3rd International Conference on Earth System Modelling
Vol. , 3ICESM-279, 2012
3rd International Conference on Earth System Modelling

Regional downscaling of global multiyear predictions for Northern Europe

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The global general circulation models used for decadal predictions are usually too coarse to resolve many smaller regional processes, which could have an impact on the climate change in regions such as the North Sea and Baltic Sea. We present an approach for dynamical downscaling of decadal predictions using a regionally coupled climate model. We investigate the interactions between the North Atlantic Ocean and the Northwest European shelves.
The REgional atmosphere MOdel REMO (37 km resoluton) is coupled to the global ocean – sea ice – marine biogeochemistry model MPIOM/HAMOCC with increased resolution on the Northwest European shelves (up to 4 km in the German Bight). The coupled domain includes Europe, the North-East Atlantic and part of the Arctic Ocean. The models are coupled via OASIS coupler. The ocean tidal forcing was derived from the full ephemeridic luni-solar tidal potential. The global Hydrological Discharge model (HD), which calculates river runoff (0.5º horizontal grid resolution), is coupled to both the atmosphere and ocean components. Exchange between ocean and atmosphere was made with a coupling time step of 2 hours.
Lateral atmospheric and upper oceanic boundary conditions outside the coupled domain were prescribed using data from the ECHAM6/MPIOM LR decadal prediction runs. The model was spun-up till the year 1980 using the ocean and atmospheric forcing obtained from global MPIOM/ECHAM6 assimilation run. Then, starting from the year 1980, three ensemble members were initialized for every year (till 2003) and decadal ensemble simulations (1980-1989, 1981-1990, . . . , 2003-2012) were carried out.
To estimate the prediction skill we used COR skill for different atmosphere and ocean parameters, such as 2m air temperature, precipitation, SST etc. Corresponding skills were compared against those obtained from the global MPIOM/ECHAM6 simulations. Instead of much higher spatially resolved forecasts we also got some improvements in prediction skills for certain regions like Central Europe, North and Baltic seas basins.