Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrologic feasibility of artificial forestation in the semi-arid Loess Plateau of China" *by* T. T. Jin et al.

Anonymous Referee #3

Received and published: 22 March 2011

General comments: In my opinion, this is an interesting paper that investigates the major factors controlling large scale spatial variability in soil water content in afforested areas of the Loess Plateau (China). The paper focuses on two spatial scales: regional scale (a transect across a large latitudinal and rainfall gradient spanning 300 kms) and watershed scale (three separate watersheds with very different precipitation amount). The data presented here are interesting, and the major conclusions of the paper are probably correct. However, my major concern with this study is the authors' decision to emphasize and focus on the relationships between soil moisture content and environmental parameters at the regional scale, rather than the watershed scale (much more relevant and interesting in my opinion). At the regional scale, latitude and total annual rainfall amount (ranging from 352 to 617 mm) are by far the major factors determining spatial variations in soil moisture content (SMC, e.g. see fig 7), thus overshadowing

and obscuring the roles of other parameters (stand density, stand age, aspect, soil organic matter content, percent herbaceous cover, slope, tree height and diameter, etc). Since the strong positive relationship between rainfall amount and soil moisture across large geographical and climatic gradients is pretty obvious and not terribly interesting, I would strongly advice the authors to focus the paper instead on the watershed scale. I suggest to analyse the relationships between SMC and all the abovementioned environmental parameters (stand density, etc) separately for each watershed. I would emphasize the differences and similarities between watersheds in the relationships between environmental parameters (stand density, etc) and SMC, and would then discuss the role that total annual precipitation may have in modulating these relationships. Also, I recommend that the paper is revised by a native English speaker for the sake of clarity and readability.

Specific comments:

P656, L12: the difference between "neglectable" and "non-apparent" is not very clear to me, please reword.

P657, L8-9: How uniform is soil texture across the latitudinal gradient? And how uniform is it within watersheds? This is an important consideration for the interpretation of SMC data (e.g. the authors recognize that soils are sandier at the northern end of the regional gradient). It would be very helpful if the authors could provide detailed soil texture data for the different watersheds.

P657, L19: How many of these 30 sites were located in watersheds 1, 2 and 3?

P658, L10-11: These degrees refer to aspect, not temperature, so please remove all the "C" after the figures. Also, do the figures stand for angles in degrees , measured clockwise from north, so that 0-360° is North and 180° is South? If so, please rephrase and clarify in the text.

P658, L14: What is the difference between stand density and canopy density? Please

explain it.

P660, L5-7: This contention is somewhat contradictory with the underlying assumption that soil texture is relatively homogeneous across the entire Loess Plateau region. If this assumption is not correct, please provide soil texture data for the 3 different watersheds at least.

P660: I recommend to eliminate the whole 3.2 Section, as the true relationships between environmental factors and soil moisture are greatly overshadowed and confounded by the rainfall gradient at the regional scale. I think the relevant scale to investigate these relationships is the watershed scale.

P660-661 and Fig 5: Again, I think it would be much more adequate and informative to conduct separate CCA analyses for each watershed, and then compare the results between watersheds.

P661, L11-12: This result supports my view that the relationships between SWC and environmental parameters will likely be very different between watersheds due to widely divergent climates.

P662, L8-14: I think this is the correct way to analyse the data, so please conduct similar analyses to evaluate the influence of all the other environmental parameters.

P663, L1: evapotranspiration instead of evaporation.

P663, L4-5: Once again, how uniform is soil texture within and across watersheds in this region?

P663, L11-13: Is self thinning in high density stands and important process in these afforested plantations, and the major reason for decreased stand density with stand age? Please clarify.

P663, L24-28: please rephrase the whole paragraph, as it is difficult to understand in its present form. The meaning of the terms "shielding" and "low suction force for water"

is unclear in this context.

P664, L24-25: What do you mean by "shadowed roots"? Please reword and clarify.

Table 2: The correlation between Stand age and SMC at 30-40cm depth must be wrong, please correct this error.

Fig 2. Please provide the N (sample size) for each soil moisture profile.

Fig 4. Please conduct separate analyses for each watershed.

Fig 5. Please consider conducting separate CCA analyses for each watershed.

Fig 6. I think the relationship in fig 6b (watershed 2) is asymptotic (reflects a saturation response of SMC when SOM content is greater than about 12 mg per gram of soil).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 653, 2011.