

SPECIAL PROJECT INTERIM REPORT

Interim 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 2011

Project Title: Climate change impacts on the European ecosystems and assessment of forest fires risk

Computer Project Account: SPJRCFIR

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

Start date of the project: 2011

Expected end date: 2013

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)			300000	~4000 at 06/08. Expect to use full allocation
Data storage capacity	(Gbytes)			200	~40 Gb Expect to use full allocation

Summary of project objectives

(10 lines max)

The main objective of the project is to provide a European assessment of the potential effects of climate change on green house gases and aerosol emissions from forest fires with respect to a range of climate change scenarios. During the first phase of the project a new forest fires module developed by Kloster et al., (2010) will be implemented in the land surface/biogeochimistry model CLM4.0. Second, CLM4.0 with the new forest fires module will be forced by observed climate (e.g. NCEP, ERA-Interim) and tested against an extensive dataset of burned area provided by the European Forest Fires Information System (EFFIS) and against the Global Fire Emission Database (GFEDv3, van der Werf *et al.*, 2010) . Third, CLM4.0 will be used to create scenarios of forest fires probability, burned area and greenhouse gases emissions by using several climate projections obtained using different RCMs from the recently concluded FP6 project ENSEMBLES.

Summary of problems encountered (if any)

(20 lines max)

No serious technical problems were encountered, although some time and efforts have been required to adapt the model (scripts, libraries, compiling etc) to the system.

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

During these first six months of the project, the Community Land Model (CLM4.0) with the forest fires module developed by Kloster et al., 2010 (CLM-Fires) have been uploaded and implemented on hpce.

A description of the model system as well as the work done so far is given below.

Description of the model system:

The Community Land Model (CLM4.0) is the latest in a series of global land models developed by the CESM (Climate-Earth System Model) Land Model Working Group (LMWG) and maintained at the National Center for Atmospheric Research (NCAR). The latest version CLM4.0 in CESM1.0.3 is available for download from the public release subversion repository (link available at this address: <http://www.cesm.ucar.edu/models/cesm1.0/clm/>).

CLM4.0 simulates a variety of biogeophysical processes such as solar and longwave radiation interactions with vegetation canopy and soil, momentum and turbulent fluxes from canopy and soil, heat transfer in soil and snow, hydrology of canopy, soil, and snow, and stomatal physiology and photosynthesis.

As a community model, CLM4.0 benefits from continual and extensive evaluation, criticism, and improvement by CLM4.0 users and developers. The model has been extended with a carbon and nitrogen cycle model that includes prognostic vegetation phenology, the capability to apply transient land cover and land use change.

The technical description of CLM4.0 is available online (www.cesm.ucar.edu/models/cesm1.0/clm/CLM4_Tech_Note.pdf; Oleson et al. 2010). Regarding forest fires module, recently Kloster et al., 2010 modified the routine embedded into CLM4.0. The new routine provided a better description of burned area and green house gases emissions from biomass burning since it is able to describe quite well either natural (lightning) or anthropogenic causes of forest fires ignition.

CLM4.0 is released with a suite of tools necessary to run the model. More in detail the model system includes:

- a) There are several tools provided with CLM that allow you to create your own input datasets at resolutions you choose, or to interpolate initial conditions to a different resolution, or used to compare CLM history files between different cases. The tools are all available in the `models/ln_d/clm/tools` directory. Most of the tools are FORTRAN stand-alone programs in their own directory, but there is also a suite of NCL scripts in the `ncl_scripts` directory. The list of generally important scripts and programs are:
 1. `cprnc` to compare NetCDF files with a time axis.
 2. `interpnic` to interpolate initial condition files.
 3. `mkgriddata` to create grid datasets.
 4. `mkdatadomain` to create domain files from grid datasets used by `datm` or `docn`.
 5. `mksurfdata` to create surface datasets from grid datasets.
 6. `ncl_scripts/getregional_datasets.pl` script to extract a region or a single-point from global input datasets. See the single-point chapter for more information on this.
 7. `ncl_scripts/npdepregrid.ncl` interpolate the Nitrogen deposition datasets to a new resolution.
 8. `ncl_scripts/aerdepregrid.ncl` interpolate the Aerosol deposition datasets to a new resolution.These tools are needed for the creation of all input files needed by CLM for running the model at a particular resolution or for a particular observational sites.
- b) the source code of CLM4.0 and the new forest fires routine.
- c) the post-processing tools for displaying model results and visualization.

The new releases of the model (CLM4.0) with the modified routine for forest fires, the input forcing and the pre-processing and post-processing tools were obtained on the end of March 2011.

Implementation on ECMWF hpce:

The new releases of the model (CLM4.0) have been ported on hpce and successfully installed and compiled . The set-up of model runs is currently underway.

In the meanwhile datasets for the analysis of model results and their validation (i.e. EFFIS and GFEDv3) have been collected. These results will be finally used to appropriately tune the main parameters of the forest fires routine.

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)

Planned runs and validation:

Several test runs have been planned for the next months in order to evaluate the performances of the CLM4.0 and the new forest fires routine as implemented on hpce.

A 25 year simulation of the present climate will be performed. The results will be analyzed and evaluated against the validation datasets (i.e. EFFIS and GFEDv3).

Subsequently, several model runs will be performed forcing the model with different climate projections obtained using different RCMs from the recently concluded FP6 project ENSEMBLES.