Aurora: An open source magnetotelluric data processing package in Python linking MTH5 to EMTF XML

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SUMMARY

Aurora is a software package that calculates robust estimates of electromagnetic transfer functions (EMTF) from magnetotelluric time series data. It is being developed for two primary purposes: first, to streamline the generation of high-quality, exchangeable EMTFs for archiving at the IRIS data center and second, to provide an open-source software package to the EM community that has been benchmarked against the legacy Egbert's EMTF codes. Aurora is a Python representation of Egbert's latest EMTF Matlab code that is designed to interface with the self-descriptive MTH5 data structure for magnetotelluric time series. We use Numpy, Pandas, Scipy, and Xarray as package dependencies. Comprehensive tracking of data provenance is provided within the pipeline via Xarray. Data products are outfitted with MTH5 metadata which can be converted to FDSN StationXML for surveys and EMTF XML for transfer function archiving. The Aurora software package, which includes worked example datasets, will be released via both PyPI and Conda-Forge in the autumn of 2022. We present an overview of these codes and outline a path forward over the following 1-2 years. The longer term vision includes capability for time and frequency domain data cleaning, data visualization, and data QC as well as novel array deployment geometries and controlled source data processing. We invite members of the community to join us in using these codes and collaborating on their future development.

Keywords: Magnetotellurics, Processing, Open Source, Python, Transfer Function