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Tracking geo-neutrinos towards the future geo-neutrinography

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Directional sensitive neutrino detectors contributed to astronomy and particle physics. The solar neutrino problem was firmly believed by the directional measurement of solar neutrinos, and the atmospheric neutrino oscillation was confirmed by the zenith angle distribution for two types of neutrinos. Liquid scintillator detectors are marked by the ability to detect low energy neutrino signals, such as reactor, geo, and extraterrestrial neutrinos. On the other hand, liquid scintillator detectors do not have sensitivity of neutrino direction.

KamLAND (Kamioka, Japan) and Borexino (Gran Sasso, Italy) have showed the geo anti-neutrino detection realized by the event rate and energy spectra. We have begun to use neutrinos as " probe " to observe the Earth's interior. Geo-neutrino measurement does not have the sensitivity of its direction, so we can not distinguish the crust and mantle contribution.

It is hoped the development of new measurement technology to measure neutrino direction. Lithium-loaded liquid scintillator has the potential to have the high sensitivity of coming anti-neutrino direction. Directional sensitive detectors will contribute to the better understanding of the earth interior using geo anti-neutrino flux information. Other motivations are the earlier determination of supernova direction and improvement of oscillation sensitivity for reactor anti-neutrinos.

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