The Growth and Seeding of Supermassive Black Holes in the Early Universe with AXIS

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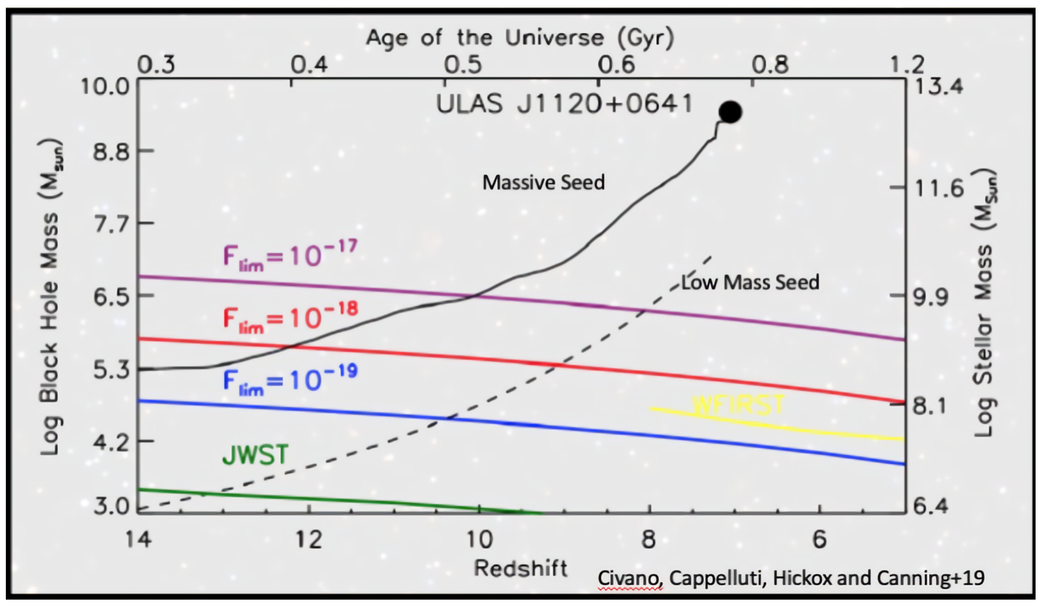
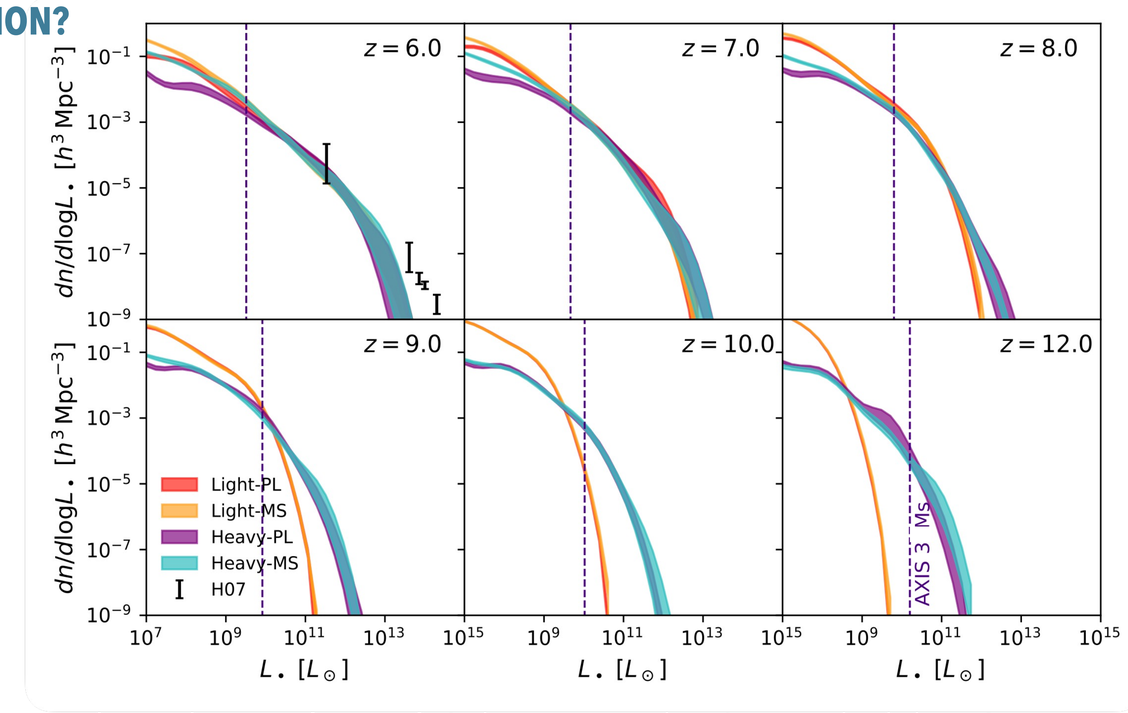
What seeds supermassive black holes and how do they grow?



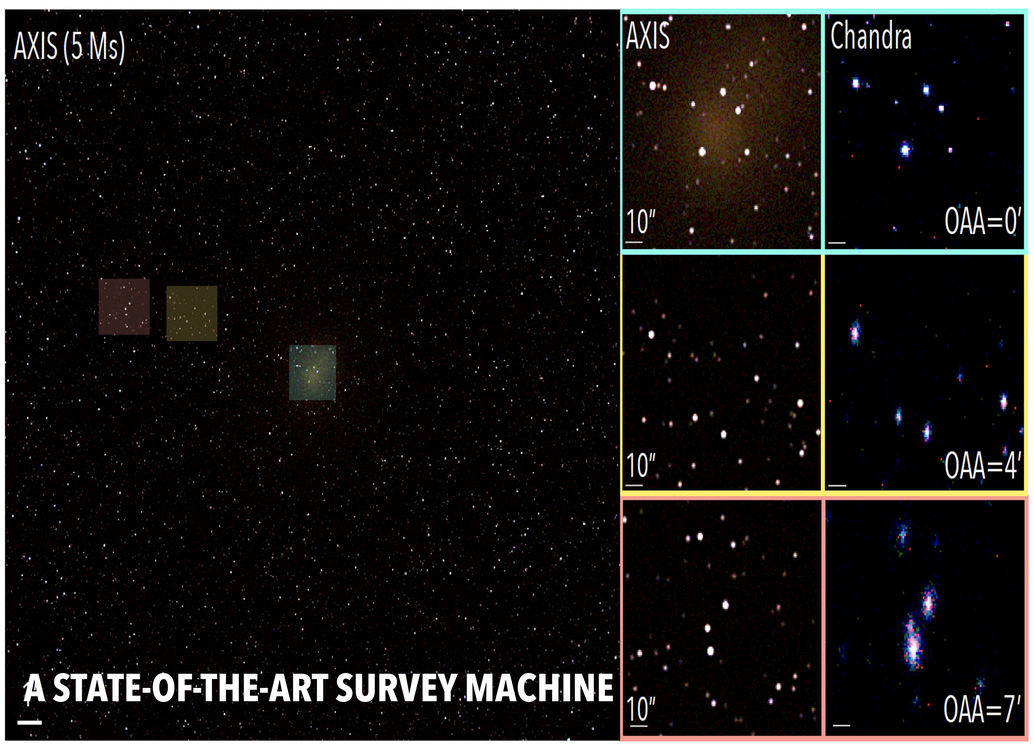
Comparison of black hole growth and detection methods. The solid line shows the simulated growth of a massive black hole seed (10^5 $M_\odot$ at z=20) up to the size of ULAS1120 + 0641 using the prescriptions in Pacucci et al. (2017). The dashed line shows the continuous Eddington limited growth of a low-mass seed (10^2 $M_\odot$ at z=20). The magenta red, and blue lines show three 0.5-2 keV limiting sensitivities with AXIS sensitivity consistent with the red curve. The green and orange lines show the black hole mass limits (derived from $M_\star$; Song et al. 2016) detectable by JWST and Roman observations, respectively. The figure illustrates that AXIS observatories will detect by z~9 both the low and high mass black holes in the first galaxies detected by JWST and Roman.

WHICH OBSERVABLE ANSWERS THIS QUESTION?



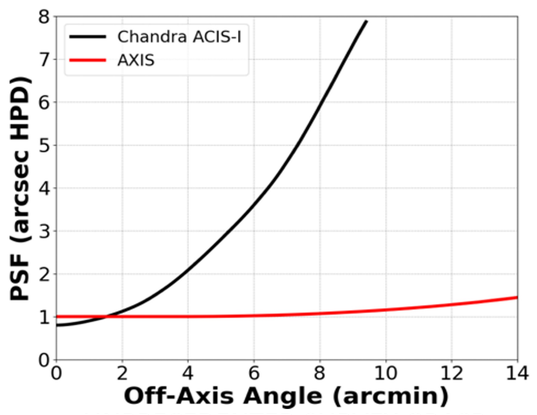
Bolometric luminosity function of AGN between z~6 and z~12 compared with the AXIS sensitivity limits (assuming obscured AGN BC). The solid and dashed lines show the theoretical predictions for different seeding models: DCBH (heavy seeds) and Pop III (low-mass seeds), respectively. The figure shows that the DCBH model produces a higher number density of luminous AGN than the Pop-III model at high redshifts, as expected from the faster growth rate of massive seeds.

WE ANSWER THIS QUESTION WITH AXIS!

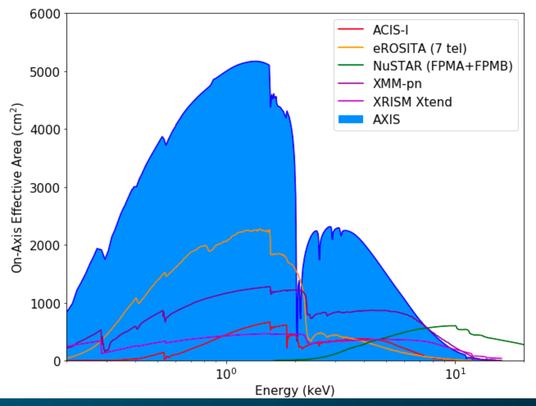


AXIS preliminary simulation results. AXIS will provide uniform coverage over the field of view and provide a 2 dex leap forward in survey grasp with respect to existing X-ray facilities. As an example, we show a comparison of an AXIS image with one from Chandra as function of the Off-AXIS angle.

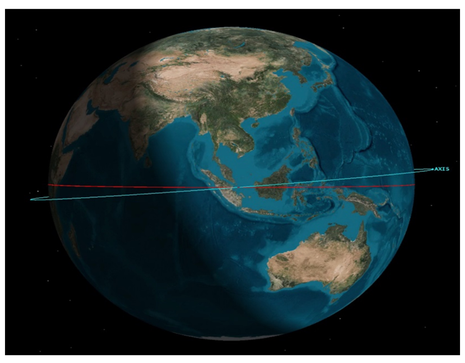
NO PSF DEGRADATION WITH OFF-AXIS ANGLE



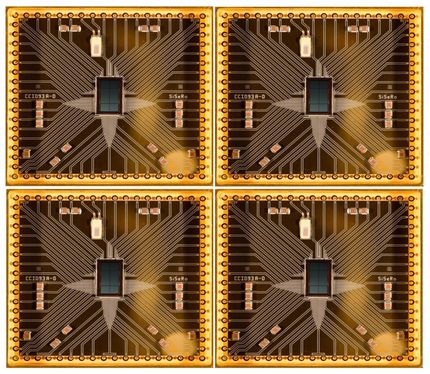
UNPRECEDENTED SURVEY GRASP



LOW AND STABLE BACKGROUND IN LEO



WIDE FOV, SENSITIVE AND FAST CCDs



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