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Climate projections over the Eastern Mediterranean Black Sea region using a pseudo global warming (PGW) approach.

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This study presents high-resolution (4 km) simulations of the Weather Research and Forecasting (WRF) model using the pseudo-global-warming (PGW) approach. The aim is to investigate seasonal climatic changes in the Eastern Mediterranean Black Sea (EMBS) region between the periods of 2071-2100 and 1985-2014. The climate change signals retrieved from the CMIP6 GCMs under the highest emission scenario (SSP5-8.5) were added to ERA5 data to account for future climate perturbation. During the baseline period (1995-2014), the dynamically downscaled ERA5 (not perturbed) and ground observations yielded daily near-surface temperature reach correlations of around 0.98 and daily precipitation correlations ranging from 0.60 to 0.76. The WRF simulations for the future climate accurately represent the low-level anticyclonic circulation over the EMBS caused by anomalous ridge development over southern Italy in winter (DJF) and the decrease in vertical pressure velocity and resulting low-level circulation due to heat-low development over the Eastern Mediterranean in summer (JJA) as represented by the GCMs. Likewise, the wetting and drying patterns in the regional WRF simulations match those in the GCM ensemble over the subregions of the EMBS in winter. However, abnormal precipitation increases occur in the WRF simulations over the Caucasus and nearby regions, which is a new insight as this pattern does not exist in the GCM ensemble. This abnormality is likely caused by the higher-than-expected sea-surface temperature (SST) of the Caspian Sea and considering high-resolution simulations over the complex topography of that region.