

## ***Interactive comment on “An efficient semi-distributed hillslope sediment model: the Anjeni in the sub humid Ethiopian Highlands” by S. A. Tilahun et al.***

**Anonymous Referee #2**

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The paper presents an empirical model to assess daily sediment concentrations at the outlet of a small catchment (Anjeni, 113 ha) in Ethiopian highlands. The model assumes saturated overland flow generation and predicts erosion from a fraction of the catchment that is defined as degraded land + saturated floodplains. although the model addresses the need of improving runoff predictions to predict erosion, and struggles to keep modelling approach simple and with limited parameters, I fail to see the practical utility of the model proposed. Particularly: 1) the model cannot be used to identify where the sediment is coming from. the fraction of degraded area and saturated area are calibrated parameters of the hydrological model and are not identified in the space.

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The model utility would improve if at least these 3 areas were identified from the catchment geography rather than calibrated. 2) the term 'degraded land' is generic and is never defined in the paper. the authors mention gully erosion in part of the catchment, but do not state if their model is built to assess gully erosion. Instead, they refers to models that work on hillslope (sheet/rill) erosion, therefore I assume they worked on the hypothesis that dominant erosion process was hillslope erosion. This needs clarification. 3) the model has not predicting capability. it cannot be used to assess a likely impact of catchment management on water quality.

The organization of the paper should be improved. Introduction: in presenting the different models that were trialled in Ethiopian highlands, focus discussion on runoff predictions only, given that the hypothesis of the study was to improve runoff prediction by using a saturation excess approach instead of infiltration excess. Material and Methods: need reorganization. I suggest: 1) model description. in the methodology the discussion on baseflow is excessive. it is quite common in fact to cut base flow and consider only event flow (techniques differ on how to assess baseflow); for example AGNPs is used only on event flow, not all the flow. I think this part should be reduced. 2) study area. 3) calibration and validation dataset. there is considerable confusion in the presentation of the dataset used for the calibration and validation, given that some years were discarded because of incomplete or missing data. probably a table will help presentation and readability of the paper. also, present here data relative to Fanya Juu implementation in the catchment, as this comes at different times in the paper. results. I was not convinced of the good model predictions: what are the implications of overpredictions of flow at flow  $> 20$  mm/day and underpredictions of flow  $< 20$  mm/d, (page 2219, 17-21)? Results. page 2220, 9: that there are the two surface runoff areas in the catchment is an assumption not a result of the model. page 2221 line 10: the incorporation..[].. helps cto capture the higher sediment concentration before July". this is not correct: in the model sediment concentrations from the two eroding areas are constant (a1 and a2), and do not change in the model. do you mean change in the sediment load perhaps? Conclusions: page 2222, line 6-7: teh statement "Using these models it

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was possible to define the runoff sources areas" is not correct: you identified a fraction of land that generates erosion, but did not locate it in the catchment. Table 1: take out the first column (Anjeni); re-organize in three columns: column 1= input parameter name ; column 2 = units of measure, column 3 = calibrated value Table 2: Specify units of measure for hydrology (better "daily flow"?) and sediment concentrations; consider reverting columns/rows. Figure 1: enlarge study area instead of Ethiopia map, revise legend of DEM figure 2: I only find reference to Fig 2 at page 2219 when talking about the deep water table ner the stream. Figure 2 shows a hillslope with terraces and I cannot see how it is related to the text? revise the grammar and English. one example over all: Fanya Juu (no reference given in the paper, I suggest: Thomas DB, Biamah EK. 1991. Origin, application and design of fanya juu terrace. In Development of Conservation Farming on Hillslopes, Moldenhauer WC, Hudson NW, Sheng TC, Lee SW (eds). Ankeny IA, Soil and Water Conservation Society: Ankeny; 185–194.) is written in a number of different ways, e.g. fanny juu at page 2217, maybe not that funny? Best regards

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2207, 2011.

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