

## ***Interactive comment on “A small volume multiplexed pumping system for automated, high frequency water chemistry measurements in volume-limited applications” by Bryan M. Maxwell et al.***

**Bryan M. Maxwell et al.**

bmmaxwel@ncsu.edu

Received and published: 18 July 2018

Page 1.10: The authors state that their MPS system was previously reported, but this phrasing seems awkward without direct reference to the citation.

Response : Text has been edited to clarify this comment : "An automated multiplexed pumping system (MPS) for high frequency water chemistry measurements at multiple locations previously showed ability to increase spatial and temporal resolution of data and improve our understanding of biogeochemical processes in aquatic environments

C1

and at the land-water interface." The HESS Manuscript Guideline instructions say to not include references in the Abstract, but this reference can be added if this is recommended by the Referree.

Page 1.20: "The technology is most promising". . . I would mention at what spatial scale (i.e., I presume reach scale or transect style studies) and perhaps temporal scale your technology would be best for.

Response : Edited text : "The technology is most promising at the reach or transect scale for observing pore water solute dynamics over daily time scales, with data intervals <1 h for up to 12 locations."

Main Text Section 1.1 Page 2.10: "Multiplexing" can mean different things across disciplines. I would just be very clear how you are using that term here.

Response : Sentence added for clarification : "The MPS is a 'multiplexed' system in that it delivers sample volumes from separate sources to a single probe used to consecutively observe water chemistry at all sources."

Section 1.1 Page 2. 15: Do you mean soils or sediments here? Either way, both should be mentioned given your application.

Response : Updated to include "sediment"

Section 1.1 Page 2.25: If one of the challenges is tube clogging, it would be useful to describe at some point the limitation of the instrument. For example, if the system has high organic matter, would that system be a candidate for your instrument? Are there ways to avoid tube clogging to make it work in that type of system?

Additions were made to Section 5.1 : "Valves and tubing are also more susceptible to clogging. In both applications a plankton net fabric (60  $\mu$ m mesh ) was used and no clogging occurred, even in the case of the woodchip bioreactor application with high dissolved organic matter." In the authors' extensive use of this system in multiple applications, there has not been an issue where clogging occurred as long as plankton

C2

mesh filters were used.

Section 2.3 Page 5.5: "Although this is admittedly undesirable. . ." Can you describe in greater detail the solutions to minimize risk here?

Response : Edited text "Potential solutions for minimizing cross-contamination include a pre-measurement rinse with the current source water or extended purging of the lines with air after each measurement."

Section 3.2 Page 9.15-20: I really enjoyed the discussion of the short circuiting of the reactor.

Figure 1: Please also include the lettering system in your figure description.

Figure caption edited to include letter description. Updated caption : "Graphical depiction of small volume multiplexed pumping system (MPS) configurations which include 1) DI water source, 2) 12 port intake valve, 3 & 4) waste or air purge, 5) fractional volume collector (FVC), 6) bidirectional peristaltic pump, and 7) spectrophotometer with cuvette housing. An Arduino microcontroller actuates a series of 3 way valves to move between separate configurations 1(a) – 1(f) described in Sec. 2.2.1 – 2.2.5."

Figure 3-4: The symbols are slightly difficult to distinguish. Putting the y axis on a log scale might help.

Figures corrected to show nitrate concentrations at each well in separate panels to make points easier to distinguish, as a log scale did not help significantly for this data. See attached figure.

Would it be possible to include a picture of your experimental setup in the SI?

The authors are not clear on which experimental set up photos are being requested. Currently there are photos of the mesocosm experimental set up and the woodchip bioreactor in the SI. Depending on which photos are being requested, will try to include these in the supplemental information.

C3

Please advise where to post the updated manuscript with updated figures and text. Thank you for your comments!

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-220>, 2018.

C4

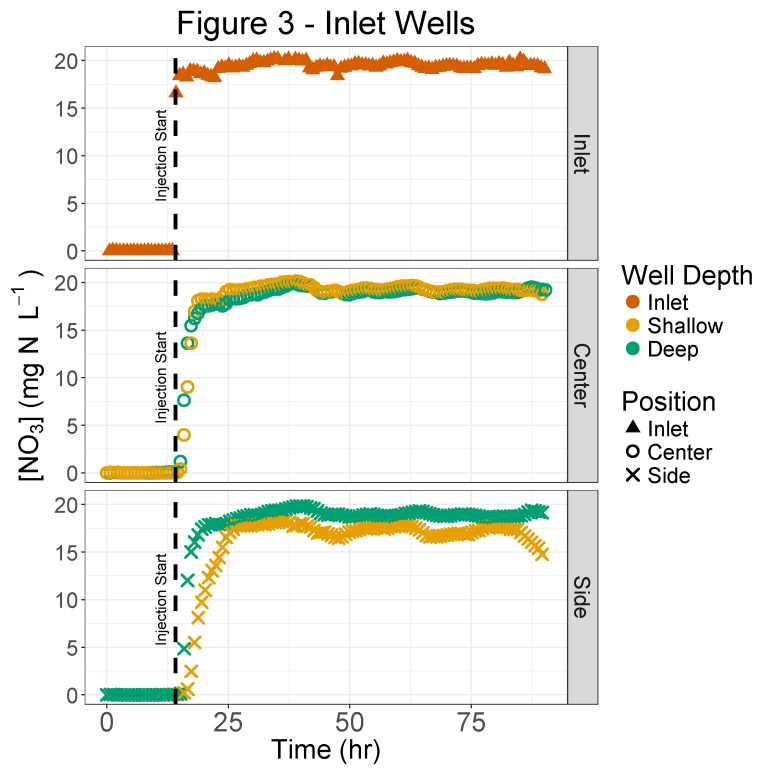


Fig. 1.

C5

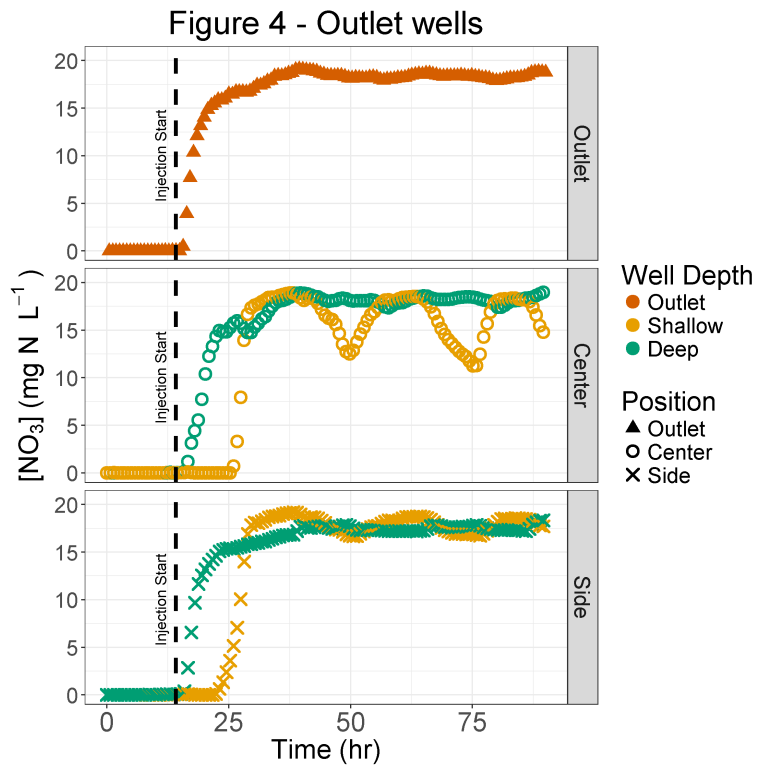


Fig. 2.

C6