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Recent Observations of Atmospheric Neutrinos with the IceCube Observatory

Wednesday 5 August 2015 17:00 (30 minutes)

The IceCube Neutrino Observatory, designed to identify high energy neutrinos of astrophysical origin, efficiently collects the penetrating by-products of cosmic ray induced extensive air showers: the muons and neutrinos. IceCube, along with its densely instrumented in-fill array Deep-Core, has collected and identified approximately 450,000 neutrinos in the energy range from 10 GeV to over 100 TeV. Such event sample makes it possible to constrain the atmospheric neutrino flux at low energy and determine its properties at unprecedented high energies. Standard neutrino oscillations at 20-30 GeV are well known; besides, uncertainties from cosmic ray flux and mass composition, and from high energy hadronic interaction models are relatively small below 1 TeV neutrino energy. The large statistics observation of neutrino flux at high energy makes it possible to probe physics beyond the standard model, such as the existence of sterile neutrinos or the violation of Lorentz invariance. In addition it is essential in the understanding of the transition from atmospheric to astrophysical origin. In particular, heavy quark production in the atmosphere in the forward region, not directly probed by any existing collider experiment, is a key element in the assessment of the nature of the collected neutrinos. An overview of the recent results on atmospheric neutrinos obtained by IceCube will be presented in the context of its importance at high energy and of the possibility to probe global properties of hadronic interaction models.

Collaboration

IceCube

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