

Meta data description for RCM model simulations in ENSEMBLES RT3

ERA40@50 Simulations

1. General:

- 1.1 Name of model RCA
- 1.2 Version RCA3.0
- 1.3 Reference

Kjellström, E., Bärring, L., Gollvik, S., Hansson, U., Jones, C., Samuelsson, P., Rummukainen, M., Ullerstig, A., Willén U. and Wyser, K., 2005. A 140-year simulation of European climate with the new version of the Rossby Centre regional atmospheric climate model (RCA3). Reports Meteorology and Climatology, 108, SMHI, SE-60176 Norrköping, Sweden, 54 pp.

Other references in this document can be found in Kjellström et al. (2005).

- 1.4 URL www.smhi.se (go to “Research”, “Rossby Centre”, “The RCA model”).

2. Model setup:

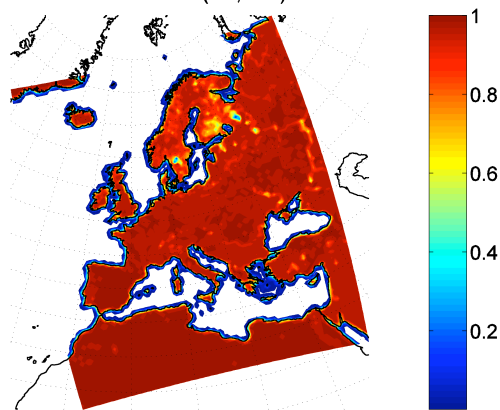
- 2.1 Grid specifications: Rotated lat/lon-grid
- 2.1.1 Projection Coordinates of the South Pole in the rotated lat-long grid (-39.25N, 18.00E). The western and southern boundaries are given by (ALONW=-25.57, ALATS=-24.09).
- 2.1.2 Number of horizontal grid points 102x111
- 2.1.3 Number vertical levels 24
- 2.1.4 Type of vertical coordinate hybrid levels
- 2.2 Soil and surface specifications
- 2.2.1 Name of soil and SVAT model RCA land surface model
- 2.2.2 Physiographical data

*e.g. orography, LSM, LAI, soil type etc.
for each please provide
Name, source, figure
e.g. orography, GTOPO30, figure*

The land surface is initiated from HIRLAM climatology (Undén et al., 2002).

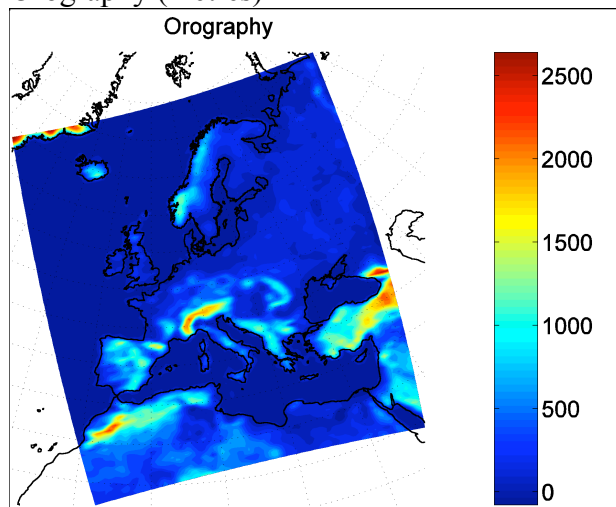
Land-sea mask

81 105 0 Land-sea mask (1=l; 0=s) 191-01-01 00Z



/data/proj/rossby/climate/ensem_102111/c/00010000

Orography (metres)



2.3 External Forcings

The ERA40 data (Uppala et al., 2005) was downloaded from the ECMWF at 2° horizontal resolution and 60 vertical levels (of which only levels 13-60 are used). In addition to lateral boundaries and SSTs and sea-ice from the ERA40 boundaries, CO_2 increases linearly with time 1.5 ppm per year. All other external forcing conditions (aerosols, land use, solar constant= 1370W/m^2) were held constant in the simulations.

4. Additional information on model set up

The time step used for the calculations is 30 minutes. The time period covered is 19600901-200208, where the first four months are considered as spin-up and not to be used.

5. Information on the performance

A thorough presentation of various aspects of this simulation can be found in Kjellström et al. (2005). Here, a citation of parts of the conclusions in that report is given.

“Given so called “perfect boundary conditions” from ERA40, RCA3 is found to reproduce observed seasonal mean features of near surface temperature, precipitation, wind, snow conditions, mean sea level pressure and clouds in today’s climate. Seasonal mean temperature

errors are generally within $\pm 1^{\circ}\text{C}$ except during winter when two major biases are identified; a positive bias in the north-eastern parts of the model domain, and a negative bias in the Mediterranean region. The positive bias is related to too much longwave radiation reaching the surface. The negative bias in the south is related to too little clear-sky shortwave radiation reaching the surface. During most of the year RCA3 simulates excessive amounts of cloud water, particularly in northern Europe. These biases; in cloud water content, downward longwave radiation, and clear-sky downward shortwave radiation all contributes to underestimations in the diurnal temperature range and the annual temperature range in many areas in the model. In many areas precipitation biases are smaller than in the corresponding reanalysis data used as boundary conditions showing the benefit of a higher horizontal resolution. Compared to the observational climatologies RCA3 tends to overestimate precipitation in northern Europe during summer and underestimate it in the south-east. A parameterisation of wind gusts is evaluated against a climatology for Sweden showing encouragingly good results.

In general, RCA3 shows equally good, or better, correspondence to climatologies as compared to the previous model versions. Among other things there are improvements in the representation of the interannual variability in Mean Sea Level Pressure during all seasons. However, there remains a bias in the pressure pattern over the Mediterranean Sea during winter when the MSLP is too high, indicating a problem in cyclone formation in that area. The seasonal mean temperature errors in RCA3 are smaller than in earlier model versions for most areas with the exception of North-Western Russia as mentioned above. The large summertime bias in south-eastern Europe as reported in RCA2 (and other RCMs) has been substantially improved. This is also the area and season where the only notable difference in the precipitation climate compared to RCA2 is found. RCA3 simulates more precipitation in better agreement to observations. Also the snow climate, evaluated against Swedish observations, shows an improvement compared to the previous model version.”

6. Email address for contact person:

Erik.Kjellstrom@smhi.se

7. References

Kjellström, E., Bärring, L., Gollvik, S., Hansson, U., Jones, C., Samuelsson, P., Rummukainen, M., Ullerstig, A., Willén U. and Wyser, K., 2005. A 140-year simulation of European climate with the new version of the Rossby Centre regional atmospheric climate model (RCA3). Reports Meteorology and Climatology, 108, SMHI, SE-60176 Norrköping, Sweden, 54 pp.

Undén P., Rontu L., Järvinen H., Lynch P., Calvo J., Cats G., Cuxart J., Eerola K., Fortelius K., Garcia-Moya J. A., Jones C., Lenderlink G., McDonald A., McGrath R., Navascues B., Nielsen N. W., Ødegaard V., Rodrigues E., Rummukainen M., Rõõm R., Sattler K., Sass B. H., Savijärvi H., Schreuer. B. W., Sigg R., The H., Tijm A., 2002. HIRLAM-5 Scientific Documentation. HIRLAM Report, SMHI, SE-601 76 Norrköping, Sweden, 144 p.