Piacenza • 30th August – 1st September 2011

XIV Symposium in Pesticide Chemistry

Pesticides in the environment: fate, modelling and risk mitigation

RISK PREVENTION/RISK MITIGATION SESSION

Urban pesticide best management practices: results of Phyt'Eaux Cités, a program to reduce river contamination (2007-2010, France)

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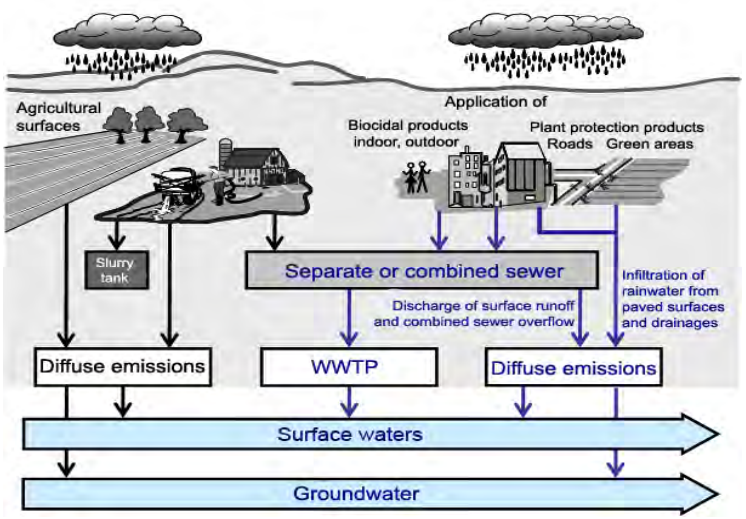
Introduction

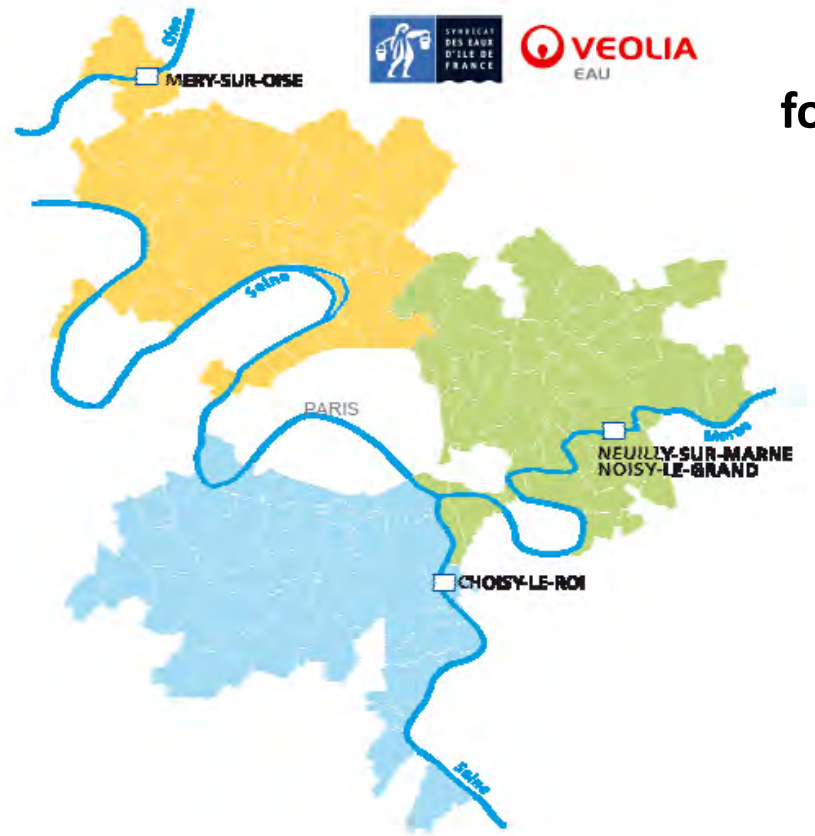


Gerecke *et al.*, 2002

Runoff principal way of pesticides transfer to surface water in urban areas

impervious surfaces – irregular land cover – multiple uses and users

Context

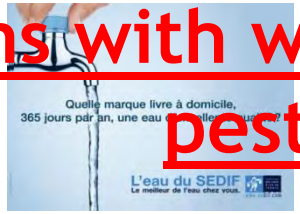


SEDIF : A public DRINKING WATER SERVICE for the GREATER METROPOLITAIN PARIS AREA

- Delivery territory: 144 Municipalities
- 4 Milli
- 900
- Es %

More than 13600 pesticide analyses par year

More than 130 molecules



Problems with water treatment related to pesticide detection

Idea developed in 2006

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SYNDICAT DES EAUX D'ILE DE FRANCE

PROJECT LEADER

ASCONIT CONSULTANTS

USES AUDIT

Phyt'Eaux Cités

VEOLIA WATER
Solutions & Technologies

WATER QUALITY

E P H E

PIREN Seine

SCIENTIFICAL RESEARCH

Material and methods

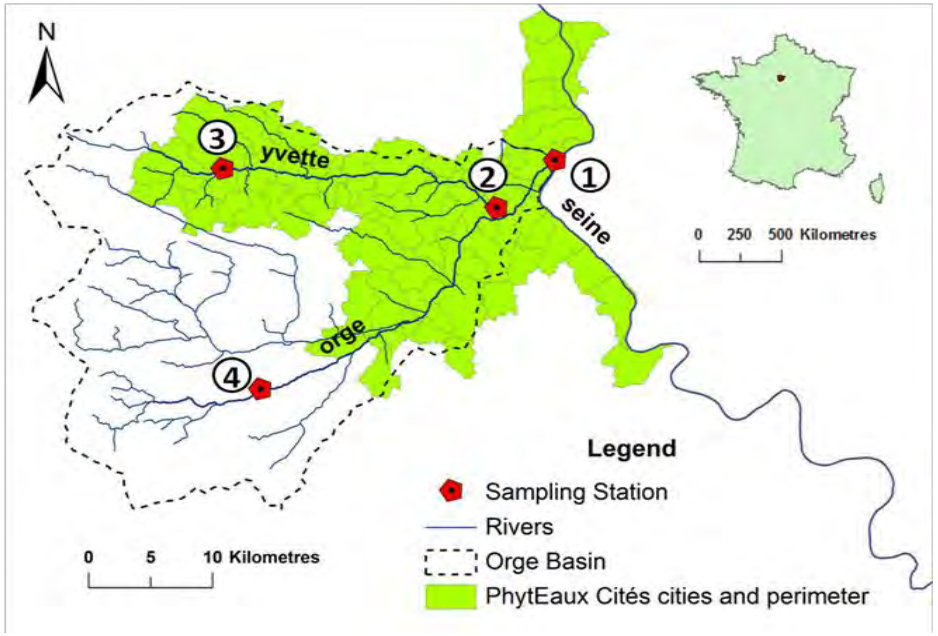
Phyt'Eaux Cités

Audit of public users and inquiry on total applied quantities

Sampling

- 1st sampling first week of the month
  189 molecules (2007)
  212 molecules (2008-2009-2010)

- 2nd sampling third week of the month
  42 substances (principal urban contaminants)



Audit Results

✓ After one year 53% applications less as compared to 2007. A good percentage of local authorities had also started other type of treatments.

✓ After three years, 50 municipalities participated at least to one theoretical training (49 to the practical one)

✓ After four years, 28 cities started a sustainable planning and 2 cities stopped treatments

✓ At the end of 2010, 414 technical service agents trained (97% considered those trainings useful)

Hamelet et al. , 2009

Audit Results

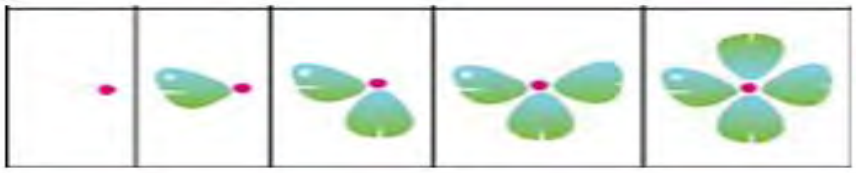
- ✓ Between 2007 and 2009, 56 municipalities have signed the Phyt'Eaux Cités charter

- ✓ Reduction of 68% of active substance quantities (2267 kg in 2007 as compared to 728 kg in 2009)

- ✓ 12% of the inquired cities stopped some treatments (ex. cemeteries) and 44 cities stopped sport field treatments

- ✓ 77 % of the local authorities respect of environmental - health European and national policies (better use)

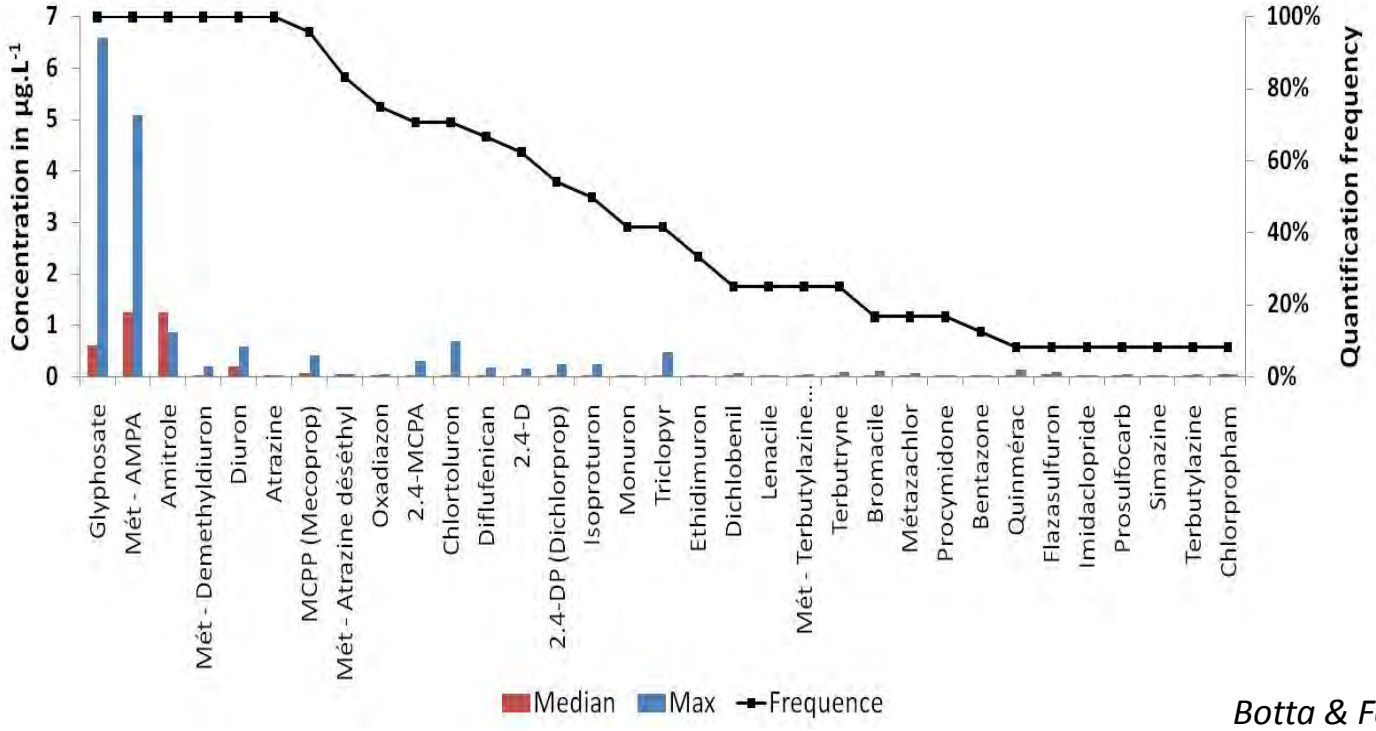
Clover of engagement



Hamelet et al. , 2009

Result screening 2007

- 189 substances (171 active substances and 18 metabolites, filtered water).
- At the outlet of the Orge Basin, 33 substances (29 active substances and 4 metabolites) were quantified at least one time and 6 displayed 100% frequencies (glyphosate and its metabolite, diuron and its metabolite, amitrole and atrazine)



Botta & Fauchon, 2009

Annual variation Sampling

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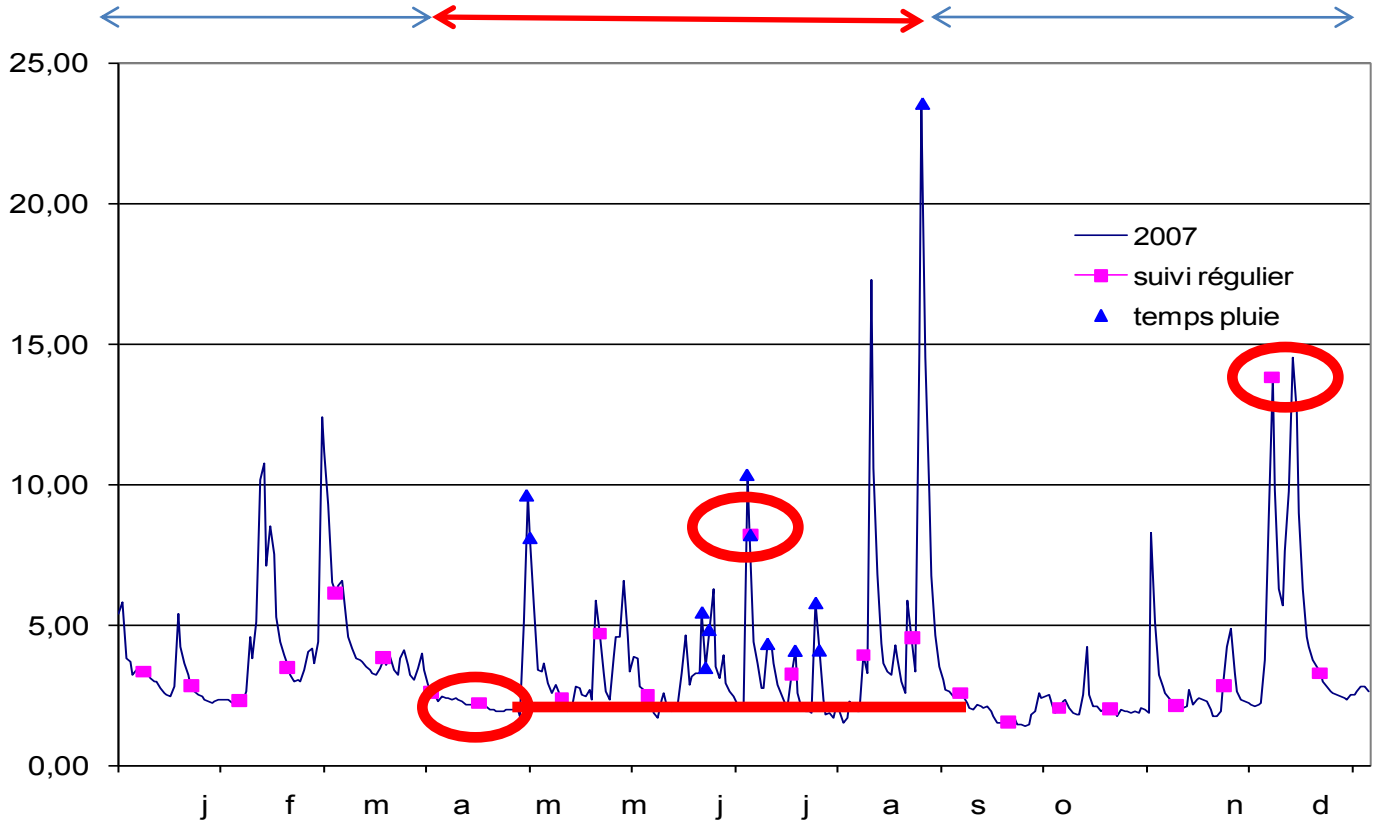

Blanchoud et al., 2011, Piren Seine

- ✓ Pesticide application months: maximal risk of transfert
- ✓ Fortnight sampling: established sampling date, random hydrology
- ✓ 10 rainfall events : maximal concentrations

Inter annual variations

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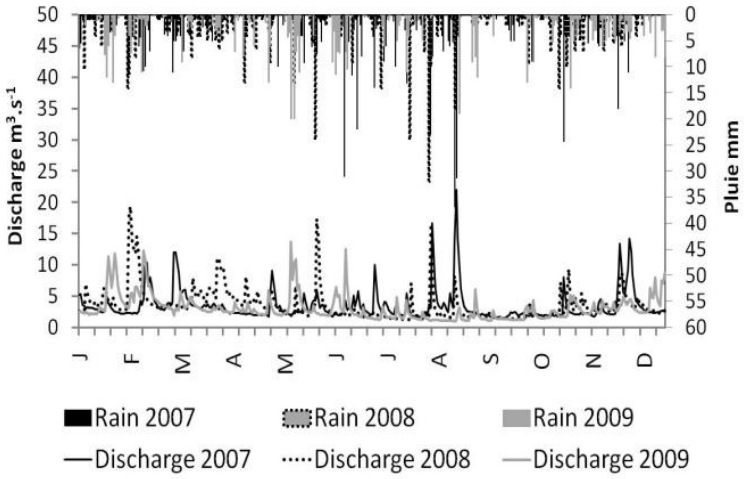
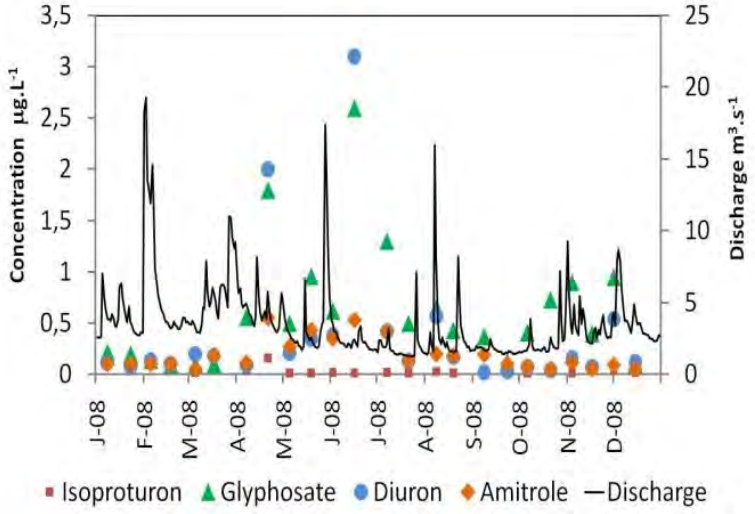
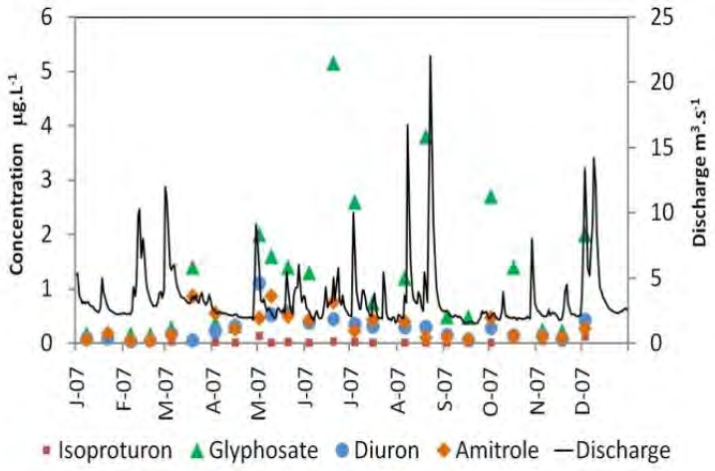
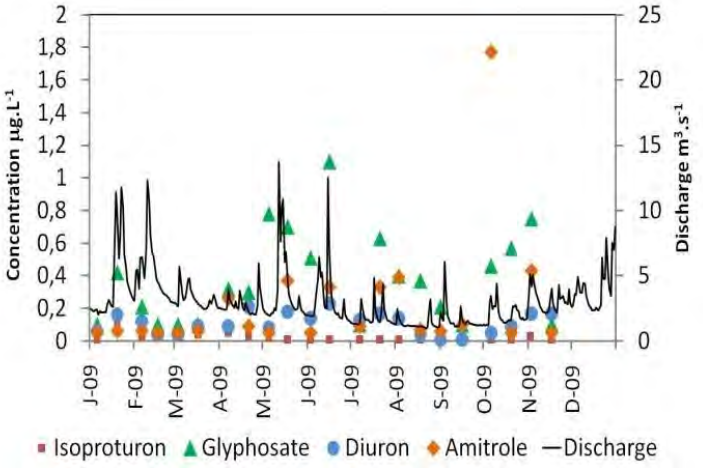






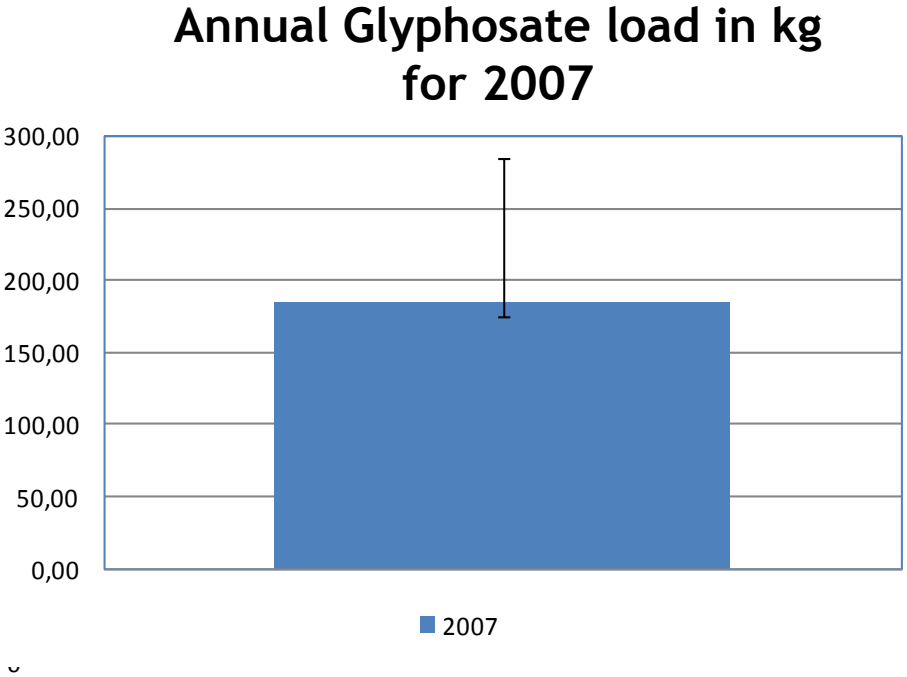


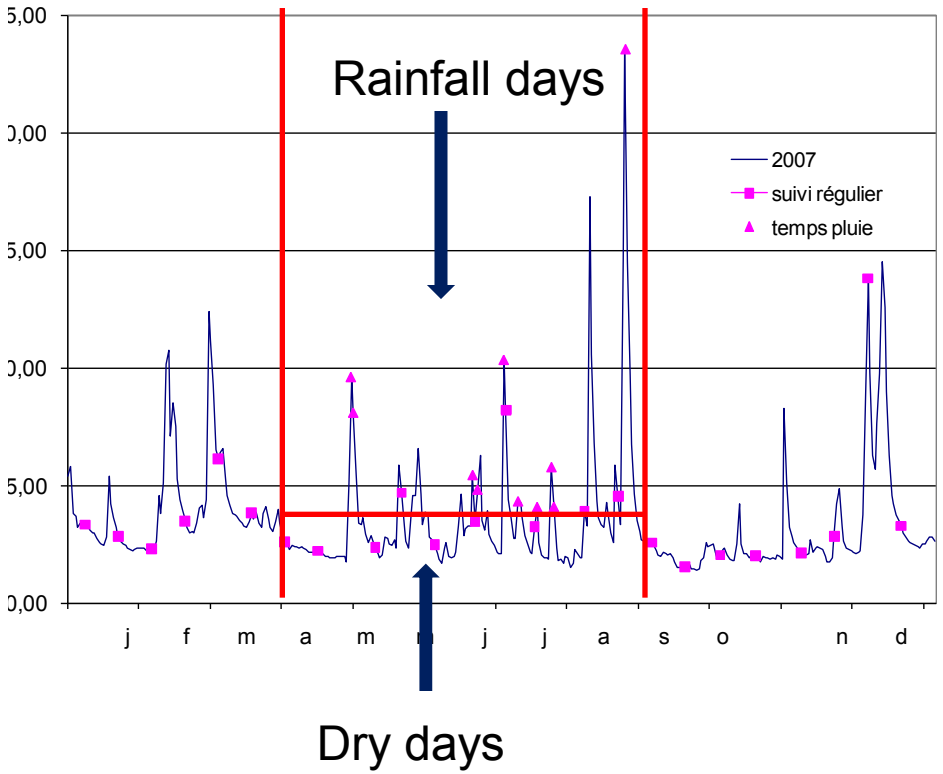
Botta et al. , 2011, Chemosphere, submitted

Load Results

$$\text{Flux} = \frac{\sum_{j=1}^{91} [C]\,continu.\,Qj\,prél.\,continu + \sum_{j=92}^{244} ([C]moy.\,Tps\ sec \times Qj\,Tps\ sec) + ([C]moy.\,Tps\ pluie.\,Qj\,Tps\ pluie)) + \sum_{j=245}^{365} [C]moy.\,Qj}{\sum Qj\,prél.\,total} \times Qtot$$

$$\text{Flux} = \frac{\sum_{j=1}^{365} [C]j.\,total\,Qj\,prél.\,total}{\sum Qj\,prél.\,total} \times Qtot$$





Blanchoud et al. , 2011, Piren Seine

Results

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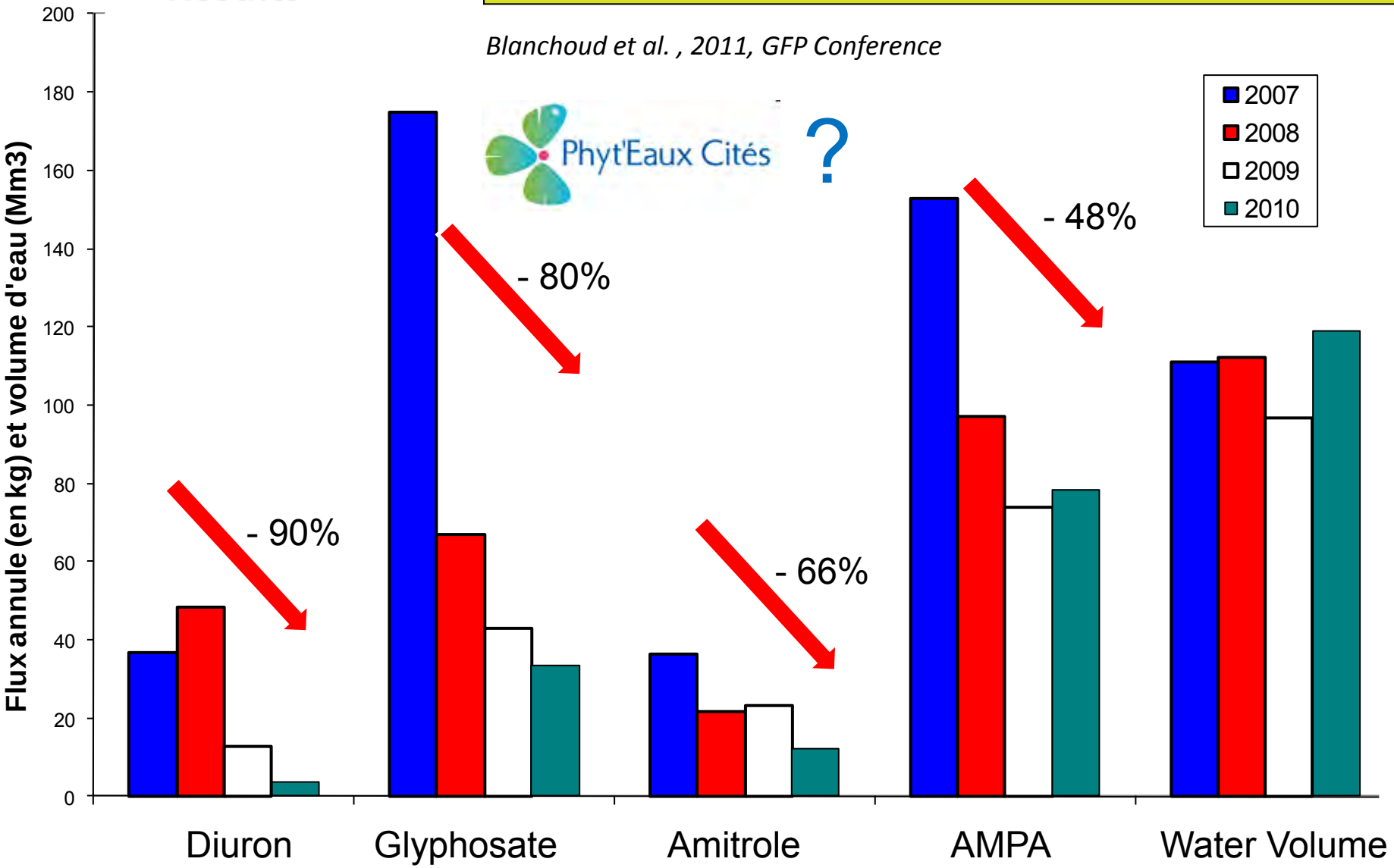
Blanchoud et al. , 2011, GFP Conference



Load decrease

Year	2007	2008	2009	2010
Rainfall days	176	182	149	162
Water Volume at Athis Mons (Mm^3)	111	111	98	119

Maximal periods	2007	2008	2009	2010
Rainfall days	76	67	52	53
Water Volume at Athis Mons (Mm^3)	48	41	35	39

Substances	Decrease 2008 – 2010
Diuron	93 %
Glyphosate	50 %
Aminotriazole	44 %
AMPA	20 %

Uncertainties summary

- Uncertainty on pesticide analysis
  - Between 10% and 30%

Blanchoud et al. , 2011
Piren Seine

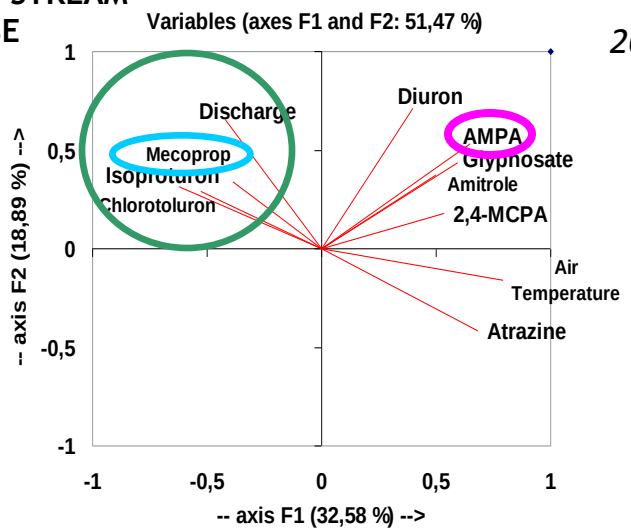
- Uncertainty on load calculation when detection frequency is very low
  - Different quantification limits
  - Maximal load values: LQ / 2
  - Minimum load values : 0

- Discharge uncertainty
  - Daily mean discharge

- Uncertainty on method, rainfall – dry periods
  - Considering suspended matter or discharge?

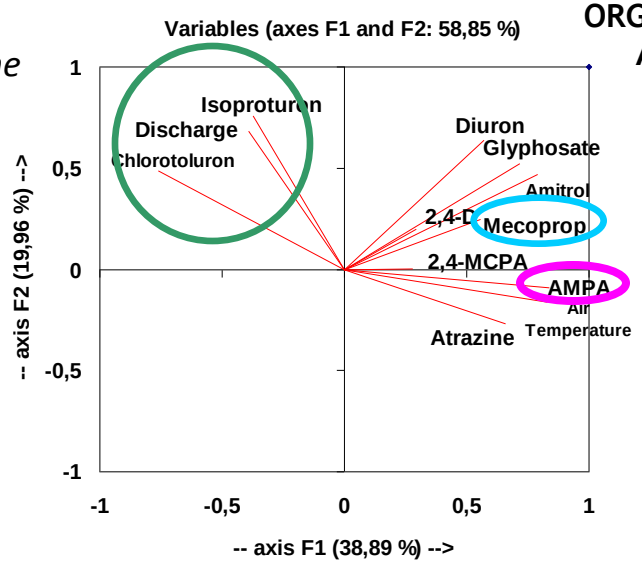
Pesticide origin

ORGE UPSTREAM - SERMAISE



Botta et al., 2010, Piren-Seine

ORGE OUTLET - ATHIS-MONS



✓ *Chlortoluron and isoproturon essentially applied in winter (high discharge – low temperature)*

✓ *AMPA metabolite of glyphosate upstream, at Athis-Mons partly originated from detergent degradation*

✓ *Mecoprop has urban origine in Athis-Mons whereas it as agricultural origins in Sermaise*

Study at the Orge watershed scale : URBAN origin of Orge River contamination

Export modeling

Documented Urban Input


Municipalities


Railways


Airport


Roads

?
Householders

Botta et al., 2009
PhD Manuscript

	Glyphosate	Diuron	Amitrole	
Scenario 1 *Phyt'Eaux Cités* No impact of householder applications 	11 %	16 %	15 %	**Max**
Scenario 2 *Blanchoud, 2004* Estimation Householders (13 g.hab.year^{-1}) 	2.3 %	3.5 %	3.4 %	
Scenario 3 *Boulet, 2006* Estimation Householders (86% of total urban application) 	1.4 %	2.1 %	2 %	**Min**

Conclusions

Phyt'Eaux Cités → 2007-2010

- *The impact of pesticide used in urban settlements on surface water quality was confirmed.*
- *Use of pesticides by municipalities generally decreased from 2007 to the end of 2010.*
- *In some cities, chemical treatments were also replaced by other type of weed-control (thermal, mechanical, etc…).*
- *Using different load calculation methods, a sensible decrease of pesticide load in river was registered from 2008 and 2010.*

Outlook

"Phyt'Eaux Cités was a new approach to reduce the contamination of surface water by pesticides.

The programme suggested to city staff specific pest management strategies and general alternative controls.

The more knowledge and mobilization of the local authorities could reduce urban pesticides transfer.

Project Phyt'Eaux Cités 2 → 2012-2016

Acknowledgements

for funding the project

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