

## Response to reviewers comments (bg-2018-422)

We would like to thank the editor for handling our manuscript and finding two constructive reviewers. Additionally, we wish to thank the editor for extending the deadline which ensured we could properly complete the revision of the manuscript. We also would like to thank the two reviewers for their careful and thorough reading of this manuscript and for the thoughtful comments and constructive suggestions. This has helped us to further improve the quality of this manuscript. Moreover, we have taken the trouble to enhance readability at some few selected places throughout the revised manuscript, marked in green font, the intended meaning has been maintained.

Our response follows (the reviewer's comments and our responses in blue are given below. Changes to the text and citations from the have additionally been marked in italics.)

### Response to Reviewer #1 (bg-2018-422-RC1)

Specific comments

Page 2, line 18: Replace “mesoscalic” with mesoscale  
Rephrased as suggested.

Page 7, line 12: Replace “instalment” with “set up” or remove it  
Thanks for this remark. The word “*instalment*” was deleted.

Page 7, line 16: It would be better to rephrase “time variable canopy height” with something like: canopy height, which changed over time due to crop growth. Question here: how was the canopy height used in the flux software? Some flux software have the option to input heights over time. If this was the case in TK3, how frequently was the crop height changed in the software (bi-weekly, monthly: : :)?

Correct. The sentence was rephrased and now reads as follows (page 7, line 16): “[...] *canopy height, which changed over time due to crop growth, was measured biweekly. The mean measured crop height was considered in TK3 for the respective two-week periods.* “

Legend of Fig. 10: Space between “2017study”

Sorry, that was a typo. Corrected.

Page 12, 25-30: If the storage due to photosynthesis is straightforward to calculate from CO<sub>2</sub>-fluxes, why was it not included in this study? How about the heat storage in the soil layer? It can be derived with measurements of soil temperature and soil moisture, which were available in the experimental setup described in this study. Both terms were included in the EBC for crops in this study: Zeri, M.; Anderson-Teixeira, K.; Hickman, G.; Masters, M.; DeLucia, E.; Bernacchi, C.J. Carbon exchange by establishing biofuel crops in Central Illinois. *Agric. Ecosyst. Environ.* 2011, 144, 319–329, doi:10.1016/j.agee.2011.09.006.

It would greatly help if both terms were included for at least one year per site, to compare with the use of only Rn, G, H and LE.

The soil heat storage was considered in hour study. On p. 5, line 6-7, we write “...*Data from thermistor (0.02 m and 0.06 m) and FDR sensors (0.05 m) were used to calculate the soil heat storage between the soil heat flux plates and the ground surface ...*”. We have now added references to Wizemann et al. (2014) and Eshonkulov et al. (2019), where this has already been calculated and discussed in great detail.

In the previous study (Eshonkulov et al., 2019) had quantified minor storage terms and assessed their effect on the EBC. There it was found that all minor storage terms (enthalpy change in the plant canopy, the air enthalpy change, the energy consumption and release by photosynthesis and respiration, and the atmospheric moisture change) together increased EBC by 5% to 6.8% on average. Among the terms, energy consumption and release by photosynthesis and respiration dominated with an increase of EBC between 4.7% and 5.1%. We discuss this issue on p. 12, line 20-27.

Page 14, line 15: “Moreover, the sources of secondary circulations are unclear, and they are most probably not well linked with the locally measured available energy”. Complex topography can induce advective fluxes of CO<sub>2</sub> and energy (Feigenwinter et al. 2008; Rebmann et al. 2010).

Rebmann, C.; Zeri, M.; Lasslop, G.; Mund, M.; Kolle, O.; Schulze, E.-D.; Feigenwinter, C. Treatment and assessment of the CO<sub>2</sub>-exchange at a complex forest site in Thuringia, Germany. *Agric. For. Meteorol.* 2010, 150, 684–691, doi:10.1016/j.agrformet.2009.11.001.

Feigenwinter, C.; Bernhofer, C.; Eichelmann, U.; Heinesch, B.; Hertel, M.; Janous, D.; Kolle, O.; Lagergren, F.; Lindroth, A.; Minerbi, S.; Moderow, U.; Mölder, M.; Montagnani, L.; Queck, R.; Rebmann, C.; Vestin, P.; Yernaux, M.; Zeri, M.; Ziegler, W.; Aubinet, M. Comparison of horizontal and vertical advective CO<sub>2</sub> fluxes at three forest sites. *Agric. For. Meteorol.* 2008, 148, 12–24, doi:10.1016/j.agrformet.2007.08.013.

We thank the reviewer for this remark. We follow the reviewer’s suggestion by rephrasing to (now on page 16, line 4-5):

“Moreover, *complex topography can induce advective fluxes (Feigenwinter et al., 2008; Rebmann et al., 2010). Therefore, the former waste dump located about [...]*”.

The references have additionally been added to the reference list.

Page 15, line 23: Another reference to katabatic advection: Heinesch, B.; Yernaux, Y.; Aubinet, M. Dependence of CO<sub>2</sub> advection patterns on wind direction on a gentle forested slope. *Biogeosciences* 2008, 5, 657–668, doi:10.5194/bg-5-657-2008.

Many thanks for suggesting the additional reference to katabatic advection which we have now included on page 16, line 3 and added to the reference list.

Page 15, line 25: Advective fluxes are mentioned here but not explained before or any citation to experiments are given.

This point is covered by responding to the two previous comments, and adding the references stated, there.

Page 16, References: Missing reference cited in the text:

Zeri, M.; Sá, L. D. A. The impact of data gaps and quality control filtering on the balances of energy and carbon for a Southwest Amazon forest. *Agric. For. Meteorol.* 2010, 150, 1543–1552, doi:10.1016/j.agrformet.2010.08.004.

Well spotted. We now added the paper to the list of references. (Page 22, Line: 34-35)

### **Additional changes:**

1)

The work was in parts supported by a previously not listed source of funding. Therefore, we added the following sentence to the acknowledgements.: *“Additionally, this work received support from the funding by the Collaborative Research Center 1253 CAMPOS (Project 7: Stochastic Modelling Framework), funded by the German Research Foundation (DFG, Grant Agreement SFB 1253/1 2017).”*

2)

To enhance the flow of the text, we have made a slight change to the introduction, explained in the following:

The paragraph of the original manuscript on page 3 lines 7-16 was moved to what is now page 2 lines 29-27 and the first sentence was deleted. The moved paragraph has been marked in green in the revised manuscript.

3)

The reference to Eshonkulov et al. (2018) has now been updated to Eshonkulov et al. (2019), since in the meantime it has been published.

4)

We deleted the sentence: *“... Note, however, that the difference of residual energy under stable conditions may be the result of using only daytime data (from 7 am to 7 pm)...”* because it was not well connected to the previous part.

5)

Because the sentence was misleading we rephrased the sentence *“...Eshonkulov et al. (2019) demonstrated that minor storage and flux terms over winter wheat in southwest Germany contributed the most to the EBC during the main vegetation period in May...”* into *“...Eshonkulov et al. (2019) demonstrated that the contribution of minor storage and flux terms over winter wheat in southwest Germany was largest during the main vegetation period in May...”*

6)

We extended the acknowledgements to the associate editor and the two involved reviewers.

*“We thank Dr. Paul Stoy for handling the manuscript, one anonymous reviewer and Marcelo Zeri for helpful and constructive comments.”*

7)

To enhance readability, we rephrased the sentence now on page 13 line 16 to read *“At our study sites, neutral conditions dominated (~ 60 %), followed by unstable conditions (~ 34 %) and by stable conditions (6 %) (Table 4)”*

8)

The email of corresponding author was changed to [ravshan.eshonkulov@qmii.uz](mailto:ravshan.eshonkulov@qmii.uz).