

G332.4-0.4

1 Summary

- Common Name: RCW 103
- Distance: 3.3 kpc (Caswell et al., 1975)
- Position of Central Source (J2000): (16 17 36.5, -51 02 41.2)
- X-ray size: 9.3' x 8.9'

• Description:

1.1 Summary of Chandra Observations

Sequence	Obs ID	Instrument	Exposure _{uf} (ks)	Exposure _f (ks)	Date Observed	Aimpoint (J2000) (α , δ)
500010	970	ACIS-23678	18.9	18.9	2000-02-08	(16 17 36.5, -51 02 26.7)

Exposure_{uf} → Exposure time of un-filtered event file
 Exposure_f → Exposure time of filtered event file

- Most part of the remnant is covered by chip ACIS-S3(CCD_ID=7)
- ACIS-S2 covers some northern part while some eastern and western part are not covered in this observation

1.2 Chandra Counts and Fluxes

Region	Energy Range (keV)	Signal (counts)	Rate (counts s ⁻¹)	F _w ^{sh} (ergs cm ⁻² s ⁻¹)	F _x (ergs cm ⁻² s ⁻¹)	L _x (ergs s ⁻¹)
Total (970)	0.3 - 10.0	1.106e+06	5.842e+01	1.75e-10	1.70e-08	2.21e+37
	0.3 - 2.1	1.079e+06	5.701e+01	1.58e-10	1.70e-08	2.21e+37
	2.1 - 10.	2.720e+04	1.437e+00	1.73e-11	2.13e-11	2.77e+34
Shell (970)	0.3 - 10.0	1.086e+06	5.736e+01	1.68e-10	1.70e-08	2.20e+37
	0.3 - 2.1	1.064e+06	5.620e+01	1.55e-10	1.70e-08	2.20e+37
	2.1 - 10.	2.232e+04	1.179e+00	1.32e-11	1.66e-11	2.16e+34
Around central source (970)	0.3 - 10.0	2.016e+04	1.065e+00	6.94e-12	5.67e-11	7.36e+34
	0.3 - 2.1	1.534e+04	8.105e-01	2.89e-12	5.21e-11	6.76e+34
	2.1 - 10.	4.884e+03	2.581e-01	4.08e-12	4.69e-12	6.08e+33

- N_H = 1.04 (10²² cm⁻²)
- Assumed distance: 3.3 kpc (Caswell et al., 1975)
- nH was derived by fitting the shell region with two thermal plasma model.

1.3 Nearby Sources

Obs ID 970	Position (J2000)	Size	Net Count	Count rate	Note
	(16 17 23.7, -50 51 49.8)	< 14.4"	144.0	7.61e-03	
	(16 17 28.0, -50 55 48.1)	< 4.7"	65.3	3.45e-03	
	(16 17 29.4, -50 55 11.4)	< 6.2"	1610.0	8.51e-02	
	(16 18 20.7, -51 07 37.3)	< 9.5"	163.0	8.61e-03	
	(16 18 49.3, -51 04 24.9)	< 20.7"	60.0	3.17e-03	

- (note) 1. This nearby source list is incomplete.
 All the above sources are originally from the "src2.fits" file which is distributed with standard chandra processing.
 Only sources with significant count rate and which are clear to visual inspection are included.
2. The size given above is the size of the region used in detecting that source.
 3. For each source, background was subtracted from annular region around the source.

1.4 References

- Caswell et al., 1975 A&A, 45, 239 : Parkes HI absorption

2 Fit Detail

- See spectrum page for used regions.

2.1 Shell:

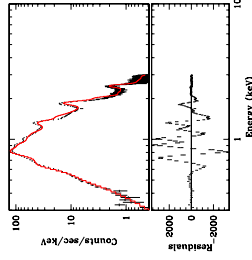
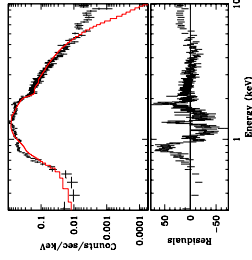
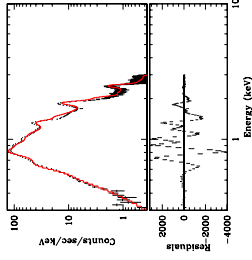
- Two thermal plasma model.

```
source=(xswabs * (xraymond + xraymond))
reduced  $\chi^2 = 30.9262$ 
nh = 1.0408 1022/cm2
```

2.2 Central source:

- nH fixed at the value derived above.
- Power-law model used

```
source=(xswabs * powlaw1d)
reduced  $\chi^2 = 2.72424$ 
nh = 1.0408 1022/cm2
```



2.3 Total:

- nH fixed at the value derive above.
- Twth thermal plasma model with power-law

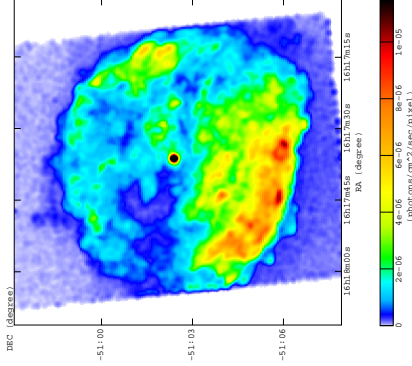
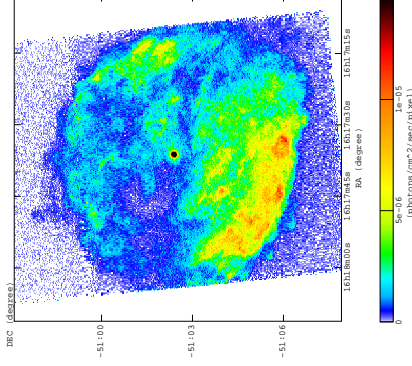
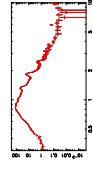
```
source=(xswabs * ((xraymond + xraymond) + powlaw1d))
reduced  $\chi^2 = 31.5457$ 
nh = 1.0408 1022/cm2
```

3 Chandra Images : Band Images

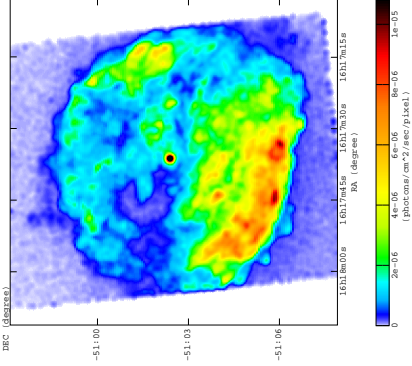
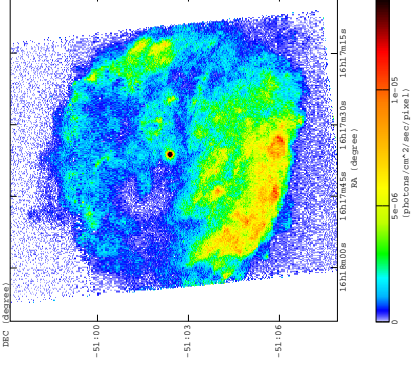
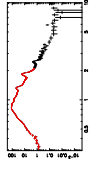
- Left : raw image, binned by 1x1 pixel
- Right : gaussian smoothed version of above ($\sigma = 2$ pixel)

3.1 Wide Band Images

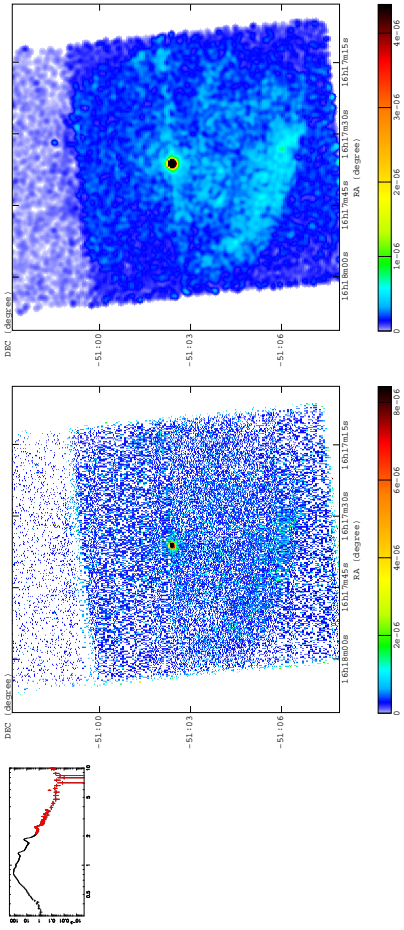
Total : 300-10000 eV



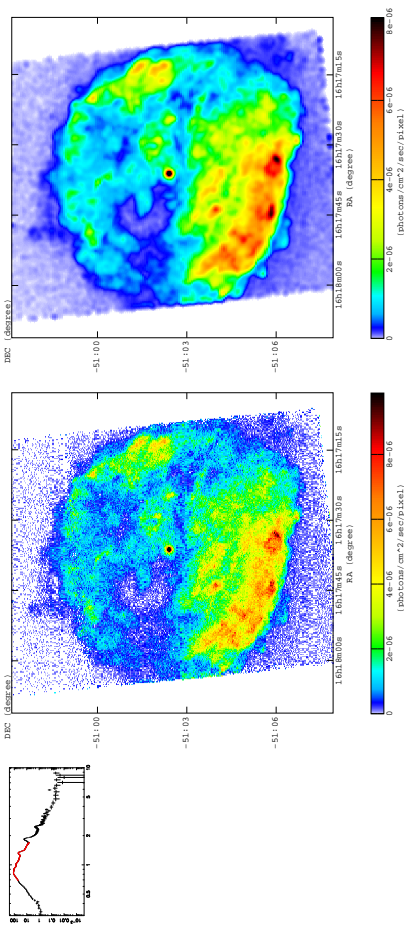
Soft Band : 300-2100 eV



Hard Band : 2100-10000 eV

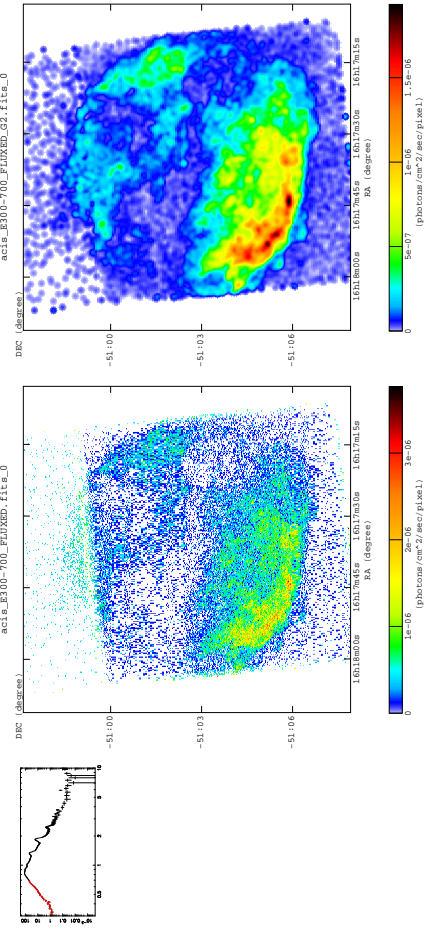


Green : 700-1690 eV

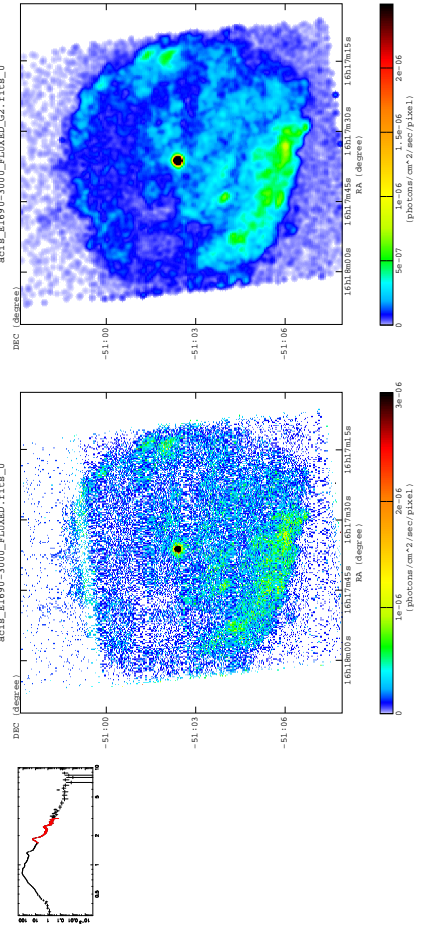


3.2 Band images used in true color image.

Red : 300-700 eV

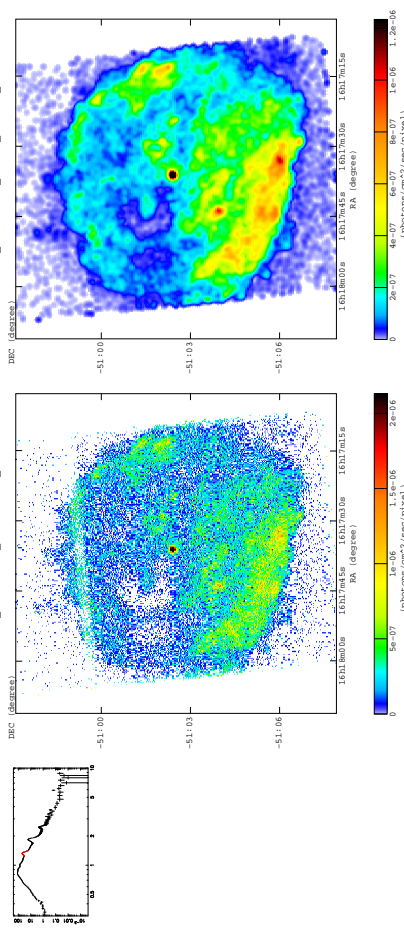


Blue : 1690-3000 eV

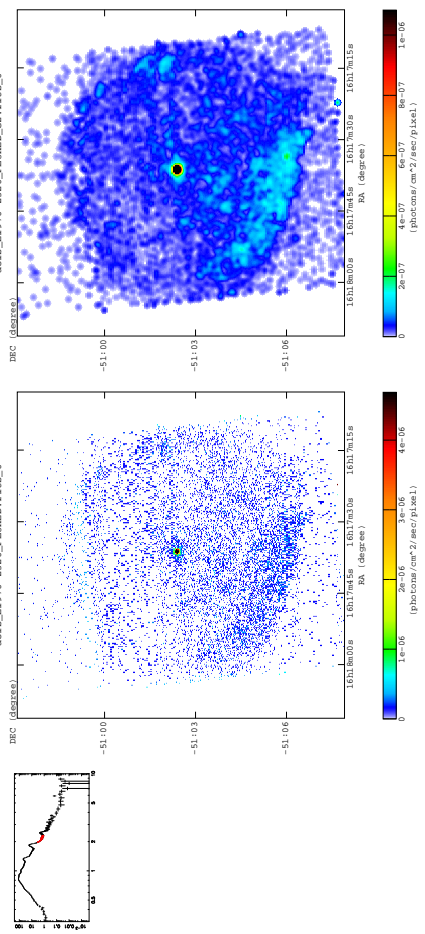


3.3 Misc.

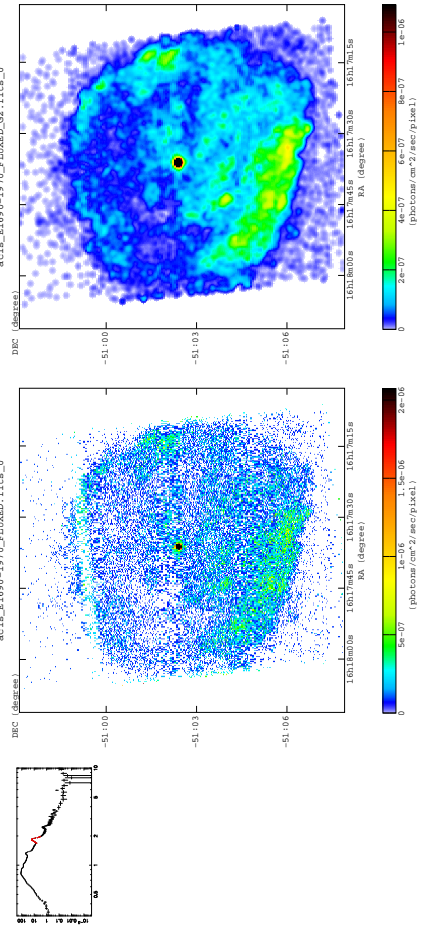
: 1230-1410 eV



: 1970-2320 eV



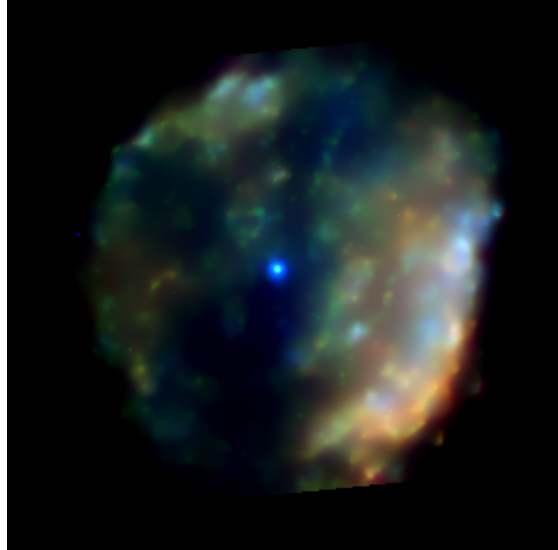
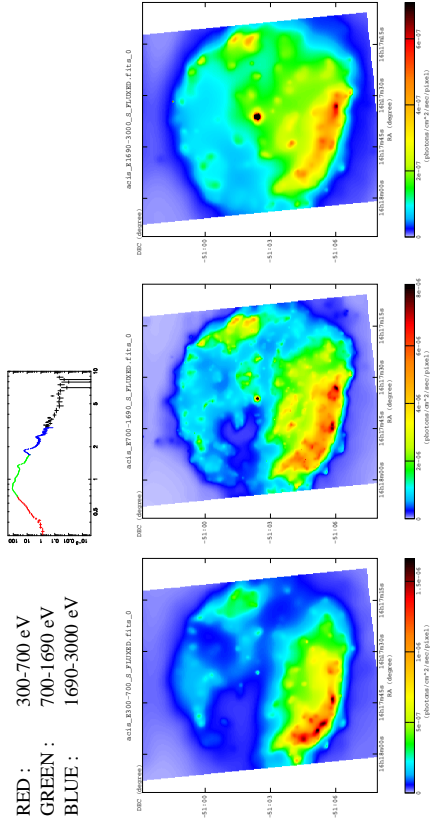
: 1690-1970 eV



4 Chandra Images : True Color

- Individual images are adaptively smoothed.
- Warning : the adaptive smoothing process sometimes produces artifacts.
- convolution method : fit
- kernel type : gauss
- significance (min , max) : (3 , 5)

RED : 300-700 eV
 GREEN : 700-1690 eV
 BLUE : 1690-3000 eV



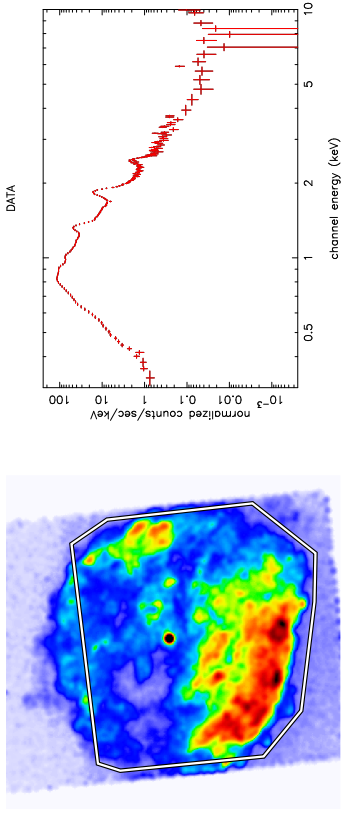
5 Chandra Spectrum

- Images show Regions used to extract spectra
- Regions with red strikes are excluded

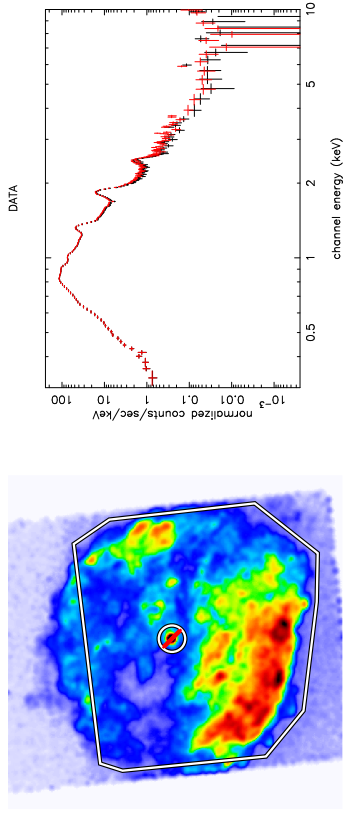
5.1 ObsID 970

- Background was subtracted from the region around the SNR.

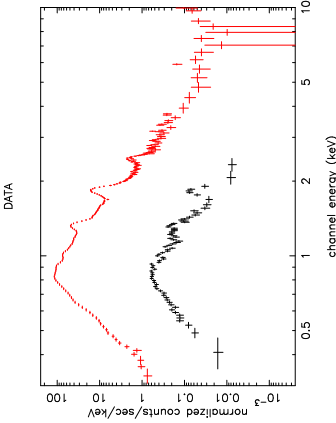
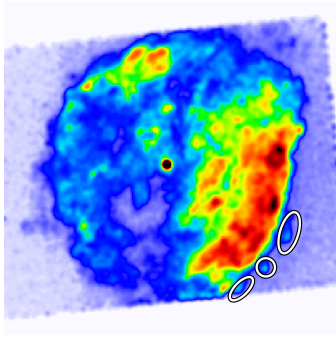
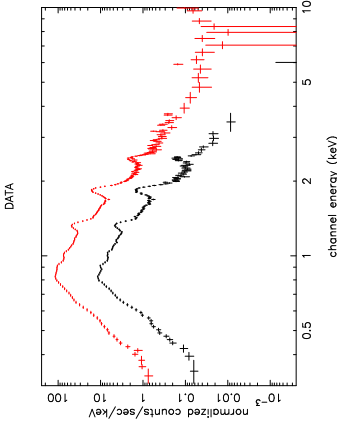
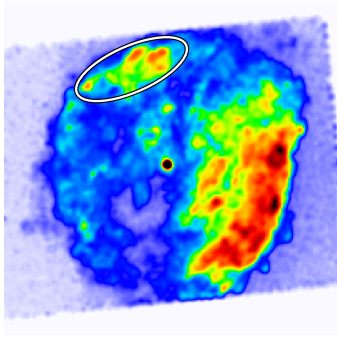
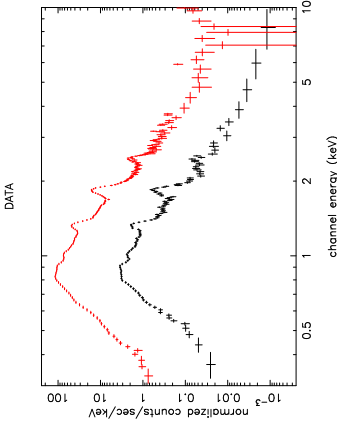
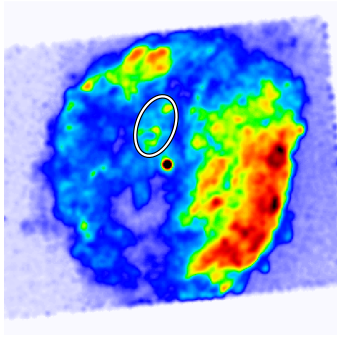
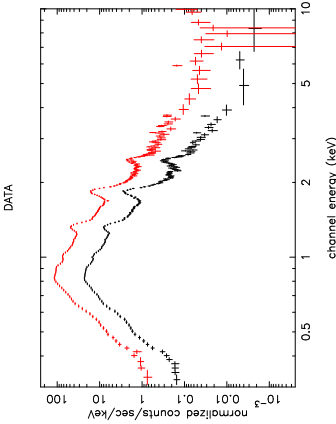
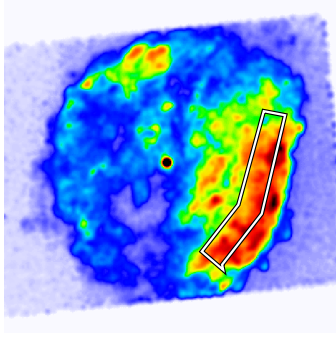
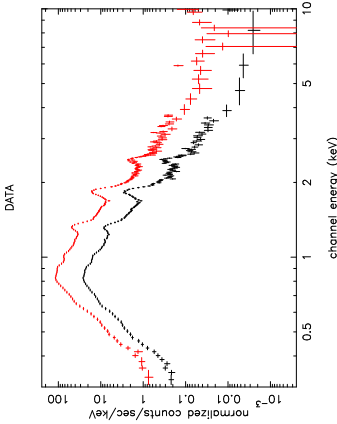
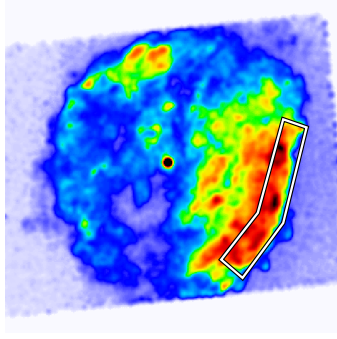
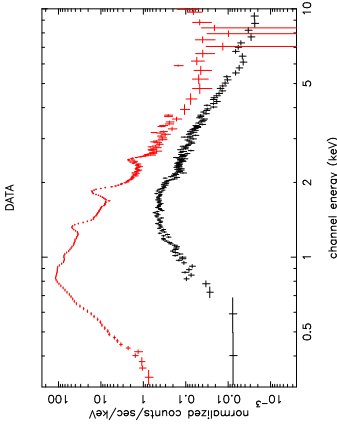
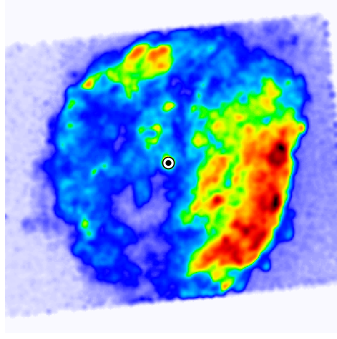
Total



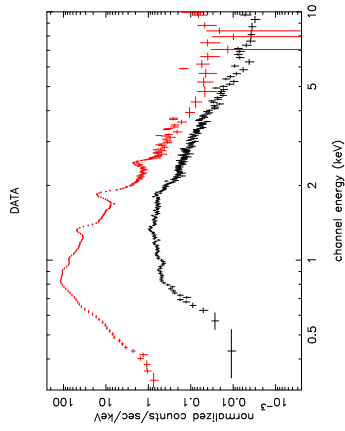
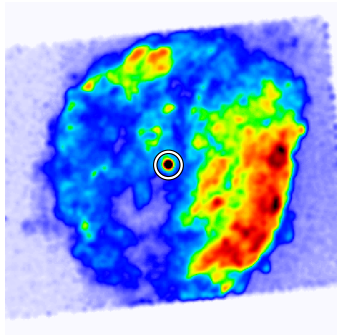
Shell



Central source



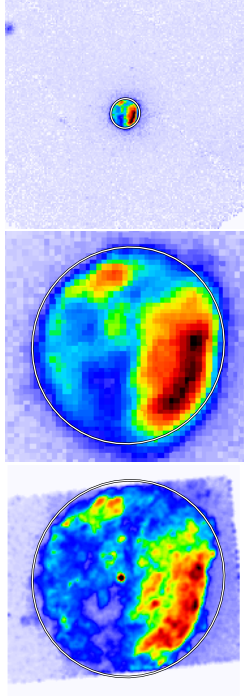
Around central source



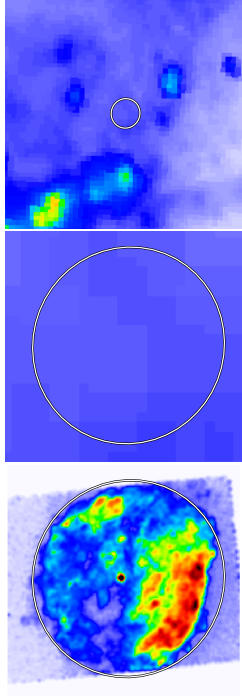
6 Images from Survey Missions

- Left : Chandra Image (0.3-10. keV)
- Center : Images from *SkyView* with the same scale
- right : Images from *SkyView* with a reduced scale

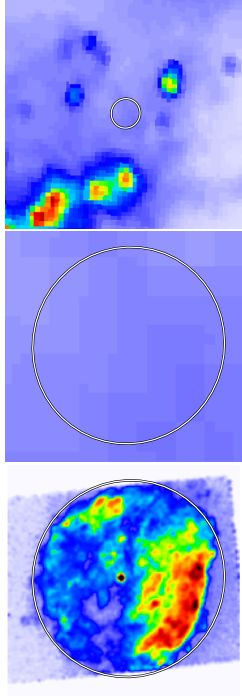
ROSAT PSPC (2.0 deg): X-ray (0.1-2.4 keV)



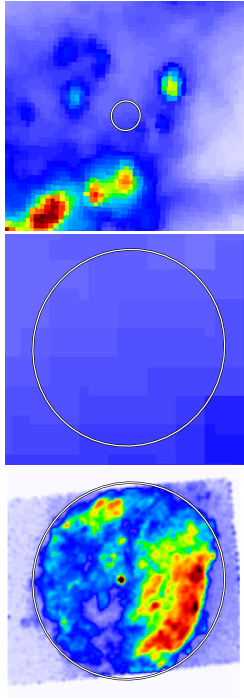
IRAS 12 micron: Infrared (12 micron)



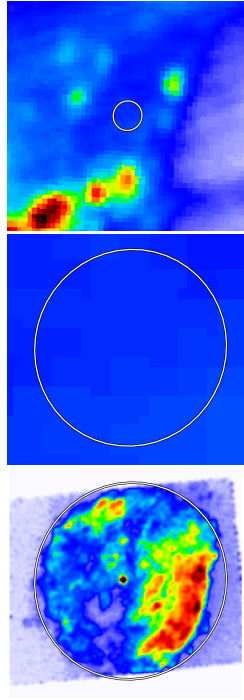
IRAS 25 micron: Infrared (25 micron)



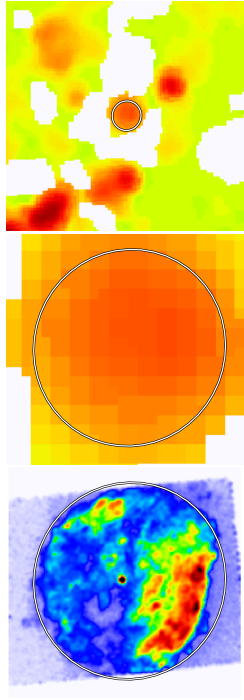
IRAS 60 micron: Infrared (60 micron)



IRAS 100 micron: Infrared (100 micron)



4850 MHz: Radio (4850 MHz continuum)



Digitized Sky Survey: Optical (J or E band images with a few exceptions)

