

Optimisation of groundwater model predictions using advanced calibration techniques

Building and construction projects often involve groundwater lowering, which calls for knowledge of pump rates in order to achieve the target level. The ability of groundwater models to determine pump rates depends on how well the model's hydrological parameters are defined. Thus, calibration of these models is key to determining pump rates. Traditional calibration defines few parameters, which often leads to a simple representation of the hydrogeological system. As a result, models have an inherent lack of precision, which may cause an increase in costs when the model results are applied.

To optimise model calibration, present project will apply the latest calibration techniques, including inverse regularisation. Regularisation allows for the estimation of many more parameters by using both observations (hard data) and expert knowledge (soft data). Thereby, you achieve a better representation of the hydrogeological system. Practical experience with regularisation is limited and, furthermore, to our knowledge, regularisation has never been used for modelling of building and construction projects. A unique feature of building and construction projects is data collection since data are collected before, during and after the change (groundwater lowering) in the hydraulic system. Our hypothesis is that the combination of these unique data and new implementation of inverse regularisation will lead to far better model estimates – and thereby increase the reliability of results for end users.

The perspectives of present project are (i) to strengthen calibration techniques in groundwater modelling in the research community and the consultancy industry, (ii) to secure better model predictions (estimates) and thereby reduce the costs for end users, and (iii) to potentially set precedence in future groundwater modelling projects in research communities and the consultancy industry.

To secure exchange of knowledge between the research community and the consultancy industry, this project is a collaboration between modellers with GEUS and COWI.