

Plenary 4: Advances in understanding and forecasting hazards (Bartlow, Elliot)

The afternoon of the second day of the meeting was focused on hazards and how Earthscope tools such as SAFOD, PBO, and USArray and the increasing availability of real-time data have advanced our understanding of earthquake, volcanic, and other natural hazards and have the potential to further transform hazard analysis in the future.

Paul Bedrosian of the USGS discussed how Earthscope magnetotellurics can improve models of electric and magnetic fields during solar storms. Coronal mass ejections can cause geomagnetic storms that induce currents in power grids and pipelines, which can result in failures in power systems and increased likelihoods of pipeline erosion. Back in the 1850s, a large storm led to visible auroras down to the equator. In 1989, a geomagnetic storm knocked out the Hydro Quebec power system. To address these problems, there is now a federal mandate to develop reliability standards for models to mitigate the effect of future geomagnetically induced currents. Currently, a major problem with reliability of the models concerns the fact that while the Earth has a complex conductivity structure in three dimensions with major conductivity boundaries such as coastlines, 1-D resistivity models are used piecemeal by region. While based on data and valuable, these 1-D models imply that there will be a uniform response of the electric field to an incoming magnetic field, which is not true as the electric field response can be highly variable. New data from Earthscope arrays have captured some of this variability, such as differences in both direction of amplitude of electric fields in the US midwest observed during storms. Continuing work is being done to develop 3-D conductivity models that can be used to make forecasts of electric field forecasts for magnetic field event scenarios.

Moving to seismic hazards, Katie Keranen of Cornell University talked about induced seismicity.