Response to Referees' Comments:

We would like to thank the editor, the topical editor, and the anonymous referee for the time and efforts handling and reviewing our manuscript. The constructive comments and suggestions are very helpful to improve our manuscript.

The referee's original comments are formatted in black, while our point-by-point responses are formatted in **blue** font. All the corresponding revisions in the revised manuscript are indicated in **red**.

Referee 1

General comments

The authors did an interesting and challenging research, as it is known that the ET is essential to water and energy cycle on the TP. The authors estimated the ET from 2001 to 2018 by using SEBS model, which has contribution to understand the water cycle on the TP, while the MODIS products should be used carefully over the TP for its complicated weather and underlying surface. The authors, please, add more information in detail of the MODIS data used in this study.

We would like to thank the reviewer for the helpful comments and suggestions and for recognizing the contributions made by this work. More detailed information on MODIS data has been added in section 2.2 "Data" in the revised manuscript.

"……*MODIS monthly land surface products, including land surface temperature and emissivity, land surface albedo, and vegetation index, provide land surface conditions for the SEBS model. Detailed information on MODIS land surface variables are listed in Table 1. The values of land surface variables in the MODIS monthly products are derived by compositing and averaging the values from the corresponding month of MODIS daily files. Validations of MODIS land surface temperature and albedo against in-situ observations on the TP suggesting a high quality of MODIS land surface products with low biases and small root-mean-square errors (Wang et al., 2004; Ma et al., 2011; Chen et al., 2014)*……"

And, in this investigation, the estimated ETa by using the SEBS model were validated with six flux tower data from EC observation. It could show the estimated ETa was reasonable used over the whole TP, however, the results are not fully convinced, and the Rn, air temperature and velocity should be evaluated by using the observation data at 6 sites, and then extend to analyze the variations of ET in the western TP ,Eastern TP and the whole TP.

Thank you very much for your comments and suggestions. Validations of the meteorological variables of the China Meteorological Forcing Dataset (CMFD) against in situ observations at the six sites have already been made by several researchers, for

example Wang et al. (2020) and Xie et al. (2017). We also compared meteorological variables including air temperature, specific humidity, wind velocity, downward shortwave, and longwave radiation between CMFD and in situ measurements at the six sites. Please check Figures S1-S6 in the supplementary materials. However, we decided not to discuss the validation of the CMFD dataset in this manuscript, while only focused on the validation of ET_a. We added a sentence *"…CMFD dataset has been validated against in situ meteorological observations and compared with other reanalysis datasets on the TP, demonstrating that it is one of the best meteorological forcing datasets over the TP area ..."* in the revised manuscript mentioning the validation of CMFD on the TP to make the current work more convincing.

In general, I would like to recommend accept this manuscript after minor revision and publish it in this journal.

Specific comments

P2: line 37-38," The domain mean of annual ETa on the TP decreased slightly …"should give a reference.

Thank you very much for your comment. This statement is one of the conclusions of this study, and we do not think it is necessary to add a reference.

P3: line 57-58, the sentence does not make sense, please make it clearly.

The sentence has been changed to "…*The SEBS-estimated monthly ET_a during 2001-2018 has been validated against 6 flux towers on the TP…*"

P4:line 78, ET and its variations have been drawing more attention worldwide.

Thank you very much for your suggestion. The sentence has been changed in the revised manuscript.

P5: line 95-102, the authors listed three studies, how does their results performance? Do the authors compare the results (Ma, 2019) with the 6 flux tower observations? It is not clear why the authors conducted this research, just like the authors mentioned, Ma, et al, 2019 they got the Eta from 1982-2012. We know the two methods are both used to estimate ETa at regional and global scale.

Thanks very much for your comments and suggestions. We have not got chance to validate ET_a estimates by Zhang et al., 2018, Ma et al., 2019, or Wang et al., 2020, due to no access to their data. It would be very interesting to compare their results with the 6 flux tower observations.

However, in this study, our intention is not to evaluate the performance of different methods, either based on complementary relationship or surface energy balance. One of the key points of this study is that an improved parameterization scheme for effective aerodynamic roughness length was introduced into the SEBS model, that takes into account not only the shear stress imposed by canopy but also the form drag generated by large-scale topography, which is very important in the mountainous areas of the Tibetan Plateau. Our model is more reasonable physically and ET_a estimate is of high accuracy compared to in situ observations.

P7: line148-149, the “the”, in the net radiation flux, the latent heat flux, the sensible heat flux, the ground heat flux, should be removed.

“the” has been removed in the revised manuscript.

P7 and P8, line 169-196, whether the parameter, d0,Cp and U * are also from CMFA?

Those parameters are not from CMFD. Cp is the specific heat for moist air, and a constant was used. d0 is zero-plane displacement height and u* is fraction velocity, those two variables are parameterized in the SEBS model.

P11, line 272- 273, the specific data should be used to show how does the SEBS performance well at the two sites.

Correlation coefficient and MB value have been used to show the performance of SEBS model is well at the two sites. The sentence has been changed to “……*Specifically, the SEBS model performed exceptionally well at the short grass sites (BJ and NAMORS), with correlation coefficients as high as 0.98 and MB values below 5.0 mm mo-1…*”

P25/P27: The length-width ratio of Figure 1 and other Figures is different.

The length-width ratio of figure 1 has been changed to the same as the rest of figures.

Reference:

Wang, B., Y. Ma, Z. Su, Y. Wang, W. Ma. 2020. Quantifying the evaporation amounts of 75 high-elevation large dimictic lakes on the Tibetan Plateau. *Science Advances* 6(26): eaay8558.

Xie, Z., Z. Hu, L. Gu, G. Sun, Y. Du, X. Yan. 2017. Meteorological Forcing Datasets for Blowing Snow Modeling on the Tibetan Plateau: Evaluation and Intercomparison. *Journal of Hydrometeorology* 18(10): 2761-2780.