

JANUARY 2020



RESEARCH

GEONEUTRINOS CONFIRM THAT WE ARE ON A MANTLE OF URANIUM AND THORIUM

Protected by the Gran Sasso massif from radiation coming from space, and thus immersed in what is called cosmic silence, Borexino

is the purest experiment in the world for measuring neutrinos. Not only does the experiment measure neutrinos coming from the Sun, but also those coming from inside the Earth, so-called geoneutrinos. After more than ten years of acquiring data and performing a sophisticated analysis of these, the international collaboration that is conducting the experiment at the INFN Gran Sasso National Laboratories has published new results on geoneutrinos in the journal Physical Review D. The journal selected these results as an Editors' Suggestion, due to their value, including them among those articles considered to be of the greatest scientific significance and interest. For the first time, the signal of neutrinos produced by the radioactive decay of uranium and thorium distributed in the Earth's mantle was clearly observed. This means it is possible to exclude the hypothesis regarding the absence of radioactivity deep in the Earth by up to 99%. The published results demonstrate that a good part of the heat released from inside Earth originates from the radioactive decay of Uranium-238 and Thorium-232. These are both present in the Earth's mantle, which is almost 3,000 km thick, on which the thin crust that we tread on rests. In fact, the Borexino researchers have estimated, with a high probability (around 85%), that it is the radioactive decay in rocks that produces more than half of the Earth's heat, with the Earth's mantle playing a greater role than the crust. This evidence opens new avenues for a global, geochemical exploration of our planet. Having established a minimum value for the quantity of Uranium and Thorium in the Earth's mantle, it is possible to affirm that a non-negligible portion of the energy that supplies volcanoes, earthquakes, and the Earth's magnetic field is produced by terrestrial radiation.