SPECIAL PROJECT PROGRESS REPORT

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

Reporting year 2019

Project Title: Innovative iNitialisation techniques for multi-annual ClImate PredIcTions (INCIPIT)

Computer Project Account: spitvolp

Principal Investigator(s): Danila Volpi

Affiliation: Institute of Atmospheric Sciences and Climate, National Research Council (ISAC-CNR)

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

……

Start date of the project: 1/1/2019

Expected end date: 31/12/2020

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)	-	-	36 million	516011.74
Data storage capacity	(Gbytes)	-	-	50000	25

Summary of project objectives (10 lines max)

The objective of this project is to implement two new initialisation techniques and test them for multi-annual predictions. The first technique (first year) consists of performing a quantile matching between the reanalysis and the model: the initial state is found between the model states, choosing the one that has the same cumulative distribution function as the reference data (reanalysis) at the initialisation time. This correspondence is searched grid point by grid point for all the ocean variables. The second method (second year) is the analog method. It consists of choosing a few modes to characterize the state of the system (e.g. AMOC, PDO, ocean heat content in some regions...) and compute them with the reference data at the initialisation date. Then, create a pool of those modes from all the members and years available from the model historical run. The initial state will be the model state that minimizes the distance of all the modes with the reference modes at the initialisation date.

Summary of problems encountered (10 lines max)

We planned to run the experiment with the CMIP6 version of EC-Earth (EC-Earth 3.3.1). To implement the quantile matching technique we need the restart files of the initialisation month (November) from a historical simulation. The CMIP6 historical simulations that save those restart files are currently under production and are planned to be ready by the end of next month. Therefore we will be able to run the experiment planned for year 1 as soon as we will have those files available.

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

Currently, all the scripts to prepare the quantile matching and to create the initial conditions are under testing with provisional data, in order to accelerate the initial condition generation process as soon as the final CMIP6 restart files will be available. This will allow us to put in production the multi-annual experiment as soon as possible. We have thought a few changes in the experimental set-up with respect to the project proposal: we will increment the number of start dates, reducing the ensemble size. The experiments will be initialised in November with 55 start dates (1960-2014, each year), it will be run for 5 years and it will have 6 ensemble members. This is the optimal set-up in order to maximize the number of start dates and the ensemble size, considering all the resources allocated in year 1 (in fact, with the new version of the model we run one year of simulation with 21000 SBU).

List of publications/reports from the project with complete references

None - the experiments still need to be run.

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.

As explained above the experiment planned for year 1 is not yet in production. The little amount of SBU units that have been employed so far were used to test and learn to use the new version of the tool Autosubmit to create and run an experiment on cca.