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***Interactive comment on* “Surface energy exchanges above two grassland ecosystems on the Qinghai-Tibetan Plateau” by S. Liu et al.**

Anonymous Referee #1

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General comments: The authors reported seasonal and interannual variability of surface energy exchange at two grassland sites in China. The topic is important to understand how land cover could change surface energy exchanges in high altitudes. However, I found that the analysis was too simple to draw meaningful conclusions. The authors showed many figures (twelve) and simply explained how they look like. There were almost no insightful interpretations on the figures. The authors argued that annual precipitation and air temperature on May were the main determinants to control interannual variability of energy exchange at AS and AM, respectively. However, there was no convincing support on this argument. Also the authors heavily focused on the bower ratio throughout the manuscript, which made this manuscript very boring. Even though bower ratio defines the ratio of H and LE, it only reveals a small piece information on the surface energy exchanges. I recommend analyzing each energy flux

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components, LE and H, rather than just focusing on bowen ratio itself. The comparisons between bowen ratio and Rnet, VPD, SWC, NDVI, and gs in the figures did not provide converging story, which degraded the presentation quality. I do not find significant scientific findings/interpretations in the current form. Finally, there were a lot of language problems. A careful proofreading must be made.

Specific comments: P9164 L11: Report longitude, latitude, and altitude for each site.

P9166 L16: Also consider energy balance. PM equation assumes energy balance is closed, thus energy imbalance can cause unrealistic surface conductance estimates.

P9167 L7: Define the uncertainty. It is applied throughout the manuscript.

P9167 L8: As authors reported, annual rainfall was lower for AS than AM. Thus I suspect the lower SWC at AS is not only due to soil water holding capacity but also due to smaller rainfall.

P9168 L11: It is unclear why the ratio of net longwave radiation to net shortwave radiation is used. Explain why this quantity is related with energy partitioning.

P9168 L24: The expression on the linear model ($\text{albedo} = -0.003 \cdot \text{SWC} + 0.208 \pm 0.002$) is weird. Why \pm appears in the intercept? Also, the authors suggested that albedo was influenced by SWC and vegetation activity. Then the linear model must include both variables. The variance of albedo was explained only 50% when using SWC only.

P9169 L20-22: This section focuses on the interannual variation of bowen ratio. However, the authors used May ET in this sentence. How higher ET in May 2006 is related with annual scale bowen ratio?

P9169 L23-24: I do not follow this logic. The large variation of bowen ratio and precipitation does not necessarily indicate annual bowen ratio is controlled by precipitation.

P9170 L15: Higher sensible heat flux does not necessarily indicate the increase of air temperature. There are a range of feedback mechanisms (e.g. PBL feedback).

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Remove this sentence.

P9170 L15-26: This paragraph is mixed with different arguments that are not related each other. The authors argued that grazing effects must be considered (for what?). How grazing effects modulate energy partitioning? Table 1 shows that there is grazing in the only winter. However, grass is not active in this season. Then why grazing effects must be considered?

P9171 L14: I do not think gs is the indicator of vegetation growth status.

P9171 L15-19: The authors did not explain Fig 7 adequately. Given NDVI (or gs), why bowen ratio at the AM site is higher than the AS site?

P9171 L27-P9172 L12: The Fig 8 shows that SWC controlled bowen ratio where SWC only ranged 5-10% at the AS site. Thus I do not think SWC was the main factor that regulated bowen ratio as the authors argued. What factors explain the variation of bowen ratio when SWC is larger than 10% at the AS site?

P9172 L24: Such an expression “slightly increased” does not make sense. If the authors want to show the positive slope, then report p-value on the linear regression.

P9173 L1-4: Soil heat flux must be considered here. Fig 5 shows that the proportion of soil heat flux in the surface energy budget is considerable.

P9173 L4: It is really unclear whether there is stronger positive relation between bowen ratio and Rnet under drought condition. Fig 9a shows the scatterplot at drought condition looks “clouds”. Develop linear regression for both drought and non-drought condition, and then test whether their slopes are significantly different.

P9173 L5-8: Did Gu et al (2006) conduct field measurements at the current study sites?

P9173 L5-12: I recommend moving this paragraph to the next section because the current section focuses on Rnet, not VPD.

BGD

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P9173 L16-17: Test the significance of slopes in the Fig 10 a and b. If VPD and bowen ratio showed significantly positive relation at drought condition, explain the reason.

P9173 L20-21: Use statistics. In Fig 11 a and b, test whether the slope is significantly negative. The authors argued that the slope was “sharper” at (b). Prove this using statistics. In Fig 11, narrow the x-limit from 0-3 to 0-2.

P9173 L20-21: Define the degree of “medium”.

P9173 L23-24: Fig 10 and 11 are not comparable because they used different criteria to separate their data. The comparison between 10a and 11 does not make sense.

P1973 L24: “nonlinear”. Fit the non-linear curve and report p-value.

P1973 L25: Provide references on “Studies”.

P1974 L1-9: All discussion can stand after testing the significance of the slope at Fig 10 and 11 as I pointed above.

P1974 L18: Scatterplot between g_s (or g_a) and decoupling factor must experience autocorrelation because decoupling factor is the function of g_s and g_a . All discussion in L18-26 does not make sense.

Table 2: Add annual evaporation (mm yr^{-1}), sensible heat flux ($\text{GJ m}^{-2} \text{ yr}^{-1}$), latent heat flux, ground heat flux and net radiation. The annual budget of water and energy will be greatly useful to other scientists.

Technical corrections:

P9168 L20: Remove “same latitude”. Otherwise, one might interpret albedo is related with latitude.

P9168 L7: generatively => generally

P9169 L6: G_{was} => G was

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