

U, Th concentrations of Japanese rocks for geo-neutrino modeling

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With the aim of determining the amount of radioactive elements contained in the earth's core and mantle with high precision, using the world's highest precision earth neutrino data obtained with KamLAND, we are conducting lithological modeling of the crust of the Japan arc using the seismic velocity structure data.

In order to estimate the uranium-thorium concentration of the Japanese Island Arc crust using the result of the lithological distribution obtained from the seismic velocity structure, We constructed the database of the chemical composition, especially the uranium and thorium concentrations and some major elements of the rocks of the Japanese arc. It consists of data of more than 10000 points, data of about 100 papers and reports. In addition, we carried out the sampling and chemical analysis of the lower crustal xenolith from Japan arc.

By using the uranium-thorium concentration of various rocks of the Japanese arc, it is possible to estimate the uranium-thorium concentration in the Japanese arc, and thus to more realistically estimate the neutrino flux from the crust is possible.

Variations of U-Th concentrations can be explained by the melt process such as melting and crystal differentiation, U enrichment due to alteration at the ocean floor, U loss at the ground surface. In addition, the average value of the composition was somewhat depleted than the estimation using the continental crust.

Using the compiled compositional data, we model the probability distribution to calculate chemical composition distribution and neutrino flux. Although in the previous geochemical studies, log-normal distribution or gaussian distribution has been widely used, the gamma distribution is newly used in this study. In addition to numerous advantages in mathematical usages, it also has the advantage of being able to adapt to both symmetric and asymmetric distributions, do not have negative values, and it can accurately reproduce the sample mean. In addition, the gamma distribution has been used to model the chemical processes such as protein concentration.

By using the probability density function for each rock type which is represented by the gamma distribution, it enables us to estimate the compositional distribution of the arc crust of the Japanese arc and thus the more realistic neutrino flux from the crust.

Keywords: Arc crust, Geo neutrino, radiogenic elements