

Interactive comment on “Ground subsidence effects on simulating dynamic high latitude surface inundation under permafrost thaw using CLM5” by Altug Ekici et al.

Anonymous Referee #4

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This is an interesting study about a new parameterization of surface water dynamics including the effect of ground subsidence induced by excess ice melt in high latitudes. A simulation with the new parameterization shows increased surface water fractions in most areas compared to the control simulation. Though the purpose of the study is solid and sound, the manuscript has some major issues that need to be addressed before final publication.

Major issues:

1. The assumption for the proposed equation may not be correct. The authors assumed that decreased micro topography distribution (microsigma) represents in-

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creased surface inundation (fh2osfc). However, from equation 1, it seems that the assumption is true only when surface water level d is greater than 0, hence fh2osfc is greater than 0.5.

2. When the subsidence value surpasses the 0.5 m threshold, microsigma suddenly increases as shown in the lower middle panel of figure 5. Does this sudden change represent any physical processes?

3. Is there any feedback from surface water fraction to other hydrology variables (e.g. soil moisture) in the model?

4. The initial conditions seem to be important for the simulations. How was the spin up period determined? Is 100-years enough for spin up?

5. There are not enough validations performed. It is not clear for me which simulation is better when comparing with the observation. Is it possible to validate time series of surface water fraction using GIEMS dataset?

Minor issues:

P1 L28-31: Is this true? The authors say “The largest increases in fh2osfc are observed in central Siberia and southeastern Russia” on line 27 of page 6.

P3 Equation 2: What is η ?

P5 L11-15: This is confusing. σ_{micro} is defined as microtopography distribution on line 9 of page 3. Why does lower σ_{micro} represent increased variability in surface microtopography?

P8 L10: “higher microsigma” should be “lower microsigma”?

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