RCAO, the Rossby Centre Atmosphere-Ocean-Ice model

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RCAO is a coupled ocean - sea ice - atmosphere modelling system for climate applications in regional domains. The ocean component RCO has been developed based on the global OCCAM model. The atmosphere component RCA is based on the weather forecast system HIRLAM. The sea ice model is physically 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. Model validation for coupled and uncoupled setups in different domains potentially leads to more universal and converging flux formulations and parameterizations. The technical coupling between RCA and RCO is build upon the OASIS coupler. Different versions of OASIS in combination with different message passing systems are (or have been) used on varying high performance computer systems. Currently a beta version of the newly written OASIS4 is used on a Linux cluster with SCALI message passing. The RCA domains are allowed to exceed the RCO domain. In such areas, RCA is forced with standalone formulations and ECMWF re-analysis data (ERA40). Lateral boundary conditions in ocean and atmosphere depend on specific domain and application type (hindcast or downscaling/scenario). Typical applications for RCAO are climate studies for regional domains centred at Northern Europe (with a Baltic RCO) and the Arctic. RCA is even used for domains in Africa and America. Hydrological assessment of change in river flow is carried out with the delta-change method.