ABSTRACT: Long-duration ground motions, such as those that could be produced by a Mw 9.0 Cascadia Subduction Zone earthquake, can trigger liquefaction and produce greater ground deformation than shorter-duration motions with similar amplitudes. Observations and recorded ground motions from earthquakes in Japan, including the 2011 Mw 9.1 Tohoku earthquake, illustrate some of the potential consequences of liquefaction during long-duration ground motions. Liquefied soil is extremely soft and responds differently to lower frequency-content motions than non-liquefied soil. Because the soil is so different before and after liquefaction is triggered, different intensity measures can be used to estimate liquefaction triggering and post-triggering deformation. Recently, a team at the University of Washington used time-frequency analyses to develop a procedure to decouple the intensity of shaking that triggers liquefaction from the intensity of shaking that drives deformation. The procedure reduces the uncertainty in estimates of liquefaction-induced ground deformations and is especially beneficial in areas where large-magnitude earthquakes present a significant hazard, such as in the Willamette Valley.

BIOGRAPHY: Mike Greenfield completed his M.S. at Virginia Tech in 2007 and has since worked as a researcher and geotechnical earthquake engineering consultant in the Pacific Northwest. Last year, he completed his Ph.D. with Prof. Steven Kramer at the University of Washington where he researched the effects of long-duration ground motions on soil liquefaction. This year, he became the principal engineer and sole proprietor of a geotechnical and earthquake engineering firm in Portland, Oregon, where he provides geotechnical and seismic hazard analyses and design solutions. Mike continues to research liquefaction hazards with the University of Washington and UCLA and has recently developed 16 case histories from sites in Japan for the Next Generation Liquefaction project.