Biogeosciences Discuss., 8, C2404–C2407, 2011
www.biogeosciences-discuss.net/8/C2404/2011/

Biogeosciences Discussions

Interactive comment on "Alternative methods to predict actual evapotranspiration illustrate the importance of accounting for phenology – Part 2: The event driven phenology model" *by* V. Kovalskyy and G. M. Henebry

Anonymous Referee #2

Received and published: 10 August 2011

General comments

The paper addresses relevant scientific questions within the scope of BG. The manuscript presents evaluates the event driven phenology model (EDPM) against evapotranspiration (ET) measurements. This is important and the authors should be praised for trying to explore the impact of phenology on relevant ecosystem fluxes.

Overall I would recommend publication.

I find, however, the conclusions not particularly substantial as they mostly consider

where there are differences, but much less so deeper reasons for the differences (see my comments below). Results are sufficient to support the interpretations and conclusions. The language is fluent, but in places some definitions are missing or symbols are not clear.

Significant points

P5338 l. 29. Phenology was modelled interactively even in global models much before Pitman (2003), e.g. Lüdeke et al. (1994) and Kaduk and Heiman (1996a), and effects were explored (e.g. Kaduk and Heiman, (1996b) and Kindemann et al., (1996)). I suggest that if the authors wish to explore the historical development of phonological modelling, then they need to also consider earlier work much more comprehensively. Otherwise, I would recommend to rewrite this part such that it explains and contrasts the different approaches not attempting a historical perspective.

P5339 l.10f I do not think that the concept of the EDPM stands apart from "traditional" models. "Traditional" models have also determined "triggers of change" from meteorology, e.g. heat sums for leaf appearance, or have directly used environmental events, e.g. temperature dropping below a certain threshold to initiate leaf fall. Also, the EDPM uses a serious of thresholds to convert continuous meteorology into events – this is not any different from using heat sums. I find the statements here inflate the differences between the EDPM and other models and distract from the really interesting questions, e.g. what can actually be gained by including real events, such as frost.

P5339 l15f Here the authors themselves say that continuous forcing is transformed into triggers of plant responses – this is really just the heat sum approach to model leaf appearance, which is very old. Moreover, there is the problem in that the model might use triggers for plant responses which in reality one might want to consider as a response to a continuous change, e.g. plants might not respond to precipitation, but the slow increase in soil moisture. By introducing the event "precipitation" (l15) the model might actually use the wrong forcing for plant development.

P5339 l19. Well, the EDBM is not the only model with that potential, and in fact many models do not use climatologies any more.

P5340 l3-6: Questions (1)-(4). I would think that a difference that is not statistically significant should not be treated as a difference. Hence I think there are really two questions here: (1) How does the interactive phenology differ from the static phenology? (2) If there are differences, then when and where are results from the interactive phenology significantly different from the static phenology?

P5357 I do not understand why the EDPM should be better than the retrospective MODIS. I have difficulties believing that this is solely due to the 8 day temporal resolution – certainly not in the crops? I would like to see a bit more discussion about why that might be. TNDVI versus MODIS NDVI? Does the VPD calibration for the EDPM play a role?

Overall I would like to see more discussion how the differences come about. OK, so there are some statistically relevant differences. Where do they come from? What really makes the EDPM better then the retrospective MODIS? As part of that I would like to see more discussion about how relevant differences in phenology actually are for the differences in evapotranspiration. There is a start on that by looking at the growing season length, but does this explain the differences in ET? What about maximum ET rates or similar, that would allow to factor out the phenology?

Minor points

P5338 l1 What “factor” is meant?

P5338 l3 What is the "canopy factor"?

P5340 l14 I would not claim “all” climatic factors.

P5340 l20 What is Kcp and Kc? Please explain.

P 5344 l2 What do you mean by: “depending on the nature of weather factor or surface

attribute.”?

P5346 l21 Do you consider five not four procedures?

P 5353 l11 What do you mean by “coupling scheme”? This term was not used before.

Fig. 2. Shouldn’t there be more labels? Or state which apply to what panel in the caption.

Fig. 2, 3, 6. Provide more explanation in the figure captions

Fig. 7: Unit on y axis – really day-1? I think this should be just mm m-2, no?

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Interactive comment on Biogeosciences Discuss., 8, 5335, 2011.