

Interactive comment on “On the factors influencing surface-layer energy balance closure and their seasonal variability over semi-arid loess plateau of Northwest China” by X. Xiao et al.

X. Xiao et al.

zuohch@lzu.edu.cn

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We would like to thank you for your suggestion on our manuscript. As this paper has been rewritten, and it is very much different from the original one, we feel sorry about that many of the comments can not be revised directly. The comments are addressed in the following response and the manuscript is being revised to accommodate the changes.

General comments: I recommend a native speaker for improving the English. Response: We apologize for the inconvenience caused by our poor English. A lot of work

has been done to improve the expression of this paper

Specific comments: (1) Abstract, first sentence. An example of a sentence which is much too long (eight lines) and needs to be divided in multiple sentence. Response: The sentence has been divided into several parts following reviewer's suggestion.

(2) Page 556, line 25, 26. Unclear. Response: this sentence has been removed.

(3) Page 557, line 5. Skip "too". Response: Since this section has been rewritten, the original sentence has been revised.

(4) Page 557, line 6. "However, not until the late 1980s (...)". Reformulate. Response: We have reformulated the sentence as "However, during the late 1980s it became obvious that the energy balance at the earth's surface could not be closed with experimental data (McCaughey, 1985; Foken and Oncley 1995)."

(5) Page 557, line 8-10. Sentence should be improved. Response: The original sentence has been removed.

(6) Page 557, line 22. Better "land-atmosphere interaction" instead of "air-earth interaction study"? Response: Sure, "land-atmosphere interaction" is better than "air-earth interaction study", thanks for your suggestion.

(7) Page 558, line 6-7. Why is this of much significance to improving land surface process parameterization schemes in models? You work with data but models inherently conserve energy. Response: This part has been removed in the paper.

(8) Page 558, line 24-25. What do you mean with "corresponding figures of 3.47% and 0.775 of the total"? This is not the correct expression. Response: It means that the missing data in spring (in winter) is accumulated to 3.47% (0.77%) during the four years (2006.09-2010.08). This part has been removed in the paper.

(9) Page 559, line 24. The variables u and T_s were not properly introduced. Response: " u " means horizontal wind component, " T_s " means virtual temperature. This part has

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been revised.

(10) Page 560, line 6-8. Why is the number of valid data so low if contributions of less than 50% were removed? Response: We have increased the figure of distribution (see Fig.2) and have given the explanation in 2.4 (3) of the paper.

(11) Page 560, line 12. The energy balance itself has not been introduced yet. I think this is necessary. Response: Thanks for your suggestion and the introduction has been added in Sect. 2.2.

(12) Page 563, line 1-2. “There was deviation delta T (...)”. Sentence very unclear. Response: This sentence means $\Delta T = T_{obs} - T_{TDEC}$. Actually, we have simplified this part of content in the modified manuscript.

(13) Page 563, line 15-19. More recently, see also a multi-site study by Franssen et al. (2010, AFM) for the role of heat storage on energy balance closure. Response: Thanks for your recommendation, I have read it carefully and it helps me a lot. The vegetation type is short grassland at SACOL site, however, the reference is for the tall vegetation (e.g. mixed forest, evergreen needle leaf, evergreen broad leaf, deciduous broad leaf) when research the role of heat storage on energy balance closure.

(14) Page 563, line 24-25. “And the average time is 30 min.” This is not a good sentence like this and should be integrated somewhere else. Response: Thanks for your suggestion and we have revised it as “The averaging period of 30 min is adopted for the flux computation in this paper.” This sentence has been located in Sect.2.3.

(15) Page 563, line 25-27. Sentence very unclear. Response: The original sentence has been deleted and we have revised this part so that readers can understand the paper more clearly.

(16) Page 564, line 1. “typical patterns of fine days”. What do you mean? Response: It just means sunny days.

(17) Page 564, line 5-6. The author should specify how the soil heat flux is analyzed in

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the context of the EB closure. The net surface soil heat flux integrated over a complete year will be close to zero. How can it account then for a comparable portion of the EB gap or net radiation? Probably you mean that for individual 30-minute periods the portion of the soil heat flux was calculated, and later average over the different periods. This should be clarified and precisely defined in the paper. Response: We absolutely agree with the fact that the net surface soil heat flux integrated over a complete year will be close to zero, and because of this, in order to clearly express the surface soil heat flux in the proportion of net radiation, we only selected the data during daytime to analysis. And this part has been got rid of the revised paper.

(18) 565, line 13-14. “(...) meaning that The EBC took place (...)” Sentence should be rewritten. Section 4. I suggest to use as section title “Results and discussion” Response: This sentence has been deleted in the revised paper. We have change the section title to “Results and discussion” and section 4 has now become section 3.

(19) Page 567, line 11-12. “In a similar way we analyzed the seasonal flux contributions in a range of z/L and wind directions in agreement, on the whole, with the above.” Reformulate sentence and specify: agreement what? Response: In the modified manuscript, we added the concrete figures and illuminations of seasonal characteristics for the flux contribution from the target area in percent depending on the stability parameter and on wind direction (See Fig. 7 and Sect. 3.3)

(20) Page 569, line 5. “the results are shown”. Response: This sentence has been deleted in the revised paper.

(21) Page 569, line 20-23. Reformulate and explain. It is very unclear. Response: We have revised it as “Most of the non-convergent ogive function curve generally takes place during stable night-time conditions, or in a condition of sudden change of the relative humidity in the evening and around sunrise.”

(22) Page 570, line 8-10. Unclear what has been done. Modify sentence. Response: “The observations is separated into two parts, one for the daytime and the other for

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night-time, according to whether net radiation R_n is higher than 0.0 W m^{-2} . For both daytime ($R_n > 0.0 \text{ W m}^{-2}$) and night-time ($R_n \leq 0.0 \text{ W m}^{-2}$), the data from each group is segregated into 10 equal portions, each accounting for 10% of the total data, to explore the relationship between OLS slope and R_{lw} . ” has been used to instead of it.

(23) Page 570, lower part. All this information can already be found in Figure 3. Is it necessary to repeat all this in so much detail? Response: We are appreciative for your advice and have revised it in Sect. 3.5.

(24) Page 571, line 10-11. This is a very strange sentence and written as if EBC would be a physical property. Reformulate. Response: The original sentence is “It follows that when turbulent mixing attained certain strength, the EBC arrived at its optimal state and became stabilized.” We have revised it as “It follows that the poor EBC is derived from the weak turbulence. During daytime, the EBC can reach a stable condition and no longer obviously changes with the developed turbulence when the turbulence mixing reaches a certain degree.”

(25) Page 571, line 24-25. “with EBC dropping from spring to winter”. What does this mean? Response: It means that the EBC has a trend to decrease from spring to winter. It has been revised in Sect.3.2.

(26) Page 571, line 26. “in lieu”. What does it mean? Response: We have replaced “in lieu” to “instead”. You can see it in Sect.3.2.

(27) Page 572, line 5. “comparison”. Response: Thanks for referring to the spelling error. The original sentence has been removed.

(28) Page 572, line 17. The spring data are not optimal but “only” have the less missing data over the different seasons. Response: Thanks for your suggestion. And we have already made a corresponding revise.

(29) Page 572, line 23. I don’t think that the conclusions can be generalized for semi-arid climates. They hold for this particular region. Response: We are sorry for missing

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the messages that it is special for native short grassland over semi-arid loess plateau of Northwest China.

(30) Page 573, line 14-15. Which other factors? Response: “But due to other factors the EBC is better in the daytime than the nighttime even at the same Rlw.” In this sentence the other factors include the flux contribution from the target source area, the low-frequency part of the turbulence spectra and diverse schemes for surface soil heat fluxes. And the sentence has been removed.

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