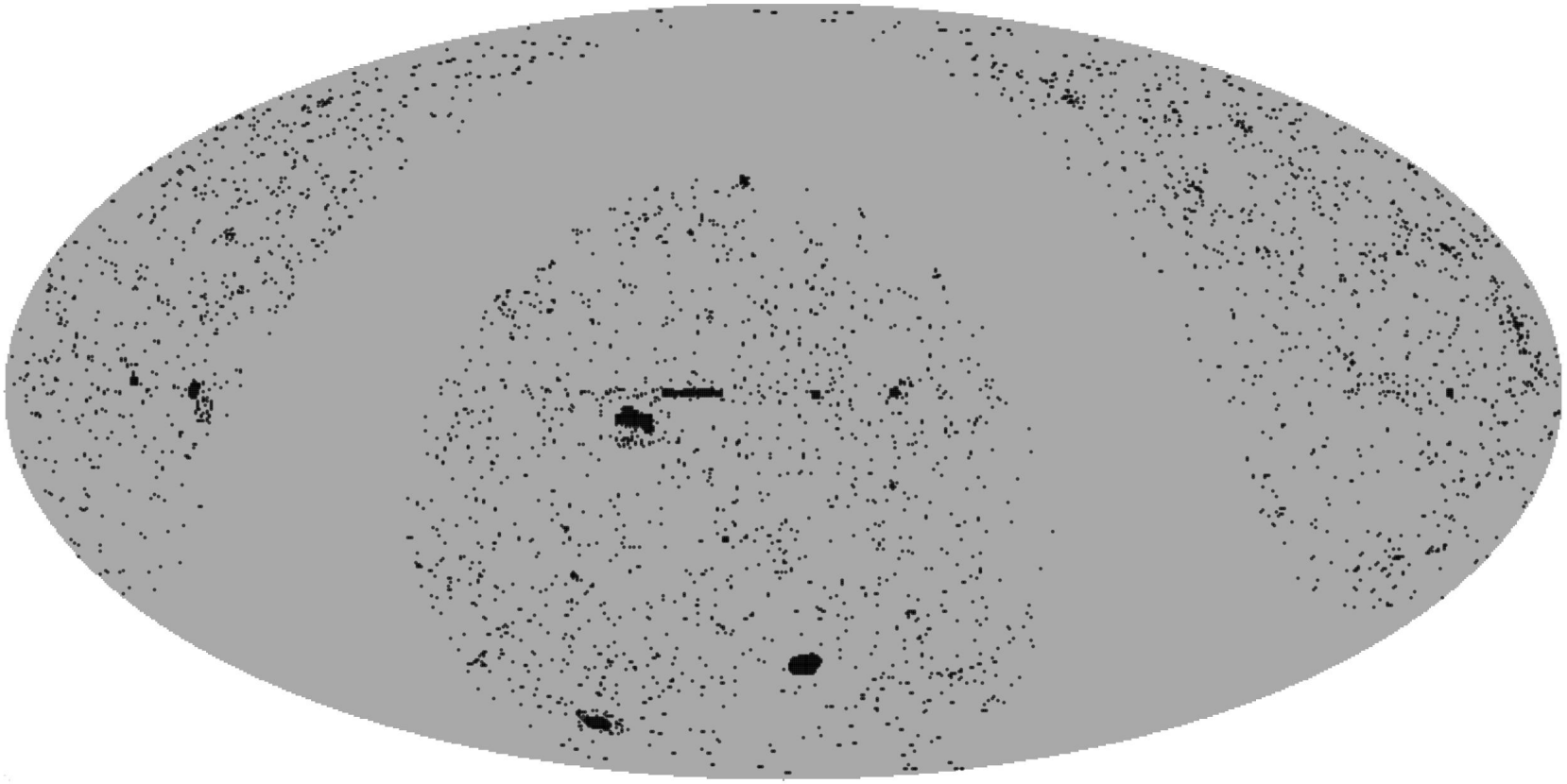
X-rays in the era of LSST

(a focus on galaxy clusters)

P. Giles* on behalf of XCS

*p.a.giles@sussex.ac.uk

Where we are now (XCS)

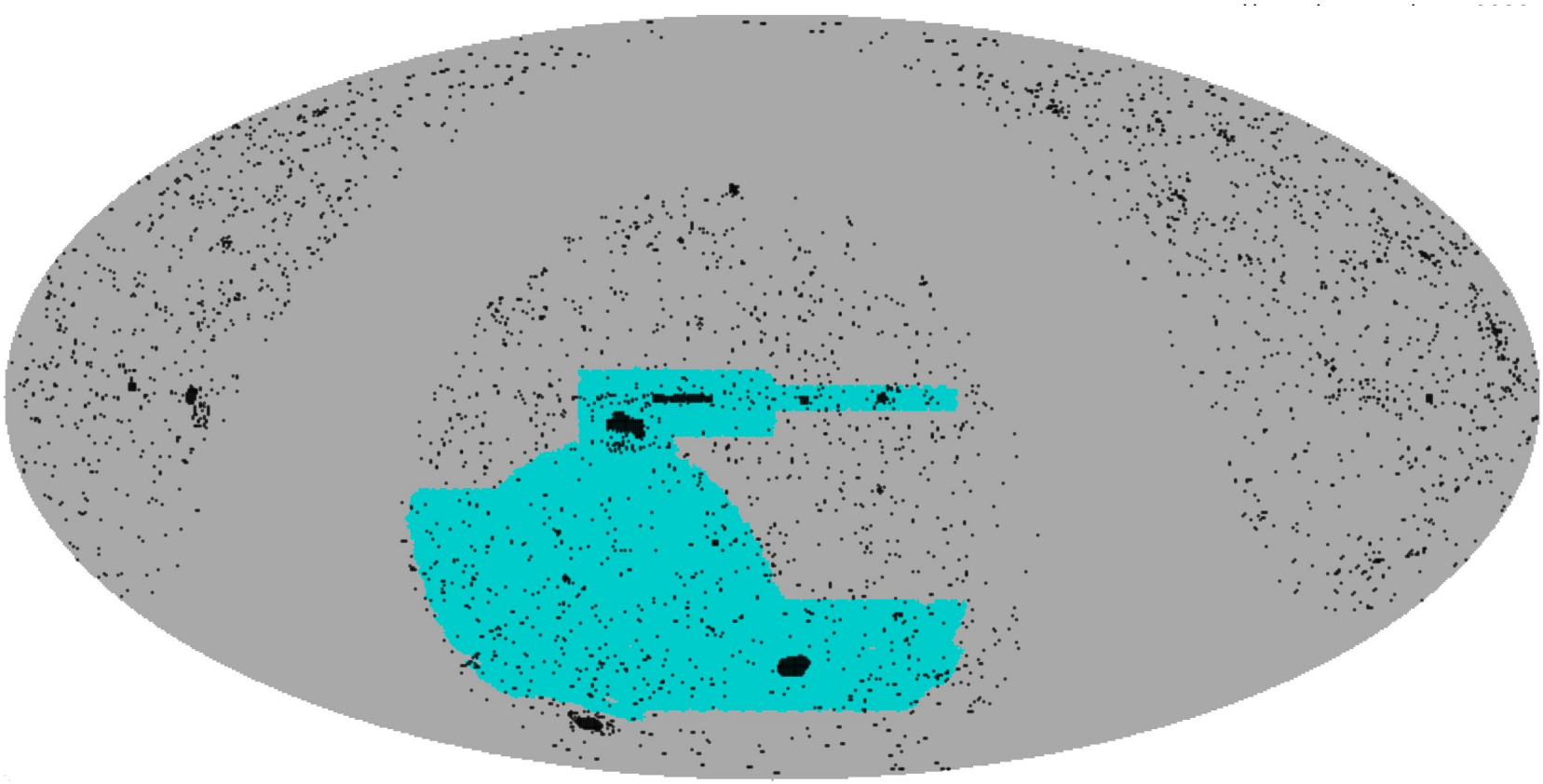


	Area (deg^2)	Observations	Sources	Extended sources
XCS	~1000	~13000*	~400000	~40000

*based upon obs to 2020

*p.a.giles@sussex.ac.uk

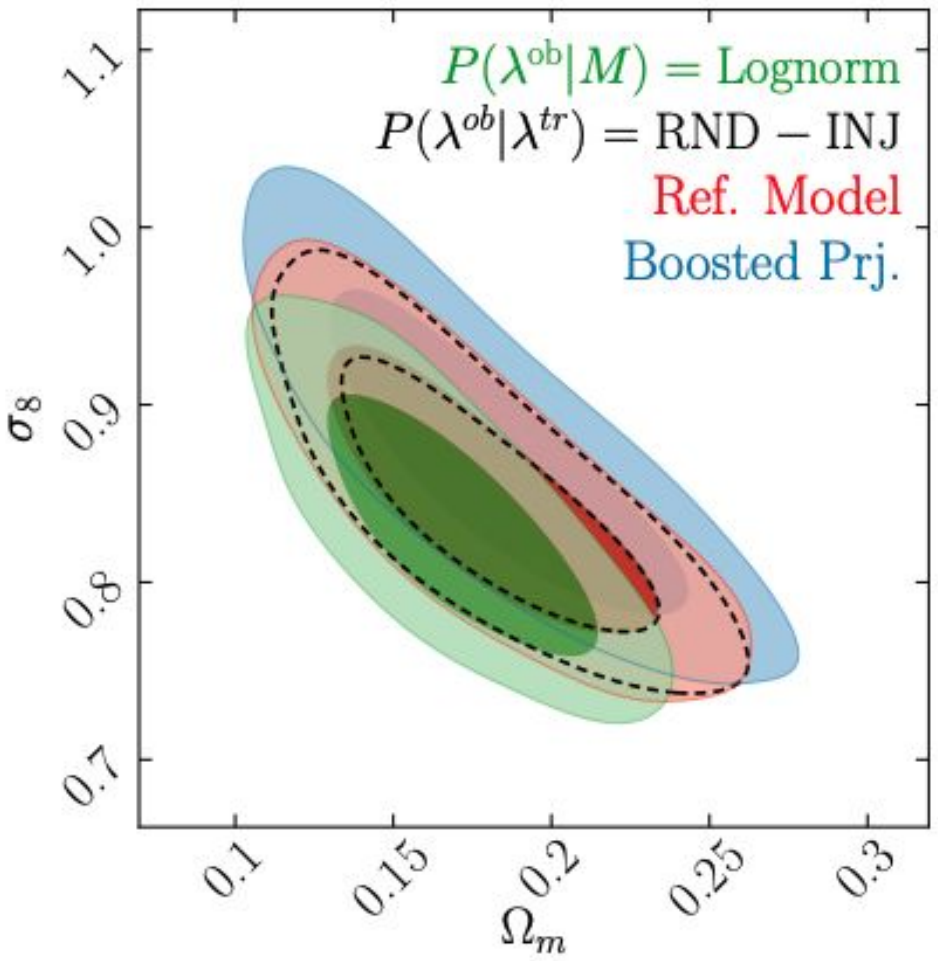
Where we are now (XCS + DES)



	Area overlap (deg^2)	Observations	Confirmed cluster matches
XCS	~250	~1500*	~330

*p.a.giles@sussex.ac.uk

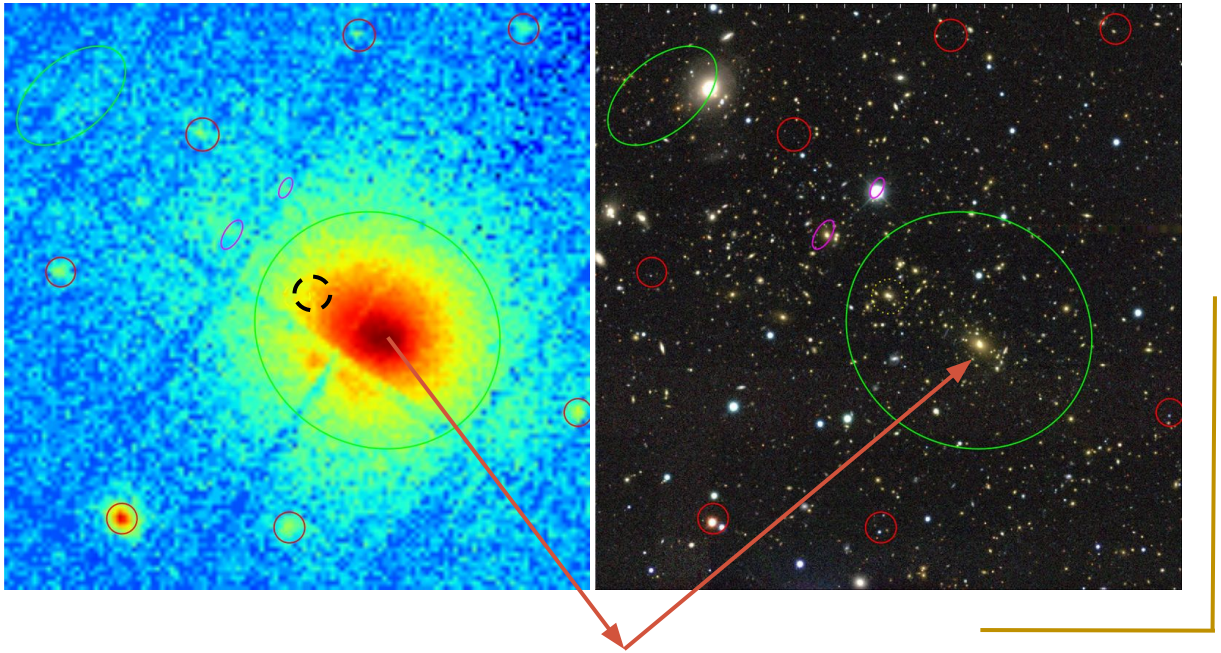
Why do we need X-rays?

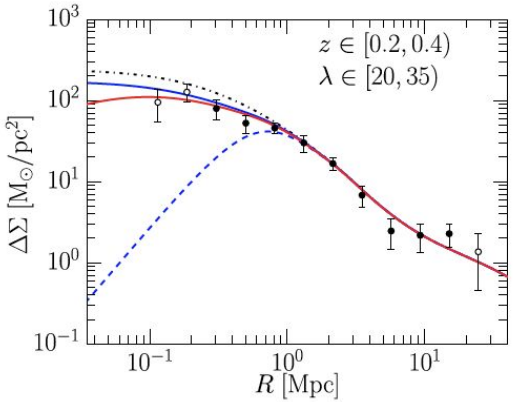


Dark Energy Survey cluster cosmology, Abbott+ 20

*p.a.giles@sussex.ac.uk

Why do we need X-rays?

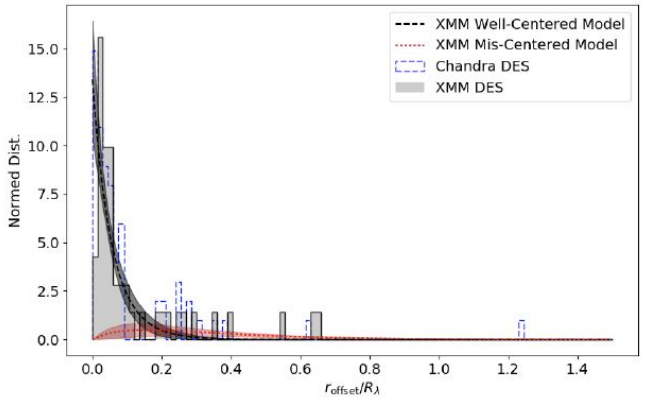




Melchior+ 17

Y. Zhang+ 19

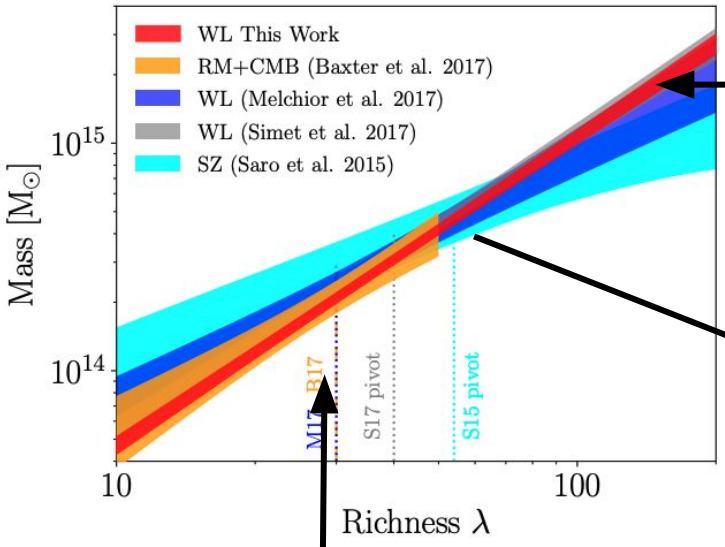
- Correctly identifying the centre of a cluster is of great importance for WL mass estimation
- Fraction of mis-centered clusters can be used as a prior in WL analysis (e.g. Melchior+ 17)



*p.a.giles@sussex.ac.uk

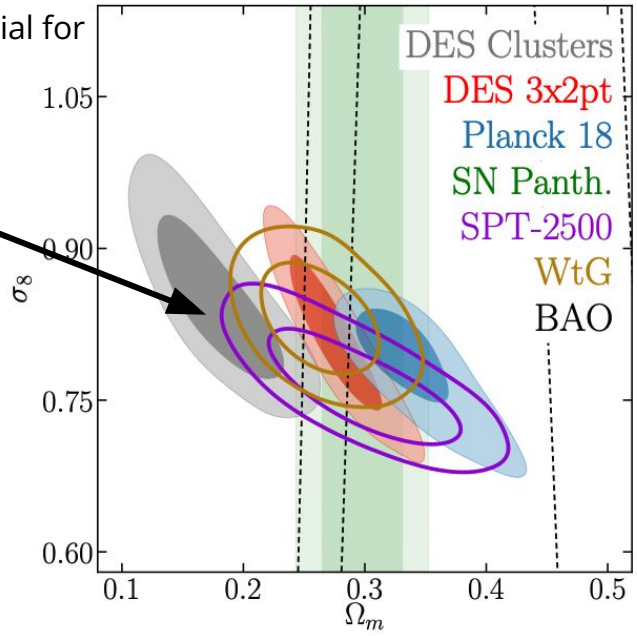
Why do we need X-rays?

McClintock+ 19



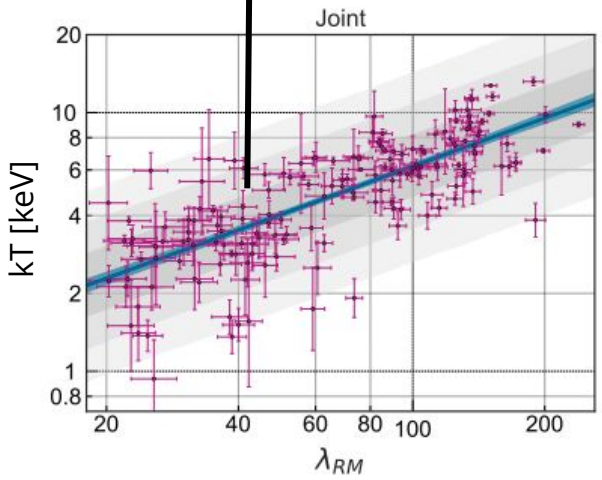
Stacked measurement, scatter lost

Mass calibration crucial for cosmology



Abbott+ 20

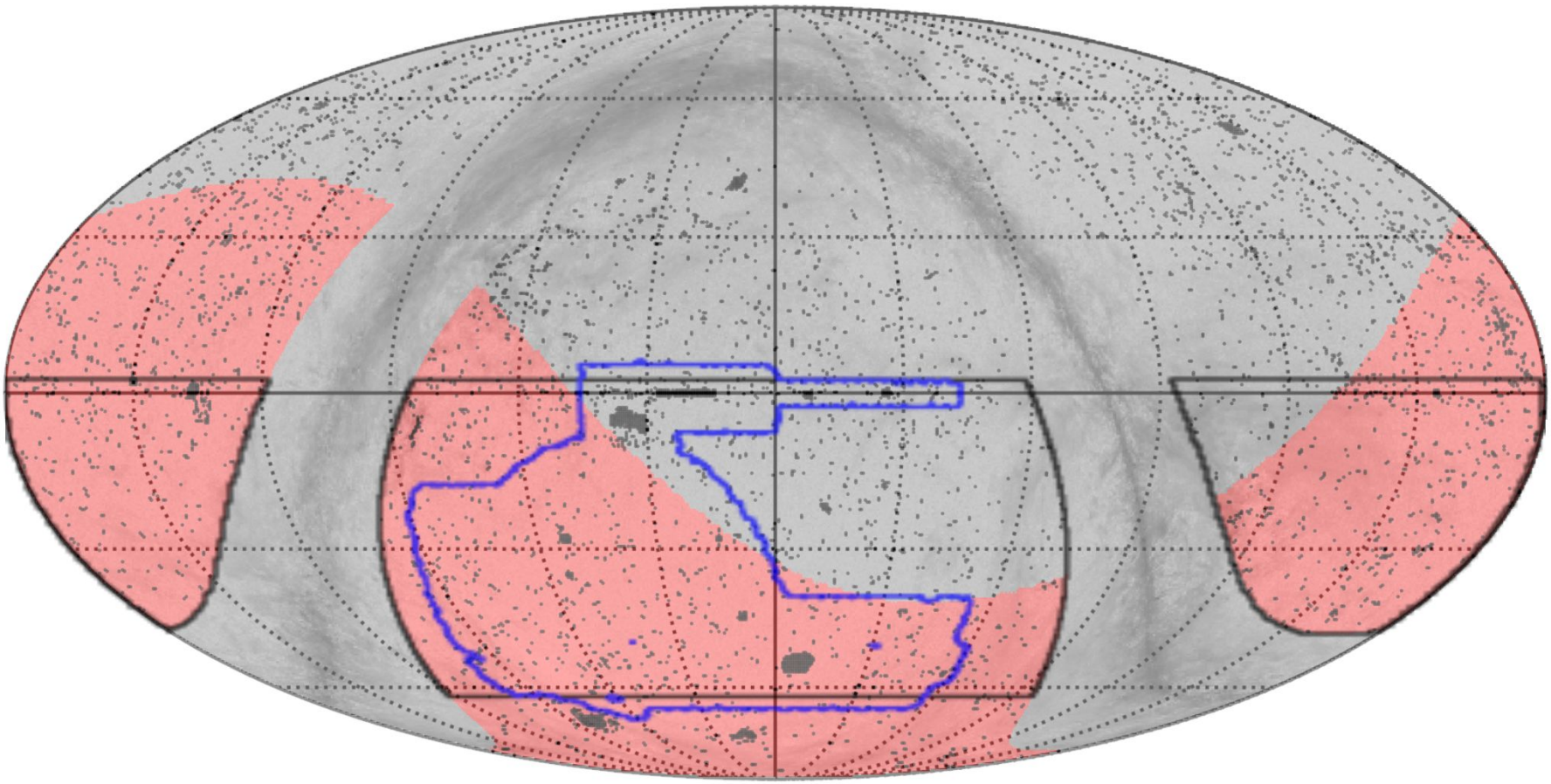
X-ray mass proxy regains scatter information



Farahi+ 19

*p.a.giles@sussex.ac.uk

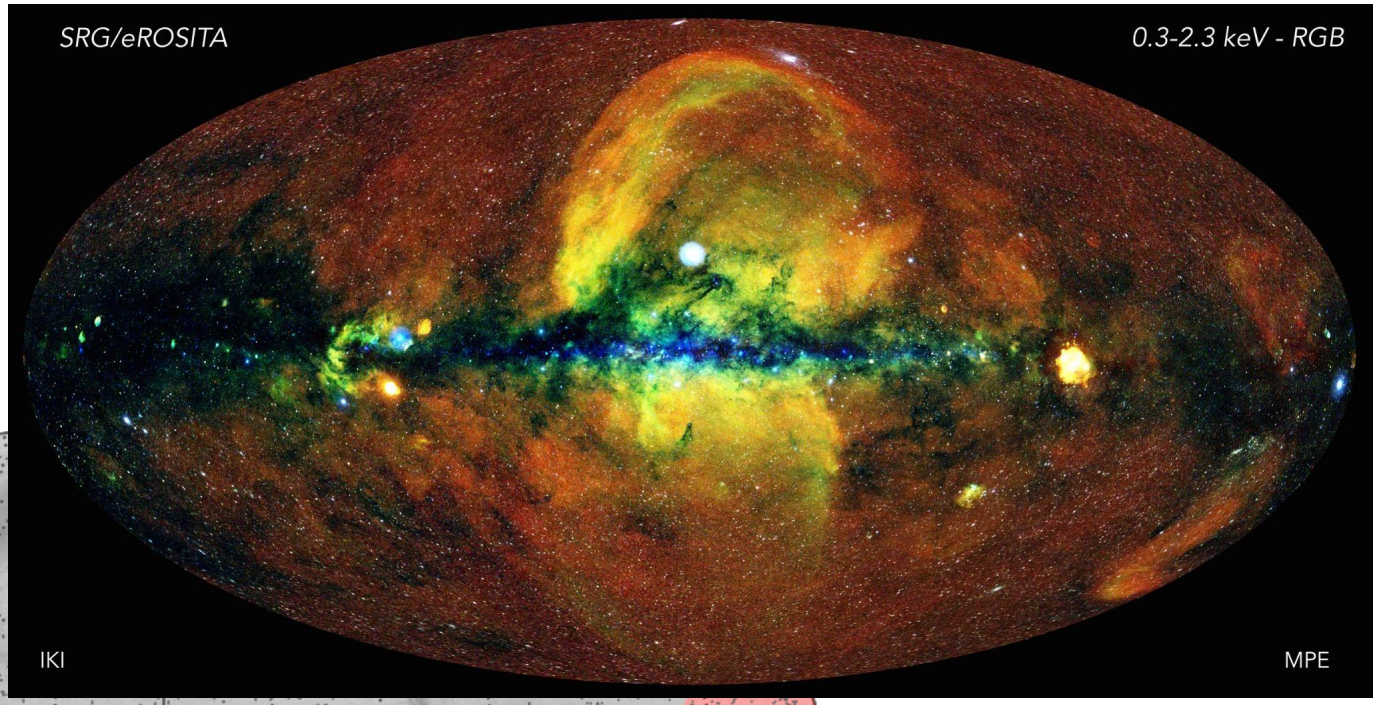
Where will we be during LSST operations

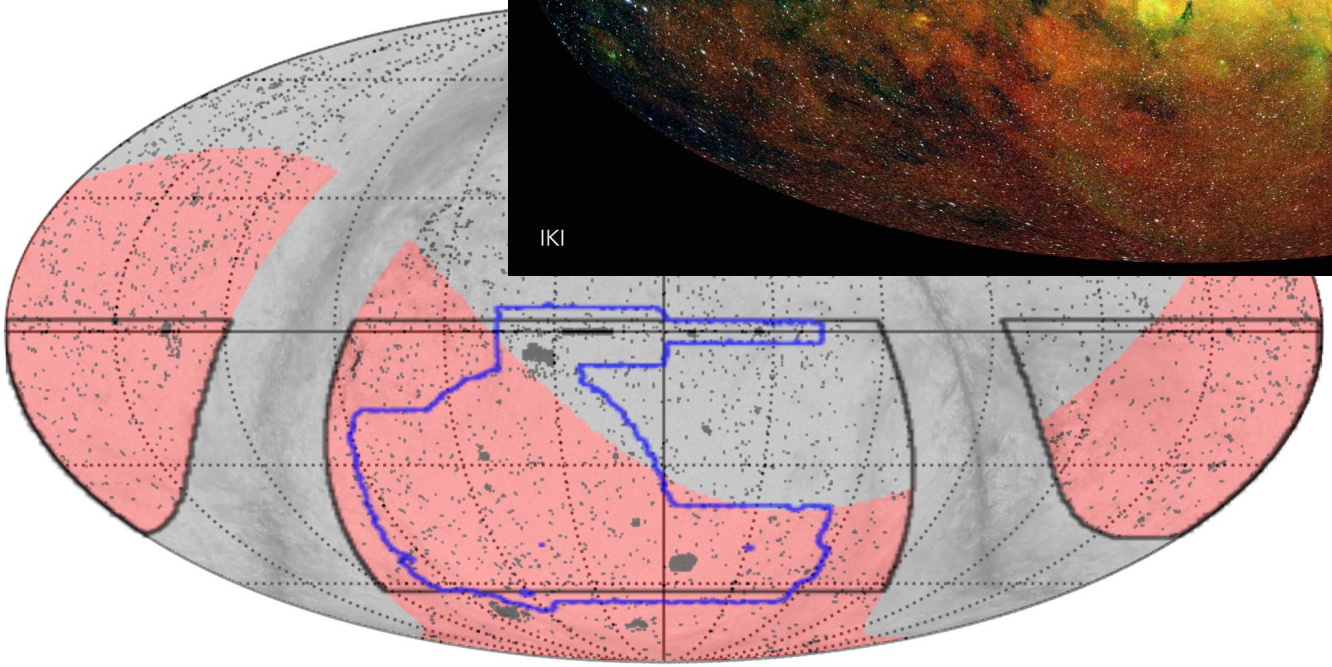


XMM Obs: Grey points, LSST: Black outline, eRASS: pink shaded, DES: Blue outline

*p.a.giles@sussex.ac.uk

Where will we be during LSST operations

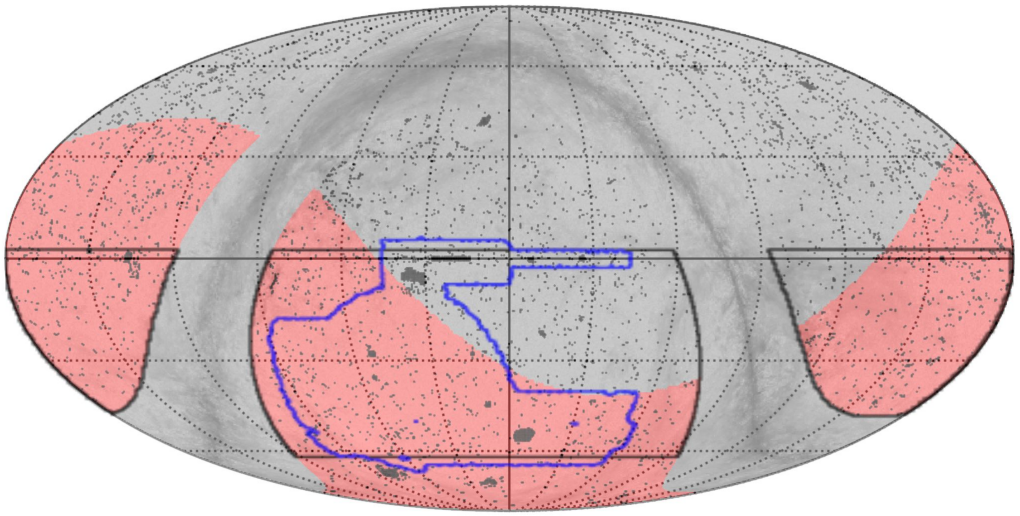




XMM Obs: Grey points, LSST: Black outline, eRASS: pink shaded, DES: Blue outline

*p.a.giles@sussex.ac.uk

Where will we be during LSST operations

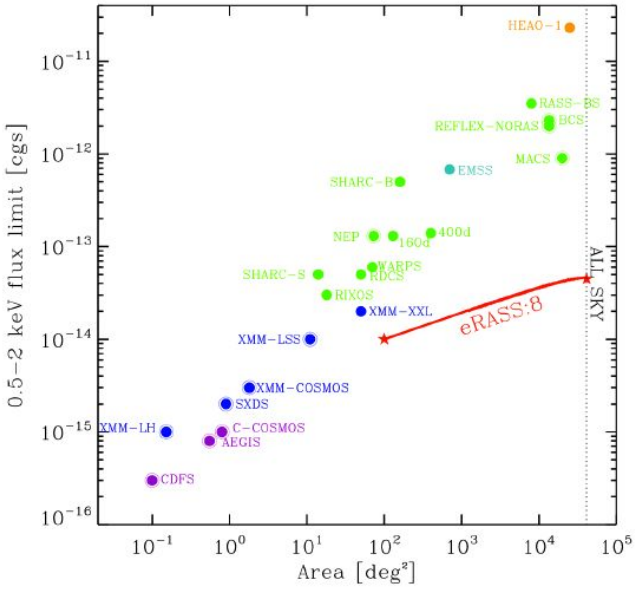


XMM Obs: Grey points, LSST: Black outline, eRASS: pink shaded, DES: Blue outline

- LSST will overlap with various X-ray
- Overlap with XMM will provide 100s of clusters, eROSITA 10000s of clusters!
- However, XMM typically deeper than eRASS
- For example, eRASS:4 will not be deep enough for X-ray hydrostatic masses

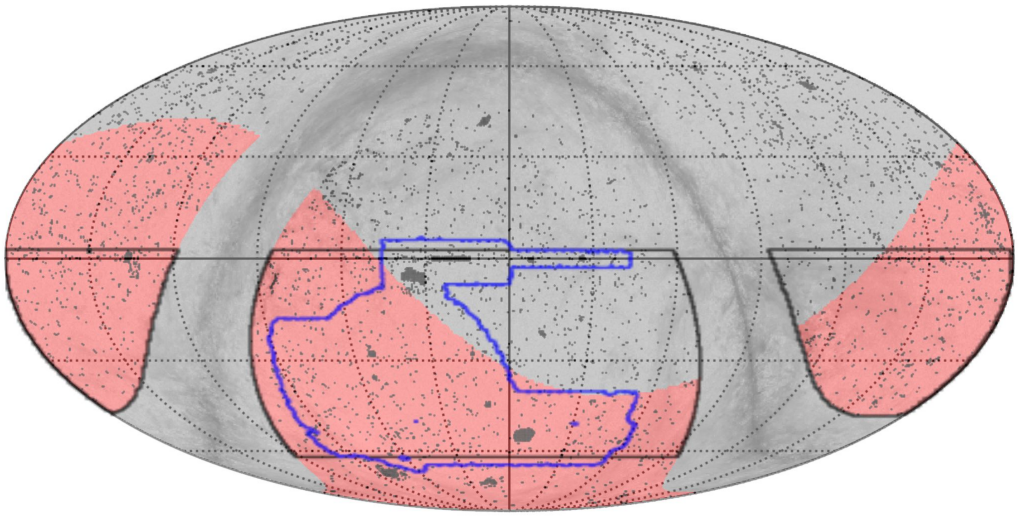
	Area (deg^2)	Predicted No. clusters	Predicted measured Tx
XCS/LSST	~502	663	586
eROSITA/LSST	~10000	2400* (20000)	430* (3700)

*Based upon estimates from 140 deg^2 eFEDS region. Numbers for eROSITA are based on 1(4) passes of the sky performed for the eROSITA All Sky Survey (eRASS)



*p.a.giles@sussex.ac.uk

Where will we be during LSST operations

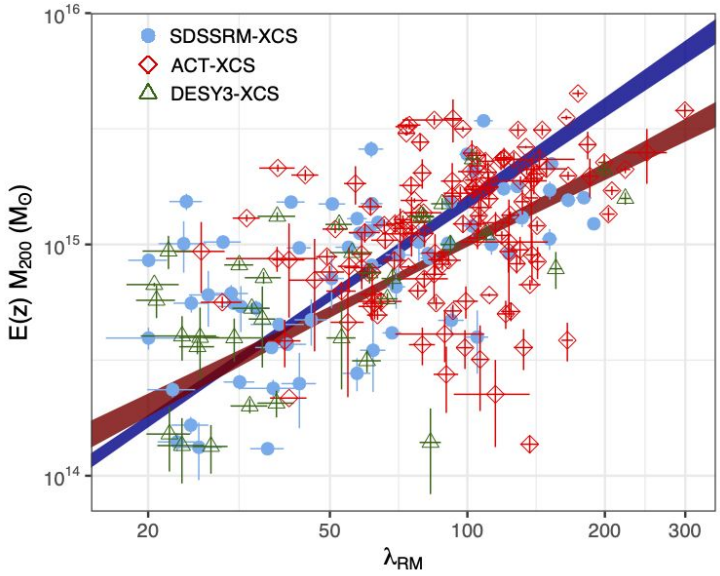


XMM Obs: Grey points, LSST: Black outline, eRASS: pink shaded, DES: Blue outline

- LSST will overlap with various X-ray
- Overlap with XMM will provide 100s of clusters, eROSITA 10000s of clusters!
- However, XMM typically deeper than eRASS
- For example, eRASS:4 will not be deep enough for X-ray hydrostatic masses

	Area (deg^2)	Predicted No. clusters	Predicted measured Tx
XCS/LSST	~502	663	586
eROSITA/LSST	~10000	2400* (20000)	430* (3700)

*Based upon estimates from 140 deg^2 eFEDS region. Numbers for eROSITA are based on 1(4) passes of the sky performed for the eROSITA All Sky Survey (eRASS)



Turner+ (in prep), see David Turner poster

*p.a.giles@sussex.ac.uk

Where will we be in the future

2023

2030s

2030s

*p.a.giles@sussex.ac.uk

Summary

- There is a wealth of X-ray data currently available to the community
- Within the next year, we will have access to an all sky X-ray survey, eRASS (the first in 30 years)
- At the start of LSST operations, there will be an overlap of ~520 deg^2 with XMM and ~10000(!) deg^2 with eRASS

*p.a.giles@sussex.ac.uk