Geophysical Research Abstracts
Vol. 17, EGU2015-5470, 2015
EGU General Assembly 2015

Projected Climate change effects on North Sea and Baltic Sea: CMIP3 and CMIP5 Model-Based Scenarios

Dhanya Pushpadas (1), Corinna Schrum (1,2), Ute Daewel (1,2)

(1) University of Bergen, Geophysical Institute, Bergen, Norway (Dhanya.Pushpadas@gfi.uib.no), (2) Nansen Environmental and Remote Sensing Center, Thormøhlensgate 47, 5006 Bergen, Norway

Climate change impacts on the marine biogeochemistry and lower trophic level dynamics in the North Sea and Baltic Sea have been assessed using regional downscaling in a number of recent studies. However, most of these where only forced by physical conditions from Global Climate Models and regional downscaling considering the climate change impact on oceanic nutrient conditions from Global Earth System Models (ESMs) are rare and so far solely based on CMIP3-generation climate models. The few studies published show a large range in projected future primary production and hydrodynamic condition. With the addition of CMIP5 models and scenarios, the demand to explore the uncertainty in regional climate change projections increased. Moreover, the question arise how projections based on CMIP5-generation models compare to earlier projections and multi-model ensembles comprising both, AR4 and AR5 generation forcing models are increasingly asked for. Here, we investigated the potential future climate change impacts to the North Sea and the Baltic Sea ecosystem using a coherent regional downscaling strategy based on the regional coupled bio-physical model ECOSMO. ECOSMO was forced by output from different ESMs from both CMIP3 and CMIP5 models. Multi-model ensembles using CMIP3/A1B and CMIP5/RCP4.5 scenarios are examined, where the selected CMIP5 models are the successors of the chosen CMIP3 models. Comparing projected changes with the present day reference condition, all these simulations predicted an increase in Sea Surface Temperature (SST) in both North Sea and Baltic Sea, reduction in sea ice in the Baltic, decrease in primary production in the North Sea and an increase in primary production in the Baltic Sea. Despite these largely consistent results on the direction of the projected changes, our results revealed a broad range in the amplitude of projected climate change impacts. Our study strengthens the claim that the choice of the ESM is a major factor for regional climate projections. The change in oceanic nutrient input appeared to be the major driver for the projected changes in North Sea primary production. Assessing the spread in ensemble groups, we found that there is a significant reduction in the spread of projected changes among CMIP5 compared to CMIP3 forced model simulations for the North Sea, except for salinity. The latter was due to an unexpected salinification observed in one of the CMIP5 model, while all other models exhibit freshening in the future. However, in the Baltic Sea substantial improvement in inter-model variability among CMIP5 models is lacking compared to CMIP3 models, which affirms that the mean and range of both the climate sensitivity and the climate response of the CMIP5 models is relatively coherent to CMIP3 models, in enclosed regions.