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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Analysing surface energy balance closure and partitioning over a semi-arid savanna FLUXNET site in Skukuza, Kruger National Park, South Africa" *by* N. P. Majozi et al.

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General comments

The paper presents a data record of 14 years of radiative and turbulent fluxes measured at a semi-arid savanna FLUXNET site in South Africa. The value of this data record cannot be discussed and it is great that a publication looks at energy partitioning for this type of environment (certainly not the environment where most tower fluxes are locate). Nevertheless, in my opinion the paper could have exploited the data record better and make more efforts to identify and separate possible instrumental issues from inter-annual variability. In general, the figures are not commented in great detail, and more efforts could have been made to make the paper more attractive to the readers. Some

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of the papers mentioned with similar analyses (but in different environments, e.g., Gu et al., 2006 and Li et al., 2006) are more complete in that sense and propose more interesting analyses of the existing data.

Specific comments

P1-L16. The abstracts should be more specific about the paper findings, it seems more focused on just listing what the paper will be looking at.

P2-L67. The OLS could also be explained with a line if text or so a bit more in this context.

P2-L78. "Research on the South African savanna, i.e. using data from the Skukuza EC system", strange sentence, all research in South African savannah is linked to once EC system?

P2-L84. EBR is defined, but not EB on its own, presumably Energy Balance.

P4-L144. Not sure I understand the line "data without gaps". Does it refer to the original $\frac{1}{2}$ hour data being gap-filled, or to the seasonal averages?

P4-L154. I am confused here, what do random errors mean here? I have problems understanding that the Rn and G observations at the station are free from random errors, as I imagine that there is always some instrumental noise in the observations.

P4-L159. Potential to "remove"?

P5-L182. Mean of 1.19 +- 0.21, could you state what +-0.21 means?

P5-L183. Wm-? 2 missing?

P5-L184. The variation in the slopes and EBRs are scarily large. The authors are not looking for explanations? Assuming that the environmental conditions at the tower have not changed, and that the soil/vegetation covered by the fetch of the tower observations remains similar along the years, the variability has to be related to the effect

of missing data (not all years are sampled equally) and /or instrumental issues (e.g., instrumentation replacement). The latter is possibly more likely. For instance, I noticed that 2006-7-8 have slopes around 1.4, while 2009-10-11 around 0.9, with a change of Rn instruments in 2009. The authors should be looking into these things to help building confidence in the data record.

P5-L191. Absence of negative Rn-G because those times of the day were not measured, or because of issues with the instruments operating at those times? P6-L219. Figure 2 shows a larger number of outliers for summer and spring, any reasons for that?

P7-L242. The references point towards the EC measurements not being reliable at nighttime (low turbulence, advection, etc). What about the net radiation measurements at nighttime? More trustable than the EC ones?

P7-L252. There seems to be things to comment on Figure 4. What happens with the daily means in 2006? Why the Rn from 2004-2010 looks different form the other years? Inter-annual variability or instrumental issues? The LE, H, and G look more consistent from year to year.

P7-L275. Even if references are given, it will be good to explain the links between cloudiness and precipitation and the observed Rn seasonal variability. Clouds should increase the downward longwave component and reduce the downward shortwave. I'm not an expert, but it is not that obvious that the overall effect is an increase in the net radiation. Also, it may have helped to understand this figure to have Figure 5 plotted as monthly means, instead of a time series.

P8-L301. The findings of Gu 2006 correspond to a temperate forest site, so the environmental conditions are in principle different for the location of the study, which is a semi-arid savannah environment. It is worth mentioning.

P8-L302. The "concave" and "convex" mentioning requires further explanations, can it

be illustrated with the data at the Skukuza station? It does not seem obvious from the figures shown so far in the paper, or I am missing something.

P9-L321. I am having some problems understanding Figure 8. If the aim is to discuss the partitioning of the heat fluxes, perhaps it could have been better to normalize with the available energy, i.e., the ratio of LE and H with Ae=Rn-G and only plot LE/Ae and H/Ae. This is because the energy closure shown in the figure seems very poor some times, so I am wondering if we can draw any conclusions about the fluxes partitioning at those times of the day. If we are plotting LE/Rn, H/Rn, and G/Rn, the sum LE/Rn+H/Rn+G/Rn = Rn/Rn =1 if energy closure was perfect and there were no missing terms. Now, if we take just before 18 hours in spring, LE/Rn$\sim$=4, H/Rn$\sim$=2, G/Rn$\sim$=-2, so the net sum is 4 instead of 1 (for perfect closure). Or, in other words, the energy required for that situation is 4 times larger than the available Rn. A similar thing happens in summer around the same time, in winter around 6 hours. Is there a source of energy missing, or is it related to instrumental issues (small value of the fluxes and ratios between them)?

P9-L325. In summer before the sun sets, there is a new peak of positive LE not too different in magnitude from the peak associated to the presence of dew. What can be the cause for that?

P9-L332. The conclusions are too short and too general. A food example is the last sentence “The results also show that water availability âĂĺand vegetation dymanics play a critical role in energy partitioning, whereby when it rains, vegetation growth âĂĺoccurs, leading to an increase in latent heat flux / evapotranspiration”, which is certainly true, but sort of common knowledge. âĂĺ

Table 1. Any specific reasons to replace “at” by “@” in the text of the Table? Figure 1. Years should be added to the individual plots.

Figure 2. For consistency with Figure 1, it would be more useful to have the EBR in the plots, instead of the number of points.

Figure 5. Is air humidity also measured at the station in a routine basis? Given the study of the heat flux partitioning, something like VPD would have been nice to have and analyse. Figure 6. It would have been nice to have a new bar with the H+LE+G, so it could be compared with Rn and used to assess the seasonal energy balance closure.

Figure 7. The labels, legends, and lines are difficult to read, they need to be made larger. The a, b, c, d symbols are missing in the figures.

Figure 8. Same as figure 7, we can hardly read the labels or identify the colours of the lines.

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