EGU2020-10181, updated on 25 Oct 2021
https://doi.org/10.5194/egusphere-egu2020-10181
EGU General Assembly 2020

Estimation of distributed parameters at regional scale by history-matching of a multi-layered sedimentary aquifer

Ryma Aissat[1], Alexandre Pryet[1], Marc Saltel[2], and Alain Dupuy[1]
[1]EA 4592 Géoressources & Environnement, Bordeaux INP & Univ. Bordeaux Montaigne, ENSEGID, Talence, France (ryma.aissat@ensegid.fr)
[2]Direction Régionale Nouvelle Aquitaine, Parc Technologique Europarc, 24 Avenue Léonard de Vinci- 33600 PESSAC (m.saltel@brgm.fr)

Large scale, physically-based groundwater models have been used for many years for water resources management and decision-support. Improving the accuracy and reliability of these models is a constant objective. The characterization of model parameters, in particular hydraulic properties, which are spatially heterogeneous is a challenge. Parameter estimation algorithms can now manage numerous model runs in parallel, but the operation remains, in practice, largely constrained by the computational burden. A large-scale model of the sedimentary, multilayered aquifer system of North Aquitania (MONA), in South-West France, developed by the French Geological Survey (BRGM) is used here to illustrate the case. We focus on the estimation of distributed parameters and investigate the optimum parameterization given the level of spatial heterogeneity we aim to characterize, available observations, model run time, and computational resources. Hydraulic properties are estimated with pilot points. Interpolation is conducted by kriging, the variogram range and pilot point density are set given modeling purposes and a series of constraints. The popular gradient-based parameter estimation methods such as the Gauss–Marquard–Levenberg algorithm (GLMA) are conditioned by the integrity of the Jacobian matrix. We investigate the trade-off between strict convergence criteria, which insure a better integrity of derivatives, and loose convergence criteria, which reduce computation time. The results obtained with the classical method (GLMA) are compared with the results of an emerging method, the Iterative Ensemble Smoother (IES). Some guidelines are eventually provided for parameter estimation of large-scale multi-layered groundwater models.