Topcat – Tool for Operations on Catalogues And Tables

- Allows to view table and meta-data
- Perform statistics on data
- Create plots of data
- Match/concatenate tables
- Perform functions (conversions, arithmetic, format change, ...)
- Use virtual observatory data/software
- Link several virtual observatory services together

Please also download for this session :

- SUSS 6.2 https://www.cosmos.esa.int/web/xmm-newton/xsa#download
- 4XMM-DR14s : https://xmmssc.aip.de/cms/catalogues/4xmm-dr14s/

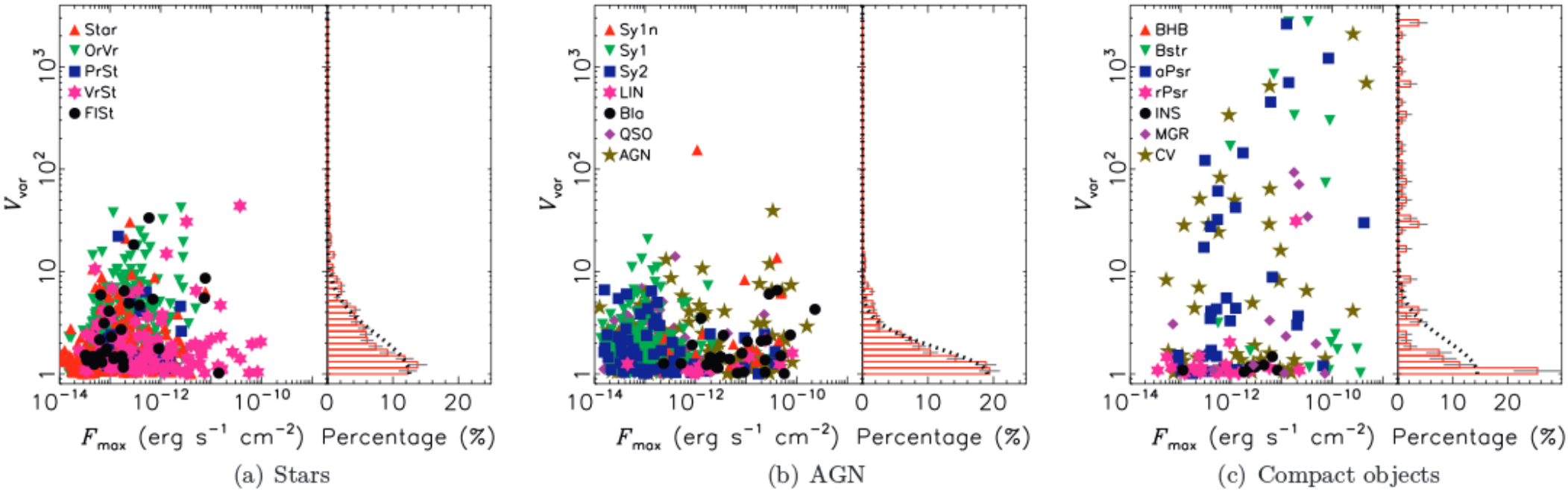
Using Topcat to manipulate the XMM catalogues

- Use the XMM-Newton catalogues to find clean objects with X-ray lightcurves that may be compact objects

Hints

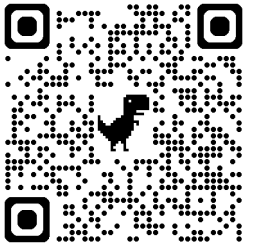
- Accreting compact objects often have high Fx/Fopt ratios
- They can be strongly variable

(Lin, Webb & Barret 2012)



(a) Stars (b) AGN (c) Compact objects

Find compact objects with X-ray lightcurves



- Retrieve 4XMM-DR14 : http://xmmssc.irap.omp.eu/Catalogue/4XMM-DR14/4XMM_DR14.html and SUSS 6.2 https://www.cosmos.esa.int/web/xmm-newton/xsa#download
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Find compact objects with X-ray lightcurves

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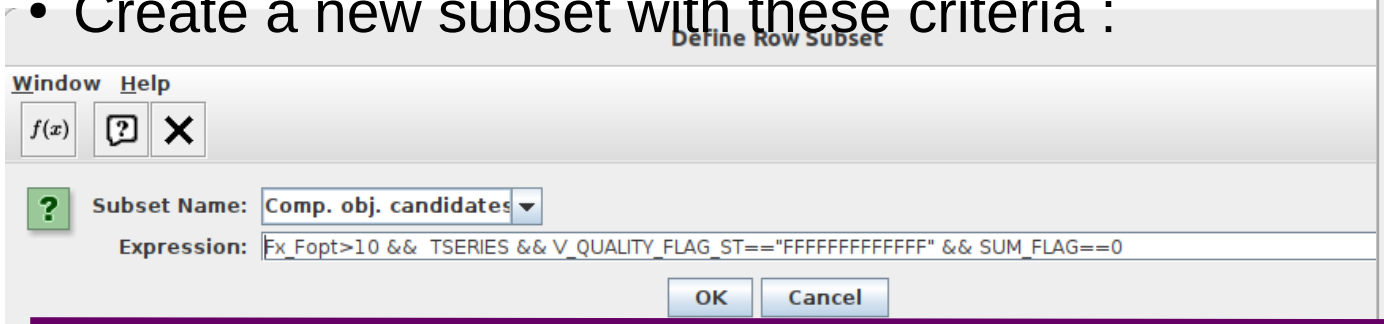
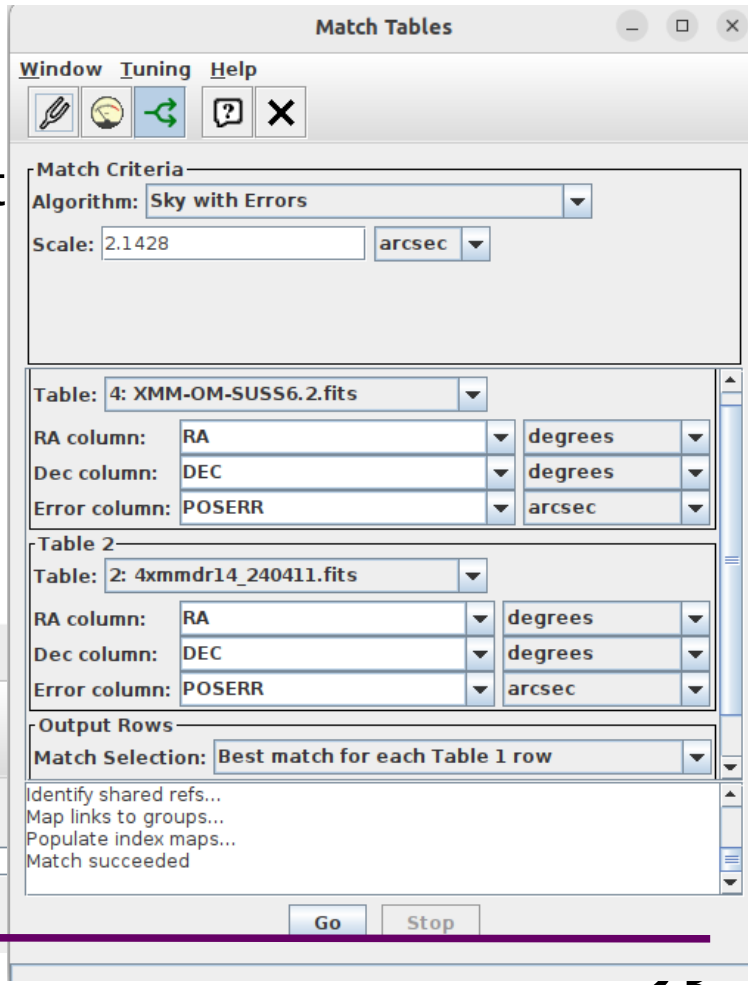
- Cross-match 4XMM-DR14 and SUSS 6.2 using POSERR, common to both
- Use a 2σ radius = 2*1.0714*POSERR
- There are 205377 matches
- Create a new column in this new table – click right
- Use EP_8_FLUX/V_AB_FLUX
- Use clean optical sources :

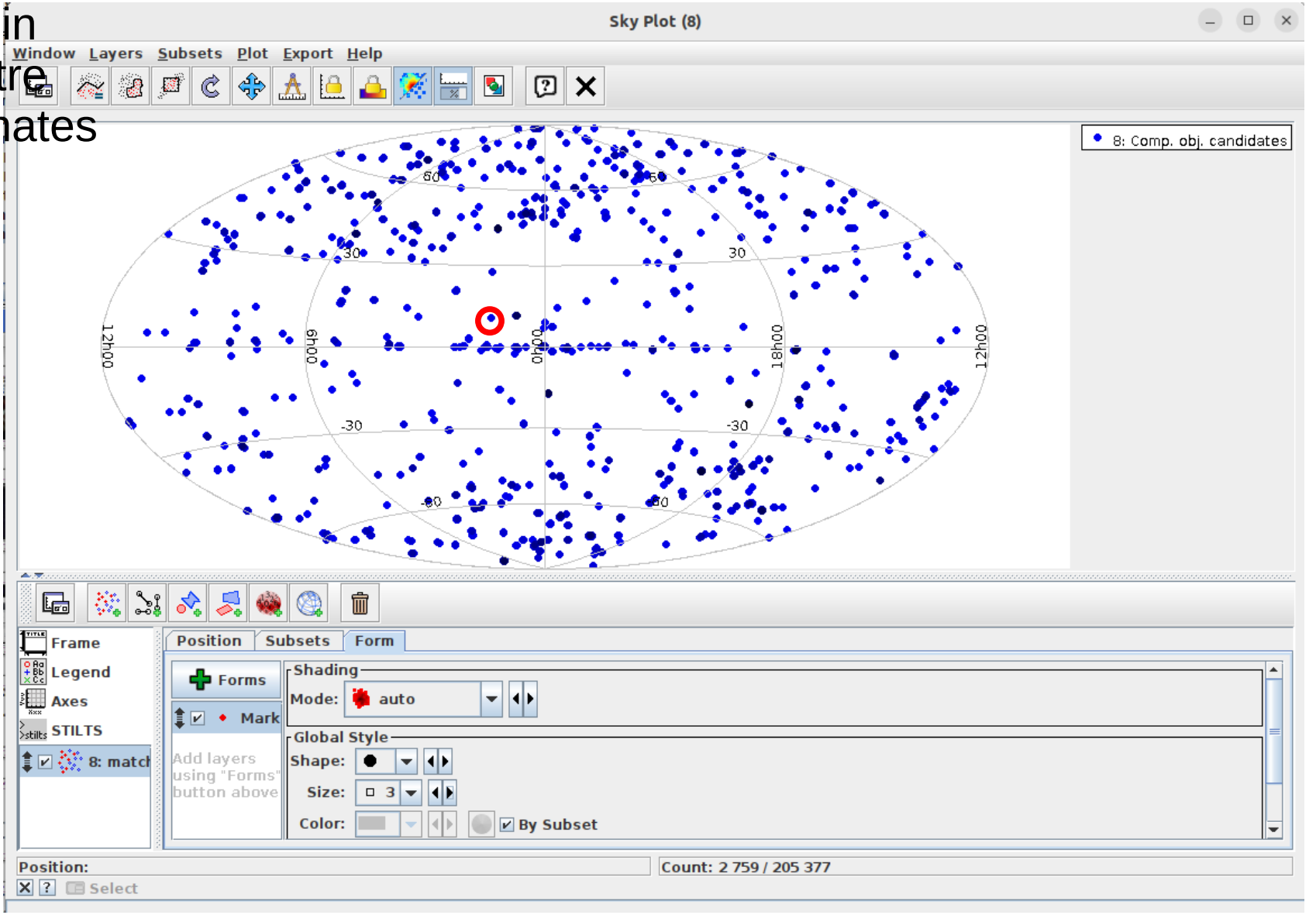
  V_QUALITY_FLAG_ST== »FFFFFFFFFFFFF »
- Use clean X-ray sources : SUM_FLAG==0
- Create a new subset with these criteria :





Finding compact objects with X-ray spectra/lightcurves

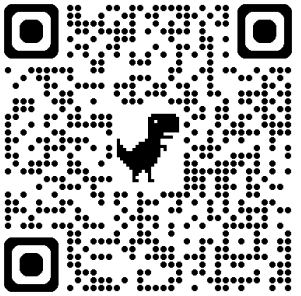
- Plot new subset in Hammer-Aitoff projection:
- Choose one in Galactic centre
- Copy coordinates into ESASky
- View source & products



Finding clean point like sources in extended emission

- Cross-match 4XMM-DR14 with the slew catalogue that you can retrieve here :

  http://xmmssc.irap.omp.eu/Catalogue/XMMSL3/XMMSL3.html



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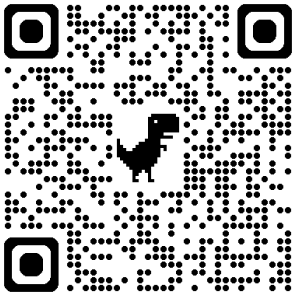
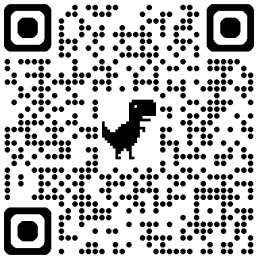


- Use a 2σ radius, but here use RADEC_ERR which is common to both catalogues & is 1σ
- Select a subsample using the slew (with poorer resolution) EXT_B8 > 6 (extended emission) with VAL_FLAG== »CLEAN_SAMPLE » and 4XMM-DR14 EP_EXTENT<6 (point-like source) with the SUM_FLAG==0
- Identify the nature of the source in the centre of the aitoff projection (galactic view sky system and equatorial data sky system) using the slew catalogue
- Check the source nature through ESASky – what is the object ?

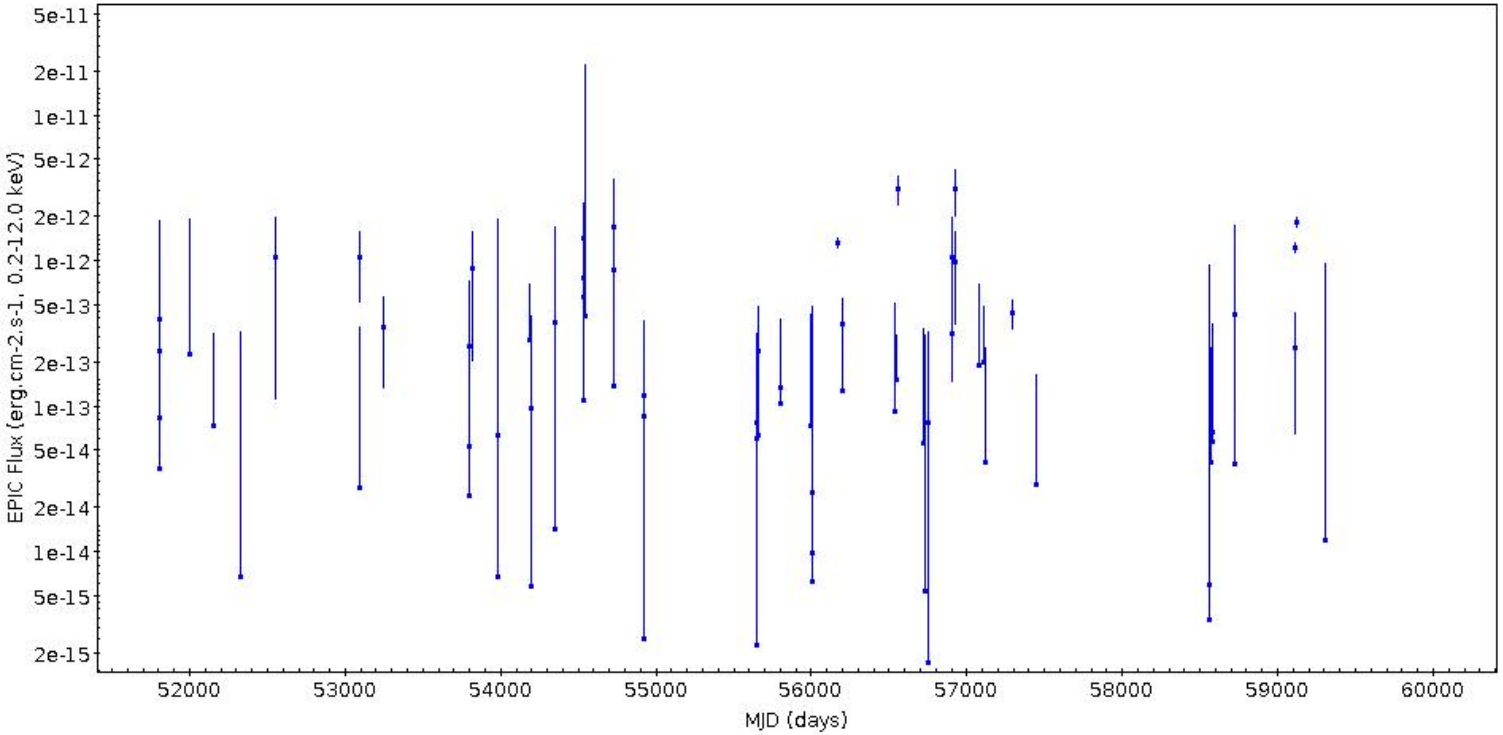
Find a clean source with >70 pointings & plot lightcurve

- Retrieve the 4XMM-DR14s catalogue here :
  https://xmmssc.aip.de/cms/catalogues/4xmm-dr14s/



Find a clean source with >70 pointings & plot lightcurve

- Retrieve the 4XMM-DR14s catalogue here : https://xmmssc.aip.de/cms/catalogues/4xmm-dr14s/
- Sort the column N_CONTRIB to find sources with >70 pointings
- Choose one source and create a subset of all clean detections (STACK_FLAG==0) using the SRCID
- Plot the EP_FLUX (band 8) and EP_FLUX_ERR (use the form +) as a function of time with the Topcat plotting tool



Using the online data archives

http://xmm-catalog.irap.omp.eu/

Provide a 4XMM-DR14 source name or do a cone search

e.g. J133129.6+110755

or : cone('13 31 29.6 +11 07 55', '1deg')

or search categories of sources (CVs, ULXs, ...)

Visualise : Image (XMM and other catalogues)

Source parameters (flux in different bands, date obs., ...)

Fit spectrum

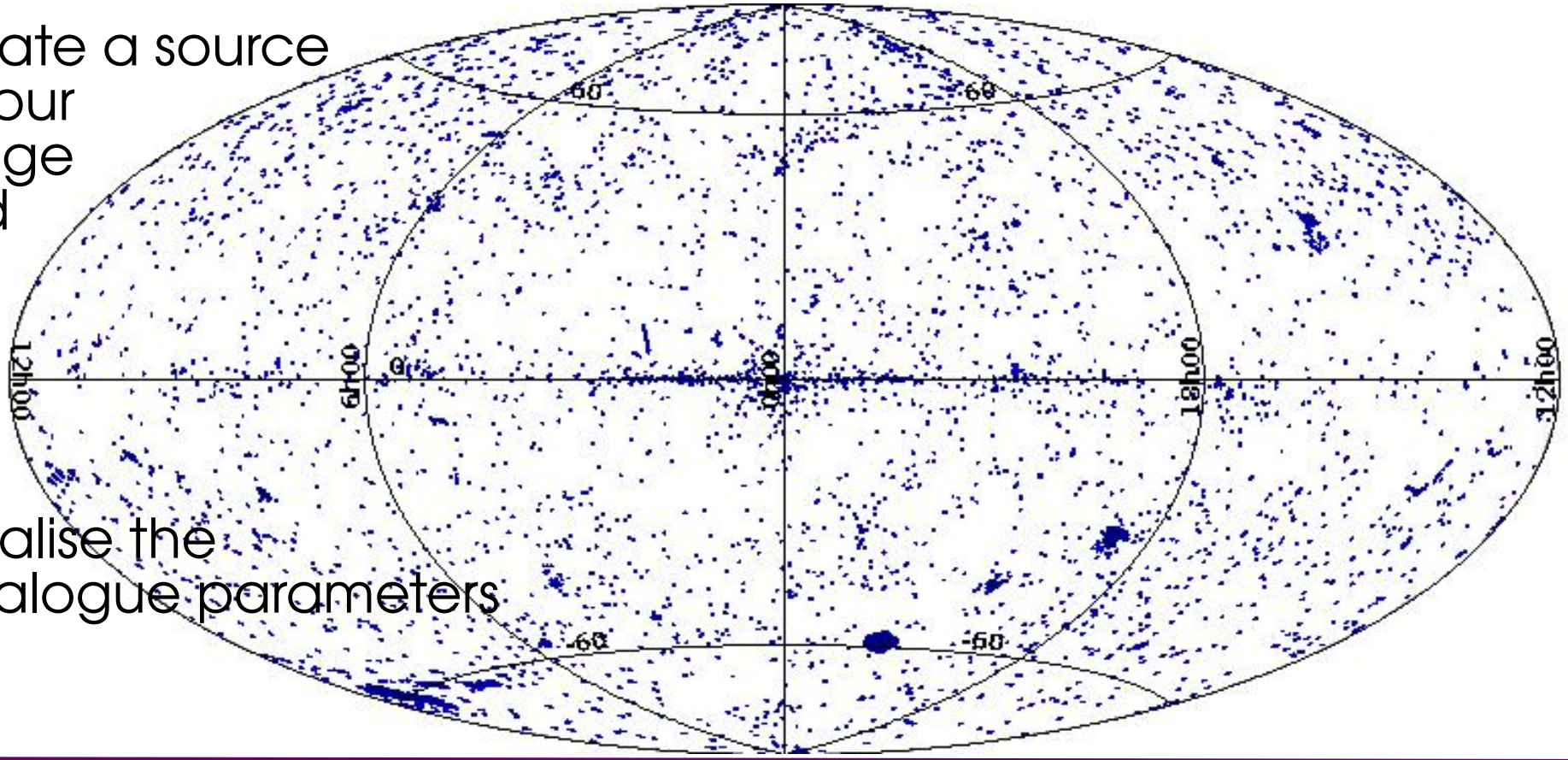
Visualise/extract lightcurve

Cross correlate with other catalogues

Topcat – plot the 4XMM-DR14 catalogue

How many detections in 4XMM-DR14 ?
How many unique sources in 4XMM-DR14 ?
What is the mean number of detections of a source ?
What is the maximum number of detections of a source ?
Plot the whole catalogue in a Hammer-Aitoff projection :

Locate a source in your image and



visualise the catalogue parameters