

## **CARBOOCEAN – A EUROPEAN INTEGRATED PROJECT ON OCEAN CARBON SOURCES AND SINKS**

A.N.A. Volbers<sup>1</sup>, C. Heinze<sup>1</sup>, and the CARBOOCEAN Consortium

<sup>1</sup>*Bjerknes Centre for Climate Research, University of Bergen, Allégaten 70, N-5007 Bergen, Norway, [andrea.volbers@bjerknes.uib.no](mailto:andrea.volbers@bjerknes.uib.no) and [heinze@gfi.uib.no](mailto:heinze@gfi.uib.no)*

The CARBOOCEAN consortium aims at an accurate scientific assessment of the marine carbon sources and sinks within space and time. It will determine the ocean's quantitative role for uptake of atmospheric carbon dioxide (CO<sub>2</sub>), the most important manageable driving agent for climate change. Since the ocean has the most significant overall potential as a sink for anthropogenic CO<sub>2</sub>, the correct quantification of this sink is a fundamental necessary condition for all realistic prognostic climate simulations. Target is to reduce the present uncertainties in the quantification of net annual air-sea CO<sub>2</sub> fluxes by a factor of 2 for the world ocean and by a factor of 4 for the Atlantic Ocean.

CARBOOCEAN is an Integrated Project funded by the European Commission (contract 511176-2) with 14.5 Million € over a 5 year period to assess the marine carbon sources and sinks with special focus on the Atlantic and Southern Oceans of -200 to +200 years from now. It combines the key European experts and scientific resources in the field and cooperates with 7 research institutes from the US. Altogether, 40 international partners from Belgium, Denmark, France, Germany, Iceland, Morocco, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland, United Kingdom, and the USA represent the CARBOOCEAN consortium.

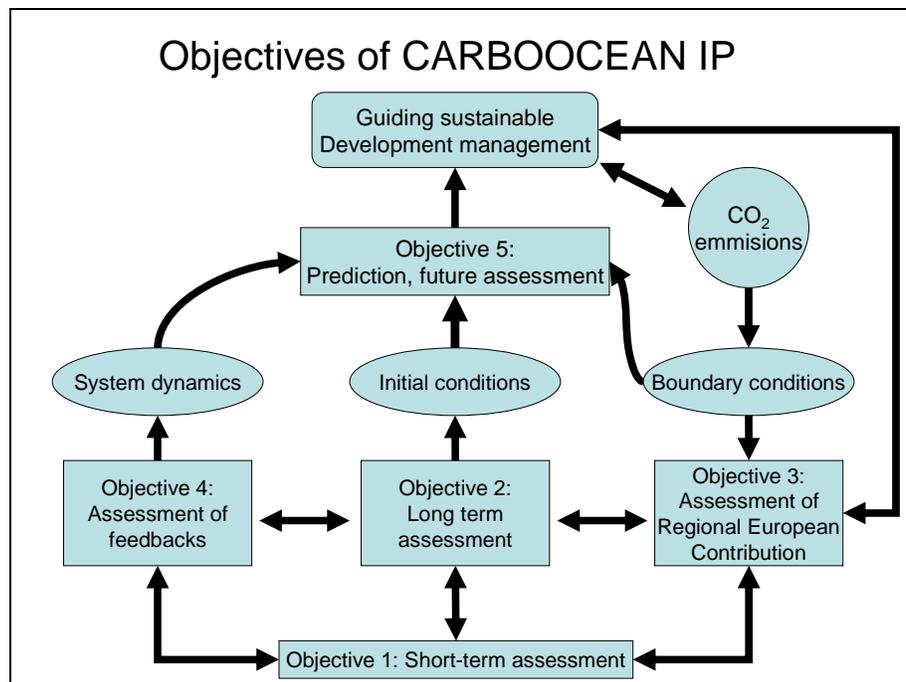
Expected breakthroughs by CARBOOCEAN IP will be firm answers to the following as yet unresolved questions:

- How large are the Atlantic and Southern Ocean CO<sub>2</sub> sinks precisely, i.e. how efficient is the downward transport of carbon in the deep-water production areas of the world ocean?
- What do European rivers and shelf seas contribute to the large scale CO<sub>2</sub> sources and sinks pattern of the North Atlantic Ocean in relation to uptake within Western Europe?
- What are the key biogeochemical feedbacks that can affect ocean carbon uptake and how do they operate?
- What is the quantitative global and regional impact of such feedbacks when forced by climatic change in the next 200 years?

The CARBOOCEAN IP will answer these questions through basic research in a strategic combination of extensive large-scale observations, process studies and advanced computer models focusing on all quantitatively important aspects to the problem. The three elements - observations, process studies, and integrative modeling – equivalent to description, understanding and prediction will create scientific knowledge, which is essential to a quantitative risk/uncertainty judgment on the expected consequences of rising atmospheric CO<sub>2</sub> concentrations. Based on this judgment, it will be possible to guide the development of appropriate mitigation actions, such as the management of CO<sub>2</sub> emission reductions within a global context (e.g., Kyoto Protocol, 1997; <http://unfccc.int/resource/docs/convkp/kpeng.html>).

The CARBOOCEAN scientific project objectives are:

- Objective 1: Description and quantification of the CO<sub>2</sub> air-sea exchange on a seasonal to interannual scale for the Atlantic Ocean and the Southern Ocean (*short term assessment of net air-sea CO<sub>2</sub> fluxes*)
- Objective 2: Quantification of decadal-to-centennial large-scale Atlantic and Southern Ocean carbon inventory changes (*large scale assessment of the ocean carbon storage*)
- Objective 3: Quantification of the carbon sources and sinks at the European regional scale (*assessment of the western European contribution to the oceanic CO<sub>2</sub> uptake*)
- Objective 4: Identification and understanding of biogeochemical feedback mechanisms which control marine carbon uptake and release (*assessment of the role of biogeochemical feedbacks for oceanic CO<sub>2</sub> uptake*)
- Objective 5: Integration of carbon observations into an integrated prognostic modeling framework (*assessment of future marine CO<sub>2</sub> uptake kinetics based on models and data*)



This project is coordinated by the University of Bergen (UoB) and the Bjerknes Centre for Climate Research (BCCR) through an International Project Office in Norway. Please visit <http://www.carboocean.org> for further information.