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Astrophysical neutrinos: IceCube highlights

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The IceCube Neutrino Observatory features a cubic-kilometer volume of instrumented ice at the geographic South Pole. A high energy astrophysical neutrino flux has been confirmed since 2013 as an excess of neutrinos above 10 TeV compared to the expectation from atmospheric neutrino background. This excess, nowadays significant at >6 sigma level, has been observed both in neutrino interactions starting in the detector volume and in through-going muons generated in charged-current muon neutrino interactions outside the detector. No objects have been identified as sources of the astrophysical flux, which is so far consistent with isotropic. I will review the evidence for the astrophysical flux and the status of the search for its sources. I will also present proposed detector extensions which are now being designed to solve the mystery of the neutrinos origin.

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