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Climate change projections over the MED-CORDEX domain from a multiple physics ensemble of RegCM4.3 simulations

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In this study we analyze a set of regional climate model (RCM) simulations applying dynamical downscaling of global climate model (GCM) simulations over the Mediterranean region. The RCM simulations are completed with the Regional Climate Model RegCM, version RegCM4.3, and cover one of the domains specified by the international initiative Coordinated Regional Downscaling Experiment (CORDEX). Two GCMs were selected from the Coupled Model Intercomparison Project Phase 5 (CMIP5) ensemble to provide the driving fields for the RegCM: HadGEM2-ES and MPI-ESM-MR. The simulations consist of an ensemble including multiple physics configurations and different "Reference Concentration Pathways" (RCP4.5 and RCP8.5). In total 13 simulations were carried out with 6 model physics configurations with varying convection and land surface schemes. The simulations were completed as part of the CORDEX REgCM4 hyper-Matrix (CREMA) experiment. The horizontal grid spacing of the RCM simulations is 50 km and the simulated period in all cases is 1970-2100. The Mediterranean region was divided into 6 subregions: Spain, Alps, Balkan, Turkey, Adriatic and full Mediterranean Basin. Mean temperature and precipitation changes are assessed from monthly through seasonal to annual scale mainly focusing on the period of 2070-2099 with respect to the 1976-2005 corresponding model reference period. We analyze changes in mean climate as well as climate variability and different indexes of extreme events. The results show a clear warming trend by the end of the XXIst century over all subregions, especially in the warm season, along with a corresponding drying. The change of the interannual variability of precipitation and temperature show a prevailing increase, especially over the Iberian peninsula. Changes in extremes are spatially coherent for temperature, but more variable for precipitation. Although these results are generally consistent with previous scenario runs, we also find that the model exhibits significant sensitivity to the physics configuration used, particularly in the summer season, while in the winter the GCM boundary forcing appears to be more dominant.