Parallel Session A: Advances in regional downscaling

A3: Downscaling tools and methods

FESOM2.0 in climate simulations: from global to regional scales

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In this work, we present a set of climate simulations using a hierarchy of AWI climate models: the global AWI-CM2 (FESOM2/ECHAM6) and the regionally coupled AWI-RCM1 (FESOM2/REMO). The main advantage and novelty of these models is its common next generation ocean component FESOM2, which use unstructured meshes. FESOM2 allows to simulate the global ocean circulation on eddy-resolving spatial scales for the climate simulations with throughput of 5-10 model years per day.

We begin with the description of results from the global model AWI-CM2 where an eddy resolving FESOM2 mesh is coupled to the global atmospheric model ECHAM6 with ca. 100 km. resolution. The FESOM2 mesh is globally adjusted to the quarter of the baroclinic Rossby radius with 2 km fine and 20 km coarsest resolution. This simulations are then downscaled with the regionally coupled climate model AWI-RCM2. In this case FESOM2 setup remains unchanged, but the resolution of the atmospheric component regionally increases from 100 to 12 km due to the use of REMO. This approach allows to avoid problem with boundary conditions for the ocean model as well as long ocean model spin-up.

We investigate the impact of using an eddy-resolving ocean model and increased atmospheric resolution on the representation of the North Atlantic and European climate. In particular, our strategy allows us to explore the impact that the explicit simulation of the mesoscale activity of both the ocean and the atmosphere has on the representation of many aspects of the regional climate, especially the ocean circulation and sea-ice variability.

Our results are discussed with a special emphasis on the perspectives regarding the use unstructured ocean models in high-resolution climate simulations.

Keywords: climate modelling , downscaling, FESOM2