

CHANGING SNOW CONDITIONS AND VEGETATION PATTERNS: IMPACT ON BOREAL FLOW CONDITIONS

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ABSTRACT

Recent climate projections and studies indicate drastic changes in snow cover extent, properties and timing in boreal areas. Snow cover duration is expected to decrease in Finland and more frequent warm spells and rain-on-snow events will lead to more variable snowpack. Snowmelt acts as a major input to northern hydrology affecting soil moisture conditions, recharging groundwater and sustaining flow during the winter and early summer. Simultaneous to changing climate and snow conditions the vegetation patterns are evolving due to natural and/or anthropogenic processes. Vegetation, snow properties and the physical catchment structure together with climate conditions determine the hydrological response of the catchments. However, their co-evolution, interconnections and impact on hydrology are still not completely understood.

In this study, existing long (over 30 year) and spatially well represented monitoring time series from meteorology and hydrology monitored at dozens of headwater catchments in Finland are combined with multi-source data. We utilize latest calculation methods, high resolution digital elevation model and remote sensed vegetation inventory data sets. The objective is to evaluate the impact of changing environmental factors on snow cover and consequently on boreal headwater flow conditions. The evaluation will be done by determining relevant streamflow signatures for different catchments and analysing their relationships and sensitivity to catchment structure and changes in vegetation and snow cover.

The results are needed for deeper understanding of the future hydrological behaviour of the boreal catchments which is necessary information for future decision making in water resources management and sustainable bioeconomy in boreal region.

Keywords: snow, vegetation, headwater, boreal, flow, hydrology