

Colombian - French Conference on  
Urban Water Systems 30<sup>th</sup> Nov- 1<sup>st</sup> Dec. 2017

OTHU  
(Observatory in Urban Stormwater Management)

**Organisation and results**

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**INSA Lyon – DEEP**

INSA INSTITUT NATIONAL  
DES SCIENCES  
APPLIQUÉES  
LYON

UNIVERSITÉ  
DE LYON

deep

AÑRÉE  
COLOMBIA  
FRANCE  
2017

Pontificia Universidad  
JAVERIANA

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**French Context:**

– In France :

- **76 %** of the population lives in urban areas,
- on less than **18 %** of the total French area



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2017

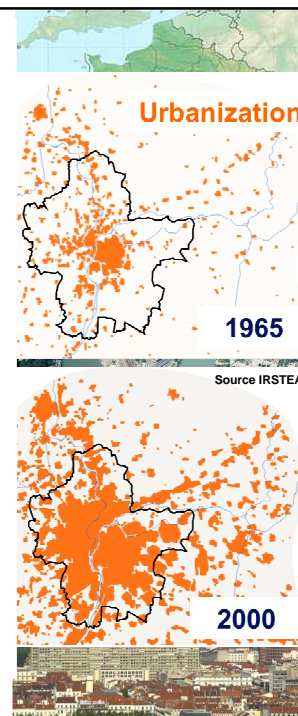
## Context of Lyon:

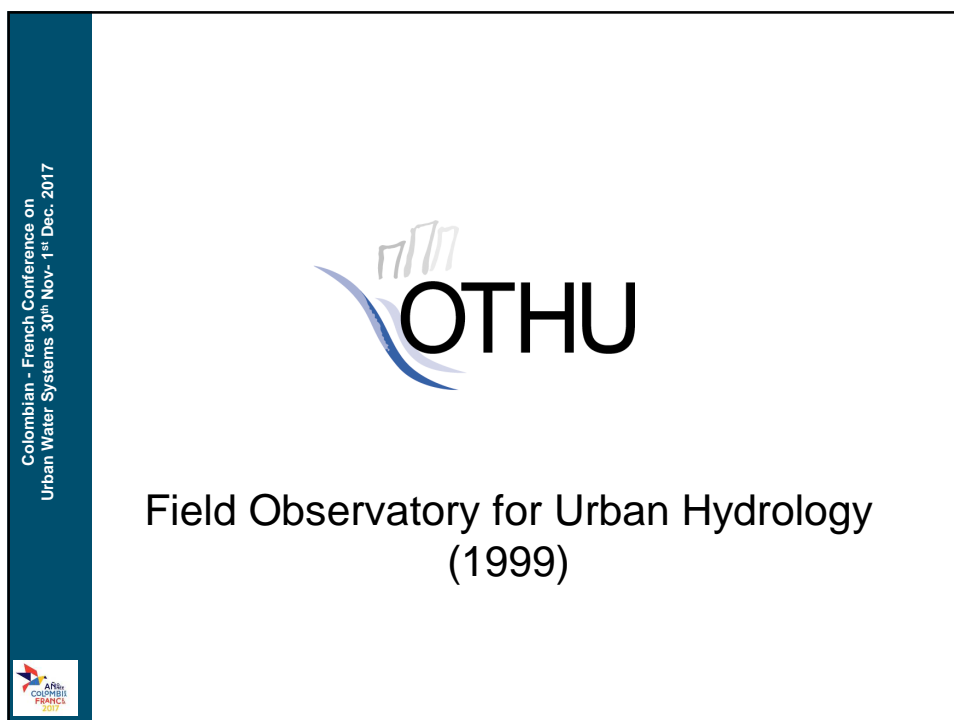
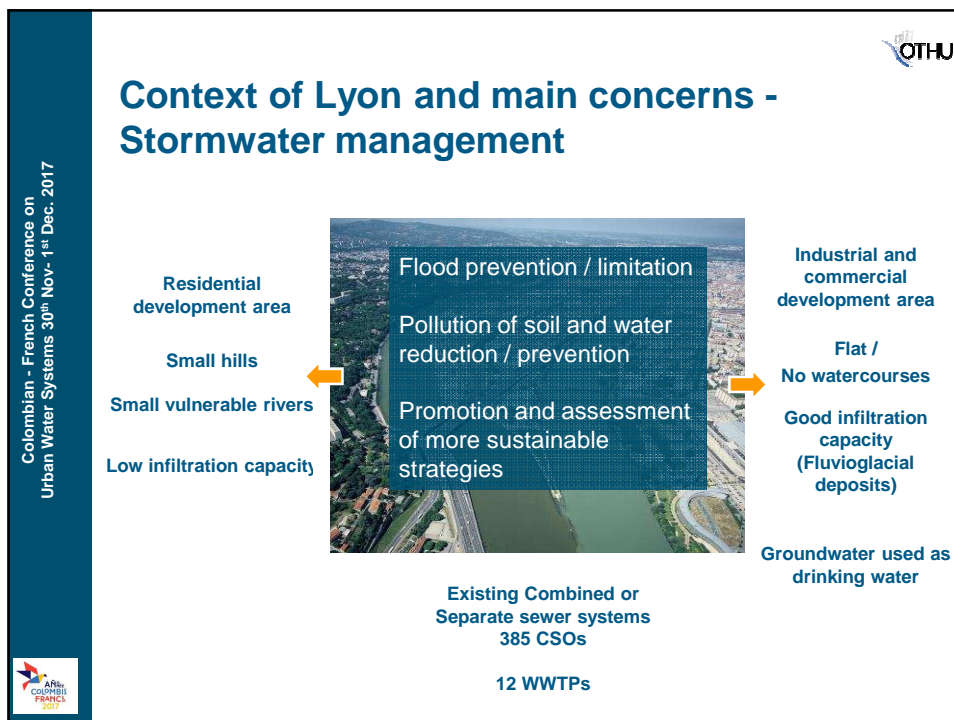
- Administrative organization
  - Metropolis of **59** municipalities  
(Grand Lyon Metropolis )
- Area
  - ~ **540** km<sup>2</sup>

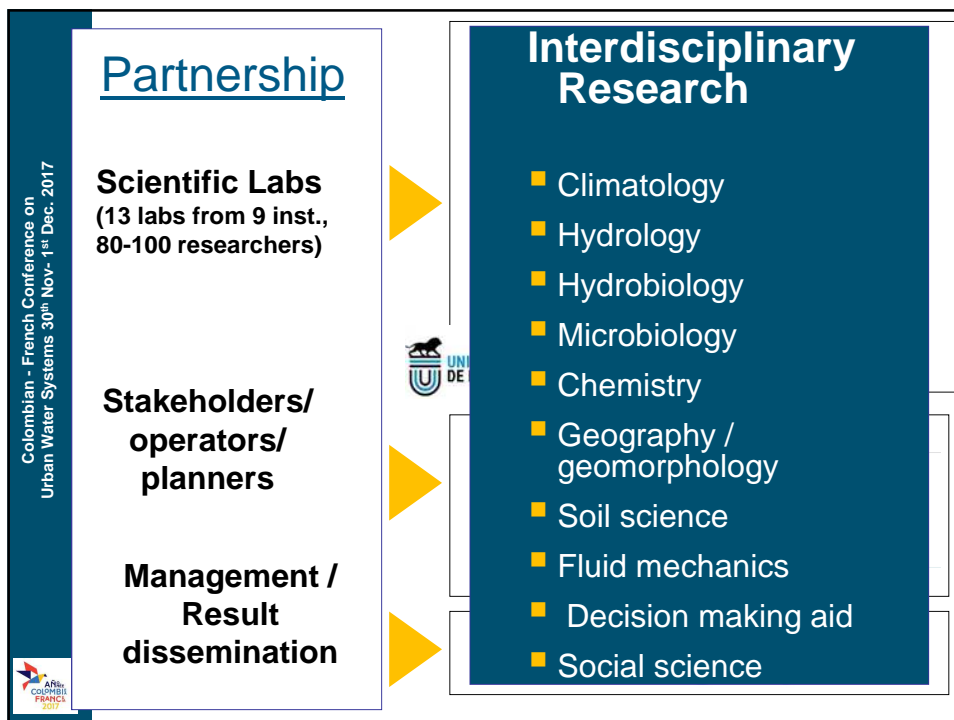
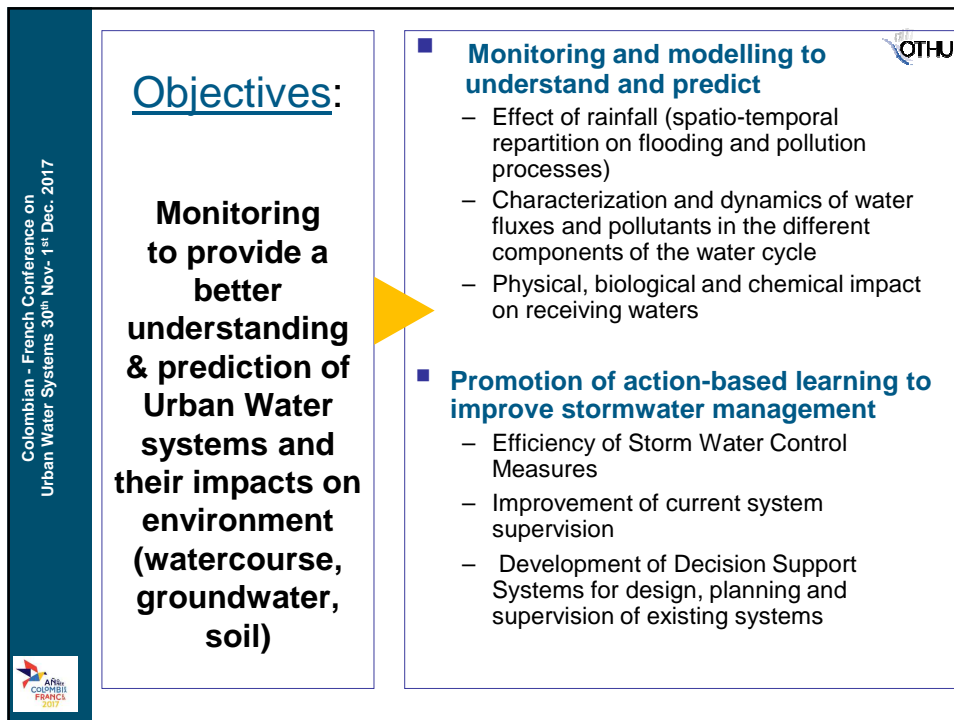


## Context of Lyon :

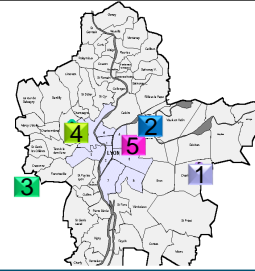
- Administrative organization
  - Urban community of **59** municipalities  
(Grand Lyon Metropolis )
- Area
  - ~ **540** km<sup>2</sup>
- Population
  - ~ **1.3 million** inhabitants  
(~ 500 000 in Lyon)
  - ~ x **1.3** from 1965 to 2000







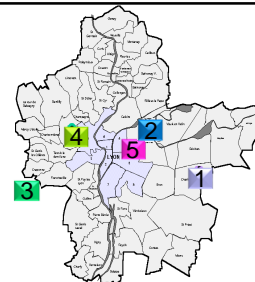
## Sites (characteristics)



**Monitoring Systems = Quantity and quality measurements installed on 5 real sites representative of various contexts (landuse, drainage systems, receiving bodies)**

- Installed all along the water cycle (from atmosphere to receiving bodies (small water courses and groundwater))
- are designed to match short & long term effects with adapted time steps
- with a multidisciplinary approach (physical, biological, hydrological, ...) integrating professional expertise
- Uncertainty analysis

## Sites (characteristics)



|                   | Site | Catchment type           | Drainage system  |                             |
|-------------------|------|--------------------------|--|-----------------------------|
| Django Reinhardt  | 1    | Urban, industrial flat   | Separate network + infiltration<br>Unsaturated zone (13 m deep)        | groundwater<br>water course |
| IUT – La Doua     | 2    | Urban, flat (university) | Separate network + infiltration<br>Unsaturated zone (1 up to 2 m deep) |                             |
| Greyzieu / Yzeron | 3    | Periurban                | Combined sewer system (1 major CSO)                                    |                             |
| Ecully            | 4    | Residential (with slope) | Combined sewer system (CSOs)<br>Small urban water course               |                             |
| EcoCampus         | 5    | Urban, university        | Source control system  |                             |



## Some examples of research results

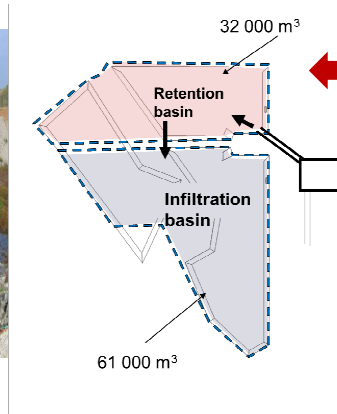
(highlighting the interest of continuous and long term data series)



## Do stormwater infiltration systems clog rapidly?



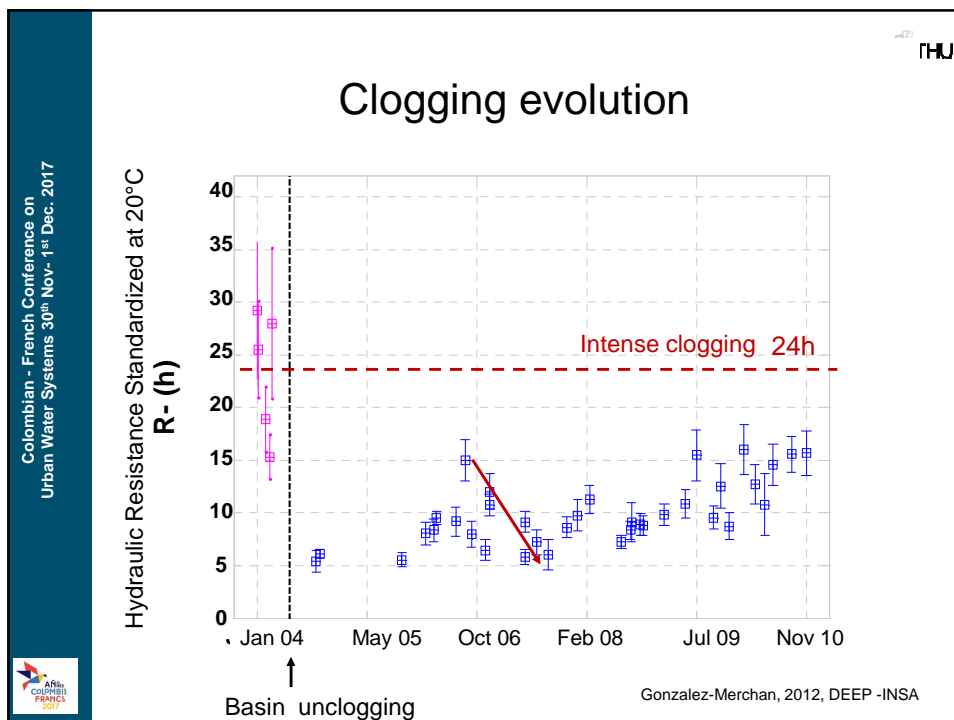
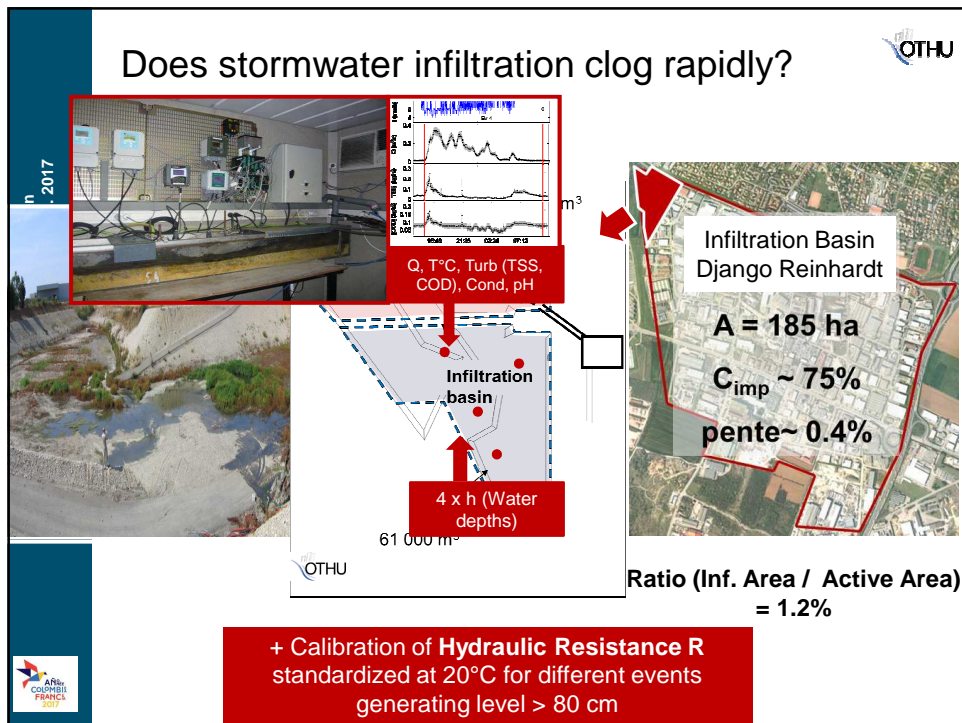
Infiltration basin

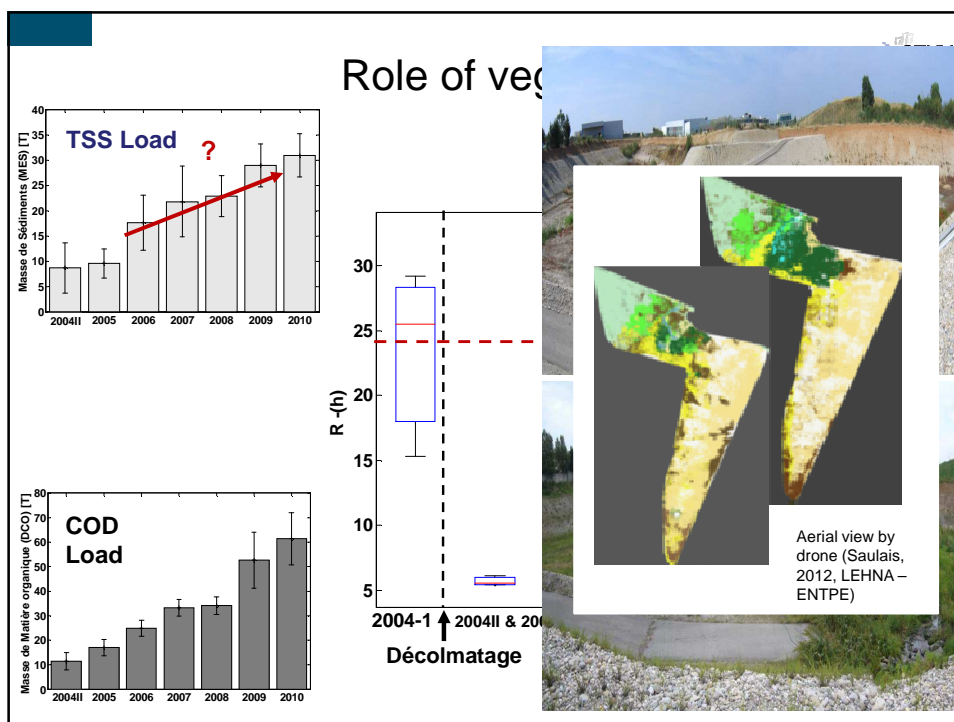
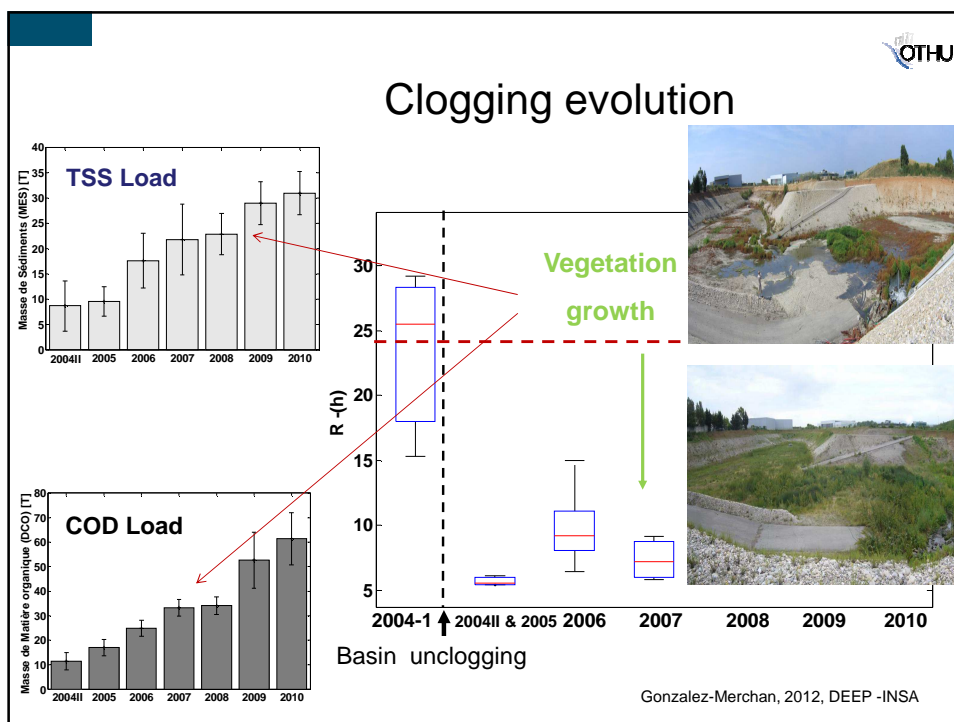


Catchment  
Django Reinhardt

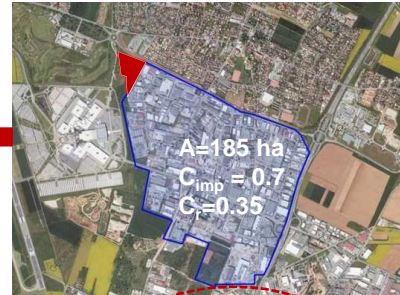
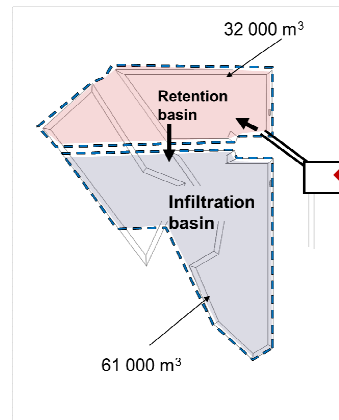
Ratio  
(Inf. Area / Active Area)  
= 1.2%







## Evolution of TSS concentrations & loads over time?

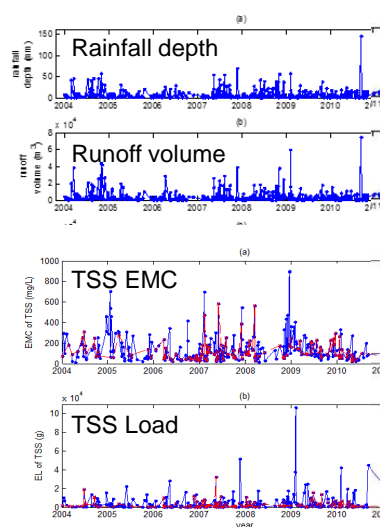


Catchment  
Django Reinhardt  
supposed to be  
stable in terms of  
urbanization

## Evolution of TSS concentrations & loads



### Mann-Kendall Test



➡ No significant trend

➡ Significant trend

➡ No significant trend

➡ Significant trend

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## Evolution of other temporal series

- **Rainfall (1970 – 2015)**  
→ No trend
- **Air temperature (1970 – 2015) / (1986- 2015)**  
→ Trend +0.05 °C /year
- **Groundwater temperature (2003-2013)**  
→ Trend + 0.02 – 0.03 °C/year

```

graph TD
    TS[Time series] --> S{Seasonality?}
    S -- Yes --> SR[Seasonality removed]
    S -- No --> AC{Auto-correlation?}
    AC -- Yes --> ARC[Auto-correlation removed]
    AC -- No --> MKT1[Mann-Kendall Test]
    ARC --> MKT2[Mann-Kendall Test]
    MKT1 --> MKT2
    MKT2 --> TD[Trend detection]
    TD --> Note["Si P-value < 5% → Trend, Si P-value > 5% → No trend"]
          
```

Sun et al, 2015 – DEEP / LEHNA – INSA – Lyon 1

ARH COLONNELLE FRANCE

## Dissemination

**Les moustiques dans les ouvrages de gestion alternative des eaux pluviales en ville ?**  
[ Retour sur l'Étude exploratoire OTHU 2016 ]  
Exemple des bassins d'infiltration et rétention de la Métropole de Lyon

**Programme ECOPLUES**  
Technique alternative de traitement des eaux pluviales et de leur valorisation en milieu urbain. Développement des ouvrages d'infiltration.

**L'infiltration en questions**  
Recommandations pour la faisabilité, la conception et la gestion des ouvrages d'infiltration des eaux pluviales en milieu urbain

Versión 7 - Janvier 2009

**FICHE TECHNIQUE OTHU N°20**  
Anticipation des pics de gestion des résidus de graisse


**FICHE TECHNIQUE OTHU N°1**  
Mesures de la pollution des sols issues des rejets urbains de temps de pluie

**Les petites rivières perturbées :**  
Connaissance des risques, évaluation de la qualité, aide à la décision

**OTHU**  
<http://www.graie.org/othu/>

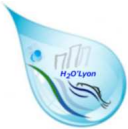
**Les Partenaires Scientifiques**

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 OTHU

**Soon**

- Academic coherent projects launched
- 2 Special schools of excellence (University of Lyon) with
- Possibility of courses, exchange, research projects, Summer schools...



**H2O Lyon**  
**Graduate School of Integrated**  
**Watershed Science**



**ÉCOLE URBAINE**  
**DE LYON**  
 Université de Lyon

**Lyon Urban School**

**Convergence Institute**  
**Convergence between the**  
**contemporary urban question and that**  
**of the Anthropocene**

