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High energy cosmic ray anisotropy

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The study of cosmic ray anisotropy could provide clues about the origin and propagation of cosmic rays in our galactic neighborhood. Because the observed anisotropy is very small, below the permille level, large event volumes are needed in order to characterize it in sufficient detail. Over the last six years, the IceCube Observatory has collected 150 billion cosmic ray induced muon events. This large data sample made it possible to detect anisotropies in the southern hemisphere, down to the 10^-5 level, at primary energies in excess of 10 TeV. The observed anisotropy is not a simple dipole, but it can be described as composed of multipole components of the spherical harmonic expansion, to about 10 degrees. A change in topological structure of the cosmic ray arrival distribution is observed above 100 TeV. Data collected with the air shower array IceTop above 300 TeV confirm the observations up to the PeV energy scale. Moreover, the addition of data collected with the AMANDA neutrino telescope, which operated between 2000 and 2007, has enabled us to search for time variability in the observed TeV anisotropy. I will discuss IceCube in the context of other observations at different energy scales.

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