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An ensemble approach to assess the effects of climate change on riverine inorganic nitrogen loading in Sweden

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The dramatic increase of bioreactive nitrogen entering boreal ecosystems is attracting growing attention. Large quantities of inorganic nitrogen are flushed from land to water, accelerating freshwater and marine eutrophication. Multiple, interacting, and potentially countervailing drivers control the future hydrologic export of inorganic nitrogen.

In this contribution, we attempt to resolve these land-water interactions and present a versatile modeling framework, which employs an ensemble of climate model projections, hydrological simulations and several parameter parsimonious regression models to project future riverine inorganic nitrogen dynamics across Sweden, while maximizing the use of existing measurements.

The projected total amount and seasonal pattern of inorganic nitrogen loads in a future climate are mostly influenced by longer growing seasons and more freshwater flowing into the Baltic Sea. The gain in winter streamflow and winter loads is greater than the loss of spring flood, which consequently leads to a considerable overall increase of inorganic nitrogen loading.