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Biogeosciences Discussions

Interactive comment on "Concentrations and fluxes of dissolved organic carbon in runoff from a forested catchment: insights from high frequency measurements" *by* S. Strohmeier et al.

S. Strohmeier et al.

egbert.matzner@uni-bayreuth.de

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Dear Editor, we have received two thorough reviews on our paper and we thank the reviewers for their constructive inputs that will improve the paper. Both reviewers agree that the data are worth publishing, but suggest major changes in the presentation of data and discussion. We can follow most of the arguments of the reviewers and we are confident that the paper will fulfill the necessary requirements after revision. Our response to the major points raised by reviewers is as follows: Reviewer 1 (A. Butturini): Reviewer 1 sees the identification of the "spatial" origin of DOC as the main goal of the paper and focusses his critique around this. Our response: We disagree here, since

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the spatial origin is only one of 3 issues addressed in the paper. Nevertheless, following the reviewer, we will strengthen the focus of the paper (e.g. see comments about flux calculations) and to avoid confusion, we will change the text with regard to "spatial" sources. We agree that this should be changed to "compartment sources" as suggested by the reviewer. Like reviewer 2, reviewer 1 did not see much innovation in the export (annual fluxes) calculation. Our response: We would thus follow the suggestion of reviewer 2 to calculate a "critical" time resolution for a reasonable error of the annual export calculation and also refer better to the recent literature. Reviewer 1 suggests to highlight the snowmelt period and compare its hysteresis with other seasons and the literature. Our response: We agree that this is an interesting issue and will follow this suggestion. We will also quantify the degree of hysteresis in different time periods by hysteresis area and slope as suggested by the reviewer and we are thankful for the provision of related references. We will add more information on the variability of DOC concentrations under base flow conditions, including both information about concentrations and quality. The reviewer 1 addresses very intensively the questions related to DOC quality, spectroscopic properties and the PARAFAC analysis. Our response: We are glad to read these points as we also see the usefulness of the DOC quality parameters as derived from fluorescence spectroscopy. Therefore, in the revised version the PARAFAC analysis of DOC and interpretation will be explained and extended in more detail and related to other published quality data. We will also discuss the usefulness of other spectroscopic parameters (as used e.g. in the paper of Fellman et al. 2009, EST) that indeed did not show such distinct differences as the fluorescence components. Additional evaluations of DOC quality under baseflow conditions will be implemented. Reviewer 1: Use of Cl as a tracer Our response: We agree with reviewer 1 that conservative tracers would be helpful in identifying the compartment sources of the respective discharge components if concentration variation is large enough. However, as DOC has very distinct sources and also behaves non-conservative, we find it more appropriate to study DOC quality itself. We did not measure Cl in high temporal and spatial resolution and no further evaluation of Cl data is possible. We will

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discuss/justify the final conclusion about temperature effects more in depth Reviewer 1 suggests to improve the figures. Our response: can be easily handled and will be done accordingly.

Reviewer II Reviewer II: M+M section: several parameters poorly explained. Our response: We will check this and improve the text. Reviewer II: Terminological problems in the text: Our response: will be resolved. The reviewer criticize that the PARAFAC analysis and source terms were only investigated at 4 dates. Our response: The residence time of water in deep groundwater in our catchment is too long to influence the short term quality of DOC in runoff. The average retention time in the deeply weathered aquifer is about 4 years. Furthermore, the pool of DOC in the upper horizons of the wetland area (shallow groundwater) is very large and its quality mirrows the peat quality. The spectroscopic properties of DOC mostly result from refractory humic substances with low temporal dynamics. Significant short term changes in DOC quality in this source area are not expected. We will add more explanations on that in the revised paper. All in all, we think that our analysis of these source terms on only 4 occasions is sufficient to assign specific fingerprints. Reviewer comment: Discuss the limitations of the approach. Our response: Will be done in more detail (see also above). Reviewer critique on DOC export fluxes: Our response: We agree that the present calculations of DOC exports were not well implemented in the message of the paper and not entirely new. Thus, we will follow the suggestion of reviewer 2 to calculate a “critical” time resolution for a reasonable error of the annual export and refer to the recent literature. Reviewer suggestion on conclusion: Our response: Temperature effect on future DOC dynamics will be discussed in more detail and recent literature included. We will more strictly avoid repetition of results in the discussion section. We regret not to have checked this more thoroughly before.

A large number of specific comments and questions were made by reviewer 1. In most cases additional information was requested and suggestions made to modify figures and tables. In general, those suggestions are welcome and we will implement those in

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the revised version along with detailed answers to all suggestions. A few more detailed comments on the more severe issues from our side: P11931, L1: Table 2: We will further investigate the relation between delay of DOC peak and antecedent conditions, esp. groundwater table and the rainfall-discharge relations. Criteria for differentiating base flow and storm flow will be achieved by using a baseflow separation software (WHAT-tool). P11932 L20: This section will be modified and critical time resolutions calculated for the annual fluxes (see above). P 11933 L9-18: More information on the method and conditions of groundwater sampling will be given. P11936 L5: see above comments on table 2: will be modified. P11937 L 12-14: The reviewer was confused by the different range of component 1 in figure 5 and 6. There was indeed a mistake in Fig. 6: The scaling of the Y axis was wrong. We apologize for this mistake and Fig. 6 will be corrected. P 11937 L16-21: Fig. 7 will be modified by inserting the snowmelt period and more clearly point out the diverging slopes of both curves in different periods. P11941 LI19 ff. We agree with the reviewer on the role of groundwater for the DOC concentrations under base flow and we will add these considerations to the interpretation of the data. Nevertheless, based on current, yet unpublished results, seeping groundwater is mostly devoid of DOC and the DOC quality is shifted towards wetland quality indices as soon as the groundwater discharges through even small peaty patches. Table 2 will be modified and information of base flow separation added. Table 3 will be deleted.

Interactive comment on Biogeosciences Discuss., 9, 11925, 2012.