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Geochemical modeling for no-bias balance calculation

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We report a stochastic modeling of 3-D compositional distribution within the Japan arc crust over three sequential talks by Takecuhi et al., Iizuka et al., and Enomoto et al. In this second talk, we present a new geochemical modeling for rock composition. For calculation of the neutrino flux using the mass of U and Th, conservation of the mean value between input data distribution and a modeled probability density function (PDF) is critical. We show that a gamma distribution model does not bias the mean value estimation and fits consistently well to both highly-skewed and close-to-normal distributions. This is not the case for the log-normal distribution model that has been widely used in geochemistry including geoneutrino modeling studies. In addition, we demonstrate a method to properly treat samples below analytical detection limits. By applying these new methods to newly collected geochemical datasets of rock samples from the Japan arc, rock composition PDFs were constructed for individual rock types. The results demonstrate the importance of proper geochemical modeling for no-bias neutrino flux calculation and further allow us to link the variable rock compositions to underlying geologic processes.

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