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Supernova Neutrino Detection with IceCube - Overview and Outlook

BENEDIKT RIEDEL[1], University of Wisconsin-Madison

The IceCube Neutrino Observatory is a 1 km^3 scale neutrino telescope completed in the Austral summer of 2010/2011. The detector forms a lattice of 5,160 photomultiplier tubes (PMTs) installed in the South Polar ice cap at depths from 1450 to 2450 m. IceCube is designed to detect astrophysical neutrinos upward of 100 GeV. The special environment of the Antarctic ice and low-noise PMTs make the detection of a large MeV neutrino number flux possible as a collective rise in all photomultiplier rates on top of the dark noise. Assuming a supernova at the galactic center, the detectors sensitivity compares to a background-free megaton-scale supernova search experiment. At present, supernova data acquisition provides a 2 ms time resolution, allowing to track subtle features in the temporal development of a supernova neutrino burst. Recent work has been focussed on deepening the understanding and subsequently removing several dark noise contributions, especially from atmospheric muons, improving the detector response to supernova neutrinos, and setting a limit on the number of dark supernovae in the galaxy.

[1]IceCube Collaboration