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## Abstract

To efficiently calibrate the 16 parameters involved in the four-layered tank model, many automatic calibration processes were proposed, in which the Multi-start Powell and SCE methods were considered the best two procedures. To compare the effects and efficiencies of the two methods, two designed rainfall events were adopted. One is short-term and the other is long-term rainfall data. Both include a lengthy no-rainfall period. Meanwhile, two sets of the upper and lower values of the search range were selected for the numerical tests. Results show that both of the Multi-start Powell and SCE methods have a good ability to search for the true values of the 16 parameters as the length of the no-rainfall period after a rainfall event is sufficiently long. The effect due to the change of the objective function is mild on the no-rainfall period needed to find all the true values of the parameters. The use of the SCE method provides a more efficient search as the preliminary searching range is determined appropriately. The Multi-start Powell method, on the other hand, leads to more accurate search results as there is no suitable search range and it is selected based on the parameter calibration experiences.

**KEY WORDS**: Surface Water Hydrology; Modeling; Tank Model; Parameter Estimation; Multi-start Powell Method; SCE Method

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