



Transient modeling of regional groundwater flow using parameter estimates from steady-state automatic calibration

Torben O. Sonnenborg*, Britt S.B. Christensen¹, Per Nyegaard, Hans Jørgen Henriksen, Jens Christian Refsgaard

Geological Survey of Denmark and Greenland (GEUS), Øster Voldgade 10, DK-1350, Copenhagen K, Denmark

Received 1 October 2001; revised 18 November 2002; accepted 22 November 2002

Abstract

Use of automatic calibration of large physically based hydrological models running in a transient mode is severely constrained by the long simulation time. Here, the possibility of using a steady-state model, with fast model execution, as the basis for automatic calibration of the involved parameters is examined. It is tested if the parameters estimated with the steady-state model can be used for the subsequent transient modeling of the same hydrological system. The problem is analysed for the 5900 km² South Jutland area, being one of the 11 model areas of the National Water Resource Model of Denmark. The area is modelled using the MIKE SHE code while UCODE is used for optimization. Hydraulic head data and stream discharge data are available for calibration. It is examined how the estimated parameters are affected by the choice of (a) recharge input to the steady-state model, and (b) target data used for calibration. The reliability of the parameters is evaluated and the resulting ability of the optimized models to simulate the transient response of the system is assessed. The results show that the estimated parameters are highly sensitive to the way that the steady-state model is conceptualized. The study suggests how the steady-state model should be conceptualized in order to obtain reliable parameter estimates that produce acceptable transient model results.

© 2003 Elsevier Science B.V. All rights reserved.

Keywords: Modeling; Catchment scale; Automatic calibration; Steady state; Transient modeling; Recharge
