Meta data description for RCM model simulations in ENSEMBLES RT3

ERA40@25 Simulations

1. General:

1.1. Name of model	HIRHAM
1.2. Version	met.no version 2 (ECHAM4 physics, semi-Lagrangian dynamics)

1.3. Reference

2. Christensen J. H., Christensen O. B., Lopez P., van Meijgaard E. and M.Botzet. The HIRHAM4 Regional Atmospheric Climate Model. DMI Scientific Report 96-4, 1996.
3. Roeckner E., Arpe K., Bengtsson L., Christoph M., Claussen M., Dümenil L, Esch M., Giorgetta M., Schlese U. and U. Schulzweida. The atmospheric general circulation model ECHAM-4: Model description and simulation of present-day climate. Report No.218, MPI, ISSN 0937-1060. 1996.
4. Haugen J. E. and H. Haakenstad. Validation of HIRHAM version 2 with 50 km and 25 km resolution. RegClim General Technical Report No. 9. pp 159-173. 2006.

1.4. URL: http://regclim.met.no/results/gtr9.pdf

2. Model setup:

2.1. Grid specifications:

2.1.1. Projection

Rotated lat/lon grid

North Pole at	[lat/lon]	=	[39.25 / -162.]
Lower left corner at	[lat/lon]	=	[-22.22/ -25.46]
Upper right corner at	[lat/lon]	=	[24.42 / 17.88]

2.1.2. Number of horizontal grid points

NLAT=213
NLON=198

2.1.3. Number vertical levels

31

2.1.4. Type of vertical coordinate

ECMWF hybrid (η) with pure pressure levels at the top and terrainfollowing (σ) at the surface.

2.2. Soil and surface specifications

2.2.1. Name of soil and SVAT model

Five soil layers with predicted temperature, one layer with predicted soil water and a surface storage containing intercepted water and snow. Vegetation effects and run-off scheme (Dümenil and Todini 1992). Variables for maximum soil water holding capacity of the soil (Clausen et al. 1994; Roeckner et al. 1996). Initial fields and climatological values from ECMWF monthly data base.

Dümenil L. and E. Todini (1992) A rainfall-runoff scheme for use in the Hamburg climate model. In: O'Kane, J. (ed) Advances in theoretical hydrological hydrology, A tribute to James Dooge vol. 1, European Geophysical Society Series of Hydrological Sciences, 129-157. Elsevier, Amsterdam.

Clausen, M., U. Lohmann, E. Roeckner and U. Schulzweida (1994) A global data set of land surface parameters. MPIM Rep No. 135.

Roeckner, E., K. Arpe, L. Bengtsson, M. Christoph, M. Claussen, L. Dümenil, M. Esch, M. Giorgetta, U. Schlese and U. Schulzweida (1996) The atmospheric general circulation model ECHAM4: model description and simulation of present-day climate: MPIM Rep No. 218.

2.2.2. Physiographical data.

The physiographical data have been extracted from

(a) HIRLAM climate generation programs (Unden, 2002):
Orography, land sea mask, roughness, initial climatological temperature and moisture over land and fraction of forest.

(b) ECHAM4 climate fields:
Orographic variance, soil types, vegetation index, max soil moisture capasity

Orography: Global 30 Arc Second Elevation data (GTOPO30), figure 1
LSM, figure 2.
LAI, figure 3.
Soil type, figure 4.

2.3. External Forcings

The concentrations of CO_2 used in the model, are observed values for the period 1960-1990 and IPCC IS92a after 1990 supplied from the MPI ECHAM4.
The value of the solar constant is 1376 W m-2 .
The model uses tabulated values for aerosols from ECHAM4 (constant during 1960-2000)

4. Additional information on model set up
Dynamics: A two-time-level three-dimensional semi-Lagrangian semi-implicit time-integration scheme described in Unden et. al 2002. Timestep 225 s.

Modified the computational scheme in the ECHAM4 physical parameterization package. The Asselin time filter coefficient has been set to zero and all variables involved in the physical parameterization routines run as a two-time-level forward scheme from n to n+1 (as in the dynamical core of the model).

Lateral boundary values available in 6-hourly intervals, are interpolated in time by taking into account 4 subsequent sets of the boundary forcing data. This allows cubic interpolation in time for computation of values at intermittent timesteps. (McDonald, 2000).

A new implicit diffusion scheme is developed in connection with the semi-Lagrangian scheme, but the old explicit formulation for temperature and humidity has been kept because the humidity needs a modification term to avoid spurious moistening effects over steep terrain, which would be difficult to include in the implicit diffusion scheme.

A new albedo parameterization of sea-ice and snow is implemented in the model. The new albedo parameterization scheme is described in Køltzow et.al., 2003.

Unden P., L. Rontu, H. Järvinen, P. Lynch, J. Calvo, G. Cats, J. Cuaxart, K. Eerola, C. Fortelius, J. A. Garcia-Moya, C. Jones, G. Lenderlink, A. McDonald, R. McGrath, B. Navascues, N.W.Nielsssen, V. Ødegaard, E. Rodriguez, M. Rummukainen, R. Rõõm, K. Sattler, B. H. Sass, H. Savijärvi, b. W. Schreur, R. Sigg, H. The, A. Tijm (2002) HIRLAM-5 Scientific Documentation. HIRLAM-5 project, c/o Per Unden, S-60176 Norrkøping, Sverige.

McDonald, A. (2000) Boundary conditions for semi-Lagrangian schemes: testing some alternatives in one-dimensional models. Monthly Weather Review 128, 4084-4096.

Køltzow, M., S. Eastwood and J. E. Haugen (2003) Parameterization of snow and sea ice albedo in climate models, Research report no. 149. met.no.

5. Information on the performance
http://regclim.met.no/results/gtr9.pdf

6. Email address for contact person:
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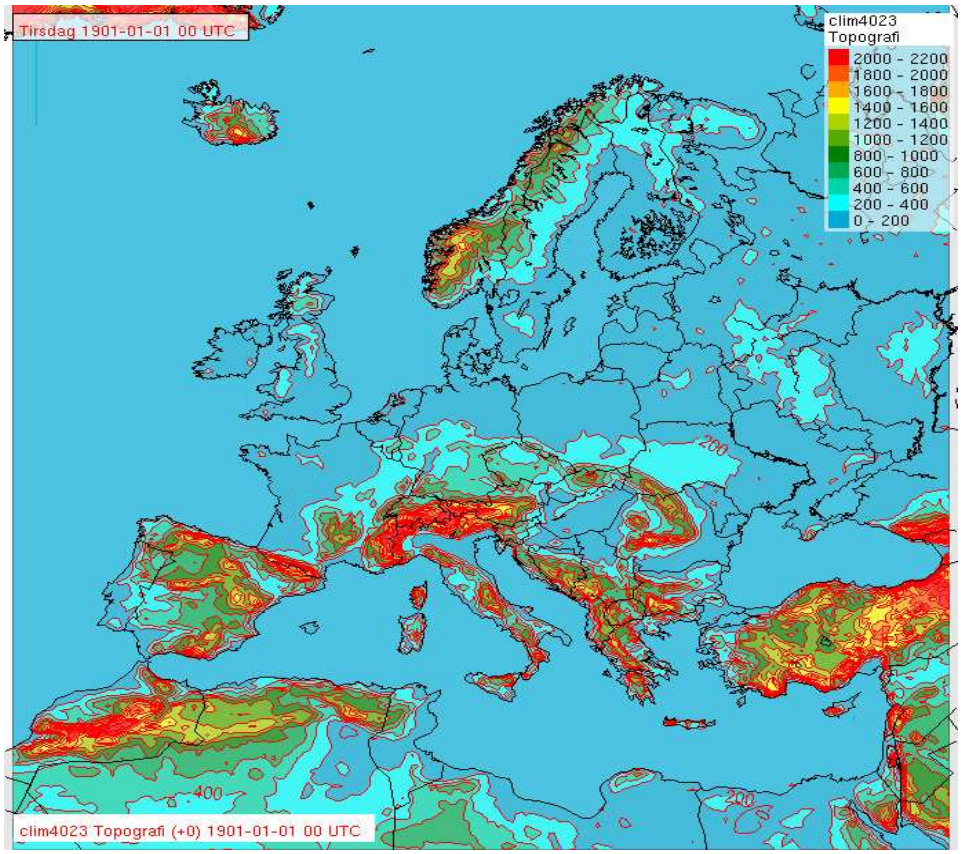

Figure 1. Topography used in ERA40@25.

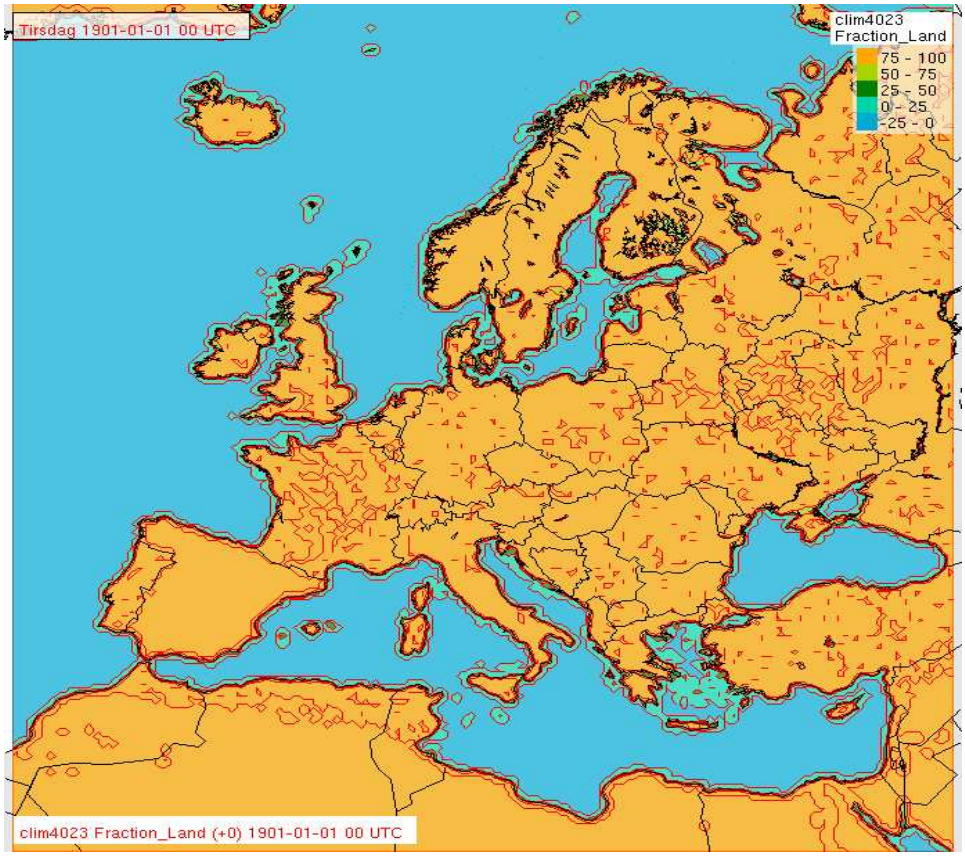

Figure 2. Land sea mask used in ERA40@25

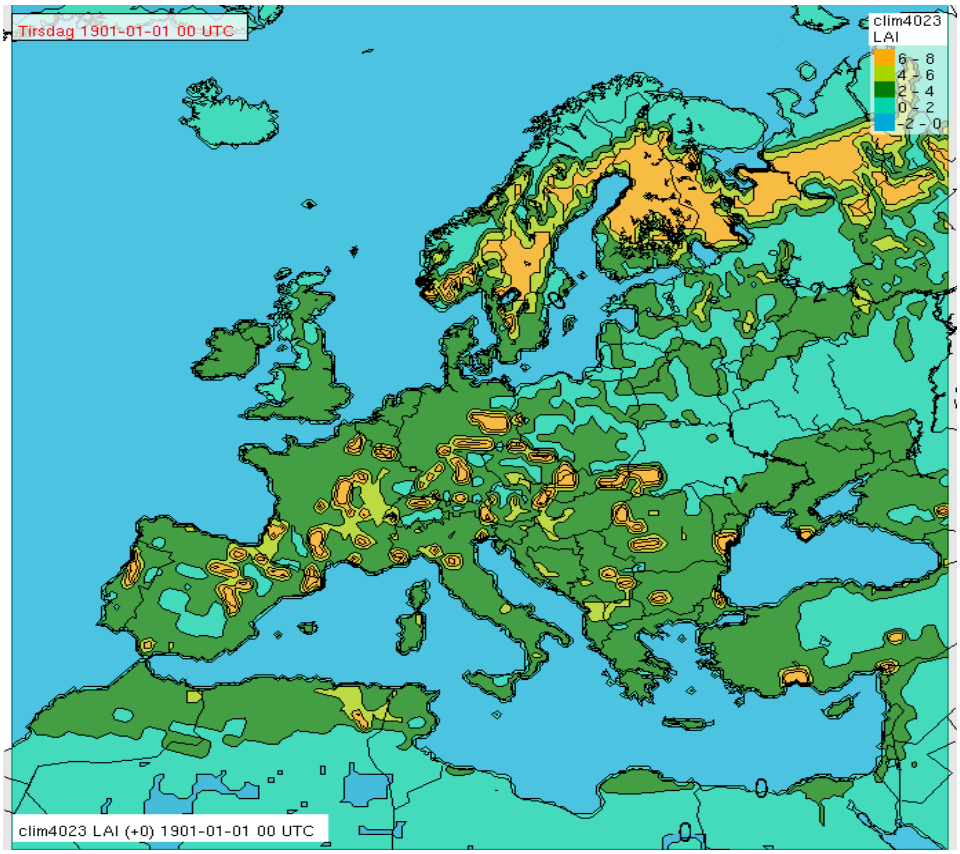

Figure 3. Leaf area index used in ERA40@25.

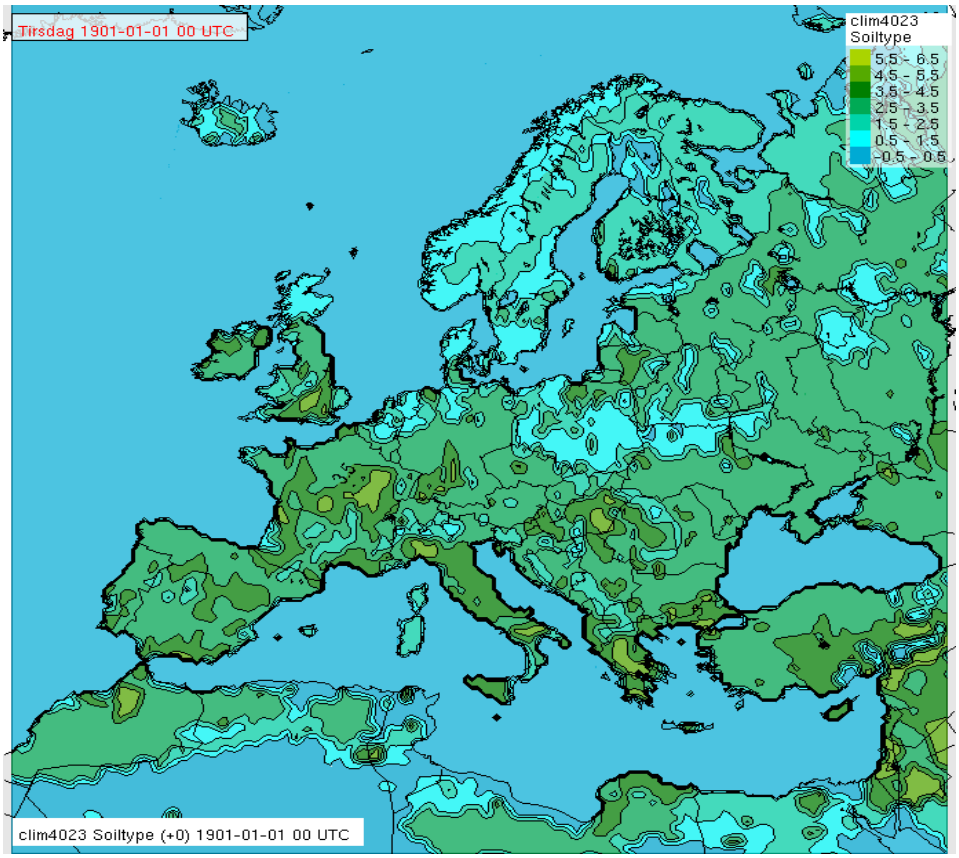

Figure 4. Distribution of the FAO soil types used in ERA40@25