Parameter Sensitivity analysis for hydrological model improvement in diverse catchments

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We investigate the sensitivity of the semi-distributed TopNet hydrological model, in order to understand the important hydrologic processes and influential model parameters to be accurately calibrated. Using different objective functions to evaluate the model performance, sensitivity analysis was done for TopNet applications in seven catchments located in South and North Island of New Zealand, with diverse watershed characteristics (i.e. topographic properties, response behaviours and geological features). The sensitivity approach combining the global sensitivity analysis methodology, Morris method and State Dependent Parameter (SDP) method was used in this study. Generally, the most sensitive parameters are precipitation multiplier(to correct water balance), TOPMODEL f parameter and soil water capacity which contributes to over 50% model uncertainty, while other parameters (e.g., snowmelt and routing parameters) are watershed and objective function dependent. It has being found that shape of the catchments and objective function have a strong influence on the sensitivity of the parameters. A relationship between the catchment feature and the sensitivity of the parameters was established. This will help in selection of sensitive parameters for catchments of interest. Which will help in proper calibration of the model parameters. That in turn will help in improving the model structure and reducing the uncertainty in the prediction due to parameterisation.