



# THE ROLE OF NUMERICAL SIMULATIONS OF MECHANIZED TUNNEL EXCAVATION – FUNDAMENTALS & APPLICATION

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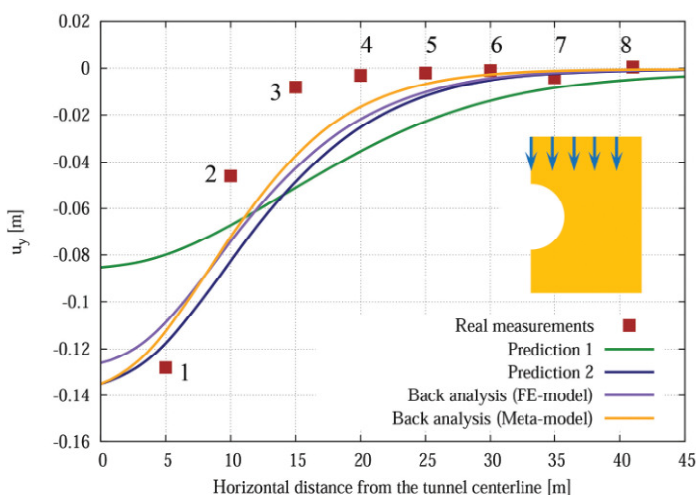
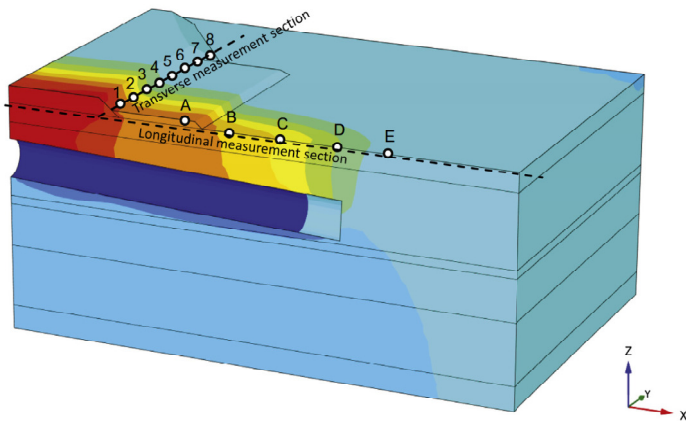
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In this research, Finite Element (FE) method is applied to simulate the shield supported mechanized excavation of Western Scheldt tunnel in the Netherlands. Both 2D and 3D numerical models are created to predict the system behavior. Sensitivity analysis and parameter identification techniques are utilized to calibrate and validate the model based on field measurement. The mechanical behavior of the soil is modeled by an advanced elasto-plastic model, namely Hardening Soil model correlating small strain stiffness (HSS).

Global sensitivity analysis is carried out to evaluate the relative sensitivity of model response to each input parameter. Thereafter, a parameter identification technique (back analysis) is employed to find the optimized values of the selected parameters. To accomplish this, the computationally expensive FE-model is replaced by a meta-model in order to reduce the calculation time and effort. Moreover, a soft soil constitutive model based on the modified Cam-clay model deals with primary compression of fine grained soils is assigned to the clay layer to further improve the numerical prediction of system behavior. Due to the importance of model subsystems, such as face pressure and volume loss, the sensitivity of model response to subsystems has been evaluated. The results show that optimized parameters obtained via back analysis make the numerical simulation capable to well predict the ground settlement.



Professor Schanz completed his PhD at Swiss Federal Institute of Technology (ETH Zürich) in 1994 and undergraduate studies in Civil Engineering at University of Stuttgart in 1988. He obtained habilitation in Geotechnics at University of Stuttgart in 1998. From 1998-2009 he was Professor at BAUHAUS Universität Weimar. Since 2009 he is Professor and Head of Chair for Foundation Engineering, Soil and Rock Mechanics at Ruhr-Universität Bochum.



His research interests include constitutive modeling of geomaterials, application of numerical methods in geotechnical engineering, unsaturated soil mechanics, coupled thermo-mechanical soil behavior, modeling of soft soil behavior. Professor Schanz published more than 200 scientific publications. He also acts as referee and member of editorial boards of many scientific journals.

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