

# SPECIAL PROJECT PROGRESS REPORT

Progress Reports should be 2 to 10 pages in length, depending on importance of the project. All the following mandatory information needs to be provided.

**Reporting year** 2009

**Project Title:** Decadal climate change experiments of EC-Earth at high resolutions and with top atmosphere

**Computer Project Account:** **SPDKHRES**

**Principal Investigator(s):** Shuting Yang

**Affiliation:** Danish Meteorological Institute

**Name of ECMWF scientist(s) collaborating to the project (if applicable)** .....

**Start date of the project:** Feb. 2009

**Expected end date:** December, 2011

**Computer resources allocated/used for the current year and the previous one**  
(if applicable)

Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
<b>High Performance Computing Facility</b>	(units)	0		200,000 SBU	0
<b>Data storage capacity</b>	(Gbytes)	0		1,000 GB	0

## **Summary of project objectives**

(10 lines max)

The aim of this project is to explore the impacts of high resolution on model simulated climate and climate variability on decadal time scales. Two sets of experiments using the newly developed climate model EC-Earth are designed in the study. The first set of the experiments is an ensemble of high horizontal resolution version of the EC-Earth system at a horizontal resolution of T511 (or T799) and 62 vertical layers for the atmosphere, and with and without ocean model (ORCA1) coupled. These experiments are to study the extent of the importance of enhanced horizontal resolution in decadal predictions. The second set of the experiments will use a high-top atmosphere version of the EC-Earth system with the IFS atmospheric GCM at T159 and 91 vertical layers and the top at 0.01 hPa. These set of experiments will focus on understanding the stratosphere-troposphere feedback and its implication for surface climate prediction.

## **Summary of problems encountered (if any)**

(20 lines max)

The EC-Earth model is currently under development. Debugging and tuning of the fully coupled atmosphere-ocean system is well on the way. It is expected the coupled system will be ready for production runs in the beginning of the autumn.

## **Summary of results of the current year (from July of previous year to June of current year)**

This section should comprise 1 to 8 pages and can be replaced by a short summary plus an existing scientific report on the project

The project was just started this Spring. We have been working on tuning and validation of the fully coupled EC-Earth model system, using the high performance computer at DMI (Cray XT5). It has been showed that the EC-Earth model simulates the present day climate with a skill above the mean CMIP3 models that participated in the IPCC Fourth Assessment Report (AR4). It is expected that fully coupled EC-Earth model system will be ready for production runs in the autumn.

Meanwhile, we have been preparing the AMIP-type of experiments using the stand-alone IFS model in EC-Earth. The initial fields and forcing fields for these runs at various resolutions have been prepared. It is expected the AMIP-type of the experiments at T511L62 resolution will start at the ECMWF's high performance computers in the summer. Experiments at relatively lower resolutions are already on the way at our local Cray XT5. These experiments, together with the high resolution runs at the ECMWF will help us to understand the implication of increasing model resolutions for not only the model climatology, but also the simulated interannual variability.

## **List of publications/reports from the project with complete references**

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## **Summary of plans for the continuation of the project**

(10 lines max)

AMIP-type of experiment using the stand-alone IFS in EC-Earth at resolutions T511L62 have been prepared and will be started in August/September. Depending on the progress and first results of this experiment, a even higher resolution of T799, that are at the limit for models to represent synoptic weather systems, may be planned in order to test the extend for the simulated climatology to be saturated as model resolution increases.

Testing runs using the stand-alone IFS in EC-Earth with stratosphere resolving and high top atmosphere, i.e. with 91 vertical layers, are also planned later this year.

The fully coupled model experiments with configurations of either high horizontal resolutions and/or high vertical resolutions will be on the way next year.