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Specific discharge variability in a boreal landscape

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The understanding of interactions between landscape and hydrologic response in boreal systems is crucial to the development of effective and efficient future management scenarios that must both consider streamflow conditions at ungauged locations and allow for interpretation of hydrochemical behavior. Specific discharge variations within a meso-scale catchment were studied based on three synoptic sampling campaigns conducted during stable flow conditions within the Krycklan catchment study area in northern Sweden. These discharge samplings allowed for the comparison between years within a given season (September 2005 vs. September 2008) and between seasons within a given year (May 2008 vs. September 2008) of specific discharge across this boreal landscape. There was great variability in specific discharge across this landscape. Percentage wet area (i.e. wetlands, mires, and lakes) and elevation were found to be directly related to the specific discharge during the drier September 2008 sampling while potential annual evaporation was found to be inversely related. There was less of a relationship determined during the wetter post spring flood May 2008 sampling and the late summer re-wetted September 2005 sampling. This may indicate large-scale hysteresis with regard to how this boreal landscape dries down and wets up. To demonstrate the biogeochemical implications of such spatiotemporal variations in specific discharge, we estimate dissolved organic carbon (DOC) exports with available data for the May 2008 and September 2008 samplings using both the spatially-variable observed specific discharges and the spatially-constant catchment average values. The average absolute difference in DOC export for the various sub-catchments between using a variable and using a constant specific discharge was 28% for the May 2008 sampling and 20% for the September 2008 sampling.