Dear Editor,

We are so appreciated for your letter on our manuscript “Reduction Evaluation and Management of Agricultural Non-Point Source Pollutant Loading in the Huntai River Watershed in Northeast China”, Reference No: hess-2018-339. We are also extremely grateful to the comments of anonymous Referee #2 on our manuscript and carefully considered every comment and made cautious revision accordingly. Based on their suggestions, we have answered the questions in detail one by one. If you have any other questions about this paper, I would quite appreciate it if you could let me know them in the earliest possible time.

Most sincerely,

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Additive list

We have studied the valuable comments from you, the assistant editor and reviewers carefully, and tried our best to revise the manuscript. The point to point responds to the reviewer's comments are listed as following.

Reviewer's Responses to Questions

(1) First I don't think the manuscript is novel enough for this journal. Second, the buffers simulated are not realistic so I don't see the benefit of simulating scenarios that are not possible. Third, the model has some fundamental flaws. See below for more details. I didn't review much past the model set up and results. If these are set up incorrectly the results are not worthwhile.

Answer: Thanks for your very thoughtful suggestion.

The NPS pollution is prone to cause in dry farmland, paddy, rural & urban areas. The SWAT model has been applied to study NPS in China by numerous research literature, they were mainly focuses on scenario simulation of NPS pollution and management in agricultural areas with rich hydrological and meteorological data. The basic monitoring data of HTRW were deficient; we selected the SWAT as the feasible method to access NPS pollutant loading in watershed level. We applied certain practices based on EPS to reduce the NPS pollutant loading in the Hunhe River, Taizi River and Daliao River watershed. The status quo scenario and EPS were used to calculate the output of NPS pollutant production. The output of NPS pollutant production, the loading intensities of TN & TP was reduced by 21.9%, 25.9% and 10.4% compared with the status quo scenario, respectively. In different regions of NPS pollutant loading in the HTRW changes greatly, and the pollutant loading intensity of different nutrients in the same region is slightly different. Land eco-restoration and land development mode adjustment measures should be practiced reducing NPS pollutant loading of cultivated land.

In order to increase the readability of the paper, we reduced the number of pictures, and increased the number of tables to describe the reduction of agricultural NPS pollution loading. The spatial distribution of the mean annual TP and TN loading in the HTRW were 19, and 7 kg/ha, respectively. The region with a high NPS pollution loading is located in the middle and lower the HTRW, which included the urbanization and population density highly areas of Shenyang, Liaoyang and Anshan. Under the EPS, the TN and TP per unit area were 14, and 6 kg/ha, respectively. The output of NPS pollutant production, the loading intensities of TN & TP was reduced by 21.9%, 25.9% and 10.4% compared with the status quo scenario, respectively. The NPS pollution occurring within different sub-basins and regions located in the watersheds varied greatly, and the loading intensities of different pollutant types in the given sub-basin were slightly different. Land eco-restoration measures should be implemented to control agricultural NPS pollution from croplands. Therefore, SWAT simulation results provide a reference for the prevention of agricultural NPS pollution in agricultural watersheds.

At present, the Liaoning Liaohekou National Nature Reserve (http://lnsthkgjjzrbhqglj.shidi.org/coohome/coserver.aspx?uid=lnsthkgjjzrbhqglj&sid=20393&clid=5B70C87692924C399BD5A1504571F993&t=66, 121°28′24.58″---121°58′27.49″E, 40°45′00″--41°05′54.13″N) has been completed. The HTRW (40°27'~42°19'N, 121°57'~125°20'E) is situated in the Liaoning province (Northeast China), and the river basin area is 2.73×10^4 km^2, which comprises approximately 1/5 of the Liaoning province (Fig.2). The establishment of protected areas effectively reduces pollutants. The protected area takes full advantage of the buffer zone. Therefore, the buffers simulated are realistic in the HTRW, and the benefit of simulating scenarios is possible.

(2) Line 13: change rainfall runoff to precipitation.

Answer: Thanks for your very thoughtful suggestion.

We have revised the rainfall runoff to precipitation runoff.

(2) Line 62: specify version. The number of equations changes from version to version.

Answer: Thanks for your very thoughtful suggestion.

We have changed the contents as follow

The SWAT model's main body contains 80 mathematical equations and 530 intermediate variables.

(3) Line 71: GDP is not relevant.

Answer: Thanks for your very thoughtful suggestion.

We have deleted the sentence.

(4) Line 72: What do you mean by urbanization rate? Looking at Figure 2, it looks like there are a few reservoirs within the watershed. You can't model a watershed with dams unless you use the reservoir outflow as an input into SWAT. How was this handled? Remove the "The" from each item in the legend. The land use and soil legends are too small.

Answer: Thanks for your very thoughtful suggestion.

We have deleted the sentence of “and the urbanization rate was almost 75%”.

By 1989, 689 large, medium and small reservoirs had been built in the Liaohe River Basin, with a total storage capacity of 13.80 billion m^3. In the HTRW, there are 4 large reservoirs, which are Dahuofang Reservoir (located in the middle of Hunhe river), Guanyinge Reservoir (located in the upstream of Taizihe river), Shenwo Reservoir (located in the middle of Taizihe river), and Tanghe Reservoir (located in the middle of Tanghe river). Therefore, are many reservoirs in the HTRW. In the SWAT model, we used the reservoir outflow as an input into SWAT.

We have deleted “the” from each item in the legend.

We have enlarged land use and soil legends.

(5) Lines 146-147: Does a 1 km and 5 km buffer sound reasonable and realistic? To me it does not.

Answer: Thanks for your very thoughtful suggestion.

The 1 km and 5 km buffer were reasonable and realistic.

(6) Line 158: For such a large waters, the number of sub basins and HRUs is quite small especially for the large number of land uses and soil types.

Answer: Thanks for your very thoughtful suggestion.

The downstream of Hunhe River, Taizi River, and Daliao River has little change in terrain, the direction of water flow is single, and the source of contaminant is relatively stable. Therefore, some small calculation units are combined during the calculation process to reduce calculation time and improve operating efficiency.

(7) Line 178: This is incorrect. It is based on land use, soil type and slope.

Answer: Thanks for your very thoughtful suggestion.

We have revised the sentence as followed,

Hydrological response unit demarcation is based on land use, soil type and slope.

(8) Line 182: You state that with a threshold of 0, there are 184 HRUs just like you stated in line 158. Then you go on to state that you used a threshold of 5%, 8% and 15%. This would decrease the number of HRUs.

Answer: Thanks for your very thoughtful suggestion.

In Line 158 “Hunhe River, Taizi River, and Daliao River sub-catchments were delineated into DEM and river system and further divided by 29 small calculation modules based on 184 HRUs”. And in Line 182 “The area threshold percentages for land use, soil and slope were 5%, 8%, and 15%, respectively”. There is no correlation between the two.

(9) Line 189: What about min and max temp?

Answer: Thanks for your very thoughtful suggestion.

The min and max temp is -30℃and 40℃, respectively.

(10) Line 190: What were the results of the crop irrigation time? This varies greatly across a watershed.

Answer: Thanks for your very thoughtful suggestion.

We have added the related content,

such as crop irrigation time (late April and early May) and water.

(11) Line 243: This is too many land uses. You would have many more HRUs.

Answer: Thanks for your very thoughtful suggestion.

We delineated land-use types into 27 categories. The main type of HTRW land use and land cover change is forest (including orchard, 49%), dry land (24%), rice paddy (15%), urban land (vacant land, 8%), unused land (uncultivated land, 3%) and grassland (1%). We have combined different land use types into six common types. Therefore, the manuscript is mainly divided into 184 calculation units for the calculation of pollutants for the six land types. The number of calculation units is reasonable.

(12) Line 255: What do you mean you simulated rainfall? In line 253 you stated that you had rainfall data from 76 stations.

Answer: Thanks for your very thoughtful suggestion.

To reduce ambiguity, we deleted the expression of "We used meteorological monitoring data to simulate rainfall and evaporation".

(13) Line 286: These are both downstream of reservoirs.

Answer: Thanks for your very thoughtful suggestion.

The runoff data series of these two hydrological stations are relatively complete, and the downstream runoff changes can reflect the overall runoff variation of the basin. These two hydrological stations are also the key monitoring sections of the basin, which can reflect the overall spatial and temporal changes in the water volume of the basin.

(14) Line 362: How many samples do you have from each site? Did you use Loadest or some other program to estimate the loads for days where you didn't have data? How did you compare simulated to monthly concentrations?

Answer: Thanks for your very thoughtful suggestion.

There are 6 samples of each site. Samples were obtained during the wet season, the wet season, intermediate season, and dry season. Two samples are set for each water period.

We used Loadest to estimate the loads for days where we didn't have data.

The Xingjiawopeng, Xiaolinzi and Tangmazhai Hydrological stations had only the TN data during the study period; therefore, Beikouqian was selected for the validation curves, and the TN E_{NS} and R^2 were 0.64 and 0.78, and the TP E_{NS} and R^2 were 0.60 and 0.75, respectively (Figs. 6 a and b). The E_{NS} and R^2 for the Xingjiawopeng, Xiaolinzi and Tangmazhai hydrological stations were 0.62 and 0.73, 0.61 and 0.72, and 0.62 and 0.77, respectively. The values of all R^2 were higher than 0.7, confirming that the SWAT could be used for water quality simulation in HTRW. The simulated TN and TP have a certain synchronization with the measured changes of TN and TP in each month. The variation law of simulated N and P content is not much different from the measured value, and the model has good workability.

We tried our best to improve the manuscript and made some changes in the manuscript. These changes will not influence the content and framework of the paper. And here we did not list the changes but marked in red in revised paper (Revision, changes marked).

We appreciate for Editors/Reviewers' warm work earnestly, and hope that the correction will meet with approval.

Once again, thank you very much for your comments and suggestions.