AMPA in the Vilaine watershed : sources, behavior and fate

Nancy, 05.16.2017

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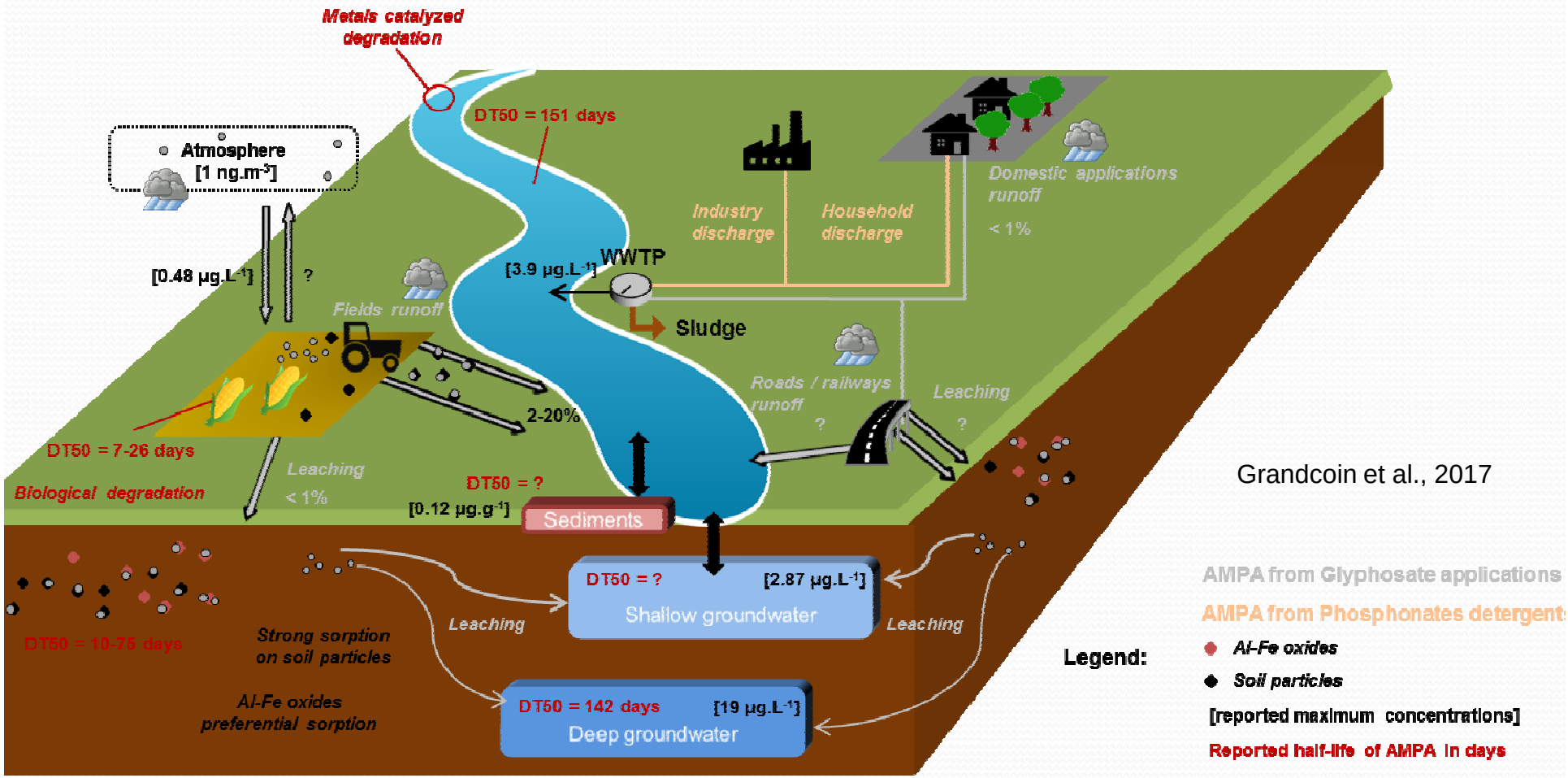
Context

AMPA in natural waters: its sources, behavior and environmental fate



Grandcoin et al., 2017

Objectives

Is the AMPA in natural waters, mainly derived from glyphosate or phosphonates?

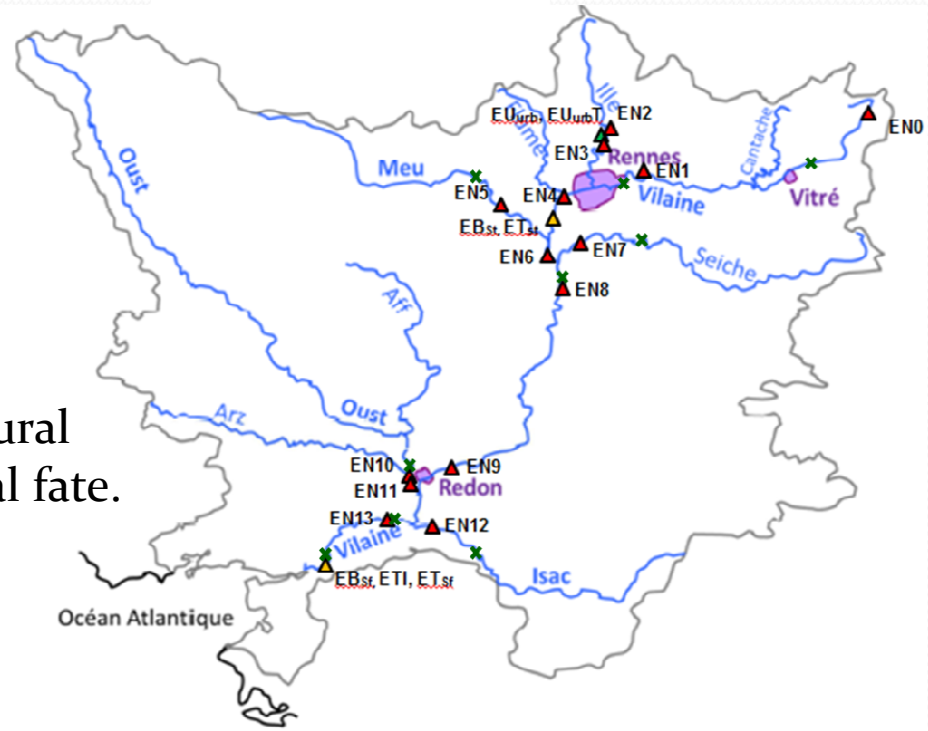
What sector (and how much) contributes to AMPA loads in natural waters?

Methodology-1

Bibliography

Current knowledge of the AMPA contamination of the watershed

Determination of relevant locations for AMPA monitoring



Grandcoin, A., Piel, S., & Baures, E. (2017). AminoMethylPhosphonic Acid (AMPA) in natural waters: Its sources, behavior and environmental fate. *Water Research*, *117*.

Methodology-2

Experimentations

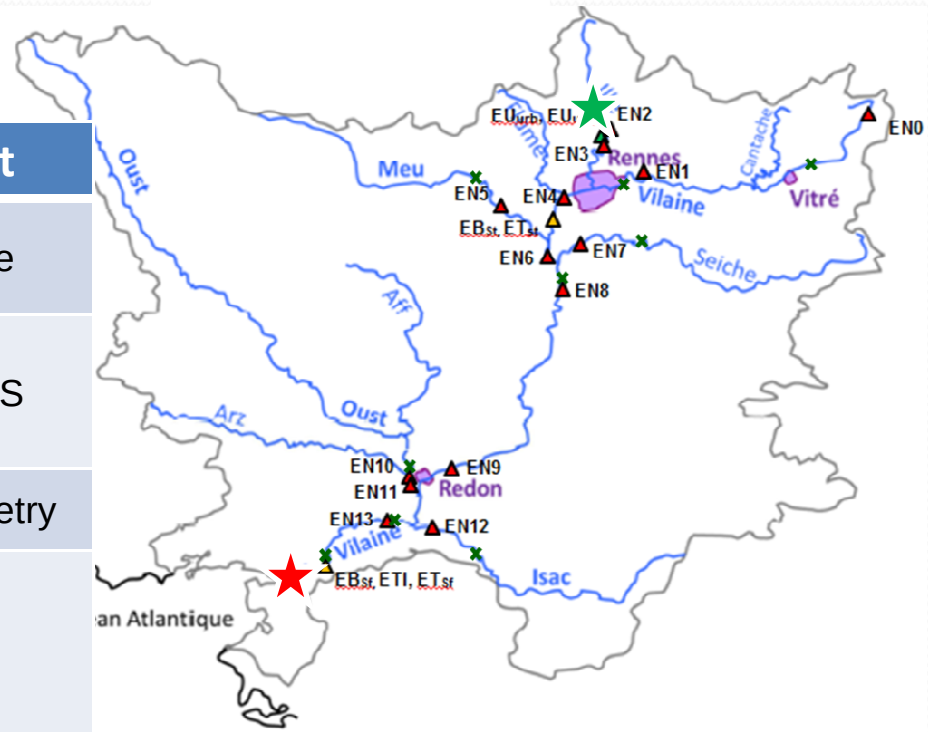
Ponctual sampling of natural waters, 2 campaigns:

Classic conditions (10-20 mm rainfall)

Low water (no rain for 2 months)

Balance of in/outputs of WWTP (24h)

Parameter	Equipment
Temp, pH, cond, fDOM, Chlorophyll, $\%O_2$, salinity, redox	EXO 2 probe
Diuron, DCPU, DCPMU, 3,4-DCA, chloroacetamids and ESA/OXA forms of chloroacetamids	HPLC-MS/MS
Glyphosate, AMPA	HPLC-Fluorimetry
NO_2, NO_3, NK, NH_4, Ptot, PO4, UV Spectra, DOC, TOC, MES, DCO, DBO.	Various



Preliminary results

AMPA and glyphosate in the watershed-1

		AMPA	Glyphosate
Classic conditions (19 samples)	FOD (%)	100	33
	Min (µg/L)	0.23	0.08
	Max (µg/L)	2.10	0.17
	Median (µg/L)	0.72	0.11
Low water (19 samples)	FOD (%)	92	46
	Min (µg/L)	0.10	0.10
	Max (µg/L)	2.48	0.26
	Median (µg/L)	1.09	0.15

Rennes upstream

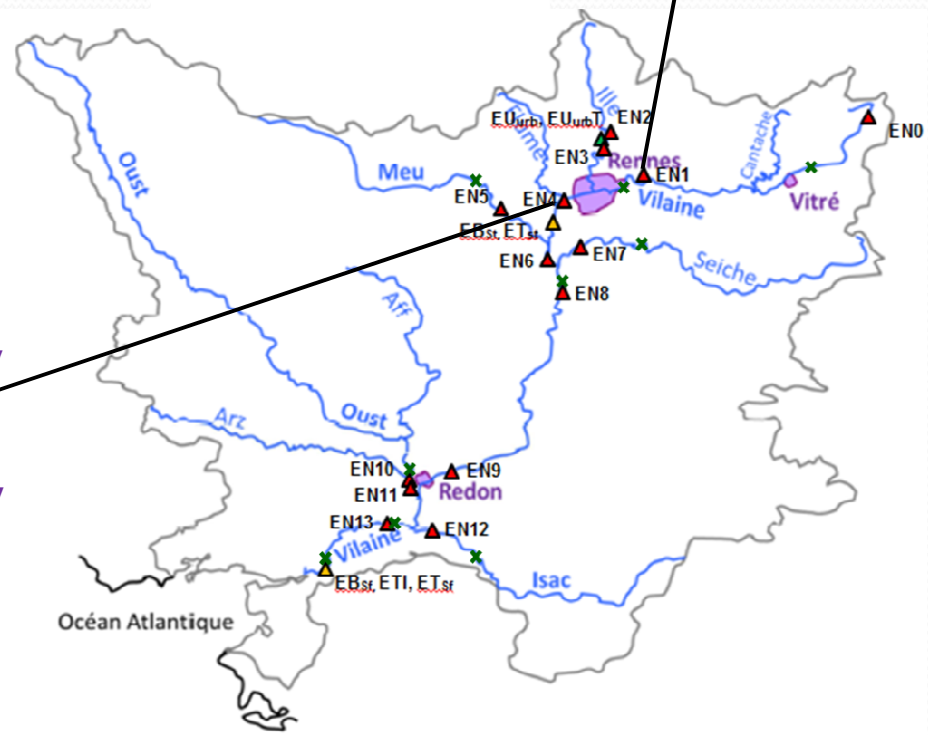
Classic Flux AMPA = 79 kg/day
Gly < LQ

Low water Flux AMPA = 98 kg/day
Gly < LQ

Rennes downstream

Classic Flux AMPA = 809 kg/day
Gly < LQ

Low water Flux AMPA = 693 kg/day
Flux Gly = 100 kg/day



AMPA and glyphosate in the watershed-2

Vilaine (Main river)

Classic Flux AMPA = 288 kg/day
Gly < LQ

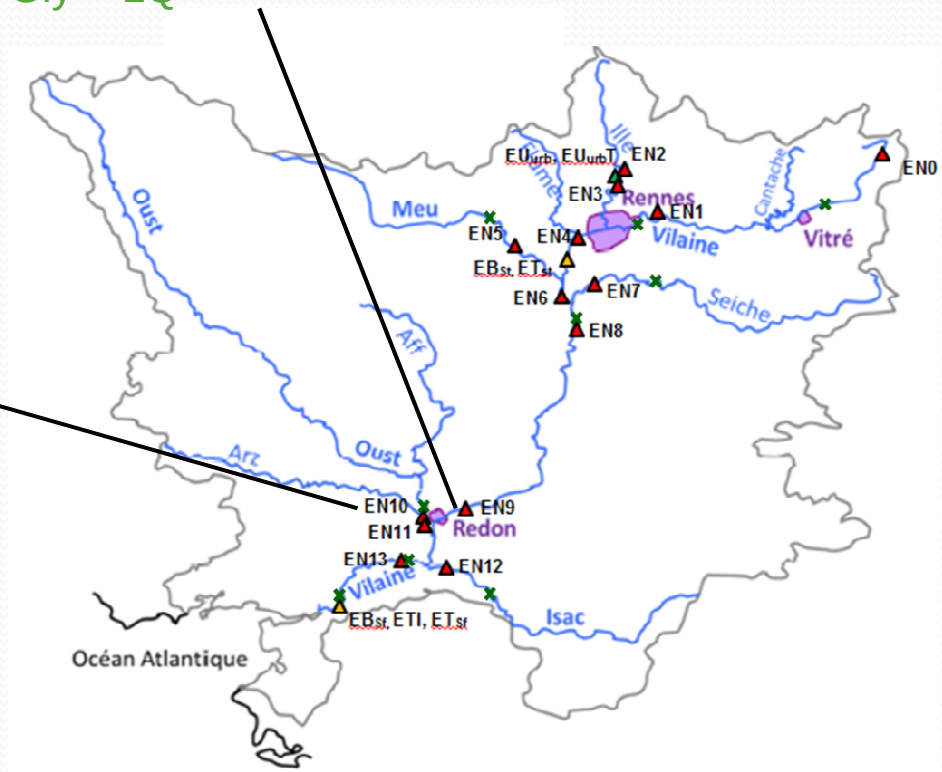
Low water Flux AMPA = 60 kg/day
Gly < LQ

« Oust » (Main affluent)

Q ≈ 40% Q(Vilaine)

Classic Flux AMPA = 37 kg/day
Flux Gly = 12 kg/day

Low water Flux AMPA = 8 kg/day
Gly < LQ



Influencing parameters

Correlation matrices (Pearson)

	Positive correlation	AMPA
Classic conditions	fDOM	**0.95**
	NH4	**0.83**
	PO4 / P total	**0.62 / 0.45**
	TOC / DOC	**0.44 / 0.29**
	Negative correlation	
	Glyphosate	***-0.13***
	pH	***-0.31***
	O2 dissolved	***-0.40***
	NO3	***-0.65***

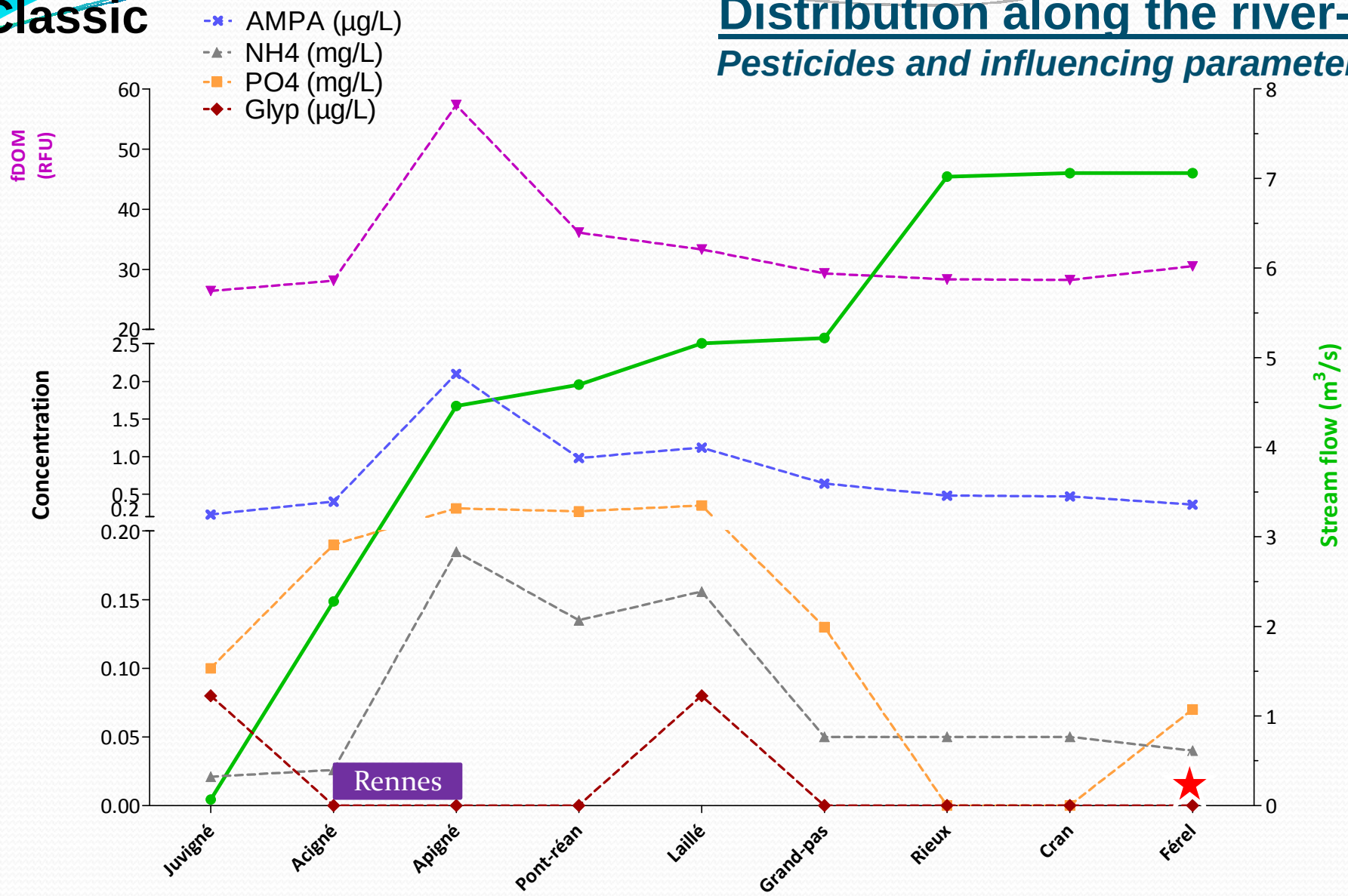
AMPA is not correlated to Gly

AMPA is correlated to Gly

Classic

Distribution along the river-1

Pesticides and influencing parameters



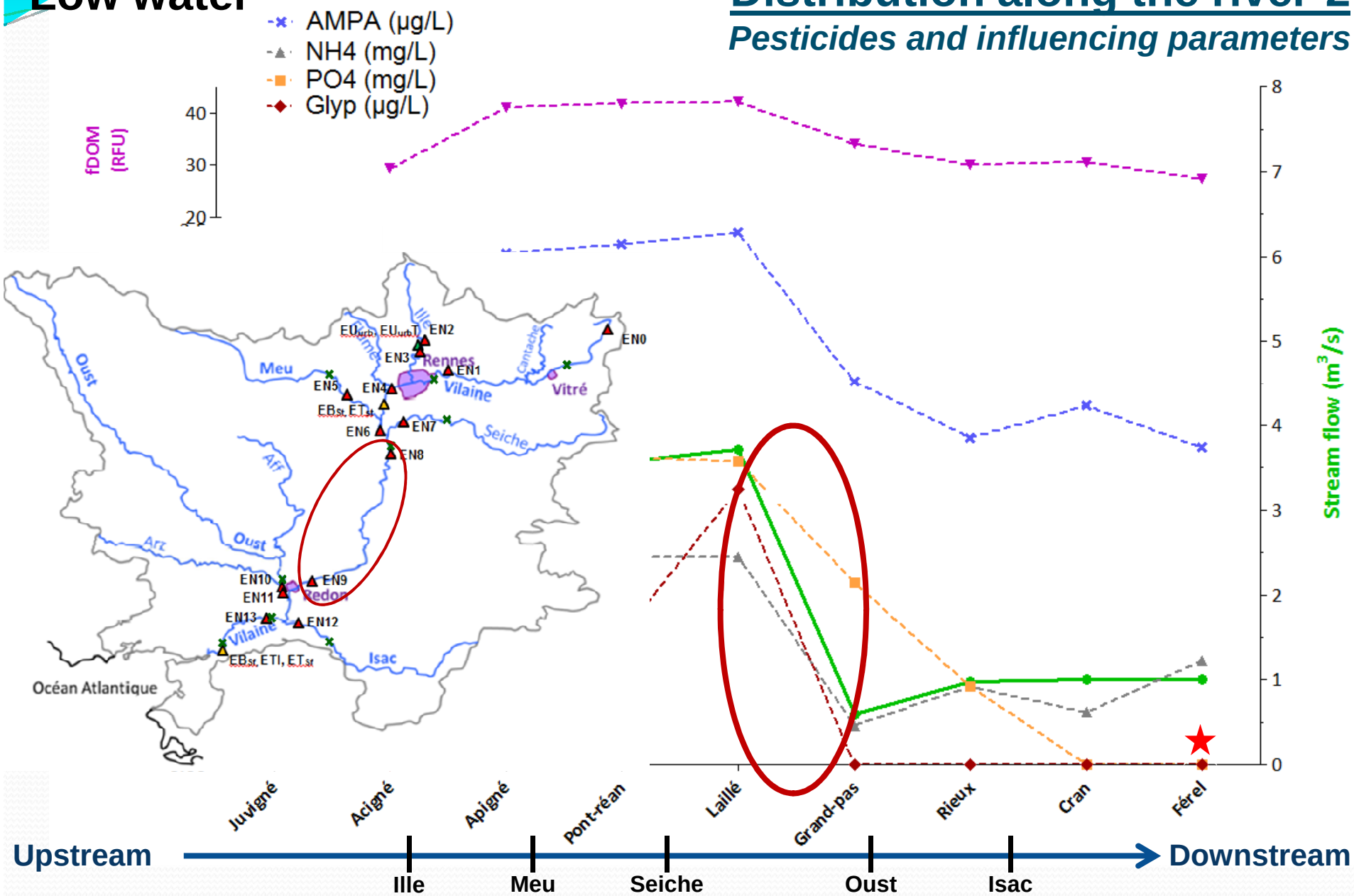
Upstream → Downstream

Ille | Meu | Seiche | Oust | Isac

Low water

Distribution along the river-2

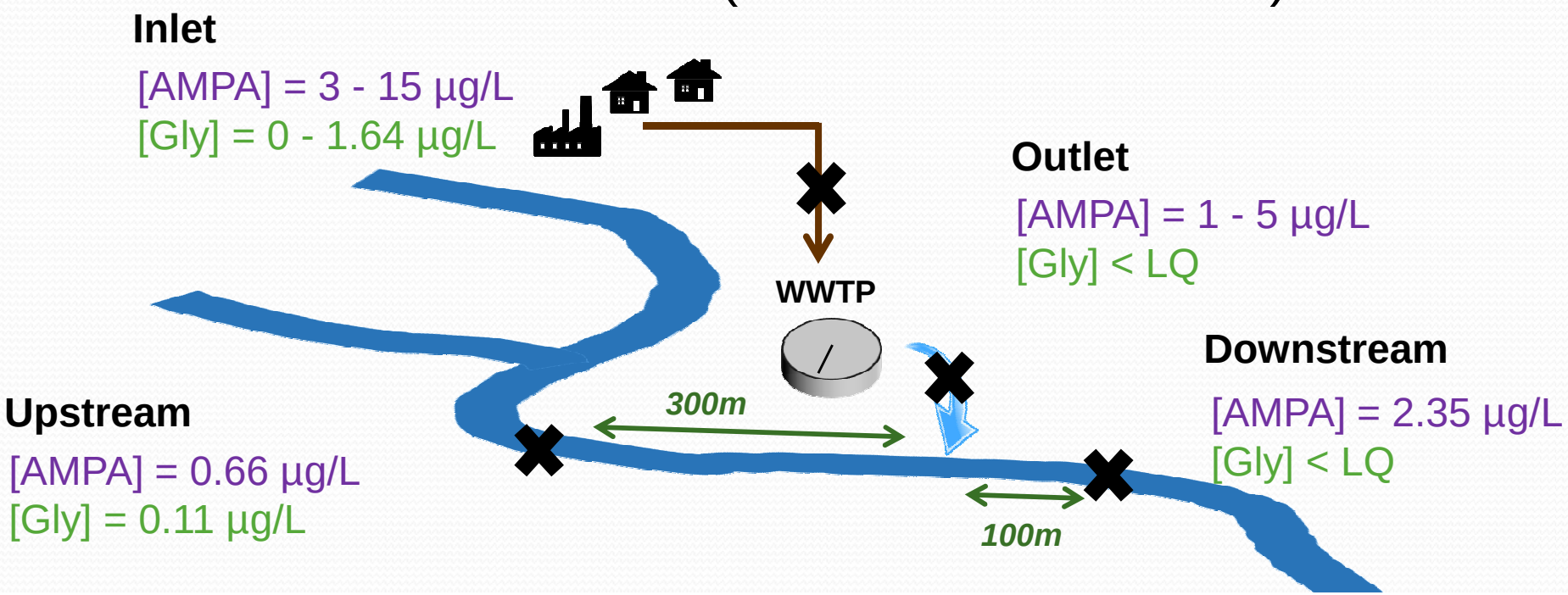
Pesticides and influencing parameters



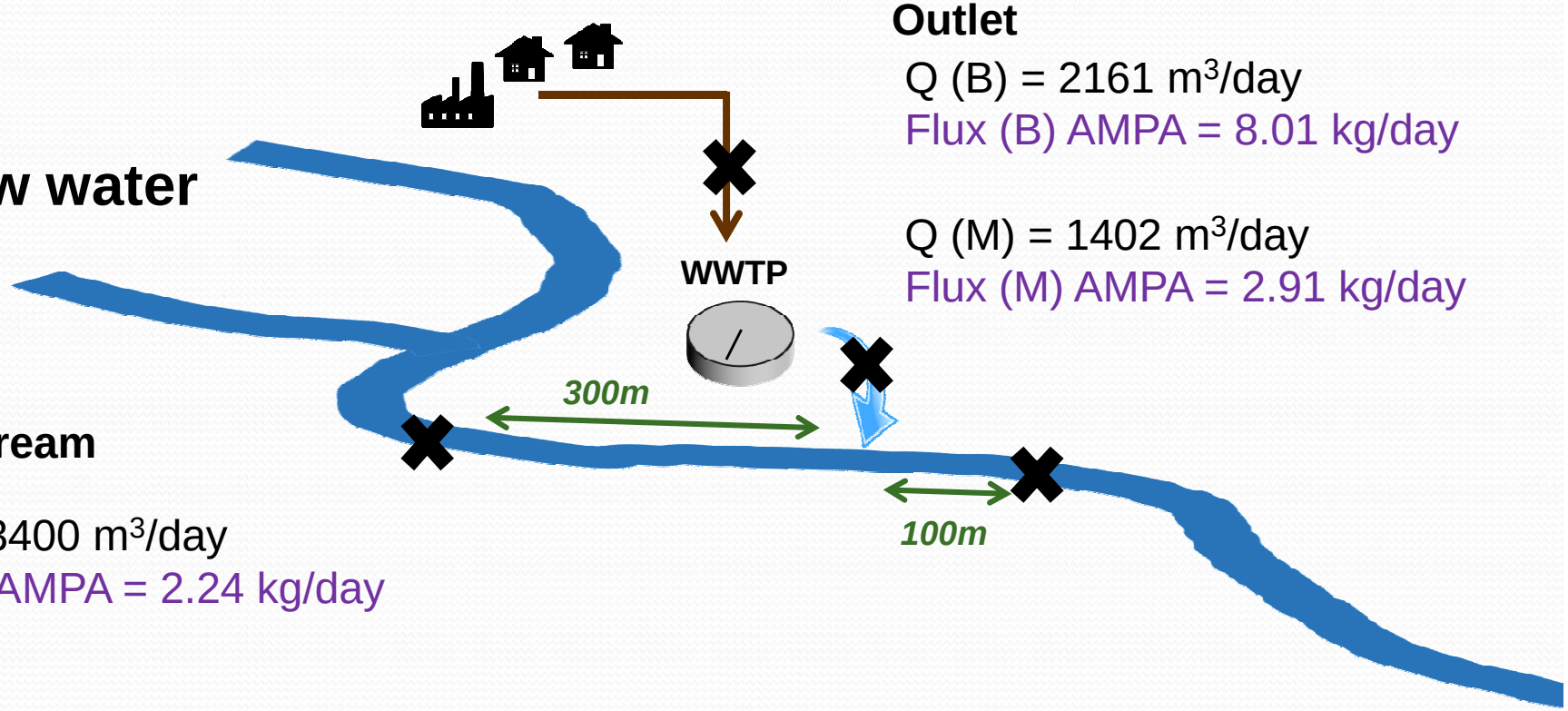
★ Balance of in/outputs of a WWTP

AMPA is quantified in all samples
Glyphosate is quantified in only 1 sample

Elimination of AMPA 30-70% (Biological treatment)
55-90% (Membranes treatment)



★ Comparison of fluxes WWTP/Stream



Outlet

Q (B) = 2161 m^3/day

Flux (B) AMPA = 8.01 kg/day

Q (M) = 1402 m^3/day

Flux (M) AMPA = 2.91 kg/day

Upstream

Q = 3400 m^3/day

Flux AMPA = 2.24 kg/day

Conclusions

AMPA in the Vilaine watershed, is derived from both glyphosate and phosphonates

Urban area increases AMPA load in the Vilaine, and with more reason in low water conditions

WWTP increases x5 the AMPA loads in the receiving stream under low water conditions

LERES Lab Team 2016

Thank you for your attention!