Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-204-RC2, 2018


Geoscientific Model Development Discussions

# *Interactive comment on* "EDDA 2.0: integrated simulation of debris flow initiation and dynamics, considering two initiation mechanisms" *by* Ping Shen et al.

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Received and published: 20 March 2018

Version 2.0 of the EDDA model features improvements over the previous version. However, its process representation is still deterministically-derived and it rests on assumptions that limit the veracity of the physics-based representations of key processes. Some examples: Line 189 - the assumption here is that surface runoff is generated solely by Hortonian Overland Flow - that is the rainfall intensity exceeds the infiltration capacity. In fact, surface runoff is often associated with other situations and locations. Saturation Overland Flow (SOF) is another likely driver of surface erosion that may trigger a debris flow, for example. The spatial distribution of SOF is largely, topographically controlled and could be predicted based on the DEM and application of appropriate topographic analyses. Line 197 - Richards equation is outmoded. we know it doesn't



work. It should be replaced in EDDA 3.0 by a current approach to simulating through flow. Line 214 - Terrain places an important role in determining the initiation point and pathway for a debris flow. This is not well represented by the infinite slope model. Line245 - the du Boys shear stress equation is old and outmoded. There are better methods based on, for example, specific stream power (stream power per unit bed area. Goodness of fit - describing model and observed results as agreeing 'reasonably well' is insufficient. Quantitative criteria for agreement should be derived and applied to test 'goodness of fit'. Notwithstanding these criticisms, the model and paper have merit and can be used for broad scale forecasting of debris flows triggered by rainfall that is heavy and/or prolonged.

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