

Spectrometry of the Earth using neutrino oscillations

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Neutrinos have favorable properties for measuring the elemental composition deep inside the earth's interior. First, they propagate a long distance almost undisturbed through the earth due to their weak interactions with matter. Secondly, neutrino oscillations in matter are sensitive to the electron density of the medium traversed by them. Therefore, neutrinos can be used for a probe to determine the average atomic mass ratio Z/A of the earth's core by comparing with the earth's nucleus density distribution that is inferred from seismic observations. There is little uncertainty in densities of the earth's core, but our knowledge of its main light element is very limited. With the advent of the new-generation megaton neutrino detectors, neutrino oscillation spectrometry will allow us to constrain directly the light elements in the earth's outer core. We report the detail of this novel technic and the sensitivity study.

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