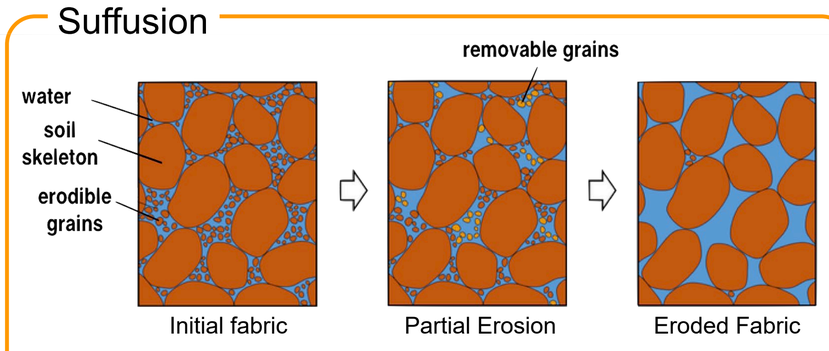
Mechanical Properties of Suffused Gap-graded Soil

細粒分流出したギャップグレード土の力学特性

Suffusion is a type of erosion that has contributed to the failure of several earth-filled water retaining structure. Despite numerous experimental and numerical investigations, our understanding of the effects of changing fabric caused by suffusion on the mechanical properties of the soil remain unclear. A parametric study of density and stress state is conducted using a reconstituted gap graded mix and a modified triaxial cell for the purpose of erosion. The results show that the eroded specimens exhibit different peak strength, small strain stiffness and effective stress path compared with non eroded specimens.

盛土の浸透破壊と細粒分流出との間には関係があると考えられています。既往の研究や調査は数多くありますが、細粒分流出による土の工学的性質の変化は未だに明らかにされていません。試験中に細粒分流出を許した特殊な三軸試験を行い、細粒分流出による力学特性の影響を体系的に調べました。

Suffusion



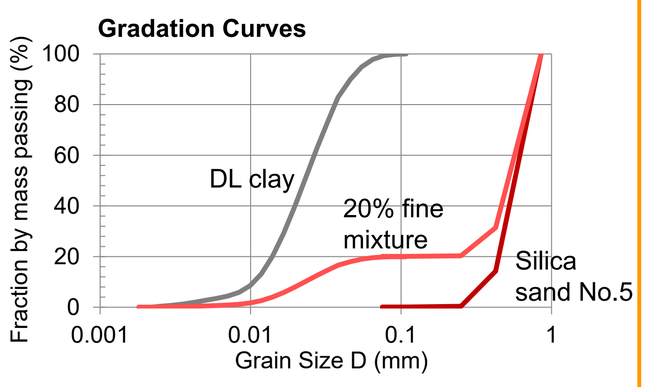
Suffusion is the removal of fine particles from the soil though mechanical action of a fluid flow, leaving behind the coarse fabric.

Tested material

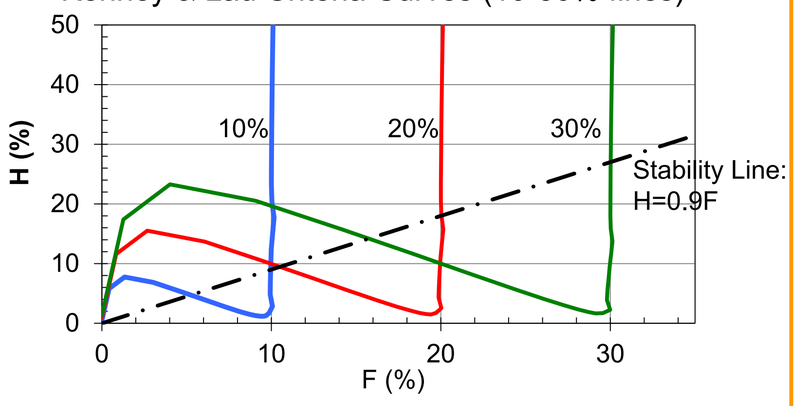
a gap graded mix of **Silica sand & DL Clay (20%)**

Silica sand No.5

DL clay



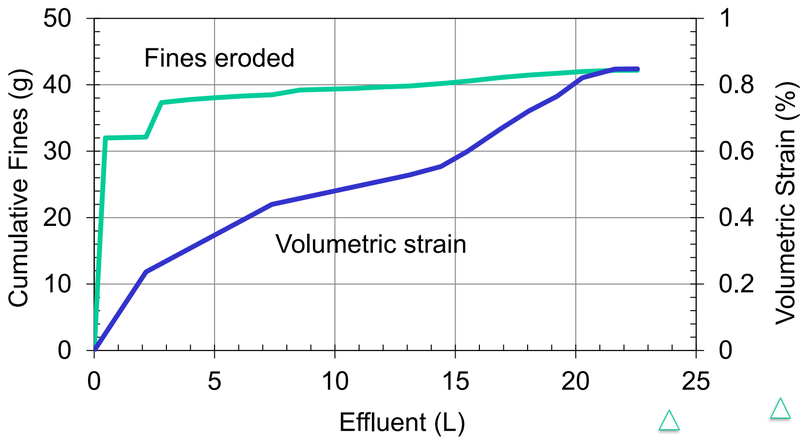
Kenney & Lau Criteria Curves (10-30% fines)



This soil is **internally unstable,** (i.e. unable to filter itself) according to:
Kedzi's, Burenkova's, Kenney & Lau's criteria.

Eroded Fines & Deformation

Eroded Fines & Volumetric Strain vs Effluent

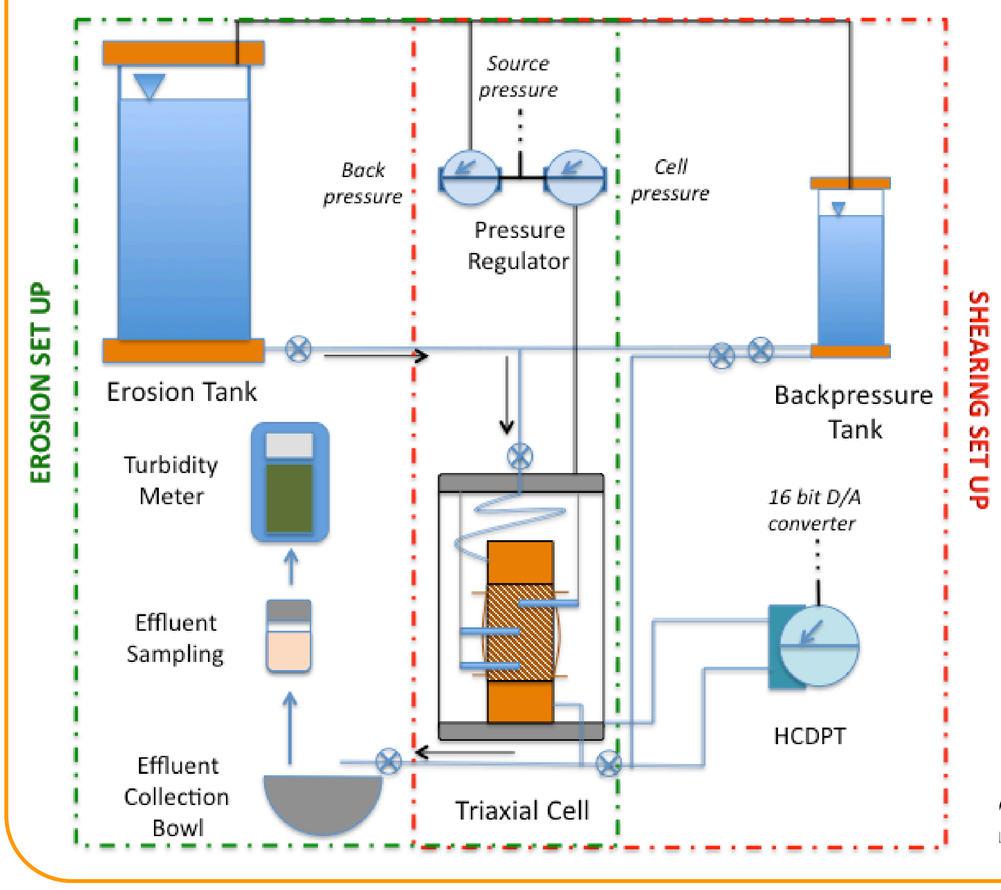


The **erosion rate** is high at first and flattens rapidly, whereas the **volumetric strain** increases almost linearly. This indicate that the fines eroded at the beginning are not a part of the force chains.

Objectives & Methodology

Investigation of the **effects of suffusion** on **mechanical properties** of **gap graded soils** through erosion/non erosion test comparison.

<Apparatus set up>



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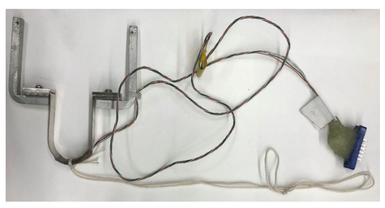
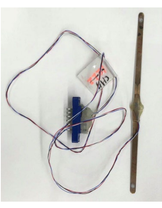
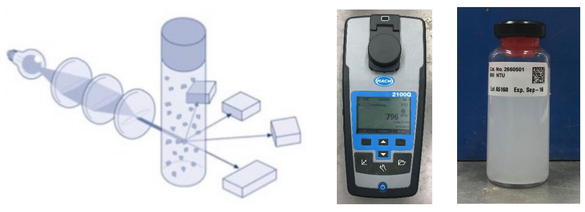


<LDT>



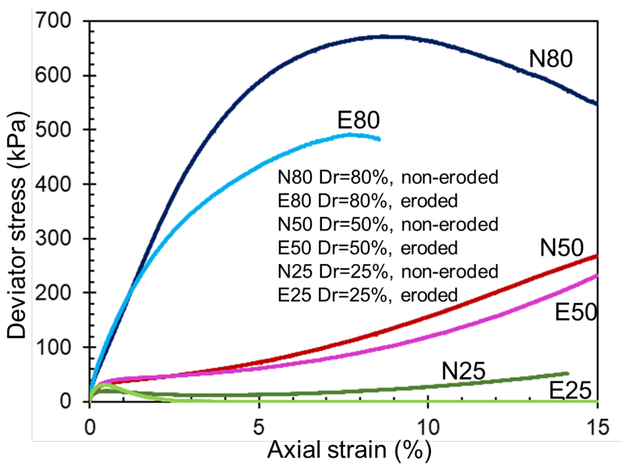
<Turbidity Meter>

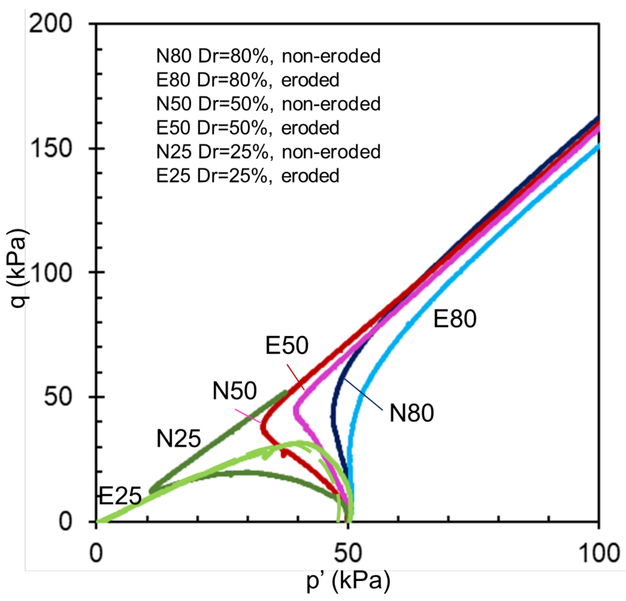


Mechanical properties (peak strength, young's modulus) are obtained through a **modified triaxial cell**.

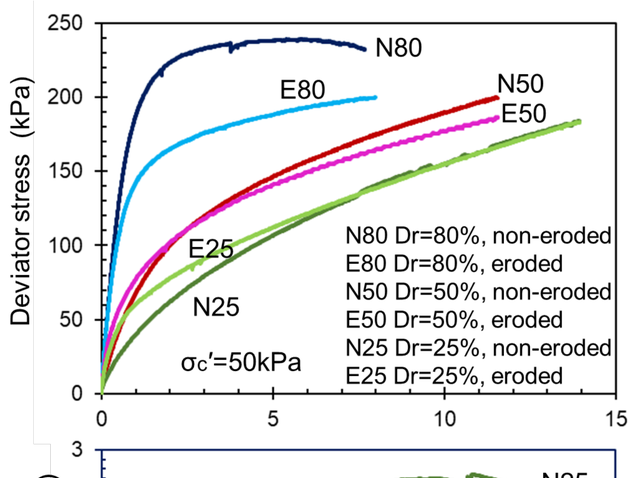
Behaviour in triaxial compression

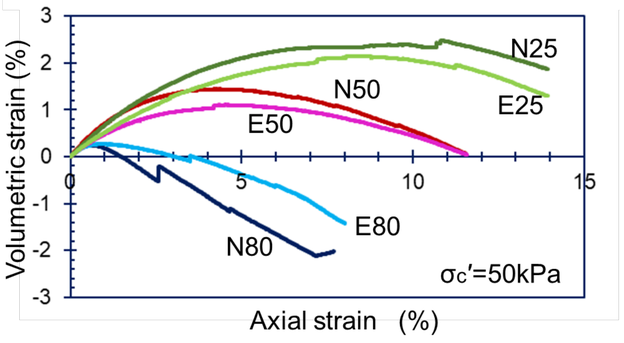
Undrained compression





Drained compression





In drained shear, the stiffness of the eroded specimens in the small strain range are larger in comparison with non-eroded specimens. At medium and large strains, the decrease in strength was highest for eroded soils with high initial density, whereas initially loose specimens showed no change in strength.
Under undrained conditions, suffusion caused an increase in peak strength in the small strain region and a decrease in strength in the medium strain range. These observed effects are also density dependent.

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