

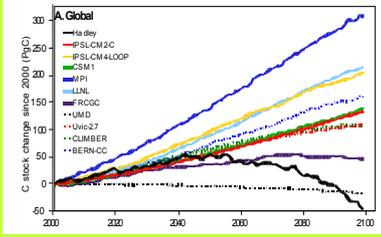
Long term bare fallow experiments open a new window to study stable carbon in soil



Carbosoil

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1. Large spread in C stock change predictions for the 21st century



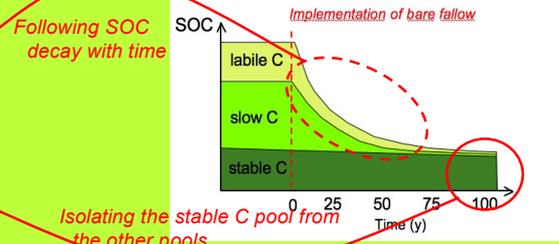
Frindlingstein et al., 2006, J. Clim.

2. Long-term bare fallow experiments offer promising opportunities for SOC model improvement

1. Inputs difference

2. Soil model differences:

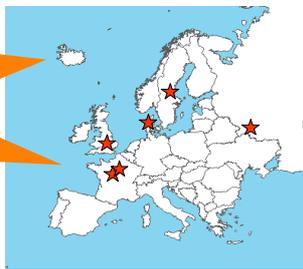
- Model architecture (number of pools, pool sizes...)
- What do these pools represent? (important for the initialization)
- Temperature sensitivity of C pools



Isolating the stable C pool from the other pools

Objectives of the work:

- 1) Inventory of LTBF experiments
- 2) Compile and compare SOC contents evolution
- 3) Determine if the stable C pool has been reached

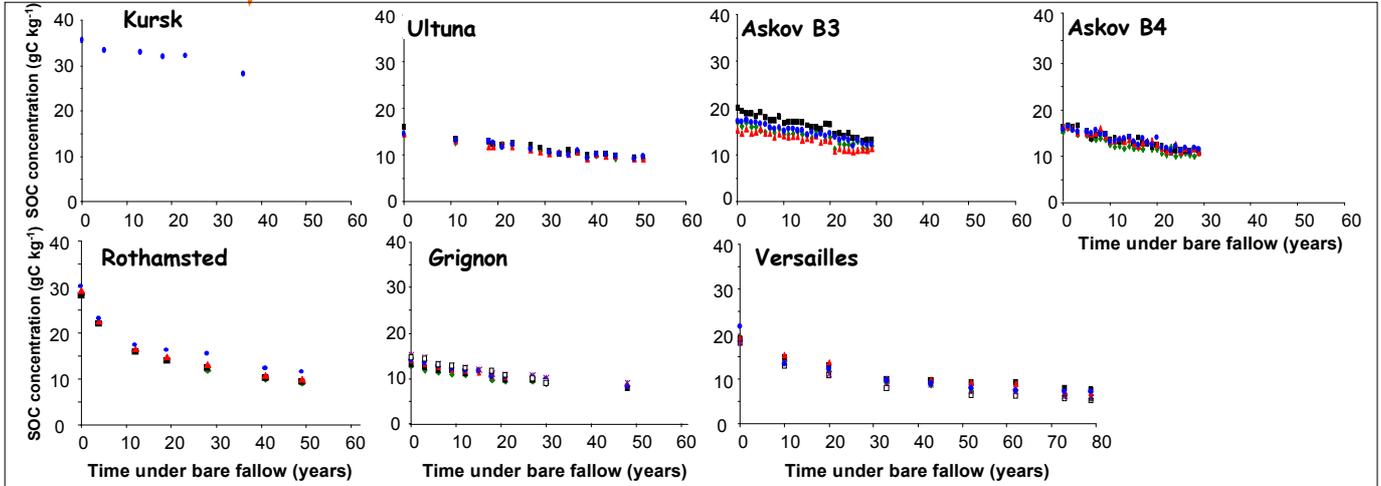


Site	Period	History	Plot size (m x m)	Sampling depth (cm)
Kursk	1965-	Arable	10 x 10	0-25
Ultuna	1956-	Arable	2 x 2	0-20
Askov	1956-1985	Arable	11.7 x 9.4	0-20
Rothamsted	1959-	Grassland	7 x 12.5	0-23
Grignon	1959-	Grassland	2.5 x 4	0-25
Versailles	1928-	Grassland	2 x 2.5	0-25

Table 1: Selected site characteristics

Remark: first samples taken before the grassland was ploughed at Rothamsted and after at Versailles & Grignon

Figure 1: SOC concentration decrease in the 7 LTBF experiments



Site	Model			
	Mono-exponential	Mono-exponential + constant	Bi-exponential	Bi-exponential + constant
Kursk	-2.2	-1.2	OP	OP
Ultuna	-144.3	-146.6	OP	OP
Askov B3	-147.3	-143	OP	OP
Askov B4	-126	-132.2	OP	OP
Grignon	-128.5	-200.2	-198.4	OP
Versailles	20.4	-80.1	-82.3	OP
Rothamsted	44.2	-10.2	-63.4	-62.9

Table 2: Akaike's information criterion (AIC) of different pool models optimized on LTBF data (OP= over-parameterized)
 $AIC = 2k + n \ln(RSS/n)$ (with k=parameters; n=data)

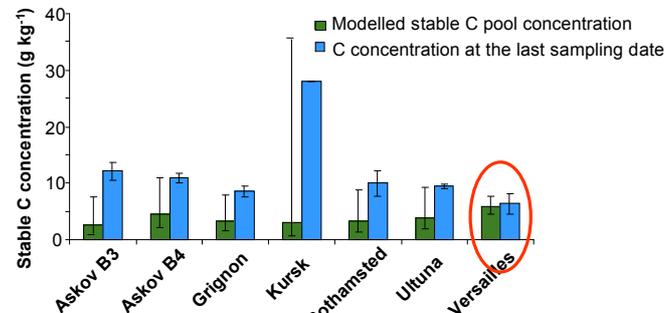


Figure 2: SOC concentration measured at the last sampling date and modelled stable C concentration

- ✓ 6 sites included in the LTBF network
- ✓ LTBF data do not falsified « classical » 3 pool models (labile pool being negligible apart at Rothamsted)
- ✓ Stable C pool concentration have been estimated
- ✓ Soil stable C pool has been isolated at Versailles and concentrated in other sites