

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 year2023.....

Project Title: ...Investigating the stratospheric dynamics of high-top climate model configurations.....
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Computer Project Account:SPITSERV.....

Principal Investigator(s):Federico Serva.....
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Affiliation:Consiglio Nazionale delle Ricerche.....
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Name of ECMWF scientist(s) collaborating to the project (if applicable)
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Start date of the project:January 2022.....

Expected end date:December 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) | 500 000 | 500 000 | 7 500 000 | 160 000 |
| Data storage capacity | (Gbytes) | 10 000 | 0 | 20 000 | 1 |

Summary of project objectives (10 lines max)

...In this project we aim to study the climatology and biases of high-top model configuration of the Integrated Forecasting System (IFS) used by the EC-EARTH climate model. This is made possible by the availability of specific diagnostics related with momentum and thermal budgets which have been developed during previous Special Projects following coordinated experiment protocols (QBOi Phase 2).

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Summary of problems encountered (10 lines max)

...Due to the transition to the Atos HPC server and revision of the experimental protocol, extensive simulations could not be started during 2022. The Special Project team efficiently helped reducing loss of resources by timely reducing the initial project allocation and releasing them for other uses.

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

...A set of atmosphere-only simulations (at least three experiments) will be conducted to test the model response to nudging of the tropical upper atmosphere. The ERA5 reanalysis outputs, also produced with the IFS model at ECMWF, will be used for this objective.

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List of publications/reports from the project with complete references

...None. Publications documenting the model intercomparison results are foreseen starting next year, as modeling groups are currently running simulations and uploading data to the CEDA archive.

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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 small amount of resources have been used to test the model porting to the new Atos HPC system. Initial results show much improved performances, with the bottleneck still represented -as expected- by model output postprocessing, needed to produce the diagnostics required by the QBOi experimental protocol.

Short experiments have been done to test the impact of nudging of EC-EARTH to the ERA5 fields. This seems to work well globally, and an ad-hoc configuration is currently investigated to better match the QBOi protocol (requiring zonal mean zonal wind nudging, which is not supported by EC-EARTH).

ERA5 data needed for the nudging (on model level and for the period 1970-2020) have also been downloaded from MARS and processed on the HPC system using resources allocated to the project.

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