Galaxy formation in the PLANCK era: Matching the observed evolution of star formation rates, colours and stellar masses across cosmic time

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Abstract

I will present results from the recent major release of the Munich galaxy formation model. In addition to the new PLANCK cosmology, significant modifications to the physics were implemented in order to fix major problems identified in previous versions. These include the too early formation of low mass objects and their too passive populations at later times. I will show how the new physics result in a model that is consistent with the observed evolution of the stellar mass functions of all, red and blue galaxies from $z = 3$ to $z = 0$, while matching the evolution of the star formation rate densities and the main sequence of star formation across the entire observable mass range.

I will connect the different evolution of low and high mass galaxies to the efficiency of the star formation quenching processes included in the model such as AGN radio mode feedback and environmental effects across cosmic time. Particular attention will be paid to the processes affecting more massive galaxies and moving them to the passive population as early as $z = 3$. Finally, I will show how the predictions from this new model compare with observations of the early universe (UV luminosity functions and stellar mass functions at $z > 5$), which were never used as constraints.