Recent results on the LAE luminosity function

Luminosity function
(on A1689, A2390, A2667, A2744):
• 160 LAEs with $2.9 < z < 6.7$
• $39.5 < \log (L_{\text{Ly}\alpha}) < 42.5$
• Increasing steepness with $z$

LAEs characterization
• Sample reduced to A2744 : 132 LAEs
• Astroseeph photometry (Merlin+2016, Castellano+2016) from Hubble Frontiers Fields (HST FF) observation program
• LAE detection catalog produced by G. Mahler

Process
• Lensing correction
• Monte Carlo iterations on photometry
• SED fitting with HypeZ (Bolzonella+2000)
• Dust correction
• Resulting EW(\text{Ly}\alpha) and \text{Foc}_{\text{lim}}(\text{Ly}\alpha) population

Example of SED fitting: Red and green points
real and synthetic photometry points, blue points no detection, red line: Lyman-Break position, green line: Ly\alpha emission position and cyan line: UV continuum estimation position

Lya escape fraction is A2744 field

Observation strategies
• Use of lensing clusters, selected galaxies 10 - 100 fainter than in blank field survey
• Explored volume decreases
• Robust mass model required (Lenstrael, Kneib=1996, G. Mahler=2017 in prep.)

MUSE instrument
• Integral Field Unit (IFU)
• 1’ x 1’ field of view
• Very efficient for emission line detection
• Captures $\text{Ly}\alpha$ emission between $z = 2.9$ and 6.7

MUSE white light image of A2744 (blue) and amplification maps at $z = 3.5$ (red)

What’s next
• Do the lensing characterization for the LAE selection
• Compute the Luminosity function for the LAEs
• Investigate the relative contribution of the two populations to ionizing flux
• Extending to higher redshifts with EMIR
• Multi Object Spectroscope (0.9 - 2.5 µm)
• GTC canary islands (10.4m diameter mirror)
• Apply same process to other lensing clusters observed by MUSE GTO

References:

LBG selection
• First selection based on photometric break (98 candidates)
• Galaxies selected with $z > z_{\text{sw}} = 3.4$ (F435w)

Results of the LBG selection

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No correction for multiple sources yet

Secure LBGs overlaid on HST RGB image.
Green: 3.4< $z$ <4.5, red: 4.5< $z$ <5.5, and yellow: 5.5< $z$ <8.3

Preliminary conclusion
• We selected a sample of 72 LBGs behind A2744 field with $3.4< z <8.3$
• On the 132 LAEs in A2744, 34 have no continuum detection (25%) and in the intersection (78 galaxies) of the photometry catalog and the LAE detection catalog, 20 of them (26%) are selected as LBGs as well
• On the 72 selected LBGs, 20 are spectroscopically confirmed LAEs (28%)
• LAEs are likely to play a predominant role in the reionization process at $z = 6$