An ocean-atmosphere coupled regional model for climate simulation over Baltic Sea and North Sea Regions

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The regional climate model COSMO-CLM (COnsortium for SMall scale MOdelling model in CLimate Mode) is coupled with the regional ocean model TRIM-NP (the "Nested and Parallel" model which was developed in Helmholtz-Zentrum Geesthacht, Germany, on the basis of TRIM3D model developed at the University of Trento, Italy) by the OASIS (Ocean-Atmospheric-SeaIce-Soil) coupler version 3 of CERFACS (France). The atmospheric model component COSMO-CLM is setup with a horizontal grid mesh size of 50km and 32 vertical levels. The initial and boundary conditions are from six hourly ERA-interim reanalysis data. The regional ocean model TRIM-NP is setup with a horizontal grid mesh size of 12.8km and 50 vertical levels. In a two-way coupling mode, COSMO-CLM is linked to TRIM-NP through sea surface temperature SST as the lower boundary condition and TRIM-NP is driven by standard atmospheric variables from COSMO-CLM. Since the integration domain of TRIM-NP is smaller than that of COSMO-CLM the SST data beyond the outer area of TRIM-NP is taken from ERA-interim. We applied the coupled model in a study for winter months of 1997 over Baltic Sea and North Sea regions. Despite the cold bias the regional ocean model TRIM-NP captures quite well the daily variation of SST over the Baltic Sea and along eastern coastline of the North Sea. Over the Baltic Sea, the monthly averaged SST of TRIM-NP is much closer to that of OISST (NOAA Optimum Interpolation Sea Surface Temperature) and observation (from Bundesamt fur Seeschifffahrt und Hydrographie) than the reanalysis data ERA-interim due to the higher resolution of the regional ocean model. The air-sea interaction and feedback implemented in coupling process lead to more consistent heat fluxes and precipitation of CCLM over the considered region.