

Preliminary results from the Magnetotelluric Imaging of the Salton Trough (MIST) experiment

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SUMMARY

The Salton Trough in Southern California provides the ideal area to study the influence of different plate tectonic margins within a confined region. The Salton Trough marks the southern end of the San Andreas Fault System (SSAF), where three types of tectonic margins converge: the SSAF transform plate boundary, localized incipient rifting, and the remnant subduction of the Farallon slab. This confluence of tectonic margins has implications for a variety of geohazards, such as major earthquakes and possible volcanic threats throughout southern California, while also making geothermal power generation feasible. Previous geophysical studies have applied seismic and geodetic methods to constrain the subsurface in this area, but a dense regional scale MT survey is lacking.

Here we aim to use the magnetotelluric (MT) method to constrain the subsurface electrical conductivity structure and understand both the deeper lithospheric interactions and shallow faulting processes happening at these plate boundaries. We deployed 61 land MT stations in March 2024, using both broadband and long-period instruments to make an initial map of the electrical conductivity around the entire Salton Trough. We processed the data using the open-source Aurora package to make initial data quality and dimensionality assessments. Overall, the response functions are high quality between 1000 Hz and 5000 s at most sites. We plan to collect several more MT sites next year to expand our station coverage, focusing on dense profile deployments across the San Andreas fault as well as lake-bottom deployments covering the Salton Sea.

Keywords: magnetotelluric, salton trough, fault zone, lithosphere-asthenosphere boundary
