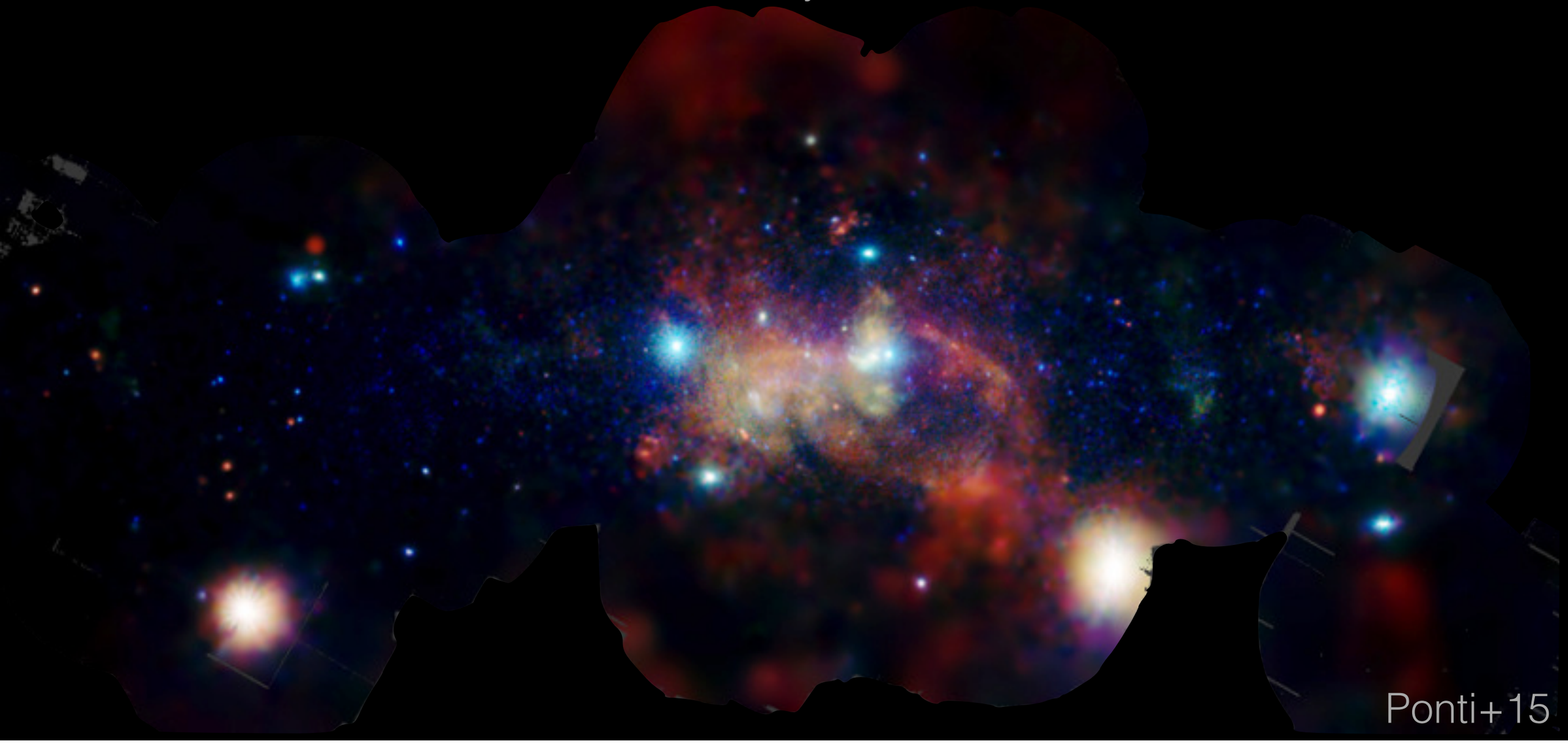


X-ray imaging

F. Acero, AIM/CEA-Saclay

www.github.com/facero/OHP-2016-material

Outline

launch binder

Click me

- **Event lists**
- **Simple sky images**
- **Hardness ratio**
- **Image backgrounds**
- **Exposure maps**
- **Creating flux maps: general procedure**
- **ESA image script (link)**

Chandra image generation

- **User friendly image script:**
  - **http://cxc.harvard.edu/ciao/ahelp/fluximage.html**

```
unix% download_chandra_obsid 1843
unix% cd 1843
unix% chandra_repro indir=. outdir=repro
unix% fluximage . fluxed/
unix% ds9 fluxed/broad_flux.img
```

- **Almost no manual steps**
- **Backgrounds generated automatically**

XMM Background files

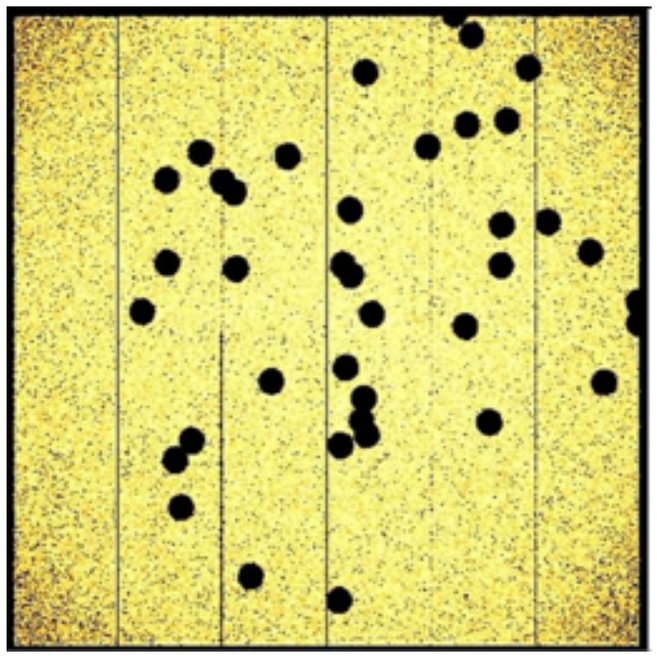
- **Blank sky images (link)**
  - **Deep exposure of «blank» regions of the sky. Includes**
    - **~~Point sources~~ (masked and holes infilled)**
    - **Diffuse astro background**
    - **Instrumental background**

- **Filter wheel closed image (link)**
  - **Observation with filter wheel in closed position (1.05 mm Al)**
    - **Instrumental background:**
    - **electronic readout noise (at lowest energies)**
    - **high energy particles producing charge directly in CCD**
    - **Particle induced X-rays (continuum and fluorescent lines), generated inside the camera**

Blank sky

- **Not recommended anymore**
- **Used to come in two flavors**

Unfilled

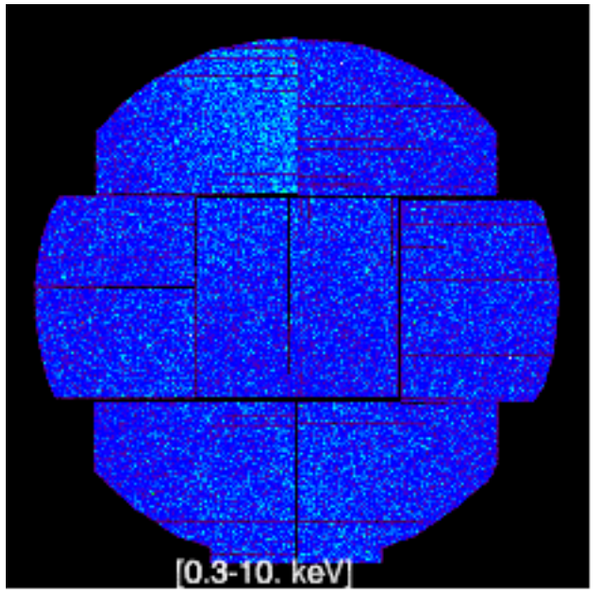


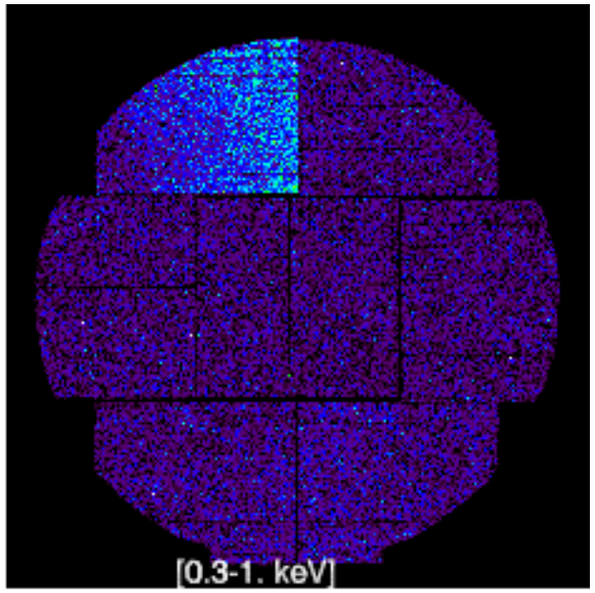
Ghosted (inpainting)

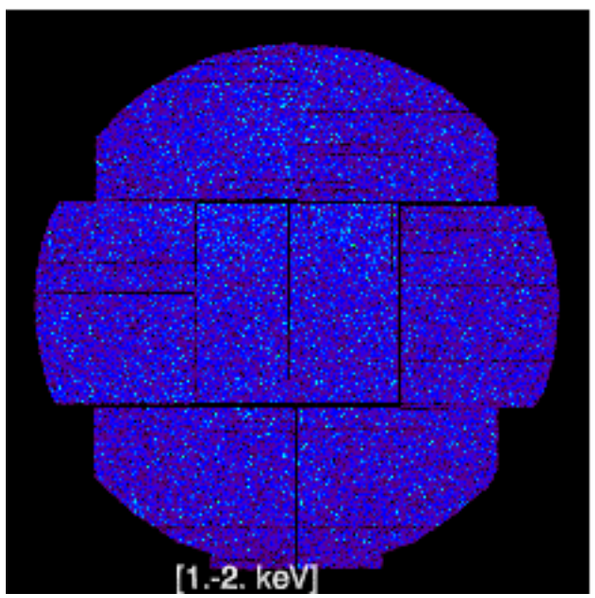
- **Caveats:**
  - **Using blank sky from a different region of the sky will cause inapropriate astro bkg subtraction (Gal plane vs off plane)**

Filter wheel closed

- **Example for MOS2. 1.5 Ms of observation available**







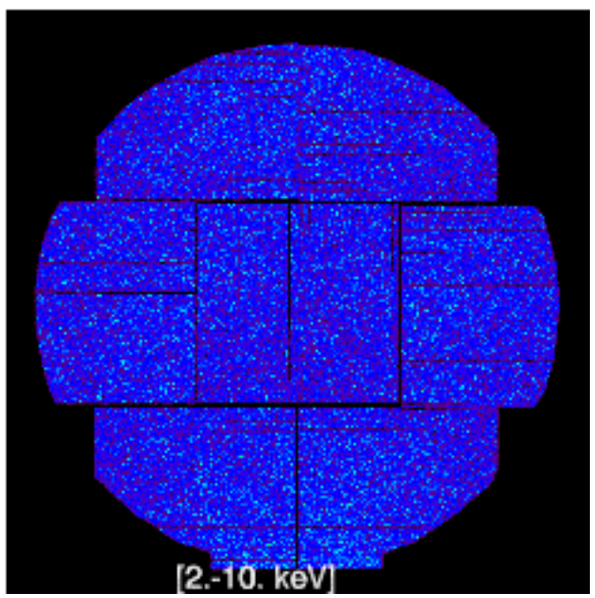
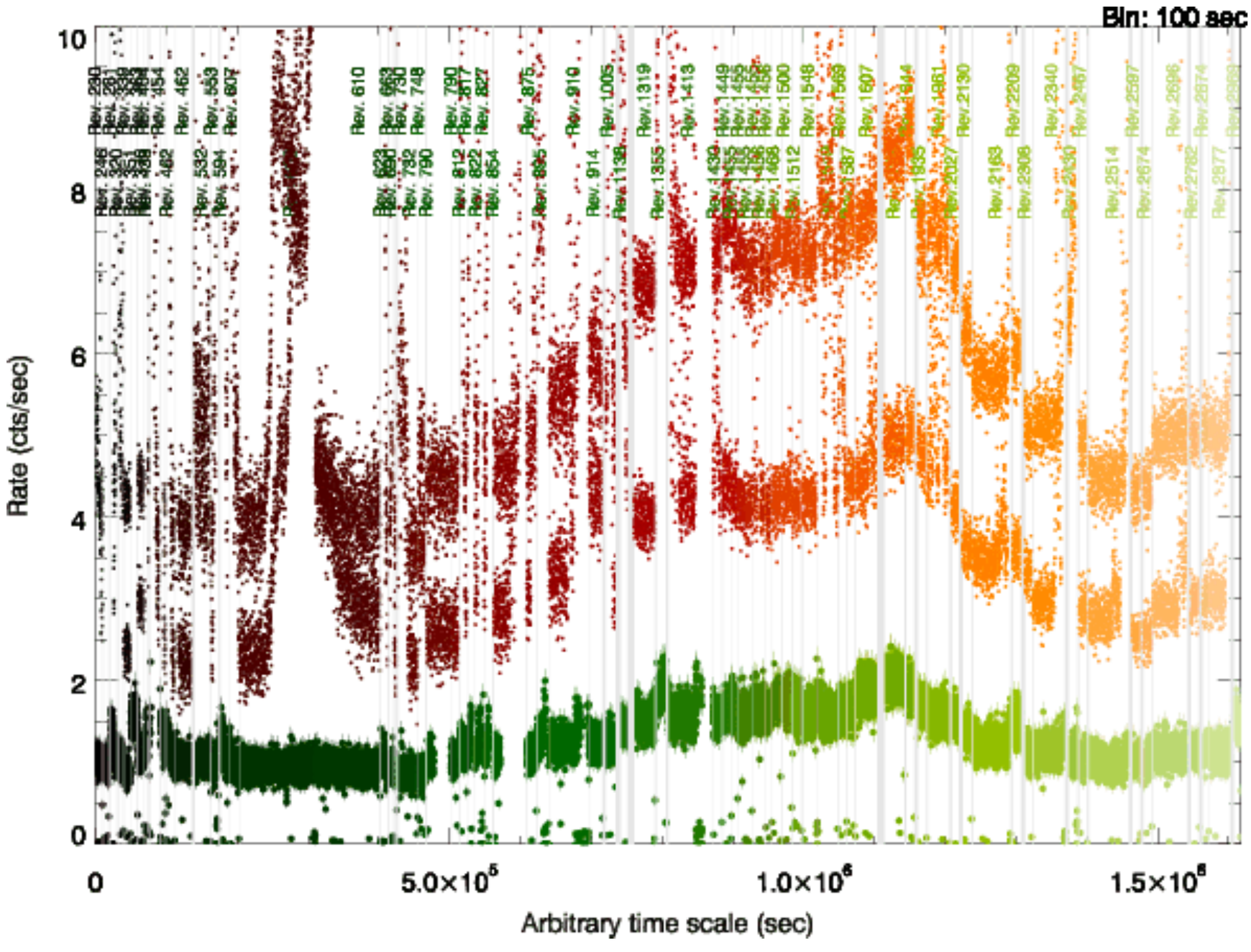


Image from merged event lists from 2001-2016 observations

Filter wheel closed

- **Light curves**

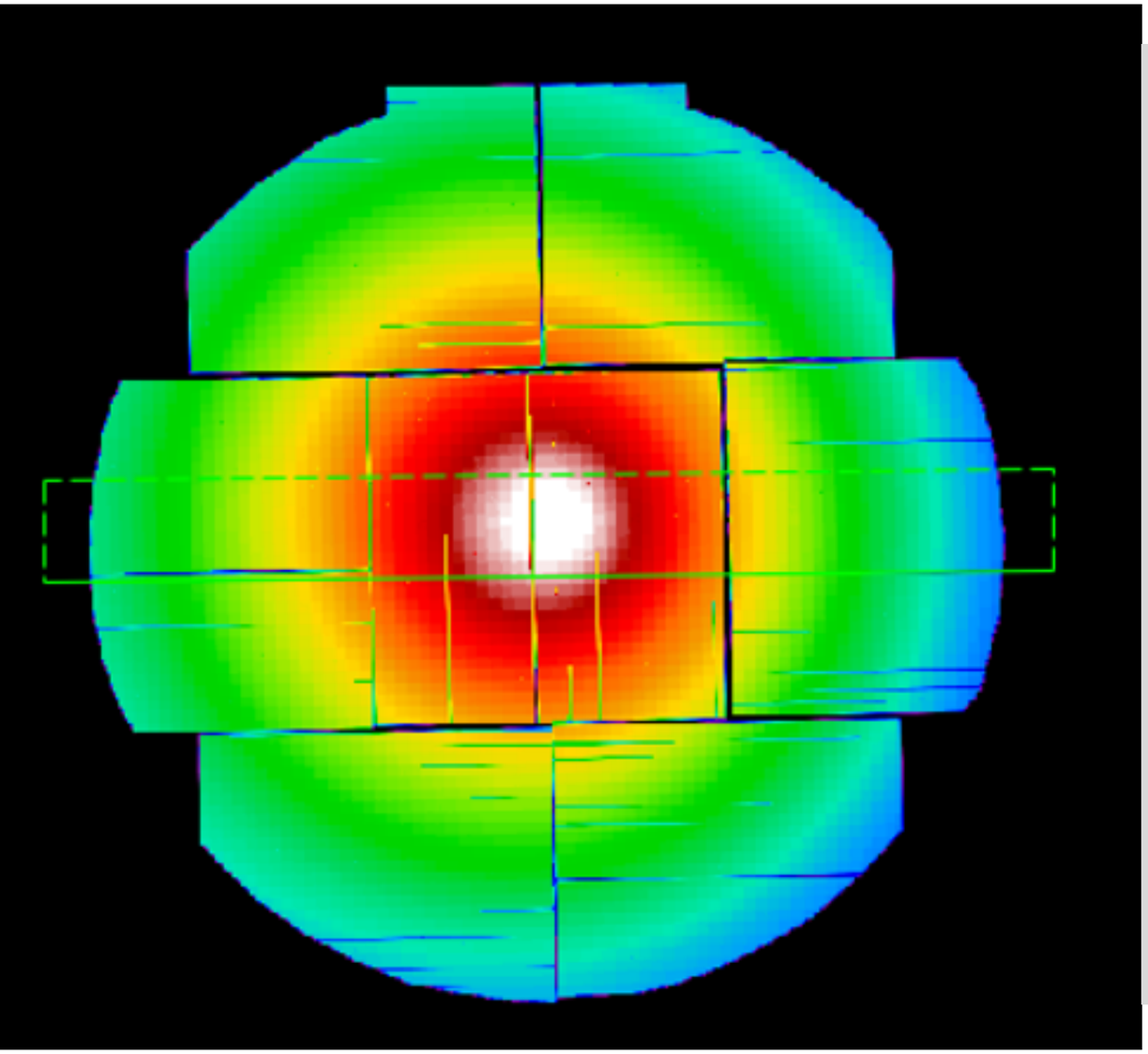


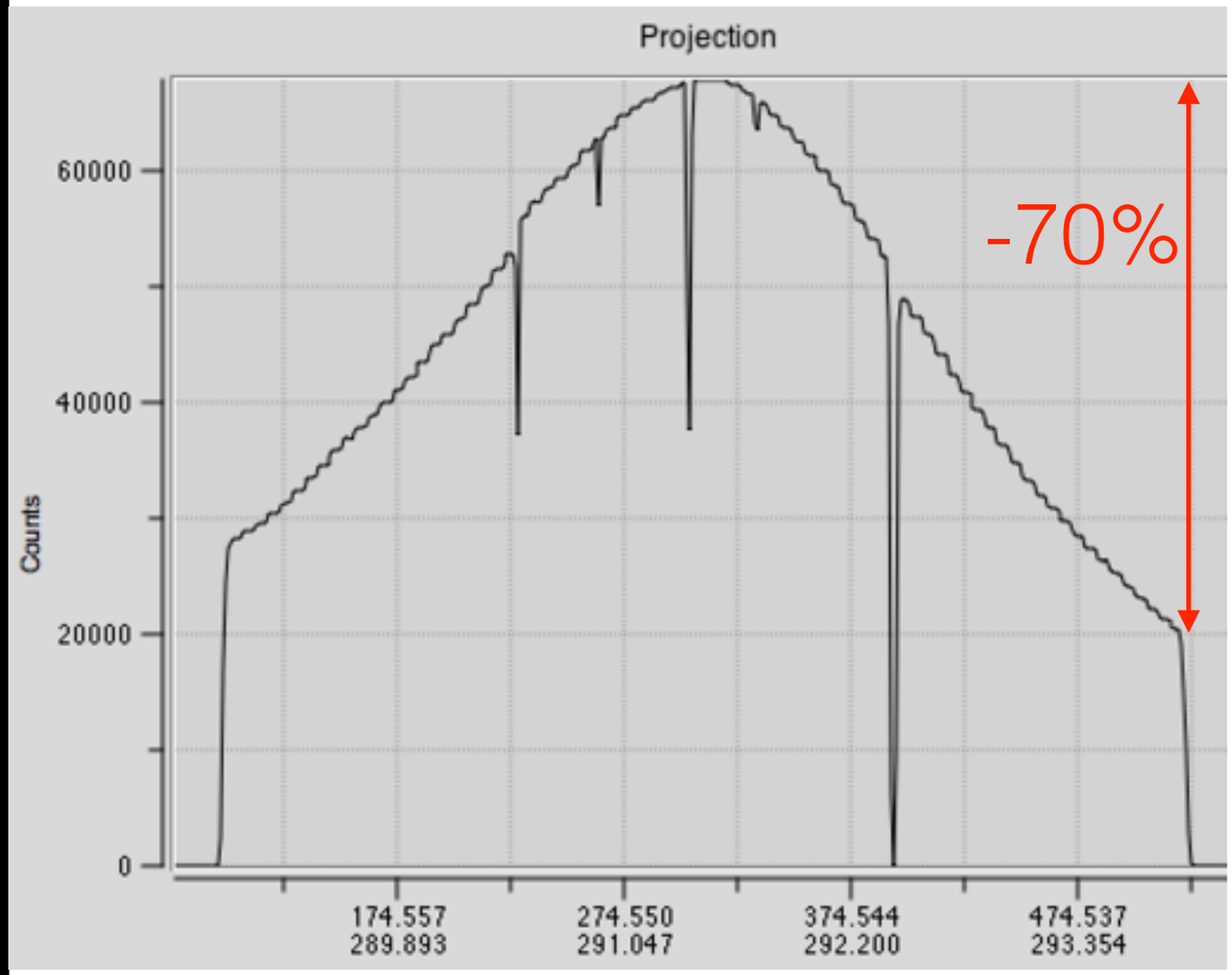
high/low energy XMM radiation monitor

Filter wheel count rate

Vignetting effect

- **Strong vignetting towards the edge. More pronounced at high E**

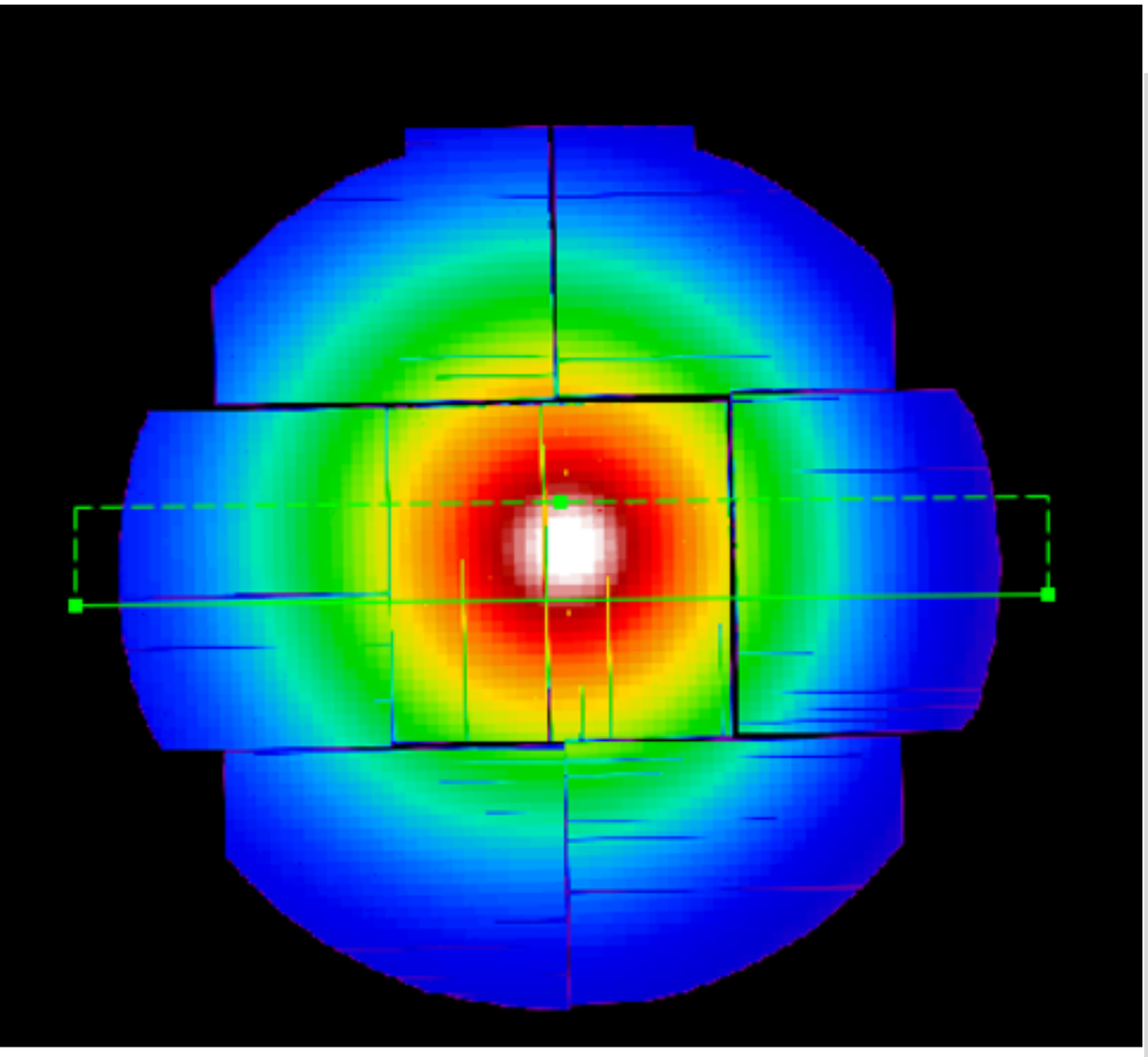


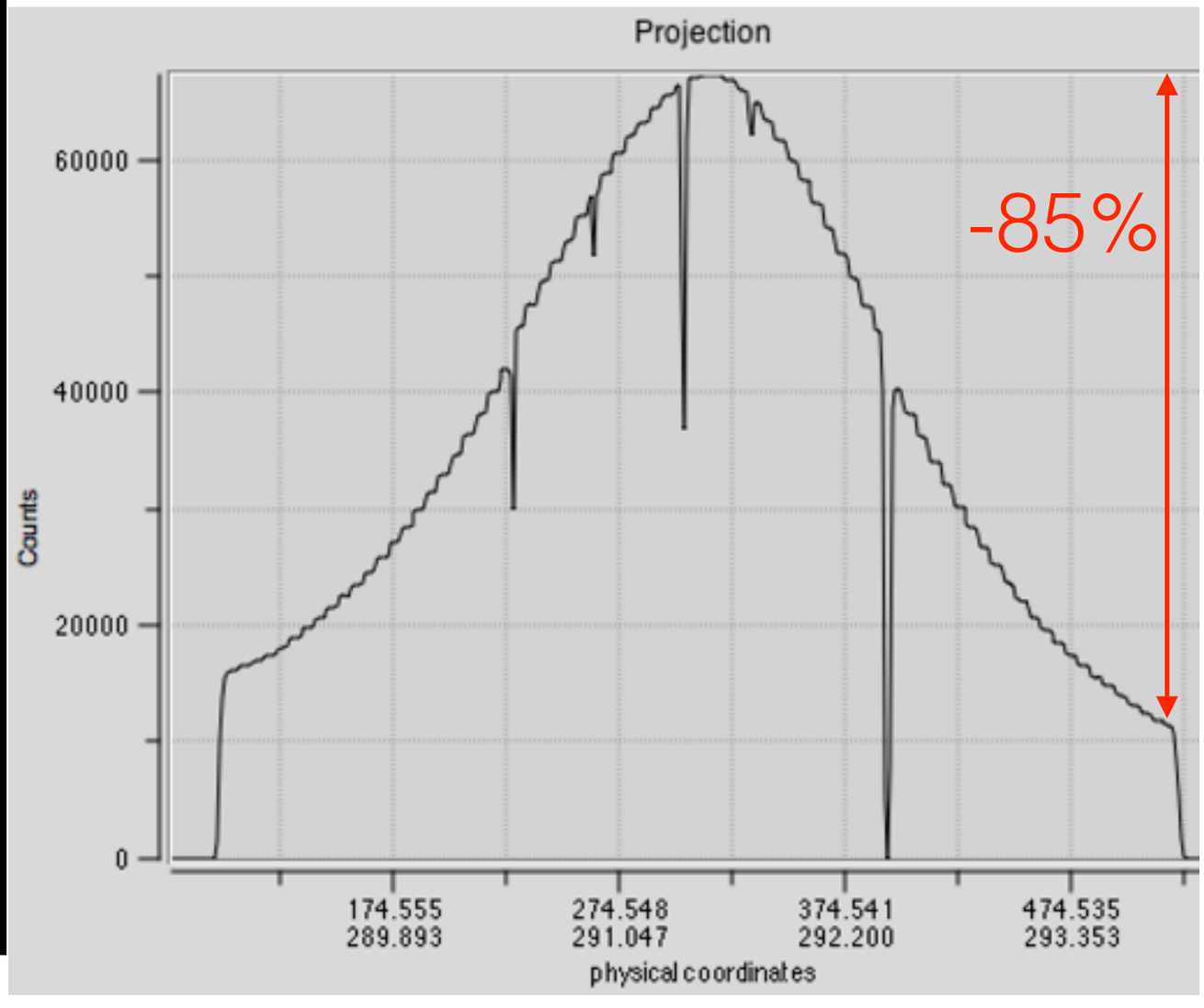


0.5 - 1.0 keV

Vignetting effect

- **Strong vignetting towards the edge. More pronounced at high E**





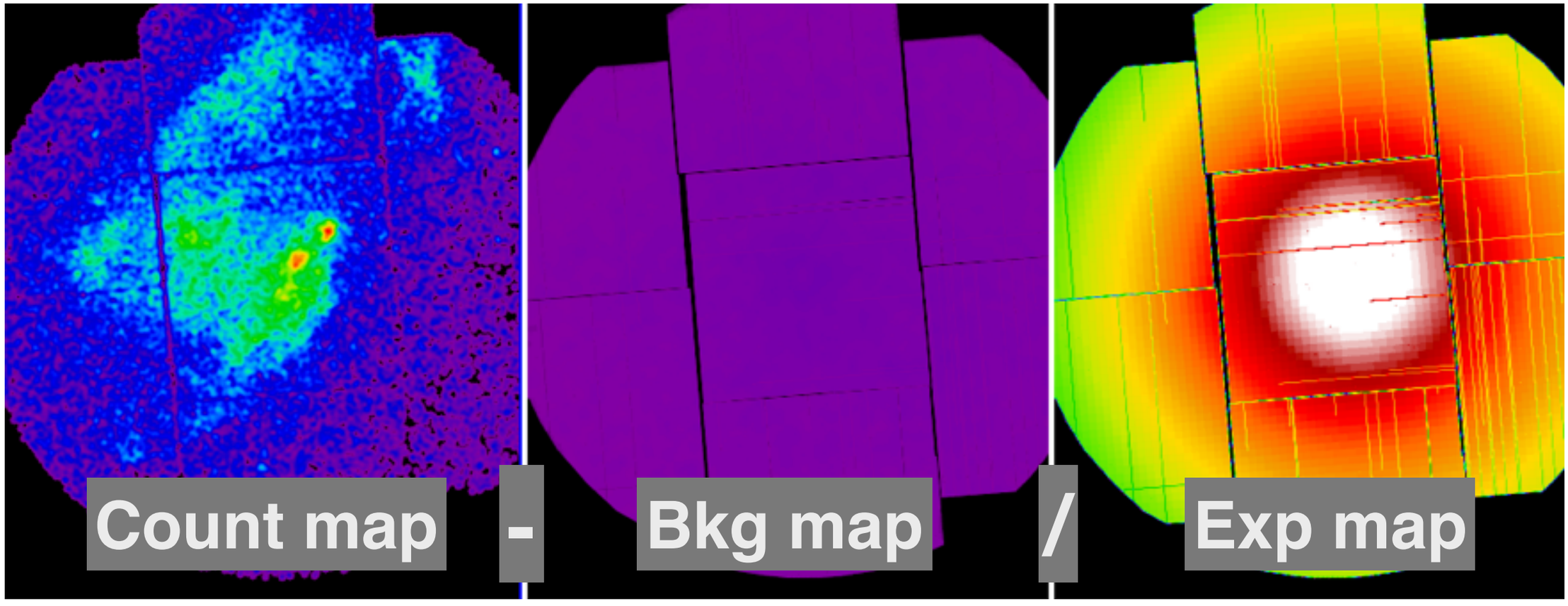
4.5 - 12 keV

Steps

- **Clean observation from flares (same step as in spectral reduction)**
- **Remove bad columns, hot pixels, etc**
- **Generate observation images, exposure maps**
- **Generate bkg image from filter wheel closed in same E-band**
- **Renormalize instrumental bkg image in 10-12 keV band**

See script here (not as easy as Chandra script):
http://www.cosmos.esa.int/web/xmm-newton/images

Flux map recipe



Don’t divide a count map by exposure map without bkg subtraction !

Give it a try

- **Starting from individual pre-generated images, bkg images, exp maps.**

- **Try to create a flux map, a smoothed flux map and a mosaic**

Go get the material here:
www.github.com/facero/OHP-2016-material
and download the entire archive

or click here if you don't have Python installed:

launch binder