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Increasing organic C and N fluxes from a northern boreal river basin to the sea

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Abstract Increasing trends in dissolved organic carbon (DOC) concentrations in lakes and streams across Europe and North America have been reported. The widespread occurrence of these phenomena indicates large-scale causes, e.g. enhanced decomposition of organic soils, changes in hydrology or decreased acid deposition. The Simojoki River basin (3160 km²) is located in the Northern Boreal Zone where human impacts are minor. Long-term changes (30–40 years) of organic C and N concentrations and fluxes in the Simojoki River system were studied: both TOC and TON concentrations were increasing, fluctuating between droughts and wet periods. Highest concentrations were detected in 1998–2000 during a period of very high flows, after the drought period of 1994–1997. The average TOC flux increased by 38% during the 1990s compared with the 1980s, while the average TON flux during the same period increased even more, by 42%. Runoff accounts for part but not all of the increase in the TOC and TON outputs. Since 2000, the fluxes have decreased to slightly lower levels but year-to-year variability has remained considerable. Multiple effects are probable, i.e. changes in both hydrology and in catchment soils have impacts on these increasing fluxes.

Key words organic carbon; organic nitrogen; fluxes; climate change; river basin; boreal zone; Finland