SPECIAL PROJECT PROGRESS REPORT

Reporting year 2023

Project Title: Globo Ensemble Reforecast 2023 – GLEREF23

Computer Project Account: spitmast

Principal Investigator(s): Daniele Mastrangelo

Affiliation: CNR-ISAC

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

Start date of the project: 1 September 2023

Expected end date: 31 December 2023

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)			35.000.000	~4.000.000
Data storage capacity	(Gbytes)			13.500	~2.500

Summary of project objectives (10 lines max)

The goal of the project is the creation of a new dataset of 35-days, 8-member ensemble reforecasts with an updated version of the atmospheric general circulation model Globo developed at CNR-ISAC. This dataset is the preliminary step to update the CNR-ISAC S2S forecasting system, which operationally runs since 2015 participating, among the others, into the S2S Prediction Project and its database. Also, covering a climatologically significant period, this dataset will be the basis to perform research studies on the model performance and its forecasting skill on the subseasonal scale.

Summary of problems encountered (10 lines max)

No relevant issues were encountered.

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

The production phase started later than planned because I've tried to take advantage from a major update (a new radiation scheme) in the model formulation got available almost simultaneously to the beginning of the project. After having tested the new upgraded version, the production of the planned reforecasts got started.

As of 20 December 2023, about 20% of the whole dataset has been created. Therefore, for the continuation of the project, the plan is to complete the whole dataset running all the planned, remaining reforecast simulations.

When completed, the technique used to calibrate the real-time forecasts and based on this reforecast dataset will be tested and adopted to continue with the operational activity of the CNR-ISAC subseasonal forecasting system.

List of publications/reports from the project with complete references

No publication is available for this project yet.

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.

The work initially performed in this project focused on the installation and setup of Globo. This phase also concerned the configuration of an efficient workflow to exploit the computing resources both for model simulations and its output post-processing. Post-processing tools convert binary output files into grib2 files and work on 2 different outputs: the S2S output, at 1.5x1.5° lat-lon resolution, and the original-resolution files where a subset of variables are stored on the 360x512 lat-lon points of the model regular grid. This workflow was initially tested to assess model outputs after the implementation of the new radiation scheme in Globo, the ECMWF ecRad scheme.

Subsequently, the modelling chain has been used for the real production phase: reforecasts are initialized on fixed dates, every 5 days, over the 2001-2020 reference period with initial conditions based on the ERA5 reanalyses. Every ensemble is made up of 8 members for a total of 160 35-days runs for each calendar day. So far, all the reforecasts for the January and July calendar dates have been produced. In Fig. 1, as an example, the Z500 hPa weekly bias, computed against the ERA5 matching reanalyses, is shown for a boreal winter (1 Jan) and a summer (5 Jul) calendar date.
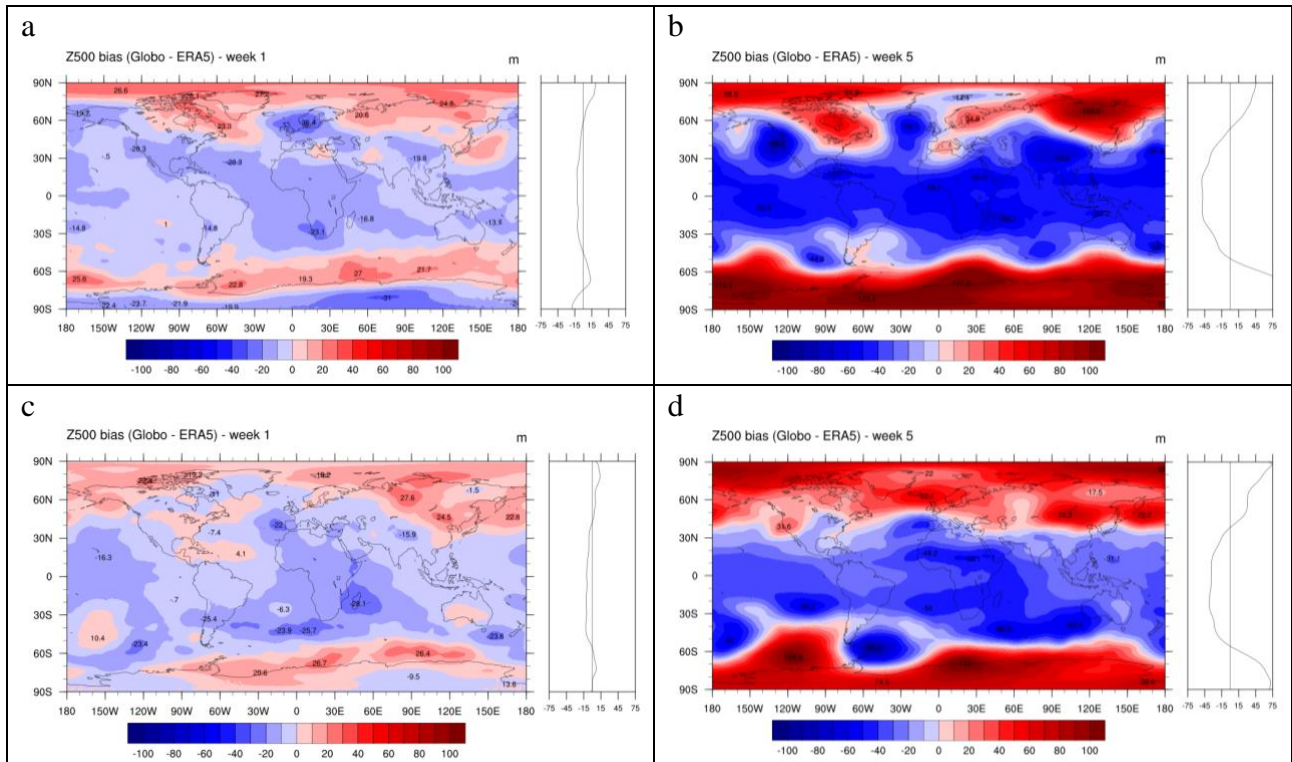
Fig. 1: week 1 (a, c) and week 5 (b, d) averaged Z500 bias (m) computed from Globo reforecasts and the matching ERA5 reanalyses for all the reforecasts initialized on 1 Jan (upper panels) and 5 Jul (lower panels) of the 2001-2020 period.