Investigating the Metallicity Evolution of Sub-damped Lyman alpha Systems

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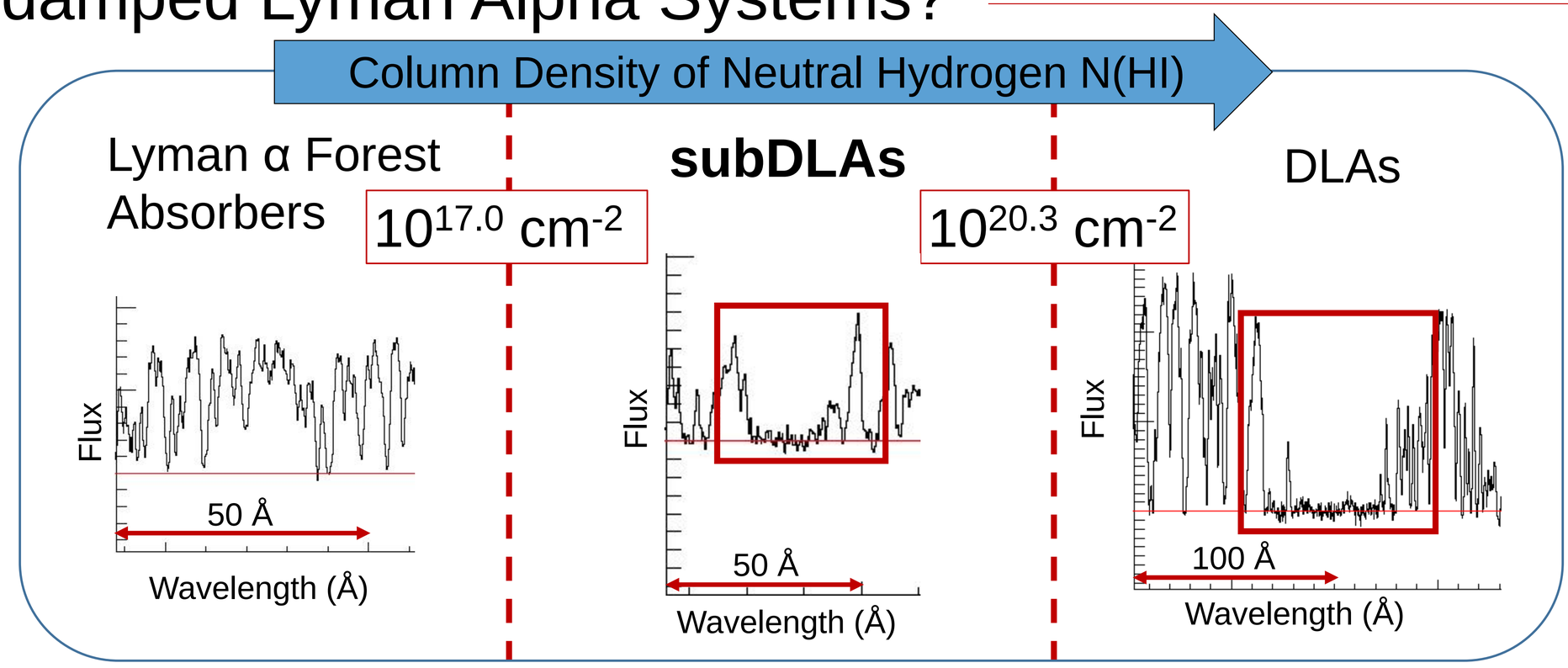
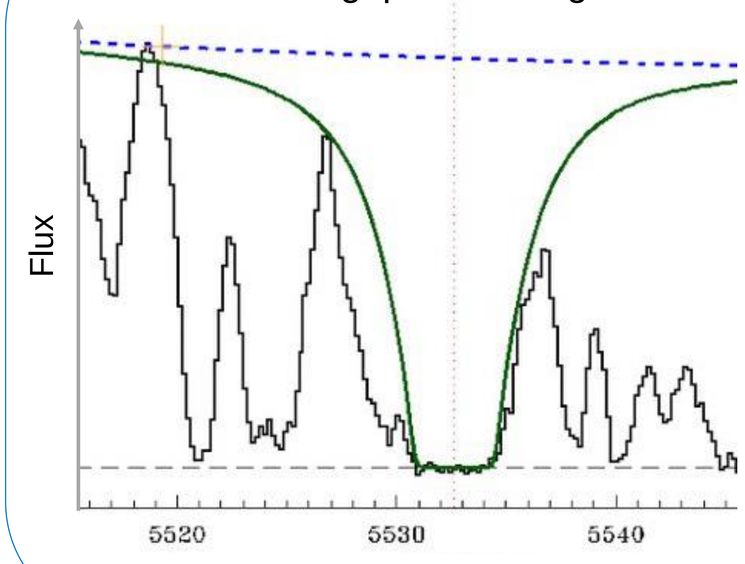
What are Sub-damped Lyman Alpha Systems?

- Sub-damped Lyman alpha systems (subDLAs) are a class of quasar absorption line systems
- Damped Lyman alpha systems (DLAs) and subDLAs are primary neutral gas reservoirs at $0 < z < 5$
- They can be used to study galaxy compositions at high redshift independent of galaxy luminosity

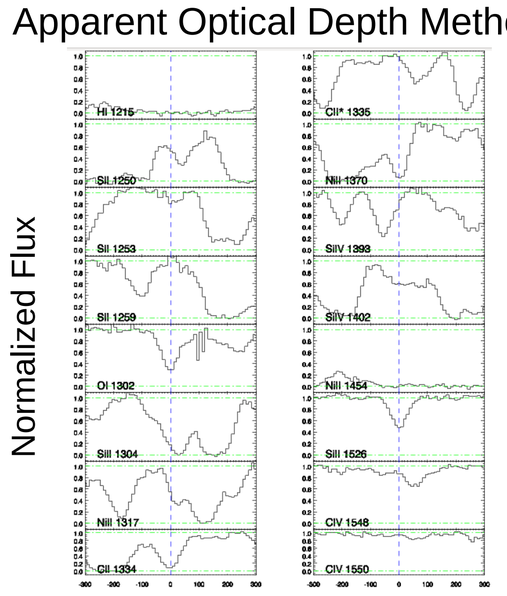


Finding subDLAs and Determining Metallicities

Hydrogen column density measured via Voigt profile fitting



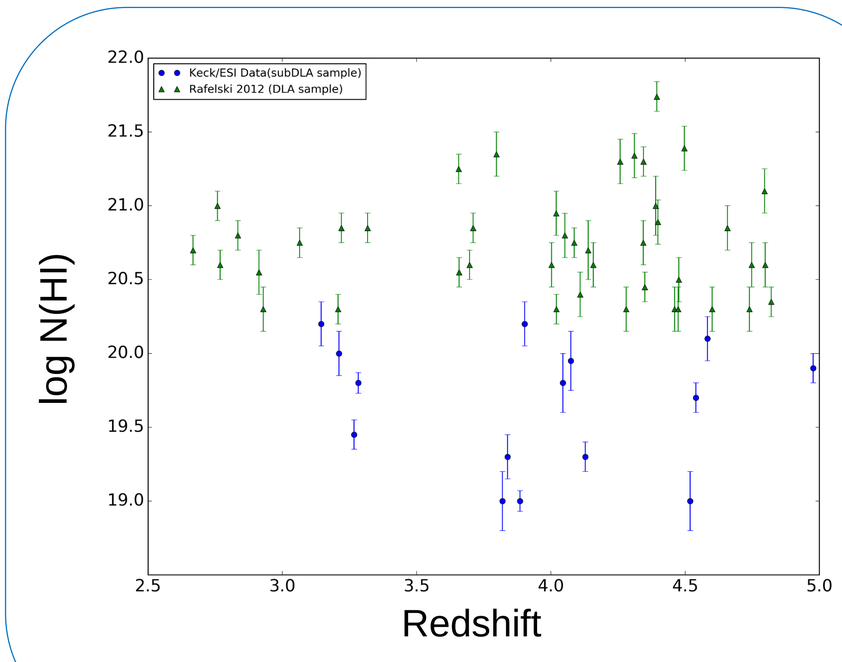
Ion metallicities measured by the Apparent Optical Depth Method

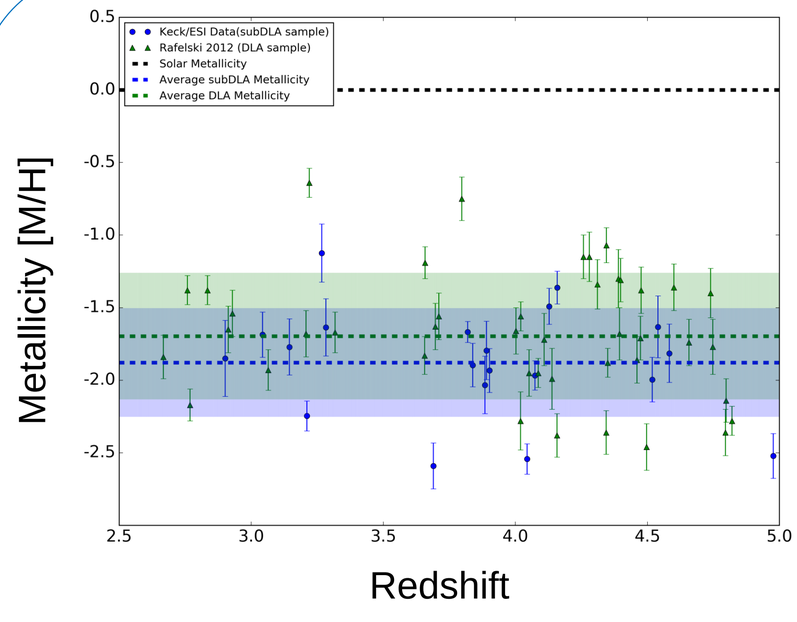


- Searched 72 quasar absorption spectra taken by the Keck Echellete Spectrograph and Imager (ESI)
- Identified 17 subDLAs with $10^{19.0}$ cm^{-2} < N(HI) < $10^{20.3}$ cm^{-2}
- The ions that were used to calculate the metallicities included O, S, Si, Zn, Fe and Al.

Apparent Metallicity Evolution as compared to DLAs

- We are building a catalog of subDLAs to compare to existing DLA samples
- The N(HI) of subDLAs appears to be independent of redshift
- The mean subDLA metallicity measured is -1.88 ± 0.36, and the mean DLA metallicity is -1.70 ± 0.43
- DLAs and subDLAs appear to have similar metallicities over the redshift range sampled





Green, blue bars indicate one standard deviation from the mean

References

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- Wolfe, A.M et al. 2005, ARAA, 43, 861
- Rafelski, M.et al. 2012, ApJ, 755, 89

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