



Pesticide and Nitrate Monitoring in Seepage Water and Soil

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Introduction

- Around 48 000 t pesticides are being applied per year on German agricultural soils – using 270 active compounds
- Soil properties, land use and the chemical characteristics of compounds define their occurrence in solids and seepage water
- Thus, Atrazine, although banned in Germany since 1991, is still found widespread in soils

Objectives

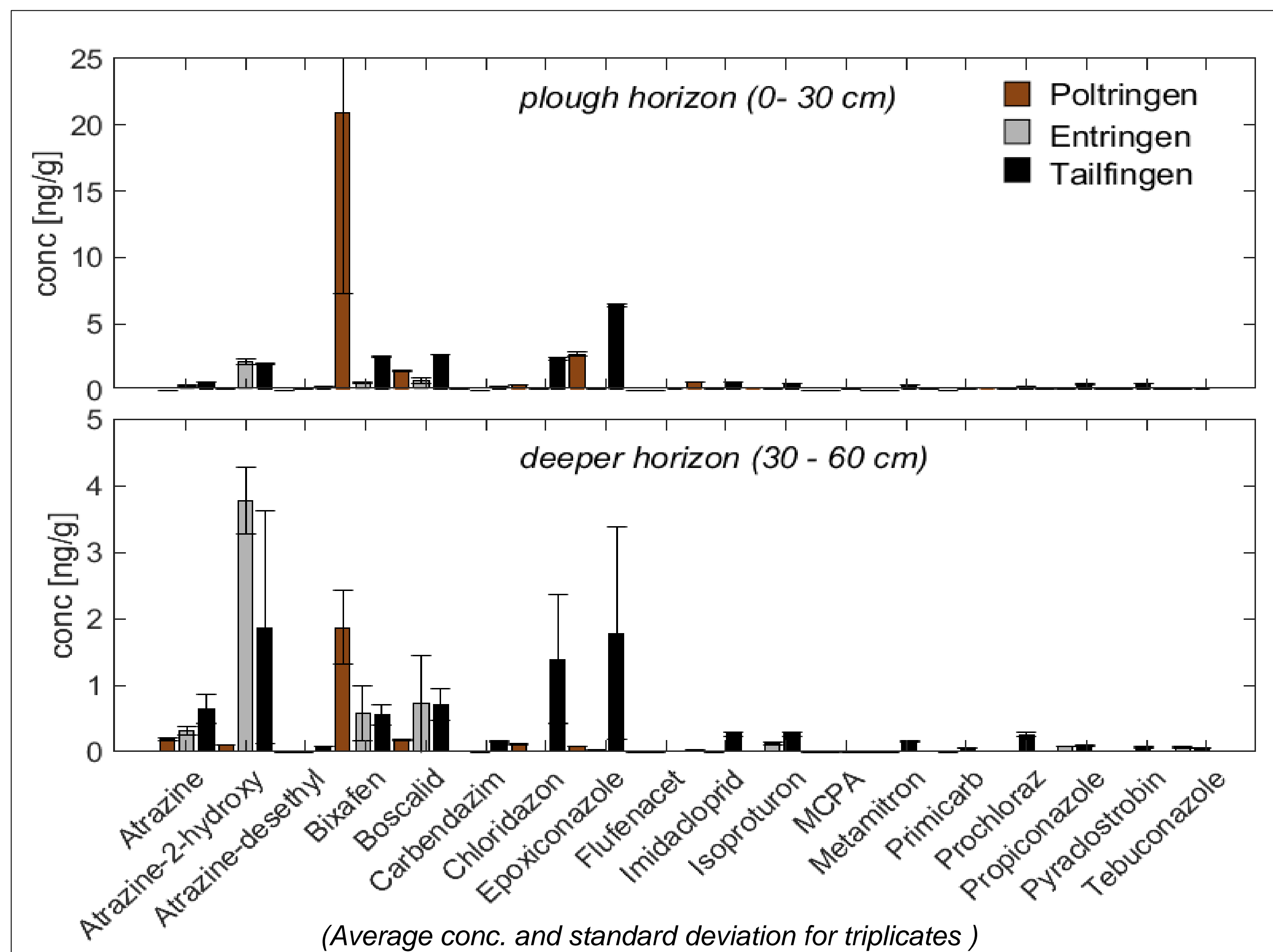
- 1.) Characterization of field sites; focus on pesticide inventory
- 2.) Identification of water and nitrate fluxes and relevant pesticide concentrations
- 3.) Determination of the sorption properties for Atrazine and Desethyl-Atrazine

Methodes

- Exhaustive extraction of two soil horizons; 0- 30 cm and 30- 60 cm depth
- Continuous in situ monitoring with tension controlled suction plates provides the accessible soil water
- Sorption tests performed at 20°C

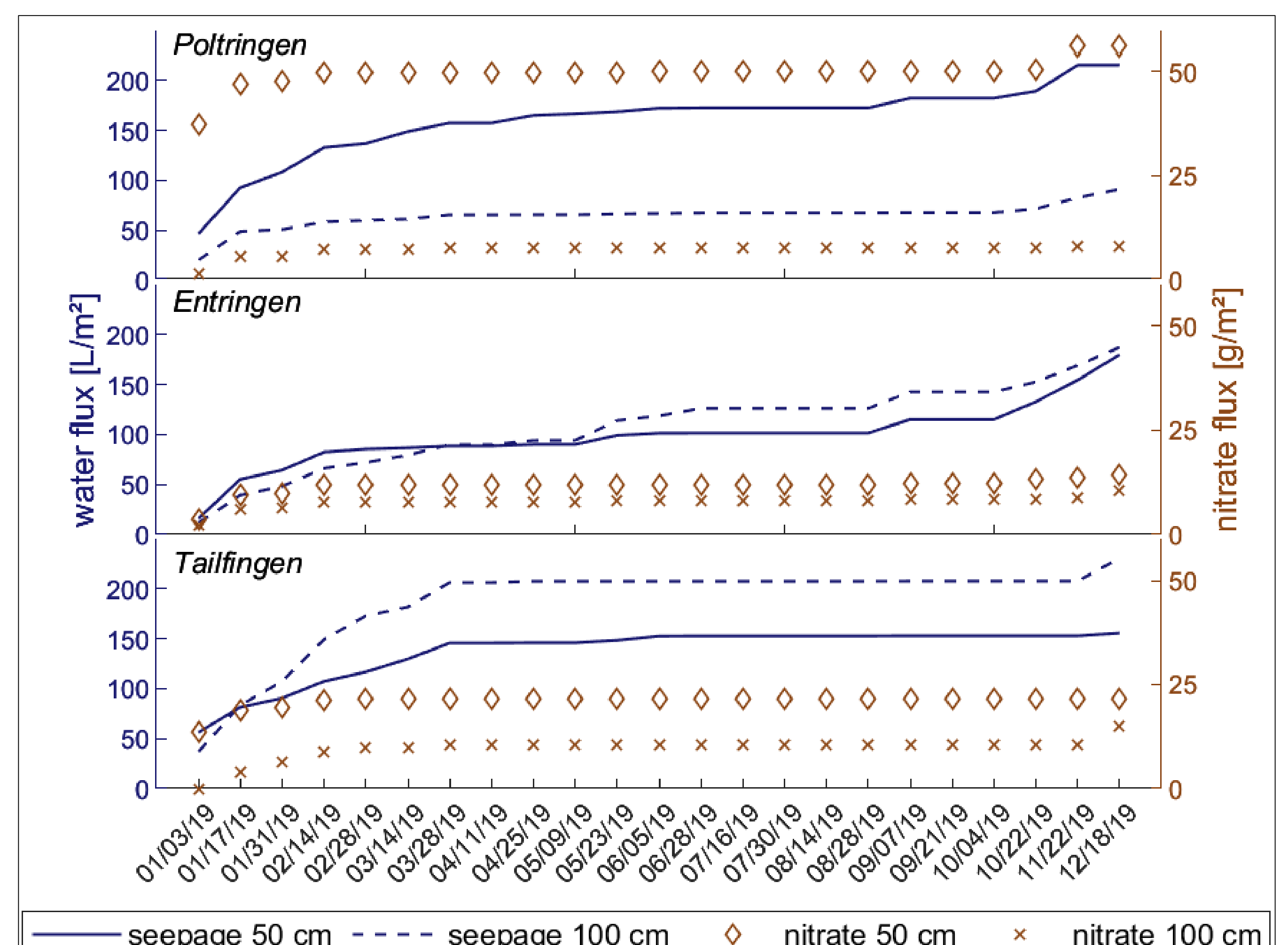
Results

1.) Pesticide inventory in bulk soils



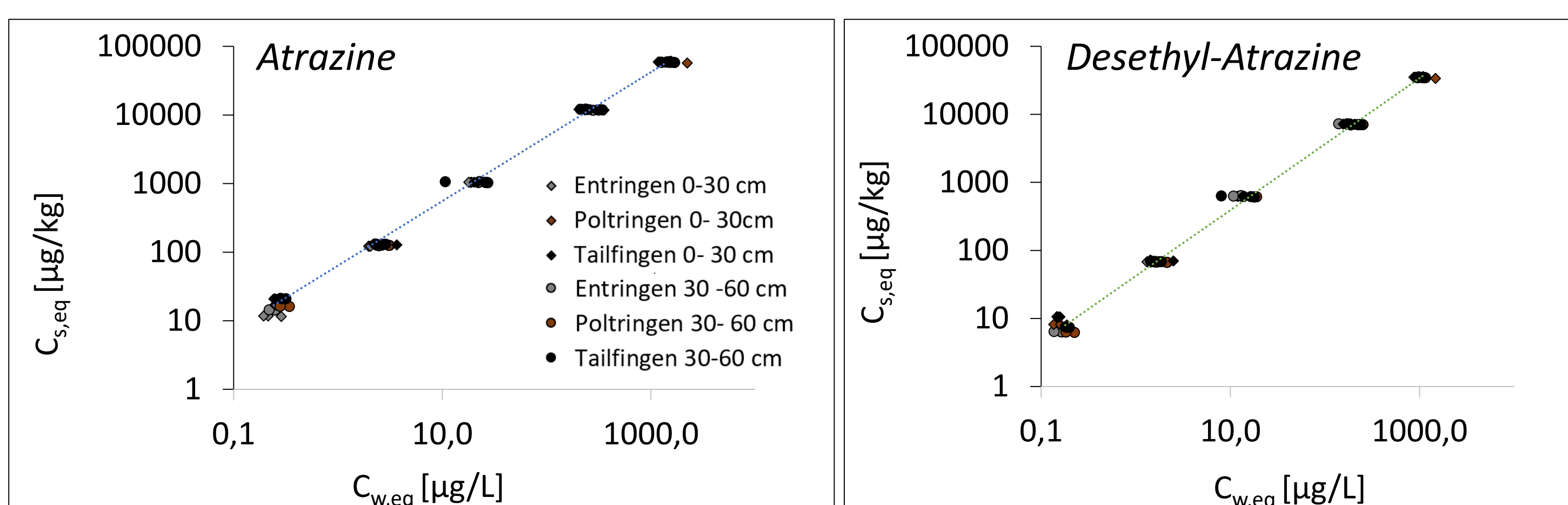
→ Higher concentrations in plough horizon, except for Atrazine and Atrazine-2-hydroxy

2.) Cumulative water and nitrate fluxes



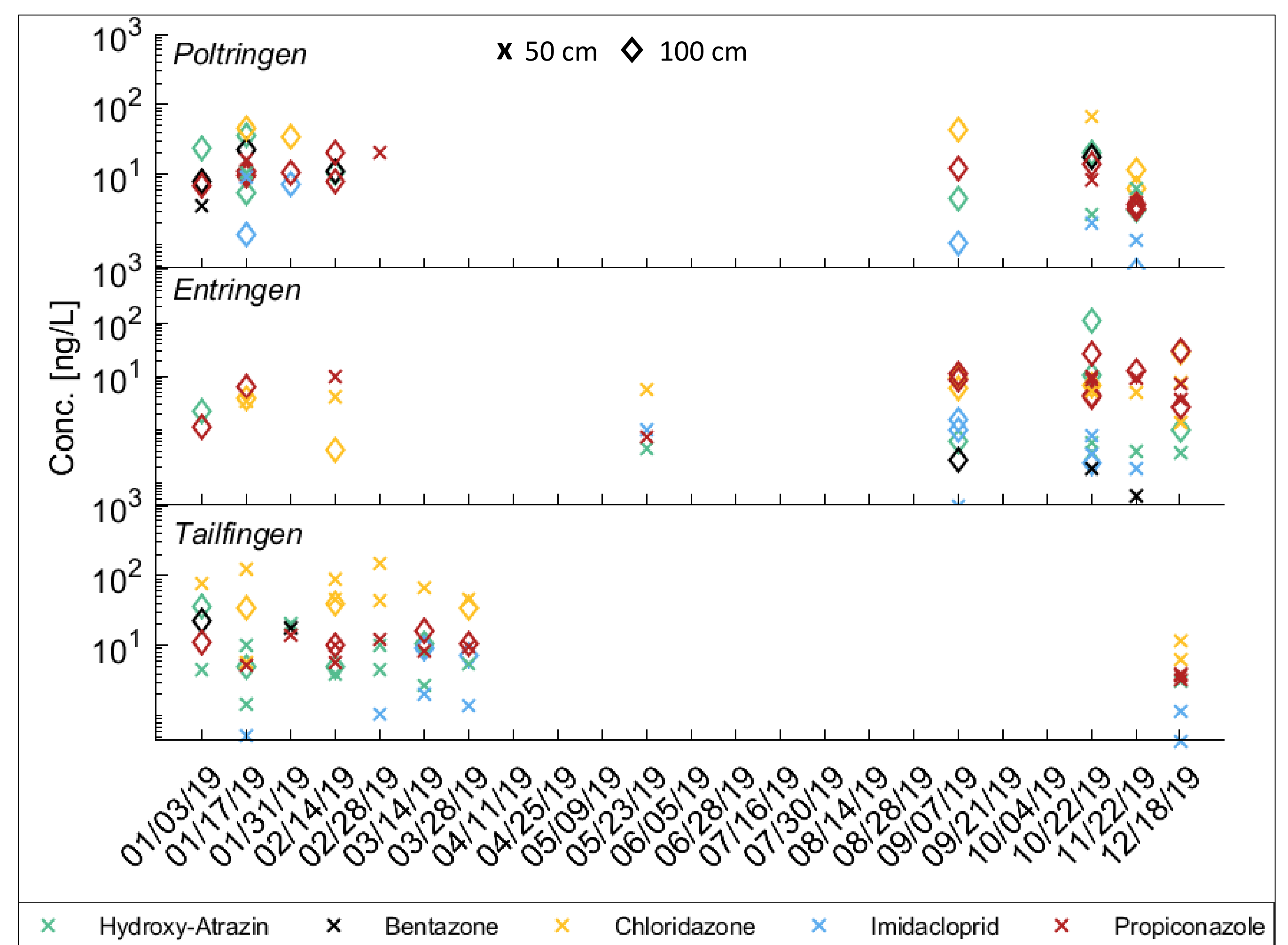
→ Nitrate flux correlates directly to water flux: highest during winter

3.) Sorption isotherms



sorption properties 20°C		Atrazine		Desethyl-Atrazine	
study site	soil depth	KFr	1/n	KFr	1/n
Poltringen	0 - 30 cm	60	0.94	47	0.94
	30 - 60 cm	46	0.98	33	1
Entringen	0 - 30 cm	56	0.97	49	0.96
	30 - 60 cm	55	0.97	44	0.98
Tailfingen	0 - 30 cm	64	0.94	53	0.93
	30 - 60 cm	63	0.93	42	0.97

→ Almost the same sorption in all soils for both compounds



→ Pesticide concentrations in seepage water independent of soil depth

Summary

- 1.) Broad range of compounds detected at all sites, lowest concentrations in Poltringen (organic farming), generally higher values in plough horizon
- 2.) Seepage water only accessible during autumn and winter, pesticides in seepage water, do not directly correlate to soil inventory
- 3.) Sorption of Atrazine and Desethyl-Atrazine (and low water contents) may lead to enhanced persistence in soils

Outlook

- 1.) Determination of desorption enthalpies for all detected compounds
 - 2.) Characterization of pesticide leaching in studied soils via column tests
- Comparison of artificially produced to natural seepage water

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