

***Interactive comment on* “New measures of deep soil water recharge during vegetation restoration process in semi-arid regions of northern China” by Yiben Cheng et al.**

Anonymous Referee #2

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The Three North Shelterbelts is a huge afforestation program launched in China in the last century, which has made great contributions to regional sand fixation, dust-storm prevention and ecological environment improvement. However, it caused great concerns about hydrological cycle and ecological environment evolution. In this manuscript, the characteristics of water cycle were obtained through the comparative analysis of the observation data of the key parameters in the process of hydrological cycle in the *Artamisia sphaerocephala* Krasch sand-fixing land in the Three North Shelterbelt area. The basis of this research is the formula (1) in L160, as the evapotranspiration, the manuscript stated “Evapotranspiration is calculated through a water balance equation when precipitation and soil moisture data are collected”, how is

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it calculated? whether the calculation is accurate. Is $DSR = P + C_m \cdot d - E$? $\pm \Delta W$ a soil moisture storage change (should be variation here), what is the physical basis or meaning? W is soil moisture storage, what is this? what form it is stored? Since the horizontal growth of shallow roots is concluded, is it reasonable for the Lysimeter not to consider the horizontal soil water transformation? In addition, how many samples of *Artamisia sphaerocephala* Krasch sand root excavations? How representative is it? Before accepting for publication, all these questions need to be implemented by the authors.

Specific questions

L16-all other lines: Why do not use the Eddy Covariance System to measure the near surface evapotranspiration? At least the calculated values should be validated by this observation.

L72-other lines: The full text should use the passive voice, because characteristics of *Artamisia sphaerocephala* Krasch are not developed by itself, but formed by environmental forcing.

L133: Since the *Artamisia sphaerocephala* Krasch developed horizontal root, is it too small to excavate a length and width both of 0.3m soil column or design such size of a lysimeter?

L163: How the DSR is measured or estimated should be specified here.

L206: It makes sense to analyze the changes of soil organic matter.

L240: How to physically define the thawing recharge period, germination consumption period, rain season recharge period and plant dormancy period and the frozen soil period?

L245: Figure 3 should show the soil temperature curve to identify whether it is soil thawing period.

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L504: What is "sufficient precision" means? I'm sure that 2.33 will be changed with a different "sufficient precision".

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