

A tomographic view of metals in the Milky Way



Astronomía

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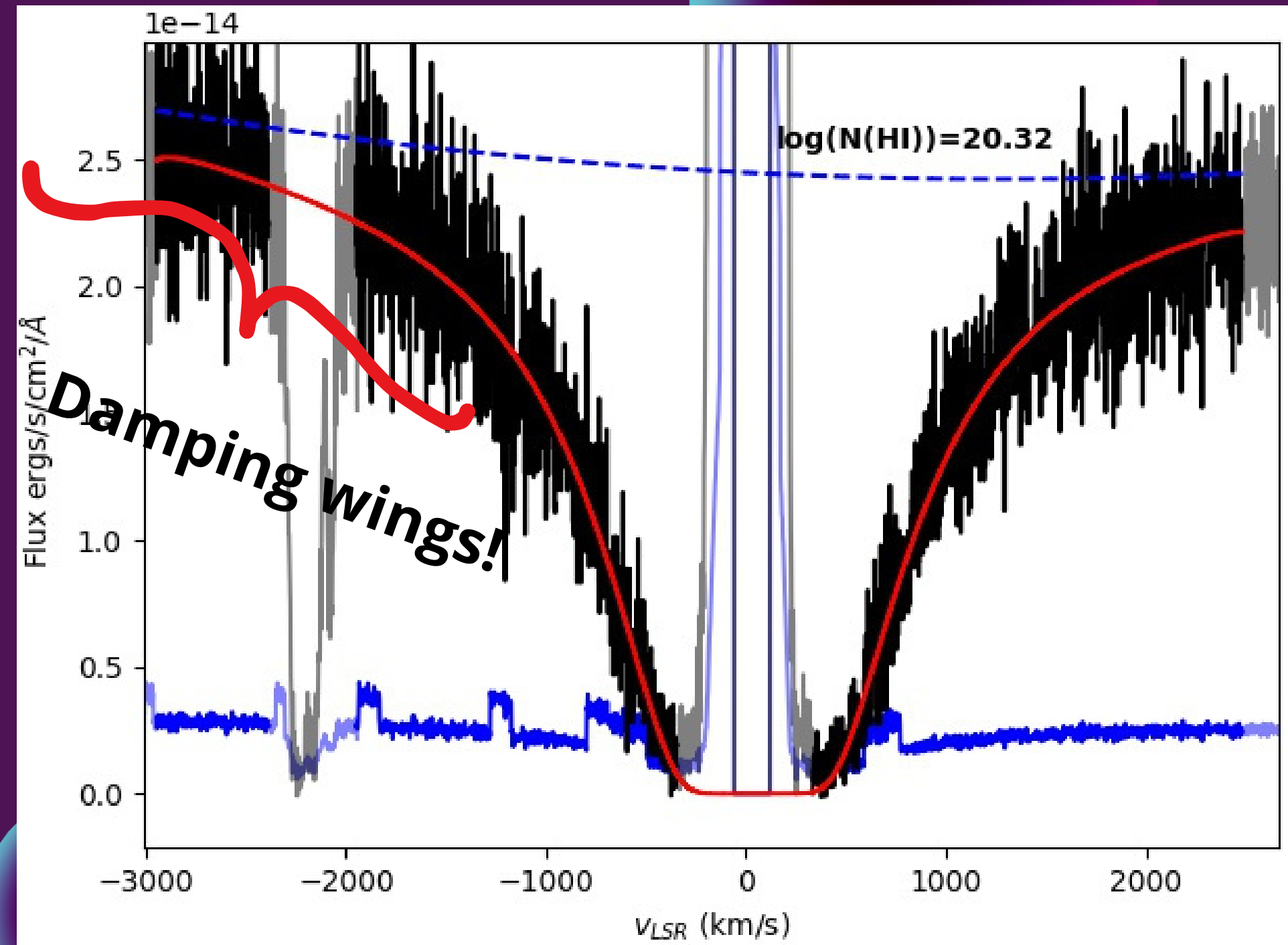
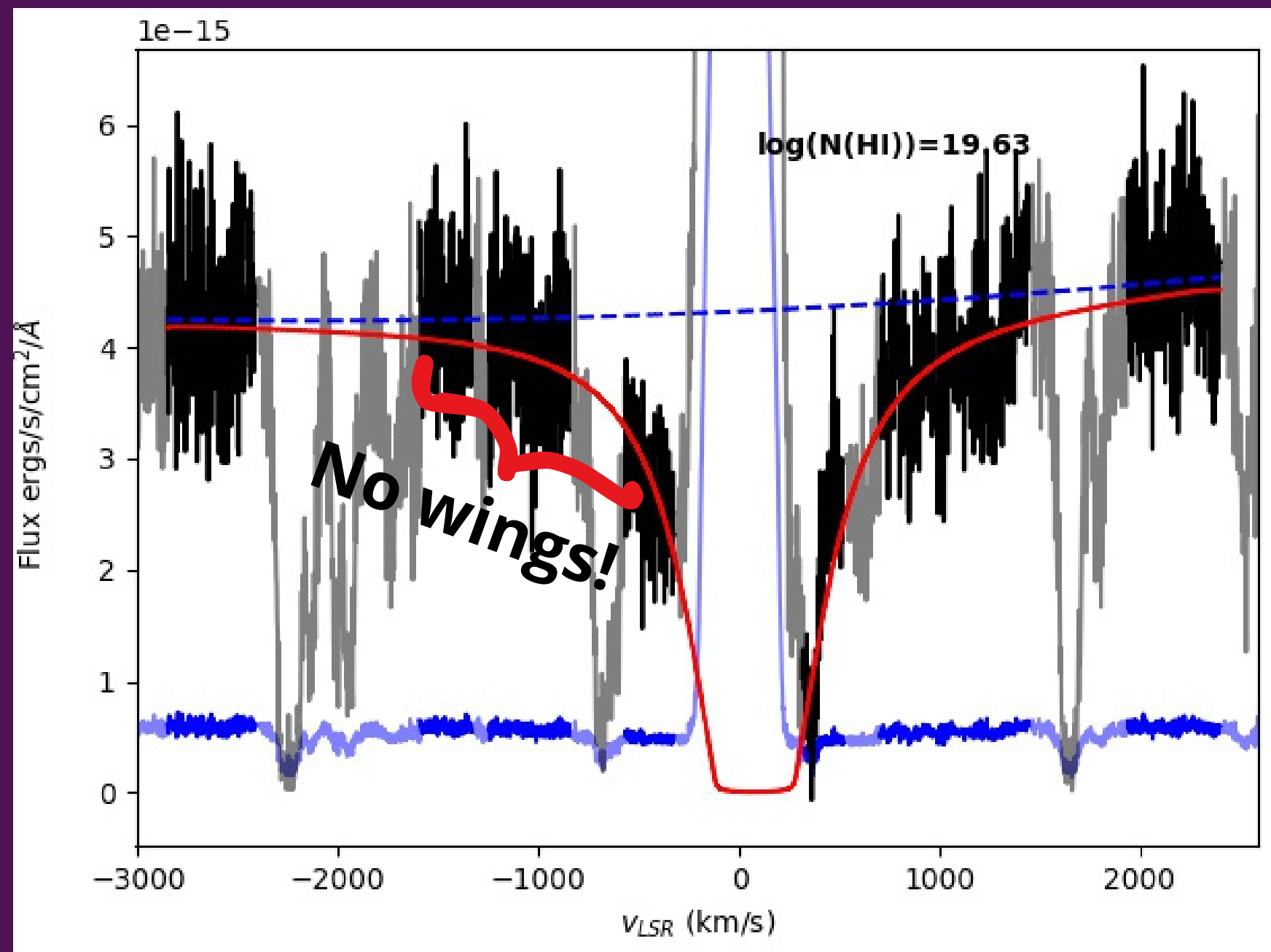
In the context of cosmic metallicity evolution

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Graduate program

Trystyn Berg – Università degli Studi
di Milano Bicocca

Sebastian Lopez – Universidad de Chile

What is a Damped Ly-alpha system?

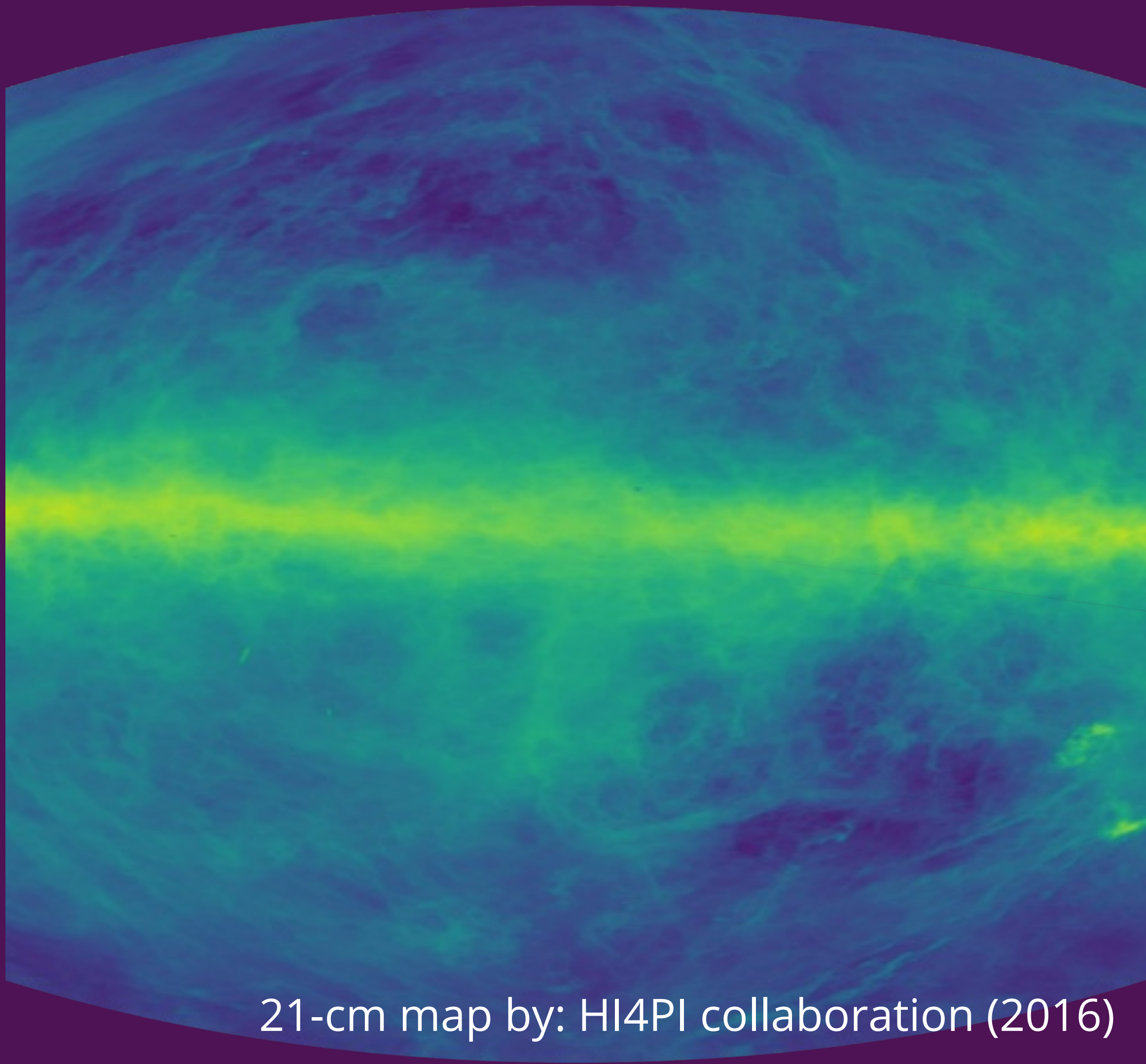


Self-shielded from ionization!

Why the MW?

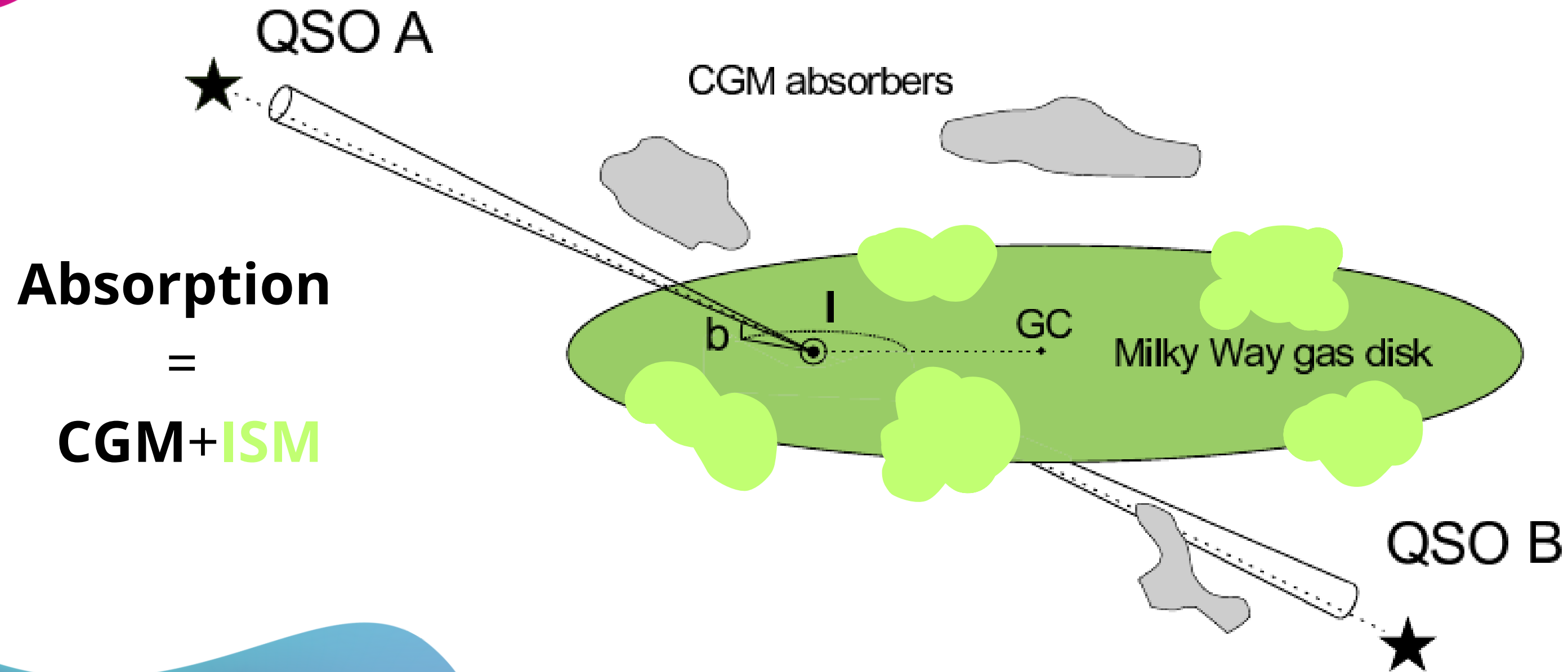
The Milky Way provides a unique point to study its circumgalactic medium (CGM) tomographically.

- What is the gas-phase metallicity distribution?
- How is this distribution connected to the cosmic evolution of metals?



21-cm map by: HI4PI collaboration (2016)

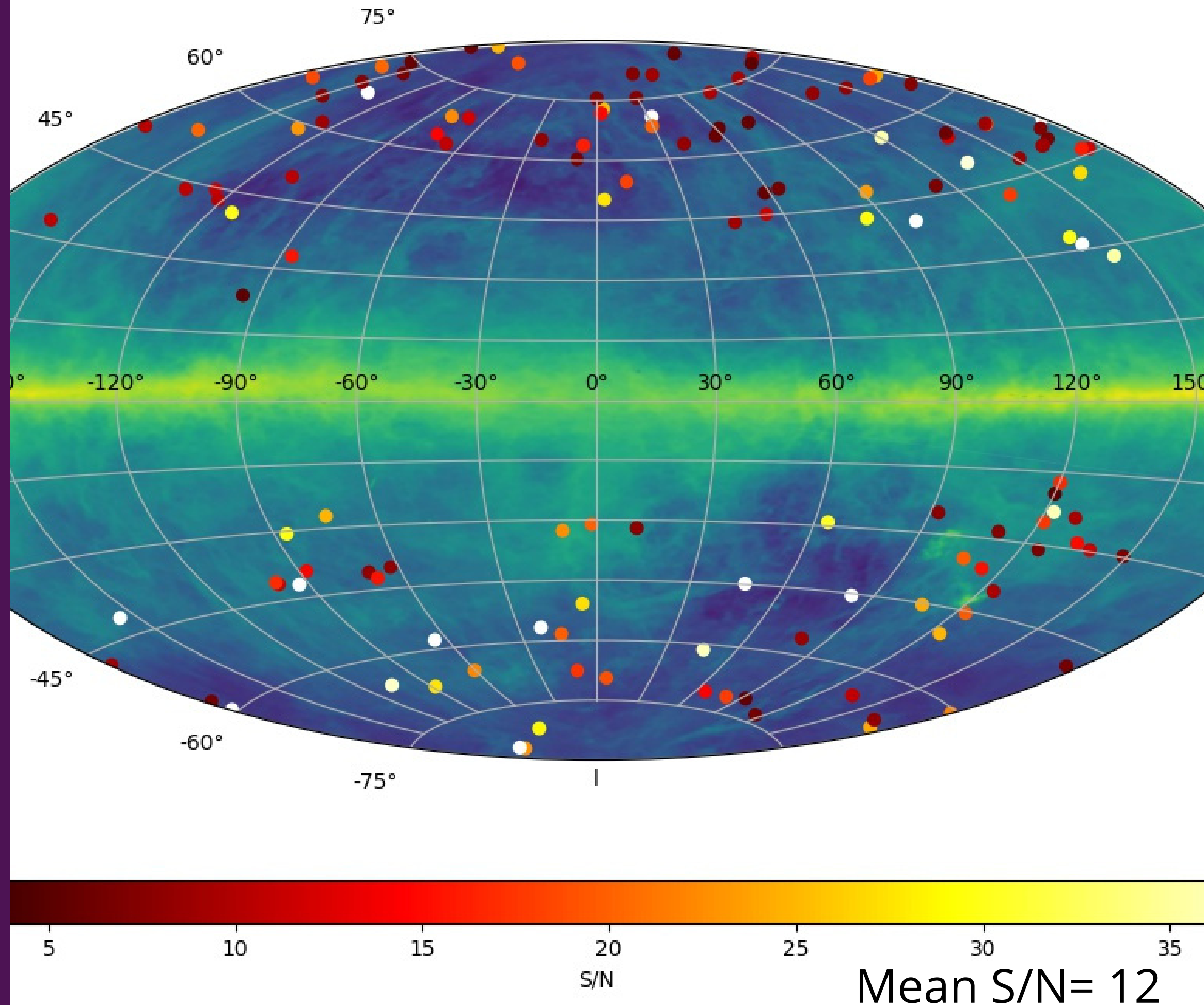
How are QSO probing the MW gas?



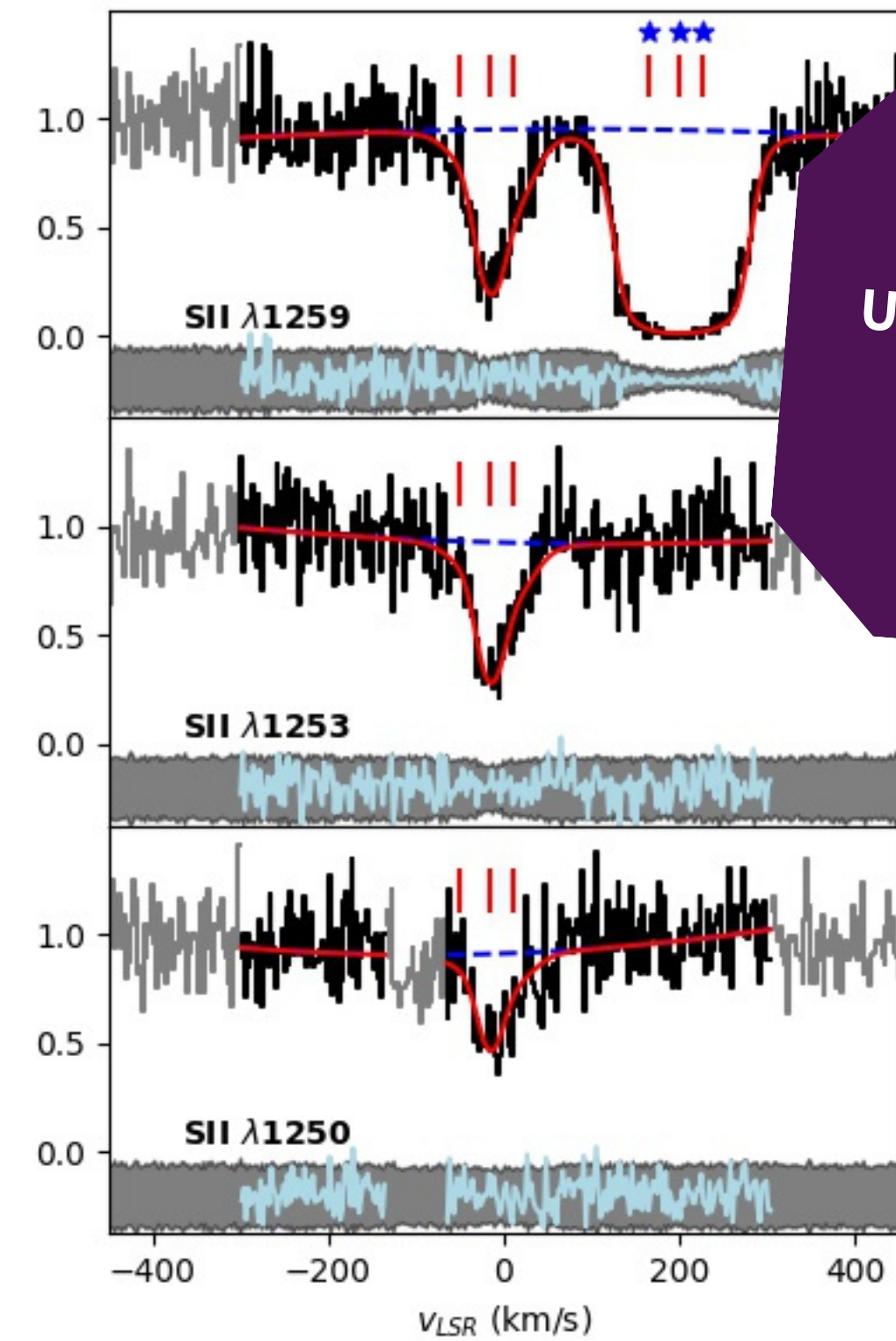
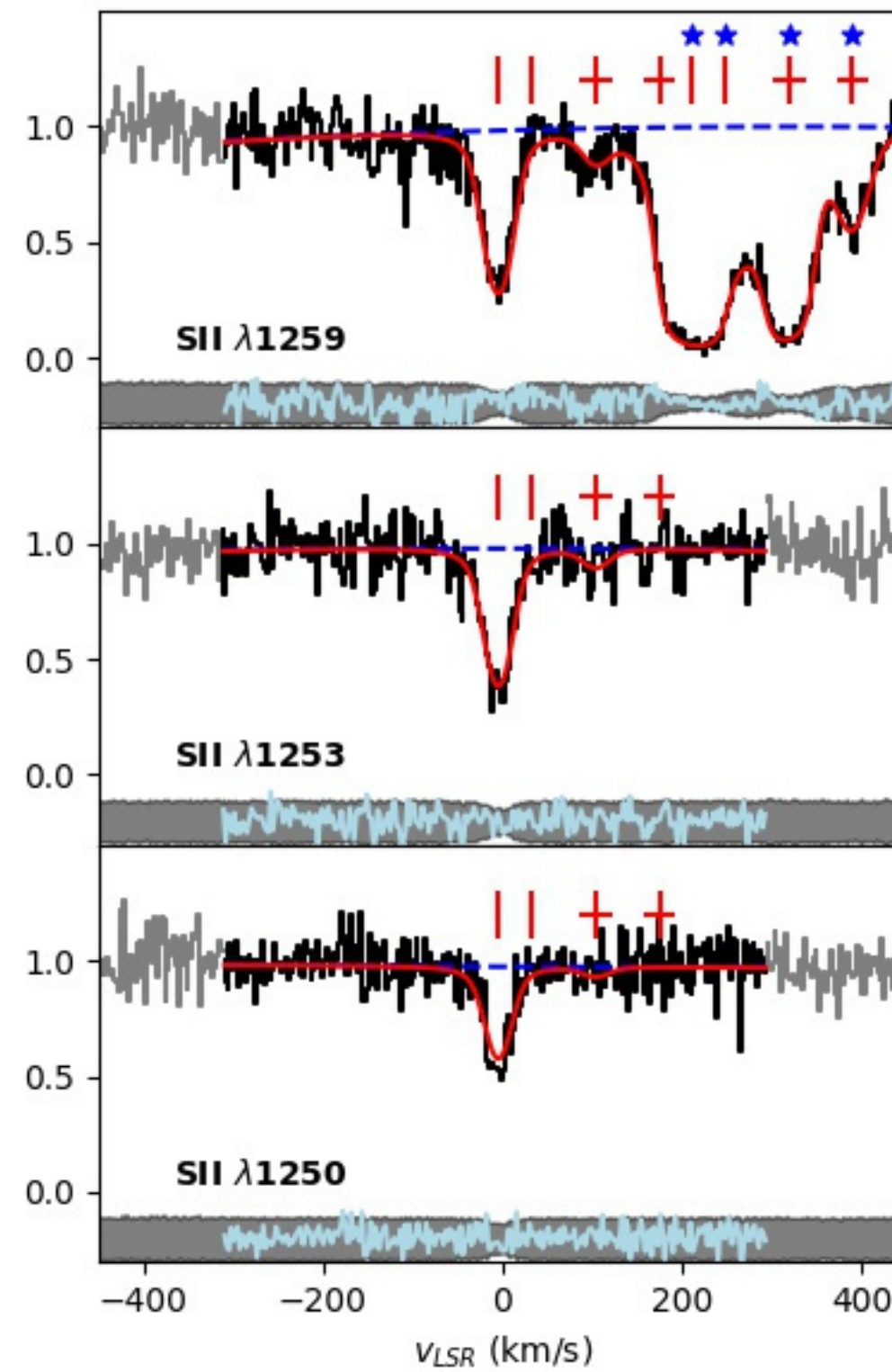
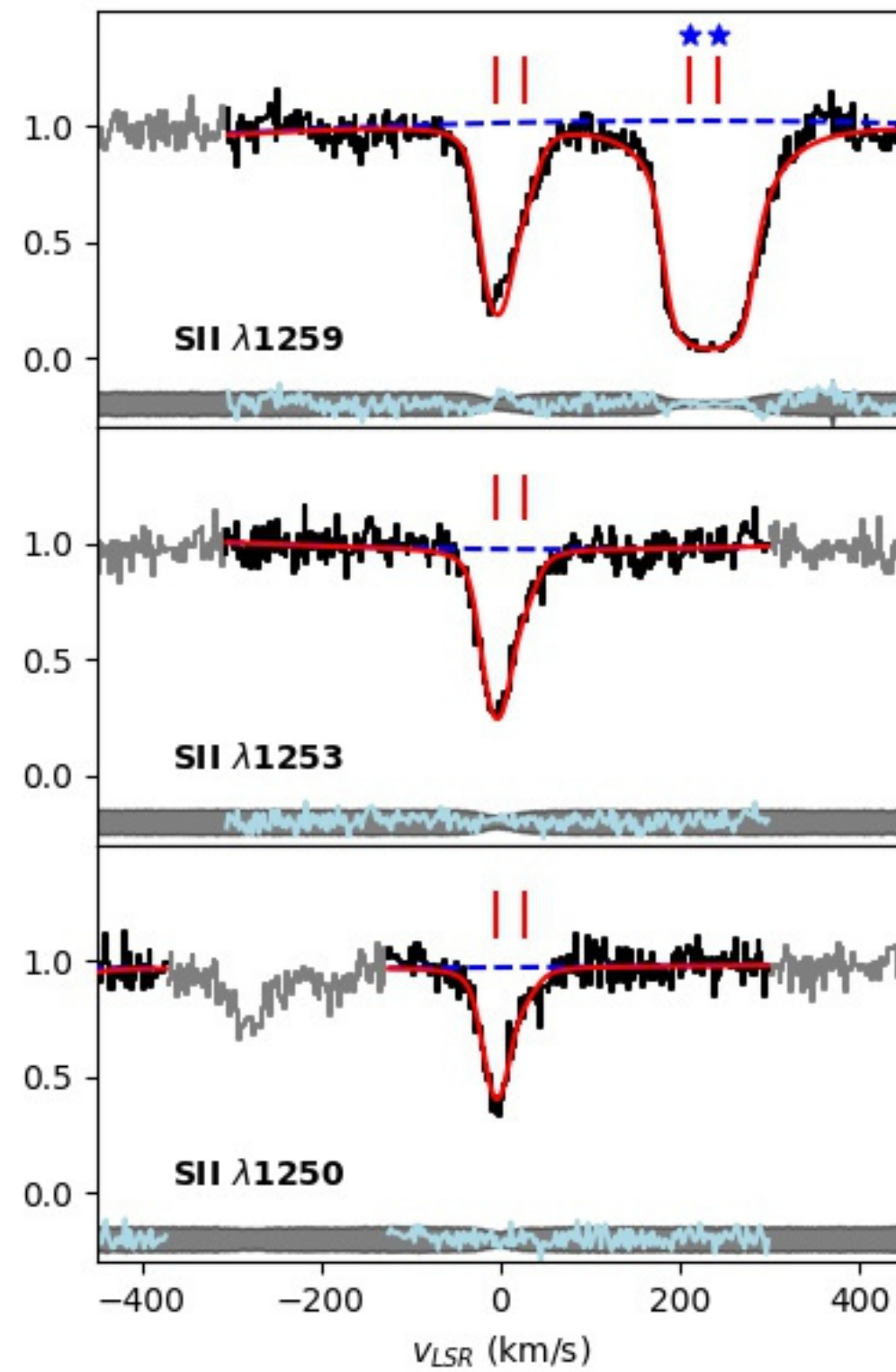
Adapted from Richter, P et. al (2017)

HST/COS Quasars spectroscopy

- 209 UV spectra from COS/HST archive
- All spectra Voigt profile fitted to Ly-alpha and metal lines

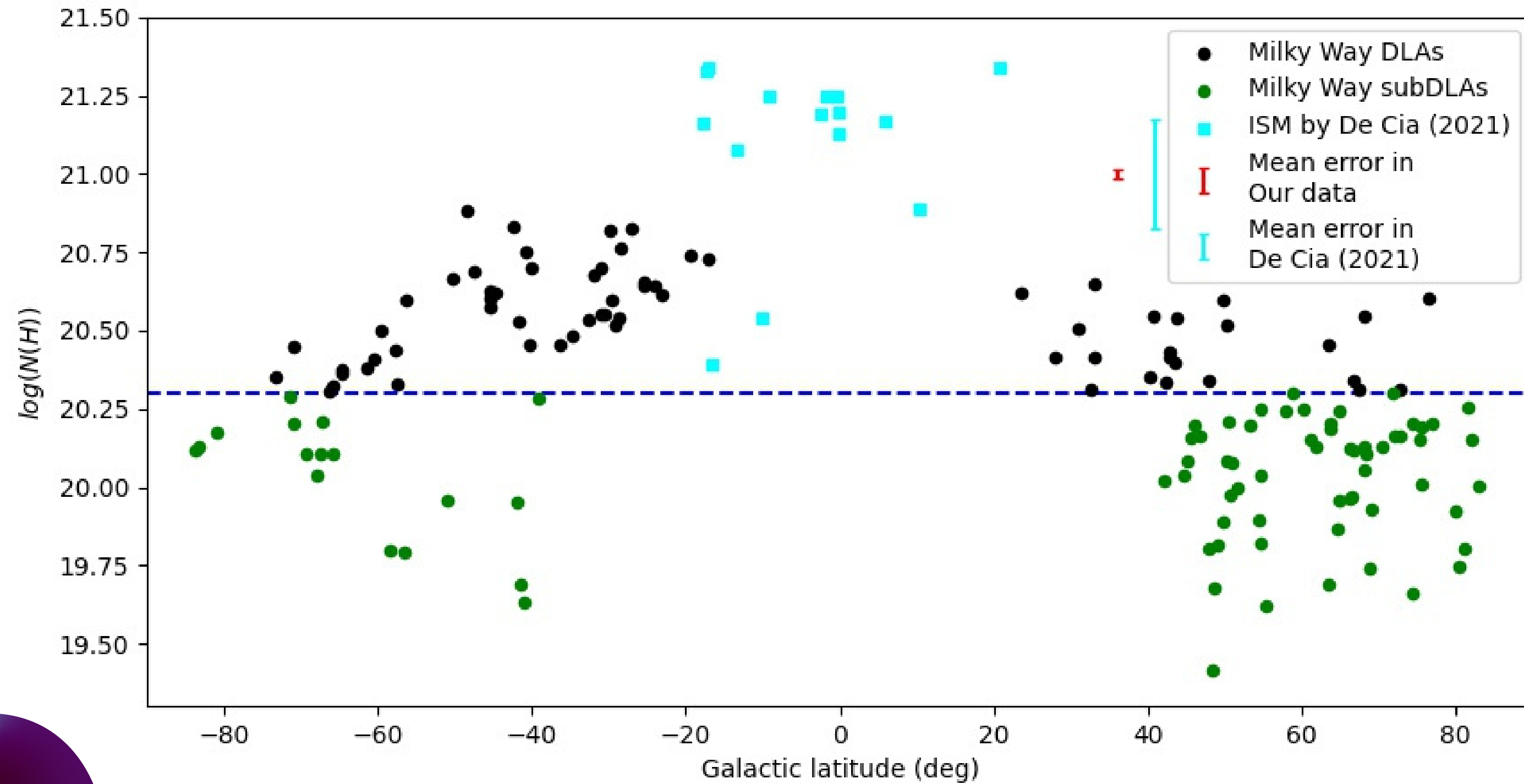


Sulfur as a proxy for [M/H]

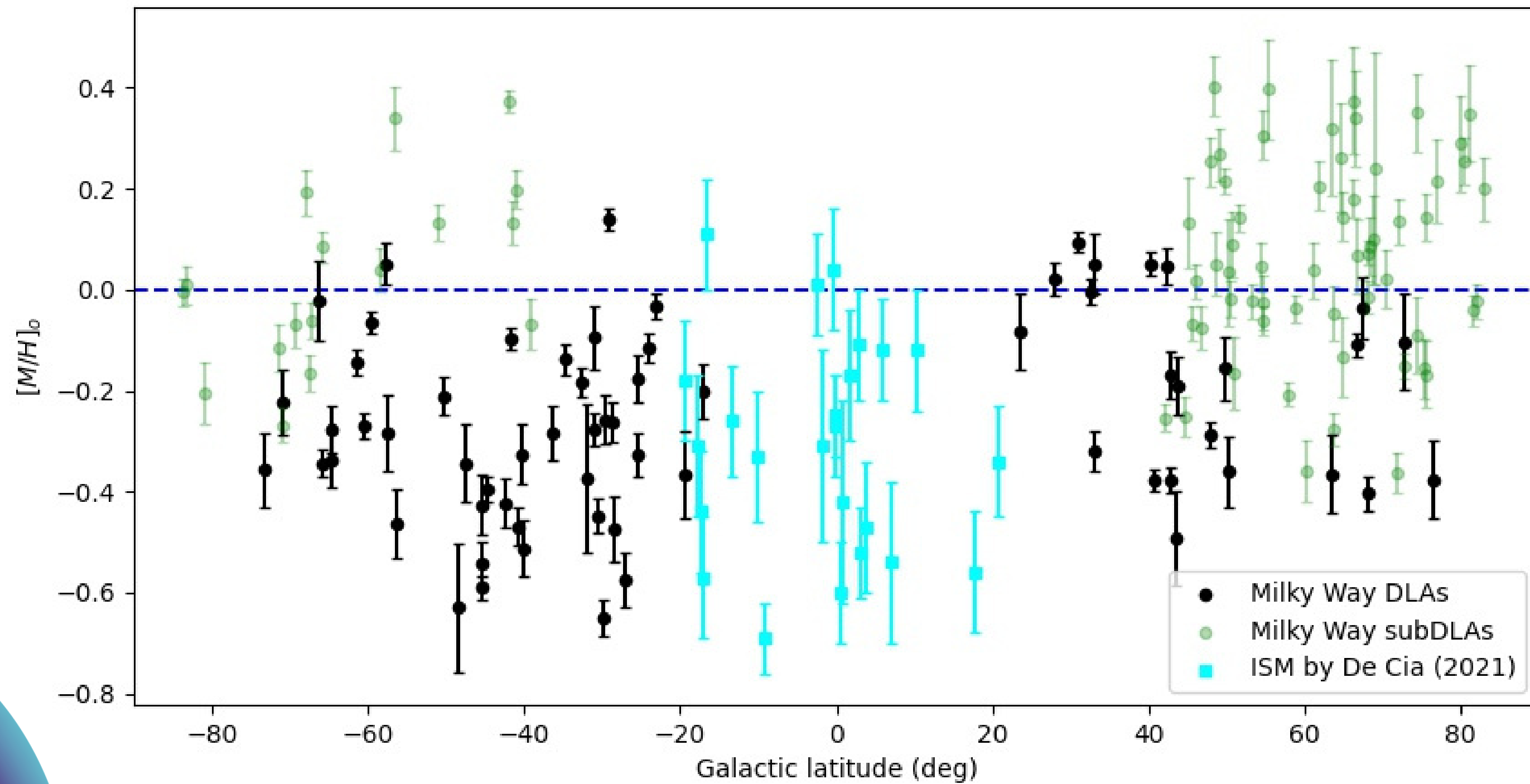


Volatile!
Unsaturated for
most of the
sample!

Clumpy HI in the MW



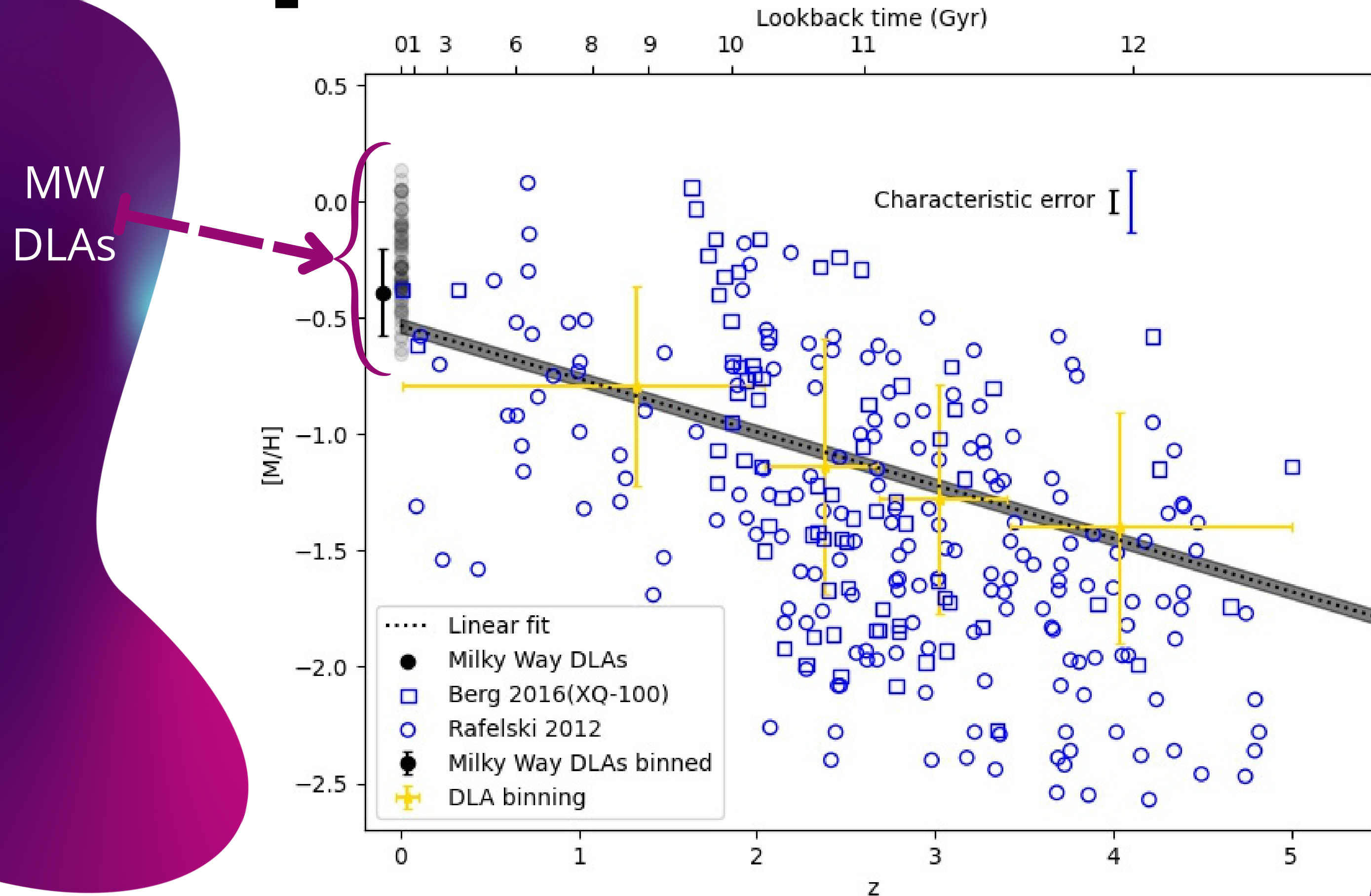
[M/H] along galactic latitude



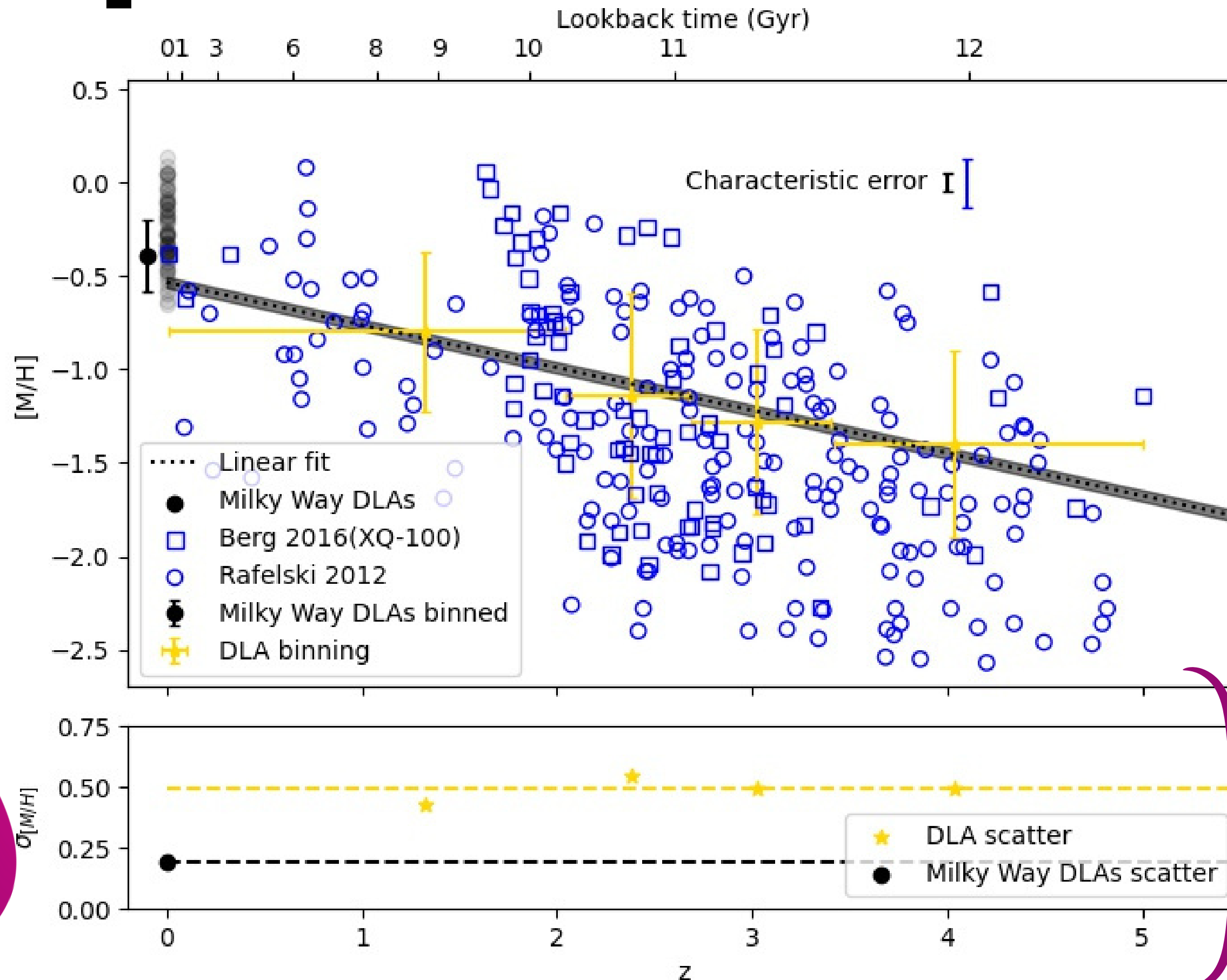


How does the MW $[M/H]$ fit in the
gas phase cosmic evolution?

$[M/H]$ evolution in DLAs



[M/H] evolution in DLAs



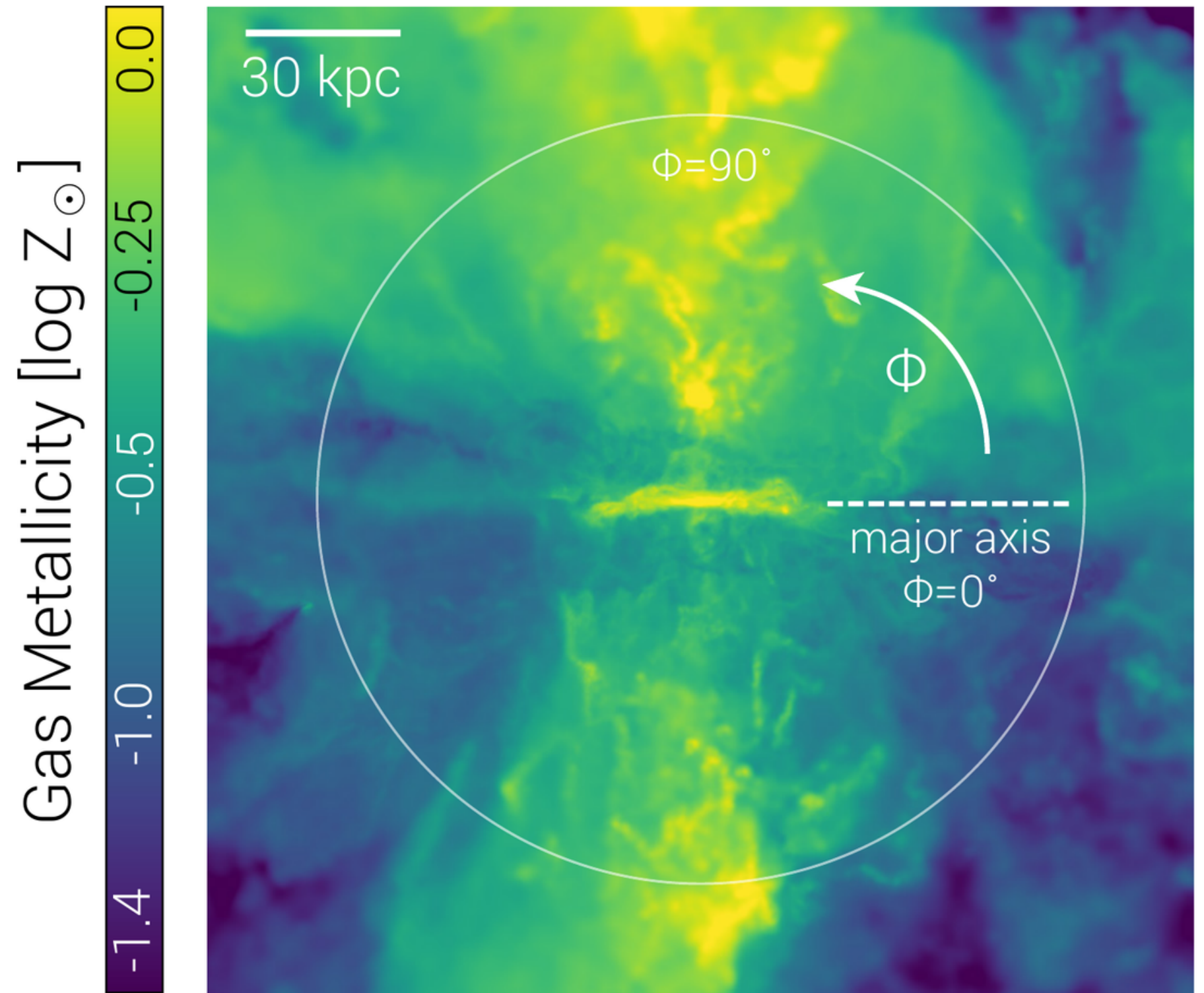
$$\sigma_{MW}/\sigma_{DLA} \sim 40\%$$

The background features a dark purple gradient with several large, soft-edged, organic shapes in lighter shades of purple and blue. A large, semi-transparent blue circle is centered behind the text.

**What affects the metallicity in
the DLAs?**

What drives the scatter in DLA Metallicity?

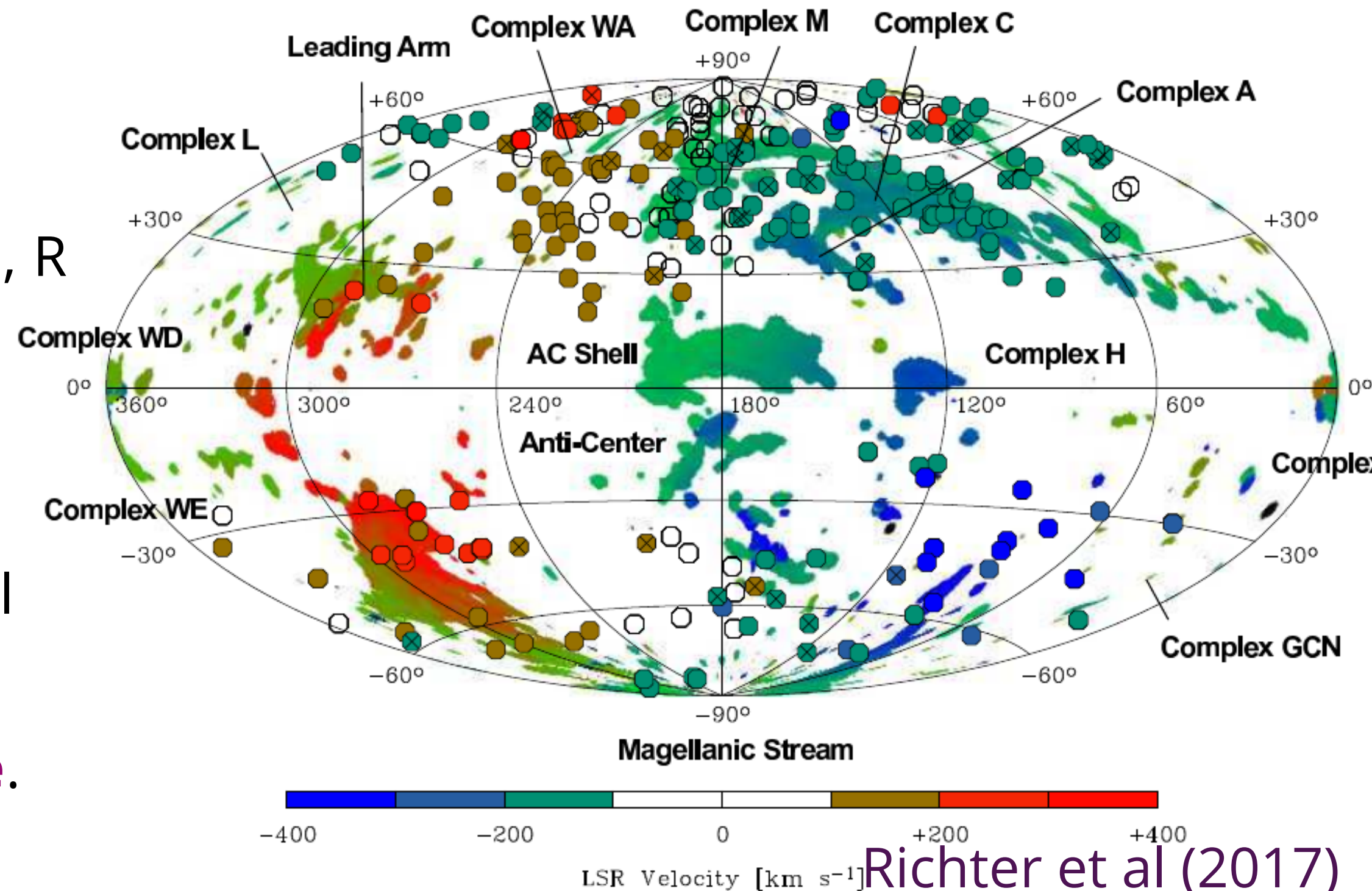
- [Stellar] Mass to metallicity relation, Baker, W & Maiolino, R (2023).
- Impact parameter
- **Azimuthal angle**. Wend, M et al (2021), Peroux, C et al (2020)
- Structures of the gas phase.



Peroux, C et al (2020),

What drives the scatter in DLA Metallicity?

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- **Structures of the gas phase.**



Conclusion

The variety of structures present in the MW CGM responsible for the scatter in metallicity in the MW implies that the scatter in the metallicity evolution of DLAs is driven significantly by similar structures found around other galaxies.

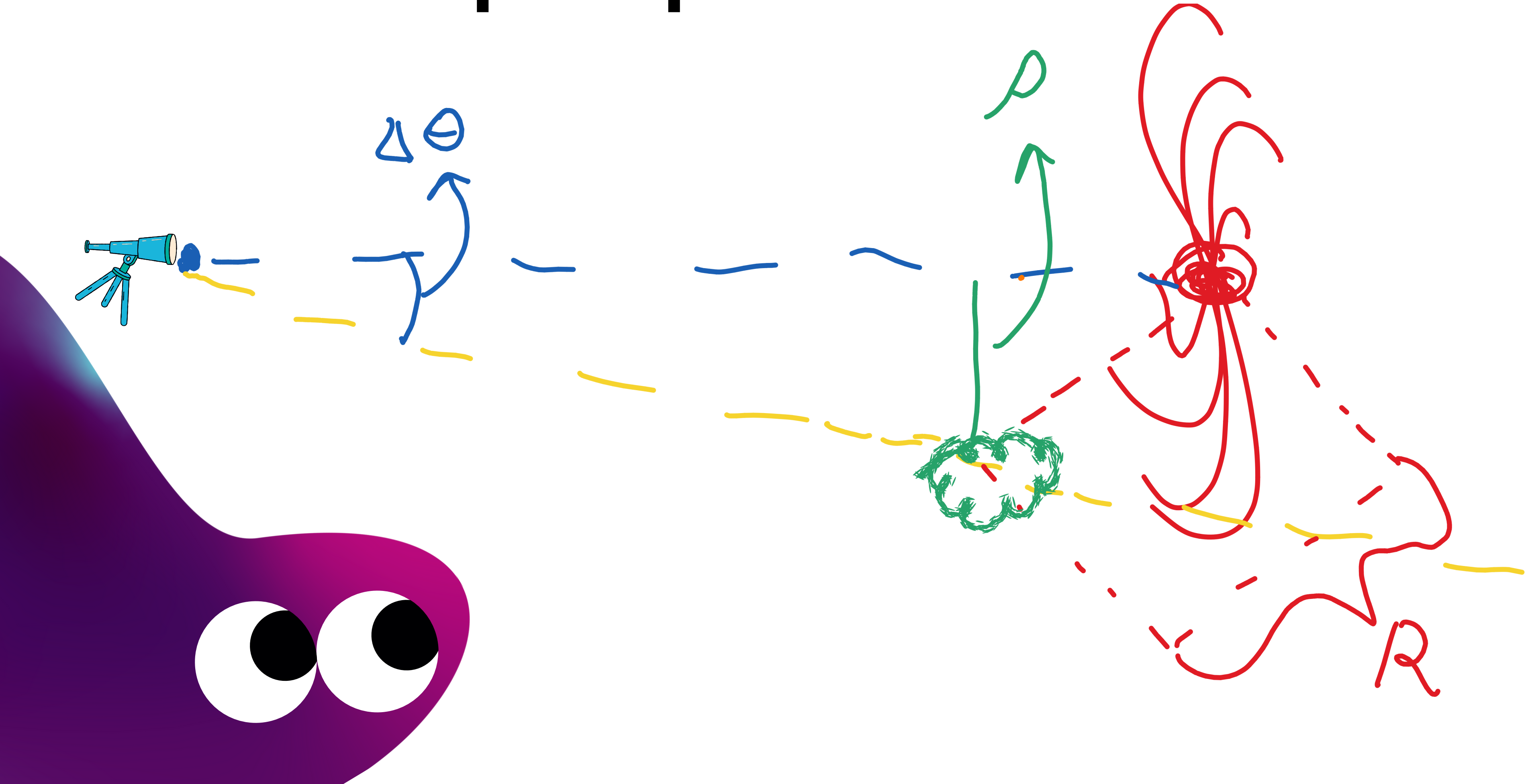
$$\sigma_{MW} / \sigma_{DLA} \sim 40\%$$

The background is a solid dark purple color. It is decorated with several large, organic, wavy shapes in lighter shades of purple and blue. These shapes are positioned in the corners and along the edges, creating a modern, abstract aesthetic.

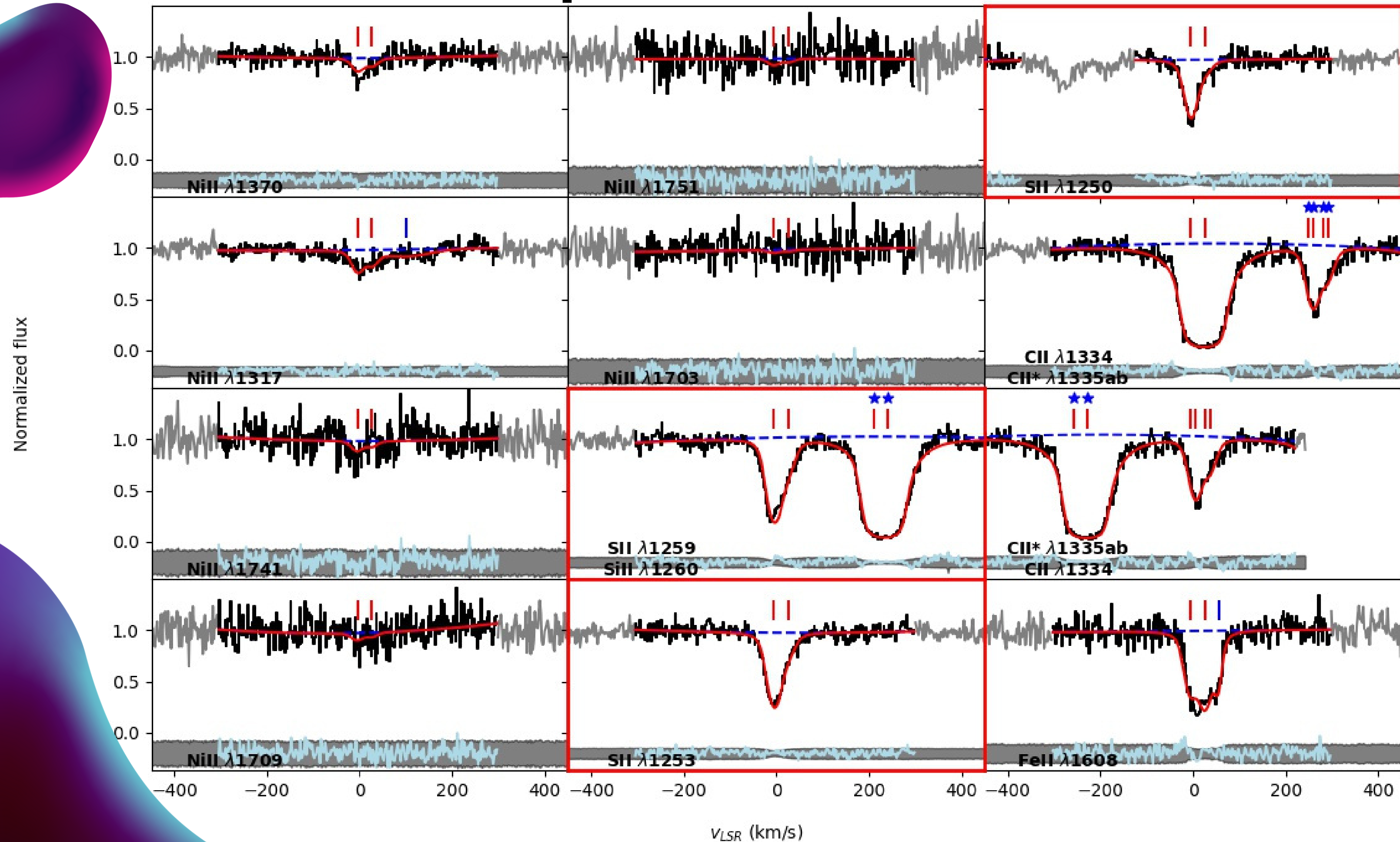
Thanks!

Felipe Corro-Guerra
fcorro@das.uchile.cl

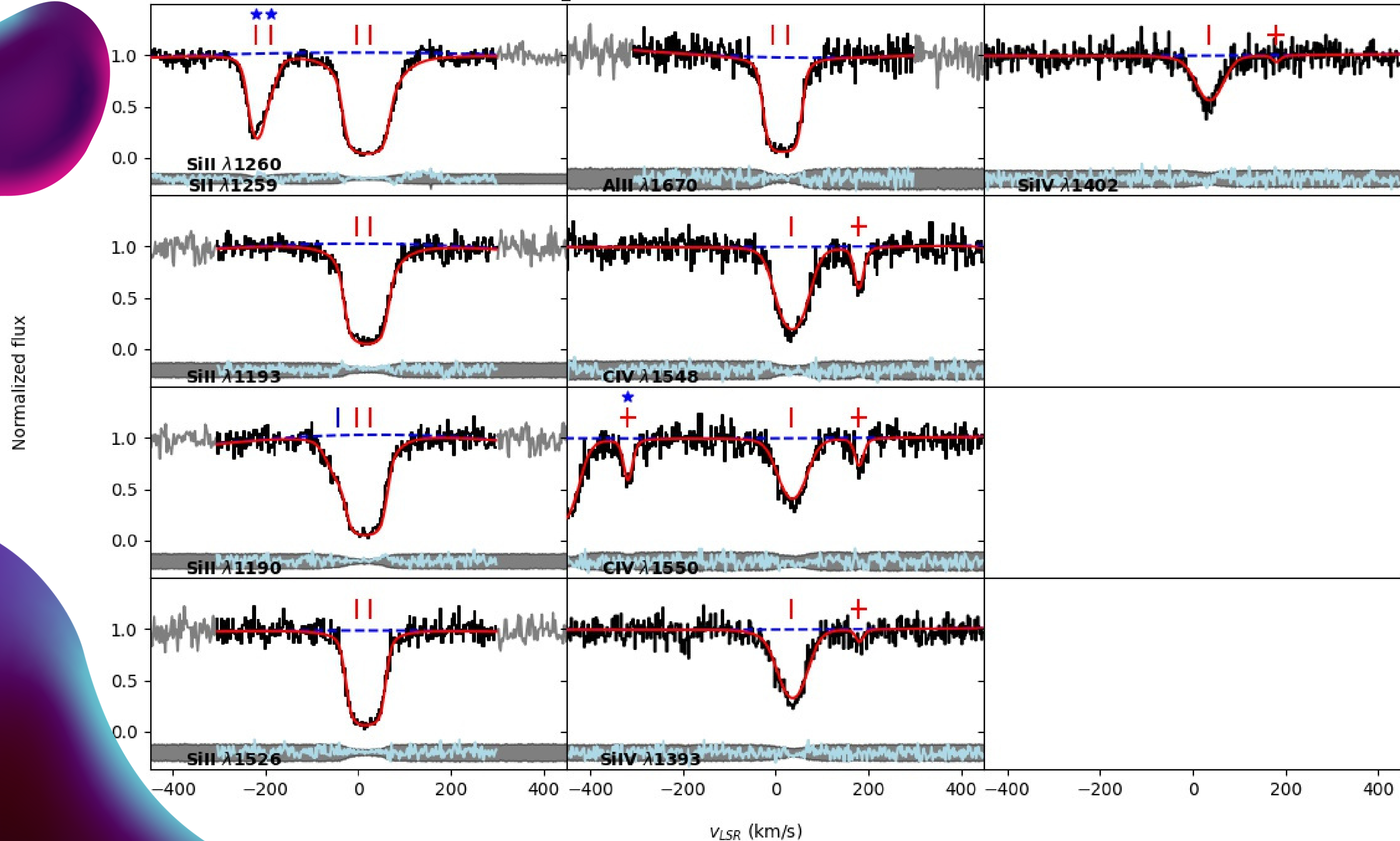
What is impact parameter?



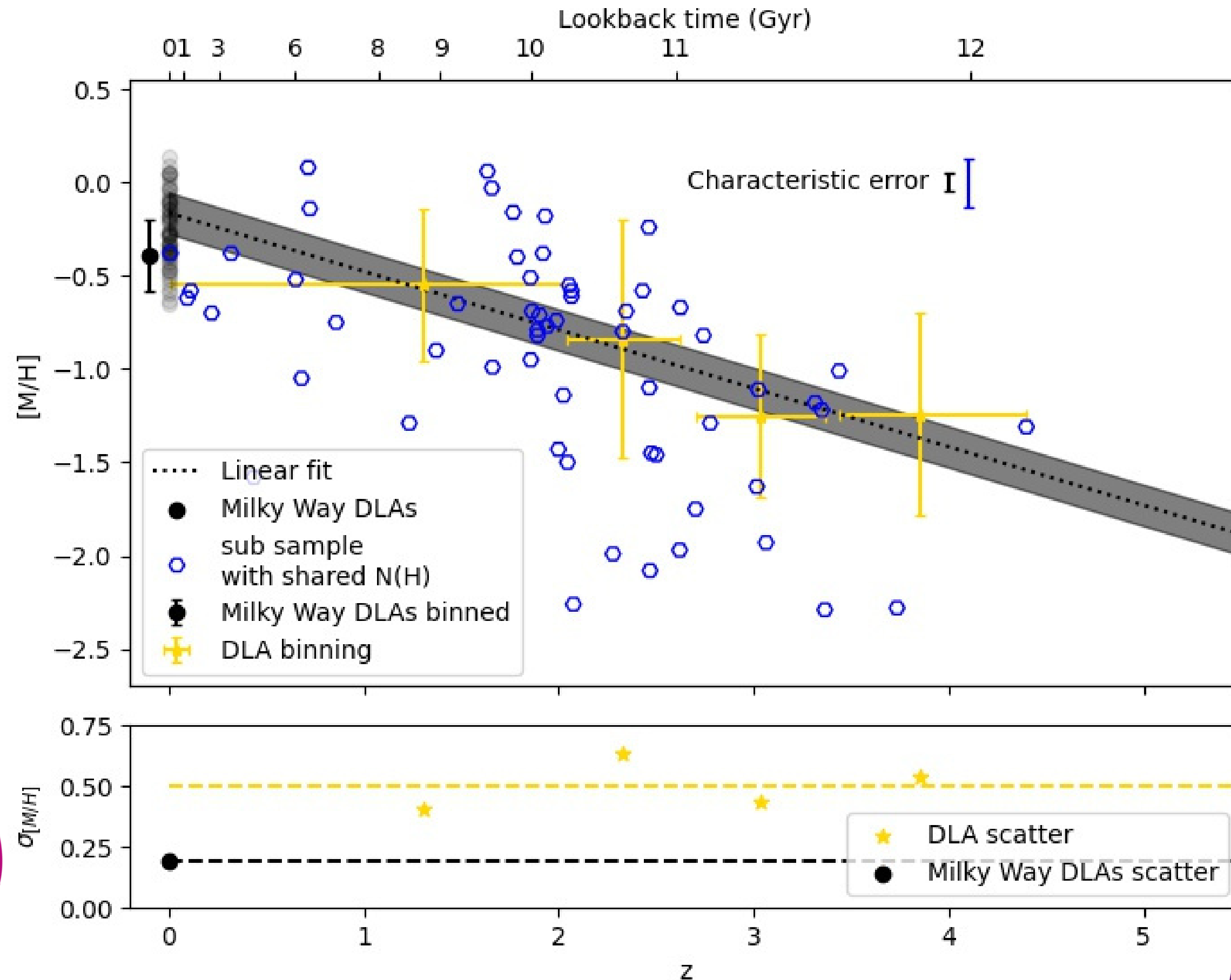
Metal lines absorption



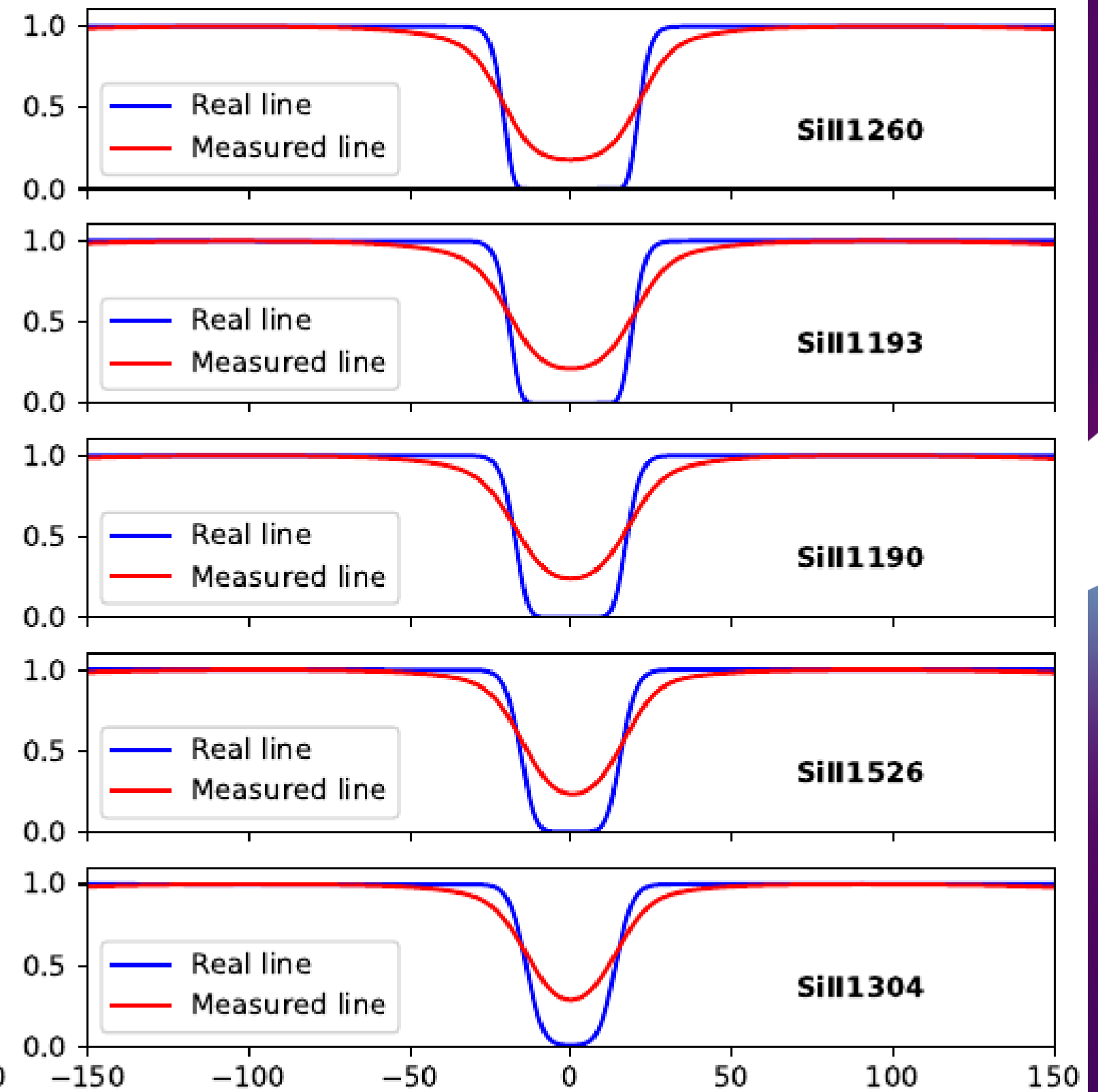
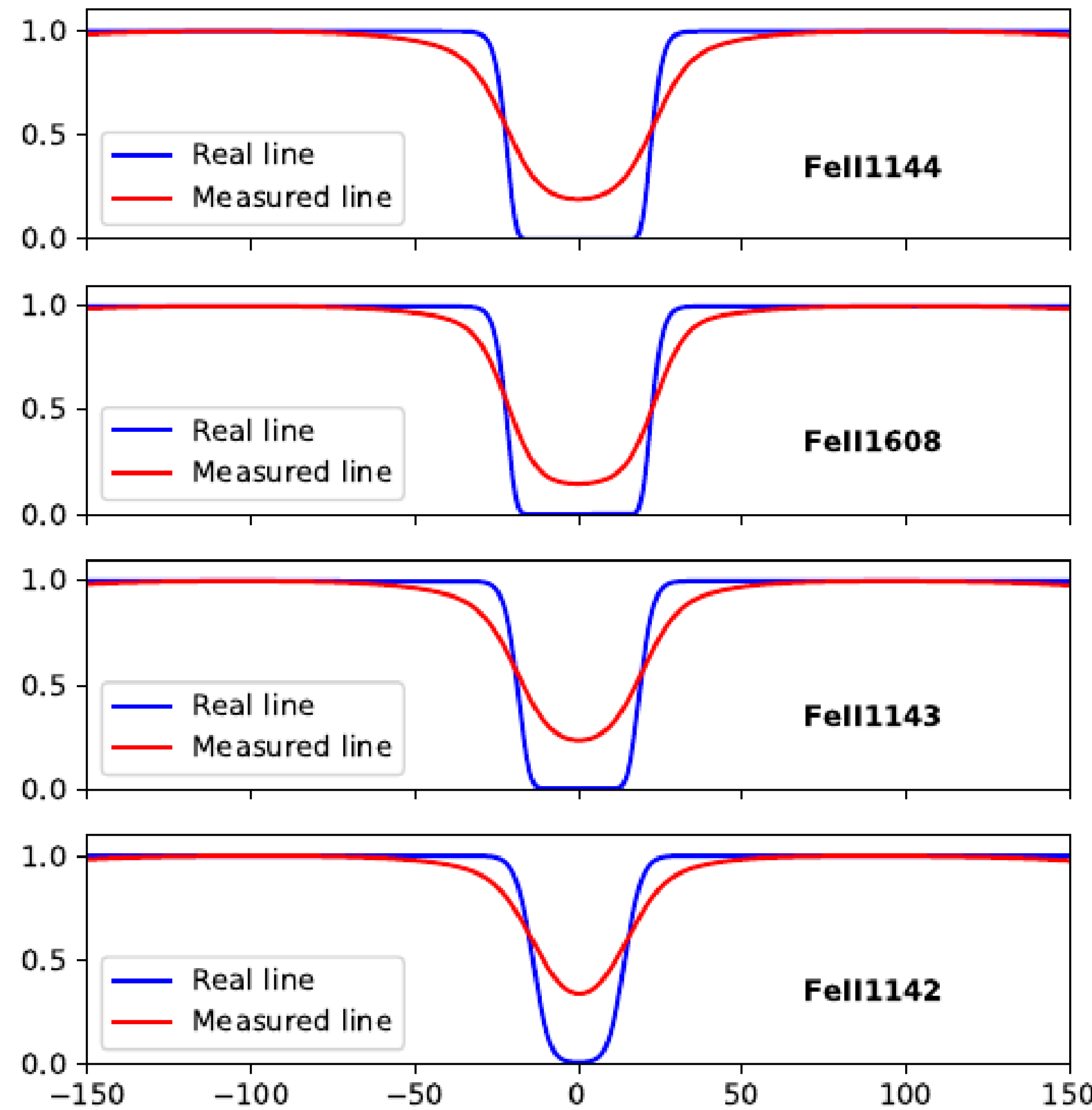
Metal lines absorption



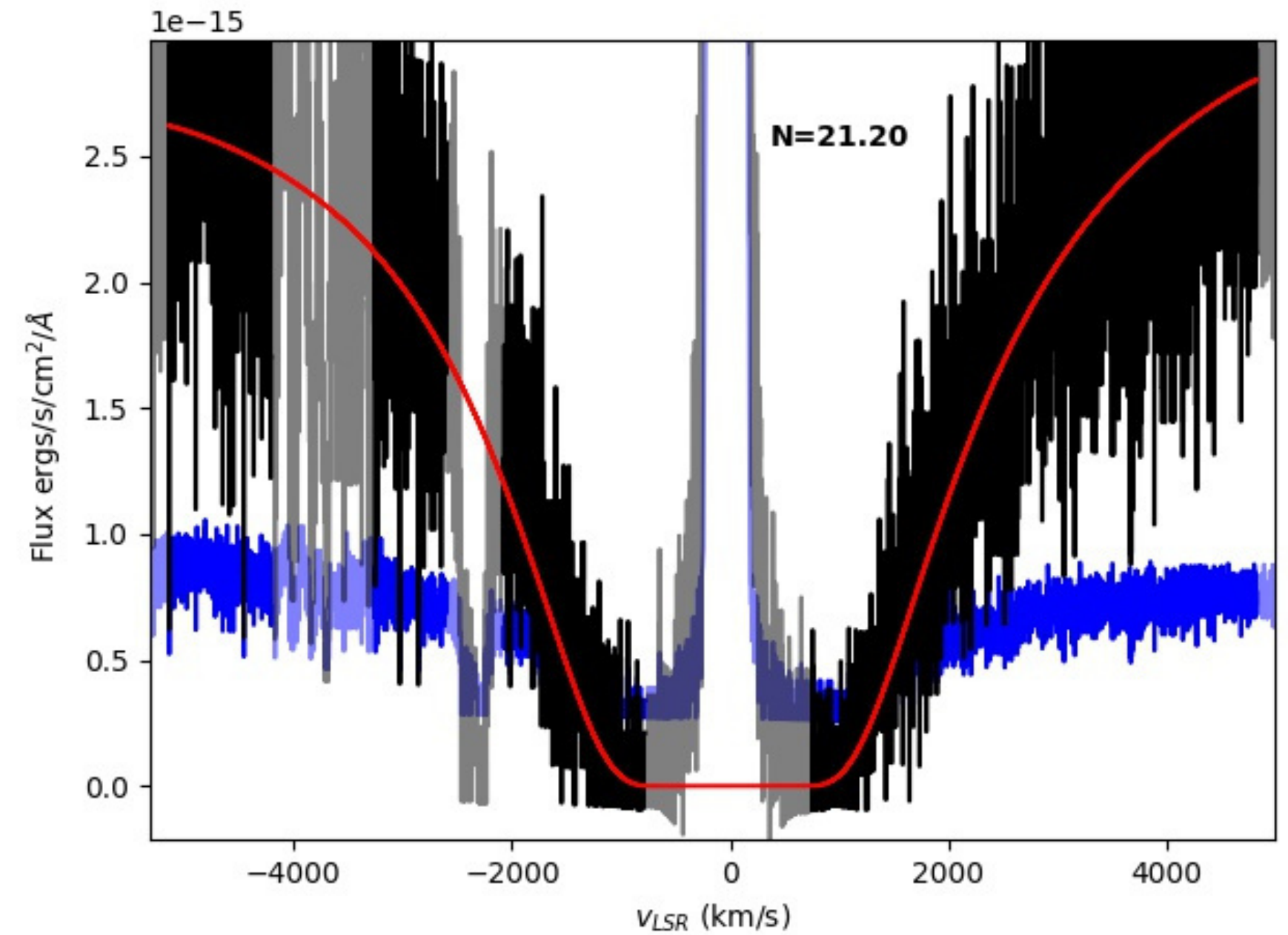
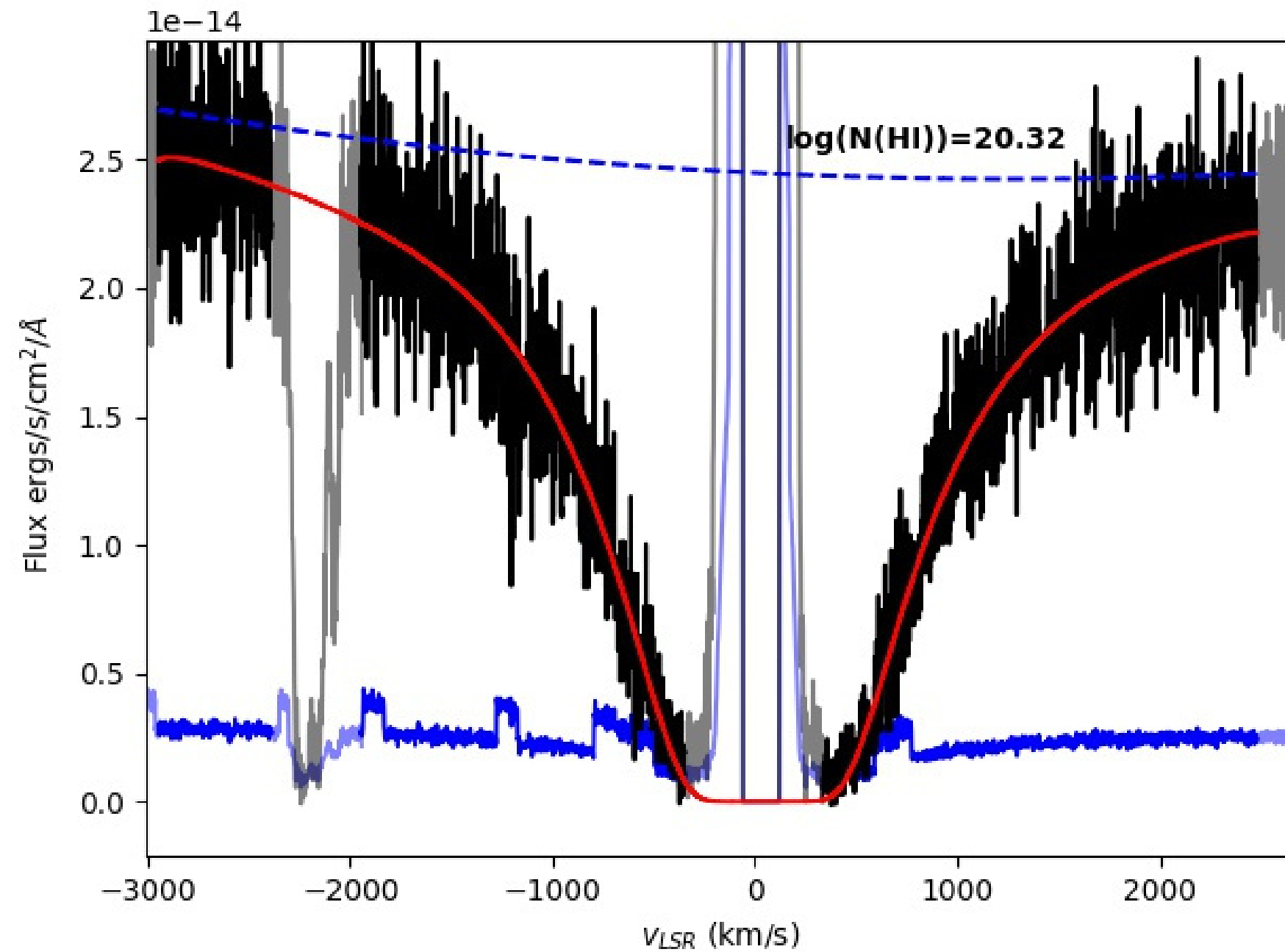
Does the $N(\text{HI})$ affect $[M/H]$ scatter?



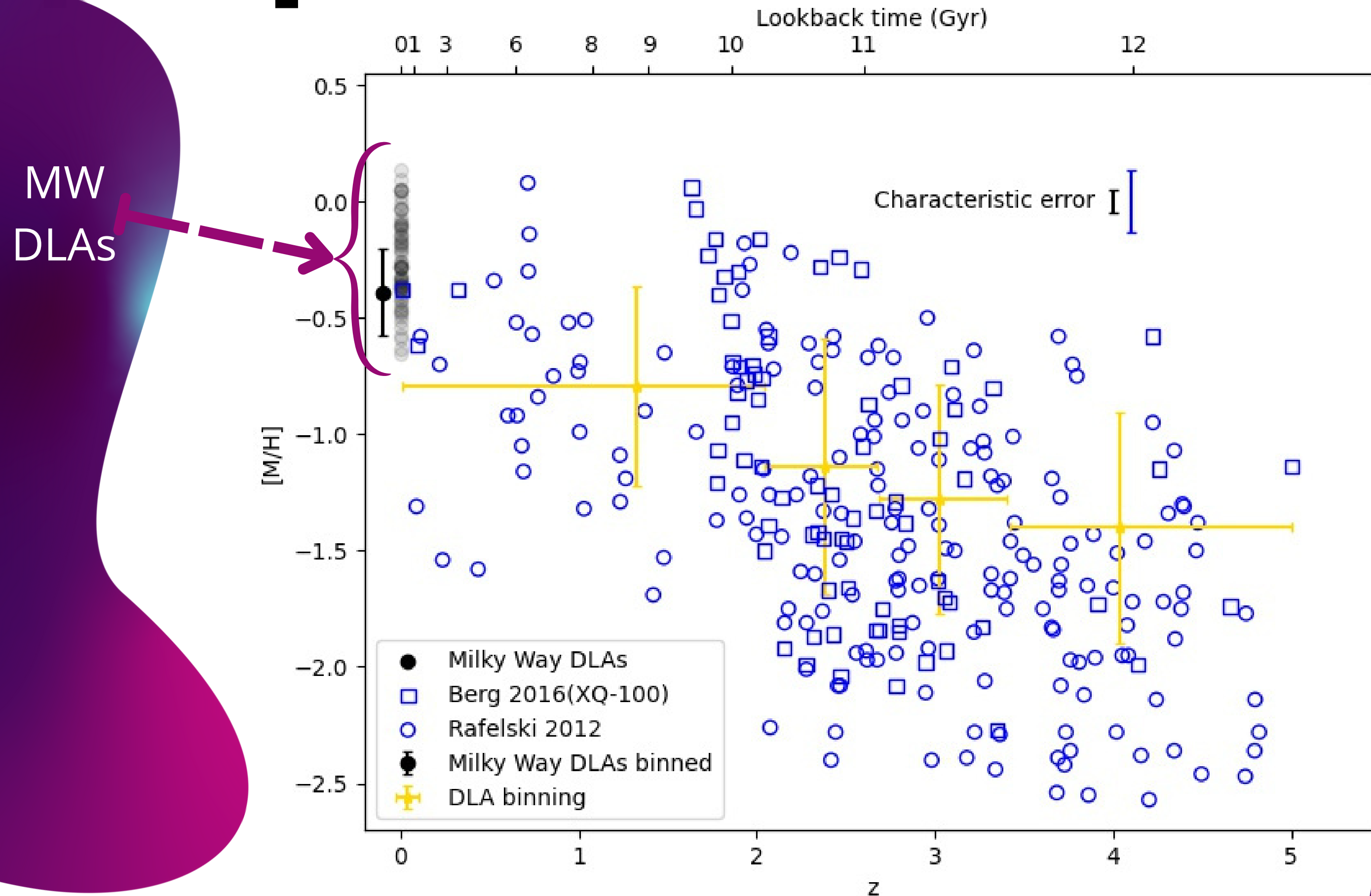
What about hidden saturation?



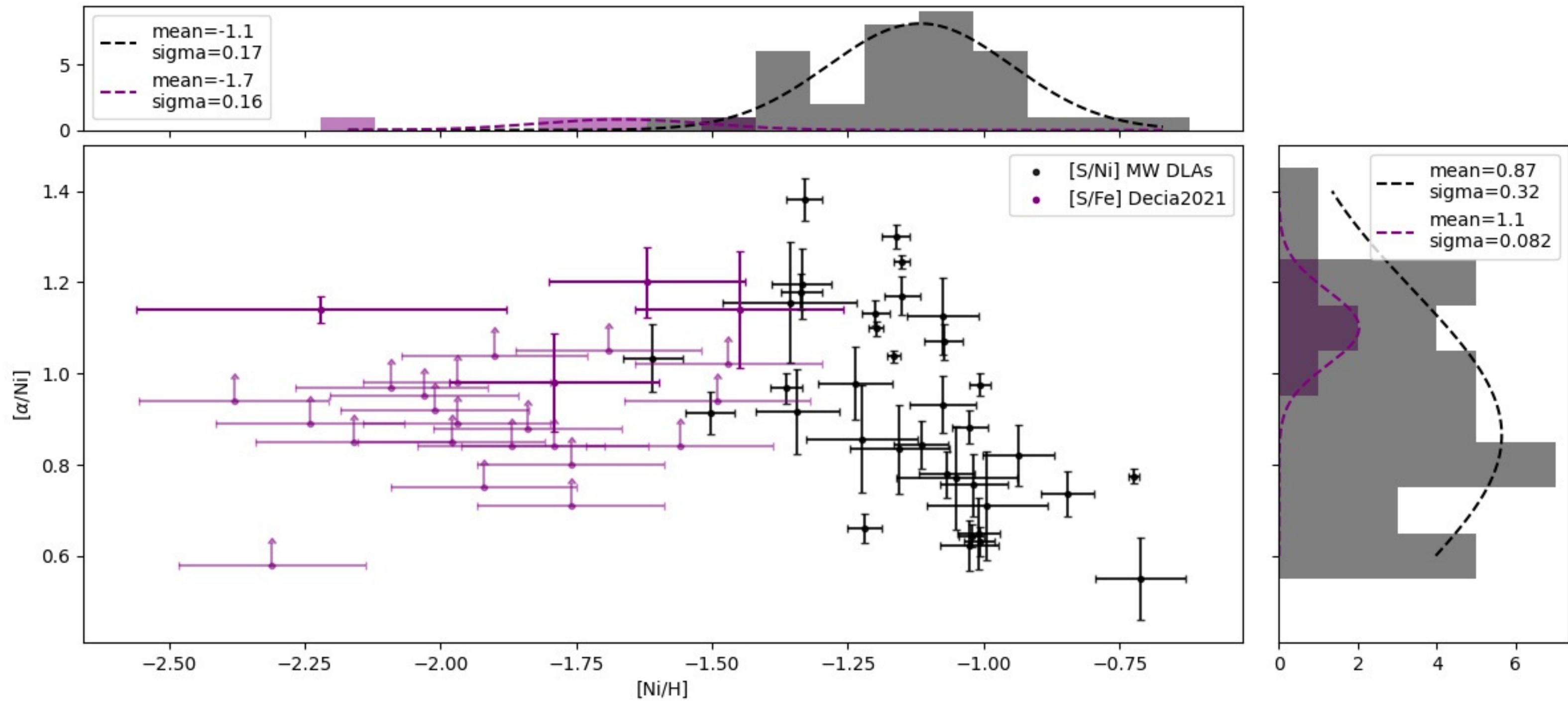
Ly-alpha examples



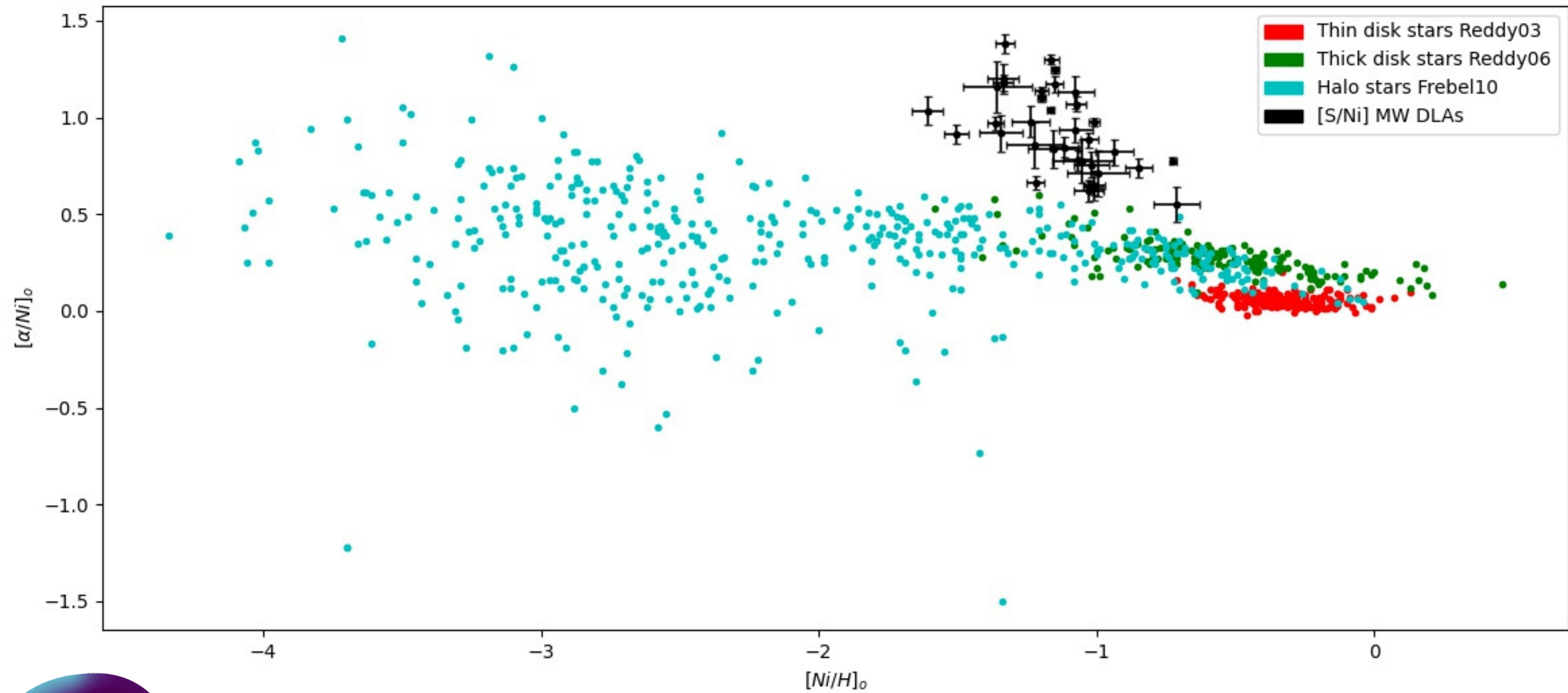
$[M/H]$ evolution in DLAs



Alpha elements in the MW



Alpha elements in the MW



Alpha elements in the MW

