MEDDELELSER OM GRØNLAND
UDGIVNE AF
KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND
BD. 127 · NR. 6

DANSK PEARYLAND EKSPEDITION 1947–50
LEADER: EIGIL KNUTH

REPORT FROM THE WEATHER SERVICE

BY

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WITH 20 FIGURES IN THE TEXT

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1955

INTRODUCTION

The Danish Peary Land Expedition, under the leadership of EIGIL KNUTH, wintered in Peary Land for two years, from 1948 to 1950. A preliminary expedition to Peary Land was made in the summer of 1947.

From the wintering station in Jørgen Brønlund Fjord large areas of Northern Greenland were explored, mainly on sledge journeys. As the pack-ice always blocks up the coasts of Northern Greenland, and the fjords in Peary Land are largely covered by the winter ice during the whole summer, a transport of the expedition by sea was not possible. The only possibility left was air transport by suitable airplanes and the only type that might be considered was the amphibian Catalina belonging to the Air Force of the Danish Royal Navy. The flying group was under the command of Commander in the Royal Navy OVERBYE.

During the preliminary expedition, the members were so fortunate as to find Jørgen Brønlund Fjord open, with good conditions of landing on the fjord. The question was whether this would be the case every summer, but fortunately this was so during the four summers when the aircraft of the expedition were operating in the area. For some periods the landing on the fjord was inconvenienced by ice drifting in.

The supply base of the expedition was established at Zackenberg in Northeast Greenland ($74^1/_2^\circ$ lat. N.). There the ships unloaded their cargo of all kinds of supplies, besides the large quantity of fuel needed for keeping three aircraft in regular service to Jørgen Brønlund Fjord during the summer time. The aircraft PBY–5 A Catalina used is known from the last war as a long-distance reconnaissance plane. Its all-up weight is about 16.6 tons, carrying capacity almost 2 tons, cruising speed 180 km/h, crew 5 men.

The maximum number of flying hours during a flight to Peary Land was 13.

The aircraft were well provided with navigation aids, among them also radar and radio altimeter.

The distance from Zackenberg to Jørgen Brønlund Fjord is about 1000 km, which gives a flying time of about 5 hours; by crossing the inland ice the flight may be shortened somewhat. A flight to Peary

Land and back, including unloading in Jørgen Brønlund Fjord, normally lasted 11—12 hours.

At Zackenberg a radio and weather service was established in order to secure the flights to Peary Land and Iceland. The present report contains the experiences of weather conditions during the summer time gained on the basis of the synoptic weather service conducted at Zackenberg.

The interest was in the first place directed towards the operational area itself, i. e. Northeast Greenland and Peary Land, in the second place towards the adjoining areas north of 68° lat. North. The working up of the two years' observation series from Jørgen Brønlund Fjord has been published elsewhere. The times used in this report are Greenwich Mean Time.

GEOGRAPHICAL CONDITIONS

The climate of Northern Greenland is not only conditioned by the position of the country in so high latitudes, but in particular by its extreme geographical structure. In the coastal area we find in summer a fringe of mountainous country bare of snow and with deep incised fjords, surrounded by steep, torn mountainous parts, which in the southern part of the area rise to altitudes of more than 2000 m. Behind the country bare of snow the inland ice rises evenly to altitudes of 2000—3000 m, with offshoots into the bottom of many fjords in the form of glaciers. In some places the mass of the inland ice to a greater breadth reaches right out to the coast, e. g. about 79° lat. N. on the east coast and at Melville Bugt on the west coast. Peary Land is not covered by inland ice, but there, as elsewhere, there are on all elevated mountainous parts glaciers which are without connexion with the inland ice.

Off the coast of East Greenland runs the hugest ice current of the world, which with an average breadth of 300 km in summer carries the drifting ice masses of the polar basin (the pack-ice) down along the coast. The current of the pack-ice is accompanied by the icebergs which have been broken off from the large glaciers. The icebergs may be of such an order of magnitude that an aircraft trying to pass under a low cloud layer off the coast must take into account the possible presence of icebergs.

Thus there are always a number of large icebergs stranded off Kap Brewster at the entrance to Scoresbysund.

The Inland Ice.

The inland ice is one of the largest plateaux of the earth, only surpassed by the Asiatic highlands. The climate in this ice desert is among the most unpleasant to be found on the northern hemisphere. It is the coldest place where uninterrupted observations have been made, with an annual mean temperature of —30° C. and a minimum temperature of —65°. Even in the months of summer temperatures have been measured down to —34° C. and the warmest month, July, has a mean of —14° C. These figures originate from WEGENER's wintering station "Eismitte".

In the central parts of the inland ice precipitation always comes down as snow, while in the marginal areas there may be heavy rain at high altitudes.

Because of the enormous radiation from the huge expanses of snow, we constantly find a strong inversion with a cold bottom layer a few hundred metres thick. This cold air flows like a flood from the interior down the sloping surface of the ice towards all coasts because of its gravity. The rotation of the earth is the cause of the fact that inland-ice wind is deflected to the right and arrives in Northeast Greenland as a northwesterly wind, while on the west coast it comes from the southeast.

This catabatic flow is so constant in its direction that sledge-parties on the inland ice use it for navigation. In the marginal area the force of the wind increases somewhat by night because the contrast of temperature is increased. The direction of the catabatic wind only changes if the inversion is destroyed by strong wind from incoming frontal systems. The gradient is not, however, always capable of exterminating the cold bottom layer; but if it does so the temperature promptly rises.

The Coastland.

The country bare of snow along the coast of Northeast Greenland may be divided into two climatic areas: the exterior area, closest to the coast — the maritime area, and the interior, the continental area.

On the coast and some 20—50 km into the fjords there is a constant struggle between the moist and foggy maritime air and the very dry and cloudless continental air above the interior mountainous areas. It depends completely on the geographical conditions and the prevailing gradient how far into the country this very constant sea wind is capable of penetrating.

This line may be established by direct observation of the advance of the fog; but in many cases the dividing line appears from the vegetation up the mountain sides. The species and colour of the vegetation are different in the continental climatic regime. Godthaab, which is situated on the coast, has 13 foggy days in July, while Qôrnoq farther into the fjord has 6 foggy days only.

At the foundation of air bases it is of great importance that the landing area is situated inside the range of the ice fog. Perhaps this is not always possible, as conditions of approach and landing must be considered. A certain danger may also be connected with start and landing in too narrow fjords surrounded by steep walls, particularly as regards heavily loaded and slow aircraft. It is common to find a high wind above the inversion while at the same time there is calm on the ground.

In the continental climate we find excellent weather conditions in summer, nearly cloudless with intense solar radiation, the sun being in the sky day and night in summer. The cooling by terrestrial radiation by night is, however, perceptible because of the difference in the altitude of the sun day and night. It also appears from the day and night variation of conditions of the wind. The only clouds observed during calm weather are minor amounts of cumulus-like orographic clouds above the hill-crests. Visibility in the pure air is very good, some two hundred kilometres not being uncommon.

The orographic clouds are no obstacle to aviation in the interior of the fjord area, but above the coastal mountains they may be merged with a higher stratocumulus layer already found there. Stratified clouds tend to descend on the highest mountains and make these invisible to the aircraft.

The breadth of the pack-ice varies much and is dependent on conditions of the wind over the sea. At times the ice is so widely scattered that it does not impede navigation materially; at other times it is so densely packed that the ships are able to reach land only with the greatest difficulty. Sometimes navigation to the northernmost stations on the east coast must be given up.

As the temperature above the ice-covered sea keeps near 0° C., the pack-ice in summer is covered by widely extended and continuous fog formations. The prevalent southeasterly wind brings warm and moist air in over the ice from more southerly regions and promptly creates a fog.

In July Jan Mayen has wind from the southeastern quadrant in 60 per cent. of all observations and Myggbukta even 75 per cent. Whereas the wind of Jan Mayen mainly is a gradient wind, the southeasterly wind along the coast of East Greenland is a locally determined sea wind which with great regularity blows towards the land and takes the advection fog with it into the fjords. Thus Myggbukta, which is situated quite unprotected on the coast, has a fog in 40 per cent. of all days in July-August.

It has been reported that one year there was a fog over Myggbukta almost without interruption for three weeks until a westerly wind produced a clearing.

During a wintering in 1935—36 at Scoresbysund, which is not very far from the outer coast, but still somewhat protected in a small bay, the present writer observed a fog in the colony in 16 cases, and in 179 cases a fog was visible in the fjord or the mouth of the fjord. The times of observation were 1200 and 1800.

Instead of fog, stratus is frequently developed under the inversion, which is at an altitude of about 500 metres. As the vertical extent of

the fog of the polar sea is slight, there are no difficulties in the over-flying of foggy areas, even though the fog stretches some distance into the fjords. Most of the mountains will rise above the fog and thus give good clues for flying along the coast, but the low fog may spoil the results during an ice reconnaissance.

Flying at a low altitude through stratus or fog-banks are not without risks. In most cases the consequence will be a heavy icing.

Flying Weather over Northern Greenland.

It was with some hesitation that the weather service started securing the flying operations over the coasts of Northeast Greenland and in part over the marginal area of the inland ice; but especially weather conditions over Peary Land were so little known and the weather stations so widely scattered that perhaps it would be impossible to form an idea of the development of the weather over the northern-most regions of the earth. A hint was given by the observations from the Russian expedition in the polar basin in 1937 and the meteorological flights made by the U. S. Air Force from Fairbanks to the North Pole.

In May 1926 the airship "Norge" flew from Svalbard over the North Pole to Alaska. During the flight from the North Pole the airship ran into bad weather on 86° lat. N. with a high wind and sleet, which gave a heavy icing of clear ice. On its arrival at Teller in Alaska the airship had accumulated 1 ton ice.

SVERDRUP has described pressure distribution and air masses over the Arctic Ocean. The main points of his description are as follows:

"From October to February there is in general high pressure weather, but very low pressure may occur, which moves towards the northeast from Eastern Siberia north of 75° lat. N. These frontal systems occur in an interior arctic front which in mean position goes northeast over Northeastern Siberia, is deflected towards the east with increasing latitude and continues towards the southeast over the western Canadian islands. The coldest air north of the front will in the Beaufort Sea be maritime arctic air and continental arctic air over the Canadian islands. The warmer air south of the front will in general be continental polar air. If the low pressure occurs in the Bering Strait region, the warm air will be maritime polar air. This interior arctic front is the cause of a low pressure movement from Northeastern Siberia, round Alaska to the Canadian archipelago.

In March-April the interior arctic front is very slightly developed and cases of low pressure are rare, except for slow occluded systems.

May represents a transition to the months of summer.

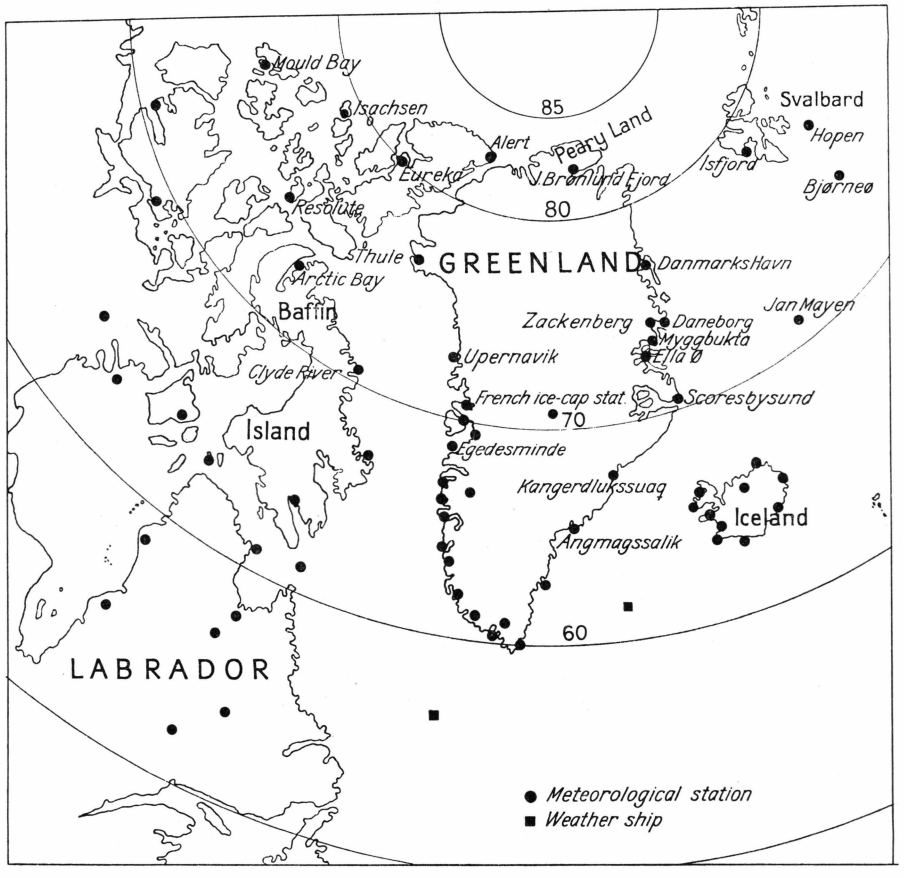

Fig. 1.

From June to August the weather is unsettled, but the depressions are generally small and weak. They seem to arise as disturbances along a more or less stationary front, known as the Pacific polar front, the mean position of which passes from Northern Siberia across the Bering Strait through Alaska and continues over Northern Canada to the neighbourhood of the Arctic Circle. The colder air north of it will be maritime arctic air or continental arctic air, and the warmer air south of the front will be maritime or continental polar air. If this front moves north low-pressure disturbances of the front will occur which will touch on the Canadian arctic coast and the islands.

September represents a transition to the winter months."

In the case of Peary Land the above-mentioned frontal zone is of the very greatest importance in summer. The frequency of the frontal attacks from the northwest over Northern Greenland are of vital importance for the success of flying operations over Northern Greenland.

Fortunately there has in recent years been a development of the observational network in the Arctics; especially the stations in the Canadian area west of Northern Greenland were of great importance. Without these observations, which we received direct from Thule, a synoptic service for Peary Land is not possible.

In good time the fronts might be plotted on the charts west of Peary Land. The Canadian stations are not, as most places in Greenland, materially influenced by local conditions because of deep fjords and high mountains, but give a correct picture of the advance of bad weather towards the east.

The centre of the depression is generally found over the Arctic Ocean, but sometimes over the islands. The latter cases apparently occur most frequently towards the end of August. A flying magnetic expedition to the Canadian arctic islands had in the last half of August to give up accomplishing its task on the northwestern part of the Melville Island because of continuous low cloud and icing. The depression on the ground goes north of Greenland; in a single case there seems to have been a calving at Thule, so that a southern centre moved down into the Melville Bugt. The fronts over the Canadian islands are oriented in the direction northeast-southwest. The weather at Thule under the influence of the frontal disturbances is very bad, with heavy precipitation and a high wind.

The supposition that the inland ice should be an obstacle to frontal and depression movements, is contradicted by the experiences we have gained. In summer and north of 70° lat. N. there is frequent passage of warm air masses over the inland ice from the west and northwest.

The pressure distribution on the inland ice, according to information from WEGENER's expedition and the French expedition, does not suggest a stationary high pressure. On the contrary Northern Greenland is in higher levels now and then covered by a widely distributed depression. The so-called "glacial anticyclone", which was first mentioned by HOBBS, is not a permanent high pressure, but only a strictly local phenomenon which only rises a few hundred metres in the air and which is due to the extraordinarily intense radiation from the surface of the ice. The regular flow-off of the katabatic wind is highly favoured by the sloping and smooth surface of the inland ice. The cold layer in the interior seems to be of a vertical extent varying from about 100 m to about 500 m. When the German airman VON GRONAU in the middle of August 1931 crossed the inland ice, it was not possible for him to get the airplane through the inversion and in the highest places he had to fly at an altitude of about 70 m, so that the aerial now and then was trailing in the snow.

Probably he flew immediately below the inversion. The crew had an impression that they were flying in a deep plate as the horizon because of reflection was raised in all directions.

For that matter, the plane was later forced to turn farther south in order to evade warm-front clouds, where a maximum temperature of —1° C. was measured.

There is no doubt that the inland ice is maintained by precipitation from warm air masses which at intervals penetrate over the ice. "Eismitte" had snowfall in 56 per cent. of all days, and there was precipitation for 2000 hours. According to measurements of the firn layers from 21 years the accumulation should be 30 cm a year. Above the inland ice weather reports sent every half hour from aircraft on their way to Peary Land have frequently told about the situation and advance of the fronts. In the pure air the pilots may survey a very large area of the inland ice and report on sheer object lessons of increasing frontal clouds. These go right down to the ice as a milk-white veil with virgae.

On its arrival in East Greenland the front is so greatly weakened that it only consists of cirrus and altostratus clouds, sometimes accompanied by a little rain. A final outbreak of cold air may, however, be accompanied by a low ceiling and showery precipitation of snow.

The cloud ceiling and changes of pressure are normally observed at the coastal stations, while a change of wind behind the front towards the west or northwest on the ground completely depends on the intensity of the front—whether it is strong enough to break the inversion near the ground. A weak front is unable to sweep the cold bottom layer away; it may at most produce a few gusts of wind from the northwest during the passage. In such cases only cirrostratus is seen to pass the station, while at the same time we get a downward indentation in the barograph curve.

The greatest prefrontal pressure fall occurs in the Ella Ø area, where as a rule a local depression develops during the passage. Ella Ø may even get transitory forces of the wind up to 35 knots; the same may happen along the coast. While the low pressure near the ground disappears north of Greenland, an extensive low pressure over Northern Greenland may appear in the high altitudes.

Above Peary Land and down to 79° lat. N. the passage of the front takes place in a different way. There we get no appreciable diminishing of the frontal activity because of the lower altitudes over the northern part of the inland ice and Peary Land.

While south of 79° lat. N. (Norske Øer) there are no appreciable difficulties for flying when the fronts come from the northwest or west, a flight in the front northwards may be associated with such inconveniences as high-reaching masses of cloud, heavy rain, and icing.

The radiosonde soundings show a mass of warm air with subsequent cooling and change of wind in the height.

If Jørgen Brøndlund Fjord reports a closed cloud ceiling at an altitude of 2000 m after passage of the front, it is most probable that low clouds with precipitation still cover the northeast bend and the entrance to Danmark Fjord and Independence Fjord. Such a medium cloud layer is observed as a low ceiling if an aircraft flies over the land. As the plane rises over the inland ice the clouds come down near the ground. After a passage of a front over the coast, the local depression at Ella Ø is soon filled in and a general pressure rise sets in, although often of short duration until the fall from the next disturbance begins. After passage of a series of fronts there is finally a high pressure which develops above the Canadian islands and slowly crosses Northern Greenland and later passes to the Greenland Sea with its centre east of Danmarks Havn. From there it slowly moves south and may give rise to lengthy formations of fog along the coast and far into all fjords. An example is shown in fig. 18.

In fig. 16 is shown an example of a disturbance from due west, where the front and the depression have gone direct on to the west coast from Baffin Island. While the upper part of the front continues across the ice, the cloud masses of the ground front remain along the west coast and produce bad weather for some time. In summer fronts from that direction are very weak on their arrival in East Greenland because the transition has taken place over the highest parts of the inland ice. Such a front is, however, sufficient to spoil a mapping flight, for which an absolute cloudless state up to an altitude of 4000 metres is required.

Northeast Greenland gets the worst flying weather from the well-known track of low pressure across Iceland to Northern Norway and Svalbard. Only in these cases does the coast in summer get a wind which attains to gale force. See fig. 6.

Fig. 7 shows a situation in which a depression has become stationary east of Svalbard, through which the cyclonal air current carries a strange air mass round the depression up over the Arctic Sea and down towards Peary Land and Northeast Greenland. Many clouds and some precipitation may be expected along the coast, heavier precipitation over the sea, broken by transitory clearings. Especially the eastern part of Peary Land will get bad conditions of the weather during such a period.

Foehn.

The katabatic wind which in summer is weaker, only reaches the head of the fjords as a moderate nightly wind. Perhaps it may now and then get beyond the coast over the inversion in the fjords. There are

signs of this in the observations of the upper winds in the layer from 500 to 1500 metres.

The start of a stronger outbreak of the inland-ice wind, the foehn gale, is effected by powers off the coast. This gale seems to be started when an intensified pressure gradient coincides with the direction of the flow of the katabatic wind. Local geographical conditions completely decide in what places and how far out into the fjords the foehn gale is active. The dangerous thing about the foehn gale is that it may at short notice and with violent force rush down into the heads of the fjords. Fjords which are direct connected with the inland ice and are oriented in a northwestern-southeastern direction seem especially exposed to sudden foehn gales.

In another respect such a geographical orientation is unfortunate for flying operations as the foggy maritime air can more easily push in.

Most foehn gales starting at the heads of the fjords do not reach the coast, while other foehn gales blow above the cold bottom layer and pass beyond the coastal mountains. One observes the characteristic foehn clouds hanging over the coastal area, gigantic, menacing lenticular clouds, three or four on top of each other.

In winter there may be perfect calm near the ground, while a hurricane may be heard thundering ahead a few hundred metres in the air.

That the foehn gale can reach a good distance beyond the coast appears from the observations from the station on the east side of Shannon Ø (75° 20′ lat. N.) secretly established by the Germans during World War II. Between the 20th and the 22th of February 1944 a foehn storm was blowing during which the temperature jumped from −32° C. to +8.4° and the winter ice broke up. Shannon Ø is a relatively flat island situated 40 km from the mainland and 150 km from the inland ice[1].

Experiences from flights over the coast of East Greenland during outbreaks of foehn winds show that aircraft must be advised not to fly into or near lenticular clouds. The aircraft may be exposed to violent turbulent actions.

In a report it is stated that even a flat and innocently looking lenticular cloud in the proximity of which the plane was flying, produced so violent a turbulence that the plane was in danger of being lost.

Zackenberg

is situated at 74° 28′ lat. N. and 20° 38′ long. W.; altitude 3 metres. The base is situated at the head of Young Sund or 40 km from the outer

[1] In April 1944 the station was discovered and attacked by the Danish sledge patrol and on the 3rd of June a Ju-290 landed on the firn ice south of Kap Sussi and took the Germans off.

coast; 25 km southeast of Zackenberg is the weather station Daneborg. From Zackenberg a narrow fjord, the Tyrolerfjord, which is a continuation of Young Sund, runs west and northwest to the inland ice, which begins 70 km inland. The base is sheltered from westerly winds by the 1470 m high mountain after which the place is named. Westerly winds were measured near the ground as southwesterly or northwesterly. This drawback of local conditions of the wind is known from most Greenland stations. A certain experience and a carefully prepared report on the development of weather conditions will be of great use for the working meteorologist.

Zackenberg belongs to the maritime climatic regime open as it is towards the coast with easy access for the advection fog.

The sea wind from the southeastern quadrant begins between 0600 and 0900 and is prevalent until 2100, after which calm or wind from westerly directions is most frequent until morning.

A great part of the fog in the place is, however, radiation fog, which begins about midnight and lasts until the middle of the morning.

In such cases the fog arose as stratus under the inversion or as low fog-banks in the extensive valley above Zackenberg.

The Tyrolerfjord remained without fog in most cases and must be considered as belonging to the continental climate, apart from the outermost part.

The upper wind blows from all directions, also over the inland ice. In summer the northwesterly upper wind is prevalent and may blow with a considerable force, while under the inversion at an altitude of 500 metres a sea wind is blowing from the southeast.

Frequent measurements of the upper winds are an important part of the prognostic work. The presence of the inversion in bright weather can easily be observed by means of the small masses of cloud hanging up the mountain sides immediately under the inversion. Zackenberg is not sheltered from low clouds and rain from depressions passing along the coast. The masses of cloud from depression activity pass a good distance in over the inland ice, as appeared from observations from the margin of the inland ice made by three glaciologists who were associated with the Expedition.

In 76 days the Zackenberg base was closed for 290 hours because of bad flying weather, the longest period lasting without interruption for three whole days, furthermore about 48 hours because of pack ice drifting in.

The lowest pressure measured was 995.0 mb and the highest 1021.2 mb. The absolute maximum temperature was 16.4° C. and the minimum —1.1°. The lowest relative humidity was 25 per cent.

The fjord ice in Young Sund breaks up about the 22nd of July.

The Ella Ø Base.

The weather service of the Peary Land expedition had an opportunity to work at Ella Ø for 17 days at the end of August 1950, while the flying photo reconnaissance expedition of the Geodetic Institute, under the leadership of Lieutenant Colonel HELK, made extensive photo reconnaissance flights from there.

Ella Ø, the position of which is at 72° 54′ lat. N. and 24° 55′ long. W., is a markedly continental base. It is situated 100 km from the outer coast and is well protected by a number of large islands, which reach altitudes of 1800—1900 metres. The 6 km broad Kempes Fjord leads to the inland ice, on the way being divided into three small fjords. The distance from Ella Ø to the inland ice is 100 km.

Ella Ø has long been known as one of the best sea bases in East Greenland as regards the weather. The base is situated in a small bay on the north side of the island in front of a more than 1000 m high mountain wall which shelters the station from southerly winds.

The sea wind, which has its maximum about 1800 comes in through Sofia Sund, Vega Sund, and Kong Oscars Fjord, but is deflected and measured at the base as wind between north and east.

54 of the 128 observations in August recorded sea wind, 22 westerly winds, and 49 calm. Westerly winds were most frequent from midnight to 1200, after which the sea wind set in. In spite of the regular sea wind the sea fog did not reach the base, but was often carried in at Sofia Sund and covered a zone over Ruths Ø and Maria Ø, 13 km northeast of the station, in part as a stratus layer below the inversion.

As described in fig. 18 Ella Ø is covered by fog only in definite synoptic situations, and it may be considered that there are some few periods of fog every summer, each of 20—30 hours.

At frontal disturbance from the south, the altitude of the clouds remains 800—1000 metres, light rain with good visibility. The coastal mountains and the entrances to the fjords on the other hand are completely covered by clouds and approach to Ella Ø from the coast may be difficult without radio aids.

During the 17 days when the weather service was working there, the base was closed because of fog for 53 hours; furthermore approach from the coast was closed for another about 15 hours.

The highest pressure measured was 1030.6 mb, the lowest 993.2 mb. The absolute maximum temperature was 12.2° and the minimum 2.9° C. The lowest relative humidity was 41 per cent. The pack-ice does not reach Ella Ø; only single icebergs may drift down over the landing area. The fjord ice at Ella Ø breaks up at about 10/7 and continuous fjordice returns about 20/10.

Fig. 2. Peary Land. Right background the icebound Independence Fjord. In the middle, to the right of the airplane's engine, the ice-free Jørgen Brønlund Fjord. Geodætisk Institut. Copyright.

Jørgen Brønlund Fjord.

The station, the position of which is 82° 10′ lat. N. and 30° 30′ long. W., is situated on the southern side of the 50 km long Jørgen Brønlund Fjord, which is a branch of Independence Fjord. The distance from the outer coast in the north, west, and east is about 200 km, and to the inland ice a little more than 100 km.

From its head Jørgen Brønlund Fjord continues westwards in deep extended valleys and through J. P. Kochs Fjord is connected with Lincoln Hav.

Almost only two directions of the wind are measured. They are conditioned by the local geographic conditions: out of or into the fjord. The west is prevalent and has a considerable force; calm is rare. The west wind, connected with the outlet of a fairly large river at the head

of the fjord, is the cause of the fact that Jørgen Brønlund Fjord keeps ice-free in summer. Moist maritime air from the sea in the east rarely reaches the fjord, even at easterly winds. The wind system is of a local character, and the west wind is nearly always a foehn wind, which together with the low annual precipitation gives the area a desert-like appearance. The wind erosion on the ground is very intense; the stones are polished by the sand-drift; but above 400—500 metres there is no wind erosion. This observation tells about a pronounced inversion, and at the same altitude as elsewhere in the Arctics.

Those who have wintered in Peary Land have noticed that a strong westerly wind may be prevalent near the ground, while light winds occur above the inversion.

Even if the local winds are predominant, passages of fronts are distinct enough in summer. It was intended to provide the station with equipment for observing upper winds in 1949; but this was not flown up there because of the late time of the year.

The Changes of the Inversion.

The observations were made onboard the S/S. "Godthaab" on her way through the pack-ice off the coast of Northeast Greenland. While the ship, which is stoked with coal, lay off Kong Oscars Fjord, it was possible to see the smoke from her funnel whenever the boiler was stoked, settle beautifully in the inversion. Fig. 3 shows the distribution of the

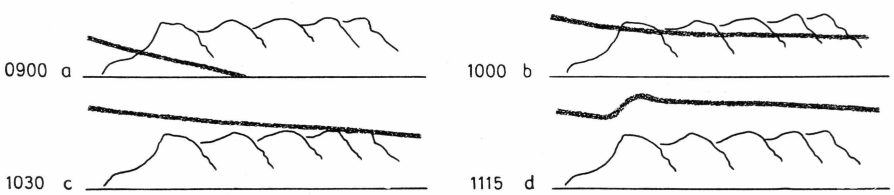

Fig. 3.

smoke particles in the inversion, as seen towards the south in front of the projecting Canning Land and Liverpool Land.

The observation 16/7 1949 at 0900 shows that the cold air under the inversion during the night had been pushed to the outer coast by warmer continental air. At 1000 the inversion rose because of the increase of the sea wind and penetrated into the fjord. At 1030 o'clock the inversion had risen higher and at 1115 a hump on the inversion had formed on the coast. Probably because the sea wind at this time had become higher and had struck an orographic obstacle.

Conditions of the weather were changing, an increasing sheet of cirrus and altostratus appeared in the northwest, later a little rain, and a rainbow was visible above the land towards the northwest. The next morning the coast lay in a cold continental air mass and the inversion showed a picture as indicated in fig. 4, where a cold-front-like structure of the inversion is seen.

On 19/7 1950 at 1700, while the ship was icebound in the pack-ice 5 miles southeast of Kap Parry, the contours of the inversion appeared as shown in fig. 5, as seen towards the north. The surface wind was southerly, 5—8 knots, while the upper wind was northerly, observed from 6/8 altocumulus at 2000 metres. In this case a very distinct mirage

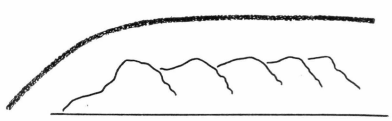

Fig. 4.

Fig. 5.

was observed during a lengthy period, through which the country round Hold with Hope and Franklin Ø became twice as high as in actual fact. Mirages are common along East Greenland, and what is seen is a reflected image of the object put on top of the original. Sailors are of opinion that mirages predict fog, which may very well be imagined, as these phenomena arise when the inversion is intensified and a greater contrast of temperature develops.

In this case the fine weather was replaced by overcast and snow early the following morning, which later passed into light rain after a transitory clearing in the morning. The surface wind had now turned to the north, 5—10 knots.

Movement of Depression from the South.

The normal depression track in summer ranges from the Icelandic area by way of Jan Mayen to the sea between Northern Norway and Svalbard and thus does not give bad flying weather in the northern part of Northeast Greenland. Apart from the fact that outbreaks of continental air behind the depression centre may produce a high foehn wind and locally may make landing and start difficult in the places in question.

Scoresbysund generally gets rain and a low cloud ceiling, while Ella Ø and Zackenberg only get high or medium clouds.

But in cases when a persistent high pressure is found over England and Scandinavia, the depressions with their fronts are forced into a

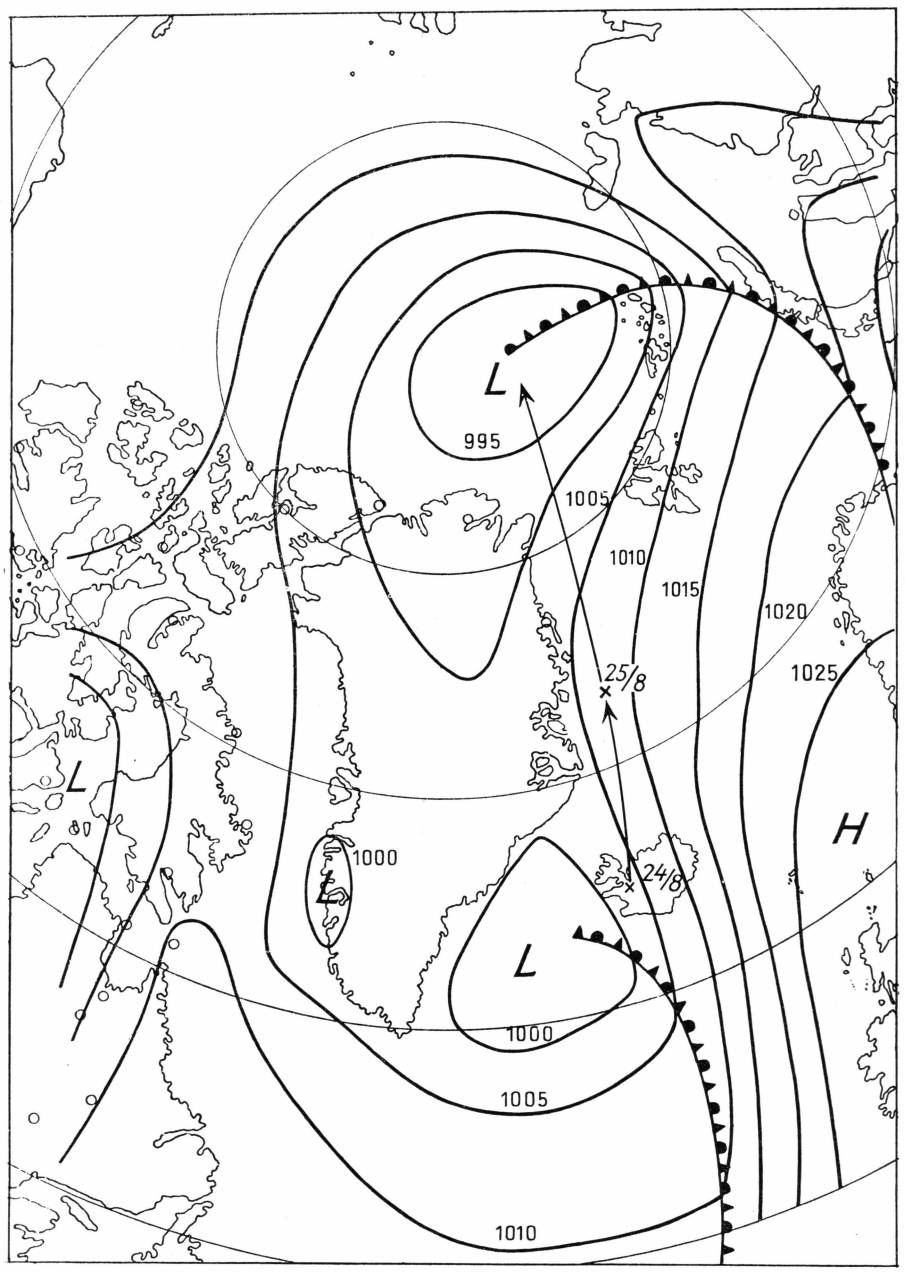
L
995
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Fig. 6.

northern track close to the east coast of Greenland and disappear over the North Pole.

Fig. 6 shows a case from 1937 with a northern depression track. The Russian expedition made regular observations and was then close to the North Pole on 20° long. West.

Fig. 6 is from USWB Daily Series Synoptic Weather Maps.

The same situation occurred on 25—28 July, 1948. After a prolonged waiting time in Iceland with the aircraft of the Peary Land Expedition because the pack-ice was still found at Zackenberg, it was reported that the landing area had become ice-free. But now it was impossible to carry through the flight in the, according to summer conditions, very bad weather along the coast in those days. Heavy rain with poor visibility and wind forces of 35—45 knots were common. The lowest pressure was observed in the depression centre at Jan Mayen,—988 mb.

With good weather charts it will not give any difficulty to see that a depression is approaching from the North Atlantic and by means of the upper air flow to determine its track.

In a situation like the one mentioned above there will be good reason to consider issuing a gale warning to Danish ships which are in exposed places near the coast or in the pack-ice.

The depression may remain stationary in the Danmarksstrædet, while the occlusion continues moving north and passes Scoresby Sund. A high pressure in the Greenland Sea is quickly built up or intensified; the northeastern gradient is intensified and stops the frontal movement and after a short time sends it back southwards. We then get a passage from the north in Scoresby Sund of the same front and may have a low cloud ceiling and rain along the coast to Angmagssalik for several days, while the coast from Kong Oskars Fjord northwards has fine weather.

Frontal Disturbances from the Northeast 29/7—10/8 1949.

On 29/7 there was a high pressure over the whole of Greenland and a depression between Svalbard and Novaya Zemlya. An airplane on its return flight from Peary Land reported in the early morning: stratified cirrostratus in the direction northeast to east. During the day Danmarks Havn was overcast with cirrostratus and altostratus after several days of cloudless weather; the pressure was unsettled. At 1200 o'clock a cold front passed through with cooling in the high altitudes. Near the ground the wind sprang up from calm to northwest 15 knots, and the temperature rose from 2° C. to 7° C. because of the foehn effect. At 1800 there was a calm again and 4° C.

On 30/7 the slight disturbance passed Zackenberg from the northeast with an increasing sheet of cirrostratus with parhelia and falling

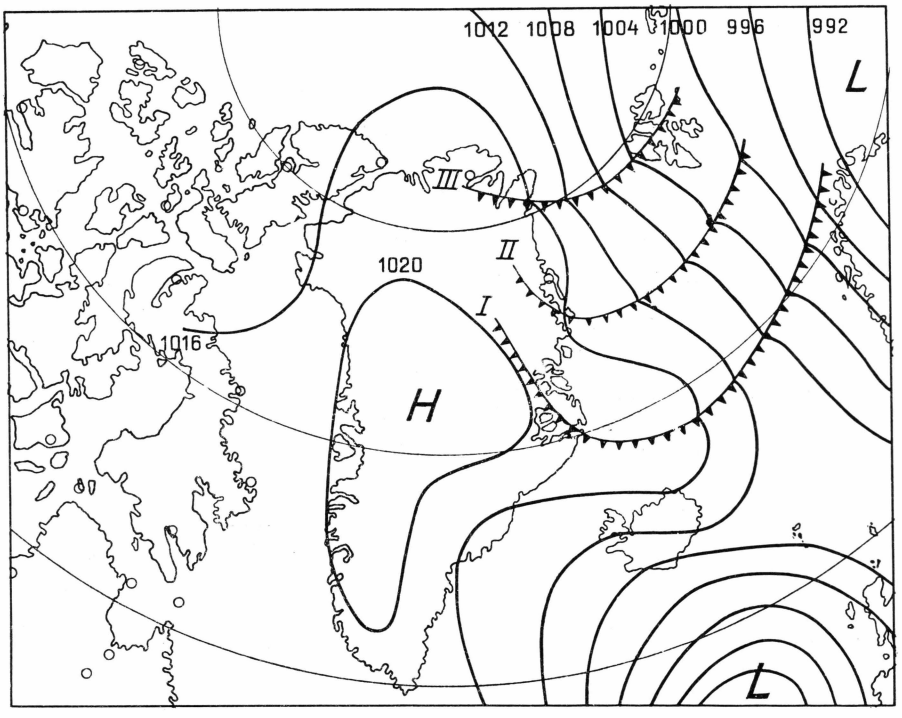

Fig. 7.

pressure. After the passage there was a rise in pressure; the sea wind subsided and there was a calm broken by gusts of wind from west-north-west. The humidity fell from 86 per cent. to 47 per cent., and the temperature rose to 13° C. from 8° C. the preceding day.

During the following days it was fine flying weather in the area. The northern gradient in the Greenland Sea was reinforced considerably, so that a plane achieved a record for the fastest home flight from Peary Land, viz. 3 hours 35 minutes. Isfjord in Svalbard on 1/8 had had a front passage. The pressure fell from Peary Land along Northeast Greenland; masses of cloud had been observed from the air over the sea in the north.

On 3/8 0300 a plane from 79° lat. N. reported: a coldfront-like system of cloud stretches from east-south-east to north-north-west over the sea (front 1). See fig. 7.

The upper wind in Danmarks Havn veers from the north to the west in the morning; the same happens at Daneborg in the afternoon.

Front 1 passed Jørgen Brønlund Fjord at 2100 o'clock after preceding overcast sky and rain from 1200. Behind the front, clearing.

In the evening of the same day a plane on its way to Peary Land reported having passed through front 1.

77° lat. N.: horizon clear over the inland ice.

79° lat. N.: the coast cloudless to 79° lat. N. 7/8 altocumulus over the inland ice, in places precipitation in the northeast, the cloud bank moving at a good rate towards the southeast.

80.5° lat. N.: 8/8 altocumulus at an altitude of 7000 feet.

81° lat. N.: 6/8 altocumulus at 6000 feet, Hagen Fjord covered by fog, the weather obviously fine over Peary Land.

82° lat. N.: Cold front from Lambert Land to Jørgen Brønlund Fjord, altitude of cloud ceiling 6000 feet with patches at 5000 feet, top presumably not above 8000 feet, visibility good below the clouds, bright weather behind the front. Considerable drop of temperature behind the front. Landing in 10 minutes.

On 4/8 there was again a change of wind from southeast to west in Jørgen Brønlund Fjord; it was front 2 that was passing. See fig. 8. Then the weather was bad with rain or drizzle until the passage of front 3 on 5/8.

The first cold front passed Danmarks Havn between 1200 and 1500 on 4/8. The radiosonde indicated a sharp frontal inversion with a cooling of 6° C., the upper wind veering towards the northwest.

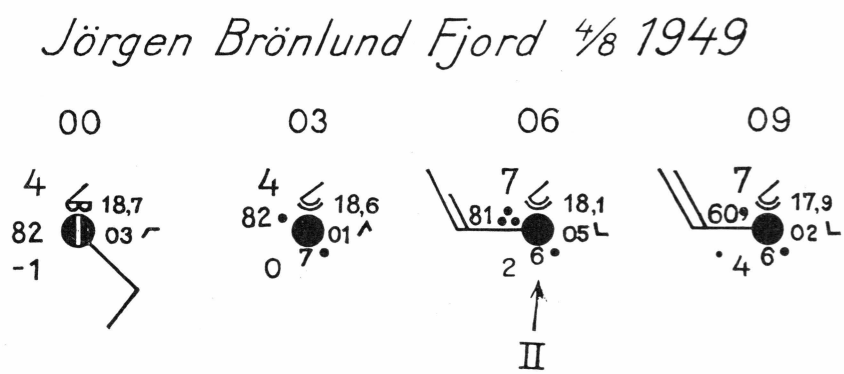

Fig. 8.

The same front passed through Zackenberg between 1600 and 1800. Overcast at 1500 metres, increasing pressure, dew-point temperature dropping from 4.4° C in the morning to 0.6° C. at 1600; the temperature rose one or two degrees. See fig. 9.

Cold front 1 passed through Scoresbysund on 5/8 in the morning; the ascent was a copy of the radiosonde in Danmarks Havn during the passage of the same front there. Cold front 2 passed Danmarks Havn about midnight on 5/8; before the front overcast and rain, southeasterly

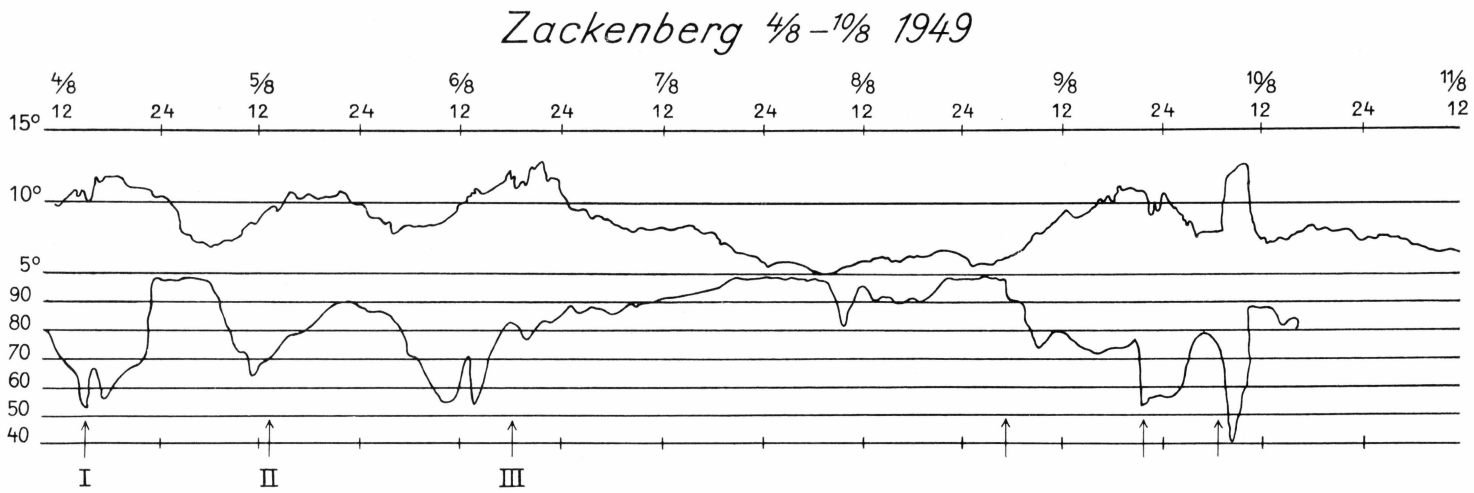
Zackenberg 4/8 – 10/8 1949
4/8 5/8 6/8 7/8 8/8 9/8 10/8 11/8
12 24 12 24 12 24 12 24 12 24 12 24 12 24 12
15°
10°
5°
90
80
70
60
50
40
I
II
III

Fig. 9.

wind, falling pressure, temperature 4° C. Behind the front transient clearing, rising pressure, the wind veering to the north, temperature 7° C.

Cold front 2 passed through Zackenberg about 1500 and cold front 3 on 6/8 at 1800. The rain stopped in Jørgen Brønlund Fjord at 0900 (front 3), while there was a passage at Isfjord (front 3) and heavy prefrontal rain at Hopen (front 2).

Besides, several frontal disturbances passed during the following days, accompanied by rain and many clouds. There had been no flying since 3/8. On 9/8 in the evening a plane attempted a start northwards in order to look at the weather conditions, as the sky was completely bright in Jørgen Brønlund Fjord. The situation was the same as the preceding days with a depression in Northern Norway and a northerly gradient in the Greenland Sea and over Northeast Greenland. The plane reported:

74.5° lat. N.: temperature 9° C., 6/8 high and medium clouds.

76° lat. N.: temperature 1° C., 7/8 altostratus and stratus, in the south cirrostratus. The temperature suddenly dropped at our passage under a cloud ceiling; heavy precipitation to the east.

76.7° lat. N.: in the north 8/8 stratus at 3100 feet, in the south a little higher; return to base.

The return flight was made in the cold front at 2156 a little south of Danmarks Havn, where the front had passed at 1900. The surface wind changed from northwest 10 knots to north 20 knots; there was a high increase in pressure.

According to the measurements of temperature and a single radiosonde ascent from Danmarks Havn, there seemed to be a warm front ahead. This warm front, indeed, had passed through Danmarks Havn earlier in the day, viz. at 0300, Zackenberg at 0730, and Myggbukta about 1200. The cold front passed Zackenberg at 2200 and Myggbukta 10/8 0300.

At the passage in the area of the base we got prefrontal rain from the warm front, overcast with altostratus, below 6/8 stratocumulus at 1500 m, on the coast down to 300 m. Temperature/dew-point temperature 6/4° C., which after the passage of the warm front rose to 12°/7°, and the low clouds disappeared, and 6—8/8 cirrus and altocumulus were left. The pressure again fell from 1500 o'clock in advance of the cold front. The temperature on the top of the Zackenberg mountain rose in the warm air from negative degrees C. to 2° C. and behind the cold front it dropped again to negative degrees.

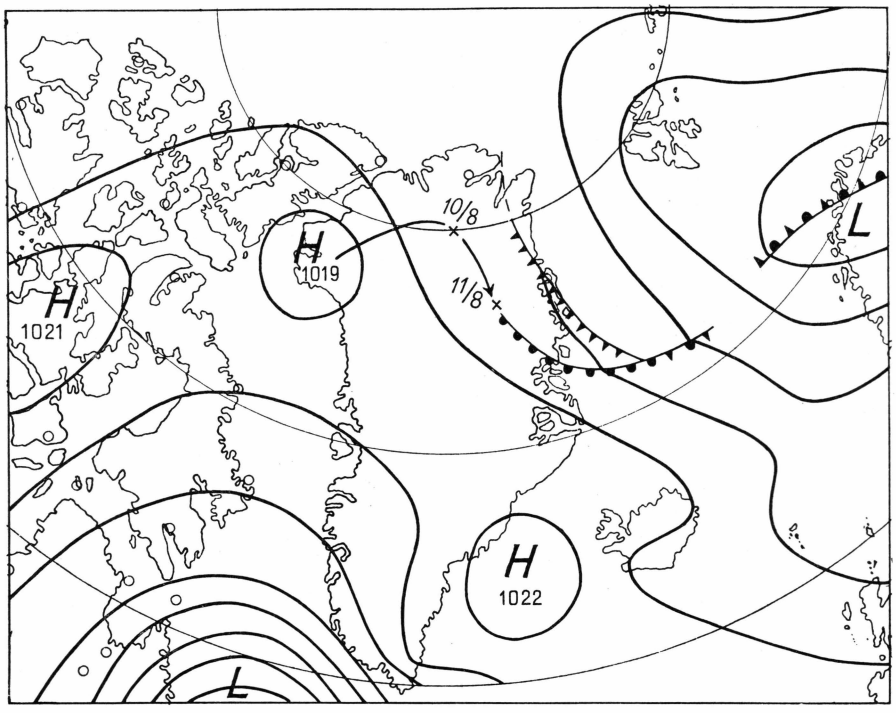

Fig. 10.

At the passage of the cold front at Zackenberg the wind changed from calm to westerly wind 20 knots, at Daneborg to north-north-east 35 knots.

Both Danmarks Havn and Myggbukta had cumulus clouds in the air masses behind the cold front. See fig. 10.

On 10/8 in the morning Zackenberg had an outbreak of foehn wind with a relative humidity of 40 per cent. and a rise in temperature of 5° C. See fig. 9.

In Scoresbysund the cold front passed on 11/8 at 1200 o'clock with increasing pressure and a cloudless sky after the front. The ascent at 1500 showed a considerably colder mass of air.

In the evening of 11/8 three airplanes left for Peary Land, conditions of the weather now being good. A high pressure was shifting from Northern Greenland beyond the coast of Northeastern Greenland and a ridge of high pressure had replaced the depression east of Svalbard. On 12/8 the gradient to high altitudes was slight and variable.

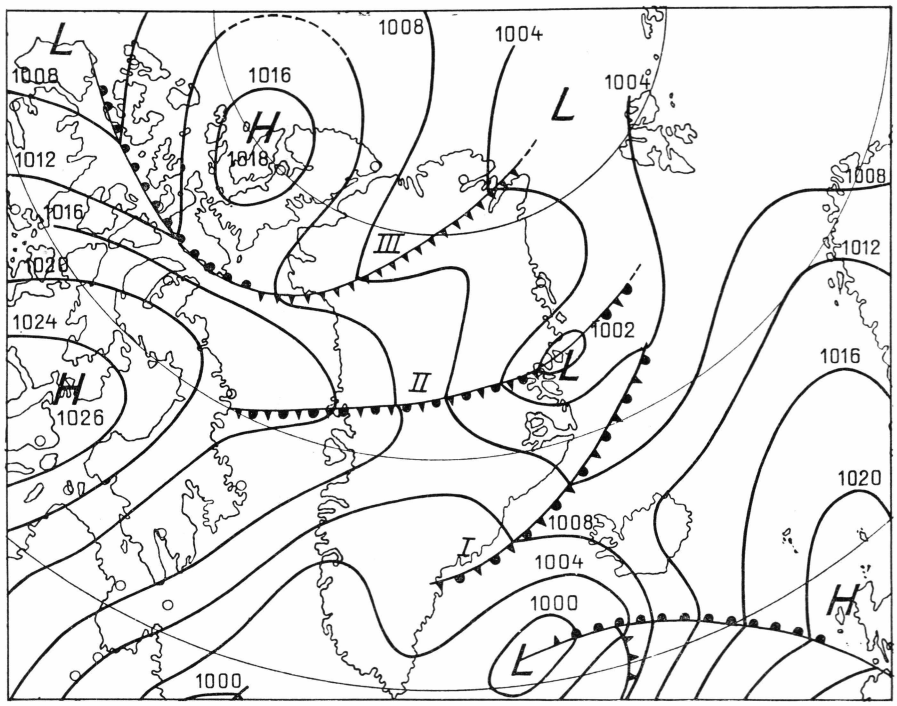

Fig. 11.

Frontal Disturbances from the Northwest 16/8—18/8 1949.

While for some time there had been no disturbances in the Arctic Ocean and Northern Canada, from where Peary Land most frequently gets bad weather, we then got a period with a depression over Northern Greenland.

Front 1 (occlusion) passed Jørgen Brønlund Fjord at 1200 o'clock on 16/8; overcast and rain from thick altostratus clouds.

An airplane during a flight to Peary Land reported: cloudless over Northeast Greenland, increasing cirrostratus and altostratus in the west and northwest.

At 1503 the plane reported: over Amdrup Land and the FynskeAlper 8/8 stratus at 4500 feet, above scattered cirrus, from 81° lat. N. 4/8 at 5000 feet, over the mountains in the west only cirrus. From 81.9° lat. N. a bright sky with scattered altocumulus in the west, some cirrus above.

The airplane passed the front again on its way south. A note from Jørgen Brønlund Fjord states that the clouds passed over the station in an easterly direction.

A strong front had passed Moult Bay early in the morning with a great fall in pressure and a zone of rain (front 2). At 1800 o'clock front 2 had passed Isachsen Island. See fig. 11.

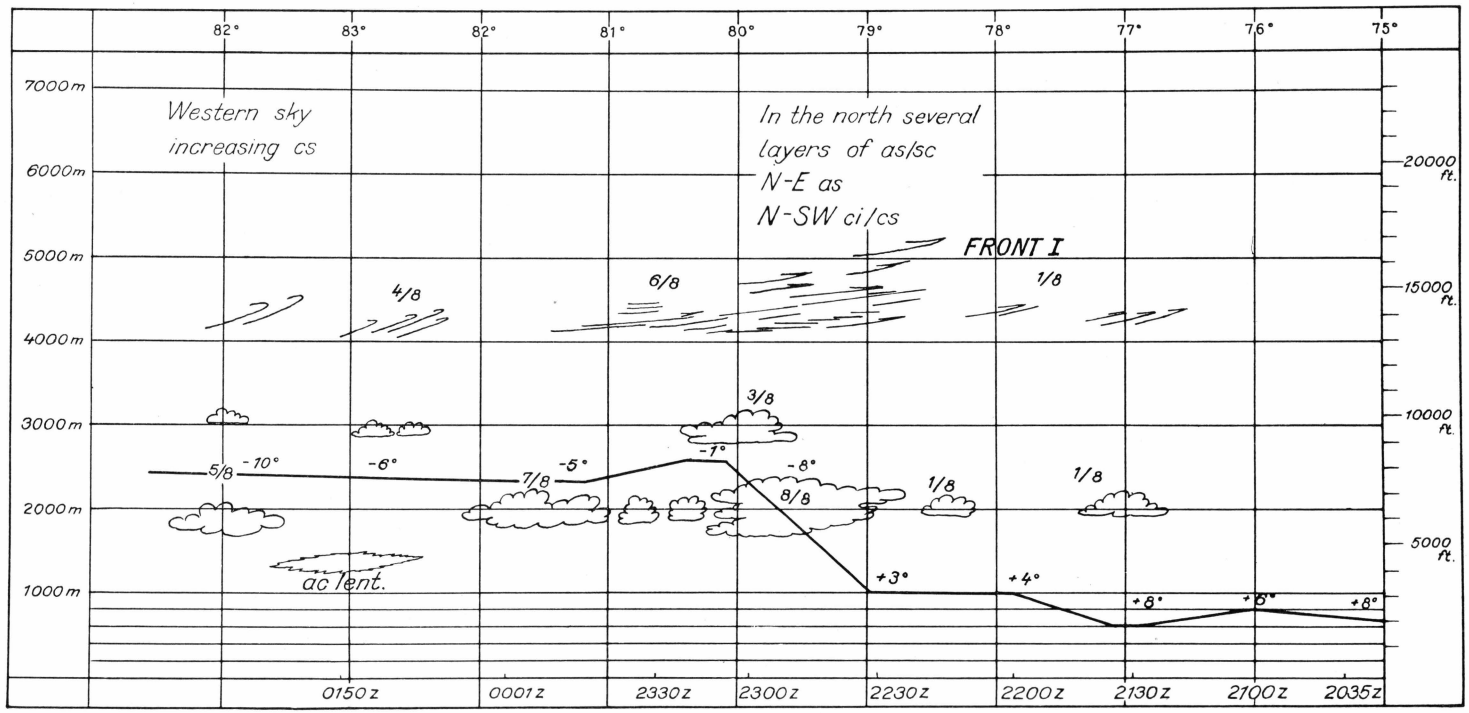
82°
83°
82°
81°
80°
79°
78°
77°
76°
75°
7000m
6000m
5000m
4000m
3000m
2000m
1000m
20000 ft.
15000 ft.
10000 ft.
5000 ft.
Western sky
increasing cs
In the north several
layers of as/sc
N-E as
N-SW ci/cs
FRONT I
4/8
6/8
1/8
3/8
5/8
-10°
-6°
7/8
-5°
-1°
-8°
8/8
1/8
1/8
ac lent.
+3°
+4°
+8°
+8°
+8°
0150z
0001z
2330z
2300z
2230z
2200z
2130z
2100z
2035z

Fig. 12.

On the same day at 2000 o'clock a second airplane started north for reconnaissance and dropping of containers over Peary Land, and then landing in Jørgen Brønlund Fjord. The forecast for Peary Land ran as follows: the rise in pressure and the clearance over Peary Land are only temporary; the new disturbance will assert itself about midnight with rain, poor visibility, and thick layers of cloud.

On its way north the plane passed front 1 at 2300 o'clock about 79° lat. N. See section of this flight in fig. 12. According to the tempera-

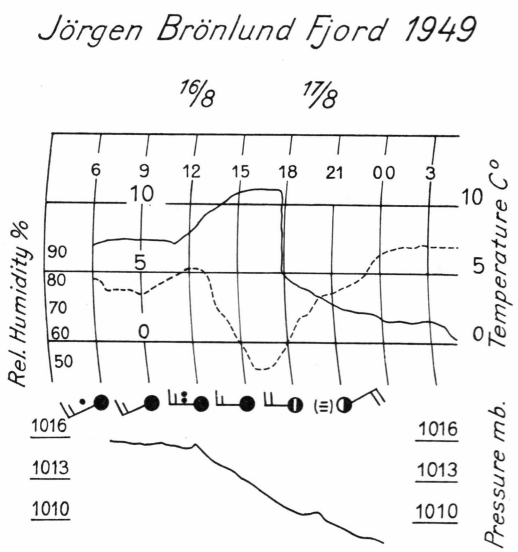

Fig. 13.

tures recorded by the plane it seems that front 1 was an occlusion; later, at the return flight the same conditions of temperature were observed.

On 17/8 at 0200 o'clock the base at Jørgen Brønlund Fjord was closed with increasing cloud and fog in fjords and valleys, and conditions remained bad until 21/8. The second airplane did not succeed in reaching Jørgen Brønlund Fjord before the fog set in. During the following days Jørgen Brønlund Fjord had continuously easterly wind near the ground, which was due to the fact that the depression had passed into Northern Greenland from the Arctic Ocean and given Peary Land an easterly gradient. This was in agreement with the upper wind in Thule, where northeast was recorded at all altitudes on 19/8. In fig. 13 the front passage at 1200 o'clock is clearly seen, and the maritime air which entered when the wind changed into the east at 1800 o'clock.

The second front passed Thule on 17/8 at 1200 o'clock after a preceding heavy rain; the wind southeasterly 25 knots. No real clearing

and change of the wind were observed because front 3 (cold front) was on its way to Thule. Fig. 11.

Front 3, the cold front, passed Isachsen Island at 1200 o'clock, which got a northwesterly wind and rise in pressure. At 1800 front 3 had passed Eureka Sound, where the wind veered to northwest 25 knots, from overcast and rain to 3/8 cumulus. The temperature/dew-point changed from 9°/3° to 3°/—5° C.

Front 1 passed Danmarks Havn on 17/8 at 0600 o'clock; weak, the clouds broken altostratus/altocumulus; the pressure falling, then steady; the surface wind from calm to northwesterly. Later cloudless sky and falling pressure; the wind veered to the southwest because of front 2, which was on its way from the northwest.

The upper wind was between west and northwest, which at 1500 o'clock changed to the southwest before front 2.

Front 1 passed Zackenberg-Daneborg at 1800 o'clock; the clouds only a little cirrus; the dew-point temperature dropped from —0.5° to —1.5° C.

The upper wind at Daneborg, which at 0400 was northwesterly 15 knots freshened at 1500 to south 30—35 knots. Besides to the proximity of the front this was presumably also due to the fact that a depression was developing in the Ella Ø area. This development of a depression is a rule at a front passage coming over the inland ice. Ella Ø at 1200 o'clock reported westerly wind 35 knots near the ground; temperature/dew-point 11°/—1° C.

Front 1 passed Scoresbysund after midnight 18/8, after advection of warm air in the high altitudes, his ascent now showed good cooling. At Jan Mayen front 1 passed through in the morning; overcast at 100—200 m and rain; at 1200 o'clock clearing to 1/8 cumulus.

Front 1 passed Kangerdlugssuaq between 1700 and 1800 with wind forces up to 45 knots and a drop of 11° C. in dew-point temperature. Fig. 14.

The sky was practically cloudless both before and after the passage. It is typical of stations in deep fjords with broken shore-lines, when a frontal disturbance is a little west of the station, that the wind suddenly increases to gale force from the coast into the fjord.

Front 2 passed Zackenberg at 0400 o'clock on 18/8 with altostratus clouds and rise in pressure. The temperature for a short period rose by 4° C.

The upper wind at Daneborg showed the same conditions as during the passage of front 1.

On the west coast front 2 had passed through Upernavik after midnight with overcast sky and rain and change of the wind to the northeast; then a great decrease in pressure again and prefrontal wind because

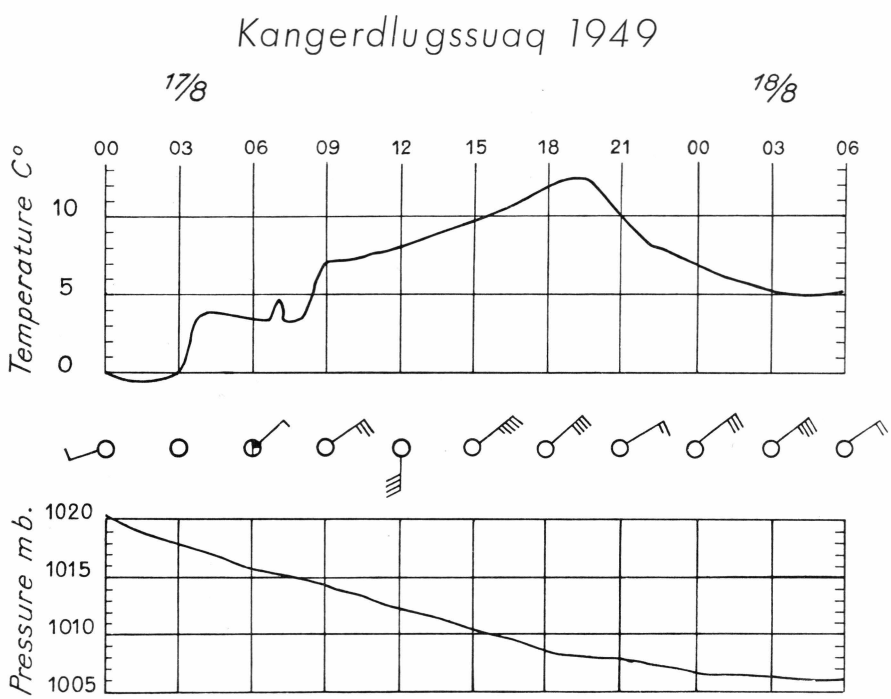

Fig. 14.

of front 3. The cold front, front 3, passed Thule about 0900 o'clock. The upper wind veered to north-north-west 40 knots. The cold front, front 3, passed through Upernavik in the evening.

Warm Air over the Inland Ice from the West 12/8—18/8 1950.

On 12/8 the weather was fine over Northern Greenland after passage of a depression with fronts from the south.

Depression over the Canadian Islands at 980 mb with a southeasterly direction accompanied by heavy snowfall in places. The gradient along Northeast Greenland between northwest and west. The ascent from Scoresbysund showed intense cooling of the continental air. In the high altitudes there was a deep depression west of the Canadian islands, and the gradient over the central parts of Greenland in the course of the afternoon become southwesterly.

On 13/8 the ascent from Scoresbysund showed a great advection of warm air with a rise in temperature of 8° C. at 3000 m; the upper wind had changed to a direction between southwest and west at high altitudes. Increasing cirrostratus and fall in pressure along the coast in the afternoon. From Ella Ø an increasing sheet of fibrous cirrus was

Fig. 15. 13/8 1950 at 4000 metres. Increasing frontal clouds over the ice-cap. Looking westward from the east coast of Greenland.
Geodætisk Institut. Copyright.

observed to approach from the west. On the west coast the depression had moved down near Upernavik, and the west coast was overcast with rain but showed increasing pressure.

An observation over the interior of Scoresbysund at 4000 m: a frontal increasing sheet of fibrous cirrus can be seen in the southwest over the inland ice, the direction of the front northwest—southwest, moving towards the northeast; inversion established at 4000 m. See photo fig. 15.

The French station on the inland ice all the day had overcast with snow, the surface wind was southwesterly while the ordinary katabatic wind was southeasterly; the temperature had risen. The upper front passed Ella Ø between 2000 and 2100 o'clock; then rise in pressure along the coast.

On 14/8 the sky was almost cloudless; there was increasing pressure over Northeast Greenland, but otherwise the pressure was low over the whole of Greenland.

In the night of 15/8 the inland ice station had heavy snowfall and falling pressure. During a mapping flight from Ella Ø to Danmarks Havn (altitude 4000 m) it was reported: front over the inland ice from 75° lat. N. southwards, direction northwest—southeast, wind at 4000 m southwesterly. The ascent from Danmarks Havn indicated advection of warm air; the upper wind from Daneborg was from west-south-west. The pressure was falling from Danmarks Havn southwards, while a high increase had set in on the west coast.

At 1800 o'clock the station on the inland ice reported: clearing after snow; pressure falling, then rising; wind west-north-west; temperature falling.

The passage of the upper front took place at Ella Ø about 2100 o'clock; almost overcast with medium clouds, which approached from the west; pressure rising. A small local depression can be recorded over the Scoresby Sund.

On 16/8 there was a good increase in pressure along the whole of East Greenland. A high pressure developed over Northern Greenland. In the morning a heavy fall in pressure set in in West Greenland, particularly around Disko.

The ascent from Egedesminde at 1500 o'clock showed a well developed warm front west of and close to the station; the warm front indeed passed at 1900 o'clock. At midnight the warm front passed Upernavik and on 17/8 at 0300 the cold front passed the same station with heavy rain and a surface wind of 61 knots. At the same time the front passed Thule as occlusion; from there it passed towards the northwest between the weather stations Eureka Sound and Isachsen Island. At 0300 o'clock the French station on the inland ice reported overcast with snow and change of the wind towards the south. The temperature, which the preceding day was —24° C. during the day rose to —4° C. The warm air seems to have reached the station at 1200, the wind veering to the southwest, and there was a fog for some hours. In the morning at 0600 the fall in pressure began in the wedge of high pressure along Northeast Greenland. In the evening the greatest fall in pressure was at Danmarks Havn; the disturbance had a northeasterly direction, and the depression near the ground was north of Greenland. At 1800 o'clock an increasing sheet of cirrostratus was observed west of Ella Ø from an altitude of 4000 m; farther south it was turning towards the southwest. At 1830 the upper front passed Ella Ø, an increasing sheet of fibrous cirrus approached from the west. The pressure ceased falling and passed straight on. The measurement of the upper wind at Daneborg at 1500 indicated

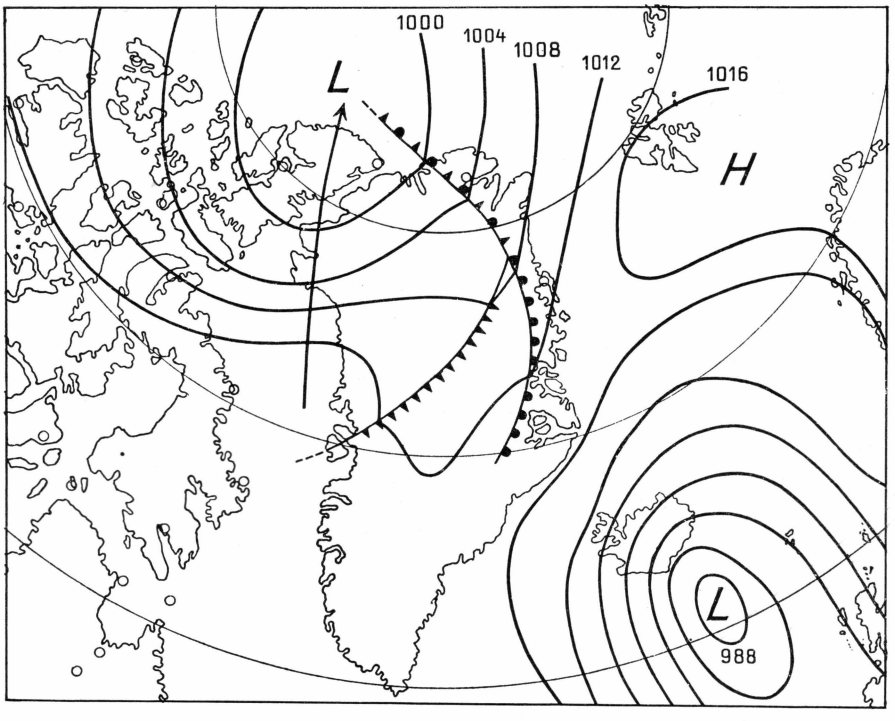

Fig. 16.

250° and from Ella Ø at 2130 after the passage, calm until the inversion at 600—700 m; above that, 300°. See fig. 16.

Fig. 17 shows the recording from the mountain Bastionen at an altitude of about 1200 m. The normal fall in temperature at that time of the day was interrupted by an increase on the arrival of the warm front, and the increase was further speeded up, because of a foehn effect, after the arrival of the cold air from a direction between west and northwest.

Danmarks Havn got the warm air in the high altitude in the morning at the same time as the fall in pressure near the ground; between the ascents at 0300 and 1500 o'clock the temperature had increased by 5—6° C., and the freezing level from 700 m to 2500 m.

On 18/8 the cold continental air passed in over Northern Greenland with high increases in pressure. The fog which during the preceding days had prevailed along the coast was cleared away. Increases in temperature from negative degrees C. to 4° because of the foehn effect. Towards the evening there was a high pressure over Northeast Greenland with cloudless weather. The ascent from Danmarks Havn recorded a cooling at 500 mb of 8° C. The ascent from Scoresbysund was influenced by the current from the depression between Scotland and Iceland, but at 0900

the station also had a high increase in pressure after a fall, and then clearing. The French station had clearing, normal katabatic wind and a fall in temperature to – 20° C. At 0300 Egedesminde recorded a change of wind and the arrival of air from the colder Davisstrædet, but this process only took place below the ground inversion; the station only got cold air into the high altitude during the night.

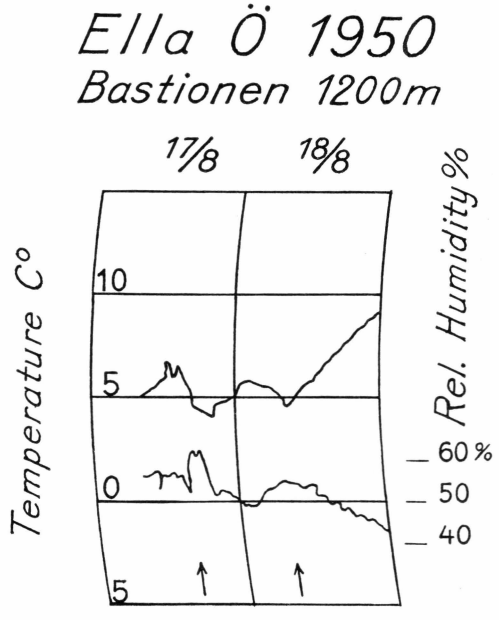

Fig. 17.

Continuous Fog in Northeast Greenland 20/8—24/8 1950.

The example fig. 18 shows a case in which the gradient wind has the same direction as the daily sea wind from the southeast along the coast in summer. We have then a persistent fog, prevailing for several days, independently of the time passing before the gradient again changes from easterly to westerly.

Generally the sea wind blows the moist maritime air into the mouths of the fjords during the afternoon and fog develops from about midnight until the morning. But in this situation the fog is pressed far into the deepest fjords and prevents flying for a prolonged time. Even Ella Ø gets a fog. Otherwise it is one of the very best air bases in Greenland as regards the weather.

After frontal passage from the west over the inland ice a protracted high pressure had on 20/8 developed from Scoresbysund to Danmarks

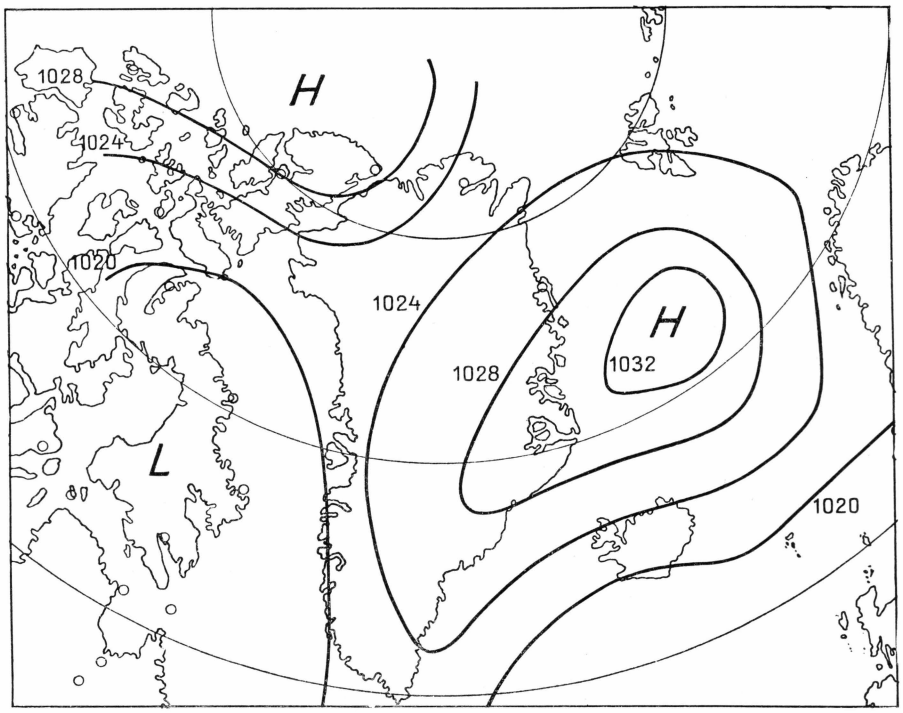

Fig. 18.

Havn. The whole coast was situated in a continental mass of air with a cloudless sky.

On 23/8 all stations reported dense fog except Danmarks Havn. The centre of the high pressure had moved towards the southeast and was then near Jan Mayen. Danmarks Havn was north of the high pressure with a westerly to southwesterly gradient, i. e. wind from the inland ice, a cloudless sky and a visibility of 150 km.

Zackenberg-Daneborg cleared up and there was a cloudless sky when the high pressure during the day moved farther south and the gradient changed from an easterly to a westerly direction.

At 0600 o'clock the base at Ella Ø was closed because of fog. Fog banks or stripes of raised fog, which normally by the daily sea wind is pressed in through Vega Sund and Sofia Sund and are visible from Ella Ø, but by no means prevent air operations in the Ella Ø area, already the preceding day were more widely distributed than usual.

The westerly gradient moved south and appeared at Ella Ø on 24/8 at 1130, when the inversion was torn by a gusty westerly wind. The fog then quickly disappeared out of the fjords. A few hours later, calm was measured by a balloon to the inversion at 500 m; above that,

westerly wind. The development of the temperature in the lowest layers was measured by airplane. Here, too, the inversion was found at 500 m.

In the Scoresbysund area the fog remained during the following days, as the westerly gradient did not reach so far when the high pressure stopped and moved a little northwards. A report from an airplane on 22/8 stated that low fog filled the whole of the Scoresbysund and all its ramifications; above the fog there were stratocumulus clouds, which on the margin of the inland ice changed into a roll cloud. Presumably the meeting-place of the continental and the maritime air.

At the passage of the high-pressure axis in Ella Ø the humidity fell by 10 per cent. and the temperature by 4° C. measured at the top of the mountain Bastionen at an altitude of about 1200 m. This happened at 1600 o'clock, thus $5^1/_2$ hours before than at the surface of the sea. Fog at Ella Ø only appears in the situation described here, and during the summer months we must reckon with two periods, each of 20—30 hours.

Fine weather in Northeast Greenland in summer in a high-pressure situation is conditioned by the fact that the centre is situated above the inland ice or south of 70° lat. N.

Frontal Disturbances from the Northwest to 27/7 to 2/8 1950.

On 27/7 the situation was as follows: High pressure from Svalbard to Northeast Greenland, depression south of Iceland and north of Canada in the Arctic Sea. High pressure south of Thule.

The Zackenberg base had been closed because of fog since midnight the preceding day. At 1200 o'clock there was a clearing to almost cloudless. The cause of the clearing was a slight frontal disturbance from the northwest, which had passed Jørgen Brønlund Fjord on 25/7 and Danmarks Havn on 26/7, when the fog disappeared after the wind had changed to a fresh northwesterly.

The gradient at Zackenberg calm or light westerly; at the passage the wind veered to the north and the clearing appeared promptly. Three airplanes started for Peary Land.

Front 3 distinctly passed the recently founded station Alert in the evening.

On 28/7 the situation was fairly the same as on the preceding day, only that the high pressure in the Greenland Sea and that south of Thule had been merged so that there was a zone of high pressure across Northern Greenland. Front 3 passed Thule in the morning of 29/7 with rain and low clouds. A closer examination showed that front 3 was a warm occlusion, while front 4, which might be drawn in over northernmost Canada, was a cold occlusion. As the considerably warmer mass

of air between the two occlusions, was to be considered a warm sector, the fronts are termed respectively warm and cold in what follows.

On 29/7 the cold front (front 4) passed through Alert between 0300 and 0600 o'clock. Before the front south-south-east wind 30 knots, overcast and falling pressure. Behind the front change of the wind to the northeast 15 knots, high increase in pressure and fall of temper-

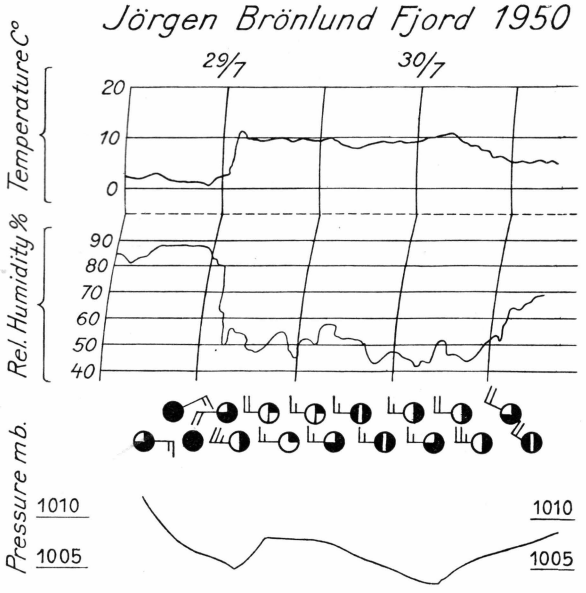

Fig. 19.

ature, almost cloudless sky. The same front passed Resolute Bay at 1800 o'clock.

The warm front passed Jørgen Brønlund Fjord at 1400, when the wind from calm increased to west 26 knots; rise in temperature from 3° C. to 10° C. Overcast with medium clouds decreased to 4/8 and a sudden increase in pressure occurred. Fig. 19.

The centre of the depression was somewhere in the Arctic Ocean north or northeast of Greenland. The high pressure across the inland ice had divided with a centre between Norway and Jan Mayen and another west of Disko. The decrease in pressure along Northeast Greenland set in towards the evening; the warm front was crossing the inland ice. Especially the pressure in the Ella Ø area was falling, which empirically indicates the development of a later depression in the Ella Ø area.

On 30/7 at 1800 the cold front passed Thule with prefrontal heavy rain and visibility down to 3 km, the wind southeasterly; after the passage veering to the northwest, increase in pressure and clearing.

The temperature decreased highly from the ground to higher altitudes, while the freezing level in the warm mass of air was at 2000 m, it was now at 770 m. A measurement of the upper wind at 6000 m in the warm and the cold air showed 240°/58 knots and 300°/30 knots, respectively.

Upernavik reported overcast and rain the whole day of 31/7.

On 31/7 at 0600 the warm front passed Danmarks Havn with increasing clouds; the wind sprang up from calm to light westerly. The upper wind, which had been light and variable, was westerly. The temperature near the ground rose to 10° C. The pressure increased slowly; only at the passage of the cold front at midnight a higher increase occurred; the surface wind changed to the northwest; there was a little rain but later clearing to 3/8 cumulus.

At Zackenberg there was passage of the warm front at 0700 o'clock on 31/7 the same conditions of the upper winds were observed as at Danmarks Havn. From 2100 the preceding day observations from Zackenberg showed an increasing sheet of cirrostratus clouds coming from the northwest, and during the passage medium clouds and no precipitation. According to conditions in summer there was a fair decrease in pressure before the front, behind it steady or slightly increasing. In the warm sector there was no surface wind, only a light breeze now and then from directions between north and west.

The temperature rose greatly, reaching 16.4°, which is the highest temperature measured in Zackenberg; it was felt to be quite tropical. In the evening increasing medium and low clouds from the northwest with virgae were observed: the cold front was approaching.

A report from the air off Kap Rink at 2130 o'clock stated: There is a zone of altocumulus/altostratus along the coast and then in a northeasterly direction; rain in places. The clouds cease on the margin of the inland ice, sunshine farther west with scattered altocumulus.

During a flight to Ella Ø and back again in the evening before the cold front it was reported: over land cirrus/cirrostratus at about 17000 feet, increases in density; over the inland ice it seems to be merged with a milky white layer which is merged with horizon and ice. The frontal clouds are in a direction northeast—southwest with a more westerly turn from Ella Ø.

A third plane on its way to Reykjavik reported passage of the warm front at 1500 o'clock.

At 1800 a depression over Ella Ø might be recorded. Fig. 20.

On 1/8 at 0200 the cold front passed Zackenberg with overcast and rain. Above the freezing level the mountains became completely white because of the first snowfall. During the passage itself the wind

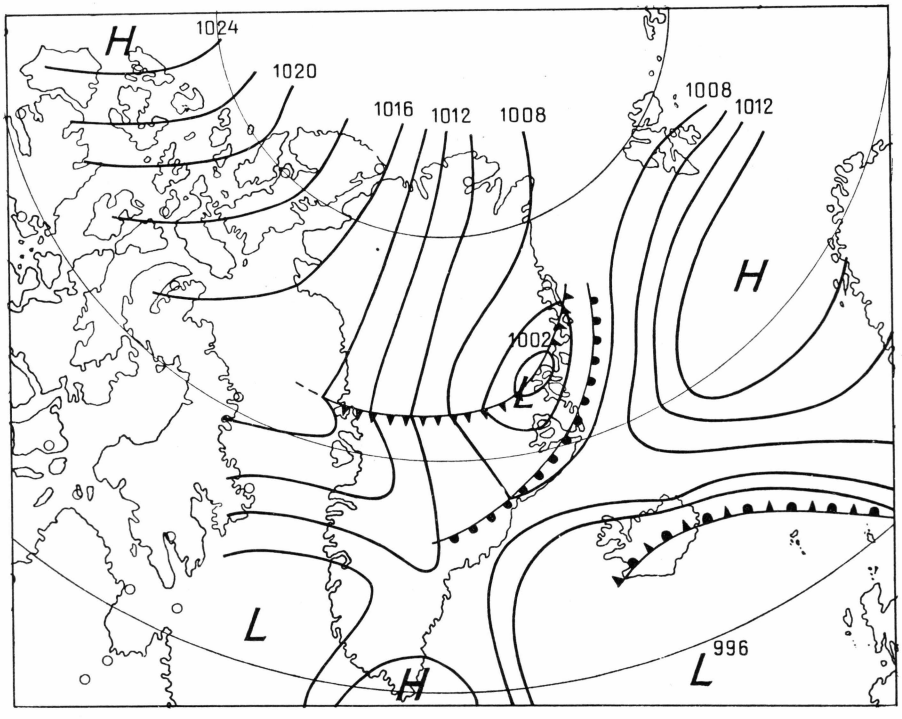

Fig. 20.

very suddenly, after several periods of calm, sprang up to 330°/20 knots and a high increase in pressure and fall in temperature set in.

A few hours before the arrival of the front the wind freshened greatly from the east—on the coast to gale force. In that period a water-spout phenomenon was observed over the coastal mountains: rows of dark, vertical funnel-shaped clouds without any visible connexion with the overlying cloud layer, appeared from an altitude of about 1200 m almost down to the ground.

At 1200 the pressure increased highly along the whole of Northeast Greenland and the local depression west of Scoresbysund was filled in; during this Ella Ø registered southwesterly wind 35 knots. Both Scoresbysund and Jan Mayen apparently had a front passage. On Svalbard the pressure was falling and it was raining.

While the gradient on 30/7 from Danmarks Havn southwards to Kap Farvel was between the northeast and the east because of the central cyclone south of Iceland, it became westerly from the morning of 31/7 from Daneborg northwards; in Scoresbysund the upper wind had veered to the southeast.

In the morning Kangerdlugssuaq and Angmagssalik had northeasterly wind, but already at 1500 o'clock Kangerdlukssuaq had a change

of wind to the northwest in the high altitudes. Already during 1/8 there was a change from westerly—northwesterly to a southwesterly gradient at all East Greenland stations. The depression in the high altitudes from a position northwest of Thule had moved in over the northern part of the inland ice; hence the southwesterly gradient, and hence Northeast Greenland got a clearing of short duration only. In the evening the fall of pressure began along the coast; the new mass of air from the southwest produced very bad conditions of the weather with sleet and snow for several days. The Zackenberg base was closed during the whole of 2/8. At the French station on the inland ice a high increase in temperature was observed on 31/7, with a fall of pressure and an overcast with high clouds. On 1/8 this station had overcast with low clouds and snowfall, which continued for several days. There was no passage of cold air from the northwest because the southwesterly gradient strengthened and became predominant.

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Færdig fra trykkeriet den 10. juni 1955.