EMS Annual Meeting Abstracts
Vol. 8, EMS2011-573, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Sea Level Rise and Sea Ice Changes in a 2°C-scenario and a "business-as-usual" scenario: Results from the ENSEMBLES Second Stream Experiment

J. Körper (1), I. Höschel (1), J.A. Lowe (2), C.D. Hewitt (2), D. Salas-Melia (3), E. Roeckner (4), H. Huebener (5), J.-F. Royer (3), J.-L. Dufresne (6), A. Pardaens (2), M.A. Giorgetta (4), M.G. Sanderson (2), O.H. Ottera (7,8), J. Tjiputra (7), S. Denvil (6), and U. Cubasch (1)

(1) Freie Universität Berlin, Institute for Meteorology, Berlin, Germany (janina.koerper@met.fu-berlin.de), (2) Met Office Hadley Centre, Exeter, UK, (3) Centre National de Recherches Météorologiques-Groupe d'Etude de l'Atmosphère Météorologique (CNRM-GAME Meteo-France CNRS), Toulouse, France, (4) Max-Planck-Institut für Meteorologie, Hamburg, Germany, (5) Hessian Agency for the Environment and Geology, Wiesbaden, Germany, (6) Institut Pierre Simon Laplace, Paris, France, (7) Nansen Environmental and Remote Sensing Center, Bergen. Norway, (8) Bjerknes Centre for Climate Research, Bergen, Norway

With an increasing political focus on the need to significantly reduce greenhouse gas emissions and to limit global warming to no more than 2ºC above pre-industrial levels it is vital that we also understand the consequences of these targets on key parts of the climate system. Here we compare 21st century projections in a "business-as-usual" scenario (A1B scenario, from the IPCC Special Report on Emission Scenarios) with those under a scenario with large reductions in greenhouse gas concentrations. Projections are given from eight coupled ocean-atmosphere global circulation models. Analysis focuses on sea level rise and Arctic and Antarctic sea ice changes.

At the end of the 21st century the model simulations show that global mean steric sea level rise is reduced by about a third in the mitigation scenario compared with the A1B scenario. Nevertheless, changes in near-surface air temperature across the model ensemble for a particular scenario are poorly correlated with steric sea level changes, meaning that temperature alone is a poor indicator of sea level changes. Differences in the expansion are related to substantial differences in the heat uptake and the efficiency with which the uptake can be translated into expansion. Sea ice extent is projected to decrease in 21st century, independent of the season or scenario. Moreover in the Arctic our results suggest an amplification of the seasonal cycle. By the end of this century the majority of the models simulate an ice free Arctic in September in the A1B scenario, whereas in the mitigation case an ice free Arctic can be avoided according to most models. However, Arctic sea ice is still projected to decline by 42 % of the present September extent.