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Diffuse Emission of Neutrino Sources beyond the Discovery Horizon

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Resolving the origin of diffuse TeV-PeV neutrino emission measured by the IceCube Observatory is a key part of multi-messenger astronomy. We study the neutrino emission of Galactic and extragalactic source populations by investigating the relation between IceCube's point-source discovery potential and diffuse flux observations. For Galactic sources, we show that the flux of unresolved neutrino sources can contribute significantly to the Galactic diffuse emission at 100 TeV at a level comparable to that expected from cosmic ray interactions in the interstellar medium. For extragalactic sources, we explore avenues for improving existing constraints on candidate source populations via improved statistical methods and/or population models. We also examine whether Galactic and extragalactic candidate sources can be probed by current and planned future neutrino detectors.

Primary author: GROTH, Kathrine Mørch (Niels Bohr Institute, University of Copenhagen)

Presenter: GROTH, Kathrine Mørch (Niels Bohr Institute, University of Copenhagen)

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