SVALBARD WATERS

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Preface.

The present paper deals with the oceanographic observations made by the Swedish-Norwegian Svalbard Expedition 1931, under the conduct of Professor HANS W:SON AHLMANN.

I am very much indebted to Professor Ahlmann for giving me the leadership of the sea-party and free disposition of the "Quest" during most of the summer.

My best thanks are presented to Captain LUDOLF SCHJELDERUP, whose knowledge of the areas traversed and skillful ice-navigation was of dominant importance for the researches, and to Mr. LUDVIG ROSENBAUM, the cartographer of the expedition, whose energic and interested assistance never failed.

I also wish to express my thanks to Professor BJØRN HELLAND-HANSEN, for leaving at my disposal some unpublished observations from the "Ringsæl" 1912, the "Blaafjeld" 1923 and the "Hisø" 1929.

Important parts of the instrumental equipment was loaned to the expedition by *Det Geofysiske Institutt*, Bergen. Professor J. BJERKNES has made it possible for me to carry out the present work.

Det Geofysiske Institutt, Bergen, October 1937.

I. Researches.

On June 17, 1931, at 2^h in the morning the "Quest" left Tromsø, bound for Svalbard.[1] After calling at Green Harbour and Advent Bay on June 21, for fetching the dogs for the sledge journey, we proceeded northwards along the west coast of Spitsbergen (cf. map Fig. 1). In the night 23—24, the first hydrographic station was taken near Moffen Island, and some more stations were obtained on the way to Murchison Bay, which was reached in the afternoon on June 24. One of the crew was suddenly taken ill and it was necessary to bring him to the hospital in Advent Bay, but already in the afternoon on June 28, we returned to the basis station "Sveanor" in Murchison Bay. On June 30, in the morning we arrived at Wahlenberg Bay, searching for a suited start place for the sledge party. On July 2, Dr. AHLMANN and his two companions started with two sledges, and early the next morning we left Wahlenberg Bay and took stations 6—10 in Hinlopen Strait. Landing was undertaken at Cape Torell and at Smith Island for geological and botanical work. Next day we took stations 11—15 and returned to Sveanor at 22^h. On Sunday 5, the sea party left Sveanor at 17^h and anchored at station A in Hinlopen Strait at about 400 m depth for current measurements. After more than 24 hours' current measurements at different depths the station was interrupted. This was probably the first time that current measurements with modern instruments were made from an anchored ship in the Arctic. At the anchor station the serial observations of temperature and salinity were repeated about every 3 hours.

On July 7, we stopped for 6 hours at Waigatt Island for a small repair of the machine and in the

[1] Svalbard or the Svalbard Archipelago, which came within the sovereignty of Norway in 1920, includes all islands between 74 and 81° Lat. N and between 10 and 35° Long. E. Note the names of the following islands (cf. map Fig. 1): Spitsbergen or Vest-Spitsbergen, Nordostlandet (Northeast Land), Storøya (Great Island) and Kvitøya (the former Giles' White Island).

afternoon stations 17 and 18 were taken off Cape Mohn, while the position of a spot near the cape was determined by the cartographer, who ascended the glacier. Next day at 19^h we were between Storøya and Cape Leigh Smith, the easternmost point of Nordostlandet. Here we made some current measurements when the "Quest" was moored to an ice-floe (station B). Next day at noon we landed on the northern end of Storøya and I mounted a stick for readings of the tidal variations; the readings are given in Table 6, p. 48. A couple of days were devoted for works ashore. On July 12—13, current measurements could be made from the vessel, anchored at 18 m depth (station C), while the works ashore were carried on. Afterwards a visit was paid to the southern end of the island. On July 14, in the morning we left Storøya, going eastwards, and took stations 21—25. At midnight we landed on Kvitøya, near the camping place of ANDRÉE at the south-western end of the island. As the direct reading of the tidal variations was a tedious work and would require one man ashore, I constructed a registering apparatus by means of an ordinary clockwork and the primitive material available onboard. This apparatus was mounted ashore, and appeared to functionate satisfactorily. The necessary work was spent at erecting a monument for Andrée, Strindberg and Fraenkel, who died here in 1897. On 17, we landed on the north-eastern point of the island and mounted the tidal recorder here. As the ice was suddenly observed to approach very quickly, we had to leave the instrument with the registration ashore, and the short series obtained was lost. A new visit was now paid to the Andrée camp, where the cartographic work was finished.

On July 19, at noon we left Kvitøya taking a section towards west-south-west (stations 26—28). The next day two stations were taken south of the island, and at last we started on a section from the east coast towards Victoria Island (stations 31—37). We anchored south of Victoria Island, but no landing was tried, because the dense fog made astronomical observations impossible. On July 22, we went towards the north-east, bound for Franz Joseph Land, and took stations 38—43. We then anchored at about 200 m depth for current measurements (station D). These were carried on for more than 30 hours, and the hydrographic series station 43 was repeated as stations 43 A—K. On 24, in the morning the measurements were interrupted and the section was continued (stations 44—46). Fog, wind and the difficulty of obtaining a correct log when going in the ice, explains why the section was not extended nearer towards the coast. As no land was sighted, the section was interrupted and after some time we entered Cambridge Channel in the forenoon of July 25. We anchored off Cape Nansen (station 47) and landed. Next day we found a better sheltered place farther east (station 48) and finally on 27, "Quest" was driven into the bay-ice in a third place (station 49), where cleansing of the boilers was undertaken. At this time the German airship "Graf Zeppelin" met with the Russian ice-breaker "Malygin", and in the afternoon she made a bend of her route to salute us before proceeding northwards. Also here the cartographer went ashore for measurements. Immediately after midnight 28—29, we left this place and took stations 50—51 in Cambridge Channel. Early next morning we left Cambridge Channel through an opening to the north, not given in the former maps. After numerous soundings in bad weather, with snow and heavy fog, we were again in the open sea and could start towards the west. As no ice was sighted to the north, we proceeded towards north-west until station 58, which was taken in latitude 81° 17′ N and longitude 42° 22′ E, the northernmost point of the voyage (July 31).

During the whole voyage we were in wireless contact with Sveanor, and we had heard that the sledge journey across the inland ice of Nordostlandet had been successfully carried out on July 18. According to the plan, the whole expedition should visit some of the fjords in Svalbard before returning, and although no ice was sighted to the north from station 58, we turned towards south-west, towards Kvitøya. We took stations 59—69 and a series of soundings near Kvitøya and then turned towards Foyn Island north of Nordostlandet. On August 3, we lay moored to an ice-floe during nearly 10 hours, because of the heavy fog; early next morning we reached Foyn Island and went ashore. On this island cartographic measurements were made, during which we also found a dog-sledge and some other things left behind by Sora and van Dongen. It will be remembered that these two men were saved by the Russian ice-breaker "Krassin" after the tragedy of the "Italia" in 1928. Soundings and stations were taken along the route also in this region, and when we were stopped by the ice and fog in the afternoon, some current measurements were tried from the vessel when moored to an ice-floe (station E). On August 5, three hours were spent for a visit on Karl XII Island. After proceeding in a north-westerly

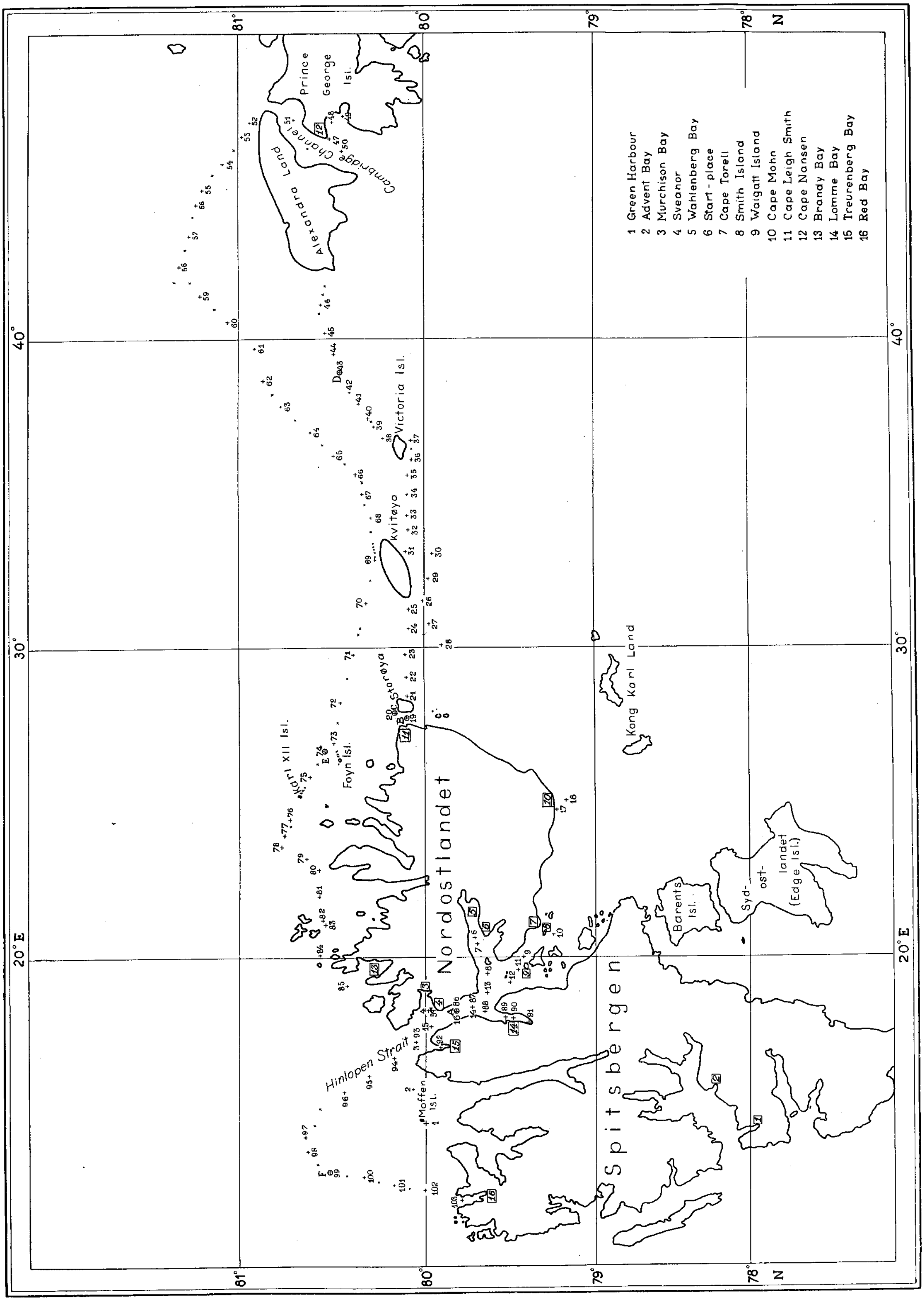

Fig. 1. Stations and soundings of the "Quest" 1931.

direction, we were stopped by the ice at station 77. We lost more than a day here, until on 7, early in the morning, the "Quest" became free and went through an opening in the ice south of Seven Islands to Brandy Bay, taking stations 78—85. August 8, was spent at Brandy Bay for cleansing of the vessel, and on August 9, in the morning we arrived at Sveanor.

Three days were used for taking down the house and bringing all equipment of the land station onboard. On August 12, about noon the whole expedition went from Sveanor to Lomme Bay on the western side of Hinlopen Strait, taking stations 86—91 in the strait and in Lomme Bay. After landing in Lomme Bay for geological and botanical researches, we went to Treurenberg Bay (station 92), also for researches ashore. On August 17, we went out of the northern entrance of Hinlopen Strait, taking stations 93—97 in a section towards the north-west. In the afternoon we anchored at 300 m depth for current measurements (station F), at 80° 31′ Lat. N. After measuring during more than 30 hours, and taking the hydrographic series 99—99 J, the anchor station was interrupted on August 19, at 7^h, and a section was taken towards the south-west (stations 100—102). The last station 103 was taken in Red Bay, where the last landing was undertaken.

On August 21, at noon we arrived at Advent Bay, where the material of the house was brought ashore. Early in the morning on August 24, the "Quest" left Advent Bay, bound home. On 26, in the forenoon we passed Bjørnøya (Bear Island), and in the morning on August 29, we reached Tromsø.

II. Instruments and Methods.

1. Positions.

The determination of position is specially difficult in regions like those visited by our expedition, anyway in summer. When going in the ice, it is impossible to use the patent log, and the variable speed also makes an estimation of distance difficult. The possibility of astronomical observations is extremely limited, because of the high frequency of fog and covered sky and because the ice often makes the horizon uneven. The hunters are usually not much trained in ordinary astronomical navigation, most of them make their voyages without using a sextant and even often without a good set of maps. They sometimes seem to have developed special instincts for finding their way, and they often show an astounding knowledge of the different coasts and islands, a short glimpse of the contours being usually sufficient for knowing the correct place.

Aware of the above difficulties and also of the importance of correct positions, I offered much attention to this question from the very beginning of the researches. When going along the sections, the distances between the soundings and stations were always estimated by the pilot at the top of the foremast (usually one of the officers), and often the distances were discussed by all officers present and myself. In this way I hope to the have obtained a roughly uniform estimation, which may replace the readings of a log. When the positions of the different islands were, after the return, determined by the cartographer of the expedition, the whole voyage was reconstructed on a map. It then appeared that the distances were all over-estimated, and usually most when much ice had been passed. This appears reasonable, because, after going through the ice at a low speed, the sudden increase of the velocity when coming into open water, will often seem much greater than it really is.

There were only few occasions on which the ordinary sextant could be used, because the horizon was only seldom clear. The use of an air-bulb sextant appeared difficult, because we were, none of us, sufficiently trained in the use of this instrument. However, most of the astronomical observations obtained, are probably fairly trustworthy.

Due to the great care taken at the determination of the positions, I hope the results are of an accuracy not too far from the ordinary accuracy of positions at sea.

2. Soundings.

Although the expedition should visit unknown regions, it might be expected that the depths would usually not reach many hundred meters, and I did not find it necessary to require any special arrangements for the soundings. The 3 mm steel-wire of the hydrographic winch was used for the soundings — a total number of 180. The sounding lead was tallowed before use, and would thus either show marks after touching hard bottom or it would bring up samples of sand, clay or mud. In this way 128 primitive bottom samples were brought home. These samples were sent to Dr. H. B. Bigelow, Woods Hole, for further treatment. All soundings were left to Dr. Ahlmann for his topographic map. Only the soundings at the stations are tabulated below in the Tables of Results.

3. Experiments with a Secchi Disk.

A white, circular iron plate of 45 cm diameter was used for 10 determinations of the transparency of the sea. In connection with these measurements, the radiation from the sky was roughly determined by a Haka Expometer, to make it possible to decide whether the determinations were comparable or not. During the Arctic summer the light from sun and sky will vary only little during day and night. The time necessary for obtaining the colour of comparison on the photographic paper of the Haka Expometer was always found to be about 10 seconds, varying between 7 and 12 seconds. The variation was in no clear relation to the hour of the day, being obviously chiefly determined by the cloudiness. The values of the depth of transparency determined by the Secchi Disk are, therefore, roughly comparable. These determinations were carried out immediately after the water bottles were brought on deck. The values of the depth at which the Secchi Disk disappeared, are not given in the Tables of Results; they are as follows:

Station. .	10	13	16 G	48	57	66	75	87	92	98
m.	21	12	15 1/2	11 1/2	19	20	20	4	5	10

The low value of 5 m at station 92 is reasonable, determined as it is at the shallow station (79 m depth) in Treurenberg Bay, late in summer. Also the high values 19, 20, and 20 m at stations 57, 66, and 75 respectively are reasonable at relatively deep water in the open sea. The value 10 m at station 98 appears unexpectedly low; one may think of a decrease of the transparency during the summer, due to flourishing of organisms at this time. This view is confirmed by the values from the deeper stations in Hinlopen Strait. Stations 13 and 16 G are taken in the first part of the summer and give 12 and 15 1/2 m respectively, or moderate depths of transparency. Between these stations we found at station 87, late in the summer, only 4 m or the lowest value of all. The highest value, 21 m, was observed at station 10 in the southern part of Hinlopen Strait in the early summer. A moderate value of 11 1/2 m was found at station 48 in Cambridge Channel in the middle of the cruise. Thus, on the whole, the few determinations of transparency seem to be in accordance with the view that coastal waters are usually less transparent than the waters of the open sea, but the values are greatly influenced by causes, which are obviously varying much from place to place and from time to time. It seems to be without doubt, that during the summer time, from the first to the last part of our expedition, a flourishing of plankton has taken place, perhaps parallel to the increase of temperature and salinity in Hinlopen Strait (see later); this would explain the great decrease of the transparency. Much more material of observations would, however, be necessary to follow these variations in details.

4. Thermometers.

The expedition was in position of 16 protected reversing thermometers and two surface thermometers. Among these, three had not been controlled by the Physikalisch-Technische Reichsanstalt in Berlin, as the rest had been, and other three did not always functionate satisfactorily. The temperatures referred to in this paper are determined by the ten thermometers left, made by the firms Richter & Wiese, Schmidt & Vossberg or C. Richter; they were always read by means of a Nansen reading lense. The results of 65 simultaneous determinations by the two reversing thermometers PTR. 265 (RW. 2110) and PTR. 37340 (CR. 109) may illustrate the accuracy of the determinations. The differences were:

0.00 —0.01°	in	25	cases
0.015—0.02°	-	22	-
0.025—0.03°	-	18	-

The mean difference was thus nearly 0.02° C.

5. Water Bottles.

The expedition had 10 water bottles, all of the newest construction of the Nansen reversing water bottle, made by Bergen Nautic A/S. Each water bottle was provided with two brass tubes for the reversing thermometers.

6. Salinity.

The water samples for determination of the salinity were preserved in 200 cc bottles with patent stoppers. The salinity of each sample was determined after the return by chlorine titration at Det Geofysiske Institutt in Bergen. Station curves of temperature and salinity, as well as temperature-salinity-diagrams were drawn for all stations after the first salinity determination. At the faintest suspicion against the validity of an observation, and in all specially important cases, the titration of the sample was carried out a second, and in certain cases even a third time. The salinities must be regarded as trustworthy at 0.02 ‰.

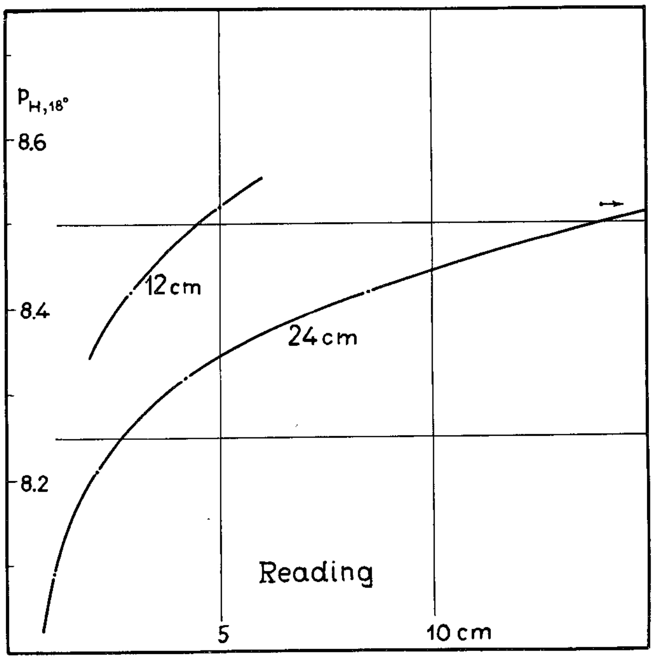

Fig. 2. Calibration curves for p_H-determinations.

7. Oxygen.

Also the determination of the content of oxygen was carried out after the return to Bergen. The samples were preserved in 200 cc bottles of the type required for the Winkler method.

8. Hydrogen Ion Concentration.

The values of p_H were determined immediately after each station by means of the colorimeter of SUND [1931], using phenolphtalein as an indicator. The red wedge was calibrated onboard the "Quest" on August 6, at temperatures of the buffer 1) near 20°, 2) near 11° and 3) between 7 and 8° C. Most samples could be determined by the 24 cm tubes, only in a few cases the 12 cm tubes were used. When reducing the results of the calibration to 18° buffer temperature, the different series agreed excellently. The resulting calibration curves for the two tubes of 24 and 12 cm length, at 18° buffer temperature, are reproduced in Fig. 2. By means of these curves the readings of the instrument were transformed to p_H-values. Applying the corrections for temperature and salinity, the final values were obtained.

9. Phosphates.

The values P_2O_5 were determined by the method of ATKINS as modified by SUND, using Sund's colorimeter for determining the colour of the samples. The blue wedge was calibrated on 14 different occasions (87 single determinations), using surface water for the standard series. The surface water usually contained small amounts of phosphates, varying from place to place. When plotting the readings of the scale against the amounts of KH_3PO_4 added, each calibration series gave a curve, from which it was possible by extrapolation to determine the content of phosphates of the surface water used. The first two calibrations in this way gave the average relation: content of phosphates in mg/m^3 equal to 2.2 multiplied by the reading in mm, and in this way the tabulated values of P_2O_5 were determined for the stations 21—25. The other calibrations agreed on the relation: content of phosphates in mg/m^3 equal to 1.6 multiplied by the reading in mm, and in this way the tabulated values of P_2O_5 were determined for the rest of the stations. A clear change has thus taken place, either in the colour of the wedge or in the effectivity of the chemicals.

Computing the average divergency from the above relations, of the single determinations for calibration, disregarding signs, we find ± 5 mg/m^3, but several values diverged by $+20$ or -20 mg/m^3. The accuracy cannot, therefore, be very great; it may be estimated to ± 10 mg/m^3 on an average.

10. Anchoring.

During several years the "Armauer Hansen" of Det Geofysiske Institutt, Bergen has carried out a number of successful experiments on anchoring in the open ocean at depths down to some thousand meters. From parttaking at a great number of these anchorings and from experiences in Arctic and Antarctic Regions, I understood that the ice would make the risk at such experiments rather great. On the other hand, important difficulties would be eliminated due to the calm sea near the ice. On account of the numerous tasks of the expedition, I was, when planning, satisfied at obtaining a good equipment of current meters, intending to measure the current by mooring the ship to an ice-floe, as done by NANSEN and others. However, the sealers use a steel-wire for drawing the capture across the ice to the ship, by means of the engine. The wire of the "Quest" was about 600 m long, and would thus allow for anchoring at at least 400 m depth. I was, therefore, very lucky to hear, that Captain SCHJELDERUP was not afraid of making an experiment by the equipment present onboard. An ordinary warp-anchor was attached to the wire by means of a piece of chain-cable, and the wire passed two blocks, one at the bow and one at the fore-mast, after being regulated by hand on the steam-winch. Our first experiment was, as mentioned, made in Hinlopen Strait, which is known for its difficult and dangerous weather- and ice-conditions. It must to a great extent be ascribed to the extraordinarily favourable ice-conditions of 1931, that this, as well as the following experiments were carried out successfully.

11. Current Meters.

The current meters were loaned to the expedition by Det Geofysiske Institutt, Bergen, and consisted of one electric recording instrument of Sverdrup and Dahl's construction [Sverdrup and Dahl 1926] and three instruments of Ekman's construction, old type [Ekman 1905]. The constants of these instruments had been determined before the expedition, and a very good agreement was obtained when making a new determination at Det Geofysiske Institutt after the return. The constants used are:

Sv.-Dahl No. 2	$v = 1.8 + 1.873 \cdot N$
Ekman No. 60	$v = 0.5 + 0.45 \cdot n$
Ekman No. 136	$v = 1.2 + 0.37 \cdot n$
Ekman No. 137	$v = 1.3 + 0.37 \cdot n \ (n < 160)$
	$v = 10.0 + 0.33 \cdot n \ (n > 160)$

where v is the current velocity in cm/sec, n is the number of revolutions per minute of the propeller of the Ekman current meter and N is the number of contacts per hour of the Sverdrup-Dahl current recorder (1 contact *per* 100 revolutions).

12. Work at Stations.

At the hydrographic stations I usually carried out myself all important work regarding the handling of water bottles, water samples, reading of thermometers a. s. o., unless when stations were taken during night and day continuously. When I was not present, the work was led by Mr. Rosenbaum. Several controls proved that he read the thermometers very correctly. The p_H- and P_2O_5-samples were all examined by myself At the anchor stations the current meters were, after some exercise, excellently handled by Mr. Rosenbaum, Mr. Malmberg and the crew.

13. Tabulation.

The results obtained by the above instruments and methods are tabulated in the Tables of Results below. Table I includes all serial observations, containing position, temperatures, salinities, densities, oxygen, p_H, P_2O_5, sounded depth and a short note on the consistence of the bottom at each station. Table II gives the results of the current measurements at the anchor stations as well as those taken when drifting with the ice. A detailed explanation of the tables is given below, p. 64. Some readings of the variations of the sea-level, made at Storøya, are tabulated on p. 48 (Table 6). The determinations of transparency of the sea-water are given above, p. 9.

III. Bottom Topography.

The topography of the bottom of the regions in question was most recently studied by Ahlmann [1933]. The map Fig. 3 is taken from the "Bathymetric Chart of Barents Sea and adjacent parts of the Norwegian Sea and the Arctic Ocean" by Ahlmann and Friberg (scale 1:4 000 000 on 75° Lat. N), attached to the said paper by Ahlmann. Only small alterations had to be made in order to obtain full agreement with some of the soundings from the "Blaafjeld" 1923 and the "Hisø" 1929.

The northern part of the Norwegian Sea reaches more than 3 000 m depth, but is separated from the North Polar Sea by the Nansen Ridge with a saddle depth of around 1000 m. The Svalbard Islands, Franz Joseph Land and Novaya Zemlja are all situated on the continental shelf. In the Barents Sea the depth seldom exceeds 300 m. The waters to be discussed here are covering the northern part of the shelf, north of Spitsbergen, around Nordostlandet, Storøya, Kvitøya, Victoria Island to Franz Joseph Land. Hinlopen Strait separates Spitsbergen from Nordostlandet, and is in its northern part deep, more than 400 m, in its southern part shallow, less than 100 m. To the east of Nordostlandet the waters between the islands reach depths between 200 and 400 m; the deepest and widest channel is that between Victoria Island and Franz Joseph Land. Still deeper is Cambridge Channel between Alexandra Land and Prince George Island, the westernmost two islands of the Franz Joseph Archipelago; here we sounded more than 500 m.

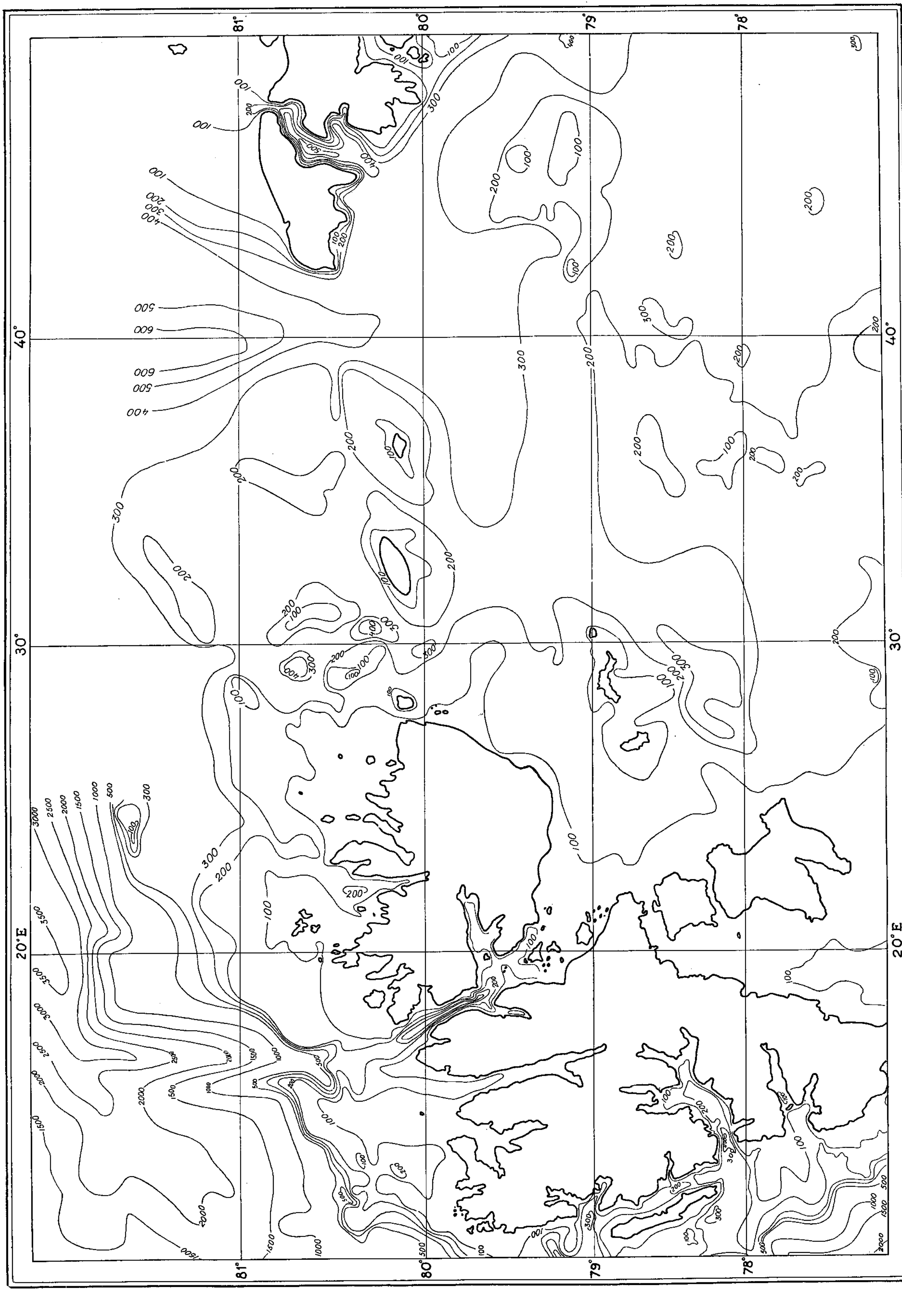

Fig. 3. Bottom topography.

IV. The Sea North of Spitsbergen.

1. Material of Observations.

The "Quest" stations Q 1—2 and Q 94—102 were taken in the sea north of Spitsbergen (cf. map Fig. 5, p. 14), Q 1—2 in the night of June 23—24, the others during August 17—19, 1931. For orientation we shall regard the general features exhibited by the *t*—*S*-diagrams from stations Q 2, 94, 98, and 100, which are reproduced in Fig. 4. In the uppermost 25 m the temperatures at Q 2 are about 1.4°, while at the other stations the temperature of the corresponding water layer is about 4°, up to 5°. This is obviously due to heating by radiation during the nearly two months, an increase of nearly 0.05° per day. The salinities are only little altered, except for the uppermost 10 m at stations Q 94 and 100, where we find a rather great decrease; this decrease is obviously due to melting and precipitation. At station Q 98 no similar effect can be traced. Also between 50 and 150 m we find an increase of the temperatures from June to August, amounting to about one half of a degree, while the salinities are nearly unaltered, except for station Q 98, which has higher salinities than the other stations. The high temperatures and salinities at station Q 98 can hardly be explained as a seasonal phenomenon, they must be explained from the situation of the station in relation to the currents. This is our deepest station, with observations down to 700 m, thus being taken outside the shelf, and showing that a very saline water is here situated in the Polar Sea, close to the shelf. From 50 to 600 m the salinities are all above 35.00 ‰, and this water may be characterized as Atlantic Water, brought by the Gulf Stream.

It appears from the diagram Fig. 4 that no typical shape of the *t*—*S*-curves can be pointed out as common to the different stations. Thus stations Q 94 and 98 give a temperature maximum at about 25 and 50 m respectively; Q 100 has an intermediate minimum at 75 m and a maximum at 100 m, while Q 2 shows a minimum at 10 m and a maximum at 75 m. At all stations the salinity is generally increasing from the top to about 200 m. At station Q 98 a slight but regular decrease is observed below this depth.

As already mentioned, no determination of p_H or P_2O_5 were made at these stations. At station Q 2, 10 m, we find a high oxygen content of 8.70 cc/L, while at stations Q 97, 98, and 99 we have 7.64, 7.64, and 7.68 cc/L respectively at the same depth. The

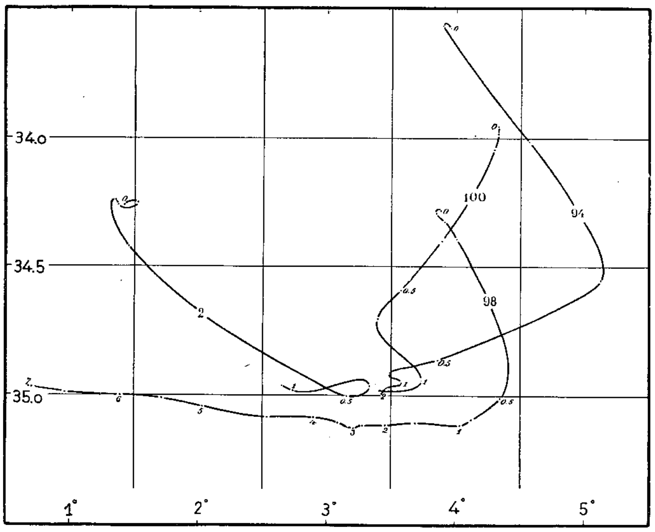

Fig. 4. *t*—*S*-diagrams for four stations north of Spitsbergen.

variation of percentage saturation, however, is small, from 111 % at Q 2 to 105, 104, and 106 % at Q 97, 98, and 99. It is seen that this water layer is in all cases over-saturated (*i. e.* when disregarding pressure). At the other depths the oxygen values in *cc per litre* are roughly the same.

2. Dynamic Current Calculations.

The map Fig. 5 shows the stations taken north of Spitsbergen by various expeditions in different years. A closer inspection of these stations shall be undertaken later (p. 38). The station N 6 from the "Nautilus" Expedition [Sverdrup 1933 a] was taken on September 6, 1931, or about three weeks earlier than our stations Q 93—103. From N 6 a section is constructed through Q 98, 99, 100, 101, 102; the distance between N 6 and Q 98 is about 120 n. miles, and the isolines are not well determined here. However, when drawing the isotherms, isohalines, and isopycnals, the values in each single point of the section shall be in agreement, and the densities in each vertical line of the section must give a reasonable stability of the layers. By interpolations for two imaginary stations A and B, I arrived at the picture seen in Fig. 6. It here appears that a well pronounced nucleus of Atlantic Water is situated near the shelf. The highest temperatures occur at the stations near the shelf at about 100 m depth, while at N 6 the highest temperature is observed near 250 m, the warm layer being here covered by a cold surface water of temperatures below zero. Salinities above 35.00 ‰

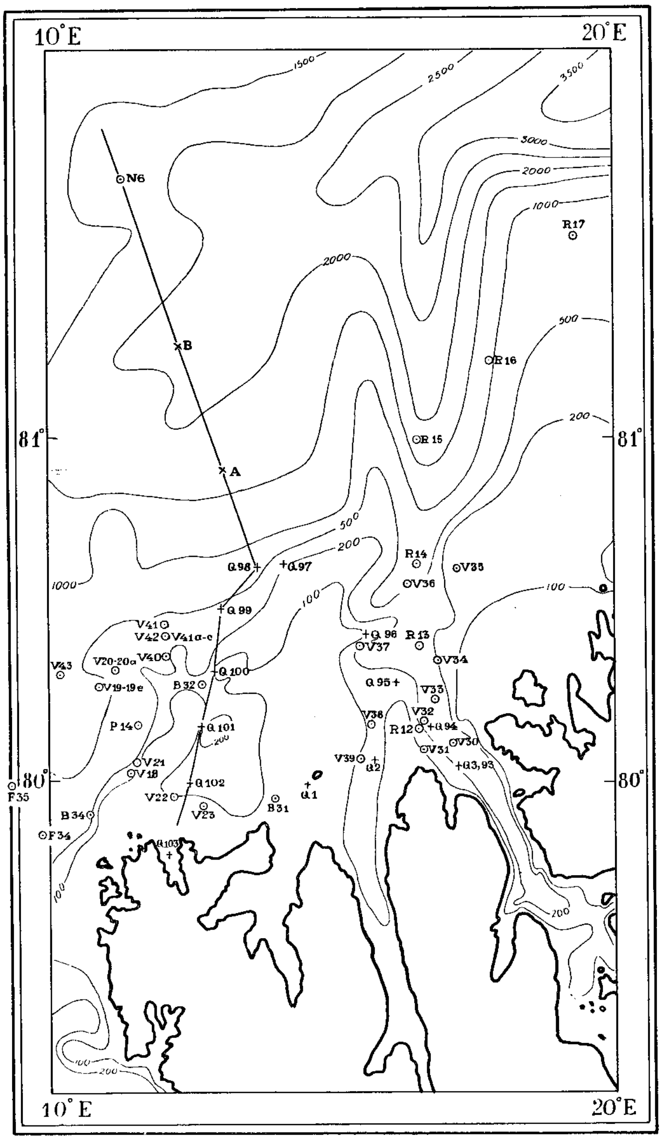

Fig. 5. Stations taken north of Spitsbergen.

are observed at station Q 98 within a thick layer from 50 to 600 m, while at N 6 the said salinity is only reached at one single depth, namely 400 m. The 0° isotherm falls near 800 m depth at N 6, and from here the temperature decreases downwards to —1° a little below 1600 m. Station N 6 thus falls near the northern limit of the Atlantic Water.

When constructing a section of the densities, it appears that the isopycnals fall much nearer to the surface near A than elsewhere in the section, dropping down towards north and south.

The surface layer has the highest content of oxygen, at N 6 amounting to 8.8, at Q 98 to 7.6 cc/L; at 700 m the values are nearly the same at both stations (7.1 cc/L). From about 100 m to about 600 m, *i. e.* in the Atlantic Water, the oxygen values are lower at N 6 than at Q 98. Within this layer there will probably be a decrease of the oxygen content with time, due to consumption by organisms. Accordingly the lower values in the northernmost part of the section should indicate that the waters here have, for a longer time, been subject to the mentioned reduction of its oxygen. This may mean that the current velocity is lower in the north than near the shelf, or it may better be explained by the spreading out towards the north and north-west pointed out by SVERDRUP [1933 a].

We shall now try to determine the current components through the section, according to the method of BJERKNES [1910—11], using the tables of SVERDRUP [1933 b] and the formula of HELLAND-HANSEN [1905] for the calculations. As the conditions are roughly uniform below 700 m, and as this is the greatest depth from which observations exist at station Q 98, we may assume 700 m to represent the approximate depth of zero current. The anomalies of the specific volume were used for construction of the isosteres in the section (not reproduced). Between 300 and 700 m we have no observations south of Q 98, where the current must be expected to be strong. However, the deepest three observations at station Q 99 (150, 200, and 250 m) give the same value 28 of $10^5 \triangle \alpha$, and the shape of the isostere corresponding to this value is thus determined, it must bend down rather steeply near land.

According to HELLAND-HANSEN and NANSEN [HELLAND-HANSEN 1934] a calculation of the current near the slope of the bottom in a case like this, may be carried out in the following way. Imagine a tube running from the sea-surface at station Q 99 vertically to the bottom and from there following the bottom until station Q 98. The pressure at the lower end of this tube must be the same outside as inside, *i. e.* the same as at the lower end of a vertical tube going from the surface to the bottom at Q 98. If it is possible to determine the run of the isosteres between Q 98 and Q 99 in the section, we know the distribution of density, or of specific volume, along the bottom. This distribution may be regarded as valid also for an imagined continuation of station Q 99 below the bottom, the isosteres being drawn horizontally below the bottom.

In order to find the most correct way of drawing the isosteres, the values of $10^5 \triangle \alpha$ for stations Q 98 and 99 were plotted against depth. The curve for

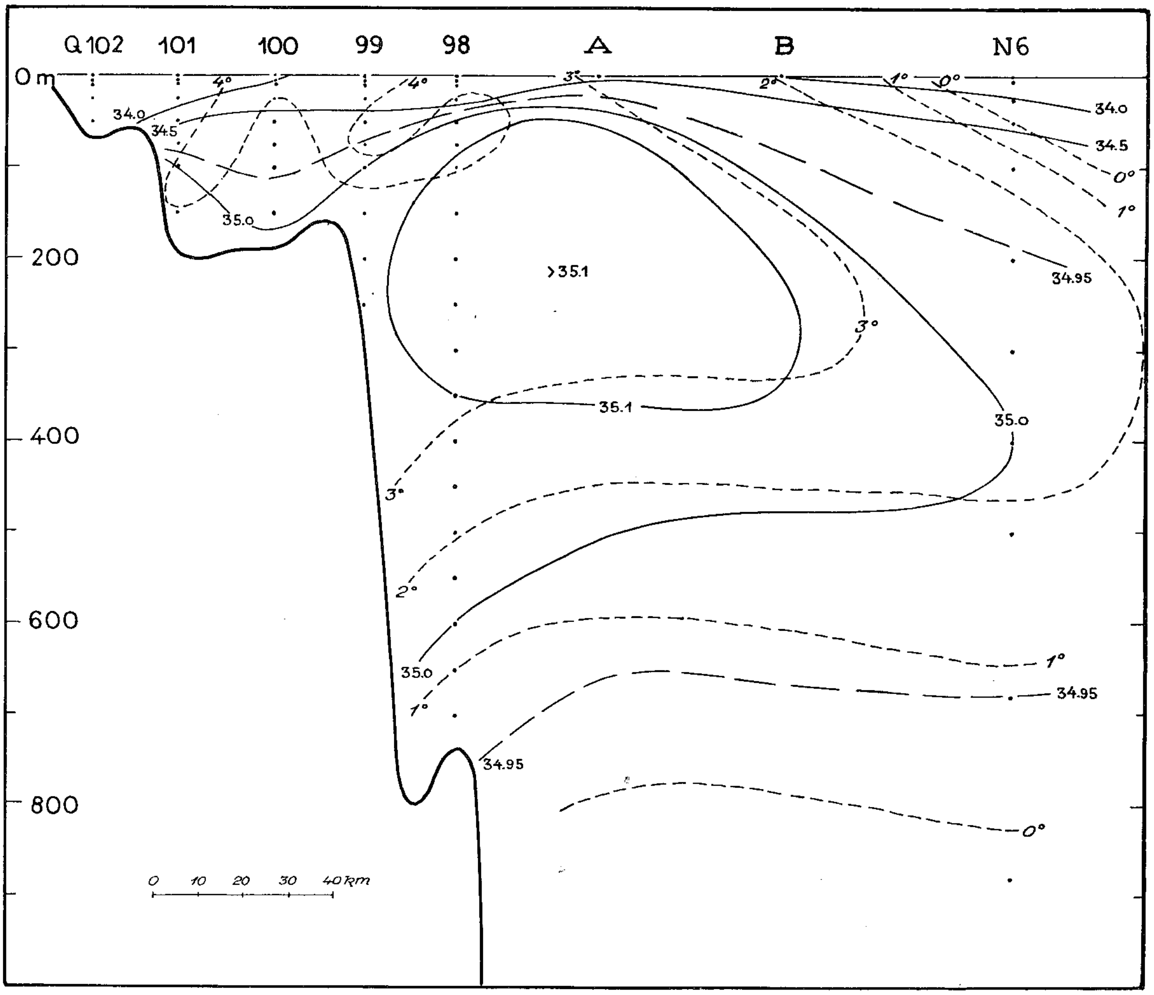

Fig. 6. Distribution of t and S in the section north of Spitsbergen.

station Q 99 was extrapolated below 250 m depth by claiming a little above 700 m $10^5 \triangle \alpha$ to be equal to 7, the value occurring at station Q 98 at 700 m and at station N 6 somewhere between 800 and 900 m. The values thus obtained were used for the current calculations.

The interpolated stations A and B made it possible to use the claim of correspondance between temperature, salinity, and density for determining the run of the iso-lines better and to determine the distribution of velocity more in details. The obtained velocity values were used for construction of curves showing the distribution of velocity along the section, one curve for each standard depth. Details of such curves are not known, but we know that the area between the curve and the mean value within each part of the section, counted positive and negative, must always be nil, and the distribution of velocity must in most cases correspond to a smooth curve. From these curves it was now possible to read off the velocity in any point of the section at a certain standard depth, and by a sufficient number of such readings it was easy to construct the velocity profile reproduced in Fig. 7. It is seen that nearly all transport takes place between stations Q 99 and A, or, the current is limited to a distance within the section of about 50 km. Of course the construction of the curves is to some extent dependant on subjective judgement, but even if the isotherms, the isohalines, and the isopycnals may, in agreement with the actual observations, be drawn in different ways, they must fall rather near to the picture here obtained, if the claim of correspondance between temperature, salinity, and density shall be obeyed in most points of the section.

A control of the results may be obtained from the current measurements at anchor station F, in the

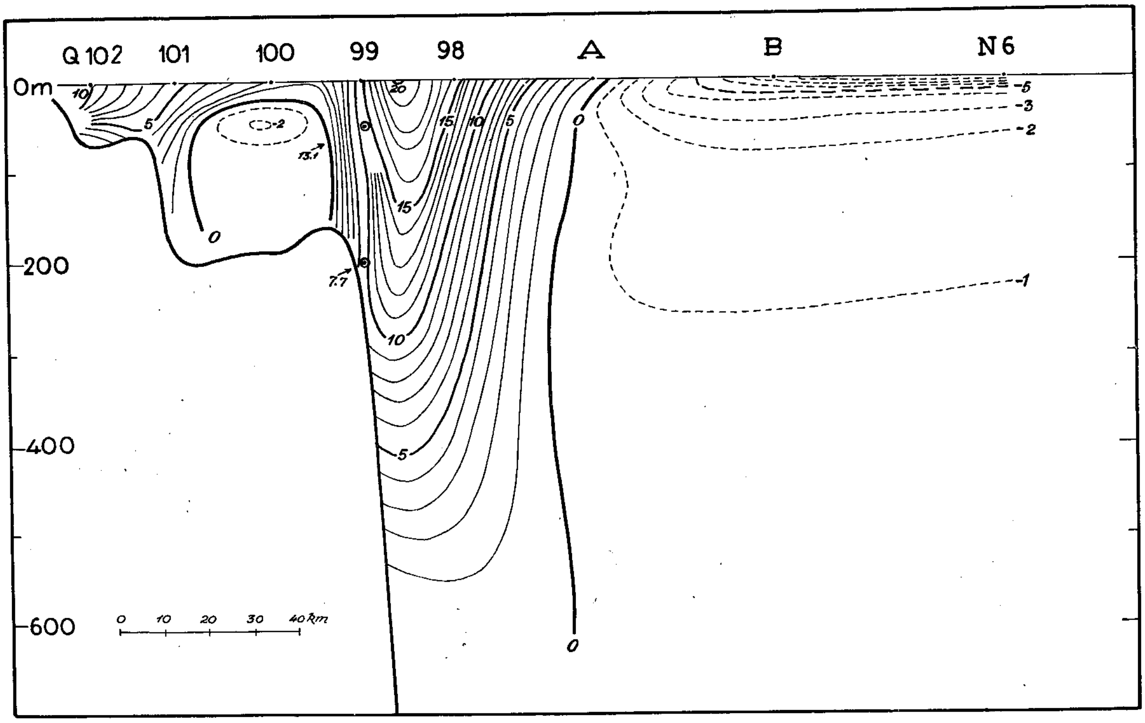

Fig. 7. Distribution of velocity in the section north of Spitsbergen.

position of station Q 99. We here obtained a complete series of current measurements of more than 24 hours. The results are dealt with in Chapter VIII, the rest-currents at the different depths are given by N- and E-components on p. 50. As the section between stations Q 99 and Q 98 runs towards N 43° E, we have computed the components of the rest-currents towards S 47° E. They are:

5	m	20.6	cm/sec
10	»	2.3	»
50	»	13.1	»
200	»	7.7	»

The values from the surface layer do not agree with the velocity section, especially not the 10 m value. However, no good agreement was to be expected here, because the pure wind-currents near the surface cannot be included in the dynamic calculations. The values from 50 and 200 m are, on the other hand, in perfect agreement with the velocity section. This control indicates that the assumption of zero-current at 700 decibars should be very nearly right.

The negative velocities towards S 47° E (current towards N 47° W) through the section north of the zero-line at about 80° 50′ Lat. N are in agreement with the views of Sverdrup [1933 a]. It is also seen that the actual Atlantic Current cannot be limited by any distinct isohaline or isotherm, the characteristics of the Atlantic Water being found also north of the zero-line; this is explained by the view of Sverdrup, that part of the Atlantic Water spreads out towards the north and north-west. This water should not then be reckoned to the Atlantic Current, although it originates from it. We shall return to this section later (Chapter VI).

V. The Northern Barents Sea.

1. Material of Observations.

In addition to our material of observations some observations from the Northern Barents Sea, taken from the "Blaafjeld" 1923 (B) and the "Hisø" 1929 (H) by Captain Thor Iversen are used. The total material from this area then consists of stations B 66—75, B 79—80, H 2—22, H 24—25, Q 17—46, and Q 52—85.

At station Q 46, between Victoria Island and Franz Joseph Land, the temperature decreases from 1.2° at the surface to below 0.6° between 25 and 50 m. Farther down it increases to above 2.1° below 100 m. From this maximum value the temperature decreases towards the bottom; at 350 m, 25 m from the bottom, we find 1.55°. At most of the stations within the northern part of the Barents Sea we find a similar variation. The summer surface water with a relatively high temperature near the surface, is highly variable, due to currents, ice-melting *etc.* The cold layer below it is also variable, both regarding depth and temperature. Usually the minimum temperature lies between —1.4 and —1.7°, and in most cases the layer is found between 50 and 100 m depth. But sometimes an intermediate maximum appears at about 75 m, dividing the cold water into two layers with slightly warmer water in between. This irregularity appears specially well pronounced at stations H 2, 6, 9, 16, 17, and is also traced at stations Q 22, 33, 52, 62. We must, therefore, assume this irregularity to be actual, because it could hardly occur at so many different stations by erroneous observations only. As the "Hisø" stations are taken a month later in the summer of 1929 than the "Quest" stations in 1931, the phenomenon seems to develop in the summer. The maximum temperature usually occurs between 150 and 200 m, its value being very different. The temperature at 300 m may vary between —1.15 and +2.2°, at 350 m between —0.59 and +2.00°. At greater depths our values are few. At 400 m we have three observations: —0.08, +0.12, and +0.37°; at 500 m we have two observations: + 0.02 and +0.08°; at 550 m we have one observation: —0.03°.

The salinity, at station Q 46, increases from below 33.6‰ near the surface to 34.86‰ at 100 m. From this depth it keeps nearly constant towards the bottom, increasing to 34.93‰. The salinities for more than 50 m depth from all stations are plotted in Fig. 8, including interpolated values from the standard depths. Each value is entered on the corresponding salinity value of the abscissa by a dot. When drawing the original diagram, different colours were used for the different expeditions, but the differently coloured dots appeared to be mixed without any clear system. Table 1 gives for each standard depth below 50 m, the mean value of the salinity and the number of observations (n) on which it is based. It is seen that below 200 m the mean values are varying extraordinarily little. The mean of all salinity values below 200 m is 34.89‰, based upon 88 observations. The diagram shows that the single values are only little different from the mean values at the greatest depths, while higher up the differences are greater, especially when regarding the standard depths 75, 100, and 150 m. About half the number of observations below 200 m give 34.88, 34.89, or 34.90‰; as the salinity determinations do not claim any greater

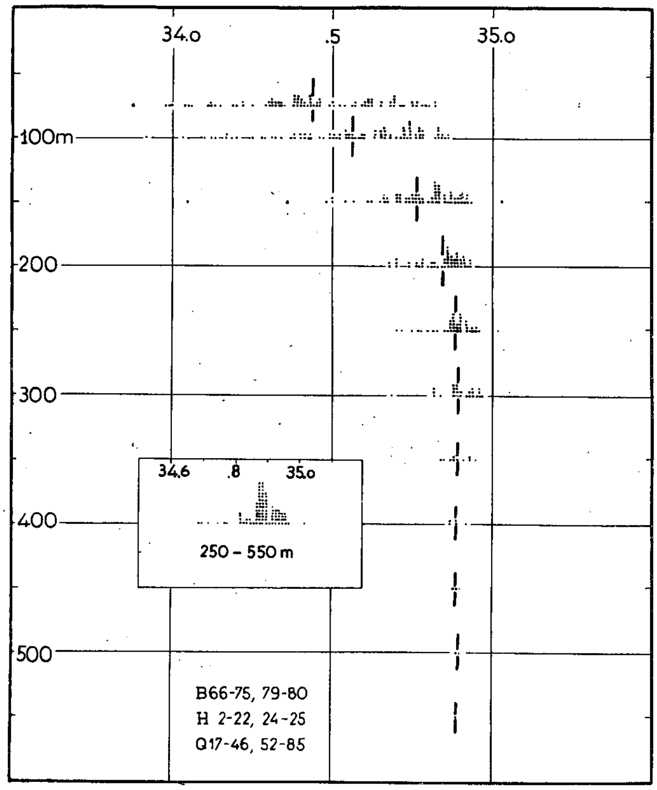

Fig. 8. Distribution of salinity-values at different depths from some stations in the Northern Barents Sea.

accuracy than 0.02 or 0.03‰, we may say that half of the observations give exactly the mean value. The higher values give averagely 34.94, the lower 34.81‰. The extreme values are 35.02 and 34.69‰. The deeper layers, below 200 m, are thus very nearly homohaline.

Table 1.

Mean salinities at different depths from stations in the Northern Barents Sea.

m	S ‰	n
75	34.438	90
100	.563	91
150	.763	73
200	.847	54
250	.886	41
300	.895	26
350	.893	10
400	.888	5
450	.890	3
500	.895	2
550	.890	1

The content of oxygen, at station Q 46, decreases from 8.5 cc/L at 10 m depth to 7.1 cc/L at about 75 m, and this last value keeps nearly constant to the bottom. The percentage saturation of oxygen is 108 at 10 m, 90 at 50 m and 92 or 93 at greater depths. The oxygen determinations were only carried out at 36 of the above named 99 stations from the Northern Barents Sea, and even usually only at 10, 50, 100, 200 etc. m depth. The observations do not, therefore, allow for any statistical study of the vertical distribution.

The hydrogen ion concentration, p_H, was determined at nearly all stations from the "Quest" in the Northern Barents Sea, and usually at all standard depths. The general variation with depth may be best seen from Table 2, where the averages from all stations from this area are given for certain standard depths. The highest values are found in the surface layer, with $p_H = 8.35$ at the surface and regularly decreasing values downwards, the average from 200 m or more being $p_H = 8.09$. On the whole the variation with depth at the single stations is more or less similar to the variation of the averages.

Table 2.

Averages of p_H and P_2O_5 at different depths from stations in the Northern Barents Sea.

m	p_H	P_2O_5
0	8.35	4
5	.33	2
10	.34	3
25	.26	10
50	.17	30
75	.14	36
100	.13	41
150	.12	47
$\geqq$ 200	.09	51

The phosphates, P_2O_5, are more irregular, but on the whole they show a very clear increase with depth, as seen from the averages given in the last column of Table 2. In most cases the surface layer gives values $= 0$, two-thirds of the observations from 0, 5, and 10 m being zero. The averages show a very regular increase with depth, reaching 51 mg/m³ for depths of 200 m and more.

When comparing with the averages given by SVERDRUP [1933 a] from the "Nautilus" stations north of Spitsbergen, it is seen that the p_H-values are very nearly the same, while the P_2O_5-values are higher than the above averages, the difference being between 25 and 30 mg/m³ in the uppermost 100 m, decreasing to 10 or 15 mg/m³ at 500 m depth. As the method and also the blue colour and the standard solution was the same in both cases, being prepared at Det Geofysiske Institutt in Bergen, the determinations should be specially well comparable. Even when allowing for quite a great error in the determinations (cf. p. 10), it does not seem reasonable to explain the average divergency between the determinations from the two expeditions for the upper layer by low accuracy of the method used; the waters north of Spitsbergen must have had a conspicuously higher content of phosphates at the end of August and beginning of September 1931 than had the waters east of Svalbard in July and August the same year. In the deeper strata the average difference is probably within the limits of accuracy.

2. Relation between Oxygen and p_H.

From the Tables of Results it is seen that in 121 cases we have simultaneous determinations of oxygen and p_H. In a preliminary report [MOSBY 1936] it was shown that these pairs of observations, when entered on a diagram with the oxygen values and the p_H-values as co-ordinates, agree fairly well on the straight line: $p_H = 7.36 + 0.101 \cdot O_2$, the oxygen content expressed in cc/L. The observations cover an interval of O_2 from 6.7 to 10.7 cc/L and of p_H from 8.0 to 8.4. The correlation coefficient was determined to 0.87; the average deviation of the single observations from the line was ± 0.25 cc/L of the oxygen values, corresponding to ± 0.025 of p_H. A very similar picture is obtained when using the relative oxygen content.

Different authors [*e. g.* PALITZSCH 1912, HELLAND-HANSEN 1914, GAARDER 1917] have found indications of a similar proportionality. As far as I know, however, our observations represent the first case when a relatively great number of observations show a so well pronounced proportionality. The reason may be sought in the lower accuracy of the determination of p_H according to the elder methods. For among the observations of a newer date I have found some series which show the proportionality rather clearly. The observations from the "Sedoff" in the Northern Barents Sea in 1929 [WIESE und LAKTIONOFF 1931] on the whole fall a little higher in p_H than the "Quest" values, but give a roughly parallel proportionality.

The observations at station 137 of the "Carnegie" in the Pacific [Graham 1934] from 500 m downwards give a very clear proportionality, covering an interval of much lower values. Of great interest in this connection are also the observations at station 172 of the "Thor" in the Black Sea [Palitszch 1912]. As it is only the upper layer of about 200 m which contains any oxygen at this station, the amount of H_2S determined may be used instead of the oxygen value, as "negative oxygen content". In this way the interval covered by simultaneous observations of O_2 and p_H is extended to about —5 cc/L of oxygen and about 7.4 of p_H. When entering these observations together with those from the "Quest", the "Sedoff", and the "Carnegie" on a diagram, it is seen that most of them fall about one straight line, the averages of the "Quest" and "Sedoff" values being continued by the "Carnegie" data along the same line as that determined by the "Thor" observations. We find $p_H = 7.71 + 0.06 \cdot O_2$; the formula is based on observations covering an interval from about —5 to +11 cc/L of oxygen. When expressing the oxygen content in per cent of saturation, also the "Carnegie" values from less than 500 m agree on the average formula; in the above case they have to be put out of consideration.

Qualitatively, the above proportionality appears in reasonable agreement with the experimental results of the later years [Buch 1930, 1932, Gaarder 1932]. We shall not go further into the explanation of the above proportionalities and the differences between the proportionalities found from the "Quest" values on one hand, and from the observations of other expeditions on the other. But it seems that the methods are now sufficiently developed for a systematic study of the different oceanic areas. The variation of the constants of the above relation from region to region may then appear useful as a characteristic of the biological and biochemical processes dominating in the different regions.

3. Vertical Distribution.

The left part of Fig. 9 shows the distribution of temperature and salinity in the section from Storøya to Kvitøya, consisting of stations Q 21—25, which were taken on July 14, 1931; the section is seen from the south. The uppermost layers are cold, usually below —1.0°, minimum values down to —1.68° appearing at 25 m depth. Below this cold layer the

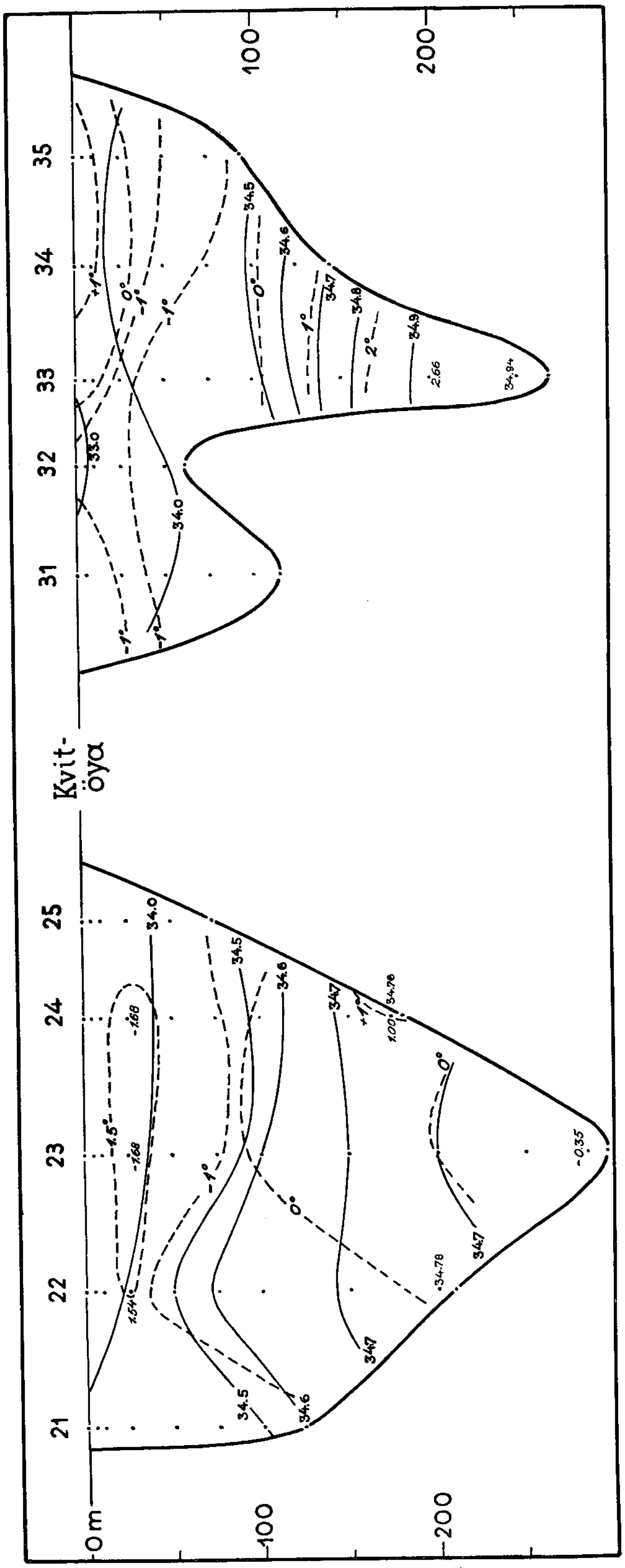

Fig. 9.
Distribution of t and S in the sections Storøya—Kvitøya—Victoria Island.

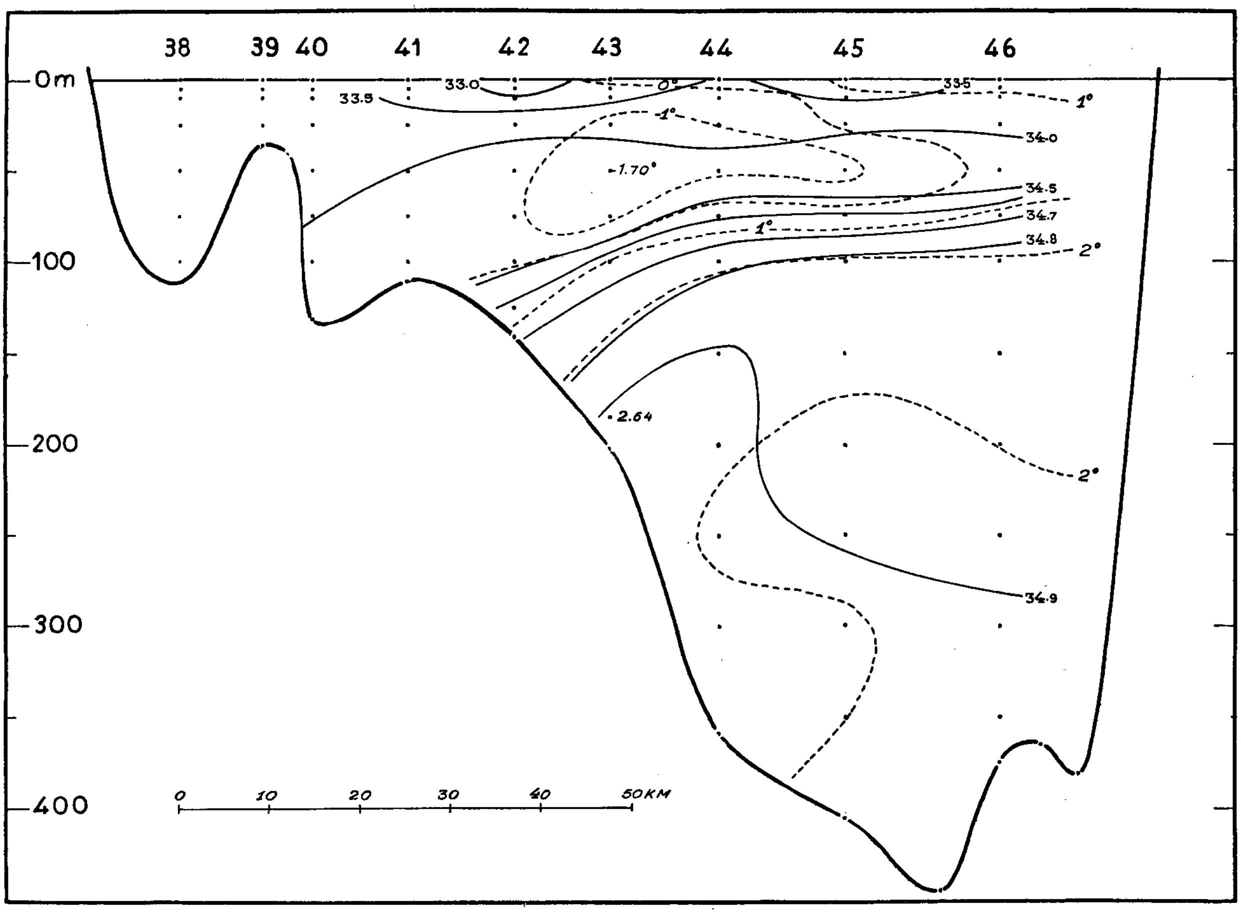

Fig. 10. Distribution of t and S in the section Victoria Island—Franz Joseph Land.

temperature increases. It is seen that the 0° isotherm limits a warm layer which lies along the eastern part of the bottom profile from a little above 100 m down to 200 m, while in the west only a belt between 200 and 225 or 250 m has positive temperatures, and these latter are only little different from zero, reaching +1.0° at station Q 24. Below 200 m most of the water is cold, with negative temperatures. The isotherms thus show one cold layer at 25 m and one warm layer which follows the eastern slope between 100 and 200 m depth. Between these two layers certain wave-like bends of the isotherms are observed. Similar bends also occur in the isohalines, the salinities above 34.7 ‰ occurring chiefly in a layer between 150 and 200 m depth, with lower values above and below. The highest salinity is 34.78 ‰.

Stations Q 19 and 19 A were taken at 120 and 103 m depth respectively, in the channel between Nordostlandet and Storøya. The highest temperature observed here was —1.53°, and the highest salinity was 34.46 ‰. Thus no warm and saline layer is traced in the channel west of Storøya.

The right part of Fig. 9 shows the distribution of temperature and salinity in the section from Kvitøya to Victoria Island, consisting of stations Q 31—35, which were taken on July 20. The upper cold layer is not so well pronounced in this section, the temperature not reaching far below —1.0°; the lowest value is —1.41°. The depth sounded at station Q 33 is 268 m, but all temperatures below 100 m are positive; the maximum value 2.66° was observed at 200 m. The salinity within the cold layer is roughly 34 ‰, while from 100 m downwards it increases regularly from about 34.5 to 34.94 ‰ at 250 m. Thus the warm water in this section is much warmer and much more saline than that of the previous section. As shall be seen later, this warm and saline water enters the Barents Sea from the north and west; an inspection of the bathymetric chart Fig. 3 (p. 12) shows that the bottom configuration is much more complicated

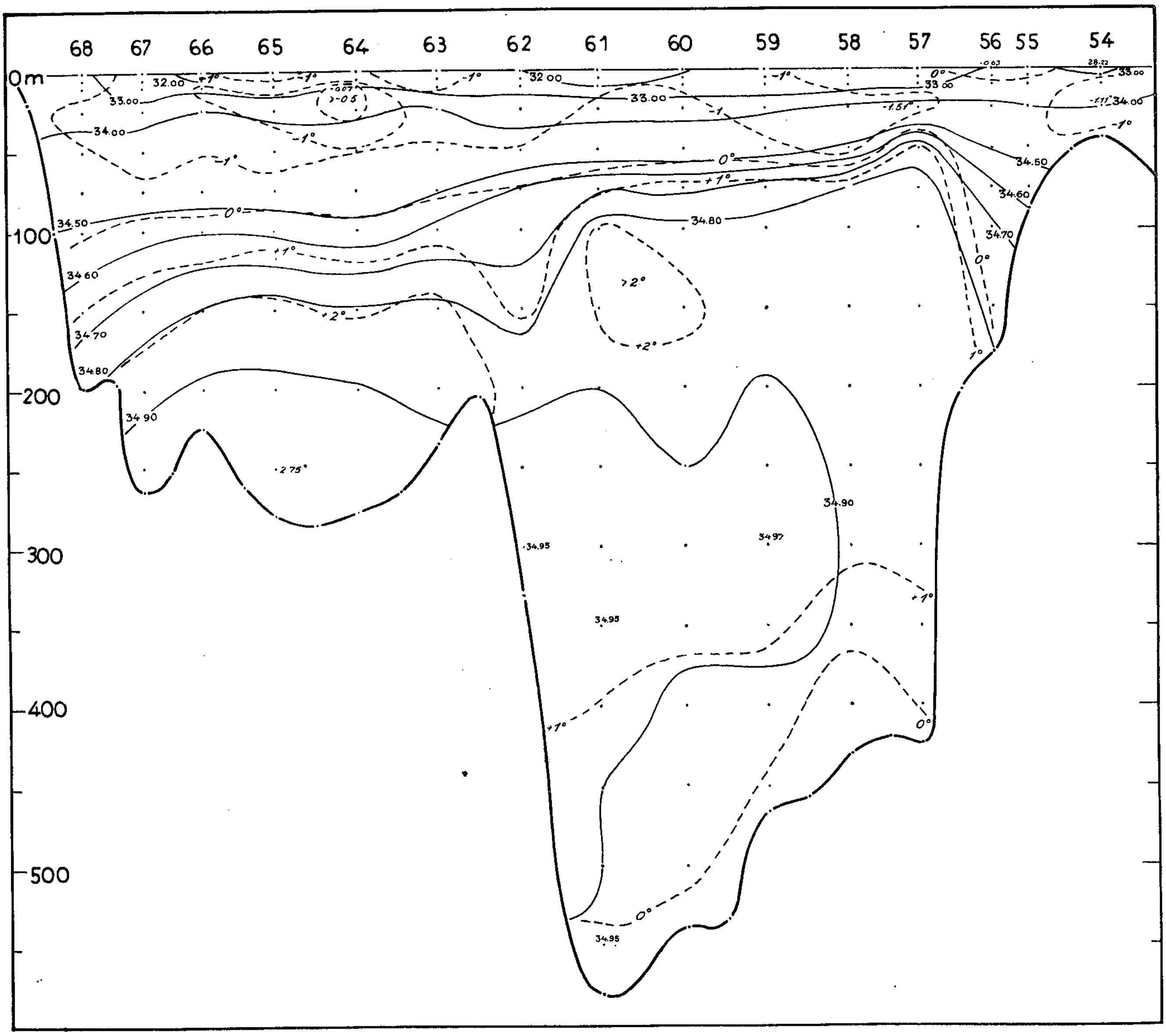

Fig. 11. Distribution of t and S in the northern section in the east.

to the north of the western section than of the eastern. It is clearly seen that the warm water entering from the north will meet greater hinderances on the western side of Kvitøya than on the eastern.

The section from Victoria Island towards Franz Joseph Land, stations Q 38—46, was taken on July 22—24, with a long stop at the anchor-station D (Q 43); the section is reproduced in Fig. 10. At stations Q 42—45 we find a very cold layer at about 50 m depth, the minimum around the value —1.70° at station Q 43 being very well pronounced. The 0° isotherm falls lower in the west than in the east, limiting the negative temperatures to roughly 75 m, while below this depth we find very high temperatures throughout most of the wide channel crossed by this section. The highest temperature is 2.64°, which was observed at station Q 43, 185 m (a slightly higher value, 2.69°, was found at station Q 43 G, 150 m). Also the isohalines for 34.5 to 34.8 ‰ are sloping, the difference in depth of these isohalines in the west and in the east being about 50 m. Below 100 m all salinities are above 34.5 ‰, the maximum value being 34.96 ‰ or slightly higher than the maximum salinity observed in the section from Kvitøya to Victoria Island. It thus

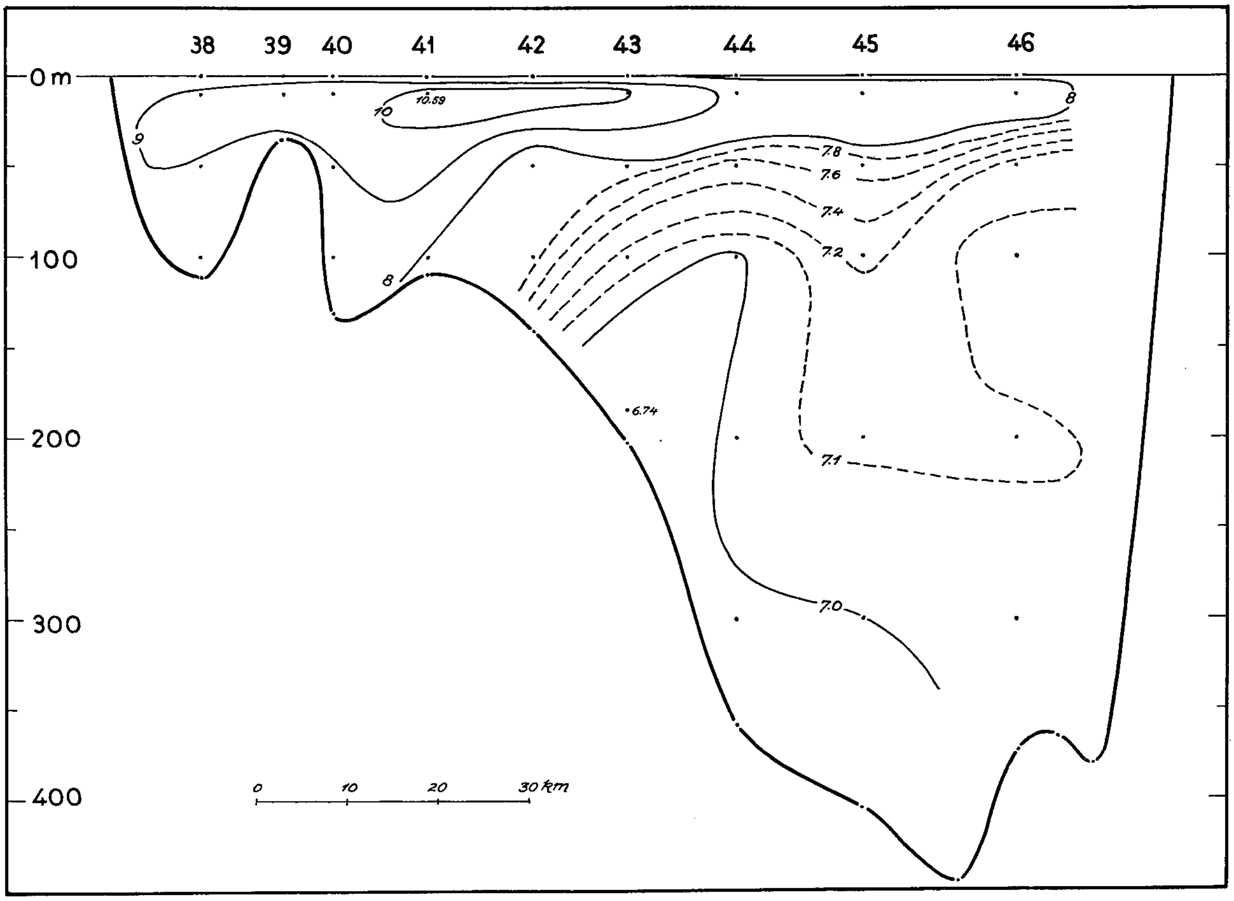

Fig. 12. Distribution of O_2 cc/L in the section Victoria Island—Franz Joseph Land.

seems that the warm and saline water entering the Barents Sea from the north, can only pass east of Kvitøya, the bottom topography hinders its inflow west of the island. Fig. 10 shows a great vertical gradient of the salinity between 34.5 and 34.8 ‰ and of the temperature between 0 and 2°. These isohalines and isotherms fall very near to each other at depths between 75 and 125 m and thus determine a discontinuity layer between the cold water above and the warm and saline water below. When regarding the 1.5° isotherm and the 34.7 ‰ isohaline as the rough limits of the warm and saline water, we find a cross-area of this water between Victoria Island and Franz Joseph Land of about 17 km², and between Kvitøya and Victoria Island of about 1.2 km².

The next section, reproduced in Fig. 11, consists of stations Q 54—68 and was taken from July 30, to August 2, 1931. It is seen from Fig. 1 (p. 7) that this section was taken along the route from the northern entrance of Cambridge Channel towards a north-westerly direction until station Q 58, and from here towards the south-west until near Kvitøya. The isotherms in Fig. 11 show a cold layer of below —1.0° at about 25 m depth; the lowest temperature observed in the section is —1.57°. The stations on the shelf north of Alexandra Land give only negative temperatures, except four values near the surface at stations Q 55 and 56. The cold water layer is separated by an intermediate layer of great vertical gradients of temperature and salinity from the warm and saline water below. The 0° isotherm slopes from about 50 m in the east (station Q 57) to about 100 m in the west, similarly the isohalines for 34.5 and 34.6 ‰. The 1.5° isotherm roughly follows the 34.7 ‰ isohaline, as in the previous sections, but the two isolines do not coincide so well here; it may specially be noted that while the 34.7 ‰ isohaline meets the bottom between stations Q 55 and 56 at a little more than 100 m depth, the 1.5° isotherm bends downwards without touching bottom on the eastern side of the channel. From roughly 100 m depth downwards we find a very warm water, with many temperatures about 2°. The highest values are found at between 200 and 300 m near the bottom on the western side of the channel (stations Q 63—67), on the continental shelf north of Victoria Island. The highest values are 2.73 and 2.75°, which are observed 14 to 30 m from the bottom. In the deepest part of the channel the temperatures decrease from 300 m downwards, reaching a little below zero near the bottom at 400 to 600 m depth. The highest salinities are usually observed near the bottom on the shelf north of Victoria Island, as are also the highest temperatures; but equally high, and even higher salinities are found at about 300 m depth in the deepest part of the channel, specially near the western slope.

It shall here be mentioned that a number of the observations within the cold water layer have shown that this water is often near its freezing point. The averages of temperature and salinity from 79 values from the "Quest", the "Blaafjeld" and the "Hisø" accumulating nearest to the freezing temperatures at the corresponding salinities, are —1.59° and 34.29 ‰. The freezing point at this salinity would be at —1.87° or 0.28° lower. A number of 40 among these observations are from the "Quest" and give the slightly different averages: —1.60° and 34.24 ‰. We may regard these values as characteristics of the extreme type of the Arctic Water. The relatively small difference between observed temperature and freezing point is a criterion that the observations are taken in a water which is near to its original state, because the Arctic Water, in the moment it is formed, must be very near to the freezing point.

Concerning the northern section from Kvitøya westwards (stations Q 69—85), it shall only be mentioned that the highest temperatures are found at station Q 76 at 50 m (1.23°) and at station Q 71 at 75 m and deeper (between 1.31 and 1.01°). At station Q 71 the salinity reaches 34.87 ‰, the water thus being of Atlantic origin.

The distribution of oxygen in cc/L in the section from Victoria Island towards Franz Joseph Land is seen from Fig. 12. The highest values are found within the uppermost 25 m at stations Q 41—43, amounting to 10.59 cc/L. On the whole the values are highest at the western stations on relatively shallow water and in the uppermost layers at the eastern stations. The values decrease with depth from 8 cc/L or more near the surface to 7 cc/L near the bottom, but it is seen that the lowest values, below 7 cc/L, are found near the bottom on the western slope (stations Q 43, 44, 45).

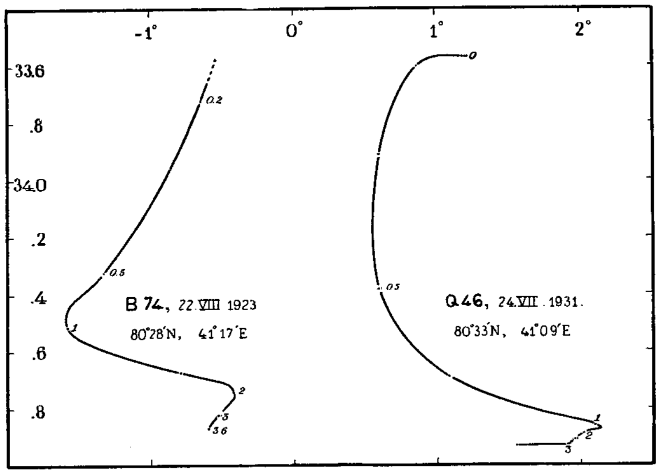

Fig. 13. *t*-*S*-diagram from two stations in the Northern Barents Sea.

4. Horizontal Distribution.

The horizontal distribution may be studied by charts of temperature and salinity. Unfortunately it soon appears impossible to obtain representative charts over a greater area by using the "Blaafjeld" and the "Hisø" stations in addition to the "Quest" stations. In the Northern Barents Sea, with depths of only some hundred meters and relatively strong currents rather near to the bottom, the waters are obviously exchanged with those to the north and perhaps also with other adjacent waters, during a relatively short time. Anyway, it appears that the observations from the above mentioned three expeditions cannot be compared directly for giving a picture of the conditions. The best illustration of this is found in the observations from stations Q 46 and B 74; the t-S-diagrams from these two stations are constructed in Fig. 13. Q 46 was taken on July 24, 1931 in latitude 80° 33′ N and in longitude 41° 09′ E, while B 74 was taken on August 22, 1923 in latitude 80° 28′ N and in longitude 41° 17′ E; the distance between them is only some nautical miles. The temperatures are seen from Fig. 13 to be very different all through, in the upper layers differing by about 1°, at 100 m the difference is 3.68° and deeper down about 2°; the higher temperatures are found at station Q 46. Also the salinities are different at the two stations, being at all depths higher at station Q 46; the differences are between 0.08 and 0.20 ‰.

On the basis of the "Quest" stations only I have constructed the isotherms and the isohalines for 50 m depth in Fig. 14. North of Nordostlandet we find

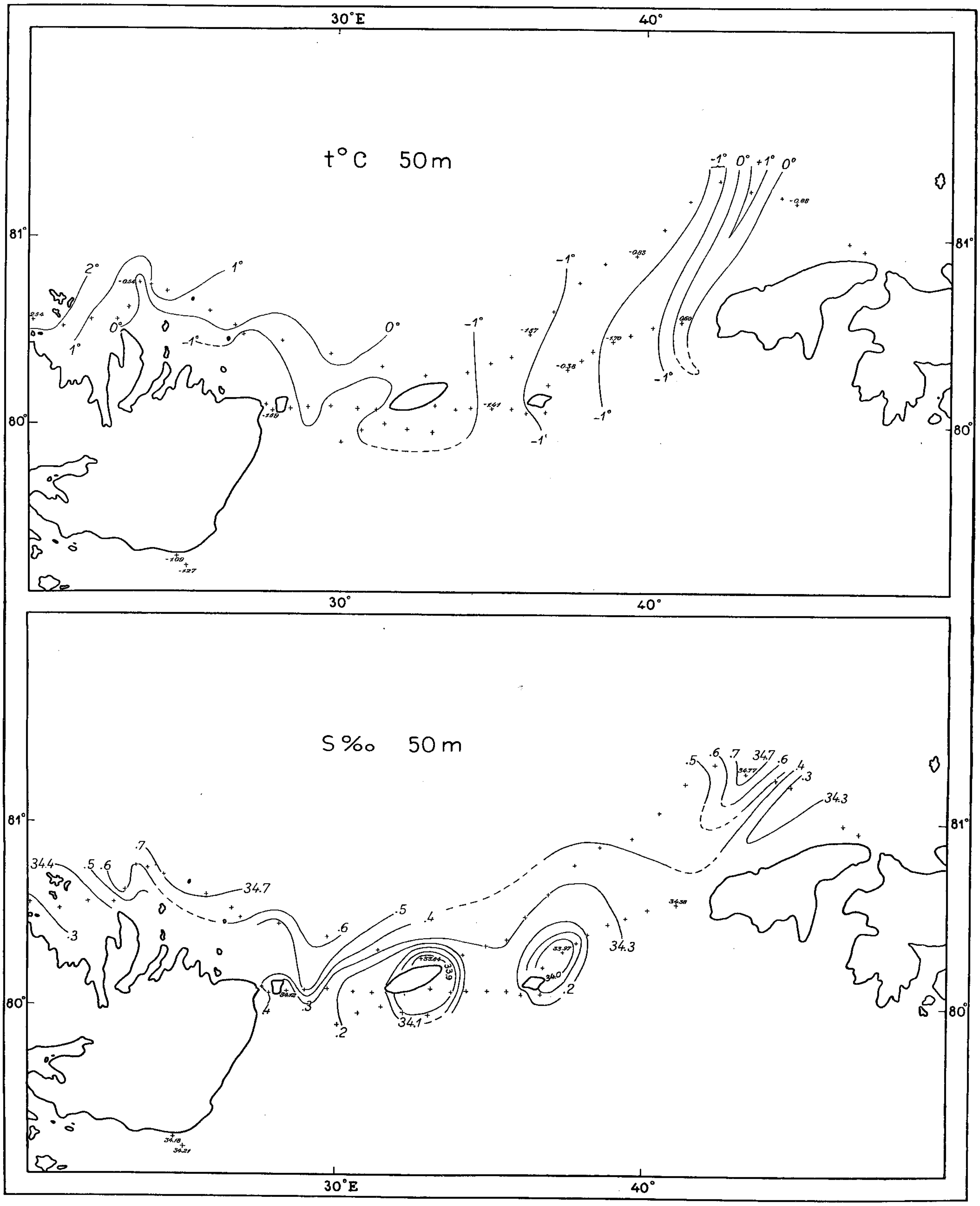

Fig. 14. Horizontal distribution of t and S at 50 m depth in the Northern Barents Sea, according to the observations of 1931.

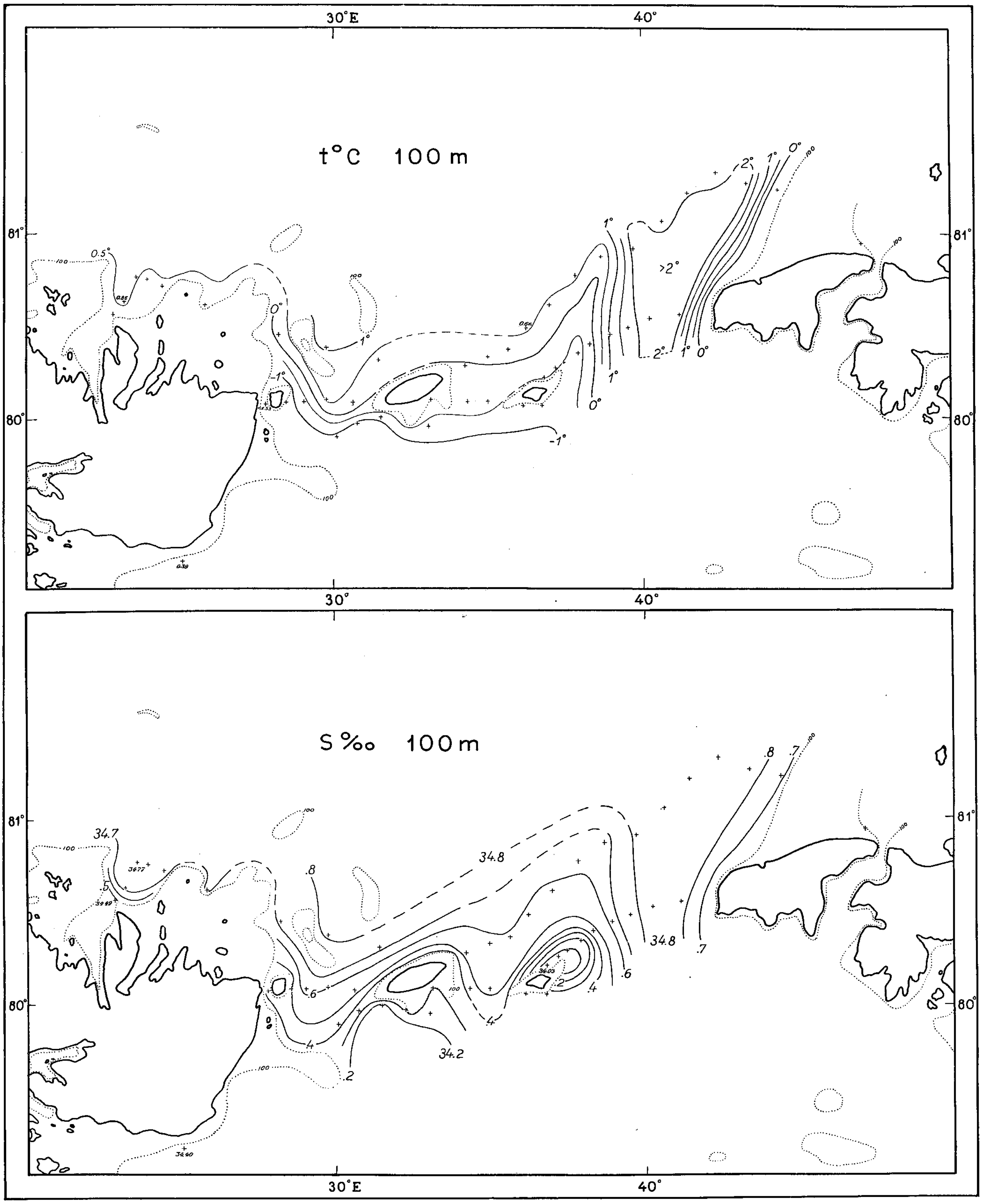

Fig 15. Horizontal distribution of t and S at 100 m depth in the Northern Barents Sea, according to the observations of 1931.

water of more than $+1^\circ$ around Seven Islands and a little north of Karl XII Island. Also north of Alexandra Land similarly high temperature is observed at station Q 57, namely 1.26°; from here a wedge of warm water stretches in a south-westerly direction into the channel west of Alexandra Land, where it still has a positive temperature: 0.60° (station Q 46). The 0° isotherm is determined also north of Nordostlandet, where it runs rather near the coast. Along the sections between Nordostlandet and Alexandra Land all values are negative, with the mentioned exceptions. Values below -1° are found near Nordostlandet and Storøya, in the channel between Storøya and Kvitøya, between Kvitøya and Victoria Island and between Victoria Island and Alexandra Land. Around Kvitøya and Victoria Island the temperatures are a little higher. The belts of cold water (below -1°) between Kvitøya and Victoria Island and between Victoria Island and Alexandra Land cross the northern section as well as the southern ones, while between Storøya and Kvitøya the -1° isotherm does not reach our northern section. The lowest value is -1.70°, at station Q 43. The salinities are also highest north of Nordostlandet and Alexandra Land, amounting to 34.77 ‰ at station Q 57. Values above 34.5 ‰ are found at most stations north of Nordostlandet and at station Q 57 and 58, all the others are lower. The areas around Kvitøya and around Victoria Island show the lowest salinities; the lowest value, 33.84 ‰, was found at station Q 69 immediately north of Kvitøya. From these charts it thus appears that at 50 m depth a cold and little saline water is situated near the islands and in the channels between them, while north of Nordostlandet a warm and saline water is moving eastwards along the shelf, sending west of Alexandra Land a branch towards the south-west into Barents Sea. The movements of the waters shall be studied more closely later.

At 100 m depth (Fig. 15) the 0° isotherm runs from a point of the 100 m isobath of the bottom north of the eastern point of Nordostlandet into the channel between Storøya and Kvitøya, eastwards north of Kvitøya; then it bends out towards north-north-east from Victoria Island, after which it runs finally towards the south along the western side of the channel between Victoria Island and Alexandra Land. A little outside the 100 m isobath of the bottom to the north and west of Alexandra Land we also find the 0° isotherm. North of Nordostlandet the highest temperature is 0.86°, while at station Q 71 in the northern section between Storøya and Kvitøya we have 1.08°. The -1° isotherm runs from north of Storøya south of Kvitøya and south of Victoria Island. The warmest water is found in the channel between Victoria Island and Alexandra Land, where the highest values are 2.21° (Q 57), 2.10° (Q 46), and 2.07° (Q 45). The highest salinities are found in the same channel, thus 34.86 ‰ (Q 46) and slightly lower values; 34.86 ‰ is also found at station Q 71. North of Nordostlandet the salinity amounts to maximally 34.77 ‰. The lowest salinities are found to the north-east of Victoria Island: 34.03 at station Q 38 is the lowest salinity at this depth. Also south of Kvitøya there are low values: 34.17 ‰ at station Q 26. In the channels Storøya—Kvitøya and Kvitøya—Victoria Island the isohalines bend southwards, giving relatively high salinities, similarly as in the channel Victoria Island —Alexandra Land. It thus appears that also at this depth a warm and saline water runs towards the east, north of Nordostlandet, bending southwards in the channels, especially in the easternmost channel, where a broad branch of this water enters Barents Sea. This branch is perhaps the most interesting feature of the chart.

At 200 m we have only few observations. All temperatures are here positive, except at station Q 23 between Storøya and Kvitøya, where we have -0.03°. This channel has the coldest and least saline water at this depth (34.70 ‰), while the narrow channel between Kvitøya and Victoria Island has the warmest and most saline water (2.66°, farther north 2.74° and 34.93 ‰). The three stations Q 44, 45, and 46 in the channel between Victoria Island and Alexandra Land give the temperatures 2.14, 1.68, and 2.02° respectively and the salinities 34.91, 34.85, and 34.89 ‰ respectively. Station Q 45 in the middle of the channel thus gives a slightly colder and less saline water than the others. We thus find the conditions at 200 m depth quite different from those at 100 m, a fact which may have its explanation in stowing up of water from the deeper layers in this, bathymetrically complicated area.

By inspection of the tables as well as of the station curves, it appears possible to point out, at a number of stations, a maximum temperature corresponding to the above mentioned warm and saline water. These maximum temperatures are used on the chart Fig. 16, upper part. The 1° isotherm is determined by stations Q 76 and 77 to run along the shelf north of Nordostlandet and southwards into the channel between Storøya and Kvitøya. Probably the tongue

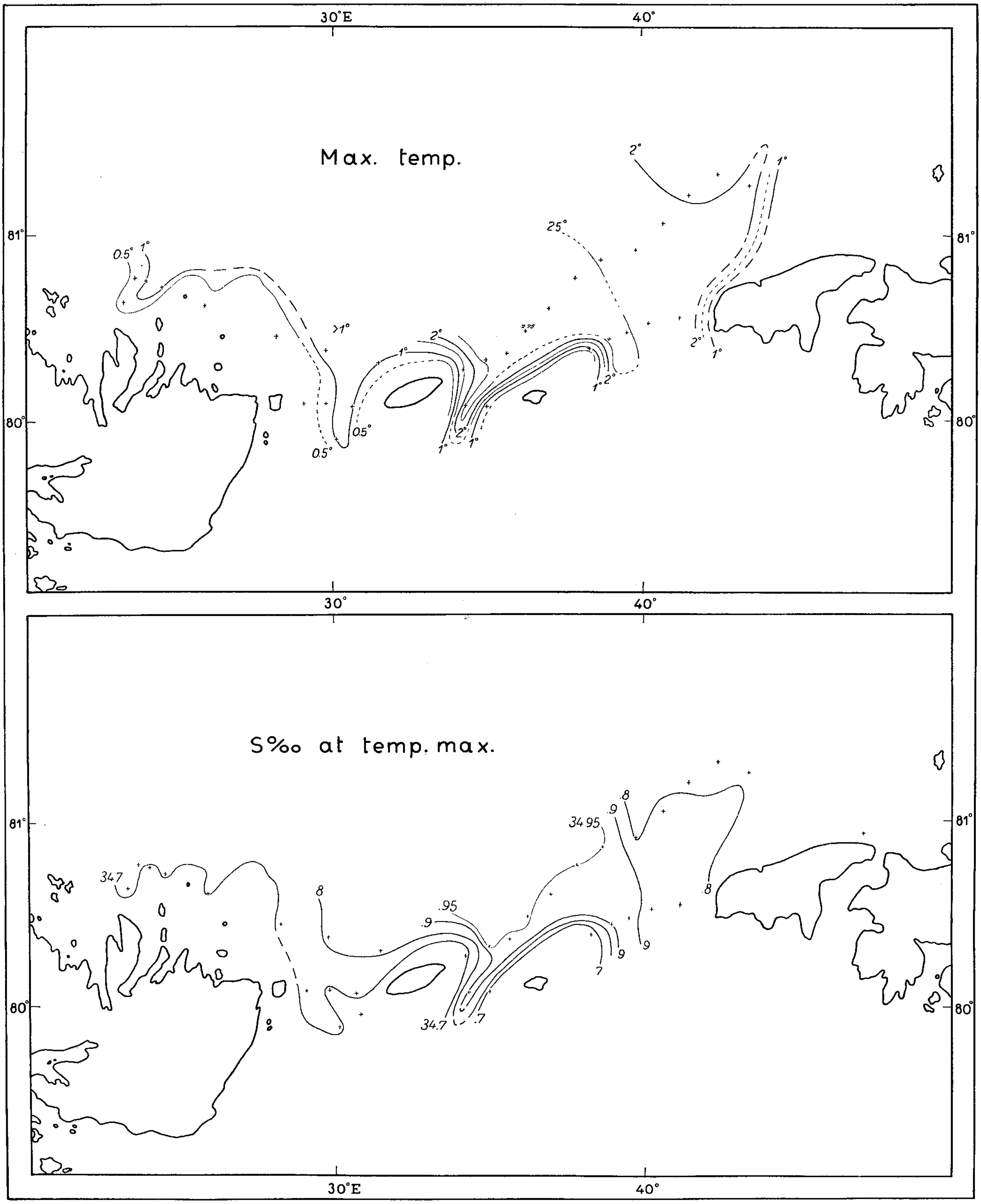

Fig. 16. Distribution of maximum temperature and corresponding salinity in the Northern Barents Sea in 1931.

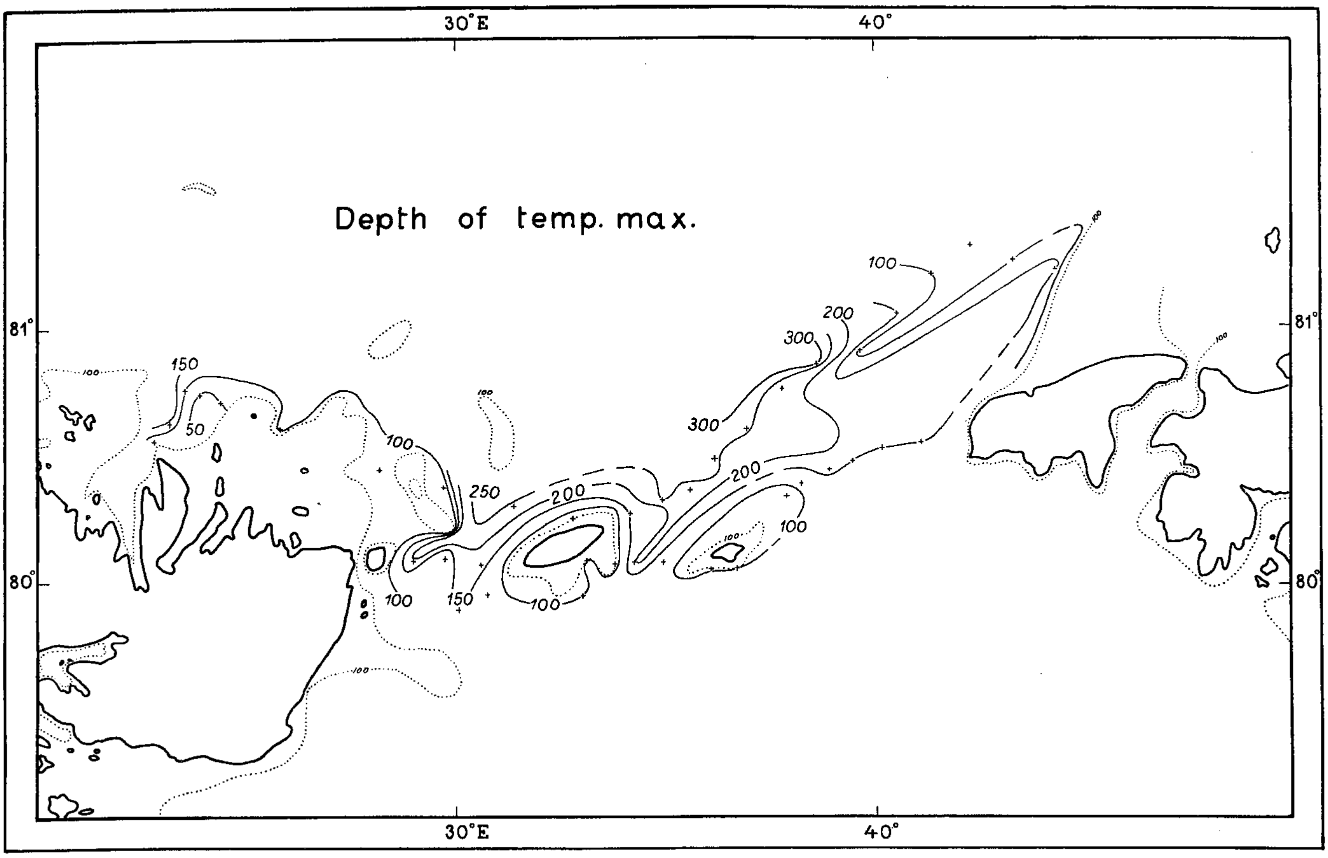

Fig. 17. Depth of temperature maximum in the Northern Barents Sea in 1931.

of maximum temperatures above 1° does not reach far south here. In the channel between Kvitøya and Victoria Island a similar tongue obviously must reach farther towards the south, because at station Q 33 the temperature reaches the high value 2.66°. The broad tongue east of Victoria Island must be supposed to reach farthest south; the area north of Victoria Island and north of the channel between Victoria Island and Alexandra Land has a number of very high maximum temperatures. Values below 1° are found on the shelf north of Nordostlandet and Storøya and in the areas around Kvitøya, around Victoria Island, and probably also around Franz Joseph Land. Similarly we find the lower salinities (Fig. 16, lower part) on the shelf north of Nordostlandet and Storøya and in the areas around Kvitøya, Victoria Island, and Franz Joseph Land, while the highest salinities are found in the two well pronounced tongues stretching southwards between Kvitøya and Victoria Island and between Victoria Island and Alexandra Land as well as in an extensive area north of Victoria Island. Fig. 17 shows the depths at which the maximum temperatures are found. It is seen that this depth is great in the channels Storøya—Kvitøya and Kvitøya—Victoria Island, and partly also Victoria Island—Alexandra Land. The greatest depths are found farther north, along the northern section. North of Nordostlandet the depths are small, similarly on the shelf north of Storøya, around Kvitøya and Victoria Island and north of Alexandra Land.

Resuming, we may say that a warm and saline water passes along the shelf north of Spitsbergen towards the east. A great part of it enters the flat part of the shelf north of Kvitøya and Victoria Island, at depths between 200 and 300 m, and from here runs southwards into the channels: most of it between Victoria Island and Alexandra Land, much of it between Kvitøya and Victoria Island, a little between Storøya and Kvitøya, but nothing between Nordostlandet and Storøya. The highest temperature and salinity observed here is 2.75° and 34.95 ‰ at 250 m depth at station Q 65. A great number of the observations give temperatures above 2.5° and salinities above 34.85 or even 34.90 ‰.

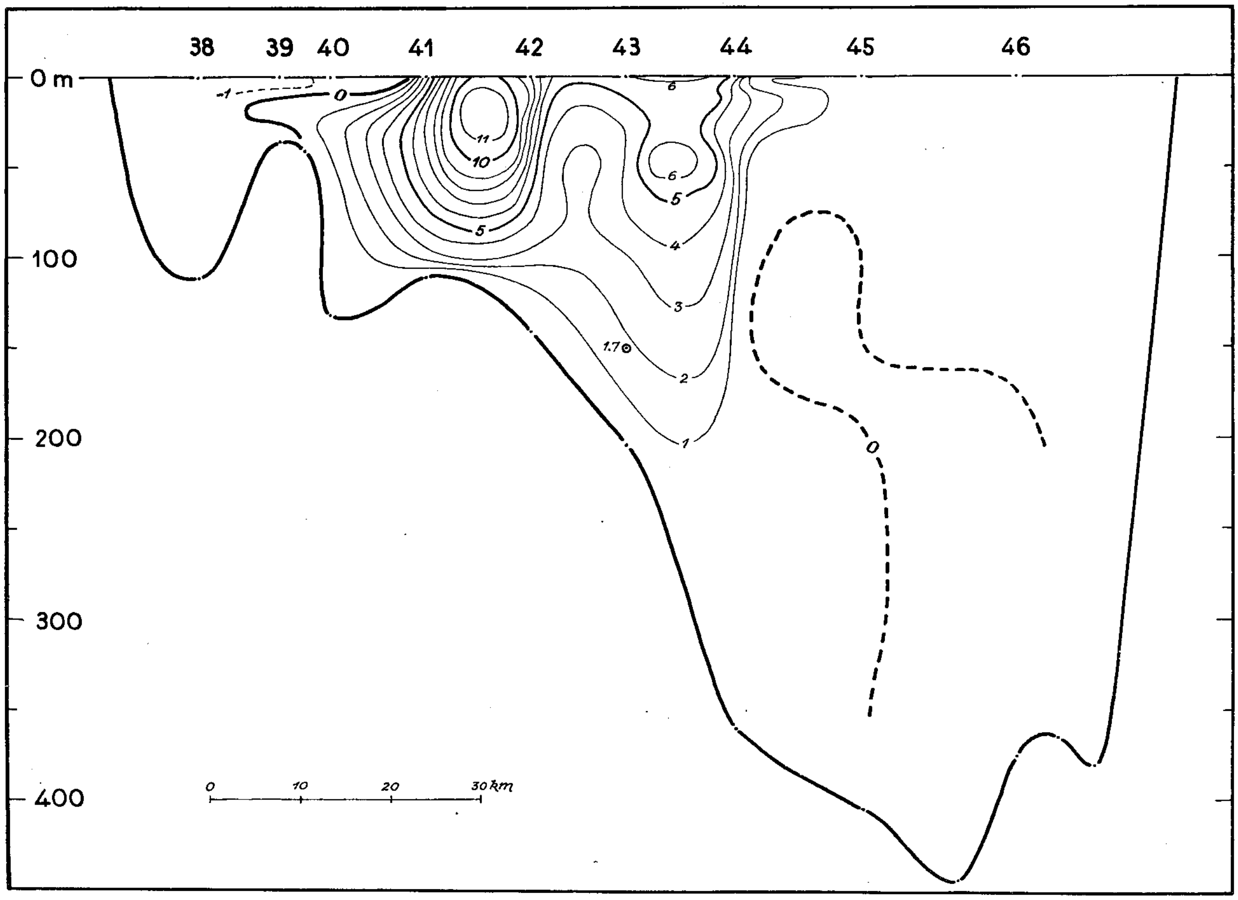

Fig. 18. Distribution of velocity in the section Victoria Island—Franz Joseph Land.

5. Dynamic Current Calculations.

On the basis of the observed values of temperature and salinity, we have computed values of the specific volume; by means of these it is possible to construct isosteres for the section between Victoria Island and Alexandra Land (stations Q 38 to 46); only for the area east of station Q 46, which was taken about 15 km from Alexandra Land, the isosteres are difficult to determine. By means of the method of extrapolation of Helland-Hansen and Nansen (cf. p. 14) it is now possible to base the velocity computations on the 400 decibar surface as assumed surface of zero current, although many of the stations are taken at less than 400 m depth. As done when discussing the section north of Spitsbergen (p. 15), I have determined the distribution of velocity components in cm/sec by drawing for each standard depth a smooth curve of the velocity component, trying to obtain the best possible agreement with the average velocities computed for each pair of stations. From these curves the distribution of the velocity components in the section was determined; the obtained picture is reproduced in Fig. 18.

A control of the validity of the result may be obtained from the direct current measurements at anchor station D (station Q 43). From the north- and east-components of the rest-current determined in a later chapter (p. 49), we can compute the component at right angle through the section, *i. e.* towards S 25° E; we find

Depth m	Measured cm/sec	Calculated cm/sec
10	0.2	4.6
50	—2.1	4.1
150	1.7	1.7

The calculated values in the last column are taken from the mentioned velocity curves for these standard depths. It appeared that the values would come out very nearly the same when using the 250 decibar surface as surface of zero current as when using the 400 decibar surface.

It is seen that at 150 m the agreement between current measurements and dynamic current calculation is perfect. For 10 and 50 m depth the two different methods give very different results. The electric current records at 50 m were now and then controlled by single measurements by one of the Ekman current meters, and it does not seem possible to detect any reason of suspicion against the results of the measurements. On the other hand the distribution with depth found from the dynamic calculations appears very reasonable, the values decreasing downwards. It seems that the only possible explanation is that the discrepancies within the upper layers must be due to wind currents. It is not possible to control the effect of the wind in detail, partly because we do not know very much about the wind during the period before our visit, and partly because it is not possible to determine the actual direction of the current from the dynamic calculations, which give only the component at right angle through the section. Our observations and the synoptic charts published by ERIKSSON [1933] show that north-easterly winds were blowing about the time in question. The rather uncommon thing in these regions, that no ice was sighted to the north from our stations, must be due to wind-drift, and as the surface drift will go towards a direction about 45° to the right of the direction of the wind, the wind must have come from some direction more easterly than north-east. A wind from a direction between north-east and south-east would give a surface drift towards a direction between west and north, and it should give a current at 10 m of a slightly more northerly direction and at 50 m it should give a current roughly towards the north. Qualitatively the wind may thus be regarded as a possible cause of the discrepancies at 10 and 50 m, but coming to the current velocities, it is hard to understand that at 50 m the effect seems to have been stronger than at 10 m.

The current measurements thus bring no full and satisfactory control of the dynamic calculations; as the agreement is excellent at 150 m, however, where wind-currents do not exist, it seems reasonable to regard the dynamic current components, as they are represented in the velocity section Fig. 18, as giving a fairly correct picture of the velocity distribution in the section when disregarding wind currents.

Inspecting the velocity profile Fig. 18, we find that the greatest velocities, up to more than 11 cm/sec, occur between stations Q 41 and 42 at about 25 m depth. Between stations Q 43 and 44 velocities of 6 cm/sec are found at roughly the same depth. Between these maxima the velocities are lower, the whole current nucleus situated between stations Q 40 and 44 from the surface to between 100 and 150 m depth, being thus split up by a belt of lower velocities. Between stations Q 45 and 46 the velocities are nearly zero from the surface to the bottom, showing some irregularities of less importance. From station Q 46 to Alexandra Land the iso-lines cannot be drawn with full certainty. The most reasonable shape of them leads to a weak return current (negative velocity-components), specially in the upper strata.

VI. The Svalbard Atlantic Current.

The Atlantic Water plays an important part in the hydrography of the waters north and east of Svalbard, and we shall try to obtain a sufficiently clear view of the characteristics of this water and its mixing components, to be able to formulate a more clear definition of the Atlantic Water in these regions. Such a definition will be of importance when trying to calculate the transport of Atlantic Water within the Svalbard Atlantic Current.

The Atlantic Water is characterized by higher temperature and higher salinity than the surrounding water masses. This is clearly seen from the *t*-*S*-diagrams Fig. 19, Fig. 20, and Fig. 21, on which all pairs of observations from 1931 with salinities above 34.1 ‰ are plotted. Fig. 19 is based upon the observations north of Spitsbergen, namely the "Nautilus" stations N 1—9 and the "Quest" stations Q 94—101, including the repeated series Q 99 A—J at the anchor station F. As mentioned later (p. 38) in connection with Fig. 5 (p. 14), the observations from 1931 show higher temperatures and salinities than any observation from former years; the extreme values are 5.04° and 35.14‰, observed at station Q 99 I at 100 m. *We may regard these extreme values, 5.04°, 35.14‰, as the characteristics of the extreme Spitbergen Atlantic Water.*

From former investigations [NANSEN 1902, 1915, SVERDRUP 1933 a] it is known that the deep water of the Polar Basin has a nearly uniform salinity of slightly above 34.92 ‰, exactly the salinity of the

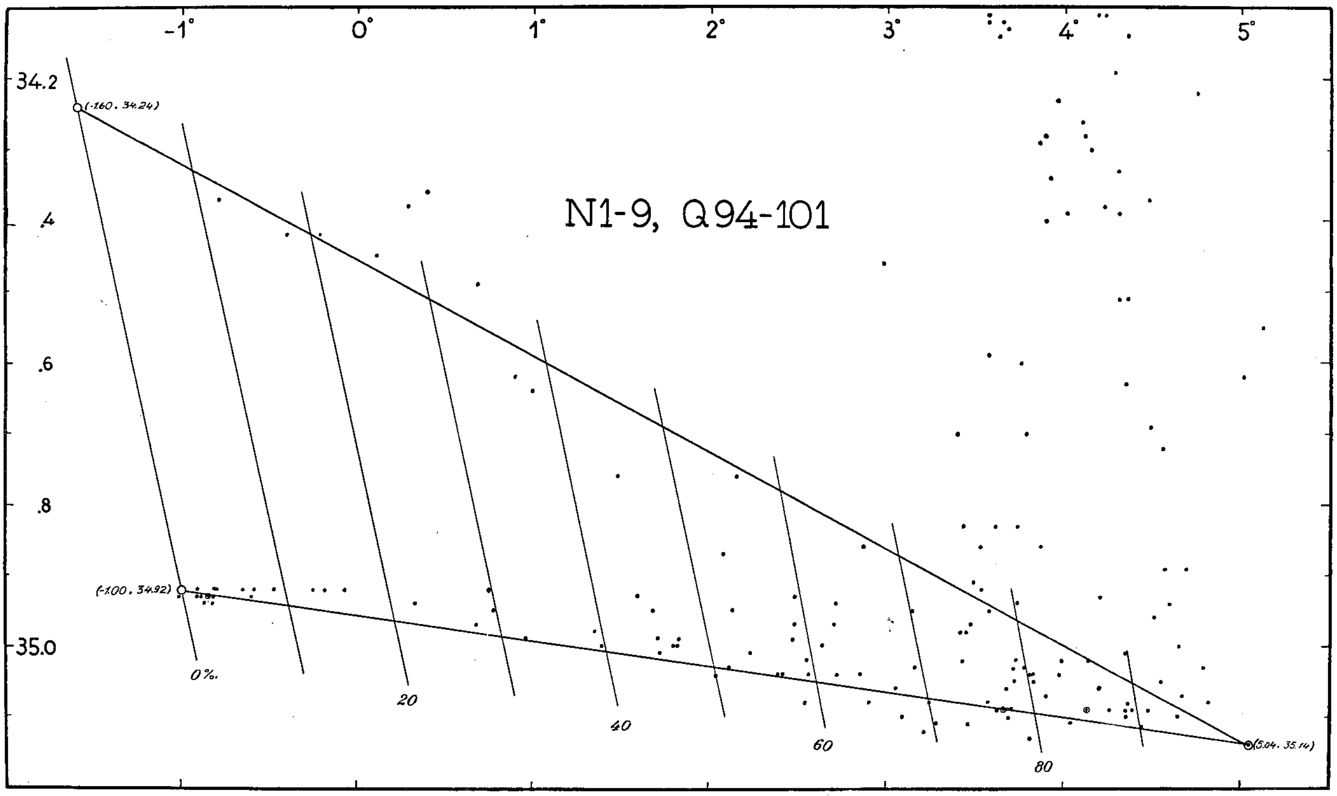

Fig. 19. *t-S*-diagram from stations north of Spitsbergen in 1931.

deep water of the Norwegian Sea [cf. HELLAND-HANSEN and NANSEN 1909], and a temperature down to nearly one degree below zero. The observations from the deeper strata are seen on Fig. 19 to approach *these values, —1.00°, 34.92 ‰, which are, in the following, regarded as the characteristics of the deep water of the Polar Sea.*

In a previous chapter (p. 23) we have studied the cold layer of Arctic Water at about 75 m depth east of Svalbard; *we found the characteristics of this water to be about —1.60°, 34.24 ‰.* This cold water, which is not far from its freezing point (—1.87°), is probably formed in the winter by cooling and ice-freezing at the surface. In summer this water does obviously not occur in its original form, it is more or less mixed up and its temperature is higher than the freezing temperature. It therefore appears reasonable to use as the characteristics of this water in summer the above values, which were found as the averages of a number of values observed within the most extreme cases occuring.

The above mentioned three types of water, in extreme cases characterized by the above given values, are the dominating water masses in the region here studied; they are denoted in Fig. 19 by small circles. Imagine a layer of extreme Spitsbergen Atlantic Water situated between the typical Deep Water below and the cold Arctic Water above. After some time we should by thorough investigations in the layer near the original limit between Deep Water and Atlantic Water find water samples represented in the *t-S*-diagram Fig. 19 by dots along the straight line between the two corresponding circles. Similarly an accurate investigation within the mixing layer between Atlantic and Arctic Water should give dots in the diagram falling along the straight line between the two corresponding circles. In nature the processes do not go on exactly so; the different layers may be more or less pronounced, the rate of mixing may be different a. s. o. But on the whole we find a very satisfactory agreement with the straight-lined scheme. Very many of the dots in Fig. 19 fall near to the two straight lines, approaching the extremes of Deep Water and of Atlantic Water, but not reaching the characteristics of the Arctic Water. This layer is less pronounced in the region immediately north of Spitsbergen, while a summer-heated surface layer of high temperatures and relatively low salinities gives, in the

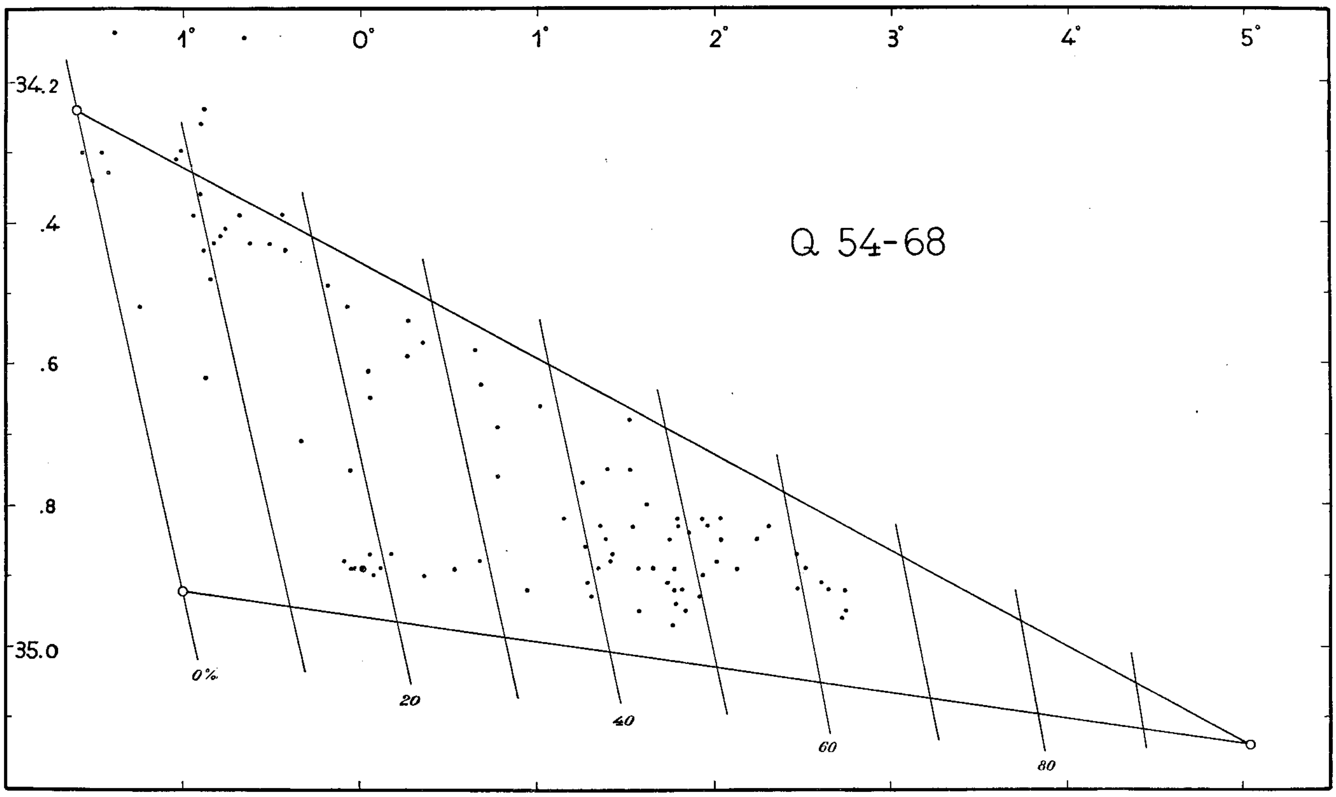

Fig. 20. *t*-*S*-diagram from stations in the northern section in the east in 1931.

diagram, dots spreading over the right part of the diagram.

On Fig. 20, containing the observations from stations Q 54—68, neither Atlantic nor Deep Water is found in extreme, while the Arctic Water here approaches the extreme values. But the observations from the Atlantic Water at these stations from the northern section in the east, all fall between the two straight lines mentioned.

The stations from the southern sections in the east, stations Q 31—46, are represented in Fig. 21; these observations do not either show the extremes of Atlantic or of Deep Water, only the Arctic Water layer is well pronounced.

If a water of 0.51° and 34.98 ‰ is produced by mixing between extreme Spitsbergen Atlantic Water (5.04°, 35.14 ‰) and Polar Deep Water (—1.00°, 34.92 ‰), we know that it consists of about 25 per cent Atlantic Water and about 75 per cent Deep Water. In this way it is possible to provide the straight lines of the *t*-*S*-diagrams with linear scales showing percentage of constituents contained. As the Deep Water and the Arctic Water does not, in our observations, occur directly above each other, we never find a water to be explained by direct intermixture between these two water types. By drawing straight lines combining the corresponding scale values of the two scales of percentage, we obtain a scaling of most of the area of the diagram covered by dots of observations; the surface water gives a number of exceptions. That this scheme may be used for determining the percentage of extreme Spitsbergen Atlantic Water contained in any given water sample from this region, may appear still more evident by the following reasoning. If an original intermediate layer of extreme Spitsbergen Atlantic Water is reduced in thickness by mixing from above and from below, it may be used up, and the two mixing processes may, so to say, cover each other. A water of 1.87° and 34.85 ‰ may now be regarded as the result of mixing f. inst. between two water masses, of which one consists of 54 % Atlantic Water and 46 % Arctic Water, the other of 44 % Atlantic Water and 56 % Deep Water, these two water masses being mixed in proportion about 34 : 25. A simple computation shows that this means a content of Atlantic Water of 50 %. We might also regard this water of 1.87° and 34.85 ‰ as consisting of two water masses,

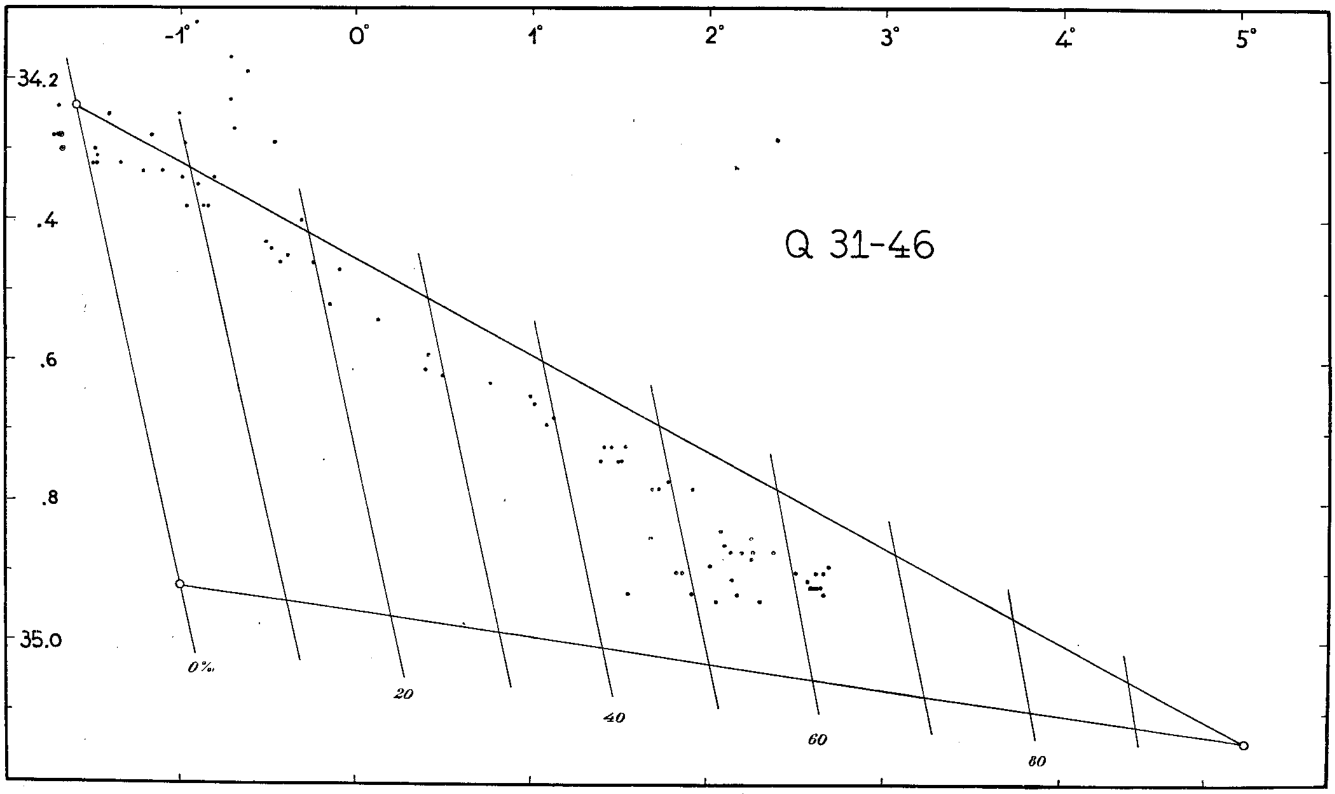

Fig. 21. *t-S*-diagram from stations in the southern section in the east in 1931.

each containing 50 % Atlantic Water and 50 % Deep Water resp. Arctic Water, the two masses being mixed in equal proportions. We also then find that the resulting water must contain 50 % Atlantic Water. The straight-lined scheme must, on the whole, be correct, because the very process of mixing is represented in the *t-S*-diagram by a straight line.

The extreme values from the stations plotted in Fig. 19 were 5.04°, 35.14 ‰, corresponding to 100 % Spitsbergen Atlantic Water. The extreme values of Fig. 20 from the northern section in the east are 2.75°, 34.95 ‰, corresponding to 74 % Spitsbergen Atlantic Water. The extreme values in Fig. 21 from the southern sections in the east are 2.69°, 34.89 ‰, corresponding to 64 % Spitsbergen Atlantic Water.

Inspecting the sections it may by rough judgements be regarded reasonable to put the limit of the Atlantic Water at about 1.5°. This would usually correspond to a content of the extreme Spitsbergen Atlantic Water of between 46 and 41 %.

When using the above method for determining the percentage of extreme Spitsbergen Atlantic Water at the different points of the section north of Spitsbergen, it is possible to construct a picture of the distribution of the percentage, as done in Fig. 22. Within the surface layer, where the temperature is high and the salinity low, the percentage has been roughly determined from the salinities only, regarding 35.14 ‰ as 100 % and 33.5 ‰ as 0 % Spitsbergen Atlantic Water. It is seen on Fig. 22 how the highest values, representing the nucleus, fall at relatively small depths near the edge of the shelf at stations Q 99, 98, and A. Also farther north relatively high values are found at 200 to 300 m depth, in the part of the section where the velocity components are small and negative (cf. Fig. 7, p. 16).

By means of the distribution of percentage (Fig. 22) and of velocity (Fig. 7) it is now possible to determine the transport of extreme Spitsbergen Atlantic Water through the section, by multiplying the total transport through each element of the section by the corresponding average percentage and summing up over the whole section. We shall study the transport through the section north of Spitsbergen by means of Table 3, which contains on the first line the total transport of water towards the east, basing on the 700 decibar surface as surface of zero current. Next line gives the corresponding values for the water

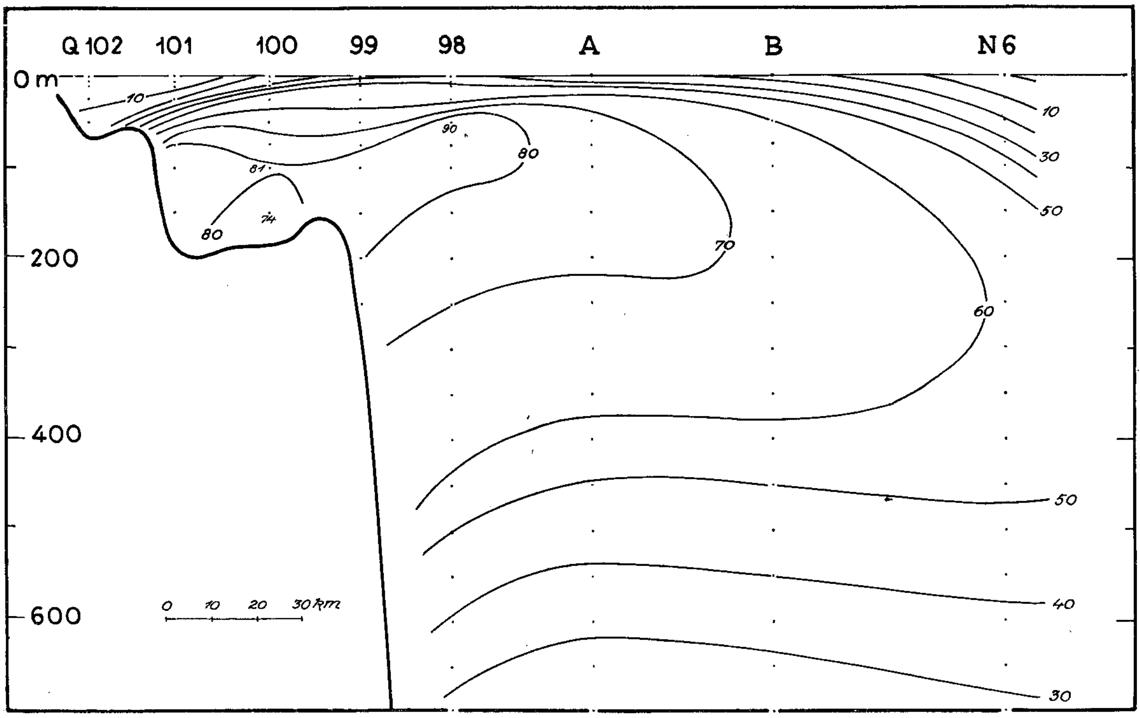

Fig. 22. Percentage of extreme Spitsbergen Atlantic Water in the section north of Spitsbergen.

masses not colder than 1.5°; these values agree very well on those of the total transport, the greatest difference occurring in the northernmost part of the section and amounting to 25 per cent of the total transport between stations B and N 6. The next line gives the results of the determinations of the transport of extreme Spitsbergen Atlantic Water, indicated by "Of 100 %"; these values are all lower than those in the lines above, the transport between stations 102 and 99 nearly disappearing. In all cases we find a negative transport north of station A; we may compile the values south and north of this station:

Stations	102—A	A—N 6
Total trsp.	1.364	—0.580
Above 1.5°	1.355	—0.480
Of 100 %	0.907	—0.303
If 1 cm/sec	0.266	0.326

The last line of Table 3 and of the above compilation gives the values which would have been found if the velocity component through the section had been 1 cm/sec everywhere in the section. It is seen that between stations 102 and A this transport would be

Table 3.

Transport through the section north of Spitsbergen, in mill. m³/sec.

Stations	102—101	101—100	100—99	99—98	98—A	A—B	B—N 6
Total trsp.	0.073	0.006	0.014	0.934	0.337	—0.242	—0.338
Above 1.5°...............	0.073	0.006	0.014	0.934	0.328	—0.227	—0.253
Of 100 %	0.015	—0.003	0.008	0.665	0.222	—0.145	—0.158
If 1 cm/sec................	0.008	0.020	0.022	0.079	0.137	0.150	0.176

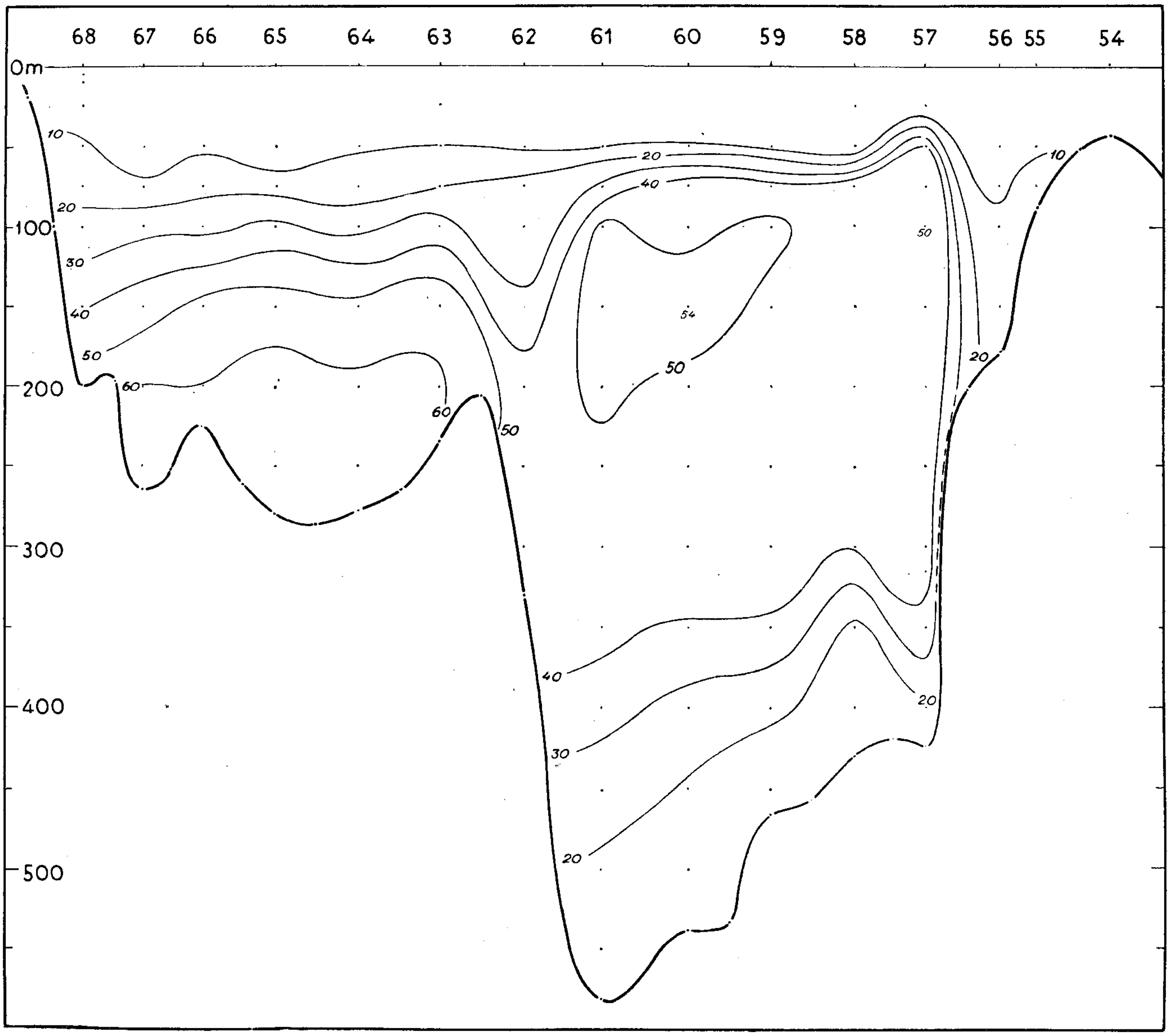

Fig. 23. Percentage of extreme Spitsbergen Atlantic Water in the northern section in the east.

0.266 mill. m^3/sec or 29 per cent of the transport of 100 % water; as the results of dynamic calculations and direct current measurements differed by much less than 1 cm/sec, it seems that the error of the transport calculation is hardly ± 10 %.

Turning to the northern section east of Svalbard, stations Q 55—68, we remember from the discussion of temperature and salinity in this section that the Atlantic Water appeared east of Kvitøya between stations Q 57 and 67. When drawing an approximate limit of this water along the 1.5° isotherm and the 34.70‰ isohaline, we may determine the transport within these limits. Basing on the 400 decibar surface as surface of zero current, *we then find an approximate transport of Atlantic Water of 0.0583 mill. m^3/sec.*

When determining, as described above, the percentages of extreme Spitsbergen Atlantic Water, the distribution within the section is found to be as seen in Fig. 23. The highest values, above 50 %, appear between 100 and 200 m at stations Q 59—61 and below 150 m at the shallower stations Q 63—68. The values decrease to about 10 % at about 50 m depth, and at the deep stations they decrease towards the bottom. The shallow stations on the eastern side of the channel,

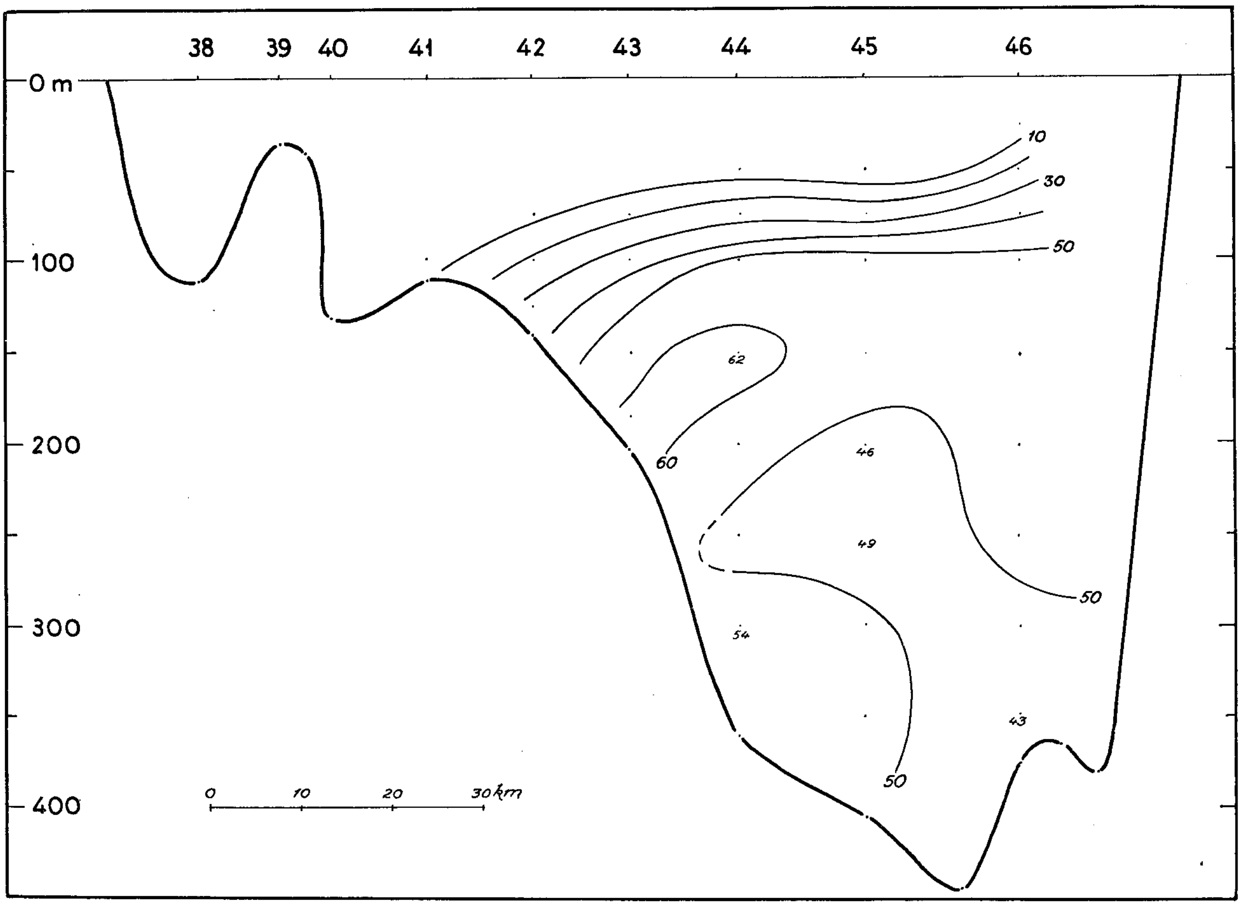

Fig. 24. Percentage of extreme Spitsbergen Atlantic Water in the section Victoria Island—Franz Joseph Land.

stations Q 56—54, show very low values. Using these percentages, as shown above, for *determining the transport of extreme Spitsbergen Atlantic Water through the northern section in the east, we find the value 0.0475 mill. m³/sec.*

For the southern sections east of Svalbard, stations Q 31—35 and Q 38—46, we have similarly determined the transport of Atlantic Water by using a rough limit of this water; *the result obtained was 0.0510 mill. m³/sec.* Fig. 24 shows the distribution of the percentages in this section; basing on these, *we find a transport of extreme Spitsbergen Atlantic Water of 0.0454 mill. m³/sec.* Of this water 0.0099 mill. m³/sec or about 22 % passes through the channel between Kvitøya and Victoria Island (stations Q 31—35).

We may obtain some information as to the validity of the above calculations in the following way. Through the northern section the main transport runs towards the south between stations Q 68 and 58, mainly towards the north between stations Q 58 and 55; through the southern section it goes mainly towards the south between stations Q 31 and 46. Compiling the volumes of extreme Spitsbergen Atlantic Water transported between these stations and the volumes which would have been found if the velocity had been constantly 1 cm/sec, we find:

Stations	68—58	58—55	31—46
Trsp. of 100 %	0.086	—0.022	0.0454
If 1 cm/sec	0.232	0.056	0.084
Average cm/sec	0.37	0.39	0.54

By uniform velocity the transport of extreme Spitsbergen Atlantic Water would correspond to the velocity values given in the last line. These values are small, 0.4 to 0.5 cm/sec, and even if the agreement between the dynamic calculations and the direct current measurements at 150 m was good (cf. p. 29), it appears that *the volume of extreme Spitsbergen Atlantic Water conveyed into the Barents Sea from the north*, which must of course be roughly the same according to the northern and southern sections, *is near to the limit of accuracy of the determination,*

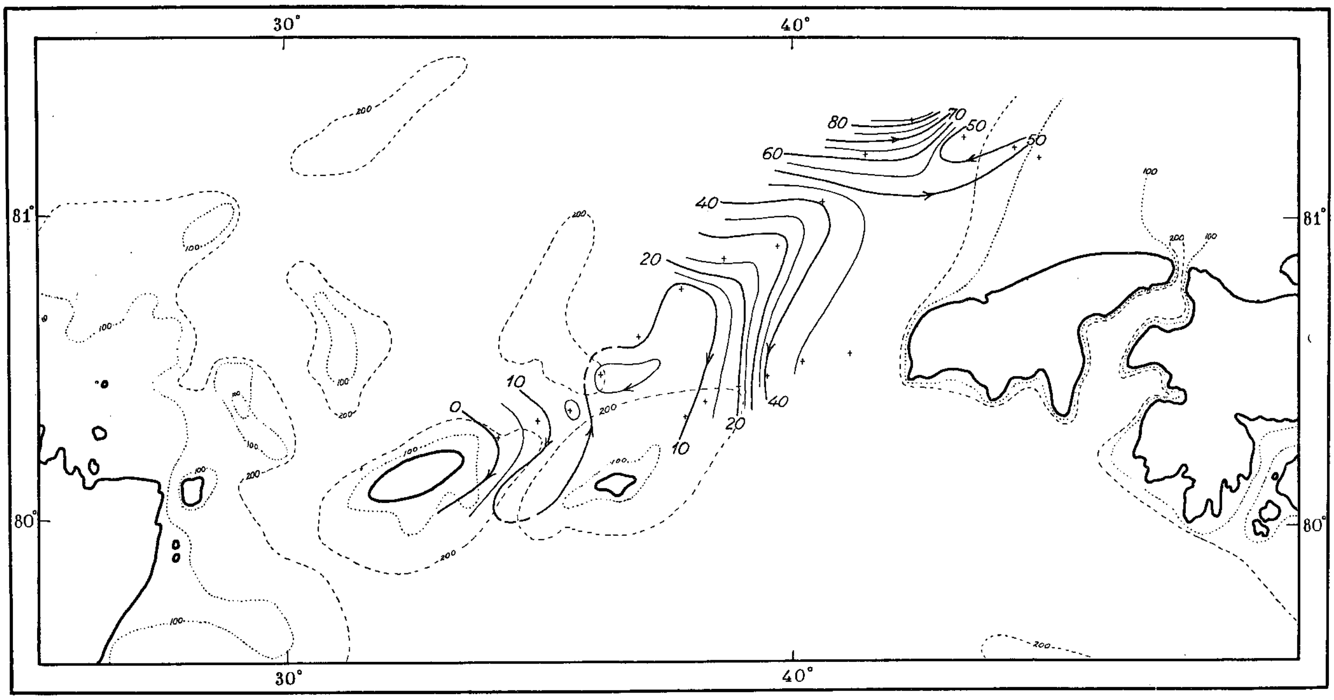

Fig. 25. Transport of extreme Spitsbergen Atlantic Water through the sections in the east.

being about 0:05 mill. m³/sec. The actual value of the transport is thus very difficult to determine, but there can be no doubt as to the general result, that water of Atlantic origin is actually transported southwards into the Barents Sea, even if the transport is only small.

It is, however, possible to obtain som more knowledge of this weak branch of the Svalbard Atlantic Current. In Fig. 25 the total transport of extreme Spitsbergen Atlantic Water between Kvitøya and the different stations farther east is used for constructing the lines of equal transport. Although the amount of water transported is small, the obtained picture appears very reasonable, being also in good agreement with what might be expected from the horizontal distribution of temperature and salinity exhibited in Fig. 14—17.

It is seen that the Svalbard Atlantic Current, after passing north of Spitsbergen and Nordostlandet, is separated into two branches when meeting the bank indicated on Fig. 25 by the 200 m contour line north of Kvitøya and Victoria Island. One very weak branch runs through the channel between these two islands, while most of the water proceeds eastwards. Approaching Alexandra Land, the westernmost island of the Franz Joseph Archipelago, the current is again separated into two parts, one turning towards the south between Victoria Island and Alexandra Land, the other turning towards the north-east into the Polar Sea. It is seen that the amount of water transported towards the south into the Barents Sea is roughly equal to the amount running into the Polar Sea within our sections. It seems reasonable to think that a greater amount of water might have been found to flow into the Polar Sea if our sections had been extended farther northwards.

Adding the volumes of water transported towards the south into the Barents Sea to those disappearing into the Polar Sea, we arrive at an amount of roughly 0.1 mill. m³/sec or about 11 % of the water transport determined from the section in the west, north of Spitsbergen. It was seen (p. 16) that water was lost from the Atlantic Current north of Spitsbergen, by a process of spreading out towards the north-west. We do not know whether this spreading out and the consequent loss of water takes place all the way along the northern coasts of Spitsbergen and Nordostlandet, but in any case it seems reasonable to expect the water masses conveyed by the current through the section in the west, north of Spitbergen, to be greatly reduced when the current reaches our eastern sections. This is also found from our calculations, but according to these the reduction of the water volume may seem too greatly reduced, and it thus appears reasonable to expect that a greater volume be transported towards the north-east into the Polar Sea than our sections can show.

From the distribution of the percentage of Spitsbergen Atlantic Water in the sections it is seen that the Atlantic Water appears at different depths below the surface. Where it is situated above a deep water of Polar origin, we find a relatively great decrease of the percentages towards greater depths; this occurs at the deep stations of the section north of Spitsbergen (Fig. 22) and at the deepest stations in the northern section in the east, stations Q 57—61 (Fig. 23.) In these cases we find the highest percentages usually at depths about 100—150 m. At stations Q 62—67 it is found at greater depths, below 200 m; it seems that topographic influences from the bottom are present here; the Atlantic Water, which is here found immediately above the bottom, is probably stowed up above the bottom, and it cannot be diluted by admixture from below. The highest percentages of the northern section in the east are, therefore, found at 200 and 250 m at these shallower stations.

In the section north of Spitsbergen (Fig. 22) rather high percentages are found even near the surface; a thin surface layer contains principally melting water, but otherwise we find that the Atlantic Current reaches to the very surface. In the sections east of Svalbard, on the other hand, the Atlantic Water is covered by a layer of cold, Arctic Water, and the percentage of Atlantic Water decreases rapidly upwards. The value 15 % is found in the northern section (Fig. 23) usually 50—60 m below the surface, in the southern section (Fig. 24) a little deeper. Thus, during its passage from the section north of Spitsbergen to the sections in the east, the Atlantic Current turns down below the Arctic Water. It is easily understood that this important change of the current, from being a surface current to getting a sub-surface current, must be of great influence upon its "intensity", and that the mixing processes must get much more intense here. It seems to me most reasonable that this is one of the causes why the current appears so greatly reduced during its passage north of Nordostlandet.

The transport map Fig. 25 shows that the transport of extreme Spitsbergen Atlantic Water towards the south through the channel between Victoria Island and Franz Joseph Land is chiefly accumulated on the western slope, nearer to Victoria Island. Also the sections Fig. 23 and 24 show this clearly. This is probably an effect of the earth's rotation, which tends to bend the current towards the right hand side.

In the above investigations we have used the characteristic values, 5.04°, 35.14‰, of the extreme Atlantic Water found north of Spitsbergen in 1931 as a sort of reference values, determining for each sample the percentage of this water contained. We have used these reference values also when studying the water samples from the sections east of Svalbard towards Franz Joseph Land, and then found that the extreme values within these sections amounted to about 70 %. As we believe this water to originate from the Florida Current, it would in this connection be highly interesting to know the percentage of original Florida Current Water contained in the Atlantic Current near Svalbard. To carry out this calculation, it would be necessary to study the "Gulf Stream" water all along its way across the North Atlantic and the Norwegian Sea, and especially to study the mixing processes in the different regions. It may be doubted if sufficient observational data exist for a detailed investigation along this line, an investigation which would be far beyond the scope of the present paper. However, I have tried by means of the available material of observations, to reconstruct in a schematic way the rough lines of the mentioned complex of mixing processes in a t—S-diagram. I then arrived at the result that the extreme Spitsbergen Atlantic Water north of Spitsbergen of 1931 should contain nearly 20 % of original Gulf Stream Water from the Florida Current. Within the sections east of Svalbard the extreme Atlantic Water should thus contain between 10 and 15 % Florida Current Water.

Variations of the Svalbard Atlantic Current.

The map Fig. 5 (p. 14) shows the stations taken by various expeditions in different years in the sea-area immediately north of Spitsbergen. They are: F 34, 35 from the "Farm" 1910 [HELLAND-HANSEN and NANSEN 1912], V 18—23, 30—43 from the "Veslemøy" 1912 [NANSEN 1915], R 12—17 from the "Ringsæl" 1922 (not yet published), P 14 from the "Polarbjørn" 1923 [SCHULZ 1927], B 31, 32, 34 from the "Blaafjeld" 1923 (not yet published), N 6 from the "Nautilus" 1931 [SVERDRUP 1933 a] and Q 1—3, 93—103 from the "Quest" 1931. We shall study these observations a little closer, in order to see if conspicuous variations from year to year are present.

Station V 39 was taken on August 15, 1912 at 80° 05′ N, 15° 33′ E, and station Q 2 on June 24, 1931 at 80° 04′ N, 15° 43′ E or at a distance of only a couple of n. miles. The temperatures at V 39 are between 1.0 and 1.5°, observed at 0, 10, 40, 90, and 130 m; at Q 2 we found between 1.3 and 1.6° down to 25 m, and between 2.65 and 3.34° below 50 m depth. The layer from 50 m to the bottom at 150 m is thus *roughly 1.5° warmer at the "Quest" station*, about 19 years later. At V 39 the salinities are low, the highest value being 34.68 ‰, observed at 130 m; at Q 2 we found from 34.96 to 35.00 ‰ from 50 m to the bottom, *an increase of 0.30 ‰*.

Station V 37 was taken on August 14, 1912 at 80° 24′ N, 15° 32′ E, and station Q 96 on August 17, 1931 at 80° 26′ N, 15° 38′ E or a couple of n. miles to the north. The temperature at V 37 increases from 1.50° at 50 m to 1.72° at 200 m (bottom 246 m); at Q 96 we found between 3.53° and 3.79° from 50 to 100 m (bottom 109 m), *i. e. about 2° higher.* Above 50 m depth the differences are still greater. Between 50 and 100 m *the salinities are about 0.10 ‰ higher in 1931.* These stations are taken near the highest part of the bottom ridge between the Polar Sea and the Hinlopen Basin, a little nearer to the latter.

Station V 36 was taken on August 13—14, 1912 at 80° 36′ N, 16° 17′ E, and station R 14 in August 1922 at 80° 39′ N, 16° 28′ E or about 4 n. miles to the north-east. The temperature at V 36 increases from 1.23° at 50 m to 1.72° at 300 m, while at R 14 the temperature decreases from 5.08° at 50 m to 3.77° at 300 m. Thus the water at station R 14 was much warmer, from nearly 4° at 50 m to 2° at 300 m or roughly *about 3° warmer in 1922 than in 1912.* The salinity increases at station V 36 from 34.80 ‰ at 100 m to 34.90 ‰ at 300 m, while at station R 14 it increases from 34.95 ‰ at 100 m to 35.05 ‰ at 300 m, thus *being 0.15 ‰ higher in 1922.*

At stations V 19, 20 a, 41, 41 b, 41 c, 42, 43 there were, during August 3, 5, 17, 19, and 20, 1912 made 6 determinations from 200 m, 5 from 300 m, 4 from 400 m, 2 from 500 m and 1 from 600 m. The resulting mean values are as follows:

Depth ...	200	300	400	500	600 m
Temp. ...	2.01	1.85	1.48	1.19	0.90° C
Salin. ...	34.91	34.93	34.92	34.91	34.91 ‰

The salinity amounted in single cases to 34.94 ‰. These stations were all taken slightly west of our stations Q 99—100. As we did not reach farther down than to 250 m at any of these stations, we may compare the above values with those from stations Q 98 and 99. At station Q 99 the temperature was 3.78 and 3.72° at 200 and 250 m. At station Q 98 the temperature decreased from 3.46° at 200 m to 1.39° at 600 m. When comparing with the values from 1912, this means an increase of the temperature between 1.45° at 200 m and 0.49° at 600 m, or *an average increase of about one degree.* The salinities from 1931 at 200 m or more are all above 35.00 ‰, showing a slight decrease from 35.11 ‰ at 200 m and 35.12 ‰ at 300 m to 35.00 ‰ at 600 m. This means an increase of the salinity since 1912 of between 0.20 ‰ at 200 m and 0.09 ‰ at 600 m or *an average increase of more than 0.1 ‰.*

Farther to the south-west than these stations the Isachsen Expedition took two stations in 1910, on August 19, stations F 34 and 35. At these two stations the temperature decreases from 3.14° at 200 m to 1.95° at 450 m, the greatest depth of observation, while the salinities are between 34.96 and 35.00 ‰, if some doubtful observations are put out of consideration. These stations thus seem to represent an intermediate state of conditions, *the values from 1910 are roughly the averages of those from 1912 and those from 1931.* The stations from 1910 are, as mentioned, taken farther west and south, and are, therefore, perhaps not comparable to the others. The seasonal variation may also make the comparisons doubtful. However, the most important fact at the observations of the Isachsen Expedition, the high salinities of 34.96 to 35.00 ‰, can hardly be explained by other reasons than real salinity variations of the Svalbard Atlantic Current. This is also seen when comparing with stations V 12 and 15—17 or with the section Fig. 12 on page 17 of NANSEN's paper [1915]. Two single observations, from 300 and 500 m at station V 17 give high salinities, namely 34.95 and 34.90 ‰. These values are lower than those from 1910, and even the highest value, 34.95 ‰, is not much higher than the highest single value 34.94 ‰ at the "Veslemøy" stations farther north; the highest salinity 34.94 ‰ of the northern stations in 1912 appeared several times. Even if we would assume a regular decrease of the salinity of the Svalbard Atlantic Current on its way along the coast of Spitsbergen, it must be stated, that *the salinity has decreased from 1910 to 1912 by about 0.06 ‰ and increased from 1912 to 1931 by roughly the double amount. The temperature has decreased from 1910 to 1912*

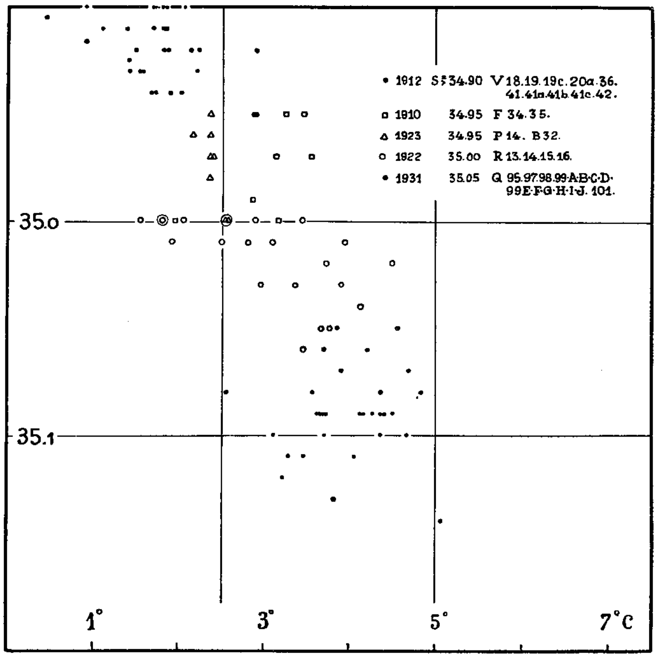

Fig. 26. Extreme values of t and S in the Atlantic Water north of Spitsbergen in different years.

by roughly 0.9° and increased from 1912 to 1931 by roughly 1.3°, when taking into consideration only the layer from 200 to 450 m, because the "Farm" stations do not reach deeper down.

As shall be seen later, we found by the repeated serial observations at the anchor station F (stations 99 and 99 A—J) that great variations of temperature and salinity took place within the tidal period. If such variations are of regular occurrence in this region, only little knowledge of the variations from year to year is to be expected from comparisons of single pairs of stations, as those carried out above. Divergencies may occur, which are independant of the variations from year to year. It would, therefore, perhaps be better to compare the extreme values of temperature and salinity from the different years, without taking the geographical position of the single stations into consideration. We shall soon see that the general contents of the results obtained above by comparing the stations individually, are corroborated in this way.

On the t—S-diagram Fig. 26 I have plotted the observations with the highest salinities from the different years, using from 1912 all values with salinities $\geqq$ 34.90 ‰, from 1910 and 1923 all values with salinities $\geqq$ 34.95 ‰, from 1922 all values with salinities $\geqq$ 35.00 ‰ and from 1931 all values with salinities $\geqq$ 35.05 ‰. It is seen that these values are scattered about a line of roughly linear relation between temperature and salinity. The maximum salinity was 34.95 ‰ in 1912, 35.00 ‰ in 1910 and 1923, 35.06 ‰ in 1922, and 35.14 ‰ in 1931. The maximum temperature was 2.90° in 1912, 3.55° in 1910, 2.57° in 1923, 4.48° in 1922, and 5.04° in 1931. One might think of a periodical variation with period of about thirty years, the minimum falling about 1915 and the maximum about 1931; however, the material of observations is too scanty to show any satisfactory agreement on a similar variation, especially the observations from 1910 and 1923 are probably not representative. We shall, however, keep in mind that from 1910 to 1912 a decrease of temperature and salinity has obviously taken place, from 1912 to 1922, 1923 and 1931 we have on the whole an increase. The best representation of the variation may be found simply in the maximum salinities mentioned above; arranged according to the years, they are:

1910	1912	1922	1923	1931
35.00	34.95	35.06	35.00	35.14

It thus appears clearly proved that the old view, that the salinity of the Atlantic Current should be nearly constant, is not right, as already stated by SVERDRUP [1933 a] partly by means of our station Q 98 and by HELLAND-HANSEN [1934]. In order to obtain a real knowledge of the nature of the variations, a much more complete material of observations will be required. The numerous hydrographic stations taken west of Spitsbergen during later years may make a much closer study of the variations from year to year possible.

In the region between Svalbard and Franz Joseph Land, where our eastern sections were taken, no observations had been made before. But the "Blaafjeld" and "Hisø" stations to the south of the channel between Victoria Island and Franz Joseph Land may be used for comparison in regard to the warmest and most saline water.

By our above inspection of the southern sections it was seen that salinities as high as 34.90 ‰ were only found in the section east of Kvitøya: twice between Kvitøya and Victoria Island and 7 times between Victoria Island and Franz Joseph Land. These ten values are: 34.96, .94, .93, .93, .93, .92, .91, .91, .90, .90. Temperatures above 2.00° were also found only in the sections east of Kvitøya, two of them between Kvitøya and Victoria Island, twelve between Victoria

Island and Franz Joseph Land. These fourteen values are: 2.66, .64, .57, .30, .25, .25, .20, .14, .14, .10, .07, .05, .02, .00. Six of these temperatures correspond to six of the highest salinities, namely:

2.66°	34.93 ‰
.64	.92 -
.57	.91 -
.30	.94 -
.20	.96 -
.14	.91 -
2.42°	34.93 ‰

The averages of the six pairs of values may be regarded as moderate maximum values, extraordinarily high single values not being regarded as representative.

In the northern sections no salinity above 34.90 ‰ was found west of Kvitøya, and no temperature as high as 2.00°. East of Kvitøya we found 22 salinity values of 34.90 ‰ or more: 34.97, .96, .95, .95, .95, .94, .94, .93, .93, etc. and 14 temperatures above 2.00°: 2.75, .74, .73, .65, .61, .52, .47, .47, etc. Among these, six temperatures and salinities correspond to each other, namely:

2.75°	34.95 ‰
.74	.92 -
.73	.96 -
.65	.92 -
.61	.91 -
.47	.92 -
2.66°	34.93 ‰

The averages may be regarded as representative of the warmest and most saline water in the northern sections. The mean temperature is somewhat higher than that from the southern sections, while the salinity is the same. We may, therefore, take the average of the six maximum observations from the northern and the six from the southern sections as representative of *the warmest and most saline water determined in this region in 1931, viz. 2.54°, 34.93 ‰*, remembering that the absolute maximum temperature was 2.75°, the absolute maximum salinity 34.97 ‰, and the highest values occurring together 2.75°, 34.95 ‰.

Turning to the "Blaafjeld" observations from 1923, we shall examine stations B 66—74, which were taken in a section from Kong Karl Land towards Alexandra Land, and stations B 75—78, which were taken south of Franz Joseph Land. We then find 14 values of the salinity as high as 34.85 ‰ or more, and 12 values of the temperature above 1.00°. Only six pairs are above the same limits, namely:

1.94°	34.86 ‰
.81	.85 -
.76	.87 -
.51	.86 -
.35	.87 -
.01	.93 -
1.56°	34.87 ‰

The highest single value of salinity was 34.96 ‰ (corresponding temperature: 0.95°), the highest single value of temperature was 1.94° (corresponding salinity: 34.86 ‰); the latter is the pair of highest corresponding values: 1.94°, 34.86 ‰.

Among the "Hisø" observations from 1929, we find from stations H 5—23, in the region south and south-west of Franz Joseph Land, a number of 30 salinities which are higher than 34.79 ‰, but half of the number corresponds to negative temperatures; 24 temperatures are above zero. In 14 pairs of corresponding values we find temperatures and salinities above the said limits:

2.49°	*34.93 ‰*
2.24	.82 -
1.55	.83 -
1.36	*.86 -*
1.23	*.94 -*
1.08	*.91 -*
1.08	.84 -
0.52	*.90 -*
0.41	.84 -
0.34	.82 -
0.25	.88 -
0.14	.86 -
0.11	.88 -
0.07	.90 -

The five pairs printed in *italics* have temperatures above 0.5° and salinities above 34.85 ‰; they may be regarded as representing the warmest and most saline water at these stations. The averages are:

1.34° 34.91 ‰

The highest single value of temperature is 2.49° (corresponding salinity: 34.93 ‰), the highest single value of salinity is 34.94 ‰ (corresponding temperature: 1.23°).

The obtained mean values of six pairs of observations may be regarded as to a certain degree representative of the three different years. The number of observations, especially from 1923 and 1929, is hardly great enough to give reliable mean values, but it may be sufficient for giving an idea of the conditions. The stations from 1923 and 1929 are taken farther south than those from 1931, and may consequently be expected for this reason to give lower temperatures and salinities. That this effect due to the geographical position cannot be great, however, is seen from the above inspection of the observations from the southern and northern sections, from which the representative means gave a difference of 0.24° and no difference in salinity; the highest temperature was found in the north.

From the compilation in Table 4 it is seen that the differences between 1923 and 1929 are not conspicuous, the representative temperature varying opposite as the maximum temperature, and the representative salinity varying opposite as the maximum salinity. But all values from 1931 are higher than the corresponding values from both 1923 and 1929. Even if the different columns of Table 4 do not agree quantitatively, we may conclude that *the traces of Atlantic Water in the Northern Barents Sea were more pronounced in 1931 than in 1923 and 1929, the increase of temperature and salinity being estimated at about 1.00° and 0.04 ‰.* As these differences can hardly be due only to the difference in geographical position, they seem to indicate a slight intensification of the last traces of the Gulf Stream entering the Barents Sea from the north-west.

Table 4.

Atlantic Water in the Northern Barents Sea.

Expedition	Year	Repres. data		Max. t°	Max. S‰
Blaafjeld ..	1923	1.56°	34.87 ‰	1.94	34.96
Hisø	1929	1.34	.91	2.49	.94
Quest	1931	2.54	.93	2.75	.97

VII. The Arctic Currents.

It was seen from the sections of temperature and salinity that a layer of cold, Arctic Water covered the Atlantic Water in the sections east of Svalbard. It might be of interest to study the transport of this cold water in a similar way as done above for the Atlantic Water. One might regard the extreme values determined above (p. 23), —1.60°, 34.24 ‰, as representing the "pure" or 100 % Arctic Water and determine the percentage for the single samples by means of a similar scale as that constructed in Fig. 19, 20, and 21. Even if the wind-currents in the uppermost layers cannot be included in the dynamic calculations, it might be assumed that the dynamically calculated velocity distribution, exhibited by the very reasonable velocity sections obtained, should in some way represent average conditions. On the other hand it was shown above that the accuracy of the transport calculations for the Atlantic Water was very low, and it would hardly be greater by a study of the Arctic Water. When studying the sections of velocity components, it is found that the direction of the current is usually the same at all depths between the same stations, and usually the velocity increases towards the surface. From this it is immediately seen that the transport of water as a whole must to the great features follow a circulation system more or less similar to that obtained for the Atlantic Water (Fig. 25). West of Kvitøya we found no transport of Atlantic Water; it may be worth mentioning that dynamic calculations give a transport northwards through this channel. It thus seems that part of the water-transport southwards into the Barents Sea between Kvitøya and Victoria Island and specially between Victoria Island and Franz Joseph Land, is counter-ballanced by a transport northwards into the Polar Sea. On the whole the Arctic Water seems to circulate around the two islands Kvitøya and Victoria Island, in a clockwise direction.

When asking for the surface currents near the island, the difficulties appear still greater. In connection with the tragic drift of ANDRÉE and his companions in 1897 it is, however, worth mentioning that stations Q 22—25 and Q 71—69 all give currents northwards outside the north-west coast of Kvitøya. Stations Q 31—33 and Q 68—66 all give currents towards the south along the south-east coast. If assuming our stations to be representative of the general conditions in the region near Kvitøya, we must, therefore, expect the ice to drift with the current around the island in a clockwise direction. As the wind will of course be of dominant importance for the actual drift, too much attention should not be paid to this result; but it is worth remembering that ANDRÉE and his men actually drifted southwards on the east side of Kvitøya and reached the coast at the south-west end of the island. During this last part of their drift, from September 17, to October 2, 1897, they obviously had no strong wind, but the wind which was blowing, was, according to their observations, of a direction as to set them towards the island.

VIII. Direct Current Measurements.

As mentioned above, current measurements were made at the six stations A to F, using two Ekman current meters and one Sverdrup-Dahl electric current recorder. The stations A, C, D, and F were anchor stations.

1. Treatment of Observations.

From the readings on the Ekman current meters the current velocities were determined by means of the formulae given on p. 11. As the first messenger (the small one) falls a little slower than the second one, the time-interval between the messengers was reduced by 6 seconds or 0.1 minute per 50 m depth, before computing the number of revolutions per minute. The direction of the current is determined by small bronze balls, falling down into the compass box, which is divided into 36 small chambers. The mean direction of all balls, taking the number of balls in each chamber into account, gives the mean magnetic direction of the current during the time of observation. At strong current, and if no disturbancy occurs, it may happen that all balls fall into the same chamber. But usually they will be scattered over a part of the box. In this case we may use a factor k for reducing the velocity. This factor was determined as the mean value of the cosines of the deviations from the mean direction, of the single directions shown by each ball. Thus f. inst. at station A we observed on current meter No. 137:

From	$22^h 28^m 55^s$	Balls:	3 N40°E	239 revolutions
To	22 38 55		2 N50 E	
			1 E	
			1 S70 E	

We find the number of revolutions per minute $= {}^{239}/_{10} = 23.9$. Introducing this value in the formula for current meter No. 137 (p. 11), we find the mean velocity $v = 10.1$ cm/sec. This instrument is of an old construction and shows the direction from which the current moves. The mean magnetic direction towards which the current runs, is found from the above observations to be S60°W. The factor k is

$$k = \frac{3.\cos 20^\circ + 2.\cos 10^\circ + 1.\cos 10^\circ + 1.\cos 50^\circ}{7} = 0.900$$

and the average velocity towards the average direction is $10.1 \cdot 0.900 = 9.1$ cm/sec towards S60°W magnetic or S54°W true (the magnetic variation at station A was 6° W).

The electric records were all read such that mean values for each half-hour were determined, and these half-hour values were treated as the single observations from the Ekman instruments. When, within the half-hour, the record showed two or more contacts of different compass directions, the single contacts were used for determining the factor k corresponding to that used in connection with the measurements of the Ekman current meters.

In this way the tabulation could be made very similar for the two different types of current meters, giving date, mean hour of the observation, average velocity, and single directions; the latter correspond to the single bronze balls at the Ekman current meters, to the single contacts at the electric recording instrument. The single directions are given in Table II of Results as magnetic directions, while the components given in the last two columns are true north- and east-components.

Longer series of observations were only obtained at stations A, C, D, and F. Table 5 shows the average number of observations per hour at the different depths. For 50 m only the half-hour values from the electric recorder are counted, not the few control values which were from time to time taken with one of the Ekman instruments. It is seen that at smaller depths, 5, 10, and 15 m, on an average 4 observations were taken per hour, while at greater depths, 50, 100, 150, and 200 m, averagely 2 observations were obtained per hour.

Different authors [*e. g.* HELLAND-HANSEN 1930] have smoothed the observations at free hand, in order to obtain values corresponding to each full hour lunar time, the values which shall be analysed harmonically.

Table 5.

Number of current measurements at different stations and depths.

Depth	Station A			Station C			Station D			Station F		
	Obs.	Hours	Obs. per hour	Obs.	Hours	Obs. per hour	Obs.	Hours	Obs. per hour	Obs.	Hours	Obs. per hour
5	128	24.9	5.1	102	19.8	5.1	-	-	-	92	29.7	3.1
10	71	25.8	2.8	16	12.5	1.3	159	32.8	4.8	95	29.7	3.2
15	-	-	-	81	17.2	4.7	-	-	-	-	-	-
50	43	21.0	2.0	-	-	-	62	30.8	2.0	58	29.5	2.0
150	-	-	-	-	-	-	58	30.7	1.9	-	-	-
200	-	-	-	-	-	-	-	-	-	61	30.0	2.0

This method has several advantages, making it possible to judge on single values which appear unreasonable, and to draw the curve relatively trustworthy even where the observations appear scattered as well regarding force of the components as also regarding the intervals of time between the observations. However, the individual judgement by free hand drawing may be ever so trustworthy, it always remains individual, it cannot be exactly equally reproduced by everybody. As our observations are usually taken at rather regular intervals of time, I have, therefore, preferred to determine the smooth curves through a smoothing by 5 consecutive observations. Thus, if the observations be denoted by a, b, c, d, *etc.*, the values $(a+b+c+d+e)/5$, $(b+c+d+e+f)/5$ *etc.* are referred to the hours which are found by a similar treatment of the hours at which the same observations were taken. It appeared that the curves obtained in this way would usually fall rather near to those which should, by my individual judgement, be regarded as good, but they would sometimes contain details, which would probably have disappeared by a free-hand drawing. It is seen that the longest periods eliminated from the series of observations by this smoothing, will amount to some two hours, corresponding to 2 observations per hour. As the obtained mean values usually fall near to a smooth curve, linear interpolation between the consecutive mean values has been used when reading the values corresponding to full lunar hours.

The upper passage of the moon was found for each station of current measurements from BROWN'S NAUTICAL ALMANAC 1931, expressed in MET (Mean European Time). The scales of LT (Lunar Time) where then easily constructed by means of the duration of the lunar hour, which is slightly more than 1^h02^m ordinary time.

The values at every full lunar hour, determined from the smoothed values of the north- and east-components, were analysed harmonically, using the standard forms of Det Geofysiske Institutt, Bergen. The results obtained were of the form:

$$N = N_0 + N_1 \cdot \sin(\theta + \varphi_1) + N_2 \cdot \sin(2\theta + \varphi_2) + N_3 \cdot \sin(3\theta + \varphi_3) + N_4 \cdot \sin(4\theta + \varphi_4)$$

$$E = E_0 + E_1 \cdot \sin(\theta + \psi_1) + E_2 \cdot \sin(2\theta + \psi_2) + E_3 \cdot \sin(3\theta + \psi_3) + E_4 \cdot \sin(4\theta + \psi_4).$$

They will be studied for each station.

As an example we have reproduced in Fig. 27 the curves of N- and E-components of the current at station D, 150 m. The scales along the upper and lower frame of the diagram show Lunar Time (LT), while Mean European Time (MET) is scaled along the axes of abscissae. The single observations are denoted by points, combined with thin straight lines. The thick curves show the synthetic currents as computed from the results of analysis.

2. Station A, Hinlopen Strait,

79° 49′ N, 18° 05′ E. On July 5, we anchored in Hinlopen Strait between Murchison Bay and Wahlenberg Bay. The position is determined from the map; the ship was lying roughly in the middle of the strait. We arrived at the station at $18^h 17^m$ and sounded 418 m. At $18^h 52^m$ the anchor reached the bottom; 575 m of anchor wire were let out altogether. The "Quest" soon turned over towards the NE and the work could start. Current meter Ekman No. 60 was worked from about 19^h at starboard midship, measuring at 10 m depth, in between also at 50, 100, 200, 300, and 400 m. Current meter Ekman No. 137

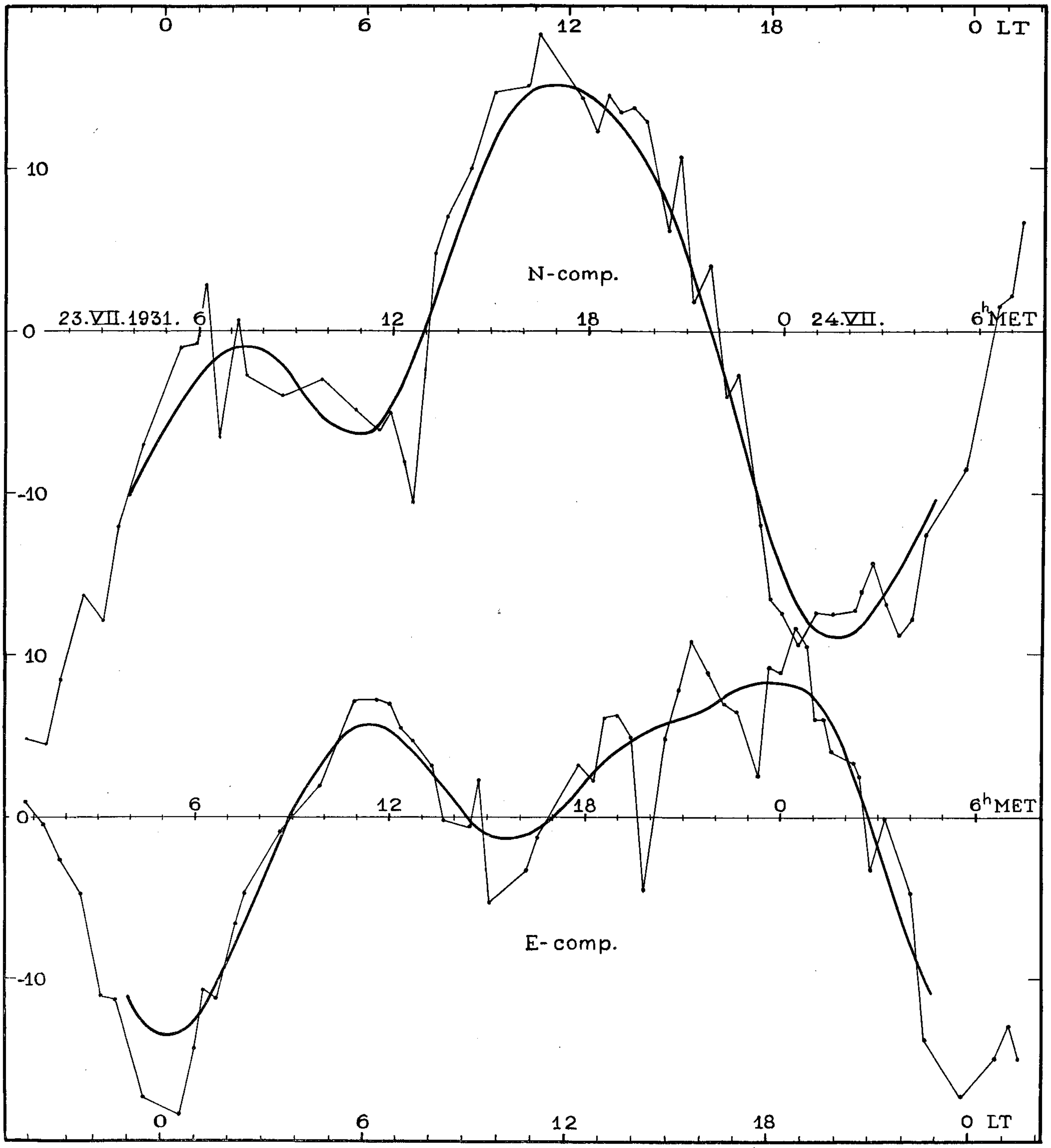

Fig. 27. Example of current measurements; anchor station D, 150 m.

was worked at starboard foreship from $20^h 30^m$, measuring at 5 m depth. Sverdrup-Dahl's electric current recorder No. 2 was not functionating satisfactorily until a while after midnight, when it was placed at 50 m depth. A short while before this we had let out 50 m more of the anchor wire, because the anchor did not hold the ship towards the strong current. From this time the current measurements were carried out continuously until $21^h 20^m$, with some interruptions at No. 137 when the winch was used for the hydrographic series. A northerly wind of 3 Beaufort was blowing most of the time, except during the last hours, when it was calm. During the whole station we had a nearly calm sea. As in the afternoon fog was approaching from the north, I found it better to give up the measurements at $21^h 20^m$. The anchor was well onboaid at $22^h 15^m$ and we left the station.

The results of the measurements at station A shall be studied later, when discussing the conditions in Hinlopen Strait (Chapter IX).

3. Station B, between Nordostlandet and Storøya,

was taken from the "Quest" moored to an ice-floe, drifting from 80° 06′ N, 27° 38′ E to 80° 07′ N, 27° 33′ E. These positions are determined by judgement, estimating the distances from the coasts of Storøya and the north-eastern point of Nordostlandet as well as the drift velocity. Current meter No. 136 was worked at 5 and 10 m from $22^h 00^m$ on July 8, the electric recorder No. 2 from $22^h 20^m$ at 50 m. At $23^h 18^m$ we sounded 148 m. The current meter No. 60 was used near the bottom for determination of the drift. It appeared very difficult to control the drift by means of the sounding lead sticking in the mud of the bottom, as tried by NANSEN [1915]. Three current determinations were made near the bottom immediately after the following soundings: 132 m at $23^h 48^m$, 134 m at $0^h 54^m$ on July 9, and 102 m at $2^h 21^m$. The current meter was worked at 125, 130, and 95 m respectively (cf. Table II). Due to the increasing motion of the sea-ice surrounding us, the station was interrupted at about $2^h 30^m$, to avoid damage of the instruments. During these measurements a moderate fog limited the sight. A rather weak wind was blowing from about E^bS, and should be expected to give a drift towards roughly NW, while the above mentioned positions would correspond to a more westerly drift, towards about N 19° W. This may be due to compression of the ice in the north, but it should also be remembered that the estimated drift may very well happen to be exaggerated in one direction or the other. The two hydrographic series Q 19 at $0^h 30^m$ and Q 19 A at $3^h 45^m$, do not show any considerable change of temperature and salinity.

As the series of current measurements do not cover more than 4 hours, they cannot tell much. When entering on the time as abscissa, once the velocities and once the directions of the determinations from the different depths, it appears that the velocities determined for 50 m depth are greatest, even somewhat higher than those found near the bottom. The average of the velocities near the bottom and at 50 m depth is about 30 cm/sec, and the average direction near the bottom is S 30° E, at 50 m S 9° E. The velocities at 10 m are lower, about 18 cm/sec, and those at 5 m are lowest, about 12 cm/sec; the directions at 10 m are averagely towards S 27° E, at 5 m about S 44° E. On the assumption that the waters near the bottom and at 50 m depth have been approximately at rest during the 4 hours of measurements, this would mean an actual current at 5 m of about 20 cm/sec and at 10 m of about 14 cm/sec, both running roughly towards N 16° E. The only conclusion to be drawn from these measurements is thus that during the 4 hours of observations the vessel and the ice-floe have been moving northwards, while the layers from 50 m to the bottom have probably been relatively quiet. Whether this may be due to wind, to movements of the ice farther north, to a stationary current or to tidal or other periodical variations cannot be decided. We shall soon see from the measurements at station C that periodical variations may be well pronounced in the region.

4. Station C, 80° 11′ N, 27° 47′ E,

near the north-western corner of Storøya, was taken about three quarters of a n. mile from the coast; the position was determined from the map. On July 12, we anchored with the ordinary ship's anchor at 18 m depth; this was at $10^h 15^m$. Current meters No. 136 and No. 60 were used regularly at 5 and 15 m depth. No. 60 was also partly used at 10 m, because the electric recorder did not functionate satisfactorily and, therefore, was put out of use. In the morning on July 13, the fog became lighter, and as there might be a chance of cartographic works ashore, the current measurements were interrupted at about 7^h. Three hydrographic series were taken.

The series of current measurements cover the following intervals of time:

5 m from July 12, $11^h 03^m$ to July 13, $6^h 48^m$ or 19.8 hours
10 m from July 12, $11^h 11^m$ to July 12, $23^h 39^m$ or 12.5 hours
15 m from July 12, $13^h 19^m$ to July 13, $6^h 32^m$ or 17.2 hours

and thus do not suffice for harmonic analyses without some hours' extrapolation. Such extrapolation is easily carried out for the E-component of the longest series, from 5 m depth, while for the N-component we reason as follows. The maximum value of the N-component reaches 35 cm/sec at 19^h MET; the minimum at about 14^h is —19.5 cm/sec and the minimum at about $2^h 30^m$ is —34 cm/sec. It thus appears reasonable to carry out the extrapolation by drawing a maximum of about 20 cm/sec at about 9^h the latter day. We then find by harmonic analysis:

$$N = -2.13 + 9.7 \cdot \sin(\theta + 149) + 21.5 \cdot \sin(2\theta + 108) + 4.7 \cdot \sin(3\theta + 220^\circ)$$

$$E = -1.43 + 2.8 \cdot \sin(\theta + 325) + 3.1 \cdot \sin(2\theta + 327) + 2.6 \cdot \sin(3\theta + 334^\circ)$$

This means that a constant rest-current of 2.6 cm/sec runs towards S 34° W, while the 24-hour period ellipse falls very near a straight line from N 16° W towards S 16° E with an amplitude of 10 cm/sec (Fig. 28). The 12-hour period has an amplitude of 21.3 cm/sec and the ellipse is very flat, the direction of the longer axis being from N 6° W towards S 6° E. The 8-hour period has an amplitude of 4.8 cm/sec and the longer axis near the same direction as that of the 24-hour period. It thus appears that the chief movements at this station follow in directions very near to S 10° E, except the rest current, which flows towards S 34° W. It is also seen that the 12-hour period is clearly dominating, with its amplitude of more than twice the amplitude of the 24-hour period, more than four times the amplitude of the 8-hour period and between 8 and 9 times the velocity of the rest current.

As seen above, the measurements at 10 and 15 m cover periods of 12.5 and 17.2 hours respectively. To extend these series by extrapolation so as to cover the diurnal period could hardly be done with sufficient reliability. To use them for analysis within the semi-diurnal period only, however, cannot be allowed for, though such treatment of observations may now and then be met with in literature. It shall on this occasion be remarked, that 12-hour series must on the whole be regarded as useless for harmonic analysis if 24-hour periodical variations are, or may be expected to be present. This is clearly seen when analysing the values from one half of a pure 24-hour periodical curve; if, f. inst., the values corresponding to the higher half of the 24-hour period are used, they may be fairly well represented by a 12-hour period, although no such period is present.

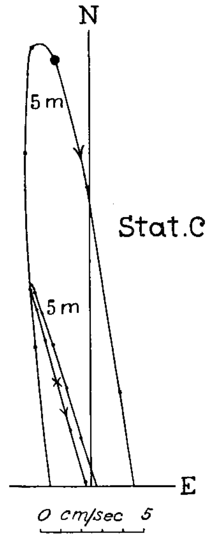

Fig. 28. Diurnal and semi-diurnal current-ellipses from anchor station C, 5 m.

As mentioned above, a stick was mounted on the north-western corner of Storøya, for readings of the tidal variations. The observations are given in Table 6. The variation of the sea-level is not very well determined from these readings, but the values suffice for an approximate determination of high- and low-water. It is found that high-water occurred at about 23^h MET on July 9, and low-water at about $16^h 45^m$ the same day. When passing from these hours by steps of $12^h 25^m$ (the semi-diurnal period), we find

high-water on July 12, at $13^h 05^m$
low-water on July 12, at $19^h 15^m$

to be reasonable assumptions. The 12-hour period of the current has its maximum value towards N 6° W at about $11^h 15^m$ LT or at $19^h 57^m$ MET on July 12; maximum current towards S 6° E occurs at $13^h 28^m$ on July 12. Thus high-water occurs 23^m before the maximum of current towards the south, low-water 41^m before the maximum of current towards the north. In other words: high- and low-water occur about half an hour earlier than should be expected in the open sea, conditions being thus only slightly modified by the local topography.

From the measurements at 5 m we are led to the assumption that maximum current towards the south must have occurred on July 8, at about $22^h 19^m$, maximum towards the north at about $4^h 48^m$ on July 9. If the conditions at station C are similar to those at station B a little farther west in the strait between

Table 6.

Readings of sea-level, Storøya 1931. Latitude 80° 10′ N, longitude 27° 44′ E.

Date	Hour	cm	Date	Hour	cm	Date	Hour	cm
9. VII	12h 50m	44 (42-46)	9. VII	19h 55m	31	9. VII	22h 55m	52
9. »	13 00	42 (40-44)	9. »	20 00	31-32	9. »	23 00	52
9. »	17 05	10	9. »	05	32	9. »	05	52+
9. »	10	10+	9. »	10	33—	9. »	10	52
9. »	15	11—	9. »	15	33+	9. »	15	52+
9. »	20	11	9. »	20	34	9. »	20	52+
9. »	25	11+	9. »	25	35—	9. »	25	52+
9. »	30	12—	9. »	30	36	9. »	31	52+
9. »	35	12	9. »	35	37—	10. »	17 45	22—
9. »	40	12	9. »	40	38—	10. »	50	22+
9. »	45	12+	9. »	45	39—	10. »	55	22+
9. »	50	13—	9. »	50	40	10. »	18 00	24
9. »	55	13	9. »	55	41	10. »	05	25
9. »	18 00	13+	9. »	21 00	42—	10. »	10	24—
9. »	05	14—	9. »	05	42+	10. »	15	25
9. »	10	14	9. »	10	43	10. »	20	24
9. »	15	15—	9. »	15	43—	10. »	25	24
9. »	20	15	9. »	20	42+	10. »	30	24+
9. »	25	15+	9. »	25	44—	10. »	35	25
9. »	30	16+	9. »	30	45—	10. »	40	25—
9. »	35	17+	9. »	35	46	10. »	45	24+
9. »	40	18	9. »	40	47	10. »	50	25
9. »	45	19	9. »	45	48	10. »	55	25—
9. »	50	20	9. »	50	49	10. »	19 00	26
9. »	55	21	9. »	55	50	10. »	05	26
9. »	19 00	21+	9. »	22 00	49	10. »	10	27
9. »	05	22	9. »	05	50	10. »	15	28—
9. »	10	22+	9. »	10	50	10. »	20	29
9. »	15	23+	9. »	15	49+	10. »	25	29+
9. »	20	24	9. »	20	50	10. »	30	30+
9. »	25	25	9. »	25	50+	10. »	35	30
9. »	30	26+	9. »	30	50	10. »	40	31—
9. »	35	27	9. »	35	51—	10. »	45	31+
9. »	40	28	9. »	40	52	10. »	50	31
9. »	45	29	9. »	45	52+	10. »	20 45	38
9. »	50	30	9. »	50	52+			

A + or a — after the reading means that the value is slightly too low or too high.

Nordostlandet and Storøya, this would mean that the current was here going towards the south during most of the four hours when measurements were carried on at station B. However, it was found, as seen above, that the vessel was during these hours drifting with the ice-floe to which it was moored, in a northerly direction. In the preceding afternoon there was no wind at station B, but during the night we had some 2—3 Beaufort from ESE; if it may be assumed that this wind was sufficient for producing the northerly drift, this would lead to an apparant southerly current, stronger than the assumed actual current. As seen above the apparent currents were rather strong towards southerly directions. On the whole, the measurements at station B and C are not sufficient for obtaining a good agreement or a representative picture of the average conditions. The only series of measurements covering a reasonably long period, was obtained at 5 m at station C. But the situation of this station on shallow water near the coast of Storøya makes general conclusions on the conditions in the strait west of the island doubtful. The above mentioned rest-current of 2.6 cm/sec towards S 34° W should, therefore, hardly be regarded as representing more than a local effect near the shore, giving no proof of a southerly stationary current in the strait. The general dynamic considerations led to another conclusion (p. 42), namely a slight northerly transport of the upper layers. Even the fairly good agreement between the current measurements and the tidal readings may be due to merely local effects.

5. Station D, 80° 26′ N, 38° 56′ E,

was taken on July 22—24, in the position of the hydrographic station Q 43 in the section from Victoria Island towards Franz Joseph Land. The position is chiefly determined from the log after controlling the total distance. We sounded 202 m, the anchor reached the bottom about 23^h and about 450 m of anchor wire was let out. No ice was sighted, and there was a little sea or swell. At midnight current meter No. 136 started working at 10 m, while No. 137 was used at 150 m. Three quarters of an hour after midnight the electric recorder was started working at 50 m. At $0^h 20^m$ in the morning on July 24, we sounded 176 m. At 8^h the measurements were interrupted, and about half an hour later the anchor was onboard. Twelve hydrographic series were taken. The current measurements cover the periods:

10 m from July 23, $0^h 08^m$ to July 24, $7^h 55^m$ or 31.8 hours
50 m from July 23, $1^h 00^m$ to July 24, $8^h 00^m$ or 31.0 hours
150 m from July 23, $0^h 40^m$ to July 24, $7^h 20^m$ or 30.6 hours

Tables 7 a and b contain the results of harmonical analysis of the observations within 24 lunar hours from these series.

When the tidal variations are eliminated, we thus find the rest-currents represented by N_0 and E_0, or:

Depth	N_0	E_0	Result	Towards
10	−0 10	0.21	0.23	E 22° S
50	1.53	−1.75	2.33	N 49° W
150	−1.71	0.38	1.75	S 12½ E

Table 7 a.

N-components of current at station D.

Depth	N_0	N_1	N_2	N_3	N_4	φ_1	φ_2	φ_3	φ_4
10	−0.10	5.0	7.9	5.6	1.0	276	112	88	248
50	1.53	10.8	17.2	3.6	2.1	254	110	153	273
150	−1.71	12.2	8.0	1.5	1.1	290	59	25	230

Table 7 b.

E-components of current at station D.

Depth	E_0	E_1	E_2	E_3	E_4	ψ_1	ψ_2	ψ_3	ψ_4
10	0.21	2.4	3.7	5.7	1.4	242	22	47	277
50	−1.75	3.2	9.6	4.3	2.6	79	16	116	336
150	0.38	5.9	6.7	2.2	0.6	246	272	238	346

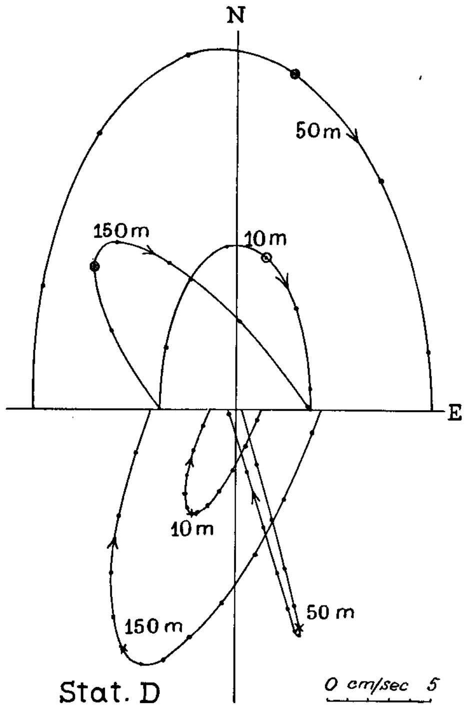

Fig. 29. Diurnal and semi-diurnal current-ellipses from anchor station D, 10, 50, and 150 m.

The uppermost layer, 10 m, is nearly motionless, the determined resulting velocity of 0.23 cm/sec towards E 22° S being near the limit of accuracy of the determination. The deeper layers, 50 and 150 m, show a slow motion towards nearly opposite directions. These rest-currents have been studied on p. 29 for controlling the dynamically calculated velocities through the section from Victoria Island towards Franz Joseph Land.

The results of the harmonic analysis for the diurnal and semi-diurnal periods are constructed in Fig. 29, the upper part of the diagram showing the semi-diurnal, the lower part the diurnal variations at 10, 50, and 150 m. A small circle denotes the upper passage of the moon and an arrow indicates the direction of rotation. The latter is seen in all cases to be *cum sole* or clockwise. The phases are uniform, the passage of the moon falling at the semi-diurnal period near the northern end of the longer axis of the ellipse, at the diurnal period the lower passage of the moon (indicated by a cross) falls near the southern end of the longer axis of the ellipse. The orientation of the ellipses is nearly the same at 10 and 50 m for the semi-diurnal period, while at 150 m the longer axis points towards N 40° W or 40° west of the others. For the diurnal period the longer axes at 10 and 150 m point towards S 23° W, while at 50 m the direction is S 17° E or 40° different. To explain these features is hardly possible, because the currents at 10 and 50 m depth are probably influenced by wind- or other drift-currents. We shall, however, return to this question when dealing with the observations from station F. It shall only be noted that the strongest rest-current, from 50 m, is only 2.3 cm/sec, while the amplitudes of the diurnal variations are 5.5, 11.4, and 13.1 cm/sec at 10, 50, and 150 m respectively, and those of the semi-diurnal variations are 8.0, 17.2, and 10.1 cm/sec. All of these amplitudes are much greater than the strongest rest-current, and on the whole the semi-diurnal variations are dominating.

6. Station E, 80° 32′ N, 26° 40′ E.

On August 4, we stopped at an ice-floe for some small repair of the engine, and I used the occasion for measuring the current at 10 m depth, current-meter No. 136. After two single measurements the work was, however, hindered by ice and the station was given up after one hydrographic series.

7. Station F, 80° 31′ N, 13° 05′ E,

was an anchor station. The position was determined by the ship's log supported by one single astronomical observation. On August 17, at 22^h we sounded 314 m depth. Half an hour later the anchor was at the bottom and we let out 500 m of anchor wire altogether. During the following night 100 m more of wire were let out. Current meter No. 137 was worked from midnight at 5 and 10 m alternatingly; from the same moment No. 136 was worked at 200 m and the electric recorder No. 2 at 50 m. A hydrographic series was taken about every 3 hours. The measurements were carried on until August 19, at 6^h; an hour later the anchor was onboard.

The series of observations are as follows:

5 m from Aug. 18, $0^h\,25^m$ to Aug. 19, $6^h\,05^m$ or 29.7 hours
10 m from Aug. 18, $0^h\,05^m$ to Aug. 19, $5^h\,55^m$ or 29.8 hours
50 m from Aug. 18, $0^h\,30^m$ to Aug. 19, $6^h\,00^m$ or 29.5 hours
200 m from Aug. 17, $23^h\,50^m$ to Aug. 19, $5^h\,50^m$ or 30.0 hours

or of a duration of averagely 30 hours. As 12^h LT falls, on August 18, on 16.2^h MET, the harmonic analysis was carried out for the period from 0 to 24^h LT. The results of the analysis of the N- and E-components are given in Table 8 a and b.

Table 8 a.

N-components of current at station F.

Depth	N_0	N_1	N_2	N_3	N_4	φ_1	φ_2	φ_3	φ_4
5	−0.40	1.4	10.2	9.6	10.3	167	110	1	80
10	−0.50	1.9	10.9	6.1	8.9	79	71	326	25
50	1.65	4.7	15.5	2.4	6.8	64	339	83	236
200	1.89	3.7	9.8	1.8	0.8	312	335	270	196

Table 8 b.

E-components of current at station F.

Depth	E_0	E_1	E_2	E_3	E_4	ψ_1	ψ_2	ψ_3	ψ_4
5	2.43	12.2	14.3	5.4	7.0	124	353	196	277
10	2.71	1.3	1.5	0.8	0.8	123	351	187	266
50	19.49	7.4	11.9	4.8	3.9	30	318	156	262
200	12.27	11.5	5.2	6.4	3.7	56	152	213	311

The rest currents are seen to be strong at 50 and 200 m, while at 5 and 10 m they are relatively weak. It was seen above (p. 16) that the values from 50 and 200 m were in good agreement with the dynamic calculations, while those from 5 and 10 m were obviously influenced by wind, ice or other causes not envolved in the dynamic calculations.

The diurnal and semi-diurnal current ellipses are constructed in Fig. 30, on the basis of the above results of the harmonic analysis. A small circle denotes the upper passage of the moon and an arrow indicates the direction of rotation. The latter is seen to be clockwise, with two exceptions. The semi-diurnal period at 10 m gives a rotation counter clockwise, but the amplitudes are here so much smaller than every other, that its importance is small. At 200 m, however, we find an important discrepancy; both diurnal and semi-diurnal rotation here takes place counter clokwise; the semidiurnal ellipse is very flat, nearly a straight line; the diurnal ellipse is not flat.

At station D all diurnal and semi-diurnal current-ellipses showed rotation clockwise, and we thus find, when studying stations D and F, the two anchor stations taken within the Svalbard Atlantic Current and in relatively open sea, that the diurnal and semi-diurnal rotation usually takes place *cum sole*, with one important exception: 200 m at station F. The phases were fairly uniform at station D, at station F they are variable. The orientation of the diurnal ellipses is fairly uniform at station F, the ellipses from 5, 50, and 200 m having their longer axes towards roughly the same direction. The orientation of the semi-diurnal ellipses is more variable.

The measurements from station F, 200 m and from station D, 150 m are taken sufficiently far below the surface to be assumed independant on disturbing effects from wind, ice-drift etc. The rest-currents and amplitudes of diurnal and semi-diurnal periods at 50 and 150 m at station D and at 50 and 200 m at station F are compiled in Table 9. At both stations we find that the rest-current is somewhat stronger at 50 than at 150 or 200 m. The diurnal amplitude is a little greater at the greater depths, while the semi-diurnal amplitude is greater at the smaller depths. At both stations the semi-diurnal amplitude is greater than the diurnal amplitude at 50 m; the semi-diurnal amplitude at 50 m is greater than at 150 or 200 m. We thus find several similarities between the two stations, but on one point we find an important difference between them: at station D the diurnal and semi-diurnal amplitudes are 5 to 7 times as great as the rest current, while at station F they are slightly smaller than the rest current.

Table 9.
Rest-currents and amplitudes.

Stat.	Depth	Rest-current	Diurnal amplitude	Semi-diurnal amplitude
D	50	2.3	11.3	17.2
D	150	1.8	13.0	10.1
F	50	19.7	8.4	19.3
F	200	12.5	11.6	11.2

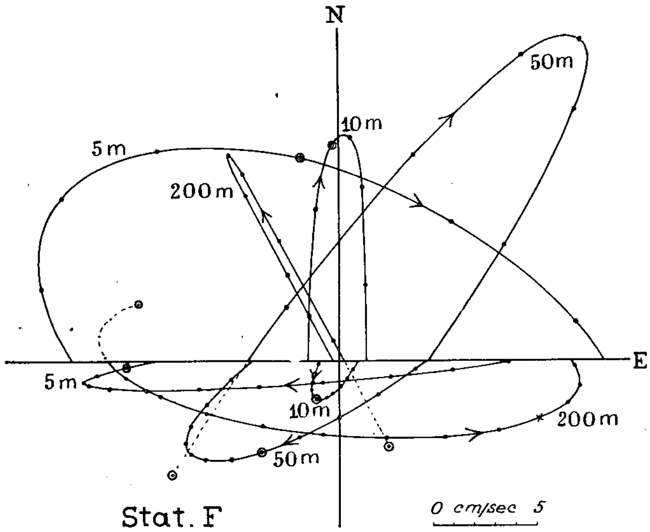

Fig. 30. Diurnal and semi-diurnal current-ellipses from anchor station F, 5, 10, 50, and 200 m.

When studying the currents in the Norwegian Sea, especially at 10 m at station No. 307 (62° 50′ N, 4° 47′ E, depth to bottom 260 m), HELLAND-HANSEN and NANSEN [1909] came to the result that the complicated currents at this station were composed of two parts, *viz.* a semi-diurnal tidal current and a current of varying strength and constant direction. By harmonical analysis of the same observations WERENSKIOLD [1916] showed "that the currents may be interpreted as a combination of a semi-diurnal tidal current, changing its direction clockwise, and a diurnal variation of the velocity of the ordinary current, the so-called "Gulf Stream"." Returning to our observations, we might think of a similar explanation of the diurnal period at station F, although the orientation of the longer axes of the diurnal ellipses do not agree so

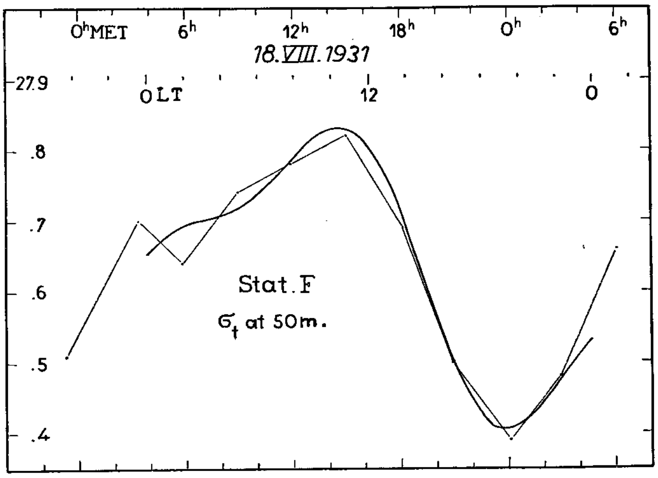

Fig. 31. Variation of σ_t at anchor station F.

well with the direction of the rest-current, a discrepancy which might have its explanation from the bottom- and coast-configuration. Coming to station D, however, a similar explanation cannot be upheld; also here the direction of the longer axes of the diurnal current ellipses may be said to agree roughly with the direction of the rest-currents; but the rest-currents are here very slow, the diurnal amplitudes being 5 to 7 times as great. It then seems unreasonable to regard the diurnal variation as a sort of pulsation of the rest current. It must probably be caused in some way totally independant of the very slow Atlantic Current, perhaps being due to some internal wave entering from the Polar Sea. If this is true, there is no reason why a similar internal wave should not be found also at station F, and then one might think of a similar cause of the pulsations observed off the Norwegian coast at Storeggen, mentioned above.

This view seems to be also in fairly good agreement with the results of the hydrographic observations during the current measurements. As mentioned above we took 11 hydrographic series at station F, with roughly three hours' interval (stations Q 99 and 99 A—J), using the standard depths 0, 10, 50, 100, and 200 m. It appears that temperature, salinity, density and dynamic height vary considerably with time. The temperature varies roughly equally at 0 and 10 m, the difference between the highest and lowest value being 0.85°. At 50 m the variation runs nearly opposite that at 0 and 10 m, with differences up to 1.08°. At 100 m the variation is different from the other depths, being something between the variation at 0 and 10 m and the variation at 50 m; the differences amount to 1.06°. At 200 m the variation is less, about 0.24°. Also the salinity varies nearly equally at 0 and 10 m, amounting to 0.4 and 0.5 ‰ respectively. At 50 m we find a very regular variation, difference between maximum and minimum being 0.59 ‰. At 100 and 200 m the salinity variations do not give differences of more than 0.18 and 0.10 ‰ respectively. Thus the variation of temperature and salinity appears rather different at the different depths and it is very difficult to point out any logical explanation of the irregularities. Looking, however, on the variation of the density σ_t, we find very much of a parallelity between the curves from the different depths. The difference between the highest and lowest value obtained at 0, 10, 50, 100, and 200 m is 0.36, 0.40, 0.43, 0.16, and 0.08 respectively. We shall study the 50 m curve more closely. From the part of the curve between 0^h LT on August 18, and 0^h LT on August 19, the values corresponding to each full lunar hour were read. As the two ends of the curve did not give the same value, a linear correction was applied, and then the values were used for harmonic analysis. The result of this treatment was that the density at 50 m may be expressed as follows:

$$\sigma_{t,50} = 27.700 - 0.005 \cdot \frac{\theta}{15} + 0.162 \cdot (\theta + 320)$$
$$+ 0.058 \cdot \sin(2\theta + 89°).$$

The curve represented by this formula is drawn in Fig. 31 together with the broken line combining the observed values. It is seen that the observations are well represented by the formula. Thus the density variation at 50 m mainly consists of a diurnal and a semi-diurnal period, in addition showing a slight linear decrease with time. The results of the harmonic analysis of the current measurements show that the diurnal and semi-diurnal periods are dominating. But the corresponding two current ellipses are differently orientated (Fig. 30), and the amplitude of the semi-diurnal period is greater than that of the diurnal period. It thus appears difficult to explain in details the connection between the variations of current and of density. Inspecting the phase-angles, however, we find that the maximum of density occurs nearly six hours later than the maximum of current in the diurnal period, and about four hours earlier or eight hours later than the maximum of current in the semi-diurnal period.

A similar inspection of the hydrographic series taken at the anchor station D (hydrographic stations Q 43 and 43 A—K) shows very small variations of the density as well as of temperature and salinity, except for the upper layers 0 and 10 m; the variations at these two standard depths are opposite. At 50, 75, 100, and 150 m the variations are small, usually not exceeding 0.02 of σ_t, and the curves show no periodicity. This may be understood if we remember that the current at this station flows towards the south into the Barents Sea. An internal wave entering the channel from the Polar Sea, will propagate along the current, and in this direction the horizontal gradients of temperature, salinity, and density are small. It thus seems, that also when concerning variations of density the assumption of internal waves from the Polar Sea fits well with the observations.

IX. Hinlopen Strait and Adjacent Fjords.

The map Fig. 32 shows our stations and soundings in Hinlopen Strait as well as in Murchison Bay, Wahlenberg Bay, Lomme Bay, and Treurenberg Bay. Some of these stations were merely occasionally taken, in order to make use of the opportunity when visiting one fjord or the other for geological, glaciological and botanical research.

From the map it is seen that the northern part of Hinlopen Strait is a deep basin of more than 400 m depth. Towards the north-west it is separated from the Polar Sea below 200—300 m depth, while towards the south-east only the uppermost layer of less than 100 m is in communication with Barents Sea. The 100 m isobath does not enter into Murchison Bay or Treurenberg Bay, but it enters Wahlenberg Bay and reaches in the south to the latitude of Wahlenberg Island on both sides of this island. The innermost part of Lomme Bay is deeper than 100 m, but is probably separated from Hinlopen Strait by a threshold. In the north, Hinlopen Strait is continued below the sea as a channel through the shelf.

1. Hinlopen Strait.

The stations in Hinlopen Strait are Q 3, 9—16, 86—88, and 93, while Q 94 and 95 are taken outside the northwestern entrance, but inside the threshold of the Hinlopen Strait Depression in the shelf.

The Tables of Results show that great variations took place within the interval of time covered by our observations. Station Q 3 was taken on June 24, and station Q 93 on August 17, both in exactly the same place near the northern entrance of Hinlopen Strait. At all levels the temperature has increased and the salinity decreased. The temperature difference (Q 93 minus Q 3) increases from 3.45° at the surface to 3.67° at 25 m, then decreases to 1.24° at 200 m and finally decreases until zero at 325 m, very near the bottom. The salinity difference (Q 3 minus Q 93) decreases from 0.38‰ at the surface to 0.04‰ at 200 m, and than keeps nearly constant to the bottom. The changes are different above and below 200 m; when disregarding the uppermost layers and certain irregularities of little importance, the temperature at station Q 3 thus decreases from the top to the bottom; at station Q 93 the temperature decreases until 200 m, while it shows a slight increase from 200 m to the bottom. The salinity difference decreases from the surface to 200 m and keeps about 0.04 ‰ from 200 m to the bottom. It shall in this connection be remembered that the threshold in the north reaches between 200 and 300 m depth; the exchange of the water is therefore more direct above 200 m than below.

Station Q 16 was taken on July 5, and station Q 86 on August 12, both in exactly the same place in the middle of the narrowest part of Hinlopen Strait, north of Wahlenberg Bay and Lomme Bay. These stations show great irregularities in the vertical distribution of temperature, but on the whole they give a conspicuous increase of the temperature at all levels, except at 25 m, where station Q 86 has a cold layer. The differences at the standard depths vary between —0.25 and +3.03°, without any pronounced relation to depth, giving as an average 1.31°. In the uppermost 50 m the salinity has decreased, especially at 0 and 5 m; deeper down it has increased, from 75 m to the bottom averagely by 0.07‰, the greatest increase, of 0.21‰, occurring at 250 m.

Station Q 14 was taken on July 4, station Q 87 on August 12, both in exactly the same place in the middle of Hinlopen Strait, immediately outside the entrance of Lomme Bay. The temperature curves are also here irregular, but give a great increase from July 4, to August 12. The lowest increase is found at 400 m: 0.60°; the average difference from all standard depths is 1.71°. The salinity has decreased in the uppermost 25 m, especially at 0 and 5 m; from 50 m to the bottom it has increased by averagely 0.09‰.

Computing for each of the above mentioned six stations the average temperature and the average salinity, by reading the station curves at each 12½ m from the surface to 300 or 400 m, we find the following differences:

Stations	Temp. diff.	Salin. diff.	Number of days	Δ t° per day	Δ S ‰ per day
3—93	2.07	−0.125	54	0.038	−0.0023
14—87	1.47	−0.037	39	0.038	−0.0009
16—86	1.45	−0.046	38	0.038	−0.0012
		Average increase per day		0.038	−0.0016

Thus at the mentioned three points of Hinlopen Strait the whole column of water has got an average temperature increase of 0.038° per day. The decrease of the salinity is not in so good agreement at the three points, the average for all is about 0.0016 ‰ per day. The determination of the salinity decrease is uncertain at station Q 86 and 87, because of the very low salinities near the surface. The mentioned temperature increase corresponds to more than 1° per month and the salinity decrease to nearly 0.05 ‰ per month. These great changes make the study of observations from Hinlopen Strait difficult.

At the anchor station the hydrographic series was repeated about every three hours (stations Q 16 and 16 A—G). An inspection of the values thus obtained shows that great variations take place also within the tidal period, and this fact will of course complicate the conditions still more. We shall return to these variations when discussing the current measurements from the anchor station.

The explanation of the average temperature increase and salinity decrease found above, may be sought in different conditions. The summer heating leads to an increase of the temperature of the upper layers, and the melting of ice and snow ashore leads to a reduction of the salinity of the upper layers. The strong tidal currents may effect a specially intense mixing between the different layers, partly because an in-going tidal current from the northern entrance of the strait will give a stowing up of water in the strait. This pumping in and out of the strait twice a day may effect a mixing such that the summer heating and diluting of the uppermost layers may in this way be transferred downwards. The mentioned changes were, as will be remembered, greatest near the surface, least near the bottom, a natural result from this point of view.

It may be expected that in winter the cooling and freezing of the surface water in Hinlopen Strait and especially in the Adjacent Fjords will lead to the formation of a heavy, salt, and cold bottom water, which will possibly fill the deeper part of Hinlopen Strait. In that case, the strong tidal currents and the mentioned mixing will probably make it possible to have these waters exchanged in summers. Each winter the bottom water is formed anew, with the result that the oxygen content must always be high even near the bottom; all our oxygen determinations from Hinlopen Strait give very high values, only very seldom corresponding to less than 100 % saturation even near the bottom. At stations Q 14, 15, and 16 the content of oxygen is determined at 300 and 400 m depth. At 300 m we found 100, 99, and 100 %, at 400 m we found 101, 100, and 98 % respectively. If the above explanation is correct, it is easily understood that these oxygen values must be very high, because the water is then originated through mixing between an oxygen-rich bottom water and the surface water.

Stations V 32 from the "Veslemøy" [Nansen 1915] and Q 94 were taken on August 13, 1912, and August 17, 1931 respectively, in nearly exactly the same position: 80° 11′ N, 16° 40′ E and 80° 10′ N, 16° 43′ E. At V 32 the temperatures are between 0.87 and 1.69°, observed at 0, 20, 50, 100, and 210 m. At Q 94 we have between 3.45 and 5.13°, observed at the standard depths down to 200 m, *an average increase below 50 m of about 2°*, and still more above 50 m depth. The salinities at V 32 are increasing downwards, reaching 34.76 ‰ at 100 m and 34.90 ‰ at 210 m. At Q 94 the salinity increases regularly from 34.86 ‰ at 50 m to 34.98 ‰ at 200 m, *an increase of 0.1 to 0.2 ‰ from 1912.*

Station V 30 was taken about midway between Q 93 and 94. Here the temperatures are lower than at station V 32, being −1.0° at the surface and increasing to 1.64° at 200 m depth or to very nearly the same as at station V 32. Below 200 m the values are roughly equal (deepest observation 440 m). At Q 93 the temperature decreases regularly from 4.63° at the surface to 2.74° at 200 m, and then increases slightly to 2.80° at 300 m, which is the greatest depth of observation. *At the greater depths the temperature increase from 1912 to 1931 is thus a little more than 1°*; the salinities at V 30 have *about the same values* as those from Q 93.

Thus stations V 30, 32, and Q 94, 93 show that *in the northern part of the Hinlopen Basin the temperature was in 1931 about 1.5° higher in the intermediate layer from 50 to 200 m and about 1.0° higher in the bottom layer from 200 to 300 or 400 m, when compared to the observations from 1912. The salinities show only a slight increase.*

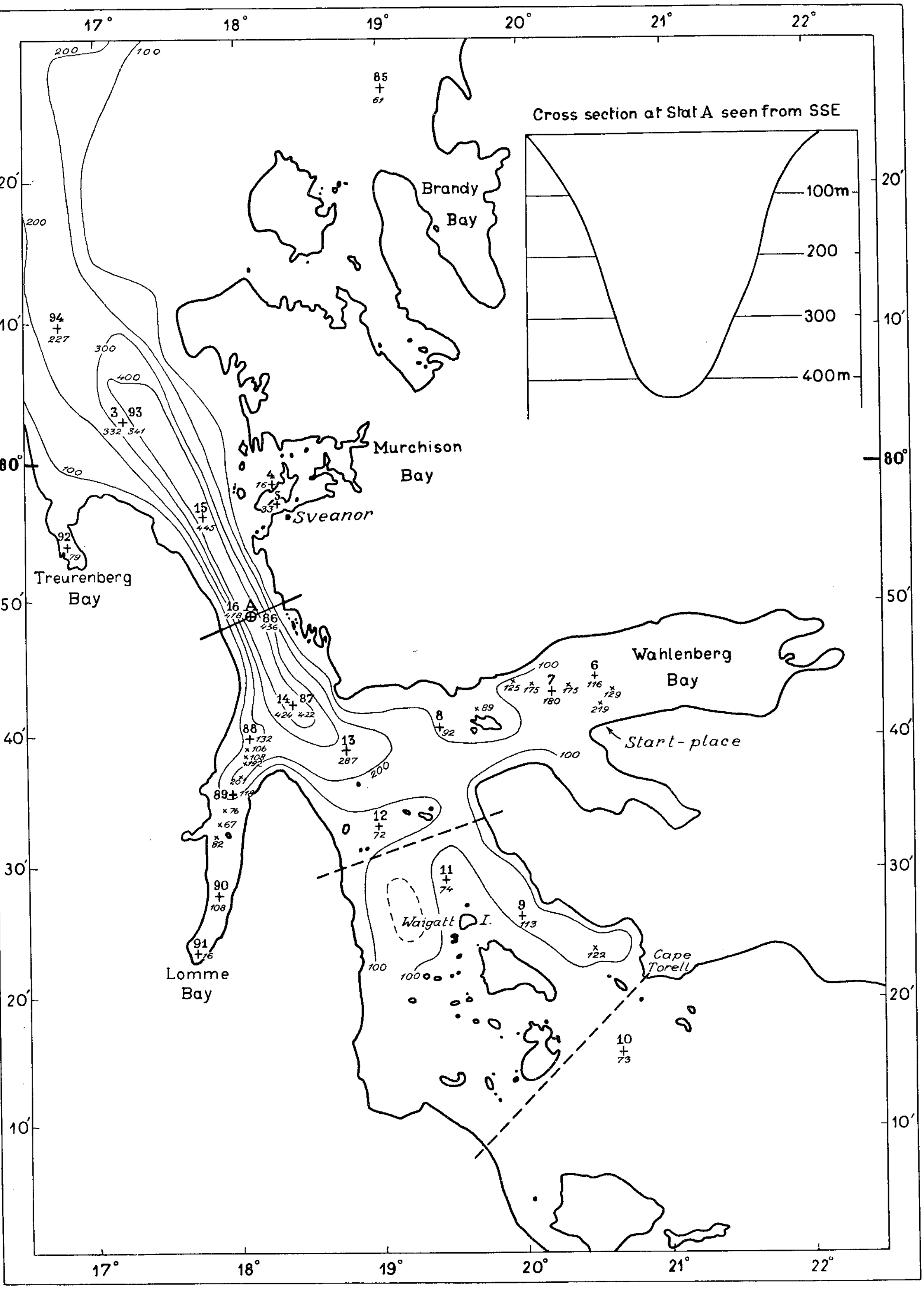

Fig. 32. Stations and soundings of the "Quest" in Hinlopen Strait and adjacent fjords in 1931.

In this connection it shall be mentioned that our stations Q 3 and 93 were taken in the same position, 80° 03′ N, 17° 15′ E, on June 24, and August 17, respectively. At Q 3 the temperature increases from 0.85° at 50 m to 1.50° at 200 m and 2.28° at 300 m. At Q 93 the temperature decreases from 4.30° at 50 m to 2.74° at 200 m and increases to 2.80° at 300 m. Thus *the temperature increased by about one degree during less than two months, even at greater depths (200 m). The salinities are nearly the same,* perhaps a little lower in August. This shows that the great temperature increase from the observations of Nansen in 1912 to our observations in 1931 in Hinlopen Basin should not be taken too seriously, as nearly the same increase has taken place during part of the summer 1931. Even if our latest stations were taken about the same date as Nansen's stations, they may hardly be regarded as comparable representatives of the two different years. We may only state that *in the middle of August 1912 the temperatures were about the same as in the late part of June 1931, while in the middle of August 1931 they were one degree or even more higher.*

2. The Anchor station A

was taken in the position of station Q 16, as mentioned above. The current measurements cover the following periods:

5 m from July 5, $20^h 37^m$ to July 6, $21^h 29^m$ or 24.9 hours
10 m from July 5, $19^h 10^m$ to July 6, $20^h 52^m$ or 25.7 hours
50 m from July 6, $0^h 15^m$ to July 6, $21^h 45^m$ or 21.5 hours

Thus from 5 and 10 m the series are sufficient for harmonical analysis, and the lack in the series from 50 m seems fairly trustworthily interpolable. The results of the analyses are given in Table 10 a and b.

The rest-currents are thus:

Depth	N_0	E_0	Result	Towards	Towards N 30° W
5	—4.32	2.03	4.77	S 25° E	—4.75
10	—2.28	1.10	2.53	S 26° E	—2.52
50	—3.51	—2.08	4.08	S 31° W	—4.08

It is seen that the currents at 5 and 10 m agree well regarding the direction, going towards S 25° E and S 26° E or very near the direction of the strait. At 50 m the direction of the rest-current differs by 56° from this direction, a fact which is very difficult to understand. As shall be seen below, Fig. 33, the orientation of the diurnal and semi-diurnal current ellipses are in a similar disagreement with 5 and 10 m. The difference in direction of the longer axis of each of these ellipses from that of the corresponding ellipse at 5 and 10 m is roughly 25°.

After this station I discovered that the resistance-head of the electric recording instrument No. 2 could be placed in a wrong position without hindering the function of the instrument, and for the later stations notes are made in the journal that the resistance-head was properly adjusted. It is thus possible, although I do not find it reasonable, that at station A the resistance-head may have been placed in a wrong position, thus

Table 10 a.

N-components of current at station A.

Depth	N_0	N_1	N_2	N_3	N_4	φ_1	φ_2	φ_3	φ_4
5	—4.32	6.6	11.9	4.9	1.2	57	179	116	295
10	—2.28	7.5	12.4	6.0	0.6	48	182	100	48
50	—3.51	10.1	7.4	5.8	2.3	28	186	81	43

Table 10 b.

E-components of current at station A.

Depth	E_0	E_1	E_2	E_3	E_4	ψ_1	ψ_2	ψ_3	ψ_4
5	2.03	5.8	8.9	1.2	1.8	216	359	30	134
10	1.10	3.7	8.6	0.7	1.3	220	352	310	139
50	—2.08	2.5	1.9	2.9	0.8	205	318	272	193

causing a systematic error in all measurements from 50 m depth.

During the current measurements the vessel is moving with the current or the wind, stretching out the anchor wire towards different directions from the spot where the anchor lies. The depth to the bottom at station A was 418 m, the total length of anchor wire was 575 m at the beginning, 50 m more after 4—5 hours. The ship may thus possibly have swayed between points of the surface at a distance from each other of some 600 m. When caused by the tidal current, this motion of 600 m during 6 hours, from maximum of current towards one to maximum towards the other direction, would correspond to an average velocity of nearly 3 cm/sec. But in the single cases the motion of the ship may reach much greater velocities, because the swaying does not go on with a constant velocity, it will usually happen more or less suddenly about the time when the tidal current turns. In the electric current recorder the propeller is in motion according to the apparent current during all the time of working the instrument. The current records will, therefore, include all movements of the vessel, while many of them may be lost when using the Ekman current meter, which is f. inst. in work during 5 minutes and then out of work for 10 or 15 minutes before it is ready for the next measurement. By suited movements of the vessel we might think of an explanation of the above divergency between the current at 50 m and at 5 and 10 m. This might be decided by reading off from the electric record the current within each of the single intervals of time when the Ekman current meter f. inst. at 10 m was working, and treat these readings exactly as done with the measurements from 10 m. Doing this, I find a slightly better agreement between the results at 10 and 50 m, but by no means so much better that the whole discrepancy can be ascribed the difference between the instruments.

It thus seems impossible to find any satisfactory explanation of the difference between the currents at 50 m and at 5 and 10 m by erroneous measurements. Assuming, therefore, the observations to be correct, it seems, however, difficult to understand what can cause the great difference. The anchor place may have been chosen not exactly in the middle of the strait, and local influences from the bottom may have been present. Perhaps may the bottom configuration of the whole deep basin of Hinlopen Strait, which is certainly not well known in details, account for the irregularities of the currents at 50 m.

Computing the components of the currents along the strait, towards N 30° W, we find the values given on p. 56; the rest current flows through the strait from the northern to the southern entrance with a velocity of between 2.5 and 4.8 cm/sec. The average for 5, 10, and 50 m is 3.8 cm/sec.

When plotting the components of current along the strait, towards S 30° E, from the different depths against time, it is seen that all curves exhibit the same main picture, although the single curves show individual irregularities. The greatest irregularity is found at the 50 m curve in the afternoon on July 6, where this curve falls about two hours later than the others. The few single measurements from greater depths are all in fairly good agreement with the curves from the upper strata. Thus at 100, 200, 300, and 400 m the actual current velocities are roughly equal to those observed simultaneously at 5, 10, and 50 m depth. Nothing can be concluded from this as to the rest-current, but no doubt the periodical currents must be roughly the same at all depths down to shortly above the bottom.

Combining all measurements, a total of 255, from all depths to one curve, using the components towards S 30° E and computing the mean values within each hour, we arrive at the mean curve reproduced in Fig. 34. The average divergency from the mean value, disregarding signs, *i. e.* the average velocity towards one or the other direction, is found equal to 10 cm/sec, a value which may be assumed to be valid also for the deeper layers. On the assumption that the measurements at station A are representative of the currents in all points of a cross-section of the strait in this place, we may calculate the watermasses transported through the section. Fig. 32 shows the bottom configuration in Hinlopen Strait and some of the surrounding bays. From this map the bottom line of the section is constructed in the small diagram at the right top of the figure. It is found that the total square of the cross section is 2 mill. m^2, of which 0.8 mill. m^2 fall between 0 and 100 m depth. Below 100 m thus $1.2 \cdot 10^6 \cdot 0.1 \cdot 60 \cdot 60 \cdot 6 = 2.6 \cdot 10^9$ m^3 of water are transported towards one or the other direction during the six hours when the current runs in that direction. From the map Fig. 32 it is found that the 100 m contour line south of the section through station A limits an area of $1.2 \cdot 10^9$ m^2. During the six hours of current towards S 30° E the 100 m surface will be raised by $2.6 : 1.2 = 2.2$ m due to the transport below this surface. The bathymetric

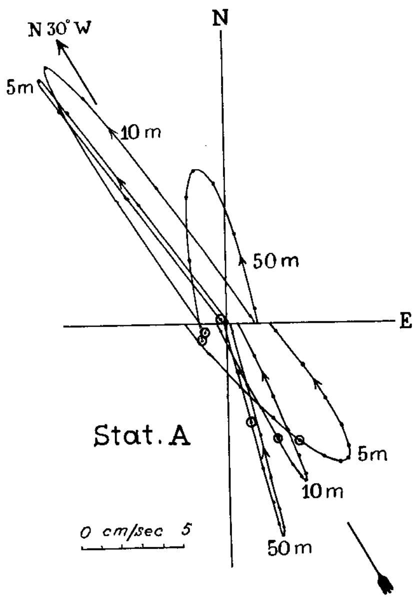

Fig. 33. Diurnal and semi-diurnal current-ellipses from anchor station A, 5, 10, and 50 m.

map is not very accurate in the south, but it shows that the saddle depth is probably less than 100 m; thus we may regard 100 m as the limit between the top layer, which can move freely through the strait and the deep layer, which is only in free connection with the Polar Sea in the north. Above the 100 m surface we have a rest-current giving a constant water transport through the strait from the Polar Sea to the Barents Sea. Above and below 100 m we have nearly the same periodical movements at all depths; when the current runs into the strait from the north, the deep layer will be stowed up and its upper limit is raised by 2.2 m. Above 100 m the water can move out of the strait towards the south, and the upper layer as well as part of the stowed-up deep layer will pass through the strait. According to the registrations of the tide gauge at the basis station Sveanor, the variations of sea-level are only 0.65 m, and it is thus seen that most of the layer of 2.2 m thickness, which is raised above the 100 m surface, must pass together with the upper layer towards the south.

The average rest-current along the strait was found above to be 3.8 cm/sec towards S 30° E (5, 10, and 50 m). If this current is supposed to be limited to the upper layer of 100 m, it gives a transport of water of $0.8 \cdot 10^6 \cdot 0.038 = 3 \cdot 10^4$ m³/sec or 0.66 mill. m³ during 6 hours. The average periodical current was found to be 10 cm/sec, and the transport due to this current must be equal to $2.0 \cdot 10^6 \cdot 0.1 = 0.2 \cdot 10^6$ m³/sec or $4.3 \cdot 10^9$ m³ during 6 hours. When the tidal current flows through the strait from north to south, we thus find a total transport of water through the strait of $5 \cdot 10^9$ m³ during six hours, and when the current flows the opposite way, we get a transport in the opposite direction, into the Polar Sea, of $3.6 \cdot 10^9$ m³ during the next six hours. On the map Fig. 32 two cross sections farther south are indicated, the horizontal extension is 2.2 respective 3.4 times as long as the section through station A, which was 9.4 km from coast to coast. A transport of $4.3 \cdot 10^9$ m³ per six hours through these sections is very reasonable. Assuming the average depths of the two sections to be 100 and 75 m respectively, we find that the average velocity of the tidal currents in these sections should be 9.6 and 9.0 cm/sec respectively, or a little below the average value found for the section through station A (10 cm/sec).

The harmonic constants given p. 56 are used for the construction of the diurnal and semi-diurnal current ellipses in Fig. 33. The 24-hour period shows a rotation counter clockwise in the three depths of observation: 5, 10, and 50 m, and the phase is nearly the same for them all. The ellipses are flat and the longer axes fall roughly along the direction of the strait, about S 30° E: the 5 m ellipse towards S 40° E, 10 m towards S 26° E, and 50 m towards S 14° E. The amplitude is 9 cm/sec at 5 and 10 m and about 10.5 cm/sec at 50 m depth.

The 12-hour period also shows a rotation counter clockwise at 5, 10, and 50 m depth and roughly the same phase. The flat ellipses from 5 and 10 m point towards S 36° E, while at 50 m the ellipse has a relatively great shorter axis and the longer axis points towards S 10° E. Maximum current at 5 and 10 m is about 15 cm/sec, while at 50 m it is only about 7.5 cm/sec.

The shorter periods are of less importance; the 8-hour period shows a clockwise rotation of roughly the same phase at all depths, the amplitudes are about 6 cm/sec and the orientation of the ellipses towards between S and S 25° E. The 6-hour period has amplitudes of only some 2 cm/sec.

It was mentioned above that eight series of hydrographic observations were taken at the anchor station A (stations Q 16 and 16 A—G). Temperature and salinity show fairly small and irregular variations within the uppermost 75 or 100 m, while below this depth we find great changes with time. Specially

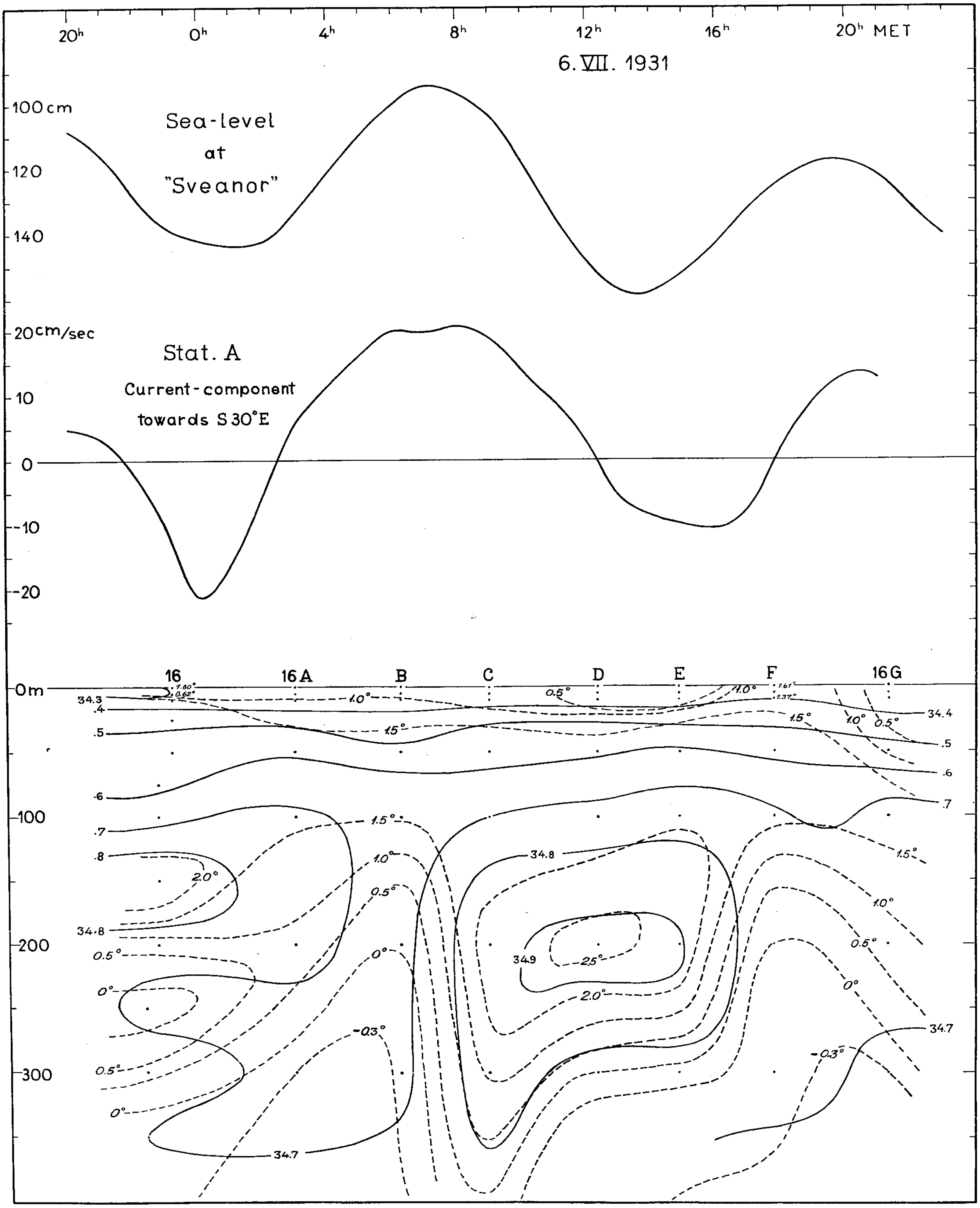

Fig. 34. Variation of sea-level at Sveanor, of average current-component along Hinlopen Strait at anchor station A, and of t and S at different depths at anchor station A.

clear is the temperature increase from station Q 16 B to 16 C, when the temperature increased from 0.03 to 2.36° during $2^h 45^m$ at 200 m and from —0.27 to 1.59° at 300 m. From station Q 16 E to 16 F we had a decrease from 2.38 to 0.01° at 200 m during $2^h 55^m$ and from 0.34 to —0.22° at 300 m. The corresponding changes of salinity were at stations Q 16 B—16 C from 34.67 to 34.89 ‰ at 200 m and from 34.68 to 34.85 ‰ at 300 m. At stations Q 16 E —16 F we find a decrease from 34.91 to 34.73 ‰ at 200 m and from 34.75 to 34.72 ‰ at 300 m. Thus at 200 m we have changes of more than 0.8° and about 0.07 ‰ per hour in these cases.

Fig. 34 shows on its uppermost part the variation of sea-level at Sveanor in Murchison Bay during the time when the anchor station A in Hinlopen Strait was worked. The scaling is kept from the original registration; the scale and the curve is turned upside down in Fig. 34, a maximum of our curve thus corresponding to a maximum height of sea-level. Below this curve on Fig. 34 the current components towards S 30° E at the anchor station are used for the construction of an average curve. As already mentioned the single observations from all depths were used for the construction of this curve (p. 57). Finally the isopleths of temperature and salinity are constructed on the lower part of Fig. 34.

Comparing the variation of the current with that of sea-level, we find that the high-water a little after midnight on July 5—6, falls at the time of minimum current towards S 30° E or maximum current out of the strait into the Polar Sea, and the low-water in the morning on July 6, falls at the time of maximum current towards S 30° E. The minimum of the current in the afternoon on July 6, occurs a couple of hours later than the low-water at Sveanor; this retardation is connected to the above mentioned difference between the observations at 50 m and those from the other depths. The maximum current towards S 30° E in the late afternoon on July 6, also occurs somewhat later than the high-water at Sveanor, a retardation also chiefly determined by the measurements at 50 m. On the whole, however, it thus appears that the *maximum current out of the strait into the Polar Sea corresponds to high-water at Sveanor, while maximum current into the strait (towards S 30° E) corresponds to low-water.* Local conditions will, of course, always influence the tidal wave in fjords and straits, but as Sveanor is not far from station A, we might expect a correspondance as that actually found, which is in full agreement with ordinary views.

The variations of temperature and salinity during the tidal period were already mentioned above. A clear picture of these variations is obtained from the isopleths on the lower part of Fig. 34. Comparing with the upper part of the same figure, it is seen that the greatest changes of temperature and salinity occur about the time of maxima and minima of current along the strait, thus also about the time of maxima and minima of the sea-level, or perhaps a little later. Temperature and salinity increase when the current flows into the strait from the north and decrease when the current flows out again. Within the upper 100 m the variations are seen to be very small.

By means of the average velocity curve of the component of current along the strait it is possible to compute the movement of a particle from the moment when one of the hydrographic series was taken to the moment when the next series was obtained. In this way it is possible to construct a "section" through the water masses passing at the anchor station during the period of measurements. We find

Station	16 A	16 B	16 F	16 G	16	16 E	16 C	16 D
Distance	0.0	1.1	1.4	2.0	2.1	2.7	2.8	3.7 km

where the distances are reckoned towards the direction of the strait, towards N 30° W; thus the waters investigated at station 16 D are belonging to the northernmost end of the water-length passing the station, station 16 A similarly to the southern end of it. When plotting the observed values of temperature and salinity in a section, we find a somewhat irregular picture, the details of which shall not be discussed. When disregarding the irregularities, we find that on the whole both temperature and salinity increase towards the northern end of the strait. From station 16 A to 16 D we find for the deeper strata the following differences:

Depth	$\Delta t°$	ΔS ‰	$\Delta \sigma_t$
100	0.19	0.02	0.00
200	1.58	.20	.02
300	0.84	.07	.02
Average	0.87	0.097	0.013
Per km.	0.24	0.026	0.0035

The increase of the temperature is thus very clear, while the increase of the salinity is small, and the average increase of σ_t is near the limit of accuracy, being only 0.013 per 3.7 km. It seems that the water is perhaps slightly heavier in the north than in the south, the salinity is obviously higher in the north than in the south and the temperature is much higher in the north than in the south.

From Fig. 32, p. 55, it is seen that station Q 15 was taken farther north in the strait than the anchor station, while stations Q 14 and 13 were taken farther south, all of them on July 4, the day before anchoring at station Q 16. By adding to the hour of observation at stations Q 13, 14, and 15 a number of 24 lunar hours or 24.8 hours ordinary time (or twice this amount), it is possible to pick out of the isopleths the values of temperature and salinity to be compared to the observations at the three stations, in order to study the distribution of temperature and salinity along the strait. When counting, in this way, the differences from north towards south along the strait as positive, we find the following values:

Depth	Difference in t°			Difference in S ‰			
	Q 15	Q 14	Q 13	Q 15	Q 14	Q 13	
100....	0.041	0.969	0.079	0.011	0.0085	0.006	per km
200....	0.885	1.138	0.085	0.005	0.012	0.010	» »
300....	0.048	0.035	(0.070)	0.0015	0.0046	(0.0075)	» »
Mean..	0.32	0.71	0.08	0.006	0.008	0.008	per km

All observations show an increase towards the northern end of the strait. The values from station Q 13, 300 m are printed in parenthesis, because they are observed at 250 m, the depth to the bottom being at this station only 287 m. The values are seen to vary greatly, all values of the salinity difference are small, the average being less than 0.01 ‰. However, the fact that all values come out positive for the increase towards the north seems to prove that the salinity is actually increasing towards the north. The average temperature increase is found equal to 0.37° per km, somewhat more than the value 0.24° per km found from the serial observations at the anchor station immediately above.

When comparing the observations at 100, 200, and 300 m depth at station Q 15 with the maximum values from the same depths at the anchor station (Q 16), and comparing the observations from the same depths at stations Q 14 and 13 with the minimum values at the anchor station (Q 16), it appears that the values at station Q 15 are not all higher than the maximum values at the anchor station, and the values at stations Q 14 and 13 are not all lower than the minimum values at the anchor station. But those values which are not higher than maximum or lower than minimum, do not diverge in the "wrong" sense very much — in the worst cases only about fifty per cent of the difference between maximum and minimum.

After this it seems doubtless that the general stratification in Hinlopen Strait actually corresponds to a decrease of temperature and also of salinity towards the south, a stratification which leads to a reasonable explanation of the variations of temperature and salinity during the tidal period at the anchor station by internal waves entering the strait from the north, similarly as found above when discussing the observations at the anchor station F north of Spitsbergen.

3. Murchison Bay

is a shallow bay, and the only investigations made here are stations Q 4 and 5, the first immediately north and the latter immediately south of the small island outside the basis-station Sveanor. All temperatures were below zero and the salinities were also low, the highest value being 34.29 ‰, which was observed at 25 m depth, 8 m from the bottom at station Q 5. It thus appears that these waters are extensively diluted by melting water from land, from the glaciers.

4. Wahlenberg Bay

was investigated at stations Q 6, 7, and 8 after the start of the sledge-party. The deepest station was Q 7 (180 m) with samples from 150 m depth. Also in this bay all temperatures were below zero, the salinities reaching 34.58 ‰ in the deeper layers. The entrance of the bay is not sufficiently known to determine whether the bottom layers of the bay may be in communication with the corresponding layers of the strait outside. Comparing with the observations at station Q 13 directly outside, we find that the latter are different, giving f. inst. a density of $\sigma_t = 27.91$ at 150 m, while at station Q 7, 150 m we have $\sigma_t = 27.82$, which indicates that the waters may be separated by a threshold. Due to the great variations of the waters in Hinlopen Strait it seems difficult to draw any conclusion from this comparison. However, as the σ_t-values do not vary by more than 0.05 at 100 and 200 m at the anchor station (Q 16), the above difference of 0.09 and the very different temperatures and salinities seem to give a sufficient base for concluding that Wahlenberg Bay must be separated from Hinlopen Strait by a threshold, the saddle depth of which must probably be less than 100 m. The upper layers are similar to those in the strait, with low temperatures, below zero and down to —1°, still lower salinities than in the strait, and with an oxygen content of about 8 cc/L or more than 100 ‰.

5. Lomme Bay

was visited on August 12—13, mainly for geological investigations, and four hydrographic stations were taken while going up the bay (stations Q 88—91). We here find high and positive temperatures, except at station Q 90 at 100 m, 8 m from the bottom (—0.41°). As seen from the topographic map in Fig. 32 this station is taken in the inner part of the bay, the deepest part of which is probably separated from Hinlopen Strait, and the bottom water here can obviously be renewed only slowly. At the utter stations Q 88—89 we find more than 2° near the bottom at 100 and 125 m depth. At stations Q 14 and 87, which were taken in the same position in Hinlopen Strait, outside the entrance of Lomme Bay, we found low temperatures on July 4, (station Q 14) and high temperatures on August 12, (station Q 87). Such variations probably also take place in Lomme Bay, because most of the waters are here in direct communication with the strait, the bottom layer of the inner part of the bay only excepted.

6. Treurenberg Bay

was visited on August 16. The observations at station Q 92 show that the conditions are very similar to those in Hinlopen Strait as observed at station Q 93 outside the entrance of Treurenberg Bay.

7. Red Bay

was visited on August 19, when finishing the section north of Spitsbergen and station Q 103 was taken at a depth of 116 m. The temperatures are between 4.57 and 2.90°, decreasing from the surface to the bottom. The uppermost 25 m are warmer and less saline than at station Q 102 outside the coast, and also the densities are lower; obviously the melting water, heated by radiation, flows out of the bay at this time of the year. Deeper down the stratification is in rough agreement with the waters outside the coast.

X. Cambridge Channel.

Our researches in Cambridge Channel consist of the data from stations Q 47—51 (cf. the map Fig. 1, p. 7). All temperatures at these stations are negative. A very well pronounced temperature minimum is found at 100—150 m depth, the minimum values being about —1.5° at stations Q 48—50, but only —0.84° at station Q 51. From about 250 m downwards the water is warmer, about —0.2°; this is the warmest layer at these stations. The salinity of this lower layer is usually above 34.8 ‰, while at the temperature minimum about 100—150 m the salinity is 34.5 to 34.6 ‰. The surface water has a lower salinity, about 33.5 ‰ at 5 m depth; at the very surface it may be much lower, thus at station Q 48 23.86 ‰ and at station Q 49 17.61 ‰. The hydrogen ion concentration shows a regular decrease from about 8.30 or more near the surface to 8.06 as the lowest value, observed at 300 and 350 m. The phosphates are more irregular, but on the whole the content increases from a relatively low value or even nought near the surface to a highest value near the bottom, amounting to about 60 or even 64 mg/m^3. The oxygen content is always between 9.23 and 6.81 cc/L or between 112 and 84 % saturation, decreasing regularly downwards. Cambridge Channel thus appears to be very different from Hinlopen Strait, where the waters even near the bottom were saturated with oxygen.

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TABLES OF RESULTS

Table I

gives the vertical series from the stations, including the observations and the results of the calculations mentioned in the text. Values, printed in [ ], are interpolated.

1. column, *MET*: Hours and minutes when the observations were taken, in Mean European Time. The time recorded at any certain depth is valid also for the subsequent depths until a new time is recorded. The depth to the bottom was usually determined immediately before the first haul was taken.

2. column a: The argument, a, has a different meaning in the different columns. It gives the depth in meters for the following seven columns (3 to 9 incl.), and it means pressure (in decibars) for the data in columns 10 and 11.

3. column, $t^\circ C$: The corrected temperature in centigrade.

4. column, S‰: The salinity *per mille*.

5. column, σt: The usual indication of density, disregarding compression.

6. column, P_2O_5: The amount of phosphates, in mg/m³.

7. column, p_H: The logarithm of the reciprocal value of the hydrogen ion concentration.

8. column, O_2 *cc/L*: The amount of oxygen, in cubic centimeters per litre.

9. column, O_2 %: The amount of oxygen, in *per cent* saturation.

10. column, $10^5 \Delta\alpha$: The specific volume (taking into account compression) at the isobaric surface of a decibars, expressed in 10^{-5} units as the difference between the actual specific volume *in situ*, and the value which would have been found if the water had had a temperature of 0° C and a salinity of 35‰. The values t, S and σt recorded for a meters have been used without reduction as valid also for the depth where the pressure is a decibars.

11. column, $10^4 \Delta D$: The dynamic depth from the sea surface to the isobaric surface of a decibars, expressed as the difference (in tenthousandth parts of a dynamic meter) between the real dynamic depth in the actual conditions found in the water layers, and the dynamic depth which would have been found in water of 0° C and 35‰.

Table II

contains the current measurements. The following table shows, for each current station, the corresponding hydrographic series, the geographical position and the magnetic variation used when determining true directions.

Stat.	Hydr.	Lat. N.	Long. E.	Magn. var.
A	16—16 G	79° 49′	18° 05′	6° W
B	19—19 A	80 06	27 38	1 E
		07	33	
C	20—20 B	11	27 47	1 E
D	43—43 K	26	38 56	11 E
E	74	32	26 40	0
F	99—99 J	31	13 05	10 W

1. column, *Date*: Date and month.

2. column, *MET*: The mean hour of the observation, in Mean European Time.

3. column, *cm/sec*: The mean current velocity in centimeters per second, as computed from the number of revolutions of the propeller by means of the formulae given p. 11.

4. column, *Single directions (magn.)*: In the cases when an instrument of Ekman's construction was used, *i. e.* at Instr. 60, 136, or 137, this column gives the distribution of the single balls in the compass box (if necessary converted so as to give the magnetic direction towards which the current moved). As the compass boxes are divided into 36 chambers, these directions could be given simply by ciphers, counting N = 36, N 10° E = 1, E = 9, S = 27, *etc.* The electric current recorder of Sverdrup-Dahl, Instr. 2, gives the direction by a division of the contact head into 18 contacts, and here the directions are, therefore, always given by equal numbers, counting as above. The sequence of the single directions is the same as in the registration, but in some cases one contact is counted twice, namely when covering parts of two half-hour intervals.

5. column, *Towards true N*: After reducing the velocity given in 3. column by multiplication by the coefficient k as explained p. 43, and converting into true directions by means of the values of the magnetic variation given above, the current vector was decomposed. The component towards true north is given in 5. column.

6. column, *Towards true E*: The current component towards true east, determined as explained for 5. column.

Measurements of transparency by means of a Secchi Disk are given p. 9.

Readings of sea level at Storøya are given in Table 6, p. 48.

Table I. Hydrographic stations.

MET	*a*	$t° C$	$S ‰$	σt	P_2O_5	*pH*	$O_2\ cc/L$	$O_2\ \%$	$10^5 \Delta\alpha$	$10^4 \Delta D$
Stat. 1. 23. VI, 1931. 80° 00′ N. 14° 37′ E.										
21 25	0	1.39	34.11	27.32					77	0
	2	1.30	.14	.35						
	5	1.31	.14	.35					74	38
	10	1.29	.16	.37					72	74
	16	bottom								
Stat. 2. 24. VI, 1931. 80° 04′ N. 15° 43′ E.										
4 35	0	1.42	34.26	27.44					65	0
	2	1.53	.25	.42						
	5	1.37	.26	.44					65	32
	10	1.36	.24	.42			8.70	111	67	66
4 15	25	1.46	.42	.56					54	156
	50	3.16	35.00	.89			7.08	95	23	252
	75	3.34	34.96	.84					27	315
	100	2.74	.98	.92			7.14	95	21	375
	130	2.65	.96	.90					23	441
	150	bluish grey clay or sand								
Stat. 3. 24. VI, 1931. 80° 03′ N. 17° 15′ E. Hinlopen Strait.										
8 45	0	1.18	34.37	27.54					56	0
	5	1.20	.34	.52					58	28
	10	1.21	.34	.52			8.56	109	58	57
	25	0.88	.41	.60					50	138
	50	0.85	.53	.70			8.34	106	41	252
	75	0.90	.58	.73					38	351
8 30	100	0.92	.68	.82			8.24	104	29	435
	150	1.22	.76	.86					26	572
	200	1.50	.81	.88			7.56	97	24	700
	300	2.28	.93	.91					23	940
	332	fine sand or clay								
Stat. 4. 24. VI, 1931. 79° 59′ N. 18° 13′ E. Murchison Bay.										
20 00	0	-0.44	33.93	27.28					80	0
	2	-0.60	.91	.27						
	5	-0.72	.91	.28					80	40
	10	-1.02	.97	.34			9.08	109	75	79
	16	clay and sand								
Stat. 5. 30. VI, 1931. 79° 58′ N. 18° 16′ E. Murchison Bay.										
8 35	0	0.12	33.84	27.18					90	0
	2	-0.02	.84	.19						
	5	-0.13	.89	.24					84	44
	10	-0.24	34.02	.34			9.58	117	75	83
	25	-0.40	.29	.57					53	179
	33	clay								
Stat. 6. 3. VII, 1931. 79° 45′ N. 20° 35′ E. Wahlenberg Bay.										
7 10	0	-0.29	33.63	27.04					103	0
	5	-0.82	.66	.08					99	50
	10	[-0.95]	.88	.26			9.50	114	82	96
	25	-1.02	34.13	.46					63	204
	50	[-0.93]	.30	.60			9.29	112	50	346
	75	-0.83	.41	.68					43	462
	100	-0.84	.55	.80			8.26	100	31	554
	116	reddish brown clay								
Stat. 7. 3. VII, 1931. 79° 44′ N. 20° 19′ E. Wahlenberg Bay.										
8 25	0	-0.63	33.72	27.12					96	0
	5	-0.76	.79	.18					90	46
	10	-1.00	.82	.22			9.20	111	86	90
	25	[-0.92]	34.08	.42					67	205
	50	-0.75	.35	.63			9.05	110	47	348
	75	-0.76	.47	.73					38	454
	100	-0.70	.54	.78			8.34	102	33	543
	150	-0.86	.58	.82					29	698
	180	greyish brown clay								
Stat. 8. 3. VII, 1931. 79° 41′ N. 19° 24′ E. Wahlenberg Bay.										
10 40	0	-0.66	33.68	27.09					98	0
	5	[-0.80]	.66	.08					99	49
	10	-0.82	.73	.14		8.30	9.10	110	94	98
	25	-0.64	34.28	.57		.26			53	208
	50	-0.56	.44	.69		.25	8 58	104	42	326
	75	-0.60	.52	.76		.22			35	423
	92	rock								
Stat. 9. 3. VII, 1931. 79° 26′ N. 20° 00′ E. Hinlopen Strait.										
13 30	0	-0.43	34.41	27.66					44	0
	5	-0.49	.45	.70		8.20			41	21
	10	-0.50	.45	.70		.22	8.74	108	41	42
	25	-0.44	.53	.76		.21			35	99
	50	-0.49	.58	.80		.21	8.27	101	31	181
	75	-0.42	.58	.81		.20			30	258
	100	-0.46	.59	.82		.22	8.48	104	29	331
	114	greyish brown clay								
Stat. 10. 3. VII, 1931. 79° 18′ N. 20° 44′ E. Hinlopen Strait.										
17 30	0	-0.82	34.06	27.40					69	0
	5	-0.90	.07	.41					68	34
	10	-0.93	.07	.41			8.43	102	68	68
	25	-0.99	.16	.49					60	164
	50	-0.76	.33	.62			8.62	104	48	299
	73	greyish brown clay								

Table I (continued).

MET	a	$t°C$	$S‰$	σt	P_2O_5	pH	$O_2\,cc/L$	$O_2\,\%$	$10^5\,\Delta\alpha$	$10^4\,\Delta D$
Stat. **11.** 4. VII, 1931. 79° 29′ N. 19° 27′ E. Hinlopen Strait.										
8 25	0	-0.43	34.31	27.58					52	0
	5	-0.50	.30	.58					52	26
	10	-0.51	.33	.60			8.68	106	50	52
	20	-0.52	.40	.66					44	98
	24	rock								
Stat. **12.** 4. VII, 1931. 79° 34′ N. 18° 58′ E. Hinlopen Strait.										
10 00	0	-0.18	34.08	27.39					70	0
	5	-0.23	.23	.51		8.26			59	32
	10	-0.20	.32	.58		.27	8.64	106	52	60
	25	-0.13	.52	.74		.22			37	127
	50	0.06	.63	.82		.19	8.17	101	29	209
	72	grey clay								
Stat. **13.** 4. VII, 1931. 79° 40′ N. 18° 50′ E. Hinlopen Strait.										
11 55	0	-0.10	34.04	27.36					73	0
	5	[-0.20]	.05	.37		8.26			72	36
	10	-0.89	.19	.51		.27	9.00	109	59	69
	25	-0.14	.36	.62		.26			48	149
	50	0.56	.52	.70		.26	8.23	103	41	260
	75	0.71	.61	.76		.23			35	356
11 40	100	-0.11	.60	.80		.22			31	438
	150	-0.10	.72	.91		.21			21	568
	200	0.07	.68	.87		.19	8.08	100	25	683
	250	-0.14	.68	.88		.13			24	806
	287	bluish black clay								
Stat. **14.** 4. VII, 1931. 79° 43′ N. 18° 25′ E. Hinlopen Strait.										
14 45	0	-0.23	34.18	27.48					62	0
	5	[-0.31]	.25	.53					57	30
	10	-0.32	.22	.51			8.34	102	59	59
	25	-0.30	.22	.51					59	147
	50	-0.27	.35	.61			8.58	105	49	282
14 30	75	[-0.12]	.56	.77					34	386
	100	0.54	.63	.80			8.06	101	31	467
	150	0.66	.68	.83					28	615
	200	-0.03	.69	.88			8.10	100	24	745
14 00	250	-0.16	.68	.88					24	865
	300	-0.15	.68	.88			8.05	100	24	985
	350	-0.21	.69	.89					23	1102
	400	-0.26	.69	.89			8.18	101	23	1217
	424	grey clay								
Stat. **15.** 4. VII, 1931. 79° 56′ N. 17° 44′ E. Hinlopen Strait.										
20 35	0	0.18	33.70	27.07					100	0
	5	0.08	.72	.09					98	50
	10	-0.02	34.01	.33			9.37	116	76	93
	25	1.32	.46	.60					50	188
	50	1.13	.58	.72			8.40	107	39	299
20 25	75	2.24	.75	.78					33	389
	100	2.03	.80	.84			7.64	100	28	465
	150	1.74	.81	.86					26	600
	200	1.93	.85	.87			7.44	97	26	730
20 00	250	2.64	.95	.90					24	855
	300	0.62	.76	.90			7.88	99	22	970
	350	0.00	.73	.92					20	1075
	400	-0.21	.74	.93			8.08	100	19	1172
	445	grey clay								
Stat. **16.** 5. VII, 1931. 79° 49′ N. 18° 05′ E. Hinlopen Strait.										
23 10	0	1.80	34.32	27.46					63	0
	5	0.62	.30	.52					58	30
	10	1.76	.33	.47			8.93	115	62	60
	25	1.74	.46	.58					52	146
23 10	50	1.53	34.58	27.69			8.60	111	42	263
22 45	75	1.70	.59	.68					43	370
	100	1.52	.67	.76			8.57	110	36	468
	150	2.43	.89	.87					26	623
	200	0.78	.75	.88			7.80	99	25	751
22 20	250	-0.10	.69	.88					23	871
	300	0.52	.73	.88			7.93	100	23	986
	350	-0.24	.70	.90					22	1098
	400	-0.25	.72	.92			7.98	98	20	1203
	418	grey clay								
Stat. **16 A.** 6. VII, 1931. 79° 49′ N. 18° 05′ E.										
3 00	0	0.97	34.32	27.52					58	0
	5	0.86	.32	.52					57	29
	10	1.05	.34	.53					57	57
	50	1.56	.59	.69					42	255
	100	1.54	.71	.80					32	440
	200	0.83	.72	.86					26	730
	300	-0.30	.68	.88					23	975
Stat. **16 B.** 6. VII, 1931. 79° 49′ N. 18° 05′ E.										
6 15	0	0.91	34.34	27.54					56	0
	5	0.90	.32	.52					58	28
	10	1.09	.36	.54					56	57
	50	1.60	.53	.64					46	261
	100	1.56	.68	.77					35	464
	200	0.03	.67	.86					25	764
	300	-0.27	.68	.88					23	1004
Stat. **16 C.** 6. VII, 1931. 79° 49′ N. 18° 05′ E.										
9 00	0	1.02	34.35	27.54					56	0
	5	0.93	.34	.54					56	28
	10	0.79	.33	.54					56	56
	50	1.62	.57	.67					43	254
	100	1.58	.70	.79					33	444
	200	2.36	.89	.88					25	734
	300	1.59	.85	.90					23	974
Stat. **16 D.** 6. VII, 1931. 79° 49′ N. 18° 05′ E.										
12 20	0	0.34	34.38	27.60					50	0
	5	0.10	.35	.60					50	25
	10	0.16	.33	.58					52	50
	50	1.55	.59	.70					41	236
	100	1.73	.73	.80					32	419
	200	2.61	.92	.88					25	704
	300	0.54	.75	.90					23	944
Stat. **16 E.** 6. VII, 1931. 79° 49′ N. 18° 05′ E.										
14 55	0	0.32	34.34	27.57					53	0
	5	0.49	.33	.56					54	27
	10	0.33	.35	.58					52	53
	50	1.68	.61	.70					41	239
	100	1.93	.76	.81					31	419
	200	2.38	.91	.90					23	689
	300	0.34	.75	.91					21	909
Stat. **16 F.** 6. VII, 1931. 79° 49′ N. 18° 05′ E.										
17 50	0	1.61	34.41	27.54					55	0
	5	1.62	.40	.54					56	28
	10	1.37	.40	.56					54	55
	50	1.68	.58	.68					43	249
	100	1.61	.71	.80					33	439
	200	0.01	.73	.91					20	704
	300	-0.22	.72	.92					20	904

Table I (continued).

Stat. **16 G.** 6. VII, 1631. 79° 49' N. 18° 05' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
21 20	0	0.44	34.35	27.58					52	0
	5	0.12	.33	.58					52	26
	10	0.09	.35	.60					51	52
	50	0.96	.54	.70					41	236
	100	1.72	.74	.81					31	416
	200	0.77	.73	.87					25	696
	300	-0.30	.69	.90					22	931

Stat. **17.** 7. VII, 1931. 79° 17' N. 24° 45' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
19 45	0	-0.70	33.53	26.97					110	0
	5	-0.90	.60	27.04					104	54
	10	-1.27	.67	.10					97	104
	25	-1.23	.89	.28					80	236
	50	-1.09	34.18	.50					59	410
	68	greyish brown clay								

Stat. **18.** 7. VII, 1931. 79° 12' N. 25° 05' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
21 10	0	-1.04	33.12	26.65					140	0
	5	-1.25	.33	.82					124	66
	10	-1.40	.60	27.05					102	122
	25	-1.66	.98	.36					73	254
	50	-1.27	34.21	.54					56	415
	75	-0.54	.38	.64					46	542
	100	-0.39	.40	.66					45	656
	146	greyish brown clay								

Stat. **19.** 8. VII, 1931. 80° 06' N. 27° 38' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
0 30	0	-1.57	34.22	27.55					55	0
	5	-1.57	.26	.58					52	27
	10	-1.62	.26	.58			8.55	101	52	53
	25	-1.60	.31	.62					48	128
	50	-1.59	.40	.70			8.38	100	41	239
	75	-1.54	.41	.70					40	340
	100	-1.53	.42	.71			8.08	96	39	439
	120	greyish brown clay								

Stat. **19 A.** 9. VII, 1931. 80° 07' N. 27° 33' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
3 10	0	-1.55	34.18	27.52						
3 45	0	-1.54	.25	.58					53	0
	5	-1.64	.24	.57					53	26
	10	-1.62	.26	.59					51	52
	25	-1.62	.32	.64					47	126
	50	-1.61	.40	.70					41	236
	75	-1.56	.46	.74					36	332
3 10	75	-1.54	.44	.73						
	103	bottom								

Stat. **20.** 12. VII, 1931. 80° 11' N. 27° 47' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
10 25	0	-0.94	33.58	27.02					105	0
	5	-1.24	.60	.04					103	52
	10	-1.39	.88	.28					81	98
	15	-1.39	.88	.28					81	138
	18	bottom								

Stat. **20 A.** 12. VII, 1931. 80° 11' N. 27° 47' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
23 50	0	-1.28	33.94	27.32					77	0
	5	-1.34	.92	.30					78	39
	10	-1.37	.94	.32					77	78
	15	-1.36	.96	.34					75	116

Stat. **20 B.** 13. VII, 1931. 80° 11' N. 27° 47' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
6 50	0	-1.37	33.70	27.13					95	0
	5	-1.40	.96	.34					75	42
	10	-1.45	34.13	.48					62	76
	15	-1.41	.18	.52					58	106

Stat. **21.** 14. VII, 1931. 80° 06' N. 28° 15' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
11 10	0	-1.34	34.02	27.38					71	0
	5	-1.44	.01	.38	22	8.20			71	36
	10	-1.47	.02	.39	20	.20	8.68	103	70	71
	25	-1.48	.03	.40	22	.23			70	176
	50	-1.48	.12	.47	24	.20	8.66	103	62	341
	75	-1.30	.39	.68	31	.17			43	472
	100	-1.16	.50	.76	35	.11	8.20	99	35	570
	123	gravel and mud								

Stat. **22.** 14. VII, 1931. 80° 06' N. 29° 02' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
13 40	0	-1.03	33.37	26.86					120	0
	5	-0.95	.33	.82	0				124	61
	10	-1.13	.34	.83	0	8.29	9.79	117	123	123
	25	-1.54	34.16	27.50	22	.22			60	260
	50	-0.47	.50	.74	44	.17	8.14	99	37	381
13 30	75	-0.54	.61	.84	53	.14			27	461
	100	-0.60	.65	.88	44	[.13]	8.00	98	24	525
	150	-0.28	.71	.91	42	.12			21	638
	200	0.17	.78	.94	40	.13	7.90	98	18	735
	209	grey clay and gravel								

Stat. **23.** 14. VII, 1931. 80° 06' N. 29° 50' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
16 25	0	-1.26	33.41	26.90					117	0
	5	-0.94	.40	.88	0	8.34			118	59
	10	-1.36	.42	.90	0	.34	9.87	117	116	117
	25	-1.68	.76	27.19	11	.21			89	271
	50	-1.30	34.26	.58	24	.18	8.29	99	52	447
	75	-1.02	.38	.66	35	.16			45	568
16 05	100	0.58	.60	.76	44	.12	7.20	91	35	668
	150	0.50	.70	.86	46	.15			26	821
	200	-0.03	.70	.89	46	.15			23	944
	250	-0.29	.70	.90	48	.15			21	1054
	285	-0.35	.69	.90	48	[.15]	7.61	93	22	1129
	296	grey clay								

Stat. **24.** 14. VII, 1931. 80° 05' N. 30° 37' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
18 30	0	-1.20	33.56	27.02	0				106	0
	5	-1.30	.54	.00	0	8.24			107	53
	10	-1.37	.55	.01	0	.27	9.16	108	106	106
	25	-1.68	.84	.25	18	.23			83	248
	50	-1.43	34.15	.49	26	.19	8.50	100	61	428
18 15	75	-1.14	.34	.64	35	.20			46	562
	100	0.22	.55	.74	44	.14	7.36	92	37	666
	150	0.96	.73	.86	51	.12			26	823
	175	1.00	.76	.88	51	.11	7.35	94	24	886
	182	mud (and rock?)								

Stat. **25.** 14. VII, 1931. 80° 05' N. 31° 13' E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
8 05	0	-0.88	33.42	26.89					117	0
	2	-0.96	.39	.87	0	8.39				
	5	[-1.02]	[.39]	.87					119	59
	10	[-1.11]	[.44]	.91					116	118
	17	-1.15	.60	27.04	0	.32				
	25	[-1.15]	[.84]	.23					85	268
	42	-1.09	34.10	.44	31	.20				
	50	[-1.06]	[.14]	.48					62	450
	67	-1.00	.18	.50	33	.16				
	75	[-0.97]	[.19]	.51					59	600
	75	mud								

Stat. **26.** 19. VII, 1931. 80° 00' N. 31° 30° E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
14 50	0	-0.31	33.35	26.81	0				125	0
	5	-0.32	.35	.81	0	8.34			125	62
	10	-0.36	.43	.88	0	.34			118	123
	25	-0.80	.76	27.16	0	.27			92	281

Table I (continued).

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
14 50	50	-0.88	34.15	27.48	24	8.15			62	473
	75	-0.92	.15	.48	26	.15			61	627
	100	-0.91	.17	.49		.15			60	778
	122	grey clay								
		Stat. **27.** 19. VII, 1931. 79° 58′ N. 30° 48′ E.								
17 30	0	0.13	33.29	26.74		8.41			132	0
	5	-0.06	.32	.77		.38			129	65
	10	-0.11	.36	.81		.37			125	129
	25	-0.29	.54	.96		.34			111	306
17 20	50	-0.94	34.16	27.48		.16			61	521
	75	-1.56	.20	.54		.18			56	667
	100	-1.14	.31	.61		.16			49	798
	125	-0.32	.47	.71	38	.12			40	910
	149	grey clay with traces of sand								
		Stat. **28.** 19. VII, 1931. 79° 54′ N. 30° 04′ E.								
20 10	0	-0.25	33.09	26.59	0	8.29			146	0
	5	-0.36	.08	.59	0	.30			146	73
	10	-0.77	.42	.88	0	.31			118	139
	25	-1.44	.90	27.29	10	.21			80	288
	50	-1.62	34.21	.54	30	.16			55	456
	75	-1.41	.31	.62	38	.14			48	585
19 55	100	-1.06	.42	.70	27	.13			41	696
	150	0.99	.71	.84	38	.12			28	869
	200	0.53	.74	.89	50	.11			23	996
	250	-0.37	.72	.92	38	.12			20	1104
	280	grey clay								
		Stat. **29.** 20. VII, 1931. 79° 58′ N. 32° 15′ E.								
3 20	0	0.03	33.47	26.90	16	8.34			117	0
	5	-0.06	.50	.92	0	.35			115	58
	10	-0.11	.50	.92	0	.34			114	115
	25	-0.79	.69	27.10	0	.26			98	274
	50	-0.91	34.00	.36	18	.16			73	489
	75	-0.79	.12	.44	24	.17			65	663
	89	gravel and grey clay								
		Stat. **30.** 20. VII, 1931. 79° 57′ N. 33° 03′ E.								
6 10	0	-0.82	33.92	27.29	0	8.40			80	0
	5	-0.92	.92	.30	0	.41			79	40
	10	-0.82	.99	.34	0	.41			74	78
	25	-1.00	[34.00]	.36	0	.28			73	188
	50	-0.89	.03	.38	18	.21			71	368
	75	-0.85	.13	.46	30	.18			63	536
	100	-0.67	.25	.54	32	.16			55	683
	117	grey clay								
		Stat. **31.** 20. VII, 1931. 80° 06′ N. 33° 09′ E.								
9 00	0	-0.52	33.34	26.81	0	8.33			125	0
	5	-0.57	.30	.77	0	.35			129	64
	10	-0.74	.49	.94	0	.34	9.75	117	113	124
	25	-1.07	.76	27.17	16	.27			91	277
	50	-0.95	.98	.34	16	.22	8.57	103	75	484
	75	-0.62	34.19	.50	26	.20			60	653
	100	-0.46	.29	.57	42	.14	7.77	95	53	795
	115	greyish black clay								
		Stat. **32.** 20. VII, 1931. 80° 05′ N. 33° 48′ E.								
13 05	0	-1.27	32.82	26.42	0	8.39			162	0
	5	-1.32	.90	.48	0	.37			156	80
	10	-1.05	33.73	27.14	0	.24	8.78	105	94	142
	25	-1.03	.82	.22	14	.23			86	277
	50	-0.91	.98	.34	16	.22	8.41	101	75	478
	61	sand, mud and grey clay								

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
		Stat. **33.** 20. VII, 1931. 80° 05′ N. 34° 18′ E.								
16 05	0	0.71	33.28	26.70	0	8.24			135	0
	5	0.07	.30	.74	0	.24			131	66
	10	0.65	.27	.72	0	.22	8.48	104	134	133
	25	-1.15	.93	27.31	8				78	292
	50	-0.69	34.27	.56	32	.14	7.92	96	54	457
	75	-0.31	.40	.65	37	.13			45	580
15 45	100	-0.24	.46	.70	40	.13	7.51	92	41	688
	150	1.73	.78	.84	48	.12			28	860
	200	2.66	.93	.88	50	.10	6.91	92	25	993
	250	2.30	.94	.92					21	1108
	268	grey clay with traces of brown sand								
		Stat. **34.** 20. VII, 1931. 80° 05′ N. 34° 59′ E.								
19 05	0	1.28	33.98	27.22					86	0
	5	1.27	.96	.21	0	8.24			87	43
	10	1.27	.97	.22	0	.24	8.69	111	87	87
	25	0.41	34.04	.32	3	.25			77	210
18 50	50	-1.41	.25	.57	32		7.89	94	53	372
	75	-0.96	.38	.66	43				45	495
	100	-0.14	.52	.74	46		7.34	91	37	597
	125	0.50	.62	.79	50	.12			32	684
	144	grey clay								
		Stat. **35.** 20. VII, 1931. 80° 05′ N. 35° 34′ E.								
22 25	0	1.11	33.92	27.19					89	0
	5	1.10	.92	.19	0	8.11			89	44
	10	1.08	.92	.19	0	.30	9.23	117	89	89
	25	0.25	34.03	.33	0	.20			76	213
	50	-1.01	.25	.56	32	.13	7.75	93	54	375
	75	-1.10	.33	.62	42	.09			48	503
	94	grey clay								
		Stat. **36.** 21. VII, 1931. 80° 04′ N. 36° 08° E.								
0 55	0	0.62	33.78	27.11	0				97	0
	5	0.70	.76	.08	0	8.33			99	49
	10	0.63	.76	.09	0	.35	10.06	126	98	98
	25	0.25	.91	.23	0	.26			85	236
0 45	50	-1.16	34.28	.59	32	.13	7.76	93	51	406
	75	-0.90	.35	.64	32	.13			46	527
	100	-0.84	.38	.66	34	.12	7.55	92	44	639
	125	-0.86	.38	.66	40	.09			44	749
	145	grey clay								
		Stat. **37.** 21. VII, 1931. 80° 04′ N. 36° 44′ E.								
3 15	0	0.92	33.63	26.97	0				110	0
	5	0.87	.62	.96	0	8.36			110	55
	10	0.88	.62	.96	0	.38	9.26	116	110	110
	25	0.28	.83	27.16	0	.27			92	262
	50	-0.91	34.12	.45	30	.15	7.99	95	64	456
	75	-0.97	.29	.59	37	.14			51	600
	100	-0.81	.34	.62	43	.12	7.70	93	48	724
	117	grey clay								
		Stat. **38.** 22. VII, 1931. 80° 13′ N. 36° 47′ E.								
10 10	0	0.00	33.85	27.20	8				88	0
	5	-0.06	.86	.21	8	8.14			87	44
	10	-0.06	.86	.21	8	.27	9.51	117	87	87
	25	-0.14	.88	.23	2	.30			85	216
	50	-0.33	.96	.30	8	.24	8.95	109	79	421
	75	-0.34	.98	.30	8	.24			78	618
	100	-0.39	34.03	.36	18	.22	8.65	106	73	806
	112	grey clay								

Table I (continued).

MET	a	$t°C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\%$	$10^5 \Delta\alpha$	$10^4 \Delta D$
Stat. **39.** 22. VII, 1931. 80° 16′ N. 37° 10′ E.										
12 40	0	-0.18	33.82	27.18	8				90	0
	5	-0.24	.82	.18	8	8.11			90	45
	10	-0.27	.84	.20	8	.28	9.36	114	88	90
	25	-0.30	.87	.23	8	.28			85	219
	36	rock								
Stat. **40.** 22. VII, 1931. 80° 18′ N. 37° 26′ E.										
13 50	0	-0.15	33.77	27.14	0				94	0
	5	-0.24	.74	.12	0	8.30			96	48
	10	-0.25	.84	.20	0	.33	9.62	118	88	94
	25	-0.32	.88	.24	0	.28			84	222
	50	-0.38	.97	.31	8	.27	8.96	109	78	425
	75	-0.40	.99	.33	8	.25			76	618
	100	-0.50	34.09	.41	18	.19	8.55	104	68	798
	131	rock and clay								
Stat. **41.** 22. VII, 1931. 80° 20′ N. 37° 54′ E.										
16 30	0	-0.54	33.23	26.72	8				134	0
	5	-0.61	.30	.78	0	8.40			128	66
	10	-0.63	.24	.73	0	.39	10.59	128	133	131
	25	-0.58	.86	27.23	8	.26			85	294
	50	-0.67	34.01	.36	24	.19			73	492
	75	-0.69	.06	.40	24	.15			70	670
	100	-0.71	.17	.48	24	.15	7.99	97	61	834
	110	grey clay								
Stat. **42.** 22. VII, 1931. 80° 24′ N. 38° 28′ E.										
20 05	0	-0.42	32.89	26.44	0				160	0
	5	-0.47	.87	.42	0	8.42			162	80
	10	-0.48	33.21	.70	0	.46			135	155
	25	-0.32	.90	27.25	0	.24			83	318
19 55	50	-0.72	34.23	.54	24	.15	7.93	96	56	492
	75	-0.99	.34	.63	30	.13			47	621
	100	-0.09	.47	.70	42	.10	7.93	98	41	731
	125	0.77	.63	.78	40	.03			33	823
	141	grey clay								
Stat. **43.** 22. VII, 1931. 80° 26′ N. 38° 56′ E.										
23 10	0	0.12	33.06	26.55	0				150	0
	5	-0.07	.08	.58	0				147	74
	10	-0.49	.34	.80	0	8.29	10.04	122	126	142
	25	-1.44	.91	27.30	0	.18			78	296
	50	-1.70	34.24	.57	0	.13	7.89	93	53	459
22 55	75	-1.49	.30	.62		.12			48	586
	100	1.02	.66	.79	42	.10	7.14	91	32	686
	150	2.25	.82	.83	46	.09			29	838
	185	2.64	.92	.87	46	[.08]	6.74	89	26	934
	202	gravel and greyish brown clay								
Stat. **43 A.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
2 10	0	0.05	33.09	26.58					147	0
	10	-0.28	.28	.74					132	140
	50	-1.71	34.28	27.60					50	504
	100	1.13	68	.80					31	706
	150	2.38	.87	.93					20	834
Stat. **43 B.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
4 55	0	-0.20	33.15	26.64					141	0
	10	-0.24	.19	.68					138	140
	50	-1.50	34.32	27.63					47	510
	100	1.46	.72	.82					30	702
	150	2.60	.92	.88					25	840

MET	a	$t°C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\%$	$10^5 \Delta\alpha$	$10^4 \Delta D$
Stat. **43 C.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
8 20	0	-0.10	33.16	26.64					141	0
	10	-0.17	.21	.69					136	138
	50	-1.68	34.30	27.62					48	506
	100	1.78	.77	.83					29	699
	150	2.17	.93	.92					21	824
Stat. **43 D.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
11 15	0	-0.11	33.04	26.55					150	0
	10	-0.92	.50	.96					111	130
	50	-1.69	34.28	27.60					50	452
	100	1.40	.74	.84					28	648
	150	2.63	.92	.87					26	782
Stat. **43 E.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
14 10	0	0.05	32.78	26.34					170	0
	10	-0.65	33.41	.88					119	144
	50	-1.48	34.32	27.63					47	476
	100	1.69	.78	.84					28	664
	150	2.59	.92	.88					25	796
Stat. **43 F.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
17 20	0	-0.01	33.02	26.53					152	0
	10	-0.80	.45	.91					115	134
	50	-1.61	34.33	27.64					46	456
	100	2.24	[.84]	.84					28	640
	150	2.66	.90	.86					27	778
Stat. **43 G.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
20 10	0	-0.08	33.00	26.52					153	0
	10	-1.01	.55	27.00					107	130
	50	-1.70	34.28	.60					50	444
	75	-0.39	.45	.70					41	558
	100	1.54	.72	.80					32	649
	150	2.69	.89	.85					27	796
Stat. **43 H.** 23. VII, 1931. 80° 26′ N. 38° 56′ E.										
23 00	0	-0.17	32.49	26.11					191	0
	10	-0.90	33.52	.97					110	150
	50	-1.34	34.32	27.62					48	466
	75	-0.51	.43	.68					42	579
	100	1.00	.65	.78					33	673
	150	2.62	.90	.87					26	820
Stat. **43 I.** 24. VII, 1931. 80° 26′ N. 38° 56′ E.										
2 00	0	-0.09	32.94	26.47					157	0
	10	-0.88	33.51	.96					111	134
	50	-1.69	34.28	27.60					50	456
	75	-0.43	.46	.70					40	568
	100	1.42	.72	.82					30	656
	150	2.50	.90	.87					26	796
Stat. **43 J.** 24. VII, 1931. 80° 26′ N. 38° 56′ E.										
5 00	0	0.07	33.13	26.61					144	0
	10	-0.23	.28	.74					131	138
	50	-1.68	34.30	27.62					48	496
	75	0.13	.54	.74					37	602
	100	1.50	.74	.82					30	686
	150	2.19	.87	.87					26	826
Stat. **43 K.** 24. VII, 1931. 80° 26′ N. 38° 56′ E.										
7 45	0	-0.07	33.19	26.67					138	0
	10	-0.15	.20	.68					137	138
	50	-1.72	34.28	27.60					50	512
	75	-0.48	.44	.69					42	626
	100	1.51	.74	.82					30	716
	150	2.26	.87	.87					26	856

Table I (continued).

Stat. **44.** 24. VII, 1931. 80° 29′ N. 39° 30′ E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
11 55	0	0.85	33.53	26.90	24				116	0
	5	-0.02	.53	.95	8	8.31			112	57
	10	[-0.37]	.55	.97	8	.30	8.83	108	110	112
	25	-0.95	.63	27.06	8	.34			101	271
	50	-1.21	34.33	.63	35	.12	7.47	90	47	456
	75	0.42	.59	.76	42	.12			35	558
11 35	100	1.92	.78	.83	48	.13	6.99	91	29	638
	150	2.57	.91	.88	48	.08			24	771
	200	2.14	.91	.92	48	.09	7.08	93	21	883
	250	1.83	.90	.93	48	.09			20	986
	300	2.20	.96	.94	48	.02	6.97	92	20	1086
	359	greyish brown clay								

Stat. **45.** 24. VII, 1931. 80° 32′ N. 40° 12′ E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
15 20	0	1.09	33.35	26.74	0				132	0
	5	1.04	.35	.74	16	8.30			132	66
	10	0.17	.38	.82	16	.31	8.80	108	124	130
	25	0.16	.93	27.26	8	.23			83	285
	50	-1.48	34.31	.62	40	.09	7.67	91	48	449
	75	0.40	.61	.78	48	.10			33	550
	100	2.07	.84	.87	48	.09	7.21	94	26	624
14 50	150	2.25	.88	.88	48	.11			25	752
	200	1.68	.85	.89	42	.10	7.12	92	24	874
	250	1.86	.90	.93	48	.10			20	984
	406	greyish brown clay								

Stat. **46.** 24. VII, 1931. 80° 33′ N. 41° 09′ E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
19 40	0	1.22	33.57	26.90	0				116	0
	5	1.19	.57	.90	0	8.25			116	58
	10	0.87	.60	.95	0	.26	8.55	108	112	115
	25	0.60	.91	27.21	0	.25			87	264
	50	[0.60]	34.38	.59	30	.11	7.17	90	51	437
	75	1.09	.69	.82	30	.09			29	537
	100	2.10	.86	.87	43	.08	7.06	92	26	606
19 10	150	2.14	.87	.88	42	.12			25	733
	200	2.02	.89	.91	43	.08	7.11	93	22	851
	250	[1.96]	[.91]	.92	54	.09			21	958
	300	1.91	.93	.95	59	.08	7.07	92	19	1058
	350	1.55	.93	.97	56	.08			17	1148
	375	greyish brown clay								

Stat. **47.** 25. VII, 1931. 80° 31′ N. 46° 27′ E.
Cambridge Channel.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
21 45	1	-0.34	33.80	27.18					90	0
	5	-0.33	.85	.21					87	35
	10	-0.35	.86	.22					86	79
	17	rock								

Stat. **48.** 26. VII, 1931. 80° 29′ N. 47° 06′ E.
Cambridge Channel.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
23 45	0	-0.42	23.86	19.16	27				856	0
	5	-0.37	33.76	27.14	8				94	238
	10	-0.64	.93	.29	8	8.28	9.19	111	80	281
	25	-0.85	34.10	.44	16	.24			65	390
	50	-0.75	.34	.62	30	.22	8.34	101	48	531
	75	-1.29	.48	.75	50	.15			36	636
23 20	100	-1.52	.53	.80	38	.13	7.52	90	31	720
	150	-1.17	.63	.88	46	.12			23	855
	200	-0.37	.73	.93	50	.11	7.12	87	19	960
	250	-0.16	.80	.98	56	.11			14	1042
	300	-0.23	.83	28.00	64	.06	6.88	85	12	1107
	333	grey clay								

Stat. **49.** 27. VII, 1931. 80° 26′ N. 47° 17′ E.
Cambridge Channel.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
17 55	0	-0.42	17.61	14.14	10				1342	0
	5	-0.47	33.53	26.96	19	8.30			111	363
	10	-0.47	.75	27.14	16	.31	9.23	112	94	414
	25	-0.67	.96	.32	11	.27			77	543
	50	-1.02	34.22	.54	32	.21	8.29	100	56	709
17 35	75	-1.13	.42	.70	40	.17			41	830
	100	-1.32	.51	.78	51	.14	7.80	93	33	923
	150	-1.42	.58	.84	56	.12			27	1073
	200	-0.76	.68	.91	53	.12	7.17	87	20	1190
	235	grey clay								

Stat. **50.** 29. VII, 1931. 80° 25′ N. 46° 10′ E.
Cambridge Channel.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
4 15	0	0.48	33.57	26.95	0	8.28			112	0
	5	0.37	.60	.98	0	.28			109	55
	10	0.31	.65	27.02	0	.28	9.05	112	105	109
	25	0.04	.78	.14	6	.28			94	258
	50	-0.79	34.13	.46	16	.24	8.72	105	64	456
3 55	75	[-1.22]	.45	.72	34	.13			39	584
	100	-1.35	.50	.77	46	.12	7.51	90	34	676
	150	-1.25	.59	.84	46	.11			27	828
	200	-0.77	.69	.92	46	.09	7.23	88	19	943
3 25	250	-0.30	.76	.96	64	.08			16	1030
	300	-0.23	.79	.98	53	.06	7.08	87	14	1106
	350	-0.25	.82	28.00	51	.06			12	1170
	400	-0.16	.86	.02	51	[.06]	6.81	84	10	1226
	459	bluish grey clay								

Stat. **51.** 29. VII, 1931. 80° 43′ N. 47° 21′ E.
Cambridge Channel.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
10 15	0	0.12	33.49	26.90	0	8.38			116	0
	5	[0.02]	.49	.91	0				116	58
	10	-0.05	.50	.92	0	.36			115	116
	25	-0.33	.77	27.15	8	.31			93	272
	50	-0.75	34.20	.51	26	.22			59	462
	75	-0.73	.33	.62	30	.15			49	596
9 55	100	-0.83	.47	.73	34	.14			38	705
	150	-0.73	.62	.86	42	.13			26	865
	200	-0.64	.70	.92	51	.12			20	980
	250	-0.28	.79	.98	51	.10			14	1066
	300	-0.19	.86	28.01	61	.10			11	1128
	310	bluish grey clay								

Stat. **52.** 30. VII, 1931. 80° 56′ N. 47° 09′ E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
4 35	0	-0.53	33.44	26.89	19				117	0
	5	[-0.70]	.52	.96	3	8.35			111	57
	10	-0.82	.60	27.03	0	.35	9.94	120	104	111
	25	-1.13	34.05	.40	26	.18			69	240
	50	-0.86	.38	.66	34	.14	7.93	96	45	383
4 20	75	-0.75	.50	.75	40	.13			36	484
	100	-0.52	.54	.78	40	.12	7.49	92	34	572
	150	-0.40	.62	.84	50	.11			28	727
	190	0.26	.68	.86	51	.11	7.22	90	26	835
	203	grey clay with traces of sand								

Stat. **53.** 30. VII, 1931. 80° 58′ N. 46° 38′ E.

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
6 25	0	-0.64	33.16	26.66	0	8.35			139	0
	5	-1.03	.48	.94	3	.33			113	63
	10	-1.15	.85	27.24	6	.23			84	112
	25	-0.88	34.18	.50	32	.14			60	220
	50	-0.57	.38	.64	38	.13			46	353
	75	-0.40	.45	.70	38	.11			41	462
	88	grey clay with sand								

Table I (continued).

MET	a	$t°C$	$S‰$	σt	P_2O_5	pH	$O_2\,cc/L$	$O_2\,\%$	$10^5\,\Delta\alpha$	$10^4\,\Delta D$
Stat. **54.** 30. VII, 1931. 81°04'N. 45°46'E.										
11 35	0	-0.05	28.22	22.66					519	0
	5	-0.95	33.35	26.83	0	8.35			123	160
	10	-1.11	.56	27.01	8	.33			106	218
	25	-1.11	.99	.36	24	.18			73	352
	43	grey clay with sand								
Stat. **55.** 30. VII, 1931. 81°10'N. 44°52'E.										
14 25	0	0.32	33.42	26.84	11	8.35			122	0
	5	0.30	.41	.83	0	.35			123	61
	10	-0.25	.62	27.02	0	.35			105	118
	25	-0.62	34.00	.34	16	.24			75	253
	50	-0.88	.24	.54	40	.15			56	417
	75	-0.68	.39	.66	30	.13			45	543
	88	rock?								
Stat. **56.** 30. VII, 1931. 81°12'N. 44°25'E.										
16 25	0	0.63	33.03	26.50	0	8.15			154	0
	5	0.57	.10	.56	0	.27			149	76
	10	-0.37	.34	.80	8	.26	8.55	104	126	144
	25	-0.66	34.14	27.46	8	.23			64	287
	50	-0.84	.48	.74	46	.13	8.02	97	37	413
	75	-0.87	.62	.86	38	.13			26	492
	100	-0.33	.71	.91	45	.11	7.23	89	21	551
	150	-0.05	[.72]	.91	46	.10			21	651
	177	greyish yellow sand and clay								
Stat. **57.** 30. VII, 1931. 81°14'N. 43°24'E.										
21 10	0	-0.72	32.31	25.99	0	8.34			203	0
	5	-0.79	.31	.99	0	.35			203	102
	10	-0.82	.53	26.16	0	.36	9.25	110	187	199
	25	-1.51	34.34	27.65	0	.24			45	373
	50	1.26	.77	.87	48	.10	7.17	92	25	460
20 40	75	1.80	.82	.88	48	.09			25	523
	100	1.86	.84	.88	48	.10	7.07	93	25	586
22 50	150	1.36	.83	.90	48	.11			23	706
	200	1.39	.85	.91	48	.11	7.03	90	22	818
	250	1.43	.87	.92	48	.11			20	923
20 20	300	1.42	.88	.94	48	.09	6.91	89	19	1020
	350	0.68	.88	.99	48	.07			14	1103
	400	0.06	.87	28.02	54	.04	6.75	84	10	1163
	423	grey clay								
Stat. **58.** 31. VII, 1931. 81°17'N. 42°22'E.										
3 10	0	-0.83	32.26	25.95	23	8.33			207	0
	5	[-0.77]	.26	.95	0	.33			207	104
	10	-0.77	.47	26.12	0	.33			190	203
	25	-1.42	34.33	27.64	16	.24			47	380
2 00	50	-1.24	.52	.78	24	[.12]			33	480
3 10	75	1.62	.80	.86	46	.10			25	553
2 00	100	1.54	.83	.89	46	.15			23	613
	150	1.16	.82	.92	48	.14			21	723
2 50	200	1.28	.86	.93	48	.14			20	826
	250	1.58	.89	.94	54	.13			19	923
	300	1.35	[.89]	.96	58	.10			17	1013
	350	0.02	.89	28.04	61	.06			9	1078
2 00	400	-0.04	.89	.04	62	.01			9	1123
	429	greyish brown clay								
Stat. **59.** 31. VII, 1931. 81°11'N. 41°27'E.										
18 45	0	-1.08	32.10	25.83	0	8.36			218	0
	5	-1.16	.07	.81	0	.36			220	110
	10	-1.16	.11	.84	0	.36			217	219
	25	-1.56	33.94	27.33	11	.27			76	438
	50	-0.88	34.44	.71	45	.17			40	584
	75	1.40	.75	.84	56	.05			28	668
18 25	100	1.96	.83	.86	56	.14			26	736

MET	a	$t°C$	$S‰$	σt	P_2O_5	pH	$O_2\,cc/L$	$O_2\,\%$	$10^5\,\Delta\alpha$	$10^4\,\Delta D$
18 25	150	1.75	34.85	27.89	58	8.14			24	860
	200	1.74	.91	.94	54	.12			19	968
	250	1.92	.93	.94	54	.09			19	1063
18 00	300	1.77	.97	28.00	50	.02			14	1146
	350	1.31	.93	27.99	50	.05			14	1216
	400	0.18	.87	28.01	74	.04			12	1280
	450	-0.08	.88	.03	74	.01			9	1333
	466	brown clay								
Stat. **60.** 1. VIII, 1931. 81°03'N. 40°36'E.										
2 35	0	-1.06	32.00	25.75	0	8.36			226	0
	5	[-1.06]	.00	.75	0	.35			226	113
	10	-1.06	.17	.88	0	.35			213	223
	25	-0.81	33.80	27.19	2	.21			89	449
	50	-0.79	34.42	.69	32	.13			42	613
	75	1.52	[.68]	.78	48	.10			34	708
2 20	100	1.80	.83	.88	48	.10			25	782
	150	2.13	.89	.90	48	.10			23	902
	200	1.78	.89	.93	48	.10			20	1010
	250	1.85	.90	.93	48	.10			20	1110
	300	1.78	.94	.97	48	.10			17	1202
1 25	350	1.29	.91	.98	56	.11			15	1282
	400	0.54	.89	28.01	54	.10			12	1350
	450	0.12	.89	.03	56	.04			10	1404
	500	0.02	.89	.04	54	.04			9	1452
	538	brown clay								
Stat. **61.** 1. VIII, 1931. 80°55'N. 39°43'E.										
8 55	0	-1.26	31.79	25.59	0	8.36			241	0
	5	[-1.26]	.82	.62	0	.36			238	120
	10	-1.25	.91	.69	0	.35			231	237
	25	-0.75	33.82	27.20	43	.30			88	476
	50	-0.83	34.43	.70	43	.14			41	638
	75	0.78	.69	.84	43	.13			28	724
	100	2.04	.85	.87	43	.12			26	791
8 35	150	2.02	.88	.90	38	.12			23	914
	200	1.94	.90	.92	0	.12			21	1024
	250	1.88	.92	.94	37	.12			19	1124
	300	1.89	.94	.96	43	.11			18	1216
	350	1.58	.95	.98	46	.10			16	1301
8 00	400	0.95	.92	28.00	50	.11			14	1376
	450	0.37	.90	.03	54	.12			10	1436
	500	0.08	.90	.05	56	.08			8	1481
	550	-0.03	.89	.04	54	.01			8	1521
	582	brown clay								
Stat. **62.** 1. VIII, 1931. 80°52'N. 38°40'E.										
13 15	0	-1.13	32.00	25.75	0	8.38			226	0
	5	[-1.12]	.07	26.33	0	.38			171	99
	10	-1.12	.73	.34	0	.40			170	184
	25	-1.50	33.70	27.14	0	.31			94	382
	50	-0.94	34.39	.67	42	.18			44	555
	75	0.05	.61	.80	58	.16			31	649
12 45	100	0.06	.65	.84	51	.17			27	721
	150	0.78	.76	.89	40	.14			24	849
	200	1.66	.89	.93	40	.14			20	959
	250	1.82	.92	.94	43	.13			19	1056
	300	1.84	.95	.96	50	.12			18	1149
	330	brown clay								
Stat. **63.** 1. VIII, 1931. 80°44'N. 37°50'E.										
17 35	0	-0.87	32.43	26.10	0	8.44			192	0
	5	-0.96	.43	.10	0	.42			193	96
	10	-0.95	.50	.15	0	.42			188	192
	25	-1.39	34.13	27.48	8	.24			62	379
	50	-0.90	.36	.64	32	.15			46	514

Table I (continued).

MET	a	$t^\circ C$	S‰	σt	P_2O_5	pH	$O_2\,cc/L$	O_2 %	$10^5\,\Delta\alpha$	$10^4\,\Delta D$
17 20	75	-0.18	34.49	27.72	40	8.13			39	620
	100	0.69	.63	.78	50	.12			33	710
	150	2.31	.83	.83	51	.10			29	865
	200	2.52	.89	.86	50	.09			27	1005
	234	brown clay								
Stat. **64.** 1. VIII, 1931. 80° 37′ N. 37° 00′ E.										
21 30	0	-1.10	32.10	25.83	0	8.34			218	0
	5	-1.13	.20	.91	0	.43			210	107
	10	-0.07	33.08	26.58	0	.44			147	196
	25	-0.39	.93	27.28	0	.27			80	366
	50	-1.01	34.30	.60	26	.14			50	529
	75	-0.62	.43	.69	32	.13			42	644
21 00	100	0.27	.54	.74	48	.13			37	743
	150	1.93	.82	.86	54	.11			27	903
	200	2.61	.91	.88	54	.09			25	1033
	250	2.65	.92	.87	61	.08			26	1160
	277	brown clay								
Stat. **65.** 2. VIII, 1931. 80° 29′ N. 36° 14′ E.										
1 45	0	-0.95	32.14	25.86	0	8.40			215	0
	5	-0.98	.14	.86		.44			215	108
	10	-1.20	.26	.96	0	.46			206	213
	25	-0.68	33.89	27.26	0	.29			83	430
	50	-1.57	34.30	.62	38	.14			48	593
	75	-0.50	.43	.68	48	.12			48	706
1 20	100	0.66	.58	.74	51	.11			37	804
	150	2.24	.85	.85	54	.10			28	967
	200	2.74	.92	.86		.10			27	1104
	250	2.75	.95	.89	54	.08			24	1232
	280	greyish brown clay								
Stat. **66.** 2. VIII, 1931. 80° 21′ N. 35° 39′ E.										
7 00	0	-1.27	31.94	25.71	5	8.43			229	0
	5	-1.38	.94	.71	0	.46			229	114
	10	-0.86	32.88	26.45	6	.43			159	212
	25	-1.18	34.02	27.38	8	.19			71	384
	50	-1.04	.31	.61	24	.13			49	534
6 45	75	-0.42	.44	.69	32	.12			42	648
	100	0.27	.59	.78	35	.12			34	743
	150	2.04	.82	.85	40	.10			28	898
	200	2.47	.92	.89	40	.10			24	1028
	225	greyish brown clay								
Stat. **67.** 2. VIII, 1931. 80° 19′ N. 34° 58′ E.										
10 55	0	-1.26	32.14	25.87	13	8.43			214	0
	5	[-1.36]	.15	.88	0	.46			213	107
	10	-1.42	.15	.88	0	.49			213	213
	25	-1.49	33.81	27.22	0	.32			86	438
	50	-1.46	34.30	.62	26	.17			49	606
	75	-0.76	.41	.68	37	.16			43	721
10 35	100	0.36	.57	.76	43	.12			36	820
	150	1.53	.75	.83	45	.10			29	982
	200	2.47	.87	.85	51	.10			27	1122
	250	2.73	.96	.89	51	.08			24	1250
	264	grey and brown clay								
Stat. **68.** 2. VIII, 1931. 80° 16′ N. 34° 10° E.										
13 45	0	-0.62	33.17	26.68	0	8.23			138	0
	5	-0.72	.19	.70	0	.25			136	68
	10	-0.84	.41	.88	0	.31			118	132
	25	-1.10	.83	27.23	0	.25			85	284
	50	-0.90	34.26	.56	19	.14			54	458
	75	-0.44	.39	.65	40	.11			45	582
	100	-0.07	.52	.74	40	.11			37	684
	150	1.02	.66	.79	40	.10			33	859
	199	grey clay								

MET	a	$t^\circ C$	S‰	σt	P_2O_5	pH	$O_2\,cc/L$	O_2 %	$10^5\,\Delta\alpha$	$10^4\,\Delta D$
Stat. **69.** 2. VIII, 1931. 80° 16′ N. 32° 50′ E.										
19 50	0	-0.05	33.43	26.86	0	8.33			120	0
	5	-0.12	.42	.86	0	.33			120	60
	10	-0.12	.42	.86	0	.28			120	120
	25	-0.64	.59	27.02	8	.26			105	289
	50	-0.70	.84	.22	19	.22			86	528
	75	-0.45	34.11	.42	30	.12			67	719
	97	grey clay								
Stat. **70.** 2. VIII, 1931. 80° 19′ N. 31° 26′ E.										
23 35	0	-1.26	32.23	25.95	0	8.38			207	0
	5	[-1.33]	.25	.96	0	.33			206	103
	10	-1.34	.30	26.00	3	.36	9.35	110	202	205
	25	-0.99	33.60	27.04	2	.37			103	434
	50	-0.90	34.33	.62	75	.18	7.65	93	48	623
	75	-0.21	.65	.86	38	.13			26	715
23 20	100	0.27	.76	.92	38	.12	7.73	97	20	773
	150	0.64	.82	.94	54	.11			19	870
	200	0.74	.83	.95	53	.11	7.65	97	18	963
	230	0.77	.86	.96	48	.10			17	1015
	242	grey clay								
Stat. **71.** 3. VIII, 1931. 80° 23′ N. 29° 47′ E.										
13 25	0	-1.37	32.68	26.31	0	8.37			172	0
	5	-1.51	.68	.31	0	.41			172	86
	10	-1.54	.70	.32	0	.39	10.26	121	171	172
	25	-1.42	33.86	27.26	6	.29			82	362
	50	0.68	34.64	.80	38	.15	7.61	96	31	503
	75	1.31	.82	.91	45	.14			22	569
	100	1.08	.86	.94	40	.12	7.32	94	19	620
	130	1.01	.87	.96	42	.12			17	674
	149	greyish brown clay								
Stat. **72.** 3. VIII, 1931. 80° 27′ N. 28° 14′ E.										
18 40	0	-1.33	33.00	26.56	8	8.37			149	0
	5	[-1.46]	.02	.58	0	.34			147	74
	10	-1.50	.03	.59	0	.39	10.65	125	146	147
	25	-1.31	.72	27.14	10	.27			94	327
	50	-0.82	34.45	.72	24	.16	8.10	98	39	494
	75	0.12	.71	.89	24	.12			23	571
18 25	100	0.04	.72	.90	24	.12	7.73	96	21	626
	150	0.06	.73	.91	40	.12			21	731
	200	0.26	.76	.92	51	.12	7.77	97	20	834
	230	0.78	.82	.94	51	.11			19	892
	251	greyish brown clay with sand								
Stat. **73.** 4. VIII, 1931. 80° 29′ N. 26° 58′ E.										
2 05	0	-1.36	32.44	26.11	16	8.30			191	0
	5	-1.34	.43	.11	16	.36			191	96
	10	-1.32	.81	.41	14	.37	9.75	115	163	184
	25	-1.50	34.28	27.60	32	.18			50	344
	50	-1.27	.61	.86	42	.16	8.03	96	26	439
	75	-0.74	.69	.92	40	.16			20	496
	86	fine grey sand								
Stat. **74.** 4. VIII, 1931. 80° 32′ N. 26° 40′ E.										
18 50	0	-1.07	32.09	25.82	10	8.36			219	0
	5	-1.28	.55	26.20	10	.36			183	100
	10	-1.06	33.22	.73	10	.35	10.31	123	133	180
	25	-0.15	34.42	27.66	26	.25			45	313
	50	0.67	.65	.80	42	.12	8.20	103	31	408
	60	grey sand and gravel								
Stat. **75.** 5. VIII, 1931. 80° 37′ N. 25° 51′ E.										
5 35	0	-0.83	29.08	23.38	10	8.36			451	0
	5	-1.26	32.17	25.90	10	.38			211	166
	10	-1.14	33.01	26.56	10	.39			149	256

Table I (continued).

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
5 35	25	-0.12	34.02	27.34	16	8.31			75	424
	50	0.13	.72	.90	45	.19			22	545
	75	0.32	.76	.92	45	.17			20	597
	100	0.42	.77	.92	45	.15			20	647
	113	grey clay with sand								
Stat. **76.** 5. VIII, 1931. 80° 43′ N. 24° 27′ E.										
16 15	0	0.02	16.50	13.25	85	8.20			1428	0
	5	-1.15	31.86	25.64	6	.36			236	416
	10	-0.71	32.55	26.17	10	.36			186	522
	25	0.38	34.12	27.39	18	.29			70	714
	50	1.23	.71	.82	40	.16			30	838
	75	0.64	.76	.90	48	.15			22	904
	100	0.48	.74	.90	48	.14			22	958
	107	grey clay								
Stat. **77.** 6. VIII, 1931. 80° 45′ N. 23° 55′ E.										
9 15	0	0.47	8.66	6.94	32	8.48			2047	0
	5	-1.32	31.76	25.57	0	.38			243	572
	10	-1.15	32.80	26.40	0	.40			164	674
	25	0.27	34.07	27.36	10	.34			73	852
	50	1.00	.66	.80	32	.17			32	983
	75	0.62	.79	.92	35	.13			20	1048
	100	0.10	.76	.93	37	.13			19	1097
	114	grey clay								
Stat. **78.** 7. VIII, 1931. 80° 46′ N. 23° 33′ E.										
1 20	0	0.77	7.12	5.71	14	8.48			2168	0
	5	-1.27	31.84	25.63	0	.39			237	601
	10	-1.20	32.69	26.30	0	.39			173	704
	25	-0.26	33.83	27.20	0	.34			88	900
	50	-0.54	34.56	.80	35	.18			31	1048
	75	-0.34	.62	.84	45	.16			27	1121
	100	0.57	.77	.91	48	.14			21	1181
	150	-0.16	.77	.95	51	.15			17	1276
	160	grey clay and sand								
Stat. **79.** 7. VIII, 1931. 80° 38′ N. 23° 12′ E.										
12 10	0	0.55	20.44	16.41	0	8.38			1121	0
	5	[-0.19]	31.42	25.25	2	.35			273	348
	10	-0.19	33.03	26.54	0	.35	9.05	110	150	454
	25	1.05	34.28	27.48	16	.26			62	613
	50	0.69	.64	.80	42	.16	7.66	97	31	730
	75	0.65	.69	.84	40	.15			27	802
11 55	100	0.86	.73	.86	38	.15	7.56	96	26	868
	150	0.94	.77	.89	50	.15			24	993
	200	0.58	.76	.90	64	.15	7.58	95	23	1111
	250	-0.34	.75	.94	48	.15			18	1213
	264	grey clay								
Stat. **80.** 7. VIII, 1931. 80° 34′ N. 22° 48′ E.										
14 25	0	1.36	27.59	22.11	18	8.36			572	0
	5	0.63	31.66	25.41	2	.38			258	208
	10	1.06	33.66	26.98	0	.31			109	299
	25	0.60	34.24	27.48	8	.26			62	428
	50	0.32	.41	.63	26	.24			47	564
	75	0.32	.46	.67	34	.21			44	677
	100	0.06	.49	.71	32	.19			40	782
	117	grey clay								
Stat. **81.** 7. VIII, 1931. 80° 34′ N. 21° 59′ E.										
16 40	0	2.38	30.97	24.74	3	8.30			322	0
	5	2.40	.97	.74	0	.32			322	161
	10	1.60	33.13	26.52	0	.31			153	280
	25	1.17	34.04	27.28	18	.27			81	455
	50	0.90	.39	.58	19	.23			52	622
	53	gravel and greyish brown mud								

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
Stat. **82.** 7. VIII, 1931. 80° 33′ N. 21° 10′ E.										
18 40	0	2.25	31.49	25.17	3	8.30			281	0
	5	2.40	.65	.29	2	.32			269	138
	10	4.16	33.59	26.68	8	.30			137	239
	25	2.80	34.26	27.34	18	.25			75	398
	28	rock								
Stat. **83.** 7. VIII, 1931. 80° 32′ N. 21° 05′ E.										
19 20	0	3.39	32.29	25.70	2	8.29			230	0
	5	3.44	.24	.66	6	.32			234	116
	10	3.61	34.02	27.07	6	.30	8.73	118	100	200
	25	3.22	.20	.25	19	.27			84	338
	50	1.94	.33	.46	22	.23	8.30	108	64	522
	75	0.90	.38	.57	22	.21			53	669
	100	greyish black clay								
Stat. **84.** 7. VIII, 1931. 80° 34′ N. 20° 06′ E.										
20 55	0	4.03	33.61	26.70	6	8.26			135	0
	5	4.02	.61	.70	8	.27			135	68
	10	4.07	.73	.80	8	.29			126	133
	25	3.16	34.23	27.28	16	.25			81	288
	50	2.54	.29	.38	16	.23			72	479
	75	1.84	.40	.52	19	.21			59	643
	88	black and grey clay								
Stat. **85.** 7. VIII, 1931. 80° 25′ N. 19° 03′ E.										
22 35	0	4.46	32.99	26.16	13	8.32			187	0
	5	4.49	.98	.15	5	.32			187	94
	10	3.69	34.13	27.14	8	.27			94	164
	25	3.29	.25	.28	16	.24			81	295
	50	2.94	.33	.38	19	.22			72	486
	61	greyish black clay with gravel								
Stat. **86.** 12. VIII, 1931. 79° 49′ N. 18° 05′ E. Hinlopen Strait.										
17 55	0	3.18	32.60	25.97					205	0
	5	3.14	.63	26.01					201	102
	10	1.95	33.54	.84					123	182
18 05	25	1.49	34.23	27.41					68	326
	50	1.96	.39	.50					60	486
17 40	75	3.14	.61	.58					53	627
	100	3.10	.75	.69					43	747
	150	2.86	.78	.74					38	950
	200	2.86	.83	.78					34	1130
17 10	250	2.93	.90	.84					29	1287
	300	2.38	.87	.86					28	1430
	350	1.12	.83	.92					21	1552
	400	0.78	.76	.89					24	1664
	436	grey clay								
Stat. **87.** 12. VIII, 1931. 79° 43′ N. 18° 25′ E. Hinlopen Strait.										
20 40	0	1.92	31.88	25.51					248	0
	5	2.57	32.57	26.00					202	112
	10	1.11	33.24	.64					141	198
	25	1.32	.86	27.12					95	375
	50	2.82	34.56	.56					54	562
20 25	75	2.71	.71	.70					41	680
	100	2.34	.71	.74					38	779
	150	1.45	.70	.80					32	954
	200	1.55	.75	.83					29	1116
20 05	250	0.98	.77	.89					24	1239
	300	1.07	.76	.87					26	1364
	350	0.96	.77	.89					24	1489
	400	0.34	.74	.90					22	1604
	422	greyish black clay								

Table I (continued).

MET	a	t° C	S‰	σt	P_2O_5	pH	O_2 cc/L	O_2 %	$10^5 \Delta\alpha$	$10^4 \Delta D$
Stat. **88.** 12. VIII, 1931. 79° 40′ N. 18° 08′ E. Lomme Bay.										
22 20	0	3.42	31.66	25.21					277	0
	5	3.34	32.92	26.22					181	114
	10	2.82	33.33	.58					146	196
	25	1.09	34.26	27.46					64	354
	50	1.56	.52	.64					46	491
	75	1.74	.57	.66					45	605
	100	1.96	.62	.69					43	715
	125	2.28	.70	.74					38	816
	132	greyish black clay								
Stat. **89.** 13. VIII, 1931. 79° 34′ N. 17° 56′ E. Lomme Bay.										
0 35	0	3.18	30.57	24.36					358	0
	5	1.98	32.57	26.05					197	139
	10	1.12	33.56	.90					116	217
	25	1.13	34.25	27.45					64	352
	50	2.52	.60	.62					49	493
	75	2.37	.69	.72					40	604
	100	2.45	.71	.72					40	704
	118	greyish black clay								
Stat. **90.** 13. VIII, 1931. 79° 28′ N. 17° 54′ E. Lomme Bay.										
3 30	0	4.90	22.06	17.49					1017	0
	5	3.05	32.26	25.72					228	311
	10	1.66	33.26	26.62					143	404
	25	0.95	34.33	27.52					58	555
	50	0.95	.48	.65					45	684
	75	1.02	.56	.70					41	791
	100	-0.41	.68	.89					23	871
	108	grey clay								
Stat. **91.** 13. VIII, 1931. 79° 23′ N. 17° 43′ E. Lomme Bay.										
14 55	0	6.17	13.31	10.51					1696	0
	7	1.11	33.64	26.96					110	632
	15	0.71	34.07	27.34					75	706
	16	mud								
Stat. **92.** 16. VIII, 1931. 79° 54′ N. 16° 47′ E. Treurenberg Bay.										
21 25	0	5.52	32.30	25.50					249	0
	5	4.80	33.48	26.52					153	100
	10	4.62	.62	.65					140	174
	25	4.62	34.03	.97					110	361
	50	3.33	.45	27.43					67	582
	70	2.71	.55	.56					55	704
	79	grey clay								
Stat. **93.** 17. VIII, 1931. 80° 03′ N. 17° 15′ E. Hinlopen Strait.										
0 50	0	4.63	33.99	26.93					114	0
	5	[4.62]	34.01	.97					110	56
	10	4.62	.02	.98					109	111
	25	4.55	.09	27.03					104	270
	50	4.30	.32	.23					86	508
	75	3.62	.55	.49					62	693
0 30	100	3.83	.53	.46					64	850
	150	3.24	.69	.63					48	1130
	200	2.74	.77	.75					37	1343
	250	2.77	.84	.80					33	1518
	300	2.80	.88	.83					30	1676
	341	grey and black clay								
Stat. **94.** 17. VIII, 1931. 80° 10′ N. 16° 43′ E.										
4 15	0	3.96	33.57	26.68					137	0
	5	3.90	.56	.68					137	68
	10	4.57	34.01	.96					111	130
	25	5.13	.55	27.32					77	272
	50	3.87	.86	.70					41	419
4 05	75	3.49	.91	.78					34	513
	100	3.58	.95	.80					32	595
	150	3.47	.97	.84					29	748
	200	3.45	.98	.84					29	893
	227	sand and grey clay								
Stat. **95.** 17. VIII, 1931. 80° 18′ N. 16° 10′ E.										
6 50	0	3.33	33.18	26.42					162	0
	5	3.32	.16	.41					163	81
	10	3.49	.29	.49					155	161
	25	5.02	34.62	27.40					70	330
	50	4.66	35.00	.74					38	464
	75	4.55	.05	.78					34	554
	100	4.48	.09	.83					29	633
	150	3.90	.07	.87					26	771
	187	grey sand and mud								
Stat. **96.** 17. VIII, 1931. 80° 26′ N. 15° 38′ E.										
9 40	0	3.59	33.39	26.57					148	0
	5	3.86	.45	.58					147	74
	10	4.44	.95	.92					115	139
	25	4.75	34.22	27.10					98	299
	50	3.79	.70	.59					52	486
	75	3.53	.86	.74					38	599
	100	3.54	.92	.79					33	688
	109	grey clay								
Stat. **97.** 17. VIII, 1931. 80° 39′ N. 14° 10′ E.										
15 00	0	4.15	34.30	27.23					85	0
	5	4.12	.28	.22					86	43
	10	4.31	.39	.29			7.64	105	80	84
	25	4.36	.51	.38					72	198
	50	4.56	.72	.52			7.37	102	59	362
14 50	75	4.21	.93	.73					39	484
	100	3.99	35.02	.82			7.08	97	31	572
	150	3.82	.04	.85					28	720
	200	3.83	.05	.86			6.88	94	27	857
	206	sand and clay?								
Stat. **98.** 17. VIII, 1931. 80° 38′ N. 13° 41′ E.										
18 45	0	3.86	34.29	27.25					83	0
	5	[3.89]	.28	.25					83	42
	10	3.92	.34	.30			7.64	104	79	82
	25	4.01	.39	.32					78	200
	50	4.35	35.01	.78			7.20	99	34	340
	75	4.13	.09	.87					26	415
18 25	100	4.04	.11	.89			6.99	96	24	477
	150	3.69	.10	.92					21	590
	200	3.46	.11	.94			7.03	95	20	692
	250	3.28	.11	.96					18	787
	300	3.21	.12	.98			7.18	97	16	872
17 55	350	3.09	.10	.98					16	952
	400	[2.90]	.08	.98			7.12	93	17	1034
	450	2.54	.08	28.01					14	1112
	500	2.04	.04	.02					13	1180
17 20	550	1.72	.01	.03					12	1242
	600	1.39	.00	.04					11	1300
	650	0.96	34.99	.06					9	1350
	700	0.68	.97	.07			7.06	89	7	1390
	732	grey clay and red sand								

Table I (continued).

Stat. **99.** 17. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
23 20	0	4.23	34.11	27.07					100	0
	5	[4.40]	.08	.03					104	51
	10	4.48	.37	.26			7.68	106	82	98
	25	4.23	.38	.29					80	219
	50	3.76	.60	.51			7.53	102	60	394
	75	3.43	.83	.73			7.70	104	39	518
23 00	100	4.14	35.02	.80			7.33	101	32	606
	150	3.81	.04	.85					28	756
	200	3.78	.03	.85			6.90	94	28	896
	250	3.72	.03	.86			6.87	94	28	1036
	314	grey clay								

Stat. **99 A.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
3 20	0	4.19	34.11	27.07					100	0
	5	4.25	.10	.06					101	50
	10	4.35	.14	.09					99	100
	50	3.74	.83	.70					42	382
	100	4.36	35.08	.83					29	560
	200	3.57	.08	.91					23	820

Stat. **99 B.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
5 45	0	4.28	34.19	27.14					94	0
	10	4.31	.33	.24					84	89
	50	4.70	.89	.64					47	351
	100	4.35	35.10	.85					27	536
	200	3.62	.09	.92					22	781

Stat. **99 C.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
8 55	0	3.63	34.14	27.17					91	0
	10	3.68	.13	.14					94	92
	50	4.80	35.03	.74					38	356
	100	4.35	.09	.84					28	522
	200	3.68	.09	.92					22	772

Stat. **99 D.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
11 55	0	3.57	34.11	27.14					94	0
	10	3.63	.10	.13					95	94
	50	4.82	35.08	.78					34	352
	100	4.26	.09	.85					27	505
	200	3.70	.09	.91					23	755

Stat. **99 E.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
15 00	0	3.57	34.12	27.15					93	0
	10	3.65	.12	.15					93	93
	50	4.65	35.10	.82					30	339
	100	4.13	.09	.87					26	479
	200	3.66	.09	.91					22	719
	274	Bottom								

Stat. **99 F.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
18 05	0	3.96	34.23	27.20					88	0
	10	4.10	.26	.21					87	88
	50	4.60	.94	.69					42	346
18 20	100	3.98	35.04	.83					29	523
	200	3.66	.09	.91					22	778

Stat. **99 G.** 18. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
20 55	0	4.21	33.88	26.89					117	0
	10	4.36	.88	.88					118	118
	50	4.49	34.69	27.50					60	474
	100	4.51	.96	.71					41	726
	200	3.72	35.05	.87					27	1066

Stat. **99 H.** 19. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
0 05	0	4.20	33.88	26.90					117	0
	10	4.36	.89	.88					118	118
	50	4.31	34.51	27.39					71	496
	100	4.68	35.07	.79					33	756
	200	3.73	.02	.85					28	1060

Stat. **99 I.** 19. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
3 00	0	4.40	33.83	26.84					123	0
	10	4.46	.87	.86					120	122
	50	4.35	34.63	27.48					62	486
	100	5.04	35.14	.81					32	720
	200	3.81	.13	.93					21	986

Stat. **99 J.** 19. VIII, 1931. 80° 31′ N. 13° 05′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
6 05	0	4.26	33.88	26.89					117	0
	10	4.30	.89	.89					117	117
	50	4.58	34.89	27.66					45	441
	100	4.39	35.09	.84					28	624
	200	3.68	.06	.88					25	888
	311	grey clay and sand								

Stat. **100.** 19. VIII, 1931. 80° 20′ N. 12° 53′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
9 35	0	4.33	33.95	26.94					113	0
	5	4.33	.98	.96					111	56
	10	4.30	34.04	27.01					106	110
	25	3.90	.40	.34					76	247
	50	3.58	.59	.53					58	414
	75	3.40	.70	.63					48	547
	100	3.74	.94	.79					33	648
	150	3.42	.98	.85					28	800
	183	greyish green sand								

Stat. **101.** 19. VIII, 1931. 80° 10′ N. 12° 38′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
12 35	0	3.10	33.55	26.74					132	0
	5	3.10	.56	.74					132	66
	10	3.16	.58	.76					130	132
	25	3.45	.77	.88					118	318
	50	2.98	34.46	27.47					63	544
	75	3.62	.83	.71					41	674
	100	4.20	35.06	.83					29	762
	150	3.99								
	200	grey clay with sand								

Stat. **102.** 19. VIII, 1931. 80° 00′ N. 12° 29′ E.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
15 10	0	3.85	33.61	26.72					134	0
	5	3.86	.60	.72					134	67
	10	3.91	.60	.71					135	134
	25	3.71	.63	.75					131	334
	50	3.78	.71	.80					126	655
	71	rock or sand?								

Stat. **103.** 19. VIII, 1931. 79° 46′ N. 12° 02′ E.
Red Bay.

MET	a	$t° C$	$S‰$	σt	P_2O_5	pH	$O_2\ cc/L$	$O_2\ \%$	$10^5\ \Delta\alpha$	$10^4\ \Delta D$
17 45	0	4.33	33.18	26.33					171	0
	5	4.57	.28	.38					166	84
	10	4.44	.33	26.43					161	166
	25	4.17	.56	.65					141	392
	50	3.64	.71	.82					125	725
	75	3.48	34.02	27.08					101	1008
	100	2.90	.22	27.30					80	1234
	116	grey clay								

Table II. Current Measurements.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
			Stat. **A. 5 m.** Instr. 137.		
	h m				
5/7 1931	20 37	14.9	9.9.10.10.10	0.0	14.9
	53	13.1	10.11.11.11	- 2.7	12.8
	21 19	6.4			
	57	6.0			
	22 34	10.1	22.22.22.23.23.27.29	- 5.4	- 7.4
	52	11.1	25.25.26.26.27.27	- 4.8	- 9.9
	23 13	7.6	21.27.27.28	- 2.1	- 6.4
	26	26.8	36.1.1.1.1.1.2.2.2.2.2	26.3	3.7
	38	23.0			
	50	24.5	31.32.32.32.32	16.3	-18.1
6/7	0 00	20.3	34.35.35.36.36.36	19.6	- 4.5
	13	23.8	30.30.31.31.31.31.31	12.2	-20.3
	22	22.1	35.36.36.36.36.36.36	21.9	- 2.7
	31	18.1	34.35.35.35.35	17.1	- 5.6
	39	20.7	35.35.35.36.36.36.1	20.4	- 3.2
	48	23.5	32.32.33.33.33.33.33	18.2	-14.7
	1 00	7.6	1.25	2.1	- 3.2
	12	15.3	29.30.30.30	5.7	-14.2
	21	12.4	24.24.26	- 5.9	-10.7
	29	15.6	32.33.33.33.33	12.3	- 9.6
	39	19.0	29.30.30.30.30.30	7.1	-17.6
	47	14.1	27.30.30.31	4.4	-12.9
	56	7.5	2.3.4	6.9	3.1
	2 06	5.0	14	- 3.5	3.6
	19	5.8	24.28	- 1.5	- 5.3
	34	7.3	8.8.9.9.15	- 0.2	6.6
	52	7.8	13.14.20.22.22	- 6.1	0.4
	3 11	8.5	18.18.18.18.19.21	- 8.3	- 0.1
	28	13.2	19.20.20.20.20.21.21.21	-12.6	- 3.6
	43	12.9	14.15.16.18.18.18.19.20	-11.8	3.0
	57	11.7	15.15.16	- 9.8	6.4
	4 08	14.3	14.15.16.16.17.19	-12.6	5.6
	19	19.8	17.17.17.17.18.18.18	-19.3	4.1
	29	14.9	17.16.16.22	-13.4	1.9
	38	15.1	18.19.19.19.20	-15.0	- 1.0
	47	15.0	17.18.18.19	-14.8	1.6
	55	13.4	12.13.14.15	- 8.2	10.2
	5 07	17.8	15.15.15.15.15.16.16	-14.8	9.6
	22	24.2	13.13.14.14.15.16.17	-18.0	15.1
	38	22.1	15.15.15.16.16.16	-18.9	11.3
	53	25.1	16.16.16.16.16.16.17	-22.7	10.6
	6 02	24.5	16.16.16.17.18.18	-23.0	7.5
	42	21.0	17.17.17.18.18	-20.4	4.4
	53	20.4	14.14.15.15.16.16	-16.3	11.9
	7 03	22.4	13.13.13.13.14.14	-13.4	17.8
	13	21.8	11.13.13.14.14	-12.0	17.7
	23	23.1	12.13.14.14.15.15.15	-15.8	16.3
	32	26.5	14.14.14.14.14	-18.4	19.1
	40	22.9	14.15.15.16.16.16	-19.0	12.4
	51	26.1	14.14.14.15.15.15	-19.6	17.1
	57	25.3	14.15.15.15.16.16	-20.8	14.0
	8 07	25.9	14.15.15.16.16.16.16	-21.8	13.6
	19	26.1	12.13.13.13.14	-14.5	21.5
	28	20.8	12.12.14.14.15	-12.5	16.0
	35	24.7	14.15.16.16.16	-20.8	13.0
	43	28.9	12.13.13.13.13.13.13	-15.7	24.2
	51	25.6	13.13.14.14.14	-16.4	19.5
	58	27.5	13.13.13.13.14.14	-16.5	21.9
	9 08	10.7	13.14.14.15.15.15	- 7.8	7.2
	12	23.2	14.15.15.15.16	-18.7	13.6
	19	21.7	13.13.13.14.14	-13.3	17.0
	27	19.0	17.17.17.19	-18.5	3.5
	34	19.9	13.13.13.14.14	-12.2	15.6

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
6/7 1931	9 41	20.8	12.14.14.15.15.16.16.16.16	-14.9	13.8
	50	22.3	16.16.16.16.17.17.17	-20.6	8.3
	59	18.7	17.17.18	-18.1	4.2
	10 07	17.0	14.14.14.14	-11.8	12.2
	15	15.6	12.14.14	- 9.3	12.3
	25	13.0	11.12.12.12	- 4.9	12.1
	44	10.6	11.12.12.13.13	- 4.6	9.4
	55	14.6	11.12.12.13.14.16.17	- 8.8	10.5
	11 07	12.8	13.13.14	- 7.7	10.2
	15	10.2	15.17.17.18	- 9.5	3.1
	23	9.1	15.16.17	- 8.1	3.9
	31	15.1	16.19.20.20.20.21	-14.4	- 1.8
	40	7.0	18.18	- 7.0	0.7
	50	5.7	13.14	- 3.6	4.4
	12 01	9.3	21.22.23.23.24.24.25	- 6.4	- 6.4
	19	5.4	25.25	- 2.4	- 4.9
	32	9.9	29.29.30.30.30.30.31	3.8	- 9.0
	46	11.2	29.31.31.31.31.31.32	6.1	- 9.3
	57	11.8	32.32.32.33	8.5	- 8.2
	13 07	13.7	33.33.33.34.34	11.6	- 7.3
	15	12.4	34.34.34.34	11.2	- 5.4
	23	13.7	34.34.35.35.35	12.9	- 4.7
	33	10.4	30.32.33.33	7.1	- 7.3
	43	10.7	30.31.34	6.7	- 7.7
	52	11.4	35.36.1	11.2	- 1.2
	14 00	11.1	31.33.34	8.4	- 6.8
	11	15.0	32.32.32.33.33 33	11.3	- 9.8
	22	13.6	32.32.32.33	9.8	- 9.5
	33	15.9	34.35.35.35.35.35	15.1	- 4.9
	43	12.3	30.31.31	6.3	-10.5
	53	13.6	33.33.33 34.34	11.5	- 7.2
	15 03	12.5	27.33.33.33	7.1	- 8.7
	25	12.0	31.32.34.34	9.2	- 7.2
	35	11.8	31.32.32.32.33	8.1	- 8.4
	48	10.6	33.33.34	8.9	- 5.8
	58	8.8	35.35.35	8.5	- 2.4
	16 15	11.7	2.2.3	11.2	3.4
	25	15.8	1.1.1.2.2	15.6	1.6
	35	9.6	36.1	9.6	- 0.2
	44	13.7	36.36.1.1.1	13.7	0.0
	54	21.4	4.4.5	17.0	12.8
	17 04	6.0	23.32	- 0.1	- 4.2
	17	14.3	19.19.20.20.20.21	-13.9	- 3.0
	35	4.9	22.22	- 4.1	- 2.7
	52	9.3	15.16.16.17.17.17	- 8.5	3.6
	18 08	7.4	17	- 7.1	2.0
	22	6.6	14.15.15.17	- 5.4	3.6
	39	9.6	13.13.13.13.14.14	- 5.8	7.7
	55	11.7	15.15.15.15.15	- 9.5	6.9
	19 09	13.6	15.15.15.15	-11.0	8.0
	18	17.9	15.15.15.15.15.16	-14.8	10.0
	27	18.4	16.16.16.16.17	-16.7	7.4
	37	12.0	19.19.20	-11.9	- 1.5
	45	11.2	18.18.18.18	-11.1	1.2
	54	13.8	17.17.17.17	-13.3	3.8
	20 02	13.1	16.17.17.18	-12.5	3.6
	10	13.5	15.16.16	-11.8	6.5
	17	11.2	16.16.16	-10.1	4.9
	24	10.3	13.14.15.15	- 7.3	7.1
	32	10.0	16.16.16	- 9.6	2.8
	40	12.8	16.16.17.17.17	-11.9	4.8
	50	15.8	17.17.17.17	-15.2	4.4
	58	15.0	17.17.17.17	-14.4	4.1
	21 05	12.0	17.17.17.17	-11.5	3.3

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
6/7 1931	21 12	11.5	20.20.31	-4.5	-5.6
	20	10.6	15.15.16	-8.9	5.8
	29	12.5	16.16.16.16	-11.2	5.5
			Stat. **A. 10 m.** Instr. 60.		
5/7	20 34	13.0	8.9.9.9.10	1.4	12.8
	22 01	8.0	11.14	-3.7	6.7
	53	11.7	28.28.28.29	-3.6	-11.1
	23 54	31.8	33.34.35.35.35.35.35.35.36.36	30.4	-9.3
6/7	0 35	29.6	33.33.33.34.34	25.0	-15.6
	1 21	14.4	35.35	13.8	-4.0
	40	22.8	31.31.31.32.32.32.32.33	15.1	-16.8
	2 22	3.5	24	-2.1	-2.8
	36	6.5	4.5	5.1	4.1
	3 27	11.3	19.20.21	-10.8	-3.1
	42	10.9	14.19.19.19	-10.0	1.4
	51	12.6	18.18.19.19	-12.5	0.2
	4 00	14.5	15.17.17.18	-13.5	4.4
	08	14.7	14.15.16.17.18	-12.9	6.3
	17	19.2	18.18.19.19.20.20	-19.0	-1.3
	26	14.5	16.16.17.18	-13.6	4.4
	34	13.5	21.21.21	-12.3	-5.5
	40	14.8	19.20.21.21	-14.0	-4.0
	48	12.0	18.18.18	-11.9	1.3
	55	13.0	12.13.14.16	-8.4	9.4
	5 09	18.8	15.15.15.15.15.16.16.16.16	-15.9	9.9
	29	23.1	14.14.14.14.14.14.15.15.15.15	-17.1	15.4
	47	24.3	15 15.16.16.16.17	-21.3	11.3
	55	26.4	15.15.15.16.16.16.17.17.17	-23.5	11.4
	6 38	18.4	17.18.18.18.19	-18.2	1.9
	48	36.7	16.18.18.18.18	-35.9	6.3
	56	18.9	16.17.17.18.18	-18.1	4.5
	7 04	16.4	13.13.14.15	-10.8	12.0
	12	18.6	12.13.14.14.15	-11.8	14.0
	21	20.7	13.13.13.13.14	-12.1	16.7
	40	14.6	16.17	-13.5	5.2
	49	20.8	15.15.15.15.15.15.16	-17.0	11.9
	8 00	18.8	13 14.14.15	-13.0	13.5
	10	22.8	13.14.14.15	-15.7	16.3
	18	20.7	12.13.13.13.14.15	-12.9	16.3
	25	20.4	15.16.16.17.17	-18.5	8.2
	35	23.1	12.14.16.17.17.18	-18.9	10.5
	9 19	19.8	12.13.13.13.15	-11.5	15.8
	42	19.3	12.12.13.14.15	-11.1	15.3
	50	15.7	15.15.16.16	-13.4	8.0
	10 23	9.0	11.12.15	-4.4	7.4
	36	9.3	17.18	-9.1	1.8
	49	11.5	9.11.14.14.16.16.16	-6.8	7.9
	11 13	6.8	14.15.19	-5.7	2.8
	25	5.3	13.14.19	-4.0	2.6
	39	6.5	20.21.21	-6.1	-2.3
	12 46	11.0	29.29.29.30	3.0	-10.6
	13 00	11.6	30.30.31.31.31.33	6.4	-9.5
	13	13.6	33.33.33.33.34.34	11.4	-7.4
	28	11.5	33	9.3	-6.8
	41	8.1	26.27.27.29	-0.6	-8.1
	53	10.8	35.35.36.36.36	10.6	-1.9
	14 12	14.5	30.30.31.31.32.32	8.1	-11.9
	15 44	11.8	33.33.33.34	9.9	-6.4
	16 03	11.5	33.33.34.35	10.1	-5.4
	18	14.8	35.35.36.36.1	14.6	-2.1
	33	12.6	1.2.2.3	12.1	3.0
	48	17.8	36.36.1.1.1	17.7	0.0
	17 01	11.8	32.32.34.35	9.6	-6.3
	12	16.3	22.23.23.23.24	9.1	-13.4

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
6/7 1931	17 35	12.3	12.12.12.13.13.13.13	-6.2	10.7
	53	10.1	13.14.14	-6.6	7.6
	19 08	13.7	14.14.14.14	-9.5	9.9
	26	17.7	14.15.15.15.15.15	-14.0	10.9
	45	19.6	18.18.18.19.19.21	-19.3	-0.7
	56	17.9	17.17.17.17.17.18	-17.4	4.3
	20 09	22.4	16.16.16.16.16.17	-20.3	9.5
	20	12.3	16.16.16.16	-11.1	5.4
	34	10.1	16.16.17	-9.3	4.0
	52	16.1	17.17.17.17.17.17	-15.5	4.4
			Stat. **A. 50 m.** Instr. 2.		
6/7	0 30	32.9	34.34.34.34.36.36.34.34	30.3	-11.7
	1 00	16.4	34.36.32.32.30	12.1	-9.5
	50	12.9	30.32.30.28	5.1	-11.4
	2 00	8.2	28.18	-3.8	-3.7
	50	6.5	18	-6.5	0.7
	3 00	4.0	18	-4.0	0.4
	50	6.7	18	-6.7	0.7
	4 00	11.5	18.18.18	-11.4	1.2
	50	14.5	18.18.18	-14.4	1.5
	5 00	19.4	18.18.18.18.18	-19.3	2.0
	30	20.5	18.18.18.18.18	-20.4	2.1
	6 00	7.7	18.32.32.18.18	-5.0	-5.9
	30	19.8	20.20.20	-19.2	-4.8
	7 00	23.8	18.20.18.18.22.22.22	-23.4	-4.5
	30	22.2	18.20.18.18.18.18	-22.2	1.2
	8 00	19.8	18.18.18.18.18	-19.7	2.1
	30	16.4	18.20.18.18	-16.4	0.3
	9 00	14.7	20.20.16.18	-14.7	0.3
	30	11.1	16.16.20	-10.8	2.5
	10 00	7.0	20.16	-7.0	0.7
	30	7.6	20.20	-7.4	-1.8
	11 00	4.8	16	-4.3	2.1
	30	7.3	16.18	-7.0	2.0
	12 00	8.5	18.16.18	-8.1	2.3
	30	12.1	18.18.18.18	-12.0	1.3
	13 00	14.2	18.20.20.18	-14.0	-0.9
	30	9.5	18.18.16	-9.2	2.1
	14 00	11.2	18.30	-4.0	-3.9
	30	10.6	36.30.10	4.7	0.6
	15 00	4.6	36	4.6	-0.5
	30	5.9	36.28	3.1	-3.2
	16 00	15.3	28.30.30.32	6.0	-13.5
	30	17.5	32.36.32.32.32	13.2	-10.3
	17 00	14.9	32.34.30.24	4.8	-10.9
	30	8.5	28.32	3.3	-7.3
	18 00	4.8	32.26	1.0	-4.1
	30	5.9	26.36	2.1	-3.2
	19 00	7.0	36.36	7.0	-0.7
	30	10.8	34.20	-0.4	-3.7
	20 00	10.8	18.18.18	-10.7	1.1
	30	7.4	18.18	-7.4	0.8
	21 00	13.4	18.18.18	-13.4	1.4
	30	15.3	18.18.18.18	-15.2	1.6
			Stat. **A. 50 m.** Instr. 60.		
5/7	19 38	5.6	8.13.15.15.16.16.21.22.22	-3.9	1.6
	22 15	10.5	28.29.31.32.32.35.1	6.4	-6.6
	23 09	12.7	36.1.1.1	12.7	0.4
6/7	1 30	17.4	33.34.35.35.35	16.0	-6.4
	7 30	23.4	16.16.16.16.17.19	-22.0	7.1
	20 43	4.9	22.24	-3.5	-3.3

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
			Stat. A. 100 m. Instr. 60.		
	h m				
5/7	20 10	1.4			
1931	22 36	6.3	31.32.33	4.3	- 4.5
	23 30	33.4	3.3.3.3.3.3.3.3.3.3.3.3	30.5	13.6
6/7	9 29	11.8	11.15.17.18	- 8.8	5.7
			Stat. A. 200 m. Instr. 60.		
6/7	0 17	28.3	33.33.33.33.35.35.36.36.36	25.5	-10.3
	10 07	10.1	13.13.13	- 5.7	8.4
			Stat. A. 300 m. Instr. 60.		
6/7	0 56	28.6	36.36.36.1.1.1.1.1.1.1	28.5	0.5
			Stat. A. 400 m. Instr. 60.		
5/7	21 07	2.6			
6/7	1 57	9.7	34.34	8.7	- 4.3
			Stat. B. 5 m. Instr. 136.		
8/7	21 53	7.9	15.16	- 7.2	3.2
	22 03	19.5	15.15.15.15.16.16.16	-17.6	8.2
	15	13.9	13.14.14.15.15	-11.0	8.3
	27	10.1	11.12.13.13	- 5.4	8.4
	44	7.4	12.13	- 4.4	6.0
	23 11	13.1	12.13.14.14.14.14.16	- 9.6	8.6
	39	10.2	13.14.14.15	- 7.9	6.4
9/7	0 08	12.2	14.14.14.14.14.14	- 9.5	7.7
	34	14.2	12.12.12.12.12	- 7.3	12.2
	58	13.9	10.10.11.11.11	- 4.1	13.3
	1 37	4.3	14	- 3.3	2.7
			Stat. B. 10 m. Instr. 136.		
8/7	22 56	19.2	16.16.16.16.16.16.16.16.16.17	-18.3	5.9
	23 25	15.7	16.16.16.16.17.17.17	-15.1	4.0
	54	15.7	15.15.15.15.16.16	-14.1	6.9
9/7	0 18	18.4	14.14.14.14.14.14.15	-14.5	11.3
	47	18.8	14.14.14.14.15.15.15	-15.3	10.7
	1 14	18.6	14.15.15.15.15.15.15	-16.1	9.3
			Stat. B. 50 m. Instr. 2.		
8/7	22 30	29.9	16.18.16.18.18.18.18.18	-29.4	2.1
	23 00	31.3	18.18.16.18.18.18.18.16	-31.0	1.6
	30	33.9	16.16.16.16.16.16.16.16	-32.1	11.0
9/7	0 00	12.5	16.16.18	-12.0	2.6
	30	28.0	18.16.16.16.16.16.16	-26.7	7.7
	1 00	27.2	16.16.18.18.18.18	-26.7	2.8
	30	28.0	18.18.18.18.18.18.18	-28.0	- 0.5
	2 00	35.8	18.18.18.18.18.18.18.18.18.18	-35.8	- 0.6
			Stat. B. 95 m. Instr. 60.		
9/7	2 24	43.8	15.15.15.15.15.15.15.15 15. 15.15	-38.3	21.2
			Stat. B. 125 m. Instr. 60.		
8/7	23 54	29.6	14.14.14.14.14.15. 5.15.15. 15.15.15	-24.8	16.1
			Stat. B. 130 m. Instr. 60.		
9/7	0 58	20.0	15.15.15.15.15.16	-17.8	9.1
			Stat. C. 5 m. Instr. 136.		
12/7	11 03	2.5	19	- 2.5	- 0.5
	16	7.1	19.19.20.20	- 6.8	- 2.0
	31	10.0	19.19.19.19.19.20.20	- 9.7	- 2.4
	44	10.5	18.19.20.21	- 9.9	- 2.8
	56	12.3	17.18.19.21.24	-10.6	- 3.7
	h m				
12/7	12 08	11.4	18.19.19.21	-10.9	- 2.5
1931	18	12.2	18.18.19.19.20	-12.0	- 1.9
	28	12.5	18.18.18.19.19	-12.5	- 1.1
	38	13.6	18.18.19.19.20	-13.3	- 2.1
	49	15.5	18.18.18 18.18	-15.5	- 0.3
	59	15.8	18.18.18.18.18.18	-15.8	- 0.3
	13 08	16.9	18.18.18.18.18.18.19	-16.9	- 0.6
	18	16.9	17.17.17.18.18.18.18	-16.8	0.9
	28	16.7	18.18.18.18.18.18	-16.7	- 0.3
	36	19.5	18.18.18.18.18.18.18	-19.5	- 0.3
	43	19.3	18.18.18.18.18.18.18.18	-19.3	- 0.3
	51	16.0	18.18.18.18.18.18	-16.0	- 0.3
	58	5.3	18.18	- 5.3	- 0.1
	14 18	15.5	17.17.17.17.18.18	-15.4	1.6
	28	19.4	17.17.17.18.18.18.18.18	-19.3	1.0
	38	18.6	18.18.18.18.18.18.18	-18.6	- 0.3
	48	16.4	18.18.18.18.18.19	-16.4	- 0.9
	56	16.4	17.17.18.18.18.18	-16.4	0.6
	15 05	16.0	18.18.18.18.18.18	-16.0	- 0.3
	13	17.7	17.17.18.18.18.18.18	-17.6	0.6
	22	14.9	18.19.19.19.19	-14.7	- 2.3
	31	14.9	18.18.18.18.18	-14.9	- 0.3
	39	10.1	17.18.18	-10.1	0.4
	47	7.7	20.22.24	- 5.5	- 4.8
	53	9.5	18.19.19	- 9.4	- 1.3
	16 04	8.0	20.21.24	- 6.1	- 4.7
	13	6.7	20.24	- 4.8	- 4.1
	23	7.7	21.25.29.30.30.30	0.7	- 6.4
	40	12.3	31.31.31.31.31.31.31.32	8.2	- 9.1
	55	17.8	34.35.36.36.36.36.36.36.36.1	17.6	- 0.3
	17 07	18.4	36.36.36.36.36.1	18.4	1.0
	16	20.1	34.34.34.34.35.35.35	19.3	- 5.2
	24	20.1	34.34.34.34.34.35.35.35	19.3	- 5.2
	34	24.9	34.34.34.34.34.34.34.35.35.35	23.8	- 6.8
	42	20.4	34.34.34.34.34.34.35	19.4	- 6.3
	53	21.5	34.34.34.34.34 34.35.35	20.5	- 6.3
	18 01	21.7	34.34.34.35.35.35.35.35	21.1	- 4.9
	10	24.9	34.34.34.34.34.34.34.34.35.35	23.7	- 7.3
	19	29.0	34.34.34.34.35.35.35.35.35.35	28.2	- 6.5
	28	27.7	35.35.35.35.35.35.35.35.35.36	27.4	- 3.9
	37	31.6	34.34.35.35.35.35.35.35.35.36	31.0	- 5.5
	58	37.8	33.33.33.34.34.34.34.34.34.35	35.1	-13.5
	19 08	33.8	33.33.34.34.34.34.34.34.34.34	31.4	-12.1
	16	32.3	33.33.33.33.33.33.33.33.34. 34.34	29.0	-14.1
	27	38.6	32.32.32.32.32.32.32.32.33. 33.33	31.2	-22.6
	38	34.6	32.32.33.33.33.33.33.33.33. 33.33	29.6	-17.8
	49	19.7	32.33.33.33.33.34	17.1	- 9.5
	20 28	18.7	34.34.34.34.34.34.35	17.8	- 5.8
	37	15.6	33.34.34.35.35.35	14.8	- 4.2
	46	16.2	34.34.34.34.35.35	15.6	- 4.5
	54	15.4	35.35.35.35.35	15.2	- 2.4
	21 03	13.3	34.34.35.35.35 35	13.0	- 2.8
	12	13.0	33.33.33.33	11.4	- 6.3
	21	9.6	33.35.1.1	9.2	- 0.6
	31	8.5	35.36.1	8.4	0.2
	48	4.4	36	4.4	0.1
	22 07	2.2	7	0.7	2.1
	46	7.5	14.15	- 6.2	4.2
	54	8.2	13.15	- 6.5	5.1
	23 30	13.7	15.16.16.17.17	-13.0	4.0
	40	13.7	16.16.16.16.16	-13.0	4.5
	48	14.6	16.16.16.17.17.17	-14.1	3.5

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
12/7	23 56	13.9	14.15.15.15.16	-12.1	6.7
13/7	0 04	13.0	14.15.15.15.16	-11.3	6.3
1931	15	14.2	16.16.16.17.17.17	-13.7	3.4
	24	14.3	14.14	-10.8	9.4
	58	28.9	19.19.19.19	-28.4	5.5
	1 07	23.2	17.18.18.18	-23.1	0.4
	17	22.7	19.19.19.19	-22.3	- 4.3
	45	25.4	18.18.18.18	-25.4	- 0.4
	53	26.8	18.18.18.18	-26.8	- 0.5
	2 01	26.3	18.18.18.18	-26.3	- 0.5
	14	27.1	17.17.18.18	-26.9	1.9
	23	26.0	17.17.17.18	-25.7	3.2
	33	34.1	17.18.18.18	-34.0	0.6
	46	27.8	18.18.18.18.18.18.18.18.18	-27.8	- 0.5
	56	29.7	17.17.17.18.18.18.18.18.18.18	-29.6	1.0
	3 05	30.2	17.18.18.18.18.18.19.19.19.19	-29.9	- 2.1
	13	30.2	18.18.18.18.18.18.18.18.18	-30.2	- 0.5
	35	19.7	17.18.18.18.18.18.18.19 19	-19.6	- 0.7
	44	19.6	17.17.18.18.18.18.18.18	-19.5	0.7
	53	27.7	17.17.17.18.18.18.18.18.18	-27.6	1.0
	4 02	25.2	17.17.18.18.18.18.18.18	-25.1	0.4
	12	24.5	18.18.18.18.18.18.19.19.19	-24.3	- 1.7
	28	25.1	17.17.17.17.18.18.18.18.18	-25.0	1.3
	37	26.4	17.17.17.18.18.18.18.18.18	-26.3	0.9
	46	22.5	17.17.17.17.18.18.18.18	-22.4	1.6
	55	21.2	17.17.18.18.18.18.18.19	-21.1	0.0
	5 06	21.9	17.17.17.17.17.18.19.19	-21.7	1.1
	26	13.2	11.13.17.18.18	-10.5	4.9
	45	10.8	18.19.19.21	-10.3	- 2.4
	53	7.1	16.19.19	- 6.9	- 0.1
	6 05	6.6	18.18.21.22	- 6.0	- 2.1
	19	6.0	17.18.19.19	- 5.9	- 0.3
	33	8.1	17.18.19.19.20.20	- 7.9	- 1.3
	48	8.3	18.19.19.20.20	- 8.0	- 1.8

Stat. **C. 10 m.** Instr. 2.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
12/7	13 00	16.0	18.18.18	-16.0	- 0.3
	30	17.5	18.18.18.18	-17.5	- 0.3
	14 00	19.8	18.18.18.18.18	-19.8	- 0.4
	30	17.2	18.18.18.18	-17.2	- 0.3
	15 00	12.3	18.18.18	-12.3	- 0.2
	30	8.2	20.18	- 8.0	- 1.6
	16 00	4.0	18	- 4.0	- 0.1
	30	7.6	26.24	- 2.4	- 7.1
	17 00	20.0	24.32.32.26.32	6.5	-15.2
	30	29.1	26.32.36.36.6.6.6.6	17.3	4.3
	18 00	28.4	6.6.4.6.4.4.4	18.0	21.5
	30	30.3	6.10.2.2.2.2.2.36	22.2	14.4
	19 00	8.5	2	7.9	3.1

Stat. **C. 10 m.** Instr. 60.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
12/7	11 11	2.4	17	- 2.4	0.4
	24	7.1	16.17.17.17	- 7.0	1.4
	38	8.9	15.15.15.15.16.17	- 8.0	3.6
	57	11.7	14.15.15.15	-10.0	6.0
	12 07	11.6	15.15.15.15	-10.2	5.6
	15	11.7	15.15.15	-10.2	5.7
	25	11.7	13.13.14	- 8.1	8.4
	35	13.1	13.13.14.14	- 9.4	9.0
	45	14.9	13.13.13.13.13	- 9.8	11.3
	55	14.7	13.13.13.13.14	-10.0	10.8
	13 05	15.4	13.13.14.14.14	-11.3	10.5
	15 56	6.2	15.15.15.18	- 5.6	2.2
	21 30	12.3	33.33.34.34	11.2	- 5.0

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
12/7	22 10	6.1	36.1.2	5.9	1.1
1931	21	8.6	9	- 0.2	8.6
	23 39	13.2	13.13.13.13	- 8.7	10.0

Stat. **C. 15 m.** Instr. 60.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
12/7	13 12	14.3			
	19	14.4	14.14.14.14.15.15	-11.7	8.5
	28	16.3	14.15.15.15.15	-14.0	8.4
	36	13.8	14.14.14.15.15	-11.3	7.9
	46	8.1	14.14	- 6.3	5.1
	56	8.7	15.16.17	- 8.1	2.8
	14 06	13.3	15.16.16.17	-12.5	4.3
	16	12.4	15.16.16.17.17	-11.8	3.6
	25	11.1	14 15.15.15	- 9.5	5.7
	35	10.1	14.15.15	- 8.6	5.4
	44	14.0	14.15.15.15	-12.0	7.2
	57	10.1	14.15.16	- 8.7	4.8
	15 06	9.1	14.15.15	- 7.7	4.8
	15	8.0	15.17.17	- 7.6	2 2
	23	6.9	18.18	- 6.9	- 0.1
	31	5.6	18	- 5.6	- 0.1
	41	6.1	14.15.16.16	- 5.3	2.7
	16 09	1.2			
	21	5.9	28.29.29.30	2.1	- 5.5
	34	12.0	30.30.31.31.31	7.2	- 9.6
	43	13.4	31.32.32.32.32	10.1	- 8.8
	55	12.8	30.30.30.31	7.0	-10.7
	17 05	26.3	33.33.33.33.33.33.33.33.33	23.0	-12.8
	14	29.1	33.33.34.34.34.34.34.34.34	27.1	-10.4
	25	27.9	33.34.34.34.34.34.35.35	26.4	- 8.6
	34	29.7	34.34.34.34.34.34.35.35	28.5	- 8.2
	44	34.5	33.34.34 34.34.34.34.34	32.3	-11.8
	54	30.7	33.33.33.34.34.34.34	28.1	-11.9
	18 16	33.3	34.34.34.34.34.35.35.35	32.1	- 8.6
	34	31.9	34.34.35.35.35.35.35.35	31.2	- 6.1
	43	29.7	34.35.35.35.35.35.36	29.2	- 4.6
	58	17.0	34.34.34.35.35.35.35.36	16.6	- 3.2
	19 10	19.1	34.34.34.34.35.35	18.3	- 5.2
	18	27.1	35.35.35.35.35.36.36	26.9	- 2.8
	28	31.5	35.35.35.35.36.36.36.36.36	31.4	- 1.6
	40	25.7	35.35.36.36.36.36.36	25.6	- 0.9
	20 14	20.9	35.36.36.36.36.36.36	20.9	0.0
	23	23.2	35.35.35.35.36.36	23.0	- 2.4
	30	20.4	35.35.35 35.36	20.2	- 2.5
	37	21.8	35.35.35.35	21.5	- 3.4
	44	21.0	36.36.36.36.1.1	20.9	1.5
	51	19.5	36.36.1.1.1	19.3	2.4
	58	20.8	36.36.36.36.36.36.36	20.8	0.4
	21 06	16.4	34.34.34.34.34	15.5	- 5.3
	13	18.3	34.34.34.34.34.34	17.3	- 6.0
	21	14.0	34.34.34.34.35	13.4	- 4.1
	38	10.9	35.35.36.36	10.9	- 0.8
	22 32	5.0	4.11.13	- 0.3	4.9
	46	5.5	13.14.14.15	- 4.3	3.5
	23 28	10.1	12.13.14.14.14.14	- 7.2	6.9
	52	10.6	13.13.13.14.14.14.15	- 7.8	7.0
13/7	0 05	10.5			
	17	11.0	12.12.13.14.14.14.14.14.14.15	- 8.0	7.4
	30	13.0	14.14.15.15	-10.7	7.2
	39	13.5	15.15.15.15.15	-11.8	6.5
	48	14.9	14.15.15.15.15	-12.8	7.7
	57	24.4	15.15.15.15.17.17.18	-22.6	7.8
	1 18	22.3	14.14.15 15.15.15.16	-19.2	11.1
	28	21.5	13.15.15.16.17.17.17	-19.4	7.8
	37	25.1	14.14.15.15.15.16.16.16	-22.0	11.7

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
13/7 1931	1 46	27.3	14.15.15.15.15.16.17.17.17	-24.9	10.0
	55	25.4	15.15.15.15.15.15.15.15	-22.2	12.3
	2 16	35.9	15.15.15.15.15.16.16.16.16. 16.16.20	-32.9	12.0
	26	36.4	14.14.14.15.15.15.15.16.16. 16.16	-31.8	16.9
	37	31.9	15.15.15.16.16.16.16.16.16.16	-29.5	11.9
	46	32.9	15.15.15.15.15.15.15.15.15. 15.16	-29.0	15.5
	56	31.7	15.15.15.15.15.15.15.15.16.16	-28.1	14.3
	3 05	32.5	14.15.15.15.15.15.16.16.16.16	-29.1	14.2
	29	31.9	15.15.15.15.15.16.16.16.16.17	-29.2	12.4
	38	28.6	15.15.15.15.16.16.16.16.16	-26.2	11.1
	51	27.1	15.15.15.15.16.16.16.16.17	-24.9	10.1
	4 01	21.2	14.15.15.15.15.15.17	-18.5	9.9
	24	22.1	15.15.15.15.15.15.15	-19.3	10.7
	34	18.8	14.15.15.15.15.15	-16.1	9.7
	44	13.4	15.16.16.17	-12.6	4.3
	55	12.8	15.15.16.16.16	-11.8	5.0
	5 11	16.9	13.15.16.16.16	-15.1	5.8
	20	18.0	13.14.15.15.15.15	-14.8	10.0
	31	17.4	14.15.15.16.16.16	-15.6	7.6
	39	14.2	14.15.15.15	-12.2	7.3
	48	11.4	15.16.16.16	-10.6	4.1
	6 05	7.5	14.15.16.16	- 6.7	3.2
	18	5.0	18.19.20	- 4.8	- 0.9
	32	1.2	14	- 0.9	0.8
Stat. **D. 10 m.** Instr. 137.					
23/7	0 08	17.9	19.20.20.20.21	-15.3	- 9.2
Stat. **D. 10 m.** Instr. 136.					
23/7	0 42	14.1	18.18.19.22.22.22.22.23.23.23	- 9.7	- 9.1
	55	17.8	20.22.22.23.23.24.25	- 9.1	-14.6
	1 05	14.6	20.23.23.24.24	- 7.2	-12.0
	31	14.8	23.24.24.25.26	- 3.8	-14.1
	44	18.4	25.25.26.27.27.27.27	1.3	-18.2
	55	14.0	26.26.26.27.28.29	2.6	-13.5
	2 07	8.5	23.31.33	3.2	- 5.4
	18	11.7	22.28.32.35	4.3	- 6.6
	28	8.6	28.30.32	5.3	- 6.1
	37	12.4	27.27.29.29.36	6.3	- 8.4
	48	13.4	26.27.28.28	3.0	-13.0
	57	11.7	27.29.30.31	6.3	- 9.4
	3 08	12.8	29.29.30.32.32	8.8	- 8.8
	17	12.3	30.32.34.34	10.8	- 4.8
	26	11.6	30.32.32.36	9.9	- 4.4
	34	12.7	30.31.33.35.1	11.0	- 3.4
	48	11.6	28.31.32.36	8.7	- 5.3
	57	9.6	30.30.36	7.4	- 4.1
	4 06	11.2	29.30.35.35	8.9	- 4.3
	15	9.1	31.32.33.34	8.1	- 3.6
	24	9.5	33.36.36	9.2	0.2
	5 00	7.9	35.3.7	5.1	4.4
	09	6.8	30.36	5.6	- 1.9
	20	6.9	4.6.7.9	1.6	6.4
	35	13.1	1.2.4.4.4.5.5.5.5	8.2	9.7
	50	11.1	1.4.4.4.4.5.5.6	6.3	9.0
	6 22	9.5	2.3.3.4.6.6.7	5.2	7.5
	36	4.5	13.18.33	- 0.1	0.5
	50	9.8	8.8.16.17.17.17.17	- 6.8	3.3
	7 04	6.6	9.11.12.19	- 4.0	3.5
	20	9.5	12.12.12.14.16.16	- 7.6	4.8
	34	11.4	11.12.13.15.15.15.15.16.17	- 9.7	4.7
	46	10.6	13.15.19.19	-10.6	0.7

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
23/7 1931	7 55	10.2	12.14.14.17	- 8.7	4.3
	8 04	13.8	16.17.18.18.19	-13.5	- 1.7
	15	11.3	15.16.18	-10.9	- 1.2
	28	4.7	14	- 4.1	2.3
	37	10.5	15.16.17.17	-10.3	1.3
	47	6.7	14.16.19.21	- 6.0	- 0.6
	57	9.5	12.15.17	- 8.3	3.3
	40	15.6	17.18.19.19.19.20	-14.7	- 4.8
	52	19.7	19.19.19.19.20.20.21	-17.4	- 8.9
	10 01	12.9	17.19.20.21.23	-10.4	- 6.2
	12	17.9	18.19.20.21.21.21.23	-14.2	- 9.9
	23	13.3	18.18.22.22.23	- 9.9	- 7.5
	34	17.6	19.19.22.23.24.26	- 9.8	-12.5
	45	15.7	19.19.21.22.23.25	-10.1	-10.5
	55	13.8	19.19.20.23.23	-11.7	- 7.0
	11 04	13.7	19.21.22.22.26	- 7.9	- 9.8
	14	13.8	16.19.20.20.21	-12.2	- 5.2
	23	13.1	19.20.21.21.24	- 9.4	- 8.2
	31	8.7	21.22.23	- 5.4	- 6.7
	39	17.3	17.18.21.21.21.21.23	-13.6	- 9.2
	49	12.3	20.20.20.25	- 8.4	- 7.8
	57	11.7	21.23.25.25.25	- 4.0	-10.5
	12 05	10.2	19.26.28	- 2.2	- 7.7
	14	6.5	26.35	3.3	- 3.2
	22	6.1	29.35	4.6	- 2.6
	30	12.8	26.27.27.27.29	2.8	-12.3
	41	13.2	31.34.35.1.8	9.6	2.2
	13 13	13.9	33.34.1.1.3	12.7	2.5
	21	16.2	1.1.2.3.3.3	13.4	8.7
	30	12.0	1.2.2.4.5	9.1	7.4
	37	14.7	2.2.3.4.5	10.5	9.8
	45	14.9	3.3.4.5.6.6	8.1	12.0
	55	9.4	35.1.3	8.4	3.2
	14 02	14.2	33.34.35.36.1	13.8	0.2
	11	14.5	32.35.35.35.36.36	14.1	- 0.3
	20	9.5	1.1.6	6.9	5.4
	28	12.0	36.2.4.5	8.9	7.0
	36	12.1	33.33.34.35.1	11.7	- 1.0
	56	13.8	32.33.34.35.35	13.3	- 2.6
	15 04	14.5	33.34.34.35.35	14.3	- 1.8
	13	12.1	34.36.36.1	11.7	2.3
	21	12.5	36.36.1.1	11.9	3.4
	30	11.2	35.1.2.4	9.6	4.7
	38	15.4	33.36.36.36.1.1	14.8	2.3
	47	13.0	33.35.36.4	11.6	2.3
	57	14.1	34.4	11.4	4.4
	16 05	5.8	1.2	5.2	2.5
	14	8.0	35.1.1	7.7	1.9
	22	9.5	36.2.6	6.8	5.3
	30	7.1	36.4	5.7	3.5
	41	7.4	1.2.3.4.5	5.4	4.7
	55	10.4	31.31.34.34.35.35.1.2	9.5	- 0.8
	17 18	15.4	27.31.31.33	10.3	- 9.9
	30	6.5	30.32	5.0	- 4.0
	41	8.0	33.33.33.35.35	7.8	- 1.5
	55	8.0	29.29.32.32.32.35	6.2	- 4.2
	18 08	7.4	29.30.30.31.33	5.3	- 4.9
	23	8.4	27.27.27.28.28.29	2.6	- 7.9
	39	10.0	31.34.34.36.36.1.2	9.4	0.8
	56	3.2	36.5	2.4	1.7
	19 09	6.1	31.32.32.33	5.3	- 3.0
	23	5.4	29.4.6	2.8	1.1
	51	5.8	1.6	3.7	3.8
	20 05	7.9	1.2.2.3.4.5	6.0	4.9
	20	10.7	35.36.1.4.5.6.7.9	5.8	6.9

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
23/7 1931	20 34	19.3	6.7.7.7.8.9.9	1.0	19.0
	45	16.0	6.7.8.9.11	- 0.8	15.3
	58	11.4	2.3.3.5	8.2	7.6
	21 07	17.3	3.4.4.5.6.6	9.0	14.4
	18	13.4	6.7.7.8.8	1.6	13.2
	26	10.4	4.6.7.9	2.4	9.6
	34	15.8	3.5.6.6.6	7.0	13.8
	45	11.6	5.5	5.6	10.2
	55	7.6	4.5.7	3.2	6.7
	22 07	4.9	8.13	- 1.9	4.0
	20	8.5	9.10.13.17.17.22	- 5.7	2.3
	36	7.0	13.15.17.17.20	- 6.4	0.6
	50	7.7	14.16.16.19.20	- 7.0	- 0.4
	23 05	6.1	20.20.21.24	- 4.3	- 4.0
	18	6.2	16.18 19.19	- 6.0	- 1.2
	31	13.1	13.15.15.16.17.18.18.20	-12.3	0.9
	45	13.0	13.14.15.16	-11.7	5.2
	53	14.4	14.14.14.15.16	-13.2	5.6
24/7	0 01	12.5	15.15.15.16.16	-12.1	3.2
	15	13.1	10.10.11.13.13	- 7.3	10.4
	24	6.8	14.15	- 6.2	2.8
	35	7.7	15.15.16.18.18	- 7.5	0.7
	48	10.2	18.19.20.20.20.20.22	- 8.7	- 5.0
	1 02	12.7	19.21.21.22.23.23.23	- 8.1	- 9.4
	14	12.1	18.19.21	-10.8	- 4.8
	23	11.5	20.20.21.21	- 9.3	- 6.8
	30	15.0	19.19.20.20.20.21	-13.0	- 7.2
	38	16.2	19.19.19.20.20.21	-14.2	- 7.6
	45	12.9	18.19.19.20.20	-11.8	- 5.0
	53	12.2	15.17.19.19	-11.6	- 1.2
	2 01	12.5	17.17.18.19.20	-11.9	- 2.7
	11	14.1	20.20.20.20.21	-11.8	- 7.7
	20	15.6	18.19.20.20.21	-13.6	- 7.2
	28	12.9	21.22.22.23.24	- 7.3	-10.4
	37	13.0	22.23.23.24.26	- 4.9	-11.6
	45	13.0	25.25.26.26	- 0.9	-12.9
	59	13.0	24.24.24.25.25.25	- 3.1	-12.5
	3 07	15.6	24.24.24.25.25.25	- 3.8	-15.0
	16	17.5	25.25.25.26.26.26.26	- 0.9	-17.4
	26	10.2	24.25.27	- 1.0	- 9.9
	35	10.1	24.25.25.27	- 1.2	- 9.8
	51	10.7	25.26.26.28	0.6	-10.5
	4 00	11.6	29.30.32.34	8.9	- 6.5
	08	10.5	30.31.32.32	8.3	- 6.3
	17	8.6	32.32.34	7.9	- 3.2
	26	10.5	34.34.35.36	10.4	- 0.2
	35	11.3	35.35.36.36	11.2	1.2
	46	9.3	34.35.36.36.1	9.1	1.1
	59	5.1	31.33.33	4.5	- 2.2
	5 13	5.4	28.32.34.35	4.3	- 2.1
	27	6.2	31.31.34.36	5.4	- 1.9
	40	6.2	22.24.32.34	1.4	- 3.6
	54	5.7	21.23.27	- 2.0	- 4.8
	6 09	4.7	25.35.36	2.7	- 1.5
	23	4.0	18.32	- 0.2	- 1.4
	36	5.3	24.26.26.34	1.2	- 4.0
	50	7.5	25.26.26.29.35	2.4	- 5.6
	7 05	8.8	25.26.29.30.31.31	3.8	- 7.2
	19	8.8	26.29.30.33.34.35	6.0	- 4.5
	31	9.7	19.26.27.29	- 1.0	- 7.7
	47	9.2	24.25.34	2.0	- 6.3
	55	5.3	21.32	0.3	- 3.0

Stat. **D. 50 m.** Instr. 2.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
23/7 1931	1 00	18.7	22.22.24.22.24	- 9.5	-15.8
	30	16.8	26.24.24	- 3.5	-16.2
	2 30	16.8	28.28.32.28	8.2	-13.7
	3 00	14.5	30.30.28	8.0	-11.9
	30	17.2	32.32.34.34	16.0	- 5.5
	4 00	14.9	36.36.34.34	14.7	0.3
	30	12.3	34.34.6	9.3	3.0
	5 00	12.3	4.4	7.7	9.6
	30	14.2	8.10.6 6	1.0	13.6
	6 00	15.3	6.6.10.10	- 0.3	14.4
	30	11.9	8.10.14	- 5.1	9.5
	7 00	15.3	16.10.14.10	- 9.9	9.6
	30	16.4	10.12.12.14.16	-11.6	10.1
	8 00	19.8	16.14.14.14.16	-18.2	7.0
	30	20.5	16.16.16.16 16	-20.3	3.2
	10 00	21.3	18.18.18.18.18.18	-20.9	- 4.1
	30	21.3	18.16.18.18.18.16	-21.0	- 1.5
	11 00	19.8	16.18.18.16.16.18	-19.5	- 0.3
	30	17.9	18.16.16.18	-17.6	- 0.3
	12 00	15.7	18.16.18.18	-15.4	- 1.6
	30	19.8	18.26.26.24.24	- 6.8	-16.0
	13 00	21.3	26.18.32.2.28	4.3	- 9.2
	30	22.4	28.28.30.36.4.30	14.2	- 7.9
	14 00	22.0	28.34.36.34 34.2	18.9	- 3.0
	30	22.8	2.4.2.34.30.28	16.5	- 0.6
	15 00	22.8	30.30.30.2.32.30	17.1	-10.7
	30	25.4	30.30.30.30.30.30.28	15.5	-19.9
	16 00	27.6	30 30.32.30.30.32.30	20.0	-18.6
	30	30.6	30.30.34.32.36.32.32.32	26.1	-12.7
	17 00	30.3	32.32.32 32.32.32.32.32	26.5	-14.7
	30	30.3	34.32.34.32.32.32.32.32	27.4	-12.2
	18 00	26.5	34.34.34.34.32.34	25.7	- 5.5
	30	27.3	34.34.34.36.2.2.2	25.4	4.9
	19 00	26.9	2.2.2.2.8.2.4	18.7	16.9
	30	24.7	2.2.6.2.2.2	18.8	14.7
	20 00	22.0	2.2.12.4.4	9.2	15.3
	30	20.5	2.2.2.2	17.6	10.6
	21 00	17.5	2.4.4.4.2	12.6	11.7
	30	16.4	2.30.18.18	0.0	- 1.9
	22 00	16.8	18.18.18.18	-16.5	- 3.2
	30	19.0	18.18.18.18.18	-18.7	- 3.6
	23 00	20.5	18.18.18.18.18	-20.1	- 3.9
	30	14.2	22.22.18	-12.2	- 5.5
24/7	0 00	17.9	18.18.18.18.18	-17.6	- 3.4
	30	20.2	18.18.18.20.22 22	-17.0	- 9.0
	1 00	19.4	22.22.22.24.24	- 9.8	-16.4
	30	15.7	24.24.24.28	- 2.4	-14.8
	2 00	10.4	22.24	- 5.0	- 8.9
	30	13.4	24.32.30	5.2	- 9.8
	3 00	15.3	28.28.28.28.28.28	5.5	-14.3
	30	16.0	30.32.30.32	12.3	- 9.9
	4 00	14.9	34.2.34	14.1	1.0
	30	13.8	34.34.34	13.6	- 2.2
	5 00	13.0	36.2.36.34	12.3	2.4
	30	12.7	36.36.36	12.5	0.9
	6 00	16.8	2.4.2.36	13.8	8.3
	30	13.0	4.4.4	8.2	10.1
	7 00	11.2	10.4	1.5	9.6
	30	7.8	14.4	- 1.0	4.9
	8 00	11.2	6.6	3.7	10.6

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
			Stat. D. 50 m. Instr. 137.		
	h m				
23/7 1931	2 51	16.6	28.29.31.31.31	10.6	-12.0
	3 48	11.0	31.33.34.1	10.0	- 2.0
	10 17	25.8	17.17.17.17.18.18.18.18.18. 19.19	-25.3	- 4.0
	21 29	12.0	15.15.16.18.18	-11.7	1.0
			Stat. D. 150 m. Instr. 137.		
23/7	0 40	25.3	16.16.16.17.17.17.17.17.17. 17.17	-25.2	0.9
	1 16	25.6	17.17.17.17.17.17.17.17.17. 17.17	-25.6	- 0.5
	45	21.9	17.17.17.18.18.18.18	-21.6	- 2.7
	2 27	17.1	18.18.18.18.18.18.19.19.19.20	-16.3	- 4.7
	3 05	21.3	19.20.20.20.20.21.21	-18.0	-11.2
	33	16.7	20.21.21.21.22.22	-12.1	-11.3
	4 23	18.7	23.23.24.24.24.24	- 7.0	-17.3
	5 29	18.6	24.25.25.25.26.27.27	- 1.0	-18.3
	59	14.8	23.25.26.27.27	- 0.8	-14.3
	6 15	11.2	26.27.27.28.28.28.28	2.9	-10.7
	41	13.3	21.22.22.22.24.24.25	- 6.5	-11.2
	7 14	6.5	26.27	0.7	- 6 5
	31	6.3	19.23.26.30	- 2.7	- 3.6
	8 38	4.1	18.18	- 4.0	- 0.8
	51	5.7	8.11.13.22	- 3.0	2.0
	10 55	9.5	8.9.11.12.14.14	- 4.9	7.3
	11 36	10.0	10.10.11.13.13.13.13	- 6.2	7.4
	59	9.0	9.11.11.12.13.13	- 5.1	7.0
	12 21	10.0	13.13 13.13.13.14.15	- 8.1	5.7
	40	11.9	12.13.14.14.15.15.16.17	-10.5	4.7
	13 20	6.4	36.1.6	4.7	3.2
	40	7.3	33.33.35.36.1	7.0	- 0.1
	14 29	10.1	33.34.34.35.35.35.36	10.0	- 0.5
	45	9.9	35.1.1	9.5	2.4
	15 05	15.6	32.32.32.32.33.33.34.34.34	14.5	- 5.3
	16 10	15.6	33.33.33.33.33.34.34.35.35	15.1	- 3.2
	30	18.5	34.34.34 34.34.34.35.35	18.3	- 2.2
	17 50	14.9	35.35.36.36.36.1.1.2	14.3	3.3
	18 15	12.9	34.35.35.36.36.1.1.1	12.5	2.2
	36	16.3	34.34.1.2.2.2.2.3	14.5	6.2
	19 00	14.8	1.1.1.1.1.2.2.2	13.4	6.3
	22	13 1	35.36.36.1.2.2.3.3	11.7	5.0
	48	12.0	31.32.32.32.32.34.35	10.8	- 4.6
	20 29	9.2	34.35.3.4.6.7	6 0	4.9
	51	13.3	2.2.3.3	10.7	7.8
	21 13	11.1	5.7.7.7.8.8	1.7	10.8
	44	9.8	5.5.5.5.6.7	4.0	8.9
	22 14	8.5	8.10.10.11.11.11.12.12.13.15	- 4.1	6.9
	38	7.5	8.9.12.12	- 2.8	6.5
	23 18	12.4	15.15.15.16.16.16.17	-12.0	2.6
	38	19.1	13.13.14.14.14.14.14.14.14. 15.15	-16 6	9.2
	58	19.9	12.13.14.14.14.14.15.15.15. 15.15	-17.5	8.9
24/7	0 27	22.9	13.13.13.14.14.14.14.14.14. 14.15	-19.5	11.7
	48	22.8	12.14.14.14.15.15.15	-19.9	10.6
	1 02	18.6	14.14.15.15.15.16.16	-17.4	6.0
	17	16.7	14.15.15.15.15	-15.5	6.0
	33	18.0	14.15.15.16.16.16.16.16.16.16	-17.4	4.0
	2 13	17.7	15.16.16.16.16	-17.3	3.4
	26	16.6	15.15.16.16.17	-16.2	2.6
	45	14.8	17.17.18.18.18.18.19.19.19.19	-14.3	- 3.3
	3 10	17.4	14.16.16.17.17.17.18.18.18.18	-17.0	0.0
	35	19.1	17.17.17.17.17.18.18.18.18.19	-18.9	- 2.3
	h m				
24/7 1931	4 00	18.7	17.17.18.19.19.19.19.19.19	-17.9	- 4.8
	25	18.8	21.21.21.21.22.22.22.22.23	-12.5	-13.9
	5 35	19.4	23.23.23.23.24.24	- 8.5	-17.4
	6 37	15.3	25.26.26.27.27.28	1.6	-15.0
	7 00	13.6	25.26.26.27.28.29	2.1	-13.0
	20	16.7	27.28.28.28.29.30	6.7	-15 1
			Stat. E. 10 m. Instr. 136.		
4/8	19 07	8.0	29.30.32	3.5	- 5.4
	22	5.2	29.31.33	3.2	- 3.8
			Stat. F. 5 m. Instr. 137.		
18/8	0 23	7.7	34.34	6.7	- 3.9
	44	7.7	31.31.33	4.6	- 6.1
	1 00	3.4	14	- 2 2	2.6
	10	9.9	29.34.34	6.2	- 6.7
	29	7.7	2.5	6.7	3.1
	48	20.5	35.35 36.36.36.1.2	20.0	- 3.2
	3 17	24.3	36.36.1.1.1.3.3.4.4	23.1	3.7
	34	35.7	2.2.3.3.3.3.4.4.4.4.5	32.3	14.3
	52	22.0	1.2.2.3.4.4.4.5.10	17.6	9.7
	4 09	35.3	4.5.5.5.6.6.6.6.6.7	24.3	25.2
	30	27.6	7.7.7.8.8.9.9.9.10.10.10	6.5	26.1
	5 08	48.7	8.10.10.10.10.10.10.10.11.11	0.0	48.3
	41	44.2	8.9.9.9.9.9.9.9.10.11	6.1	43.4
	59	41.3	9.9.10.10.10.10.10.10.10. 10.11	0.7	41.1
	6 17	54.0	10.10.10.10.10.10.10.10.10. 10.10	0.0	54.0
	37	46.8	10.10.10.10.11.11.11.11.11. 11'11	- 4.9	46.4
	54	50.1	10.10.10.11.11.11.11.11.11. 11.11	- 6.1	49.5
	7 11	42.0	10.10.10.11.11.11.11.11.11. 11.12	- 5.8	41.4
	28	44.2	12.13.13.13.13.13.13.13.13. 13.14	-22.1	38.2
	46	43.3	12.13.13.13.13.13.13.13,13. 13.13	-21.0	37.9
	8 13	42.3	13.13.13.13.13.13.13.13.14. 14.14	-23.0	35.4
	35	39.2	13.13.14.14.14.14.14.14.15	-24.5	30.3
	51	37.9	14.14.14.14.14.14.14.14	-24.3	29.0
	9 08	40.3	13.13.13.14.14.14.14.15.15	-25.2	31.1
	23	24.1	13.14.14.14.14	-14.8	19.0
	37	29.9	13.13.13.13.13.13.14.14	-15.8	25.3
	10 08	22.0	13.13.13.13.14	-11.6	18.6
	26	23.5	13.13.13.14.14.14.14.15	-14.3	18.4
	49	16.2	11.11.12.12.12.13	- 5.0	15.3
	11 12	16.7	13.14.15.15.15.15.16.16	-12.5	10.8
	35	11.5	14.14.15.16	- 8.5	7.6
	58	10.7	16.18.19.20	-10.2	1.4
	12 18	21 5	19.20.21.21.21	-20.7	- 5.2
	50	18.6	22.27	- 9.7	-13.8
	13 10	13.1	28.31.31.31	8.7	9.4
	28	12.1	5.6.14.17	- 0.7	7.6
	51	16.5	30.32.33.33.33.33	11.1	-11.9
	14 12	10.4	5.6.7.8	5.9	8.4
	29	9.2	2.4.6	7.6	4.4
	45	12.9	31.32.32.33	8.2	- 9.8
	15 03	10.8	6.6.7	6.5	8.6
	22	18.7	33.33.34.34.34.34	15.6	-10.1
	41	16.8	35.36.36.36.1.1.1	16.6	- 2.0
	16 01	18.7	35.2.3.3.4.5.6	16.3	6.3
	19	17.7	2.2.3.3.5.5.6	15.2	7.8

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true	
				N	E
	h m				
18/8 1931	16 39	21.4	4 4.4.5.5.6.6.6	16.2	13.6
	17 12	19.4	6.7.7.7.7.8.8	9.4	16.9
	30	24.3	6.6.6.7.7.7.7.8.9	12.0	20.8
	47	30.1	6.7.7.8.9.10.10.10	8.0	38.0
	18 01	33.7	10.10.10.11.11.11.12.13.13. 13.13	- 8.5	31.8
	18	68.8	14.14.14.15.15.15.15.15.15. 15.15.15.15	-51.0	45.9
	31	63.0	12.13.13.13.13.13.13.13.13. 13.13.14.14	-32.3	53.8
	44	63.9	12.13.13.13.13.13.13.14.14. 14.14	-34.6	53.3
	57	51.3	11.11.12.12.12.12.12.13.13. 13.13	-19.1	47.2
	19 17	53.1	12.12.12.13.13.13.13.13.13. 14.14.14	-26.4	45.6
	32	55.3	11.12.12.12.12.13.13.13.13. 13.14.14	-24.9	48.7
	46	76.9	14.14.14.14.14.14.14.15.15. 15.15.15	-53.3	55.2
	20 08	35.3	10.10.10.11.12.12.12	- 6.1	34.4
	21	16.2	8.9.9.10.11.11.12	0.0	15.8
	40	40.1	9.9.10.11.12.13.13.14.14.15	-12.9	35.3
	54	28.3	7.8 8.9.10	7.2	27.0
	21 09	24.6	11.11.11.12.12.12	- 6.3	23.7
	26	27.6	8.8.8.8.8.8.9	9.0	26.0
	40	25.2	8.8.8.9.10	6.0	24.3
	52	24.7	8.8.10.10.11	2.5	24.1
	22 05	21.8	9.9.10.11.11	0.0	21.5
	58	26.3	9.10.10.10.10.10	0.9	26.2
	23 13	26.2	9.9.9.10.10.11	1.4	26.0
	24	28.4	7.7.9.9.9.10	6.8	27.1
	42	30.4	8.8.9.9.10.10	5.2	29.6
	57	23.5	10.10.11.11.11.12	- 3.2	23.1
19/8	0 09	23.9	11.11.12.12.12.13	- 7.3	22.5
	25	22.5	10.11.11.11.11	- 3.1	22.2
	58	24.7	8.9.9.9.10.10	3.4	24.3
	1 11	35.0	14.14.14.14.14.14.14	-22.5	26.8
	36	44.4	14.14.14.14.14.14.14.15.15	-29.6	32.9
	54	47.7	13.13.13.13.13.13.13.13.14. 14.14	-25.9	39.9
	2 25	39.5	12.12.12.12.12.12.12.12	-13.5	37.1
	39	38.3	11.11.11.11.11.12.12.12.13	-10.5	36.5
	53	40.5	12.12.12.12.12.13.13.13.13.13	-17.0	36.6
	3 24	31.3	4.5.6.6.6.7.7.7.7.7.8	18.1	24.9
	41	33.9	7.8.8.8.8.8.9.9 9.10	9.3	32.3
	58	33.3	7.8.8.8.9.9.10.10.10.10.10.11	4.6	32 3
	4 15	29.5	5.8.8.9.10.10.10.10.10.11	4.4	28.1
	32	31.1	8.8.9.9..9.10.10.10.11.11.11	2.2	30.5
	50	41.3	11.12.12.12.12.12.13.13.13. 13.13.13.14.14	-18.0	36.8
	5 07	29.1	10.10.11.11.11.12.12.12.12.12	15.7	24.2
	27	30.9	7.7.8.9.10.10.10.11.11.11.11	2.6	29.7
	46	29.0	8.9.10.10.11.11.11.11.11.11	- 1.5	28.6
	6 03	33.1	6.6.8.8.9 10.10.11.11.11.11	4.3	31.1
			Stat. **F. 10 m.** Instr. 137.		
18/8	0 13	8.4	7.9.10	1.8	8.0
	34	10.2	14.14.14.15	- 6.8	7.6
	52	16.5	36.36.1.2.2.3	16.2	0.9
	1 20	12.4	3.3.4.5.6	10.3	6.4
	37	20.5	2.3.4.4.4.5.5.5.5.5	17.1	10.7
	2 20	28.7	6.6.6.6.7.7.7.7.7.7.7.7	15.6	24.0
	32	23.5	5.5.6.6.6.6.6.6.7.7.7	14.7	18.1
18/8	2 42	23.6	3.3.3.3.3 3 3.3.4	22.0	8.5
	50	22.3	3.3.3 3 3.4.4.4	20.3	9.0
	3 00	26.5	2.2.3.3.4.4.5.5 5.5	22.9	12 2
	08	24.7	1.1.2.3.3.4.4.4 4.4	22 8	8.3
	26	29.4	3.4.4.5.5.5.5.6.6.6.6	22.2	18.6
	43	28.1	2.2.3.3.5.5.5.5.5	24.0	13.3
	4 00	29.8	2.4.5.5.6 6.7.7.7.7.7	19.6	21.0
	19	47.7	4.5.6.7.7.8.8.8.8.9.9	21.6	40.6
	5 32	51.0	9.9.9.9.9.9.9.10.10.10.10	5.3	50.5
	50	37.8	8.9.9.9.9.9.9.9.9.10.10	5.9	37.1
	6 08	46.4	10.10.10.10.10.10.10.10.10. 10.11	- 0.8	46.4
	27	45.9	9.9.9.9.9 10.10.10.10.10.10	4.0	45.5
	46	53.1	10 11.11.11.11.11.11.11.11. 11.11	- 8.3	52.3
	7 03	40.1	8.9 9.9.9.9.9.10.10 10.10	5.6	39.5
	19	47.9	11.11.11.11.11.11.11.11.11. 11.12	- 9.2	47.0
	37	44.7	11.11.11.11.11.11.11.11.11. 11.12	- 8.5	43.9
	55	53.8	12.12.12.12.12.12.12.12.12. 12.13.13	-20.1	49.8
	8 27	42.4	12.12.12.12 12.13.13.13	-17.2	38.7
	42	40.2	11.11.11.12.12.12.12.12.13	-12.4	37.9
	59	38.0	13.13.13.13.13.13.13.13.13	-19.0	32.9
	9 15	33.2	12.12.12.12.12.12.13.13	-12.9	30.5
	28	31.5	12.12.12.12.12.13.13	-12.3	28.9
	48	36.5	10.10.10.10.11.11	- 1.9	36.4
	10 15	23.5	12.13.13.13.14.14	-12.4	19 8
	38	19.4	13.13.13.13.13.14.14	-10.5	16.2
	11 00	15.9	11.11.11.11.11.11	- 2.8	15.7
	23	14.2	14.14.14.14.15.15	- 9.7	10.4
	47	6.2	12.14	- 3.1	5.3
	12 08	9.2	20.21.22	- 8.6	- 3.1
	29	10.1	23.23.23.23	- 7.7	- 6.5
	13 00	5.0	5.8	2.8	3.9
	20	5.7	4.8.8	2.9	4.5
	43	10.0	17.17.21	- 9.4	1.2
	14 02	27.2	16.16.16.17.17.18.19.19.19. 20.21	25.7	- 4.5
	21	8.9	4.5.10	4.8	6.4
	38	13.1	32.33.33.34.34	10.2	- 8.0
	53	10.9	19.21.31.33	- 1.9	- 5.1
	15 12	17.6	4.4.4.4.4.6.6	14.1	10.2
	32	10.2	2.4.27	5.4	- 2.0
	52	17.2	35.35.36.36.1.1.1	16.8	- 2.7
	16 10	26.7	2.3.4.4.4.4.5.5.5.5	22.6	13 6
	29	24.4	3.4.4.4.4.4.5.5.6	20.3	13.2
	48	22.7	4.4.4.5.5.5.5 6.6	17.5	14.2
	17 21	30.5	5.5 5.5.5.6.7.7.8.8.10.10	15.8	24.3
	39	33.1	5.5.5.5.6.6.7.7.8.8.9.9.10	16.4	27.2
	54	33.3	7.8.8.8.8.8.8.9.9.9.10	9.1	31.7
	18 09	64.6	12.13.13.13.13.13.14.14.14. 14.14.14.14	-36.8	52.6
	25	45.3	11.11.11.11.11.11.11.12.12.12	-10.1	44.0
	38	65.0	13.13.13.13.13.13.13.13.13.14. 14.14.14.14	-36 2	53.7
	51	57.0	7.9.10.10.10.10.10.10.10.11. 11.11	1.0	56.1
	19 10	59.5	11.11.11.11.11.11.11.11.11. 11.11.11.12	-11.3	58.3
	24	77.6	12.12.13.13.13 13.13.13.13. 13.13.13.13	-36.3	68.4
	40	79.7	13.13.13.13.13.14.14.14.14. 14.14.14	-46.7	64.3

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
	h m				
18/8 1931	19 52	53,3	11 11.11.11.12.12.12.12.13. 14.14.14	-19.6	48.4
	20 15	40.1	10.11.11.11.11.12.12.12.12.13	-10.3	38.3
	32	38.6	8.8.8.8.9.9.9.9.9	9.3	37.3
	48	35.3	7.7.7.8.8.8.10.11	10.6	32.6
	21 02	29.1	10.10.11.11.12.12.12	- 5.5	28 3
	17	30.7	7.7.8.8.8.9.9.9	10.0	28.9
	33	26.5	7.7.8.8.9.9.9	8.5	24.8
	47	25.5	8.9.9.9.10.10	3.5	25.1
	59	22.5	12.13.13.13.14	-11.2	19.4
	22 13	27.7	8.8.8.9.9.9	7.1	26.7
	23 04	26.7	10.11.11.11.12.12.12	- 6.0	25.8
	18	26.2	11.11.11.12.12.12	- 6.8	25.2
	34	26.6	9.10.10.10.10.10.11	0.0	26.5
	50	23.4	9.9.10.10.10	1.6	23.2
19/8	0 04	26.0	11.11.11.11.11.12	- 5.4	25.3
	16	29.9	7.7.8.8.8.8.9	10.6	27.7
	33	27.2	8.8.8.8.8.8	9.3	25.6
	1 04	37.5	13.13.14.14.14.14.14.14.15.15	-24.0	28 5
	18	37.8	11.12.12.13.13.13.13.13.13	-16.5	33.8
	47	44.6	12.12.12.12.12.13.13.13.13. 13.13	-18.8	40.3
	2 14	49.4	11.11.11.11.11.11.11.12.12. 12.12	-12.0	47.8
	32	45.7	10.11.11.11.11.11.11.11.11.11	- 7.1	45.1
	46	43.5	8.10.10.10.11.11.11.11.11.11	- 3.0	42 9
	59	37.7	9.10.10.10.10.10.10.10.10	0.7	37.7
	3 15	34.7	4.5.5.6.6.7.8.8.8.8.8.9 9.10	15.6	29.3
	32	37.8	5.5.5.6.6.6.6.6.6.7.7.7.8	23.5	29.1
	49	36.8	5.6.7.7.7.7.7.8.8.8.8.9.9.10	14.6	32.9
	4 06	34.6	5.5.6.6.7.7.7.9.9.10.10.10.11	12.2	30.2
	24	36.5	8.8.8.9.10.10.10.10.10.10.11. 11.11.11	1.3	35.8
	40	40.3	7.8.8.8.9.10.10.10 10.11.11. 11.11	4.1	39.0
	58	36.8	4.4.4.5.6.6.6.6 6.7.8.8.9.10	20.6	28.3
	5 16	34.6	6.6.6.6.6.7.7.7.7.7.7.7.8.8	18.2	29.2
	36	36.5	5.6.6.6.7.8.8.9.9.10.11.11. 11.12	8.8	32 7
	53	36.8	6.7.7.7.7.8.9.10.10.10.11.11. 11.12	6.1	34.3

Stat. **F. 50 m.** Instr. 2.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
18/8	0 30	20.9	14.14.14.14.14.16	-14.1	15.1
	1 00	20.2	16.14.14.14.12	-12.7	15.1
	30	20.5	14.14.14.12.12	-10.7	17.1
	2 00	16.8	12.12.14.14	- 8.3	14.3
	30	16.8	16.16.16.16	-14.6	8.4
	3 00	14.9	16.14.16.16	-12.0	8.4
	4 30	16.8	12.24.12.16.16	-10.9	6.3
	5 00	35.5	16.10.16.8.8.8.8.6.6.6	4.1	28.8
	30	40.0	8.6.6.6.6.6.6.6.6.6	24.5	31.3
	6 00	32.1	4.6.6.6.6.6.6.6	21.3	23.7
	30	43.0	6 6.6.4.4.4.6.6.6.8.6	29.3	30.3
	7 00	48.6	8.8.8.8.6.4.6.6.4.4.4.4	32.8	32.8
	30	48.6	6.8.8.6.12.6.6.6.6.8.6.8.8	21.9	41.1
	8 00	50.5	8.6.8.8.16.8.8.8.8.6.6.6.6	17.3	42.9
	30	48.6	8.8.8.8.8.8.8.8 8.8.6.8	18.2	44.9
	9 00	42.3	10.8.8.8.8.8.8.8.8.8.10	11.6	40.3
	30	30.6	8.8.8.8.8.8.8.12	7.7	28.8
	10 00	43.0	12.14.12.10.10.8.8.8.8.10.8.10	1.4	40.7
	30	37.8	10.12 12.10.10.10.10.10.10.10	- 2.7	37.4
	11 00	31.8	10.10.8.8.8.10 14.10.10	1.0	30.4
	30	29.5	10.10.10.10.14.12.10.12	- 5.0	28.2
	12 00	22.4	12.12.14.14.16	-12.7	17.5
	12 30	20.5	12.12.10.12.12	- 5.6	19.5
	13 00	11.9	14.16.16	- 9.3	7.0
	30	14.2	16.12.14	- 8.7	10.4
	14 00	13.4	16.16.14	-10.5	7.9
	30	14.5	14.16.16	-11.4	8.6
	15 00	16.8	18.18.18.18	-16.5	2.9
	30	14.9	20.18.18	-14.7	0.8
	16 00	8.7	18.18	- 8.6	1.5
	30	11.4	18.18.18	-11.2	2.0
	17 00	19.8	18.18.18.18.18	-19.5	3.4
	30	19.8	18 18.18.18.18	-19.5	3.4
	18 00	28.0	18.18.16.10	-19.4	13.6
	30	43.8	8.6.14.4.6.4.6.4.4.6 4	25.2	30.0
	19 00	52.4	6.6.6.6.6.6.8 8.10 16.8.8.6	18.5	43.6
	30	55.4	8.8.8.8.6.6.6.6.6.8.8 6.6.6.6	28.9	46.3
	20 00	39.3	6.6.6.6 8.2.4.12.4.10	22.8	31.4
	30	26.5	4.6.36.2.2.4	23.5	8.6
	21 00	24.3	12.4.12 36.2.4	11.5	12.4
	30	33.3	8.2.12.16.8.12.16.4	0.8	22.6
	22 00	25.0	4.4.4.4.12 10.10	10.8	17.9
	30	13.0	10.16.12.14	- 6.0	10.4
	23 00	16.0	14.10.14.12	- 6.5	13.9
	30	21.7	14.16.12.14.14	-13.6	16.2
19/8	0 00	10.8	12.16	- 6.6	7.8
	30	4.8	16	- 4.2	2.4
	1 00	11.2	14.16	- 8.4	7.1
	30	25.8	14.14.14.14 14.14	-16.6	19.8
	2 00	29.9	14.16.14.14.12.12.12.12	-15.8	24.3
	30	20.5	10.10.10.12.12	- 2.8	20.0
	3 00	17.2	14.8.14.36	1.7	9.7
	30	14.2	36.8.12.10	4.3	9.2
	4 00	15.7	16.16.18.34	- 5.5	- 2.0
	30	14.9	12.10.18	- 6.8	10.4
	5 00	9.3	16.14	- 7.1	5.9
	30	8.5	14.14	- 5.5	6.5
	6 00	15.7	36.2.12.10	6.4	7.7

Stat. **F. 50 m.** Instr. 136.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
18/8	0 29	21.2	15.15.15.15.15.15.15.15	-16.2	13.6
	8 00	41.7	6.6.6.6.6.6.6.6.6.6.6.6	26.8	32.0
	16 01	7.6	17.20.20	- 7.4	0.0
	19 03	50.8	5.5.5.5.5.5.5.6.6.6.6.6	36.4	35.1

Stat. **F. 200 m.** Instr. 136.

Date	MET	cm/sec.	Single directions (magn.)	Towards true N	Towards true E
17/8	23 50	25.4	11.11.11.12.12.12.12.12.12. 12.12	- 7.4	24.2
18/8	0 43	24.0	11.11.11.11.11.11.12.12	- 5.0	23.4
	1 19	24.5	10.10.10.10.10.10.10.11.11	- 0.9	24.4
	38	24.1	13.13.13.14.14.14.16.16	-15.0	18.6
	2 03	19.6	13.13.14.14.15.16.16	-13.3	13.8
	24	17.1	15.15.16.16.16.16	-14.3	9.3
	3 41	16.1	12.13.14.15.15.16.16.16.16. 17.18	-12.4	9.3
	4 07	15.4	3.15.15.16.17	- 5.5	8.8
	5 01	28.0	11.11.11.11.11.11.11.11.11.11	- 4.9	27.4
	20	24.2	8.8.8.8.8.9.9.9.9.9.9.9	5.8	23.4
	6 20	27.1	6.6.6.6.6.6.6.7	17.0	21.0
	42	26.3	6.6.6.6.6.6.6.6.6.7	16.6	20.4
	8 14	24.7	6.6.6.6.6.6.6	15.9	18.9
	34	27.3	5.6.6.6.6.7.7.7.7.7.7	15.5	22.2
	9 29	9.7	6.6.6.6.6.6.6.6.7.7	6.0	7.6
	42	27.6	8.8.8.8.8.8.8.8.8.8	9.4	25.9
	59	23.6	7.7.7.7.7.7.7.7	11.8	20.4
	10 22	22.4	8.8.8.8.8.8.8.8.8.9.9	6.9	21.2
	46	21.7	8.8.8.8.8.8.9.9.9.9.9	5.6	20.9

Table II (continued).

Date	MET	cm/sec.	Single directions (magn.)	Towards true		Date	MET	cm/sec.	Single directions (magn.)	Towards true	
				N	E					N	E
	h m						h m				
18/8	11 08	21.4	9.10.10.10.10.10	0.8	21.4	18/8	21 47	30.2	36.36.1.1.1.1.1.2.2	30.0	0.0
1931	25	20.1	9.9.9.10.10.10.10	1.4	20.0	1931	22 05	18.6	26.26	- 6.4	-17.5
	12 19	14.6	10.12.15.15.15	- 7.7	11.4		25	8.9	18.18	- 8.8	1.6
	39	11.5	10.10.10.12.16.17.17.17	- 5.8	7.9		50	34.9	5.5.5.5.5.5.15	17.3	23.8
	13 02	10.6	11.11.11.12.13.14.20	- 4.8	8.0		23 13	22.0	19 19	-22.0	0.0
	25	13.4	7.7.7.7.8.9.10.14.15	1.4	11.6		35	32.8	7.7.7.7.7.9.9.9.10	10.9	30.2
	14 00	13.9	14.15.15.15.15.15.15.15.15. 15.15	-10.5	9.1	19/8	0 37	2.3	19.19	- 2 3	0.0
	32	14.9	12.12.12.12.12.13.13.13.13.13	- 6.3	13.4		1 11	23.4	12.12.13.13.13.15.17.18	-15.5	14.9
	15 23	3.5	33	2.7	- 2.3		36	57.2	6.8.18.19	-13.8	27.1
	44	7.1	10.10.10.10	0.0	7.1		2 03	56.4	6.12.12.12.12	- 7.2	51.2
	16 15	6.0	3.3.7	4.8	3.1		21	37.6	11.11.11.11.11.11.11.11.11.11.11	- 6.5	37.0
	38	7.7	4.6.6.6.6.6.6.6	5.1	5.7		40	37.6	10 10.10.10.10.10.10.10.11.11. 11.11	- 2.7	37.4
	17 05	6.1	1.1.1.5	5.7	1.0		3 21	29.9	10.11.11.11.11.11.17	- 8.2	26.7
	30	6.2	34.34.1.5.5.9	4.6	1.4		4 00	12.7	11.15.16.17.17	- 9.3	7.3
	18 42	23.3	6.6.6.6.6.6.6.6.6.6.6	15.0	17.5		18	20.8	15.15.15.16.16.17.17	-17.7	10.6
	19 20	41.6	7.7.8.8.8.8.19	- 2.5	28.2		35	17.2	15 15.16.17.18	-15.2	7.1
	38	42.9	32.32.8.8.8	20.9	8.4		52	33.5	14.15.15.15.15.15.15.15.16	-25.6	21.5
	56	52.3	20.22.32.32.32	- 2.2	-30.9		5 10	21.5	13.14.14.14.14.14	-13.2	16.9
	20 13	25.6	30.30.30.31.31.32.32.32	12.7	-21.9		27	13.6	14.15.16.16.17	-11.1	7.5
	31	46.3	20.33.34.34	9.6	-23.6		43	23.5	10 10.10.11.11.12.12.12	- 4.0	22.9
	21 28	49.5									