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Biogeosciences Discussions



# *Interactive comment on* "DOC-dynamics in a small headwater catchment as driven by redox fluctuations and hydrological flow paths – are DOC exports mediated by iron reduction/oxidation cycles?" *by* K.-H. Knorr

**Anonymous Referee #1**

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Review of "DOC-dynamics in a small headwater catchment as driven by redox fluctuations and hydrological flow paths – are DOC exports mediated by iron reduction/oxidation cycles?" K.-H. Knorr

The aim of this study was to understand if the long term increase in DOC export from a small headwater catchment in Germany was driven by processes such as to a decline in sulfate/ acid rain recovery, decrease in ionic strength or alternatively by variability in redox conditions. As the DOC concentration was strongly correlated with Fe the author makes the claim that iron redox dynamics exerts a major control on the DOC mobi-

lization. This is a very interesting, well written and data rich paper that significantly contribute to the general understanding of DOC regulation. I have but a few comments for the author to consider. Comments: 1. Although I generally like the approach that the author use I think that too little emphasis is placed some of the most obvious and important regulating mechanisms of stream water DOC. That is on the role of the temperature and hydrology/connectivity to the stream. The author brings in both 18O data and parafac modeling, which helps decipher some of the contemporary dynamics, but has little value in helping in explaining why DOC has actually increased. It is well established that hydrology is the one of the main drivers of the long-term changes in DOC (see Erlandsson et al. 2008) in streams and rivers. Potentially this could be related to the redox mechanism postulated by the author but it could also be simply be an activation of recently DOC produced in the peat dominated riparian zone. This is elegantly modeled by Seibert et al. (2009) during different seasons and further improved by including moisture and temperature by Winterdahl et al. (2010). By simply better acknowledge the role of hydrology and temperature at the study site would strengthen the argument that the authors make. The authors do provide data on how temperature has increased but what has happened to discharge? A more thorough discussion of these points would strengthen the paper. 2. The hypothesis on line 29, page 12954 needs to be improved. There seems to be some words missing. 3. I don't agree with the statement that the most streams that have shown increased DOC concentrations are rich in peat. This finding has been across the all types of catchments (see for example Haaland et al. 2010 and Erlandsson et al. 2008). Cited papers

Haaland, S., Hongve, D., et al. (2010) Quantifying the Drivers of the Increasing Colored Organic Matter in Boreal Surface Waters, Environmental Science and Technology, 44, 2975-2980.

Erlandsson, M., Buffam, I., et al. (2008). 35 years of synchrony in riverine organic matter concentrations explained by variation in flow and sulphate, Global Change Biology, doi: 10.1111/j.1365-2486.2008.01551



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Seibert J, Grabs T, et al. (2009) Linking soil- and stream-water chemistry based on a Riparian Flow-Concentration Integration Model. Hydrology and Earth System Sciences, 13, 2287-2297.

Winterdahl, M., Futter, M., et al. (2011). Riparian soil temperature modifies relationship between flow and organic carbon concentration in a boreal stream. Water Resources Research. (47), W08532, doi:10.1029/2010WR010235, 2011

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