

Dear Nissaf Boudhina and co-authors, Dear Marina,

Please find below my review on the article “Evaluating four gap-filled methods for eddy covariance measurements of evaporation over hilly crop fields”, submitted to Geoscientific Instrumentation Methods and Data Systems.

The authors provide a comparison and evaluation of four commonly used gap-filling methods for latent heat flux in hilly terrain. The basis form three short-term (Dec. 2012 to June 2013) eddy covariance (EC) measurements experiment realized in northeastern Tunisia. Following the quality control, the gap-filled LE estimates from the REddyProc method, linear regression, multi-linear regression and evaporative fraction are compared with measured values from the EC stations. Based on the results, the authors conclude that the performances and accuracies of the methods are comparable to instrumental accuracies.

The article is well written and the measurements, processing steps and evaluation have been formulated clearly. The argumentation is scientifically solid, as far as I can tell. The article does not say something new and unexpected, but provides additional facts and increments previous studies, which can be relevant to other studies working with EC measurements. However, the article is very long and requires a strong stamina of the reader. Although the introduction is well written, the reader already needs some patient here. Scientists working in this field, and those you are probably addressing, should be familiar the basic concepts. Rather than quickly remind the readers of the variety of methods and the problem they already know, they have to be patient until the story narrows and gets to the part where the larger problem and knowledge gap, which you propose to answer, is specified. The article, and in particular the introduction, should be shortened in order to minimize the risk to loose the reader on the way. Perhaps, it might be a good idea to put some of the details in the supplement.

Here are some suggestions, where the article can be shortened and therefore becomes more accessible to the reader:

- (i) L68-88 discusses the basics of common gap-filling methods and provides a brief description of the method. This paragraph can be shortened without loss of the overall story, since the used methods are introduced in Section 3. The most important part of this paragraph is the last sentences, which is basically the motivation for this study: Different gap-filling methods have not been evaluated so far in hilly topography.
- (ii) L90-97 talks about hilly watersheds and the urgent need to understand the evaporation process. The study discusses the accuracy of gap-filling methods and does not address the understanding. Therefore, the paragraph is not relevant for this work and can be removed.
- (iii) L98-116: This paragraph can be shortened by briefly mentioning how terrain complexity and airflow characteristics impacts evapotranspiration, e.g. terrain complexity dictates the radiation fluxes, stability and flow dynamics and hence differs for hilly and alpine terrain.
- (iv) Section 2.5.2 discusses two commonly used coordinate rotation algorithms. Since the planar fit is not used at all in this study, the detail of this algorithm can be removed.

- (v) L470-479: These lines repeat the method constraints which were already discussed in the methods section.
- (vi) While the results section is normally written in past tense, I think that the facts in the discussion section should be written in present tense, e.g. (L622) REddyProc relies on existing ... or (L651) This emphasizes the impact ...

Specific comments:

L46-48: The opening offers no direction as to where the story is going. It goes over evapotranspiration, biomass production, photosynthesis, surface energy balance, water balance, Mediterranean climate, and managing agricultural activities. The first paragraph should set the direction of the paper. More precisely it should identify the problem that drives the research and target the audience. I suggest to rewrite the first paragraph to make the manuscript more interesting to the reader.

L50: Please introduce the abbreviation "... latent heat flux (LE)" and use the abbreviation throughout the text, e.g. L56, L72 etc.

L56: Why do environmental sciences require hourly evapotranspiration measurements?

L62: Isn't the expression "dysfunction" used for medical disorder?

L99: Better use "characteristics" instead of "specificities".

L102: Please write "... topographic characteristics and ABL conditions differ between hilly areas and mountainous terrain."

L104; L105; L108: Please avoid the repetition of "Regarding ...".

L105/106: What do you want to say with "..., hilly areas rise over small fractions of the daytime ABL, and the overlying airflows are slightly influenced by stratification"?

L107: Change "instable" to "unstable".

L108: I think you refer as "externally wind" the "dynamically induced winds"?

L109: Dynamically induced winds can be very important for alpine terrain. Sometimes these winds superimpose thermal winds and the interaction of topography with the wind field results in lee rotors and flow splitting. So I don't agree that these winds are more frequent than in complex terrain.

L111-116: Please split the long sentence into several small sentences.

L133: Please give the altitudes of the experimental sites.

L143: "..., yearly precipitation sums ..."

L144: Are the numbers correct? Is there more evapotranspiration than precipitation? Later in the text (L150) you mention that the agriculture is rainfed.

L194/195: Better write: "..., since the sensible and latent heat fluxes are insignificant (small) during night time."

L200: What means "normal to local topography"?

L204: Please introduce the abbreviation DEM.

L220: "H and LE fluxes were averaged over 30 minute intervals."

L261: I think the ST assesses the stationarity and not the homogeneity of turbulence.

L262: Does the ITC really test the spatial homogeneity or the isotropy of turbulence?

L272-279: What impact has the ridge on the measurements of site A and B? Do you observe eddies during strong large-scale winds?

L285: Remove "at daily timescale".

L287-288: the sentence "This value ..." is neither relevant nor representative for this study and should be removed.

L289-290: Why is there no influence of the topography on the wind field?

L294/295: As far as I see, the secondary maximum of the wind is between 120° and 160° and not between 70° and 220°.

L301: Please give the units for all variables, e.g. z and D.

L304: Remove "notably".

L314: Please write "land-sea breeze".

L329: Please change "was" to "were".

L330: Please rewrite "... the experiment was typified ...".

L335/336: The LAI is not necessary in this case and can be removed.

L350: Please specify the ratio, e.g. the ratio of the original to filtered time series ...

L358/361: Remove the blank between the number and %.

L436: Remove 'Evaporative fraction' and 'latent heat flux'.

L450-456: This paragraph should be moved to the Results section.

L587: The expression 'The method performances could be either different or similar before and after splitting ...' is trivial and can be removed.

L637: Better write: 'Overall, the four methods were able to fill all gaps in the time series, ...'

L669: Please write 'The EF method provided lower accuracies'.

L683: Change 'could be' to 'are'.

Figure 4: It would be interesting to provide the same figure (maybe in the supplements) for site B.

Table 6: I think the data is more accessible to the reader when presented with a box plot.