Contribution ID: **14** Type: **not specified**

CRPropa and cosmic ray transport in turbulent magnetic fields

Tuesday 1 October 2019 11:00 (30 minutes)

Cosmic magnetic fields, both in the galaxy and in intergalactic space, can significantly influence the propagation of cosmic rays. What can be inferred from theoretical reasoning and observations is that those magnetic fields are highly turbulent. Yet, understanding theoretically hydrodynamic turbulence is an everlasting goal of classical physics, while the subject of magnetohydrodynamic (MHD) turbulence, omnipresent in the realm of astrophysics, is even more complex and challenging to study. Hence, investigating effects of the cosmic ray propagation in a turbulent MHD medium can shed some light both on the problem of turbulence itself, and the theory of cosmic ray transport. Here, we present a broad study of cosmic ray transport in so-called synthetic models of turbulence, results obtained, and challenges encountered. The numerical part of the work has been performed with CRPropa 3.

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Session Classification: Presentations 5