In addition to the MT TA station grid, the NSF EarthScope and related programs such as GeoPRISMS have supported higher-resolution long-period and wideband MT array installations to obtain additional information in areas where geophysical targets of interest have been identified by analysis of the MT TA array data. Specific projects include the largest amphibious (seafloor and land-based) MT array ever undertaken, along the Oregon continental margin (the MOCHA Project); a very high resolution wideband MT and active/passive seismic project in the southern Washington Cascade volcanic arc designed to image the sources of melt beneath the major volcanoes (the iMUSH Project); detailed wideband MT studies of Yellowstone supervolcano; and a novel MT study in the interior of Alaska combining a large synchronously operating array of MT instruments operating underneath the footprint of an ionospheric imaging incoherent scattering radar system.

Some of the key findings of analysis of the MT TA data, as well as of the more focused studies just indicated will be presented. These studies have revealed the impact of previously undiscovered deep crustal igneous intrusive bodies (batholiths) on the migration of deep melt and the location of surface volcanic features in the Cascade volcanic arc, as well as the relationship between metasedimentary bands left over from crustal accretion events and the path of melt migration and enhanced seismicity. Images of the electrical conductivity variations immediately above the subducting Juan de Fuca-Gorda plates have been used to infer the fluid content at the plate-mantle wedge interface, and studies are underway to understand the relationship between lubrication of the boundary by such fluids and plate locking in this great megathrust seismic zone. MT data have shown evidence for the trace of an ancient (1.1 Ga) deep mantle plume as the source of melt during the incipient continental rifting event that formed the Mid-Continent Rift system, and which is linked to the formation of economically important banded iron formations. The MT TA data set, as well as recently acquired wideband MT data are more clearly illuminating the relationship between deep crustal melt sources that shallow up from the Snake River Plain and serve as the source of melt beneath Yellowstone caldera, and the well-known surface hydrothermal features that are located there. Important new information on the evolution of eastern North America has also been revealed by analysis of MT TA data.

In addition to important results of direct relevance to solid Earth geoscience questions, EarthScope MT TA data have become an important element of research efforts to understand and potentially to mitigate damage to the electric power grid due to the effects of geomagnetically induced currents arising from space weather events, such as the 1989 Hydro Quebec wide-area power failure, or the mid-19th century Carrington Event that badly impacted the global telegraph network. Researchers around the world have made use of MT TA data to study and more accurately model the ground level electric fields that result from geomagnetic disturbances, and how these fields couple into the high-voltage power transmission network. While not originally envisioned as a component of the EarthScope Science Plan, this recent application of EarthScope MT data has perhaps some of the most immediate and high-impact relevance to the practical needs of society. This illustrates that free and open availability of data such as the MT TA timeseries and impedance data may have unanticipated benefits to a wider audience than may have originally been anticipated, thus multiplying the value of efforts such as this to improve the lives of all members of society, as well as to serve the purposes of fundamental scientific inquiry.