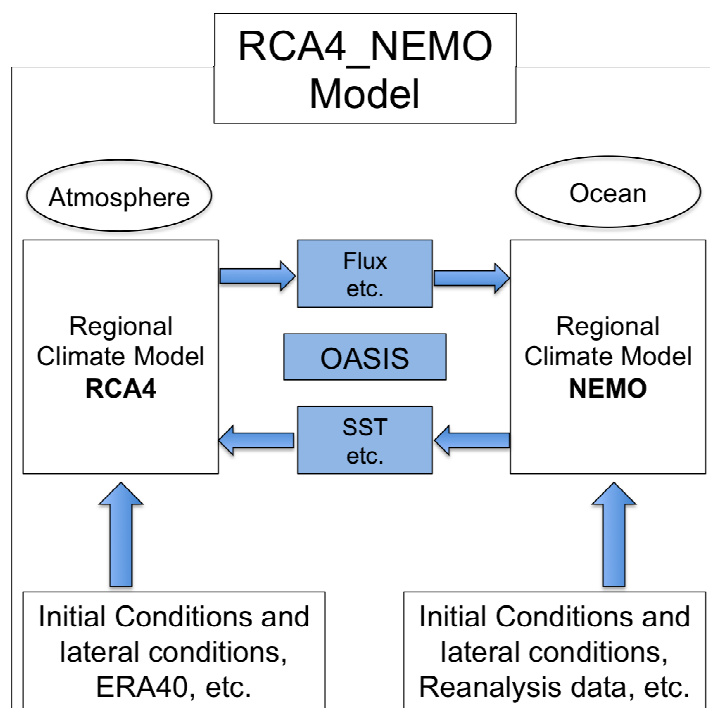


Model: RCA4-NEMO

Author fact-sheet: Christian Dieterich

1. General Information	
Model name	RCA4-NEMO
Version	016
Author(s) / First publication	Shiyu Wang, Christian Dieterich, Semjon Schimanke / Evaluation of the SMHI coupled atmosphere-ice-ocean model RCA4_NEMO; C. Dieterich, S. Schimanke, S. Wang, G. Väli, Y. Liu, R. Hordoir, L. Axell, A. Höglund, H.E.M Meier; SMHI-Report, RO 47, 2013, ISSN 0283-1112
Contact person (name, email)	Markus Meier, markus.meier@smhi.se
Institute	Swedish Meteorological and Hydrological Institute (SMHI)
Web site	http://www.smhi.se/
General modelling objectives	Regional climate simulations, regionalization of climate change scenarios, process studies
Domain of applicability	Northern Europe
KLIWAS contact (authority, name, email)	SMHI, Markus Meier, markus.meier@smhi.se , Christian Dieterich, christian.dieterich@smhi.se
Model adaption in KLIWAS	No specific adaption for KLIWAS
Model coupling in KLIWAS	Input data from ECHAM5/MPIOM (Output data for <models>)
2. Model description	
Model type	Coupled system of PE-atmosphere, EVP-ice and PE-ocean
Temporal discretization	Second order discretized differential equations
Temporal resolution	15min (atmosphere), 30min (ice), 5min (ocean)
Spatial discretization	Gridded, parallelized. Hybrid vertical coordinates (atmosphere), ice thickness distributed (ice), z*-level model (ocean)
Spatial resolution	0.22 deg, 40 levels (atmosphere), 2 nautical miles, 5 ice classes (ice), 2 nautical miles, 3 m thickness (ocean)
Dimension	3D (atmosphere, ocean), 2.5D (ice)
Short description of model structure detailing main function	RCA4-NEMO is the regional, coupled climate model at the SMHI (1). It consists of the RCA4 atmosphere model in a model domain covering the East Atlantic and Europe (2) and the NEMO setup for the North Sea and Baltic Sea (3). RCA4-NEMO is a fully coupled atmosphere-ice-ocean model, where the different components are coupled every 3 hours using the Oasis3 coupler (4). The coupler does exchange the surface temperatures of open water and sea ice together with the ice fraction and ice albedo to the atmosphere model. From the atmosphere the ocean-ice model receives the momentum fluxes and pressure at the surface, the shortwave and non-solar heat fluxes and the freshwater fluxes due to the evaporation - precipitation. The freshwater fluxes due to the runoff are routed back into the ocean model using CaMa-Flood (5), coupled to the system with the same coupling frequency. Alternatively river discharge may be prescribed using external sources like data or hydrological models.



Scheme of model structure	
Procedure of model parameter estimation	Literature, measurement, experimental values
3. Model inputs / Model outputs	
List and characteristics of input variables	(type, time step, spatial resolution, unit etc.)
List and characteristics of output variables	(type, time step, spatial resolution, unit etc.)
4. Examples of model applications	
Catchments, objectives etc.	Hindcast experiments for ERA40 and ERA-interim periods. Sensitivity and parameter studies. Historical simulations for CMIP5 scenarios with GCMs MPI-ESM-LR and EC-EARTH. RCP4.5 and RCP8.5 scenario simulations with GCMs MPI-ESM-LR and EC-EARTH.
Results of existing comparisons with other models	Please refer to references (1) and (2) below.
Application in the framework of KLIWAS	Regionalization of SRES and RCP scenarios for the North Sea region.
5. List of 5 selected references	

(1) Evaluation of the SMHI coupled atmosphere-ice-ocean model RCA4_NEMO; C. Dieterich, S. Schimanke, S. Wang, G. Väli, Y. Liu, R. Hordoir, L. Axell, A. Höglund, H.E.M. Meier; SMHI-Report, RO 47, 2013, ISSN 0283-1112

(2) Rossby Centre regional atmospheric model, RCA4; M. Kupiainen, C. Jansson, P. Samuelsson, C. Jones, U. Willén U. Hansson, A. Ullerstig, S. Wang, Ralf Döscher ; Rossby Center New Letter; <http://www.smhi.se/en/Research/Research-departments/climate-research-rossby-centre2-552/1.16562>

(3) BaltiX: A 3D Ocean Modelling Configuration for Baltic & North Sea Exchange Analysis; R. Hordoir, B. W. An, J. Haapala, C. Dieterich, S. Schimanke, A. Höglund and H.E.M. Meier; SMHI-Report, Oceanography 115, 2013, ISSN 0283-7714

(4) The OASIS3 coupler: a European climate modelling community software; S. Valcke; Geoscientific Model Development Discussions, Vol. 5, 2012, 2139-2178, doi:10.5194/gmdd-5-2139-2012

(5) A physically based description of floodplain inundation dynamics in a global river routing model; Dai Yamazaki, Shinjiro Kanae, Hyungjun Kim and Taikan Oki; Water Resource Research, Vol. 47, W04501, 2011, doi:10.1029/2010WR009726