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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.

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We would like to thank the Referee for the useful comments. The two issues raised by the reviewers are discussed below:

1) We are currently investigating possible scale dependent parameterization to correct for the model bias due to unresolved subgrid scale topography as indicated in the conclusion section of the manuscript (Pg. 6449, Ln 9-11). The simple correction of stream conductance by the reviewer is not applicable for the integrated surface-ground water model ParFlow used in this study. ParFlow uses a more general formulation

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that directly couples the shallow overland flow equation with the variably saturated groundwater flow equation via the boundary condition at the ground surface, thereby eliminating the use of the conductance concept for the exchange of fluxes between surface and groundwater (more details can be found in Kollet and Maxwell 2006).

2) This experiment was carried out with the hydrologic component of TerrSysMP. The effect of atmospheric feedbacks to these model biases have been presented earlier using two sets of idealized simulations in Shrestha et al. (2014). In the aforementioned study, the goal of idealized test case was to demonstrate the importance of subgrid-scale, topographically driven surface-subsurface flow on land–atmosphere interactions. The difference in simulations with and without mosaic approach to resolve the subgrid-scale topography, showed that the small scale slope heterogeneity enhances the overland flow, thereby reducing infiltration and mean soil moisture content, which consequently affects the vertical turbulent transport of heat and moisture, and the ensuing boundary layer circulations. The finding from this study has been discussed briefly in Pg. 6439, Ln 23 and Pg. 6442, Ln 27.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 6437, 2015.