

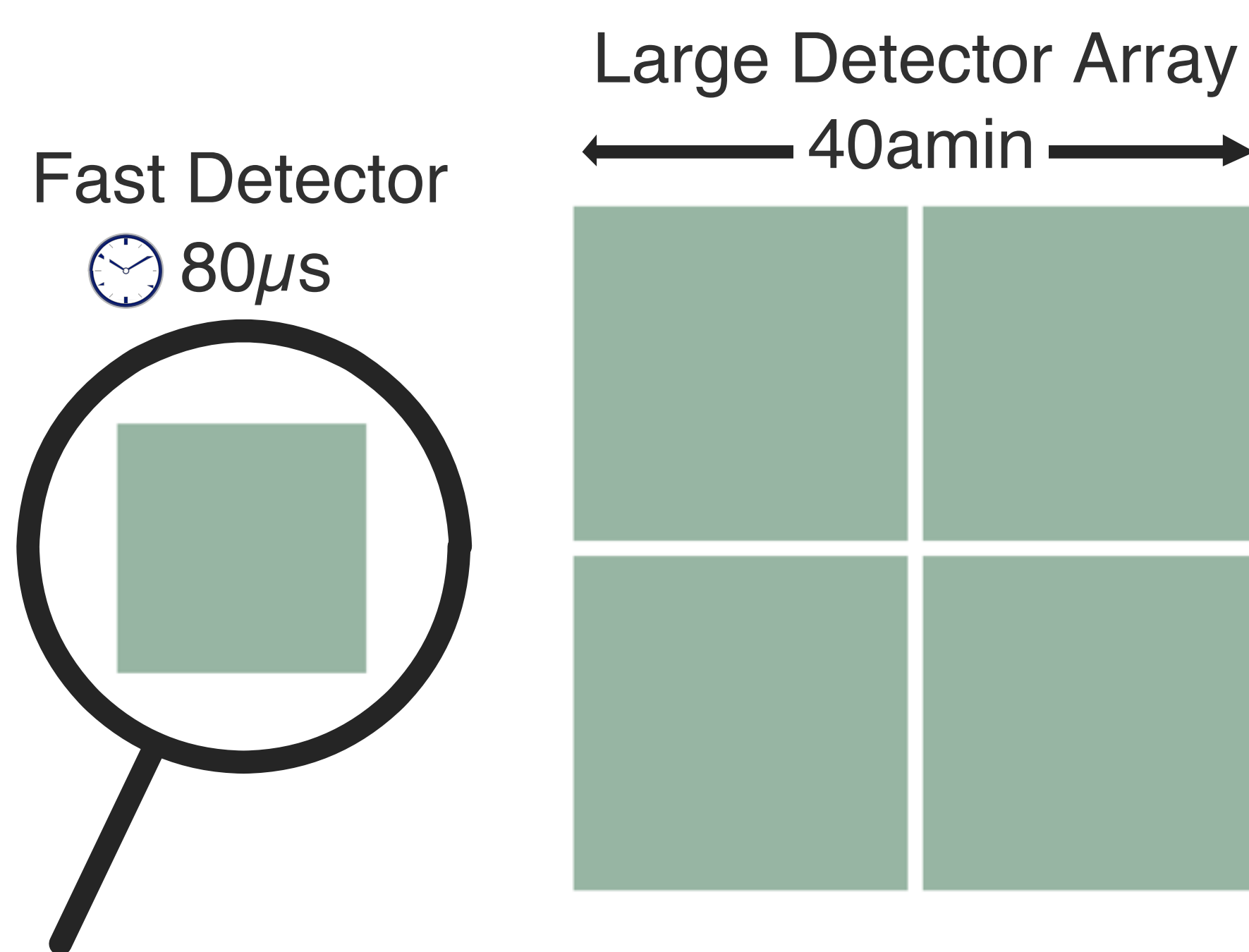
# The Science of the Athena Wide Field Imager

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## INSTRUMENT

The WFI [1] will image the 0.2-15keV X-ray sky with spectrally ( $<170\text{eV}$  at  $7\text{keV}$ ) and time-resolved photon counting. The **Large Detector Array** of 4  $512 \times 512$  DEPFET active pixel sensors, provides unprecedented wide-field survey power properly sampling the  $5''$  (HEW) mirror angular resolution. The  $64 \times 64$  pixel DEPFET **Fast Detector** will be operated out of focus to enable observations of the brightest X-ray point sources with high efficiency and low pile-up.



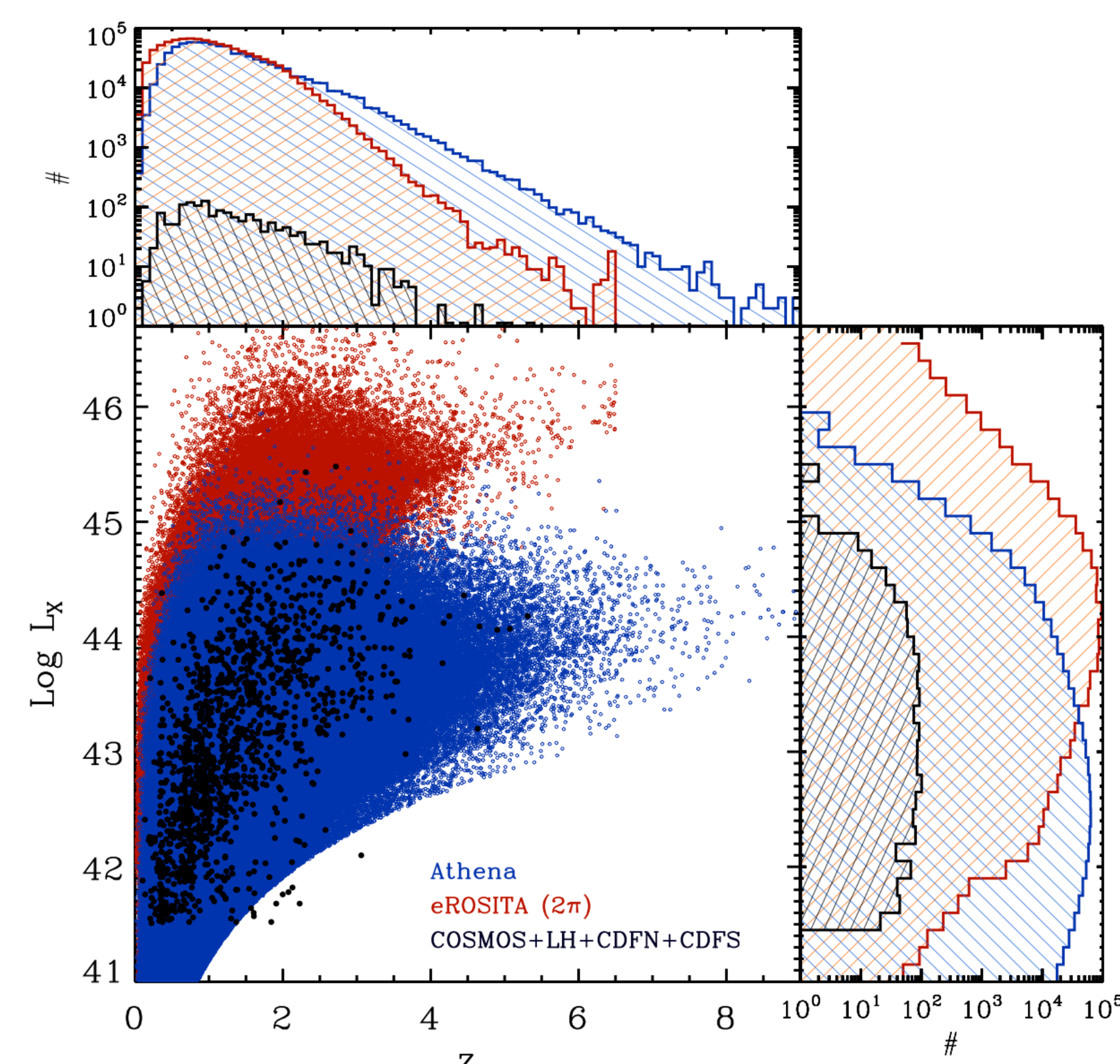
## SCIENCE THEME

### The Hot and Energetic Universe

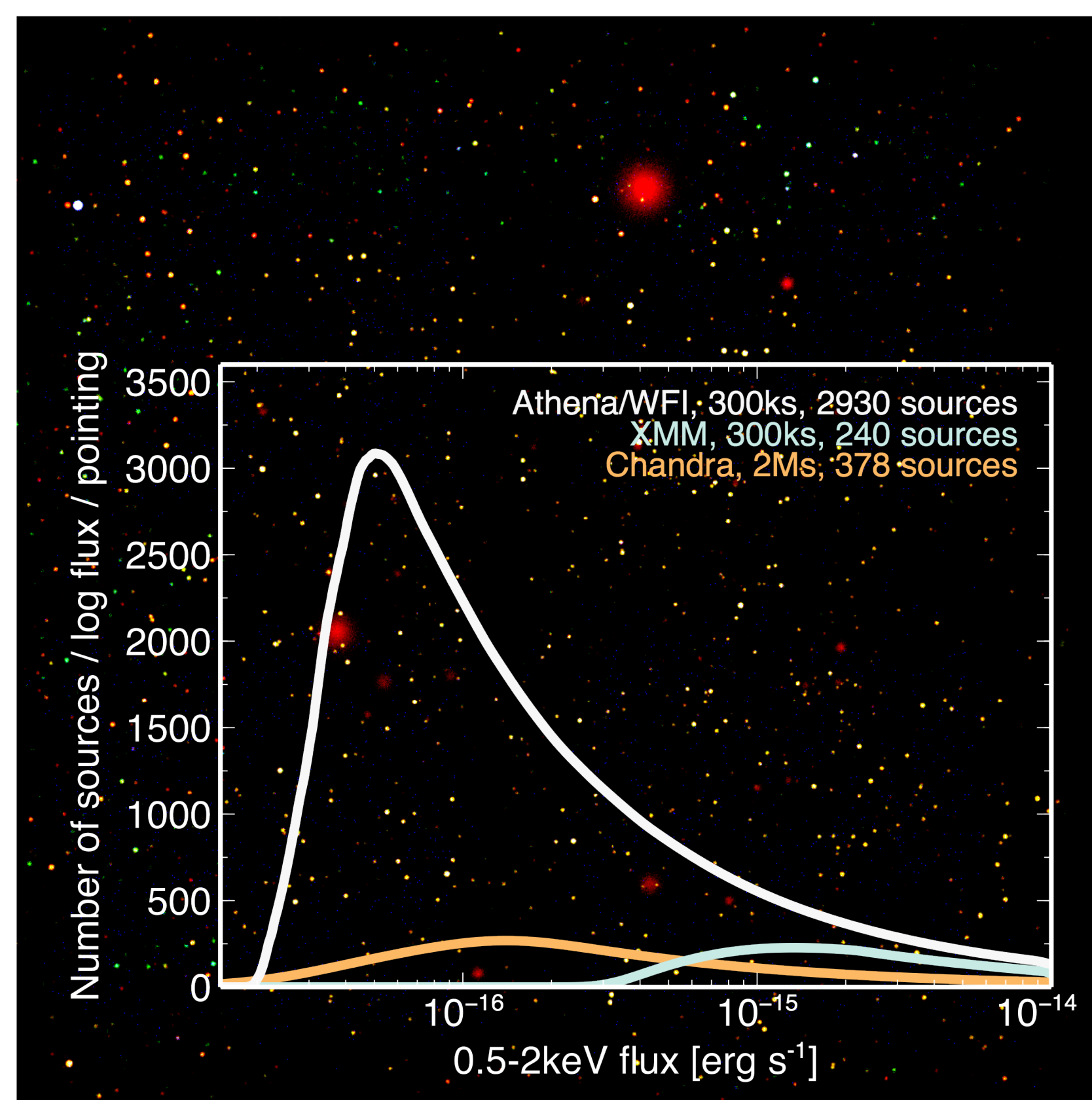
- How do black holes grow and shape the Universe?
- How does ordinary matter assemble in to the large scale structure that we see today?
- Provide a unique contribution to the astrophysics in the 2030'ies in synergy with the upcoming fleet of large observatories at all wavelengths (and beyond) [2].

## SUPERMASSIVE BLACK HOLES

With 100s of 'typical' AGN at redshift 6-8 from the planned WFI multi-tiered survey, we will explore the nature of the seeds of the earliest growing supermassive black holes and the responsible physical processes [3].

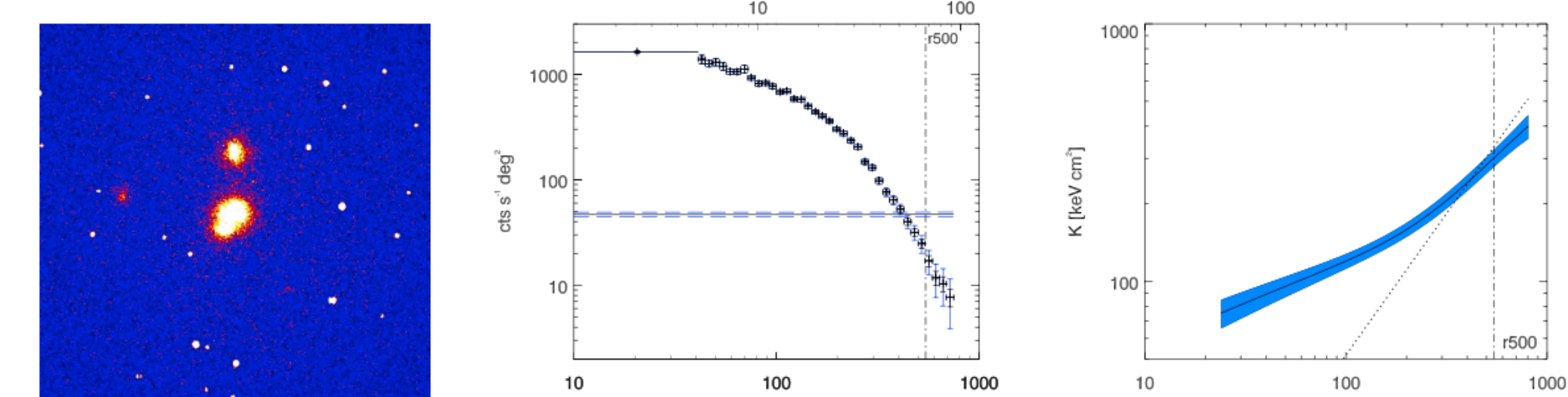


A complete census of the accretion energy density in the Universe will be obtained from the luminosity function and obscuration properties of Compton Thick AGN out to redshift 3. To the same redshift, the presence of outflows will be explored through the detection of strongly ionized absorbers [4].



## GALAXY GROUPS & CLUSTERS

The WFI survey will uncover the first evolved groups of galaxies at redshift  $>2$  with  $M_{500} > 5 \times 10^{13} M_{\text{sun}}$  and measure their global gas temperatures [5]. The study of the very low surface brightness regions in the outskirts of clusters of galaxies ( $R_{200}$  in the nearby Universe and  $R_{500}$  out to redshift 2) will give unrivaled insight into the evolution of gas thermodynamics during hierarchical gravitational collapse as function of cosmic time. Measuring abundances out to unprecedented radii will reveal how metals are distributed in the cluster volume [6].



## AND MORE

Exploring phenomena in all astrophysical contexts, incl. those yet to be discovered.

- Environments of supermassive and Galactic black holes (time lags, reverberation mapping, spins)
- X-ray binary populations in nearby galaxies
- Time Domain (TDEs, multi-messenger)
- Formation and evolution of stars (magnetic activity, stellar winds,...)
- Extended Galactic sources (SNRs, molecular clouds)
- Surveys (scan/slew, Galactic Plane)
- ...

## REFERENCES

- [1] Meidinger, talk 10699-50  
[2] Nandra, talk 10699-48  
[3] Aird et al., 2013, arXiv:1306.2325  
[4] Georgakakis et al. 2013, arXiv:1306.2328  
[5] Pointecouteau et al., 2013, arXiv: 1306.2319  
[6] Ettori et al., 2013, arXiv:1306.2322

