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Halo Occupation Distribution of Quasars : Redshift Evolution

The Halo Occupation Distribution (HOD) has been used as a powerful tool in interpreting quasar clustering and the quasar-halo connection. The HOD formalism provides a complete knowledge of the host halo mass distributions of quasars over a range of redshifts. While extracting host halo distributions of quasar and Active Galactic Nuclei (AGN) from clustering studies, the HOD is assumed to be weakly dependent on redshift. Without any theoretical study of redshift evolution of the HOD, this assumption poses a challenge for studies with quasar clustering and studies of stacked signals from quasars.

We use SIMBA and IllustrisTNG suite of cosmological simulations to probe the HOD of the high end of the AGN luminosity function and characterise their redshift evolution. We find that owing to different models of subgrid AGN-physics, TNG and SIMBA produce different HOD of quasars. In both simulations, we find that the highest luminosity quasars have a significant redshift evolution in both simulations. SIMBA produces a stronger redshift evolution for lower luminosity AGNs as compared to TNG.

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