Geophysical Research Abstracts
Vol. 14, EGU2012-10281, 2012
EGU General Assembly 2012

Ensemble projections of the Greenland ice sheet contribution to future sea-level rise

H. Goelzer, J.J. Fürst, and P. Huybrechts
Vrije Universiteit Brussel, Earth System Sciences, Departement Geografie, Brussels, Belgium (heiko.goelzer@vub.ac.be)

We present work carried out in the framework of the ice2sea project (http://www.ice2sea.eu), aimed at improving projections of the contribution of continental ice to future sea-level rise. Here we use a large-scale three-dimensional thermomechanical Greenland ice sheet model for ensemble sea-level projections over the next 100 years. The model has been extended by a higher-order Blatter-Pattyn type of core and uses improved geometrical and climatic boundary conditions provided by three different regional climate models (RCMs). The RCMs themselves were forced by two different coupled atmosphere-ocean general circulation models (GCMs) under forcing scenario SRES A1B. We present results obtained from a range of different model resolutions and forcing strategies for two different model setups. In the first case the model is initialised by a glacial-interglacial spin-up with a freely evolving geometry, while in the second case the model is initialised to the observed present-day geometry. We compare results for the model forced with surface mass balance (SMB) data from RCMs and from a classical positive-degree-day (PPD) model using temperature anomalies and precipitation ratios from RCMs and from GCMs directly.
Sea-level contributions by the year 2100 range from 4 cm to 10 cm for the whole range of model configurations and are similar for the two initialisation techniques. Results for the SMB forcing experiments are similar for the different RCM, where the integrated surface mass balance explains most of the sea-level response. Conversely, a wider spread of projections from different climate forcing is obtained with the PDD approach. Using climatic boundary conditions directly from the GCMs to drive the PDD model results in the largest sea-level contributions of 8 to 10 cm by the year 2100.