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METEOROLOGICAL RESULTS OF THE *BALAENA* EXPEDITION 1946–47

BY

H. H. LAMB, M.A.

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METEOROLOGICAL RESULTS OF THE *BALAENA* EXPEDITION 1946-47

SUMMARY

Part I of this Memoir describes the general organization of the *Balaena* expedition and the meteorological arrangements, including instrumental gear. Certain aspects of the unknown geography of the Antarctic continent and its bearing upon the meteorological work are considered here and in the later sections. Part II presents the meteorological results in terms of observation summaries and such lessons as can safely be learnt from them. The observations themselves are fully tabulated in the Appendices. An important part of the effort on this expedition was devoted to weather analysis over the Southern Ocean and to the experimental provision of a forecasting service for the remote Antarctic whaling grounds in the Indian Ocean and Australian sector. Part III consists of a description of the methods used and an appraisal of this forecasting experiment ; the lessons of weather analysis in the regions covered have a wider interest as part of the general circulation of the atmosphere.

The best maps of Antarctica and the off-lying islands, reefs and ice-shelves, which the reader may find helpful in studying this report of the *Balaena* expedition, are amongst the items listed in the classified bibliography.

PART I—INTRODUCTORY

§ 1—ORGANIZATION OF THE EXPEDITION

The floating factory *Balaena*, which sailed from Belfast on September 27, 1946, was a new ship built for United Whalers Limited of London in Harland and Wolff's yards since the end of the war in 1945. Following the disappointing catches of the first post-war expeditions to the Antarctic whaling grounds in 1945–46, provision was made for aircraft to be carried on the new factory to help in spotting whales. Provision was also made for extensive development of by-products such as meat meal, bouillon (meat extract for soups etc.), bone meal and frozen meat, as well as the production of oil from the whales caught. The 32,000 tons displacement of the ship gave none too much room for all the varied activities on board, which, apart from the boilers and tanks for producing and storing whale-oil, the plants for each of the by-products, and the gear for dismembering the whales on deck, had to include cabin and messing accommodation for the 400 men of the ship's company as well as carpenter's shop, forge, fitter's shop and stores for operating, repairing and provisioning the fleet of a dozen steam-driven whale-catchers, each a vessel of 200–300 tons.

The aircraft carried on the factory were two Walrus amphibians. The stern end of the boat deck on the factory was equipped as a flight-deck, with a hangar for two aircraft, catapult for launching and crane for recovery of the machines from the water after alighting. The aircraft

could be catapulted into the air with a free load of 1,600 lb. or could take off from the sea carrying 1,400 lb. over and above their own weight. Their flights, mainly of 3–4-hr. duration, went up to a maximum distance of 125 nautical miles away from the ship, and were used for whale-spotting, reconnaissance of ice conditions and of unknown sections of the coast of the Antarctic continent, and for obtaining meteorological data. The crew of each aircraft consisted of three men : pilot, navigator-observer and radio-operator. All were ex-Fleet Air Arm men except one of the radio-operators, who was a Norwegian for convenience in talking with the Norwegian crews of the whale-boats over the radio-telephone. In charge of the air party was ex-R.A.F. Wing-Cmdr J. Grierson.

The factory was equipped with radar and radio direction-finding apparatus for controlling aircraft and whale-boats. As a further safety measure for the flying operations it was deemed necessary to have a meteorologist on board to give professional advice on weather prospects before and during every flight. It was also hoped that a meteorologist's advice might help the whale-boats, the operations of which are considerably affected by " thick weather " (bad visibility) and rough seas.

The only previous attempt to use aircraft in connexion with whaling in Antarctic waters was made by a Norwegian whaling company in 1929 without any special aids, and resulted in the aeroplane and its crew being lost without trace in thick weather. Meteorologists had accompanied several previous Antarctic expeditions to make observations, and Simpson's account[20]* of his work with Scott's last expedition in 1910–13 has been a standard work on south polar meteorology ever since. Nevertheless it is believed that no previous attempt had been made to operate a weather-forecasting service in the Antarctic. This was included in the terms of reference of the meteorologist's duties on the *Balaena*, and the task was accepted on an experimental basis in the hope that the lessons of weather forecasting for the North Atlantic air route—sometimes without the aid of ships' reports during the recent war—would prove applicable to the problems of the Far South.

As it turned out, the *Balaena*'s aircraft were not needed for whale-spotting to anything like the extent expected, owing to the abundance of whales found in southern waters in the 1946–47 season ; nevertheless their work on the location of sperm whales, which dive and disappear under the water for 15 min. and more at a time, was of real value during the November fishing. International whaling regulations lay down a limited season each year, during which alone the great blue and fin whales may be taken. Otherwise the species would soon be exterminated. Sperm whales are not protected, and were caught during November and up to December 8, when the season for the blue and fin whales began.

The aircraft also obtained interesting information about the distribution of pack-ice, as well as valuable coastal photographs and weather observations ; 96 flying hours were completed. This has therefore been the first successful venture of its kind with a clean safety record, and at the same time the first example of a regularly maintained weather-forecasting service in the Antarctic based on routine daily weather maps.

That it was, in fact, possible to make consistent weather maps where the observation network was so sparse was something of a surprise, and undoubtedly reflects the comparatively regular manner in which the known processes of atmospheric circulation work themselves out over the world's widest ocean. It had been hoped that weather reports would be transmitted by each of the 13 floating factories operating in the Antarctic ; but this came to nothing owing to the highly competitive nature of the whaling industry, and the reluctance of the whaling ships to give away their positions to each other. This meant that the *Balaena* was often over 2,000 miles

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* The index numbers refer to the bibliography on p. 27.

from the nearest weather-observing station from which reports could be received. The weather maps so drawn were not accepted without careful examination in the light of any checks that became available ; the methods used and the conclusions drawn are discussed in a later section of this report. An altogether subsequent check of the charts against the log of one of these other factories, operating in high latitudes in the region between the Falkland Islands and the *Balaena*, for which no reports had been available when the charts were drawn, indicated the following probable errors : pressure ± 6·8 mb., wind ±33° and about 1 unit of Beaufort force, trough and ridge positions about 150–190 miles.

§ 2—ROUTE AND DETAILS OF THE VOYAGE

The *Balaena* sailed first to Tönsberg, Norway, to pick up the whaling crew from that district of south Norway which has almost a world monopoly of whaling skill and experience. Her master, Capt. R. Pedersen, the chief officer, 2nd, 3rd and 4th mates, the chief, 2nd and 3rd radio-operators, and all the engineers were also Norwegians. The ship's company of nearly 400 men contained some 80–90 who were not Norwegians, these being mainly British, Irish and South Africans. Thus, although the ship bore British registration, the British party on board was limited to the whaling inspector, the air party, certain chemists and scientists representing the *Discovery* Committee of the Colonial Office and the Department of Scientific and Industrial Research, the author as meteorologist, and the 5th mate, as well as a good many of the unskilled labourers on deck. The Chairman of United Whalers Ltd, Mr. R. de B. Trouton, was also on board until early in January 1947, when a visiting tanker took off the first consignment of oil for shipment to the United Kingdom.

Calling at Southampton, the Canary Islands and Cape Town for stores and bunkers, the floating factory reached Antarctic waters and started fishing for sperm whales near 55° S. 40° E. on November 17, 1946.

At first there was no meteorological working room. The decision to allot a special room to meteorology and flying-control was taken shortly before reaching Cape Town on the outward voyage ; a store-room amidships was converted for this purpose and suitably fitted out in Cape Town. At the same time it was also decided to take on an extra radio-operator assigned solely to work on the reception of meteorological messages, and to provide a set for this purpose in the new meteorological room. These generous decisions altered the entire prospect of success of the meteorological venture on this expedition.

Weather forecasts for practice flights on the voyage south before reaching Cape Town had been made under cramped conditions in the ship's smoke room, and at the cost of some hardship to the regular users of that room. The barometers and barograph, used in making the routine observations, had been set up in the same room, and were left there in view of the vibration in the new meteorological room caused by the winches overhead. A corner of the hangar was reserved for the pilot-balloon equipment and the gas cylinder in use, and the balloons were sent up from the flight-deck astern. This scatter of the meteorological equipment for'ard, amidships and astern, resulting in many journeys of up to 10 min. which were awkward when whaling was in progress, was unavoidable.

From 55°S. 40°E. the expedition proceeded on an erratic and variable course, governed by the whaling operations, in a general south-easterly direction. On December 6, 1946 a point 60°41′S. was reached in 68°E. at the finish of the sperm fishing. The opening of the season for blue and fin whales on December 8 found the *Balaena* moving rather further north again to reach 55°S. 81°E. on the 9th. The 60° parallel was passed once more on January 9 in 85°E., and from there the factory went on south and east, halting occasionally to linger for some days in areas

FIG. 1—MAP OF THE VOYAGE

where many whales were found, to about 65°S. 114°E. on March 3, 1947. This point, in the Australian sector of the Antarctic, was the furthest point reached (see Fig. 1*). The most southerly point reached by the factory was 65°24′S. 110°35′E. on February 24.

* For fuller details of the geography see the maps listed in the bibliography (p. 27). The navigation charts are not always reliable owing to the unavoidable use of dead-reckoning positions, which may be considerably at fault after days of overcast skies.

Something was seen of the little known coast of Antarctica between 108° and 113°E. ; the author made sketches of the line of coastal hills on two occasions when very clear weather permitted (see Fig. 2), using field glasses to verify the main features since the distance was estimated to range from 30 to 60 nautical miles. In making these sketches a bearing taken on a three-pointed hill was found to check with the position of a similar feature over which one of the aeroplanes had flown a few days previously ; the position of the hill may therefore be given with some confidence as 66°10′S. 110°00′E. The air party reported these hills as bare rock, the only occasion on which they confidently observed snow-free surfaces.

Their flights took them over the coast between 108° and 110°E. and over the Shackleton shelf-ice in 97–98°E. ; the sketch, made from the factory in 65°18′S. 111°00′E. on February 22, as well as observations made by the officer of the watch and the author in the very early hours of March 8, when the dead-reckoning position was 65°S. 112½°E., seem to confirm the problematical Budd Land coast which is shown on the Admiralty charts but whose existence was doubted in the latest amendments to the " Antarctic Pilot ". Two large dome-shaped masses of ice, one 8–10 miles across near 64°00′S. 100°35′E. and the other 3–4 miles long near 64°00′S. 99°40′E., both seen from the factory on February 4 and 5, were considered to be either glaciated islands or reefs ; a row of icebergs and congested pack-ice seemed to be stranded along an east–west line and the ship, steaming towards this ice, got depth soundings showing 180–200 fathoms in 63°46′S. 100°30′E. decreasing to 46 fathoms in 63°50′S. 100°18′E. at which point it was thought inadvisable to go nearer. These observations are thought to amplify, and possibly amend a little, the existing charts.

Meteorological effects, attributed to the topographical influences of the land to the south, were experienced at many points south of 62–63°S. Some of these, which emerged as regular features of the weather maps used in day-to-day forecasting, prompted certain preliminary conclusions about the shape of major features of the unseen land, and it will be interesting to see if these conclusions are eventually confirmed by direct observation. The requirements of a forecasting service compelled a bold policy in the interpretation of observed meteorological effects which can only be attributed to the unknown topography. This aspect and implications of the meteorological work on the *Balaena* expedition formed the subject of a special article in the *Geographical Journal*[11] (see also bibliography Nos. 10, 15, 17 and 18). The geographical examination of the *Balaena* observations, and of such other observations as came to hand occasionally, suggests that the climate and circulation of the atmosphere over at least the southern parts of the Southern Ocean and Antarctic coast are by no means so uniform and devoid of characteristic regional differences as had been supposed. From the observations of a single, moving ship one cannot make any final conclusions regarding the climate of regions in which the vessel is only a passing visitor, staying at most for a week or two ; but the weather maps, prepared daily on the basis of all the observations available from land and sea around the Southern Ocean during the *Balaena*'s voyage, do suggest characteristic regional differences associated with circulation patterns controlled, at least partly, by the subtropical anticyclones, which steer the warm air currents into higher latitudes.

In the last few weeks of whaling the expedition worked its way west along the edge of the pack-ice, thus obtaining a synoptic view of a thousand miles of the ice limit at the end of the melting season[38,39]. The ice reached out northwards as far as 62°30′S. in a great headland about 101°E. in mid March. As against this, earlier in the month, the whale-boats had reported that there was no ice at all off the coast of the continent in 65½°S. 116°E. When the whaling season ended on April 7, the last whales were taken near the edge of the ice in 63°S. 84°E. From there the homeward voyage continued due west to 44°E., the water becoming more and more open and free of ice as the *Balaena* approached the stormy sector off the coast of Enderby Land.

The passage through the Fifties and the Roaring Forties on the homeward journey to Cape Town was one of prolonged storm. Derricks broke adrift from the whale-factory ship and the little whale-boats spent days hove to or proceeding at slow speed against the weather.

The voyage gave opportunities of gathering some data about ocean swells and about the water-temperature discontinuities, known as the antarctic convergence and subtropical convergence, which are used to define the limits of the antarctic and subtropical climates and of the Southern Ocean proper between them. By force of circumstances these were, in each case, only sample observations of a few separate occasions.

The term " Antarctic " in the following text, has been used to mean the regions south of the antarctic convergence[14] which is found in 50–55°S. in the sectors visited. These are the regions customarily referred to as the Antarctic zone of the Southern Ocean, where the whaling grounds are. The usage is climatic rather than geographical, since the Antarctic Circle runs close to the coast of the Antarctic continent and at some points south of it in the Indian Ocean sector.

§ 3—METEOROLOGICAL WORK

Ninety pilot-balloon ascents were made in the Antarctic from the flight-deck of the *Balaena*, of which 13 reached 10,000 ft. or over. The highest balloon was followed to 55,000 ft., and one other (in 59°S. 81°E. on December 28, 1946) was observed to enter a sheet of cirrus and cirrostratus at 43,500 ft. On several occasions 2 or 3 balloons were sent up in succession with results consistent enough to warrant some confidence in the method. This was a necessary test, as an ordinary land-station's theodolite and tripod had to be used. Fortunately moderate and slight seas were common, whilst dead calm water was not unknown and the ship was then steady. Much more difficulty was caused by the prevalence of overcast skies in many parts of the great ocean and by the frequent alterations of course of the factory when picking up whales from the catchers (whale-boats). Fourteen more pilot-balloon ascents were made in tropical waters between 20°S. and 12°N. on the way home, observations from 9 of which are included in Appendix III. The speed and vibration of the ship when steaming at full speed limited these accents to 7,000 ft. or less, but it is thought unlikely that many such observations from these waters in the Atlantic exist at all.

The *Balaena*'s aircraft flew mainly at about 1,000 ft. on their normal operations ; but 12 special ascents were made to read upper air temperatures, and of these 4 reached 10,000 ft.

These data are tabulated in the Appendices to this report together with the routine surface observations made on the factory. Owing to the many aspects of the meteorological work on this voyage and to the fact that the officers of the watch were not permitted by the captain to take part in the official observation routine, observations could only be made at 6-hr. intervals, and of these one each day was compiled afterwards from the recording instruments and the ship's (Norwegian) log.

The ship called in at Cape Town homeward bound on April 20, and left on the 23rd. On this visit, as on the outward voyage, the author had cause to be grateful for the help received from Lt-Com. Britton and Lt-Com. Morgan of the Naval Meteorological Research Station, Simonstown.

Observations were continued until the ship reached Southampton on May 11, 1947, where the author left the ship. The meteorological equipment remained on board, until the ship, having taken her Norwegian crew home to Norway, returned to Liverpool to discharge her cargo.

§ 4—INSTRUMENTS AND EQUIPMENT

The following instruments and equipment were taken.

Instruments.—

Marine-type mercury barometers, slung in gimbals and equipped with Gold slides
Open-scale barograph
Thermometers (Mk IA—porcelain scale reading −15° to +115°F.), air protectors and sea protectors, canvas buckets (Mk II) and small glass water jars for wet-bulb thermometers
Assmann psychrometer with 4 certified thermometers reading 0° to 100°F.
Distant-recording thermograph (dry bulb and wet bulb)
Ship's modified portable screens
Hair hygrograph
Hydrometers
Cup generator anemometer (Mk IA)
Portable cloud searchlight
Portable alidade for use with the searchlight
5-in. Snowdon rain-gauges with bottles and measuring glasses
Aircraft strut psychrometers (Mk VIA low-temperature model reading −60° to +80°F. and with a safety chamber at the top of the stem permitting exposure to temperatures up to +120°F. during the voyage through tropical waters)
Aircraft aneroids (Mk IIB)
Camera.

Pilot-balloon equipment.—

Marine sextant
Theodolite (Mk IV) and tripod
Stop-watches
400, 48-in. balloons (assorted colours) 400 ft./min.
350, 90-in. balloons (assorted colours) 500 ft./min.
12, large balloons (100 gm., red) 1,000 ft./min.
15, 200 cu.ft. hydrogen cylinders, fine-adjustment valve, filling keys and a pressure gauge.

A bigger proportion of large balloons would have been useful, in order to take advantage of the all-too-brief and infrequent occurences of favourable conditions for following pilot balloons to considerable heights over the Southern Ocean. It was not feasible to undertake radio-sonde or radar-wind observations aboard this ship for a variety of practical reasons.

Serious difficulty was experienced with the hair hygrograph, owing to the corrosive effect of the vapours contained in the fumes from the whale-factory boilers in which the whale-oil is produced. The oily deposit from these vapours also fouled the hairs with remarkable rapidity. Other instruments suffered from the same trouble though in a less severe form. The hair hygrograph and the cloud searchlight might well have been omitted from the equipment as it happened, the latter being ineffective in the long daylight of summer in the Far South.

The marine sextant proved unsatisfactory for pilot-balloon work, but was extensively used for taking the elevations of remote cloud features and thus gauging their distances by use of an assumed height. (The estimation curves used have been published elsewhere[40].)

A recording thermometer exposed in one of the engine or refrigerator-plant intakes 15 ft. below the surface forward on the factory-ship for measuring the temperature of the sea water continuously would have been a valuable addition to the equipment. However, successive observations of sea temperature at intervals of 4 hr., and in some cases less, on *Balaena*'s two crossings of the Southern Ocean are presented as curves in Fig. 3.

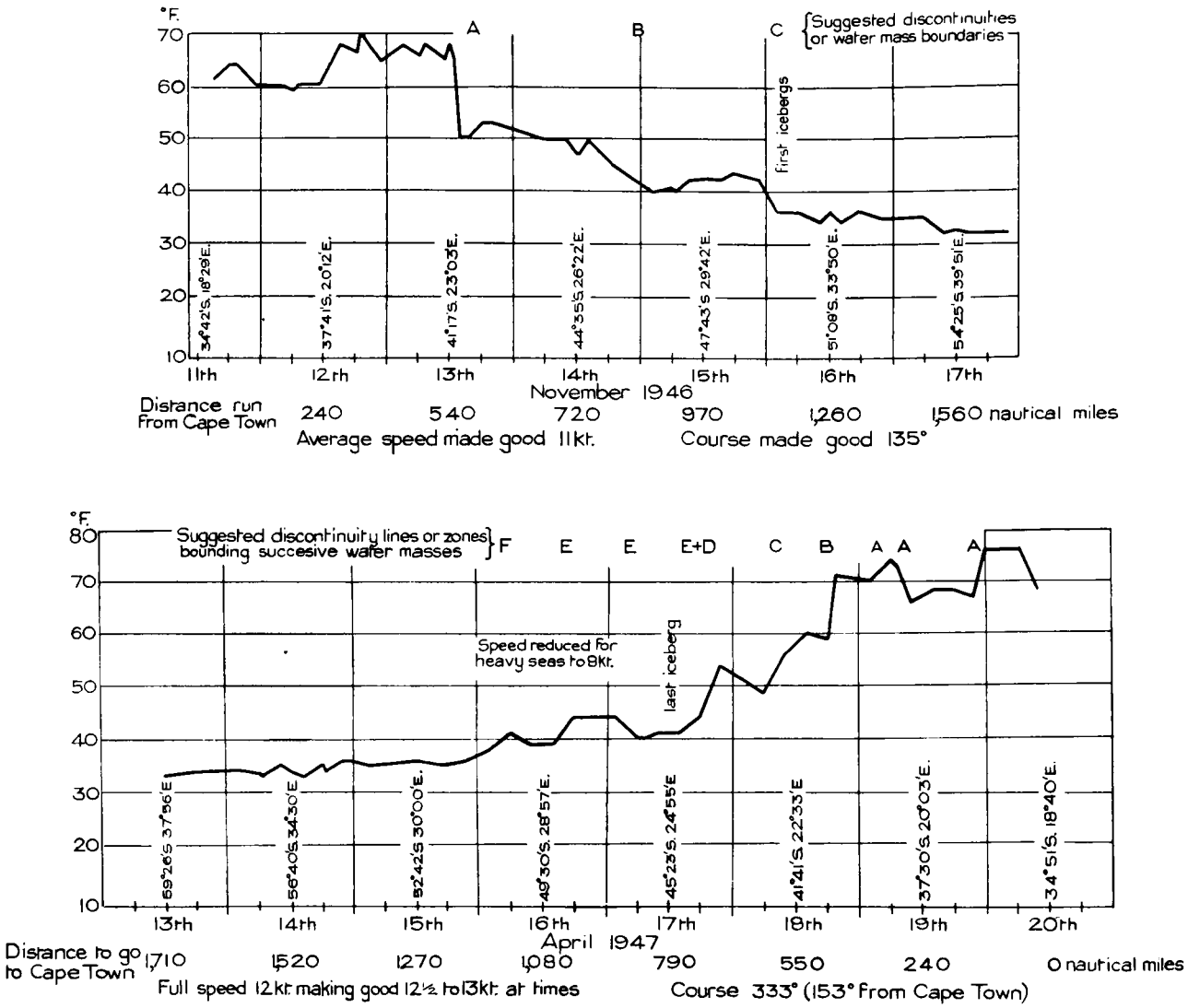
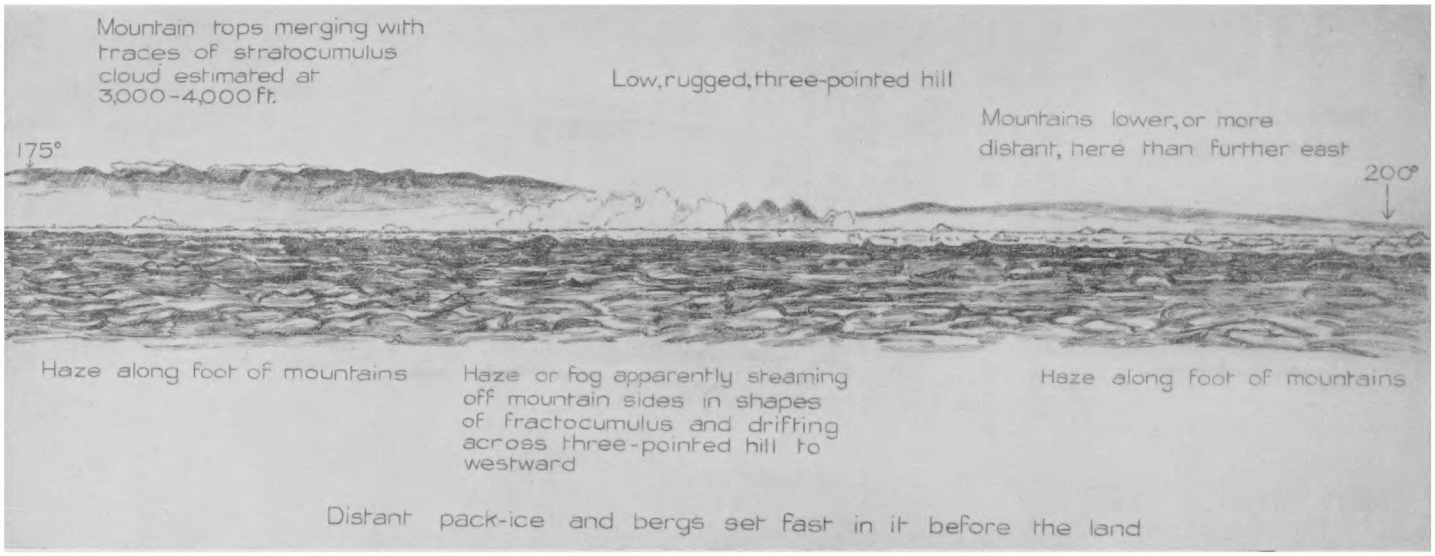


FIG. 3—SEA-WATER SURFACE TEMPERATURES RECORDED ON THE OUTWARD AND RETURN VOYAGES OF THE *BALAENA* ACROSS THE SOUTHERN OCEAN

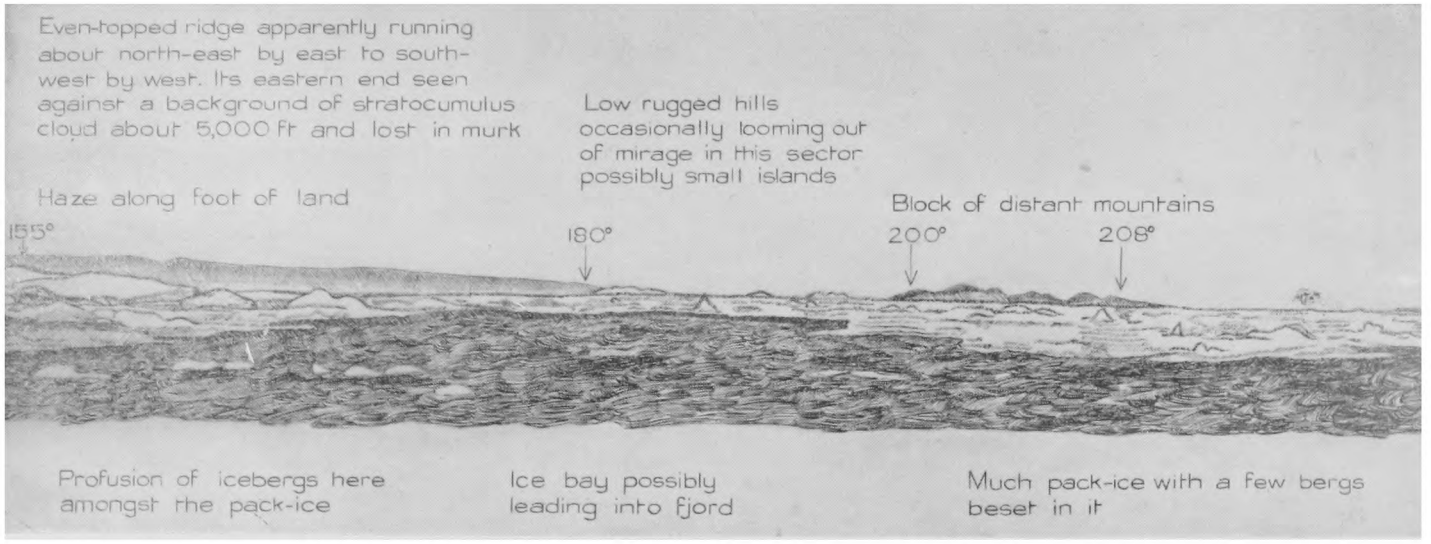
The Centigrade scale of temperature was used for reports on board in response to general demand.

The equipment included two Snowdon rain-gauges which were not, however, found suitable for measuring precipitation in the Far South without considerable adaptation. An electrical heating element was introduced to melt snow entering the funnel of the gauge, but the heat applied had to be kept down to avoid evaporation. The nice adjustment of this heating which was necessary could not be achieved in the lowest temperatures observed.

Exposure of the rain-gauges also presented difficulties. A position hoisted to the yard-arm on the foremast was generally considered best. This position was high enough to avoid collecting salt water from spray except during the outward and homeward ocean crossings of the Roaring Forties and Fifties, but the yard-arm position suffered at times from over-exposure



Seen from the *Balaena* at 64 56′S. 109 57′E. at 0600 G.M.T. February 22, 1947; sketch made at great distance from coast in extreme visibility shortly after weather and sky had cleared. Maximum elevation angle of mountains 15 min. of arc at bearings of 180-185°

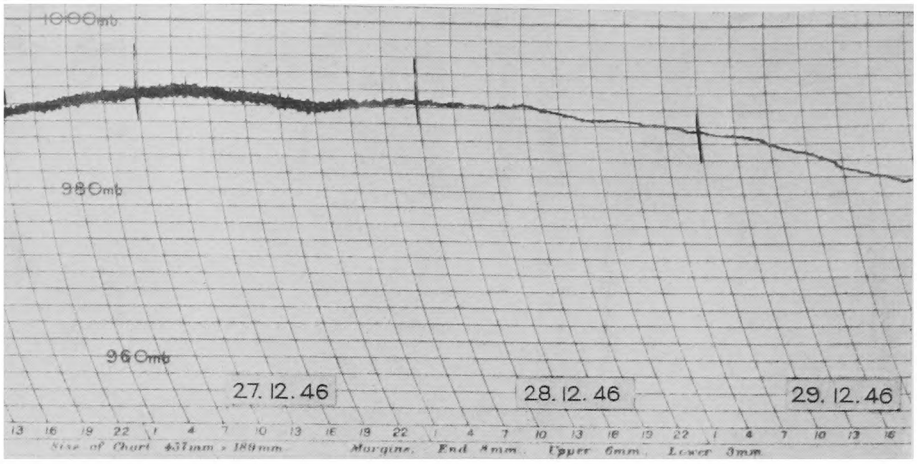


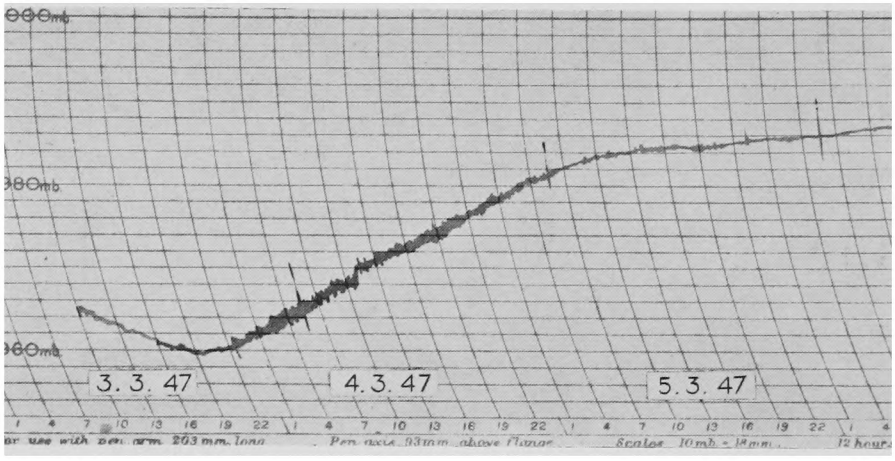
Seen from the *Balaena* at 65 18′S. 111 00′E. at 1200 G.M.T. February 22, 1947; sketch made at 30-50 miles from coast in extreme visibility

FIG. 2—SKETCHES OF THE COASTAL RANGES OF ANTARCTICA

facing p. 10

facing p. 11





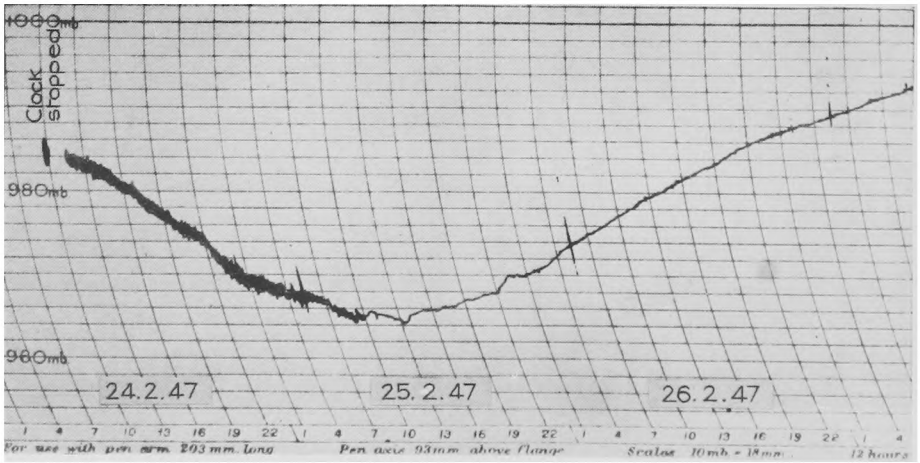


FIG. 4—SPECIMEN BAROGRAMS DURING PERIODS OF HEAVY AND SMOOTH SEAS

through snow being blown out of the funnel. In very strong winds the vessel behaved as a serious obstacle in the path of the wind, and the trajectories of the snow-flakes could be seen to rise as they passed over the ship in the course of a long wave-like undulation ; in these circumstances there could be no good exposure for a rain-gauge on board. In practice, measurements of equivalent rainfall were fairly successful, using the modified gauges in different exposures for purposes of comparison from November until mid February, but thereafter (when the season became colder and stormier) these had to be eked out by estimations. In making estimates it was usual to consider chiefly the depth of the most evenly spread accumulation of new snow on the open deck.

Apart from these difficulties the instrumental equipment suited its purpose admirably*.

The barograms show that occasional broadening of the trace was almost entirely due to the rolling and pitching of the ship in heavy seas. This conclusion may be illustrated by the specimen baragrams shown in Fig. 4. The instrument was an ordinary land-station's open-scale barograph, mounted on an eight-times folded soft woollen blanket. This mounting was used throughout the voyage after early experiments with various suspensions had shown that it was the best that could be contrived with the materials available on board.

Where the pack-ice afforded shelter heavy seas did not invariably accompany strong winds, and the effects of each upon the behaviour of the barograph could therefore be studied separately. The broadest traces (3–3½ mb. broad) were recorded on the outward and homeward voyages when the *Balaena* was steaming through the heavy swells of the Roaring Forties and Fifties, actually with winds between Beaufort forces 5 and 8.

The trace for February 24–26, 1947 (Fig. 4) was recorded near the ice margin in 65°S. 113°E. when a SE. wind of force 11 was observed. The swell was less severe than in the crossings of the open ocean, where gales of up to force 8 blew over a far longer fetch of open water. Moreover the trace shown in the figure became fine around 1000 G.M.T. on the 25th as soon as the swell ceased ; the wind was still over force 6 but beginning to come directly off the ice in the neighbourhood of the vessel. The trace for March 3–5, 1947 (Fig. 4) was recorded near the same position. In this storm the barograph record remained fine till about 2200 G.M.T. on the 3rd, when the wind had been blowing force 6–9 all day and was actually beginning to moderate. There had been only slight swell with the wind off the ice, but at this time a moderate north-easterly swell began to reach the ship. The trace for December 27–28, 1946 (Fig. 4) recorded near 58°S. 80° E. appears rather broad in a period with light winds, force 1–3, accompanied by moderate to heavy swell from a distant disturbance.

The barograph was set fore and aft in the vessel, and oscillations of the arm appeared to keep in phase with the motion of the ship. With heavy swells coming from points abeam, the rolling of the vessel carried the pen arm back and forth between the barogram on the clockwork drum and the glass of the case. Pitching and rolling in the heaviest seas produced about the same broadening of the trace, which was therefore attributed largely to the mechanical accelerations associated with the motion of the ship†. Because of this, the barograms present, incidentally, a record of the heavy seas experienced during the voyage. The specimens reproduced in Fig. 4, and many others in the full set recorded on the voyage, indicated that in none of the cases experienced was the distribution of strong winds and heavy seas about a travelling depression symmetrical or even approximately symmetrical.

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* Fuller details of tests of instruments and experience with their exposures, maintenance, etc., are available in the Meteorological Office.

† Fuller discussion of these barograms and of the problem of obtaining good traces from barographs in ships at sea has been published elsewhere[41]. The full observations of wind and sea are given in Appendix I to this report.

Probably the most striking results of the instrumental observations are the consistently low values of atmospheric pressure and the low rainfall aggregate obtained in high southern latitudes.

PART II—RESULTS OF THE OBSERVATIONAL WORK

§ 5—GENERAL

The quotation of averages and statistics from the observations of one moving ship, visiting various regions in the course of a single southern summer and autumn, can have little meaning unless great care is exercised in the manner in which the data are grouped and considered. It has been thought best to present selected observations of special interest and to point to what appear to be significant trends.

Certain occurrences which had commonly been considered as unusual are to be noted in the observations tabulated in Appendix I, for instance :

The prevalence of overcast and nearly overcast skies on the voyage south through the zone of SE. trade winds in the South Atlantic Ocean seems worthy of mention. These skies included some frontal (altostratus) cloud sheets. At one other observation, in 24°S., 10 tenths stratus at 800 ft. was reported.

After the vessel had left Cape Town for the south a vigorous depression passed north of the *Balaena* giving easterly winds up to force 7 in the Roaring Forties ; auxiliary vessels some 100–200 miles farther south, proceeding ahead of the *Balaena*, reported light, variable winds during this time.

The frequency of occurrence of cumulus and cumulonimbus cloud in the Far South was noteworthy. So too was the observed occurrence of frontal cloud systems, one of which (1800, March 17, 1947) contained embedded cumulonimbus, emerging from the interior of Antarctica (see pp. 23 and 51).

One special weather condition, which occurred several times and may be considered as an occasional characteristic of the Far South, is exemplified by the observation for 0600 G.M.T. on January 14, 1947 (see Appendix I). This condition might be described as " snow from clear sky " ; in such cases the sun or moon, at night occasionally also some stars or the aurora australis, is visible owing to the extremely thin texture of the cloud. In the observation quoted fairly copious, but moderately fine, snow was falling none the less ; the thin altostratus reported had been identified before the snow began, patches of poorer visibility drifting past the ship were interpreted as 8 tenths of fractostratus/fractonimbus forming at surface level in the falling snow. The clouds, although all of thin texture, may not have been entirely ice crystals, as the surface temperature on this occasion was 33·7°F. (+1·0°C.).

§ 6—UPPER AIR OBSERVATIONS

A deeper troposphere than had been commonly supposed to occur in high southern latitudes was indicated by a pilot balloon entering cirrus cloud at 43,500 ft. near 59°S. 81°E. on December 28, 1946. Comparable observations of the height of the tropopause (if allowance be made for about 5° difference in latitude) have come to hand in the radio-sonde records during the same season from the Dutch whaling ship *Willem Barendsz* (operating mainly south of 60°S. in the Atlantic sector) though these would suggest that the tropopause is somewhat lower on most days.

Low cloud limited pilot-balloon work in the stronger easterly winds, hampering efforts to explore the depth of the easterly current. Although the easterly components generally decreased upwards, this was not so in all cases ; the balloon of January 18, 1947 showed increasing SE. wind up to 134° 36 kt. at 13,000 ft., the greatest height reached. This was the deepest, so-called

" solid " easterly current probed. The prevailing westerly currents of the upper levels of the troposphere were however distorted or replaced by southerlies and northerlies on a number of occasions ; and it is clear that when the wind in the lowest layers was easterly the currents between 10,000 and 20,000 ft. were commonly light airs from various directions.

The highest-level wind observation of all was 166° 14 kt. at 55,000 ft. on January 24, 1947 in 63½°S. 97½°E. This was in an anticyclonic situation with light southerly and south-westerly winds in the lower levels. There were several progressive changes aloft in this ascent : to 268° 9 kt. at 14,000 ft., 153° 19 kt. at 28,000 ft., and 280° 22 kt. at 41,000 ft. Samples of typical deep westerly currents are given by the ascents on December 16, 1946 at 0800, on January 7, 1947 at 1100 and on March 7, 1947 at 0900, the last named being in 65°S. (see Appendix II).

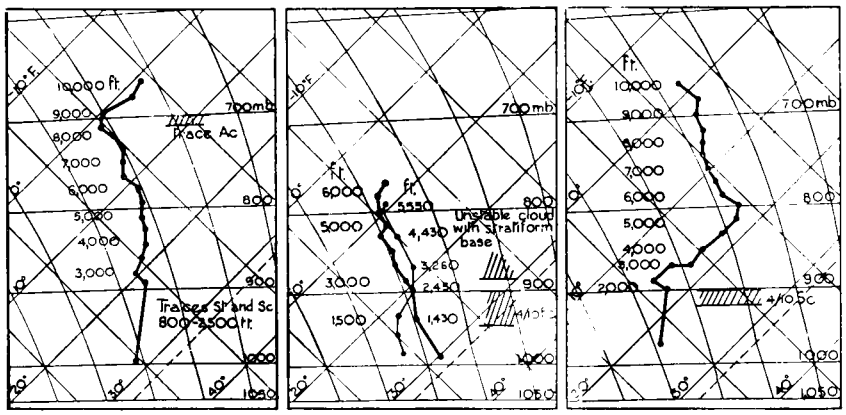

FIG. 5—TEPHIGRAMS OF AIRCRAFT OBSERVATIONS IN THE SOUTHERN OCEAN
Observations were usually made at 500-ft. intervals

(*a*) in 65°18′S. 110°00′E. at 0430 G.M.T., February 11, 1947

(*b*) in 65°18′S. 113°48′E. at 0540 G.M.T., March 8, 1947 (thick line) and in 65°42′S. 116 12′E. at 0650 G.M.T., March 8, 1947, in clear patch with towering cumulus further east (thin line)

(*c*) in 64°18′S. 106°18′E. at 0830 G.M.T., March 15, 1947

Sample upper air temperature soundings made by the *Balaena*'s Walrus aircraft are plotted in Fig. 5. The ascent on February 11, 1947 was made in a deep westerly current in high latitudes, the centre of lowest pressure being estimated over Wilkes Land in 65–70°S. 125–130°E. ; the lapse rate approached the saturated adiabatic in the surface air mass up to 8,500 ft. The ascents on March 8, 1947 were made in a stagnant situation with what was presumed to be antarctic continental air over open water close to the coast in 114–116°E. ; instability was indicated by the growth of towering cumulus and altocumulus castellatus clouds, with tops in sight probably reaching 20,000 ft. over the coastal mountains. The sky looked thundery—this being the only occasion during our sojourn in high southern latitudes when it did—although most of the cloud had a high base and no thunder was heard. Small hail fell in a brief shower over the ship. Another type of situation is represented by the ascent of March 15, 1947 with south-westerly winds and a ridge of high pressure thrusting out from Antarctica ; the stable layer and clear sky above the stratocumulus top at 2,000 ft. probably indicated subsidence.

These ascents dispel any idea of an ever-present surface inversion over the cold waters of the Far South, at any rate in the sector visited, even in summer. There were usually indications of subsidence inversions between 2,000 and 4,000 ft. in fine weather ; at other times unstable air masses often separated in the vertical plane by thin, stable layers were common.

§ 7—SURFACE WEATHER OBSERVATIONS

The mean of all the *Balaena*'s pressure observations in five months south of 50°S. was 982·2 mb. with a standard deviation of 9·0 mb. This is consistent with the generally low level of pressure represented by all available annual mean pressure values south of 50°S. It is rather lower than any of the known annual means (the lowest being 986·5 mb. at Mawson's Queen Mary Land base, near the coast in the same sector in 66°S. 95°E.*). During the 1946–47 season another whaler, *Empire Victory*, operating around 63°S. 84°E. over a more restricted area than the *Balaena*, had a mean pressure value of 985 mb. for 4 months. All the available reports during the same period in other sectors, including some from whaling ships in the Weddell Sea, show values within 2 mb. of the known annual means†. These figures therefore suggest that a complete annual mean pressure map for the southern hemisphere would show a centre of lowest pressure in the Indian Ocean sector. The author has ventured to put forward the suggested map of annual mean pressure[31]** shown in Fig. 6, which makes use of all previously known data and has been extended to cover the hemisphere in the light of the indications described. The sector over Antarctica follows Meinardus[13] with very slight adjustments where the *Balaena* daily

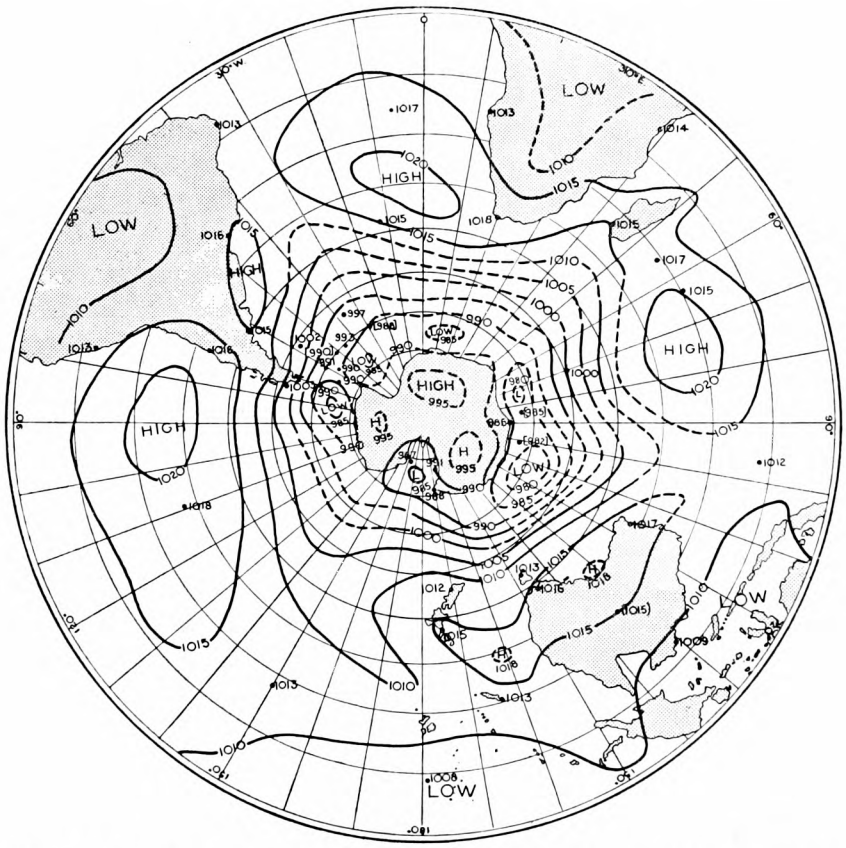

FIG. 6—SUGGESTED ANNUAL MEAN PRESSURE PATTERN OVER THE SOUTHERN HEMISPHERE

Figures in square brackets taken from the 1946–47 whaling vessels' observations, using these figures as indicative of the probable yearly values over the same parts of the Southern Ocean

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* The German expedition ship *Gauss* had a mean pressure of 986 mb. over 11 months, when she was ice bound near 66°S. 90°E., also in the same sector[13]

† See map of annual pressure given by Shaw[33].

** The reader may also be referred to numerous maps of monthly mean pressure for individual months over Antarctica and the Southern Ocean, published in *Notos*[30], for the years since 1951.

weather maps suggested the recurrent appearance of troughs or ridges probably attributable to topographical influences. Any such attempt to complete the map of annual means for the southern hemisphere must necessarily show many broken lines where details remain uncertain, but it appears that the main concentrations of pressure gradient on this map correspond well with the regions and sectors where the most recurrent storminess has been reported, and that the cols in the belt of subtropical anticyclones indicate important frontogenetic regions.

Pressures observed, even in good weather in extensions or offshoots of the antarctic anticyclones over the surrounding ocean, were low by comparison with those experienced in the northern hemisphere and ranged from 988 mb. to about 1010 mb.—the latter figure coming from the Weddell Sea region. The *Balaena* only once recorded pressure over 1000 mb. south of 60°S., 1002·3 mb. being observed near 63°S. 96°E. on January 24, 1947.

These figures hint at an unequal division of the atmosphere between the northern and southern hemispheres for which there is a good deal of other evidence. A similar conclusion might indeed be suggested by comparison of the highest and lowest pressures ever observed in the northern and southern polar regions, since mean values for really long periods of years are lacking. The lowest pressure observations reported in 3–4 yr. at Macquarie Island (54°S. 159°E.) and at Scott's base (77½°S. 166½°E.) were close to 940 mb., whilst the highest figure in 4 yr. at the latter station was only 1024·4 mb. in spite of its proximity to the central regions of the Antarctic anticyclones. The highest pressure recorded in Antarctica prior to 1946 was 1030·5 mb., observed in September 1912 at Commonwealth Bay (67°S. 143°E.). Pressures of 1032–1035 mb. have been recorded on two occasions since—actually in 1946 and 1952—in Graham Land[16], where there is now a considerable network of permanent observing stations operated by the Falkland Islands Dependencies Survey. The lowest pressure recorded anywhere on the Antarctic continent so far is 932·5 mb.—actually at Little America in 78°S. (Ross Sea sector) in September 1940[6]*. A pressure of 927·7 mb. was observed by R.R.S. *Discovery* near 67°S. 80°W. in the Bellingshausen Sea in 1932[44]. Thus, on the one hand the lowest pressures in the Antarctic are comparable with (or rather lower than) those likely to be obtained in any 4-yr. period in the Far North, the highest pressures certainly do not come within 20 mb. of the maxima reached in most winters in northern Greenland and Siberia. It seems clear that the mass of air contained in the southern polar regions within, say, the 50°S. circle is habitually less than in the corresponding northern polar cap, especially when allowance is made for the high land mass of Antarctica.

The explanation probably lies in the recurrent strong westerly winds blowing over the main width of the Southern Ocean where there are few features to maintain any large-scale meridional transport of air. The geographical disposition of the southern continents, whose heated land surfaces are relatively small and far away, can hardly favour the development of such great, more or less stationary, blocking waves of warm air intruding into high latitudes as occur from time to time in the northern hemisphere. Waves of warm air in the middle and upper troposphere would be particularly liable in the southern hemisphere to occlusion over deep maritime polar air, swept forward at any time by an advancing depression from the west. Two pilot-balloon ascents already quoted have revealed that occasional instances of meridional transport on a considerable scale can nevertheless be found, and indeed this may be essential in periods when the antarctic anticyclones are built up. Yet if it is to be supposed that large-scale meridional transport is rather unusual and easily broken down in the southern hemisphere, so that it seldom lasts long, this may be the key to the relatively low pressure observed even near the centres of the anticyclones of the Far South and the development within the southern polar regions of an isolated air mass in which peculiarities of chemical composition have been detected[21].

* Since this was written a pressure of 927·1 mb. at mean sea level has been reported on September 3, 1951 at the French expedition station at Port Martin on the Adélie Land coast in 67°S. 141°E. (see Prudhomme, A. and Le Quinio, R. ; Les observations météorologiques de Port Martin en Terre Adélie. Relevés quotidiens. Expeditions Polaires Francaises. Resultats Scientifiques No. S.V., Fascicule II, Paris, 1954).

The surface air temperatures observed by the *Balaena* require little comment. The average of all observations south of 50°S. was +28·7°F. (−1·8°C.), extremes being +37·8°F. (+3·2°C.) and +12·1°F. (−11·1°C.).

Relative humidities varied from 100 to 55 per cent., values of 65–70 per cent. being typical in fine weather.

Fog was not common, and occurred on only 15 out of the 600 observations south of 50°S. ; in this respect it is thought that the eastern longitudes visited by the *Balaena* differed from certain other sectors. For instance, fogs are believed to be commoner in the South Atlantic sector east of the Weddell Sea. In the high latitudes of the Indian Ocean sector, according to observations of various whaling ships in the 1946–47 season and available indications as regards prevailing winds and sea-surface temperatures, fogs appear to be relatively commoner in longitude 80–90°E. than farther east.

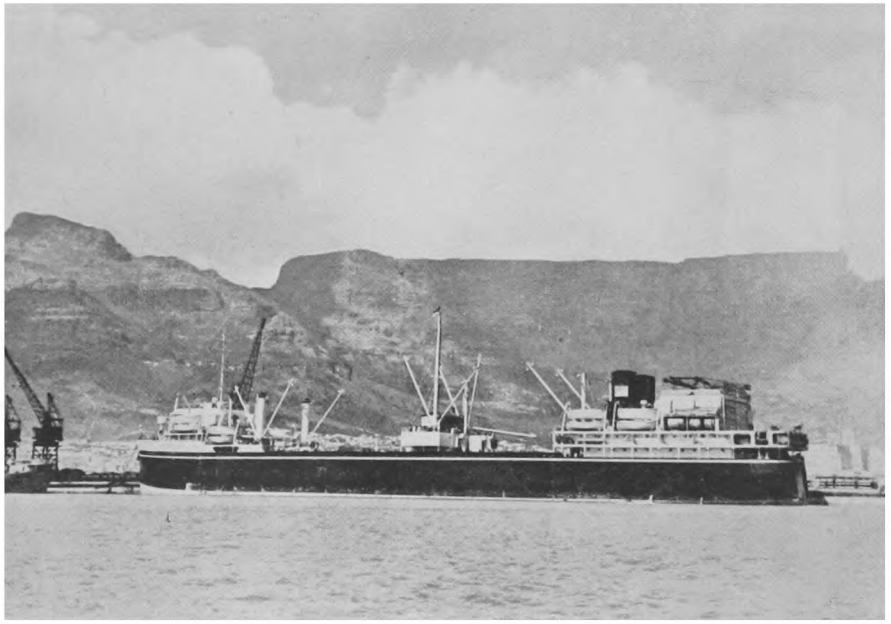
Air-mass advection fogs are noticeably associated with winds with northerly components—even slight northerly components—bringing warmer air streams over the cold water. This generalization seems to apply to widespread fogs in all sectors in high latitudes in the Southern Ocean and is familiar to the whalers. Most of the fogs experienced on the *Balaena*'s voyage in the Far South were, however, frontal fogs, in narrow and very isolated belts, and these could and did persist for some time even when drifting slowly from south to north. These frontal fogs, believed to have been associated with increased humidity in the lowest layers where precipitation was, or had been, falling, were accompanied by residual frontal cloud sheets, attributed in most cases to old, decaying occlusions.

Cumulonimbus and large cumulus clouds were observed on 35 out of 150 days south of 50°S. Altocumulus castellatus was rare. Stratocumulus clouds prevailed, often with small cumulus penetrating the base. Frontal altostratus, altocumulus and cirrostratus were often seen. In the Fifties these systems advanced mainly from the west and south-west, but farther south cases of frontal cloud systems advancing from other quarters, notably from the east and south as well as from the north, became frequent.

Cloud amounts averaged over 9 tenths in most sections of the *Balaena*'s voyage south of 50°S., but fell to 7·4 tenths in the narrow sector between 105° and 110°E., where the ship was fairly close to the coast of Antarctica and experienced off-shore winds. Yearly averages of 5–6 tenths cloudiness are typical for expedition stations on the Antarctic coast in eastern longitudes. In the Fifties in the Indian Ocean away from the pack-ice appreciable amounts of clear sky seemed only to occur in regions of strong subsidence between frontal systems ; even so, totally clear sky was never observed in this zone, the next advancing cloud system always coming into view before the last had disappeared ; in such regions sunshine was confined to periods of 3 or 4 hr. once in 4 or 5 days. Cloudless skies did occur with off-shore winds sufficiently near the ice margin or coast of Antarctica.

The equivalent rainfall measurements for the period when the ship was in the Antarctic (as defined by the limit of the cold water south of the antarctic convergence) are set out in Table I. There were 3 occasions when the measurement or estimate quoted may have been vitiated by upward-curved trajectories of air and precipitation across the ship, all towards the end of the season, namely, February 25, 1 mm. ; March 3–4, 1 mm. ; March 10, trace. If this possible source of error may be overlooked, it appears that, although only 29 out of 151 days were altogether free of rain and snow, the total equivalent rainfall was 43·6 mm., a strikingly low figure. It corresponds to 105 mm. in 12 months—it must be remembered that the 5 months in which it was actually measured covered the summer period—or roughly 4 in. a year, a figure in the same class as those for the Australian desert or the Sahara, but also matched in the coastal regions of northern Greenland.

To face p. 16



WHALING FACTORY SHIP *BALAENA*

The *Balaena* in Cape Town docks, November 6, 1946

WHALE-CATCHER VESSEL IN PANCAKE ICE

Whale-catcher vessel steaming in towards the factory with whales towed, tail foremost, at either side through newly formed pancake ice. Her wake is marked by open, ice-free water

ONE OF *BALAENA'S* AIRCRAFT WITH LARGE TABULAR ICEBERG IN BACKGROUND

The aircraft is seen during a take-off run on the water in the Antarctic zone. Aircraft could also be catapulted into the air

WHALING OPERATIONS ON THE DECK OF THE FACTORY SHIP

Steam saws used for sawing up the backbones and skulls of the whales

GALE IN THE "FIFTIES"

Photograph taken near 55 S. 80 E.—40-ft. high waves

CALM WEATHER AT THE ICE EDGE

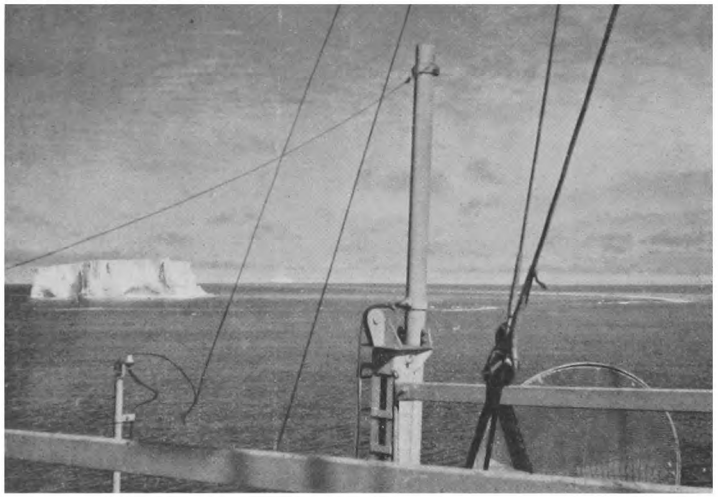
Stratocumulus and clear sky in wedge situation on November 26, 1946 near 57°S. 55°E.- a picture taken during the light summer night, the ice appearing dark against the pale background of open water which reflects the light and colour of the sky. The water is 2,500 fathoms deep here

SMOOTH SWELL 10 20 FT. HIGH RUMPLING THE CALM WATER AT THE ICE MARGIN

Photograph taken near 65°S. 109 E.

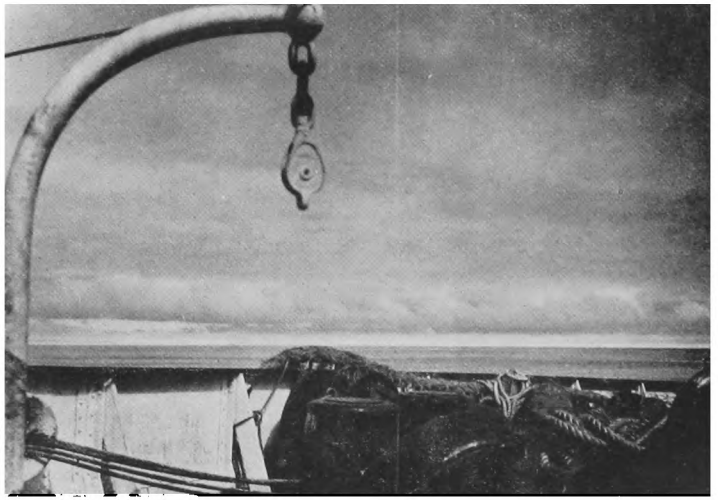
ICE WILDERNESS

Showing may icebergs of different forms and patchy reflected light on the overcast sky above corresponding to patches of broken pack-ice and open water after storm.



BRILLIANT SUMMER MORNING IN ANTARCTIC WATERS, JANUARY 1947

Typical flat-topped tabular iceberg of the Far South with caverns at the water line. Note the brilliant white illumination of the altocumulus by reflected light from extensive pack-ice. This ice could not be seen from the ship at this view point, but the illumination of the cloud (iceblink) is a reliable indication much used by seamen in these waters



MOST TYPICAL CLOUD STRUCTURE IN ANTARCTIC WATERS

Line of cumulus penetrating a layer of stratocumulus at no great height above it, January 26, 1947 near 63° S. 98 E.

PART OF A CUMULONIMBUS SNOWSQUALL CLOUD WITH STRATUS AND STRATOCUMULUS ABOVE

Photograph taken over open water near 59 S. 38° E. on April 13, 1947. The wind shifted from ESE.2 to SSW.3 as the squall passed

LOW STRATUS, APRIL 1, 1947 NEAR 62° S. 86°E.

LOWERING STRATUS AND STRATOCUMULUS

Cloud accompanying the line of an old occlusion returning southwards and acting as a weak preliminary warm front, November 22, 1946 near 56°S. 49°E.

FRONTAL STRATUS AND STRATOCUMULUS

The same frontal cloud as that shown in the photograph at the top left but here seen half an hour later, when slight snowfall had developed at points along the cloud edge

FRONTAL CLOUD SHEET, AHEAD OF A SNOW BELT ADVANCING FROM THE SOUTH-EAST

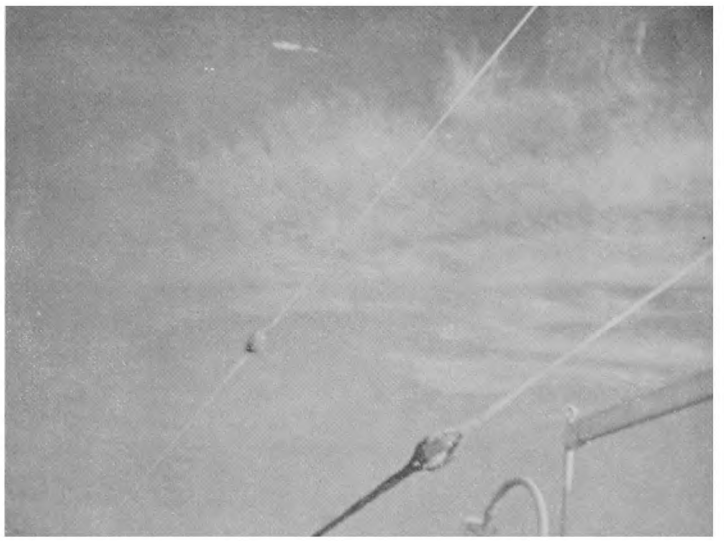
The photograph was taken looking west near 59 S. 84°E. on January 2, 1947, as the segment of clear sky was retreating to the horizon—the prefrontal southerly wind is shown by the smoke from the whale-catcher vessel. Systems advancing from east and south-east were common in high latitudes

EDGE OF A SHEET OF FRONTAL STRATOCUMULUS OVER THE ICE MARGIN ABOUT SUNSET, FEBRUARY 8, 1947 NEAR 64°S. 105°E.

Fronts and their associated cloud systems are commonly halted at, or near, the ice margin

TYPICAL NARROW BELT OF CLEAR SKY OVER THE OPEN WATERS OF THE SOUTHERN OCEAN, FEBRUARY 6, 1947 NEAR 64°S. 106°E.

Clear sky is a rarity over the Southern Ocean. In this picture the next cirro-stratus system is seen already advancing above the horizon before the previous one has cleared to the zenith



CIRRUS AND CIRROSTRATUS AT 43,500 FT., DECEMBER 28, 1946 NEAR 59°S. 81°E.

Very high cirrus cloud indicates a deep troposphere for high latitudes

LARGE CUMULUS AND CUMULONIMBUS, DECEMBER 16, 1946 NEAR 57°S. 84°E.

These cloud types were encountered as far south as 65°S., the most southerly point reached by the vessel

LINE OF DISTANT CUMULONIMBUS HEADS NEAR 62 S. 93°E., 1800 G.M.T., JANUARY 1, 1947

These cumulonimbus heads were seen north-east of the ship in contorted shapes with "corkscrew" twisting columns rising into the altocumulus cumulogenitus about 12,000 ft. above

Wind was measured by a cup anemometer exposed above the hangar roof astern, 70 ft. above the water-line. In the highest gust noted 65 m.p.h. was registered on February 25, 1947 near 65°S. 113°E. At the same time the wind was averaging 55–57 m.p.h. and SE. force 11 was reported. The steadiness, or relative freedom from gusts, of this south-easterly storm near the coast of Antarctica was remarkable, and the ocean swell was not great owing to the short fetch of open water. Vessels at sea are, of course, less liable to extreme winds than stations on land exposed to katabatic gales, especially in valleys. Points close to a mountainous coast in high latitudes seem most prone to extreme winds at sea ; this generalization fits the *Balaena*'s observations and the experience of other vessels, particularly in the Ross and Weddell Seas.

Storms were not very frequent, Beaufort force 8 or over being reported at only 16 out of the observations south of the antarctic convergence. The mean wind force observed over the same waters was only 3·9. It was interesting to compare the annual means given by the *Gauss* station[13] in 65°S. 90°E. in the belt of easterlies (3·5) and by Kerguelen Island[13] in the zone of the Brave West Winds near 50°S. 70°E. (5·0), each taken from 1 year's observations. It appears that the easterlies near the coast of Antarctica in this sector are on the average less strong than the westerlies over the ocean farther north, although occasional extremes may be experienced near mountainous stretches of the coast.

TABLE I—RAINFALL IN FORM OF SNOW, DRIZZLE AND ICE DEPOSITS FROM CLOUD

Estimated values are shown in brackets

		1946		1947			Total (5 months or 151 days)
		Nov.*	Dec.	Jan.	Feb.	Mar.	Apr.†	
					millimetres			
Rainfall (rain and melted snow)	Total	3·4	7·6	5·8	7·7	11·3	7·7	43·6
	Maximum in one day	1·0	5·7	2·5	3·7	3·6	3·5	..
Clear ice formation on horizontal objects	Total	(slight)	0	0	(4·3)	(0·4)	tr.	4·7
	Maximum in one day	(slight)	0	0	(3·3)	(0·4)	tr.	..
Clear ice formation on vertical objects	Total	(20·0)	0	0	(21·0)	(8·0)	(4·0)	(53·0)
	Maximum in one day	(10·0)	0	0	(11·5)	(5·0)	(4·0)	..
					days			
Number of days with no rainfall		0	7	8	10	4	0	29
Number of days with trace		5	12	12	8	11	3	51

* November 16–30 only. † April 1–15 only.

An attempted geographical analysis of the *Balaena*'s and *Empire Victory*'s wind observations south of 62½°S., between November 1946 and April 1947, suggests that the pressure patterns prevailing may also favour stronger winds and rather different mean directions in different longitudes. Table II summarizes the evidence. It will be noticed that the prevalent wind directions follow the broad configuration of the coast, and become more variable west of 90°E. where the vessels were farther from land owing to the great bight in the coast of Antarctica between 55° and 90°E. Westerly and north-westerly winds made up over 10 per cent. of the observations in these longitudes, and were distinctly less frequent, though never entirely absent, east of 90°E. Northerly and north-easterly winds were almost lacking in the observations east of 100°E.

These observations agree with other indications that near the coast of Antarctica, longitudes east of 110°E. as far as 120° or 130° E. and east of the point of Enderby Land between 55° and 75° E. are particularly liable to strong south-easterly winds and frequent storms, whilst the sector between 80° and 105°E. experiences more quiet weather.

These considerations, based partly on the experience of the whalers in other seasons, have been taken into account in drawing the suggested mean isobars in Fig. 6.

TABLE II—WINDS OBSERVED SOUTH OF 62°30′S.

	Mean Beaufort force	Number of occasions from N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	No. of observations
°E.						*per cent.*					
115–110	5·0	3	4	24	51	7	3	4	3	3	74
110–105	4·1	0	1	21	27	14	21	12	4	0	79
105–100	3·2	3	6	25	25	3	19	9	6	3	33
100– 95	3·6	2	8	24	37	19	12	0	0	0	67
95– 90	3·4	0	12	38	26	11	11	3	0	0	86
90– 85	3·7	10	14	19	15	11	14	8	8	1	73
85– 80	3·5	9	15	24	12	11	12	12	5	0	102
80– 75	3·7	3	5	21	16	11	21	8	14	0	37
75– 70	(5·5)	0	6	12	29	18	24	12	0	0	17

The mean for 75–70°E. has been put in brackets and is considered of doubtful worth because of the small number of observations.

§ 8—OTHER OBSERVATIONS

Fig. 3 presents the sea-surface temperature observed on the outward and homeward voyages across the Southern Ocean between Cape Town and the whaling grounds. Observations made with the standard Meteorological Office canvas bucket and readings taken in the engine intake pipes are both included in Fig. 3 ; repeated checking during the voyage suggested the assumption that the two methods gave comparable values for sea-surface temperature in the rough seas prevailing on these ocean crossings. (The intake pipes were actually 15 ft. below the surface.) Identification of the classical temperature discontinuities known as the subtropical and antarctic convergencies from these observations would be difficult. The curves suggest rather a variable situation with three well marked discontinuities passed on the southward voyage in November, and no major, but several minor, discontinuities on the return voyage in April.

Between March 3 and April 12, 1947 the *Balaena* travelled rather quickly west along the ice margin, giving a more or less synoptic view of the limit of open water at the end of the warm season in the Indian Ocean and Australian sectors. Open water reached to the coast of Antarctica in 116°E. From there the ice-margin ran approximately north-west as far as a great ice headland in 62½°S. 101–102°E. West of this, open water extended gradually south again, reaching south of 64°S. between 60° and 80°E. It is clear that open water extended farthest south in the stormiest regions, and it is thought that the accumulation of ice near 100°E. marked a transition or boundary region in both air and water circulations between the broadly cyclonic, clockwise systems of the southern Indian Ocean and those farther east.

The observations of sea ice have been published in the *Marine Observer*[38,39]. Details of the observations of ocean surface current made on the *Balaena* voyage and by various auxiliary vessels are available in the Meteorological Office.

§ 9—METEOROLOGICAL STATISTICS FROM THE ANTARCTIC ZONE

The period November 16, 1946 to April 15, 1947 was spent south of the antarctic water convergence, i.e. the limit of the coldest water in approximately 50°S. The following statistics pply to observation hours during that period.

Barometric pressure

Average value	..	982·2 mb.
Highest value	..	1013·4 mb. at 0600, 17.11.46 at 53°27′S. 38°08′E.
Lowest value	..	960·0 mb. at 1800, 3.3.47 at 65°11′S. 114°12′E.

Changes of barometric pressure in 3 hr.

Greatest plus value	+6·0 mb. at 1800, 29.3.47 at 62°00′S. 86°00′E.
Greatest minus value	−8·6 mb. at 0600, 15.4.47 at 53°42′S. 31°05′E.

Air Temperature

Average value	..	28·7°F.(−1·8°C.)
Highest value	..	37·8°F.(3·2°C.) at 1800, 15.4.47 at 52°08′S. 29°20′E.
Lowest value	..	12·1°F.(−11·1°C.) at 1800, 9.4.47 at 63°13′S. 72°20′E.

The next highest value was 37·5°F. (3·1°C.) at 0600, 7.1.47 at 59°15′S. 84°25′E.

Dew point

Average value	..	25°F.(−4°C.)
Highest value	..	38°F.(3°C.) at 0600, 15.4.47 at 53°42′S. 31°05′E.
Lowest value	..	8°F.(−13°C.) at 1800, 9.4.47 at 63°13′S. 72°20′E.

The values include observations with precipitation falling.

Relative humidity

Average value	..	84%
Highest value	..	100% at 30 observation hours
Lowest value	..	55% at 1800, 16.11.46 at 51°51′S. 35°10′E.

Wind force

Average value	.	4
Highest value	..	11 at 0000, 25.2.47 at 65°12′S. 113°16′E.
Lowest value	..	0 at 5 observation hours

Gales

No. of occurrences of force 8 or more	..	16
Percentage of observations affected	..	3

Fog

No. of occurrences	.. .. ..	15
Percentage of observations affected	..	3

Cases of fog patches and fog in sight have been reckoned as fog but cases of fog in last hour have been omitted—each of these categories accounted for 2 or 3 observations.

Poor visibility

No. of occurrences of visibility <2 Km. due to fog, snow, drizzle or rain..	43
Percentage of observations affected	7

Cumulus and cumulonimbus clouds

No. of days on which large cumulus or cumulonimbus clouds were observed	35
Percentage of days affected	23

The height of the highest cumulonimbus tops observed was estimated to be 20,000 ft. on March 7–8. The estimate on several other days was 15,000–17,000 ft.

Hail

No. of days on which hail was observed	..	5

Thunder

No. of days on which thunder was observed .. 0

Thunder was, however, credibly reported by the observing station at Cumberland Bay, South Georgia on 1 day during these 5 months. This observation was reported in a fast-moving cold outbreak and may have been set off by the mountains of that very mountainous island. Thundery sky was observed from the *Balaena* on 1 day, March 8, 1947, in an air stream from Antarctica which had probably been rapidly heated over the open sea. There may have been thunder over the coastal mountains near the point where the air stream, after a curved track over the sea, blew on shore again.

§ 10—STATISTICS OF FLYING WEATHER

The period on the whaling grounds was from November 18, 1946 till April 7, 1947, approximately five months in the late spring, summer and autumn of the Far South. The statistics given in Table III were prepared by the Flight Commander J. Grierson.

First-class flying weather was weather which in no way restricted flying.

Second-class flying weather was defined as weather in which flying around the ship could take place, but which was not considered safe for extended flight without a YE beacon or more positive meteorological information. The technique used in these cases was for the aircraft to be sent out first on a course from the factory ship 30–50 miles directly towards the worst weather, in order to fix the position of this exactly or to establish a minimum range of clear weather. This information was signalled back to the ship by radio, and instructions were sent in return by the controller of the flight regarding the estimated reliable duration of clear weather at the ship. The aircraft would then go off on another course to complete its mission in the permitted time.

TABLE III—FLYING WEATHER

	1946		1947					
	November	December	January	February	March	April	Total	Percentage
				days				%
1st class flying weather	9	19	12½	8	5	0	53½	38
2nd class flying weather	0	3½	9	9½	12	3	37	26
Unflyable weather ..	4	8½	9½	10½	14	4	50½	36
Days flown	5	4	6	3	4	0	22	16
No. of days on the whaling grounds ..	13	31	31	28	31	7	141	100

PART III—WEATHER ANALYSIS AND FORECASTING FOR THE SOUTHERN OCEAN

§ 11—WHALING REQUIREMENTS

Weather conditions do not seriously affect the catching of whales, unless visibility is very bad or the sea very rough. Fog, snow, visibility, wind, swell and sea are therefore the important items in any forecast for the whalers and especially for the whale-gunners.

Whales are shot, from the cannon on the bows of the catcher, at a range of not more than 80–100 yd., and the chase is a long struggle to manoeuvre the vessel as close as this. The real chase hardly begins until the vessel is within 400 yd. of the whale. Visibility has to fall

appreciably below a mile therefore before constituting any hindrance to the chase and kill. Longer ranges are, however, desired for observation and recording of flagged whales (see below). Poor visibilities are most commonly caused by snow or fog and seldom by anything else. The whale blasts are seen most easily in very cold weather, when the saturation vapour content of the air is low.

The main factor hindering the whalers in strong winds is the awkwardness and delay involved in securing a whale in a rough sea once it has been shot dead. Visibility is not seriously affected by the spray and spume from the broken waves until force 10 is reached and exceeded. The whales can still be shot in rough weather, but making the tail fast alongside the whale-boat takes time and becomes very difficult. Although the wind must reach force 6–7 before any hindrance is noticed, shelter from the pack-ice may still help greatly when the wind is force 5–8. Force 10 brings whaling to a halt.

Forecasts giving reliable estimates of wind and sea (described simply as slight, moderate or heavy) and of visibility may affect the decision of the whaling manager whether to ration the catch allowed to each whale-boat during a glut or to allow unrestricted " free " fishing in view of impending storm or thick weather.

For safety during severe storms the whale-boats seek the shelter of the ice. Storm warnings are appreciated ; but the whale-gunners and skippers are not unduly worried about the safety of their whale-boats, which are very seaworthy, so long as they do not become unstable owing to encrustations of sea ice formed on the upper works and rigging from breaking waves. They must, in any case, ride out any weather that comes.

Whale-gunners have drawn attention to the fact that the most crucial operation for them, in which weather is the deciding factor, is the flagging (i.e. marking with a flag on a long spear) and leaving afloat of a killed whale when going after more. If thick weather comes, even if it is only a brief snow-flurry, they tend to stop chasing and go off at once to find and bring in their flagged whales. It would be of great help if they could know whether the snow would pass over within a short time, say less than a couple of hours, or not.

§ 12—AIRCRAFT REQUIREMENTS

Aircraft operating from whale factories in the Antarctic are concerned with much the same problems as aircraft, and particularly seaplanes, operating anywhere. Prohibitive factors are principally: seas too rough to alight on, bad visibility, and excessively low cloud with the attendant risk of icing. Flights with the *Balaena*'s Walrus aircraft were not planned if there were a prospect of wind above force 4–5 for alighting on return, unavoidable patches with visibility less than 5 miles, or cloud below 500 ft. Icebergs with portions projecting upwards to about 350 ft. were found by the aircraft to be not uncommon, and these would be a hazard for flying with continuous cloud below 500 ft. On one occasion the risk of low stratus cloud hiding uncharted mountainous land had to be referred to in a forecast.

§ 13—AIR CIRCULATION AND WEATHER OVER THE SOUTHERN OCEAN

The provision of an experimental forecasting service to meet these needs on the whaling grounds located in some of the remotest tracts of the Southern Ocean was the prime object of the whaling company in attaching a meteorologist to the expedition. The hazards involved in the flying venture were the most important consideration.

The method used in giving meteorological advice and making forecasts was based upon once-daily weather maps covering much, or even most, of the southern hemisphere*. Lack of reports of actual weather observations in the surrounding regions of ocean beyond the range of the *Balaena*'s own fleet of whaling vessels and aircraft compelled this broad view, in which all available radio reports from the southern continents, inhabited island outposts and ships at sea in more frequented waters were used to give the main features of the hemispheric circulation at sea level. Particularly close attention was paid to the shape, position and orientation of the cores of the respective anticyclone cells in the subtropical belt of high pressure, where reported observations were relatively plentiful, and which largely determine the positions of frontal-wave formation and cyclonic development in lower latitudes. These anticyclones and the shapes of their cores are also intimately bound up with the deep, basic steering currents of warm air which guide the depression tracks into high latitudes. Great use was made of this principle, based on experience in the northern hemisphere, and it worked well in the circumstances of the Far South.

The assumption of far-reaching control exercised by the great warm anticyclones, situated in or near the belt where the greatest amounts of solar radiation are received and where weather-observing stations are fortunately plentiful, made possible the completion of the weather maps over the broad ocean spaces farther south where reports are scarce. Detailed features of more local significance, such as frontal patterns, naturally became subject to position errors on the maps ; though the evidence of after-checking suggests that the probable error for major systems was of the order of 200 miles or rather less (see p. 5). These errors of detail could be corrected by the observations of our own fleet of vessels and aircraft as the individual systems and disturbances approached the factory, once the associated high cloud and falling pressure, etc., came within the range of observation from the *Balaena*'s whaling fleet. The orientations of the observed cloud systems played a very helpful part, their recognition and understanding in terms of the weather map leading to refinement of the map.

In the absence of positive information on the decay of weakening frontal systems over the broad spaces of the Southern Ocean, it was seldom safe to leave out minor fronts until the general circulation pattern suggested that several of them had become bunched together or consolidated into a single, sharper front. Frontolysis certainly also occurred in the normal way through the assimilation of the air masses on either side of the frontal line, particularly in air streams subjected to heating from progressively warmer water below. One required, however, to be on very safe ground before deciding to omit a front which might still become rejuvenated and approach the whaling regions. Moreover, the general prevalence of cold surface water in those regions tended to hinder this type of frontolysis, even where consolidation of several old occluded fronts was indicated, since vertical stability tends to preserve even minor discontinuities[42]. The subsequent weather often gave evidence of the continued existence of several distinct belts of snow and fog, lying quasi-parallel to one another and separated by patches of clear weather 50, 100 or 200 miles wide.

This policy resulted in the retention of rather more frontal systems than are commonly shown on weather maps covering so wide an area. The policy justified itself by results, however. It was always possible to interpret the observed weather in terms of the weather maps, as long as the basic features of the flow pattern were right and a probable position error of 200 miles in the detail features was allowed for. In no month was the percentage of failures of the daily forecasts, as verified by the independent checkers, higher than 15 per cent.

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* The original weather maps, forming a continuous series over 156 days from November 1946 to April 1947, are retained in the Meteorological Office where fuller details of the work may be studied. The results of careful re-analysis (with fuller data which came to hand afterwards) of a specially interesting sequence of these charts have been described elsewhere[26,27].

The pattern shown by the frequency map of frontal distribution in the month of March 1947 (Fig. 7), when the maps were most complete and covered the greater part of the southern hemisphere, is of interest. The main depression paths can be picked out from this map and they appear to provide confirmation, for this particular month, of the work of Palmer[29] and Ramage[31]. An interesting point is the existence of a maximum of frontal frequency concentration over the actual land mass of Antarctica in the Wilkes Land sector in 120–130°E. This is supported by the *Balaena*'s rather frequent observations, near the coast in 90–115°E., of frontal cloud and weather systems advancing from the south-east off the land. This phenomenon can be connected with Admiral Byrd's reported discovery[5] that the coast is low-lying and that the ice surface slopes up gradually into the continental interior between 115° and 138°E. The *Balaena*'s daily weather maps show occluded depressions passing inland about these longitudes, and usually later stagnating over Wilkes Land or moving on recurving tracks and eventually out to sea again. Some of these depression centres may occasionally travel considerable distances over the inland ice, before their circulations die or emerge over the ocean again ; further evidence of this is supplied by observations[22] of westerly and north-westerly surface winds on the ice-cap near the magnetic pole by Shackleton's expedition and on the polar plateau itself by Amundsen's and Scott's expeditions.

One recent work[23] discusses the occurence of occasional slow-moving cold cyclones in high southern latitudes as in the Far North.

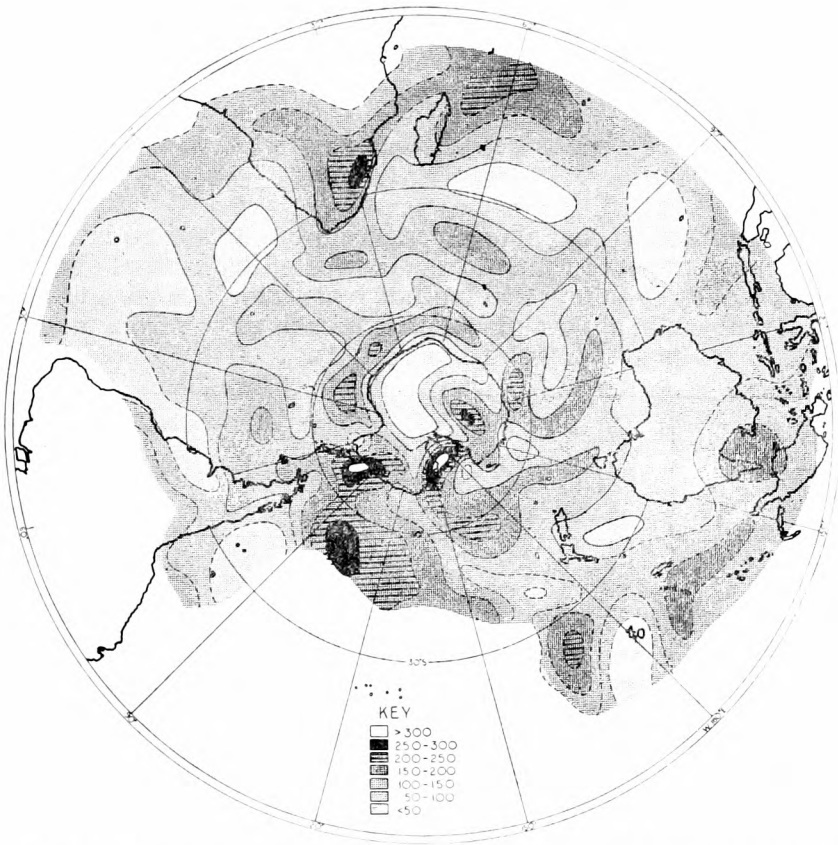

FIG. 7—FRONTAL FREQUENCIES IN THE SOUTHERN HEMISPHERE, MARCH 1947
Mean number of fronts occurring per day within an area 100 × 100 nautical square miles (numbers shown in the key should be divided by 1,000)

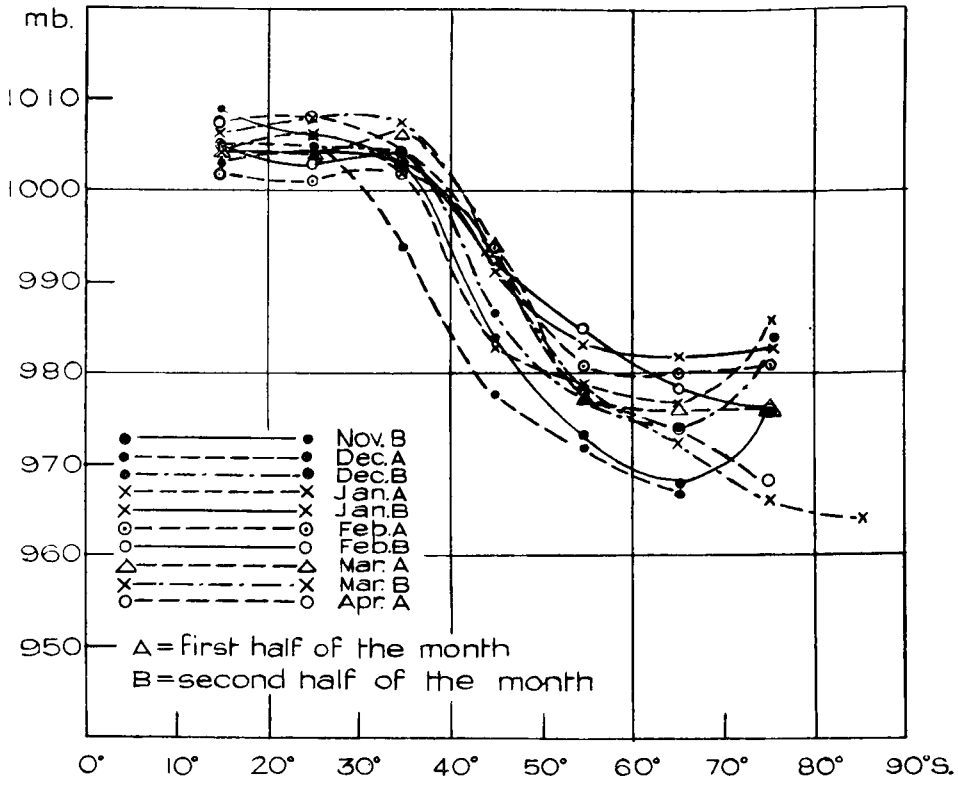

FIG. 8—MEANS FOR VARIOUS LATITUDES OF DEPTHS OF DEPRESSION CENTRES AS SHOWN ON THE *BALAENA* DAILY WEATHER CHARTS

Other lessons of the weather-mapping experience are summarized in diagram form in Figs. 8–10 which give the mean pressure values at the centres of depressions and anticyclones on the *Balaena*'s daily maps month by month and latitude by latitude. A curious feature was the very low values of central pressure in anticyclonic centres breaking away from the Antarctic continent. Observations showed that a central pressure of the order of 1000–1010 mb. is typical in the Weddell

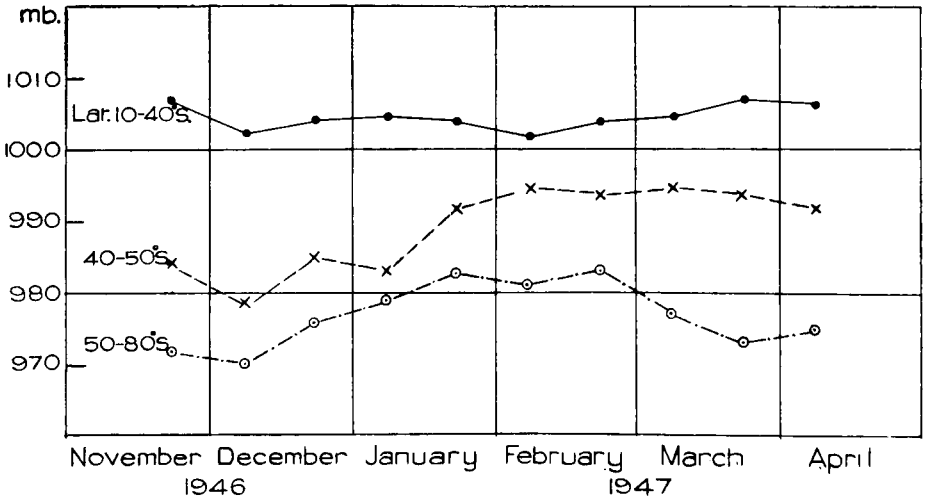

FIG. 9—SEASONAL VARIATION OF DEPTHS OF DEPRESSION CENTRES AS SHOWN ON THE *BALAENA* DAILY WEATHER CHARTS

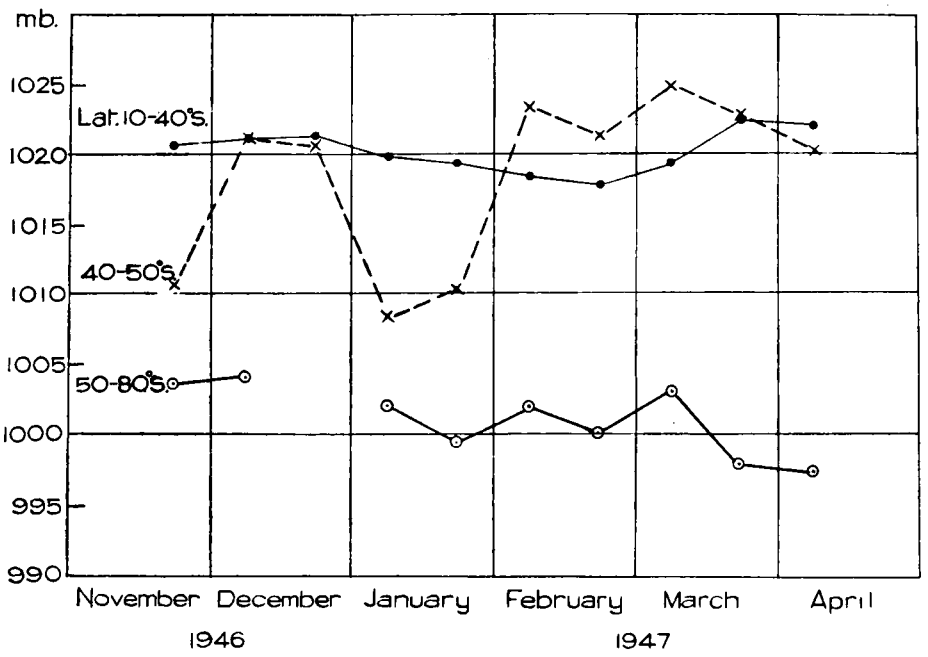

FIG. 10—SEASONAL VARIATION OF CENTRAL PRESSURES OF ANTICYCLONES AS SHOWN ON THE *BALAENA* DAILY WEATHER CHARTS

Sea and Graham Land sector, and the observations of the *Balaena* and *Empire Victory* in eastern waters hinted at occasionally even lower values (990–1000 mb.) at the centre of these high-pressure systems, which therefore soon lost their identity over the ocean. They generally became absorbed in the tips of moving ridges of high pressure extending south from the subtropical belt. In marked contrast the subtropical anticyclones, which occasionally wandered as far south as 40–50°S. near South America and in the Australasian sector, commonly showed a central pressure of 1025–1035 mb. This results in a marked irregularity in the curve of mean values, month by month, of anticyclonic centres in 40–50°S. (Fig. 10), according as these systems came mostly from Antarctica or from the subtropical belt during the month in question.

Local effects were important close to mountainous sections of the coast, where the topographical influence on the dense, cold air streams was strong. Surface winds showed a high preponderance of frequency of directions blowing parallel to such mountain barriers. Convergence (funnelling) between the mountain wall and a warm-type frontal surface out over the sea sometimes causes gales of great strength. The strongest easterly gales seem to require this condition.

The forecasting of easterly gales in the higher latitudes over the Southern Ocean presented the most outstanding technical difficulty encountered during the expedition. Preliminary investigation of this aspect of the subject had to be carried out during the expedition with the means available on the spot, and apparently led to better handling of the matter as the season went on. As might have been expected, development of the severest storms seemed to require a coincidence of several contributory factors :—

(i) Formation of a rejuvenated depression centre, deepened by the coalescence of two or more pre-existing lows
(ii) Incursion of an occluding warm sector of tropical air
(iii) Topographical convergence near mountainous parts of the coast of Antarctica
(iv) Funnelling of air between such mountain walls and a frontal surface out at sea.

A few of the depression centres of the Far South in the Indian Ocean and Pacific Ocean sectors probably originate as recurving tropical storms in summer and autumn.

Recognition of these factors made it possible to foresee the strongest storm winds (Beaufort force 10 and over) in all the observed cases, but a serious difficulty remained in the fact that many storms appeared to blow in rather narrow " corridors " or " jets " whose over-all width was no more than the probable error (150–200 miles) in placing systems over these remote regions on the *Balaena*'s daily weather maps.

Perhaps the most striking and important lesson of the weather-mapping experiment is, however, that the south polar anticyclones can no longer be regarded as a constant and ever-present feature nor as particularly intense. The same result would be sure to emerge from any synoptic study extending over much more than a month at any time and is indeed implicit even in the observations of the earliest expeditions. The situation over Antarctica is apparently sometimes cyclonic, but is more often than not relatively anticyclonic, and is sometimes marked by (warm) anticyclonic circulations extending to very high levels[26,27]. Easterly storms around the periphery of the Antarctic continent can hardly occur except when pressure is relatively high over the interior.

ACKNOWLEDGEMENTS

The author wishes to express his thanks to the Meteorological Office and United Whalers Ltd, whose dual initiative made possible the meteorological side of this expedition ; to the Marine, Library and Instrument Branches of the Meteorological Office, who worked out, with remarkably complete foresight, the equipment needed ; to the *Balaena*'s Flight Commander J. Grierson, whose full and unfailing co-operation allowed all the advantages of complete flexibility of organization in meeting new problems and difficult situations throughout the expedition ; and to the Naval Meteorological Service and the Meteorological Service of the Union of South Africa, who jointly arranged for the supply, at Cape Town, of the blank charts of the southern hemisphere which were used every day for weather mapping in the Antarctic. In addition two other individual acknowledgements are due : to Mr. Robert S. Currie, ex-R.A.F. pilot and radio-operator, who was assigned as meteorological radio-operator on board on leaving Cape Town southward bound, and whose keenness and interest in his work secured remarkably full synoptic messages from all the southern continents ; and to Mr. Leslie Holmes, air-crew radio-operator, navigator and observer, who attached himself to the meteorological department in his spare time and gave invaluable assistance when a special investigation of the antarctic easterly storms was found necessary during the season and in working out certain preliminary statistics and averages for guidance in forecasting.

The Whaling Inspector, Cmdr H. Buckle (R.N. retired), the Flight Commander J. Grierson, and Mr. A. Bryce, film photographer on board, very kindly gave of their time to checking the forecasts issued during the season, in order that this might be done objectively. Encouragement received from the whale-gunners was welcome ; but the routine impartial check gave the best grounds for believing that the weather charts and general principles used in forecasting were sound in character, in spite of the shortage of observations. The checking was also useful for spotting the advantages and disadvantages of various changes in the arrangements made during the season.

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APPENDIX I—SURFACE WEATHER OBSERVATIONS

Abbreviated observations, from which cloud details, etc., are omitted, are observation reports copied from the ship's log and the recording instruments.

Figures in brackets are doubtful values, such as temperatures probably affected by relative calm or following wind, humidities or dew points taken from the hair hygrograph or affected by deck heating etc., or precipitation estimated.

In one or two cases the unusual combination of drizzle and snow will be noticed in the Beaufort letters. These are authentic.

CODE FOR VISIBILITY

Code figure	Description	Visual range
		yd.
0	Dense fog	<55
1	Thick fog	55–220
2	Fog	220–550
3	Moderate fog	550–1,100
4	Mist or haze	1,100–1 n. mile
		n. miles
5	Poor visibility	1–2
6	Moderate visibility	2–5
7	Good visibility	5–10
8	Very good visibility	10–30
9	Excellent visibility	>30

BEAUFORT SCALE OF WIND FORCE

Force	Description	Limits of speed
		kt.
0	Calm	<1
1	Light air	1–3
2	Light breeze	4–6
3	Gentle breeze	7–10
4	Moderate breeze	11–16
5	Fresh breeze	17–21
6	Strong breeze	22–27
7	Moderate gale	28–33
8	Fresh gale	34–40
9	Strong gale	41–47
10	Whole gale	48–55
11	Storm	56–63
12	Hurricane	64–71

CODE FOR CHARACTERISTIC OF BAROMETRIC TENDENCY

Code figure	Description	
0	Rising, then falling	The barometer is now higher than, or the same as, three hours ago
1	Rising, then steady; or rising, then rising more slowly	
2	Unsteady	
3	Steady or rising	
4	Falling or steady, then rising; or rising, then rising more quickly	
5	Falling, then rising	The barometer is now lower than three hours ago
6	Falling, then steady; or falling, then falling more slowly	
7	Unsteady	
8	Falling	
9	Steady or rising, then falling; or falling, then falling more quickly	

CODE FOR SWELL

A short swell may be considered as being under 300 ft. from crest to crest, a long swell as over 600 ft.

Scale number	Description	
0	No swell	
1	Low swell, short or average length	Height <6 ft.
2	Low swell, long	
3	Moderate swell, short	Height 6–13 ft.
4	Moderate swell, average length	
5	Moderate swell, long	
6	Heavy swell, short	Height >13 ft.
7	Heavy swell, average length	
8	Heavy swell, long	
9	Confused*	

* Non-measurable, indistinct (e.g. crossing swells of nearly equal height).

CODE FOR CLOUD

Code figure	Form of low cloud
0	No low cloud
1	Fair weather cumulus
2	Large cumulus without anvil
3	Cumulonimbus
4	Stratocumulus formed by the spreading out of cumulus
5	Layer of stratus or stratocumulus
6	Ragged low clouds of bad weather (or fracto-nimbus)
7	Fair weather cumulus and stratocumulus
8	Large cumulus (or cumulonimbus) and strato-cumulus
9	Large cumulus or cumulonimbus and ragged low clouds of bad weather

Code figure	Form of high cloud
0	No cirriform cloud
1	Fine cirrus not increasing : sparse
2	Fine cirrus not increasing : abundant but not a continuous layer
3	Anvil cirrus (usually dense)
4	Fine cirrus increasing : usually in tufts
5	Cirrus or cirrostratus increasing still below 45° altitude : often in polar bands
6	Cirrus or cirrostratus increasing and reaching above 45° altitude : often in polar bands
7	Veil of cirrostratus covering the whole sky
8	Cirrostratus not increasing and not covering the whole sky
9	Cirrocumulus predominating, and a little cirrus

Code figure	Form of medium cloud
0	No medium cloud
1	Typical altostratus (thin)
2	Typical altostratus (thick), sun or moon invisible, or nimbostratus
3	Single layer of altocumulus or high stratocumulus
4	Altocumulus in isolated bands (often lenticular)
5	Altocumulus in bands (increasing)
6	Altocumulus formed from the spreading out of cumulus
7	Altocumulus associated with altostratus or altostratus with parts resembling altocumulus
8	Altocumulus castellatus (or altocumulus in ragged fragments)
9	Altocumulus in several layers generally associated with fibrous veils and a chaotic appearance of the sky

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	N.	W.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
17.10.46	1500	42°01′	9°45′	180	10	S′E.	8	1005·6	..	..	66·0	62·2	59	80	66·0	S′E.	3
17.10.46	1800	41°32′	9°44′	176	10	S.	6	1006·7	4	+1·1	65·3	62·7	61	86	65·5	S′W.	3
18.10.46	0000	40°32′	9°45′	181	11	S′W.	5	1010·1	3	+2·0	64·3	63·0	62	93	64·5	S′W.	3
18.10.46	1200	38°02′	10°32′	203	13	SW′S.	4	1014·4	3	+0·6	68·1	63·9	61	79	68·5	W.	1
18.10.46	1800	36°45′	11°10′	203	12	SW′W.	3	1013·6	4	+0·4	69·7	66·1	64	82	70·0	WNW.	1
19.10.46	0000	35°43′	11°45′	203	13	SW.	4	1013·8	0	+0·2	70·2	67·2	65	85	70·9	..	0
19.10.46	1200	33°22′	12°56′	203	13	NNW.	3	1018·1	3	+0·8	69·6	64·2	61	73	72·4	NW.	1
19.10.46	1800	32°05′	13°45′	201	13	N.	2	1018·0	8	−0·0	71·0	64·0	59	67	72·5	NW.	2
20.10.46	0000	30°47′	14°21′	201	13½	N.	2	1018·6	9	−0·2	70·6	65·0	61	73	72·7	NW.	2
20.10.46	1200	entering Las		Palmas		ENE.	3	1018·9	1	+0·4	72·8	68·2	66	78	73·2	N.	1
22.10.46	1200	27°25′	15°28′	200	12	NE.	3	1019·8	0	+0·6	73·3	65·3	60	63	73·0	..	0
22.10.46	1800	26°12′	15°50′	200	12½	NE′E.	3	1017·8	5	−0·2	71·2	64·9	60	70	74·3	..	0
23.10.46	0000	24°48′	16°31′	200	12½	ENE.	3	1018·3	9	−0·0	70·0	65·6	63	78	70·9	..	0
23.10.46	1200	22°39′	17°51′	210	13	ENE.	3–4	1018·6	0	+0·6	72·5	66·5	63	71	71·4	..	0
23.10.46	1800	21°10′	17°57′	180	13	NNE.	5	1015·8	7	−0·2	70·0	64·3	61	72	70·0	..	0
24.10.46	0000	19°56′	17°58′	180	13½	N′E.	5	1015·9	0	+0·1	71·4	66·4	63	75	77·4	N.	2
24.10.46	1200	17°14′	18°02′	180	13	NE′N.	5–6	1013·7	0	+0·2	77·0	71·8	69	77	81·0	N.	1
24.10.46	1800	16°02′	17°59′	178	13	NE′N.	5	1010·4	6	−0·8	78·0	72·5	70	76	82·5	NE.	1
25.10.46	0000	14°53′	17°56′	170	13	NE.	4	1011·9	1	+0·8	79·3	73·5	71	74	81·5	NE.	1
25.10.46	1200	12°18′	17°34′	180	13	ENE.	3	1011·6	0	+0·0	83·3	74·7	70	65	82·7	N.	1
25.10.46	1800	11°03′	17°33′	143	13	NNE.	3	1008·4	6	−1·0	80·8	74·8	72	74	82·8	..	0
26.10.46	0000	10°00′	16°45′	143	13	Calm		1011·3	1	+1·2	80·4	76·7	75	84	81·3	..	0
26.10.46	1200	7°56′	15°11′	143	13	S.	2	1012·3	0	+1·2	79·8	76·0	74	83	82·5	..	0
26.10.46	1800	7°00′	14°22′	143	12½	S′W.	3	1010·4	4	+0·2	78·0	74·7	(76)	85	81·6	SE.	1
27.10.46	0000	6°06′	13°41′	143	11½	S.	2	1012·7	0	+0·0	76·3	74·8	74	93	81·0	..	0
27.10.46	1200	4°20′	12°05′	143	12½	SSE.	2	1013·3	0	+0·0	79·0	73·9	71	78	80·8	..	0
27.10.46	1800	3°02′	11°01′	143	12½	SSE.	2	1011·3	5	−0·2	77·5	72·0	69	76	(80)	..	0
28.10.46	0000	2°00′ S.	10°12′	143	12½	SE′S.	3	1013·5	1	+0·8	77·1	71·9	69	77	79·3	..	0
28.10.46	1200	0°02′	8°43′	143	12	SE′S.	3	1013·2	0	+0·0	75·3	72·9	71	89	76·9	..	0
28.10.46	1800	1°04′	7°42′	143	12½	SE′S.	3	1011·0	6	−0·2	75·8	71·0	69	78	77·0	SE.	1
29.10.46	0000	2°02′	7°11′	143	12	SSE.	2	1016·8	1	+0·0	74·6	70·7	69	82	76·4	..	0
29.10.46	1200	4°02′	5°30′	143	12	SE′S.	3	1013·9	8	−0·6	73·9	68·7	66	76	75·1	SSE.	1
29.10.46	1800	5°02′	4°51′	143	12	SSE.	3	1012·6	4	+0·2	73·0	67·2	63	73	75·0	SSE.	1
30.10.46	0000	6°02′	4°09′	146	12	SE′S.	3	1013·8	9	−0·8	71·9	67·0	64	76	73·4	..	0
30.10.46	1200	8°07′	2°44′	145	12	SE.	3	1014·1	9	−0·2	71·7	66·4	63	74	73·4	SSE.	1
30.10.46	1800	9°02′	1°45′	143	12	SE.	2	1013·3	4	+1·0	69·6	66·6	65	85	72·1	SSE.	1
31.10.46	0000	10°10′	1°22′ E.	143	12	SE.	3	1015·0	0	+0·2	67·0	65·6	65	93	70·6	SE′S.	1
31.10.46	1200	12°13′	0°09′	145	12½	SE.	4	1015·2	8	−0·8	70·6	64·3	61	70	70·1	SE′S.	3
31.10.46	1800	13°09′	1°03′	143	11¼	SE.	3–4	1014·8	4	+0·8	67·4	62·8	59	77	69·0	SSE.	4
1.11.46	0000	14°03′	1°35′	143	11¼	SE.	4	1015·6	0	+0·0	66·5	61·5	59	74	68·6	SE.	3
1.11.46	1200	16°09′	2°55′	142	12	SE.	3	1016·2	9	−1·6	67·3	61·6	57	71	66·4	SE.	1
1.11.46	1800	17°04′	3°40′	142	11½	SE.	3	1015·4	4	+1·2	64·6	60·1	57	76	66·0	SE.	3
2.11.46	0000	18°00′	4°27′	142	11	SE.	3	1016·8	9	−0·0	64·0	60·7	60	81	65·7	SE.	3
2.11.46	1200	19°47′	5°56′	142	11	SE.	2–3	1018·1	7	−0·6	64·4	60·4	58	78	65·2	SE.	1
2.11.46	1800	20°37′	6°34′	142	11½	SSW.	2–3	1017·4	5	−0·2	62·8	60·3	59	86	64·8	..	0
3.11.46	0000	22°01′	7°31′	141	11	SW′S.	3	1017·5	7	−0·4	63·2	60·2	58	83	63·8	S.	1
3.11.46	0600	22°59′	8°22′	..	..	S.	3–4	1019·5	..	..	..	..	..	..	..	SE.	1
3.11.46	1200	23°56′	9°13′	141	12	SSE.	3	1018·4	8	−0·8	63·9	61·4	60	87	65·7	SE.	1
3.11.46	1800	24°45′	9°58′	141	12	S.	2	1017·5	4	+0·2	63·6	60·9	60	85	65·0	..	0

* See codes, p. 28.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
7		c	bc	Cu (2) tr., 2,500; As Ac (7); Ci (3)	8	..
6		or_or_o	or_or_oc	Fn (6) tr., 800; As (2) 10, 10,000	10	Maximum wind 9 about 1600
8		c	orrc	As Ac (7) 9, 9,000	9	..
8		c	cpr	As Ac (7) 9+, 10,000	9+	Moderate shower 0900
8		c	cpr_o	Cu (1) 1, 1,500; Sc (5) 9, 5,500	9	Two light showers afternoon
8		o	c	St Sc (5), 9, 4,000; As Ac (7)	10	Medium cloud east of ship
9		c	c	St Sc (5) 8, 2,200	8	St thin overhead, lower to east
9		bc	bc	St Sc (5) 6, 2,800	6	..
9		c	bc c	St Sc (5) 9, 2,800	9	..
9		bc	cpr_o	Cu (2) tr., 2,800; Sc (5) 5, 3,300	5	Light shower from Sc 0700. Cloud on mountains
9		bc	bc	St Sc (5), 3, 4,000	3	Cloud on mountains
9		c	bc c	Cu (1) tr., 3,200; Sc (5) 8, ..	8	..
9		b	bc	Sc (5) tr., 6,000	tr.	Cloud on western horizon
8		b	b	Cu (1) tr., 2,800	tr.	Cooler water, sea temperature 69°F. at 0900
8		b	b	Ac (4) tr., 12,000; Ci (3)	2	Ci as belt across south-south-east horizon
8		b	b	Ci (3)	2	Ci mainly across southern sky
8		b	b	Cu (1) tr., 3,500; Ci (2)	2	..
8		bc	b bc	Ci Cs (6)	7	..
9		bc	bc	Ci (2)	3	Cape Verde light seen
8		bc	bc	Ci (2)	3	..
8		bc	bc	Ci (2)	5	..
7	No observations	bcl	bcl	Cb (3) tr.; As Ac (7); Cs (8)	3	Calms began suddenly and dew point rose. Cb
9		c/r	ctlr	Cb (9) 9+, 1,200	9+	.. [to south-east
9		bcjp	bcjp	Cb (9) 5, 1,500; Ac (3); Ci (3)	7	..
9		$bcpr_o$	$bcpr_o$	Cb (9), 7, 1,000	7	..
9		bc	bc	Cu Sc (7) 7, 2,200	7	..
9		bc	bc c	Cu Sc (7) 7, 2,800	7	..
9		c	c	Cu Sc (7) 9+, 4,000	9+	..
8		cjp	c	Cu Sc (8) 9, 1,800	9	Sc base ranging 4,500–7,000 ft.
9		b	bc	Cu (1) 2, 1,200; Sc (5) tr., 4,000	2	..
9		bc	bc	Cu (1) 3, 1,500	3	..
8		o	cir_o	Sc (5) 10, 8,000	10	Cu tr.
8		c	c	Sc (5) 9, 4,000	9	..
9		c	c	Sc (5) 9+, 2,500	9+	..
9		c	c	Sc (5) 8, 2,800; Sc (5) .., 3,500	8	..
8		cid_o	cid_o	Sc (5) 9+, 1,200	9+	..
7		$cdod_o$	cid_o	Sc (5), 9+, 1,200	9+	..
8		bc	c	Sc (5), 7, 2,500; Sc (5) .., 3,500	7	..
8		c	bc c	Sc (5) 9+, 2,500	9+	..
9		c	c	Sc (5) 9+, 2,200	9+	..
8		c	c	Sc (5) 9+, 3,500	9+	Probably no upper cloud
8		c	c	St (5) 9, 900; Ac (3); Cc (9)	9+	..
8		c	c	Sc (5) 9+, 1,200	9+	..
8		c	c	Sc (5) 9, 1,500; As (1)	9+	..
9		bc	c bc	Ac (8) .., 8,000; Ci Cs (6)	5	Massive Ac castellatus. Ci Cs lenticularis
9		bc	bc	Sc (5) tr., 800; Ac (3) 4, 10,000	4	..
8		b	..	Sc (5), 1, 700	1	..
8		o	b bc c	St Sc (5) 10, 800	10	..
9		bc	c bc	Cu (1) 4, 1,100	4	Cloud height from aircraft observation

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
4.11.46	0000	25°40′	10°42′	141	13	S.	2	1017·4	9	−1·0	62·1	59·4	58	85	62·3	SW.	1
4.11.46	1200	27°52′	12°43′	141	12	S.	4	1015·8	8	−1·2	61·8	56·8	53	72	63·0	SW.	1
4.11.46	1800	28°37′	13°24′	141	12	S.	3	1013·7	5	−0·0	61·3	57·3	54	77	63·0	SW.	3
5.11.46	0000	29°35′	14°20′	141	12	SE′S.	2	1012·5	8	−1·6	59·9	56·2	54	78	62·7	SW.	3
5.11.46	0600	30°42′	15°20′	141	12½	SSW.	3	1012·1	1	+0·2	59·9	55·8	53	76	62·1	SW.	3
5.11.46	1200	31°38′	16°12′	143	12	W.	3	1013·0	2	+0·0	61·3	56·2	52	71	63·0	SSW.	3
5.11.46	1800	32°40′ at Cape	17°07′ Town	143	13	WNW.	5	1014·0	2	+1·2	62·3	58·7	56	80	61·9	WSW.	7
11.11.46	1800	34°42′	18°29′	150	11	SSW.	3	1014·6	1	+0·8	61·1	56·1	52	72	63·7	SW.	3
12.11.46	0000	35°41′	19°11′	..	..	S.	3–4	...	..	..	...	...	..	..	...	...	..
12.11.46	0600	36°41′	19°52′	150	11	SW′S.	3	1015·6	3	+1·8	56·5	51·0	47	67	59·0	W′S.	4
12.11.46	1200	37°47′	20°12′	150	11	WSW.	5	1013·8	8	−1·2	57·2	49·8	41	55	61·3	SW.	3
12.11.46	1800	38°45′	21°00′	150	9½	WSW.	5	1013·3	2	+0·2	57·1	50·9	45	63	66·0	SW.	6
13.11.46	0000	39°34′	21°39′	..	..	SW.	3	...	..	..	...	...	..	..	...	...	..
13.11.46	0600	40°23′	22°18′	148	11	W.	2	1008·7	9	−0·6	53·5	47·6	40	62	66·0	SW.	3
13.11.46	1200	41°17′	23°03′	145	11	NE′N.	3	1005·0	8	−2·2	53·4	49·3	45	73	67·8	SW.	1
13.11.46	1800	42°10′	24°10′	145	10½	E′N.	5	1000·8	8	−1·8	46·8	46·1	46	95	52·8	W.	1
14.11.46	0000	42°57′	24°51′	..	..	E′S.	7	...	..	..	...	...	..	..	...	..	3
14.11.46	0600	43°45′	25°32′	145	9¾	E.	6	994·0	4	+1·8	46·2	45·3	44	93	50·0	E.	3
14.11.46	1200	44°35′	26°22′	144	9	E′N.	6	993·5	9	−0·4	43·3	42·5	41	93	47·0	E.	6
14.11.46	1800	45°22′	27°15′	144	10	ENE.	5	992·5	8	−0·4	42·7	42·2	42	96	45·8	E.	3
15.11.46	0000	46°14′	28°10′	..	..	E.	5	...	..	..	...	...	..	..	...	..	4
15.11.46	0600	47°05′	29°06′	143	10	E′S.	5	992·2	2	+0·2	37·2	36·9	36	97	40·7	E.	3
15.11.46	1200	47°43′	29°42′	139	10	SE.	5	993·6	2	+1·8	37·3	36·2	34	89	42·2	SE.	4
15.11.46	1800	48°40′	30°38′	134	9½	SE.	4	998·2	3	+2·8	36·2	34·2	30	80	43·4	SE.	1
16.11.46	0000	49°30′	31°35′	..	..	SE.	3	...	..	..	...	...	..	..	...	..	3
16.11.46	0600	50°20′	32°33′	132	10½	S.	3	1006·7	3	+2·0	34·0	32·5	30	84	35·9	E.	1
16.11.46	1200	51°08′	33°50′	134	11	SSW.	2	1009·9	2	+1·4	33·8	31·4	28	78	35·8	E.	1
16.11.46	1800	51°51′	35°10′	132	11½	SW.	2	1012·5	3	+0·8	31·2	27·3	17	55	36·0	..	0
17.11.46	0000	52°39′	36°39′	..	..	W.	1	...	..	..	...	...	..	..	...	..	2
17.11.46	0600	53°27′	38°08′	132	10	W.	1	1013·4	3	+0·0	31·2	27·8	19	62	35·0	SW.	1
17.11.46	1200	54°25′	39°51′	132	11	NNW.	2	1011·2	8	−1·4	31·3	28·4	21	68	32·4	..	0
17.11.46	1800	55°12′	41°43′	92	12	N.	2	1009·1	7	−1·0	29·8	27·2	22	70	32·0	..	0
18.11.46	0000	55°08′	42°19′	..	..	N.	3	...	..	..	...	...	..	..	...	..	2
18.11.46	0600	55°05′	42°55′	..	0	N.	4	1001·7	8	−2·8	29·4	29·4	29	100	30·7	..	0
18.11.46	1200	55°06′	43°11′	90	1	NNW.	4	996·1	8	−2·4	31·0	31·0	31	100	29·7	NW.	1
18.11.46	1800	55°03′	43°18′	..	0	W′N.	4	996·4	2	+0·0	30·1	29·4	28	92	29·7	..	9
19.11.46	0000	55°01′	43°49′	..	..	NW.	2	...	..	..	...	...	..	..	...	..	1
19.11.46	0600	55°00′	44°20′	90	1	NW′N.	4	991·7	7	−1·8	29·6	29·3	29	96	30·7	NW.	1
19.11.46	1200	55°00′	44°31′	..	0	WNW.	4	988·1	6	−0·8	31·0	30·4	29	93	30·8	..	9
19.11.46	1800	55°00′	44°35′	..	0	WNW.	5	989·3	1	+0·4	31·0	30·3	29	92	30·4	W.	1
20.11.46	0000	55°10′	45°21′	..	..	WNW.	3	...	..	..	...	...	..	..	...	..	3
20.11.46	0600	55°20′	46°06′	180	5	NW′W.	4	994·2	2	+1·2	31·7	31·3	31	95	31·1	NW.	1
20.11.46	1200	55°18′	46°15′	180	10	NW.	3	993·8	9	−0·2	32·1	31·6	31	95	32·0	NW.	1
20.11.46	1800	55°35′	46°08′	180	3	NNW.	2	992·4	8	−0·8	31·0	30·7	30	97	30·4	..	0
21.11.46	0000	55°58′	46°13′	..	..	NNE.	2	...	..	..	...	...	..	..	...	..	2
21.11.46	0600	56°21′	46°18′	..	0	NE.	2	982·5	8	−2·0	31·8	31·5	31	97	30·4	NW.	1
21.11.46	1200	56°15′	47°09′	90	8	SSW.	3	978·3	8	−1·8	30·2	29·9	29	97	30·3	W.	1
21.11.46	1800	56°48′	47°08′	180	5	WSW.	4	978·8	1	+0·2	29·0	28·9	27	99	29·7	..	0
22.11.46	0000	56°25′	47°53′	..	..	W.	4	...	..	..	...	...	..	..	...	..	3
22.11.46	0600	56°01′	48°37′	90	6	WNW.	3	978·1	7	−0·8	29·0	27·9	25	86	30·7	N.	3
22.11.46	1200	55°50′	48°56′	..	0	W.	4	977·8	4	+0·0	29·7	..	(27)	(85)	31·0	W.	1
22.11.46	1800	55°45′	49°27′	90	5	W.	3	977·7	4	+0·2	28·7	28·4	26	96	30·5	NW.	3

* See codes, p. 28.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
9	..	b	bc b	Cu (1) 1, 900	1	Moonlight
8		b	b	Cu (1) tr., 1,400	tr.	..
8		b	b	..	0	..
9		bc	b	Sc (5) 7, 1,700	7	Moonlight
9		b	b	Sc (5) 1, 2,000	1	..
9		c	bc c	Sc (5) 9, 1,900; Ac (5); Ci (3)	9	..
8		cido	c bc c	Sc (5) 9+, 2,700; Ac (5)	9+	..
9		c	bc c	Cu (1) 7, 3,000; Ci Cs (6)	8	..
..		b	..	..	..	..
9		bc	c	Sc (5) 2, 2,500; Ci Cs (5)	5	Sea temperature rising southwards
9		c	bc	Cu (1) 3, 2,500; Ci (4)	8	..
9		c	c	Sc (4) 7, 2,300 ; Ci (4)	8	..
..		c	..	..	..	..
8	..	cirо	c	Sc (5) 9+, 2,800	9+	..
9		o/rо	crorо	Sc (5) 8, 2,200; AsAc (7)	10	..
7		ororof	crorо	St (5) 10, 900	10	Sea temperature fell to 50 F. by 1400
..		cr	..	..	..	..
5	33·2	ododо	orodо	St (5) 10, 300	10	..
7		o	o	St (5) 10, 500	10	Sun visible through St
6		ododо	oidо	St (5) 10, 400	10	..
..		ojp	..	..	..	..
5	10·8	o/dо	oidо	St (5) 10, 350	10	..
7		o	oc	St Sc (5) 10, 450	10	..
7		ososo	ccisо	Sc (5) 10, 500	10	Snow began 1630
..		c	..	..	..	} Hygrograph record suggests sea temperature
9	0·2	c	c	Cu (2) 2, 1,200; Sc (5) 9, 4,000	9	} dropped sharply 0000–0300. First icebergs
9		bc	c bc	Cu (1) 2, 1,600; As Ac (7) .., 9,000	3	.. [seen 0100
9		cvy	bc cpsoc	Sc (5) 9, 3,500	9	Ice on wet bulb
..		o	..	..	..	..
9	..	o	c	Sc (5) 10, 3,500	10	..
9		cv	cv	Sc (5) 9+, 3,100	9+	Relative calm. Assmann used
9		ov	cv	Sc (5) 10, 4,500	10	..
..		o	..	..	..	Pack-ice edge 56°18′S. 40°18′E. at 2100
5	0·4	ososo	cvososo	St (5) 10, 800	10	Sun visible through St
6		omoiso	ososo	St (5) 10, 400	10	..
9		c	ossc	Sc (5) 9+, 3,200	9+	Swell NW. and W., both code* Scale 1
..		o	..	..	..	..
8	0·7	o/so	co	Fs (6) 10, 1,100; Ns (2)	10	..
8		o	o iso	Sc Fs (5) 10, 1,800	10	..
6		ososo	coiso	Sc (5) 10, 2,200; Ns (2)	10	..
..		o	..	..	..	..
6	0·1	omo	omo	St (5) 10, 2,500; Ns (2)	10	..
3		ofo	omososoofo	Sky obscured	..	..
1		oF	omcof	Sky obscured	..	..
..		oms	..	..	..	..
2	0·1	of	oFf	Sky obscured	..	..
4		ososo	omososo	Sky obscured	..	Sun visible
9		c	ososoFc	St (5) 2, 800; As Ac (7) .., 6,000	9	..
..		c	..	..	..	..
8	0·2	c	c	Cu (1) 1, 1,200; As Ac (7) .., 6,000	9	..
8		c	bc	Sc (5) 9, 1,000; Ac (5)	9+	Gusty
6		cpso	c	Cu Sc (8) 8, 1,200; Ac (3)	9+	Visibility code* 9 to south

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
23.11.46	0000	55°52′	49°26′	..	..	W.	3	...	..	..	...	...	..	..	...	..	3
23.11.46	0600	55°59′	49°25′	..	0	WNW.	3	977·3	9	−1·2	29·3	28·4	26	89	30·0	W.	3
23.11.46	1200	56°10′	50°24′	90	5	NW.	2	976·2	7	−0·4	30·1	..	(27)	(90)	30·7	NW.	1
23.11.46	1800	56°11′	51°09′	90	6	W'N.	1	973·9	8	−0·4	29·1	..	(27)	(96)	30·8	..	0
24.11.46	0000	56°03′	51°20′	90	6	SSE.	1	973·2	8	−1·0	29·1	..	(27)	(94)	30·3	NW.	2
24.11.46	0600	55°44′	52°15′	70	8	SE'S.	3	974·1	3	+0·6	32·9	31·3	27	83	32·0	NW.	2
24.11.46	1200	56°14′	52°50′	130	13	SSE.	4	978·2	3	+2·6	30·0	..	(24)	(80)	32·3	NW.	1
24.11.46	1800	56°14′	53°25′	90	6	S'W.	4	982·3	2	+2·4	28·3	27·7	25	93	30·2	S.	1
25.11.46	0000	56°18′	52°46′	270	3	SSW.	4	987·7	3	+2·0	27·3	..	(13)	(60)	29·8	S.	2
25.11.46	0600	56°28′	52°52′	140	10	SW.	4	990·2	2	+0·6	27·5	24·8	16	66	30·0	S.	2
25.11.46	1200	57°35′	53°48′	..	..	WSW.	3	991	..	..	27	..	..	..	...	..	..
25.11.46	1800	56°50′	54°32′	57	10	W.	2	993·2	2	+1·0	28·2	..	(26)	(95)	28·8†	W.	5
26.11.46	0000	56°52′	55°00′	..	0	NW.	1	995·2	2	+0·4	27·8	..	(25)	(90)	29·5	NW.	4
26.11.46	0600	56°54′	55°42′	90	8	N.	1	996·8	3	+0·6	29·3	28·5	26	90	31·8	..	0
26.11.46	1200	56°58′	56°01′	..	..	Calm		996	..	..	34	..	..	..	...	..	..
26.11.46	1800	56°56′	56°25′	135	8	ESE.	2	994·3	7	−0·8	28·4	..	(18)	(70)	30·7	W.	1
27.11.46	0000	56°56′	56°25′	90	2	SE'S.	2	990·9	8	−1·8	25·8	..	(20)	(81)	30·0	..	0
27.11.46	0600	56°57′	56°56′	90	3	S.	3	987·7	8	−1·0	26·8	24·7	19	73	30·2	..	0
27.11.46	1200	57°06′	57°54′	..	..	S.	3	984	..	..	25	..	..	..	...	..	..
27.11.46	1800	57°20′	58°27′	150	11	WSW.	3	981·6	9	−1·8	27·6	..	(25)	(94)	30·7	..	0
28.11.46	0000	57°18′	58°43′	..	0	SW.	6	980·4	4	+0·4	28·2	27·8	26	95	30·4	SW.	3
28.11.46	0600	58°00′	59°22′	135	11	WSW.	3	983·8	2	+1·6	28·4	27·0	23	83	31·0	..	0
28.11.46	1200	58°12′	59°48′	90	5	W'N.	3	985·3	0	+0·2	28·6	..	(20)	(70)	30·7	..	0
28.11.46	1800	57°53′	60°31′	80	4	W'N.	3	986·3	3	+0·2	28·1	..	(20)	(76)	29·7	..	0
29.11.46	0000	58°04′	60°52′	135	8	N.	1	985·9	7	−0·4	28·0	..	(27)	(96)	30·0	..	0
29.11.46	0600	58°19′	61°43′	135	3	N.	3	985·0	8	−0·6	30·5	..	(28)	(92)	30·2	..	0
29.11.46	1200	58°37′	62°07′	120	3	NE.	2	985·3	3	+0·2	29·8	29·6	29	98	30·3	NW.	1
29.11.46	1800	58°20′	62°25′	135	3	E.	1	986·4	2	+1·2	29·0	..	(27)	(94)	30·2	N.	1
30.11.46	0000	58°34′	63°06′	..	..	S.	1	988	..	..	28	..	..	..	...	..	..
30.11.46	0600	58°30′	63°44′	135	3	S.	2	990·3	3	+1·4	30·0	29·4	29	93	31·2	N.	1
30.11.46	1200	58°50′	64°19′	..	..	S.	1	992	..	..	31	..	..	..	...	..	..
30.11.46	1800	58°49′	64°33′	..	0	SSW.	2	993·0	3	+0·2	28·9	..	(22)	(76)	30·7	N.	1
1.12.46	0000	59°06′	65°13′	..	..	SW.	2	992	..	..	28	..	..	..	...	..	..
1.12.46	0600	59°22′	66°04′	135	8	SW.	2	991·1	6	−0·6	31·3	29·2	25	76	31·5	..	9
1.12.46	1200	59°39′	66°27′	150	10	WSW.	2	988·6	9	−2·0	29·0	27·0	22	76	32·0	NE.	1
1.12.46	1800	59°54′	66°43′	160	6	NNE.	1	985·2	8	−1·8	27·3	..	(16)	(66)	31·1	NW.	4
2.12.46	0000	59°44′	66°39′	..	..	SE.	2	980	..	..	27	..	..	..	...	..	..
2.12.46	0600	60°03′	66°52′	160	7	ESE.	2	977·0	6	−1·8	27·1	25·0	19	73	31·0	..	0
2.12.46	1200	60°06′	66°53′	220	1	SE.	3	975·3	8	−0·6	28·0	26·6	22	83	31·2	..	0
2.12.46	1800	60°08′	66°53′	..	0	SE.	3	975·4	1	+0·4	27·4	..	(21)	(80)	31·2	..	0
3.12.46	0000	60°07′	66°52′	..	..	SSE.	2	974	..	..	28	..	..	..	...	..	..
3.12.46	0600	60°06′	66°51′	..	0	SSE.	3	973·0	6	−0·6	27·6	26·9	25	92	31·1	N.	4
3.12.46	1200	60°00′	66°48′	360	2	W.	1	972·6	8	−0·2	30·2	29·2	27	88	32·1	NW.	4
3.12.46	1800	59°46′	66°48′	360	2½	WSW.	1	974·3	2	+1·0	28·1	..	(25)	(91)	31·0	NW.	4
4.12.46	0000	59°43′	66°33′	..	..	E.	1	975	..	..	28	..	..	..	...	..	..
4.12.46	0600	59°39′	66°31′	305	2	E.	3	974·8	7	−0·8	31·6	..	(26)	(80)	31·6	NW.	1
4.12.46	1200	59°35′	66°33′	90	3	ESE.	4	972·9	7	−1·4	29·7	28·0	24	80	31·0	..	9
4.12.46	1800	59°33′	67°09′	80	6	SE'E.	5	971·5	8	−0·2	29·3	28·4	26	90	30·2	NE.	1
5.12.46	0000	59°46′	67°33′	..	..	SE.	4	971	..	..	28	..	..	..	...	..	..
5.12.46	0600	59°58′	68°06′	140	6	SSE.	4	973·7	3	+1·6	30·2	28·9	26	85	30·8	NNE.	6
5.12.46	1200	60°31′	68°19′	..	0	S.	4	975·1	3	+0·8	30·5	29·7	28	91	31·3	NE.	4
5.12.46	1800	60°30′	68°28′	..	0	S.	5	975·0	6	−0·6	29·3	27·9	25	84	30·3	NE.	1

* See codes, p. 28.
† Ice.

Visibility*	Precipitation of last 24 hr.	Weather: Present	Weather: Past 6 hr.	Cloud: Type, code* number in brackets, amount (tenths) and height of base (ft.)	Cloud: Total amount	Remarks
	mm.				tenths	
..		c	..	..	..	..
8	(1·0)	c/ps	c cps	Cu Sc (8) 8, 900; Ac (6) .., 10,000	9+	..
8		cjp	c	Cb Fn (9) 9, 1,500; Ci (4) .., 15,000	9	..
8		c	$cps_{o}ps$	Cb Fn (9) 9+, 1,200	9+	..
8		c	cjp	Cb Fn (9) 9, 900; As Ac (7) .., 8,000	9+	..
9	tr.	bc	c bc b	Cu Sc (7) 2, 1,500; Ac (3) .., 9,000	3	..
9		bc	bc	Cu (1) 4, 1,800; Ac (4)	4	..
8		cps_{o}	$ccps_{o}c$	Cu Sc (8) 9+, 1,800	9+	Gusty, humidity varying erratically
9		c	$ccps_{o}c$	Sc (5) 9+, 3,200	9+	Gusty
9	tr.	bcv	ccjpbc	Cu (1) 5, 1,800; Cc (9)	6	Some bands of Sc 4,000 ft.
9		..	o	..	..	..
9		cph_{o}	oc	Cu Sc (8) 4, 1,500; As Ac (7) .., 8,000	9+	Very small, white, opaque hail cones
9		cv	bc b bc	Sc (5) 8, 5,500	8	..
9	tr.	cjp	cps_{o}	Cu (2) .., 2,400; Sc (5) 9+, 4,000	9+	..
9		o	..	..	..	..
9		c	oc	Sc (5) 9+, 6,000	9+	..
5		ops	$ccps_{o}c$	Cu (2) 10, 2,000	10	Line-squall cloud
9	0·1	o	$cps_{o}c$	Cu (2) .., 1,800; Sc (5) 10, 5,500	10	..
9		o	..	..	..	..
7		$os_{o}s_{o}$	$cos_{o}s_{o}$	Fs (6) .., 1,700; Ns (2) 10, 3,000	10	..
7		c/s	cshossq	Cu (2) 9+, 800; Ac (3) .., 8,000	9+	Barometer minimum 979·2 mb. 2300 with ossq
9	(0·5)	c	$cis_{o}c$	Sc (4) 9, 2,100; As (2) .., 6,000	9+	.. [WSW. 7
9		c	c	Cu (2) .., 1,800; Sc (5) 9+, 3,000	9+	..
9		ov	c	Sc (5) 3, 2,800; Sc (5) 10, 4,500	10	..
7		$cs_{o}s_{o}$	$ccs_{o}s_{o}$	Fc Fn (6) 8, 700 ; Ac (3) .., 8,000; Ci Cs (6)	9+	..
8	0·1	c	cis_{o}	Cu (1) 1, 2,000; Sc (5) 9+, 5,000	9+	..
8		c	$ccis_{o}c$	St Sc (5) 6, 4,500; Ac (3) .., 8,000; Cs (7)	9+	..
9		bc	c	St (5), 1, 6,000; Ac (3) .., 11,000; Ci Cs (7)	7	..
7		..	c	..	..	..
8	tr.	c	c	St (5) 3, 500; Ac (3) .., 9,000; Ci Cs (7)	9	Aircraft reported St tops 1,500 ft.
8		c	..	..	..	..
9		bc	c bc	St (5) 5, 2,300; As Ac (7) .., 15,000	6	..
9		c	..	..	..	..
9	tr.	bc	c bc	Cu (1) 3, 2,200; Sc (5) 5, 4,500; Ac (4) .., 10,000	6	..
9		bcv	bc	Cu (1) 3, 2,500; As Ac (7) .., 10,000	4	..
9		b	bc b	Sc (5) 1, 2,600	1	..
9		c	..	..	..	..
9	tr.	cis_{o}	c	Cu (1) 5, 2,000; St Sc (5) 9, 4,500	9	..
9		o	cis_{o}	Cu (2) 3, 2,200; St Sc (5) 10, 4,500	10	..
9		c/s	$cs_{o}s_{o}$	Fs (6) 1, 1,500; Cb (9) 9, 2,500	9+	..
..		cps_{o}	..	..	..	..
6	0·1	$os_{o}s_{o}$	$cps_{o}c$	Fs Fn (6) .., 1,100; As Ns (1) 10, ..	10	..
9		c	$os_{o}s_{o}cbc$	Cu (1) 3, 1,600; As Ac (7) .., 12,000; Cs (8)	8	Cu tops below 2,000 ft.
9		$bcis_{o}$	cis_{o}	Fs Fn (6) tr., 800; As Ac (7) .., 12,000; Cs (8)	6	Aircraft report: glassy smooth sea surface [amongst ice in spite of considerable swell
9		c	..	..	..	..
9	(0·1)	bc	c bc	Cu (2) 3, 1,200; Sc (5) .., 2,500; Ac (4)	4	..
9		c	bc c	Cu (2) 1, 1,000; Sc (5) 9+, 4,000	9+	..
9		c	ccjp	Cu (2) 4, 1,200; St (5) .., 5,000; Cs (7)	8	..
8		bc	..	..	..	..
8	0·0	o	bc co	St Sc (5) 3, 1,000; St Sc (5) 10, 2,800	10	..
8		o	oc	Fs (6) 1, 1,400; St (5) 2, 5,000; Ac (3) .., 8,000	10	..
9		cjp	c	Cu Cb Fs (9) 9+, 1,800; Ac (3)	9+	..

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
6.12.46	0000	60°41′	68°29′	..	..	S.	3	975	..	..	29	..	..	..	..	..	..
6.12.46	0600	60°37′	68°57′	100	6	S.	3	975·6	3	+0·2	30·2	29·2	27	88	32·3	..	0
6.12.46	1200	60°24′	69°45′	80	6	S.	2	975·0	9	−0·8	30·0	29·0	27	88	32·1	..	0
6.12.46	1800	60°29′	69°52′	..	0	SSW.	1	973·7	8	−0·6	29·6	(30·2)	(29)	(94)	31·6	..	0
7.12.46	0000	60°29′	69°52′	..	..	SW.	1	973	..	..	28	..	..	..	..	..	..
7.12.46	0600	60°02′	70°34′	32	6	SSW.	1	973·0	4	+0·2	30·9	29·9	28	89	31·0	..	0
7.12.46	1200	59°29′	71°34′	30	10	NNW.	1	973·2	1	+0·2	30·6	29·5	27	87	32·1	NW.	1
7.12.46	1800	58°33′	73°07′	51	12	W.	1	974·6	3	+0·8	30·7	30·1	28	93	32·1	NW.	1
8.12.46	0000	57°52′	73°51′	..	..	WSW.	2	977	..	..	30	..	..	..	..	..	..
8.12.46	0600	57°15′	74°35′	75	12	W'N.	3	980·0	3	+2·4	33·2	32·2	29	89	32·3	NW.	3
8.12.46	1200	56°42′	76°04′	90	12	W.	3	983·6	3	+2·0	(33·2)	(32·0)	(30)	(87)	32·2	NW.	3
8.12.46	1800	56°14′	77°54′	56	11	W.	4	988·0	2	+2·6	30·7	(31·0)	(30)	(97)	31·6	NW.	3
9.12.46	0000	55°42′	79°28′	..	..	W.	3	994	..	..	32	..	..	..	..	..	..
9.12.46	0600	55°10′	81°01′	45	11	W.	5	998·4	3	+3·4	34·1	32·4	29	84	33·1	WNW.	6
9.12.46	1200	55°03′	80°54′	45	10	WNW.	5	1001·0	1	+1·0	33·4	32·1	30	86	33·8	NW.	7
9.12.46	1800	55°00′	81°06′	..	0	N.	6	994·5	9	−5·6	30·2	..	(29)	(96)	33·4	N.	4
10.12.46	0000	55°05′	81°15′	..	..	NNW.	6	985	..	..	33	..	..	..	..	..	..
10.12.46	0600	55°10′	81°23′	..	0	WNW.	5	988·8	1	+0·2	34·1	33·1	31	90	33·8	NNW.	3
10.12.46	1200	55°18′	81°27′	..	0	WNW.	5	988·6	8	−0·2	34·0	33·3	33	93	34·0	..	9
10.12.46	1800	55°27′	81°27′	..	0	NNW.	5	988·2	8	−0·2	33·0	33·0	33	100	33·5	NW.	6
11.12.46	0000	55°27′	81°42′	..	..	WNW.	4	988	..	..	33	..	..	..	..	..	..
11.12.46	0600	55°21′	81°58′	..	0	WNW.	5	989·9	3	+2·0	34·0	33·2	32	92	34·2	WNW.	7
11.12.46	1200	55°41′	81°40′	225	7	NW'W.	7	991·9	1	+0·4	34·2	33·1	31	89	33·9	NW.	7
11.12.46	1800	55°31′	81°39′	..	0	NW.	6	990·5	9	−1·4	32·7	32·4	32	92	33·9	NW.	7
12.12.46	0000	55°48′	81°48′	..	..	N'E.	7	975	..	..	33	..	..	..	..	..	..
12.12.46	0600	56°11′	82°04′	160	3	W'S.	8	973†	4	+2·2	33·0	32·1	30	91	34·3	W'S.	7
12.12.46	1200	56°50′	82°15′	170	8	W.	6	979·5	3	+0·8	32·8	32·0	31	91	33·2	W.	6
12.12.46	1800	56°50′	82°26′	..	0	W'S.	4	981·1	1	+0·2	32·2	(32·4)	(31)	(94)	33·3	WNW.	6
13.12.46	0000	57°05′	82°50′	..	..	W.	3	978	..	..	31	..	..	..	..	..	..
13.12.46	0600	57°29′	83°31′	130	4	ESE.	2	974·6	8	−1·8	31·5	..	(29)	(90)	34·0	N.	4
13.12.46	1200	57°03′	83°38′	25	5	SE'S.	2	974·7	4	+0·6	32·3	31·0	28	86	34·0	NW.	4
13.12.46	1800	57°21′	83°44′	300	1	SW'S.	3	977·5	3	+1·8	31·5	30·7	29	91	33·3	NW.	3
14.12.46	0000	57°26′	83°42′	..	..	SW.	2	982	..	..	31	..	..	..	..	..	..
14.12.46	0600	57°32′	83°39′	..	0	WNW.	1	984·6	2	+1·2	33·8	33·3	33	95	34·6	NW. / SE.	3
14.12.46	1200	57°39′	83°21′	160	1	W.	2	983·3	9	−1·4	31·5	30·9	30	93	34·7	SSE. / NNW.	6
14.12.46	1800	57°41′	83°19′	220	1	NW.	1	982·9	9	−0·4	30·0	29·0	27	88	34·0	NW.	4
15.12.46	0000	57°51′	83°15′	..	..	SW.	1	983	..	..	30	..	..	..	..	..	..
15.12.46	0600	57°52′	83°17′	25	1	SSW.	2	983·7	3	+0·2	31·7	31·5	31	98	34·0	NW.	4
15.12.46	1200	57°52′	83°17′	..	0	SSW.	3	985·7	3	+1·0	32·8	31·2	28	82	33·7	NW.	3
15.12.46	1800	57°52′	83°16′	315	1	SW.	4	988·0	3	+1·8	31·2	30·0	28	88	33·2	..	0
16.12.46	0000	57°35′	83°30′	..	..	SW'S.	4	990	..	..	31	..	..	..	..	..	..
16.12.46	0600	57°09′	83°51′	320	1	SW'S.	4	993·6	3	+1·6	32·5	30·0	25	73	33·2	..	0
16.12.46	1200	57°05′	83°45′	320	1	WSW.	5	996·7	3	+1·2	33·7	31·5	27	78	34·3	SW.	2
16.12.46	1800	57°03′	83°33′	..	0	SSW.	4	999·4	2	+1·6	31·6	29·2	24	74	33·7	SW.	1
17.12.46	0000	57°01′	83°21′	..	..	SW.	4	1002	..	..	33	..	..	..	..	..	..
17.12.46	0600	56°41′	83°09′	330	1	SW.	4	1003·8	3	+0·4	32·8	31·2	28	83	34·3	SW.	1
17.12.46	1200	56°34′	83°09′	360	1	SW.	5	1005·0	3	+1·0	32·3	29·8	25	73	33·2	SW.	1
17.12.46	1800	56°30′	83°05′	210	1	SW.	5	1005·2	9	−0·2	32·2	29·2	22	68	33·7	..	0
18.12.46	0000	56°30′	83°02′	..	..	SW.	3	1004	..	..	31	..	..	..	..	..	..
18.12.46	0600	56°31′	82°59′	210	1	WSW.	3	1000·2	8	−2·0	32·1	29·2	22	69	33·7	W.	1
18.12.46	1200	56°36′	82°51′	220	1	NW.	3	997·0	8	−2·0	32·5	31·8	31	92	33·7	..	0
18.12.46	1800	56°50′	82°57′	190	3	W.	2	993·4	8	−2·0	31·9	(32·0)	(28)	(82)	33·7	NW.	1

* See codes, p. 28.
† Pressure taken from barograph as observations 15 min. late owing to swell observing aft and barometer rising steeply.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
9		c	..	..	..	..
8	0·0	c	cjp	Sc St (5) 9, 2,200; As Ac (7) .., 12,000; Cs (8)	9+	..
8		ojp	ciso	Cb (3) 7, 1,200; As Ac (7) .., 18,000	10	..
8		o_{is_o}	c_{is_o}	Cb (3) 6, 1,500; As Ac (7)	10	..
..		cps_o	..	..	..	..
9	tr.	o	o	Fc (1) 6, 900; As Ac (7) .., 20,000	10	..
9		o	oc	Fc (1) 3, 1,100; As Ac (7) .., 16,000	10	Ac showing mammatus form for brief period
9		o	c	Cu (2) tr., 1,800; Ac (3) .., 12,000	10	..
9		ojp	..	..	..	..
9	0·0	c	c	Cb Cu Fs (9) 1, 1,500; Ac (3) .., 10,000; Ci (3)	8	..
8		bc	c bc	Cu (2) tr., 1,500; As Ac (7) .., 12,000, Ci (3)	7	..
6		os_os_o	bc c os_os_o	As (1) 10, ..	10	Stars visible through As
6		bc/s_o	..	..	..	..
7	0·1	c	c	As Ac (7) 9+, 14,000	9+	..
7		b	c bc b	Fs (6) tr., 1,200; Ac (4) .., 12,000	tr.	..
4		os_os_o	b bc c	Sky obscured	..	..
5		om_o	..	..	..	..
6	0·1	o	c	Ac (3) 10, 12,000	10	..
6		om_o	c om_o	St (5) 10, 900	10	Heavy swell
5		or_os_o	o	St (5) 10, 1,200	10	..
6		om_o	..	..	..	..
6	tr.	om_o	om_o	St (5) 10, 900	10	..
7		bcm_o	oc bcm_o	Ac (3) 6, 11,000	6	..
6		ois_o	bc cm_o	As Ac (7) 10, ..	10	Snow, arriving from north began 1800
3		oss	..	..	..	..
7	5·7	cq	od_om_o	Sc (5) 9+, 800; As Ac (7) .., 10,000	9+	..
7		c	cq c	Sc (5) 9+, 1,400; Ac (3) .., 10,000; Ci (1)	9+	..
7		cs_os_o	ccs_os_o	Sc (5) 9+, 1,100	9+	..
6		cps_o	..	..	..	..
8	tr.	c	cps_oc	St (5) 9, 2,200	9	..
9		cjp	c	Sc (5) 2, 2,200; St Sc (5) 9, 6,000; As Ac (7)	9	..
9		c	c	Fc Fn (6) tr., 1,800; St Sc (5) 3, 5,200; As Ac (7) .., [8,000	9+	..
9		o	cjp	..	..	..
6	tr.	cd_os_o	cjp	St (5) 8, 800; Sc (5) 10, 5,000	10	Continuous light drizzle and snow
9		bc	cis_oc bc	Cu (1) 3, 2,000; Ac (5) .., 10,000	4	..
9		bc	bc	As Ac (7) 6, 15,000	6	..
9		bc	..	..	..	..
5	tr.	os_os_o	c	Cu (2) 4, 1,200; Ns (2) 10, 4,000	10	..
9		bcv	cs_os_oc bc	Cu (2) 3, 2,200; Ac (5) tr., .., Ci (3)	4	..
9		c	cjp	Fn (6) tr., 800; Cu Cb (9) 7, 1,500; Ac (6) .., 11,000	9	..
7		cjp	c	..	..	..
9	0·1	c	c	Cu Sc (7) tr., 2,200; As Ac (7); Cs (8) .., 20,000	9+	..
9		c	c	Cu Cb Fs (9) 4, 1,700; Ac (3) .., 10,000	8	..
9		bc	cpsqbc	Cu Cb Fs (9) 3, 1,700; Ac (6) .., 9,000	5	Gusty
9		c	cps_o	..	..	..
9	tr.	c	c bc c	Cb (3) 3, 1,800; Ac (6) .., 10,000	8	..
9		cjp	c	Cu Sc (8) 9, 1,800; As Ac (7) .., 10,000	9+	..
9		o	c	Cu Sc (8) 8, 2,500; As Ac (7)	10	..
9		o	o	..	..	..
9	0·0	o	c	Sc (5) 10, 3,800	10	..
9		ojp	co	St (5) 9, 500; Ns (2) 10, 3,000	10	..
9		c	oc bc	St (5) 5, 800; Ac (9) .., 20,000; Ci Cs (6)	7	..

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
19.12.46	0000	56°59′	82°54′	..	..	NNE.	3	990	..	..	33	...	...	...	...	..	..
19.12.46	0600	56°59′	82°48′	300	1	NE'N.	4	986·0	8	−2·2	33·9	33·0	31	91	34·2	..	0
19.12.46	1200	57°01′	82°51′	130	1	NE'E.	4	982·7	8	−1·8	33·4	33·4	33	100	34·2	WNW.	1
19.12.46	1800	57°05′	82°59′	130	1	NE'E.	5	980·1	7	−1·4	33·5	33·2	32	97	34·1	..	0
20.12.46	0000	57°07′	83°14′	..	..	E.	4	978	..	...	33	...	...	...	...	..	..
20.12.46	0600	57°22′	83°14′	190	2	E'S.	4	977·8	3	+0·2	34·2	32·8	30	85	34·2	..	0
20.12.46	1200	57°33′	83°14′	180	1	SE'E.	3	979·9	3	+1·2	33·1	31·6	29	84	34·0	..	0
20.12.46	1800	57°42′	83°24′	120	1½	ESE.	2	981·5	3	+1·2	33·0	30·2	25	72	33·7	..	0
21.12.46	0000	57°46′	83°30′	..	..	NNE.	1	984	..	...	32	...	...	...	...	..	..
21.12.46	0600	57°50′	83°35′	180	1	SE'E.	1	984·3	3	+0·0	34·5	33·1	31	85	33·9	W.	3
21.12.46	1200	57°45′	83°30′	290	1	E.	2	983·1	7	−1·2	33·2	31·8	29	85	34·3	W.	1
21.12.46	1800	57°52′	83°22′	180	1	ENE.	3	980·6	7	−1·4	32·0	30·4	28	83	32·9	..	0
22.12.46	0000	57°57′	83°25′	..	..	E'S.	4	978	..	...	32	...	...	...	...	..	..
22.12.46	0600	58°03′	83°18′	225	1	SE.	4	978·6	2	+0·0	32·1	31·0	29	88	33·0	..	9
22.12.46	1200	58°03′	83°07′	270	1	SSE.	5	979·0	1	+0·2	31·7	30·0	27	81	33·1	..	9
22.12.46	1800	58°03′	82°55′	270	1	SSW.	4	979·0	7	−0·2	31·9	30·6	28	86	33·6	..	0
23.12.46	0000	58°04′	82°21′	..	..	SSW.	5	979	..	...	31	...	...	...	...	..	..
23.12.46	0600	57°44′	81°57′	270	1	SW'S.	6	981·7	3	+1·4	32·3	30·9	28	85	33·0	SW.	3
23.12.46	1200	57°39′	81°51′	280	1	SW.	6	984·5	3	+1·4	32·6	31·9	31	93	33·7	SW.	3
23.12.46	1800	57°34′	81°50′	..	0	S'W.	4	988·2	3	+2·2	32·2	(32·3)	(30)	(91)	33·6	SW.	1
24.12.46	0000	57°30′	81°34′	..	..	SSW.	3	995	..	...	32	...	...	...	...	..	..
24.12.46	0600	57°27′	81°18′	270	1	WSW.	2–3	999·4	1	+1·4	31·9	31·8	31	99	33·7	SW.	3
24.12.46	1200	57°25′	81°15′	..	..	NW.	2	1001	..	...	33	...	(29)	(83)	...	..	..
24.12.46	1800	57°28′	81°12′	270	1	N'W.	5	997·0	8	−2·4	33·2	31·8	29	85	34·7	..	0
25.12.46	0000	57°35′	81°16′	..	..	N.	7	991	..	...	32	...	...	...	...	..	..
25.12.46	0600	57°41′	81°20′	..	0	NNE.	8	982·0	8	−3·4	34·2	33·9	33	97	33·7	N.	6
25.12.46	1200	57°46′	81°24′	..	..	NNE.	7	976	..	...	34	...	...	...	...	..	..
25.12.46	1800	57°51′	81°28′	150	1	NNE.	4	975·0	4	+0·2	33·7	33·3	33	96	33·5	N.	6
26.12.46	0000	57°51′	81°20′	..	..	W.	3	978	..	...	32	...	...	...	...	..	..
26.12.46	0600	57°51′	81°07′	282	9	WNW.	3	982·0	2	+2·0	32·6	32·0	32	94	33·6	N.	7
26.12.46	1200	57°49′	80°49′	..	0	NW'N.	2	986·1	2	+1·6	33·0	32·7	32	97	33·6	N.	4
26.12.46	1800	57°44′	81°00′	..	0	N.	2	987·9	2	+0·8	32·4	32·4	32	100	33·8	N.	4
27.12.46	0000	57°44′	81°03′	..	..	NNW.	1	990	..	...	32	...	...	...	...	..	..
27.12.46	0600	57°48′	80°59′	225	1	N.	1	990·9	3	+0·8	34·0	33·9	34	99	35·0	N.	8
27.12.46	1200	57°51′	80°49′	270	1	NW.	1	991·1	3	+0·2	33·2	33·2	33	100	34·6	NW.	4
27.12.46	1800	57°51′	80°51′	..	0	NNE.	3	990·3	9	−0·6	31·5	31·3	31	97	33·7	N.	4
28.12.46	0000	58°30′	81°04′	..	..	NE.	2	990	..	...	31	...	...	...	...	..	..
28.12.46	0600	59°11′	81°17′	135	½	NE.	3	990·4	3	+0·2	33·5	32·8	32	93	33·7	N.	1
28.12.46	1200	59°12′	81°18′	135	½	E.	3	990·0	8	−0·2	33·1	32·3	31	93	33·9	NE.	1
28.12.46	1800	59°10′	81°26′	135	½	E.	3	989·5	9	−0·4	32·5	32·1	32	96	33·6	..	0
29.12.46	0000	59°14′	81°16′	..	..	ENE.	2	989	..	...	32	...	...	...	...	..	..
29.12.46	0600	59°34′	81°33′	90	1	E'N.	4	987·4	6	−0·6	33·0	32·5	32	95	33·8	..	0
29·12·46	1200	59°29′	82°00′	82	2	E.	4	986·0	8	−0·8	32·8	31·8	30	90	33·7	NE.	1
29.12.46	1800	59°32′	82°17′	110	2	E.	5	983·3	8	−1·6	32·6	32·6	32	100	33·2	..	0
30.12.46	0000	59°36′	82°27′	..	..	E.	4	981	..	...	33	...	...	...	...	..	..
30.12.46	0600	59°37′	82°37′	83	1	E.	5	980·5	7	−0·4	34·0	33·4	33	94	33·8	..	0
30.12.46	1200	59°36′	82°55′	80	1½	ENE.	5	980·6	4	+0·2	33·1	32·8	32	97	32·9	..	0
30.12.46	1800	59°35′	82°57′	135	½	NE'N.	4	981·6	1	+0·6	32·3	32·0	(31)	97	32·9	..	0
31.12.46	0000	59°30′	83°00′	..	..	N.	1	983	..	...	31	...	...	...	...	..	..
31.12.46	0600	59°36′	83°06′	140	½	NE.	3	984·7	3	+1·0	33·2	32·0	30	87	34·3	NW.	1
31.12.46	1200	59°35′	83°04′	..	0	NE.	2	986·1	3	+0·6	32·0	32·0	(30)	100	33·7	..	0
31.12.46	1800	59°35′	83°03′	..	0	E.	1	987·4	3	+0·6	32·3	31·9	31	96	33·2	..	0

* See codes, p. 28,

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
9		bc	bc c bc	..	..	..
8	0·0	o	bc co	St (5) 9, 400; St (5) .., 1,400; Ns (2)	10	..
4		od_od_om	ois_o od_od_om	Ns (2) 10, 500	10	..
7		or_os_o	od_od_om	Ns (2) 10, 700	10	..
8		o	..	..	..	..
8	0·1	o	c	Sc (5) 10, 3,500	10	..
8		o	c	Sc (5) 10, 3,700	10	Many icebergs near Banzare Bank
9		o	c	Sc (5) 10, 4,000	10	..
9		o	o	..	..	..
9	0·0	c	c	Sc (5) 9+, 3,200	9+	81 icebergs in view, also much drift ice
9		c	c	Sc (5) 9+, 2,500	9+	..
8		oir_o	$ccir_o$	Sc (5) 10, 3,500	10	Slight confused swell
9		o	o	..	..	..
9	tr.	o	c	Cu (2) 7, 1,500; Sc (5) 10, 4,000	10	..
9		o	c	Cu (2) 3, 1,800; Sc (5) 10, 4,500	10	..
9		c	c	Cu (2) 9, 1,500; Sc (5) 9+, 5,000	9+	..
7		cjp	c	..	..	..
8	0·0	c	c	Fn (6) 1, 1,500; Sc (5) 9+, 2,500	9+	..
7		cjp	$ccps_oc$	Fn (6) tr., 800; Cu (2) 7, 1,500; Ac (9)	9	..
6		or_os_o	cos_os_o	St (5) 10, 900	10	..
7		o	or_os_oo	..	..	..
6	tr.	bcif	ocif	St (5) 6, 0	6	Visibility estimated between fog banks
8		bc	oc bc	St (5) 3, 1,400; Ci Cs (5)	3	..
9		c	c	Sc (5) 9, 4,500; As Ac (7) 9+, 15,000	9+	..
6		om_o	o	..	..	..
3	0·1	or_or_of	or_or_of	St (5) 10, 500	10	Gusty
4		or_or_o	m	..	..	Gusty
5		$or_os_om_o$	or_or_om	St (5) 10, 800	10	Gusty
6		om_o	of	..	..	..
8	1·1	cis_o	cis_o	St (5) tr., 4,000; As Ac (7); Cs (8)	9+	..
7		c	cofc	St (5) 9, 250; Sc (5) 9+, 2,500	9+	..
1		5f	cFiF	Sky obscured	..	..
1		F	..	..	..	..
2	tr.	4f	5f	Sky obscured	..	..
3		3f	$f\ om_of$	Sky obscured	..	..
7		o	fom_oo	St (5) 10, 400	10	..
6		om_o	om_oif	..	..	..
7	tr.	o	o	St (5) 10, 500	10	..
9		bcv	oc bcv	Sc (5) 2, 2,500; Ac (4); Ci (1) .., 43,500	4	..
8		bc	bc	Sc (5) 7, 4,500	7	..
6		o	..	..	..	..
6	tr.	os_os_o	ccs_os_o	Fs Fn (6) tr., 800; As Ac (7) .., 20,000; Cs (7)	10	..
8		bc	c bc	As Ac (7) 4, 25,000; Ci (3)	6	..
7		ois_o	$bccos_os_o$	St (5) 10, 900	10	..
6		om_o	cor_os_of	..	..	..
7	0·2	c	c	St Sc (5) 9, 700	9	..
6		om_oc	co	St (5) 10, 600	10	..
7		c	om_oc	St (5) 3, 900; Sc (5) 9+, 2,500	9+	..
7		bc	c bc	..	..	Snow squalls seen about 0000
8	tr.	c	c	Sc (5) 9, 2,500	9	..
6		os_os_o	cos_os_o	Ns (2) 10, 500	10	..
3		o3f	om_o	Sky obscured	..	..

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
1. 1.47	0000	59°35′	83°03′	..	..	ESE.	1	988	..	..	30	..	..	..	..	..	..
1. 1.47	0600	59°35′	83°03′	360	1	ENE.	1	986·6	8	−0·2	32·2	31·8	32	96	33·0	NW.	1
1. 1.47	1200	59°27′	83°32′	..	0	SE.	1	986·0	9	−0·8	33·3	32·5	31	92	35·0	..	0
1. 1.47	1800	59°28′	83°38′	70	3	SE′E.	3	983·8	6	−0·6	32·1	31·7	31	96	33·7	..	0
2. 1.47	0000	59°19′	84°08′	..	..	SSE.	1	983	..	..	30	..	..	..	..	..	..
2. 1.47	0600	59°01′	84°26′	90	4	S′E.	3	980·8	7	−1·0	31·7	31·5	31	98	34·2	..	0
2. 1.47	1200	58°56′	84°16′	325	1	SW′S.	4	979·4	9	−0·8	32·5	31·9	31	93	33·7	..	0
2. 1.47	1800	58°51′	84°29′	360	½	SW.	4	977·8	8	−0·8	31·2	(31·6)	(28)	(88)	33·7	..	0
3. 1.47	0000	58°48′	84°29′	..	..	SW.	2	978	..	..	31	..	..	..	..	..	..
3. 1.47	0600	58°39′	84°22′	330	½	SW.	4	978·4	2	+0·4	32·5	31·7	31	91	33·5	SE.	1
3. 1.47	1200	58°39′	84°22′	150	1	SW′W.	5	980·0	3	+0·8	32·6	32·3	32	97	33·7	SE.	1
3. 1.47	1800	58°40′	84°23′	320	½	SW.	4	981·6	3	+1·2	32·0	32·0	32	100	33·8	NW.†	1
4. 1.47	0000	58°38′	84°22′	..	..	W′S.	2	983	..	..	31	..	..	..	..	..	..
4. 1.47	0600	58°35′	84°21′	170	1	W′S.	5	984·1	1	+0·4	32·8	31·6	30	88	34·1	..	0
4. 1.47	1200	58°41′	84°23′	150	1	W.	2	983·7	8	−0·4	(35·0)	(33·3)	(30)	(84)	(34·5)	SE.	1
4. 1.47	1800	58°45′	84°24′	170	1	NW′W.	2	983·1	8	−0·6	33·2	32·0	30	86	34·6	W.	1
5. 1.47	0000	58°50′	84°27′	..	0	..	..	982	..	..	32	..	..	..	..	..	..
5. 1.47	0600	58°54′	84°29′	170	½	SW.	1	981·7	3	+0·0	34·1	31·8	27	77	35·0	N.	1
5. 1.47	1200	58°56′	84°43′	340	½	WSW.	1	982·1	3	+0·2	33·0	31·3	29	82	35·2	N.	1
5. 1.47	1800	58°52′	84°43′	360	½	W.	3	982·3	1	+0·2	33·4	32·0	29	84	35·2	..	0
6. 1.47	0000	59°01′	84°31′	..	..	WSW.	1	982	..	..	33	..	..	..	..	..	..
6. 1.47	0600	59°07′	84°18′	220	2	W.	3	981·3	8	−0·4	33·0	32·7	32	97	34·6	..	0
6. 1.47	1200	59°18′	84°18′	180	3	W′S.	4	980·4	8	−0·4	33·8	32·4	30	85	35·0	..	0
6. 1.47	1800	59°18′	84°18′	..	0	W′N.	5	980·8	3	+0·6	33·4	32·4	30	90	33·8	..	0
7. 1.47	0000	59°15′	84°24′	..	..	WNW.	4	984	..	..	32	..	..	..	..	..	..
7. 1.47	0600	59°15′	84°25′	145	2	WNW.	4	985·3	3	+0·4	37·5	34·5	29	72	33·7	..	0
7. 1.47§	1200	59°31′	84°43′	150	2	NNW.	2	985·8	7	−0·0	(36·4)	(35·0)	(30)	(86)	34·2	..	0
7. 1.47	1800	59°39′	84°58′	160	2	NNW.	3	985·0	8	−0·4	32·7	32·1	31	94	33·8	..	0
8. 1.47	0000	59°39′	85°18′	..	..	NE.	3	984	..	..	32	..	..	..	..	..	..
8. 1.47	0600	59°42′	85°21′	150	1	E′N.	5	981·7	8	−1·4	35·0	33·0	29	79	35·6	E.	1
8. 1.47	1200	59°51′	85°28′	160	1½	E.	6	980·3	7	−0·2	34·6	33·4	31	87	33·7	E.	3
8. 1.47	1800	59°57′	85°29′	180	1	E′S.	6	979·9	7	−0·2	32·5	32·5	32	100	33·2	E.	3
9. 1.47	0000	60°04′	85°33′	..	..	ESE.	6	981	..	..	32	..	..	..	..	..	..
9. 1.47	0600	60°11′	85°37′	145	2	E′S.	6	980·6	8	−0·2	33·4	33·4	33	100	32·9	E.	6
9. 1.47	1200	60°36′	85°46′	145	9	E′S.	5	981·1	4	+0·6	34·9	34·2	33	93	34·2	E.	6
9. 1.47	1800	60°38′	86°05′	250	½	E′S.	5	980·5	8	−0·4	33·6	32·7	31	91	33·8	E.	6
10. 1.47	0000	61°15′	86°45′	..	..	ESE.	5	983	..	..	33	..	..	..	..	..	..
10. 1.47	0600	61°54′	87°30′	..	0	ESE.	4	986·0	3	+1·6	32·7	32·0	31	93	35·0	E.	6
10. 1.47	1200	61°57′	87°54′	110	2	SE′S.	4	988·2	4	+0·8	32·1	31·7	31	96	34·0	E.	6
10. 1.47	1800	61°59′	88°00′	..	0	SSE.	4	989·3	2	+0·8	30·0	29·7	29	96	34·2	E.	6
11. 1.47	0000	62°03′	88°10′	..	..	S.	5	990	..	..	32	..	..	..	..	..	..
11. 1.47	0600	62°19′	88°24′	200	2	SSW.	5	989·7	4	+0·6	34·9	33·1	30	81	34·3	..	9
11. 1.47	1200	62°40′	88°50′	160	1	S′W.	4	990·4	3	+0·6	34·3	33·0	30	86	34·8	S.	3
11. 1.47	1800	62°25′	88°40′	300	1	SSW.	4	989·9	2	+0·4	33·2	32·4	30	91	34·5	E.	4
12. 1.47	0000	62°21′	88°40′	..	..	SW.	4	990	..	..	29	..	..	..	..	..	..
12. 1.47	0600	62°17′	88°41′	360	1	SW.	4	989·0	2	+0·0	30·4	30·1	29	96	34·6	..	0
12. 1.47	1200	62°17′	89°03′	90	2	WSW.	3	989·6	2	+0·2	31·0	30·6	29	95	34·6	..	9
12. 1.47	1800	62°19′	89°29′	90	2½	SW′S.	2	988·8	7	−0·4	30·2	29·2	27	88	36·0	SW.	1
13. 1.47	0000	62°16′	90°00′	..	..	††	1	990	..	..	30	..	..	..	..	..	..
13. 1.47	0600	62°13′	90°31′	90	3	E′N.	2	990·2	4	+0·8	30·3	29·3	27	88	35·2	NW.	1
13. 1.47	1200	62°22′	90°55′	135	2½	ENE.	3	991·0	2	+0·4	31·3	30·7	29	93	35·2	..	0
13. 1.47	1800	62°26′	91°03′	135	½	ENE.	4	991·1	3	+0·2	31·3	..	(27)	(82)	33·5	..	0

* See codes, p. 28

† Darkness made it difficult to discern swell direction which might be north-west or south-east.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
1		oF	..	..	..	..
8	0·1	c	$ofcm_ooc$	St (5) 9, 600	9	..
8		cjp	ccjfc	St (5) tr., 600; Sc (5) 1, 1,500; As Ac (7); Cs (7)	8	Line of fog patches passed ship from south to
5		os_os_o	cos_os_o	St (5) 10, 400	10	.. [north about 0930
3		cps	os_os_oc	..	..	..
9	1·0	c	ofc bc	St (5) 1, 150; Sc (5) 8, 3,400; Ac (8) 1, 7,000; Ci (1)	9	Ac casteflatus with As streaks or virga below to
9		cjp	c	Fc (1) 3, 500; Sc (5) 9+, 3,500	9+	.. [6,000 ft.
7		os_os_o	os_os_o	Cu (1) 5, 1,200; As (1) 10, ..	10	..
7		o	os_os_oo	..	..	..
8	0·9	cjp	cps_o	Cu (1) 8, 1,000; Ac (5)	9	Small Cu and Cb developing from old Sc
5		os_os_o	cps_o ccs_os_o	Fs Fc (6) 10, 400; Ns (2)	10	Cloud height gauged from icebergs
5		om_o	ois_oom_o	St (5) 10, 400	10	..
9		o	o	..	..	..
9	0·1	bc	oc bc	St (5) 1, 1,500; Ac (5) 7, 10,000	7	..
9		bc	bc	Sc (5) 4, 1,200; As Ac (7) .., 8,000	7	Temperatures read by inexperienced observer
9		bc	bc	Sc (5) 6, 2,800; Ac (5) .., 10,000	7	..
9		o	co	..	..	..
9	0·0	ov	cv	Sc (5) 10, 3,500	10	..
9		oid_o	cish	Cu (2) 3, 2,000; Sc (5) 10, 3,200	10	..
9		c	cjp	Sc (5) 9+, 4,000	9+	..
9		o	o	..	..	..
9	tr.	c/is_o	$ccis_o$	St (5) 4, 400; Ns (2) 9, 4,000	9	Ns showing traces of Sc form
9		c/ps_o	$ccps_oc$	Fs (6) 5, 1,000; Sc (5) 9+, 7,000; As Ac (7)	9+	..
9		o	c	Fs Fc (6) 3, 2,000; Sc (5) 6, 4,000; As Ac (7) .., [10,000	10	..
9		c	$ocps_oc$	..	..	..
8	tr.	b	c bc b	Cb (3) 1, 2,500; Ac (6)	1	..
8		bc	bc cps_o bc	Cu Sc (8) 4, 1,800	4	..
9		c	bc c	Sc (4) tr., 1,700; Sc (4) 9, 4,000; Ac (6) .., 12,000	9	..
9		bc	cjp	..	..	..
8	tr.	c	c	Cu (1) 1, 1,800; As Ac (7) .., 15,000; Ci Cs (6)	8	..
8		o	co	Fs (6) 1, 1,500; As (1)	10	..
5		os_os_o	os_os_o	Sc (5) 9, 2,500; As (1)	10	..
6		o	..	..	..	..
6	0·1	oid_o	o oid_o	Fs Fn (6) 10, 500; As (2)	10	..
7		o	$coid_oc$	St Sc (5) 10, 900	10	Gusty
8		c	c	St (5) 9+, 1,500	9+	Gusty
9		c	c	..	..	..
7	tr.	cps_o	cps_o	Cb (3) 5, 1,200; Sc (5) 9+, 2,500	9+	Gusty
8		cjp	cps_o	Cb (3) 6, 900; Sc (5) 9+, 1,800	9+	..
8		cps_o	cps_o	Cb (3) 9+, 1,600	9+	..
8		o	..	..	..	..
8	tr.	bc	oc bc	Ac (5) 7, 9,000; Ci (4)	7	No low cloud in fresh southerly wind
8		c	c	As (1) .., 6,600; Ac (3) .., 20,000; Cs (7)	9	Gusty. Frontal cloud sheet encroaching from
9		bc	c bc	As Ac (7) .., 15,000; Cs (7)	5	.. [east
6		om_o	bc cif	..	..	..
8	0·0	c	om_oc	St (5) 9+, 400	9+	..
8		o	co	St (5) 10, 800	10	..
8		oish	oosh	St (5) 10, 1,200	10	..
8		o	osh om_o	..	..	..
8	tr.	oish	oc	St (5) 10, 2,000	10	..
9		cjp	cps_o	Sc (5) 9+, 1,600	9+	..
7		cps_o	cps_o	Cb (3) 9+, 1,200	9+	..

§ Ship changed course twice whilst observations were being taken and readings could not be saved from influence of surroundings.
†† Variable.

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind Direction	Wind Force*	Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature Dry bulb	Temperature Wet bulb	Dew point	Relative humidity	Sea-surface temperature	Swell Direction	Swell Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
14. 1.47	0000	62°28′	91°14′	..	..	NE.	4–5	990	..	..	32	..	..	..	..	..	..
14. 1.47	0600	62°29′	91°26′	180	1	ENE.	5	989·3	5	−0·6	33·3	31·9	29	85	34·7	NE.	3
14. 1.47	1200	62°36′	91°26′	180	1	E′N.	5	988·0	7	−0·0	32·5	32·4	32	99	33·7	E.	3
14. 1.47	1800	62°41′	91°26′	180	1	E.	4	987·9	7	−0·0	32·1	(32·2)	(31)	(92)	34·2	E.	1
15. 1.47	0000	62°44′	91°39′	..	..	E′S.	4	986	..	..	32	..	..	..	..	..	..
15. 1.47	0600	62°46′	91°52′	90	1	ESE.	4	982·1	8	−1·8	31·3	30·9	29	95	34·0	..	0
15. 1.47	1200	62°46′	92°58′	90	4	ESE.	4	978·4	8	−2·0	32·1	31·3	29	91	34·2	..	0
15. 1.47	1800	62°46′	94°31′	90	9	SE′E.	4	976·3	8	−1·0	31·2	30·7	29	94	33·2	..	0
16. 1.47	0000	62°48′	94°15′	..	..	SE.	3	975	..	..	31	..	..	..	..	..	..
16. 1.47	0600	62°54′	94°10′	140	2	SE.	4	976·5	3	+0·8	31·8	31·7	..	99	33·0	E.	1
16. 1.47	1200	62°56′	94°36′	100	1	E′S.	4	979·5	2	+1·6	31·3	30·9	29	95	30·3	..	0
16. 1.47	1800	62°57′	94°35′	..	0	E.	4	982·4	2	+1·6	31·1	30·7	29	95	30·7	..	0
17. 1.47	0000	63°10′	94°42′	..	..	ESE.	3	984	..	..	29	..	..	..	..	..	..
17. 1.47	0600	63°23′	94°46′	90	1	SE′E.	3	982·5	7	−0·8	31·0	30·6	29	95	33·2	..	0
17. 1.47	1200	63°23′	94°52′	90	½	SE.	2	981·3	8	−0·6	31·0	31·0	28	(88)	32·7	..	0
17. 1.47	1800	63°23′	95°07′	..	0	SSE.	2	980·4	4	+0·2	30·7	30·7	28	(87)	32·8	..	0
18. 1.47	0000	63°21′	95°00′	300	½	S.	4	982·3	3	+1·2	(30·8)	(30·0)	(28)	(91)	32·2	..	9
18. 1.47	0600	63°21′	94°50′	180	½	S′E.	5	983·8	2	+1·2	33·0	32·8	26	(74)	32·2	..	0
18. 1.47	1200	63°21′	94°35′	270	1	S.	4	986·7	2	+1·8	32·2	31·3	29	90	32·8	..	0
18. 1.47	1800	63°20′	94°27′	..	..	SW.	3	987	..	..	30	..	..	..	..	..	.
19. 1.47	0000	63°21′	94°24′	..	..	SW.	5	986	..	..	27	..	..	..	..	..	..
19. 1.47	0600	63°21′	94°22′	225	1	WSW.	4	985·2	5	−0·8	29·2	28·5	27	91	33·7	..	0
19. 1.47	1200	63°22′	94°24′	135	½	SW′W.	3	986·4	4	+0·6	29·5	28·7	27	90	34·0	N.	1
19. 1.47	1800	63°22′	94°25′	..	..	SW.	1	988	..	..	28	..	..	..	..	..	..
20. 1.47	0000	63°22′	94°25′	..	0	ENE.	2	989·9	1	+0·8	28·5	27·2	23	84	34·0	N.	1
20. 1.47	0600	62°58′	93°53′	350	6	ENE.	3	990·1	3	+0·0	32·3	31·3	29	89	34·2	..	0
20. 1.47	1200	62°15′	93°34′	350	9	ENE.	3	990·9	3	+0·4	(34·1)	(32·1)	(28)	(79)	35·6	..	0
20. 1.47	1800	62°13′	93°30′	..	..	E.	2	992	..	..	32	..	..	..	..	..	..
21. 1.47	0000	62°11′	93°28′	210	½	ENE.	3	994·1	3	+1·2	34·1	33·1	31	90	35·5	..	0
21. 1.47	0600	62°28′	93°24′	210	½	NE′E.	3	994·6	2	+0·2	35·3	33·8	31	85	35·1	..	0
21. 1.47	1200	62°26′	93°22′	..	0	ENE.	4	993·7	8	−0·6	34·6	33·8	32	92	35·9	..	9
21. 1.47	1800	62°30′	93°22′	..	..	NE.	3	992	..	..	33	..	..	..	..	..	..
22. 1.47	0000	62°33′	93°22′	180	½	E′N.	5	990·6	8	−0·6	34·6	33·2	31	85	34·7	..	0
22. 1.47	0600	62°41′	93°37′	180	1	ENE.	6	989·6	6	−0·4	35·0	33·7	31	86	34·7	E.	1
22. 1.47	1200	62°39′	93°37′	70	3	ENE.	5	989·4	7	−0·0	35·6	33·8	31	82	34·3	E.	3
22. 1.47	1800	62°46′	93°29′	..	..	E.	5	989	..	..	33	..	..	..	..	..	..
23. 1.47	0000	62°46′	93°07′	260	1	E.	5	991·8	3	+1·8	33·2	32·2	30	90	34·4	E.	3
23. 1.47	0600	63°21′	94°27′	130	10	SE.	4	995·8	3	+2·0	28·5	..	(24)	(84)	31·6	..	0
23. 1.47	1200	63°30′	96°10′	90	9	SSE.	3	998·8	2	+1·6	28·1	27·1	24	87	34·7	..	0
23. 1.47	1800	63°24′	95°38′	..	..	SSE.	2	1001	..	..	28	..	..	..	..	..	..
24. 1.47	0000	62°58′	95°38′	360	10	S′W.	2	1002·3	1	+0·6	30·0	27·5	22	71	34·3	..	0
24. 1.47	0600	63°30′	96°19′	120	4	S′W.	2	1000·7	7	−1·2	29·0	27·8	25	85	30·9	..	0
24. 1.47	1200	63°36′	97°26′	..	0	SW′S.	2	997·4	8	−1·8	30·1	28·7	25	84	34·2	..	0
24. 1.47	1800	63°36′	97°26′	..	..	WSW.	2	993	..	..	26	..	..	..	..	..	..
25. 1.47	0000	63°38′	97°36′	120	1	SSW.	2	990·4	8	−1·6	26·8	26·2	25	92	33·4	..	0
25. 1.47	0600	63°37′	97°51′	90	2	S.	2	989·6	6	−0·2	29·3	27·3	22	76	34·5	..	0
25. 1.47	1200	63°36′	97°58′	..	0	SSW.	2	989·3	3	+0·0	32·0	29·6	23	74	34·9	..	0
25. 1.47	1800	63°29′	97°54′	..	..	SSW.	2	989	..	..	26	..	..	..	..	..	..
26. 1.47	0000	63°29′	97°58′	60	½	S′E.	2	989·3	0	+0·2	24·5	23·7	21	89	35·0	..	0
26. 1.47	0600	63°27′	98°11′	90	½	NE.	1	989·7	3	+0·2	30·4†	28·7†	24†	80†	34·2	..	0
26. 1.47	1200	63°26′	98°08′	..	..	SE.	3	991·0	1	+1·0	29·8	27·8	23	77	34·5	..	0
26. 1.47	1800	63°23′	98°16′	..	..	SE.	3	993	..	..	27	..	..	..	..	..	..

* See codes, p. 28.
† Air temperatures taken an hour or so late after ship had turned to avoid effects of relative calm

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
9		o/ps$_o$	ops$_o$	..	..	..
8	tr.	o	cps$_o$	Sc (5) 9, 2,200; As (1)	10	..
6		os$_o$s$_o$	cofs$_o$os$_o$s$_o$	Fs Fn (6) 8, 0 ; As (1)	10	Cloud from surface. Moderate visibility in thin
7		os$_o$s$_o$	os$_o$s$_o$	Fs Fn (6) 9, 500 ; As (2)	10	.. [texture cloud. Sun visible
6		om$_o$	..	..	..	..
6	0·1	osh	oish	St Ns (5) 10, 300	10	..
9		o	osh c	Sc Fs (5) 9, 700; Ns (2)	10	..
8		oish	ccs$_o$s$_o$	Fn Fc (6) 9, 600; Ns (2)	10	..
..		om$_o$	..	..	..	..
6	tr.	cis$_o$	ois$_o$	Fn St (6) 7, 200; As (1)	10	..
8		cis$_o$	os$_o$s$_o$	Fn Sc (5) 9, 800; As (2)	9+	..
7–9		ojs$_o$	cis$_o$	St (5) 9, 500; As (1)	10	..
6		cps$_o$	c	..	..	..
7	tr.	osh	cish	St (5) 9, 1,000; As (2)	10	..
7		os$_o$s$_o$	cish cos$_o$s$_o$	Fs Fn (6) 8, 800; As (2)	10	..
8		os$_o$s$_o$	ois$_o$	St (5) 10, 800	10	..
9		bv	oc bc b	Ac (4) 1, 8,000; Ci (5)	1	.. [advancing east over the Antarctic ice-cap
9	0·1	c	bvbc cps$_o$	Sc (5) 9, 2,800	9	South-east—north-west orientated cloud belt
9		bv	c bc bv	Ci (5) tr., ..	tr.	Banded Ci dense
9		bc	b	..	..	..
8		cish	bc cfs$_o$c	..	..	Belt of snow and fog passed from west 2200
8	tr.	ojs	c	St (5) 10, 450	10	Aircraft report of cloud base
6		o	os$_o$s$_o$oc	Cu (2) 10, 1,000	10	Snow belts passed from west and south-west
9		o	..	..	..	.. [about 0600 and 1100
8		ojp	ocjp	Cu (2) 1, 1,200; Sc (5) 10, 2,500	10	..
9	tr.	c	c	Sc (5) 9+, 2,300	9+	..
9		cjp	c	Sc (5) 9+, 2,500	9+	..
7		o	ccps	..	..	..
9		c	ccpsc	Cu (2) 4, 2,500; Sc (5) 9, 5,000	9	..
9	0·8	c	c	Cu Cb (3) 2, 2,800; Sc (5) 3, 4,900; Ac (3) 9, 9,000	9	..
8		c	c	Cu Cb (3) 2, 2,500; Sc (5) 9+, 6,500; Ac (6) tr., ..	9+	..
8		c	c	..	..	..
8		c	ccps$_o$c	Cu Cb (3) 3, 1,200; Sc (5) 7, 4,000; Ac (6); Ci (1)	8	..
8	tr.	o	ccps$_o$c	Cu (2) 3, 1,500; Sc (5) .., 5,000; As Ac (7) .., 8,000	10	..
7		o	c	Fn (6) 3, 1,800; St (5) .., 3,500; As Ac (7) .., 5,000	10	As Ac ranging up to 8,000 ft. within view,
8		o	o	..	..	.. [sloping frontal cloud sheet
8		o	c	Sc (5) 10, 3,500	10	..
9	0·0	c	c	Sc (5) 9+, 2,200	9+	..
9		ovjp	c	St (5) 10, 2,000	10	..
8		o	o	..	..	..
9		o	c	St Sc (5) 10, 3,000	10	St Sc and associated As Ac systems, orientated
9	0·0	cv	c	Cu (2) 1, 1,800; Sc (5) 9, 2,800	9	north-east south-west, passed over from
9		bcv	c bc cbcv	Cu (1) 3, 1,800; As Ac (7) .., 1,500	5	east or south-east and later returned
9		bc	bc	..	..	travelling from west to east
9		c	bc c o	St (5) 8, 300; As Ac (7) .., 15,000	9	Aircraft reported Shackleton Ice Barrier 50–
9	0·0	c	c bc	Cu (1) 5, 1,000; Ac (4)	5	150 ft. high 40 miles south of *Balaena*.
9		bv	bc bv	Cu (1) tr., 1,800; Ac (3)	tr.	Quasi-frontal low cloud system orientated
9		bcv	b bc v	..	..	north-east south-west ceased abruptly over
9		cv	bc c v	Sc (5) 9, 1,000	9	[land ice; but associated Ac continued as
9	0·0	bc	c bc	Cu (2) 1, 1,800; Sc (5) 7, 3,500; Ci (1)	7	[far as the eye could see
9		cv	bc cv	Cu (2) 3, 2,000; Sc (5) 9, 4,000	9	Cloud systems passing over from east to west
9		c	c	..	..	

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
27. 1.47	0000	63°22′	98°18′	60	<½	S.	3	994·0	3	+0·8	27·0	25·9	23	86	34·2	SE.	1
27. 1.47	0600	63°15′	98°46′	25	3	SSW.	3	994·5	2	+0·6	29·5†	28·3†	25†	86†	35·5	E.	1
27. 1.47	1200	63°15′	98°38′	260	1	WSW.	2	995·9	3	+0·8	30·0	28·7	26	85	35·0	E.	1
27. 1.47	1800	63°17′	98°22′	..	..	††	1	996	..	..	28	..	..	..	..	..	..
28. 1.47	0000	63°17′	98°02′	270	2	NE'E.	2	994·1	9	−0·8	(37·0)	(34·0)	(29)	(71)	35·1	E.	1
28. 1.47	0600	63°19′	97°35′	250	3	E'N.	5	991·7	6	−1·4	32·0	30·1	26	80	33·2	E.	3
28. 1.47	1200	63°22′	97°25′	240	1½	ENE.	6	989·1	7	−1·4	31·6	31·1	29	93	32·9	E.	6
28. 1.47	1800	63°28′	97°16′	..	..	E.	7	987	..	..	31	..	..	..	..	..	..
29. 1.47	0000	63°31′	97°06′	230	1	E'N.	6	985·4	7	−0·6	32·3	31·6	30	92	32·0	E.	6
29. 1.47	0600	63°31′	96°45′	270	1½	E.	6	982·9	5	−1·2	31·0	30·7	30	97	30·3	E.	6
29. 1.47	1200	63°24′	95°12′	280	10	E.	6	979·2	8	−2·4	33·0	32·7	32	97	33·2	E.	7
29. 1.47	1800	63°26′	94°56′	..	..	E.	7	977	..	..	30	..	..	..	..	..	..
30. 1.47	0000	63°28′	94°46′	250	½	ESE.	5	976·6	8	−0·2	29·5	29·0	27	94	30·4	E.	3
30. 1.47	0600	63°24′	94°42′	..	0	SE.	3	974·2	9	−1·6	31·0	29·5	27	84	30·9	E.	1
30. 1.47	1200	63°25′	94°42′	..	0	S.	1	969·9	8	−2·4	28·2	27·6	26	93	32·0	NE.	1
30. 1.47	1800	63°27′	94°47′	..	..	††	1	965	..	..	24	..	..	..	..	..	..
31. 1.47	0000	62°40′	94°47′	360	10	NE'N.	2	966·3	4	+0·6	30·6	30·0	29	93	34·2	E.	1
31. 1.47	0600	63°00′	95°48′	90	6	N.	3	970·9	3	+4·0	33·5	33·3	33	98	34·2	..	0
31. 1.47	1200	62°52′	96°49′	45	8½	NE.	3	979·4	1	+4·0	34·6	33·1	31	84	34·5	N.	2
31. 1.47	1800	62°49′	97°09′	..	..	ENE.	3	985	..	..	33	..	..	..	..	..	..
1. 2.47	0000	62°46′	97°38′	90	9	E'N.	3	991·6	3	+3·4	34·9	34·2	33	93	34·9	..	0
1. 2.47	0600	62°57′	99°37′	130	9	E'S.	4	994·8	3	+1·4	34·5	33·0	31	84	35·2	E.	1
1. 2.47	1200	63°00′	100°54′	63	10	E'S.	4	996·6	2	+0·0	31·3	30·6	29	92	34·0	..	0
1. 2.47	1800	63°00′	100°42′	..	..	E.	3	996	..	..	30	..	..	..	..	..	..
2. 2.47	0000	63°00′	101°06′	90	2	E.	3	994·7	8	−0·4	33·4	32·4	30	90	35·0	..	0
2. 2.47	0600	63°05′	101°22′	138	3	ENE.	3	992·4	7	−0·6	32·6	32·3	32	97	34·5	..	0
2. 2.47	1200	63°10′	101°16′	200	½	ENE.	3	990·3	7	−1·2	33·3	33·1	33	98	33·3	..	0
2. 2.47	1800	63°16′	101°19′	..	..	E'N.	2	989	..	..	32	..	..	..	..	..	..
3. 2.47	0000	63°24′	101°25′	160	2	E.	4	988·4	7	−0·2	33·1	32·6	32	95	34·2	..	0
3. 2.47	0600	63°41′	101°03′	210	1	E'S.	4	988·0	7	−0·2	33·2	31·9	29	86	34·3	..	0
3. 2.47	1200	63°46′	101°08′	190	1	E'S.	5	987·4	7	−0·4	32·5	31·8	31	92	33·7	E.	1
3. 2.47	1800	63°49′	101°02′	..	..	E'S.	5	987	..	..	30	..	..	..	..	..	..
4. 2.47	0000	63°45′	101°02′	360	½	ESE.	5	986·6	8	−0·2	28·7	28·1	27	93	33·4	E.	3
4. 2.47	0600	63°44′	100°34′	330	5	SE'E.	5	986·6	2	+0·0	28·6	27·8	26	90	34·5	E.	3
4. 2.47	1200	63°46′	100°30′	240	1	SE'E.	4	987·2	2	+0·4	29·0	28·6	27	95	33·0	E.	3
4. 2.47	1800	63°52′	100°11′	..	..	SE.	3	989	..	..	26	..	..	..	..	..	..
5. 2.47	0000	63°55′	99°37′	260	2	SSE.	2	991·1	3	+0·8	25·0	24·5	22	93	30·2	E.	1
5. 2.47	0600	63°49′	99°48′	44	2½	S'E.	3	992·0	2	+0·4	27·2	27·2	27	100	34·7	E.	1
5. 2.47	1200	63°46′	101°11′	90	3	SE'E.	3	992·6	3	+0·6	31·8	31·4	31	96	33·6	E.	1
5. 2.47	1800	64°08′	102°14′	..	..	SE.	1	993	..	..	27	..	..	..	..	..	..
6. 2.47	0000	64°08′	102°48′	98	4	S'W.	1	993·6	7	−0·0	29·6	28·6	27	88	31·3	E.	1
6. 2.47	0600	64°14′	104°25′	98	11	SE.	2	993·2	7	−0·2	25·0	24·3	22	90	33·6	E.	1
6. 2.47	1200	64°07′	105°07′	100	2	E'S.	1	992·1	8	−0·4	27·9	26·5	22	83	33·6	E.	1
6. 2.47	1800	64°14′	105°02′	..	..	E.	3	990	..	..	30	..	..	..	..	..	..
7. 2.47	0000	64°17′	105°04′	110	½	ENE.	4	989·0	1	+0·2	30·0	28·0	23	77	29·8	E.	3
7. 2.47	0600	64°18′	105°20′	90	1½	E.	4	989·6	2	+0·2	29·0	27·3	23	79	32·2	E.	7
7. 2.47	1200	64°17′	106°08′	85	4½	E.	3	989·4	8	−1·2	27·2	24·9	18	71	30·0	E.	7
7. 2.47	1800	64°21′	105°49′	..	..	ENE.	4	985	..	..	26	..	..	..	..	..	..
8. 2.47	0000	64°25′	105°32′	240	1	SE'E.	5	982·6	7	−1·0	23·0	22·4	20	91	29·0	ENE.	3
8. 2.47	0600	64°23′	105°49′	60	1	SE'E.	6	980·4	7	−1·2	27·3	26·9	25	95	28·9	E.	6
8. 2.47	1200	64°25′	105°54′	130	½	SE'E.	6	979·6	2	+0·2	25·3	24·4	21	88	29·9	E.	6
8. 2.47	1800	64°26′	106°00′	..	..	SE.	4	977	..	..	21	..	..	..	..	..	..

* See codes, p. 28.
† Air temperatures taken an hour or so late after ship had turned, to avoid effects of relative calm.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
9		o	c	Sc (5) 9, 1,800; Ac (5)	10	
9	0·0	cv	c	Cu (1) 7, 1,600; Ac (5); Ci (1)	8	Cloud systems passing over from east to west
9		bcv	cv	Sc (5) 5, 2,000; Ac (4) .., 10,000	5	
9		c	c	..	..	
9		o	c	Sc (5) 10, 3,500	10	..
8	0·0	c	c	Cu (2) 3, 2,500; Sc (5) 9, 4,000; Ac (5); Cs (7)	9+	Shower cloud developing from Sc
9		ojp	c	Cu (2) 1, 1,800; Sc (5) 10, 4,500	10	..
7		ops	ops	..	..	..
8		osh	$cis_o sh$	Cu (2) 3, 1,000; Sc (5) 4, 3,500; As Ac (7) 9+, 8,000	10	..
4	0·2	osh	csh	Fs (6) 3, 1,000; Cs (7)	10	Gusty; sunshine penetrating cloud veil and
5		$os_o s_o$	$cshos_o s_o$	Fs (6) Ns (2) 10, 250	10	.. [snow
7		o	cis_o	..	..	..
5		$os_o s_o$	o	St (5) 10, 500	10	..
8	(2·5)	o	oc	St (5) 10, 800	10	..
9		c	c	St (5) tr., 1,500; As Ac (7) 9, 6,000	9	..
9		o	c	..	..	..
8		o	c	St (5) 9, 500; As Ac (7)	10	..
5	tr.	$od_o d_o$	$cod_o d_o$	St (5) 10, 150	10	..
8		o	c	As Ac (7) 10, 6,000	10	Very slight rain for 6 hr.
7		oir_o	oir_o	..	..	..
8		c	o ir_o c	As Ac (7) 9, 6,000	9	..
8	0·2	o	c	St (5) 10, 2,000	10	..
8		c	c	St Fs (5) 9, 1,300 ; Ac (3) .., 15,000	9	..
9		c	c	..	..	..
8		c	c	St (5) 9+, 600	9+	..
8	0·0	o	co	St (5) 10, 500	10	..
8		o	o	St (5) 4, 400 ; St (5) 10, 5,500	10	..
7		o	o	..	..	..
8		o	c c is_o c	St (5) 1, 500; St (5) 10, 5,000	10	..
8	tr.	c	c	Cu (1) tr., 2,800; As Ac (7) 9+, 5,000; Cs (8)	9+	Gusty
8		c	c	St Sc (5) 9, 4,300; As (2); Ci (3)	9+	..
9		o	..	..	..	..
8		oish	c	St (5) 10, 1,500	10	Line of congested ice and many bergs lying
9	tr.	o	cishc	St (5) 10, 1,600	10	.. [east-west near 64°S.
8		o	c	St (5) 10, 700	10	..
9		o	c	..	..	Uncharted shoal 46 fathoms at 63°50′S. 100° [18′E. 1600, glaciated islands or reef suspected
9		bcv	c bc	St (5) tr., 200; Ci (2)	4	..
4	0·0	om/f	bc o f	St (5) 10, 50	10	..
9		cps_o	$ocps_o$	Cu (2) 9+, 1,000	9+	..
7		o	c	..	..	..
9		o	c	Cu (2) 7, 900; Sc (5) 10, 2,200	10	..
9	tr.	c	c	Cu (1) 8, 1,800; Ac (3) .., 10,000	9	..
9		c	c	Cu (1) 8, 2,200; Ac (3) .., 12,000	9	..
7		o	c	..	..	..
9		o	c	Sc (5) 3, 2,600; Sc (5) 10, 4,000	10	..
8	0·0	c	c	Sc (5) 3, 3,000; As Ac (7) .., 15,000	9+	..
9		c	c	Cu (1) 3, 3,000; Ac (3) .., 12,500; Cs (5)	8	..
9		bc	c bc	..	..	..
8		c	bc c	Cu Fc (1) tr., 800; Sc (5) 2, 4,500; Ac (3) .., 14,000;	8	Ice forming on hulls and rigging of whale-boats
8	0·0	bc	c bc	Fs (6) 3, 500; Sc (5) 6, 2,500; Ci (1) [Cs (6)	7	..
8		c	bc c	Cu (1) 1, 3,000; Sc (5) 8, 4,500; Cs (8)	9	..
9		bc	c bc	..	..	..

†† Variable.

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
9. 2.47	0000	64°26′	106°07′	90	½	SSE.	8	975·2	7	−1·0	24·2	23·7	21	93	29·8	E.	7
9. 2.47	0600	64°27′	106°14′	110	½	SE′E.	8	974·7	3	+0·4	24·3	24·2	23	98	30·4	E.	7
9. 2.47	1200	64°29′	106°16′	..	0	SE′E.	6	978·2	3	+2·0	25·0	24·2	21	89	30·8	E.	7
9. 2.47	1800	64°26′	105°46′	..	..	ESE.	3–4	981	..	..	23	..	..	..	..	..	..
10. 2.47	0000	64°24′	106°11′	80	2	SSE.	5	981·0	7	−0·4	25·8	24·8	22	87	32·8	E.	6
10. 2.47	0600	64°28′	107°30′	90	5	SE′S.	5	982·6	3	+0·8	27·6	26·6	24	87	33·4	E.	6
10. 2.47	1200	64°30′	108°34′	120	4	SSW.	3	984·4	3	+0·8	29·3	28·4	26	87	32·2	E.	6
10. 2.47	1800	64°33′	108°46′	..	..	SW.	3	986	..	..	27	..	..	..	..	..	..
11. 2.47	0000	64°32′	108°48′	..	0	WNW.	3	988·9	3	+1·4	(27·8)	(26·8)	(24)	(87)	32·8	E.	4
11. 2.47	0600	64°19′	109°03′	40	2	W.	4	991·9	3	+1·4	29·0	27·6	24	83	32·9	E.	1
11. 2.47	1200	64°13′	108°59′	350	1½	WSW.	5	993·8	3	+1·0	30·8	28·0	24	69	32·6	W.	3
11. 2.47	1800	64°10′	109°01′	..	..	NW.	2	996	..	..	30	..	..	..	..	..	..
12. 2.47	0000	64°13′	108°50′	..	0	NW.	1	997·5	3	+0·8	33·3	31·8	29	84	32·8	NW.	1
12. 2.47	0600	64°17′	108°39′	200	1	SE.	3	996·6	8	−0·4	31·6	30·6	29	89	32·5	NW.	1
12. 2.47	1200	64°18′	108°25′	260	1	SE′S.	3	995·7	7	−0·4	27·1	26·3	24	89	31·3	NW.	1
12. 2.47	1800	64°21′	108°13′	..	..	SE.	4	995	..	..	24	..	..	..	..	..	..
13. 2.47	0000	64°25′	108°00′	240	1	S′E.	5	995·0	2	+0·0	25·0	24·2	21	89	30·0	E.	1
13. 2.47	0600	64°26′	108°08′	110	1	S.	5	994·1	7	−0·6	25·9	25·3	23	92	32·8	E.	3
13. 2.47	1200	64°31′	108°32′	110	2	WSW.	4	994·0	9	−0·8	24·2	22·9	20	81	29·4	NE.	3
13. 2.47	1800	64°40′	108°48′	..	..	W.	4	992	..	..	20	..	..	..	..	..	..
14. 2.47	0000	64°41′	108°39′	..	0	SW′W.	4	990·6	6	−0·2	20·8	20·0	17	88	29·3	NE.	1
14. 2.47	0600	64°42′	108°39′	360	2	SW′W.	5	990·1	5	−0·0	24·2	23·1	19	84	31·8	..	0
14. 2.47	1200	64°40′	108°39′	360	½	SW.	4	990·7	1	+0·2	25·6	24·8	22	89	30·8	..	0
14. 2.47	1800	64°40′	108°44′	90	½	W′S.	3	991	..	..	23	..	..	..	..	..	..
15. 2.47	0000	64°40′	108°44′	..	0	SW′W.	5	988·4	8	−2·0	23·2	22·5	19	90	27·2	..	0
15. 2.47	0600	64°42′	108°46′	..	0	WSW.	6	985·6	6	−1·0	24·7	22·9	18	75	29·0	..	0
15. 2.47	1200	64°42′	108°46′	..	0	SW.	7	986·5	3	0·0	23·6	21·2	14	66	30·0	..	0
15. 2.47	1800	64°40′	108°46′	..	..	SSW.	6	986	..	..	16·0	..	..	..	..	..	..
16. 2.47	0000	64°40′	108°46′	..	0	S.	4	982·0	8	−2·0	18·0	16·5	10	73	30·0	..	0
16. 2.47	0600	64°34′	108°48′	360	½	SE′E.	1	977·1	7	−1·9	18·0	17·5	14	91	30·6	..	0
16. 2.47	1200	64°34′	108°48′	..	0	E′S.	3	973·0	6	−1·8	24·1	24·0	23	97	20·0	..	..
16. 2.47	1800	64°29′	108°49′	..	..	SE.	4	972	..	..	24	..	..	..	..	..	..
17. 2.47	0000	64°29′	108°49′	..	0	SE′S.	3	973·6	9	−0·2	25·3	25·1	23	97	31·7	NW.	3
17. 2.47	0600	64°25′	108°48′	360	1	S.	4	974·0	3	+0·4	26·8	26·2	24	92	30·8	NNW.	3
17. 2.47	1200	64°19′	108°40′	300	1	W.	2	974·2	9	−0·6	25·8	24·0	18	76	31·3	NW.	4
17. 2.47	1800	64°16′	108°40′	..	..	WNW.	2	973	..	..	25	..	..	..	..	..	..
18. 2.47	0000	64°17′	108°15′	..	0	E.	4	971·6	8	−0·6	30·6	28·2	23	73	32·0	N.	1
18. 2.47	0600	64°18′	108°11′	360	½	E′S.	6	970·2	7	−1·4	30·0	29·6	29	95	32·8	..	9
18. 2.47	1200	64°21′	107°58′	220	1	ESE.	7	969·4	8	−0·2	30·2	30·2	30	100	31·3	E.	6
18. 2.47	1800	64°26′	107°50′	..	..	E′S.	8	972	..	..	29	..	..	..	..	..	..
19. 2.47	0000	64°27′	107°40′	270	1	SE′E.	7	975·4	1	+2·0	28·6	27·8	26	90	29·4	..	9
19. 2.47	0600	64°30′	107°30′	270	1	SE′E.	5	976·4	1	+0·6	27·3	26·7	25	92	29·0	E.	6
19. 2.47	1200	64°32′	107°40′	90	5	ESE.	4	976·6	3	+0·0	26·0	25·4	23	92	29·2	E.	6
19. 2.47	1800	64°35′	108°14′	..	..	E.	3	977	..	..	25	..	..	..	..	..	..
20. 2.47	0000	64°36′	108°31′	90	1½	SE′E.	4	975·4	7	−0·6	24·3	23·5	20	89	29·2	E.	3
20. 2.47	0600	64°40′	108°24′	..	0	SE′E.	3	973·9	7	−0·8	25·8	24·3	20	80	29·2	ENE.	1
20. 2.47	1200	64°50′	109°18′	110	3	SE.	4	973·1	7	−0·0	25·6	24·4	21	84	29·3	ENE.	3
20. 2.47	1800	64°51′	109°18′	..	..	SE′S.	4	974	..	..	24	..	..	..	..	..	..
21. 2.47	0000	64°52′	109°13′	270	1	SSE.	5	974·9	2	+0·8	23·8	23·6	23	97	29·0	E.	1
21. 2.47	0600	64°52′	109°17′	50	½	ESE.	3	975·5	2	+0·4	27·0	27·0	27	100	29·0	E.	3
21. 2.47	1200	64°53′	109°01′	270	1	E.	5	977·0	3	+1·2	26·9	26·9	27	100	29·4	E.	6
21. 2.47	1800	64°56′	108°47′	..	..	E.	7	981	..	..	25	..	..	..	..	..	..

* See codes, p. 28.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
7		cks	ccks	Fs (6) 9, 800; St (5) 9+, 2,400; Cs (7)	9+	Belt of slight snow arrived from east and lasted
4	tr.	o $s_o s_o$	c o $s_o s_o$	Fn (6) 3, 300; Ns (2) 10, ..	10	.. [11 hr.
8		c	o $s_o s_o c$	Fn (6) 7, 1,500; Sc (5) 7, 5,000; As Ac (7); Cs (7)	9+	..
7		om_o	om_o	..	..	..
8		$cjks_o$	c	Fs St (6) 1, 1,500; Ac (3) 5, 9,000; Cs (7)	8	..
8	(0·1)	cis_o	c	Fn (6) 4, 700; Cs (8)	9	..
9		c	c	St (5) 1, 2,500; Ac (3) .., 12,000; Cs (8)	8	..
9		bc	c bc	..	..	..
9		bc	bc	Fs Fc Sc (6) 2, 800; Ac (5) .., 8,000; Cs (8)	3	..
9	0·0	b	b	Cu (1) tr., 1,800; Ac (5); Cs (8)	tr.	..
9		bc	b bc	Sc (5) 4, 2,000; Ac (5) .., 10,000; Cs (8)	5	Aircraft report used
9		c	bc c	..	..	..
9		cjp	c	Cu (2) 9, 2,500; Ac (3) tr., 7,000	9	Radiation fog over the pack-ice and new ice
9	0·0	bc	c bc	Cu Sc (8) 6, 2,000; Cs (6)	7	.. [forming on enclosed pools (aircraft
9		c	bc c	Fs (6) 8, 400; As Ac (7); Cs (6)	9+	.. [report)
9		o	c	..	..	..
9		o	c	St (5) 10, 1,100	10	Very short swell amongst pack-ice
9	0·0	ov	c	Fs (6) 6, 800; St (5) 10, 2,500	10	..
9		cv	cv	Sc (5) 9, 1,400	9	..
9		bcv	c bcv	..	..	..
9		bv	bc bv	Cu (1) tr., 1,500	tr.	Hoar frost on deck
9	0·0	bv	bv	Sc (5) tr., 1,800; Ac (4)	tr.	..
9		c	bv bc c	St (5) 9, 2,000; Ac (4)	9	..
7		c	bc	..	..	..
9		bc	bc	Cu (1) 2, 2,000; Ci (5)	3	..
9	0·0	b	bc	Cu (1) tr., 2,000	tr.	..
9		b	b	Ac (9) 1, ..	1	..
9		c	b bc c	..	..	..
8		c	c	St (5) 7, 2,500; Ac (3) 8, 6,000	8	..
4	0·0	$os_o s_o$	c	St (5) 9+, 1,000	9+	Stern wind
2		oss	$os_o s_o$ oss	Fs St (5) 10, 200	10	..
6		$cs_o s_o$	$cs_o s_o$	..	..	..
7		$cs_o s_o$	$cs_o s_o$	Fs (6) 4, 500 ; As Ac (7) .., 10,000	9	..
9	3·7	cis_o	cis_o	Cu Cb (3) 9+, 900; Sc St (5) .., 4,000	9+	..
9		cv	c	Sc (5) 9, 1,800	9	Green flash at sunset
9		cv	cv	..	..	..
9		o	c	Sc (5) 7, 2,500; As Ac (7)	10	..
5	tr.	osh	c $os_o s_o$sh	Fs (6) Ns (2) 10, 300	10	..
4		$os_o s_o$m	$oshs_o s_o$	Sky obscured	..	Gusty
6		ois_o	ois_o	..	..	..
8		o	c	St (5) 10, 800	10	Gusty
9	(tr.)	o	c	St (5) 10, 800	10	Gusty
9		o	c	St (5) 10, 1,000	10	Gusty
9		c	c	..	..	..
9		o	c	St (5) 10, 1,000	10	..
9	tr.	o	cis_o	Sc (5) 10, 1,500	10	Appearance of land to southward
9		o	c	Sc (5) 10, 1,800	10	..
6		cis_o	c	..	..	..
6		$os_o s_o$	$os_o s_o$	Fs (6) Ns (2) 10, 300	10	..
5	(0·5)	$os_o s_o$e	$os_o s_o$e	Sky obscured	..	..
4		$os_o s_o$	$os_o s_o$e	Sky obscured	..	..
6		$os_o s_o$	$os_o s_o$	..	..	..

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
22. 2.47	0000	64°56′	108°49′	90	1	E.	6	986·2	3	+3·0	25·7	24·7	22	87	29·0	E.	3
22. 2.47	0600	64°56′	109°57′	100	10	E.	4	990·4	3	+2·2	25·0	23·0	17	73	29·0	E.	1
22. 2.47	1200	65°18′	111°00′	180	3	E.	4	994·1	1	+1·4	23·3	21·7	16	77	29·3	..	0
22. 2.47	1800	65°17′	111°03′	..	..	E.	3	996	..	..	24	..	..	..	..	..	..
23. 2.47	0000	65°20′	111°01′	200	½	E'S.	4	993·3	6	−1·8	25·9	25·4	23	93	28·7	..	0
23. 2.47	0600	65°18′	111°19′	80	2	E'S.	7	988·5	8	−3·0	26·3	26·3	26	100	28·9	..	0
23. 2.47	1200	65°18′	111°33′	140	1	ESE.	9	984·6	7	−0·8	26·1	26·1	26	100	28·7	..	0
23. 2.47	1800	65°21′	111°17′	..	..	ESE.	9	984	..	..	26	..	..	..	..	..	..
24. 2.47	0000	65°22′	111°00′	..	0	ESE.	8	985·6	1	+1·2	26·2	25·6	23	92	28·7	NE.	3
24. 2.47	0600	65°24′	110°35′	..	0	ESE.	6	985·8	2	+0·0	26·8	26·1	24	91	29·0	NE.	3
24. 2.47	1200	65°18′	111°42′	40	½	SE'E	7	983·5	9	−1·2	26·0	23·8	17	71	28·4	NE'E.	6
24. 2.47	1800	65°13′	112°40′	..	..	ESE.	9	978	..	..	22	..	..	..	..	..	..
25. 2.47	0000	65°12′	113°16′	90	4	SE.	11	972·0	8	−4·0	21·0	20·8	19	97	29·2	E.	6
25. 2.47	0600	65°08′	113°20′	..	0	SE.	9	968·5	6	−1·2	21·6	21·1	19	93	29·2	E.	3
25. 2.47	1200	65°11′	113°48′	120	1	SE'S.	6	966·0	3	+0·0	23·2	22·6	20	91	29·5	..	0
25. 2.47	1800	65°02′	113°37′	..	..	SSE.	5	967	..	..	24	..	..	..	..	..	..
26. 2.47	0000	64°59′	113°30′	310	½	S'E.	4	970·7	1	+2·2	25·0	24·4	22	91	30·2	..	0
26. 2.47	0600	65°00′	112°57′	††	7	SW.	3	974·3	2	+2·8	(27·7)	(27·4)	(27)	(96)	32·0	E.	1
26. 2.47	1200	64°55′	113°16′	..	0	W.	3	978·8	3	+2·4	27·4	25·8	21	80	31·5	NW.	1
26. 2.47	1800	64°42′	113°37′	..	..	WSW.	3	983	..	..	26	..	..	..	..	..	..
27. 2.47	0000	64°42′	113°34′	200	1	NW'W.	2	986·9	3	+1·4	26·1	23·5	16	66	31·4	NW.	3
27. 2.47	0600	64°40′	113°26′	200	1	WNW.	3	989·3	3	+1·4	26·8	24·7	19	74	30·8	NW.	1
27. 2.47	1200	64°51′	113°21′	200	½	W.	2	992·1	3	+0·8	26·7	24·9	20	78	30·3	NW.	1
27. 2.47	1800	64°50′	113°18′	..	..	NW.	3	993	..	..	27	..	..	..	..	..	..
28. 2.47	0000	64°56′	113°20′	180	1	N'W.	3	992·4	4	+0·0	29·0	28·2	26	91	30·2†	..	0
28. 2.47	0600	64°55′	113°19′	..	0	E.	2	992·6	9	−0·6	29·6	28·9	28	92	30·2	NW.	1
28. 2.47	1200	64°44′	113°35′	60	3	ENE.	5	989·1	7	−1·6	31·4	31·3	31	99	31·0	NW.	1
28. 2.47	1800	64°49′	113°25′	..	..	ENE.	6	984	..	..	30	..	..	..	..	..	..
1. 3.47	0000	64°54′	113°11′	220	1	E.	8	978·1	8	−4·0	28·0	28·0	28	100	31·0	NE.	6
1. 3.47	0600	64°55′	112°52′	250	1	SE'E.	10	971·3	6	−2·0	26·0	26·0	26	100	29·8	NE.	7
1. 3.47	1200	64°55′	112°50′	290	3	E'S.	6	973·0	3	+1·6	30·2	30·1	30	99	29·8	NE.	7
1. 3.47	1800	64°56′	112°55′	..	..	SE'E.	7	976	..	..	24	..	..	..	..	..	..
2. 3.47	0000	65°03′	113°12′	150	4	SE.	6	978·2	3	+1·0	21·0	20·7	19	95	29·0	NNE.	3
2. 3.47	0600	64°48′	113°26′	††	..	SE'S.	5	977·2	6	−0·4	22·4	21·9	19	92	29·0	NE.	1
2. 3.47	1200	64°48′	113°32′	..	0	SE.	4	978·2	0	+0·2	22·2	21·7	19	92	29·5	N.	1
2. 3.47	1800	64°48′	113°48′	..	..	E'S.	4	976	..	..	20	..	..	..	..	..	..
3. 3.47	0000	64°49′	113°50′	170	½	E'S.	6	972·9	7	−2·0	20·0	20·0	20	100	28·8	..	0
3. 3.47	0600	64°58′	114°00′	140	2	ESE.	7	967·9	7	−2·0	23·4	22·8	20	91	29·4	..	0
3. 3.47	1200	65°07′	114°12′	140	1½	SE'E.	8	963·7	7	−2·0	24·5	24·3	23	97	29·2	NE.	1
3. 3.47	1800	65°11′	114°12′	..	..	SE.	9	960	..	..	26	..	..	..	..	..	..
4. 3.47	0000	65°12′	114°00′	..	0	SE.	7	961·6	4	+2·0	26·3	26·3	26	100	29·1	NE.	4
4. 3.47	0600	65°12′	113°37′	270	1	SE.	6	965·1	3	+2·0	26·1	25·6	23	94	28·6	NE.	4
4. 3.47	1200	65°09′	113°25′	320	1	SE.	5	969·8	2	+2·2	26·7	25·7	23	87	29·8	NW.	5
4. 3.47	1800	65°07′	113°12′	..	..	SE'E.	6	973	..	..	25	..	..	..	..	..	..
5. 3.47	0000	65°06′	113°00′	300	½	ESE.	5	977·3	3	+2·0	25·5	24·4	21	85	30·2	WNW.	4
5. 3.47	0600	65°05′	112°43′	..	0	E'S.	4	980·4	4	+1·6	25·8	24·7	22	85	30·2	WNW.	1
5. 3.47	1200	65°06′	112°52′	110	1	SE'E.	5	982·8	1	+0·6	25·3	24·1	21	84	30·8	NW.	1
5. 3.47	1800	65°06′	112°37′	..	..	ESE.	3	984	..	..	24	..	..	..	..	..	..
6. 3.47	0000	65°07′	112°36′	120	½	SE.	3	984·4	1	+0·6	24·3	23·7	21	91	31·0	NW.	1
6. 3.47	0600	65°07′	112°34′	270	½	SE.	2	984·8	1	+0·2	24·9	24·7	23	97	**	NW.	1
6. 3.47	1200	65°07′	112°11′	270	½	S.	2	985·8	3	+0·2	26·2	24·6	20	79	31·2	..	0
6. 3.47	1800	65°07′	112°08′	..	..	Calm		986	..	..	25	..	..	..	..	..	..

See codes, p. 28.

† Temperature taken 1–3 hr. late to avoid effects of relative calm amd pollution in water around ship.

Visibility*	Precipitation of last 24 hr.	Weather: Present	Weather: Past 6 hr.	Cloud: Type, code* number in brackets, amount (tenths) and height of base (ft.)	Cloud: Total amount	Remarks
	mm.				tenths	
7		cis_o	cis_o	St (5) 5, 1,500; Ac (3); Cs (6)	9	Land in view all day
9	tr.	bcv	c bc	Cu (1) tr., 3,000; Cs (8)	4	Sky cleared from east and south-east
9		bv	bcvbv	Cu (1) tr., 3,000; Sc (5) 1, 5,000; Cs (8)	2	..
7		o	bv bc co	..	..	..
8		o	c	St (5) 10, 800	10	..
6	(1·5)	om_o/d	codd ods_o	St (5) 10, 200	10	..
6		om_osh	$od_od_om_o$	Fn (6) Ns (2) 10, 500	10	..
6		o	ois_o	..	..	..
6		ois_o	cis_o	Fs (6) 7, 1,000; As (1); Cs (7)	10	..
6	tr.	ois_o	cis_o	Fs (6) 8, 1,200; As (1); Cs (7)	10	..
8		cq	c bc c	Fs (6) 3, 1,500; As Ac (7); Cs (7)	7	Gusty
6		o	co	..	..	..
5		om_osh	om_osh	Fs (6) Ns (2) 10, 500	10	..
4	(1·0)	oms_os_o	$om_os_os_o$	Fs (6) 5, 500; As (1); Cs (7)	10	..
7		cps_o	$om_os_os_ocps_o$	Cb (3) 9, 1,200; As Ac (7); Cs (7)	9+	..
7		cps_o	cps_o	..	..	..
7		cps_o	cps_o	Cb (3) 8, 1,200; Ac (6); Cs (7)	9+	..
6	(0·5)	os_os_o	cps_o	Cu (2) 5, 1,200; As (1)	10	..
8		c	cps_oc	Cu (2) 1, 1,000; Sc (5) 9, 2,200	9	..
8		o	o	..	..	..
9		o	c	Sc (5) 10, 3,500	10	..
9	(0·1)	cjp	c	Cu (2) 7, 2,600; St Sc (5) 9, 3,800	9	..[cloud advancing from west and south-west
9		b	cps_oc bc	Cu (1) 1, 2,800; Ac (4); Ci (4)	2	Formidable belt of frontal high and medium
8		c	b bc c	..	..	Aurora, faint display 1500–1530
8		c/ps_o	cps_o	Sc (5) 9, 2,900	9	..
8	0·1	cjs	c	St Ns (5) 9+, 6,000	9+	..
8		o	os_os_oco	St (5) 1, 5,250; As (2) 10, 7,000	10	..
7		o	o	..	..	..
4		os_os_o	os_os_o	Sky obscured	..	..
4	(0·4)	os_os_o	os_os_o	Fs (6) Ns (2) 10, 800	10	..
6		$od_od_om_o$	$os_os_od_od_o$	St (5) 10, 200	10	Gusty
6		osh	ois_o	..	..	..
6		osh	osh	St (5) 10, 900	10	Gusty
8	(0·4)	o	oshoc	St (5) 10, 1,500	10	..
9		o	c	St (5) 10, 1,200	10	..
9		o	o	..	..	..
8		o	o	St (5) 10, 400	10	..
8	0·0	o	o	St (5) 10, 400	10	..
6		osh	ood_od_osh	St (5) 10, 200	10	Supercooled drizzle with air temperature 24°F.
6		osh	osh	..	..	.. [at 0830
4		os_os_o	os_os_o	Sky obscured	..	Gusty
5	(1·0)	os_os_o	os_os_o	Fs (6) 8, 600; Ns (2) 10, 2,500	10	Gusty
9		c	os_os_oc	Sc (5) 5, 1,700; As Ac (7) .., 14,000; Cs (7)	8	Gusty
7		cis_o	cis_o	..	..	..
9		cis_o	cis_o	Sc (5) 9, 1,200	9	..
9	tr.	c	c	Sc (5) 6, 1,500; As Ac (7) St (5) .., 6,000	9	..
9		c	c	Cu (1) 4, 2,200; St (5) 3, 5,000; Ac (3) .., 12,000	9	..
9		c	c	..	..	..
9		o	c	Sc (5) 9, 1,200; As (2)	10	Steam fog (sea smoke) beyond the pack-ice to
6	tr.	cd_od_o	$cis_ocd_od_o$	St (5) 10, 700	10	.. [southward
9		c	cd_od_oc	Cu (2) tr., 2,000; As Ac (7) .., 8,000	10	..
7		cis_o	c	..	..	..

** Water polluted.
†† Variable.

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind Direction	Wind Force*	Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature Dry bulb	Temperature Wet bulb	Dew point	Relative humidity	Sea-surface temperature	Swell Direction	Swell Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
7. 3.47	0000	65°04′	112°29′	50	2	N.	3	984·1	8	−1·2	28·0	26·0	20	75	31·0	..	0
7. 3.47	0600	65°02′	112°20′	..	0	Calm		981·9	8	−0·8	29·3	29·0	28	96	31·2	..	0
7. 3.47	1200	65°02′	112°23′	..	0	NE′E.	1	981·3	3	0·0	28·2	27·3	25	88	31·0	..	0
7. 3.47	1800	65°02′	112°25′	..	..	E.	1	982	..	..	26	..	..	..	..	..	..
8. 3.47	0000	65°02′	112°24′	..	0	SE.	3	983·7	3	+0·8	25·6	25·5	25	97	30·6	..	0
8. 3.47	0600	65°00′	112°16′	360	½	NE.	3	987·0	3	+1·6	30·5	29·5	27	88	30·8	..	0
8. 3.47	1200	64°57′	112°24′	50	½	SE.	3	990·4	3	+2·0	25·8	25·2	23	92	29·0	NE.	1
8. 3.47	1800	64°55′	112°34′	..	..	SE.	3	990	..	..	24	..	..	..	..	..	..
9. 3.47	0000	65°03′	112°36′	180	1	SE′S.	5	988·0	8	−0·6	24·4	23·4	20	86	30·4	..	0
9. 3.47	0600	65°07′	112°45′	135	1	SE.	5	983·6	8	−2·0	25·0	23·2	18	76	31·0	..	0
9. 3.47	1200	65°11′	112°51′	..	0	SE.	6	980·0	8	−1·4	27·3	27·0	26	96	30·1	..	0
9. 3.47	1800	65°10′	112°31′	..	..	SE.	8	979	..	..	24	..	..	..	..	..	0
10. 3.47	0000	65°10′	112°20′	270	1	SE.	6	980·9	3	+1·6	25·4	24·8	22	92	28·7	..	0
10. 3.47	0600	65°03′	113°03′	65	7	SE.	5	982·2	3	+1·2	26·0	25·0	22	87	29·1	ENE.	1
10. 3.47	1200	65°03′	112°53′	270	1	SE′E.	6	984·1	3	+1·4	28·7	26·6	21	74	31·0	NE.	5
10. 3.47	1800	65°03′	112°28′	..	..	SE′S.	5	984	..	..	27	..	..	..	..	..	0
11. 3.47	0000	65°00′	112°36′	270	½	SE′S.	5	982·6	9	−1·8	27·2	26·0	22	85	31·7	ENE.	5
11. 3.47	0600	65°00′	112°34′	270	1	SE.	6	981·2	7	−0·4	26·9	25·4	21	81	31·5	ENE.	4
11. 3.47	1200	65°00′	112°20′	270	1	SE′S.	6	981·1	2	+0·0	26·4	25·6	23	89	31·2	..	0
11. 3.47	1800	65°00′	112°10′	..	..	SE.	5	981	..	..	27	..	..	..	..	..	..
12. 3.47	0000	65°00′	111°56′	270	1	SE.	6	980·3	2	+0·4	27·6	24·8	16	66	30·2	ENE.	1
12. 3.47	0600	65°04′	111°36′	250	2	SE.	5	980·6	2	+0·2	29·5	28·0	24	82	30·2	..	0
12. 3.47	1200	65°05′	111°13′	250	2	S.	5	983·6	3	+1·8	29·3	28·7	27	93	31·0	..	0
12. 3.47	1800	65°05′	110°42′	..	..	S.	3	985	..	..	29	..	..	..	..	..	..
13. 3.47	0000	65°05′	109°38′	270	7	S′E.	3	986·5	1	+0·4	29·0	27·5	24	82	29·9	..	0
13. 3.47	0600	64°51′	109°54′	††	8	WSW.	2	986·3	6	−0·2	30·0	28·4	25	81	30·6	NE.	4
13. 3.47	1200	64°49′	108°57′	280	3	W.	2	986·1	3	0·0	26·5	24·7	19	77	30·9	NE′E.	4
13. 3.47	1800	64°47′	108°52′	..	..	SW.	2	985	..	..	26	..	..	..	..	..	..
14. 3.47	0000	64°43′	108°36′	300	1	S′E.	2	984·2	8	−0·6	29·0	28·6	27	95	30·7	NW.	1
14. 3.47	0600	64°36′	108°34′	50	1	SSE.	3	981·2	8	−1·8	30·9	29·3	27	82	30·8	NW.	1
14. 3.47	1200	64°34′	107°45′	260	½	S.	4	979·2	8	−0·6	28·4	27·6	25	90	30·3	NNW.	1
14. 3.47	1800	64°39′	107°12′	..	..	S′W.	3	979	..	..	25	..	..	..	..	..	..
15. 3.47	0000	64°37′	106°50′	360	2	SW.	4	979·1	3	+0·0	21·4	20·4	16	85	29·0	..	0
15. 3.47	0600	64°20′	106°29′	290	2	SW′W.	4	976·1	8	−2·4	24·3	21·7	13	64	29·0	..	0
15. 3.47	1200	64°17′	105°58′	290	3	SW′W.	5	971·9	8	−2·8	20·5	19·7	16	87	28·7	NW.	1
15. 3.47	1800	64°11′	105°42′	..	..	SW′W.	4	966	..	..	18	..	..	..	..	..	..
16. 3.47	0000	64°03′	105°28′	300	1	SW′W.	5	966·9	3	+0·6	16·1	15·1	10	81	28·5	..	0
16. 3.47	0600	64°01′	105°16′	290	1	SW′W.	4	969·5	3	+1·4	19·7	18·5	13	81	28·4	..	0
16. 3.47	1200	63°59′	105°06′	290	1	SW′W.	3	972·1	3	+1·8	19·4	18·3	13	83	28·4	..	0
16. 3.47	1800	63°52′	104°58′	..	..	SW′W.	3	975	..	..	18	..	..	..	..	..	..
17. 3.47	0000	63°49′	104°35′	285	1	SW.	3	977·0	3	+0·6	19·6	18·8	15	87	28·4	NNW.	1
17. 3.47	0600	63°46′	104°36′	50	1	SW′W.	4	978·3	3	+0·8	23·4	22·3	18	86	29·2	NW.	1
17. 3.47	1200	63°45′	104°30′	300	1	WSW.	5	980·9	3	+1·2	21·2	20·2	16	85	29·7	NW.	1
17. 3.47	1800	63°39′	104°23′	..	..	SW.	5	985	..	..	20	..	..	..	..	..	..
18. 3.47	0000	63°37′	104°23′	360	½	WSW.	5	989·1	0	+1·0	18·9	17·9	13	83	29·3	..	0
18. 3.47	0600	63°45′	104°26′	180	2	W′S.	4	987·1	8	−1·2	21·2	20·1	16	83	29·7	..	0
18. 3.47	1200	63°43′	104°26′	360	½	SW′W.	4	987·7	1	+0·2	21·0	19·7	14	80	29·5	..	0
18. 3.47	1800	63°34′	104°05′	..	..	WSW.	2	986	..	..	21	..	..	..	..	..	..
19. 3.47	0000	63°25′	103°42′	330	2	NW′W.	1	982·6	8	−2·4	30·6	30·3	30	97	29·8	N′W.	1
19. 3.47	0600	62°59′	103°24′	340	6	NE′N.	3	975·5	8	−4·2	31·8	31·8	32	100	34·0	..	0
19. 3.47	1200	62°37′	102°30′	315	8	WNW.	2	970·0	8	−1·2	33·0	33·0	33	100	32·8	..	0
19. 3.47	1800	62°30′	101°16′	..	..	N.	2	967	..	..	31	..	..	..	..	..	..

* See codes, p. 28.
†† Variable.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
8		c	c	Sc (5) 6, 3,500; Ac (3) .., 10,000	9	..
2	3·6	oss	coss	Sky obscured	..	..
8		bc	ossbc	Sc (4) 3, 2,500; As Ac (7) 7, 8,000	7	..
9		o	o	..	..	..
						[view of coastal ranges, 2200
9		c	cvc	Cb (3) 6, 1,600; As Ac (7) .., 1,200; Ci (1)	9+	Cb base covering coastal mountains. Excellent
9	0·4	ois_o	ccphc	Cu (2) 3, 4,000; Ac (8) .., 8,000	10	Thundery sky
9		c	cis_oc	Sc (5) 3, 2,500; As (2) .., 9,000	9+	..
9		c	c	..	..	..
8		cjs	c	Sc (5) 9, 1,500	9	..
8	(0·1)	o	os_os_oc	Sc (5) 10, 7,000	10	Single Sc St (Ac As) cloud sheet sloping from
2		osh	cosh	Sky obscured	..	Gusty [about 3,000 ft. in north-west to
5		ois_o	ois_o	..	..	.. [13,000–14,000 ft. south-east of ship,
						[0600
5		os_os_o	os_os_o	Fs (6) 3, 800; As (1)	10	..
8	tr.	o	os_os_oc	St (5) 10, 1,100	10	Gusty
9		o	c	Sc (5) 2, 2,700; Ac (3) .., 12,500; As (2) .., 25,000	10	..
9		c	c	..	..	..
7		o	c	Sc (5) 9, 1,500; As (1)	10	..
8	tr.	o	coshc	Sc (5) 10, 1,200	10	..
7		ois_o	c cis_o	St (5) 9+, 1,200; As (1)	10	..
7		cis_o	cis_o	..	..	..
9		o	c	As Ac (7) 1, 18,000; Cs (7) 10, ..	10	Halo
9	tr.	ojs	cos_os_oc	Sc (5) 10, 2,200	10	..
7		ois_o	c	Sc (5) 10, 2,500	10	..
9		o	o	..	..	..
9		c	c	Sc (5) 9, 4,500	9	..
9	tr.	c	c	Sc (5) 9, 5,300	9	..
9		c	c	Sc (5) 9, 6,000	9	Virga 6,000 ft.
9		o	o	..	..	..
7		os_os_o	cos_os_o	St (5) 10, 200	10	Swell, moderate length
9	tr.	c	os_os_oc	St (5) 8, 3,000; Ac (5) .., 8,000	9	..
9		b	c bc b	St (5) 2, 5,000	2	..
9		bc	b bc	..	..	Green flash at sunset
9		bv	bc b	St (5) tr., 5,000; Ci (3)	tr.	..
9	0·0	bv	bv	Cu (1) tr., 1,200	tr.	..
9		bv	bv	Sc (5) tr., 1,500	tr.	Mirage rendered moonrise unrecognizable
9		b	b	..	..	Aurora 1400–1800
9		b	b	Sc (5) tr., 4,000	tr.	..
9	0·0	cv	b bc c	Cu (1) 8, 2,200; Sc (5) 7, 4,500	8	..
9		cv	cv	Sc (5) 9, 1,900; Sc (5) 9, 4,000	9	..
9		c	c	..	..	..
9		c	c	Cu (1) Sc Fs St (5) 1, 1,800; Sc (5) 8, 4,500; Cs (7)	8	..
9	0·0	c	c	Cu Cb (3) 5, 1,800; Sc (5) 9, 5,000	9	..
9		c	c	Sc (5) 9+, 1,700	9+	..
6		o†	co†	..	..	Front with Cb line and followed by 2 hr. of
						[snow and soft hail approached from south-
9		c	o†c	Sc (5) 9, 2,200	9	.. [east passing *Balaena* about 1600
9	(0·7)	cjp	$ccps_oc$	Cu (2) 9, 1,500; St (5) As (2) .., 6,000	9+	..
9		bcv	c bc	Cu (1) 4, 1,800; Cs (7)	5	..
7		cjs	bc c	..	..	..
5		os_os_o	cos_os_o	Fn (6) Ns (2) 8, 300	10	South-west north-east orientated front with well
4	0·2	oss	ois_o	Sky obscured	..	.. [marked cloud system and 10° F. tem-
4		oir_om	oir_om	Fs Fn (6) 9, 500; As (1)	10	.. [perature passed 63°24′S. 103°48′E. at
6		os_os_o	oir_os_o	..	..	.. [2200

† Soft hail.

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency haracteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
20. 3.47	0000	62°30′	100°54′	270	4	Calm		965·3	8	−0·8	31·8	..	..	..	30·5	NW'N.	3
20. 3.47	0600	62°58′	99°56′	200	5	ESE.	3	966·4	3	+0·8	28·5	28·2	27	96	30·2	NW'N.	3
20. 3.47	1200	63°03′	100°04′	110	½	SE'E.	4	969·0	3	+1·6	25·7	25·3	23	95	29·0	NW.	4
20. 3.47	1800	63°03′	99°55′	..	..	SE.	4	970	..	..	27	..	..	..	..	..	..
21. 3.47	0000	63°07′	99°46′	225	1	SE.	4	972·4	2	+1·4	26·4	26·2	25	97	29·7	NW'N.	3
21. 3.47	0600	63°06′	99°56′	70	1	SSE.	5	974·5	3	+1·2	25·2	24·7	22	93	29·7	NNW.	1
21. 3.47	1200	63°05′	99°47′	250	½	S'E.	4	977·0	3	+1·2	23·9	23·2	20	90	29·3	N'W.	1
21. 3.47	1800	63°10′	99°43′	..	..	S'E.	3	979	..	..	20	..	..	..	..	..	..
22. 3.47	0000	63°08′	99°37′	300	1	SSE.	3	979·5	3	+0·2	23·3	22·5	19	89	29·0	..	0
22. 3.47	0600	63°06′	99°34′	270	½	SE'S	2	977·7	7	−1·0	25·2	24·4	21	89	29·0	..	0
22. 3.47	1200	63°07′	99°35′	..	0	SE'E.	3	975·5	6	−1·2	23·3	22·9	21	94	29·0	NW.	1
22. 3.47	1800	63°08′	99°27′	250	1	ESE.	5	971·2	8	−3·0	24·2	24·0	22	97	29·0	..	0
23. 3.47	0000	63°11′	99°00′	..	..	ESE.	6	968	..	..	20	..	..	..	..	..	..
23. 3.47	0600	63°13′	99°27′	114	5	SE.	6	966·8	8	−0·6	19·9	19·6	17	95	29·4	..	0
23. 3.47	1200	63°15′	98°47′	250	5	SE.	4	969·1	2	+2·2	(20·5)	(20·2)	(17)	(94)	29·4	..	0
23. 3.47	1800	62°43′	97°49′	..	0	SE'S.	3	970·2	2	+0·6	21·8	21·2	18	91	30·8	..	0
24. 3.47	0000	62°41′	97°29′	..	..	SE.	3	971	..	..	17	..	..	..	..	..	..
24. 3.47	0600	63°06′	97°05′	190	6	SE'S.	4	973·6	2	+1·4	18·8	17·5	11	78	30·0	..	0
24. 3.47	1200	63°29′	95°53′	280	8	SSE.	4	976·6	2	+1·4	17·4	17·0	13	92	29·6	..	0
24. 3.47	1800	63°29′	95°02′	265	10	SSE.	3	977·5	3	+1·0	17·3	16·3	11	82	29·1	..	0
25. 3.47	0000	63°25′	92°46′	..	..	ENE.	3	980	..	..	21	..	..	..	..	..	..
25. 3.47	0600	63°55′	90°39′	260	4	E'N.	4	981·2	8	−0·0	24·9	23·2	18	77	29·3	..	0
25. 3.47	1200	63°40′	89°50′	315	10½	ENE.	3	981·7	2	+0·0	26·6	24·1	16	67	29·0	..	9
25. 3.47	1800	63°36′	89°25′	230	1	ENE.	4	982·4	3	+0·6	26·4	25·4	22	87	29·2	..	0
26. 3.47	0000	63°40′	89°12′	..	..	NNE.	4	981	..	..	26	..	..	..	..	..	..
26. 3.47	0600	63°20′	87°39′	285	10	Calm		977·9	6	−0·8	28·0	**	..	..	31·0	..	0
26. 3.47	1200	62°58′	87°29′	††	8	SSW.	4	979·8	2	+1·4	23·2	22·2	18	86	29·3	N.	1
26. 3.47	1800	62°37′	87°21′	..	0	SSW.	4	983·1	3	+1·8	19·5	18·5	13	84	29·5	..	0
27. 3.47	0000	62°37′	87°24′	..	..	N.	2	982	..	..	22	..	..	..	..	..	..
27. 3.47	0600	62°40′	87°28′	140	1	NW'N.	5	976·9	8	−3·6	30·0	30·0	30	100	28·9	..	0
27. 3.47	1200	62°15′	86°22′	310	4	W.	4	975·9	4	+1·6	32·2	31·6	31	93	32·2	..	0
27. 3.47	1800	62°14′	86°43′	70	1	W'N.	5	982·3	3	+2·8	31·8	31·6	31	98	30·7	..	0
28. 3.47	0000	62°14′	86°46′	..	..	NW'N.	4	986	..	..	32	..	..	..	..	..	..
28. 3.47	0600	62°06′	86°18′	320	1	N.	4	983·2	8	−3·6	31·4	31·4	31	100	29·3	..	0
28. 3.47	1200	62°00′	86°13′	350	1	N.	5	976·3	8	−4·2	32·2	32·0	32	98	30·1	N.	1
28. 3.47	1800	62°01′	86°15′	220	½	N.	5	966·8	8	−4·2	32·0	31·8	32	98	..	N.	3
29. 3.47	0000	62°03′	86°14′	..	..	N.	5	967	..	..	29	..	..	..	..	..	..
29. 3.47	0600	61°59′	86°05′	160	1	N.	6	962·8	8	−2·4	31·2	31·2	31	100	30·4	N.	7
29. 3.47	1200	61°59′	85°45′	285	2	NW'N.	4	963·9	4	+3·0	31·4	..	..	..	30·8	N.	7
29. 3.47	1800	62°00′	86°00′	60	1	W.	7	973·7	3	+6·0	28·3	27·0	23	84	30·3	N.	4
30. 3.47	0000	62°00′	86°06′	..	..	WSW.	7	984	..	..	25	..	..	..	..	..	..
30. 3.47	0600	62°02′	86°15′	130	½	W'N.	4	989.5	3	+2·2	27·8	25·3	18	69	30·4	W'N.	4
30. 3.47	1200	62°20′	86°50′	150	9	NNW.	4	991·2	5	−0·0	28·4	25·6	18	67	30·4	..	0
30. 3.47	1800	62°24′	86°54′	170	½	WNW.	2	991·2	9	−0·2	28·7	27·2	24	82	30·4	..	0
31. 3.47	0000	61°44′	86°21′	..	..	ENE.	4	984	..	..	29	..	..	..	..	..	..
31. 3.47	0600	62°01′	85°12′	230	10	NE.	2	980·0	8	−1·4	30·0	..	..	..	30·4	NNW.	1
31. 3.47	1200	61°56′	85°32′	††	3	NE.	1	979·8	4	+0·4	29·6	29·6	30	100	31·0	N'W.	3
31. 3.47	1800	61°57′	85°27′	..	0	SE.	1	980·2	8	−0·0	29·3	29·3	29	100	30·9	N.	1
1. 4.47	0000	61°57′	85°28′	..	..	S.	1	980	..	..	27	..	..	..	..	..	..
1. 4.47	0600	61°41′	86°03′	50	8	SW.	2	978·4	8	−1·0	29·4	29·4	29	100	30·7	NW'W.	1
1. 4.47	1200	61°44′	86°10′	135	2	ENE.	1	973·5	8	−2·6	27·4	26·8	25	93	30·2	NW.	1
1. 4.47	1800	61°49′	86°12′	240	2	NE.	2	966·4	8	−3·2	27·2	26·8	25	95	30·4	..	0

* See codes, p. 28.
** Front arrived before wet bulb had reached a steady reading and temperature dropped several degrees by 0630.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
8		cjf	os_os_oc	Cb (3) 1, 1,500; As Ac (7) .., 9,000	9	Rounding pack-ice " headland "
7	(1·7)	o/F	c bcoF	St (5) 10, 400	10	Gusty
8		o	c	St (5) 10, 1,000	10	..
7		c	cjp	..	..	..
7		c	c	Fs St (5) 9, 400 ; Sc (5) 9+, 3,000	9+	Gusty
7	(0·2)	ops_o	cps_o	Cb Fs (9) 9+, 800; As (2)	10	..
8		ois_o	cps_oois_o	St (5) 10, 1,200	10	..
7		ois_o	ois_o	..	..	..
9		o	ois_oo	St (5) 10, 1,400	10	..
7	tr.	ois_o	ois_o	St (5) 10, 1,100	10	..
7		o/s_os_o	$ois_oos_os_o$	St (5) 10, 700	10	..
7		o	o	St (5) 10, 300	10	Gusty
9		o	o	..	..	..
9	(1·0)	o	o	St (5) 10, 900	10	..
8		o	oc	St (5) 10, 1,200	10	..
9		ois_o	co	St (5) 10, 1,400	10	Aurora visible through St
9		o	o	..	..	..
9	tr.	c	oc	Sc (5) 7, 5,500; Ac (5)	8	..
8		c	c	Cu (1) 7, 5,500; As Ac (7)	8	..
9		bv	c bc b	Sc (5) 1, 7,000	1	Aurora
9		o	b bc c	..	..	..
8	tr.	c/ps_o	$occps_ocps_o$	Cu (1) 4, 1,800; Ac (4) .., 8,000; Ci (3)	6	..
8		o	$ccps_oc$	Sc (5) 5, 2,000; As (2) . , 5,000	10	..
9		c	c	As Ac (7) 9, 8,000	9	..
7		cjs	c	..	..	..
7–9	tr.	cjs	c	Cu Cb (3) 8, 1,800; Sc (5) Ac (3) 9.., 6,000	9+	Sc Ac layer sloping from 6,000 to 8,000 ft.
9		c	cqpsho†c	Cu (1) 8, 1,600; Sc (5) .., 6,000	9+	Line-squall, wind SSW. 5, 0610
9		cps_o	$ccps_oc$	Sc (5) 9, 2,000	9	..
9		ojs	o	..	..	..
4	(1·1)	os_os_om	os_os_om	Sky obscured	..	New ice. Sludge and pancake ice
6		cjp	od_od_of	St (5) 9, 200; Sc (5) 9, 4,000	9+	..
8		bc	c bc	As Ac (7) 4, 12,000	4	Aurora
6		o	co	..	..	..
4	(0·2)	os_os_om	ocs_os_om	Sky obscured	..	Heavy pack-ice 62°S. 86°E. and much new ice
4		od_od_om	od_od_om	Sky obscured	..	.. [(sludge)
4		or_os_om	or_os_om	Sky obscured	..	..
7		c	os_os_oc	..	..	..
4	0·2	os_os_o	cos_os_o	Fs (6) 9, 800; Ns (2) 10, ..	10	..
6		ojs	os_os_oo	St (5) 10, 1,400	10	..
7		ois_o	cis_o	Sc (5) 10, 2,500	10	Gusty
7		c	cis_o	..	..	..
8	tr.	ois_o	cis_o	Sc (5) 10, 5,500	10	..
8		o	c	Cu (2) tr., 2,800; Sc (5) 9, 4,500; As Ac (7)	10	..
9		o	c	As Ac (7) 10, 15,000	10	..
6		ois_o	ois_o	..	..	..
4	(0·1)	os_os_om	os_os_om	As (1) 10, ..	10	Ice pellets in rows north-east to south-west
2		c4f	or_oFcf	Ci (2) 9+, ..	9+	.. [about 15 ft. apart and 1–2 ft. broad on
1		b Fe	bc Fe	..	0	.. [ocean surface
6		bif	oFe	..	..	..
1	0·3	ofe	oiFciF	St (5) 10, 80	10	St base 80 ft on icebergs
6		$ojfjs_o$	$cifis_o$	St (5) 10, 250	10	..
7–9		ois_o	c	Sc (5) 9, 1,200	10	..

† Soft hail.
†† Variable.

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb†				Direction	Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
2. 4.47	0000	61°42′	85°55′	..	..	E.	2	962	..	..	28	..	..	..	..	..	..
2. 4.47	0600	61°31′	85°28′	..	0	SSW.	1	961·9	3	+0·0	28·0	27·7	27	96	30·3	..	0
2. 4.47	1200	61°31′	85°29′	..	0	SE.	4	963·0	4	+0·8	30·2	29·7	29	94	30·0	NW.	1
2. 4.47	1800	61°36′	85°13′	225	1	SE.	5	967·2	3	+2·0	27·4	26·8	25	93	29·5	..	9
3. 4.47	0000	61°40′	85°01′	..	..	SSE.	4	973	..	..	25	..	..	..	..	..	..
3. 4.47	0600	61°45′	84°48′	230	1½	S.	5	977·8	3	+2·4	24·3	23·2	19	85	29·3	WNW.	4
3. 4.47	1200	61°54′	84°33′	220	2	SSW.	4	982·7	3	+3·4	24·5	22·9	18	78	29·3	W'N.	4
3. 4.47	1800	62°15′	83°35′	215	7	SW'W.	3	987·2	3	+2·6	26·2	24·0	17	71	29·3	W.	4
4. 4.47	0000	62°52′	84°06′	..	..	WSW.	5	989	..	..	21	..	..	..	..	..	..
4. 4.47	0600	62°49′	84°08′	180	1	NW.	5	984·6	8	−3·6	29·2	27·7	24	82	31·0	W'N.	3
4. 4.47	1200	62°44′	84°08′	..	0	NW'N.	5	977·2	8	−2·4	30·3	30·2	30	99	31·2	NW'N.	3
4. 4.47	1800	62°39′	84°08′	..	0	W'S.	4	978·1	4	+2·4	30·5	29·2	27	85	31·1	W.	1
5. 4.47	0000	62°33′	84°20′	..	..	W.	4	980	..	..	28	..	..	..	..	..	..
5. 4.47	0600	62°57′	84°24′	167	5	W'N.	5	981·1	6	−0·2	30·9	29·4	27	84	30·4	W.	6
5. 4.47	1200	63°07′	84°11′	220	2	WSW.	4	984·2	3	+1·8	27·6	26·9	24	91	29·8	W'N.	6
5. 4.47	1800	63°05′	84°06′	310	1	SW.	4	988·8	1	+1·8	22·7	22·0	18	89	30·0	W.	4
6. 4.47	0000	63°08′	84°03′	..	..	ESE.	2	990	..	..	20	..	..	..	..	..	..
6. 4.47	0600	63°07′	84°17′	210	1	NE'E.	3	990·3	7	−0·8	23·2	22·7	20	92	29·4	W'N.	1
6. 4.47	1200	63°05′	84°15′	..	0	NE'N.	4	989·7	7	−0·8	25·2	24·5	22	90	29·3	WNW.	1
6. 4.47	1800	63°07′	84°19′	150	½	NE.	4	988·0	8	−1·8	24·1	23·2	19	88	29·3	WNW.	1
7. 4.47	0000	63°10′	84°22′	..	..	E.	2	985	..	..	24	..	..	..	..	..	..
7. 4.47	0600	63°12′	84°07′	270	1½	E.	3	984·0	6	−0·2	(29·2)	(28·0)	(25)	(86)	31·2	NNW.	1
7. 4.47	1200	63°14′	84°03′	..	0	NE.	4	983·3	8	−0·2	26·4	26·4	26	100	31·8	NW'N.	1
7. 4.47	1800	63°17′	84°06′	..	0	NNE.	3	980·4	8	−1·6	28·9	(28·6)	(28)	(96)	32·0	NW.	1
8. 4.47	0000	63°15′	83°37′	..	..	N.	2	978	..	..	27	..	..	..	..	..	..
8. 4.47	0600	63°14′	83°32′	270	4	N.	3	976·7	8	−1·0	29·8	29·4	29	96	33·1	NW'N.	1
8. 4.47	1200	63°14′	82°15′	270	7	SSE.	4	976·1	8	−0·2	28·3	27·8	26	96	32·0	NNW.	3
8. 4.47	1800	63°14′	81°01′	270	5	SSE.	4	979·3	3	+2·4	21·9	21·6	19	96	30·3	N.	3
9. 4.47	0000	63°14′	79°00′	..	..	S.	3	984	..	..	19	..	..	..	..	..	..
9. 4.47	0600	63°13′	76°25′	270	11	ENE.	1	987·9	1	+2·0	24·2	23·0	18	83	31·0	N'W.	1
9. 4.47	1200	63°13′	74°07′	270	10	WSW.	5	989·5	1	+1·8	21·3	20·1	15	82	29·8	WSW.	3
9. 4.47	1800	63°13′	72°20′	270	9	SW'W.	5	994·8	3	+3·0	12·1	11·7	8	91	28·9	WSW.	1
10. 4.47	0000	63°13′	69°20′	..	..	SW.	3	994	..	..	16	..	..	..	..	..	..
10. 4.47	0600	63°13′	66°20′	270	13	SE'S.	4	993·1	4	+0·0	16·8	16·4	13	92	29·3	..	0
10. 4.47	1200	63°13′	63°29′	270	13	ENE.	2	990·8	8	−1·6	20·0	19·2	15	87	28·9	NW'W.	1
10. 4.47	1800	63°13′	60°23′	270	12	NNW.	4	982·3	8	−4·2	29·9	29·7	30	98	30·8	NW.	1
11. 4.47	0000	63°52′	57°33′	..	..	N.	3	975	..	..	29	..	..	..	..	..	..
11. 4.47	0600	63°50′	54°43′	275	12	SE'S.	6	974·1	5	−0·2	21·8	21·6	20	97	30·2	SE.	6
11. 4.47	1200	63°48′	51°45′	278	12	SE.	6	978·9	3	+3·0	17·8	17·4	14	93	29·8	..	9
11. 4.47	1800	63°39′	49°20′	278	11	SE.	3	983·3	3	+2·4	16·9	16·3	13	89	30·4	..	9
12. 4.47	0000	63°27′	46°30′	..	..	SE.	3	987	..	..	20	..	..	..	..	..	..
12. 4.47	0600	63°14′	44°22′	290	13	NE.	2	987·2	4	+0·4	28·4	26·0	19	71	31·4	..	9
12. 4.47	1200	62°02′	42°31′	317	12	NE.	5	980·9	8	−5·0	28·1	27·9	27	97	33·0	..	0
12. 4.47	1800	61°00′	40°25′	317	11	NW.	4	976·0	7	−1·0	31·1	30·4	29	92	32·5	NW.	3
13. 4.47	0000	60°14′	39°04′	..	..	NNW.	3	973	..	..	30	..	..	..	..	..	..
13. 4.47	0600	59°37′	37°54′	..	0	E'S	3	972·9	4	+0·8	31·9	31·6	31	97	33·1	WNW.	6
13. 4.47	1200	59°26′	37°56′	..	0	SSW.	4	974·6	3	+0·6	30·8	29·6	27	86	33·1	NW'W.	6
13. 4.47	1800	59°17′	37°53′	360	1	WSW.	3	976·9	3	+1·0	31·1	30·1	28	89	33·7	NW.	3
14. 4.47	0000	58°28′	36°51′	..	..	SW.	3	983	..	..	30	..	..	..	..	..	..
14. 4.47	0600	57°29′	35°36′	324	11	SW.	6	992·2	3	+5·0	29·6	27·3	22	73	33·3	SW.	6
14. 4.47	1200	56°40′	34°30′	330	11	SW'W.	6	997·7	3	+2·4	30·4	27·9	22	71	34·0	SW'W.	7
14. 4.47	1800	55°40′	33°20′	326	11½	SW'W.	4	1000·8	1	+1·2	31·8	30·9	29	90	35·5	..	..

* See codes, p. 28.

† Wet-bulb temperature affected by dampness or snow in screen. It was found impossible to keep the wet-bulb muslin salt free during the ocean crossing.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
6		o_{is_o}	o_{is_o}	..	..	..
7	tr.	osh	cjp	St (5) 10, 400	10	..
6		$o_{s_o s_o}$	$o_{s_o s_o}$	Fn (6) 9, 1,500; As (2) 10, ..	10	Gusty
8		o	o_{is_o}	St (5) 10, 1,500	10	..
7		o	o	..	..	..
7	(tr.)	o_{ir_o}	oo_{ir_o}	St (5) 10, 2,000	10	Slight supercooled rain froze anemometer up
8		o	$o_{ir_o c}$	St (5) 10, 2,000	10	..
9		c	c	St (5) 9+, 3,000	9+	..
9		c	c	..	..	..
8	tr.	c	$cc_{ps_o c}$	Cu Fc (2) 8, 1,700; Sc (5) 9+, 4,500	9+	..
3		$o_{s_o s_o f}$	$cor_{o s_o f}$	Sky obscured	..	..
9		cv	$o_{s_o s_o f bc}$	Cu (2) 8, 3,200; Ac (3) .., 11,000	9	Snow ceased 1400 with sharp wind shift to [about S. force 4
7		bc	bcps	..	..	..
7	0·2	bc/ps	bcps	Cu (1) 4, 1,500; Ac (9) Ci (3)	6	Some Ac floccus
7		cjp	bcpsph	Cb (3) 6, 1,500; Ac (6) .., 8,000	9+	Real Cb sky with successive brief showers
9		c	cpshc	Sc (5) 8, 2,500; As Ac (7)	9	..
9		c	c	..	..	..
9	(0·3)	c	$cc_{is_o c}$	St Sc (5) 3, 6,000; As Ac (7) .., 12,000; Cs (7)	9+	Plates of new ice over entire ocean surface until
8		c	c	Fn Fs St (6) tr., 2,500; Ac (3) 8, 8,000; Ci (3)	8	.. [wind rose to force 4
9		c	c	Sc (5) 2, 4,000; As (2) .., 8,000; Cs (7)	9	..
7		o_{is_o}	cc_{is_o}	..	..	..
8	tr.	c	c	Fn Cu (1) tr., 1,800; Sc (5) 9+, 2,800	9+	..
4		$o_{s_o s_o}$	$co_{s_o s_o}$	Sky obscured	..	..
8		c	$o_{s_o s_o c}$	Cu (2) 3, 2,800; Ac (3) .., 15,000	9+	..
9		c	cps_o	..	..	..
8	(tr.)	$bcjp/ps_o$	cps_o	Cu Cb (3) 4, 800; St Sc (5) 3, 4,000; Ac (3) 2, 15,000,	7	Halo
9		cjs/ss	bcoss	Fn (6) 5, 500; As Ac (7) .., 8,000 [Cs (7)	9+	..
9		cis_o	c	Sc (5) 9+, 1,600	9+	..
8		o	o	..	..	..
9	2·5	c	c	Cu Fn Fc (1) 3, 1,200; Sc (5) 9, 4,500	9	..
7		cjs	cphbc	Sc (5) 9+, 2,400	9+	..
8		o	$cc_{is_o c}$	Sc (5) 10, 2,600	10	..
6		o_{is_o}	o_{is_o}	..	..	..
7	(0·2)	o_{is_o}	$o_{s_o s_o cis_o}$	St (5) 10, 1,500	10	Rain-gauge frozen up
9		o	cojsc	Sc (5) 8, 2,200; As (1)	10	..
6		$o_{s_o s_o}$	coss	Cs (7) 10, ..	10	Pronounced warm front
6		o_{is_o}	o_{is_o}	..	..	..
6	(3·5)	$o_{s_o s_o}$	$o_{s_o s_o}$	St (5) 10, 1,200	10	..
6		$cs_{o s_o}$	$ocs_{o s_o}$	Sc (5) 9+, 1,800	9+	..
6		$cs_{o s_o}$	$cs_{o s_o}$	Cu (2) 5, 2,800; Cs (7)	9	..
7		o_{is_o}	o_{is_o}	..	..	..
9	(0·2)	c	$o_{is_o c}$	Cu (2) 2, 2,200; Sc (5) .., 4,000; As Ac (7) .., 12,000;	8	Double halo
4		$o_{s_o s_o m}$	$co_{s_o s_o m}$	Fn (6) 9, 400; Ns (2) 10, .. [Cs (7)	10	..
7		c	$oir_{o m e}$	Cu (2) 4, 1,200; Sc (5) 9, 4,000	9	..
9		c	$cph_{o bc b}$	..	..	..
8	(0·1)	cjp	$cc_{ps_o c}$	Cu (2) 8, 2,200; Ac (5) .., 8,000	9	Lunar halo 0200
6		$cps_{o q}$	c	Fc Cb (9) 4, 1,200; Sc (5) 5, 5,000	8	Gusty
9		bc	cps_o cbc	Cu (2) 3, 2,500; Sc (5) tr., 5,000; Ac (3) .., 10,000	7	..
7		bc	bc	..	..	..
8	tr.	cjp	bc cps_o	Fn (6) tr., 2,000; Cu Cb (3) 5, 3,000; Ac (3) .., 8,000	8	..
9		bcjp	bc ps_o	Cu (1) 3, 2,500; Sc (5) 4, 6,000	4	..
9		c	$bcpr_{o h_o}$	Cu (2) .., 2,500; Sc (5) 9, 4,500	9	..

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind Direction	Wind Force*	Pressure at M.S.L.	Tendency characteristic*	Change in last 3 hr.	Temperature Dry bulb	Temperature Wet bulb†	Dew point	Relative humidity	Sea-surface temperature	Swell Direction	Swell Scale*
	G.M.T.	S.	E.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
15. 4.47	0000	54°30′	31°55′	..	..	N.	5	995	..	..	35	..	..	..	..	..	..
15. 4.47	0600	53°42′	31°05′	327	12	N.	5	979·3	8	−8·6	37·6	37·6	38	100	35·2	..	0
15. 4.47	1200	52°42′	30°00′	330	11	WNW.	8	971·7	4	+2·0	36·6	36·3	36	96	35·8	WNW.	4
15. 4.47	1800	52°08′	29°20′	333	7	W'S.	8	997·3	3	+2·0	37·8	36·6	35	89	38·0	..	9
16. 4.47	0000	51°30′	29°00′	..	..	W'S.	10	987	..	..	38	..	..	..	..	..	..
16. 4.47	0600	50°42′	28°20′	340	6	W'N.	9	995·8	3	+5·0	38·0	36·9	35	(90)	39·0	WNW.	7
16. 4.47	1200	49°30′	28°57′	340	8	NW'W.	8	1000·3	1	+0·2	41·5	40·7	40	(93)	44	W.	8
16. 4.47	1800	48°39′	28°20′	330	10	NNW.	6	996·0	9	−3·6	43·0	42·6	42	(97)	44	W.	8
17. 4.47	0000	47°40′	27°24′	..	..	NW'N.	5	991	..	..	44	..	..	..	..	..	..
17. 4.47	0600	46°57′	26°06′	329	11	NW.	6	993·0	3	+1·4	41·5	41·2	41	(97)	41·5	..	9
17. 4.47	1200	45°23′	24°55′	343	11	W'N.	8	994	1	+0·2	41·8	38·7	33	(73)	45·0	W.	7
17. 4.47	1800	44°38′	24°20′	334	11	WNW.	7	999·7	3	+4·0	43·5	40·7	37	(77)	50	W.	7
18. 4.47	0000	43°42′	23°50′	..	..	WNW.	8	1008	..	..	46	..	..	..	..	..	..
18. 4.47	0600	42°48′	23°06′	334	10	WNW.	6	1010·7	2	+1·8	51·6	48·2	45	77	56	W.	7
18. 4.47	1200	41°41′	22°33′	334	11	W'N.	6	1011·6	9	−0·6	57·9	53·4	49	72	57·5	W.	7
18. 4.47	1800	40°36′	21°50′	334	12	WNW.	6	1013·5	2	+1·6	60·0	57·5	56	85	71·0	W.	4
19. 4.47	0000	39°30′	21°14′	..	..	NW.	5	1014	..	..	62	..	..	..	..	..	..
19. 4.47	0600	38°24′	20°38′	334	11½	NNW.	4	1013·3	0	+0·8	62·4	56·2	51	66	66·0	SW'W.	1
19. 4.47	1200	37°30′	20°03′	..	..	NW'W.	4	1009	..	..	63	..	..	..	..	SW.	3
19. 4.47	1800	36°05′	19°19′	..	..	NW.	4	1010	..	..	57	..	..	..	..	..	..
20. 4.47	0000	34°51′	18°40′	..	..	NNW.	5	1010	..	..	62	..	..	..	..	..	..
		Cape Town Docks															
23. 4.47	0600	Leaving Cape Town		..	..	..	..	..	..	..	..	..	..	..	..	..	..
23. 4.47	1200	32°55′	17°27′	..	..	SW.	1	1011	..	..	67	..	..	..	..	..	..
23. 4.47	1800	32°00′	16°30′	..	..	SW'W.	3	1014	..	..	63	..	..	..	..	..	..
24. 4.47	0000	30°58′	15°35′	..	..	W.	2	1017	..	..	66	..	..	..	..	..	..
24. 4.47	0600	29°52′	14°37′	..	..	SW.	3	1018	..	..	62	..	..	..	..	..	..
24. 4.47	1200	28°40′	13°47′	..	..	SW.	3	1019	..	..	69	..	..	..	..	..	..
24. 4.47	1800	27°25′	12°42′	..	..	S.	3	1019	..	..	66	..	..	..	..	..	..
25. 4.47	0000	26°30′	11°57′	..	..	S.	3	1019	..	..	65	..	..	..	..	..	..
25. 4.47	0600	25°20′	10°58′	..	..	SSE.	4	1020	..	..	66	..	..	..	..	..	..
25. 4.47	1200	24°07′	9°48′	324	14	SE'S.	5	1019	9	−0·6	69	..	..	..	70	S.	2
25. 4.47	1800	23°05′	8°58′	324	14	SSE.	4	1019	3	+0·6	68	..	..	..	..	..	..
26. 4.47	0000	22°09′	8°15′	..	..	SE.	4	1019	..	..	65	..	..	..	..	..	..
26. 4.47	0600	21°10′	7°26′	..	..	SE.	4	1018	..	..	66	..	..	..	..	..	..
26. 4.47	1200	19°41′	5°56′	324	14	SE.	5	1017	9	−1·4	71	..	..	..	73	SE.	2
26. 4.47	1800	18°29′	5°00′	..	..	SSE.	4	1016	6	−0·8	69	..	..	..	73	..	0
27. 4.47	0000	17°35′	4°18′	..	..	SSE.	4	1017	..	..	69	..	..	..	..	..	..
27. 4.47	0600	16°22′	3°22′	..	..	SSE.	5	1016	..	..	69	..	..	..	..	..	..
27. 4.47	1200	15°18′	2°38′	324	14	SE.	4	1016	9	−0·6	75	..	..	..	74	..	0
27. 4.47	1800	14°13′	1°42′	324	14	SE.	4	1014	4	0·0	72	..	..	..	74	..	0
28. 4.47	0000	13°06′	1°00′	..	..	SE.	4	1015	..	..	71	..	..	..	..	..	..
28. 4.47	0600	11°53′	0°05′ W.	..	..	SE.	3	1014	..	..	72	..	..	..	..	..	..
28. 4.47	1200	10°41′	0°35′	324	14	SE.	4	1013	9	−1·0	77	..	..	..	80	..	0
28. 4.47	1800	9°25′	1°30′	324	14	ESE.	4	1011	4	+0·4	74	..	..	..	81	..	0
29. 4.47	0000	8°29′	2°17′	..	..	S.	3	1011	..	..	74	..	..	..	..	..	..
29. 4.47	0600	7°20′	3°00′	..	..	SE.	2	1012	..	..	76	..	..	..	..	..	..
29. 4.47	1200	6°11′	3°50′	324	13½	E.	2	1012	9	−0·8	83	..	..	..	82	..	0
29. 4.47	1800	5°08′	4°38′	324	13½	S'E.	3	1010	4	0·0	80	..	..	..	83	..	0

* See codes, p. 28.

† It proved impossible to keep the wet-bulb muslin salt free, and even the rain-gauge at the masthead collected salty spray, during this stormy ocean-crossing.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
7		o	o	..	..	..
5	0·3	$or_or_om_o$	$or_or_om_o$	Ns (2) 10, ..	10	..
6		oir_om_o	$or_or_or_os_om_o$	St (5) 9+, 500; As (2) 10, ..	10	Gusty
7		c/q	oir_om_oq	Sc (5) 9, 2,500	9	Gusty
6		c	c	..	..	..
7	..	c	c	Sc (5) 9+, 2,500	9+	Sea water in rain-guage
7		c	c	Fn Fs (6) 4, 2,500; Ac (3) .., 10,000; Ci (2)	9+	..
7		c	c	As (1) .., 20,000; Ci (6)	9	Swell smashed derrick amidships
7		c	c	..	..	..
7	(0·0)	cujp	bc	Cb Fn Fs (9) 9, 2,500	9	2·6 mm. of "rain" in rain-gauge believed
8		bc	cprb bc	Cu (1) 4, 2,800; As Ac (7)	4	.. [entirely sea water from spray
8		bc	bc cpr_o bc	Cu (1) 3, 2,800; As Ac (7)	3	Gusty. Small iceberg at 1330, last ice seen
7		bc	cpr bc	..	..	Aurora 2130
8	1·0	bcpr	bcpr	Cb (3) 7, 2,800	7	..
8		bc	bc pr_oq	Cu (1) 1, 3,500; Ac (3) 6, 12,000; Ci (2)	6	..
8		bc/pr_o	bc pr_o	Cb (3) 7, 3,500	7	..
8		cpr	bc c cir	..	..	..
9	3·0	bc	bc	Cu (1) 6, 2,500; As Ac (7)	6	..
9		c	bc c	..	..	Packing of gear curtailed observing
8		bc	b bc	..	..	..
7		c	bc c	..	..	..
6	..	bz_o	..	..	..	..
8		bc	bcjf	..	..	..
9		b	bc	..	..	..
8		o	bc c	..	..	..
6	..	cid_o	$ccid_o$	..	..	..
8		c	cid_o	..	..	..
9		bc	co bc	..	..	..
8		c	bc c	..	..	..
8	..	c	c	..	..	..
8		c	c	Sc (5) 9+, 3,800	9+	..
9		bc	c bc	Cu (1) 6, 4,500; Sc (5) .., 5,500	6	..
9		c	$bcpr_o$	..	..	} Showers extremely slight
9	..	bc	c $bcpr_o$	..	..	
8		cpr_o	bc	Cu (1) 8, 2,200; Sc (5) .., 3,500	8	Cloud top 4,000 ft.
9		c	cpr_oc	Sc (5) 9, 3,800	9	..
8		o	co	..	..	..
8	..	o	o	..	..	..
8		bc	o bc	Cu (1) 4, 3,500	4	..
8		bc	bc	Cu (1) 4, 3,500	4	..
8		c	bc c	..	..	..
8	..	c	c	..	..	..
8		bc	c bc	Cu (1) 1, 3,000; Sc (5) 3, 6,000; Ci Cs (6) .., 20,000	4	Ci Cs bands orientated east west across north
8		bc	bc	Cu (2) 5, 3,200; Sc (5) 3, 5,000	5	.. [sky
8		bc	bc	..	..	..
8	..	bc	bc	.. [16,000; Ci (1)	..	..
8		cjp	bc	Cu Cb (3) 8, 3,500; Sc (5) 9+, 7,000; Ac (3) ..,	9+	Breeze SE. force 4 at 0900
8		c	cpr_oc	Cu (2) 1, 3,500; Sc (5) 1, 7,000; Ac (9) .., 20,000; Ci Cs (6)	8	..

Date	Time	Ship's position		Mean course and speed in last 3 hr.		Wind		Pressure at M.S.L.	Tendency characteristic	Change in last 3 hr.	Temperature		Dew point	Relative humidity	Sea-surface temperature	Swell	
						Direction	Force*				Dry bulb	Wet bulb				Direction	Scale*
	G.M.T.	S.	W.	°	kt.			mb.		mb.	°F.	°F.	°F.	%	°F.		
30. 4.47	0000	4°05′	5°20′	..	..	SE.	3	1011	..	..	77	..	..	..	..	..	..
30. 4.47	0600	2°48′	6°20′	..	..	SSE.	3	1011	..	..	76	..	..	..	..	..	..
30. 4.47	1200	1°55′	7°13′	324	14	SSE.	3	1012	9	−0·6	(87)	..	..	..	83	..	0
30. 4.47	1800	0°42′	8°03′	324	14	S.	3	1009	6	−1·0	81	..	..	..	85	..	0
		N.															
1. 5.47	0000	0°12′	8°43′	..	..	S.	2	1010	..	..	79	..	..	..	..	..	..
1. 5.47	0600	1°23′	9°38′	..	..	SW.	2	1009	..	..	78	..	..	..	..	..	..
1. 5.47	1200	2°50′	10°28′	324	14	S'W.	1	1011	9	−0·2	86	..	..	..	85	..	0
1. 5.47	1800	4°03′	11°18′	322	14	SSW.	1	1009	9	−2·0	82	..	..	..	86	..	0
2. 5.47	0000	5°02′	12°07′	..	..	W.	1	1011	..	..	82	..	..	..	..	..	..
2. 5.47	0600	6°03′	12°59′	..	..	NNW.	1	1010	..	..	83	..	..	..	..	..	..
2. 5.47	1200	7°05′	13°50′	314	13½	NNE.	2	1011	9	−0·8	82	..	..	..	84	..	0
2. 5.47	1800	8°05′	14°46′	315	14	NE.	2	1009	4	+0·4	81	..	..	..	84	..	0
3. 5.47	0000	9°03′	15°45′	..	..	WNW.	2	1011	..	..	77	..	..	..	..	..	..
3. 5.47	0600	10°00′	16°43′	..	..	W.	2	1010	..	..	73	..	..	..	..	..	..
3. 5.47	1200	11°12′	17°27′	345	13½	WNW.	3	1012	9	−0·4	77·1	71·2	68	74	76	..	0
3. 5.47	1800	12°26′	17°33′	358	13	NNW.	3	1008	6	−1·6	73·6	70·6	69	86	72	..	0
4. 5.47	0000	13°45′	17°39′	..	..	N.	3	1010	..	..	74	..	..	..	..	..	..
4. 5.47	0600	15°08′	17°42′	..	..	NNE.	4	1011	..	..	73	..	..	..	..	..	..
4. 5.47	1200	16°18′	17°43′	360	12	NNE.	5	1013	1	+0·4	70·7	62·2	56	60	70	N.	3
4. 5.47	1800	17°30′	17°43′	360	11½	N.	5	1012	7	−0·6	68·1	62·9	60	74	68	N.	3
5. 5.47	0000	18°30′	17°43′	..	..	N.	4	1013†	..	..	64	..	..	..	..	..	..
5. 5.47	0600	19°48′	17°43′	..	..	NNE.	5	1012†	..	..	64	..	..	..	..	..	..
5. 5.47	1200	21°25′	17°55′	360	12	NNE.	5	1017	9	−0·4	63·1	59·1	56	78	64	NNE.	3
5. 5.47	1800	22°38′	17°30′	22	12½	NNE.	5	1015	5	−0·6	63·1	59·2	56	78	65	NNE.	3
6. 5.47	0000	23°42′	17°00′	..	..	NE.	3	1017	..	..	64	..	..	..	..	..	..
6. 5.47	0600	24°51′	16°32′	..	..	N'E.	2	1016	..	..	65	..	..	..	..	..	..
6. 5.47	1200	26°14′	16°00′	22	13	NE.	1	1018	0	+1·0	65·1	59·1	54	69	64	NE'N.	1
6. 5.47	1800	27°23′	15°21′	24	13½	W.	1	1016	5	..	65·3	58·3	52	63	67	NE.	1
7. 5.47	0000	28°45′	14°55′	..	..	NW.	1	1017	..	..	64	..	..	..	..	..	..
7. 5.47	0600	29°48′	14°32′	..	..	W.	2	1015	..	..	..	..	..	..	..	..	..
7. 5.47	1200	31°30′	13°59′	17	13½	W.	3	1015	8	−0·4	64·5	63·0	63	91	66	W'N.	1
7. 5.47	1800	32°36′	13°32′	16	14	W'S.	3	1013	6	−0·4	65·6	62·0	59	81	66	WNW.	3
8. 5.47	0000	33°59′	13°06′	..	..	W.	3	1013	..	..	63	..	..	..	..	..	..
8. 5.47	0600	35°30′	12°32′	..	..	W.	4	1011	..	..	61	..	..	..	..	..	..
8. 5.47	1200	36°30′	12°04′	17	13	NW.	4	1012	1	..	62	..	..	..	62	NW.	1
8. 5.47	1800	37°55′	11°35′	17	13	WNW.	3	1012	3	0·0	59	..	..	..	60	NW'N.	1
9. 5.47	0000	39°08′	11°03′	..	..	NW.	2	..	..	..	56	..	..	..	..	..	..
9. 5.47	0600	40°26′	10°30′	..	..	W.	2	..	..	..	54	..	..	..	..	..	..
9. 5.47	1200	41°50′	9°58′	13	13	WSW.	4	1011	3	..	..	..	..	..	58	..	0
9. 5.47	1800	43°04′	9°29′	12	14	WSW.	4	..	..	..	51	..	..	..	56	..	0
10. 5.47	0000	44°18′	8°37′	..	..	WSW.	4	..	..	..	54	..	..	..	..	..	..
10. 5.47	0600	45°32′	7°46′	..	..	WSW.	4	..	..	..	..	..	..	..	..	..	..
10. 5.47	1200	46°53′	6°50′	27	13½	WSW.	5	..	3	..	..	..	..	..	54	..	0
10. 5.47	1800	48°07′	5°43′	31	13½	S.	3	..	3	..	..	..	..	..	52	..	0

* See codes, p. 28.
† Pressure taken from unofficial barograph.

Visibility*	Precipitation of last 24 hr.	Weather		Cloud		Remarks
		Present	Past 6 hr.	Type, code* number in brackets, amount (tenths) and height of base (ft.)	Total amount	
	mm.				tenths	
8		c	c	..	..	..
8	..	c	c ojp c	..	..	Surface wind WNW. force 2 at 0300–0400 after
8		cpr_o	c bc	Cu (2) 7, 3,200; Ac (6) .., 14,000; Ci (3)	8	.. [ojp
8		bc	c bc	Cu Cb (3) 3, 3,500; Ac (4) .., 18,000; Ci (3)	4	Ci at various levels
8		bc/pr	bc cpr bc	..	..	Shower 2300
8	..	bc	bc cpr bc	..	..	Shower 0200
9		bc	bcjp	Cu Cb (3) 3, 3,000; Ac (9); Ci Cs (7) .., 20,000	5	Cu tops mainly 4,000–5,000 ft. Cb higher
6		bcjp	bc b	Cu Cb (3) 4, 2,800	4	Highest sea temperature
8		bc	bcjpl	..	..	..
7	..	c	bc	..	..	..
7		cz_o	cz_o	Cu (1) 5, 3,800; Ci Cs (7)	9	Dust haze gradually thickening
6		bcz_om_o	$cbcz_o$	Ci Cs (7)	3	..
6		cz_o	cz_o	Ci Cs (7)	..	..
6	..	cz_o	cz_o	Ci Cs (7), 8, ..	8	..
7		b	bcz_o	..	0	Dust haze gradually thinning
7		b	b	..	0	Strong smell of sea weed
7		b	b	..	..	..
7	..	b	b	..	..	..
7		b	b	..	0	..
7		b	b	Ci Cs (5)	1	..
8		b	b	..	..	Ci Cs to west of ship. Dust deposit. North Star
8	..	b	b	..	..	.. [and Southern Cross both visible 2300
8		bc	b	Ci (3)	3	..
8		bc	bc c	Ci Cs (8)	7	Ci Cs clearing from north-north-west
8		b	bc b	..	..	Cc at 1900
8	..	bc	b bc	..	..	..
8		bc	b bc	Sc (5) 1, 5,200; Ci Cs (6)	6	..
8		c	bc c	Sc (5) 6, 4,500; Ci (3)	9	..
8		c	c	..	..	..
8	..	bc	c bc	..	..	..
9		bc/d	codd	Cu (2) 3, 800; Sc St (5) 5, 2,500	5	Clearance from north-west after front with
9		cpr_o	bc	Fc Cu (1) 3, 1,200; Sc (5) 8, 6,000	8	.. [drizzle. Stronger insolation in trans-
9		c	c	..	..	[parent post-frontal polar air produced
9	..	c	c	.. [12,500; Ci Cc (9)	..	.. [more sunburn cases than equatorial sun
9		cpr_o	cir_o	Cu Cb Sc (3) 8, 2,400; Sc St (5) 6, 5,000; Ac (3) 9,	9	.. [had done
9		bc	cpr_ocpr_o	Cu (2) Cb (3) 4, 2,500; Ac (3) 3, 8,000; Cs (7)	7	..
9		bc	$bcpr_o$	..	..	..
..	..	cpr	bc cpr_o	..	..	..
9		bc	cpr bc	Cu (2) 4, 2,800; Ci (3)	5	Distant Cb anvils to north-west
8		bcjp	$bcpr_o$	Cb Fn (9) 6, 2,500; Ac (3) .., 14,000; Ci (3)	7	Cb tops and Ci about 14,000 ft.
8		bc	$bcpr_o$	..	..	..
8	..	bc	bc	..	..	..
8		bc	bc	Cu (2) 3, 2,500; Ci (1)	3	..
8		b	b	Cu (2) tr., 2,500; Ci Cc (9) .., 22,000	1	Ci Cs (8) and Ci (3) over France

APPENDIX II—OBSERVATIONS OF OCEAN WAVES

Date	Time	Position		Ship's head Direction	Ship's Speed	Waves Height	Waves Length*	Waves Period	Waves Speed	Direction from	Corresponding theoretical Length	Corresponding theoretical Speed	Probable water depth
	G.M.T.	°S. ′	°E. ′	°true	kt.	ft.	ft.	sec.	kt.	°true	ft.	kt.	fathoms
4.11.46	1500–1600	28 21	13 07	141	12	10–12	250	13	11·5	210	860	39	1,750
5.11.46	1600–1700	32 30	17 00	143	13	18–20	420	9	27·6	250	413	27	180–200
14.11.46	1400	44 54	26 42	144	10	8–10	140–160	9	10–11	80	413	27	2,800
22.11.46	1400	55 42	49 00	90	5	10	<300	..	..	*c.*290	..	..	2,300
22.11.46	2000	55 48	49 30	90	5	20	*c.*600	..	..	*c.*350	..	..	2,400
9.12.46	0500–0600	55 12	80 45	45	11	25–32	170–180	6–7	14–16	295	*c.*215	19–20	1,500–2,000
9.12.46	1515	55 02	81 00	45	0	20–25	350	7–7·5	28·5	315	*c.*270	22	1,500–2,000
10.12.46	1100	55 17	81 26	228	<1	16–20	200–250	9†	13–16·5	300 & 350	413	27	1,500–2,000
11.12.46	0930	55 30	81 55	11	0	15–20	300	9·5	18·7	286	460	28·5	1,500–2,000
11.12.46	1130	55 40	81 43	223	7	30–35	400–450	9	26–30	310	413	27	1,500–2,000
12.12.46	0600	56 11	82 04	187	0	20–25	300–350	10	18–20	257	510	30	2,000
3. 1.47	1200	58 39	84 22	165	0	3–4	100–110	8	*c.*8	135	326	24	1,500
4. 2.47	1030	63 45	100 31	360	0	6–10§	200	7–8	15–17	90	*c.*280–290	22–23	180–200
6. 2.47	1040	64 09	104 56	360	0	3–4‖	60–70	6	6–7	90	184	18	500–1,000
7. 2.47	1200	64 18	105 20	90	1·5	12¶	300–350	10	19	90	510	30	1,000
13. 2.47	0130	64 25	108 00	90	0	3–4	100‡	6–7	*c.*9	85	*c.*215	19–20	1,300
3. 4.47	0440	61 44	84 51	245	0	10–12	500	10–12	27	290	618	33	1,000

* Wave-lengths were, in some cases, supported by observations from as high as 80–100 ft. above the water-line.
† From both directions.
§ Occasionally 12 ft.
‖ Occasionally 6 ft.
¶ Occasionally 15 ft.
‡ Or slightly less.

Wind Direction	Force	General	Remarks
S.	4	Moderate southerly or south-south-easterly sea superimposed on bigger waves	Height of swell judged when Walrus aircraft floating on water lay in trough with its upper wing 13 ft. above the water-line and just above the wave crests**
WNW.	4	Confused sea during wind shift from W. to WNW. Rough	Wave height obtained by sighting from ship's deck 25 ft. above water-line**
E'N.	6	Swell steep and short but not complicated by other disturbance	Wave height got by sighting from portholes below decks**
W.	3–4	Sea rather smooth, apart from the swell ; smoothness due to ice shelter	..
W.	3–4	Sea rather smooth due to ice shelter	..
W.	5	Rough westerly sea	Wind veered abruptly from W. to NNW. later and soon freshened to force 6 from that direction
NNW.	4	Moderate sea from north-north-west superimposed	Wind soon freshened to force 6. Direction of swell continued to veer, and became eventually 360°, whilst the height of the waves moderated
WNW.	5	Confused sea with west-north-westerly and northerly wave sequences crossing	Very difficult to judge wave-lengths and periods accurately because of confused state of sea
WNW.	6–7	Rough westerly sea	Swell rising and lengthening, reached height of 20–25 ft. and length of 400 ft. by 1030
NW'W.	7	..	..
W'S.	8	No superimposed motions from other directions discernible	Tops of waves blown off by wind, thus presumably reducing height of swell
SW'W.	5	Sea little disturbed by wind, probably on account of ice shelter	Swell noticeably slow moving
SE'E.	4	Moderate short sea from south-east superimposed	This easterly swell was believed at the time to be the product of the force 5 easterly winds of the past 24 hr., but may really have been due to a fresh E.–SE. wind still blowing further east than the *Balaena*'s position. In several instances east or east-north-east swells were noticed with south-easterly winds near the ice-edge††
ESE.	1	Sea smooth	This easterly swell had continued ever since the force 5 easterly winds of February 3–4. It was thought at the time that this meant that the water disturbance could last for 2–3 days after the wind died down ; evidence from other occasions in the season suggests, however, that this is not so, and therefore a more likely cause of the swell here observed was the continuance of a strong E. or SE. wind at points farther east. On the 6th renewed freshening of the easterly wind was reported setting in near 100°E. and spread eastwards to the *Balaena*'s position, where the height of the swell increased to 10 ft. before the wind rose. This apparently surprising circumstance of increasing easterly swell at a point east of where the wind was known to be increasing must be noted
E.	4	Only small waves from east superimposed on main wave motion from same direction	Swell presumed associated with strong easterly or south-easterly wind still blowing at points further east
S'E.	5	Water surface smooth	Observation made at edge of pack-ice, which probably affected direction and wave-length of swell which was attributed to south-easterly wind further east. At 0700 a mile inside the pack-ice the swell was observed coming from 65°, the situation being otherwise unchanged.
SSE.	4–5	Water surface smooth, due to ice shelter	On this occasion ice lumps were used as buoys for timing wave crests

** Wave-length observed with reference to ship's wake, as the factory steamed nearly along the line of crests and troughs, and sighted from a height above the water of 70–80 ft.
†† As in this case, dead whales, floating astern of the factory and waiting to be hauled aboard, were used as marker buoys for timing wave crests on some occasions.

APPENDIX III—UPPER WIND OBSERVATIONS FROM PILOT BALLOONS

Heights are given in feet

Date	Time	Position S.	Position E.	Surface	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
	G.M.T.	° ′	° ′	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.
16.11.46	1045	51 00	36 36	218 6	197 9	..	..	..	..	..	..	..	..	..
17.11.46	0845	53 54	39 00	316 6	319 7	316 9	Balloon entered Sc base at 2,700 ft.				..	..	..	..
19.11.46	1115	55 00	44 24	286 23	278 33	Balloon entered Fs at 1,900ft.				..	..	..	..	..
22.11.46	1100	55 54	48 54	265 7	365 29	Balloon entered Sc base at 1,050 ft.				..	..	..	..	..
25.11.46	0045	56 18	52 48	195 12	201 20	..	..	..	..	..	..	..	..	..
26.11.46	0030	56 54	55 00	320 11	312 8	..	..	..	..	..	..	..	..	..
26.11.46	0215	56 54	55 12	293 7	283 10	275 15	..	..	..	..	..	..	..	..
26.11.46	1330	57 00	56 00	160 2	185 5	207 4	249 4	229 7	213 7	Balloon entered Sc base at 6,000 ft.				..
27.11.46	1330	57 12	58 12	228 26	230 25	239 24	Balloon entered Sc base at 2,600 ft.				..	..	..	..
28.11.46	0945	58 06	59 36	261 18	267 23	273 26	Balloon entered Sc base at 2,500 ft.				..	..	..	..
29.11.46	0920	58 18	61 42	16 12	360 15	357 14	344 11	308 13	Balloon entered Sc base at 4,800 ft.				..	..
30.11.46	0700	58 30	63 42	151 5	137 9	152 11	154 13	152 9	179 12	192 14	168 5	212 20	..	..
1.12.46	0450	59 18	65 42	260 7	195 8	195 11	Balloon entered Sc base at 2,200 ft.				..	..	..	..
3.12.46	1030	60 00	66 54	170 9	168 10	175 8	189 7	189 9	..	..	..	..	..	..
3.12.46	1550	59 54	66 48	233 5	237 6	223 5	205 3	111 1	49 2	51 3	33 4	39 4	17 3	68 3
8.12.46	1015	56 48	75 48	276 19	268 21	261 21	257 19	251 18	250 19	..	..	..	..	..
8.12.46	1030	56 48	75 48	276 19	261 24	261 23	259 18	255 22	..	..	..	..	..	..
10.12.46	1100	55 18	81 24	300 22	(280 22)	Balloon entered St base at 900 ft.				..	..	..	..	..
11.12.46	1115	56 42	81 42	302 33	(305 35)	Balloon entered St base at 1,100–1,200 ft.					..	..	..	..
12.12.46	0900	56 30	82 12	264 41	(264 40)	Balloon entered Fc at 1,000 ft.					..	..	..	..
13.12.46	0920	57 18	83 30	158 7	(151 6)	Balloon entered Fc at 1,250 ft.					..	..	..	..
13.12.46	1410	57 12	83 42	297 2	248 4	233 5	216 9	231 10	(270 10)	Balloon entered St Sc base at 5,150 ft.				..
14.12.46	1130	57 36	83 24	237 5	257 5	(249 7)	Balloon entered Cu base at 2,000 ft.				..	..	..	..
16.12.46	0400	57 18	83 48	219 17	216 19	216 13	..	..	..	..	..	..	..	..
16.12.46	0745	57 06	83 48	232 13	231 14	223 15	216 15	219 14	223 16	215 18	215 18	223 16	225 17	219 17
17.12.46	1530	56 30	83 06	218 18	218 18	207 25	195 25	..	..	..	..	..	..	..
18.12.46	0515	56 30	83 00	250 10	245 16	247 15	237 13	Balloon entered Sc base at 3,800 ft.				..	..	..
18.12.46	1415	56 36	82 54	275 7	277 9	259 9	261 9	(247 5)	Balloon entered Sc base at 4,100 ft.				..	..
19.12.46	0400	57 00	82 48	30 12	48 16	Balloon entered Ns or St at 1,400 ft.				..	..	..	..	..
20.12.46	1115	57 30	83 12	101 13	94 16	115 12	107 12	Balloon entered Sc base at 3,700 ft.				..	..	..
28.12.46	0910	59 12	81 18	70 10	39 14	35 13	..	..	..	..	..	..	..	..
28.12.46	1130	59 12	81 18	70 10	..	36 11	22 14	33 18	46 19	47 19	45 21	33 21	16 14	6 10
29.12.46	1105	59 30	81 48	90 9	79 18	69 16	87 15	114 15	103 15	69 16	59 14	47 13	41 13	47 15*
2. 1.47	1040	58 54	84 18	210 12	222 12	227 14	201 10	Balloon entered Sc base at 3,500 ft.				..	..	..
4. 1.47	0745	58 36	84 24	278 15	258 14	254 17	264 13	262 17	252 20	Balloon entered thin St at 5,300 ft.				..
5. 1.47	0905	58 54	84 36	250 9	259 11	250 11	(230 7)	Balloon entered Sc base at 3,200 ft.				..	..	..
7. 1.47	1035	59 30	84 42	280 7	285 16	290 18	..	..	305 21	..	..	..	..	265 22
11. 1.47	1040	62 36	88 42	180 12	167 27	159 33	160 30	165 30	164 25	156 25	Balloon lost in virga at 6,600 ft.			
13. 1.47	0740	62 18	90 36	65 10	47 11	..	..	..	..	..	..	..	[below dense As	
14. 1.47	0350	62 30	91 24	73 19	67 24	65 24	Balloon entered Sc base at 2,300 ft.				..	..	..	..
14. 1.47	0415	62 30	91 24	73 19	63 24	61 30	Balloon entered Sc base at 2,200 ft.				..	..	..	..
18. 1.47	1100	63 18	94 36	180 16	172 19	171 21	179 21	186 21	186 20	183 21	187 21	187 22	174 23	153 25
20. 1.47	0350	63 12	94 18	70 7	43 17	33 16	Balloon entered Sc base at 2,250 ft.				..	..	..	..
21. 1.47	0345	62 24	93 24	75 12	57 19	42 15	38 11	35 10	Balloon entered Sc base at 4,900 ft.				..	..
22. 1.47	0845	62 42	93 36	75 22	73 35	67 43	Balloon entered Sc fragment at 3,500 ft.				..	..	..	..
23. 1.47	0345	63 00	93 48	100 15	115 20	94 24	Balloon entered Sc base at 2,200 ft.				..	..	..	..
24. 1.47	0335	63 18	96 00	190 7	186 9	175 7	Balloon entered St Sc base at 2,750 ft.				..	..	..	..
24. 1.47	1330	63 36	97 24	250 6	216 9	186 7	185 6	195 7	210 10	217 14	217 16	217 17	216 16	220 14
27. 1.47	1400	63 18	98 30	250 6	222 5	98 5	74 5	93 5	50 4	79 3	145 3	172 5	183 3	260 4
28. 1.47	0330	63 18	97 42	70 19	72 24	74 25	41 23	Balloon entered Sc base at 3,900 ft.				..	..	..
31. 1.47	1140	62 54	96 48	50 7	47 17	49 19	35 21	30 11	(45 30)	..	..	..	..	..
1. 2.47	0345	62 54	98 48	91 12	85 20	Balloon entered St base at 1,900 ft.				..	..	..	..	..
3. 2.47	0210	63 24	101 24	90 15	75 21	71 29	69 17	Balloon entered St Sc base at 4,000 ft.				..	..	..
3. 2.47	0415	63 24	101 30	90 14	71 26	74 19	73 16	Balloon entered St Sc base at 3,450 ft.				..	..	..
7. 2.47	1005	64 18	105 54	80 9	85 13	81 14	63 13	85 13	84 12	130 8	72 6	165 3	131 5	30 2
8. 2.47	0300	64 24	105 42	133 24	115 29	105 29	..	..	..	..	..	..	..	..
11. 2.47	1230	64 12	109 00	270 15	275 17	286 17	277 21	..	..	..	..	..	..	..
14. 2.47	0330	64 42	108 42	240 15	225 17	205 20	(195 24)	..	..	..	..	..	..	..
22. 2.47	0430	64 54	109 36	90 14	85 16	75 15	55 11	47 7	78 7	126 8	145 7	133 4	133 4	142 6
24. 2.47	1215	65 18	111 42	100 53	106 40	Balloon launched in squall			..	..	..	..	..	..

* Balloon believed to have entered fragment of Ac at 11,800 ft.

Date	Time	Position S.	Position E.	Surface	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
	G.M.T.	° ′	° ′	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.
25. 2.47	1030	65 12	113 42	135 30	145 27	135 30	Squally	..	..	..	..	..	..	..
27. 2.47	0300	64 48	113 42	300 8	282 13	290 16	300 15	Balloon entered Sc base at 3,850 ft.				..	..	..
28. 2.47	0340	64 54	113 18	30 4	29 6	19 8	352 10	Balloon entered Sc St base at 3,450 ft.				..	..	..
28. 2.47	0945	64 48	113 36	57 8	44 20	41 18	41 16	23 18	7 24	Balloon entered St. base at 5,250 ft.				
5. 3.47	0430	65 06	112 42	90 15	96 27	101 31	100 25	152 12	Wind veering sharply to 222° 12 kt. at 4,750 ft.†					
5. 3.47	1050	65 06	112 54	127 17	127 17	127 21	130 25	151 15	152 15	78 4	79 4	73 3	— 0	89 7
7. 3.47	0400	65 00	112 30	360 3	350 11	..	..	..	..	..	..	..	..	..
7. 3.47	0920	65 00	112 30	270 3	263 3	264 6	290 9	300 8	311 9	327 10	321 17	319 20	320 19	318 20
8. 3.47	1015	65 00	112 30	100 6	86 17	82 13	63 14	75 10	52 8	72 4	96 5	120 7	Balloon entered	
10. 3.47	1010	65 00	112 54	130 23	128 35	Balloon entered St base at 2,100 ft.				..	..	..	[As base at 9,000 ft.	
13. 3.47	0130	65 00	109 42	165 9	126 11	107 8	..	..	..	..	..	..	[about1,000 ft.	
13. 3.47	0500	64 54	109 54	225 5	..	140 12	154 15	147 17	159 15	Sharp discontinuity of wind direction				
14. 3.47	0500	64 36	108 36	150 12	152 14	161 12	Balloon entered St base at 3,000 ft.‡			..	..	..	..	..
15. 3.47	0745	64 18	106 24	250 18	239 26	192 23	218 27	..	..	..	..	..	..	..
16. 3.47	0410	64 00	105 48	250 10	222 15	202 7	217 12	239 19	Balloon entered Sc base at 4,500 ft.				..	..
20. 3.47	1050	63 00	100 00	110 12	(90 20)	Balloon entered St base at 1,000 ft.				..	..	..	..	..
21. 3.47	1055	63 06	99 48	160 12	(135 14)	Balloon entered St base at 1,200 ft.				..	..	..	..	..
24. 3.47	0520	63 06	97 06	146 12	156 23	156 14	155 15	160 22	..	..	..	..	..	..
25. 3.47	0530	63 54	90 30	65 10	70 15	45 16	Direction turning sharply to 24° 13 kt. at 2,750 ft.						..	..
26. 3.47	0530	63 24	87 48	22 14	9 22	345 27	Surface wind shifted abruptly at 0630 to 205° 16 kt. with line-squall							
30. 3.47	1050	62 18	86 24	290 10	275 20	276 28	299 16	279 24	Balloon entered Sc base at 4,500 ft.				..	..
6. 4.47	0500	63 06	84 12	65 12	35 12	322 12	..	..	..	..	..	..	..	..
6. 4.47	0515	63 06	84 12	65 8	15 8	299 11	275 9	275 8	276 11	..	..	..	..	..
9. 4.47	0555	63 18	76 24	70 2	50 4	280 7	230 4	..	..	..	..	..	..	..
12. 4.47	0730	63 00	43 54	20 6	15 15	23 17	25 18	35 17	27 14	19 17	(347 12)	302 11	308 15	259 17
26. 4.47	1030	20 06	6 18 W.	135 20	131 29	129 30	130 34	Cu base about 2,100 ft., Sc base about 3,200 ft., tops of all cloud					[about 4,000 ft.	
28. 4.47	1324	10 24	0 48	135 15	128 21	120 24	127 21	131 17	Balloon entered Sc base at 4,500 ft.					
28. 4.47	1352	10 18	0 54	135 15	126 22	124 22	119 20	121 20	117 19	68 15**	..	..	..	..
29. 4.47	1500	5 42	4 12	180 10	142 20	129 15	102 13	74 12	89 14	128 7	Balloon entered Sc base at 7,000 ft.††			
29. 4.47	1800	5 06	4 36	165 8	143 13	127 13	101 10	102 9	103 12	162 7	137 11	..	..	..
30. 4.47	1730	0 48	8 00	180 7	164 12	158 11	174 11	132 3	90 3	Cu heads above 3,000 ft. leaning south				
30. 4.47	1750	0 42	8 00	180 7	160 13	159 13	167 11	171 5	..	..	..	..	..	..
1. 5.47	1145	N. 2 48	10 30	190 3	191 7	274 3	188 5	..	..	..	..	..	..	..
3. 5.47	1520	11 54	17 30	325 15	350 15	19 24	..	..	..	..	..	..	..	..

CONTINUATION OF ASCENTS

Date	Time	Position S.	Position E.	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	19,000	20,000	21,000
	G.M.T.	° ′	° ′	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.
3.12.46	1550	59 54	66 48	52 5	Balloon entered Ac base at 12,000 ft.					..	..	..	..	..
28.12.46	1130	59 12	81 18	358 9	353 10	319 10	292 10	297 13	299 17	296 19	272 20	261 18	274 19	273 19
7. 1.47	1035	59 30	84 42	..	250 20	Ship lacked steerage way, directions possibly unreliable							..	..
18. 1.47	1100	63 18	94 36	132 25	125 30	134 36	..	..	..	..	..	..	..	..
24. 1.47	1330	63 36	97 24	227 14	229 12	248 10	268 9	258 10	252 12	242 12	226 12	217 15	211 18	207 18
27. 1.47	1400	63 18	98 30	289 3	290 3	237 3	167 4	147 5	142 6	119 3	211 3	177 3	195 3	..
7. 2.47	1005	64 18	105 54	30 2	230 4	Balloon entered Ac about 12,600 ft.				..	..	..	..	..
22. 2.47	0430	64 54	109 36	130 8	..	..	..	..	..	..	..	..	..	..
5. 3.47	1050	65 06	112 54	131 10	124 9	Balloon entered Ac base at 12,800 ft.				..	..	..	..	..
7. 3.47	0920	65 00	112 30	318 20	320 19	322 18	322 21	324 24	324 22	323 25	320 27	322 23	321 24	310 24
12. 4.47	0730	63 00	43 54	258 12	Balloon entered As base at 11,700 ft.§					..	..	..	..	..

† Both before and after the ascent surface winds of force 5 from 100° to 105° were observed. Balloon's motion across field of view gave the impression of wind continuing to veer sharply with increasing height up to 5,400 ft.
‡ Direction of surface breeze not very steady at first after snow ceased.
** Estimated 1 tenth Cu, base 3,000 ft., tops 4,000—4,500 ft. 3 patches Sc base 4,500 ft., tops 5,000—5,500 ft.
†† Ascent made just after the ship had passed northward through an east-south-east—west-north-west orientated shower belt.
§ The change over to wind from about 300° may have been sudden and smoothing invalid.

CONTINUATION OF ASCENTS

Date	Time	Position S.	Position E.	Height 22,000	23,000	24,000	25,000	26,000	27,000	28,000	29,000	30,000	31,000	32,000
	G.M.T.	° ′	° ′	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.
28.12.46	1130	59 12	81 18	272 15	272 15	260 19	250 18	255 17	264 16	263 14	273 10	291 12	289 20	282 19
24. 1.47	1330	63 36	97 24	190 20	176 19	160 15	162 19	172 22	159 20	153 19	180 17	208 18	214 21	210 24
7. 3.47	0920	65 00	112 30	311 25	321 25	329 26	331 33	331 28	331 25	327 25	322 25	..	..	..

CONTINUATION OF ASCENTS

Date	Time	Position S.	Position E.	Height 33,000	34,000	35,000	36,000	37,000	38,000	39,000	40,000	41,000	42,000	43,000
	G.M.T.	° ′	° ′	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.
28.12.46	1130	59 12	81 18	295 13	324 13	340 10	327 7	340 11	Balloon entered Ci Cs base at 43,500 ft.					
24. 1.47	1330	63 36	97 24	210 21	222 21	218 24	226 19	236 22	218 16	231 14	271 22	280 22	259 19	251 22

CONTINUATION OF ASCENTS

Date	Time	Position S.	Position E.	Height 44,000	45,000	46,000	47,000	48,000	49,000	50,000	51,000	52,000	53,000	54,000
	G.M.T.	° ′	° ′	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.	° kt.
24. 1.47	1330	63 36	97 24	260 24	255 25	249 25	235 24	219 16	220 11	202 18	175 20	172 14	171 18	168 18**

** 55,000 ft. 166° 14 kt.

APPENDIX IV—UPPER AIR TEMPERATURE OBSERVATIONS FROM AIRCRAFT ASCENTS

Date	25.11.46		29.11.46		1.1.47		18.1.47		18.1.47		25.1.47	
Time(G.M.T.)	0200–0300		0800–0900		1200		0200		0300		0430–0500	
Position	56°18′–57°06′S. 52°48′–53°00′E.		58°18′S. 61°36′E.		59°36′S. 83°06′E.		63 42′S. 95°00′E.		65°00′S. 95 00′E.		63°36′–64°00′S. 97°42′E.	
Height ft.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.
6,500	..	..	..	..	..	..	..	..	..	..	770	+16·7
6,000	..	..	..	..	..	..	..	..	..	..	785	+17·6
5,500	..	..	..	..	..	..	..	..	..	..	800	+18·5
5,000	..	..	..	..	811	+14·2	..	..	..	..	816	+20·3
4,500	..	..	..	..	..	..	..	..	..	..	..	..
4,000	..	..		..	844	+19·3	..	..	..	..	..	..
3,500	..	..	..	..	..	..	862	+26·7	862	+22·7	866	+24·8
3,000	..	..	886*	+18·6*	877	+22·6	878	+27·5	878	+23·3	..	..
2,500	898	+12·9	896	+20·3	..	..	894	+27·5	897	+24·5	..	..
2,000	..	..	913	+22·1	913	+26·7	..	..	910	+25·5	916	+26·6
1,500	935	+20·1	931	+23·0	..	..	929	+27·7	..	..	..	..
1,000	953	+27·3*	949	+24·8	950	+30·5	947	+30·0	..	..	953	+27·5
500	..	..	967	+26·6	..	..	..	..	..	..	..	..
Surface	990	+27·0	985	+30·0	986	+33·0	983	+31·0	..	..	990	+29·0
	8 tenths Sc and a little Cb, base 3,500 ft., with fragments trailing to 1,500 ft. Some lines of snow showers. * Doubtful reading.		8 tenths Sc base 2,800 ft., 2 tenths Fs, Fc, Fn in snow showers base 900 ft. tops 1,500 ft. * 2,800 ft.		10 tenths As Ns base 5,300 ft., 6 tenths Fc Cu base 1,800 ft. tops mainly 2,600 ft. but some growing into As above.		St layers 2 tenths base 4,000 ft. and wisps base 1,500 ft. tops 1,600 ft.		St layers 2 tenths base 3,000 ft. tops 3,300 ft. and traces at 2,400 ft.		Variable amounts of St Fs base 1,000 ft. tops 2,000 ft. This cloud became a continuous line of Sc near 64°S., and beyond that to southward there was no cloud at all. A north–south orientated line of Ci Cs was seen to westward.	

Date	26.1.47		11.2.47		8.3.47		8.3.47		15.3.47		16.3.47	
Time(G.M.T.)	0615		0430		0540		0650		0830		0730	
Position	63°30′S. 96°00′E.		65°18′S. 110°00′E.		65°18′S. 113°48′E.		65°42′S. 116°12′E.		64°18′S. 106°18′E.		64°00′S. 105°00′E.	
Height ft.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.	Pressure mb.	Temp. °F.
10,000	667	+ 7·0	664	+ 0·4	..	..	..	..	667	− 1·5	656	− 3·5
9,500	683	+ 8·7	678	+ 1·5	..	..	..	..	682	+ 2·0	670	− 1·0
9,000	698	+ 9·6	692	+ 0·5	..	..	..	..	697	+ 3·5	685	+ 0·5
8,500	713	+10·5	706	+ 1·5	..	..	..	..	711	+ 5·5	700	+ 3·0
8,000	728	+12·3	720	+ 4·0	..	..	..	..	726	+ 7·0	714	+ 4·5
7,500	743	+13·2	734	+ 6·0	..	..	..	..	741	+ 8·5	729	+ 6·5
7,000	757	+13·2	749	+ 7·7	..	..	..	..	756	+10·0	744	+ 7·5
6,500	772	+15·0	764	+ 9·2	767	+ 7·5	..	..	770	+12·0	759	+ 9·5
6,000	787	+16·8	779	+11·2	782	+ 8·0	..	..	785	+14·0	774	+10·5
5,500	802	+20·0	794	+13·5	797	+ 9·5	791*	+ 9·5*	801	+17·0	789	+12·0
5,000	818	+20·0	810	+15·0	813	+11·5	800†	+10·0†	816	+18·0	804	+13·0
4,500	834	+20·0	826	+16·5	829	+12·0	828‡	+14·0‡	832	+18·0	819	+13·5
4,000	844*	+20·4*	843	+18·0	846	+15·0	..	..	848	+17·5	835	+14·8
3,500	..	..	859	+19·2	864	+17·0	867§	+19·0§	864	+17·5	851	+13·8
3,000	878†	+19·4†	876	+19·6	881	+19·0	..	..	870	+16·0	967	+13·0
2,500	..	..	892	+21·8	898	+21·0	894‖	+21·0‖	885	+16·0	883	+12·0
2,000	917	+24·0	..	..	915	+23·0	..	..	900	+18·0	..	..
1,500	..	..	..	..	932	+24·5	930¶	+22·5¶	..	..	..	..
1,000	..	..	..	..	..	..	..	..	..	..	..	..
500	..	..	..	..	..	..	960**	+24·5**	..	..	..	..
Surface	990	+30·0	992	+28·5	987	+30·5	983	+26·5	973	+23·0	970	+17·0
	8 tenths Sc base 2,300 ft. tops (flat) 4,200 ft., high-level wisps of Ci above aircraft. *4,200 ft. †3,200 ft.		Ac traces about 8,500 ft.		4 tenths Fc base 1,500 ft. tops 2,500 ft., 8 tenths unstable upper cloud with base like St at 3,000 ft. and tops extending out of sight.		Ascent made in clear patch with sunshine, between masses of towering Cu east and west of the aircraft. *5,550 ft. †5,270 ft. ‡4,430 ft. §3,260 ft. ‖2,450 ft. ¶1,430 ft. **620 ft.		4 tenths Sc base 1,400 ft. tops 1,900 ft. No other cloud.		9 tenths Sc base 1,800 ft. tops 3,500 ft. No other cloud.	

APPENDIX V—ADDITIONAL SURFACE WEATHER OBSERVATIONS FROM AUXILIARY VESSELS

Oil-tanker M/V Norvinn. 6,320 tons gross. Captain: Harald Hansen.—Vessel bound from Aruba in the Caribbean Sea to the *Balaena* in the Southern Ocean. Deeply laden, proceeding at 10–11 kt. The vessel carried an aneroid barometer which was checked against the *Balaena*'s mercury barometers on various dates between December 22, 1946 and January 4, 1947 on the Antarctic whaling grounds. The figures here given for the atmospheric pressure were obtained by converting the *Norvinn*'s readings from inches into millibars and using the aforementioned check as a basis for correction; even so, the individual comparisons with the *Balaena*'s barometers showed that the *Norvinn*'s aneroid instrument should only be trusted to about ±3 mb.

Date	Time	Position (at noon local time)		Pressure	Wind		Weather	Temperature	
					Direction (true)	Force		Air	Sea
	G.M.T.	S. ° ′	W. ° ′	mb.				°F.	°F.
24.11.46	1400	2 15	35 57	1016	SE.	3	bc	63	79
	0200			1015	ESE.	3	b	61	
25.11.46	1400	5 20	33 47	1016	ESE.	3	b	61	79
	0200			1014	ESE.	3	bc	77	
26.11.46	1400	7 50	30 38	1015	ESE.	3	b	78	79
	0200			1014	E.	3	b	76	
27.11.46	1400	10 11	27 24	1015	E.	3	c	76	79
	0200			1017	E.	3	b	76	
28.11.46	1400	12 34	24 14	1016	E.	4	c	76	77
	0200			1018	E.	5	o	74	
29.11.46	1400	14 50	21 08	1018	ESE.	4	c	75	75
	0100			1017	E.	3	o	73	
30.11.46	1300	17 04	17 45	1018	ESE.	3	bc	71	75
	0100			1018	ESE.	2	o	71	
1.12.46	1300	19 25	14 15	1018	ESE.	2	c	76	75
	0100			1019	NE.	1	bc	72	
2.12.46	1300	21 37	10 34	1019	NE.	3	c	74	73
	0100			1019	NE.	1	b	72	
3.12.46	1200	23 54	6 42	1020	NW.	1	bc	76	73
	2000			1020	NW.	3	bc	75	
	2400			1019	S.	4	o	69	
4.12.46	1200	25 59	2 57 E.	1022	S.	5	c	70	70
	2400			1023	S.	5	o	66	
5.12.46	1200	28 01	0 49	1025	E.	3	o	65	70
	2400			1026	SE.	4	c	64	
6.12.46	1200	29 49	4 47	1026	SE.	3	bc	68	68
	2400			1024	SE.	3	c	62	
7.12.46	1100	32 23	8 14	1023	SE.	2	c	64	68
	1500			1022	WSW.	3	c	66	
	2300			1021	WSW.	3	bc	63	
8.12.46	1100	35 30	11 21	1019	WSW.	4	c	68	..
	1900			1018	WNW.	4	od	66	
	2300			1018	W.	4	od	62	
9.12.46	1100	38 34	14 44	1016	WNW.	4	bc	65	61
	1500			1014	NW.	5	c	66	
	2300			1012	WNW.	5	c	61	
10.12.46	1100	41 46	18 28	1007	WNW.	4	o	63	57
	1500			1004	WNW.	2	c	64	
	1900			1001	WNW.	2	c	60	
	2300			999	Calm		c	54	
	0300			996	Calm		o	52	
	0700			997	E.	3	o	54	
11.12.46	1100	44 45	22 25	998	Calm		o	54	55
	1500			1000	ESE.	5	or	40	
	1900			1003	S.	4	prs	35	
	2300			1005	WNW.	3	or	35	
	0200			1006	S.	3	o	34	
	0600			1010	S.	4	bcps	40	
12.12.46	1000	47 29	26 24	1014	S.	4	b	38	38
	1400			1015	SSW.	4	bc	42	
	1800			1016	SW.	4	bc	41	
	2200			1014	WNW.	3	c	39	
	0200			1015	NW.	4	o	38	
	0600			1007	NE.	5	ps	39	
13.12.46	1000	50 18	31 27	1004	WSW.	5	o	44	37
	1400			1003	W.	6	o	42	
	1800			1002	W.	6	ps	39	
	2200			1000	W.	6	o	37	
	0200			999	W.	6	o	37	
	0600			998	NW.	5	o	39	
14.12.46	1000	52 56	36 41*	995	WNW.	5	rs	39	36
	1400			991	WNW.	5	s	38	
	1800			992	WNW.	5	m_o	37	
	2200			994	W.	3	m-f	36	
	0100			995	W.	2	m-f	36	
	0500			996	W.	3	f	34	
15.12.46	0900	53 58	43 07*	996	N.	2	cif	41	34
	1300			994	N.	4	om	39	
	1700			993	N.	4	m-f	36	
	2100			991	N.	4	r	36	
	0100			990	N.	4	$m_o$pr	36	
	0500			985	N.	5	m-f	38	
16.12.46	0900	54 41	48 08	985	N.	6	cif	39	34
	1300			982	N.	7	opr	40	
	1700			978	N.	8	m_or	39	
	2100			978	NNW.	7	m_or	38	
	0100			975	N.	6–7	om$_o$r	37	
	0400			973	N.	6–7	m_or	37	
17.12.46	0800	54 41	54 02*	969	N.	5	m_or	38	34
	1200			974	WSW.	6	ops	37	
	1600			981	W.	6	o	33	
	2000			986	WNW.	5	o	33	
	2400			989	WNW.	5	o	35	

*–Dead-reckoning position from log.

Date	Time	Position (at noon local time)	Pressure	Wind Direction (true)	Wind Force	Weather	Temperature Air	Temperature Sea
	G.M.T.	° S. ' ° E. '	mb.				°F.	°F.
	0400		990	N.	3	bc	42	
18.12.46	0800	54 38 60 25	990	N.	3	c	44	34
	1200		988	N.	3	c	44	
	2000		984	N.	3	bc	36	
	0400		981	N.	4	o	38	
19.12.46	0800	55 00 67 05	979	E.	3	bc	42	34
	1200		978	Calm		c	44	
	1600		978	SE.	3	bc	38	
	2000		977	SW.	3	c	36	
	2400		977	SW.	3	o	36	
	0300		978	S.	3	ps	37	
20.12.46	0700	55 28 74 18	979	S.	3	c	42	35
	1100		981	SW.	2	o	44	
	1500		982	SW.	2	f	38	
	1900		982	SW.	2	f	36	
	2300		982	W.	1	f	35	
	0300		983	S.	2	f	37	
21.12.46	0700	56 44 80 09*	983	N.	2	f	41	34
	1100		981	NE.	3	o	40	
	1500		979	E.	4	o	38	
	1900		979	NE.	4	c	36	
	2300		979	E.	3	o	34	

* Dead-reckoning position from log.

Oil-tanker M/V Sysla. 10,341 tons gross. Captain: Knut Helgesen.—Vessel bound from Cape Town to the *Balaena* in the Southern Ocean. Deeply laden, proceeding at 12½ kt. The vessel's aneroid barometer, reading pressure in millimetres, was checked against the *Balaena*'s instruments on February 14, 1947. This check has been used as the basis for correction of the figures converted to millibars in the following table.

Date	Time	Position (at noon local time)	Pressure	Wind Direction (true)	Wind Force	Weather	Temperature Air	Temperature Sea
	G.M.T.	° S. ' ° E. '	mb.				°F.	°F.
31. 1.47	1220	Left Cape Town						
	1500		1014	S.	2	b	66	
	1900		1015	S.	2	b	66	
	2300			SSW.	2	b	66	
	0300		1015	WSW.	2	b	66	70
	0700			WSW.	3	bc	68	66
1. 2.47	1100	38 11 19 31		WSW.	3	bc	70	73
	1500			WSW.	4	c	72	75
	1900			WSW.	4	c	64	68
	2300			WSW.	2	c	63	75
	0200		1015	WSW.	2	c	64	75
	0600		1013	W.	2	c	70	72
2. 2.47	1000	41 15 25 11		W.	2	c	66	54
	1400		1011	W.	2	c	68	55
	1800			W.	3	bc	55	59
	2200			WSW.	3	bc	50	55
	0200			WSW.	3	bc	50	48
	0600			WSW.	3	bc	52	48
3. 2.47	1000	44 04 31 07	1010	W.	3	bc	54	46
	1400		1009	W.	3	bc	63	46
	1800			W.	4	o	52	46
	2200		1006	NW.	4	o	48	45
	0100		1002	NW.	5	o	48	45
	0500			WNW.	5	odmo	50	43
4. 2.47	0900	45 46 37 33		WNW.	5	bc	57	41
	1300			W.	5	bc	52	42
	1700		1001	W.	5	o	50	43
	2100		1002	WSW.	5	o	45	43
	0100		1002	WSW.	6	bc	43	41
	0500		1005	WSW.	6	bc	48	43
5. 2.47	0900	47 05 44 56		WSW.	6	bc	48	41
	1300		1006	WSW.	6	prs	43	41
	1700		1009	SW.	5	c	41	39
	2100		1010	WSW.	5	c	41	37
	2400		1011	WSW.	5	c	39	37
	0400		1011	WSW.	5	c	45	37
6. 2.47	0800	48 19 52 22	1010	WSW.	5	c	48	37
	1200		1005	WNW.	5	o	45	38
	1600		999	WNW.	6	ir	41	37
	2000		996	WNW.	7	ir	43	39
	2400		996	W.	7	d	43	39
	0400		998	W.	7	o	45	37
7. 2.47	0800	49 32 60 08	996	W.	7	d	46	39
	1200		995	W.	6	o	43	37
	1600			W.	6	o	45	36
	2000		993	W.	6	o	41	36
	2300			WNW.	5	c	39	37
	0300		994	W.	5	c	43	36
8. 2.47	0700	50 49 67 57	995	W.	5	c	45	36
	1100			W.	5	c	43	36
	1500		996	W.	5	c	41	36
	1900		998	W.	5	o	41	36
	2300			W.	6	o	37	36
	0300		999	W.	6	c	41	34
9. 2.47	0700	52 01 75 59	1001	W.	6	c	41	34
	1100		1002	W.	6	c	43	34
	1500		1003	W.	5	c	39	34
	1900		1003	W.	5	c	37	34
	2200		1002	WSW.	2		37	

Date	Time	Position (at noon local time)	Pressure	Wind Direction (true)	Force	Weather	Temperature Air	Sea	Date	Time	Position (at noon local time)	Pressure	Wind Direction (true)	Force	Weather	Temperature Air	Sea
	G.M.T.	°S. °E.	mb.				°F.	°F.		G.M.T.	°S. °E.	mb.				°F.	°F.
	0200		999	WSW.	2		39			0200			SSE.	8		34	
10. 2.47	0600	54 12 83 02	999	Var.	2		41	34	12. 2.47	0600	59 55 95 48		SSE.	8		36	36
	1000		998	S.	5		41			1000			SSE.	8		34	
	1400		996	S.	5		37			1400			SSE.	8		34	
	1800		995	SSE.	6		34			1800			SSE.	8		30	
	2200			SSE.	8		34			2200		996	SSE.	7		30	
	0200			SSE.	8		36			0100			SSE.	7		32	
11. 2.47	0600	57 16 89 29		SSE.	8		36	36	13. 2.47	0500	62 50 103 04		SSE.	6		30	32
	1000			SSE.	8		36										
	1400			SSE.	8		34										
	1800			SSE.	8		34										
	2200			SSE.	8		32										

Whale-boat S/S Terje 8. 335 tons gross. Captain: (Whale-gunner) Hans Marthinsen.—Vessel bound from Cape Town to the *Balaena* in the Southern Ocean. Proceeding at 10½ kt. The vessel's aneroid barometer, reading pressures in centimetres, was checked against the *Balaena*'s instruments on January 3, 1947. This check has been used as the basis for correction of the figures converted to millibars in the following table. Aneroids on small vessels such as these whale-boats do not seem to be as trustworthy as on the larger tankers, and probably should not be trusted to a finer degree of accuracy than about ± 5 mb. The wind directions were consistently related to the magnetic compass on this vessel, and in the following table have been converted to true directions.

Date	Time	Position (at noon local time)	Pressure	Wind Direction (true)	Force	Weather	Date	Time	Position (at noon local time)	Pressure	Wind Direction (true)	Force	Weather
	G.M.T.	°S. °E.	mb.					G.M.T.	°S. °E.	mb.			
	0445	Left Cape Town						0100		978	E'S.	1	bc
26.11.46	1000		1014	SSE.	5	b		0500		977	E'S.	1	c
	2200		1020	ESE.	3	bc	3.12.46	0900	52 15 46 51*	977	E'S.	1	c
								1300		976	E'S.	1	b
	0600		1018	ESE.	3	c		1700		976	S'W.	1	p
27.11.46	1000	36 50 22 58	1018	ESE.	3	bc		2100		976	S'W.	1	c
	2200		1020	ESE.	1	b							
								0000		974	SW.	1	c
	0200		1018	NW.	1	b		0400		974	Calm		p
28.11.46	1000	40 05 24 10	1016	WNW.	1	b	4.12.46	0800	54 23 53 08	974	SW.	1	bc
	2200		1010	WNW.	3	o		1200		974	S.	1	op
								1600		977	S.	2	op
29.11.46	1000	42 53 28 02	1001	WNW.	5	b		2000		977	S.	2	ps
	2200		992	WNW.	4	or		2400		976	S.	3	op
	0200		992	WNW.	4	o		0400		978	S.	3	cp
	0600		993	NW.	3	b	5.12.46	0800	56 50 59 22	982	S.	3	ps
30.11.46	1000	46 45 32 39	994	WSW.	3	o		1600		982	S.	2	o
	1800		993	SW.	2	pr		2000		982	S.	1	o
	2200		993	SW.	2	pr							
							6.12.46	0800	59 01 66 16	977	S.	1	o
	0200		993	W'S.	3	pr		1600		974	S.	1	op
	0600		993	W'S.	3	c							
1.12.46	1000	48 09 37 02	992	W'S.	3	bc							
	1400		900	W'N.	3	ps							
	2200		988	W'N.	3	bc							
	0100		986	W'N.	3	c							
2.12.46	0900	50 09 41 30	985	W'N.	3	bc							
	1300		984	W'N.	2	bc							
	1700		981	NW'W.	2	bc							
	2100		980	Calm		b							

* Dead-reckoning positions from log.

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