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

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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_halo/h^-1Msun) = 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^-1Msun, a typical mass of quasar at z<~3. Applying the empirical stellar-to-halo mass ratio to the measured DMH mass, their host stellar mass is evaluated as log(M/*Msun)=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_\duty=0.0065 +/- 0.0006, namely ~*710^6 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<~3.

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