Dusty galaxies at Cosmic Dawn in the Thesan cosmological radiation-magneto-hydrodynamical simulations

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Abstract

I will discuss the build-up and properties of dusty galaxies at the Cosmic Dawn in the Thesan simulation suite, an upcoming set of state-of-the-art cosmological radiation-magneto-hydrodynamical simulations tailored to investigate the formation of the first galaxies and their impact on the inter-galactic medium. The Thesan run build upon the successful Illustris-TNG galaxy formation model and augment it with a self-consistent treatment of radiation and dust physics, non-equilibrium primordial chemistry, as well as binary stellar populations. After a brief overview of the simulations, I will show that they are able to match properties of observed high-z galaxies, as e.g. the stellar-to-dust-mass and dust-to-metal ratios. This opens up the possibility to use the high resolution and large volume of the Thesan simulations to interpret observations and explore the impact of dust models at z > 6. To this end, I will present the effect of varying dust physics in the Thesan suite. Finally, I will compare the results from the Thesan suite with semi-analytical models of dust build-up, highlighting similarities, discrepancies, and areas where improvements are needed.

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