Reply to Referee 2#

Overview This study assessed the relationships between evapotranspiration (ET) and change of land by analyzing the eddy-covariance measurements of actual ET together with data of a number of its potentially influencing factors including normalized vegetation index, soil water content as well as climate variables to estimate potential ET. Data are collected from a case study with different periods reflecting changes of land-use conditions, which provides further evidence to support the statistical analyses. The manuscript is well written and the knowledge promoted is a clear contribution to the understanding of how ET processes can potentially change with land-use in semiarid regions. I think this study is suitable for publication after moderate revision, with improved clarity and better flow especially for the Introduction and Methodology - please see my major comments below.

Answer: Thank you for your positive comments. We will revise our manuscript by carefully following your comments and suggestions.

Major comments:
1. The Introduction launched quite well with highlighting the importance of the assessing relationship between ET to vegetation conditions in arid/semiarid regions (L28-37), followed by a comprehensive literature review explaining relevant physical mechanisms (L38-61). However, the third paragraph (L62-79) seems to be a bit disjointed as the flow of ET/vegetation stops and shifts to the case study, whereas paragraph 4 (L80-98) returns to the ET/vegetation flow and paragraph 5 again introduces the study site. I think the easiest way to improve the flow is by swapping paragraph 3 and 4 (I found this can in fact fit better with your current connecting sentences between paragraphs i.e. L60-61, L96-98). So you would have: Paragraph 1: importance of the assessing relationship between ET to vegetation conditions in arid/semiarid regions Paragraph 2: physical mechanisms on how vegetation can influence ET (finish with L60-61 which then leads to the method of assessing these impacts) Paragraph 3: method to assess the vegetation impact on ET (finish with L96-98 which then leads to the case study in a sparse shrubland) Paragraph 4: introducing the case study and how it can contribute to the above-mentioned knowledge gap. I'd also recommend combining this use some discussion from the current paragraph 5 (L99-101) to help justifying the choice of the case study. Paragraph 5: I'd recommend to leave this paragraph purely as a summary of the study (as current L102-104), and maybe elaborate a little bit with highlighting the significance of the study. I think the above structure can allow the storyline about ET/vegetation relationship to complete before introducing the study site, which provides a smoother transition and also better justification on the use of Mu US sandland as the case study.

Answer: We will re-arrange these paragraphs by following your suggestions.

2. I appreciate the comprehensiveness of Section 2 which covers the details of data collections methods and models used to analyze different data variables. However, I found that Section 2.3.2 become a bit confusing with introducing models related to a number of variables. As this section describes the methods employed for the core

analyses of the study, I think the clarity can be further improved by using further subsections for individual variables. In addition, I think the methods used for data analyses should be introduced as well. Currently the statistical methods used for data analyses are mainly described in the Results section (e.g. L325-327, L380-384, L386-L389). I think it can be clearer to summarize them in the Section 2.3.2 instead (probably as an overview in the start of this section). In this way you can better justify why these analyses are conducted and how they help to answer the research questions, while purely focusing on the results and interpretation in the Results section. And then the readers can get an overall understanding on the data analyses to be conducted and knowing what to expect in the Results section. So I'd suggest the following structure for Section 2.3.2: Sub-section 1: overview – introducing the variables which are needed for analyzing the impact of ET and vegetation conditions (these will be detailed in the following sub-sections), and what analyses will be conducted with these variables (e.g. as those introduced in L325-327, L380-384 and L386-L389 etc.) Sub-section 2: estimating potential ET Sub-section 3: estimating soil water content Sub-section 4: estimating NDVI ...

Answer: We will re-arrange the structure of this section by following your suggestion.

3. I think the Section 2 (Material and Methods) is a bit too long trying to cover different aspects including case study, measurements of raw data, data processing and analyzing. In my opinion a better way to organize these is to break Section 2 into two sections, for example as: Section 2. Case study and data (note:I'd use 'data' to refer to the raw measurements here rather than in the next section, where you introduce data-processing and analyzing.) 2.1 site description 2.2 measurements ... Section 3. Methodology 3.1 flux data processing 3.2 footprint model 3.3 method of analyzing controlling factors of ET (and if you agree with my last comment, the sub-sections can go below:) 3.3.1 ... 3.3.2 ... ...

Answer: We will rearrange Section 2 and 3 by following your suggestion.

Minor comments:
1. L30: 'ET' - please define acronym when it first appears in the text, and please also check if all other acronyms are properly defined.

Answer: We will add the definition of ET.

2. L101: '4' - please spell out numbers less than 10 i.e. as 'four-year'.

Answer: We will revise it.

3. L111: please delete the repeated 'temperate'. Also, is there a better way to introduce the climate zone, as currently it seems like a 'noun train' ('temperate semiarid continental monsoon climate'). You can find some examples on improving 'noun train' from http://www.webwritingthatworks.com/DGuideCOG5b.htm.

Answer: We will revise it.

4. L194-195: Would there be any impact on the results from this data removal, and

would this be a limitation of the study? This should be briefly discussed (Maybe in the Discussion or Conclusion section?).

Answer: We will add necessary information about the missing data and discuss the limitation.

5. L208-211: It would be clearer if these lines can be presented as individual formulae (i.e. in the format of L219). Also, according to L205, the 'n' in 'Rn' should be subscripted - please also check that the use of other symbols is consistent throughout the text.

Answer: After considering your comment, we think it will be better to change these lines from several formulae to the following form: "$= a * (R_n - G)^2 + b * (R_n - G) + c$ (Period I: a = 0.0014, b = 0.075, c = 10.69, R = 0.77; Period II: a = 0.0012, b = 0.056, c = 17.69, R = 0.67; Period III: a = 0.0014, b = 0.16, c = 13.24, R = 0.75; Period IV: a = 0.0015, b = -0.083, c = 25.87, R = 0.69)"

In addition, we will revise the R_n and check the use of other symbols throughout the text.

6. L246: 'psychrometric constant' - what is the value of the constant?

Answer: We will add the equation of psychrometric constant in the text.

7. L248: 'U2' - where is it in Equation (5)?

Answer: U_2 is used to calculate the aerodynamic resistance (r_a). We will move the equation of calculating U_2 from Eq.6 to Eq.8 in the text.

8. L337: 'Ds' - not defined as in Minor comment #1. Also, how are the data of Ds obtained? I couldn't seem to find it in Section 2.2.2 (other measurements).

Answer: Thank you for your kind remind. We will add the information of measurement that obtained D_s in the section of "other measurements".

9. L337: 'normal' - I think 'average monthly' would be a better description here.

Answer: According to your comment, we plan to revise "normal" to "long-term average monthly values".

10. L347: Figure 4 has not been introduced in the text yet, should it be mentioned somewhere between L336-337?

Answer: Yes, we will add the sentence of "Four-year and long-term (1954-2014) average monthly values of D_s, T_a, R_H, P were showed in Fig.4." in this section.

11. L380: 'relationships' - 'correlations' would be a more accurate description.

Answer: Thank you for your suggestion. We will revise the word "relationships" to "correlations".

12. L389-390: the r2 only investigates linear relationships - are you expecting any non-linear relationships which are not covered here and would this be a limitation? This can

be briefly discussed.

Answer: In fact, we have used several common functions (e.g., exponential function, linear function, logarithmic function and quadratic function) to fit the correlations between ET and its controlling factors (E_{TP}, NDVI and f_s). The values of determination coefficient (R^2) are listed in the following Tab.1.

According to the results shown in Table 1, value of R^2 for the linear function is the highest. Therefore, we chose the linear function.

We will add the above information in the section of "Statistical analysis".

Table 1. The determination coefficient (R^2) of the correlations between ET and the three controlling factors.

	ET and E_{TP}	ET and NDVI	ET and f_s
Exponential function	0.46	0.54	0.27
Linear function	0.46	0.54	0.28
Logarithmic function	0.43	0.53	0.19
Quadratic function	0.45	0.54	0.28

13. L464: The term 'BSC' has already been defined in L68.

Answer: We will delete the definition here.

14. L565: It should be worth highlighting some significance and contributions of this study towards the end of conclusion.

Answer: We will highlight significance and contributions of this study at the end of conclusion.

15. Fig. 6: I don't think the use of different shapes is necessary given that you are using multiple panels?

Answer: We will revise Fig.6.

16. L884 (title of Fig. 6): 'r: Pearson's correlation significance' should r be 'Pearson's correlation coefficient' instead?

Answer: Yes, we will revise it in the title of Fig.6.