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Monitoring and modeling nutrient interannual fluxes and their uncertainties at national scale

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Many European countries have improved their water quality monitoring since the implementation of the Water Framework Directive (WFD). However, the monitoring strategy (parameter, density and frequency) highly differs among European regions. Annual fluxes, calculated from observations or estimated by models are often computed without any estimation of uncertainties, therefore it is difficult to assess trends as influenced by the mitigation options implemented. Here, we illustrate this challenge on French water quality monitoring network and national scale models. The Nutting (Dupas et al., 2015) model presented here is a conceptual model which links nutrients diffuse and point sources with annual fluxes modulated by catchment and in-stream retention factors. Both retention factors are calibrated in 231 headwater catchments with several variables such as soil, land use and climate factors and. The method consists in: (i) estimating observational uncertainty in inter-annual nitrogen and phosphorus fluxes (2008-2012) and (ii) investigating their consequences on the Nutting (N&P) model calibration. We show that the monitoring strategy highly differs among French river basin districts with higher sampling frequencies in northern France ($\sim$12 samples per year) in comparison with southern France ($\sim$6 samples per year). We estimated fluxes uncertainties based on Moatar et al. (2013) methods which consider sampling frequency, discharge variability and concentration-discharge relationships. The monitoring strategies adopted in different river basin districts affect fluxes uncertainties and consequently the model calibration. The next step will be to analyze the effects of different sampling strategies in order to improve the current monitoring network.

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