Assessment of using liquidity index for the approximation of undrained shear strength of clay tills in Scania

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Introduction

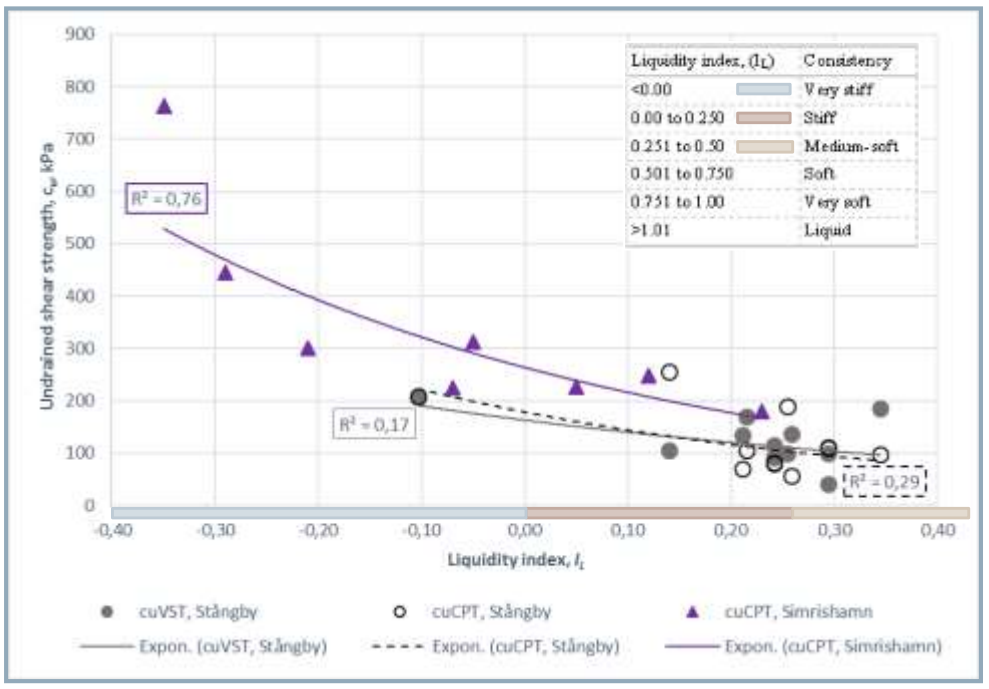
Undrained shear strength is a crucial parameter of the clay-rich sediments commonly used in the design process of geotechnical structures and is determined by several tests. As a considerable part of these tests are cost- and time consuming, it is of interest to investigate the potential relationship with shear strength (c_u) with alternative, easily measurable parameters, such as liquidity index (I_L).

Methods

In total, 23 disturbed samplings, 13 cone penetration tests (CPT), and 11 vane shear tests (VST) were performed. The natural water content and liquid and plastic limits were established from all disturbed samples and undrained shear strength was determined from CPT and VST.

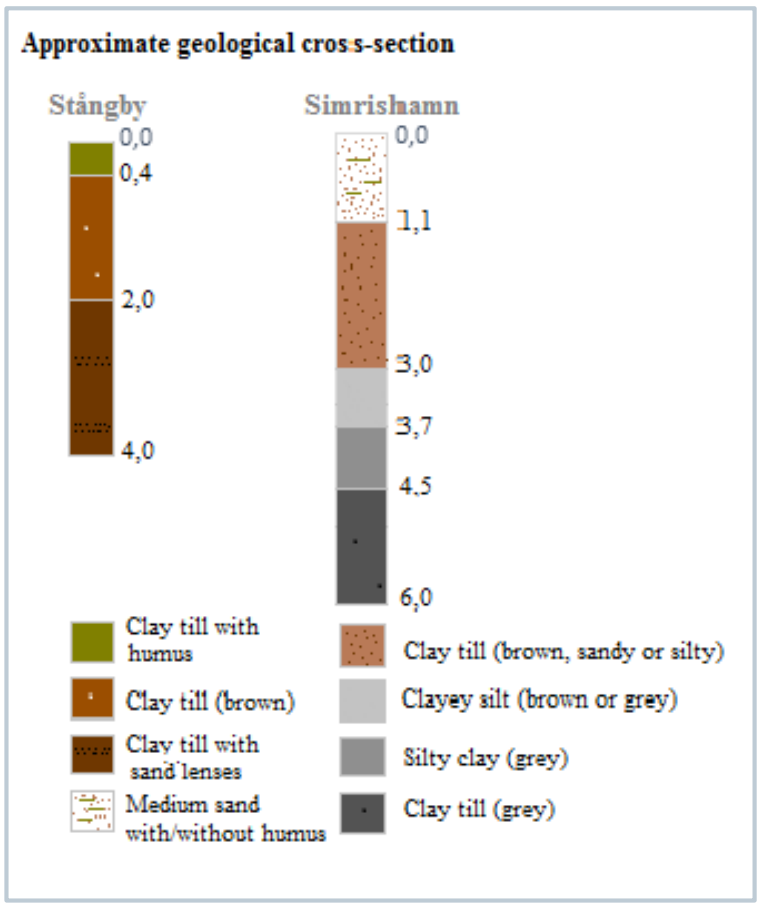
Conclusions

- The wide range of the plasticity index is crucial for the correlation between liquidity index and undrained shear strength.
- Liquidity index is primarily dependent on the composition of the sediments and less on the natural water content.
- The undrained shear strength from both CPT and VST at Stångby scatter widely, suggesting that CPT is more susceptible to the clay till impurities than VST and that different methods give different shear strength values for even quite homogeneous clay tills.



Above: A summary of undrained shear strength and liquidity index from Stångby and Simrishamn sites expressed by the exponential regression lines.

- The results from Simrishamn show a quite good correlation suggesting that it is possible to estimate the undrained shear strength from the liquidity index if liquidity indices are widely distributed within at least two consistency zones.



Above: An approximate geological cross-section of both sites (by author, 2018).

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