

## **Review for revisions to bg-2023-184: From iron curtain to green belt: Shift from heterotrophic to autotrophic nitrogen retention in the Elbe River over 35 years of passive restoration**

### **Overall:**

I thank the authors for addressing all the reviewer comments in a clear manner. While there are some grammatical issues, small typos, and awkward wordings throughout that could use another review before final submission, I find the technical work to be sound.

### **Major Comments:**

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  $PQ$ ,  $GE_{\text{auto}}$ , and  $C:N_{\text{auto}}$  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  $GE_{\text{het}}$  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.

Using Pearson's "r" without showing the actual scatter plots seems to obscure the results – we never actually see the time series or data from the  $U_{\text{met}}$  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 time series of  $U_{\text{aut}}$  and  $U_{\text{het}}$  in panel C (as from the previous version) and add the mean  $f_{\text{aut}}$  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.

### **Minor Comments:**

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."

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.