The extended gas halo of QSO host

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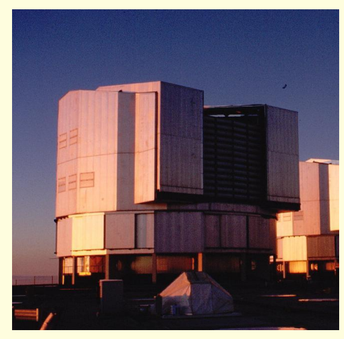
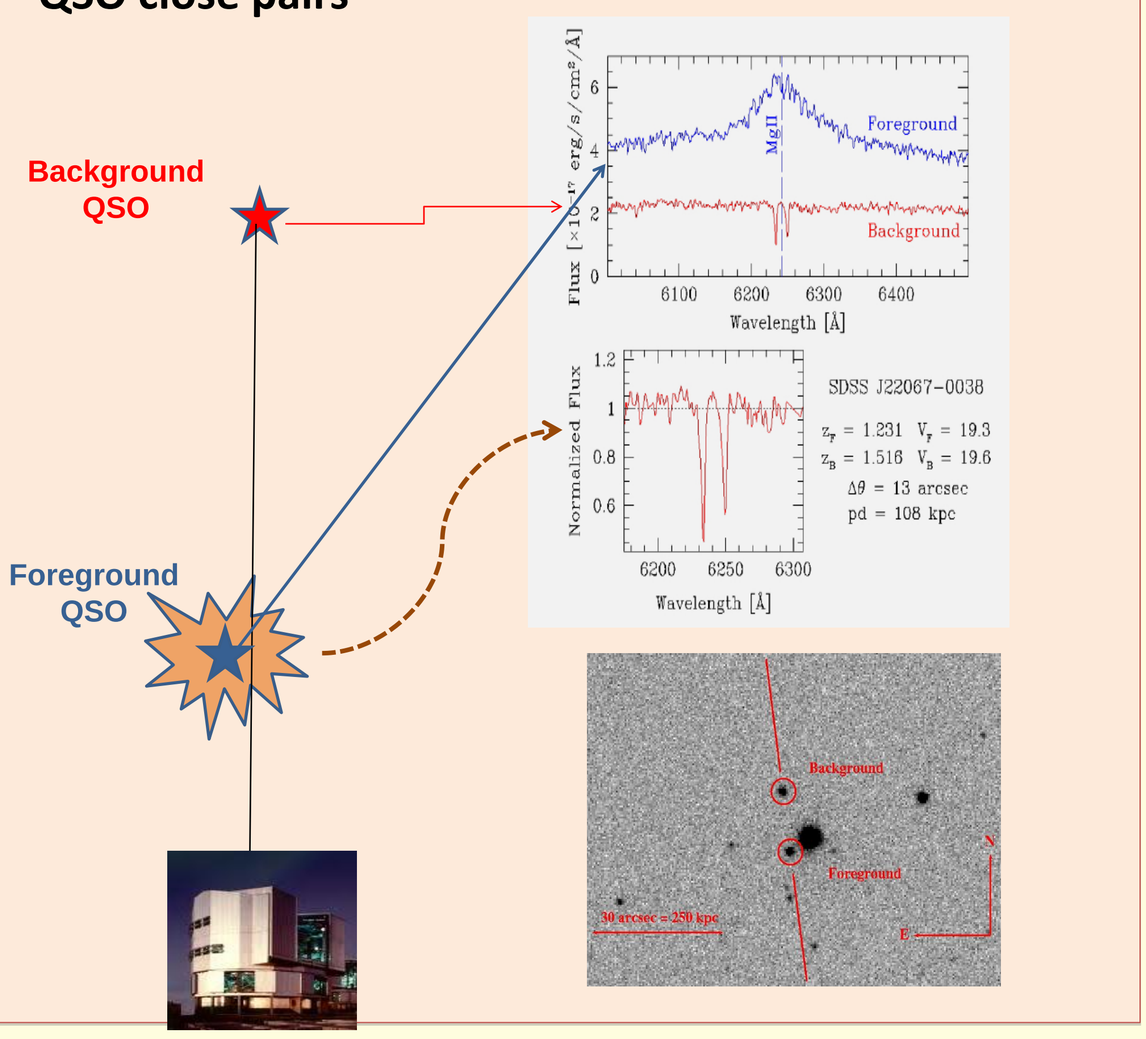


SUMMARY

We investigate the MgII 2800 and CIV 1540 absorption features of the gas in the halo of a foreground QSO through the absorption imprinting on the spectra of a background QSO that is closely aligned with the nearest quasar . We present the results for 13 QSO pairs (0.7 < z < 2.2) that allow us to probe the gas at distances between 60 kpc and 120 kpc from the QSO nucleus. We identify absorption features associated with the foreground QSO in 7 out of 10 systems for MgII , and one out of 3 for CIV .

At variance with the case of inactive and less massive galaxies we find that relatively strong (EW ~ 1 Ang) absorption features are present out to a radius of 100 kpc. This suggests that a large extended halo is associated with massive galaxies. When account is taken for different masses we find no difference between absorptions properties associated with inactive (less massive) and active (more massive) galaxies. Since in the spectra of the foreground QSO there are no signs of MgII absorptions of the same strength seen in the background QSO, we argue that the absorbing gas around the QSO is not homogeneous, as a possible consequence of the non isotropic emission from the QSO.

QSO close pairs



MgII 2800 absorptions in the QSO haloes

Spectra of the projected QSO pairs were collected with the VLT Antu telescope and FORS at the ESO Paranal observatory.
Exposure time ~4000 s, Spectral resolution ~ 3000.
See example in Figure 1.

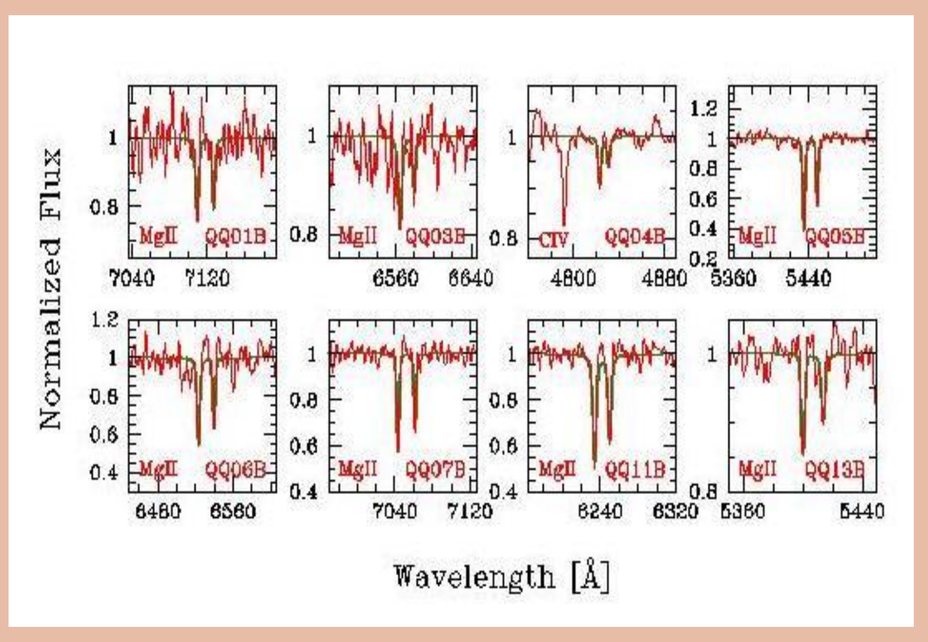


Fig. 1 Normalised QSO spectra showing the transverse absorptions of MgII 2800 (red line) and the fit by a Voigt function.

The gas in QSO and galaxies haloes

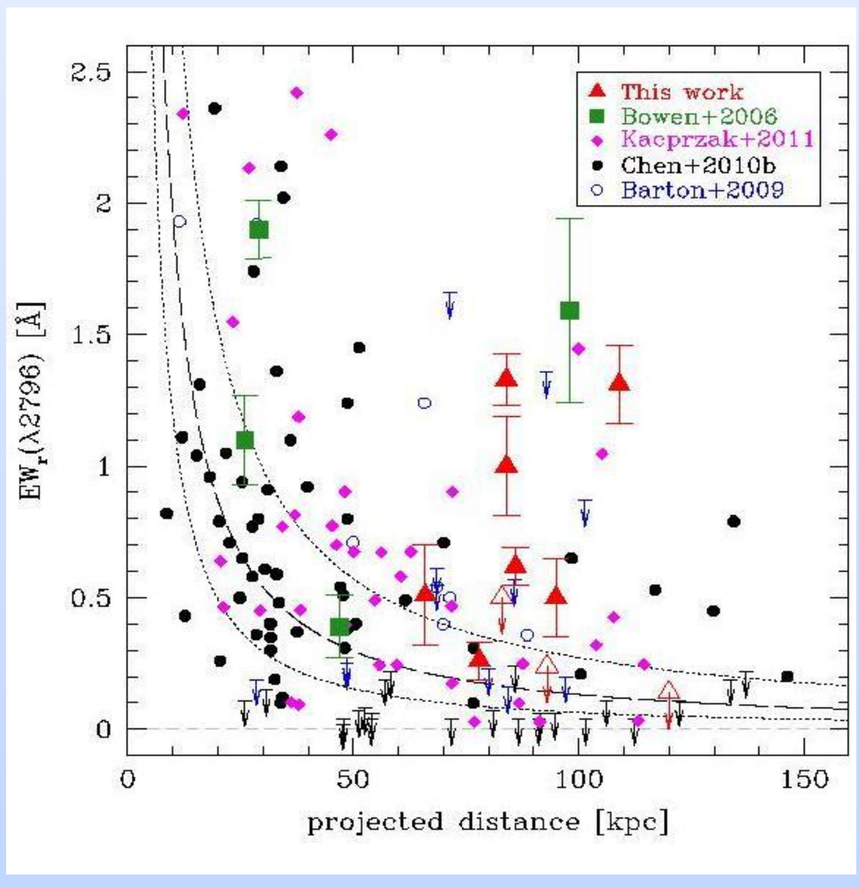


Fig. 2 Rest frame EW of Mg II(2800) absorption system as a function of the projected distance and stellar mass for QSO and galaxies. Red filled triangles are systems for which the absorption was detected, while the empty ones are 3 upper limits. Empty blue and filled black circle are data for galaxies from Barton & Cooke (2009) and Chen et al. (2010b), respectively. Black dashed line is the EW vs. projected distance anticorrelation for galaxies including the scaling relation with stellar mass proposed by Chen et al. (2010b). For the x–axis we have adopted the same projection of Figure 3 in Chen et al. (2010b).

Conclusions

We studied 13 close projected QSO pairs (separations of the systems between 60 kpc and 120 kpc) to investigate the gas in the haloes of QSO. In 7 out of 10 systems (0.7 < z < 2.2.) we have detected the Mg II 2800 doublet absorption systems on the background QSO spectrum at the redshift of the foreground QSO, while only one association out of 3 is found for CIV. 1540.

The comparison of these results with those for inactive (not hosting active black holes) galaxies by Kacprzak et al. (2011), Chen et al. (2010a), and Barton & Cooke (2009) show that the halo of QSOs is similar to that of inactive galaxies. In the observed sample we do not detect a significant enhancement of the absorption strengths, as could be expected if the QSO nuclear activity were driven by intense gas accretion onto the black hole. Moreover along the line of sight of the QSO we do not detect any Mg II absorbers of the same strength of the transverse one. These results are in agreement with models that consider a non isotropic emission of the QSO, which are hosted by massive gaseous halos.

REFERENCES

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