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# Quantifying and characterizing boreal headwater NOM using hydrological understanding, absorbance spectroscopy, and fluorescence techniques

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Boreal forests store large amounts of carbon, especially in headwater terrestrial-aquatic interfaces dominated by OM-rich riparian zones (RZs). Thus, RZs are the main source of natural organic matter (NOM) in boreal surface waters. We hydrologically illustrated that the transfer of substances, including NOM, from RZs to streams is dominated by a narrow depth range with the highest contribution to solute and water fluxes, the so-called dominant source layer (DSL). By comparing the size of potential sources in relation to lateral fluxes in the DSL in several RZs within a Swedish boreal catchment, we demonstrated that there is a potential long-lasting supply of NOM from these RZ into the stream. This was supported by rough estimates of primary production and 14C measurements, which indicated that modern carbon is the predominant fraction exported. Despite the overwhelming quantitative evidence that RZs are the source of NOM to boreal streams, few studies have compared NOM quality in streams, RZs, and upslope areas. Using absorbance indicators and fluorescence techniques we showed that the NOM character in several RZ sampling sites resembles that of the corresponding streams and differs from that of the upslope soils. Given that forecast future climate in the boreal region and depletion of sulfur pools are expected to increase NOM in aquatic systems, potentially disrupting water quality and the global carbon cycle, is critical to integrate quantitative and qualitative approaches to understand OM cycling in boreal RZs.