



ENSEMBLES – providing ensemble-based predictions of climate changes and their impacts

Predicting the future climate is a major challenge due to the complex nature of the Earth system. The only tools for this task are physically-based climate models of the key components of the Earth system. However, when making predictions of natural climate variability and the human impact on climate one has to deal with probabilities, due to uncertainties in the representation of the key processes within the models, the starting conditions used for the forecasts, and climatic forcing factors such as the future concentrations of atmospheric carbon dioxide. Hence, reliable estimates of climatic risk are best made through multiple integrations of models of the Earth system in which these uncertainties are explicitly incorporated by using different representations of processes within a model and different models, slightly varying the initial conditions, and exploring different scenarios of climatic forcing. The ensuing ensemble of results allows us to quantify the uncertainty in the climate projections by using statistical techniques.

The European Commission has funded the ENSEMBLES project to develop an ensemble prediction system to provide policy relevant information on climate change and its interactions with society. This ensemble prediction system will be used to provide probabilistic estimates of climatic risk by making a large number of integrations of Earth system models, known as an ensemble, in which the uncertainties noted above are explicitly incorporated. The system will be used across a range of timescales (from seasonal to decadal and longer) and spatial scales (global, regional and local), and there will be an emphasis on changes in extreme events (for example the severity and frequency of heatwaves, drought, forest fires, storminess and flooding), and the effects of high-impact but low-probability events such as a shutdown of the thermohaline circulation in the North Atlantic.

The main objectives of ENSEMBLES are to:

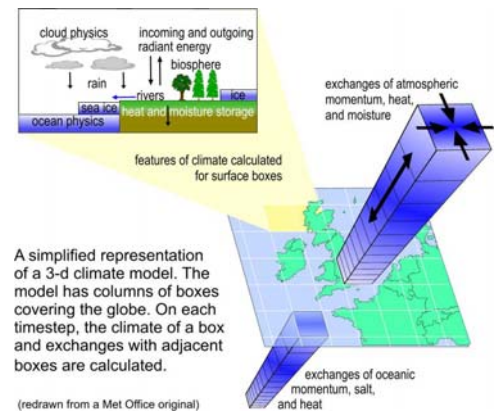
- develop an ensemble prediction system based on state-of-the-art global and regional Earth system models developed in Europe, and evaluate the system using climate observations;

- quantify and reduce uncertainty in the representation of physical, chemical, biological and human-related feedbacks in the Earth system (including water resource, land use, and air quality issues, and carbon cycle feedbacks);
- apply the outputs of the ensemble prediction system to a range of applications, including agriculture, health, food security, energy, water resources, weather risk and insurance.

ENSEMBLES is a 5-year Integrated Project funded under the EC's 6th Framework Programme and is being coordinated by the Hadley Centre at the Met Office in the UK. The project started in September 2004 and is a major undertaking by 66 institutions from 19 countries, mainly in Europe. ENSEMBLES directly addresses key objectives of the United Nations Framework Convention on Climate Change (UNFCCC) including the Kyoto Protocol, and the Intergovernmental Panel on Climate Change (IPCC), two of the most important international agencies formulating climate change policy. The relevant objectives of the UNFCCC and IPCC are to:

- provide the best available scientific information and assessment on climate change and its impacts, to provide input for policy makers concerning the assessment of dangerous anthropogenic interference with the climate system;
- reduce uncertainties in knowledge of the climate system and the adverse impacts of climate change;
- promote the development and implementation of education and training programmes;
- increase the awareness and public access to information on climate change.

The findings of the ENSEMBLES project will therefore be of great practical value to policy makers, stakeholders and the public. The results will be disseminated through web sites and informative leaflets intended to improve the understanding of climate change for wide-ranging audiences, along with the production of policy-oriented publications for bodies such as the UNFCCC and IPCC.



An example of the predicted change in summer-average precipitation over Europe from an ensemble of model simulations

For more information, see the project website: <http://www.ensembles-eu.org> or email ensemblesfp6@metoffice.gov.uk

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