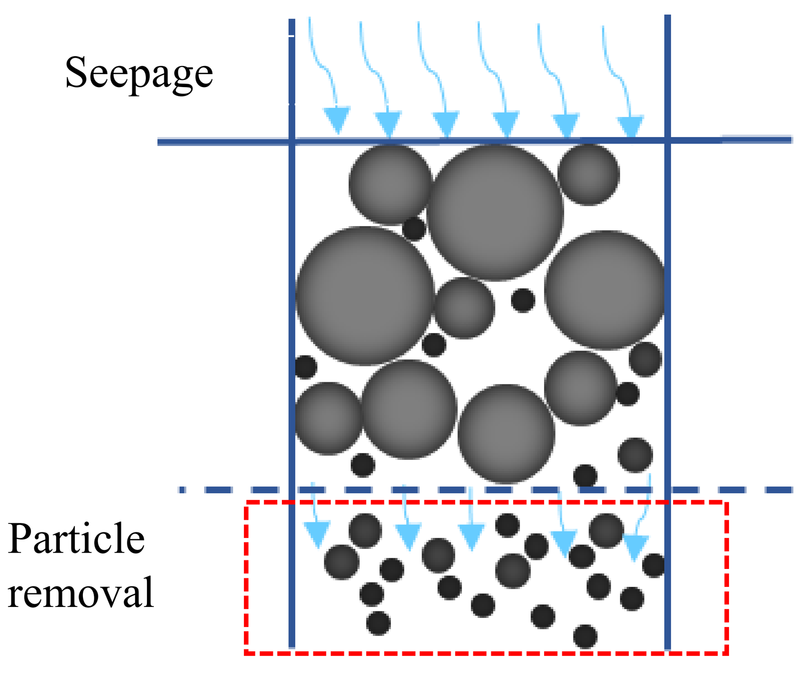
# Effects of Internal Erosion on Cyclic Response of Volcanic Ash

# 火山灰質土の繰返し載荷時応答に対する内部侵食の影響


Internal erosion is defined as detachments of soil particles from the main structure inside the ground due to seepage flow. The degree of migration of fines can affect both micro and macro structural behaviour of soil. The impact of fines content on cyclic resistance and liquefaction potential of soil becomes complicated when the change in fines content is caused by seepage flow leading to internal erosion. This research attempts to investigate the impact of internal erosion on the cyclic behaviour of volcanic ash.

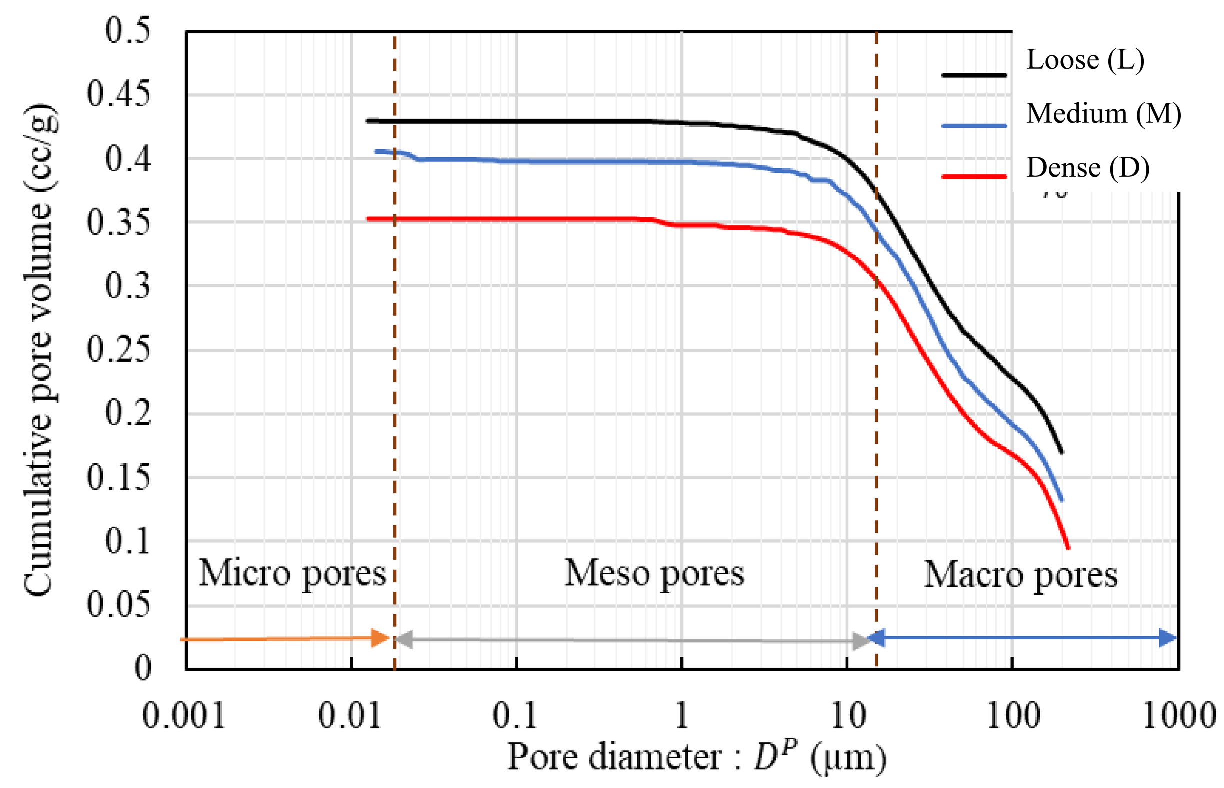
内部侵食とは、浸透流の作用を受け細粒分が地盤内の骨格構造から抜け出す現象です。その抜け出しの程度により、地盤の微視的および巨視的構造は影響を受けます。細粒分含有率は、地盤の繰返し載荷挙動や液状化抵抗に影響しますが、内部侵食によって細粒分含有率の変化が引き起こされる場合にはその影響はさらに複雑になり、十分に解明されていません。本研究では火山灰質土の繰返し載荷挙動に及ぼす内部侵食の影響を明らかにすることを目的としています。


## Internal erosion



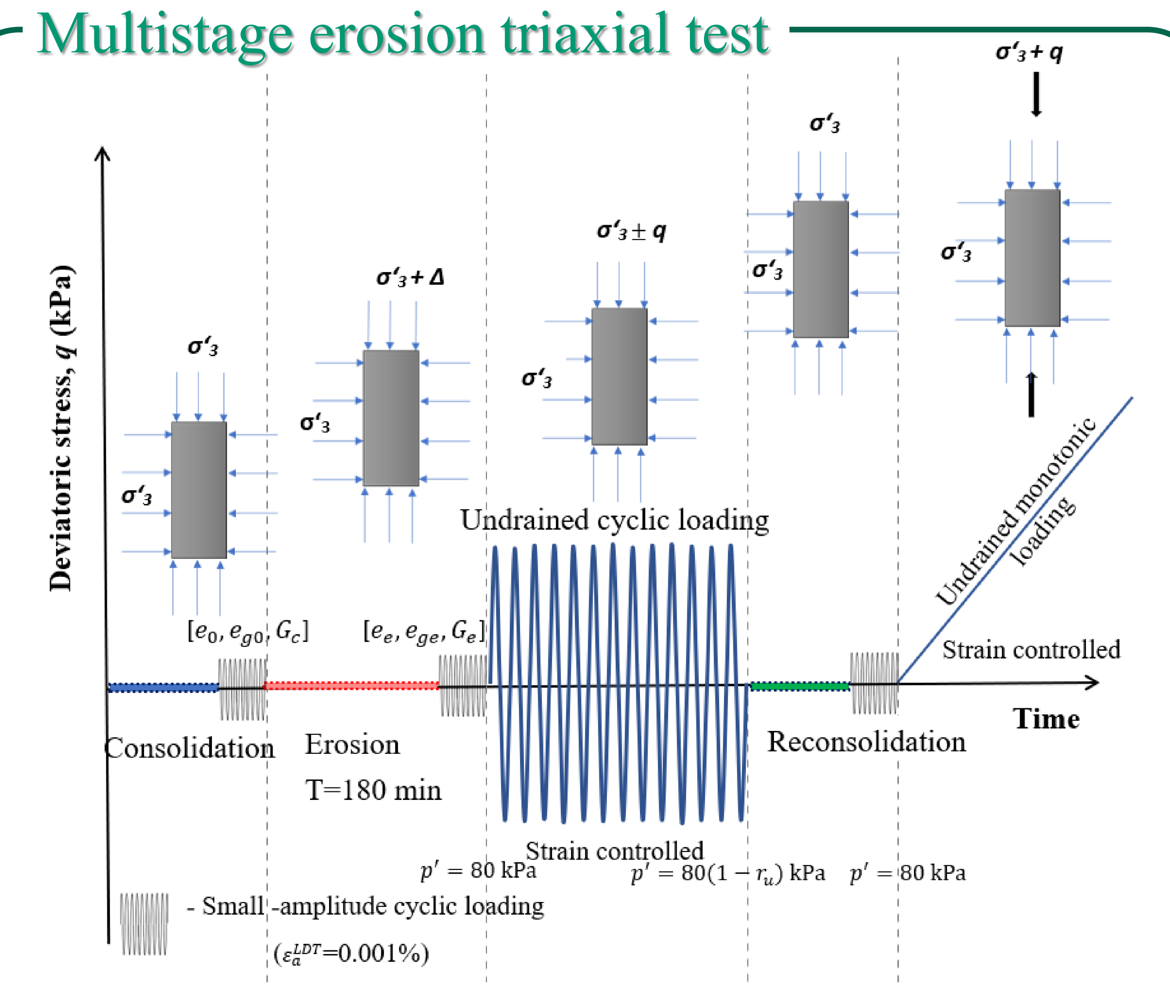

**Detachments** of soil particles from the **main structure** inside the ground due to mechanical or chemical actions of **seepage flow**

## Pore Size Distribution of Satozuka soil



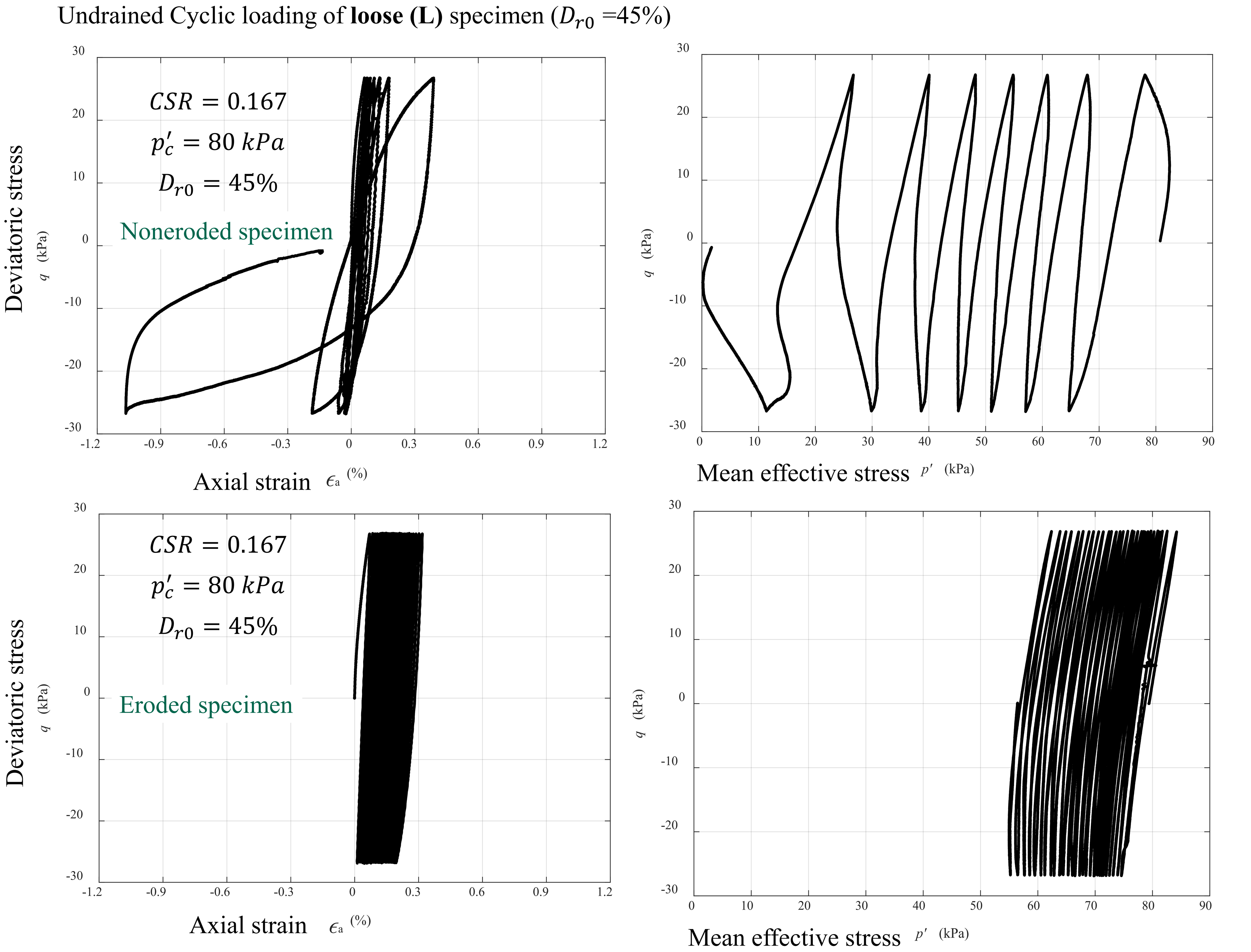

Satozuka soil is **internally unstable** according to the **Kenney & Lau's criteria.**

## Multistage erosion triaxial test




## Undrained Cyclic Loading

Undrained Cyclic loading of **loose (L)** specimen ($D_{r0}$ =45%)




## Summary

This study found that the cyclic resistance of eroded specimens is improved regardless of the percentage of eroded particles and initial relative density ($D_{r0}$). Moreover, post-erosion cyclic $\varepsilon_{DA}$ is less than 0.15% for 30 cycles for any tested density, which confirms that post-erosion stiffness increases significantly. The lower potential of liquefaction for the eroded specimens was found to be due to a decrease in the intergranular void ratio after the erosion of fine.

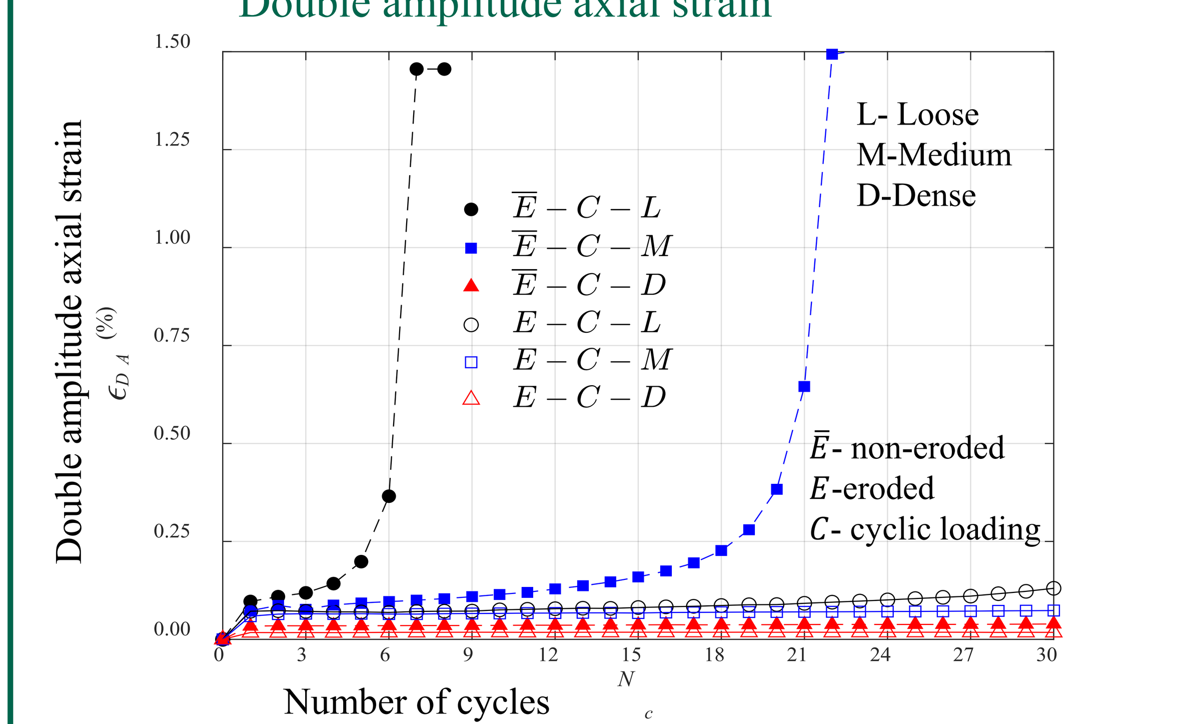
### Notation

$(e_e/e_0)$ - Normalized post erosion global void ratio
$(e_{ge}/e_{g0})$- Normalised post erosion intergranular void ratio
$(G_e/G_0)$ -small strain stiffness ratio

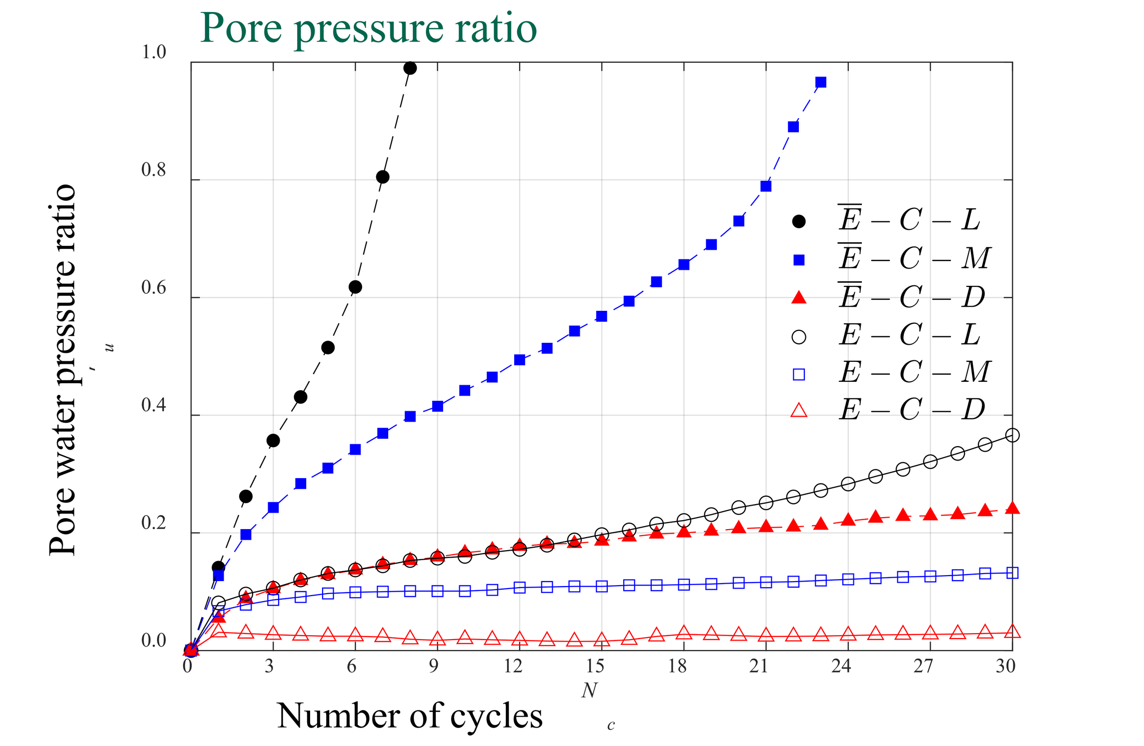
Intergranular void ratio ($e_g$) is defined; $e_g = \frac{e+FC}{1-FC}$ ; where $e_g$, $e$ and $FC$ are intergranular void ratio, global void ratio and fine content in decimals

## Summary of Results

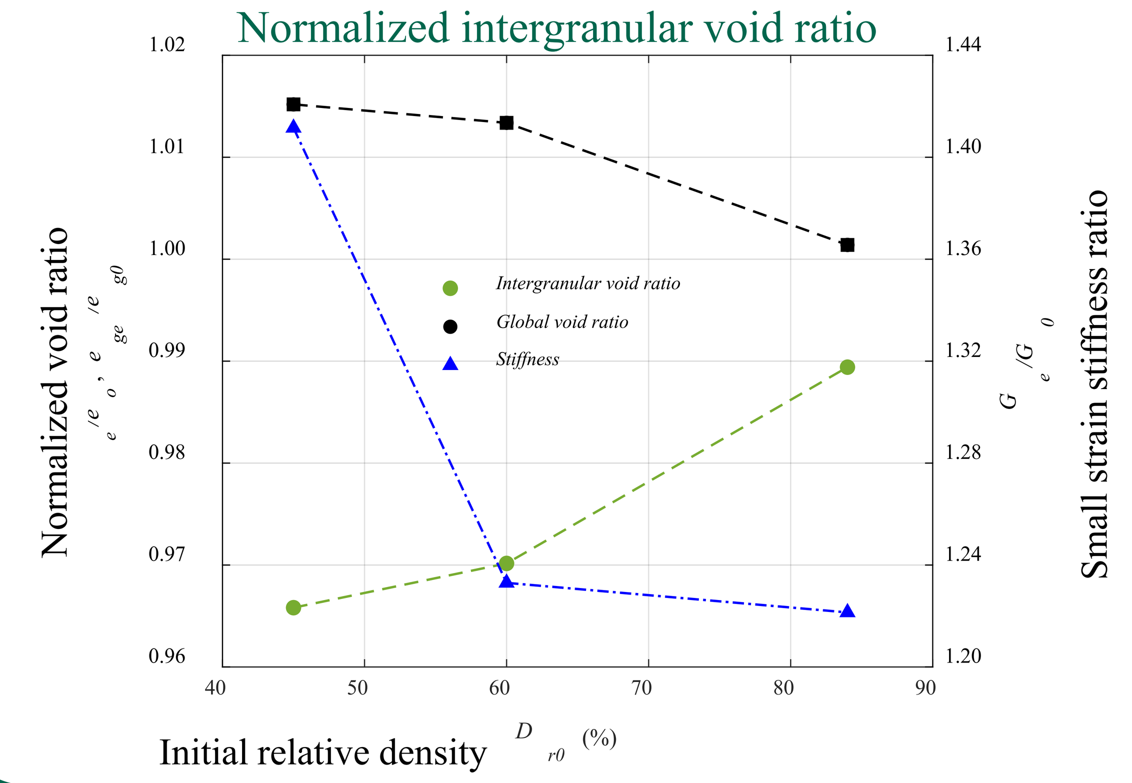
Double amplitude axial strain




Pore pressure ratio




Normalized intergranular void ratio





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