

Meta data description for RCM model simulations in ENSEMBLES RT3

ERA40@25 Simulations

1. General:

1.1 Name of model: RCA (Rossby Centre regional Atmospheric Climate model)

1.2 Version: 3

1.3 References:

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

Jones, C. G., U. Willén, A. Ullerstig, and U. Hansson (2004), The Rossby Centre regional atmospheric climate model part I: model climatology and performance for the present climate over Europe, *Ambio*, 33, 199-210.

1.4 URL: <http://www.smhi.se/sgn0106/if/rc/rca.htm>

2. Model setup:

2.1 Grid specifications:

2.1.1 Projection: Rotated latitude/longitude grid

2.1.2 Number of horizontal grid points: 206*206

2.1.3 Number vertical levels: 31

2.1.4 Type of vertical coordinate: Hybrid σ -/p-system

2.2 Soil and surface specifications

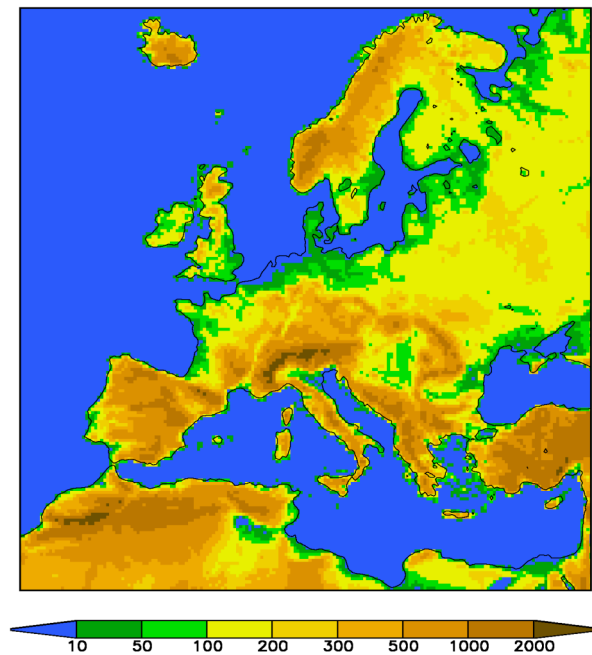
2.2.1 Name of soil and SVAT model: no name; developed at Rossby Centre:

Samuelsson P., S. Gollvik and A. Ullerstig (2006), The land-surface scheme of the Rossby Centre regional atmospheric climate model (RCA3), *Report in Meteorology*, 122, SMHI, SE-60176 Norrköping, Sweden.

2.2.2 Physiographical data

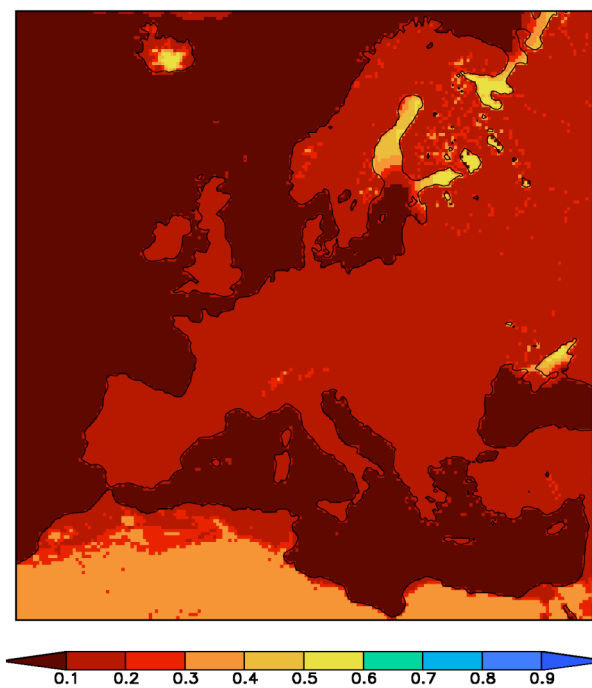
Orography, GTOPO30

Orography [m]

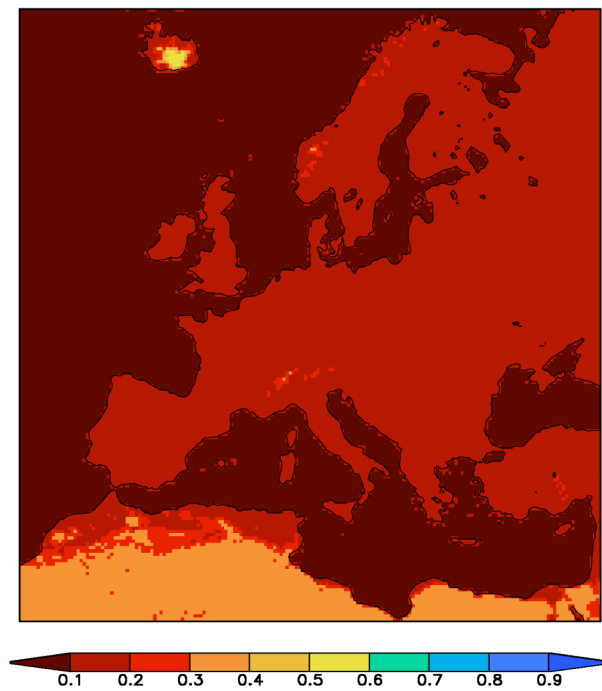


Albedo, ECOCLIMAP

Albedo in January

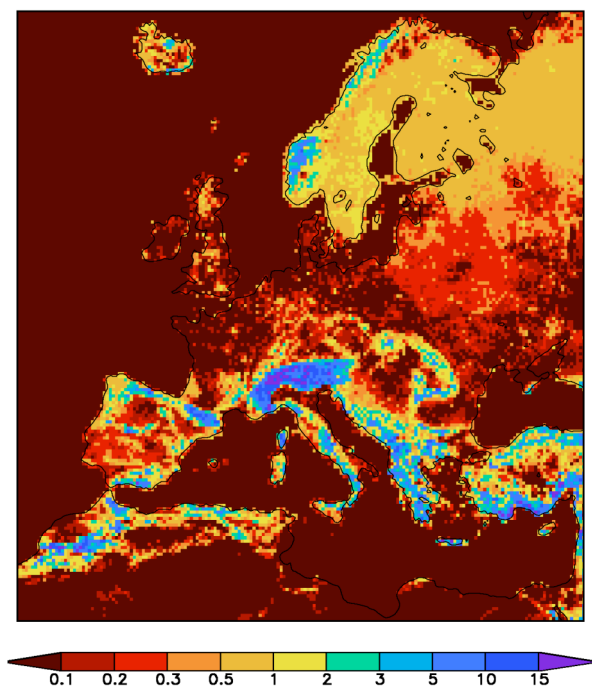


Albedo in July

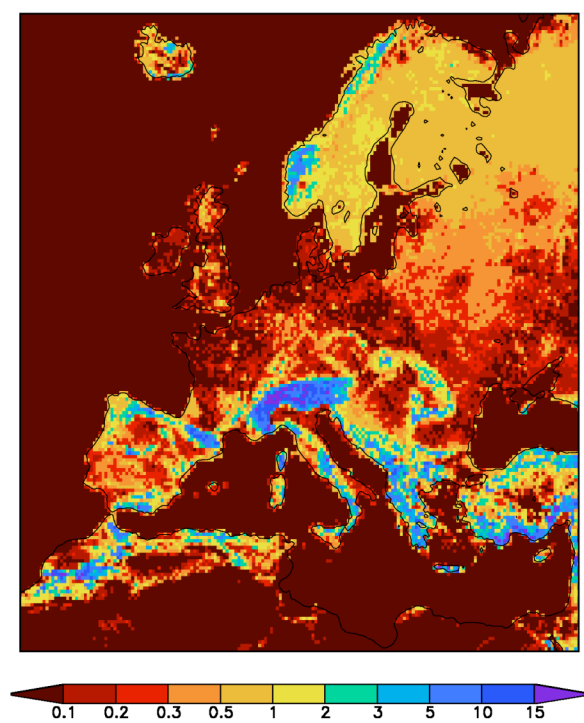


Surface roughness length, ECOCLIMAP

Surface roughness length [m] in January

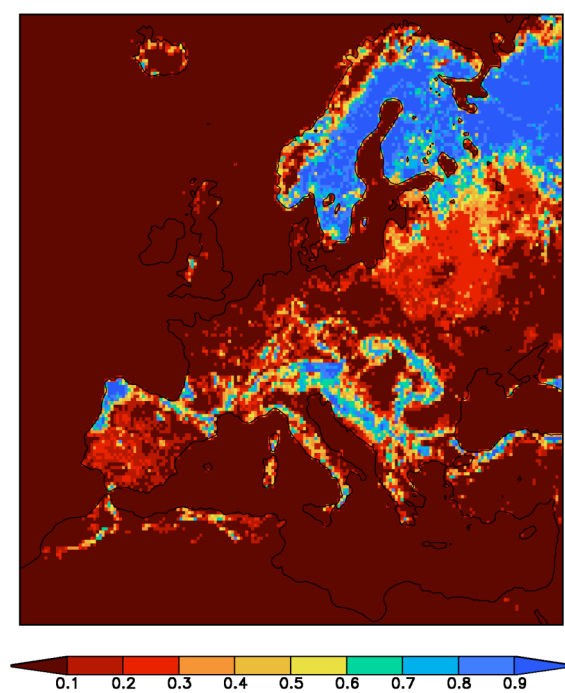


Surface roughness length [m] in July



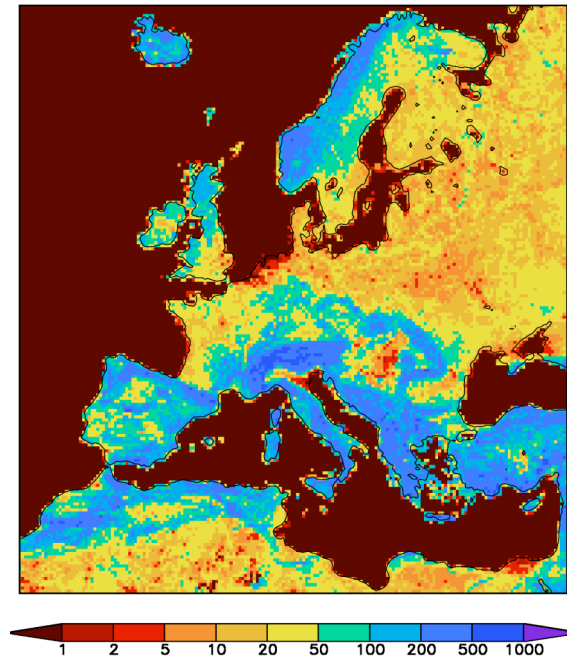
Fraction of forest, ECOCLIMAP

Fraction of forest



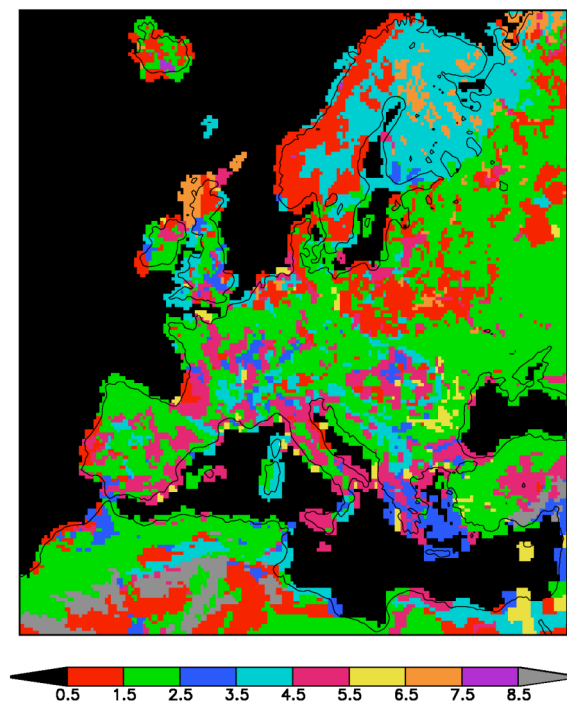
Orographic variance, Hagemann et al.

Orographic variance [m^2]



Soil texture, FAO-Unesco

Soil texture



1: sand, 2: loam, 3: clay, 4: sandy loam, 5: silt loam, 6: loam, 7: peat, 8: glacier, 9: rocks

Note: the surface parameters are plotted on the simulation domain excluding the boundary relaxation zone. In RCA3, albedo and surface roughness length are dependent on the season. For these two parameters plots for January and July are given; values for the other months generally lie between the values for January and July.

2.3 External Forcings

Solar “constant”: 1365 W/m^2 on average; it varies with the day of the year (according to Paltridge and Platt 1976):

$$sa = solar * (1. + 0.034221 * \cos(zday) + 0.00128 * \sin(zday) + 0.000719 * \cos(2. * zday))$$

Greenhouse gas concentration and aerosols: an „effective CO₂ concentration“ is used in RCA3. The radiative effects of changes of all other greenhouse gases and of the aerosols (direct and indirect effects) are considered by adding to or subtracting from the CO₂ concentration. In both the ERA-40 and ECHAM5/OM1 driven simulations the following effective CO₂ concentrations are used (following the SRES-A2 scenario from 2000 onward):

1960	313. ppm _v
1970	314. ppm _v
1980	331. ppm _v
1990	353. ppm _v
2000	373. ppm _v
2010	403. ppm _v
2020	426. ppm _v
2030	470. ppm _v
2040	532. ppm _v
2050	602. ppm _v

A linear interpolation has been applied to the intermediate years.

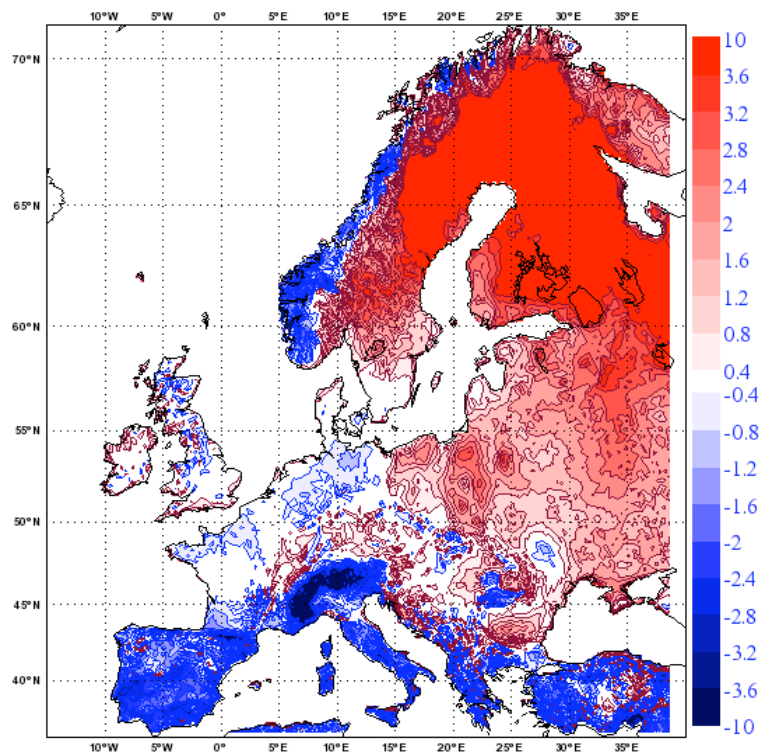
4. Additional information on model set up

Width of boundary relaxation zone: 8 grid points

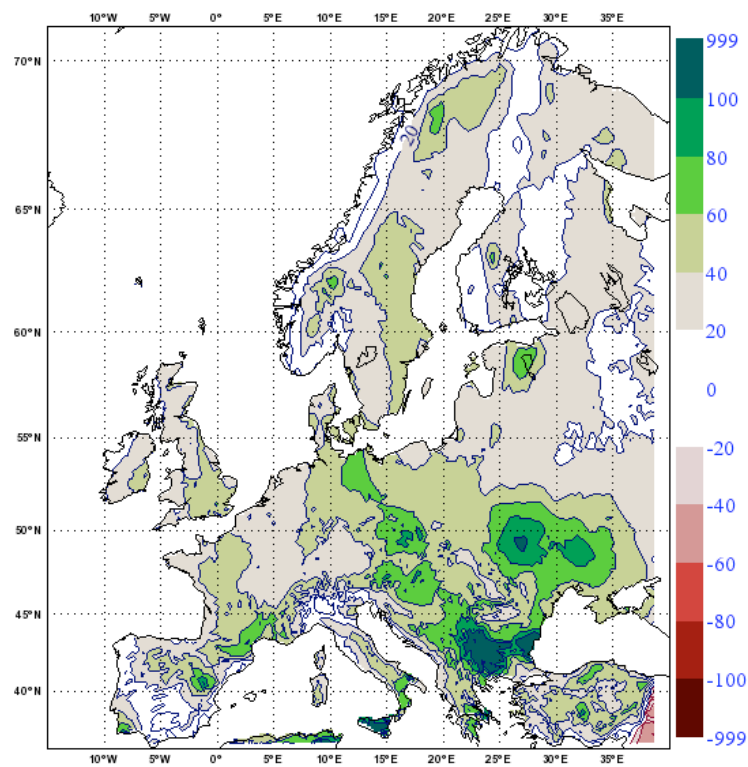
5. Information on the performance

The following biases have been detected in the model simulation: too warm winter temperatures over Scandinavia and Eastern Europe; too cold winter temperatures over the Mediterranean area; too cold summer temperatures over Eastern Europe; too many days with precipitation (this is due to the models tendency to drizzle); too few days with ground frost in winter due to too a too weak diurnal cycle.

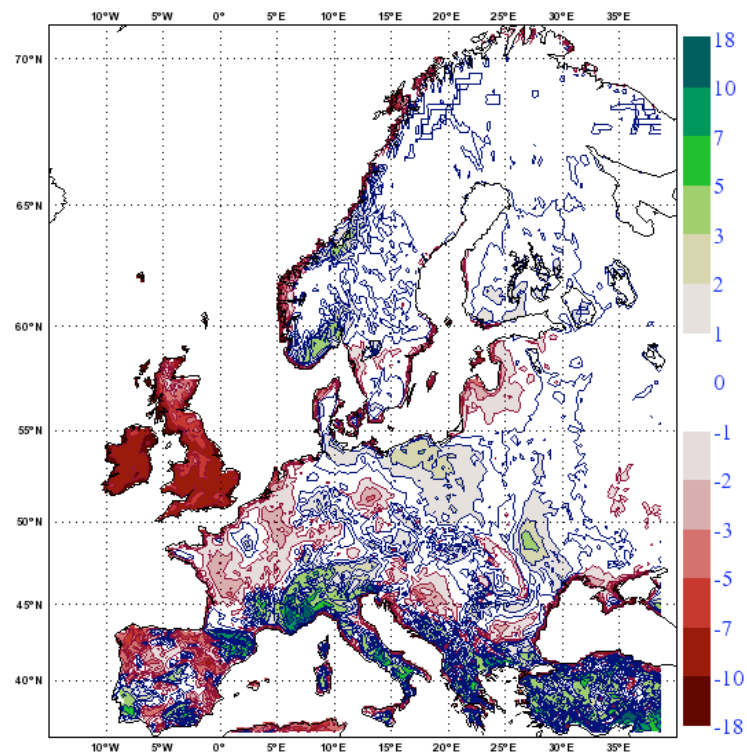
2 m temperature bias January 1961-1990 [K] (RCA3 compared to CRU)



Bias in the number of days per month with precipitation > 0.1 mm in January 1961-1990 (RCA3 compared to CRU)



Bias in the number of days per month with ground frost in January 1961-1990 (RCA3 compared to CRU)



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