Research Project Summary

Influence of Fines and Alternative Intensity Measures on Liquefaction Triggering

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Abstract
Fines content influences liquefaction triggering evaluation in two distinct ways: (1) it alters cone penetration test tip resistance and standard penetration test resistance due to drainage and compressibility issues, and (2) it alters the cyclic strength of liquefiable soils. However, in practice, these two distinct influences are lumped together into a single correction factor. This research will gather available literature related to the influence of fines on penetration resistance, and on cyclic strength, and will seek to propose separate correction factors for each. Furthermore, liquefaction evaluation uses peak horizontal acceleration and magnitude as intensity measures. Alternative evolutionary intensity measures like Arias intensity (I_a) and cumulative absolute velocity (CAV) are better related to liquefaction based on laboratory data, but adoption for field evaluation is hindered by the current lack of correction factors to account for depth based on the surface intensity measure. This project will use site response simulations to develop these correction factors. Values of I_a and CAV have already been computed at liquefaction sites in the Next Generation Liquefaction database. Combined with the depth corrections, we will use the database to assess the prediction power provided by the evolutionary intensity measures.

Deliverables
Two models will arise from this research. One will be a fines content correction for liquefaction resistance that separately addresses the effects of fines on penetration resistance and cyclic strength. The other will be depth-corrections for evolutionary intensity measures. We will deliver these findings through a PEER report and conference and journal papers.

Research Impact

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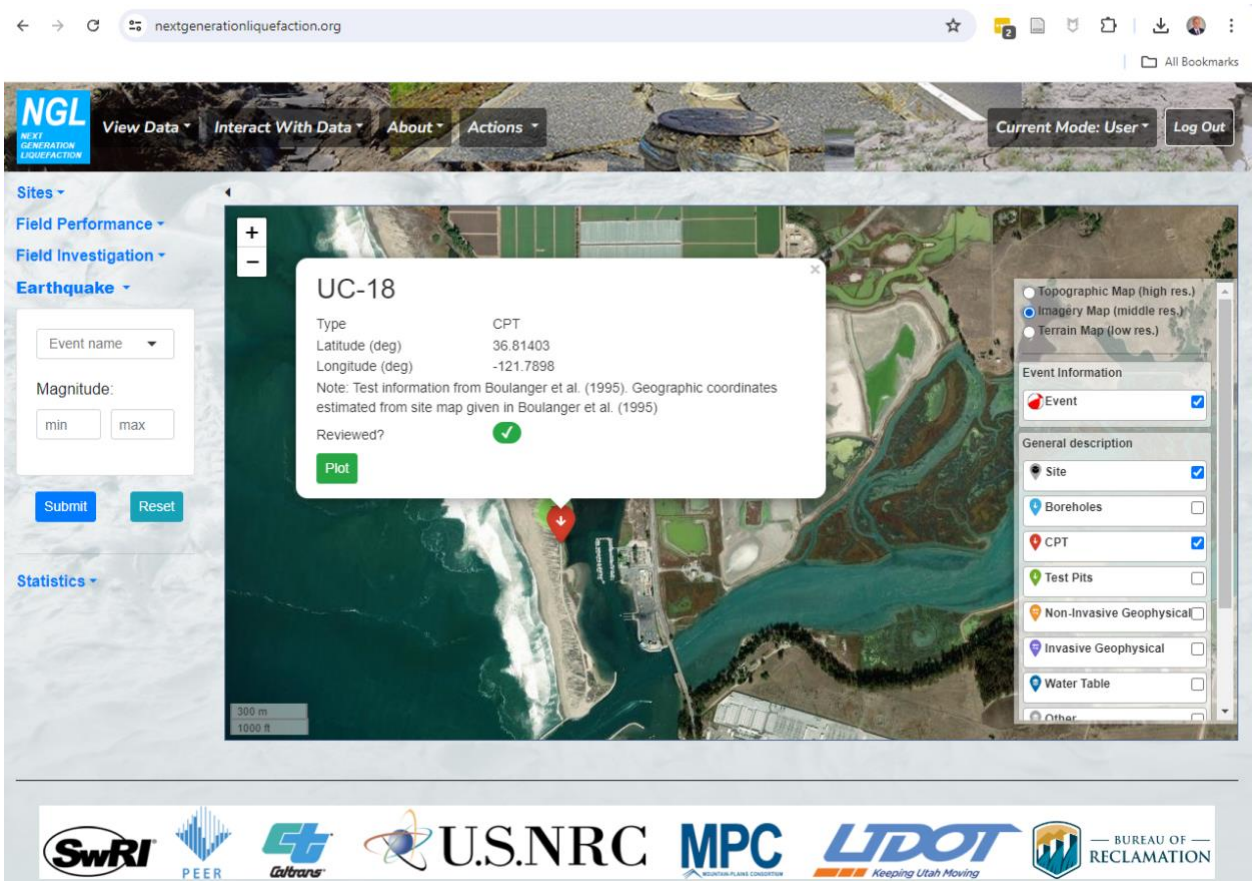
This work has the potential to alter the manner in which liquefaction manifestations are evaluated for bridges, buildings, and other infrastructure projects. Existing fines corrections simultaneously account for the influence of fines on penetration resistance, and on liquefaction resistance. Separating these two effects will clarify fundamental mechanisms and potentially reduce uncertainty in our predictions. Utilizing alternative intensity measures has the potential to decrease uncertainty in liquefaction evaluations, and also simplify the demands from a vector of PGA and M to a single constant associated with an evolutionary intensity measure.

Project Image



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