



CARBO-Extreme Work Structure

CARBO-Extreme consists of three components:

Observation component

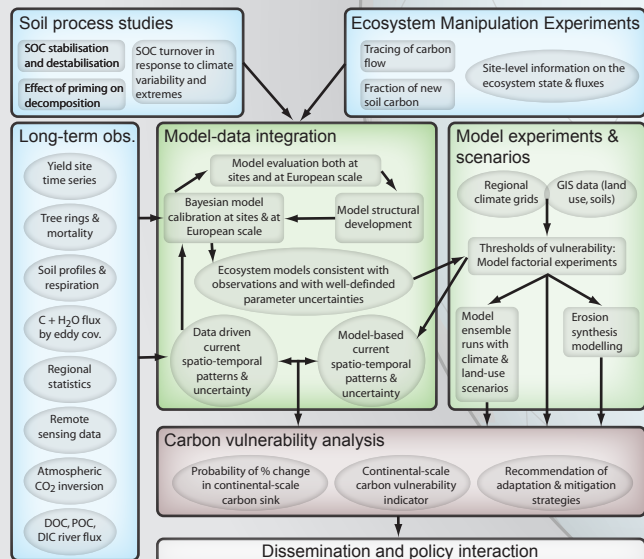
- process studies on soil carbon vulnerability
- network of ecosystem manipulation experiments
- long-term observation data sets

Modelling component

- model development & model-data integration
- model experiments & scenario analysis

Assessment component

- carbon vulnerability synthesis
- dissemination and policy interaction



SOC = soil organic carbon, DOC = dissolved organic carbon, POC = particulate organic carbon, DIC = dissolved inorganic carbon

"CARBO-Extreme will give advice to the EU commission to implement climate, soil and ecosystem protection policies."

CARBO-Extreme Partners

The Consortium consists of 25 partners from 12 European countries. It is coordinated by the Max-Planck-Institute for Biogeochemistry Jena, Germany.



Contact

Max-Planck Institute for Biogeochemistry Jena
Dr. Markus Reichstein (Coordinator)
Phone: +49 3641 576273
E-mail: markus.reichstein@bgc-jena.mpg.de

Dr. Dorothea Frank (Project Manager)
E-mail: dfrank@bgc-jena.mpg.de

Flyer layout

D. Frank / A. Görner / M. Reichstein (MPI-BGC)
C. Bounama / A. Rammig (PIK)

Disclaimer

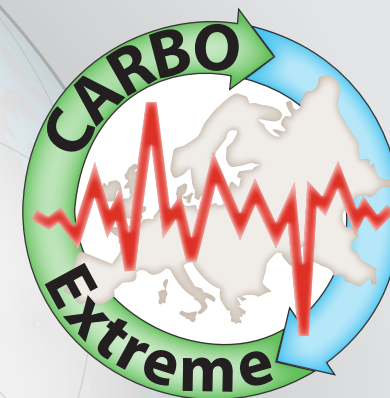
The views expressed in this document may not in any circumstances be regarded as stating an official position of the European Commission. Use of the information provided is at the reader's sole risk.



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 226701.



CARBO-Extreme



The Terrestrial Carbon Cycle under Climate Variability and Extremes - A Pan-European Synthesis

A 4-year multidisciplinary research project funded by the European Commission.

Find more info at:

www.carbo-extreme.eu



"The terrestrial carbon cycle is an essential diagnostic of ecosystem health and the basis of food and timber production."

Climate Variability and Extreme Events

Increasing concentrations of greenhouse gases do not only lead to gradual 'global warming' but also to changed precipitation patterns, increased variability and weather extremes such as heat waves, longer dry spells, variability of growing season length and heavy rainfall.

Current climate models predict specific regional effects (IPCC 2007):

- Northern Europe: warmer and wetter winters and longer growing seasons,
- Central & Southern Europe: hotter and drier summers,
- Mountain areas: reduced snow cover and glacier retreat,
- Overall more variable climate in temperate zone.

Ecosystems - like humans - are not bound by a 'mean climate' but only the actual temperature, moisture, wind etc. Climate variability does not only affect human health – e.g. with over 70.000 casualties during the 2003 heat wave - but also forest, crop and grassland productivity, which has severely suffered regionally from the recent 2006, 2005 and most prominently 2003 climate anomalies.

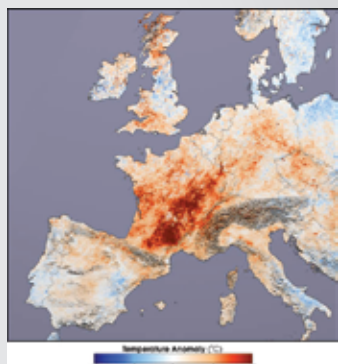


Fig.1: Temperature difference from the average during the European heat wave of 2003

(Image by Reto Stöckli, Robert Simmon and David Herring, NASA Earth Observatory, based on data from the MODIS land team.)

The European Terrestrial Carbon Cycle – State of the Art

- According to the latest assessment the European terrestrial biosphere is a net carbon sink (CARBOEUROPE-IP project).
- The future fate of this sink is highly uncertain and depending on climate and land-use.
- Climate variability and extremes will play an important role, but have not been sufficiently accounted for in modelling and experimental studies leading to a critical knowledge gap.

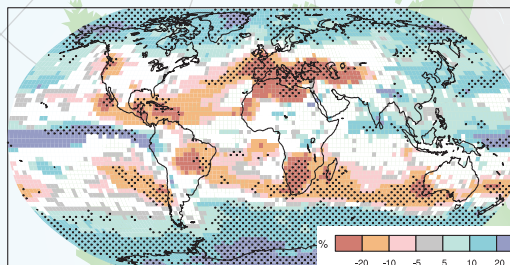


Fig.2: Relative changes in precipitation (in %) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for June to August. White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. (IPCC 2007 WG1-AR4; their fig. SPM7)

CARBO-Extreme ...

... wants to close this knowledge gap by

- bringing together and reanalyzing existing long-term carbon cycle related observations,
- synthesizing and harmonizing new experimental approaches,
- compiling and adapting latest regional climate scenarios,
- using a strong model-data integration framework,

... and thereby will yield improved assessments of the European carbon cycle under future climate and advice to the European Commission and other stakeholders regarding climate, soil and ecosystem protection policies.

"CARBO-Extreme builds upon an integrative observational, modelling and assessment approach."

"CARBO-Extreme will improve predictions about the future carbon cycle in Europe."

CARBO-Extreme Objectives

the aims of CARBO-Extreme are:

- to obtain a better and more predictive understanding of European terrestrial carbon cycle responses to climate variability and extreme weather events,
- to identify the most sensitive and vulnerable carbon pools and processes under different scenarios,
- to map the most likely trajectory of carbon pools in Europe over the 21st century and associated uncertainties,
- to build a European network of Ecosystem Manipulation Experiments feeding into a harmonized database,
- to build a consistent multi-source (ecosystem experiments, long-term monitoring of soils, trees and fluxes, remote sensing, riverine transport) database on the European carbon cycle components to study climate variability and extreme events,
- to perform a Bayesian model calibration and comparison leading to improved terrestrial carbon cycle predictions and their uncertainties in scenario analyses,
- to give advice to the European Commission and other stakeholders,
- to support the development and implementation of climate, soil and ecosystem protection policies.

Copyright & picture information:

1| Michael Bahn, UIBK (Innsbruck, Austria): Drought experiment at CARBO-Extreme site Stubai, Austria, June 2009

2| Flurin Babst, WSL (Birmensdorf, Switzerland): researches at fieldwork - sampling in Abisko National Park, Sweden & Pinus sylvestris disc collected in Finnish Lapland

3| Marie Guillot, INRA, EPHYSE (Bordeaux, France): KLAUS storm impact on a maritime pine forest in a experimental watershed near Bordeaux; 28.01.09

4| Marcel van Oijen, CEH-Edinburgh (U.K.): Drought in Mediterranean soil, island of Milos, Greece.