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Trends in nitrogen deposition and leaching in acid-sensitive streams in Europe

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Abstract. Long-term records of nitrogen in deposition and streamwater were analysed at 30 sites covering major acid sensitive regions in Europe. Large regions of Europe have received high inputs of inorganic nitrogen for the past 20 - 30 years, with an approximate 20% decline in central and northern Europe during the late 1990s. Nitrate concentrations in streamwaters are related to the amount of N deposition. All sites with less than 10 kgN ha^{-1} yr^{-1} deposition have low concentrations of nitrate in streamwater, whereas all sites receiving > 25 kgN ha^{-1} yr^{-1} have elevated concentrations. Very few of the sites exhibit significant trends in nitrate concentrations; similar analyses on other datasets also show few significant trends. Nitrogen saturation is thus a process requiring many decades, at least at levels of N deposition typical for Europe. Declines in nitrate concentrations at a few sites may reflect recent declines in N deposition. The overall lack of significant trends in nitrate concentrations in streams in Europe may be the result of two opposing factors. Continued high deposition of nitrogen (above the 10 kgN ha^{-1} yr^{-1} threshold) should tend to increase N saturation and give increased nitrate concentrations in run-off, whereas the decline in N deposition over the past 5 – 10 years in large parts of Europe should give decreased nitrate concentrations in run-off. Short and long-term variations in climate affect nitrate concentrations in streamwater and, thus, contribute "noise" which masks long-term trends. Empirical data for geographic pattern and long-term trends in response of surface waters to changes in N deposition set the premises for predicting future contributions of nitrate to acidification of soils and surface waters. Quantification of processes governing nitrogen retention and loss in semi-natural terrestrial ecosystems is a scientific challenge of increasing importance.

Keywords: Europe, acid deposition, nitrogen, saturation, recovery, water

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