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Identification of Net Recharge Rate Using Expert System - A Case Study of Choshuichi Alluvial Fan

J.P. Tsai (1), L.C. Chang (1), Y.W. Chen (1), C.J. Chiang (2), and C.C. Huang (2)

(1) The Dept. of the Civil Eng. , National Chiao-Tung University, Province Of China Taiwan (skysky2cie@gmail.com), (2) The Central Geological Survey, Province Of China Taiwan(chiang@moeacgs.gov.tw)

Conventionally, parameters identification of groundwater model can be classified into manual parametersidentification and automatic parameters identification using optimization method. Parameter searching in manualparameters identification requires heavily interaction with the modeler. Therefore, the identified parametersvalue is interpretable by the modeler. However, manual method is a complicated and time-consuming work and requires groundwater modeling practice and parameters identification experiences to performing the task. Optimization-based identification is more efficient and convenient comparing to the manual one. Nevertheless, the parameters search in the optimization approach can‘t directly interactive with modeler and one can only examine the final results. Moreover, because of the simplification of the optimization model, the parameters value obtained by optimization-based identification may not be feasible in reality.

In light of previous discussion, this study integrates a rule-based expert system and a groundwater simulation model, MODFLOW 2000, to develop an automatic groundwater parameters identification system. We apply this proposed methodology to a real case study of Choshuihsi Alluvial Fan which is located at the central Taiwan. To test the robustness for high dimension problems, the proposed methodology is applied to calibrate the net recharge rates in a transient simulation in the study area. The result is compared with the calibration results obtained from UCODE.

The results show that UCODE has difficulty converging to a global optimum in a high dimension situation and the initial guess dramatically effects the convergency of the optimization. Our proposed methodology is very robust for achieving the convergence requirements of output error criteria for high dimensional problems. These results presented the robustness and the applicability of the proposed methodology for high dimensional groundwater parameter identification problems.