

Response to reviewer 3 comments

Thank you for taking time to review our manuscript.

We thank Reviewer#3 for reviewing of this manuscript, and for contributing to its improvement. We tried to answer every specific comment in detail as shown below:

Minor comments

It is a bit a matter of taste but the word 'evapotranspiration' is not a happy one. See doi10.1002/hyp.5563 for arguments.

Agreed.

21: 'extent'

26: Not sure what is meant with 'under development' here. Seems vague and does not add information.

The abstract has been rewritten as:

L16-35: Flux towers provide essential terrestrial climate, water and radiation budget information needed for environmental monitoring and evaluation of climate change impacts on ecosystems and society in general. They are also intended for calibration and validation of satellite-based earth observation and monitoring efforts, such as assessment of evapotranspiration from land and vegetation surfaces using surface energy balance approaches.

In this paper, 15 years of Skukuza eddy covariance data, i.e. from 2000 to 2014, were analysed for surface energy balance closure and partitioning. The surface energy balance closure was evaluated using the ordinary least squares regression (OLS) of turbulent energy fluxes (sensible (H) and latent heat (LE)) against available energy (net radiation (R_n) less soil heat (G)). Partitioning of the surface energy during the wet and dry seasons was investigated, as well as how it is affected by atmospheric vapor pressure deficit (VPD), and net radiation.

After filtering years with bad data, our results show an overall mean surface energy balance closure of 0.93. Seasonal variations of EBR also showed summer had best EBR with winter having the least closure. Nocturnal surface energy closure was lowest, and this was linked to low friction velocity during night-time, and an increase in friction velocity showed an increase in closure. The high surface energy balance closure gives confidence on the usability of these data for calibrating and validating

The surface energy partitioning of this savanna ecosystem showed that sensible heat flux dominated the energy partitioning between March and October, followed by latent heat flux, and lastly the soil heat flux, except during the wet season where latent heat flux was larger than sensible heat flux. An increase in net radiation was characterised by an increase in both LE and H, with LE showing a higher rate of increase than H in the wet season, and the reverse happening during the dry season. An increase in VPD is characterised by a decrease in LE and increase in H during the wet season, and an increase of both fluxes during the dry season.

29: Introduce 'EB' at first use of energy balance.

Introduced.

38: Leave out: 'for transformation [:::] i.e.'

Done.

49: Leave out 'Hence'

Done.

57: Change to: *'the measured available energy'*
Done.

62: Is high frequency transport also not underestimated?
Thank you for the observation.

80: Replace *'Hence, the need to'* with *'Here, we'* (the *'hence'* was not really a logical connection
Thank for the comment.

The sentence has been rewritten as:

L79-80: However, there has been no investigation of surface energy partitioning and energy balance closure in this ecosystem.

82: 15 years: *This is really a unique aspect and should also enter the abstract etc.*
Thank you for the comment. Noted.

151: *'evaluated at different'*
Corrected.

177: *The standard deviation is not really something of interest here, I would think.*
Noted, thank you.

187: *The range is not described well as 2013 is not part of it.*
Thank you for the comment.

The opening sentence (L202-203) states the range as between 0.44 in 2007 and 3.76 in 2013.

223: *Summer & winter is a bit confusing here. Later it becomes clear which months are which but as summer is hot&wet and winter is warm&dry, it differs from what many other places experience as summer & winter. Perhaps better stick to wet & dry season.*

Thank you for the comment. Noted.

248: *'and as each'*
Noted, thank you.

261: *This paragraph and associated figure is not helpful. There is no comparison between weather and results (may be the most obvious point of entry to deepen the analysis) so just a climate picture does not help the reader. As mentioned before, the data should be made available on-line.*

Thank you for the comment. This subsection has been removed and further analysis done.

L321-333: The influence of VPD and Rn on surface energy partitioning was investigated during the wet and dry seasons. Results show that there is an increase in H and decrease in LE with an increase in VPD in the wet season (Fig 9). As illustrated earlier (Fig 1), VPD is higher when there is little or no rain (low soil water availability), which explains the increase in H with a rise VPD. In this instance, although the evaporative demand is high, the stomatal conductance is reduced due to absence of water in the soil, resulting in smaller LE and higher H. Rn, on the other hand, is partitioned into different fluxes, based on other climatic and vegetation physiological characteristics. Figure 10 illustrates that both latent and sensible heat flux increase with increase in net radiation, although their increases are not in proportion. During the wet season, the rate of increase of LE is higher than that of H, whereas in the dry season the reverse is true. The rate of increase of LE is controlled by the availability of soil water (precipitation), and during the wet season it increases steadily with increasing Rn, resulting in a convex, whereas the rate of

increase of H is concave, showing saturation with an increase in Rn. The opposite is true during the dry season, with limited water availability, the rate of increase of LE slows down with increase in Rn giving a concave, and a steady increase of H with Rn increase.

315: Here and elsewhere, it is not clear why the examples from the literature were chosen. One could expect more examples from the savanna or a structural overview of different climates but now it seems a bit random.

I have included an analysis of surface energy partitioning similar to Gu et al. (2006).

L320-332: The influence of VPD and Rn on surface energy partitioning was investigated during the wet and dry seasons. Results show that there is an increase in H and decrease in LE with an increase in VPD in the wet season (Fig 9). As illustrated earlier (Fig 1), VPD is higher when there is little or no rain (low soil water availability), which explains the increase in H with a rise VPD. In this instance, although the evaporative demand is high, the stomatal conductance is reduced due to absence of water in the soil, resulting in smaller LE and higher H. Rn, on the other hand, is partitioned into different fluxes, based on other climatic and vegetation physiological characteristics. Figure 10 illustrates that both latent and sensible heat flux increase with increase in net radiation, although their increases are not in proportion. During the wet season, the rate of increase of LE is higher than that of H, whereas in the dry season the reverse is true. The rate of increase of LE is controlled by the availability of soil water (precipitation), and during the wet season it increases steadily with increasing Rn, resulting in a convex, whereas the rate of increase of H is concave, showing saturation with an increase in Rn. The opposite is true during the dry season, with limited water availability, the rate of increase of LE slows down with increase in Rn giving a concave, and a steady increase of H with Rn increase.

321: Please rethink this part. I agree that the transitions are indeed interesting, it becomes difficult to interpret with this normalization. It is said that 'sensible heat flux is dominant' etc but when the net radiation is near zero, the normalization does strange things and that is all the figures then say.

This section has been removed.

Figure 1,2,3: please use 'heat plots', the ones where you see small individual points where there is space and where the color changes from blue to red depending on the density of the dots where they can no longer be discerned.

Thank you for the comment.

The authors do not think there is any information lost by using the normal figures as they have used.

Figures 7 8: Bigger lettering

They have been removed.