29 mai 2025

Présence de pesticides en Montérégie

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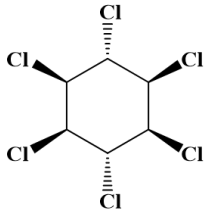
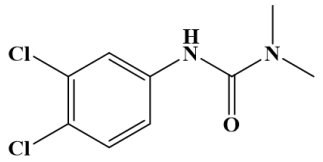
Séquence de « nouveautés » pour les pesticides

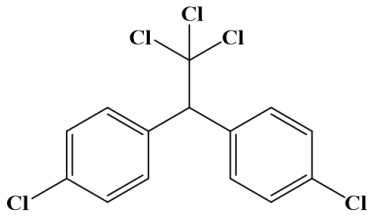
- Arséniate de plomb
- DDT
- Organophosphorés
- Atrazine
- Néonicotinoïdes
- Glyphosate
- Chlorantraniliprole



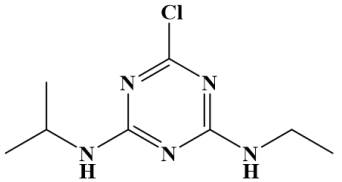
Lindane



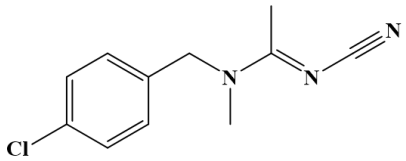
Diuron



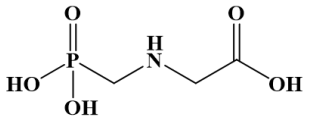
DDT (dichlorodiphényltrichloroéthane)



Atrazine

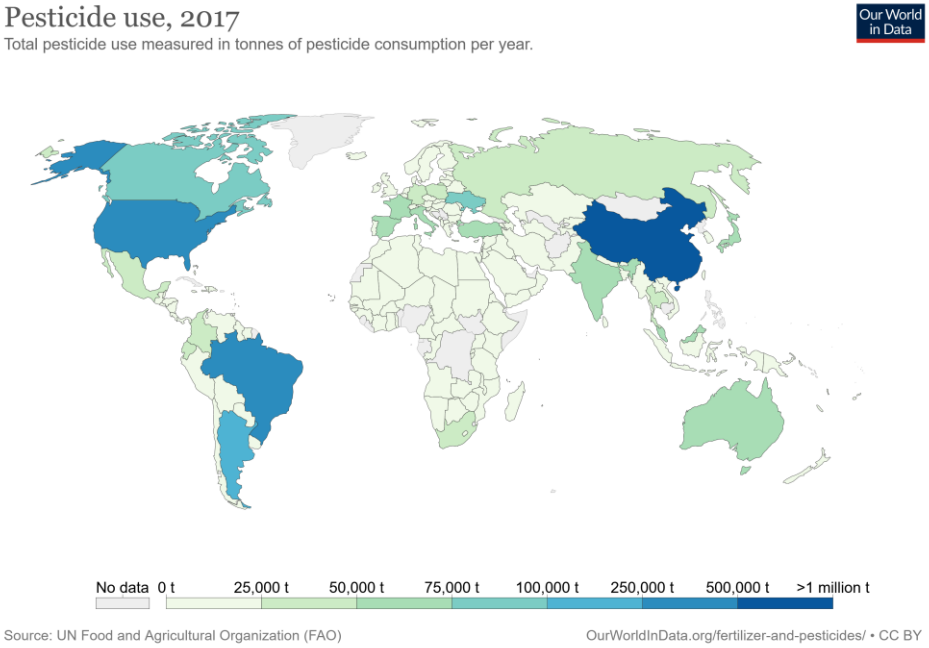


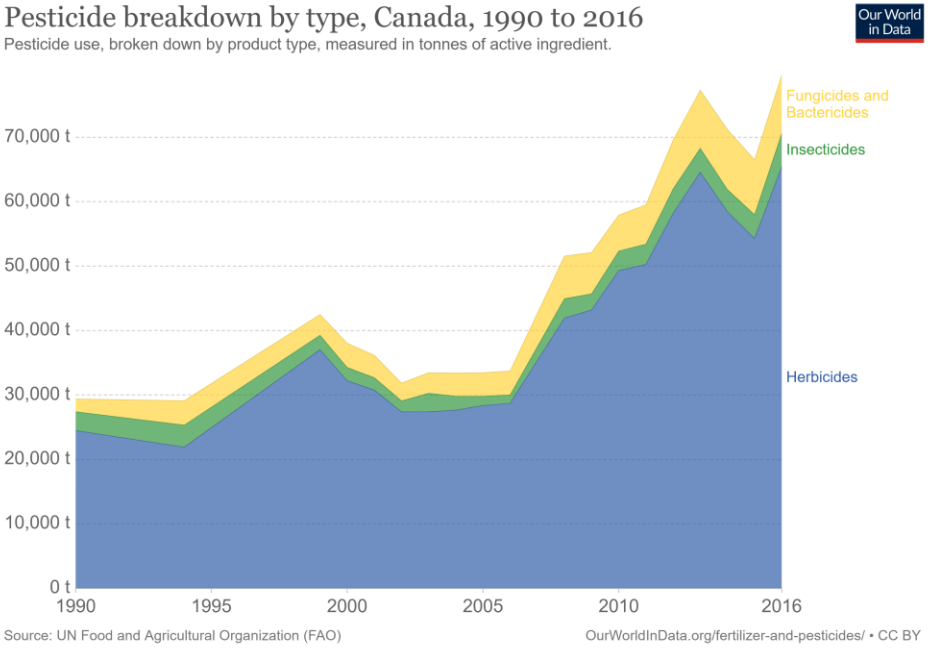
Imidacloprid



Glyphosate

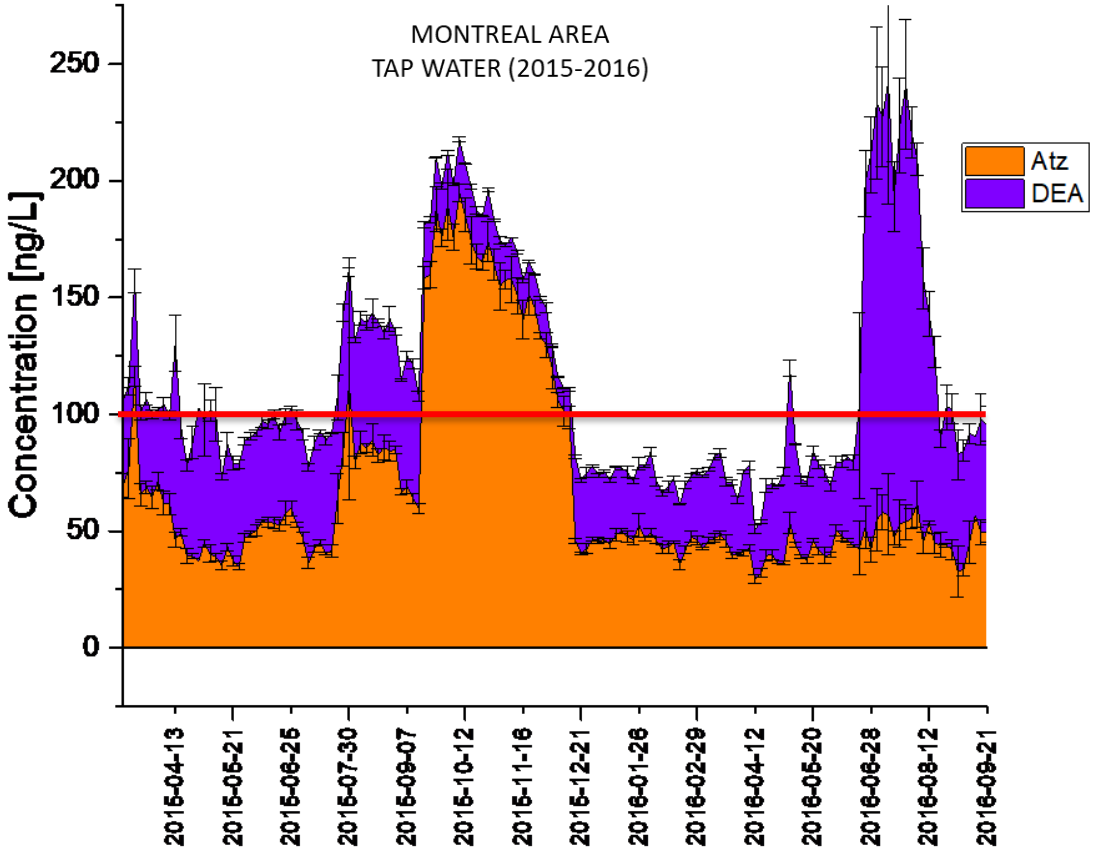
Utilisation des pesticides dans le monde





https://ourworldindata.org/

Triazines dans l'eau du robinet de Montréal



~40-90 tonnes par an

UE: 100 ng/L
OMS: 100 000 ng/L
EPA: 3000 ng/L
Canada: 5000 ng/L
Québec: 3500 ng/L

https://www.sciencedirect.com/science/article/pii/S0048969719312197

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Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Quality survey and spatiotemporal variations of atrazine and desethylatrazine in drinking water in Quebec, Canada

Juan Manuel Montiel-León [a], Sung Vo Duy [a], Gabriel Munoz [a], Maryse F. Bouchard [b], Marc Amyot [c], Sébastien Sauvé [a,*]

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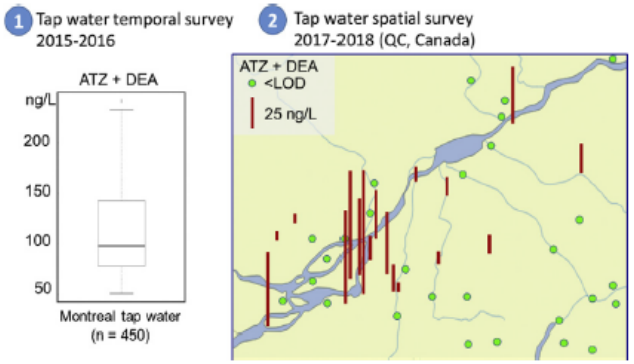
HIGHLIGHTS

- Spatiotemporal trends of triazines (ATZ & DEA) in Quebec tap water, Canada.
- 19 out of 52 municipalities (4.7M people) screened in Quebec were positive (>LOD).
- In the Montreal area, 100% of samples (n = 450) tested positive to ATZ and DEA.
- 50% of these samples had summed levels above the E.U. drinking water guideline.
- ATZ levels were compliant to Canadian, U.S. EPA and WHO drinking water guidelines.

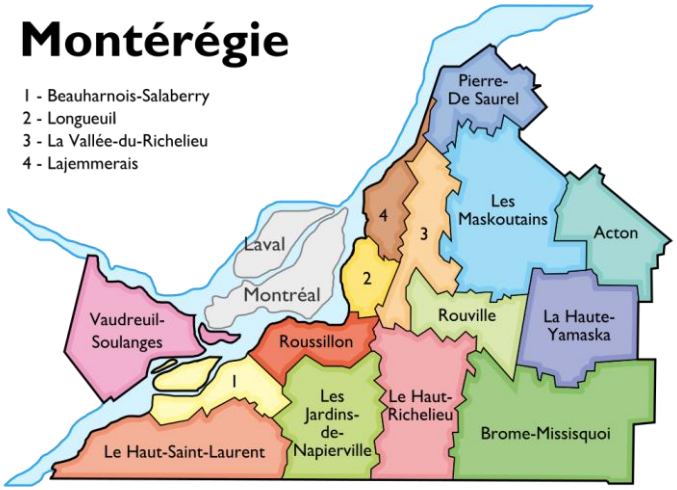
GRAPHICAL ABSTRACT

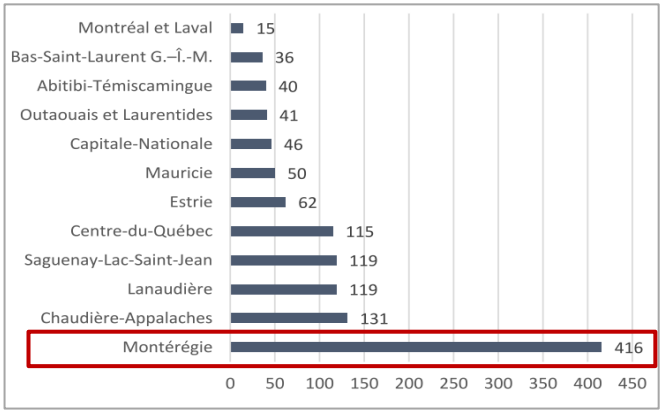


Analyse de pesticides dans l'eau de surface

- **Première région agricole en importance au Québec**
  - **24% des fermes du Québec**
  - **78% de toute la production québécoise des légumes de transformation**
  - **65% des pommes, 62% du maïs grain et 48% du soja**

- **Première région en termes de nombre de prescriptions des pesticides les plus à risque**
- **Présence de pesticides dans les eaux de surface de la Montérégie ouest a été peu investiguée**





Distribution régionale des agriculteurs et des forfaitaires qui se sont procuré les cinq pesticides les plus à risque

Bilan des ventes de pesticides au Québec, 2019, MDDELCC, Wikipedia

Environmental Science Advances

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Pesticides and transformation products in surface waters of western Montérégie, Canada: occurrence, spatial distribution and ecotoxicological risks†

Xiameng Feng,[a] Zhen Liu,[b] Sung Vo Duy,[a] Gabriel Munoz,[a] Lise Parent[c] and Sébastien Sauvé *[a]

The objective of this study was to investigate the occurrence, spatial distribution, and ecotoxicological risk of pesticides and transformation products in surface waters of western Montérégie (Quebec, Canada). A total of 29 samples were collected from 11 rivers during the summers of 2019 and 2021, and the samples were analyzed for 48 pesticides and 8 transformation products. The downstream data were used to assess the ecotoxicological risks based on Quebec's acute or chronic aquatic life criterion (AALC or CALC). Overall, 9 herbicides (glyphosate, *S*-metolachlor, 2,4-D, metribuzin, atrazine, MCPA, prometryn, dimethenamid, simazine), 3 insecticides (clothianidin, imidacloprid, chlorantraniliprole), and 4 fungicides (azoxystrobin, fluxapyroxad, tebuconazole, carbendazim) were detected at all sampling sites, demonstrating their widespread use in western Montérégie. Glyphosate (87–4095 ng L^{-1}), *S*-metolachlor (6–2519 ng L^{-1}), and 2,4-D (6–1094 ng L^{-1}) were identified as the most abundant pesticides in surface water. Furthermore, 6 pesticide transformation products (metolachlor ESA, AMPA, metolachlor OA, desethylatrazine, atrazine-2-hydroxy, desisopropylatrazine) were detected at all sampling sites. The concentration of transformation products accounted for 51% on average of the total concentration, demonstrating the abundance of transformation products in surface waters. Neonicotinoids exhibited the highest ecotoxicological risk in the surface water samples with an average CALC risk quotient of 28 for 2019 and 12 for 2021, respectively. The present study offers insights into pesticides occurrence and their ecological impacts on surface waters of western Montérégie and allows for supporting future pesticide management and ecotoxicological risk mitigation strategies.

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Carte

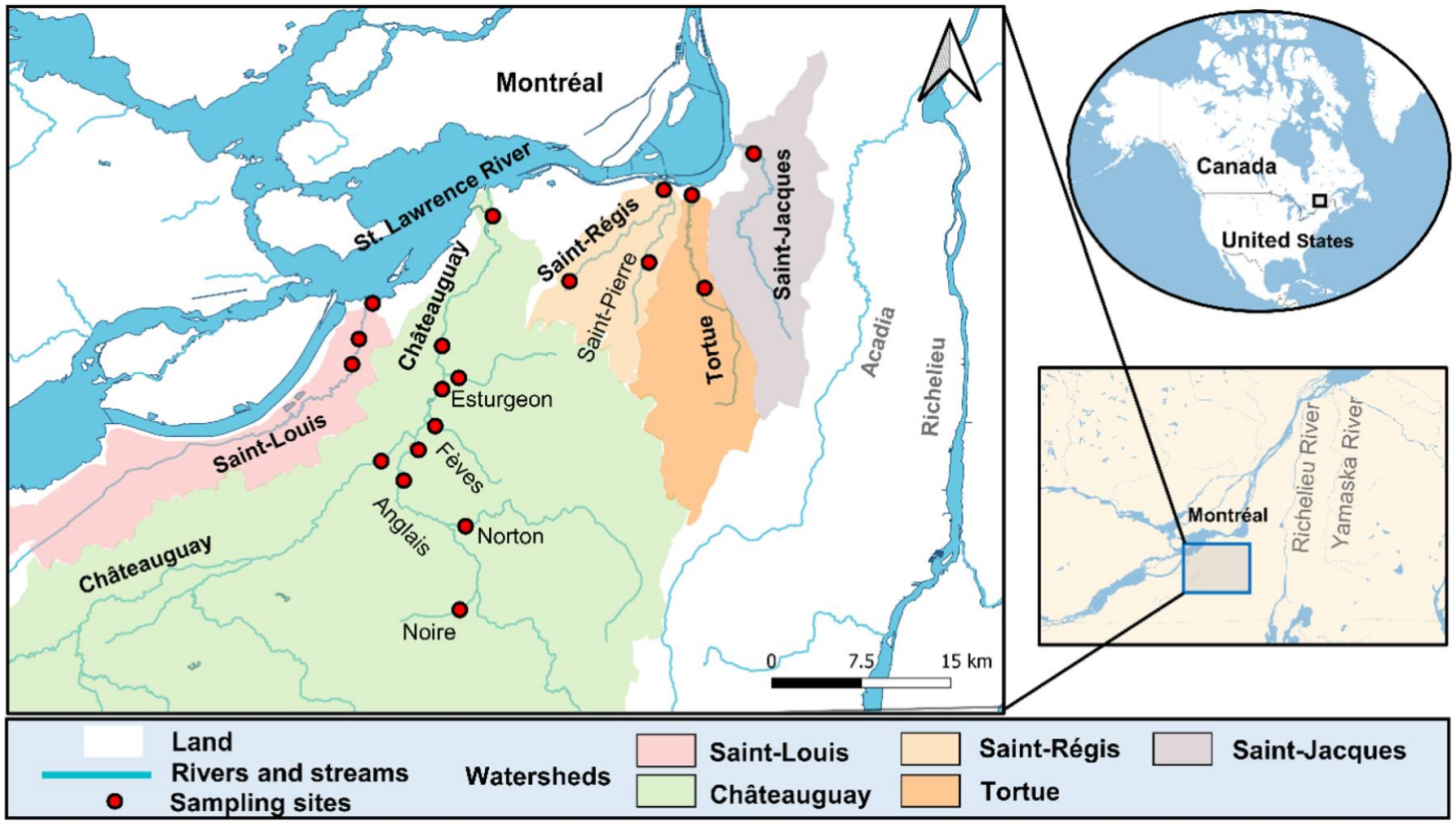
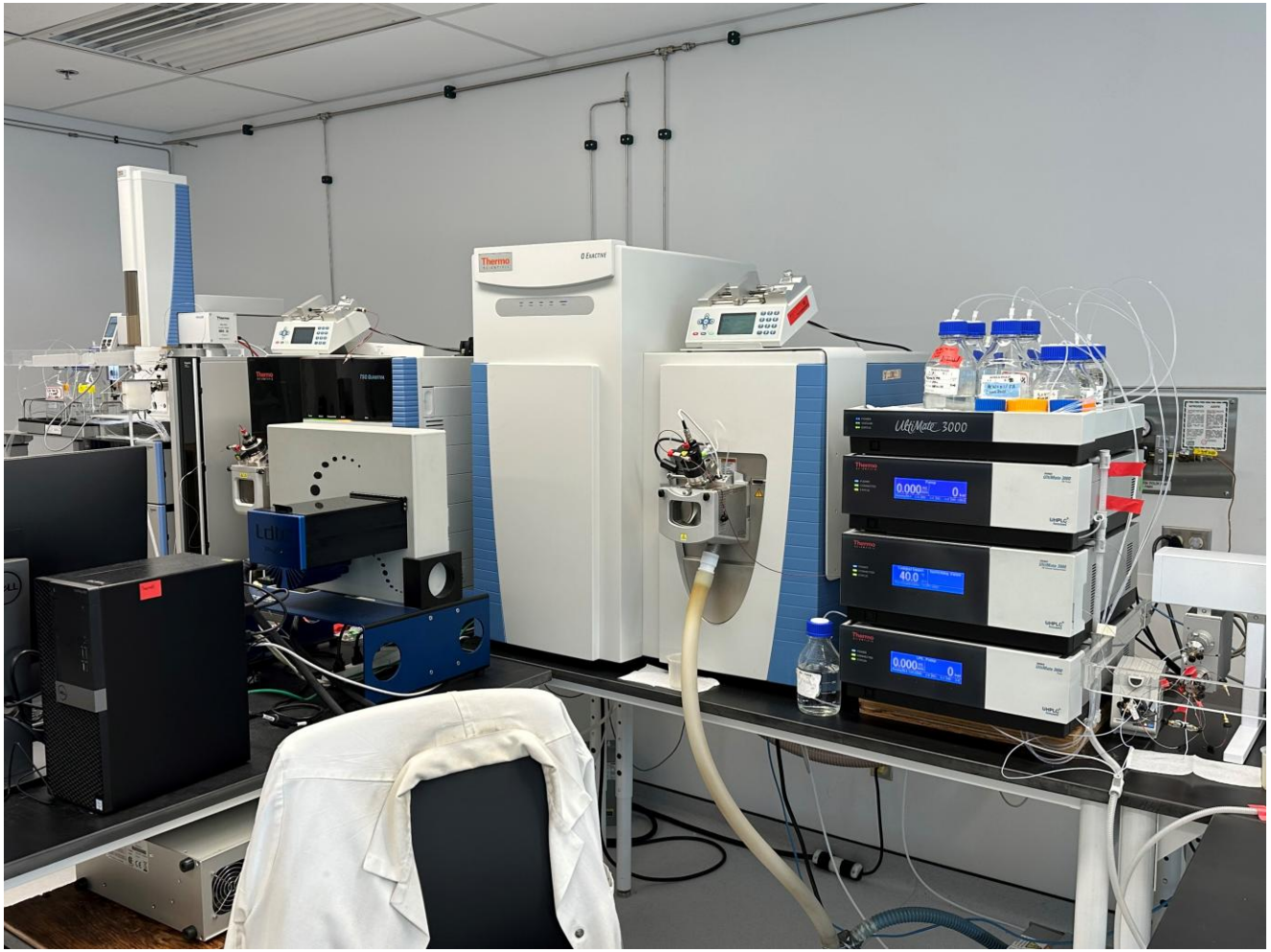


Fig. 1 Map of the study area and sampling sites (see also Table S5† for watershed size and cropland occupation, and Table S6† for sampling coordinates).

Pesticides et produits de transformation analysés

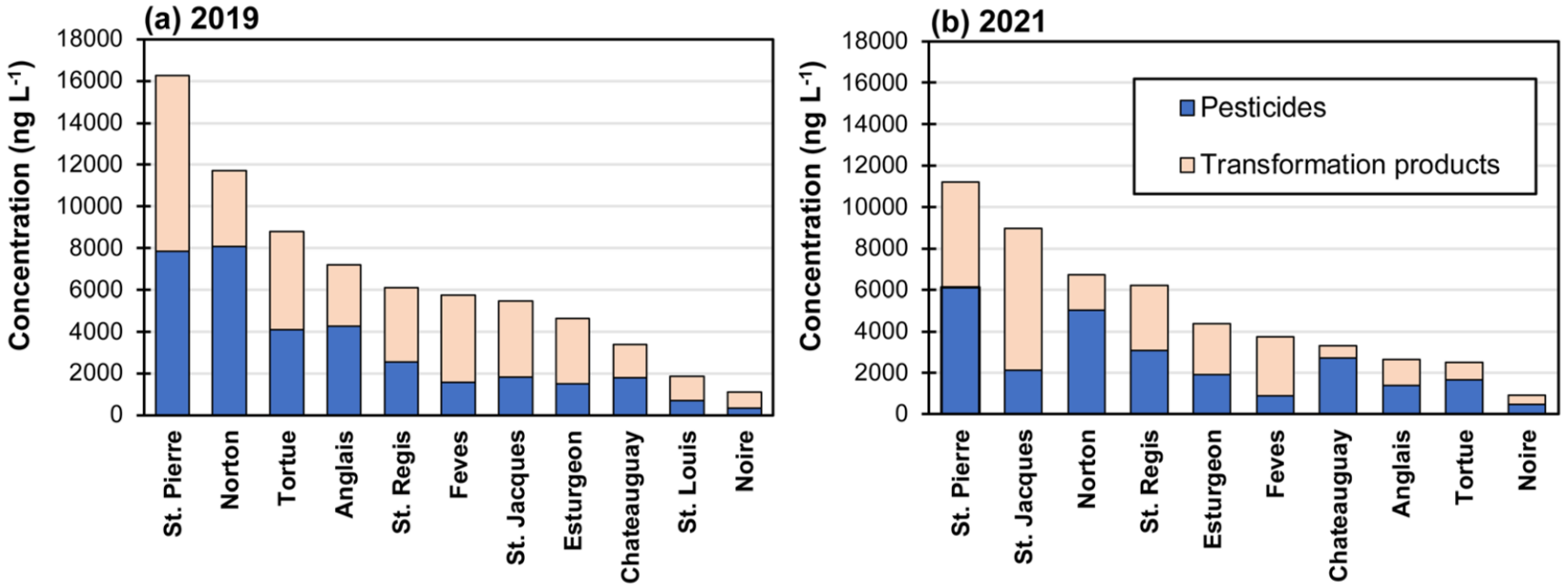
26 herbicides et 7 produits de transformation		13 insecticides et 1 produit de transformation	9 fongicides
Alachlor	Mésotrione	Acétamipride	Azoxystrobine
Atrazine	*S*-métolachlore	Carbaryl	Carbendazim
Atrazine-2-hydroxy (ATZ-OH)	Métolachlore ESA	Chlorantraniliprole	Fluxapyroxad
Déethylatrazine (DEA)	Métolachlore OA	Clothianidine	Propiconazole
Déisopropylatrazine (DIA)	Métribuzine	Chlorpyrifos	Pyrimethanyl
Bentazone	Nicosulfuron	DEET	Tébuconazole
Bromoxynil	Pendiméthaline	Desnitro-imidaclopride	Chlorothalonil
Cyanazine	Prométryn	Dinotefuran	Fluazinam
2,4-D	Simazine	Fipronil	Metconazole
Diméthénamide	Topramezone	Flonicamid	
Flumetsulame	Triclopyr	Imidaclopride	
Fomesafène	Triclopyr butoéthylester	Nitenpyram	
Héxazinone	3,5,6-trichloro-2-pyridinol	Thiacloprid	
Imazéthapyr	Glyphosate	Thiaméthoxame	
Linuron	AMPA		
MCPA	Glufosinate		
Mécoprop			

Chromatographie liquide couplée à la spectrométrie de masse de haute résolution



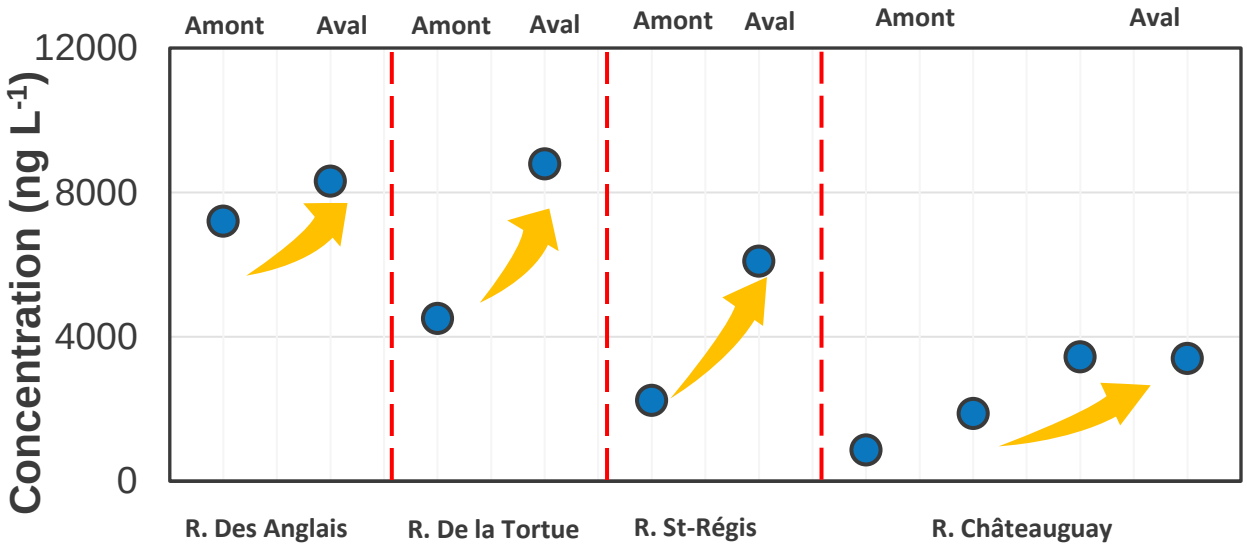
Instruments d'analyse de 0,5 à 1M $

Concentration de pesticides et de leurs métabolites dans les eaux de surface

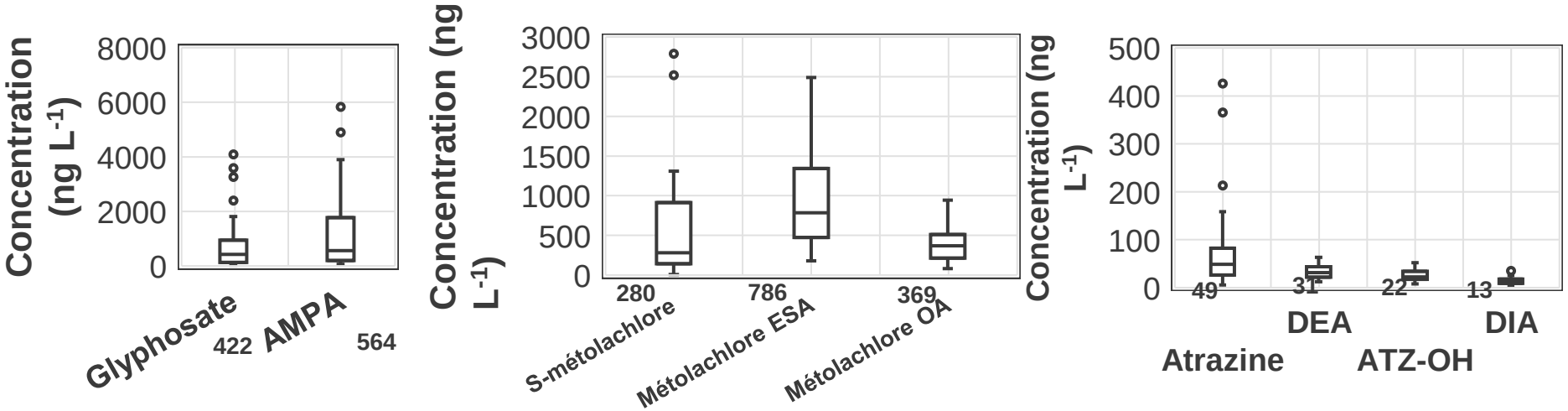


- La rivière St-Pierre et le ruisseau Norton sont les cours d'eau les plus contaminées en tenant compte des résultats de 2019 et 2021
- Les métabolites représentent environ la moitié des concentrations totales (51%)

Concentration de pesticides et de leurs métabolites dans les eaux de surface

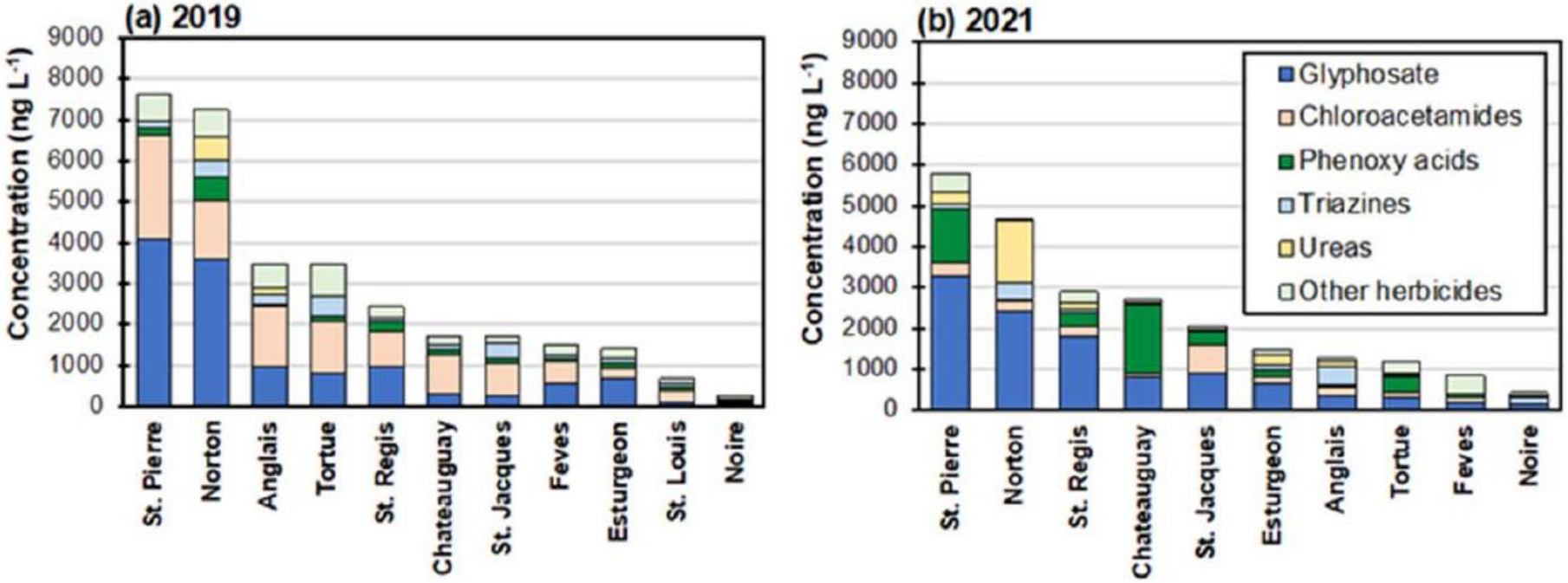


Concentration de pesticides et de leurs métabolites dans les eaux de surface



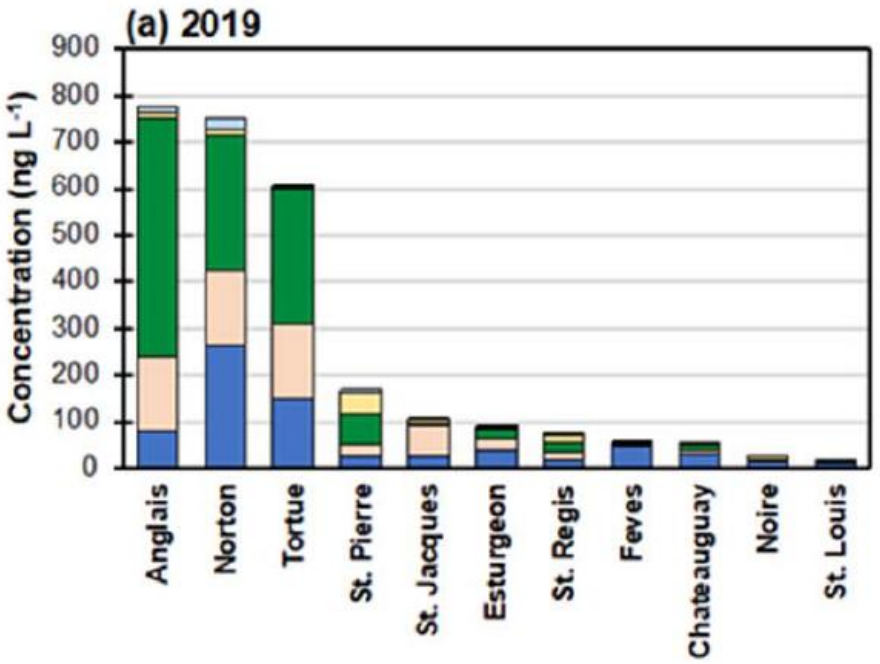
- Les concentrations médianes de l'AMPA, du métolachlore ESA et du métolachlore OA ont été plus élevées que celles des pesticides originaux

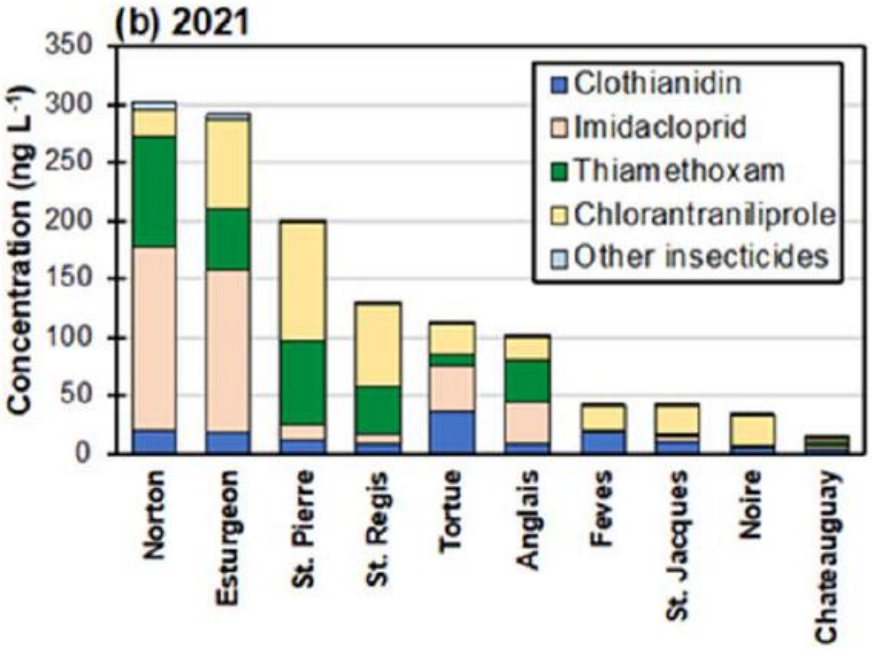
Distribution des herbicides dans les cours d'eau



- Le glyphosate est le premier herbicide en termes de concentration dans les eaux de surface de la Montérégie ouest (36% des concentrations totales des herbicides)

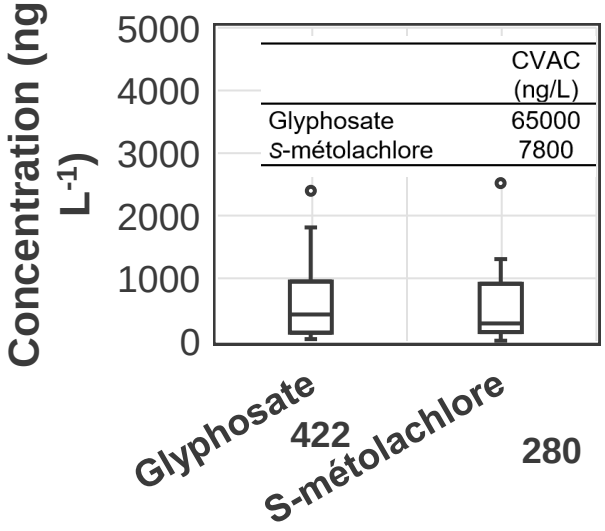
Distribution des insecticides dans les cours d'eau

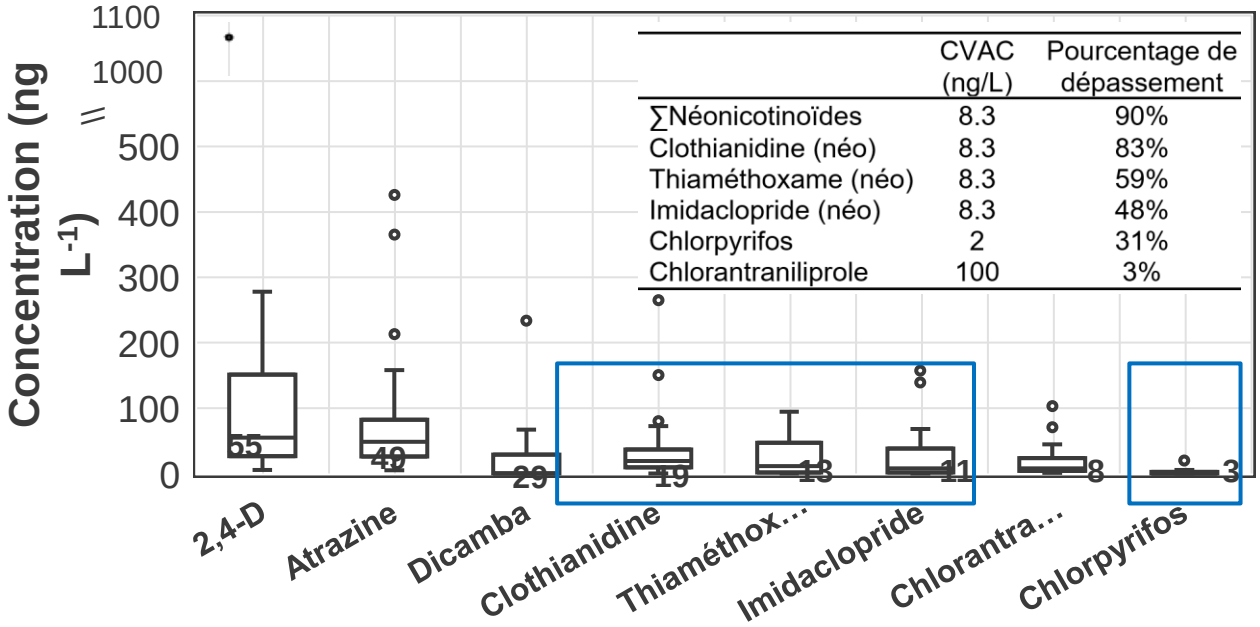




- Les néonicotinoïdes représentent 80% des concentrations totales des insecticides mesurés
- Le chlorantraniliprole a augmenté en 2021, passant de 4% en 2019 à 31% en 2021

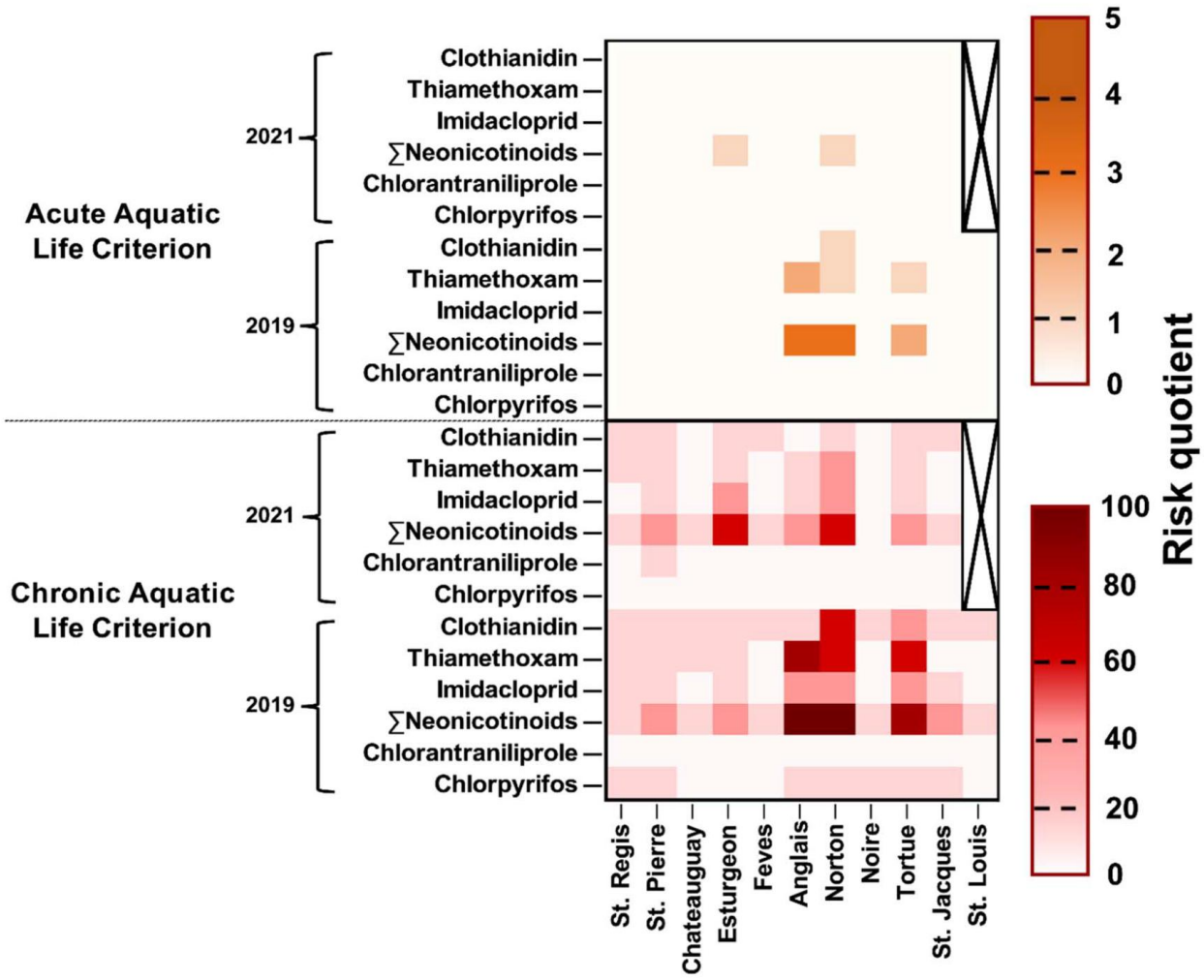
Concentration de pesticides et de leurs métabolites dans les eaux de surface





CVAC: Le critère pour la protection de la vie aquatique chronique adopté par le Ministère de l'Environnement et de la Lutte contre les changements climatiques du Québec

Risque d'effets sur la faune et la flore



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Water Research 277 (2025) 123339

Contents lists available at ScienceDirect

Water Research

journal homepage: www.elsevier.com/locate/watres

Temporal trends of 46 pesticides and 8 transformation products in surface and drinking water in Québec, Canada (2021–2023): Potential higher health risks of transformation products than parent pesticides

Xiameng Feng [a], Zhen Liu [b], Sung Vo Duy [a], Lise Parent [c], Benoit Barbeau [b], Sébastien Sauvé [a,*]

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[b] Industrial Chair on Drinking Water, Department of Civil, Mining and Geological Engineering, Polytechnique Montréal, Montréal, QC H3T 1J4, Canada
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ARTICLE INFO

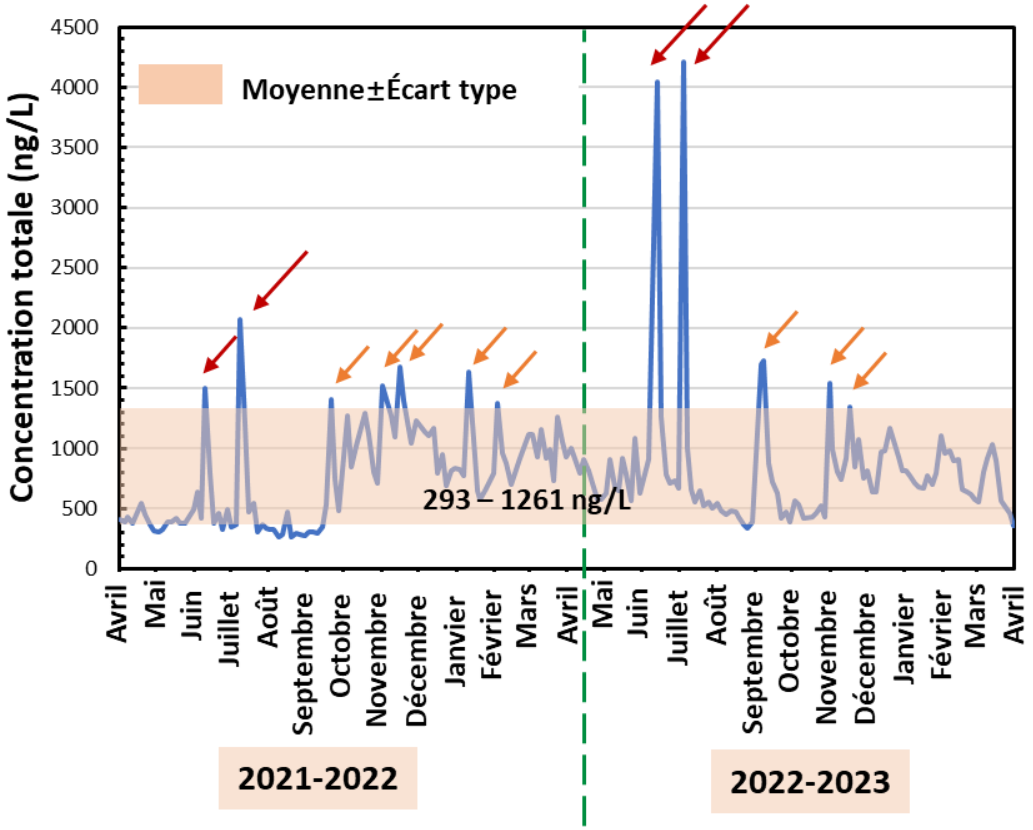
Keywords:
Pesticides
Transformation products
Temporal variation
Drinking water
Risk assessment

ABSTRACT

The objective of the present study was to investigate the temporal trends of 46 pesticides and 8 transformation products (TPs) in the surface water of Québec and assess their associated health risks posed through drinking water consumption. Surface and drinking water were sampled twice per week at a drinking water treatment plant (DWTP) from 2021 to 2023 (838 days). Pesticide and TPs concentrations were analysed using ultra-high-performance liquid chromatography coupled with mass spectrometry. The data were used to evaluate temporal variations of pesticides and TPs at the source, their removal in DWTPs, their human exposure via drinking water, and the associated health risks. The results showed that peak concentrations of most pesticides and their TPs in surface water occurred in June and July, and some TPs (such as metolachlor ethanesulfonic acid, metolachlor oxanilic acid, and desethylatrazine) exhibited higher concentrations than their parent compounds in surface water. Post conventional treatment analysis revealed no significant decrease in the total concentrations of target pesticides and TPs in drinking water. Notably, 11 pesticides (such as atrazine, mecoprop) and 1 TP (desisopropylatrazine) showed higher concentration in drinking water than in surface water. The hazard index (HI) was up to 18 times higher in summer peak periods than the annual average. Finally, TPs exhibited HI 1.4 to 144 times higher than corresponding parent compounds. This study was the first to assess health risks of TPs versus parent pesticides in drinking water through long-term sampling, highlighting the urgent need for further TPs regulation in drinking water.

https://www.sciencedirect.com/science/article/pii/S0043135425002520

Distribution temporelle de pesticides et de leurs produits de transformation dans l'eau brute



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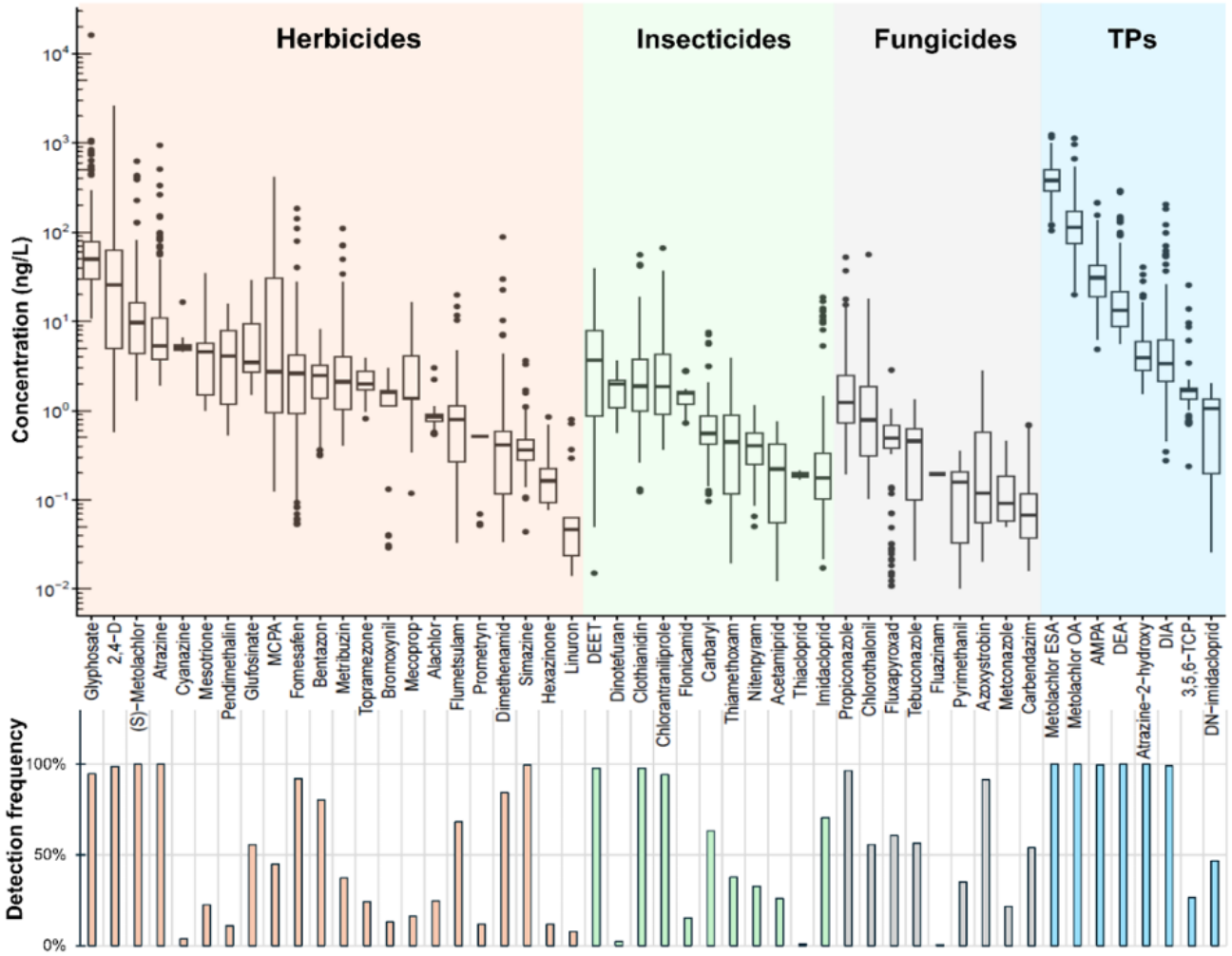
Pesticides dans l'eau de surface (2021 – 2023)



Feng, X., Liu, Z., Duy, S. V., Parent, L., Barbeau, B., & Sauvé, S. (2025). Temporal trends of 46 pesticides and 8 transformation products in surface and drinking water in Québec, Canada (2021–2023): Potential higher health risks of transformation products than parent pesticides. *Water Research*, 123339.

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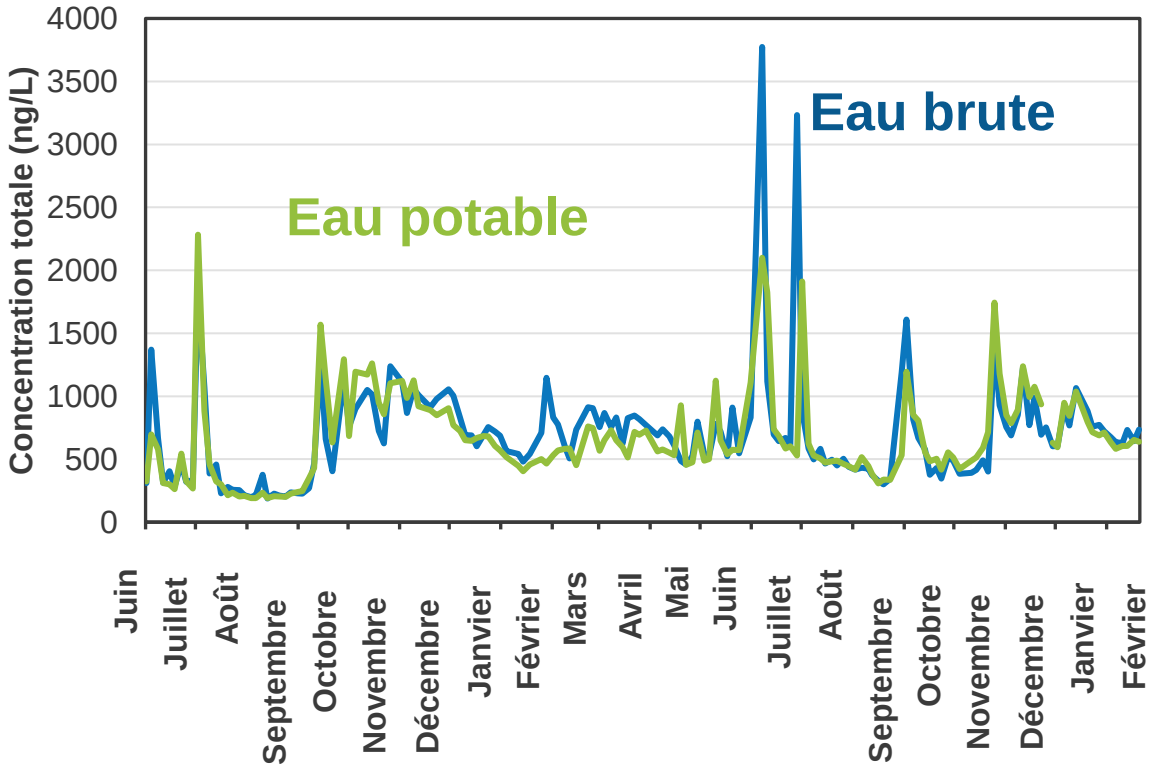
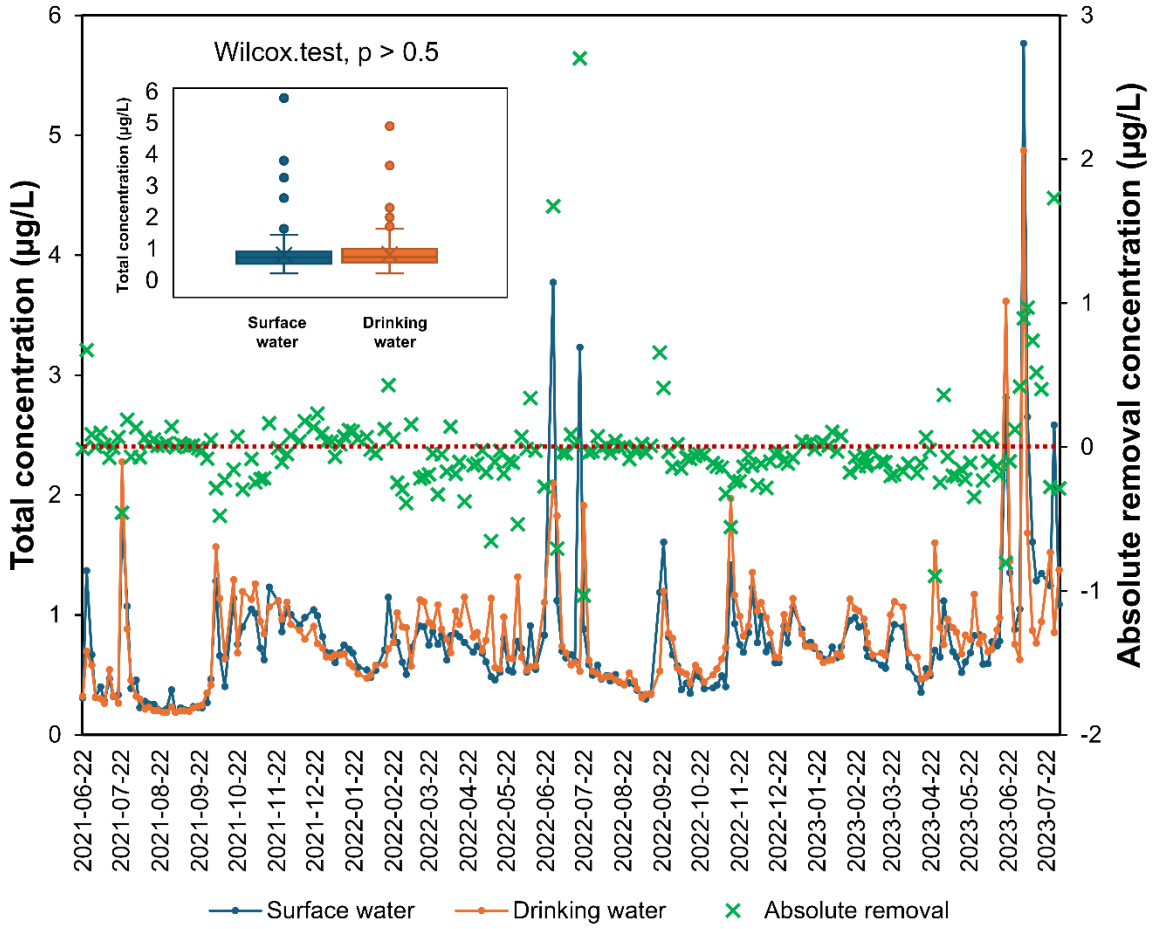
Taux d’enlèvement des pesticides



- Peu de différence entre les concentrations de pesticides avant et après traitement

Enlèvement



➢ Peu de différence entre les concentrations de pesticides avant et après traitement

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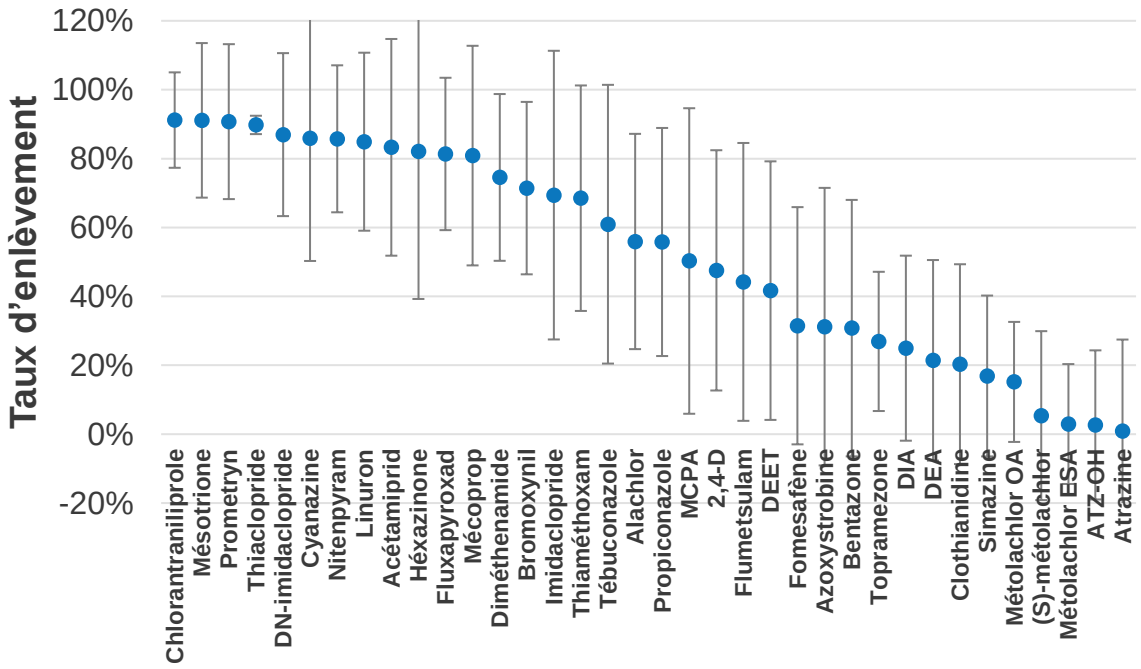
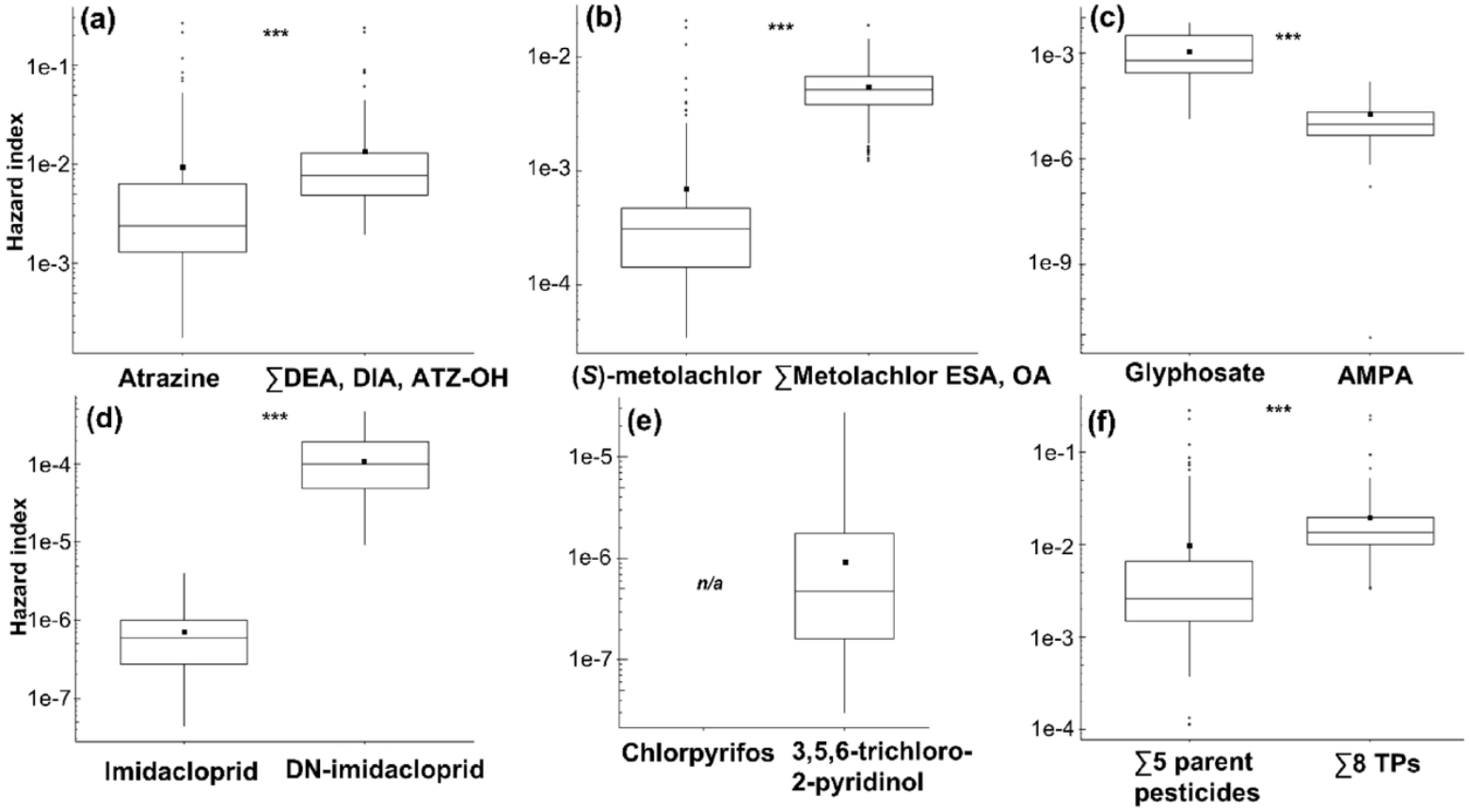
Taux d’enlèvement des pesticides



- Le taux d’enlèvement moyen pour les pesticides est de 5%
- Le chlorantraniliprole peut être enlevé jusqu’à 91%
- L’atrazine et le *(S)*-métolachlore présentent des taux d‘enlèvement <5%

Niveau de risque



https://www.sciencedirect.com/science/article/pii/S0043135425002520

Merci!

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