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PAGES 2025 ABSTRACT BOOK

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Applying the different techniques for reconstructing climate and forest cover using pollen data from the peat core of the Nizhnyaya Tunguska mire (Tura area, Krasnoyarsk Krai, Russia; 64.167884N, 100.533927E), accumulated over the last 110 years, only RF showed statistically significant results for T_{ann}, P_{ann} and forest coverage. Comparison of the climatic reconstruction using RF models with the instrumental record from the Tura weather station for 1928-2019 showed poor correlation for both sets; the Welch bootstrap t-test (9999 cycles) characterized instrumentally measured and fitted by model P_{ann} values as having similar means (p = 0.02). Despite these findings, the reconstructed values are visually very similar to the instrumental record, with the same trends and low residuals, except for the annual temperature increase since 1990. The models of forest coverage simulation demonstrated the lower fitted values compared to modern woody area. However, the models showed deforestation trends in 1950-1970 and 2010-2019 that correspond to the peak of anthropogenic activity and intensive forest fires in the region.

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Keywords: Training set, Random Forest, Transfer functions

[A0368] -Poster

Changes in the structure if atmospheric precipitation in NUUK (SW Greenland) from the late 19th to early 21st centuries

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Precipitation is key to characterizing climatic conditions. Variability in amounts and structure of precipitation in the Arctic is increasingly important, especially in the recent global warming (Przybylak 2016). This is related to the influence of precipitation on the mass balance of glaciers and the Greenland ice sheet. Cryospheric behaviour is extremely important to the evolution of the global climate system.

The analysis is based on daily precipitation sums at Nuuk station (SW Greenland) for the late 19th to early 21st centuries. Due to large data gaps, 15 years' worth of data (sometimes discontinuous) from four subperiods were selected for comparative analysis: A: 1875–83, 1886–91 (initial precipitation observations in Nuuk; Little Ice Age), B: 1925–27, 1929–32, 1934, 1936–1942 (the Early Twentieth-Century Warming); C) 1970–84 (transition from cooling to contemporary warming); and D: 2000–14 (major contemporary warming).

Daily precipitation totals from periods A and B were digitised from Danish meteorological yearbooks (*Meteorologisk Aarborg*). Precipitation for periods C and D was obtained from the Danish Meteorological Institute database. Daily precipitation totals were used to calculate monthly, seasonal and annual totals. Daily precipitation intensity was analysed using the Olechnowicz-Bobrowska classification (1970): very light 0.1–1.0 mm, light 1.1– 5.0 mm, moderate 5.1–10.0 mm, moderately heavy 10.1–20.0 mm, heavy 20.1–30.0 mm, very heavy >30.0 mm. Seasons were also analysed: spring (March–May), summer (June– August), autumn (September–October), winter (December–February). Particular attention was paid to extreme precipitation and its causes by analysing the synoptic situation for selected days using the 20th Century Reanalysis (https://psl.noaa.gov/data/20thC Rean/).

Precipitation in Nuuk is highly temporally variable. Annual precipitation totals can differ by up to 600 mm, year-on-year. In the studied periods, precipitation was highest (>1000 mm) in 1983, 2000, 2001, 2005 and 2013 and lowest (<400 mm) in 1882, 1927, 1930 and 1931. The driest years occurred in period B and the wettest in period D, when average annual totals were 517.5 and 900.9 mm, respectively. In the annual cycle, in the 60-year period, average totals were lowest (37.7 mm) in January and highest (96.9 mm) in September.

In Nuuk, over the 60-year period, no precipitation was recorded on ~60% of days. On

precipitation days, intensity was most commonly light (38.3%) or very light (33.7%). The share of days of specific precipitation intensities in the total annual number of precipitation days continued to decline with increasing precipitation intensity (i.e., 14.5%, 9.0%, 2.8% and 1.7%, respectively, for moderate, moderately heavy, heavy and very heavy). The structure of precipitation differed among periods. Very light precipitation was most frequent (37.9%) in period A, while, e.g., very heavy precipitation occurred most frequently (2.6%) in period B.

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Keywords: Precipitation, Climate change, Greenland, Nuuk

【A0539】-Oral

Long-Term evolution of Yakutian Lakes: Climate-Driven changes in permafrost-associated ecosystems since the last glacial maximum

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Arctic and subarctic warming rapidly transforms freshwater ecosystems, including lakes in the Republic of Sakha (Yakutia), vital to local communities. In Yakutia, thermokarst and alaas lakes—formed in permafrost—hold ecological, cultural, and environmental



PAGES 2025

7th OPEN SCIENCE MEETING

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Low-temperature events, as an important and disastrous weather process, can cause severe damage to agriculture, transportation, and economic systems. However, lowtemperature events occurring during the warm season have received less attention from climatologists compared to the harsh winters, with the exception of the wellknown cold summer of the post-Tambora period during 1815-1817, which resulted in terrible famines in southwest China. Historical documents have been widely used to study past climate. Aside from abnormal phenomena like snow, frost, and ice, past low-temperature events occurring in late summer and early autumn, which are key periods of rice growth, also attracted people's attention and have been documented. Through the excavation of the original literature, the presented study reconstructed a chronology of low-temperature events in the warm season over the past hundreds of years and analyzed their temporal-spatial characteristics. We also detected lowtemperature events in the past decades in southwest China and discussed the corresponding circulation pattern and potential forcing using the instrumental, reanalysis (ERA5), and paleo-simulation (ModE-Sim) datasets. Volcanic eruptions are one of the most important forcings, and Superposed Epoch Analysis (SEA) results show lower temperatures in the years following eruptions in the North Hemisphere and tropical regions. The large-scale circulation anomaly composition presents as the East-Atlantic (EA) pattern. The impact of Pacific Sea surface temperature (SST) is also present in both reanalysis and simulations, which could force an EA pattern by inducing a Rossby wave train (Wulff et al., 2017). In further work, we will make a comparison between low-temperature events in China and Europe, which are both influenced by the EA pattern and volcanic eruptions.

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Keywords: Documentary data, China, Low-temperature events

[A0450] -Poster Anemological and atmospheric pressure conditions in south-eastern



Greenland in the second half of the 18th century

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The materials used in this work come from European archives: Moravian Archives in Herrnhut (Germany) and Det Kgl. Bibliotek in Copenhagen (Denmark). Anemological and atmospheric pressure conditions were analysed based on two series of meteorological observations (1 September 1767 – 22 July 1768 and September 1784 – June 1792) from Nuuk (in the past known as Neu-Herrnhut and Godthåb). This is the capital of Greenland, located on the southwestern coast. Meteorological measurements were made by Moravian missionaries conducting religious missions in this area.

The first series is the oldest available long-term series of instrumental measurements for this region. Meteorological observations (air temperature, atmospheric pressure, wind speed and direction) were made twice daily at 8 a.m. and 2 p.m. local time. Measurements in the period 1784–92 were carried out using instructions and instruments provided by members of the Palatinate Meteorological Society. They were made three times daily at 7 a.m., 2 p.m. and 9 p.m. local time.

Observations made in the 18th century were compared with the modern period (1991–2020). To make this possible, historical units were converted to those used today. In the past, wind speed was visually assessed using a scale. For the first series, a 7-degree scale (1–6) and 8 directions were used, while for the second series, wind strength and directions were estimated on a scale of 0–4 and 16 directions, respectively. Based on the instructions for meteorological observations that were passed on to the missionaries and using the Beaufort scale, it was possible to convert both historical scales of wind to presently used units (ms⁻¹). Atmospheric pressure measurements were taken using a mercury barometer with a scale in French inches and Paris lines, which was converted to hPa. The air temperature was converted to degrees Celsius from the Fahrenheit/Réaumur scales used in the past for the first/second series, respectively.



Based on the wind speed, monthly and seasonal average values were determined, and Knoch's classification (after Jankowiak and Parczewski, eds. 1978) was used to determine intervals of wind force. In addition, analyses were made of the frequency of wind from individual directions during the year and for seasons (autumn, winter, spring and summer). The analyses carried out indicate an exceptionally low frequency of wind from the SE direction (3 to 12%), while the highest from the NE (19 to 37%). Wind roses for air temperature were also made for each series. This indicates that the wind from the southwest (especially in winter) brought air masses with the highest temperature.

In the case of atmospheric pressure, values of monthly, seasonal, and annual averages and their changes in the historical period were analysed and compared with the contemporary period. An analysis was made of the frequency of occurrence of atmospheric pressure values for different intervals, as well as the magnitudes of dayto-day changes that affect the human body.

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Keywords: Anemological conditions, Atmospheric pressure, Greenland, Historical climate, Instrumental measurements

[A0869] -Oral

Historical documents reveal the early warning signals of extreme rainstorm-flood events in the Haihe River Basin

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Although there are similarities between historical and modern impacts and adaptations, changes in the broader socio-economic context must be considered. Mahogany, a key export from the late 18th century is no longer important, while impacts on domestic water supply are now less acute. Historical records, however, help to inform debates about current and future climate change in Belize.

Keywords: Drought, Historical sources, Impacts, Instrumental records

[A0309] -Oral New series of meteorological measurements for Wrocław (SW Poland), 1773-1781 – description and analysis

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The article presents a description of the newly discovered series of meteorological measurements made in Wrocław (SW Poland) in 1773-81 and their importance for climate analysis. The series is the third oldest available for Wrocław. Earlier series exist for 04.1710–1721 (David von Grebner) and 1717–30 (Johann Kanold/A. E. Büchner) (see Przybylak, 2010). The 1773–81 observations were made by Johann Ephraim Scheibel probably in the area of the Gymnasium belonging to the Church of St Elizabeth (central Wrocław). Scheibel (1773) provides information that wind direction was estimated based on the movement of the flag on the St Elizabeth's Church tower, meaning the tower was observable from the meteorological measurement location. Other details about the exposition and place of installation of instruments are not available. Meteorological observations were made three times a day (in the morning, midday and evening) or two times (morning and evening). The following variables were measured: atmospheric precipitation (in French inches with the delimitation of its category: rain or snow), wind (direction [8 directions] and force in a 7-degree scale), air temperature (in °F) and humidity (using hygrometer produced by prof. Johann Heinrich Lambert), atmospheric pressure (in French inches). Atmospheric phenomena and weather were described. The meteorological registers were published in the newspaper Oekonomische Nachrichten der Patriotischen Gesellschaft in Schlesien

PAGES 2025

7th OPEN SCIENCE MEETING

issued in Wrocław in the years 1773–81. In the years 1773–76, meteorological data were published in each weekly edition of the newspaper (usually seven days of observations ending on Thursday; the newspaper was issued on Saturday). From 1777 onwards, data were published for the entire month and in 3-month blocks in the last two years. Besides measurements, J. E. Scheibel also published in the same source 1–3 pages of weather description of each month or block of 2–3 months.

The air temperature in Wrocław in the period 1773-81 ranged from -22.8 °C (morning date, January 27, 1776) to 33.9°C (midday date, July 4, 1781). The average air temperature in particular measurement times (morning, midday, and evening) was 7.7 °C, 12.3 °C, and 8.8 °C, respectively. For all mentioned times of the day, similarly to today, the highest values were recorded in July and the lowest in January. The preliminary analysis of the values revealed that data from midday can be treated as the maximum observed value during the day. On the other hand, the morning observation seems to indicate the minimum value of the temperature for the day. Therefore, in further analyses, it is necessary to take into account the connection of morning hours with the sunrise times in Wrocław (i.e. from 4:36 in summer to 7:55 in winter).

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Keywords: Historical climatology, Air temperature, Poland

[A0343] -Poster

Wind and atmospheric pressure changes on Labrador's coast in the late 18th century

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This work investigates the wind and atmospheric conditions along the coast of Labrador in the late 18th century (1771–87), using instrumental meteorological observations made by Moravian missionaries. We will utilise records preserved in three major archival collections: the Moravian Archives in Herrnhut (Germany), the Moravian Archives at Muswell Hill, and the Archives of the Royal Society, the latter two located in London.

Sub-daily observations (twice, thrice, or even four times daily) of winds are available for two sites lying on the coast of Labrador: Nain (Oct 1771–Jul 1786) and Okak (Sep 1776–Jul 1786). Data from Nain for the period Oct 1771–Aug 1776 were disregarded due to low quality. On the other hand, atmospheric pressure data are available only for Nain for the period Oct 1771–Jul 1786, excluding the period Nov 1774–Aug 1775. The wind force assessed on the 7-degree scale (0-6) used by the Moravian Missionaries was converted to a range of Beaufort scale values; then, the mean value of wind of that range was utilised. Atmospheric pressure was measured using a barometer in Paris inches (27.07 mm), which were converted to hPa. The original values were only corrected for gravity and then reduced to sea level. Correction of pressure for temperature was not done, due to the lack of barometer temperature data. Thus, partially corrected values were used for analysis. The basic statistics of both atmospheric pressure and wind speed were calculated, e.g. daily, monthly, seasonal and annual means, and then, based on them, various characteristics were investigated (e.g., annual cycles, day-to-day changes, extremes). Additionally, the results of historical wind and air pressure data were compared with modern data (1991–2020).

Atmospheric pressure and wind speed in Nain, Labrador are influenced by a complex interplay of climatic factors and, in the case of wind, also local topography. According to seasonal (DJF, MAM, etc.) means, the atmospheric pressure was highest in spring (1013.0 hPa) and lowest in winter (1007.5 hPa). On 22nd September 1782, there was probably a change in the barometer, which may have introduced data inhomogeneity in the series. From this time until the end of observations (Jul 1786), the atmospheric pressure was lower on average by ca. 5hPa in comparison to the period Oct 1771–Aug 1782. For this reason, it is difficult to compare them with present values. On the other

PAGES 2025 7th OPEN SCIENCE MEETING

hand, comparison of some other characteristics is possible. In the period 1776–86, the mean annual wind speed in Nain and Okak was 4.8 ms⁻¹ and 3.0 m·s⁻¹, respectively. Throughout the year, monthly averages ranged from 3.1 m·s^{-1} in July at Nain and 1.6 m·s⁻¹ in May at Okak to 6.8 m·s⁻¹ and 4.1 m·s⁻¹ in January at Nain and Okak, respectively. In the years 1991–2020, the annual average wind speed at Nain was 5.3 m·s⁻¹, with monthly averages ranging from 3.6 ms⁻¹ in Jul–Aug to 6.8 ms⁻¹ in December.

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Keywords: Wind dynamics, Atmospheric pressure, Labrador coast, Historical climatology

【A0382】-Oral

Agrometeorological relationships and food security in Early Modern Sweden

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Early Modern agriculture in the Swedish realm encountered diverse weather- and climate-related hazards that varied regionally in their impacts. Recent research has shown how in northern Sweden, agricultural production was highly sensitive to cold, short growing seasons, whereas the southernmost regions relied on adequate summer precipitation, rendering them less affected by climatic fluctuations. This study explores these agrometeorological relationships, focusing on regional vulnerabilities and their broader societal consequences. For example, the study explores to what extent trade and the different regional agrometeorological dependencies in Sweden reduced social and economic impacts following climatic shocks, thereby increasing food security.

Drawing on an extensive array of historical records, e.g. farmers' diaries, tithes, official agricultural and demographic statistics, as well as phenological observations— documenting sowing and harvest dates, crop yields, livestock production, food prices, and demographic trends—alongside dendroclimatological reconstructions, and early meteorological observations, this research provides a detailed spatio-temporal analysis of climatic influences on agriculture and society in Early Modern Sweden.





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