

## ***Interactive comment on “Spatio-temporal variations in soil hydrology of a typical semiarid sand-meadow-desert landscape” by L. Duan et al.***

### **Anonymous Referee #4**

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The manuscript overall objectives and conclusions address relevant scientific questions within the scope of HESS, especially the study of the spatial and temporal characteristics of the water resources in land masses and the study of the interactions with human activity. The paper provides a detailed description and interpretation of spatio-temporal variation of soil moisture hydrology and present supporting evidence for land cover/use influences on soil physiochemical properties. A highlight of this study is the simple fact that variation of soil moisture and the influence of land use on soil properties in a semi-arid/desert ecosystem remain poorly studied. Although, the manuscript presented in its current form does provide a contribution to the field, there are several minor revisions that should be addressed before publication, in my opinion. I have attempted to provide helpful, specific suggestions (below) that might be considered.

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## Specific suggestions:

1. Title: The paper has two main components (1) tempo-spatial variation in soil moisture and soil physiochemical properties, and (2) the influence of land cover/use of these variations. The title as presented in current manuscript just highlights on the variation of soil moisture. I recommend changing it so that it reflects more on all paper components.

2. P: 1897, lines 21-24. “Their results showed that the spatial variations in the soil physicochemical properties (e.g., total P) were more uniform in the areas of grazed dunes, but that the variations of soil moisture were more diverse in the areas of recovered sand dunes”. As it reads now, I understand that both soil physiochemical properties and soil moisture were more uniform in grazed dunes. Is this right? If so, then I suggest rephrasing it.

3. P: 1898, lines 18-19. “The study was conducted in a selected area of the Horqin Sandy Land that is typical in terms of hydrologic condition, topography, soil, and land cover”. You are using the term “typical” but it is not clear if it is typical for the Horqin Sandy land or for semi-arid/sand-meadow landscape.

4. P 1899, lines 16-18. Add the last name(s) of the person(s) who described each species (e.g., was it Linnaeus? If so, add an "L." after "halodendron". Do this once for every species mentioned it in your text.

5. P: 1900, line 4. “Similar concerns also exist in other regions in the world”. It would be good to provide some examples of these regions.

6. P: 1900, lines 16-17. “Soils at 10, 20 and 30 cm vertical depths were extracted for tests of 14 soil parameters (Table 1)”. Add a sentence to explain your rationale behind sampling soils at different depths instead of different horizons. Also in Table 1, what is Available N representing? (Is it representing NO<sub>3</sub>-N and NH<sub>4</sub>-N ?). Same for Available P and Available K.

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7. P: 1902, lines: 4-5. “The median was assumed to be the daily value of the parameter at that soil depth on that day”. Add a sentence that explains your rationale of using the median instead on the mean?

8. P: 1903, lines 9-19. “A paired t-test (two-sample for means) was performed to identify whether the values of a parameter for one land cover were significantly different from the corresponding values of the same parameter for another land cover at a significance level of 0.05”. It is not clear to me why you used t-test to compare parameters in two different land use groups then you used ANOVA to compare the five of them. Were same parameters examined in t-test and ANOVA? If this is the case then I recommend excluding t-test and just mention ANOVA and add a sentence that clearly state the mean separation method that you have used (like LSD, Duncan or Tukey...). Then use the results of the mean separation to show significant differences on figures 6-7-8 and 9 (use designated letters: a, b, c,...).

9. P: 1904, lines 19-21. “This is because vegetation roots can improve soil structure, increasing the soil water retention capacity of soils (Marshall and Holmes, 1988).” Provide other/alternative explanations of the results (vegetation density can affect soil moisture in several ways beside improving soil structure, for instance they might influence water uptake/ soil water evaporation,...).

10. P: 1905, lines 23-25. “The marginal decrease of soil moisture at site C2(G) and C3 (Fig. 3) can be attributed to the development of roots of *Leymus chinensis* tending to break the capillary rise and/or that the depth to water table at site C3 was deep (>1.0 m; Fig. 4)”. Provide other/alternative explanations of this result, especially that *Leymus chinensis* is dominant in C2(G), C3, D2, E2(C), E2(U), and E3(C) but the lower moisture content was only observed in C2(G) and C3.

11. P:1907, lines 11-13. “An ANOVA test indicated insignificant differences for bulk density, K, pH, and electrical conductivity, but revealed significant differences for the other physicochemical properties”. I suggest that you list the physicochemical properties

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that were significantly different as well.

12. P 1907, lines 24-25. “This indicates that the decrease of silt-clay content will likely cause the decrease of soil organic matter, nutrients, and water holding capacity”. Soil organic matter is mostly related to vegetation cover and microbial activity in a given plot/area. I don’t think that it’s right to conclude that the decrease of silt-clay will likely cause a decrease in soil organic matter. I suggest that you rephrase the sentence to “the decrease of silt-clay and/or soil organic matter will likely cause the decrease of nutrients and water holding capacity”.

13. P: 1908, lines 1-3. “however, insignificant correlations were found between any of these soil properties and total K, available K, pH, bulk density, and EC, though the latter five physicochemical properties exhibited variations from site to site (Figs. 5–8)”. I recommend that you provide some interpretations/explanations of the lack of correlation between these variables and the other ones.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1895, 2011.

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