



The role of organic nitrogen in the nitrogen cycle of developed landscapes

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Eutrophication, drinking water quality, ecosystem diversity and trace gases emissions are tightly related to increased N application rates in agro-ecosystems. Within the last decades, substantial effort has been put into the investigations of anorganic N compounds and the decisive role these components play in the aforementioned environmental problems. Recently, the dominance of organic nitrogen compounds in the terrestrial N cycle of pristine ecosystems has been demonstrated. A question remains, whether the observed role of organic N in these ecosystems is also of relevance in nutrient-rich, developed landscapes.

Here, we present results from two case studies in mesoscale river catchments of Hesse, Germany, that contribute new information to this debate. The basis hypothesis of the investigations are, that (1) organic N substantially contributes to total N export of these catchments, and (2) that landscape information can be used to predict the ratio of organic to anorganic N in these catchments.

In the first case study, monthly snapshot sampling (transect measurements) were conducted along various stretches and subcatchments of the Schelde and Aar river. Water samples were measured for anorganic N (NO_3^- , NH_4^+) and total N. Organic nitrogen was calculated as the difference of total N and anorganic N. Information on land use, population, soil, geology and climate derived from an extensive GIS analysis was used in a multi-variate statistical analysis to predict spatio-temporal dependency of anorganic and organic N export.

The second case study utilized public available data on total and inorganic N export

from 66 catchments. Based on catchment characteristics and a comprehensive GIS analysis, functional units of catchments with a distinct ratio of organic to anorganic nitrogen were derived. It could be shown that on average 20% of N losses can be attributed to organic compounds, with extremes of 50% and more. We conclude that (1) organic nitrogen losses might play an important role in the total N budget of developed landscapes, and (2) that current hydro-biogeochemical models should be extended to consider this missing link.