

Interactive comment on “Rapid accretion of dissolved organic carbon in the Springs of Florida: the most organic-poor natural waters” by C. M. Duarte et al.

Anonymous Referee #3

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General comments. This is a well written, concise paper describing the trends in dissolved organic carbon (DOC) concentrations around the origins of 9 Florida springs and at points downstream. The primary point of paper is a statement of significance of DOC inputs within and from outside these springs - the authors noting that spring ecosystem production, primarily dominated by macrophytes documented in previous studies, provides a reasonable account for increased DOC downstream. The paper is certainly useful to the community – providing some insight into the distribution of this key carbon reservoir in understudied ecosystems. There, however, needs to be some clarification both in setting up the scope of the discussion within the introduction and explanation for some key points made in the discussion itself. For example, there is

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a lack of background on spring waters and groundwaters worldwide to simply support the statement on the low DOC of these spring systems. Further, key statements such as the “stability” of DOC concentrations in most surface water environments is not well supported in the literature (seasonality in headwater stream DOC in temperate and boreal regions). The data provided in the paper does support the general points made regarding the low DOC levels and the importance of autochthonous and allochthonous inputs to these systems and the ease at which they can be studied. The paper could be an very useful discussion for the Biogeosciences community once the authors address these shortcomings.

Specific comments.

The main issues that need to be clarified in the paper are:

1. p.5254 lines 23-24. In the introduction provide more background on groundwaters and spring water DOC.
2. P.5255 lines 1-12. Explain what is meant by stable property. Temporal stability in DOC concentrations widely varies and for flowing systems can be quite “unstable” and highly dependent upon discharge which is a point raised in the discussion. Variation in DOC concentration with discharge is a common phenomena in headwater streams in general. Better referencing and more detail on this point needs to be made. The statement as provided is not well supported in the literature, however, the concept that the DOC pool can often be viewed as “stable” when in fact it is quite dynamic is a very important one. The point that systems such as these springs can help elucidate reactivity and processing of some pools of DOC is key and why I think the authors need to do a better job with this part of the introduction. The authors should consider discussing this in light of source and composition of DOC. Often the highly reactive portion of this pool is a small portion of the total particularly where DOC concentrations are very high.
3. P. 5256 Lines 1-2. When were these samples taken? What is known about temporal variation in DOC in these springs? Given the focus of this study it is important to provide brief detail on these factors particularly in relation to the downstream inputs.
4. P. 5259. Lines 6-15. The general discussion

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on a younger versus slightly older water mass is not well supported as given. This is the most speculative part of the discussion and could be improved by providing better reference to information on the this aquifer system to explain the differences in DOC and TN provided here. For example, the authors do not explain why total N is higher in the older water mass as discussed here. 5. P. 5260 Lines 25-30. The one point about the need for reference materials for freshwater DOC measurements is important and points out something that is often done but individual labs but not with any formal consensus. This is brought up out of the blue in the discussion and needs to be incorporated into the discussion more. 6. P. 5260 lines 22-23. The reference to long residence times should be better clarified since and any information regarding the Florida Aquifer residence time clearly cited. Obviously there are aquifers in the world which have much longer residence times then this aquifer.

In few minor details.

p. 5256. Lines 16-17. What was the resulting pH of the waters following acid addition. Low pH has been found to reduce DOC concentrations in natural samples.

p. 5257 lines 21-25. Can the authors clarify this section? Net areal inputs are cited as conservative here given that no water inputs are accounted for but can and do occur in these systems. Increased water inputs would increase spring discharge variable used in this calculation but couldn't it also alter the DOC concentrations used to calculate the accretion of DOC? Aren't the authors also assuming the DOC concentration of the water input as well when making this statement? In karst environments fractured flow paths can lead to increased inputs of various species including DOC. None of this renders serious problems with the generalized calculations made but it is important that ALL assumptions and their pros and cons be clarified briefly here.

p.5258 lines 23-24. One cannot obtain DOC concentrations from Table 2 only the figure.

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