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Stochastic Crustal Model around KamLAND

To investigate global Earth models with geoneutrino observations, it is crucial to characterize the surrounding crustal composition, since uranium (U) and thorium (Th) in the local crust contribute nearly half of the observed flux. In previous work, we developed a fully stochastic method to describe the 3D distribution of U and Th [1], along with a new geochemical approach to mitigate biases arising from non-ideal rock samples [2]. However, due to unknown structural correlations in geology, we had to adopt the most conservative assumption, which resulted in large uncertainties in the predicted flux.

In this talk, we will review our stochastic framework, discuss the correlation problem in the available geochemical datasets, and present our ongoing efforts to reduce this uncertainty. One promising approach, the use of nuclear emulsion to visualize U/Th distributions in rock samples, will be detailed in a separate presentation.

[1] A. Takeuchi et al., Phys. Earth Planet. Inter. 288 (2019) 37-57

[2] S. Enomoto et al., in “Core-Mantle Co-Evolution”, ch. 2. (2013)

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