10th International Groundwater Quality Conference

ENDOCRINE DISRUPTORS AND OTHER POLLUTANTS OF EMERGING CONCERN IN GROUNDWATER

RESULTS OF A REGIONAL-SCALE SURVEY IN WALLONIA (BELGIUM)

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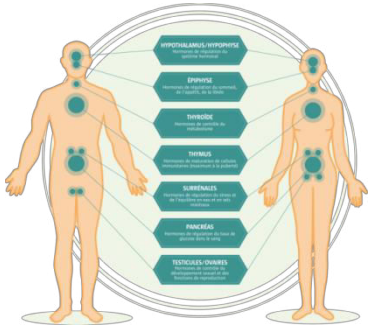
What is an endocrine disruptor ?

The most widely used definition is the one proposed by the WHO (2002) :

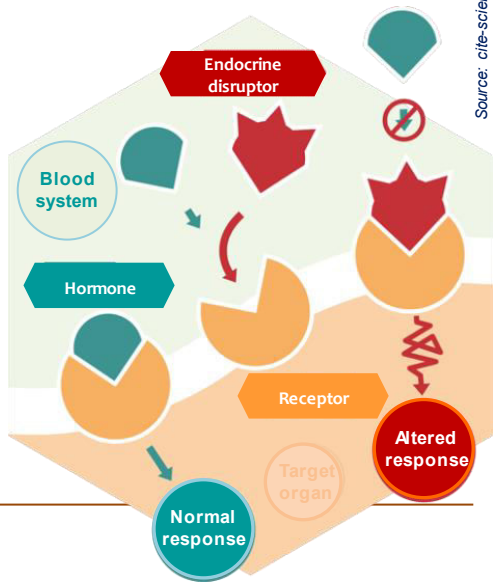
- An endocrine disruptor (ED) is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations



Source: cite-sciences.fr.

Endocrine disruptors have hormono-mimetic properties and can have 3 types of effects:

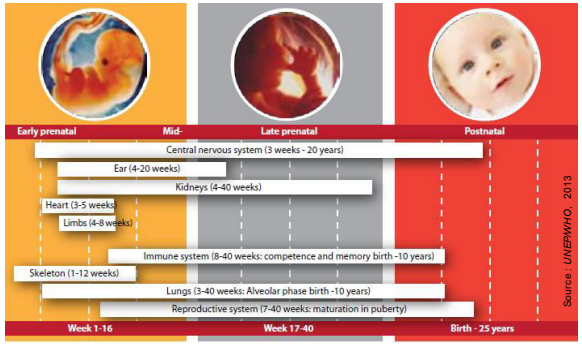
- Mimetic effect (or agonist)
- Blocking effect (or antagonist)
- Disruptive (or interference) effect



Why focus on endocrine disruptors ?

Endocrine disruptors:

- Act at any age but the effects at the earliest stages of the development are the most important
- Act at very low concentrations
- Do not act monotonously (non-monotonic response curves)

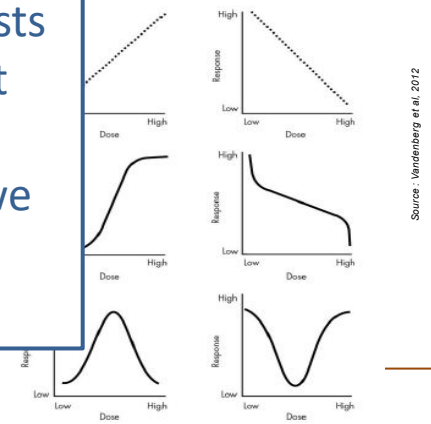


Effects of endocrine disruptors on ecosystems and human health:

- Fertility
- Thyroid
- Hormon
- Diabete
- Obesity
- Autism

Important public health problem: EU health costs for endocrine-related diseases are estimated at **630 billion € / year**

A reduction of 31 billion € / year is possible if we reduce the population's exposure to PE (Heal, 2014)



Slide adapted from C. Chalon (ISSeP)

Aims and scope

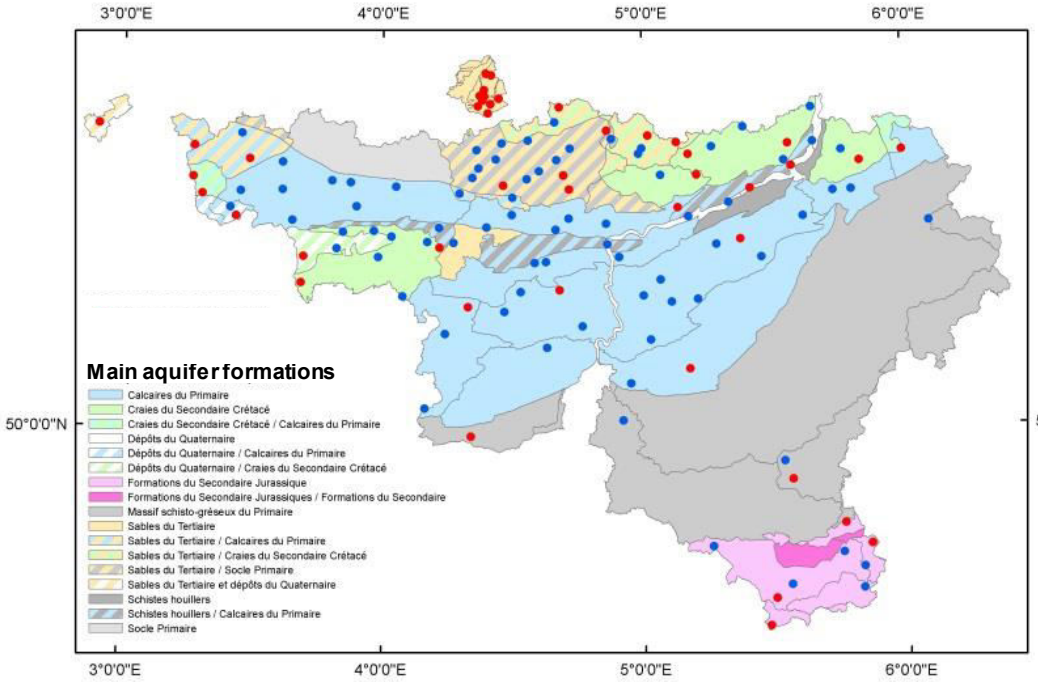
- **Why?** The aquatic environment is an important receptor for EDs. Once present in the aquatic environments, these substances can then directly impact the ecosystems that develop or depend upon them. By altering the quality of water resources, these substances may also impact human health.

- **Objectives?** Conduct a first screening of the presence of endocrine disruptors and certain other emerging substances in Walloon waters, including groundwater, surface waters, discharge and runoff water, and water intended for drinking purposes (tap water and bottled water).

Molecule selection

- Alkylphenols *(1 meth. - 10 comp.)*
- Phtalates *(1 meth. - 9 comp.)*
- Chlorophenols *(1 meth. - 20 comp.)*
- PFASs *(1 meth. - 5 comp.)*
- PAHs *(1 meth. - 16 comp.)*
- Pesticides *(4 meth. - about 110 comp.)*
- Pesticide metabolites *(2 methods – 5 comp.)*

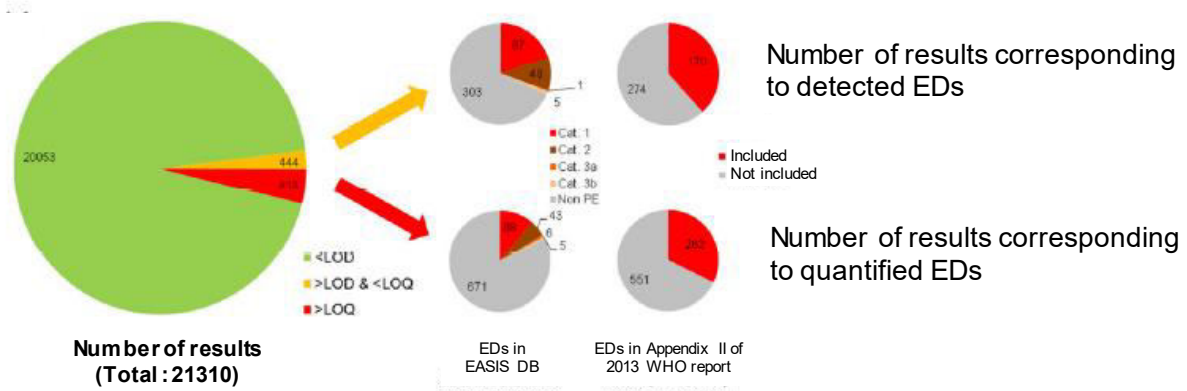
Groundwater sampling plan

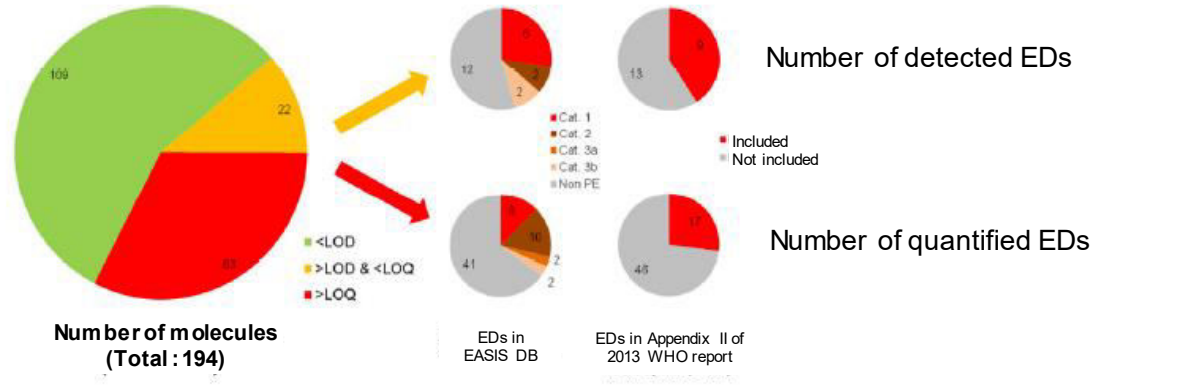


113 sampling points:

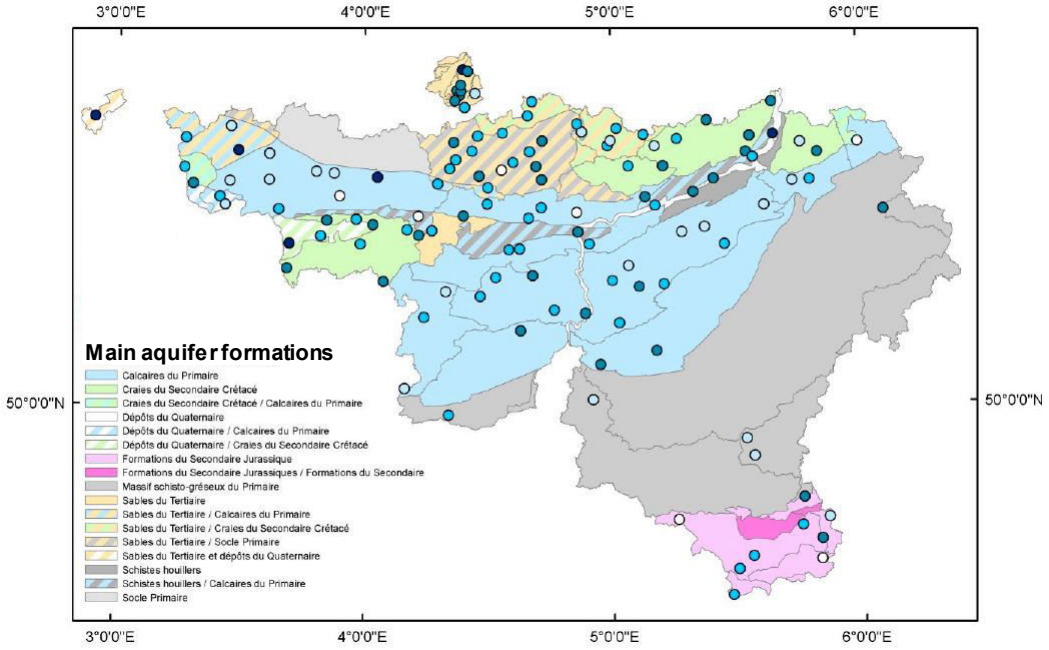
- 34 points from the Water Framework Directive (WFD) surveillance network
- 79 drinking water (DW) production points
- 32 out of 38 GW bodies covered with a sampling density adapted with respect to GW body vulnerability

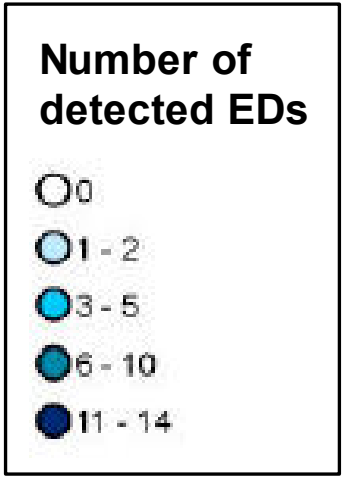
General results for GW



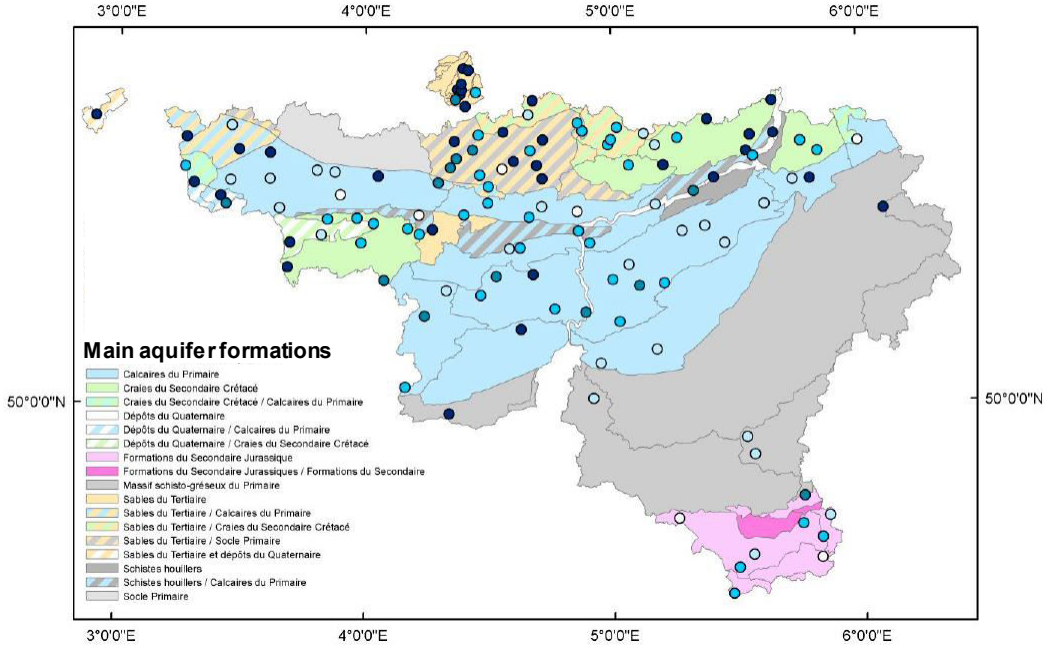


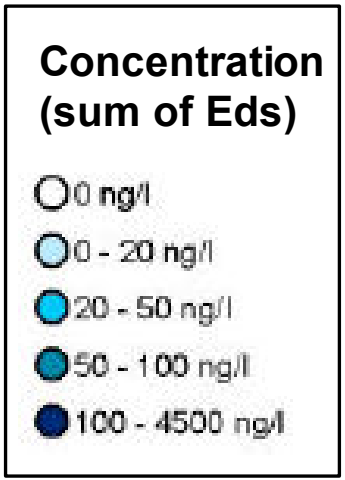
General results for GW (2)



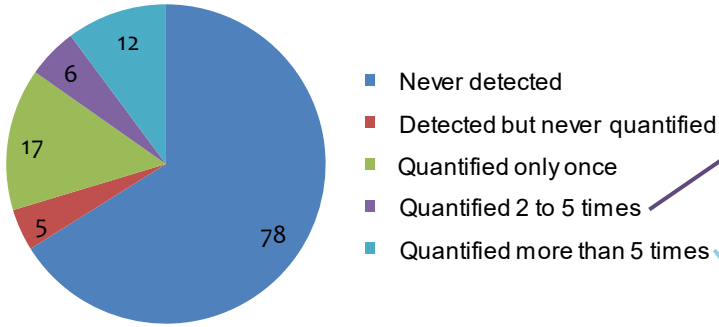


General results for GW (3)





Selected results - Pesticides and metabolites



- Metolachlor OA (metabolite)
- Imidaclopride (neonicotinoïd, insecticide)
- Chloridazon (diazin, herbicide)
- Chlorpyrifos (organophosphorus, insecticide)
- AMPA (metabolite)
- Chlortoluron (urea, herbicide)

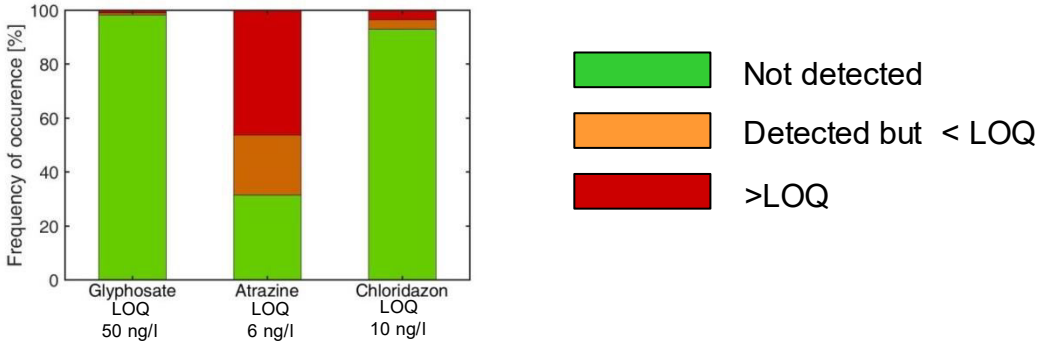
- Terbuthylazine (triazin, herbicide)
- Isoproturon (urea, herbicide)
- Metazachlor OA (metabolite)
- Diuron (phenylurea, herbicide)
- Simazine (triazin, herbicide)
- Metazachlor ESA (metabolite)
- Atrazine (triazin, herbicide)
- Metolachlor ESA (metabolite)
- Vis-01 (metabolite)
- Desthylatrazin (metabolite)
- Methyldesphenychloridazon (metabolite)
- Desphenylchloridazon (metabolite)

Over 118 pesticides:

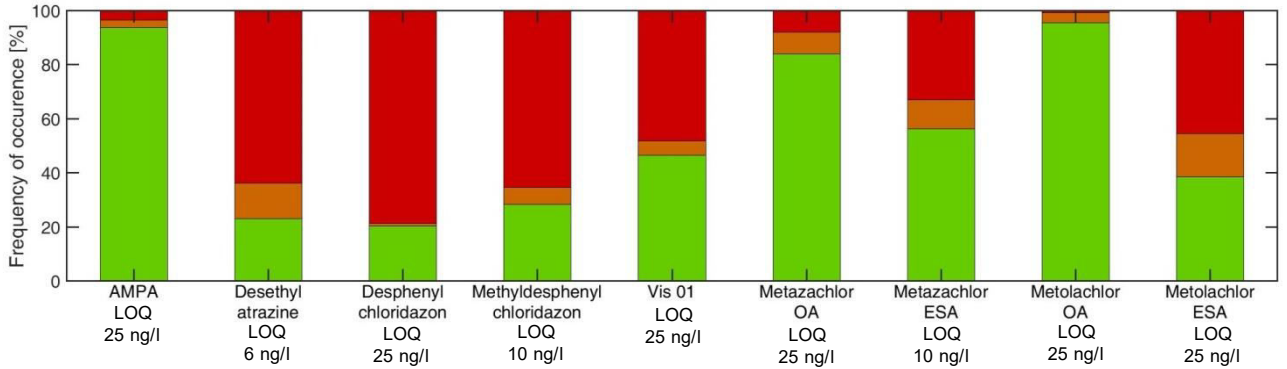
- 78 are never detected
- 5 are detected but always at C<LOQ
- 17 are detected at C>LOQ **only once**

Selected results - Pesticides and metabolites (2)

Parent substances :

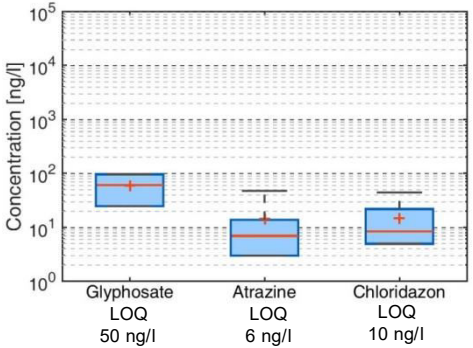


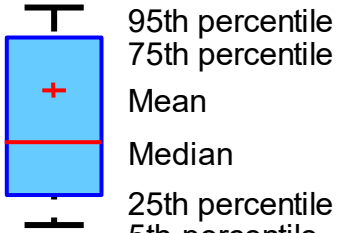
Associated metabolites :



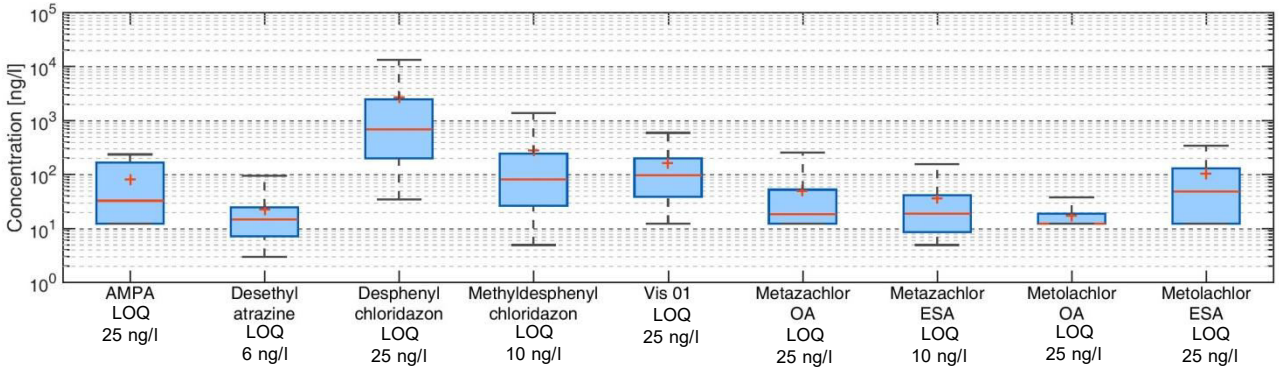
Selected results - Pesticides and metabolites (3)

Parent substances :

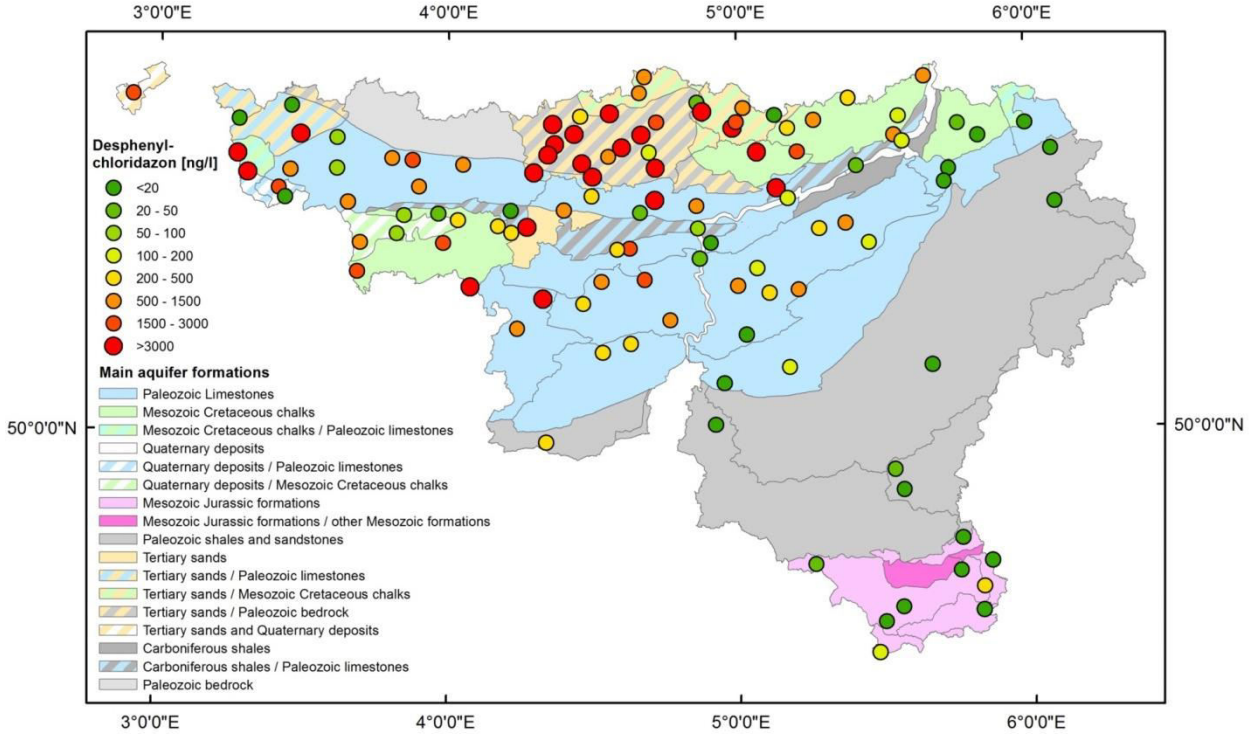




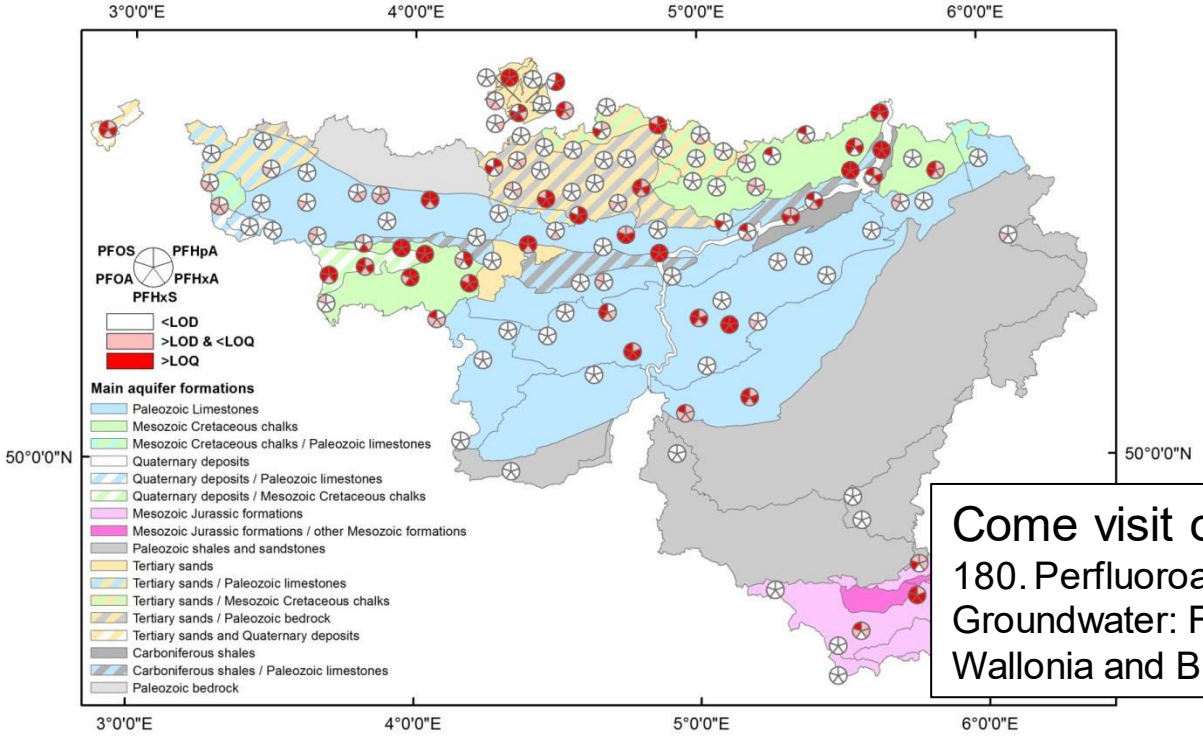
Associated metabolites :



Selected results - Pesticides and metabolites (4)



Selected results – perfluorinated compounds



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180. Perfluoroalkyl Substances In Groundwater: First Survey In Wallonia and Brussels (Belgium)

Key conclusions

In general, groundwater in Wallonia is of very high quality:

- More than half of the monitored substances in groundwater have never been detected.
- About 10% of the substances are detected at concentration levels below their limit of quantification. This includes less than a dozen ED.
- About 30% of the substances were measured at concentration levels above their limit of quantification, including 10 to 20 ED.

Over a total of 122 monitoring sites in Wallonia:

- No ED were detected in 7 of them (about 6% of the sites)
- For 10 monitoring sites (12% of the sites), a maximum of 1 ED is detected
- For 30 sites (about 25% of sites), only 2 or 3 ED are detected.
- At the most impacted monitoring sites, no more than 14 ED are detected simultaneously

Sums of ED concentrations are generally lower than 0,1 µg/l.

Key conclusions (2)

As far as substances of domestic and/or industrial use are concerned:

- Certain sites can be locally impacted by bisphenol A, certain alkylphenols, certain phthalates, or certain PAHs.
- Perfluorinated compounds are relatively ubiquitous (see poster)

Low levels of certain pesticides are observed everywhere, including pesticides that have been banned for more than 10 years.

Some classes of endocrine disrupting pesticides are either never detected or only detected at concentrations below their limit of quantification. These pesticides include organochlorine pesticides, insecticides (pyrethroids, organophosphorus and carbamates), and azole fungicides.

In Wallonia, non-relevant pesticide metabolites are the most widely detected substances, at the highest concentrations (> 10 µg/l). These non-relevant metabolites are not known to have endocrine disrupting effects.

Thank you !

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Full report of the study (in French) available at
http://eau.wallonie.be/spip.php?article168