Abstract.

Using the data from eight ocean-bottom seismometers, part of the 12-month-long deployment of the Sea of Cortez Ocean Bottom Array (SOOBA) seismic experiment, and the data from six onshore seismometers, part of the NARS-NPS experiment, we have used ambient seismic noise to estimate the phase and group velocity of surface waves propagating through the crust and the upper mantle beneath the Gulf of California. We cross-correlate the continuous data from 91 station pairs in 6-hour time windows and stack it. As inter-station distance decreases, the coherence, or the similarity of the noise recorded between each station pair and the signal-to-noise ratio increases. The cross-correlations were most successful as measured by high signal-to-noise ratios for stations 50 km to 400 km apart. We then used two methods to determine the surface-wave velocity. We found the phase velocity using a spectral method based on Aki (1987) original expression for the cross-correlation of stochastic surface waves. Using an independent-techniques frequency-time analysis, we also estimated group velocity, from which we plan to extract the phase velocity. We inverted the group velocity and created maps at a number of different frequencies.

Conclusions and Future Work

- The noise cross-correlations of our data were most successful for stations 50 km to 400 km apart.
- For several of the cross-correlation functions, the Aki spectral phaselocity analysis provided estimates that were reliable. This appears to be due to two factors: (1) very low signal strength in the long-period (17–200 Hz) band, and (2) high noise levels in the convolution function, especially for the longer inter-station distances.
- We conclude that the Aki spectral method works best when there is an inter-station distance of 50 km to 200 km and an intermediate to high SNR.
- The frequency-time technique complements our study as it works best with inter-station distances above 200 km and can work with a low SNR.
- As a future step, we will extract phase velocities from the group velocities that we obtained from the frequency-time technique. We will compute and combine the phase velocities obtained from the two different methods.

Deployment of an OBS in the Gulf of California. The seismometer is housed in the green sphere. Instrument sinks to seabed (1.3 km depth) due to its own weight. After recording for 1 year, the anchor (bottom plate) is released and instrument returns to surface, driven by buoyancy of glass spheres housed in the yellow case.