THE ALBACORE OBS ARRAY AND A 3D SEISMIC VELOCITY MODEL OFFSHORE SOUTHERN CALIFORNIA

D.C. Bowden, M. Kohler, V. C. Tsai (California Institute of Technology; dbowden@caltech.edu)
D. S. Weeraratne (California State University, Northridge)

Abstract
The Pacific-North America plate boundary in Southern California extends far west of the coastline, and a temporary ocean bottom seismometer (OBS) array, ALBACORE, spanned the western side of the plate boundary in 2010 and 2011. Here, velocities are modeled through stacked cross correlations of ambient noise data. Twelve months of continuous data were used from 22 OBS stations and 30 coastal and island Southern California Seismic Network stations. Particular attention has been paid to improving signal-to-noise ratios in the noise correlations with OBS stations by removing the effects of instrument drift and infragravity waves. Different applications of preprocessing techniques allow us to distinguish the fundamental and first higher order Rayleigh modes, especially in deep water OBS pairs where the water layer dominates crustal sensitivity of the fundamental mode. Standard time domain and frequency domain methods are used to examine surface wave dispersion curves for group and phase velocities between 5 and 50 second periods, and these are inverted for 3D velocity structure. The results define the transition in three dimensions from continental lithospheric structure in the near-shore region to oceanic structure west of the continental borderland. While the most prominent features of the model relate to thinning of the crust, the transition in three dimensions from continental lithosphere to oceanic structure west of the continental borderland and along the coast from the Los Angeles Basin to the Peninsula Ranges. The velocity model will help describe the region's tectonic history, as well as provide new constraints for determination of the tectonic history of the region.

ALBACORE (Asthenoospheric and Lithospheric Broadband Architecture from the California Offshore Region Experiment) OBS Array

- 12-month passive seismic exp; Aug 2010-Aug 2011
- 22 OBS stations, with differential pressure gauges & 10 short-period (with high frequency hydrophones) OBS
- Adjacent to Southern California Seismic Network (SCSN) stations
- Figure shows station pairs used in study, including island and coastal SCSN broadband stations

Tectonic Setting and Magnetics

- 2D Models at each period
Dispersion measurements from all available station pairs for a given period are inverted for a 2-D map at each period, as in Barmin et al (PAGP 2001). We use a linear inversion for model deviation from stiffness, simple gaussian size and smoothing, weighted by data covariance.

- Invert 1D model beneath each gridpoint
Dispersion curves at each gridpoint are collected and inverted, with scripts from Computer Programs in Seismology, by Bob Herrmann.

- Cross Sections
Averaged models, as examples

Conclusions / next steps
- In ambient noise pre-processing, the quantitative significance of the wave-loading correction and tilt correction varies from station to station, and emphasizes differences between Fundamental Mode and First Mode observations. The First Mode is critical for inversion in the region.
- Although the Paltott Experiment marks the transition between Oceanic and Continental Lithosphere, the boundary is diffuse and complicated at depth. The Inner Borderlands have experienced significant tectonic thinning, and generally, variations in the model reflect the complex tectonic history of the region.
- Combining the ambient noise surface wave data with other datasets (receiver functions, ROOGG 2015) may further constrain the model.

Support for research was provided by the NSF OCE-ASTG and USGS NEHRP programs.
- In邀请 the participation with instruments and logistical support of the U.S. National Ocean Bottom Seismic Instrumentation Pool (OBSIP)
- Deployment and recovery cruises were made possible with the equipment and logistical support of the University-National Oceanographic Laboratory System (UNOLS) vessel fleet and staff support, and Scripps Institution of Oceanography.
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Semiologic Laboratory
California Institute of Technology

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- Inversion for a 3-D model
- Tilt and Wave Loading Correction
- Processing the Noise
- Ocean-Ocean
- Borderland-Borderland
- Borderland-Land
- Predicted from Model
- Inverted Model
- Starting Model
- Inverted Model
- Predicted from Model
- Starting Model

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