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Impact of model structure simplifications on the performance of a distributed physically-based soil erosion model at the hillslope scale

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In order to make affordable the use of physcially based soil erosion models in field applications it is often necessary to reduce the number of parameters or adapt the calibration method to the available data sets. In this study we analyse how the performance and calibration of a distributed event-based soil erosion model at the hillslope scale are affected by different simplifications on the parameterisations used to compute the production of suspended sediment by rainfall and runoff. Six modelling scenarios of different complexity are used to evaluate the temporal variability of the sedimentograph at the outlet of a 60 m long cultivated hillslope. The six scenarios are calibrated within the GLUE framework in order to account for parameter uncertainty, and their performance is evaluated against experimental data registered during five storm events. The NSE, PBIAS and coverage performance ratios show that the sedimentary response of the hillslope in terms of mass flux of eroded soil can be efficiently captured by a model structure including only two soil erodibility parameters which control the rainfall and runoff production of suspended sediment. Increasing the number of parameters makes the calibration process more complex without increasing in a noticeable manner the predictive capability of the model.