# Bayesian estimation with replica exchange Monte Carlo method and application to geochemical problems

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Geochemical data sets, such as major, trace and isotopic compositions, preserve precious information about various physical and chemical processes. For example, bulk compositions of igneous rocks directly reflect melting of original rocks, magma mixing and rock-fluid interaction in the earth's interior. However, it has been still difficult to extract physical and chemical processes quantitatively due to many unknown factors and insufficient quality of data sets. Recently, many sophisticated data-driven methodologies have been proposed to extract useful information from high-dimensional data sets in information sciences. In this presentation, we will introduce a data-driven analytical technique based on Bayesian estimation and replica exchange Monte Carlo (REMC) method, which is one of Markov chain Monte Carlo method, and its application to simultaneous estimation of melting ratios and a source mantle composition from MORB bulk compositions.

Keywords: data-driven approach, Bayesian estimation, MCMC method