SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year	2022
Project Title:	BONSAI (Boosting eNsemble Size for Advanced Insights into climate predictability)
Computer Project Account:	……
Principal Investigator(s):	Alessio Bellucci
Affiliation:	Consiglio Nazionale delle Ricerche, Istituto di Scienze dell'Atmosfera e del Clima (CNR-ISAC)
Name of ECMWF scientist(s) collaborating to the project (if applicable)	…… ……
Start date of the project:	15/02/2022
Expected end date:	31/12/2024

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	(SBU)			4 Millions	0
Data storage capacity	(Gbytes)			16000	0

Summary of project objectives (10 lines max)

Special Project BONSAI aims at exploring the limit of very large ensembles of climate prediction, by designing a prototype decadal prediction system based on a reduced complexity model. Reducing the model complexity (including spatial resolution) while retaining the essential elements needed to reproduce the basic features of the observed climate and its variability, will allow a one order of magnitude increase in the size of the forecast ensembles, compared to what is currently used in standard resolution/complexity decadal prediction. Moving from O(10) to O(100s) ensemble members will allow a better sampling of the uncertainty affecting the initial conditions, and a more effective suppression of the unpredictable noise, to the benefits of the predictable fraction of the signal and the forecast skill.

Summary of problems encountered (10 lines max)

Due to a number of unexpected delays, including the late delivery of the token (password generator; early May 2022) and the sharing of the SPEEDY-NEMO model code from one of the partners (late May 2022), only very preliminary work on this SP has been completed so far. However, a more active phase is planned for the second half of the current year (July-December 2022).

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

Now that the model porting is completed, test simulations will be launched starting on July 2022, to assess the model performance on ATOS. Following the testing stage, the project will enter a more operative phase, and the decadal hindcasts production will start.

List of publications/reports from the project with complete references

N/A

Summary of results

If submitted **during the first project year**, please summarise the results achieved during the period from the project start to June of the current year. A few paragraphs might be sufficient. If submitted **during the second project year**, this summary should be more detailed and cover the period from the project start. The length, at most 8 pages, should reflect the complexity of the project. Alternatively, it could be replaced by a short summary plus an existing scientific report on the project attached to this document. If submitted **during the third project year**, please summarise the results achieved during the period from July of the previous year to June of the current year. A few paragraphs might be sufficient.

A stable version of the SPEEDY-NEMO model code has been made available by one of the partners (P. Ruggieri, University of Bologna) in late May 2022. The code supply has been complemented with supporting documentation of the model performance in terms of representation of the Earth system climatology and the main variability modes, based on the analysis of a control simulation of the pre-industrial climate, using the computing resources at the University of Bologna (Grancini et al., paper in preparation). Based on this assessment, the model turned out to be a suitable candidate for the set of experiments planned for BONSAI.

SPEEDY-NEMO has been then transferred to ATOS, to initiate the porting of the code on the ECMWF HPC facility. Once the relevant libraries needed for the compilation of the different model components (including the coupling software) have been identified in the ATOS HPC system, the shell script for the model compilation has been accordingly modified/adapted to the new computing environment and run, so as to generate a model executable.