# Supplementary Materials: Numerical Characterization of Cohesive and Non-Cohesive 'Sediments' Under Different Consolidation States Using 3D DEM Triaxial Experiments

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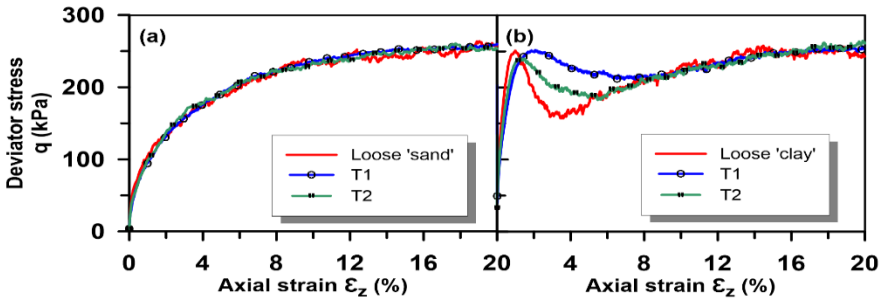


**Figure S1.** A self-similarity test was performed to assess results with the software internal model meter scale units and to show that the numerical results are not size dependent and can be further compared with laboratory tests. We carried self-similarity tests for each endmember type, by using the same triaxial setup-fixing the volume constant (220*220*220 (m)) while reducing the particle's radius by a predefined factor. $R_{original}$ is the range of radii presented in Table 1. In test 1 (T1), the particle's radius was reduced by a factor of two (i.e., $R_{original}/2$) resulting in a range of $1.85 < R < 2.75$. In test 2 (T2), the particle's radius was reduced by a factor of 1.33 (i.e., $R_{original}/1.33$) resulting in a range of $2.77 < R < 4.12$. (Note: any smaller factor would have produced more than two million particles within the volume, which is beyond the limit of the computer calculation power).

The results in Figure S1 are presented for the tests performed under a confining stress of 250 kPa. (a) 'Sand' endmember: the red line indicates the samples tested with $R_{original}$, with a blue line for test T1 and a green line for test T2. (b) 'Clay' endmember: the red line indicates the samples tested with $R_{original}$, with a blue line for test T1 and a green line for test T2. Loose 'sand' tests show a very similar stress–strain behavior, whereas loose 'clay' tests' similarity is only apparent in the peak value and residual stress. It appears that, in 'clay' samples, the cohesive strength is influenced by the rate at which the bonds breaks, once the peak shear strength is reached.

As we mainly focused on the peak behavior and further deformation was evaluated over strain intervals, we find this similarity satisfactory for the purpose of the current study.

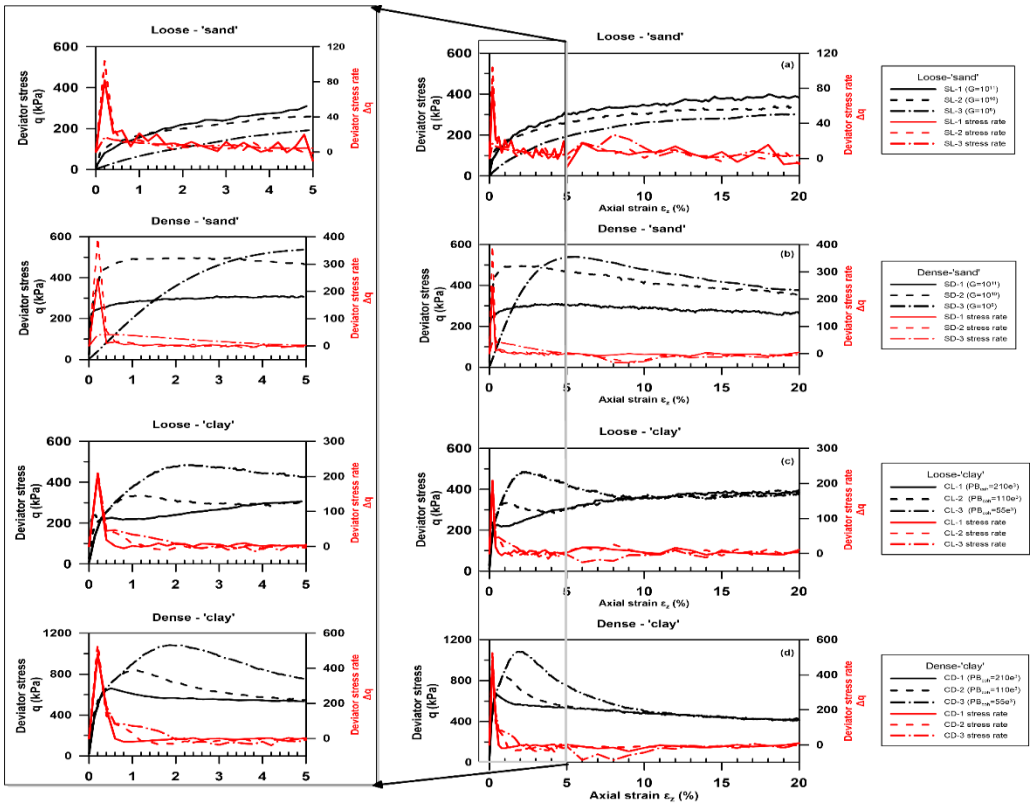


**Figure S2.** The stress rate was calculated for intervals of 1% of strain. The results are presented for samples tested under confining stress ($\sigma_3$=) 250 kPa. Stress–strain curves are in black lines and stress rate in red lines. (**a**) loose 'sand' (**b**) dense 'sand' (**c**) loose 'clay' and (**d**) dense 'clay' samples. The rectangular inset in a-d represents zooming-in for the behavior between 0–5% of strain in the figures on the left for each material.