

Continental core and margin conductivity structure: Cascadia to Great Plains, MCR and Keewenaw hot spot

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The magnetotelluric component of the EarthScope USArray Transportable Array has revealed geologic structures in both active and ancient tectonic settings. The initial data collection footprint was deployed between 2006 and 2011 to cover the Northwestern US, leading to publications focusing on the Cascadia subduction zone and the Snake River Plain/Yellowstone system. The second footprint, begun in 2011, includes much older parts of North America's geologic history, covering the area between Minnesota and Tennessee, and is now extending into Georgia and the Carolinas for the 2015 field season.

Recent modeling of the second footprint has revealed subsurface features surrounding the midcontinent rift and ancient zones of accretion from the assembly of early North America. An additional interesting result is remnants of the Keweenaw mantle plume visible at depths of 50 to 200 km beneath the southwest end of Lake Superior. The plume is believed to have initiated the Midcontinent Rift 1.1 Ga while erupting flood basalts now exposed on the shore of Lake Superior. As new data are added as this footprint expands into Eastern North America, features of the Grenville Orogeny will become visible.

This study is unique in its immense scale and it arrives at a time when 3D magnetotellurics is a rapidly developing area of geophysics. This combination of rapid technical progress and a huge dataset to work with offers us an opportunity to reevaluate the assumptions that have been made in the past, especially with regard to model parameterization, survey design, and data quality analysis. It has also highlighted how uncommon it is for 2D modeling to be accurate on a very large scale.

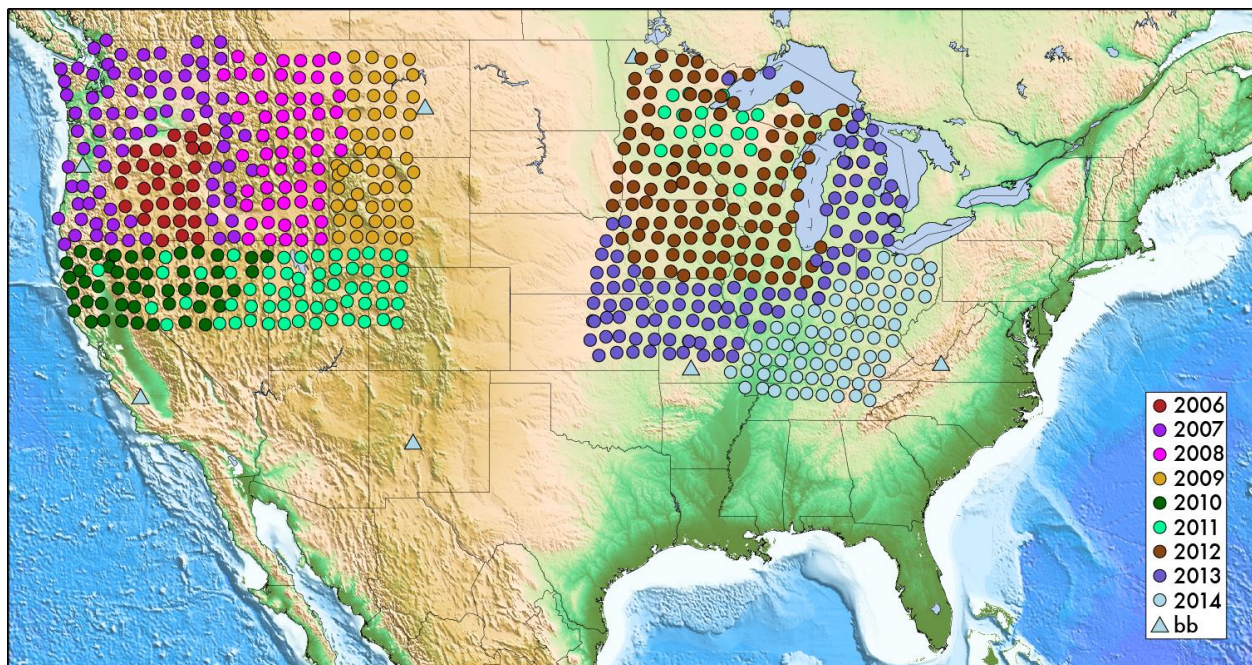


Figure 1. Annual progress of the Magnetotelluric EarthScope USArray Transportable Array up to the 2014 field season. The ongoing field work is continuing into the southeastern US in 2015.