

## ***Interactive comment on “Soil moisture control on sap-flow response to biophysical factors in a desert-shrub species, *Artemisia ordosica*” by Tianshan Zha et al.***

**Anonymous Referee #2**

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The study investigates the modulation of sap-flow response to biophysical factors (solar radiation, air temperature, and vapor pressure deficit) through soil moisture content in a semi-arid ecosystem. Soil moisture controls sap flux in shrub, *Artemisia ordosica*. Diurnal course of sap flow to biophysical factors modulated by soil moisture contents, and sensitivity enhanced with higher soil moisture levels.

I enjoyed reading. It will be a good contribution to Biogeosciences. I have some minor comments which should be addressed about the drought classification, soil and vegetation characteristics. Also at the end, I have some minor points about writing.

Based on Li et al., 2014 (L108), shrub is shallow rooted. If available/known, it may be good to include root distribution of *Artemisia ordosica* such as XX% of shrub roots are

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located within the top 30 cm, and tap root can reach up to 60 cm (Zhao et al., 2010 from L291). This also supports your soil moisture content measurements in the top 10 cm and 30 cm.

If available, it will be good to include stomata closure point, wilting point, and hygroscopic point levels. Hence, the reader can judge the severity of drought. So, there will be some justification based on your drought classification. You used 0.08 (L178), 0.09 (Figure 2), and 0.11 (Figure 2). Is it 0.08 or 0.09?

Also knowing wilting point and hygroscopic point helps us appreciating the Figure 6. You stratified soil water content based on three limits. How much severe the lowest value. My back of envelope calculation by using Campbell (1974) for sandy soil where porosity is  $\sim 0.42$  ( $1-1.54/2.65$ ), the wilting point (15000cm) is  $\sim 0.07$ . It seems your wilting point is much lower. Definitely, to appreciate the Figure 6 and drought severity, giving values are beneficial.

A little more detail about vegetation setting is beneficial. LAI and plant canopy cover of shrub are beneficial. As far as I know, in Mu Us Desert dunes are migrating or semi-migrating depending on canopy cover. So, it will be beneficial for readers.

L272-274. In your DISCUSSION, it will be good to include climate for these plant species. Because your ecosystem which is water-limited, most probably different than their study sites! For example, Huang et al. (2009) study site (L275) is in Guangxi, China where annual precipitation is 1900 mm, and mean annual temperature is 19.3°C. Most probably some/most part of the year, the ecosystem is energy-limited. So, it is not so surprising to see solar radiation control on sap flow. I could not find electronic copy of Zhang et al. (2003) work. Please include prevailing climate in their study area too.

L276-L278. To emphasize the importance of small events on ecological processes, I want to draw authors attention another study by Sala and Lauenroth (1982). Sala and Lauenroth (1982) showed the ecological importance of small events (<5mm) in

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semiarid site where dominated by C4 grass. I will be worth to check!

Sala O.E. and W.K. Lauenroth (1982). Small rainfall events: an ecological role in semi-arid regions. *Oecologia*, 53 (3), 301-304.

Minor Points:

L69. VERB. . . .low soil water availability limitS . . . .,

L70. VERB. . . .limitS vegetation productivity

L73. I recommend citation for: grass replacement by shrubs.

L103. Capitalization. . . .the Mu Us Desert. . . .

L125. Capitalization. . . .the Mu Us Desert. . . .

L137. VERB. Mean height and sapwood area of sampled shrubs WERE . . . .

L156. Replace UPSILON in the equation with lower-case gamma,  $\gamma$  for psychrometric constant.

L161. Insert a comma after "ground". . . .the ground, and. . . .

L180. VERB. Linear and nonlinear regression WERE . . . .

L197. VERB. Total precipitation and number of rainfall events. . . . WERE lower than THOSE. . . .

L266. VERB. Synergistic interactions . . . . ARE. . . .

L355-461. Please go through the references. Make sure the unity within the references. Journal names abbreviated some of them (L361, L367, L370 etc.), but not others (L 358, L383, L386 etc.). Choose one of them and stick with it. L424. Typo. Systems. . . L430. Typo. EcologY. . . L449. Typo. PLoS ONE. Compare with (L461 and L373). Use lower case for article names. Check (L456, L461, L416 etc.).

L541. Figure 4. I recommend following some color scheme (pattern) to represent

C3

different months such as jet etc. This change will help the readers to follow the figure easier than the current form.

L553. Insert a comma after (dimensionless). . . . (dimensionless), and . . . .

L554. To distinguish from straight arrows, I recommend using 'curved arrows' such as: The CURVED arrowS indicate the clockwise. . . .

L558. I recommend using 'three' instead of '3' days.

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