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Insights from filling the gaps with high-resolution nutrient monitoring in rivers

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Phosphorus and nitrogen fractions are arguably among the most important nutrient pollutants in rivers of developed countries with urban centres, industries and agriculture. National inventories of water quality monitoring data in rivers are, however, often spatially rich but temporally poor and biased in terms of source origin. Monitoring (or modelling) trajectories of water chemistry change from catchment management using these datasets is therefore problematic owing to the hydrological relationships (low and high flows) that control transfer from land to water and subsequent impact. The probabilities are high, for example, of scheduled sample collection reflecting groundwater or point source influences at low flows. Conversely, diffuse sources allied to storm flows are poorly represented; even over long-time scales. This has added implication for uncertainty generation in models designed to predict process and status of nutrients in catchment systems.

Here we present three beneficial aspects related to the use of high-resolution river monitoring equipment in a national framework in Ireland, returning fractions of phosphorus and nitrogen on a sub-hourly basis and synchronous with discharge. Firstly, the datasets provide the most complete time-series possible for nutrient fluxes in rivers and, in Ireland, are being used primarily as an empirical basis to gauge the influence of agricultural polices to mitigate nutrient loss from land; showing the influences of specific measures as well as the influences of confounding issues. Secondly, for validation, the datasets are a challenge for modelling frameworks to emulate complex processes related to inter and intra-annual climatic variability, landuse change and policy influence. Thirdly, we show how the data can be used to devise a less frequent sampling regime to capture river nutrient flux processes that optimises the need to be spatially and temporally representative in catchment monitoring programmes.