X30a Lyα Luminosity Function at $z = 1.9 - 3.5$ determined by the HETDEX Survey

Yechi Zhang, Masami Ouchi, Yoshiaki Ono, and the HETDEX Collaboration

We investigate galaxy formation and evolution with Lyα emitters (LAEs) at $z = 2 - 3.5$ by the Hobby Eberly Telescope Dark Energy eXperiment (HETDEX) blind spectroscopic survey. We obtain $\sim 20,000$ spectroscopically identified LAEs on the sky of 13 deg^2. With our LAE sample, we derive the Lyα luminosity function (LF) in the Lyα luminosity ($L_{\rm Lya}$) range of $10^{43.0-45.2}$ erg s^{-1} with great accuracy. At the bright end ($L_{\rm Lya} > 10^{43.5}$ erg s^{-1}), our Lyα LF has a significant hump, spectroscopically confirming the claims given by previous photometric surveys. Exploiting our spectra, we find that this bright-end hump is composed of type 1 AGNs that have broad Lyα emission lines with FWHM> 1000 km s^{-1}. We show that our Lyα LF can be fitted with the linear combination of the Shechter function and the power law. Combining with previous results at other redshifts, we find a possible redshift evolution of α at $z \sim 2 - 6$ such that α steepens towards high redshift. We also derive the UV continuum LF (UV LF) of type 1 AGNs in our LAE sample, reaching the very faint absolute UV continuum magnitude ($M_{\rm uv}$) of ~ -18. The number densities of our bright UV continuum ($M_{\rm UV} < -21$) type 1 AGNs agree well with those from previous studies at the similar redshift. On the other hand, our faint AGNs with $-21 < M_{\rm UV} < -18$ have number densities smaller than those previously reported. Comparing with the type 1 AGN UV LF at $z \sim 0$, we find that the number densities of faint UV continnum ($M_{\rm UV} > -21$) type 1 AGNs increases from $z \sim 2$ to $z \sim 0$. This represents the direct identification of the downsizing of faint UV continuum AGNs at $-20 < M_{\rm UV} < -18$.