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Hydrology and Earth System Sciences Discussions

Interactive comment on "Impact of phosphorus control measures on in-river phosphorus retention associated with point source pollution" *by* B. O. L. Demars et al.

Anonymous Referee #1

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The paper 'Impact of phosphorus control measures on in-river phosphorus retention associated with point source pollution' of B. Demars et al. deals with the evaluation of Phosphor reduction on point sources in rivers with clear indication of phosphor retention. A simple method is presented that relates the phosphor concentrations to the discharge rates. A strong point of the method is the simplicity, showing a thoroughfull use of data. But, the simplicity has also its weak points that cause that due to simplifications, the observed variability might not be explained in a proper way. Some of the these simplications are well addressed in the discussion section, but others are not. It is therefore recommended to try to improve the model by taking more dynamics into account, or, by addressing these simplification in the discussion section.

1. The whole analysis is based on eqaiuton 5 that relates Total Phosphor to the dis-

charge. Since a, b, c and d and the point sources are constants, this means that there is a unique relation between the total phosphor and the flow. Figure 6 (in log scale!) however shows that there is a very wide variety of possible suspended solids concentrations for a certain discharge. So, it is not very realistic that a unique relation can be formalised relating TP to discharge. Points 2, 3, 4 and 7 address some of the overlooked variabilities/dynamics.

2. The background calculation of the phosphorus, described by equation 3, assumes that there is an overall constant relation, and that only the discharge is causing the variability. This is not realistic. It is known that the agricultural and/or natural plant processes cause strong seasonalities in the nutrient dynamics: nutrient uptake during growth in spring and nutrient release during decay in autumn. Also agricultural practices, like manuring, are of major importance.

3. Also the elasticity in the retention/remobilisatin equation is not included. Normally it is expected that there is a lag between retention and remobilisation.

4. The storage of phosphor itself is not calculated. Normally, it is expected that remobilisation is higher for a discharge following a dry period will take much more P because there is a lot of phosphor stored in the river bed, than a discharge following another high discharge that took already a lot of the river bed phosphor. This "first flush" event is not described. This is however essential.

5. To me, a strange procedure was used to define the a, b, c and d coefficients. Why not a linearisation as: log(TP) = log(a)+ b log(Q)? A linear regression allows to define the uncertainty bounds for a, b, c and d as well...

6. Why were seperated b and c coefficients defined for the situation before and after phosphorus control (cfr. line 23 of page 47)?

7. The calculation of b and c, and thus the overall interpretation of retention/remobilisation, is based on the assumption that the calculation of B in eqation

2 is unbiasses. How realistic is this?

8. I do not follow the logic in the chapter between the lines 16 and 26, containing too divers information for a single chapter. First, I would like to comment that even in popuated areas, high loads can be exported. This is known as the first flush event. The authors refer to floodplain processes. But, they should note that these are not taken into account in a cQˆd relation, as, above a certain discharge, remobilisation should convert to retention.

9. line 27 of page 50: does this refers to the calibration of the flows or of the TP? Why isn't there a figure plotting the observed TP and the calculated TP values and the observed TP versus the discharge values?

10. Fig 5 shows a cumulative distribution. In my opinion, this is not a flow-duration curve, as duration of events are not represented. See Demuynck et al. for duration curves.

11. In line 16, dowstream should be downstream.

Demuynck, C. , W. Bauwens, et al. (1997). "Evaluation of pollutant reduction scenarios in a river basin : application of long term water quality simulations." Wat. Sci. Tech. 35(9): 65-75.

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