
Galaxy cluster environments, from simulations to observations

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Résumé

In this presentation, I will present galaxy cluster environments, explored from hydrodynamical cosmological simulations and in comparison to multi-wavelength observations. Galaxy clusters are connected at their peripheries to large-scale cosmic filaments that tunnel accreting material. These filamentary structures are probed to study both environment-driven galaxy evolution and out-of-equilibrium gas physics. We have developed innovative techniques, based on harmonic decompositions of matter distribution, to statistically probe filamentary patterns around clusters. In a multi-component approach, this method has been applied on both dark matter (Gouin et al., 2017), galaxy (Gouin et al., 2020), and gas distribution (Gouin et al., 2022) by using state-of-art cosmological simulations (Magneticum and IllustrisTNG) and large galaxy catalogs (WISExSCOMOS, SDSS). They revealed the connection of clusters to the cosmic web, and highlight the change of matter properties (the thermalization of gas and the quenching of galaxies) during their accretion processes from cosmic filaments up to cluster centers.

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