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# Using E-HYPE for estimating nutrient transport – experiences and challenges

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Continental to global scale hydrological models have emerged in recent years as tools e.g. for flood forecasting, large-scale climate impact analyses, and estimation of time-dynamic water fluxes into sea basins. Such models also provide an opportunity to estimate riverine nutrient concentrations and transports, if the underlying model incorporates a representation of nutrient turnover.
E-HYPE is a pan-European application of the HYPE model developed as a multi-purpose tool for large-scale hydrological analyses. HYPE is a process-based combined rainfall-runoff and water quality model, and as such allows to model transport and transformation of pollutants along with runoff. HYPE uses delineated sub-basins as computational units and as such offers a more dynamic spatial resolution than fixed grid cells. Average size of sub-basin in E-HYPE is 215 km2 with each sub-basin being further subdivided into up to 100 Hydrological Response Units.
Here, we discuss our analyses and experiences with E-HYPE with a focus on nutrient generation, transport, and transformation in the Baltic Sea Basin. We encountered some challenges during nutrient calibration such as calibration data availability and reliability, but also the development of an appropriate calibration strategy with realistic calibration objectives and relevant performance evaluation functions. Aside from observed stream discharge and nutrient concentrations data, we used three process-based datasets to improve the internal model behavior of nutrient processes, namely the interaction between soils, surface water, and groundwater: (1) proportion of baseflow, (2) reduction of nitrogen in groundwater, and (3) nitrogen leaching from the root zone. We will demonstrate how these processes affect the model outputs and calibration performance, and their interplay with model assumptions and limitations. We also show how important realistic model estimates of water fluxes are for the mobilisation, retention, and transport of nutrients at the large scale.