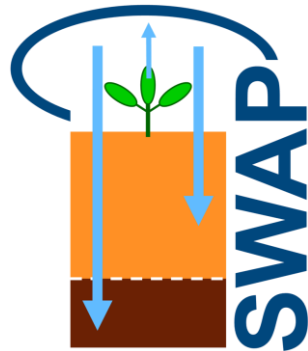


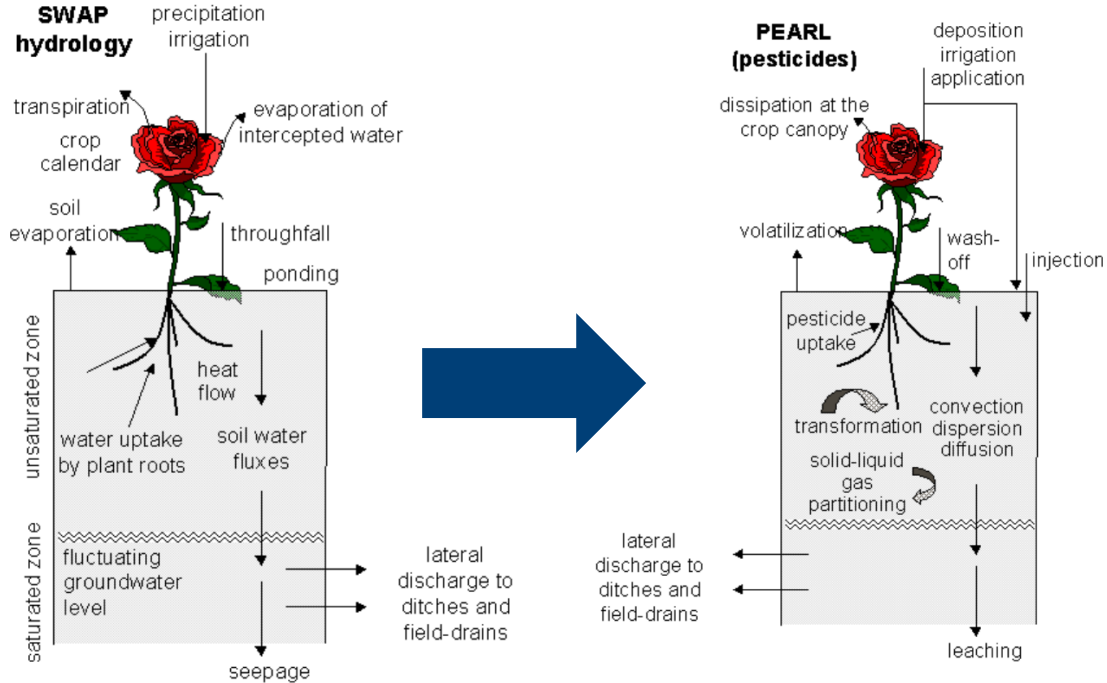
The effect of dynamic soil properties due to ploughing on pesticide leaching to groundwater

Pavan Cornelissen, Louise Wipfler, Maarten Braakhekke, Marius Heinen
Wageningen Environmental Research

22 November 2024

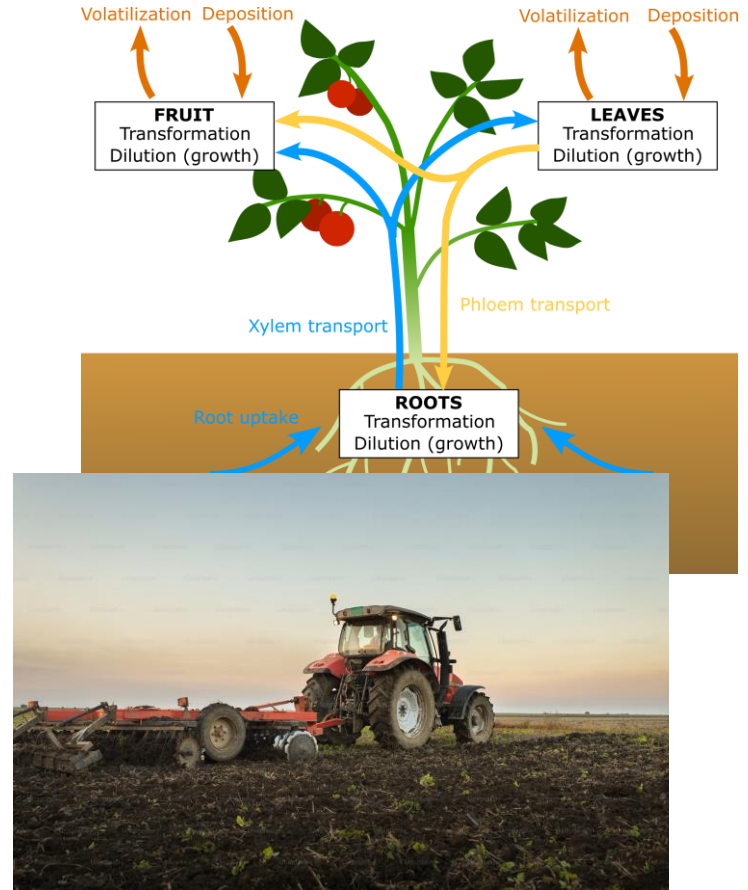


PEARL model



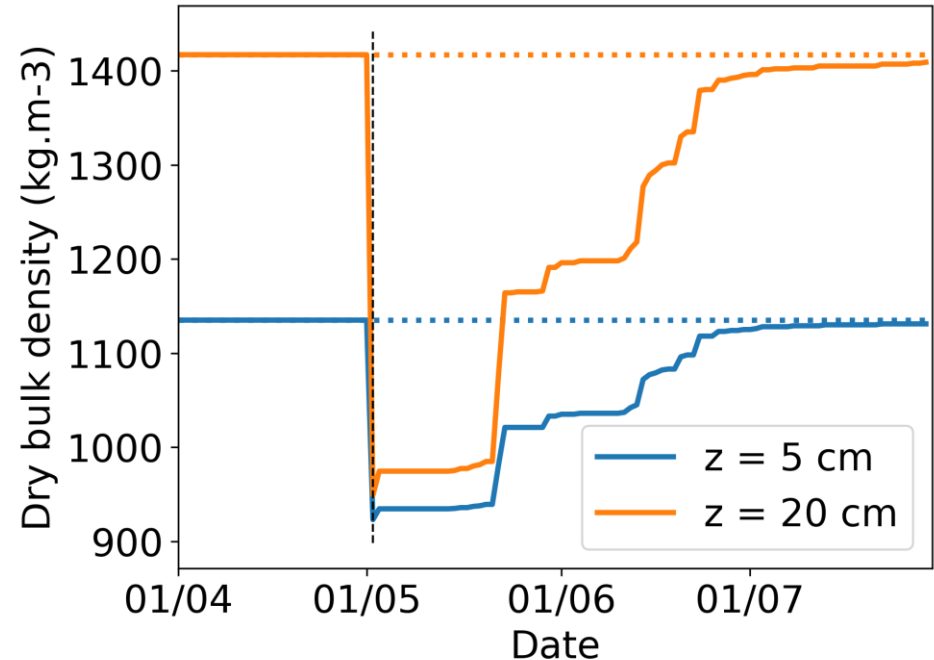
Research topics PEARL

- Transport of PFAS and ionizable substances
- Uptake of chemicals by plants
- Comparison of different macropore concepts
- Effect of dynamic soil properties on pesticide transport

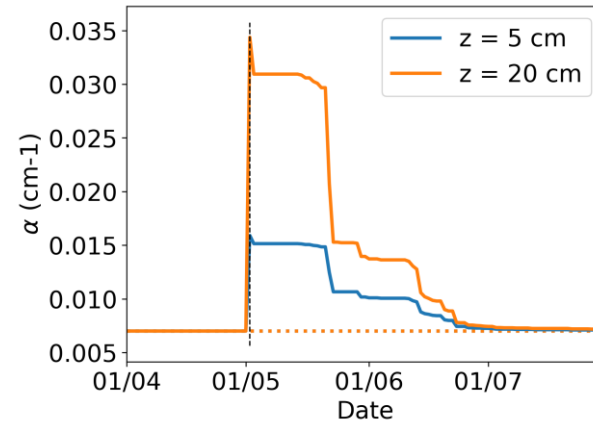
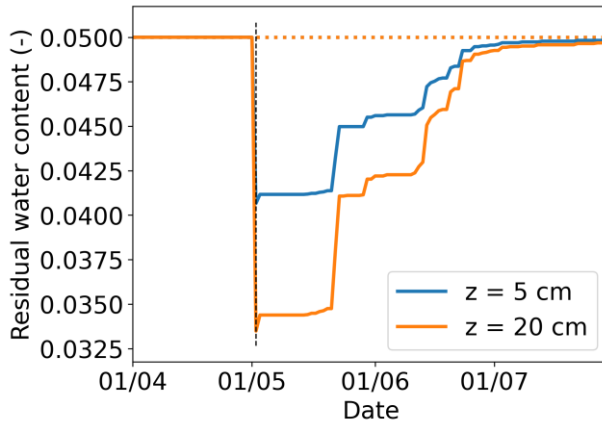
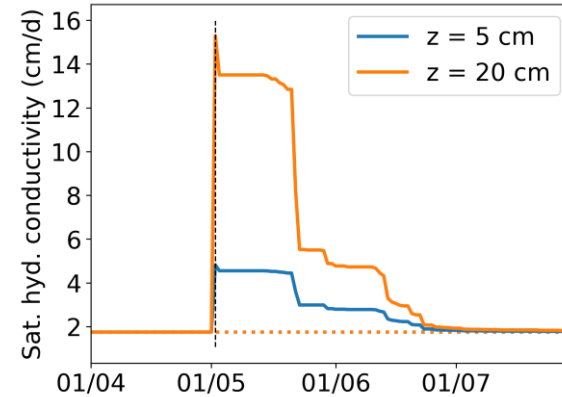
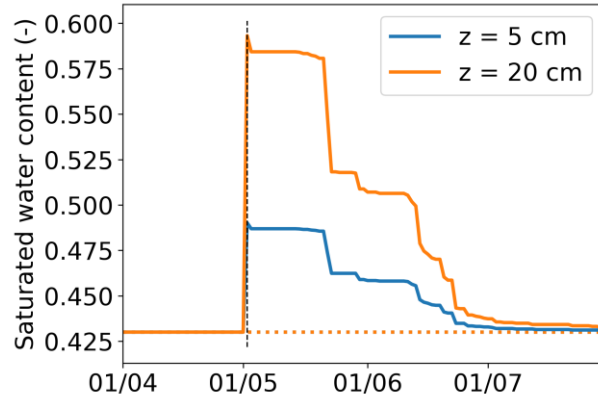


Ploughing and consolidation

- Ploughing leads to reduction of bulk density
- Consolidation increases bulk density under influence of rainfall
- Empirical relationship from Larsbo and Jarvis (2003)



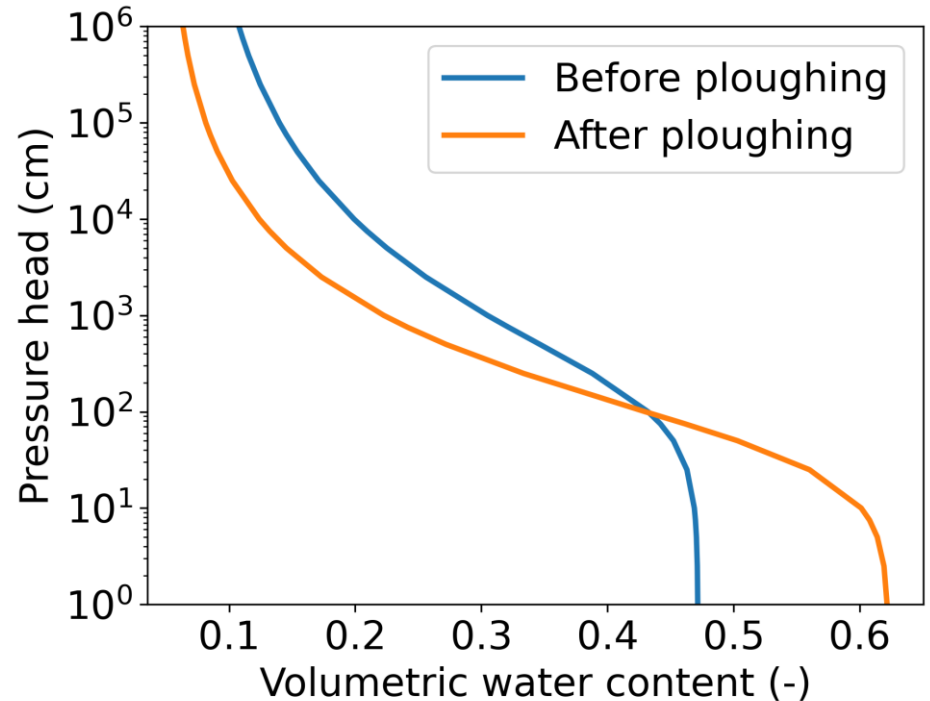
Soil hydraulic properties



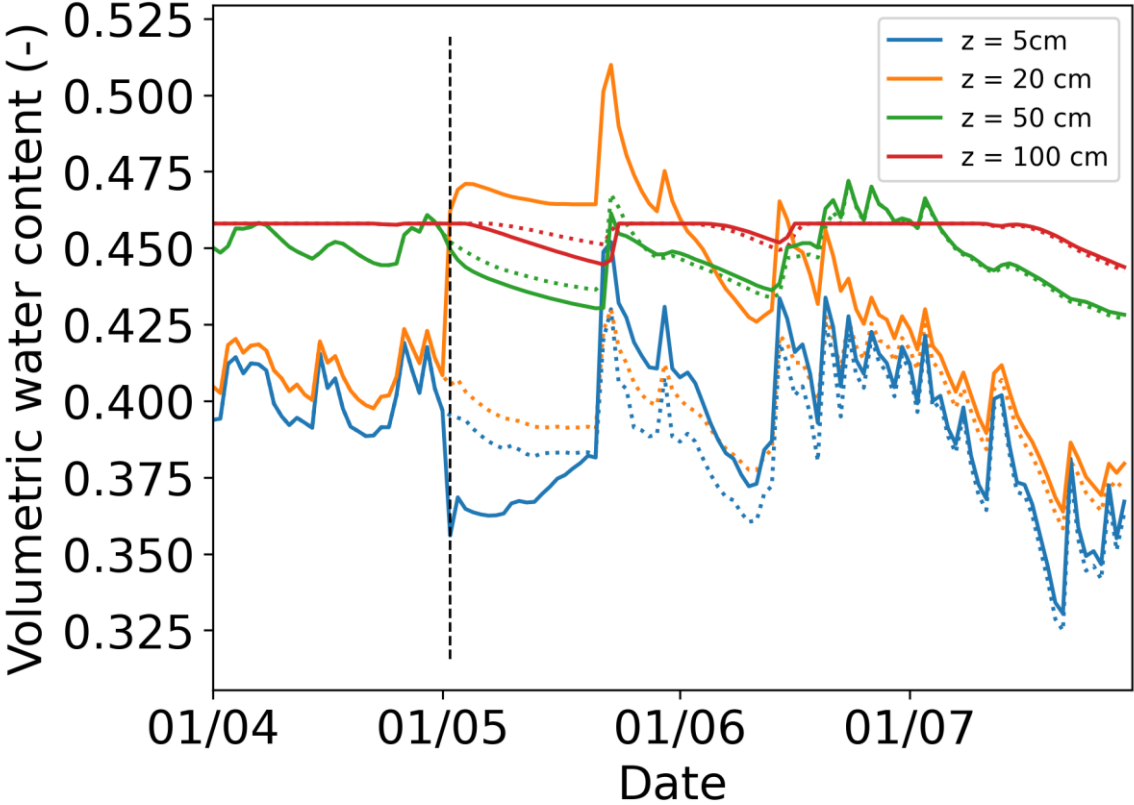
Assouline (2006), Tian et al. (2018), Kool et al. (2019)

Implementation in SWAP

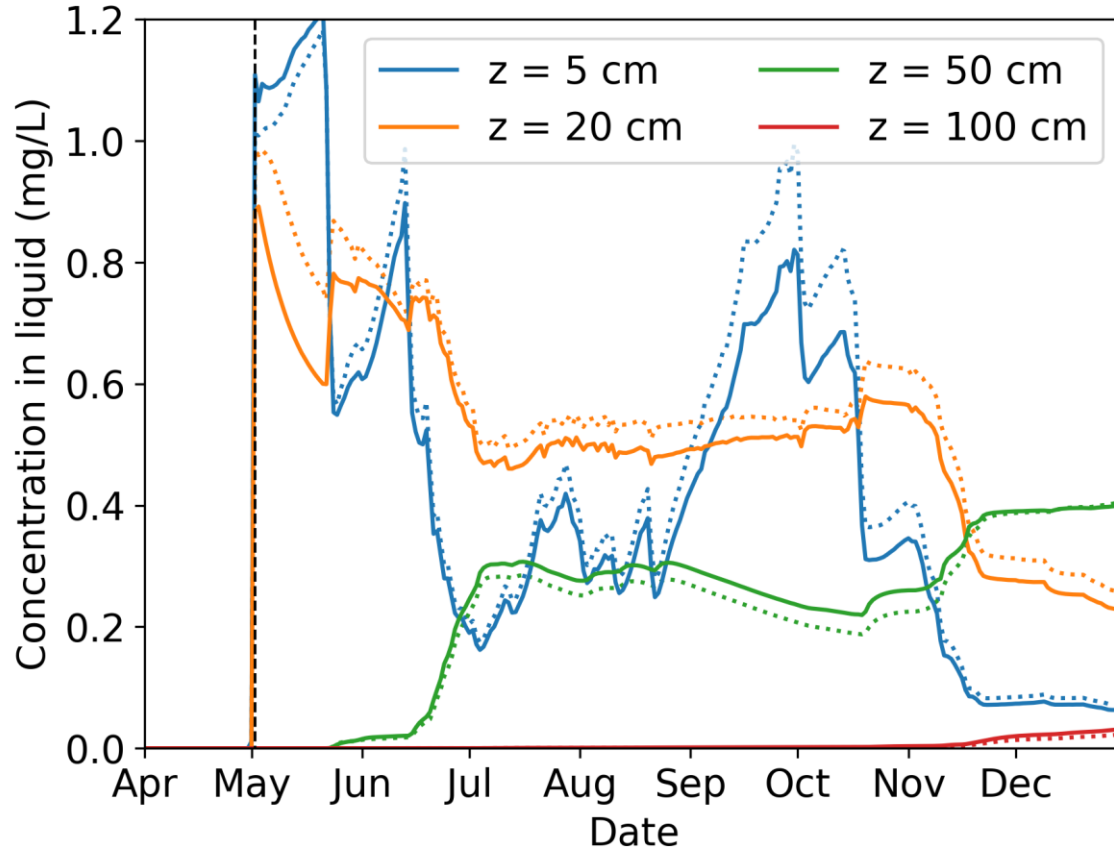
- Soil hydraulic properties are constant in Richard's equation
- Soil properties updated separately
- Then conservation of water is not guaranteed!



Short-term effect on water content



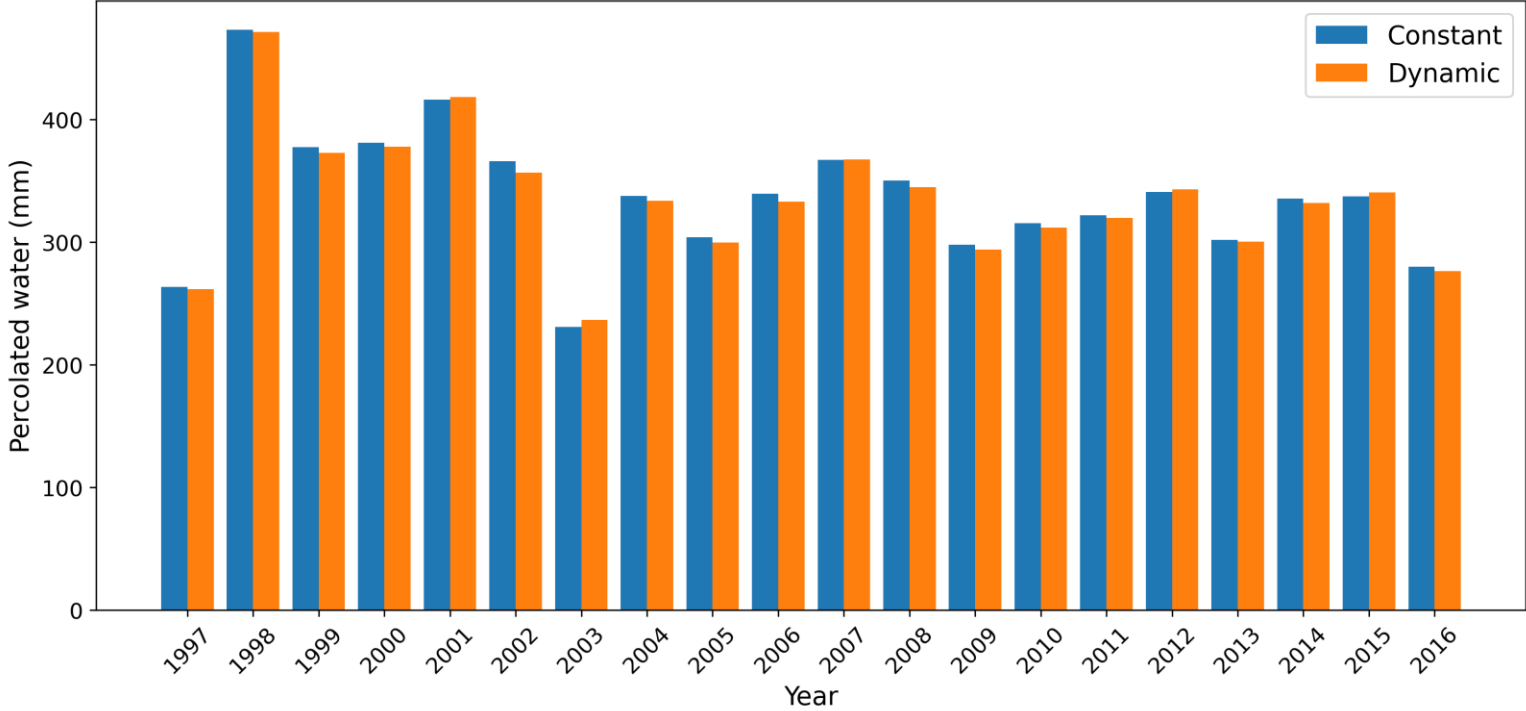
Short-term effect on pesticide concentration



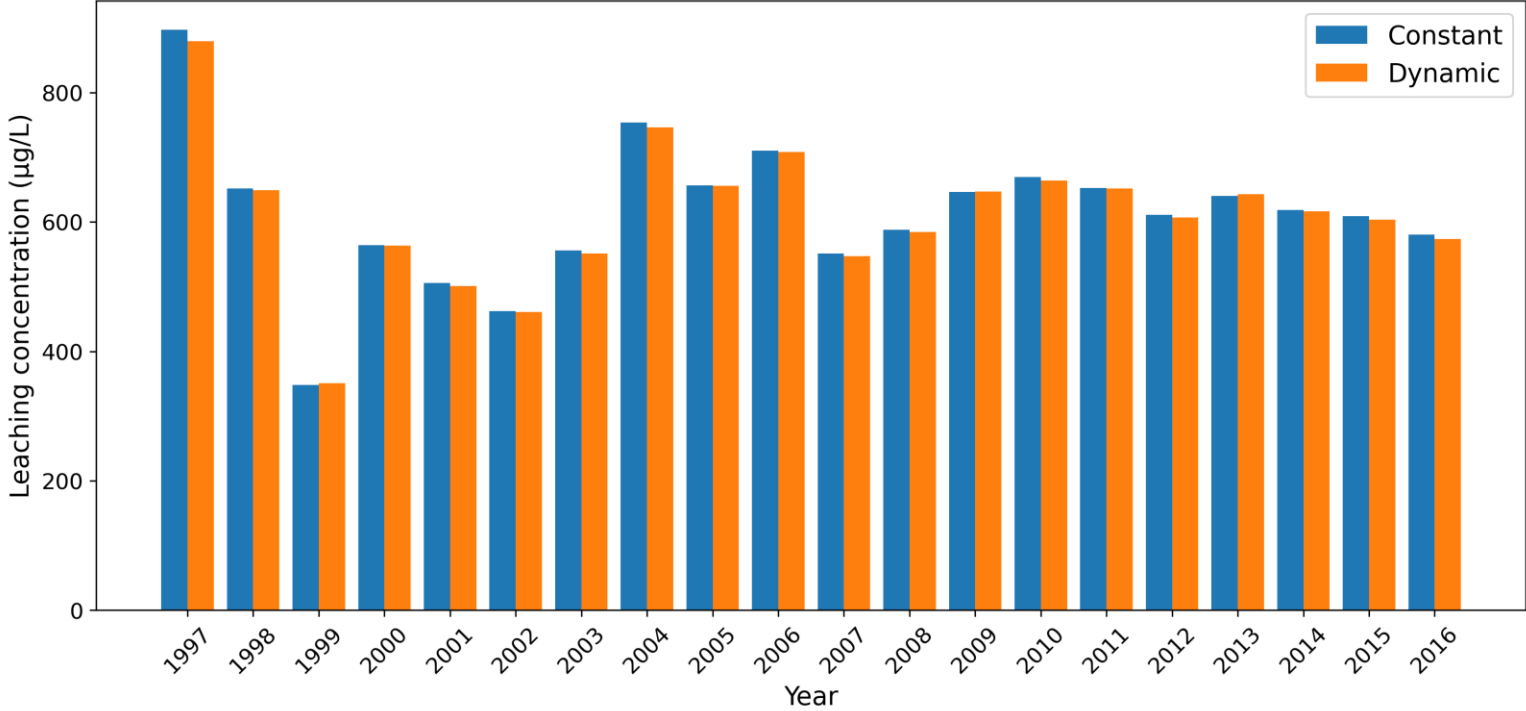
Long-term effects

- Pesticide leaching assessment:
 - Simulate 20 years
 - Take the 80th percentile of the 20 annual leaching concentrations

Long-term effects



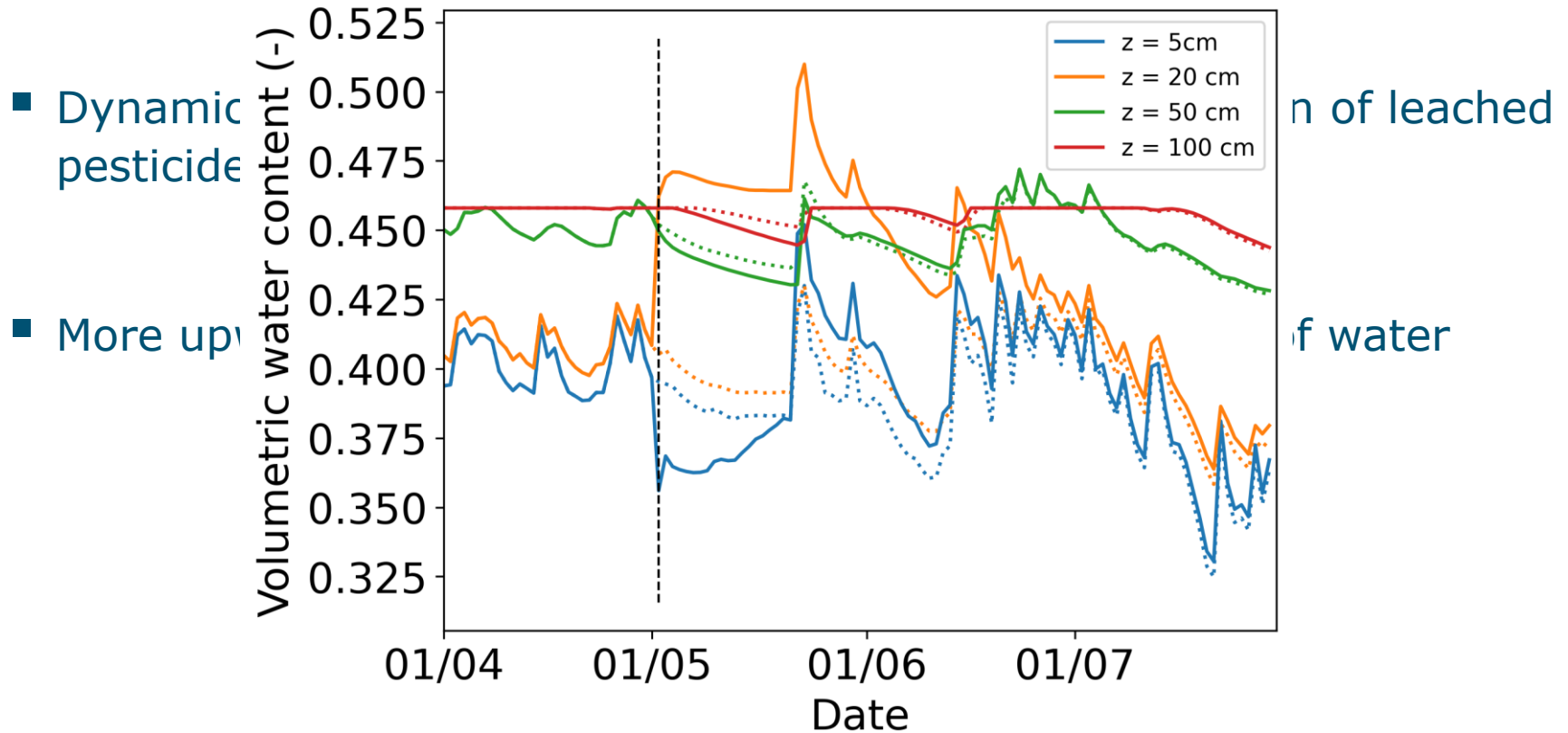
Long-term effects



Long-term effects

- Pesticide leaching assessment:
 - Simulate 20 years
 - Take the 80th percentile of the 20 annual leaching concentrations
- For Dutch climate, effect of dynamic soil properties < 1%
- For Sevilla climate, effect of dynamic soil properties < 5%

Long-term effects



Recommendations

- Investigate other options for water redistribution
- One soil type and two different weather datasets
- Only matrix flow was considered
 - What about macropores?