



HAL
open science

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

Gianni Bellocchi, Roberta Farina, Fiona Ehrhardt, Claire Chenu, Jean-François Soussana, M. Abd-Alla, Jorge Alvaro-Fuentes, Lorenzo Brilli, Hugues Clivot, M. de Antoni Migliorati, et al.

► To cite this version:

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-02790026v1>

Submitted on 5 Jun 2020

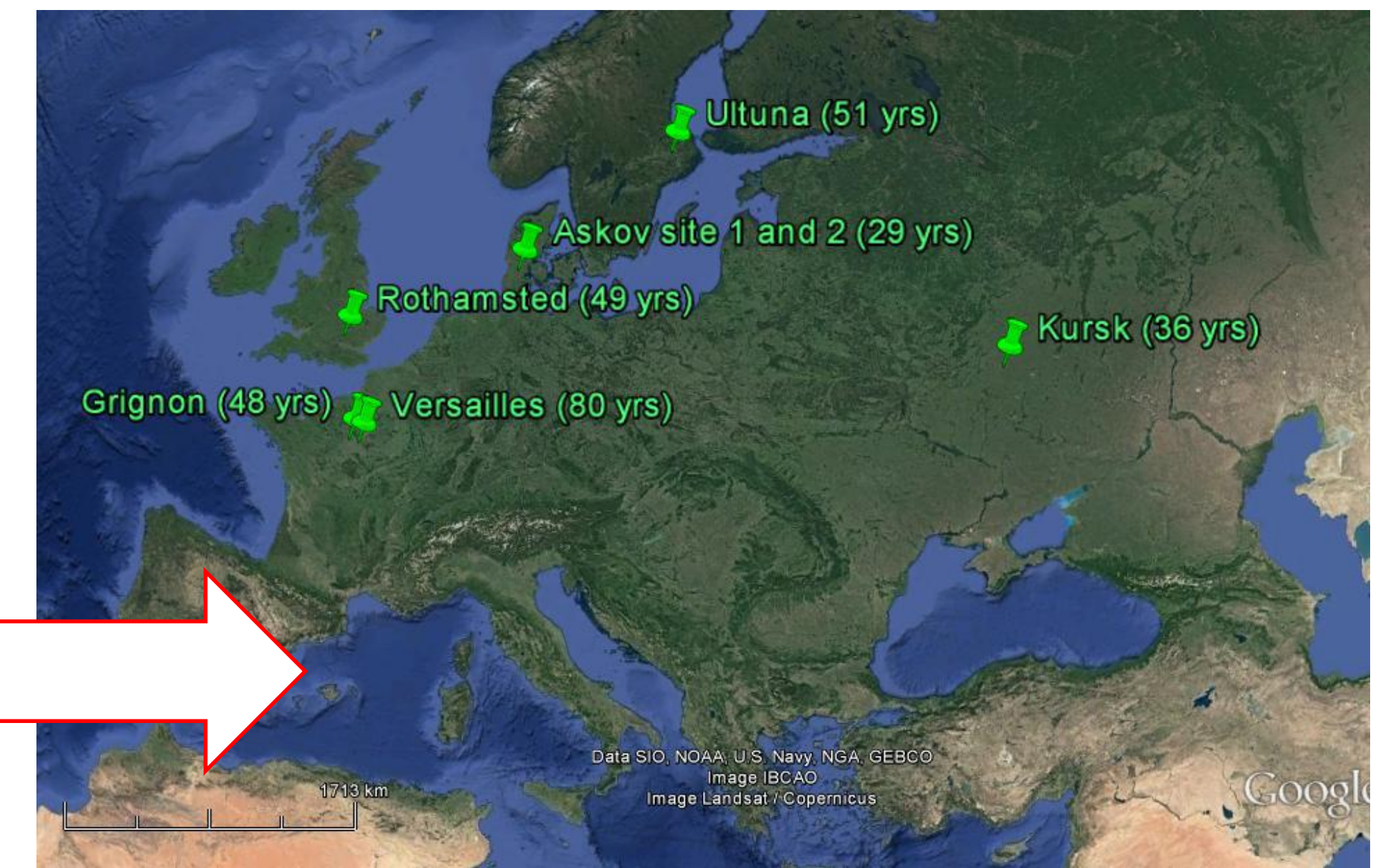
HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

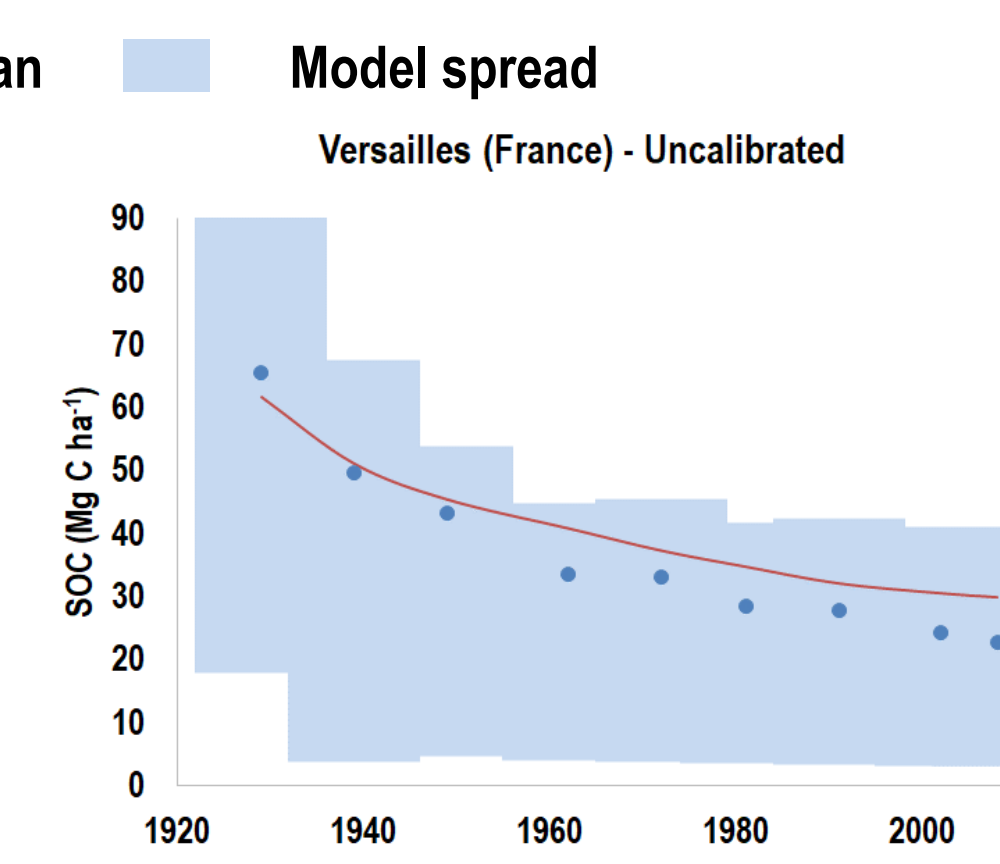
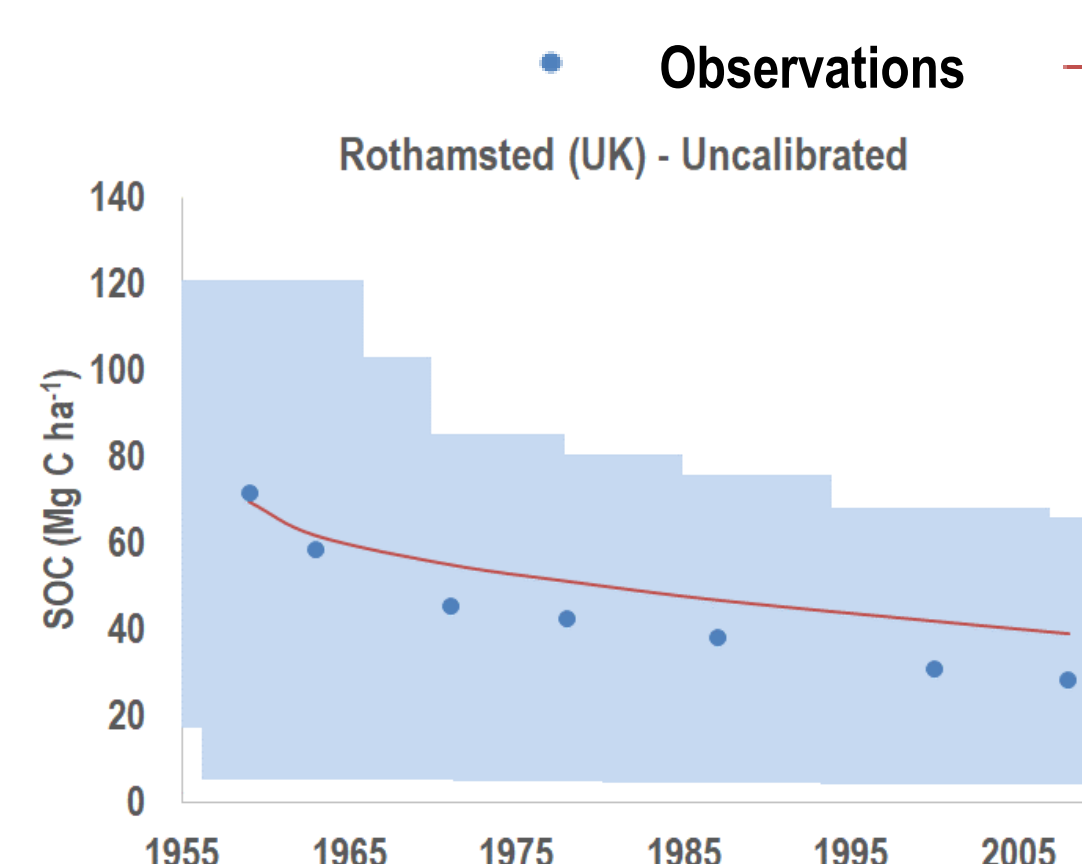
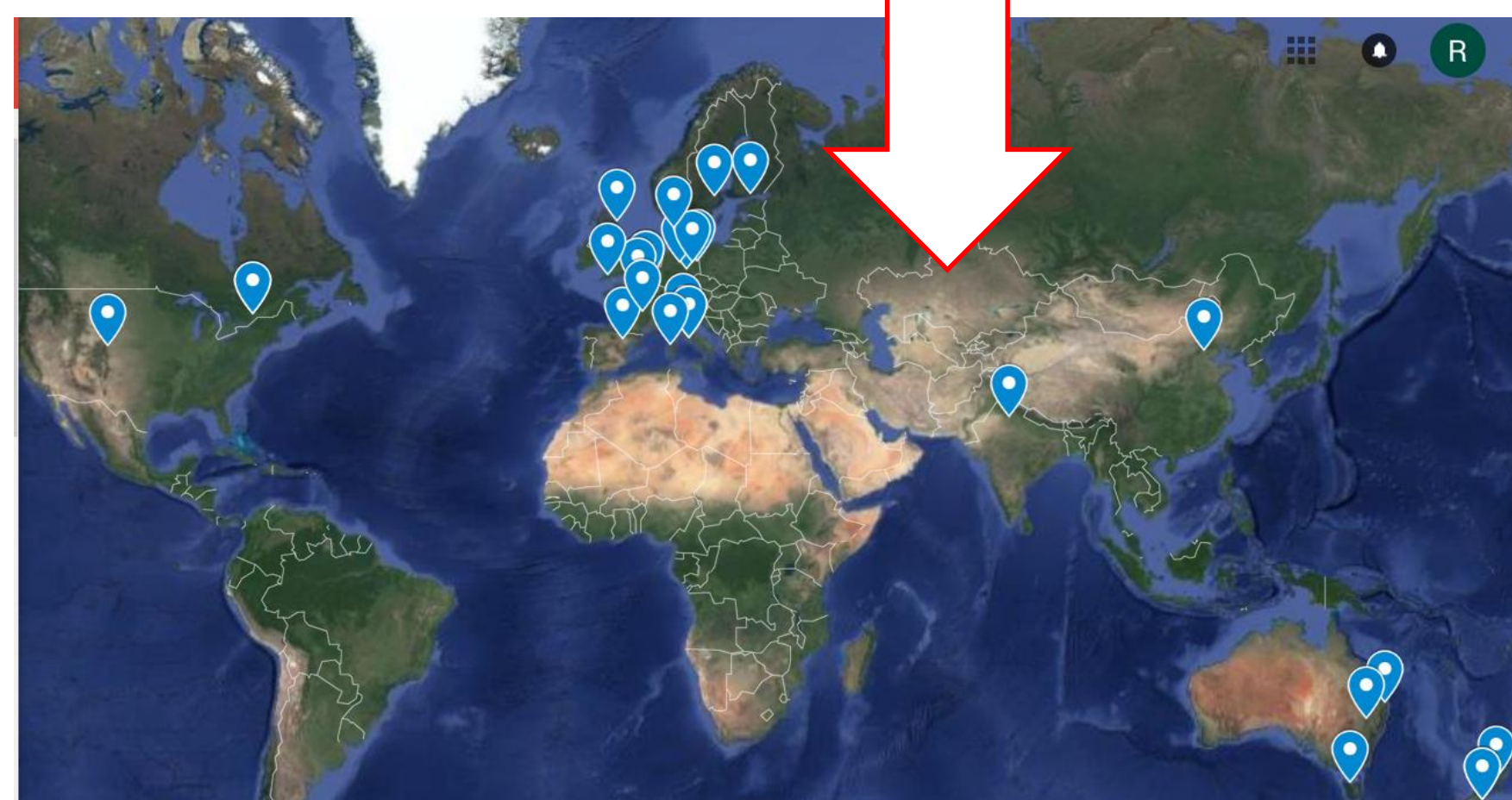
CONTACT: Roberta Farina

Agriculture and Environment (AA) - Council for Agricultural Research and Agricultural Economy Analysis (CREA), Rome (Italy)
Via della Navicella 2-4, Rome (Italy); Email: roberta.farina@crea.gov.it

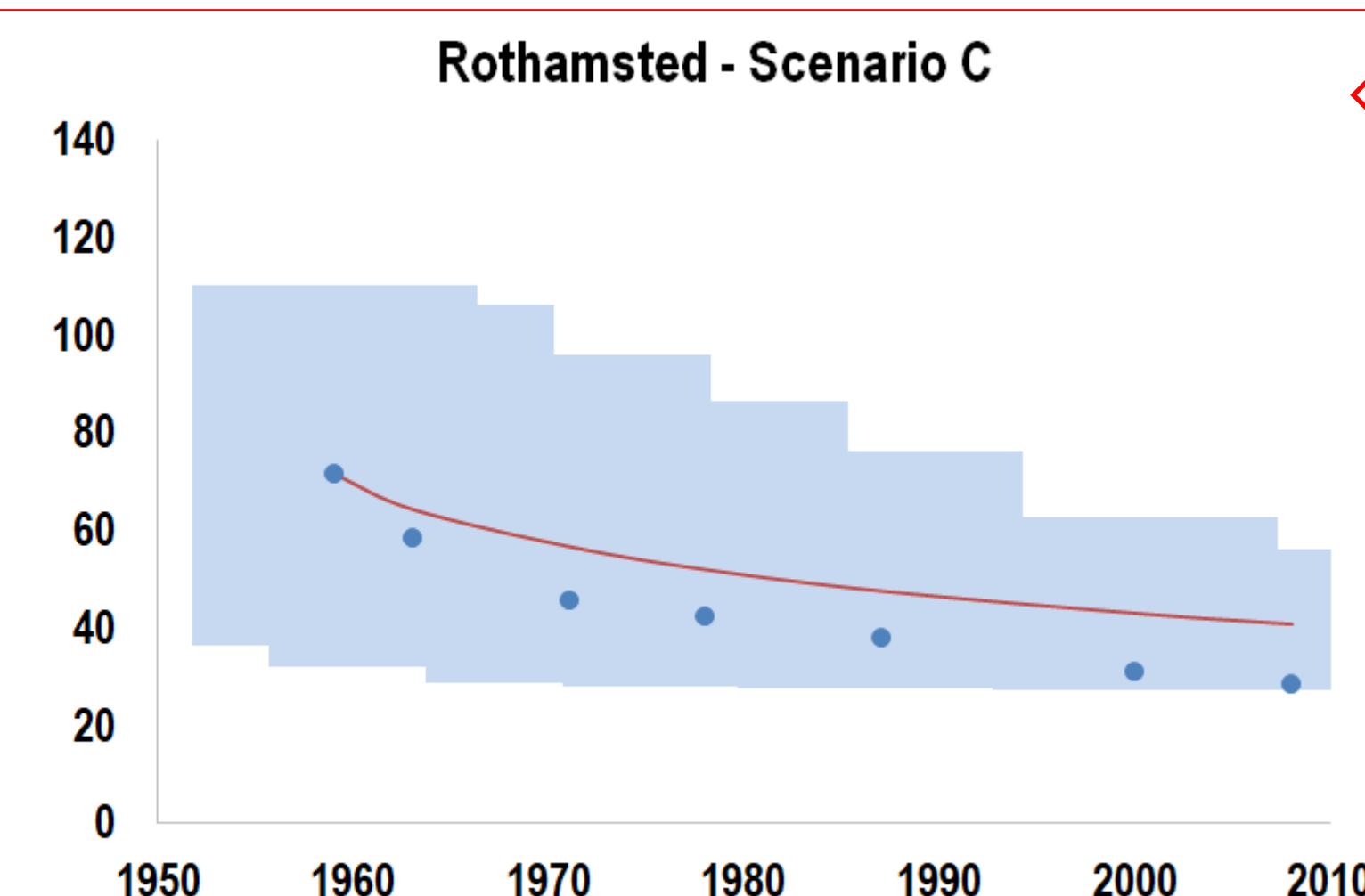
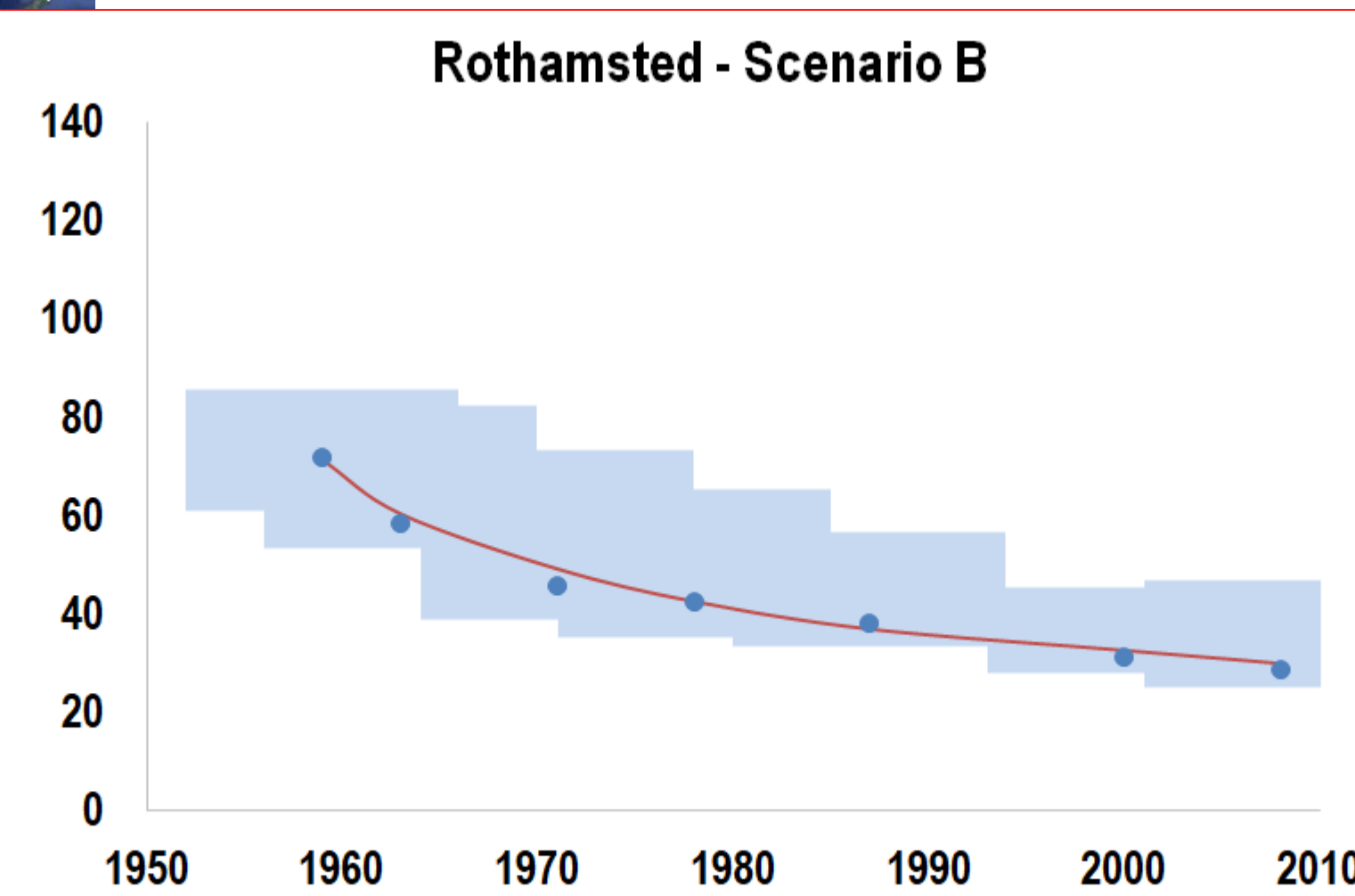
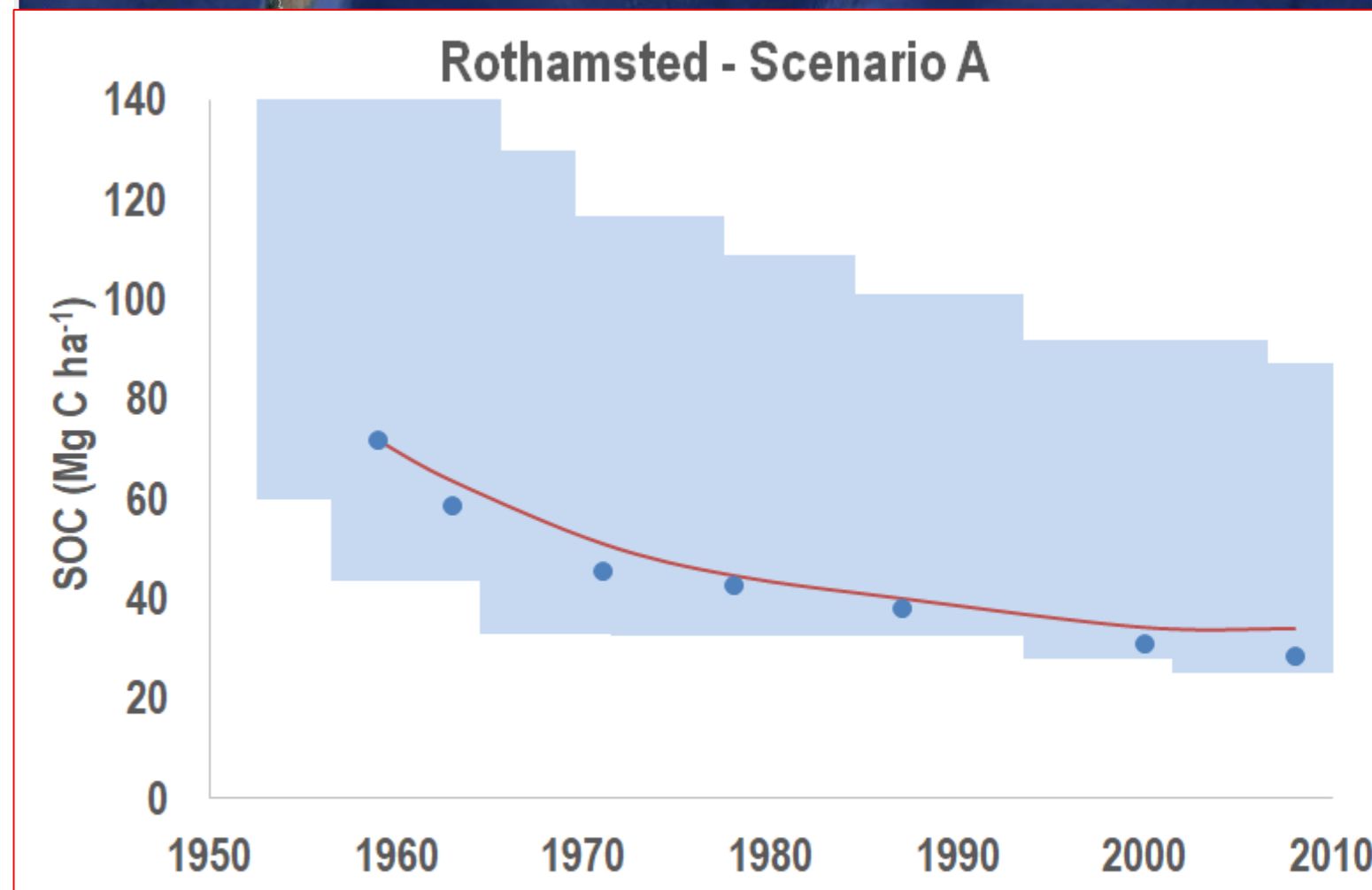
- C sequestration in agricultural soils contributes to the achievement of COP-21's "4 per 1000" initiative and there is a need of **reliable methodologies to assess soil C sequestration potential** of agricultural lands
- As part of international benchmarking actions, the C-MIP action was initiated in 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



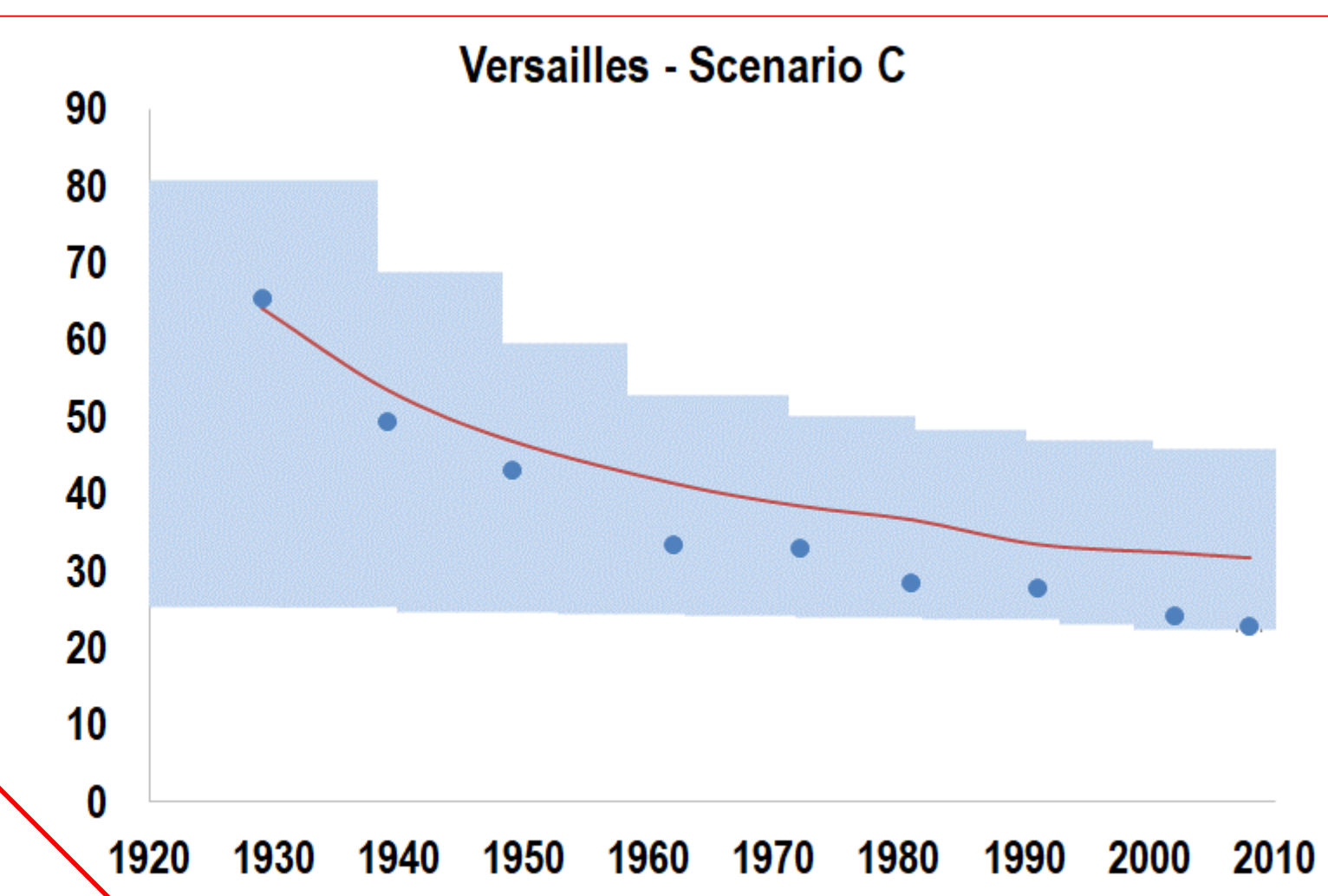
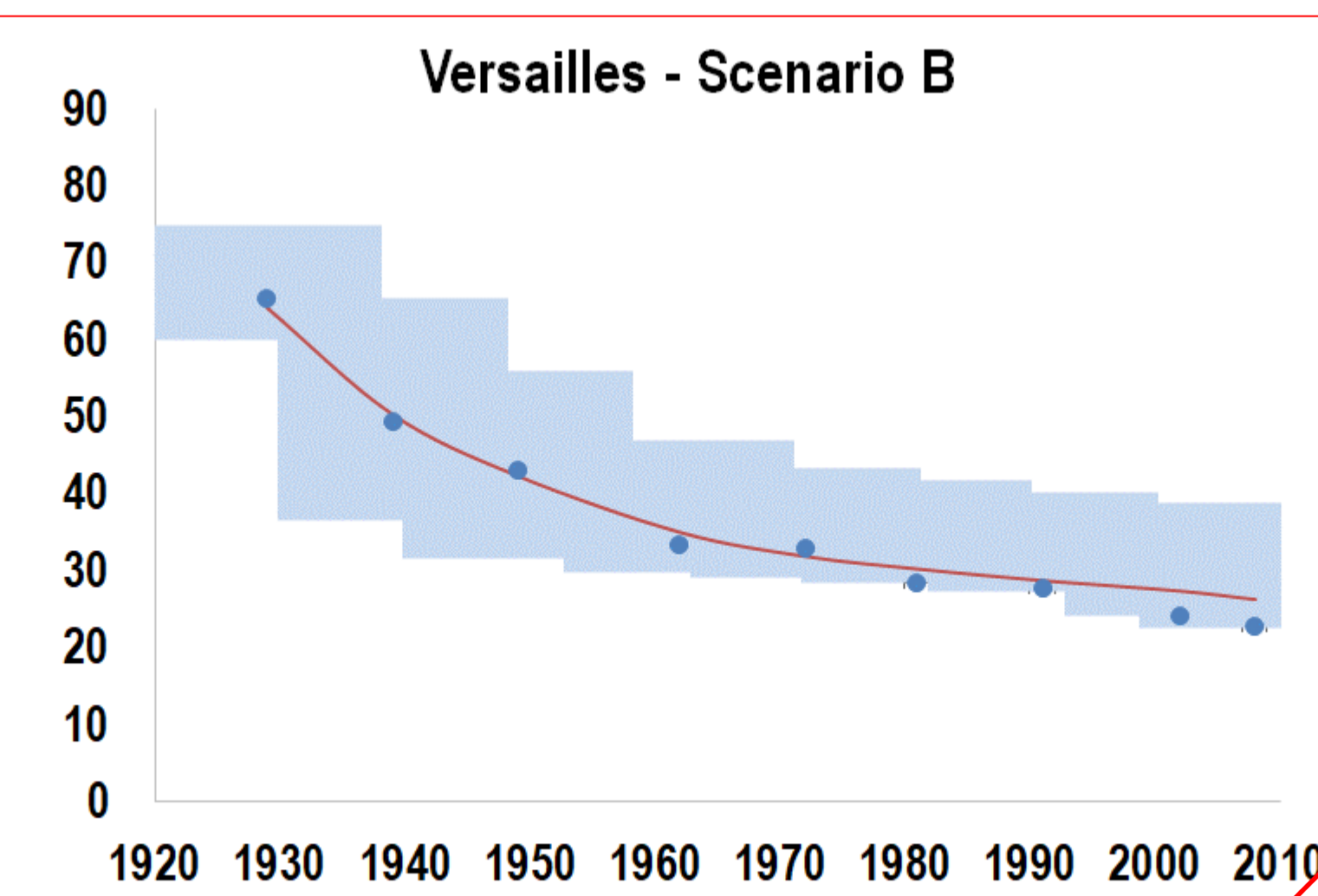
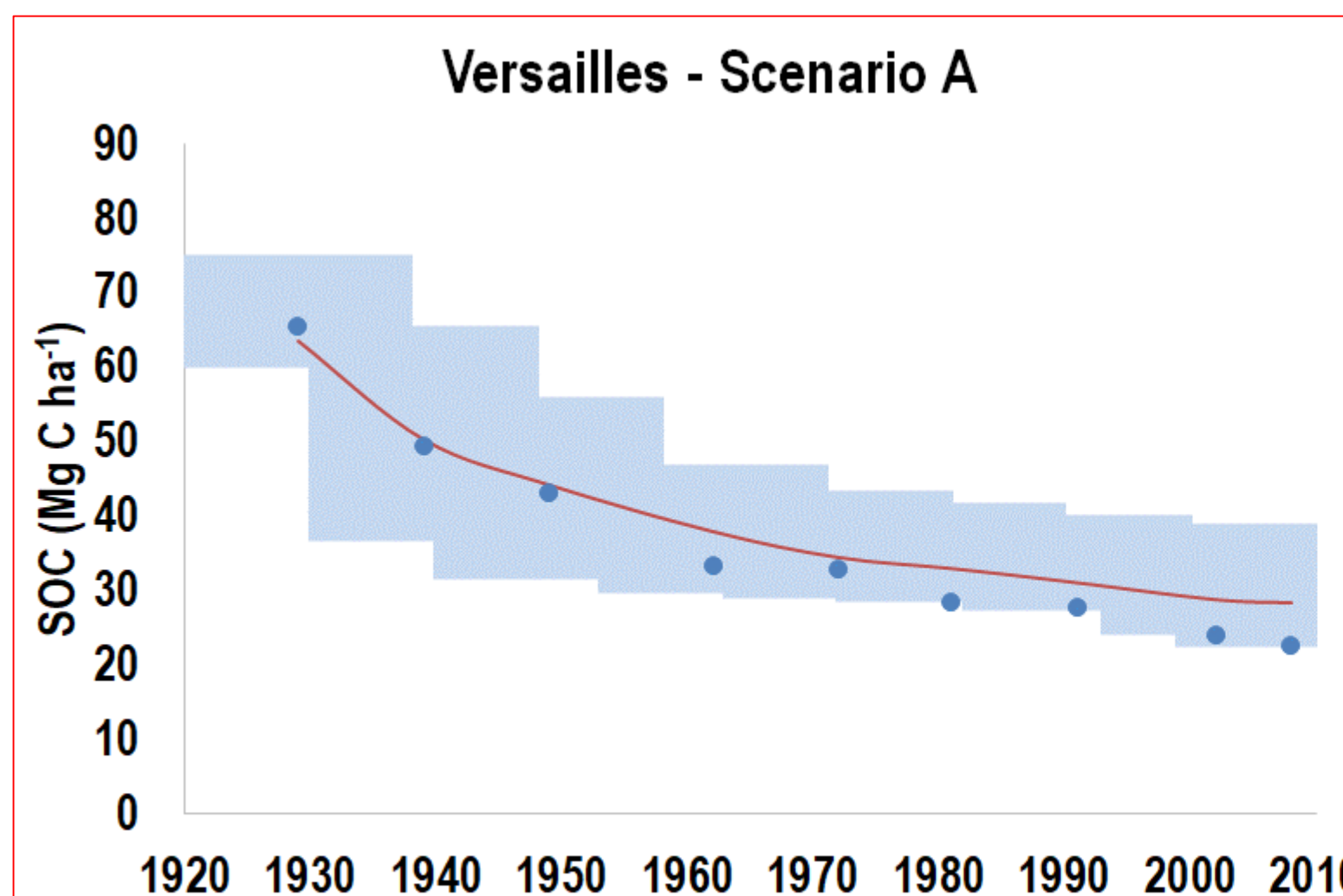
Two study sites



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