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Cosmic-ray diffusive reacceleration: a critical look

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Cosmic-ray scattering on magnetic turbulence leads to spatial diffusive propagation; if the scattering medium is moving, this will inevitably also
cause changes in the momentum of the particles, so-called diffusive reacceleration. This can be described as diffusion in momentum space. Diffusive reacceleration has often been invoked to explain the peak observed in secondary-to-primary ratios at a few GeV, in particular Boron-to-Carbon. This avoids the necessity to postulate an ad-hoc break in the spatial diffusive coefficient, and has become almost a standard in modelling cosmic-ray spectra. However, at the levels invoked, the process implies a significant input of energy from the interstellar medium into cosmic rays, so that in such models interstellar space competes with the usual accelerators like supernova remnants. The questions arise: is reacceleration really occuring at the high level required to explain secondary-to-primary ratios? and are the energy requirements physically
plausible? We address this issue using both analytical and numerical models of cosmic-ray propagation.

Collaboration

– not specified –

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