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Finite Difference Based Probabilistic Analysis to Evaluate the Impact of Correlation Length on Long-Term Settlement of Soft Soils

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Abstract : Probabilistic analysis has become one of the most popular methods to quantify and manage geotechnical risks due to the spatial variability of soil input parameters. The correlation length is one of the key factors of quantifying spatial variability of soil parameters which is defined as a distance within which the random variables are correlated strongly. This paper aims to assess the impact of correlation length on the long-term settlement of soft soils improved with preloading. The concept of 'worst-case' spatial correlation length was evaluated by determining the probability of failure of a real case study of Vasby test fill. For this purpose, a finite difference code was developed based on axisymmetric consolidation equations incorporating the non-linear elastic visco-plastic model and the Karhunen-Loeve expansion method. The results show that correlation length has a significant impact on the post-construction settlement of soft soils in a way that by increasing correlation length, probability of failure increases and the approach to asymptote.

Keywords : Karhunen-Loeve expansion, probability of failure, soft soil settlement, 'worst case' spatial correlation length
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