



Multi-metric evaluation of an ensemble of biogeochemical models for the estimation of organic carbon content in long-term bare fallow soils

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Gianni Bellocchi, Roberta Farina, Fiona Ehrhardt, Claire Chenu, Jean-François Soussana, et al.. Multi-metric evaluation of an ensemble of biogeochemical models for the estimation of organic carbon content in long-term bare fallow soils. International conference "Food security and climate change: 4 per 1000 initiative new tangible global challenges for the soil", Jun 2019, Poitiers, France. , 2019. hal-02790026

HAL Id: hal-02790026

<https://hal.inrae.fr/hal-02790026>

Submitted on 5 Jun 2020

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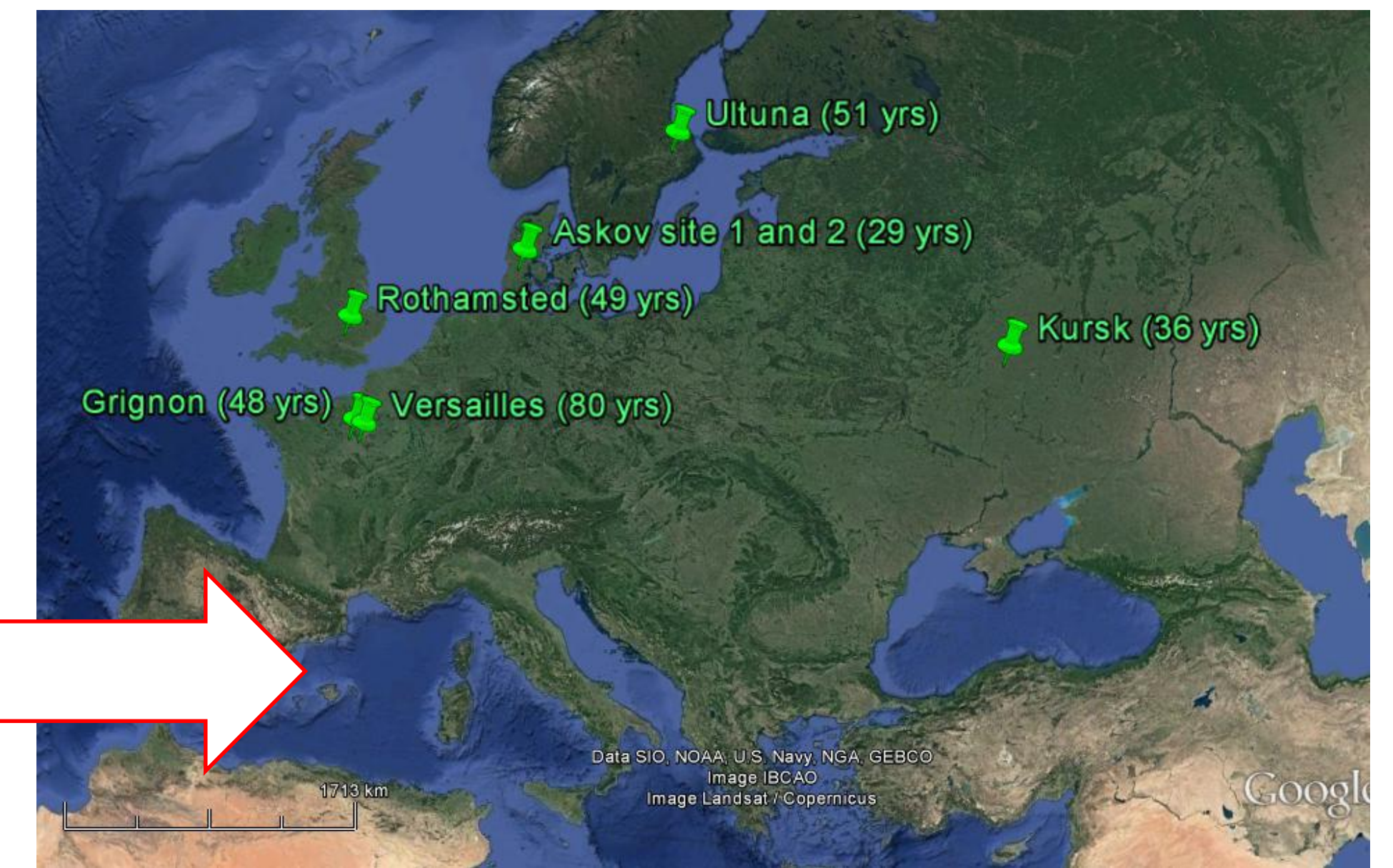
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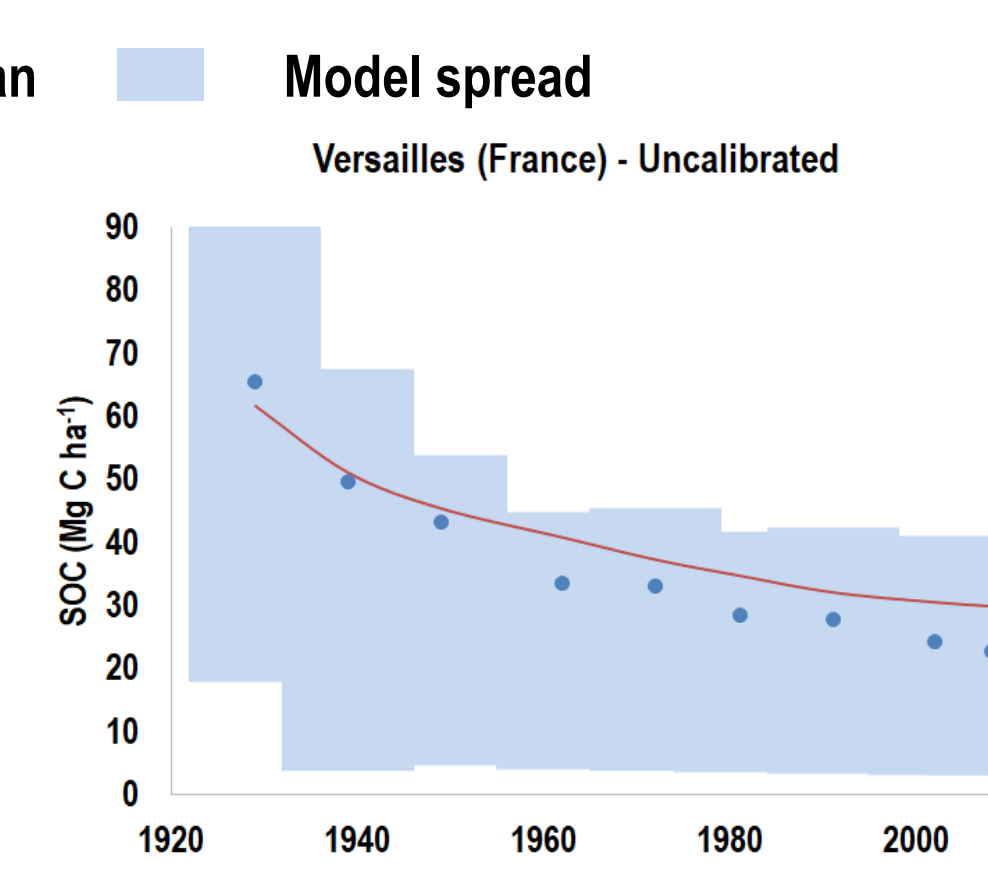
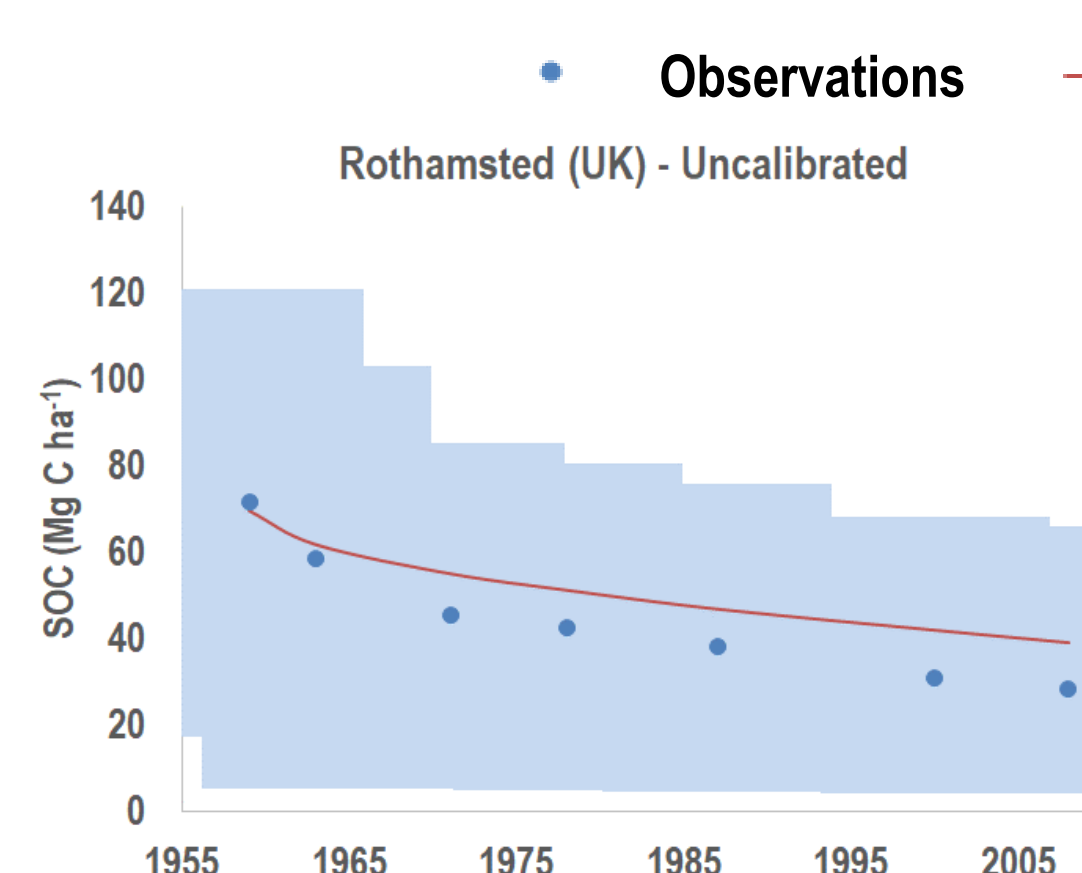
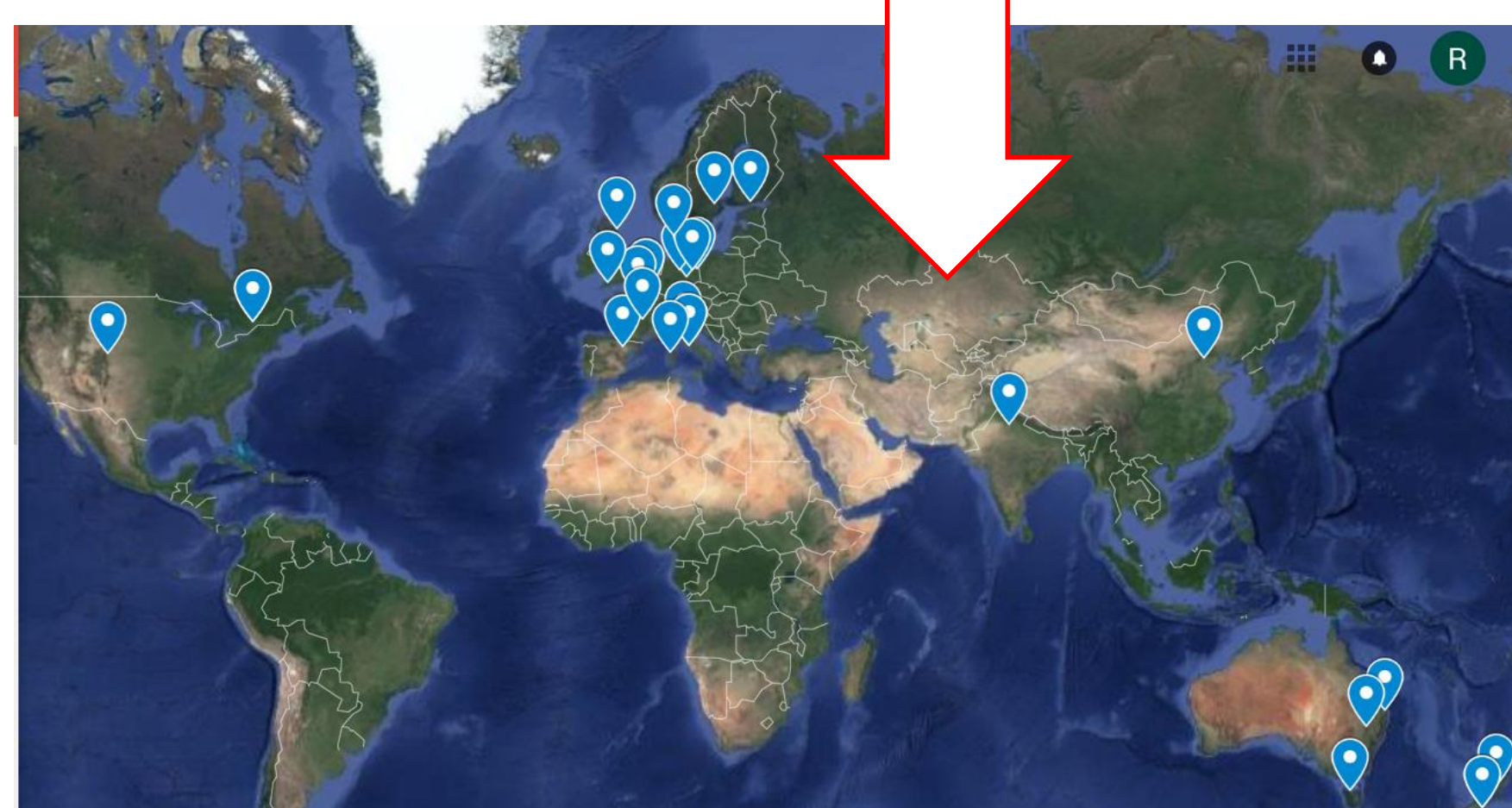
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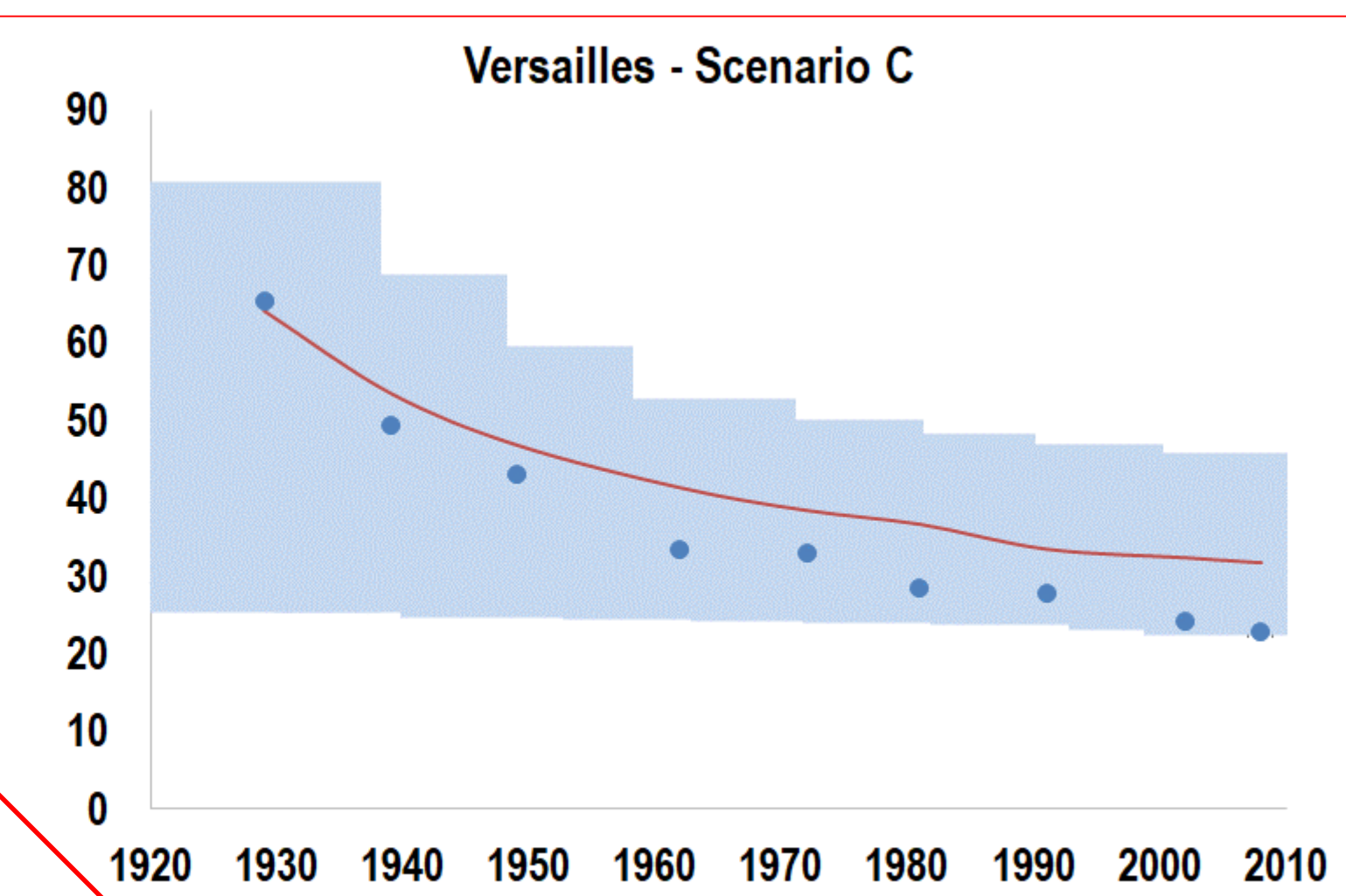
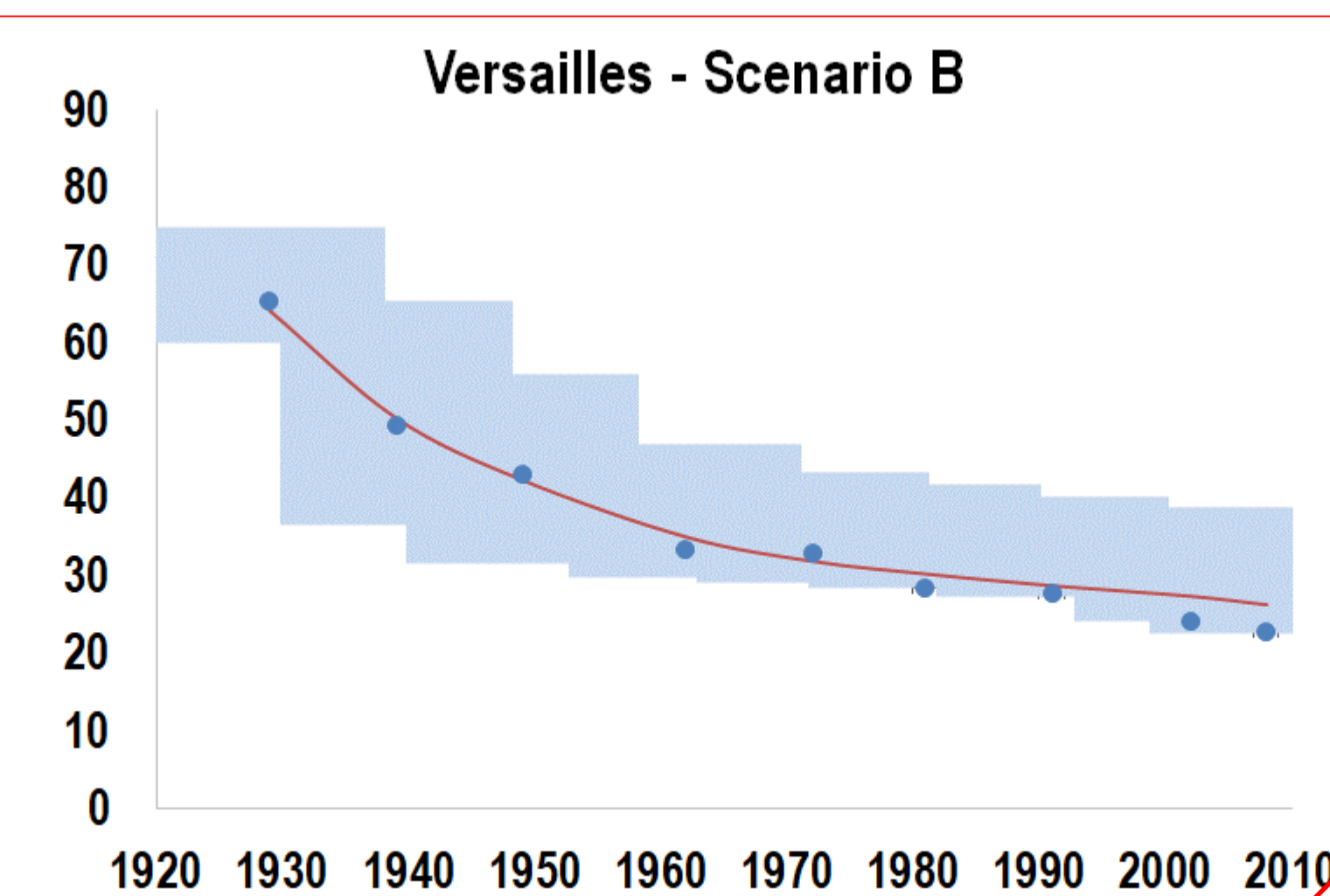
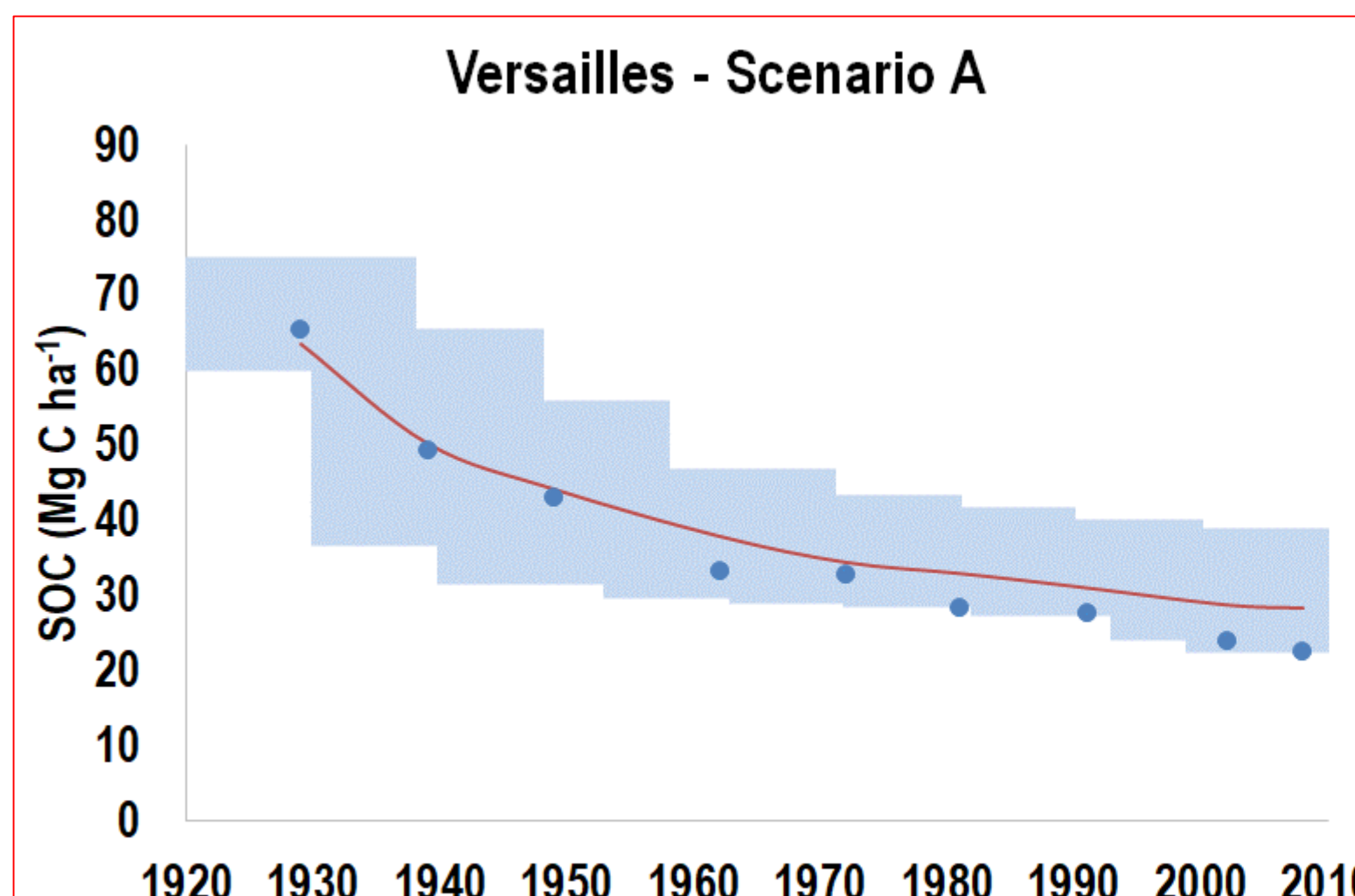
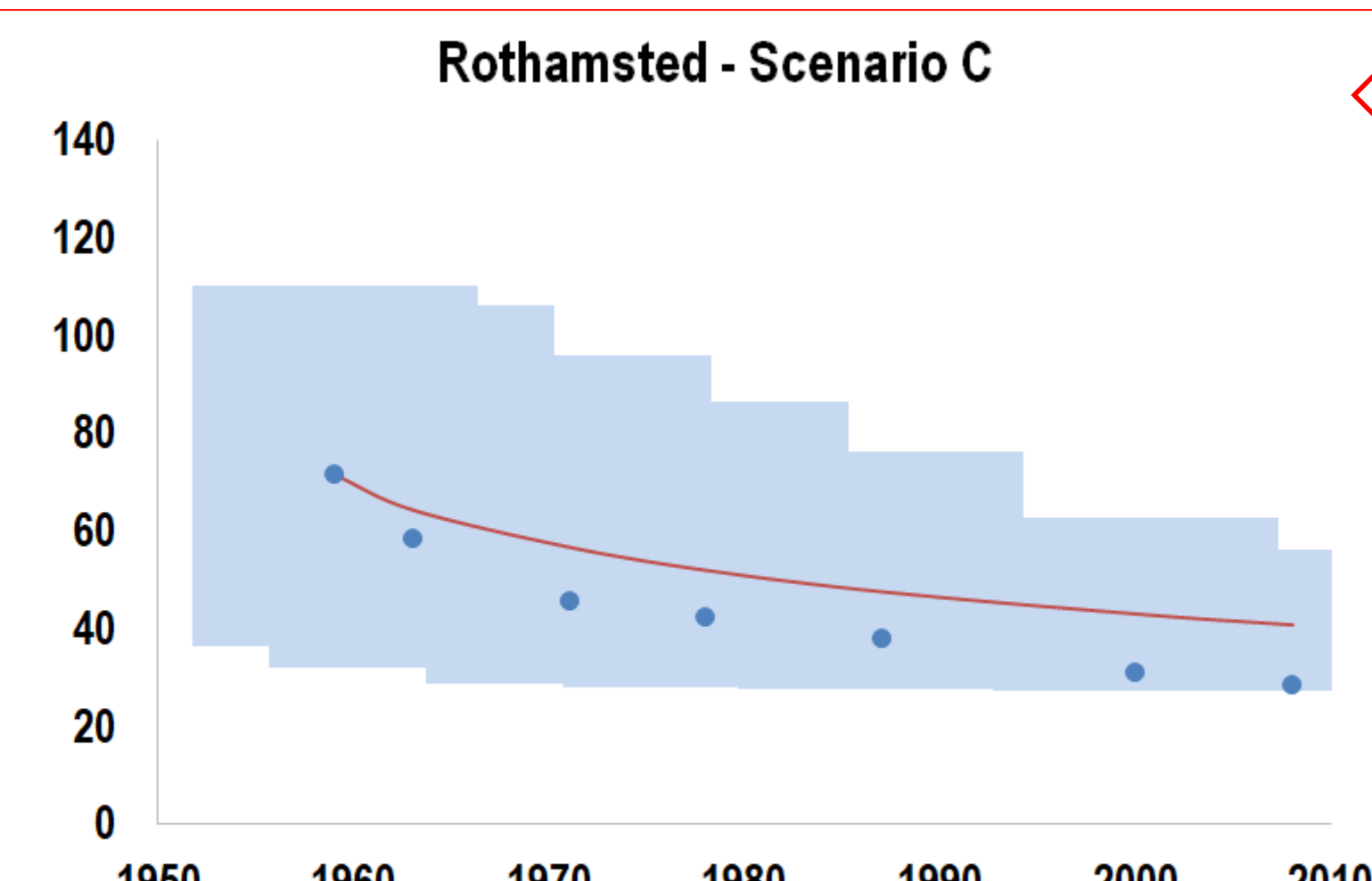
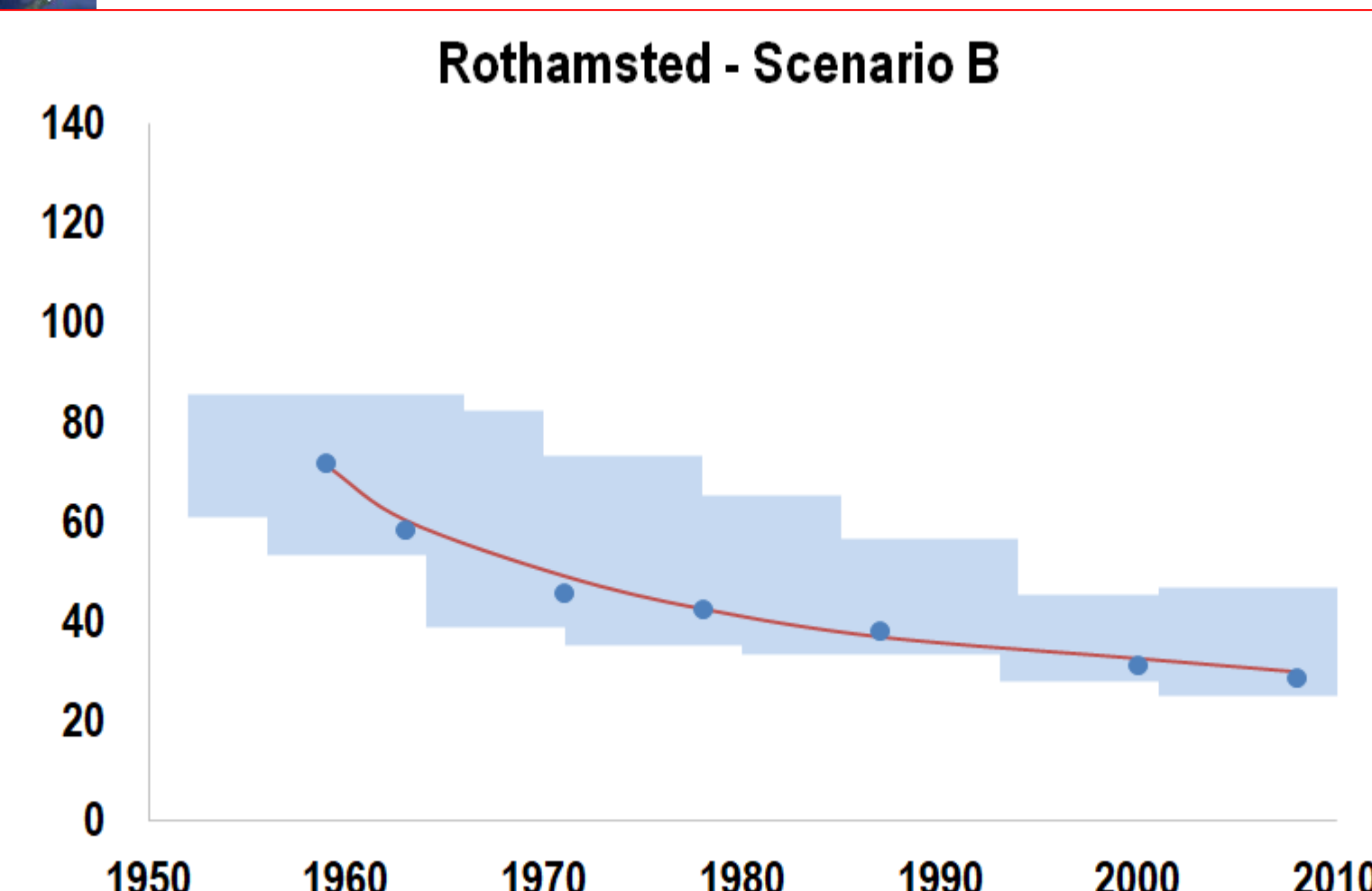
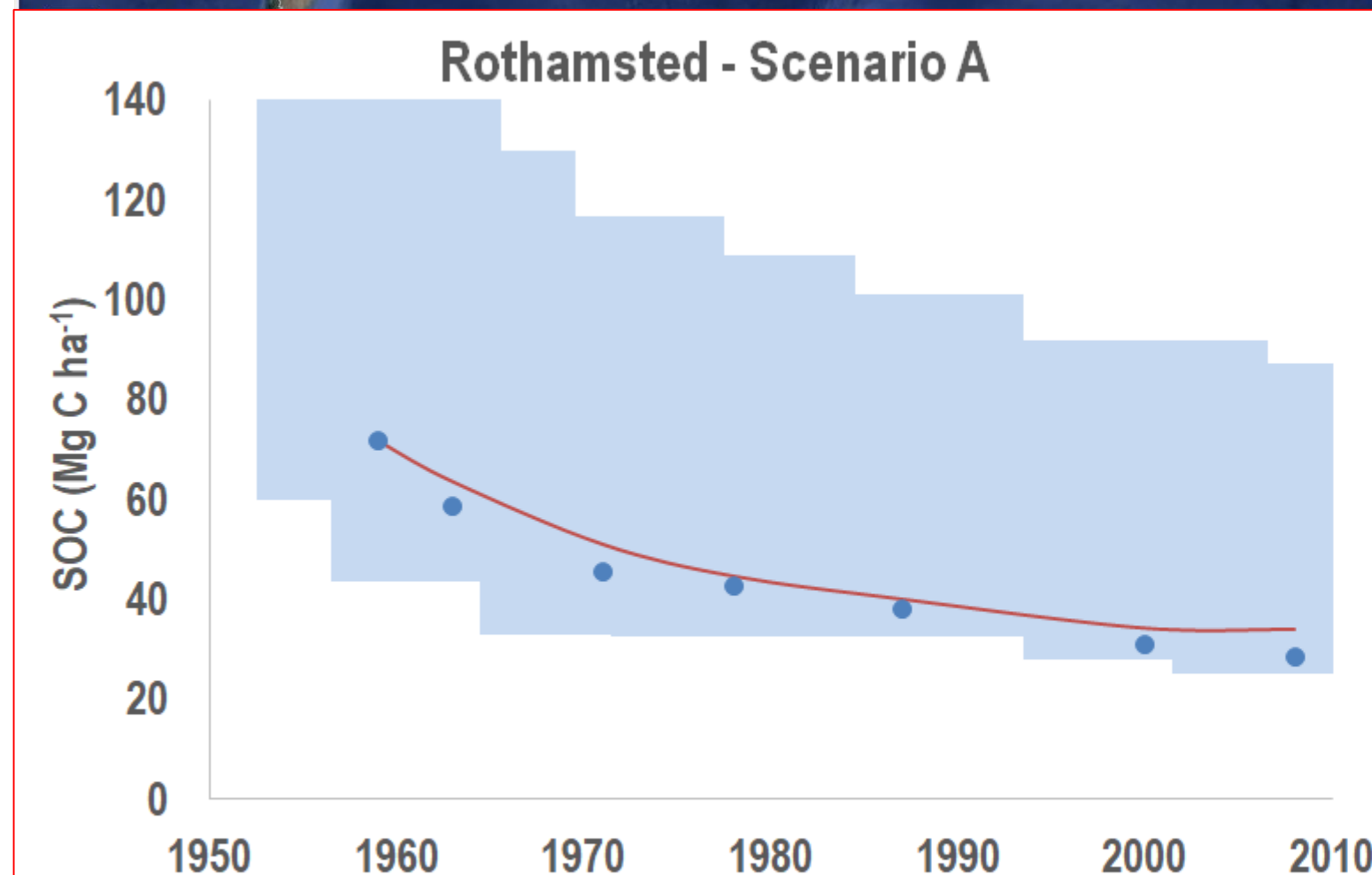
- C sequestration in agricultural soils contributes to the achievement of COP-21's "4 per 1000" initiative and there is a need of **reliable methodologies to assess soil C sequestration potential** of agricultural lands
- As part of international benchmarking actions, the C-MIP action was initiated in 2016 to address the question of whether **ensemble modelling** could improve the simulation of soil organic carbon (SOC) dynamics
- A network of six **long-term bare fallow (LTBF) experiments** offer ideal conditions to assess SOC simulations
- A multi-model ensemble with **process-based models** from 25 teams worldwide was implemented to compare simulations (before and after model calibration) to SOC data



Two study sites



Uncalibrated models



Calibration scenarios

Model category	Factors	Approaches	Scenarios		
			A	B	C
Spin-up (SP) based models	Historical management/land use	Site-specific	X	X	
		Generic/universal			X
	Decomposition processes	Site-specific		X	
		Generic/universal	X		X
No spin-up (NS) based models	Partitioning of C pools	Site-specific	X	X	
		Generic/universal			X
	Decomposition processes	Site-specific		X	
		Generic/universal	X		X

- The multi-model approach (multi-model median) represents SOC dynamics more accurately than individual models
- Calibration improves SOC simulations and reduces model variability according to different scenarios

Site	Model Quality Indicator – Multi-Model Median (best, 0≤MQI≤1, worst)			
	Uncalibrated models	Calibrated models		
		A	B	C
Rothamsted	0.2785	0.2510	0.2320	0.2707
Versailles	0.2683	0.2415	0.2435	0.2631

- Multi-metric indicator reflects the balance between model agreement and complexity

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With the support of the French-Italian programme GALILEO - CLIMSOC project

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