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Biogeosciences Discussions

Interactive comment on "Drivers of interannual variability in Net Ecosystem Exchange in a semi-arid savanna ecosystem, South Africa" *by* S. Archibald et al.

Anonymous Referee #2

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The paper is a valuable description of the past five year history of eddy-covariance derived carbon fluxes in a savanna ecosystem in South Africa. This paper represents an expansion of the database for multi-year ecosystem sites. The authors used accepted methodologies in their analysis and extended these through the presentation of a new flux partitioning approach.

Several questions come to mind after reading this manuscript.

How can the day-time extrapolation respiration procedure truly be evaluated and compared against alternatives (e.g. ANN)? From a mechanistic perspective I wondered how we could separate the direct effects of high temperature vs. the effects of short

term water deficits from surface drying? This problem is endemic to flux partition approaches and I don't expect this paper to solve the problem, but I wondered what insights the analysis provides?

Much of the text highlights the importance of water for carbon fluxes, but they present clearly that APAR is the best correlated variable for NEE, R, and GPP. I wonder how these results fit with the expectation and conclusion that water availability is key.

Why did the respiration model not include any term for moisture, when the authors cite extensive evidence for the importance of water? Do they expect some covariation between moisture and temperature that reduces the variability to a single variable?

Figure 4 documents the improved performance of the model compared to standard fluxnet approaches. I notice an apparent insensitivity of the model to resolve 0-2 gC/m2/day fluxes – these appear as a vertical band in the gap-filled estimates (Figure 4 B). Is this finer structure in the predictions and what might it implicate?

Figure 6 presents a remarkable dataset describing this savanna as a consistent carbon source to the atmosphere for the past 20 years. As the authors discuss, this is an underestimate because fire and herbivory remove even more of the carbon. Where is all of this carbon stored? When was this carbon fixed by the ecosystem? How long can this sink be maintained?

Figure B1 contains a typo in the caption.

Interactive comment on Biogeosciences Discuss., 5, 3221, 2008.