

GEOPHYSICAL SOCIETY OF ALASKA

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TITLE

Subsurface imaging using ambient noise seismic reflection analysis – a cost-effective exploration tool?

ABSTRACT

Ambient noise analysis has been used in the field of seismology to map Earth properties. One particular analysis technique, namely seismic interferometry, has gained popularity over the last decade or so. The basic concept involves retrieving seismic impulse response or Green's Function by cross-correlation of a diffuse wavefield. In other words, if one cross-correlates ambient noise signals (generated by earthquakes, ocean waves, and human activity) recorded at two locations, the resulting seismic waveform will be the response of the Earth as if one of the stations was an impulse source and the other a receiver. The process extracts coherent energy contained within the incoherent noise signals recorded for extended periods. These are assembled and processed to reveal subsurface structure.

The motivation for the research was to test and develop a cost-effective exploration tool that uses this technique for mineral and energy, specifically, geothermal exploration. The fact that there is no need for an active source like dynamite shots or large vibroseis trucks in order to generate signals provides an advantage in areas that are difficult to access. Moreover, active source seismology requires the site conditions to be quiet, which precludes its application in urban settings. Ambient noise seismic interferometry has the potential to overcome these barriers and a method for mapping geological features within the resource area. The presentation will present results from one such survey conducted across a fault zone in north-western Nevada.

PROFESSIONAL EXPERIENCE

Founder & Geophysicist, SubTerraSeis, Reno, Nevada, USA, November 2017 – present.

Visiting Assistant Research Professor, Seismological Laboratory, University of Nevada, Reno; January 1997-present: Responsibilities include working as a research associate as well as graduate student advisor and dissertation committee member.

Co-Founder, Vice-President & Chief Scientist, Optim, Reno, Nevada, USA; December 1997 – September 2017: Primary responsibilities included coordination of geophysical research, commercial software development and seismic data processing. Additional responsibilities included duties of Secretary, Treasurer, and Financial Officer of Corporation.

Senior Staff Geophysicist, William Lettis and Associates (WLA), Walnut Creek, California; January 1997-July 1998, July 1998 - October 1998 (part time): Responsibilities included processing of seismic reflection and refraction data, performing velocity optimization and pre-stack Kirchhoff migration to map subsurface structures in areas that have undergone complex tectonic processes.