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The coupled Rossby Centre Atmosphere-Ocean model RCAO

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SMHI/Rossby Centre has developed an updated version of the Rossby Centre Atmosphere Ocean model RCAO a coupled ocean - sea ice – atmosphere modelling system for climate applications in regional domains. The ocean component RCO has been developed based on the OCCAM model system. The atmosphere component RCA is based on the weather forecast system HIRLAM. The sea ice model is including an early version of the CICE sea ice model, which physically is a part of the ocean code. In standalone versions, RCO and RCA use empirical forcing functions to calculate fluxes for heat, freshwater and momentum. In coupled mode, the ocean formulations are generally replaced by fluxes from the atmosphere model. Partly, original flux formulations of RCA appear not suitable for the coupled mode and need adjustment, especially with respect to clouds and radiation.

The RCA domain is allowed to exceed the RCO domain. In such areas, RCA is forced with standalone formulations and ECMWF reanalysis data (ERA40). Lateral boundary conditions in ocean and atmosphere depend on specific domain and application type (hindcast or downscaling/scenario).

Ongoing improvements of RCAO cover a universal routing scheme for land runoff as freshwater input to the ocean, and multiple sea ice classes.

The technical coupling in the overlapping region between RCA and RCO is build upon the OASIS4 coupler with coupling fields passed through the respective root processes of RCO and RCA. Currently, RCAO with OASIS4 is running on a 64-Bit Linux Cluster with the SCALI message passing interface (MPI). As the 64-Bit architecture requires some MPI2 extension and due to the fact that SCALI is not fully supporting the required MPI2 standard, a few OASIS4 internal functions had to be modified to work with the SCALi MPI.