Atlas of

Pilot Charts

South Pacific Ocean

1998

Second Edition

Prepared from data furnished by the NATIONAL IMAGERY AND MAPPING AGENCY of the Department of Defense
and by the Department of Commerce, and published at the
NATIONAL IMAGERY AND MAPPING AGENCY under the SECRETARY OF DEFENSE

Marine Life

Drought

Flood

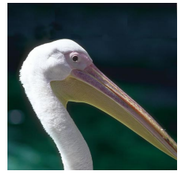
Coastal Erosion

El Niño

Yesterday...Today...Tomorrow

The NOAA ship Káiminoana supports oceanographic and climate research in the equatorial Pacific Ocean. The ship's primary mission is to deploy, recover, and service deep sea moorings that measure ocean currents, ocean temperatures, and atmospheric conditions throughout the equatorial regions of the Pacific Ocean.
The Káiminoana supports a series of 70 buoys known as the Tropical Atmosphere-Ocean (TAO) array, which were first deployed as part of an international oceanographic research program to learn how to predict the El Niño/Southern Oscillation phenomenon. The buoys measure wind direction and speed, air temperature and humidity, and temperature of the ocean at the sea surface and at various depths to 500 meters. A few buoys also measure currents, rainfall and solar radiation. These buoys help scientists learn more how warm water of the equatorial Pacific affects world-wide climate, and are providing critical data about the El Niño event.

Coral Reefs



Bird Life

Forest Fires

Tropical Storms

What is El Niño?

The term El Niño (Spanish for "the Christ Child") was originally used by fishermen along the coasts of Ecuador and Peru to refer to a warm ocean current that typically appears around Christmas and lasts for several months. Fish are less abundant during these warm intervals, so fishermen often take a break to repair their equipment and spend time with there families.

In some years, however, the water is especially warm and the break in the fishing season persists into May or even June. Over the years, the term El Niño has come to be reserved for these exceptionally strong warm intervals that not only disrupt the normal lives of fisherman, but bring heavy rains.

Subtle changes in the interplay of wind and water in the tropical Pacific can affect local ecosystems and human lives in far flung regions of the globe. El Niño can be responsible for changes in bird and marine life, coral reefs, floods, coastal erosion, drought, forest fires, and tropical storms.

El Niño and Climate

The link between climatic effects in distant parts of the globe and El Niño is now well established. Yet it has taken decades for scientists to understand how the various pieces of the puzzle from ocean currents to winds and heavy rains all fit together. Decades ago, the British scientist Sir Gilbert Walker provided the first clue.

During the 1920s, while scientists in South America were documenting the local effects of El Niño, Walker was on assignment in India trying to find a way to predict the Asian monsoon. As he sorted through world weather records, he discovered a remarkable connection between barometer readings at stations on the eastern and western sides of the Pacific. He noticed that when pressures rises in the east, it usually falls in the west, and vice versa. Walker coined the term Southern Oscillation to dramatize the ups and downs in this east-west seesaw in the southern Pacific barometers. When the seesaw is in its "high-index" (strongly tilted) state, pressure is high on the eastern side of the Pacific and low on the western side.

Along the equator, the east-west pressure contrast drives easterly surface winds which extend from the Galapagos Islands nearly all the way to Indonesia. When the seesaw switches into a "low-index" (weakly tilted) state, the easterly surface winds weaken. The biggest changes in the slope of the seesaw and in the strength of the easterlies occur over the western Pacific. West of the dateline the easterlies usually disappear altogether during low-index years, whereas east of the dateline they usually weaken.

Walker noticed that monsoon seasons with low-index conditions are often marked by drought in Australia, Indonesia, India, and parts of Africa. He also claimed that low-index winters tend to be unusually mild in western Canada. One of his British colleagues chided him in print for suggesting that climatic conditions over such widely separated regions of the globe could be linked. In his reply Walker predicted, correctly, that an explanation would be forthcoming, but that it would require a knowledge of wind patterns above ground level, which were not routinely being observed at the time.

In the following decades, researchers added new pieces to the emerging picture of the Southern Oscillation. One such piece came from a remote part of the world for which Walker had no information: the desert islands of the central equatorial Pacific. According to standard climate statistics, these islands receive as much rainfall as many islands with much more luxuriant vegetation. One might wonder, then, "Why are they so barren?" The answer becomes apparent when one examines the rainfall records year by year.

Most years, in fact, the islands receive little or no rainfall. During "low-index" years, they experience torrential rains, day after day, month after month. Hence Walker's pressure seesaw is linked to dramatic chances in the distribution of rainfall in the tropics.

In the late 1960s, University of California professor Jacob Bjerknes gained fame by publishing the first clearly understandable description of the life cycle of storms in temperate latitudes. Now, years later, he was the first to see a connection between warm sea-surface temperatures and the weak easterlies and heavy rainfall that accompany low-index conditions. Ultimately, Bjerknes' discovery led to the recognition that the warm waters of El Niño and the pressure seesaw of Walker's Southern Oscillation are part and parcel of the same phenomenon—sometimes referred to by the acronym ENSO.

Surface winds affect the temperature and chemical properties of the surface water along the coast of Peru and southern Ecuador. The southeasterly winds that blow along the coast tend to drag the surface water along with them. The earth's rotation deflects the water toward the left, away from the coast. Water "upwells" from below to replace it.

The temperature and chemical properties of the upwelled water depend upon the strength of the easterlies far to the west, in the central and western equatorial Pacific. With the absence of wind, the "thermocline" (the layer that divides the warm surface water from the colder water below) would be nearly flat.

When the easterlies are strong, they drag the surface water westward, raising the thermocline nearly all the way up to the surface along the South American coast and depressing it in the western Pacific. The cold water below the thermocline is rich in chemical nutrients.

Whenever the easterlies in the central Pacific are strong, the thermocline along the South American coast is so shallow that upwelling and stirring by the wind bring nutrient-rich water to the surface. In the presence of sunlight, tiny plant species called phytoplankton use the nutrients to produce a greenish plant called chlorophyll. The phytoplankton would soon use up all the nutrients were they not continually being replenished by upwelling.

During El Niño, the easterlies along the equator slacken and the thermocline along the South American coast plunges several hundred feet, preventing nutrient rich water from reaching the surface. Phytoplankton production declines, reducing the food supply for tiny sea animals, called zooplankton, which "graze" on them.

Ultimately, anchovies, sardines, sea birds, and many other animals at higher levels of the marine food web are adversely affected.

The National Imagery and Mapping Agency would like to thank the National Oceanic and Atmospheric Administration for its cooperation and assistance with this article.

Clouds and Winds

The easterly winds along the equator produce local upwelling, which brings cool water to the surface. When the easterlies are blowing at full strength, the band of cold water along the equator chills the air above it, making it too dense to rise high enough for water to condense to form clouds and raindrops.

As a result, the strip of ocean stays conspicuously free of clouds and the rain in the equatorial belt is largely confined to the extreme western Pacific near Indonesia. But when easterlies weaken during the early stages of an El Niño event, the upwelling slows and the ocean warms.

The moist air above the ocean also warms. It becomes buoyant enough to form deep clouds which produce heavy rain along the equator. The change in ocean temperatures thus cause the major rain zone over the western Pacific to shift eastward.

Related adjustments in the atmosphere cause a further weakening of the easterlies in the central Pacific. In this way, the dialogue between wind and sea in the Pacific can become more and more intense, as each partner sends back a stronger message. Small perturbations in the ocean and atmosphere can amplify one another until eventually a full-fledge El Niño is under way.

Just as it is often hard to say which partner was responsible for a change in the mood of a dialogue, or precisely what they said that set the conversation off in a new direction, it is often difficult to identify the subtle change in the ocean-atmosphere system that initiates a transition into or out of El Niño conditions.

El Niño Impacts

Australia, Brazil, Ethiopia, India and Peru are already successfully using predictions of El Niño in connection with agricultural planning. It is not a coincidence that all these countries lie at least partially within the tropics.

Tropical countries have the most to gain from successful prediction of El Niño because they experience a disproportionate share of the impacts and, coincidentally, they occupy the part of the world in which accuracy of climate prediction models are the greatest.

But for many countries outside the tropics, such as Japan and the United States, more accurate prediction of El Niño will also benefit strategic planning in areas such as agriculture, and the management of water resources and reserves of grain and fuel oil.

Encouraged by the progress of the past decade, scientists and governments in many countries are working together to design and build a global system for (1) observing the tropical oceans, (2) predicting El Niño and other climate variations, and (3) making routine climatic predictions readily available to those who have need of them for planning purposes, much as weather forecasts are made available to the public today.

The ability to anticipate how climate will change from one year to the next will lead to better management of agriculture, water supplies, fisheries, and other resources. By incorporating climate predictions into management decisions, mankind is better becoming adapted to the rhythms of climate.

El Niño Predictions

The National Oceanic and Atmospheric Administration has the primary responsibility within the Federal Government to routinely provide climate forecasts and products to the Nation. Most parts of NOAA are in some way involved in El Niño research, monitoring and prediction. For example, NOAA monitors the developing and, in time, decreasing pool of warm waters in the tropical Pacific with state-of-the-art satellites and buoys; launches new research initiatives; improves future climate forecast; monitors the impact of the climate event on the fish population in U.S. coastal waters; operates research ships to study the world's vast oceans; and provides critical ocean data to users.

Scientists are now taking NOAA's understanding of El Niños a step further by incorporating the descriptions of these events into numerical models (computer programs designed to represent, in terms of equations, processes that occur in nature).

Such models are fed information, mostly in the form of sets of numbers, describing the present state of the atmosphere-ocean system (e.g., observations of wind speeds, ocean currents, sea level, and the depth of the thermocline along the equator). Updated sets of numbers generated by the models indicate how the atmosphere-ocean system might evolve over the next few seasons or years.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

JANUARY

PRESSURE.—Extending from Australia to South America, the South Pacific subtropical high is the major pressure feature in January. Its mean central pressure is centered near 35°S, 93°W where it averages just over 1025 millibars. South of 50°S the pressure gradient is relatively zonal—the average pressure at 60°S is nearly 18 millibars less than that at 50°S. The center of the equatorial trough runs from northern Australia northeast to the equator at 140°W and just north of the equator from 140°W to South America.

TEMPERATURE.—Mean air temperatures range from 4°C at 60°S to 29°C in the northwest South Pacific north of Australia and west of the international date line. At 60°S approximately 98% of the observations fall between 0°C and 8°C; at the equator 98% fall between 22°C and 32°C.

WINDS.—North of 40°S, southeasterly winds prevail off the west coast of South America and in the region between Australia and New Zealand. Easterly winds prevail at these latitudes between 110°W and the date line and northerly winds prevail north of Australia. Winds average force 3 to 4 north of 40°S where the prevailing winds are westerly.

GAILS.—Winds of force 8 or greater are mainly confined south of 45°S. South of 50°S, 10% frequencies or greater are observed in most areas. Frequencies reach a maximum of 20% off the southwest coast of Chile.

TROPICAL CYCLONES.—According to historical records, all tropical cyclone activity in the South Pacific takes place in the northwest quadrant. During an average 10-year period, 34 tropical storms (≥ 34 knots) can be expected to occur during January. Of these, seven can be expected to reach hurricane strengh (≥ 64 knots).

VISIBILITY.—Poor visibilities (less than 2 miles) mainly occur from the roaring forties south. Ten percent frequencies shown up as far north as 40°S,125°W, and from this point they taper off east to Cape Horn and west to just south of New Zealand and Tasmania. Poor visibilities increase in frequency to over 30% for a few areas as far north as 58°S but generally remain south of 60°S.

WAVE HEIGHTS.—The frequency of wave heights equal to or greater than 12 feet ranges from a minimum at the equator to a maximum along the cyclone belt. With the exception of the New Zealand and Australia coastal areas, most regions south of 30°S observed wave heights of at least 12 feet 10% or more of the time. Maximum occurences of over 40% are reported south of 53°S between 80°W and 165°W and between 48°S and 57°S west of 155°E.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air temperature.

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

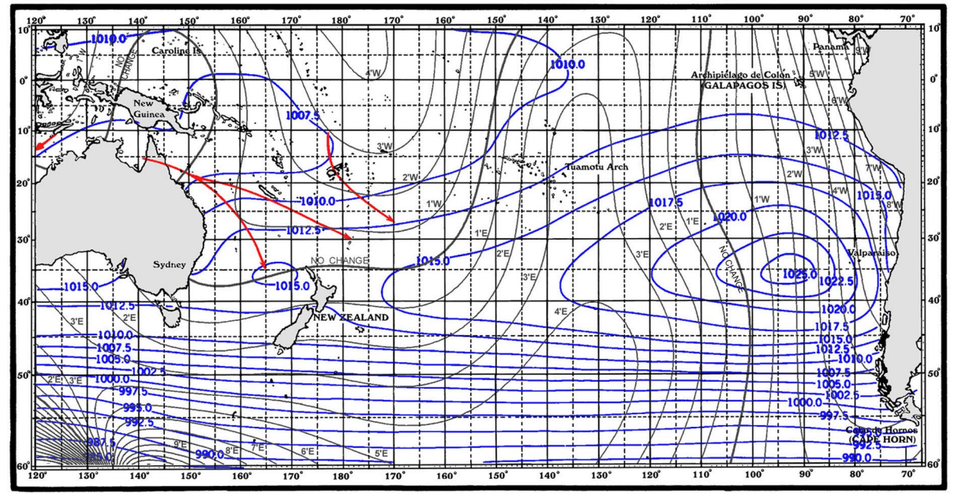
CHART #3

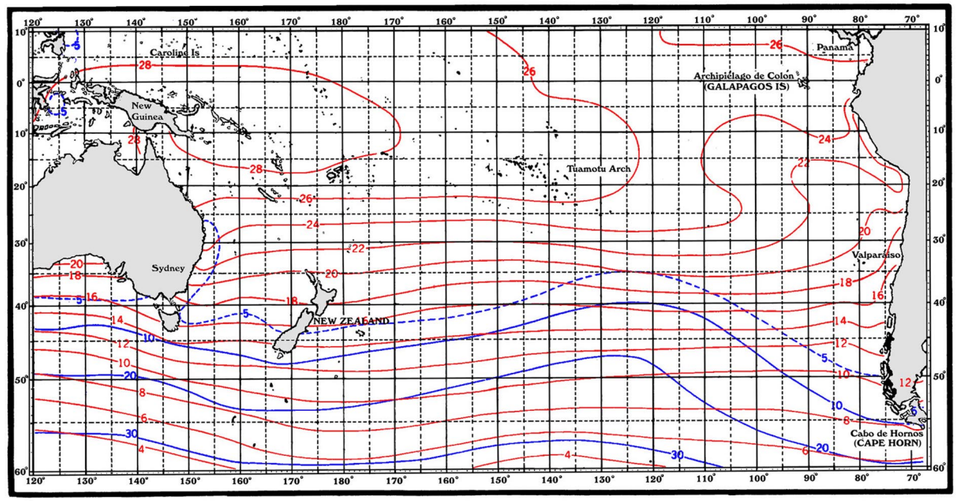
GALES

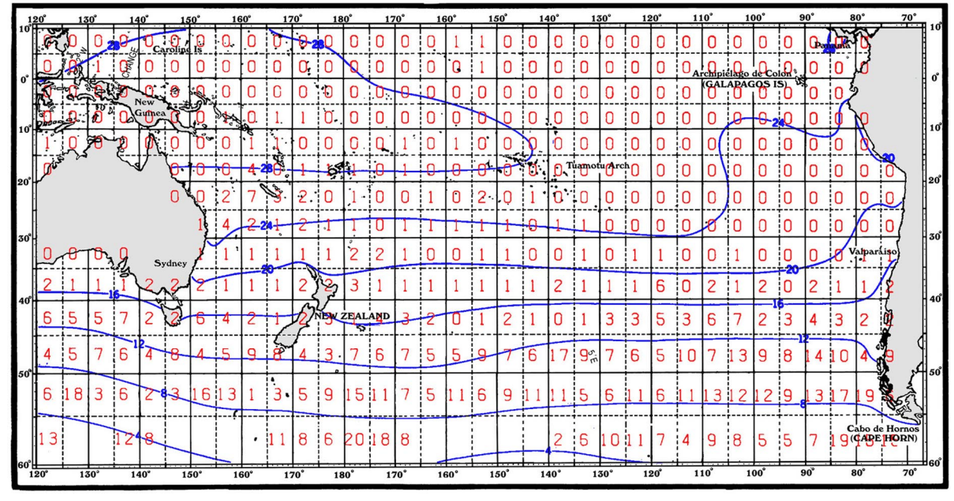
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

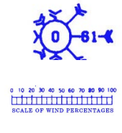




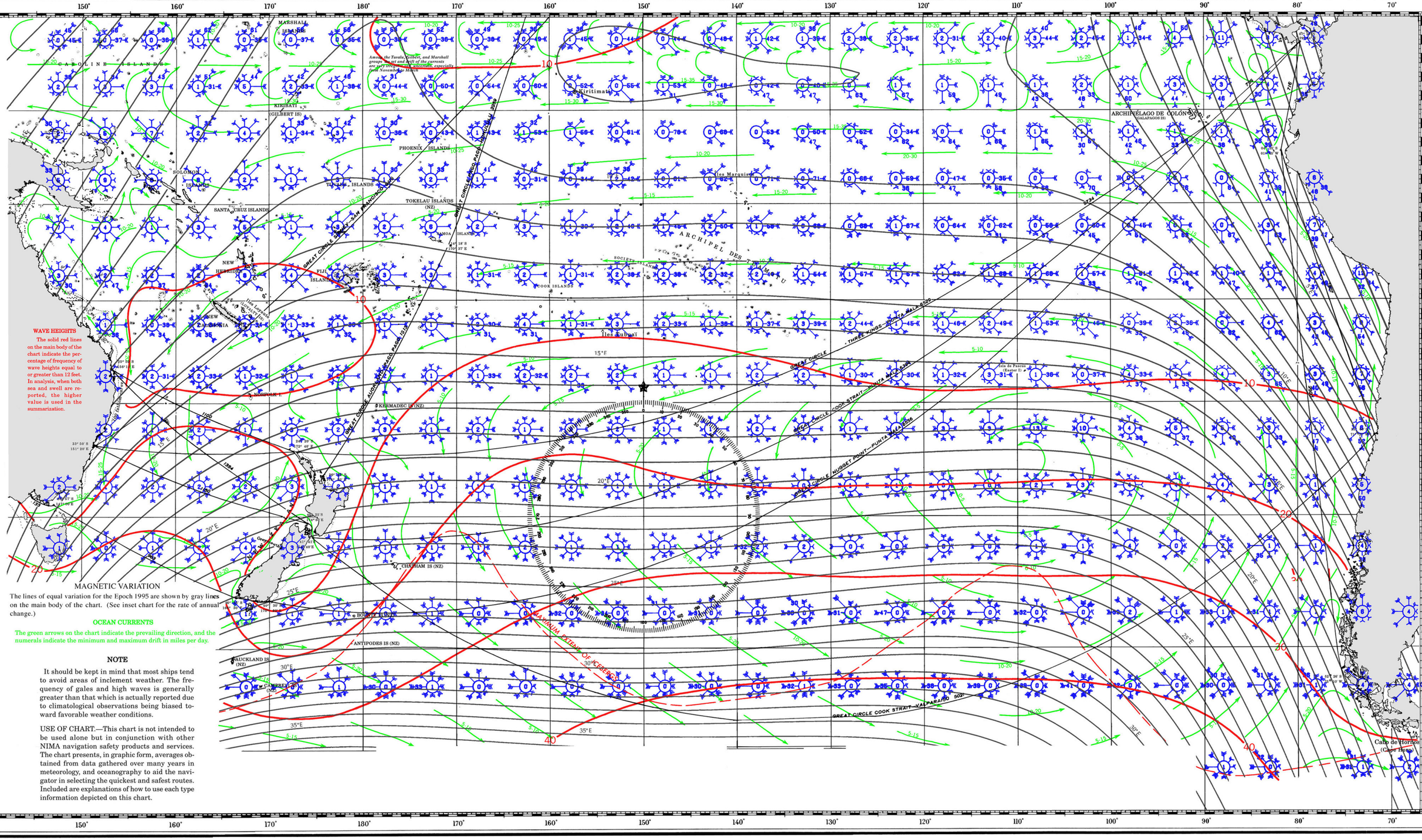


EXPLANATION OF WIND ROSES

PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.



FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows: From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.


WAVE HEIGHTS
The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.
MAGNETIC VARIATION
The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)
OCEAN CURRENTS
The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.
NOTE
It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.
USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.
Among the Tuvalu, Gilbert, and Marshall groups to west and left of the currents are very irregular, uncertain, especially from November to March
MARSHALL ISLANDS
CAROLINE ISLANDS
KIRIBATI (GILBERT IS)
Kiritimati
PHOENIX ISLANDS
SOLOMON ISLANDS
TOKELAU ISLANDS (NZ)
SAMOA ISLANDS
SANTA CRUZ ISLANDS
NEW HEBRIDES
FIJI ISLANDS
COOK ISLANDS
ARCHIPEL DES TUAMOTU
Iles Marquises
ARCHIPELAGO DE COLON (GALAPAGOS IS)
NEW CALEDONIA
Iles Loyalty
Iles Australes
Iles Gambier
Isla de Pascua (Easter I)
NORFOLK I.
KERMADEC IS (NZ)
CHATHAM IS (NZ)
BOUNTY IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL IS (NZ)
Cabo de Hornos (Cape Horn)
GREAT CIRCLE SYDNEY—SAN FRANCISCO
GREAT CIRCLE AUCKLAND—PANAMA CANAL
GREAT CIRCLE NUGGET POINT—PUNTA ARENAS
GREAT CIRCLE COOK STRAIT—PUNTA ARENAS
GREAT CIRCLE COOK STRAIT—VALPARAISO
THREE KINGS—PUNTA ARENAS
MINIMUM EXTENT OF ICEBERGS
10
20
30
40
140°
150°
160°
170°
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
10°
0°
10°
20°
30°
40°
50°
60°

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

FEBRUARY

PRESSURE.—Centered near 36°S, 98°W, the average central pressure of the South Pacific subtropical high runs just over 1023 millibars in February. The subtropical high extends from 8°S to 50°S at 100°W and from South America to Australia. The equato.0rial trough is centered north of the equator between South America and 170°W, then swings southwest between Australia and New Guinea. A strong zonal pressure gradient remains south of 50°S.

TEMPERATURE.—At the equator, mean air temperatures range from 25°C off the coast of South America to over 28°C west of 15- 5°W. Along the equator 98% of the observations fall between 22°C and 32°C. At 60°S, means range from 4°C to 5°C, with approximately 98% of the observations occurring between 0°C and 8°C.

WINDS.—Southeast trade winds range north of 40°S from the coast of South America to as far west at 130°W. Easterly winds extend from here to 170°W, northerly winds prevail north of Australia, and southeasterly winds prevail between Australia and New Zealand. Westerly winds continue to prevail south of 40°S where scalar winds average force 4 to 5. North of 40°S winds average force 3 to 5.

GALES.—Although gale force winds (force 8 or greater) are infrequently observed north of 40°S, the probablility of occurrence is slightly greater at these latitudes over the western Pacific due to tropical storm activity. Gale force winds are reported 10% or more of the time south of 50°S; frequencies reach 20% off the southwest coast of Chile and over the central South Pacific between 55°S and 60°S.

TROPICAL CYCLONES.—February brings the highest frequency of tropical storms to the South Pacific, observed solely within the northwest quadrant. During an average 10-year period, 41 tropical storms (≥ 34 knots) can be expected to occur and of these, 11 should attain hurricane strength (≥ 64 knots).

VISIBILITY.—In general, poor visibilities (less than 2 miles) occur 10% or more of the time south of 45°S. Frequencies increase to a maximum of over 30% south of 55°S.

WAVE HEIGHTS.—Wave height frequencies of 12 feet or greater are at a minimum between the equator and 20°S. Most areas south of 20°S report frequencies of 10% or more except for the coastal areas of New Zealand and Australia. Between 50°S and 60°S, frequencies of 40% or higher are reported, except south of New Zealand (30%) and South America (20%).

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera-

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

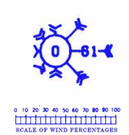
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

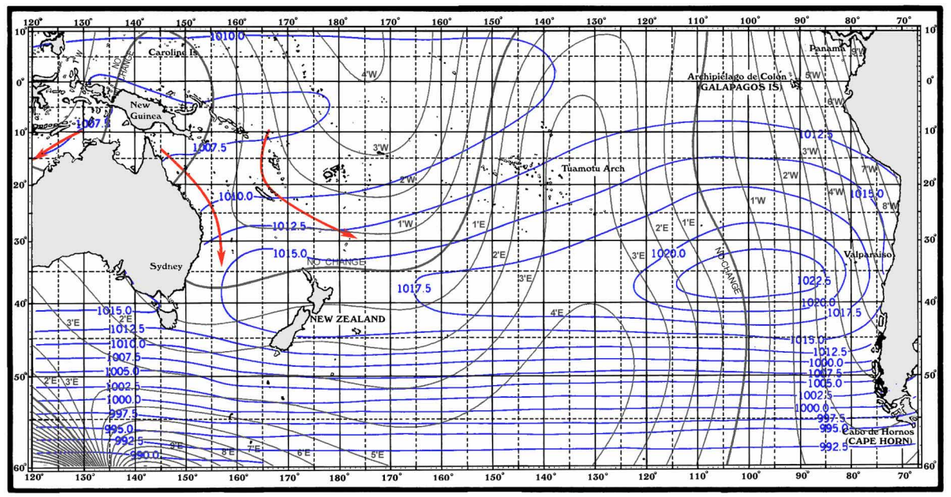
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

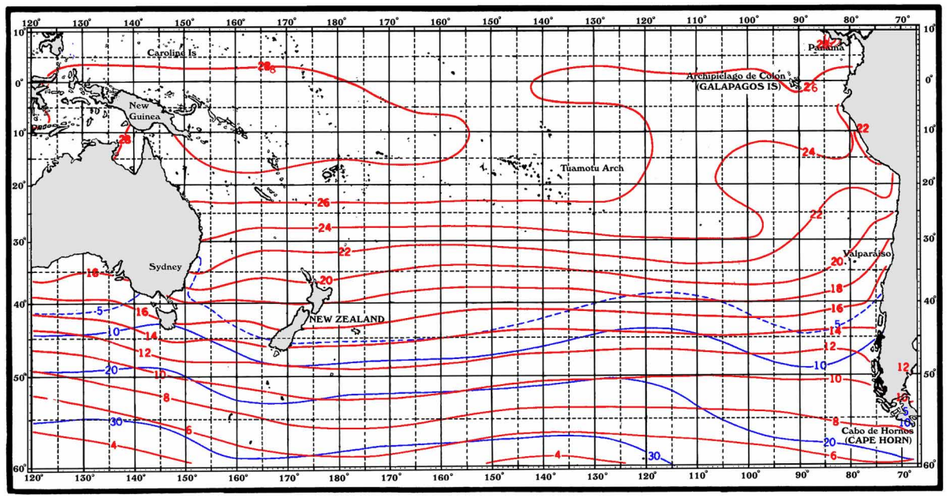
EXPLANATION OF WIND ROSES

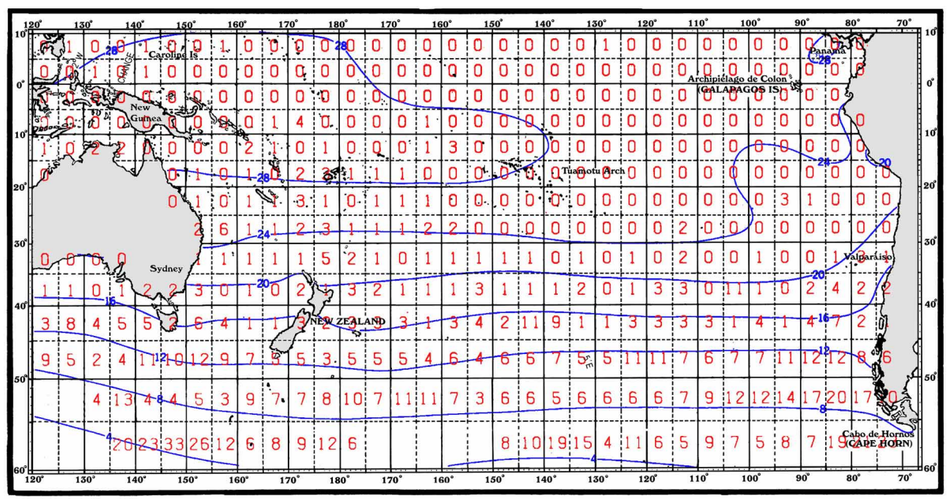
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

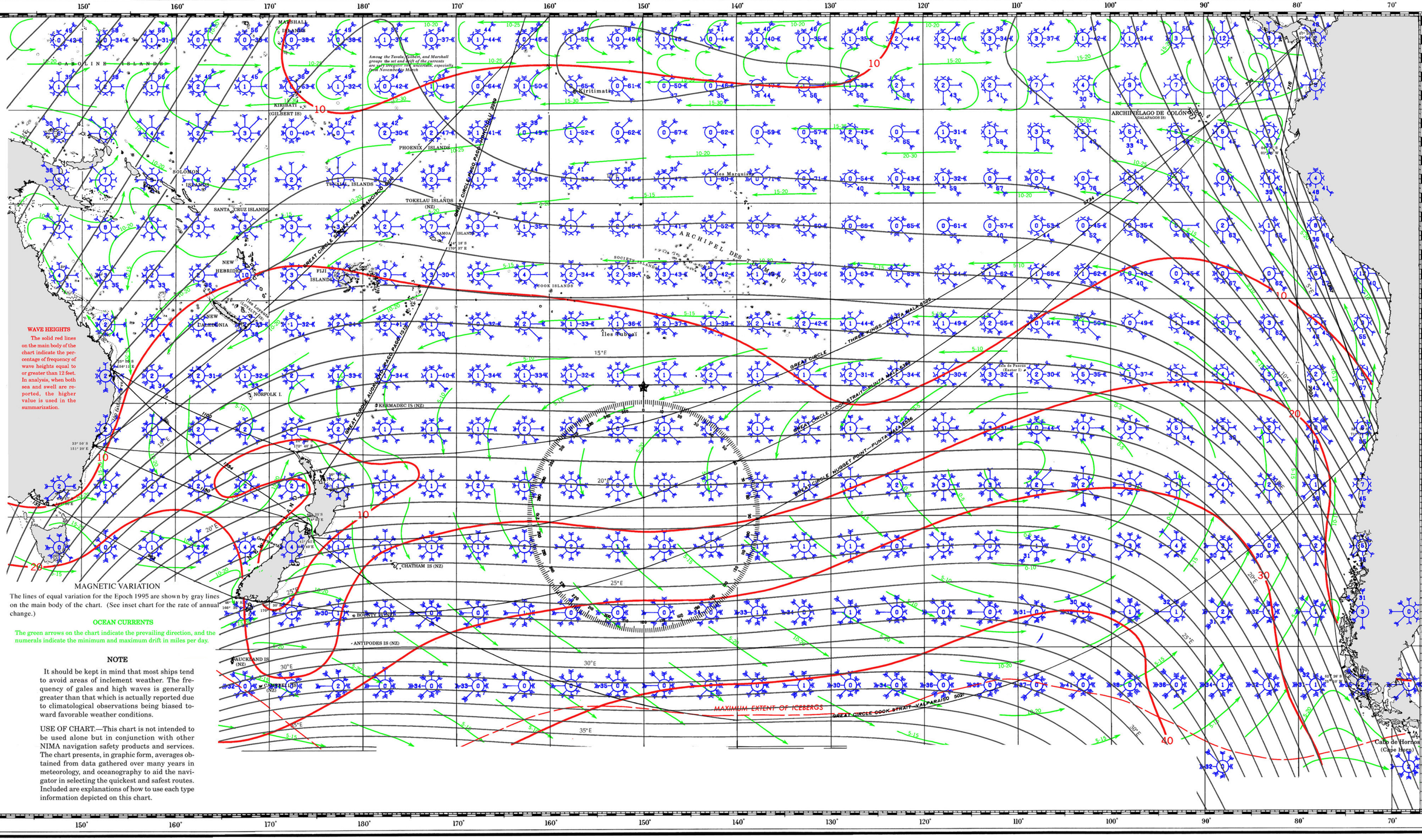


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows:
From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.









WAVE HEIGHTS

The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.

MAGNETIC VARIATION

The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS

The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.

NOTE

It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.

USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

MARCH

PRESSURE.—The South Pacific subtropical high continues to extend from South America to across the southern half of Australia in March. Its mean central pressure is located near 34°S, 95°W, averaging just over 1023 millibars. The equatorial trough remains fairly weak, and the intertropical convergence zone is most definable north of the equator. South of 50°S the relatively strong zonal pressure gradient continues.

TEMPERATURE.—Highest mean air temperatures occur over the northwest South Pacific between 10°S and the equator where mean range from 28°C to 29°C; 98% of the observations fall between 24°C and 32°C. At 60°S, mean temperatures occur in the neighborhood of 3°C to 4°C; only 2% of the observations fall outside the 0°C to 8°C range.

WINDS.—Prevailing winds are westerly south of 40°S and east to southeast north of 40°S except north of Australia where winds are northerly. Scalar wind speeds continue to average force 3 to 4 north of 40°S and force 4 to 5 south of 40°S.

GALES.—North of 40°S, winds of force 8 or greater are infrequently observed over the western half and rarely observed over the eastern half of the South Pacific. Frequencies increase to 10% or more south of 45□°S and to near 20% or more across most areas south of 50°S and east of 180° longitude. Maximum occurrences reach 30% through the center of Drake Passage.

TROPICAL CYCLONES.—During March an avarage 3.7 tropical storms reach 34 knots or greater. Of these storms an average 1.1 is expected to attain hurricane strength (≥ 64 knots). As in previous months all tropical storm activity is confined to the northwest quadrant.

VISIBILITIES.—Poor visibilities (less than 2 miles) are mainly observed south of 40°S. Frequencies reach 10% between 40°S and 50°S, and increase to 30% between 50°S and 60°S west of 120°W.

WAVE HEIGHTS.—The wave pattern changes little from month to month, reflecting the stable wind regime across the South Pacific. Wave heights of at least 12 feet are observed less than 10% of the time between the equator and 20°S. Frequencies reach 10% between 20°S and 30°S except along the coastal areas of Australia, New Zealand, and Chile. At 60°S, frequencies reach over 30% south of Cape Horn, over 40% at 90°W and over 50% at 130°E.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

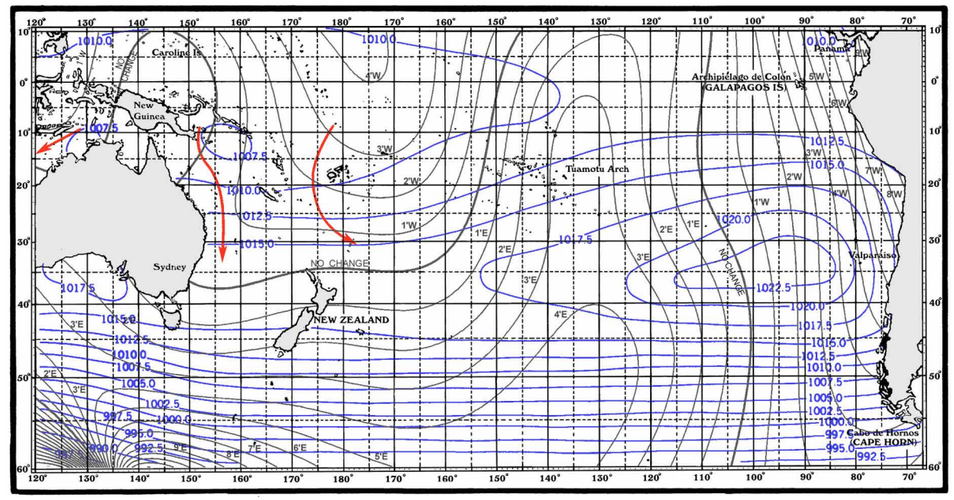
CHART #3

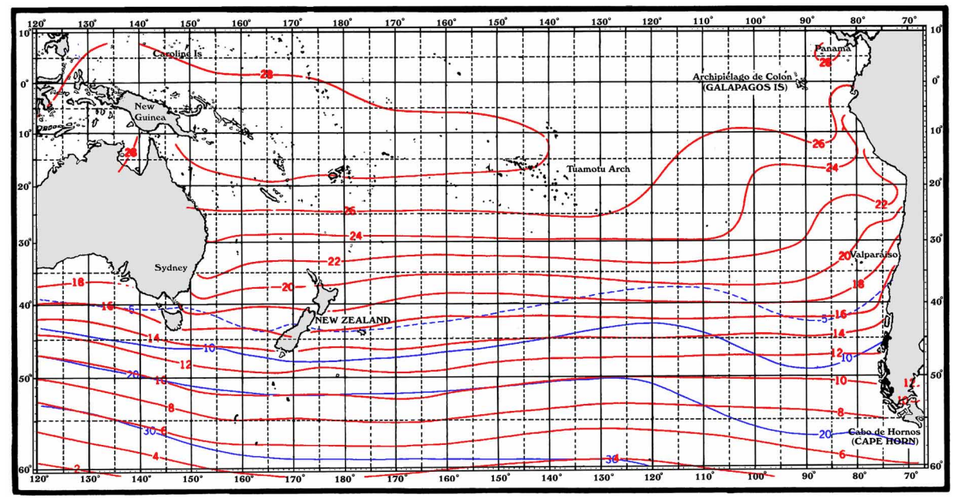
GALES

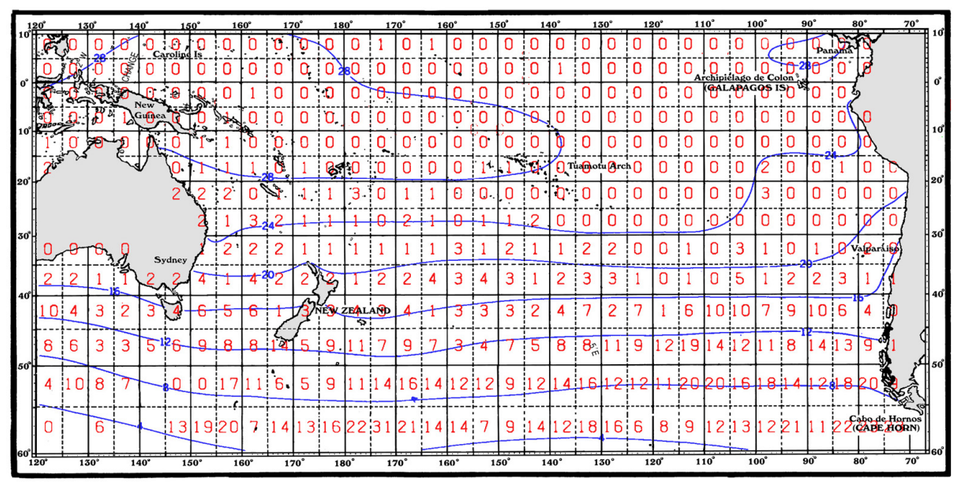
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

The mean sea surface temperature (C°), in blue lines, is shown for every degrees.







EXPLANATION OF WIND ROSES

PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows:
From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.

WAVE HEIGHTS

The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.

MAGNETIC VARIATION

The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS

The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.

NOTE

It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.

USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

Among the Tuvalu, Gilbert, and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March

CAROLINE ISLANDS
MARSHALL ISLANDS
KIRIBATI (GILBERT IS)
Kiritimati
PHOENIX ISLANDS
SOLOMON ISLANDS
TUVALU ISLANDS
TOKELAU ISLANDS (NZ)
SANTA CRUZ ISLANDS
SAMOA ISLANDS
Iles Marquises
ARCHIPEL DES TUAMOTU
SOCIETY ISLANDS
COOK ISLANDS
ARCHIPIÉLAGO DE COLÓN (GALAPAGOS IS)
NEW HEBRIDES
FIJI ISLANDS
NEW CALEDONIA
Iles Loyalty
Iles Australes
NORFOLK I.
KERMADEC IS (NZ)
CHATHAM IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL IS (NZ)
BOUNTY IS (NZ)
Cabo de Hornos (Cape Horn)

GREAT CIRCLE SYDNEY—SAN FRANCISCO
GREAT CIRCLE AUCKLAND—PANAMA CANAL
GREAT CIRCLE SYDNEY—PANAMA CANAL
GREAT CIRCLE NUBBLE POINT—PUNTA ARENAS
GREAT CIRCLE COOK STRAIT—PUNTA ARENAS
GREAT CIRCLE COOK STRAIT—VALPARAISO
THREE KINGS—PUNTA MALA
MAXIMUM EXTENT OF ICEBERGS

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

APRIL

PRESSURE.—Although the subtropical high continues to stretch the width of the South Pacific during April, the arrival of cooler temperatures decreases its prominence. This permanent high pressure belt maintains a center near 30°S, 90°W, averaging just over 1020 millibars. A second center over the Great Australian Bight has a mean near 1019 millibars. South of 45°S, the strong zonal pressure gradient continues; its southerly pressure decrease averages 20 to 22 millibars in 15° latitude. The equatorial trough nearly centered over the equator maintains a slightly lower mean pressure over the western South Pacific.

TEMPERATURE.—The temperature gradient is fairly uniform over most of the South Pacific except in the tropics where there is a very broad gradient and along the South American coast where the Peru current influences and irregular gradient. Means range from 2°C at 60°S to 29°C in the tropics. Examination of extremes shows that only about 2% of the observations fall outside the -1°C to 6°C range at 60°S and 2% fall outside the 21°C to 33°C range at the equator.

WINDS.—East to southeast winds generally prevail north of 40°S, except north and northwest of New Guinea where northerly winds prevail. Across this broad region winds average force 3 to 4. South of 40°S, winds are slightly stronger than in previous months, averaging force 4 to 6; westerly winds continue to prevail here.

GALES.—Only a few areas north of 40°S report gale (force 8 or greater) frequencies of 5% percent. Frequencies increase to 10% or more south of New Zealand over the western two-thirds of the South Pacific and south of 40°S over the eastern third. Most regions east of the international date line and south of 50°S report frequencies of 20% or more; frequencies reach 30% through the Drake Passage at 60°S.

TROPICAL CYCLONES.—During April, the average number of tropical storms (≥ 34 knots), which occur only in the northwest quadrant, is half or fewer than that of the previous three months. An average of 1.7 storms are expected to reach 34 knots or more and of these, 0.3 are expected to reach hurricane strength (64 knots or more).

VISIBILITY.—Little change is noted from the March mean pattern of visibilities less than 2 miles. Frequencies reach 10% between 40°S and 50°S and increase southerly to 30% over the western three-quarters of the South Pacific between 50° and 60°S.

WAVE HEIGHTS.—With the exception of some coastal regions of Chile, New Zealand, and Australia, most areas south of 20°S report wave heights of 12 feet or greater 10% or more of the time. Frequencies increase southerly to a maximum of 50% west of 110°W and south of 50°S.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

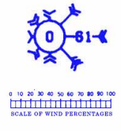
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

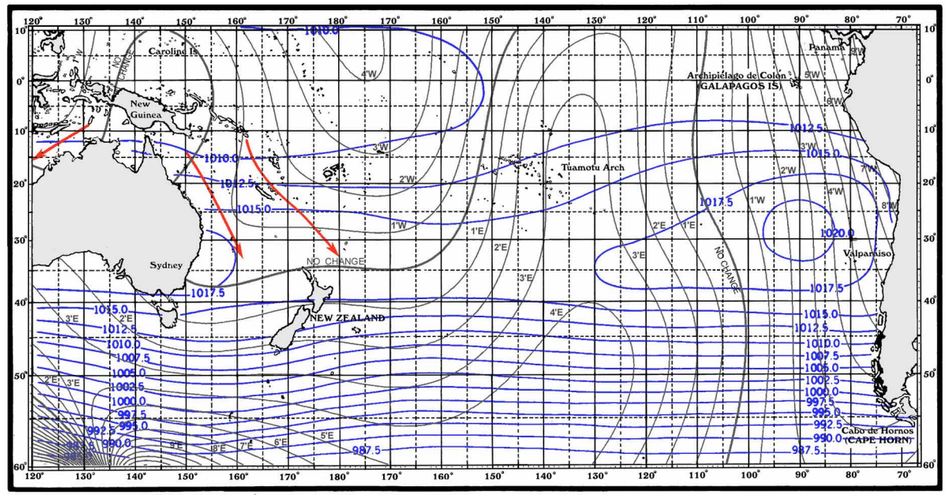
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

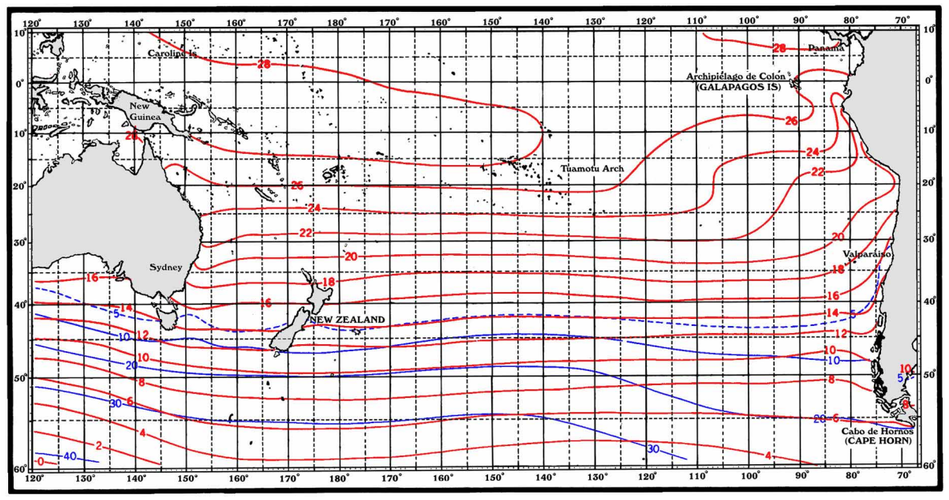
EXPLANATION OF WIND ROSES

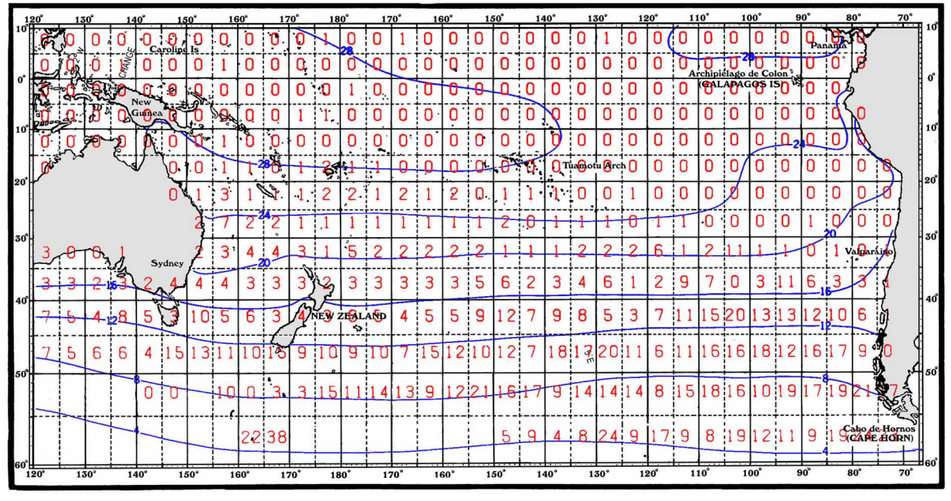
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

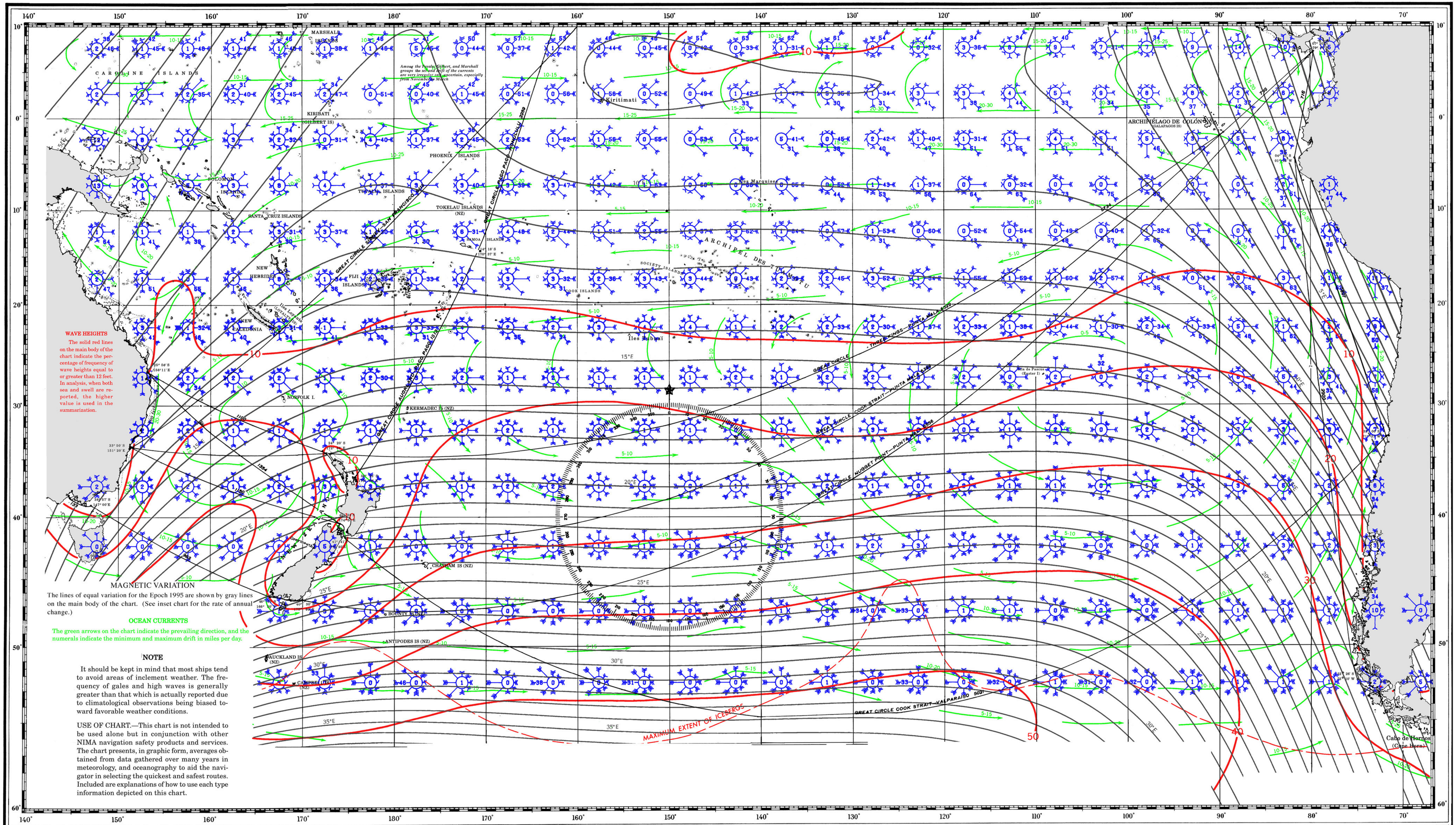


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows:
From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.









CAROLINE ISLANDS
MARSHALL ISLANDS
KIRIBATI (GILBERT IS)
Among the Tuvalu, Gilbert, and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March
Kiritimati
PHOENIX ISLANDS
SOLOMON ISLANDS
TUVALU ISLANDS
TOKELAU ISLANDS (NZ)
SANTA CRUZ ISLANDS
SAMOA ISLANDS
NEW HEBRIDES
FIJI ISLANDS
NEW CALEDONIA
Iles Loyauté (LOYALTY IS)
Îles Marquises
ARCHIPEL DES TUAMOTU
SOCIETY ISLANDS
COOK ISLANDS
Îles Tubuaï
ARCHIPIÉLAGO DE COLÓN (GALAPAGOS IS)
Isla de Pascua (Easter I)
NORFOLK I.
KERMADEC IS (NZ)
NEW ZEALAND
Greymouth
CHATHAM IS (NZ)
BOUNTY IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL IS (NZ)
Cabo de Hornos (Cape Horn)
GREAT CIRCLE SYDNEY—SAN FRANCISCO
GREAT CIRCLE PAGO PAGO—HONOLULU 2259
GREAT CIRCLE AUCKLAND—PAGO PAGO 1513
GREAT CIRCLE THREE KINGS—PUNTA MALA 6529
GREAT CIRCLE COOK STRAIT—PUNTA MALA 6388
GREAT CIRCLE NUGGET POINT—PUNTA MALA 6556
GREAT CIRCLE COOK STRAIT—VALPARAISO 5021
MAXIMUM EXTENT OF ICEBERGS
WAVE HEIGHTS
The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.
MAGNETIC VARIATION
The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)
OCEAN CURRENTS
The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.
NOTE
It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.
USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

MAY

PRESSURE.—In May the permanent anticyclone off the South American coast is centered near 30°S, 85°W with a mean central pressure of 1021 millibars. Located over southeastern Australia is a second high pressure center with a mean central pressure of 1018 millibars. Pressures diminish slightly to the north and considerably to the south of the subtropical high; mean pressures are as low as 1008 millibars over the western half of the equatorial trough and 990 millibars at 60°S.

TEMPERATURE.—Along the equator mean air temperatures range from 23°C off South America to 29°C west of the international date line. At this latitude approximately 98% of the observations fall between 19°C and 29°C over the Peruvian current and between 25°C and 33°C over Malanesia. Means vary little at 60°S—most are found to be near 2°C to 3°C. Of the observations at 60°S, 98% fall between −4°C and 5°C.

WINDS.—East to southeasterly winds prevail north of 30°S from South America to the Philippines; scalar winds average force 3 to 4. South of 30°S, prevailing winds are westerly except for southerly winds between Australia and New Zealand. Scalar winds average force 4 to 6 south of 30°S.

GALES.—With the decline of tropical storm activity over the western half of the South Pacific, the occurrence of force 8 winds is rarely reported north of 30°S. Frequencies begin to increase south of 30°S, reaching 10% south of 40°S over the eastern half and south of 45°S over the western half. Most regions east of 160°W between 45°S and 60°S report frequencies of 20% or more; a high of 30% is reported off the southwest coast of Chile.

TROPICAL CYCLONES.—With May's cooler temperatures, the occurences of tropical storms (> 34 knots) have decreased significantly. Historical records show that only three storms can be expected to reach 34 knots or greater within an average 10-year period and that less than one storm will reach 64 knots or greater (hurricane strength) within an average 20-year period. Such storms have been observed only in the northwest quadrant of the South Pacific.

VISIBILITY.—As in previous months, shipping routes north of 40°S have little problem with poor visibilities (less than 2 miles). At 130°E longitude, poor visibilities increase from 10% at 43°S to over 40% at 60°S; at 90°W they increase from 10% at 48°S to over 20% at 60°S.

WAVE HEIGHTS.—Wave heights of at least 12 feet are generally observed 10% or more of the time south of 20°S except for some coastal areas of Australia, New Zealand, and Chile. Frequencies continue to increase southerly, reaching over 40% in a large portion of the region south of 45°S and west of 90°W. Along the Chile coast frequencies reach 10% near 45°S and increase to over 30% south of Cape Horn.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

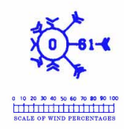
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

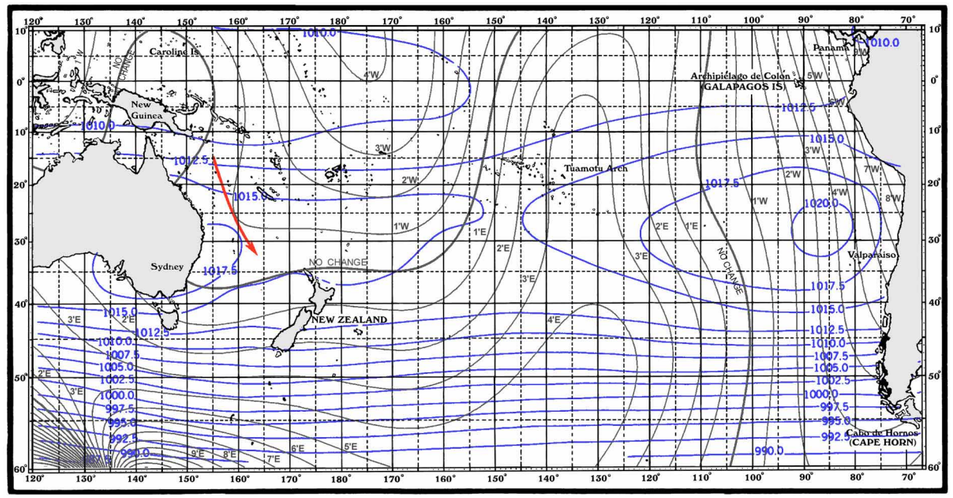
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

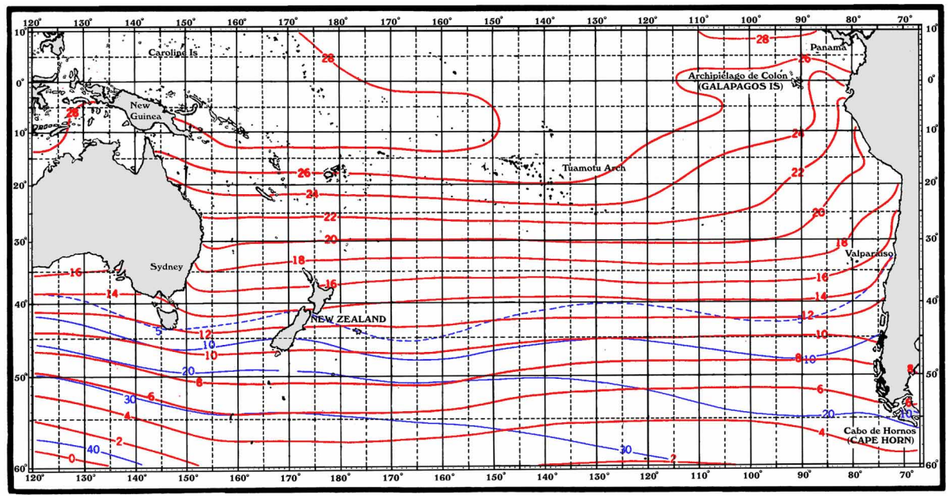
EXPLANATION OF WIND ROSES

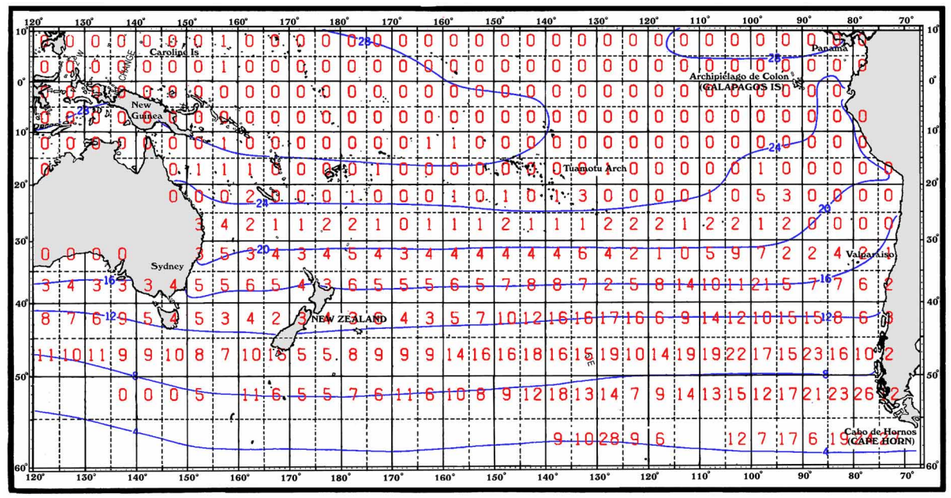
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

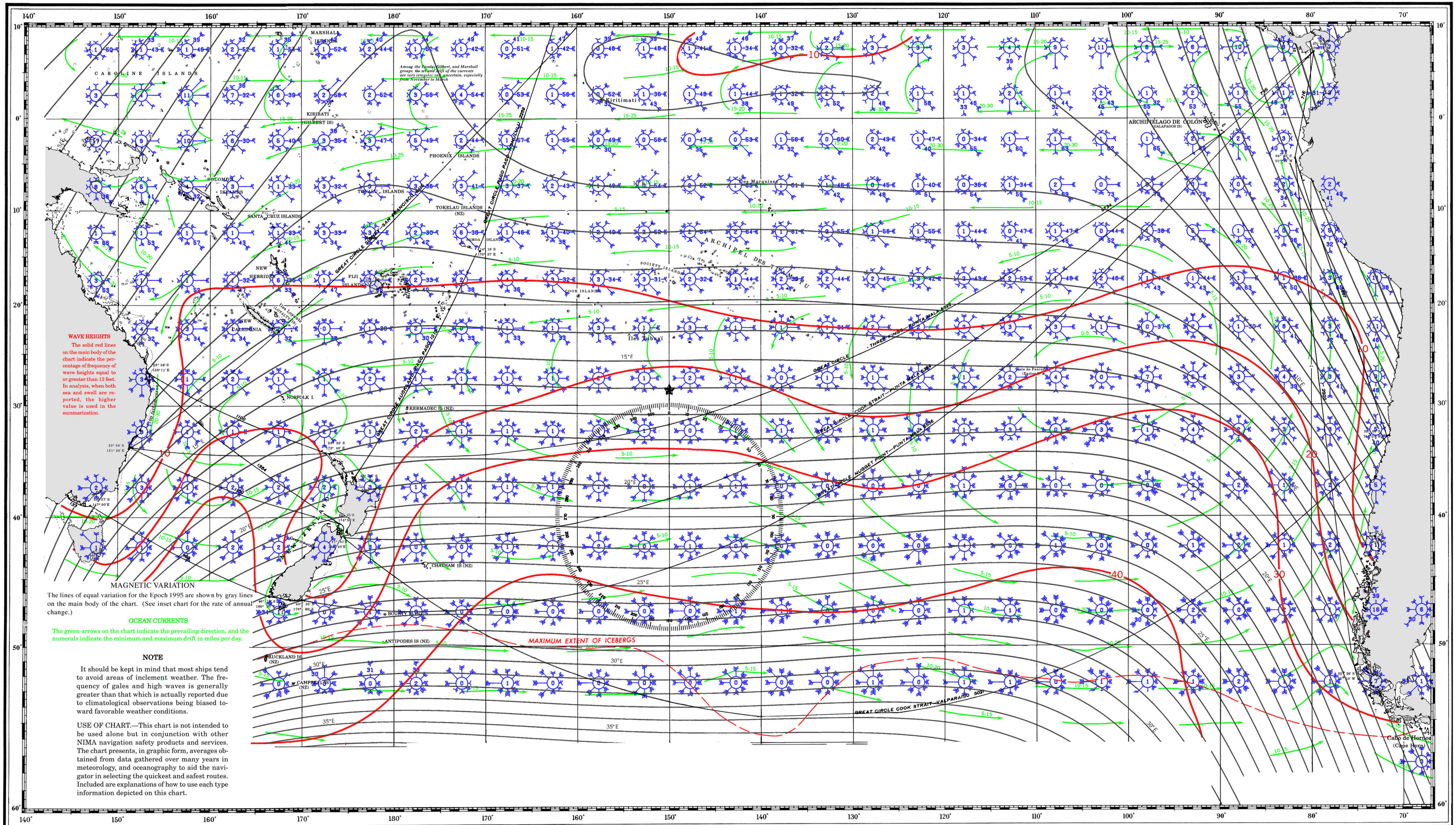


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows: From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.









WAVE HEIGHTS

The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.

MAGNETIC VARIATION

The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS

The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.

NOTE

It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.

USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

JUNE

PRESSURE.—Compared with January, the major pressure features have shifted considerably north by June. The center of the equatorial trough now lies north of the equator and the permanent high off South America is centered near 27°S, 98°W—its most northern position—with a mean central pressure of 1022 millibars. A second high is centered over the Spencer Gulf area of Australia, with a mean central pressure of 1020 millibars. South of the subtropical high, the pressure gradient is relatively zonal; pressure decreases to 990 millibars at 60°S.

TEMPERATURE.—Mean temperatures range from just under 2°C at 60°S to 29°C over the extreme northwest portion of the South Pacific. Approximately 98% of the observed temperatures at 60°S fall between -4°C and 4°C. Along the equator 98% fall between 19°C and 28°C off Ecuador to between 24°C and 33°C over the western half of the equator.

WINDS.—As in May, east to southeasterly winds prevail from central Chile to the Philippines. The region between 30°S and 40°S is a transition zone between the east-southeasterlies to the north and the westerlies to the south. North of 30°S, winds average force 3 to 4, whereas south of 30°S they average force 4 to 6.

GALES.—Gale force winds (force 8 or greater) are rare north of 30°S. Frequencies of 10% or more are generally observed south of 35°S east of New Zealand and south of 45°S west of New Zealand. Frequencies reach a high near 20% across most areas east of 165°W between 40°S and 60°S.

TROPICAL CYCLONES.—As temperatures continue to cool the frequency of tropical cyclones—observed only in the northwest quadrant of the South Pacific—continues to decrease. Past records indicate that only two tropical storms (≥ 34 knots) can be expected to develop during June within an average 10-year period. Rarely will any of these storms reach hurricane strength (≥ 64 knots).

VISIBILITY.—Poor visibilities (less than 2 miles) are observed less than 5% of the time north of 40°S. At 50°S, frequencies range from near 20% south of Australia to near 10% at 100°W. Frequencies at 60°S range from under 30% east of 110°W to over 40% west of 130°E.

WAVE HEIGHTS.—With the increase of winter cyclones the frequency of wave heights of 12 feet or higher also increases. Frequencies of 10% or more are mostly observed south of 25°S over the western half of the South Pacific and south of 10°S to 20°S over the eastern half. Frequencies increase to as high as 40% south of 45°S between 100°W and 175°W and as high as 50% south of 50°S west of 135°E.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

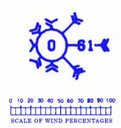
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

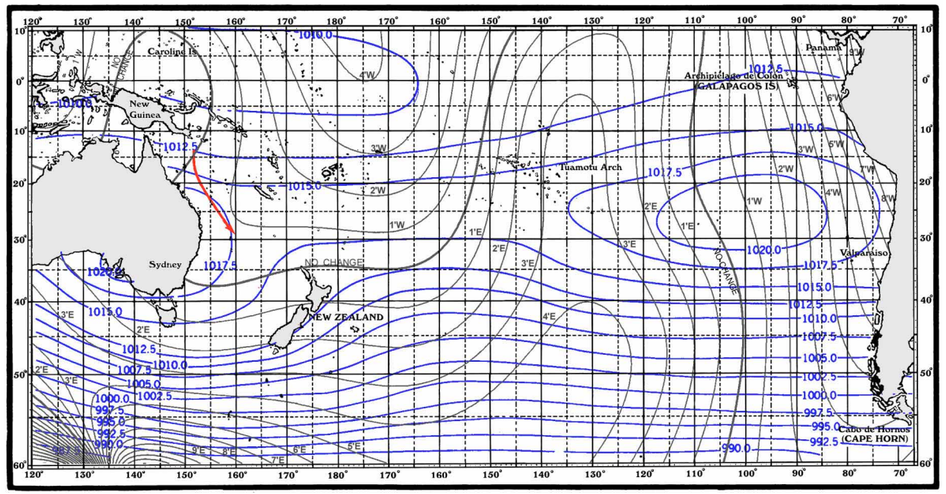
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

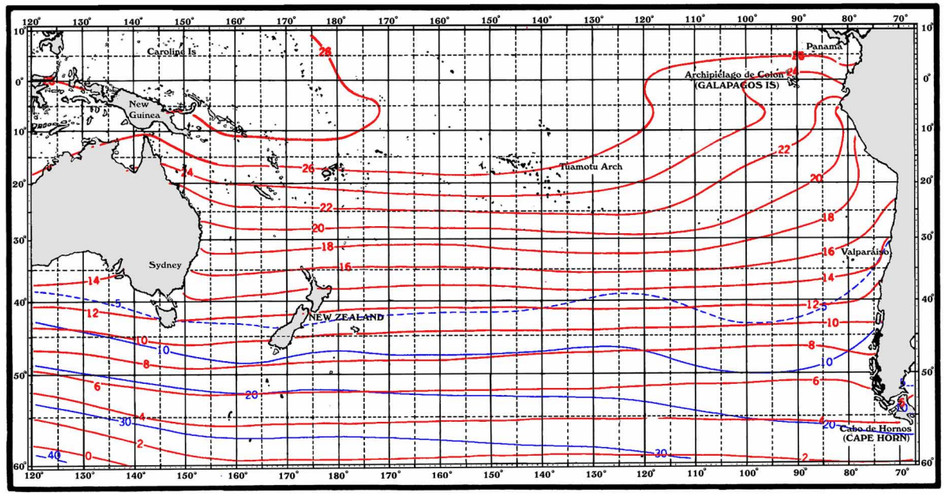
EXPLANATION OF WIND ROSES

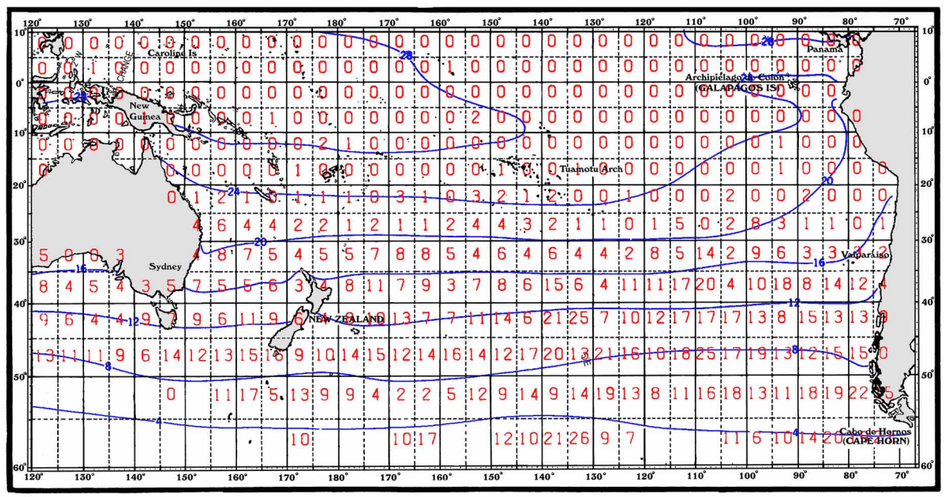
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.



FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows: From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.







WAVE HEIGHTS

The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.

MAGNETIC VARIATION

The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS

The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.

NOTE

It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.

USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

JULY

PRESSURE.—In July the central position of the permanent anticyclone off South America begins to move south from its most northern mean position during June. Now centered near 29°S,88°W it maintains a mean central pressure of 1023 millibars. A second center, over eastern Australia, averages 1018 millibars. North of the subtropical high the equatorial trough is still centered between the equator and 10°N. South of 45°S, the mean pressure pattern is relatively zonal. Mean pressure diminishes towards the pole at a rate of 2 to 3 millibars per degree of latitude between 45°S and 60°S.

TEMPERATURE.—Because of the effects of the Peruvian current, the greatest east-west variance of mean air temperatures appears along the equator. Here, means range from 22°C over the Galapagos Islands to 28°C over the Islands of Melanesia. Most observed temperatures (98%) fall between 18°C and 27°C over the Galapagos Islands and between 24°C and 33°C over Melanesia. At 60°S, means run just above freezing, 98% of the observations fall between ý6°C and 3°C.

WINDS.—East to southeasterly winds prevail north of 35°S, and west to southwesterly winds prevail south of 35°S. Wind speeds average force 3 to 4 north of 30°S and force 4 to 6 south of 30°S.

GALES.—During winter, few instances of force 8 or greater winds are observed north of 30°S. East of 170°W, gale frequencies run near 10% at 35°S and 20% in most areas beteeen 40°S and 55°S. Frequencies as high as 30% are observed in a few areas off the southwest coast and southern tip of Chile. West of 170°W, frequencies run near 10% south of 45°S.

TROPICAL CYCLONES.—By July, temperatures are cool enough that tropical cyclone activity is nearly nonexistent.

VISIBILITIES.—Over the western half of the South Pacific little change has taken place since June in the pattern of visibilities less than 2 miles. Frequencies range from 10% near 45°S to over 30% at 60°S. The eastern half, however, has shown a slight increase in the middle latitudes; frequencies over 10% are observed as far north as 35°S between 90°W and 120°W. At 60°S, frequencies remain in the 20% to 30% range over the eastern half of the South Pacific.

WAVE HEIGHTS.—The frequency of waves equal to or greater than 12 feet have increased since June. Most areas south of 15°S and a few areas north of 10°S report wave heights of at least 12 feet 10% or more of the time. Exceptions are found along the west coast of South America and the northeast coast of Australia. Frequencies increase to as high as 50% over a large portion of the area west of 100°W and south of 48°S.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

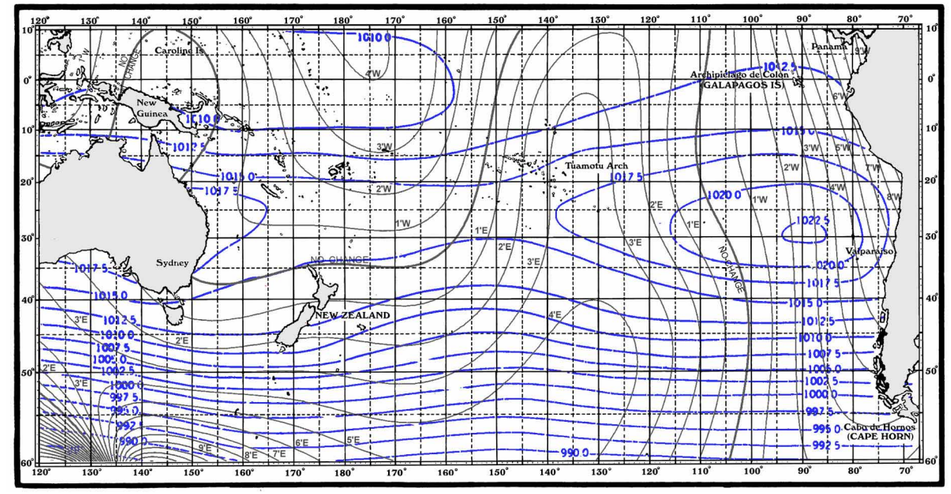
CHART #3

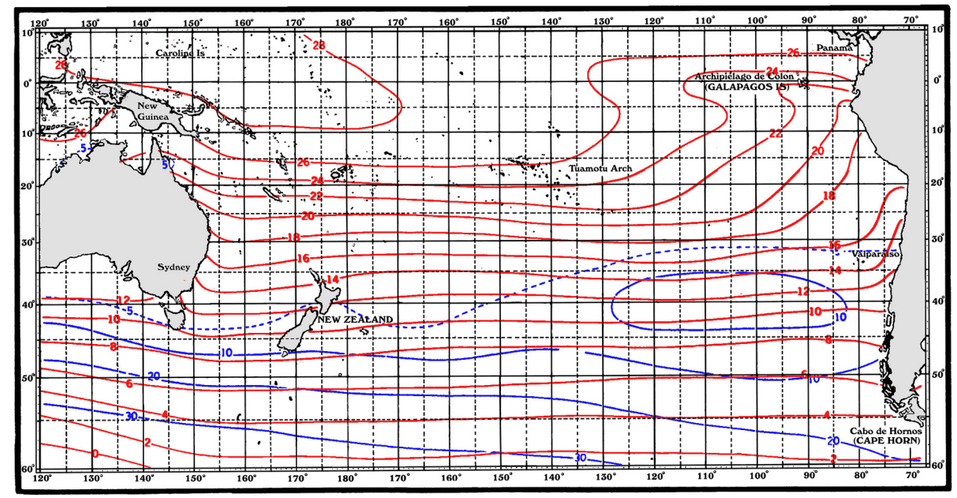
GALES

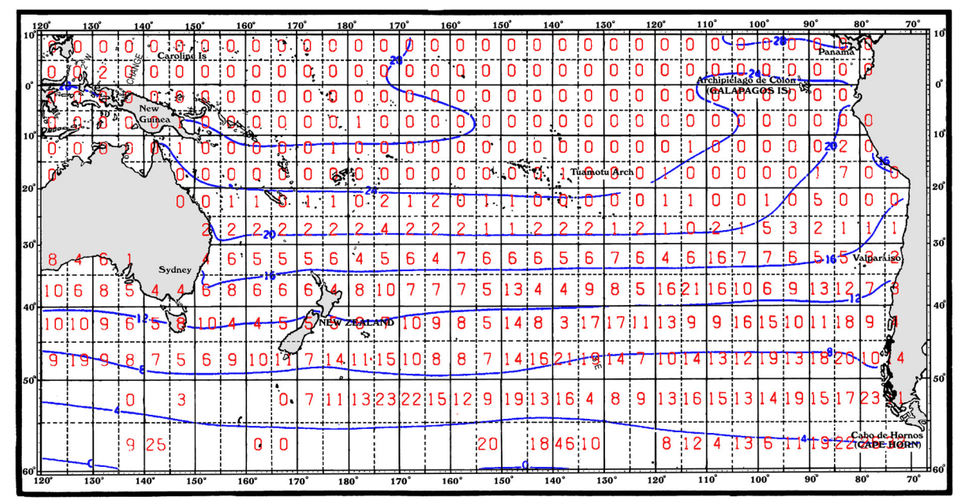
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

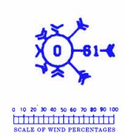






EXPLANATION OF WIND ROSES

PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.



FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows: From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.

WAVE HEIGHTS

The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.

MAGNETIC VARIATION

The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS

The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.

NOTE

It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.

USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

Among the Tuvalu, Gilbert and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March

MAXIMUM EXTENT OF ICEBERGS

MAXIMUM EXTENT OF ICEBERGS

Cabo de Hornos (Cape Horn)

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

AUGUST

PRESSURE.—An area of high pressure continues to overlie the area between South America and Australia, with a mean central pressure of 1025 millibars centered near 31°S, 90°W. Mean pressures slowly decrease to the north of the high to less than 1009 millibars within the equatorial trough centered between the equator and 10°N. South of 45°S, the mean pressure pattern remains zonal; the mean pressure decreases to near 988 millibars at 60°S.

TEMPERATURE.—Mean air temperatures are close to freezing at 60°S, while along the equator they range from 21°C off South America to over 28°C through the Melanesia Island chain. Approximately 1% of the temperature observations fall above 3°C and below -6°C at 60°S. Most (98%) equatorial temperatures fall between 18°C and 27°C over the Galapagos Islands and between 25°C and 33°C over the western South Pacific.

WINDS.—Wind speeds continue to average force 4 to 6 south of 30°S and force 3 to 4 north of 30°S. East to southeasterly winds prevail north of the 30th parallel and westerly winds, south of 30°S. The prevailing westerlies, however, are somewhat more variable in direction (northwest through southwest) than during the warmer months.

GALES.—Gale force winds (force 8 or greater) are rarely observed north of 30°S. Frequencies of 10% or higher occur south of a line that runs south of Tasmania and New Zealand before turning north and reaching as far north as 33°S at 110°W. East of 170°W, 55°S gale frequencies of 20% or more reach as far north as 38°S at 110°W and extend south of 60°S east of 110°W. Frequencies as high as 30% are observed through the Drake Passage.

TROPICAL CYCLONES.—Tropical cyclone activity is virtually non-existent during the height of the austral winter.

VISIBILITY.—Along with the winter temperatures, increased occurrences of poor visibilities (less than 2 miles) appear over the eastern South Pacific. Frequencies of 20% are reported as far north as 42°S between 85°W and 100°W, whereas over the western South Pacific frequencies are less than 10% at 42°S. Frequencies at 60°S range from 40% west of 130°E to just over 30% east of 100°W.

WAVE HEIGHTS.—Over the eastern third of the South Pacific frequencies of wave heights of 12 feet or greater range from 10% as far north as 5°S to as high as 50% west of 90°W and south of 50°S. Frequencies across the western two-thirds range from 10% south of 20°S to 25°S to over 50% south of 50°S to 55°S.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

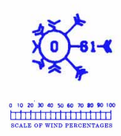
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

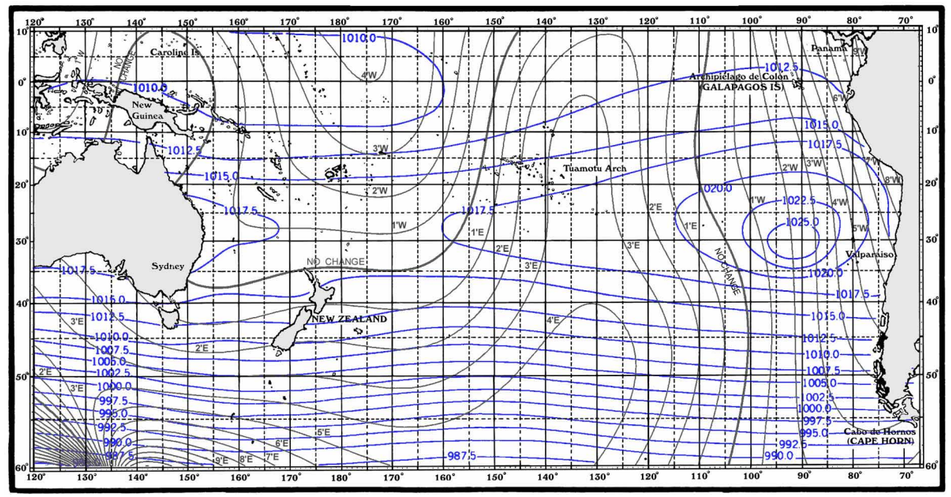
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

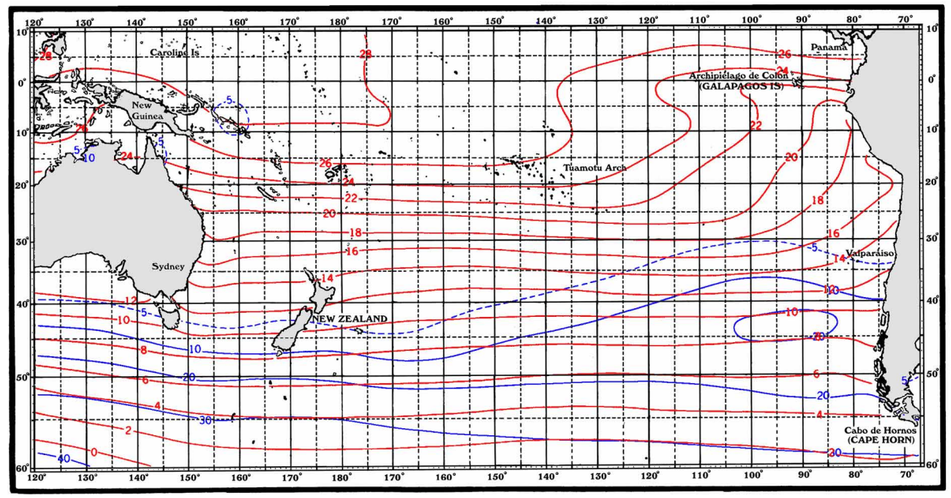
EXPLANATION OF WIND ROSES

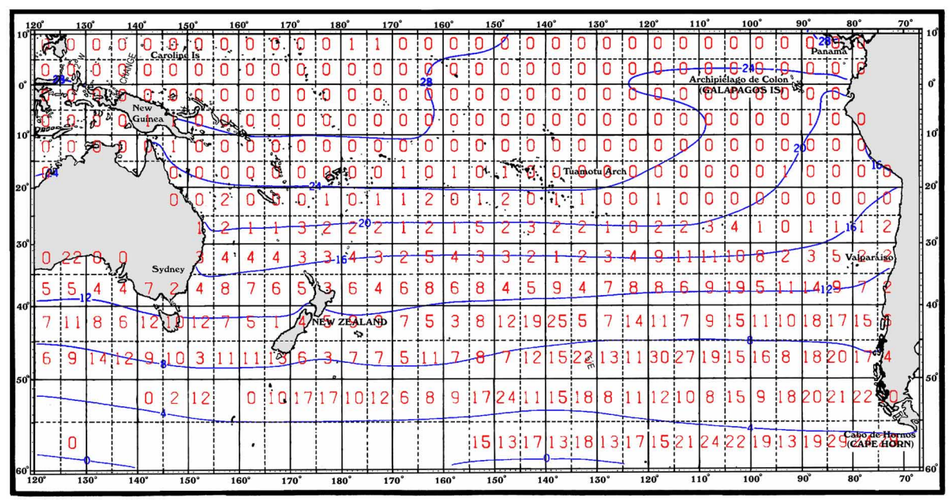
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

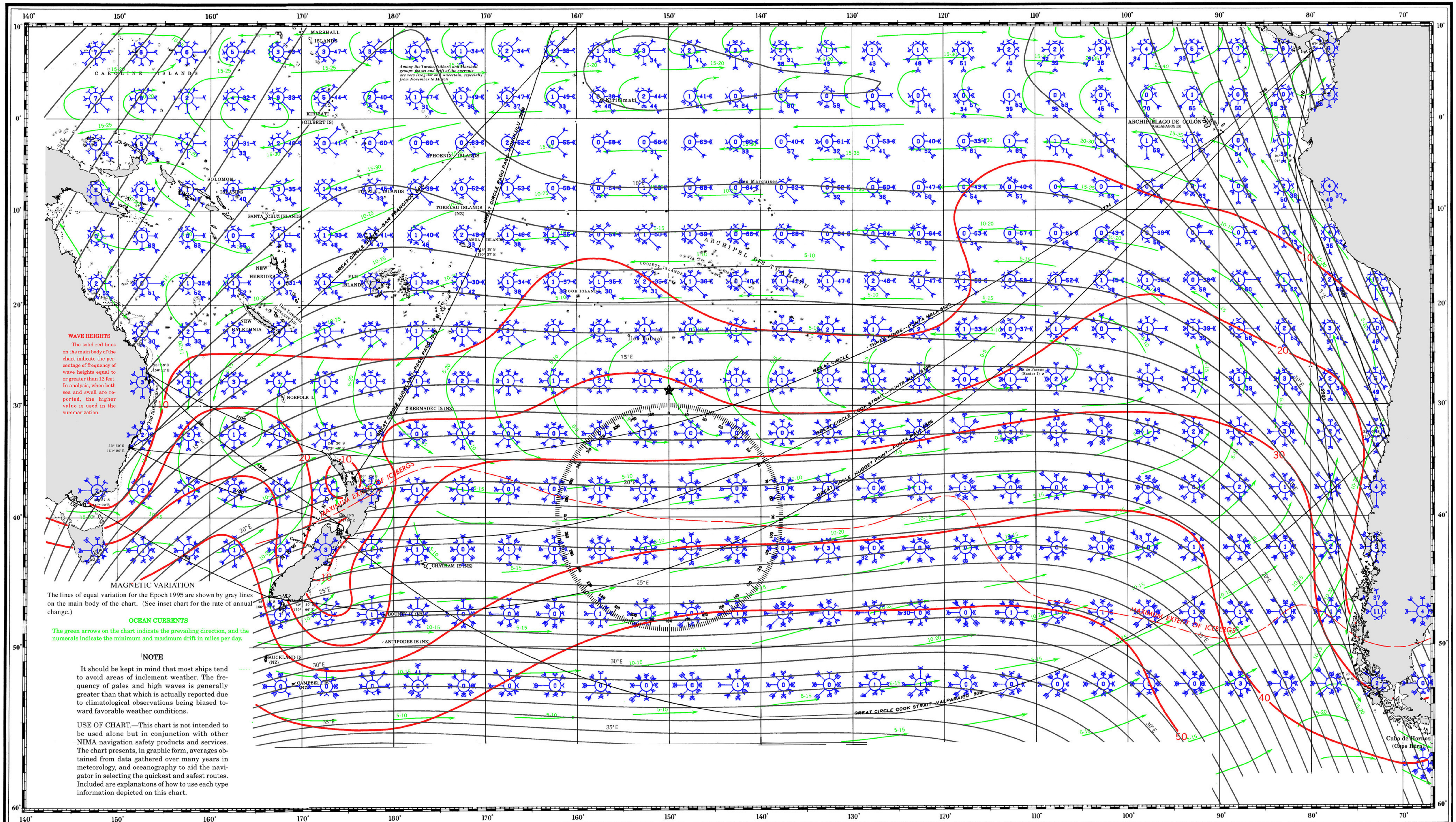


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows: From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.








WAVE HEIGHTS
The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.
MAGNETIC VARIATION
The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)
OCEAN CURRENTS
The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.
NOTE
It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.
USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.
Among the Tuvalu, Gilbert, and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March
MARSHALL ISLANDS
CAROLINE ISLANDS
KIRIBATI (GILBERT IS)
PHOENIX ISLANDS
SOLOMON ISLANDS
SANTA CRUZ ISLANDS
TOKELAU ISLANDS (NZ)
NEW HEBRIDES
FIJI ISLANDS
NEW CALEDONIA
NORFOLK I.
KERMADEC IS (NZ)
CHATHAM IS (NZ)
BOUNTY IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL I (NZ)
Iles Marquises
ARCHIPEL DES TUAMOTU
SOCIETY ISLANDS
COOK ISLANDS
Iles Tubuai
ARCHIPIELAGO DE COLON (GALAPAGOS IS)
Isla de Pascua (Easter I)
MAXIMUM EXTENT OF ICEBERGS
Cabo de Hornos (Cape Horn)
GREAT CIRCLE COOK STRAIT—VALPARAISO 5021
GREAT CIRCLE NUGGET POINT—PUNTA MALA 6556
GREAT CIRCLE COOK STRAIT—PUNTA MALA 6326
GREAT CIRCLE THREE KINGS—PUNTA MALA 6329
GREAT CIRCLE AUCKLAND—PAGO PAGO 1578
GREAT CIRCLE SAN FRANCISCO—FIJI
GREAT CIRCLE PAGO PAGO—HONOLULU 2263
33° 50' S 151° 20' E
140° 150° 160° 170° 180° 170° 160° 150° 140° 130° 120° 110° 100° 90° 80° 70°
10° 0° 10° 20° 30° 40° 50° 60°

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication “Mariners Weather Log” prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

SEPTEMBER

PRESSURE.—The subtropical high pressure belt still extends from South America to Australia. The mean center of the permanent high off the South American coast lies near 33°S, 91°W, with a mean pressure just over 1025 millibars. The equatorial trough is still centered north of the equator, just south of 10°N. South of 45°S the strong zonal pressure gradient continues; means range from 1010 to 1013 millibars at 45°S to near 985 millibars at 60°S.

TEMPERATURE.—Mean air temperatures range from near 0°C at 60°S to over 28°C in the northwestern portion of the South Pacific. At 60°S, 98% of the observations fall between ý4°C and 4°C. Along the equator, 98% fall between 18°C and 27°C and 90°W and between 25°C and 32°C at 170°E.

WINDS.—Prevailing winds are southeasterly from central Chile to New Guinea, southerly across the Philippines, and westerly from Australia to southern Chile. In general, wind speeds average force 3 to 4 north of 30°S and force 4 to 6 south of 30°S.

GALES.—Winds of force 8 or greater are mainly confined south of 30°S. Over the eastern half of the South Pacific, gales increase from 10% at 35°S to 20% at 38°S to a maximum of 30% through the Drake Passage. Across the western half, frequencies run in the neighborhood of 10% for most areas south of 45°S.

TROPICAL CYCLONES.—During the height of winter, tropical storm activity is virtually nonexistent.

VISIBILITY.—During September, the frequency pattern for visibilities less than 2 miles is relatively zonal. The 10% isopleth ranges between 42°S and 48°S and the 30% isopleth, between 55°S and 62°S.

WAVE HEIGHTS.—The frequency pattern of wave heights equal to or greater than 12 feet is very similar to that of August. Frequencies of at least 10% are found south from Australia and New Caledonia over the western third of the South Pacific to south of 10°S over the eastern third. Wave heights of this magnitude increase in frequency to over 50% in the region south of 52°S to 55°S and west of 100°W.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

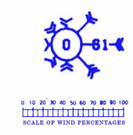
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where “0” is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

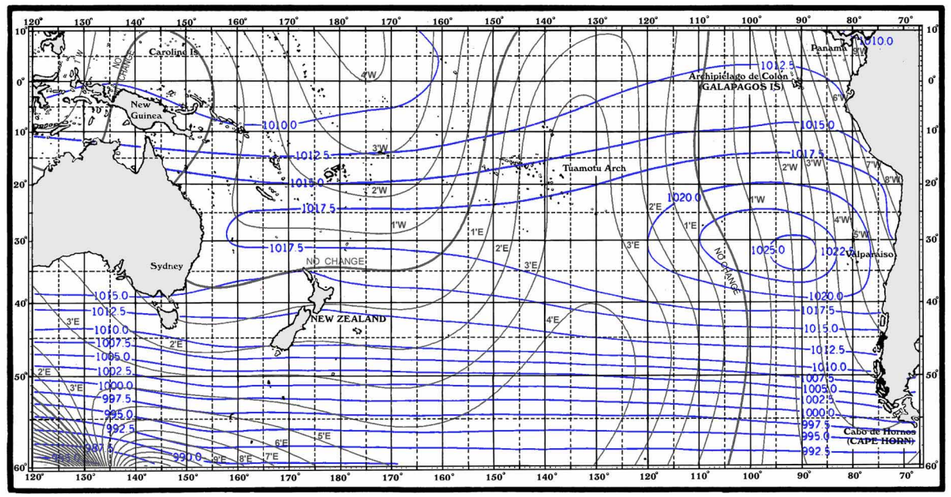
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

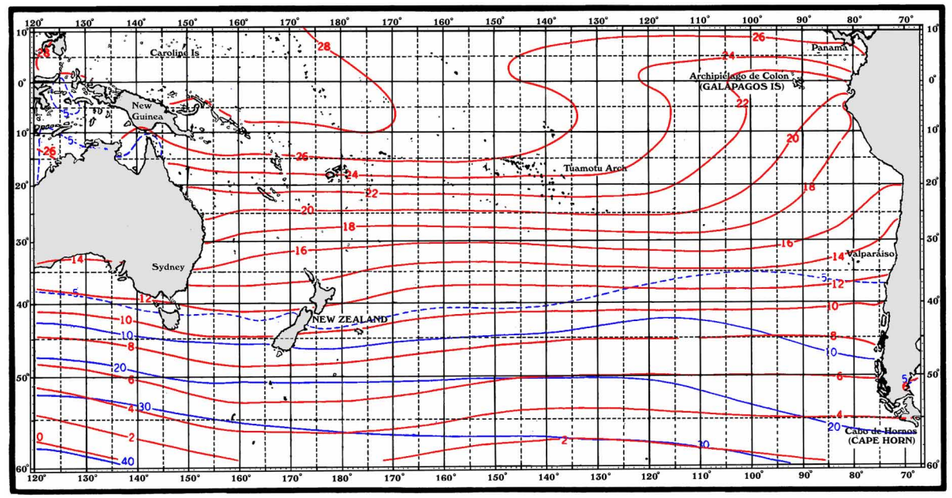
EXPLANATION OF WIND ROSES

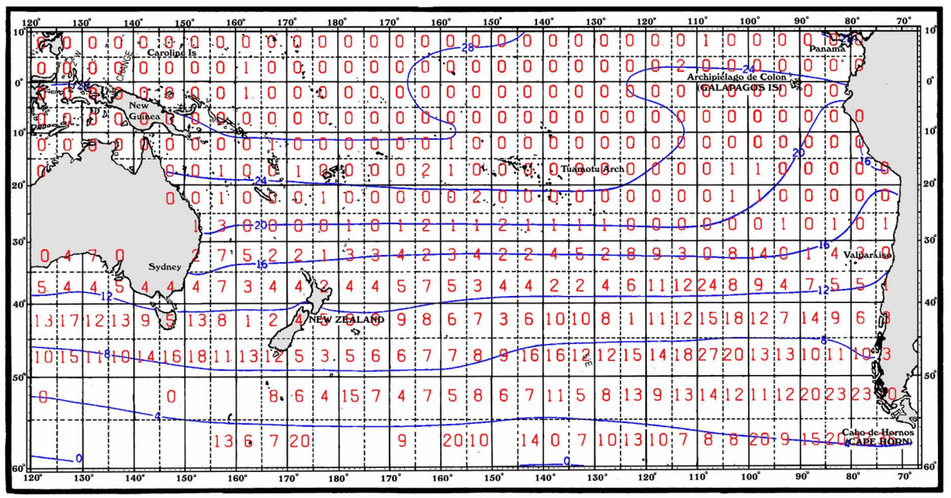
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

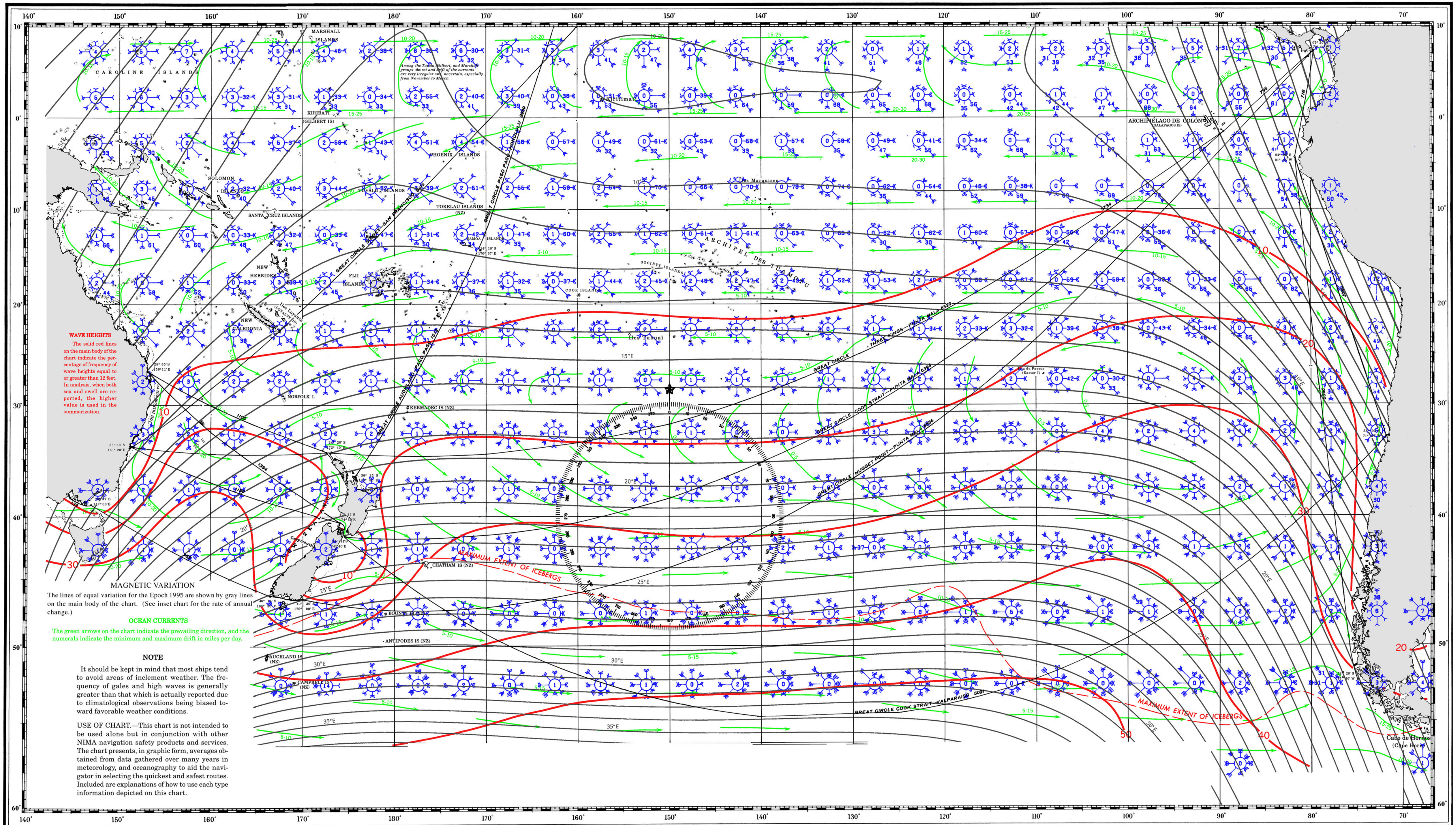


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows:
From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.









WAVE HEIGHTS
The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.
MAGNETIC VARIATION
The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)
OCEAN CURRENTS
The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.
NOTE
It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.
USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.
MARSHALL ISLANDS
CAROLINE ISLANDS
KIRIBATI (GILBERT IS)
Among the Tuvalu, Gilbert, and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March
PHOENIX ISLANDS
SOLOMON ISLANDS
SANTA CRUZ ISLANDS
TOKELAU ISLANDS (NZ)
NEW HEBRIDES
FIJI ISLANDS
NEW CALEDONIA
COOK ISLANDS
SOCIETY ISLANDS
ARCHIPEL DES TUAMOTU
Iles Marquises
Iles Tubuai
ARCHIPIÉLAGO DE COLÓN (GALAPAGOS IS)
NORFOLK I.
KERMADEC IS (NZ)
CHATHAM IS (NZ)
BOUNTY IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL IS (NZ)
Isla de Pascua (Easter I)
Cabo de Hornos (Cape Horn)
MAXIMUM EXTENT OF ICEBERGS
GREAT CIRCLE COOK STRAIT—VALPARAISO
GREAT CIRCLE NUGGET POINT—PUNTA MALA
GREAT CIRCLE COOK STRAIT—PUNTA MALA
GREAT CIRCLE THREE KINGS—PUNTA MALA
GREAT CIRCLE PAGO PAGO—HONOLULU
GREAT CIRCLE AUCKLAND—PAGO PAGO
GREAT CIRCLE SUVA—SAN FRANCISCO

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

OCTOBER

PRESSURE.—The permanent anticyclone off South America is strongest during October and November; the mean central pressure is just over 1026 millibars. During October, its mean position is near 33°S, 90°W. In contrast, the belt of high pressure over Australia is much more zonal and diffuse than during the winter months. The equatorial trough maintains its weak pressure gradient and position north of the equator. South of New Zealand the global circulation maintains the tight zonal pressure gradient.

TEMPERATURE.—Mean air temperatures at 80°W longitude range from 3°C at 60°S to 24°C at the equator. At 160°W, means range from 2°C at 60°S to 29°C at the equator. Of the observations at 60°S, 98% fall between a ý3°C and 4°C; along the equator, 98% fall between 18°C and 27°C at 90°W and between 25°C and 33°C at 160°E.

WINDS.—The transition between the southeasterly winds to the north and the westerly winds to the south takes place in the vicinity of the 30th parallel. Mean winds of force 4 to 6 are generally found south of 40°S, 10 degrees farther south than during September. Winds average force 3 to 4 north of 40°S.

GALES.—Winds of force 8 or greater are infrequently observed north of 40°S. Frequencies reach 10% at 40°S near 110°W and from 2 to 5 degrees farther south for most other areas. Frequencies of 20% are found mainly east of 155°W and within 6 degrees either side of 54°S. Maximum occurrences reach 30% through the Drake Passage.

TROPICAL CYCLONES.—Temperatures are still to cool across the South Pacific for any significant tropical cyclone development.

VISIBILITY.—Most instances of visibilities less than 2 miles occur south of 40°S. At 20°W, frequencies range from just under 10% at 40°S to over 30% at 60°S. Frequencies at 170°E range from near 10% at 45°S to over 30% at 60°S.

WAVE HEIGHTS.—Wave heights of 12 feet or more have decreased in frequency since September. In general, 10% frequencies or greater lie south of 30°S over the western half of the South Pacific, with the exception of the coastal regions of Australia and New Zealand, and south of 20° over the eastern half, with the exception of the coastal regions of Chile. Frequencies increase southerly to over 50% in many areas south of 55°S.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

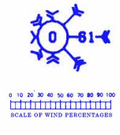
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

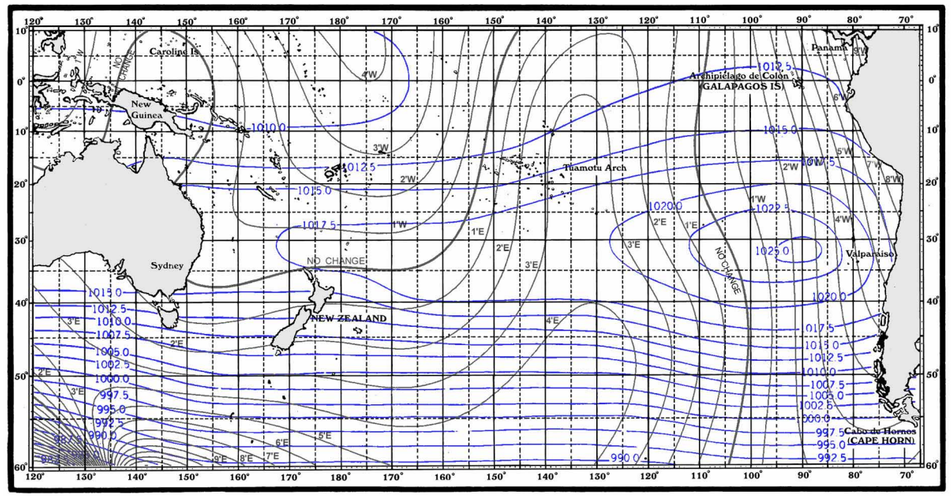
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

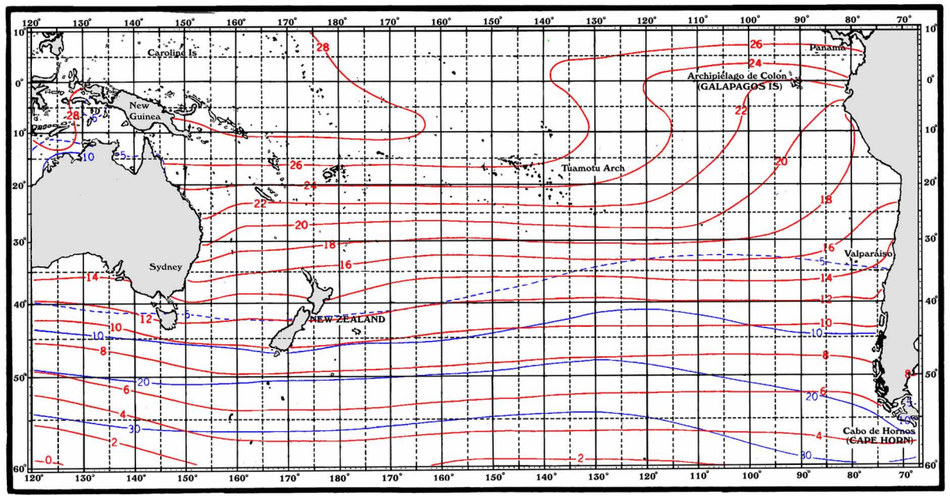
EXPLANATION OF WIND ROSES

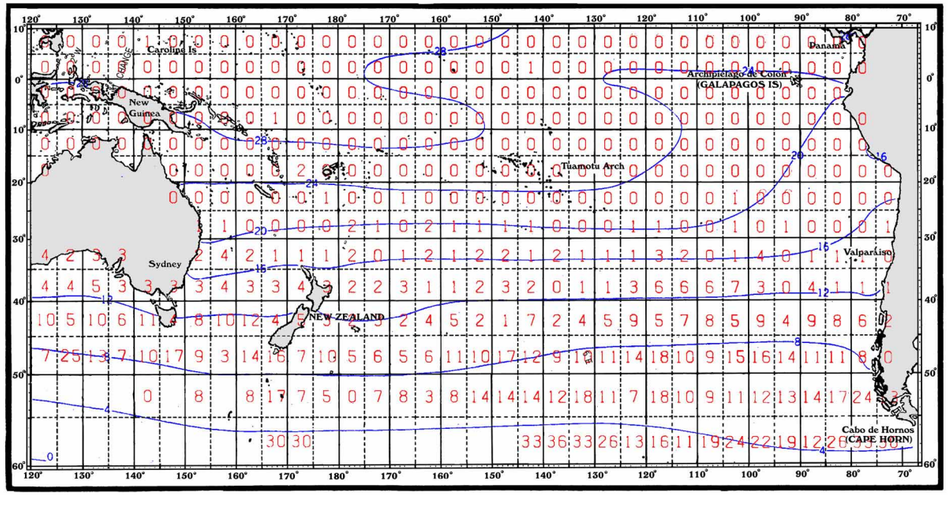
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

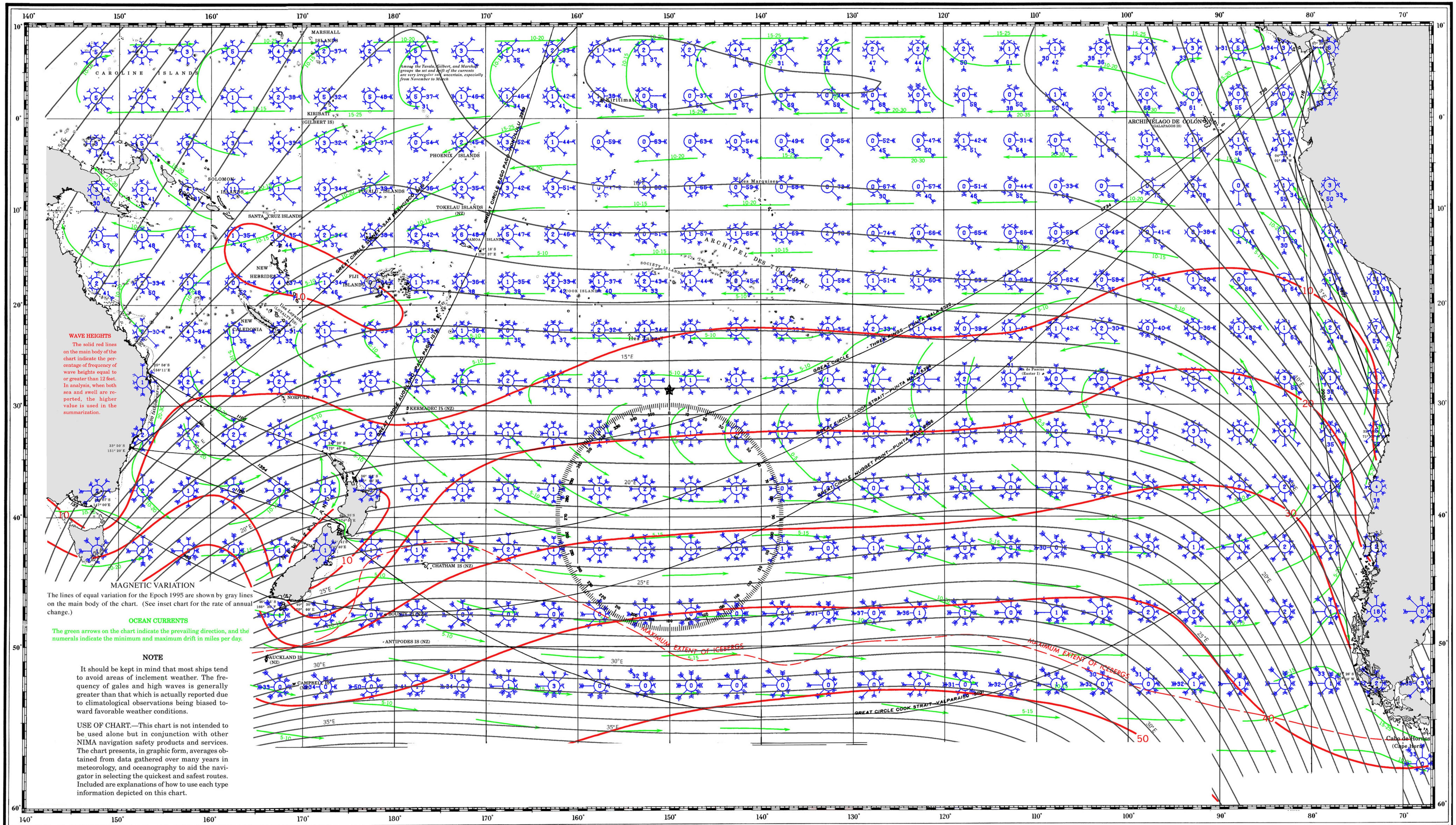


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows: From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.









WAVE HEIGHTS

The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.

MAGNETIC VARIATION

The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS

The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.

NOTE

It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.

USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

NOVEMBER

PRESSURE.—November's mean pressure pattern is little changed from October's. The permanent high off South America, centered near 33°S, 92°W, has a mean central pressure of 1026 millibars. This ties with October for the highest monthly mean pressure. South of 45°S the relatively strong mean zonal pressure gradient continues. Mean pressures decrease poleward by 2 to 3 millibars per degree latitude between 45°S and 60°S. The equatorial trough is centered over the equator west of 150°W and just south of 10°N east of 150°W.

TEMPERATURE.—Mean air temperatures along the equator begin to increase over its eastern half. Little variation is noted over its western half, even on an annual basis. Means along the equator range from 23°C off South America to 29°C west of the Gilbert Islands. Along the equator 98% of the observations at 80°W fall between 20°C and 28°C and at 160°E, between 25°C and 33°C. At 60°S, temperatures average near 3°C, with 98% falling between -2°C and 5°C.

WINDS.—Southeasterly trade winds extend from the South American coast, near 40°S, to northern Australia. Westerly winds (northwest through southwest) prevail from Australia to the Drake Passage. Average winds of force 3 to 4 occur across most areas north of 40°S, whereas south of 40°S the averge force is 4 to 5 (slightly less than in October).

GALES.—In general, most areas observe fewer gale force winds (force 8 or greater) than in October. Less than 5% of the observations north of 40°S report gales; most areas south of 45°S report frequencies of 10% or more. Frequencies reach a maximum of over 20% off the southwest coast of Chile and through the Drake Passage.

TROPICAL CYCLONES.—By November, temperatures have increased enough across the northwest gradrant of the South Pacific to spawn some tropical cyclone activity. Based on an average 10-year period, seven storms can be expected to attain force 8 strength (≥ 34 knots) during November. Of these storms, three should reach hurricane strength (≥ 64 knots).

VISIBILITY.—Ocean areas north of 40°S are infrequently affected with visibilities less than 2 miles. Between 40°S and 50°S, frequencies range from under 5% to just over 20%. Frequencies between 50°S and 60°S range from over 10% to 40%.

WAVE HEIGHTS.—The region between Australia and New Zealand experiences wave heights of at least 12 feet 10% or more of the time south of 25°S and 40%, south of 53°S. Between New Zealand and South America, wave heights of this magnitude range from 10% near 25°S to over 40% south of 55°S. Frequencies around New Zealand range from under 10% along the north and east coasts to near 20% along the southwest coast.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

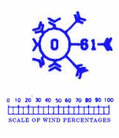
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

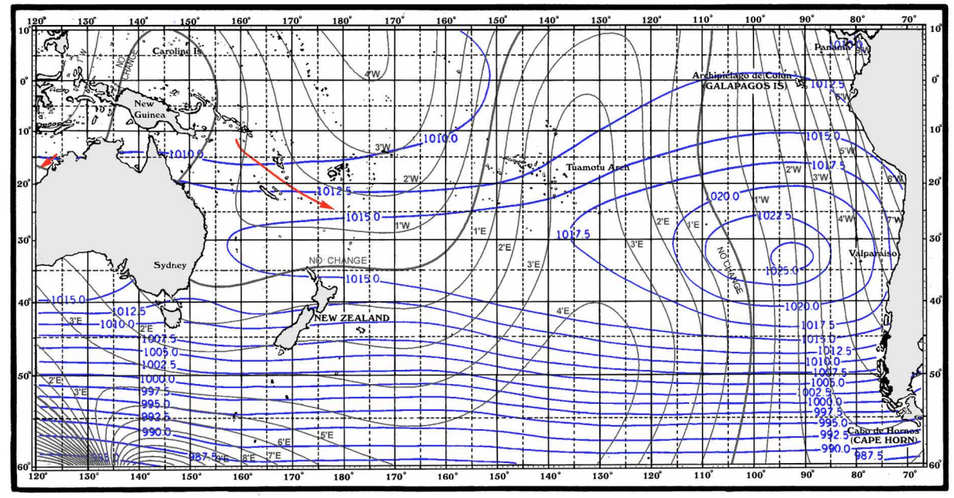
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

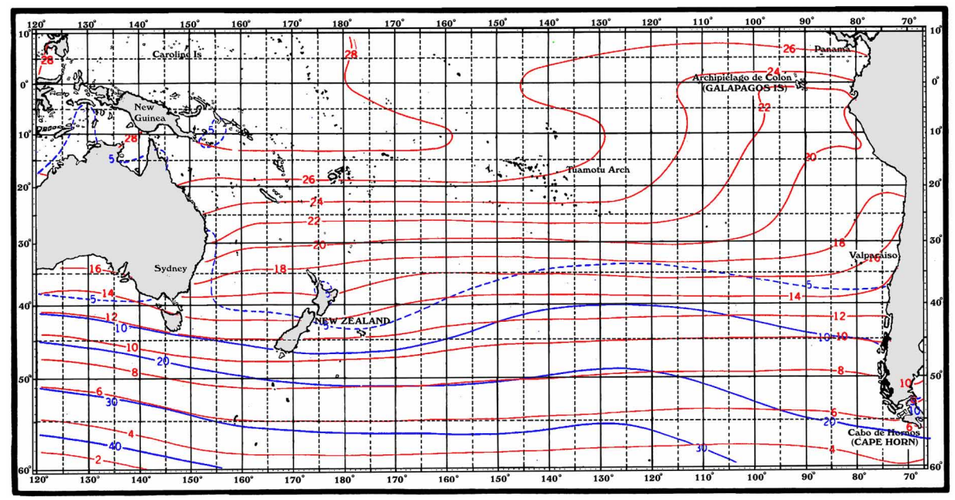
EXPLANATION OF WIND ROSES

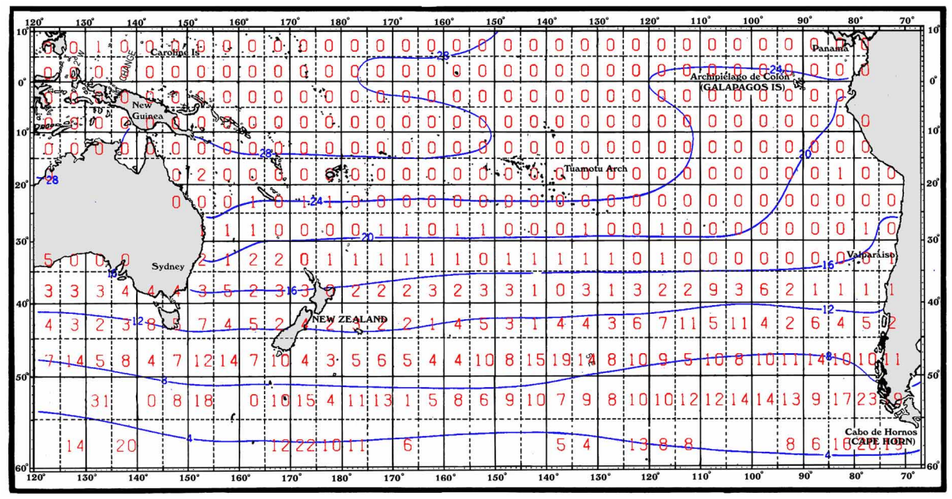
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

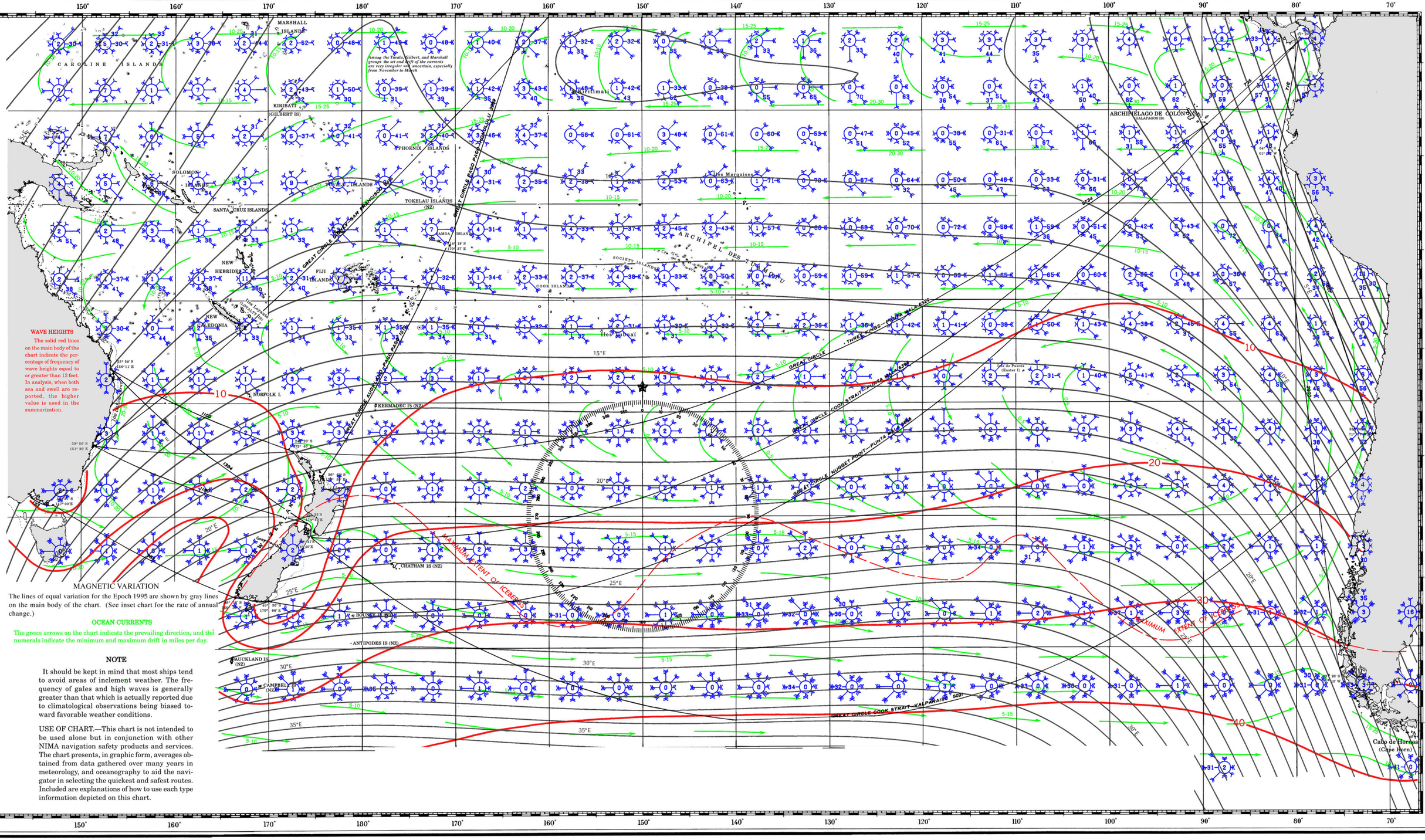


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows:
From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.








MARSHALL ISLANDS
CAROLINE ISLANDS
KIRIBATI (GILBERT IS)
Among the Tuvalu, Gilbert, and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March
Nukunau
PHOENIX ISLANDS
SOLOMON ISLANDS
TOKELAU ISLANDS (NZ)
SAMOA ISLANDS
Iles Marquises
ARCHIPEL DES TUAMOTU
SOCIETY ISLANDS
COOK ISLANDS
NEW HEBRIDES
FIJI ISLANDS
NEW CALEDONIA
Iles Loyalty
Iles Tubuai
ARCHIPELAGO DE COLON (GALAPAGOS IS)
Isla de Pascua (Easter I.)
NORFOLK I.
KERMADEC IS (NZ)
CHATHAM IS (NZ)
BOUNTY IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL I. (NZ)
Cabo de Hornos (Cape Horn)
GREAT CIRCLE SUVA—SAN FRANCISCO
GREAT CIRCLE PAGO PAGO—TOKELAU GRP
GREAT CIRCLE AUCKLAND—PAGO PAGO
GREAT CIRCLE THREE KINGS—PUNTA MALA 4626
GREAT CIRCLE COOK STRAIT—PUNTA MALA 4626
GREAT CIRCLE NUGGET POINT—PUNTA MALA 4626
GREAT CIRCLE COOK STRAIT—VALPARAISO 5021
MAXIMUM EXTENT OF ICEBERGS
MAXIMUM EXTENT OF ICEBERGS
WAVE HEIGHTS
The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.
MAGNETIC VARIATION
The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)
OCEAN CURRENTS
The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.
NOTE
It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.
USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.

LOCAL WEATHER.—For extended remarks on the marine climate along foreign coasts, see the appropriate Sailing Directions and Planning Guides prepared and published by the National Imagery and Mapping Agency ; for the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Service. The trimester publication "Mariners Weather Log" prepared and published by the National Oceanic and Atmospheric Administration, National Weather Service, carries informative articles on marine climate conditions and tropical cyclone information.

DECEMBER

PRESSURE.—As in all previous months a high pressure belt extends from South America to Australia. Centered near 33°S, 94°W, the mean central pressure of the subtropical high averages just over 1025 millibars. The equatorial trough with its shallow pressure gradient is centered south of the equator west of 140°W and north of the equator east of 140°W. South of 45°S, the tight zonal pressure gradient is maintained.

TEMPERATURE.—Mean air temperatures at 80°W range from 5°C at 60°S to 24°C at the equator; at 160°E they range from 3°C at 60°S to over 28°C at the equator. Examination of the temperature distribution along the equator shows that approximately 98% of the observations at 80°W fall between 20°C and 28°C and at 160°E, between 25°C and 33°C. At 60°S, 98% of the observations fall between 0°C and 7°C.

WINDS.—Prevailing winds north of 40°S are generally south through east except from New Guinea to the Philippines where they are northwest through west. South of 40°S, winds are predominately out of the west. Wind speeds average force 3 to 4 north of 40°S and force 4 to 5 south of 40°S.

GALES.—The occurrence of gale force winds continues to decrease. In most areas south of 50°S frequencies of 10% or more are observed, reaching a high of 20% in the Drake Passage.

TROPICAL CYCLONES.—Historical records indicate that tropical cyclones in the South Pacific spawn and live only in the northwest quadrant. Tropical cyclone activity increases during December, producing a greater number of average storms than any month since March. On the average, two tropical storms (≤ 34 knots) are observed each year. Of these, one will reach hurricane strength (≤ 64 knots) on the average of once every other year.

VISIBILITY.—As in all previous months most occurrences of poor visibilities (less than 2 miles) are confined south of 40°S. Frequencies range from 10% near 40°S to 30% to 35% at 60°S.

WAVE HEIGHTS.—Frequency isopleths of wave heights of 12 feet or more continue to be relatively zonal except in the vicinity of Australia and New Zealand where zonal frequencies decrease significantly. Between Australia and New Zealand frequencies range from 10% near 25°S, 160°E, to 40% south of 55°S, 160°E. South of New Zealand, frequencies range from 10% along the south coast to over 30% at 60°S. East of New Zealand, frequencies range from near 10% at 20°S, 90°W to over 40% south of 52°S between 90°W and 160°W.

CHART #1

TROPICAL CYCLONES

The mean tracks of tropical storms and hurricanes are shown in red. These tracks represent averages, and movements of individual systems may vary widely.

SURFACE PRESSURE

This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

CHART #2

AIR TEMPERATURE

The mean air temperature (°C) in red lines is shown for every 2 degrees. All weather narratives refer to air tempera

VISIBILITY

Blue lines show percentages of observations reporting visibilities less than 2 miles.

CHART #3

GALES

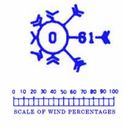
The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. In cases where the observation count is low the gale frequency may be nonrepresentative and therefore different from the values used in the text. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

SEA SURFACE TEMPERATURE

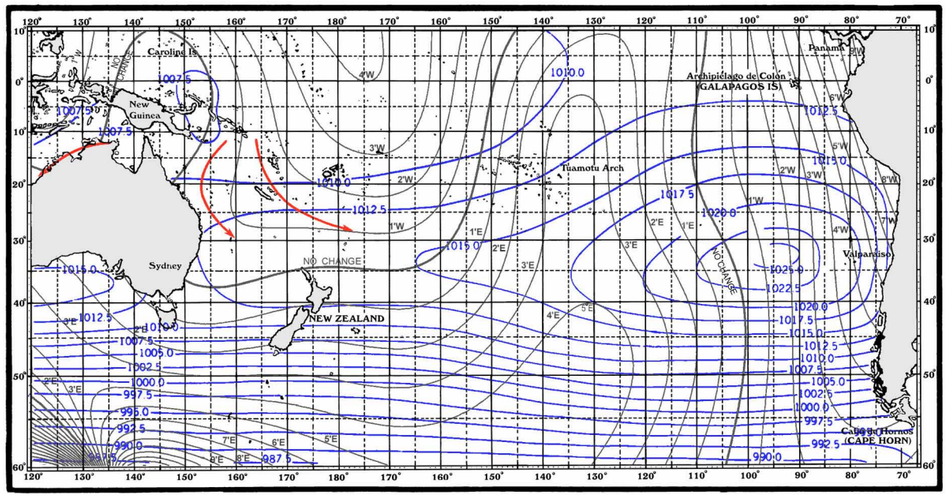
The mean sea surface temperature (C°), in blue lines, is shown for every degrees.

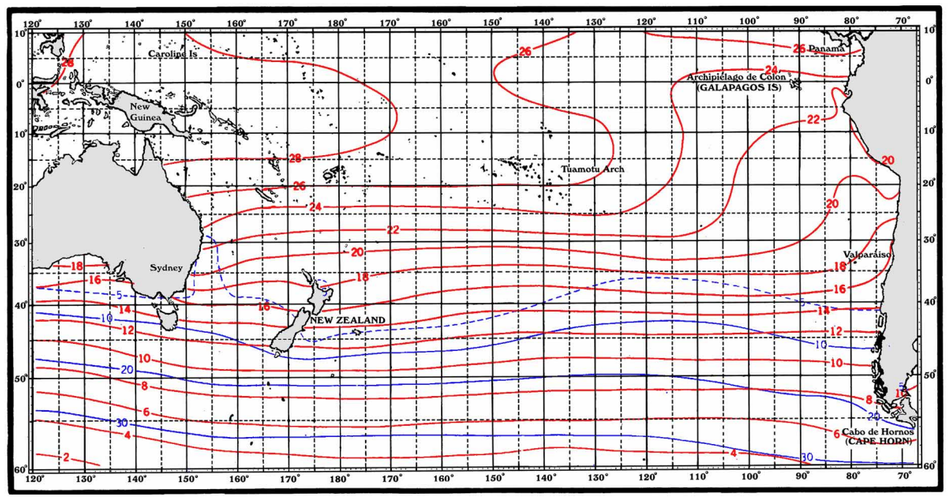
EXPLANATION OF WIND ROSES

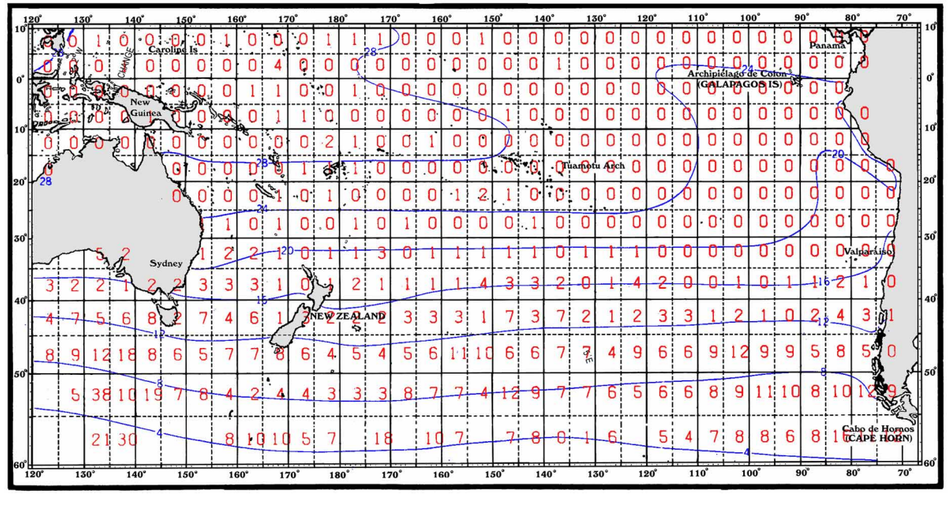
PREVAILING WINDS AND CALMS.—The wind rose in blue color is located in the center of each 5° square where there was sufficient data. The rose shows the distribution of the winds that have prevailed in the area over a considerable period. The wind percentages are summarized for the eight points and calm. The arrows fly with the wind indicating the direction from which the wind blew. The length of the shaft, measured from the outside of the circle using the scale below, gives the percent of the total number of observations in which the wind has blown from that direction. The number of feathers shows the average force of the wind on the Beaufort scale. The figure in the center of the circle gives the percentage of calms. When the arrow is too long to fit conveniently in the 5° square, anything over 29 percent, the shaft is broken and the percentage is indicated by numerals.

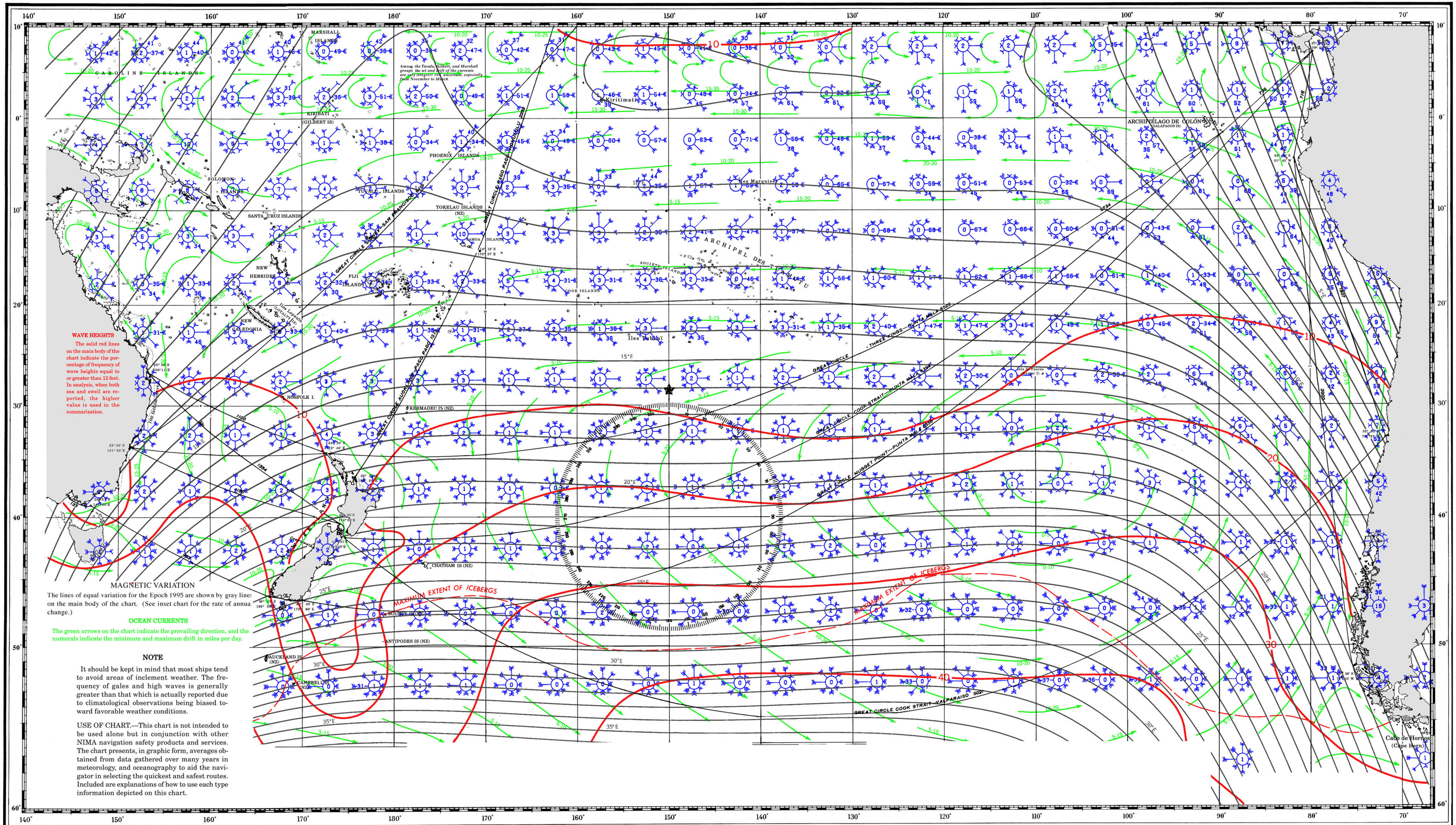


FOR EXAMPLE.—The sample wind rose should read thus: In the reported observations the wind has averaged as follows:
From N. 3 percent, force 3; N.E. 16 percent, force 4; E. 61 percent, force 4; S.E. 17 percent, force 5; S. 1 percent, force 4; S.W. less than 1 percent, force 3; W. 1 percent force 2; N.W. 1 percent, force 4; calms 0 percent.









WAVE HEIGHTS
The solid red lines on the main body of the chart indicate the percentage of frequency of wave heights equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in the summarization.
MAGNETIC VARIATION
The lines of equal variation for the Epoch 1995 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)
OCEAN CURRENTS
The green arrows on the chart indicate the prevailing direction, and the numerals indicate the minimum and maximum drift in miles per day.
NOTE
It should be kept in mind that most ships tend to avoid areas of inclement weather. The frequency of gales and high waves is generally greater than that which is actually reported due to climatological observations being biased toward favorable weather conditions.
USE OF CHART.—This chart is not intended to be used alone but in conjunction with other NIMA navigation safety products and services. The chart presents, in graphic form, averages obtained from data gathered over many years in meteorology, and oceanography to aid the navigator in selecting the quickest and safest routes. Included are explanations of how to use each type information depicted on this chart.
Among the Tuvalu, Gilbert, and Marshall groups the set and drift of the currents are very irregular and uncertain, especially from November to March
MAXIMUM EXTENT OF ICEBERGS
CAROLINE ISLANDS
MARSHALL ISLANDS
KIRIBATI (GILBERT IS)
PHOENIX ISLANDS
SOLOMON ISLANDS
SANTA CRUZ ISLANDS
TUVALU ISLANDS
TOKELAU ISLANDS (NZ)
NEW HEBRIDES
FIJI ISLANDS
NEW CALEDONIA
NORFOLK I.
KERMADEC IS (NZ)
CHATHAM IS (NZ)
BOUNTY IS (NZ)
ANTIPODES IS (NZ)
AUCKLAND IS (NZ)
CAMPBELL I (NZ)
COOK ISLANDS
SOCIETY ISLANDS
ARCHIPEL DES TUAMOTU
Iles Marquises
Kiritimati
Iles Tubuai
Isla de Pascua
ARCHIPIÉLAGO DE COLÓN (GALAPAGOS IS)
Cabo de Hornos (Cape Horn)
GREAT CIRCLE COOK STRAIT—VALPARAISO 5021