SNR 0509-68.7

1 Summary

- Common Name: N 103B
- Distance: 50 kpc (distance to LMC, **Westerlund(1990)**)
- Center of X-ray emission (J2000): (05 08 59.7, -68 43 35.5)
- X-ray size: 32” x 30”
- Description: ??

1.1 Summary of Chandra Observations

Sequence	Obs ID	Instrument	$\text{Exposure}_{\text{uf}}$ (ks)	$\text{Exposure}_{\text{f}}$ (ks)	Date Observed	Aimpoint (J2000) (α, δ)
500012	125	ACIS-23678	40.3	32.4	1999-12-04	(05 08 59.0, -68 43 30.0)

$\text{Exposure}_{\text{uf}} \rightarrow$ Exposure time of un-filtered event file
$\text{Exposure}_{\text{f}} \rightarrow$ Exposure time of filtered event file

- The whole remnant is covered by chip ACIS-S3(CCD_ID=7)

1.2 Chandra Counts and Fluxes

Region	Energy Range (keV)	Signal (counts)	Rate (counts s^{-1})	F_X^{abs} (ergs cm^{-2} s^{-1})	F_X (ergs cm^{-2} s^{-1})	L_X (ergs s^{-1})
total	0.3 - 10.0	2.261e+05	6.982e+00	2.19e-11	5.94e-11	1.77e+37
(125)	0.3 - 2.1	2.168e+05	6.694e+00	1.88e-11	5.61e-11	1.67e+37
	2.1 - 10.	9.437e+03	2.914e-01	3.16e-12	3.37e-12	1.00e+36

- N_H = 0.31 ($10^{22} cm^{-2}$)
- Assumed distance: 50 kpc (distance to LMC, **Westerlund(1990)**)
- nH was derived with two thermal plasma model

1.3 Nearby Sources

Obs ID	Position (J2000)	Size	Net Count	Count rate	Note
125					
	(05 07 36.3, -68 47 52.7)	< 14.1”	322.0	7.99e-03	
	(05 08 03.1, -68 40 16.5)	< 7.2”	67.9	1.69e-03	
	(05 08 08.4, -68 40 46.4)	< 6.1”	135.0	3.35e-03	
	(05 08 12.9, -68 44 35.6)	< 5.9”	61.3	1.52e-03	
	(05 08 32.7, -68 54 29.1)	< 17.6”	881.0	2.19e-02	
	(05 08 48.0, -68 45 53.7)	< 2.5”	5.0	1.24e-04	
	(05 09 06.8, -68 39 37.2)	< 3.6”	49.2	1.22e-03	
	(05 09 17.1, -68 40 52.9)	< 1.8”	34.7	8.61e-04	
	(05 09 39.8, -68 53 25.4)	< 15.5”	51.2	1.27e-03	
	(05 09 48.2, -68 39 57.5)	< 3.1”	19.7	4.89e-04	
	(05 10 09.3, -68 52 52.0)	< 16.2”	117.0	2.90e-03	
	(05 10 22.7, -68 39 12.8)	< 8.8”	53.4	1.33e-03	
	(05 10 22.8, -68 50 57.9)	< 16.3”	51.9	1.29e-03	
	(05 10 26.1, -68 52 31.7)	< 19.2”	51.2	1.27e-03	
	(05 10 36.4, -68 40 29.7)	< 10.3”	50.9	1.26e-03	
	(05 10 45.9, -68 56 28.8)	< 33.6”	675.0	1.68e-02	
	(05 10 48.3, -68 45 25.7)	< 12.3”	1080.0	2.68e-02	

(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

- Dickel and Milne, 1995 AJ, 109, 200 : ATCA
- Westerlund, 1990 A&ARv, 2, 29 : Distance to LMC

2 Fit Detail

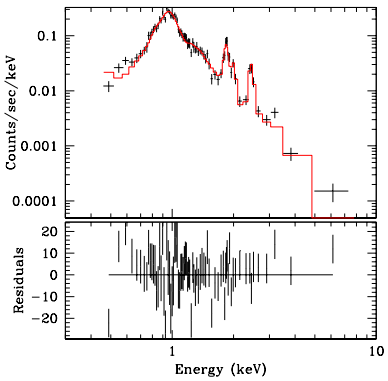
- See spectrum page for used regions.

Two componet were assumed.

2.1 Component 1:

- represented by region **far east**

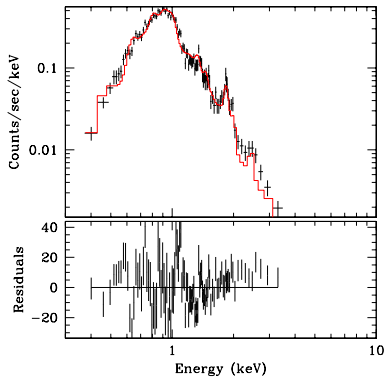
  source=(xswabs * xsvapec)
  reduced χ^2 = 1.3488
  nh = `0.2826 10^22/cm^2`



2.2 Component 2:

- represented by region **small clump around center**

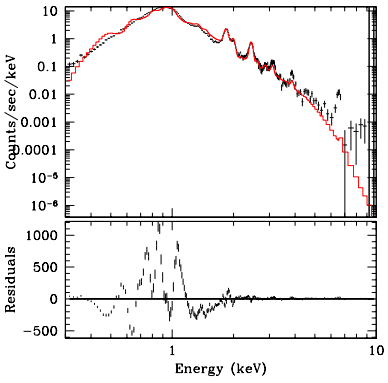
  source=(xswabs * (xsapec + xsapec))
  reduced χ^2 = 1.89472
  nh = `0.3378 10^22/cm^2`



2.3 Total:

- Above two component were added together.
- fit was done with all the parameter(except nH and normarlization factor) fixed at values from above fit.

  source=(xswabs * ((xsapec + xsapec) + xsvapec))
  reduced χ^2 = 20.8426
  nh = `0.3071 10^22/cm^2`

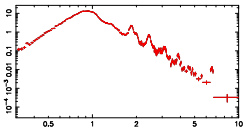


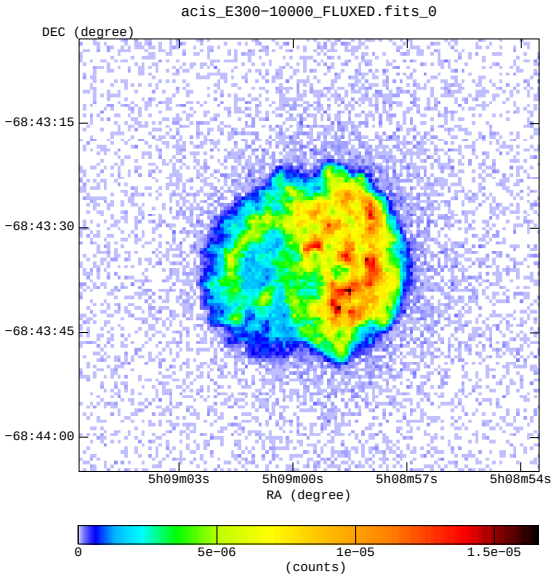
3 Chandra Images : Band Images

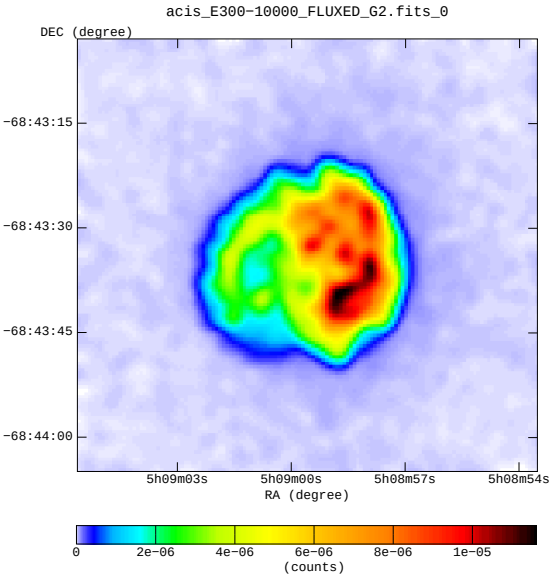
- Left : raw image, binned by 1x1 pixel
- Right : gaussian smoothed version of above (σ = 2 pixel)

3.1 Wide Band Images

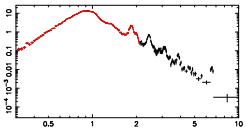
Total : 300-10000 eV

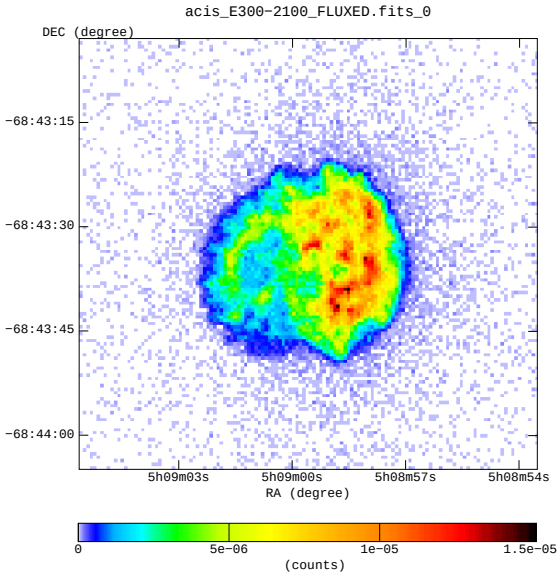


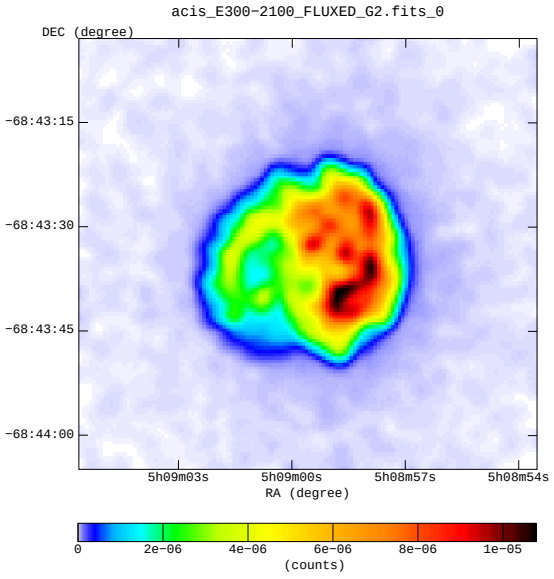




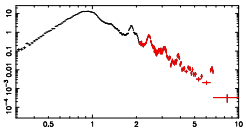
Soft Band : 300-2100 eV

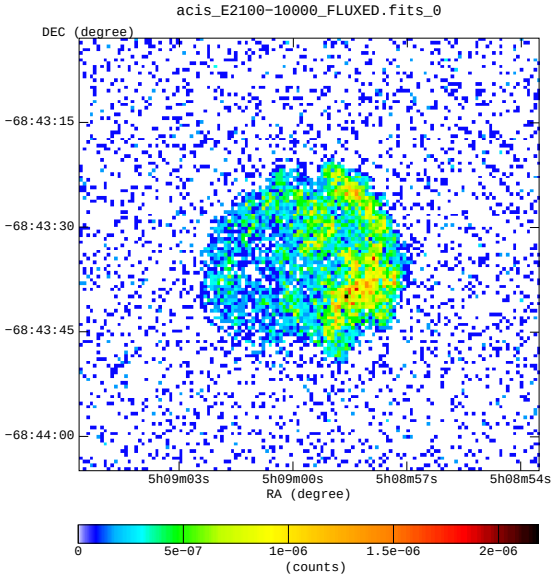


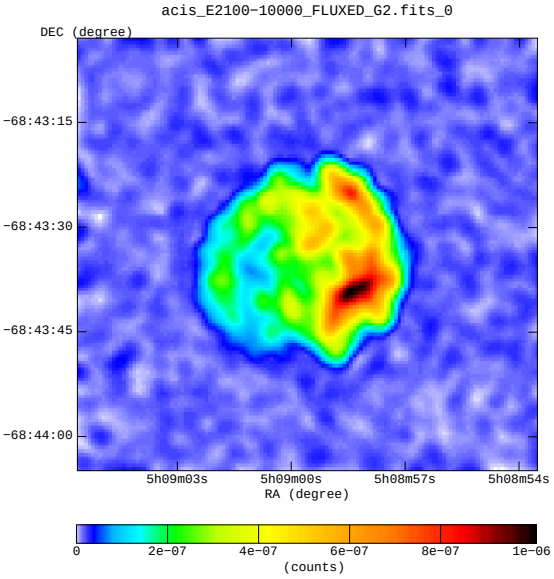




Hard Band : 2100-10000 eV

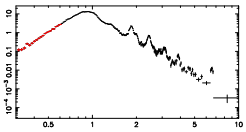


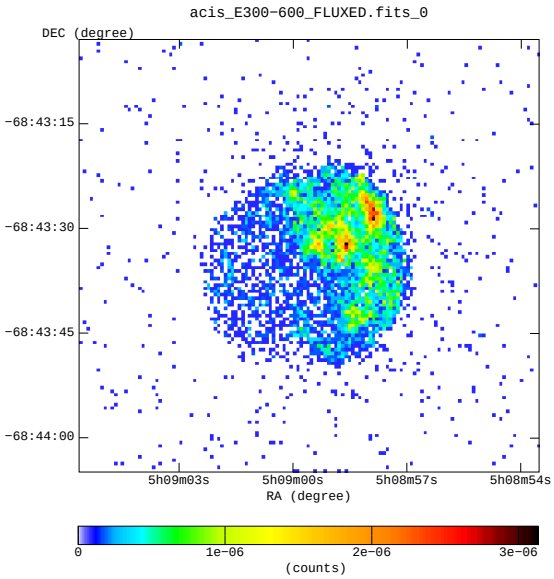


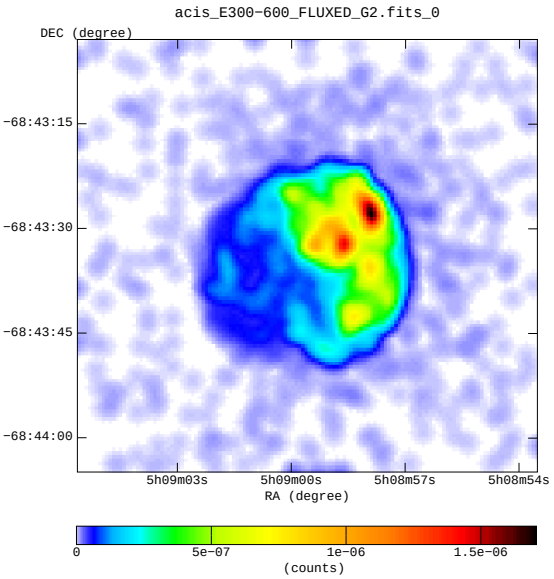


3.2 Band images used in true color image.

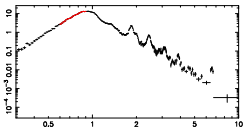
Red : 300-600 eV

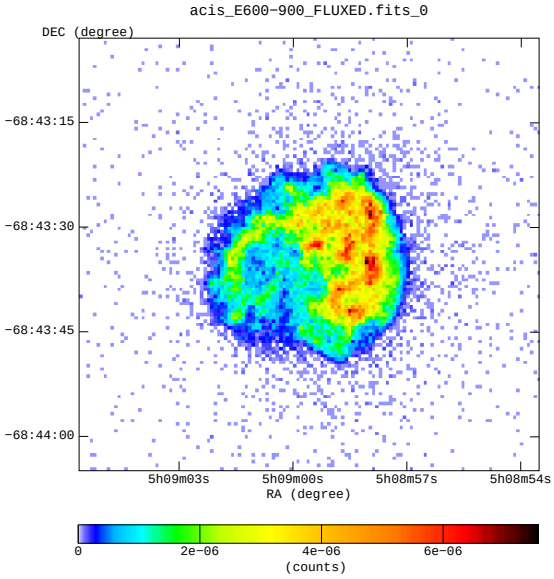


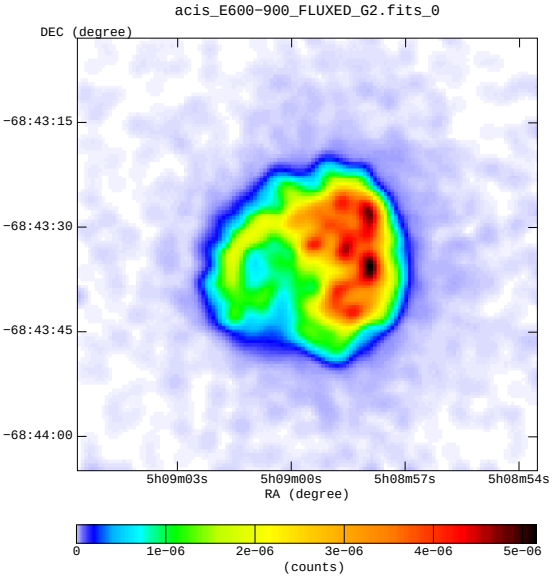




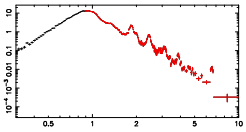
Green : 600-900 eV

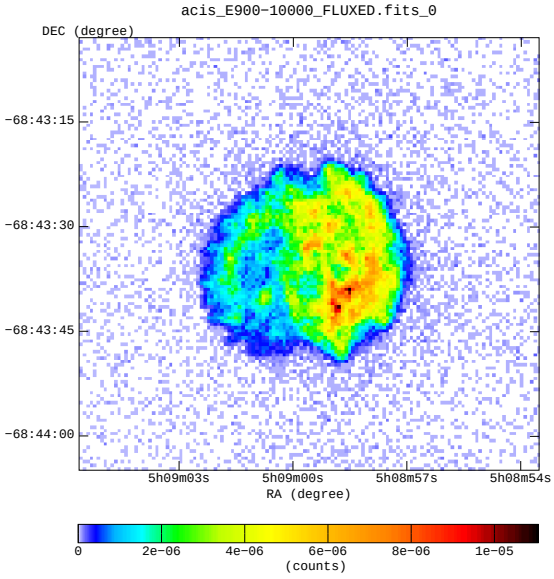


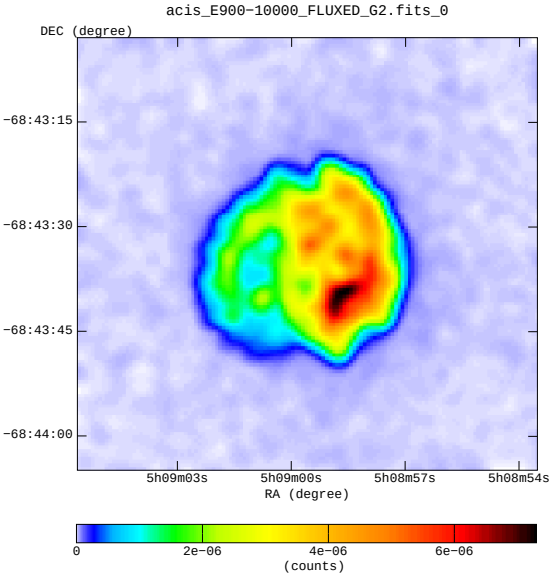




Blue : 900-10000 eV

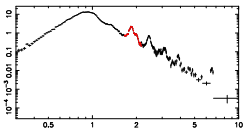


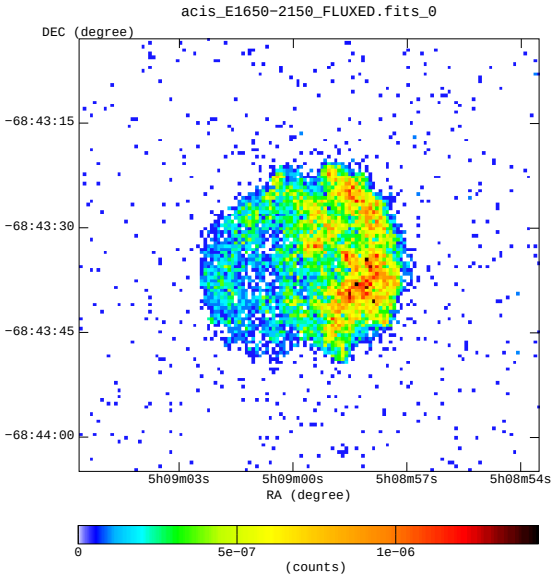


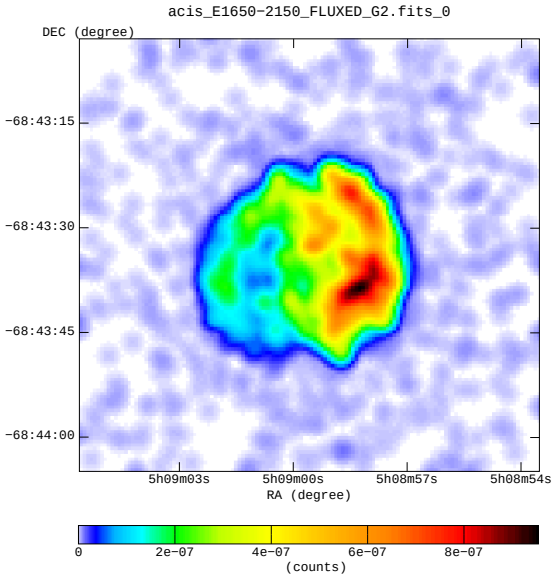


3.3 Misc.

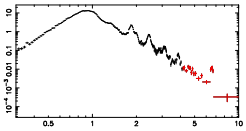
: 1650-2150 eV

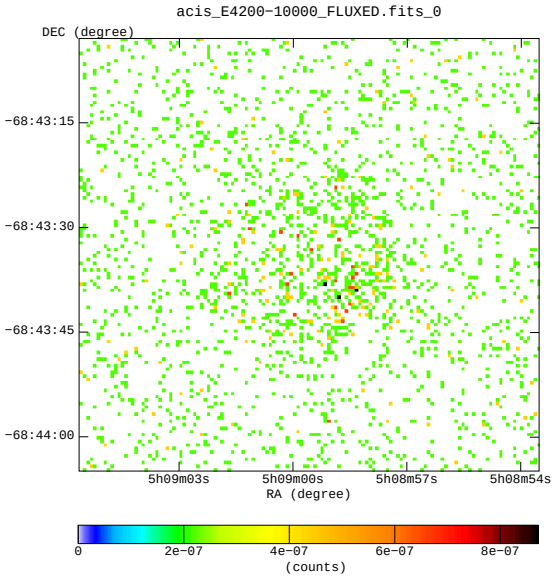


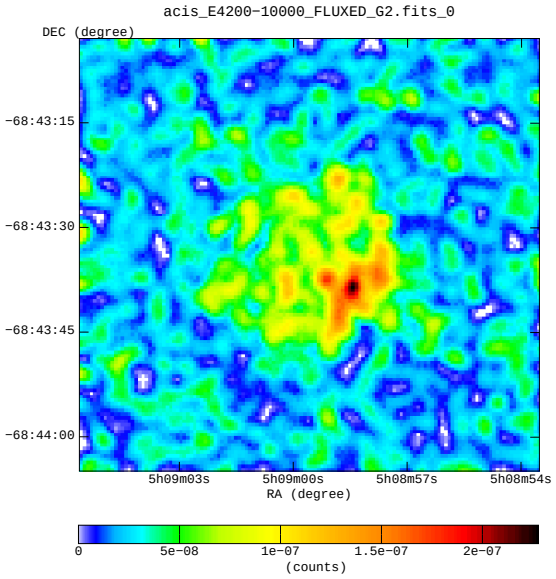




: 4200-10000 eV





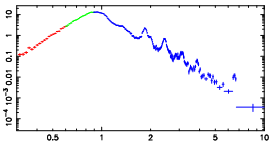


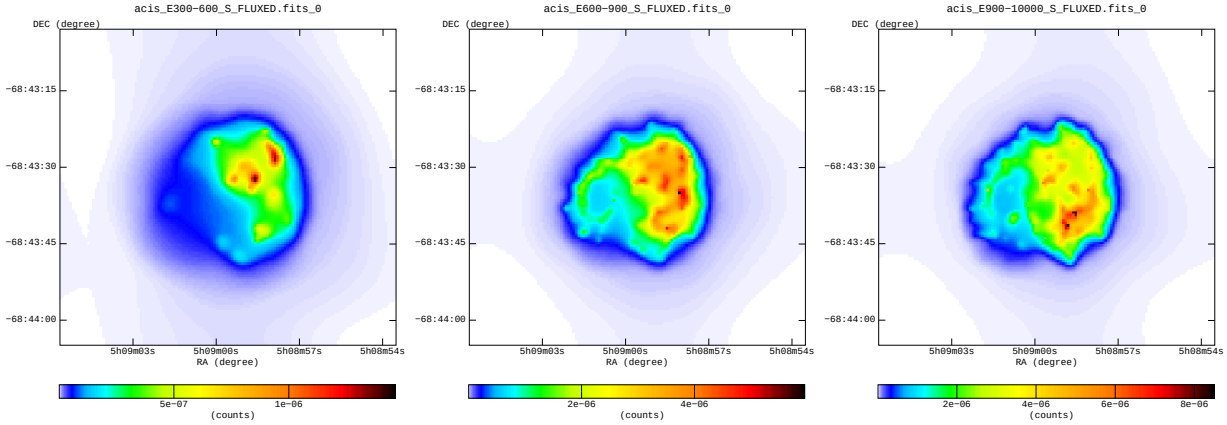
4 Chandra Images : True Color

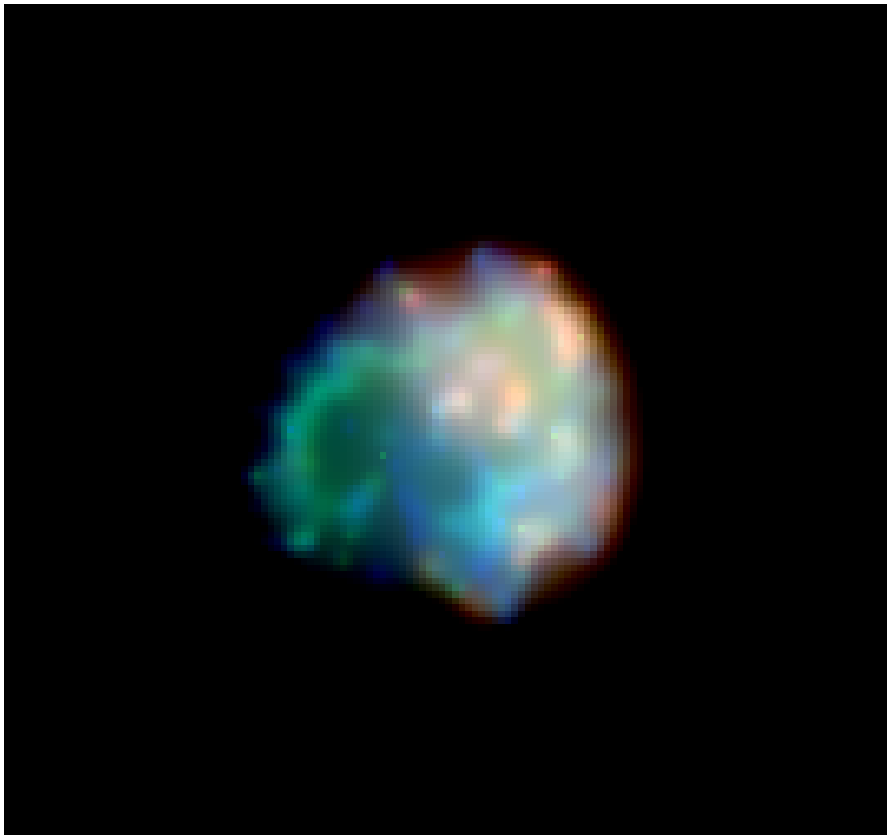
- Individual images are adaptively smoothed.
- Warning : the adaptive smoothing process sometimes produces artifacts.

- convolution method : fft
- kernel type : gauss
- significance (min , max) : (3 , 5)

RED : 300-600 eV
GREEN : 600-900 eV
BLUE : 900-10000 eV





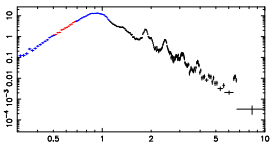


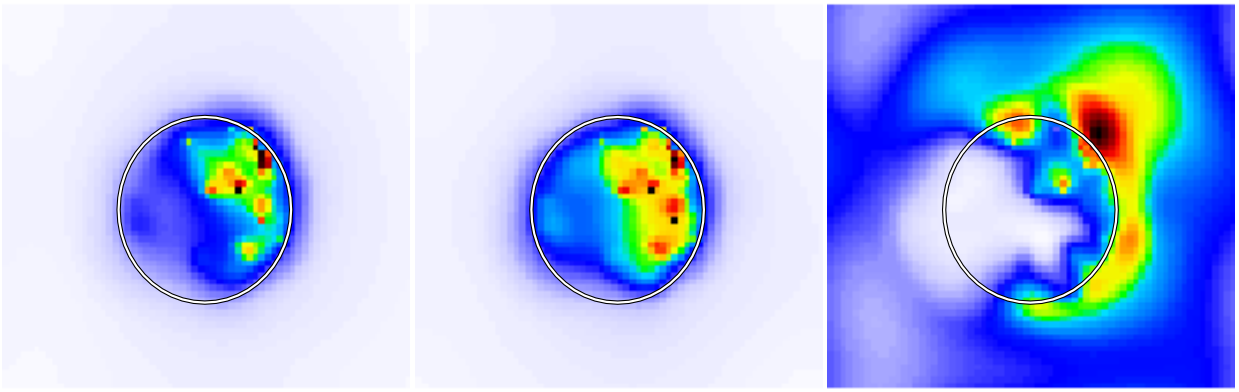
5 Chandra Images : Equivalent Width Map

5.1 Equivalent Width Images

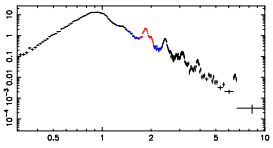
- individual images(line and two continuum) are binned by given pixel size and then adaptively smoothed.
- same scale map (from the least count images) was used for all three images.
- continuum at given line position was estimated by linear interpolation of two continuum image in pixel-by-pixel base.

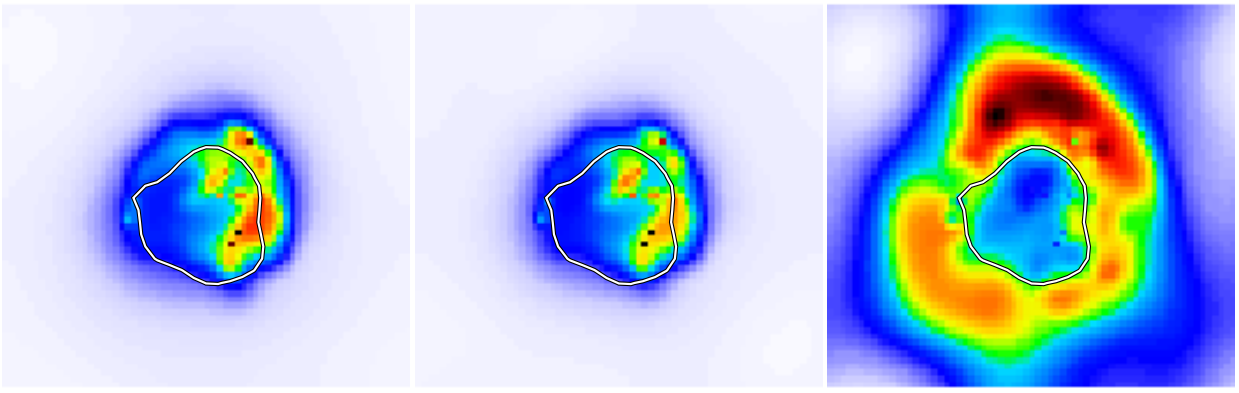
continuum :	300-500 eV
line :	500-700 eV
continuum :	700-1100 eV





continuum :	1430-1670 eV
line :	1670-2080 eV
continuum :	2080-2330 eV





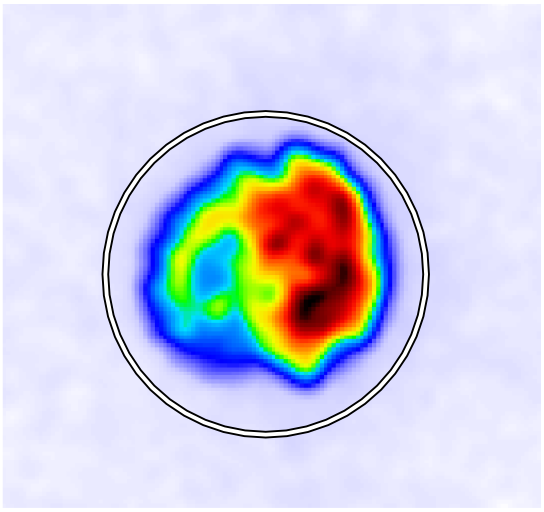
6 Chandra Spectrum

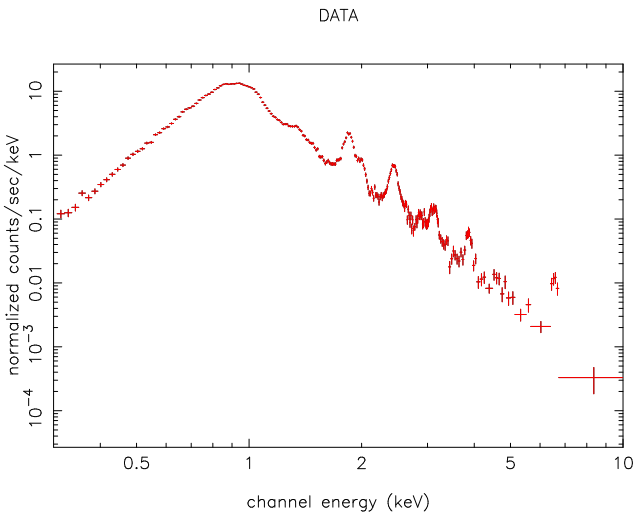
- Images show Regions used to extract spectra
- Regions with red strikes are excluded

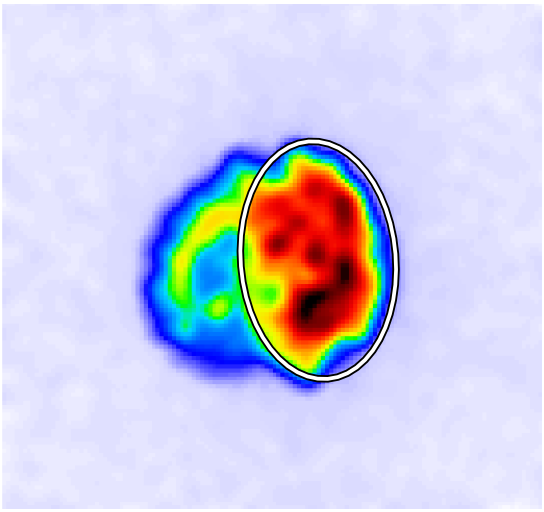
6.1 ObsID 125

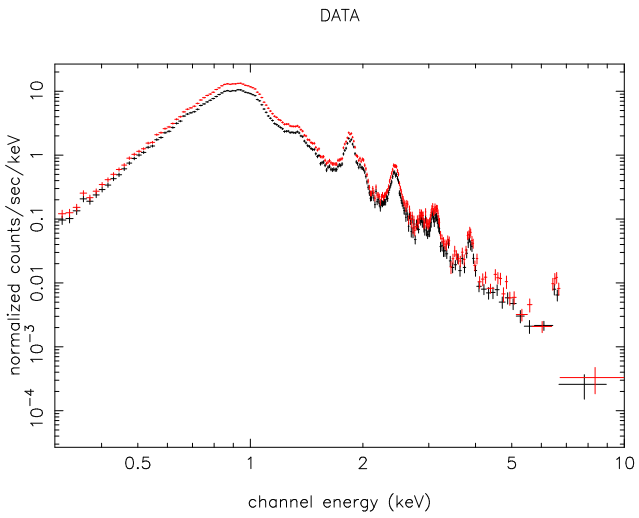
- Background was subtracted from the region around the SNR.

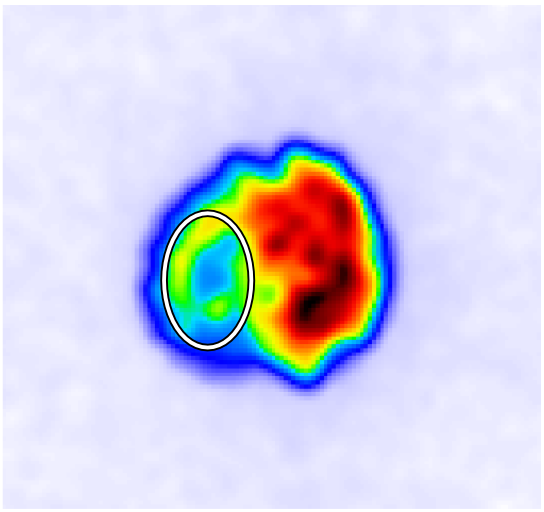
total

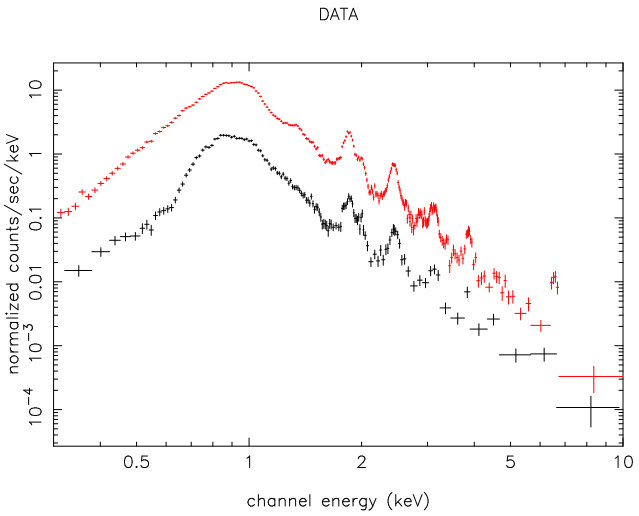




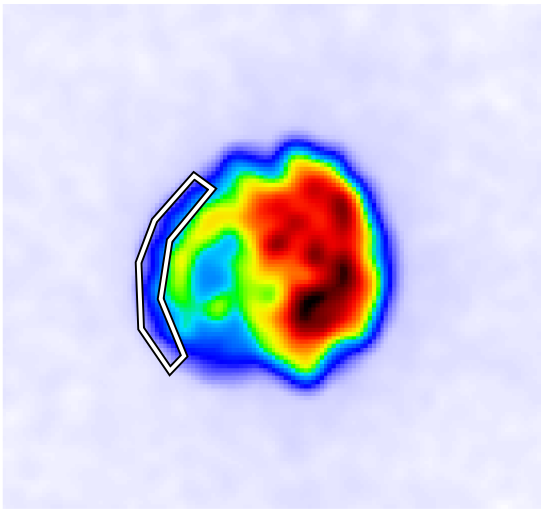


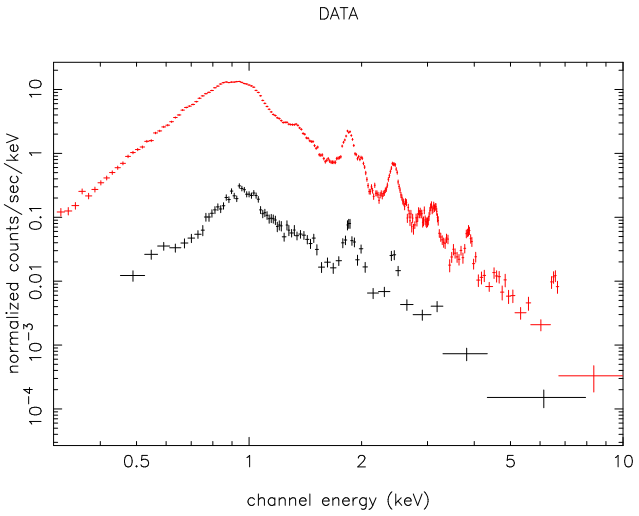


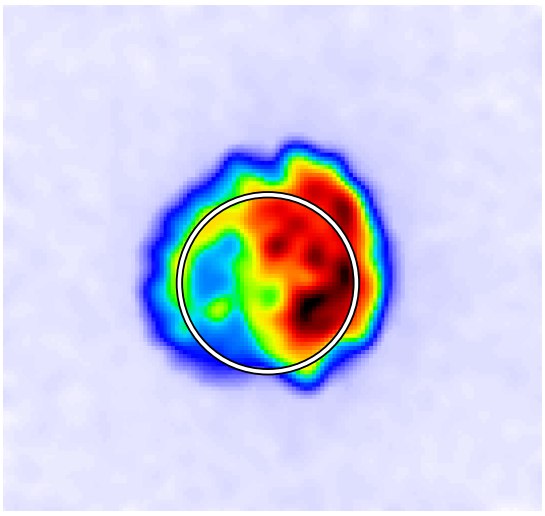


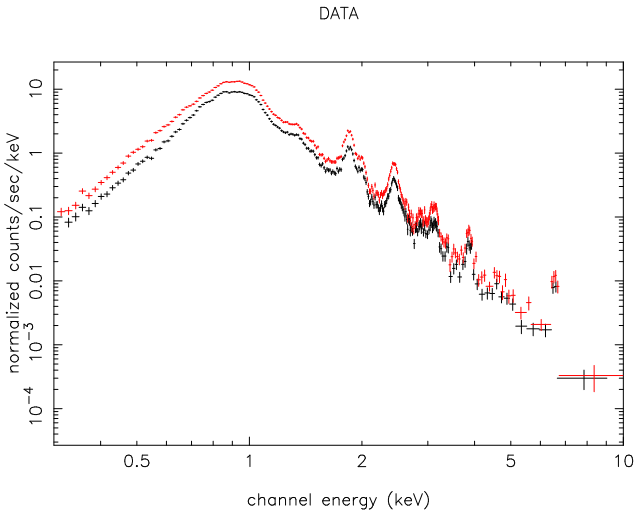

DATA
normalized counts/sec/keV
channel energy (keV)

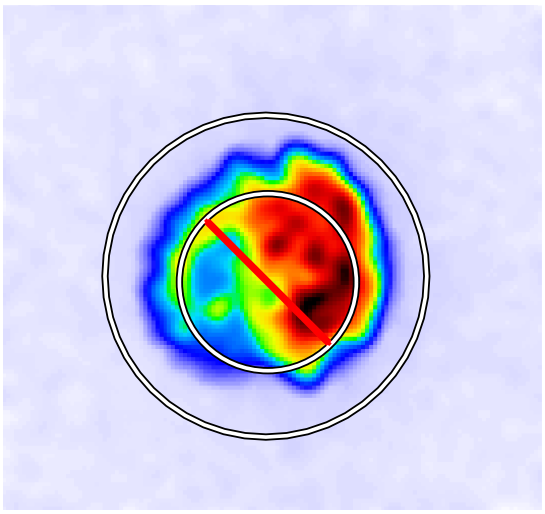
far east

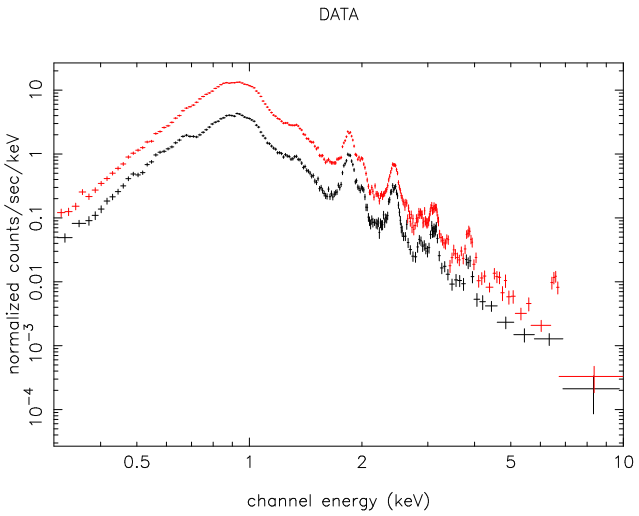


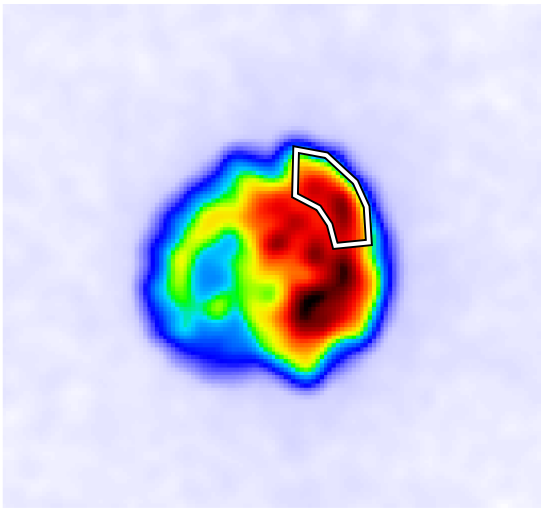

DATA
normalized counts/sec/keV
channel energy (keV)

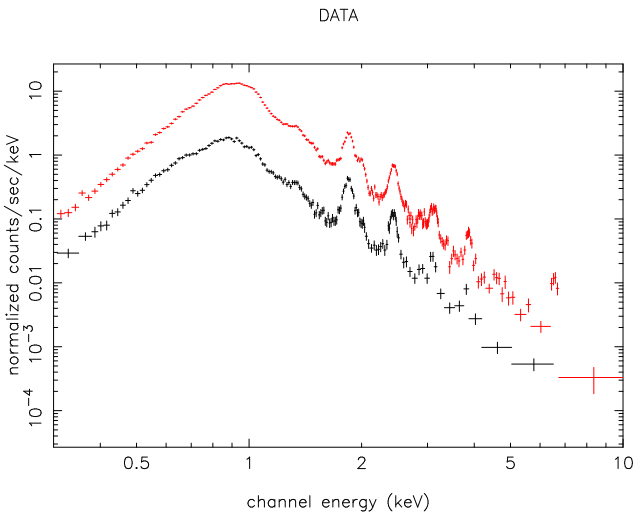


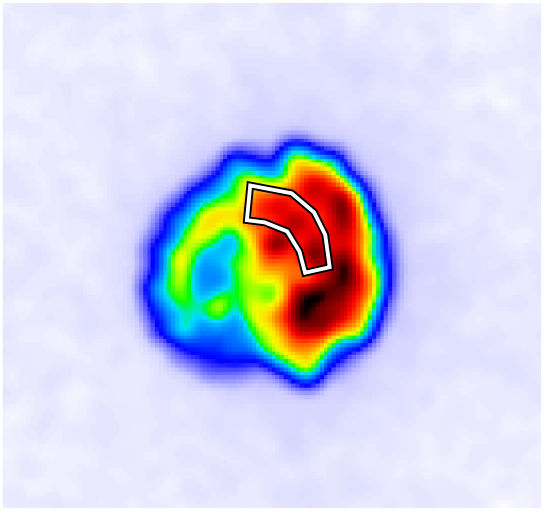

DATA
normalized counts/sec/keV
channel energy (keV)

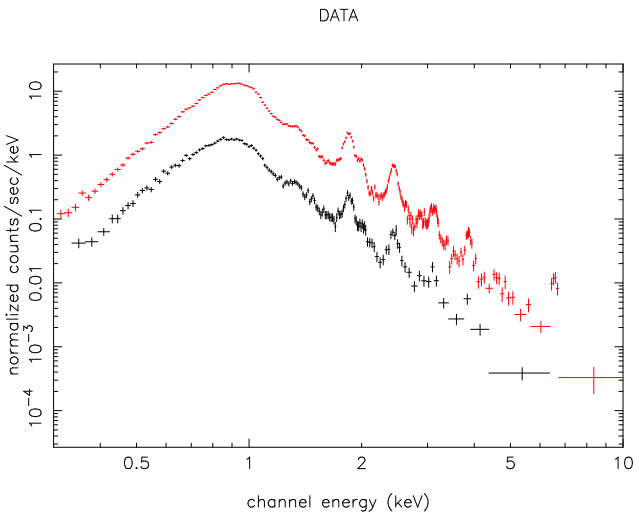



DATA
normalized counts/sec/keV
channel energy (keV)

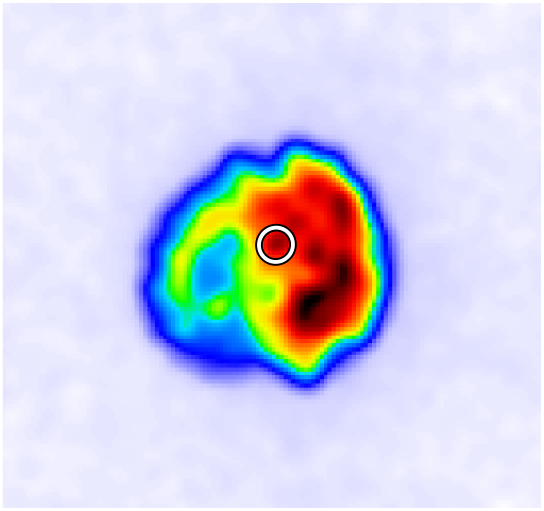


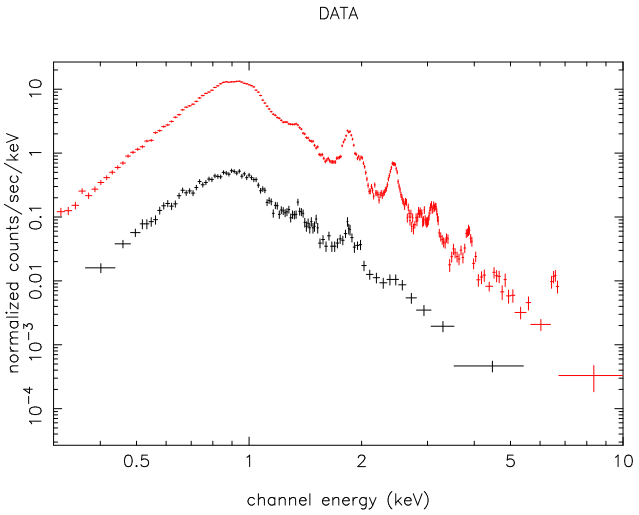

DATA
normalized counts/sec/keV
channel energy (keV)

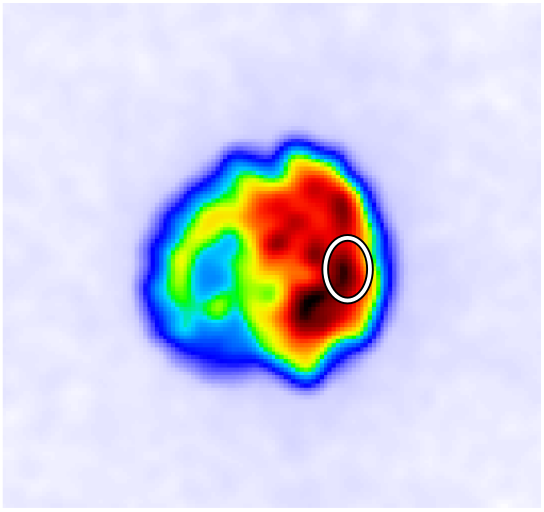


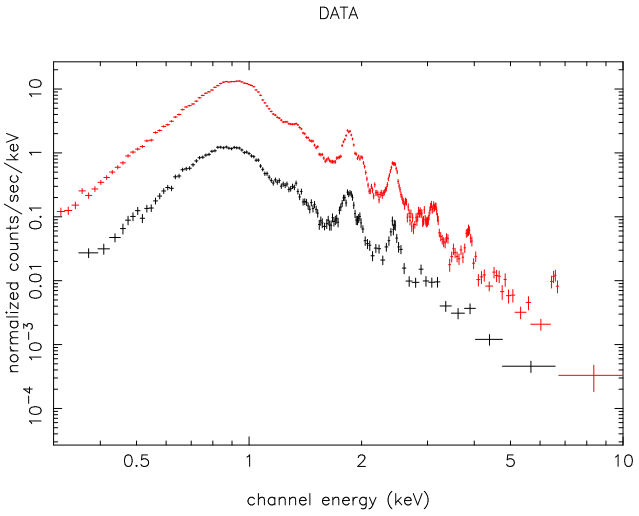

DATA
normalized counts/sec/keV
channel energy (keV)

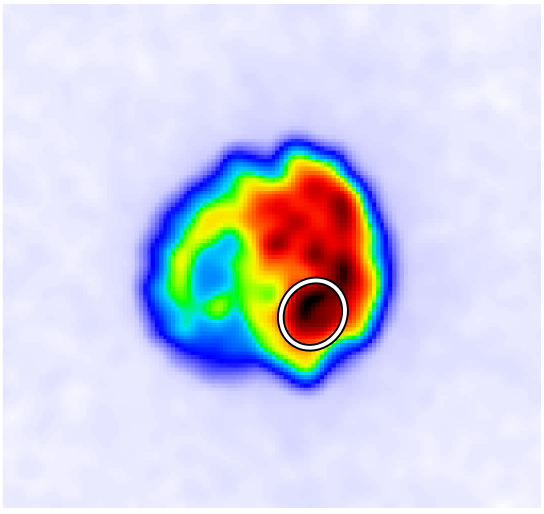
small clump around center

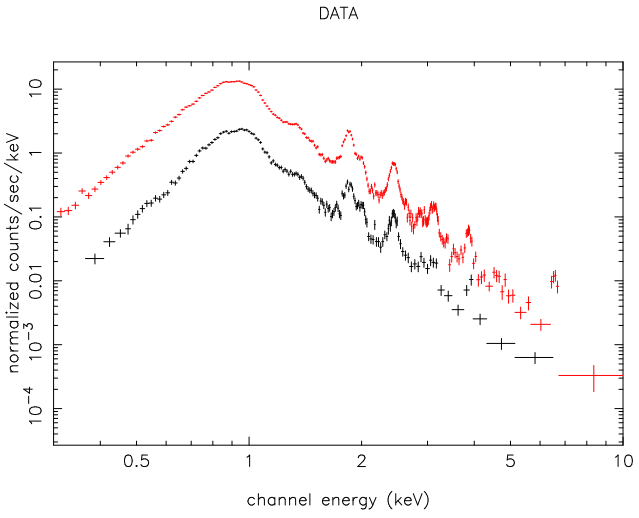


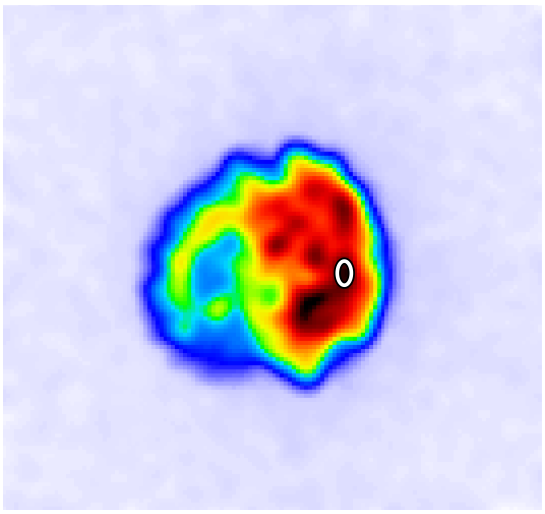


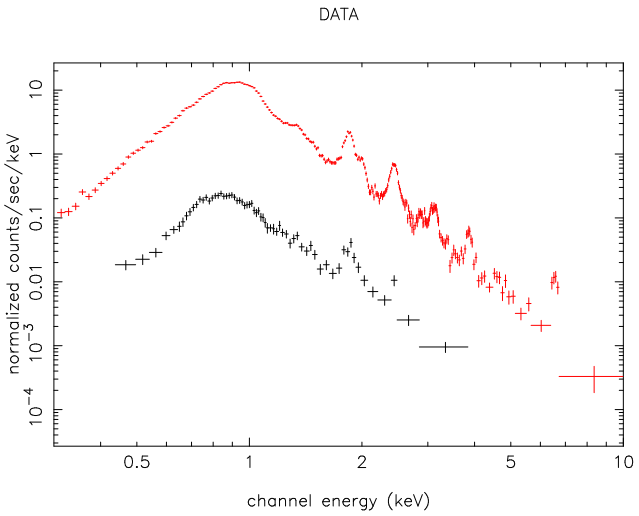










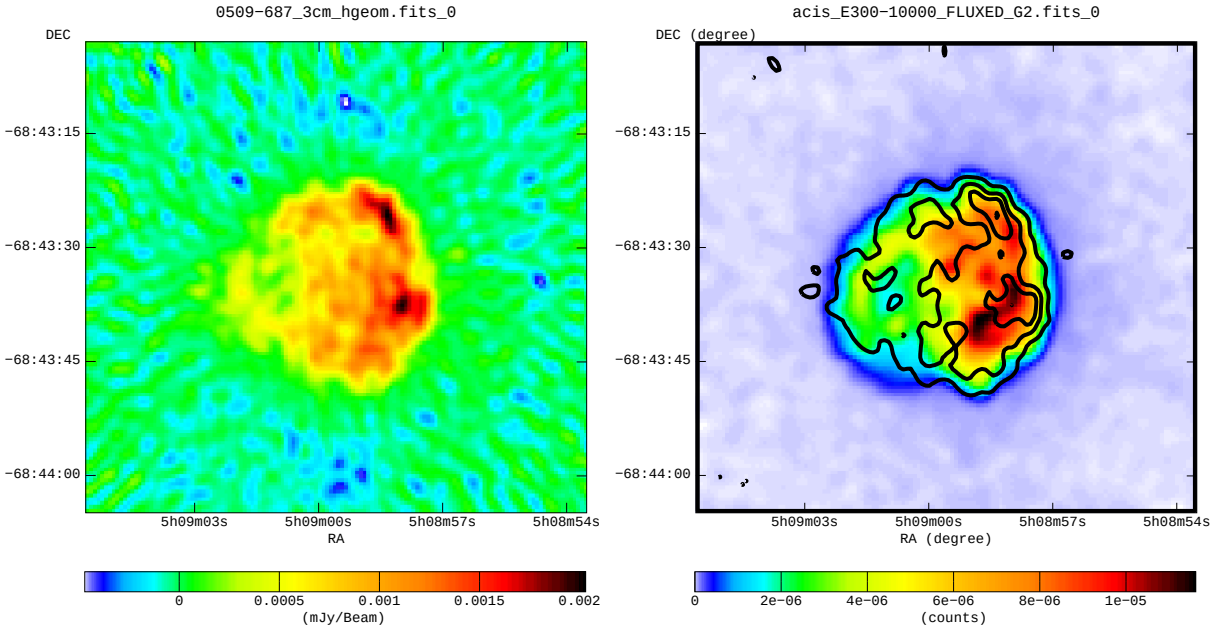

DATA
normalized counts/sec/keV
channel energy (keV)
0.5
1
2
5
10

7 Radio Image

- left : radio image
- right : chandra x-ray image with radio contour lines

3.5-cm

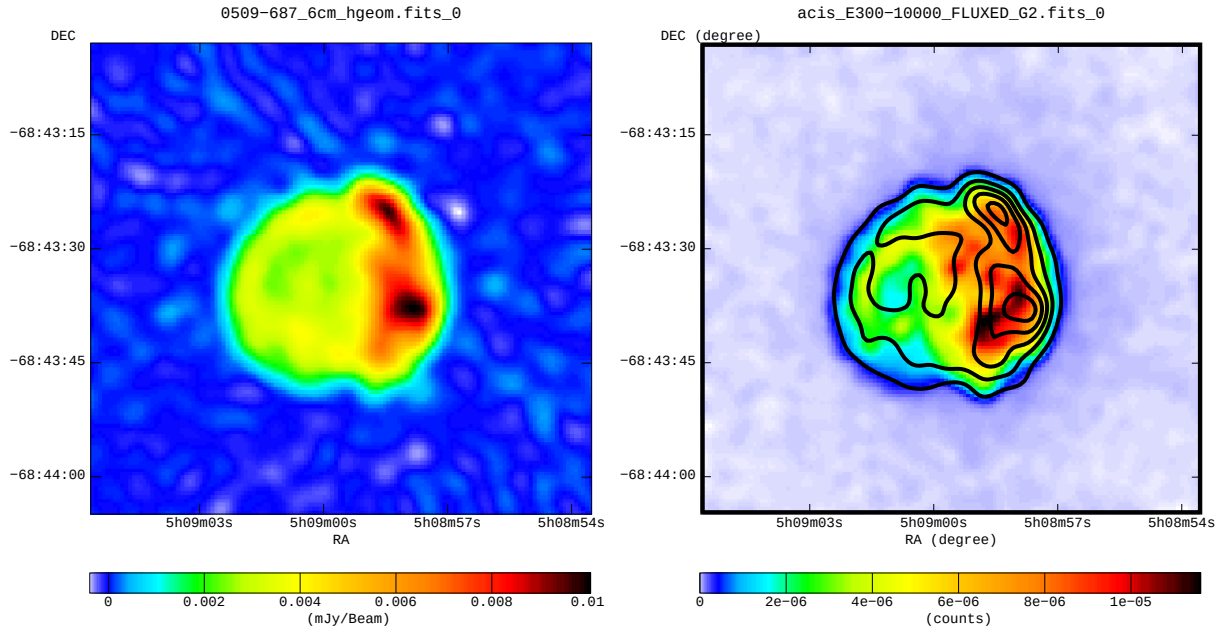
-. 3.5-cm flux density: 015 Jy
-. Image from **Dickel and Milne(1995)**



Summary of Observation	
Telescope	Australia Telescope Compact Array
Date	1992 Jun 27, 1993 Feb 21, Mar 15, Mar20
Frequency	8.640
Beam size	1.75”
1 sigma noise ..	0.09 mJy / beam

6-cm

-. 6-cm flux density: 0.26 Jy
-. Image from **Dickel and Milne(1995)**

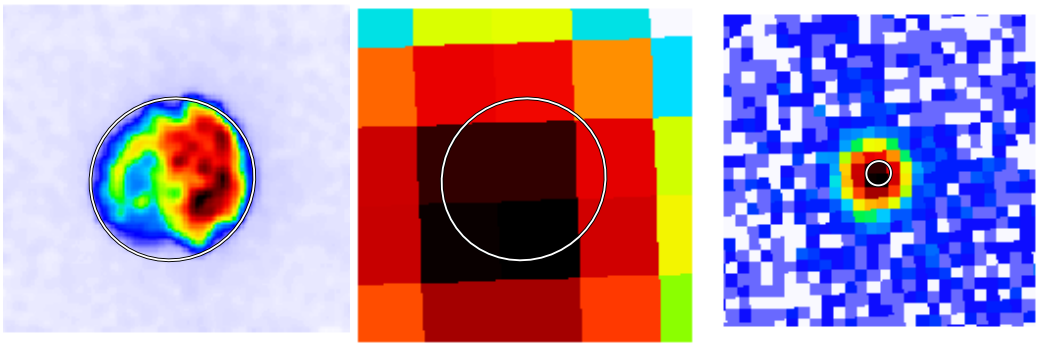


Summary of Observation	
Telescope	Australia Telescope Compact Array
Date	1992 Jun 27, 1993 Feb 21, Mar 15, Mar20
Frequency	4.790
Beam size	3.0”
1 sigma noise . .	0.10 mJy / beam

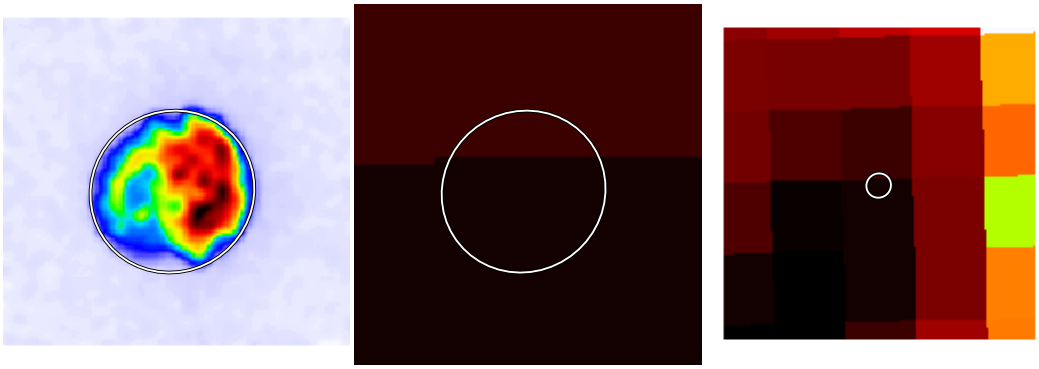
8 Images from Survey Missions

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

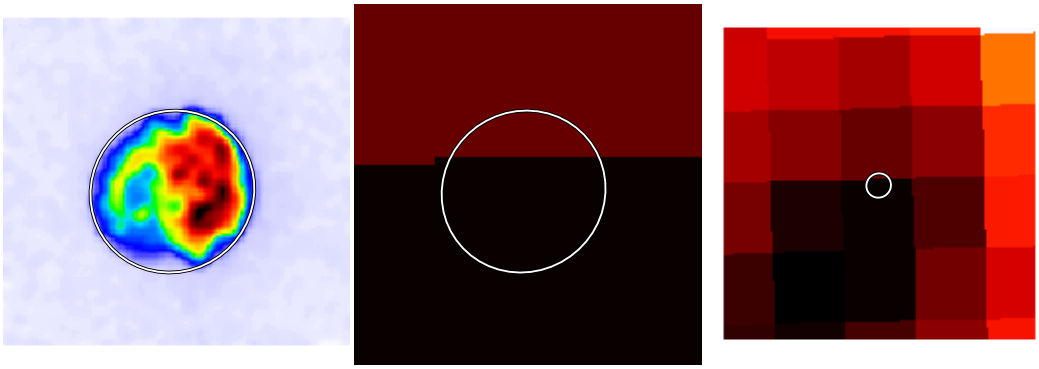
ROSAT PSPC (1.0 deg): X-ray (0.1-2.4 keV)



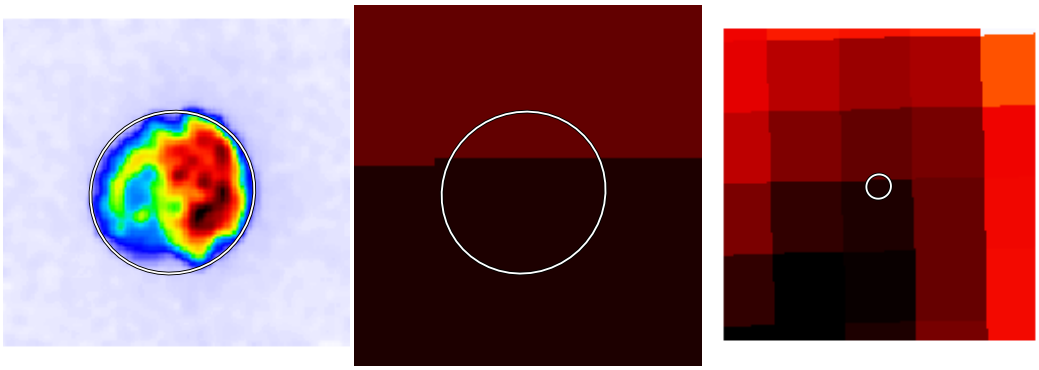
IRAS 12 micron: Infrared (12 micron)



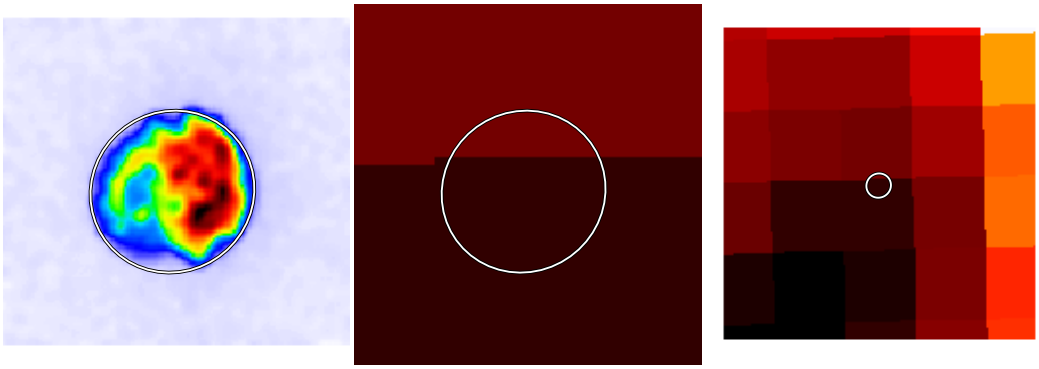
IRAS 25 micron: Infrared (25 micron)



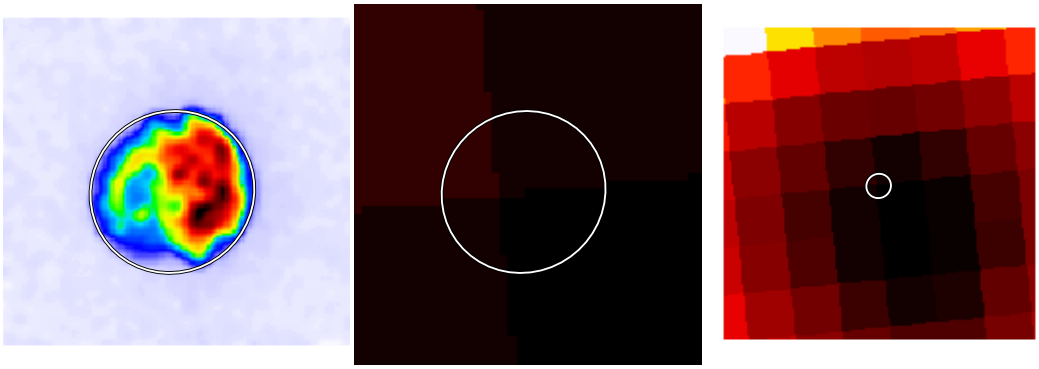
IRAS 60 micron: **Infrared (60 micron)**



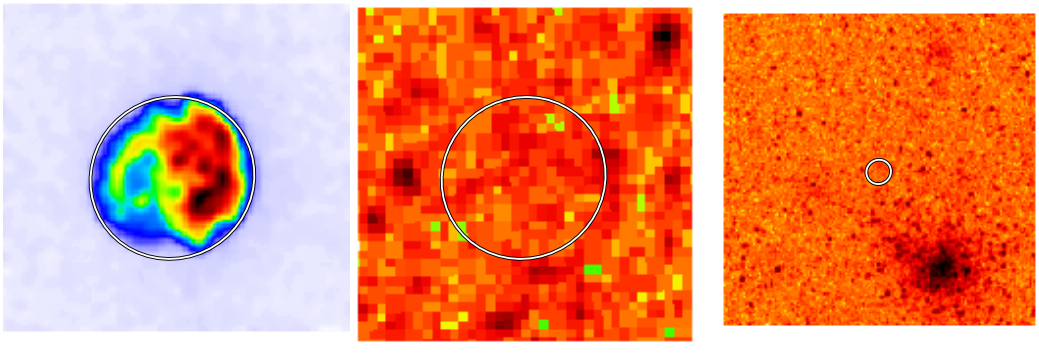
IRAS 100 micron: **Infrared (100 micron)**



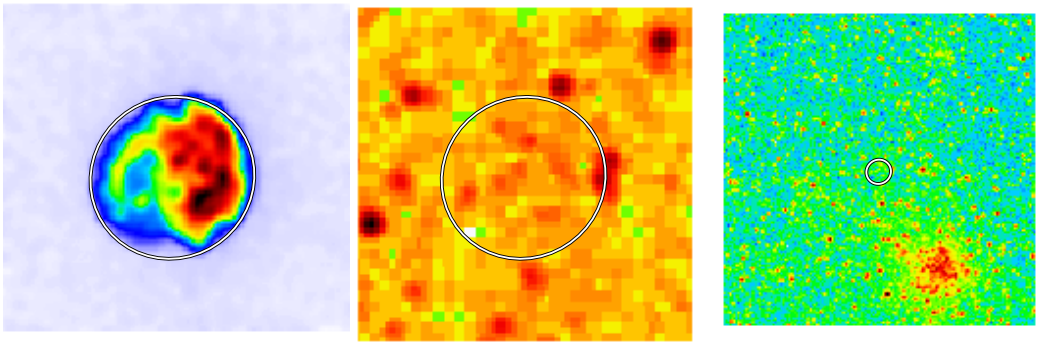
4850 MHz: **Radio (4850 MHz continuum)**



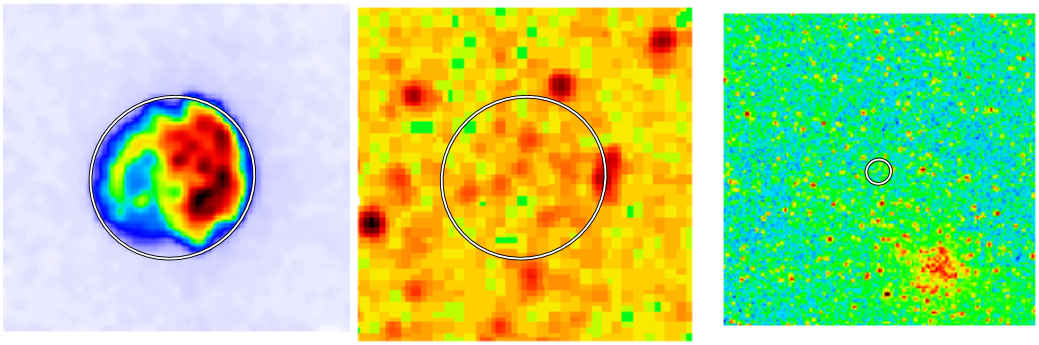
Digitized Sky Survey: **Optical (J or E band images with a few exceptions)**



The Two Micron All Sky Survey (J-band): IR (1.25 microns)



The Two Micron All Sky Survey (H-band): IR (1.65 microns)



The Two Micron All Sky Survey (K-band): IR (2.17 microns)