STUDIES OF SEISMIC ARRAY DATA IN THE SOUTHERN PERU SUBDUCTION ZONE

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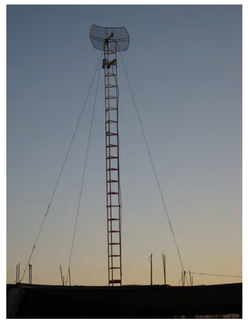
ABSTRACT

An array of fifty broadband seismic stations was installed in southern Peru between Mollendo and Juliaca. The subduction zone in southern Peru is very active seismically and of interest because it is located in a transition region between areas of differing slab dip angles. Teleseismic events recorded by the Peruvian array can be used to construct receiver functions which provide information about the structure beneath stations. The receiver function method can provide depths of discontinuities such as the Moho or slab as well as velocity information. Such information could be useful in constraining physical subduction parameters which may be relevant for models of tectonic evolution or causes of shallow subduction in Peru. A future seismic line will be installed perpendicular to the current array between the cities of Cusco and Juliaca.

INSTALLATION

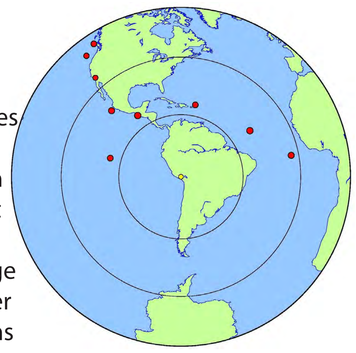


Instrumentation installed at local residences or schools is powered by electricity from the site or solar panels.

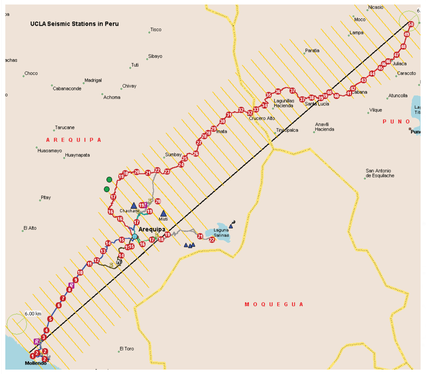
Data is transferred via YAGIs or parabolic antennas to be uploaded to internet

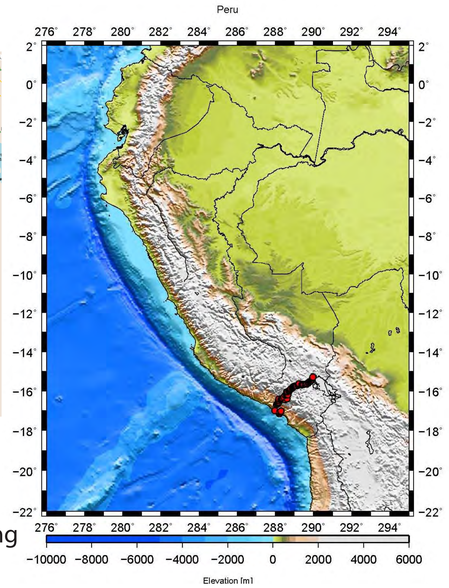
Teleseismic Events

Recent events 30 to 90 degrees distant from Peru with magnitudes 5.4 or larger. An analysis using the receiver function method can provide better information about the structure beneath Peru with the use of data from multiple large teleseismic events (usually greater than M6.5) at a variety of azimuths



LOCATION

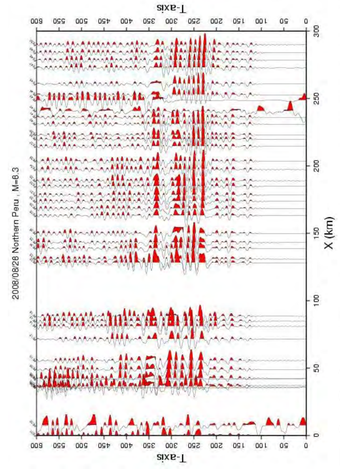




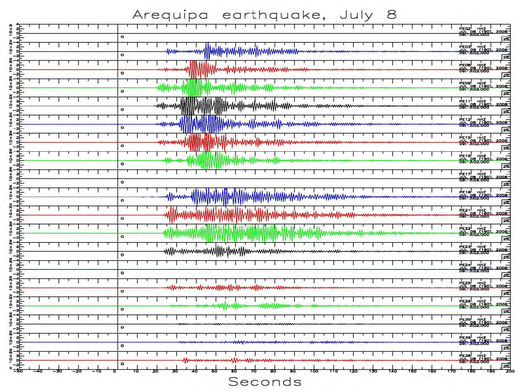
Above: Seismic array of 50 broadband seismic stations installed with 6 km spacing.
Right: Topography map of Peru showing array location in red

PERU EVENTS

Northern Peru

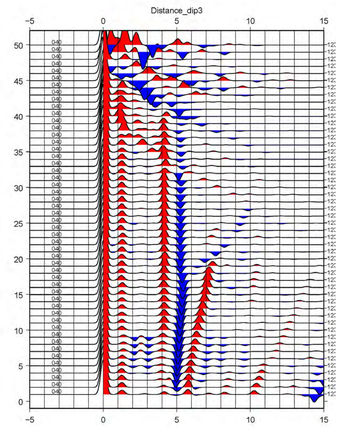


Arequipa

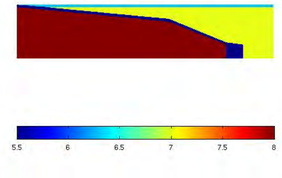


Arequipa: July 8, 2008, Mag. 6.2
Occurred during the installation process very close to array.
Northern Peru: August 26, 2008, Mag. 6.3

FINITE DIFFERENCE SIMULATIONS

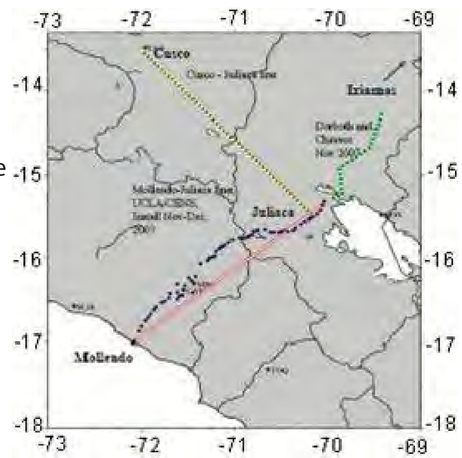


FD simulations create synthetic receiver functions based on simple 2D velocity models. These synthetics can then be compared actual receiver functions in order to evaluate model improvements.

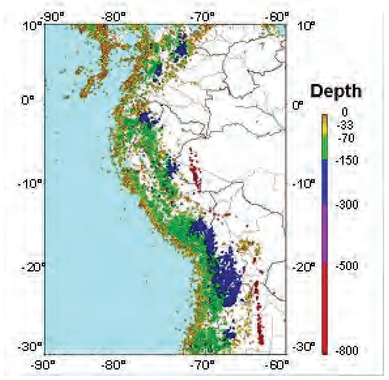


FUTURE ARRAYS

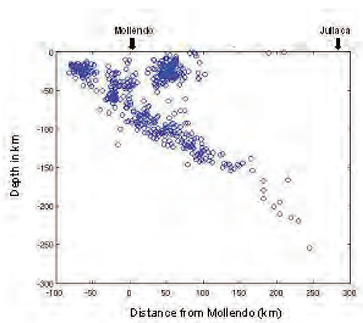
Another seismic line is planned perpendicular to the current line. The new line will run between Cusco and Juliaca parallel to the trench and will provide information about the transition from shallow to steeper subduction



SEISMICITY



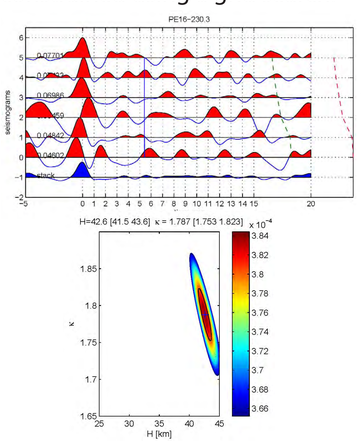
Seismicity of Peru from NEIC earthquake catalog. The earthquakes increase with depth inland from the coast. The earthquakes give a rough location of the subducting Nazca plate. The plate subducts shallowly (less than 10 degrees) in Central and Northern Peru and more steeply (close to 30 degrees) in Southern Peru

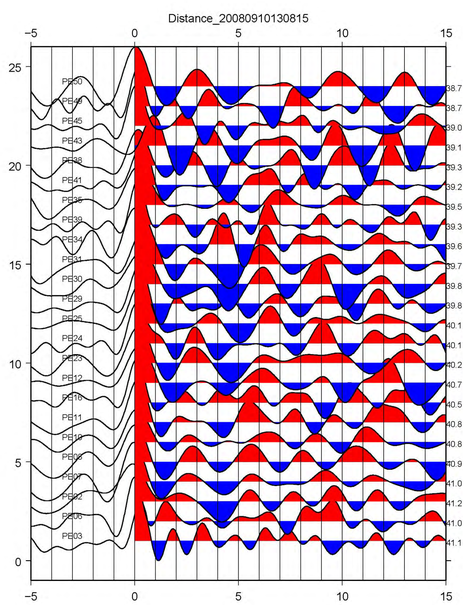


Cross section of seismicity along the seismic array line between Mollendo (on the coast) and Juliaca (near Lake Titicaca). The earthquakes show that the slab is dipping at about 30 degrees in this region

RECEIVER FUNCTIONS

P to S conversions of teleseismic arrivals provide information about depths of discontinuities such as the Moho and slab. The stacking of receiver functions allows the depth and Vp/Vs ratio to be constrained using a grid search.





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