Probing the ISM at $z > 3$ with rest-frame UV emission from LAEs in MUSE-Wide

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&

The MUSE Collaboration:

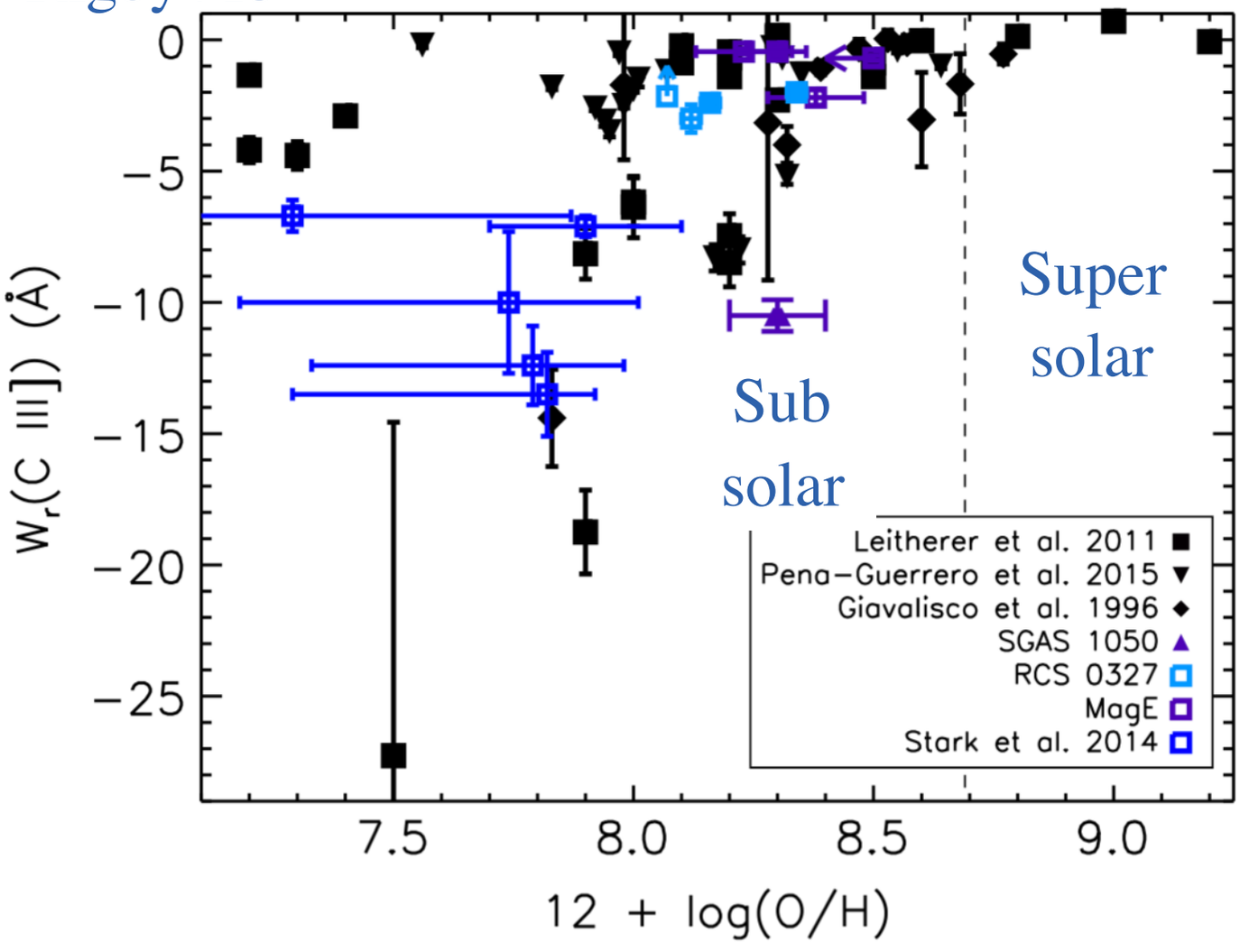
Main Goal: Understanding Galaxies

- Demographics:
  - Clustering in (R.A., Dec., z), number counts (LF),
- But also physics of the systems:
  - Stellar mass
  - Star formation rate
  - Electron density
  - Temperature
  - Gas phase metallicity
  - Kinematics and velocities
  - etc.
- Main probes are rest-frame optical photometry and spectroscopy
- But at $z > 3$ observed **optical** corresponds to rest-frame UV

Probing ISM/Galaxy prop. with UV lines

- Have to rely on rest-frame UV for early Universe studies: Lyα, CIII, CIV
  (Until JWST is launched)
- Lyα gives redshift, SFR(?) and relates to Hydrogen column density
- CIII], CIV, HeII, [OIII]4363, etc probe:
  - ionizing radiation (logU), gas-phase metallicity (Z), electron density (n_e)

Rigby+15



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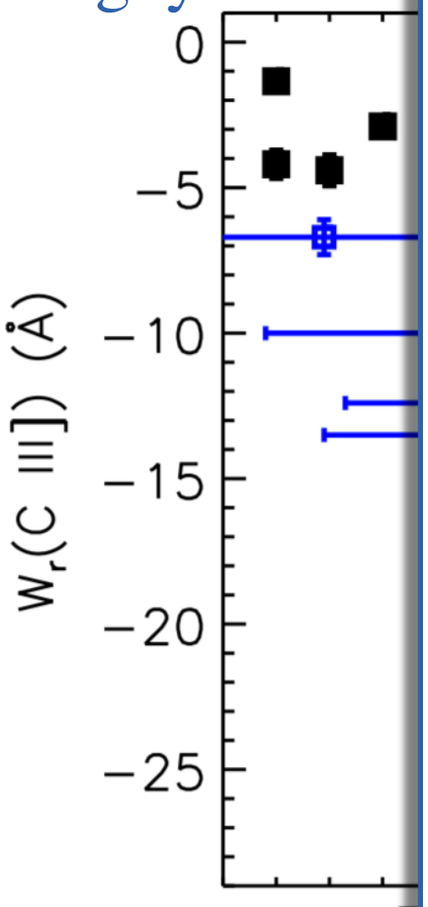
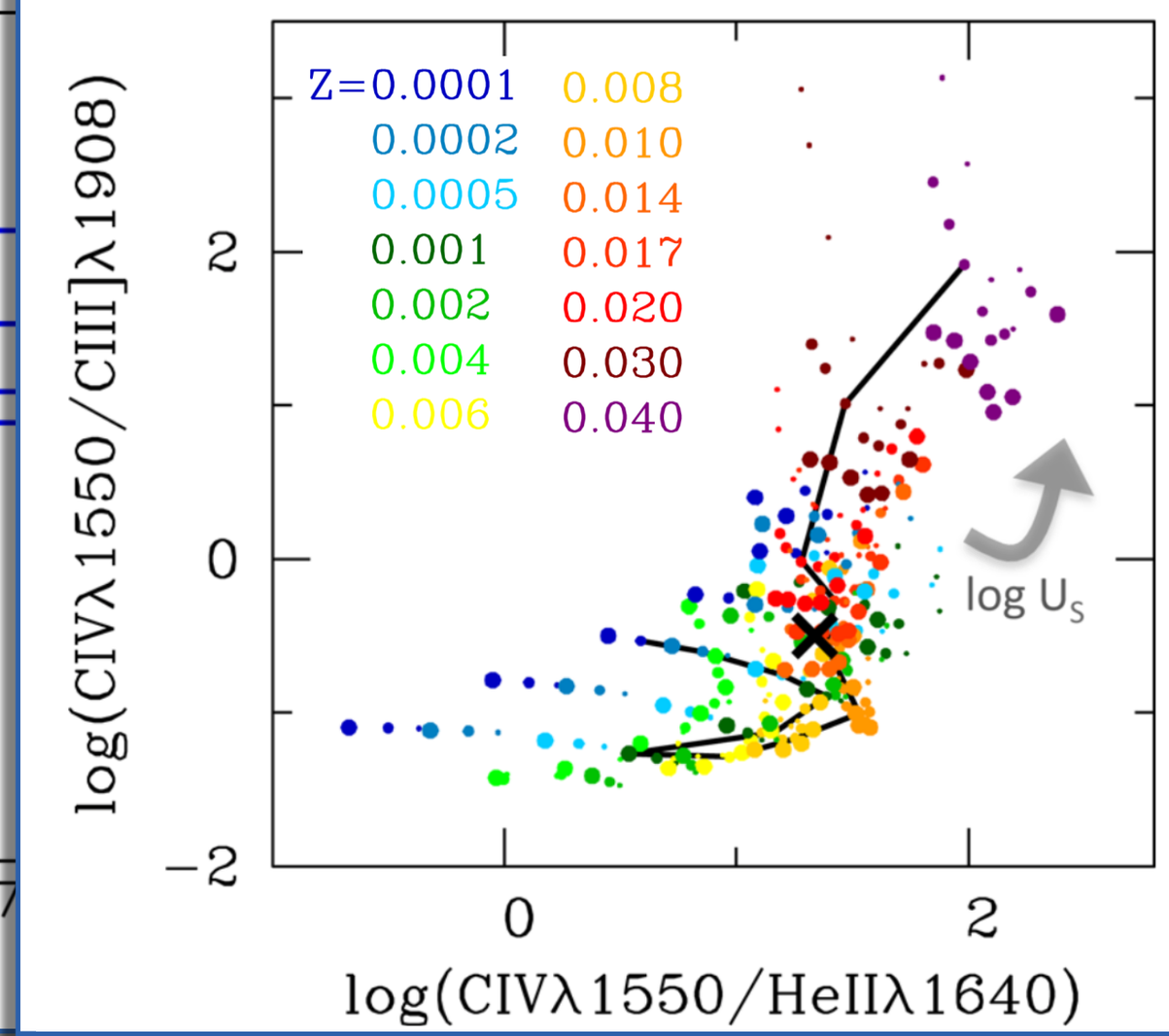


Gutkin+16



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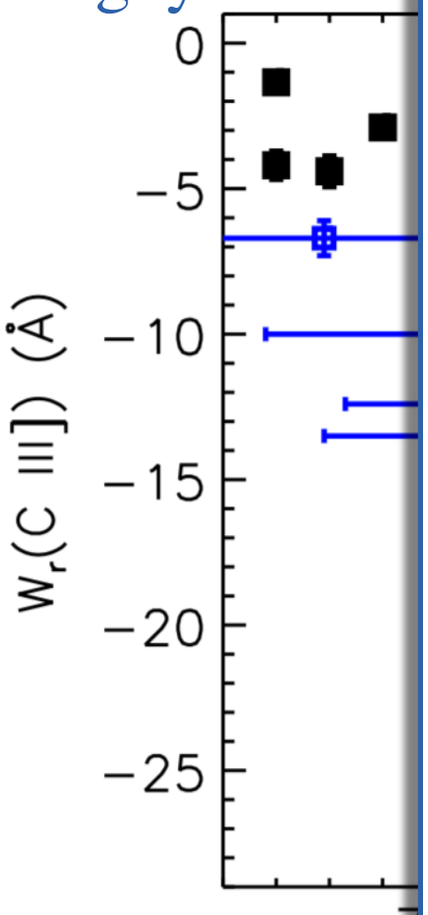

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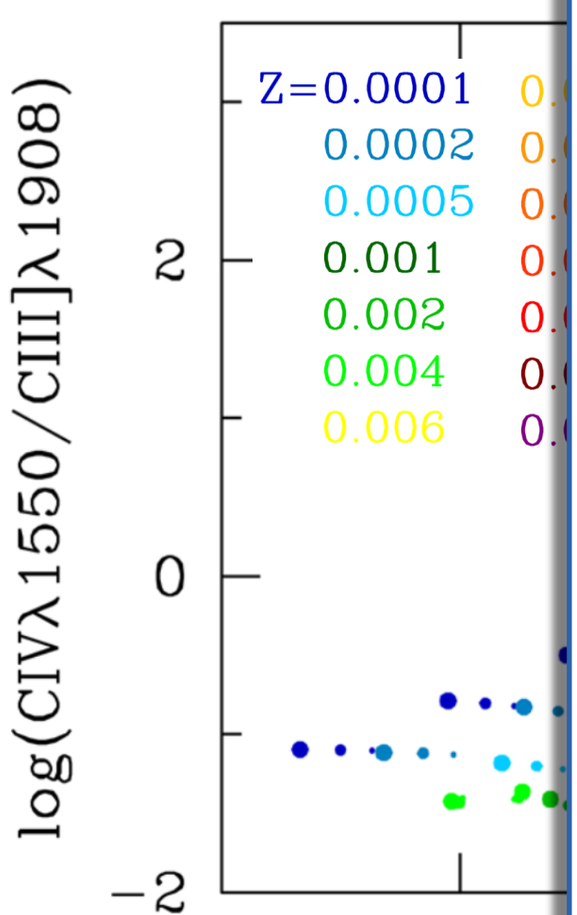
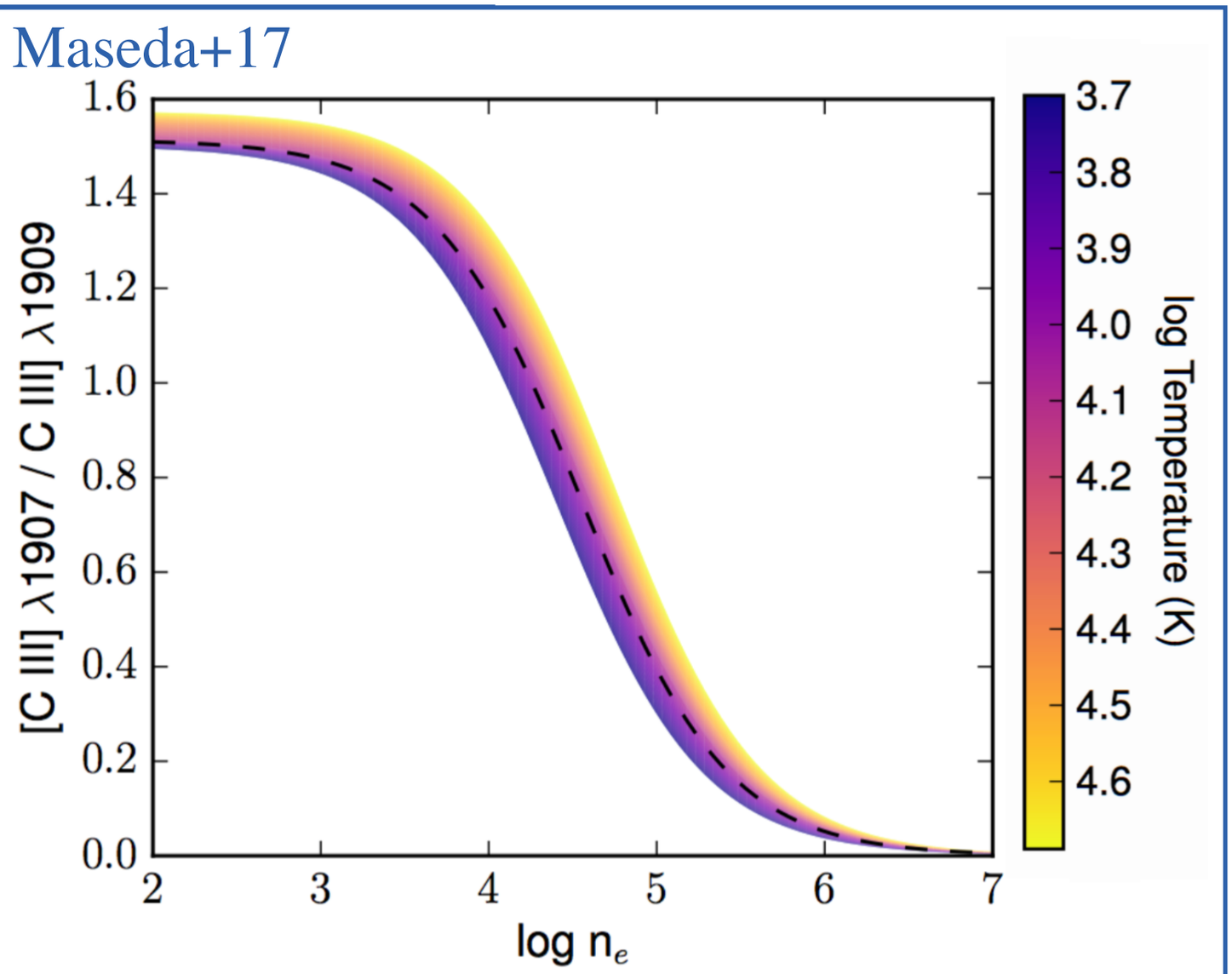


Maseda+17



MUSE WIDE

- MUSE GTO program; PI: Lutz Wisotzki
- 100 × 1arcmin^2 MUSE pointing mosaic on CDF-S and COSMOS
- 1 hour exposures reaching 6σ point-source EL depth ≈10^{-17}erg/s/cm^2
- Main Science Goals:

Low & Intermediate z Galaxies:

Spatially Resolved Spectroscopy + HST

Low mass galaxies (≳ $10^7 M_\odot$)

Studying Faint AGN

Bright Lyα Emitters

Complete census of $z > 3$ LAEs (exploiting multi-λ HST data)

Physical properties of LAEs

Studying extreme EW objects

LAE Luminosity Functions

Describe Lyα halos and Blobs

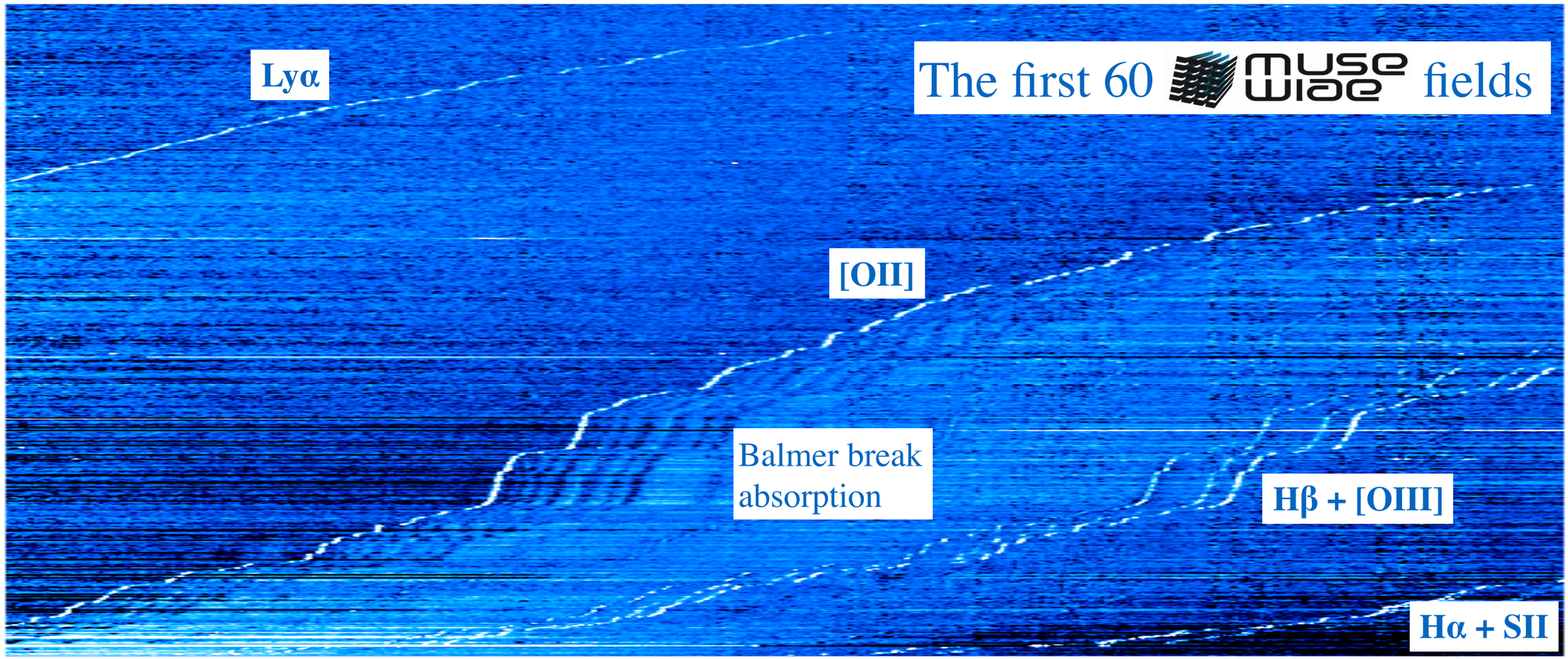
R. Saust's poster

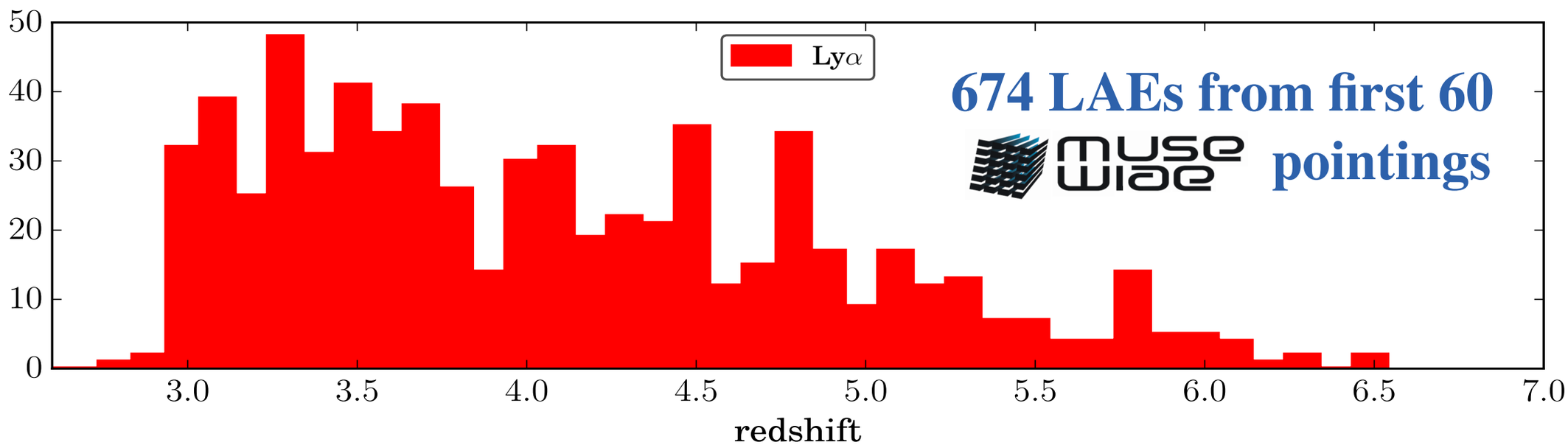
Spectra of Everything!

Immense legacy value for the broader community

Discovery potential

Emission Line Sources in MW



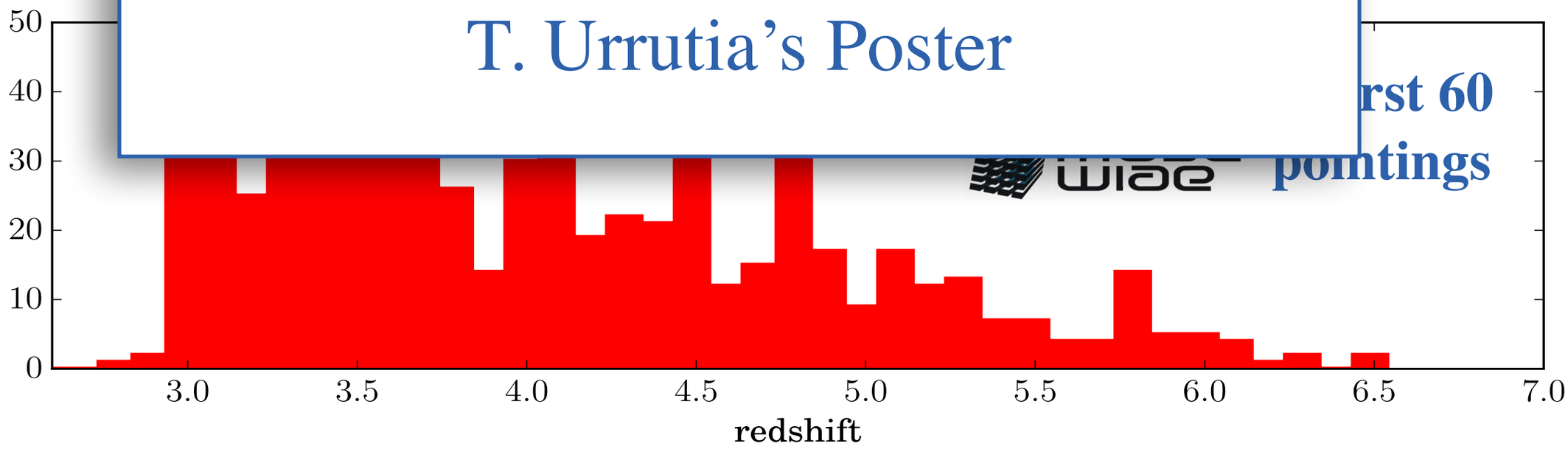


Emission Line Sources in MW

The first 60 MUSE-Wide fields

However,
As of last week, this has been added the sources from **40 more fields**…

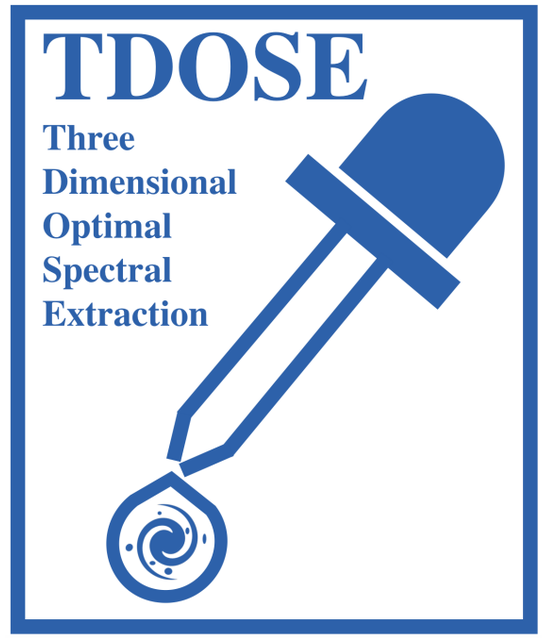
Details are on
T. Urrutia's Poster



UV lines in MUSE-Wide LAEs

- Despite MUSE sensitivity at 1hr detection is still challenging
  - Initial comparison in overlap with deep fields confirm this

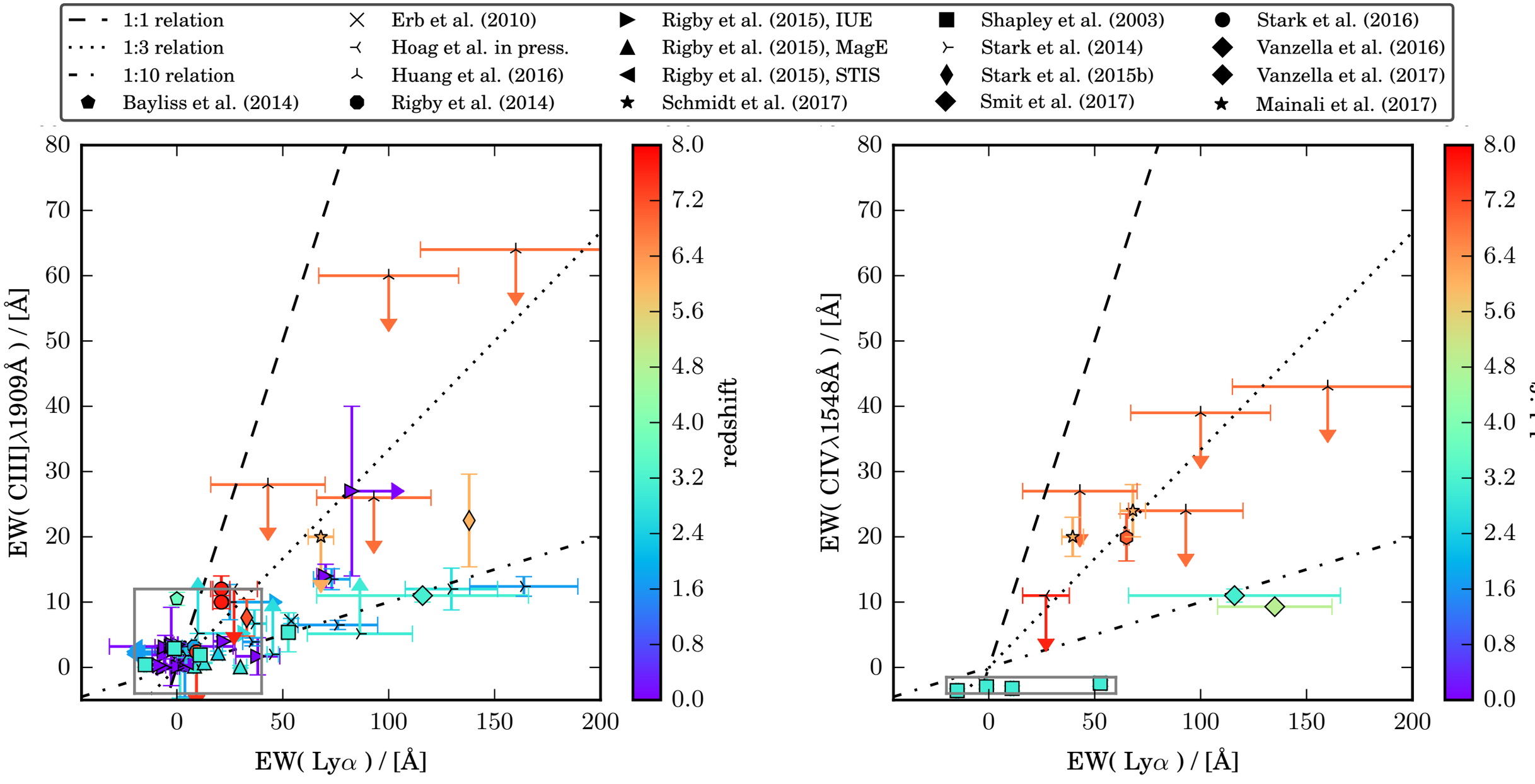
- Optimal extraction of spectra to improve S/N with:
  - Multi-component GALFIT model of HST counterpart
  - Representation of models in full 3D MUSE cube
  - Simultaneous extraction of all sources in FoV
  - Full 3D per-pixel representation of each source
  - Collapsed 1D spectra with optimal S/N



https://github.com/kasperschmidt/TDOSE

UV lines in MUSE-Wide LAEs

- Searching for CIII and CIV doublets in MUSE-Wide LAEs
  - MUSE covers CIII] at **$2.9 < z < 3.9$** & CIV at **$2.9 < z < 5.0$** for LAEs



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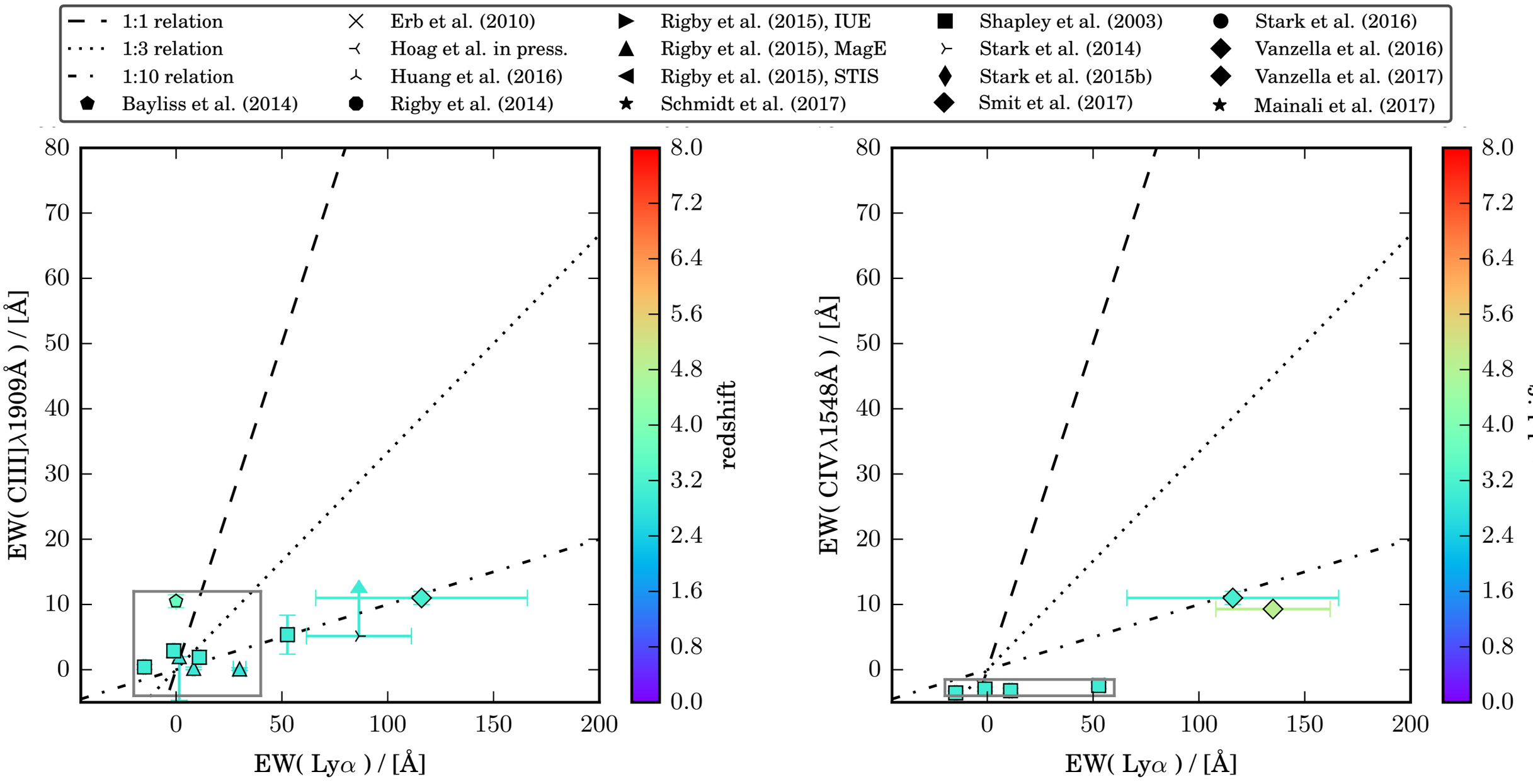

See also Maseda+17 & in prep. work in MUSE deep fields

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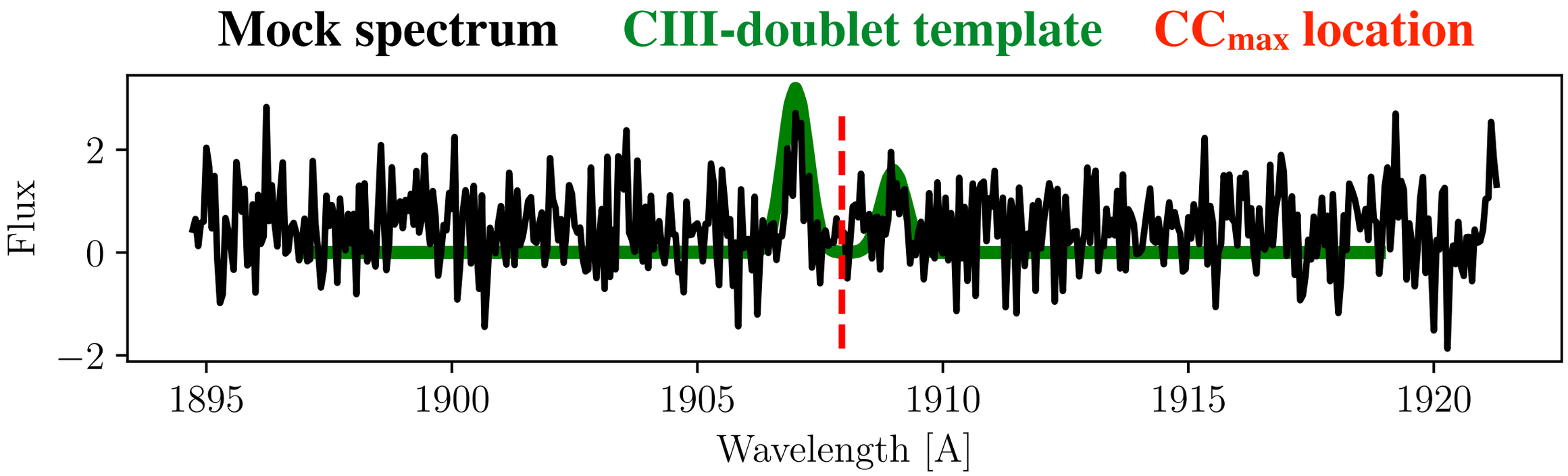
- Initial guess on z_{sys} from Verhamme et al. (submitted)
- First step: Obtain EW estimates from potential line detections
  - Forced flux estimate on optimally extracted spectra
- Template matching around z_{sys} for UV lines/doublets independently
  - First tests recover lines well in mock spectra
  - Extend to larger template grid, and apply to MUSE-Wide LAEs



Acknowledgements

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