

Priority pollutants in stormwater: the ESPRIT project

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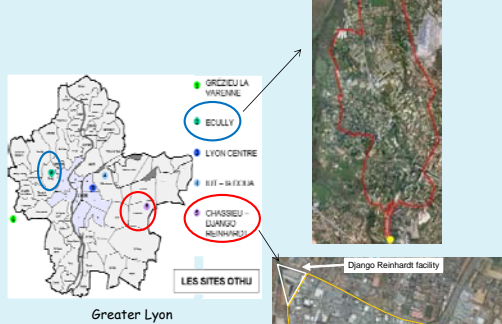
CONTEXT

- European Water Framework Directive 2000 - Good ecological status
- Priority pollutants (PP) toxic for environment and health (PAHs, metals, pesticides, solvants, etc.)
- Need to quantify PP loads and fluxes in Urban Water Systems (UWS) to define priorities for action (source reduction, downstream treatments, etc.) and comparison with non urban contributions
- The **ESPRIT** project: one of the 13 collaborative research actions within the **RHODANOS** research programme managed by the French pole of competitiveness **AXELERA** « Chemistry and Environment »

OBJECTIVES

- Evaluation of Event Mean Concentrations (EMC) of 41 PP during both storm events and dry weather periods in two urban catchments (one separate, one combined)
- Characterisation of particles on which PP are attached (grain size, settling velocities, etc.)
- Identification and quantification of PP contributions (dry atmospheric deposition, rain water, catchments surfaces, sewers)
- Estimation and modelling of EMCs and annual loads
- Evaluation of EMC variability

EXPERIMENTAL SITES

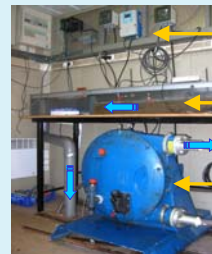


- ✓ **Ecullu catchment**
 - 245 ha
 - residential land use
 - imperviousness 42 %
 - combined sewer

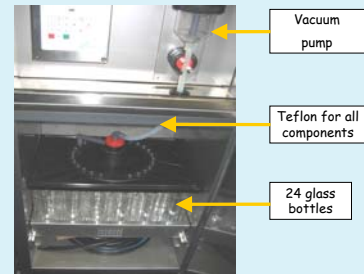
- ✓ **Chassieu catchment**
 - 185 ha,
 - industrial land use
 - imperviousness 75 %
 - separate sewer
 - Django Reinhardt storage- settling + infiltration facility at the catchment outlet

MONITORING AND SAMPLING EQUIPMENT

- Water level and flow velocity in sewers for discharge estimation
- On-line sensors in an off-line measurement flume (conductivity, temperature, pH, turbidity)
- Automatic sampler with Teflon cover Bühler 4010 to collect samples in glass bottles at catchment outlet
- Prototype of samplers for both dry atmospheric deposition and rain water (PVC boxes covered with Teflon and sampling regulation based on on-line raingauge data)



Monitoring flume



Sampler Bühler 4010



Prototype sampler for dry atmospheric deposition and rainwater

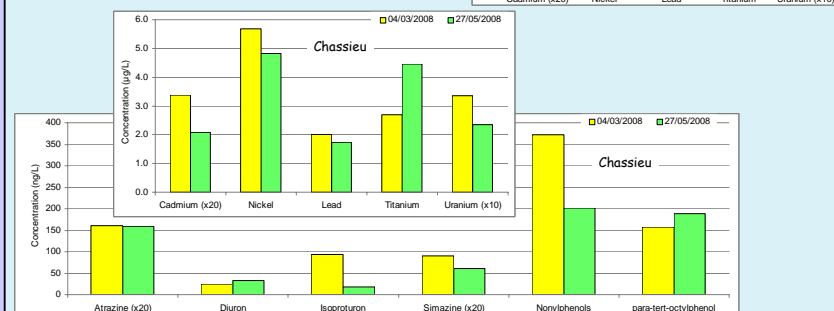
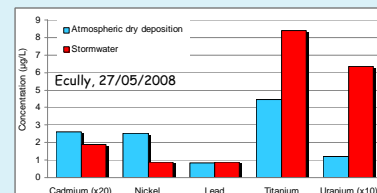
LIST OF THE 41 PP MONITORED IN THE ESPRIT PROJECT

n°	Nom	n°	Nom
1	Alachlor **	23	Nickel
2	Anthracene **	24	Nonylphenols (4-(para)-nonylphenol) **
3	Atrazine **	25	Octylphenols (para-tert-octylphenol) **
4	Benzene	26	Pentachlorobenzene
5	Brominated diphenylethers	27	Pentachlorophenol
6	Cadmium	28	Polyaromatic hydrocarbons **
7	C ₁₀ -C ₁₃ -chloroalkanes		(Benzo(b)fluoranthene **, Benzo(g,h,i)perylene**, Benzo(k)fluoranthene **, Indeno(1,2,3-cd)pyrene) **
8	Chlorfenvinphos **	29	Simazine **
9	Chlorpyrifos *	30	Tributyltin compounds (tributyltin cation)
10	1,2-Dichloroethane	31	Trichlorobenzenes (1,2,4-Trichlorobenzene) *
11	Dichloromethane	32	Trichloromethane (Chloroform)
12	Di(2-ethylhexyl)phthalate (DEHP) **	33	Trifluralin *
13	Diuron **		
14	Endosulfan (alpha-endosulfan) *		
15	Fluoranthene **		
16	Hexachlorobenzene *	1	DDT total (para-para-DDT) *
17	Hexachlorobutadiene *	2	Aldrin *
18	Hexachlorocyclohexane * (gamma-isomer, Lindane *)	3	Dieldrin *
19	Isoproturon **	4	Endrin *
20	Lead	5	Isodrin *
21	Mercury	6	Carbontetrachloride
22	Naphtalene *	7	Tetrachloroethylene
		8	Trichloroethylene

EXAMPLE OF FIRST RESULTS

(dissolved fractions only)

Date of rainfall	04/03/2008	27/05/2008
Experimental site	Chassieu	Chassieu Ecullu
Duration (hours)	12.54	1.24
Rainfall depth (mm)	3.11	0.68
Rainfall mean intensity (mm/h)	0.24	0.49



ANALYTICAL METHODS

- Dissolved and particulate fractions by 0.45 µm filtration
- Analyses of metals in dissolved and particulate fractions by Cemagref Lyon: 23 metals measured by ICP-MS + mercury measured by AFS
- Analyses of organic PP by SCA-CNRS: multi-residues analyses (pesticides, PAHs, solvants...) in dissolved fraction by a set of methods: GS-MS for most volatile compounds, LC-FLD-MS/MS for the other compounds
- Analyses of organic PP in the particulate fraction: analytical protocols in test and validation phase (extraction is critical to obtain reliable results)