TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Civil Engineering Institute of Geotechnical Engineering

Density dependent pore water pressure evolution in a simple cyclic shear test

Božana Baćić, Ivo Herle

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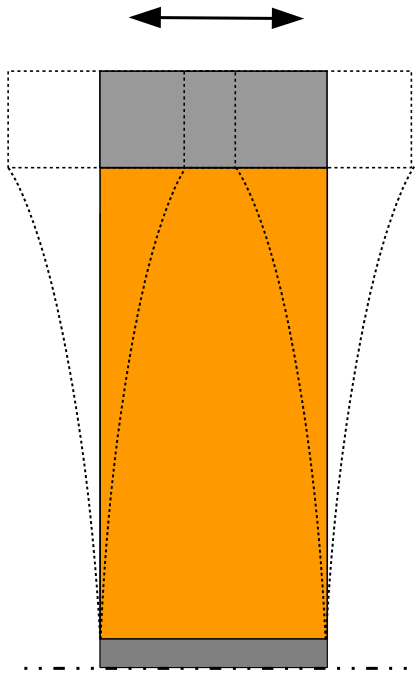
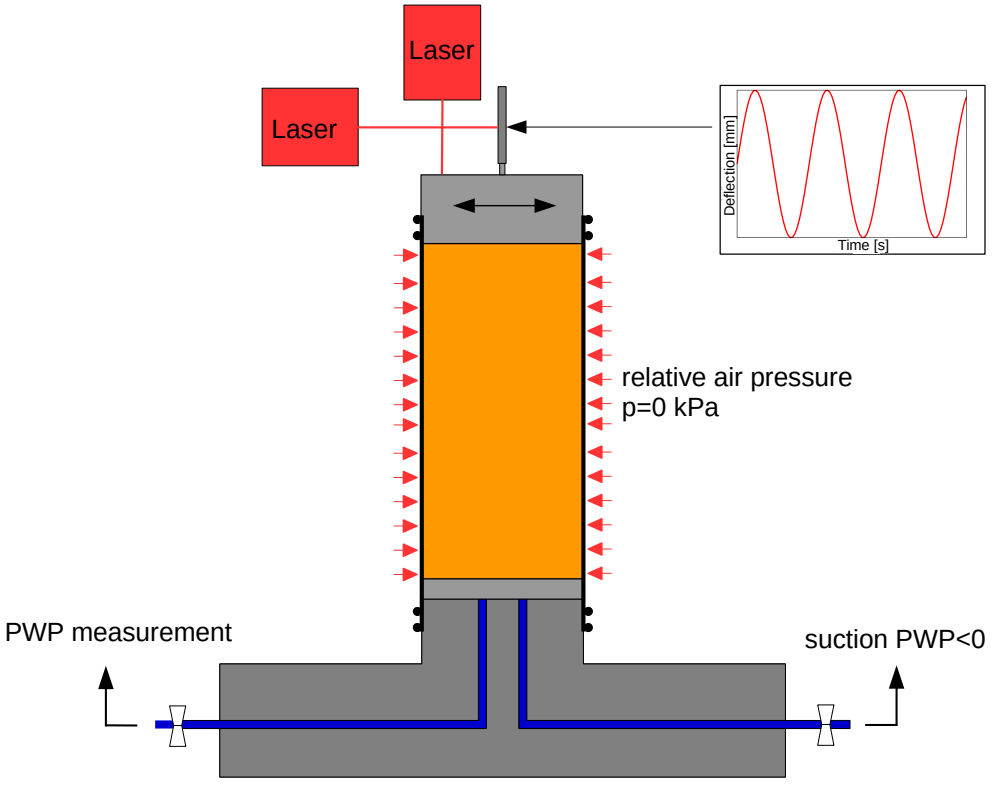
- Test that enables the comparison of the sensitivity of different sands to density dependent PWP build-up
- Fast and simple procedure

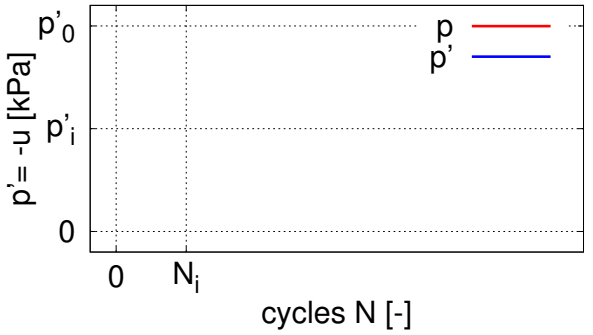
Idea of the cyclic shear test

- Cylindrical specimen (without water-filled cell)
- Analogy to simple shear test
- Evaluation: $\mathbf{p = p' + u = 0\,kPa}$ **= const.**



Single test performance: $p = p' + u = 0$ kPa





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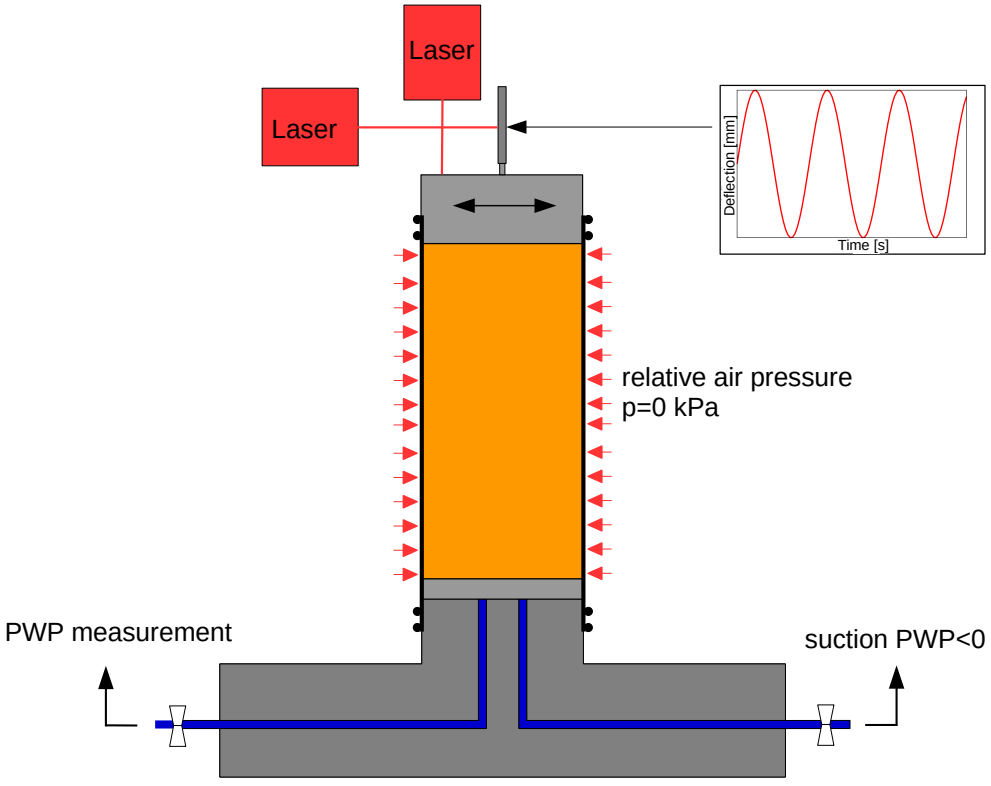
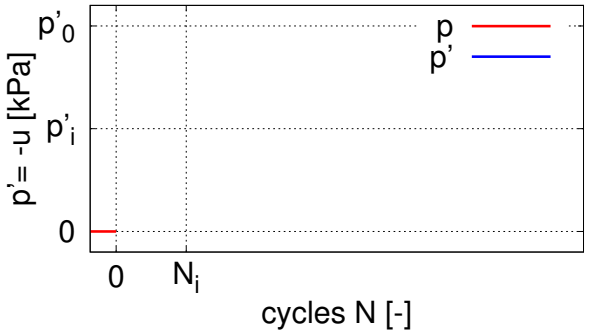
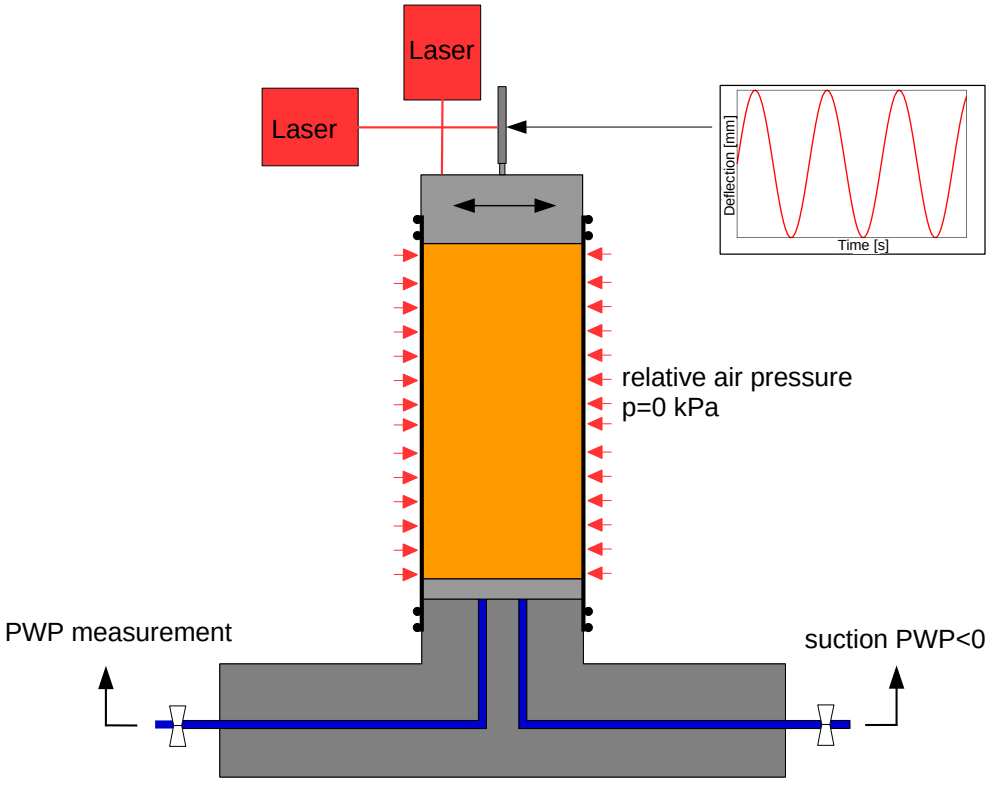


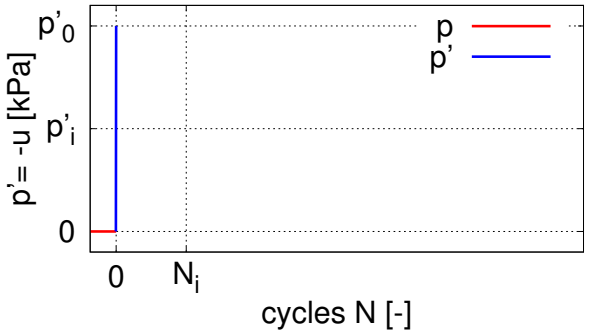


1. initial state

   $p = p' = u \approx 0$ kPa;

Single test performance: $\mathrm{p} = \mathrm{p}' + \mathrm{u} = 0\,\mathrm{kPa}$





1. initial state

   $\mathrm{p} = \mathrm{p}' = \mathrm{u} \approx 0\,\mathrm{kPa}$;
2. consolidation

   $\mathrm{u} < 0\,\mathrm{kPa} \rightarrow \mathrm{p}' > 0\,\mathrm{kPa}$

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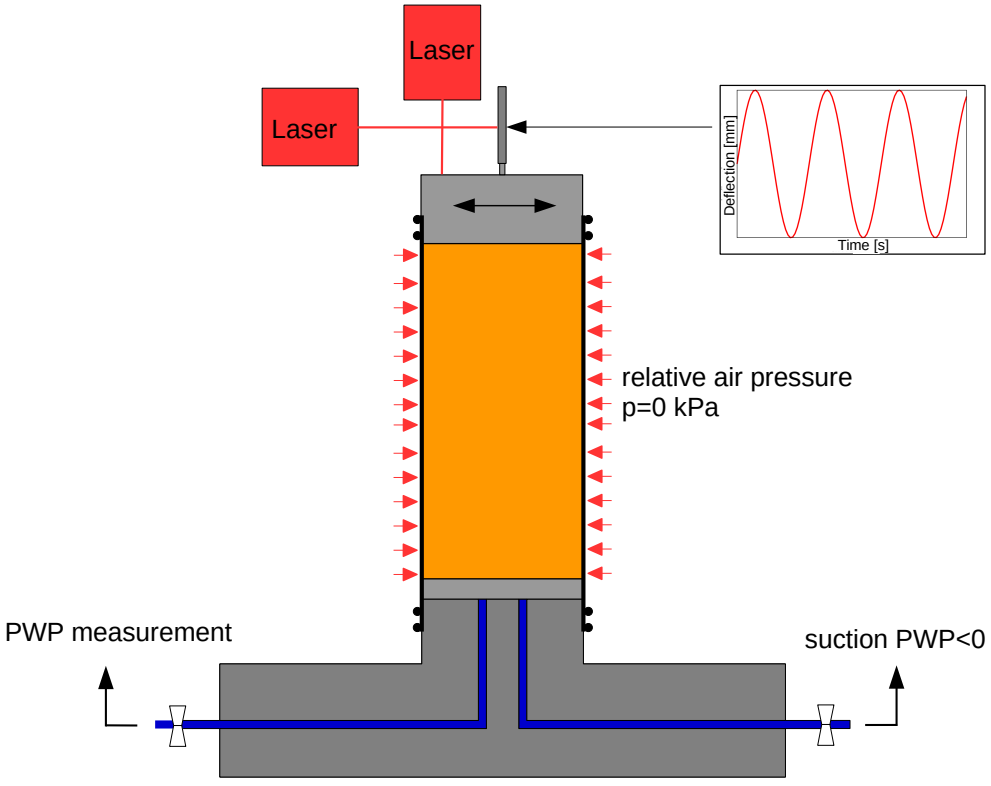

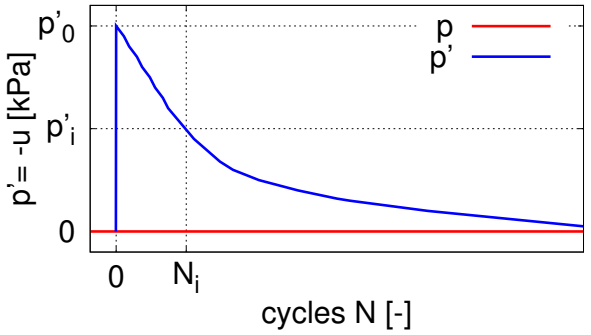

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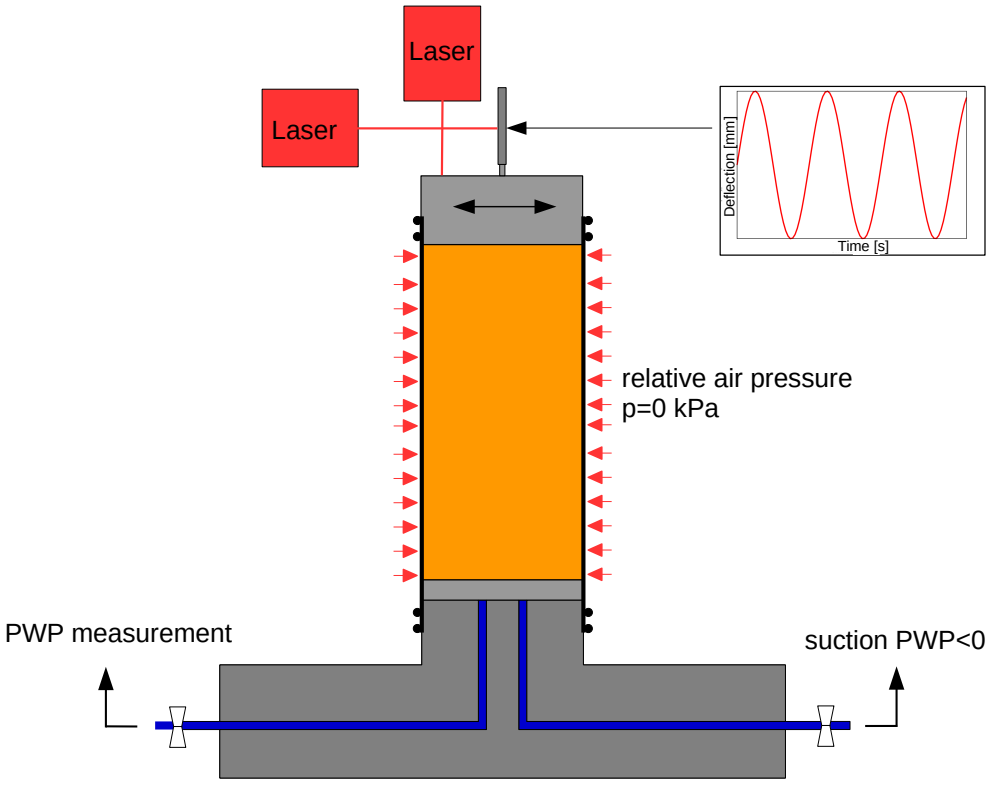

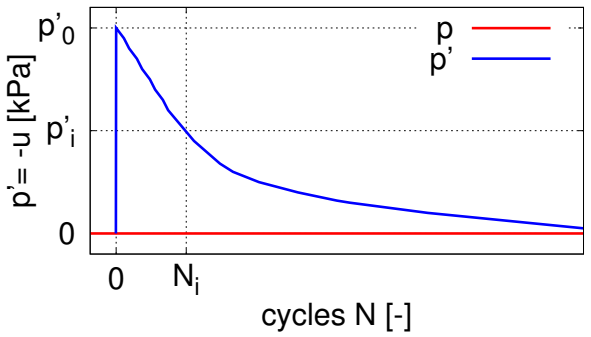

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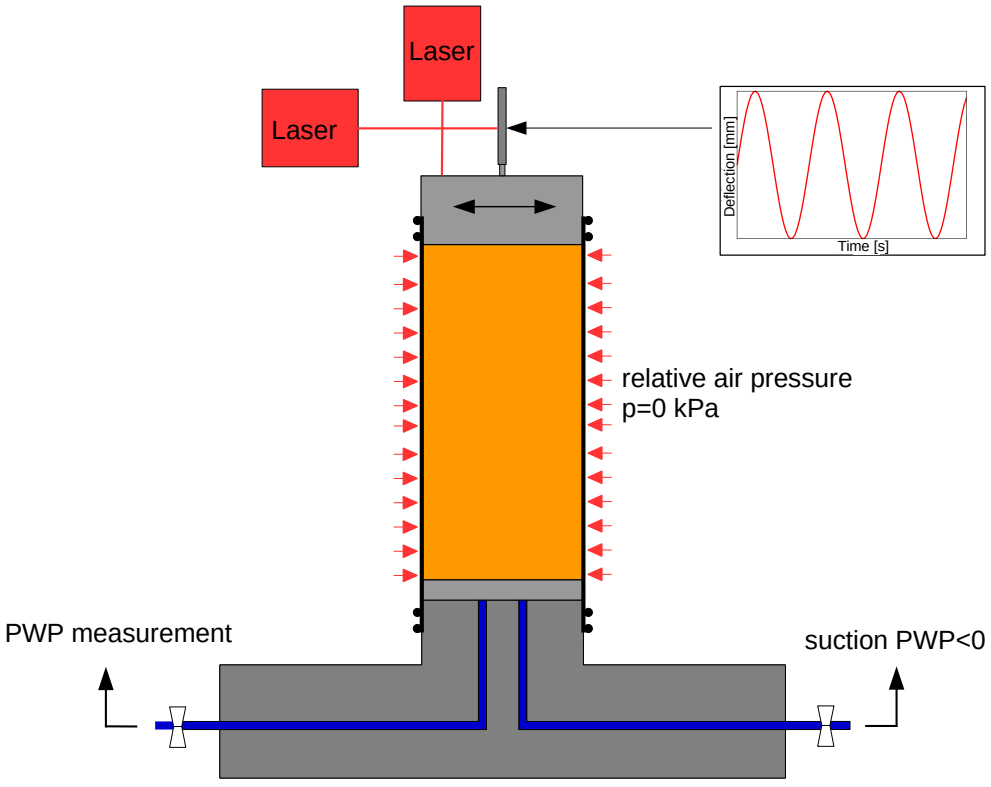
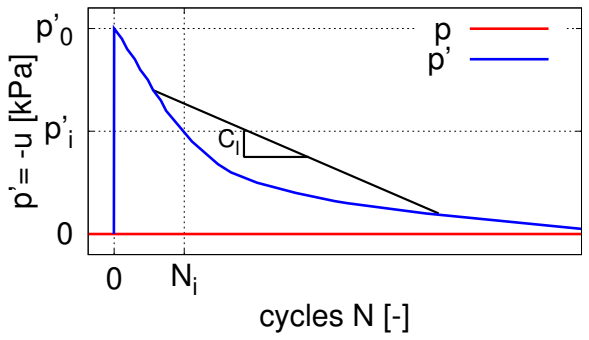
Test duration: $\approx$ 30 min.

Single test performance: $p = p' + u = 0\,kPa$





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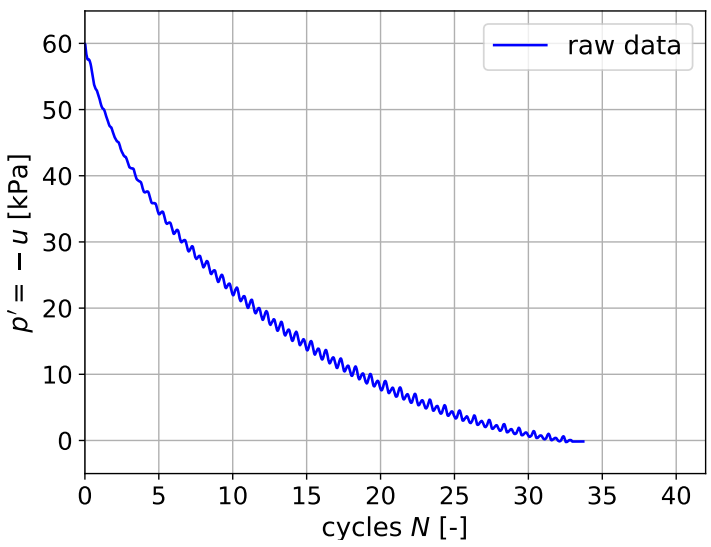
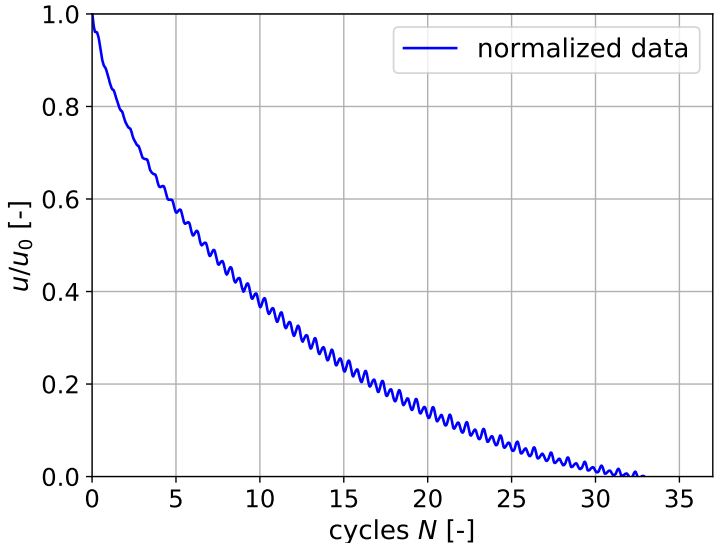
Test duration: $\approx$ 30 min.

Result: **Rate of PWP build-up - C_l** linked to initial relative density - D_{r0}

Evaluation of a single test





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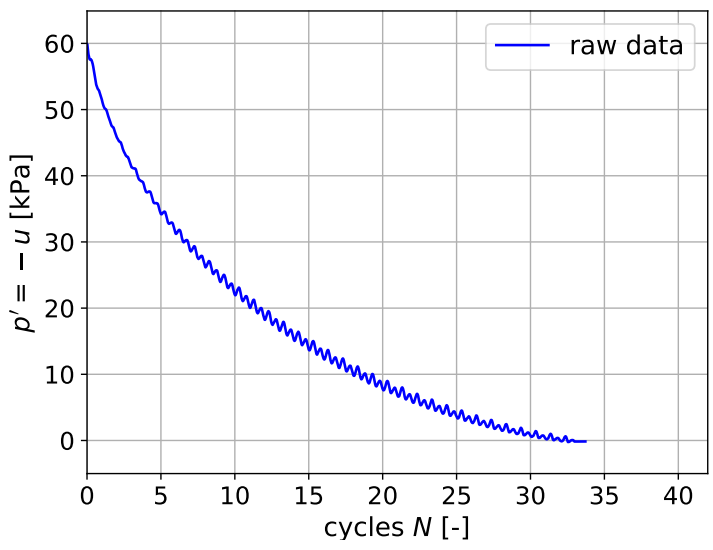

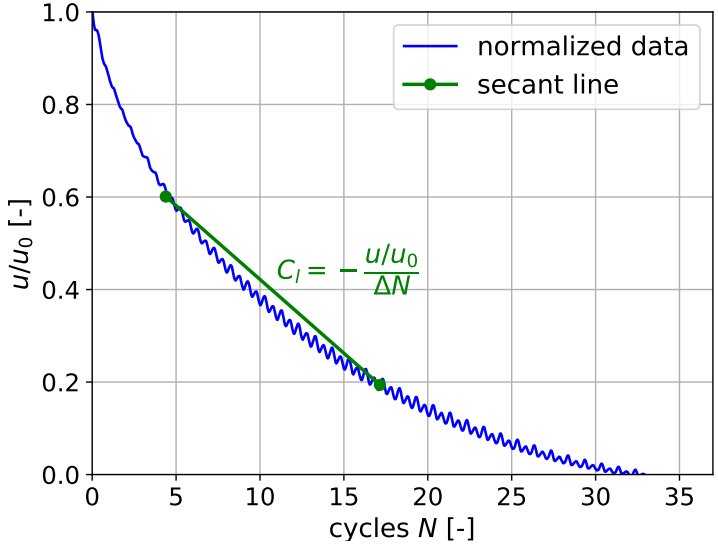

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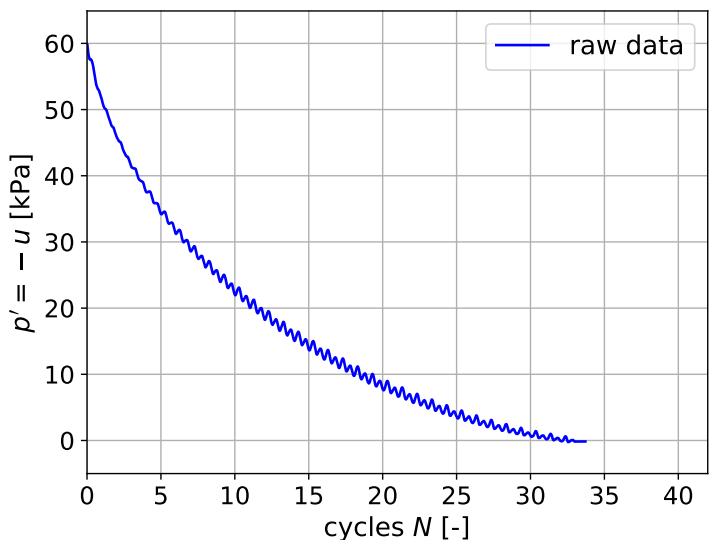
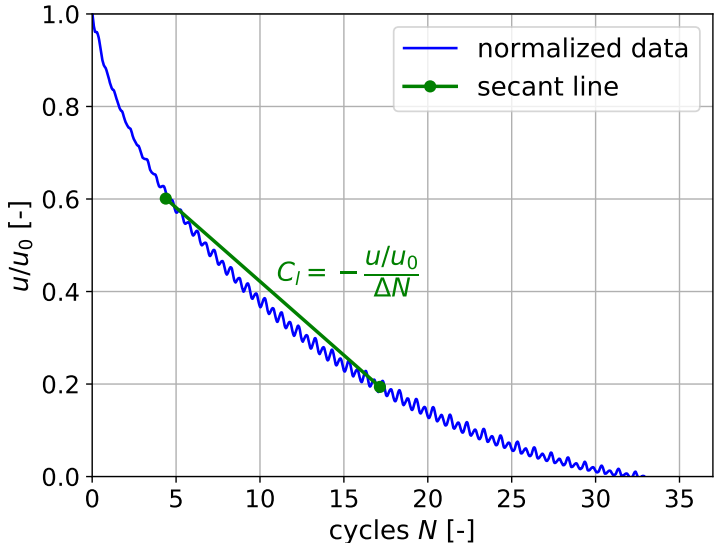
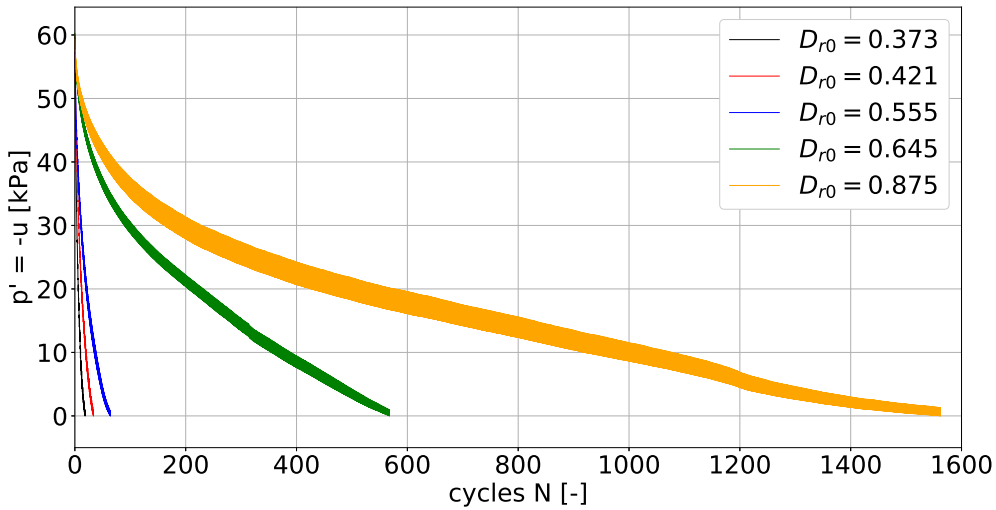




Rate of PWP build-up - $\mathbf{C_l}$ is defined as the slope of a secant line in the $\mathbf{N - u/u_0}$ graph

Test evaluation - one sand



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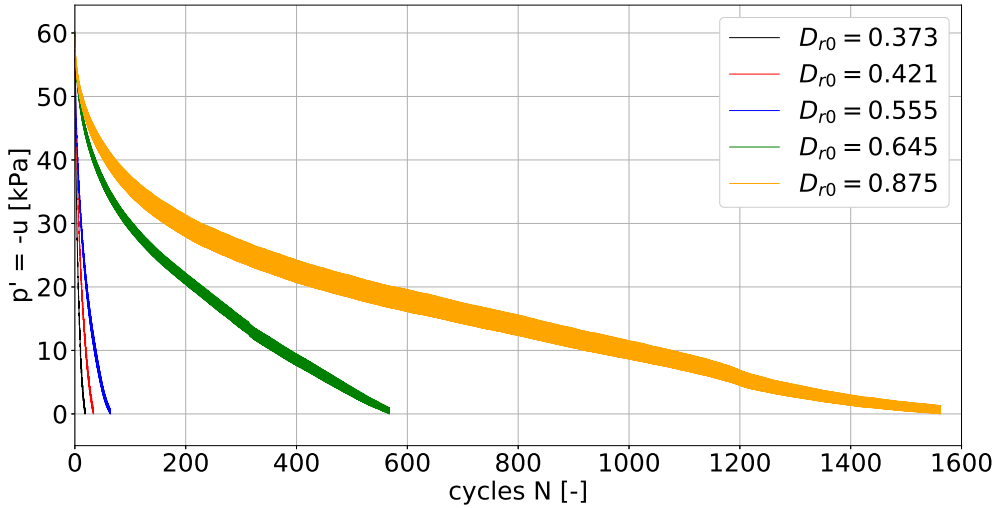

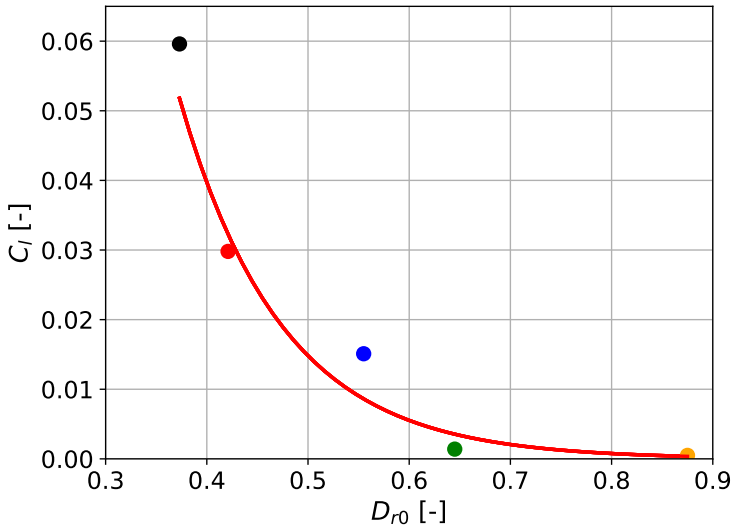

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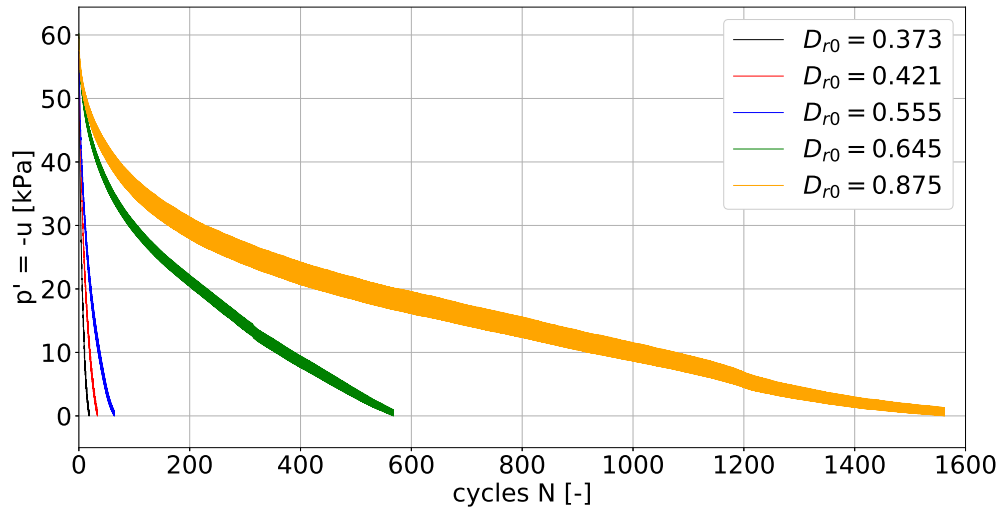

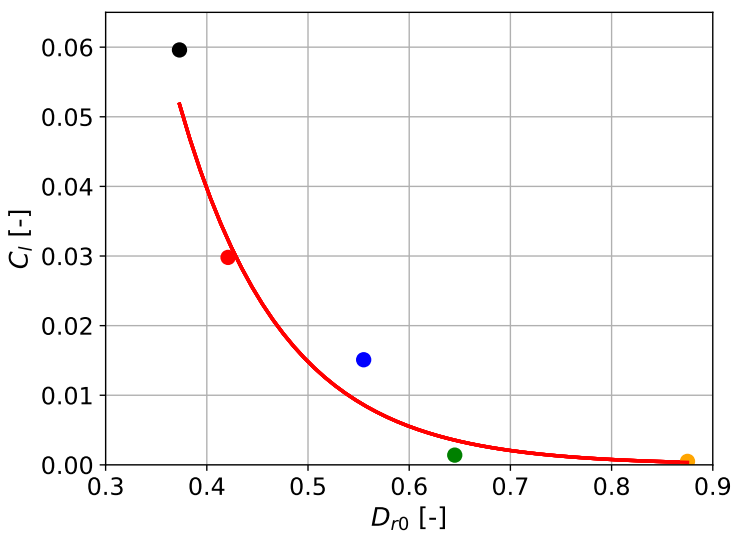

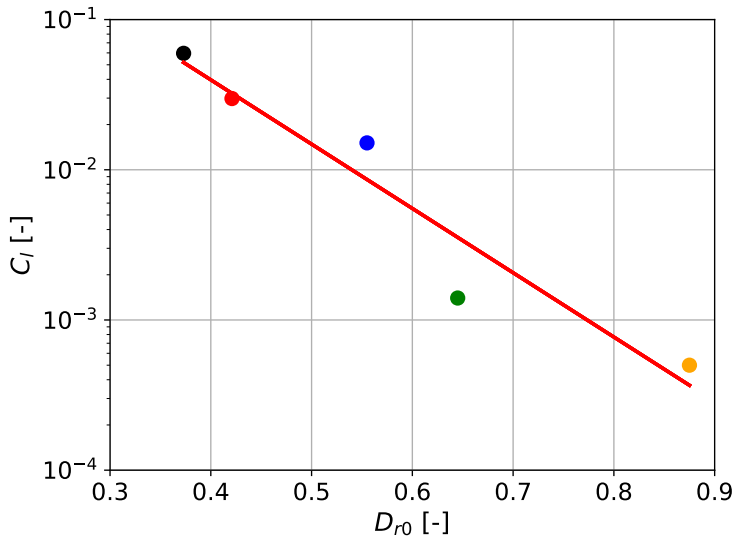

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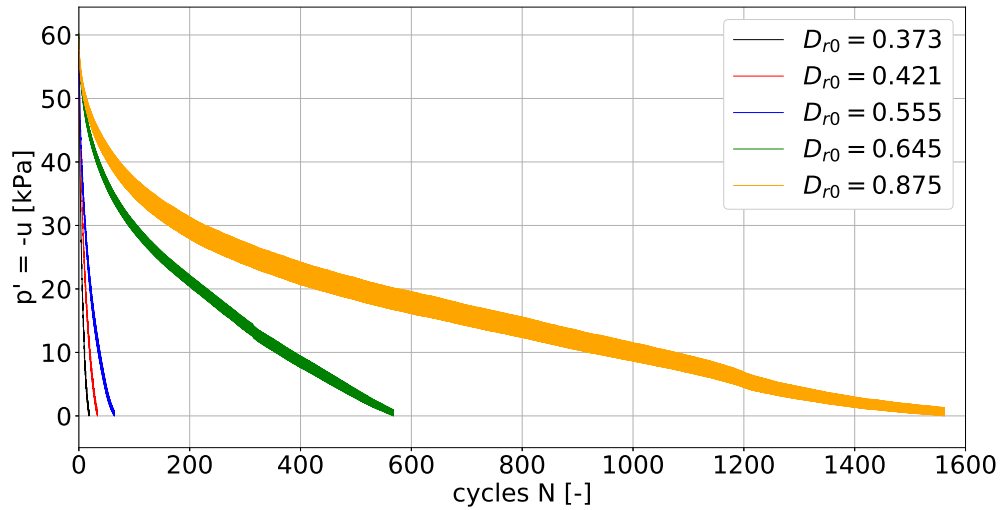

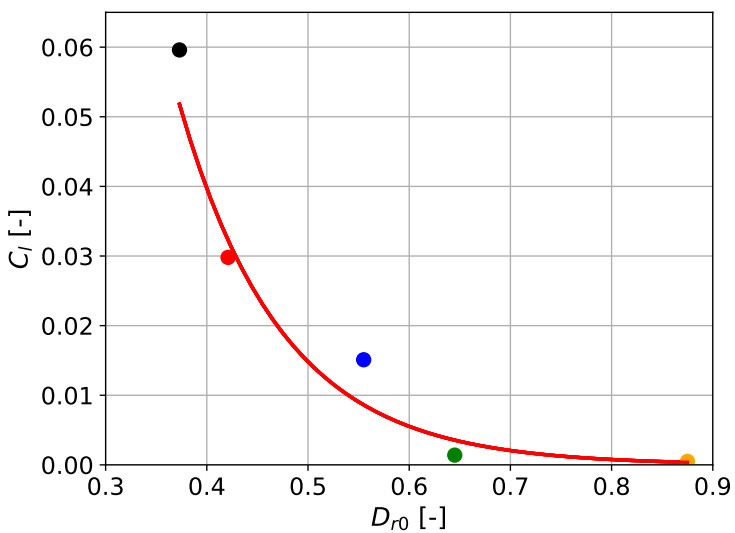

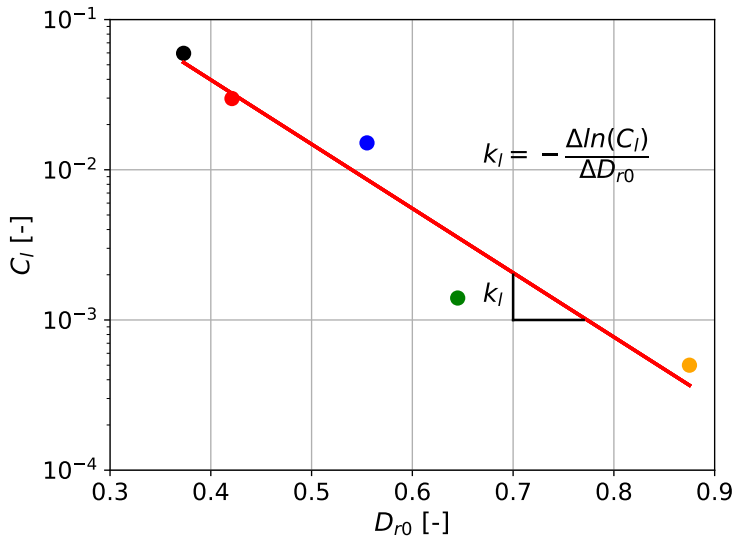

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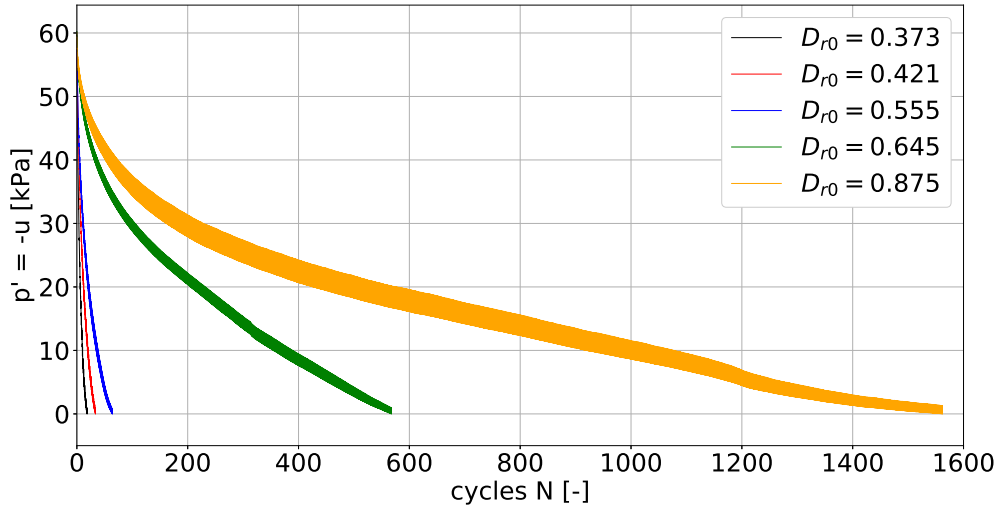

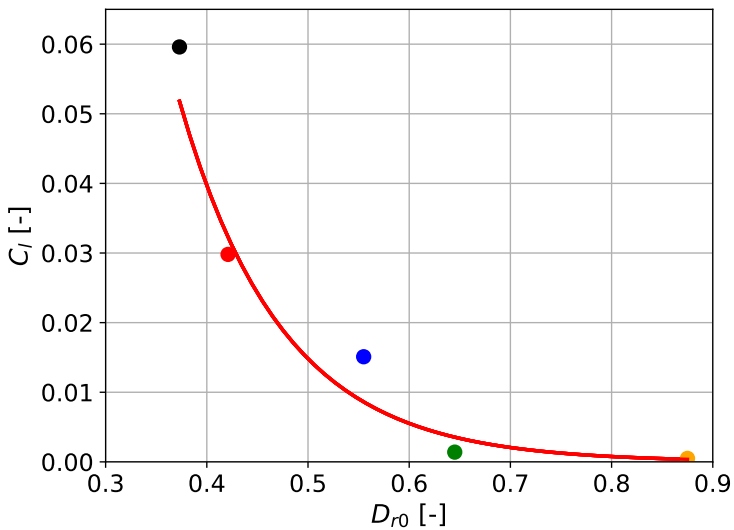

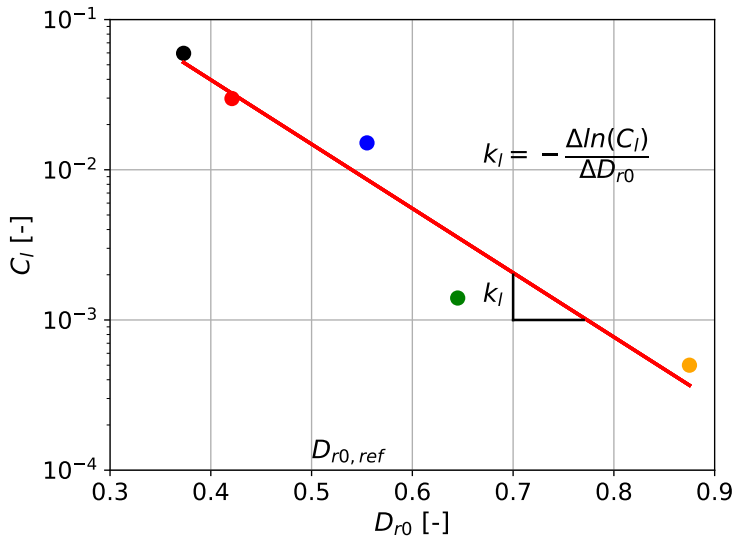

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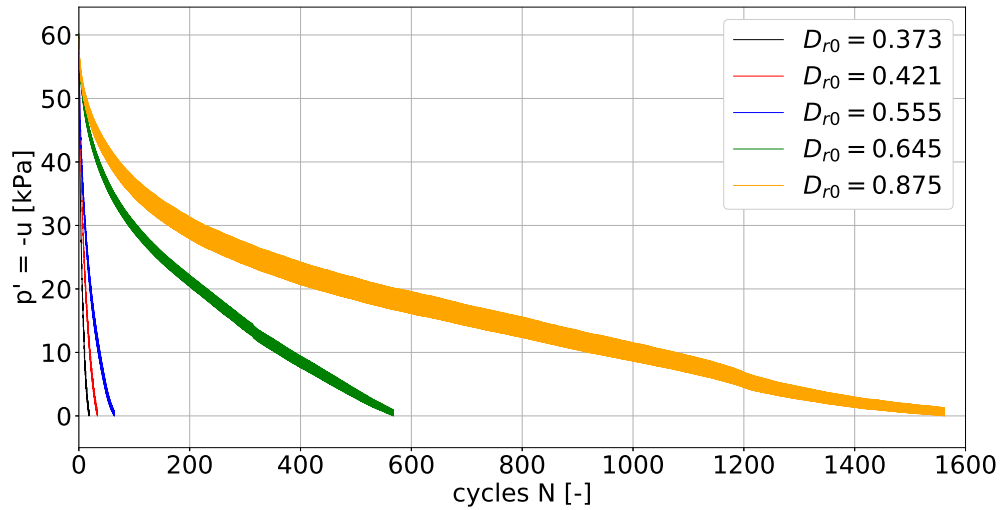

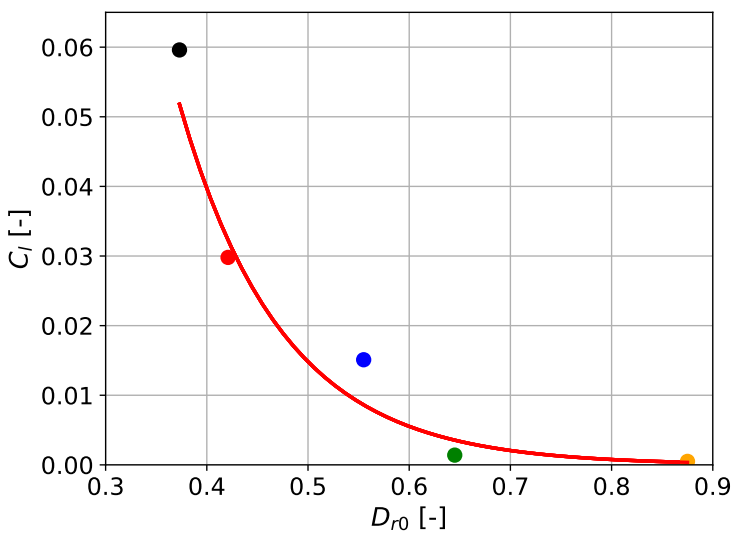

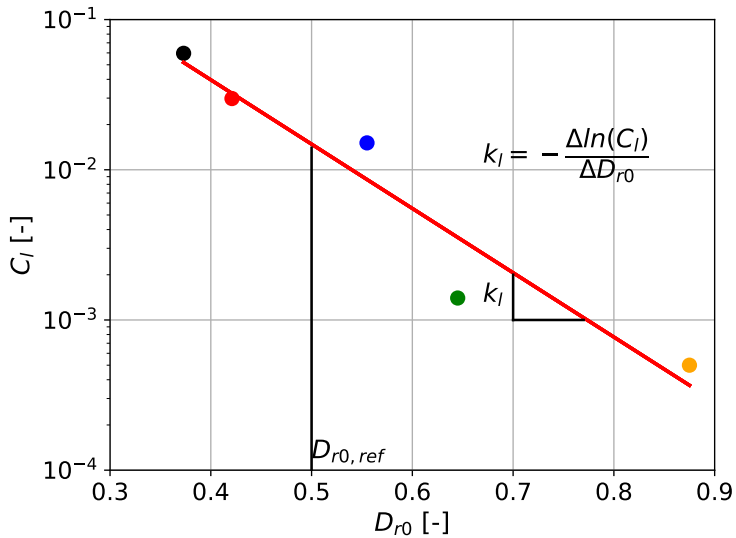

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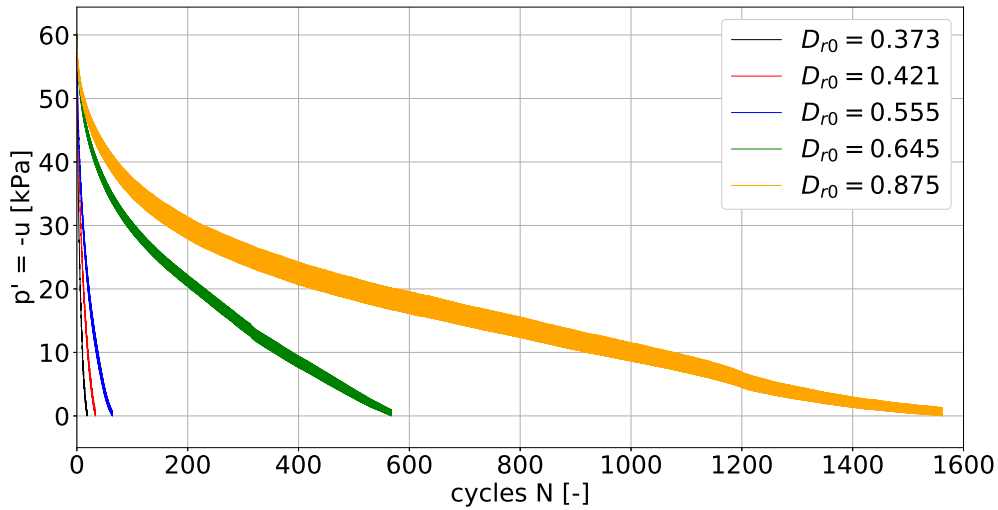

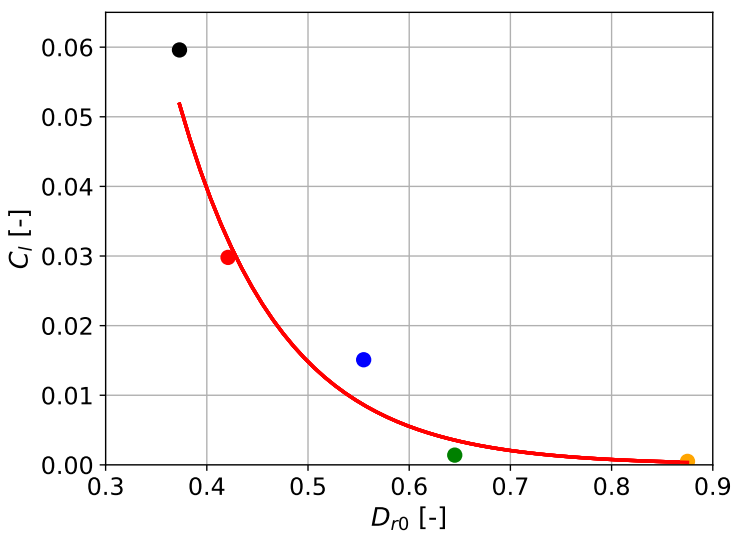

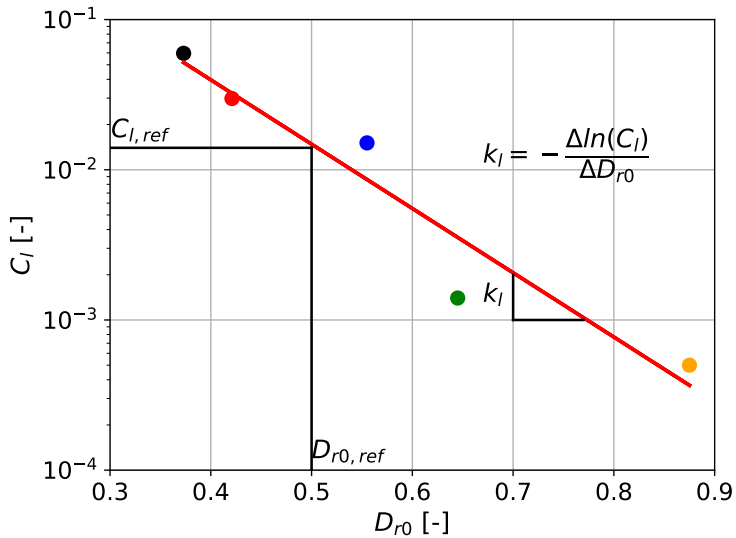

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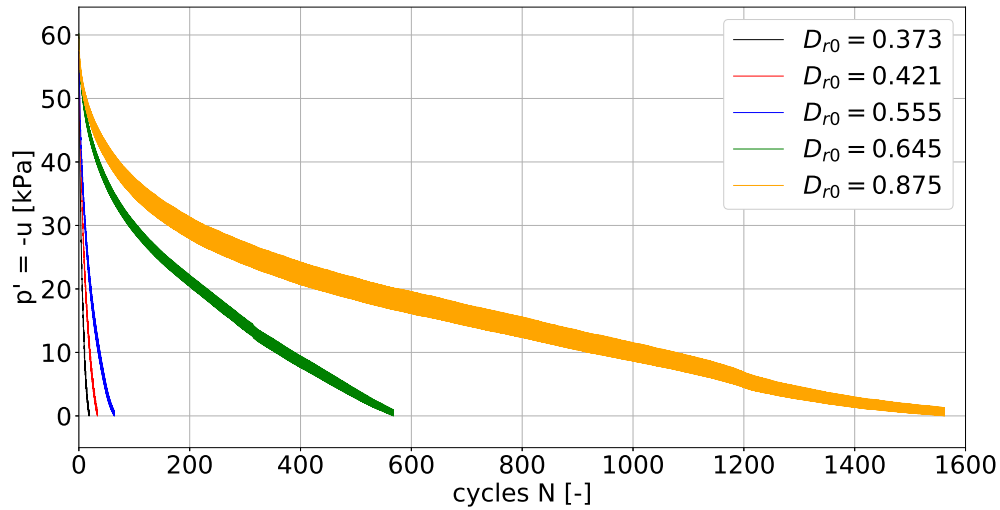
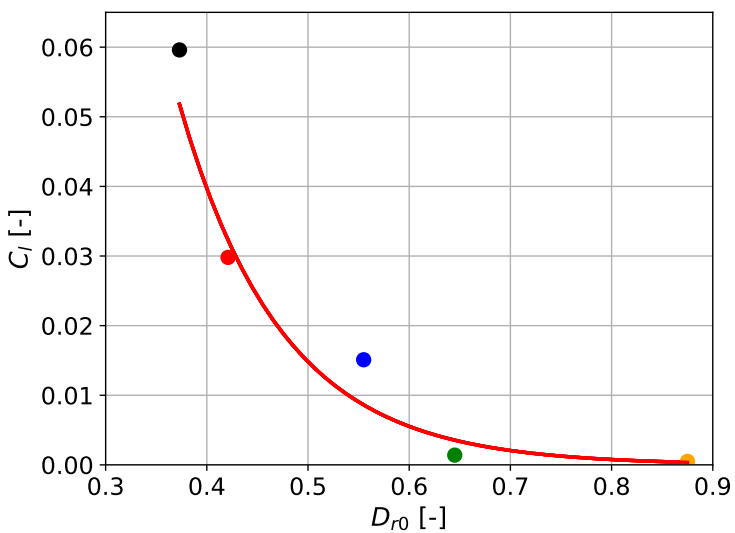
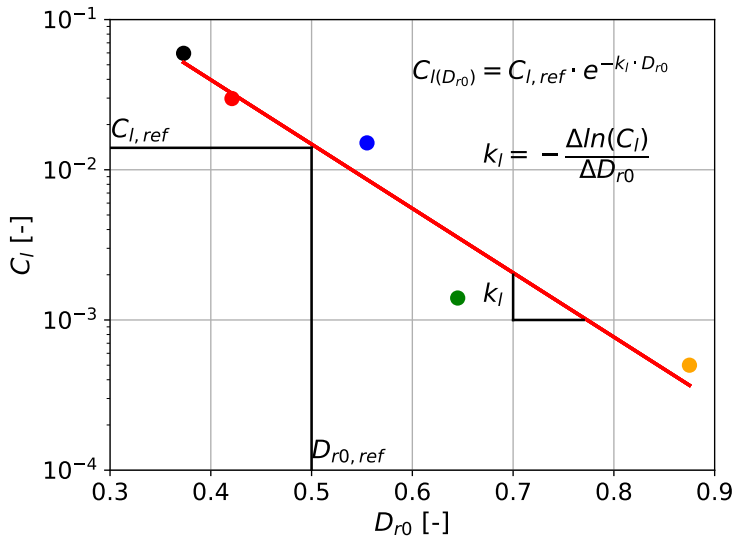
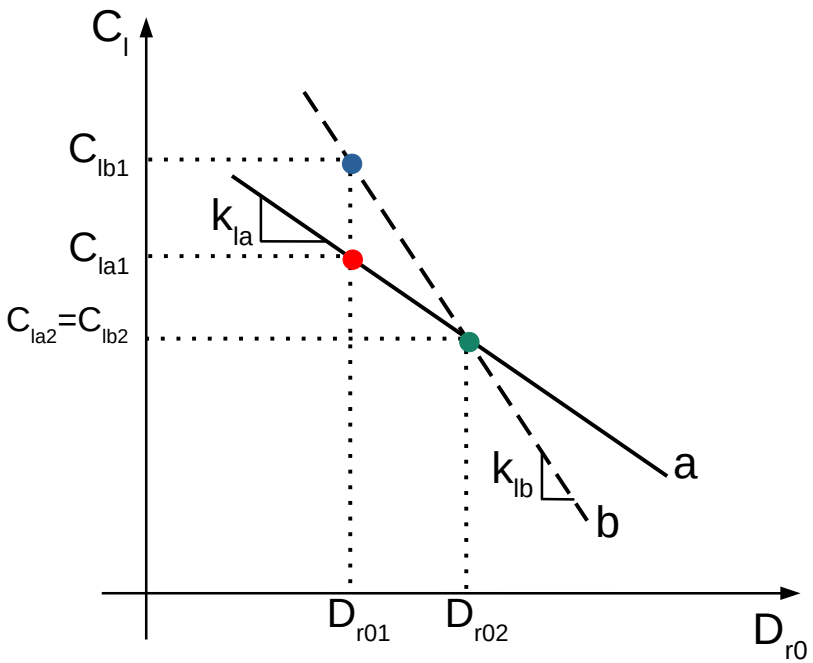






Test evaluation - two sands



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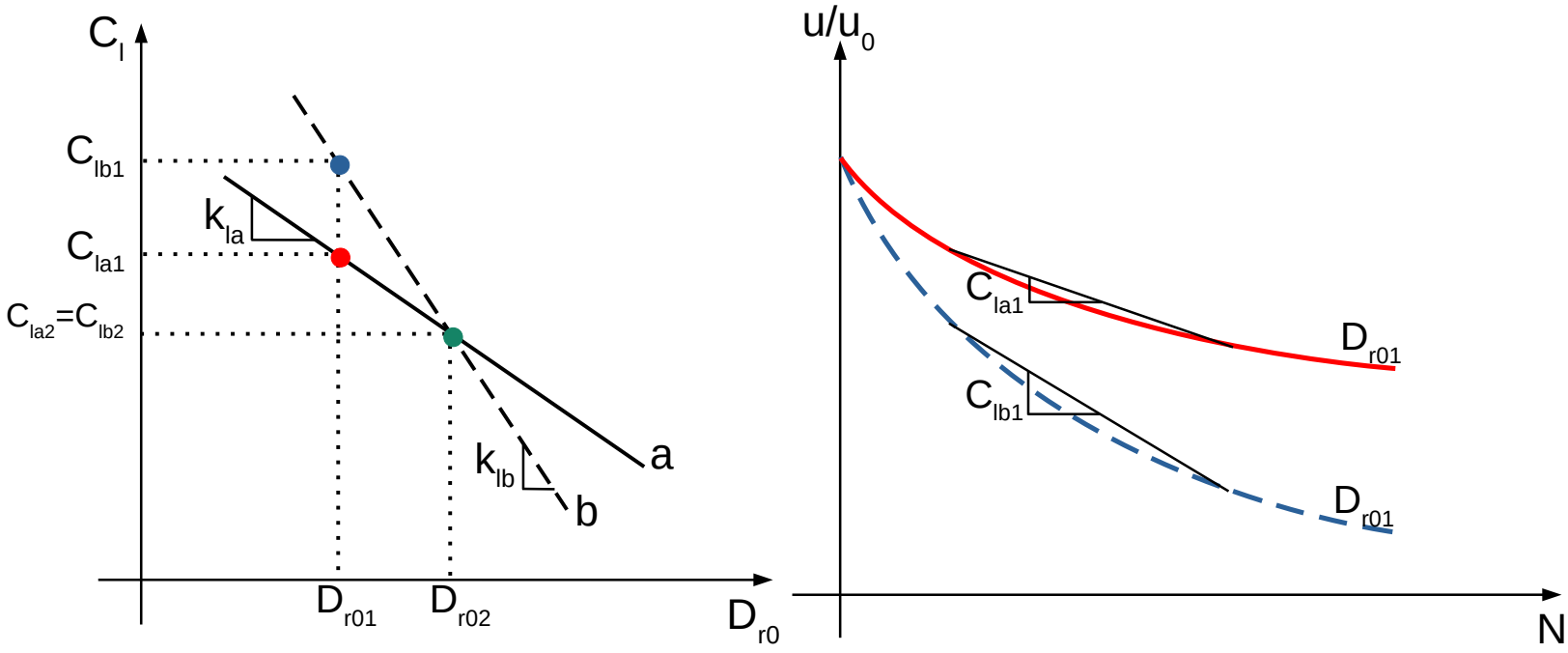

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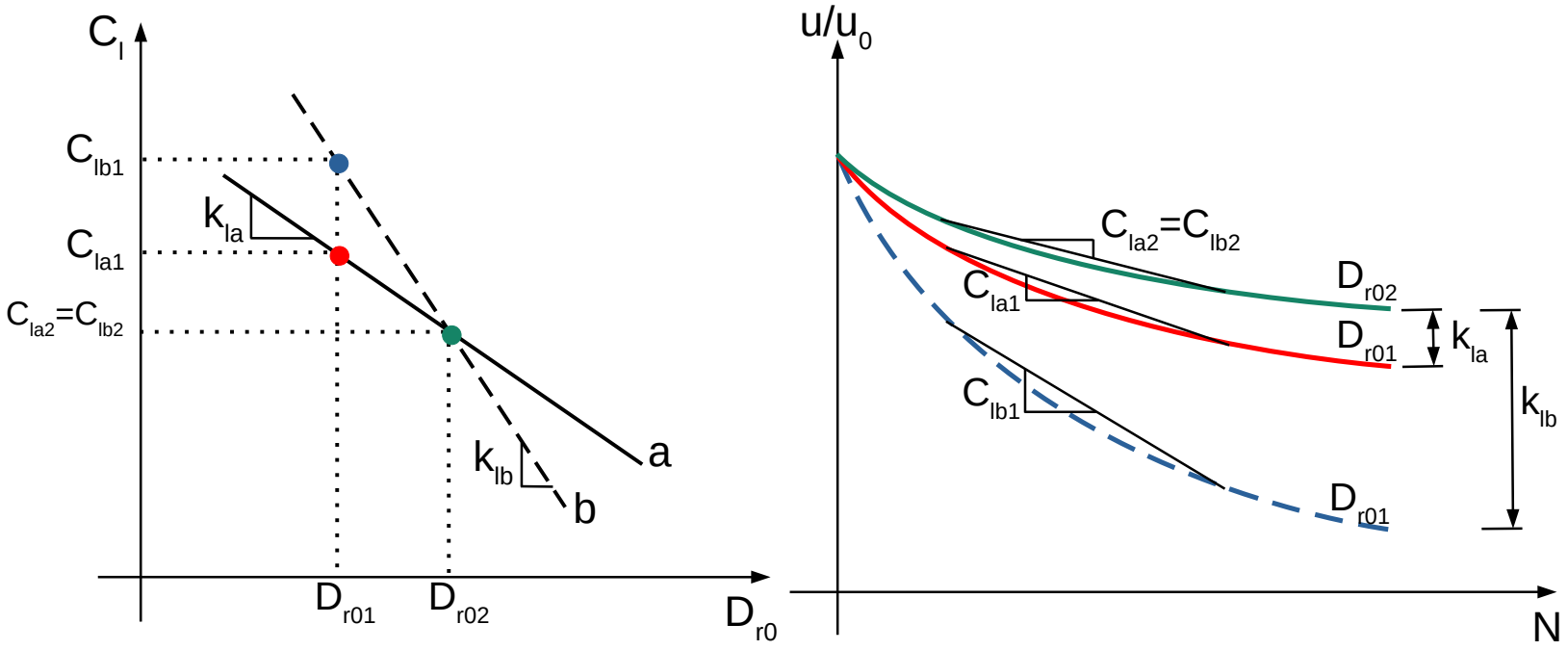
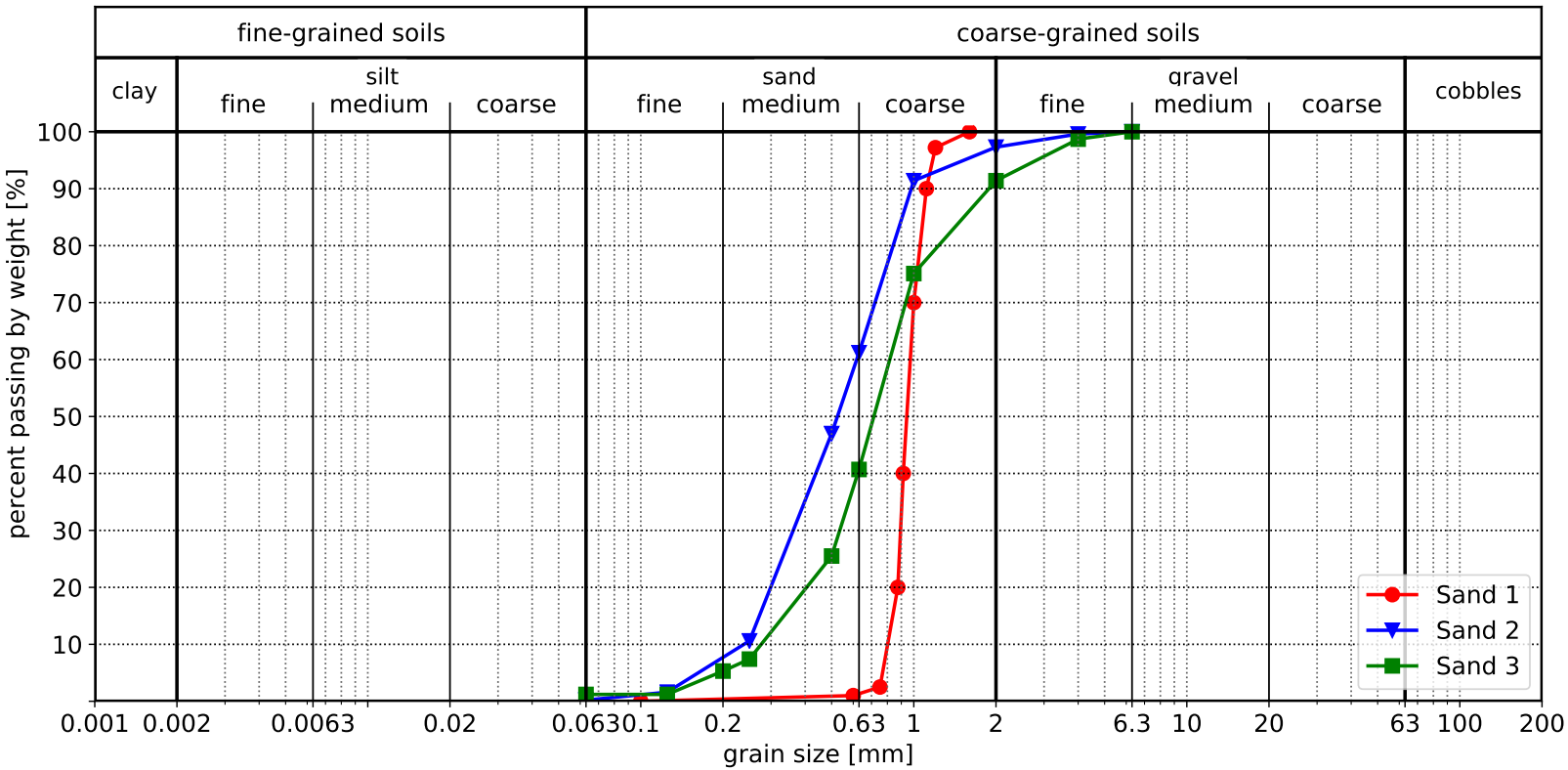
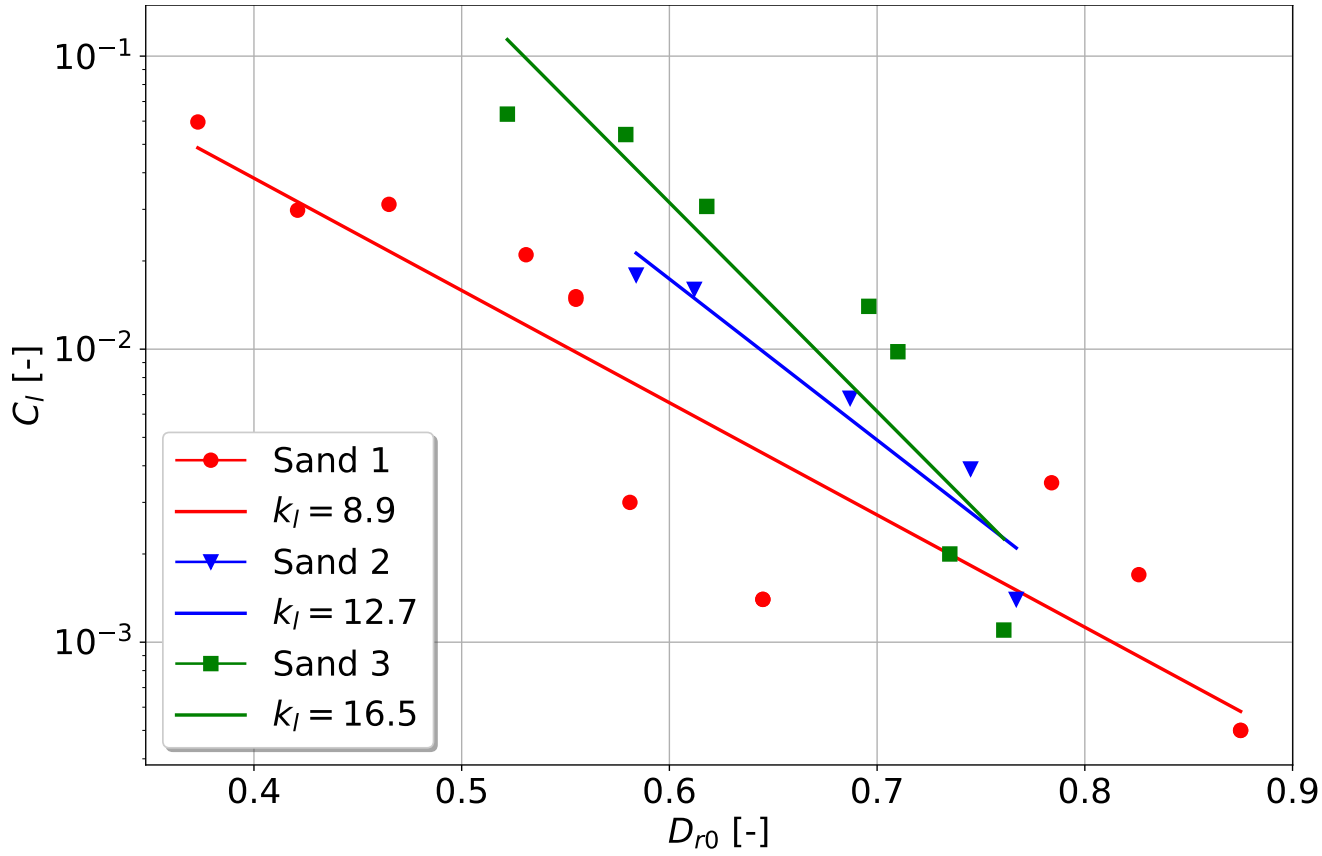


Tested sands and testing conditions



- Consolidation pressure: $\mathrm{p}'_0 = 60\,\mathrm{kPa}$
- Specimen geometry: D / H $\approx$ 50 / 100 mm
- Loading amplitude: $\mathrm{A} \approx 4.5\,\mathrm{mm}$
- Frequency: $\mathrm{f} = 1\,\mathrm{Hz}$

Test results on three different sands



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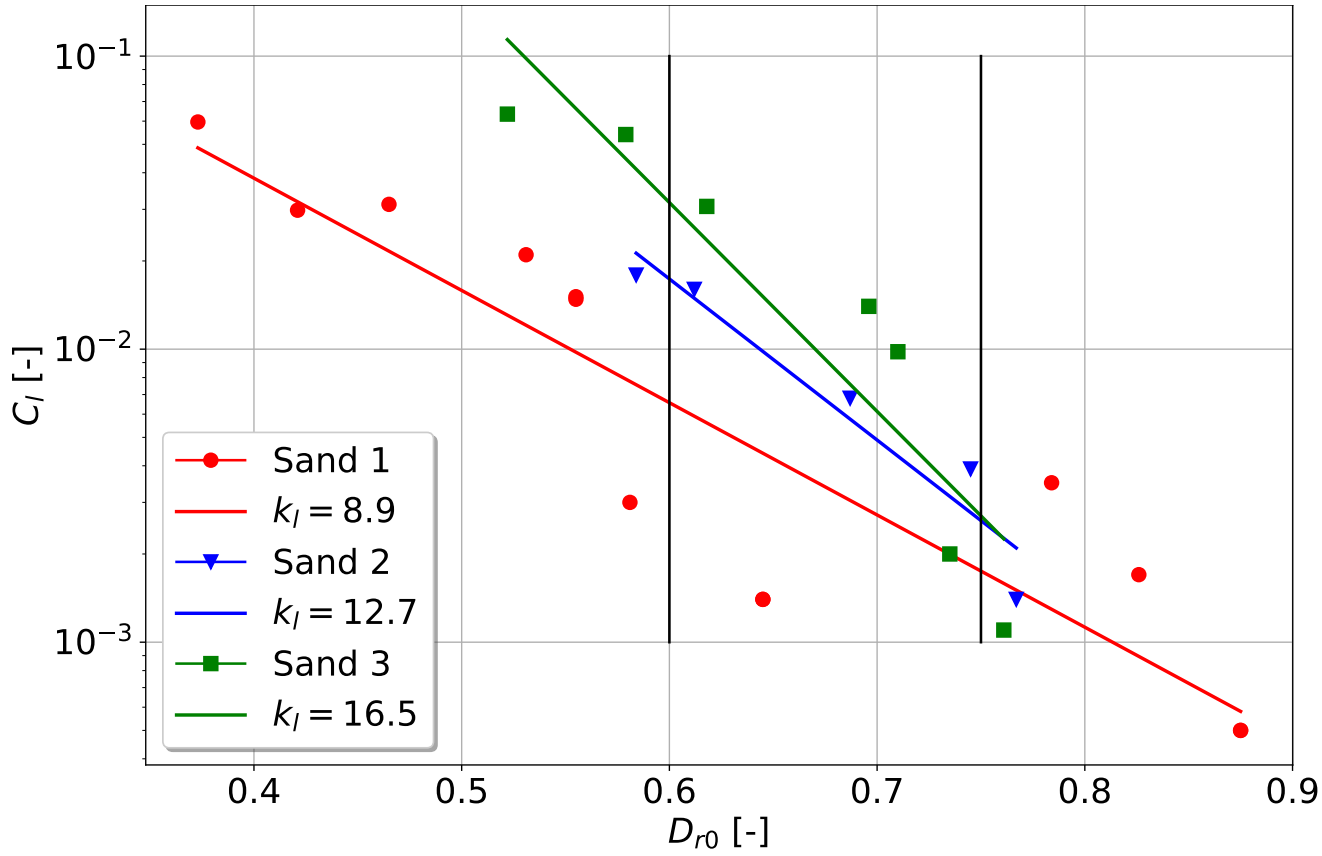

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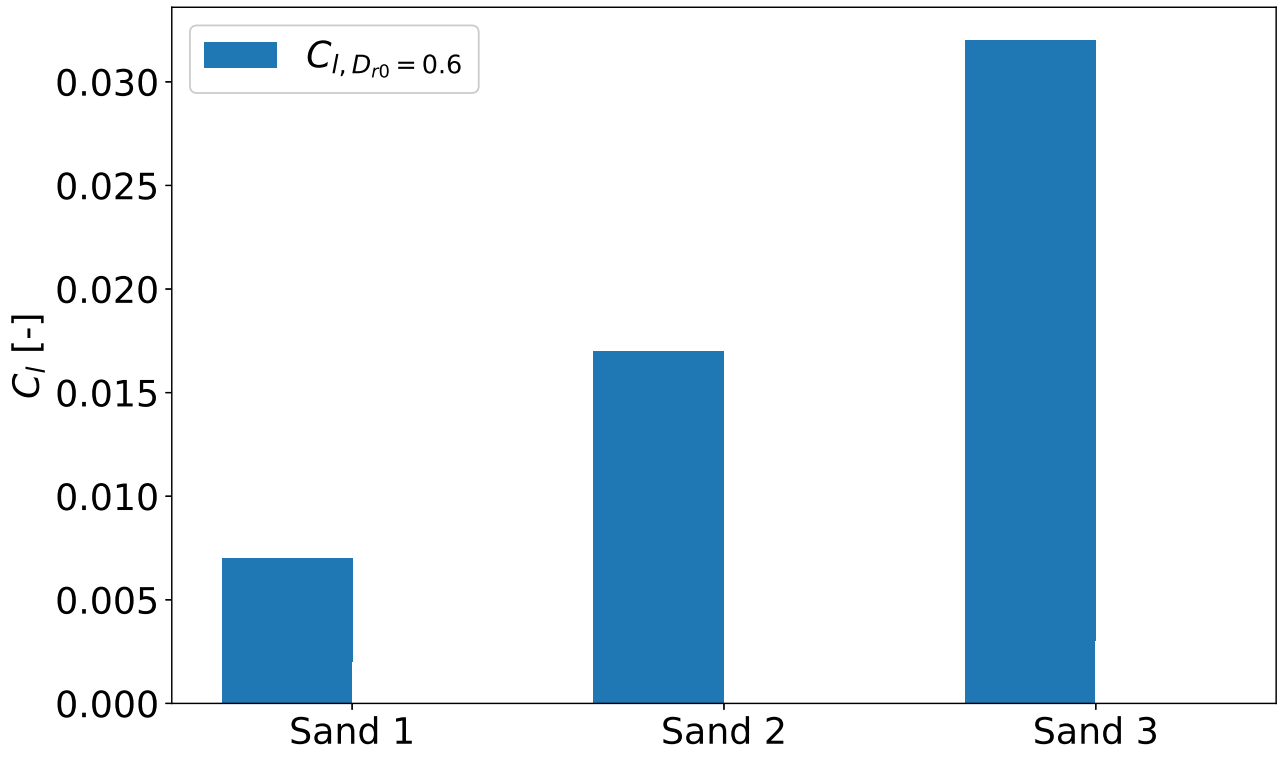

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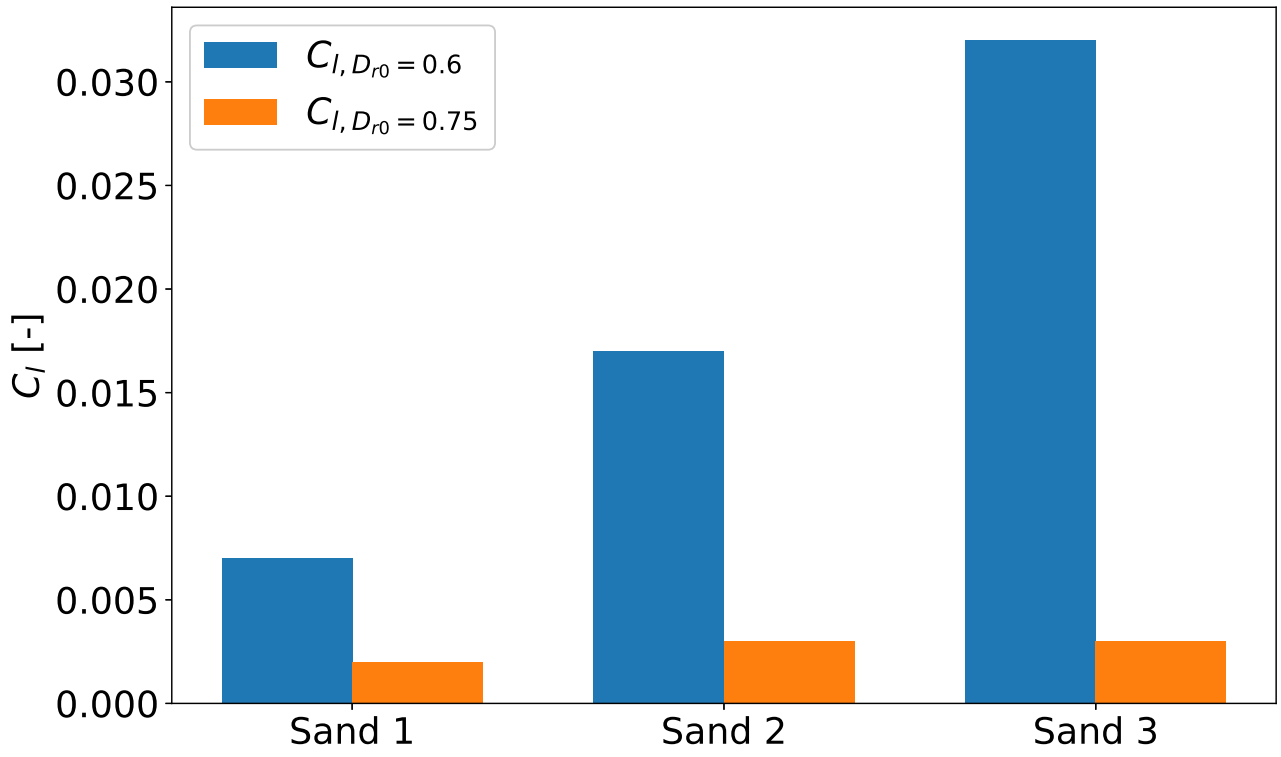

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- It delivers the **rate of PWP build-up (C_1)** at a specific relative density and enables its comparison for different soils.
- Also, it gives an information on the **change of the rate of PWP build-up by soil densification (k_1)**.

$\rightarrow$ **Index test** offering an opportunity for fast comparison of different sands with respect to density dependent PWP build-up!

Thank you for your attention!

This project is supported by DFG!
Project nr.: 316451575

"Professor Casagrande described a simple cyclic test which he considered useful for demonstration and termed the 'poor boy's simple shear test'. **In this method the centre of a triaxial specimen was oscillated laterally by hand to failure.**"

(On Liquefaction Phenomena, by Professor A. Casagrande: Report of Lecture, 1971)