

Forward modeling and inversion analysis for geochemical-process extraction: an application to chemical compositions of surface soils in Ibaraki Prefecture, Japan

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This study aims to propose a framework based on forward modeling and inversion analysis to extract geochemical processes using matrix decomposition. Matrix decomposition methods, such as principal component analysis (PCA) and independent component analysis (ICA), can be used to extract processes from geochemical datasets across a wide range of geoscientific fields. However, it has still been only a heuristic approach; moreover, it is not well-understood whether the extracted basis vectors correspond to geological processes. In this study, in order to verify the effectiveness of the inversion analysis using matrix decomposition, we conducted synthetic-data analyses using artificial soil composition data that were generated by a simple forward model that simulates geochemical weathering. We also conducted a real-data analysis using soil composition data of ground surface in Ibaraki Prefecture, Japan. In the presentation, we will discuss geochemical processes for extracted basis vectors and try to quantitatively interpret them.

Keywords: matrix decomposition, data-driven, soil