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A simple model of the cosmic ray spectrum and composition across the Galactic to extragalactic transition

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We present a simple theoretical and phenomenological model accounting for the evolution of the cosmic-ray spectrum and composition with energy, based on the available data over the entire spectrum. We show that there is no need to postulate any additional component, other than one single Galactic component depending on rigidity alone, and one extragalactic component, whose characteristics are similar to those derived from a study of particle acceleration at mildly relativistic shocks in a GRB environment (Globus et al., 2015). In particular, we show that the resulting cosmic ray spectrum and composition satisfy the various constraints derived from the current data in the Galactic/extragalactic transition region, notably from the measurements of KASCADE Grande and Auger. Finally, we derive some generic features that a working phenomenological scenario may exhibit to give a global account of the cosmic ray data with a minimum number of free parameters.

Collaboration

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