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Hydrology and Earth System Sciences Discussions

Interactive comment on "Technical Note: Demonstrating a 24/7 solution for monitoring water quality loads in rivers" *by* P. Jordan and R. Cassidy

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Short comment by C. Duvert & T. Grangeon (LTHE, Grenoble, France)

The paper proposed by Jordan and Cassidy presents a straightforward method for accurately quantifying phosphorus export from small agricultural catchments, by using an original 7-hour frequency sampling design. We enjoyed reading the manuscript, and we believe it will be of interest for the HESS readers. We would encourage the authors to address some questions about the methodology used, and to further develop their discussion. Here we provide a list of some points to be addressed in their revised

version:

- The authors state that the study catchment has a flashy nature during high flows, which is clearly visible in Fig. 1a (flood hydrograph with abrupt rise followed by fast recession). They calculated the "true loads" from high frequency data obtained every 20 min. What makes them assume that a 20-min frequency survey can be assimilated to continuous records? Given the flashiness of floods, are they certain that all phosphorus temporal variations can be accurately captured using such sampling frequency? Please elaborate on this. Also, can the authors quantify the error on real loads associated with this sampling design (for instance by using short-range records obtained at higher frequency)?

- Regarding the tested sampling frequencies, we believe that a few more simulations are missing between daily sampling (Sampling strategy S9) and sampling every 7 hours (S11). For instance, the authors could have tested the error on flux estimate associated with a sample taken every 10, or 12, or 14 hours, etc. Such strategies could result sufficiently accurate in terms of annual flux estimate, and they would be even more parsimonious and cost-effective than the 24/7 survey.

- The authors state that the 7-hour frequency sampling strategy provides accurate results because of "the increased probability of capturing short term fluctuations in concentration". Considering the high phosphorus peaks observed during floods (i.e. diffuse source transfers), it might be interesting to estimate the contribution of such peaks to the annual phosphorus load, as compared to the contribution of point source transfers to the annual load.

- Instead of "load values", consider using "Errors on true load (%)" for the ordinates of Fig 2. This might add to the readability of the figure. What would be the acceptable range of error on load estimates?

- S9 (daily sampling between 8 am-5 pm) seems to underestimate the "true load" most of the time. Fig. 1a suggests that a significant part of the phosphorus load is exported

during the nocturnal period (i.e. 6 pm-8 am). As a counterweight to diurnal S9, have the authors tried to test a nocturnal sampling strategy? Would they expect to obtain an overestimation that would be somewhat symmetrical to the underestimation given by S9?

- It is surprising how S8 (360 random) provides accurate results, especially when looking at the inter-quartile range. Have the authors tried to go further into the analysis of this sampling strategy?

- The authors might want to enlarge the scope of their work by discussing about the importance of their findings for flux calculation in small catchments, and not only for phosphorus-related issues. The works published by F. Moatar and colleagues, as well as by A.J. Horowitz and colleagues, might also be of interest to strengthen the discussion and widen it to the issues faced in larger catchments.

- Specific comment: in Fig. 2, the antepenult strategy is named “daily 8-18H”, whereas in Table 2 S9 is named “Daily sampling (8 am-5 pm)”. Please check whether 5 pm or 6 pm is the correct hour.

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