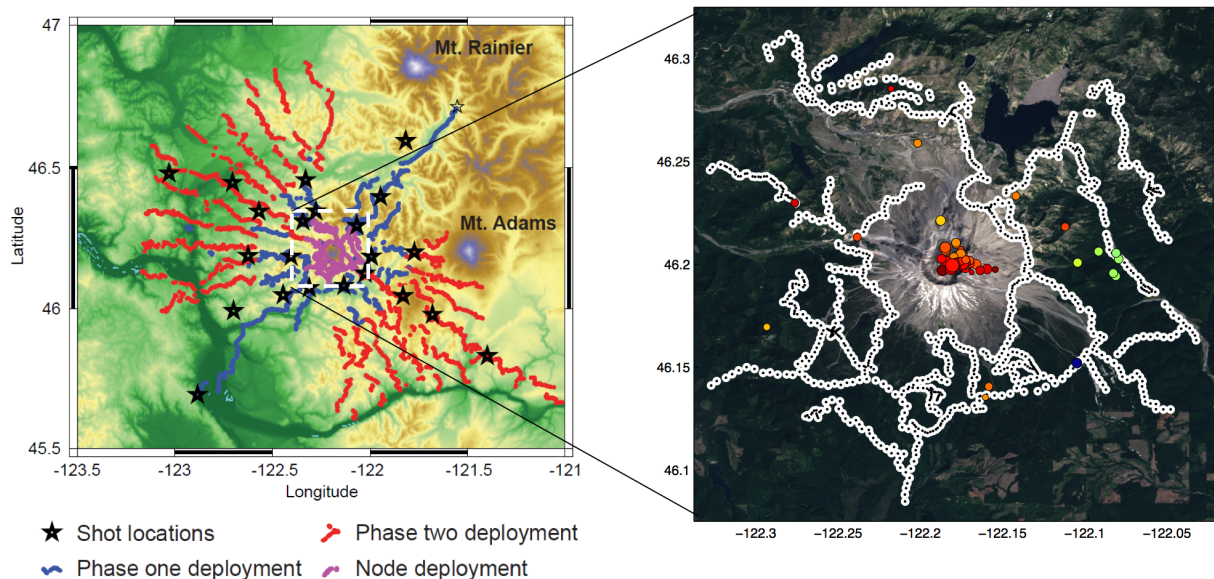


## Investigation of Mount St. Helens seismicity and volcanic arc structure with a hybrid natural and controlled source survey

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During Summer 2014 we deployed >900 cable-free seismographs within ~12 km of Mount St. Helens (MSH). Each seismograph contained a 10-Hz geophone and recorded continuously for two weeks with a sample rate of 250 Hz. The array temporarily provides a major increase in spatial coverage compared to the 9-station long-term monitoring array of the Pacific Northwest Seismic Network. We are investigating the utility of the geophone array for source and structural analyses using ambient noise, high-frequency microseismicity, long-period seismicity, and 23 explosion sources from the concurrent iMUSH active source project that deployed ~5000 geophones for shorter durations. Results emerging from the project include detection of ~2000 earthquakes using a combination of 3-D reverse time imaging [Hansen and Schmandt, 2015] and matched filter approaches, approximately daily occurrence of previously unknown low frequency earthquakes in the shallow crust beneath Mount St. Helens, and imaging of a sharp arc-parallel boundary in Moho reflectivity. The sharp transition in Moho reflectivity with high reflectivity east of MSH and weak-to-absent reflections west of MSH may identify the inboard limit of serpentinized forearc mantle and consequently a local constraint on sub-arc Moho temperature. The inferred presence of serpentinized uppermost mantle beneath and west of MSH combined with active source tomographic imaging of low velocities in the lower crust southeast of MSH [Kiser et al., in press] suggest that melt ascent into the base of crust is offset to the east, closer to the axis of the Cascades Arc.



**Array maps.** Left panel) Cumulative ~6000 geophones, with Texans recording in two phases. Right panel) Inset area with only two-week continuous recording Nodal seismographs, and a subset of detected earthquake location with red corresponding to <6 km depth and cooler colors for greater depths.