

## ***Interactive comment on “Spatial variation of shallow and deep soil moisture in the semi-arid loess hilly area, China” by L. Yang et al.***

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We thank Anonymous Referee #1 for contribution and insightful comments and suggestions on our manuscript. We have gone through all the comments and will amend the original manuscript base on the comments and suggestions. We would like to take this opportunity to answer his/her questions and explain our points of view.

Reviewer: This paper analyzed the spatial variation of shallow and deep soil moisture in a semi-arid environment. The analyses were based on large amount of field sampling and lab work. The authors should seek help from a native English speaker to polish this manuscript for final publication. Authors: Thanks for these comments and suggestions, we have paid more attention to the problem and make efforts to improve the English.

C2542

The revised manuscript will be revised by a native English speaker before submission.

Reviewer: Furthermore, most of the analyses are descriptive. Is it possible to do a statistical analysis, e.g., regression and/or CCA (Canonical Correspondence Analysis), to examine the relationships between SMC and environmental variables? Authors: We agree that more insight is needed regarding the relationships between SMC and environmental variables. This study focused on the spatial variation of shallow and deep soil moisture. We concluded that vegetation growth condition has significant negative relation with deep soil moisture. However, vegetation growth conditions of grass, shrub and forest cannot be identified by one simple index. Thus, a regression analysis is difficult to be implemented in this study. Combined the suggestions of reviewers, canonical correspondence analysis will be implemented in revised manuscript. Thanks for good suggestion.

Reviewer: P4459L24-L28: how did you store soil samples? Authors: Soil samples were stored in sealed aluminum case when taken out. Then the sealed aluminum cases were taken to laboratory to measure gravimetrically soil moisture content by using oven-drying method in time. This paragraph will be reorganized in revised manuscript.

Reviewer: P4560L11: “28 m layers”, 28 m depth? Authors: Thanks for detection of this typo. The sentence could be reworded as: “In August 2010, the deep SMC in the 2-8 m layers was measured at each site.”

Reviewer: P4561L14: “the total closeness of each quadrat” could be “canopy cover”. How did you measure canopy cover? Authors: Yes. In this study, canopy cover of shrub site was measured by visual estimation. The sentence could be reworded as: “At shrub sites, plant height (m), canopy width in a 10 m × 10 m quadrat were measured, and canopy cover were measured by visual estimation.”

Reviewer: P4564L23: “Low SMC in shallow layers led to low statistical significance”? Authors: The sentence could be reworded as: “Because the SMC in shallow layers

C2543

were always low, significant differences of shallow SMC were difficult to find between different environmental variables.”

Reviewer: Table 2a: is it possible to make the “vegetation growth condition” column consistent? You can show the same variables for different transects. Authors: The “vegetation growth condition” column in Table 2 will be reorganized base on this suggestion in revised manuscript. In our study, soil moisture in grassland (native natural grass, alfalfa), shrubland (korshinsk peashrub) and forestland (Chinese arborvitae, Chinese red pine and Siberian apricot) were analyzed. We concluded that vegetation growth condition has significant negative relation with deep soil moisture. The vegetation growth conditions of grass, shrub and forest cannot be identified by one simple index. Because vegetation type has significant influence on shallow and deep soil moisture in the semi-arid loess hilly area, the comparison of soil moisture content under different topographical factors were analyzed in the same vegetation group. In the revised manuscript, vegetation growth conditions will be showed for different transects and groups.

Reviewer: Fig. 1: what is a “valley line”? Add unit “m” for elevation. Authors: Valley line is the shoulder line of valley. The unit for elevation will be added in Fig.1 in the revised manuscript.

Reviewer: Fig. 2: it might be good if you explain NG, CP, AF, etc. in the caption. Authors: Thanks for this suggestion. We will explain NG, CP, AF, etc. in the caption in Fig. 2-Fig. 7 in the revised manuscript.

Reviewer: P4554L23-L24: soil moisture availability. .the only water source? Authors: The sentence could be reworded as: “soil moisture can be considered the only available water source for plant growth in local ecosystems (Cao et al., 2009).”

Reviewer: P4457L6: The unit of temperature should be “âĎČ” Authors: Thanks for the detection of this typo. The sentence could be reworded as: “It belongs to a typical semi-arid loess hilly region, with approximately 6.8âĎČ mean annual temperature and

C2544

386 mm mean annual rainfall.”

Reviewer: P4557L19: sparse grass with annual plants? Authors: The sentence could be reworded as: “The native vegetation in study area is sparse natural grass, dominated by species bunge needlegrass (*Stipa bungeana* Trin.), common leymus (*Leymus secalinus* (Georgi) Tzvel.), Altai heterpappus (*Heteropappus altaicus* (Willd.) Novopokr.), etc.”

Reviewer: P4458L17-L18: Abandoned farmland. .was fallowed in 2002? Consider revise this sentence. Authors: Abandoned farmland in this study area is farmland fallowed with native grasses and herbs grown. Farmland fallow is a kind of vegetation restoration type in the Loess Plateau. The sentence could be reworded as: “Abandoned farmland is farmland fallowed with native grasses and herbs grown for years. In this study, abandoned farmland was fallowed from 2002.”

Reviewer: P4459L3: You mentioned “eight typical transects” in this line. However, you have 9 transects in Fig.1. Authors: In Fig. 1 the sites of “KP1-Shady” and “KP2-Shady” was used to compare soil moisture content on different slope aspects. These two sites were not belongs to the “eight typical transects”. This figure will be revised in the future manuscript.

Reviewer: P4567L28: filed should be field. Authors: Yes. Thanks for the detection of this typo.

Reviewer: Table 3: \* means with the same letter. . .not sure what do you mean. Authors: In this table, multiple comparisons were used to test the difference of SMC between different slope positions. The letter followed the temporal- and depth-averaged SMC value was used to denote the results of LSD (least significant difference) test. In the same column, if SMC between any two different slope positions were not significant different, then the same letter was typed after SMC values. Otherwise, no same letter would be found.

C2545

C2546