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Simulation of Drought in Central Asia during the Last Millennium

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Within the Central Asian Climate Dynamics project (CADY), we aim to apply multiproxy reconstructions and climate models to analyse and (semi)quantify the Last Millennium climate variability and regional hydrology in Central Asia. In this context, we have used simulations of the uncoupled atmosphere version of global COSMOS Model (ECHAM5) in T31L19 spatial resolution within the Last Millennium; Medieval Warm Period (MWP; 900-1100 AD), the Little Ice Age (LIA; 1515-1715 AD) and after industrialization (REC; 1800-2000 AD) to drive the COSMO-CLM regional climate model at its lateral boundaries for 30 year time-slices based on the definition of extreme spells in the past climate.
The Palmer Drought Severity Index over Central Asia has been calculated for both global and regional simulations. The simulated PDSI from COSMO-CLM driven by ERA-INTERIM data shows very good agreements compared to observations (PDSI from Dai et al., 2004) in space-time-frequency. Based on the EOF analysis, the simulated drought patterns are well captured compared to the reconstructed PDSI from Cook et al., 2010 (pattern correlation = 0.68 (0.83) for LIA(REC) at a 99% significance level). Further, historical droughts can be identified by the simulated PDSI (e.g. Ming Dynasty Drought and The Great Drought). The Principal Components of simulated PDSI also show significant correlations with SST anomalies for the period from 1856 to 2000.