

Dear Ji-Hyung Park and Jacob Diamond,

We thank you for the overall positive assessment of our revised manuscript and the again very detailed and instructive comments. Please find below our detailed responses to the reviewers' comments.

on behalf of the authors,
Alexander Wachholz

Response to the reviewers comments:

Reviewer 1: *Jacob Diamond*

Comment 1: Figure 4 and associated approach: This I think is the weakest point in the manuscript, but it's not a deal-breaker. The figure and approach work as is but could be made more robust. You mention in the Discussion that PQ, GE_{auto}, and C:N_{auto} also could be (and are) changing over time, but instead only focus your uncertainty on the respiratory side of things. Please make clearer why you made this choice. Instead of picking three extreme parameter values, couldn't you use a similar approach of ML to fit the parameters? What causes GE_{het} and RQ to change? What direction would you expect them to evolve in given your understanding of the system? Reporting this would strengthen the results of the manuscript and be useful for our overall understanding riverine C and N functioning.

Response to comment 1: We agree with the reviewer and have made the following changes to the manuscript:

- In lines 248, 294, we stated why we used this specific PQ, GE_{auto} and C:N_{auto} values
- In lines 442-446, we discuss the drivers of GE_{het} and RQ in the context of our analysis

Comment 2: Using Pearson's "r" without showing the actual scatter plots seems to obscure the results – we never actually see the me series or data from the U_{met} plots. That was a visually compelling result in the previous version and I'd opt to bring it back in somehow. For example, you could choose the best parameter set for each period and then show the me series of U_{aut} and U_{het} in panel C (as from the previous version) and add the mean μ_{aut} in text above each delineated period (like in Figure 2). I think you should leverage the effort you put into this and the large amount of data to make this result more compelling.

Response to comment 2: We thank the reviewer for this constructive comment and have revised Figure 4 as suggested.

Comment 3: L89–91: First, I recommend removing the language "a natural condition" as it is meaningless here. Why do you expect weakened coupling of metabolism and DIN retention during the high pollution phase? I recommend rethinking and rephrasing this hypothesis and including at least one testable prediction from your hypothesis after this sentence. For example, "Based on this

hypothesis, we predicted that respiratory processes would explain the majority of DIN retention in the high pollution period.”

Response to comment 3: We agree with the reviewer and have rephrased the hypothesis (lines 91-93).

Comment 4: Figure 3: In the figure caption you mention the GPP/ER ratio, but I do not think it is shown in the figure, or mentioned in the text. In line with the above, I recommend reporting NEP and its change over time. This value is important for understanding the trophic state and “metabolic regime” of the system.

Response to comment 4: We agree with the reviewer and have adjusted the caption of figure 3. The NEP is reported in the lines 305-308.