

May 28, 2021

Dear Editor and Reviewer:

I very much appreciate your efforts and time in reviewing our manuscript.

According to your precious advice and suggestions, we have revised this manuscript thoroughly.

Response to each question from editors and reviewers were listed below.

Thank you very much for your precious time and tremendous efforts in reviewing and supporting this manuscript.

Best Regards,

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Editor's comments:

a) "Degradation of downstream wetlands has resulted in the loss of the soil carbon pool by approximately 60% " reduced?"

Reply: Yes, wetland degradation leads to a reduction in soil carbon. We have replaced the word "the loss of" with "reducing" from the sentence, and the sentence has been changed to "Degradation of downstream wetlands has resulted in reducing the soil carbon pool by approximately 60%.....".

b) "..... shifting the CH₄ and N₂O emissions from the source to the sink". Could you formulate this more precisely? "converting the wetland from a CH₄ and N₂O sink to a source"? Is that what you mean?

Reply: Generally, a healthy wetland is a CH₄ and N₂O source, but CH₄ and N₂O act as sink after the wetland is degraded. We have revised this sentence as follows:

"converting the wetland from a CH₄ and N₂O source to a sink".

c) "Although wetlands cover only 4–6% of the terrestrial land surface, they contain approximately 12–24% of global terrestrial soil organic carbon (SOC), thus acting as carbon sinks. Moreover, they release CO₂, CH₄, and N₂O into the atmosphere and serve as carbon sources". But they cannot be sink and source at the same time. What is the net effect? I think that should also be mentioned here.

Reply: The net effect of wetland is a carbon sink, because the carbon accumulation by plant's photosynthesis is higher than the consumption (plant respiration, animal respiration, and microbial decomposition) in the wetland. We have added this sentence as follows:

"Although wetlands cover only 4–6% of the terrestrial land surface, they contain approximately 12–24% of global terrestrial soil organic carbon (SOC), thus acting as carbon sinks. Moreover, they release CO₂, CH₄, and N₂O into the atmosphere and serve as carbon sources. In general, the carbon accumulation by plant's photosynthesis is higher than the consumption (plant respiration, animal respiration, and microbial decomposition) in the wetland, thus the net effect of the wetland is acted as a carbon sink".

d) “However, the process will be inhibited when the temperature was too high or too low”.is?

Reply: We have replaced the word “was” with “is”.

“However, the process will be inhibited when the temperature is too high or too low”.

e) “This result clearly showed that CO₂ contributed more than CH₄ and N₂O to global warming”. Do you mean that there were more CO₂ emissions than CH₄ and N₂O emissions? If so, then please reformulate.

Reply: In the previous sentence, we have shown the high accumulated CO₂ emissions. Thus this sentence, we want to show that CO₂ emissions have a significant impact on the greenhouse effect than CH₄ and N₂O emissions. We have revised this sentence as follows:

“Therefore, the total annual cumulative CO₂ emissions are high. This result clearly showed that the significant impact of CO₂ emissions than CH₄ and N₂O emissions on global warming”.

f) “The hydrology and soil properties showed more evident differences among the transects because the downstream zone was dry all year due to the presence of the Xilinhhot Dam (Fig. 1)”. I am not sure, can something be "more" evident?

Reply: The result in our study indicates that a significant change in hydrology and soil properties between different transects. The word "more" is indeed misused. We have removed the word “more”.

“The hydrology and soil properties showed evident differences among the transects because the downstream zone was dry all year due to the presence of the Xilinhhot Dam (Fig. 1)”.

Reviewer's comment:

a) I would recommend to add few sentences in the conclusion about the overall CO₂ balance considering photosynthesis. I am aware that this balance could not be measured. However, it should be mentioned because otherwise the data could be misinterpreted (A wetland is a CO₂ sink in the overall CO₂ balance).

Reply: We have added a sentence in the conclusion about the overall CO₂ balance considering photosynthesis as follows:

“The riparian wetlands were the potential hotspots of GHG emissions in the Inner Mongolian region. However, the degradation of wetlands transformed the area from a source to a sink for CH₄ and N₂O emissions, and reduced CO₂ emissions, which severely affected the wetland carbon cycle processes. Our results show that the riparian wetlands have high CO₂ emissions, but wetlands are CO₂ sink in the overall CO₂ balance general due to the photosynthesis of plants. Overall, our study suggests that anthropogenic activities have significantly changed the hydrological characteristics of the studied area, and will accelerate carbon loss from the riparian wetlands and further influence the GHG emissions in the future”.

Other revisions:

a) We have added Heyang Sun as co-author to the manuscript. Heyang Sun is contributed much in the revised version of our manuscript. After we received the referee's comments, he provided many solutions and deeper insights on many issues and hence establish the contribution of this paper.

“Xinyu Liu^{1,2}, Xixi Lu^{1,3}, Ruihong Yu^{1,2}, Heyang Sun¹, Hao Xue¹, Zhen Qi¹, Zhengxu Cao¹, Zhuangzhuang Zhang¹, Tingxi Liu⁴”.

b) We have updated the authors affiliations.

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c) We have updated the fund in the Acknowledgements.

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