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Interactive comment on "Development of a winter wheat model in the Community Land Model (version 4.5)" *by* Yaqiong Lu et al.

Anonymous Referee #1

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Review for "Development of a winter wheat model in the Community Land Model (version 4.5)" by Lu et al. Summary: Lu et al. updated the winter wheat model in the Community Land Model (CLM) to better simulate wheat growth and grain production, including schemes to represent vernalization and frost tolerance. They also validated the model with three observation data and then applied the updated the model on regional scale. The topic is interesting, but I have a few questions about the method and some comments as listed below. Comments: 1. The title "Development of a winter wheat model . . .. . ." indicates a new wheat model was implemented in the CLM. As far as I understood, they just updated vernalization and frost schemes. 2. In abstract, they claim that they calibrated the three key parameters. But I did not see how they did the calibration and which data did they use to calibrate. I have no idea about what is the difference between calibrated model and the model with default setting? 3. The im-

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Discussion paper

plemented schemes (vernalization and frost tolerance) are the key contribution of this paper. However why they decided to choose the algorithm presented in this study is not clear for me as a number of the algorithm exists. Ideally, it would be great that they can validate these two schemes specifically instead of only validating the model in general. 4. In terms of frost damage, it is a very good point of this paper as climate extreme events are more frequent. However, they did not really show the improvement of the new frost scheme in predicting the frost events and quantify the damage of the frost. It would be promote the paper into a higher level if authors can validate and quantify the frost damage in plot scale, especially quantify the damage in region scale simulation. 5. The manuscript could be better if authors can tight the introduction. From results and discussion, I think the updating and validating of the model to estimate grain production are focus this paper, but they discussed a lot of the importance of carbon emission, energy and water exchange etc. Adding introduction about the importance growth stages would be very helpful. This may link to your decision why you want to focus on updating vernalization and frost schemes and ignore other processes. 6. In the introduction, they discuss a couple of the wheat models from plot to region scale. But what are the issues or challenges of these models did not mention. How they address these issues is not clear. 7. It is also important to note that they did not really validate the model with yield data even they use the model to simulate the wheat yield on regional scale. It would be much more convincible if the model validated on plot scale with grain production data. 8. My last comment is that updating the CLM-wheat model is important, but not very new topic as this kind of job has been done for some land surface models such as JULES, ORCHEDEE and BIO-BGC model. In short, this manuscript potentially is publishable, but it needs a number of modifications. Hence I would suggest a major revision.

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