Model:

Author fact-sheet:

1. General Information	
Model name	COSMO-CLM
Version	4.0
Author(s) / First publication	None
Contact person (name, email)	Prof. U. Ulbrich (ulbrich@met.fu-berlin.de)
Institute	Institute of Meteorology, FU Berlin
Web site	http://www.geo.fu-berlin.de/met/
General modelling objectives	Regional downscaling of storm surge episodes using ERA-40, ERA-Interim and ECHAM5/MPIOM output (IPCC-AR4)
Domain of applicability	Europe: 257x271 gridpoints (curvilinear grid; corners: 7.46W/24.24N; 35.80W/26.49E; -40.97W/62.81N; 63.95E/67.65N)
KLIWAS contact (authority, name, email)	BSH, H. Heinrich, hartmut.heinrich@bsh.de
Model adaption in KLIWAS	
Model coupling in KLIWAS	Input: ERA-40, ERA-Interim reanalysis data; ECHAM5/MPI-OM model output for recent climate (20C) and from SRES A1B GHG scenario (IPCC-AR4; three ensemble members) Output: Zonal (U10M) and meridional (V10M) instantaneous wind speed in 10 meter height; mean sea level pressure (MSLP); hourly
2. Model description	
Model type	Physically-based atmospheric regional climate model
Temporal discretization	Storm surge events
Temporal resolution	1h
Spatial discretization	Gridded
Spatial resolution	0.165°x0.165° (approx. 18km) on a rotated grid (longitude of north pole: 18.0°W; latitude of north pole: 39.25°N)
Dimension	3D
Short description of model structure detailing main function	Regional climate model COSMO-CLM developed by DWD used for dynamical downscaling of observed storm events and potential storm surge events in future GHG scenarios (see www.clm-community.eu for a detailed model description)
Scheme of model structure	
Procedure of model parameter estimation	Physically-based model using the primitive equations to estimate the atmospheric flow (see www.clm-community.eu for a detailed model description)
3. Model inputs / Model outputs	
List and characteristics of input variables	COSMO-CLM is forced with 6 hourly data at its lateral boundaries by either ERA reanalysis data or ECHAM5/MPI-OM model output data. Boundary data is interpolated in time within the model integration. Spatial resolution of raw input data differs: ERA-40 (T159);

	ERA-Interim (T255); ECHAM5/MPI-OM (T63). This raw input data is then interpolated to the model grid (approx. 18km) Variables: (type, time step, spatial resolution, unit) Surface geopotential: 2D+time, 6h, depends, m^2/s^2 Temperature: 3D+time, 6h, depends, K Zonal wind: 3D+time, 6h, depends, m/s Meridional wind: 3D+time, 6h, depends, m/s Surface pressure: 2D+time, 6h, depends, Pa Water equivalent snow depth: 2D+time, depends, m Skin reservoir content: 2D+time, depends, m Surface temperature of ice: 2d+time, 6h, depends, K Surface temperature of water: 2d+time, 6h, depends, K Sea ice cover: 2d+time, 6h, depends, fractional [0-1] Surface temperature of land:2d+time, 6h, depends, K Soil wetness: 2d+time, 6h, depends, m Field capacity of soil: 2d+time, 6h, depends, m Deep soil temperatures: 3D+time, 6h, depends, K Specific humidity: 3D+time, 6h, depends, kg/kg Cloud water: 3D+time, 6h, depends, kg/kg Cloud ice: 3D+time, 6h, depends, kg/kg Land-sea-mask: 2D, constant, depends, [0/1]
List and characteristics of output variables	COSMO-CLM calculations are done on a rotated grid. The position of the pole for these simulations is: 18°W, 39.25°N Variables: (type, time step, spatial resolution, unit) Zonal wind in 10 meter height, 1h, approx. 18km, m/s Meridional wind in 10 meter height, 1h, approx. 18km, m/s Mean sea level pressure, 1h, approx. 18km, Pa
4. Examples of model applications	
Catchments, objectives etc.	COSMO-CLM driven by reanalysis data: The model was used for dynamical downscaling of wind for the most extreme observed historic storm surge events. As this study concentrated on the atmospheric influences we choosed storm surges with the highest wind surge values. The model data was used to compare wind speed estimates over the German Bight region with the storm surge atlas from the station Cuxhaven (provided by G. Gönnert, LSBG Hamburg). COSMO-CLM driven by ECHAM5/MPI-OM model data: To estimate possible future changes of storm surge risk due to increased GHG concentrations, the model was used to downscale events (detected in GCM model data) with high effective wind speeds (wind projected on the direction 295°) over the German Bight region. A comparison between the most intense events detected in GCM data under recent climate conditions (20C) and under possible future climate conditions (A1B) was used to estimate changes in storm surge intensity and frequency under future climate conditions.

	For most potential storm surge events (driven by GCM data) and for observed storm surge events (driven by ERA-Interim reanalysis data) each event is simulated by a five member mini ensemble. These members differ due to their model domain, which is shifted by 8 grid boxes to north, south, east and west. The results of this ensemble can be used to estimate the uncertainty of the storm surge event.
Results of existing comparisons with other models	
Application in the framework of KLIWAS	(see Catchments, objectives etc.) The model data can also be used to drive hydro-dynamical models to estimate storm surge heights.
5. List of 5 selected references	