

Interactive comment on “On the uncertainty of phenological responses to climate change and its implication for terrestrial biosphere models” *by* **M. Migliavacca et al.**

Anonymous Referee #1

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General comments

The authors investigated the uncertainties in model predictions related to phenology. Bud burst observations of the Harvard site were used to determine model parameters and their uncertainties of 12 different phenology models. These models and parameters were then used to predict the bud burst at the Harvard site in the next century for two different scenario's. In addition the BEPS model is used to investigate the influence of phenology on the uncertainty of photosynthesis and evapotranspiration fluxes.

Overall, the analysis is performed very well and concise, and it contains many different aspect of possible sources of uncertainty. But at times it is difficult to follow what the

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main findings of the study are, and how the results are used and fit with the objectives (see the specific comments). This could be improved by defining the objectives of the study in the introduction more clearly, and explain how the results presented in the figures and tables contribute to the objectives. The discussion should be improved to be more clearer and concise, it is difficult to follow and understand what the main points are that you want to make here. The introduction and most of the results are written very clearly.

Simulated fluxes are compared using different phenology models, but how do these compare to the eddy covariance fluxes from the Harvard site? Are they comparable? Are your simulated fluxes within the same range? Could you add something about this to the discussion by comparing your results with that available in the literature?

Specific comments

P880, L10: replace "yr" with years

P880, L13-15 "The evaluation... model structure.": rewrite this sentence, not clear what is meant.

P880, L17-26: here but also throughout the document a lot of text is used in already long sentences between (...). This makes the reading unnecessarily complicated. Could you try to avoid these?

P880,L20: what is CI?

P881, L20: can you add a reference for the AR4 report?

P882, L25-27 "Uncertainty... future climate)". The description of the three uncertainties is described well here, why not use this description also in the abstract (P880, L16)? This will remove some occurrences of the word "uncertainty" in the abstract, which is 19 times now.

P883, L11: "here" is the present study?

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P884, L5-8: I assumed that the objectives of the study are described here.

P886, L15: can you explain what the Sarvas function is, and how it is different from the threshold approach.

P887, L1: not clear what the word separately is related to, model parameters or species and models?

P889, L22: can you explain the Sen's slope estimator? Figure 4 cannot be understood now.

P892, L4-7 "The time series ... Fig.2c.": Move to section 3.2.1 and explain what is seen in the figure.

P892, L8-12: what can be seen/concluded from Fig. 3. Please describe. Could you also explain why species PRSE behaves very differently, while the same best model is found?

P892, L18-25: can you explain how this figure should be understood and what can be concluded from it? Is it necessary to include this figure for you conclusions?

P893, L7: "models" should be "model"?

P893, L8: how are the trends smoothed?

P894, L2: can you explain how dB/dT is calculated in Fig. 6?

P894, L16: over which period is the interannual variability calculated?

P894, L22: which site is 'black cherry'?

P895, L6: can you explain the Mann-Kendall test? Or at least how the reported numbers were derived?

P896, L11-14 "The sensitivity runs ... respectively": rewrite sentence.

P896, L19: why is Fig. 10 schematic?

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P897, L16-22: one sentence... rewrite. And, what is CI?

P898, L9-11 "Increasing ... model)": I do not understand what is said here, could you rewrite?

P898, L12: "whether" should be "when"?

P898, L20-end: I do not understand this paragraph. What do you mean with "driver uncertainty is enhanced"? What is the message or point you want to make here?

P899, L8: "reporting" should be "analysing"?

General question I was curious about: is it realistic to use present day phenology parameters in predictions? Is there anything in the literature about how they change or adapt when climate changes?

P899, L17: what is meant with "specific set of parameters"?

P901, L28 "because of the ... 10 days": could you rewrite this, I do not understand what is meant.

P902, L3-4: change "on annual GPP/ET" into "in annual GPP/ET"

P902, L6-14: rewrite.

P902, L16: reference to these empirical studies?

P903-904: last sentence of discussion can be taken out: "Thus, ... hampered."

P904, L4-7: rewrite first sentence of conclusions.

P904, L7-8: so, these models are wrong?

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