Author's response — bg-2021-333

Dear editor,

First of all, we would like to thank the editor for their kind attention to our article and the time that they allocated to read it and provided us with technical corrections for enhancing our paper. Please find hereafter our point by point reply to comments, including the changes brought to the manuscript.

In response to your minor technical corrections, lines numbers correspond to that of the production manuscript:

line 14: unclear meaning of phrase "and post-infrastructure improvement in treatment plants". We reworded it to "modifications in internal processes of treatment plants", line 14. Indeed a change in the efficiency or the internal processes of a treatment plant results in a modification of the outflows (bacteria and organic matter). This condition may lead to dominance of new bacteria communities in a river, that is why we had mentioned that a new bacterial community monitoring is necessary in such conditions.

15: Last sentence of abstract has unclear meaning. (It was reworded to "Furthermore, we discuss the inclusion of BDOM in statistical water quality modeling software for improvement in the estimation of organic matter inflow from boundary conditions", line 15.)

58-62: Q1 and Q2 seem to be not cleanly separated, consider rephrasing. Also in Q1 it may better be "alone" instead of "only" before "sufficient to describe DO variation". "Alone" is corrected, however, we believe the research questions are well separated because Q1 is answered in the results of first SA (section 3.1) where we discuss the general behavior of parameters and especially that of bacterial parameters. In Q2, which is answered in section 3.2 & 3.3, we focus on the role of BDOM under high and low net growth conditions.

99: unclear sentence, consider rephrasing. Reworded to "Using this OM partitioning model and depending on these five parameters, we are able to convert time varying TOC of boundary conditions, per say river inflows, into time varying $DOM_{1,2,3}$ and $POM_{1,2,3}$ fractions.". Line 99.

114-116: I do not understand why this would be relevant. The water does not need 45 days to flow through the modelled reach. As explained in line 118, it is a lagrangian approach, where we follow a river body along a river network of the above mentioned dimension with a speed of 0.14 m/s. Thus, there is no outflow in the system. We just move together with a 1000 meter long reach of the river. However, regarding the 45 days, we need to wait so long for the organic matter in the system to be consumed by the bacteria depending on the amount of organic matter and bacteria kinetics, thereby, resulting in a decrease in the dissolved oxygen levels as shown by figure 3. This is needed in order to evaluate the influence of parameters on the variation of oxygen. In other words, it takes around 5 days for the most labile part (DOM_1) to

be uptaken. Then we need to wait until day 45 for the hydrolysis of less labile (DOM_2) and particulate fractions into DOM_1.

169: correct to "their highest value".(Done, line 169)

212-213: not a sentence, maybe just delete "As" at start of sentence? (Done, line 212)

249: correct to "to synthesize our results". (Done, line 249)

267: Meaning of carbon sink unclear to me. The model has sinks. Or do you mean complete disappearance of carbon? By carbon sink we mean complete depletion or disappearance of carbon as explained in line 267. "Indeed, carbon depletion …. " . The carbon sink term was brought up by the first reviewer and therefore we included it as a limitation of the study.

270: What are "radiation effects"? Are you referring to sunlight? Yes. This was raised by the first reviewer as well. To make it clear for readers, we replaced it with "impact of solar radiation on" in line 270, and added the word "solar" before the word "radiation" in lines 271 and 274.

277: Typo in "diluation". (corrected, line 277)

334: Typo in "majorS... effluents" (corrected, line 334)