

## ***Interactive comment on* “Environmental controls on carbon fluxes over three grassland ecosystems in China” by Y. Fu et al.**

**Y. Fu et al.**

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Dear Dr. Wohlfahrt,

We sincerely thank you for handling the reviewing of our manuscript submitted to Biogeosciences “bg-2009-143”. We also want to thank you and the other two anonymous reviewer for your valuable and constructive comments on our manuscript, and appreciate you giving us a chance to revise it. We cherish this opportunity very much and tried our best to improve our manuscript according to yours and the other two Referee’s comments.

All the revisions made to our manuscript have been addressed in Authors’ reply to three Referee’s comment, separately. Please Refer to those comments.

We also would like to explain the several major revisions we've made in our revised manuscripts to you before you go through the one-by-one response to your specific comments. The major revisions in our manuscript include the following aspects:

(1) We have rewritten the Section "2.1 Sites description", which is now presented as a better organized way in Table 1 and displays a clear summarization and comparison among the three grassland sites (Line 89-98, Table 1 in revised manuscript).

(2) Major revision was made in Section "2.3 Eddy covariance flux data processing", especially about the methods gap-fillings (Line 128-143). The equations or models used for gap-filling were described in details, and we also added the window size and periods of those nonlinear regressions in the text (Line 130-158).

(3) According to Referees' suggestion, a stepwise multiple regression analysis was performed to investigate the relationships of GEP, Reco, or NEE with concurrent changes in environmental variables (Ta, Sw, PAR, P) and LAI at monthly and annual time scales. Both single factor effect and confounding effects of multiple factors were analyzed with the stepwise multiple regression analysis. As a result, two new tables (Table 3 and Table 4) were added in the revised manuscript to present the statistic information of the stepwise multiple regression analysis.

(4) Since we were lack of the phenology data, and all three referees thought it inappropriate to define the growing season length (GLS) based on NEE. Furthermore, it would be circular to relate GPP with GSL if using GPP to define GLS. Therefore, we gave up the idea of relating GEP or NEE to GLS in the revised manuscript. The definition of GLS and the discussion on the effect of GLS on ecosystem annual carbon budget were also removed from our manuscript.

(5) We have reorganized and rewritten the Sections of 3. Results and 4. Discussion. The Section 3.3 and 3.4 in previous manuscript were reorganized into sub-sections 3.3 ~ 3.6, by separating the description of seasonal and inter-annual variation in CO<sub>2</sub> fluxes with the analysis of their environmental controls. Those discussion sentences in

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Results sections were all moved to Discussion sections, and the relationship between  $P_{max}$  and air temperature and soil moisture was moved into Section 3.5 as a part of Result. Therefore, the Results and Discussion Sections are much different from the previous manuscript.

(6)After giving up the discussion of growing season length (GLS), we found an important role of leaf area index and soil moisture in controlling the variation in CO<sub>2</sub> fluxes cross the three grasslands. Therefore, the Discussion section was also changed to focusing on the environmental and LAI controls on seasonal, inter-annual and inter-site variations in ecosystem carbon budgets. The Discussion on effects of growing season length on ecosystem carbon exchange was removed from our revised manuscript.

(7)As a result after the above revisions, the conclusion of our study was also changed into “The available soil moisture remains the primary factor influencing the spatial variation in net carbon exchange in grassland ecosystems.”(Line 415-417)

(8)Three new Tables were added in the revised manuscript (Table 1, 4, 5) and the original Table 1 and 2 in the previous manuscript were revised into Table 2 and 3 in the revised manuscript.

(9)Major revision and reorganizations were made to the Figures in the revised manuscript. Figure 1 and Figure 3 were revised in a better reorganized way. A new figure for the relationships between Reco and soil temperature at the three sites was added (As shown in new Figure 5). Previous Figure 5 was deleted. Previous Figure 6 was modified into new Figure 7. Previous Figure 8 and 9 were also replaced by new ones. Please review the revised manuscript for details.

We hope the above summarization would be helpful for you to look through our revised manuscript more clearly. The enclosure is our responses to all of yours and the other two Referee’s comments.

Thanks again for your efforts on our manuscript. Please let us know your comments

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for further revision on our manuscript.

Yours Sincerely,

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