

Ref.: Dr. No. ESSD-2020-345

Title: Long time series of daily evapotranspiration in China based on the SEBAL model and multisource images and validation

Author: Minghan Cheng, Xiyun Jiao, Binbin Li, Xun Yu, Mingchao Shao, Xiuliang Jin

Research Paper

Earth System Science Data

Cover letter

Dear Editor and Reviewers

I am submitting here a manuscript entitled “*Long time series of daily evapotranspiration in China based on the SEBAL model and multisource images and validation*”. We submitted this manuscript in November 2020. Three reviewers gave us good advices. First we would like to thank the reviewers for their constructive and helpful suggestions and improvements to our manuscript (**ESSD-2020-345**). We revised the manuscript by following the suggestions of the reviewers. Our response to each suggestion or comment are given one by one in the following Pages of this letter. For details, please refer to the responses as follows (Reviewer comments are in black font, responses are in blue or red font)

Looking forward to your favorable decision.

Thanks too much.

With best regards,

Minghan Cheng and co-authors

Responses to Reviewers

Reviewer 3#:

The authors addressed most of my concerns. Below I list a few further comments:

Comment 1:

The authors reply to my comment concerning the EC measurement principle: *We have rewritten this sentence by referring the paper of Wang et al. (2012): The eddy covariance method measures λET from the covariance of the heat and moisture fluxes, respectively, with vertical velocity using rapid response sensors at frequencies typically equal to or greater than 10 Hz (Page 7, Lines 147- 148).* This is again wrong. And the authors use the paper Wang and Dickinson 2012 as a reference, but cite it incorrectly. The original sentence from the paper reads: *The EC technique measures **H and IE** from the covariance of the heat and moisture fluxes, respectively, with vertical velocity using rapid response sensors at frequencies typically equal to or greater than 10 Hz.* The covariance between heat fluxes and vertical wind velocity defines the sensible heat flux, while the covariance between the moisture flux and the vertical wind velocity defines the latent heat flux. That the authors decided to cite this sentence only partially (leaving out the sensible heat flux) is very critical in my view. This repeated wrong definition of the EC method, makes me doubt the authors understanding of the EC theory.

Response: Thank you for your help and suggestions in improving our manuscript. Regarding to the definition of latent heat flux measuring by EC tower, we revised this sentence again: *'The eddy covariance method measures λET from the covariance between moisture fluxes and vertical wind velocity using rapid response sensors at frequencies typically equal to or greater than 10 Hz.'* (Lines 147-148, Page 7).

Comment 2:

The authors replied very detailedly to my comment on the differentiation into different climate zones, terrain types etc. by referencing other papers that used a similar number of EC stations for assessing model performance. In my opinion, this is still not convincing since e.g., the class cropland includes a single site while croplands exhibit very different ET rates and

dynamics based on the cultivated crop. The same will hold true e.g., for climate types. In my opinion the authors should at least state that the low number of stations per class (land cover, terrain type etc.) might reduce the validity of these findings.

Response: Thank you for your help and suggestions in improving our manuscript. Although different crop types show different ET, this EC observations were used to verify the accuracy difference of SEBAL among different land surface types. Moreover, we classify cropland into one category because the difference between different crops, such as wheat and maize, is relatively small compared with cropland and woodland or cropland and grassland.

The number of flux towers could determine the reliability of the verification results to some extent. We agree with the reviewers. Therefore, we added a paragraph in the discussion: *In general, more ET sites could improve the reliability of the validation process. However, limited number of EC towers in this study also caused uncertainties in SEBAL ET validation. Although the validation of SEBAL was conducted in different situations (e.g., different climate zones and land cover types), and it should be noted that several situations only have one sites can be used, e.g., cropland. Therefore, only one climate zone of cropland ET can be validated, and other situations were not considered. Moreover, in this study, the different classes of land cover types, climate zones, elevation and seasons were considered for SEBAL validation by referred to previous studies (Kim et al., 2012; Ramoelo et al., 2014). However, there are still several situations may need to be considered. For example, whether the difference of SEBAL accuracy was existed in different years (Velpuri et al., 2013) and different satellite sensors (Long et al., 2011). Overall, more ground-based sites should be used to get more reliable results of SEBAL validation in the follow-up research.* (Lines 432-440, Page 22)

Comment 3:

The equations (26) to (28) are still redundant.

Response: Thank you for your help and suggestions in improving our manuscript. We have deleted the redundant equation (Eqs. 26 - 28) and only remained one equation which could contain the original three equations (Line 629, Page 29).

Comment 4:

The manuscript still needs English proofreading.

Response: Thank you for your help and suggestions in improving our manuscript. We have checked the English writing and grammar; besides, the manuscript has also been checked by a native-speaker.

Editor#:

as referee #3 is generally happy that you revised the manuscript according to most of the comments, but still raises two important points, I would encourage you to address these (and the other comments) thoroughly.

Major points:

Comment 1:

- Please ensure that you cite the EC literature correctly and provide a comprehensible understanding of EC theory. This will help the readers to best understand the suitability of the methodology and resulting dataset.

Response: Thank you for your help and suggestions in improving our manuscript. We have cited the EC literature correctly and provided a comprehensible understanding of EC theory according to your and reviewers' comments. The revised sentence is as follows: *'The eddy covariance method measures λET from the covariance between moisture fluxes and vertical wind velocity using rapid response sensors at frequencies typically equal to or greater than 10 Hz.'* (Lines 147-148, Page 7).

Comment 2:

- The "Comment 2" requires some more explanation and critical discussion of methodology on your part. If the referee is not convinced about the suitability of the approach, other readers might also be skeptical. You should address this by offering the limitations of the approach, clear description, possible uncertainties, and a critical discussion of the implications for the model validation.

Response: Thank you for your help and suggestions in improving our manuscript. According to the suggestion of the Reviewer, we supplemented a paragraph in the Discussion (Lines 432-440, Page 22).

