# Surface Wave Tomography of Mexico from Ambient Seismic Noise

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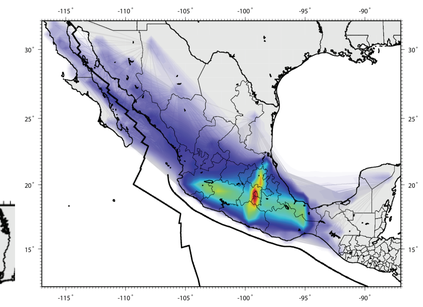
## Abstract

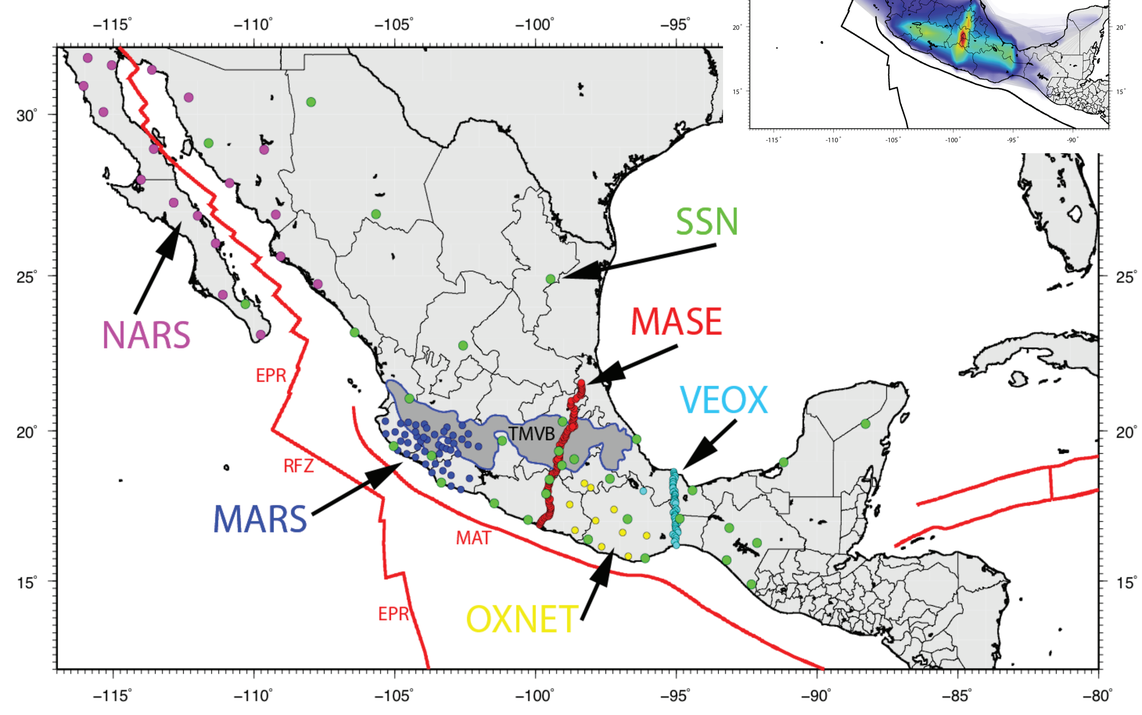
Ambient noise correlations among several local and regional networks in Mexico are presented. The results show strong arrivals in the primary and secondary microseism bands. The correlations provide a method of joining detailed local studies into a larger regional map. The dense arrays, such as the MASE array in central Mexico often show coherent scattering that is evidence of major lateral variations in the crust. The travel times shows the response of the local fast anomaly associated with the Popocatepetl Volcano, near Mexico City. There is also a significant lateral change associated with the Trans-Mexican Volcanic Belt.

## Location

Colored circles are temporary broadband stations with MASE, MARS, VEOX, and OXNET denoting temporary deployments during 2005-present. The TMVB is the Trans-Mexican Volcanic Belt, EPR is the East-Pacific Rise, MAT is the Middle America Trench.

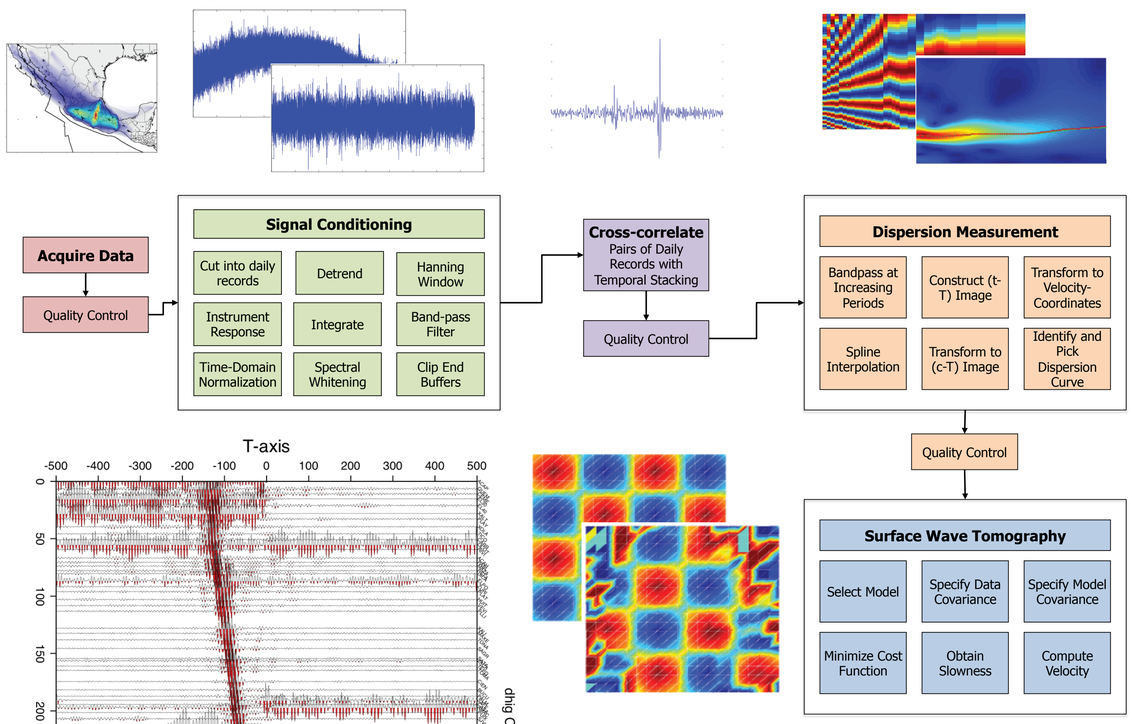
The right panel shows the coverage that is obtainable by cross-correlating between different stations.

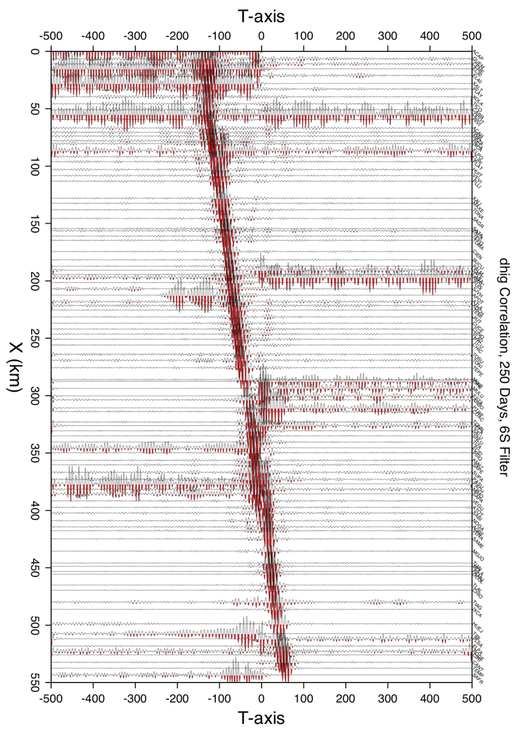





## Cross-Correlation and Tomography Methodology

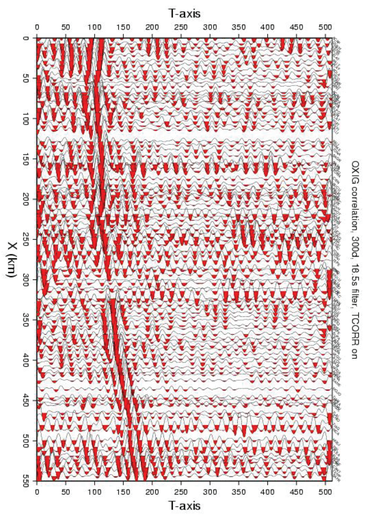
Cross-correlation methodology is derived from the signal conditioning procedure outlined by Bensen et al. (2007), the dispersion measurement method presented by Yao et al. (2006) and 2D surface wave tomography described by Tarantola and Nercessian (1984).

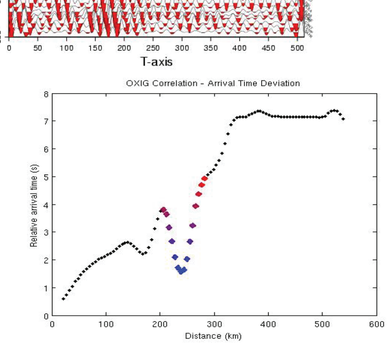



Shown to the left are results for SSN station DHIG cross-correlated against the entire MASE line. The change in slope across X = 400 highlights the velocity change across the top of the TMVB, with a faster velocity north of the TMVB (bottom of plot) and a slower velocity inside the TMVB (top of plot).

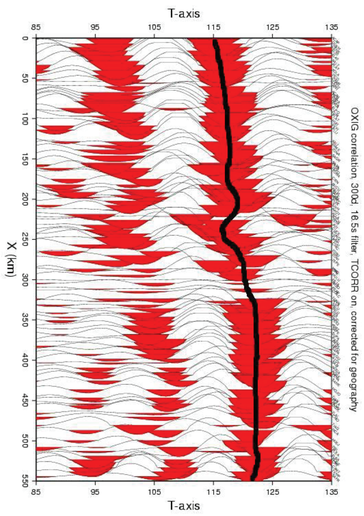
## Arrival Time Deviation and Popocatepetl Volcano




To the left are original arrival times for OXNET station OXIG correlated to MASE.

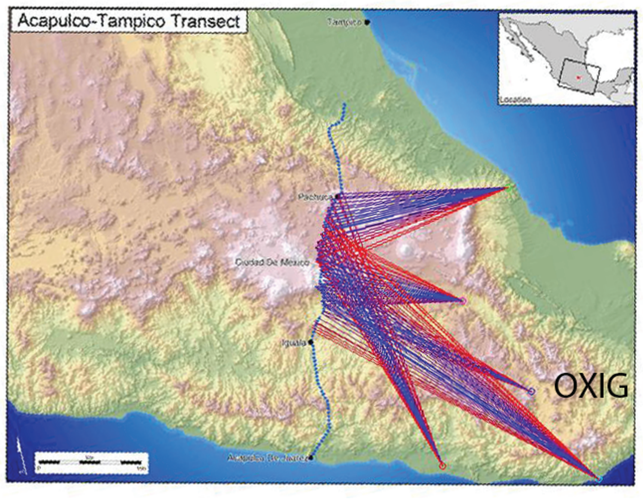
Normal moveout is used to adjust the arrival time for distance, assuming a velocity of 3.5 km/s.




Adjusted arrival times are shown above (right).

The deviation in adjusted arrival times is shown to the left.

The fan map to the right displays deviations in travel time with blue portryaing shorter travel time, red portraying longer travel time. This shows the response of the local fast anomaly associated with the Popocatepetl Volcano.




## References

Bensen, G.D., Ritzwoller, M.H., Barmin, M.P., Levshin, A.L, Lin, F., Moschetti, M.P., Shapiro, N.M., and Y. Yang (2007), Processing seismic ambient noise data to obtain reliable broad-band surface wave dispersion measurements, Geophys. J. Int.

Yao, H., van der Hilst, R.D., and M.V. de Hoop (2006), Surface-wave array tomography in SE Tibet from ambient seismic noise and two-station analysis - I. Phase velocity maps, Geophys. J. Int 166, pp. 732-744.

Tarantola, A., and A. Nercessian (1984), Three-dimensional inversion without blocks, Geophys. J. R. astr. Soc., 76, pp. 299-306.