



A surrogate modelling framework for the optimal deployment of check dams in erosion-prone areas

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Despite the great progresses made in the last decades, the control of soil erosion still remains a key challenge for land-use planning. The nonlinear interactions between hydrologic and morphologic processes and increase in extreme rainfall events predicted with climatic change create new areas of concern and make the problem unresolved. Spatially distributed models are a useful tool for modelling such processes and assessing the effect of large-scale engineering measures, but their computational requests prevent the resolution of problems requiring several model evaluations—sensitivity analysis or optimization, for instance. In this study, we tackle this problem by developing a surrogate modelling framework for the optimal deployment of check dams. The framework combines a spatially distributed model (WaTEM/SEDEM), a multi-objective evolutionary algorithm and artificial neural networks as surrogate model. We test the framework on Shejiagou catchment—a 14 km² area located in the Loess Plateau, China—where we optimize check dam locations by maximizing the mass of sediments retained in the catchment and minimizing the total number of dams. Preliminary results show that the performance of the existing check dam system could be improved by changing the dam locations.