Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-371-AC4, 2019

Hydrology and Earth System Sciences
Discussions

Interactive comment on "On the role of operational dynamics in biogeochemical efficiency of a soil aquifer treatment system" *by* Shany Ben Moshe et al.

Shany Ben Moshe et al.

benmoshe.shany@gmail.com

Received and published: 4 November 2019

We would like to thank anonymous Referee 3 for his/her constructive comments. We will account for them in a revised version of the paper, as we report in the following point–by–point reply:

General comments (GC)

GC 1 - *One of the most important phenomenon, from my point of view, is the*

issue of SS that is not addressed at all in this article while it is the main problem when applying treated wastewater on a soil (clogging).
Autors' response - We agree that this is indeed an important topic and its investigation is crucial for SAT sustainability. As reflected by the consistency in surface head and WC patterns along the flooding and drying cycles - we did not observe significant clogging in our system and hence we did not discuss it in the paper. However, since we very much agree that in field scale (or real) systems clogging is a major issue - we now shortly discuss it in the 'Comparison with field observations' section.

GC 2 - *In general English and spelling (words are often singular when they should be plural) should be reviewed for a better reading of the article. Put dots for numbers and not comma.*
Autors' response - According to Referees' general and specific comments, the entire text was revised. Grammar and spelling mistakes spotted by the Referees or found by the authors in the revision process - were corrected.

GC 3 - *When we talk about dissolved oxygen, it is better to write its unity in mgO2/L instead of mg/L for better understanding.*
Autors' response - We agree that the presentation of concentrations should indicate the correct species measured by the measuring analytical tool used / sensing device. However, as oxygen is dissolved in water as O_2, it is very acceptable and common to present its concentrations as mg/L (given that the species is noted as DO). We agree that Referee's suggestion is also a valid form of presentation but in this case we choose to leave the notations as they are currently presented.

GC 4 - *Generally, when we talk about nitrogen, concentrations are expressed in mgN/L. Is this the case in this article? For example, Figure 4 shows values but the indicated parameters are NH4+ and NO3-. Is it NH4-N and NO3-N?*
Autors' response - We accept Referee's suggestion and we now use $NO_3^- - N$ and

$NH_4^+ - N$ in mg/L .

Specific comments (SC)

Introduction

SC 1 - *Lines 26-27: the units used for DOC, ammonium and organic nitrogen are not expressed in the system of international units (mg/L)*
Autors' response - We accept Referee's comment. Units were converted to mg/L.

SC 2 - *Lines 40-42: repetition of Goren et al. (2014)*
Autors' response - Corrected according to comment.

SC 3 - *Lines 51-52: repetition of Mienis et al. (2018)*
Autors' response - Corrected according to comment.

Materials and Methods

SC 4 - *Line 78: the reference to Table 1 is not good. Table 1 does not refer to sensors and sampling equipment but to the characteristics of the applied water as well as to the duration of the flooding and drying phases.*
Autors' response - We thank Referee 3 for the attention. As part of the complete revision of the manuscript, this table was omitted. The sensors we used are now described in the last paragraph of the 'Materials and Methods' section.

SC 5 - *Table 1 and Table 2 must be reversed.*
Autors' response - As mentioned above, according to Referees' comments, Table 2 (that originally described sensors' position) was omitted. Following Table 1, we now

present the TWW composition.

SC 6 - *Lines 95-97: the sentence should be rewritten to be clearer.*
Autors' response - We accept the comment and made improvements accordingly: "Glucose was chosen as the main carbon source for two reasons: in addition to the fact that it is often used in synthetic WW for laboratory SAT systems (Essandoh et al., 2011; Ak et al., 2013), its high consumption rate by bacteria (compared to more complex carbohydrates or humic material) allowed the investigation of the system's behavior around the ranges of ORP values that are found in field SAT systems (Orgad et al., 2017)."

SC 7 - *Line 100/Table 1: why call the inflow of experiments 3 and 4 "Real TWW" while additions of glucose and ammonium have been made? If the explanation comes later, put it here.*
Autors' response - The TWW for the third and fourth experiments were collected from the Dresden WWTP after an activated sludge process. This means that the microbial community present in the TWW itself was inherently different than the synthetic WW (that were prepared with tap water). The addition of glucose and NH_4^+ was necessary in order to equalize the inflow DOC, TKN and NH_4^+ concentrations between all four experiments. A more precise term would be "ammended real wastewater", but that would be cumbersome. We did clarify the terminology in the sentence, which reads now: " The real TWW used for experiments RW150 and RW240 were enriched with glucose and NH_4^+ after initial chemical analysis (presented in the supplementary material) to match the NH_4^+, TKN and DOC concentrations to these of the synthetic TWW."

SC 8 - *Table 1: in experiment 3, in the line "inflow" it misses the letter "T" because it is treated wastewater that was added and not raw wastewater.*
Autors' response - We thank Referee 3 for the attention. Corrected according to

comment.

SC 9 - *Line 102: the sentence starting with "During all experiment, ..." should be the beginning of a new paragraph because it concerns ALL the expermientations and not only the experiment 3 and 4. Refer to Table 2. By the way, it lacks an S to "experiment".*
Autors' response - As part of this section's revision, we moved this line to the last paragraph of the 'Materials and Methods' section (that describes the sensors). It is now in a separate paragraph as was suggested. Typo was corrected according to comment.

SC 10 - *Lines 112-114: the first sentence has already been mentioned above (line 100) and the second sentence should be after line 100.*
Autors' response - This line was improved: "The real TWW used for experiments RW150 and RW240 were enriched with glucose and NH_4^+ after initial chemical analysis. (presented in the supplementary material) to match the NH_4^+, TKN and DOC concentrations to these of the synthetic TWW. Final $NH_4^+ - N$, TKN and DOC concentrations for the synthetic and real WW are resented in Table 2". However, we think the second part of the sentence, referring to the enrichment of the TWW belongs in this line (and not in line 100) since we believe this information should appear after the description of the synthetic WW composition.

SC 11 - *Lines 121: remove the ":" which would indicate a list behind whereas here the different compounds and their methods of determination are separated by dots.*
Autors' response - We fully accept the comment. The four methods used are now separated by ';'.

SC 12 - *Line 121: why do you write "ammonium" and not NH4+ whereas it has already been defined line 85? True for the whole document.*

Autors' response - We accept that consistent use of the chemical formula of ammonium (NH_4^+) is preferable. Hence, we now use it throughout the manuscript.

SC 13 - *Line 122: it misses the sign "-" behind NO2.*
Autors' response - We thank Referee 3 for the attention. Corrected according to comment.

Results and Discussion

SC 14 - *Lines 140-142: repetition of Haaken et al., 2016*
Autors' response - Corrected according to comment.

SC 15 - *Line 169: you say ∼50 minutes on average for part 1 whereas you said line 132 ∼ 80 minutes. Be consistent.*
Autors' response - We thank Referee 3 for the attention. This error was corrected.

SC 16 - *Line 179: 3 digits after the decimal point for the minutes are not necessary (2.7 minutes instead of 2.700 minutes).*
Autors' response - In this line, the commas (e.g in 2,700) do not symbolize a decimal points but thousands separators.

SC 17 - *Line 186: 'around' is not necessary because you write "∼ ". Moreover, write "for the 375 cm sensor" and "for the 575 cm sensor" instead of "in the 375 cm sensor" and "in the 575 cm sensor".*
Autors' response - The word 'around' was omitted as suggested. However, we do not believe the word 'for' is suitable for the purpose of this sentence.

SC 18 - *Lines 194-195: again, this information has already be written line 100.*
Autors' response - As this is the first time in the results and discussions section that

data with real TWW is presented, we think it is important to remind the difference between these experiments and the former ones. However, we accept the comment and the sentence, that now reads " In these experiments we used real TWW" was shortened.

SC 19 - *Figure 4: it would be better to display the input concentrations on the graphs to better see the differences between input and output for experiments 3 and 4.*
Autors' response - As mentioned in the text, input parameters (DOC, TKN and NH_4^+) were the same for both experiments (inflow concentrations are presented in Table 2 in the main text). Since the aim of this figure is to show the difference between the two experiments, we believe that addition of the input concentrations will add unnecessary complexity to the figure.

SC 20 - *Lines 203 and 205: the numbers in the parentheses are the differences between the concentrations measured at the input and those measured at the output for the experiments 3 and 4? I think that it is not wise to express the efficient removal in terms of differences in concentrations but you should rather express these removal efficiencies in terms of percentage.*
Autors' response - The numbers in parentheses represent outflow concentrations. We accept that this is not clear from the sentence and hence we improved its structure: "Outflow $NH_4^+ - N$, TKN and DOC concentrations during RW240 ($\sim$ 0.033, $\sim$ 0.62 and $\sim$ 1.65 mg/L respectively) were significantly lower compared to their inflow concentrations . During RW150, $NH_4^+ - N$, TKN and DOC outflow concentrations ($\sim$ 0.5, $\sim$ 3.8 and $\sim$ 4.4 mg/L, respectively) were also lower compared to the inflow, but averaged significantly higher compared to RW240 (t-test, α=0.05) ..

SC 21 - *Line 203: you say that your measurements correspond to what is measured in the full scale SAT site but we have no table, figure, or at least a reference on which your statement is based.*

Autors' response - Figure 5 was designed specifically to demonstrate this claim. The data presented in Figure 5a is based on field observations from one of the SHAFDAN's infiltration ponds, as explained in detail in the 'Comparison with field observations' section.

SC 22 - *Line 253: Table 1 should be Table 2.*
Autors' response - As was mentioned before, the original Table 2 was omitted.

Summary and Conclusions

SC 23 - *Line 280: 150 minutes or 240 minutes (and not only 240 m which means meter).*
Autors' response - We thank Referee 3 for the attention. Corrected according to comment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-371, 2019.