

Comments to the authors of “Carbon balance of a grazed savanna grassland ecosystem in South Africa”

I would like to congratulate the authors to a truly improved manuscript. It is very much better than the previous version; the text is better structured and the message is much clearer. I am also happy that an uncertainty analysis has been conducted; this is far too often overseen in papers presenting annual CO₂ flux budgets. Well done. However, I still have some questions and comments remaining.

Comments:

L81 What do you mean by low zero displacement height? Please give a value and explain why it was set to this.

L163-L164. Please include an explanation to why E₀ was estimated on an annual basis whereas R_b was estimated on an 6 day basis. Does it really make physical sense that E₀ is not changed over the growing season?

L189 How do you know that u_{star} 0.2 is the optimal u_{star} threshold? It is quite high in relation to most studies. For a method to determine the optimal threshold see Lund et al. (2007).

L186. Are you certain that your u_{star} filtering is a random error? More data is usually filtered during morning and during night time, indicating that it is a systematic error rather than a random error. Please see Moncrieff et al. (1996). You do not have to do the full analysis of investigating which errors are random and systematic as in Moncrieff; it is a quite big job. But if you want to keep u_{star} filtering as a random error, please explain why.

It is very good that you did an uncertainty analysis, however we all know that a true quantification of all uncertainties related to the eddy covariance method is very hard to do. What about all instrumentation errors, uncertainties related to all different kind of preprocessing choices, errors related to the WPL correction, etc. I would just like you to put in an humble sentence describing that this is an estimate including some important uncertainties, but not all, affecting the annual CO₂ flux budgets.

L199 the systematic errors should be summed without being taken in quadrature; it is only the random errors that should be taken in quadrature. Please see Moncrieff et al. (1996).

L201 I am truly sorry, I was slightly sloppy in my previous review. MCD43A2 is not a BRDF product, it is a NBAR (nadir BRDF adjusted reflectance) product.

Fig S1 Please also include an explanation to what the NDVI comparison point is in the Figure caption. When only looking at the figure I thought this was where you took your NDVI value from. Later when reading the text I realised, that it was the point without grazing.

Fig S2 Please do like in Fig 3, include all data as well as the binned data.

L217. I still do not understand why you did not use the light response function instead of the Lloyd Talyor equation when partitioning NEE into GPP and Reco. You did not see any clear relationship between night time respiration and temperature, would it then not be better to use a relationship where you see a strong correlation?

L240-L243 Why don't you combine Fig 6, Fig S3 and Fig S4, it would make it easier to see the relationship between VPD and the fluxes. Why is the Fig S3 and Fig S4 in the supplementary material, they seem to be quite important for the results?

Section 3.3 Should probably be called intra-annual, since it is investigating sesonal dynamics.

L255, I still do not understand why you using monthly data in your analysis. Your dailys sums are beautiful and not too noisy (Fig S5). The variability seen in S5 is the variability you want to explain, but that variability disappears when taking the monthly averages. If you necessarily want to keep the monthly averages you should give an explanation for this in the manuscript.

L321-L324 Please rephrase this sentence. It was really hard to understand what you meant.

L364 Which previous studies? I think that it is mainly in humid savanna ecosystems where there is a clear relationship between ecosystem respiration and temperature, whereas dry savanna ecosystems generally have not seen a clear relationship.

Table 1. I am sorry, I still do not understand what the publishing author is? Is it the first person finding this species? Please clarify this and the acronyms used in the table.

Fig 3 and Fig S2. Please explain in the figure caption how the bins were defined, between 0-150 PAR, 150-450 PAR etc. Or? They are not defined to have 100 values per bin, then there would be 28 points.

Fig 7, legend 4. What is yearly sum?

References:

Lund M et al. (2007) Annual CO₂ balance of a temperate bog. *Tellus Series B*. 59B, 804–811

Moncrieff, J. B., Malhi, Y., & Leuning, R. (1996). The propagation of errors in long-term measurements of land-atmosphere fluxes of carbon and water. *Global Change Biology*, 2, 231–240. doi:<http://dx.doi.org/10.1111/j.1365-2486.1996.tb00075.x>