

## ***Interactive comment on “Effects of terracing on soil water and canopy transpiration of Chinese pine plantation in the Loess Plateau, China” by H. Zhang et al.***

### **Anonymous Referee #1**

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The manuscript presents a study to explore and possibly quantify the effect that terracing might have on soil moisture and canopy transpiration of pine plantations. The main conclusion of the study is that terracing increases soil moisture, with a consequent enhancement of transpiration and growth; accordingly, terracing can be an effective way for re-vegetation in arid regions.

My major concern with the manuscript is that, although the conclusions of the study seem reasonable, the design of the experiment does not seem to really address the research question that the Authors want to answer. There are many reasons why soil moisture and transpiration might be different in the 2 plots selected for this study; since a lot of details on the experiment are not given, it is difficult to isolate the effect of slope

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or terrace on the water balance.

I also believe that some of the technical parts (e.g., calculation of REW and results on  $g_c$ ) are not fully correct and could be largely improved.

I listed below some specific comments and suggestions.

- Lines 24-25: re-phrase.

- L37-38: re-phrase.

- L80-81: this statement should be backed up with some additional information. What is the water table depth? Are there measurements of root depth? How can the Author be certain that trees are not reaching groundwater or the capillary fringe?

- L83: it would be good to say here how large the plots are (100 m<sup>2</sup> according to Table 1) and what percentage of the entire slope and terrace they cover.

- L85: when were the trees planted? Do they have the same age in both sites? What is the tree density and how many trees are in each plot?

- L94-96: how many soil moisture profiles were in each plot? It looks like there was only one profile per plot. Considering that the plots are about 10 m x 10 m, is one profile enough to compare the two plots? The Authors should justify this.

- If the two plots have the same soil and vegetation, REW should be the same. By using different  $\theta_{max}$  and  $\theta_{min}$  in the two years and in the two plots, the comparison between plots becomes rather confusing. I would calculate REW based on the minimum and maximum  $\theta$  in the two years irrespective of the plot, so that the comparison between plots is done using the same scaling of soil moisture data.

- Eq. 4: how was the xylem (sapwood) area measured? Since the DBH of the trees in the two plots is rather different (that is why it is important to know whether the trees were planted at the same time), larger  $A_s$  will be associated with larger transpiration rates. Errors in estimating  $A_s$  are going to affect the estimates of  $E_c$ .

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- Eq. 5: it is said that 6 trees per plot were instrumented with sap-flow sensors. Is the average of these fluxes used in this equation? It is not really clear how the measurements in 6 trees were used in Eqs. 4 and 5.
- L142-143: the Authors should explain in detail why the measurements at 10 cm were not used. Since it is likely that the majority of the root system of pines is in the first 30-40 cm of soil, using soil moisture data only at 30 cm and below will reduce the ability to link transpiration and soil moisture.
- L193: what does 'in each layer' refer to here?
- Table 1: what is the meaning of 6/14 and 6/21
- Figure 1 could be removed
- Fig 2: I would add rainfall in the figures with REW (and I would calculate REW as suggested above). It is said that the 2 plots are under the same conditions; however, looking at the delay between the increases in REW in the two plots, it seems that there might be differences in rainfall.
- Fig 3: in the text, it is said that there are 6 trees with sap flow, while here  $n=3$ . Why?
- Fig 5: it should be explained better what this figure shows. It looks like the two axes are  $\theta_{terrace} - \theta_{slope}$  and  $E_{terrace} - E_{slope}$ . Is that correct? Are these daily values or values every 30 minutes? What is the message of this figure?
- Fig 6: I would show here how  $E_c$  (not  $g_c$ ) relates to solar radiation and VPD.
- Fig 7: this is not a frequency distribution of maximum sap flux density. It seems that this figure shows the percentage of time the daily maximum flux and the daily maximum VPD occurred at certain times of the day.

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