

## ***Interactive comment on “Carbon budget assessment of an irrigated wheat and maize rotation cropland with high groundwater table in the North China Plain” by Quan Zhang et al.***

**Anonymous Referee #1**

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General comment : The authors present a detailed carbon budget of an irrigated wheat and maize rotation cropland that is characterized by high groundwater table due to irrigation systems. They report that the studied cropland behaves as a weak carbon sink. The paper is of general high quality with original results and sound data analyses, and the results are well discussed with the existing literature. However, I have a few concerns which I list here-below :

- The largest concern I have is with respect to the possibility that methane (CH<sub>4</sub>) emissions could be large in this type of poorly-drained and often flooded ecosystem. I think the authors should be a lot more cautious throughout their analysis, discussion and conclusion when they conclude that this ecosystem behaves as a carbon sink (even if

C1

weak). This is only true with respect to CO<sub>2</sub> but I am afraid that potentially large CH<sub>4</sub> emissions could occur. Did you carry out CH<sub>4</sub> emissions at this site ? Or could you provided any sort of estimation of these emissions ? Anyway, I strongly recommend to the authors to be more cautious with their conclusion about the carbon sink behaviour of this agro-ecosystem.

- The paper should be entirely proof-read for English spelling and type-setting mistakes. I provide here below the specific mistakes I could already notice.

- The authors paid attention to the evaluation of uncertainties associated to their measurements, which is a good point. However, I think that the uncertainties associated with the carbon budget terms (NBP, NEE, GPP, TER,...) are missing and should be estimated and given along with the mean values. They could indeed help to seize the reliability of claiming that the ecosystem behaves as a carbon sink.

- There are a few problems to fix in the figures (printed in black and white, some symbols or lines are not visible).

Specific comments

Abstract

L31-32 : Is this written as a general characteristic for croplands ? Or does this apply to this specific cropland ? This is not quite clear.

L32 : CUE should be defined (ratio of NPP to GPP).

Materials and methods

L182-183 : Is it really 200 wheat plants that are sampled at harvest ? This sounds really a lot.

L202 : can you check that reference temperature is well 0° ? Isn't it 10 °C, as it is often the case in the literature ?

C2

## Results

L338-342 : I think here the uncertainties related to the budget terms, and particularly NBP should be added, and particularly because the NBP values you give for wheat, maize and full crop rotation are averages.

## Discussion

L357-359 (and in the conclusion) : I think here should appear some comments on the possibility that this ecosystem releases CH<sub>4</sub> during those periods. Unless you can provide some measurements showing that no methane emissions are observed at this site ? At least more caution should be placed in this section.

L389-390 : I think this sentence is not correct : to me, GPP is the largest term and therefore it outweighs ER. Can you check this ?

L471 : As stated above, and unless it is certain that this site cannot be a source of CH<sub>4</sub>, I really think that some words should be added to say that this site could potentially be a net source of carbon if CH<sub>4</sub> emissions are taken into account.

## Tables and figures

Fig. 8 : As the NBP terms that appear on the figure are averages between two methods and do not correspond to the difference between NEE and ER, you should recall in the legend more clearly what is exactly this value of NBP.

## Technical corrections

L68 : please remove the comma (,) after AND.

L96-98 : This sentence should be rewritten. Is one verb missing ?

L100 : please write leading TO dramatic. . .

L147-150 : This paragraph should be reformulated and the capital letters after the sign ; should be removed.

C3

L178 : DISTRIBUTED rather than DISTRIBUTING

L196-200 : this sentence is too long and not very clear. This should be reformulated.

L270 : One S should be added to SHOW.

L283 : I think the correct term is -1500 kPa, and not -1500 MPa.

L294 : please remove the capital letter after the sign ;

L310 : please remove THE before HIGH TEMPERATURE

L363 : the word IN is missing before OUR STUDY

L363-365 : I do not understand this sentence, which should be re-written

L370 : I guess the term CLOSE should be added after PRETTY?

L375 : one S should be added to EXHIBIT

L378-379 : please remove the capital letter after the sign ;

L382 : BE should probably be added between MAY and SUBJECT

L431 : BE should be added between ALSO and SUBJECT

L437 : -GROUND should be added after ABOVE

L437-440 : I do not understand this sentence. Please can you reformulate ?

Table 1 : in the column titles, it should be written GREEN instead of GREE.

Fig. 3(c) : this figure is not clear, and particularly the distinction between rainfall and irrigation.

Fig.4 (legend) : one T is missing in the word HARVESTING

Fig. 6 : The distinction between GPP and NEE colors and line types is not possible. In addition, the acronyms HW, PM and HM should be explained in the legend.

C4

Fig. 5 (legend) : OF is missing before THE FOUR SAMPLING POINTS. And STANDARD should be written STANDARD. You can also add (SEE LEGEND IN GRAPH) after DIFFERENT ORGANS.

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