



Introduction

- Emerging pollutants like veterinary antibiotics and pesticides, widely used in agriculture, may persist in groundwater due to long residence times [1] [2].
- Atrazine (1960-2001) : Herbicide
- Metolachlor (1980 - present) : Herbicide restricted since 2023.
- Oxytetracycline (1950 - present) : Veterinary antibiotic (pigs, cattle, poultry)

Objective

Investigate the presence and heritage of antibiotics and pesticides in an intensive agricultural watershed

Methodology

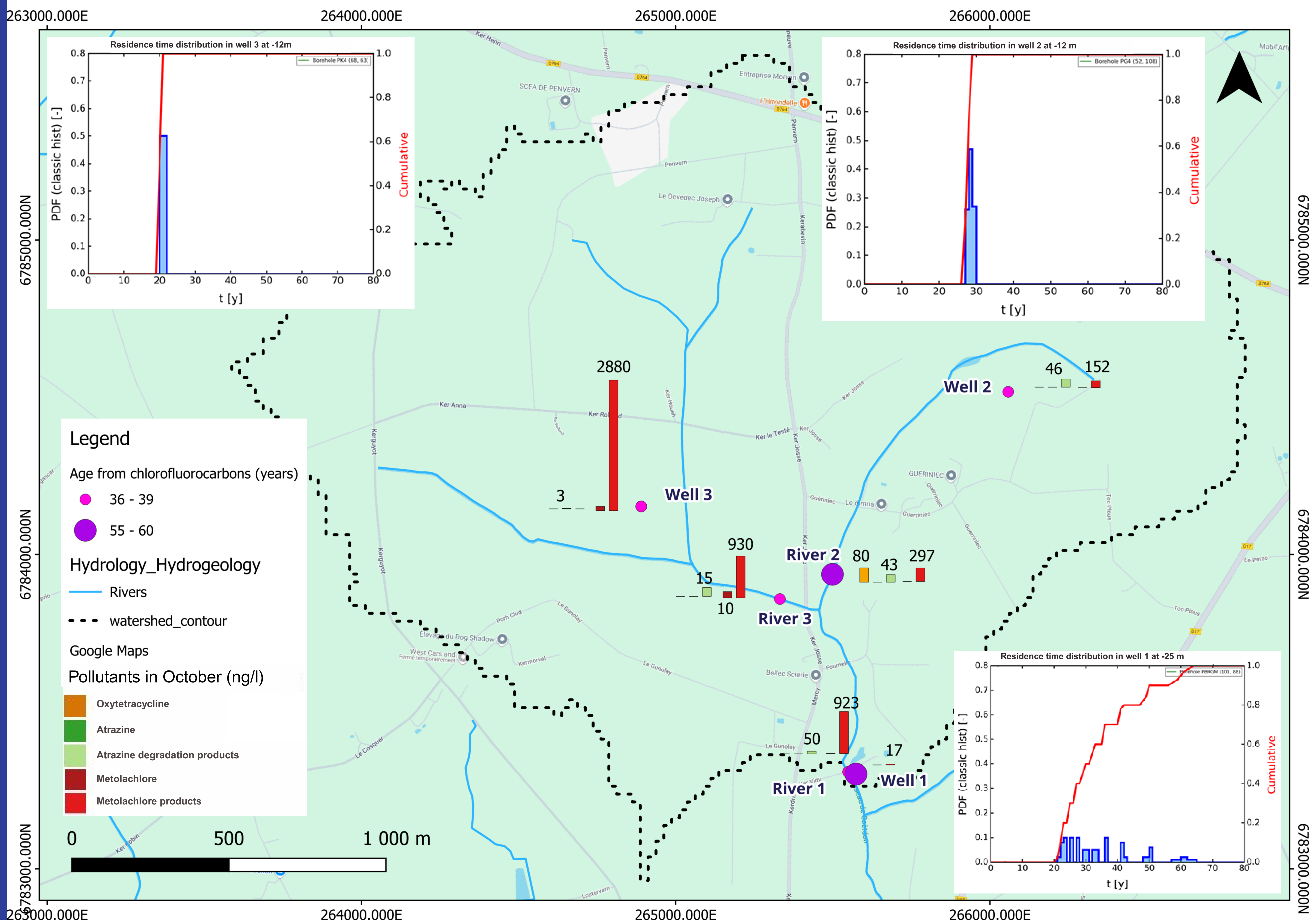
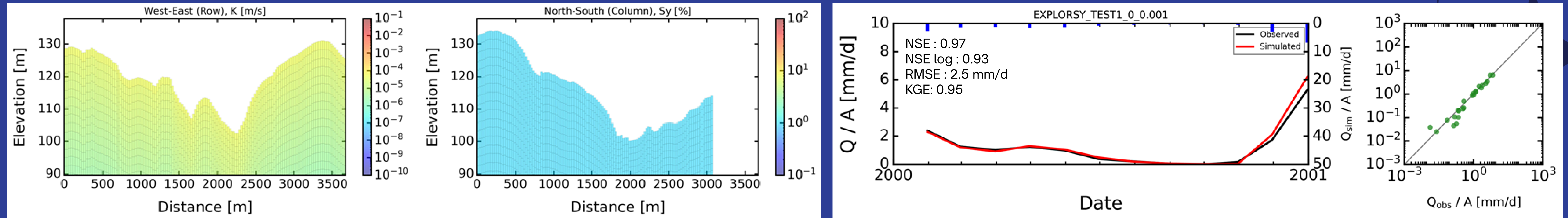
Field Measurements:

- Quantification of antibiotics and pesticides in water samples (surface & groundwater) using LC-MS/MS.
- Chlorofluorocarbons (CFC) tracers for groundwater age dating using μ GC.

Modeling Approach:

- Calibration and validation of the model using MODFLOW-based model HydroModPy
- Backward Particle-tracking method to estimate residence times.

Results



Discussion

Oxytetracycline present in river water, not in ground water : retention in soil matrix ?

Pesticides and by-products present in river and groundwater : Atrazine banned in 2001 still observed in old water

Conclusion

Key Takeaways:

- Pesticides can last long in groundwater (30-40 years), implying long-term strategies (Metolachlore).

Future Research Directions:

- Reactive transport modelling of degradation rate of pesticides

REFERENCES

- [1] Kivits, T., Broers, H. P., Beeltje, H., van Vliet, M., & Griffioen, J. (2018). Presence and fate of veterinary antibiotics in age-dated groundwater in areas with intensive livestock farming. Environmental Pollution, 241, 988-998.
- [2] Lapworth, D. J., Baran, N., Stuart, M. E., & Ward, R. S. (2012). Emerging organic contaminants in groundwater: a review of sources, fate and occurrence. Environmental pollution, 163, 287-303.