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The impact of ocean-atmosphere interaction and atmospheric model resolution on the Mediterranean climate as simulated by regionally coupled ESM ROM

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The Mediterranean Sea and adjacent land is located in a transitional area between tropical and mid-latitudes and presents a complex orography and coastlines where intense local air-sea and land-sea interactions take place. These intense local air-sea interactions together with the inflow of Atlantic water drive the Mediterranean thermohaline circulation. The resolution of global climate models in general is too coarse to correctly describe air–sea fluxes of energy and mass that play a key role in the process of deep water formation in the Mediterranean Sea. From the other hand stand-alone atmospheric models can be inadequate to simulate the air-sea fluxes correctly. For these reasons, the Mediterranean Sea is a region where atmosphere-ocean regional climate models (AORCM) are critical for the study of the processes in the atmosphere and ocean.
In this work we use the regionally coupled atmosphere-ocean model ROM and its atmospheric component REMO in standalone configuration in order to assess the role of ocean-atmosphere feedbacks and the ocean and atmosphere models resolution in the simulation of both the ocean and atmospheric features of the Mediterranean hydrological cycle.
To this end, a number of coupled and uncoupled simulations forced by ERA-Interim boundary conditions have been carried out. Namely, four different sets of coupled and uncoupled simulations with different atmospheric resolutions (25 and 12.5 km) are used to estimate the impact of resolution and coupling on the mass and heat budget as well as deep water formation in the Mediterranean Sea.