



## **Model-based Characterization of European Climate Evolution during the Little Ice Age**

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A set of three simulations covering the last millennium carried out with the Max Planck Institute Earth System Model (MPI-ESM-P) is analyzed focusing on the coldest periods during the last 500 years. Comparing the results with the PAGES2K summer-temperature reconstruction for Europe indicates that the simulations are able to reproduce important aspects of the climate evolution, such as amplitudes, trends, and duration of particular cold periods. The model framework allows identifying the sources and mechanisms of the variations, as well as their regional representation. We investigate the role of the North Atlantic ocean-atmosphere exchanges, and variations in oceanic and atmospheric transport and circulation. In particular, we analyze the relation of atmospheric blocking to the regional and continental temperature and precipitation variation. In addition to externally driven changes, such as those caused by strong volcanic eruptions, internal variability in the Atlantic ocean-atmosphere system is identified as an important element shaping the climate evolution over the European continent.