



## Towards a daily weather type classification for the alpine region back to the late 18th century

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Synoptic weather type classifications for the alpine region go back to the 1950s. The aim of such a combination of various meteorological elements over a certain area is to better understand atmospheric circulation and weather events, and to provide a basis for long-term weather forecasts.

For the analyses of climate change an investigation of a change in the atmospheric circulation patterns over a long period is of high interest. Such weather type classifications are based on high temporal resolution (subdaily) data of different meteorological parameters. For many stations this kind of data is only available back to the mid of the 19th century, because this was the starting time for many observational stations, or if existing, earlier data are often not (yet) existing fully digital.

For Switzerland, three long ( $\sim 250$  yrs) historical time series (Basel, Geneva, Gr. St. Bernhard), that were hitherto available in the form of monthly means only, have recently been digitized on a subdaily scale (in cooperation with MeteoSwiss). The digitized time series comprise subdaily data (varies from 2–6 daily measurements) on temperature, precipitation/snow height, pressure and humidity, and subdaily descriptions on wind direction, wind speeds and cloud cover.

Based on different combinations of the parameters pressure, wind direction and wind speed, a weather type classification can be performed back to the late 18th century. With information on absolute pressure height, tendencies and gradients, as well as changes in wind direction and wind speed, typical circulation patterns can be expressed, and subsequently weather types for the alpine region classified. For Switzerland, Schüepp's "Alpenwetterstatistik", which is often used for daily weather type classifications in the alpine region, contains daily assignments to weather types for the last 50 years. Together with additional high-resolution long-term data from stations located around the alpine region, a probabilistic approach for a daily weather type classification, based on centralized weather types of the "Alpenwetterstatistik", can be performed. In this way the weather type classification for the alpine region can be extended back to the late 18th century, for every single day.

For the analysis of temperature and precipitation anomalies in the year without a summer (1816) in Switzerland, a daily weather type classification for a small area, based on pressure and wind data from Geneva, was already conducted and applied. Daily weather types, for a 20-year reference period (1796–1821, with some exceptions), were assigned and compared to the year 1816. With this method, anomalous circulation patterns between the year without a summer and the reference period could be analyzed.