



## **Performance evaluation of a non-hydrostatic regional climate model over the Mediterranean/Black Sea area and climate projections for the XXI century**

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In the framework of the Work Package 4 (Developing integrated tools for environmental assessment) of PERSEUS Project, high resolution climate simulations have been performed, with the aim of furthering knowledge in the field of climate variability at regional scale, its causes and impacts. CMCC is a no profit centre whose aims are the promotion, research coordination and scientific activities in the field of climate changes. In this work, we show results of numerical simulation performed over a very wide area (13W-46E; 29-56N) at spatial resolution of 14 km, which includes the Mediterranean and Black Seas, using the regional climate model COSMO-CLM. It is a non-hydrostatic model for the simulation of atmospheric processes, developed by the DWD–Germany for weather forecast services; successively, the model has been updated by the CLM-Community, in order to develop climatic applications. It is the only documented numerical model system in Europe designed for spatial resolutions down to 1 km with a range of applicability encompassing operational numerical weather prediction, regional climate modelling the dispersion of trace gases and aerosol and idealised studies and applicable in all regions of the world for a wide range of available climate simulations from global climate and NWP models.

Different reasons justify the development of a regional model: the first is the increasing number of works in literature asserting that regional models have also the features to provide more detailed description of the climate extremes, that are often more important than their mean values for natural and human systems. The second one is that high resolution modelling shows adequate features to provide information for impact assessment studies. At CMCC, regional climate modelling is a part of an integrated simulation system and it has been used in different European and African projects to provide qualitative and quantitative evaluation of the hydrogeological and public health risks.

A simulation covering the period 1971-2000 and driven by ERA40 reanalysis has been performed, in order to assess the capability of the model to reproduce the present climate, with “perfect boundary conditions”. A comparison, in terms of 2-metre temperature and precipitation, with EOBS dataset will be shown and discussed, in order to analyze the capabilities in simulating the main features of the observed climate over a wide area, at high spatial resolution.

Then, a comparison between the results of COSMO-CLM driven by the global model CMCC-MED (whose atmospheric component is ECHAM5) and by ERA40 will be provided for a characterization of the errors induced by the global model. Finally, climate projections on the examined area for the XXI century, considering the RCP4.5 emission scenario for the future, will be provided.

In this work a special emphasis will be issued to the analysis of the capability to reproduce not only the average climate trend but also extremes of the present and future climate, in terms of temperature, precipitation and wind.