Chapter 8
Caused Naval War the Arctic Warming?

A. Which are the potential forces available?

Around the winter of 1918/19, nature had run its normal course. No "natural" event, as asserted by Johannessen (Johannessen, 2004), which could have affected the natural commons, had been observed in the North Atlantic or Arctic region, or at a global level. There was no significant earthquake, no eruption of a forceful volcano, no tsunami, no sunspots, and no big meteorite fell on the continent or into the sea. As previous analysis showed it, there was no hot spot in the atmosphere, from which warm air could have been transferred to Spitsbergen, causing a very pronounced warming and sustaining the phenomenon for such a long time. The only conclusion so far is that the sea areas around Spitsbergen must have undergone dramatic changes in a very sudden and unexpected manner. What must happen for science to regard something unexpectedly and out of tune with statistical average as worth to investigate, to understand, and to explain.

It is evident that the Spitsbergen event was, in the common sense of the word, 'unnatural'. Science has never recorded a similar situation again. To quote Bjerknes once again, this rise had been probably the greatest yet known on earth. As there was no extraordinary event in the space, in the atmosphere or in the common ocean behavior observed which might have caused this special phenomenon, it is reasonable to think about a causational force never experienced before: the First World War. Highly destructive forces had been fighting in the air, on land and at sea, in Europe, from August 1914 until November 1918, when the big warming at Spitsbergen began to manifest itself.

It is not so easy showing a pathway to a convincing solution, as to set up an interesting hypothesis. A correlation of naval war and weather has not yet been established, and any considered correlation is most likely not driven by mere shelling and bombing. The result of naval war activities in the natural commons, which is affecting the weather and climate, occurs in a chain of setting causations is a lengthily transformation process. The theorization in this respect does not assume in any way that naval war activities actually caused the Arctic warming during the First World War, but that naval war might have contributed to the event in whatever margin. If WWI contributed only 1% or less, it would require to be acknowledged in climatology. If the proportion were in any rate greater, it would be a sensation, and the general public and the politicians should know. Not knowing about this correlation would be gross negligence and could hardly be regarded as a convincing scientific commitment.

For demonstrating this correlation we have to add to the analysis already done in the foregoing chapters, with regard to the sudden temperature jump, the location Spitsbergen, the timing winter1918/19; three further complexes:

- Naval War activities in the North- and Baltic Sea, the Eastern North Atlantic from the English Channel to the North Cape and Archangels.
- Extreme cold winter conditions during the second half of WWI, with exceptional sea ice conditions in the Nordic Sea off Spitsbergen in spring 1917.

- The intensity of naval activities since autumn 1916 that culminated with the laying of an 80,000 sea mines barrage between Norway and Orkney Islands in Summer 1918.

Although each item is a story on its own, their interrelation is often quite evident. To start with, a brief assessment of the naval war situation will be given before picking up the climatically relevant correlation-issues. However, it shall be noted that fact presentation and consideration shall help to answer the question: Why did it come to the temperature explosion at Spitsbergen in winter 1918/19?

B. Naval War, a force to recon

WWI had destructive effects on men and on the environment, but nothing changed the commons of nature as much as the naval war did. This notion derives from understanding that the oceans, together with the sun, determine the status of the atmosphere on a short, medium or long term. The author of this paper has suggested and discussed this matter in a number of publications[45]. The impact of naval warfare on the ocean environment is in so far unique because it includes two principal aspects: one which is destructive to men, ships, and materials, and another one which is changing the temperature and salinity structure of the seas, where naval activities have taken place.

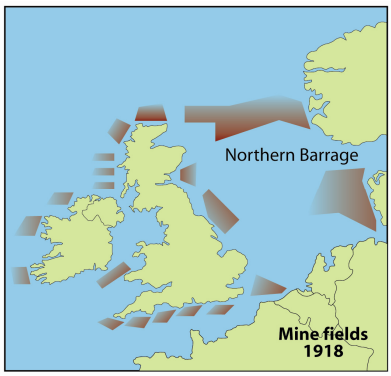
The second aspect is certainly not the only one, which might have had a significant impact on the interior of the seas in question, but it is, presumably, the most important one. Particularly sea surface layers of 50 metres depth and shallow seas (like the North Sea) are highly complex entities, always under permanent change due to season, wind, rain, river water, melt water, ice, and so on. Huge water masses in Western Europe seas were churned upside-down by naval war activities. The Norwegian Current transports these water masses northwards, to Spitsbergen. The temperature and salinity structure of the water had certainly changed its composition.

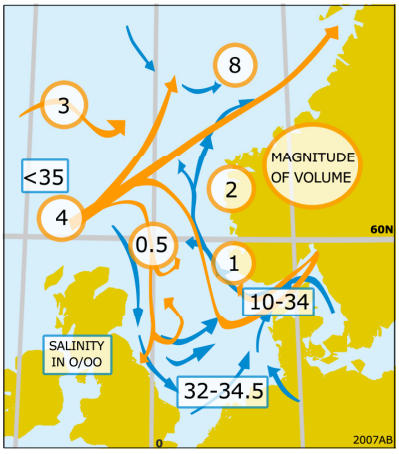
C. Forcing potential of naval war during WWI

Timing and ship losses. Although WWI started in August 1914, naval war began in earnest only two years later, when a series of new weapons were put in use: sea mines, depth charges, new sub-marines, and airplanes. By then naval warfare had reached a destruction stage to which no one might have thought of only two years earlier. The situation became dramatic when U-boats destroyed more ships than Britain could build in early 1917. In April 1917, the same total rate of the previous annual rate of 1916, ca. 850,000 tons, was destroyed by U-boats. In April 1917, Britain together with the Allies lost 10 vessels every day. During the year of 1917, U-boats alone sank 6,200,000 tons, which means more than 3000 ships, and, during the war months of 1918, another 2,500,000 ship tonnage. The total loss of the Allies ship tonnage during WWI is of about 12,000,000 tons, namely 5,200 vessels. The total loss of the Allies together with the Axis naval vessels (battle ships, cruisers, destroyers, sub-marines, and other naval ships) amounted to 650, respectively 1,200,000 tons.

A weapon scenario churning the seas. The weapon scenario employed since 1916 is too complex to make a full assessment. Many figures are even impossible to quantify. The air force, for example, went through a great development. Airplanes were increasingly used in bombing and attacking missions over the sea. But it would be a mere speculation to try to indicate the number of bombs, which fell and exploded above or under

[45] Reference can be found at: http://www.whatisclimate.com/





NORTH SEA CURRENTS

the sea surface. We can say the same for the torpedoes activated or for the depth charges dropped upon the submarines, certainly many ten thousands of them. More detailed information is available about the sea mines. Sea mines were planted massively in the water column as soon as they became available since 1916.

A total of about 200,000 sea mines had been deployed. Of much powerful effect in churning the sea on a huge scale were those ships known under the name of minesweepers, which navigated the seas day and night to find and destroy the mines. Britain alone had more than 700 operational minesweepers; the Germans came close, too.

Churning the sea. War matters are usually quantified on the basis of costs and destruction caused to soldiers, population, buildings, industries, material, etc. Whether the water masses of a sea body have been turned upside down has never been of any interest. But that has happened on a grand scale. While in many cases seawater may have remained unchanged, temperature and salinity structure over a range of one meter to many dozen metres of surface water was always altered by any naval activity, whether there were weapons, sunken ships or mines planed or swept. Naval war at the magnitude of WWI means that many thousands of vessels navigated in defense-, combat-, or training missions, day and night. Battle ships had a draft of ten metres and could travel at a speed of 30 knots/hour (ca. 60 km/h).

In addition, the wide range of other impacts should be at least mentioned. Most ships that were sunk transported a variety of cargo, and all of them had equipment and provisions on board. The total number could be somewhere in the range of 10-15 millions tons. It has been never quantified how much cargo and provisions surfaced and travelled with the currents towards the Arctic region and how the sea and sea-ice interacted with all that stuff - a matter that should not be ignored outright.

D. The connection between naval war and the Arctic warming

The naval war from1914 to 1918 can be considered as the most comprehensive single event in the late 1910s that has altered the common sea body structure around Great Britain through a huge variety of activities and means. In previous sections, we have proved that an extraordinary warming phenomenon took place at Spitsbergen. These two events

Note

Weather protects impertinent attacker

Extract "Climate Change & Naval War"

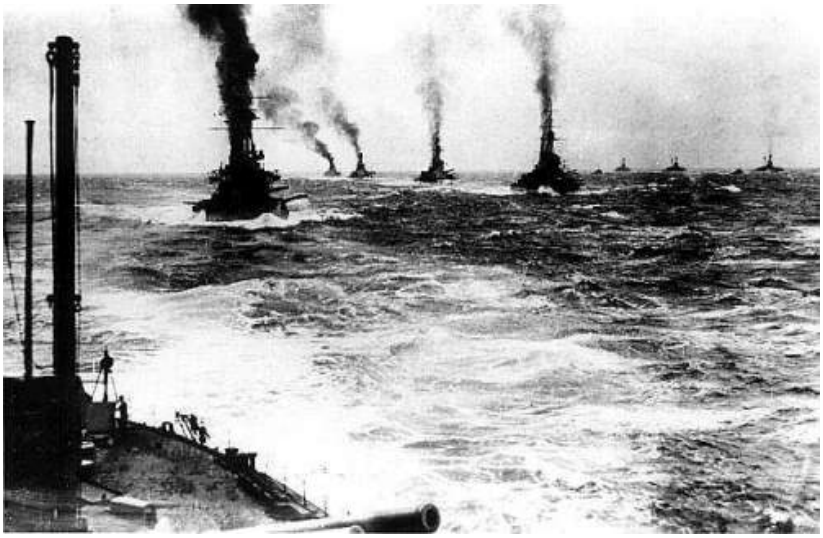
Victoria/Canada, p.277 (references not shown);
And Chapter 5_15 at: http://www.seaclimate.com/

German battle cruiser bombards North Yorkshire's coast, 16 December 1914: The story is about weather-making by naval forces in combat missions at sea and is taken from the book 'Swept Channels' (Taffrail, 1938). The narrative tells the story of a German battle-cruiser bombarding Hartlepool, that had a battery of guns, and Whitby and Scarborough, that had not, shortly after daylight on December 16, 1914. That left 120 people killed, and over 400 wounded. A German Communiqué short time later reports about "parts of our naval forces", but does not name the vessels involved. It was claimed that one English cruiser was destroyed, others damaged. It follows the excerpt:

"The whole story is told by Mr. Winston Churchill in the *World Crises, 1911-1914, Vol. I, p. 467.* Squadrons and flotillas were moved to deal with the expected raid, and these forces actually made contact with the enemy during their retreat and opened fire. At one point the British and German battle-cruiser forces were only twenty-five miles apart, and were still closing in on each other. Further seaward there was a powerful battle squadron under the command of Sir George Warrender. The action was imminent, and it could only have one result.

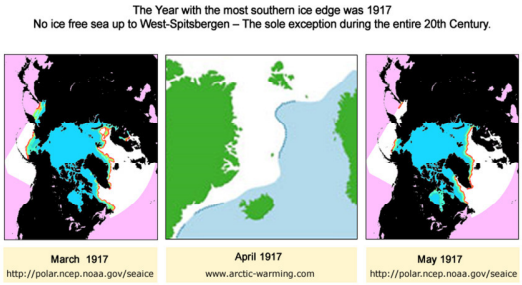
Then, as it so often had happened before, the weather supervened. The wind sprang up and the sea started to run high. The North Sea mist came down until the horizon became blotted out in a curtain of thin vapor. The weather gradually thickened, the visibility dropping from 7,000 to 5,000 yards, then to 3,000. In the driving rain-squalls the area of vision was bounded by a circle whose radius was sometimes less than a mile.

Between fifteen and twenty heavy ships, and a number of light cruisers and destroyers, all steaming at high speed, were groping for each other within a space of about sixty square miles. Their wireless signals could be overheard in Whitehall, where their positions were constantly plotted on the large chart in the War Room at the Admiralty. It was like a nerve-racking game of Blind Man's Buff played in the dark, with huge ships instead of children – and the enemy escaped."



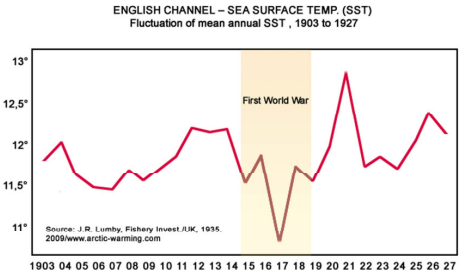
are strongly connected by the timing of each event and bythe current system linking the two locations. No other coincidence of such a close relation has ever been observed before or after WWI. Is this a *prima facie* evidence that naval war could have contributed in causing the warming?

Correlation I – Extreme Sea Ice at Spitsbergen in Spring 1917



Here we have a story, which every one would call far-fetched. We too! Nevertheless, the story needs to be told – albeit here only in brief - as it may show what naval war is capable to do to the natural common. The brevity is due to the fact that naval war did presumably the same to the regional weather conditions as it did it during the Second World War (WWII), which is lengthily investigated elsewhere (Bernaerts, 2005)[46]. The point to make is two fold:

- The sea ice off Spitsbergen was extreme during spring 1917; actually it was the only time during the last century when the sea ice extended so far South by almost reaching the latitude of Bear Island. During all other years since 1900 a sea-ice free tongue up to the Fram Strait remained open sea. This lead to the question, whether the generation of higher salinity above the West Spitsbergen Current (WSC) during the freezing process, or the subsequent infusion of a huge fresh water component during the melting in summer 1917 initiated or promoted the big warming at Spitsbergen in less than 24 months later.
- The other aspect derives from naval war activities since August 1914 and can be again divided in two aspects, here formulated as questions:
  - Did naval war activities generate sea water conditions that supported the sea surface in the Spitsbergen region to freeze earlier, more heavily and extensively?
  - Are naval war activities partly responsible for the extreme cold winter conditions in North Europe and elsewhere in the Northern Hemisphere, through which the extensive freezing of Spitsbergen was enhanced?

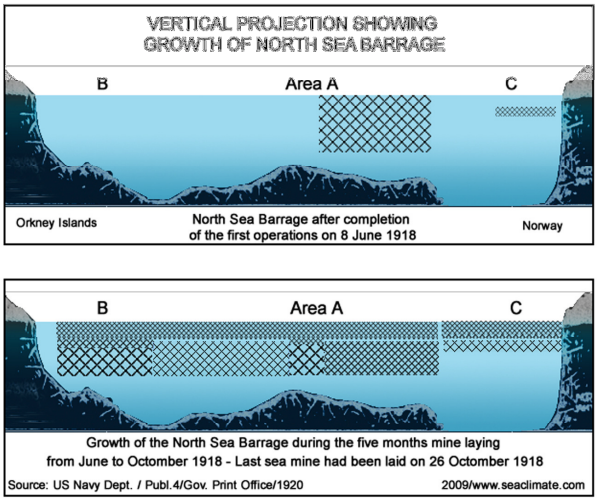


Fact is that the war winters prior 1919 had been very cold in Europe. At the top stands the winter 1916/17. For Great Britain it was the third coldest on record[47]. After a cold series from 1881-1888 the coldest winters in the Arctic

[46] See also: http://www.seaclimate.com/; http://www.warchangesclimate.com
[47] Web page: t.a.harley; http://www.personal.dundee.ac.uk/~taharley/1917_weather.htm

had been 1902, 1917, 1918, and 1966 (Kelly, 1982), and the coldest temperature measured on Spitsbergen was – 49.2°C measured on the 28th March 1917. One year later New York was served with the coldest in history of the city, wrote the New York Times in April 1919 remembering that it occurred "when Uncle Sam was feverishly trying to hurry his supplies to the East for shipment to Europe, when Jack Frost hampered transportation and coal was scare, are hard to forget".[48]

But a loose collection of some distinct weather conditions or significant deviation in statistics will prove little at this place. That does not say anything whether this aspect should not receive more attention, bearing in mind that the naval war got very serious only in autumn 1916 and remained devastating over two winters until 1918. Three examples may indicate the possible relevance:



__The Baltic Sea was an extensive scope for all sort of naval activities from August 1914 until the Russian October Revolution 1917. The sea ice cover increased with the length and intensity of the fight, as illustrated by the attached image, but diminished since winter 1917/18, when the naval war in the Baltic Sea ceased due to the Russian October Revolution. Since winter 1917/18, the Baltic Sea had been left to a rest, fact immediately reflected in a much lower sea ice extension. Had fighting continued, had this sea got another record cold year?

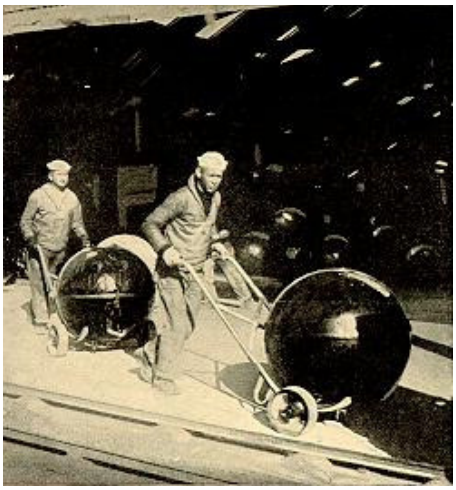
__The Royal Navy had to do a lot of surveillance, mine sweeping and war activities in the English Channel. For example in September 1916 a flotilla of about 570 anti-submarine vessels were on hunt for three U-Boats operating for about one week between Beachy Head and Eddy Stone Light. The U-Boats were able to sink thirty ships without having been unscathed themselves. The operation of such a flotilla is presumably reflected in the record of sea water temperature (SST) taken in the English Channel for the year 1916-1917 (see image). This suggests the conclusion that a cooling of the English Channel water by naval activities will inevitably support cold winter conditions in Great Britain including Ireland and southern part of the UK.

__The third example is an observation made by a scientist from Kew Observatory near London in 1942: "Since comparable records began in 1871, the only other winters as snowy as the recent three (1939-1942), were those of the last war, namely 1915/16, 1916/17, and 1917/18." (Drummond, 1942)

Whether or whether not the naval war contributed to the harsh winter conditions, for ocean research it would be still high time to show that they analyzed and understand the consequences of extraordinary sea ice conditions between Bear Island and Spitsbergen in winter 1916/17.

[48] Pearson, Samuel K. (1919); "Illusion about Weather!, The New York Times, the 6th of April 1919.

Correlation II – The sea water from West Europe ends up at Spitsbergen



Even the wildest guess will hardly tell with any precision how intensive the seas around Britain have been churned, mixed, or altered by naval activities during WWI. The hazard to the marine environment will not be coming from any sort of pollution but from the mere mixing of sea water structures, concerning temperature and salinity, over many meters depths below the sea surface. Thus the complete sea water body of the North Sea could have been turned over several times during the war. Assuming that this has no effect on the 'natural common' could be called naïve. At least during a number of months the temperature structure cover considerable ranges according to the sea level. The same applies for the salinity, which is further complicated by rain, river run-off, etc. For example, any rain water would usually "swim" on a body of saltier water until it is either much colder than the sub-water layer, or the wind would start mixing the sea surface layer. Naval war activities would add a third option. The sea structure has not remained any longer the structure the sea used to have. The changed structure is transferred by the ocean current system to other regions.

All naval activities around Britain had changed the water structure that moved on toward the North. These activities culminated in building the monstrous Northern Mine Barrage at the northern out-let of the North Sea between Orkney Island and Norway from spring to October 1918. A total of 80,000 sea mines were laid. The aim was to prevent U-Boats from leaving the North Sea. For further details see the Special Page. The sea area used for the Barrage is complex, as the attached image indicates. The area consists not only of brackish North Sea water, but warm Atlantic water is flowing around the Orkney Islands and enters the North Sea. The outflow from the North Sea is along the Norwegian Coast up to the North.

How close was the naval war to Spitsbergen?

The distance between Spitsbergen and the main naval battleground was of about 2000 km. But this distance is not very significant in this case. The currents moving along the Norwegian coast consist of water from the North Sea and of water from the Golf Current, flowing at a medium speed of 0.1 km/hour. At the sea surface, the current is up to 10 times faster.

- The branch of the North Atlantic Current has temperatures exceeding 6°C and salinity greater than 35. The main arm is well below the sea surface and in quite a distant to the coast of Norway.
- Norwegian Coastal Current flows closer to the coast of Norway in the upper 50-100 m of the water column with lower temperatures than the Atlantic branch and low-salinity water, less than 34.8.

1920	Daniels, J. **'The Northern Barrage'** No. 2 and No..4 - Publication, Navy Department, Washington 1920.

SUMMARY OF THE BOOKS

U-boats had been a serious threat to the Allies since 1916. They regarded it paramount to prevent U-boats from leaving the North Sea into the Atlantic. To 'close' the northern outlet of the North Sea, about 150 sea miles (ca. 275 km), a long barrage between the Orkney Islands and Norway would be required. Off the Norwegian coast the water is 300 metres deep and the coast off Orkney about 100 metres. Sea currents can reach 3-4 nautical miles/hour. That was a challenge and required the development of a new mine, the MK6, to meet it. The charge consisted of 300 pounds of grade B trinitrotoluol (TNT). The mine itself was supposed to have a destructive radius of 100 feet (ca. 30 m) against submarines. Calculations showed that approximately 100,000 mines should effectively prevent U-boats from passing the line. Actually, only about 70.000 mines were laid until October 1918.

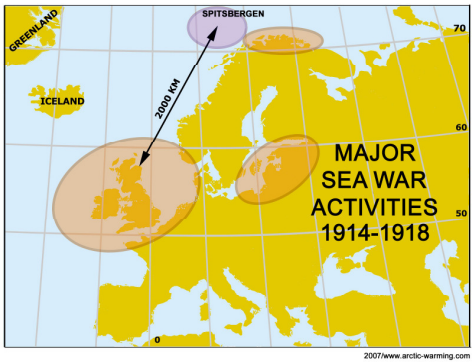
Mines were available by March 1918, laying started. "Shortly after mine laying had commenced mines began to explode prematurely. By counting the explosions it was estimated that between 3 and 4 per cent of 3,385 mines laid blew up". In the middle section "A" mines were supposed to be laid as follows: 10 rows of mines at 80 feet submergence, 4 rows of mines at 160 feet submergence, 4 rows of mines at 240 feet submergence. Corresponding rows were laid before the Orkney Islands (section B) and Norway (section C).

From a detailed account by Daniels here are some illustrative events:

__When deep level mines exploded, 'a circle of brown discolored water was spreading slowly around the vessel'. July 6th, a mine had been found on the Norwegian coast in the vicinity of Bergen (Daniels, p.108).
__July 14th, 5,395 mines had been laid in 4 hours and 22 minutes (Daniels, p.109).
__Approximately 5% of the mines exploded prematurely – a slight increase over previous statistics.
__July 29th, 5,399 mines laid with 14% of mines going off (Daniels, p.111), at one time even 19% in section C (Daniels, p.112).
__August 18th, 12% of mines exploded prematurely.
__Section A; mines which had been laid in this area by the British in March 1918, had in the meantime been swept up. (Daniels, p.115).
__September 29th, the Norwegian Government said that mines would be laid in the vicinity of Udsire Island, and it is understood that this had been done by October 07th (Daniels, p. 119).
__With the signing of the armistice on November 11th, the building of the mine barrage ended. (Daniels, p.120).
__Final Status of Barrage (extract): up to November 11th a total of 56,760 United States and 16,300 British mines have been laid. Completion of the barrage within the Norwegian territorial waters had been effected by Norway herself.

Mine sweeping started in spring and ended in autumn 1919. From more than 73.000 mines

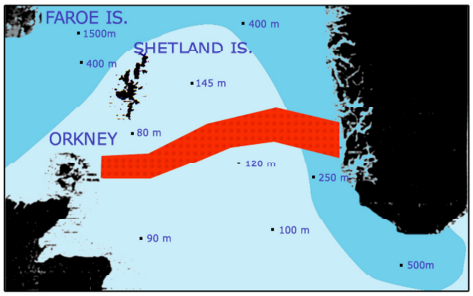
__about 5,000 exploded prematurely soon after laying
__20,000 mines were disposed of while the work was in progress
__from the remaining ca. 50,000 mines
__more than 30,000 mines were already 'gone' in spring 1919, either drifted away, or exploded during winter storms;
__rest 20,000 were swept in 1919.
Six months of sweeping operation comprised seven sweeping missions involving more than 70 vessels and 10 supply vessels.

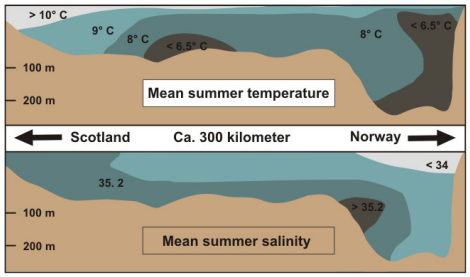


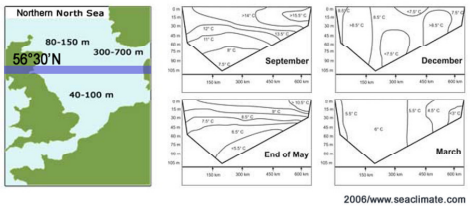
NORTHERN BARRAGE
70'000 sea mines laid from June to October 1918 to stop U-Boats

The current speed between the two currents is not equally high, but the distance of ca. 1000 km from the Lofoten to Spitsbergen can be covered by 4 to six weeks (Berge, 2005), although the Atlantic branch requires more time. While the Atlantic branch current needs some time to cover the distance between Scotland-Shetland Islands and Spitsbergen (ca. 1500km), the transport of surface water into the high North can be accomplished within few weeks or months. All mentioned timing, although only rough estimates, illustrates perfectly the "connection" between WWI and Spitsbergen warming.

E. The system shift







What does a system shift mean in respect to the Spitsbergen region? The main answer is simple. The incoming warm water of the West Spitsbergen Current was "positioned" in a manner that it could release more heat into the atmosphere. This can happen in two ways: (1) the sea ice forming during the winter season diminishes, which would not explain the suddenness of the shift; or (2) the thickness of cold sea water layer above the warm water was suddenly substantially reduced so that the air temperatures could immediately benefit from warmer water close to the sea surface. This was actually the case. In the mid 1930s it had been already discovered and published, that since the FRAM expedition in 1893-1896 the cold surface layer had grossly weaken:

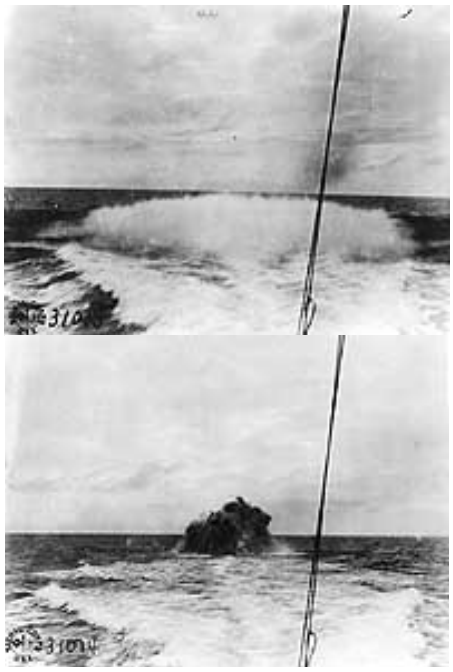
"The branch of the North Atlantic Current which enters it by way of the edge of the continental shelf around Spitsbergen has evidently been increased in volume, and has introduced a body of warm water so great, that the surface layer of cold water which was 200 metres tick in Nansen's time, has now been reduced to less than 100 metres in thickness. " (Schokalsky, 1936)

Between the two observations, by Nansen and Russian research vessels, lays a time span of more than three decades. Was the diminishing process gradually over the full time period? Definitely not. To be clear, it is the observation of a sudden shift. The temperature could not 'explode' during the winter season without more heat release from the warm water current which could only be sustained by a thinner cold surface layer, respectively by more war water from the South. That was a sudden system shift. Science should have been

able to explain the findings since long. Brooks noted 70 years ago: “Whatever the mechanism, the rise of temperature did begin and presumably had a cause”. (Brooks, 1938)

F. Summing up

The chapter covered a quest for the reasons of the Arctic warming since winter 1918/19. The goal was high; and achieved? The judge is out. On one hand one could say: Correlation is not causation. But science without investigating a surprising correlation would get not far. Correlation is the spice to take actions and to ask: Why. We could demonstrate a case where the correlation of events, magnitude, space, location, and timing, are so closely intertwined that one is forced to assume that the connection is inevitably the source of causation. That is called a prima facie evidence. And a prima facie evidence between the naval war activities in West Europe waters and the system shift to the West Spitsbergen Current in the sea area off Spitsbergen could be established. That is not necessarily a 100% proof, but it is enough to require from every claim, otherwise dissembling the demonstrated strong correlation, and establishing another, more solid, evidential conclusion. As there can be no doubt that only the warm Atlantic water in the West Spitsbergen Current could have initiated the big Spitsbergen warming in the late 1910s, and sustain it in the region for two decades, the naval war thesis can only be challenged with conclusive evidence that the dramatic system shift in the Northern north Atlantic stand in correlation with another event, respectively the system shift in the current was ‘natural’. But due to the strong correlation with WWI, this cannot only be merely claimed, but the claimant should establish such claim on solid proof.



Source: U.S. Naval History Center
http://www.history.navy.mil
Top-Left: **Explosion of a depth charge**
Top-Right: **Escorting Atlantic convoy**
Bottom-Left: **Depth charge exploding**