

# Shear Wave measurement for Real-time Monitoring of Soil Fabric Changes Due to Suffusion

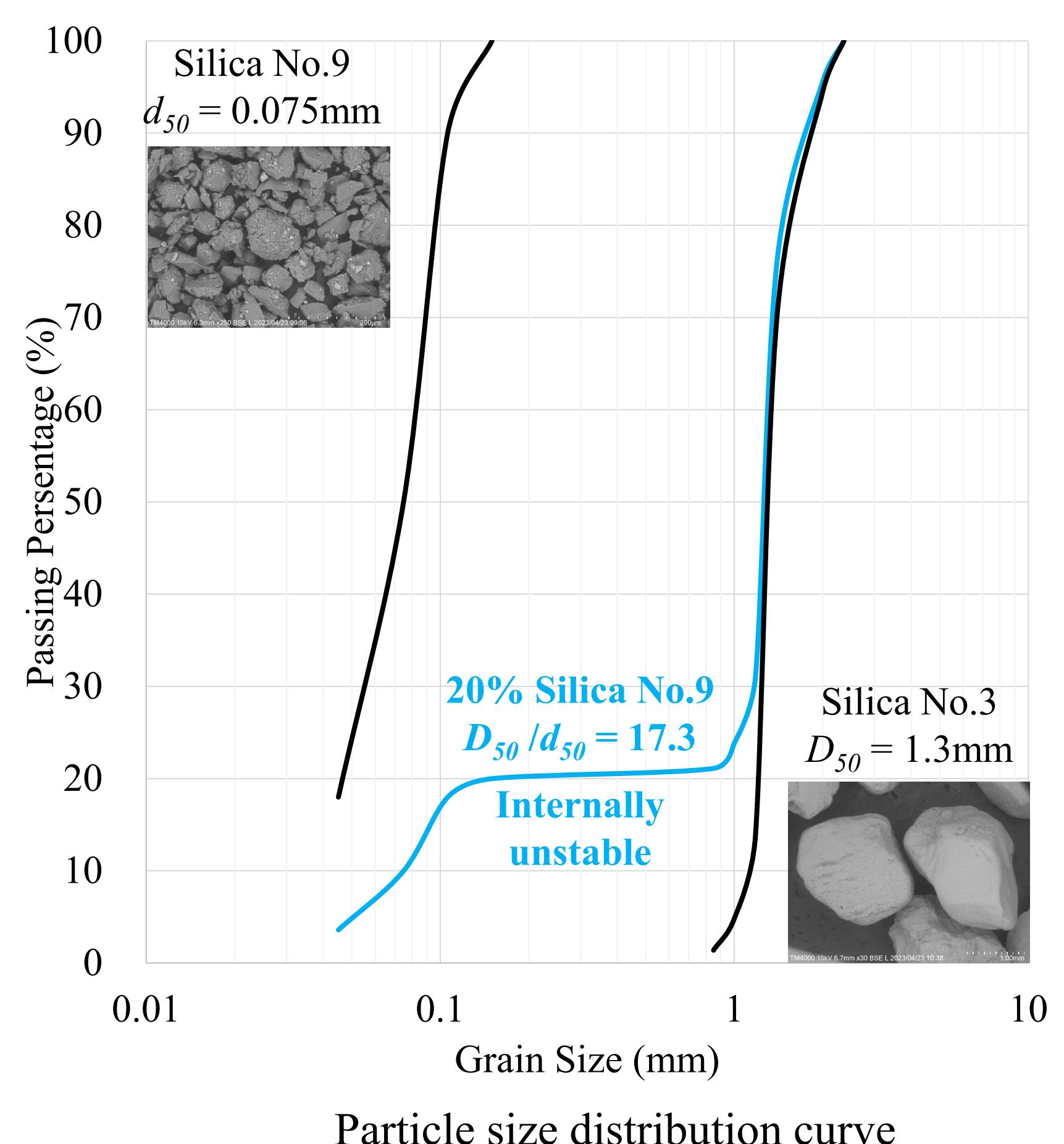
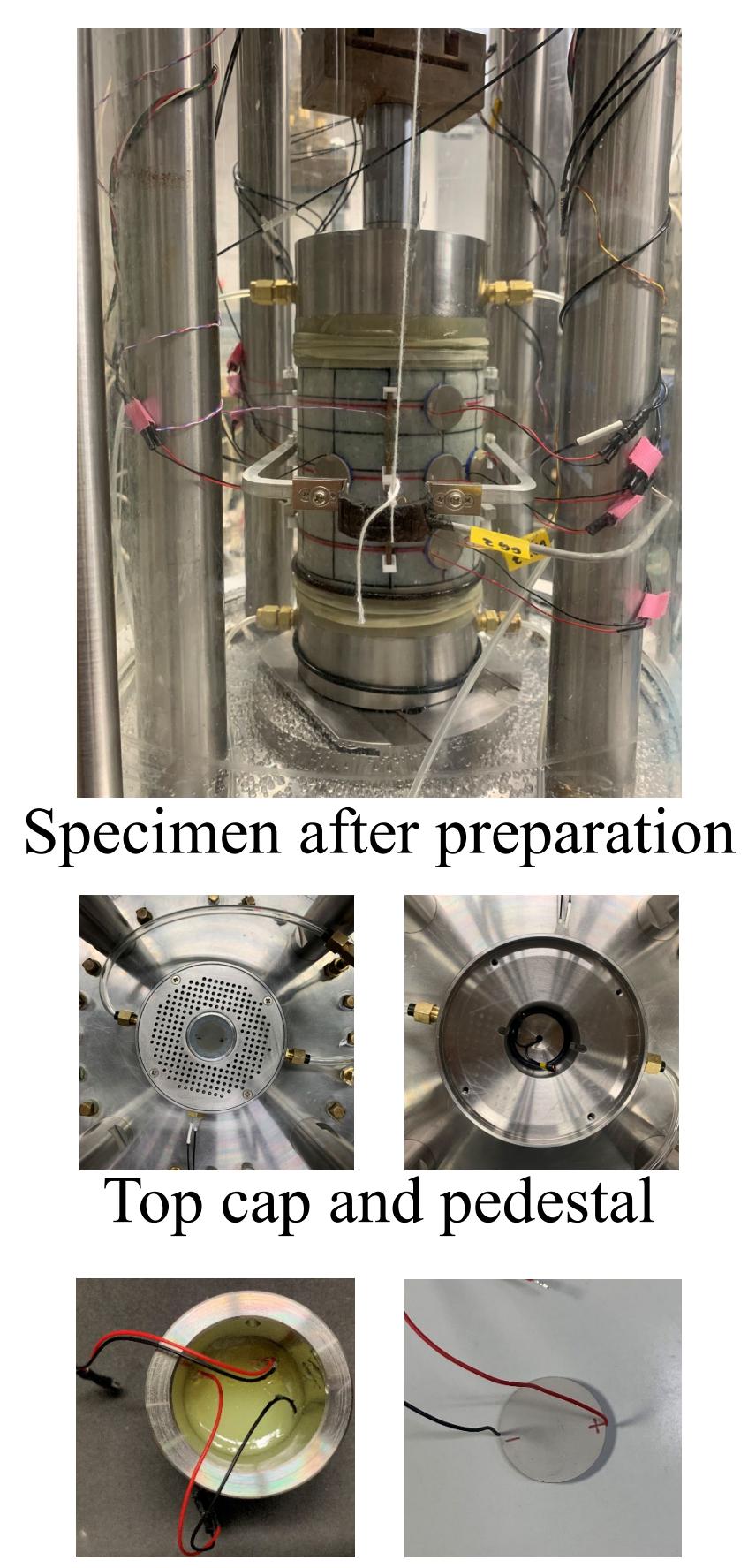
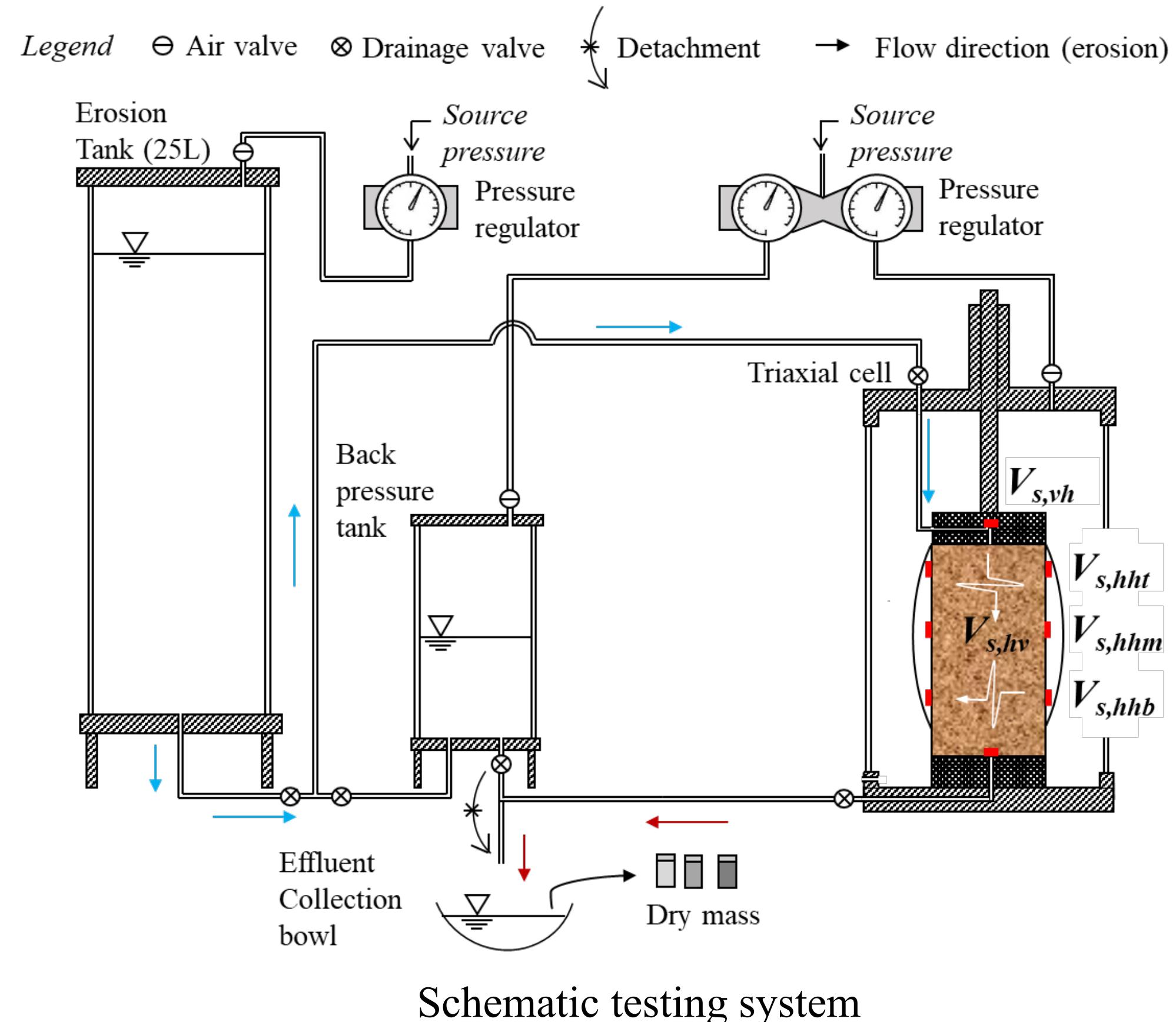


せん断波を用いた内部侵食のリアルタイムモニタリング

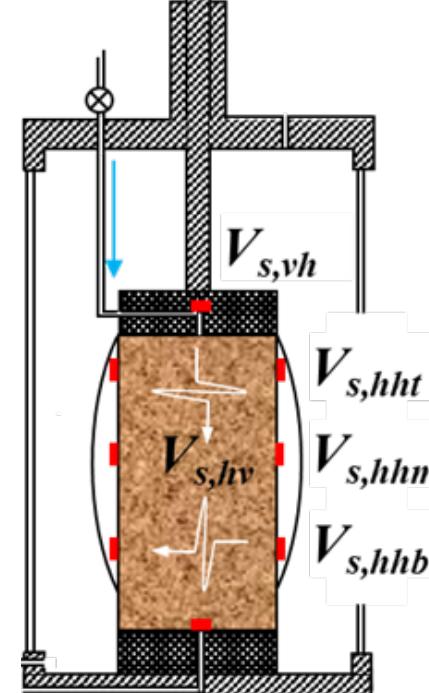
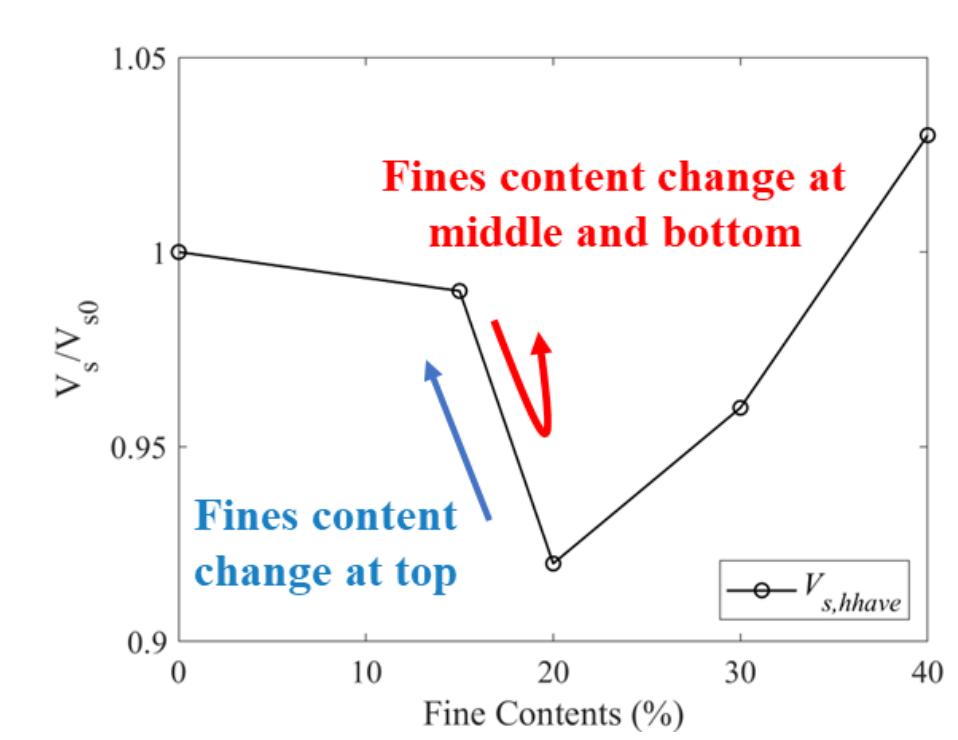
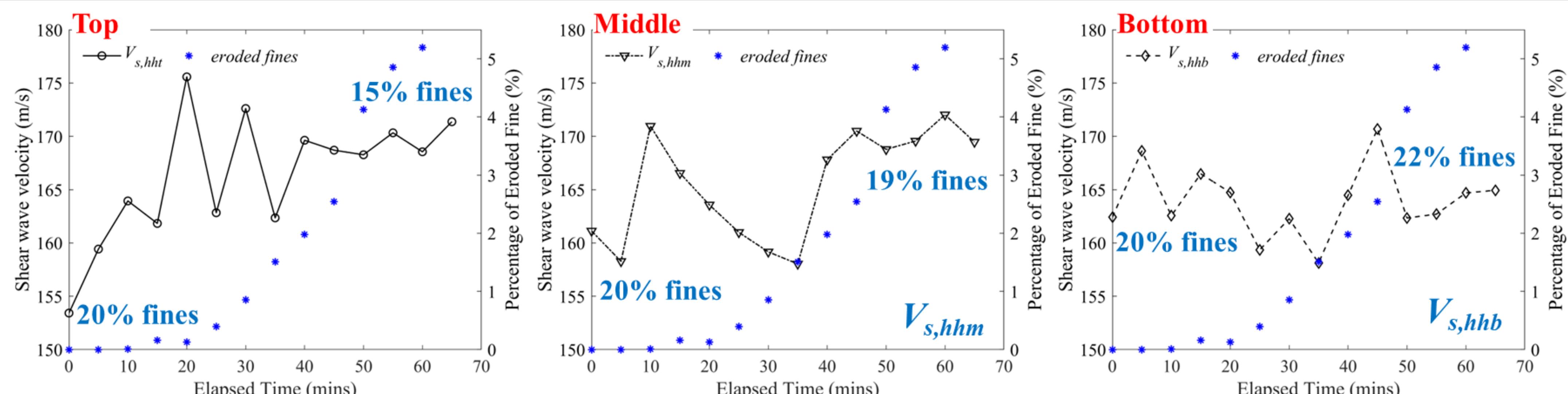
Internal erosion, caused by water-induced soil displacement and transportation, poses a significant risk to the stability of earthen structures. Advancing our scientific understanding and crafting tools for early-stage internal erosion detection is crucial because prompt intervention could help avert catastrophic structural damage and the ensuing costly repairs. The shear (S-) wave's sensitivity to changes in soil structure makes it an ideal instrument for non-destructive monitoring of internal erosion in soils. Our study has innovatively modified a conventional triaxial device to measure S-wave propagation from multiple directions during internal erosion. This advancement successfully tracks the structural changes in internally unstable, gap-graded soils.

土の内部侵食は、水流により地盤内部で土粒子が移動・流出する現象で、これにより、地盤や土構造物の強度が低下する恐れがあります。せん断波(S波)は、土の構造の変化に対する感度が高いため、土の内部侵食の非破壊モニタリングに適しています。本研究では、従来の三軸試験装置を改良し、内部侵食を受けている際の地盤材料のS波の伝播を多方向から測定できるようにしました。この改良により、内部侵食を受けたギャップグレード材料の構造の変化を追跡することができました。

## Materials and Apparatus



## Results



- $V_s$  transitions occur as fines content increases, resulting from the disruption of force chains by coarse particles and the inactivity of the filled fines.
- The transitional point of the horizontal component ( $V_{s,hh}$ ) occurs later than that of the vertical component ( $V_{s,vh}$ ), likely due to particle orientation favoring the horizontal plane during deposition, leading to more force chains horizontally.

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