

Biogeosciences Discuss., referee comment RC1  
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## Comment on bg-2021-340

Anonymous Referee #1

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Referee comment on "Dissolved organic matter signatures in urban surface waters: spatio-temporal patterns and drivers" by Clara Romero González-Quijano et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-340-RC1>, 2022

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Overall, this is an interesting dataset and questions.

The results and discussion are somewhat challenging. The discussion and results lack a clear organizing structure. Some of the relationships claimed in the analysis have no clear/singular interpretation. For example, the authors say that C2 and C8 are associated with wastewater because authors have said they were associated with wastewater in other study in other regions of the world and because they are associated with TrOCs. A similar statement is made about nutrients. The problem, however, is that all of the components ordinate in the same direction. So all of the components are correlated with wastewater and all of the components are correlated with nutrients (at least on RDA 1). What then makes you focus on a few components over others?

Some more methodological details are needed on the PARAFAC process. Which software and how did you handle validation. An overlay of the split halves would be nice to see on the plot of the PARAFAC model. It helps the reader evaluate the quality of the model.

A number of times DOM diversity is equated with functional diversity 'in the aquatic system' and I don't seem much evidence of this or a framework built for it. Connection DOM composition to ecosystem functioning is still pretty speculative (to be clear it is speculation I support, just still feel it has a long way to go). In particular the authors point to the diversity of DOM as an indicator of diversity or functional diversity in the aquatic system, but provide little evidence why it should be so. Clearly, DOM diversity is an indicator of the diversity of watershed processes both natural and anthropogenic – source diversity if you will. Is that function 'in the aquatic system' or function in the watershed? I would argue that it is the latter. However, with respect to the watershed you only ever look at a 50 M buffer (see detailed comments on this below).

In several places hydrology and runoff are presented as the cause of an observed

relationship, but there is no mention of any aspect of the study design that evaluates hydrology. E.g. "...for example, was formerly connected to a sewage farm and appeared to be influenced by previously unrecognized storm water runoff that likely delivered inputs during heavy rain. " No storm sampling was ever discussed, no pre-post sampling that would disambiguate this. There are just a lot of instances of statements and conclusions that are not or are not unambiguously supported by collected data.

All that said. This is an interesting dataset and general question, I do encourage the authors to develop it further and focus on the clear and well-supported interpretations of the data.

#### Specific comments

39 'failure of citizens' ... inappropriate and subjective statement. You blame the public, but have scientists properly communicated the issue to the public? Rather adversarial language that will only function to pit the general public against science. Why make an enemy?

47-48 Subjective. What is the purpose of monitoring? What is the endpoint. Often it is something much larger like ensuring healthy available habitat for human or animal use. If a primary driver of healthy habitat for animals is the availability of oxygen in the water, is that really a 'narrow focus' or is it the focus that is appropriate for monitoring given the monitoring goals. I think you would be better arguing that high resolution approaches can expand the suite of bigger picture ecosystems states that can be monitored with DOM.

78-80 More info on this. What about these sites, what type of pollution do they represent. All the same type/intensity, different types?

84-86 Why only a 50 buffer? Why not a series of buffers to determine what the spatial scale is that is most relevant. The water interconnections in an urban ecosystem are complex, I doubt 50m captures the reality of the source areas. See Kaushal and Belt 2012.

105-110 Did you collect and process any blanks?

105-110 Was iron measured in any of these samples? This can have significant effects on

optical DOM determination and is often elevated as it runs through urban infrastructure.

123 A few things here. This is almost universally abbreviated FI and not FIX. You are using the wavelengths for your calculations for samples corrected for instrumental bias. This is appropriate. However, the citation you reference here was based on FI values calculated from the old wavelengths that were not corrected for instrumental bias. McKnight updated this in Corey et al. 2010 and it makes a significant difference in the reference values of allochthonous and autochthonous endpoints. Lastly in heavily impacted urban systems, the classical interpretation of FI as developed by McKnight may simply not be applicable. You may be getting a 1.2 or a 1.9, but it may not mean the same thing as it would in a more natural system.

126-127 Would like to see the split half validation overlaid on this PARAFAC model (Fig A1). Overall more details on the PARAFAC modelling process used would be nice.

286-288 Does it reflect high functional diversity across the 'aquatic network'? So far it would seem to suggest a variety of inputs or a diversity of input. I don't know if it says anything about what is going on in terms of functional/metabolic processes in the aquatic network. Also consider what 'functional diversity' means and what is 'desirable' vs. 'undesirable.' High functional diversity might be due to the wide range of degradation states that stream in an urban landscape may be experiencing.

306-308 Could be, but you have provided no information on the hydrologic conditions at the time of sampling. Also within a season you haven't sampled during runoff conditions and during 'base flow' conditions to determine if there is a difference.

313-315 weak inference. All of your components ordinate in the same direction of TrOCs. Also how did you establish the link to WWTPs. Is it just based on what other people said who found similar looking components?

316-317 I would think that the greater abundance of light might be as big or a bigger factor than nutrients.

320-321 Again, not sure I see where that statement comes from. All of your DOM components ordinate in the same direction not just C2 and C8. C1,2,4,5,7,6,8 (what happened to C3?) are all pretty well correlated with elevated nutrients on the primary RDA axis. It just seems like increased fluorescence is associated with increased nutrients.

340-341 why would you propose green space as a proxy for paved surfaces when you said you measured paved surfaces earlier?

353 I don't know if your map is showing urban heterogeneity or not. I mean, none of this is clearly linked to urban influences (clearly some of it has to be). I just don't think the data and analyses you have presented lead to strong support for this statement.

374-375 what do you mean by that? This study is based on single grab samples and average data? Most monitoring is part of a broader survey. This needs to be clarified.

384 How are you coming to this conclusion? You have presented no information that you ever sampled storm runoff?

385 This is the first time it is mentioned. You should talk about this up in the sites section of the methods. Overall, a map showing the location of WWTPs would be very helpful. The WWTPs are being treated as a bit of an afterthought in the analysis when I feel like you should be framing your study and analysis around them.

388-389 how do you know it "actually" received the inputs anything you have showing the hydrologic connectivity to a WWTP would be appreciated.

404-405 What was actually detected? Which optical properties? Fluorescence? All the components ordinate in the same direction. TrOCs seem to be more a function of increasing DOC fluorescence overall. In this particular case for Berlin, I would then argue that the simplest thing to do is to measure FDOM fluorescence as an aggregate value as opposed to the finer resolution.