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Extremes during the "year without summer 1816" in Switzerland

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The year 1816 is known as the "year without summer" that followed the eruption of Tambora in 1815. In Switzerland, this was the coldest summer during the past few hundred years, and socio-economic impacts were extreme. The "year without summer" is mostly analysed in monthly data. We have recently digitized sub-daily data from several stations in Switzerland, which allows much more specific analyses such as changes in the diurnal cycle, weather type dependence, frequency distributions, and extremes. The results are compared to the "public perception" of the extreme weather in 1816 as manifest in newspaper reports.

The main series used is that from Geneva. The year 1816 is compared with a reference climatology based on a surrounding approximately 20 year long interval during which no instrument changes occured (a reported drift of the thermometer was corrected). The temperature decrease in summer 1816 with respect to that reference was much larger at 14:00 compared to sunrise. The temperature at 14:00 also shows changes in extremes (more negative extremes, less positive), while the early morning temperature shows no change in negative extremes, but a lack of positive extremes. Precipitation shows no change in 24h intensity (concerning both mean value and extremes), but a very large change in the frequency of rainy days, which explains the large increase in monthly precipitation. Sub-daily data is also available for pressure, wind direction, and cloud cover, which allows a simple weather-type classification. This method is used to quantify to what extent the year without summer can be explained by changing frequencies of weather types compared to changes within weather types.

A systematic analysis of all weather-related articles in two newspapers in the years 1815-1817 suggests that the public perception of the summer 1816 was focusing more on precipitation and storms (including extremes such as hail storms) and less on temperature (coldness, frosts). This is interesting also with respect to the current perception of climatic changes.