

# ENVIRONMENTAL FATE OF FLUFENACET IN A LOWLAND CATCHMENT IN NORTHERN GERMANY

U. Ulrich, C. Hugenschmidt, N. Fohrer

XIV Pesticide Symposium Piacenza

# Motivation

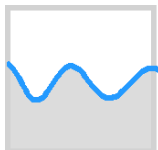
---

EU-WFD: „good ecological“ state of water bodies until 2015

- ▶ consideration of watersheds
- ▶ prevention of priority substances (e.g. pesticides) in water bodies

Knowledge about the pesticides' fate/behaviour is essential to comply with EU-WFD

- ▶ identification of main entry routes
- ▶ management strategies to reduce the input into water bodies



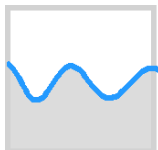
# Objective

---

Mobility of Flufenacet in a catchment study:

- herbicide discharge pattern
- effect of various scale sizes
- quantification of herbicide loss
- relevance of inputs via drainage systems

in the North German lowlands

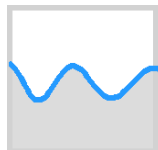


# Kielstau catchment

- size of 5000 ha
- length of river 17 km
- rural area, no industry
- dominant soil type Luvisol
- mean slopes of 4% (0-10%)
- 38 % area drained
- farmyards not connected to wtp



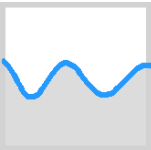
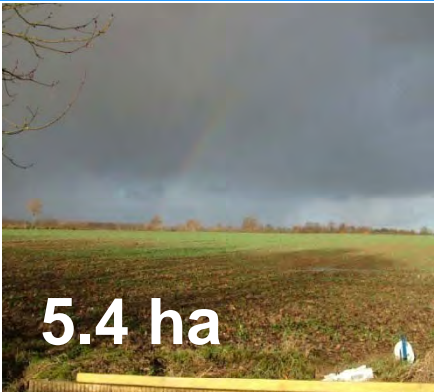
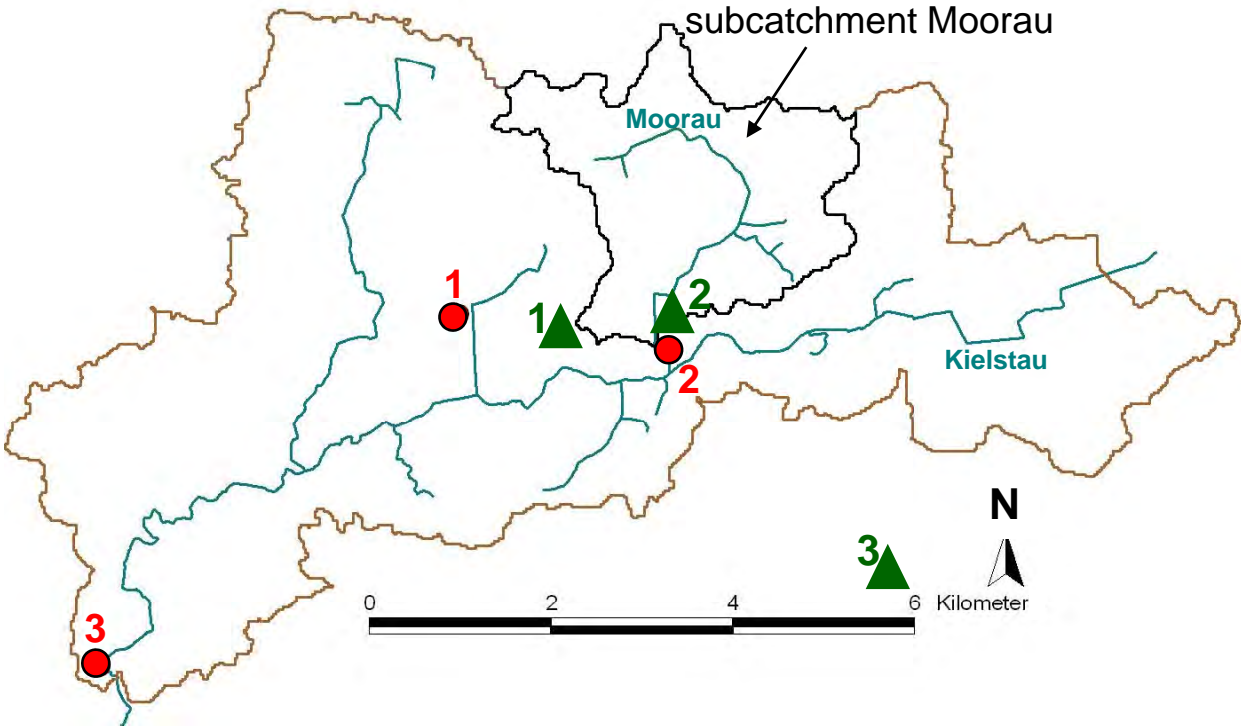
©intermap



wtp= waste water treatment plant

**Study set up**

# Monitored scales in the Kielstau catchment

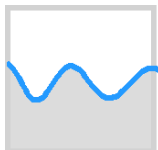


Study set up

# Observed parameters

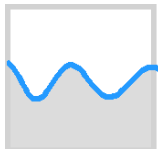
---

- soil parameters
- hydrological parameters (daily values)
- Flufenacet concentrations in water samples (daily mixed samples)
  - tile drainage und groundwater (drained field)
  - Moorau (subcatchment)
  - Kielstau (catchment)
- land use mapping and assessment of applied Flufenacet amounts in the catchment



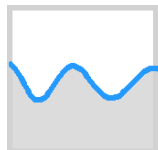
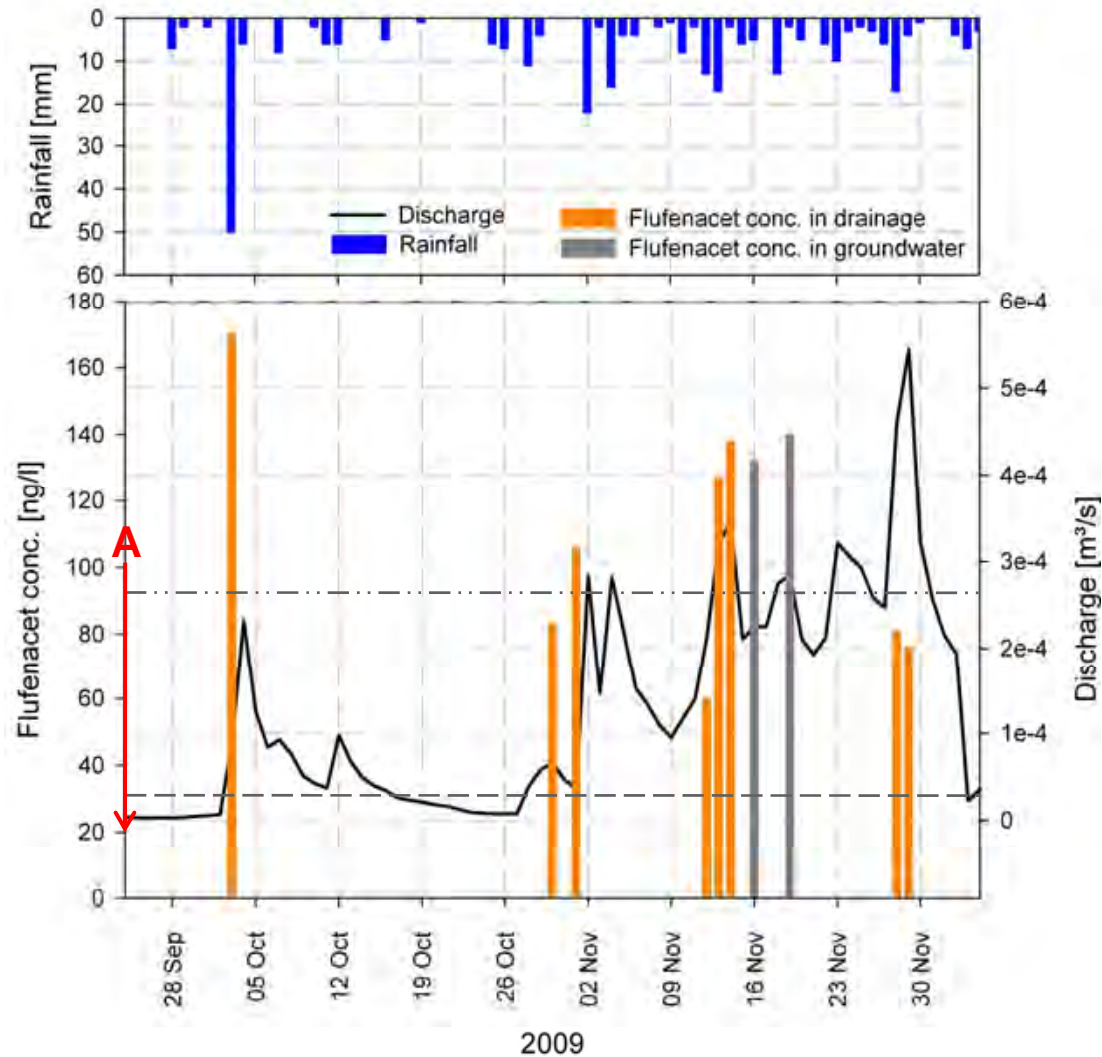
---

# Results



Results

# Hydrological discharge pattern: tile drainage



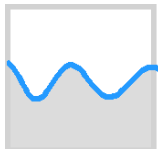
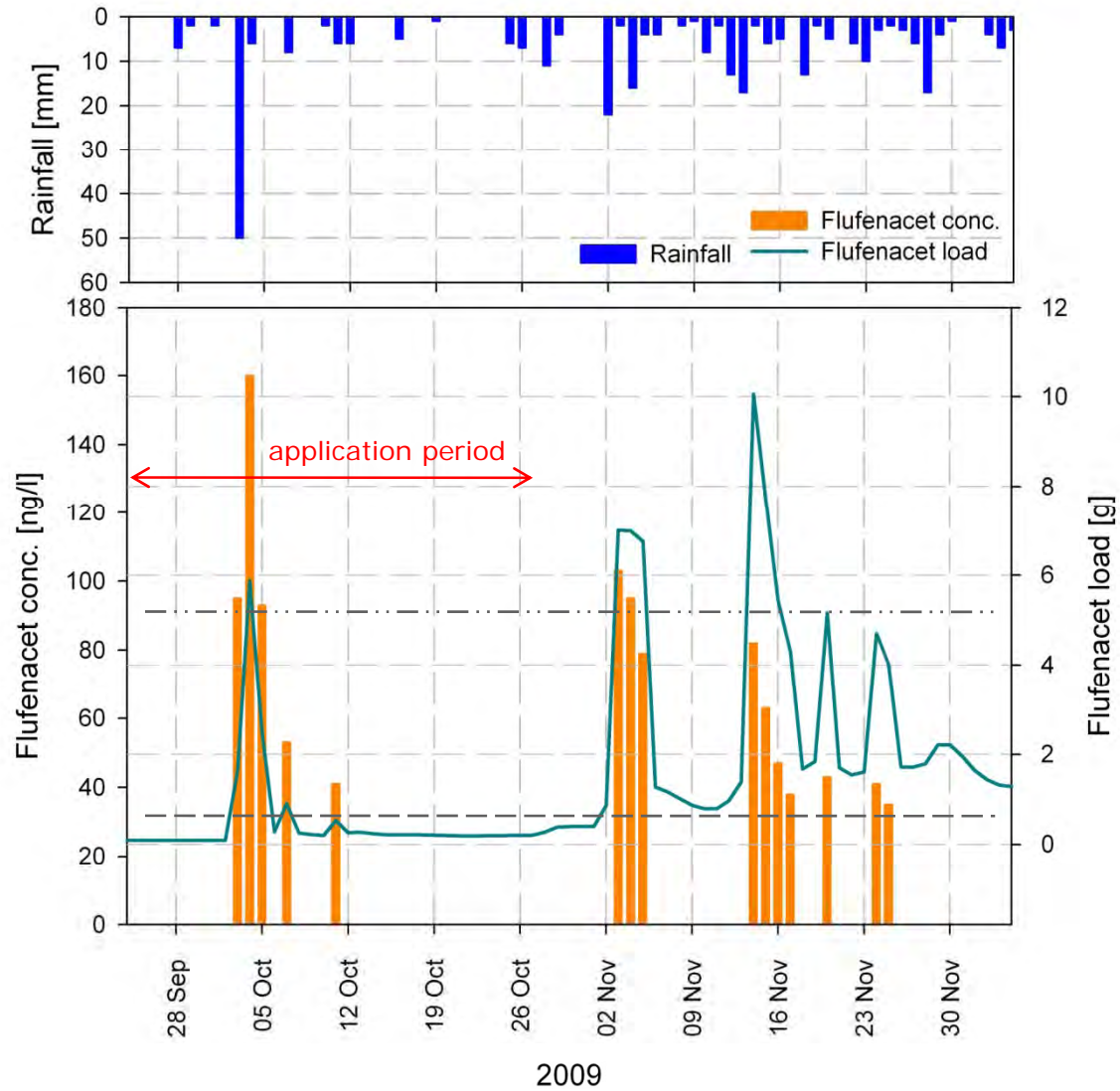
Results

— · — · — · quantification limit    - - - - - detection limit

A=application



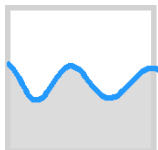
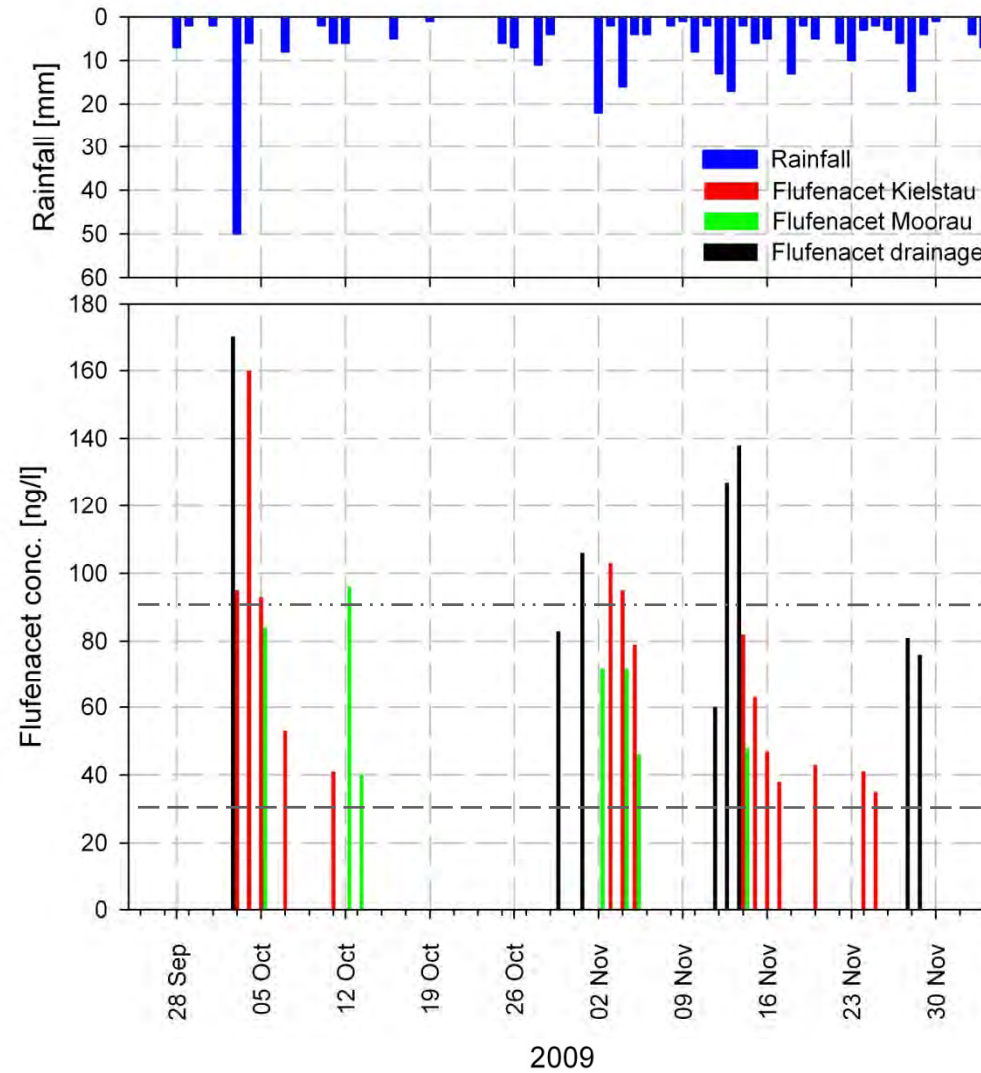
# Trends of max. concentrations and loads: Kielstau



Results

— · — · — · quantification limit    - - - detection limit

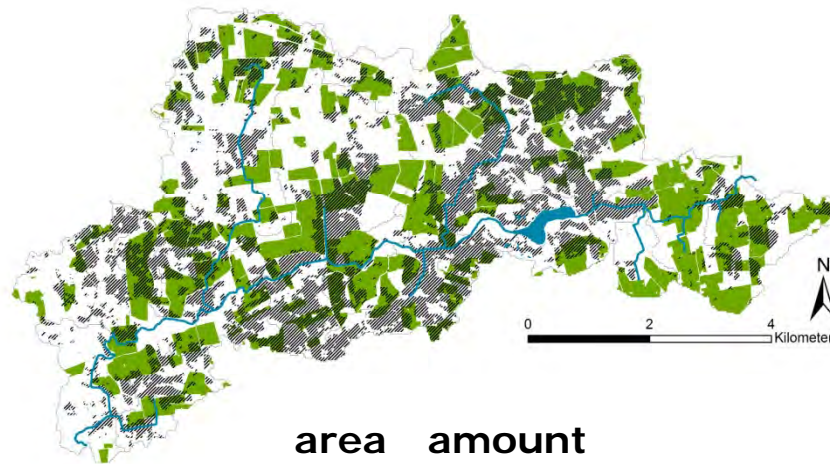
# Flufenacet concentrations on different scales



Results

— · — · quantification limit    - - - detection limit

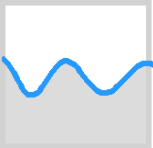
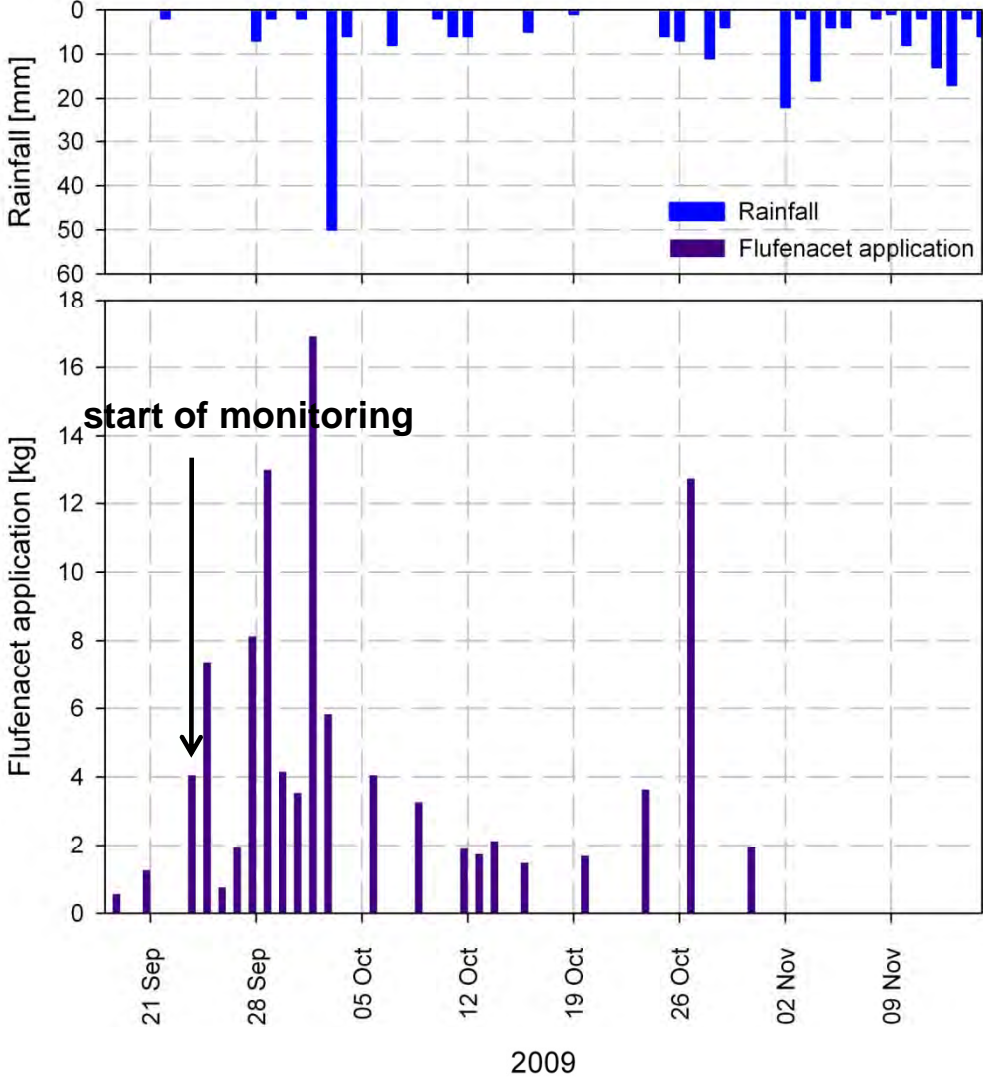
# Assessment of applied Flufenacet amounts



37 % winter grain   
 drained areas

	area ha	amount kg		area ha	amount kg		area ha	amount kg
Applica- tion data farmers	764	103	subcatch- ment Moorau	295	40	catchment Kielstau	1748	236
thereof drained	308	42	thereof drained	130	18	thereof drained	630	86

# Temporal distribution of application

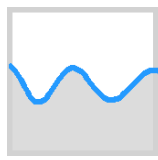


# Conclusion

## Quantification of Flufenacet losses

scale	max daily concentrations [ng/l]	total load within 70 d after application [g]	percentaged loss of amount applied [%]
field (drainage)	170	0.09-0.37	0.01-0.03
subcatchment (Moorau)	96	2-28.1	0.01-0.07
catchment (Kielstau)	160	24-157	0.01-0.07

↑  
uncertainty due to data extrapolation



# Conclusion

## Pattern of Flufenacet losses

depending on

- discharge
- transport mechanisms
- scale size
- time of application
- entry routes

herbicide relocation with pcp-induced discharge peak

fast transport of Flufenacet to tile drainage

marginal differences in concentrations

maximum concentrations with first discharge peak after application, maximum loads in 2nd half of monitoring due to increased flow

clear attribution on field scale, on larger scales mixed signal. Drainage systems relevant pathways as proportion of surface runoff accounts for 5% of total discharge (Kielstau)

