

Author's response to comments by anonymous referee #3

We would like to thank referee #3 for taking the time to read our manuscript and for providing constructive feedback. The helpful comments will improve the quality of our manuscript. Our responses to the individual comments are shown in blue below.

This novel approach of analyzing and visualizing diel nutrient data is an important contribution to stream ecosystem science. It fits the scope of this journal well. Overall, I found this manuscript to be interesting and advancing the use of diel cycles of nutrients to interpret ecological functions in streams. However, the lack of simultaneously measured process rates (such as metabolism, nitrification or denitrification) makes parts of the discussion and conclusions very speculative and I strongly recommend to shorten and nuance that section.

Reply: We agree that our statements on the relative importance are somewhat speculative and should not be presented as key findings. We will shorten the corresponding parts of the discussion and focus on compelling results.

Specific comments:

1. In figure 1 I wonder why the evaluated stream reach is mapped outside of the land use map? In particular, information on urban areas including pasture between the measuring points are of interest to the interpretation of this data set.

Reply: Figure 1 will be revised accordingly.

2. Line 220. "Downstream transport of solute signals therefore fails to explain most of our data. We therefore interpret our data to indicate primarily in-stream origin of diel nitrate cycles." What about signals from land, i.e. soil water signals. Especially during low flow. I realize this comes later in the manuscript but I would move some of that discussion here and clarify it also in the methods.

Reply: The topic of groundwater/soil water will be moved towards the beginning of the manuscript.

3. Line 368-60 "In the remaining clusters temporal shifts were evident that could be explained by temporal shifts in microbial nitrate processing but not by photosynthesisdriven uptake." This line makes it sound like you measured microbial processing or photosynthesis, please re-phrase.

Reply: We will rephrase this sentence to avoid misunderstanding.

4. Line 250-256. My experience of dissolved oxygen signals is that they can often match cluster C, with maximum %O₂ in the afternoon. I would not be so quick to discard cluster C from being driven by photoautotrophs without evidence. Especially since there was a negative correlation between solar radiation and cluster C (line 183), which is what you use to argue for photoautotrophic dominance in driving cluster A and B.

Reply: In fact, there is no sharp border between clusters. Cluster C may contain days where drivers deviated from the usual pattern. However, this was not systematically the case as correlations of cluster C with radiation were weaker than those of cluster B and (slightly) cluster A. We will refer to this in the discussion.

5. Could spring photoautotrophs be light inhibited during mid-day and therefore cluster C peaks in the afternoon? Cluster C was most prominent in spring when harmful UV is the highest. Which were the light levels in this study? Was light ever measured under water?

Reply: We will include this question in the revised discussion. Light was only measured as global irradiance at a nearby climate station and never under water.

6. No statistics are presented in the results section on page 8, please include that.

Reply: Statistics will be added to the results on page 8.