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Subresolution description for supernova remnants as sources of cosmic rays

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In large-scale simulations, that also include spectral cosmic-ray physics, high-energy protons and electrons accelerated at the shocks of supernova remnants have to be described by a sub-grid model. Usually, the injected cosmic rays are represented by a simple power-law spectrum in momentum space. However, in the recent past several models for more realistic cosmic-ray spectra from supernova remnants have been published. They rely heavily on results from state-of-the-art simulations of particle acceleration at strong, collisionless shocks. By combining different approaches, tabulated spectra can be generated, which are the basis for a physically motivated sub-grid description for cosmic-ray seeding by supernova remnants in OpenGadget3. With this code simulations of galaxies in isolated and dense environments can be performed in order to check if the more realistic cosmic-ray spectra lead to quantitative differences in galactic properties and non-thermal radiation.

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