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Re-ionization imprints in high-z QSO spectra

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Abstract. We use a semi-analytical approach to simulate absorption spectra of QSOs at high redshifts with the aim of constraining the cosmic reionization history. More details are given in Gallerani *et al.* (2006) and references therein.

Keywords. intergalactic medium quasars: absorption lines, cosmology: theory large-scale structure of Universe.

We consider two physically motivated and detailed re-ionization histories: (*i*) an Early Re-ionization Model (ERM) in which the intergalactic medium is re-ionized by Pop III stars at $z > 10$ (Choudhury & Ferrara 2005), and (*ii*) a more standard Late Re-ionization Model (LRM) in which overlapping, induced by QSOs and normal galaxies, occurs at $z \simeq 6$. From the analysis of current Lyα forest data at $z < 6$, we conclude that it is impossible to disentangle the two scenarios, which fit equally well the observed Gunn-Peterson optical depth, flux probability distribution function and dark gap width distribution. At $z > 6$, however, clear differences start to emerge which are best quantified by the dark gap width distribution, as can be seen from Figure 1.

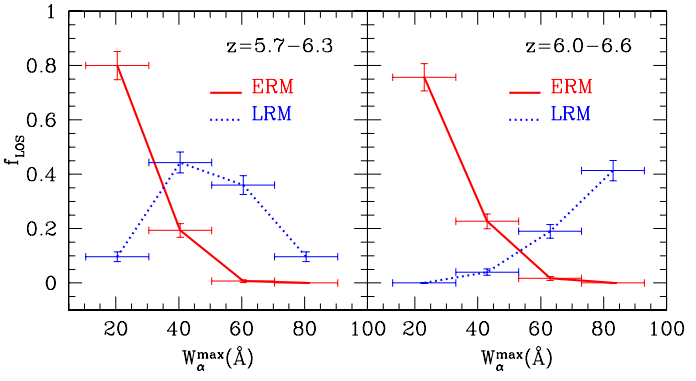

Figure 1. Distribution of the largest dark gap widths $W_\alpha^{\max}$ for 300 lines of sight in the redshift range 5.7 - 6.3 (*left panel*) and 6.0 - 6.6 (*right panel*) for ERM (*solid line*) and LRM (*dotted line*). The vertical error bars denote the cosmic variance; the horizontal error bars show the bin size.

We find that 35 (zero) per cent of the lines of sight within $5.7 < z < 6.3$ show dark gaps widths > 50 Å in the rest frame of the QSO if reionization is not (is) complete at $z \gtrsim 6$. We conclude that the dark gap width statistics represent a superb probe of cosmic re-ionization if about ten QSOs can be found at $z > 6$.

References

Gallerani, S., Choudhury, T. R., & Ferrara, A. 2006, *MNRAS*, 370, 3
Choudhury, T. R., & Ferrara, A. 2005, *MNRAS*, 361, 577