

# Modelling the future behaviour of oceans and atmosphere

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Over the past century, the atmosphere and ocean have warmed, sea ice extent has reduced and greenhouse gases have increased. How future changes will evolve and how humankind can protect itself from possible

calamities depends on the implementation of effective political measures and scientific insight. These are major challenges that require international collaboration.

The EU project COMBINE ('Comprehensive Modelling of the Earth System for Better Climate Prediction and Projection'), which is now nearing completion, has contributed significantly to improved Earth system models.

"COMBINE's major contribution is in increasing our ability to project and predict [climate](#) change," says project manager Elisa Manzini of the Max Planck Institute for Meteorology in Hamburg, Germany.

The project brought together leading European Earth system modelling researchers with the goal of achieving a better understanding of how atmosphere, land and oceans behave and interact.

Indeed, the project has been hugely successful, enabling the European climate community to participate in the international Coupled Model Inter-comparison Project Phase 5 (CMIP5) of the World Climate Research Programme (WCRP).

COMBINE addressed the challenge of coupling nitrogen and carbon cycles in land and ocean ecosystems, which will help scientists study ocean de-nitrification in response to a predicted decline in marine ecosystem productivity.

A particularly interesting aspect of the project focused on modelling the evolution of the Greenland ice-sheet in response to CO<sub>2</sub> increases in comprehensive climate models.

Incorporating [sea ice](#) observations in climate predictions is leading to more accurate simulations of the past and possible future of Arctic sea

ice evolution.

COMBINE also investigated the climate impact on water availability and agriculture, and has contributed to the assessment of vulnerability and adaptability of the Earth System.

Scientific results gleaned from the project have been disseminated to the international research community through peer-reviewed articles. Indeed, throughout the project, COMBINE's research goals have been consciously aligned to boost international research activities.

As a result, the [project](#)'s findings will support international [climate research](#) well into the future, including assessments carried out under the Intergovernmental Panel on Climate Change (IPCC).

COMBINE, which runs until October 2013, received EU funding of  $\text{€}7.9$  million.

**More information:** [www.combine-project.eu](http://www.combine-project.eu)

Provided by CORDIS

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