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	2013
Project Title:	Performance analysis of the OpenMP+MPI version of the NEMO oceanic model
Computer Project Account:	SPITALOI
Principal Investigator(s):	Giovanni Aloisio
Affiliation:	University of Salento & Euro-Mediterranean Center on Climate Change, Italy
Name of ECMWF scientist(s) collaborating to the project (if applicable)	…… ……
Start date of the project:	15/03/2013
Expected end date:	31/12/2013

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)	-	-	100000 (SBU)	-
Data storage capacity	(Gbytes)	-	-	100 (GB)	-

Summary of project objectives
(10 lines max)

The main goal of this project is to evaluate the computational performance of a hybrid parallel version of the NEMO ocean model, to identify bottlenecks and to estimate the real benefit.
Several OpenMP approaches have been implemented. The simplest one is to parallelize the outermost loop of all the 3 level nested loops used in the code. The second approach is based on the tiling. The sub-domain assigned to each MPI process is divided into tiles. The operations over the tiles are distributed among the OpenMP threads. The dimension and shape of the tiles are key factors for better exploiting the cache hierarchy and hence strongly influence the overall performances. The last approach is based on flattening the nested loops in one "big" loop on all of the matrix elements and hence distributing the operation among the OpenMP threads. The proposed approaches have been applied in the tracer advection using the MUSCL scheme (traadv_muscl) kernel.

Summary of problems encountered (if any)
(20 lines max)

The actual starting date of the project has been delayed till the 12th of June due to involved people has been involved on other planned activities.

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

During the first weeks of the project, the porting of the NEMO code has been successfully completed. After the analysis of the Power7 documentation, the code has been compiled on c2a cluster using the optimal flags for the MUSCL advection schema. A run script for the job submission has been created following the LoadLeveler documentation. It has been executed to test the correctness of the code porting.

List of publications/reports from the project with complete references
Not applicable

Summary of plans for the continuation of the project
(10 lines max)

In the following months we planned to complete the test on the three OpenMP approaches with two different grid resolutions. Moreover we planned to evaluate the scalability of the three hybrid versions and eventually the scalability of the entire NEMO code.
We would like to know if the data storage capacity can be doubled (from 100 GB to 200 GB) to allow our test on the NEMO high resolution configuration (0.25 degrees) with the biogeochemical component.