

General comments:

I reviewed the manuscript “Representing winter wheat in the Community Land Model (version 4.5)” drafted by Lu *et al.* The main contribution of this paper is improving the winter wheat representation in CLM, by modifying the vernalization, frost damage, and carbon allocation scheme etc. In general, the model structure and function is explained clearly, but some concerns should be clarified further, including:

1. what is the nitrogen limitation effect on the winter wheat growth and grain yield? Do you consider it? If not, please expand this part a little bit more.
2. I notice that your model generally overestimate the LAI for all simulations on TXLU, KSMA, NESA, NDMA, ABLE, especially at the latter of growing season, but it simulate well at US-ARM. Can you explain a little bit more about it? Nitrogen? Or you do not have leaf senescence process in your model?
3. where do you get the key equations for improving the winter wheat representation? I did not see the exact literatures for most of those equations?

Please also see my specific comments below.

Specific comments

Line 19, is this module a new one? Or you just modify some specific processes on this module? If so, I suggested to change this sentence to one like “ We modified xxx or adapted xxx ”

Line 21, use the subscript

Line 28, add some numeric evidence, such as how much reduction in RMSE?

Line 30, to what extent does it underestimate winter wheat yield?

Line 54, literature?

Line 59, literature?

Line 173, there is no irrigation, right? I am not sure which sites do you finally use to validate your model, all or just some of them? You mentioned that there is nitrogen and irrigation experiment on these sites, but finally you select seven site-years rainfed plots. It is not clear.

Line 204, what is the threshold of the maximum daily increment?

Line 206, literature is needed.

Line 211, what is the planting depth for seeds?

Line 235-248, literature?

Line 252, you mentioned that the VF affects the grain filling with same extent to growth. But the VF is effective during leaf emergence to flowering. As far as I know the grain filling starts after flowering. How does it affect grain filling, by heading? Please clarify it.

Line 465, to what extent?

L505, generally, there is energy closure problem at EC observations, and do you figure out the problem in LE?

Line 586, do you compare your model simulation with observations from only rainfed regions or all winter wheat regions? I suggest to compare your model results with that from rainfed regions.