

Air temperature and humidity conditions in the northern part of Nordaustlandet (Svalbard) at the end of World War II



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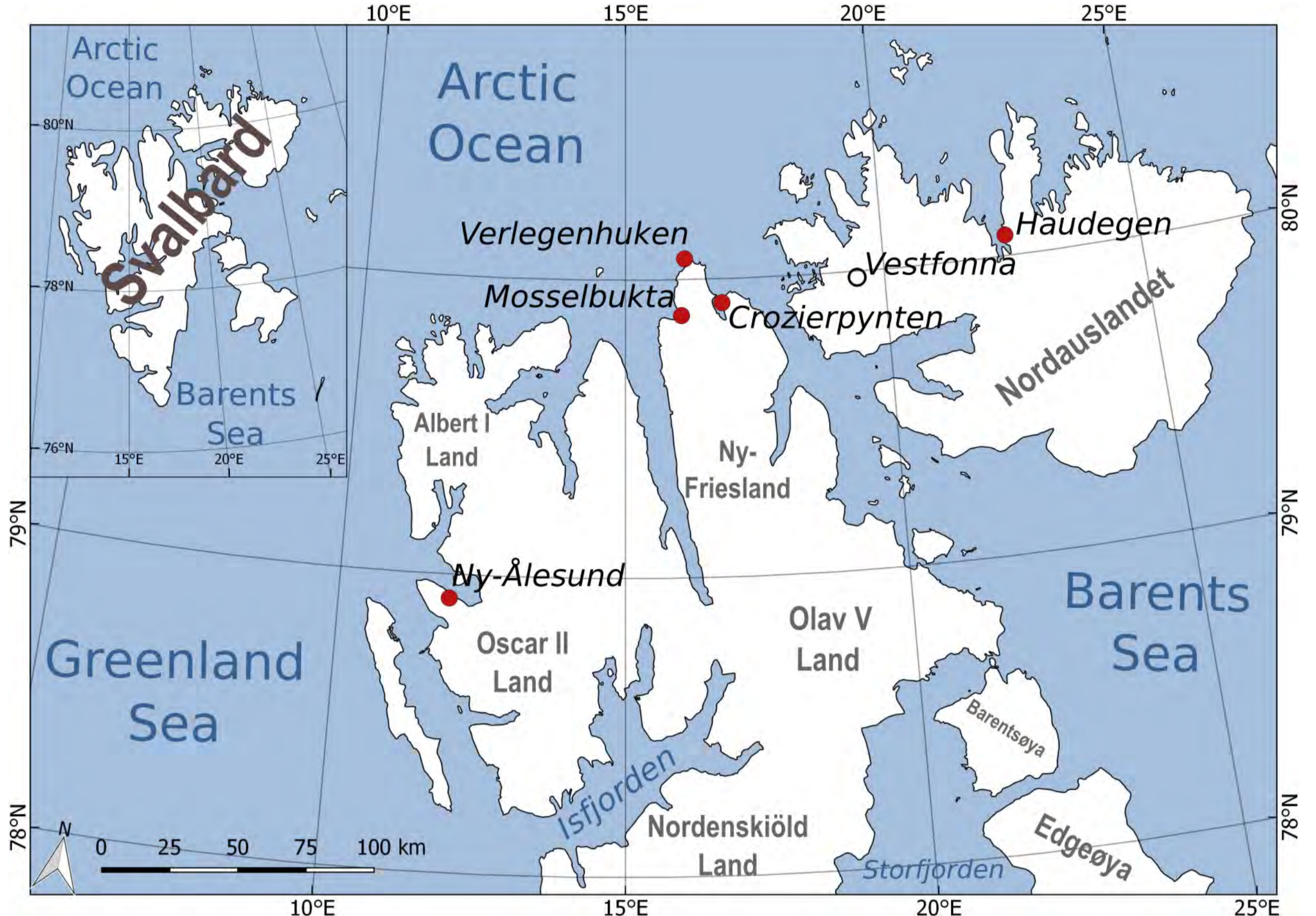
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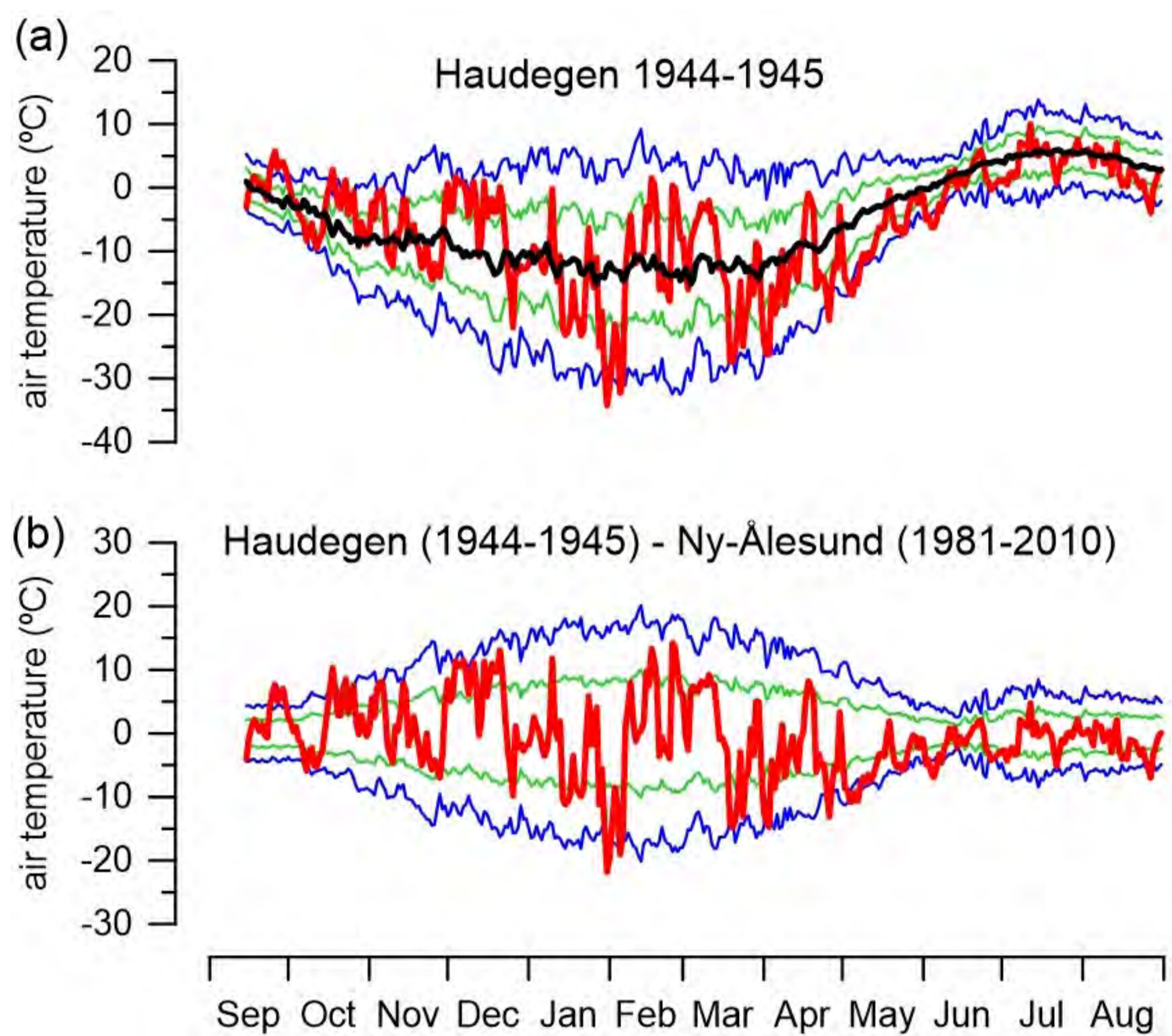
INTRODUCTION AND AREA

All Norwegian meteorological stations operating in Svalbard were destroyed during the World War II (WWII, 1941) by the German army and therefore there are considerable gaps in the data concerning that period. Later on, however, the German army decided to set up eight automatic and manned stations in Svalbard because weather information for this part of the Arctic was very important for military operations. All of them used to work about one year, and half of them operated in the final year of the war. Until now, however, no detailed statistics from those observations, except for monthly means calculated by the Norwegian Meteorological Institute for some stations, have been presented to the scientific community. The period of WWII was the warmest part of the Early Twentieth Century Warming period (1921-1950), mostly manifested in the Arctic, and in Greenland and Svalbard areas in particular. For the aforementioned reasons, any new information about weather and climate is very valuable. In this study, a detailed thermal-humidity characteristics of the northern part of Nordaustlandet (Wordiebukta located in the south-eastern part of Rijp fjord, $\varphi=80^{\circ}4'N$, $\lambda=22^{\circ}24'E$) is presented based on meteorological measurements made during the Haudegen expedition led by dr. Wilhelm Dege. Data were taken from 'Wissenschaftliche Beobachtungen auf dem Nordostland von Spitzbergen 1944-1945' published in Berichte des Deutschen Wetterdienstes, Nr.72.

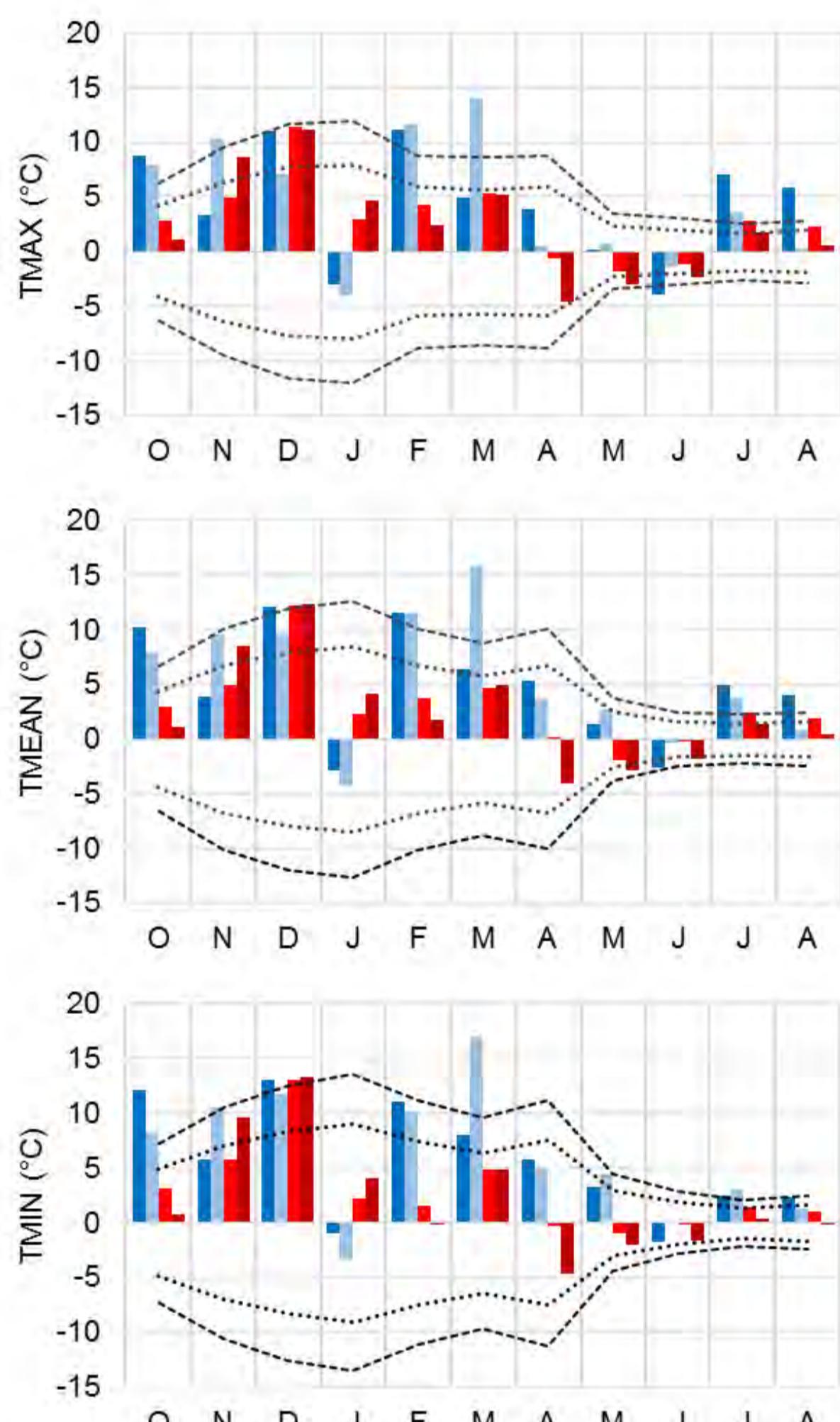


Location of land meteorological stations (red dots) in Northern Svalbard analysed in this study. Data from Vestfonna (blank circle) were used to introduce spatial correction between Haudegen and rest of the stations.

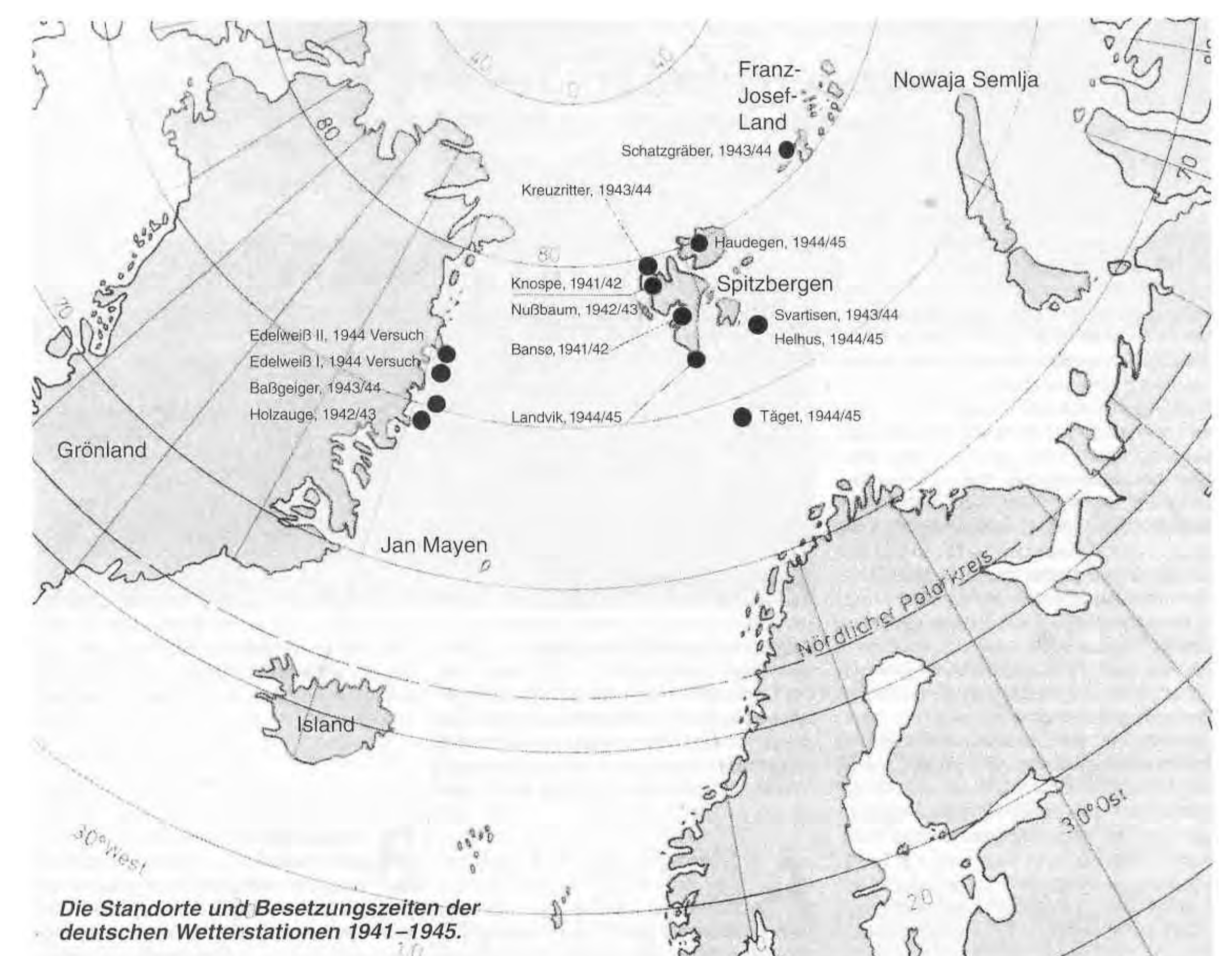
RESULTS



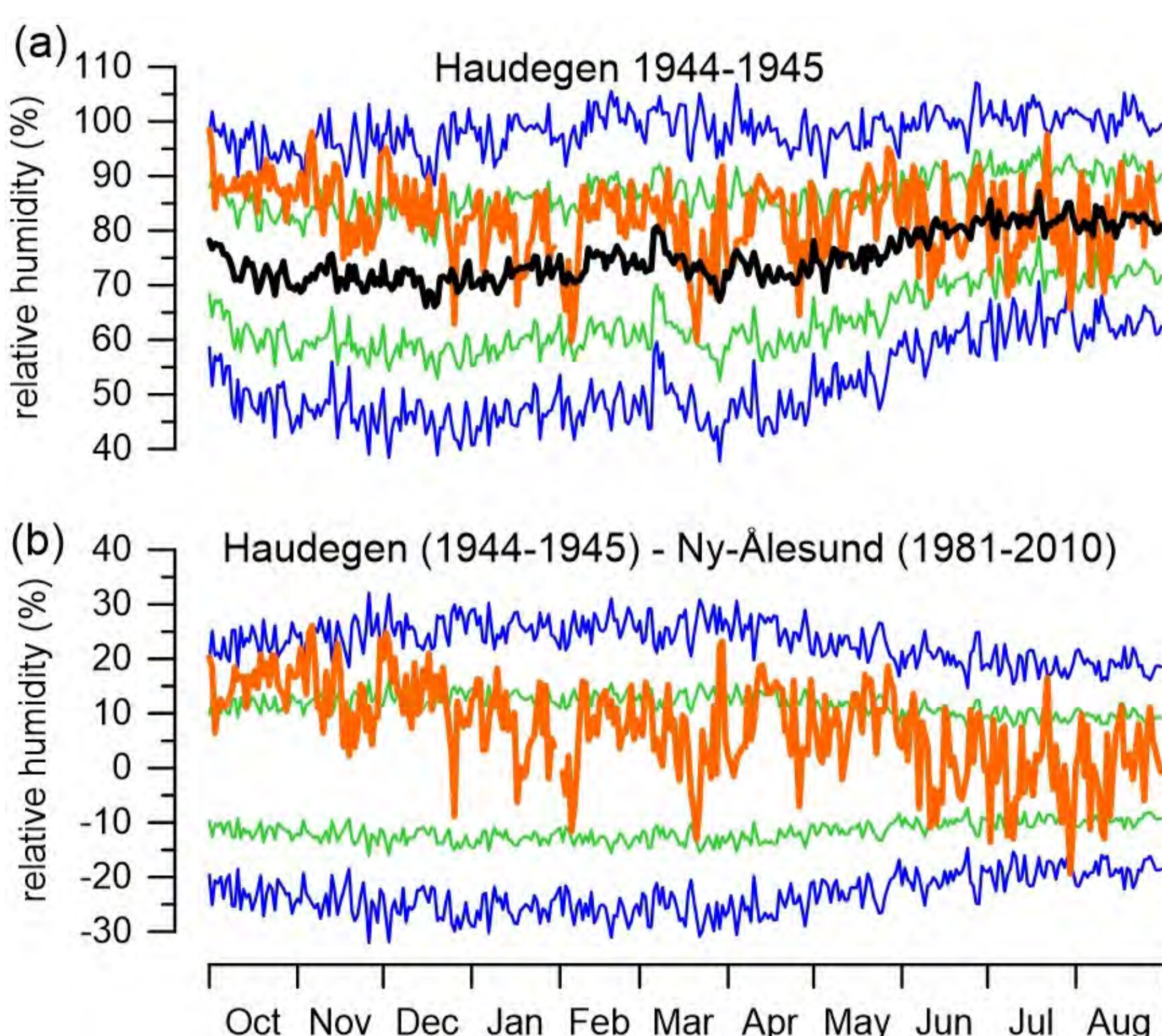
(a) Annual courses of mean daily air temperature in Haudegen (15 Sep 1944 - 31 Aug 1945, red) and Ny-Ålesund (multiyear 1981-2010 daily mean, black) and (b) their differences (red). Green and blue lines indicate $\pm 1SD$ and $\pm 2SD$, respectively. SDs have been calculated on the basis of present data (1981-2010) taken from Ny-Ålesund.



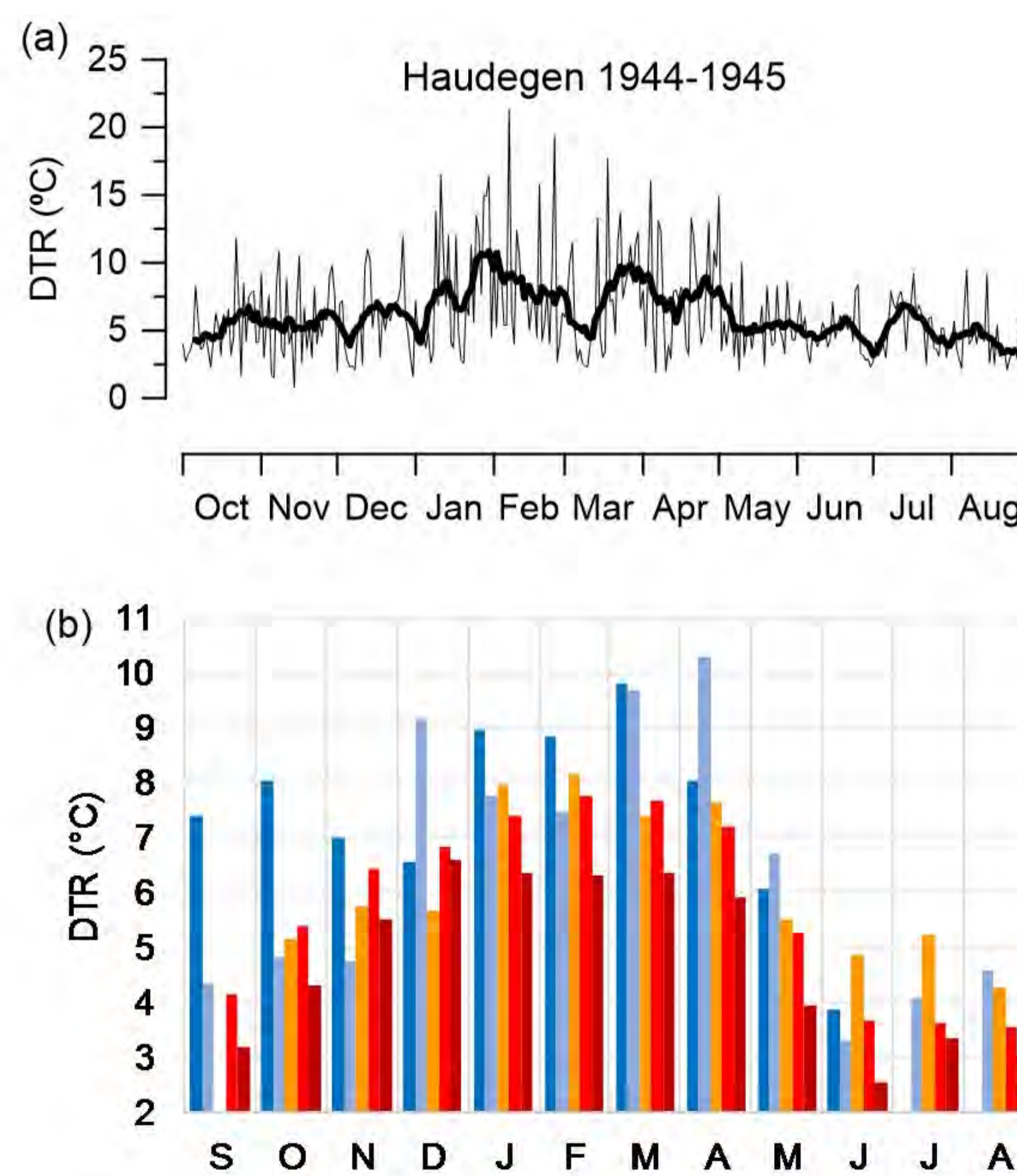
Annual courses of differences of monthly mean (TMEAN), maximum (TMAX), minimum (TMIN) air temperature between Haudegen 1944-1945 and Mosselbai 1872-1873 (dark blue), Crozierpynten 1899-1900 (light blue), Ny-Ålesund 1981-2010 (light red) and Verlegenhuken 2010-2011 (dark red). Dotted and dashed lines indicate $\pm 1SD$ and $\pm 2SD$, respectively. SDs have been calculated on the basis of present data (1981-2010) taken from Ny-Ålesund.



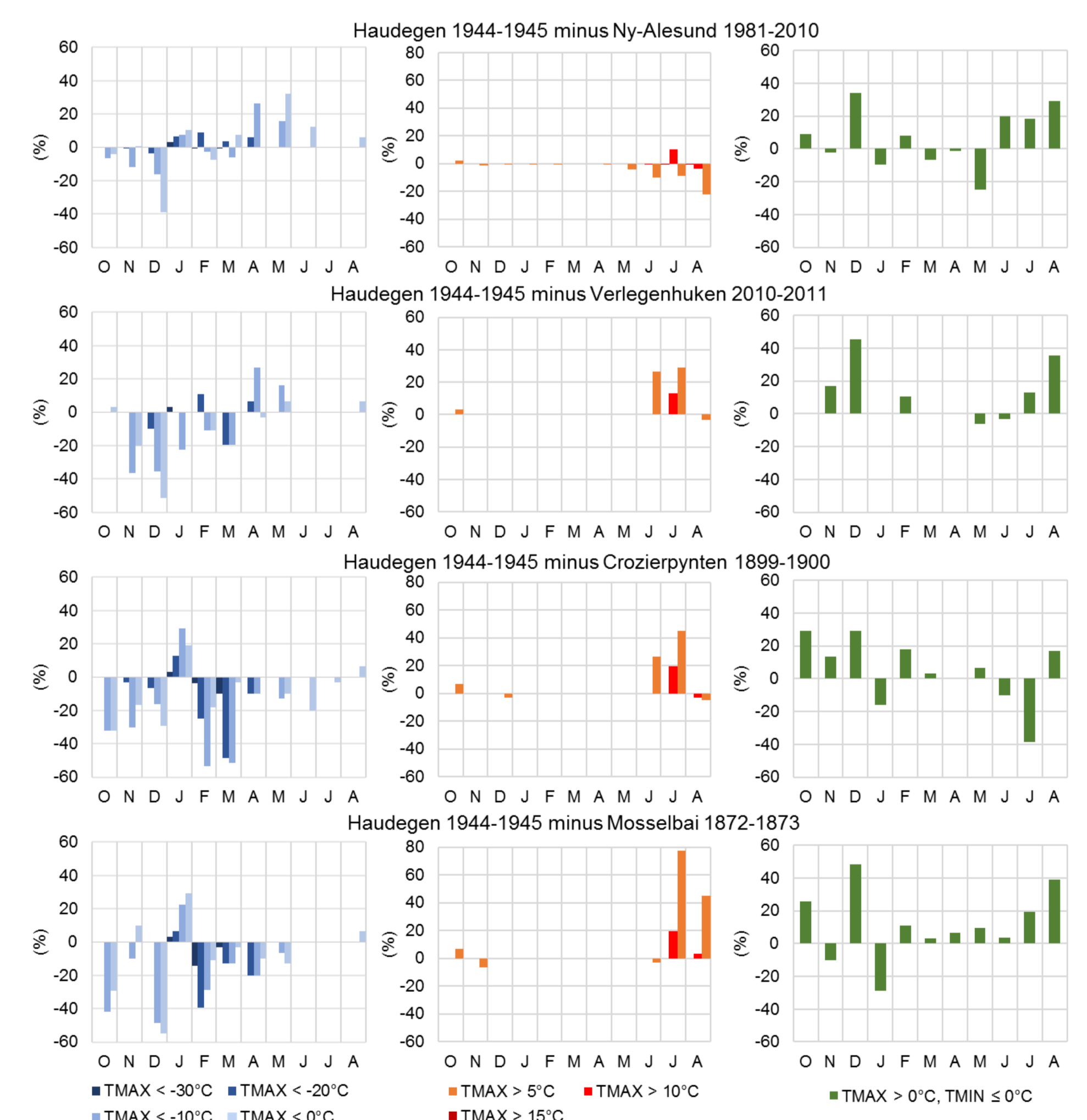
German weather stations in the Arctic during the WWII
Source: <https://www.landmarkscout.com/the-last-german-surrender/>



(a) Annual courses of mean daily relative humidity in Haudegen (15 Sep 1944 - 31 Aug 1945, orange) and Ny-Ålesund (multiyear 1981-2010 daily mean, black) and (b) their differences (orange). Green and blue lines indicate $\pm 1SD$ and $\pm 2SD$, respectively. SDs have been calculated on the basis of present data (1981-2010) taken from Ny-Ålesund.



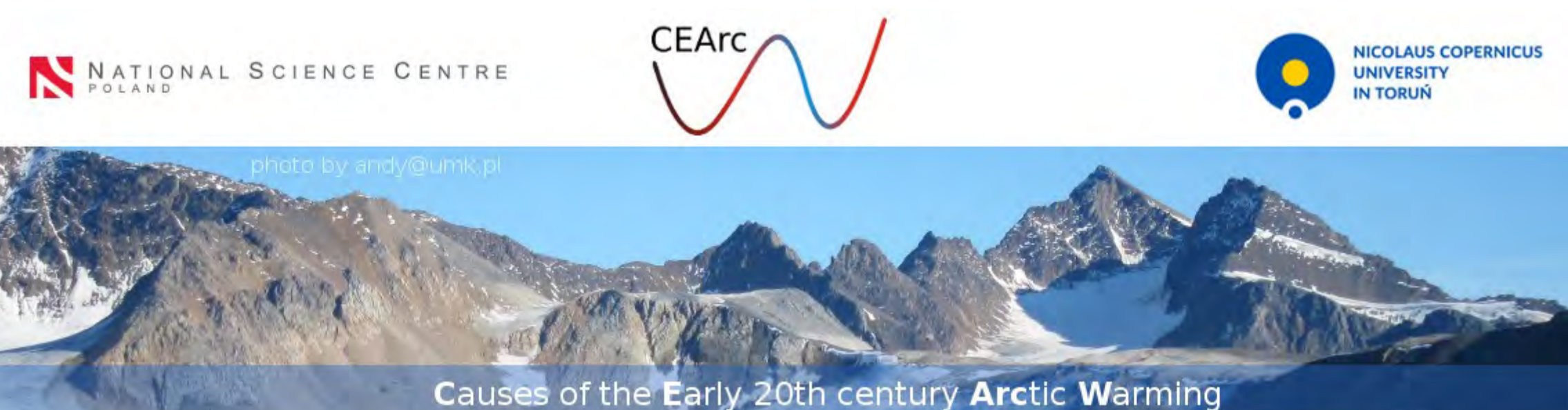
(a) Annual courses of diurnal range (DTR) in Haudegen 1944-1945 and (b) monthly means of DTR in Haudegen 1944-1945 and Mosselbai 1872-1873 (dark blue), Crozierpynten 1899-1900 (light blue), Haudegen 1944-1945 (orange), Ny-Ålesund 1981-2010 (light red) and Verlegenhuken 2010-2011 (dark red). Thick black line indicates 11-day moving average.



Annual courses of differences between the number of characteristic days (in %) in Northern Svalbard between the Early Twentieth Century Warming and present warming and the end of the Little Ice Age (LIA).

CONCLUSIONS

1. The northern part of Nordaustlandet in 1944/45 was markedly warmer than the end of the LIA in all seasons. Warmest was autumn (on average by ca $8^{\circ}C$) and least warm - summer (by $1.8^{\circ}C$). While temperature differences with respect to present warming were lower. Warmest was winter (on average by ca $6^{\circ}C$) and least warm - spring (by $0.2^{\circ}C$). The majority of mean monthly air temperatures in 1944/45 lie within two SDs from the modern 1981-2010 mean. This means that values of air in historical times lie within the range of contemporary temperature variability.
2. A decrease of the DTR between historical and present-time values has been noted in the northern Svalbard. Such a tendency occurred in most of the months.
3. In comparison to present-day conditions, mean monthly RH values in Haudegen (Oct 1944 to Aug 1945) were higher by 7.4%. The greatest differences mainly occurred from October to December (13.0-15.5%), whereas in the rest of months the positive differences were smaller (up to 9%). Only in July mean monthly RH difference was negative (-1.7%). The majority of mean daily RH in 1944/45 lie within two SDs from the modern 1981-2010 mean.



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