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Biogeosciences Discussions

Interactive comment on "Relative effects of precipitation variability and warming on grassland ecosystem function" *by* P. A. Fay et al.

Anonymous Referee #1

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Fay et al. provide interesting results from a long-term manipulation study in a tallgrass prairie, in which effects of altered precipitation patterns, drying and warming were tested. I really liked the manuscript and have only minor comments/suggestions. I suggest being more specific in the title and use the term tallgrass prairie instead of grassland p. 6869: What were the size (diameter) and insertion depth of the PVC collars? p.6868: At what temperature was ACO2 measured? Were measurements made at a reference temperature for all treatments, or did the temperature vary among treatments? Could you find an indication for acclimation to warming? If ACO2 at one reference temperature was similar in heated and unheated plots, no acclimation occurred, whereas lower ACO2 in heated versus unheated plots (measured at one reference temperature) indicates thermal acclimation of ACO2. If thermal acclimation occurred, this would explain (in part) why the grasses revealed no warming response

for ACO2.

p.6879, l. 6: authors write 'The result of increased water limitation may be a grassland that is more sensitive to interannual climate variation (Huxman et al., 2004).' Did you find any indications for this in your study? I think the significant year*pattern interaction effect on e.g. ACO2 may indeed confirm Huxman et al (2005) if this interaction effect reflects a larger effect on ACO2 to interannual variability for the altered versus ambient rainfall pattern.

p.6880, l. 9-19: How does acclimation of soil respiration to warming - a commonly observed phenomenon (see e.g., Luo et al., 2001; Hartley et al., 2007; Bradford et al., 2008) - fit into this story? The positive warming effect on soil respiration during winter seems to indicate no or only partial thermal acclimation. I realize that this may be too detailed to include into this paper, but maybe it's worth a sentence.

p.6880-6881: The decrease in forb ANPP to warming is striking, in particular it can certainly not be related to soil moisture (which did was not altered by the warming and to which forb ANPP did not respond in the other treatments). Authors suggest that the potentially stronger warming effect in spring, when forbs are growing stronger, as compared to summer may be responsible for this. I have some doubts about this explanation. Were optimum temperatures actually exceeded to such degree that warming could be expected to decrease forb ANPP? Can a shift in root:shoot ratio in response to warming have induced the decrease in forb ANPP? And what about competition for resources with the C4 grasses? I think it's impossible to go into this with the current data set (which lacks any measurements of the roots and also ACO2 was not determined for forbs in the warming experiment), so I suggest not to speculate on this and admit that the question cannot be answered at this moment.

Interactive comment on Biogeosciences Discuss., 8, 6859, 2011.