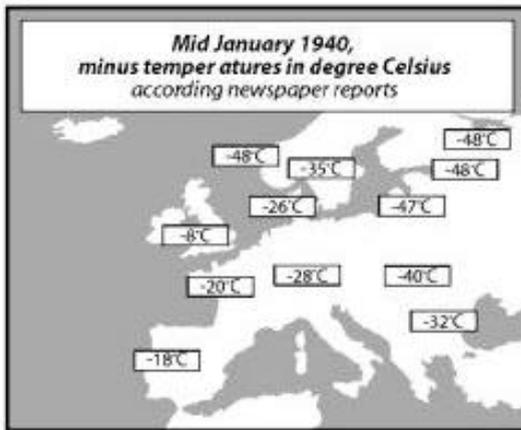


Four-month war brewed arctic winter War and Naval warfare

This investigation is not concerned with history but only with climate change. Describing military events which happened in Europe after September 1939 would require from any historical writer to distinguish between activities on land, in the air and on sea. In our presentation, these military aspects are of interest only as far as they relate to climate. As climate should be defined as ‘continuation of oceans by other means’, a distinction can be made straight and to the point. It is of interest what happened above and under the sea surface: activities such as ship propulsion, shelling, mining, bombing, torpedoing, depth charging, ship scuttling and sinking, ship fire and explosion, loss of cargo, oil, chemicals, bulk general cargo, etc. Each and every activity that resulted in ‘churning and turning’ of seawater could be of interest and importance in this study. If the ocean undergoes a change, a subsequent change of atmospheric conditions is inevitable.

However, the suddenness of changes during the initial war period is nevertheless surprising. After only 100 days at war, North Europe tumbled straight into severe Little Ice Age conditions that are comparable to those of more than 100 years ago. On the other hand, 65 years have passed and science has not yet taken up the issue of analysing these phenomena. It is a fact that many trained meteorologists were called to military service, that weather data was considered top secret because of its military impact and that Met Offices had little time at hand to do scientific work. But these can hardly serve as an excuse for not doing anything after the end of WWII. Not even a reasonable assessment of general weather conditions during the extraordinary winter of 1939/40 has been made. But this is a preliminary requirement before elaborating causation and effect. The first to be done is to draw a picture of what it meant for Europe to go back in the Little Ice Age.

General winter weather scenario



Even Northern Spain recorded a temperature of -18°C at the beginning of WW2. Severe winter period lasted from mid-December 1939 to March 1940. Cold centre was The Netherlands and North Germany, generated by arctic air from Siberian interior. Extreme conditions were felt in

Finland, Sweden, South of Norway, Denmark, Southwest of England, North of France, Hungary, Yugoslavia, Romania, Poland, Baltic countries and Western Russia. In the south of the line London-Budapest-Bucharest, weather was extremely cold and erratic for some days but mean value was not exceptional. In Switzerland, for example, winter was short and weather in February 1940 was close to normal. By mid-January, newspapers reported extraordinary temperatures as it follows: Finland and Baltic countries -48°C , South of Sweden -35°C , Denmark -26°C , Poland -40°C , Budapest -32°C , Paris -20°C .

Although weather remained cold until mid-February, a second cold wave gripped Northern Europe with temperatures of -25°C in Sweden, Denmark and Holland, -33°C in Budapest, and -47°C in the Baltic countries. Subzero temperatures lasted at Potsdam/Berlin until the 15th of April, with only about 20 days without freezing temperatures in-between.

Winter conditions in Northern European Countries

A brief assessment in respect of the most affected countries in Northern Europe will be listed and remarks given if deemed helpful in further discussion. The list will start with Great Britain that is always of particularly climatic interest due to its location between maritime and continental weather conditions. Germany, which reported a record winter in its northern and eastern areas, will be dealt with at the end of the next section.

Great Britain

In January 1940, England was plunged into cold: it was the coldest month since 1895. The South was particularly affected, probably the coldest month for 100 years, as the chronologist of the Royal Met Society (H.C. Gunton)¹ wrote a few months later. According to Kew Observatory, January 1940 was the coldest since 1791 and had the highest percentage of frost days. Also Greenwich figure was the lowest recorded during the past one hundred years, which was 0.5°C lower than the means for the long-remembered January 1881.

January 1940 is also remarkable for its high snow figures throughout many parts of the country and for a great Ice Storm from Kent to Exmoor and the Cotswolds, and from Sussex to Cambridgeshire and the north Midlands at the end of the month. Reports indicated: Icy Storm hits Britain; London has Heavy Snow, Heavy snow paralyses Britain; Transportation is badly affected (NYT, the 29th of January 1940). Cold broke a forty-six-year record. There were three inches of snow in the centre of London (NYT, the 30th of January 1940). In the close vicinity of London, the river Thames had frozen for the first time since 1814 (Neue Zürcher Zeitung, the 29th of January 1940). These conditions show that continental and maritime air fought their own battle for supremacy. In Britain, maritime site gained back

¹ Gunton, H.C. (1939/40): 'Report on the Phenological Observations in British Isles from Dec. 1939, to Nov. 1940', in: Quarterly Journal of Royal Met. Soc. 1941, p.670.

control a few days later. February 1940 was without extreme temperatures. Only the melting of the remains from the Ice storm caused widespread flooding.

Notice: The facts stated in the previous two paragraphs give a strong indication that Southern North Sea has been cooled down too much and too early due to enormous naval activities since September 1939, a principal factor for the emergence of arctic winter in Northern Europe and a key subject in the following chapters.

The Netherlands

It was the same with the Netherlands: the coldest winter since 1830 (NYT, the 20th of February 1940). Some further reports say:

The 6th of January 1940: Drift ice in the East Scheldt. Ameland temporarily cut off from the mainland by ice. River Maas is frozen over from Woudrichem to Heusden².

The 12th of January 1940; Amsterdam: Floating ice is halting traffic on the rivers Rhine, Maas and Yssel. The ports of Amsterdam and Rotterdam are being kept open with considerable difficulty. The cold increases the losses already caused by war conditions. For instance, the number of ships calling at Rotterdam has dropped from 1,300 per month, before the war, to 380 now. (NYT, the 13th of January 1940)

The 14th of January 1940: At least two ships were crushed in ice packs on the Rhine and Ijsselmeer Rivers and thirty others were damaged severely. (NYT, the 14th of February 1940)

The 21st of January 1940: Heavy ice drift reported on the west Scheldt.

The 13th of February 1940; Amsterdam: Hundreds of persons abandoned their homes in the face of crushing ice packs boiling up

2 Frankcom, C.E.N.: 'Ice conditions in the Baltic and Danube Areas December 1st 1939 to January 23rd 1940', in: The Meteorological Magazine, Vol.75, February 1940, pp. 1-8.

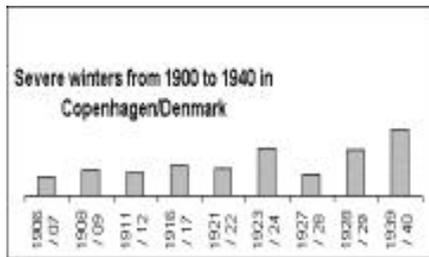
from ice-locked canals, rivers and seas. Europe suffered tonight in the paralysing grip of the bitterest cold in more than 100 years. Weather Bureaus in Amsterdam recorded the lowest temperature ever recorded in this country: 11.2 degrees below zero Fahrenheit (-24°C). For the Netherlands, which has a rather mild climate, this is more severe than the lowest temperatures recorded in Minnesota. The average for the whole country was 1.4 Fahrenheit degrees above zero (-17°C). Water transportation in the Netherlands has been completely paralysed. Canals have been covered with thick ice for more than six weeks, while traffic on the Rhine and Waal stopped on the 11th of January. (NYT, the 14th of February 1940)

Notice: The cold came early and was severe. It prolonged for two full months. Every aspect points out to the impact that naval activities had on North and Baltic Sea conditions.

Denmark

“It is Denmark’s worst winter since 1860”. (NYT, the 15th of February 1940) What else was reported? A few examples:

The 28th of December 1939: Snow storms sweep Denmark (Frankfurter Zeitung, the 29th of December 1939)



The 3rd of January 1940: Heavy snowstorms reported again from Denmark and traffic at Jutland is affected. (Neue Zürcher Zeitung, the 3rd of January 1940).

The 17th of January 1940: In Copenhagen, 14.8 degrees below zero Fahrenheit (-26°C) was registered early today; there was no sign that the cold wave would abate soon. Heavy snowstorms accompanied the cold, and traffic in many parts of Denmark was impeded or brought to a standstill. (NYT, the 18th of January 1940)

The 13th of February 1940: At Copenhagen temperature dropped to 13 degrees below zero Fahrenheit (-25°C). (NYT, the 14th of February 1940)

Sweden

On the 21st of February 1940, the New York Times (NYT) reported: “In Sweden all cold records were broken in the last twenty-four hours, the coldest since 1805”. On the basis of data of four months, i.e. December 1939–March 1940, the winter of 1939/40 ranked the 9th on the list of the coldest winters after 1757, trailing behind the winters of 1880/81 (rank 6), 1837/38 (rank 5) and 1808/09 (rank 2). On the basis of data for three months, the winter is ranked the 10th, outranking the winter of 1892/93 (rank 9)³.

Finland

High in the North, the winter situation 1939/40 was special due to the war that Russia started against Finland on the 30th of November 1939 and it requires a detailed assessment in one of the subsequent chapters. Below, there are only a few cases of relevant weather information from December 1939:

The 1st of December 1939: “Bombs dropped on Helsinki, civilians were hastily leaving in mist and rain in the northern winter”. (NYT, ‘The Week in Review’, the 3rd of December 1939)

The 2nd of December 1939: “Snow began falling on Helsinki where relief workers sought to extinguish fires and to clear away rubbles before Russian bombers returned again with a rain of death”. (NYT, ‘The Week in Review’, the 3rd of December 1939)

The 10th of December 1939: “Violent fighting in knee-deep snow on Finland’s eastern frontiers, at the Arctic Circle was reported today”. “Hostilities in the northern sector were said to be proceeding in

3 Liljequist, Gösta H. (Severity): ‘The severity of the winters at Stockholm 1757 – 1942’, in: *Geografiska Annaler* 1-2, 1943, p. 81-104; and as an extended paper in: *Meddelanden, Serien Uppsatser*, Stockholm 1943, pp.1-24.

weather 4 degrees below zero Fahrenheit (-20° C)". "In addition to the Red Army troops killed in battle, many others were reported to be dying of cold and exposure after being isolated from their supply trains and bases in the snow-piled wastes". (NYT, the 11th of December 1939)

The 24th of December 1939 - Report by James Aldridge (extract from NYT, the 25th of December 1939): "The cold numbs the brain in this Arctic hell, snow sweeps over the darkened wastes, the winds howl and the temperature is 30 degrees below zero Fahrenheit (-34.4°C). Here the Russians and Finns are battling in blinding snowstorms for possession of ice-covered forests. ...I reached the spot just after the battle ended. It was the most horrible sight I had ever seen. As if the men had been suddenly turned to wax, there were two or three thousand Russians and a few Finns, all frozen in fighting attitudes. Some were locked together, their bayonets within each other's bodies; some were frozen in half-standing positions; some were crouching with their arms crooked, holding the hand grenades they were throwing; some were lying with their rifles shouldered, their legs apart... Their fear was registered on the frozen faces. Their bodies were like statues of men throwing all their muscles and strength into some work, but their faces recorded something between bewilderment and horror." (NYT, the 25th of December 1939)

The 28th of December 1939: "Russian forces in winter cold, 30 degrees below zero Fahrenheit, and amid blinding storm... (in) the bitterest weather conditions of any war ever fought". (NYT, the 29th of December 1939)

The 29th of December 1939; Petsamo Front: heavy snowstorms are continuing. (Neue Zürcher Zeitung, the 29th of December 1939)

The 30th of December 1939: According to reports from Kirkeness, in North Norway mighty snowstorms blew over North Finland. Horrible cold prevailed in the Finnish north front area. Temperatures have fallen to 40°C below zero, a cold of such magnitude is seldom seen in

this area in December. Weather experts consider larger military actions impossible. (Hamburger Anzeiger, the 30th/31th of December 1939)

The 31st of December 1939: According to a review of the first war month, the Russians attack on seven fronts with 700,000 men. Russian losses are estimated at 35,000 killed, 100,000 wounded, 332 tanks destroyed or captured. (NYT, the 31st of December 1939)

Baltic Countries

A full assessment of weather conditions during WWII still needs to be written. Conditions during winter 1939/40 must have been 'killing' as some reports imply:

The 24-27th of December 1939: In the Eastern parts of the Baltic countries (Russian West border) temperatures fell to -17°C from the 24th to 25th, and below 20°C one day later, extending to the Baltic coast, with -14°C in Klaipeda and -17°C in Gdynia (Bight) on 27th of December⁴.

The 13th of January 1940: Bitterest cold wave for years, which sent temperatures in the Baltic countries down to as low as 40 degrees below zero Fahrenheit, ended abruptly today. The mercury rose rapidly to a few degrees below zero. Parts of the Baltic Sea have frozen over and floating and pack ice are likely to interfere with shipping for some time. (NYT, the 14th of January 1940)

The 13th of February 1940: In Estonia, Latvia and Lithuania, more than 10,000 persons suffered from severe frostbite. At least five persons froze to death in the three Baltic countries, where temperatures reached 54 degrees below zero Fahrenheit (-47.7°C) for the first time in 160 years. Baltic Sea was frozen over. (NYT, the 14th of February 1940)

4 German daily weather charts of 'Seewarte'.

Central Europe (e.g. Hungary, Rumania)



Weather was erratic, very cold, very snowy, and possibly the coldest for fifty or more years, but not the coldest for a century or record breaking. However, some reports demonstrate the severity of this winter.

The 22nd of December 1939: A very severe snowstorm brought shipping in the Black Sea and the lower Danube river to a standstill. On the coast, temperatures dropped to 15°C below zero. Snow also fell all over Bulgaria on the 21st-22nd of

December, starting a new cold weather episode (down to -16°C): -20°C in Northern Bulgaria.

The 29th of December 1939: Ice closes Danube to German supplies; rail traffic expected to be hampered by snow. “Cold winds have been recently blowing at the west of Russia. Constantly low temperature in the river valley indicates that a general freeze will set in soon”. (NYT, the 30th of December 1939)

The 10th of January 1940: Cold weather, worst in Hungary since 1929, is expected to break all previous records. The Danube is a solid sheet of ice. (NYT, the 11th of January 1940)

The 11th of January 1940: In Rumania, temperatures are of 40 degrees below zero Fahrenheit (-40°C); Bulgaria was reported to be suffering under the worst cold in the memory of living persons (NYT, the 12th

of January 1940). Riga -41°C ; Budapest -26°C , Vienna -25°C , Sofia -22°C (Neue Zürcher Zeitung, the 11st of January 1940).

The 17th of January 1940: Cold Paralyzes Northern Europe. The unexpected swiftness with which temperatures fell was featured in almost all weather reports. After a comparatively warm weather during the weekend, the temperatures began suddenly to drop towards the bottom of the thermometers. A typical report from Riga said that the temperature was at freezing point on Monday morning (the 15th of January) and at 22 degrees below zero Fahrenheit yesterday morning. Then it tumbled to 47.2 degrees below zero – a drop of 79.2 degrees in about thirty-six hours (NYT, the 18th of January 1940).

The 22nd of January 1940: Severe snowstorms swept Europe from the Adriatic Sea to Scandinavia (NYT, 23 January 1940).

The 13th of February 1940: Europe suffered tonight... in the cold wave which extended from the Arctic fringes of Norway and Finland... the Baltic countries to the Netherlands and Hungary. (NYT, the 14th of February 1940)

The 15th of February 1940: All cold records in Europe were broken last month and just when it was hoped the worst was over, another cold wave has bound the whole continent. (NYT, the 15th of February 1940)

The 15th of February 1940: Budapest suffered today from the bitterest cold in sixty years, 28 degrees below zero Fahrenheit (-33°C). (NYT, the 16th of February 1940)

War winter 1939/40 in Germany

Most of the naval activities of the initial war months occurred in the proximity of Northern Germany's coast, in the North and Baltic Sea. The location of Germany in Europe is of great importance in tracing the reasons for an extreme winter after only four-month warfare. That

is why no other country had to look so far back in its historical weather recordings to find comparable winters, with the same coldness magnitude. Vast parts of Germany experienced the coldest winter in more than 100 years. In the early 1800s, the Little Ice Age had reached its heights and, suddenly, Northern Europe was back in an Epoch of Cold.

The centre of cold stretched from Amsterdam, via Bremen, Hamburg, Berlin, to Königsberg (Kaliningrad). Naval activities were the most intense in the Helgoland Bight and Southern Baltic Sea, starting with a ten days battle from sea to shore in the Gdansk area (in early September) and with the laying of many dozens of mine fields along the German coast. A detailed picture will be provided later.

Hamburg, a port city on the river Elbe and close to North and Baltic Sea, experienced record conditions despite its usually maritime weather conditions, with winter temperature averages just above zero degrees Celsius. Instead, for almost two months, from the 1st of January to about the 20th of February, average temperature was below -12°C. The Elbe was heavily iced. With a big headline newspaper, “Hamburger Anzeiger” had claimed on the 23/24th of December 1939: “The Elbe will never be frozen over, since 1874/75 icebreaker would keep the shipping fairway open”. Only a short time later, nature creates extreme problems to the German navy: heavily frozen seas and rivers. Many naval vessels could not be moved for a considerable period of time.

For Berlin and Halle it was the coldest winter in 110 years. The assessment is based on the ‘summary of the daily mean data from November 1939 to March 1940’. For Berlin (correspondingly for Halle), the data noted for 1829/30 is the ‘cold sum’ figure -791°C, for the winter 1939/40 the figure -736°C⁵. These data are confirmed by other researches as well. The coldest months of January in Berlin since

5 Stellmacher, R. and Tiesel R.: ‘Über die Strenge der mitteleuropäischen Winter der letzten 220 Jahre – eine statistische Untersuchung’, Z. Meteorol.39 (1989) 1, p.56-59.

recording has started, in 1719, are: 1823, 1838 and 1940. With regard to the winter of 1928/29, February (-10.4°C) was colder than February 1940 (-7°C), but as January 1929 is not among the 20 coldest winter months, the winter 1939/40 ranks higher on the list of cold winters. For Dresden, about 150 km south of Berlin and close to Halle, the winter of 1939/40 (December-February) was also the coldest in 110 year, surpassed only by the winter of 1829/30.

At the most eastern end of the southern region of the Baltic Sea, former Königsberg (later Kaliningrad), with long-term winter average of -2°C, had to cope with following mean temperatures:

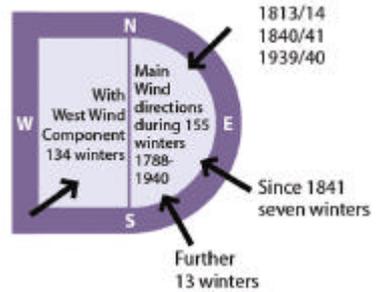
	Medium	Maxi-mal	Minimal	Deviation from means	Lowest
January	-10,7°C	-7,2°C	-14,4°C	-8,0°C	(14.Jan.) – 25,4°C
February	-11,4°C	-7,9°C	-15,8°C	-9,0°C	(24.Feb.) – 25,8°C
March	-2,2°C	0,7°C	-5,4°C	-2,8°C	(13.Mar.) – 15,1°C

Summary

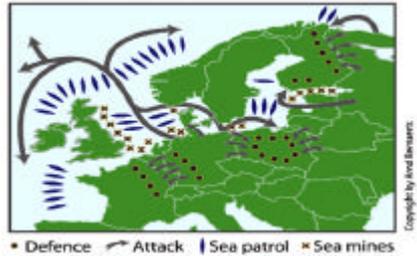
The evidence of extraordinary winter conditions is overwhelming. It is further possible to clearly demonstrate that the whole Northern Europe, from Riga to Budapest and London, fell prey to arctic conditions. Cities like Amsterdam, Hamburg, Berlin and Dresden registered record cold never experienced in more than a century. While the impact and appearance of winter 1939/40 is now presented, the next move is to establish how this could happen. After all, global and regional weather is based on physics. Nothing happens without a cause.



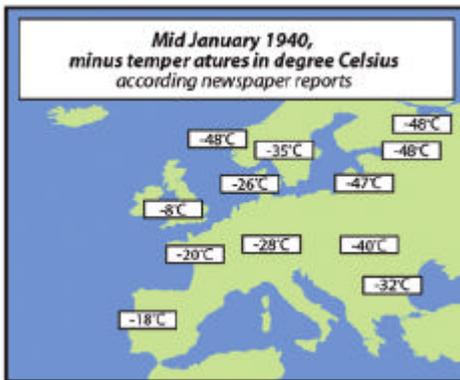
200% to 300% rain above average during October & November 1939



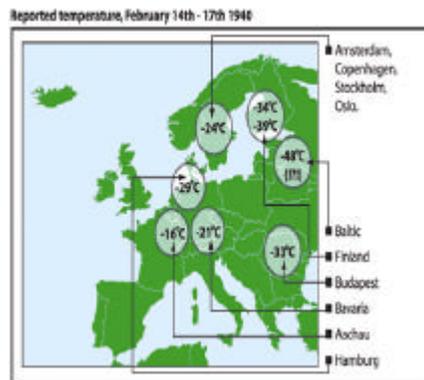
In 155 winters the wind came only three times from NE quadrant including Winter 1939/40



Huge war-machineries were put in action in autumn 1939 which caused an arctic winter to come



The first extreme cold wave winter 1939/40, Mid January 1940



Second extreme cold wave in February 1940