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New insights on particle acceleration at non-relativistic shocks

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I present the results of large kinetic simulations of particle acceleration at non-relativistic collisionless shocks, which allow an ab-initio investigation of diffusive shock acceleration (DSA) at the blast waves of supernova remnants, the most prominent sources of Galactic cosmic rays (GCRs).

Ion acceleration efficiency and magnetic field amplification are obtained as a function of the shock properties and compared with theoretical predictions and multi-wavelength observations of individual remnants.

In particular, I will focus on two new results: 1) the origin of the chemical enhancement of heavy elements observed in GCRs as naturally due to DSA, and 2) the re-acceleration of energetic particle “seeds” and its phenomenological implications.

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