QUADICA: A large-sample data set of water quality, discharge and catchment attributes for Germany

Pia Ebeling[1], Rohini Kumar[2], Stefanie R. Lutz[1,3], Tam Nguyen[1], Fanny Sarrazin[2], Michael Weber[2], Olaf Büttner[4], Sabine Attinger[2], and Andreas Musolff[1]

[1]Helmholtz Centre for Environmental Research GmbH - UFZ, Hydrogeology, Leipzig, Germany (pia.ebeling@ufz.de)

[2]Helmholtz Centre for Environmental Research GmbH - UFZ, Computational Hydrosystems, Leipzig, Germany

[3]Copernicus Institute of Sustainable Development, Utrecht, the Netherlands

[4]Helmholtz Centre for Environmental Research GmbH - UFZ, Aquatic Ecosystems Analysis and Management, Magdeburg, Germany

Environmental data are critical for understanding and managing ecosystems, including mitigation of degraded water quality. Therefore, we provide the first large-sample water quality data set of riverine water quality combined with water quantity, meteorological and nutrient forcing data, and catchment attributes for Germany in a preprocessed and structured form. The QUADICA data set (water QUAlity, DIscharge and Catchment Attributes for large-sample studies in Germany) covers 1386 German and transboundary catchments with a large range of hydroclimatic, topographic, geologic, land use and anthropogenic settings. The data set comprises time series of riverine macronutrient concentrations (species of nitrogen, phosphorus and organic carbon), discharge, meteorological and diffuse nitrogen forcing data (nitrogen surplus, atmospheric deposition and fixation). The time series are generally aggregated to an annual basis; however, for 140 stations with long-term water quality and quantity data (more than 20 years), we additionally provide monthly median discharge and nutrient concentrations, flow-normalized concentrations and corresponding mean fluxes as outputs from weighted regressions on time, discharge, and season (WRTDS). The catchment attributes include catchment nutrient inputs from point and diffuse sources and characteristics from topography, hydroclimate, land cover, lithology and soils. QUADICA is a comprehensive, freely available, ready-to-use data set that facilitates large-sample data-driven water quality assessments at catchment scale as well as mechanistic modeling studies. We hope to stimulate the hydrological and water quality communities to provide similar data sets to create novel research opportunities, increase our understanding of catchment functioning, and ultimately improve water quality management.