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Detecting neutrino signals from the deep Earth with Borexino

Borexino is a 280-ton liquid scintillator detector located at the Laboratori Nazionali del Gran Sasso (LNGS), Italy and is one of the two detectors that has measured geoneutrinos so far. The unprecedented radio-purity of the scintillator, the shielding with highly purified water, and the placement of the detector at 3800 m w.e. depth have resulted in very low background levels, making Borexino an excellent apparatus for geoneutrino measurements. This talk will summarize the latest geoneutrino analysis with Borexino, using the data acquired from December 2007 to April 2019. The updated statistics and the optimized analysis techniques such as an increased fiducial volume and sophisticated cosmogenic vetoes have led to more than a factor two increase in exposure when compared to the previous measurement in 2015, resulting in a significant improvement in the precision. In addition, Borexino was also able to reject the null hypothesis of the mantle geoneutrino signal with 99% C.L., for the first time, by exploiting the detailed knowledge of the crust surrounding the detector. This talk will also include other geological interpretations of the obtained results such as the estimation of the radiogenic heat and the comparison of the results to various predictions. Additionally, upper limits for a hypothetical georeactor that might be present at different locations inside the Earth will also be discussed.

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