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Accounting for soil spatial variability when assessing liquefaction risk

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Abstract

Liquefaction triggering assessments are typically performed for only individual locations, providing little or no information in regard to the expected extent of liquefaction events. The present paper proposes a method to quantify the potential extent of liquefaction by accounting for spatial dependence of soil properties and potential future earthquake shaking. Random field theory and geostatistics tools are used to model soil properties and earthquake shaking intensity; this approach facilitates incorporation of measurement results obtained at individual locations within the area of interest. An empirical liquefaction triggering criterion is then used to model liquefaction occurrence as a function of the random field realizations. The framework components are briefly described and an example analysis is performed to illustrate the details of the approach. The area of liquefied soil under a building in Adapazari, Turkey, is considered in the example, conditional upon soil property measurements obtained from nearby Standard Penetration Tests.