Biogeosciences Discuss., 7, C4508–C4510, 2010
www.biogeosciences-discuss.net/7/C4508/2010/

Biogeosciences Discussions

Interactive comment on "A quantitative approach for comparing modeled biospheric carbon flux estimates across regional scales" *by* D. N. Huntzinger et al.

Anonymous Referee #2

Received and published: 23 December 2010

Overall Comments:

Evaluating estimates of the various components of the carbon balance from ecosystem process models can be difficult due to the lack of validation data of sufficient spatial density or extents. Moreover, inter-model comparisons require standardization of input driver data sets across models as well as considerable mobilization of resources for actually preparing and running the models. This manuscript presents a suite of techniques designed to circumvent some of these problems by exploiting the spatial autocorrelation structures inherent in output raster maps of carbon balance for three biosphere models. Variogram analysis of NEE, GPP and Re estimates for North Amer-

ica (and their time dependent changes in 'correlation length' and semivariances) are used to compare the spatial properties of model results that cannot be ascertained from looking at maps, while informing the next step of the study. Variable selection and geostatistical regression are used to identify those factors in the biosphere models that most influence NEE, GPP and Re without having to depend on complex model formulations and to allow ease of comparing these sensitivities across the models.

I very much like the spirit of this manuscript, partly because it describes a more parsimonious approach to inter-model comparisons. But also because it brings together what has been usually up to now to separate 'knowledge arenas,' that of global ecosystem modelling and geostatistics, and here lies a vast amount of underexploited potential. The work is well-motivated, technically sound and very well written (mercifully so).

Scientific/Technical Comments:

I notice that all variograms that the authors present are forced to pass through the origin. Is this also true of those variograms underpinning Figure 2? If the curves pass through the y-axis, and therefore have a positive semi-variance, this indicates a residual non-spatial variance. This is either interpreted as noise or the occurrence of spatial structure smaller than the sample spacing. How might this feature inform the study (e.g. computation of nugget-to-sill ratios as a way to standardize signal-to-noise ratios and intercompare model results)?

Presentation/Language/Structure:

I am a little surprised that the authors have not computed variograms for the data sets used to drive these models and used these to compare to the variograms of the model results. Particularly for the LUE models I would expect that much of the structure underpinning the variograms of some of the carbon balance estimates (and particularly GPP) would be very similar to the NDVI data, since it is one of the only data sets that are not actually a result of interpolation and thus artificial smoothing. In fact, basic metadata about the original spatial resolution of the drivers appear to be absent. This

BGD

7, C4508–C4510, 2010

is important information that can be used to guide the analysis and interpretations.

I think the manuscript would benefit from a brief introduction to the concept of geostatistics and the variogram, particularly as a diagnostic tool. It would be instructive to show an idealized variogram, label its components and describe them briefly. I mention this because I think that many reading this article (and journal) may be very interested in comparing ecosystem models but may not have a technical background in geostatistics. The vector algebra is tedious to read, and is not central to your message. Section 2.3 can be reduced and moved into an appendix, which is also where you may want to place short tutorial on the variogram as a tool.

I wonder what the authors mean when they use the term 'spatial scale' – to me the term is ambiguous. Does it mean 'spatial extent' or 'spatial resolution,' (sampling density)?

p. 7907, lines 9-10: Can the authors describe briefly (or provide and example) of how not accounting for spatial autocorrelation of modelled estimates can lead to misrepresentation of inferred relationships?

p. 7908, lines 10-12: The objective in the paper is presented firstly as what the authors do not do, before what the authors actually do in the same sentence. This is awkward, please fix.

p. 7911, lines 11-13: NOAA/NASA Pathfinder NDVI is from the NOAA AVHRR instrument and is essentially the same thing. Which NDVI data set (derived from NOAA AVHRR data) was therefore used in this model?

Interactive comment on Biogeosciences Discuss., 7, 7903, 2010.