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The Evolution of the Simulated and Observed Star Formation Rates of Galaxies for the Past 13 Billion Years

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Abstract : I present the evolution of the galaxy Star Formation Rate Function (SFRF), star formation rate-stellar mass relation (SFR-M*) and Cosmic Star Formation Rate Density (CSFRD) of z = 0-8 galaxies employing both the Evolution and Assembly of GaLaxies and their Environments (EAGLE) simulations and a compilation of UV, Ha, radio and IR data. While I present comparisons between the above, I evaluate the effect and importance of supernovae/active galactic nuclei feedback. The relation between the star formation rate and stellar mass of galaxies represents a fundamental constraint on galaxy formation, and has been studied extensively both in observations and cosmological hydrodynamic simulations. However, a tension between the above is reported in the literature. I present the evolution of the SFR-M* relation and demonstrate the inconsistencies between observations that are retrieved using different methods. I employ cosmological hydrodynamic simulations combined with radiative transfer methods and compare these with a range of observed data in order to investigate further the root of this tension. Last, I present insights about the scatter of the SFR-M* relation and investigate which mechanisms (e.g. feedback) drive its shape and evolution.

Keywords : cosmological simulations, galaxy formation and evolution, star formation rate, stellar masses
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