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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Impact of climate forecasts on the microbial quality of a drinking water source in Norway using hydrodynamic modelling" *by* Hadi Mohammed et al.

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Comment #1. Line 233-234, How was the water sampling performed for E. coli counts? How could the authors simulate the E. coli proïňĄle just using the surface and raw water intake point? Did the authors perform any sampling at different depths for E. coli counting, C1. Besides surface and intake point? If the authors measured temperature proïňĄles why did they not performed the same approach for the E. coli counting? I suggest a sentence explaining how it was done because it is not very clear how the model was calibrated only with these two sampling points.

Response to Comment # 1.

The sampling was performed in the streams on biweekly basis, and the analysis was done using membrane filtration. Delusions of up to 10-2 were used for samples that showed relatively higher E. coli concentrations.

The E. coli data at the water intake point of the lake were obtained from the water treatment plant, who also enumerate the bacteria using membrane filtration. Analysis of samples at different depths were not performed. This could be a very good option for future investigations.

The temperature profiles were also measured by the water treatment plant managers.

The model was calibrated by manually setting parameters and running model simulations until the best fit was found. The model calibration was fitted to measured temperature data were both the profiles and intake data were used. The E. coli data measured at the streams were used as input data in the temperature calibrated model. The e. coli data in itself was not calibrated. But t o see how the current peak of E.coli could be in the future, scaling of the input data was done to match the measured peak at the intake depth before running the future scenarios (2045 and 2075).

Comment #2. What was the technique to measure the E. coli counting, was it membrane ïňĄltration? If so, how could the authors get concentrations of 45524 CFU/100 ml, it had to be a huge dilution. Although this was not part of the objective of the experiment, these questions, in my opinion, should be considered for a better understanding and calibration of the model.

Response to Comment # 2.

See response to comment # 1 above. The 45524 CFU/100ml is after scaling, see response to comment # 1.

Comment #3. Abstract, line 17, the sentence "The results is expected to..." should be corrected for "The results are expected to...".

Response to Comment # 3.

The comment is well noted and would be corrected in the revision.

Comment #4. Section2.1–In the description of the lake, I would suggest including a sentence saying the classiïňĄcation of the lake concerning the type of mixing. Is it a dimictic lake?

Response to Comment # 4.

The lake is mainly dimictic. Thermoclines occur in the summer, while mixing occurs in spring and autumn. The condition in the winter however depends on the water temperature.

Moreover, the vast cover of mountains that surround the lake reduces the effect of wind on the mixing conditions. Thus, mixing is not complete throughout the lake.

Comment #5. Section 2.2.2 Microbial discharge into the lake, line 146, the method and units used to determine the E. coli concentration in water samples should be referred to in the text in this section.

Response to Comment # 5.

The comment is well noted and the method used in determining the E. coli concentrations would be explained and referred to accordingly.

Comment #6. Line 157, at the end of the sentence I would suggest including the reference of Table 1.

Response to Comment # 6.

Well noted and would be done accordingly

Comment #7. Line 215, please, explain better the terms of this equation.

Response to Comment # 7.

Further clarifications about the terms in the equation will be given in the revision.

Comment #8. Line 158, units of E. coli concentrations is missing.

Response to Comment # 8.

Well noted. The units of E. coli shall be added accordingly.

Comment #9. Line 277, Figure 4 shows the distribution of temperature and concentration of E. coli in the Lake in 2017 during the four major seasons or cross-sections from the model output? Do the numbers 15 after the month corresponds to the year of 2015? Shouldn't it be the year 2017? I suggest a clariïňĄcation of the legend and ïňĄgure.

One thing that is not very clear is that, although the authors say that the major streams are the key source of E.coli load on the Lake(line331-332), "Under the current climate forecast for the catchment area of the Lake, the concentrations of E. coli in the Lake... is expected to marginally increase by 2075" (line 395-397) but table 2 shows that average concentrations of E. coli in the tributaries tend to decrease by the year 2075. Also, in table 2, the Arsetelva and Vasstrandelva streams, although they are the "key sources" they exhibit the lower average concentrations. So maybe it should be clear that, perhaps, the "key source" of bacterial contaminations are not the major streams but the populated areas surrounding the north-western part of the Lake.

Response to Comment # 9.

The distributions shown in Figure 4 were taken on the 15th of the months (march, July, November, and January), which were respectively assumed to as the middle of each of the four seasons; spring, summer, autumn and winter. The year was however 2017.

The values in Table 2 show the average concentrations of E. coli observed in the streams in 2017, compared with the predictions for 2045 and 2075. However, the statement as quoted by the reviewer refers to the predicted concentrations at the raw water intake point of the lake (35 m below surface).

The two streams; Arsetelva and Vasstrandelva are two of the major streams. However,

the other two major streams; Slettebakk and Brusdalen were identified as the “most important” sources of E. coli.

We agree with the reviewer that other potential sources including the populated areas could be more important sources, although no discharging streams are located in these areas. Therefore, further explanation shall be given in the revision to clarify this.

The decrease in tributary E.coli concentrations is partly because of higher flows in the tributaries. The overall microbial impact of the tributaries is increasing.

In our model two of the streams, Slettebakk and Brusdalen has the highest concentrations of E.coli. However, the two streams, Vasstrandelva and Arsetelva has the highest flow. The overall microbial impact of a stream is a combination of the flow and the concentration of E.coli in the flow. Line 331-332 talks about all four streams.

Because of the scaling of the E.coli input data to fit the peak measured level at the intake point, we agree that other sources are likely to be more important.

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