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Borexino: Latest Improvements of the Geoneutrino Results

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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 a 3800 m w.e. depth have resulted in very low background levels and has made Borexino an excellent apparatus for geoneutrino measurements. This talk will summarize the latest geoneutrino analysis with Borexino, using the data obtained from December 2007 to April 2019. Enhanced analysis techniques, such as an increased fiducial volume, improved veto for cosmogenic backgrounds, extended energy and coincidence time windows, as well as a more efficient α/β particle discrimination have been adopted in this measurement. The updated statistics and these elaborate techniques have led to more than a factor two increase in exposure and an improvement in the precision from 26.2% to 17.8%, when compared to the previous measurement in 2015. The talk will highlight the geological interpretations of the obtained results, namely, the estimation of the mantle signal by exploiting the relatively well-known lithospheric contribution, the calculation of the radiogenic heat, as well as the comparison of these results to the various predictions. Even though the results are compatible with all the Earth models, there is a 2.4σ tension with those models that predict the lowest concentration of heat-producing elements inside the mantle. Additionally, we present the upper limits for a hypothetical georeactor that might be present at different locations inside the Earth.

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