Neutrino Astronomy with IceCube

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IceCube Neutrino Observatory

ABSTRACT: The IceCube Neutrino Observatory is a cubic kilometer neutrino telescope located at the Geographic South Pole. Cherenkov radiation emitted by charged secondary particles from neutrino interactions is observed by IceCube using an array of 5160 photomultiplier tubes embedded between 1.5-2.5 km deep in the Antarctic glacial ice. The detection of astrophysical neutrinos is IceCube’s primary goal and has now been realized with the discovery of a diffuse, high-energy flux consisting of neutrino events from tens of TeV up to several PeV. Many analyses have been performed to identify the source of these neutrinos, correlations with active galactic nuclei, gamma-ray bursts, the galactic plane, as well as multi-messenger campaigns to alert other observatories of possible neutrino transients in real-time. However, the source of these neutrinos remains elusive, as no corresponding electromagnetic counterparts have been identified. This talk will give an overview of the detection principles of IceCube, the properties of the observed astrophysical neutrinos, the search for corresponding sources (including real-time searches), and plans for a next-generation neutrino detector, IceCube-Gen2.