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Multi-messenger modeling of Galactic cosmic-ray acceleration and transport

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Recent observation of LHAASO's detection of several ultrahigh energy gamma ray sources and IceCube's observation of the Galactic plane in neutrinos are clear indication of Galactic cosmic ray sources with energies in the PeV range. However, up to now the exact acceleration processes are still unknown. Therefore, modeling the acceleration and propagation of those particles in the source and on their way to Earth can help to understand their origin.

In this talk, I will show recent improvements of CRPropa's, an open source simulation framework, ensemble averaged approach to model the diffusive propagation of charged cosmic rays in arbitrary magnetic fields. This includes more sophisticated models of spatial diffusion, allowing for changing Eigenvalues of the diffusion tensor and anomalous diffusion. Besides diffusive shock acceleration, also momentum diffusion can now be taken into account. Furthermore, our advances to model hadron-hadron interactions with CRPropa will be shown. Combining the two will allow us to build a more consistent model of the complete cosmic-ray lifetime, from acceleration to arrival at Earth.

Presenter: MERTEN, Lukas (RUB)**Session Classification:** Presentations