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GALAXY EVOLUTION-STAR FORMATION CONNECTION: FROM PC TO KPC SCALES

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Energization of the interstellar medium by supernova explosions covers a crucial role in a number of astrophysical situations. Supernova explosions are important for the gas evolution on small scales, because they drive turbulence and are able to provide a self-regulation mechanism for star formation. Besides, their blast waves may also form molecular clouds by sweeping gas into a turbulent flow.

The gas heated by supernova explosions may also acquire an expansion velocity larger than the escape velocity and leave the galaxy through a supersonic wind. The interplay between supernova explosions, stellar winds and interstellar medium is, therefore, important also for the gas evolution at large scales, playing important role on the dynamical and chemical evolution of different galactic systems, like dwarf, spiral and starburst galaxies and affecting their metallicities, the surface brightness, the total gas mass evolution and the star formation rate itself, as illustrated in Figure 1 (see, e.g., Mac Low & Ferrara 1999; Strickland & Stevens 2000; Hopkins et al. 2012; Melioli et al. 2013). Diffuse magnetic fields may play an important role over all these processes, because they reduce the compressibility of a fluid and together with the turbulent energy may dominate over the thermal energy in many interstellar environments, providing an important component of the vertical pressure that supports the interstellar medium, preventing, in some cases, the vertical expansion of superbubbles and driving galactic outflows by cosmic ray and Alfven wave pressure (see, e.g., Everett et al. 2008). In this contest, 3D MHD simulations of SN-driven turbulence in star formation regions (at small scales) and SN-driven galactic winds (at large scales), demonstrate that stellar feedback may be able to drive new star formation processes, but is unable to change significantly the metal abundance of the surrounding environment of the galaxies.

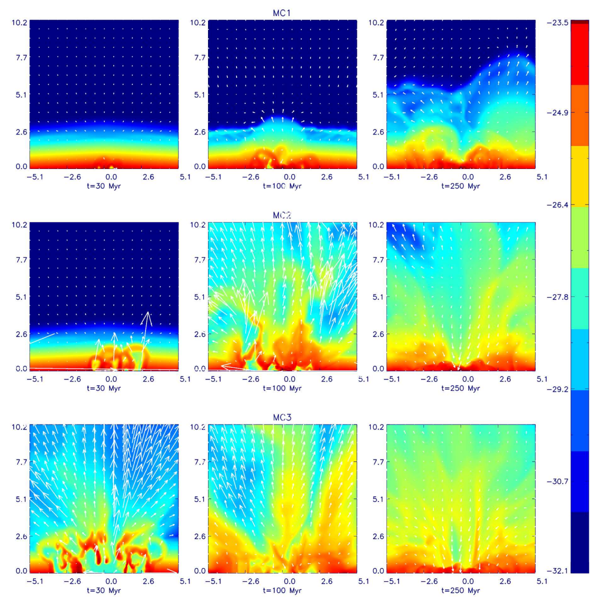

Fig. 1. Gas density distribution on the x = 0 plane (edge-on view). Each row refers to a model with a different SFR. Each column refers to a single time. The arrows illustrate the velocity field. Distances are in kpc. Densities are in log(g cm^{-3}) units.

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