

Thank you very much again for the constructive review of our manuscript. We carefully went through your comments and revised the manuscript as suggested for point 3 of your general questions, which is described below. Since the upload of the revised manuscript is not possible during this stage of publishing, revised sections are given by page and line number.

### **Reviewer #1:**

First, let me thank the authors for their careful replies to my comments and suggestions. Let the paper be published or, as it goes in this journal, renamed.

Many of my arguments came from the point of view of someone from another era: One who made measurements in the field, designed the data acquisition and analysis approaches and produced data sets. The authors are from the generation that aims to homogenize the flux data sets, turning them into a commodity. This effort is aimed at facilitating comparisons of long-term datasets among land cover types and ecosystems. For rapidly changing conditions, such as seasonal phenological changes or long periods with a preponderance of calm nights presents a challenge to this approach. Another response might be to identify phenomena and redo the flux calculation to focus on establishing particular phenomena, using event-based composites of observations, something that might be done before a suite of interlocking models are called on to fill in (“gapfill”!) the problematic situations. This latter is the aim of this paper.

I am pleased with how thorough the authors have been in responding to my questions, and I guess no more changes are likely to happen. The authors have not included in the revised text, as far as I found, the answer they had to my ‘general question #3, but a diligent reader might find this information when rummaging around in the files online.

One of the difficulties of dealing with this journal is that the paper is essentially ‘published’ at the time of submission. Any later revisions may or may not be seen by the eager reader. However, in this case, it appears that publishing the reviewers’ comments is a good thing. The adept reader can find all the comments and the authors’ largely excellent responses.

*3. How many actual observations (not “gap-filled”) are in these Fluxnet evaporation data series during and after rainfall?*

*“The period 2008 to 2010 shows an above-average annual precipitation sum of  $1088\pm 138$ mm as compared to the long-term record for the period 1991 to 2020 with an average sum of 842mm a-1. Interception conditions prevail on around  $55\pm 7\%$  of all days of the year, of which  $21\pm 3\%$  are with precipitation. Hence, a majority of data is affected by the systematic underestimation effect of LEEC during interception.*

*The data series for LEEC from 2008 to 2020 in half-hourly resolution consists of 52561 data points of which 2058 data points (3.9%) are missing. 68.4% of the gaps are located within interception events, of which 28% occur during rain conditions ( $P_g > 0$ ) and 71.6% during conditions with water stored on the canopy ( $C > 0$ ). Similar to our previous paper are only 24% of the LE measurements during rain conditions flagged as data of good quality, while 46.3% are of moderate quality (flag=1) and 28.3% are flagged as data of bad quality (flag=2). During dry conditions (no rain and a dry canopy), 54.1% of the LE measurements are of good quality (flag=0), 30.8% of moderate and only 15.2% of bad quality.”*

The authors responded to me about the fraction of flux “data” that was “gapfilled”, but these sentences do not appear in the manuscript. I would have preferred that the authors include the information in the reply to my review, suitably edited. The reader deserves to know what fraction of the final analyzed time series was made up.

Response:

The following statement was already included in the paper (page 15, line 440-443).

“Interception conditions prevail on around  $55\pm 7\%$  of all days of the year, of which  $21\pm 3\%$  are with precipitation. Hence, a majority of data is affected by the systematic underestimation effect of  $LE_{EC}$  during interception. This applies also to the analyzed period 2008 to 2010, with an above-average annual precipitation sum of  $1088\pm 138\text{mm a}^{-1}$  as compared to the long-term record for the period 1991-2020 with an average annual sum of  $842\text{mm a}^{-1}$ .”

However, since this is only found in chapter “4. Discussion”, we added the following statement under chapter “3.3.1 Conditions for implausible turbulent fluxes” (page 12, line 343-351):

“Since the rH dependent underestimation of  $LE_{EC}$  highly coincides with precipitation and interception, we substituted  $LE_{EC}$  with  $LE_{2D}$  for these conditions. The analyzed time series is characterized by relatively wet years in which  $55\pm 7\%$  of the days per year exhibit interception conditions; of these  $21\pm 3\%$  are days with precipitation. Additionally, we analyzed the performance of the  $LE_{EC}$  data from 2008 to 2010 which revealed approximately 3.9% data gaps. Of these gaps, 68.4% occur during interception events, with 28% associated with rain conditions ( $P_g > 0$ ) and 72% with conditions where water is stored on the canopy ( $C > 0$ ). Similar to Fischer et al. (2023), only 24% of the  $LE_{EC}$  measurements during rain conditions are classified as good quality (flag = 0), while 46.3% are of moderate quality (flag = 1) and 28.3% are of bad quality (flag = 2). In contrast, during dry conditions (no rain and a dry canopy), 54.1% of the  $LE_{EC}$  measurements are of good quality, 30.8% of moderate quality, and only 15.2% of bad quality.”