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Interactive Comment

Interactive comment on "Impact of spatial data resolution on simulated catchment water balances and model performance of the multi-scale TOPLATS model" *by* H. Bormann

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Author's comment

The author thanks the anonymous referee #2 for some helpful comments and the review of the paper. In the following I will comment on the general comments of anonymous referee #2.

Author's comments on the general comments:

1) pS1168, l2-6: Referee #2 states that the objectives of the paper are commonplace and many authors have been dealing with the same objective before. Unfortunately referee #2 does not provide any references which confirm this statement. As discussed in the introduction of my paper, many studies have analysed the problem of data aggrega-

tion, and have assessed to quantify the effect of using aggregated data on hydrological model simulation. But as introduced, all of the studies I cited in the paper focus on one single data set to be aggregated only (most of them on topography) and do not focus on all spatial data sets required by spatially distributed hydrological models for catchment wide application. This is realised by this study, aggregating systematically all spatial input data sets (digital elevation model, soil map and land use classification) and quantifying the effect on water balance simulations.

2) pS1168, l7-9 - pS1169, l1-5: Referee #2 argues that the statement on the performance of the TOPLATS model is too optimistic with regard to the objectives of the model application. In the paper Nash-Suttcliffe coefficients for daily simulations between 0.61 and 0.73 were called "satisfying" emphasizing the fact that the model was calibrated only to a minimum. Three parameters were adjusted, one parameter to meet the long-term water balance and two parameters to adjust the baseflow recession curve. All other model parameters were taken from available parameter data bases or were directly derived from the input data sets using transfer functions. So calibration was reduced to a minimum, and especially parameters governing the peak values of stream flow, primarily determining the Nash-Suttcliffe efficiency, have not been adjusted. Against this background the model results were called satisfying. An analysis of uncertainty as proposed by referee #2 of course would be interesting. Unfortunately a suitable tool does not exist to analyse both, the effect of parameter uncertainty and the effect of data uncertainty, which is addressed by this paper. Tools such as the GLUE methodology (Beven & Binley, 1992) examine the uncertainty of model parameters and the behaviour of model concepts but do not explicitly consider the effects of input data uncertainty. Tools quantifying parameter uncertainty such as SIMLAB (Saltelli et al., 2004) which are based on Monte Carlo simulations require probability density functions as input information of all input parameters to be included in the uncertainty analysis. Unfortunately this statistical information cannot be provided for most of the parameters. Assumptions have to be made to define these pdf's which again comprises uncertainties which cannot be quantified. That's why the author re-

viewed many modelling studies in which TOPLATS was applied, and in which TOPLATS has been proven to be behavioural for calculating water flow and water budget calculations. As proposed by referee #1, additional information on scale characteristics of former TOPLATS applications will be provided in the revised paper to substantiate the scales where TOPLATS already has been applied successfully.

3) pS1169, l6-8: Referee #2 asks whether it would be interesting to recalibrate TOPLATS for each step of aggregation. Indeed that could be interesting, and as mentioned a result could be that the performance would be as good at a 1000m resolution as it is at 25m resolution. Nevertheless the model as introduced by Famiglietti and Wood (1994) assumes that at the SVAT scale vertical fluxes are dominant. They propose to transfer the model to regional scale by aggregation of simulated fluxes and by taking into account lateral processes using the TOPMODEL concept. Aggregating input data and applying the model without recalibration accommodates these assumptions. If the model stops working with increasing grid size, then the reason is that input data and model concept do not match anymore. A threshold of reasonable data aggregation is reached. If the model is recalibrated for each aggregation step, then the result may be that the model also works at larger grid cells, but then the model probably works well for the wrong reason. Although the grid cells are that big that lateral flow processes are relevant, the model calculates good results ignoring the lateral processes.

4) pS1169, l9-12: The referee #2 is right asking for more comments on the transferability of the model to other catchments. As referee #1 proposed, comments will be added on transferability with respect to the physiographic characteristics of the basins, e.g. catchment size, climate variability (rainfall, temperature) and land uses. As already mentioned commenting the comments of referee #1, in the investigated range of the 4 catchments (e.g. 60-700km^2 catchment size, 700-1100mm annual rainfall, ˜150-700m asl) the results are transferable to other catchments.

5) pS1169, l13-18: Many thanks to the referee #2 evaluating the conclusions as most

interesting part of the paper. If required, the conclusions of course can be dealt with and commented on more in depth. Thereby it should be important not to repeat too many information already provided in the text. In my opinion, the “most interesting” statements on data quality and data resolution are directly related to the results of the study described in this paper. They are also closely related to the design of the study (e.g. simulation of aggregated data sets without recalibration), and therefore the design of the study should not be changed.

Finally I also thank the anonymous referee #2 for the minor comments which will help to eliminate typing errors and improve the style of the paper.

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