

ALTER-net conference
Side Event: Multisite experiments

Multisite experiment II

**Decomposition of standard litter along a
biogeographic gradient (2010-2013)**

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Decomposition of standard litter along a biogeographic gradient

Objective:

- ❖ An interesting scientific question answered with a “simple and low cost” experiment
- ❖ Applicable for different ecosystems and habitats
- ❖ Applicable for an unlimited number of partners
- ❖ Open for additional experiments



Decomposition of standard litter along a biogeographic gradient

Object: decomposition

- ❖ is an important ecosystem function
- ❖ is an important process for nutrient cycling
- ❖ Influenced by climatic and biotic factors
- ❖ Is therefore influenced by geography
- ❖ Sufficient literature available



Decomposition of standard litter along a biogeographic gradient

- 8 countries
- 16 Partner
- 17 sites
- 14 LTER sites
- 6 grassland
- 11 forest

	LTER	Site	Country	Ecosystem	Latitude N	Longitude E	Soil type	Soil N%	Soil C%
1	Yes	Gumpenstein	AT2	Grassland	47°29′	14°06′	Cambisol	0.31	2.88
2	Yes	Zoebelboden	AT1	Forest	47°50′	14°26′	Leptosol	0.42	7.19
3	N	Frankfurt Bot.G.	DE1	Grassland	50°7′	8°39′		0.13	2.74
4	N	Bayreuth	DE2	Forest	49°58′	11°30′	Cambisol	0.51	7.23
5	Yes	Bavarian Forest1	DE3	Forest	45°95′	54°39′		0.61	8.52
5	Yes	Bavarian Forest2	DE4	Forest	46°03′	54°22′		0.86	16.83
6	N	Aix-en-Provence	FR1	Forest	43°31′	5°30′			
7	Yes	Huez-Oisans	FR2	Grassland	45°06′	6°34′		0.53	5.75
8	Yes	Nogent-sur-Ver.	FR3	Forest	47°50′	2°45′	Luvisol	0.12	2.27
9	Yes	Wytham Woods	UK1	Forest	51°46′	-1°19′	Cambisol	0.49	6.46
10	Yes	Moore House	UK2	Grassland	54°05′	-2°80′		1.60	38.54
11	Yes	Sikfökut	HU1	Forest	47°55′	20°26′	Luvisol	0.32	3.88
12	Yes	Bucegi-Piatra	RO1	Forest	44°20′	25°40′	Phaeozem	0.44	5.19
12	Yes	Neajlov catchm.	RO2	Grassland	45°12′	27°58′	Fluvisol	0.17	1.72
13	Yes	Kindla	SE1	Forest	59°45′	14°54′	Podsol		
14	Yes	Bab Slovakia	SLO1	Forest	48°18′	17°53′	Cambisol		
15	Yes	Kralova hola	SLO2	Grassland	48°53′	20°07′	Podzol		
16	Yes	2010 only	FI1	Forest	60°10′	24°56′			
17	N	2010 only	NO1	grassland	63°26′	10°24′			

Decomposition of standard litter along a biogeographic gradient

Hypothesis

- ❖ Decomposition rate shows a humped-shaped relationship with latitude (north: temperature; south: moisture)
- ❖ Increase in nutrient availability increases decomposition rate.



Decomposition of standard litter along a biogeographic gradient

Material and Methods:

- ❖ Mixed double-nested split-plot design
- ❖ Barley leaves as standard litter in two qualities: fertilized and unfertilized
- ❖ 2 mesh sizes for litter bags to test for the importance of the decomposer community
- ❖ Every 3rd week addition of N (NH_4NO_3) and C (household sugar) to treatment plots
- ❖ Removal of litter bags after 1, 3 and 10 month

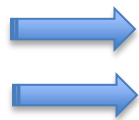


Decomposition of standard litter along a biogeographic gradient

Methods:

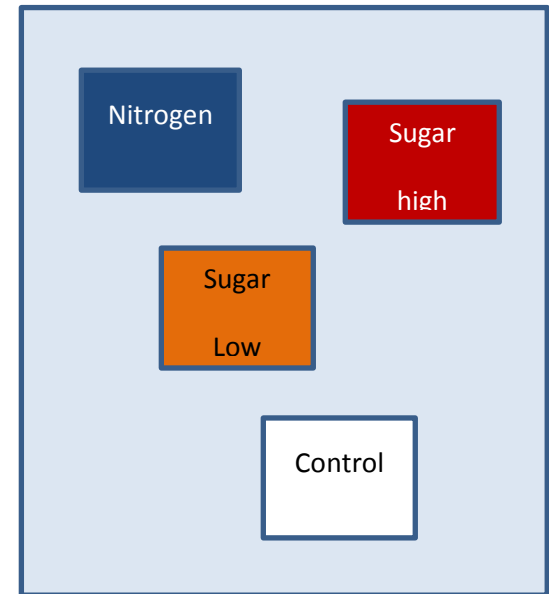
Mixed double-nested split-plot design

Block	Plot/Treatment	Sub-plot level
5 repeats/site	Control	Litter quality (fertilized/non fertilized)
	Nitrogen	Mesh size (coarse/fine)
	Sugar high	Sampling date (August/October/April)
	Sugar low	



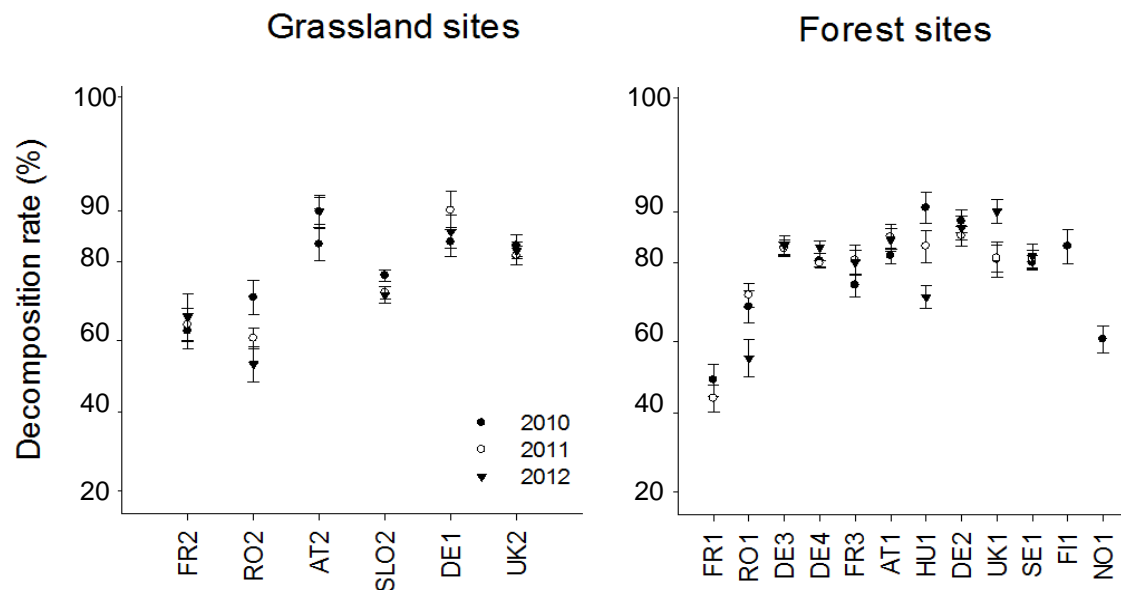
240 litter bags per site

4080 litter bags per all sites/year



Decomposition of standard litter along a biogeographic gradient

Results:

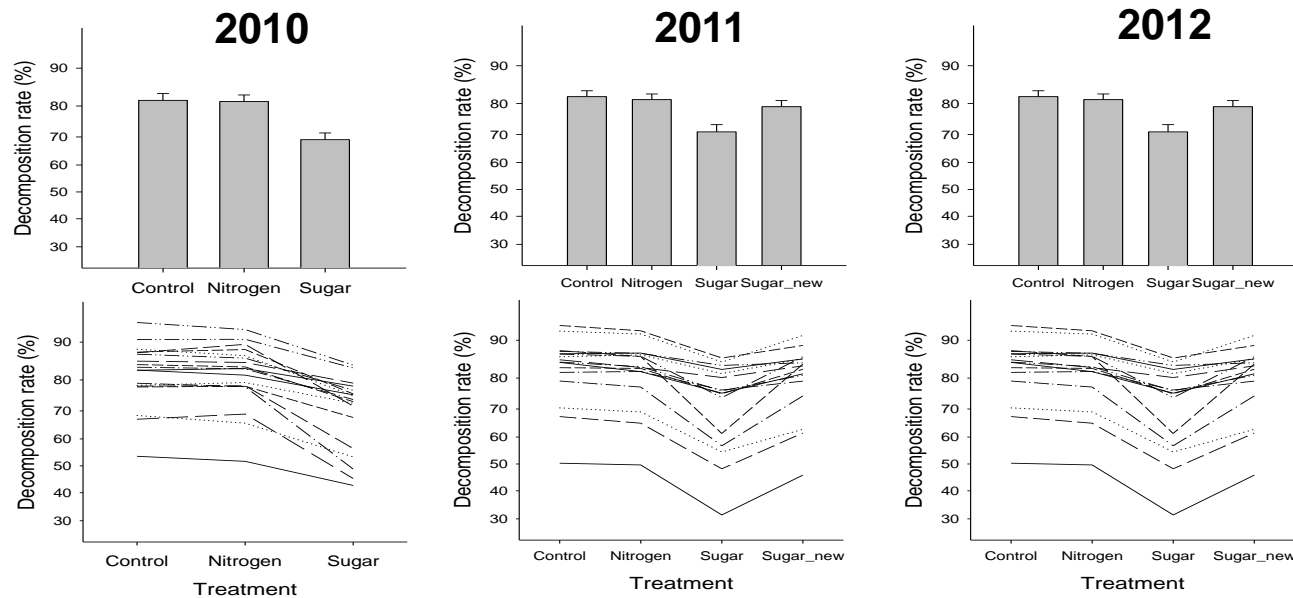


	<u>2010</u>	<u>2011</u>	<u>2012</u>
Habitat	n.s.	n.s.	n.s.
Site (Habitat)	***	***	***



Decomposition of standard litter along a biogeographic gradient

Results:

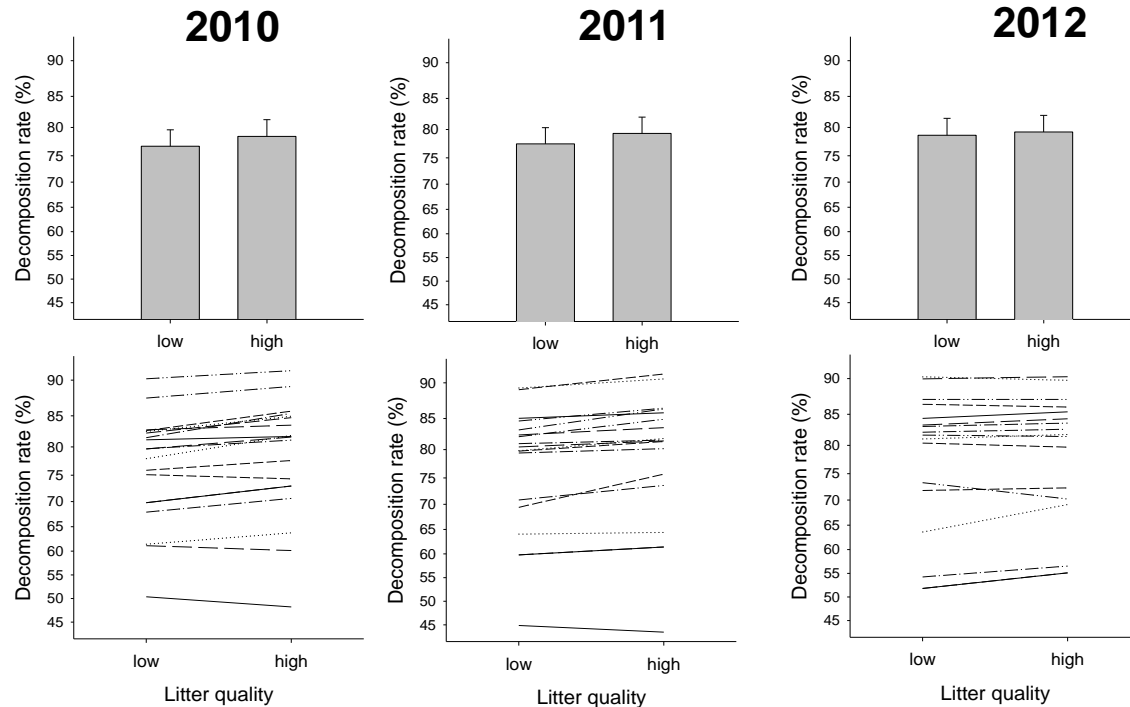


Treatment ***
Treatment x Site ***



Decomposition of standard litter along a biogeographic gradient

Results:



Litter quality ***
Quality x Site **

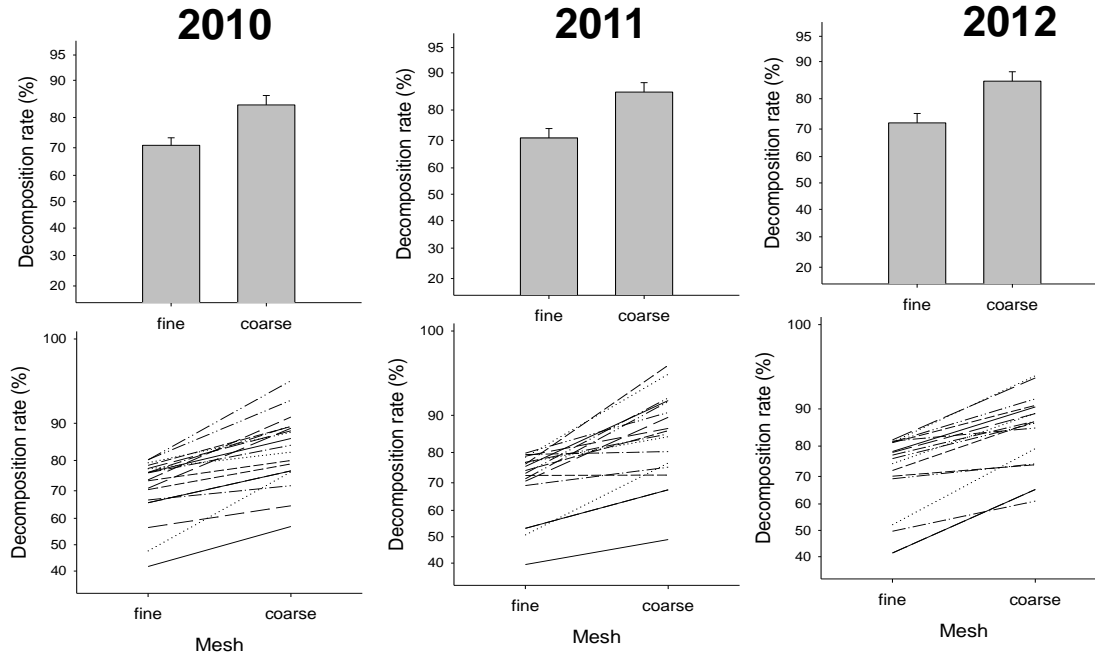
**

n.s.



Decomposition of standard litter along a biogeographic gradient

Results:



Mesh	***	***	***
Mesh x Site	***	***	***



Decomposition of standard litter along a biogeographic gradient

Conclusion:

- ❖ Hump shaped relationship with latitude
- ❖ Small effect of nutrient and litter quality treatment
- ❖ Strong effect of macrofauna; depends on sites



Decomposition of standard litter along a biogeographic gradient

Future analysis:

- ❖ e.g. relative importance of Macrofauna across latitude

Perspectives for the project:

- ❖ Screening of soil macrofauna
- ❖ Screening soil microbiota (e.g. bacteria, fungi)
- ❖



Decomposition of standard litter along a biogeographic gradient

Experience

- ❖ Establishment of a scientific network; designing a quick, simple and cheap experiment with a valuable data set
- ❖ Centralization of many activities (litter production, analysis of litter bags) minimalizes errors and allows a quick reaction on questions
- ❖ Time expenditure per partner : 4 weeks per year
Time expenditure coordinator: ++ 5 month per year



Decomposition of standard litter along a biogeographic gradient

Lessons learnt

- ❖ A protocol must be detailed and contain clear instructions even for very simple activities. 10 partners are equivalent with 15 interpretations of simple actions
- ❖ But: long protocols are hardly read carefully enough – “quick info bar”, “top action of the month”
- ❖ Additional regular communication between all partners is essential
- ❖ A training lesson can be helpful to detect gaps in the protocol

