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Manuscript Number: EGUSPHERE-2026-524 (in revision for Biogeosciences)

Title: Building a random forest machine learning model for carbon budget estimation in agricultural fields using discontinuous atmospheric Eddy Covariance measurements

Article type: Research article

Dear Associate Editor Ivonne Trebs,

We really thank you for handling our submitted manuscript and the four reviewers for their critical evaluation of our work, which help us improve our work. Accordingly, we deeply address their concerns point by point, making several changes to our data analysis and modelling, which will lead to significant changes in the coming revised manuscript we hope we will be able to send you after your decision. In particular:

- To better understand the RF model's performances on wheat, we tested it separately on the 3 subsectors we had defined in Fig. 2a (Sector 4: 133°-173°; sector 5: 173°-213°; sector 6: 213°-283°). We also included sector 5, that we previously excluded due to u* contamination from the instrumentation wake, requiring recalculating the u* values, needed to filter the NEE data, allowing now the comparison of these 3 subsectors with those of the entire wheat sector (133°-283°).

- In our new analyses, we also included sectors 3 (103°-133°) and 7 (283°-313°) (Fig. 2a) corresponding to the canal and the vegetation along its banks. This will allow us to discuss the validity of the carbon balances for the grassland and the mixed grain field that we obtained from NEE measurements in corresponding sectors 2 (70°-103°) and 8 (313°-15°), where this riparian vegetation, present in the foreground, is likely to warp our results.

- To better assess the uncertainty associated with the RF simulations, all models are now trained multiple times, allowing us to derive a distribution of predictions and corresponding confidence intervals around the median predicted fluxes. In addition, hard limits are applied to the CO_2 fluxes prior to model training to remove aberrant values and extreme events, such as those observed during the storm period, thereby improving the robustness of the simulations as requested by reviewers.

- The partitioning of simulated NEE into GPP and Reco was carried out on the 8 sectors (presented in Fig. 2a), as well as on the entire area occupied by the wheat.

- At last, to more strongly justify the 10-min. averaging time period chosen in the present study, we did further computations comparing the friction velocity, wind speed and flux data between the mean of the three 10-minute values and the corresponding mean values obtained by reprocessing all data.

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Through this extensive revision work and change we made, we now hope our combined measured and modelled EC flux approach we believe can overcome possible limitations and prove the feasibility of EC measurements giving well constrained and quantified NEE values coming from each parcel over such heterogenous crop field, will be further considered by Biogeosciences Journal allowing us submitting the revised manuscript for a final publication in the Journal.

We apologize again and are grateful for the delay we obtained allowing us to made these substantial changes as detailed in our responses to Referees.

Thank you again for your consideration of our work. Please address all correspondence concerning this manuscript to me by e-mail (camille.pery@bordeaux-inp.fr).

Sincerely, Camille Pery and my coauthors.