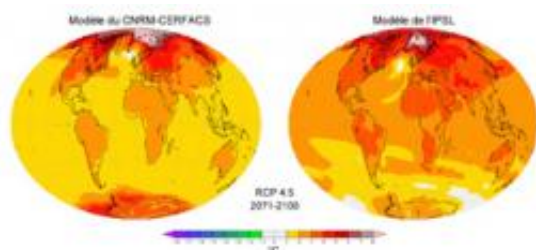


Climate change: French researchers complete new simulations for the next IPCC report

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Changes in the Earth's surface temperature for the period 2071-2100 compared with the period 1971-2000, calculated using the CNRM-CERFACS and IPSL models for scenario RCP4.5 (moderate). Credit: Patrick Brockmann (LSCE/IPSL, CEA/CNRS/UVSQ)

The French climatology community, which includes CNRS, Météo-France, the CEA, UPMC and UVSQ, has just completed a major exercise in the simulation of past and future climate conditions on a global scale. This new body of data confirms the conclusions of the most recent report by the IPCC(2007) on future changes in temperature and rainfall. By 2100, average global temperatures are expected to rise by 3.5 to 5°C according to the most unfavorable scenario, or 2°C according to the most optimistic projections. This study has been made available to the international community, and will be used by the IPCC in its next report, to be released in 2013. It provides information on likely climate conditions and trends at the end of the century and, for the first time, over the next 30 years as well.

The IPCC was formed for the purpose of gathering and summarizing all the available scientific information on [climate change](#), its impact and solutions for countering or adapting to it. The first section of its fifth report, to be published in mid-September 2013, will give an update on the new findings compiled in recent years. Just as for the 2007 edition, the international scientific community has joined forces, in particular through the WCRP, to define and carry out an exercise to simulate past and future climate conditions, called the CMIP-5 (Coupled Model Intercomparison Project).

This ongoing research effort, which requires vast resources in terms of manpower, computing power and data storage capacity, involves more than 20 climatology centers around the world and the development of some 50 digital models. In France, many organizations are contributing to the project, in particular through the CNRM, in association with CERFACS and IPSL.

The CMIP-5 project introduces a number of innovations in relation to the previous exercises:

- The inclusion of scenarios that incorporate climate policies intended to reduce greenhouse gas emissions;
- The use of models that are both more complex (for the better integration of factors like aerosols, the carbon cycle, etc.) and more precise (for better resolution);
- An in-depth evaluation of the models' capacity to reproduce past climate conditions and the mechanisms that underlie their evolution;
- A series of “retrospective forecasts” for the past 50 years, as well as a preliminary forecast exercise for the period between 2010 and 2035.

Findings of the French simulations

In keeping with the IPCC's conclusions of 2007, all scenarios predict a

trend toward higher temperatures between now and 2100. The severity of the rise varies depending on the scenario under consideration, reaching 3.5 to 5°C for the most unfavorable but only 2°C for the most optimistic — a scenario that depends on the successful implementation of policies to reduce greenhouse gas emissions. In addition, it seems that natural factors alone cannot explain the average global warming observed since the second half of the 20th century.

The new simulations confirm an intensification of the hydrological cycle and the rapid melting of the Arctic ice cap. According to the most pessimistic scenario, the Arctic Sea will be totally ice-free in the summer by 2040 or 2060, depending on the model.

Some new responses are offered by the simulations that link climate conditions to the carbon cycle. In particular, they make it clear that anthropogenic emissions must be rapidly reduced in order to reach “negative” emissions (i.e. a level of anthropogenic activity that makes it possible to draw CO₂ directly from the atmosphere) by the end of the 21st century.

The analyses of this set of simulations, in combination with simulations by other international research groups, will shed new light on the link between human activity and climate change, both in the past several decades and, more importantly, in the decades and centuries to come.

Provided by CNRS

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