CS06

iCLIPS

Constraining long-term climate and sea-level projections using the Last Interglacial

DURATION OF THE PROJECT
15/12/2010 – 31/03/2015

BUDGET
960.304€

KEYWORDS
Earth System Models, Climate Change, Last Interglacial, Ice sheets, Sea Level

CONTEXT

Uncertainties in future climate and sea-level projections are of major concern for policy makers, facing the need for concrete decisions on mitigation and adaptation strategies. Aside from the inherent uncertainties of future anthropogenic emissions of greenhouse gases and aerosols, the wide range of possible scenarios of long-term climate and sea-level evolution arises from uncertainties in the modeling of key processes in the Earth system. iCLIPS intends to constrain these uncertainties by using information from the Last Interglacial (LIG, 130-115 kyr BP), a period warmer than today which is probably the best analogue for future climate change for which increasingly better proxy data have recently become available.

PROJECT DESCRIPTION

Objectives

The overall objective of iCLIPS is to improve projections of climate and sea-level changes over the current century and this millennium, to identify the likelihood of abrupt changes, and to better understand their causes and mechanisms. The focus lies on the evolution of the two polar regions, the North Atlantic and Europe.

Methodology

Climate simulations of the LIG, the recent past, and the future will be performed with an improved version of LOVECLIM (v.1.2), a three-dimensional Earth system model of intermediate complexity. The parameter uncertainty in LOVECLIM will be investigated by varying values of key physical parameters that cover a wide range of the model's sensitivity to warming while still simulating the climate and ice sheet evolution over the recent past and the present-day within observational uncertainties. The ensemble of parameter sets will be constrained by the ability of the model to simulate the climate and ice sheets of the LIG. LOVECLIM is an ideal tool for this study, since it incorporates all important components and ice-climate interactions necessary to simulate climate and sea-level changes on centennial to millennial time scales. Compared to coupled general circulation models, LOVECLIM has the advantage of greatly reduced computer requirements, so that climate and sea-level integrations of much longer duration and a larger number of sensitivity experiments can be conducted.

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INTERACTION BETWEEN THE PARTNERS

Each partner (UCL and VUB) contributes its specific expertise to further develop and run the fully coupled model. VUB is responsible for improvements to the ice-sheet component and its interfaces with the ocean and atmosphere, and for the melt algorithm for glaciers and small ice caps. UCL is responsible for improvements to the atmospheric and oceanic components and the inclusion of an optional module that represents melting icebergs. The workload to run the long-term transient climate simulations will be shared equally between the two teams. Both groups will also be equally involved in the analysis of the different simulations in order to combine their expertise for a better understanding of the underlying processes and interactions governing climate change. Regular meetings allow for a thorough discussion of the results.

LINK INTERNATIONAL PROGRAMMES

Both iCLIPS teams are deeply involved in the IPCC assessment work and in European and international research programmes on climate change such as the European Union's Seventh Framework Programme (ice2sea, Past4Future), WCRP (CliC, CLIVAR, COPES), IGBP (PAGES), IUGG (IACS and IAPSO) and SCAR (ACE).

EXPECTED RESULTS

The major outcome of iCLIPS will be an improved version of LOVECLIM yielding an improved range of future climate and sea-level change projections with reduced parameter uncertainty. The climate simulations carried out over the Last Interglacial will provide very useful information to help us answer some of the key questions regarding the evolution of the climate system during that warm interglacial period. The project is expected to better assess the likelihood of abrupt changes, thresholds and potentially irreversible behaviour in the climate system in the future, with a particular focus on processes involving the North Atlantic meridional overturning circulation, the Greenland and Antarctic ice sheets, and their effects for Europe. The scientific results will be disseminated via presentations at national and international scientific workshops and meetings, and publication of results in leading international, peer-reviewed scientific journals. Moreover, the results will be made available to the community interested in impact studies. A specific web site will be created on the server of the coordinator that will include a database with the relevant model outputs and a critical assessment of their accuracy. Finally, it is planned to incorporate the outcomes of iCLIPS projections of climate and sea-level changes in international climatic databases such as the IPCC Data Distribution Centre

PARTNERS

Activities

Philippe Huybrechts is professor of climatology and glaciology and heads the Physical Geography research group under the umbrella of the VUB interdisciplinary research unit Earth System Sciences. He has more than 25 years of expertise in the numerical modelling of ice sheets and glaciers, with a focus on ice-climate interactions.

Thierry Fichefet is professor of climatology and heads the Georges Lemaître Centre for Earth and Climate Research (TECLIM at UCL). He has more than 25 years of experience in global climate modelling, with focus on climate-cryosphere interactions.

CONTACT INFORMATION

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Follow-up Committee

For the complete and most up-to-date composition of the Follow-up Committee, please consult our Federal Research Actions Database (FEDRA) by visiting http://www.belspo.be/fedra or

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