

REQUEST FOR A SPECIAL PROJECT 2010–2012

MEMBER STATE: Germany

Principal Investigator¹: Stefan Hagemann

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Project Title: Regional downscaling of ERA40 and validation of the hydrological cycle

If this is a continuation of an existing project, please state the computer project account assigned previously.	SP DESVHC	
Starting year: <small>(Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project. For projects started before 2009, please state 2009 as the start year.)</small>	2009	
Would you accept support for 1 year only, if necessary?	YES <input type="checkbox"/>	NO <input type="checkbox"/>

Computer resources required for 2010-2012: <small>(The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2012.)</small>	2010	2011	2012
High Performance Computing Facility (units)	640000	700000	760000
Data storage capacity (total archive volume) (gigabytes)	5200	5800	6400

An electronic copy of this form **must be sent** via e-mail to: *special_projects@ecmwf.int*

Electronic copy of the form sent on (please specify date): 17 April 2009

Continue overleaf

¹ The Principal Investigator will act as contact person for this Special Project and, in particular, will be asked to register the project, provide an annual progress report of the project's activities, etc.

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Extended abstract

The main objective of the regional down-scaling is to analyze to what extent problems in ERA40 are transported into the regional domain, and to what extent the regional model may yield an improved simulation of the regional climate due to the higher resolution and its own model parameterizations. This analysis will mainly focus on the hydrological cycle.

Regional downscaling of the ERA40 data has been conducted with the regional climate model REMO (Jacob 2001) over several regions to study the climate of the last 40 years. The regions comprise South Africa, South America and the Aral Sea catchment, and results from these regions were described in previous special project reports. Validation and analyses of results for South Africa were continued, and new downscaling simulations over India and the Nile catchment have been conducted and are currently being evaluated.

In addition, downscaling simulations will be performed and analysed over the West Africa, Canada and Siberia. For all regions, validation studies will be conducted and comparisons to re-analysis data will be added.

Moreover it is planned to validate the simulated hydrological cycle of the planned ECMWF Interim Re-analysis that will cover the period 1989-today. It is known that ERA40 has problems with the hydrological cycle in the tropics, which are expected to influence the regional results via the lateral boundary conditions. As we expect this to be less of a problem in the Interim Re-analysis, it is planned to perform a regional down-scaling for potentially affected regions of both ERA40 and the Interim Re-analysis in the ERA40 satellite period (1989-2001). A detailed comparison between the Interim Re-analysis and the results from the down-scaling will be conducted.

Computing cost estimate

The computing costs of a 1 year REMO simulation is estimated to range between 2700 and 6000 units per model year, with a clustering around 4800 units. For simplicity we have estimated a typical value of 5000 Units per year. It is expected that one ERA40 run plus some spin-up years requires about 50 model years which sum up to about 250000 units. (The West Africa domain is expected to costs about 10000 Units per year, but here only about 25 years are planned.). We want to perform runs on 2 domains per project year, added some overhead for testing and increase in total computing time, such as we did for the last project requests so that we came up with the given numbers.

ERA40 forcing

[Domain Standard Europe (81*91, L27) = 2700 Units, only for comparison]

Domain Siberia (121*91, L27) = 4000 Units

Domain Canada (not decided)

ERA Interim forcing 1989-2007

Domain West Africa 0.44° (193x145, L27) = 10000 Units

Domain Ensembles Europe 0.44 (109*121, L27): = 4800 Units