Water and pesticide transfers in undisturbed soil columns sampled from a Stagnic Luvisol and a Vermic Umbrisol both cultivated under conventional and conservation agriculture

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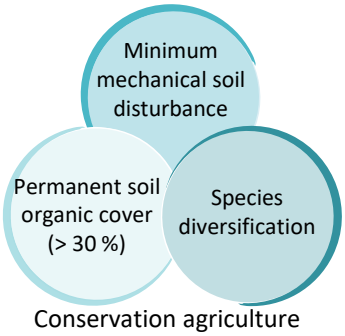
INTRODUCTION



- reducing tillage intensity increases weed pressure, generally leading to an **increase in herbicide use**
- the modification of soil properties under conservation agriculture practices **deeply modifies water and organic pollutant dynamics** in soil
- as compared with a regularly tilled soil, the infiltration of pesticides through **preferential pathways** is generally higher, increasing the risk of contamination of groundwater

The objective of our study was to characterise water and pesticide transfers in two soils from the South West of France, managed under contrasted agricultural practices

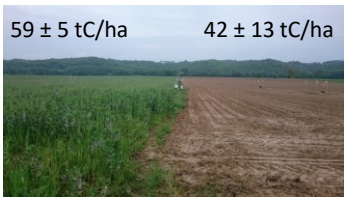
METHODS

- 2 sites with adjacent regularly tilled (TILL) and conservation agriculture (CONS) plots
- Twelve undisturbed soil columns (2 sites x 2 plots x 3 samples) from the surface horizon 0-30 cm
- Mobility of a conservative water tracer (bromide ion), a molluscicide (metaldehyde) and two herbicides (nicosulfuron and mesotrione) under a series of two rainfall events (high and low intensities) and under unsaturated conditions (- 80 cm)

Pyrénées-Atlantiques
Vermic Umbrisol

TILL > 40 years CONS > 10 years

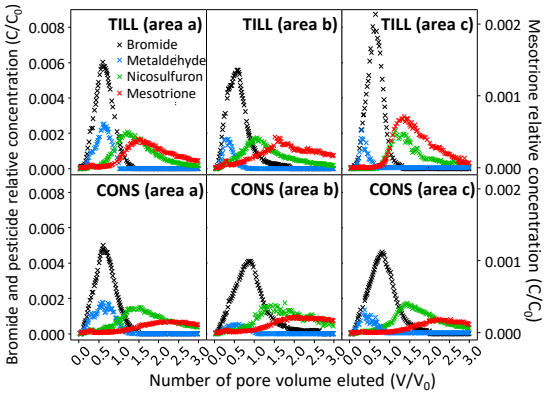
Gers
Stagnic Luvisol



CONS > 15 years TILL > 40 years

RESULTS

Vermic Umbrisol

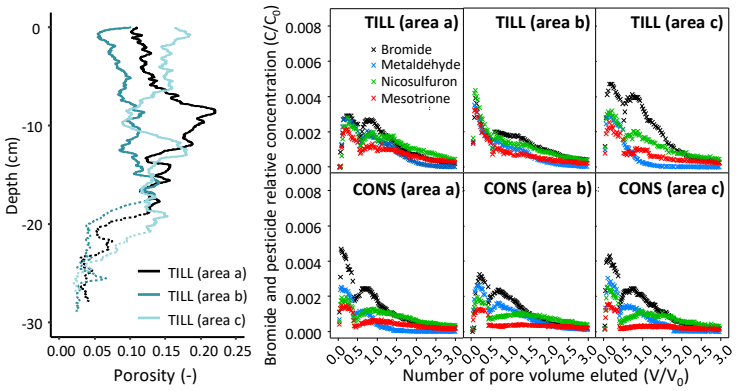


Physical non-equilibrium under both agricultural managements

Pesticide order of arrival was expected according to their **sorption properties**, but expected delays were **overestimated**

Nicosulfuron and mesotrione arrival were **delayed**, even **more** under conservation agriuclture

Stagnic Luvisol



Physical non-equilibrium under both agricultural managements (faster transfers than in the Vermic Umbrisol)

Early and **simultaneous** breakthrough of all solutes
No peak delay, inconsistent with the sorption properties

⚠ the length of the TILL columns was reduced due to a significant **decrease in soil porosity** that prevented water flow

CONCLUSIONS

- **Soil type** strongly influenced water and pesticide transfers

Cueff et al. (2020), *Geoderma,* vol. 377, p. 114590.

- The **effect of agricultural practices differed according to soil type** :

Vermic Umbrisol	the risk of transfer was not enhanced under conservation agriculture
Stagnic Luvisol – TILL	flows below a depth of 20 cm were prevented
Stagnic Luvisol – CONS	two decades of conservation agriculture restored the transfers up to a depth of 30 cm

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