

Atlas of Pilot Charts Indian Ocean 2001

NVPUB109
Fourth Edition



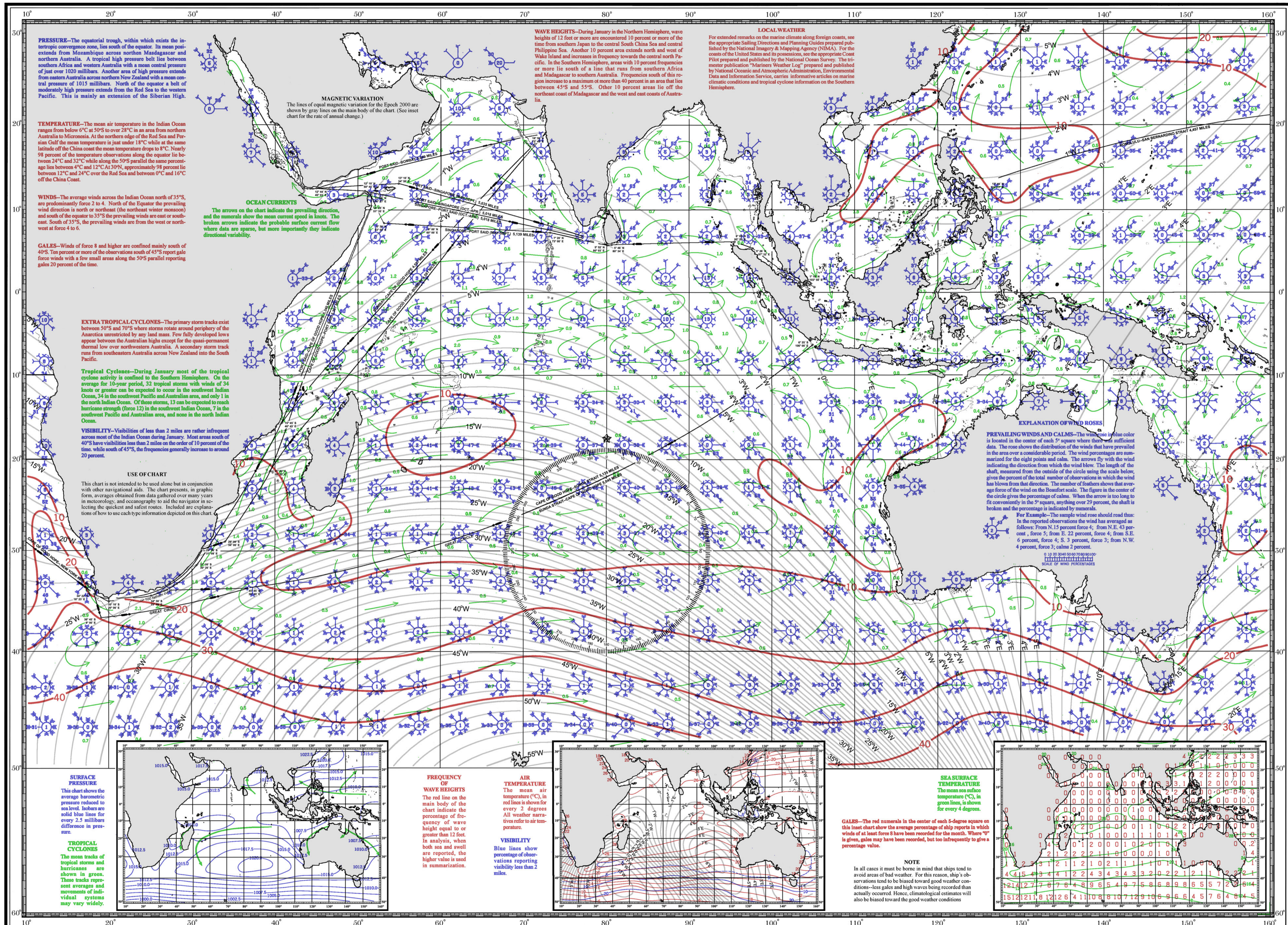
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PILOT CHART OF THE INDIAN OCEAN

JANUARY



PRESSURE—The equatorial trough, within which exists the intertropical convergence zone, lies south of the equator. Its mean position extends from Mozambique across northern Madagascar and northern Australia. A tropical high pressure belt lies between southern Africa and western Australia with a mean central pressure of just over 1020 millibars. Another area of high pressure extends from eastern Australia across northern New Zealand with a mean central pressure of 1015 millibars. North of the equator a belt of moderately high pressure extends from the Red Sea to the western Pacific. This is mainly an extension of the Siberian High.

TEMPERATURE—The mean air temperature in the Indian Ocean ranges from below 6°C at 50°S to over 28°C in an area from northern Australia to Micronesia. At the northern edge of the Red Sea and Persian Gulf the mean temperature is just under 18°C while at the same latitude off the China coast the mean temperature drops to 8°C. Nearly 98 percent of the temperature observations along the equator lie between 24°C and 32°C while along the 50°S parallel the same percentage lies between 4°C and 12°C. At 10°N, approximately 98 percent lie between 12°C and 24°C over the Red Sea and between 0°C and 16°C off the China Coast.

WINDS—The average winds across the Indian Ocean north of 35°S, are predominantly force 2 to 4. North of the Equator the prevailing wind direction is north or northeast (the northeast winter monsoon) and south of the equator to 35°S the prevailing winds are east or southeast. South of 35°S, the prevailing winds are from the west or northwest at force 4 to 6.

GALES—Winds of force 8 and higher are confined mainly south of 40°S. Ten percent or more of the observations south of 45°S report gale force winds with a few small areas along the 50°S parallel reporting gales 20 percent of the time.

EXTRA TROPICAL CYCLONES—The primary storm tracks exist between 50°S and 70°S where storms rotate around periphery of the Antarctica unrestricted by any land mass. Few fully developed lows appear between the Australian high except for the quasi-permanent thermal low over northwestern Australia. A secondary storm track runs from southeastern Australia across New Zealand into the South Pacific.

Tropical Cyclones—During January most of the tropical cyclone activity is confined to the Southern Hemisphere. On the average for 10-year period, 32 tropical storms with winds of 34 knots or greater can be expected to occur in the southwest Indian Ocean, 34 in the southwest Pacific and Australian area, and only 1 in the north Indian Ocean. Of these storms, 13 can be expected to reach hurricane strength (force 12) in the southwest Indian Ocean, 7 in the southwest Pacific and Australian area, and none in the north Indian Ocean.

VISIBILITY—Visibilities of less than 2 miles are rather infrequent across most of the Indian Ocean during January. Most areas south of 40°S have visibilities less than 2 miles on the order of 10 percent of the time, while south of 45°S, the frequencies generally increase to around 20 percent.

USE OF CHART
This chart is not intended to be used alone but in conjunction with other navigational aids. 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.

MAGNETIC VARIATION
The lines of equal magnetic variation for the Epoch 2000 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS
The arrows on the chart indicate the prevailing direction, and the numerals show the mean current speed in knots. The broken arrows indicate the probable surface current flow where data are sparse, but more importantly they indicate directional variability.

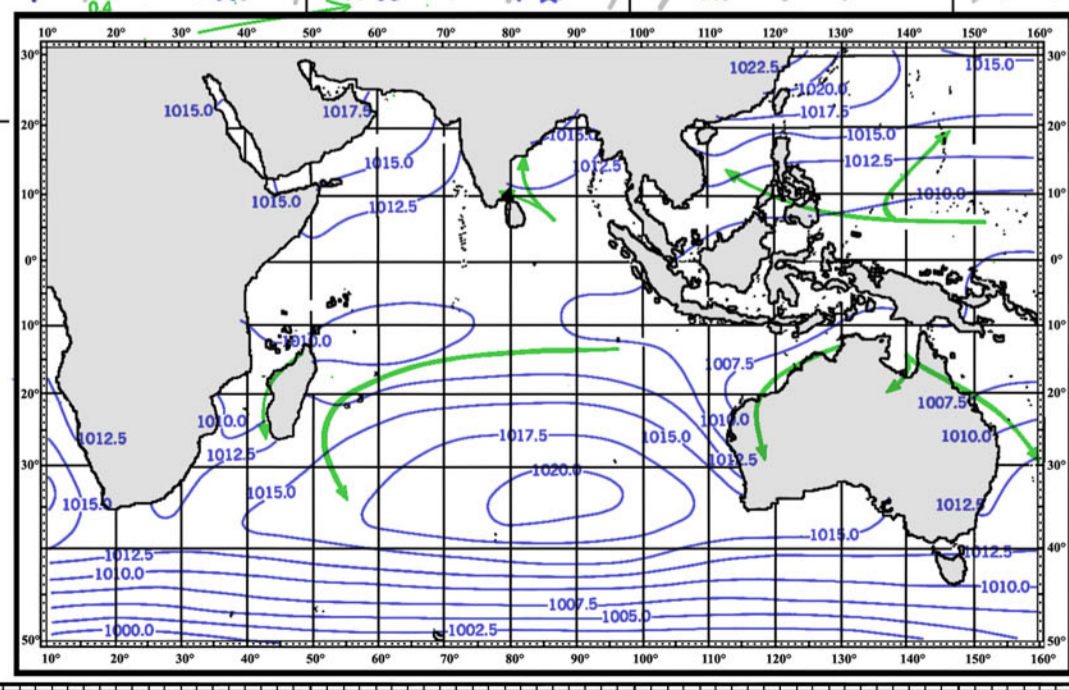
WAVE HEIGHTS—During January in the Northern Hemisphere, wave heights of 12 feet or more are encountered 10 percent or more of the time from southern Japan to the central South China Sea and central Philippine Sea. Another 10 percent area extends north and west of Wake Island and increases in frequency towards the central north Pacific. In the Southern Hemisphere, areas with 10 percent frequencies or more lie south of a line that runs from southern Africa and Madagascar to southern Australia. Frequencies south of this report increase to a maximum of more than 40 percent in an area that lies between 4°S and 55°S. Other 10 percent areas lie off the northeast coast of Madagascar and the west and east coasts of Australia.

LOCAL WEATHER
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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 calms. 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 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 that 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.

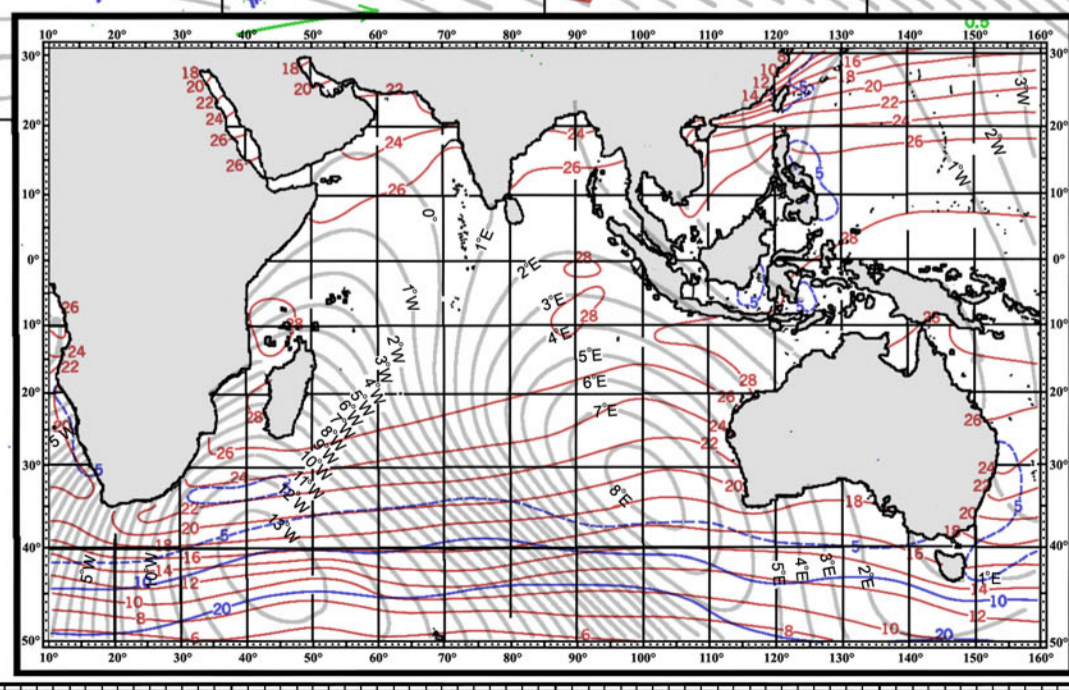
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FREQUENCY OF WAVE HEIGHTS
The red line on the main body of the chart indicates the percentage of frequency of wave height equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in summarization.

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

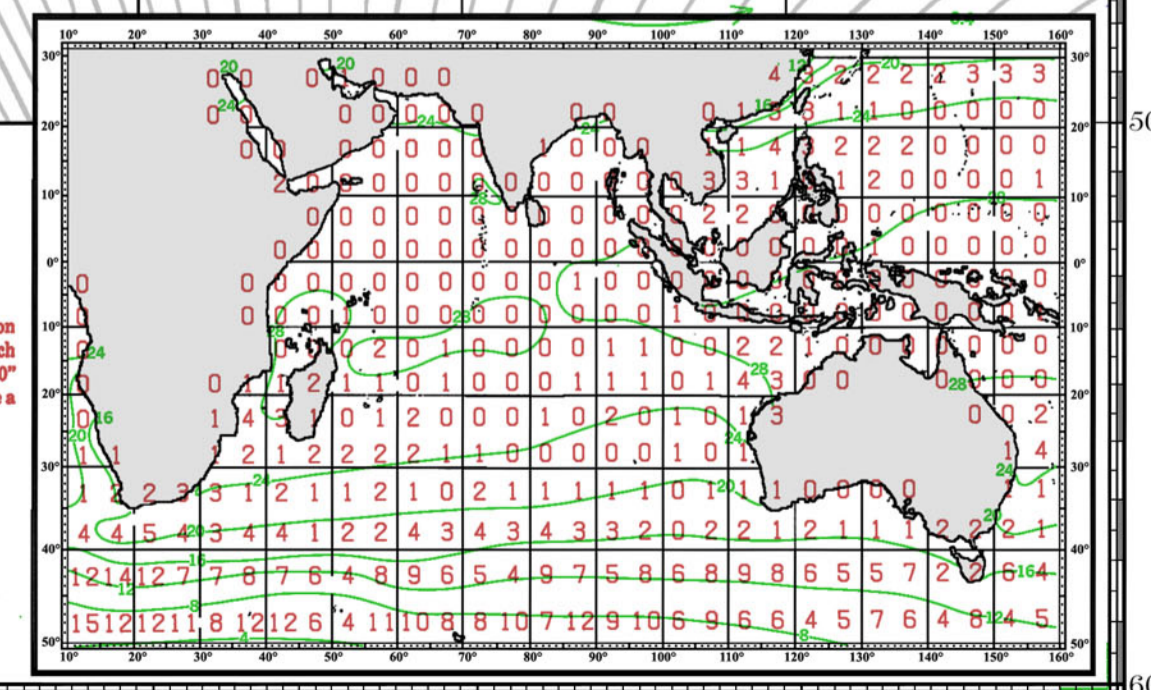
VISIBILITY
Blue lines show percentage of observations reporting visibility less than 2 miles.



SEA SURFACE TEMPERATURE
The mean sea surface temperature (°C), in green lines, is shown for every 4 degrees.

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. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

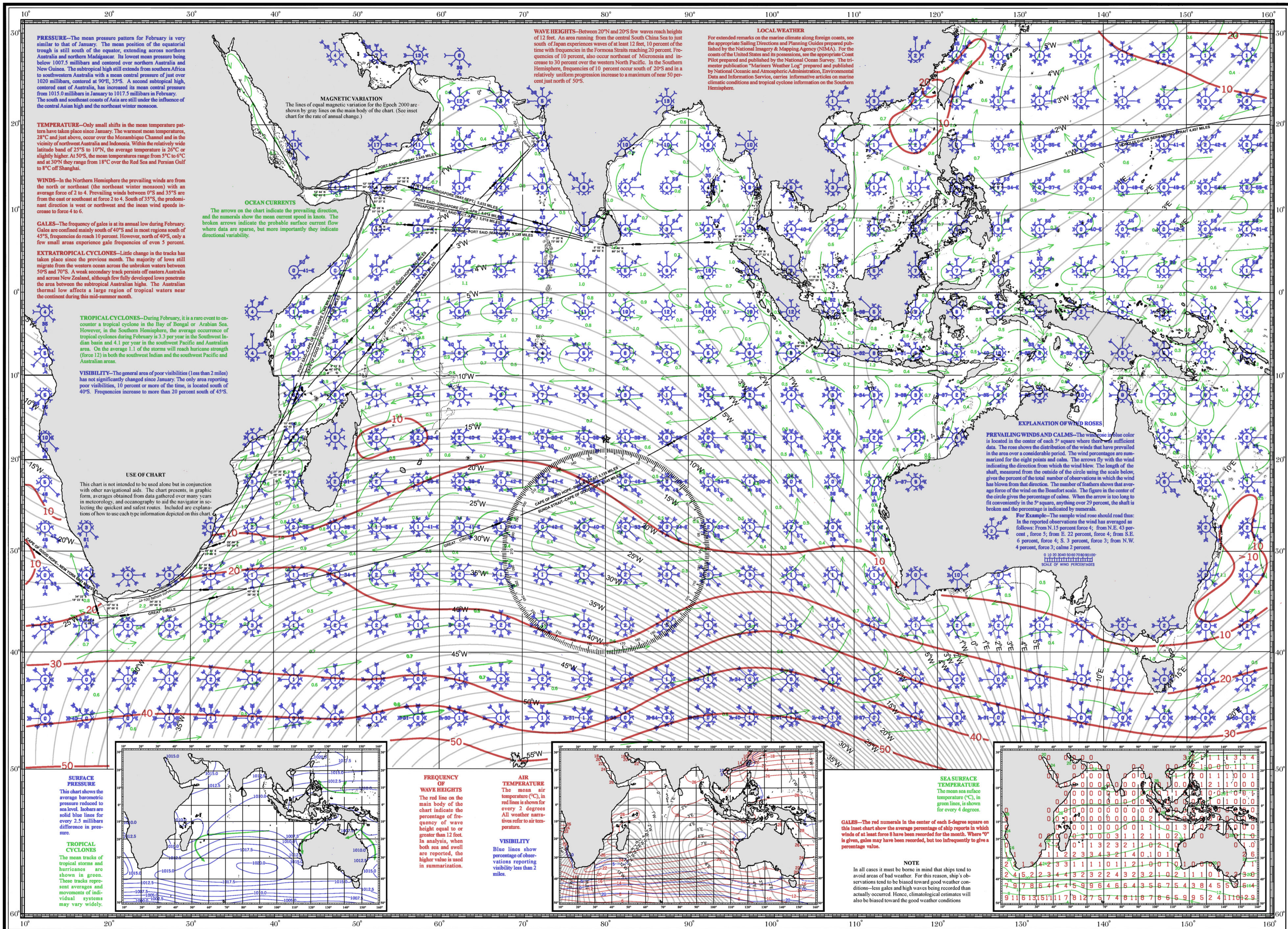
NOTE
In all cases it must be borne in mind that ships tend to avoid areas of bad weather. For this reason, ship's observations tend to be biased toward good weather conditions—less gales and high waves being recorded than actually occurred. Hence, climatological estimates will also be biased toward the good weather conditions.





PILOT CHART OF THE INDIAN OCEAN

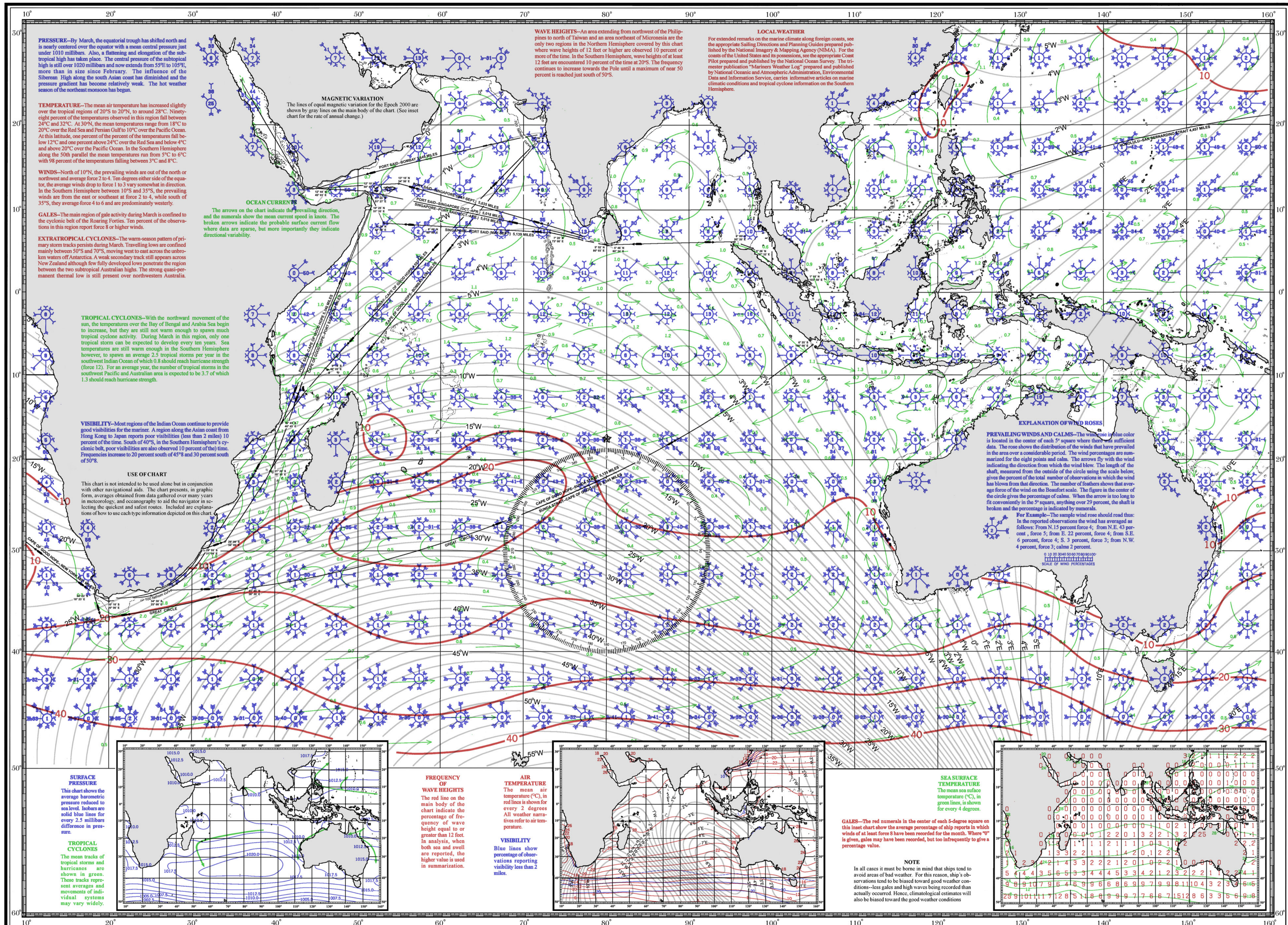
FEBRUARY





PILOT CHART OF THE INDIAN OCEAN

MARCH



PRESSURE—By March, the equatorial trough has shifted north and is nearly centered over the equator with a mean central pressure just under 1010 millibars. Also, a flattening and elongation of the subtropical high has taken place. The central pressure of the subtropical high is still over 1020 millibars and now extends from 55°E to 105°E, more than in size since February. The influence of the Siberian High along the south Asian coast has diminished and the pressure gradient has become relatively weak. The hot weather season of the northeast monsoon has begun.

TEMPERATURE—The mean air temperature has increased slightly over the tropical regions of 20°S to 20°N, to around 28°C. Ninety-eight percent of the temperatures observed in this region fall between 24°C and 32°C. At 30°N, the mean temperatures range from 18°C to 20°C over the Red Sea and Persian Gulf to 10°C over the Pacific Ocean. At this latitude, one percent of the temperatures fall below 12°C and one percent above 24°C over the Red Sea and below 4°C and above 20°C over the Pacific Ocean. In the Southern Hemisphere along the 50th parallel the mean temperatures run from 5°C to 6°C with 98 percent of the temperatures falling between 3°C and 8°C.

WINDS—North of 10°N, the prevailing winds are out of the north or northwest and average force 2 to 4. Ten degrees either side of the equator, the average winds drop to force 1 to 3 vary somewhat in direction. In the Southern Hemisphere between 10°S and 35°S, the prevailing winds are from the east or southeast at force 2 to 4, while south of 35°S, they average force 4 to 6 and are predominantly westerly.

GALES—The main region of gale activity during March is confined to the cyclonic belt of the Roaring Forties. Ten percent of the observations in this region report force 6 or higher winds.

EXTRATROPICAL CYCLONES—The warm-season pattern of primary storm tracks persists during March. Travelling lows are confined mainly between 50°S and 70°S, moving west to east across the unbroken waters off Antarctica. A weak secondary track still appears across New Zealand although few fully developed lows penetrate the region between the two subtropical Australian highs. The strong quasi-permanent thermal low is still present over northwestern Australia.

TROPICAL CYCLONES—With the northward movement of the sun, the temperatures over the Bay of Bengal and Arabia Sea begin to increase, but they are still not warm enough to spawn much tropical cyclone activity. During March in this region, only one tropical storm can be expected to develop every ten years. Sea temperatures are still warm enough in the Southern Hemisphere however, to spawn an average 2.5 tropical storms per year in the southwest Indian Ocean of which 0.8 should reach hurricane strength (force 12). For an average year, the number of tropical storms in the southwest Pacific and Australian area is expected to be 3.7 of which 1.3 should reach hurricane strength.

VISIBILITY—Most regions of the Indian Ocean continue to provide good visibilities for the mariner. A region along the Asian coast from Hong Kong to Japan reports poor visibilities (less than 2 miles) 10 percent of the time. South of 40°S, in the Southern Hemisphere's cyclonic belt, poor visibilities are also observed 10 percent of the time. Frequencies increase to 20 percent south of 45°S and 30 percent south of 50°S.

USE OF CHART
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MAGNETIC VARIATION
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OCEAN CURRENTS
The arrows on the chart indicate the prevailing direction, and the numerals show the mean current speed in knots. The broken arrows indicate the probable surface current flow where data are sparse, but more importantly they indicate directional variability.

WAVE HEIGHTS—An area extending from northwest of the Philippines to north of Taiwan and an area northeast of Micronesia are the only two regions in the Northern Hemisphere covered by this chart where wave heights of 12 feet or higher are observed 10 percent or more of the time. In the Southern Hemisphere, wave heights of at least 12 feet are encountered 10 percent of the time at 20°S. The frequency continues to increase towards the Pole until a maximum of near 50 percent is reached just south of 50°S.

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 & Mapping Agency (NIMA). For the coasts of the United States and its possessions, see the appropriate Coast Pilot prepared and published by the National Ocean Survey. The trimester publication "Mariners Weather Log" prepared and published by National Oceanic and Atmospheric Administration, Environmental Data and Information Service, carries informative articles on marine climatic conditions and tropical cyclone information on the Southern Hemisphere.

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 that 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. 15 percent, force 4; from N.E. 43 percent, force 5; from E. 22 percent, force 4; from S.E. 6 percent, force 3; from S. 3 percent, force 3; from N.W. 4 percent, force 3; calm 2 percent.

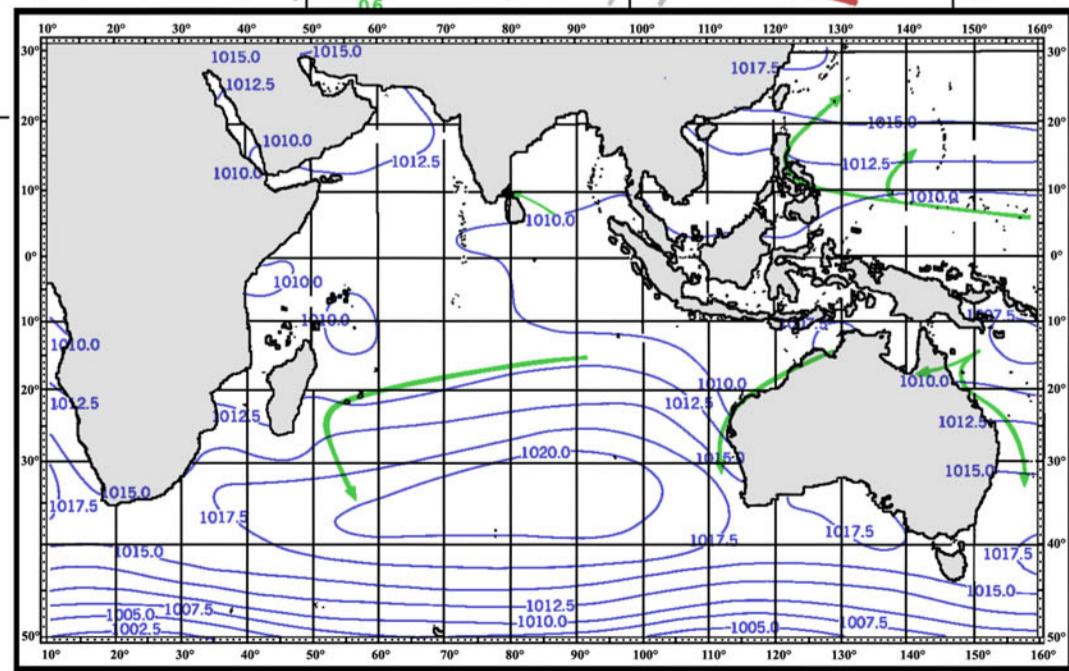
0 10 20 30 40 50 60 70 80 90 100
SCALE OF WIND PERCENTAGES

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.

TROPICAL CYCLONES

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



FREQUENCY OF WAVE HEIGHTS

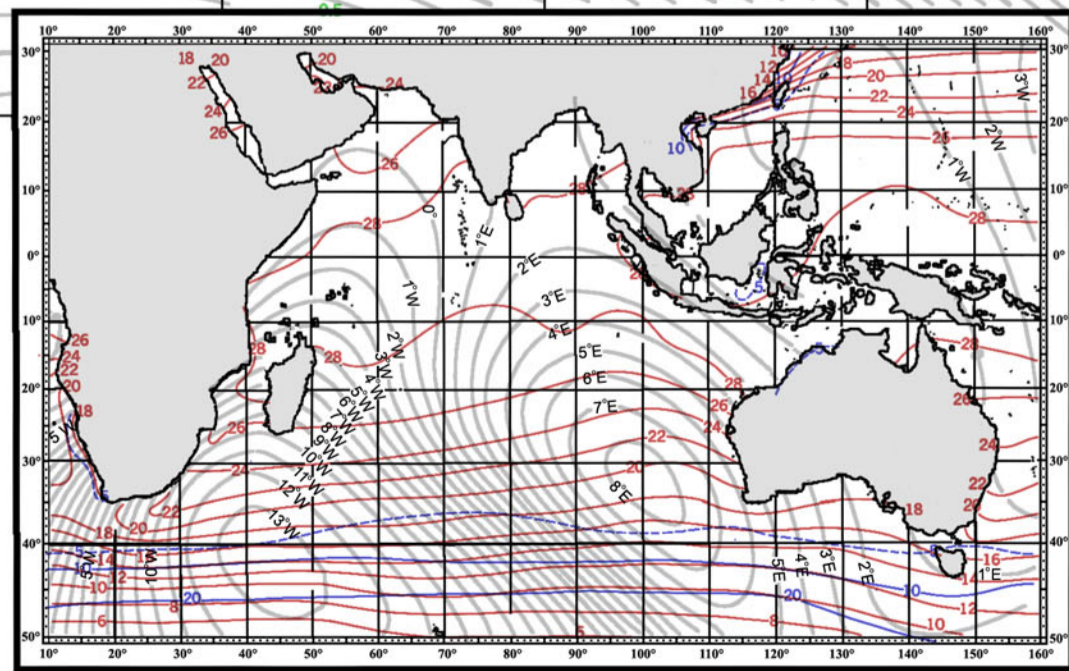
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AIR TEMPERATURE

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VISIBILITY

Blue lines show percentage of observations reporting visibility less than 2 miles.



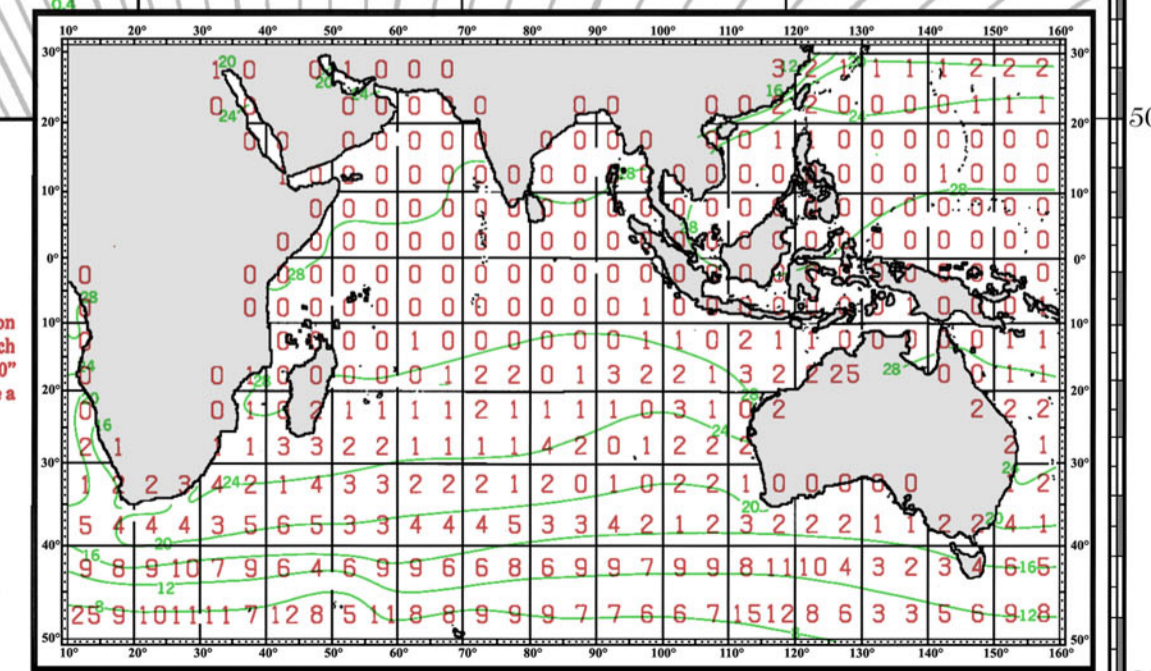
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GALES—The red numerals in the center of each 5-degree square on this inset chart show the average percentage of ship reports in which winds of at least force 8 have been recorded for the month. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

NOTE

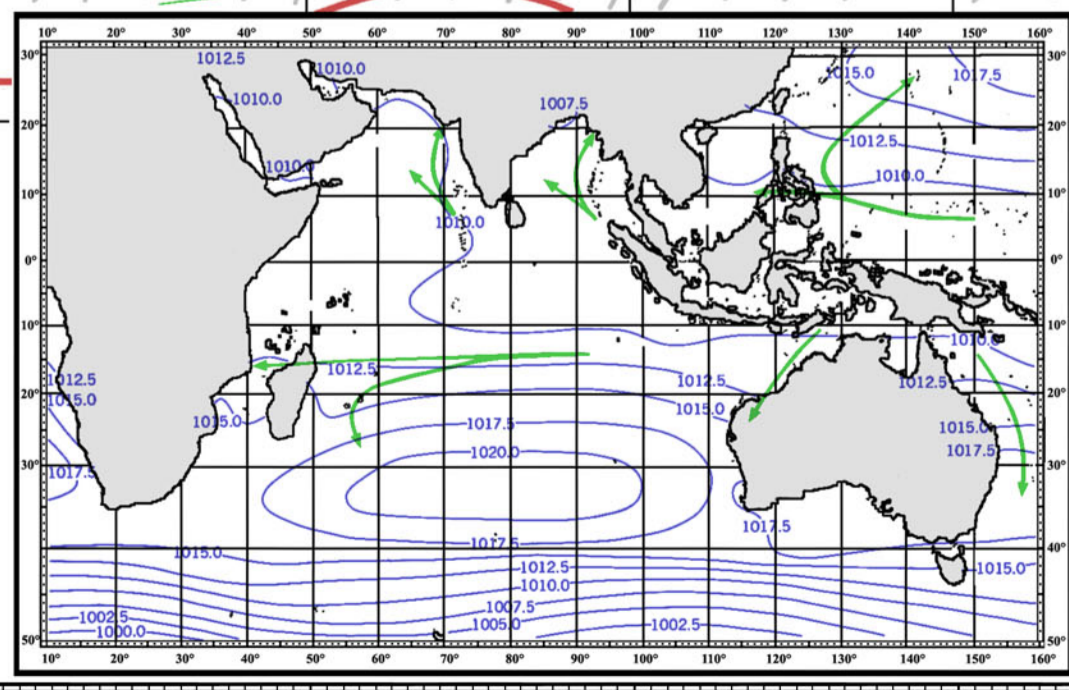
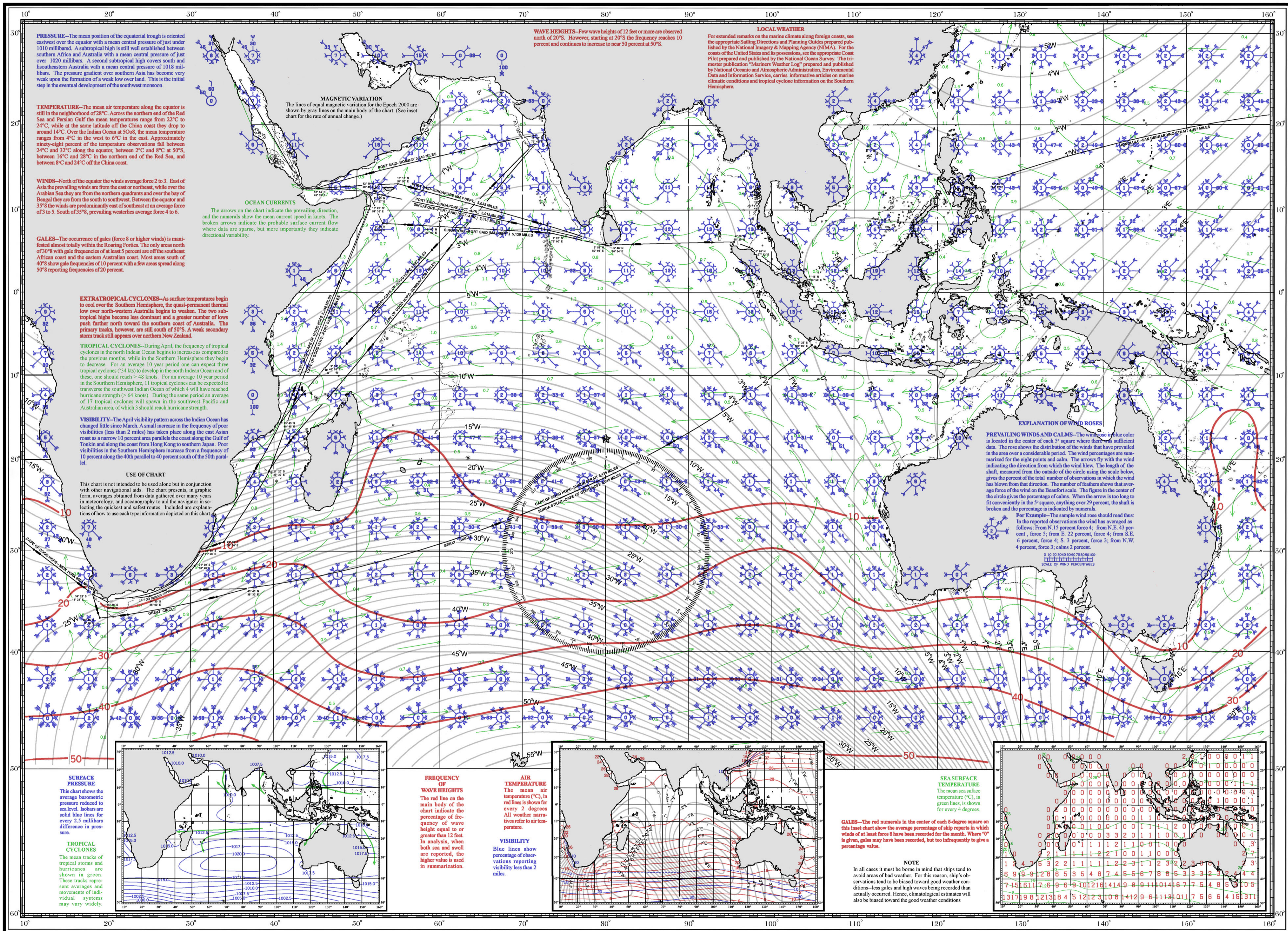
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PILOT CHART OF THE INDIAN OCEAN

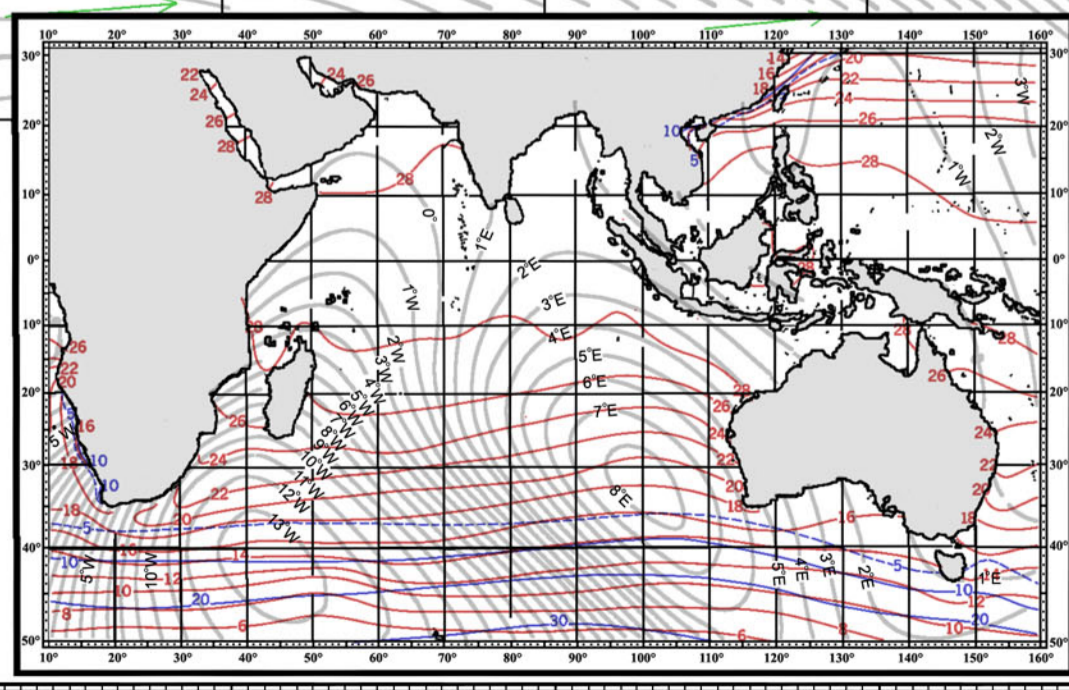
APRIL



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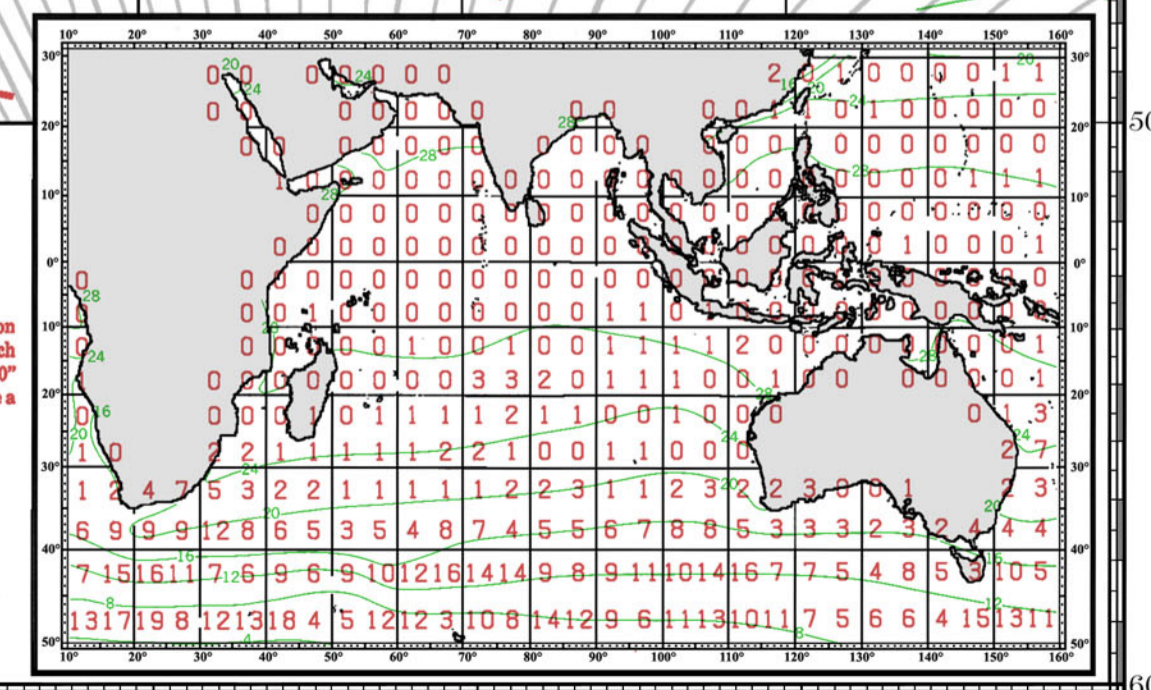
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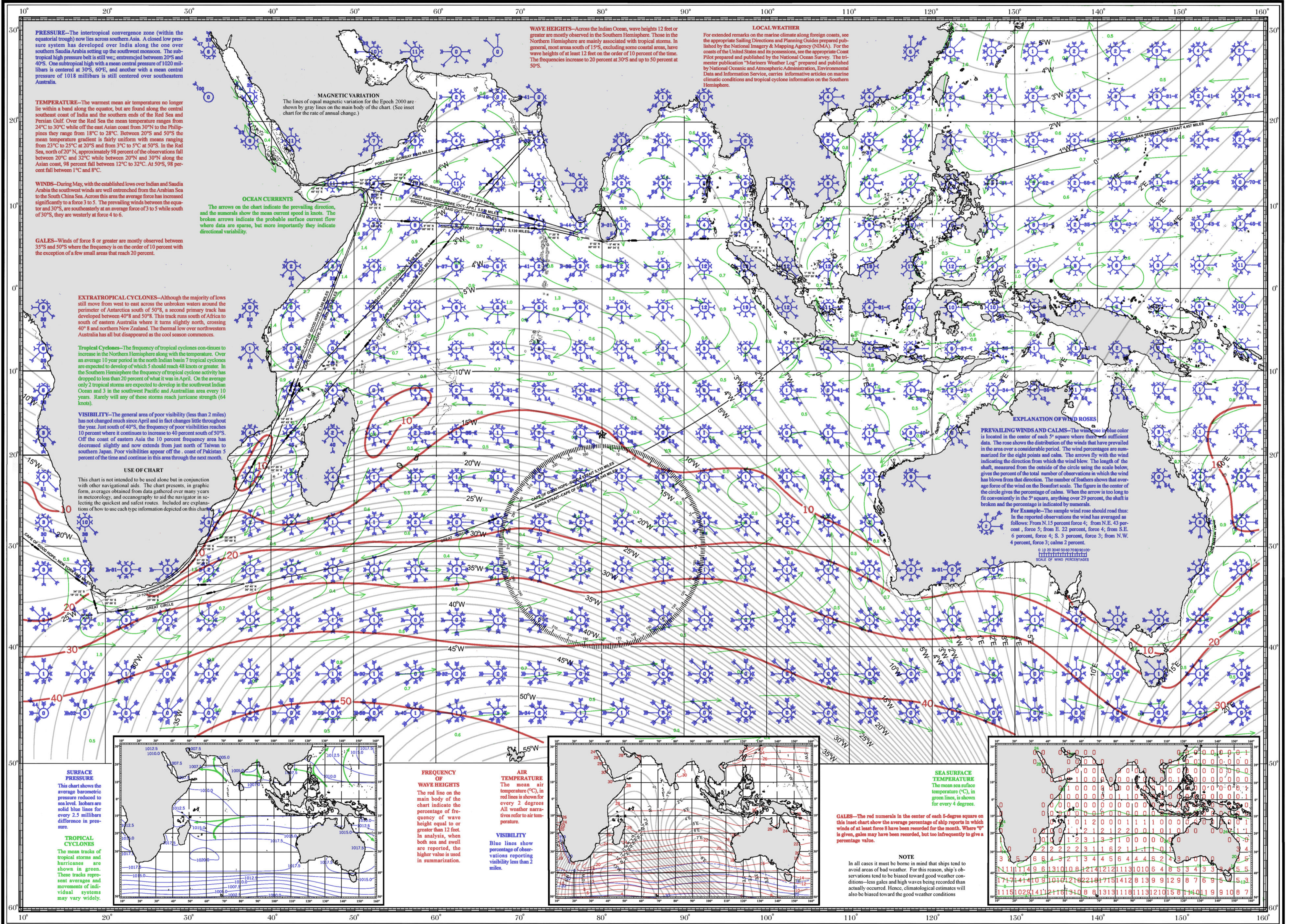
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PILOT CHART OF THE INDIAN OCEAN

MAY



PRESSURE—The intertropical convergence zone (within the equatorial trough) now lies across southern Asia. A closed low pressure system has developed over India along the one over southern Saudi Arabia setting up the southwest monsoon. The subtropical high pressure belt is still well entrenched between 20°S and 40°S. One subtropical high with a mean central pressure of 1020 millibars is centered at 30°S, 60°E, and another with a mean central pressure of 1018 millibars is still centered over southeastern Australia.

TEMPERATURE—The warmest mean air temperatures no longer lie within a band along the equator, but are found along the central southeast coast of India and the southern ends of the Red Sea and Persian Gulf. Over the Red Sea the mean temperature ranges from 24°C to 30°C while off the east Asian coast from 30°N to the Philippines they range from 18°C to 28°C. Between 20°S and 50°S the mean temperature gradient is fairly uniform with means ranging from 23°C to 25°C at 20°S and from 3°C to 5°C at 50°S. In the Red Sea, north of 20°N, approximately 98 percent of the observations fall between 20°C and 32°C while between 20°N and 30°N along the Asian coast, 98 percent fall between 12°C to 32°C. At 50°S, 98 percent fall between 1°C and 8°C.

WINDS—During May, with the established lows over India and Saudi Arabia the southwest winds are well entrenched from the Arabian Sea to the South China Sea. Across this area the average force has increased significantly to a force 3 to 5. The prevailing winds between the equator and 30°S are southeasterly with an average force of 3 to 5 while south of 30°S, they are westerly at force 4 to 6.

GALES—Winds of force 8 or greater are mostly observed between 35°S and 50°S where the frequency is on the order of 10 percent with the exception of a few small areas that reach 20 percent.

EXTRATROPICAL CYCLONES—Although the majority of lows still move from west to east across the unbroken waters around the perimeter of Antarctica south of 50°S, a second primary track has developed between 40°S and 50°S. This track runs south of Africa to south of eastern Australia where it turns slightly north, crossing 40°E and northern New Zealand. The thermal low over northeastern Australia has all but disappeared as the cool season commences.

Tropical Cyclones—The frequency of tropical cyclones continues to increase in the Northern Hemisphere along with the temperature. Over an average 10 year period in the north Indian basin 7 tropical cyclones are expected to develop of which 5 should reach 48 knots or greater. In the Southern Hemisphere the frequency of tropical cyclone activity has dropped to less than 20 percent of what it was in April. On the average only 2 tropical storms are expected to develop in the southwest Indian Ocean and 3 in the southwest Pacific and Australian area every 10 years. Rarely will any of these storms reach hurricane strength (64 knots).

VISIBILITY—The general area of poor visibility (less than 2 miles) has not changed much since April and in fact changes little throughout the year. Just south of 40°S, the frequency of poor visibilities reaches 10 percent where it continues to increase to 40 percent south of 50°S. Off the coast of eastern Asia the 10 percent frequency area has decreased slightly and now extends from just north of Taiwan to southern Japan. Poor visibilities appear off the coast of Pakistan 5 percent of the time and continue in this area through the next month.

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OCEAN CURRENTS
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WAVE HEIGHTS—Across the Indian Ocean, wave heights 12 feet or greater are mostly observed in the Southern Hemisphere. Those in the Northern Hemisphere are mainly associated with tropical storms. In general, most areas south of 15°S, excluding some coastal areas, have wave heights of at least 12 feet on the order of 10 percent of the time. The frequencies increase to 20 percent at 30°S and up to 50 percent at 50°S.

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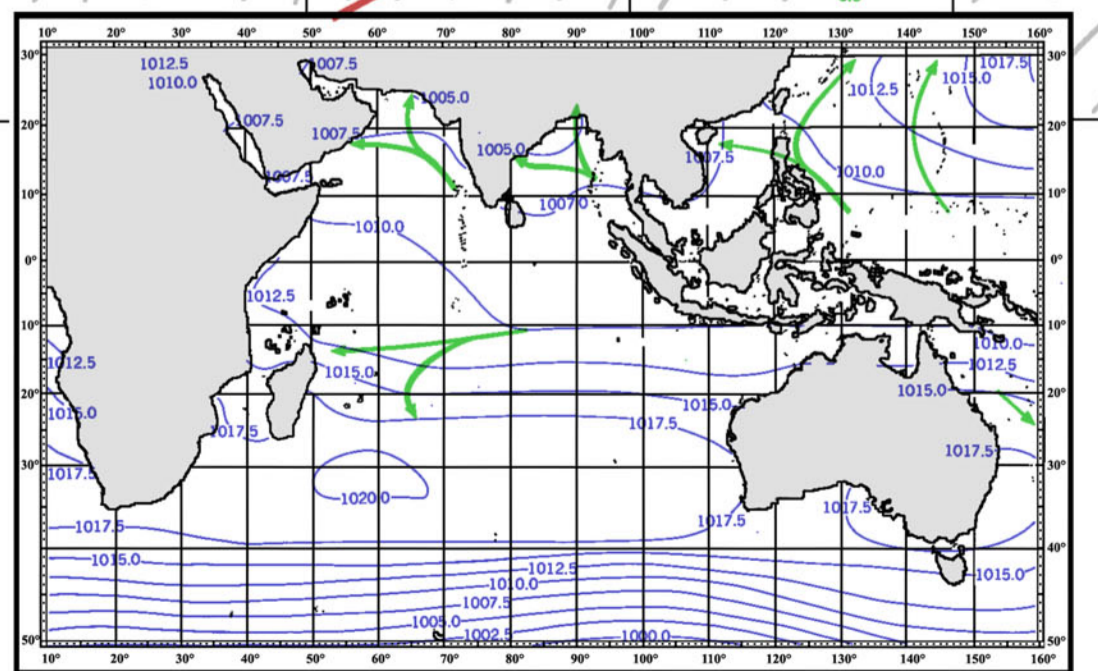


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FREQUENCY OF WAVE HEIGHTS

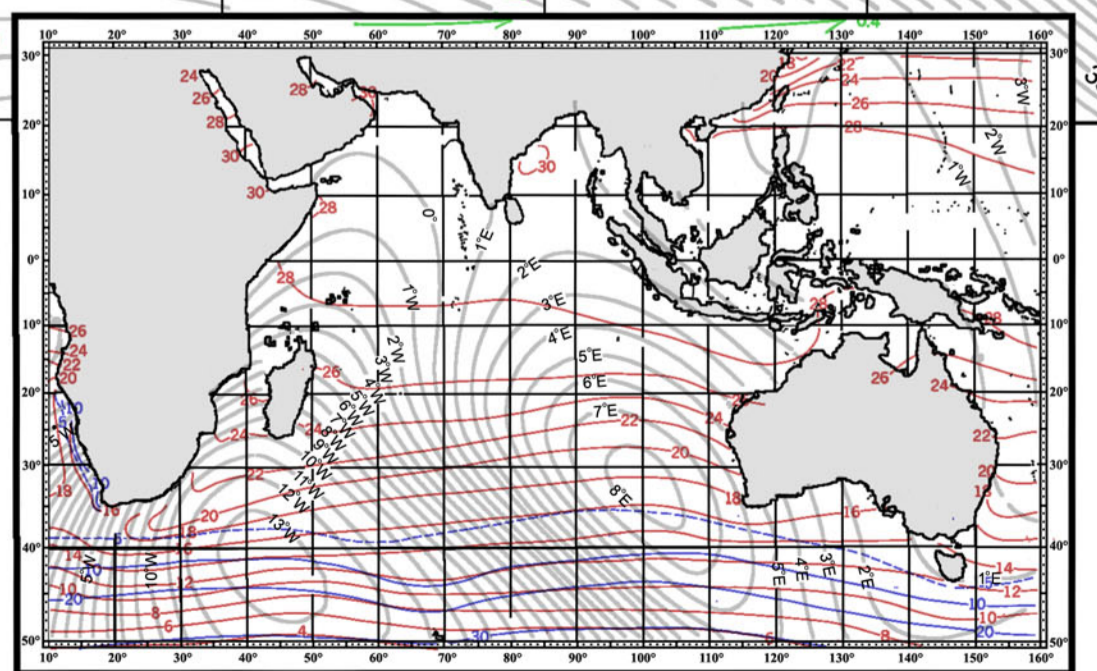
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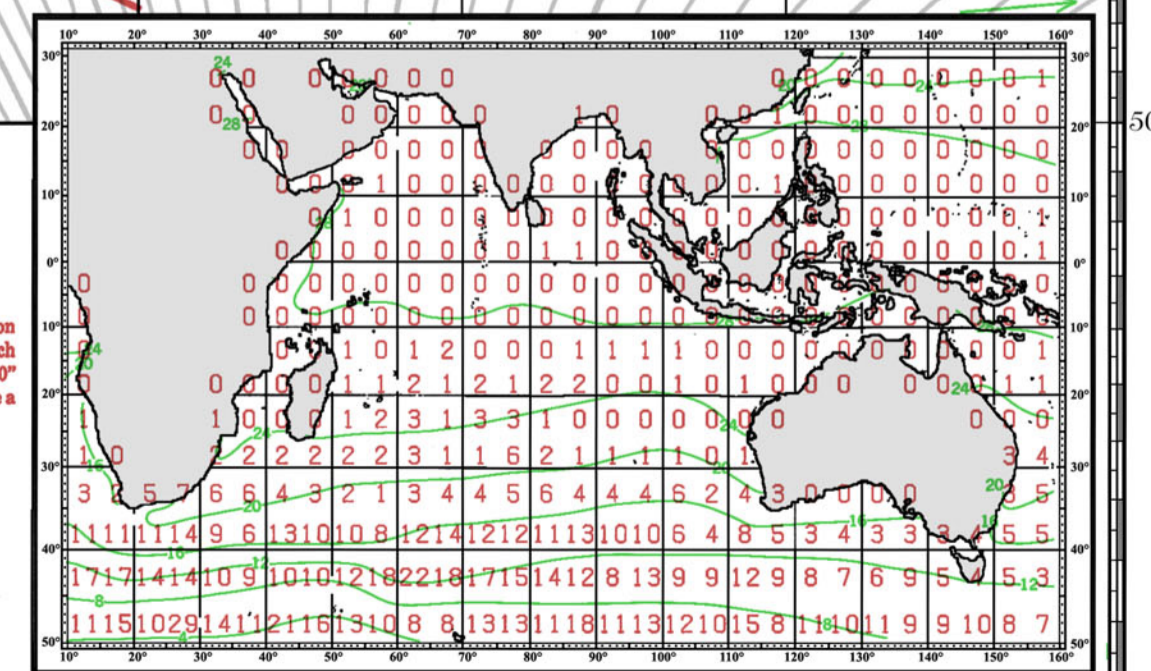
VISIBILITY

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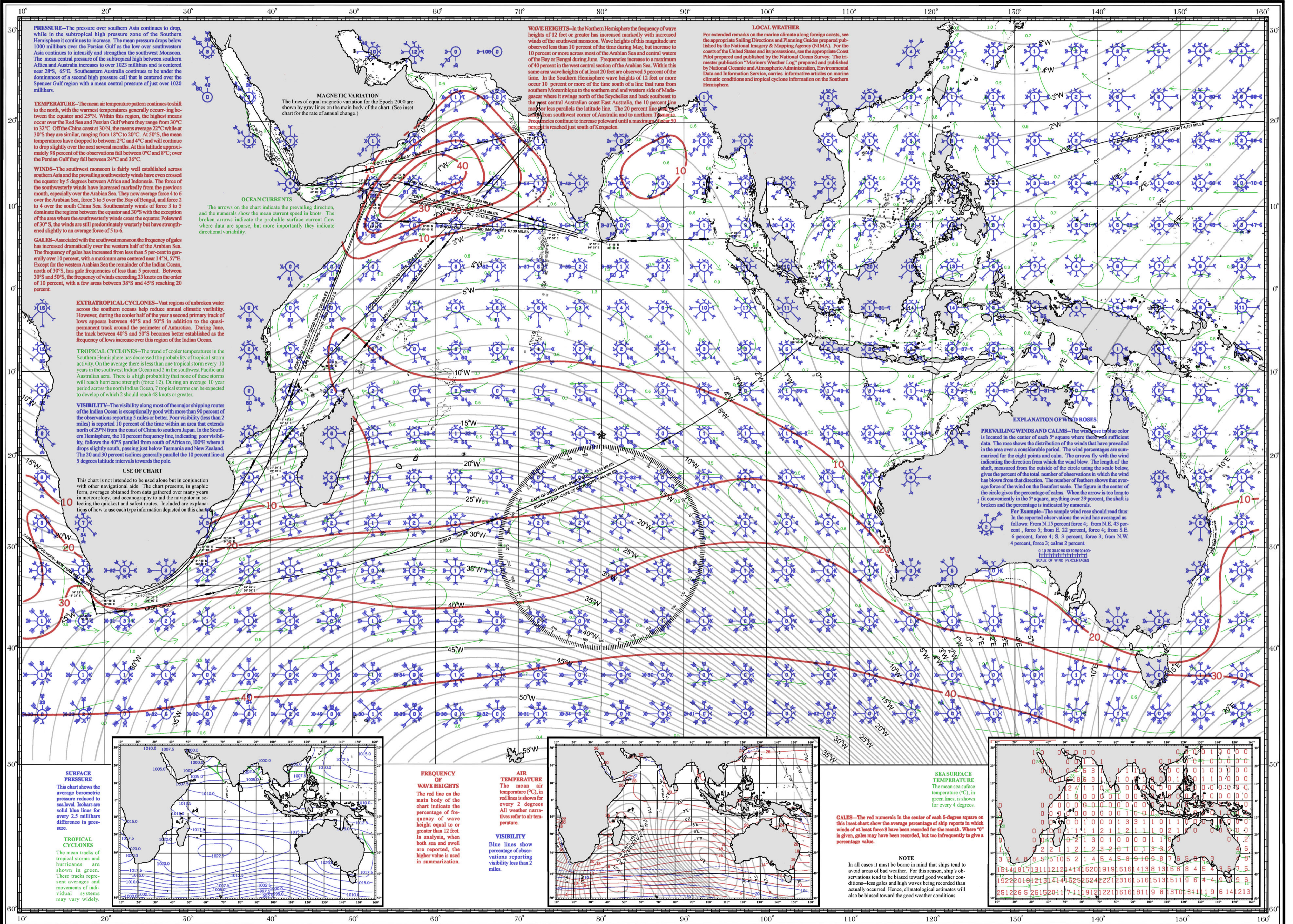
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PILOT CHART OF THE INDIAN OCEAN

JUNE



PRESSURE—The pressure over southern Asia continues to drop, while in the subtropical high pressure zone of the Southern Hemisphere it continues to increase. The mean pressure drops below 1000 millibars over the Persian Gulf as the low over southwestern Asia continues to intensify and strengthen the southwest monsoon. The mean central pressure of the subtropical high between southern Africa and Australia increases to over 1023 millibars and is centered near 28°S, 65°E. Southeastern Australia continues to be under the dominances of a second high pressure cell that is centered over the Spencer Gulf region with a mean central pressure of just over 1020 millibars.

TEMPERATURE—The mean air temperature pattern continues to shift to the north, with the warmest temperatures generally occurring between the equator and 25°N. Within this region, the highest means occur over the Red Sea and Persian Gulf where they range from 30°C to 32°C. Off the China coast at 30°N, the means average 22°C while at 30°S they are similar, ranging from 18°C to 20°C. At 50°S, the mean temperatures have dropped to between 2°C and 4°C and will continue to drop slightly over the next several months. At this latitude approximately 98 percent of the observations fall between 0°C and 8°C, over the Persian Gulf they fall between 24°C and 36°C.

WINDS—The southwest monsoon is fairly well established across southern Asia and the prevailing westerly winds have even crossed the equator by 5 degrees between Africa and Indonesia. The force of the southwesterly winds have increased markedly from the previous month, especially over the Arabian Sea. They now average force 4 to 6 over the Arabian Sea, force 3 to 5 over the Bay of Bengal, and force 2 to 4 over the south China Sea. Southeasterly winds of force 3 to 5 dominate the regions between the equator and 30°S with the exception of the area where the southwesterly winds cross the equator. Forward of 30°S, the winds are still predominantly westerly but have strengthened slightly to an average force of 5 to 6.

GALES—Associated with the southwest monsoon the frequency of gales has increased dramatically over the western half of the Arabian Sea. The frequency of gales has increased from less than 5 percent to generally over 10 percent, with a maximum area centered near 14°N, 57°E. Except for the western Arabian Sea the remainder of the Indian Ocean, north of 30°S, has gale frequencies of less than 5 percent. Between 30°S and 50°S, the frequency of winds exceeding 33 knots on the order of 10 percent, with a few areas between 38°S and 45°S reaching 20 percent.

EXTRATROPICAL CYCLONES—Vast regions of unbroken water across the southern oceans help reduce annual climatic variability. However, during the cooler half of the year a second primary track of lows appears between 40°S and 50°S in addition to the quasi-permanent track around the perimeter of Antarctica. During June, the track between 40°S and 50°S becomes better established as the frequency of lows increase over this region of the Indian Ocean.

TROPICAL CYCLONES—The trend of cooler temperatures in the Southern Hemisphere has decreased the probability of tropical storm activity. On the average there is less than one tropical storm every 10 years in the southwest Indian Ocean and 2 in the southwest Pacific and Australian area. There is a high probability that none of these storms will reach hurricane strength (force 12). During an average 10 year period across the north Indian Ocean, 7 tropical storms can be expected to develop of which 2 should reach 48 knots or greater.

VISIBILITY—The visibility along most of the major shipping routes of the Indian Ocean is exceptionally good with more than 90 percent of the observations reporting 5 miles or better. Poor visibility (less than 2 miles) is reported 10 percent of the time within an area that extends north of 29°N from the coast of China to southern Japan. In the Southern Hemisphere, the 10 percent frequency line, indicating poor visibility, follows the 40°S parallel from south of Africa to 100°E where it drops slightly south, passing just below Tasmania and New Zealand. The 20 and 30 percent isolines generally parallel the 10 percent line at 5 degree latitude intervals towards the pole.

USE OF CHART
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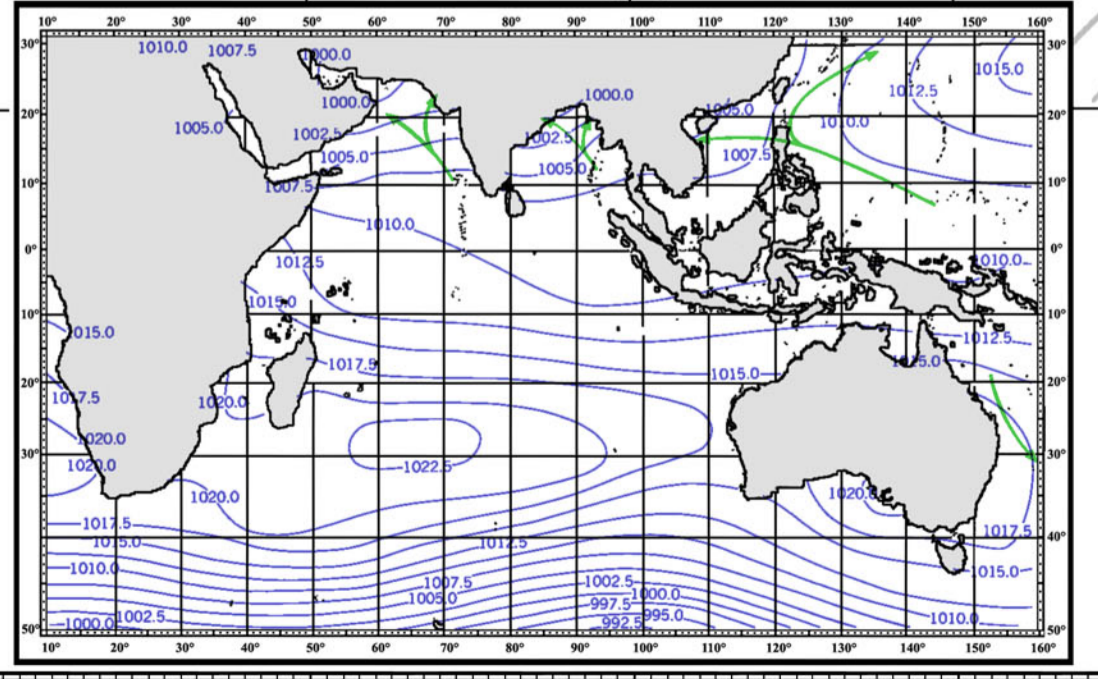
OCEAN CURRENTS
The arrows on the chart indicate the prevailing direction, and the numerals show the mean current speed in knots. The broken arrows indicate the probable surface current flow where data are sparse, but more importantly they indicate directional variability.

WAVE HEIGHTS—In the Northern Hemisphere the frequency of wave heights of 12 feet or greater has increased markedly with increased winds of the southwest monsoon. Wave heights of this magnitude are observed less than 10 percent of the time during May, but increase to 10 percent or more across most of the Arabian Sea and central waters of the Bay of Bengal during June. Frequencies increase to a maximum of 40 percent in the west central section of the Arabian Sea. Within this same area wave heights of at least 20 feet are observed 5 percent of the time. In the Southern Hemisphere wave heights of 12 feet or more occur 10 percent or more of the time south of a line that runs from southern Mozambique to the southern end and western side of Madagascar where it swings north of the Seychelles and back southeast to the west central Australian coast East Australia, the 10 percent line moves or less parallels the latitude line. The 20 percent line runs from southwest corner of Australia to northern Tasmania. Frequencies continue to increase poleward until a maximum of 50 percent is reached just south of Kerguelen.

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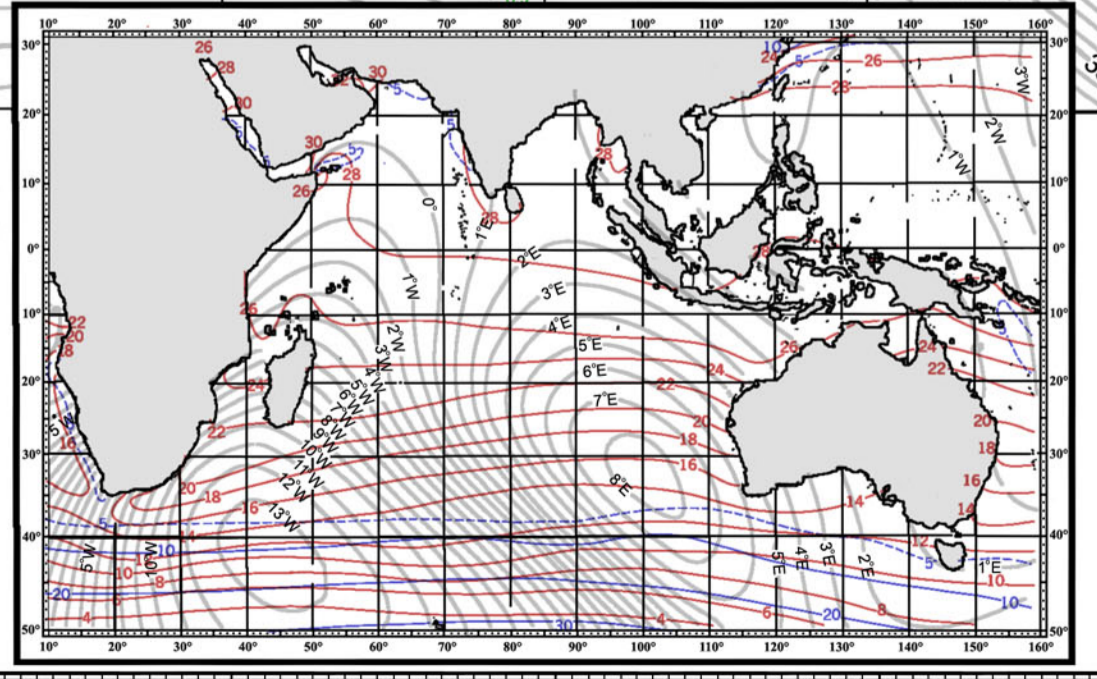
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This chart shows the average barometric pressure reduced to sea level. Isobars are solid blue lines for every 2.5 millibars difference in pressure.

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

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

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

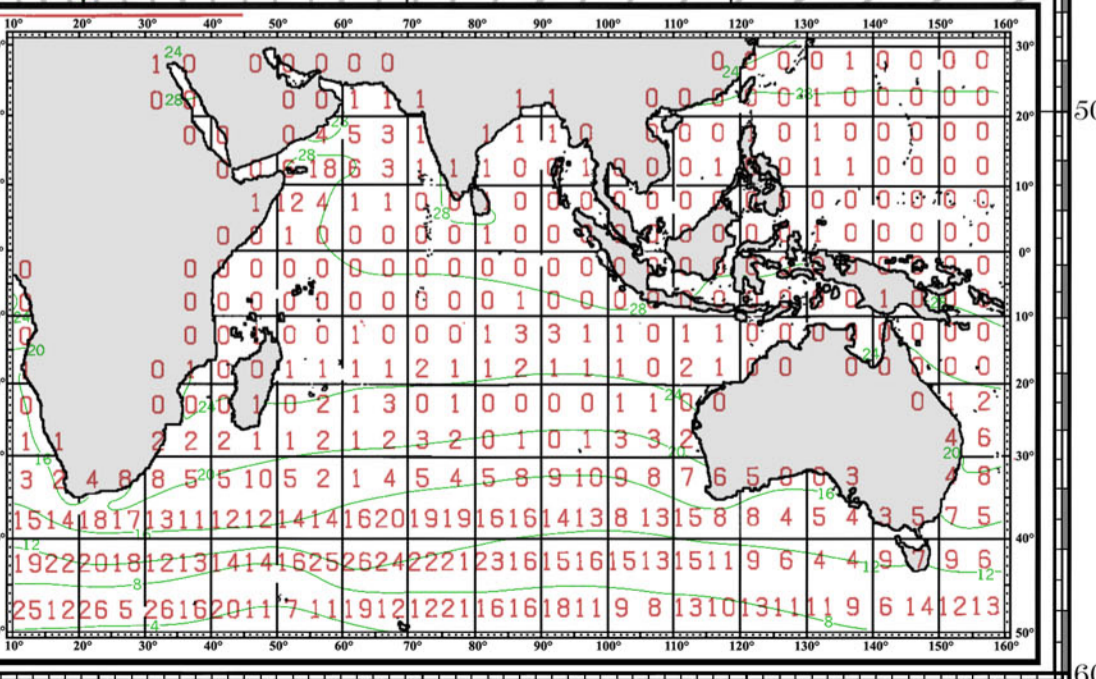
VISIBILITY
Blue lines show percentage of observations reporting visibility less than 2 miles.



SEA SURFACE TEMPERATURE
The mean sea surface temperature (°C), in green lines, is shown for every 4 degrees.

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. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

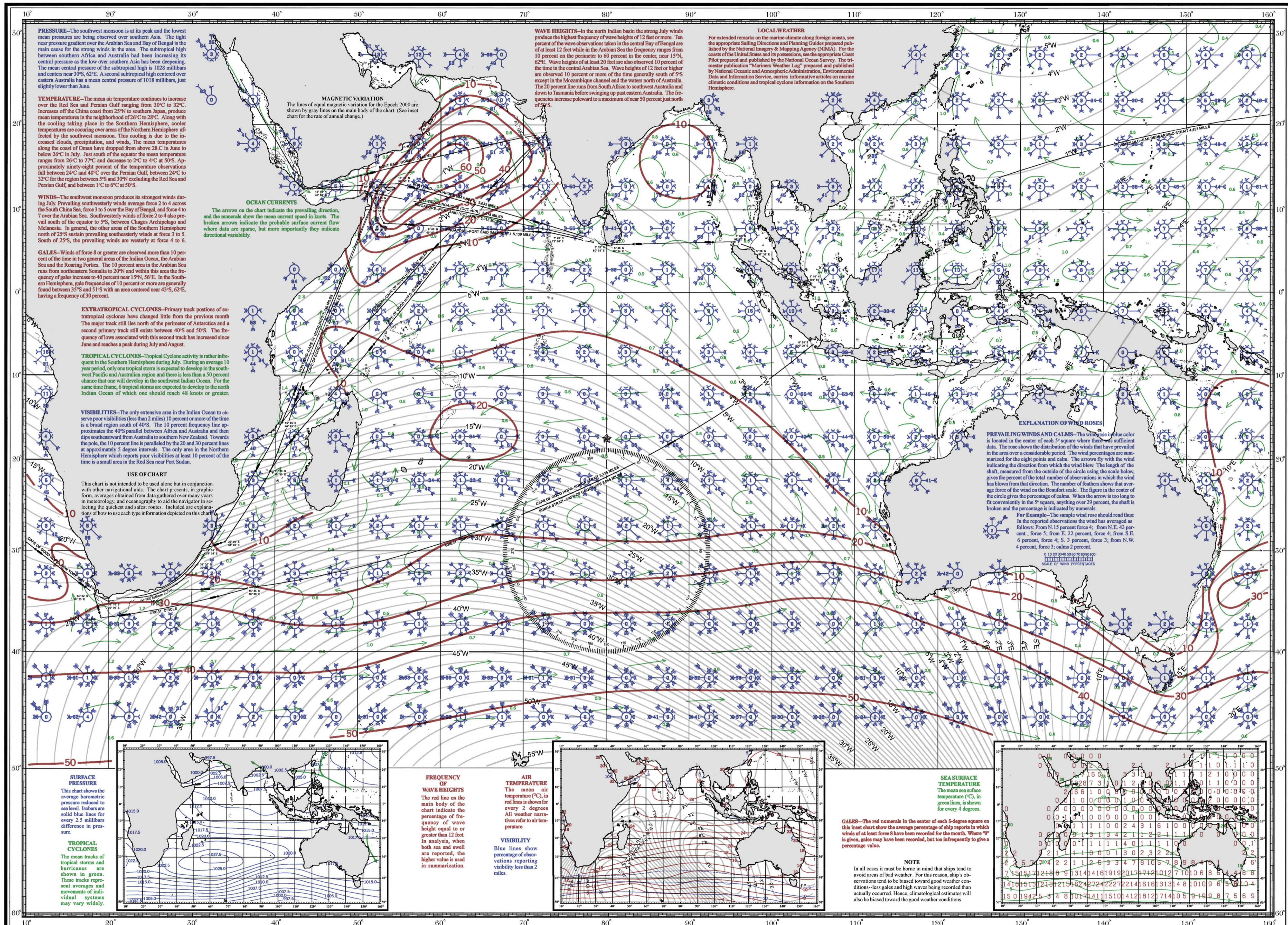
NOTE
In all cases it must be borne in mind that ships tend to avoid areas of bad weather. For this reason, ship's observations tend to be biased toward good weather conditions—less gales and high waves being recorded than actually occurred. Hence, climatological estimates will also be biased toward the good weather conditions.





PILOT CHART OF THE INDIAN OCEAN

JULY



PRESSURE—The southwest monsoon is at its peak and the lowest mean pressures are being observed over South Asia. The tight north pressure gradient over the Arabian Sea and Bay of Bengal is the main cause for the strong winds in the area. The subtropical high between southern Africa and Australia had been increasing its central pressure as the low over southern Asia has been deepening. The mean central pressure of the subtropical high is 1028 millibars and centers near 30°S, 62°E. A second subtropical high centered over eastern Australia has a mean central pressure of 1018 millibars, just slightly lower than June.

TEMPERATURE—The mean air temperature continues to increase over the Red Sea and Persian Gulf ranging from 30°C to 32°C. Increases off the China coast from 25°N to southern Japan, produce mean temperatures in the neighborhood of 26°C to 29°C. Along with the cooling taking place in the Southern Hemisphere, cooler temperatures are occurring over areas of the Northern Hemisphere affected by the southwest monsoon. This cooling is due to the increased clouds, precipitation, and winds. The mean temperatures along the coast of Oman have dropped from above 28°C in June to below 26°C in July. Just south of the equator the mean temperature ranges from 26°C to 27°C and decrease to 2°C to 4°C at 50°S. Approximately ninety-eight percent of the temperature observations fall between 24°C and 40°C over the Persian Gulf, between 24°C to 32°C for the region between 5°S and 30°N excluding the Red Sea and Persian Gulf, and between 1°C to 6°C at 50°S.

WINDS—The southwest monsoon produces its strongest winds during July. Prevailing westerly winds average force 2 to 4 across the South China Sea, force 3 to 5 over the Bay of Bengal, and force 4 to 7 over the Arabian Sea. Westerly winds of force 2 to 4 also prevail south of the equator to 5°S, between Chagos Archipelago and Melanesia. In general, the other areas of the Southern Hemisphere north of 25°S sustain prevailing southeasterly winds at force 3 to 5. South of 25°S, the prevailing winds are westerly at force 4 to 6.

GALES—Winds of force 8 or greater are observed more than 10 percent of the time in two general areas of the Indian Ocean, the Arabian Sea and the Roaring Forties. The 10 percent area in the Arabian Sea runs from northeastern Somalia to 20°N and within this area the frequency of gales increase to 40 percent near 15°N, 56°E. In the Southern Hemisphere, gale frequencies of 10 percent or more are generally found between 35°S and 51°S with an area centered near 43°S, 62°E, having a frequency of 30 percent.

EXTRATROPICAL CYCLONES—Primary track positions of extratropical cyclones have changed little from the previous month. The major track still lies north of the perimeter of Antarctica and a second primary track still exists between 40°S and 50°S. The frequency of lows associated with this second track has increased since June and reaches a peak during July and August.

TROPICAL CYCLONES—Tropical Cyclone activity is rather infrequent in the Southern Hemisphere during July. During an average 10 year period, only one tropical storm is expected to develop in the southwest Pacific and Australian region and there is less than a 50 percent chance that one will develop in the southwest Indian Ocean. For the same time frame, 6 tropical storms are expected to develop to the north Indian Ocean of which one should reach 48 knots or greater.

VISIBILITIES—The only extensive area in the Indian Ocean to observe poor visibilities (less than 2 miles) 10 percent or more of the time is a broad region south of 40°S. The 10 percent frequency line approximates the 40°S parallel between Africa and Australia and then dips southward from Australia to southern New Zealand. Towards the pole, the 10 percent line is paralleled by the 20 and 30 percent lines at approximately 5 degree intervals. The only area in the Northern Hemisphere which reports poor visibilities at least 10 percent of the time is a small area in the Red Sea near Port Sudan.

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The arrows on the chart indicate the prevailing direction, and the numerals show the mean current speed in knots. The broken arrows indicate the probable surface current flow where data are sparse, but more importantly they indicate directional variability.

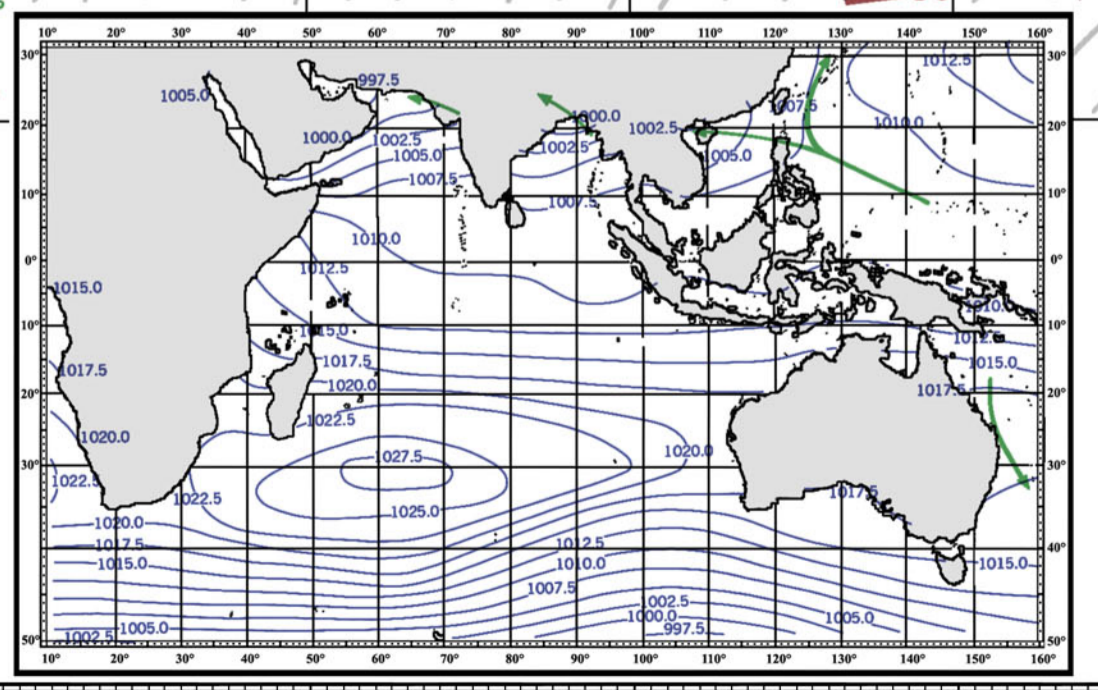
WAVE HEIGHTS—In the north Indian basin the strong July winds produce the highest frequency of wave heights of 12 feet or more. Ten percent of the wave observations taken in the central Bay of Bengal are of at least 12 feet while in the Arabian Sea the frequency ranges from 10 percent on the perimeter to 60 percent in the center, near 15°N, 62°E. Wave heights of at least 20 feet are also observed 10 percent of the time in the central Arabian Sea. Wave heights of 12 feet or higher are observed 10 percent or more of the time generally south of 5°S except in the Mozambique channel and the waters north of Australia. The 20 percent line runs from South Africa to southwest Australia and down to Tasmania before swinging up past eastern Australia. The frequencies increase poleward to a maximum of near 50 percent just north of 5°S.

LOCAL WEATHER
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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 that 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.

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FREQUENCY OF WAVE HEIGHTS
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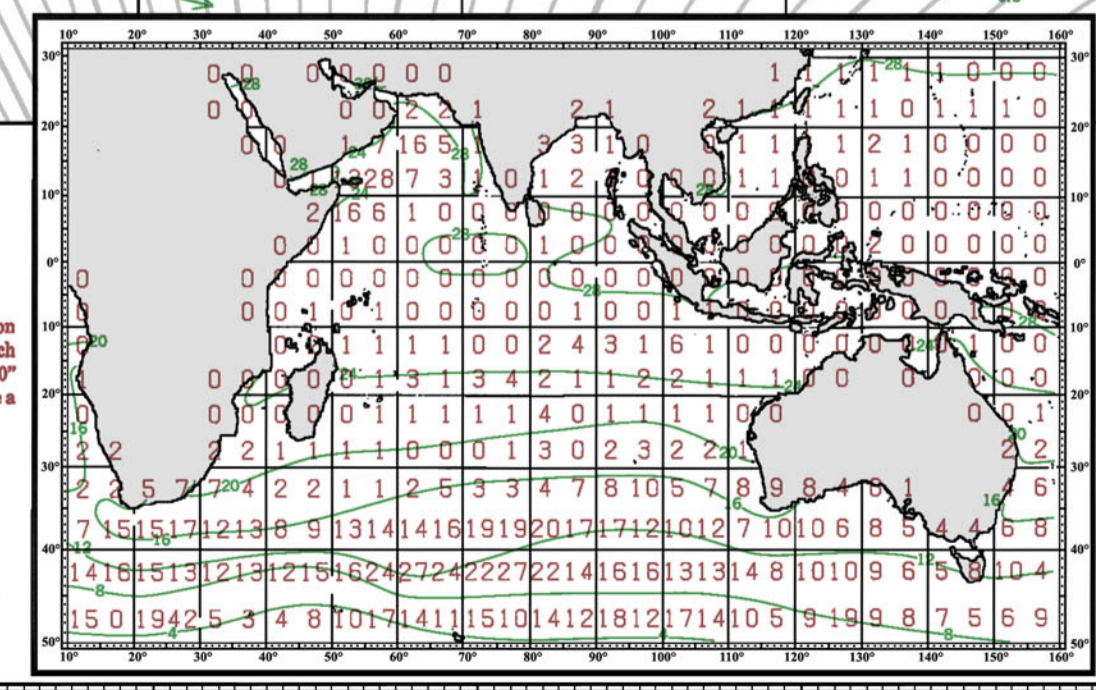
AIR TEMPERATURE
The mean air temperature (°C), in red lines is shown for every 2 degrees. All weather narratives refer to air temperature.

VISIBILITY
Blue lines show percentage of observations reporting visibility less than 2 miles.

SEA SURFACE TEMPERATURE
The mean sea surface temperature (°C), in green lines, is shown for every 4 degrees.

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. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

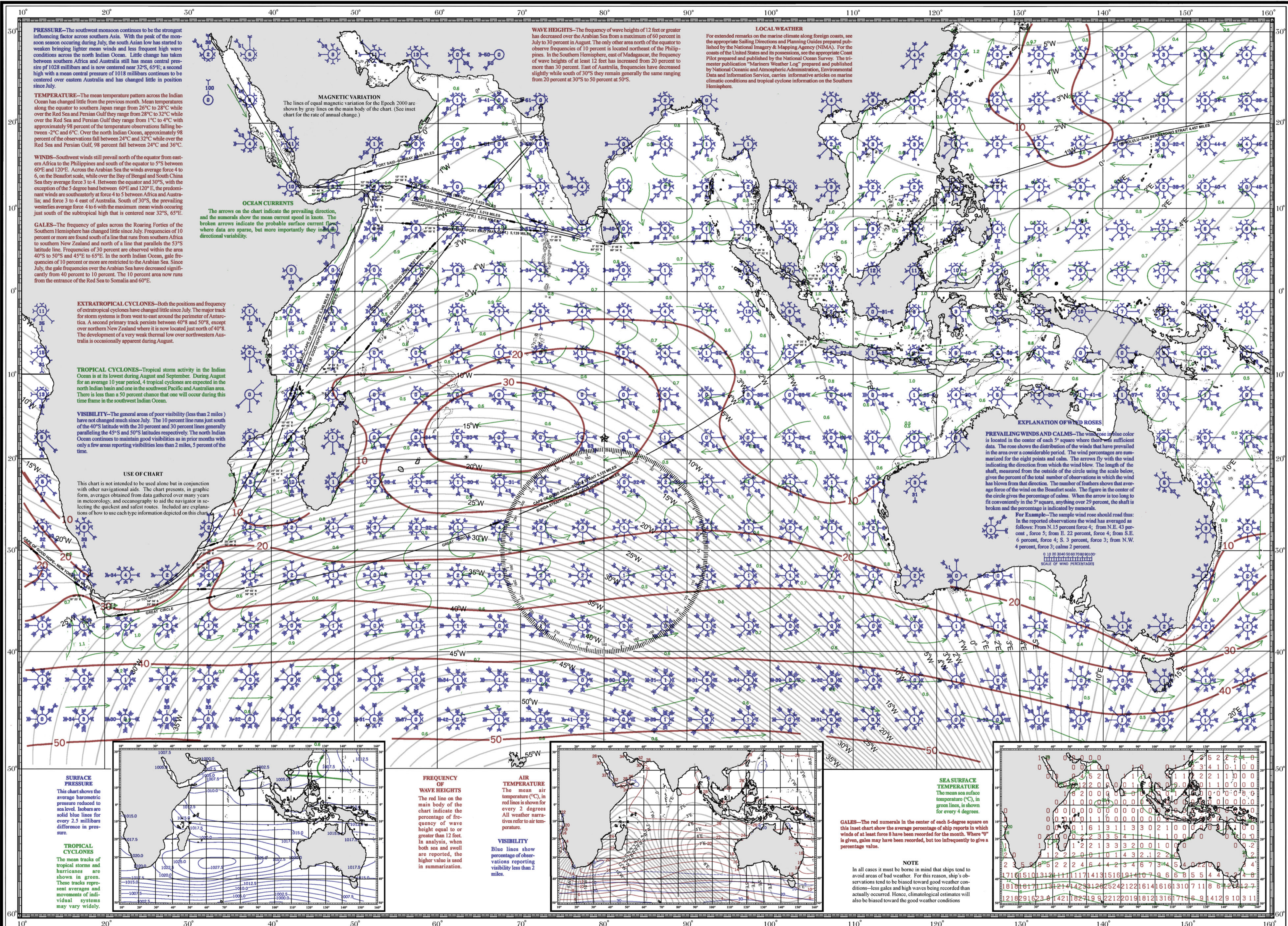
NOTE
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PILOT CHART OF THE INDIAN OCEAN

AUGUST



PRESSURE—The southwest monsoon continues to be the strongest influencing factor across southern Asia. With the peak of the monsoon season occurring during July, the south Asian low has started to weaken bringing lighter mean winds and less frequent high wave conditions across the Indian Ocean. Little change has taken place between southern Africa and Australia still has mean central pressure of 1028 millibars and is now centered near 32°S, 65°E; a second high with a mean central pressure of 1018 millibars continues to be centered over eastern Australia and has changed little in position since July.

TEMPERATURE—The mean temperature pattern across the Indian Ocean has changed little from the previous month. Mean temperatures along the equator to southern Japan range from 26°C to 28°C while over the Red Sea and Persian Gulf they range from 28°C to 32°C while over the Red Sea and Persian Gulf they range from 1°C to 4°C with approximately 98 percent of the temperature observations falling between 2°C and 6°C. Over the north Indian Ocean, approximately 98 percent of the observations fall between 24°C and 32°C while over the Red Sea and Persian Gulf, 98 percent fall between 24°C and 36°C.

WINDS—Southwest winds still prevail north of the equator from eastern Africa to the Philippines and south of the equator to 5°S between 60°E and 120°E. Across the Arabian Sea the winds average force 4 to 6, on the Beaufort scale, while over the Bay of Bengal and South China Sea they average force 3 to 4. Between the equator and 30°S, with the exception of the 5 degree band between 60°E and 120°E, the predominant winds are southeasterly at force 4 to 5 between Africa and Australia; and force 3 to 4 east of Australia. South of 30°S, the prevailing westerlies average force 4 to 6 with the maximum mean winds occurring just south of the subtropical high that is centered near 32°S, 65°E.

GALES—The frequency of gales across the Roaring Forties of the Southern Hemisphere has changed little since July. Frequencies of 10 percent or more are found south of a line that runs from southern Africa to southern New Zealand and north of a line that parallels the 53°S latitude line. Frequencies of 30 percent are observed within the area 40°S to 50°S and 45°E to 65°E. In the north Indian Ocean, gale frequencies of 10 percent or more are restricted to the Arabian Sea. Since July, the gale frequencies over the Arabian Sea have decreased significantly from 40 percent to 10 percent. The 10 percent area now runs from the entrance of the Red Sea to Somalia and 60°E.

EXTRATROPICAL CYCLONES—Both the positions and frequency of extratropical cyclones have changed little since July. The major track for storm systems is from west to east around the perimeter of Antarctica. A second primary track persists between 40°S and 50°S, except over northern New Zealand where it is now located just north of 40°S. The development of a very weak thermal low over southwestern Australia is occasionally apparent during August.

TROPICAL CYCLONES—Tropical storm activity in the Indian Ocean is at its lowest during August and September. During August for an average 10 year period, 4 tropical cyclones are expected in the north Indian basin and one in the southwest Pacific and Australian area. There is less than a 50 percent chance that one will occur during this time frame in the southwest Indian Ocean.

VISIBILITY—The general areas of poor visibility (less than 2 miles) have not changed much since July. The 10 percent line runs just south of the 40°S latitude with the 20 percent and 30 percent lines generally paralleling the 45°S and 50°S latitudes respectively. The north Indian Ocean continues to maintain good visibilities as in prior months with only a few areas reporting visibilities less than 2 miles, 5 percent of the time.

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WAVE HEIGHTS—The frequency of wave heights of 12 feet or greater has decreased over the Arabian Sea from a maximum of 60 percent in July to 30 percent in August. The only other area north of the equator to observe frequencies of 10 percent is located northeast of the Philippines. In the Southern Hemisphere, east of Madagascar, the frequency of wave heights of at least 12 feet has increased from 20 percent to more than 30 percent. East of Australia, frequencies have decreased slightly while south of 30°S they remain generally the same ranging from 20 percent at 30°S to 50 percent at 50°S.

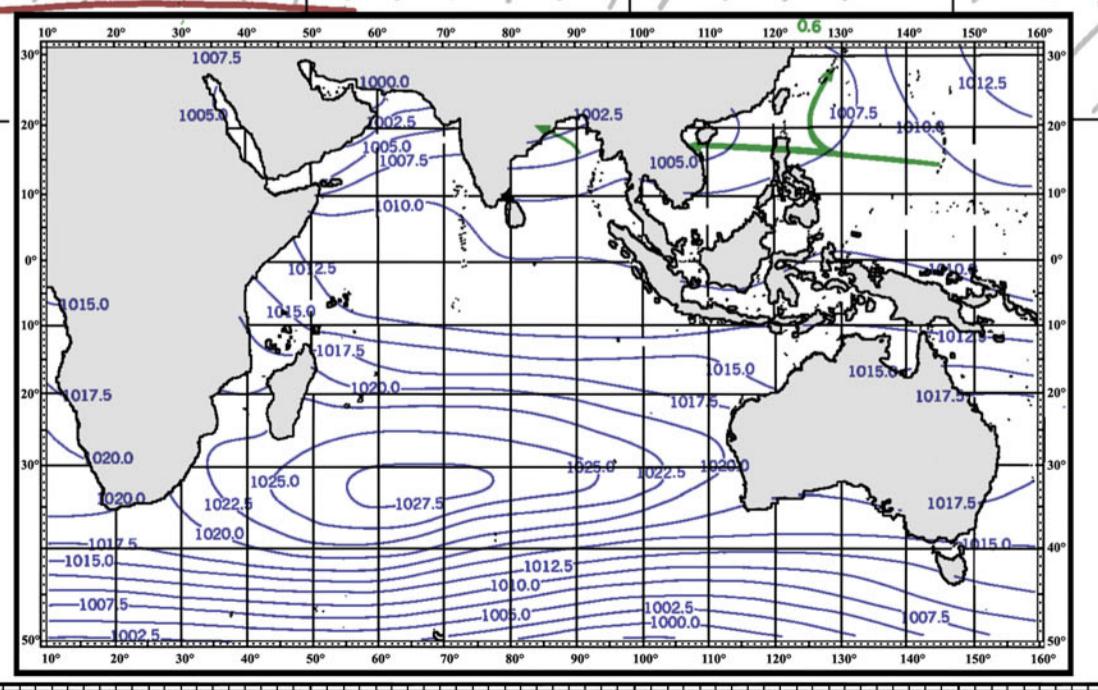
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0 10 20 30 40 50 60 70 80 90 100
SCALE OF WIND PERCENTAGES



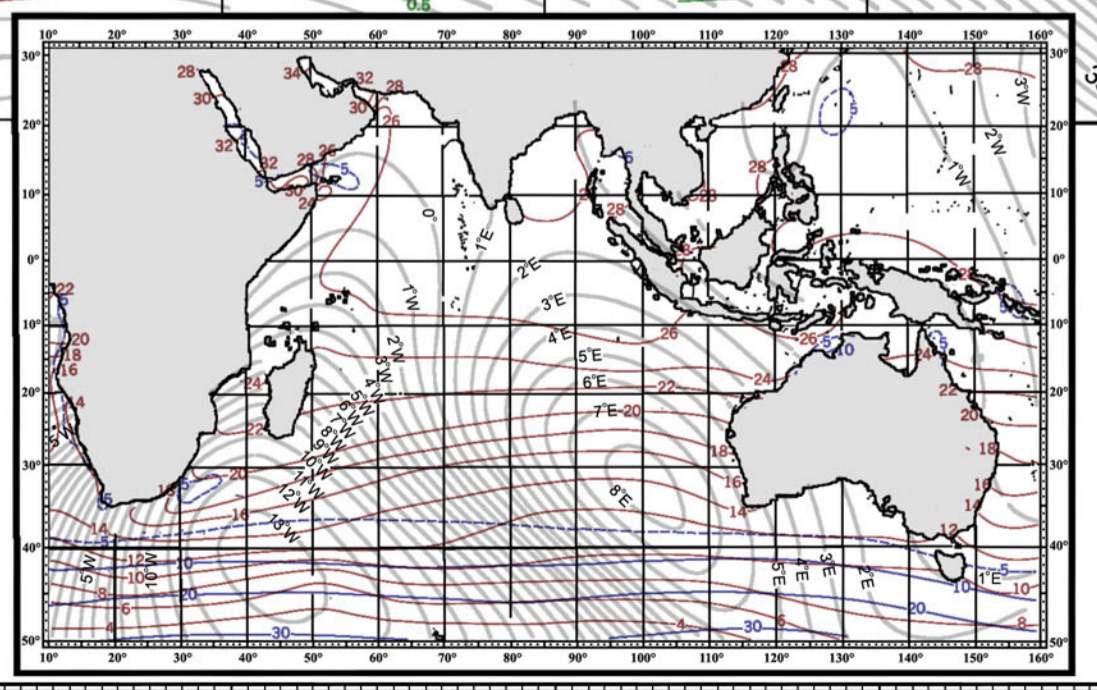
SURFACE PRESSURE
This chart shows the average barometric pressure reduced to sea level. Isotherms are solid blue lines for every 2.5 millibars difference in pressure.

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

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

AIR TEMPERATURE
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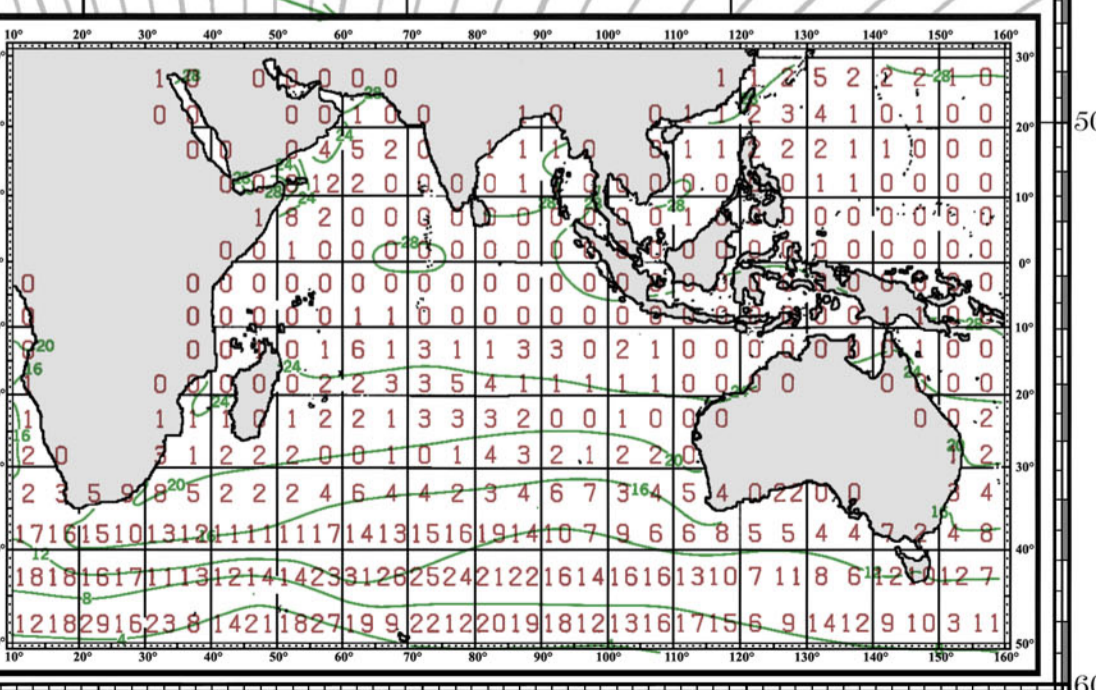
VISIBILITY
Blue lines show percentage of observations reporting visibility less than 2 miles.



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The mean sea surface temperature (°C), in green lines, is shown for every 4 degrees.

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. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

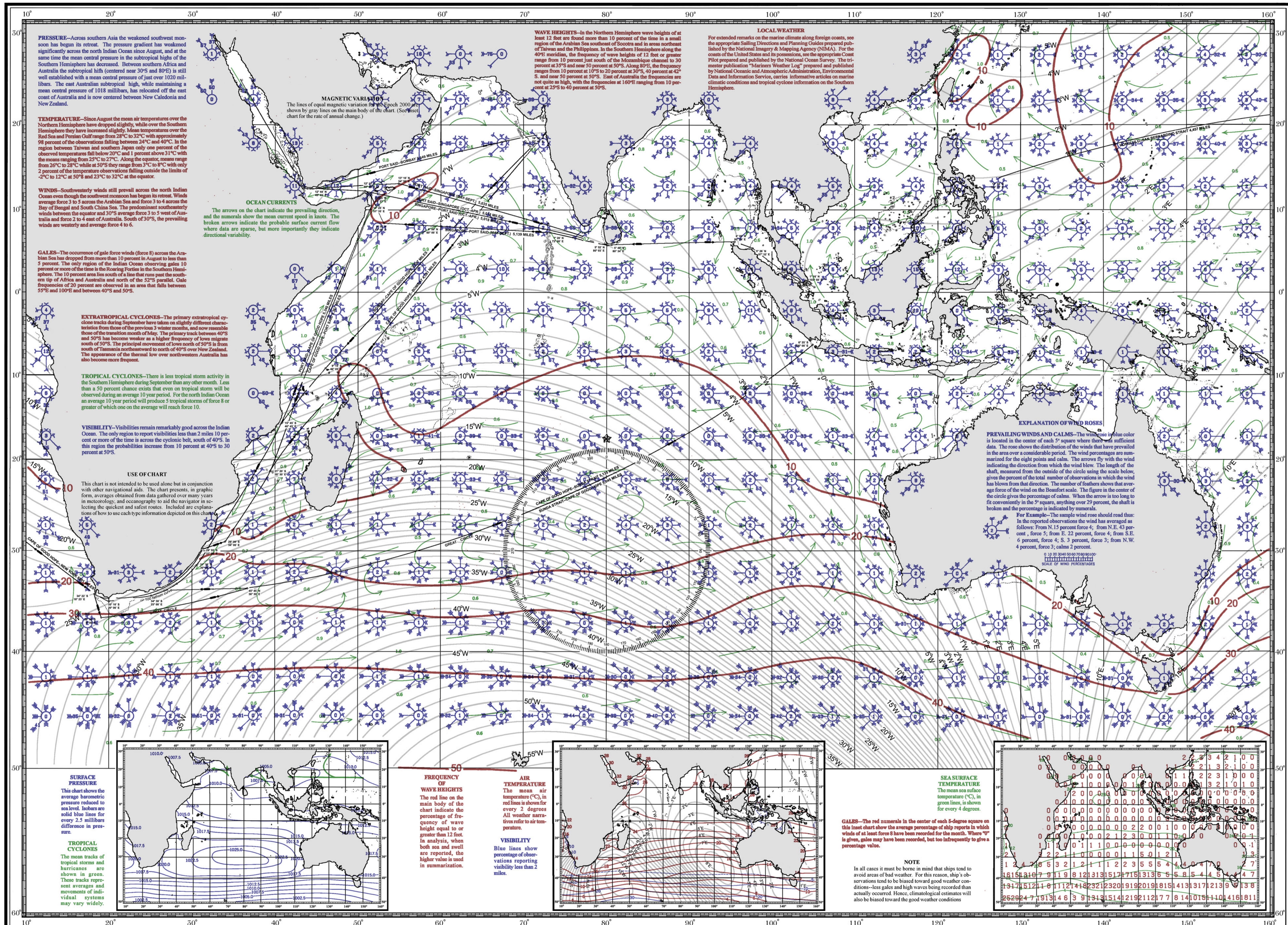
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PILOT CHART OF THE INDIAN OCEAN

SEPTEMBER



PRESSURE—Across southern Asia the weakened southwest monsoon has begun its retreat. The pressure gradient has weakened significantly across the north Indian Ocean since August, and at the same time the mean central pressure in the subtropical highs of the Southern Hemisphere has decreased. Between southern Africa and Australia the subtropical high (centered near 30°S and 80°E) is still well established with a mean central pressure of just over 1020 millibars. The east Australian subtropical high, while maintaining a mean central pressure of 1018 millibars, has relocated off the east coast of Australia and is now centered between New Caledonia and New Zealand.

TEMPERATURE—Since August the mean air temperatures over the Northern Hemisphere have dropped slightly, while over the Southern Hemisphere they have increased slightly. Mean temperatures over the Red Sea and Persian Gulf range from 28°C to 32°C with approximately 98 percent of the observations falling between 24°C and 40°C. In the region between Taiwan and southern Japan only one percent of the observed temperatures fall below 20°C and 1 percent above 31°C with the means ranging from 25°C to 27°C. Along the equator, means range from 26°C to 28°C while at 50°S they range from 3°C to 8°C with only 2 percent of the temperature observations falling outside the limits of -2°C to 12°C at 50°S and 23°C to 32°C at the equator.

WINDS—Southwesterly winds still prevail across the north Indian Ocean even though the southwest monsoon has begun its retreat. Wind average force 3 to 5 across the Arabian Sea and force 3 to 4 across the Bay of Bengal and South China Sea. The predominant southeasterly winds between the equator and 30°S average force 3 to 5 west of Australia and force 2 to 4 east of Australia. South of 30°S, the prevailing winds are westerly and average force 4 to 6.

GALES—The occurrence of gale force winds (force 8) across the Arabian Sea has dropped from more than 10 percent in August to less than 5 percent. The only region of the Indian Ocean observing gales 10 percent or more of the time is the Roraring Forties in the Southern Hemisphere. The 10 percent area lies south of a line that runs past the southern tip of Africa and Australia and north of the 52°S parallel. Gale frequencies of 20 percent are observed in an area that falls between 55°E and 100°E and between 40°S and 50°S.

EXTRATROPICAL CYCLONES—The primary extratropical cyclone tracks during September have taken on slightly different characteristics from those of the previous 3 winter months, and now resemble those of the transition month of May. The primary track between 40°S and 50°S has become weaker as a higher frequency of lows migrate south of 50°S. The principal movement of lows north of 40°S is from south of Tasmania northeastward to north of 40°S over New Zealand. The appearance of the thermal low over northwestern Australia has also become more frequent.

TROPICAL CYCLONES—There is less tropical storm activity in the Southern Hemisphere during September than any other month. Less than a 50 percent chance exists that even on tropical storm will be observed during an average 10 year period. For the north Indian Ocean an average 10 year period will produce 5 tropical storms of force 8 or greater of which one on the average will reach force 10.

VISIBILITY—Visibilities remain remarkably good across the Indian Ocean. The only region to report visibilities less than 2 miles 10 percent or more of the time is across the cyclonic belt, south of 40°S. In this region the probabilities increase from 10 percent at 40°S to 30 percent at 50°S.

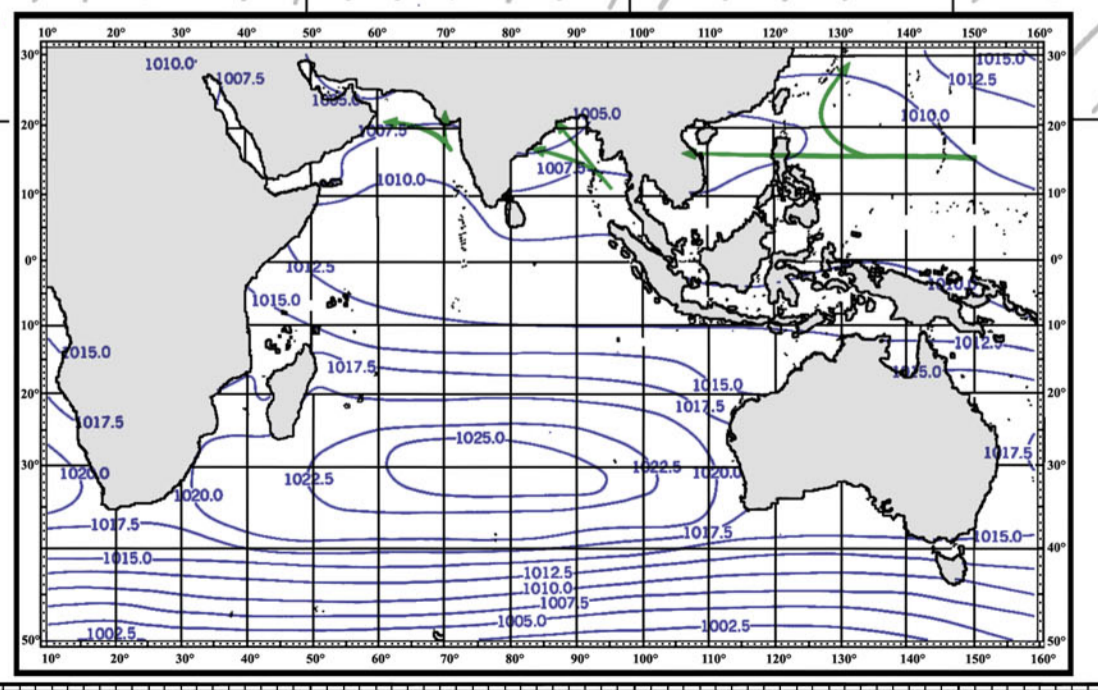
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FREQUENCY OF WAVE HEIGHTS

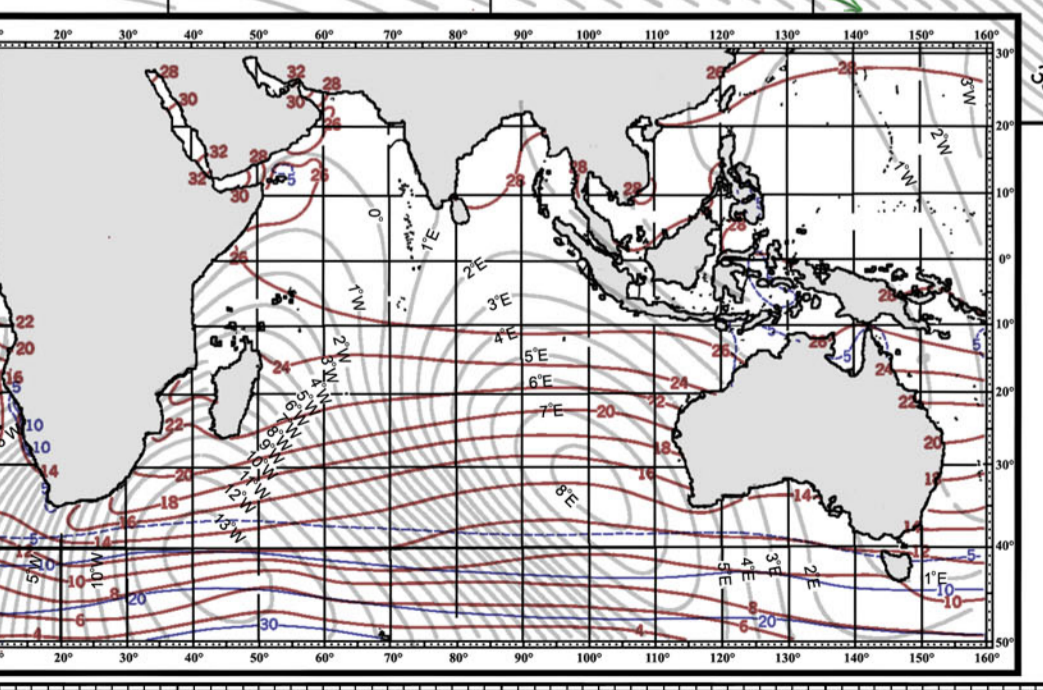
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AIR TEMPERATURE

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

VISIBILITY

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SEA SURFACE TEMPERATURE

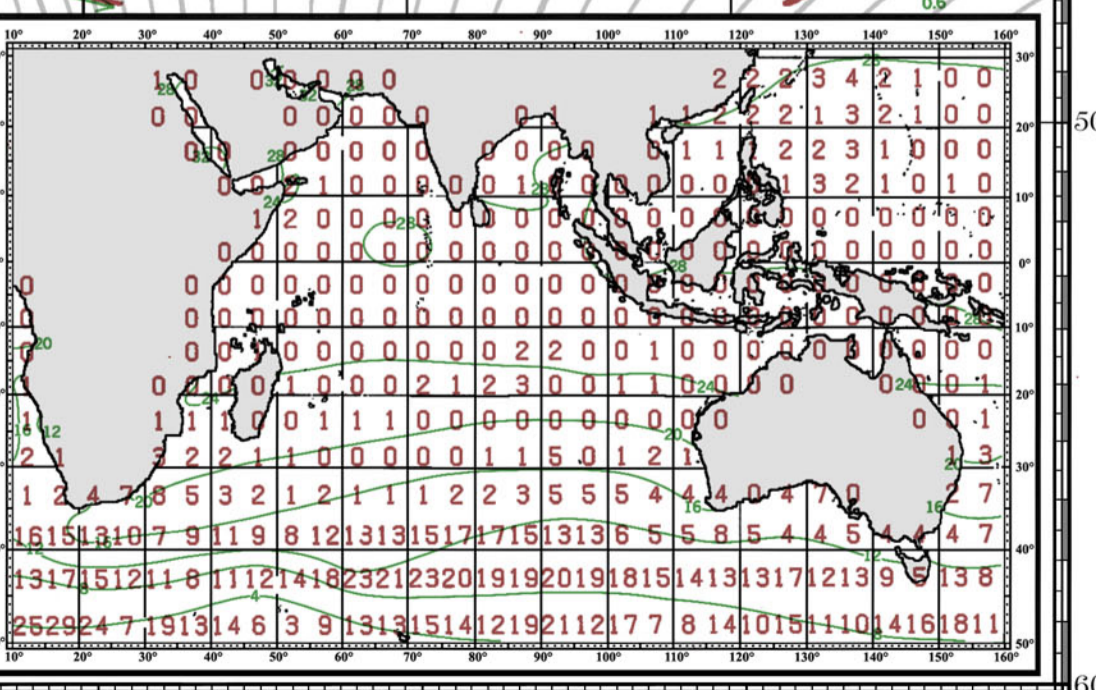
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GALES

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WAVE HEIGHTS—In the Northern Hemisphere wave heights of at least 12 feet are found more than 10 percent of the time in a small region of the Arabian Sea southeast of Socotra and in areas northeast of Taiwan and the Philippines. In the Southern Hemisphere along the 40°E meridian, the frequency of wave heights of 12 feet or greater range from 10 percent just south of the Mozambique channel to 30 percent at 35°S and near 50 percent at 50°S. Along 80°E, the frequency ranges from 10 percent at 10°S to 20 percent at 30°S, 40 percent at 42°S, and near 50 percent at 50°S. East of Australia the frequencies are not quite as high, with the frequencies at 160°E ranging from 10 percent at 25°S to 40 percent at 50°S.

LOCAL WEATHER
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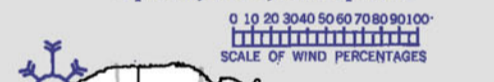
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The lines of equal magnetic variation for the Epoch 2000 are shown by gray lines on the main body of the chart. (See inset chart for the rate of annual change.)

OCEAN CURRENTS
The arrows on the chart indicate the prevailing direction, and the numerals show the mean current speed in knots. The broken arrows indicate the probable surface current flow where data are sparse, but more importantly they indicate directional variability.

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 that 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.

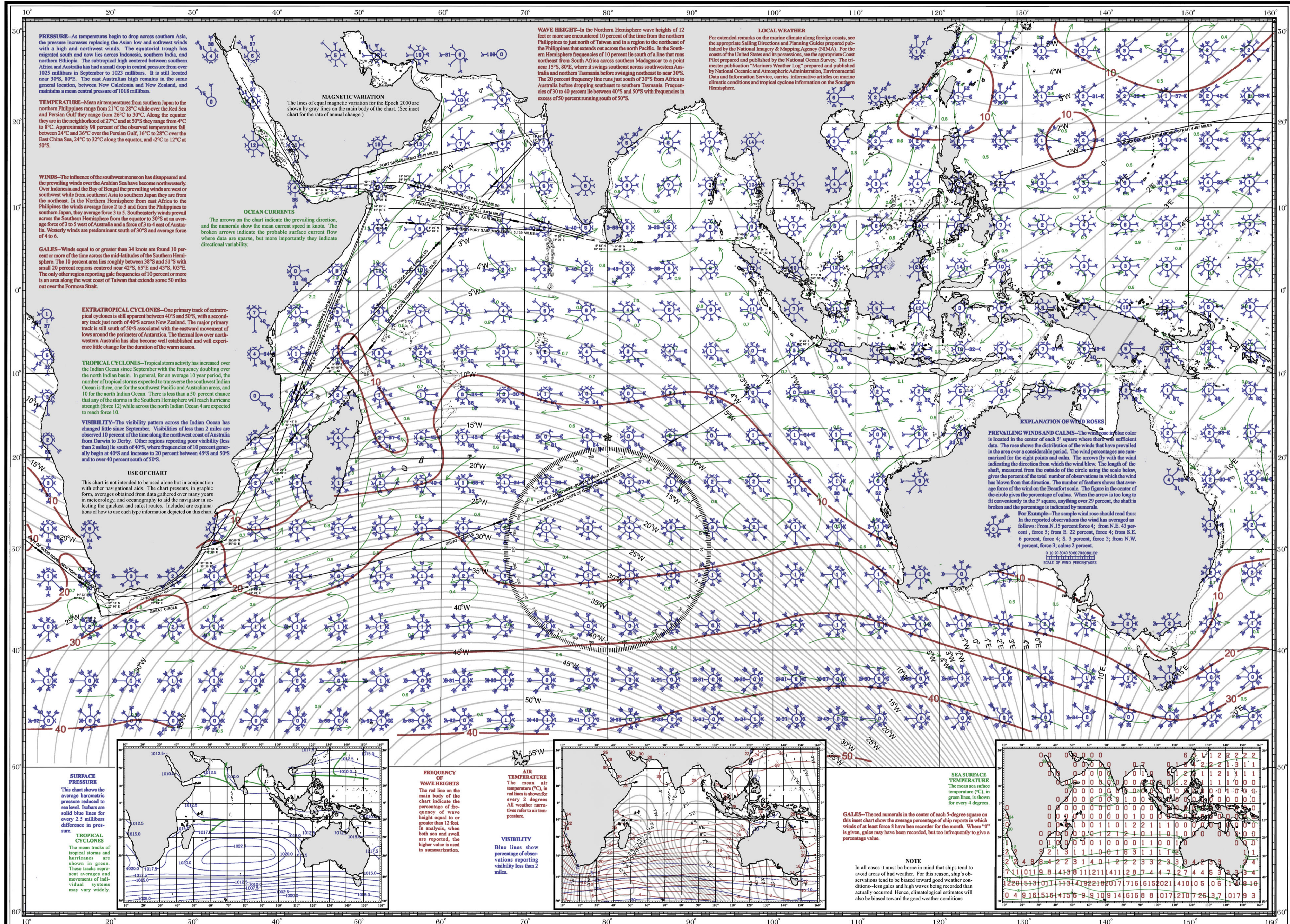
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PILOT CHART OF THE INDIAN OCEAN

OCTOBER



PRESSURE—As temperatures begin to drop across southern Asia, the pressure increases replacing the Asian low and southwest winds with a high and northwest winds. The equatorial trough has migrated south and now lies across Indonesia, southern India, and northern Ethiopia. The subtropical high centered between southern Africa and Australia has had a small drop in central pressure from over 1025 millibars in September to 1023 millibars. It is still located near 30°S, 80°E. The east Australian high remains in the same general location, between New Caledonia and New Zealand, and maintains a mean central pressure of 1018 millibars.

TEMPERATURE—Mean air temperatures from southern Japan to the northern Philippines range from 21°C to 28°C while over the Red Sea and Persian Gulf they range from 26°C to 30°C. Along the equator they are in the neighborhood of 27°C and at 50°S they range from 4°C to 8°C. Approximately 98 percent of the observed temperatures fall between 24°C and 36°C over the Persian Gulf; 16°C to 28°C over the East China Sea, 24°C to 32°C along the equator, and -2°C to 12°C at 50°S.

WINDS—The influence of the southwest monsoon has disappeared and the prevailing winds over the Arabian Sea have become northeasterly. Over Indonesia and the Bay of Bengal the prevailing winds are west or southwest while from southern Asia to southern Japan they are from the northeast. In the Northern Hemisphere from east Africa to the Philippines the winds average force 2 to 3 and from the Philippines to southern Japan, they average force 3 to 5. Southeastery winds prevail across the Southern Hemisphere from the equator to 30°S at an average force of 3 to 5 west of Australia and a force of 3 to 4 east of Australia. Westerly winds are predominant south of 30°S and average force of 4 to 6.

GALES—Winds equal to or greater than 34 knots are found 10 percent or more of the time across the mid-latitudes of the Southern Hemisphere. The 10 percent area lies roughly between 38°S and 51°S with small 20 percent regions centered near 42°S, 65°E and 43°S, 103°E. The only other region reporting gale frequencies of 10 percent or more is an area along the west coast of Taiwan that extends some 50 miles out over the Formosa Strait.

EXTRATROPICAL CYCLONES—One primary track of extratropical cyclones is still apparent between 40°S and 50°S, with a secondary track just north of 40°S across New Zealand. The major primary track is still south of 50°S associated with the eastward movement of lows around the perimeter of Antarctica. The thermal low over northwestern Australia has also become well established and will experience little change for the duration of the warm season.

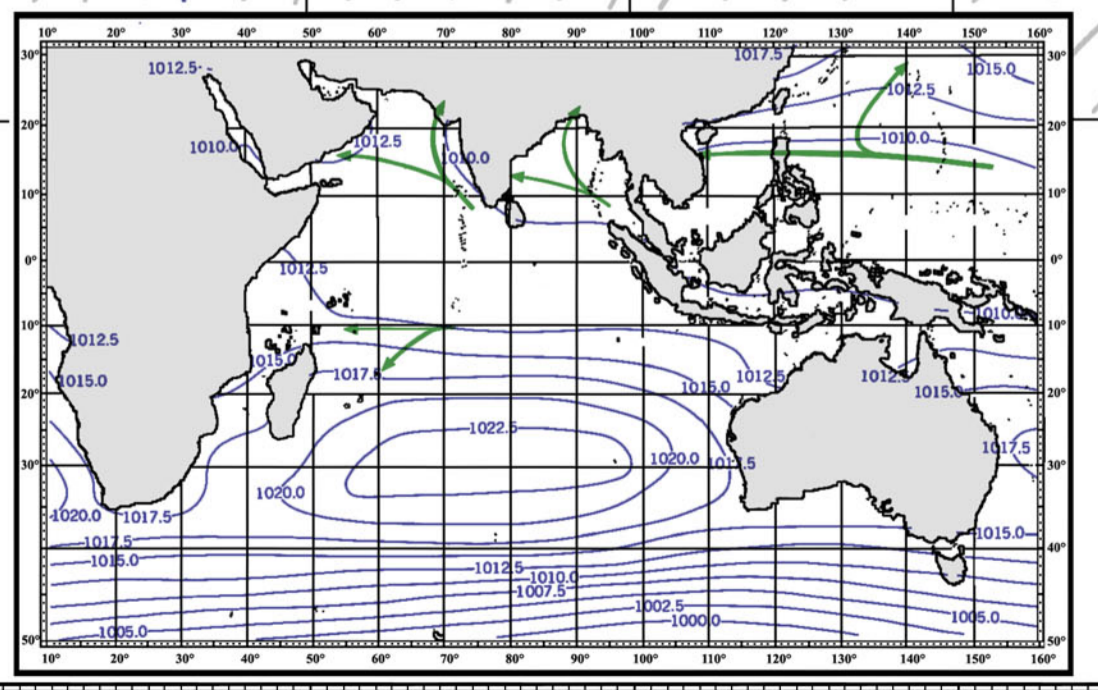
TROPICAL CYCLONES—Tropical storm activity has increased over the Indian Ocean since September with the frequency doubling over the north Indian basin. In general, for an average 10 year period, the number of tropical storms expected to transverse the southwest Indian Ocean is three, one for the southwest Pacific and Australian areas, and 10 for the north Indian Ocean. There is less than a 50 percent chance that any of the storms in the Southern Hemisphere will reach hurricane strength (force 12) while across the north Indian Ocean 4 are expected to reach force 10.

VISIBILITY—The visibility pattern across the Indian Ocean has changed little since September. Visibilities of less than 2 miles are observed 10 percent of the time along the northwest coast of Australia from Darwin to Derby. Other regions reporting poor visibility (less than 2 miles) lie south of 40°S, where frequencies of 10 percent generally begin at 40°S and increase to 20 percent between 45°S and 50°S and to over 40 percent south of 50°S.

USE OF CHART
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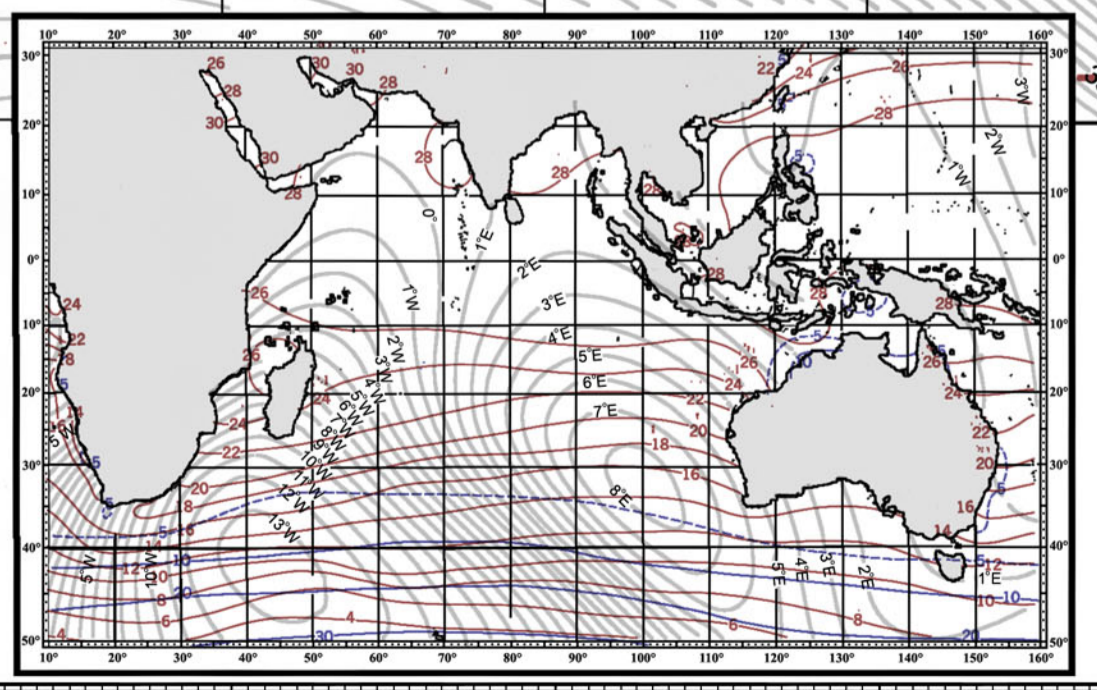
TROPICAL CYCLONES
The mean tracks of tropical storms and hurricanes are shown in green. These tracks represent averages and movements of individual systems may vary widely.



FREQUENCY OF WAVE HEIGHTS
The red line on the main body of the chart indicates the percentage of frequency of wave height equal to or greater than 12 feet. In analysis, when both sea and swell are reported, the higher value is used in summarization.

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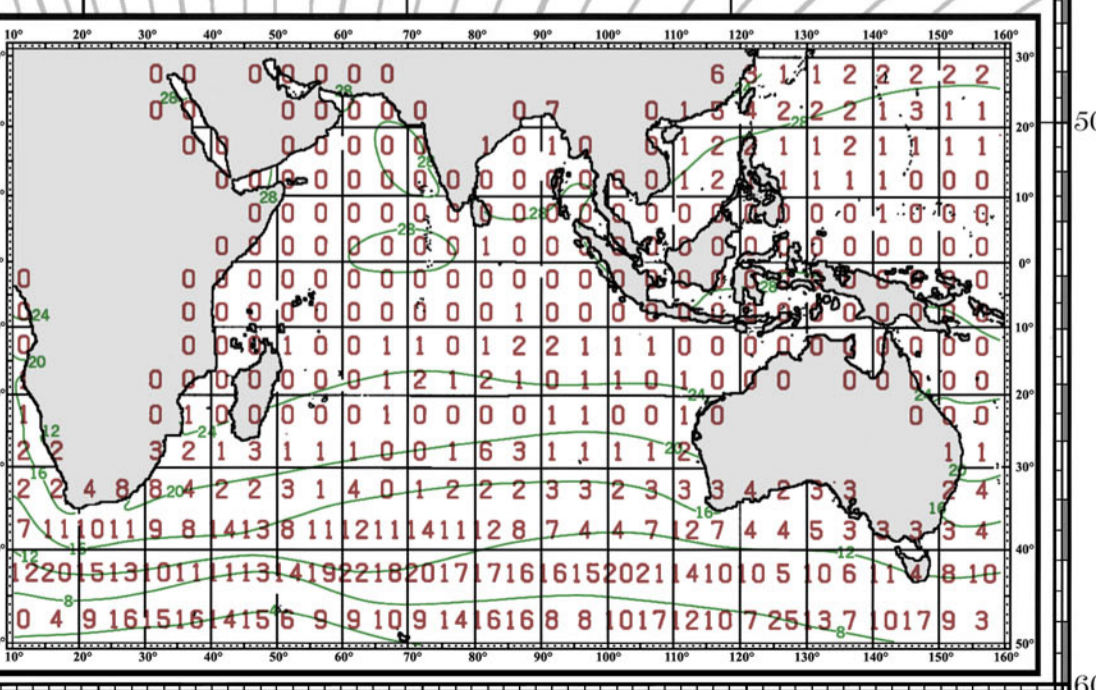
VISIBILITY
Blue lines show percentage of observations reporting visibility less than 2 miles.



SEA SURFACE TEMPERATURE
The mean sea surface temperature (°C), in green lines, is shown for every 4 degrees.

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. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

NOTE
In all cases it must be borne in mind that ships tend to avoid areas of bad weather. For this reason, ship's observations tend to be biased toward good weather conditions—less gales and high waves being recorded than actually occurred. Hence, climatological estimates will also be biased toward the good weather conditions.



WAVE HEIGHT—In the Northern Hemisphere wave heights of 12 feet or more are encountered 10 percent of the time from the northern Philippines to just north of Taiwan and in a region to the northeast of the Philippines that extends out across the north Pacific. In the Southern Hemisphere frequencies of 10 percent lie south of a line that runs northeast from South Africa across southern Madagascar to a point near 15°S, 80°E, where it swings southeast across southwestern Australia and northern Tasmania before swinging northeast to near 30°S. The 20 percent frequency line runs just south of 30°S from Africa to Australia before dropping southeast to southern Tasmania. Frequencies of 30 to 40 percent lie between 40°S and 50°S with frequencies in excess of 50 percent running south of 50°S.

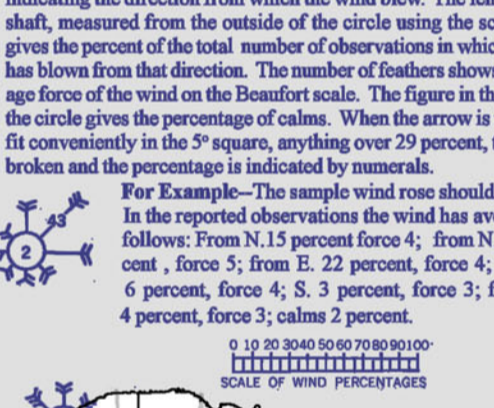
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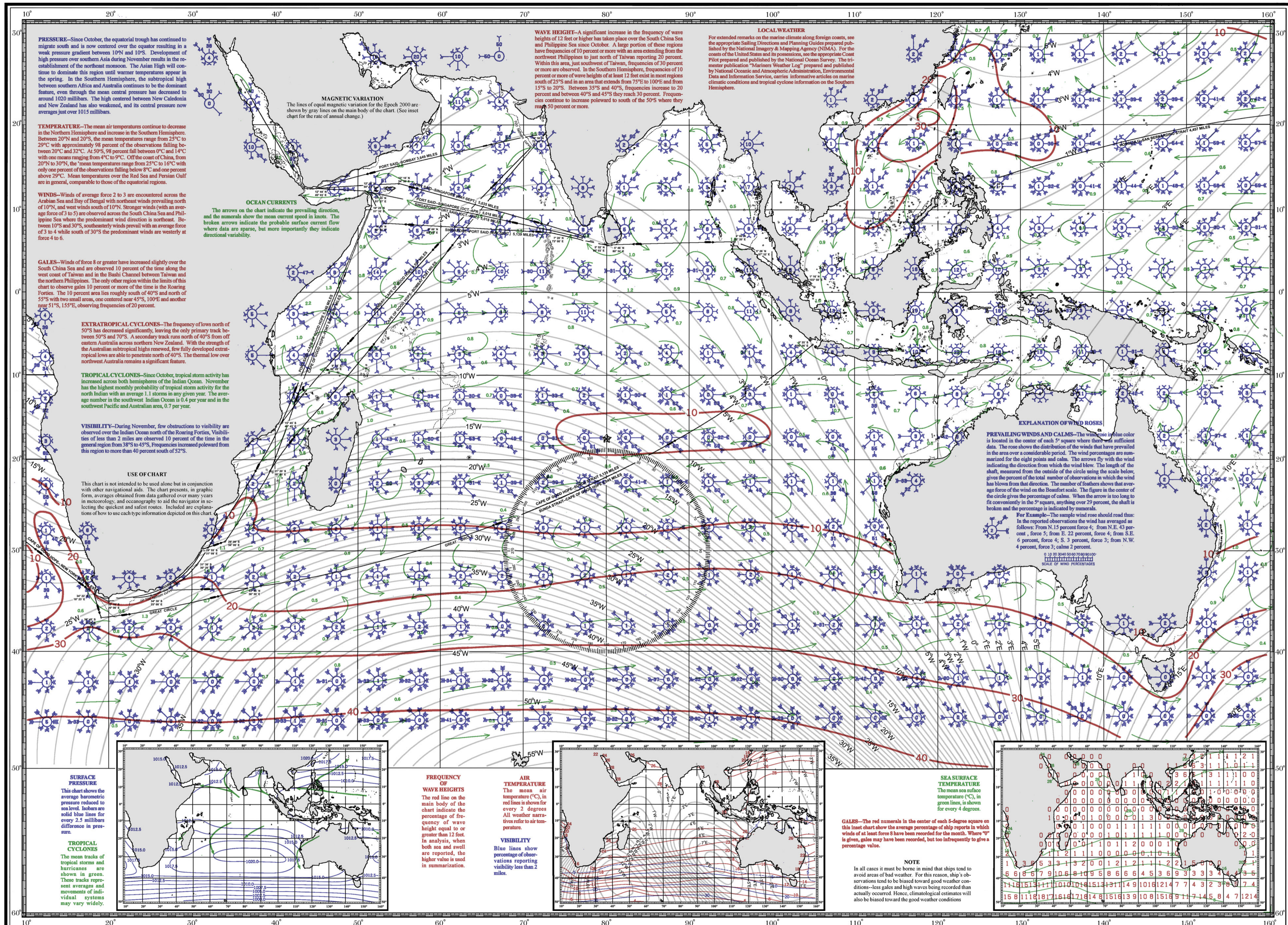
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PILOT CHART OF THE INDIAN OCEAN

NOVEMBER



PRESSURE—Since October, the equatorial trough has continued to migrate south and is now centered over the equator resulting in a weak pressure gradient between 10°N and 10°S. Development of high pressure over southern Asia during November results in the re-establishment of the northeast monsoon. The Asian High will continue to dominate this region until warmer temperatures appear in the spring. In the Southern Hemisphere, the subtropical high between southern Africa and Australia continues to be the dominant feature, even though the mean central pressure has decreased to around 1020 millibars. The high centered between New Caledonia and New Zealand has also weakened, and its central pressure now averages just over 1015 millibars.

TEMPERATURE—The mean air temperatures continue to decrease in the Northern Hemisphere and increase in the Southern Hemisphere. Between 20°N and 20°S, the mean temperatures range from 25°C to 29°C with approximately 98 percent of the observations falling between 20°C and 32°C. At 50°S, 98 percent fall between 0°C and 14°C with one means ranging from 4°C to 9°C. Off the coast of China, from 20°N to 30°N, the mean temperatures range from 25°C to 16°C with only one percent of the observations falling below 8°C and one percent above 29°C. Mean temperatures over the Red Sea and Persian Gulf are in general, comparable to those of the equatorial regions.

WINDS—Winds of average force 2 to 3 are encountered across the Arabian Sea and Bay of Bengal with northeast winds prevailing north of 10°N, and west winds south of 10°N. Stronger winds (with an average force of 3 to 5) are observed across the South China Sea and Philippine Sea where the predominant wind direction is northeast. Between 10°S and 30°S, southeasterly winds prevail with an average force of 3 to 4 while south of 30°S the predominant winds are westerly at force 4 to 6.

GALES—Winds of force 8 or greater have increased slightly over the South China Sea and are observed 10 percent of the time along the west coast of Taiwan and in the Bashi Channel between Taiwan and the northern Philippines. The only other region within the limits of this chart to observe gales 10 percent or more of the time is the Roaring Forties. The 10 percent area lies roughly south of 40°S and north of 55°S with two small areas, one centered near 45°S, 100°E and another near 51°S, 155°E, observing frequencies of 20 percent.

EXTRATROPICAL CYCLONES—The frequency of lows north of 50°S has decreased significantly, leaving the only primary track between 50°S and 70°S. A secondary track runs north of 40°S from off eastern Australia across northern New Zealand. With the strength of the Australian subtropical highs renewed, few fully developed extratropical lows are able to penetrate north of 40°S. The thermal low over northwest Australia remains a significant feature.

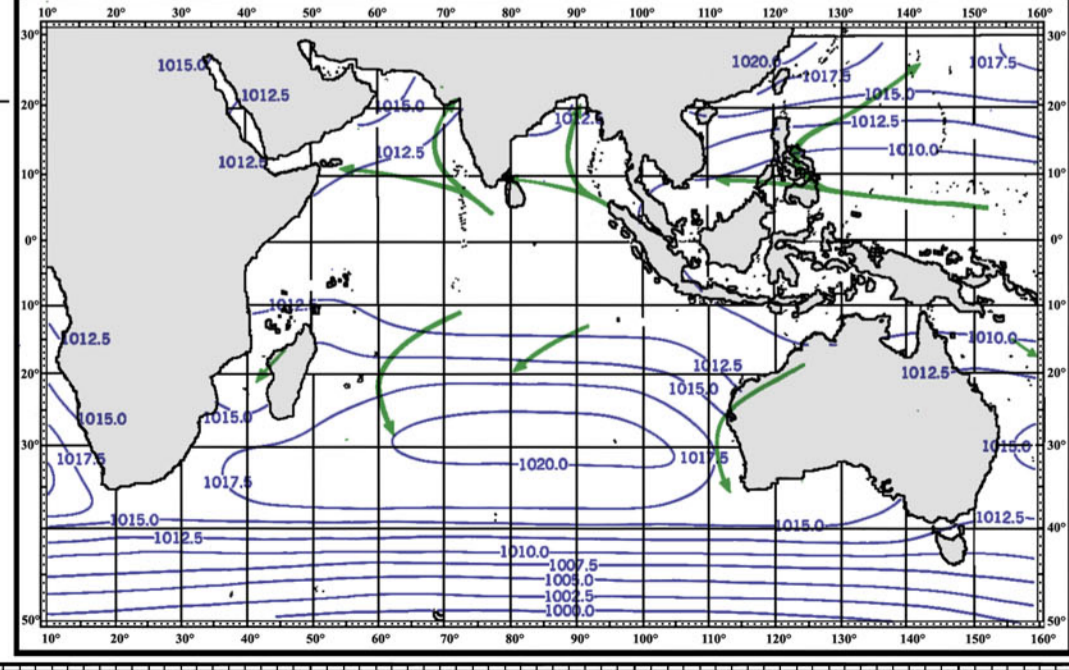
TROPICAL CYCLONES—Since October, tropical storm activity has increased across both hemispheres of the Indian Ocean. November has the highest monthly probability of tropical storm activity for the north Indian with an average 1.1 storms in any given year. The average number in the southwest Indian Ocean is 0.4 per year and in the southwest Pacific and Australian area, 0.7 per year.

VISIBILITY—During November, few obstructions to visibility are observed over the Indian Ocean north of the Roaring Forties. Visibilities of less than 2 miles are observed 10 percent of the time in the general region from 38°S to 45°S. Frequencies increased poleward from this region to more than 40 percent south of 52°S.

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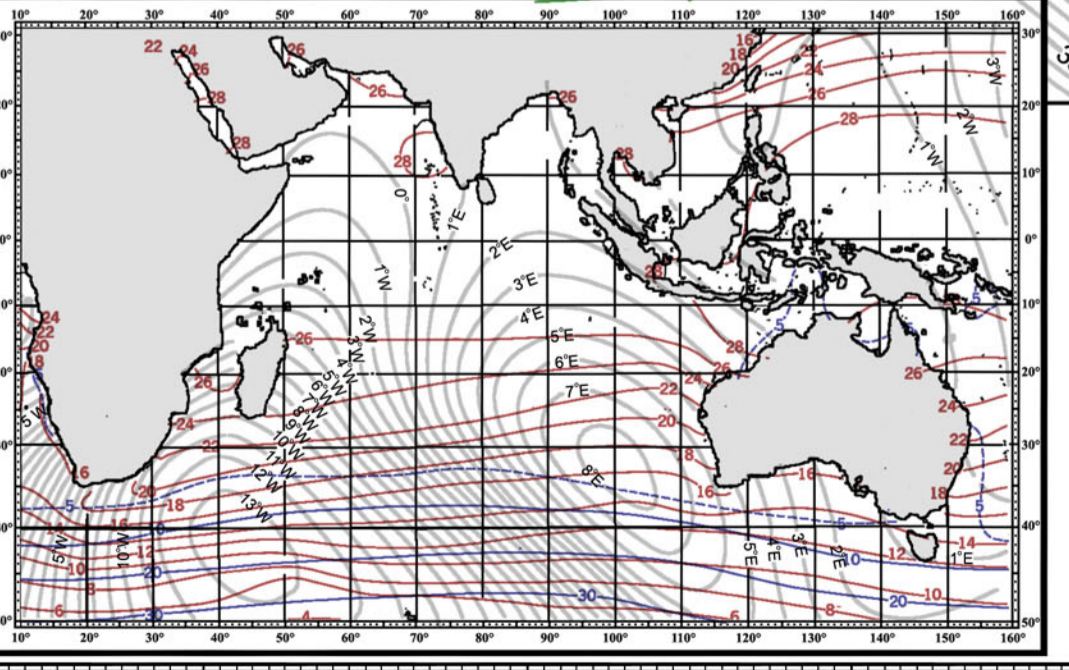
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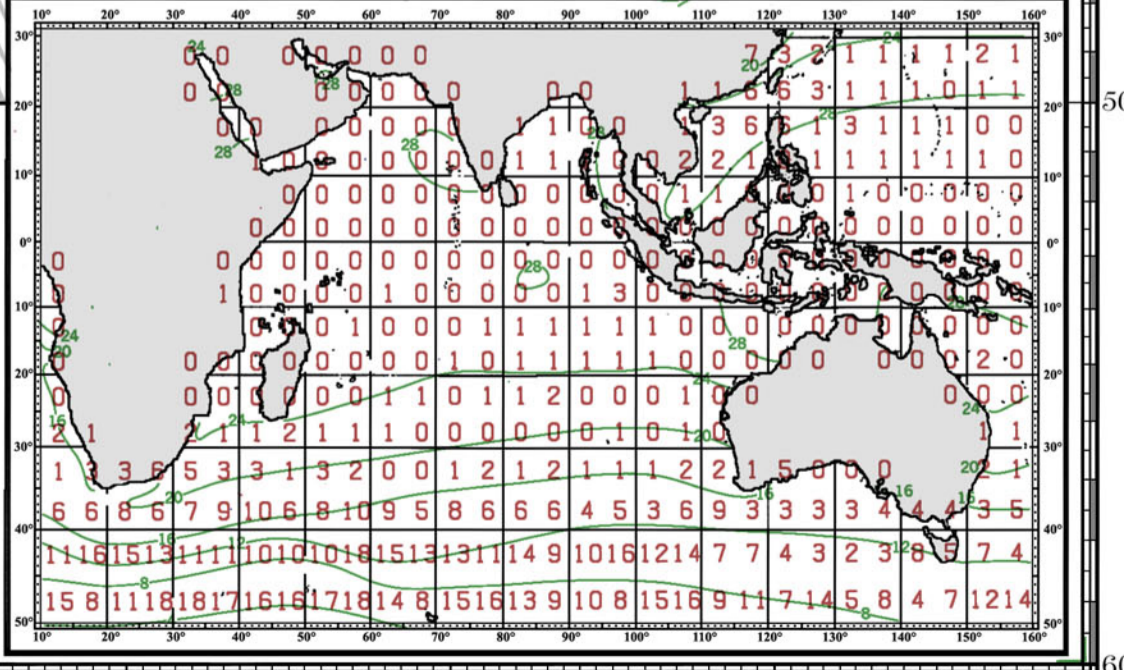
VISIBILITY
Blue lines show percentage of observations reporting visibility less than 2 miles.



SEA SURFACE TEMPERATURE
The mean sea surface temperature (°C), in green lines, is shown for every 4 degrees.

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. Where "0" is given, gales may have been recorded, but too infrequently to give a percentage value.

NOTE
In all cases it must be borne in mind that ships tend to avoid areas of bad weather. For this reason, ship's observations tend to be biased toward good weather conditions—less gales and high waves being recorded than actually occurred. Hence, climatological estimates will also be biased toward the good weather conditions.



WAVE HEIGHT—A significant increase in the frequency of wave heights of 12 feet or higher has taken place over the South China Sea and Philippine Sea since October. A large portion of these regions have frequencies of 10 percent or more with an area extending from the northwest Philippines to just north of Taiwan, frequencies of 30 percent or more are observed. In the Southern Hemisphere, frequencies of 10 percent or more of wave heights of at least 12 feet exist in most regions south of 25°S and in an area that extends from 75°E to 100°E and from 15°S to 20°S. Between 35°S and 40°S, frequencies increase to 30 percent and between 40°S and 45°S they reach 50 percent. Frequencies continue to increase poleward to south of the 50°S where they reach 50 percent or more.

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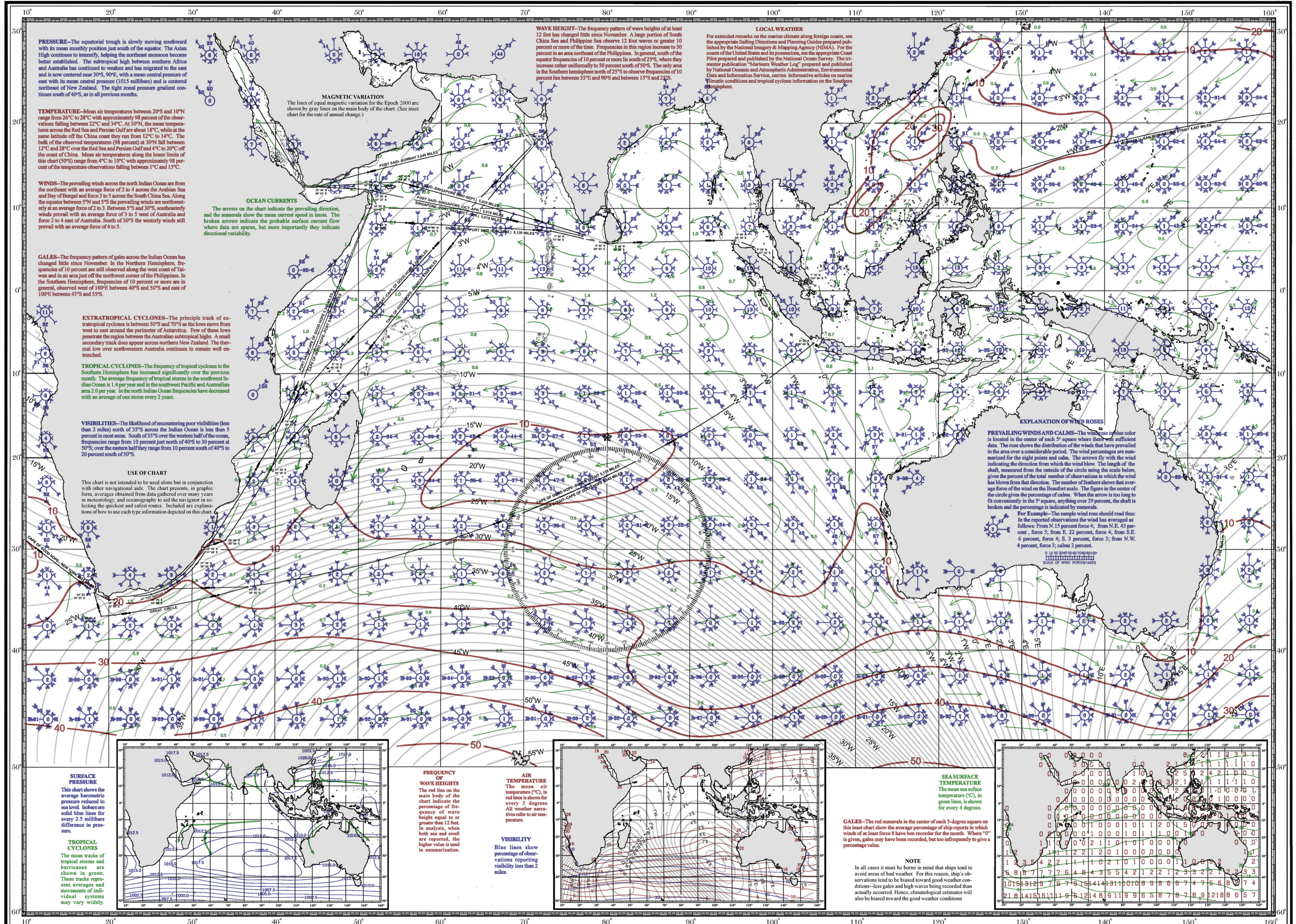
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PILOT CHART OF THE INDIAN OCEAN

DECEMBER



PRESSURE—The equatorial trough is slowly moving southward with its mean monthly position just south of the equator. The Asian High continues to intensify, helping the northeast monsoon become better established. The subtropical high between southern Africa and Australia has continued to weaken and has migrated to the east and is now centered near 30°S, 90°E, with a mean central pressure of east with its mean central pressure (1015 millibars) and is centered northeast of New Zealand. The tight zonal pressure gradient continues south of 40°S, as in all previous months.

TEMPERATURE—Mean air temperatures between 20°S and 10°N range from 26°C to 28°C with approximately 98 percent of the observations falling between 22°C and 34°C. At 30°N, the mean temperatures across the Red Sea and Persian Gulf are about 18°C to 14°C. The bulk of the observed temperatures (98 percent) at 30°N fall between 12°C and 28°C over the Red Sea and Persian Gulf and 4°C to 20°C off the coast of China. Mean air temperatures along the lower limits of this chart (50°S) range from 4°C to 10°C with approximately 98 percent of the temperature observations falling between 1°C and 15°C.

WINDS—The prevailing winds across the north Indian Ocean are from the northeast with an average force of 2 to 4 across the Arabian Sea and Bay of Bengal and force 3 to 5 across the South China Sea. Along the equator between 5°W and 5°E the prevailing winds are westerly at an average force of 2 to 3. Between 5°S and 30°S, southeasterly winds prevail with an average force of 3 to 5 west of Australia and force 2 to 4 east of Australia. South of 30°S the westerly winds still prevail with an average force of 4 to 5.

GALES—The frequency pattern of gales across the Indian Ocean has changed little since November. In the Northern Hemisphere, frequencies of 10 percent are still observed along the west coast of Taiwan and in an area just off the northwest corner of the Philippines. In the Southern Hemisphere, frequencies of 10 percent or more are in general, observed west of 100°E between 40°S and 50°S and east of 100°E between 45°S and 55°S.

EXTRATROPICAL CYCLONES—The principle track of extratropical cyclones is between 50°S and 70°S as the lows move from west to east around the perimeter of Antarctica. Few of these lows penetrate the region between the Australian subtropical highs. A small secondary track does appear across northern New Zealand. The thermal low over northwestern Australia continues to remain well entrenched.

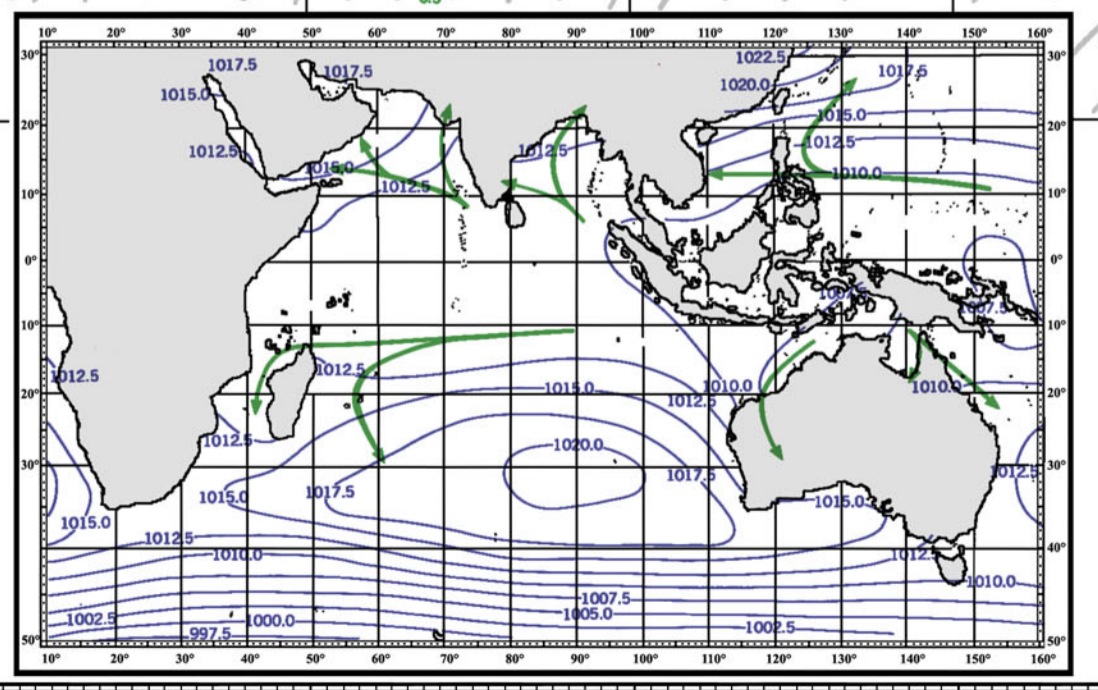
TROPICAL CYCLONES—The frequency of tropical cyclones in the Southern Hemisphere has increased significantly over the previous month. The average frequency of tropical storms in the southwest Indian Ocean is 1.4 per year and in the southwest Pacific and Australian area 2.0 per year. In the north Indian Ocean frequencies have decreased with an average of one storm every 2 years.

VISIBILITIES—The likelihood of encountering poor visibilities (less than 2 miles) north of 35°S across the Indian Ocean is less than 5 percent in most areas. South of 35°S over the western half of the ocean, frequencies range from 10 percent just north of 40°S to 30 percent at 50°S; over the eastern half they range from 10 percent south of 40°S to 20 percent south of 50°S.

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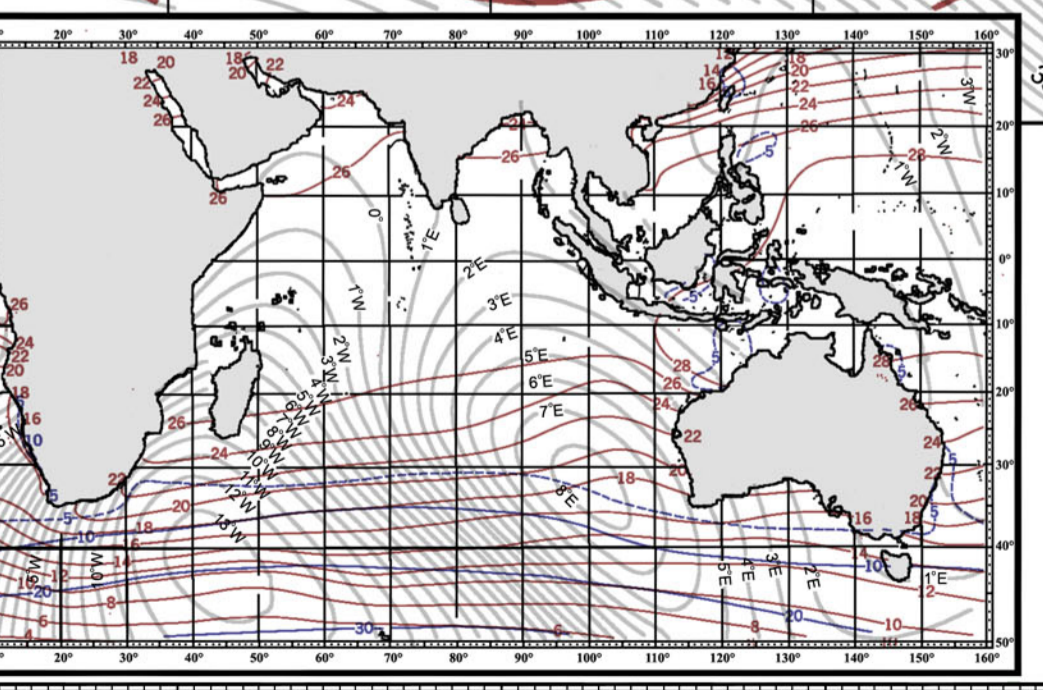
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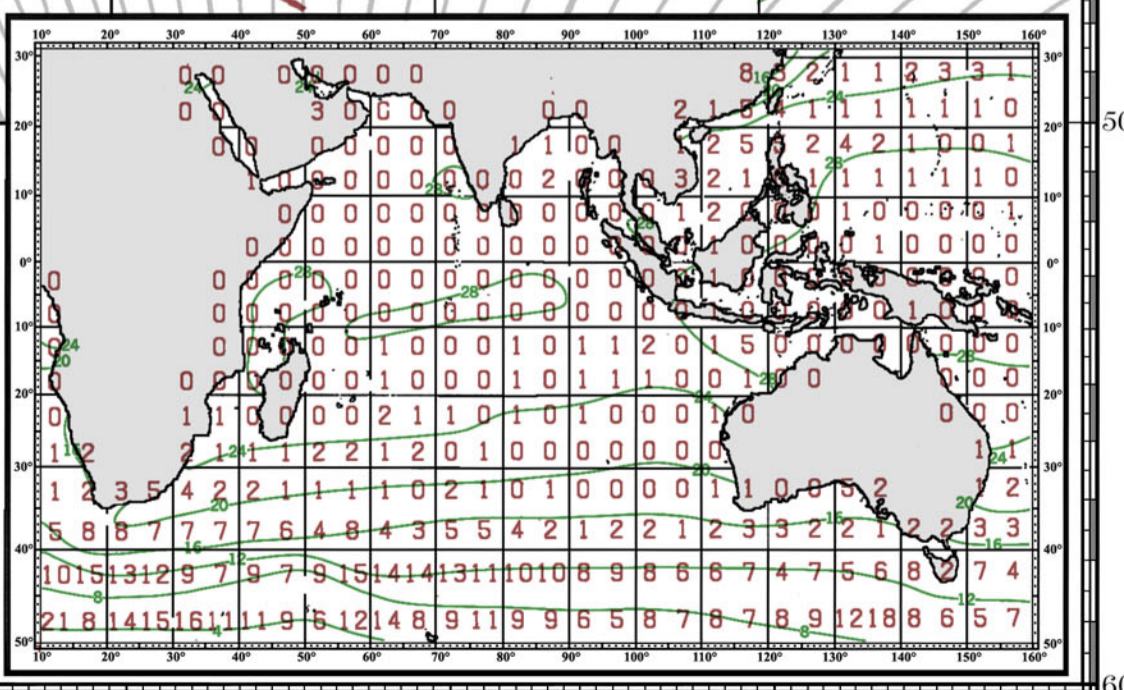
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WAVE HEIGHT—The frequency pattern of wave heights of at least 12 feet has changed little since November. A large portion of South China Sea and Philippine Sea observe 12 foot waves or greater 10 percent or more of the time. Frequencies in this region increase to 30 percent in an area northeast of the Philippines. In general, south of the equator frequencies of 10 percent or more lie south of 25°S, where they increase rather uniformly to 50 percent south of 50°S. The only area in the Southern Hemisphere north of 25°S to observe frequencies of 10 percent lies between 55°E and 90°E and between 15°S and 25°S.

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0 10 20 30 40 50 60 70 80 90 100
SCALE OF WIND PERCENTAGES