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Cosmic ray transport simulations with CRPropa: Extensions and applications

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Experimental observations of Galactic and extragalactic cosmic rays in the last decade challenge the theoretical description of both the sources and the transport of cosmic rays. The latest version of the publicly available simulation framework CRPropa 3.2 aims at a consistent solution of the cosmic-ray transport problem, including the production and propagation of secondary neutrinos and electromagnetic cascades. The Monte-Carlo based software is not only able to describe the transport of cosmic rays in a ballistic single-particle propagation but is also able to solve a transport equation. This combined approach will allow a consistent description of cosmic rays from the highest energies down to the TeV-range.

This talk will summarize the latest extensions of the code, e.g. solving the transport equation, improved electromagnetic cascades, source targeting, cosmic-ray acceleration and many technical improvements. The transport of cosmic rays accelerated at the galactic termination shock is discussed as an example for these new features.

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