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High-redshift clustering measurements in the era of JWST: modeling the properties of quasars, galaxies, and ”Little Red Dots”

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Clustering measurements have always been foundational in building our understanding of the properties of quasars and galaxies, as well as their (co-)evolution with redshift. Recently, thanks to the advent of the James Webb Space Telescope (JWST), we have pushed the study of clustering well into the era of reionization: several JWST NIRCam/WFSS surveys, such as EIGER and ASPIRE, are measuring the quasar-galaxy cross-correlation and galaxy-galaxy auto-correlation functions at z>6, providing a way to constrain the clustering of luminous quasars and galaxies at these early epochs. However, modeling these measurements is particularly challenging, because of the highly non-linear scales probed by the JWST field of view and the large range of halo masses involved. In this talk, I will present a model that uses these clustering measurements (along with constrain on luminosity functions) to jointly infer the properties of quasars and galaxies in the early Universe. The model builds on a new large-volume dark-matter-only cosmological simulation with more than one trillion particles, FLAMINGO-10k, and returns key quantities such as the mass distribution of quasar/galaxy-hosting halos, the luminosity-halo mass relation for quasars and galaxies and their duty cycle/occupation fraction. I will discuss how these quantities can provide fundamental constraints to the evolution pathways of early SMBHs and galaxies, and examine how measurements at different redshifts reveal the evolution of quasar activity and UV-bright star formation across cosmic time. Finally, I will argue that the clustering of quasars can already give us valuable insight into the properties of the enigmatic “Little Red Dot” population revealed by JWST, and explore how directly probing the clustering of this new population will help us constrain its nature.

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