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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Spatial variations of deep soil moisture and the influencing factors in the Loess Plateau, China" *by* X. N. Fang et al.

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We thank reviewer for the detailed comments. We have gone through all the comments and will amend the original manuscript base on the suggestions and comments. In the following pages we provide brief answers to the reviews comments and we will make corresponding changes when we receive the editor decision.

Reviewer: The title is not representative of the results reported in the manuscript. The authors didn't show the spatial variation of soil moisture. The title should be more tailored on "influencing factors" rather than "spatial variation".

Authors: Considering the collective suggestions from all four reviewers, we will revise the title in the revised manuscript, and make the title more tailored on "influencing factors".

Reviewer: The manuscript is too long with several repetition and some confusing sentences.

Authors: Following the reviewer's suggestion, we will exam the manuscript carefully and remove some sections that are less relevant with our key findings. Besides, we will invite a native English speaker to revise the language of our manuscript to increase the readability of the manuscript.

Reviewer: Equation 1 and 2 are not necessary.

Authors: Following the reviewer's suggestion, we will delete equation 1 and 2.

Reviewer: Citation should be always necessary. The need of some citation is not clear to me (i.e. at line 21 page 11). Do the authors say that tests on the distribution of data were performed by Shi et al. (2014)? In this case the authors should clearly state the origin of statistical results in table 2. Other- wise I think the citation to Shi et al. (2014) should be removed, because the need of normally distributed data to perform statistical analysis such as ANOVA was already known before Shi et al. (2014).

Authors: We agree some citations in this manuscript may be inaccurate; we will carefully exam all the citations in the manuscript to ensure their accuracy, and remove the unnecessary ones.

Reviewer: The authors state that data were normally distributed, and then they should probably explain why they choose a non-parametric correlation test (Spearman).

Authors: The data were normally distributed; however, significant correlations exist in SMC at different soil depth ranges (Figure 7). So, we chose a non-parametric correlation test (Spearman) in this manuscript. In the revised manuscript, we will further clarify this point.

Reviewer: The authors collected soil sample during summer 2014 (two months), but they say: "Most rain occurs in the form of thunderstorms during the summer months from July to September." (lines 20-21 page 6). How they took into account the effects

of rainfall and actual evapotranspiration on soil moisture dataset? The duration of the sampling campaign is a key point. In the case the measurement campaign of a single soil moisture profile at each of the 151 sites took two months, the study is questionable, because the author considered fifteen parameters without taking into account the effects of water added from thunderstorms or removed by actual evapotranspiration. The authors should clarify this point.

Authors: Actually, the exact sampling period is from July 10 to August 6. Based on field observation and EM50 dynamic monitoring data, the rainfall events and evapotranspiration influenced soil moisture no deeper than 80cm, thus we consider the deep soil moisture (80-500cm) is seldom influenced by rainfall events and evapotranspiration during the sampling period. Besides, the main objective of this manuscript is to exam the variation of deep soil moisture and its influencing factors, the surface layer soil moisture variation is only considered as a comparison. We will further clarify this point in the revised manuscript, and EM50 dynamic monitoring data will be added to verify this point.

Reviewer: According to data presented in Table 1 the density of the solid phase of the soil varies from 2.37 to 2.47 Mg m-3. How the authors measured this parameter? Why the authors decided to employ a variable density of the solid phase? A constant solid phase density would establish a linear relation between porosity and soil bulk density.

Authors: Actually, the data "porosity" presented in Table 1 is "capillary porosity" not "soil total porosity". Capillary porosity was calculated by solid phase density and bulk density. To calculate this parameter, undisturbed soil cores were collected in metal cylinders (diameter 5 cm, length 5 cm) at each sampling site, and then capillary porosity were measured by "cylinder soak method". In the revised manuscript, we will change "porosity" to "capillary porosity" in order to eliminate confusion.

Reviewer: In some cases the authors drawn conclusions from results of statistical analysis, but in the discussion they didn't give any explanation on the hydrological

processes that could have led to such results. Since any influence was observed in the upper layers, why soil moisture between 4 and 5 m depth below David peach should be influenced by grass biomass? Same question should be answered for the influence of litter biomass below apple orchard.

Authors: As suggested by the reviewer, we will exam results of statistical analysis and provide explanations on the hydrological processes that could have led to such results in the revised manuscript.

Reviewer: the authors should change "buck density" to "bulk density" and "organic" to "organic matter". Pay attention to the use of "infiltration", sometimes was used instead of "storage".

Authors: Following the reviewer's suggestion, we will exam the entire manuscript and change all the "buck density" to "bulk density" and "organic" to "organic matter". We will also carefully check the use of "infiltration".

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