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Inferring Magmatic Activity via Ambient Noise Interferometry: Application at Laguna del Maule Volcanic System, Chile and Veniaminof Volcano, Alaska

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Ambient noise interferometry is an emerging geophysical technique that allows us to probe the subsurface of a volcanically active region and determine temporal changes in seismic velocity related to magmatic activity (e.g. preeruption inflation and coeruptive deflation of a volcanic edifice, lava dome collapse). Laguna del Maule is a large, rhyolitic volcanic system within the southern Andes. A decade-long period of rapid uplift likely reflects intrusion of new magma into a broad shallow reservoir of crystal-rich silicic mush. As part of a large interdisciplinary project, a temporary array of 48 broadband seismometers has been deployed across the 400 km2 central rhyolite field. Initial ambient noise interferometry findings, based on continuous waveforms recorded at four permanent seismic stations, reveal a large decrease in seismic velocity immediately preceding a number of long period events occurring in July, 2011. A second large decrease in seismic velocity is observed coincident with the arrival of the swarm of volcano-tectonic earthquakes that follows these long period events. Current work focuses on obtaining and analyzing changes in seismic velocity for the region using seismic data recorded on the currently deployed dense, temporary seismic array. Veniaminof volcano is one of the largest and most active volcanoes in the Aleutians. It is a stratovolcano located on the Alaska Peninsula and ~700 km SW of Anchorage, AK. We apply ambient noise interferometry to study recent eruptions in 2002, 2004, 2005 (two separate eruptions), 2006, 2008, 2009, and 2013. Preliminary analysis of eruptions between 2002 and 2006 show decreases in seismic velocity preceding the 2004 and 2005a eruptions while the remaining eruptions are absent of such a decrease in seismic velocity. Current work focuses on examining changes in seismic velocity related to the 2008, 2009, and 2013 eruptions at Veniaminof.