Geophysical Research Abstracts
Vol. 14, EGU2012-8431, 2012
EGU General Assembly 2012

Geoneutrinos and heat production in the Earth: constraints and implications (Robert Wilhelm Bunsen Medal Lecture)

W. McDonough

Dept of Geology, University of Maryland, College Park, MD, 20742, United States (mcdonoug@umd.edu)

The KamLAND and Borexino electron antineutrino (geoneutrino) counting experiments demonstrate that heat derived from the decay of Th and U contributes only about 40% (20±9 TW) of the Earth's total present-day power (46±3 TW) [we consider here only Th and U, since they produce the only detectable geoneutrinos]. Compositional models of the Earth based on geochemical and cosmochemical observations predict that the bulk silicate Earth has 8.2 x 10^{16} kg of U, Th/U of 3.9 and K/U of 1.4 x 10^{4}, with none of these heat producing elements in the metallic core, due to their pronounced chemical affinities for silicates and oxides. Consequently, these particle physics experiments are now establishing limits on acceptable compositional models for the Earth. Soon we will be able to distinguish between different models of the amount of planetary nuclear power inside the Earth, the power driving plate tectonics, the geodynamo and compositional models for the Earth's accretion.