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Biogeosciences Discussions

Interactive comment on "Responses of soil respiration to elevated carbon dioxide and nitrogen addition in subtropical forest ecosystems in China" *by* Q. Deng et al.

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There were some wrong in the on-line version. Once the percent symbol appears, the text will be terminated. Thus, the reponses to the general comments point 5,6 and the specific comments point 4 of referee 1 comments were incomplete in the above version. Please note the supplement that was a complete response to referee 1 comments. Here I resubmited the response to the general comments point 5, 6 and the specific comments point 4.

Anonymous Referee 1

the general comments point 5

5- I think more discussion is needed to explain why the combined effect of N and CO2 increased soil respiration rates. Did the authors expect this a priori? Which are the possible mechanisms that were triggered? This is a study using seedlings. . .are there any differences with previous studies using larger and older plants (e.g. FACE experiments)?

Response: We further discussed the interactive (combined) effects of elevated [CO2] and N addition on soil respiration and compared our results with some previous studies using FACE in temperate forests (section 4.5, page 14-15). We think that elevated [CO2] could maintain increasing plant growth and provide more soil C input under N addition (Finzi et al., 2002). The greatest root biomass and SOM were also revealed in the CN treatment at our study sites (Fig. 4), which would lead to the response of soil respiration in the young subtropical forest ecosystems to elevated [CO2] under high N deposition could be much stronger than under low N deposition. In addition, soil respiration was gradually suppressed when soil moisture was below 15 percent (Table. 2). However, decreased soil moisture under N addition was offset by elevated [CO2]. Soil moisture in the CN treatment was significantly higher than that in the NN treatment (Table. 3), which indicated the effect of N on soil respiration was enhanced by CO2 treatment, further indicating a strong interactive effect of these two factors on soil respiration. This may be why the combined effect of these two factors on soil respiration at our study sites was greater than the impact of either one alone. (more details showed in this revision)

Finzi, A.C., DeLucia, E.H., Hamilton, J.G., Richter, D.D., and Schlesinger, W.H.: The nitrogen budget of a pine forest under Free Air CO2 Enrichment, Oecologia, 132(4), 567–578, 2002.

the general comments point 6

6- The authors calculated the temperature sensitivity based on Q10 (equation4). However, the authors do not present the error bars, the confidence intervals of these estimates, or any statistical test between treatments. This is important because Q10 values vary from 1.5 to 1.84 and it is possible that the error in this calculation is larger than the reported range. If there are no significant differences (which should be tested in a revised version) I would suggest removing or editing section 4.2 in page 8372. In the current version of the manuscript there is stated that a one-way anova test was used to compare the b values among treatments (page 8369 line 4-5) but I do not see the results of this test that would support the arguments presented in this section 4.2.

Response: In this revision, we added confidence intervals of the Q10 estimates (we originally presented the standard errors of Q10 in Table 4). In response to the specific comments point 4 below, we recalculated soil temperature sensitivity based on the soil moisture threshold (15 percent). Since there is no relationship between soil respiration and soil temperature when soil moisture was below 15 percent, we only calculated temperature sensitivity Q10 when soil moisture was larger than 15 percent. And under this conditions (soil moisture >15 percent), soil respiration is only influence by soil temperature, not soil moisture. The revised temperature sensitivity (Q10) was 1.87, 1.90, 1.86 and 1.57 in the CN, CC, NN and CK treatments, respectively (Table. 4). While the relative values changed from the previous estimations, the conclusion is still the same: temperature sensitivity (Q10) of soil respiration was significant higher in the CN, CC, NN treatments than that in CK (Table. 4 and Fig. 2). We believed the higher the temperature sensitivity (Q10) of soil respiration was due to the additional substrates of root biomass and SOM (Fig. 4), which would stimulate soil respiration in these treatments.

the specific comments point 4

4- The authors state that soil moisture may play a more important role in soil respiration rate as the soil becomes dryer (page 8372 lines7-8). This result has been shown in many other studies and the authors should also explore what happen at the other end of the moisture spectrum. . ..what about the interaction of soil temperature and water? If the idea is to revise interactions I believe that it is important to explore how the com-

bined effect of high CO2 and high N influence the combined effect of soil temperature and soil moisture on soil respiration.

Response: We did test if there was a significant relationship between soil respiration and soil moisture when soil moisture is high. We found that there was no significant relationship between soil respiration rates and soil moisture when soil moisture was above 15 percent. Only soil temperature controlled soil respiration under this relative moisture conditions. We also found that there was no relationship between soil respiration and soil temperature when soil moisture was below 15 percent. Thus, we believed that there was no interaction of soil temperature and water on soil respiration.

We also tried to explore how the combined effect of high CO2 and high N influence the combined effect of soil temperature and soil moisture on soil respiration. We believed that varied soil moisture due to CO2 treatment may affect soil respiration response to N addition. At our study sites, soil respiration was gradually suppressed when soil moisture was below 15 percent at our study sites (Table. 2). We found that soil moisture was significantly reduced by N addition alone (Tables. 2 and 3), particularly in dry season (all below 15 percent), which also led to reduced soil respiration. But this decreased soil moisture was offset by elevated [CO2]. As a result, Soil moisture in the CN treatment was significantly higher than that in the NN treatment (Table. 3). Thus, the effect of N on soil respiration was enhanced by CO2 treatment, further indicating a strong interactive effect of these two factors on soil respiration. We added these in the section 4.5 of this revision.

Please also note the Supplement to this comment.

Interactive comment on Biogeosciences Discuss., 6, 8359, 2009.