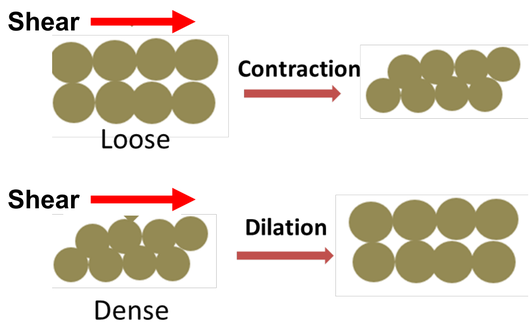
Effect of Strong Contraction on the Shear Behavior of Volcanic Soil

火山性土のせん断挙動における強い収縮傾向

Volcanic soil are often referred as problematic materials, these material exhibit strong contraction upon shear deformation. Due to different source of volcanic origin, weathering formation and aging, the underlying mechanism of these soils is not well understood. The monotonic undrained and drained triaxial tests under varying confining pressures and void ratios were conducted in this study. The results show that the crushability nature of volcanic soil results in contractive behaviour and the effect of contraction depends much on the initial relative density.

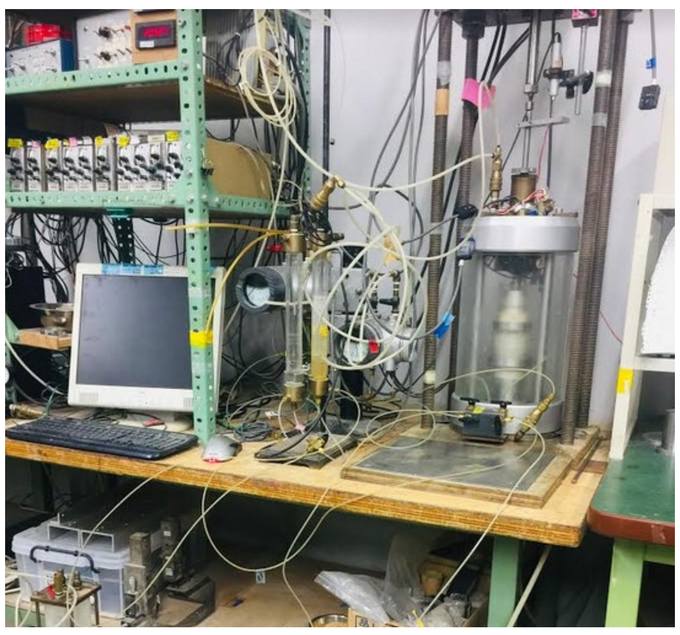
火山性土は災害の起因となることが多く特異な挙動を示します。特にせん断時に強い収縮傾向を持ち、火山起源、風化の形成、年代効果等が多様で、その力学特性は未だ解明されていません。本研究では、異なる拘束圧と密度条件で火山性土の非排水および排水三軸圧縮試験を実施しました。火山性土の破砕性がせん断時の収縮挙動をもたらすこと、またそれは供試体の密度に大きく依存することがわかりました。

Dilatancy

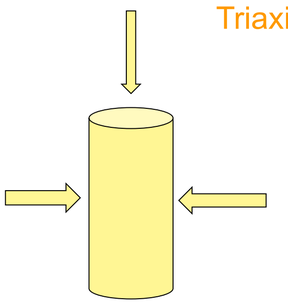


Dilatancy is the volumetric deformation of soil under the action of shear stress. Contraction (negative dilation) occurs in term of volume decrease.

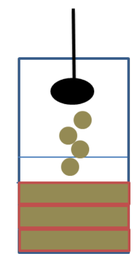
Experimental Apparatus



Triaxial Apparatus

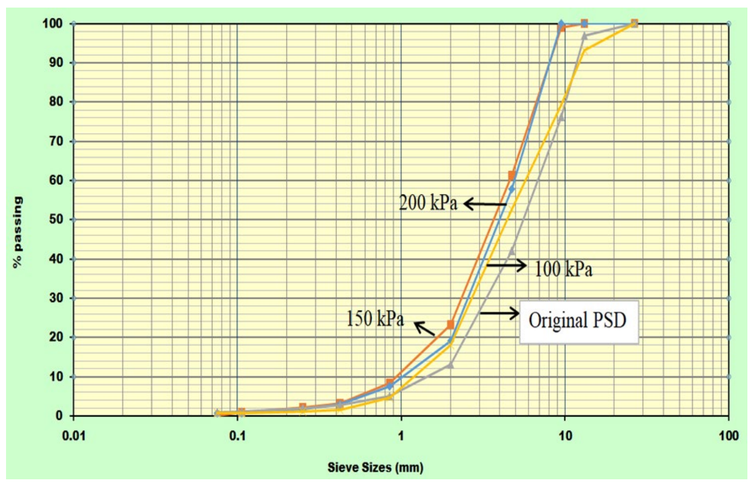


Specimen size:100mm
height:50mm diameter



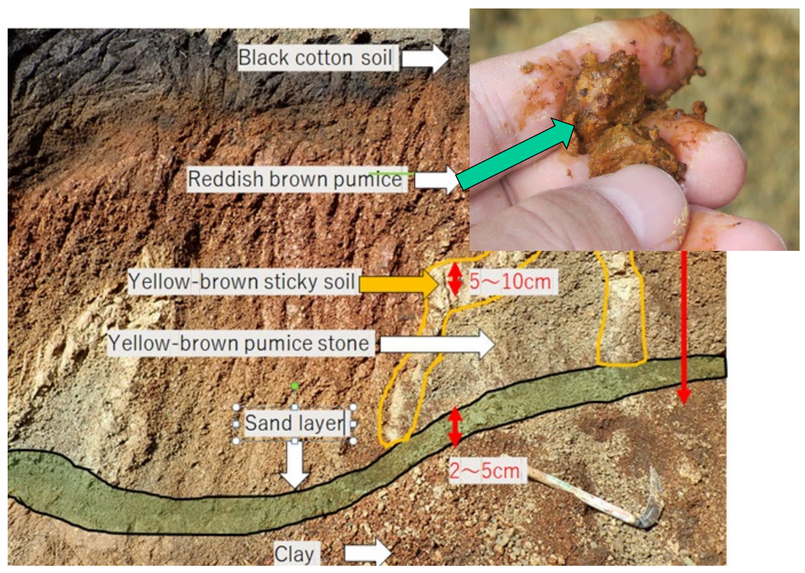
Sample preparation:
Moist Tamping

Particle size distribution after shearing

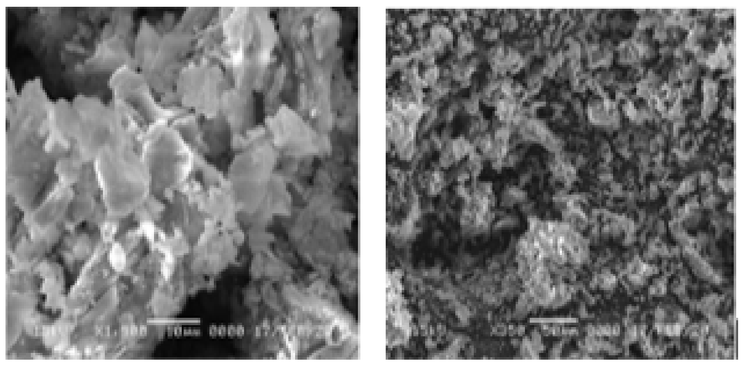


The **particle breakage rate** increases with the increase in confining pressure. This indicate that particle crushability during shearing induces more contractive response.

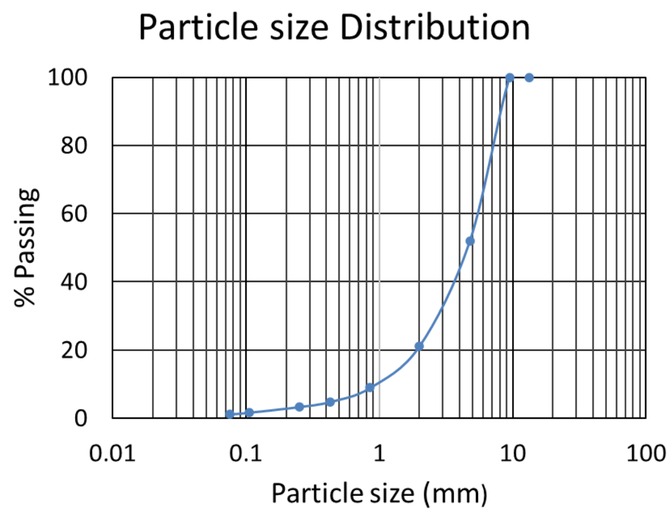
Tested Material



Soil profile from the location site



Microscopic electronic Images

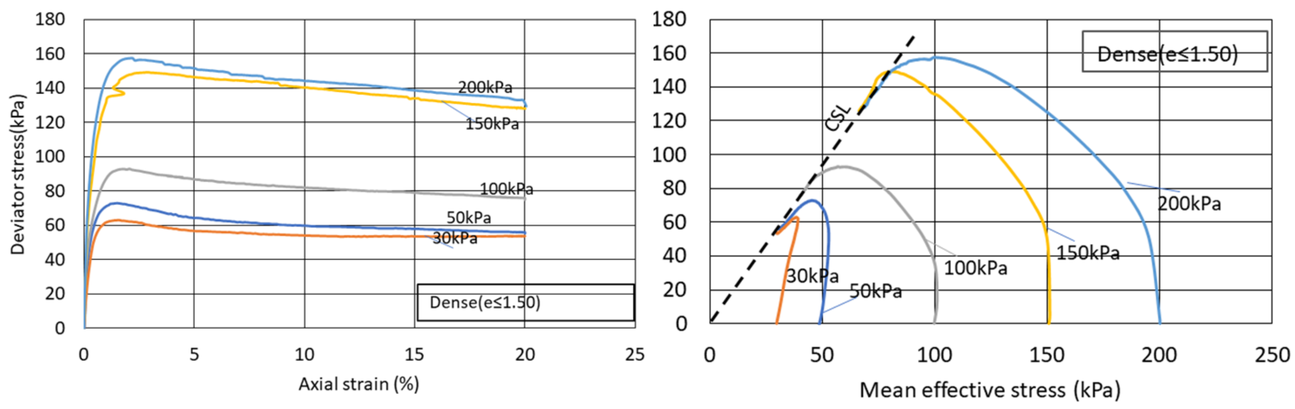


Physical Properties

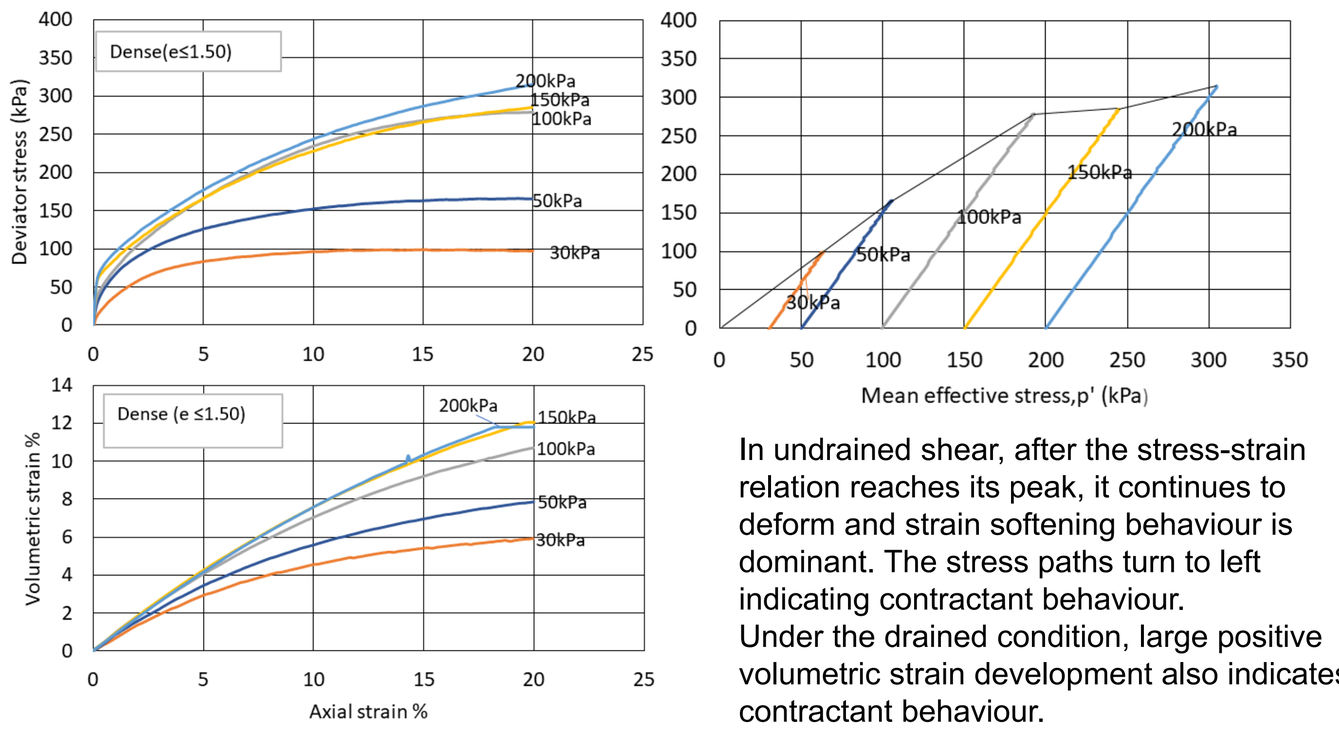
Specific Gravity, Gs	2.56
In-situ Dry Density (g/cm^3)	0.42
Water Content (%)	195
In-situ Void Ratio, e	2.75
Reconstituted specimen void ratio, e (Particle size < 6.7mm)	1.50

Behavior in triaxial compression

Undrained compression of dense state specimen



Drained compression of dense state specimen



In undrained shear, after the stress-strain relation reaches its peak, it continues to deform and strain softening behaviour is dominant. The stress paths turn to left indicating contractant behaviour.
Under the drained condition, large positive volumetric strain development also indicates contractant behaviour.

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