

Climate History of Central Europe during the Little Ice Age

Ulrich Foelsche¹, Martin Stangl², Thomas Pliemon², Erik Kraml², Bruno Besser³,
Christian Rohr⁴, Christian Pfister⁴

1 University of Graz, Institute of Physics, Department of Astrophysics and Geophysics and Wegener Center for Climate and Global Change

2 Institute of Physics, University of Graz, Austria

3 Space Research Institute, Austrian Academy of Sciences

4 Oeschger Centre for Climate Change Research and Institute of History, University of Bern Switzerland

Time series of measured climate parameters are rarely longer than about a hundred years, and thus hardly go back to the time when the climate was still largely unaffected by human activities. Longer, high-quality time series would be extremely important, on the one hand, to better assess the magnitude of anthropogenic climate warming, and, on the other hand, to more accurately determine the frequency of extreme events, such as hot summers or cold winters. They can also help to determine the relative importance of natural climate changes.

In this context, the so-called "Little Ice Age" (LIA) is of particular interest, which lasted from about 1300 to 1850 - especially since particularly cold phases during this period seem to coincide with periods of low solar activity, e.g. during the "Maunder Minimum" from about 1645 to 1715. In recent years, however, it has become more and more evident that the LIA was by no means homogeneous - neither in time nor in space. It is therefore important to study the climate evolution in different regions in detail - ideally based on measured data, or otherwise on historical records or proxy data, such as tree rings and the like.

Here we present results from a recently completed FWF project, where we have contributed to this endeavour by studying early measurement series in Paris and Graz, on the one hand, and by evaluating historical data in Transylvania, on the other hand, which have not been considered so far. It turns out that there were indeed very cold winters during the LIA - but also surprisingly hot summers in supposedly cold times. There is some evidence that even under natural conditions the frequency of hot summers was higher than we previously estimated - and that we are thus even underestimating the future frequency of hot summers in the course of climate change.

Over the observed period, there is some correlation between climate change and reconstructed solar activity - but it is not particularly pronounced. Surprisingly, we have found some credible accounts of auroral observations in Transylvania during the period of the "Maunder Minimum", suggesting that solar activity during this time was not as low as often assumed.