Towards hydrochemical PUB – stable vs. heterogeneous NO_3 and COD signatures across hydrographic structure and size

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Intensive agriculture is a major disturbing factor for water quality in Brittany, France. Observations of chemical data from 350 catchments over a 15 year period show that the high variability of hydrochemical dynamics between catchments in relation to geographic characteristics and farming practices, decreases with an increase in the catchment size. A stable signature of nitrate and DOC dynamics does emerge for bigger catchments, and was evidenced statistically.

We adapted a modified version of the standard deviation formula to calculate an index on mean inter-annual winter nitrate and dissolved organic carbon concentrations to characterize each catchment. The method was applied to the whole sample of catchments, some of them nested, to investigate variation of our new index across scales and regions. Results show an increasing and non-linear relationship between the criterion and the surface, with threshold effects. The stability of the thresholds across river basins in Brittany, and across seasons and years is explored.

This emergence relates to the progressive connection of streams with heterogeneous characteristic chemical signatures into a mixing dominant effect. The better assessment of this relationship opens two major perspectives: i) to define a geomorphology-based PUB (Prediction in Ungauged Basins) approach for hydrochemistry; ii) to identify the most critical sub-catchments for mitigating actions in terms of farming and landscape practices towards water quality recovery.