Revolutionising our understanding of distant Lyman-α emitters: the evolution of the LF from $z \sim 9$ to $z \sim 2$

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Abstract

I will present results from our recent largest narrow-band surveys in order to improve our understanding of the early Universe ($z > 2$) using the Lyα emission line. This talk will focus on the $z = 6.6$ LAE luminosity function (LF; arXiv:1502.07355). To derive this LF, we used a combination of archival narrow-band NB921 data in UDS and new NB921 measurements in SA22 and COSMOS/UltraVISTA, all observed with the Subaru telescope, with a total area of 5 deg2. Lower redshift interlopers were excluded by using broad-band optical and near-infrared photometry and we also excluded three supernovae with data split over multiple epochs. We spectroscopically confirmed the two most luminous Lyα emitters ever found at $z = 6.604$ and 6.541 in the COSMOS field using Keck/DEIMOS and VLT/FORS2, for which I will show the spectra. Combining the UDS and COSMOS samples we find no evolution of the bright end of the Lyα LF between $z = 5.7$ and 6.6, which is supported by spectroscopic follow-up, and conclude that *Himiko*-like sources are not as rare as previously thought, with number densities of $\sim 1.5 \times 10^5$ Mpc^3. Combined with our wide-field SA22 measurements, our results indicate a non-Schechter-like bright end of the LF at $z = 6.6$ and a different evolution of *observed* faint and bright LAEs. This differential evolution was not addressed in previous studies, or discarded as cosmic variance, but we argue instead that it may be an effect of re-ionisation. Using a toy-model, I will show that such differential evolution of the LF is expected, since brighter sources are able to ionise their surroundings earlier, such that Lyα photons are able to escape. Our targets are excellent candidates for detailed follow-up studies and provide the possibility to give a unique view on the earliest stages in the formation of galaxies and re-ionisation process.