**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Quantifying the constraint of biospheric process parameters by CO_2 concentration and flux measurement networks through a carbon cycle data assimilation system" *by* E. Koffi et al.

Anonymous Referee #3

Received and published: 10 January 2013

Koffi et al. investigate the constraining power of measurements of atmospheric CO2 concentration (with differing numbers of stations or different time resolution) or of CO2 flux, for estimating parameters in a biosphere model in a CCDAS framework. They do not find much gain from using submonthly variations in CO2 concentrations, but strong constraints from using flux measurements. The paper is an interesting step in the development of CCDAS's, which I would like to recommend for publication after revision.

My largest concern is that some of the conclusions will strongly be specific for the

particular CCDAS system based on few PFT's. The authors finally mention this briefly at the end of Sect 7, but this important caveat needs to be discussed more prominently. Though the PFT concept is certainly attractive for CCDAS's, the rigid coupling of the parameters of hugh portions of the land surface is a great simplification of the high heterogenity of the biosphere in reality. I expect that the strong impact of the flux measurements (compared to atmospheric measurements) is an artifact of the small number of PFT's.

Small comments:

The methods section is very long and somewhat confusing. I suggest to mainly describe the layout of the test cases, and move all the general mathematics and implementation details to footnotes or an appendix. For example, if I understand right, the PYVAR system is essentially used as a wrapper around LMDz that picks the modelled concentrations from the gridded field at the right location and time - if so, put it that simple. On the other hand, I found the description of the various configurations not very clear - maybe a flow chart would help here (also consider to use more easy and more mnemonic codes).

p 24132 l 21: What is "evidence-based"?

p 24133 l 1ff: The uncertainties that lead to spread in "approach 1" also affect "approach 2" in the same way, i.e. "approach 2" cannot be put as a solution of these uncertainties.

p 24136 l 4: The wording "ratio of..." contradicts the later definition Eq (4).

Headline 2.2 "CCDAS"?

p 24137 l 6 and later: Avoid spelling out numbers, as this is harder to read.

Sect 2.3 and 2.4: See comment above

p 24138 l 11: Likelihood of what?

p 24140 l 1: What does it mean "We use the same linearity assumption. . ."?

Eq 4: Missing "%" (in "100%")

p 24141 l 23: If NPP=0 is treated differently, doesn't this introduce discontinuities?

Sect 4.2 and 4.3 partially overlap with Sect 2 and are partially not actually on "Data".

p 24146 l 3: Did you mean "DM" rather than MM?

Sect 5.3 "FLUXNET": Do you not consider the real PFT (land cover) of the sites, and if not why not?

p 24148 l 12: Add what a(J,V) is relevant for.

p 24150 l 11: The number of observations does not seem to be a relevant metric, as the type of data is so diffeernt anyway.

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 24131, 2012.

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