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Interactive comment on "ORCHIDEE-CROP (v0), a new process based Agro-Land Surface Model: model description and evaluation over Europe" by X. Wu et al.

J. Elliott (Referee)

jelliott@ci.uchicago.edu

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The paper describes incorporation of the field-scale process-based crop model STICS into the land-surface model ORCHIDEE, in order to better represent crop-processes and growth and feedbacks on the climate system, especially though changes in carbon cycle and energy balance. The paper gives a clear and detailed description of the growth and stress processes modeled. Overall the authors do a very good job. The paper is clear and concise and very thorough. There are a few points where I would like to get more information if available. The biggest deficiency in the approach is clearly the failure to include a mechanism for irrigation. This is mentioned in the

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process description only briefly on 4663. It would benefit the paper if this could be expanded somewhat to describe why irrigation was not included. Irrigation is not generally considered to be a difficult thing to include in a process model, with most models using simple rules where additional water is applied if topsoil moisture falls below some threshold. Given that water cycles and especially large-scale irrigation patterns have been shown to have significant impacts on regional climate in several recent studies, this seems like a surprising oversight in what is otherwise a very comprehensive treatment of crops in a land-surface scheme. I also have some further questions about the root distribution. Root biomass is accrued dynamically but as stated it seems that root depth and distribution is static, with 65% in the top 20cm. Is that correct? This should be clarified further, along with how it effects water access via the exponential root density function over the lifetime of the crop. Since the model considers winter wheat, it would be good to comment on whether/how cold temperature effects (leaf kill and full plant kill) are considered and (in the case where leaves are killed but he plant survives) whether/how this effects allocation during subsequent growth. The model validation and especially the improvements made over the previous land-surface scheme are truly impressive and well done and I have no real comments here. It may not be in the scope of this paper, but I'm certainly very curious to know also how different the new scheme is in terms of large-scale factors that could affect climate feedbacks. Some integrated measure of surface albedo, total carbon budgets, etc. if possible, it would be good to add to the conclusion some statement about this. Does it greatly increase or decrease the land-surface climate feedback in any way that you expect to have implications for future IPSL coupled runs?

Small things. Some editorial work is needed to improve readability. For example, page 4659 line 10 "in the crop module same to STICS".

Interactive comment on Geosci. Model Dev. Discuss., 8, 4653, 2015.