

Contributions of Natural and Human Activities to Urban Surface Runoff with Different Hydrological Scenarios (Orléans, France)

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Abstract : This study aims at improving the urban hydrological cycle of the Orléans agglomeration (France) and understanding the relationship between physical and chemical parameters of urban surface runoff and the hydrological conditions. In particular water quality parameters such as pH, conductivity, total dissolved solids, major dissolved cations and anions, and chemical and biological oxygen demands were monitored for three types of urban water discharges (wastewater treatment plant output (WWTP), storm overflow and stormwater outfall) under two hydrologic scenarii (dry and wet weather). The first results were obtained over a period of five months. Each investigated (Ormes and l'Egoutier) outfall represents an urban runoff source that receives water from runoff roads, gutters, the irrigation of gardens and other sources of flow over the Earth's surface that drains in its catchments and carries it to the Loire River. In wet weather conditions there is rain water runoff and an additional input from the roof gutters that have entered the stormwater system during rainfall. For the comparison the results La Chilesse is a storm overflow that was selected in our study as a potential source of waste water which is located before the (WWTP). The comparison of the physical-chemical parameters (total dissolved solids, turbidity, pH, conductivity, dissolved organic carbon (DOC), concentration of major cations and anions) together with the chemical oxygen demand (COD) and biological oxygen demand (BOD) helped to characterize sources of runoff waters in the different watersheds. It also helped to highlight the infiltration of wastewater in some stormwater systems that reject directly in the Loire River. The values of the conductivity measured in the outflow of Ormes were always higher than those measured in the other two outlets. The results showed a temporal variation for the Ormes outfall of conductivity from 1465 $\mu\text{S cm}^{-1}$ in the dry weather flow to 650 $\mu\text{S cm}^{-1}$ in the wet weather flow and also a spatial variation in the wet weather flow from 650 $\mu\text{S cm}^{-1}$ in the Ormes outfall to 281 $\mu\text{S cm}^{-1}$ in L'Egoutier outfall. The ultimate BOD (BOD₂₈) showed a significant decrease in La Corne outfall from 210 mg L⁻¹ in the wet weather flow to 75 mg L⁻¹ in the dry weather flow because of the nutrient load that was transported by the runoff.

Keywords : BOD, COD, the Loire River, urban hydrology, urban dry and wet weather discharges, macronutrients

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