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Using official map data on topography, wetlands and vegetation cover for prediction of stream water chemistry in boreal headwater catchments

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Abstract. A large part of the spatial variation of stream water chemistry can be related to inputs from headwater streams. In order to understand and analyse the dominant processes taking place in small and heterogeneous catchments, accurate data with high spatial and temporal resolution is necessary. In most cases, the quality and resolution of available map data are considered too poor to be used in environmental assessments and modelling of headwater stream chemistry. In this study 18 forested catchments (1–4 km²) were selected within a 120×50 km region in the county of Värmland in western Sweden. The aim was to test if topographic and vegetation variables derived from official datasets were correlated to stream water chemistry, primarily the concentration of dissolved organic carbon (DOC), but also Al, Fe and Si content. GIS was used to analyse the elevation characteristics, generate topographic indices, and calculate the percentage of wetlands and a number of vegetation classes. The results clearly show that topography has a major influence on stream water chemistry. There were strong correlations between mean slope and percentage wetland, percentage wetland and DOC, mean slope and DOC, and a very strong correlation between mean topographic wetness index (TWI) and DOC. The conclusion was that official topographic data, despite uncertain or of low quality and resolution, could be useful in the prediction of headwater DOC-concentration in boreal forested catchments.

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