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Exploring constraints on the core radius and density jumps inside Earth using atmospheric neutrino oscillations

Atmospheric neutrinos, through their weak interactions, serve as an independent tool for exploring the internal structure of Earth. This information is complementary to that obtained from seismic and gravitational measurements. The Earth matter effects depend upon the energy of neutrinos and the electron density distribution they encounter during their journey through Earth, and hence, can be used to probe the inner structure of Earth.
In this talk, we demonstrate how well an atmospheric neutrino experiment, such as an iron calorimeter detector, would simultaneously constrain the density jumps inside Earth and determine the location of the core-mantle boundary. In this work, we employ a five-layered density model of Earth, where the densities and radii of the layers are modified to ensure that the mass and moment of inertia of Earth remain constant while satisfying the hydrostatic equilibrium condition. We further demonstrate that the charge identification capability of an ical detector would play a crucial role in constraining the parameter space.

Working Group

WG 1: Neutrino Oscillation Physics

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