Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10285, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10285
EGU General Assembly 2008

Reproducing temporal variations in TOC concentration in a forested boreal headwater catchment- the effect of soil TOC, temperature, soil wetness and flow.

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The growing awareness of the anthropogenic impact of change on land use and climate on landscape biogeochemistry has increased the interest in understanding and quantifying the temporal and spatial variation of TOC in headwaters and higher order streams and lakes. In an earlier paper we have analyzed the spatial and temporal variation of TOC in 12ha a forested headwater catchment in the boreal region and identified seasonal patterns using average values in seasons instead of instantaneous values. In this paper we test three different hypotheses of TOC transfer from the soil to the stream in our boreal forested catchment to identify possible weaknesses in either of the following hypotheses 1) Is TOC transport limited by the water flux through the riparian soil 2) Is the TOC transport driven by a combination of flow and soil processes 3) Can changes in soil TOC concentrations help to favor either of the two conceptual models or are there other important processes that need to be considered? We present two approaches for reproducing temporal variations of organic carbon concentrations: One based on the transmissivity feedback mechanism and observed riparian soil chemistry

and the other a simple flow and temperature driven model that was calibrated to a 11 year time series. Both models capture the observed dynamics of stream DOC during the snow free period. The hydrologically based model that was not calibrated against any stream data reproduces surprisingly well the strong observed variations during summer and autumn rain events. This finding confirms the strong effect of the riparian zone processes on the temporal variation of hydrochemistry in first order catchments.