

Interactive comment on “Long cold winters give higher stream water dissolved organic carbon (DOC) concentrations during snowmelt” by A. Ågren et al.

Anonymous Referee #1

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General Comments: General Comments: This manuscript presents the results of a study designed to investigate the affects of multiple variables on peak stream water DOC concentrations in a boreal catchment. Through analysis of a long term data set, the authors demonstrate that discharge is an important control on peak DOC concentrations. Then, through application of a model, the authors control for the effects of discharge to identify four other variables that are important non-discharge controls on peak DOC. Further, a soil-frost-duration experiment was conducted to support the finding that winter conditions (winter length, temperature, soil frost thaw date) influence DOC concentrations. In general, the manuscript presents novel ideas that are supported by appropriate data analyses. The appropriate literature is cited and the

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presentation is clear. My main concern is that the findings of others are presented in a very general context. These generalizations may lead to misinterpretation and are discussed in detail below.

Specific Comments: 1) In the Introduction section of the manuscript the authors cite the findings of many other studies. While these findings are relevant and useful to the present study, they are presented in a very general fashion and I recommend that more specific information is included with the citations. For example, on pg 4859, lines 23-24 the authors state, “Between 70-90% of the water that enters the stream during snowmelt will be old water previously stored in the soil (Rodhe, 1989, Laudon et al., 2007).” This sentence implies that this is true in all types of systems. While this may be true in the streams included in the cited studies, it is not necessarily true in all systems (e.g. alpine systems, urban systems, etc.), and this should be clarified. Similarly, I suggest that the authors to be more specific about their statements throughout the introduction (e.g. pg. 4859, lines 13-15; lines 19-20, lines 24-27, etc.).

2) The authors do an excellent job of separating out the effects of discharge-related variables and non discharge-related variables on peak DOC concentrations. However, as indicated by other studies (which are cited here) and the data in the present study, discharge does play an important role in controlling peak DOC concentrations. I encourage the authors to more clearly state this point in the Discussion section. Highlighting this point does not take away from the finding that non-discharge variables are also important contributors to peak DOC concentrations in the stream studied here.

3) The results of the study show that certain variables (e.g. length of spring flood, length of winter, temperature, etc.) influence peak DOC concentrations in the stream, as measured by DOCM and DOCF. However, the fact that only data on the “peak DOC concentrations” were investigated is not specified throughout the Discussion section. I recommend that the Discussion section is revised to highlight this point.