DESCRIPTION FOR THE GENERAL PUBLIC

In this era of climate change, with its increasing occurrence of extreme hydrometeorological events, the new knowledge that this research provides on these phenomena in history, especially warm periods, may be extremely useful for forecasting the future occurrence and scale of such phenomena.

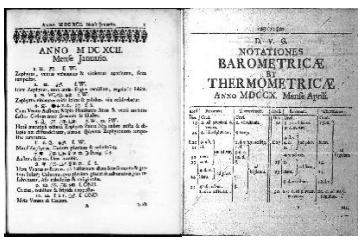
The main objective of the proposed project is to learn about the history of changes in the occurrence and nature of some of the most important extreme **W**eather, **C**limate and **W**ater event**s** (**WCWs**) according to WMO classification in Poland in the pre-instrumental period (1001-1800) and to compare them with contemporary conditions. Another important goal will be to identify the causes (meteorological, hydrological and other) of some WCWs, but particularly droughts and floods.

Documentary evidence (historical sources and early-instrumental meteorological measurements and observations) as well as dendrochronological data will be used for the above purposes (see Fig. 1). The literature on WCWs in Poland is rich, but mainly limited to the "instrumental period" (the last 200 years or so). Meanwhile, publications regarding the pre-instrumental period are few, especially for groups of extreme weather and climate events. Although significantly more studies exist for extreme water events (in particular floods), and they are highly valuable, they are noticeably somewhat mechanical in their recording of floods, most often focusing on the largest scale events.

A more detailed analysis of the sources is thus needed to obtain better description of individual WCWs. This task - that is, the collecting of historical data as part of the project's planned archival and library queries, and their detailed analysis - will be carried out by a team of historians with 20 years' experience. All the information collected about weather conditions, including the extreme events analysed in the project, will be evaluated in terms of the reliability of their occurrence and descriptions, using methods in common use in the historical sciences (historical source criticism). Only information that passes this evaluation will be submitted for further statistical analysis. With this verified database of weather conditions for the analysed historical period, the following will be constructed in the first stage of research: 1) A database of all studied WCWs using the documentary evidence and their critical evaluation, 2) An updated version of thermal and precipitation indices for individual seasons and months based on available documentary evidence, 3) A catalogue of droughts and floods, specifying time of occurrence, type, degree of intensity, synoptic conditions, temporal and geographical coverage, and socio-economic consequences. In addition to historical sources dendrochronological data will be used, and therefore at this stage of work a database of these data will also be constructed. We will focus on gathering the most negative and positive pointer years, which can be useful for analysis of WCWs, i.e. mainly droughts, floods, and the extreme temperature character of late winter and early spring (severe cold), which is a main driver of the reduced coniferous tree growth in Poland.

In the second research stage, the datasets obtained from the above procedure will be comprehensively analysed using modern statistical tools and GIS techniques. Among others, the frequency of occurrence of various types of WCWs in Poland in the period 1001-1800 will be analysed, including a determination of trends across the centuries. In the case that the historical sources contain sufficient information, extreme droughts (megadroughts), catastrophic floods and other WCWs (e.g. warm/cold waves, heavy rains) will be described in detail, along with a reconstruction of the areas in Poland where they occurred. The meteorological, hydrological and other conditions that contributed to individual instances of droughts and floods and some other WCWs will also be determined. Relationships will also be studied between thermal and precipitation indices for the whole of Poland or individual regions, and the appearance of WCWs. The knowledge gained for such a long period will also enable the assessment of whether, in the period from the 11th to the 18th century and particular sub-periods, the occurrence and characteristics of WCWs were significantly different from their modern-day characteristics.

HISTORICAL WEATHER DESCRIPTIONS



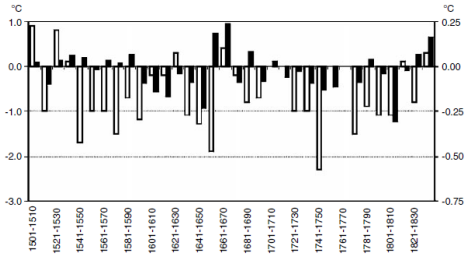
Source: Grebner (1692, 1710)

INDEXATION OF WEATHER CONDITIONS

Index	Winter (DJF) Mean temp. (°C)	Freq. of occurrence (%)
+3	1.3	7.3
+2	−0.1	14.5
+1	−1.3	25.0
0	−3.1	32.8
−1	−5.2	10.9
−2	−6.4	4.5
−3	−8.1	5.0

Source: Przybylak *et al.* (2005)

CLIMATE RECONSTRUCTION



Source: Przybylak *et al.* (2005)

Fig. 1. Stages of research work leading to weather and climate reconstructions.