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| Altered Seasonal Sensitivity of Net Ecosystem Exchange to Controls Driven by Nutrient Balances in a Semi-arid Savanna | |
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Response to Technical corrections

The reviewer's report is printed in black.

Answers by the authors are printed in blue.

The authors clearly took the advice and comments of the reviewers into account. The restructuring of the text improved the readability a lot. The adaptations in sections 3.2 and 3.3 made the text more concise. The questions that came up during the reviewing process were answered nicely and short additional explanations were added into the article in a precise and to the point manner.

Thank you very much for this assessment.

Some small additional remarks:

Line 164: friction velocity is here shortened as u_{star} (also in the table) while in line 161 it is shortened as u^* , make this consistent.

Thanks for this remark, we changed both occurrences of " u^* " into " u_{star} " in line 161.

Section 2.2: it is not entirely clear for me what the authors mean with the caption of table 1
Caption in table 1: Soil heat flux and soil temperatures were calculated based on the shadow fraction estimated from the solar zenith angle (variable SZA) and a canopy cover of 20%.

Therefore it is also not entirely clear which soil measurements are actually measured and which are calculated based on shadow fractions and/or canopy covers. I think it is useful to refine Line 166-169, stating clearly how many sensors are used for T_{soil_op} , T_{soil_bc} , SHF_op , SHF_bc and for SWC_n and on which locations (under canopy or open field).

Line 166 – 169: Soil measurements comprised soil temperature in open pasture (T_{soil_op}) and below oak tree canopy (T_{soil_bc}) as well as soil heat flux in open pasture (SHF_op) and below canopy (SHF_bc). For soil water content we used the different measurements integrated over the top 20 cm of the soil, weighted by a canopy cover of 20 % to obtain soil water content values (SWC_n) representative for the ecosystem.

Thank you for pointing out this inconsistency. Indeed, we made a small mistake in the caption of table 1, as only soil water content is calculated based on the shadow fraction estimated from the solar zenith angle and a canopy cover of 20%. We changed the caption of Table 1 as follows (lines 208-210):

“Table 1: Flux, meteorological, soil variables and vegetation indices used in this study. Soil water content was calculated based on the shadow fraction estimated from the solar zenith angle and a canopy cover of 20%.”

For both soil heat flux and soil temperature there are two sensors each in open pasture (“_op”) and below canopy (“_bc”) (, i.e. two soil temperature sensors under open pasture, and two soil heat flux sensors under open pasture, and the same for below canopy). To be more precise we altered the lines 166-171 as follows:

“Soil measurements comprised soil temperature measured from two sensors in open pasture (Tsoil_op) and below oak tree canopy (Tsoil_bc), and soil heat flux from two sensors in open pasture (SHF_op) and below canopy (SHF_bc). We used the average of two sensors when both were available and otherwise the measured values of one sensor. Additionally, to calculate soil water content we used the different measurements integrated over the top 20 cm of the soil, weighted by a canopy cover of 20 % to obtain ecosystem soil water content values (SWCn).

Line 183: here RGB is mentioned but only in line 185 the letters are explained.

Thank you for pointing this out. We removed the “RGB” in line 183, as it is not necessary to specify at this point and as the details are explained in line 185-186. The respective section now reads as follows:

“We used daily mean GCC values extracted from images collected every 30 minutes by digital cameras (Stardot NetCam 5MP) which were installed at the top of each ecosystem EC tower facing north. The cameras were set up according to the protocol of the PhenoCam network (<https://phenocam.sr.unh.edu/webcam/tools/>) and collected red, blue, green (RGB) images (Luo et al., 2018).”

Section 2.4.1: revise this: several sentences are added but now some information is mentioned twice.

Thank you for your comment. We revised section 2.4.1 and removed the sentences in line 216-217 and in line 223-224 to avoid repetition and the section now reads as follows:

“To make sure that the driver identification is not confounded by gap-filling techniques based on meteorological measurements, we only use non-gapfilled, measured flux data. To ensure that there are only high-quality measured values, we selected data with quality flag = 0 (flagging policy according to Mauder and Foken (2004)). Consequently, the data coverage of the measured half-hourly timeseries is quite low (around 30%) and especially heterogeneous during the night-time. Therefore, we calculated from the biometeorological and flux data daily mean values by aggregating only daytime measurements to avoid the bias. Daytime includes only values measured after sunrise and before sunset, identified using the suncalc package in R (Thieurmél, 2017). This does not apply to vegetation indices as they were calculated as described above. GPP and R_{eco} were not assessed in this study as partitioning methods depend on other environmental factors that would also confound the analysis of NEE controls.

If not stated differently, the following analyses cover the 7-year period from 2016-2022 as in this time all variables are available. For the assessment of NEE variability and budgets, we utilized data spanning 8 years (2016-2023) because this extended dataset was available and incorporating additional years enhances the robustness of observed trends.”

Section 2.4.2: some mathematical details

Line 247: I think it is not $X \cdot X$ but $X \cdot X^T$ or $X \cdot X'$

Thanks, we corrected that and changed it to $X \cdot X'$.

Formula (6) is not entirely correct or completely clear, maybe rewrite as:

$$MI_{max} = \max_{\tau} (MI_{sync}(\tau)) = \max_{\tau} (...)$$

Thank you for your remark. MI_{max} identifies the maximum value and not the maximum time lag, therefore we believe that the notation is correct as it is. However, we noticed that \log_2 was not noted correctly and we corrected that as follows:

$$MI_{max} = \max(MI_{sync}(\tau)) = \max\left(\frac{\sum_{x_{t-\tau}} \sum_{y_t} p(x_{t-\tau}, y_t) \log_2 \frac{p(x_{t-\tau}, y_t)}{p(x_{t-\tau}) p(y_t)}}{-\sum_{y_t} p(y_t) \log_2 p(y_t)}\right) \quad (6)$$

Thank you very much for contributing and helping us to improve this manuscript!

While working on the manuscript, we realized that the numeration of the figures is not correct anymore, since we added a new figure (Fig.1) with a map and climate diagram during the first revision process. We corrected the numeration of the figures in their captions and in the text.

Further, we noticed that in the supplementary plots the soil variables (soil temperature and soil heat flux) still had the old suffices (“_Shd” and “_Sun” instead of “_bc” and “_op”). We corrected that in the supplementary figures (S1.1, S1.2, S4 and S5) accordingly.

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