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Hydrological processes in an intermittent river catchment: perception through observations and validation through modeling.

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The hydrological processes of the Vène River (South of France) are analyzed and assessed through the coupled approach based on observations and modelling.

The Vène catchment is a 67 km^2 experimental research catchment characterized by three sharply contrasting geology and land use zones: urban zones (3%), vineyards (21%) and permanent crops (13%) and karstic scrubland areas (63%). The river is fed by two karstic springs: the first one is the river spring, the second is located 1km-upstream from the outlet. Three nested basins are gauged: K station gauges the upstream karstic spring plus a 1.4-km^2 catchment; S station ($35km^2$) cuts the river down the middle; V station ($67km^2$) is located at the outlet. Each gauging station is equipped with automatic level and conductivity loggers. Three automatic rainfall stations are located on the catchment area. Data are available since August 2002.

The Vene River has an intermittent functioning, characterized by the alternation of long dry periods cut by short flush flood events. During the dry periods, the riverbed may fall completely dry, except in some sections where human inputs contribute to feed the river.

The various origins of the runoff at the outlet (surface, subsurface and karstic) are separated by the coupled analysis of discharge and water conductivity data. The main hydrological processes taking place at basin (and sub basin) scale are identified and the "perceptual model" of the catchment is used to build the hydrological modelling protocol. The model is based on a simple spatial and temporal aggregative approach, in which each water origin is associated with its own hydrological behaviour. The model

confirmed the identified hydrological processes and helped to quantify the functioning thresholds in this intermittent hydrological system.

The great variability of rainfall controls the hydrological behaviour of the catchment. From one year to another the hydrological balance varies in great proportions. So the influence of each land-use area varies from one year to another. The annual hydrological balance is highly affected by the karstic external inputs and the agricultural areas contribute significantly to the discharge only during recession periods.

During rainfall events, the natural areas do not contribute directly to the runoff. The infiltration on these zones feeds the karstic aquifer directly and contributes to the spring discharges. The urban areas play a major part during intense autumn rainfall events. These zones are characterized by a rather constant runoff coefficient whose value compares well to the extent of urbanisation and explains the whole volume of small floods. Even if the agricultural zones have a significant influence on runoff processes during intense rainfall events, they do not contribute directly to the flood peak. Interflow in the unsaturated zone seems to be the major hydrological process on the agricultural zones.