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Interactive comment on "Inter-annual precipitation fluctuations alter the responses of above- and belowground biomass to water and N enrichment" *by* D. L. Kong et al.

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Review 2 I was confused whether this manuscript was looking at inter annual variation in the amount of precipitation, or just the effect of a single extreme rainfall event. Changes in rainfall from one year to the next may be due to changes in intensity, changes in the intervals between rainfall events, and changes in the total amount. It would be interesting to know if the rainfall outside the single major event was similar for both years. The authors need to clarify their purpose for the research, and also consider changing their title from fluctuations to something that reflects single events. The text can be shortened and tightened to make the points clearer, but the figures and

tables are very clear and well presented. Response: This is important issue. We have compared the average rainfall intensity and intervals in the same sampling period of the two years. They are similar except the August with a similar interval but contrasting intensity. This is caused to much an extent by this extreme rainfall event. Based on the suggestions, we have changing the title by stressing the extreme rainfall events. It reads: Inter-annual precipitation fluctuations caused by an extreme rainfall event alter the responses of above- and belowground biomass to water and N enrichment. In addition, we have tried our best to short and tighten the text in order to mark the idea clear.

There is some confusion in the introduction about the nature of the experiment. Obviously it was set up for human controlled manipulations, but nature intervened with a single large pulse of rain, which the authors used to examine effects of such events. It is interesting to consider the consequences of this same amount of rain occurring earlier or later in the season. Too early in the season and the temperatures might have been too cold for a response, or the soil might have already been saturated. If it occurred at the optimal time there might have been a large response in growth due to the long term effect of filling soil water reservoirs, later in the season the grasses may not have had time to respond as they flowered and started to senesce. Although this is a one off event it does nicely exemplify the flow on effects of large rainfall events have on other controlling variables. Response: The reviewer talks about the timing of the rainfall events which is important for our study. It seems that this extreme rainfall event occurred in the middle growing season that could have stronger influence on plant growth response to water and N enrichment. We admit that this influence may change when the timing of this event varies. This is an important issue to be considered in future study. We have added this point into the summary section.

Since nutrient status of the grassland is an important consideration and is also a treatment, some more information about the status of nutrients before commencement of the experiment, and also some discussion on the likely natural inputs of nitrogen that

might occur. These inputs might also vary between years, confounding the results. Response: This site belongs to the typical steppe. The soil total N is 2.28 g kg-1 results which is higher than 1.73 g kg-1 of a site nearby fenced since 2005 (Kong et al., 2011). This indicates the soil in our site is in a good place after a long term of enclosure. The natural inputs of N in this area may not be significant as those in industrialized south China with great precipitation. However, the natural N input may come up with another form, the dust deposition. As the reviewer suggested, this N input may vary between years and may have potentially affected results of our study. But it is an interesting topic in future studies.

Detailed comments on the text P13429 L 22+24. The authors don't say if the increases or decreases in ecosystem carbon fluxes are gains or losses of carbon from the ecosystem. Response: We have changed "ecosystem carbon fluxes" into "ecosystem carbon sequestration".

P13431 L 11. We need more information about the site, altitude, past history, nutrient status before the experiment, grazing and fertilizer history. Response: We have added some of the information in the revised version.

P13432 L26 A little bit more information about the methods used to determine the soil moisture would be helpful. Response: We have supplemented this information.

P13433 L16 Is the precipitation really summed for the whole year, or just this part of the growing season? What happens in the rest of the year? Is the soil fully saturated at the beginning of May? Response: The accumulated precipitation here referred to precipitation from the beginning of a year up to the sampling date including irrigated water. For example, when plants were sampled on July 15, the accumulated precipitation was the sum of precipitation from January 1 to July 15 of the year. We feel this index could approximate the amount of water available to plants during this period. We have not measured the saturated soil moisture at the beginning of May. However, we feel the soil was not so because semiarid grassland is water limited and most of the

precipitation concentrates from May to September.

P13434 L15 With a single large event, the average of all the events will be increased. The seasonal average is strongly skewed by the single event. It would be nice to know if 2008 was a typical year for precipitation, except for the single large event. Response: The single 63 mm rainfall event contribute more than half of the difference (121.6 mm) of growing season precipitation between the two years. The annual precipitation in 2008 is 362 mm. When excluding this extreme rainfall event, the left precipitation, 299 mm, is 86.7 % of the long term annual mean precipitation, 345 mm, which is close to the typical year.

Interactive comment on Biogeosciences Discuss., 10, 13427, 2013.