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Interactive comment on “A new concept for simulation of vegetated land surface dynamics – Part 1: The event driven phenology model” by V. Kovalskyy and G. M. Henebry

Anonymous Referee #3

Received and published: 2 August 2011

General comments

The paper addresses relevant scientific questions within the scope of BG. While the paper seems to present a novel modelling concept, it is not clear how different this actually is from other approaches (see below). I find the conclusions not particularly substantial as the model seems to have a lot of parameters; however, since the authors are not specific about this, it is difficult to say. The model description should be much more detailed. Results are mostly sufficient to support the interpretations and conclusions. Descriptions do not allow reproduction. The language is fluent, but in parts not precise enough - again this is related to the insufficient model description.

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Some definitions are missing or symbols are not clear. The supplementary material needs to be improved to allow reproduction.

The manuscript presents an interesting concept for an event driven phenology model. This is clearly important as some phenologically relevant forcings can be considered as events, e.g. frost.

I argue, however, that it is not clear that anything is gained by choosing this form as opposed to a more truly continuous one. As the authors say:

"The transformation of continuous factors into events relies on partitioning that depends on canopy responses." (p 5285, l 21)

Hence a set of thresholds needs to be determined for this transformation. In a continuous formulation one can use integrals and stepfunctions, which also allow to indicate events. Again some thresholds are required. I am therefore not convinced that there is really a difference between an "event driven" and "continuous" approach.

I also find the following statement not really appropriate:

"This modeling approach opens the door to representing an ecological understanding of interactions of multiple drivers/events that drive the temporal variability of canopy characteristics..." (p 5285, l 25)

While this may be true, it is also true of other truly continuous approaches, and not specific to this model. In addition, however, nothing in the work presented here shows more ecological understanding than other models nor is it shown how this would work. In fact the "learning" aims at reproducing the TNDVI which is a very integrated measure of canopy growth and not of detailed specific ecological processes. I would expect that there multiple instances of the model presented here that lead to rather similar, and in fact statistically indistinguishable, TNDVI dynamics. As such it remains to show how an approach like the presented one actually helps with the understanding of the effects of multiple drivers.

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I should like to ask the authors to modify their text to consider the above points

My main reservation about the model presented here, is that it seems to have a very large number of parameters and that it is not discussed how well these parameters are actually determined in the light of errors on TNDVI. So equation (7) is used to train the sensitivities. If there are errors one Anext, what does this mean for the sensitivities?

I am afraid it is not clear to me how the model is trained. How do the observed TNDVI data enter the optimisation? What does the index i stand for in (7)? Please explain more clearly what you do with the observed TNDVI and how your training procedure works. Maybe give an example, or full equations. As things stand I do not feel I can fully comment on the model and certainly I would not be able to reproduce it. I think this should be possible, though.

Please give a full list of parameters and equations for the finalized model.

Minor points

P5306,l6. What is the "canopy driven factor"? This is not used/explained before. The sentence does not seem to make sense.

Fig. 1 Explain clearly what the different modules are doing. This might help understanding how this model is set up.

Fig. 3. Where, when, for which crop, etc is the TNDVI shown?

Fig. 4. How are the "mean seasonal errors" calculated? What are they exactly?

Generally, provide more explanation in your table and figure captions about what is shown.

Interactive comment on Biogeosciences Discuss., 8, 5281, 2011.

BGD

8, C2303–C2305, 2011

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