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## Impact of elevated CO<sub>2</sub> on rhizodeposition of ryegrass grown on FACE soils exposed to CO<sub>2</sub> enrichment

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Vincent Allard, Stephane Bazot, Herbert Blum, Paul Newton, Christophe Robin. Impact of elevated CO<sub>2</sub> on rhizodeposition of ryegrass grown on FACE soils exposed to CO<sub>2</sub> enrichment. Pavel Tlustoš; Jiřina Száková. Final COST 631 meeting "From understanding and modelling to application: managing the natural potential of the rhizosphere for designing rhizosphere technologies", Apr 2006, PRAHA, Czech Republic. Czech University of Agriculture, Department of Agrochemistry and Plant Nutrition, Proceedings, pp.34, 2006. hal-04475194

**HAL Id: hal-04475194**

**<https://hal.univ-lorraine.fr/hal-04475194>**

Submitted on 23 Feb 2024

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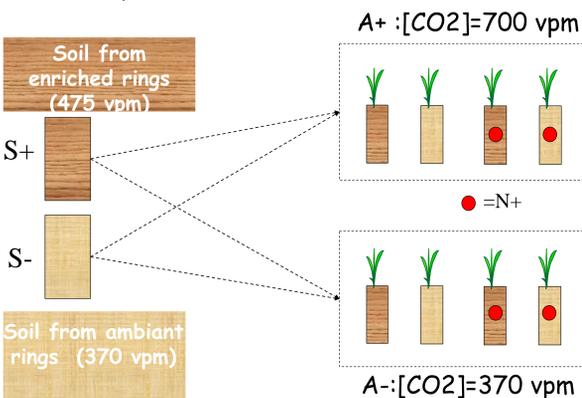
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## Objectives

The poster summarizes the main results of two distinct experiments, both aiming to assess the effects of enriched atmospheric  $CO_2$  on carbon partitioning to rhizosphere compartments and to determine the consequences of elevated  $CO_2$  on mineralization activity of soil micro-organisms towards soil organic matter and rhizodeposits.

## Methods

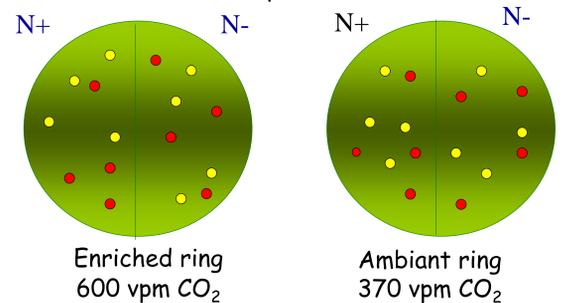
The effects of elevated atmospheric  $CO_2$  on C allocation were evaluated on ryegrass planted on soil monoliths sampled from the New Zealand FACE experiment after 5 years enrichment. Ryegrass and soil monoliths were subjected to elevated  $CO_2$  in a greenhouse for 3 months (Allard et al., 2006)



The effects of elevated atmospheric  $CO_2$  on C allocation were evaluated on ryegrass planted on soil monoliths from the Swiss FACE experiment (9 years enrichment). See Bazot et al. (2006).



- : Monoliths sampled in June
- : Monoliths sampled in September



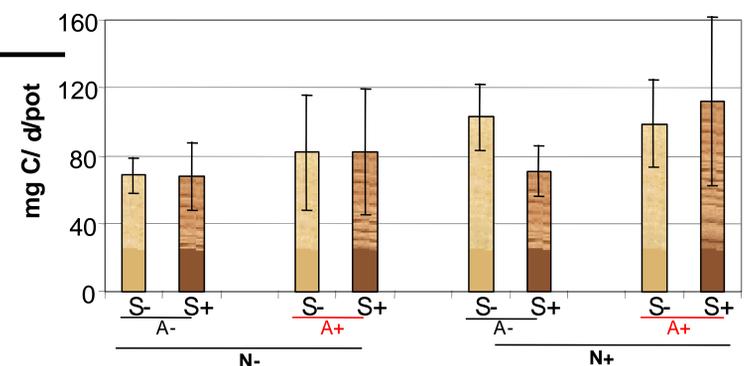
## Results

### $^{14}C$ -carbon allocation

Treatment			$^{14}C$ (in % of total recovered)			
N	Atm	Soil	Plant	Rhizosph respiration	Soil	MB
N-	A-	S-	85	11	4	0.4
		S+	83	12	5	0.6
	A+	S-	84	11	5	0.7
		S+	80	14	6	0.8
N+	A-	S-	85	12	3	0.3
		S+	85	11	3	0.3
	A+	S-	87	10	3	0.5
		S+	84	11	5	0.6
Treatment effects		N	+	n.s.	**	*
		A	n.s.	n.s.	+	***
		S	n.s.	n.s.	n.s.	+

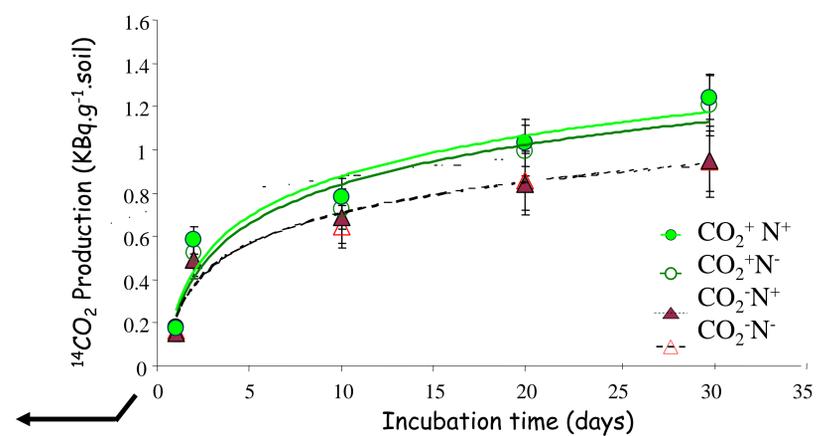
Under elevated  $CO_2$ , the belowground respiration was stimulated because the size of the MB was significantly increased (data not shown). This surplus of heterotrophic respiration is provided by the mineralisation the soil organic matter (non labelled), indicating a priming effect of rhizodeposits on SOM.

### Belowground Respiration



For the NZ experiment, the C allocation was proportionally increased in the soil and within the microbial biomass (MB) under elevated  $CO_2$ , suggesting strongly that rhizodeposition was stimulated.

For the Swiss experiment, C allocation to rhizosphere compartment was not modified by elevated  $CO_2$  at the spring sampling. At the autumn sampling, the C allocation to belowground compartments was depressed (data not shown). Mineralization rates and amounts of  $^{14}C$  and total C mineralized by MB during the incubation of adhering soil are higher for soils from enriched rings. This result suggests that the MB was more active in the soils from enriched ring and/or the root-released organic compounds (rhizodeposits) were more easily available for degradation by the MB.



Mineralisation of  $^{14}C$ -organic compounds in the adhering soil (incubated for 30 d.).

## Conclusion

The amount of total soil C was not modified after 5 or 9 years of continuous  $CO_2$  atmospheric enrichment of plant canopies. Moreover, when more C is allocated to the soil, the increase in size and activity of the MB stimulates the C mineralization of easy decomposable compounds. The two independent experiments strongly suggest that the rhizodeposition fluxes under elevated  $CO_2$  are context dependent because they are driven by a combination of factors including the management of the plots and pedo-climat.