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Groundwater quality across scales: impact on nutrient transport to large water bodies

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High concentrations of dissolved nutrients such as nitrogen (N) and phosphorus (P) in groundwater are an increasing concern in many areas of the world. Especially regions with high agriculture impact see widespread declining groundwater quality, with considerable uncertainty mainly regarding the impact of phosphorus (P). Implications reach from direct impacts on different water users to discharge of nutrient-rich groundwater to rivers, lakes and coastal areas, where it can contribute to eutrophication, hypoxia or harmful algal blooms. While local-scale studies are abundant and management options exist, quantitative approaches at regional to continental scales are scarce and frequently have to deal with data inconsistencies or are temporally sparse. Here, we present the research framework to combine large databases of local groundwater quality to data sets of climatical, hydrological, geological or landuse parameters. Pooling of such information, together with robust methods such as water balances and groundwater models, can provide constraints such as upper boundaries and likely ranges of nutrient composition in various settings, or for the nutrient transport to large water bodies. Remote Sensing can provide spatial information on the location of groundwater seepage. Results will eventually help to identify focus areas and lead to improved understanding of the role of groundwater in the context of global biogeochemical cycles.