Part 1. (Paul Floury on behalf of the co-authors).

Please find a new version of our manuscript "The Potamochemical symphony: new progress in the high-frequency acquisition of stream chemical data" with the corresponding associated content.

We are really sorry about the tone the review has taken and we did our best in the revised version to take the (positive) comments and suggestion of the reviewer into account. We present a new version of the paper which has been significantly reworked. We understood that some sentences of the initial manuscript were hurtful for the reviewer and did not give enough credit to his work. We apologized if sentences give him the feeling that we deliberately wanted to refuse acknowledge previous studies or even worst, disregard them. The fact is that the design of the River Lab that we describe in this paper and the design of the lab-in-the-field Swiss hut were contemporary. The Swiss paper (von Freyberg et al., 2017) was published first, what we totally humbly acknowledge now in the paper. We have changed the introduction to make it clear that the River Lab is a parallel initiative to the Swiss hut. Our intention was not to hurt.

In the following, we take the point by point list of comments raised by the reviewer and specify the corresponding changes made to the ms. All reviewer's comments has been taken into account and accepted.

Reviewer: This is an improvement over the original submission, but there are still problems that need to be dealt with. The general issue is that the manuscript still claims a level of originality and significance that is not justified by the evidence that is presented. I assume that the authors are not intentionally shading the facts, but unfortunately this is the impression that the manuscript gives.

We apologize if some sentences in the manuscript gave the feeling to misrepresent previous studies in the field. This was not our goal. We reformulated all sentences mentioned by the reviewer (see in the following).

Reviewer: For example, the introduction is still written as if nothing like the authors' River Lab has ever been built before. But various "field lab" setups have been built, many times. Indeed, there was a paper published in HESS earlier this year describing a field lab based on ion chromatography that is very similar to the River Lab. The authors are well aware of this prior work (and indeed it was pointed out in a previous review), but they still refuse to acknowledge it. Instead, for example, they only cite the HESS paper following a statement about "issues related to sample transport, filtration and storage". Refusing to acknowledge prior work and instead citing it for trivial or tangential points is inappropriate and one would hope that the authors would recognize this.

The introduction was reworked. We now present the achievements of the Swiss group the reviewer is referring too as follow:

“A new solution for high1frequency measurement of river chemistry is offered by bringing the laboratory’s measuring devices to the field (the “lab in the field” concept). A Swiss group has recently successfully developed such a system (von Freyberg et al., 2017) by installing ionic chromatography devices in a hut next to a stream. In this paper, we present a parallel initiative named as the River Lab (RL) and funded by French program CRITEX: “Innovative sensors for the temporal and spatial EXploration of the CRITical Zone at the catchment scale” (https://www.critex.fr)”.

Line 76 was confusing and therefore has been changed. It now reads as:

“This approach, like the previously published one, overcomes traditional limitations on the number of samples and avoids several issues related to sample transport, filtration and storage”

Reviewer: The manuscript says that "online instrumental devices in which continuously pumped water is injected have been suggested as an alternative to monitor water chemistry." Such systems have not only been "suggested", they have actually been built and used, in some cases for many years.

We reformulate correctly this part of the introduction. The sentence in question now read as:

“Several papers have been published over the last decade reporting existing devices mostly focused on monitoring dissolved N or P and organic matter (Kunz et al., 2012; Clough et al., 2007; Aubert et al., 2013a; Aubert et al., 2013b; Rode et al. 2016)”

Reviewer: The manuscript continues, "To date, these systems have only been used to monitor nutrients such as dissolved N or P." This is false and the authors know that it is false. They know perfectly well that another group has already published an ion chromatography system very similar to theirs and that measures the same ions that they have measured, but their manuscript appears to have been carefully written to conceal that fact.

We have rewritten the introduction that we now think is overcoming the issue raised by the reviewer. We separated the devices allowing people to measure nutrients and organic matter at high frequency, usually based on is situ sensors from the "lab in the field" concept now represented by the Swiss and our group initiatives.
We also quoted in the conclusion von Freyberg et al. (2017) to acknowledge previous work and emphasizing the fact that both studies (our and von Freyberg et al., 2017) were conducted simultaneously:

" The improvements made possible by the RL here or concomitantly by von Freyberg et al. (2017) allow us to consider hearing the full potamological symphony"

Reviewer: Likewise the authors have not acknowledged the major recent overview of high-frequency sampling applications (Rode et al., 2016), even after this was pointed out to them in the previous round of review.

Authors: We have added this reference in the new version of the introduction and give credit to this publication offering an overview of in situ commercial probes.

"A recent overview of the potential of available conductivity, dissolved oxygen and carbon dioxide, nutrients, dissolved organic matter, chrlorophyll and Co in situ probes is given by Rode et al. (2016)"

Reviewer: The slanted presentation extends to technical matters as well. The manuscript simulates the addition of 2% and 4% noise, saying that these are "representative of the relative analytical precision reported for most laboratory IC devices (Neal et al. 2011; Aubert et al., 2013a)." The implication is that the data from Neal et al. or Aubert et al. would look as messy as the simulations presented here, but this is a gross distortion.

The goal of the discussion was not to disregard the previous work but just to highlight an improvement in the precision. In order to avoid any misinterpretation, we deleted the two references in Line 553 "(Neal et al. 2011; Aubert et al., 2013a)."

"Noise levels of 4% and 2% were tested as they are representative of the "standard' analytical precision reported for most laboratory IC devices"

Reviewer: For example, the precisions of the IC measurements of SO4 in Neal et al. are about 2%, but at concentrations of only 2 ppm, rather than the roughly 60 ppm presented here. Because IC analytical noise expressed as a percentage typically decreases as

concentrations go up, the Neal et al. measurements would likely not be much worse (and possibly better) than the RL measurements at comparable concentrations. The data from the River Lab look very nice, and it is neither necessary nor appropriate to try to make them look better by misrepresenting the accomplishments of others.

We apologize if the manuscript gives the impression to the reviewer that we misrepresent previous works. This was an awkward way of writing as the only goal of the exercise proposed in the discussion was to highlight the added-value of the RL permitted by the improvement of precision. We hope the new formulation will satisfy the reviewer and clears up misunderstanding.

Reviewer: The comparison of the River Lab data and the IGPG lab data depends critically on the calibrations that are used for the two instruments. Here the manuscript directly contradicts itself. On line 268 the reader is told, "The calibration procedure in both laboratory and RL is the same using the same set of calibration solutions." But just one page later, in explaining the different results obtained from the two instruments, the manuscript says, " In addition, the most accurate measurements were obtained with the RL rather than with the laboratory equipment because (1) the calibration curve of the RL was made from a series of solutions (dilutions of the "River x1" solution) having the same element ratios as the solution used for the accuracy test (the "River x1" solution) ... with our in-lab IC instruments ...we used a series of calibration solutions having the same concentration for all elements..."
This is a rather obvious discrepancy and it is surprising that apparently none of the authors have noticed it, even after the issue of calibrations was raised in the previous review.

Authors: This is a mistake remaining from the first version. We deleted the following sentence Line 331: “(1) the calibration curve of the RL was made from a series of solutions (dilutions of the "River x1" solution) having the same element ratios as the solution used for the accuracy test (the "River x1" solution)”. We are sorry about this confusion.

There are language problems here that should not be present in submission to a major international journal (particularly after revision). The SI is particularly bad; after finding 14 language errors in just two pages, I stopped counting. There are 10 authors on this paper, some of whom are really good at scientific English, and if they have really all read and approved the manuscript it is hard to understand how so many errors could still persist. Apparently nobody has even run a spell-checker; otherwise bloopers like "ratther" would have been caught.

Authors: We modified “ratther” to “rather”. We also checked all language mistakes in the supplementary content. We are sorry about this negligence.

Other additions.

- We added in Fig. 1 a photography of the River Lab.
- We correct the figure caption in the manuscript
- We add a picture of the RiverLab in the figure 1.

- We added a reference of high-frequency measurement in rivers in the introduction (Escoffier, N., Bensoussan, N., Vilmin, L., Flipo, N., Rocher, V., David, A., ... & Groleau, A. (2016). Estimating ecosystem metabolism from continuous multi-sensor measurements in the Seine River. *Environmental Science and Pollution Research*, 1-17.).