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The climate of the Eastern Mediterranean and the Nile river basin 2500 years before present: a fully forced paleo regional climate simulation with COSMO-CLM

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How did climatic and environmental variability and stress affect past societies in an area of increasing relevance for contemporary planning and policy concerns? The Eastern Mediterranean (EM) and the Nile river basin (Nile) bear a long history of human social dynamics, making it a suitable area for exploring potential interactions between climate variability, extreme events, environmental changes and society over a variety of time scales. The areas contain abundant natural and human-historical archives that preserve information on the climate conditions and impacts on humans and ecosystems covering the past centuries to millennia. So far, the links between climate and societies are examined mainly from the proxy records or the derived paleoclimatic reconstruction perspectives, without addressing the detail of the processes and underlying dynamics that offer the regional climate model simulations. In order to improve our understanding of past climate in the EM and Nile at the regional scale, we developed a spatially high resolved fully-forced paleoclimate version of the COSMO-CLM running over the past 2500 years. All forcings used for the driving ESM, namely volcanic (stratospheric aerosol optical depth), orbital (eccentricity, obliquity, precession), solar (irradiance), land-use and greenhouse-gas changes are implemented to COSMO 5.0-clm16 (see Hartmann et al. for more details). As a starting point for exploring the relationship between climate and society over the last 2500 years, we compared the mean climate conditions (2m temperature and precipitation) of two periods that are 2400 years apart, namely BCE 400-362 and 1980-2018 CE. Overall, the results show that summer temperatures differ by up to 3 degrees between the two periods. In particular, over the tropics, the temperature differences are largest. Precipitation changes vary within the study area and the climate regimes covered. We will further analyze the dynamics and climate variability of the area over the two periods to explore more details of regional and local climate change.