X05a Spectroscopic Constraints on the UV Luminosity Functions at z=7-14: Clumpiness and Compactness of the Brightest Galaxies

播金優一 (東京大学)

We present the number densities and physical properties of the bright galaxies spectroscopically confirmed at $z \sim 7-14$. Our sample is composed of 60 galaxies at $z_{\rm spec} \sim 7-14$, including recently-confirmed galaxies at $z_{\rm spec} = 12.34-14.32$ with JWST, as well as new confirmations at $z_{\rm spec} = 6.583-7.643$ with $-24 < M_{\rm UV} < -21$ mag using ALMA and Keck. The UV luminosity functions derived from these spectroscopic results are consistent with a double power-law function, showing tensions with theoretical models at the bright end. To understand the origin of the overabundance of bright galaxies, we investigate their morphologies using JWST/NIRCam high-resolution images obtained in various surveys including PRIMER and COSMOS-Web. We find that $\sim 70\%$ of the bright galaxies at $z \sim 7$ exhibit clumpy morphologies with multiple subcomponents, suggesting merger-induced starburst activity, which is consistent with SED fitting results showing bursty star formation histories. At $z \gtrsim 10$, bright galaxies are classified into two types of galaxies; extended ones with weak high-ionization emission lines, and compact ones with strong high-ionization lines including NIV]λ1486, indicating that at least two different processes (e.g., merger-induced starburst and compact star formation/AGN) are shaping the physical properties of the brightest galaxies at $z \gtrsim 10$ and are responsible for their overabundance.