



ORACLE: An experimental site since 1962 for the study of hydrological hazards and biogeochemical processes

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Context: Understanding how hydrosystems function is a crucial point in the current context of the new water policy implementation (European Water Framework Directive). This policy aims at ensuring both the sustainable development and the protection of human lives and goods. In this context, the challenge is to acquire and provide scientific knowledge to be used for the management of water resources and risks (drought and floods) along with the assessment of human impacts on water regime and quality. Increasing human control over rural areas increases the general vulnerability of our environment to extreme events. Evaluating the risks requires observation of hydrological and biogeochemical processes on a long term basis and at different scales that are from the plot to the basin scale. The project is based on the monitoring of a set of embedded watersheds of the Parisian Basin, representative of watersheds over limestone.

The aim of this research project is to 1) provide forecast for the prevention of hydrological risks such as floods or low flows, and to 2) better understand and represent water and pollutant fluxes and transfers. To achieve these objectives, collaboration with operational water managers is much desirable from the beginning of the project.

The results of this research will improve hydrological modelling and forecasts quality.

Scientific topics: This project aims at identifying determinants of hydrological and biogeochemical functioning in human impacted rural watersheds lying over limestone.

Monitoring pollutant fluxes and transfer at different spatial (embedded watersheds from 1 to 1200 km²) and time scales serves a basis to attain the objectives.

The concerned basins are the Grand Morin and Petit Morin watersheds, where the Orgeval watershed, sub-basin of the Grand Morin watershed, plays a particular role by the number of stations and details with which data has been, is and will be collected. The availability of long term hydrological and climate data makes this geographical domain an exceptional site of study. It allows for statistical approaches of processes and land modifications using data rarely available. Approaches developed in this project are adapted to the functioning of this kind of environment. Also, the social and economical stakes linked to the degradation of the natural environment (diffuse pollution) and to flood forecasting and risks prevention for the Parisian agglomeration are studied.

The project is based on the three axes below:

- Monitoring and modelling processes during water and pollutant transfer at different scales; Aim: propose a hierarchy of the driving processes corresponding to the scale of study
- Monitoring and modelling flows to improve risk forecasting ; Aim: developing and validating innovative methods
- Measurement strategies and study of system representation mode; Aim: optimising data acquisition methods and scale representation; System conceptualisation

For ORACLE, 42 years of streamflow and rainfall data and 30 years of water quality data are available. Specific measurement campaigns were also done for different kinds of data (soil moisture, soil state, land cover, agricultural uses, etc.). With this experimental site, a significant database of observations at different scales already exists. Hydrometeorological radar coverage from Météo France is also available on the whole site.