Observing the Temperature Gradient of Diffuse X-Ray Emissions of Edge-on Galaxies

(A work in progress)

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Goals

- Get a detailed temperature gradient of the target galaxy
  - Observe the diffuse x-ray emissions of target galaxy using Chandra and CIAO

•Get a stepping stone in understanding whether galaxies “recycle” or “leak”

•Understand whether the energy given off by a galaxy is mainly due to star clusters or supernovas

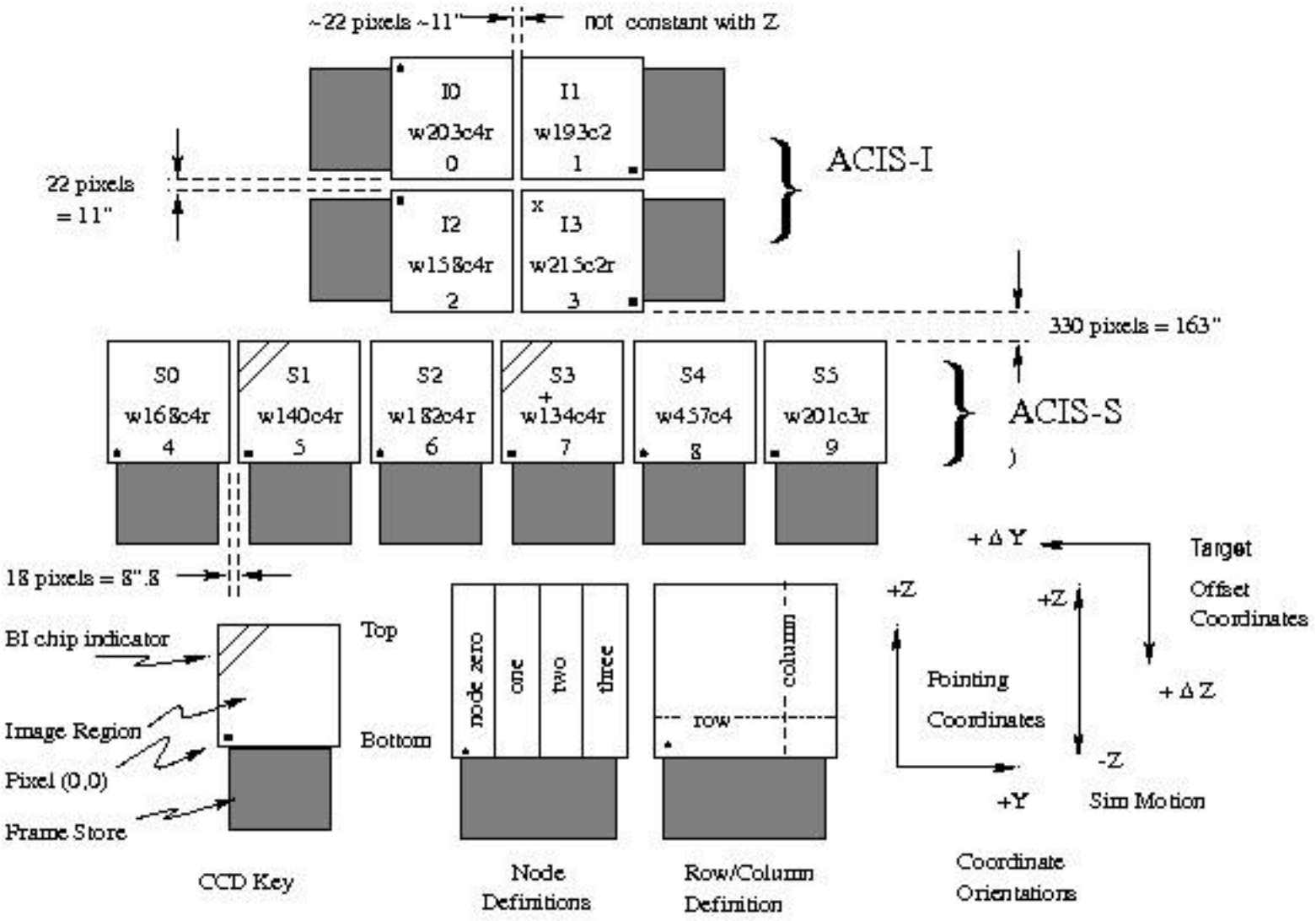
Chandra and CIAO

- Chandra; the x-ray observatory that orbits Earth
- Launched on July 23, 1999
- In a low earth orbit (133,000 km highest point, and 16,000 km at it's lowest)

Chandra and CIAO

- The Chandra uses the ACIS to create x-ray images
  - The ACIS (Advanced CCD (Charged Coupled Device) Imaging Spectrometer) has a layout of 10 CCD's, two of which are BI (Back Illuminated) and eight are FI (Front Illuminated)
  - BI chips get a better low energy response than FI chips, but have a lower energy resolution.
  - BI chips are nice for this project, (specifically ACIS-S3, or CCD ID 7)

ACIS FLIGHT FOCAL PLANE

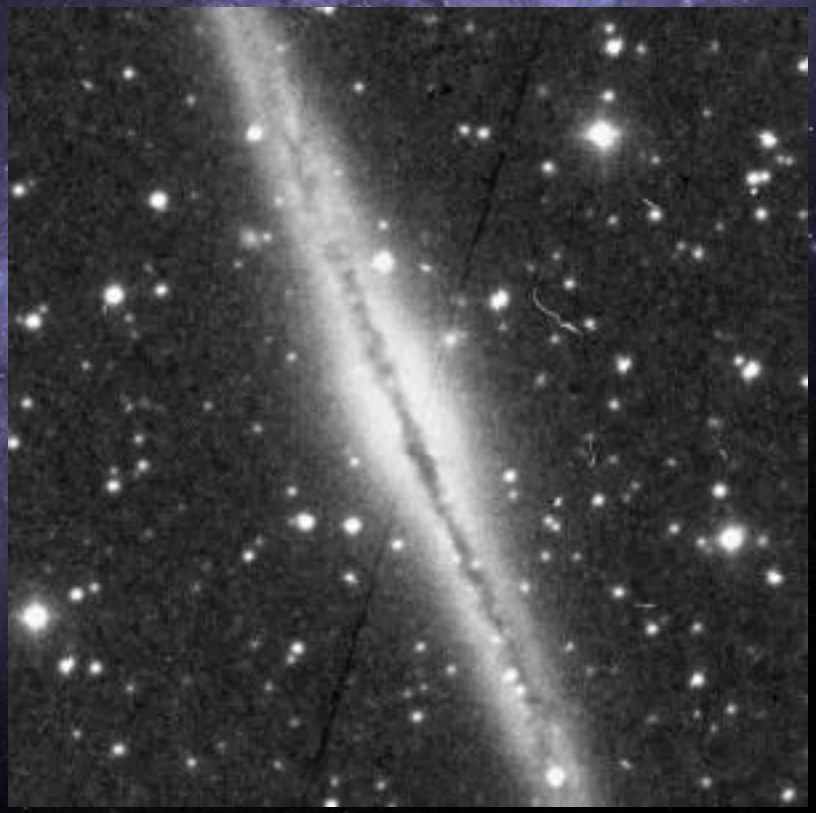


Chandra and CIAO

- CIAO (Chandra Interactive Analysis of Observations)
- Image application ds9
- Prism is a GUI application for easy plots and histograms of data

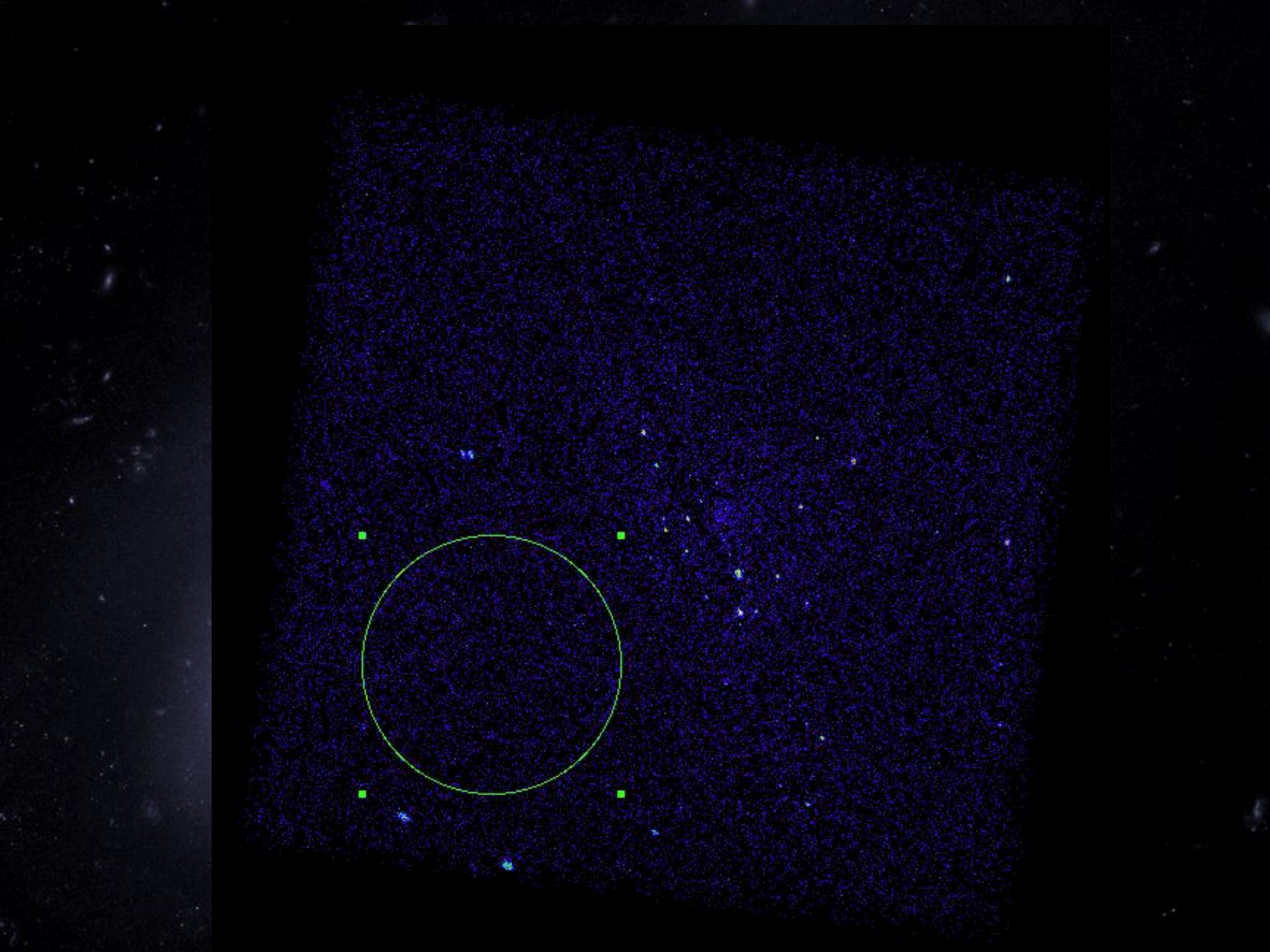
Target Galaxy: NGC891

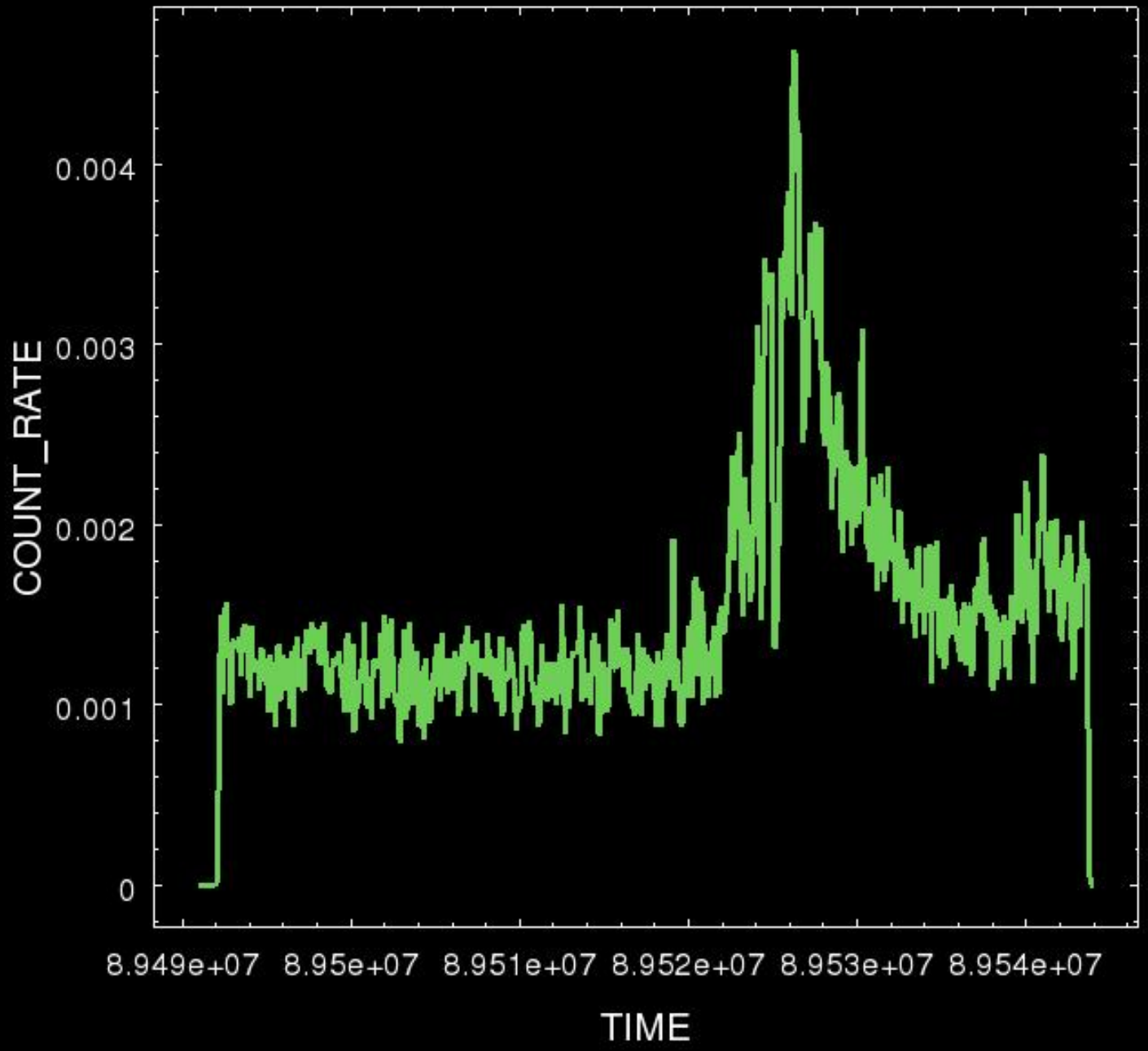
- NGC891 is a edge-on galaxy
  - Nearby, with good energy emissions
  - Chandra has viewed NGC891 for decent periods (plenty of information has been gathered)



Process

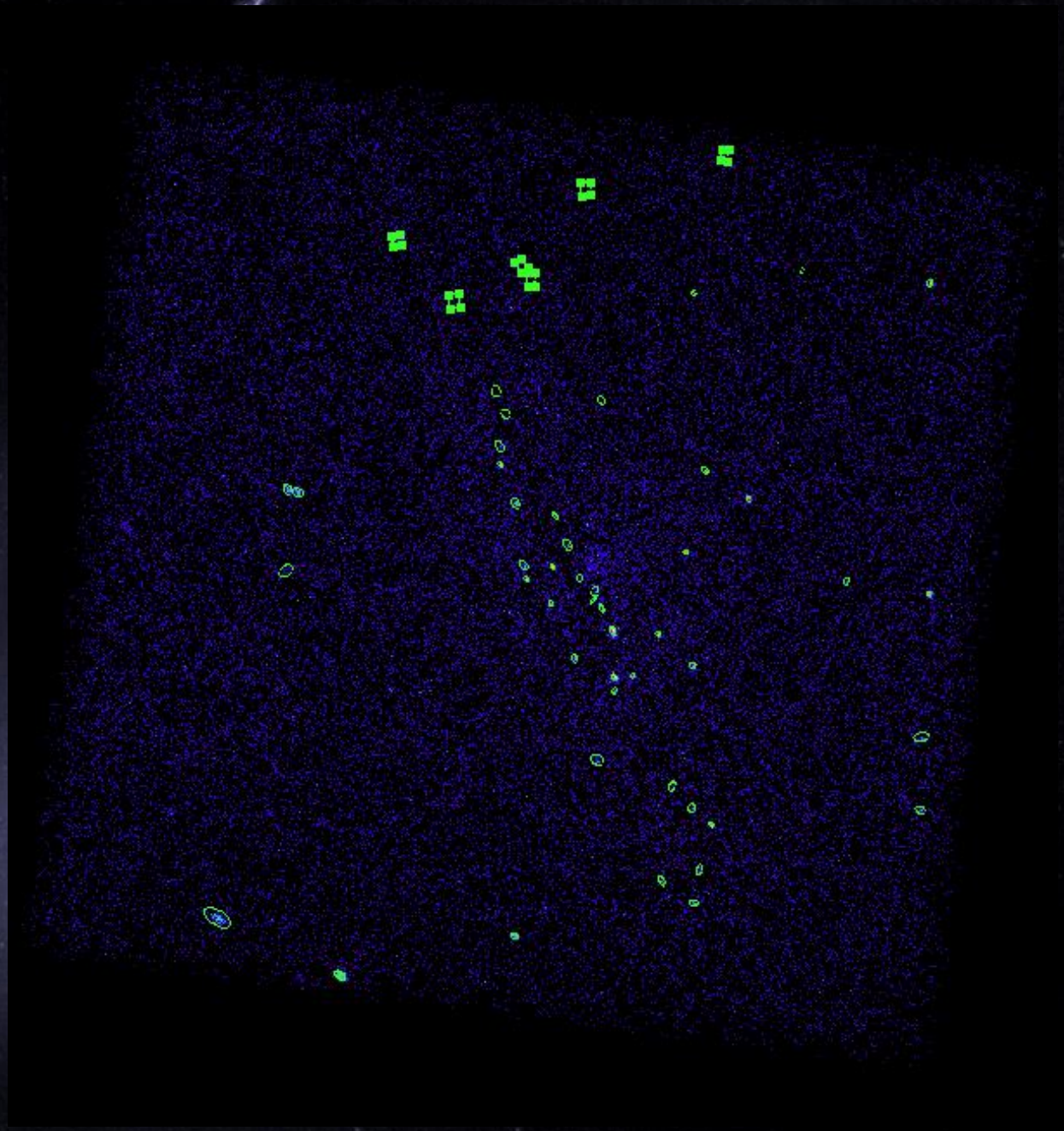
- It’s necessary to make sure the data collected by Chandra has no flares in the background
- Extract region in background using ds9, and create a histogram of time vs. counts
- A vast margin of error would be a indication of a flare (10-100 times normal amount)




COUNT_RATE
0.004
0.003
0.002
0.001
0
8.949e+07
8.95e+07
8.951e+07
8.952e+07
8.953e+07
8.954e+07
TIME

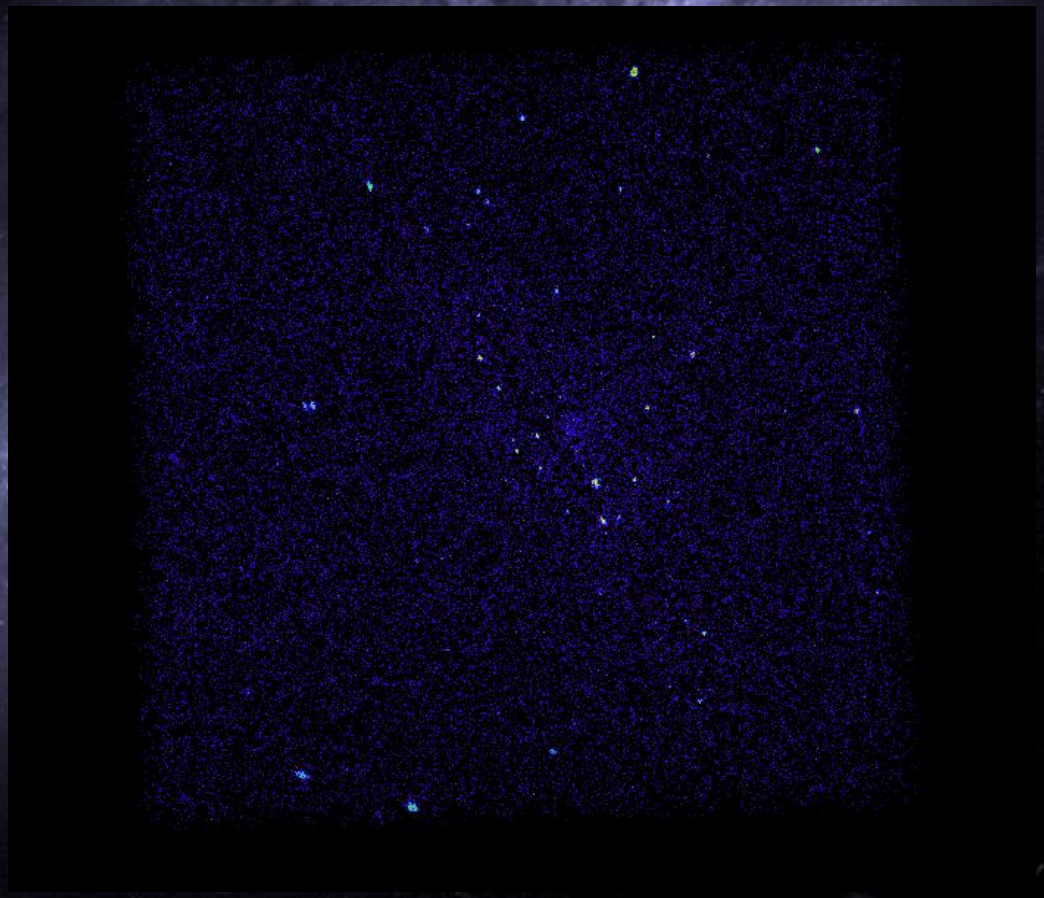
Process

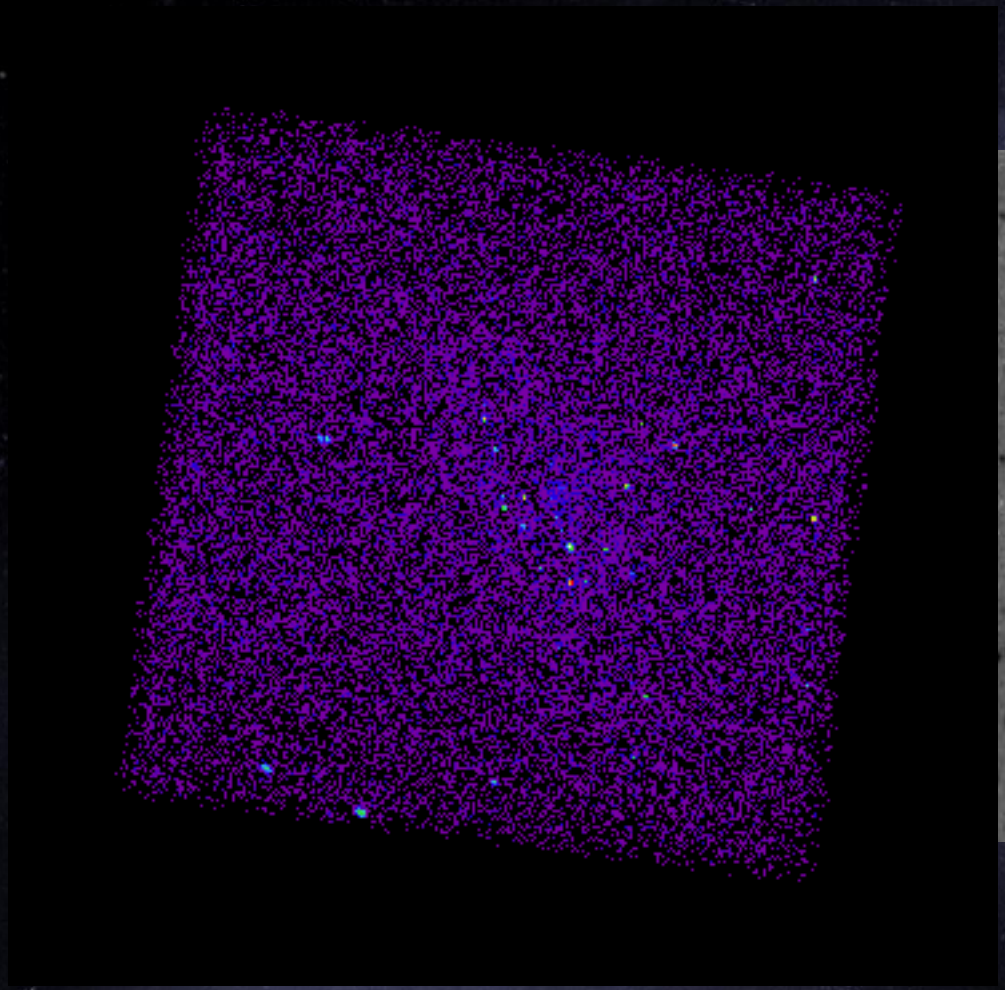
- Find point sources using *wavdetect* script
- *Wavdetect* points out all the point sources in your ds9 image
- Take region of each point source, and exclude them from the data
- Fill in empty regions using surrounding background
- The data is then ready to be analyzed

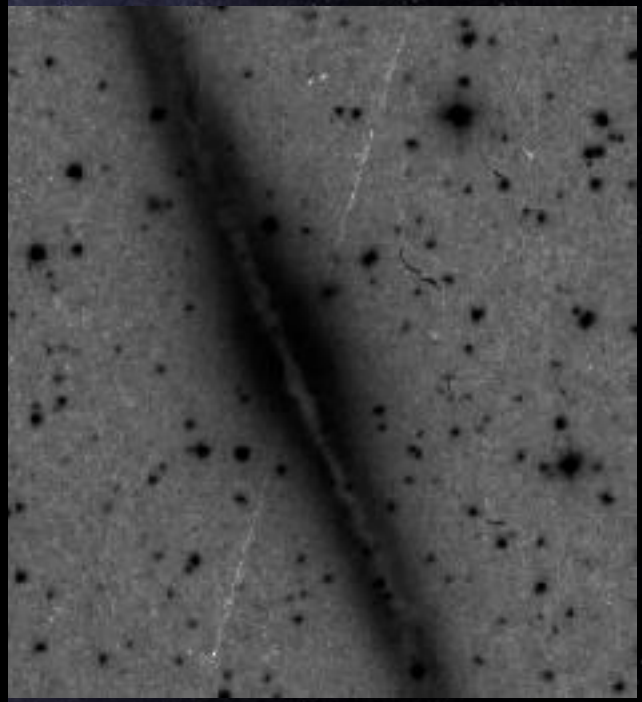


Plane of the Galaxy

- Plane of the galaxy can be difficult to spot when observing the galaxy's x-ray emissions

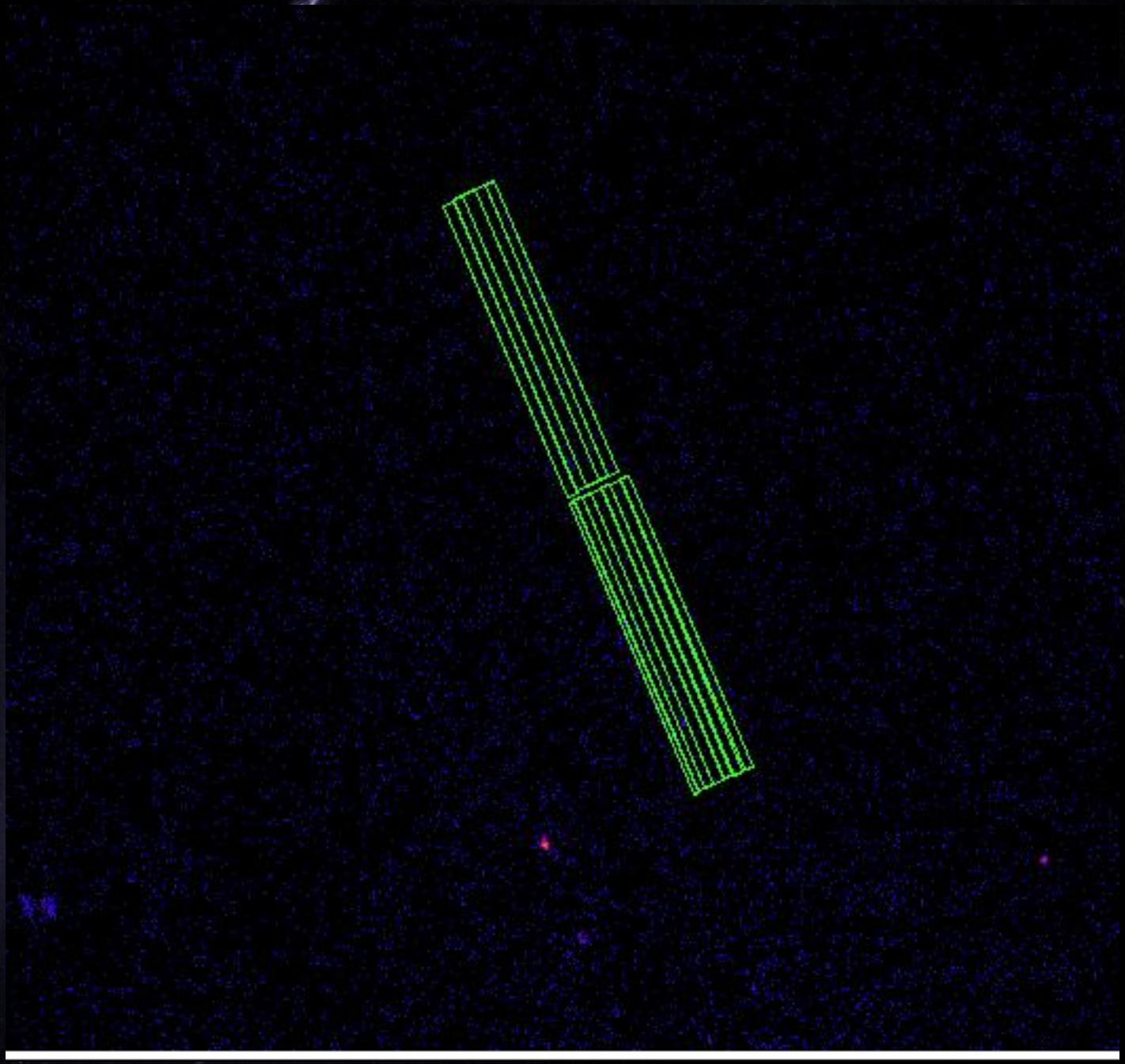






Taking the temperature gradient

- By extracting regions with a set amount of counts (in our case, 30-35) expanding out from the plane, we can then find the temperature of those regions
- We can also compare regions on the inner side of the disk compared to the outer




Questions?