

## ***Interactive comment on “Sediment transport modelling in a distributed physically based hydrological catchment model” by M. Konz et al.***

**Anonymous Referee #1**

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The article by Konz et al. comprises very interesting work in the field of bedload modelling in mountain regions and presents a new modelling system (TOPKAPI), the derivation of validation data and the application of the model to a major runoff event for a study catchment in the Bernese Alps and a model comparison with another, more complex model (SETRAC). The described sediment-transport module of the model contains a novel and innovative sub-grid level for bedload processes which enables an improved spatial discretisation of cross-section variations important for accurate calculation of bedload storage and deposition. Although the article is generally well composed, I have several reservations towards its current form. The manuscript reads to a certain extent more like a project report for a larger study containing a very broad perspective on model development, description, application, validation and sce-

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nario simulations. The objectives of the paper are not clearly defined, and within the first several chapters it is not clear if the paper is supposed to give a description of a new model system and/or the derivation of validation data using LIDAR based digital elevation models and only in chapter 5 the major goal of the study is stated: to compare two models (with each other, and not against real validation data). I would suggest that certain parts of the article should either be extensively reduced and thus the focus of the article more narrowed or, contrarily, certain chapters require a substantial amount of more information to enable a comprehensive view on the methods used. At the moment no information on the quality and uncertainty of the validation data is given. No runoff data are available from the study catchment and I think it is questionable to reconstruct streamflow measurements from neighbouring gauges for the assessment of bedload rates of a single flood (high risk of error-propagation). The information on how the LIDAR dems are used to derive bedload rates is not explained well enough to give any estimate on accuracy and uncertainty (spatial and temporal) and the whole section should be excluded if the information have been published somewhere else (Chiari et al 2010?). Especially the information contained in Figure 2a (reconstructed bedload transport), which are then later used to attempt a model validation, are not derived properly. Some of the TOPKAPI model equations are not adequately explained, eg. Equation 8: why is this equation adequate for alpine channels, how were they derived (lab, what psd, slope etc.) or Equation 11-14: which D50, D90 values were used in the original studies by Rickenmann and Chiari, - are the particle size distributions comparable to the ones in the study channel? Can the empirical formulas be used for 1-sec time steps? Model application in Chapter 5 does not give enough information on the three model scenarios M1 to M3; it appears that exponent alpha has a huge impact on model result, reducing the bedload rates by nearly one magnitude between scenarios M1 and M2. The entire chapter requires more information on scenario setup or should be excluded from the study. I disagree with the authors that the performance of the TOPKAPI model is satisfying (as concluded in Chapter 8). The validation study (and the non-existing information on uncertainty of validation data) did not show that. In

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summary, the authors might want to consider changing the scope of the study by only concentrating on the presentation of the TOPKAPI model development and a model inter-comparison with SETRAC – it would still make a very interesting and innovate study and would focus on the novel aspects of their model in comparison to previous approaches.

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