Biogeosciences Discuss.,
doi:10.5194/bg-2016-186-RC1, 2016

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Interannual variability in Australia's terrestrial carbon cycle constrained by multiple observation types" *by* Cathy M. Trudinger et al.

Anonymous Referee #1

Received and published: 1 June 2016

Trudinger et al. reported a study on the interannual variability of terrestrial carbon fluxes in Australia using a model-data fusion approach. Comparing to previous studies, this work used a multiple constraints approach and explored the uncertanty from parameter equifinality. It is an interesting and useful study, however I have a few major concerns on the methods and manuscript organization:

Major points (1) The models (CABLE and CASA-CNP) produce daily carbon and water fluxes, why do the authors used monthly mean flux measurements (P5 L16) as constraints? Also, please make a table for the other biometric data (e.g., leaf NPP, soil carbon and above-ground phytomass and litter etc.) if there are a few data points. (2) Please provide more details on the calculation of the cost function. For example, how

Printer-friendly version

Discussion paper

"Different types of observations were then weighted relative to each other"? (3) The approach of generating ensemble parameter sets is not clear. How does "the null space Monte Carlo method" work? The authors stated that the purpose of using this method is "to quantify uncertainty due to parameter equifinality in model predictions", so my understanding is that this method can generate the posterior parameter distributions. Although the authors have detailed introduction to this method (P6 L27-33), I feel it is still difficult for the readers to understand why the generated parameter sets are sufficient to represent the posterior distribution of the parameters. Are there some special features of this method? Otherwise I can't believe only 30 parameter sets are enough to represent possible combination of parameters that are consistent with the observations, given more than 10 parameters are involved in each model. Even if we assume there are only 10 parameters, and each parameter can only be two possible values, there will 2^10 possible parameter sets. I understand that it may not be feasible to run regional simulations for a huge number of sets of parameters, but the authors need to demonstrate the 30 parameter sets are a good sample of the posterior parameter space.

Specific points: P1,L15, L16: ecosystem respiration –> heterotrophic respiration P1,L21: you can give a hint to the readers that the detailed description of BIOS-2 is in setion 2.1 P5, L12, L25: evaporation –> evapotranspiration P8, L7: R2 is unitless Fig 6, Fig S11: change the figure style to 2D. i.e., x axis is parameter, y axis is observation variable (ET, NPP etc), and use colors (light to dark) to represent the increase/decrease in variance P9, L12: please give the sources of the six bioclimatic regions P9, L18: the anomaly from the best case

consider citing these papers:

Richardson, A.D., M. Williams, D.Y. Hollinger, D.J.P. Moore, D.B. Dail, E.A. Davidson, N.A. Scott, R.S. Evans, H. Hughes, J.T. Lee, C. Rodrigues, and K. Savage. 2010. Estimating parameters of a forest ecosystem C model with measurements of stocks and fluxes as joint constraints. Oecologia, 164: 25-40, doi: 10.1007/s00442-010-1628-

y Chen, M., Zhuang, Q., Cook, D. R., Coulter, R., Pekour, M., Scott, R. L., Munger, J. W., and Bible, K.: Quantification of terrestrial ecosystem carbon dynamics in the conterminous United States combining a process-based biogeochemical model and MODIS and AmeriFlux data, Biogeosciences, 8, 2665-2688, doi:10.5194/bg-8-2665-2011, 2011. Keenan, T.F., E. Davidson, A. Moffat, W. Munger, and A.D. Richardson. 2012. Using model-data fusion to interpret past trends, and quantify uncertainties in future projections, of terrestrial ecosystem carbon cycling. Global Change Biology, 18: 2555-2569, doi: 10.1111/j.1365-2486.2012.02684.x

---

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-186, 2016.

Printer-friendly version

Discussion paper