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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Energy fluxes and surface characteristics over a cultivated area in Benin: daily and seasonal dynamics" *by* O. Mamadou et al.

Anonymous Referee #2

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General Comments: The manuscript by Mamadou et al. presents results from one year of eddy covariance (EC) measurements from an agricultural site with monsoon climate in northern Benin. The subject of the manuscript is within the scope of the journal and the research topic is of significant scientific interest. The authors present some new insights into the dynamics of energy fluxes for one of the few EC sites in Africa. Their main result of this paper is the very detailed characterization of the daily and seasonal variability in energy fluxes, which is complemented by modelling of selected parameters for this specific site. However, there are two major flaws that need to be addressed by the authors before the manuscript can be recommended for publication.

I would like to highly encourage the authors to improve their manuscript that presents certainly interesting results from a rare site in the tropics.

Major points: (1) The manuscript is overall very detailed and descriptive, however, clear objectives or hypotheses seem missing, see e.g. page 10607, line 22ff – documentation seems to be the first & only aim of this paper?. Accordingly, the results contain large amounts of detailed descriptions (for 16 Figures and 3 Tables) of various variables without making it clear to the reader to what extend this contributes to the main objectives. Potentially new insights and the main results are thus diluted and limit the applicability of this study for other colleagues.

(2) The structure of the manuscript is not coherent, i.e. the content of the main sections are mixed-up to such a large extend that makes it hard to follow a clear line of argumentation and understanding. The methods section is relatively short and does not contain all methods, corrections, assumptions or definitions used throughout the analysis. For instance, (a) the footprint method selection and assessment appears first in the results section (3.2), or (b) the modelling approaches used in the discussions section (4.2 ff) are not listed in the methods and the reader gets informed about these there for the first time. The results and discussions section appear not clearly distinguished between each other at all, i.e. the results contain substantial amounts of interpretations and referencing to other results already, while the discussion section continues to derive and list results, instead of clearly discussing the results from the prior section. According to the journal guidelines, the authors need to comprehensibly decide for a either a separated Results & Discussion section, or clearly merge both sections. The unusual long conclusions section does not conclude from the results and discussions before but is rather a summary of everything, by repeating large parts of the introduction and results, and still referencing to other published research. It would certainly help the manuscript if the authors would streamline their overall structure.

In summary, I would suggest the authors to rethink the objectives of their study and align their manuscript structure and content accordingly to convey a clear message to

the reader.

Specific Comments: - The term ‘cultivated area’ seems rather confusing to me, would agricultural land not be more appropriate if considering the dominant land use within the footprint of the flux tower? - I would consider it essential to reference and refer to the content of the companion paper on surface radiation budgets that was published by the authors for the same site in early 2013: Kounouhéwa et al. 2013, Atmospheric and Climate Sciences, 2013, 3, 121-131, DOI:10.4236/acs.2013.31014, http://file.scirp.org/Html/14-4700125_27583.htm - Page 10608, line 3: do you mean ‘energy fluxes’ here instead of the ‘climate’? - The 4 specific periods of 15 days were not yet introduced in the methods section at the point of first usage (Page 10612, line 6ff) and should be before instead of refereeing to later. - The usage of soil water content in term of units appear confusing and requires further explanation or adjustment: while the authors measure with CS616 sensors in cm3/cm3 (Tab. 1), they report the results in mm (page 10625, line 2; Fig. 2g) without giving details on how they derived these. Instead, Fig. 2g seems to indicate that volumetric SWC might be actually displayed in percent. In contrast to earlier use and the figure, the authors than use the term ‘soil water storage’ with the unit in mm later on (Page 20624, line 16f). - Page 10615, line 16f: the term ‘monsoon flux intrusions’ is not clear to me. Could you try to elaborate this? - Page 10627, line 27ff: (1): It would be helpful to get some distance values for the maximum footprint extension reported here. (2) Why is the footprint only relevant for the sensible heat flux & what about the latent heat flux then? - Page 10622, line 25ff: Was the latent heat flux statistically different from zero, particularly if considering all measurement & method uncertainties? - Page 10624, line 2ff: If P4 cannot be used for generalization with the 15-day sample, why did you choose this period and still use it for analyses? - The authors should evaluate if the modelling part at the end of the paper is really needed and contributing to the story and for this manuscript. - Most figures contain a lot of content and are scaled rather small (thus captions etc. tiny) to read the content properly, in particular the Figures 2+3+5+6+8+9+10+13 and Table 2. Figure 5 is for instance largely redundant with the information listed in Table 3 already.

In addition to that, the authors should evaluate if all figures are needed for the story of the paper. - Table 1: (1) The last column appear to be not needed (as same entry everywhere) and this info could be added e.g. in the caption. (2) What is ‘Eurosep’ for the LI-7500, which is produced by Licor? - Table 3: The dates should be given here for each specific period (P1 to P4) and it might be good to mention in the caption, that each period is 15 days so to avoid confusion about the small versus large number of n compared to the full year. - Figure 4: The periods should be named & defined here in the caption linked to the panels a-d. Similar considerations should be taken for the captions of Figures 8+9+13+16, to clearly define and name which periods are dry/wet/transition for the reader without flipping back-and-forth in the manuscript all the time.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 10605, 2013.