SF2A Abstract

Ilias Goovaerts

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Faint, star forming galaxies at mid-to-high redshifts are of crucial interest as the likely dominant contribution to the process of cosmic reionisation. We present results on the properties of these galaxies, focusing on gravitationally lensed Lyman-alpha emitters (LAEs) and Lyman break galaxies, observed behind the Hubble Frontier Fields galaxy clusters with VLT/MUSE, HST and JWST/NIRCAM. The lensing magnification provided by these clusters of galaxies allows us to probe down to $M_{UV} \sim -12$ and $L_{Ly\alpha}$ $10^{39}\,\mathrm{erg\,s^{-1}}$ in a redshift range $2.9 < z < 6.7$. We derive star formation rates, stellar masses, UV slopes from SED fitting as well as Lyman-alpha parameters from MUSE spectroscopy for these galaxies and assess the interrelation of the Lyman-alpha emitting and UV-selected populations. This can help to constrain the progress of reionisation by probing the neutrality of the IGM (which absorbs and scatters Lyman-alpha photons). We also investigate the Lyman-alpha escape fraction and its evolution with redshift, with the help of dust-corrected star formation rates in individual galaxies as well as the state-of-the-art luminosity functions of LAEs and UV-selected galaxies. We find that our intrinsically faint Lyman-alpha-selected galaxies are in general highly star forming with steep UV slopes, and that they lie above typical estimations of the star-forming main sequence derived at higher masses. However, we find that they are similar in their position on the star-forming main sequence to UV-selected galaxies at the same masses and redshifts, suggesting that LAEs do not have significantly heightened specific star formation rates and therefore do not play a greater role in cosmic reionisation versus the general UV-selected population. We also see an enhanced fraction of galaxies displaying Lyman-alpha emission at low equivalent widths among our UV-brighter sample, especially interesting in the context of UV-bright galaxies detected within the epoch of reionisation, situated in reionised bubbles and overdensities, which show Lyman-alpha emission at low equivalent widths. This is an atypical result given the existing literature but important in the context of the progression of reionisation, suggesting that ionised bubbles grow around brighter galaxies, which allow Lyman-alpha photons to escape by redshifting out of resonance. This study highlights the potential of combining MUSE, HST and JWST observations to constrain galaxy properties around the epoch of reionisation, taking advantage of secure spectroscopic redshifts and the extensive wavelength coverage of HST and JWST.