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Metallicities and dust content of proximate damped Lyman alpha systems in the Sloan Digital Sky Survey

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(Submitted on 25 Oct 2010)

Composite spectra of 85 proximate absorbers (log N(HI)>20 and velocity difference between the absorption and emission redshift, dv<10,000 km/s) in the SDSS are used to investigate the trends of metal line strengths with velocity separation from the QSO. We construct composites in 3 velocity bins: dv<3000 km/s, 3000<dv<6000 km/s and dv>6000 km/s, with further sub-samples to investigate the metal line dependence on N(HI) and QSO luminosity. Low (e.g. SiII and FeII) and high ionization (e.g. SiIV and CIV) species alike have equivalent widths (EWs) that are larger by factors of 1.5 -- 3 in the dv<3000 km/s composite, compared to the dv>6000 km/s spectrum. The EWs show an even stronger dependence on dv if only the highest neutral hydrogen column density (log N(HI)>20.7) absorbers are considered. We conclude that PDLAs generally have higher metallicities than intervening absorbers, with the enhancement being a function of both dv and N(HI). It is also found that absorbers near QSOs with lower rest-frame UV luminosities have significantly stronger metal lines. We speculate that absorbers near to high luminosity QSOs may have had their star formation prematurely quenched. Finally, we search for the signature of dust reddening by the PDLAs, based on an analysis of the QSO continuum slopes relative to a control sample and determine a limit of E(B-V)<0.014 for an SMC extinction curve. This work provides an empirical motivation for distinguishing between proximate and intervening DLAs, and establishes a connection between the QSO environment and galaxy properties at high redshifts.

Comments: Accepted for publication in MNRAS
Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as: **arXiv:1010.5244v1 [astro-ph.CO]**

Submission history

From: Sara L. Ellison [view email]
[v1] Mon, 25 Oct 2010 20:01:27 GMT (387kb)

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