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Interactive comment on "A numerical analysis of the role of the microbial loop in regulating nutrient stoichiometry and phytoplankton dynamics in a eutrophic lake" *by* Y. Li et al.

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General comments:

The paper is relevant for the research area of lake water quality modeling, specifically for the aspect of how to describe the processes related to the bacterial community properly. As typically the effects of the microbial loop are described in a very simplified way in most lake models, the paper is a very valuable contribution to its field. In general, the paper is interesting, well-structured and written well. It seems that the presented study was conducted thoroughly. My main concerns are related to the validation of the model and the related comparison of its three different sub-models/configurations.

It is not clearly stated, but it seems that the model parameter values for all three configurations are mostly taken from an earlier study (Table 4) of the same lake model (Gal et al. (2009)), which includes the most detailed bacteria model configuration (BAC+DIM). I am wondering if the two newly presented model configurations only perform less well, because they are not calibrated separately and the parameters from the BAC+DIM model do not fit to the alternative model configurations. It should be explained how the older version of the model was calibrated and if and how the newer two model versions were calibrated as well. If there was no additional calibration done, the choice of parameter values for the NOBAC and BAC-DIM configuration should be justified.

If the main purpose of the paper is to find out, which model configuration is closest to reality, this should be supported by measurement data. It does not seem to be enough to state that the NOBAC and BAC-DIM configurations had higher errors than the BAC+DIM simulation. This should be shown by a direct comparison with measurement data and/or by a quantitative comparison of errors, e.g. RMSE.

Additionally, I have some comments to some specific aspects of the manuscript:

Specific comments:

1) p. 19733, lines 10-12 / p. 19734, lines 22-27 / p. 19738, lines 10-17: I found it difficult to find out which mechanism is described in which microbial loop sub-model. Table 2 helps a lot to find out, but it should be also clarified in the text. For example, the order of the listed potential mechanisms is not the same in the abstract and in the introduction, numbering could be done consistently and it could be stated that the bacterial provision of an alternative food source for zooplankton is somehow integrated in all three sub-models.

2) p. 19743, lines 3ff: for a thorough comparison of the three model configurations and evaluation of the importance of specific processes, the parameters sensitivity analysis should be conducted for the three model configurations and not only one.

3) p. 19744, lines 6ff: As mentioned above, “matching the field data” should be proven.

4) p. 19744, lines 11ff: It is not clear to me what the comparisons like “reduced”, “higher”, “increased” refer to in this section. Is that the comparison of the three model configuration simulations among each other or to field data?

5) p. 19744, lines 16/17: the errors or a direct comparison of model results and measurement data (e.g. added to Fig.2) should be shown.

6) P. 19755: the final conclusions of the shown results could be presented a bit more clearly and pronounced (as done on the following page).

7) Table 4: Are the parameters, for which the authors refer to the earlier study, the same for all three model configurations? How were those parameter values chosen (manual/automatic calibration)?

8) Fig. 2: As mentioned above, a comparison with data would help.

Technical corrections:

1) p. 19737, line 25: for clarification, “A” as the specification of the phytoplankton state variables should be added after “five phytoplankton groups”, as done for zooplankton in line 2 on the following page.

2) p. 19741, line 17: “DOC” should be a subscript in UDOC

3) p. 19749, line 18: there is one “accurately” too much in this line

4) p. 19751, line 20: “increases” should be “increase”

5) p. 19755, line 18: “therfore” misses an “e”

6) Table 1: Are “N_A” and “N_Z” also “simulated variables”?

7) Table 1: Where “CAEDYM names” are missing, are they the same as written in “Notation”?

8) Table 4: “N” = “N/A”?

Interactive comment on Biogeosciences Discuss., 10, 19731, 2013.