Dear Thomas Launois and co-authors,

thanks for resubmitting your manuscript. I read through the revised manuscript and your response to the reviewers. In general, the manuscript greatly improved in its structure in the revised version. This is a really comprehensive study on the potential of using OCS observational data to constrain GPP modeled in DGVMs.

I have a few minor issues you might want to revise before final publication. Your manuscript does not include page numbers, I hope you can connect my comments to the right text passages. If not, don't hesitate to ask. In general, the language could be improved in several parts.

Abstract:

- The abstract should clearly state the limitations of your study.
- 'new parameterizations' is not correct for all of the sources you mention

Leaf uptake of OCS:

Line13: but in your approach you use a global constant kLRU?

Equation3: please check underlines

2.3. Models used in the study

Why do you choose only the period 2006 – 2009 for the models? Also, the plots show 2007 – 2010. Are OCS data only available for that timeperiod? Such a short timeinterval also limits your conclusion due to the strong interannual variability of GPP and the imperfect meteorological forcing from reanalysis data used in the DGVMS. This should be included in the discussion.
For the optimization you state that you use the timeperiod 2004-2009.

Why is the landcover fixed?

Table1/Table2/Table3: The Tables are not correctly referenced in the text. In most of the cases references to Table1 actually should refer to Table2. Please check.

Oxic soil uptake of OCS
Line16: you might want to add 'regional distribution' and the single sensitivity experiments.

Plant uptake of OCS: 'seasonal cycle peaks' – 'seasonal cycle shows a distinct peak'

… see Figure A3: I can't find this in the figure

differences between the GPPs are significant: did you check for the significance?

3.2 annual trends

Figure 3 shows only STD-ORC

Figure5: The smoothing procedure should move from the appendix into the main text. Also, the figure captions for all figures showing smoothed results have to clearly state that the data was transformed (not in the last sentence, please). The same applies for the normalization in Figure7.

Figure5 compared three different simulations not four.

… and canceling out. – please, rephrase

4.1. Atmospheric trend

… are likely what? Too large/small?

Figure11: what is the line in the last two rows for?

Phase and amplitude of atmospheric seasonal cycle

Line15: 7 is not correct. The unit is also not ppt but ppp/year*2

Figure12: What are filled and open symbols?

LPJ model/Line14: How are the differences coherent? Please detail this out.

Line 20.: 1. -> 2.

Your single points on the limitations are they listed according to the importance? I'd rank them differently.

Achnowledgements: I guess you want to thank Samuel Levis. Were the CLM4 simulations not part of TRENDY?