Solid Earth Physics Seminar, Harvard University

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Faculty Lounge, 4th Floor, Hoffman Lab, 20 Oxford Street

Shake and Sink: Liquefaction Without Pressurization

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Abstract:

Soil liquefaction is a significant natural hazard associated with earthquakes. Some of its devastating effects include tilting and sinking of buildings and bridges, and destruction of pipelines. Conventional geotechnical engineering practice assumes liquefaction occurs via shear-driven compaction and consequent elevation of pore pressure. This assumption guides construction for seismically hazardous locations, yet evidence suggests that liquefaction strikes also under currently unpredicted conditions. Here we show, using theory, simulations and experiments, another mechanism for liquefaction in saturated soils, *without high pore fluid pressure* and *without special soils*, whereby liquefaction is controlled by buoyancy forces. This new mechanism supplements the conventional pore pressure mechanism, enlarges the window of conditions under which liquefaction is predicted to occur, and may explain previously not understood cases such as liquefaction in well-compacted soils, under drained conditions, repeated liquefaction cases, far-field liquefaction and the basics of sinking in quicksand. These results may greatly impact hazard assessment and mitigation in seismically active areas. **This is collaborative work with C. Clément and R. Toussaint of the Institute de Physique du Globe de Strasbourg.**