Galaxies at High Redshift and Their Evolution Over Cosmic Time
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The impact of stellar feedback on high-z galaxy populations

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Abstract. One major deficiency of state-of-the-art galaxy formation models consists in their inability of capturing the observed galaxy downsizing trend significantly over-estimating the number density of low-mass galaxies, in particular at high redshifts. Employing an enhanced galaxy formation model with a full chemical enrichment scheme (DeLucia *et al.*, 2014), we present an improved model for stellar feedback (based on parametrizations from cosmological zoom simulations), in which strong gas outflows occur due to bursty star formation at high z, while star formation is mainly "quiescent" not causing any significant outflows anymore at low z. Due to the stronger gas outflows at high z, early star formation is strongly delayed towards later times. This helps to sufficiently detach the evolution of galaxy growth from the hiearchical dark matter assembly resulting in a fairly good agreement with the evolution of the observed stellar mass function (SMF, see Fig. 1). With our new feedback scheme, we can also successfully reproduce many other observational constraints, such as the metallicity content, the cold gas fractions or the quiescent galaxy fractions at both low and high redshifts. The resulting new-generation galaxy catalogues (Hirschmann *et al.*, in prep) based on that model are expected to significantly contribute to the interpretation of current and up-coming large-scale surveys (HST, JWST, Euclid). This will, in turn, provide a rapid verification and refinement of our modeling.

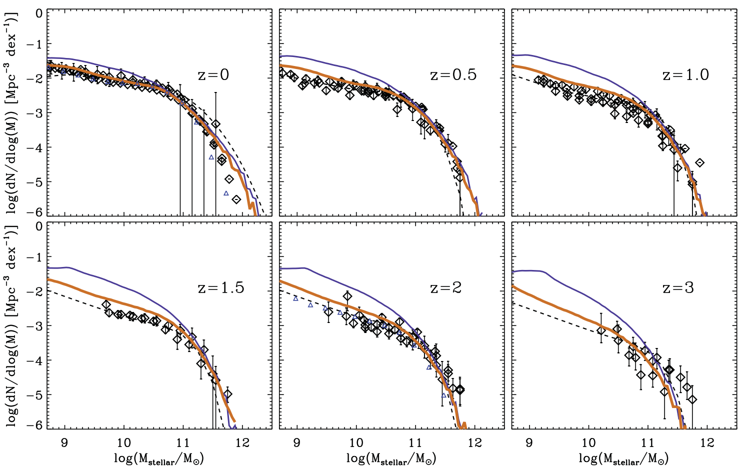

Figure 1. Cosmic evolution of the SMF in the old (lila lines) and new stellar feedback model (orange lines) compared to observations (black symbols and lines).

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