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Conference Abstract

# Hydrological fragmentation alters the spatial configuration of dissolved nutrient and organic carbon concentrations in temperate river networks

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## Abstract

Intermittent streams are characterised by a fragmentation phase during which the biogeochemistry of isolated pools differs from that of perennial streams. Studies of the former have mainly focused on arid and Mediterranean climates, although intermittent streams also exist in temperate climates where intensive agriculture and wetter conditions cause high nutrient loads. Our aim was to analyse how hydrological fragmentation alters the spatial variability of dissolved nutrient and organic matter concentrations among isolated pools. We conducted repeated synoptic sampling campaigns along the stream network of the Ria d'Etel catchment (northwest France, 65 $km^2$) during the spring and summer of 2024. We sampled 30 sites and analysed dissolved organic carbon (DOC) concentrations and fluorescence properties, as well as dissolved inorganic nitrogen (DIN), dissolved organic nitrogen (DON) and soluble reactive phosphorus (SRP) concentrations, during three sampling campaigns, including stream recession (27 May 2024), early and late fragmentation (2 and 29 August 2024, respectively). The results showed an increase in the spatial variability of concentrations during hydrological fragmentation. In contrast to the flowing phase, where nutrient concentrations were highly correlated with catchment properties (DIN and agricultural

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land use; DOC and hydromorphic soils, etc.), concentrations in isolated pools appeared to be disconnected from catchment characteristics. We interpret this observation as a result of local in-stream processes gaining importance in determining concentrations in the isolated pools. More specifically, DOC concentrations were higher in isolated pools than in flowing reaches, while the DIN concentrations were lower. SRP concentrations were lower during the initial formation of isolated pools and then showed no difference compared to the flowing reaches. The chemical composition of the dissolved nitrogen pool also changed, with an increasing proportion of ammonium in DIN and an increasing proportion of DON in total dissolved nitrogen measured in isolated pools, both with greater spatial variability than in flowing reaches. With increasing degree of humification in isolated pools, the DOC composition showed more decomposed DOM with a probable terrestrial source. These results, together with the observed variations in dissolved oxygen concentrations, suggest that anoxic microbial respiration processes drive these concentration changes during hydrological fragmentation. As the number of intermittent streams is predicted to increase under climate change, we anticipate that the biogeochemical conditions that we observed are likely to become more common in temperate aquatic ecosystems.

## Keywords

Intermittent stream, non-perennial, nitrogen, phosphorus, DOM

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## Conflicts of interest

The authors have declared that no competing interests exist.