



Contribution ID: 13

Type: **not specified**

IllustrisTNG: the new frontier to understand the co-evolution of (cold) dark matter and galaxies with cosmological simulations of structure formation

Tuesday 23 October 2018 10:00 (30 minutes)

I will describe the numerical efforts to simulate galaxies with the moving-mesh code AREPO across an unprecedented range of halo masses, environments, evolutionary stages and cosmic times. In particular, I will focus on the IllustrisTNG project (www.tng-project.org), a series of three gravity+magnetohydrodynamics cosmological volumes (50, 100, 300 Mpc a side, respectively) in a Λ CDM cosmology that are capable of both resolving the inner structures of galaxies as small as the classical dwarfs of the Milky Way, as well as of sampling the large scale structure of the Universe with thousands among groups and clusters of galaxies. I will briefly explain what is explicitly and empirically solved in gravity+magnetohydrodynamics simulations for galaxy formation in a cosmological context and what is required and what it means to “successfully” reproduce populations of galaxies which resemble the real ones. I will therefore show novel insights allowed by the new simulations, ranging from the assembly of the most massive structures in the Universe to the coevolution of galaxies and their black holes. I will hence focus on a series of results to highlight how baryonic physics and feedback mechanisms can affect our “standard” theoretical expectations for the distribution of dark matter on large scales and within galaxies.

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Session Classification: Morning session