

From Coast to Coast: Ongoing Magnetotelluric Data Processing for the National-Scale Survey, USMTArray-CONUS South

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SUMMARY

The U.S. National Science Foundation's (NSF's) EarthScope program (2006-2018) produced many valuable geophysical datasets, including a large-scale, long-period magnetotelluric transportable array (USMTArray). Through EarthScope, approximately two-thirds of the conterminous U.S. was covered at a quasi-regular 70-km station spacing. NASA funded the project through 2019, and since June 2020, Oregon State University, cooperatively with the U.S. Geological Survey, has been completing the southern conterminous U.S., marching stations from California to Florida. Disseminating an ongoing, national-scale survey to the public is a novel undertaking in the magnetotelluric community, as it requires continuous processing of magnetotelluric array data, quality control for the raw time series, and maintaining an updated database of transfer functions. Transfer functions are used to estimate space weather power grid hazards; thus, timely processing is a national priority.

Here, we present the latest workflow for the ongoing real-time magnetotelluric data processing and archiving. We discuss processing and automation improvements to the workflow, including approaches to expand the range of long-period data into the "dead band." Weekly feedback is given to field crews about instrumentation issues as well as recommendations to continue data collection or to extract quality stations. We discuss the variety of field issues encountered, from cultural noise in California, to flooding issues in Florida. In addition, we focus on unidirectional noise in transfer functions in Florida and other gulf coast stations that may have oceanographic origins. The processing workflow for the USMTArray data has been expanded to work for wideband data, building upon the original USMTArray long-period workflow. We have applied the wideband processing workflow to a diversity of datasets and geologic settings including Yellowstone (Wyoming), Katmai (Alaska), and the Stillwater Complex (Montana). Finally, transfer functions are openly available and can be queried by survey (USMTArray) at the EM Transfer Function Product Query on IRIS SPUD (<http://ds.iris.edu/spud/emtf>).

Keywords: magnetotelluric, transfer functions, data processing, national-scale survey, archiving
