

Response to referees' comments (SE-2014-109)

Manuscript title: Responses of vertical soil moisture to rainfall pulses and land uses in a typical loess hilly area, China.

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Dear Editor,

Thank you very much for your valuable comments and considerate suggestions for our manuscript. These comments are helpful for improving our manuscript. We have made careful modifications and revisions on the original manuscript in response to all the reviewers' comments. We hope the new version of the revised manuscript would meet the Journal's standard. Answers to referee's questions are bold.

Anonymous referee #1:

This paper attempts to analyze the response of soil moisture variations to rainfall pulses by in-situ consecutive monitoring of five typical vegetation types in the loess hilly area of China, including artificial grassland, cropland, shrubland, woodland and native grassland both during and after each rainfall pulse at plot scale. This manuscript would be of interest to readers of Solid Earth, BUT the article would not be acceptable for the journal in the present form. I suggest minor revision. In general, the English should be improved.

Response: Thank you for the positive evaluation for our manuscript. We have carefully studied the valuable comments and suggestions, and revised the manuscript accordingly. We hope the revisions would be satisfactory for publication in Solid Earth.

Detailed comments:

1. ABSTRACT The authors state that ... *“In this study, vertical soil moisture variations of woodland (*Pinus tabulaeformis*), native grassland (*Stipa bungeana*), shrubland (*Hippophae rhamnoides*), cropland (*Triticum aestivum*) and artificial grassland (*Onobrychis viciaefolia*) in five soil profiles were monitored in a typical loess hilly area during the 2010 growing season”*. I have searched the characteristics of these five soil profiles in the paper and I have not found

anything. Please to add a table with the main features of the five soil profiles, for horizons or for soil control sections. Indicating at least texture, porosity, organic matter, bulk density ... etc. I think that these parameters are essentials to analyze the variations of soil moisture regime as a function of use, especially in Calcic Cambisol, characterized by cambic horizon presence (Bw).

Response: According to your comments, we have added a table about some of the major physicochemical properties for the five soil layers of each plot. Please see if it is available. (See page 24, table 1). It is true that soil features may affect the hydrological consequences. In further studies, we will pay more attention to the specific characteristics of soil properties on soil moisture, infiltration and other hydrological responses. Meanwhile, we are sorry that we have no soil texture data so far, and this indicator will be monitored in the following research.

2. The authors reported the precipitation effects only. Indicating issues that are known. Nevertheless they do not indicate anything about the soils physical and chemical properties in Cambisols, which obviously affect to soil moisture regime. In this respect, I recommend that the authors should read some paper of Parras-Alcántara or Lozano-García that have studied physical and chemical properties in Cambisols in semiarid environments, plus some Pf. Cerdá paper. In addition SE is international journal, the paper will give a more global vision. Hereby the introduction would be improved enough.

Response: Thanks for your comments. We have carefully read some papers referring to the soil physicochemical properties related to hydrological cycle in semi-arid ecosystem, particularly Prof. Parras-Alcántara's work in Spain. SE is an international journal, we have discreetly revised the introduction of the manuscript, and improved the quality as well as add the new citations according to another reviewer's suggestion. (See page 2, line 17; page 3, line 9-14).

3. ...annual mean precipitation of 408mm (1958–2004). Is not information very ancient? ...The mean annual potential transpiration is 1510 mm.
...potential transpiration or potential evapotranspiration? ... The soil at the study site is of the Calcic Cambisol group in the FAO-UNESCO classification system

(FAO-UNESCO, 1974). Why a more recent classification is not used?...for example....IUSS-ISRIC-FAO, 2006. World Reference Base for Soil Resources. International Union of Soil Science, International Soil Reference and Information Centre. Food and Agriculture Organization of the United Nations, Rome, Italy.

Response: Thanks for your careful comments for our manuscript. We checked the references again and update the new information for the annual mean precipitation of the study region. In addition, 1510 mm was the potential evapotranspiration, we have revised in the new version of the manuscript. Finally, the reference of soil classification was also updated. Thanks for your valuable comments again. (See page 4, line 22-27).

4. It exhibits a unique texture composed of 50% silt (0.01–0.05 mm), 39% clay (< 0.01 mm) and 11% sand (> 0.05 mm)... These data do not provide information on soil.... these data are mean soil values? The soil thickness varies from 40 to 60 m in the same region.... these data are correct?. As I said before it would be interesting to incorporate soil physical-chemical properties, beside updating some information.

Response: Thanks for your comments and sorry for not making it clear. These data were the mean soil values of the study site. According to the previous research in the same region, we used these data as basic information to our study site. Moreover, the local soil is developed from loess material, with a mean soil depth ranging from 40 – 60 m. In some regions, it even can reach 100 m. We re-checked it and added new references in the same study area, hope the new version of our manuscript could follow your point.

5. The results are well prepared.
But, I think that to clarify and justify the results you should start with physical-chemical soil analysis by horizons or soil control section (0-20, 20-40...etc). Also, you should take into account land use, and even take into account the land use change occurred in the study area. It is also important that you clarify management especially in grassland (native and artificial)

Response: Thank you very much for your comments. Your advice on the effects of soil physical-chemical properties can benefit the studies on soil moisture variation. We added the new result in the revised manuscript. (See

page 8, line 8-25). There was no doubt that soil properties changed during the vegetation restoration. In this study, however, we mainly focused on the response of soil moisture to rainfall pulse under different vegetation types in this manuscript. In the future research, we will pay more attention to the effect of soil physical-chemical properties on soil moisture variation, particularly the relations between the fractal features and soil moisture characteristics under different land use patterns, and we hope to focus this topic and write new manuscript. Thanks for your valuable suggestions again.

6. The discussion is poor, mixing results and not clarifying the basic questions of work done. The discussion should be shorter and concise.

Response: Thanks for your valuable suggestions. In the new version of our manuscript, we revised the discussion and simplified the mixing results in this part. We hope our efforts can make this part shorter and concise.

7. Regarding the conclusions are quite clear, but it could improve a lot if you will incorporate physical parameters such as texture, bulk density, organic matter, porosity ... etc.

Response: According to your comments, we added a table regarding the soil physical and chemical properties in the manuscript, and also added some information in the conclusion part. (See page 17, line 4-6). As mentioned before, we mainly try to focus on the response of soil moisture to rainfall pulse under different vegetation types in this manuscript. We will focus on the effect of soil physiochemical properties on soil moisture variation in the further studies. The related data such as soil texture will be measured in the next step. Thank you for your valuable suggestion.