Multivariate processing of controlled source (CSEM) and transient (TDEM) electromagnetic data

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Multivariate techniques proved to be a superior tool when dealing with simultaneous multichannel data. Previously we developed and validated a scheme (MsDEMPCA, for Missing data EM Principal Components Analysis) to process large synoptic magnetotelluric arrays. Here we focus on applications of MsDEMPCA to controlled source (CSEM) and transient electromagnetic (TDEM) data with a goal to demonstrate how the MV approach can clarify signal and noise characteristics, improve estimates of transfer functions and decay curves. As discussed in Smirnov and Egbert (2012) one can apply MV statistical methods to EM data having missing data to reduce bias, improve signal- to-noise ratios, and provide better control over coherent noise contamination.

New approach was used to process Long-offset Transient Electromagnetic (LOTEM) data set, which consisted of several sites recorded simultaneously, having five channels each (two electric components and three magnetic components). The data are courtesy of KMS Technologies. Combined with robust stacking procedure we were able to derive more stable decay curves.