

The nature of AGNs newly discovered by JWST at $5 < z < 6$ based on a clustering analysis

Tuesday 19 November 2024 14:00 (20 minutes)

James Webb Space Telescope (JWST) has discovered many faint AGNs at high- z by detecting their broad Balmer lines. However, some of their characteristics are quite different from general type-1 AGN features, such as ~ 2 - 3 dex higher number density compared with the extrapolated quasar luminosity function, hosting a very massive SMBH, and no detection in X-rays. Are AGNs newly discovered by JWST (JWST AGNs) really the same population of type-1 quasars? We addressed this issue using a dark matter halo (DMH) mass measured by a clustering analysis. We select 28 JWST AGNs and 679 galaxies at $5 < z < 6$ from the literature and the public galaxy catalogue, respectively. Cross-correlation analysis with angular and projected correlation functions yields the typical DMH mass of JWST AGNs as $\log(M_{\text{halo}}/h^{-1}M_{\text{sun}}) = 11.53_{-0.27}^{+0.22}$, $11.70_{-0.26}^{+0.20}$, respectively, which is ~ 1 dex smaller than that of quasars. The DMHs of JWST AGNs at $5 < z < 6$ are predicted to grow a DMH with $10^{12-13} h^{-1} M_{\text{sun}}$, a typical mass of quasar at $z \sim 3$. Applying the empirical stellar-to-halo mass ratio to the measured DMH mass, their host stellar mass is evaluated as $\log(M/M_{\text{sun}}) = 9.59_{-0.45}^{+0.41}$ and $9.87_{-0.43}^{+0.32}$, which are higher than those estimated from the SED fitting. We also evaluate their duty cycle as $f_{\text{duty}} = 0.0065 \pm 0.0006$, namely $\sim 7 \times 10^6$ yr as the lifetime of JWST AGNs. While we cannot exclude the possibility that JWST AGNs are simply low-mass type-1 quasars, these results suggest that JWST AGNs are a different population from type-1 quasars, and may be the ancestors of quasars at $z \sim 3$.

Presenter: ARITA, Junya (University of Tokyo)