

Summer temperature and drought co-variability across Europe since 850 CE

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Under the present global warming condition the increasing risk of droughts and floods is a major concern. Droughts have severe consequences for agricultural productivity across wide areas. However, state-of-the-art climate models are not consistent in their projections of hydroclimate changes under global warming, on regional scales, which limits attempts at defining long-term mitigation strategies. A better understanding of past summer temperature and hydroclimate co-variability will provide valuable empirical information on how increasing/decreasing temperatures will affect summer drought conditions at different time-scales over Europe.

We use instrumental data, the new gridded tree-ring-derived Old World Drought Atlas by Cook et al. (2015), the gridded European summer temperature reconstruction by Luterbacher et al. (2016), as well as two high-resolution last millennium (850–2005 CE) climate simulations (CCSM4 and MPI-ESM-P), to assess the spatio-temporal co-variability of summer temperature and summer drought over Europe, at inter-annual to centennial time-scales, since 850 CE. This allows us to i) investigate potential changes in the dominating patterns of co-variability at different time scales, and ii) assess the accuracy and precision of climate models to simulate summer temperature and summer drought co-variability as found in both the 20th century instrumental data and millennium-long tree-ring based climate reconstructions. The discussion of cross-spectral analyses of temperature and drought will likely improve our understanding of the long-term co-variability of these important climate variables at continental scales in Europe.

References:

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