Geophysical Research Abstracts
Vol. 20, EGU2018-11198, 2018
EGU General Assembly 2018

Uncertainty of parameter estimation and future prediction in land subsidence modeling with a genetic algorithm

Masaatsu Aichi
University of Tokyo, Environment Systems, Kashiwa, Japan (aichi@k.u-tokyo.ac.jp)

Land subsidence prediction is one of the major topics in groundwater resource management. Land subsidence modeling requires many mechanical properties for elastoplastic constitutive relations as well as hydraulic conductivity and the data on these parameters are often sparse. Then, the parameter estimation to reproduce the observed data is necessary. However, finding a single set of physical parameters including geological heterogeneity is difficult enough and searching another candidate of parameter sets requires further unimaginable efforts.
This study presents a parameter search method with a genetic algorithm to find many possible candidates of parameter set in the wide parameter space and to assess how the parameter estimation and future prediction are uncertain by comparing the many models with parameter sets of good reproducibility.
The proposed method was applied to the land subsidence modeling in the Tokyo lowland area to test the performance. The parameter sets in the models of good reproducibility showed the reasonable relations between parameters, e.g., the relation between the void ratio and the logarithm of yield stress of consolidation was estimated to be linear as modeled in Cam-Clay theory. In addition, the spatial distribution of estimated parameter sets was consistent with the geological structure. These results suggest that the parameter estimation part worked well and the models are the reasonable candidates for future prediction. Based on these models, the uncertainty range of future prediction was visualized for several scenarios of future groundwater level change.