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Biogeosciences Discussions

Interactive comment on "Multiple observation types reduce uncertainty in Australia's terrestrial carbon and water cycles" *by* V. Haverd et al.

Anonymous Referee #1

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The study is interesting because it uses multiple constraints on estimating ecosystem model parameters. Respective different continental-scale NPP estimates and uncertainties are presented in section 3.1. However, despite the importance of this section for the overall objective of the paper, it appears to be far to short. - I suggest comparing Australia's NPP against inventory-based NPP or against previous studies in the same fig 4. - I request comparing also streamflow data and ET at watershed level or continental scale. The water flux is of same interest than the carbon flux, also in the results and conclusions sections of that study. Hence, the reader wonder about the value of individual datasets for constraining the water balance. - It is unclear which parameter sets from which combinations of data for calibration has been used further in the following sections. Please clarify and also explain why to use one specific configuration. Was it the one with all three datasets included, Eddy data, streamflow+precipitation,

leafNPP because you wanted to have reduced possible biases? Or are the continental results based on parameter sets constrained only by using eddy covariance data because that showed the lowest uncertainty? Would it not make sense to show both results?

Model parameter estimation and initial condition: Due to the simplified representation of aut. respiration being a constant fraction of GPP, initial conditions are not important for the NPP parameter estimation. However, it remains unclear how parameters for the CASA model, e.g. turnover times can be estimated without considering the problematic (see above) initialization of carbon pools. The methods of how this parameter estimation has been performed need to be explained in detail. Was the search algorithm in parameter space performed for the full spin-up period? Starting from initial conditions which has been estimated by using prior turnover time values will have a great effect on the optimal parameter values.

Fig 18 and continental-scale carbon and water dynamics: I suggest in addition an anomaly plot and a comparison to independent published results, e.g. there are several recent global GPP and ET products available for comparison. Once parameter values have been estimated using eddy tower NEP anomalies, I suggest comparing also your continental net CO2 flux anomaly with the one derived from atmospheric inversion modeling.

Eddy-covariance based ET: Is the site-level energy balance closed? Or has the data been corrected?

There has been no discussion on the fact that fire as one important process has been neglected. I think that a mean fire return interval is parameterized into the turnover rate. However, annual anomalies of continental-scale carbon fluxes as potentially shown in Fig 18 will be influenced a lot by the fire activity during specific years.

Despite its importance for the overall results, the model setup has been only superficially described. Were soil moisture pools first equilibrated before calculating 1970-

1989 as imput to spinup the carbon pools? Which atmospheric CO2 have been used? A 1989 value which is not reflecting pre-industrial conditions which however determined the recent carbon pools? A 1850 value which quite different from the 1990 value used later in the transient simulation? Is it clear that 1970-1989 is a time period in which climate is representative for pre-industrial conditions in Australia?

Interactive comment on Biogeosciences Discuss., 9, 12181, 2012.