Geophysical Research Abstracts
Vol. 13, EGU2011-7535, 2011
EGU General Assembly 2011

Emulating Atlantic overturning strength for low emission scenarios: consequences for sea-level rise along the North American east coast

Carl-Friedrich Schleussner (1,2), Katja Frieler (1), Malte Meinshausen (1), Jianjun Yin (3), Anders Levermann (1,2)

(1) Potsdam Institute for Climate Impact Research, Telegrafenberg A62, 14473 Potsdam, Germany, (2) Physics Institute, Potsdam University, Potsdam, Germany, (3) Department of Geosciences, The University of Arizona, Tucson, Arizona

In order to provide probabilistic projections of the future evolution of the Atlantic Meridional Overturning Circulation (AMOC), we calibrated a simple Stommel-type box model to emulate the output of fully coupled three-dimensional atmosphere-ocean general circulation models (AOGCMs) of the Coupled Model Intercomparison Project (CMIP). Based on this calibration to idealised global warming scenarios with and without interactive atmosphere-ocean fluxes and freshwater perturbation simulations, we project the future evolution of the AMOC within the covered calibration range for the lower two Representative Concentration Pathways (RCPs) until 2100 obtained from MAGICC6. For RCP3-PD with a global mean temperature median below 1.0°C, we project an ensemble median weakening of up to 11% compared to 22% under RCP4.5 with a warming median up to 1.9°C over the 21^{st} century. Additional Greenland melt water of 10 and 20 cm of global sea-level rise equivalent further weakens the AMOC by about 4.5 and 10%, respectively. By combining our outcome with a multi-model sea-level rise study we project a dynamic sea-level rise along the New York City coastline of 4 cm for the RCP3-PD and of 8 cm for the RCP4.5 scenario over the 21^{st} century. We estimate the total steric and dynamic sea-level rise for New York City to be about 24 cm till 2100 for the RCP3-PD scenario, which can hold as a lower bound for sea-level rise projections in this region.