Comments on the revised version of:

**Quantifying evaporation of intercepted rainfall: a hybrid correction approach for eddy-covariance measurements**
by Stefanie Fischer, Ronald Queck, Christian Bernhofer, and Matthias Mauder

Comments by: David R. Fitzjarrald, Atmospheric Sciences Research Center, UAlbany, SUNY, US of A

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±138mm 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±7% of all days of the year, of which 21±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 o”f 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 (Pg>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 t in the reply to my review, suitably edited. The reader deserves to know what fraction of the final analyzed time series was made up.

*7. Do you think a similar approach could work at the Norway spruce conifer forest in Europe considered in this paper? Question is related to the paper (Czikowsky and Fitzjarrald, 2009):*

"The method developed by Czikowsky and Fitzjarrald (2009) is essentially based on correct eddy covariance measurements. As already shown in Fischer et al. (2023) and this study, eddy measurements underestimate evaporation during periods of wetting. This means that, according to the measurements at our site, the method developed by Czikowsky and Fitzjarrald (2009) would lead to an underestimation of interception."

The authors misunderstood the argument at work in the Czikowsky & Fitzjarrald (CF2009) paper, that one tries to form event-based composites. More careful examination of CF2009 reveals that the fluxes were calculated in different time intervals, starting the "clock" at the time when the rainfall ends. If anything, the CF2009 approach would somewhat overestimate the return interception fluxes. The authors can argue that during the rainfall the fluxes are suspect, but even then, careful filtering can yield valid eddy fluxes during light rain. *However,* when the rain stops, the eddy flux is again as good as it gets. The authors are presenting their work based only on examining the processed data—they do not wish to go back to recalculate things.

It may well be that long dreary periods of sustained light rainfall are characteristic of their European situation and that this does not lend itself to the compositing approach. The grand advantage of the tropical application was the regularity of small rainfall events by time of day. However, if one wants to use the eddy fluxes, should one not want to optimize the periods for which it is available?

"605 The Penman-Monteith equation is a widely used model that combines flux-gradient relationships with the energy balance equation to estimate total evaporation. This approach integrates the "loss" of latent heat through both evaporation and transpiration (Monteith and Unsworth, 2008). Thus, both components are treated as a combined process in the following model. In the Equation A8, the latent heat flux is converted into its water equivalent, denoted as ETmod, using the latent heat of vaporization. This conversion allows the model to express total evaporation in terms of water loss. Key variables in the Penman-Monteith
610 equation include: the radiation balance Rn, the water vapor pressure in air e, the saturation vapor pressure es(T ) at temperature T , change of es with temperature Δ = des/dT, the psychrometric constant γ, the density of air ρa and the heat capacity of air cp."

"A question which arises from these common observations is whether EC measurements of
480 measurements that modelled latent heat flux above forest is often overestimated and unlikely to match the (corrected) EClatent heat fluxes for forest ecosystems might be a reasonable reference for the calibration and **validation** of evaporation models, especially considering the systematically underestimated interception component and the still remaining decreasing relation between LEβ along increasing rH."

The authors constructed a 'data-assisted agglomeration of models', a *chimera* that *then* is likely to be compared with other models. Here we are.