Evolution of the Hβ+[OIII] and [OII] Luminosity Functions and the [OII] Star-Formation History of the Universe up to $z \sim 5$ from HiZELS

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Abstract

We unveil the evolution of the Hβ+[OIII] and [OII] luminosity functions and star formation histories from $z \sim 0.8$ to 4.7 using data from HiZELS. This is the first time that the Hβ+[OIII] and [OII] luminosity functions and star formation histories have been studied at these redshifts in a self-consistent analysis. This is also the largest sample of Hβ+[OIII] and [OII] emitters in this redshift range, with a large comoving volume coverage of $\sim 1 \times 10^6$ Mpc^3 in two independent volumes (COSMOS and UDS), greatly reducing the effects of cosmic variance. We find significant evolution in both $L_\star$ and $\phi_\star$ for both emitters. Our predicted [OIII] LFs shows that, in comparison to our Hβ+[OIII] LF and AGN LFs, our Hβ+[OIII] samples are dominated by star-forming, [OIII] emitters. We will also present the cosmic star-formation history based only on [OII] emitters up to $z \sim 5$ (to reduce bias effects from different tracers) and find that the peak of star-formation occurred around $z \sim 3$. For the $z < 2$ measurements, we find that our [OII] star-formation rate densities (SFRDs) are in agreement with Hα and stacked radio studies, suggesting that our sample is representative of a star-forming population. Our star formation history is able to recover the stellar mass density evolution. Interestingly, we also find that the Hβ+[OIII] SFRDs are in agreement with other star-forming results in the literature, suggesting that even our Hβ+[OIII] sample is dominated by star-forming galaxies.