



Thermal and chemical tracing of discrete riparian inflow points (DRIPs) in a boreal first order stream under warm and cold field conditions

Stefan Ploum (1), Jason Leach (2), Lenka Kuglerová (1), and Hjalmar Laudon (1)

(1) Department of Forest Ecology and Management, Swedish University of Agricultural Sciences, Umeå, Sweden (stefan.ploum@slu.se), (2) Department of Geography, Simon Fraser University, Burnaby, Canada (jleach@sfu.ca)

The riparian zone has a dominant control over water quantity and quality in first order streams. In the Krycklan catchment in northern Sweden, topographic depressions in the near-stream area route hillslope water to the stream channel, creating discrete riparian inflow points (DRIPs). Thermal and chemical tracing campaigns in summer and autumn showed DRIPs to be determinant for surface water chemistry, hydrology and stream biology. Summer is a favorable season for the thermal tracing using optic fiber techniques because temperature gradients between surface water and lateral incoming hillslope water are large which allows clear identification and quantification of contributions of DRIPs along the stream reach. In cold winter and spring conditions these temperature gradients decrease, nonetheless we have been able to detect strong thermal signals. This was due to unexpectedly fast warming lake surface which delivered relatively warm water to the stream reach, and ice sheets at the DRIPs that cooled hillslope water before entering warmer surface water. These results are framed in a visual animation which provides comprehensive insights in governing field conditions and data. Parallel to the thermal tracing, a chemical analysis of both hillslope and stream water during late winter and throughout spring again emphasizes the biogeochemical role of DRIPs and further elucidates how runoff is generated in the complex spring conditions. The combined use of tracing techniques in presumably sub-optimal field conditions, has delivered new insights in the links between terrestrial and aquatic ecosystems in boreal regions.