

Ambient noise monitoring in a region of disposal-induced seismicity, Central Alberta

J. Rojas-Parra, D. Eaton, and R. Salvage
Dept. of Geoscience, Univ. of Calgary, Calgary, AB, T2N 1N4, Canada.
jesus.parra@ucalgary.ca

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Abstract

Ambient seismic noise has been shown to be a useful tool for monitoring subtle changes in the subsurface that are reflected in changes in seismic wave properties. Here, we aim to use ambient noise to characterize reservoir response to sustained fluid injection, and in particular wastewater disposal, over a number of years. Central Alberta has observed an increase in the rate of seismic events since the end of 2019, believed to be associated with water disposal. Using continuous seismic data from January 2019 to August 2021, we calculate the relative change in seismic velocity over time. Our initial results suggest a correlation between velocity changes and seismicity rate; by using an histogram grouping the sum of events for seven days, and compare it to the stacking of the cross-correlation functions over the same number of days. Initial observations go in accordance to the fracture theory where relative wave velocities go down as a reservoir fractures and up as it heals. Nonetheless, these change occur in synchronic way making the observations undesirable for early warning systems. Finally, future plans include utilizing high performance computing and cuda processing to cut down on computational time.

Keywords

Ambient seismic noise; Alberta; Wastewater disposal; seismic monitoring