Geophysical Research Abstracts
Vol. 19, EGU2017-14550, 2017
EGU General Assembly 2017

The use of EuroCordex in marine climate projections

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The Northwest European Shelf seas (NWS, including the North Sea, Irish Sea and Celtic Sea) are of economic, environmental and cultural importance to a number of European countries. However, their representation by global climate models (GCMs) is very crude, due to their inability to represent the complex geometry and the absence of tides. Therefore, there is a need to employ dynamical downscaling methods when considering the potential impacts of climate change on the European (and other) shelf seas. Using a shelf seas model to dynamically downscale of the ocean component of the GCM is a well established method. While taking open ocean lateral boundary conditions from the GCM ocean is acceptable, using surface flux forcings from the GCM atmosphere is often problematic. The CORDEX project provides an important dataset of high spatial and temporal resolution atmospheric forcings, derived from 'parent' CMIP5 GCM simulations.

We drive the NEMO shelf seas model with data from CMIP5 models and EURO-CORDEX Regional Climate Model (RCM) data to produce a set of NWS climate projections. We require relatively high temporal resolution output, and run-off (for the river forcings), and so are limited to a subset of the available EURO-CORDEX RCMs. From these we select two CMIP5 GCMs with the same RCM with two emissions scenarios to give a minimum estimate of GCM model structural and emission scenario uncertainty. Other experiments allow an initial estimate of the uncertainty associated with the model structure of both the shelf seas and the RCM. Our analysis is focused on the uncertainty associated with the mean change in a number of physical marine impacts and the drivers of coastal variability and change, including sea level and the propagation of open ocean signals onto the shelf. Our work is part of the UK Climate Projections (UKCP18) and will inform the following UK Climate Change Risk Assessments, required as part of the Climate Change Act.