REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING SPECIAL PROJECT

MEMBER STATE: Germany, Greece, Italy

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Project title: **Testbed for the Evaluation of COSMO Model Versions**

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Project account: **SPITRASP**

Additional computer resources requested for	14/09/2018
High Performance Computing Facility (units)	2.650.000
Data storage capacity (total) (Gbytes)	1000

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The Principal Investigator is the contact person for this Special Project

Technical reasons and scientific justifications
why additional resources are needed

The aim of the **"Testbed for the Evaluation of COSMO Model Versions"** Special Project is to employ the software environment built on the ECMWF platform during the SPITRASP projects (2013-2015, 2016-2018) with the aim to perform rigorous testing, including the generation of objective verification statistics, for any COSMO model test-version prior to its official release.

The evaluation of new model versions is taken into account before operational implementation (release of an official version) and is performed according to source code management procedures. This type of carefully controlled verification procedure is useful in deciding whether the upgrade of the model from a test version to a new official release is advisable.

Apart from simple evaluation of the model performance, the testing of new model versions in the frame of the numerical weather prediction test suite offers the possibility to assess the impact resulted from new implementation of developments for the representation of various numerical or physical processes, especially for convection permitting model resolutions.

The NWP test suite currently represents a benchmark for rigorous testing of all new model resolutions, which allows the model developers to produce guidelines for the selection of a new operational implementation of the model. This also offers the research community baselines against which new techniques and their impact can be evaluated on a larger spatial and temporal domain.

Until now, nine model versions / configurations have been installed and evaluated overall in the framework of the SPITRASP special project, two are on-going and more are expected to be tested using this platform. Computer resources are used to run the COSMO model and the model verification using the VERSUS software and R-based libraries. The model output obtained from the numerical experiments is stored locally in the ECFS system. To set-up and run the VERSUS software, a dedicated machine at ECMWF is used for internal use only (no Internet surfing).

Given the fact that the verification platform was set-up 5 years ago, a more recent period was chosen for the evaluation of new model versions (previous tests have been performed for January and July 2013, while new runs will be evaluated for July and December 2017). This has also required the integration of the current operational model version as control run against the new official release that needs to be evaluated, which needs more computational resources.

Activities in the frame of the Special Project (including use of resources) also have to be carried out in the second part of the year, when other official releases of the COSMO model will be available and should be tested at both resolutions (7 km and 2.8 km), in various configurations.

In addition, the performance of the model in "single precision (SP) mode", that is occupying 32 bits in computer memory instead of the usual 64 bits, "double precision, (DP) mode" will also be tested. Model runs performed in SP mode are 30-40% cheaper than in DP, in terms of computer time usage. Up to now (May 2018), we have already used about 4.100.000 of the total 5.000.000 SBUs allocation for 2018 (82%) and we would like to perform the following tests (two months each):

- For the present model version (5.05, on-going):
  - ✓ runs at 7.0 km, 40 model levels; 72h forecast range, forecast mode, single precision: ~ 2250 BU/run
  - ✓ runs at 7.0 km, 40 model levels; hindcast mode (30 days forecast range), single precision: ~ 30000 BU/for a 30 day run

- ✓ runs at 2.8 km, 50 model levels; hindcast mode (30 days forecast range), double precision: ~ 547500 BU/for a 30-day run
- ✓ runs at 7.0 km, 40 model levels; hindcast mode (30 days forecast range), double precision: ~ 30000 BU/for a 30 day run

- For the future model versions (version 5.06 expected by the end of 2018):
- ✓ runs at 2.8 km, 50 model levels; 48h forecast range, forecast mode, double precision: ~ 36500 BU/run
- ✓ runs at 7.0 km, 40 model levels; 72h forecast range, forecast mode, double precision: ~ 3000 BU/run
- ✓ runs at 7.0 km, 40 model levels; 72h forecast range, forecast mode, single precision: ~ 2250 BU/run

Since experimentation in forecast mode will be run for 62 days, the SBUs requirement amounts to:
(2250*62 + 547500 + 30000) + (36500 +3000 + 2250) *62 = 3305500

While the last tests for model version 5.05 (which will take about 712.500 BUs) can be done with the remaining BUs, we will need additional resources for tests with a new model version - estimated with (36.500 + 3.000 + 2.250) * 62 = 2.588.500 BUs.

Considering the computer time needed by the interpolation of initial and lateral boundary conditions to the COSMO grid, by the archive and by the computation time for the verification tasks, the overall request amounts to 2.650.000 BUs and 1000 Gbytes to archive the fields.