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Assessment of the Mediterranean Water Cycle using an atmosphere-ocean coupled model

A. Elizalde, D. Jacob, and U. Mikolajewicz
MPI-M, Atmosphere, Hamburg, Germany (alberto.elizalde@zmaw.de)

A regional coupled model was developed using a composition of three models: REMO for the atmospheric component, MPIOM for the oceanic component and HDModel for the hydrological part. The goal of this development is to study the Mediterranean climate and the impact of the climate change over this region with a special interest on the water cycle. A coupled model simulation allows, through the comprehension of the atmosphere-ocean interaction, a better understanding of the processes' mechanisms involved on each component of such cycle (cloud formation, precipitation, evaporation, runoff, processes interaction, feedbacks, etc.).

Climate simulations over the Mediterranean region are carried out using the coupled model and uncoupled models. Both simulations run with perfect boundary conditions from the ERA40 reanalysis dataset. The results show that changes on the sea surface temperature influence the heat and moisture fluxes at the sea surface. This interaction is enhanced in the coupled simulation, which in turn, influence the temperature and moisture in the air. The atmospheric circulation advects the moisture southwesterly and lifts it when elevated topography is found, producing condensation and eventual precipitation. Large scale precipitation changes, between both simulations, are seen on the southeastern coast of the Black Sea. Changes in the convective precipitation are observed on the southeast coast of Turkey, east coast of the Adriatic and Levantine Sea.