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Role of ejecta clumping and back-reaction of accelerated cosmic rays in the evolution of supernova remnants

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The thermal structure of the post-shock region of a young supernova remnant (SNR) is heavily affected by two main physical effects, namely the back-reaction of accelerated cosmic rays and the Rayleigh-Taylor instabilities developing at the contact discontinuity between the ejecta and the shocked interstellar medium (ISM). In this contribution, we investigate the role played by both physical mechanisms in the evolution of SNRs through detailed MHD modeling. In particular, we explore the role of the initial ejecta clumpiness in developing strong instabilities at the contact discontinuity which may extend upstream to the main shock and beyond. Here we present a three-dimensional MHD model which describes the expansion of the remnant through a magnetized ISM, including consistently the initial ejecta clumping and the effects on shock dynamics due to back-reaction of accelerated cosmic rays.

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