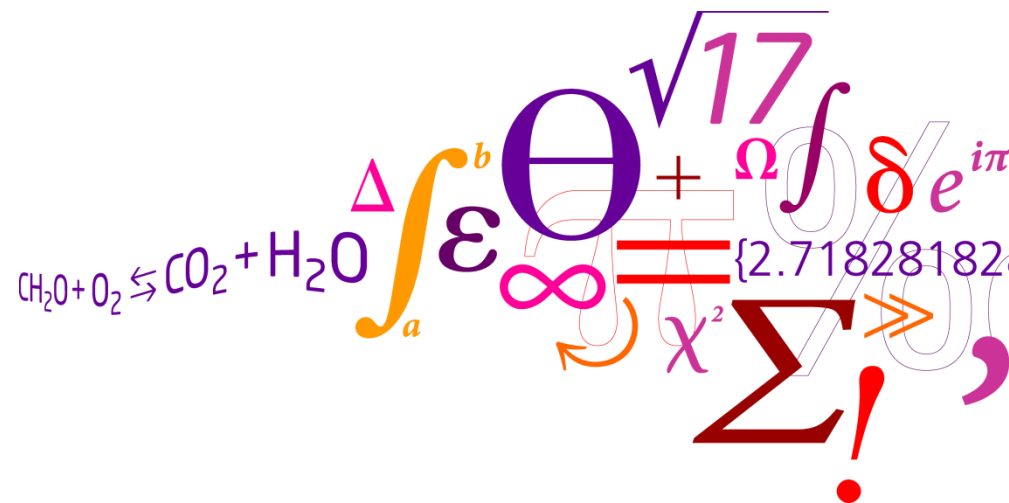


# Applicability of an activated carbon felt strip on a NAPL FLUTE™ (FACT) for DNAPL characterization

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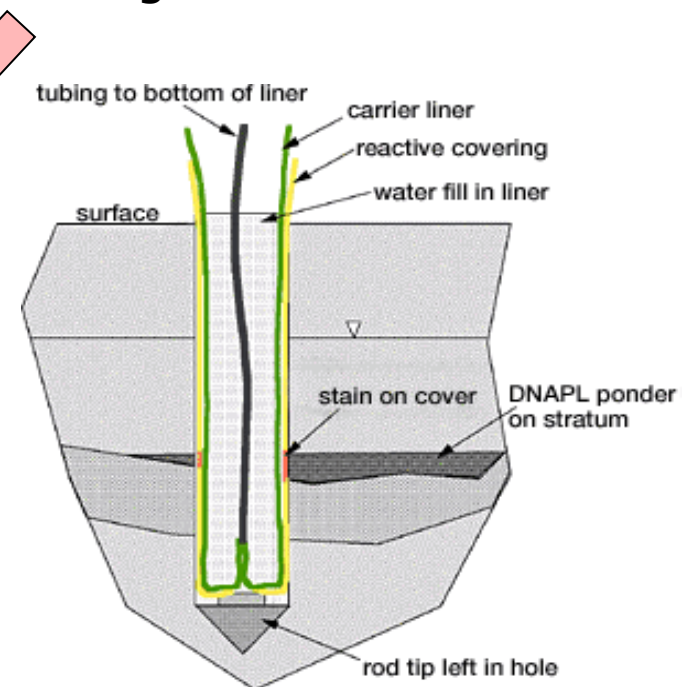


# Outline

- FACT liner and expectations
- Sorption Processes on carbon felt
- Overview of experiments (analysis, handling of the FACT & interpretation of data)
- Fieldwork
- Results
- Summary
- Conclusion

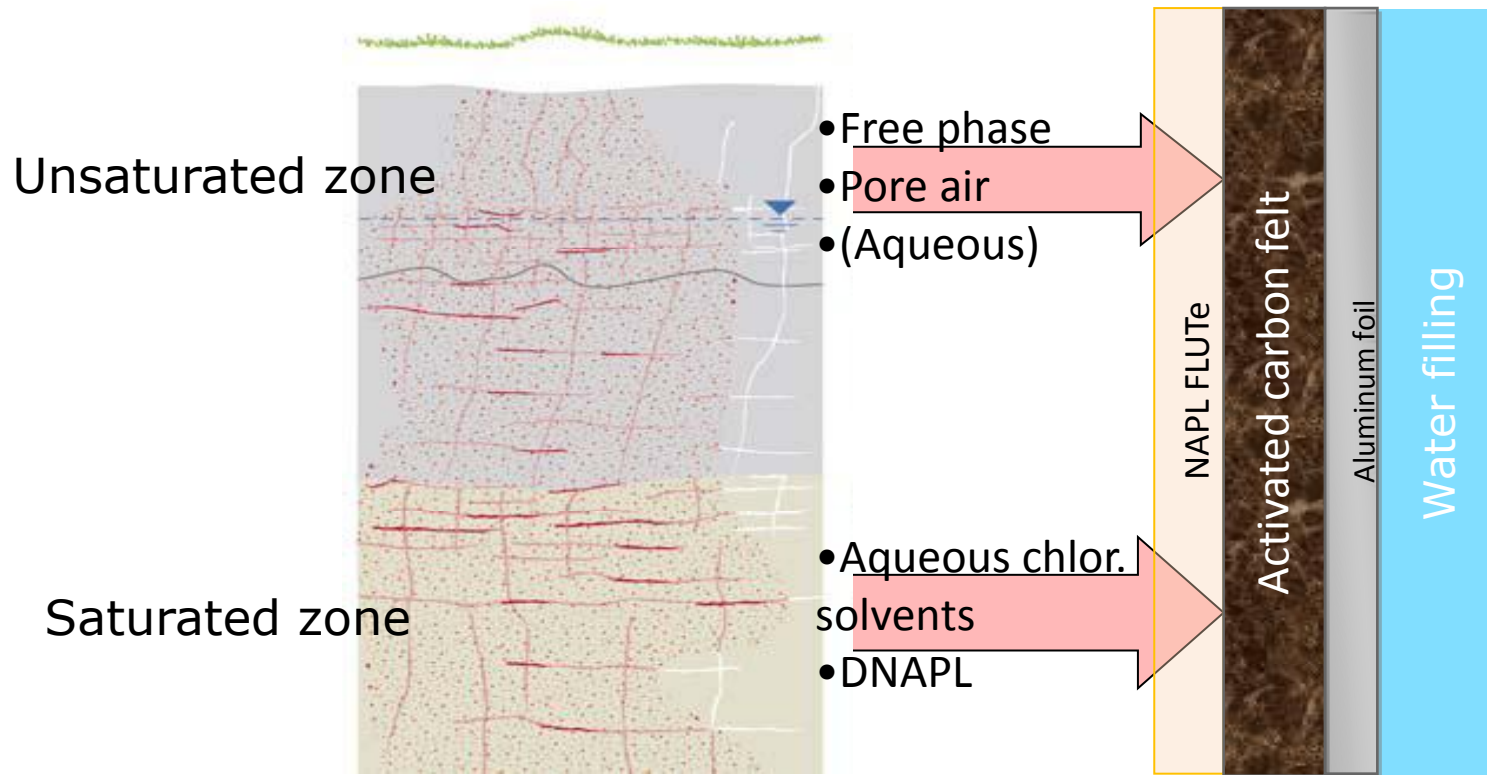
# FACT liner & Expectations

- FACT = combination of:
  - dye striped hydrophobic tubular covering - NAPL FLUTE
  - Strip of activated carbon felt



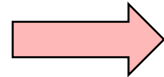
- Expectation
  - high discreet samples, determining DNAPL presence
  - differentiate high aqueous conc. & DNAPL

# Sorption processes on carbon felt



# Overview of experiments

**Lab experiments**

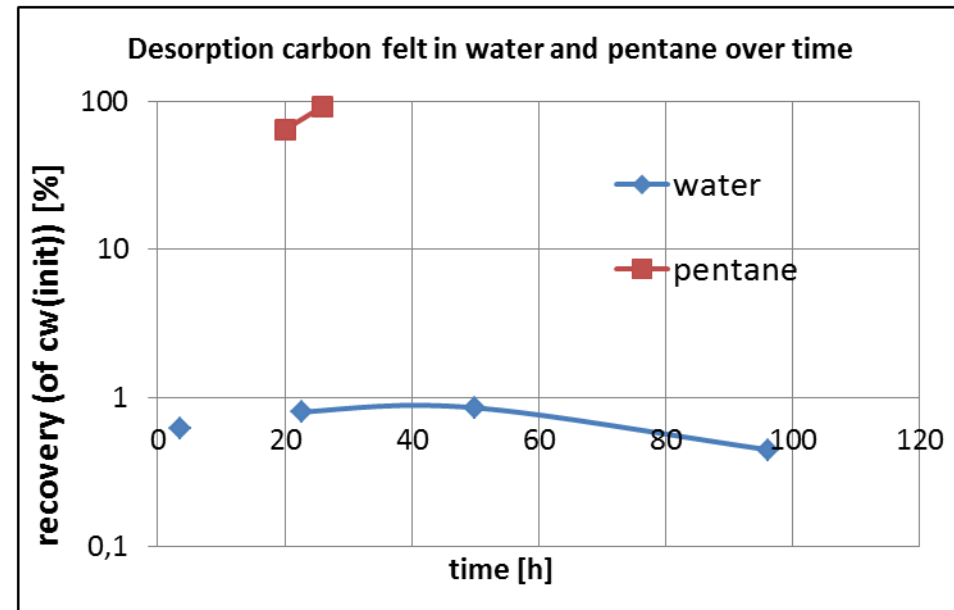
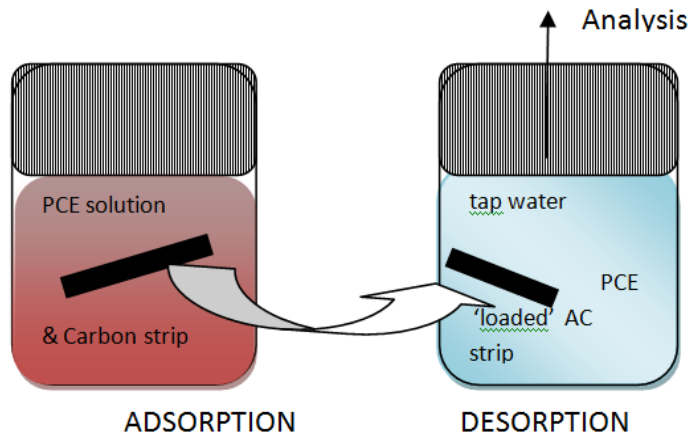


**Field work**

step	Aim/results obtained	Information used for field work
<b>Extraction/ Desorption</b>	extraction method(s), equilibrium times	→ Analysis of carbon felt
<b>Adsorption</b>	Equilibrium times	→ application time in field
<b>Discretization</b>	long and short samples	→ Size of samples
<b>Staining</b>	Different staining at different concentr.	→ Interpretation of field work samples
<b>Sorption in different phases</b>	concentration range	→ corresponding concentration in matrix

# Analysis of carbon felt - Extraction

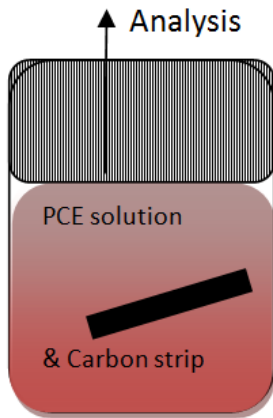
- Water vs pentane



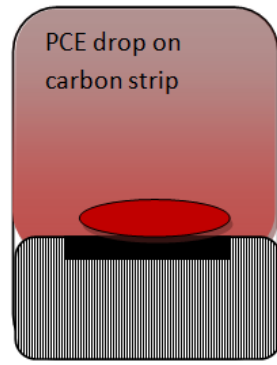
→ Water – low recovery < 1% → preservation

→ Pentane – good recovery ~ 100% → analysis

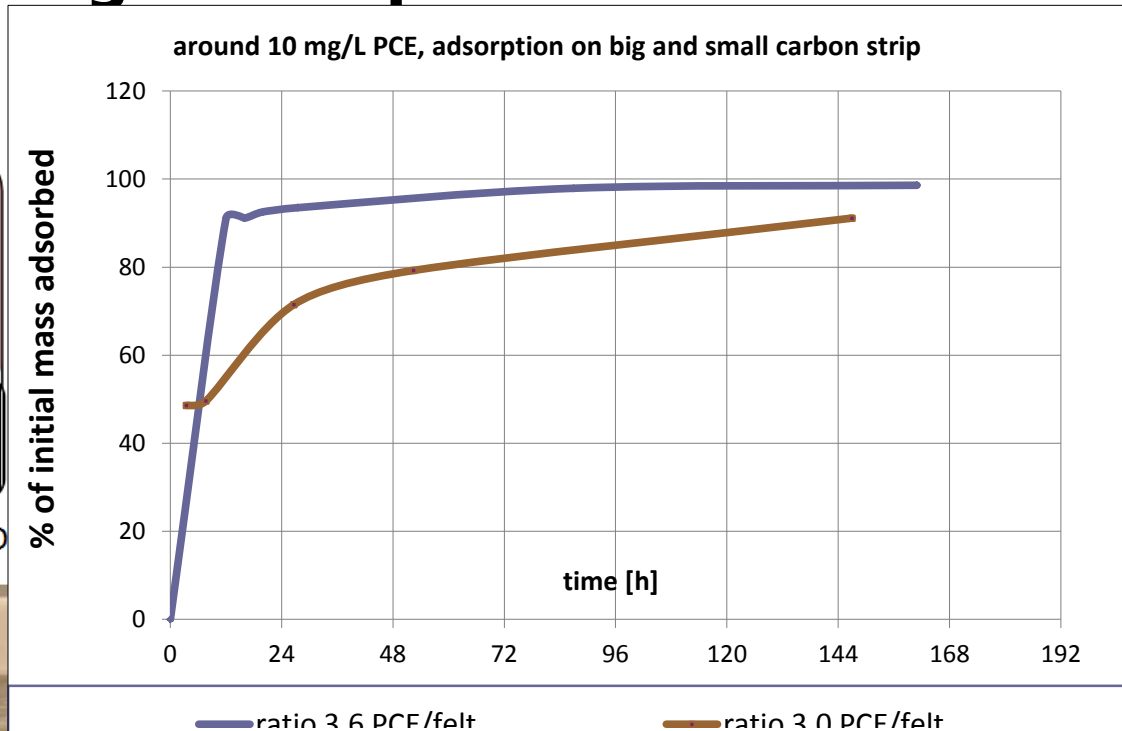
# Application/handling -adsorption



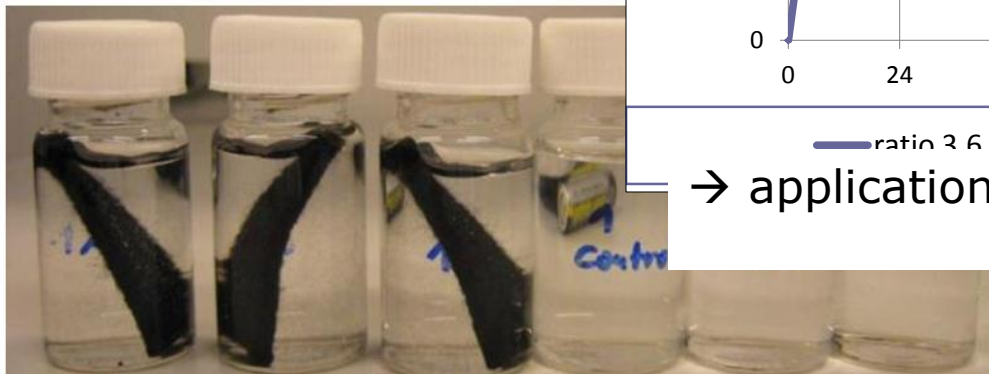
ADSORPTION



DNAPL phase ADSO



→ application time of FACT in soil set to: >24h

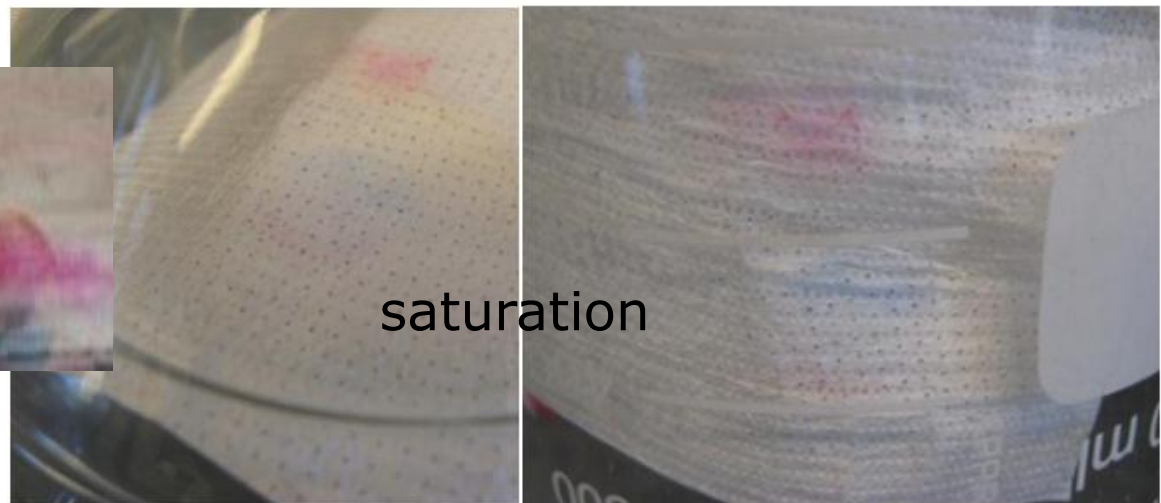


# Interpretation of results

## Different phase exposure

- PCE saturated air  $\rightarrow$   $\sim 45$  mg/g on carbon felt
  - a drop of PCE  $\rightarrow$   $\sim 3$  mg/g on carbon felt
  - PCE saturated solution  $\rightarrow$   $\sim 0.7$  mg/g on felt
- $\rightarrow$  Diffusion controlled sorption

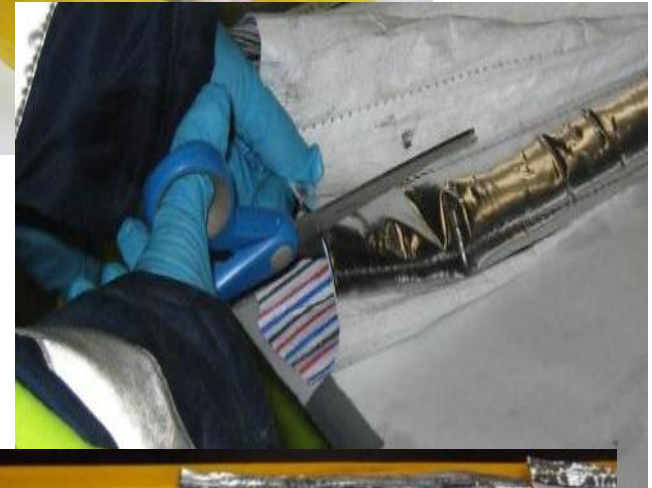
## Staining





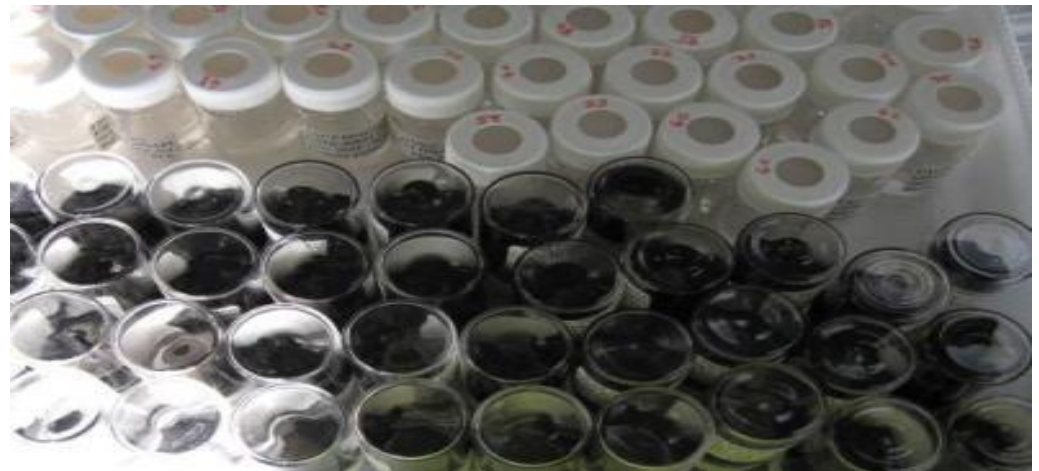
# Fieldwork

1. cut liner open & PID measurement
2. cut carbon strip in half, lay liner flat & observe staining
3. sampling accoring to PID, staining or geological data
4. samples in water (in field)+ pentane (in lab)



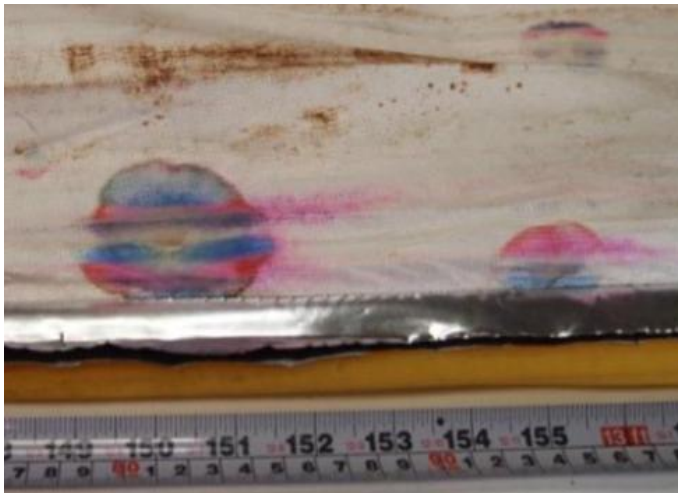
## Fieldwork

- 700 samples in chalk and clay till
  - Clay till: 24h, up to 8m FACT liners, 2 to 10cm discret
  - Chalk: 48h, up to 13m, 2 to 10cm discret not entirely sampled

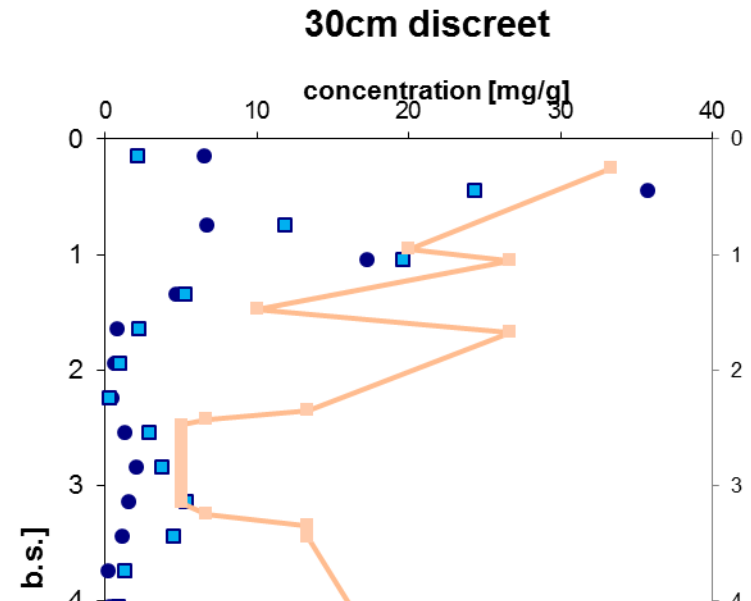
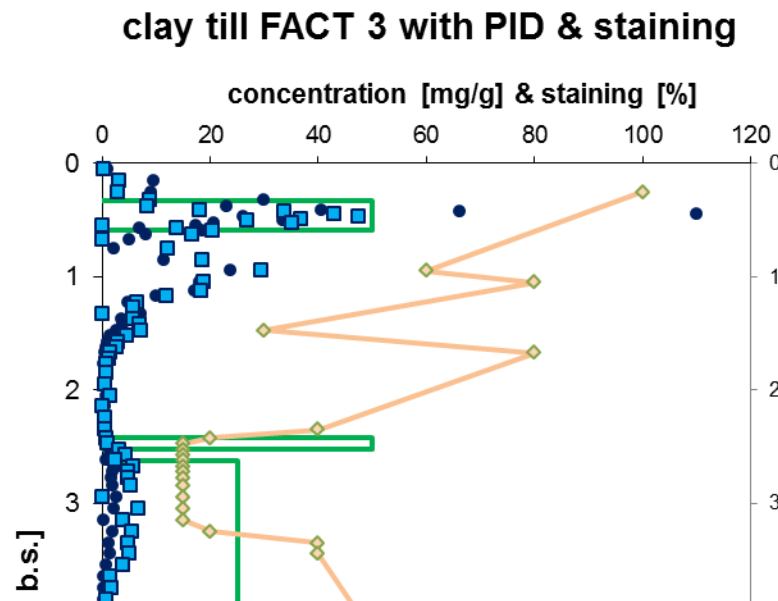


## Results

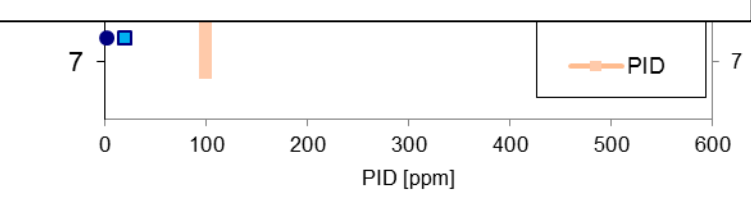
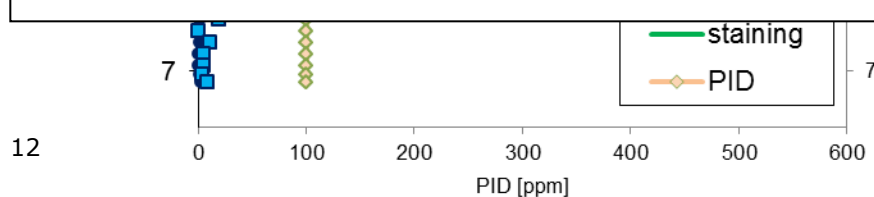
- Clay till: high concentrations up to 120 mg/g on carbon felt, DNAPL staining
- Chalk: lower concentrations up to 5 mg/g on carbon felt, light staining
- Staining: different staining obvious (1) & light (0.5)



# Results & discretization



- + good correlation of PID, staining and concentration data
- + representative concentration results with less discreet samples



## Summary

- Clay till – unsaturated zone:

high conc. on felt (up to 120 mg/g) & DNAPL staining

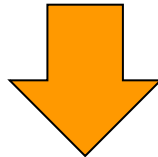
→ Lab: highest PCE conc. (40 mg/g) in PCE saturated air

- Chalk – saturated zone:

lower concentrations (up to 5 mg/g), light staining

→ Lab: medium concentration (3 mg/g) a drop of DNAPL

→ Lab: in saturated PCE solution 0.7 mg/g PCE on carbon



Diffusion controlled adsorption → difference between unsaturated and saturated zone

## Conclusion

- + Combination PID, staining, carbon = very useful tool (discretization & interpretation)
- no direct backcalculation to aquifer concentration
- + however: trends and range explainable due to diffusion controlled processes
- + simple sample handling ("conservation" in water)
- + discreet method
- + good correlation also to soil data

# Thanks for your attention!

- Questions???