I. Warming before Cooling – The trace to the First World War

a. A WWI ended with a Climatic Jump

Last but not least, global warming that succeeded global cooling by two decades. It was the second big climatic shift during the last century, respectively since the end of the last Little Ice Age, which ended about 160 years ago. Actually warming affected mainly the Northern Hemisphere, and was in fact was a warming in the Arctic, primarily located in the North Atlantic sector of the Arctic. Here it commenced in winter 1918/19[1], sending warmth southward. In the United States it lasted until about 1933, in Europe until winter 1939/40. Precision in location and timing matter highly in this case, as this may be the key to name the actual causes. The more precisely a shift from a warm to a cold period are, and the region where it occurred is identified, the more it might be possible to identify the cause. Timing and location leave few options, but to regard the naval war in Europe from August 1914 to November 1918 as the most promising event that gave the kick off to, or contributed to the unprecedented warming trend from 1919 to 1939.

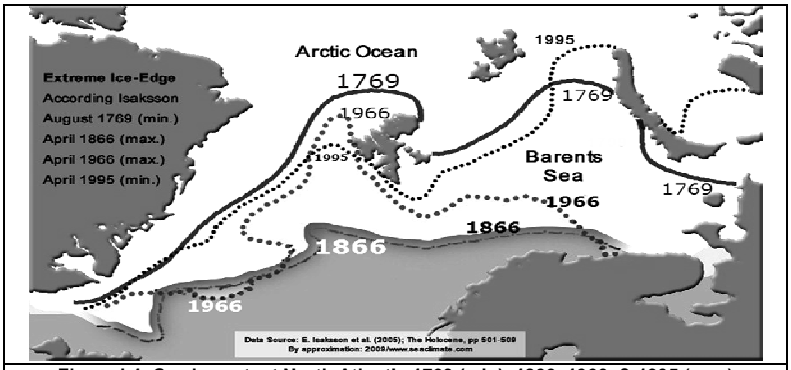


Figure I-1; Sea ice extent North Atlantic 1769 (min), 1866, 1966 & 1995 (max)

As timing and location of the commencement of an Early Arctic warming (EAW) is still not a settled issue in science, the matter was thoroughly investigated in a recent book: "Arctic Heats Up, Spitsbergen 1919-1939" (see p. 221). For this reason the following discussion with regard to timing, location, and the link to naval war in Europe presents a general overview. However the emphasis is on the interconnection between the naval war and the result in temperature increase in the Spitsbergen /Fram Strait region.

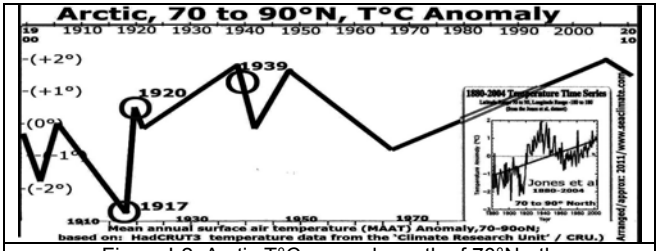


Figure I-2; Arctic T°C anomaly north of 70°North

aa. Overview – Season

A substantial point in the EAW matter is a more pronounced warming of the Northern Hemisphere and primarily during the winter season. That is exactly what the warming period in

[1] This time period is not generally acknowledged, as many authors identify it as period of the 1920s and 1930s (i.e. *Drinkwater*, 2006; *Bengtsson*, 2004, *Johannessen*, 2004), and the IPCC Report 2007 mention the time from 1925 to 1945; details see: "Arctic Heats Up", Chapter 2, p. 16f.

the early 20th Century is primarily all about. While the summer temperatures increased only modestly, the winters generated steep warming as observed at Spitsbergen (Figure below, I-3), which is also well reflected in the annual data set for latitude north of 70°N (Fig. I-2). The decade from 1921 to 1930 showed remarkable winter warming (Fig. G3-1, p. 173), which lasted until 1940. This fact is a paramount aspect to identify the reason for this significant shift during the winter period. The influence of the sun is remote north of 50°N (i.e. London, Vancouver), but any warming must have been coming from somewhere else.

bb. Time and Region

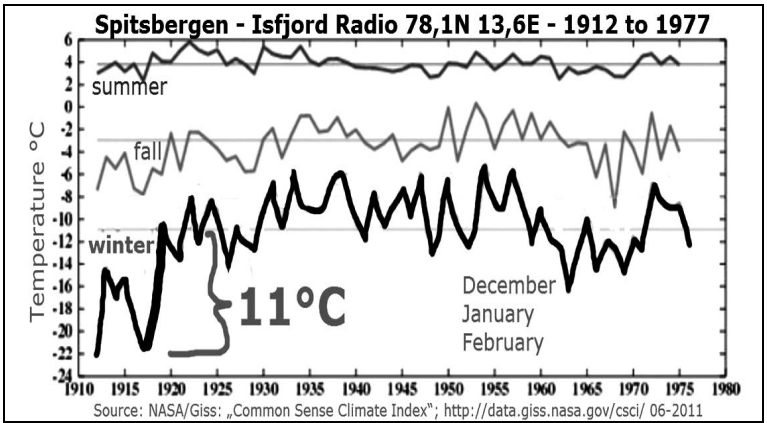


Fig. I-3 Spitsbergen T°C during the season, 1910-1975

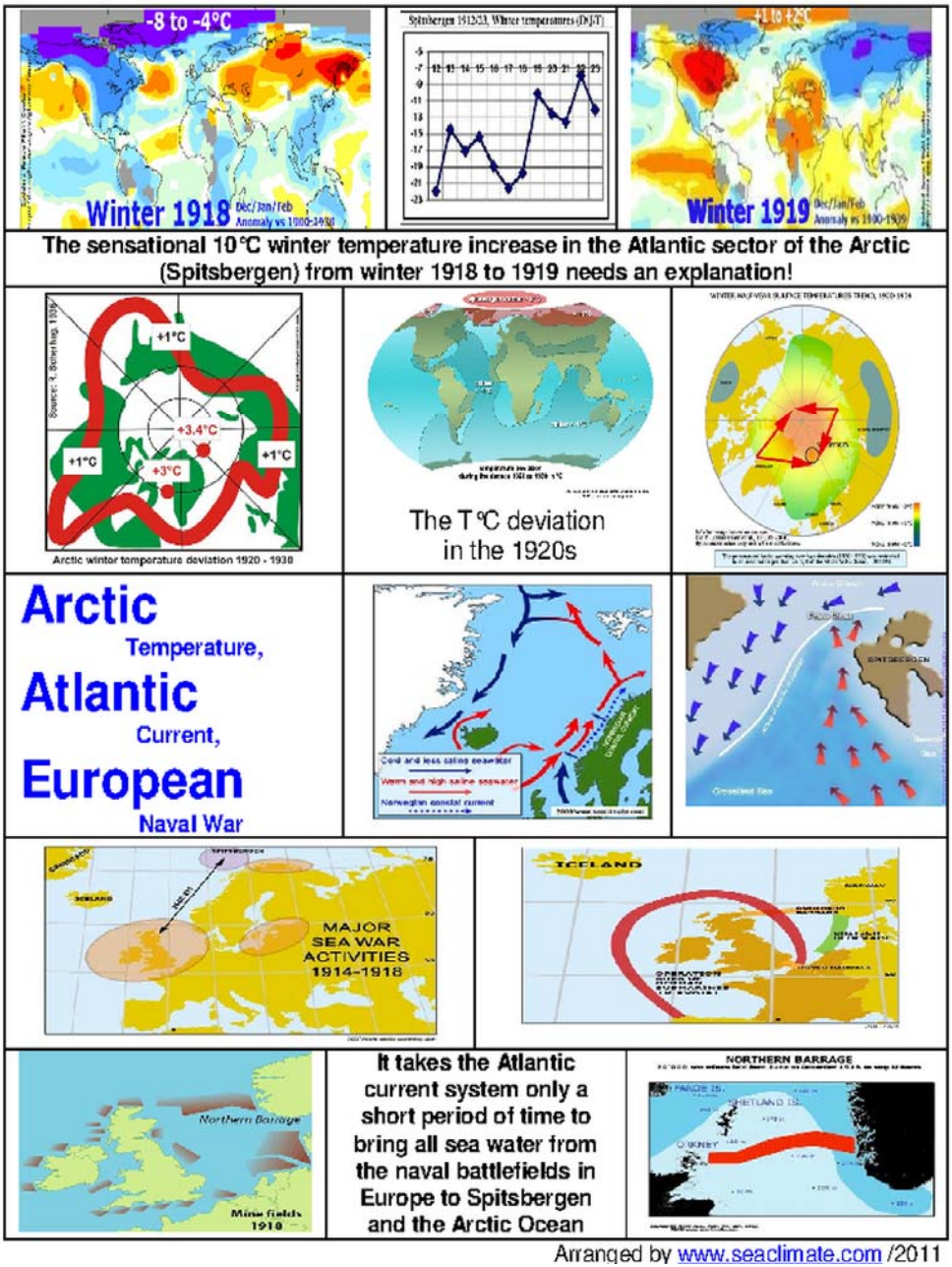
The upper two rows in TM14, (next page) give a clear indication that the previous warming period in the 1920s and 1930s was located primarily in the North Atlantic section of the Arctic Ocean. Graphics demonstrate equally that the temperature rise commenced before 1920, probably in 1918. This date (1918) should be regarded as the time when the Arctic suddenly moved into a strong warming period. Actually warming started in the Spitsbergen region, and was only subsequently observed beyond this station. With some generalisation there had been a modest temperature increase before 1910 (Fig. I-2), followed by a significant decrease from 1910 to 1917. At Spitsbergen the shift between winter 1912 and 1918 and winter 1919/23 is about 8°C, for the whole Arctic region the increase between the decades before and after 1919 is about 2°C.

cc. Causes

Cause I: West Spitsbergen Current

Having established the time and region of the sudden temperature shift close to Spitsbergen and narrowing it down to the winter of 1918/19, it is high time to ask, what caused and sustained the warming for two decades. The Arctic Ocean winter weather is dominated by a sunless period for more than 6 months, full sea ice cover, extreme cold, low humidity, low cloudiness, and anticyclones. Neither sun spots, nor carbon dioxide, nor water vapor can be considered as a significant direct contributor to generate such a sudden remarkable shift and keep it sustained for over two decades. As there is no indication that this warming was generated elsewhere, and subsequently moved to the polar region, it must have been a local source, namely warm high saline Atlantic water carried by the West Spitsbergen Current to the Arctic Ocean, TM14, center row. Whether this change was due to an increase of the water masses, or due to a change in the structure of various sea layers over a considerable depth around the gate to the Arctic Ocean, the Fram Strait, is not known. It seems that the latter is the more likely reason.

(More details in "Arctic Heats Up – Spitsbergen 1919-1939" - Chapter 7, see: p 221)



Temperature map 14 (TM14), Figure I-4; online: www.seaclimate.com.

At least the news magazine TIMES seems to have known what it was all about when it reported in 1947:

> *"Norwegian and Russian scientists believe that the Gulf Stream, Europe's warm-water heating system, is flowing faster and farther into the north, tempering the climate, driving back the pack ice. In 1909, the Spitsbergen coalfields had an annual shipping period of only 95 mid-season days. In 1946, the last ship got safely away on Dec. 6. (TIME, June16, 1947)*

The Times names *Dr. Ahlmann* as the source of information saying that he has been collecting evidence from a variety of sources: temperature records, glaciers, trees, fish, and cites him claiming that: *"In the Scandinavian countries, the winters have been getting milder since the 19th Century, and that he "hopes the warm cycle will last for at least a few centuries."*

Read all: http://www.time.com/time/magazine/article/0,9171,855780,00.html#ixzz1Q2CnocEq

It lasted only two decades. For example *Vinther et al* regard the year 1941 as the warmest in Greenland, while the 1930s and 1940s shall have been the warmest decades. North of Greenland the warming ended earlier, actually soon after WWII commenced.

Fig. I-5, I-6, I-7, & I-8; Extreme sea ice conditions in summer 1917. Naval war related?

Cause II: A shift through sea ice cover in 1917?

Little is known about an extraordinary North Atlantic sea ice season in 1917. To my knowledge, such a long and extensive sea ice cover occurred only once throughout the 20th Century. Usually there remains a sea ice-free tongue off the shores of Spitsbergen (Fig. I-5)[2]. Against all rules, tis tongue disappeared in April 1917 (Fig. I-6) the sea ice extended far South (Fig. I-7), remained very high throughout June, and only retreated in July 1917 (Fig. I-8). About the consequences one can only speculate, but it was certainly not without any reason.

Throughout its long freezing process the ice-covered sea surface layers must release salt, which makes the sea water heavy, and thus increases the vertical water exchange with deeper levels. During the subsequent melting process through July 1917 the sea surface would have received a huge amount of fresh water; this stays at the surface level, until salinity and/or water temperatures are back to normal. This highly unusual event in the Northern part of the North Atlantic from April to July 1917 could well have contributed to a shift in the ocean structure between Spitsbergen and the Fram Strait, which subsequently caused warming of the Northern Hemisphere from winter 1918/19 to 1940.

Cause III: The change in the northern NA ocean structure.

This is the point which calls for raising the naval war issue. Which kind of force changed the ocean structure in the high North to allow more heat to be released during the winter

[2] Figutre I-5 to I-8 are based on data from: http://polar.ncep.noaa.gov/seaice/climatology/months.shtml;

season? As there was nothing in "the air" (for example a volcanic eruption, a major earthquake, a tsunami, a meteorite plunging on land or into the sea), it seems necessary to recall what happened in Europe from 1914 to November 1918. Over four years a devastating battle on land, in the air and at sea took place. Huge naval forces battled in the waters east and west of Great Britain. It is my point of view that this may have changed the sea structure with respect to heat and salinity over many meters depth. All this water moved north with the Norwegian Current, and the West Spitsbergen Current, to enter the Arctic Ocean after a time period of several weeks or months (Fig. I-16, p. 199). This could have influenced the exceptional sea ice conditions during summer 1917, or even may alone have contributed, via a change in the ocean structure between Spitsbergen and Greenland, toa climatic shift in the high north in winter 1918/19.

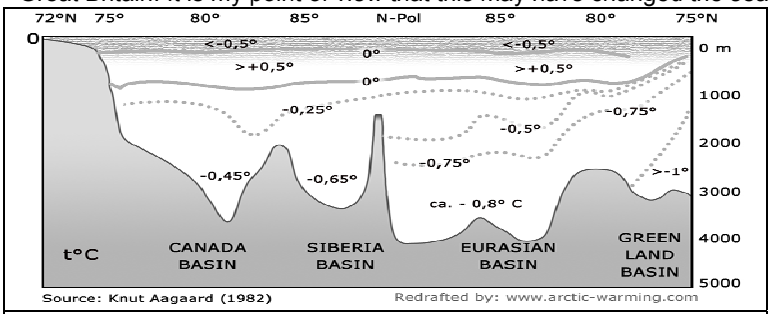


Figure I-9 The fragile water structure in the Polar Sea

b. A big naval war, and a big temperature shift in the Arctic

aa. Which mechanism – an introduction:

Analysing the causes and mechanisms for the EAW faces two fundamental problems, of which the interested reader should be aware. On one hand the acknowledgement of the influence of the ocean on all atmospheric processes is still in an infancy stage. How many people and scientists consider weather and climate matters in the relevant dimension between sea water and an air column, which ranges from 3 to 10,000 cubic-meters, this means, that one degree temperature taken from the $3m^3$ water volume and the atmosphere above, over 10 kilometres, can be warmed by one degree. If the air surface layer over 100 metres has a humidity of 100%, the one degree from a 3m water-column could inject into this layer the amount of 100 degrees. On the other hand for the Arctic in the early 20th Century there are virtually no direct observations available, very few air temperature data series, and not any on ocean temperatures, neither from the sea surface, nor from any lower sea layer.

However, few, but very important circumstances are established and build the foundation for further analysis:

1. The First World War (WWI) lasted from August 1914 until November 1918. Since summer 1916 naval war activities and effectiveness increased significantly due to new weapon systems and mass production.
2. The Arctic temperatures (north of 70°N) between 1915 and 1917/18 were particularly low (Fig. H-2). Western Europe experienced a very cold winter 1916/17, which was the third coldest in Great Britain during the last century[3].
3. A highly unusual sea icing in the North Atlantic occurred in summer 1917, when for the only time in 110 years (1901-2010) the ice covered all sea area off Spitsbergen in

[3] Web page: *T.A.Harley*; http://www.personal.dundee.ac.uk/~taharley/1917_weather.htm

April, thereon extended far south in May and June, and only retreated in July 1917 (Fig. I-5 to I-8).
4. Record high increase in winter temperatures on Spitsbergen in the winter 1918/19, which sustained for two decades (Fig. I-16).

While close timing of the four events within a very short time period is self-evident, it is not immediately obvious that their interdependence is also very close. From a geographical point of view it looks as if the mentioned events, which cover a sea area from the English Channel, along the Norwegian coast up to the Fram Strait with a bit more than 2000 kilometres, but with regard to the sea this distance does not exist. In practical terms of oceanology the distance between Scotland and Spitsbergen is zero, as by far the most of all sea water which was once around Great Britain, reaches the front garden west of Spitsbergen, within a small time lag of a couple of weeks or few months.

The initial making of the EAW is not a global issue, and it is neither a North Atlantic issue, but related to a small corridor in the east of the northern North Atlantic, which functions more like a single spot, rather than a long geographical stretch due to the permanent flow of a current in only one direction, from south to north, from the UK to the Arctic Ocean.

bb. The possible nature of causation.

Although we have some strongly correlated events it does not tell very much about the causation, or as presumably required in our case, about the chain of causes. On the other hand there is no causation without correlation, and what should not be ignored, that the more strings and circumstances are pointing into one direction the more it is rectified to take any correlation seriously. That is what good science should be all about. Unfortunately earth science is far away from acknowledging fundamental aspects, which would have made it so much easier to present the case. Although it would make little sense to include them all in later reasoning, they shall at least be mentioned briefly:

Figure I-10; Depth charges in action

- Long term average weather (climate) is the blue print of the ocean. The influence is a matter of conditions of the water column (e.g. heat and salinity), and a time factor. For a full investigation of the previously mentioned events, one would presumably need many millions of data records along the stretch from the English Channel to the Atlantic section of the Arctic Ocean. There are extreme few sea surface data available, and none from lower sea layers.
- Until now science has very little knowledge about what kind of human activities at sea (e.g. shipping, fishing, offshore platforms) might have an impact on atmospheric conditions. Even naval war activities, which is a very sudden, and forceful penetration into the marine environment, has not reached the attention of science.
- Neither can any benefit be drawn from the fact that the First World War and the Second World War (WWII) came up with a number of similar weather patterns in

Europe, as science has done irresponsibly little research in this respect. That becomes evident if once again, the observation by *A.J. Drummond* at the Kew Observatory (London) published in 1943, is recalled*: "Since comparable records began in 1871, the only other three successive winters as snowy as the recent ones (1939/40, 1940/41, and 1941/42) were those during the last war, namely 1915/16, 1916/17 and 1917/18, when snow fell on 23%, 48% and 23%, of the days, respectively*" (*Drummond* , 1943).

If meteorology and oceanology would have done sufficient observations and research on each of the three mentioned subjects, the question what actually caused the EAW would presumably have been answered long ago: the ocean and naval war contributed, by a small, medium, or to a large extent.

cc. A brief chronology of four years of naval war.

Four years of naval war can not be pressed into one brief paragraph. However it should be recognised that a naval war of the magnitude of WWI has a much more serve dimension as other ocean uses over comparable or even much longer time periods. A particularly decisive factor is the suddenness and the intensity over considerable depths with regard to temperature, and salinity structure. These are the two main factors of concern, while any other kind of interference, e.g. by pollution, is not subject to this analysis, as it is, for me, completely impossible and out of reach to quantify and verify its relevance.

SPITSBERGEN, 1912 TO 1926

Temperature deviation of monthly mean from a 15-year average

Year	Jan.	Febr.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly
1912	-8.4	-7.3	-3.4	-6.2	-1.2	-0.1	-1.3	-2.0	-2.9	-2.9	-1.2	+1.8	-3.1
1913	+0.3	-1.7	+0.7	+3.8	-0.4	-1.8	-0.8	+0.6	+0.6	-2.8	+4.0	+1.1	+0.2
1914	-5.7	-4.9	-1.4	+3.0	-0.4	-0.2	-0.5	+0.2	-1.0	+1.2	-1.5	-3.6	-1.3
1915	+1.8	-0.5	-3.1	+2.5	-4.0	-0.4	-1.5	-1.0	-0.6	+0.9	-9.0	-8.3	-2.0
1916	-8.6	+2.1	-2.3	-3.0	-1.2	+0.4	-0.4	-0.9	-0.2	-1.3	-5.9	-8.4	-2.5
1917	-7.4	-10.3	-8.7	-9.2	-4.8	-1.4	-2.1	-2.3	-2.8	-2.7	-2.6	-5.4	-5.0
1918	-10.1	-0.4	-0.1	+0.8	+2.4	+0.8	+1.9	-0.1	-0.4	-1.8	+0.9	+7.4	+0.1
1919	+8.6	-4.7	-6.9	-6.3	+3.3	+0.7	-1.1	+0.2	-0.6	+1.0	-4.0	+0.8	-0.8
1920	+3.8	+1.4	+8.9	+0.8	+1.9	-0.5	-0.5	+0.7	+0.4	+3.5	+4.3	+3.8	+2.3
1921	-0.8	+0.1	+2.3	+2.5	-0.2	+0.5	+1.0	+1.2	-0.9	-2.1	+1.3	+2.5	+0.6
1922	+10.5	+6.9	+0.1	-0.5	+1.1	+1.7	+2.1	+1.2	+1.4	+1.8	+5.0	-0.9	+2.5
1923	+3.3	+4.8	+5.9	+3.8	+2.3	-0.1	+1.4	+1.5	+1.5	+3.0	+3.9	+4.5	+2.9
1924	+5.7	+8.1	-1.9	+2.3	+2.6	-0.6	+2.1	+0.8	+0.9	+2.3	+3.1	+5.3	+2.5
1925	+4.3	+6.3	+7.7	+2.1	-0.9	+1.4	+0.1	+1.4	+3.1	-0.7	+1.7	-3.1	+1.9
1926	+2.2	+0.5	+1.5	+4.0	-0.8	-0.5	+0.1	-0.8	+1.5	+0.1	-0.7	+2.5	+0.8

Source: B.J. Birkeland, Meteorologische Zeitschrift, June 1930, p. 234

Fig. I-11 The Spitsbergen record published for the first time in 1930

- *August 1914 to autumn of 1916:* The first two war years are presumably irrelevant for initiation of an EAW toward the end of the war. The sea areas affected were the Baltic, the route to Murmansk, and all waters around Great Britain (see bottom rows of TM14, p. 191). Which interested meteorologist could have realised that it was not difficult to observe that bigger naval encounters immediately influenced local weather conditions, from good visibility to mist, dust, fog, or rain due to moving from 'hither and thither' and shelling. For example it happened off the coast of Scarborough on December 16th 1914 and during the biggest sea battle ever, the Jutland Battle close to the Skagerrak, on May 30 and June 1, 1916, about which Winston Churchill brilliantly elaborates in his book "The World Crisis 1911-1918" (p. 251-272, and 599-651).
- *Autumn 1916 to November 1918:* The naval war machinery went along in full gear since summer 1916, due to new weaponry and mass production. From now on to the end of 1917 the Allies lost, a ship tonnage of about 7,000,000 tons, which means every month between 70 and 350 ships (April 1917) that correlates perfectly with the exceptional summer sea icing in the North Atlantic during the months April to July 1917.

During the remaining 10 full war months in 1918 the Allies lost another 2,500,000 tons. The total loss of the Allied ships tonnage during WWI is of about 12,000,000 tons, or about 5,200 vessels. Some five million tons of cargo and storage must have been on board the sinking ships. The total loss of all naval vessels (battle ships, cruisers, destroyers, sub-marines, and

other naval ships) amounted to 650, respectively 1,200,000 tons. It is impossible to verify how much ammunition, how many shells, torpedoes, and bombs were used in countless encounters.

Not less than 200,000 sea mines were placed, of which about 75,000 had been used to build the Northern Barrage between the Orkney Island and Norway during summer 1918. Only a few months later temperatures at Spitsbergen went into a steep rise that became the EAW.

dd. Brief overview of some sea and weather observations.

As the assumption of comparability between a number of weather conditions during WWI and WWII is still an unsolved issue, and it is not possible to be discussed here, a few aspects shall nevertheless be mentioned in chronological order. This is merely done to indicate that a thorough analysis of the entire period could be of considerable help to understand the reasons of the EAW better.

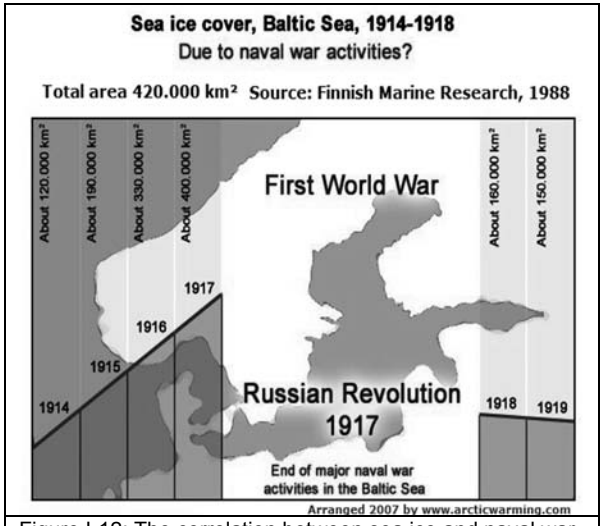


Figure I-12; The correlation between sea ice and naval war.

- __(A) The Arctic temperature record north of 70°North indicates a period of slightly lower temperatures between 1915 and 1918. (Fig. G3-1). See also: Fig G1-5 (SST, NW of Scotland.
- __(B) The famous icy winter battle of Masuria (north-eastern Poland) in February 1915 between the German Army and the Russian Tenth Army, caused the German Field Marshall Hindenburg to question:“ Have earthy beings really done this things or is all but a fable or a phantom”, (citation from: NYT, January 7, 1942).
- __(C) The winter 1916/17 was one of the very cold winters in Northern Europe.
    - The German attack on Verdun started on February 21st 1916 with one million troops; the battle became the longest of WWI and ended on December 18th 1916. The French and German Army lost several hundred thousand men each. From a climatic perspective it is to note that close battle field regions had been more wet than usual, e.g. Baden had 30% more precipitation, and in the Black Forest rain was even 50-80% higher than normal.
    - Along all coastal areas of Great Britain the winter season 1916/17 (DJF) was the coldest for about two decades.
    - For Great Britain it had been the third coldest winter during the last century (including war winter 1939/40). All three winter months were beneath 2.0 C.[4]

[4] Web page: T.A.Harley; http://www.personal.dundee.ac.uk/~taharley/1917_weather.htm

  - The sea surface temperatures in the English Channel had been the coldest between 1903 and 1927 .
  - On Spitsbergen the months February, March, April, and May 1917 had been the coldest ever recorded, Fig. I-16, below.
- __(D) The Baltic sea-ice conditions extended during the war each year until naval war activities ended with the Russian Revolution in October 1917. In 1941 *C.J. Oestman* observed:
  - *Two very heavy ice years in succession are very rare since regular observations began in 1879. Beside the two last winters 1939/40 and 1940/41 that has been only the case in 1915/16 and 1916/17. (Oestman, 1941)*

  The sea-ice cover during the winter 1917/18 was evidently much less, see previous Figure.
- __(E) At least one report exists claiming that the sea water at the west coast of Spitsbergen had shown unusually high temperatures in summer 1918. (*Weikmann*, 1942).
- __(F) During the Spitsbergen winter of 1918/19 the temperatures varied considerably. There were long periods in November and December 1918 with temperatures close to zero degrees, 4 days with temperatures above zero in November and 7 days in December. In January 1919, the temperatures did not reach –5°C for 14 days, and five days were frost-free. (Fig. I-11)
- __(F) The Fisheries Research Service/Aberdeen took sea surface temperatures in the Scotland - Faroe Channel that show a dramatic drop from about 1914 to 1920 (Fig. A3-7, G1-6; p. 20 & p.166).
- __(G) The Russian scientist *Jules Schokalsky* informed the Royal Scottish Geographical Society in 1935: *"The branch of the North Atlantic Current which enters it by way of the edge of the continental shelf round Spitsbergen has evidently been increasing in volume, and has introduced a body of warm water so great, that the surface layer of cold water which was 200 meters thick in Nansen's time (1895/96), has now been reduced to less than 100 meters in thickness"* (*Schokalsky*, 1936).

This seldom mentioned situation should just give an idea that there might be many hundreds other suspicious weather or sea observations, which meteorology should identify and analyze for a full understanding of the WWI interconnection between naval war and weather conditions.

ee. Cause III: Which evidence is possible, available or sufficient to draw a link to naval warfare?

As the data required to present 100% proof are missing to 99,999%, namely ocean data over considerable time periods of time, space, and depths in many millions, and because only few air temperature data are available, full proof is out of question. Ideally we seek "empirical evidence", that is the basic practice of science, which relies on direct experience or observation in order to describe or explain a phenomena. In a strict sense it requires that observations are considered as being potentially replicable, a non option for the EAW case. On the other hand it was possible to list a number of observations and phenomena, which are closely linked by time, space, and exceptionality, to a strong force, namely naval warfare, and to one or more other effects, e.g., unusual sea and air temperatures in 1917 & 1918, the North Atlantic sea ice in summer 1917 (Fig. I-5 to I-8), and the temperature jump at Spitsbergen (Fig. I-3 & Fig. I-16). That is no proof of causality, but the closer, stronger, and the more comprehensive observations correlate with each other, it can reach a stage of a "prima facie evidence". *Prima facie* denotes

evidence which – unless rebutted – would be sufficient enough to prove a particular proposition or fact[5].

Our case is strong in at least two aspects, which can not be rebutted with reference to "natural variability", namely:

- The extensive sea icing in the North Atlantic in summer 1917, that happened - to my knowledge - only this time since 1900, and
- The sudden Arctic winter warming 1918/19 (in the Atlantic section), which was presumably the highest temperature rise in the Arctic ever recorded.

If these events shall be regarded as 'natural', the claimants of such assertions need to prove that this happens more frequently, and that they are able to compare it with other observations of the same or of similar nature. If they remain silent, they have to accept that the naval war thesis is a serious option and a necessity to investigate.

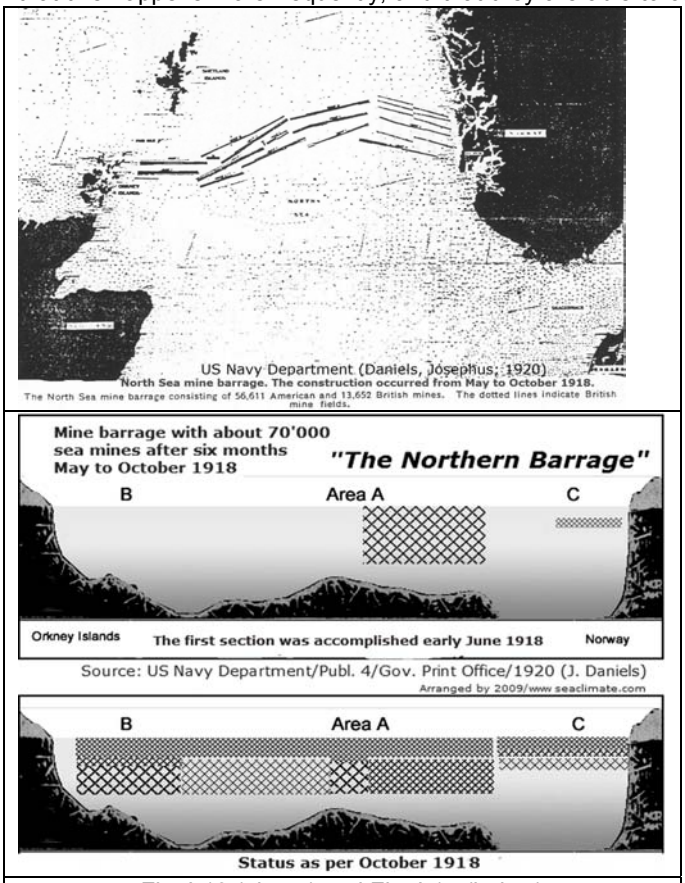


Fig. I-13 (above) and Fig. I-14 (below)

With regard to the summer sea ice 1917, it is very difficult to name a possible cause. One can exclude that the icing had been generated from atmospheric conditions, and if so, then only marginally, as the sea off Spitsbergen was still ice free in March, which only ended in April at a time the sun already has some influence[6]. Also any assumption that favourable conditions for icing could have come from the interior of the ocean seem to be a too remote possibility. Considering a link to naval warfare would require coming up with pollution or other factors, in a way that indicate conditions that favour the forming of sea ice, a matter completely out of bounds for this investigation. That is a task for universities and institutions, and is within the responsibility of governmental departments in

[5] See: http://en.wikipedia.org/wiki/Prima_facie

[6] To rely in this situation on the very cold Spitsbergen temperatures from February to May 1917 (the lowest ever recorded), could prove to be tricky, as much lower air temperatures can be assumed inevitable from the moment the usually sea ice free tongue of Spitsbergen was gone in April, which lasted until July 1917.

charge of climate change matters.

Concerning the sudden temperature shift in winter 1918/19, my consideration starts with the observation by *Jules Schokalsky*, that between about 1895 and 1935 the body of warm water (West Spitsbergen Current) was so significant, that the surface layer of cold water of 200 meters was reduced to less than 100 meters in thickness (see above). This observation leaves two options for the process that happened over a time span of 40 years:

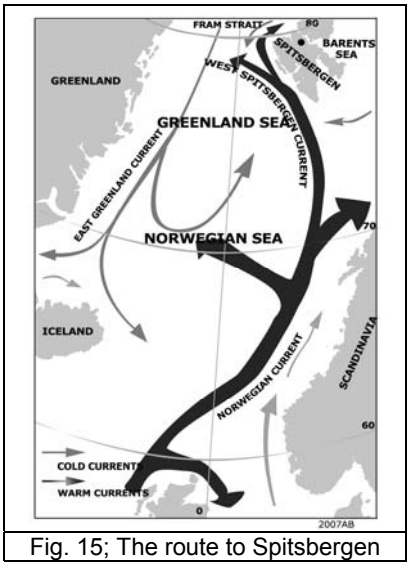


Fig. 15; The route to Spitsbergen

a) the decrease of thickness over 100 meters occurred gradually, e.g. about 2,5 meters per year, or
b) it happened within a very short time span, with an initial push during a couple of months prior to, and during winter 1918/19, causing a significant shift that lasted for two decades. All circumstances leave little room for not taking the push option, but to assume a kick off situation.

Although the push-option could have started as early as in winter 1916/17, it seems only remotely possible that any major influence could have been coming from the low winter air temperatures in the region between Europe and Spitsbergen. The starting point is more likely to be the summer sea ice in 1917, by setting the internal ocean process into motion, which is unfortunately completely out of reach for any consideration here. But there is at least the information that the SST at Spitsbergen in summer 1918 had been unusually high, and the extraordinary low SST in the Scotland – Faroe Channel in the second half of the 1910s, making it virtually impossible to assume 'natural variability' and completely ignoring the influence of naval war.

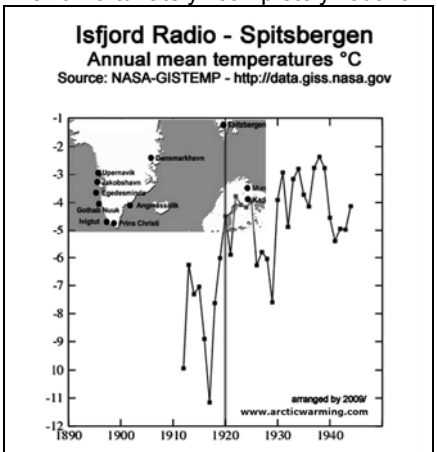
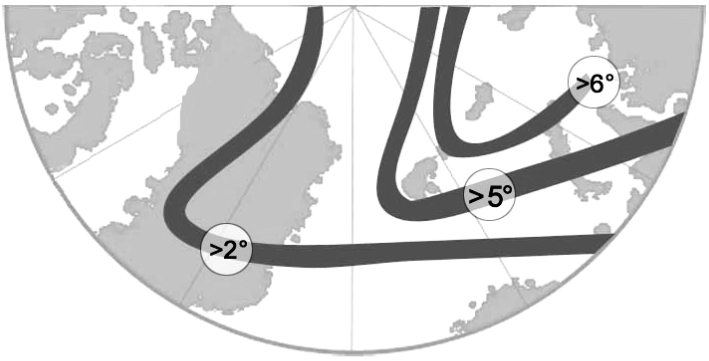


Fig. I-16, T°C Spitsbergen 1912-1945

In support of 'prima facie' it shall be once more repeated what has already been outlined in the previous part, that there was nothing in "the air", for example a volcanic eruption, or a major earth quake, or a tsunami, or a meteorite plunging on land or into the sea, which could have caused the sudden temperature shift in the high North. Instead there was a devastating war in Europe, with massive naval activities which penetrated deeply into huge sea areas, where the water masses all ended up after a short period of time in the vicinity of where the shift commenced.



Winter temperature difference 1921-1930 minus 1911-1920
Data info source: H.H. Lamp; in: "The Arctic Ocean" (1982), Fig.7.10a.
- By approximation only - 2007AB

Figure I-17

c. Conclusion

The Arctic warming from 1920-1940 is one of the most puzzling climatic anomalies of the 20th century, says *Bengtsson, et al*., (*Bengtsson*, 2004). Meanwhile, the time available for science was more than 90 years, but they are not even able to reckon with the early Arctic warming (EAW) that commenced within a very short period during which a number of strange meteorological observations could be made, e.g. in Europe (winter temperature), in the North Atlantic the summer sea ice in 1917, and the temperature shift at Spitsbergen in winter 1918/19, which is topped by a simultaneous operation of disastrous naval warfare in a huge sea area around Great Britain. Due to the prevailing ocean current system, the assumed cause (naval warfare), and the observation in the northern North Atlantic and the adjacent Arctic Ocean sector, human activities and significant meteorological changes occurred, practically at one and the same location, in the northern North Atlantic and adjacent Arctic Ocean sectors.

The circumstances are so numerous and closely interrelated, and two major events in the North Atlantic are so exceptional, that it is high time that atmospheric science solves the puzzle, or rebuts the prima facie evidence that the naval war contributed considerably. Regardless of whether the role of naval war during WWI had been only marginal, medium, or considerable, for a science that talks about the danger of climate change it is irresponsible not to know precisely, the circumstances of the EAW, why it happened and why it remained from winter 1918/19 to winter 1939/40, and whether man did contribute through naval war in Europe.

A detailed discussion at:
http://www.arctic-heats-up.com/
http://www.arctic-warming.com/
and the corresponding book see below page 221