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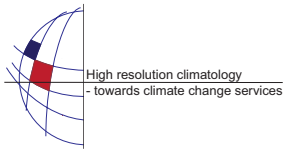

Climate change projection in the Mediterranean Region as obtained from a global AOGCM coupled with an interactive high-resolution model of the Mediterranean Sea

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In this work we present and discuss the results obtained from a set of present and future climate simulations performed with a high-resolution model able to represent the dynamics of the Mediterranean Sea. The ability of the model to reproduce the basic features of the observed climate in the Mediterranean region and the beneficial effects of both atmospheric improved resolution and interactive Mediterranean Sea are assessed. In particular, the major characteristics of the variability in the Mediterranean basin and its connection with the large-scale circulation are investigated. Furthermore, the mechanisms through which global warming might affect the regional features of the climate are explored, focusing especially on the characteristics of the hydrological cycle.
The model used is the CMCC-MED model, developed under the framework of the EU CIRCE Project (Climate Change and Impact Research: the Mediterranean Environment), which provides, for the first time, the possibility to accurately assess the role and feedbacks of the Mediterranean Sea in the global climate system. CMCC-MED, in fact, is a global coupled ocean-atmosphere general circulation model (AOGCM) coupled with a high-resolution model of the Mediterranean Sea. The atmospheric model component (ECHAM-5) has a horizontal resolution of about 80 Km, the global ocean model (OPA8.2) has horizontal resolution of about 2° with an equatorial refinement (0.5°) and the Mediterranean Sea model (NEMO in the MFS implementation) has horizontal resolution of 1/16° ($\sim$7 Km) and 72 vertical levels. The communication between the atmospheric model and the ocean models is performed through the OASIS3 coupler, and the exchange of SST, surface momentum, heat, and water fluxes occurs approximately every 2 hours. The global ocean-Mediterranean connection occurs through the exchange of dynamical and tracer fields via simple input/output operations. In particular, horizontal velocities, tracers and sea-level are transferred from the global ocean to the Mediterranean model through the open boundaries in the Atlantic box. Similarly, vertical profiles of temperature, salinity and horizontal velocities at Gibraltar Strait are transferred from the regional Mediterranean model to the global ocean. The ocean-to-ocean exchange occurs with a daily frequency, with the exchanged variables being averaged over the daily time-window.