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Test conditions influence on thermal conductivity and contact conductance of sand at transient state

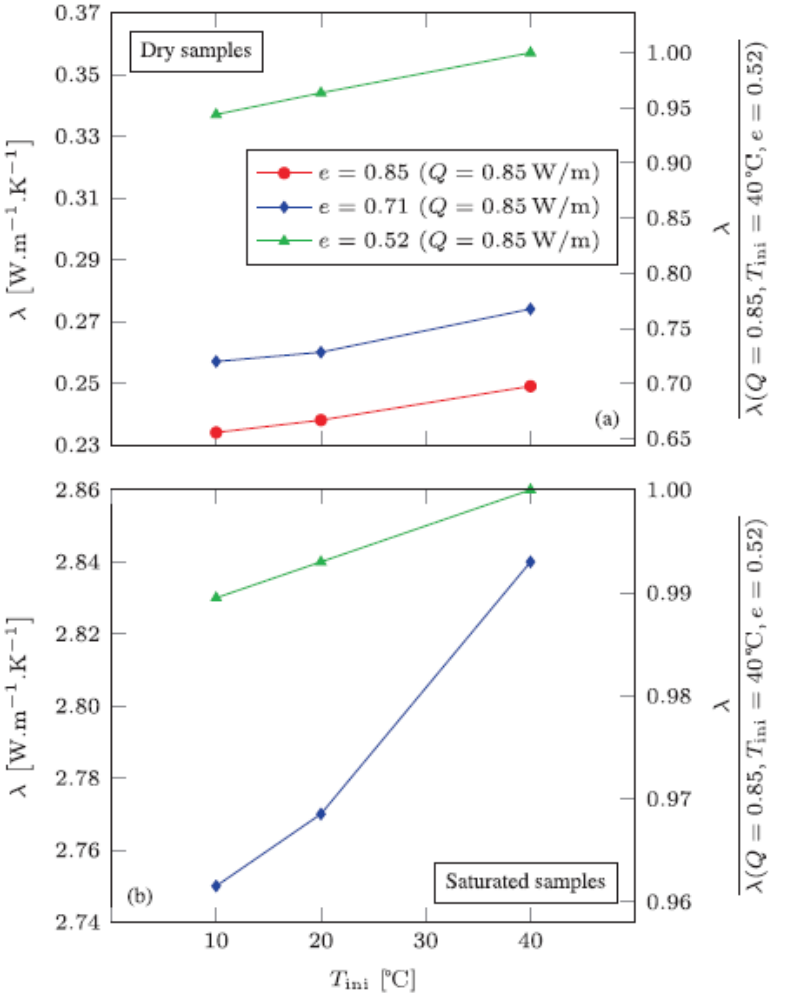
Kamar Aljundi, Carlos Pereira, Ana Vieira, Joao R. Maranha, Jose Lapa, Rafaela Cardoso

[Outline] {GSHP is the air conditioning system?}
Assess soil thermal conductivity
[soil thermal conductivity: crucial for the design and energy efficiency of GSHP systems.]
Experiments ~ dry sand/saturated sand → to analyze thermal conductivity and contact conductance.

[Methods]
Samples prepared at three different compaction ratios were systematically tested in both dry and saturated conditions.
Variable [temperature], [testing time], [injected heat flux].
Thermal conductivity was estimated using two analytical methods, and the [probe-to-soil thermal contact conductance].

[Results]
Ambient Temperature Effects: Thermal conductivity increased with ambient temperature.
Heat Flux Effects: The magnitude of the heat flux also affected soil thermal conductivity.

Still don't understand is it really important?
Review of overall knowledge and the review on previous research seems required.



Temperature effect on k in dry and saturated conditions (tf=1000 s).

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Nonlinear consolidation of arbitrary layered soil with continuous drainage boundary: An approximate closed-form solution

Zongqin Wang, Yunpeng Zhang, Mengfan Zong, Tao Wuc, Wenbing Wua, Guoxiong Mei, Shengtao Zhou

[Outline]

e and k constantly change during the consolidation.

Nonlinear consolidation not only involves the changing k but also the variable Cv (so-called double nonlinearity).

EPWP at the ground discontinuous, which is not in line with the practice.

Considering all of this is only applicable to the research propose and can hardly popularize in practical engineering.

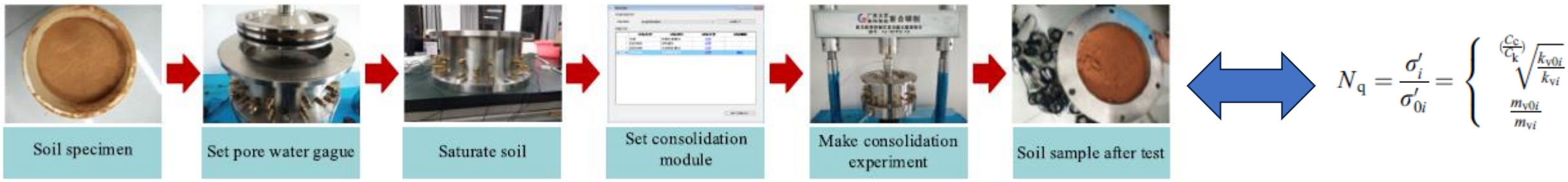
[Method]

employs a homogenization of boundary conditions and the eigenfunction method to derive the approximate solutions.

Validation to justify the rationality of the approximation and the effectiveness of the continuous drainage condition.

[Results]

Provides a rigorous analytical approach to address double nonlinear consolidation problems in arbitrarily layered soils and serves as a benchmark for comparing and validating more sophisticated numerical methods in the future. The research underscores the importance of consolidation on the safety of ground and underground infrastructures and enhances understanding of soil consolidation theory.



$$N_q = \frac{\sigma'_i}{\sigma'_{0i}} = \begin{cases} \frac{(C_c/C_k)}{\sqrt{k_{v0i}/k_{vi}}} \\ \frac{m_{v0i}}{m_{vi}} \end{cases}$$

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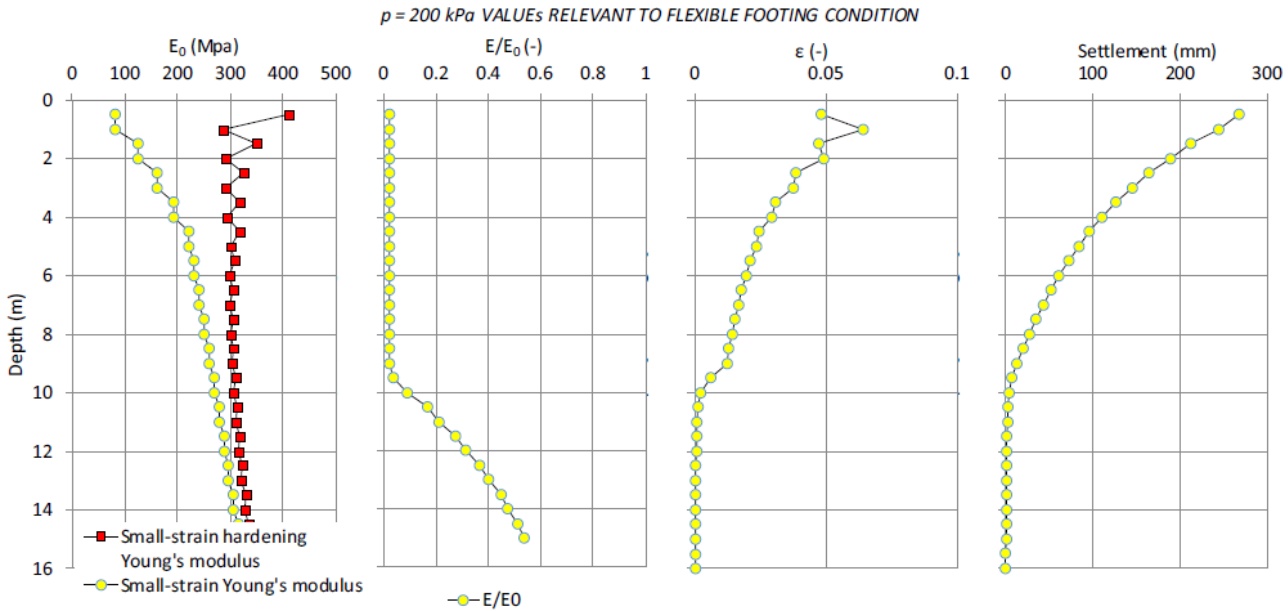
Settlement prediction of shallow foundations for quality controls of sandy hydraulic fills V. Fioravante, D. Giretti, A. Masella, G. Vaciago

[Outline] Acceptance criteria for land reclamation and ground improvement are based on prescribed profiles of CPT or V_s.
These profiles are intended to guarantee the achievement of minimum target D_r.
However, these has difficult to apply in presence of crushable materials (calcareous soils).
Difficulties based on D_r, static (CPT/CPTU) and dynamic (SPT/DP) tests .
➔ crushable calcareous sands [susceptibility of sand particle breakage]
➔ Difficulties that aim to assure the required performance. -> these criteria rely on indirect measures.
It is desirable to develop **performance-based acceptance criteria** by adopting **simple**, **standardized** procedures.

[Method] Using Boussinesq's solution.

[Result] Effectively predict settlement under various ground and load conditions.
In particular, the above existing methods are effective in difficult conditions.
Possibility of ground deformation can be assessed by measuring shear wave velocity.
However, continuous verification and improvement are required.



Output of CS test simulation: a) small strain stiffness and hardened small strain stiffness, b) degraded stiffness ratio, c) strains, d) settlement profile computed for p = 200 kPa at the centre of a flexible foundation

Settlement prediction model and output for applied pressure at center of flexible foundation.
Shows the initial zero strain modulus and corrected/hardened values as a function of pressure, and presents the calculated K_R, ε, and s_A profile up to max soil depth for a given load.

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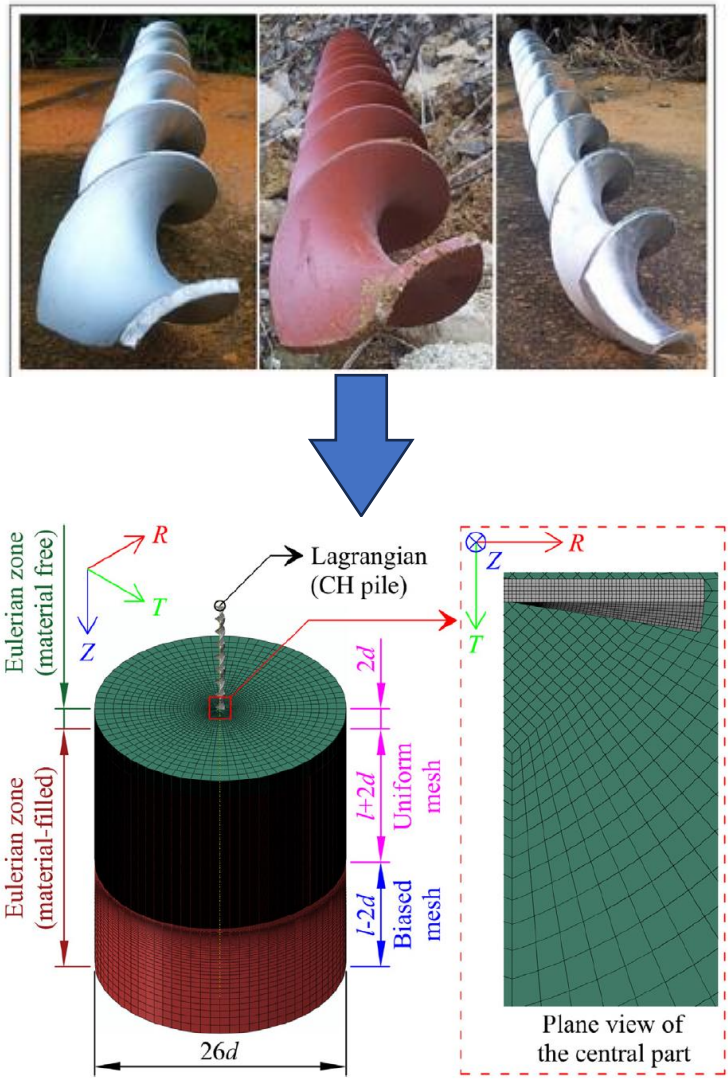
Numerical investigation of the installation process and bearing capacity of circular helicoid piles in undrained clay

Kunpeng Wang, Chunyi Cui, Peng Zhang, Noriyuki Yasufuku, Guangli Xu, Meng Wang

[Outline]
CH pile is outstanding axial bearing properties.
[Methods]
For asymmetric-shaped pile
→ simplified to transform the pile-soil interaction into a plane strain/axisymmetric
Coupled Eulerian-Lagrangian (CEL) method
→ reasonable method [plane strain or axisymmetric properties cannot be used]

Axial compression and pullout loading in undrained clay to assess.
CH pipe surfaces were divided into the bottom, outer, and inner(compressive and pullout).

[Result]
Installation/axial loading processes of CH piles to verify.
→ Provides understanding of nonlinear consolidation theory in soils
→ Provides solution to the nonlinear consolidation problem in arbitrarily layered soils



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Prediction of ground vibration under combined seismic and high-speed train loads considering earthquake intensity and site category

Wei Xie, Guangyun Gao, Jian Song, Yonggang Jia

[Outline]

Reasonable method of predicting the ground vibration under combined seismic and highspeed train loads

Previous studies,

little attention of the **soil dynamic behavior** under the combined loads

[Method]

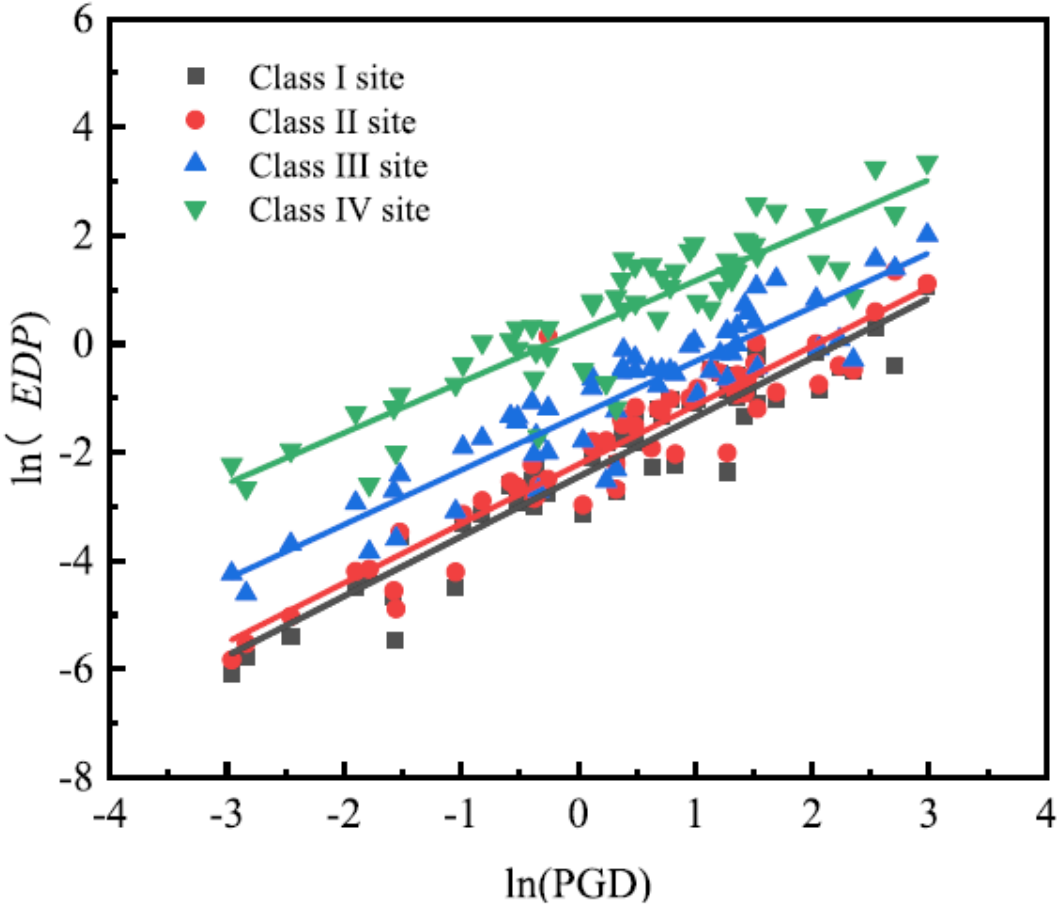
Layered ground vibration under combined seismic and high-speed train loads was calculated.

Considering site category & earthquake intensity

Ground motion intensity measures (IMs) suitable for evaluating ground vibration → parameter sensitivity analysis.

[Results]

1. Predictable results are shown, but the considerations of subsoil condition were provided.
2. PGD is reasonable seismic intensity index.
3. The proposed **equivalent shear wave velocity and PGD-based prediction formula** effectively estimates ground vibration caused by high-speed train loads during earthquakes.



Relationship between the GVD_{max} at the track center and PGD in logarithmic coordinates.

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The effects of internal erosion on granular soils used in transport embankments

I. Johnston, W. Murphy, J. Holden

[Background]

Transport embankments are typically not intended for flood retention.

However, they can inadvertently act as barriers to runoff.

+ Climate change, considering flooding effect is required.

Problems are seepage, dynamic load by vehicles

Seepage processes research is insufficient.

Understand processes which can impact on embankment stability.

[Objective]

How seepage forces affect the strength, Vs, and permeability, focusing on the impact of fine particle movement.

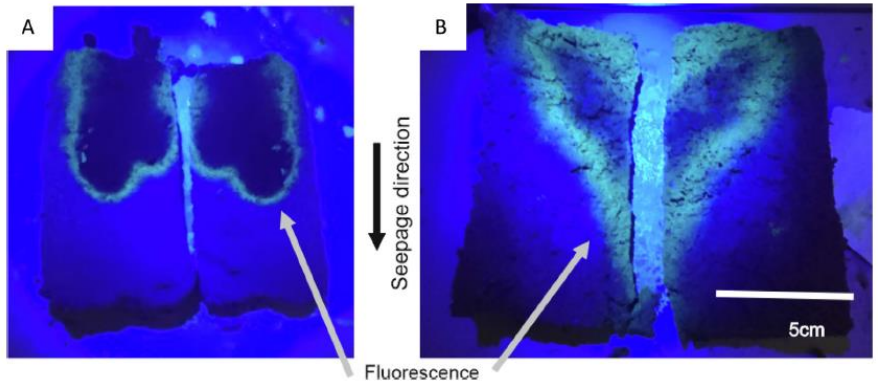
[Methods]

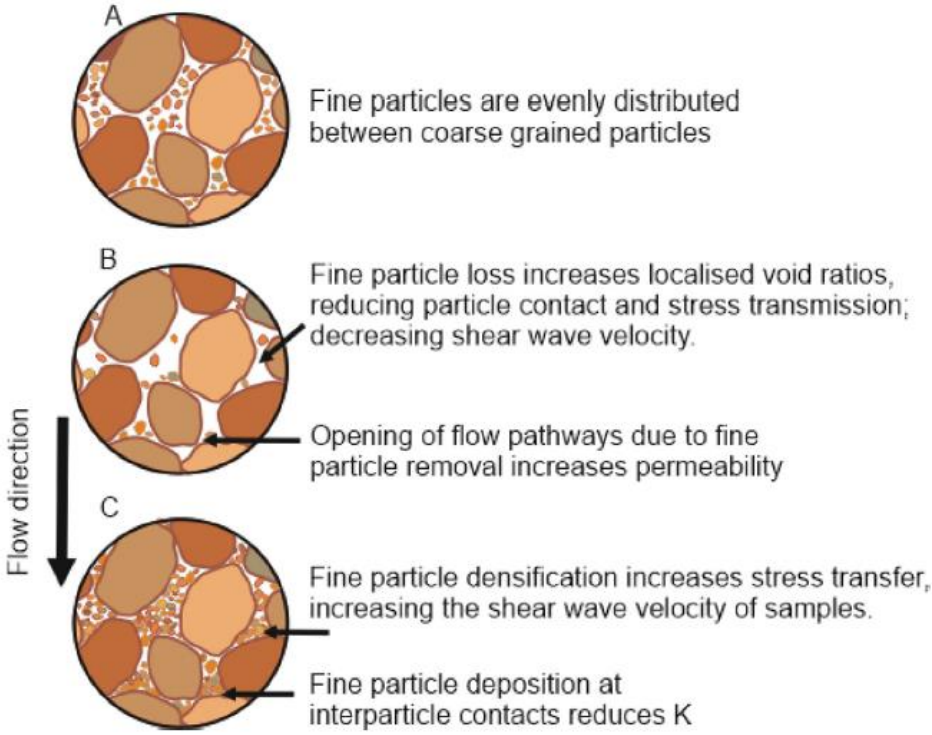
Indoor test ~ varying hydraulic heads and durations of flood simulation using micro-seismic technique and outflow measurements.

[Results]

Permeability change during seepage-induced particle migration, which can serve as an indicator for detecting the development of internal erosion.

Changes in soil properties were attributed to the redistribution of fine particles and the opening of pore spaces.





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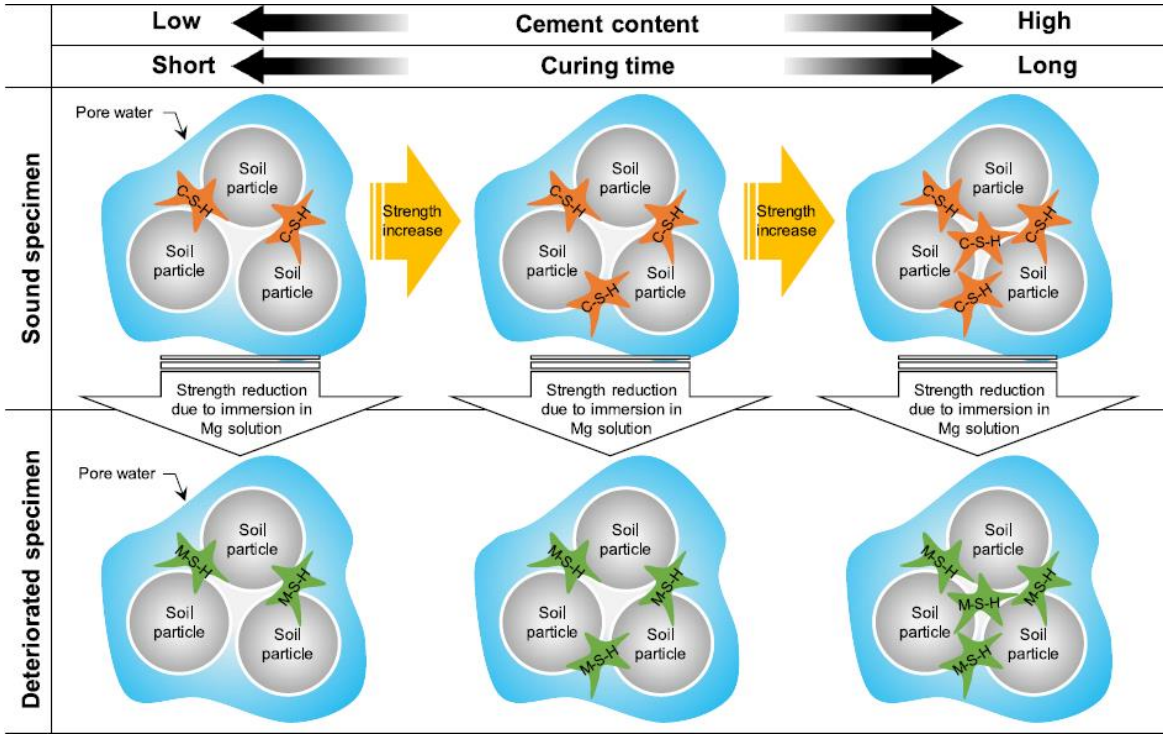
Strength reduction mechanism of cement-treated soil under seawater environment

Hiroyuki Hara, Kenshi Ikeda, Norimasa Yoshimoto

[Outline]
Improving soft grounds with cement is used to increase their strength.
↔ Properties of cement/lime-treated soil deteriorate in seawater.

[Method]
{X-ray fluorescence, Unconfined compression tests}
[Changes in the unconfined compressive strength]
➔ [various water contents], [amounts of added cement], [curing times].
[thermogravimetric-differential thermal analysis]
[scanning electron microscopy]
➔ strength reduction based on changes in hydrate composition

[Results]
Cement-treated soil lost 80% strength after immersion in Mg solution.
Initial conditions strongly influenced, and higher strength was observed in the samples with larger amounts of added cement and longer curing times.
Cement-treated soil strength loss was caused by C-S-H to M-S-H.



Conceptual diagram of strength reduction mechanism for cement-treated soil exposed to Mg solution