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Improving calibration strategy of physically based model by using critical events

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The use of physically complex models is limited due to the complexity in the measuring some of the parameters and calibrating others. The parameterization of these models is a very difficult task. To run a complex model for a single simulation can take a few hours to a few days, depending on simulation period and complexity of the model. The information contained in a time series is not uniformly distributed. The length of the observation period has a great influence on the identification of the model parameters. So if we can recognize the critical events which are important for identification of parameters, we can make parametrization of complex models more efficient. In this study, the data depth function is used to identify the critical events. Low depth of any point in multi-variate set is unusual combination in that cloud of points.

The methodology will be demonstrated using the hydrological model TOPNET on the Whirinaki catchment in New Zealand. Once the critical events were selected from time series of precipitation or discharge, the model is calibrated using Robust Parameter Estimation (ROPE) algorithm (Bardossy and Singh, 2010). The result is compared with a standard model calibration, where the whole data set is being used. It is found that results are very similar. Hence model calibration using critical events may be very useful for the places where there is shortage or computational resources are limited.

Bardossy A., Singh S. K. (2008). Robust estimation of hydrological model parameters., Hydrol. Earth Syst. Sci., 12, 1273-1283