HIGH RESOLUTION SURFACE WAVE TOMOGRAPHY FROM AMBIENT SEISMIC NOISE

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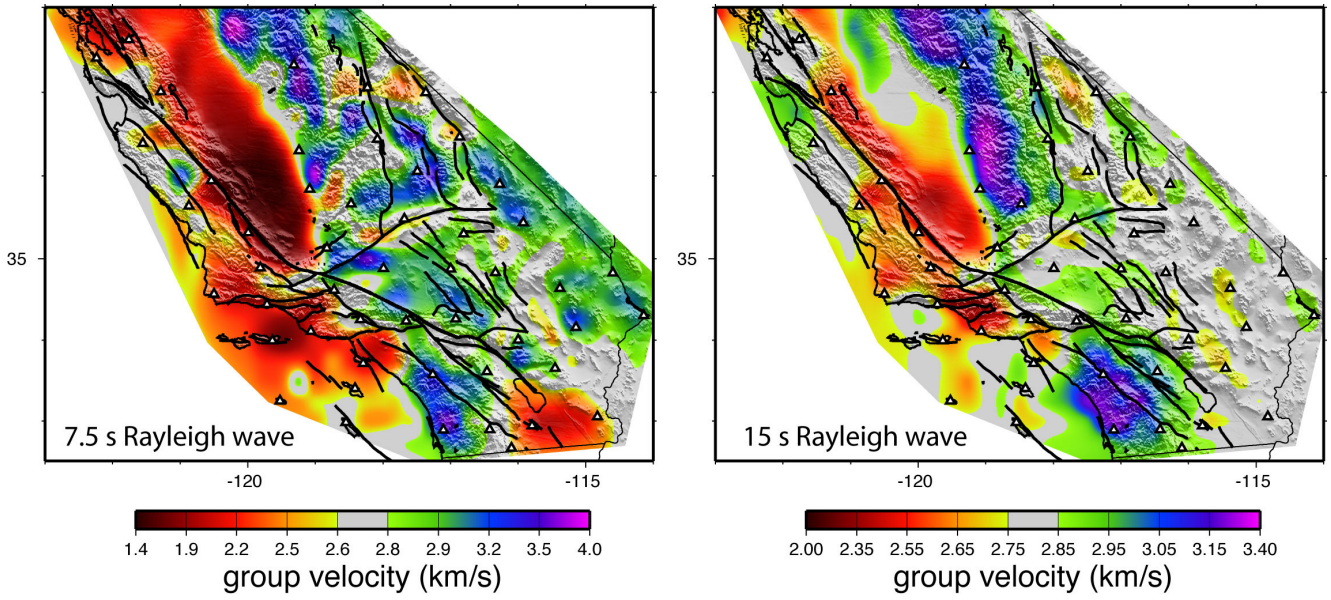
Rayleigh wave Green functions, extracted by cross-correlating long sequences of ambient seismic noise (Shapiro and Campillo, 2004) normally discarded as part of traditional seismic data processing, contain information about the structure of the shallow and middle crust. Cross-correlating one month of ambient seismic noise recorded at USArray stations in California yields hundreds of short period (6 – 20 s) surface-wave group-speed measurements on inter-station paths. These measurements are used to construct dispersion maps of the principal geological units of California (Figure 1), with low-speed anomalies corresponding to the main sedimentary basins and high-speed anomalies corresponding to the igneous cores of the major mountain ranges (Shapiro et al., 2005). The use of ambient seismic noise as the source for seismic observations addresses several shortcomings of traditional surface wave methods. The method is particularly advantageous in the context of temporary seismic arrays such as the Transportable Array component of USArray or PASSCAL experiments because it can return useful information without earthquakes. The short period dispersion maps provide homogeneous information about shear wave speeds in the crust which are hard to acquire with traditional methods. The new method enhances resolution because measurements are made between regularly spaced receivers, which may lie much closer to one another than to earthquakes.

Shapiro, N.M. and M. Campillo, Emergence of broadband Rayleigh waves from correlations of the ambient seismic noise, Geophys. Res. Lett., 31, L07614, doi:10.1029/2004GL019491, 2004.

Shapiro, N.M, M. Campillo, L. Stehly, and M.H. Ritzwoller, High resolution surface wave tomography from ambient seismic noise, Science, 307, 1615-1618, 2005.



Group speed maps constructed by cross-correlating 30 days of ambient noise between USArray stations in California. Black solid lines show known active faults. White triangles show the locations of USArray stations used in this study.