

## ***Interactive comment on “Incorporation of crop phenology in Simple Biosphere Model (SiBcrop) to improve land-atmosphere carbon exchanges from croplands” by E. Lokupitiya et al.***

### **Anonymous Referee #2**

Received and published: 1 April 2009

#### General comments

This paper describes the development of crop phenology models for a climate model land surface scheme, to replace the currently used NDVI data. The paper presents a well-written and interesting discussion of how the model has been validated against observed datasets, and makes a useful contribution to the literature. I do not have significant suggestions to improve the paper.

It would be good to see more explicit estimates of uncertainty in the observations. The presentation of variability in the data might also be enhanced, perhaps with model/observation comparisons presented as solid lines for means, and error bars

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or an 'envelope' representing the spread? It would also be good to see some statistics on model fit (e.g. RMS error and R<sup>2</sup>), particularly for the data presented on figures 5,7,8,9, and 10.

The authors should also make it clearer whether the current model was intended to represent maize, soybean and wheat only for the Mid West USA, or for these crops more widely.

It would be useful to expand on potential reasons for some of the model's shortcomings, e.g. overprediction of maximum LAI at Mead in some years, and underestimation of CO<sub>2</sub> uptake at sub-hourly scales.

Finally, a table comparing the basic characteristics of existing linked crop - climate/land surface model approaches would be useful in the introductory section (e.g. scale, number/type of crops, fundamental approaches, other schemes used, data inputs, timestep..).

#### Specific comments

P1906, Line 10: There are several sources of literature which could be cited here e.g.:

Betts R. Integrated approaches to climate-crop modelling: needs and challenges. Phil Trans R Soc B 2005; 360: 2049-2065.

Desjardins RL, Sivakumar MVK, de Kimpe C. The contribution of agriculture to the state of climate: Workshop summary and recommendations. Agric Forest Meteorol 2007; 2-4: 314-324.

(and the special issue from which the paper comes)

Hansen JW, Challinor A, Ines AVM, Wheeler T, Moron V. Translating climate forecasts into agricultural terms: advances and challenges. Clim Res 2006; 33: 27-41.

P1907, first paragraph: Further work describing coupled climate-crop modelling:

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Challinor AJ, Wheeler TR, Slingo JM, Hemming D (2005) Quantification of physical and biological uncertainty in the simulation of the yield of a tropical crop using present day and doubled CO<sub>2</sub> climates. *Phil. Trans. R. Soc. B* 360: 2085-2094. doi:10.1098/rstb.2005.1740.

Bondeau, A., Smith, P.C., Zaehle, S., Schaphoff, S., Lucht, W., Cramer, W., Gerten, D., Lotze-Campen, H., Müller, C., Reichstein, M. & Smith, B. 2007. Modelling the role of agriculture for the 20th century global terrestrial carbon balance. *Global Change Biology* 13: 679-706.

Please make sure the figure legends are consistent - for instance red/black are used interchangeably e.g. in figure 11 where the meaning of black/red differs in b) to the other parts of the plot.

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6, S663–S665, 2009

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