Mt. St. Helens seismicity observed with a 900-geophone array

Brandon Schmandt[1], Steven Hansen[1], Eric Kiser[2], Alan Levander[2]
1. University of New Mexico, 2. Rice University

Mt. St. Helens provides a natural laboratory for studying microseismicity due to the abundance of earthquakes resulting from tectonic and magmatic processes. An excellent opportunity is provided by the MSH nodal deployment, which recorded for two weeks in July 2014 and consisted of over 900 autonomous seismometers within 15 km of the summit crater. During that time, the PNSN permanent monitoring network detected 65 earthquakes within the array footprint, 45 of which were located directly beneath the summit at <10 km depth. The array temporarily increased spatial sampling of the wavefield in this area by roughly two orders-of-magnitude and thus offers the potential to significantly increase event detection. However, the scale of this dataset also presents a challenge to traditional data processing schemes that often require human intervention. Here, several semi-automated event detection algorithms are investigated for their efficacy including subarray beamforming and continuous reverse-time imaging (RTI), which is particularly beneficial because it simultaneously detects and locates events but is relatively computationally expensive. Initial efforts at detection with RTI resulted in a >15x increase in events relative to the network catalog. Preliminary results from ongoing structural seismology studies will also be presented including Moho imaging with PmP phases and Rayleigh wave phase velocity maps extracted from two weeks of ambient noise.