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# Development of a novel Nutrient Prediction System (NPS) for a perennial river in a semi-arid region

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Knowledge about nutrient flow in the landscape, especially in rivers, is becoming increasingly necessary for water, soil and land management within catchments. Major sources of nutrients include both point and nonpoint sources. Agriculture and sewage water are two of the most significant sources of nutrients in the landscape. As population increases, fuelling rapid urbanisation, we expect to see surges in the quantity and types of nutrients in the landscape. Dramatic effects of nutrients such as eutrophication-driven hypoxia are well documented worldwide. However, predictions of hydro-biogeochemical turnover at the landscape scale are difficult due to intrinsic complexity and the limited number of models that simulate relevant processes.

The Ellen Brook catchment in Western Australia was selected as the study area due to availability of data and the fact that a number of hydro-biogeochemical models have already been successfully tested in the catchment. An ensemble of numerical weather prediction (NWP) systems, through the 'THORPEX Interactive Grand Global Ensemble' (TIGGE) programme, was used to force an ensemble of hydro-biogeochemical models. A probabilistic ensemble hydro-biogeochemical modelling cascade system was thus set up to forecast in-stream nutrient fluxes for 6 hours and to up to 10 days. Uncertainties that originate from weather prediction and hydro-biogeochemical models, and propagate through the cascade system were assessed. The economic benefits of the system were also evaluated.

Results demonstrate a promising tool to predict in-stream nutrient fluxes. Benefits of such as a system include the potential to satisfy a growing demand for real-time or quasi real-time ecological status of streams around the world. Such an effort can contribute capacity to better manage nitrogen loads in streams to improve ecosystem functions and services.