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Upscaling riparian DOC exports to streams in the boreal Krycklan Catchment, Northern Sweden: Combining snapshot samples of riparian soil water with terrain analysis

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Dissolved organic carbon (DOC) is a major component of the biogeochemical cycle and plays an important role in the structure and functioning of aquatic ecosystems. Wetlands and riparian peat soils are the most prominent sources of stream DOC in boreal systems. In Krycklan, previous snapshot campaigns have revealed a considerable variability of stream DOC concentrations. This variability should be related to varying flow pathways and DOC concentrations of hydrologically connected wetlands and riparian soils. However, until today only little is known about the spatio-temporal patterns of flow pathways and soil water DOC concentrations in riparian peats and wetlands. Moreover, most currently available tools for terrain analysis are inadequate for deriving hydrological flow pathways in the riparian zone.

In this study we present data from 6 snapshot campaigns at the Krycklan riparian observatory. The observatory is a unique experimental design strategy for monitoring the interaction between soil and stream water chemistry based on 13 riparian plots with lysimeters installed at 5 soil depths. More than 600 samples were analyzed and related to automatically recorded groundwater tables and stream discharge. A riparian flow model was established by extrapolating local groundwater-discharge relations to the entire catchment based on a novel terrain analysis routine. Combining the riparian DOC measurements with the riparian flow model allowed to upscale riparian DOC exports and, thus, to estimate stream DOC concentrations for the entire stream network. Preliminary results indicate a good agreement between predicted and observed stream DOC concentrations.