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Hydrology and Earth System Sciences
Discussions

# *Interactive comment on* "Predicting land use and soil controls on erosion and sediment redistribution in agricultural loess areas: model development and cross scale verification" *by* U. Scherer and E. Zehe

**Anonymous Referee #1**

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The paper represents a further effort to develop "simpler, but better" erosion models. While many reasons support such efforts, the paper does not represent a novel contribution, but just, to stay with analogy used by the authors, generates another "beast in the zoo of erosion models". There are three main reasons for this assessment. 1. The rationale for the algorithms eventually used in the model is not based on available empirical evidence to support the selections made. The lack of reference to data on e.g. C or P erosion or movement of pollutants illustrates this problem, i.e. model design choices are made, but not based on an argument derived from data published in the



literature. 2. The model is tested based on observations in the Weiherbach catchment that ignore the interdependence of scale and simulated process. Neither small-scale rainfall simulation, nor 69 m plots, nor sediment load at gauging stations reflect soil erosion, but sediment export from natural or artificial catchments with an increasing complexity of interaction of surface processes and properties. While the authors rightfully argue that models cannot and do not have to reflect such complexity, they do not provide evidence or a good rationale why discoupling scale and process interaction is suitable for using simple models. One would actually expect the opposite, i.e. that simple models work best if suited to a particular scale and geomorphic complex. This way, scale can be matched to a small number of processes dominating the erosional redponse observed on this scale and thus a simple numerical representation of erosion. In this manuscript, no argument matching scale to processes is made, which renders the model mostly an excercise of fitting observations to a set of equations perceived, but not shown to be relevent. 3. Finally, simple models with a strong empirical component should rely on a data base that represents the range of possible events. The data used in this paper appear to lack such quality of a good sample. For example, conducting rainfall simulation during spring and fall to collect data on different soil moisture conditions appears to ignore other differences, e.g. soil density and roughness which also change over time. The same is true for the assumptions made on sediment properties through the duration of movement through the catchment or effects of rainfall patterns and their impact on sediment loads, e.g. those identified by Quinton in "P-Erosion, does event size matter?". Overall, I do not think that the approach presented in this paper provides better modeling capacity than existing models, despite their shortcomings. Using the data from the Weiherbach catchment for a critical evaluation of the shortcomings of existing models would instead be much more desirable to prepare the way for the development of sound and capable simple erosion models.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 3527, 2015.