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Biogeosciences Discussions

Interactive comment on "Terrestrial carbon sinks in the Brazilian Amazon and Cerrado region predicted from MODIS satellite data and ecosystem modeling" *by* C. Potter et al.

Anonymous Referee #2

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General comments: The paper by Potter et al. (Biogeosciences Discussions 6: 947-969) describe the application of the CASA model to describe regional patterns of net primary production (NPP), soil heterotrophic respiration (Rh), and net ecosystem productivity (NEP) of the Amazon Basin between 2000-2005. This period is unique because it spans a relatively strong El Nino-Southern Oscillation (ENSO) event, which should result in declines in rainfall for some portions of the Amazon Basin. This is not the first application of the CASA model to the Amazon Basin; however, this application utilizes the Enhanced Vegetation Index (EVI) to drive the estimates of NPP and is a significant improvement over the Normalized Difference Vegetation Index (NDVI), which can saturate at high leaf area index. Furthermore, the authors compare their

model output to eddy flux data derived from the Tapajos tower and demonstrate that the model can capture important seasonal features in net ecosystem CO2 exchange (NEE), at least for the Tapajos site. Thus, utilization of the EVI is a significant improvement over previous modeling studies and the comparison of the model estimated NEE to the tower data provides the reader with some evidence that the model captures patterns of NEE for a given site. Given this, the paper is likely to be of interest to readers of Biogeosciences Discussions.

Specific comments: The authors begin discussing the modeling approach on page 950 and describe how NPP is estimated using time-varying stress terms (lines 20-25), but it is unclear what the time-scale is for these terms. Since the model runs on a monthly time-scale, the reader is left to assume that these stress terms also vary on a monthly time-scale as well. If so, is a monthly time-scale sufficient to capture changes in C, H2O, and nutrient cycling processes to changes in temperature and precipitation? For example, there is some indication from more seasonal tropical forests of the Amazon Basin that litter decomposition can increase rapidly (ca. over 1-2 weeks) after the onset of the rainy season. Thus, a monthly time-scale may not capture some of these dynamics.

On page 954 the comparison between the model-estimated NEE and the tower NEE is presented (lines 1-20). First, the authors suggest that the tower data have “relatively large uncertainties,” and while this may be true, the authors point out that these data have been validated using a variety of methods including tracer studies and more traditional measurements of woody growth and biomass production. Thus, what are these “uncertainties” and how might they affect the evaluation of model performance? Secondly, it is intriguing that the NPP increased during the dry season when reports from the Tapajos forest suggest that gross primary production (GPP) is not particularly sensitive to seasonal drought but tree growth actually declines in response to seasonal drought (Saleska et al. 2003). What is the mechanism for the increase in NPP during the dry season?

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Interactive Comment

On page 956, line 10 change “latitudes” to “longitudes.”

The figures were very hard to read and could be substantially improved. For example, Fig. 2-4 could be larger, and would benefit from the addition of tick marks (x-axis) and the months of the year (1st letter?) so the seasonal variation is more obvious. The authors suggest that the “opposite seasonality” of Rh and NPP can be easily discerned from Fig. 3 (Page 954; lines17-18), and while that may be true, the actual seasonality is hard to discern without the month of the year also plotted on the x-axis. Also, the symbols could be different colors so each time series is obvious. Fig. 4 is very small and it is difficult to understand when years begin and end. Fig. 5 could also be larger, and the scale a bit broad given the discussion in the text. On page 956 (lines 14-15) the authors claim that NEP ranged between +90 and -70 gC m-2 y-1 for 2001-03, which would fall into the pale-blue-white-pink range on Fig. 5. Given the range of NEP, these subtle color variations and nearly impossible to discern on the figure.

Interactive comment on Biogeosciences Discuss., 6, 947, 2009.