Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-303-AC2, 2018

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Optimal Inverse Estimation of Ecosystem Parameters from Observations of Carbon and Energy Fluxes" *by* Debsunder Dutta et al.

Debsunder Dutta et al.

debsunderdutta@gmail.com

Received and published: 13 October 2018

Response to Reviewer 2 Comments

The present study attempts to develop an optimal inversion framework to use SCOPE for estimating Vcmax, m, and LAI by against measurements of carbon and energy flux from EC towers. They demonstrated the applicability of their approach in terms of capturing the seasonal variability of these key ecosystem parameters. The current work may provide additional information on estimating key ecosystem parameters from field data. Compared to the literatures, however, the novelty of the current study is not clear. There are so many papers which estimates the key ecosystem parameters

Printer-friendly version

Discussion paper

from models and EC flux tower data (e.g., Mackay et al 2012, Xu et al 2006; Wu et al 2009; Wolf et al 2006; Wang et al., 2010). What is the main novelty for this work? If it is the technical approach of an optimal inversion framework, then it may go some other technical journal. Even for the inversion framework, I didn't see too much improvements compared to previous work. My general impression is that this work is a rather technical description on the inversion framework of using SCOPE. I understood the rather detailed information by the authors, but the manuscript is really too long and some parts are too lengthy. I think some parts could be simplified.

We thank the reviewer for the comments on the manuscript. In this study we try to set up an inversion framework with the SCOPE model which is a fairly sophisticated canopy radiative transfer and energy balance model. SCOPE uses spectrally resolved irradiance and also produces spectral reflectance and fluorescence along with water and CO2 fluxes which are coupled through leaf photosynthesis and stomatal conductance. As also pointed out by Peter Rayner (reviewer 3), a major novelty of this study is breaking up the seasonal assimilation into smaller time windows and together with a fully Bayesian non-linear optimal estimation approach allows us to get posterior estimates of state vector comprising a number of important ecosystem parameters together will its full uncertainty characterization.

To address the novelty comment further we have now modified the framework to assimilate MODIS reflectance bands and match these with the spectral reflectance simulated by SCOPE model for optimal parameter estimation. We admit that our original manuscript didn't really make use of the complexity of the SCOPE model and the benefit of modeling spectrally resolved reflectance (and fluorescence, thermal emissions). A couple of retrieval examples are now presented as well for different ecosystems. The results using 2 MODIS bands indicate much better constraints on LAI and in turn on Vcmax and BBslope (which partially interfered with LAI before). This constraint further reduces the fluctuations in the retrievals due to observational noise in the fluxes. The posterior error reduction is also improved as a result. More discussion about the results

of parameter retrieval and further intercomparison within sites and year are presented as well. More discussion of physiology and ecosystem functioning as revealed with parameter estimations are included as well. Finally following the comments of all the reviewers, we have streamlined the presentation and included supporting information in the supplementary.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-303, 2018.

Printer-friendly version

Discussion paper