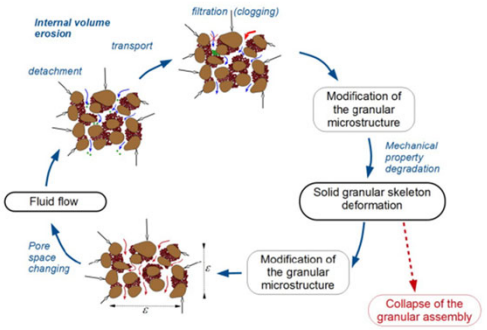
Effects of Suffusion on Mechanical Properties of Volcanic Ash

火山灰質土の力学特性における細粒分流出の影響

Suffusion is a type of internal erosion in which the fine particles migrate through the voids between the coarse particles under seepage flow, leaving behind the coarse skeleton. The degree of migration of fine particles can affect both micro and macro structural behaviour of soil. A few studies have used widely graded soil to explore the effect of suffusion. This study analyses the impacts of suffusion on the mechanical properties of widely graded volcanic ash in triaxial compression. The results show that the eroded specimens exhibit different undrained peak strength, small strain stiffness and effective stress path compared with non eroded specimens.

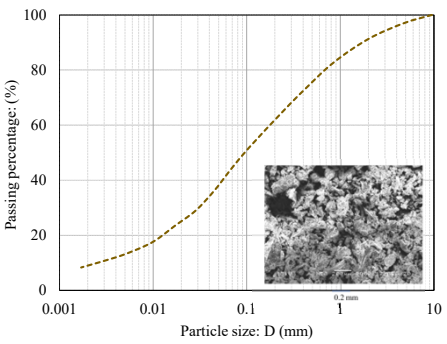
細粒分流出は内部侵食の一つの形態で、細粒分が浸透流のもとで粗粒分骨格を残したまま間隙中を移動する現象である。細粒分の流出の程度によって、土壌の微視的・巨視的構造の両方の挙動に影響が生じる。本研究では粒度のよい火山灰質土の力学特性に対する細粒分流出の影響を三軸圧縮試験にて調べた。侵食を受けた供試体では、侵食を受けていない供試体に比べて異なる非排水ピーク強度、微小ひずみ剛性、有効応力経路を示すことがわかった。

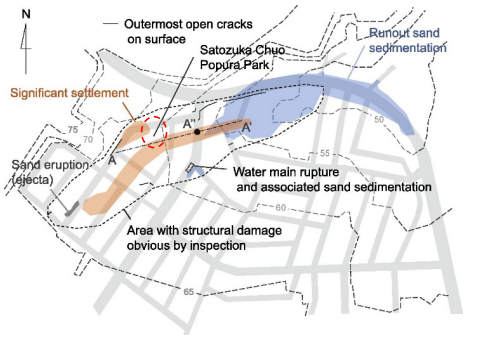
Suffusion



Seepage induced **loss of fine** particles with no change in volume and an increase of hydraulic conductivity

Soil type-Satozuka soil



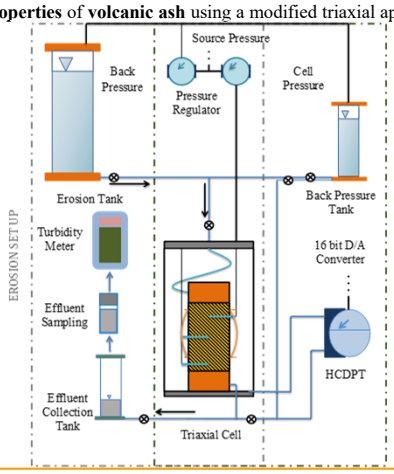


(Watabe and Nishimura, 2020)

Satozuka soil is **internally unstable** according to the **instability criteria.**

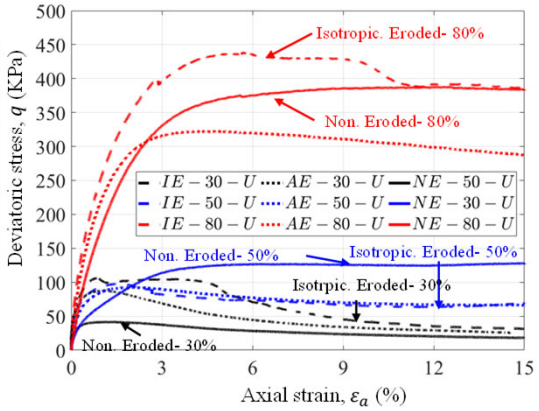
Methodology

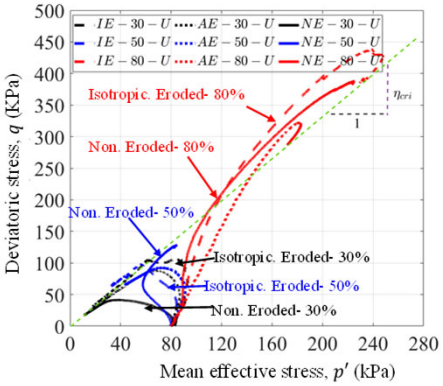
Investigation of the **effects of suffusion** on **mechanical properties** of **volcanic ash** using a modified triaxial apparatus.



Behaviour in Triaxial Compression

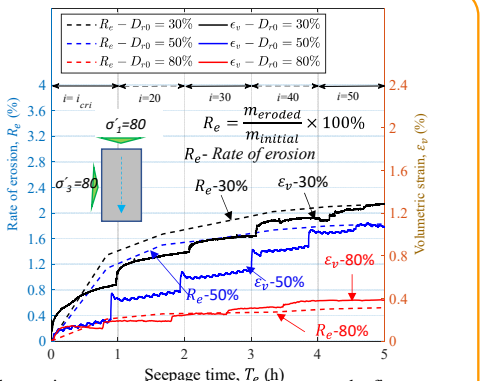
Undrained monotonic compression





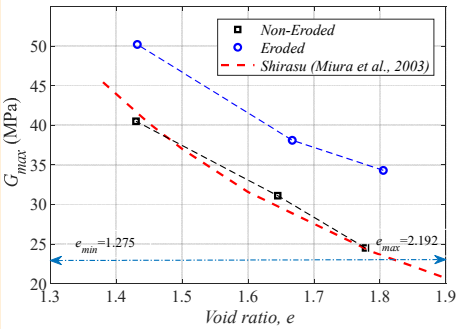
In the undrained triaxial compression tests it was observed that eroded soil shows higher peak strength due to cushioning effect at small strain and becomes more collapsible than uneroded soil at higher strains due to removal of fines and particle rearrangement during the erosion.

Erosion of soil

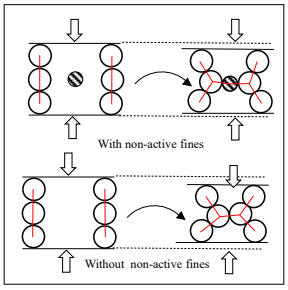


The erosion rate reaches an asymptotic state as the fines participating in the force transfer become more difficult to erode. Rate of erosion is density dependent.

Small strain stiffness of non/eroded soil



Network chains of interparticle force



Elastic yield surface seemed to be expanded for eroded soil specimen. It could be due to action of suffusion and fine removal.

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