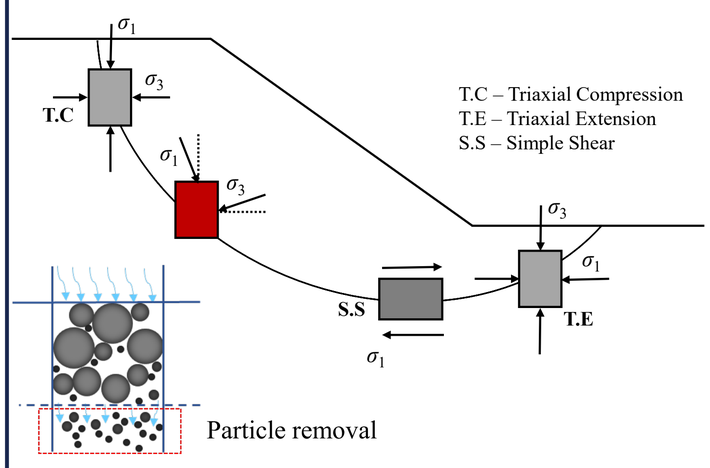
Effects of Suffusion on Simple-Shear Response of Silty-Sand

シルトまじり砂の単純せん断応答に及ぼす細粒分流出の影響

Internal erosion is the transportation of soil particles from within or beneath a water-retaining structure due to the seepage flow, impacting the mechanical and hydraulic behaviour of soil. The impact of fines removal on post-erosion response under different loading direction with respect to the seepage direction is crucial since it is hypothesized vertical reinforcement is improved due to erosion. This research attempts to investigate the impact of internal erosion on the simple-shear response of gap-graded soil with 20% fine content.

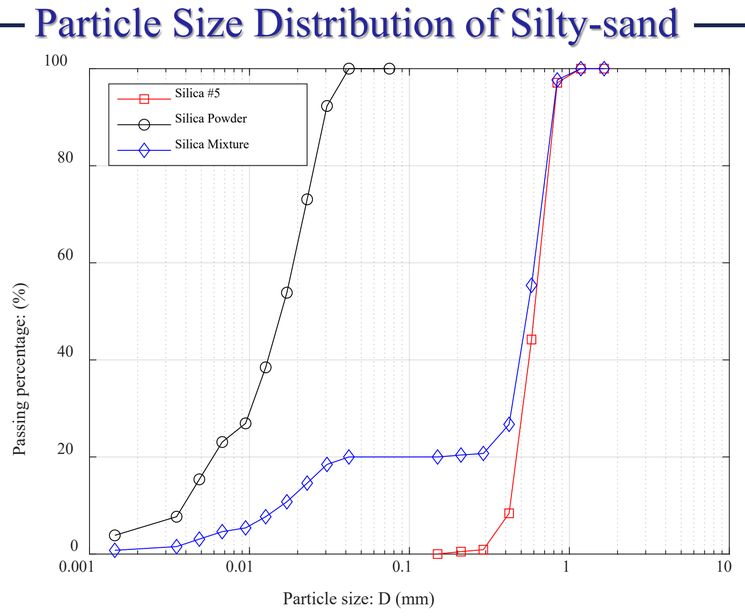
内部侵食は、貯水構造物の内部またはその下からの浸透流による土粒子の流出により起こり、地盤の力学的・水理学的挙動に影響を与えます。上下流浸透に伴う内部侵食により鉛直方向の強度が改善されるという現象が観察され、細粒分流出が、侵食後に浸透方向に対して異なる方向に載荷した際の応答に影響を及ぼすと考えられます。 この研究では、細粒分含有率20%のギャップグレード土の単純せん断応答に対する内部侵食の影響を調べました。

Internal erosion



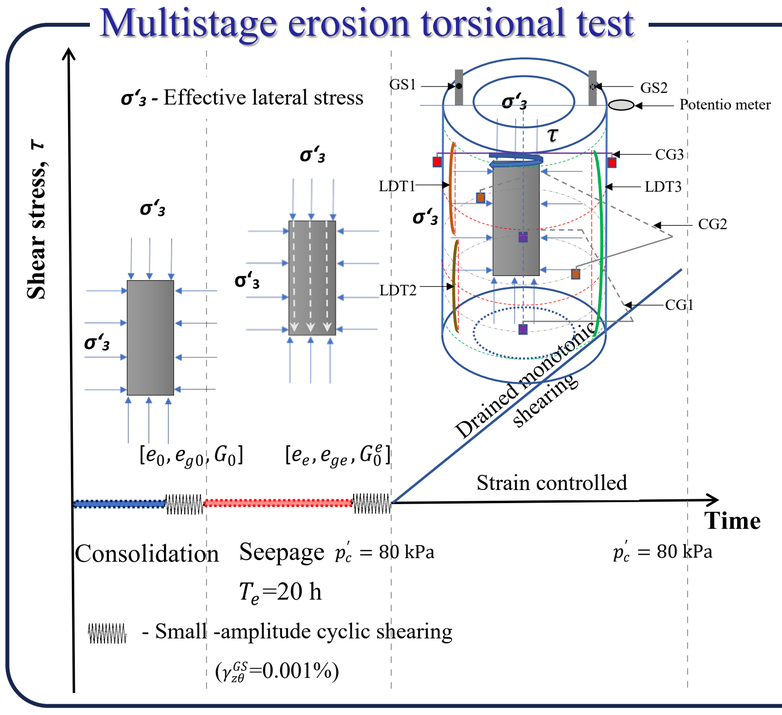
Suffusion is defined as migration of fine particle due to seepage flow without significant volume change.

Particle Size Distribution of Silty-sand

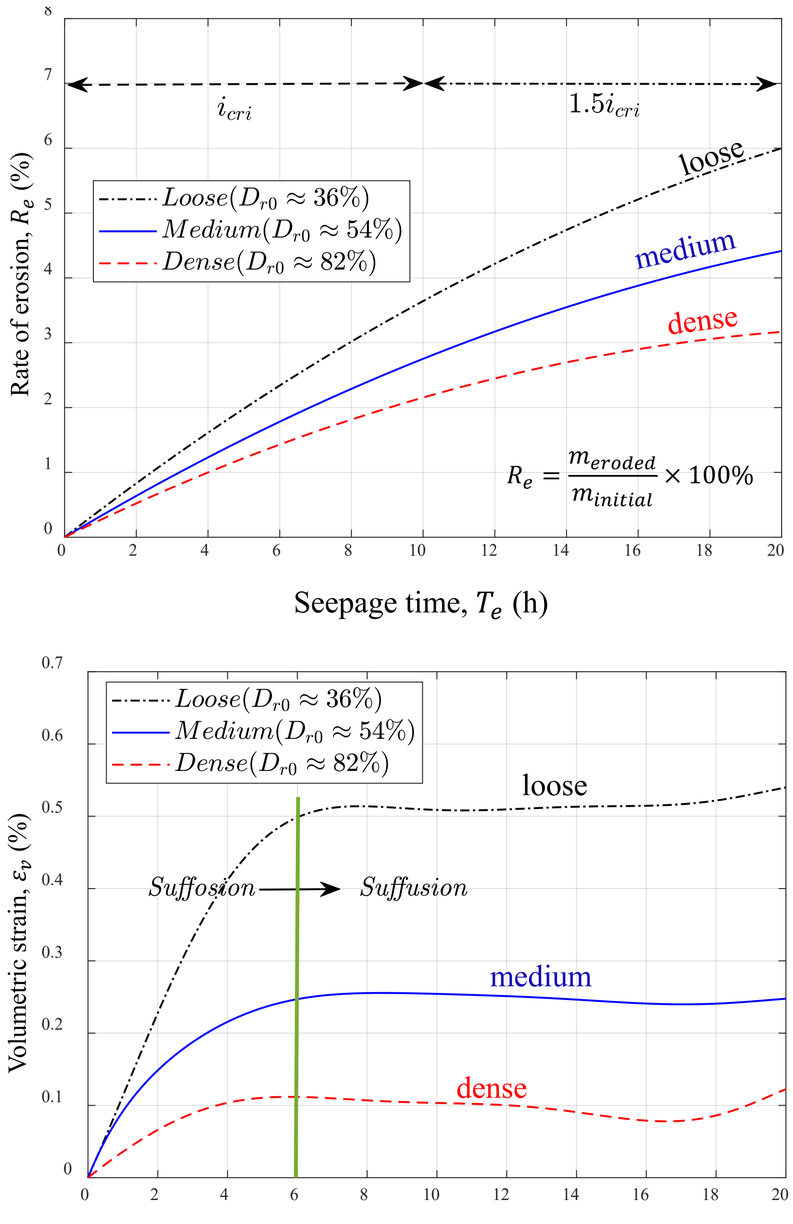


Selected gap-graded soil is **internally unstable** according instability **criteria.**

Multistage erosion torsional test

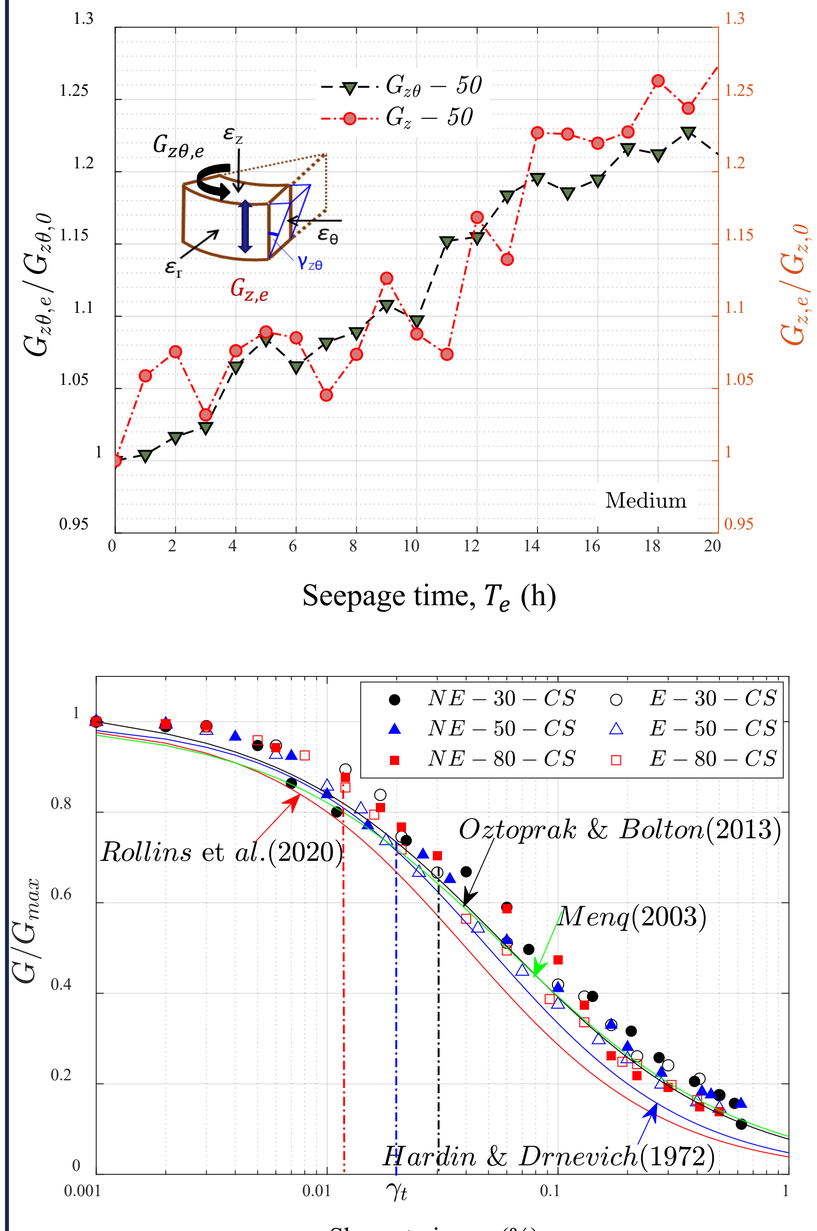


Suffusion response



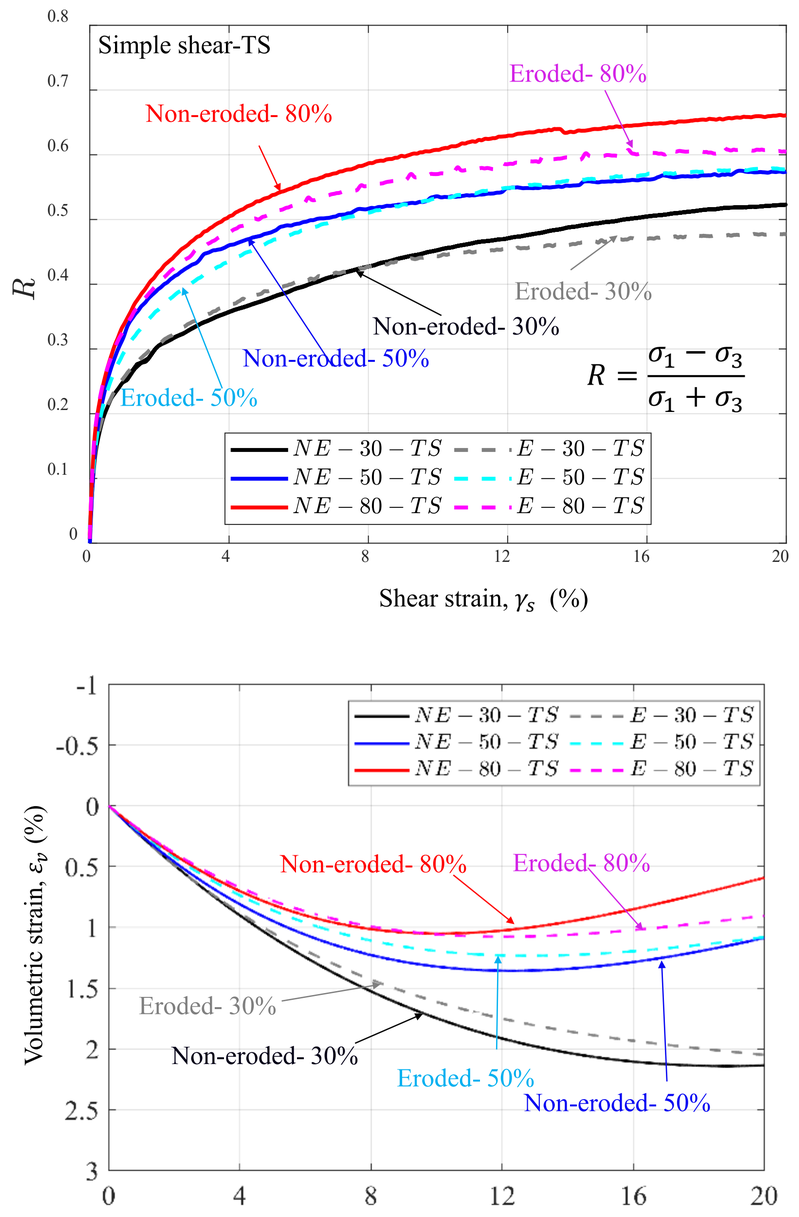
Volumetric strain during seepage increases initially and reaches a steady state.

Shear-modulus



Post-erosion shear modulus increases due to fine removal. Degradation of shear-modulus is rapid for eroded soil

Stress-strain



Post-erosion R_{peak} under decreases while dilatancy of eroded soil is improved.

Summary

This study found that volumetric strain during seepage increases initially and reaches a steady state regardless of initial relative density (D_{r0}). In essence, the limited amount of volume change can be referred to as suffusion. Post-erosion shear modulus increases significantly, however degradation of shear modulus with increasing shear strain is rapid than non-eroded soil. Moreover, Post-erosion R_{peak} under simple-shear depends on the density. This indicates that the horizontal bedding plane becomes weaker.

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