Hydrol. Earth Syst. Sci. Discuss., 9, C2613–C2618, 2012
www.hydrol-earth-syst-sci-discuss.net/9/C2613/2012/


Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "From existing in situ, high-resolution measurement technologies to lab-on-a-chip – the future of water quality monitoring?" *by* A. J. Wade et al.

**Anonymous Referee #2**

Received and published: 29 June 2012

Review of the paper "From existing in situ, high-resolution measurement technologies to lab-on-a-chip: the future of water quality monitoring?" by A.J. Wade, E.J. Palmer-Felgate, S.J. Halliday, R.A. Skeffington, M.Loewenthal, et al.

Outline of the paper and major remarks

This is a good paper presenting the "goods and bads" of high frequency sampling of stream water chemistry, and introducing where to go next. The implementation of in situ automatic samplers and analyzers has been done carefully, and the authors have done an excellent job testing the quality of the data acquired in the field. The paper

reads well, yet some sections need to be revised/shortened for improving clarity.

The introduction is somehow overlooking a bunch of studies performed during the last decades in which high frequency monitoring during storm events has been performed for understanding hydrological flow paths and sources of nutrients in pristine and non-pristine catchments. These storm-based studies have been useful for increasing load estimation accuracy and for understanding catchment functioning. The authors have undoubtedly a point when saying that continuous high-frequency monitoring is going one step further because it allows answering a set of new and interesting questions such as complex daily cycles during base flow conditions as well as pulses of industrial pollution. However, some reference to these storm-based studies should be made.

Section 2 explains in detail the different urban areas (with their corresponding STW) for each of the three studied catchments. However, the map in Figure 2 does not show the location of many of these towns/counties (?). It does not seem very useful to the reader knowing the name of these towns, especially when many of them cannot be localized in the map. It would be more useful (and the text will be more synthetic) if focusing on the PE of the STWs without giving too much detail on the specific names.

Following with section 2, Figure 1 does not seem very informative. I would suggest deleting Figure 1 and enlarging Figure 2 so that key names can be found in the map. It is a bit confusing to refer to the same sampling point with two different names (either Enborne or Brimpton, Kennet or Clatford, Cut or Bracknell). This is especially confusing for the River Cut because the chemical sampling station was at Bray (or Bray Marina, not sure), the streamwater level was recorded at Bighams, but the stream discharge considered in the study was measured at Binfield. Wouldn't it be more simply to use only one name for each of the three rivers?

In section 4, some info on detection limits and analytical errors would be acknowledged.

Be consistent with the subtitles in sections 2 and 3: either "The River X" or "The X".



HESSD

9, C2613–C2618, 2012



There are some issues that need to be improved regarding the interpretation of P and N temporal patterns. First, the authors are interpreting daily cycles without a “pristine” or “reference” site not affected by human activities. Thus, they need to be cautious when interpreting daily cycles because the contribution of natural vs human activity on daily cycles cannot be disentangled. Second, the authors refer several times to a two-peak daily cycle exhibited by Q, TRP, and nitrate which they interpreted as an indication of the STW dominance of water and nutrient inputs to the stream. However, such two-peak daily cycle is only clear for discharge (figure 5) and maybe (only some days) for TRP at the Cut. It is not exhibited by TRP at the Enborne and there is no data shown for nitrate. The authors need to analyze these daily cycles more thoughtfully to make a more meaningful discussion of these patterns.

Please, revise the order and the content of the figures. Figure 5 does not fit with its related text. Figure 10 is introduced before Figure 9.

Specific points

P6462-5. Nitrate instead of NO3.

P6463-6. Which was the recording frequency for these data?

P6464-11. Do not refer to Figure 1 because it does not show these features.

P6464-11. Marlborough is not shown in the map (Fig. 2).

P6464-14. Fyfield is not shown in the map (Fig. 2).

P6464-18. Binfield is not shown in the map (Fig. 2).

P6464-19. Do you know the BFI for the river Cut.

P6464-25. Ascot is not shown in the map (Fig. 2).

P6464-26. If Bray Marina and Bray correspond to the same site, delete Marina to be consistent.



HESSD

9, C2613–C2618, 2012

Interactive Comment



P6466-8. Which volume of water was pumped?

P6467-11. Is 39025 the EA ID? For Brimpton this is 7128 according to legend in Figure 2. Please clarify.

P6468-1. Is 39037 the EA ID? For Marlborough this is 7113 according to legend in Figure 2. Please clarify.

P6468-2. If there are no major tributaries and SWT, the specific discharge should be the same at the two points. However, groundwater lateral inputs may increase stream discharge along the 3 km transect. By how much increases the drainage area between these two points? These could give an idea of by how much stream discharge would increase between Kennet and Marlb. in relative terms.

P6468-3. If acronyms have been defined, make use of them through the text consistently: use STW instead of sewage treatment work.

P6469-14. Is 39052 the EA ID? For Binfield this is 7167 according to legend in Figure 2. Please clarify.

P6469-18. A good relationship between daily mean flow and flow level between the two points indicates a consistent hydrological response. However, it does not imply that stream discharge was similar between the two points. If there are no major tributaries and SWT, one may expect an increase in stream discharge proportional to the increase in drainage area between these two points. If such increase in drainage area is small in relative terms, the approach made by the authors would be appropriate; otherwise, the authors could be underestimating the load of P at the Bray site. This issue may not be relevant for this particular study since the annual loads are not compared among rivers, but it could be an issue for future studies.

P6469-24. What is CEH?

P6470-3. Not for NH4 at Kennet (6467-21).



HESSD

9, C2613–C2618, 2012



P6470-25. Figure 5 does not show the agreement between hourly and weekly samples.

P6472-7. Define Le and N.

P6473-17. Bray? The authors used stream discharge measured at Binfield, didn't they (P6469-18).

P6474-12. Considering the fluctuation of P concentration in stream water between consecutive samples shown in Figure 6b, 1 ppb of P may be a too low concentration to be analyzed with precision. Could you add in M&M some information regarding the detection limit and/or the analytical error of the used instrumentation?

P6475-5. According to section 3.1, Tp was not measured at Enborne.

P6476-25. According to Figure 7, there is no a two peak cycle in Enborne (at least, it is distinguishable by visual inspection only some days). The two peak cycle in the Cut is not apparent either. In my opinion, the one peak daily cycle at the Enborne (Fig 7b) would suggest that the two peak cycle for Q is not accompanied by a change in the input of P. Therefore, the two peak cycle for Q may not indicate the influence of the SWT on P (or N concentration, unless the P signature of the SWT would be undistinguishable from that in groundwater.

P6476-24. Was this two peak diurnal cycle more evident for nitrate than for P? Were nitrate peak concentrations occurring at night or day time?

P6476-27. Please explain better how denitrification and aquatic vegetation activity would result in high nitrate peaks at midday?

P6477-3. Why one would expect that alders prefer fixing N2 during the day when there is enough bioavailable inorganic N in stream water (and likely in groundwater)? N2 fixation is energetically expensive.

P6477-14. Please, check the order of figures in the manuscript.

P6479-11. Please, explain better for which sort of data analysis this aliasing effect



HESSD

9, C2613–C2618, 2012

Interactive Comment



occurs. Some readers of HESS may not be used to work in the frequency domain.

P6480-2. Please, introduce INCA. Many readers of HESS may not have ever heard about this model.

P6487-9. Heterotrophic algae? Please clarify!

Caption Figure 5. “occurring” instead of “occur”.

Caption Figure 6. Add “flow and” after Enborne.

Figure 2. Enlarge the size of the legend to improve legibility. What is EPSRC? How was the river level calibrated at Bighams? Equivalent instead of Equivelent.

Figure 6. Maybe it would be more illustrative to plot Q vs concentration, the hysteresis loop will be more clearly seen than in the actual plot.

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 6457, 2012.