

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

Anonymous Referee #2

Received and published: 30 July 2011

The paper presents a new approach to model vegetation phenology called the ‘event driven phenology model’ (EPDM) and illustrates its performance at two Ameriflux crop sites. The paper is well written and the EPDM concept is interesting. I also appreciate the aspect of satellite data assimilation and propagation of uncertainties. I recommend publishing the paper in BG if the raised points below will be adequately addressed in a revised version.

+ The authors should clarify for what exactly the model has been developed. Is it for site-level analyses, regional or even global applications? Is it useful for all vegetation types and climate zones? It seems to me that the heavy data requirements for training

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constrain the application domain of the model a lot.

+ The authors should clarify if their model runs operationally or needs particular ‘tuning’ (I do not mean training) for specific sites. Operationality would be a requirement for large scale applications and the coupling to e.g. RCMs or GCMs.

+ In the introduction the authors refer to simple phenology models in RCMs and GCMs. However, there are better phenology models implemented in some carbon cycle /terrestrial biosphere models where phenology is interactively modeled based on daily carbon allocation. The authors may also acknowledge the work by Knorr et al 2010 and Stöckli et al 2011 in the introduction.

+ The authors mention that their EPDM approach opens the door for ecological understanding of interacting phenology drivers while this has not been demonstrated in the paper. Consider removing the statement.

+ The selected sites are crop sites. Please clarify if EPDM is specifically developed for crops or works for any veg type. The authors argue that one of the advantages of EPDM is that e.g. disturbances can be taken into account. Management is somewhat related and I wonder why irrigation has not been incorporated as a driver but instead the irrigated years were removed from the analysis. Also harvest should be an important factor that is not incorporated or discussed.

+ Page 5293: The countdown for a start of a season is the first day of a calendar year. There are various problems with that such as the growing season may be in northern hemisphere winter e.g. in the southern hemisphere or Mediterranean systems in the northern hemisphere. Can EPDM deal with multiple cropping/growing seasons per calendar year?

+ Page 5296 lines 17-19: I expect a problem with co-linearity between the drivers. Does that matter here?

+ I see a potential for circularity because the ‘y’ variable (TNDVI) is calculated from

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radiation data while radiation data are also used as 'x' variable, i.e. it is on both sides of the equation. Please comment.

+ I do not understand the point of including predefined phenological dates in the analysis. Please clarify or consider removing that from the paper.

+ I suggest indicating training and validation data in table 1.

+ The draw-back of the event concept is that events have to be defined using some thresholds. Is there a way to also optimize the thresholds instead of using some literature values?

+ I would find it more interesting if the data-model comparison would explicitly elucidate to what extent the 'seasonal curve' vs 'anomalies' are captured by the model. One of the motivations for an interactive phenology model was that it can model also deviations from the mean seasonal cycle but it was not demonstrated how well that actually works. The r^2 values in table 5 are dominated by the strong seasonal cycle which is relatively easy to capture.

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