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Biogeosciences Discussions

Interactive comment on "Impacts of increasing water and nitrogen availability on ecosystem CO_2 fluxes in a temperate steppe of Northern China" *by* L. Yan et al.

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Thank you very much for your valuable comments and suggestions. We have carefully revised our manuscript and believe that we have addressed and answered the major comments and questions and the manuscript is in good shape now. Detail responses to the reviewer #2's comments as following:

Comment 1: L30-33: "The potential contribution. . .. . .changes of precipitation amount". These sentences are unclear, please rephrase.

Response: We changed the sentence to "Net carbon uptakes were found in all of treatments over the growing season in both years. However, their magnitudes had

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inter-annual variations which related well with changes in precipitation amount." in the revised version (Lines 30-32).

Comment 2: L59-63: add more references, not just a study case, suggest to read "For example, some studies. . .. . ., whereas others. . ..."

Response: We changed this sentence to "For example, some studies have reported that GEP increased more than that of ER by increasing precipitation resulting in positive changes in NEE (Huxman et al., 2004; Patrick et al., 2007; Chen et al., 2009), whereas others have showed the increase in GEP was offset by corresponding increase in ER, resulting in no even negative net NEE changes (Verma et al., 2005; Risch and Frank, 2007)." in the revised version (Lines 58-62).

Comment 3: L121-122: were the fertilization rates in this study analogous to "grazing and N fertilization and/or atmospheric deposition"?

Response: The N addition treatment in this study is not analogous to atmosphere deposition in this area. To determine the N addition level, we referred to the N-fertilized studies conducted in the same ecosystem. Zhang et al. (2008b) found that in term of the microbial biomass and functional diversity, an N optimum exists between 16-32 g N m-2 yr-1 in the same area. Bai et al. (2010) also reported that no significant effects of N addition on aboveground productivity were found till N amounts of 28 g N m-2 yr-1 in the first two years after N treatment. Therefore, to evaluate the potential responses of ecosystem CO2 fluxes, we selected 28 g N m-2 yr-1 as N addition treatment in our study. We added this information in the revised version (Lines 121-126). References: Bai, Y. F., J. G. Wu, et al. (2010). Tradeoffs and thresholds in the effects of nitrogen addition on biodiversity and ecosystem functioning: evidence from inner Mongolia Grasslands. Global Change Biology 16, 358-372. Zhang, Y., L. X. Zheng, et al. (2008a). Evidence for organic N deposition and its anthropogenic sources in China. Atmospheric Environment 42, 1035-1041. Zhang, N. L., S. Q. Wan, et al. (2008b). Impacts of urea N addition on soil microbial community in a semi-arid temperate steppe

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in northern China. Plant and Soil 311, 19-28.

Comment 4: In Result and Discussion sections, you mentioned Q10, but you did not how calculate Q10 in this section.

Response: We added this information in the section of Material and Method (Lines 180-188) and Discussion in the revised version (Lines 330-338).

Comment 5: Results L215-217: This sentence is vague, please rephrase.L217-220: “leading. . .. . .”,repeat the front. Please re-write.

Response: As the reviewer’s suggestion, we changed the whole paragraph in the revised version (Lines 227-229).

Comment 6: In general, “Discussion” section was a neatly written presentation. It was good to see (ïňĄnally) some concluding statements which give a broader take-home message.

Response: Author thanks for reviewer’s positive comment.

Comment 7: L288-301: ANPP and BNPP did not signiïňĄcantly change in 2007. Do you have plant N contents data? Increased plant N content may increase GEP and ER.

Response: Thanks for the reviewer’s suggestion. The N status of plant could be important in regulating plant growth and ecosystem carbon exchange. Unfortunately, we didn’t determine the plant N contents, so we can not do any analysis between plant N content and ecosystem CO2 fluxes in this study.

Comment 8: L347-349: rephrase this sentence.

Response: We changed this sentence to “The decreasing magnitude of water-induced effects with increasing precipitation demonstrated that responses of CO2 fluxes to water addition depended significantly on natural water condition” in the revised manuscript (Lines 368-340).

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Comment 9: The number of references cited to support the author's comments is appropriate.

Response: Author thanks for reviewer's positive comment.

Comment 10: L36-37: Revise sentence to read: "Soil moisture regulated seasonal and inter-annual variability in GEP and RE subsequently changed NEE." L38: delete "strength of". L46: delete "with" before associated. L223-225: Change to "Effects of water and N addition on ecosystem CO2 ïňĆuxes had distinct year-to-year variations (Table 2). L232-233: remove "Regression analysis, with NEE, ER and GEP as the dependent variables and ANPP, BNPP as the independent variables, respectively, showed that". L242: should be "Table 4"? Table 3 title is the same as Table 2, I think is should be "Results (P- values) of two-way ANOVA on the effects of water addition (W), N addition (N) and their interactions on soil temperature (Tsoil, OC), soil moisture (θv, %), net primary productivity (ANPP and BNPP, g m-2) and ecosystem CO2 ïňĆuxes (NEE, ER and GEP; μmol m-2 s-1)." Figure 5: In title you mentioned NEE, but no NEE in ïňĄg.5.

Response: We have corrected these mistakes as reviwer's suggestions in the revised version (Lines 35-37; 37; 45; 234-235; 253-254; Table 3; Fig.5)

Interactive comment on Biogeosciences Discuss., 7, 5829, 2010.