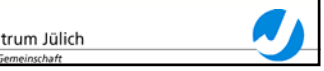
Organic carbon status in soils and its influence on the fate and behaviour of benazolin:

Investigating physically extracted soil fractions

Frauke Schnitzler

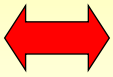


Possible effects of crop residues on the transport and the behaviour of xenobiotics

Increase of **DOM** due to turnover of the crop residues

Increase of association between DOM and the xenobiotic (co-transport)

↳ **Increase** of translocation and bioavailability



Increase of **microbial activity** after incorporation of readily available organic substances

Enhanced degradation and formation of bound residues of the xenobiotic

↳ **Decrease** of mobilisation and bioavailability

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Model studies with undisturbed soil columns under field-like conditions

- Undisturbed soil columns with crop residues (incubation time: three months)

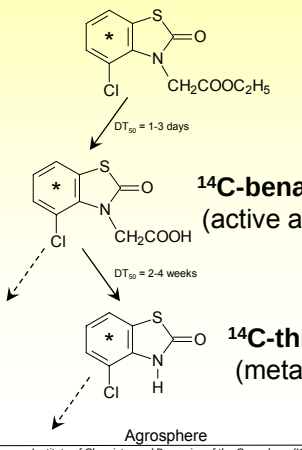
  soil: "Merzenhausen" *orthic luvisol*

  crop residue: ^{14}C-labelled maize straw (10 t ha^{-1})

Model studies with undisturbed soil columns

- Application of one xenobiotic (incubation time: three months):

^{14}C-benazolin-ethyl (parent)
1 MBq / column 460 g ha^{-1}



^{14}C-benazolin
(active agent)

^{14}C-thiazolin
(metabolite)

Column experiments

	3 months incubation		3 months incubation	
	maize		benazolin	
	unlabelled	^{14}C-labelled	unlabelled	^{14}C-labelled
soil + maize		x	x	
		x	x	
		x	x	
soil				x
				x
				x
soil + maize	x			x
	x			x
	x			x

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Column setup

soda lime trap for $^{14}CO_2$

5 cm slicing

leachate

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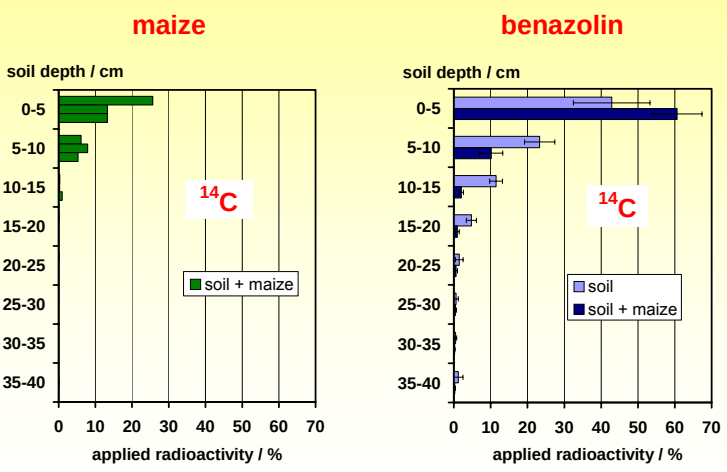
Translocation of the ^{14}C-labelled compounds into the soil



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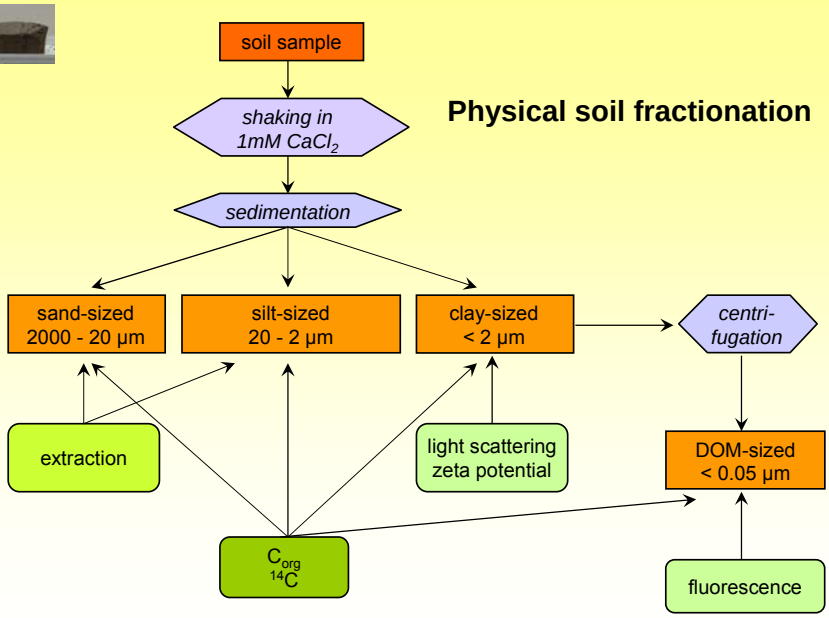
Physical soil fractionation



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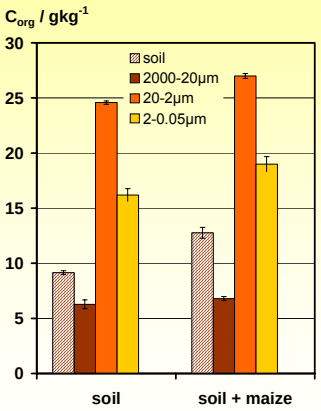
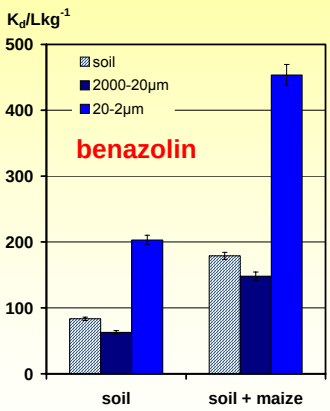
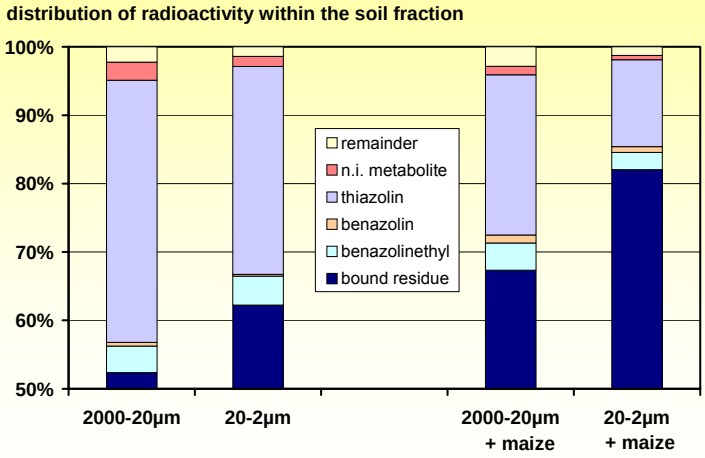
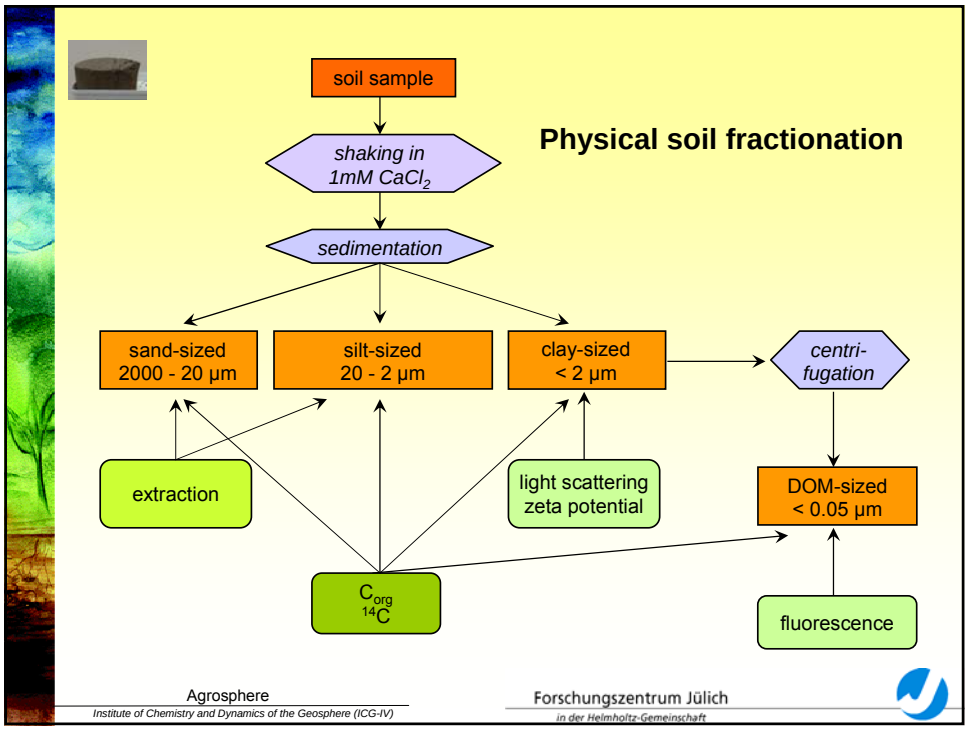
Distribution of C_{org} and K_d values of ´benazolin´ equivalents in soil fractions (0-5 cm)





Extraction of soil fractions (0-5 cm): Distribution of benazolin and its metabolites




soil sample
shaking in 1mM $CaCl_2$
sedimentation
sand-sized 2000 - 20 µm
silt-sized 20 - 2 µm
clay-sized < 2 µm
centri-fugation
extraction
light scattering zeta potential
DOM-sized < 0.05 µm
C_{org} ^{14}C
fluorescence
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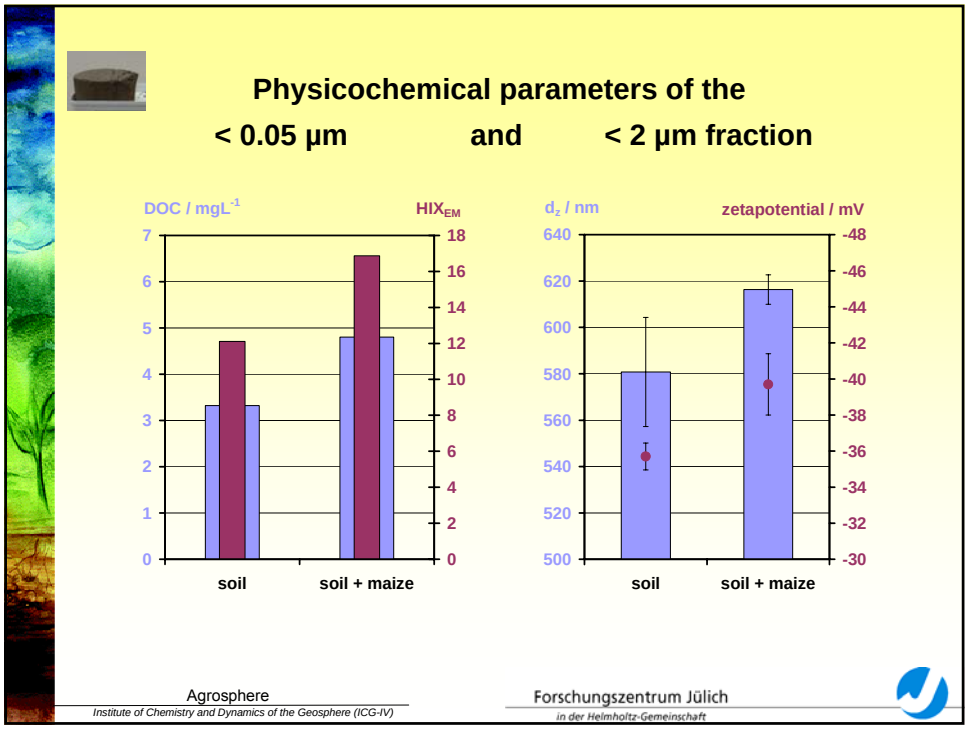
Physicochemical parameters of the
< 0.05 µm and < 2 µm fraction
DOC / mgL^{-1}
HIX_{EM}
d_z / nm
zetapotential / mV
soil
soil + maize
soil
soil + maize
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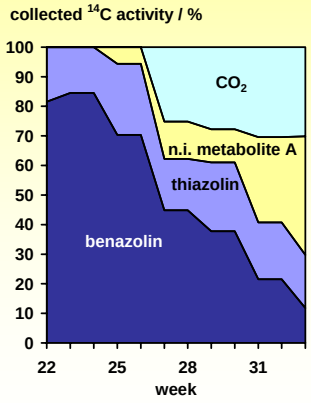
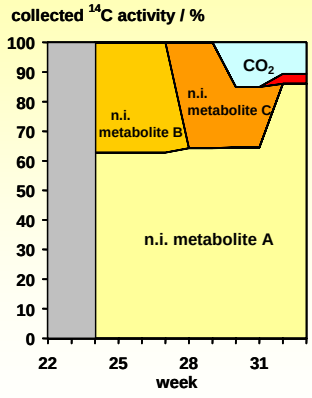
Partition of benazolin and its metabolites within the leachate

soil



soil + maize

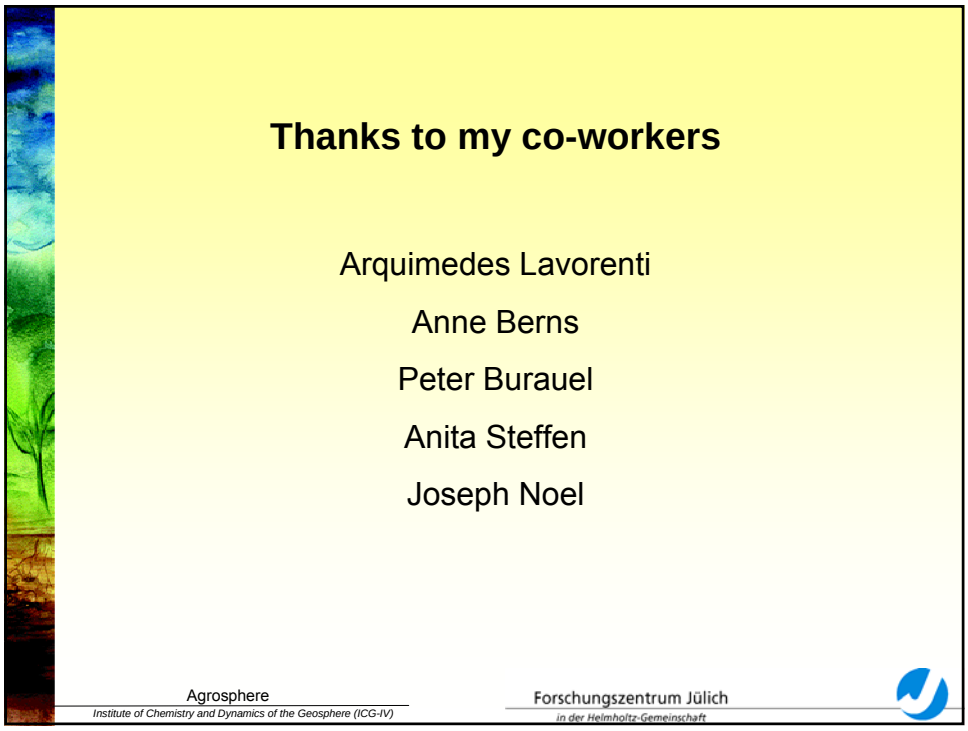


Summary

The **incorporation of maize residues** results in:

- increase of DOM, but no co-transport of benazolin
- increase of aromaticity and enhanced formation of aggregates
  → higher sorption possibilities for hydrophobic metabolites
- higher metabolism of benazolin and formation of ´bound residues´

→ **decrease of mobilisation and bioavailability of benazolin**


Thanks to my co-workers
Arquimedes Lavorenti
Anne Berns
Peter Burauel
Anita Steffen
Joseph Noel
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