



# In situ pesticide monitoring in seepage water and soil

Jana Meierdierks<sup>1</sup>, Michael Lesch, Thilo Streck<sup>2</sup>, Peter Grathwohl<sup>1</sup>

<sup>1</sup>Center for applied Geosciences, University of Tübingen

<sup>2</sup>Institute of Soil Science and Land Evaluation, Biogeophysics, University of Hohenheim

## 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 the compound define their availability for uptake, degradation or leaching
- Thus, Atrazine, although banned in Germany since 1991, is still found widespread in soils

## Objectives

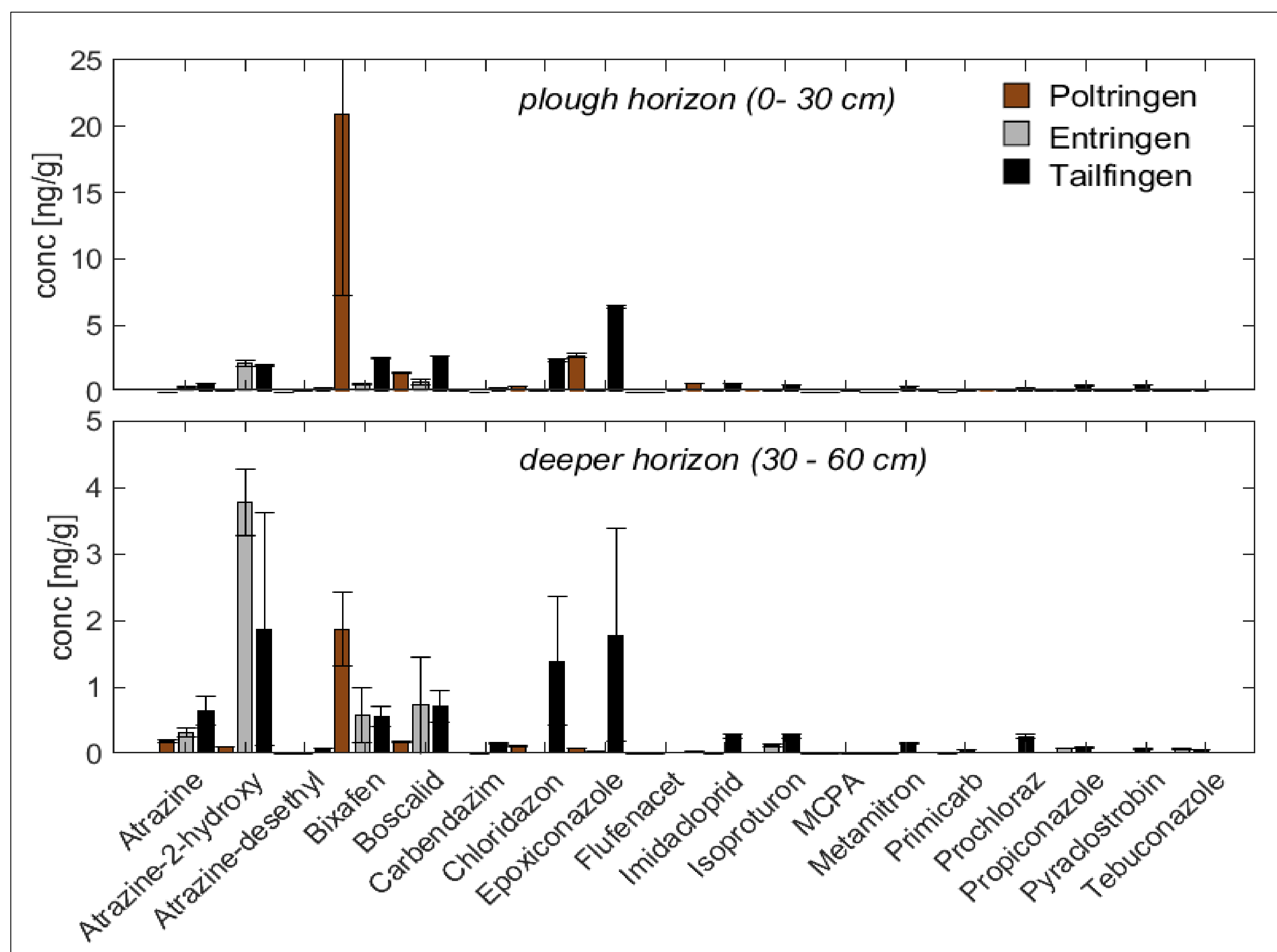
- 1.) Characterization of field sites; focus on pesticide inventory
- 2.) Identification of water and nitrate fluxes and relevant pesticide concentrations
- 3.) Determination of the sorption properties for Atrazine and Desethyl-Atrazine

## 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
- Ex situ sorption tests performed at 20°C

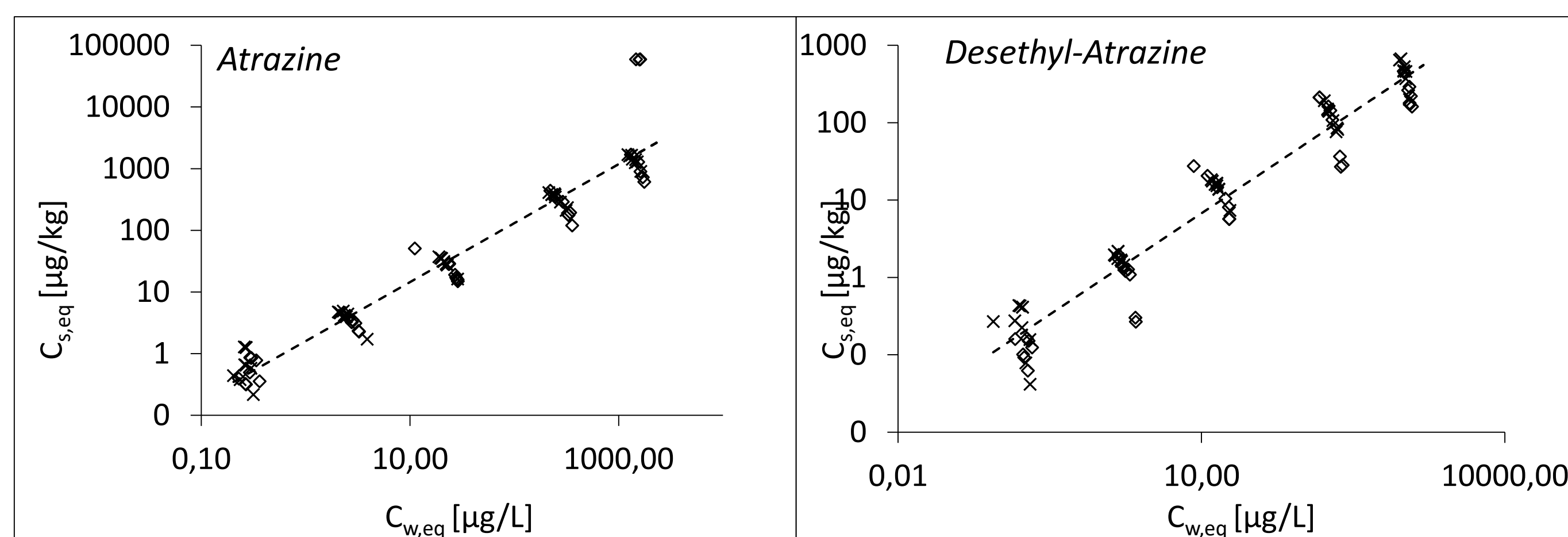
## Results

### 1.) Pesticide inventory in bulk soils



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

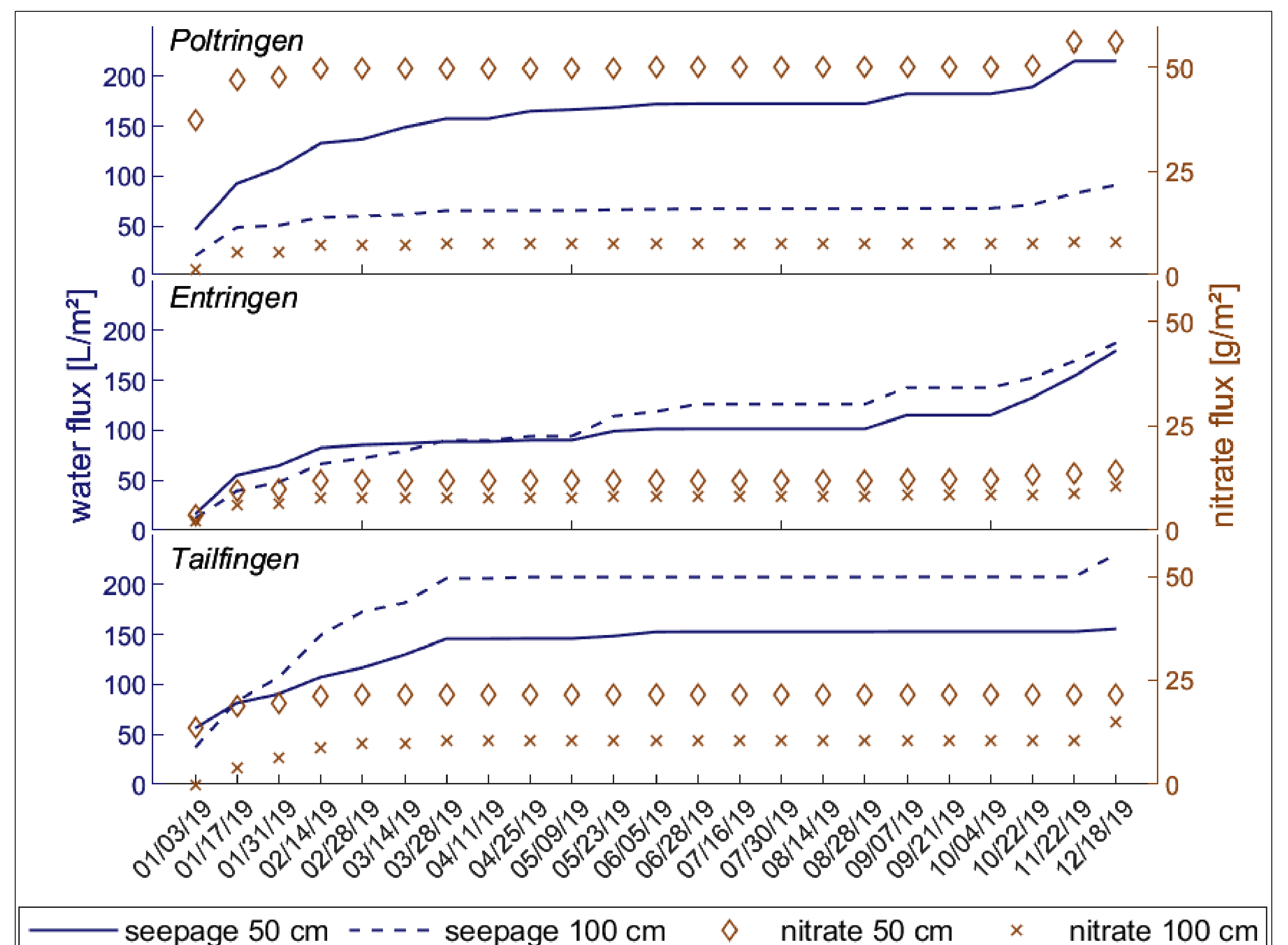
### 3.) Sorption isotherms



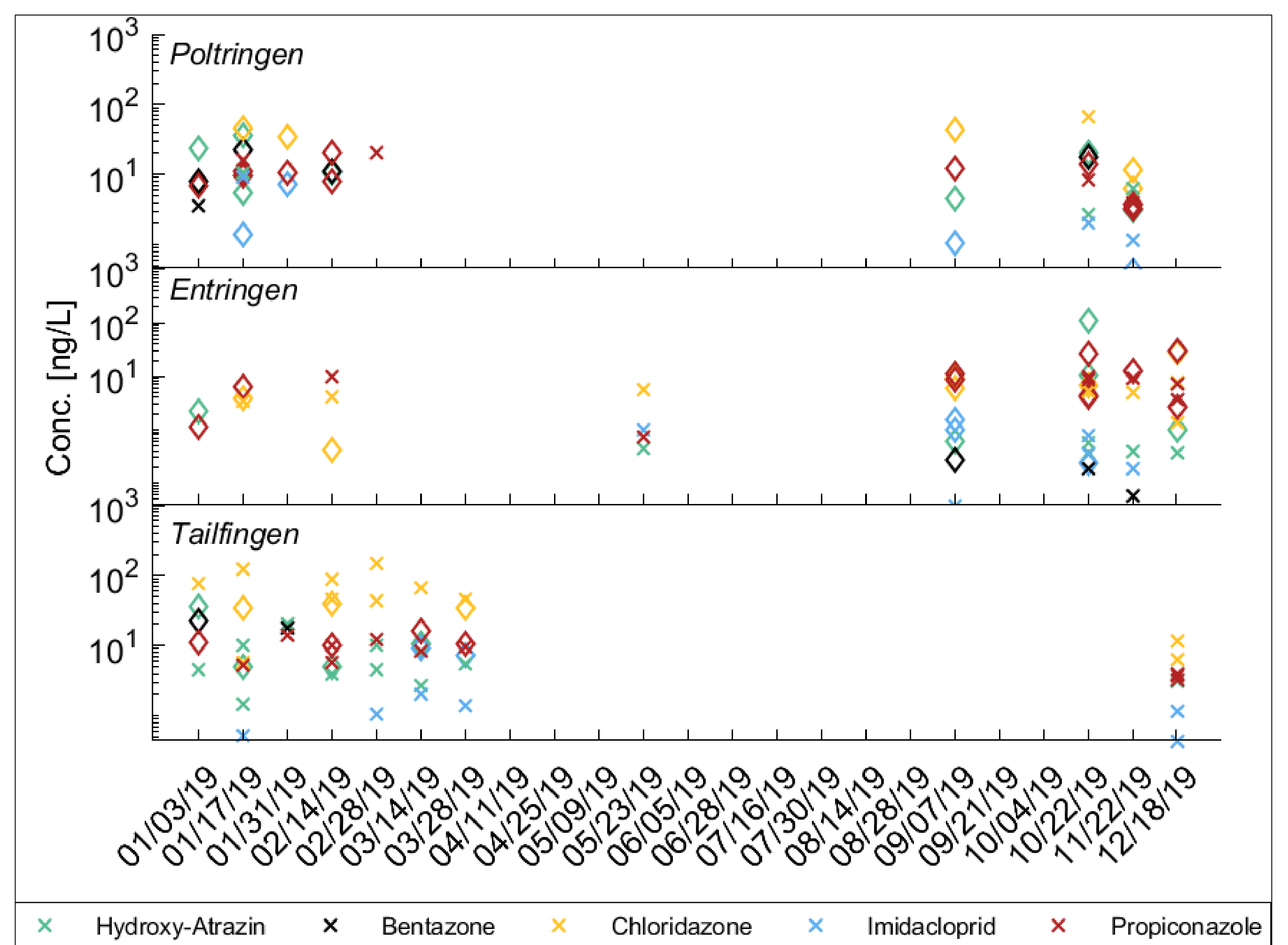
sorption properties 20°C		Atrazine		Desethyl-Atrazine	
study site	soil depth	KFr	1/n	KFr	1/n
Entringen	0 - 30 cm	2.5	0.85	1.5	0.81
	30 - 60 cm	2.2	0.86	1.3	0.85
Poltringen	0 - 30 cm	3.4	0.76	1.9	0.70
	30 - 60 cm	2.6	1.01	0.5	0.79
Tailfingen	0 - 30 cm	4.4	0.71	2.9	0.68
	30 - 60 cm	3.4	0.69	1.2	0.75

→ Very comparable sorption properties for both compounds in all soils

### 2.) Continuous monitoring



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



→ 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.) Low sorption coefficients of Atrazine and Desethyl-Atrazine cannot explain their 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

**Acknowledgement:** This work was supported by the Collaborative Research Center 1253 CAMPOS (P6: Soils), funded by the German Research Foundation (DFG, Grant Agreement SFB 1253/1 2017).

**Contact:** jana.meierdierks@uni-tuebingen.de

