Characterization of the PeV astrophysical neutrino energy spectrum with IceCube using down-going tracks

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Motivation

- The IceCube Neutrino Observatory has observed a diffuse flux of astrophysical neutrinos with energies from TeV to a few PeV.
- Recent IceCube analyses have limited sensitivity to PeV neutrinos.

What has been done

- We developed a new event selection that fills the gap between 1 PeV and 10 PeV.
- This sample is obtained by selecting high-energy down-going through-going tracks from 8 years of data.

Methods for reducing backgrounds

- Stochasticity cut: single muons created by neutrinos lose energy more stochastically than atmospheric muon bundles.
- IceTop veto: atmospheric muons are accompanied by air showers.

Future Plans:

- Perform a join fit by combining this sample with the 7-year High Energy Starting Events (HESE) sample.
- Characterize the astrophysical neutrino flux.
- Test the existence of a PeV cut-off in the neutrino energy spectrum.