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Biogeosciences Discussions

Interactive comment on "Multi-model analysis of terrestrial carbon cycles in Japan: reducing uncertainties in model outputs among different terrestrial biosphere models using flux observations" *by* K. Ichii et al.

Anonymous Referee #2

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This paper uses eddy flux data to improve the performance of terrestrial biosphere models, and then compares the performance of these models for predicting carbon fluxes. This is a useful contribution to the areas of data assimilation and carbon cycling. The following issues should be taken care of before the manuscript can be accepted.

The authors did not make it clear how they adjusted the model parameters using eddy flux data. Is this a data assimilation approach? What is it? How did you adjust the model parameters? Details should be provided as this is an important part for understanding why the use of eddy flux data improved the performance of the models.

The use of “uncertainty” is very confusing in the manuscript. It should not be interchangeably used with “difference” or “discrepancy”. The authors mentioned the uncertainties among various models again and again, but these are not uncertainties but differences or discrepancies.

Machine learning approaches should not be classified into terrestrial biosphere models. Moreover, unlike terrestrial biosphere models, the default parameters of the Support Vector Machine approach were obtained using eddy flux measurements. The Support Vector Machine approach (both text and associated components of tables and figures) should be removed.

Lines 21-23: “Flux observation data significantly improved terrestrial biosphere models, not only on a point scale but also on spatial scales”. This statement is too strong. The use of eddy flux only optimized model parameters, but did not improve model structure and algorithms at all. This statement should be rephrased to something like this: “The use of eddy flux data optimized model parameters and thereby improved the performance of the models for predicting NEE”.

Lines 9-14, page 8458. The motivation of these previous model intercomparison efforts was not to quantify the uncertainties in the models and to identify the causes of the uncertainties, but to compare the performance of these models for simulating carbon and/or water fluxes. Again, uncertainties and differences (discrepancies) should not be used interchangeably.

Lines 1-2, page 8459. “however, larger uncertainties in each biosphere model remain owing to validation with observations.” This statement does not make sense. Did you mean “owing to calibration (or parameter optimization) with observations”?

Following this statement, the authors argued that “previous model intercomparison projects generally lacked detailed validations, resulting in errors in the simulations.” (lines 4-6, page 8459). This makes no sense. Did you mean detailed calibration or model optimization? Optimization and validation are two totally different concepts, and

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should be not used interchangeably. Moreover, not all errors in simulations are from parameters. Model structures and algorithms could lead to substantial uncertainties in simulations.

Lines 23-29, page 8459. Are these three bullets really the goals of the manuscript? If so, the manuscript did not reach these goals. Apparently, the actual goal of the manuscript is to compare the performance of various models for predicting carbon fluxes and to reduce the uncertainties in model simulations and the differences among models using eddy flux data.

Lines 22-27, page 8467. The explanation for the underestimation of the seasonal magnitude of carbon fluxes is quite right. How does the underestimation of GPP lead to a significant change in Re? NEE is the difference of GPP and Re. An increase in Re can also lead to a reduction in net carbon uptake.

The improved model analysis at the point scale does not mean much. You used the eddy flux data to optimize the model parameters, and then compared the new simulations with eddy flux data. Of course the simulations will have better agreement with observations.

Lines 25-26, page 8470. This statement is not supported by data. The numbers are indeed different. But how did you know which estimates are more accurate? Without the support of independent, spatially explicit data, how did you know the new model simulations led to improved estimates of carbon budget across Japan?

Lines 10-12, page 8463. Specify the version of MODIS data products used (Collection 4 or 5).

Lines 24-27, page 8463. Explain why you used NCEP/NCAR reanalysis for point analysis rather than the AMeDAS data collected in Japan with much higher spatial resolution.

There is redundancy in the results section. The whole section can be reduced and be more concise.

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Line 22, page 8458. “more reliable estimates” were mentioned twice.

Lines 20-21, page 8466. “seven models out of eight” should be “seven out of eight”.

Interactive comment on Biogeosciences Discuss., 6, 8455, 2009.