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	2015
Project Title:	The Impact of Stochastic Parametrisations in Climate Models: EC-EARTH System Development and Application
Computer Project Account:	spgbtpsp
Principal Investigator(s):	Prof Tim Palmer Dr Hannah Christensen Dr Andrew Dawson Dr Stephan Juricke Dr Aneesh Subramanian Dr Peter Watson
Affiliation:	University of Oxford
Name of ECMWF scientist(s) collaborating to the project (if applicable)	Antje Weisheimer
Start date of the project:	Jan 2015
Expected end date:	Dec 2017

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
High Performance Computing Facility	(units)	n/a	n/a	9,000,000	2,239,241
Data storage capacity	(Gbytes)	n/a	n/a	5,000	

Summary of project objectives

The central aim of the project is to implement stochastic parametrisation schemes in multi-year integrations of the EC-Earth climate model and investigate their impacts on the modelled climate. Oxford University recently joined the EC-Earth Consortium. Because the EC-Earth model is based on System 4, all development done so far at Oxford for System 4 will be tested and implemented within the EC-Earth system. Once the stochastic parametrisations have been implemented in the EC-Earth system, the impact of stochastic parametrisations on the coupled model mean state and variability can be investigated.

Summary of problems encountered (if any)

The major issue we encountered was the fact that EC-Earth hadn't been ported to the new Cray machine by the end of last year. This prevented us from immediately implementing new schemes in EC-Earth and running simulations. The primary difficulty was compilation of EC-Earth on the Cray using the Cray compiler. We managed to circumvent this problem by using the old Intel compiler with help from the User Support department, as discussed below.

We also had some initial difficulties in setting up CY40R3 for experiments with super-parametrisation and stochastic physics, but received excellent help from Paul Dando to sort out the problems and setup the runs as external users.

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

Over the first three months of this year we have successfully ported EC-Earth to the new Cray computer at ECMWF, using the old Intel compiler. We were assisted in this by Simona Stefanescu, and by the ECMWF user support team, especially Paul Dando and Umberto Modigliani. A major contribution was also made by our colleagues at IC3 in Barcelona, namely Muhammad Asif, who sent us their scripts and told us about necessary changes and adjustments for EC-Earth. We have carried out preliminary test simulations, testing different configurations and set-ups. EC-Earth will be one of the main tools to carry out climate type simulation in our group in the near future, both for fully coupled as well as atmosphere- and ocean-only simulations. Most of the infrastructure for running climate simulations has been set up, even though there is still some work to be done regarding postprocessing and archiving as well as for running fully automated ensemble simulations. Running EC-Earth with the Cray compiler is still not possible at this stage.

We have started to implement and test stochastic parametrisation schemes for the ocean and sea ice in the EC-Earth framework, building on previous work that has, to some extent, been carried out with the ECMWF seasonal forecasting System 4. For now, these schemes have been tested in uncoupled ocean-only simulations. After some more evaluation, they will be tested in the fully coupled framework and might then also be ported to the ECMWF seasonal forecasting system. This ongoing work is done in close collaboration with Antje Weisheimer.

In addition to this work on EC-Earth, we have been working with Filip Vana, Peter Bechtold, Antje Weisheimer, Frederic Vitart and Martin Leutbecher at ECMWF to rigorously test the stochastic physics packages in IFS. We are analysing experimental seasonal forecasts made by Antje Weisheimer to study the impact of stochastic physics on climate variability in the model. This is in parallel with the efforts of the EC-Earth consortium, who are planning to carry out century long simulations using the IFS model in coupled and uncoupled mode. We are assisting them in preparing and fine tuning the simulations of EC-Earth by sharing results from our analysis of the seasonal forecast runs. We have also produced two 50 year runs with the IFS at T159 resolution with specified climatological SSTs and sea ice, one with SPPT and one without, which we will use to examine the impact of SPPT on the model climatology.

Finally, we are also working on a super-parametrised version of IFS, in close collaboration with Filip Vana at ECMWF.

Two members of our group, Aneesh Subramanian and Stephan Juricke, attended the training course on "Physical Parametrisations in IFS". In addition, several members of our group attended the EC-Earth meeting that took place at ECMWF in May.

List of publications/reports from the project with complete references

n/a

Summary of plans for the continuation of the project

(10 lines max)

From November 2015, the University of Oxford will be collaborating on the H2020 project PRIMAVERA (PRocess based climate sIMulation: AdVances in high resolution modelling and European climate Risk Assessment). Within this project, we will be considering the impact of stochastic parametrisation schemes in the atmosphere, ocean, land surface, and sea ice models on the simulated climate of EC-Earth. Our ECMWF special project, spgbtpsp, will be invaluable for our contribution to PRIMAVERA. Over the coming months we will continue testing the stochastic ocean and sea ice modules, particularly considering coupled simulations, before including the stochastic land and atmosphere components. Once satisfied with the model performance, we will begin our long climate simulations.