



## **Hydrological processes and water quality dynamics in an intermittent Mediterranean river: the experimental basin of the River Vène (France)**

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The Mediterranean rainfall regime is characterised by long dry periods and intense rainfall events. This feature has a direct consequence on the hydrological behaviour of small rivers where long low flow periods are cut by extreme floods of short duration. Water quality dynamics in such basin is characterised by the importance of accumulation processes during the low flow period and by the flush effect of the floods. These peculiar behaviours are quite well known but not well documented: data are poorly available and very few experimental basins are devoted to the combined study of hydrological processes and water quality dynamics in intermittent Mediterranean rivers. Since 1994, these topics have been studied in the experimental basin of the river Vène.

The river Vène drains a superficial basin of 67 km<sup>2</sup> that ranges from 2 to 323 m in elevation. It is fed by two main springs flowing out of a Jurassic karst. The river has a 12-km course with a regular slope of 0.4% and a Strahler stream order of 3. The cross sections are about 5-meter wide and present a dense riparian vegetation, with abrupt banks (35%), straight walled banks (15%) or a mixed pattern. The Vène catchment is characterised by sparse population; 12,400 inhabitants are distributed between three small villages (3% of the total basin area). In terms of land use, 63% of the total area corresponds to karstic scrubland zones and 34% to agricultural zones of which 21% are vineyards. Point-source pollutant inputs come from two wineries and three sewage treatment works that are sized for 6450 equivalent-inhabitants.

Rainfall data are recorded by three automatic rain gauges, equipped with tipping bucket devices. Wet and dry atmospheric deposits are collected at the three stations. Other meteorological parameters are recorded close to the river outlet. Four stream

gauges are operating; three are installed on the main river course, the fourth one on the main tributary. Each station is equipped with automatic water level and conductivity loggers. Data are recorded at a 5-minute time step. Rating curves are available for contrasted flow values. Automatic samplers are coupled to the stream gauges for flood sampling. Water quality measurements include the following parameters: temperature, pH, conductivity, Eh and dissolved oxygen - all measured in-situ-; suspended solids, major elements, nitrogen, phosphorus, trace elements, bacteria of sanitary concern - all measured on samples. Biogeochemical parameters are also measured in soils and sediments.

Hydrological processes and water quality dynamics are observed at different time and space steps. At local scale, slope processes are observed on different plots on the catchment area (soil water profiles, infiltration processes, chemical contents and mobilisation of chemical elements). Accumulation and remobilisation processes are observed in some river reaches. At river scale, one-day sampling campaigns are conducted in various hydrological conditions (from dry period to floods). Flow measurements, water and sediment samples are done along the river course, at eighteen points: nine in the main river (from the spring to the outlet) and nine in its tributaries and direct inputs (storm sewers and treatment plants). At catchment (and sub-catchment) scale, regular (monthly or bi-monthly) observations are available at the stream gauges. During floods, samples are collected at an hourly time step at the same stations.

Many significant results have been obtained in this experimental river basin. Among them: - diffuse and point sources of pollution have been ranked taking into account hydrological conditions and their associated processes; - riverbed has been identified as a potential pool of pollutants during flood events; - domestic pollutant inputs have been identified as the main source of pollution (nutrients and bacteria) although the Vène catchment is a rural catchment.