Biogeosciences
Discussions

Open Access

Interactive comment on "Forest NEP is significantly driven by previous year's weather" *by* S. Zielis et al.

Anonymous Referee #1

Received and published: 9 December 2013

General Comments: Zielis et al. provide a well written and succinct manuscript that demonstrates that annual forest carbon balance (i.e. Net Ecosystem Production) can be influenced by the current and previous year's weather. Clearly demonstrating this is important because most carbon cycle models do not incorporate legacy effects from previous year's weather or biology, and as a result, have had a difficult time modeling year-to-year variation in ecosystem carbon fluxes. These legacy effects are poorly understood and arise from the low frequency ecosystem processes (i.e. carbohydrate mobilization, nutrient mineralization, and soil water) that integrate over multiple years to influence higher frequency processes like photosynthesis and respiration. With the development of more long-term eddy covariance datasets, like the one analyzed here, researchers are gaining a greater appreciation for- and understanding of-the impact of these legacies on current forest carbon cycling. Elucidating these effects is the

first step in incorporating these processes into ecosystem models and improving their predictive power over annual to decadal timescales.

Specific Comments: The manuscript is well written, the hypotheses are clearly stated, the data analyses are appropriate, and the conclusions are well supported. Consequently, my recommendations are mostly cosmetic and are intended to improve the clarity and flow of the paper.

1. The topic sentence in the second paragraph has little context for its introduction. I would have liked to have seen more background information before you presented this hypothesis. Also, there are a number of current papers listed below that may be useful for you to include in the introduction and discussion.

Rocha, A.V. and M.L. Goulden (2008) Large interannual CO2 and energy exchange variability in a freshwater marsh under consistent environmental conditions. JGR- Biogeosciences. 113, G04019, doi:10.1029/2008JG000712

Rocha, A.V. and M.L. Goulden (2010) Drought legacies influence the long-term carbon balance of a freshwater marsh.JGR-Biogeosciences. 115, G00H02, doi:10.1029/ 2009JG001215.

Richardson AD, Carbone MS, Keenan TF, Czimczik CI, Hollinger DY, Murakami P, Schaberg PG, Xu X. (2013) Seasonal dynamics and age of stemwood nonstructural carbohydrates in temperate forest trees.New Phytologist197: 850–861.

Mariah S. Carbone, Claudia I. Czimczik, Trevor F. Keenan, Paula F. Murakami, Neil Pederson, Paul G. Schaberg, Xiaomei Xu,Andrew D. Richardson, (2013) Age, allocation and availability of nonstructural carbon in mature red maple trees, New Phytologist, 200:2

2. Please specify the proximity to the nearby MeteoSwiss weather station. 3. Please specify how much gap filling was done to the dataset to get a continuous record for each year. 4. On line 405-410 you state that "..is less likely to be responsible for

47% of inter-annual variability.." It is unclear where this number can from and how you calculated it. 5. I thought that the conclusions were a little weak and didn't really add anything to the paper. I would consider removing the conclusions section and incorporating the important parts into the discussion. 6. In the caption of Figure 3, please specify how many days were included in the smoothing.

All in all, I thought that this was a really good manuscript and should be accepted with minor revisions.

C5807