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Constraints on very faint high-z quasars

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Abstract. I discuss the constraints that can be derived on the abundance of high redshift ($z > 6$) (mini)quasars from the unresolved soft X-Ray background. Furthermore, I will show how existing Lyα surveys can be used to probe the very faint $M_B \gtrsim -21$ mag (i.e., $\gtrsim 7$–8 mag fainter than the SDSS quasars) end of the $z \geqslant 4.5$ quasar luminosity function.

Keywords. galaxies: high-redshift, X-rays: diffuse background, cosmology: theory, quasars: emission lines.

1. Constraints from the soft X-ray background

A population of black holes (BHs) at high redshifts ($z > 6$) that contributes significantly to the ionization of the intergalactic medium would be accompanied by copious production of hard ($> 10\,\mathrm{keV}$) X-ray photons. The resulting hard X-ray background would redshift and be observed as a present-day soft X-ray background (SXB). In Dijkstra *et al.* (2004) we show how existing models, in which BHs are the main producers of re-ionizing photons in the high-redshift universe, contribute more to the present-day SXB, than its unresolved component. This suggests that accreting BHs (be it luminous quasars or their lower-mass 'miniquasar' counterparts) did not dominate re-ionization. These results depend most sensitively on the exact spectrum emitted by these accreting BHs.

2. Constraints from Lyα surveys

There is good evidence that low numbers of Active Galactic Nuclei (AGN, or quasars) are among observed faint Lyα emitters at $z = 4.5$–6.5. Combining this observations with an empirical relation between the intrinsic Lyα and B-band luminosities of AGN, we obtain an upper limit on the number density of AGN with absolute magnitudes $M_B \in [-16,-19]$ at $z = 4.5$–6.5 (Dijkstra & Wyithe 2007). These AGN are up to two orders of magnitude fainter than those discovered in the Chandra Deep Field, resulting in the faintest observational constraints on the quasar luminosity function at these redshifts to date. We believe that existing and future Lyα surveys could make a significant contribution to our understanding of the formation and evolution of high redshift BHs and AGN.

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References

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