

Interactive comment on “Effect of DEM resolution on SWAT outputs of runoff, sediment and nutrients” by S. Lin et al.

Anonymous Referee #1

Received and published: 9 July 2010

This manuscript addresses the question of effects of DEM quality and resolution on modeling results using SWAT. Basically there are two questions: 1) how do topographic indices vary between DEMs of different sources/resolution and 2) how do these different topographic indices affect model simulations. These are important questions which are definitely worth being addressed. However, significant efforts are required before this manuscript might become a valuable contribution to these issues. In its present form, I have the following concerns with the manuscript:

1) A fundamental question is why a catchment has been chosen that is to 96% covered by forests (p4416, 8). Looking on the papers about the Taihu Lake Watershed the major non-source pollutions come from agriculture and also in general one would expect

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larger contributions from agricultural areas. Looking on a forested catchment does not seem to be most relevant.

2) A major limitation is that the results are analyzed only in a lumped way with regard to both space and time. Interesting questions could be addressed by looking at smaller spatial scales (e.g., different subcatchment) and/or shorter periods. This would allow to investigate when and where differences occur and, thus, provide much more information than the lumped analysis of average values

3) This leads to another important point: what is currently missing is a more detailed investigation on WHY the DEM influences the results. This would include looking on why we see effects in the models and how this relates to the ‘real’ processes.

4) More information on the model application is needed (examples of information which I could not find: how many precip gauges, point sources, runoff observations, . . .). One question is how a particular model parameterization might influence the overall results. A full parameter sensitivity analysis might be beyond the scope of the study, but some tests of ‘parameter effects on DEM effects’ would be motivated. This would allow to say something on the generality of the results.

5) It also remains fully unknown how well the SWAT model reproduces observations of runoff and nutrients. The authors refer to three papers where the model has been ‘found to be acceptable’ (p 4420, 18ff), but in these applications the model has been applied to the much larger Taihu Lake Watershed (37 000 km² compared to the 81 km² subcatchment used in the present paper).

6) The results are presented as ‘relative errors’. While I do not like the term (it implies that the baseline simulation is true, I’d prefer ‘relative difference’), using the relative differences makes sense. However, the absolute differences should also be provided. Without this information it is impossible for the reader to assess the importance of certain relative differences!

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7) The results are based on only one year (p4419, 23). Please discuss at least how 2008 was compared to other years and how this might have influenced the results.

8) The DLG5m is taken as the 'truth'. One might argue that the highest resolution DEM not necessarily is the best for hydrological modeling. This could at least be discussed.

9) I don't think a summary in the end is needed, I'd rather see some conclusions (i.e., what have we learnt from this study)

10) It might be valuable for the authors to better connect to previous work. Below I list some references on DEM-scale effects on topographic indices which the authors might want to consider.

Some literature on the effects of DEM resolution:

Brasington, J. and Richards, K., 1998. Interactions between model predictions, parameters and DTM scales for TOPMODEL, *Comput.Geosci.*, 24, 299–314, doi:10.1016/S0098-3004(97)00081-2

Lassueur, T., Joost, S., Randin, C.F., 2006. Very high resolution digital elevation models: do they improve models of plant species distribution? *Ecological Modelling* 198 (1–2), 139–153.

Sørensen, R. and Seibert, J., 2007. Effects of DEM resolution on the calculation of topographical indices: TWI and its components, *Journal of Hydrology*, 347: 79-89

Zhang, W.H., Montgomery, D.R., 1994. Digital elevation model grid size, landscape representation, and hydrologic simulations. *Water Resources Research* 30 (4), 1019–1028.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 4411, 2010.