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Earth tomography with supernova neutrinos and the first neutrino tomography of Earth

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There are two approaches to perform Earth tomography with neutrinos: (i) neutrino oscillation tomography, based on coherent Earth matter effects modifying neutrino oscillations patterns and (ii) neutrino absorption tomography, based on partial absorption of a neutrino flux as it propagates through the Earth. Oscillation tomography is usually discussed in the context of GeV atmospheric neutrinos. In the first part of this talk, however, I will focus on supernova neutrinos with tens of MeV. Whereas at GeV energies, Earth matter effects are driven by the atmospheric mass-squared difference, at energies below ~ 100 MeV, it is the solar mass-squared difference what controls them. The capabilities of future neutrino detectors, such as DUNE, Hyper-Kamiokande and JUNO will be presented, including the impact of the energy resolution and other factors. In the last part of this talk, I will present the first, and so far only, neutrino tomography of Earth with actual data. This was performed with IceCube data, by studying the absorption of atmospheric neutrinos after crossing the Earth.

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