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	2018
Project Title:	EC-Earth climate simulation for AerChemMIP
Computer Project Account:	SPNLNOIJ
Principal Investigator(s):	Dr. T.P.C. van Noije
Affiliation:	Royal Netherlands Meteorological Institute (KNMI)
Name of ECMWF scientist(s) collaborating to the project (if applicable)	Not applicable
Start date of the project:	January 2017
Expected end date:	December 2019

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)	11,000,000	5,473,482	41,000,000	2,775,201
Data storage capacity	(Gbytes)	5,000	3,000	43,000	3,500

Summary of project objectives

(10 lines max)

Within this special project, we will carry out climate simulations with the global climate model EC-Earth within the context of the Coupled Model Intercomparison Project Phase 6 (CMIP6). The simulations will be done with a model configuration with interactive aerosols and atmospheric chemistry, and will be part of the consortium's contribution to the Aerosols and Chemistry Model Intercomparison Project (AerChemMIP). The set of simulations will also include a selection of the CMIP DECK simulations (Diagnostic, Evaluation and Characterization of Klima) and the CMIP6 historical simulation for this model configuration.

Summary of problems encountered (if any)

(20 lines max)

Last year various aspects of the physical model configuration (EC-Earth3) have been improved. In particular, the description of the vegetation and land surface albedo, which now accounts for vegetation dynamics and changes in land use. Moreover, various cloud activation schemes have been included and tested. Progress has also been made regarding the tuning of the model's energy balance. All in all, these activities have taken more time than expected, causing a further delay of the simulations planned in this project.

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

Simulations completed during the past year have focused on three activities, which are part of the final development of EC-Earth3-AerChem:

1) Improved description of secondary organic aerosols and boundary layer nucleation
2) Implementation of diagnostics for CMIP6 and CRESCENDO
3) Atmosphere-only test simulation for CRESCENDO

A short summary for each of these activities is given below.

Improved description of secondary organic aerosols and boundary layer nucleation
A number of offline TM5 simulations were carried out to evaluate the quality of the new schemes describing the formation of secondary organic aerosols (SOA) and boundary layer nucleation. Results from these simulations will be described and evaluated in a scientific publication (Bergman et al., in preparation). Results have also been evaluated as part of the AeroCom (http://aerocom.met.no) and BACCHUS (Fanougakis et al., in preparation) model intercomparison projects. The new schemes have also been merged into EC-Earth3-AerChem.

Implementation of diagnostics for AerChemMIP and CRESCENDO
We have included all available output diagnostics requested for AerChemMIP into TM5. Additional diagnostics requested for the EU Horizon-2020 project CRESCENDO have also been included.

Atmosphere-only test simulation for CRESCENDO
For CRESCENDO we have completed a 25-year (1990-2014) atmosphere-only test simulation with EC-Earth3-AerChem. This setup of this simulation is essentially the same as for the CMIP6 AMIP simulation, but then with a preliminary model version. The requested output diagnostics from the last 15 years of this test run have been submitted to the project's server at JASMIN.

List of publications/reports from the project with complete references

Bergman, T., T. van Noije, et al., in preparation.
Fanourgakis, G. M. Kanakidou, A. Nenes, T. Bergman, T. van Noije et al., Evaluation of global CCN simulations for droplet formation: A BACCHUS and AEROCOM intercomparison, in preparation.

Summary of plans for the continuation of the project

(10 lines max)

The tuning of the physical model configuration is now well underway. Once this process has been completed, we will use this set of tuning parameters in the model configuration with interactive aerosols and chemistry (EC-Earth3-AerChem). With this model setup we will run a pair of atmosphere-only simulations for the EU CRESCENDO project. One will be a re-run of the present-day test simulation described above. The other will be a similar simulation, using anthropogenic and biomass burning emissions for 1750.

As a parallel activity, we will re-tune specific aspects of EC-Earth3-AerChem, if required. According to the current time line, we aim to start the pre-industrial control spin-up simulation for this configuration before the end of the year. As the length of this spin-up simulation will depend on the outcome of the tuning of EC-Earth3-AerChem versus EC-Earth3, it is hard to estimate the resources that will be spent in 2018. In any case, the plan is to start the various simulations as soon as realistically possible. Most likely, many of the simulations planned in the project will have to be moved to the next year.