



- RAY ASTRONOMY 2019

Current Challenges and New Frontiers in the Next Decade

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X-ray and SZ scaling relations from galaxies to clusters with the IllustrisTNG simulations

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The observable thermodynamical properties of the intracluster medium reflect the complex interplay between astrophysical processes such as AGN feedback and the gravitational collapse of the host halo. Using the IllustrisTNG simulations, we measure the X-ray emission and the impact of the gas on CMB through the Sunyaev-Zel'dovich effect over a wide range of mass scales: from galaxies and groups, all the way to the most massive clusters ($M_{500\text{crit}} > 10^{15} M_{\odot}$). We calculate the X-ray properties of our simulated haloes using methods that are consistent with observational techniques, which account for the bias and scatter introduced by estimating halo masses. Thus, we infer the scaling relations between X-ray measurements such as the soft-band luminosity and the spectroscopic temperature, hot gas content and Sunyaev-Zel'dovich properties, and we find reasonable agreement between IllustrisTNG and the observed relations. Our work helps to better understand the role played by AGN feedback from cluster to galaxy scales, informing future subgrid BH feedback models. Moreover, our results highlight the scatter and bias introduced by estimated masses, and thus the importance of converting simulated ICM properties to the observable space when comparing simulations to current X-ray observations. Finally, we will provide important predictions for future X-ray missions such as eROSITA, Athena and Lynx regarding the redshift evolution of the X-ray and SZ scaling relations.

Topic

Hot and diffuse baryons

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