READING MELTING PARAMETERS FROM RARE EARTH AND HIGH-FIELD STRENGTH ELEMENT ABUNDANCES IN LUNAR PICRITIC GLASS MELTS: AN APPLICATION OF MARKOV CHAIN MONTE CARLO METHODS. B. Liu and Y. Liang, Department of Earth, Environmental and Planetary Sciences, Brown University, Providence RI 02912 (boda_liu@brown.edu).

Markov chain Monte Carlo (MCMC) simulation is a powerful statistical method in solving inverse problems that arise from a wide range of applications. In lunar and planetary sciences applications of MCMC simulations are primarily in the field of planetary geophysics. The purpose of this study is to use MCMC method to study geochemical inverse problems related to trace element fractionation during lunar mantle melting. MCMC method has several advantages over least squares methods in deciphering melting processes from trace element abundances in melting products. Here we use MCMC method to invert for extent of melting, fraction of melt present during melting, and extent of chemical disequilibrium between the melt and residual solid from REE and high-field strength element (HFSE) abundances in primitive lunar picritic glass melts. We consider a number of melting models that are formulated on the basis of the physics of melt segregation and the chemistry of melt-rock interaction. We consider both diffuse porous flow and channelized melt migration. We solve the governing equations numerically in a chain of melting models according to the Metropolis-Hastings algorithm. The probability distribution of inverted melting parameters depends on assumptions of the physical model, knowledge of mantle mineralogy and source composition, and constraints from the REE and HFSE data. Results from MCMC inversion are robust with and provide more reliable uncertainty estimates than results based on nonlinear least squares inversion. We will show that mantle source composition or heterogeneity is required to explain the observed REE and HFSE data.