

Interactive comment on “Investigating the sensitivity of soil respiration to recent snow cover changes in Alaska using a satellite-based permafrost carbon model” by Yonghong Yi et al.

Anonymous Referee #2

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In this study, Yi et al used a satellite-based permafrost carbon model to analyze the response of soil respiration to changes in snow coverage and temperature in the Alaska ecosystems. They concluded that for the time period from 2001 to 2017, soil respiration has overall increased with the warming. While I can sense the study was well-attempted and carefully written, I feel some additional analyses may further improve the quantitative strength of some of the currently too colloquial conclusions. For instance, a time series plot showing how the carbon fluxes over Alaska have changed through the whole time period will give readers a more direct visual impression. In addition, in the trend analysis presented in Fig. 7, it is unclear how such trend change should be put into the context of changes in snow cover and warming. Perhaps an attribution

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analysis of these carbon flux trends to changes in snow cover, temperature, ALT, etc. will be helpful? Finally, maybe the authors could think of beginning the paper with a diagram (or flow chart) of how soil respiration is related to the variables they are investigating in this study? Such a diagram will put the attribution analysis (if the authors decide to do it) or the analysis in the result section into a better mental perspective. Some more specific points are given below.

Model description: the hydrological module is not well described. It took me quite a while to figure out the soil moisture is not simulated but rather is model input (am I right?). Moreover, in order to understand the model, I also read a number of other papers about the model, but was never clear how the whole model was assembled. So, if I may request, can the authors present a model description as supplemental material? Or at least give a list of what major variables are simulated, and what are prescribed as input.

Fig 2, it is not easy to compare model with observations, even though I can see the model ball-park agrees with the response curve derived in Slate et al. (2017). The authors may consider interpolate the model results to the observations and present a scatter-plot as an addition to help analyzing the model performance.

Fig 3, it will be helpful to present a scatter-plot of modeled vs measured NEE.

Fig 6. Panel c and d are hard to compare, maybe the authors can consider contrasting two depths each panel in two panels, so readers can compare the time series more straightforwardly.

Fig. 7, like in my major comments, if a quantitative attribution analysis can be done here, it will be very helpful.

Other minor comments: L 204 “soil moisture” is unclear, maybe “liquid water” should be used.