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Assessment of fluxes of priority pollutants in stormwater discharges in two urban catchments in Lyon, France

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The European Water Framework Directive (WFD, 2000) requires both a progressive reduction of priority substances discharges and a cessation of hazardous priority substances discharges into water bodies. In order to define priorities for action in a global and integrated urban water management approach, we need to identify and quantify all sources of pollutants (diffuse agricultural and urban emissions, industrial emissions, effluents from wastewater treatment plants, from separate and combined sewer systems, etc.). The objectives of the ESPRIT collaborative project are to identify, evaluate, characterise and later on model the fluxes of priority substances in urban stormwater, for both combined and separate sewer systems.

This paper presents i) the methodology applied to collect representative samples of dry atmospheric deposits, of rainwater and of stormwater discharges at the outlet of experimental catchments, ii) the EMC (Event Mean Concentrations) values and the fluxes of 36 organic substances and of 26 metals calculated for various storm events, and iii) the discussion of these results. Two experimental sites have been selected in Lyon for the project: Ecully (combined sewer system draining a 245 ha residential catchment) and Chassieu (separate stormwater system draining a 185 ha industrial catchment). Each catchment outlet is equipped with sensors measuring various parameters (flow depth and velocity, pH, conductivity, turbidity, temperature) and with refrigerated automatic samplers. Each site is also equipped with prototype devices collecting separately samples of both dry atmospheric deposits and rainwater. All sampling devices comply with requirements for trace micro-pollutants monitoring (Teflon tubing, clean glass bottles, etc.). Field and laboratory blank procedures were carried out to quantify the possible contamination along the sampling/conditioning chain. Event mean samples are built manually according to both discharge and conductivity time series. 26 metals are analysed by ICP-MS in dissolved and particulate phases. A multi-residue analytical method is used to quantify 36 organic micro-pollutants in the dissolved phase by GS-MS and LC-FLD-MS/MS (validation of the method for particulate phase is currently carried out).

Since the beginning of 2008, 19 campaigns have been carried at the outlet of both sites, plus 12 campaigns of atmospheric deposits and 20 campaigns of rainwater. 8 organic pollutants in the dissolved phase and almost all metals in both dissolved and particulate phases are detected. The contribution of the atmosphere to the fluxes is significant. A significant variability between the two catchments has been observed, both for metals and for some organics pollutants including pesticides. Inter-event variability is also very significant in each site for concentrations and specific fluxes (i.e. per active ha), indicating that long term campaigns are necessary to reliably evaluate annual fluxes. The paper will present and discuss the results with more details.