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

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Received and published: 18 September 2013

General comments

This paper by Mamadou et al. represents a remarkable work in terms of precision and details, with careful and extensive errors estimates and quality checks, in the study of energy partitioning processes for the poorly documented Sudanian climate. The author discretised the yearly surface-atmosphere-exchange into four distinct seasons, and describes precisely the underlying processes of energy partitioning at fine temporal scale. The main results from their work are: (i) the strong seasonal pattern of the

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evaporative fraction; (ii) the skin surface temperature importance as a key variable to describe/understand surface – atmosphere processes in this region. This study and the related dataset are of great importance for future modelling work. I enjoyed reading that paper, and strongly recommend it for publication. Below are only a few comments.

Specific comments

(i) In the introduction, (10607 L26 to 10608 L6) the author is describing results arising from different techniques. Schuettemeyer et al. involves Large Aperture Scintillometry (LAS) and Eddy Covariance (EC), when most of the other authors used EC. When EC enables a 'quality check of the data' by 'closing the energy balance', i.e. by comparing the latent heat flux estimated through an energy balance, and directly by simultaneous measurement by the sonic anemometer and the Licor, LAS only proposes an estimate of the latent heat flux based on an energy balance. This difference makes somehow the LAS technique less robust that the EC.

Because of this, I think that the author should either include a few words on these technical differences, or focus on studies involving EC techniques.

From 10608 (L20 to L25), the reader then discovers that indeed there are experimental surface-atmosphere exchange data sets that have been published (Guyot et al. [2009] and [2012]), over 3-years (which is then in contradiction with the previous paragraph).

Thus, the author should decide between: (i) considering EC data studies only; (ii) including published LAS observations in the previous paragraph.

Besides, study sites cited in Schuettemeyer et al. fall into the Sudanian Climate as defined by the author: cumulative annual rainfall are given, which are very similar to the one in the actual paper (1200 mm).

(ii) 10614L18 to 23 In the methodological part, the authors stated that: "During the selected periods (defined below), these tests eliminated 4% of H and 5% of LE in P1, 20% of H and 37% of LE in P2, 35% of H and 55% of LE in P3, 25% of H and 30%

of LE in P4." In order to be achieving "the same number of days, which makes their statistical characteristics as comparable as possible", wouldn't that be more adequate to have the same amount of test-validated data for each period instead of the same number of days, if following that reasoning? (I doubt about the argument used to select the periods, but not the size of each of the dataset, which I think is fine).

(iii) 10617 Paragraph 3.2 It is not clear to me how the authors estimated the roughness length and the displacement height for the different seasons. Were they derived from manual measurement of the vegetation height (for d) and was then an empirical relation used to go from vegetation height to d? Or were they derived from the EC measurements using a technique such as Martano [2000]? In the later case, footprint estimates, and d and z0 estimates are not independent from each other, which mean there might be a need of a sufficient amount of iterations to reach a stable estimate of the footprint area. Maybe the authors could add a few words or a reference to further explain their methodology?

Minor comments

10608 L26 'an Eddy Covariance system was' 10608 L28 Would you have a REF for the '25%'? 10610L13 'Controlled burning' or 'Controlled fires' instead of 'bushfire' 10610L19 'Water table depth' 10610L22 Could you specify if 'bas-fond' is a soil water saturated area or an area with a higher soil moisture content as compared to the surroundings? 10611L3 How was the vegetation height measured? 10611L24 Specify 'Air humidity and pressure' 10614L9 I would suggest to replace 'found' by 'proposed'? 10611L18 'Daily mean of VPD $\sim$ 2.3 kPa?' 10617L9 Replace 'the highest' by 'at its yearly maximum'? 10617L15 I would use "Representativeness' instead of 'Representativity' 10617L18 'It is presented for each period'? I do not understand why this sentence appears here. You may point that statement to a figure or a table, otherwise I think this is not useful here.

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