

Interactive comment on “Coupling a three-dimensional subsurface flow and transport model with a land surface model to simulate stream-aquifer-land interactions (PFLOTRAN_CLM v1.0)” by Gautam Bisht et al.

Anonymous Referee #1

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The authors present a new coupled version of CLM4.5 and PFLOTRAN, and demonstrate the impacts of resolution, horizontal fluxes, and river stage height in simulating groundwater levels and turbulent fluxes between the land and the atmosphere. The authors demonstrate that the new model is capable of simulating the observed water table depth, independent of the model resolution.

The authors show PF-CLM results when there is no lateral subsurface exchange. Does this produce the exact same results as CLM without PFLOTRAN? If not CLM should be included in the manuscript. If so the authors should state that running PF-CLM without

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horizontal transfer gives identical results to CLM.

The description of the technical details of the coupling needs more explanation. It is clear that only the soil moisture and hydraulic properties are passed between CLM and PFLOTRAN. However, how does this work given that the vertical discretization of CLM differs from PFLOTRAN? The vertical resolution of the subsurface (PFLOTRAN) component is only 0.5 meters, while CLM uses layers from mm to m. How does this impact transpiration? Is the default rooting depth used in CLM? How are the 0.5 meter thick layers mapped to the much thinner layers? Does CLM compute freezing and thawing? Which processes are no longer used by CLM in the coupled version?

I am having trouble understanding why the grasses away from the river always have near zero latent heat flux (Figure 7a) while the bare ground has a larger latent heat flux? This explains why the latent heat flux only differs over the bare soil surfaces between PFCLM2m and PFCLMv2m. I fail to understand why the bare soil has a higher latent heat flux than the vegetation, especially given that the moisture available to the roots from horizontal transfer should be even greater than the moisture at the surface. The authors need to explain if this is the expected behavior in CLM, or if it is due to the coupling between PFLOTRAN and CLM.

Figure 6 should be shown as the difference between the observations and the simulations. This will show much more information concerning how the simulations differ.

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