

# OBSERVIL – a french network project of urban critical zone observatories

Observil: a **network** of instrumented sites, regrouping the data in a **common open data infrastructure**, bringing the information to the whole scientific community

Scientific focus : Monitoring needs **regrouping** for the study of the **water, energy and pollutants fluxes** in soil/surface/atmosphere in urban environments

What to do? Better handle the impact of growing cities & climate change  
=> mitigation with urban nature ?  
=> improve the knowledge with *continuous* environmental data  
=> numerical models assesment and data assimilation



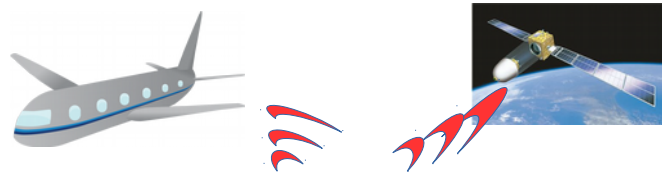
*11 observatories in various*  
*- pedo-climatic contexts,*  
*- urban planing strategies*  
*- urban morphologies*

# Monitored variables and data sharing

## Land use and materials characterization - Remote sensing

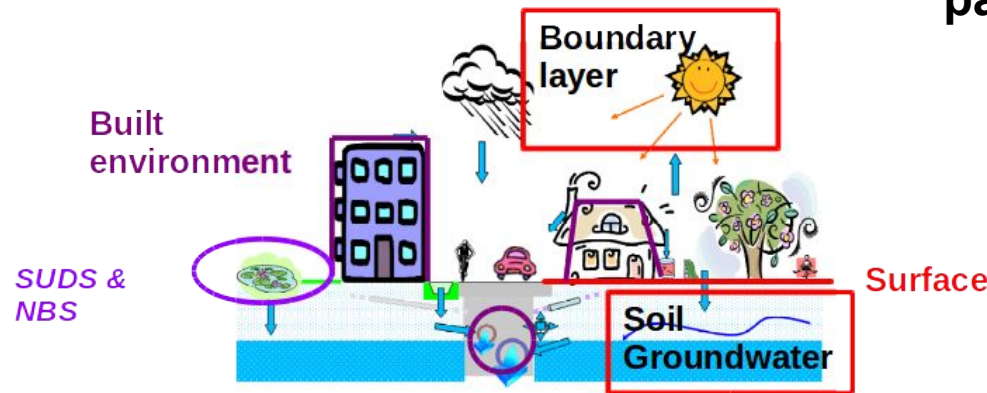
Hydrological patterns

Urban soil patterns



Climatological patterns

Buildings and Energy patterns



### Observatories data

Database portals  
*harvesting*  
Metadata (1) and  
data (2) *collection*



### SDI Observil

Spatial Data Infrastructure  
Metadata  
Data view and download

Link to other data  
infrastructures

Structuration of the urban community in order to better integrate Research Infrastructures (OZCAR, e-LTER)



# OBSERVIL – a french network project of urban critical zone observatories

PI F Rodriguez, Université Gustave Eiffel  
IRSTV LEE, OSUNA  
J Nabucet, LETG Rennes

*Main issues and research questions*  
*Monitored parameters and observatory sites*  
*Illustrations of data sharing*  
*IDS and data structuration*  
*Interactions with RI*



# Main issues

Cities : interactions between *inhabitants*, the *natural environment*, the *built environment*

## Growing cities

=> an increasing anthropogenic pressure on the environment (soil, water, air).

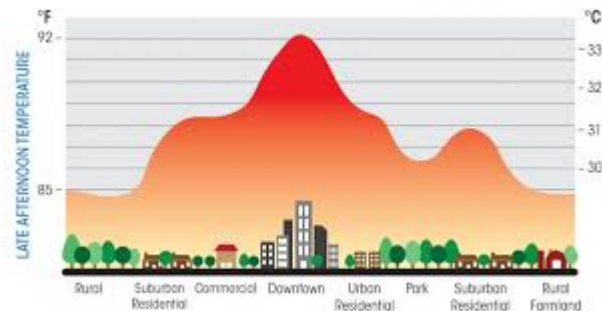
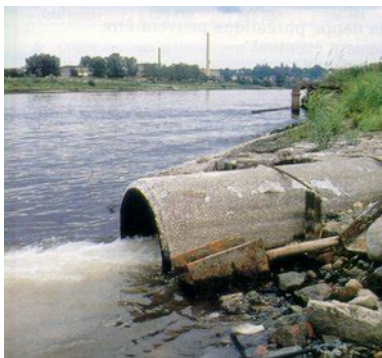
## Climate change

=> Impact on local climate.

=> impact on resources : water, soil, biodiversity.

=> Exacerbation of risks : floods, pollution (air, surface and ground water), heat stress (UHI)

=> Many people exposed to these risks.



# Main issues

Cities and critical zone - Different compartments

**Surface** / Land cover heterogeneity :

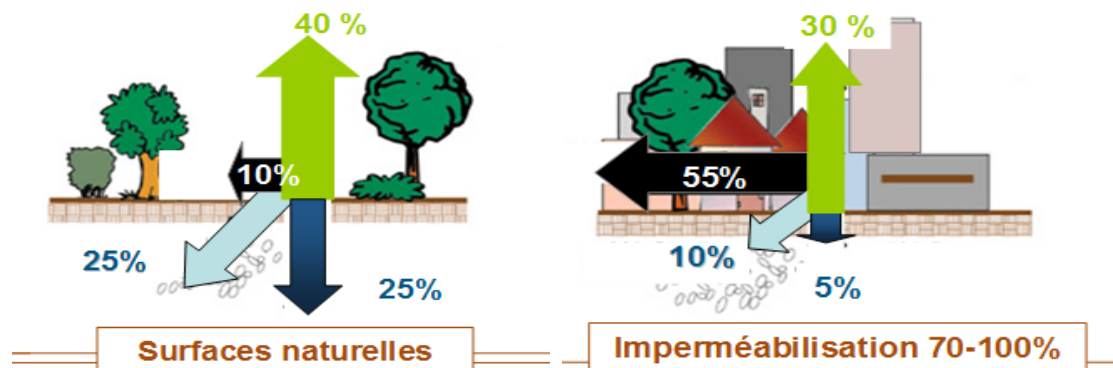
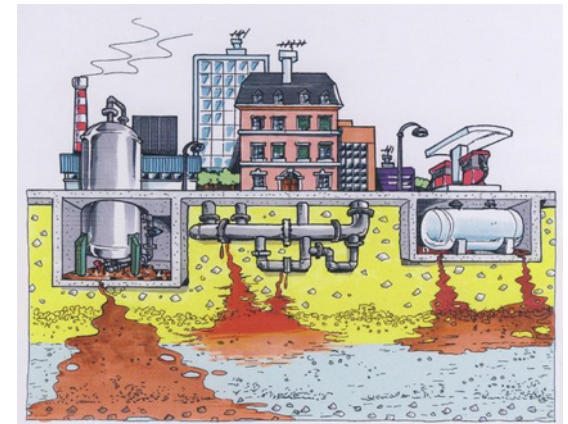
- impervious... more and more « nature based »
- numerous remote sensing data

**Soil** / Soils composition heterogeneity :

- many buried structures
- continuously reworked

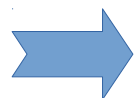
**Atmosphere** / Built environment & industry modification on the atmosphere energetic budget.

=>



# Scientific questions and objectives

Existing french urban research observatories focus on the monitoring of different compartments of the critical zone



Monitoring needs **regrouping** for the study of the **water, energy and pollutants fluxes** in soil/surface/atmosphere in urban environments

.... some scientific questions :

Which urban characteristics/morphology are relevant to limit risks (UHI, floods, receiving water pollution) ?

In which urban contexts the urban nature can mitigate the global changes ?

Objectives :

- Work together on a set of common scientific questions
- Cover a large set of urban typology/morphology/planning strategies
- Cover a large set of pedo-climatic contexts
- Better interaction between data and models for an integrative consideration (time and spatial scales) of the urban environment



Observil : a **network** of instrumented sites, regrouping the data in a **common open data infrastructure**, bringing the information to the whole scientific community dealing with this topic

# Monitored variables

## Hydrological patterns

Rainfall  
Sewer or river flowrate  
Groundwater level

Physico-chemical patterns (water)

Temperature, pH

CEC

O<sub>2</sub>

*Specific sampling*

*Major conc°*

*Micropolluants conc°  
(organic, metals)*

## Urban soil patterns

Groundwater level

Physico-chemical patterns (soil water)

Temperature, pH

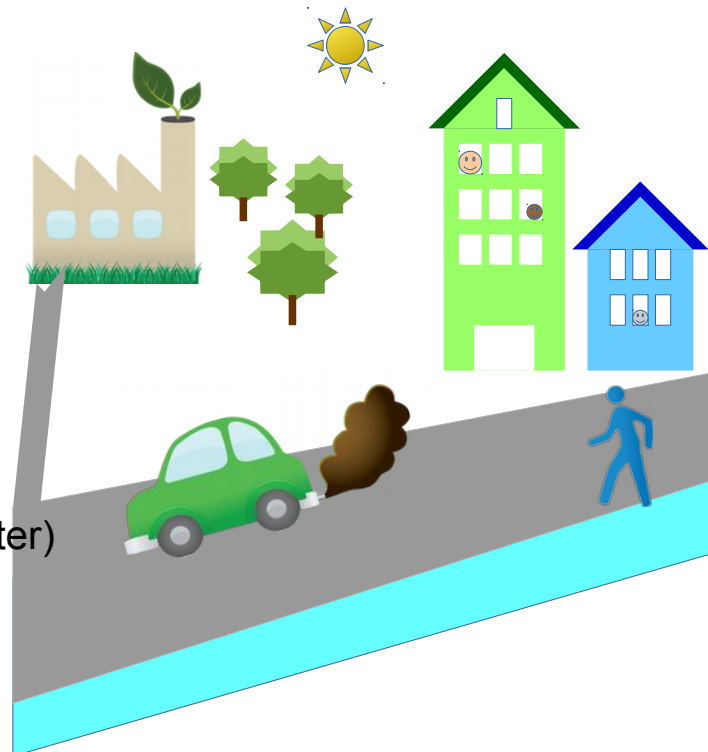
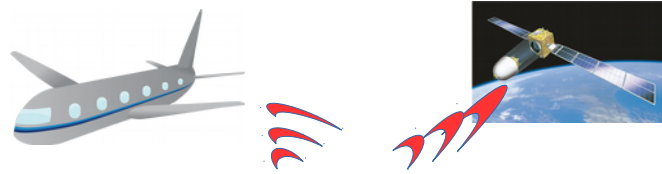
CEC

O<sub>2</sub>

COT

Worms and micro-organisms diversity

## Land use and materials characterization Remote sensing



## Climatological patterns

- Air TRH - Air temperature & humidity network

Meteo station

Wind (direction and velocity)

Pressure

Solar radiation (global, diffuse and IR)

## Buildings and Energy patterns

indoor:

- air TRH

- window opening,

- energy consumption

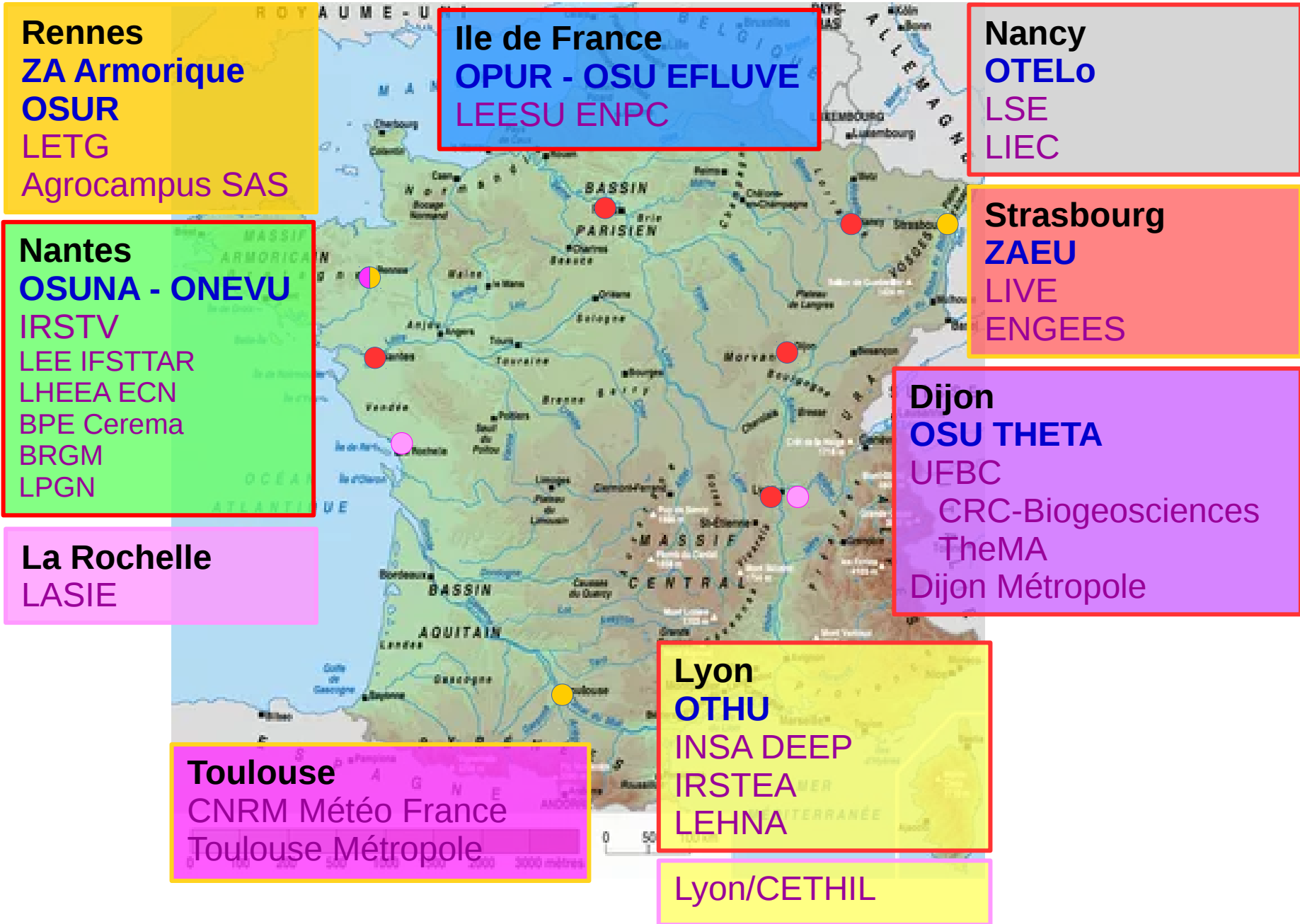
outdoor

- weather station (TRH, wind)

- roof surf temperature

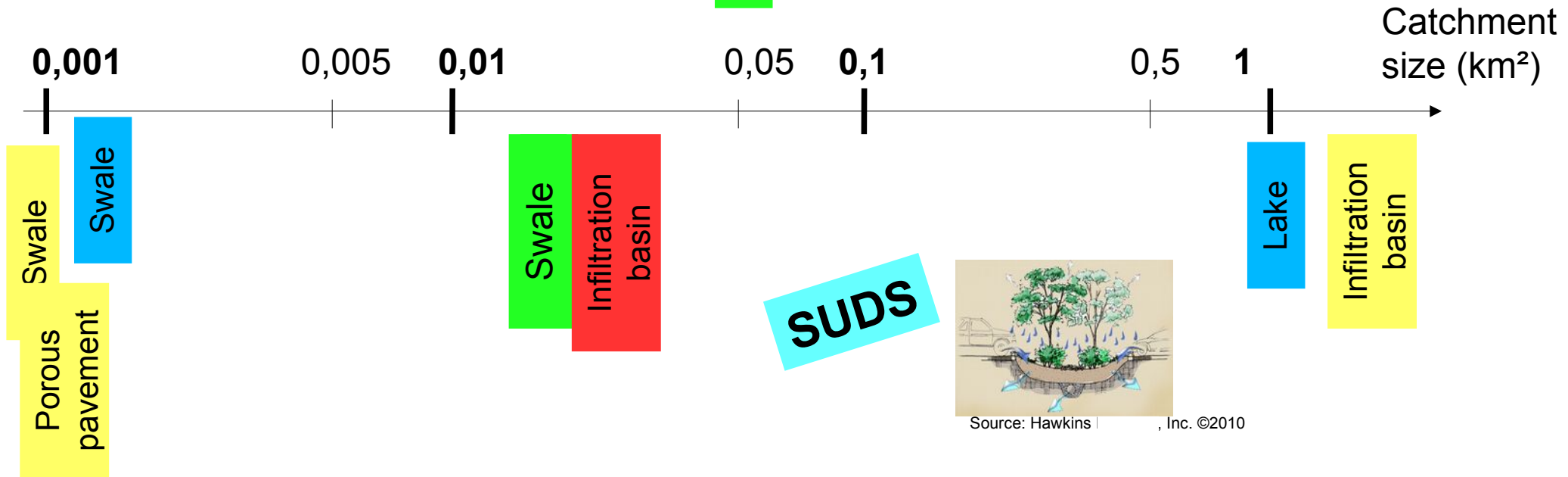
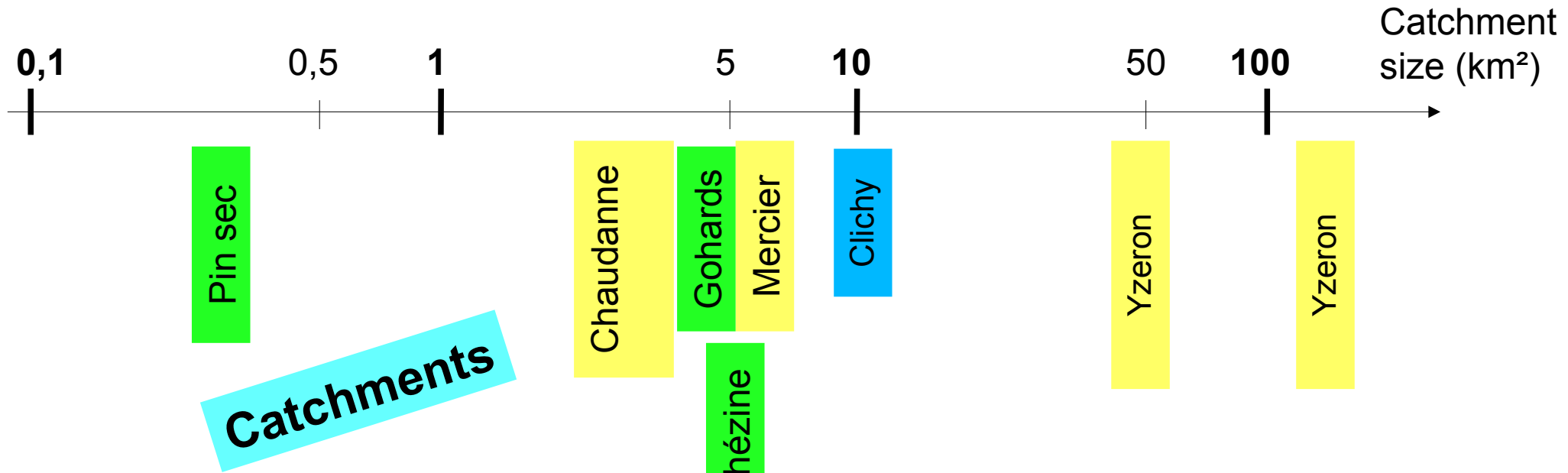
- wall surface temperature

# Scientific Partners



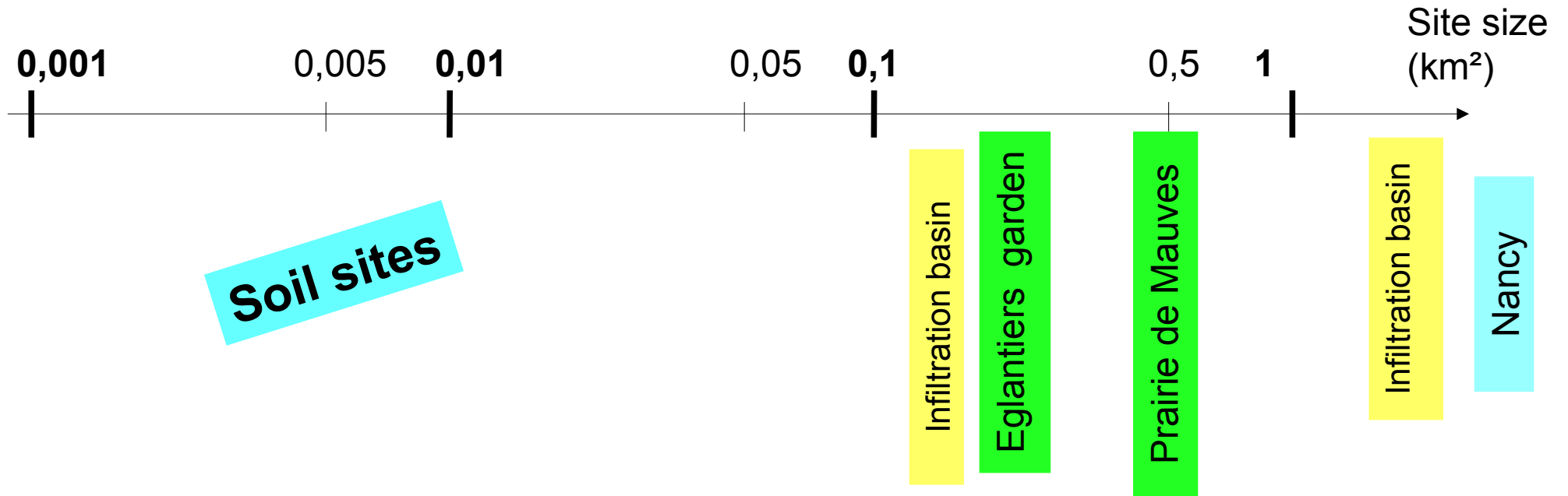


# Variability of site characteristics

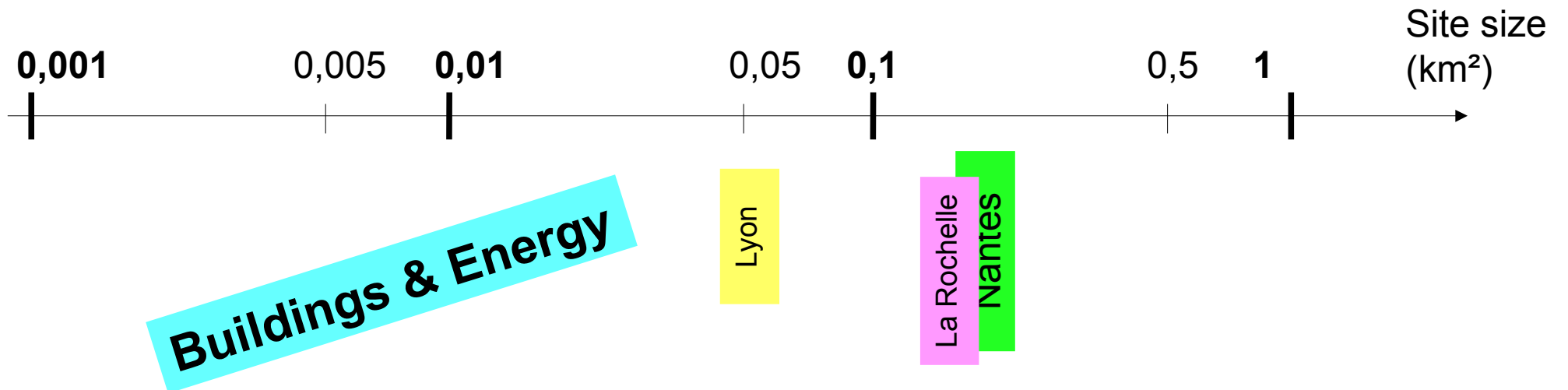
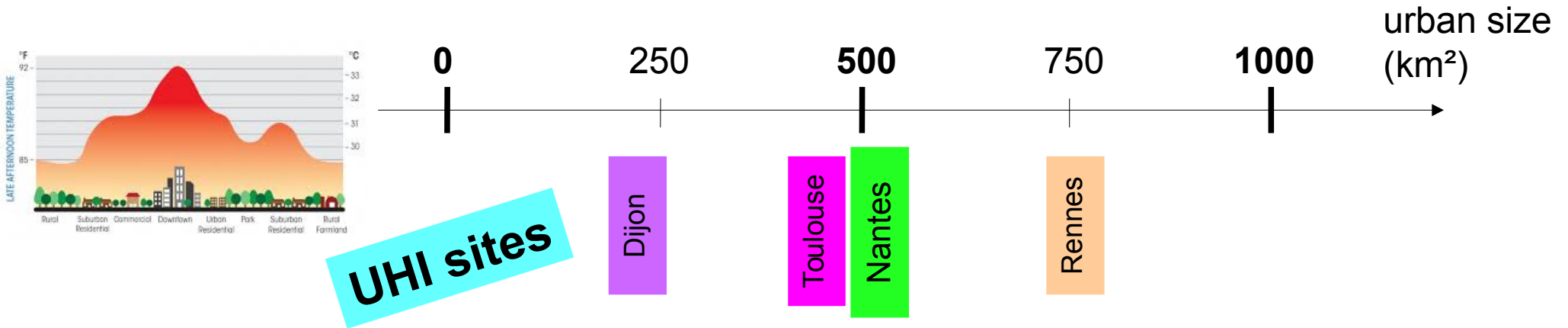


Source: Hawkins | , Inc. ©2010

# Variability of site characteristics



# Variability of site characteristics



# Some data regrouping applications

## NBS & SUDS / Flow volume reduction

(Nantes, Lyon, Ile de France)

Put together data from various SUDS in order to show the variability of hydrological response / best performances for infiltrating SUDS

Lyon

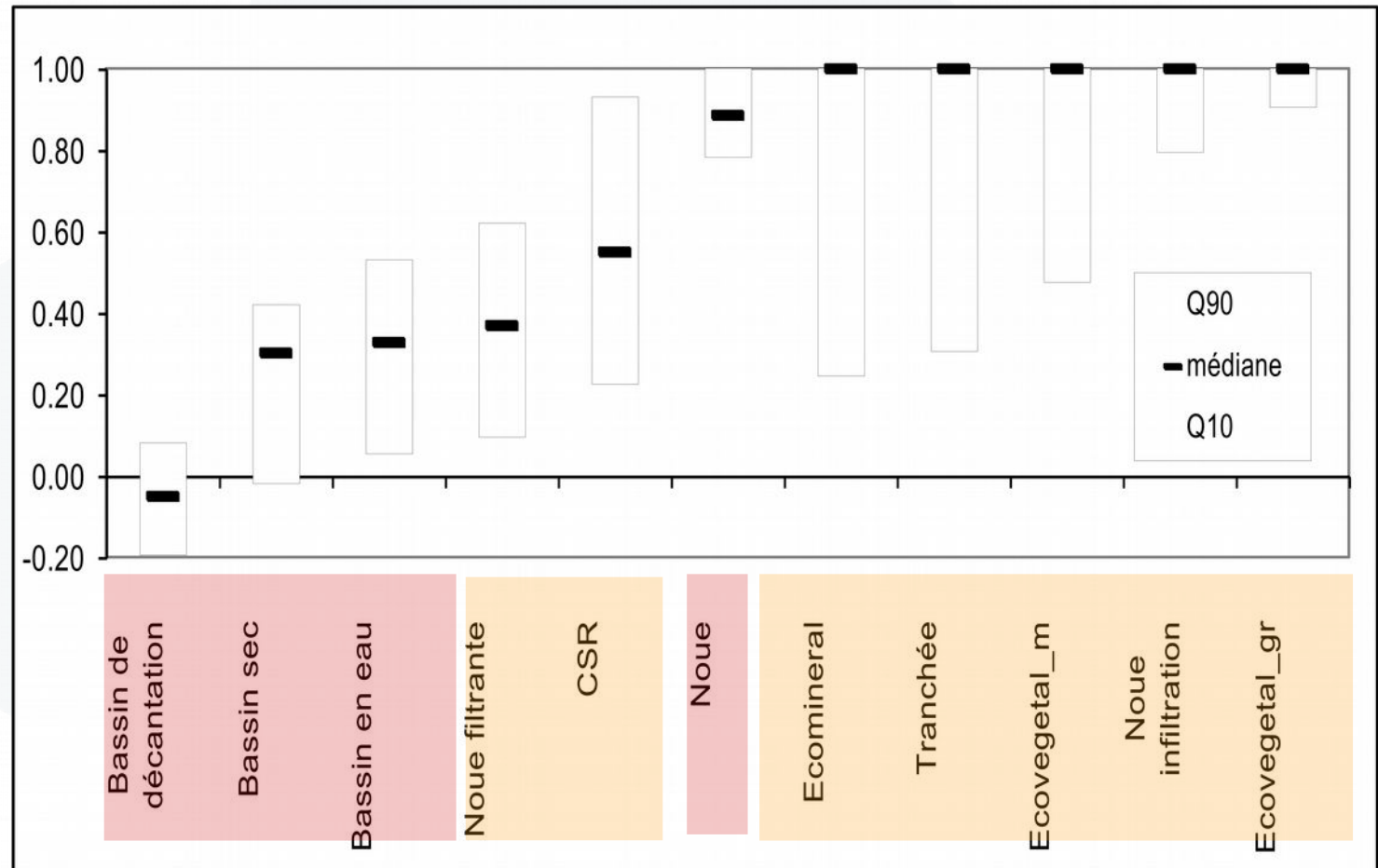
Ile de France

Nantes

**Flow reduction indicator**  
**HC1<sub>ouv</sub>**



Micro Mégas

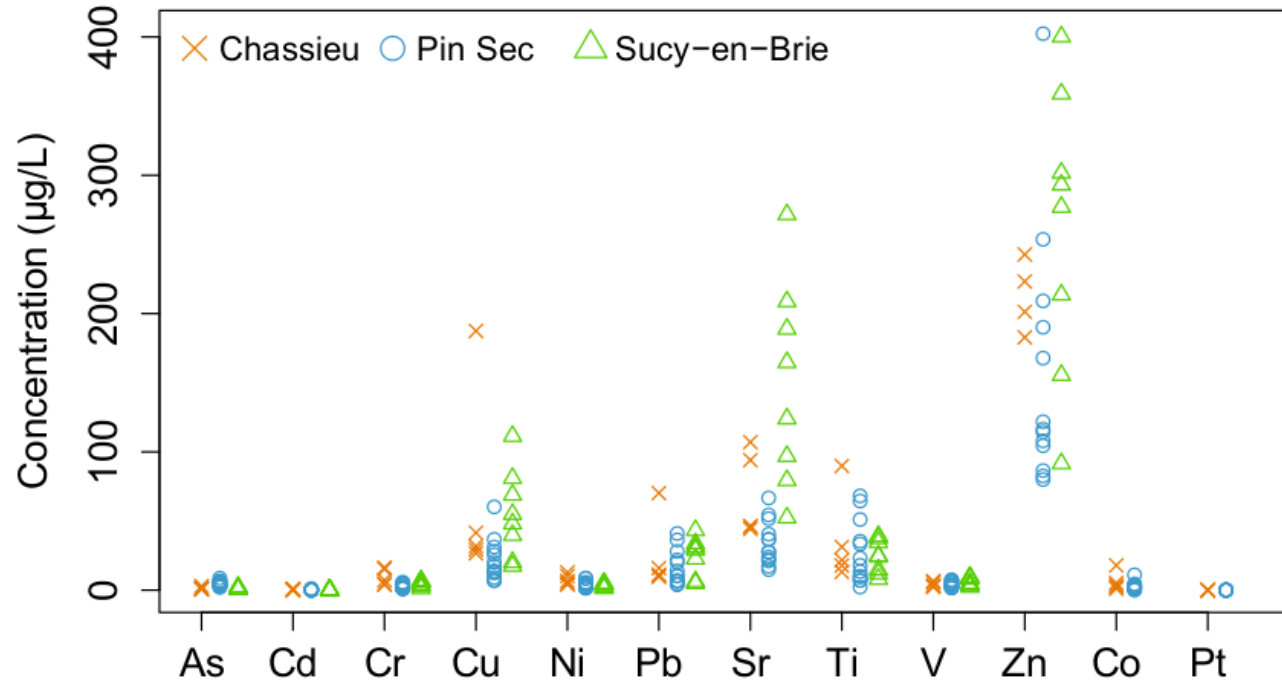


Gromaire, M. C., Barraud, S., Rodriguez, et al. (2019). How efficient are stormwater control measures for micropollutant management? Feedback from Matriochkas, MicroMégas and Roulépur projects. 10th international conference on Urban Water NOVATECH., Jul 2019, Lyon, France

# Some data regrouping applications

## Runoff water pollution

Comparison of 3 urban catchments : Chassieu (Industrial, Imp~72 %), Sucy en Brie (Housing estate, Imp ~25%), Pin sec (Housing development, Imp~49%)



Trace metals comparison in runoff (catchments sewer outlets)

Small metallic pollution (except Zn, Cu, Sr)

Large inter-sites variability

- Cu & Pb in atmospheric falls (Chassieu)

- land use and uses (more heavy traffic in Sucy, industry in Chassieu)

# Data integration - methodology

## Observatories data

Database portals  
*harvesting*

Metadata (1) and  
data (2) *collection*



## SDI Observil

Spatial Data Infrastructure  
Metadata

*What to do ?*

Search/View/Download Data  
Metadata provision

- sites
- sensors
- samples
- data (series or on-time sampling analyses)

Cartographic server

Catalog server

Graphic tool for data series  
and sampling data

**Storage of secure data**  
Data traceability

Data Management Plan  
*FAIR*  
*Inspire*

Link to other data infrastructures



# Summary

A pluridisciplinary approach of urban environment study

Observil : Answer to the need of data sharing

This project is a good way for a more homogeneous monitoring methodology

Structuration of the urban community in order to better intergrate Research Infrastructures (OZCAR, ILTER)