

What did or didn't contribute?

Scope of this section

In our previous sections, naval Warfare was established as the cause of the arctic winter 1939/40 in Europe. Further significant events during the final months of 1939 will be presented in this section to support the argument mentioned above. This short period is of utmost importance as climate statistics were unaffected of non-natural influence when war started. In other words, during the initial war months, climate statistics and man-made causation faced each other directly.

It has to be strongly emphasized that the initial four war months should have a very prominent place in climate research. Although military destruction by land, air and sea was modest if compared to later war situations during WWII, military size, material and destructive capabilities were tremendous from the very beginning. From war day zero, the common appearance of an industrialized world changed dramatically. A sudden 'stress' on the environment is imminent, when many million soldiers start to march with thousands of tanks, air bombers and naval vessels. In physics, dynamical processes tend sustaining. Ocean and atmospheric affairs go similarly. Once war commences, the environment remains in its 'natural status' only for a very short period. Very soon, nature adapts and reaches new equilibriums. From that moment on, climate statistics need to be analysed with particular care and reserve.

In addition, the first four war months in 1939 should find foremost place of interest in climate research due to the fact that the influence of the sunrays on climate receded in North Europe since war commenced. During a normal winter season, only nearby seas and oceans are able to sustain common mild winter conditions. They function like a central heating. One should search for an explanation if they fail. The failure of the regional seas "winter heating" has been investigated in the previous three chapters in which we have showed

that the arctic winter conditions and the churning of nearby seas reached extraordinary dimensions and that it is possible and necessary to link them together. This makes the main task easily achievable.

Nevertheless, over a short period of time, from the summer of 1939 to January 1940, Europe was not the only place on earth where something happened. Based on the view mentioned earlier that initial months of war are particularly interesting in climatic studies, other climate relevant aspects shall be listed briefly to provide the best possible overview. Only a fairly comprehensive picture may enable the interested reader to draw his own conclusion.

For this purpose a chronological listing of significant events is given, followed by an analysis of possible impact or contribution of these events to the arctic winter 1939/40, in Northern Europe.

Chronology of events Pre-war months – June to August 1939

(8) El Niño

El Niño occurs once in every three to seven years. There was such an occurrence in 1938/39. The phenomenon begins with an eastward drive of equatorial warm water, which displaces cold surface water off continental American coast, e.g. Peru. Warm sea evaporates there more than usual, resulting in torrential rain along the coast. In Peru, July and August 1939 had been the wettest for past two decades. Indeed, an El Niño event occurred at about that time.

(2) Flood in China

A major flood occurred in China in July 1939. Vast areas in North China's Plains were submerged and the water in the streets in Tianjin (120 km south-east of Beijing) was two meters high so that boats were the only means of transport for more than two months. The flood inundated 3.3 million ha. Of farmland and affected 8 million people.

Death toll was estimated at 20,000, though it could have been much more.

(3) Russian-Japanese war in China

War was raging on China's soil between China and Japan since 1936, when Russian and Japanese forces of about 80,000 men on each side went into direct clash, on the 20th of August 1939, at Nomonhan, a place on the boarder between Outer Mongolia and Manchuku. Battles raged for four weeks. Soviets had transported more than 400 tanks, 200 heavy guns, 400 armoured cars, 500-700 planes and several thousand tons of ammunition, shells, bombs, etc. via Dessert Gobi to the Far East. Presumably not less military equipment had been available with the Japanese Kwantung Army which eventually was the loser in this event, with 20,000 dead men, when the truce was signed, on the 16th of September. The Japan-China war continued with daily bombings, shelling, military encounters and battles.



War months – September 1939 to January 1940

(4) Rain and tropical storm in California

In September 1939, California experienced record rains with precipitation up to 370% of normal and an eight days' heat wave since the 16th of September, which was followed by a severe tropical storm³² (NYT, the 25th of September 1939). It was the heaviest September rain in Los Angeles' weather history and it broke the worst heat wave record in Weather Bureau records, measured in intensity

³² A tropical cyclone in which the maximum surface wind speed ranges from 39 mph to 73 mph. Hurricane: when winds in a tropical cyclone equal or exceed 74 mph.

and duration (eight days) (NYT, the 26th of September 1939). It was a month with four storms, including the only storm on record hitting California as a tropical storm until 2003³³, actually crossing the shore at Long Beach.

(5) September anti-cyclone over North Atlantic?

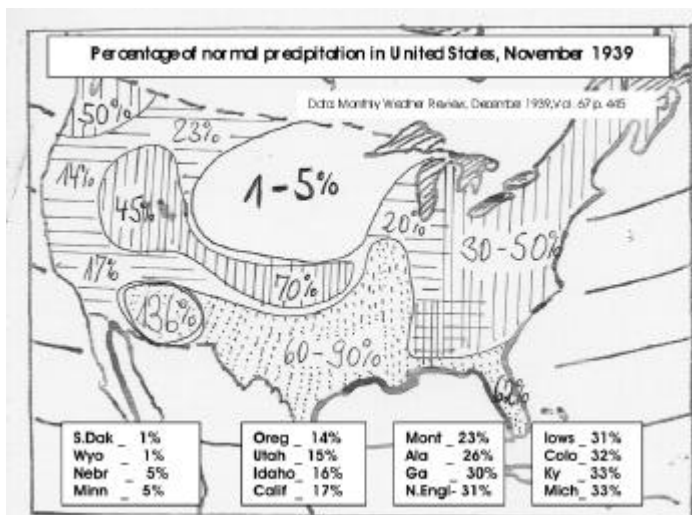
During the early war period, daily weather charts showed a high-pressure area between Iceland and Scotland, between the 16th and the 28th of September. It was a sea area ‘crowded’ by several dozens of big Royal Navy ships chasing German merchant and naval vessels and German U-boats, 14 of which operated west of Scotland since the end of August. French navy operated near Brest. Convoys sailed. Ships were shelled, torpedoed, scuttled and eventually a number of them were sunk.

(6) Sinking of Rawalpindi and Atlantic cyclone

First sea engagement of naval surface vessels in the North Atlantic occurred east of Iceland, on the 23rd of November 1939. New and big German battleships *Gneisenau* and *Scharnhorst* sailed in a flotilla of six naval vessels, when they saw HM Armed Merchant Cruiser *Rawalpindi* of 16,697 tons at some distance. *Scharnhorst* fired salvos over a distance of 10,000 yards (NYT, the 28th of November 1939). One hit the *Rawalpindi*'s forward magazine and soon a big explosion sank the ship. The Royal Navy ordered all available Home Fleet ships (ca. 20 big naval vessels) to sail to the scene of action to hunt the German flotilla. This naval encounter was immediately followed by a rapid decrease of air pressure with more than 50mb in 48 hours. On the 26th of November, air pressure was down to 945mb.

33 Jack Williams, 'Background: California's tropical Storms', www: USATODAY, Weather, 12/29/2003.

(7) USA dried out



This event has only a remote connection with Europe's arctic winter of 1939/40. As mentioned in a previous section, WWII had hardly started when it began to rain excessively in

Western Europe, from Berlin and Basel to Paris, Amsterdam and London, for three months. The amount was more than three times the previous averages. What makes this event even more interesting is what happened on the other side of the globe.

In the late autumn of 1939, the U.S.A. 'fell dry', receiving only a small percentage of the normal precipitations: October 78%, November 44% and December 71%. On the 7th of January 1940, The New York Times reported that November was unusual because of its dry air. According to US Weather Bureau³⁴ "the fall season was extremely dry over large areas. From the Rocky Mountains eastward, it was the driest fall on record considering the area as a whole." Therefore, a frame for the arrival of an early winter and a bitter cold and snowy January for the USA was predicted.

(8) Russian – Finish War

Without having declared war, Josef Stalin sent his Red Army and Baltic Fleet to attack Finland, on the 30th of November 1939. At that

34 R.J. Martin, 'The Weather of 1939 in the United States', Monthly Weather Review, Vol.67, 1939, pp.444f

time, “military observers believed that the total Russian forces in the Leningrad district and the Lake Ladoga region were of at least 5,000,000 men. The number of tanks was estimated at 1,000 and the number of fighting planes at 500.” (NYT, the 7th of December 1939) “All in all, the Leningrad Military District command (Red Army) enjoyed a material superiority over the Finnish army by 3:1 in respect of manpower, 80:1 in respect of tanks, 5:1 in respect of artillery of all types and 5.5:1 in respect of aircraft”³⁵. The battle took unimaginably destructive dimensions during the full winter period and ended with a treatise only on the 12th of March 1940.

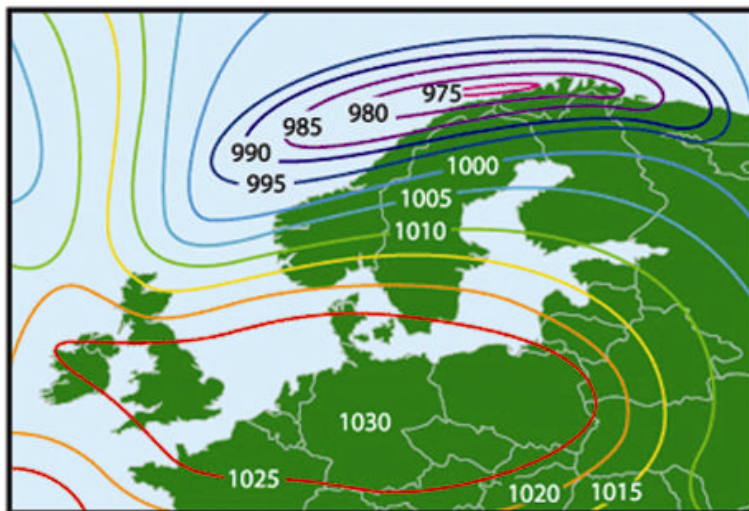
It can hardly be overruled that major military activities went ‘hand in hand’ with drastic weather changes and deadly low temperatures, for example:

- Invasion of Finland had started – and ‘blinding snowstorms’ waged along the 750 miles of the battle line. (NYT, the 4-5th of December 1939)
- Russians started a major offensive on the 20th/21st of December – and blizzards occurred and the temperature fell to below –30°C. (NYT, the 21st of December 1939)
- Joseph Stalin had amassed 300,000 of his best troops to attack Finland from the north and the east (NYT, the 27th of December), sometimes shelling Finnish positions up to 48 hours continuously – and snowstorms and unusual low temperatures reached the battlefields. (NYT, the 29th of December 1939; Hamburger Anzeiger, the 30th/31st of December 1939)
- Russia deployed 2,000 large guns (NYT, the 18th of January), which spat hundreds of shells every minute (NYT, the 1st of February) – but ‘a pitiless deathly cold laid a glacial cover on Russia’s war machinery tonight with phenomenal 54 degrees-below-zero temperatures’. (NYT, 18 January)

35 Van Dyke, p.39-40, reference above

These events are too obvious to be a coincidence. A few years later, William Mandel³⁶ pointed to the fact that much lower temperatures were experienced in the winter campaigns around Leningrad during the Soviet-Finnish fighting in 1939/40, around Moscow and Leningrad in 1941/42 and around Stalingrad in 1942/43.

December 1939 was extremely variable in terms of weather. The first cold wave came around the 24th of December. The New York Times correspondent, James Aldridge, reported as it follows:

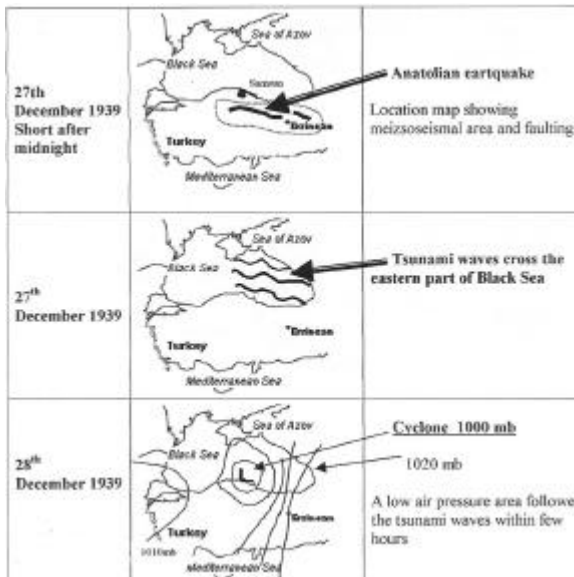


A low-pressure area developed suddenly off the Lofoten on 21st December 1939 causing wind forces of Beaufort 12 in some parts of Norwegian coast. On 22nd December the cyclone passed the city of Lulea (most northern city of the Baltic Sea) with unchanged air pressure of 975 mb., while Central Europe was fully controlled by a continental high pressure system.

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36 William Mandel, 'Some notes on the Soviet Arctic during the past decade', in: Journal of Arctic Inst. Of North America, Vol. 3, 1950, p.55ff

“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 (minus 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)



**(9) Earth Quake
in Turkey – the
27th of December
1939**

On Wednesday, the 27th of December 1939, a devastating earthquake in the north-easterly highlands of Anatolia shook the whole of Turkey at 1:57:35 a.m. local time³⁷. The quake

37 Recent seafloor earthquake off Aceh/Indonesia with deva stating tsunami in Indian Ocean coastal rim occurred almost exactly 65 years later, on December 26th 2004, at local time 07-57 hours (GMT 00-59 hours).

with a force of 8 on Richter scale caused 35,000 fatalities and injured 100,000 besides making homeless other several hundred thousands. 90 villages and 15 cities over an area of 30,000 square kilometres were completely destroyed. The earthquake produced a tsunami wave of 3-4 metres. A one-metre high wave crossed the eastern part of the Black Sea from South to North, as recorded by several Russian stations. Immediately after the quake, bitter cold, storms, heavy rains, floods and snow fall occurred.

Low pressure from above Ukraine moved into the southern Black Sea, off the city of Sinop/Turkey, halfway between Bulgaria and Georgia, presumably due to quake and related tsunami. A previous high-pressure centre was still in place ca. 600 kilometres away, in Eastern Anatolia. At this short distance, an air pressure difference of at least 35mb generated strong winds that brought hardship to Turkey by way of bitter cold, stormy winds, heavy snow fall and floods. “Temperatures of 22 degrees below zero Fahrenheit (minus 30°C) and strong winds from the Black Sea claimed many lives...” (NYT, the 29th of December 1939) This constellation contributed to sudden cold and snow further west in Yugoslavia and Italy, during the last days of the year.

(10) A bitter cold January in USA and China

January 1940 was very cold all over the Northern Hemisphere, including USA and China. First signs of a ‘real’ US winter emerged at Christmas time 1939 when, except for the Deep South and California, the United States experienced snow and extreme cold (NYT, the 26th of December 1939). Winter came earnestly with a frigid wave that gripped most of the United States (in early January 1940). Icy north-westerly winds swept New York with force on the 6th of January, causing temperatures to drop to an average of 10 degrees Fahrenheit below normal (NYT, the 7th of January 1940). From the Continental Divide to the Atlantic Coast, there were strange occurrences as compared with normal weather conditions. Frigid waves even touched the northern parts of Florida (NYT, ditto).

However, the severity of the winter in the United States was over by the end of January 1940.

A similar cold wave gripped China. According to the newspaper reports, by the end of January 1940, all parts of China reported unusually harsh weather with snow falling in some districts where snow was unknown for twenty years. The cold wave had extended to China's southernmost provinces of Kwangtung and Kwangsi. In Changsha, capital of the Hunan Province, the weather was described as the worst in twenty years. A blinding snowstorm swept Lanchow (Lanzhou), the capital of Kansu, where the cold was said to be the severest in China (NYT, the 23rd of January 1940).

Synthesis of events Matters to consider

Now that a new stage was reached, we have to think whether the events listed above may have made a significant contribution to arctic winter conditions of 1939/40 in Northern Europe. Previous sections established that naval warfare, due to turning and churning of huge sea areas, must have caused a drop in winter temperatures to such low levels that have not seen in the past 100 years. What role did each of the above-mentioned events play during the second half of 1939?

To begin with, it might be prudent to express clearly that none of the events listed above alone or in combination with any other provided a major contribution for generating the forthcoming winter conditions in Europe. This was decisively caused and sustained by naval war at sea. Yet, it cannot and will not be concluded that contributions on a varying scale from very little to significant levels are possible. Some aspects are logic and easy to present; others are not. This is often in respect of the cause and effect of the weather. The principle applied is: "what was first, the chicken or the egg?"

Actually only two weather conditions out of ten events listed above deserve particular attention. The rest of them are very interesting

aspects for understanding the general situation as they may have presumably played a minor role during initial war months, as it will be discussed later in this section.

The most relevant aspects should be discussed first. Out of two subjects, one, which needs a more detailed consideration, relates about rainmaking in Europe, dryness in USA and subsequent cold in January 1940. The second is related to a recent claim that the extraordinary winter of 1939/40 had been caused by the El Niño phenomenon. This shall be reviewed first.

Substantial contributor? (a) Arctic winter due to El Niño?

An international group of scientists suggested recently that there could be a link between the arctic war winter of 1939/40 and an El Niño event which started in autumn 1939, reached its full strength in January 1940 and lasted, with varying intensity, until spring 1942³⁸. According to them, the dominant global feature was the contrast between high tropical and low extra-tropical sea surface temperatures (SSTs) in both hemispheres.

This claim is already weak on facts. As mentioned earlier, an El Niño effect had started in 1938 and reached full strength in South America in July 1939. From then on, the warm water pool causing extra rain, e.g. as in Peru, had been receding. Even if one is willing to accept that a prolonged event occurred, there are not sufficient facts to support the claim. There have been about 25 El Niño events during the past 150 years. It has already been established that subsequent, long distant effects could have been caused, e.g. increased rain in Florida, flood in Brazil and draught in Australia. During the 25 El Niño periods, there were indeed cold European winters as well as normal ones. For example, during the very cold winter of 1928/29, previous to that of

38 Broennimann, S.; Luterbacher, J.; Staehelin, J., Svendby, T.M.; Hansen, H. & Svenøe, T.; , Extreme climate of the global troposphere and stratosphere in 1940–42 related to El Niño', in NATURE, Vol. 431, 21 October 2004, pp. 971-974.

1939/40, the Pacific saw a La Niña, actually the opposite of a warm water pool under El Niño conditions.

The claim of a prolonged El Niño from 1940–1942 should be treated with suspicion, too. Based on sea surface temperatures (SST), it is not too difficult to dismiss it as too shaky due to various circumstances and war conditions³⁹. On the one hand, means and techniques of SST data collection changed considerably during wartime. Talking about a prolonged event over a three-year period fails to give a convincing explanation from the first place. How this could have happened as it does not fit typical El Niño features wherein warm water pools move across equatorial Pacific frequently in multi year intervals?

Regarding the claim that an El Niño would have commenced in autumn 1939, this study attempts to make an altogether different claim. With the commencement of WWII, Europe's seas were turned so much about that they affected weather conditions in distant areas, too, e.g. Northern Pacific. Fresh WWII impacts could have raised the impression that certain statistical deviations have been caused by equatorial Pacific conditions. After all, in late September 1939, California was hit by the only tropical storm ever since such events have been recorded. During this month, severe land wars were fought in Europe and China, causing excessive rain in West Europe. There were thousands of naval vessels out at sea churning the seas so much that they prevented Atlantic depressions to take their common route via Central Europe.

After all this investigation, we will not refute the argument that the El Niño phenomenon from 1938/39 may have had a small share in weather making conditions during the autumn of 1939 and the winter of 1939/40 as far as heavy rain in California, Arizona and Florida, in

39 Bernaerts, A.: 'Reliability of sea-surface temperature data taken during war time in the Pacific', presented at Symposium on Resource Development, August 8-9, 1997, Hong Kong, in: PACON 97 Proceedings, pp. 240-250; Bernaerts, Arnd; „How useful are Atlantic sea-surface temperature measurements taken during World War II", paper submitted at the Oceanology International 1998 Conference, "The Global Ocean", March 10-13, 1998, Brighton/UK; in: Conference Proceedings Vol.1, pp 121-130; texts are available on: www.oceanclimate.de; and www.seaclimate.de, in section: Previous Essays

September 1939, is concerned. They have less, if anything to do with the extremely dry months of October, November and December 1939, in USA. Regarding the excessive rain in West Europe during the first four war months and concerning the closing of the pathway for westerly winds and Atlantic depression through Central Europe, nothing indicates any El Niño contribution. The subsequent arctic war winter in Northern Europe is definitely a 'Europe-made' affair, caused by navies turning the regional seas about.

(b) Rain, dryness and polar air

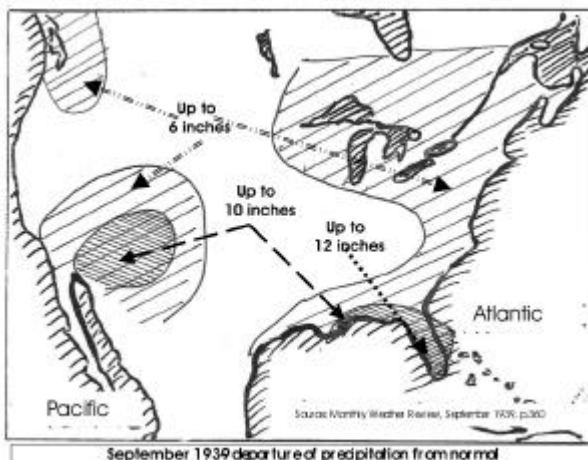
Rain or no-rain is an interesting issue in the second half of 1939, which definitely had something to do with a snowy and bitter cold in January 1940, in the United States. Physically, the issue has two aspects. Due to thinner humidity in the atmosphere during winter in the Northern Hemisphere, polar air can leave Arctic easily and expand southwards. A further aspect is the wetness of the continental soil. The war in Europe, and with a possible small contribution the war in China, had made the Northern Hemisphere dryer than usual since September 1939. This lasted until snow and frost established different conditions in December. In USA, the Weather Bureau noted that November 1939 was unusual because of its dry air (NYT, the 7th of January 1940). If a strip of land, meadows, fields, forest, and mountains received much less rain than usual over a longer period of time, the evaporation rate will be correspondingly low and, subsequently, humidity will be low, attracting the dominance of dry cold air. This mechanism produced a cold January in the States. With this general picture in mind, the correlation of above mentioned events shall be discussed by first focusing on: 'Wet Californian September', and secondly on: 'Dry US November'.

aa. Wet Californian September 1939

After only a slightly lower precipitation than normal during USA's growing season, from April until August 1939, precipitations were below normal during September, except for California and four other

States⁴⁰. Four storms affected California during this single month, causing almost four times more rain than usual, including the only tropical storm ever moving onshore, with sustained winds of 50mph on the 26th of September 1939. Can these exceptional circumstances be linked to the following four very different and interesting events?

- There was an ongoing El Niño event which reached its peak in July 1939;
- In China a war was going on, including a clash between Japanese and Russian forces, lasting from the 20th of August to the 16th of September 1939;
- A war in Europe started on 1st September saw Poland shelled, bombed and burnt down until Warsaw surrendered on 27th September 1939.
- Since war commenced, weather pattern changed in Europe from usually prevailing maritime to continental conditions, by blocking typical westerlies while, simultaneously, a 1,035mb high-pressure area between Iceland and Scotland dominated the North Atlantic from the 16th of September to the 28th of September.



It is not the intention of this study to prove whether the war influenced weather change over Northern Europe or Northern Atlantic, which can be linked to the only tropical storm ever to enter California. However, war in

40 Precipitation in percentage of normal: Calif. 370%, Ariz. 335%, Nev. 327%, N.Mex. 114% and Utha 251%.

Europe and at sea in the North Atlantic ‘fell’ on nature very suddenly. Common atmospheric and oceanic equilibrium was disrupted with extreme suddenness. In so far, it is not impossible that, at quite some distance from Europe, a tropical storm was forced to make a completely unusual move and enter the shore of Southern California.

Concerning the question whether land wars in China and Europe have influenced the intensity of rain in California, this needs to remain unanswered at this juncture. However, a connection to distant events should not be rejected outright. Humid air masses must be available to condense aerosol particles e.g. particles of dust, salt, desert sand or smoke (condensation nucleus). War machineries in Europe and China generated such stuff abundantly. If manned balloons can fly around the world at mid latitude in 10 to 20 days, condensation nuclei can certainly travel from China and Europe to East Pacific region in one or two weeks.

As an interim result, it is possible to establish that neither the interesting Californian tropical storm nor excessive rain influenced weather conditions in Europe. Vice versa, weather conditions due to war may have had generated, on their own or in combination with ongoing El Niño event of 1938/39, unique weather conditions in California during September 1939.

bb. Dry November generates cold January in USA

Wet September 1939 in California is part of a more important aspect when searching for a connection between war conditions in Europe and distant weather anomalies. The issue will demonstrate that not only the cooling of Europe’s seas caused by naval war initiated a Little Ice Age winter in Europe but that an unleashed war machinery presumably contributed to winter weather conditions in distant countries, viz. China and USA, as both experienced a bitter cold and snowy January 1940. Physical processes could have been as it follows:

- Military activities support the tendency to excessive rain due to throwing abundant condensation nuclei into the atmosphere.
- Excessive rain in Northern Hemisphere in autumn is particularly critical as it may take more days or weeks to ‘refill’ any gap (lower than usual humidity) than during summer season⁴¹.
- With lower water content in the atmosphere, cold heavy air can easily dominate the scene and this air is abundantly available in the Arctic, moving southwards if mid-latitude humid conditions are thin.

The rest of the story of the autumn 1939 is quickly told. Heavy rainfall was recorded in quick succession: in China in July, in California in September and in Western Europe during September, October and November. The result quickly became statistically visible. United States fell dry. In November 1939, USA received only 44% of usual rain, in October and December 1/3 less than the average. After three months with too little rain, soil and ground were too dry for reasonably supplying the atmosphere with humidity through evaporation. The door was open for polar air. From Mountain View, Franklin County⁴² minus 20°F (= -29°C) was already reported before mid December (NYT, the 13th of December 1939). Before the year’s end, winter came with “a biting northerly wind, driving gray, snow-laden clouds before it. Yesterday, it brought to New York its coldest day of the winter”, down to 12°F (= -11°C). (NYT, the 28th of December 1939)

41 Richard Scherhag (see reference above), who analysed disruption in circulation of air in the winter 1939/1940, states with regard to air movements that there must have been a subsequent air-body-transfer (Massentransport) from the Southern Hemisphere towards the Arctic. This remark makes it clear that ‘dry air’ could have circled the globe for some time before a ‘humidity gap’ could be refilled. It also confirms that there was a ‘humidity gap’ in the first place.

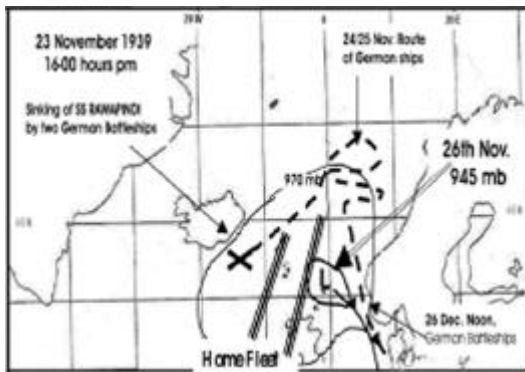
42 The New York Times presumably refers to location: Mountain View in New York State, ZIP Code 12969: Franklin County; Latitude 44° 72’ N, Longitude 74° 08’.

(c) Remaining potential contributor

From 10 events listed above, viz. July 1939 (1 - Flood in China) to January 1940 (10 - Cold USA), only three have not been mentioned and integrated in previous sections, namely: (6) November 1939 cyclone; (8) Russian-Finnish winter war; and (9) Turkey earth quake.

All three events occurred in a different area of Europe, viz. west of Scotland, high in the NE (Finland) and SE (Anatolia). Each of them had a temporary regional effect but certainly did not contribute to forthcoming Little Ice Age winter in Northern Europe. Nevertheless, their context to weather developments is quite interesting:

aa. Sinking of HMS Rawalpindi



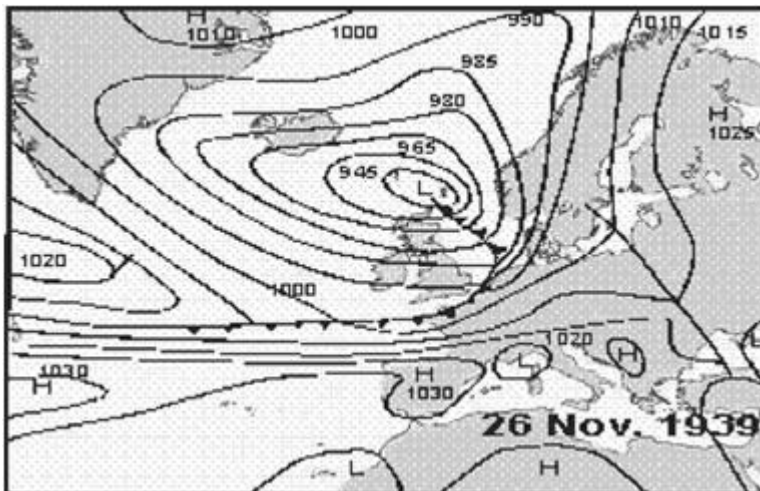
A free fall of air pressure by 50mb in 48 hours, following the first direct naval WWII high sea encounter (SE of Iceland, on the 23rd of November 1939), is interesting to study. It is just about two decades ago that meteorologists began

talking about something they called the *Butterfly Effect*. High politics was impressed and nodded agreement. The thesis suggests that, if a butterfly flaps its wings in one part of the world, it can cause a storm in another part. More precisely, the claim says that the flapping of the wings produces a tiny change in the status of the atmosphere which, over time, can result in a much larger effect elsewhere. This effect is often used in connection with “chaos theory”, which assumes that the atmosphere is fundamentally chaotic. As such, it is said that it is inherently unpredictable⁴³. Is that indeed the case? Is it really only a

43 Palmer, Tim; 'A weather eye on unpredictability', in: Hall, Nina (ed); 'Chaos - The new scientist Guide to Chaos'; London 1991; pages 69 and 74.

matter of atmosphere? Can a 15 minutes naval shelling and subsequent aggressive criss-crossing of the sea area by several dozen naval vessels produce sufficient ‘butterfly-effect’ to turn a modest low air pressure into a violent cyclone? Such situations happened again and again until 1945. The impressive 945mb depression in the aftermath of the *Rawalpindi* event is nevertheless unique as, at that time, in November 1939, the sea area between Iceland and Scotland was still in her natural virgin status. Churning about the warm Northern Atlantic produces a direct atmospheric effect. There is no need for a butterfly around, neither alive nor in theory.

bb. Red Army in Finland for winter war



Several hundred thousands of Red Army soldiers were sent to attack Finland along an 800 miles long boarder, on the 30th of November 1939, when precipitation started with fog, rain and blinding snowstorms. Many dozens Russian naval ships from the Baltic Fleets navigated and fought shelling duels with Finish forces in the Gulf of Finland and the sea area remained ice free much longer than one could have expected. Winter cold had come early.

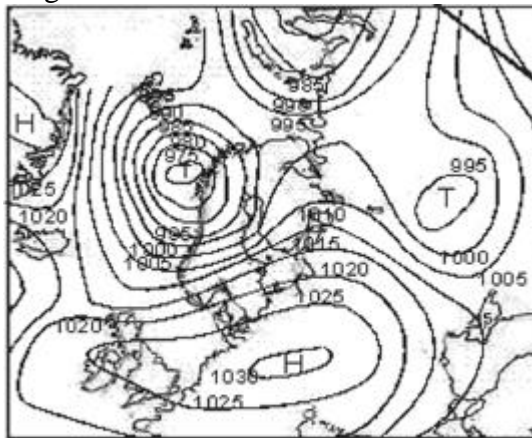
Big military land offensives of tanks, aerial bombing, battery shelling, and ground forces under permanent sunless conditions are highly likely to bring down a lot of water. The mechanism is the same as previously explained with regard to rainmaking process in Western Europe during the autumn of 1939. In winter, there will be snow, out of which much would have reached soil only 100, 200, or more Kilometers east of Finland, within the Soviet Union territory. Little if any information is available in this respect.



However, Russia was not spared of a bitter cold winter, starting in early January 1940 with the thermometer already at 31 degrees below zero Fahrenheit (-35°C) in Northern and Central Russia, which affected normal activity. (NYT, the 9th of January, 1940) Severe cold continued in Moscow. One week later, the average morning temperature had been of 49 degrees below zero Fahrenheit (-45°C). (NYT, the 18th of January 1940)

Churning of Baltic Sea by naval forces has, for sure, contributed to the severest sea icing since 1883. Nevertheless, the foundation for an arctic winter had been laid earlier and much further southerly. In other words: Northern Europe would have had an arctic winter due to naval war, as explained in previous sections, even if the Winter War in Finland had not taken place. Whether it has finally contributed to

overall winter conditions, by 5%, 10% or 15%, is a matter that still needs to be investigated.



Weather Chart December 21th,1939

cc. Earthquake in Turkey

Anatolia earthquake from the 27th of December 1939 is extremely interesting with regard to temporary weather-making, but has not made any significant contribution to the war winter of 1939/40. What is still not investigated in depth is the chain of events such as quake, Black Sea tsunami, air depression on Turkey northern seacoast (off Sinop City) and a cold wave in Yugoslavia and Italia. A tsunami-generated cyclone ‘shovelled’ cold air from Siberia westwards, as

<p>1020 mb 1025 mb</p> <p>24th December 1939</p>		<p>Two high pressure centers building up (> 1035 mb) South of Samsun, and NE of Erzican, the later earthquake region</p> <p>Central and northern Turkey (Ankara & Samsun), and Bulgaria Report minus 13°C.</p>
<p>1015 mb</p> <p>26th December 1939</p>		<p>Before the earthquake struck, extreme high air pressure center</p> <ul style="list-style-type: none"> • South of Samsun >1045mb • Near Erzican > 1050 mb <p>Snow and moderate freezing temperatures reported.</p>

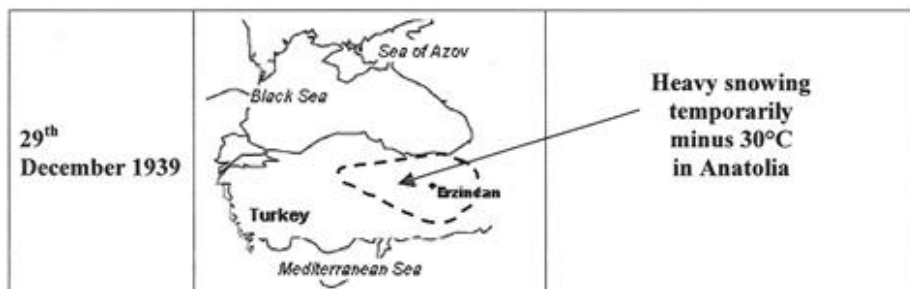
indicated by the following excerpts from newspapers

The 28th of December 1939: “A quake in Turkey was felt around the world”. “Successive aftershocks took heavy toll of life and property in Anatolia region. “Three additional tremors, sub-zero temperature (minus 17°C) and blizzard winds”; “Temperature 22 degrees below zero (minus 30°C) and strong winds from the Black Sea claimed many victims...” (NYT, the 29th of December 1939)

The 29th of December 1939: From Agram, in Yugoslavia, temperature of minus 32°C is reported. (Neue Zürcher Zeitung, the 31st of December 1939)

the 30th of December 1939: “In Naples region, an unprecedented severe snow storm today...”. “Rome’s heaviest snowfall in recorded history - six inches - made the Romans feel as New Yorkers did in the 1888 blizzard. There had been nothing closer to this since the three-day snowfall from the 16-18th of December 1846”. (NYT, the 31st of December 1939)

The 30th of December 1939: a cold wave over the Riviera. Genoa falls



of temperature rapidly, extensive snowstorm. Trieste reports heavy winter storms. Malians had -10°C . (Neue Zürcher Zeitung, the 31st of December 1939).

Summary

Which events along with naval war contributed to Europe's arctic winter of 1939/40 is a question, which needs to be answered. From 10 events listed above, none was, alone or in combination with other events, decisive enough to throw a continent back into the Little Ice Age.

By far the most interesting element is war-related rainmaking in Europe which subsequently dried-out the North American continent, in November and December 1939, and attracted polar air in USA, in January 1940. This chain of causes is an exciting experiment because, only in the autumn of 1939, atmosphere and seas from Northern Hemisphere were at a virgin state before naval war machinery changed the equilibrium of the marine environments, hundred or thousand times a day, over more than five years.

Which events along with naval war contributed to Europe's arctic winter of 1939/40? Can this question be answered comprehensively? Definitely not! Actually, each of the 10 events listed above would deserve an in-depth research supported by more facts and analysis. The war in China and the July flood; the only tropical storm going onshore in California at Long Beach, in late September, and the low air pressure cyclone in the aftermath of sinking of 16,697 tons HMS *Rawalpindi*, in late November, and, in particular, the winter war under the Arctic Circle during December. Each of the above events has tremendous potential for a better understanding of anthropogenic weather making. It seems high time for meteorology to take up the above-mentioned issues. After all, 65 years have passed since the events have occurred and each event seems to be able to contribute to climate change research. However, the arctic winter of 1939/40 in North Europe cannot be explained by any of the 10 events investigated. The first cold war winter was solely made by naval warfare in Europe's home waters.