3D electrical image of the Pacific Northwest: results from USArray transportable array magnetotelluric data

Prasanta Patro[1]; Gary Egbert[2]

[1] National Geophysical Research Institute
Earthquake Research Institute; [2] Oregon State University, USA

Long period magnetotelluric (MT) data in a series of arrays across the United States is being acquired by IRIS in combination with the USArray component of EarthScope. Initial deployments in 2006 and 2007 acquired 110 sites covering Washington and Oregon, and extending into eastern Idaho. In the 2008 field campaign 60 sites were occupied covering rest of the Idaho and NW of Montana. The MT sites, distributed with the same nominal spacing as the seismic transportable array (˜75 km), produced data in the period range 10-10,000s of very good to excellent quality. We present the results from processing and 3D inversion of the dataset from 2006 to 2007. The most striking and robust features revealed by the inversion are extensive areas of high conductivity in the lower crust beneath the Northwest Basin and Range, and beneath the Cascade mountains, contrasting with very resistive crust in Siletzia (basement rocks in the Coast ranges, Willamette Valley and Puget Lowlands) and the Columbia Embayment. Significant variations in upper mantle conductivity are also revealed by the inversions, with the most conductive mantle beneath the Northeastern part of the array, and the most resistive corresponding to subducting oceanic mantle. Comparison with interpretations from previous 2D MT transects shows reasonable agreement at the large scales resolved by the USArray MT data. Resolution of fine details, especially in the upper crust, is clearly limited, both by the wide station spacing, and the lack of high frequency data. In spite of the wide site spacing and limited control over near-surface distorting structures, a very sensible and coherent large scale picture of regional scale conductivity variations have resulted from the 3D inversion.