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TITLE:
Illuminating the most massive Cosmic Web nodes
at high redshift and their relation with galaxies with the help of quasars

ABSTRACT:
Our standard cosmological model predicts that most of the matter in the universe is distributed into a network of filaments - the Cosmic Web - in which galaxies form and evolve. Because most of this material is too diffuse to form stars, its direct detection in emission has remained elusive for several decades leaving fundamental questions still open, including: How are galaxies linked to each other? What are the morphological, physical and kinematical properties of the Cosmic Web on both large and small scales? How do they affect galaxy and AGN formation and evolution? During the last few years we have been able to start addressing these questions in a completely new way: i.e., by directly detecting intergalactic gas in emission thanks to “cosmic flashlights” such as quasars which can ionise and thus light-up through fluorescent emission cosmic gas over large volumes. Recent surveys exploiting the capabilities of new instruments such MUSE and KCWI are now providing a large statistical sample of three-dimensional images of rest-frame-UV line emission from “cold” gas haloes (and sometimes filaments) around galaxies, which are ubiquitously detected in the surrounding of quasars at all explored redshifts ($2<z<6.5$). In this talk, I will review these exciting results and discuss how they can provide new learning opportunities for our understanding of the physical properties of gas around massive galaxies and high-redshift galaxy formation. In particular, I will present recent deep and wide follow-up studies using ALMA, JWST, Chandra and HST on some quasar fields which are revealing the Cosmic Web distribution on Mpc-scales associated with the largest galaxy and AGN overdensities found so far at high redshift. These surveys are providing surprising results on the properties of galaxies and AGN within rich environments and give us the unique opportunity to directly correlate galaxy and intergalactic gas properties as measured in emission.