

# Bay Area Geophysical Society Seminar Series



**Dr. Jamie Rector**

**UC Berkeley**

**March 20, 2019**

**4pm Rm 265 McCone Hall**

**UC Berkeley Campus**

## **An Improved Method for Obtaining Earthquake Site Response Using Cell Phones**

Understanding the seismic response of buildings, bridges, roads, and other infrastructure is critical for earthquake risk assessment and earthquake retrofitting plans. The frequencies of interest are between about .5 Hz and 10 Hz, where structural resonances typically occur. Along with the structural response, a knowledge of the ground forcing function is obviously very important. The geotechnical community currently requires costly borings, cone penetrometer surveys, or MASW surveys to provide shear wave properties of the ground and predict the site response. They are not direct measures. Site response is ‘inferred’ from shear wave velocity. Moreover, these tools do not incorporate near surface heterogeneity such as surface or bedrock topography.

In this talk, I will provide an improved solution to the site response problem. Rather than focusing on shear wave velocity measurement we directly compute the earthquake site response in the frequency range of interest. The approach requires a dense array of cheap sensors. It also requires cultural noise sources (trucks, cars, trains, generators, etc) that become the proxy for earthquake signals. Finally, it uses techniques

adapted from 3D seismic data processing to recover the site response. All calculations and results are performed in the frequency domain.

The methodology is at an early stage. Initial work has focused on measuring the spectra of some of the cultural noise sources, understanding the moving nature of some of the noise sources, and exploiting the accelerometers present in cell phones to provide high fidelity data that can be used in conjunction with or as a substitute for much more expensive sensors. I believe that within a generation, the current site response tools will be obsolete and we will use a similar approach to the one outlined above.

Speaker Bio: JW(Jamie) Rector is a Professor of Applied Seismology at UC-Berkeley. He is also a musician. He was almost nominated for a Grammy for his debut album, “No Chance the Rapper Sings Gershwin” in the new category of “Best new album for albums with no sales “.

Professor Rector has been an innovator and entrepreneur in borehole seismic imaging for the oil and gas industry for over 35 years. His research and professional interests are, thankfully, unrelated to oil and gas at the present time. He is developing new LWD tools for blasthole characterization and serving as geoscience adviser for a deep borehole nuclear waste disposal company and for a plasma drilling startup.

At Cal, he is working on near surface infrastructure characterization using passive seismic method and machine learning (isn't everyone?). He teaches applied geophysics, digital signal processing, and a course on the current transition from a fossil-fuel based energy system to one primarily based on renewables. He has held numerous positions at SEG and was recently nominated for President Elect. The reaction to this bio may convince him to withdraw his name from consideration!



After the talk: We will gather at Matiki Island BBQ and Brew (no host) 1828 Euclid St (300ft from North Gate entrance on Euclid)