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Angular power spectrum analysis on current and future neutrino data

To constrain the contribution of source populations to the observed neutrino sky, we consider isotropic and anisotropic components of the diffuse neutrino data. We simulate through-going muon neutrino events by applying statistical distributions for the fluxes of extra-galactic sources and investigate the sensitivities of current (IceCube) and future (IceCube-Gen2 and KM3NeT) experiments. The angular power spectrum is a powerful probe to assess the angular characteristics of neutrino data and applying this analysis we are already constraining rare and bright sources with current IceCube data.

In addition, we investigate the decay and annihilation of heavy dark matter as a potential neutrino source, as suggested by the observed excess in the High-Energy Starting Event dataset. We apply our angular power spectrum analysis to this HESE data for different channels, allowing us to interpret the observed neutrino sky and perform a sensitivity forecast.

Mini-abstract

Interpreting the neutrino sky by using anisotropic and isotropic features

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