Lehrstuhl und Prüfamt für Grundbau,
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Ingenieurfakultät Bau Geo Umwelt
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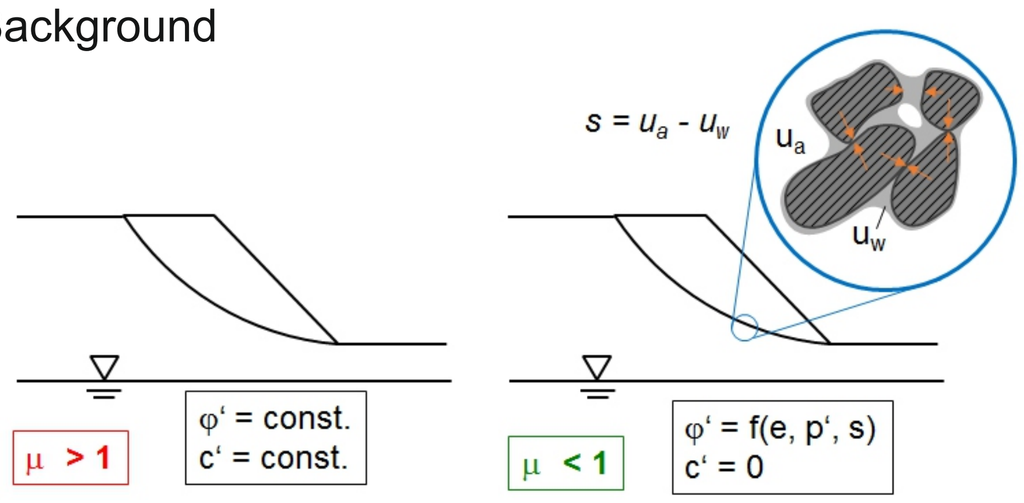
Suction induced effective stress and non-linear shear strength of an as-compacted silty sand

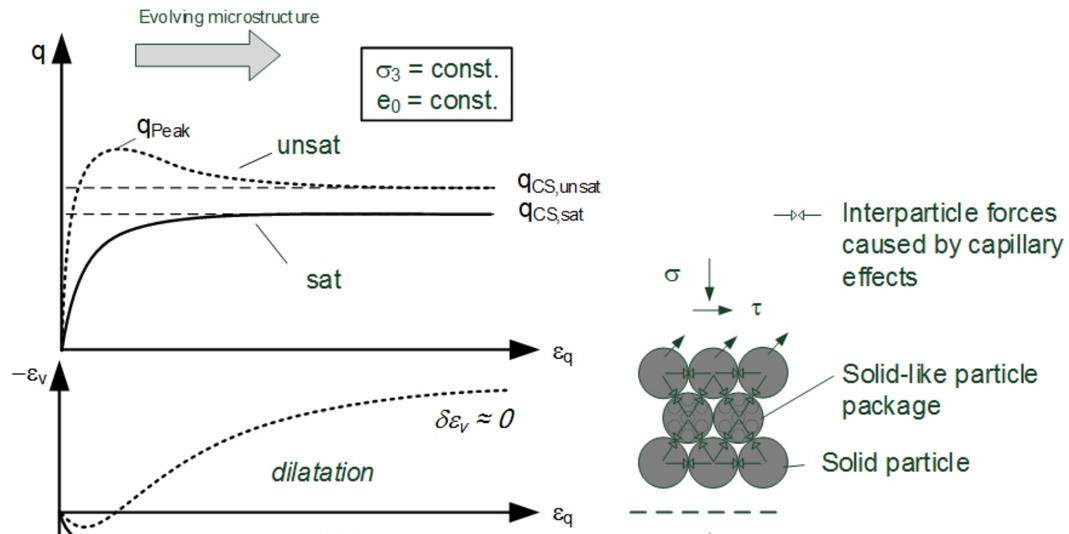
Background



The discrepancy between the difficulty of proving slope stability and the observed stable behavior of existing traffic embankments of as-compacted silty sands can be traced back to the dual effect of suction on shear behavior:

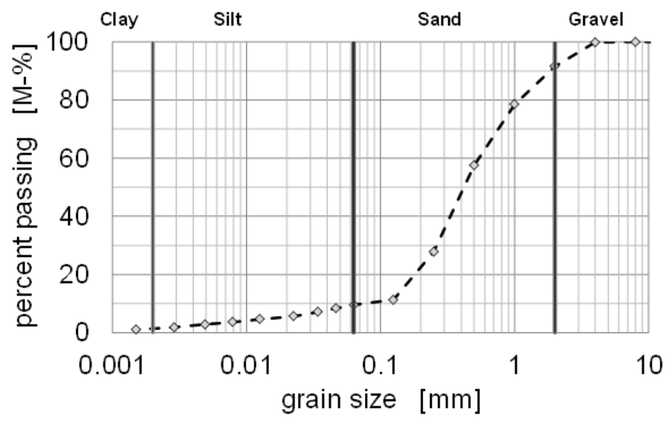
- Increased tendency to dilate
- Increased effective stress

This study shows the effect of suction on both the peak shear strength and the effective stress under prevailing site conditions.



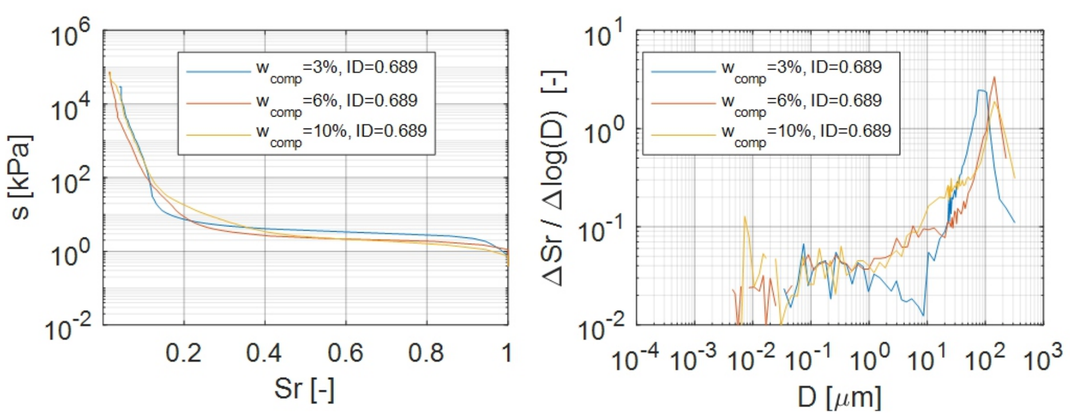
Dual effect of suction on the shear behavior.

Soil



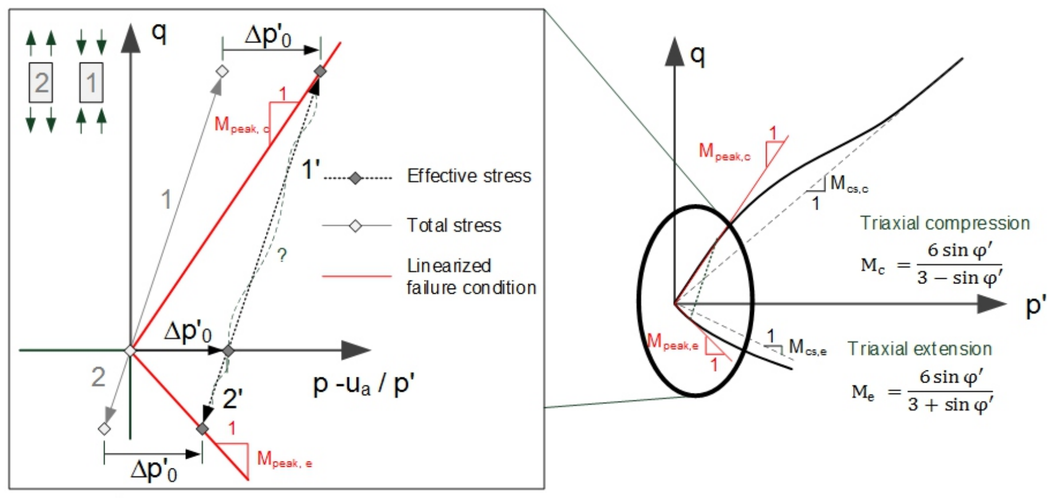
Non-plastic silty sand.

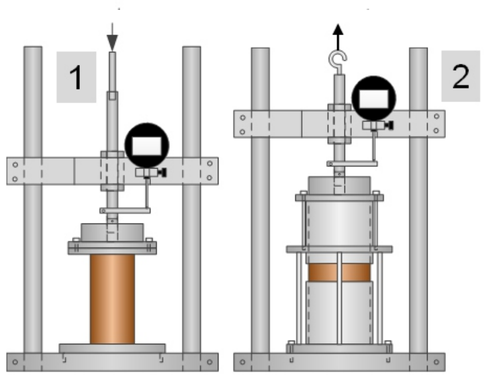
The microstructure of compacted samples



Soil-water retention curves and pore-size distributions from mercury intrusion porosimetries on samples compacted at different water contents revealing double-porosity for low water contents.

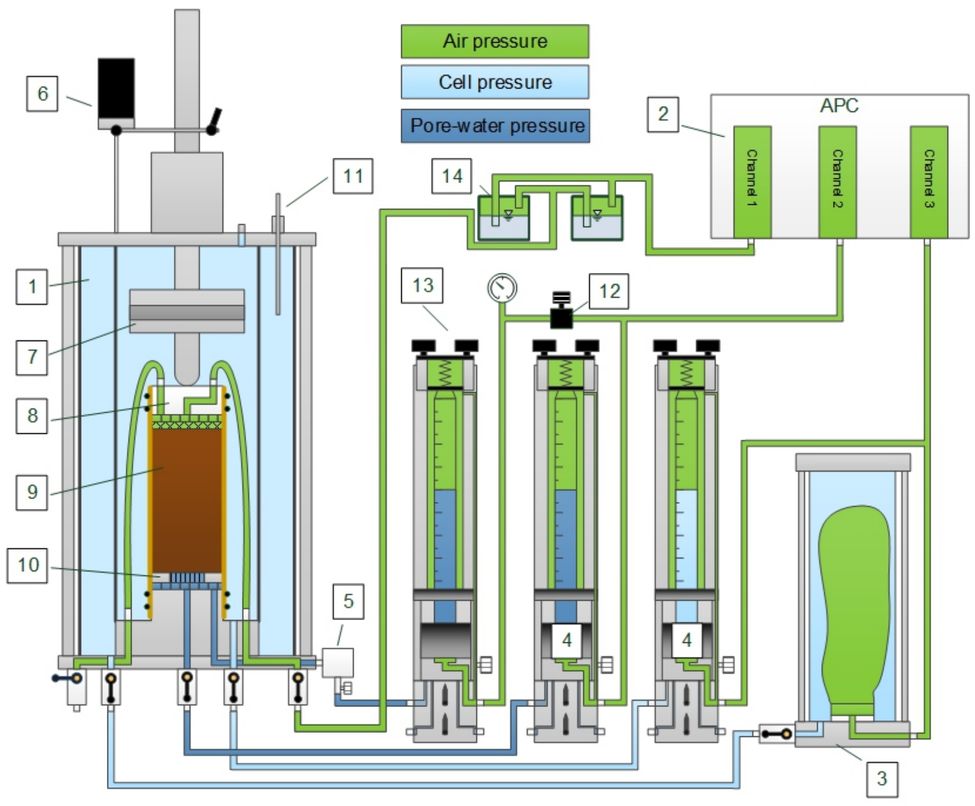
Experiments to assess the shear strength at low stress states





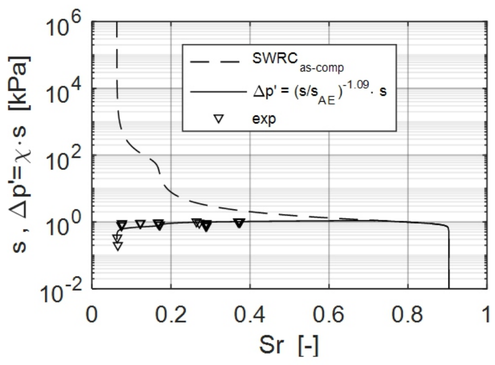
Determination of the effective stress and the peak shear strength from uniaxial tensile tests [2] and unconfined compression tests [1].

Experiments to assess the shear strength at moderately high stress states



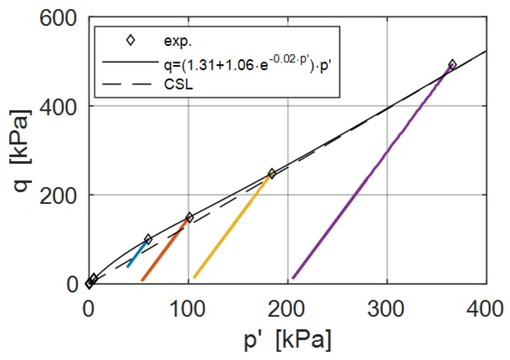
Determination of the peak shear strength from suction-controlled and constant water content triaxial compression tests.

Suction induced effective stress ($I_D \approx 0.69$)

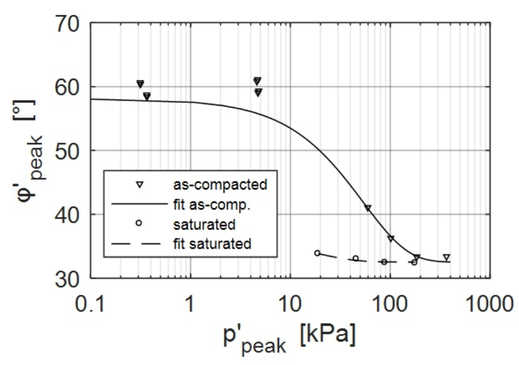


Suction induced effective stress vs. degree of saturation representing various as-compacted water contents.

Failure criterion (w_{comp} = 3 % and $I_D \approx 0.69$)



Non-linear failure criterion of the as-compacted silty sand.



Secant peak friction angle vs. effective stress for as-compacted and saturated conditions.

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