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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Impacts of grid resolution on surface energy fluxes simulated with an integrated surface-groundwater flow model" *by* P. Shrestha et al.

Anonymous Referee #1

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The authors present an interesting numerical experiment using a state-of-the-art physically-based modelling code simulating the complete terrestrial water cycle for a catchment in Germany. The goal is to investigate the effect of resolution on soil moisture variation and land-atmopshere water and energy exchange. They show convincingly that soil moisture mean and variability as well as variability and mean latent and sensible heat flux is strongly dependent on grid resolution and that this dependency in turn depends on and is modulated by the vegetation cover. These results are quite relevant for atmopsheric modelling a mesoscale.

I find this a well written paper that should be published with limited revisions. Two more

issues remain to be discussed by the authors:

1) The authors perform this without subgrid parameterization. This is understandable given the role of the experiment. However, it would be good to speculate (or even calculate if possible) if a simple subgrid parameterization could correct for this. For instance, if the higher groundwater is caused by the lack of low order streams tapping and draining the groundwater this can be corrected for if most of the drainage resistance is concentrated at the streams. This is generally the case in permeable subsoils. In that case a simple correction would be to multiply the original stream conductance at high resolution by the ratio of total streamlength at high resolution and the streamlength at lowere resolution:

C_low = C_high*(sum_length_high/sum_length_low).

This would probably keep the results of the high and low resolutions soil moisture and fluxes pretty close.

2) This experiment is all done in coupled mode. I wonder if with atmospheric feedbacks the differences in Bowen ratio between the different resolutions would still bes o large. This should be discussed by the authors.

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