



Effect Of Saturated Porous Soil Medium on Seismic Wave Propagation

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Abstract

The seismic response of a structure depends on many factors such as earthquake fault properties, local site conditions like local topography, soil stratigraphy, soil saturation, and structure material. For structures like dams that are located near a large water body, to simulate a realistic site response, the effect of pore water on seismic wave propagation must be coupled with the local site conditions. The present study aims to investigate the effect of a fluid-saturated porous medium on seismic wave propagation at a fundamental level. The MASTODON/MOOSE software developed by Idaho National Laboratory is used for numerical analysis. A three-field coupled model (u-p-w) is implemented in a finite element framework to analyze the problem and verified using analytical results. Models of the 1D soil column and 2D idealized dam geometry in saturated and dry conditions subjected to vertically propagating Ricker SV wave are simulated. To isolate the impact of pore-water, the estimated response for each case is compared against similar scenarios with the dry condition. The results from this study give an insight into seismic wave propagation in saturated porous medium and will facilitate different structures' economical and optimal design and liquefaction studies.

Keywords: Wave propagation, Saturated porous medium, Dynamic response