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Looking Inward with Neutrinos

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Electron anti-neutrinos have been studied now for more than half a century, starting with the first observation of electron antineutrinos from reactors by Reines and Cowan. Neutrinos from Supernovae were see in SN1987A in several large detectors. Solar neutrinos remained problematic until the SNO detector results in 2002. The long anticipated observations of neutrinos from radioactive decays throughout the earth was finally accomplished in 2005 by KamLAND, and then Borexino.
While devilishly difficult to resolve, the prospect of detecting the electron antineutrino flux from the Uranium and Thorium decay chains from these trace elements in the deep earth, offers the only known means of determining the distribution of terrestrial internal radiation heating which drives most of geodynmanics. Much of the U and Th remain in the continental crusts, while the geologically more interesting material remains deeply buried in the mantle, but with great uncertainty in amount and distribution. It is presumably the heat associated with these decays (dominantly) which drives the convection in the mantle, powering sea floor and continental motions, volcanoes and earthquakes.

I will summarize the state of our knowledge of this unique cross disciplinary endeavor, and our plans for exploration as a beginning to doing neutrino tomography of the earth. In particular I will talk about the prospects for Ocean Bottom KamLAND.

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