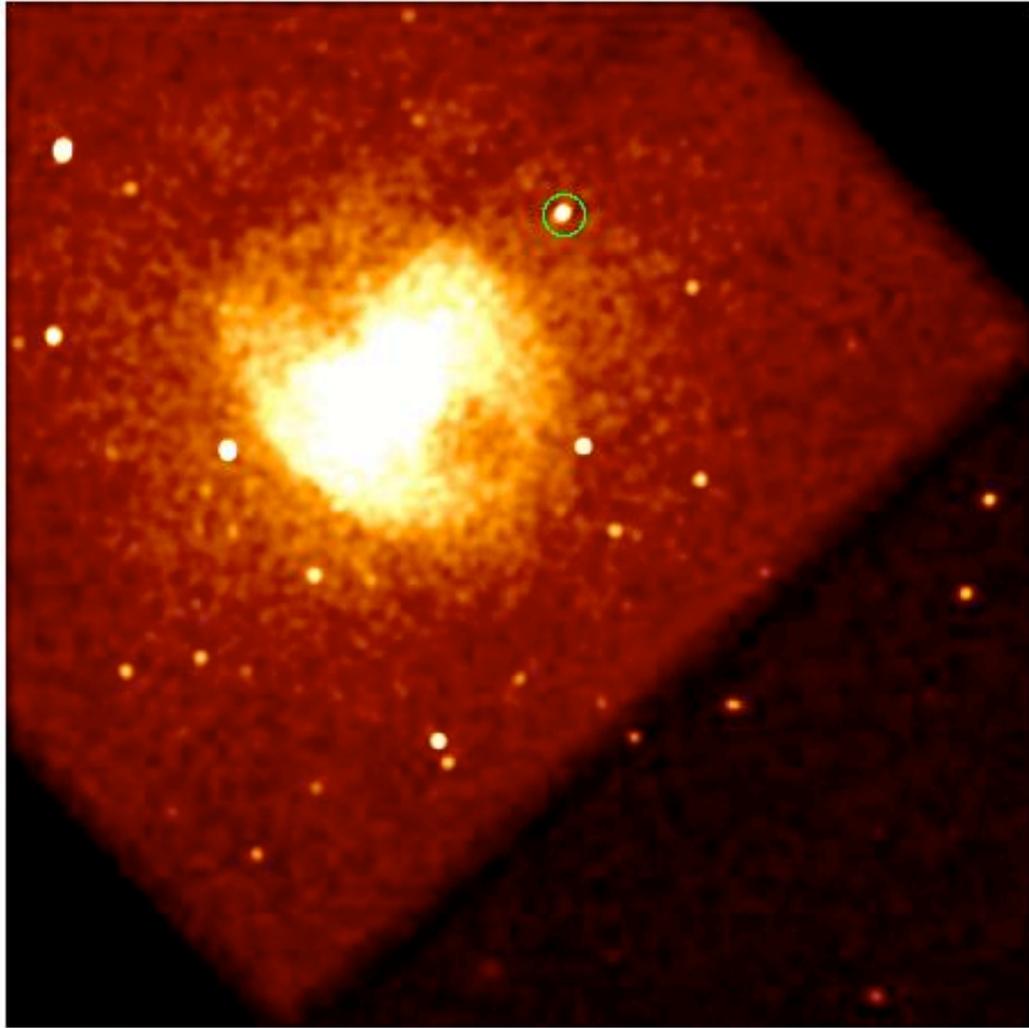overlay optical contours on optical image

clear optical contours

overlay x-ray contours on optical image
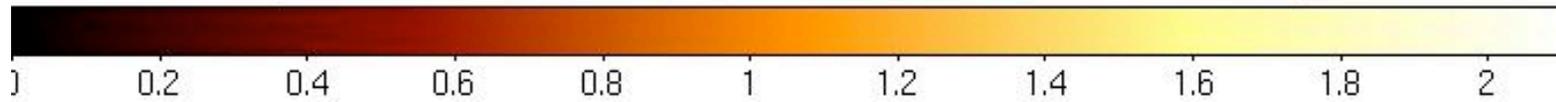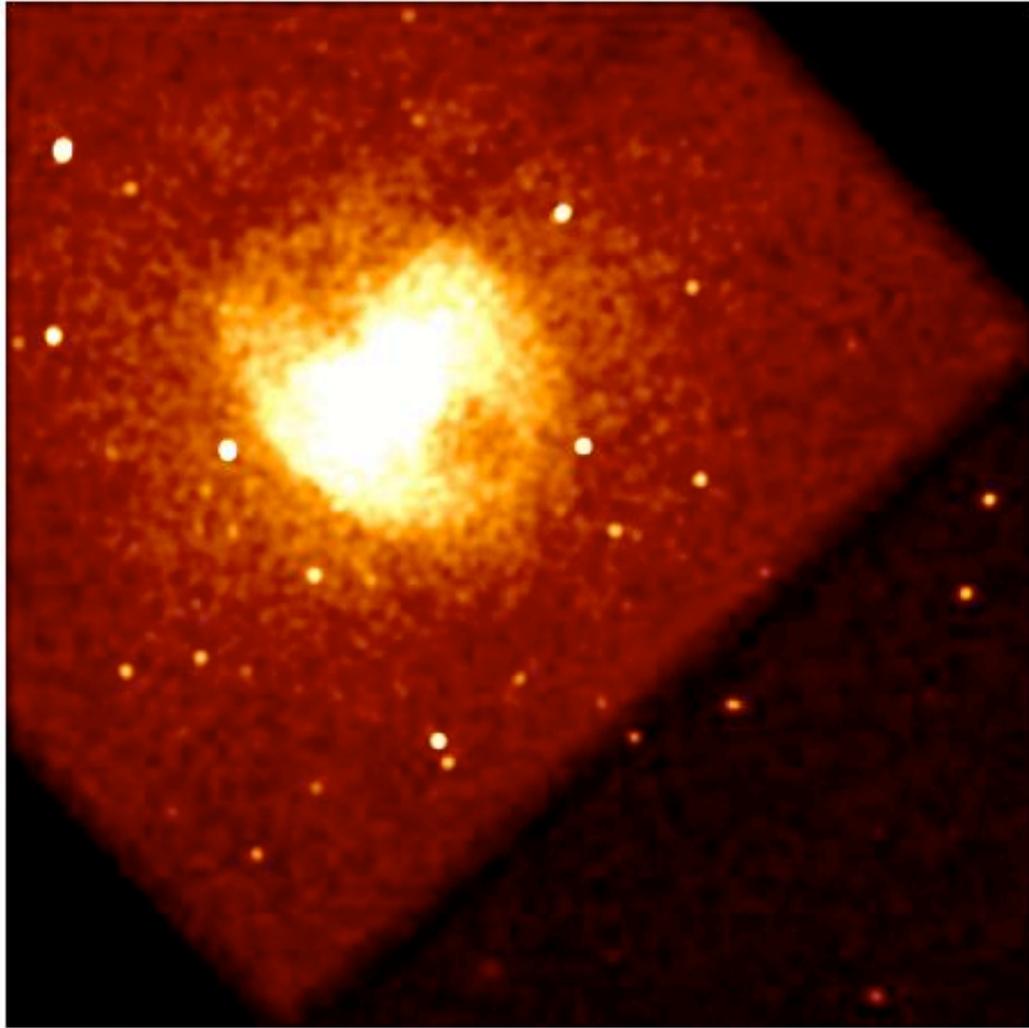[*analysis –> contour parameters –> file –> load contours*]

# A Quick Look at Regions and Catalogs in DS9

The frame with the smoothed X-ray image, contours *cleared*.
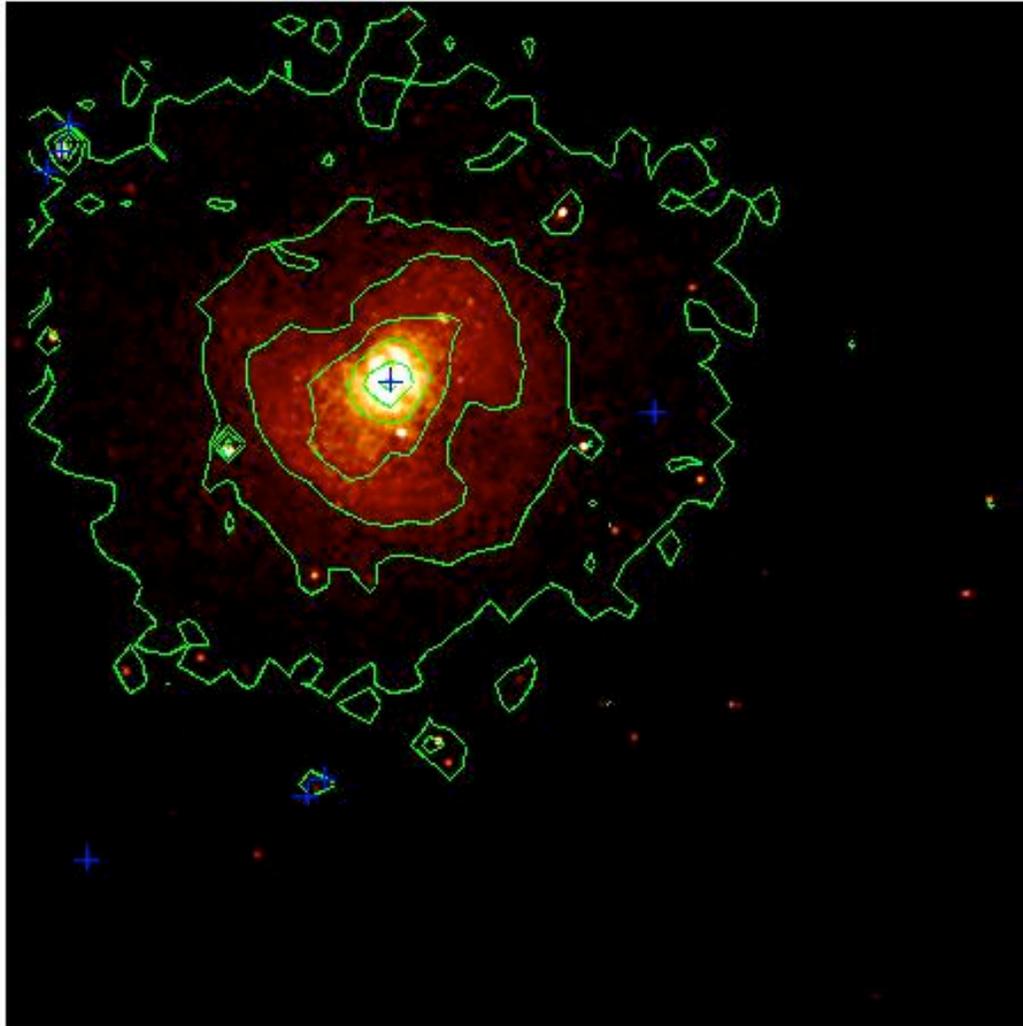
Place a circle (the default *region shape)* around a point source. Adjust the center and radius (to 10''), and express these in sexagesimal WCS coordinates [*region –> get information*].

save these in a file [*region –> save regions*], and then remove from the image [*region –> delete all regions*]
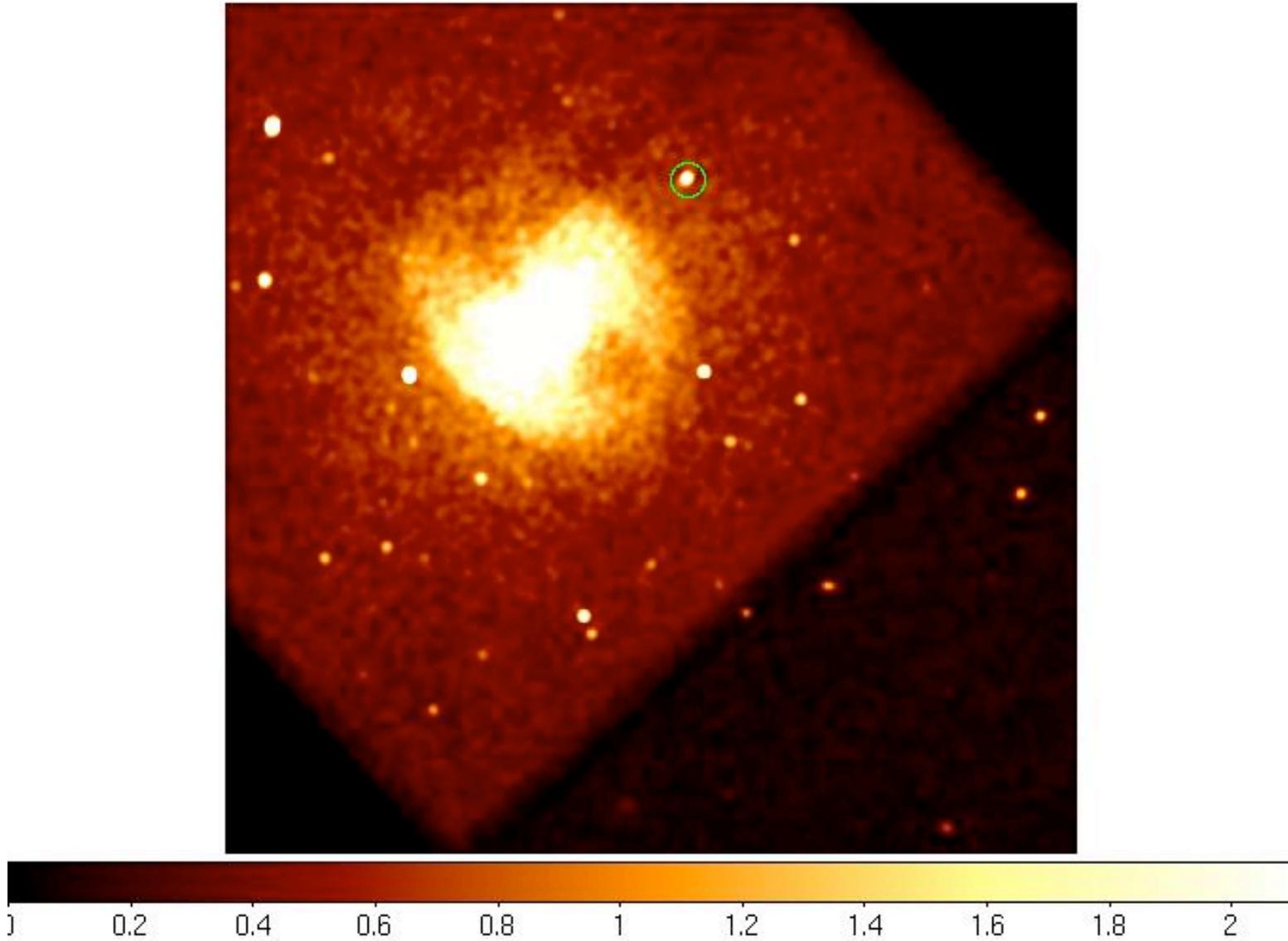
Reload the saved region [*region –> load regions*]

Overplot source positions *retrieved* from the FIRST radio survey, using blue cross point symbols [*analysis –> catalogs –> radio –> first survey*]