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Experimental design for coupled water and nutriment dynamics on intermittent rivers: the Vene (France).

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Intermittent rivers have a specific hydrological behaviour resulting in long draught periods interrupted by floods of high intensity and short duration which also influence the water quality dynamics. Indeed during low flow periods pollutants accumulate in the river bed and are flushed away by the first floods.

Although the hydrological regimes of these rivers are known, more knowledge about the processes governing water and nutriment transport is indispensable. The information gathered at the catchment scale is also essential to determine nutriment loads to downstream water bodies. Thus, it is necessary to set up a special observation network in order to determine the temporal and spatial variability of the water and pollutant contributions to the river.

Since 1994, an experimental catchment has been set up on the River Vène for the combined study of hydrological and water quality dynamics with special emphasis on intra-bed transformations. The Vène River drains a 67 km^2 topographic catchment. The seasonal and spatial variability of rainfall combined to a mixed landuse pattern render it very heterogeneous.

Given the intermittent nature of flows, both continuous and event based monitoring are necessary to acquire a full knowledge of the river and nutriment dynamics. However, hydrological and water dynamics are observed at different time steps and spatial scales.

- To assess the contribution of the various inputs to the river and assess its contamination level continuously, three automatic rain gauges, four stream gauges recording

both water flow (5-min time step) and conductivity (1-hour time step) are used. In addition, every fortnight, water samples are also collected manually and water quality probes are used for the in-situ measurement of temperature, pH, conductivity, Eh, and dissolved oxygen content. The water samples are used to determine both the chemical signature of water (major elements and trace elements, nitrogen, phosphorous) and its bacteriological quality (EColi and Streptococcus). Biogeochemical parameters are also measured in soils and sediments.

- During flood events, automatic samplers are used for water collection and the same quality parameters are determined. However, the higher sampling frequency i.e. one hour, allows a better quantification of the various flow and nutriment sources.

- To capture the spatial variability at the river scale and identify the losses in the river-bed during differing hydrological conditions, several one-day measurement campaigns are conducted at eighteen points. At selected locations, sediment traps are also installed to study accumulation and remobilisation processes at the reach scale.

The combination of continuous and event based monitoring coupled with the multi-scale sampling strategy allows a global understanding of the factors and processes influencing water quality at the catchment scale: concentration data is used to assess the contamination levels of the river and the bio-disponibility of Nitrogen and Phosphorous while by analysing the instantaneous fluxes the various contributions to the river in suspended solids, nitrogen and phosphorous could be established. Finally the total load is calculated in order to evaluate the exports at the catchment outlet. The multi-disciplinary approach followed herein improved our knowledge of the integrated catchment response and its impact for downstream environments.