Responses to Comments

We have listed the comments in black font and our responses in blue font.

Anonymous Referee #3

Thank you very much for your valuable and useful comments, and also for your time and effort in improving our manuscript.

General comment and decision:
This manuscript explores the impact of vegetation type and growth age on soil water content profiles at three sites in the Loess Plateau of China. The profiles are interpreted towards extent of soil drought in deep soil layers by different indicators and these are compared between different growth stages. Most of the indicators rely on estimates of field capacity and permanent wilting point which, as far as I understood, stem from independent measurements at a different site. This is problematic.
Apart from that, the paper lacks in novelty and the results are rather obvious and not well discussed. For instance, accompanying simulations with a 1D Richards model, real data for atmospheric forcing (measured at the sites or stochastically generated from available statistical data), vertically resolved estimates of hydraulic properties from available texture data and pedotransfer functions and rough estimates of a root density profile from the presented root weight data could be of great help, to test if the presented soil moisture profiles are reproducible. It would shed some light on important plant-soil interactions like hydraulic redistribution by soils and compensational root water uptake or hydraulic lift by plants. Also, the impact of atmospheric forcing (e.g. a very wet or dry year) could be better discussed then.
All in all, I cannot recommend to publish the paper in HESS.

Reply: Thank you for your comprehensive, informative, and reasonable evaluation. We revised the manuscript according to your suggestions as follows: (i) introducing pedotransfer functions (PTFs) to determine field capacity and permanent wilting point at each sampling soil layer, by using the measured data of soil particle composition and soil organic carbon; (ii) using HYDRUS 1D model to simulated the soil water content; (iii) making a broad discussion on the relationships of plant-soil interactions.

Specific comments:
The abstract is of little help in giving a concise summary of the manuscript. It contains too many abbreviations, some wrong expressions and is generally hard to read.

Reply: We have revised the abstract, and removed some abbreviations.

The introduction needs some improvements, not even mentioning typos, grammar and

wrong expressions. In some of the mentioned studies the authors only repeat objectives without discussing their findings, e.g. Yao et al. (2012) in P12032 L8-11 or Li & Huang (2008) and Wang et al. (2010b) P12032 L16-24. Also the three different objectives presented on P12033 L23-27 are virtually the same.

Reply: As also suggested by the other reviewers, the introduction was rewritten thoroughly.

Most critical in the materials and methods section is how the authors deal with soil heterogeneity. The authors report that soil moisture exhibits spatial variability (P12035 L15-19). This may stem from soil heterogeneity or a heterogeneous root distribution or both. The authors should have collected more replicates from additional drillings to capture this heterogeneity. On top of this, they only used one set of hydraulic variables (PWP, SFC, FC) for the entire soil profile in Ansai and Luochan in spite of soil heterogeneity.These values are adapted from published values in Li et al. 1983 and Wu et al. 2011. I couldn't retrieve the first reference. Yet, the second one presented results for a location called the north Yangling district in the Loess Plateau, which is according to the geographical coordinates a completely different site and might have values far off from those at the three studied locations. This is not discussed at all. One more specific detail: DSL-SWC is only added over horizons in which the soil water storage is depleted beyond SFC. What if, there are layers in between which are still moister than SFC, due to lower root density or different soil texture. They should negatively contribute to DSL-SWC due to hydraulic redistribution into the surrounding dry layers, because loess has a relatively high unsaturated hydraulic conductivity.

Reply: (i) The heterogeneous of soil properties was taken into account by introducing the PTFs which were used to determine the field capacity and permanent wilting point at each sampling soil layer, in revised manuscript. This would be a way to overcome the variation of soil textures in the deep profile.
(ii) The hydraulic redistribution of moister layer, which may transfer water into the surrounding dry layers with a relatively high velocity, is a very interested and important scientific issue. We have discussed this process in revised manuscript.

Discussion section: The interpretation of five different stages in soil water- plant growth relationships is promising (P12043 L21- P12044 L9). It should have a more prominent role and should be accompanied by references.

Reply: This sentence was improved and accompanied by references.

Fig 2: The authors should use more distinguishable colors than just different kinds of blue. Also the red SFC lines do not correspond to the values listed in Tab. 1. Some prominent features like a layer of high soil moisture at 9m depth in Luochan (12years)

are not discussed and a red line for SFC in missing in Fig. 2d, probably because the values are different in each growth age plot (see Fig. 5 and main text at P12041 L3-6). Why do you conversely assume homogeneity in the other locations? This has to be discussed.

Reply: Since we introduced the PTFs in revised manuscript, the related data was corrected and thus correspondingly the data presented in Tables and Figures were changed. The quality of the Figures was improved. The conversely assumption of homogeneity in the other locations was discussed.

Fig.3: What does a-f stand for? "Changes of mean soil water ..." in the caption is misleading as you do not plot the difference between years on the y-axis.

Reply: (i) "a-f" represents the statistical difference among the measured mean values. The same letter means the difference is not significant.
(ii) The caption was corrected.