

Quantity and quality of phosphorus losses from an artificially drained lowland catchment

Monika Nausch (1), Jana Woelk (1), Petra Kahle (2), Günther Nausch (1), Thomas Leipe (1), and Bernd Lennartz (2)

(1) Leibniz Institute for Baltic Sea Research, Biological Oceanography, Rostock- Warnemünde, Germany (monika.nausch@io-warnemuende.de), (2) Faculty of Agricultural and Environmental Sciences, University of Rostock, Germany

Currently, agricultural diffuse sources constitute the major portion of phosphorus (P) fluxes to the Baltic Sea and have to reach the good ecological status aimed by the Baltic Sea Action Plan and the Marine Strategy Framework Directive. The objective of this study was to uncover the change in phosphorus loading as well as in P fractions along the flow path of a mid-size river basin in order to derive risk assessment and management strategies for a sustainable P reduction. P-fractions and the mineral composition of particulate P were investigated in a sub-basin of the river Warnow, the second largest German catchment discharging to the Baltic Sea. Samples were collected from the sources (tile drain, ditch) and along the subsequent brook up to the river Warnow representing spatial scales of a few hectares up to 3300 km². The investigations were performed during the discharge season from November 1th 2013 until April 30th 2014 covering a relative dry and mild winter period. We observed an increase of total phosphorus (TP) concentrations from $15.5 \pm 3.9 \mu\text{g L}^{-1}$ in the drain outlet to $72.0 \pm 7.2 \mu\text{g L}^{-1}$ in the river Warnow emphasizing the importance of sediment-bound P mobilization along the flow path. Particulate phosphorus (PP) of 36.6 – 61.2% accounted for the largest share of TP in the streams. Clay minerals and Fe(hydr)oxides were the main carrier of particle bound P followed by apatite. A transformation of dissolved inorganic phosphorus (DIP) into particulate organic P was observed in the river Warnow with the beginning of the growth season in February. Our investigations indicate that the overall P load could be reduced by half when PP is removed.