

Variable contribution of soil and plant derived carbon to dissolved organic matter

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Experimental setup

Total field size:

Ca. 10 ha

Plot size:

20 m x 20 m

Species pool:

60 species

Functional groups:

*small herbs, tall herbs,
grasses, legumes*



Photo: J. Baade



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C4 plots:

Amaranthus retroflexus,
split plot design



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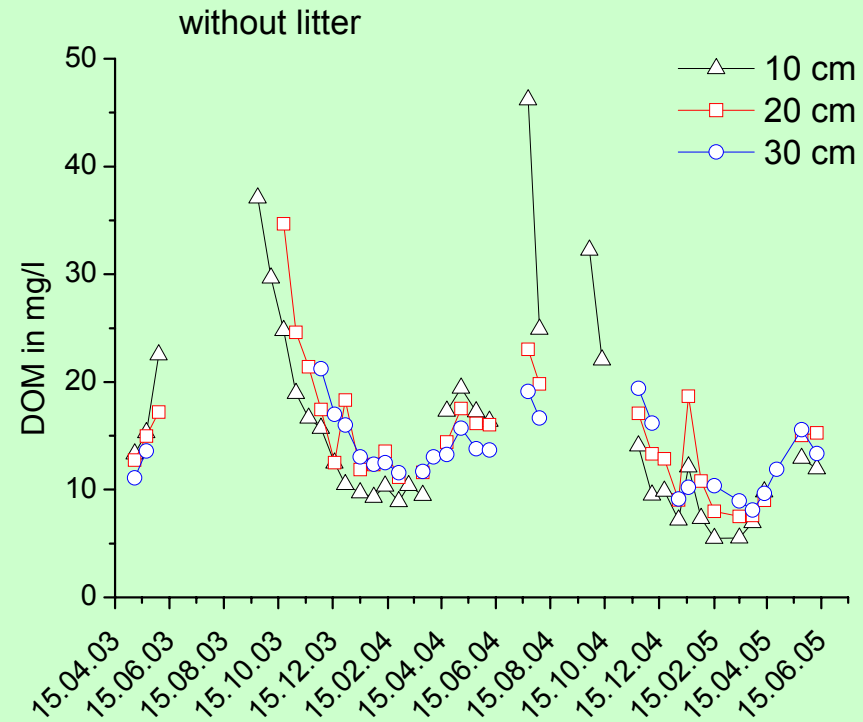
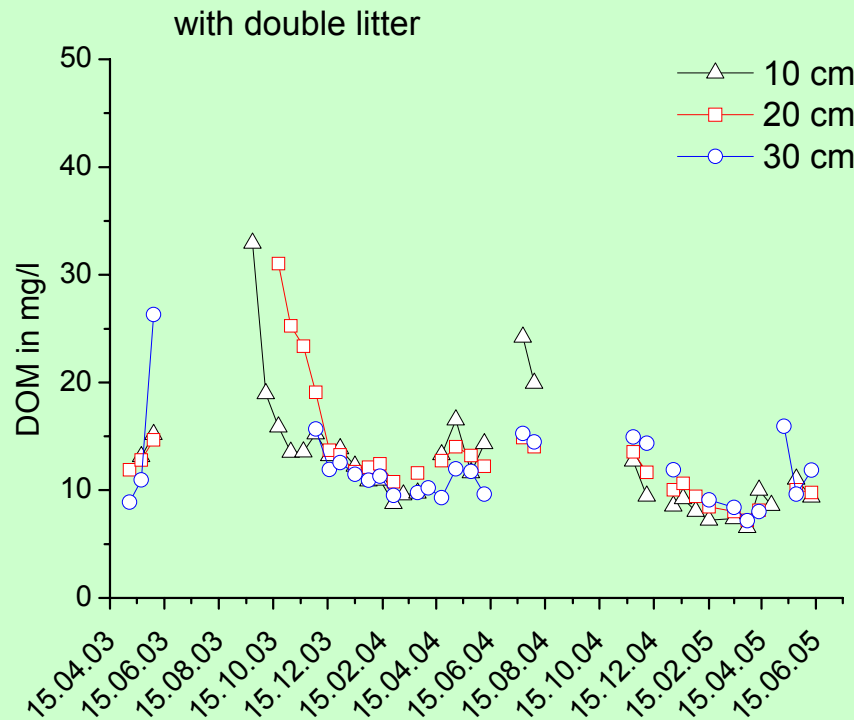
Installation and sampling



- installation of glass suction plates in 10, 20 and 30 cm depth
- sowing in spring 2002
- biweekly collection of soil solution
- soil sampling to 30 cm depth in spring 2002 and 2004



Seasonal changes in DOM concentrations



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Questions

High DOM concentrations in summer caused by plant input, SOM mobilization or simply volume effects?

Differences due to plant biodiversity?

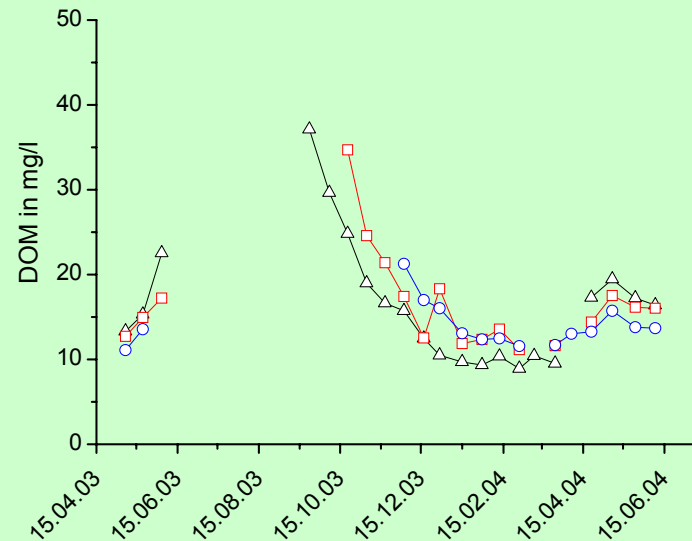
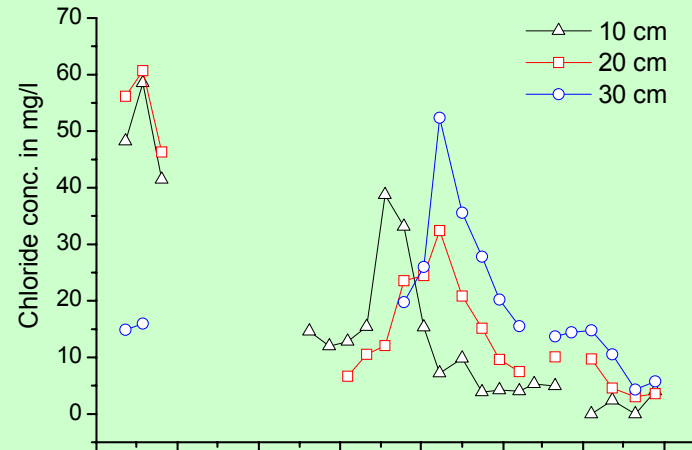
Changes of DOM sources with seasons?

Changes in DOM composition with depth?



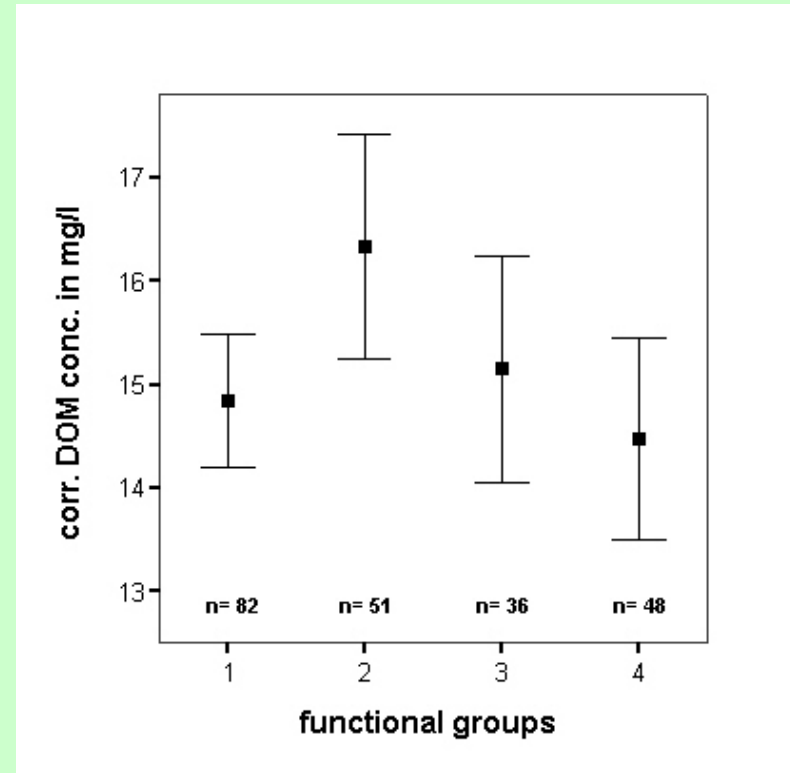
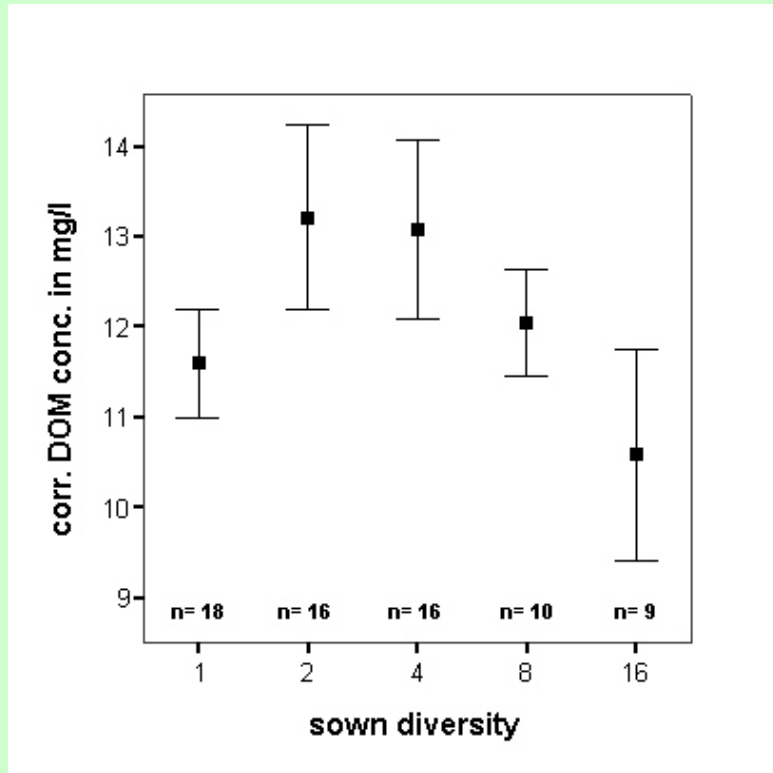
Volume effects ?

Chloride ion
concentration as
plant independent
tracer to follow
transport
processes and
dilution effects.



Biodiversity and DOM concentrations ?

spring vs. fall



Changes of DOM sources with seasons ?

Use of C4 plants as natural tracers



$\delta^{13}\text{C}$ of *Amaranthus retroflexus*:

-13,0 ‰

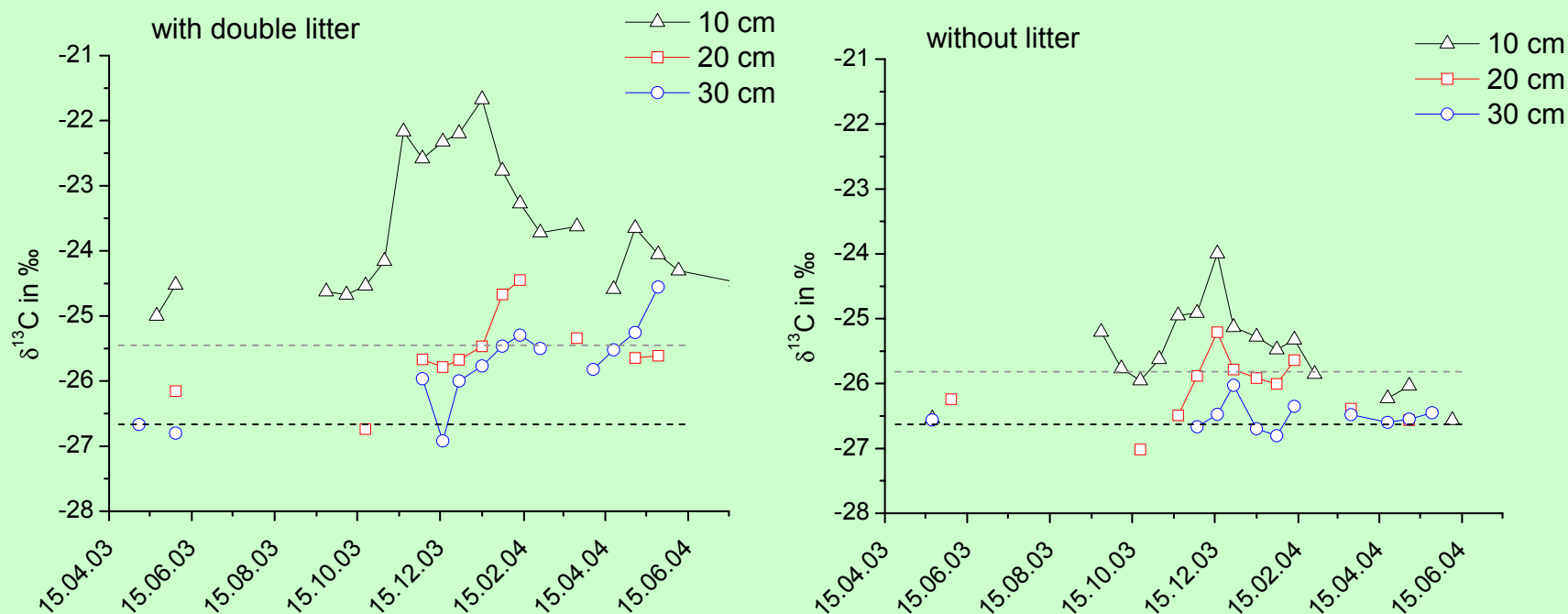
$\delta^{13}\text{C}$ of SOM 2002 average of 30 cm:

-26,6 ‰

$\delta^{13}\text{C}$ of SOM 2004 average of 30 cm:

-26,0 ‰

Changes of DOM sources with seasons and depth



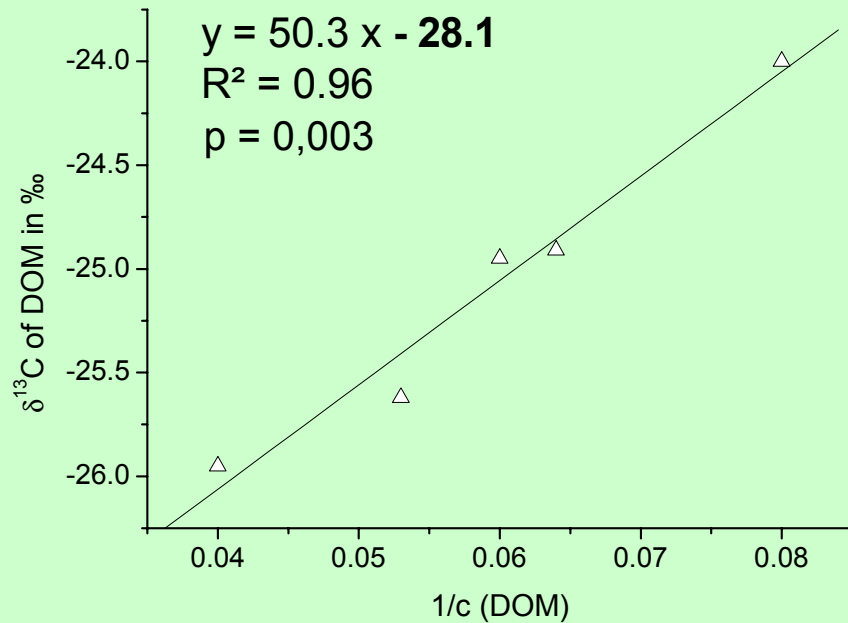
Dashed lines represent SOM isotope ratios.



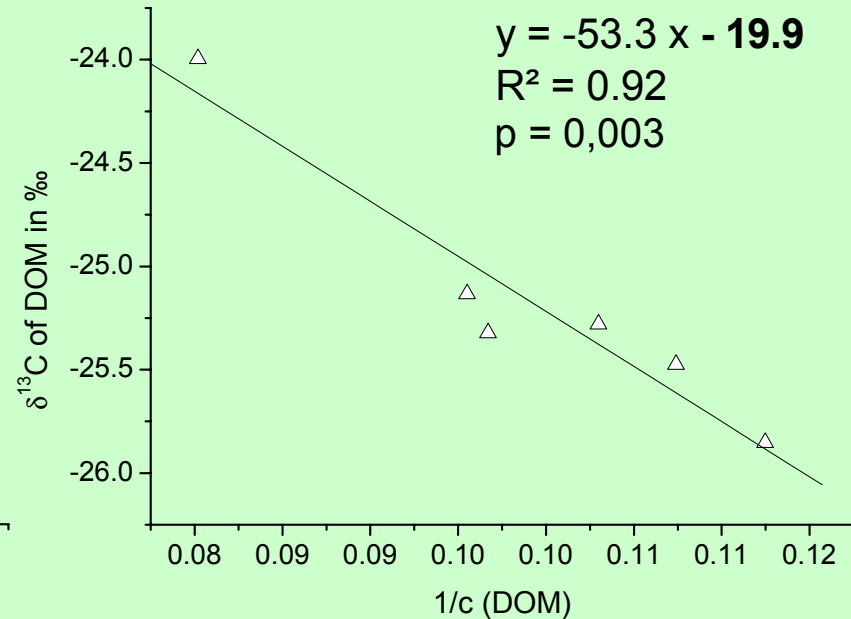
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Keeling plots as tool to determine DOM sources



21.10.03 - 17.12.03
10 cm depth, without litter



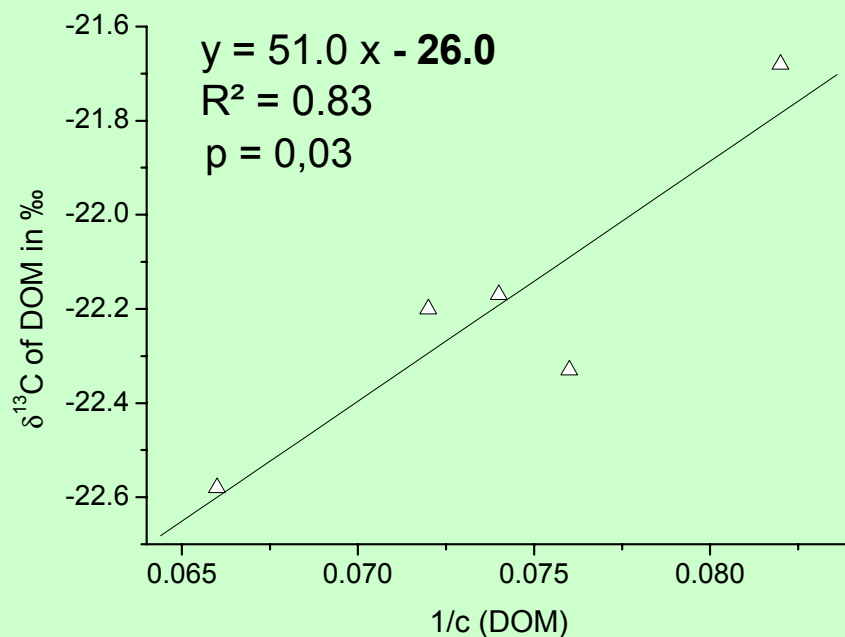
17.12.03 - 27.02.04
10 cm depth, without litter



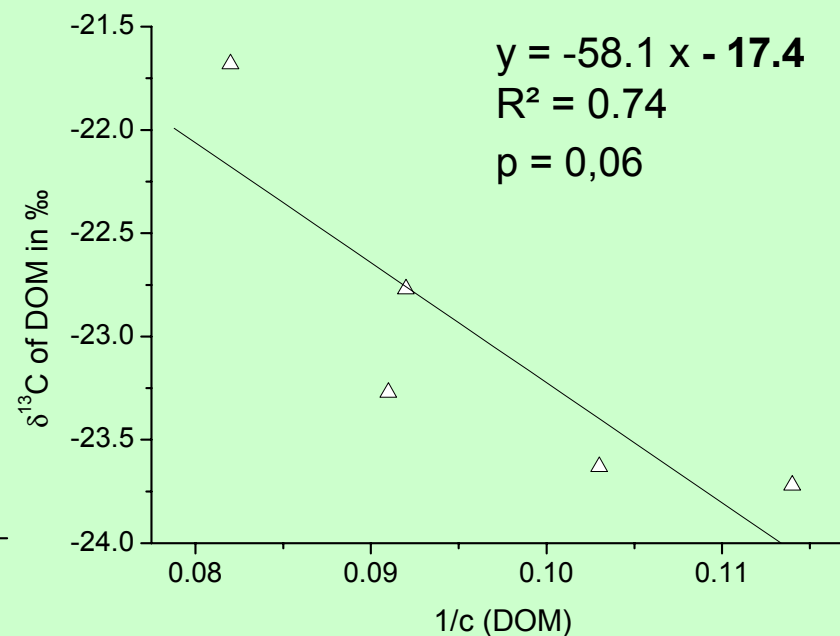
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Keeling plots as tool to determine DOM sources



18.11.03 - 15.01.04
10 cm depth, with double litter



15.01.04 - 25.03.04
10 cm depth, with double litter



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Summary

1. Seasonal changes of DOM concentrations not only due to dilution effects.
2. Plant derived carbon basically in fall and early winter. Summer concentrations determined by mobilization of SOM.
3. Decomposition products of plant material contribute to 36 % of DOM on double litter plots and 19 % without litter in 10 cm depth at the maximum C4 signal.
4. Keeling plots reveal input of lighter material than the respective source.
5. Changing DOM composition with depth.



Acknowledgement

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- the Isolab team for carrying out the isotope measurements



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An aerial photograph of a large agricultural field divided into many small, rectangular plots. The plots are mostly green, with some showing different shades of green and some brown patches, indicating different crops or stages of growth. In the background, there are several large industrial buildings with white roofs and a parking lot. To the left, there are stacks of colorful shipping containers. The foreground is dominated by a dense line of green trees and bushes. The overall scene is a mix of agriculture and industry.

Thank you for listening

Photo: C. Roscher