Geosci. Model Dev. Discuss., 5, C757–C759, 2012
www.geosci-model-dev-discuss.net/5/C757/2012/

**Geoscientific
Model Development
Discussions**

Interactive comment on "Quantifying the model structural error in carbon cycle data assimilation systems" *by* S. Kuppel et al.

Anonymous Referee #2

Received and published: 8 October 2012

This article characterises model uncertainties of a land surface model that can be subsequently used in a data assimilation system. The characterisation of model uncertainties is of great importance for a carbon cycle data assimilation system. The authors apply a method to characterise these uncertainties with various approaches and hence contribute significantly to this field of research. I have some specific comments that might help to improve the manuscript with respect to the presentation of the findings and to the discussion of the limitations.

1 Summary of error characteristics

A general summary (e.g. as a table) of the various error characteristics could help to get a better overview of the results derived in this work (e.g from P2267 L25 – 27; P2268 L14; P2269 L19 – 20). Additionally the authors also could extend their descriptions of the prior-residuals, prior-parameter errors and observation errors beyond the reporting of median values and they could also describe the spread of these errors derived from the different Fluxnet sites.

2 Limitation to DBF

The authors limit their study to deciduous broadleaf forests and also state this as a limitation. I suggest to further discuss this limitation and where possible the authors could make an attempt to give some quantitative arguments. Specifically this could include:

P2263 L6-8 and P2271 L7: How much does DBF really dominate Northern Hemisphere (in Orchidee) and what could this mean for the results presented here?

P2268 l16: The uncertainties from Hollinger et Richardson (2005) is derived for one site which is dominated by an evergreen needleleaf forest. The errors are described to depend on the magnitude of the fluxes themselves. This should be more prominently stated and the consequences of potentially higher measurement uncertainties on R_{mod} should be discussed.

3 Further considerations

p2261 L1 : Scholze et al (2007) have done this as well .

P2261 L10: What about uncertainties in the surface characteristics (eg.: pft assignment to grid-cells)

P2265 L3-4: I assume that $\hat{R}^{prior}$ is the estimation derived from eq. 1 and $\hat{R}^{eval}$ from eq. 3. The authors should make clearer statements, what they exactly mean with those terms.

P2271 L14-16 Any reason why the surface stations (flasks and continuous) do not show a correlation structure but the total column measurements do.

P2271 L21-21: To my understanding, the model structural error is not equivalent to the aggregation error, even though its misrepresentation might have similar consequences for the results of the data assimilation system.

P2272 L14-19: This statement is not fully clear to me. Maybe the authors could describe their intention with more details.

4 References

Hollinger, D. Y., and Richardson, A. D.: Uncertainty in eddy covariance measurements and its application to physiological models, Tree Physiol., 25, 873–885, 2005.

Scholze, M., Kaminski, T., Rayner, P., Knorr, W., and Giering, R.: Propagating uncertainty through prognostic carbon cycle data assimilation system simulations, J. Geophys. Res.- Atmos., 112, D17305, doi:10.1029/2007jd008642, 2007.

Interactive comment on Geosci. Model Dev. Discuss., 5, 2259, 2012.