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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 #2

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General comments:

This manuscript by Fay and others aims to provide insights into the relative importance of interannual versus intra-annual variability in precipitation (for a part in combination with increased temperature). This is a very important subject, and the long term dataset provides a unique opportunity to test how differences between and within years affect a range of ecosystem parameters. I found the manuscript generally of excellent quality, with timely research questions that are addressed in a clear manner. The only major comment I have is related to the choice and measurement of the three abiotic parameters used in the analysis (see below).

Specific comments:

1. The study links biotic variables to three abiotic variables: the mean soil water content, its variability (through the coefficient of variation) and the temperature 5 cm in the soil. Although I realise that most roots in a grassland system are found in the upper 15 cm, I do wonder whether measuring the water content in deeper layers would not provide important information to better attribute changes in soil moisture to plant or ecosystem performance (cf. p 6879 li 1-8). Indeed, plants often have one or a few deeper roots that serve as lifelines when water in the top soil becomes limiting. I suggest that the authors address this briefly in the manuscript. I find the use of soil temperature to connect this to parameters such as canopy greenness, aboveground productivity and leaf photosynthesis somewhat problematic, as these are all affected much more by air than by temperatures. I would argue that only the soil CO2 efflux is governed mainly by soil temperature. Were air or canopy temperatures measured? Please provide these, and at least explain why you opted to use soil temperatures for correlation with aboveground parameters rather than air or canopy temperatures.

2. p6861 li 26-28: mesic and semiarid grasslands seem to differ in their responses to rainfall variability, but in the next lines, only responses from tallgrass prairie seem mentioned.

3. p6867 li 2: how precisely was the percentage of green cover quantified from the images?

4. p6867 li 21: how many profiles were omitted?

5. p6868 li 22: how many omitted, how many were left?

6. p6869 li 11: more detail is needed on how exactly the measurements were made (e.g. duration) and the dimensions of the PVC collars

7. p6871 li 7: 600 mm of rainfall was the maximum, but on p 6864 (li 15) it is mentioned that rainfall during the growing season averages 635 mm. Please explain.

8. p6871 li 22: the 1.9% and 1.8% reductions, what was the baseline/average?

9. p6878 li 19-20: what does this imply?

10. p6879 li 23-25: this is fairly irrelevant as the reader does not know whether the two experiments were similar (soil type, infrared lamps used, power output, etc.)

11. p6882 li 1-8: I would argue that the rate of warming is also very important as is its variability (and note that your method stimulated soil warming more in some parts of the year than others)

12. Fig 2: how many different years are shown?

13. Fig 3BCDE: I can spot only 3 treatments here on the graphs, I never see the ambient/unwarmed line

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