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Geoneutrinos

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Electron anti-neutrinos produced by natural radioactivity inside the Earth - geoneutrinos - can be used as a unique direct probe in order to determine the amount of long-lived radioactive elements inside our planet and to constrain the radiogenic contribution to the terrestrial heat. The composition of the Earth's interior, the heat sources driving the mantle convection, the generation of the Earth's magnetic field are all not well understood, but in many models the abundance of radioactive elements is one of the key points. Geoneutrinos with extremely small interaction cross sections propagate undisturbed through the Earth and today represent the only possibility how to trace down radioactivity in the deep Earth. The large volume liquid scintillator detectors, originally built to measure neutrinos or anti-neutrinos from other sources, are capable to detect them, as was demonstrated by KamLAND (Japan) in 2005 for the first time. Since then geoneutrinos were measured with high statistical significance both by KamLAND and by the Borexino underground experiment (central Italy) designed to measure low energy solar neutrinos. Several future projects of large volume detectors have geoneutrinos among their scientific goals, as SNO+ (in construction phase) or LENA and HanoHano. The status-of-art and scientific potential of this new inter-disciplinary field will be presented.

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