CIII] EMITTERS AT $z \sim 3$: STATISTICS AND EVIDENCE FOR AGN QUENCHING
Why CIII]?

- There is a lack of spectral features in the UV rest-frame 900-2800Å
  - Lyα-1215Å is a resonant line, ~unreliable
- Redshift measurement is critical (particularly at z>6)
- Estimates of the systemic redshift
  - measure outflows
- The CIII] doublet 1907-1909Å is the most frequent emission line besides Lyα
- Ionization potential 24eV
- Can be ionized by hot star in star-forming galaxies, or by AGN
- By its nature, it is present whether Lyα is in emission or not

The hope is that CIII] is both a redshift helper and a diagnostic tool

- How frequent is it?
- Properties of CIII] emitters?
VUDS a large sample of ~7000 galaxy spectra
2<z<6.5 representation of the SFG population

The largest sample of UV-rest selected star-forming galaxies with spectroscopy in 2<z<6.5

Is CIII] ubiquitous?
Median CIII\] emission in the star-forming galaxy population $2<z<3.8$

**VUDS $2<z<3.8$:**

$\text{EW(CIII\]}=2.2\text{Å}$

**Shapley+03:**

$\text{EW(CIII\]}=1.7\text{Å}$

*Using positive EW as emission*
How frequent is CIII] emission?

- Use sample of 3899 galaxies with 2 < z < 3.8
- Measure EW(CIII]) and local noise
- Reliable for EW(CIII]) > 3 Å
- Use false detections with EW(CIII]) < 3 Å to correct the distribution
- Result: **24% of the SFG population emits CIII] > 3 Å**
- CIII] is frequent but CIII] emission at a level accessible to the deepest spectra mises 3/4 of galaxies
  - Cannot be used alone to find out high-z > 6 redshifts

*Le Fèvre et al., in prep*
Specific populations: CIII]-1909A emitters 2<z<3.8

Stacks of CIII] emitters identify a wealth of other nebular emission lines: OIII, CIII, CIV, NIII, NIV, NV

Studying the population of strong CIII] emitters is possible only if a large volume is explored (VUDS)

Le Fèvre et al. in prep.

See study of 10 low metals VUDS galaxies in Amorin+17
CIII] vs. Lyα

Nice correlation?

But large dispersion:
There are strong CIII] emitters without Lyα, and vice-versa
Strongest CIII] emitters in the SFG population at $z \approx 3$

- Producing large EW(CIII$\lambda$) > 20Å requires a powerful ionizing source
- Fraction of emitters with EW(CIII$\lambda$) > 20Å $f$(CIII$\lambda$) ≈ 2.4%
- What is producing the ionizing spectrum?

Nakajima+17
Ionizing field producing CIII] at z~3: stars or AGN?

- Classification diagrams using UV nebular lines
  - Expands into the UV the classical BPT in optical
- Photoionization models with Cloudy using different sources: Young stellar populations, AGN, blackbody, ...
- Classification shows that 1/3 of the strongest CIII] emitters are powered by AGN

Nakajima et al., arXiv:1709.03990

Black symbols: VUDS CIII] emitters
Black-yellow: VUDS CIII] stacks
Other symbols: calibration on known sources
CIII] emitters on the Main Sequence?

What is the location of CIII] emitters of increasing strength on the MS?
CIII] emitters on the Main Sequence

Weak to moderate emitters $\text{EW(CIII]}<10\text{Å}$
... are located on the MS
CIII] emitters on the Main Sequence

Strong emitters $10 < \text{EW(CIII)]} < 20 \text{Å}$

... are on average 0.15 dex below the MS
CIII] emitters on the Main Sequence

Strongest emitters
$\text{EW(CIII])}>20\text{Å}$

... are on average 0.3dex below the MS

Reduced SFR by $\sim \times 2$
Age of CIII] emitters

Strongest emitters EW(CIII])>20Å
Are older than weak emitters
~0.9Gyr vs. ~0.4Gyr

- Strong CIII] emitters fall below the MS
- A fraction of these emitters are shown to host AGN from photoionization classification diagrams
- The strongest emitters are the oldest (caveat: SED fitting)

A likely explanation is that we are witnessing AGN feedback quenching star formation
This is most evident in the oldest galaxies, for which quenching has had time to act
Summary

- Important to explore spectral diagnostics in the UV
  - To be combined with optical rest-frame (JWST...)

- CIII] is a very useful line, 24% of SFGs have EW(CIII])>3Å
  - But will not replace multi-feature redshift measurement

- Analysis of CIII] emitters with photoionization models shows that 1/3 of the strongest emitters are powered by AGN

- The position of CIII] emitters around the MS shows that the strongest, those with AGN, are below the MS

- We are likely witnessing the effect of AGN feedback, suppressing, "quenching", star formation