Enigmatic neutrinos

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Wednesday, 02 June 2010
Last Updated Monday, 23 August 2010

Artistâ€™s view of the kilomtere cube KM3NeT undersea telescope project / credit: ASPERA/G.Toma/A.Saftoiu

Hidden in the depths, like thousands of eyes, some light detectors scan the deep sea to detect the faint trail of light betraying the interaction of neutrinos. These high-energy particles have crossed phenomenal distances without being deflected or absorbed by the intergalactic environment. Then, they travel through the Earth, and a tiny fraction of them will be detected under the sea. The challenge: answering to some of the greatest secrets of the universe.

Composite image of Supernova 1987A / credit: NASA/CXC/PSU/STScI/CfA

The supernova of 1987 was the first opportunity to detect neutrinos from a distant object. Coming directly from the core of stars, these particles enable us to access the most violent sources of the Universe, such as supernovae (seen here in gamma rays), black holesâ€¦ This new window on the Universe is constrained by the weak interaction of neutrinos with matter. To capture muons generated by this interaction, it requires extensive and deep detectors to overcome as much as possible the background noise generated on the surface by the cosmic radiation. The ocean becomes the ideal environment for deploying thousands of photosensitive detectors. With a volume of one kilometre cube, the KM3NeT undersea telescope will be able to detect hundreds of events per year.