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Biogeosciences Discussions

Interactive comment on "Consistent assimilation of MERIS FAPAR and atmospheric CO_2 into a terrestrial vegetation model and interactive mission benefit analysis" *by* T. Kaminski et al.

T. Kaminski et al.

thomas.kaminski@fastopt.com

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We thank the two reviewers for their valuable comments and suggestions. In the following we address both sets of comments and provide a revised version of the manuscript as supplement.

Response to Comment by Anonymous Referee 3

Limited novelty: We would like to note that this is the first data assimilation study at the global scale that shows FAPAR data can constrain quantities related to the hydrological cycle. And not only that, it also shows that the better quantification of hydrological quantities is the main benefit of FAPAR assimilation. This result is not only new, but

runs counter to the commonly accepted view that FAPAR is more a measure of the carbon cycle (e.g. existence of FAPAR based NPP products etc.) To make this clearer, we have changed the first sentence of the conclusions, and added a further sentence related to the potential assimilation of SMOS soil moisture data: "Use of SMOS is particularly interesting, as it would allow comparing the benefits of SMOS soil moisture data to the already considerable benefit of FAPAR for hydrological quantities."

Effect of LAI on variables other than LAI: We added a short discussion at the end of the paragraph.

In situ network: In fact the tool is more general and can address networks beyond the European network. We have modified the text (from line 214 of the revised manuscript) and also added a reference to a first comprehensive study that uses the tool (Kaminski et al., 2012).

Assimilation at site-scale: We thought it would be instructive and convenient for the reader to start with the summary of site-scale results, as they use the same model and the same consistent assimilation philosophy. But in fact, both reviewers suggest that a reference to Knorr et al. (2010) is fine. So we removed the site-scale summary.

Scaling of PFT fractional cover: We are not sure what the reviewer suggests. We suspect he suggests to use not the average FAPAR over the PFTs at each grid cell during assimilation, but FAPAR for each of the PFTs separately. However, we do not understand what is meant by "the same information from the satellite data, which could be averaged using a map of the PFTs." If we wanted to assimilate PFTs separately, we would have to disaggregate the satellite signal into PFTs, not average it. However, this information is not available, as the satellite only "sees" mixes of PFTs even at the full resolution of the FAPAR data (ca. 1km). It would also not help to use a PFT map for disaggregation because the contributions of each PFT are not constant in time, but change through the seasons.

Reference to Figure 8: Thanks. Has been added.

Discussion of Results of Mission Benefit Analysis: We added text to the manuscript at two places: First, at the end of Sect. 5, where we analyse the effect of extended mission length. Second, in the conclusions (Sect. 6, from line 345 of the revised manuscript).

Response to Comment by Anonymous Referee 4

Assimilation at site-scale: We thought it would be instructive and convenient for the reader to start with the summary of site-scale results, as they use the same model and the same consistent assimilation philosophy. But in fact, both reviewers suggest that a reference to Knorr et al. (2010) is fine. So we removed the site-scale summary.

Sensor resolution in MBA tool: Even if the hypothetical case in which we use a very high resolution would be feasible in terms of sensor technology and process modelling, it would (as our analysis shows) still leave an important fraction of the parameter space unsampled, which then is responsible for the residual uncertainty in the fluxes.

Mission length in MBA tool: We added text at the end of Sect. 5, where we analyse the effect of extended mission length.

Technical corrections: First and third item fixed. And for the second item we have extended the text (from line 214 of the revised manuscript).

References

Kaminski, T., Rayner, P. J., Voßbeck, M., Scholze, M., and Koffi, E.: Observing the continental-scale carbon balance: assessment of sampling complementarity and redundancy in a terrestrial assimilation system by means of quantitative network design, Atmos. Chem. Phys. Discuss., 12, 7211-7242, doi:10.5194/acpd-12-7211-2012, 2012.

Knorr, W., Kaminski, T., Scholze, M., Gobron, N., Pinty, B., Giering, R., and Mathieu, P.-P.: Carbon cycle data assimilation with a generic phenology model, J. Geophys. Res., 115, G04017, 16 pp., doi:10.1029/2009JG001119, 2010.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/8/C6439/2012/bgd-8-C6439-2012-supplement.pdf

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Interactive comment on Biogeosciences Discuss., 8, 10761, 2011.