Contribution ID: **24** Type: **not specified**

Importance of tighter constraints on U and Th abundances of the whole Earth by Geo-neutrino determinations

Thursday 7 January 2016 16:30 (30 minutes)

The Earth is differentiated and chemically heterogeneous planet. Chondrites, undifferentiated meteorites, have been used to estimate the composition of the Earth. Chondrites are similar in composition to the Sun except volatile elements. They have been considered to keep the composition of the building blocks of the Earth regarding refractory (not volatile) elements.
Because both parent and daughter elements of 147Sm-143Nd decay system are refractory and lithophile (distributed in silicate phase), it has been considered that 143Nd/144Nd isotope evolution of the silicate part of the Earth can be estimated by that of chondrites.
Short life radioactive isotope 146Sm decays to 142Nd, which constitutes another Sm-Nd decay system. The high precision of state of the art thermal ionization mass spectrometers has revealed that 142Nd/144Nd of terrestrial samples are slightly higher than those of chondrites, which suggests that the Earth has different Sm/Nd ratio (about 6% higher) from chondrites.
The different 142Nd/144Nd of terrestrial samples from chondrites has been explained by 1) that the building blocks of the Earth had different Sm/Nd ratio from chondrites, 2) that we have obtained no samples from the part with lower Sm/Nd than chondrites, 3) that the Earth lost a part with lower Sm/Nd than chondrites. The third candidate assumes that the surface layer, which was enriched in incompatible elements with low Sm/Nd ratio, in the early time of the Earth was abraded off by heavy bombardments of impactors. If the dissipation of the enriched layer to the space happened, it can be anticipated that the Earth lost about half of U and Th. In that case, the present composition of the Earth is no more chondritic. The second candidate, on the other hand, would predict that the abundances of U and Th are similar to that of chondrites.
It is hoped that tighter constraints on U and Th abundances of the whole Earth by Geo-neutrino determinations may solve the problem.

Author: NAKAI, Shun'ichi

Presenter: NAKAI, Shun'ichi

Session Classification: Recent progress of history, structure, chemical composition of deep Earth II