

Interactive comment on “Effects of vegetation change on evapotranspiration in a semiarid shrubland of the Loess Plateau, China” by T. T. Gong et al.

Anonymous Referee #1

Received and published: 4 January 2015

In this paper, the authors attempt to investigate the effects of vegetation change on evapotranspiration in shrubland area. Eddy-covariance measurement of three periods' data was analysed. The authors would like to conclude that 1) the cut-off of vegetation increased evapotranspiration; 2) the soil evaporation consumes more water than canopy transpiration in this study site. Overall, the authors did lots of work on field experiment and data analysis. The kind of observation and experiment is very important and interesting for hydrologists and land surface modellers to understand the land surface water and energy processes. I appreciate what the authors have done. But I think the authors have to do more intensified and condense discussion to clarify and support

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these two main conclusions.

For the first conclusion, the authors compared three years' observed ET data. It was found that the observed ET increased after the cut-off of original vegetation in this study site. But the authors should note that the increase of ET might be caused by several factors. Except for vegetation, meteorological condition is another important influence factor, especially the temperature. From Figure 4, it is clearly shown that from 2011 to 2014, the monthly temperature obviously increased. This could increase potential evaporation and then the actual evaporation, which is not related to vegetation change. Additionally, Figure 2 shows that the bare soil might be tilled in 2014, which could release more soil moisture as well. The difference between original bare soil and tilled bare soil should not be neglected. Overall, I think the authors should exclude the influence of these factors in different years, before the analysis of vegetation impact.

For the second conclusion, I suppose this statement is not quite clear. If the authors would like to discuss the total amount evaporation from soil is larger than the total amount of transpiration from canopy. I would agree with that. Because bare soil/sparse shrubland is the dominated land cover in this arid study site. If this is true, I do not see any relationship between this statement and the influence of land cover change on evapotranspiration. If the authors intended to say that the soil evaporation of each unit area is larger than the transpiration from each unit area covered by canopy. Firstly, the other influence factors should be excluded before doing analysis. More importantly, I suggest the authors explain the possible physical mechanism of this phenomena. Since this does not quite match with our knowledge on evaporation that soil evaporation can only consume soil moisture in top layer; while vegetation can consume soil moisture in deeper root zone layers, especially in this arid area where the rooting depth could be over 1m. I would like to ask the authors to do more discussion on this issue.

Thirdly, I am quite confused with the discussion on impacts of phenological change on ET and effects of land use change on ET. The authors mentioned that ET has positive relationship with NDVI on the influence of vegetation phenology. This indicates that

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the better vegetation it is, the larger ET it is in different seasons. Simultaneously, the authors mentioned that after the vegetation cut-off, annual ET increased. I would like to authors clarify this 'contradiction'.

Small comments:

P13572 (P72 hereinafter), L20: '...consumed by ET...', references are needed.

P73, L17: references are needed.

P80: Equation 7. It might be $\theta > \theta_k$ in the first line.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 13571, 2014.