# 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:** | AddRessing iMpact of lArGe- and small-scale biases of North Atlantic SSTs on the mid-latitude Circulation (ARMAGNAC) |
| **Computer Project Account:** | spitdav2 |
| **Principal Investigator(s):** | Paolo Davini |
| **Affiliation:** | Istituto di Scienza dell'Atmosfera e del Clima, Consiglio Nazionale delle Ricerche (CNR-ISAC) |
| **Name of ECMWF scientist(s) collaborating to the project** (if applicable) | |
| **Start date of the project:** | 01/01/2022 |
| **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** | (units) | 0 | 0 | 26 million | 320 k |
| **Data storage capacity** | (Gbytes) | 0 | 0 | 40,000 | 0 |

## Summary of project objectives (10 lines max)

Within ARMAGNAC we aim at exploring the impact that different patterns and biases of North Atlantic sea surface temperatures (SSTs) - at different spatial and temporal scales - have on the mid-latitude circulation, using the newly developed version 4 of the EC-Earth Global Climate Model (GCM). Making use of a set of atmosphere-only integrations at three different horizontal resolutions (~100 km, ~50 km and ~25 km) we will 1) explore the effect of the most common large-scale SST bias featured by GCMs, such as the ones participating to the CMIP6 effort, 2) assess to what extent spatial and temporal resolution of the SST boundary forcing are relevant for a high resolution atmosphere, and 3) explore what are the impacts of different topologies of the Gulf Stream front, comparing *elongated* (non-meandering) vs. *convoluted* (meandering) Gulf Stream configurations on the local and downstream atmospheric circulation. Overall, ARMAGNAC aims at providing a deeper understanding of the influence that North Atlantic SST biases exert on the mid-latitude circulation dynamics, providing insightful indications for future pathways of bias reduction and model development.

## Summary of problems encountered (10 lines max)

During 2022 massive updates have been performed on the EC-Earth Global Climate Model code following the development of the new version, which is expected to be used in the ARMAGNAC project. A new version of EC-Earth4 is planned to be released this summer, including upgrades to OASIS3-MCT5 and NEMO4.2.
Furthermore, the fact that free computing time is freely available on Atos AA and that the model has not been ported to CCA (since not useful in the upcoming years for the project) implies that none of the available computing time has been used so far.
Overall, the original planning has been slightly postponed so that the first integrations will start in the upcoming weeks.

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

We will start as planned with the CTRL integrations, i.e. the AMIP like integrations at the 3 different horizontal resolution based on CMIP6 forcing.

## List of publications/reports from the project with complete references

None – The experiments will be starting shortly.

## Summary of results

In the first 6 months of the project (from January 2022 up to June 2022) the most of the work has been technical, porting the EC-Earth global climate model code on the Atos AA platform and setting up the diagnostic and postprocessing tool. The model has been tested in both AMIP and coupled mode at Tco95 and Tco199 resolutions. While the Tco95 scaling tests are confirming the previously expected numbers, the Tco199 resolution seems to be slightly more expensive than originally foreseen (about 20%). Is therefore expected that Tco399 resolution – which testing is under development – will be similarly more expensive. It would be then evaluated if move back to Tco319 or to the intermediate resolution in order to being able to complete the planned experiments.