

Internal erosion is a phenomenon of fine particles' washing out from the ground, which causes various ground disaster such as a sinkhole accident. It is supposed to happen due to water penetration under the ground with rainfall. In this research, new triaxial test apparatus, which was possible to cause internal erosion inside the specimen was developed. The influence of small degree of internal erosion on mechanical properties was investigated.

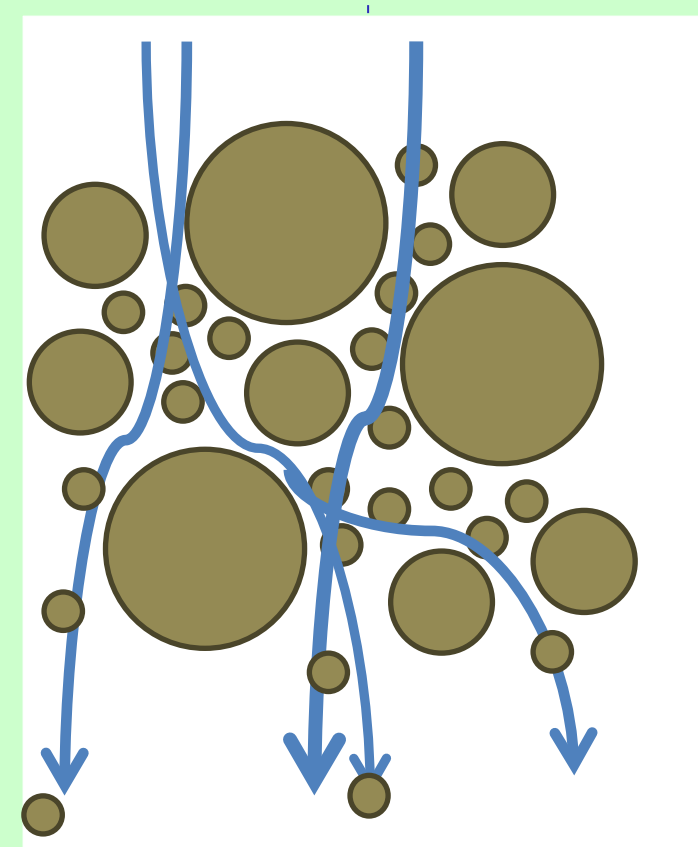
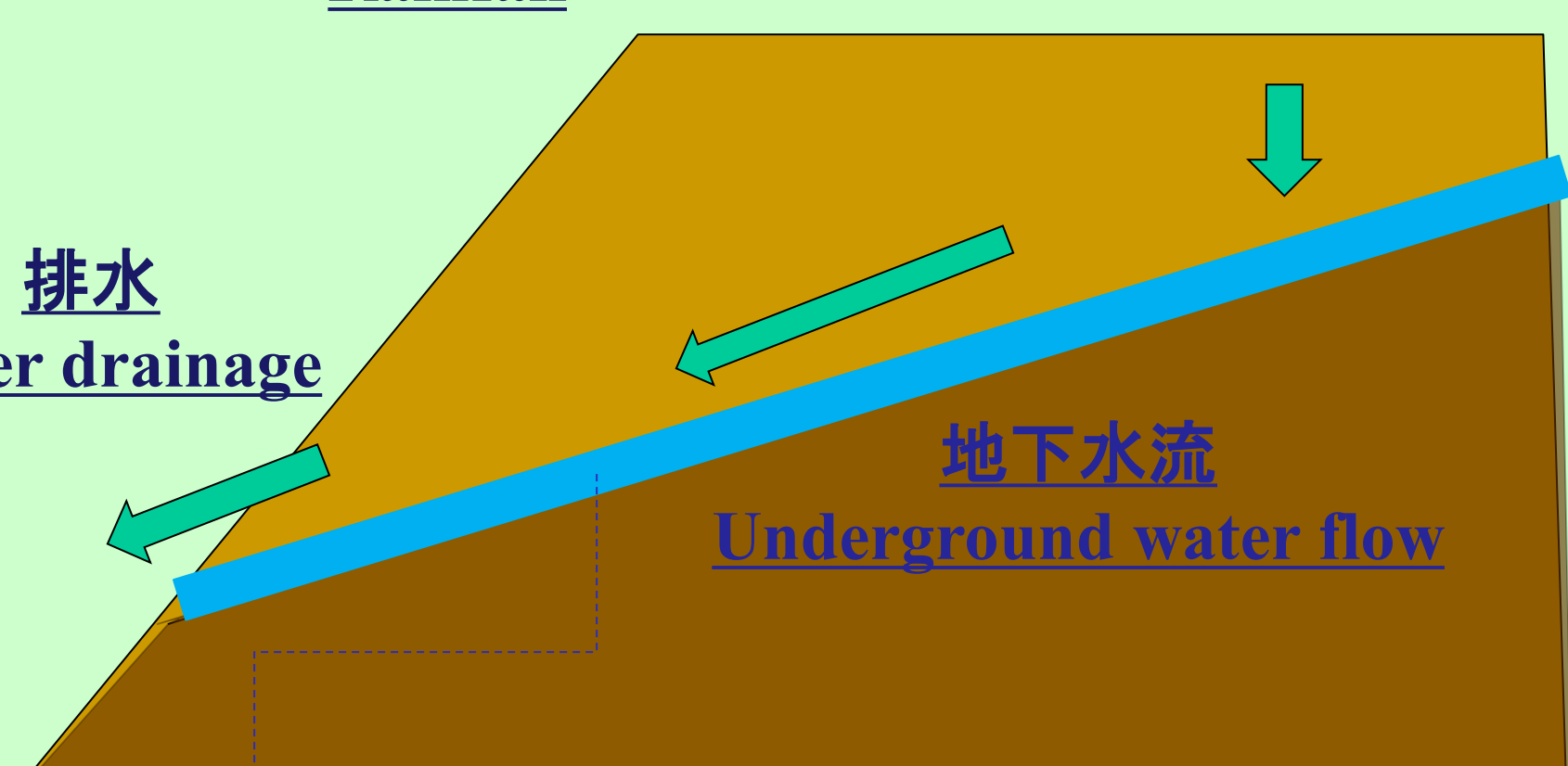
地盤内土砂流出(内部侵食)は地中空洞の形成、地盤陥没の発生や地滑り等様々な土砂災害を引き起こす。こうした土砂流出は降雨に伴う地中の水の浸透で発生すると考えられ、粒度の良い地盤においては細粒分が卓越して流出すると思われる。本研究では、供試体内で内部侵食の発生が可能な三軸試験装置を開発し、内部侵食が地盤の強度や変形に与える影響について定量的な評価を行った。

内部侵食について Internal Erosion

沢筋等の水みちへの浸透と排水の繰り返し

Repetition of water flows through

降雨
Rainfall

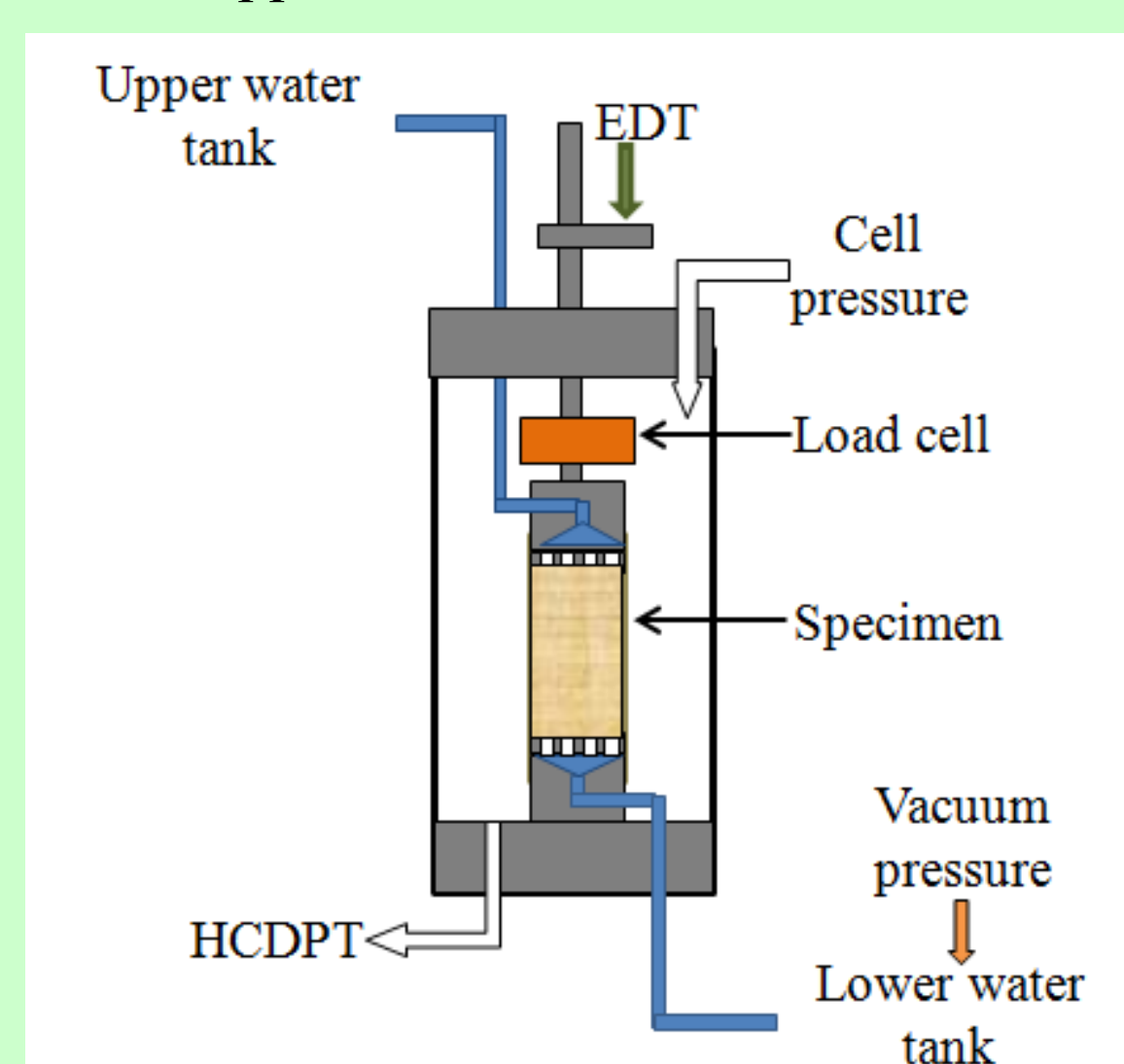


- Water seepage was concentrated at the certain areas such as boundary of fills→internal erosion
- Influence of small degree of erosion was not clarified.
- 浸透流は盛り土境界など特定の箇所で集中し、“水みち”となる。→内部侵食発生の恐れ
- 少量の内部侵食が地盤に及ぼす影響は明らかになっていない

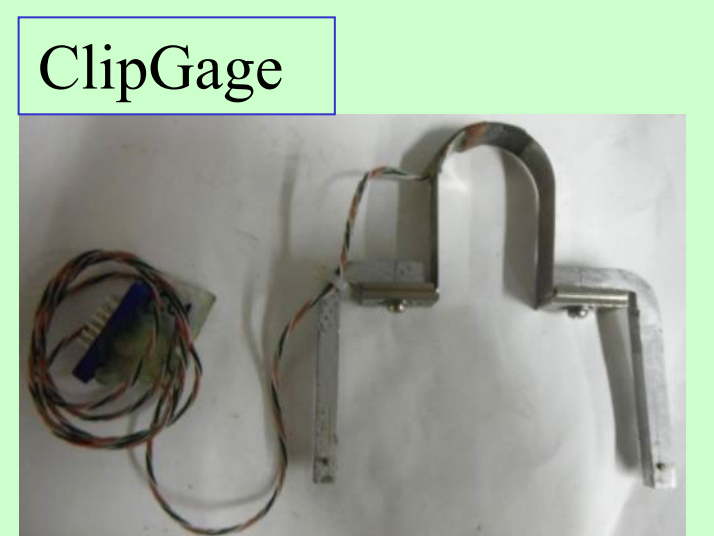
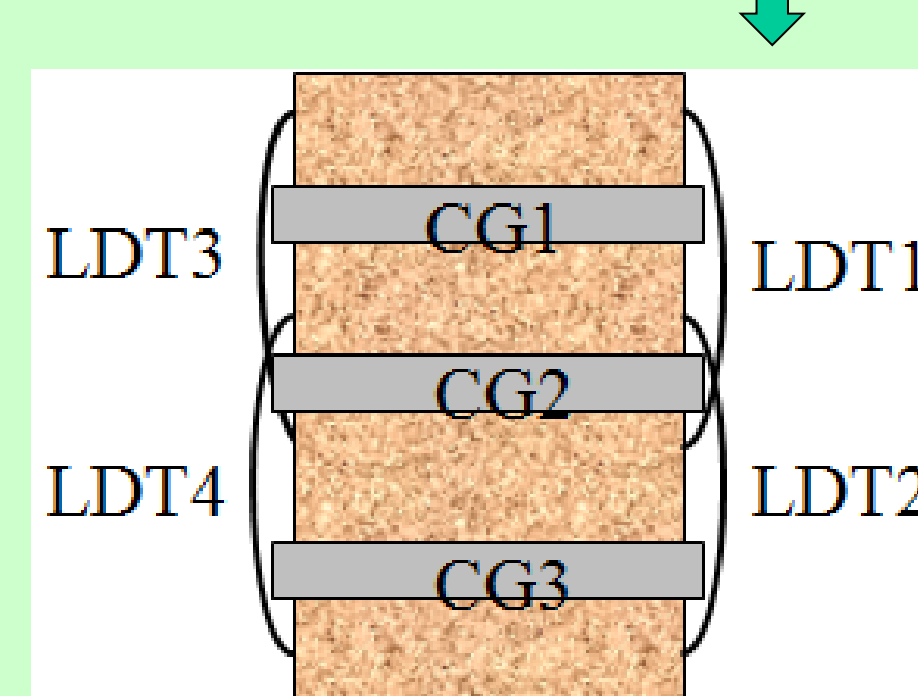
供試体内部で侵食を発生させる三軸圧縮試験装置 Triaxial test apparatus causing internal erosion inside the specimen

三軸圧縮試験装置内で浸透流を発生させ、侵食を発生させる。侵食終了後排水せん断を実施。
Internal erosion was made in the specimen and then the specimen was sheared with drained condition.

<Test apparatus>



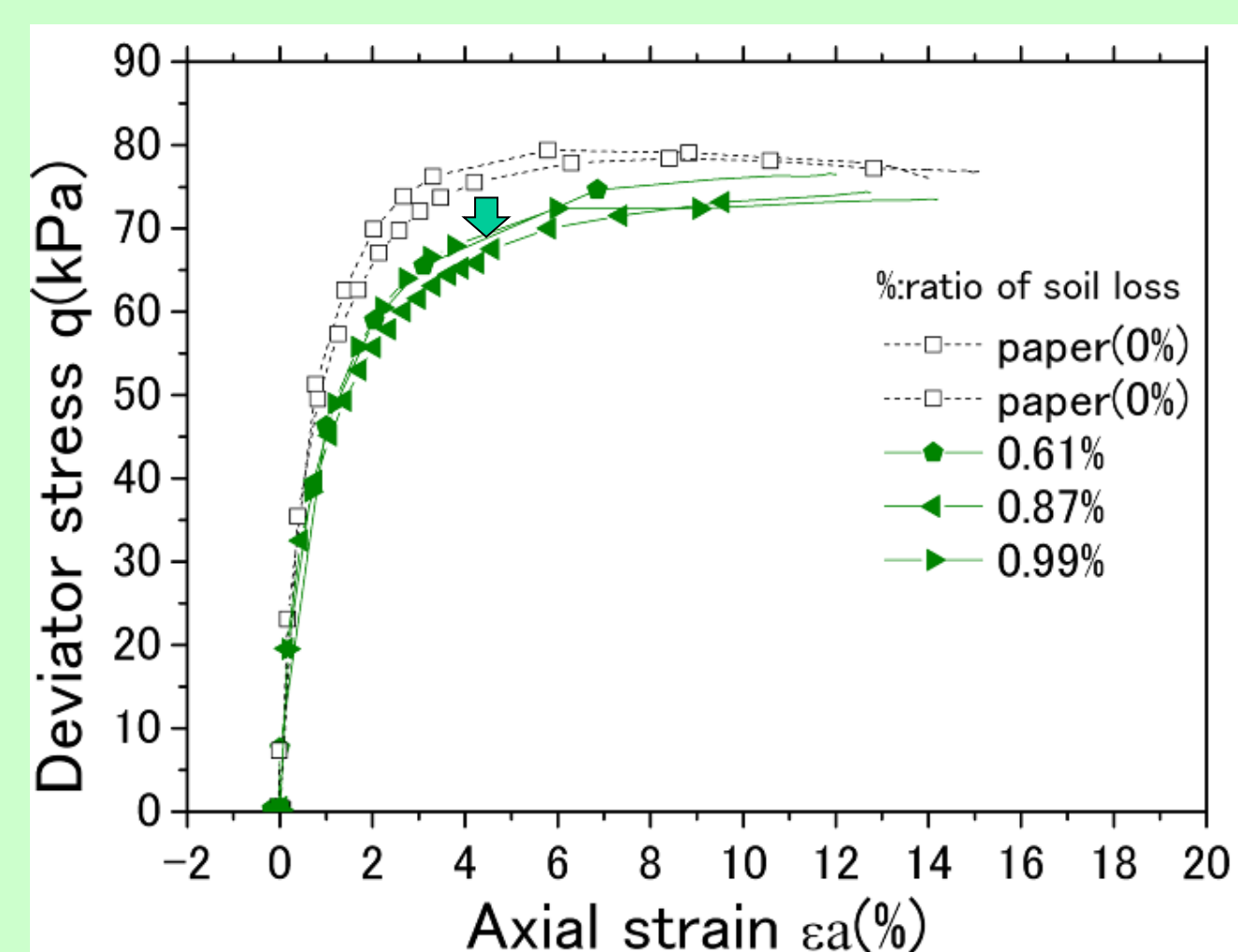
<Sensors>



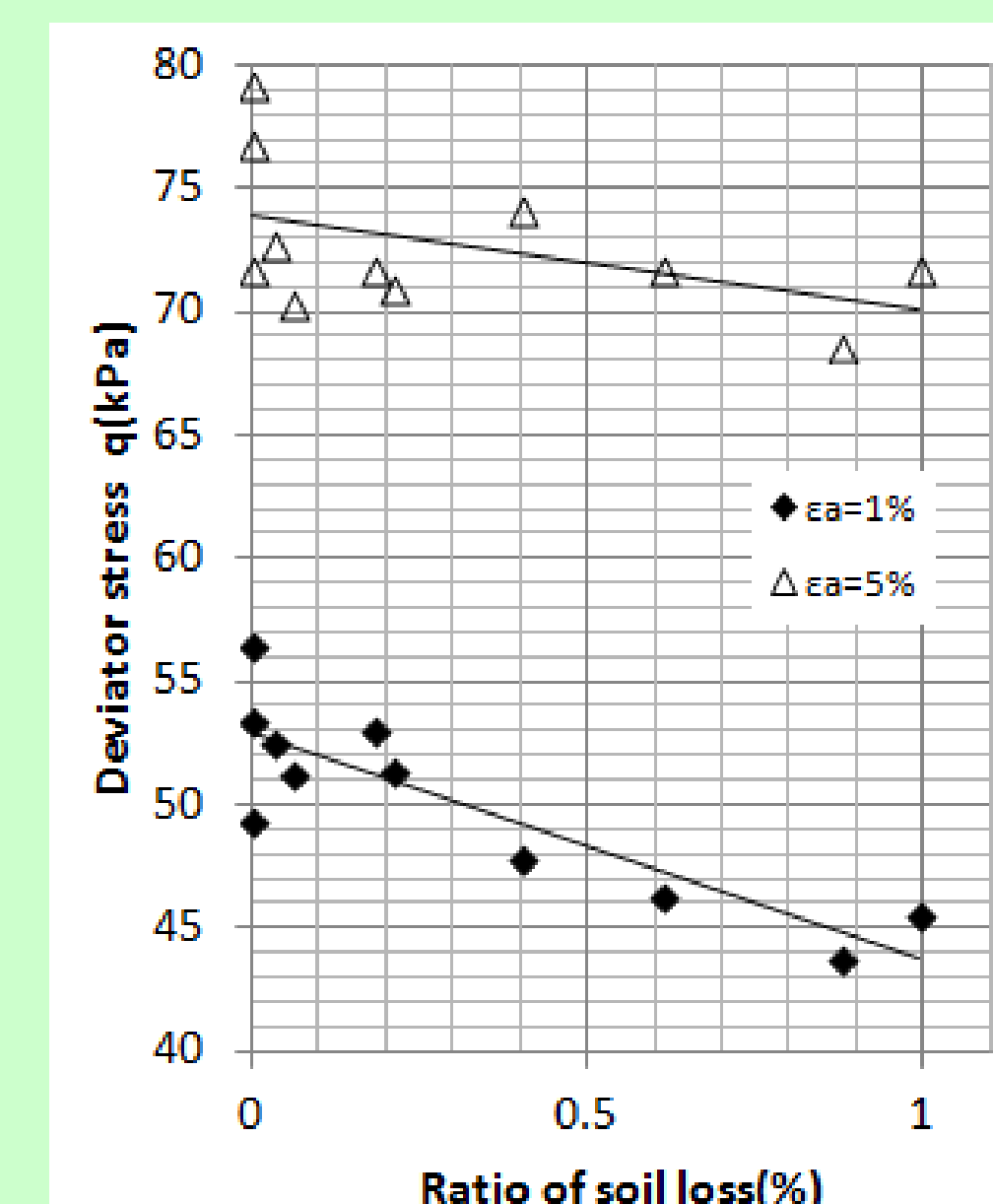
センサーを設置し水平ひずみ(CG)と鉛直ひずみ(LDT)を測定
微小ひずみ繰り返しにより実験中のヤング率とポアソン比を算出
ClipGages are for horizontal strain and LDTs are for vertical strain
Young's Modulus and Poisson's Ratio were estimated from these sensors by applying the cyclic loadings.

地盤の力学特性に与える影響 Effects of internal erosion on the strength and stiffness of soil

<stress-strain curve>



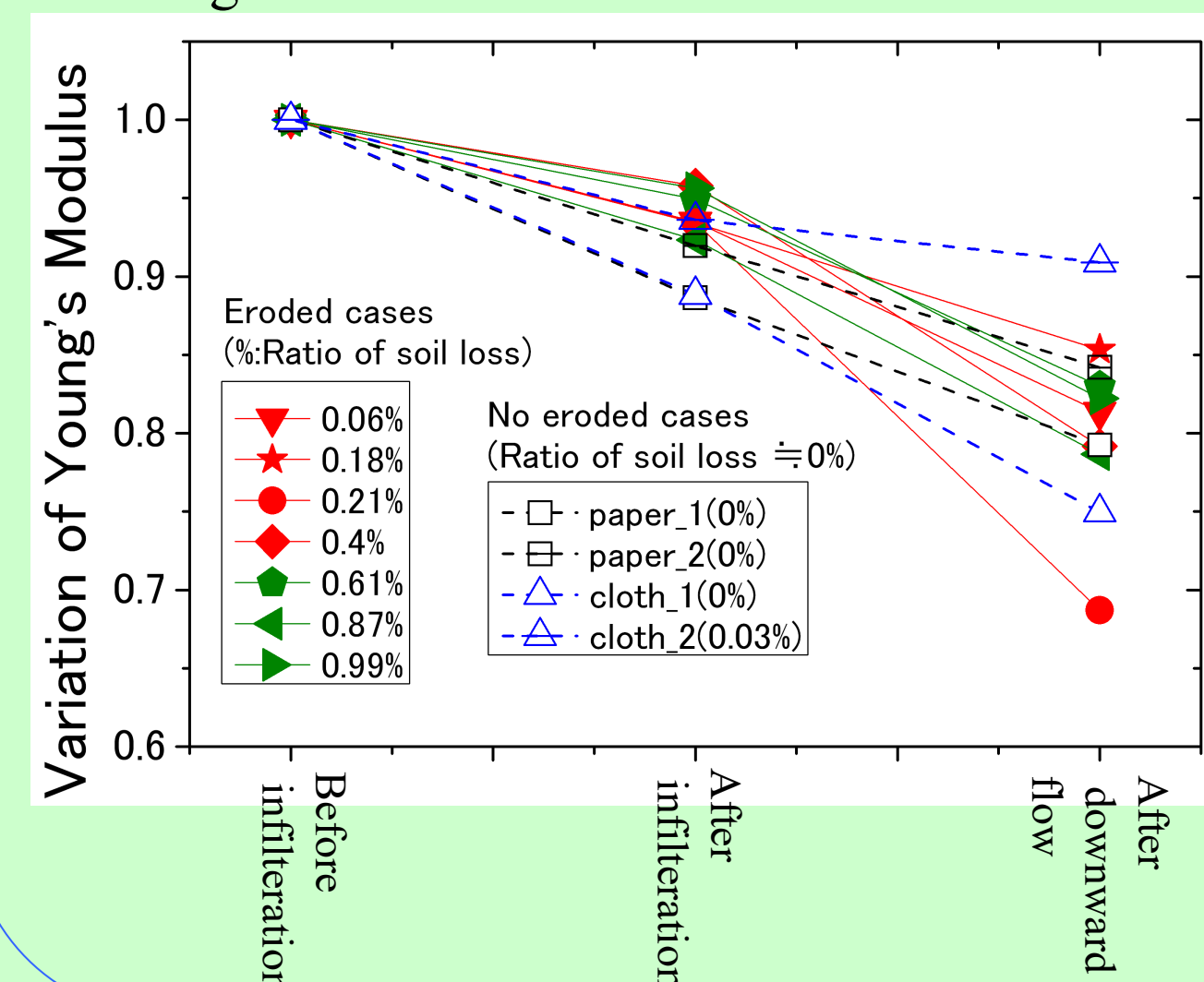
<Deviator stress at εa=1% and 5%>



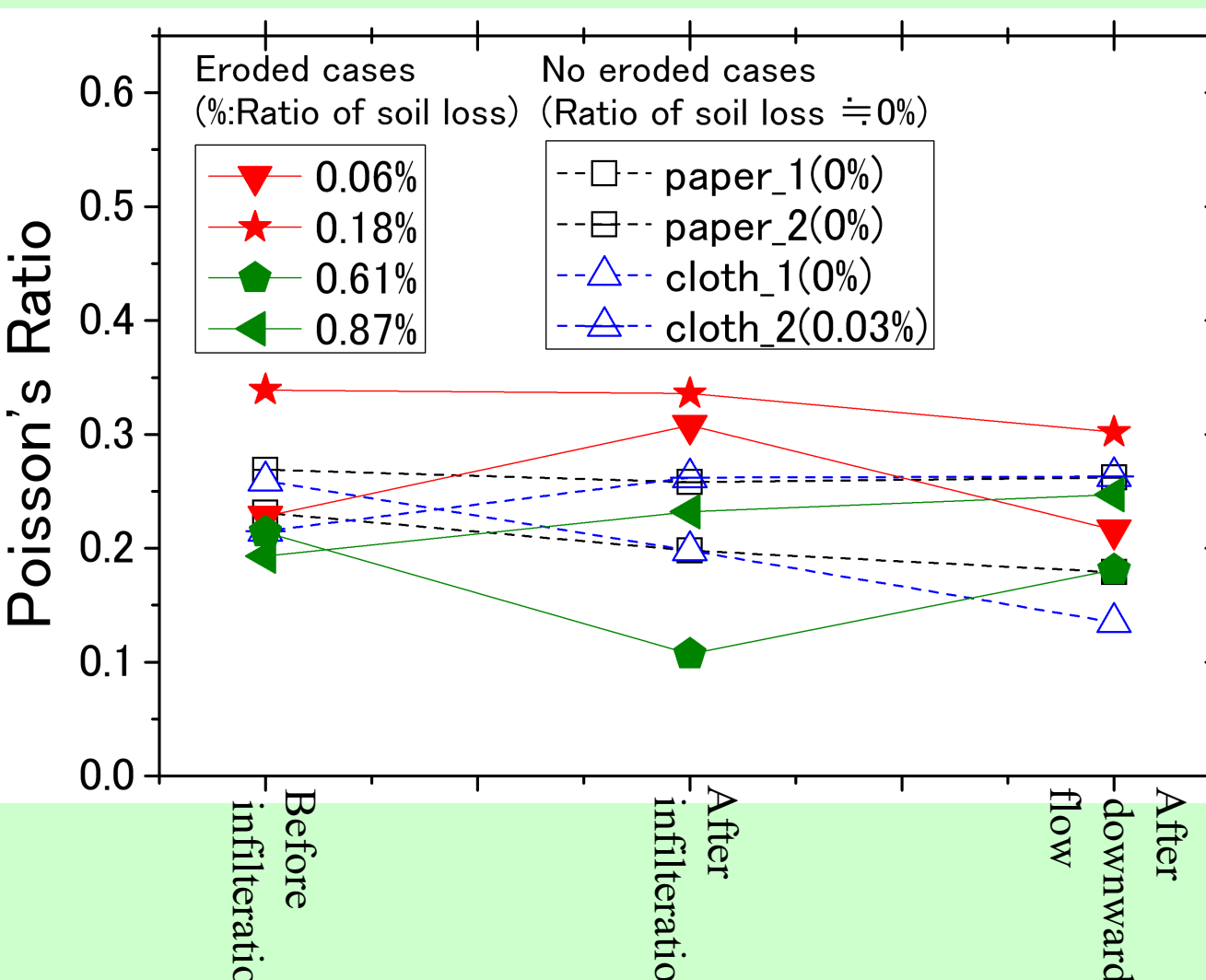
- Deviator stress decreased due to less than 1% amount of erosion in the whole specimen.
- The decreasing ratio was larger at small strains, and was relative to the amount of eroded soil.

- 偏差応力は少量の侵食(全体の1%以下)でも低下がみられた
- この減少程度は特にひずみの小さな範囲で大きく、侵食量に比例した。

<Young's Modulus>



<Poisson's Ratio>

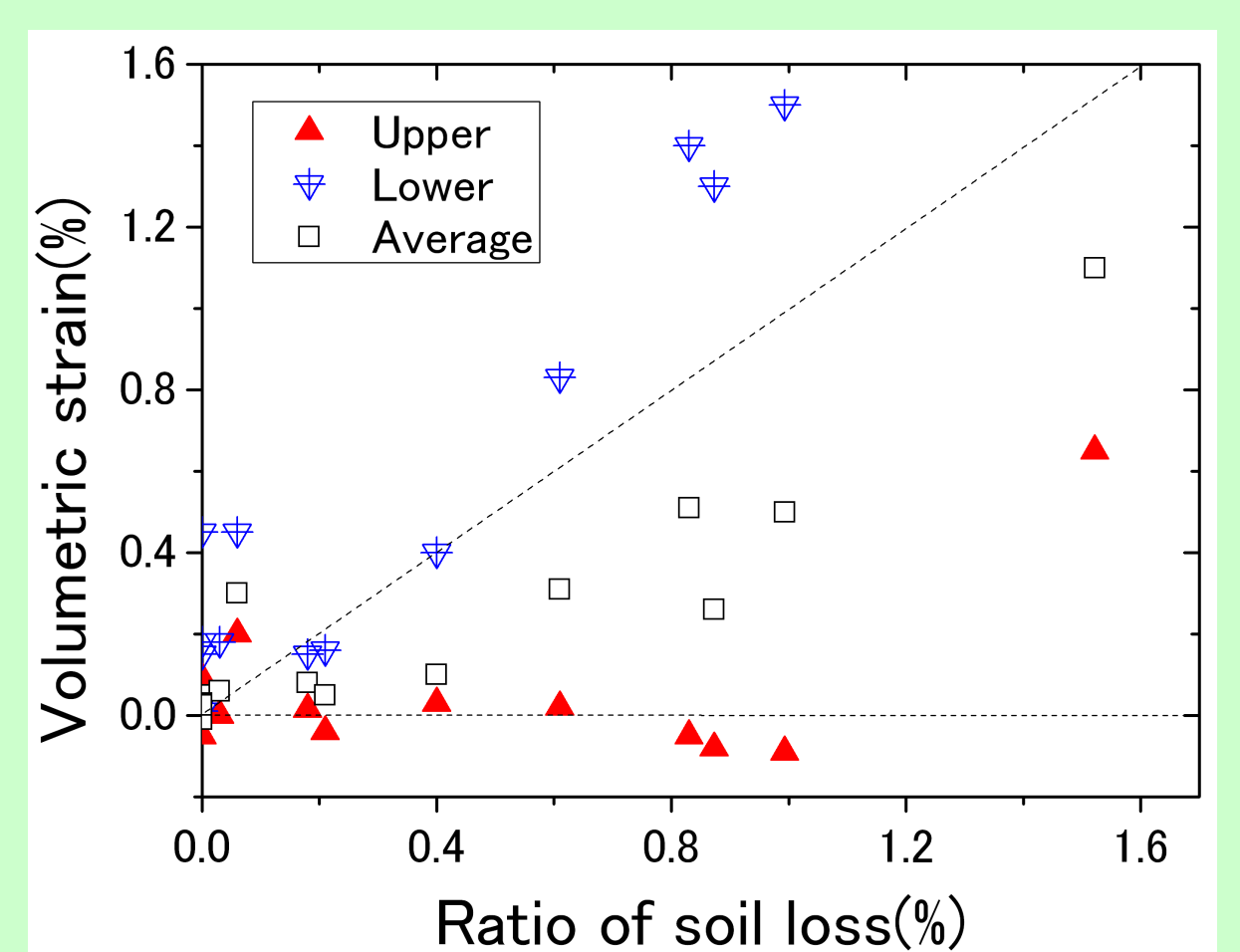


- Young's Modulus decreased due to internal erosion but Poisson's ratios were not affected by erosion.

- ヤング率は侵食が発生したケースで減少したが、ポアソン比にはほとんど影響がみられなかった。

侵食による変形 Deformation

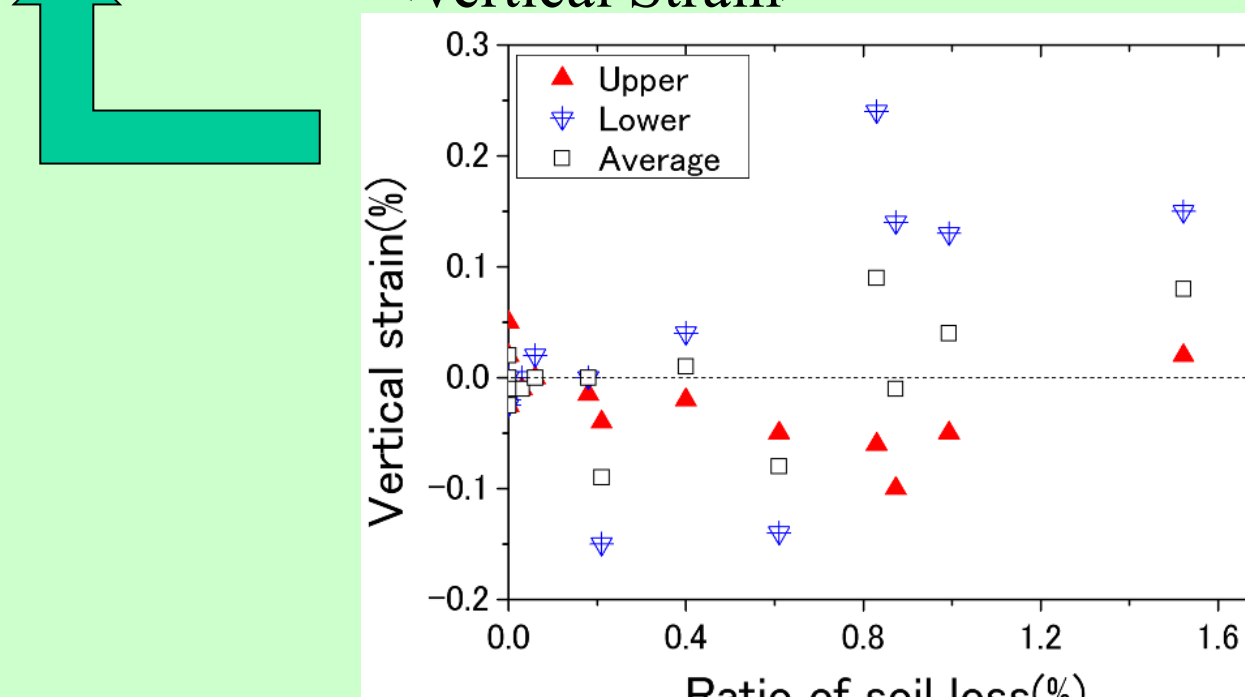
<Volumetric Strain>



- 下部においては侵食量以上に圧縮されたが上部においてはほとんど変形がみられなかった。
- 鉛直ひずみはほとんど発生せず。異方性がある。

- Lower part was compressed more than the amount of erosion but upper part was not deformed so much.
- Vertical strain was not so large, which suggested anisotropic behavior.

<Vertical Strain>



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