

The X-Ray AGN Bias Factor at Zero Redshift

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Abstract. Using an AGN sample from the *INTEGRAL* all-sky survey, we show that the density fluctuations of matter in the local universe translate linearly into the density fluctuations of accreting supermassive black holes. Our results imply that hard X-ray emitting AGNs are unbiased tracers of the galaxy population in the nearby universe and SMBH activity is independent of the density of galaxies.

Keywords. large-scale structure of universe, galaxies: Seyfert, X-rays: galaxies

We have studied the volume density variations of nearby ($D < 70$ Mpc) hard X-ray emitting AGNs from the *INTEGRAL* all-sky survey conducted by Krivonos *et al.* (2007). AGN clustering is characterized by a so-called bias factor, i.e., ratio of fractional X-ray AGN-density fluctuations to the fractional matter-density fluctuations. We used the most straightforward way to measure the AGN bias factor by directly correlating the matter-density variations with the AGN volume density. As a tracer of the matter distribution, we use the *IRAS* PSCz redshift survey of Saunders *et al.* (2000). Volume-density fluctuations of *IRAS* galaxies in the local universe reflect matter-density fluctuations, i.e., their bias factor approaches unity (Basilakos & Plionis 2006). We calculated the volume-density excess for different directions in the sky by using 39 X-ray AGNs and 3680 *IRAS* galaxies at $D < 70$ Mpc (for details see Krivonos *et al.* 2007). X-ray and IR density fluctuations are related by dependence that is consistent with a linear law. Our preliminary best-fit value of the IR to X-ray ratio is 0.80 ± 0.13 .

The measured X-ray AGN bias factor is consistent with unity, which means that matter-density fluctuations on a scale of 70 Mpc at zero redshift translate linearly into fluctuations of the X-ray AGN volume-density. Hard X-ray emitting AGNs are apparently unbiased tracers of the galaxy population in the nearby universe. The measured AGN bias factor implies that SMBH activity is independent of the density of galaxies on spatial scales of 70 Mpc.

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References

- Basilakos, S. & Plionis, M. 2006, *MNRAS*, 373, 1112
Krivonos, R., *et al.* 2007, *A&A*, 475, 775
Saunders, W., *et al.* 2000, *MNRAS*, 317, 55