

## ***Interactive comment on “Water erosion research in China: A review” by Haiyan Fang***

**Haiyan Fang**

fanghy@igsnr.ac.cn

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Dear referee, Great thanks for your invaluable suggestions and comments. According to your descriptions, the suggestions or comments were extracted from your comments and summarized into the following aspects, and specific responses were given as followed.

For the specific comments 1, The title of the paper is lack of information, although it is brief. There's too much content to handle. It could be more appropriate after adding some determiners, such as In the last hundred years, a brief history of development, achievements and prospects, etc. You don't need to add them all, just follow your thoughts and your needs. Response: Thanks. Because there is around 100 years from initial water erosion to current, the phrase “in the last one hundred years” was added.

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2, I think it remains to be discussed that the rationality of dividing the study of soil erosion into three stages in China. For example, it is too rough to simply divide it into one stage because of the small number of employees and articles, although those years belong to the initial stage of research from 1922 to 1980. As we all know, China's social progress was relatively slow lasted at least 100 years before 1980. The total economic volume and the number of college students were in a low range, and then the indicators had explosive growth. It may also make sense to apply the dividing method in this paper to other fields. The progress of scientific research is often marked by the innovation of theory and technology. It is suggested that the above factors should be taken into account when dividing. Response: The three stages were divided based on the published review papers (Li et al., 2009; Shi et al., 2020), and the published papers' numbers. Further insight indicates that the technologies' development just coincide with the stages of water erosion research stages in the original manuscript. Before 1980, runoff plots, gauging, and field investigation were major methods. After 1980, computer and remote sensing technologies' development as well as the introduction of tracer method into China accelerated water erosion research. From 2000 and thereafter, further development of high resolution remote sensing images, unmanned aerial vehicle (UAB) and physically based water erosion models in combination of atmospheric sciences also allow large scale, high-resolution water erosion studies. The information was added at the three stages of water erosion research in China.

3, China's scientific and technological progress is inseparable from the development of the world, which is partially reflected in the paper. I would suggest that China's research progress in each period should be connected with the world's research environment for proper comparison. It can be classified and counted on the time scale, and compared with other major countries to show whether China has its particularity. It is necessary to summarize the complementary and promoting role of China's soil erosion research in related fields of the world. China's topography and soil types should be focused on for further exploring the characteristics of related fields. It will be very interesting, such as the soil erosion control process, and environmental evolution of the Loess Plateau. Re-

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sponse: Good suggestions. The development of water erosion research in China were compared with other countries was done in the manuscript. The complementary and promoting roles of China's soil erosion research were given in some parts, including physically based models which included a gravitational erosion module, small catchment management in China, a comparison of runoff and sediment monitoring network between China and the United States, water pollution study etc. The information was added in the revised manuscript. The Chinese complex topography and multiple soil types were also added in the introduction and 3.5 section.

4, In terms of the progress of observation technology, it is suggested to summarize the status of the main research methods in different periods in history, such as gauging stations, estimation of sediment erosion with radionuclide or magnetic minerals, sediment fingerprinting method and so on. It should also be pointed out that new technologies and new methods can partly replace the old ones to make up for their shortcomings, what demerits still exist, and how to evolve in the future, rather than simply citing by years and researchers. Response: Yes, main study methods were summarized in each stage, their merits, demerits as well as their future evolutions were also given.

5, The evidence is not enough, by only describing the progress of scientific research and regulations. It is suggested to supplement the actual effect, such as the situation of wind and sand control, the change of erosion and sediment yield of big rivers and so on. Where is it still getting worse? What is the future development direction? Response: Good suggestions. The changes in sediment load in Chinese large rivers were given, and those basins that get worse or land use types with higher soil erosion rates as well as future key places to implement soil conservation measures were also pointed out at the end of 3.5 section in the revised manuscript.

6. It can be tried to increase the actual effect after taking reasonable soil erosion protection, and describe quantitatively, in addition to the improvement of commonly used indicators like water erosion and sediment yield. Such as the content of soil organic matter rising, the fertility increased, the days of dust storms decreased, and

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the farmers' income growth. Response: This suggestion is similar to the former one. However, more information was added in 3.5 section including the rising soil organic carbon, increased fertility, and farms' income. However, the days of dust storms were not added because this study focuses on water erosion.

7. The development history of scientific research institutions and government organizations in relevant fields in China is also worth mentioning, such as the Chinese Academy of Agricultural Sciences, the Institute of soil and water conservation of the Ministry of Water Resources of the Chinese Academy of Sciences, and Cold and Arid Regions Environmental and Engineering Research Institute Chinese Academy of Sciences, etc. As far as I know, most of the relevant researches and measures were carried out with the government as a leader in the past. How do non-governmental organizations and private enterprises participate in them, such as the annual tree planting activities? These are Chinese characteristics all of the above.

Response: Thanks for your suggestion. Some national institutes as suggested were added, and two examples were given for their history development. Provincial research institute and enterprises were also discussed. However, the Cold and Arid Regions Environmental and Engineering Research Institute Chinese Academy of Sciences was not added because the researchers in this institute did not study water erosion.

8, The research on soil development process and local climate evolution should also be mentioned. For instance I think the viewpoints from Tang Keli are valuable. That on bio-climatic environmental evolution in Quaternary were proposed based on analysis of physical, chemical, mineralogical composition, spore pollen and micro morphology studies on soil samples. Response: Yes. Tang Keli gave a systematic discussion in her book Soil and Water Conservation. Based on this suggestion, the relations of soil formation and soil erosion with bio-climatic environment were added in the 3.5 section of the revised manuscript.

9, The paper revised according to the above opinions may add some content. Please

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pay attention to the limitation of space, and choose the content of the article. Response: Great thanks.

For the comments on some purely technical corrections 1. The full text is easy to understand, but there are several spelling mistakes that need to be corrected. For example, "loss plateau" in line 86 should be "loess plateau", and "a test of t he pollen" in line 821 has an extra space in letters. The sentence pattern is slightly single, such as the repeated use of the word "however". Response: Yes. They were corrected. In order to avoid similar problems, the manuscript was carefully read after all the comments were completely responded.

2. There are lots of Chinese scientists appeared in the list of references, they sometimes have the same family name. It is difficult to find the corresponding line, especially when published in the same year. In this case, whether the full name can be written in the quotation of the text (This is also a suggestion to the editorial department)? Response: The reference list was carefully checked. The references with the same surname and the same year were differentiated through adding a, b after the years

3. About Fig.3, the curves in Fig.3b seem to be inconsistent with the Figure captions. Response: Yes. Thanks. The words of "the Loess Plateau and" was added.

4. The position of small sticks, circles and other symbols in Fig.4 is irregular. The same problem also appears in other figures. Please pay attention to the beauty of the picture and make some adjustments. Response: Thanks for your suggestion. This figure was redone, and regular symbols were used in the revised manuscript.

5. About Fig.5a, the curves are fuzzy, it is recommended to add the number units near the drawing, and change the line type or color. In Fig 5b, does the symbol "m" of different color lines stand for "meters"? It should be indicated in the drawing. And the Fig.5d, are the right end of the number axis able to reach 100? Is the unit percentage (%)? Response: Fig. 5a was edited. The number units were not added because I think it can add the complexity. The line type and color were changed. Yes, in Fig. 5b,

“m” represents “meter”, this information was given. In Fig. 5d, the right end is 100, therefore, the scale of Y-axis was revised. Yes, the unit is percentage. This word was corrected.

6. Line 173 says "mainly include five aspects, which are described below", but there are more than five parts below. The part 3.6 may not be a summary, but just one of them. Response: Yes. This is an error. The word “five” was replaced by “six” in the revised manuscript.

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