

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

### **Anonymous Referee #3**

Received and published: 22 May 2012

#### General Comments:

The authors present a novel dataset of soil moisture measurements from the Loess Plateau of China and the topic is appropriate for publication in HESS. The disturbed samples were made in soil cores from 0-2 m and 2-8 m over different time periods and a range of vegetation types, slope, aspect, and hillslope position. While I found the mean behavior of the measurements and conclusions interesting, I had a difficult time reading the paper because of grammar and word choice, please see technical comments for a few examples. I suggest the paper be edited for basic English grammar, as it is not acceptable in its current form. In addition to the grammar problems, I have reservations about the conclusions of the paper given the inherent uncertainty of point soil moisture

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measurements. It was not clear to me whether the mean values were statistically significant given the standard error, please see specific comment 2 below. I believe the paper needs major revisions before publication.

#### Specific Comments:

1. The grammar of the paper made it difficult to read and is not appropriate for publication in its current form. Words were commonly conjugated incorrectly or the completely wrong word was chosen making understanding the paper difficult. While I have provided a list of technical comments here it may be most appropriate to have a professional scientific writer proofread the manuscript.

2. It is not clear to me that any of the mean soil moisture values for vegetation type, slope, aspect, position are significantly different from the other mean values. The authors state that 3 random sample points were chosen to estimate the mean behavior (Page 4560 L 15). The authors state that 30 individual samples were used to estimate the average soil moisture of 0-2m in 20 cm increments. It seems to me that there should only be 3 independent samples, not 30. Given the standard deviations in Tables 2-5 are on the order of 1-2%, I am not sure the standard errors of  $1-2\%/3^{0.5}$  are statistically significant given the small differences in the reported means? Also, it is not clear whether the soil moisture content is gravimetric ( $\text{g g}^{-1}$ ) or volumetric ( $\text{m}^3 \text{m}^{-3}$ ). The authors should include the units instead of the ambiguous %. If the units are indeed volumetric then the authors must have assigned average bulk density values to convert the disturbed gravimetric measurements to volumetric. Table 2 illustrates the variability in bulk density, where samples were only taken at 0-5cm and 20-25cm (pg 4561, 1-2). From Table 2 the sample bulk densities vary between 0.8 and  $1.2 \text{ g cm}^{-3}$  and may account for the variation in mean behavior reported by the authors. The authors report the loess is homogeneous (pg 4556, 12) but the variation in bulk density indicates otherwise or the samples are too small to get a representative sample. I suggest the authors clean up the soil moisture units, include their assumptions about bulk density estimates if needed, and redo the uncertainty analysis but with individual

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sample sizes of 3 instead of 30 as I think it has been currently done to see if they get the same statistically significant differences.

3. The authors conclude that there are differences in the deep soil moisture pools due to vegetation differences of water use. However without any direct measurements of water flux in the top layer (either deep drainage inferred from modeling results of the observed state variable of soil moisture or evapotranspiration from latent energy measurements), it is difficult to believe the small observed differences in the mean soil moisture, particularly given the small number of disturbed samples as discussed in 2. The authors suggest the rooting profiles and abstraction rates are the likely cause but they provide only above biomass differences. Is there any direct evidence of different rooting profiles for the different vegetation types or for different above ground biomass? Direct evidence would greatly strengthen the authors' arguments and conclusions.

Technical Comments:

A scientific writer for basic sentence structure, conjugation, and word choice should edit the manuscript. Here are a few examples but it is not an exhaustive list.

Pg 4554, 7-9: The sentence does not make sense, rewrite. I believe you mean variations in slope, aspect . . .

Pg 4555, 5-9: the introduced vegetation phrase does not make sense in the sentence

Pg 4555, 11, should be needs

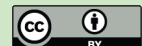
Pg 4556, 4, In fact, factors is an awkward phrase

Pg 4556, 8, complicated should be complex

Pg 4556, 11, should be are homogeneous

Pg 4556, 24, should be are the same

Pg 4557, 11, should be the rainfall had a uniform. . .

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Pg 4557, 24-26, start sentence with, Because the study area is located . . . then water shortage major constraint. . .

Pg 4558, 3, should be native natural

Pg 4559, 4, should be soil moisture variations

Pg 4559, 8, and 4562, 5, phrase should be top and bottom and head and foot.

Pg 4559, 15, meanwhile is an awkward transitional statement

Pg 4559, 19, should be From the limited. . .

Pg 4561, 18, should be of mean values

Pg 4563, 1-2, sentence doesn't make sense

Pg 4563, 6-7, showed what difference?

Pg 4564, 12, not sure what is full of capillary pore

Pg 4564, 23, led is wrong word

Pg 4565, 27, should be proven by previous studies

Pg 4567, 19, leaded should be led

Pg 4567, 28, should be field investigations?

Table 1. Add phrase year sense disturbance

All tables and figures should have soil moisture units of  $g\ g^{-1}$  or  $m^3\ m^{-3}$  to avoid confusion.

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