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Preliminary Seismic Velocity Structure Results from Ambient Noise and Teleseismic Tomography: Laguna del Maule, Chile

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Laguna del Maule Volcanic Field is a large, restless, rhyolitic system in the Southern Andes that is being heavily studied through several methods, including seismology, by a collaborative team of research institutions. A temporary array of 48 seismometers from OVDAS (the Southern Andean Volcano Observatory), PASSCAL (Portable Array Seismic Studies of the Continental Lithosphere), and the University of Wisconsin-Madison was used to collect the ~1.3 years worth of data for this preliminary study. Ambient noise tomography uses surface wave dispersion data obtained from noise correlation functions (NCFs) between pairs of seismic stations, with one of each pair acting as a virtual source, in order to image the velocity structure in 3-D. NCFs were computed for hour-long time windows, and the final NCFs were obtained with phase-weighted stacking. The Frequency-Time Analysis technique was then utilized to measure group velocity between station pairs. With the surface wave data from ambient noise, our small array aperture limits our modeling to the upper crust, so we employed teleseismic tomography to study deeper structures. For picking teleseismic arrivals, we tested two different correlation and stacking programs, which utilize adaptive stacking and multi-channel cross-correlation, to get relative arrival time data for a set of high quality events. Selected earthquakes were larger than magnitude 5 and between 30 and 95 degrees away from the center of the array. Stations that consistently show late arrivals may have a low velocity body beneath them, more clearly visualized via a 3-D tomographic model. Initial results from the two tomography methods indicate the presence of low-velocity zones at several depths. Better resolved velocity models will be developed as more data are acquired.