Dust evolution in zoom-in cosmological simulations of galaxy formation

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Abstract

We present cosmological zoom in hydro simulations for the formation of disc galaxies, including dust evolution and dust promoted cooling of hot gas. We couple an improved version of our previous treatment of dust evolution, which adopts the two-size approximation for a prediction on grain size distribution, with the MUPPI star formation and feedback sub resolution model. Our dust evolution model follows separately carbon and silicate dust. We show possible effects on the Spectral Energy Distribution of variations of the size distribution and chemical composition of grains predicted by our simulations during the evolution of the simulated galaxy.

We discuss the role of various dust related physical processes, and the effect of a few possible approximations adopted in literature. Our results show that metal depletion and dust cooling have significant effects on the evolution of the system.
We compare dust surface density, dust-to-gas ratio and small to big grain mass ratio as a function of galaxy radius and gas metallicity for our fiducial run with recent observational estimates for three disc galaxies of different masses. The general agreement is very good, in particular taking into account that we have not adjusted any aspect of our model for this purpose.

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