

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

Please email the completed form to special_projects@ecmwf.int.

MEMBER STATE: Italy

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Project title: Analysis of the Urban Heat Island over Torino with COSMO model at 1km

Project account: SPITMIL2

Additional computer resources requested for		2020
High Performance Computing Facility (units)		700000
Data storage capacity (total) (Gbytes)		300

Continue overleaf

¹ The Principal Investigator is the contact person for this Special Project

Technical reasons and scientific justifications why additional resources are needed

The project goal is the introduction of a new physical parameterization in the COSMO Model. This will permit to represent the urban areas in a more correct way and, consequently, the urban heat island (UHI) effect.

For this purpose, a series of simulations have been programmed, using a single test case initially. It took some work to define the best configuration in terms of domain and chain of the simulation. Eventually we proved that the direct interpolation of ICs and BCs from IFS@9km to COSMO@1km does not corrupt the result with respect to the operational method (IFS@9km to COSMO@5km to COSMO@1km). We also found out that it is better to start the simulation one week before the start of the period of interest, because the soil of COSMO Model needs more time to adjust. This part of the work consumed a considerable amount of SBU.

Moreover, the parameterization itself needed to be debugged, because of errors that affected the results of the simulations. Therefore, the simulations had to be run again. This situation brought us to have only 30% of this year's SBU remaining.

Now we have a final and stable version of the code, a final setup of the simulations and promising results, but only for a single test case. We need to enlarge the statistics by considering other cases, also performing tests with different external urban fields in input (such as the building height, the building fraction, the street canyon ratio). The idea is to use the LCZ approach that provides an easy way to obtain generic urban canopy parameters (see references).

Considering that a standard simulation consumes about 20000 SBU, we think that with other 700000 SBU and 300 Gbytes we will have the technical conditions to complete the project in 2020 with all the necessary runs.

References

- Stewart, I.D. & Oke, T.. (2012). Local Climate Zones for Urban Temperature Studies. Bulletin of the American Meteorological Society. 93. 1879-1900. 10.1175/BAMS-D-11-00019.1
- Stewart ID, Oke TR, Krayenhoff ES (2014) Evaluation of the “local climate zone” scheme using temperature observations and model simulations. Int J Climatol 34:1062–1080 Wouters et al., 2016
- Demuzere M, Bechtel B, Middel A, Mills G (2019) Mapping Europe into local climate zones. PLoS ONE 14(4): e0214474. <https://doi.org/10.1371/journal.pone.0214474>