

Review of hess-2020_34 'Drivers of nitrogen and phosphorus dynamics in a groundwater-fed urban catchment revealed by high frequency monitoring' by Yu et al. (2020)

Context – Goals:

This paper presents a 12-month investigation of variations in nutrients and various water quality indicators at the Geuzenveld polder in Amsterdam through, mainly, *in situ* monitorings of the waters recovered close to a pumping station (allowing to regulate the water levels in the polder). The authors investigated variations among the datasets over 12 months, and tested the incidence of rain events, and pumping events. They've applied a mixing model to explain some of the observed variations. Several parts of this paper are highly speculative. Correlations between data, and several other issues, would need to be supported by statistical tests. There are no M&M sections on the statistical tests performed; except a presentation of the mixing model. The raw datasets and scripts should be presented in the suppl. materials. Conclusions are not always supported by the presented datasets, and are sometimes highly speculative. They need to be supported by other studies which are not always cited and explained. This paper will require major improvements to meet the scientific quality of HESS papers. Several parts of this paper will need to be re-written and re-considered after a presentation of the statistical tests.

Major comments

1. L86, Please specify the possible “management strategies” and add references
2. Fig. 1; picture is too dark and its resolution is too low; please position the temporary floating platform used for the monitorings on this fig. The Drain 3 sampling point should be indicated; Yu et al., 2019 should be cited in the legend
3. High and low frequency monitorings: How did you compute the confidence intervals / error bars on the monitored values? please clarify these issues.
4. low frequency monitorings - L153 - “monitored at the pumping station” ; please clarify; where were these samples or values collected?
5. There is no section in the materials and methods regarding the statistical analyses of the datasets? please describe the statistical tests that were performed; which statistical packages were used? What was your experimental design regarding these tests?
6. Fig. 2: please indicate in the legend that nutrients and other quality indicators were monitored at the pumping station; variations in the presented datasets should be supported by statistical tests; correlation tests between monitored values should be performed. All raw datasets should be presented in the suppl. materials
7. L219: “The wet season is distinguished by a higher frequency of pumping and lower water temperatures” ; please do statistical tests to validate these conclusions; when you indicate frequency, do you mean “volume”? please clarify
8. L221-222: “Especially in January and February 2017, there was a considerable period...”: please define a “considerable period” by using statistical tests; was that specific of that year?
9. After the pumps stopped, the surface water level recovered faster during the wet season (between October 2016 and 225 March 2017) than during the dry season? Comment: where is this shown? Please clarify
10. L226-227; L229; section 3.1.2: conclusions should be supported by statistical tests and should consider “confidence intervals” of the monitoring tools
11. Please show the position of the piezometer on Fig. 1; its GPS coordinates should be indicated in the materials&methods section
12. L230; please cite a document for the “water level regulation of the boezem Haarlemsmeer”
13. L254: “significantly increased” : which test was performed?
14. L259-263: correlation tests should be done between total Fe values and turbidity
15. L277: there are no red blocks in Fig.1; neither in Fig. 2???

16. Section 3.3.1: datasets should be supported by statistical tests and should consider the confidence intervals of the monitored values
17. L301-304: to be moved in the discussion
18. Section 3.3.2: add statistical tests e. g. L309-310, correlation test between values, validate the seasonal effect, etc
19. L310: “during events 2, 3 and 4, TP and EC are positively correlated”; which test? Please give the p-values, etc
20. Figs. 4; please clarify the legend and relation with Fig. 2. Add statistical tests to define which values are correlated, etc.
21. Please clarify what is correlated or not according to pumping
22. Line 332 - “This presumption is supported by the mixing model result of EC, which revealed close similarity to the measurements”.: comment - How did you test this similarity between monitored and modeled values? please give the details of this performance analysis in the result section
23. Too many citations of the figs in the discussion; several issues should be transferred in the result section
24. L333: not clear
25. No cited literature in section 4.1 of the discussion ?
26. Fig. 6 should be presented in the results; the raw datasets should be presented in the suppl. materials. Any information on the confidence intervals for these datasets?
27. L362-364; 380-382, etc: please add statistical tests to support these conclusions
28. L365; 398: qPCR datasets to estimate the population levels of some of the organisms involved in NH₄ assimilation, etc, would be interesting to support some of the conclusions reached in this paper
29. L401; Fig. 6 is indicated in relation with NO₃ datasets; where are these data?
30. L417 “...significantly..”: please support this by a statistical test
31. Scripts and data should be made available in the suppl. materials
32. Section 4.4: speculative section on the importance of biotic processes (benthic algae, bacteria / nitrification-denitrification-anammox) in the variations observed in Fig. 2 and Fig. 6-> there are very few datasets on these issues (only chlorophyll a monitorings); it would have been relevant to add qPCR (variations in total bacterial numbers, cyanobacteria, denitrifiers, etc) assays to validate the inferences made in Fig. 7. This section need to be supported by more citations of the literature on similar issues.
33. L444-445: “... Phytoplankton biomass decreased because of competition for N or grazing activity...”; this is speculative – there are no data on grazing? At least add a reference on this issue to support this possibility
34. 445-446: not supported by the presented data
35. Fig. 7; please cite in the legend all papers which made possible most of these inferences, and indicate which data presented in this paper added support for the presented scenarios
36. L447- “.. relatively low in oxygen (because of warming)”; please add data which support this effect of warming on oxygen levels (or a citation)
37. L448 – “... Biological activity declined (colder and less light)...”: there are no data on these issues; following sentence is also an inference from the literature and not from the presented data
38. L463 – “this accelerates the further aggregation of the iron complexes...” ; this is speculative / not based on the presented data; add arguments (a citation) to support this conclusion or delete
39. L464 – “...The resulting larger particles more readily settle to the bottom..”; comment : no data on this issue; add a citation to support this conclusion or delete
40. L473 +– “... the water was highly turbid because of the formation of iron hydroxide colloids in the water column..”; “..The activation of the pumps caused export of these colloids and particles and thus reduced turbidity ...”– comment : no data on this issue / have you monitored “particle sizes”? please add these datasets; or add a citation to support this conclusion or delete
41. Fig. 8 should be presented in the M&M and result sections. Please show on Fig. 1 where these monitorings were performed

42. Only fig. 7 should be cited in the discussion; other figs should not; all data presentation issues should be moved from the discussion into the result section
43. Discussion is too long; please simplify but avoid over-interpretation of the datasets (conclusions should be strictly based on statistically well supported trends)
44. L499 “..Iron redox chemistry was the dominant process controlling the P dynamics in shallow groundwater fed ditches”; comment: dominant over which other processes??? Please clarify and give arguments / which data demonstrate clearly this relation? Datasets present total Fe values and total-P; have you done correlation tests?
45. L503 – L508 “..mostly in the form of iron hydroxides”: comment – did not see any datasets on this issue? Please limit your conclusions to the points that were investigated in the paper
46. L510 – “...by intensifying iron oxidation and precipitation...”: comment – did not see any datasets on this issue? Please limit your conclusions to the points that were investigated in the paper

Minor comments

1. In the introduction, L84: “.. to understand the mechanisms that control the dynamics of N and P in urban delta catchments..”; please clarify by changing “mechanisms” by “ the hydrobiogeochemical processes that control...”
2. L115: “During rainfall events, the surface water level will rise faster”; please be more accurate or add a citation on these issues.
3. L17, please put the month before the year
4. Doi numbers have not been indicated for the cited papers
5. L43; why “pivotal”? explain
6. L49; please use another term than “preferred” ; most effectively uses NH₄ for protein synthesis
7. Several sentences are too long; please simply at least the following sentences e. g. L36-39; L62-65; 160-163; 356-359
8. L74: “In recently years » ; to be changed
9. L75, Please define “high frequency technology”
10. L89-90: last part of this sentence is not needed i. e. “... unraveling the hydrological and the reactive biogeochemical processes that control the nutrient 89 dynamics at these 3 time scales”
11. L118; replace pump by “pumping”
12. L135: “calibrated” instead of calibrating
13. L146: “times”; “lightening -> lightning,
14. L153-154; 164: not clear; to be re-worded
15. L161: shook -> mixed
16. L169: inlets -> inputs
17. L170: outlets -> outputs
18. Fig S1; change valid for validated; please indicate color code in the legend; please perform and indicate the p value for the correlation test. Description of Fig. S1 in this suppl. material should be deleted.
19. L189: please delete “sourced from groundwater”
20. L191-192; to be moved in the results or discussion section
21. L207-212: to be deleted
22. Please avoid citing figs in the discussion
23. Fig. 5; translate the “x” axis
“