Contribution ID: **1050** Type: **Invited talk in the parallel session**

Study of antineutrinos from the Cosmos and from the Earth

Thursday, 8 July 2021 19:05 (25 minutes)

The largest amount of antineutrinos detected about the Earth is emitted by the natural radioactive decays inside the Earth: more than 99% of the present-day Earth's radiogenic heat is originated by the β^- decays of ^{40}K and of ^{232}Th and ^{238}U chains isotopes. Other flux components are provided by cosmic rays interactions in the atmosphere or by possible extra-terrestrial sources such as supernovae explosions, gamma ray bursts, GW events and solar flares.
Large underground ultrapure liquid scintillators are very suitable to antineutrinos studies. Electron antineutrinos are detected through the inverse beta-decay mechanism on the free proton: the fast time coincidence between the emitted positron annihilation and the neutron capture provides an almost background free signature, that allows to investigate also tiny flux components.
The extreme radiopurity of the BOREXINO detector has allowed to set new limits on diffuse supernova antineutrino background for $\bar{\nu}_e$ in the previously unexplored energy region below 8 MeV, and to obtain the best upper limits on all flavor antineutrino fluences in the few MeV energy range from gamma-ray bursts and from gravitational wave events.
Moreover, BOREXINO has robustly detected the geo-neutrino signal and begun to place constraints on the amount of radiogenic heating in the Earth's interior: the null-hypothesis of observing a geoneutrino signal from the mantle has been excluded at a 99.0% C.L. and the overall production of radiogenic heat constrained to $38.2^{+13.6}_{-12.7}$ TW.
The talk presents a complete review of the results obtained by BOREXINO about antineutrinos from the Earth and from other possible extraterrestrial sources.

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Session Classification: Why and How the Sun and the Stars Shine: the Borexino Experiment

Track Classification: Fundamental Interactions and Stellar Evolution: Why and how the Sun and the Stars shine: the Borexino experiment