

PeV Cosmic Rays measured by IceCube/IceTop

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We report on the high-resolution measurements of cosmic ray spectrum and mass composition from the knee region up to 1 EeV based on one year of data collected with IceCube/IceTop. Complementary to the PeV neutrinos, IceCube measures extensive air showers of PeV cosmic rays on the surface with the IceTop array and the penetrating high energy muon bundles with the matrix of detectors in deep ice. The measured spectrum can not be explained by a simple power law beyond the knee, which confirm the other recent measurements (GAMMA, Tunka, Kascade-Grande). We observe a prominent hardening above 18 ± 2 PeV followed by a sharp steepening beyond 130 ± 30 PeV. In this energy region, the composition gets heavier as indicated by the steady increase in the measured mean logarithmic mass $\ln A$. The change in shape and amplitude of anisotropy observed by IceCube/IceTop in the arrival direction distributions of PeV cosmic rays will also be discussed.

We will present a model independent analysis of the recent cosmic ray measurements driven by the combined data from satellite, balloon and air shower experiments. We find that at least 3 different source populations needed to describe the observed spectral shape and the mass composition from 200 GeV up to 200 EeV.

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