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Evaluation concepts to compare observed and simulated deposition areas of mass movements

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A delineation of potentially endangered areas by geophysical mass flows, like debris flows, rock and snow avalanches, is an important for regional and urban planning. For this numerical simulation programs have become an important tool in engineering hazard assessment. However, when being confronted with the evaluation of model performance and sensitivity there are no standard, objective approaches. In this contribution we present a new approach to quantitatively compare 2D simulations of observed and simulated deposition patterns - a concept derived from a literature review of 75 peer reviewed articles which inverse modelled real events of different types of mass flows. It seems that existing evaluation concepts with respect to the deposition distribution does only account for one or a combination of two possible evaluation errors based on overestimation, underestimation and/or overlap of the simulation outcome with the observed reference. The proposed evaluation concept integrates all three possible errors and yields a single metric between -1 (no fit) and 1 (perfect fit). Combined with a ternary plot we further show that the proposed evaluation concept might act as a simple decision support tool to i) identify weaknesses and strengths of the simulation model, ii) to find the best simulation setup and iii) to test whether higher complexity of simulation models are balanced by higher accuracies. This method shall help developers and end-users of simulation models to better understand model behavior and provide a possibility for comparison of model results, independent of simulation platform and type of mass flow.