EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-549, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

The Hydrological Cycle in the Mediterranean Basin Simulated with a global AOGCM coupled with an interactive high-resolution model of the Mediterranean Sea

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In this work we will present the preliminary results obtained from a present climate simulation performed with a high-resolution climate model able to represent the dynamics of the Mediterranean Sea. The model, developed under the framework of the EU CIRCE Project (Climate Change and Impact Research: the Mediterranean Environment), is a global coupled ocean-atmosphere general circulation model (AOGCM) coupled with a high-resolution model of the Mediterranean Sea. More specifically, the atmospheric model (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° (∼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.

This model provides, for the first time, the possibility to accurately assess the role and feedbacks of the Mediterranean Sea in the global climate system and in particular to explore the characteristics of the hydrological cycle in the Mediterranean region and its connections with the large-scale circulation and climate variability.