

Interactive comment on “Influencing factors and their interactions of water erosion based on yearly and monthly scale analysis: A case study in the Yellow River basin of China” by T. Hua et al.

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Received and published: 7 August 2019

1. What is the meaning to do the quantitative attribution analysis of soil erosion in different months, as we all know, in the rainy season soil erosion is much higher than other months. In addition, the policy made to control soil erosion is usually based on the spatial distribution of soil erosion, not based on temporal distribution of soil erosion. For example, the construction of check dam, the dam will be used for a long time, rather than during some months.

Answer: Thank you for your helpful comment and the reasons for my analysis on the monthly scale are as follows 1) For the RUSLE model, the soil erodibility (K factor)

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and topography (LS) factors are stable over a long time period and are relatively independent of anthropogenic interventions. However, the rainfall erodibility (R factor) and vegetation cover and management factor (C factor) are seasonally variable. The amount of soil erosion are seasonally variable. More and more people are paying attention to the study of soil erosion at the monthly scale. Some studies began to focus on the C factor for a more in-depth discussion at the monthly scale, such as the calculation method of C factor, the characteristics of C factor in different periods (Alexandridis et al., 2015; Schmidt et al., 2018). In summary, the discussion of seasonal changes in soil erosion is necessary. a. Alexandridis, T. K., Sotiropoulou, A. M., Bilas, G., Karapetsas, N., and Silleos, N. G.: The Effects of Seasonality in Estimating the C-Factor of Soil Erosion Studies, *Land Degradation & Development*, 26, 596-603, 2015. b. Schmidt, S., Alewell, C., and Meusburger, K.: Mapping spatio-temporal dynamics of the cover and management factor (C-factor) for grasslands in Switzerland, *Remote Sensing of Environment*, 211, 89-104, 2018. 2) We strongly agree with your point of view that the construction of check dam, the dam will be used for a long time, rather than during some months. However, the policy is not only a long-term engineering measure, but also includes early warning of soil erosion disasters by various government departments. The focus of our research is not just on the monthly scale of soil erosion assessment, but on the contribution of different environmental factors and the interaction of two environmental factors to the spatial distribution and spatial variation of soil erosion in different months. We have come up with many interesting conclusions that in most cases the two-factor interaction to the spatial distribution and spatial variation of soil erosion exhibits a nonlinearly enhanced state. From this perspective, the research of soil erosion on a monthly scale is important.

2. The quantitative attribution analysis of soil erosion and its variability have been done by other researchers previously, thus innovation was lacked in this paper.

Answer: Thank you very much for allowing us to reconsider the innovation of this manuscript. While, it seems that few people have studied the interaction of two en-

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environmental factors on soil erosion. We applied an interaction detector module of geographical detector to the research of distribution and spatial variation of soil erosion. And we used four figures and a lot of text to elaborate on this work. We found that the two-factor interaction exhibits a nonlinearly enhanced state in most cases (please see Lines 275-281, 308-315 of the manuscript, and Lines 4-16 of the supplement). In summary, we believe that our work is still innovative.

3. In page 2, line 51, there is a problem in the format of reference cited.

Answer: We apologize for our overlook and have revised the format of reference cited (please see Lines 68-71 of the manuscript).

4. Please check the unit of soil erosion calculated by RUSLE model, ton/(km² a) or ton/(ha a).

Answer: We apologize for our overlook and have revised these units (please see Lines 22, 225-231 of the manuscript).

5. Do you have any verification of the results simulated by RUSLE model? The validity of the results is the basement for the following analysis. By the way, I doubt the soil erosion module mentioned in abstract, it is too small for the Yellow River Basin.

Answer: Thank you very much for your helpful comments. The RUSLE model is an effective tool for rapid assessment of soil erosion. And using the detailed surface information provided by remote sensing, the RUSLE model has successfully been applied to a variety of spatial scale assessments of soil erosion, from the plot scale to the global scale (Thiam, 2003; Vrieling, 2006; Van der kniff, 1999; Van der kniff, 2000; Borrelli et al., 2013). We think the result of soil erosion is reliable. The values appearing in the Abstract are only the amount of soil erosion we estimated in July based on the RUSLE model. It is not the amount of soil erosion throughout the year, so it may be much smaller than the impression. In addition, considering that our research mainly focuses on the impact of environmental factors on soil erosion, the data input required

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by Geographical detector needs to be reclassified. In other words, we need to ensure that the relative value of the results is accurate, and there is no strict requirement for the absolute value of the data and the evaluation results.

6. In the uncertainty analysis part, "Other classification methods, such as the geometrical interval and equal interval methods, are also worth trying", why don't you try other methods and select the most appropriate method for your study.

Answer: Thank you for your suggestion. According to the paper of the inventor of geographical detector, it is emphasized that a variety of classification methods are applicable to geographical detector. In other words, geographical detector are not mandatory for which classification method to use. We referred to a paper on the application of geographical detector to soil erosion assessment, and we decided to use the natural break method in this study. In addition, in order to avoid a certain degree of misinformation, we have added a description in the 2.2 Data and processing (Please see 194-197), and removed the original sentence in 4.3 Uncertainty analysis and future perspectives.

7. The language expression need to be improved, for example, "Topographical factors such as slope and surface roughness have a greater impact on the spatial distribution of soil erosion, while rainfall and vegetation are as follows." In this language, there is no adversative relation.

Answer: Thanks to reviewers for pointing out grammatical errors in manuscript, we have modified similar expressions (Please see Lines 14-16, 431-432). In addition, we went over this paper carefully and invited a native speaker of English from American Journal Experts (<https://www.aje.com/>) to improve the readability of our paper.

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-122/nhess-2019-122-AC2-supplement.zip>

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess->

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