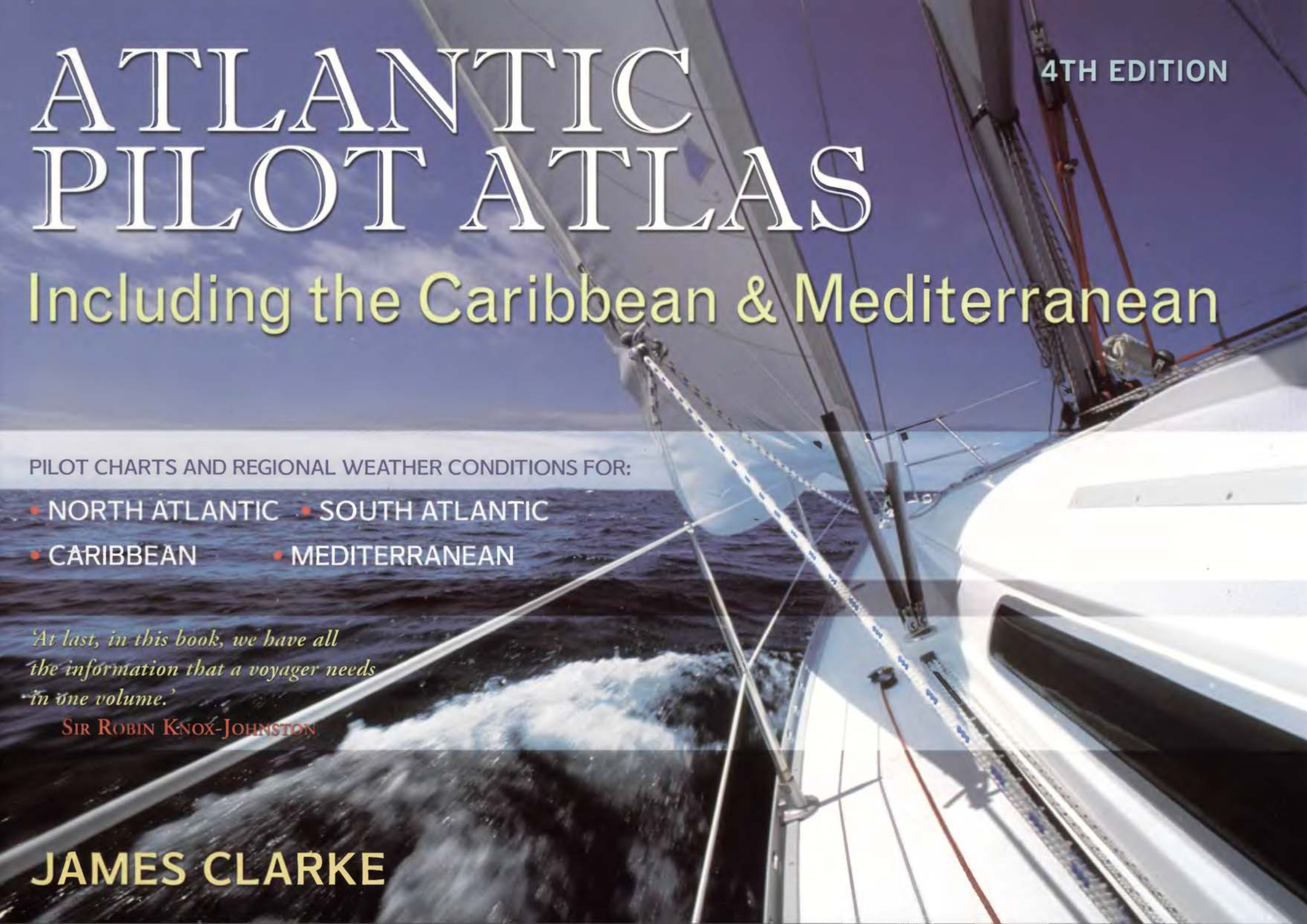
ATLANTIC PILOT ATLAS

4TH EDITION

Including the Caribbean & Mediterranean



PILOT CHARTS AND REGIONAL WEATHER CONDITIONS FOR:

- NORTH ATLANTIC
- SOUTH ATLANTIC
- CARIBBEAN
- MEDITERRANEAN

'At last, in this book, we have all the information that a voyager needs in one volume.'
SIR ROBIN KNOX-JOHNSTON

JAMES CLARKE

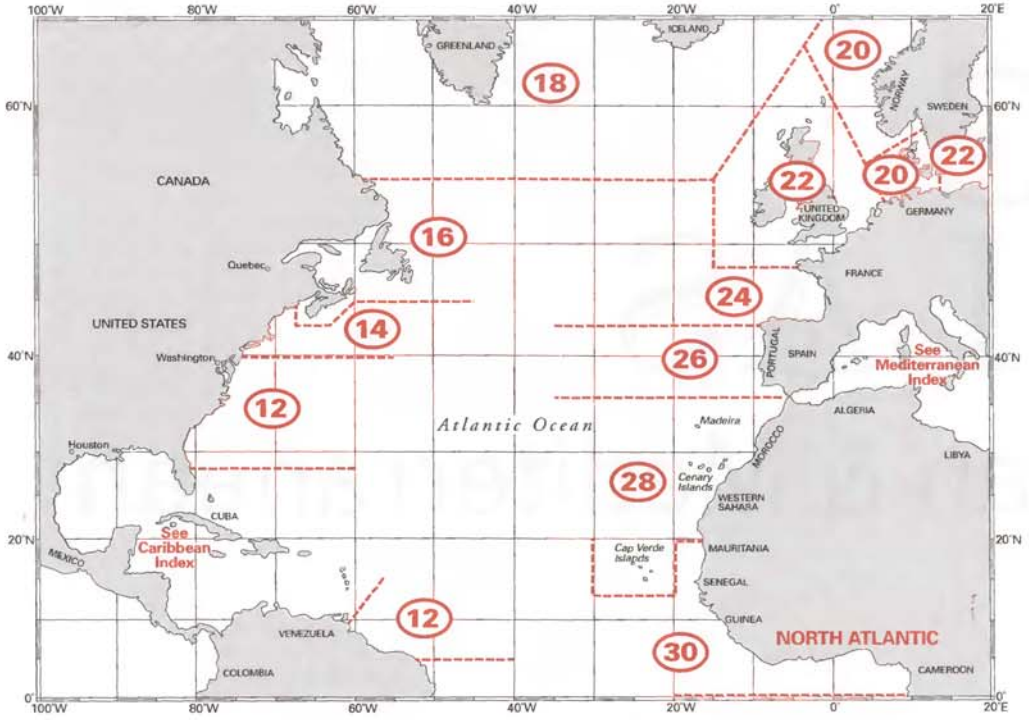
ATLANTIC PILOT ATLAS

Including the Caribbean & Mediterranean

4TH EDITION

JAMES CLARKE

ADLARD COLES NAUTICAL
London


NORTH ATLANTIC
Atlantic Ocean
CANADA
UNITED STATES
GREENLAND
ICELAND
NORWAY
SWEDEN
UNITED KINGDOM
GERMANY
FRANCE
PORTUGAL
SPAIN
ALGERIA
LIBYA
MOROCCO
Madeira
Canary Islands
WESTERN SAHARA
MAURITANIA
SENEGAL
GUINEA
CAMEROON
CUBA
MEXICO
VENEZUELA
COLOMBIA
Quebec
Washington
Houston
Cap Verde Islands
See Caribbean Index
See Mediterranean Index
18
20
22
16
24
14
26
12
28
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80°W
60°W
40°W
20°W
0°
20°E
60°N
40°N
20°N
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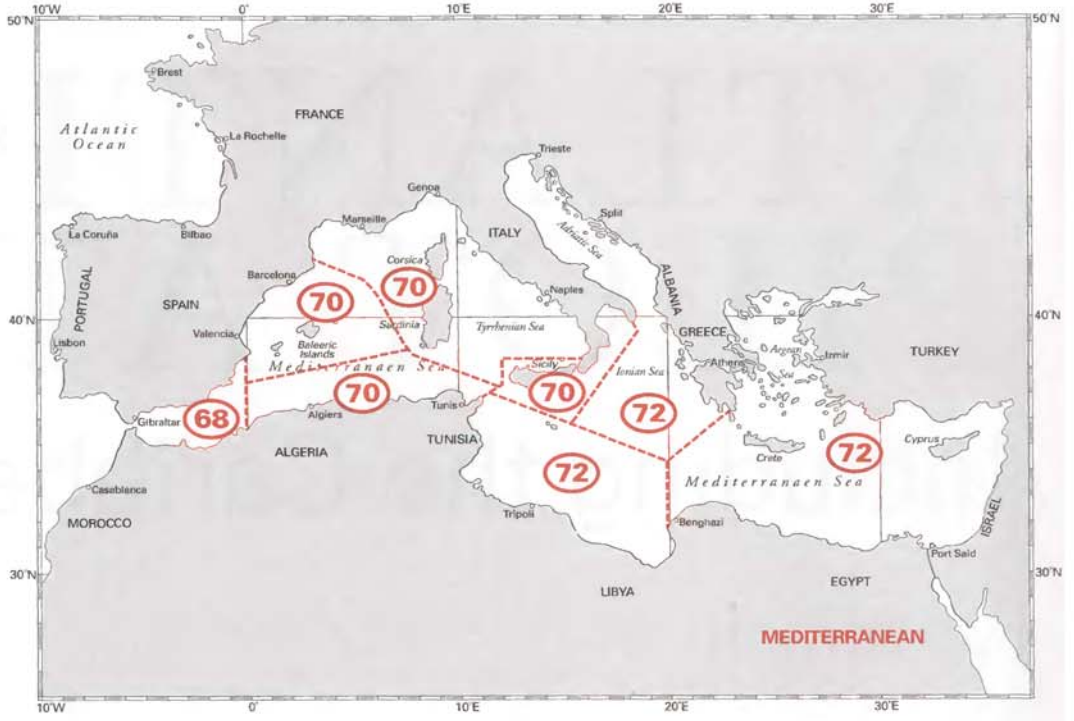
MEDITERRANEAN
Atlantic Ocean
FRANCE
SPAIN
PORTUGAL
ITALY
ALBANIA
GREECE
TURKEY
ALGERIA
TUNISIA
LIBYA
EGYPT
MOROCCO
Brest
La Rochelle
La Coruña
Bilbao
Lisbon
Barcelona
Valencia
Marseille
Genoa
Trieste
Split
Naples
Corsica
Sardinia
Tyrrhenian Sea
Adriatic Sea
Ionian Sea
Aegean Sea
Athens
Izmir
Crete
Cyprus
Sicily
Baleeric Islands
Gibraltar
Algiers
Tunis
Tripoli
Benghazi
Port Said
Casablanca
ISRAEL
Mediterranean Sea
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68
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40°N
30°N
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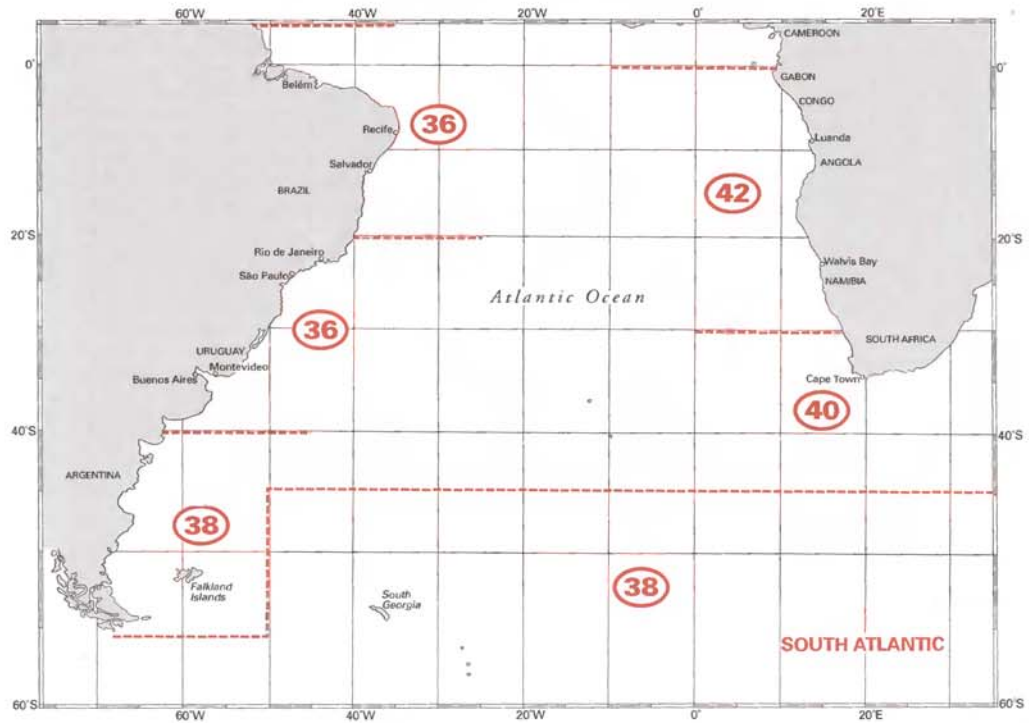
10°E
20°E
30°E


SOUTH ATLANTIC
Atlantic Ocean
BRAZIL
ARGENTINA
URUGUAY
CAMEROON
GABON
CONGO
ANGOLA
NAMIBIA
SOUTH AFRICA
Belém
Recife
Salvador
Rio de Janeiro
São Paulo
Montevideo
Buenos Aires
Luanda
Walvis Bay
Cape Town
Falkland Islands
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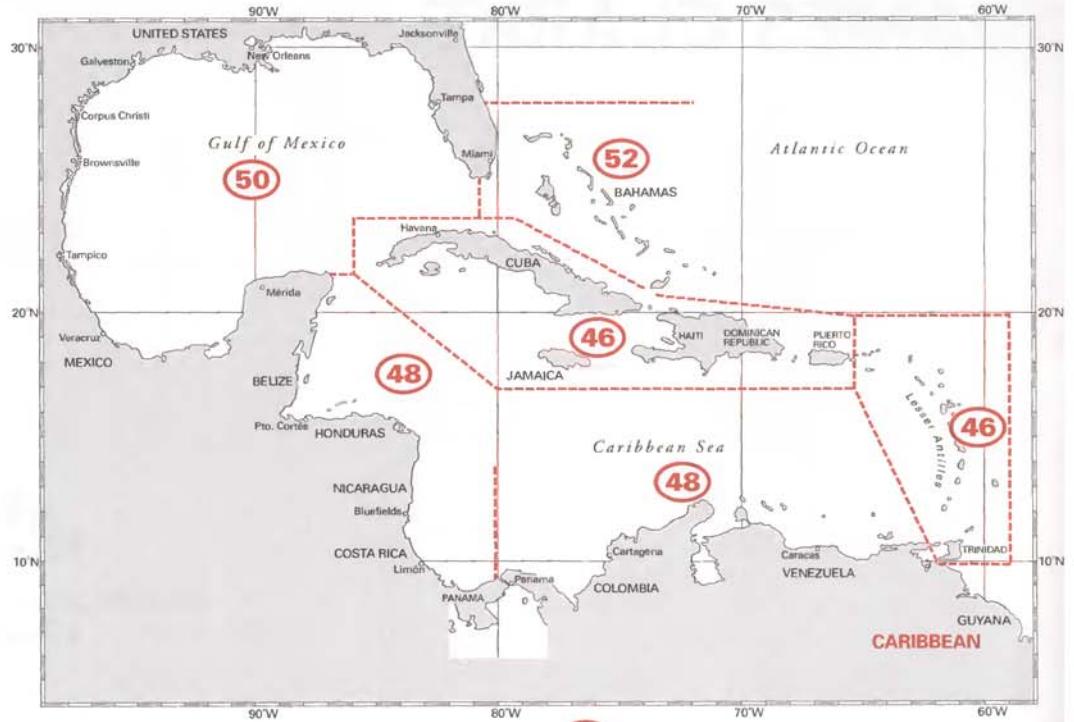

CARIBBEAN
Gulf of Mexico
Caribbean Sea
Atlantic Ocean
UNITED STATES
MEXICO
CUBA
BAHAMAS
JAMAICA
HAITI
DOMINICAN REPUBLIC
PUERTO RICO
BELIZE
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
COLOMBIA
VENEZUELA
GUYANA
TRINIDAD
Galveston
New Orleans
Jacksonville
Tampa
Miami
Corpus Christi
Brownsville
Tampico
Veracruz
Mérida
Pto. Cortés
Havana
Bluefields
Limón
Cartagena
Caracas
Panama
Lesser Antilles
50
52
46
48
90°W
80°W
70°W
60°W
30°N
20°N
10°N

CONTENTS

FOREWORD

Within the last 30 years there has been a dramatic change in oceanic traffic. The oceans used to be the preserve of professionally manned merchantmen and warships; yachts were a rarity. Nowadays the number of merchant ships has fallen, their place being taken increasingly by yachts.

In the same period there has been a huge general expansion in yachting. The sport is now far from being the exclusive preserve of a few, and has grown to the point where it ranks in the top four participation sports. This growth is obvious to anyone visiting the coast, where every creek and river seems to have marinas or moorings filled with small craft. One of the results of this expansion is that the coastal waters are becoming crowded, and it is more difficult to find anywhere to sail to – apart from another marina – and people have tended to look further afield for their cruising.

Until the publicity surrounding "Blondie" Hasler and Francis Chichester's famous half-a-crown bet to see who could win a single-handed race across the Atlantic in 1960, Atlantic crossings by yachts were rare, and considered to be a major adventure. The 1960s were the last great years for exploring the frontiers of single-handed sailing, and before they passed the world had been circumnavigated single-handed and non-stop, further emphasising the capabilities of the modern yacht. The fact that such voyages could be made, and single-handed at that, encouraged others to be adventurous. The Atlantic seems smaller now and more manageable, and the growth in crossings has now reached the point where thousands of yachts achieve it each year.

Although the perception of the Atlantic may have changed with familiarity and confidence, the weather and routes are still the same as those available to the sailing ships three centuries ago. Modern yachts have a much better sailing performance of course, particularly in their ability to sail closer to the wind, but their progress is still governed by the prevailing winds and currents. Their improved performance just widens the choice.

The earliest sailors quite quickly realised that there was a circular pattern to the North Atlantic wind system, clockwise in direction. To sail west they had only to go south to the latitude of the Canary Islands to be guaranteed a favourable wind across to the West Indies. If they followed this wind round and northwards to the North American coast, at about the level of New York they found that the wind would blow them back to Europe. Hence the name given to these winds – the Trade Winds. Knowledge grew with experience as more ships made the voyage and their experiences were noted and compared. The lack of any official guide, however, led to some very obvious phenomena being ignored until quite recently. When Benjamin Franklin was Postmaster General for the American Colonies, he noted that the mail packets from England frequently made their landfall to the north of their expectations. Enquiries amongst local traders elicited the cause, a strong wind setting current close to the American coast. This was, of course, the Gulf Stream, but Franklin was unable to convince the packet captains of its existence!

During the nineteenth century the first major effort was made to collate and publish weather routeing information. The United States Bureau of Charts, under one of its most famous directors, Mathew Maury, published monthly charts containing the average wind and currents. These were the first of the Pilot Charts, and were an invaluable aid to mariners. Since then the quantity of information has increased enormously, and the modern pilot chart has the sound base of over 150 years of data collection.

The problem facing a yachtsman to-day when planning an Atlantic crossing is not so much the availability of the information, but its source. Most of the necessary publications are for the professional market and expensive. They are also inclined to be specialised so that to glean all the data required involves the purchase of a number of costly volumes. At last, in this book we have all the information that the voyager needs in one volume, conserving valuable shelf space aboard, and also providing a considerable saving. For this we can only be extremely grateful.

Robin Knox-Johnston

INTRODUCTION

The Atlantic Pilot Atlas is a complete guide to the weather in the North Atlantic basin, including the Caribbean and Mediterranean. It is a planning guide for yachtsmen, containing all the seasonal weather indications that will determine favourable timing and routeing for a voyage or a cruise. Before I set out on my own circumnavigation, 20 years ago now, I discovered that the weather information I needed was spread thinly through various dense and expensive tomes and across many large and unwieldy charts. Of course, I thoroughly enjoyed the arcane process of plotting my way over the globe, from Admiralty Sailing Directions Volume A Part IV to ditto Part V while poring over Ocean Passages for the World and transferring positions and routes from one pilot chart to the next. I was transported into the esoteric and dusty world of Anson and Cook. I imagined that I was about to set out on a voyage of discovery to undreamt worlds of beauty and mystery.

On the voyage, I discovered that the inconvenience and expense of planning the old way is rather magnified when on board. It occurred to me that there must be a better way of presenting cruise planning information, and this book is the result.

The Atlas contains monthly pilot charts that present statistical averages of records of past weather and ocean currents. These records, in an ideal world, will reflect the probability of experiencing similar weather at the same time of year in the future. At the time of writing (January 2000), I believe that the Atlas still represents the best planning aid for the Atlantic, in spite of the uncertainties of climate change and the spectre of global warming.

In the early 19th century, Lieutenant Matthew Fontaine Maury USN started to collect weather reports from ships to produce the first pilot charts. The process of collecting information has continued ever since. The US Pilot Charts are summaries of all that information, and have been used in the compilation of the charts in this book. Conventional wind roses have been replaced with arrows, to allow reduction without great loss of detail. The arrows give a better feel for the wind regime of the ocean – useful when considering course changes. Recommended sailing tracks are included for the classic trans ocean voyages – but they should not be adopted too rigidly, as the best routes vary each year.

Since the Atlas was first published over ten years ago, fears of man-made global warming have prompted an explosion in the amount of weather information recorded, and in the amount of research carried out on that information. Technological advances have allowed detailed records of wind strength, wind direction and wave heights to be collected from satellites. Huge computers run climate models to test theories of cause and effect. Our understanding of the mechanisms at work has been greatly enhanced. We do not yet, however, fully understand the reasons for the climate changes that we appear to be experiencing.

It is now generally accepted in the scientific community that climate change is occurring. It is also generally accepted that the changes are related to man-made effects on the climate, although the extent of this is hotly debated. The Earth's climate is an enormous system with many complicated sub-systems. Every occurrence on the Earth has effects that may last for decades. Sub-systems oscillate naturally with time bases of years, decades, centuries, and even millennia. Chaos and random events have their parts to play.

Climate research into the weather changes in the North Atlantic has now focused on the North Atlantic Oscillation (NAO) as being a major factor in determining climate variability in the North Atlantic. This is a natural oscillation of pressure difference between the Azores High and the Iceland Low. The NAO winter index has shown an unusual trend, steadily rising from the mid 1960s to the early 1990s when it maintained strong positive values. Research continues into the causes of this unusual trend, but its effect is linked to increased winter storminess in the North Atlantic, and thus increased wave heights, shifts in storm tracks, and other variations. It is thought that the NAO may be weakening now, but NAO forecasting is not yet a reliable reality.

Other mechanisms at work include the Tropical Atlantic Dipole (TAD), and the El Niño/Southern Oscillation (ENSO). The TAD is a similar oscillation in the tropical region, but this time of sea temperatures. It appears to be linked to the wind strengths of the NE tradewinds. Although the periodic ocean warming of the ENSO operates in the Pacific basin, its effects are far flung – both the Atlantic Dipole and El Niño seem to affect the number and intensity of hurricanes in any particular year.

Data in all pilot atlases is, at the moment, based on long time bases, as ship observations are still used, and coverage would be inadequate if only recent input was used. Given the certainty about the mechanism of change in the future, and even the uncertainty of trends, the traditional long time base pilot atlas still represents a logical source of weather means. In this era of change, we must accept that variability from the mean might be greater, and unexpected events may be more common.

Ocean forecasts are better and more easily available now. Longer-term forecasts, for example on the prospects for the hurricane season, are improving. I would expect predictive capabilities to improve enough to allow reasonably accurate ocean season forecasts within the next ten years.

Climate variability, man-made or natural, has always been with us. In the past, successful voyagers expected the unexpected, and honed their knowledge of meteorology to help them understand changes going on around them. Plus ça change.

James Clarke 2000

INTRODUCTION TO 4TH EDITION

The enormous amount of research and discussion about global warming and climate change over the last five years has yielded many climate models and theories, and more consensus about climate change mechanisms and rates of change. It is still difficult to separate real climate change due to global warming from natural climate variations. This is especially so in the noisy media environment in which all new papers and research results are greeted with sensational and alarmist prognostications. Let's hope that this at least results in some concerted action to mitigate the consequences.

One such recent flap concerns an old favourite – that global warming will increase sea temperatures, which will in turn increase the number and intensity of hurricanes. Peering through the fog of misinformation and disagreement, I perceive that some scientists accept that hurricane numbers *may* increase slowly over the course of the century, but that such an increase would be small, and masked by the huge and natural multi-decadal and annual variations. It must be remembered that the maximum recorded number of tropical storms in any one year is twice the average number, and five times the minimum number. There appears to be slightly more acceptance of a connection between global warming and a slow and slight increase in hurricane severity over the century.

A tropical cyclone in the South Atlantic made landfall in Brazil in March 2004. We may not know for many years yet whether this was a freak incident or the start of a new trend. Is it even possible that such cyclones have occurred in the past and gone unreported or misinterpreted?

The North Atlantic Oscillation (NAO) winter index appears to have weakened since the late nineties, as expected, but there is still great difficulty in predicting the NAO, and thus its consequences. Research continues into hurricane season forecasting, with rather uncertain, but generally improving results. The Hadley Centre (the climate research arm of the Meteorological Office in the UK) has begun to run its latest climate model on a vast computer in Japan, with high hopes of better climate predictions.

For all that, a pilot atlas remains the best tool for long distance passage planning. The atlas reflects the long-term weather averages and gives the navigator a good idea of what to expect. It should be complemented by regular weather forecasts en route.

One spin off from climate research and better climate modelling is the increased availability and accuracy of medium range forecasting. Combined with improved accessibility, this makes receipt of reliable forecasts on passage fairly straightforward. Some consolation at least in a changing world.

Fair winds.

James Clarke, 2005

USING THE PILOT CHARTS

GENERAL

All the charts use Mercator's projection, but should not be used for navigation. The information in the pilot charts represents a summary of collated ships reports for each 5° (or 2°) square. This represents the probable mean for future weather in the same month.

When using the charts, note the following points:

- The information has been collected over time, starting in the mid 19th century, and represents averages of conditions over many years. You will only experience some of the conditions that go to make up the average; they may be better, they may be worse.

- It always pays to understand the local weather systems overlying the prevailing tendencies that will dictate the actual weather experienced. This is especially important in areas of tropical storm activity.

- Ships tend to avoid bad weather, so ship reports have a natural tendency to fairer weather. A random presence at any place on the chart would thus tend to find slightly worse weather than that indicated.

- Climate variability, natural and man-made, can produce large differences from the norm. This is especially true in these times of climate change. See Introduction on previous page.

- Conditions tend to vary smoothly across oceans, so additional information can be gained by looking at adjacent squares. This applies to currents, waves and other variables as well as the wind.

CURRENTS

The green arrows show the prevailing direction of the surface current, with mean rates in 1/10ths of a knot. Broken arrows show weaker currents, and probable drift where data is sparse, or where drift is variable, such as coastal areas and areas entrained between stronger streams. Broken arrows on the Caribbean charts show currents with a constancy of less than 25%.

In assessing probable current rates and drifts, consider the following:

- Surface currents in the open ocean are generally caused by wind action on the sea surface. A current of about 1/40th of the wind speed is generated over 6 to 48 hours depending on the wind speed (the faster the current, the longer it will take to build up). The Coriolis effect will deviate the current 20° to 45° to the right of the wind direction in the Northern Hemisphere. The NE Trades thus produce a current with a rate of around ½ knot. Currents are also generated by pressure gradients, caused by wind action near coastlines, and by differences in temperature and salinity (thermohaline effects).

- All ocean currents vary in rate to some extent. This variation is caused mainly by changes in the wind that caused them, but also by gradient effects and continuity considerations. The aggregate run of the currents is likely to be as shown on the charts over the length of a transatlantic crossing, with variations of rate and drift during the passage. Currents will be found to be steadier in areas of constant winds.

- The sum total of sea surface movement comprises the current set and the tidal stream. The tide may be stronger than the current in coastal areas, and should not be forgotten at landfall.

- Currents are affected by the seabed topography and are deflected by land masses in coastal areas. Gradient currents often contribute to the final set near the coast. Counter currents are often to be found along the coast, and there may be no mention of it in your pilot. These counter currents range from small eddies in bays to counter currents extending hundreds of miles seaward.

OTHER VARIABLES

CYCLONE TRACKS Mean monthly tracks of tropical cyclones are shown on the charts. These tracks represent typical or average tracks, and movements of individual systems deviate considerably from these. Mean tracks are an indication only of where cyclones may be expected. The average number occurring each month is given in the circle – this is the number of tropical storms, ie cyclones containing winds of force 8 and over. Slightly more than half of these will go on to reach hurricane strength.

WAVE HEIGHTS Isograms of percentage wave heights over 12 ft (3.7 m) are shown (8 ft (2.4 m) in the Caribbean). If both sea and swell heights have been reported, the higher value has been used.

POOR VISIBILITY Fog is defined as visibility of less than ½ mile, and poor visibility is that of less than 2 miles. Areas of poor visibility are shown on the charts.

ITCZ The mean position of the Inter Tropical Convergence Zone (ITCZ) is shown on the main Atlantic charts. The actual position and width of this zone tends to change from day to day. On the South Atlantic charts the zone depicted is wider, as it shows the extremities of the ITCZ over 3 months.

SUBTROPICAL CONVERGENCE The approximate position of the subtropical convergence in the South Atlantic is shown. This marks the convergence of the South Atlantic and polar current systems.

ICE LIMITS Pack ice limits show the maximum extent of 1/10th coverage of polar pack ice. Exceptional sightings of icebergs occasionally occur outside the maximum iceberg limits shown.

TEMPERATURES Temperatures are given in °C. There is a conversion table to °F in the back of the book.

WINDS

The system of wind arrows used in this book has been derived to give a good idea of the likely wind direction.

The wind roses used in the US Pilot Charts show the percentage wind from each 45° sector (see opposite page). The arrows fly with the wind, and the length of the arrow is proportional to the percentage wind from that sector. Percentages over 30% are printed. The number of tails on the arrow indicates the average wind force recorded on the Beaufort scale. Percentage calms are shown in the centre of the rose.

In this atlas, the charts use one arrow in each square. The arrows fly in the direction of the mean wind, and the constancy of the wind direction is indicated by the weight of the arrow. The number of strokes on the arrowhead shows average wind force. Percentages of calms and gales are given in the bottom corners of each of the squares.

The constancy is a measure of the regularity of the wind direction. A high constancy indicates a wind blowing with great regularity from the same direction, and is indicated by a bold arrow. Zero constancy signifies winds blowing equally from all points of the compass, and is indicated by a short arrow. Intermediate constancies are shown – the bolder the arrow, the more constant the wind direction.

The six different styles of wind arrow used are shown opposite with their equivalent range of US Pilot Chart wind roses. The constancy for each wind rose is shown in brackets. Sector wind percentages are given for the central rose to give an idea of likely wind direction. Wind strengths here are all force 4, with no calms.

(For the mathematical, the mean wind direction is found by adding the vectors of the occurrences in each sector. The direction of the resultant vector gives the mean wind direction. The magnitude of the resultant vector gives the directional constancy, related to standard deviation from the mean. Directional constancy ranges from zero, when the wind is evenly distributed around all sectors, to 100, when all the wind blows from one sector.)

In the open sea, the wind generally has a normal distribution around the direction of the mean wind. The likelihood of winds from any particular direction can thus be gauged from the direction and style of the wind arrow. Winds are less likely to occur the more they differ in direction from the mean wind, depending on the constancy. This is shown clearly on the opposite page. The ability to estimate the likelihood of winds from a particular quarter is especially useful if planning a passage to windward. The constancy of the wind direction shows if there is enough variability in the wind direction to allow good progress to be made to weather.

This assessment of wind direction is valid for areas of open ocean, but may not apply inshore, where the wind might be affected by the land. If the wind does not have the usual distribution around the mean, it is mentioned in the text. One such case is the area around Gibraltar, where the wind usually blows either E or W.

Land and sea breezes are to be experienced in coastal areas, and may predominate over prevailing winds. All the usual coastal effects may be found, such as refraction, convergence and divergence,

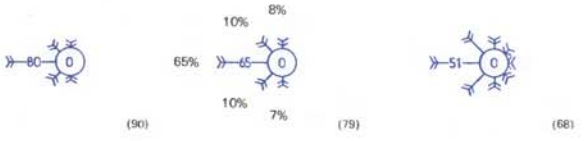
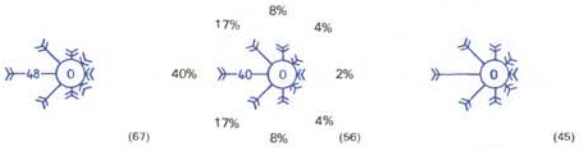
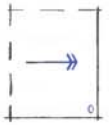
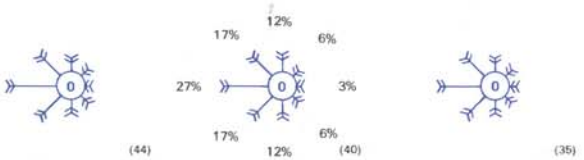
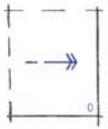
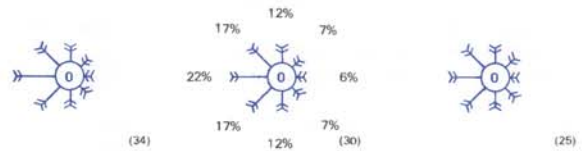
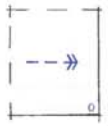
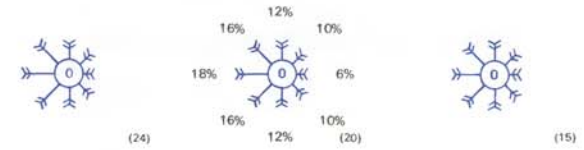
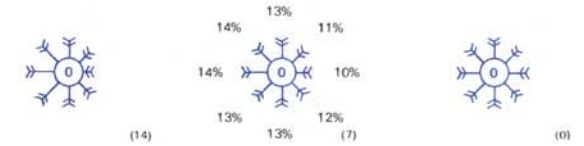
USING THE PILOT CHARTS

valley winds, katabatic winds and back eddies. Some of the more prominent local winds in coastal areas are mentioned in the text.

Average wind force is shown by the strokes on the arrowheads. An idea of the variation in the wind force can be gained from the percentages of winds and calms and the directional constancy. Winds that are steady in direction tend to have steady speeds, and vice versa. A large percentage of gales and calms, and a low constancy of wind direction would indicate a large variation in wind strength.

Variations in wind direction and strength can be expected in the vicinity of tropical cyclones or other tropical disturbances, and during the passage of temperate depressions. It is of great value to watch the weather not only during a passage, but also before setting off, to become familiar with the current tendencies of depression tracks and their effects.

Information on the charts is derived from the pilot charts issued by the Defense Mapping Agency; information in the text is drawn from the British Admiralty Sailing Directions (Pilots). There are differences in terminology between the sources. Gales in the text are usually defined as winds of force 7 and over. On the charts, winds of force 8 and over constitute a gale. The information should be complementary, but occasionally conflicts for various reasons.

US PILOT WIND ROSES	EQUIVALENT WIND ARROW	INDICATIONS
		Wind strongly predominant from one direction with little variation. Typically 65% of the wind blows from the 45° sector of the mean wind, and 75% from the 90° quarter of the mean wind. (Constancy: 67.5–100)
		Wind predominant from one quarter. Significant variation in wind direction. Typically 40% of wind from the sector of the mean wind, and 55% from the quarter of the mean wind. (Constancy: 45–67.5)
		Wind predominant from one quarter with enough variation in wind direction for a yacht to make good progress on a course against the mean wind by taking advantage of the wind shifts. 25–30% of wind from the 45° sector of the mean wind. (Constancy: 35–45)
		Predominance of wind from one 180° semicircle (65–70%). Little impediment to sailing a course against the mean wind. Less than 25% of wind from the sector of the mean wind. (Constancy: 25–35)
		Slight predominance of wind from one semicircle (59–65%). (Constancy: 15–25)
		No significant predominance of wind direction. (Constancy: 0–15)

Scale of wind percentages 

OCEAN WEATHER FORECASTS

GENERAL

There is now a huge amount of weather forecast information available to mariners: the challenge is to find it. The internet, Admiralty List of Radio Signals, cruising guides, and other skippers heading in the same direction are the best places to start.

Skippers should check their proposed forecast sources before departure, to ensure that they are still current and operational. Radio stations sometimes change frequencies and broadcast routines, and websites come and go.

It is wise to identify at least two reliable forecast sources using different broadcast modes, in case of gear failure or traffic problems. Bear in mind that hurricane warning sites on the internet are heavily used when there is a tropical storm warning in force, and access to those sites can be difficult just when needed.

The information given below is only accurate at the time of going to print; it is most relevant to North Atlantic tradewind crossings. In the text, websites exclude www.

INTERNET

In the US, the National Weather Service (NWS) and the National Hurricane Center (NHC) are part of the National Oceanic and Atmospheric Administration (NOAA). Their websites are linked, and provide a vast amount of background information on climatology and forecasts. Marine text forecasts for the North Atlantic W of 35°W and tropical cyclone warnings can be found via *nws.noaa.gov* and *nhc.noaa.gov*. The latter is particularly informative on hurricanes (see hurricane FAQ's).

Meteo France (*meteofrance.com*) provides extensive web forecasts for much of the European offshore waters and across the North Atlantic as far as the Lesser Antilles. Pick up a copy of their free booklet in any French marina – it contains all the sea area maps, times and frequencies of broadcasts, and much other useful information. The sea area names in the booklet are illegible if downloaded, but good booklets with these are available from the RYA (*rya.org.uk*).

The Spanish Instituto National Meteorologia (*inm.es*) has extensive offshore coverage from the UK to the equator, including the Azores, available on the website. The UK Meteorological Office (*met-office.gov.uk*) issues shipping forecasts for offshore areas from Iceland to Gibraltar on the website.

There are any number of other sites out there – the more esoteric they are, the less useful for day to day forecasting.

wetterzentrale.de/topkarten/fsfaxsem.html is a useful site.

weatheronline.co.uk/sail.htm gives interesting wind field diagrams and extensive coverage.

Access to the internet or Inmarsat also allows the reception of grib (gridded binary) weather files, which are highly compressed. They are received via email and can be downloaded with a slow connection. A software viewer is required to display the information; some plotter programmes are grib friendly and can overlay the information on the chart on screen. The files themselves are available from a number of sources, many of which do not make a charge. See the internet for more information on grib files and providers.

RADIO

Radio France International broadcast a daily weather forecast on SW for most of the Northeast Atlantic and as far west as the Antilles, thus covering most of the classic transatlantic passages. Check *rfi.fr* for changes and frequency/coverage information. Radio Monaco issues daily forecasts covering the North Atlantic out to 35°W on HF SSB.

MW and LW offshore forecasts are available for the UK, French and Spanish sea areas.

Radio WWV in Fort Collins, Colorado, broadcasts hourly high seas storm warnings for the Atlantic and Gulf of Mexico, in addition to a continuous time signal – much used in the past as an aid to celestial navigation. HF and MF forecasts are available from US Atlantic coast stations.

The Caribbean is mainly served by local stations and ham nets.

Ham radio nets offer forecasts, hurricane warnings and traffic. Schedules can be found on their websites: Hurricane Watch Net (*hwn.org*), Maritime Mobile Safety Net (*mmsn.org*), Seafarers Net (*seafarers.net*) to name but three; there are many more.

INMARSAT

The Inmarsat-C system provides a relatively inexpensive data link for downloading emails, faxes and weather forecasts, and for sending distress signals as well as data. Along with the larger Inmarsat-B system, and the new generation Fleet-77 system, it is an approved part of the Global Maritime Distress and Safety System (GMDSS). The compact C system is a relatively simple installation. Regular forecasts and warnings are transmitted; grib files can also be received. The North Atlantic is fully covered, along with most of the South Atlantic.

NAVTEX

The Navtex system is also part of the GMDSS; the station network regularly transmits safety information, including forecasts. The nominal range of Navtex is 300 miles. Coverage is satisfactory in Northern Europe, but some reception difficulties can be encountered in the Mediterranean. There are only two stations in the Caribbean, in Curaçao and San Juan, so the Antilles are not well served.

WEATHERFAX

HF weatherfax is a means of receiving synoptic charts and forecasts over long ranges. Options are for a stand-alone commercial unit, or an SSB radio linked to a PC with decoding software. The latter can be effective with decent hardware, software, and operator expertise. See websites, system providers, and users for further information.

WEATHER ROUTEING

Weather routeing can be done on board using weather reception and/or chart plotting software. A human interface will no doubt use a similar package on which to base his advice, but may cost more, although some ham radio enthusiasts do this as a hobby. A voice or data connection is required to update advice, a must if it is to be of any value during a crossing.

RADIO VOICE FORECASTS

All frequencies and schedules should be checked before departure

Station	Frequencies, kHz	Times	Coverage
Radio France International	6175 AM 13640 15300 15515 17610 21645	1130 UTC Broadcast information at H-07 & H+00	N Antilles, S Antilles, NE Atlantic from 15°N E of approx line from 20°N 65°W to 48°27'N 45°W
Radio Monaco 3AC	8806 SSB 13152 17323 22768	0930 UTC French & English	N Atlantic from 7°N to 48°27'N & E of 35°W, & from 7°N to 6°S, E of 20°W.
BBC Radio 4	198	0048, 0535, 1201, 1754 LT	UK sea areas
Cross Corsen (France)	1650 then 2677 after call on 2182	0815,2015 LT	French sea areas W of the Channel
Radio France	162	2003 LT	Most French sea areas
RNE (Spain) Radio 5	774	Weekdays: 1237, 1637 LT Sat. Sun: 1119, 1749, 2249 LT	Spanish sea areas
Machichaco	1707	0703,1303, 1903 UTC	Atlantic Spanish sea areas
C de Peñas	1677		
A Coruña	1698		
Finisterre	1764		
Chipiona	1656	0733,1233, 1933 UTC	
Tarifa	1704		
WWV (Ft Collins)	2500, 5000, 10000, 15000, 20000 AM	H+08, H+09	Atlantic high seas TRS warnings. Time signal.
New Orleans (NMG)	4316 USB 8502 12788	0500, 1130, 1730, 2330 UTC	Atlantic high seas forecasts, inc TRS warnings.
Note: Subject to interruption from radiofax broadcasts			
Chesapeake (NMN)	4426 USB 6501 8764 13089 17314	0500 all UTC 0500, 1130, 2330, 0500, 1130, 1730, 2330, 1130, 1730, 2330, 1730	
U.S.C.G. MF stations	2670	Various, but always after call on 2182 or DSC alert	Offshore forecast & TRS warnings

TROPICAL REVOLVING STORMS

Tropical revolving storms are depressions that form in the tropics, with the wind revolving round the centre in an anti-clockwise direction in the Northern Hemisphere. These storms generate severe winds and sea conditions and are to be avoided. Winds of 120 knots are not uncommon. Extremely rough and confused seas are created in and around the eye of the storms due to the changing wind directions during their passage.

Note – tropical revolving storms in the Southern Hemisphere revolve in the opposite direction to those in the Northern Hemisphere. All information here refers to the Northern Hemisphere. Tropical revolving storms are extremely rare in the South Atlantic.

NOMENCLATURE

Tropical revolving storms, or tropical cyclones, occur in all oceans of the world, but only very rarely in the South Atlantic. The more severe storms are variously termed typhoons, cyclones and hurricanes. In the North Atlantic, they are named according to the maximum sustained wind speeds found in them; storms with winds of force 12 and over are termed hurricanes.

Hurricanes are further categorised on the Saffir-Simpson scale. This scale is analogous to the Beaufort scale, but was developed with estimates of storm surge heights and expected flooding, potential property damage, probable evacuation requirements and so on, to assist rescue efforts in the event of hurricane strikes in the USA.

The word hurricane is said to derive variously from Hurican, the Carib god of evil, and Hurakan, the Mayan creator god "who blew his breath across the chaotic water and brought forth dry land". However, the names used for tropical cyclones by all the forecasting agencies in the North Atlantic are shown in the table below.

When winds in a tropical cyclone reach force 8, the cyclone is named by the National Hurricane Center in Miami for ease of identification. "Named storms" are called Andrew, Bertha and so on through the season.

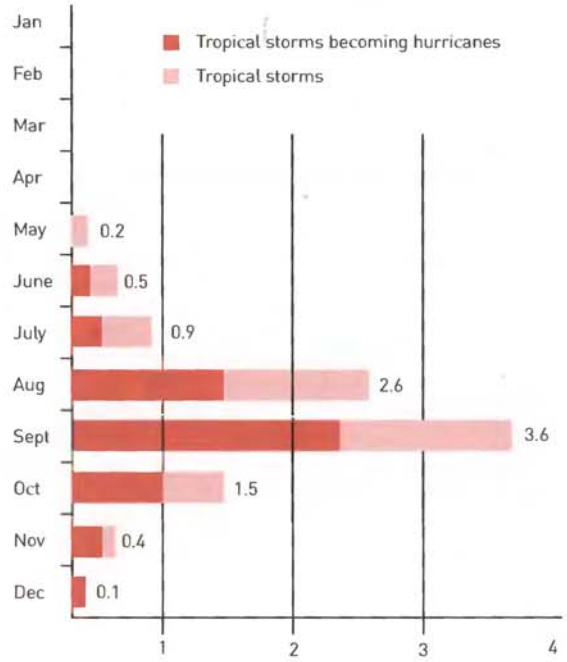
Name	Maximum wind, kts	Maximum wind force
Tropical depression	-33	Force 7 or less
Tropical storm	34–47	Force 8 or 9
Severe tropical storm	48–63	Force 10 or 11
Hurricane	64+	Force 12

		Minimum pressure, mb
Category 1 Hurricane	64–82	980+
Category 2 Hurricane	83–95	979–965
Category 3 Hurricane	96–113	964–945
Category 4 Hurricane	114–135	944–920
Category 5 Hurricane	136+	919–

OCCURRENCE

Tropical storms in the North Atlantic and Caribbean are most common during late summer and early autumn. The hurricane season is taken to be from the beginning of June through to the end of November, and storms are largely absent outside this season. Cyclones in May and December are very rare, and almost unknown from January to March, but April is the only month in which a cyclone has never been recorded. December cyclones, although infrequent, have a greater tendency to develop into hurricanes. The average incidence of tropical storms by month is shown below.

It should be noted that the cyclone tracks on the charts are different for each month. Early and late cyclones tend to spawn in the Caribbean, while mid-season cyclones more generally start in the mid-Atlantic or near the Cap Verde islands. It is worth repeating that these tracks are indications only. Cyclones can deviate from these paths quite markedly, and can move very unpredictably.



North Atlantic tropical storms by month.
Note that the percentage of tropical storms becoming hurricanes rises from about 50% in June to about 75% in November. (These incidences, from the most appropriate data base [1944-1996], differ slightly from those shown on the charts and related text.)

The likelihood of encountering a tropical storm (force 8 and over) is illustrated overleaf. This shows the probability in percentage terms of being within 100 miles of a storm for a given location for the season. It is worth noting the relatively high strike probability in the north of the Caribbean island chain and its rapid decrease to the south.

Maximum, average, and minimum numbers of cyclones per year recorded since 1944 are shown in the table below. Clearly the variability in cyclone incidence is quite high.

Number of cyclones per year

	Minimum	*Average*	*Maximum*
Tropical storms	4	10	19
Hurricanes	2	6	12

The variation in cyclone number and intensity appears to be affected by the El Niño/Southern Oscillation, conditions in the West African Sahel region, stratospheric winds, and sea surface temperatures and pressures, all of which have different periods of oscillation. It is suggested that tropical cyclone intensity is well correlated with the multi-decadal fluctuation of North Atlantic sea surface temperatures. The stormier tropical climate in the years around the beginning of this century was not exceptional, but similar to that of the 1950s. It was anticipated as the North Atlantic recovered from the cold phase in which it had been for several decades. The cold phase brought with it the relatively benign climate of the 1970s and 1980s.

CYCLOGENESIS & FORECASTING

A variety of conditions need to be in place to allow a tropical cyclone to form. Understanding these factors and the process of cyclone formation (cyclogenesis) shows how seasonal hurricane forecasts can be made.

A cyclone starts when a local low pressure area (such as a tropical wave) draws warm moist air into the centre. This air will begin to circulate if there is enough Coriolis effect deflecting it to the right. The Coriolis effect increases with distance from the equator – a latitude of at least 7° or 8° is necessary. When the air being drawn in is deflected to the right, an anti-clockwise circulation begins. The rising air deepens the low pressure, and draws in more air, accelerating the circulation, and so on.

A characteristic feature of the weather in the tropical North Atlantic in the summer and autumn is the movement of tropical waves from Africa through the island chain into the Caribbean. These waves (sometimes known as African easterly waves) are non-circulatory troughs of low pressure associated with convective activity, which usually move west at at 10 to 15 knots. The approach of a wave brings backing and increasing winds, squalls and thunderstorms. Waves usually take a day or two to pass, during which time the weather is unsettled and cloudy, accompanied by a veering wind.

Tropical waves are caused by instability in the jet stream over Africa, in turn caused by temperature differences between the Sahara desert and

TROPICAL REVOLVING STORMS

cooler areas to the south. About three-quarters of the cyclones in the North Atlantic and Caribbean originate in tropical waves, the more so when the wave is intense or slow moving. All cyclones require a seed disturbance with low pressure, usually provided by tropical waves.

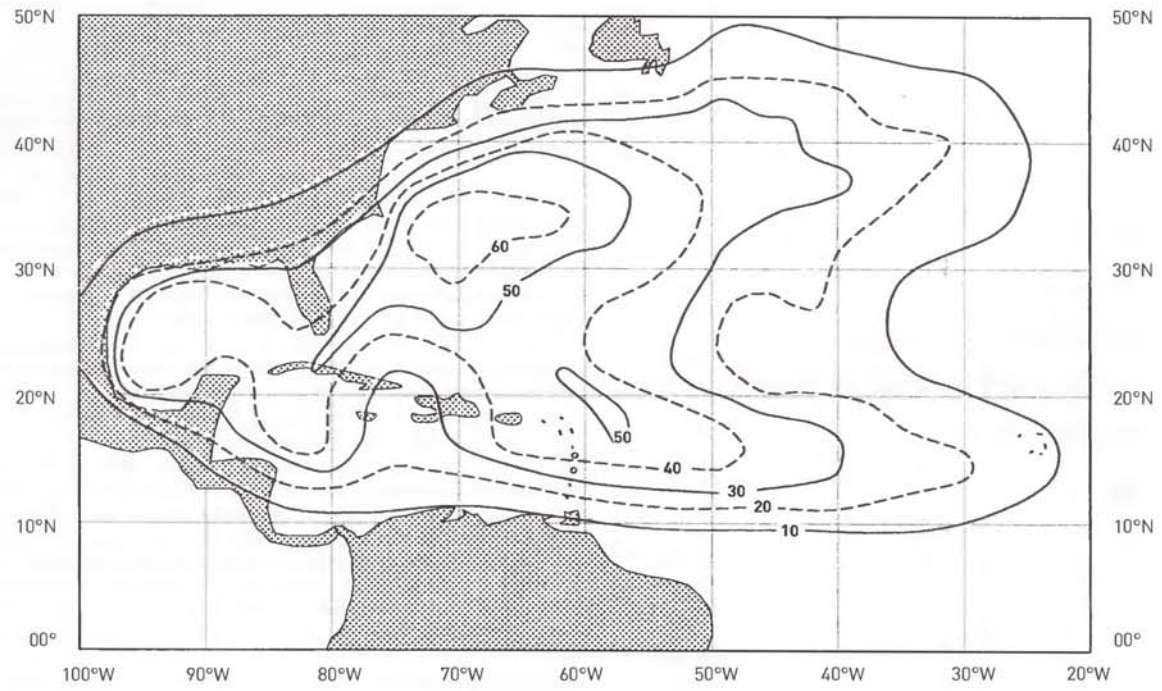
Tropical cyclones also require a minimum sea surface temperature of about 26°C (79°F) and plenty of convection activity to get going. Warm moist air is drawn into the bottom of the circulatory system. When it rises, the water vapour condenses out, releasing heat at the centre of the system. Higher temperatures are thus maintained at the centre of the cyclone, forcing more air to rise and reducing the core pressure. If the air feeding the hurricane is not warm and moist, the circulation is starved of energy and it will dissipate. This is why hurricanes lose much of their ferocity when they reach land. The smaller Caribbean islands are not large enough to have this damping effect.

Suitable upper air conditions are also necessary. The upper air layers must be sufficiently cool to allow condensation and thunderstorm activity. The upper winds must be reasonably consistent too, or they will destroy the circulation on which deepening cyclones rely. A large difference in winds at different altitudes (vertical shear) will disrupt the convection system.

Interaction between a tropical wave and the inter tropical convergence zone (ITCZ) provide ideal conditions for cyclone formation. The ITCZ is often turbulent and the site of much convection activity. It also lies along the boundary between the NE Trades and the SE Trades – both these winds will tend to blow toward the centre even without encouragement from lower central pressure.

Seasonal hurricane forecasts are made by looking at the tendencies of pressures and winds that affect the factors required for cyclogenesis. El Niño warm phases increase tropospheric vertical shear inhibiting cyclone start ups. Higher vertical shear also occurs in years of drought in western Africa, and in years when the stratospheric winds are blowing from the east. Seasonal anomalies causing unusually low pressures or high sea temperatures will contribute to a higher cyclone incidence.

Taking all these factors, and others, into account, forecasts of improving accuracy of the season's cyclone numbers and intensity are being made. These forecasts are now issued annually by the National Hurricane Centre in the USA and are available on many hurricane sites on the web. The NHC's site (*nhc.noaa.gov*) is a good place to start.



Percentage probability of a tropical storm within 100 miles (160 km) of any location over a season

CHARACTERISTICS

North Atlantic tropical storms normally form between latitudes of 7°N and 15°N, although some storms will form locally, usually south of 20°N. After formation, the storms move in a W'ly or WNW'ly direction at about 10 knots, increasing their speed to about 15 knots in 20°N before recurvature. At latitudes of about 25°N, storms generally either recurve to a path of NE or continue on their track until they encounter a land mass, where they quickly fill. This typical behaviour is generally followed, but storms can behave erratically, sometimes slowing down or stopping, and taking unexpected directions.

After recurvature, the storm systems increase in speed to 20 or 25 knots, and increase in size with a reduction in intensity and wind speeds near the centre. Thereafter they behave more like extratropical depressions, but can sometimes maintain their ferocity and cause severe weather conditions for great distances. Depressions that started as hurricanes in the West Indies sometimes persist to cause storm conditions in northern Europe.

The winds in a northern hemisphere tropical storm revolve anticlockwise around the centre and are deflected inward toward the centre. In the tropics, force 12 winds are likely within 75 miles of the centre, force 8 winds within 150 miles, and force 6 winds within 200 miles.

The left hand flank of the storm is called the navigable semicircle; the winds here are less severe as the circulating wind speed is reduced by the forward speed of the system. The reverse applies in the dangerous semicircle; here the forward speed of the storm adds to the circulating wind speed. The leading sector of the dangerous semicircle is the most hazardous. Violent and confused seas are found as a result of wave trains converging from different directions.

Avoidance is easier in the navigable semicircle, as the wind can be put abaft the beam in adopting the best course away. If the storm recurves, it will do so away from the navigable semicircle.

Storm surges of over 20ft (6m) can be caused by the high winds in a severe hurricane. These surges can be amplified by shoaling water and are a major consideration if taking shelter from a storm.

AVOIDING TROPICAL STORMS

The following signs herald the approach of a tropical storm:

- Long swells from the direction of the centre of the storm. Often the first sign of a tropical storm, these swells can extend more than 1000 miles from the storm centre, and are hard to miss at anchor.

- A drop in barometric pressure. Atmospheric pressure in the tropics is normally reasonably steady, with a superimposed diurnal variation of less than about 1.5mb. A drop in pressure of 3mb below the normal diurnal trace

TROPICAL REVOLVING STORMS

should cause concern and prompt a check of the weather services for any warnings. If the drop reaches 5mb it is fairly certain there is a tropical depression approaching, and avoiding action should be taken.

- Significant change in wind speed and direction. A wind backing to the north is consistent with the approach of a tropical storm (but also a tropical wave). An oppressive atmosphere is sometimes felt.

- High cirrus clouds, followed by cirrostratus, cirrocumulus, and then altocumulus as the storm approaches.

If at sea, yachts should make all efforts to give a wide berth to approaching tropical storms, and at least avoid the 100 miles around the centre. If at anchor, one of the options is to put to sea. Before taking action, it's essential to know where the centre lies, and in which direction it's likely to be moving.

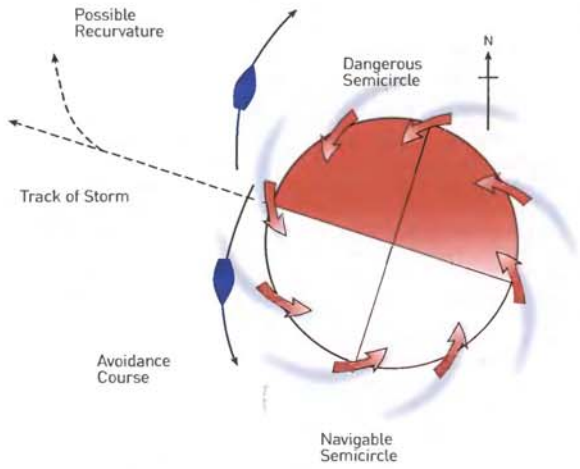
This information may be available on the ether. There are many sources of weather broadcasts in the North Atlantic and Caribbean, and all mariners in tropical waters should ensure that they have access to some of them. It pays to establish useful stations and frequencies before leaving, as information can be hard to find en route or locally. Weather information is broadcast via satellite to Inmarsat users, on HF, MF, and VHF radio, through Navtex and weatherfax stations, and on local stations. There are also several ham radio nets that keep an eye on the weather. At the time of writing, a good station for use during a crossing is Radio France International. The US Coastguard stations provide good forecasts when in range. Details of many of these stations are found in the Admiralty List of Radio signals, Volume 3. (See also information on pg 4.)

The position of the storm can be deduced from the wind direction in open water. When the barometer has fallen about 5mb, and the wind increased to force 6, the storm centre will be about 200 miles away at 100° to 125° to the right of the wind direction. This angle decreases to 90° as the storm approaches. The true wind direction should be assessed at intervals of 3 hours or so. It may be easier to heave to in a sailing vessel while this is done.

If the wind is veering, the vessel is in the dangerous semicircle. If the wind is steady in direction, the vessel is in the path of the storm. If the wind is backing, the vessel is in the navigable semicircle.

A vessel in the navigable semicircle should make all speed with the wind on the starboard quarter. This will take the vessel away from the path of the storm. If the storm changes direction, it is more likely to veer northwards and recurve, away from the vessel.

A vessel in the dangerous semicircle may have time to get across to the navigable semicircle, depending on circumstances. If this is not possible, then the only available action is to make all possible speed close hauled on starboard tack, until progress is no longer feasible, and then heave to. Power vessels should proceed with the wind about 30° off the starboard bow.



Avoiding tropical storms in the Northern Hemisphere

THE TRS DANGER ZONE

Once the position of a tropical storm is known or estimated, a plot should be made showing current position and probable path to clarify the danger zone (area of potential winds to force 8). If a tropical storm warning has been received, the storm size, track and speed will be known. Warnings generally give storm particulars at 24-hour intervals for three days ahead.

If a warning has not been received, storm size and track must be estimated. Tropical storm size is defined as the diameter within which the wind blows at 34kts (force 8) or more. Typical size is 300 miles across, but can be from 100 miles to 700 miles across. Typically, the eye is 30 miles across, and the storm will last about nine days. The size of a tropical storm is not necessarily related to its intensity.

See section on characteristics for typical storm track and speed, and for likely wind speeds. Tropical storms generally behave more predictably, so forecast track errors tend to be less, when storms are moving W or NW before recurvature, and when they are moving at 10 knots or more.

The danger zone is found by plotting the storm position at the time of the warning, and its predicted position 24, 48 and 72 hours later. The danger zone then consists of the area of the storm at these positions, plus the areas of circles round the 24, 48 and 72 hour positions, which circles have radii of the storm plus 100, 200 and 300nm respectively. This method, sometimes called the 1-2-3 rule, uses likely forecast track errors based on past records, to give a realistic danger zone forecast.

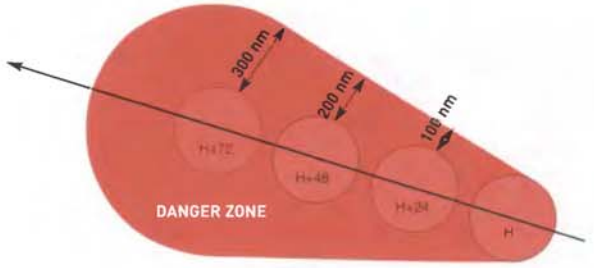
Strategy can now be formed, based on the aim of keeping clear of the danger zone. Most vessels are seriously hampered by gale force winds, severely reducing options. The plot should be updated from further warnings to ensure that the strategy continues to be sound. Monitoring the anticipated closest point of approach of the storm is a useful indicator of this.

If in port, the options are to stay in port, move swiftly to a hurricane anchorage nearby, or put to sea. Staying in port should only be considered if the protection afforded is good. Bear in mind the possibility of a storm surge, which may be accentuated by the harbour topography, and the considerable forces imposed by the wind that may be expected. These factors make staying alongside a hazardous choice.

Any move to an anchorage, or to sea, should be made as early as possible. Recognised hurricane anchorages quickly become crowded when in need, and even if one's ground tackle can cope with the storm, it may not be able to deal with another vessel dragging down on it. This may indeed affect a decision to lie at anchor for a storm.

If putting to sea as a storm avoidance strategy, time is of the essence, as rising winds and seas may limit speed and possible course. Careful calculation of possible speed and course in the likely (and probably worsening) conditions should be made before taking this option.

Tropical storms weaken when they encounter land, as the warm moist air that feeds them is not available. Thus a storm approaching over a substantial land mass, or along a coast, will have less force than a storm approaching from the sea. In harbour, the wind and storm surge will be felt most strongly in the dangerous semi-circle.



Danger zone for a 300 mile diameter TRS moving WNW at 15 kn.

NORTH ATLANTIC WEATHER

General

The weather in the North Atlantic is dominated by a relatively stable area of high pressure, called the Azores High (or the Azores-Bermuda High), and the Icelandic Low, which is an area of low average pressure situated to the SW of Iceland, and is traversed by a succession of depressions moving in an easterly or northeasterly direction. These two pressure systems generate the clockwise flow of air in the North Atlantic.

The stability of the Azores High gives rise to the steadiness of the NE Trade winds. Between the Azores High and the Icelandic Low is a belt of westerly winds; these are more variable due to the continuous passage of low pressure systems to the north.

The ocean weather system is bounded to the south by the Inter Tropical Convergence Zone (ITCZ), also called the Doldrums or the Equatorial Trough. This is an area of calms, light and variable winds, and squalls, which forms the border between the NE Trades and the SE Trades of the South Atlantic.

The SW Monsoon, over the W coast of Africa in summer, is a continuation of the SE Trades due to a local northward displacement of the ITCZ. This displacement is caused by low pressure over the land mass of N Africa; the SE Trades veer to the SW due to the earth's rotation.

The Doldrums and the Azores High, and thus the belt of NE Trade winds, move with the sun, to lie further north in the summer months.

PRESSURE

The Azores-Bermuda High dominates the North Atlantic weather system. It is greatest in extent in the winter months, extending from Bermuda to the Iberian peninsula, centred over 30°N 35°W, with a central pressure of 1020 mb. It moves northward in the summer months to 35°N, with a central pressure of 1024 mb.

The succession of low pressure systems moving over Iceland and Greenland gives rise to an average pressure in that area of 1010 mb in the summer, falling to below 1000 mb in the winter months.

WINDS

INTERTROPICAL CONVERGENCE ZONE The ITCZ is positioned in approximately 0°–2°N in the winter, moving northward in the summer months to 5°–10°N, but further north in the east of the ocean. The average width of the zone is 200 to 300 miles but the width and position vary greatly from day to day depending on the relative strengths of the trade winds on either side. The zone is generally further north and wider in the eastern part of the ocean. Reference should be made to the pilot charts for the mean position for each month.

The weather in the ITCZ can be calm and clear, or subject to violent squalls and thunderstorms. The weather is generally calmer in the western part of the zone. The eastern part is more unsettled, especially within 300 miles of the Africa coast. It is the source area of many tropical cyclones, generated by the turbulence at the convergence of the two trade wind systems.

NORTH EAST TRADE WINDS The NE Trades extend from the ITCZ to the Azores High, and cover the area from 2°N–25°N in the winter, moving north to 10°N–30°N in the summer. The wind blows from the NNE in the eastern part of the ocean, veering to E by N in the western part. The trades are relatively steady in direction and strength, averaging force 4 for the most part, and usually blowing between force 3 and force 6 with few calms or gales.

The NE Trades in the Gulf of Mexico and in the north of the Caribbean are sometimes interrupted, between November and March, by a "Norther", a strong or gale force wind from the north, caused by a large anticyclone over the American continent. This can be particularly dangerous in the area of the Gulf Stream, as it blows in a contrary direction to the current, and creates steep seas.

SOUTH WEST MONSOON The SW Monsoon blows over the W coast of Africa from June to October, east of 20°W and south of about 15°N. It is an extension of the SE Trades, drawn northward by a displacement of the ITCZ, and deflected to blow from the SW by the earth's rotation. The weather in the monsoon is cloudy, with much rain.

VARIABLES This is an area of light and variable winds lying over the Azores High, between the NE Trades and the Westerlies to the north, in about 30°N. East of about 25°W, the wind is generally from N or NE; in the western part of the belt the wind is more variable, with a higher percentage of calms.

WESTERLIES North of the Azores High and south of about 60°N, lies an area of unsettled weather with strong winds predominantly from the west. The succession of lows moving E or NE over Iceland creates the unsettled weather, of a pattern associated with the passage of depressions, and with a high percentage of gales, especially in the winter.

CURRENTS

Currents in the North Atlantic circulate in a clockwise direction; they are generated by the NE Trade winds, and, to a lesser extent, by the westerlies further north.

The North East Trades generate the North Equatorial Current, and the North Subtropical Current further north. This is joined, at the west side of the ocean, by part of the South Equatorial Current deflected northward by the Brazilian land mass. Part of this westward

NORTH ATLANTIC JANUARY

PRESSURE

During January, from eastern Canada to western Europe, the North Atlantic is under the dominating influence of the Icelandic Low. Its central position is just off the SE tip of Greenland, with a mean central pressure of just under 997 mb, which is the lowest of any month. The Azores-Bermuda High dominates the southern latitudes of the North Atlantic, extending from the southeastern US to the western Mediterranean along the 30th parallel, with a mean central pressure of just over 1020 mb.

Mean barometric pressure for the month along Latitude 15°N is: 1015.0 mb at 26°W, 1015.5 mb at 35°W, 1015.0 mb at 47°W, 1013.0 mb at 75°W. Pressure increases with latitude at a gradient of 0.5 mb/° of latitude.

EXTRATROPICAL CYCLONES

During January, lows form most frequently along a band, 150 to 250 miles wide, along the E coast of North America, from 30°N to 55°N. Other principal areas of cyclogenesis are along the Gulf coast from Texas to Florida, northeast of Newfoundland, southwest of Iceland, the Gulf of Lions and the Ligurian Sea, and the northern Adriatic Sea. Primary storm tracks extend from the Carolina Capes and the Great Lakes to Newfoundland, where the cyclones either head N to the Davis Strait or NE towards Iceland and the Norwegian Sea.

Over the Mediterranean, secondary storm tracks extend from southern France to the northern Adriatic and from Corsica to southern Turkey. Other secondary storm tracks cross Scotland, the North Sea, and enter northeastern Europe over Denmark.

TROPICAL CYCLONES

Tropical cyclones are extremely rare in the North Atlantic in January. Only one has been recorded in this month since records were started.

TEMPERATURE

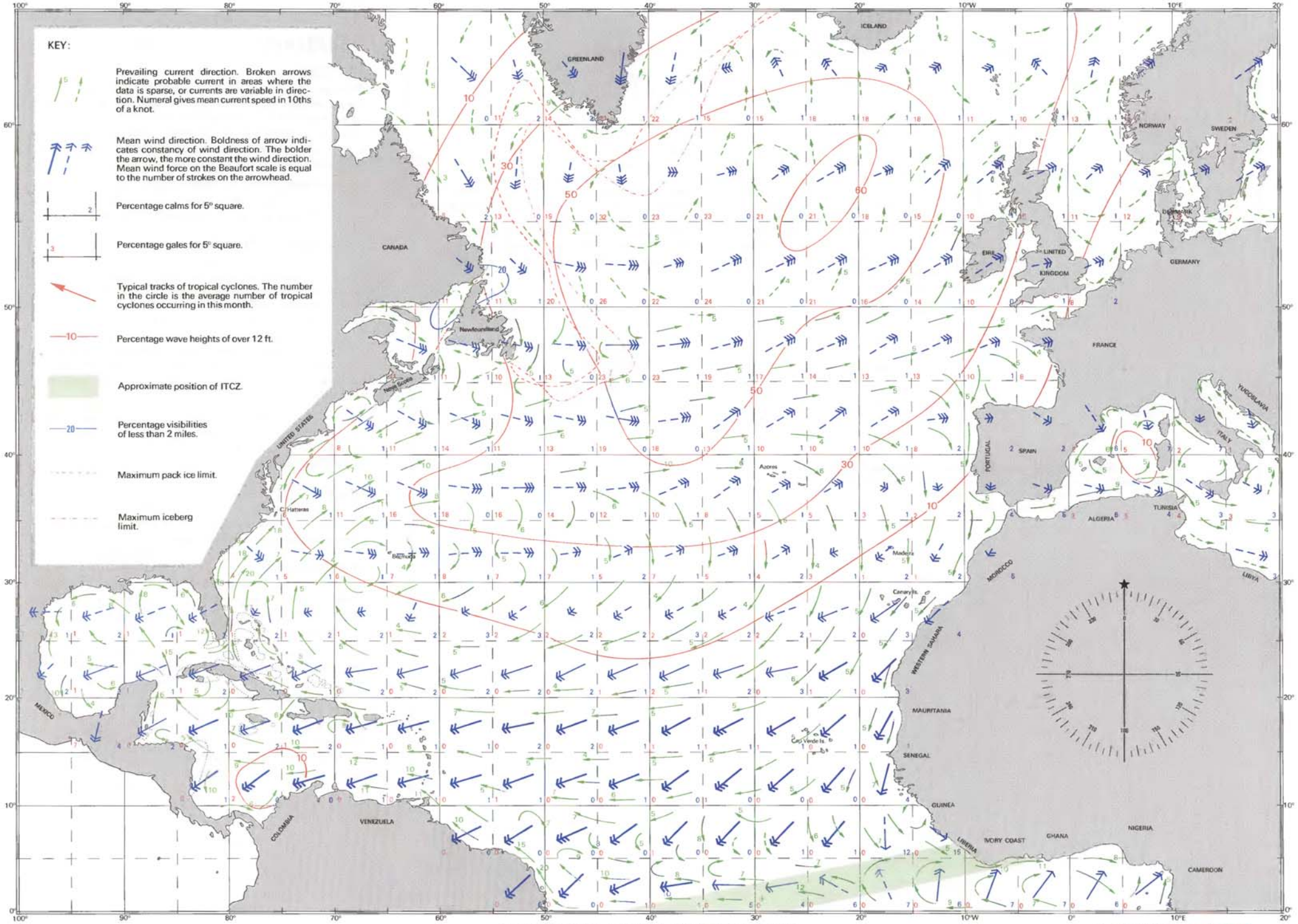
The mean air temperature in January ranges from less than −6°C over Baffin Bay to 27°C in the southern latitudes. The extreme air temperatures range from below −16°C in the Davis Strait, to over 32°C in the vicinity of Trinidad and Tobago.

Along the 60°N parallel, mean air temperature ranges from −6°C at the Canada coast, through 0°C in S Greenland to 4°C at the Norway coast. Along the 40°N parallel, temperatures range from 2°C at the US coast, through 15°C at 40°W, to 13°C at the Portugal coast. At 20°N, mean air temperatures range from 25°C in the Caribbean to 20°C at the Africa coast.

VISIBILITY

Poor visibility (less than 2 miles) is noted in more than 10% of observations in the Bay of Fundy, and north of a line extending from 200 miles SE and E of Newfoundland, through 120 miles SE of Kap Farvel to N Iceland. A 10% occurrence of poor visibility is also found in much of the British Isles, North Sea, Danish waters, and the Baltic.

Poor visibility is noted 5% of the time in an area off W Africa, in the vicinity of the Cap Verde Islands and southwards, south and east of a line between 20°N 20°W and 10°N 40°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC JANUARY

NORTH ATLANTIC WEATHER

drift current flows into the Caribbean, between the islands, and part flows on in a NW'ly direction and is called the Antilles Current.

The Caribbean Current flows westward, and then northward into the Gulf of Mexico. Some of this current, after circulating in the Gulf of Mexico, then leaves the Gulf between Florida and Cuba, rejoining the Antilles Current, and becoming the Gulf Stream.

The Gulf Stream flows strongly northward along the American coast. It is deflected eastward by the S flowing Labrador Current, widening and slowing down to become the E'ly or NE'ly North Atlantic Current.

The southern part of the North Atlantic Current turns south to become the Azores Current, moving SE to SW, and rejoining the North Subtropical Current in the eastern part of the Atlantic.

The south flowing Portugal Current and the Canaries Current, in the east of the ocean, result from the southward deflection of the North Atlantic Current on its arrival in Europe. The northern part of the North Atlantic Current flows NE past the British Isles and on to the Norwegian coast.

Further south, the Equatorial Counter-current flows E between the North Equatorial Current and the South Equatorial Current, in about 5°N, and east of about 52°W. The area covered by this current varies according to the season.

VISIBILITY

The area to the S and E of Newfoundland is often affected by fog in spring and summer. This is caused by the arrival of warm moist air from the SW over the cold Labrador Current. Incidence of over 20% of visibilities of less than 2 miles are shown on the charts.

ICE

Pack ice, or sea ice, extends to the S and E of Newfoundland in the winter months, and is most extensive from January to April. Icebergs in the North Atlantic are calved from glaciers on the west coast of Greenland, are carried south by the Greenland and Labrador Currents, and carry further into the ocean than the pack ice. Icebergs are most frequent from March to July. Iceberg and pack ice limits are shown on the charts, but the incidence of icebergs and the extent of the pack ice is subject to great annual variation.

Up to date ice information can be obtained from coastal radio stations in Canada, and the International Ice Patrol broadcasts ice bulletins twice daily from USCG Boston (see Admiralty List of Radio Stations for details).

TROPICAL STORMS

There is an average annual occurrence of 12 tropical storms (with winds of force 8 and over) in the North Atlantic and Caribbean, and about half of these reach hurricane strength. The hurricane season extends from the beginning of June to mid-November, the worst months being August, September and October.

The mean tracks and source areas of these storms vary with the month. It can be seen from the charts that the cyclones at the beginning and end of the season tend to form in the W Caribbean, and move off northward towards the mainland of the US. In the middle of the season they can form over the open ocean, sometimes as far east as the Cap Verde Islands, recurving to pass close to Florida or continuing onto the mainland, but they often form locally near or amongst the Caribbean Islands.

It should be borne in mind that the tracks of tropical cyclones are rather unpredictable, and their paths often differ widely from the norm. It is often said that early or late storms tend to be very violent.

NORTH ATLANTIC FEBRUARY

PRESSURE

The average pressure distribution remains quite similar to that of January. The Icelandic Low fills to 1000 mb and is located near 60°N 40°W. The central pressure of the Azores High is still above 1020 mb with a more clearly defined centre near 30°N 30°W. The reduction in the average north-south pressure gradient is generally caused by lows being less intense on the average during February, although many are severe.

Mean barometric pressure for the month along Latitude 15°N is: 1015.0 mb at 25°W, 1016.0 mb at 40°W, 1015.0 mb at 60°W, 1013.0 mb at 75°W. Pressure increases with latitude at a gradient of 0.45 mb/° of latitude.

EXTRATROPICAL CYCLONES

A large area of cyclogenesis extends from the Gulf coast of the United States to NE Newfoundland. Other major areas of cyclone development are over the Denmark Strait/W Iceland region and over the NW region of the Mediterranean Sea north of a line from Barcelona to central Yugoslavia. Of two primary tracks, one crosses the Great Lakes and Bay of Fundy before turning N to the Labrador coast where it splits, with one branch continuing N towards Baffin Bay, and the other heading NE past the southern tip of Greenland. The other primary track runs from northern Florida NE to about 50°N 40°W, where it divides, with lows either heading for the Denmark Strait or the Norwegian Sea.

Secondary tracks in the Mediterranean cross southern France and the northern Adriatic, while others lead from northern Spain, through southern Italy and northern Greece. Additional secondary tracks cross Hudson Bay, and the British Isles.

TROPICAL CYCLONES

Tropical cyclones are virtually unknown in the North Atlantic during February. Only one has been reported in 100 years; it passed from the Yucatan peninsula to off the Carolina coast.

TEMPERATURE

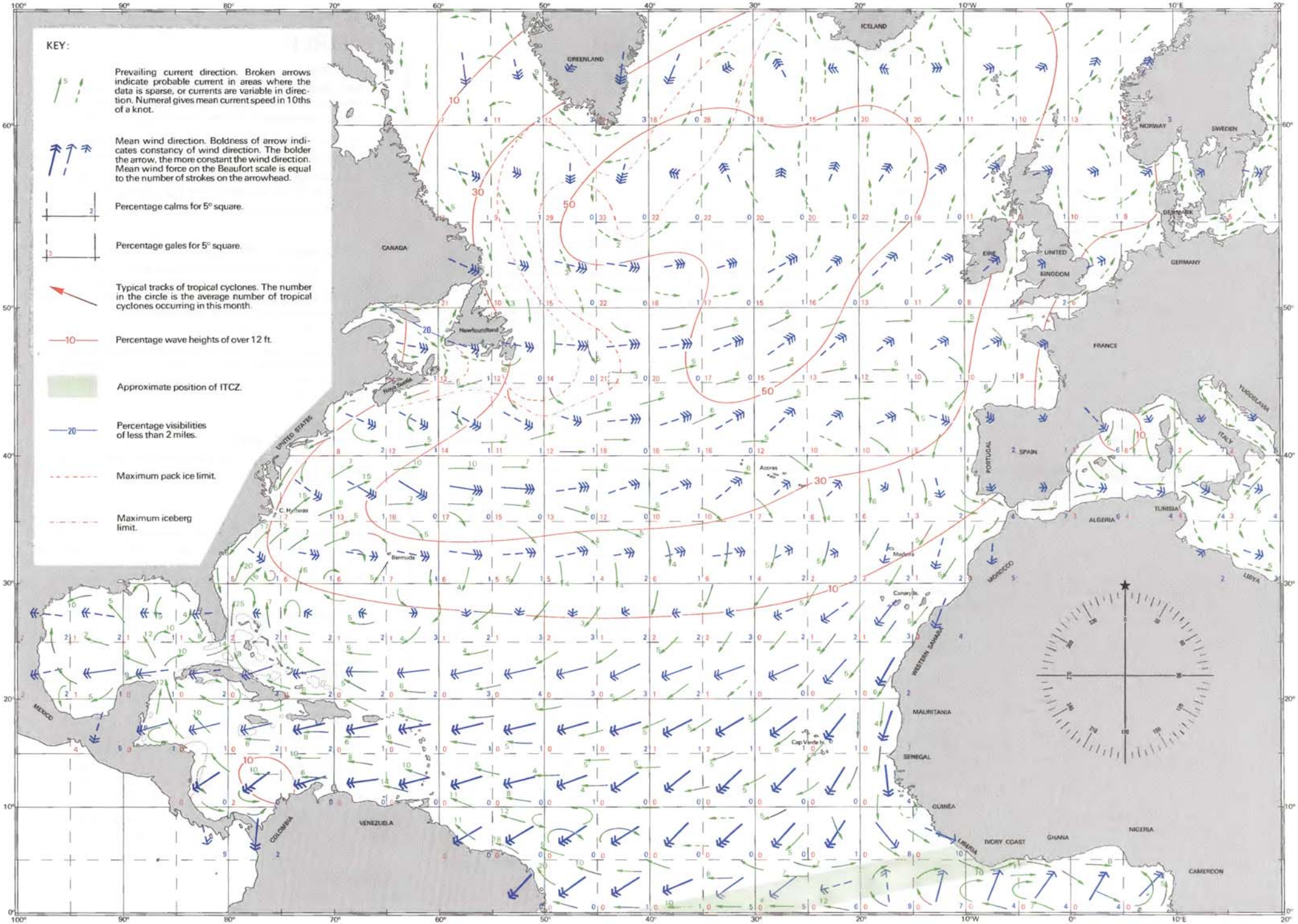
The mean air temperature pattern in February has changed little from that of January. The mean temperature ranges from below −6°C over Baffin Bay to above 26°C in areas south of 18°N in the Caribbean.

Along the 60°N parallel, mean air temperature ranges from −6°C at the Canada coast, through 0°C in S Greenland to 4°C at the Norway coast. Along the 40°N parallel, temperatures range from 3°C at the US coast, through 14°C at 40°W, to 13°C at the Portugal coast. At 20°N, mean air temperatures range from 25°C in the Caribbean to 19°C at the Africa coast.

VISIBILITY

The frequency of visibility of less than 2 miles reaches 10% or more north of a line extending from southern Maine northeastward to northern Iceland and the Barents Sea, and includes the area 250 miles SE and E of Newfoundland. Another region of 10% or more incidence of poor visibility covers the Irish Sea, English Channel and southern regions of the North Sea and Baltic Sea.

Poor visibility is encountered in 5% of observations south of the Cap Verde Islands off the W Africa coast as far west as 38°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC FEBRUARY

Regional

NORTH EAST COAST OF SOUTH AMERICA (SE OF TRINIDAD TO 5°N)

WINDS From November to July, the NE Trade winds blow in this area from ENE or NE, being steadiest from January to April, and of a strength between force 3 and force 6. From August to October, the ITCZ approaches or enters the area from the south and the winds blow from E or SE, but are less steady and weaker than the NE Trade winds. Gales are rare and tropical storms affect this area extremely infrequently.

Weak land breezes occur off this coast. Squalls are rather common, especially at the time of change from NE'ly winds to SE'ly winds, in June and July, when the Inter Tropical Convergence Zone (ITCZ) moves northward.

CURRENTS The full strength of the South Equatorial Current is felt off the coasts of The Guianas and Surinam, lessening in strength towards Trinidad. The trend is NW with a high degree of constancy, tending to be between W and NNW from November to April, and between WNW and N from May to October. The greatest strength of the current is felt 60 to 120 miles off the coast, and it is not felt close inshore; the inner edge is to be found in depths of 15 to 30 metres. The current runs at mean rates of up to 2 knots; rates of 1 to 1½ knots are more common closer inshore, and in the vicinity of Trinidad. Maximum rates of up to 3 or 4 knots in the centre of the stream can occur.

Further offshore, the Equatorial Counter-current is found eastward of 52°W; its latitude and extent varying with the seasons.

Inshore, the tides exert an effect as far as 30 miles offshore, accelerating and decelerating the current along the coast. At the mouths of the rivers, the rising tides set S into the rivers, and are deflected to set NE on the falling tide. Currents in the Serpents Mouth, the southern entrance to the Gulf of Paria between Trinidad and Venezuela, run at between 2 and 3 knots, in a NW'ly direction, and are affected by the tide. This current carries through the Gulf and exits in the north through Bocas del Dragon, where it attains rates of up to 4 knots in Boca Grande when accelerated by the tide. There is often a violent race in Bocas del Dragon.

Heavy rollers are experienced off the coasts of the Guianas and Surinam in December and January, and to a lesser extent in February, where the depths decrease irregularly, or in depths of less than 10 metres on shoals.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is good in this area. Fog is practically unknown over the open sea, but some mist occasionally affects the area in March and April. A morning haze is rather more common on the coasts.

Rainfall here is seasonal; in the north of the area, the wettest season is from June to August, the dry season is from February to April. The wet season comes earlier and lasts longer, and the dry season is less pronounced, further SE in the area, where rainfall is higher. In the SE of the area, the wet season extends from December to June, and it is relatively dry from August to November. Cayenne receives an annual fall of 320 cm, Trinidad 160 cm. The coast is hot and humid, the mean temperature remaining within a few degrees of 27°C all year round.

EAST COAST OF NORTH AMERICA (28°N TO 40°N), BERMUDA

WINDS This area is covered by the band of variable winds lying between the trade winds to the south and westerlies to the north. The northern part of the area is affected by the frequent depressions moving NE, which bring disturbed conditions, especially in the winter. Further south, the conditions are more congenial, being under the influence of the sub-tropical ridge of high pressure, but winter does bring frontal activity connected with the depressions further N, or passing to the E.

Offshore, north of 32°N, winds show a predominance from the N and NW in winter, and from S and SW in summer. Between 28°N and 32°N, winds are lighter and variable; S'ly and SE'ly winds are most frequent from June to August, and winds from between N and E are common in the autumn. South of 30°N, winds are frequent from the E, being N of E in October to January, and S of E in the remaining months.

Gales are not common in the south of the area, but increase in frequency with latitude, and are most common from the N'ly quadrant in the winter. Between 33°N and 40°N in coastal areas winds of force 7 and over show an incidence of 10% in February, increasing in frequency further offshore and northward to reach 30% in 65°W, north of 36°N. Cape Hatteras is renowned for being a boisterous part of the coast. Mean wind strength is force 5 in the N in winter, falling to force 3 or 4 in the summer, and is less in the south.

Along the mainland coast, land and sea breeze effects are well developed in the summer months, especially in the south of the area, where they often mask the prevailing wind. Small tornadoes occur, especially in the south in the spring and early summer; an average of 10 a year affect Florida.

Hurricanes affect this area, traversing N or NE up the coast after recurvature, usually affecting some part of the coast every year.

In Bermuda, light winds from the S and SW prevail from May to August. From September, winds are more variable, the islands being affected by depressions to the N, bringing winds from between S and NW through W. Easterly winds are not uncommon in the autumn. Gale frequency (force 7 and over) is about 10% in January, and declines to less than 1% in July. Winter gales are usually from SW to NW. Small cyclonic vortices of hurricane intensity may form in the summer and autumn near Bermuda, but they are rare. Tropical storms pass over or near the Bermuda islands, more commonly in September.

NORTH ATLANTIC MARCH

PRESSURE

The Icelandic Low continues to fill during March, with a mean central pressure of 1002 mb located near 60°N 30°W. The Azores High, with a mean central pressure of 1020 mb, is located near 30°N 30°W.

March is a transition month; the weather systems still retain many characteristics of winter while exhibiting some of the features of spring.

Mean barometric pressures for the month along Latitude 15°N are: 1015.0 mb at 26°W, 1016.0 mb at 40°W, 1015.0 mb at 60°W, 1013.5 mb at 80°W. Pressure increases with latitude at a gradient of 0.45 mb/° of latitude.

EXTRATROPICAL CYCLONES

The main area for cyclogenesis extends along the Gulf coast and east coast of the US as far north as Long Island, where it turns NE to approximately 55°N 40°W. Other major areas of cyclonic development are along the eastern half of the Bay of Biscay, the northwestern Mediterranean, and the Denmark Strait/S Iceland region.

Primary tracks lead from either the Great Lakes towards the waters off Iceland and Greenland or from the Carolinas into the central North Atlantic. Secondary tracks cross Hudson Bay, southern Norway and Sweden, and the northern Mediterranean Sea.

TROPICAL CYCLONES

Tropical cyclones are exceedingly rare in the North Atlantic during March. Only one has been recorded; a hurricane in 1908.

TEMPERATURE

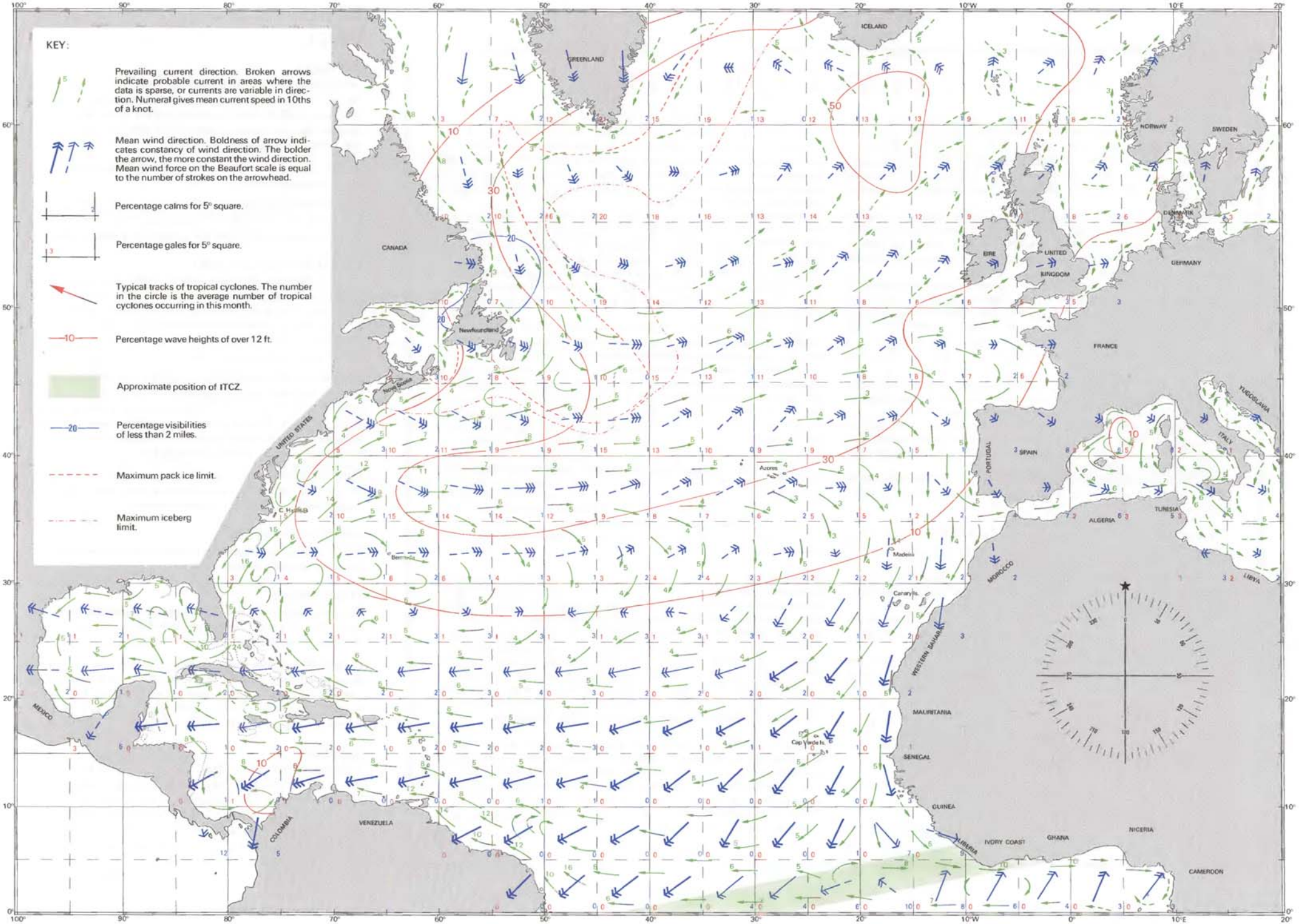
With the approach of spring the mean air temperature increases slightly over the North Atlantic, ranging from under −6°C in Baffin Bay to over 26°C in the Caribbean. The mean temperature over the Mediterranean sea increases by one or two degrees over that of February, ranging from 12°C to 16°C.

Along the 60°N parallel, mean air temperature ranges from −6°C at the Canada coast, through 0°C in S Greenland to 5°C at the Norway coast. Along the 40°N parallel, temperatures range from 5°C at the US coast, through 14°C at 40°W, and at the Portugal coast. At 20°N, mean air temperatures range from 26°C in the Caribbean to 20°C at the Africa coast.

VISIBILITY

10% of observations report poor visibility (of less than 2 miles) in an area north of a line extending from Long Island into the Labrador Sea, passing 300 miles off Newfoundland, 200 miles S off Kap Farvel to northern Iceland and the Barents Sea. Coastal areas along the North Sea, Baltic Sea and the British Isles also report poor visibility 10% of the time or more.

Visibility of less than 2 miles is encountered 5% of the time off the Africa coast between 10°N and 20°N, and in an area 500 miles across, south and west of 10°N 30°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC MARCH

NORTH ATLANTIC WEATHER

CURRENTS North of Cape Hatteras, the continuation of the Labrador Current flows weakly S along the coast with a mean rate of ¼ knot, and is somewhat variable. This current turns E'ward at Cape Hatteras to join the Gulf Stream setting NE. The boundary between the Labrador Current and the Gulf Stream is very abrupt with large sea temperature differences; this boundary is known as the West Wall.

The Gulf Stream (or Florida Current) flows N off the coast of Florida and then NE off the Carolinas towards Cape Hatteras, setting ENE thereafter into the North Atlantic. The flow of the Gulf Stream is variable and complex, meandering and forming eddies which sometimes give contrary sets.

The core of the Gulf Stream is about 40 miles wide, and maximum rates are occasionally 5 knots off the coast of Florida, 4 knots off the Carolinas and 3 knots off Cape Hatteras. Mean rates in the core of the current are 2¼ knots 50 miles off the coast in 28°N (but weak and variable currents will be found 150 miles off), decreasing to 1¾ knots 70 miles off the coast of South Carolina, and 1½ knots 40 to 50 miles off Cape Hatteras.

To the east of Cape Hatteras the Gulf Stream is joined in the south by the clockwise circulation of the ocean, and mean rates decrease with easting due to the variability of position of the Stream.

Dangerous steep waves may be found close to the West Wall in a strong NE wind, when it crosses over into the warm sector, and acts against the current. These may be avoided by staying in the cold water, or by proceeding further SE.

Inshore currents south of Cape Hatteras flow N and NE'ward at mean rates of ½ knot; there is an inshore counter-current between 29°N and 32°N.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Over the north of the area, sea fog is found in spring and early summer, being worst in the months of May, June and July and generally forming over the cold water of the Labrador Current. Visibilities of less than ½ mile are found in 10% of observations in 40°N in May decreasing to 2% in 35°N, south of which fog is rare.

Rainfall averages about 120 cm per year along this coast and is evenly distributed through the year. Snow may fall as far south as 33°N, and thunderstorms occur in the south in summer.

Mean air temperatures range from 4°C in the north in January (22°C in August) to 19°C in the south in January rising to 28°C in August. The weather is more continental in the north and thus greater extremes of temperature are to be found there.

Offshore ice is rare in this area, but some of the intracoastal passages of New Jersey, Delaware, and Maryland, and other inshore waterways in the north are closed during normal winters. Sheltered waters in the north of the area are frozen over most winters.

EAST COAST OF NORTH AMERICA (40°N TO 45°N, EXCLUDING NOVA SCOTIA)

WINDS The weather in this area is very variable and liable to extremes due to the temperature difference between the warm Gulf Stream and the cold Labrador Current, the frequent passage of depressions along the coast, and the occurrence of tropical cyclones, whose tracks often cross this area.

Pressure variations are large – changes of 20 mb in 24 hours are not uncommon. Depressions track with great frequency across the area NE'ward, most commonly between 150 and 250 miles off the coast, but also over the land, and further north across the Gulf of St Lawrence. They usually have vigorous frontal troughs causing foul weather at great distances from their centres. Tropical storms cross the area, generally from the SE to the NW, but they may move in from Bermuda.

Small cyclonic vortices of hurricane intensity may form in the summer and autumn south of Nova Scotia, and tornadoes (very small intense vortices) are also found; both are rare.

Offshore the winds are predominantly from NW in winter, from October to March, changing in April to blow predominantly from SW from May to September. Wind strength is highest in February, when 60% of observations show force 5 or more, and lightest in the late summer, when more than 80% of observations show force 4 or less nearer the coast. Coastal winds show a similar distribution to those offshore. Gales are most frequent in February, when winds of force 7 and over are found in 10% of observations along the coast, increasing with distance offshore to 30% when 250 miles off. A deep depression can affect a large area, and cause gale conditions for several days. Gales are most likely from between SW and N. Gale incidence decreases to a minimum in August, when winds of force 7 and over make up less than 2% of observations over the whole area.

CURRENTS The currents in this area are generally weak and somewhat variable, being mostly wind driven. Currents show a slight predominance of SW going streams, resulting from the continuation of the Labrador Current setting round Nova Scotia and counter-clockwise in the Gulf of Maine. Mean current rate is about ½ knot, with less than 10% of currents exceeding 1 knot. Exceptionally, a meander of the Gulf Stream may be experienced in about 40°N, resulting in a set of 1 to 2 knots between NE and SE. This effect may persist for a week or more. The Gulf Stream is not normally felt west of 60°W in 40°N, or west of 45°W in 45°N, and the Labrador Current extends for about 240 miles to the SE of Nova Scotia.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Radiation fog affects the area on calm winter nights. Sea fog affects the area mainly from late May to early September; visibilities of less than ½ a mile occur in 7% of observations in July along 40°N increasing northward to over 20% in the north part of the Gulf of Maine. Winds from between E and SW through S tend to bring fog, and winds from between N and W tend to clear it.

NORTH ATLANTIC APRIL

PRESSURE

During April a noticeable reduction in the frequency and intensity of winter lows has taken place. The Icelandic Low has filled to 1007 millibars, and is centred near 60°N, 35°W. The Azores High has become more of a blocking ridge as it becomes oriented SW-NE with a central pressure of 1021 millibars located near 30°N, 30°W.

Spring is established, and the weather is ceasing to exhibit the characteristics of winter.

Mean barometric pressures for the month along Latitude 15°N are: 1015.0 mb at 27°W, 1016.0 mb at 35°W, 1015.0 mb at 55°W, 1012.5 mb at 75°W. Pressure increases with latitude at a gradient of 0.4 mb/° of latitude.

EXTRATROPICAL CYCLONES

The main area for cyclogenesis extends along the US coast from Georgia to Maine and then northeastward along a band some 700 miles wide to a point near 52°N, 30°W. Other major areas of cyclonic development are in the Bay of Biscay and the northwestern Mediterranean, north of a line from Barcelona to central Yugoslavia. Another small area for cyclogenesis is along the northeast coast of Tunisia.

Lows following the primary track that crosses the Great Lakes generally move NE toward the Gulf of St Lawrence where they either turn north into the Davis strait or continue into the central Atlantic. A primary track leads from a point some 300 miles east of Chesapeake Bay, towards Iceland, while one from northwestern Canada along with a secondary track from the great Lakes region extends into Hudson Bay.

A secondary track from the central Atlantic crosses the British Isles into eastern Europe. Others cross Europe from the Bay of Biscay to the northern Adriatic, and from Tunisia to the southern Adriatic.

TROPICAL CYCLONES

April is the only month in which no tropical storm activity has been recorded in the North Atlantic.

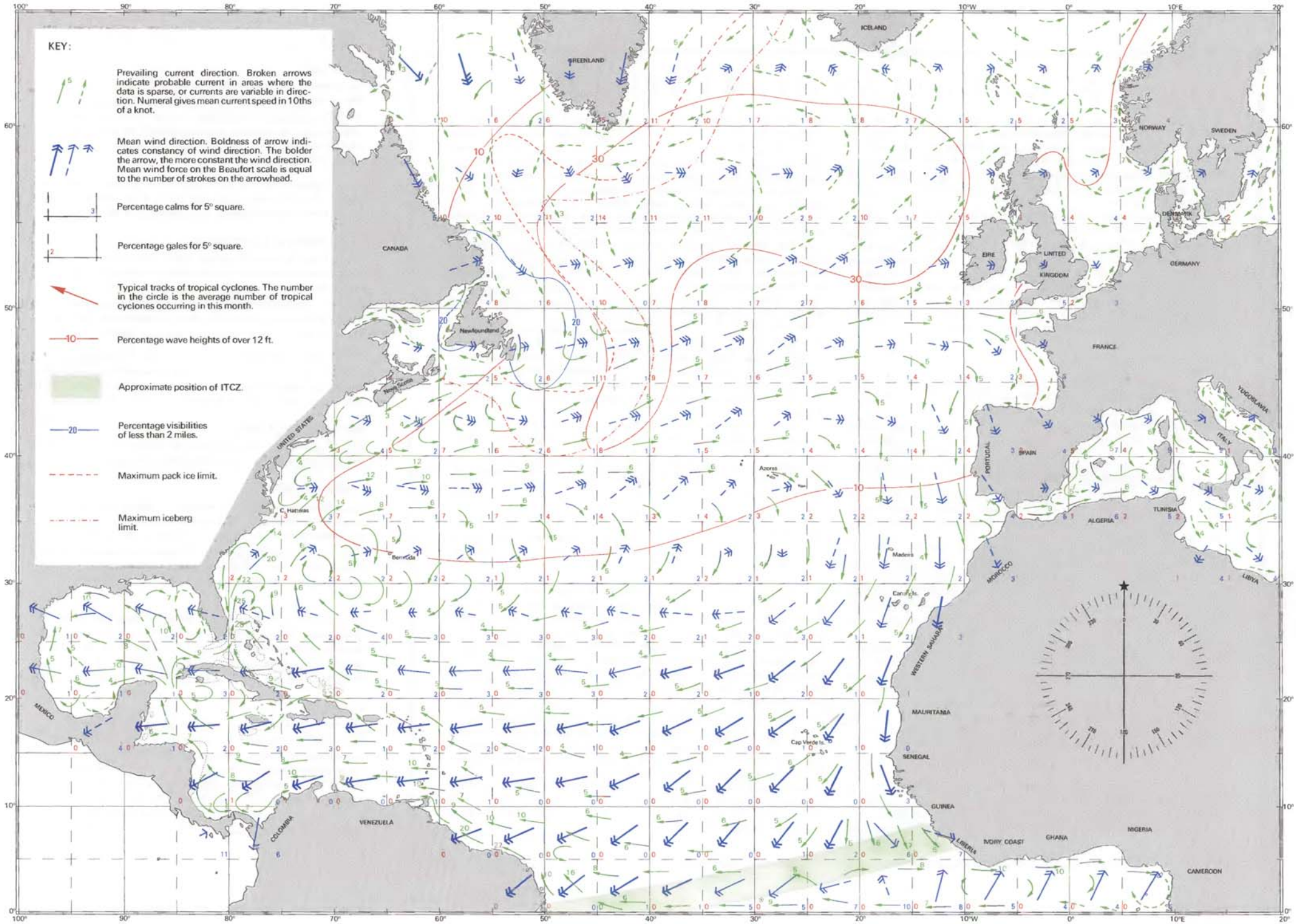
TEMPERATURE

The mean air temperatures continue to slowly increase from the previous month. The −6°C mean isotherm over Baffin Bay moves farther north with the 27°C mean isotherm remaining in the Caribbean Sea.

Along the 60°N parallel, mean air temperature ranges from −4°C at the Canada coast, through 1°C in S Greenland to 5°C at the Norway coast. Along the 40°N parallel, temperatures range from 8°C at the US coast, through 15°C at 40°W, to 14°C at the Portugal coast. At 20°N, mean air temperatures range from 26°C in the Caribbean to 19°C at the Africa coast.

VISIBILITY

A 10% incidence of visibility of less than 2 miles is found N of a line from Cape Cod to 300 miles SE of Newfoundland, and thence to the N of Iceland, bulging out 500 miles SE of the southern tip of Greenland, and is also found over the British Isles, the southern part of the North Sea, and the Baltic. There are areas of 5% incidence affecting about 500 miles of the coast of West Africa to landward of the Cap Verde Islands, and a 300 mile patch in the open sea, south and west of 10°N 30°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC APRIL

NORTH ATLANTIC WEATHER

Annual precipitation along the coast is generally about 100 cm, and fairly well spread throughout the year. Offshore it is wetter in the N and E of the area. Snow falls over the sea from October to April, affecting the whole area in mid winter. In the inner part of the Gulf of Maine, ashore, there is snow cover for over 80 days of the year. Thunderstorms are quite common in the summer; they are most frequent in July.

Great temperature variations are experienced in this area – extremes of cold are felt in the winter and intense heat waves occur in the summer. Mean air temperatures range from −5°C in 45°N to 3°C in 40°N on the coast in January, but the mean lowest temperature for that month in Portland, for example, is −21°C. Mean air temperatures in July range from 15°C in the north to 22°C in 40°N.

Icebergs are rarely encountered west of 67°W. In an average winter, ice will form in many small harbours, bays and estuaries in this area, but the larger ports are kept open by the traffic.

EAST COAST OF NORTH AMERICA (45°N TO 55°N, INCLUDING NOVA SCOTIA & GRAND BANKS)

WINDS Frequent depressions moving over this area in winter bring strong winds and gales with much variability in direction. Depressions move northeastward over or near Nova Scotia, and favoured tracks are between Newfoundland and the mainland, or across SE Newfoundland.

At sea, from October to March, the wind prevails from the W and gales are frequent. The wind becomes more variable in direction in the spring, and SW winds predominate in the summer, when gales are much less frequent.

In coastal areas, winds from the NE, of gale force at times, are common near the N and NE coasts. Coastal winds are often affected by the topography; the Strait of Belle Isle (between Newfoundland and the mainland) is affected by funnelling from E and W, and winds tend to be funnelled along the axis of the Bay of Fundy (between Nova Scotia and the mainland). Land and sea breezes are not common, but may blow in spring in fine weather in the south.

Gales are frequent in winter – winds of force 7 and over make up 10% of observations in January in the area of Newfoundland, and the frequency increases with distance offshore, to become 25% south of Greenland. Gales may blow from any direction, but are rarer from the E. Gales are less frequent in the summer – in July winds of force 7 and over account for 5% of observations in the north of the area, and decrease in frequency further south. In the vicinity of Nova Scotia, most gales are from between N and W, except in summer, when the few gales that blow tend to do so from the SW.

CURRENTS Offshore, the Labrador Current sets SE along the Canada and Newfoundland coasts at rates of up to ½ knot. Its speed and constancy are found to be greatest at 70 to 100 miles offshore.

The northern edge of the Gulf Stream is encountered about 300 miles SE of the Nova Scotia coast, lying along a line approximately from 40°N 61°W to 45°N 45°W. The Gulf Stream sets ENE between 40°N and 45°N to pass south of the 180 m contour of the Grand Banks, thereafter it widens and decreases in speed and constancy, becoming the North Atlantic Current, setting between NE and ENE between 20°W and 40°W, and 45°N and 55°N. This current is more constant and faster in the north, where it is impinged on by the Labrador Current, and where rates are ¼ to ½ knot. Further SE, rates are often less than ¼ knot, and the current is more variable.

In the Strait of Belle Isle, there is a tendency for a weak ingoing current on the Labrador side, and a weak outgoing current on the Newfoundland side, but currents here are very variable and affected by winds, tides and pressure variations, so that net flows may reach up to 3 knots. The dominant flow tends to be outgoing in July and August, but ingoing at other times of the year.

Off the NE coast of Newfoundland, the current sets SE at mean rates of ¼ knot, setting at ½ knot S'ward to the E of the island, and rounding Cape Race to set W or NW along the S coast, at rates of less than 1 knot, and much affected by wind and tides. This current continues round Cape Ray to run N along the W coast of Newfoundland. In the N part of the Gulf of St Lawrence, currents are generally W going.

There is a constant outflow of water from the St Lawrence river, felt below the Saguenay river, and known as the Gaspe Current. This sets SE along the NE of the Gaspe Peninsula, between 2 and 14 miles off the coast reaching 1½ or 2 knots 4 or 5 miles off. This current sets SE across the Gulf of St Lawrence towards the Cabot Strait, where it rounds Cape North in a SE'ly direction, and is felt, at rates of up to 2 knots, for 18 miles off the Cape.

The current sets SW along the SE coast of Nova Scotia at mean rates of between ½ and 1 knot, rounding Cape Sable to set across the mouth of the Bay of Fundy. The water movements within the Bay of Fundy are mainly tidal.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE The area off the SE coast of Newfoundland, including the Grand Banks, is notorious for sea fog, caused when a warm S'ly airstream arrives over the cold waters of the Labrador Current. The worst month is July, when an area 200 miles across off the E coast of Newfoundland experiences visibilities of less than ½ mile in 40% of observations, decreasing to about 10% in 40°W, and decreasing in the same degree to the north and south. The fog incidence in this area drops to 25% in August, and gradually decreases to 5% in December. The incidence gradually increases in spring to reach 30 or 35% in May and June.

Fog in the Gulf of St Lawrence shows the same pattern over the months, having an incidence of 20% off the W coast of Newfoundland from May to July, decreasing W'ward. Nova Scotia is less affected, experiencing 10% or 15% fog in July.

Precipitation ranges from 65 cm in the south to about 135 cm in the north; most of this falls as snow near the land north of 50°N from October to May. In the south, snow is usually found from December to early April.

NORTH ATLANTIC MAY

PRESSURE

The Icelandic Low centred east of Kap Farvel has filled during May to a mean central pressure of 1010 millibars. The Azores High builds slightly to a central pressure of 1023 millibars centred near 32°N, 35°W. As the mean pressure increases over the North Atlantic, the north-south pressure gradient decreases, associated with continued moderation in mid-latitude and sub-tropical weather.

Mean barometric pressures for the month along Latitude 15°N are: 1015.0 mb at 27°W, 1016.0 mb at 36°W, 1015.0 mb at 55°W, 1011.5 mb at 76°W. Pressure increases with latitude at a gradient of 0.4 mb/° of latitude.

EXTRATROPICAL CYCLONES

Lows continue to develop frequently off the Carolina coast, northeast to Newfoundland. Other major areas of cyclonic development include the eastern Bay of Biscay, the region between Tunisia and Sardinia, and a small area centred near 60°N 27°W. Primary tracks leading from the Great Lakes and Delaware Bay head NE towards Newfoundland, where they spread across the northern latitudes of the North Atlantic.

One secondary storm track leads from the Azores NE to waters off northwest Spain, where it divides, heading N towards the British Isles and E across the Bay of Biscay into the northwestern Mediterranean. Another track crosses central Italy and the northern Adriatic into eastern Europe.

TROPICAL CYCLONES

Tropical cyclones are rare in May. Over the hundred years to 1975, only 11 storms were reported, of which 3 reached hurricane force.

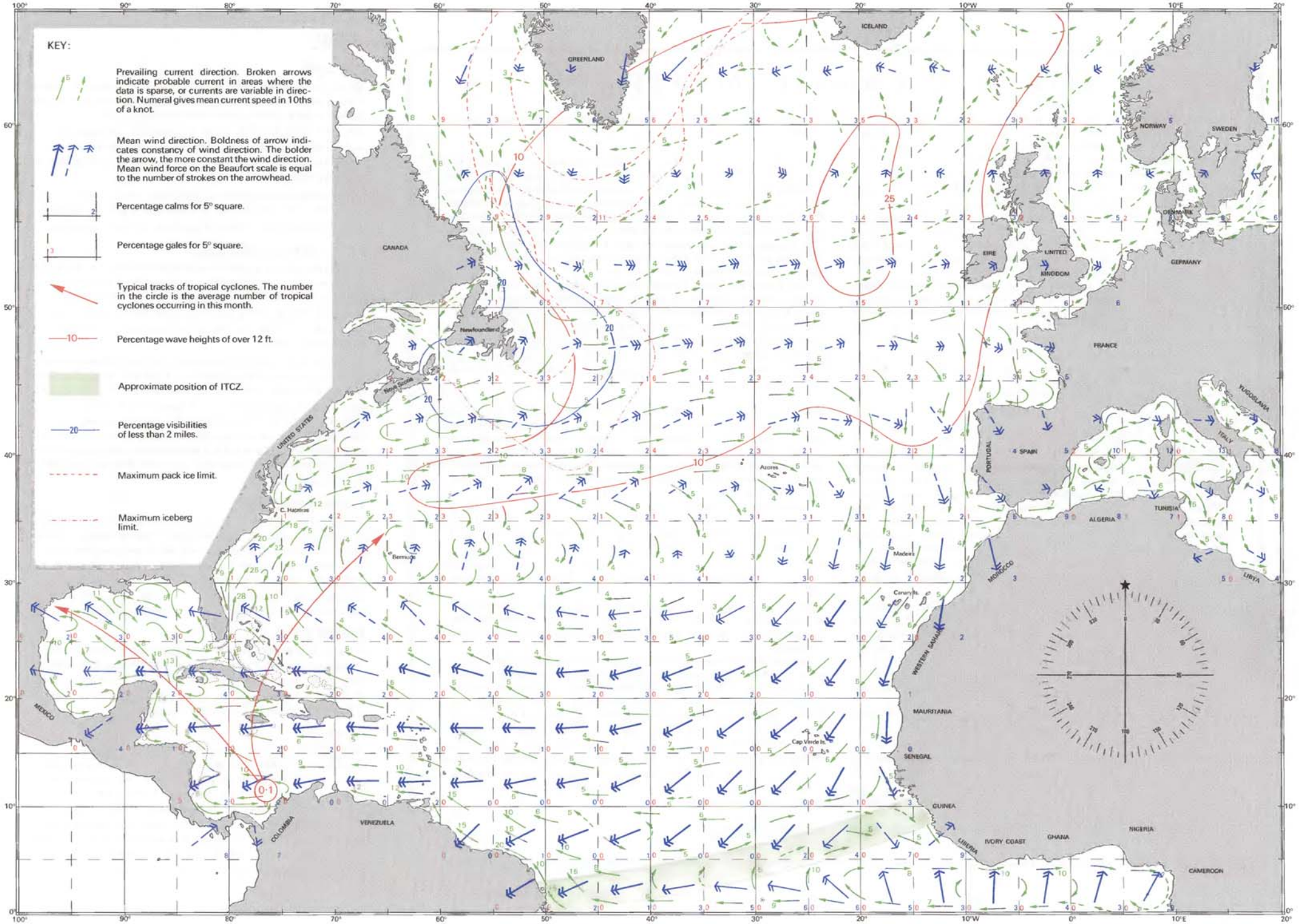
TEMPERATURE

During May, a marked increase in mean air temperatures is noted for middle and northern latitudes. The mean air temperature over Baffin Bay has increased from −6°C in April to 0°C in May. Most middle and northern latitudes have increases from 2°C to 4°C while the increases in southern latitudes are 1°C or 2°C. Extreme maximum temperatures only increase slightly over the previous month, but minimum temperatures rise by 4°C to 6°C.

Along the 60°N parallel, mean air temperature ranges from 1°C at the Canada coast, through 3°C in S Greenland to 9°C at the Norway coast. Along the 40°N parallel, temperatures range from 12°C at the US coast, through 17°C at 40°W, to 15°C at the Portugal coast. At 20°N, mean air temperatures range from 27°C in the Caribbean to 20°C at the Africa coast.

VISIBILITY

The frequency of visibility of less than 2 miles increases over the Grand Banks from the previous month, while the rest of the North Atlantic experiences little change. Waters to the north of Iceland, and between Delaware Bay and southern Greenland, and most of the North Sea, Irish Sea and English Channel report poor visibility of 10% or more. Poor visibility is evident over the Grand Banks 30% of the time. A 5% incidence of poor visibility is found between the Cap Verde Islands and the Africa coast between 10°N and 20°N, and a 500 mile area W of 10°N 30°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC MAY

NORTH ATLANTIC WEATHER

Mean air temperatures range from −6°C in the north in January to −2°C in Nova Scotia, and range from 8°C to 16°C in August. Temperatures are subject to extremes; they may reach 40°C in the summer, and fall as low as −40°C in the winter.

Pack ice usually affects the area from February to April. From July to mid-December, Nova Scotia and the Bay of Fundy are free of ice. Further north, pack ice occupies the Gulf of St Lawrence and the N and E of Newfoundland from January to April. The maximum limit of 1/10th pack ice is greatest in extent in March when it lies in about 42½°N 45°W, and 45°N 40°W; it recedes to occupy the Cabot Strait and the E coast of Newfoundland in June, and is absent in July through November.

Icebergs are found in the area of the Grand Banks, almost exclusively from March through July, with a maximum occurrence, but not extent, in April. Icebergs drift south in the Labrador Current concentrating along the 100 fathom (180 m) contour off the Grand Banks and fanning out to the west.

Sheltered harbours in this area are likely to be blocked by ice for some months between November and June, the time depending on latitude, position, and the severity of the winter. The Gulf of St Lawrence is mainly free of ice between May and December.

LABRADOR SEA, GREENLAND, ICELAND & FAROE ISLANDS (S OF 65°N)

WINDS West of Greenland, winds are very variable and much affected by local topographical conditions near the coast. Depressions traverse the area either E'ward to the south of Greenland, or N'ward into the Davis Strait. NW and SE winds are dominant closer to Greenland, while winds from NW through N to E are more common nearer the Labrador coast. Gales are moderately frequent in the summer, showing an incidence of 10% of winds of force 7 and over to the south of Greenland, decreasing to 6% nearer the coasts. Katabatic squalls can cause high winds, especially off both the E and W Greenland coasts.

East of Greenland, the area is affected by depressions moving NE through the Denmark Strait, or south of Iceland. These depressions bring frequent and violent frontal activity. Predominant winds circulate around the Icelandic Low, situated between Iceland and the southern tip of Greenland. W and SW winds predominate to the south of the Low and east of Iceland, while N and NE winds predominate between Iceland and Greenland. Strong winds are common and can be long lasting.

Gales are most frequent to the south of Iceland, north of 55°N, usually from between NW through SW to SE. The gale frequency (force 7 and over) reaches 30% in winter in this part, and is 20% over the rest of the area E of Greenland. Gale frequency drops to 10% in the area of Iceland and S Greenland in the summer. Strong onshore winds can be increased to gale force when they meet and are deflected by a steep coastline – this occurs on the Greenland coast, and on the S coast of Iceland where S winds back E and increase in strength. Topographical features affect the local winds; the Faroes are particularly susceptible to violent squalls descending from the mountains.

CURRENTS To the west of Greenland, the relatively warm West Greenland Current flows N along the Greenland coast. At the head of Baffin Bay it turns W and S to become the Labrador Current off that coast. There is a counter-clockwise circulation in the Hudson Bay, which sets mainly out through the Hudson Strait to join the Labrador Current; mean rates of these currents are less than ½ knot. The currents between Labrador and Greenland are very variable except in the core of the Labrador Current, setting SE at mean rates of ½ knot 50 miles off the Labrador coast.

The East Greenland Current sets SW along that coast, and is joined by water from the W going North Atlantic Current fanning out in a counter-clockwise circulation. South of Iceland the currents set N'ward, but at the east of the island, the S flowing East Iceland Current joins the flow to the south, which continues NE to flow along the Norwegian coast. In the Faroes the NE current has a mean rate of about ½ knot, and over the whole area, the currents are rather variable, except for the E Greenland Current.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Fog affects the area to the west of Greenland in the summer months, especially between 60°N and 63°N near the coast, where frequencies of 40% are found. East of Greenland, summer sea fog is common, especially north of a line from S Greenland, through Iceland, to N Norway. The worst month is July, when fog incidence is 20% in Iceland, and 10% in the Faroes.

Precipitation is variable over the area. A 200 cm annual fall is recorded in the S of Greenland; this decreases northward, and falls as rain in the south from May to September. Snow falls in Iceland from September to May at sea level; the annual precipitation varies from 50 cm in the north, to 200 cm in parts of the south. Rainfall is about 120 cm annually in the Faroes, most of which falls in autumn and winter.

Mean air temperatures range from −6°C in the Labrador Sea through 0°C in S Greenland to 5°C in the Faroes in January, and from 6°C in the Labrador Sea and S Greenland to 12°C in the Faroes in August.

Pack ice and icebergs affect much of the Labrador Sea. From January to April, 4/10th pack ice usually extends 100 miles off the Labrador coast as far south as Newfoundland. The pack ice recedes north in the summer, but icebergs are found in the Labrador Sea all year round. The E coast of Greenland is icebound for much of the year, but is almost ice free in August and September. The maximum 1/10th pack ice limit over the year lies about 120 miles off the coast and envelops the N coast of Iceland. Icebergs generally remain within the limits of the East Greenland Current, but the maximum limits lie 200 miles to the SE of Kap Farvel in April, the time of maximum iceberg extent.

NORTH ATLANTIC JUNE

PRESSURE

The weather over the North is usually very pleasant in June. The number of active extra-tropical lows continues to decline and storms are usually confined to the higher latitudes. The weakening Icelandic Low, centred at about 60°N 35°W, has filled to over 1010 millibars. The Azores High is well defined this month, and extends from the southeastern US to northeastern Europe. It is centered over mid ocean, in about 30°N 35°W, with a central pressure of over 1024 millibars.

Mean barometric pressures for the month along Latitude 15°N are: 1015.0 mb at 22°W, 1017.0 mb at 40°W, 1015.0 at 62°W, 1012.5 mb W of 75°W. Pressure increases with latitude at a gradient of 0.5 mb/° of latitude.

EXTRATROPICAL CYCLONES

Extratropical cyclones diminish in number and intensity from May to June. Major areas of cyclonic development exist along the E coast of North America from the Carolinas to the southern extent of the Labrador Sea, the eastern edge of the Bay of Biscay, the NW Mediterranean, and off the Algerian and Tunisian coasts, and an area about 10° in diameter centred at 60°N 30°W.

One primary track crosses Lake Winnipeg into the SE Hudson Bay where most lows either turn N into Baffin Bay or E into the Labrador Sea. Another primary track crosses the Great Lakes into the Gulf of St Lawrence, and another extends from Cape Cod across Newfoundland where the lows either continue to the NW of Iceland or turn more E'ly towards the Norwegian Sea. Secondary tracks cross the low Countries into E Europe, and from the Bay of Biscay and NW Mediterranean into Yugoslavia. Others run from Tunisia into S Italy and from about 45°N 40°W to 55°N 32°W in the central Atlantic.

TROPICAL CYCLONES

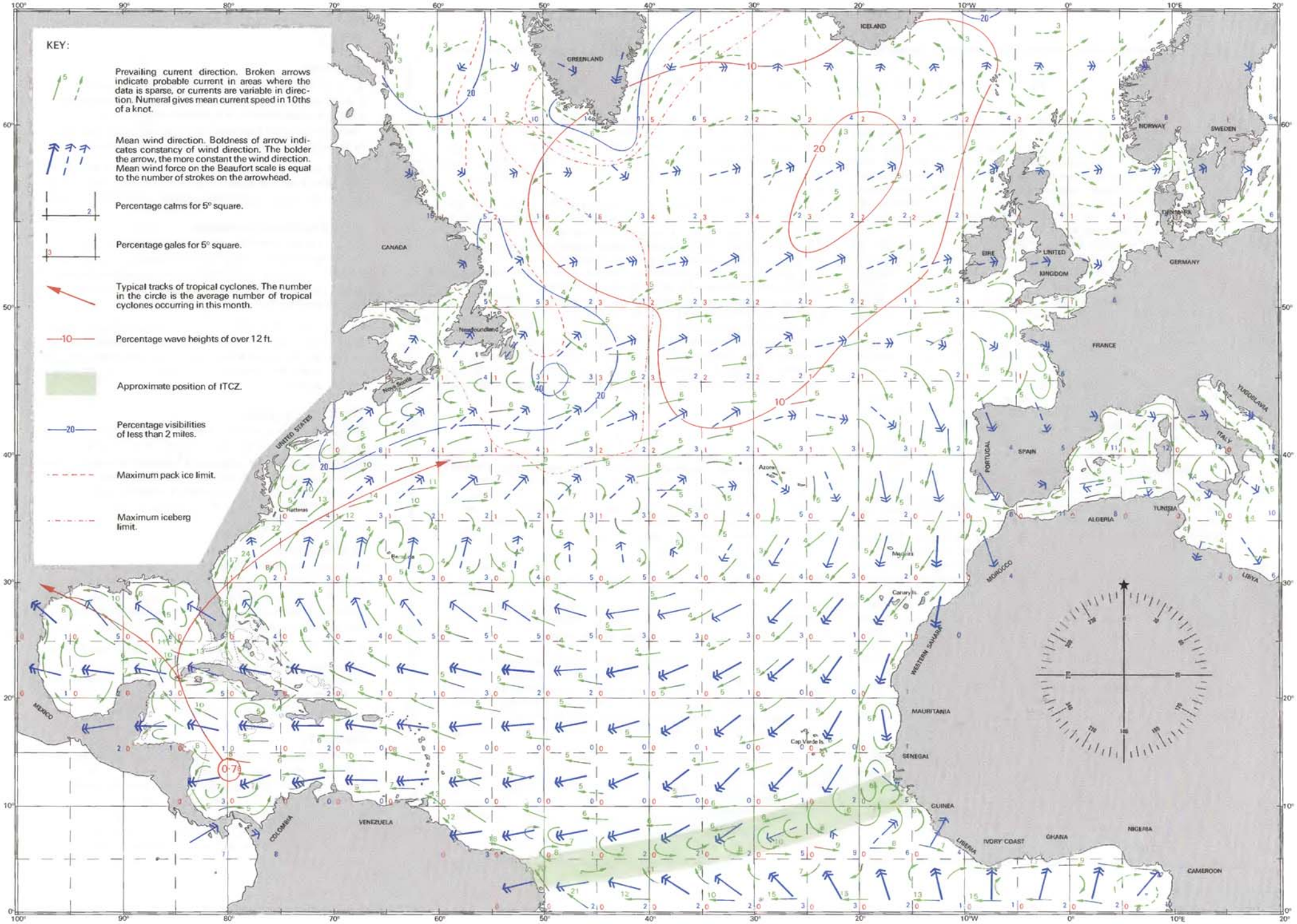
Warmer sea temperatures in the southern latitudes increase the probability of tropical cyclone development this month. Likely incidence is 0.7 tropical storms in the month, of which about half will develop hurricane force winds. Development in June is usually in the western Caribbean, passing north off the western end of Cuba, where they may either proceed N or NW into the Gulf of Mexico to dissipate over the land, or recurve over Florida, to proceed NE along the eastern seaboard of the US.

TEMPERATURE

Along the 60°N parallel, mean air temperature ranges from 5°C at the Canada coast, through 5°C in S Greenland to 12°C at the Norway coast. Along the 40°N parallel, temperatures range from 19°C at the US coast to 18°C at the Portugal coast. At 20°N, mean air temperatures range from 28°C in the Caribbean to 20°C at the Africa coast.

VISIBILITY

Foggy conditions continue to increase from the previous month for the Grand Banks and Sable Island Banks region. 30% of observations indicate visibility of less than 2 miles for the Grand Banks and N portion of the Sable Island Banks with a small area in the SE corner of the Grand Banks reporting 40%. Incidence of 10% is found roughly north of a line from New Jersey across Iceland and through the Norwegian Sea, and also around the British Isles. Areas of 5% incidence are found north of a line between Chesapeake Bay and the north of Spain, parts of the Baltic, to landward of the Cap Verde Islands, and an area 700 miles across centred on 12°N 34°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC JUNE

NORTH ATLANTIC WEATHER

NORWAY

WINDS Depressions pass in an easterly direction over this area, bringing frequent gales in the winter. The winds off the coast show a tendency to follow the coastline. South of 62°N, off the W coast of Norway, there is a predominance of winds from the S in the winter, and in summer N winds prevail, backing NW in the south. Winter gales (force 7 and over) occur from 10% to 20% of the time, and from 5% to 10 % in the summer. Gales are most often from the direction of the prevailing wind.

North of 62°N, winds show a predominance from the S and SW in the winter and tend to follow the coast line. Gales are moderately frequent in the winter; winds of force 7 and over show an incidence of 10% along the coast, rising to 20% 100 miles offshore. Winter gales tend to blow from the direction of the prevailing wind. Winds are more variable in the summer, still tending to follow the coast, and gales are less frequent (less than 5% along the coast).

In the Skagerrak, winds from NE predominate in the waters close to the Norway coast in winter, with W and SW winds prevailing over the rest of the area. W and SW winds are most frequent in the summer, with NW winds becoming more common further west. Gales show an incidence of 10% in winter; 5% or less in summer.

Topography and diurnal temperature changes affect the winds near the coasts in this region, especially near the deep fjords. The wind tends to blow into the fjords in summer, and down from the mountains and out of the fjords in winter. Local squalls descend the valleys at night.

CURRENTS The current flows N out of the Kattegat on the Swedish side, and then N along the Sweden coast with a maximum mean rate of about 1 knot, felt 4 or 5 miles off the coast. This current turns W and SW at the head of the Skagerrak, and thence SW along the Norway coast at a mean rate of 1 – 1½ knots, extending for about 20 miles offshore, the maximum rate of up to 2 knots being felt about 7 miles off. This current forms the Norwegian Coast Current on leaving the Skagerrak.

The Norwegian Coast Current sets W out of the Skagerrak off the S coast of Norway with a high constancy and a mean rate of 1½ knots. It follows the coast to the N with increased variability and reduced mean rate of about ¾ of knot in 60°N. This part of the current is about 30 or 40 miles wide, and variable eddy currents are found seaward of the current, between 40 and 60 miles offshore, south of 62°N. In about 62°N the current is joined by the North Atlantic Current to form the Norwegian Atlantic Current, setting NE along the coast at rates of ½ to ¾ knot, and with medium variability.

Surface flow in fjords is affected by many factors. In spring, an out going flow is often experienced due to the melt. Winds can cause currents of appreciable strength in the fjords. Tidal flows have an effect in the north (spring range is 2.2 m in 65°N), but are negligible south of 58°30'N and in the Skagerrak. Generally speaking, a fjord with great depths throughout will have less flow at the surface than one with a sill at the entrance, as the water flow only extends to the depth of the sill throughout the fjord.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Fog is most frequent in the Skagerrak from March to May (5%–10%), the worst area being at the head of the sea towards Oslo. Along the W Norway coast, fog is infrequent in the winter, but incidence rises from 2% in the south to over 10% north of 62°N along the coast in summer.

In the Skagerrak, annual precipitation is of the order of 80 cm along the Norway coast; it is drier here in spring and early summer and snow is frequent from December to early March. The W coast of Norway is very wet in the south where annual falls reach 200 cm in exposed places, mostly falling in autumn and winter. It is drier to the north, where snow falls from October, falling most frequently in March, but infrequently from April to September.

Mean air temperatures range from 4°C in January on the W coast to 2°C in Oslo, and from 13°C in the N to 15°C in the S in August.

Ice closes most harbours in the east of the SE coast of Norway most winters; in the south they are rarely ice-bound. On the W coast of Sweden, ice commonly forms in late January and persists until late March. On the W coast of Norway fjords will be obstructed only in very severe winters; some floating ice may be encountered during the spring.

DANISH WATERS

WINDS Depressions generally pass to the north of these waters, usually coming from the W or SW. In the Kattegat and the Danish islands, winds are very variable. From June to August there is a predominance from between SW and NW, and from October to March winds from between SE through S to W are most common. Gales of force 7 and over occur in 10% of observations in winter, 3% in summer. Most gales from June to August come from W and NW, otherwise they are usually from any direction except N and NE.

Winds off the W coast of Denmark show a slight predominance from the W; this is more marked in the Skagerrak, except in the autumn. Winds of force 7 and over occur in 10% of observations in the winter months, increasing westward, and 5% in the summer months. Summer gales are mainly from the N, otherwise gales tend to come from the directions of the prevailing winds.

CURRENTS In the Kattegat, and among the Danish islands, the current flow is generally W and N'ward out of the Baltic Sea in calm conditions, but currents in this area are much affected by winds and changing sea levels. The current flows out of the Kattegat, N along the Sweden coast at rates of about 1 knot, and thence SW along the Norway coast at a mean rate of 1½ knots, becoming the Norwegian Coast Current.

A weak current of about ½ knot circulates in an anti-clockwise direction in the North Sea, and thus sets N on the W coast of Denmark. However the net transport of water in the North Sea is most subject to tidal influences and wind effects. This latter causes a current flowing NE off the coast of Jylland of ½ to 1 knot, sometimes reaching 1½ knots off Skagen.

NORTH ATLANTIC JULY

PRESSURE

By July the well established Azores High extends from the Gulf of Mexico to the North Sea. It is centred near 35°N 35°W, with a mean central pressure of 1025 millibars, the highest for the year. The Icelandic Low remains an ill defined east-west trough extending from Hudson Bay to near North Cape, Norway with a mean pressure of 1009 millibars.

Mean barometric pressures for the month along Latitude 15°N are: 1015.0 mb at 30°W, 1016.0 mb between 40°W and 55°W, 1013.0 mb at 75°W. Pressure increases with latitude at a gradient of 0.55 mb/° of latitude.

EXTRATROPICAL CYCLONES

From June to July, a marked northward shift of cyclonic activity occurs over the North Atlantic. A major area of cyclogenesis extends along the North American coast from the Carolinas into the southern Denmark Strait. Another principal area of cyclonic development occurs over the northeastern North Sea.

One primary cyclone track leads from the southern Hudson Bay region into the Davis Strait and E across southern Iceland. Another runs from off Cape Hatteras NE into the central Atlantic. Secondary tracks cross the northern Hudson Bay, Norwegian Sea, and also cross the British Isles and southern Scandinavia.

TROPICAL CYCLONES

The frequency of tropical cyclones increases slightly from June. Likely incidence is 0.8 tropical storms in the month, of which half will reach hurricane strength. These are generally formed in the eastern Caribbean or western Atlantic and may either traverse the Caribbean, passing through the Yucatan Channel and crossing the Gulf of Mexico northeastward, or pass near Haiti/Dominican Republic, recurving east of Florida and running up parallel to the US coast.

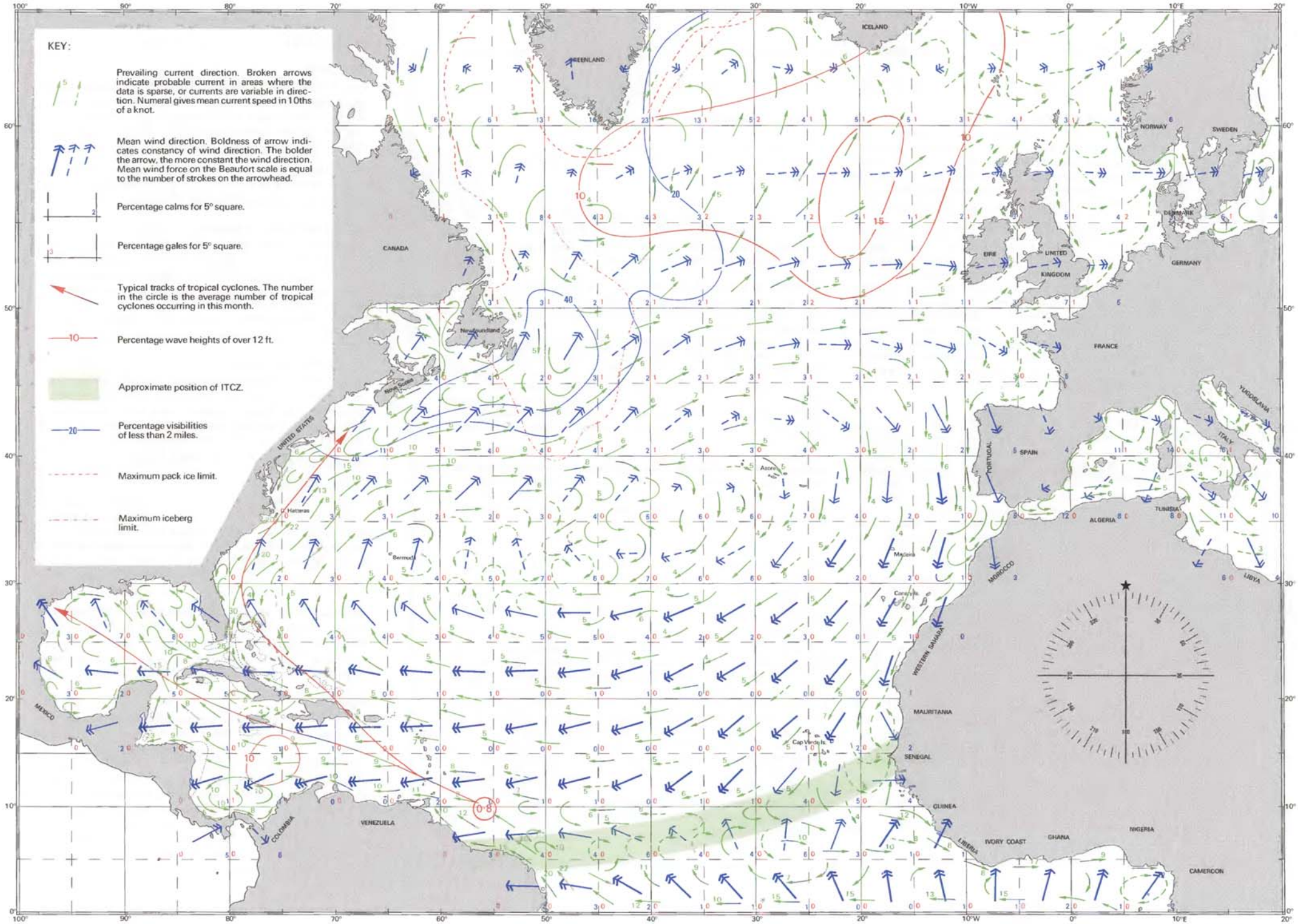
TEMPERATURE

The mean air temperature continues to rise, with the most significant increases occurring in the higher latitudes. The mean temperature ranges from 4°C in the Davis Strait to 28°C over the Gulf of Mexico and the Caribbean. At 40°N, cooler temperatures exist along the Iberian peninsula than along the east coast of the US – a reversal of previous months.

Along the 60°N parallel, mean air temperature ranges from 6°C at the Canada coast and in S Greenland to 14°C at the Norway coast. Along the 40°N parallel, temperatures range from 23°C at the US coast to 19°C at the Portugal coast. At 20°N, mean air temperatures range from 28°C in the Caribbean to 22°C at the Africa coast.

VISIBILITY

July is the foggiest month of the year over the Grand Banks, where 50% of the observations report less than 2 miles visibility. For the rest of the North Atlantic, the 10% frequency line extends from Long Island northeastward to just west of the Irish coast, where it swings northwest towards the Greenland coast and then east through northern Iceland and the Norwegian Sea. The coastal areas surrounding the British Isles also show poor visibility 10% of the time. Poor visibility is present 5% of the time generally N of 40°N, and in a large area to the W of the Cap Verde Islands.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC JULY

NORTH ATLANTIC WEATHER

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Fog is not frequent over the sea in the Kattegat, but does affect Danish coastal waters more, especially in late autumn and winter. In the Skagerrak, it is most frequent from March to May (5% – 10%) and least from July to December. Fog is infrequent along the W Denmark coast in summer, but reaches 15% incidence inshore in the S half of the coast in winter, decreasing to 5% at the entrance to the Skagerrak.

Precipitation averages about 60 cm a year in the Kattegat; it is drier in the early part of the year, and the wettest month is August. The W coast of Denmark receives about 65 cm annually, with some snow in winter; it is wettest in late summer and autumn.

Mean air temperatures range from 2°C to 4°C in January, temperatures falling to the east, and are around 16°C in August.

The Kattegat and the Danish islands are affected by ice to some extent most winters – in about half of the winters most of the harbours are ice free, but in severe winters, fast ice surrounds the Danish islands, and affects the SW part of the Baltic. Most ice occurs in February, the ice season running from January to March. Ice formation is rare along the W coast of Denmark.

THE BALTIC SEA (S OF 60°N)

WINDS The area is subject to depressions moving E'ward over the area, bringing strong winds in the winter, but an extension of the Azores High in the summer provides periods of settled weather. At sea, winds are somewhat variable, but show a predominance from between S and W in the winter, and from NE through NW to SW in summer, when winds are light and gales infrequent.

Near the coast sea breezes affect the south part of the area, and the Sweden coast is susceptible to katabatic squalls on cold clear nights.

CURRENTS Currents in the Baltic are very variable, depending largely on the winds, differences in sea levels, and the shape of the coastline. Strong winds can cause currents of 4 knots or more, but not necessarily in the direction of the wind. Currents are often augmented in narrow channels, and can, for example, reach rates of up to 8 knots between Öland and the mainland during gales. The current is often strong in the region to the west of Bornholm. Care should be taken in position fixing during periods of disturbed weather.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Sea fog over the open sea is worst from late April to early June, when most of the area suffers visibilities of less than 1 mile in more than 10% of observations. The north of the area, and near the south of Gotland, are most susceptible. The situation improves, especially in the south, in July and August.

Precipitation averages about 65 cm; it is drier on the Sweden coast and wettest on the E Baltic coast. Snow is infrequent between May and October or November.

Mean air temperatures range from 2°C in the west to −2°C in the east in February, and are about 16°C in August, being slightly colder in the north.

Ice forms from December, and has usually disappeared by the end of April. It forms along all the coastal areas and in bays and inlets.

BRITISH ISLES & NORTH COASTS OF EUROPE

This area covers the British Isles, and the Channel and North Sea coasts of France, Belgium, Holland and Germany.

WINDS Winds over the whole area are mainly from the W and SW, due to the action of the depressions passing over the British Isles, or to the north, mainly in winter. NE and E winds are common from February to May.

80% of gales (force 7 and above) occur from October to March, the majority of these being from between S and W, and almost all from between NW and SE, through SW. Exceptionally, off the NE of Scotland, gales are common from the SE in winter (10% of all wind observations in January), and the central and southern North Sea, where winter gales are commonly between NW and SE through NE. The most stormy coastal areas are between Ireland and southern Britain, and off the E coast of Scotland.

Gale frequencies in January (force 7 and over) are about 25% along a NE-SW line through the Outer Hebrides, diminishing with distance to the SE, being 10% on a NE-SW line through London, 5% in the Dover Strait, but 5–10% off the N Germany coast. Gale frequencies in July are 2% in the Channel, increasing slightly with distance N, W and E'ward, being 5% in the Frisian Islands.

CURRENTS Currents to the W of the Channel, and to the S of Ireland flow E'ward at a mean rate of ½ knot, and may reach 1½ knots in a strong W'ly wind. However, inside the 200 m contour, currents in the area due to wind and density effects are usually imperceptible, except after a strong wind, as the surface flow of water is mainly dictated by tidal effects.

Tides around the British Isles are mainly semi diurnal. The flood tide rises ENE in the Western Approaches and eastward in the Channel as far as the Thames estuary. In the Irish Sea the flood tide rises NE'ward as far as the Isle of Man. The flood runs north along the west coasts of Ireland and Scotland, setting SE through the North Channel between Ireland and Scotland. The tide floods east along the N coast of Scotland, and is joined by the S going flood of the Shetlands; it then floods S as far as the Thames estuary.

Spring rates in the wider parts of the Channel reach 2½ knots. Spring rates of up to 4 knots are encountered in the narrow part of the Dover Strait, and are 1½ to 2 knots off the coasts of Holland further east. Tidal ranges on the N coast of France are very large. Spring rates in the whole of the area off headlands and in restricted waters can exceed 3 knots and the relevant tidal publication should be consulted.

NORTH ATLANTIC AUGUST

PRESSURE

Over the North Atlantic, The Azores High is still the predominant feature during August. Its SW-NE elongation has slightly decreased from the previous month, its centre is still located near 35°N 35°W with a slightly lower mean pressure of 1023 millibars. The Icelandic Low remains an ill defined east-west trough with a central pressure of 1009 millibars.

Mean barometric pressures for the month along Latitude 15°N are: 1012.5 mb at 21°W, 1015.0 mb at 47°W, 1012.5 mb at 77°W. Pressure increases with latitude at a gradient of 0.45 mb/° of latitude.

EXTRATROPICAL CYCLONES

During August, principal areas of cyclogenesis extend from the Carolinas to the Gulf of St Lawrence, from Newfoundland to southern Greenland, and over an area centred at 50°N 23°W. Extratropical storm tracks have moved even farther north than in July. Primary tracks lead from Lake Winnipeg to the Davis Strait and from the Great Lakes into northern latitudes, extending from the Labrador Sea to the Norwegian Sea. A secondary storm track for lows crosses Great Britain and Denmark.

TROPICAL CYCLONES

The likelihood of tropical storms increases as August advances. Likely incidence is 2.5 tropical storms in the month, of which 1.5 will reach hurricane strength. These are generally formed in the mid Atlantic and arrive in the Caribbean in the north of the Leeward Islands, whence they either sweep along the north of Cuba into the Gulf of Mexico, or recurve east of Florida, to head NE off the coast of the US.

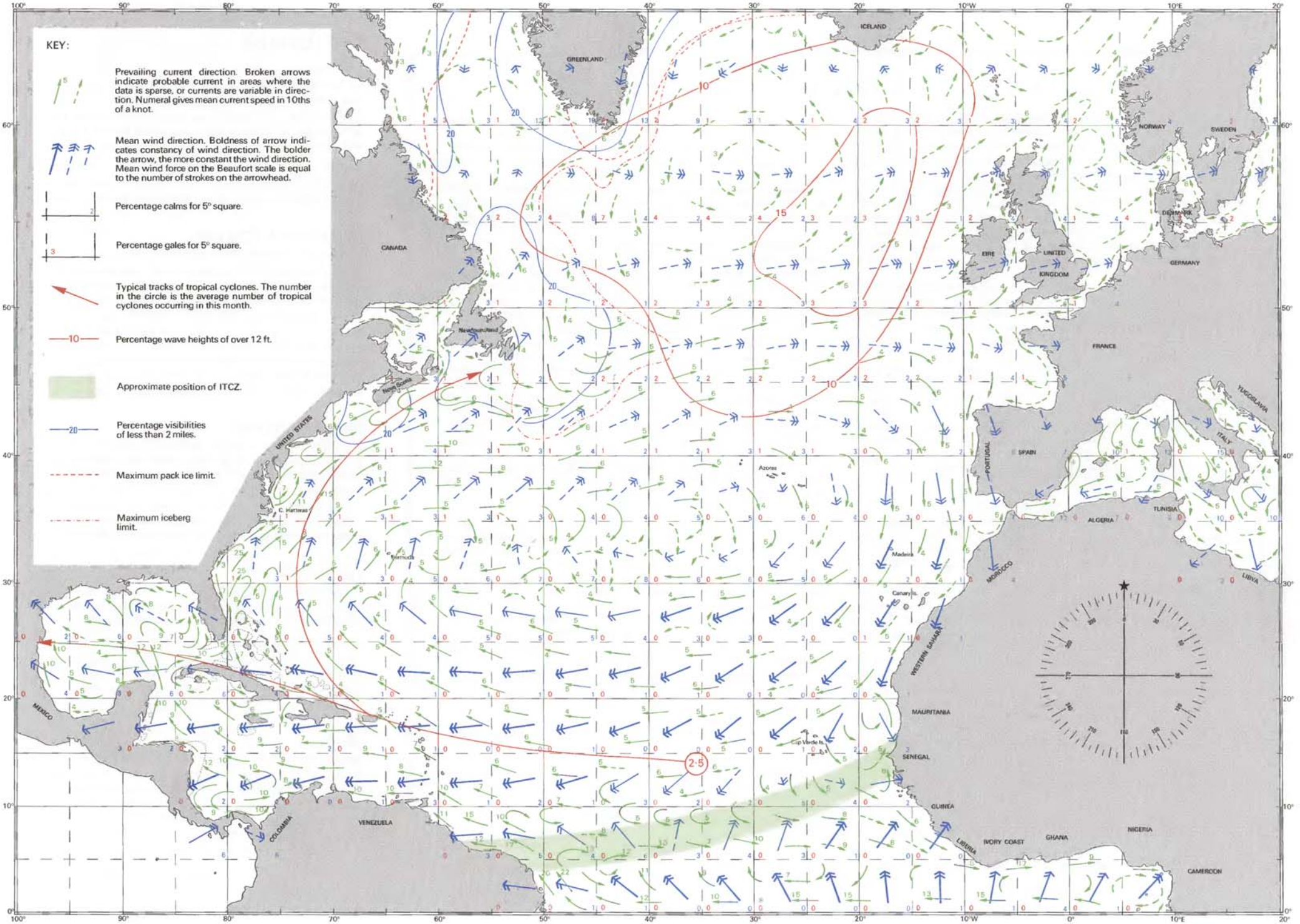
TEMPERATURE

The mean air temperature increases slightly over July with a range from 4°C over the Davis Strait to 29°C over the Gulf of Mexico. The extreme temperatures for August are close to those of July with 98% of observations along the coast of Greenland reporting temperatures between 0°C and 12°C while over the Caribbean Sea and Gulf of Mexico, 98% are between 24°C and 32°C. Along the 40°N parallel, the air temperatures are still warmer off the east coast of the US than the west coast of Portugal.

Along the 60°N parallel, mean air temperature ranges from 6°C at the Canada coast and in S Greenland to 14°C at the Norway coast. Along the 40°N parallel, temperatures range from 23°C at the US coast, through 24°C at 40°W, to 20°C at the Portugal coast. At 20°N, mean air temperatures range from 29°C in the Caribbean to 24°C at the Africa coast.

VISIBILITY

During August, fog becomes less frequent and extensive than earlier in the summer. A 5% incidence of poor visibility occurs north of a line from 40°N on the US coast to the NW corner of France, and off the Africa coast to the north of the Cap Verde Islands. Visibility of less than 2 miles occurs in 10% or more instances north of a line from Long Island past Grand Banks, from where it circles north through Iceland and south along the outer coast of the British Isles before turning northeast through the Norwegian Sea. The highest frequency of poor visibility, 30%, occurs over the Bay of Fundy, the Grand Banks, and over the southwestern tip of Greenland. Areas along the coast of Greenland and from Cape Cod to Newfoundland report a 20% incidence of poor visibility.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC AUGUST

NORTH ATLANTIC WEATHER

VISIBILITY, RAINFALL, TEMPERATURE & ICE The area is affected by sea fog and radiation fog; the former occurs most often in spring and summer, and has an average duration of 8 hours or so. Radiation fog is to be found in sheltered areas during calm weather, especially near sources of industrial pollution.

In the winter, incidence of fog (visibility less than ½ mile), ranges from 2% over Northern Ireland and Scotland to 5% over eastern England, and 15% off the N Germany coast. In the summer, 2% fog is experienced in eastern England and the N Germany coast, rising with distance north and west to 5% in the west of England, off the west of Ireland, and the north of Scotland, and to 8% in the Faroe Islands.

Rainfall in the area is moderate, but well spread, so that rain can be expected at sea on 20 days per month in the winter, and on 15 in the summer. Rainfall is greater in western areas, being from 80 to 100 cm a year in the SW to 60 cm in the SE, and on the N coasts of Holland and Germany. Scotland is wetter, with from 80 cm a year on the E coast to 120 cm on the W coast.

Mean air temperatures range from 8°C in the west of the British Isles in January to 6°C in the east, and to 4°C on the N Germany coast. In August the range is from 14°C in the north to 18°C on the N Germany coast.

Ice is found in some rivers, bays and estuaries in this area in severe winters, but sea water harbours in the British Isles rarely experience ice. Along the European coast ice occurs in German waters in sheltered areas, and may hinder navigation in severe winters.

BAY OF BISCAY

WINDS The Bay of Biscay is under the influence of depressions moving E or NE across or to the north of the British Isles, and considerable frontal activity takes place here. Very high seas occur in the Bay of Biscay in the autumn and winter with strong winds of long fetch.

In the north, the wind is mainly from SW through NW to NE, with a predominance of W'lies in winter, and a significant number of E'lies in the autumn. Gales occur mainly in winter, between November and March. Winds of force 7 and over occur in 18% of observations in December, and 3% in July and August.

East of 5°W, inside the Bay, winds are variable in the winter months, but show a predominance from the NW half of the compass in the summer months. Gales are mostly confined to the winter, with a 10% to 16% incidence of winds of force 7 and over from November to March, with a maximum in December. From May to September, gale frequency is less than 3%.

Closer to the NW extremity of Spain, winds from N and NE predominate, except in December, when SW winds are slightly predominant. Northerlies are the most common wind from April to October, with a maximum in July. Gales range from 1% in July to 12% in December; this part of the Bay has more settled weather in the summer than the areas further north.

Along the N coast of Spain, a Galerna gale occurs when a front or occlusion passes along the coast. Before the front, some shelter from the SW'ly winds is given by the mountains. On the passage of the front, however, the full force of the NW wind is felt, and this is augmented by the blocking effect of the mountains. The winds are thus sudden and violent on the passage of the front.

Here also, local intensification of a southerly wind down the valleys in the mountains may be experienced with a depression situated to the west of Spain. This can cause very strong winds close to the coast.

CURRENTS Currents in the outer parts of the Bay of Biscay derive from the continuation of the North Atlantic Current, which enters the Channel as described above. The Portugal Current turns south, off the Bay of Biscay, so that the currents in the longitude of 10°W and south of the latitude of Ouessant tend to be S going at mean rates of about ½ knot or less. Further into the Bay, currents show great variability, and are mostly dependent on the wind. There is a slight predominance of a clockwise circulation in the Bay of Biscay, but this is readily overcome by strong winds opposing it.

The west going part of this circulation is usually found in summer off the N coast of Spain, where it may reach rates of up to 2 knots, although the rate is very variable. The strongest currents in the Bay occur when this current is reversed by a W'ly or NW'ly gale in winter; it then runs eastward along the coast, sometimes reaching 3 knots off Bilbao, and 5 knots at the head of the Bay. It then runs north along the S part of the French coast. Off the coast to the south of La Gironde, the current usually sets N'ward, 5 or 6 miles off the coast, at a rate of up to ½ knot, and an inshore counter-current up to a mile offshore sets S at about the same rate.

VISIBILITY, RAINFALL & TEMPERATURE Fog at sea is most common from May to October, when it has an incidence of between 2% and 5% of observations. These frequencies are also found in March east of 4°W, and in April to the north of the Loire. Restricted visibility of less than 5 miles is rather common in the summer, especially in July. Radiation fog is also encountered in the area, most commonly in the winter.

Annual rainfall ranges from 70 cm in the N part of the French coast to 170 cm in the SE corner of the Bay, decreasing rapidly westward to be 100 cm along most of the Spanish coast. Most of the rain falls in the winter months over the whole area.

Mean air temperatures range from 9°C in the north to 12°C in the south in January, and are about 18°C or 19°C in August.

NORTH ATLANTIC SEPTEMBER

PRESSURE

Increased cyclonic activity begins to take place during September resulting from moderate intrusions of colder air. The Icelandic Low, centred SW of Iceland, becomes more well defined as its mean central pressure deepens to 1004 millibars. The Azores High, with a central pressure of 1021 millibars, centred near 35°N 30°W, is slightly weaker than in August.

Mean barometric pressures for the month along Latitude 15°N are: 1012.5 mb at 19°W, 1014.4 mb at 40°W, 1012.5 mb at 66°W, 1011.2 mb at 75°W. Pressure increases with latitude at a gradient of 0.4 mb/° of latitude.

EXTRATROPICAL CYCLONES

The frequency of extratropical cyclones has increased since August and occasional severe storms may be encountered. The primary area of cyclogenesis extends from some 300 miles off Cape Hatteras to Newfoundland and ENE to a point near 55°N 25°W. Another area of major cyclonic development is off the northeast coast of Iceland. Since August, the extratropical cyclone tracks have moved slightly south with primary tracks leading off the northeast coast of the US towards the Norwegian Sea. Other primary tracks lead from the Great Lakes to the Davis Strait and across southern Scandinavia. Secondary tracks cross northwestern Canada and the Bay of Biscay into the northwest Mediterranean.

TROPICAL CYCLONES

September is the peak season for tropical storm activity. September will average 4.5 tropical storms, of which about half will reach hurricane strength. In the hundred years to 1975 the number of storms occurring in September has ranged from 1 to 8. Storms in this month tend to originate in the mid or east Atlantic (although they may start locally) and pass through the north of the Leeward Islands, either recurving north of Haiti or continuing along the north coast of Cuba, into the Gulf of Mexico.

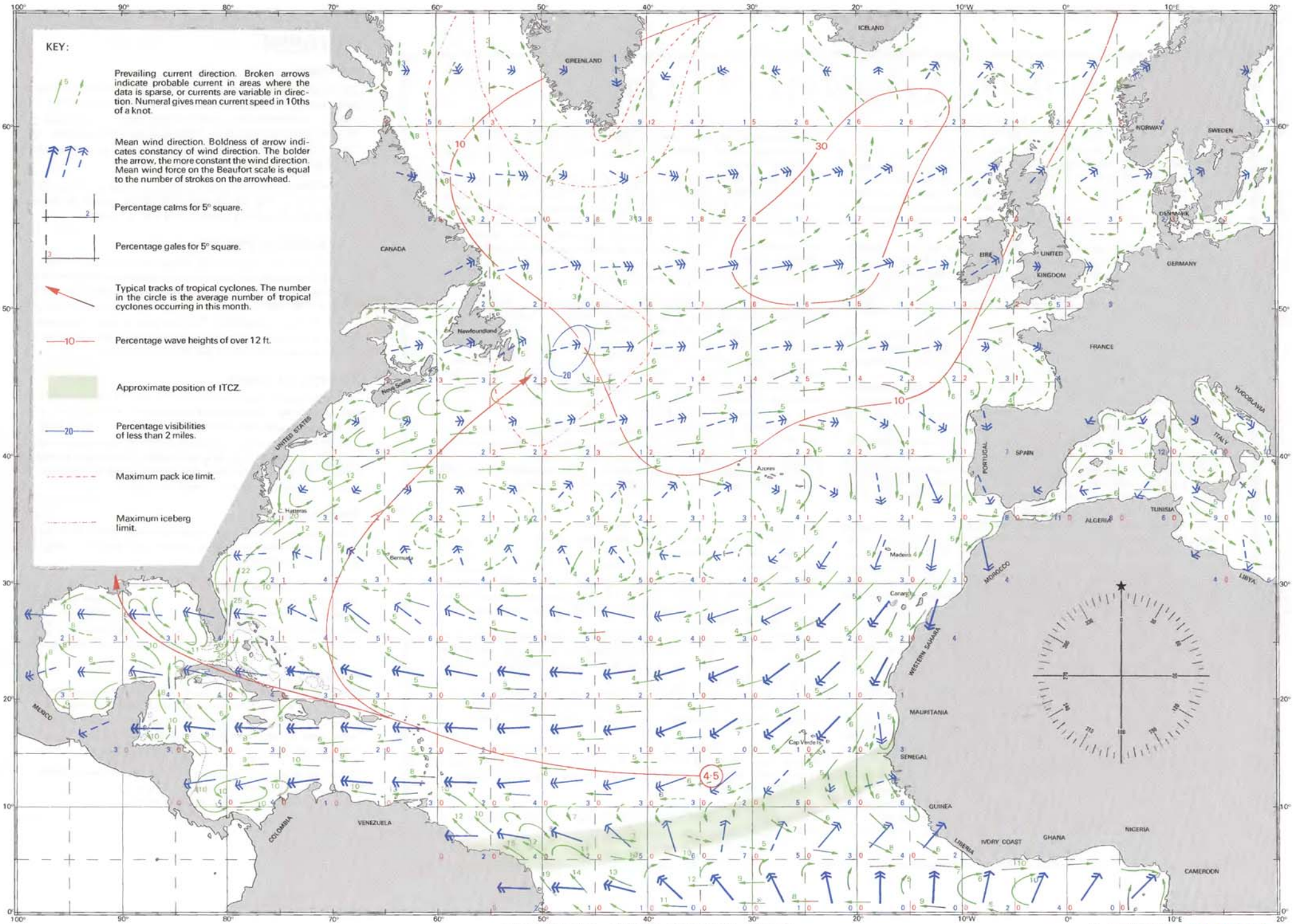
TEMPERATURE

The mean air temperatures over the north Atlantic have begun to fall from those of the previous month. Means range from under 4°C in the Davis Strait, to over 28°C in the Caribbean Sea and the Gulf of Mexico.

Along the 60°N parallel, mean air temperature ranges from 4°C at the Canada coast, through 6°C in S Greenland to 12°C at the Norway coast. Along the 40°N parallel, temperatures range from 20°C at the US coast, through 22°C at 40°W, to 20°C at the Portugal coast. At 20°N, mean air temperatures range from 28°C in the Caribbean to 25°C at the Africa coast.

VISIBILITY

Areas of visibility of less than 2 miles have become less widespread this month. Frequencies of over 5% are found to the north of a line from the NW corner of France to Long Island, and a patch some 700 miles across with its SE edge on the Cap Verde Islands. Frequencies of over 10% are found over the Grand Banks, coastal regions of Newfoundland, coastal regions of Greenland (including an area extending some 800 miles SE of Kap Farvel), the Greenland sea, northwestern Norwegian Sea, and British coastal waters.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC SEPTEMBER

NORTH ATLANTIC WEATHER

WEST & SOUTH COASTS OF SPAIN & PORTUGAL

WINDS Most of the depressions affecting this area pass well to the north, and fronts trailing from these depressions move across the area from W or NW. Secondary depressions forming on these fronts sometimes pass over the northern coasts of the area, especially in the winter months. In summer, small secondary depressions occasionally move N from Morocco into the vicinity of the Strait of Gibraltar.

North of 40°N, and east of 15°W, the wind at sea is variable, although it blows rarely from between S and E. There are more northerly winds in spring and summer, when the wind blows almost entirely from the NW half of the compass. Further offshore, to the longitude of the Azores, the winds are variable, and show a slight predominance of W'ly winds.

At sea between 35°N and 40°N, the Portuguese Trades set in from between NE and NW from April through September, when the wind is very prominent from these directions. These winds are common in other months, along with winds from W and SW.

East of Cabo Sao Vicente, the winds are variable, becoming predominant from either the easterly or westerly quadrant nearer to the Strait of Gibraltar. Winds from a W'ly quadrant are slightly more frequent in winter; the opposite applies in the summer.

Near the coast the land and sea breeze effect is common, especially in summer, although this is masked by the N'ly winds in the south part of the Portugal coast. Cold front squalls are encountered in the winter months at sea, and are accentuated in the mountainous coastal areas north of 42°N. Squalls are often in evidence to leeward of the Rock of Gibraltar during E'ly winds.

Gales are more common in the north of the area, usually being associated with fronts or secondary depressions from lows to the north. Most gales occur in the winter months from November to March, when winds of force 7 and over make up 4% of observations in southern Portugal, and 12% in NW Spain. Gales are infrequent in the summer; and throughout the year their directions tend to follow those of the prevailing winds.

CURRENTS The currents off the NW coast of Spain set in the direction of the prevailing wind, and can become quite strong during gales; they are rather dangerous during gales from W or NW, when they set towards the land.

Off the west coast of Spain and Portugal, from Cabo Finisterre to Cabo Sao Vicente, the Portugal Current sets mostly S. It is however influenced by the wind and may set in any direction. Currents may set N'ward after a spell of S'ly wind, and a significant proportion of the currents set onshore, especially as a result of gales from the W, when their rate may reach 2 knots.

Generally the rate of the Portugal Current is less than one knot throughout the year. The current becomes more constant in a southerly direction from April to September, especially south of 40°N; this is due to the increased constancy of the N'ly winds.

From Cabo Sao Vicente, the bulk of the Portugal Current continues to the Canary Islands, being similar in strength and variability to that north of the cape. In about 38°N, some of the Portugal Current branches to round Cabo Sao Vicente, whence it flows ESE to the Strait of Gibraltar.

The mean rate of this current, off the S Portugal coast, is ½ knot in the W of the region, increasing to 1 – 1½ knots in the entrance to the Strait of Gibraltar. Although this current is predominantly E going, it sometimes sets W as a result of E'ly winds. The majority of currents in this area have rates of less than 1 knot. Strong SW winds off the coast of Morocco can produce currents of up to 2 knots which flow W and NW along the southern coasts of Spain and Portugal, setting into the bays along these coasts.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is generally good in this area, although sea fog is found in 4% of observations between 38°N and 43°N, between the coast and 10°W, from July to September. The maximum occurrence of poor visibility is 10% in July, between 38°N and 40°N. Some coastal fog is encountered along the W coasts, usually associated with calm weather, but it is not usually very long lasting. Fog can be persistent near Cadiz, when the W'ly wind replaces an E'ly Levanter, and is to be found with a Levanter wind near Gibraltar.

Moderately high rainfall in the northern part of the area gives way to a drier, and clearer, climate on the south coast of Portugal. Annual rainfall in La Coruña is 80 cm, and in Lagos, 50 cm.

Mean air temperatures range from 12°C in the north to 14°C in the south in January, and from 19°C to 22°C in August.

THE AZORES

WINDS Winds from the SW predominate in the winter at sea in this area, which is affected by frontal activity from depressions passing westward to the north of the islands. In the spring and summer, NE'ly winds are predominant, being rather light in the summer, when the islands are in the Azores High. Between the Azores and the south Portugal coast, the winds are very predominant from the NE to NW in the summer.

Gales are infrequent in the summer, but in other seasons, wet and stormy weather is common. Gale frequencies are 5% or over from October to April, reaching 15% in January; the frequency increases rapidly northward.

The winds are very variable in strength and direction around the steep coastlines of the islands. In the summer and autumn, the islands are occasionally affected by tropical storms from the West Indies.

CURRENTS Currents in the area are rather variable, as the islands are on the edge of the area of variable currents in the centre of the North Atlantic circulation. Sets are most commonly between S and W, with mean rates of ½ knot or less.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is generally good in the Azores, and fog is rare.

NORTH ATLANTIC OCTOBER

PRESSURE

The increased frequency and strength of lows during October, over the middle and higher latitudes, has increased the north-south pressure gradient. The Icelandic Low, centred between Iceland and Greenland, continues to deepen with a mean central pressure of 1000 millibars. The Azores High, centred near 35°N 35°W has diminished in size, and is slightly weaker at a central pressure of 1020 millibars.

Mean barometric pressures for the month along Latitude 15°N are: 1014.5 mb from 30°W to 40°W, 1012.5 mb at 64°W, 1010.6 mb at 75°W. Pressure increases with latitude at a gradient of 0.4 mb/° of latitude.

EXTRATROPICAL CYCLONES

The temperature contrast along the Atlantic coast, from the Carolinas to the Gulf of St Lawrence is conducive to cyclogenesis. Other major areas of cyclonic development include an elliptical area extending from 50°N 40°W, to 58°N 30°W, and an area that extends from the Davis Strait across Iceland into the Norwegian Sea. Numerous primary tracks cross eastern Canada and the northeastern US heading into most areas north of 60°N. Secondary tracks cross Hudson Bay and southern England.

TROPICAL CYCLONES

The hurricane season continues into October with the frequency of tropical cyclones diminishing significantly from September. An average of 2.5 tropical storms occur during the month, with a little over half of these reaching hurricane strength. Most storms form over the western Caribbean, but a few are spawned near the Lesser Antilles. The preferred storm tracks leading from the Caribbean either head towards the US Gulf coast or recurve across southern Florida towards open water.

TEMPERATURE

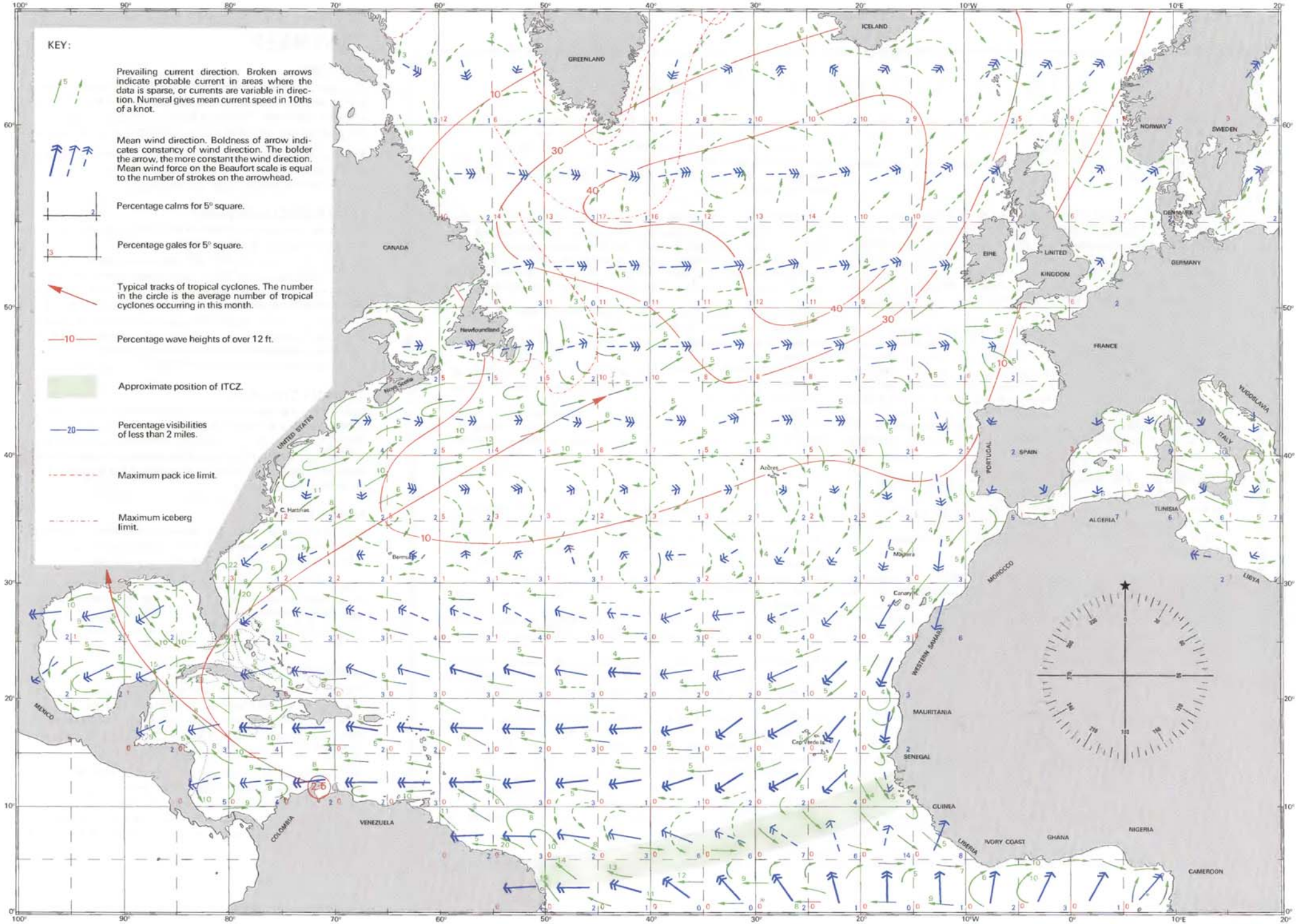
With the advent of winter, temperatures continue to drop in October. The mean air temperatures for the North Atlantic range from 0°C in Baffin Bay to 28°C in the Caribbean.

Along the 60°N parallel, temperatures range from 1°C at the Canada coast, through 4°C in south Greenland to 10°C at the Norway coast. Along the 40°N parallel, mean air temperatures range from 15°C off the New Jersey coast to 20°C at 40°W, falling to 18°C at the Portugal coast. At 20°N, temperatures range from 28°C in the Caribbean to 22°C at the Africa coast.

VISIBILITY

Observations reporting visibility of less than 2 miles are less frequent and widespread in October than in any other month. Areas reporting 10% frequencies, the highest observed, are located over the Bay of Fundy, waters along the east coast of Newfoundland and Baffin Island, some British coastal areas, and north of a line from Kap Farvel to Bear Island.

Much of the area to the NW of a line from 300 miles off Newfoundland through the Faroe Islands is subject to a 5% incidence of poor visibility, as are most of the British Isles, parts of the Baltic, and the vicinity of the Cap Verde Islands.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC OCTOBER

NORTH ATLANTIC WEATHER

Rainfall is rather high, being an average of about 130 cm annually. There is more rain in the west, and the rain tends to fall mostly on the windward side of each island.

The islands experience mean air temperatures of 16°C in January and 23°C in August.

THE CANARY ISLANDS & MADEIRA

WINDS In Madeira, N and NE winds predominate over the year, being rather variable in the winter, but more constant in the summer months. Winds are rather light in the summer and gales are infrequent. Winds of force 8 and over do not affect the area more than 2 or 3% of the time in the winter months. Winds are modified in the coastal areas, and usually blow from the S or SW in Funchal in the day time.

The NE trades are more established in the Canary Islands, where winds from the N or NE account for over 90% of winds in the summer, and blow about half the time in winter. The wind is strongest in August, averaging force 4, and weakest in the autumn. Gales are rare. Local modification of the prevailing wind is common, both due to the sea breeze effect, and because of topography; the wind often blows contrary to the prevailing wind in the lee of the islands.

Rarely, tropical storms affect the area when tracking near the Azores. More usually, weak depressions pass over or to the north of Madeira.

CURRENTS The Canary Current flows SSW through the Madeira Islands at mean rates of ¼ to ½ knot, and is rather variable. In the Canary Islands, and to the south, the current is stronger and more constant, setting SW at a mean rate of ½ knot, to pass through and to the north of the Cap Verde islands, to become the North Equatorial Current.

VISIBILITY, RAINFALL & TEMPERATURE Fog is rare in Madeira, but a dust haze is frequently present with E winds; this also affects the Canary Islands. Fog is more common in the Canaries, when it tends occur in early mornings in late winter and early spring.

Rainfall is moderate, average annual falls being from 40 to 60 cm, but the fall is very variable and unreliable.

Mean air temperatures are 18°C in January rising to 23°C in August.

NORTH WEST COAST OF AFRICA (20°N TO 35°N)

WINDS North of 30°N, N and NE winds are predominant offshore. They are rather variable in the winter, but more consistent in the summer months. Winds are light in the summer and gales are infrequent. Winds of force 8 and over do not affect the area more than 2 or 3% of the time in the winter months.

Between 20°N and 30°N the NE trades are established off the coast, and winds here blow from the N or NE most of the time in the summer, and about half the time in winter. The wind is strongest in August, averaging force 4, and weakest in the autumn. Gales are rare.

On the coast, sea breezes dominate for most of the day in the summer, blowing from the NW. Light land breezes blow at night. Hot winds from the S and E blow occasionally in the spring and autumn, and can reach the Canary Islands.

CURRENTS The current in this area trends SW along the coast. It is more constant in the spring and summer, when the mean rate is about ½ knot. At other times of the year mean rates vary from ¼ knot in the north, where the current is rather variable, to ½ knot further south, where constancy increases. A rather variable inshore counter-current is found in the gulf to the north of Tarfaya in autumn.

VISIBILITY, RAINFALL & TEMPERATURE Fog does sometimes affect the area of the Canary Current in the summer and autumn, and occasionally spreads to the coast in the night and early morning.

Annual rainfall is moderate along the Morocco coast, being 40 cm in Casablanca. Most of the rain falls in the winter months; June to September are very dry.

Mean air temperatures along the coast range from 15°C in the north to 19°C in the south in January. In the summer months the mean air temperature is 22°C, the coastal areas being kept relatively cool by the sea breeze.

CAP VERDE ISLANDS

WINDS The Cap Verde Islands lie in the NE Trade Wind belt, but the ITCZ sometimes affects the area when it moves north in the summer months, bringing turbulent weather, and sometimes strong winds from a S'ly quarter. The NE Trades blow steadiest and strongest from January to May, after which the winds become more variable. Harmattan winds sometimes affect the islands from January to March when the NE Trades blow strongly over the land and bring with them a thick dust haze.

Sudden violent squalls can blow in Ilha de Sao Nicolau, where they descend from the high ground. Gales are rare among the islands.

CURRENTS The islands lie in the path of the Canary Current/North Equatorial Current, which flows fairly steadily through the islands in a SW'ly or WSW'ly direction. Mean rate is about ½ knot.

VISIBILITY, RAINFALL & TEMPERATURE Fog is rare here, but visibility can be severely impaired by the dust haze which comes with a Harmattan, from December to March. Not only is visibility cut down, but the haze makes the estimation of distances very difficult, even though the visibility might seem to be adequate.

The islands are very dry; most of the rain falls in the late summer, but annual falls average only 20 cm and are very unreliable.

Mean temperatures in the islands range from 22°C in January to 26°C in August.

NORTH ATLANTIC NOVEMBER

PRESSURE

The Icelandic Low is still centred between Iceland and southern Greenland with a mean central pressure of 1002 millibars, which is higher than that in October or December. The Azores High has shifted slightly northeast and is centred near 38°N 30°W, with a central pressure of 1021 millibars.

Mean barometric pressures for the month along Latitude 15°N are: 1014.5 mb at 30°W, 1012.5 mb at 59°W, 1012.0 mb at 70°W. Pressure increases with latitude at a gradient of 0.35 mb/° of latitude.

EXTRATROPICAL CYCLONES

Major areas of cyclogenesis include an area that extends along the coast from the southeastern US to Nova Scotia, an area approximately 12 degrees across centred near 50°N 40°W and an area extending from southeast Greenland to near 50°W. Leading from the Great Lakes, the majority of extratropical cyclones cross the Gulf of St Lawrence and head for southwest Greenland. Other primary tracks lead from near 38°N 60°W across Iceland into the Norwegian Sea, and across Hudson Bay. Secondary tracks lead from Lake Winnipeg across Ontario; across the British Isles and southern Scandinavia into eastern Europe; and across the northwestern Mediterranean from northern Spain to Yugoslavia.

TROPICAL CYCLONES

Tropical cyclone activity has decreased substantially since the warmer months. There is a likelihood of 0.7 tropical storms this month, with 0.3 of these reaching hurricane strength. Most of these storms develop over mid-Caribbean with preferred tracks either crossing the Yucatan peninsula bound for the eastern Gulf States, or crossing Cuba and heading NE over the Bahamas into open water.

TEMPERATURE

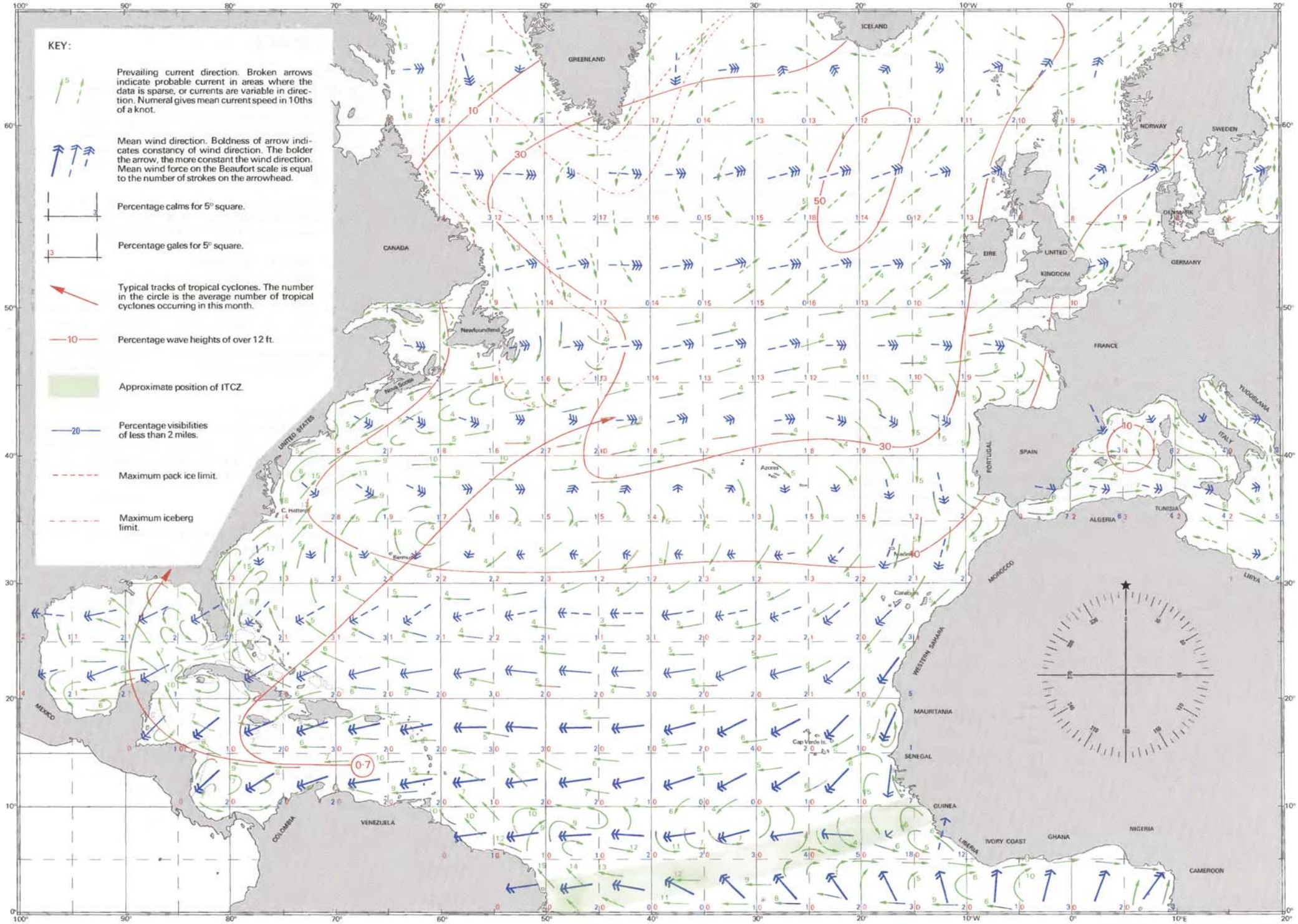
A marked difference in mean air temperatures is noted from the previous month as temperatures continue to drop. November means range from −4°C in Baffin Bay to 28°C in a small region of the Caribbean.

Along the 60°N parallel, mean air temperature ranges from −2°C at the Canada coast, through 2°C in south Greenland to 7°C at the Norway coast. Along the 40°N parallel, temperatures range from 11°C at the US coast to 15°C at the Portugal coast. At 20°N, mean air temperatures range from 26°C in the Caribbean to 22°C at the Africa coast.

VISIBILITY

Areas of visibility of less than 2 miles have slightly increased since October. Areas reporting frequencies of 10% or more include: the Bay of Fundy, the Gulf of St Lawrence, coastal areas of Newfoundland and Baffin Island, southern coastal regions of Greenland, portions of the Irish Sea and the southern part of the North Sea.

The 5% incidence line passes from Long Island to 350 miles SE of Newfoundland, thence to just off the southern coast of Iceland and then eastward, but trending north before reaching the Norway coast. A 5% incidence also covers the British Isles, some of the Baltic, and an area off West Africa 200 miles either side of the line between 36°N 23°W, and 5°N 31°W.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC NOVEMBER

NORTH ATLANTIC WEATHER

WEST COAST OF AFRICA (0° TO 20°N)

WINDS The winds along this coast are governed by the position of the ITCZ, which crosses the coast in about 5°N 10°W in January, and lies over the land north of the Ivory Coast. The ITCZ moves north in the summer, crossing the coast between 14°N and 18°N in July and August. North of the ITCZ, the NE trades blow, averaging about force 4. South of the ITCZ the winds blow from the SW to the east of 5°W. Further west this wind backs to S, and west of 20°W it blows from the SE.

The SW monsoon affects the coast for varying periods of the year. It is generally light, averaging force 2 or 3, and brings much rain. In the N of the area (N of 15°N) the dusty harmattan wind blows from the NE from November to February, and S and SW winds usually affect the region for a period between June and September. Between 10°N and 15°N, the NE winds blow from October to April and are replaced by S'lies from June to August. Further south the dry season progressively shortens; it only briefly appears in January along the Ivory Coast, where the SW winds blow for most of the year.

The movement of the ITCZ is erratic and rather unpredictable; it is an area of calms, and often thundery squalls. "West African Storms", sometimes called tornadoes, are squall lines moving W at about 25 knots, affecting the area at the beginning and end of the wet season with the passage of the ITCZ. The squalls are accompanied by massive cloud banks, heavy rain, and winds gusting up to 50 knots.

South of 10°N, the wind along the coast is erratic and much affected by land and sea breezes and the passage of the frequent thundery squalls. Strong E'ly gusts occur with the passage of squall lines, which pass in the south from April to June and September and October. Heavy squalls from the SW, backing S, are experienced in the Niger Delta in July and August. Gales are rare in the area.

CURRENTS The Equatorial Counter-current sets quite strongly E'ward in the summer months, when it is centred in about 7°N to the S of the Cap Verde Islands, and here runs at mean rates of $\frac{3}{4}$ knot. From June to August, this current divides on reaching the African coast, and a branch flows N and W along the coast north of about 5°N. This coastal current is rather variable, with rates of up to $\frac{1}{2}$ knot, and is replaced in the winter months by the normal SE current of about the same rate.

The Equatorial Counter-current enters the Gulf of Guinea, where it becomes the Guinea Current. It accelerates to 2 knots in the summer ($1\frac{1}{2}$ knots at other times) in about 7°W, and then flows E along the coast at rates of up to 1 knot.

VISIBILITY, RAINFALL & TEMPERATURE Fog is infrequent in this area, but restricted visibility due to the dust haze brought with the Harmattan, is relatively common between December and March. Visibility is also poor in the tropical rainstorms.

Rainfall is highest between 5°N and 12°N, in the months between June and October. Annual rainfall at Conakry is 440 cm, but this diminishes to the E, where annual falls are between 100 cm and 200 cm. In some parts of the S, the rainfall slackens in July and August to give a short drier season. Further north, the rainfall depends on the extent of the ITCZ, but is normally more moderate. Annual rainfall in Dakar is 60 cm, mostly falling from July to September.

Most of this area lies in the tropical weather belt, and temperatures are high all year round, having means of between 24°C and 28°C. Humidity is very high during the monsoon.

NORTH ATLANTIC DECEMBER

PRESSURE

The north-south pressure gradient increases markedly between 40°N and 60°N as the Icelandic Low deepens to 1000 millibars The mean pressure pattern of the Icelandic Low has two centres during December, one between Iceland and Greenland and the other off the northwest coast of Norway. The north-south extent of the Azores High is less than the previous month, with its central position moving east to approximately 35°N 22°W.

Mean barometric pressures for the month along Latitude 15°N are: 1015.0 mb from 30°W to 40°W, 1014.0 mb at 50°W, 1012.5 mb at 76°W. Pressure increases with latitude at a gradient of 0.4 mb/° of latitude.

EXTRATROPICAL CYCLONES

The principal areas for the formation of lows occur along the Gulf and E coasts of the US, east of Newfoundland, the waters surrounding Iceland, and the Ligurian Sea and northern Adriatic. The primary track leading from the Great Lakes crosses Nova Scotia into the Davis Strait, and another primary track runs east of Nova Scotia across northwest Iceland into the Norwegian Sea. Secondary storm tracks cross Hudson Bay, southern Sweden, the Mediterranean from Spain to Greece, and along the E coast of the US.

TROPICAL CYCLONES

Few tropical cyclones occur in the North Atlantic in December. Over the hundred years to 1975, only 7 tropical storms have been recorded, and 3 of these occurred in 1887. Of these 7 storms, 5 reached hurricane strength, which supports the adage that early or late cyclones are more likely to be violent ones.

TEMPERATURE

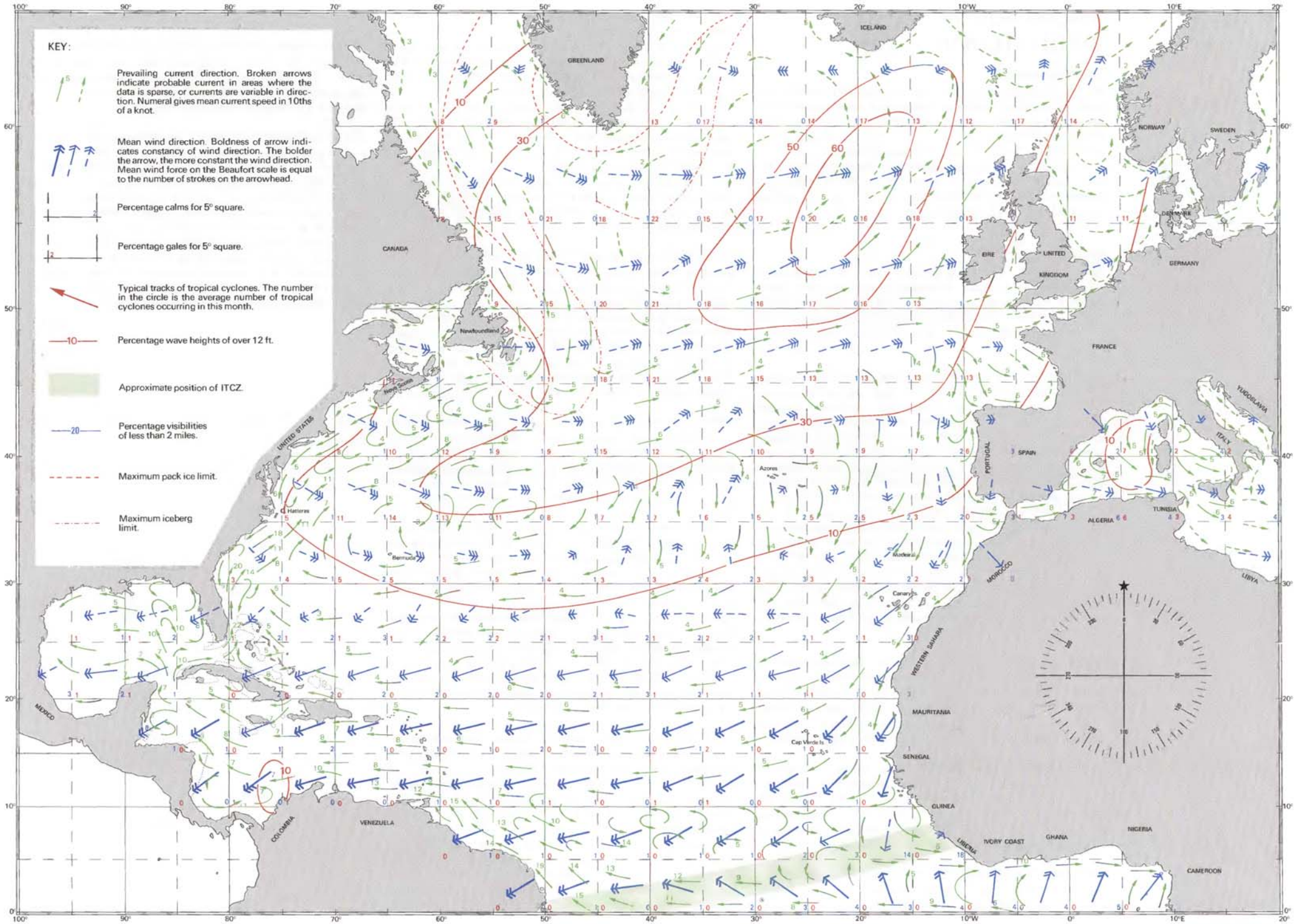
The mean air temperatures continue to fall; they range from under −4°C in Baffin Bay to 27°C in the Caribbean.

Along the 60°N parallel, mean air temperature ranges from −5°C at the Canada coast, through 0°C in south Greenland to 5°C at the Norway coast. Along the 40°N parallel, temperatures range from 5°C at the US coast, through 16°C at 40°W, to 14°C at the Portugal coast. At 20°N, mean air temperatures range from 26°C in the Caribbean to 20°C at the Africa coast.

VISIBILITY

Since November, the frequency of poor visibility has increased over the Labrador Sea with visibility in the rest of the North Atlantic not changing very much. Areas experiencing visibility of less than 2 miles in 10% or more of observations include the area from the Bay of Fundy to the west coast of Greenland including 250 miles off SE Newfoundland, and coastal areas of the North Sea, Baltic Sea and Irish Sea.

A 5% incidence of poor visibility is found N and W of a line passing from Long Island to 350 miles SE of Newfoundland to the Norwegian Sea. A 5% incidence also covers the British Isles, the Baltic, and an area 350 miles across, centred over the Cap Verde Islands.



PILOT CHART – NORTH ATLANTIC OCEAN

N. ATLANTIC DECEMBER

SAILING ROUTES NORTH ATLANTIC

SHIPPING LANES

The main shipping lanes are shown on the chart opposite. Commercial shipping adheres closely to these lanes, as the strictures of fuel economy usually dictate the most direct route. Yachtsmen should be especially vigilant in the region of the shipping lanes; it is a salutary exercise to work out the time it takes for a fast liner to come up at night in moderate visibility.

Three alter course positions are shown on the Grand Banks. The northernmost is used, but not exclusively, from mid-May to the end of November, or when the Cape Race route is clear of ice. The use of the other positions depends on ice conditions and other factors.

SAILING ROUTES

Cruising yachtsmen making ocean passages in the North Atlantic usually take advantage of the clockwise circulation of wind and current around the Azores High. Passages with a fair wind and a favourable current are agreeable and fast, and often take less time than a more direct route. The main trans-ocean sailing routes are shown on the chart opposite, and are outlined below.

TRADE WIND ROUTE TO THE CARIBBEAN This classic trade wind passage was pioneered by Columbus and has been used since the 15th century. Yachtsmen crossing to the West Indies usually depart from the Canary Islands, after sailing from Northern Europe or the Mediterranean. The passage should be timed to avoid hurricanes in the Caribbean, and in the open ocean, of which there is little risk after mid November. In fact, hurricanes in November tend to form in mid-Caribbean, but the trade winds are steadier later in the season, and are not fully developed before mid-November. It would be unwise to undertake this passage during the hurricane season.

The northern limit of the NE Trades in winter lies in about 25°N once they are established, and the strategy of this passage to get well into the Trades before turning west to the Caribbean. The latitude at which the trade winds begin to blow steadily varies from year to year, and opinion differs as to the best point to turn west. Yachtsmen generally sail SW from the Canaries to a point 150 miles NW of the Cap Verde Islands, where good winds are found, and then shape course for their destination. The trade winds are likely to be better established further N later in the season, and a more direct course is possible.

ROUTES BETWEEN THE CARIBBEAN AND USA These are rhumb line routes, and the difficulty is in timing the passages to avoid hurricanes on the one hand and winter gales further N on the other. November is a good month to sail southbound; April and May are the best months for heading north after a season in the Caribbean. Steep waves build up in strong N winds in the Gulf Stream, which should be crossed as quickly as possible.

ROUTES BETWEEN USA AND BERMUDA These passages are best undertaken in May or June, before the hurricane season gets into full swing, or in November, when the risk diminishes. Yachts en route to Europe will make their passages in May or June, and those heading to the Caribbean are likely to make the passage in November, unless the hurricane season is spent in Bermuda. Again, the Gulf Stream has to be crossed.

ROUTES FROM THE CARIBBEAN TO EUROPE Passages from the Caribbean to Europe are usually started in the spring or early summer after a season in the West Indies. This passage can be made via Bermuda, and most yachts stop in the Azores, which is a convenient jumping off point for the Mediterranean and Northern Europe. Between the Caribbean and Bermuda, some fickle winds and calms can be expected. The course is a rhumb line to Bermuda, and winds should be fair for most of the passage. Between Bermuda and the Azores, it is worth making some northing to start with, to find some westerly winds and favourable current.

If a passage is made direct from the Caribbean to the Azores, a vessel should stay on the starboard tack until favourable winds are found. The current will carry the yacht north of the direct route, and hopefully into some favourable winds north of 35°N. There will be ample calms on this route, so plenty of fuel should be taken.

From the Azores, a direct route is taken to the Strait of Gibraltar. If heading to the Channel it is wise to head north to 45°N before turning for home to avoid the N'ly winds and south going current off Portugal, and to reach favourable winds and current.

ROUTES FROM USA TO EUROPE There are 3 main routes from USA to Europe: 1. Via the Azores, 2. South of the Grand Banks, and 3. Direct. The route via the Azores is the obvious choice if going to the Mediterranean, and is a very pleasant way of reaching Northern Europe.

As the ice on the Grand Banks is less common in late summer and fog is then less of a problem, the direct route could well be used in August. Earlier in the year a route south of the Grand Banks may be preferred, to avoid fog and icebergs. The waypoint usually used on this passage is 40°N 50°W, but up to date ice information should be obtained and the course laid accordingly. Some shipping will be encountered on both these tracks.

ROUTES FROM NORTHERN EUROPE TO USA If the time does not permit a trade wind passage from east to west, a more direct route across the Atlantic might be considered. These routes are similar to those mentioned above, in the opposite direction, and a considerable amount of windward sailing will be involved. Adverse currents are to be expected, with fog and ice on the west of the ocean, so these passages should not be considered lightly.

The first option is to sail via the Azores (or leave them to the south), and cross in about 36°N, south of the body of the North Atlantic Current. This is the warmest and least perilous route, but not the fastest.

A more direct route is to steer a great circle course to 40°N 50°W, and then make for the destination. This route avoids the worst of the fog and ice, and is likely to be ice free early in the season.

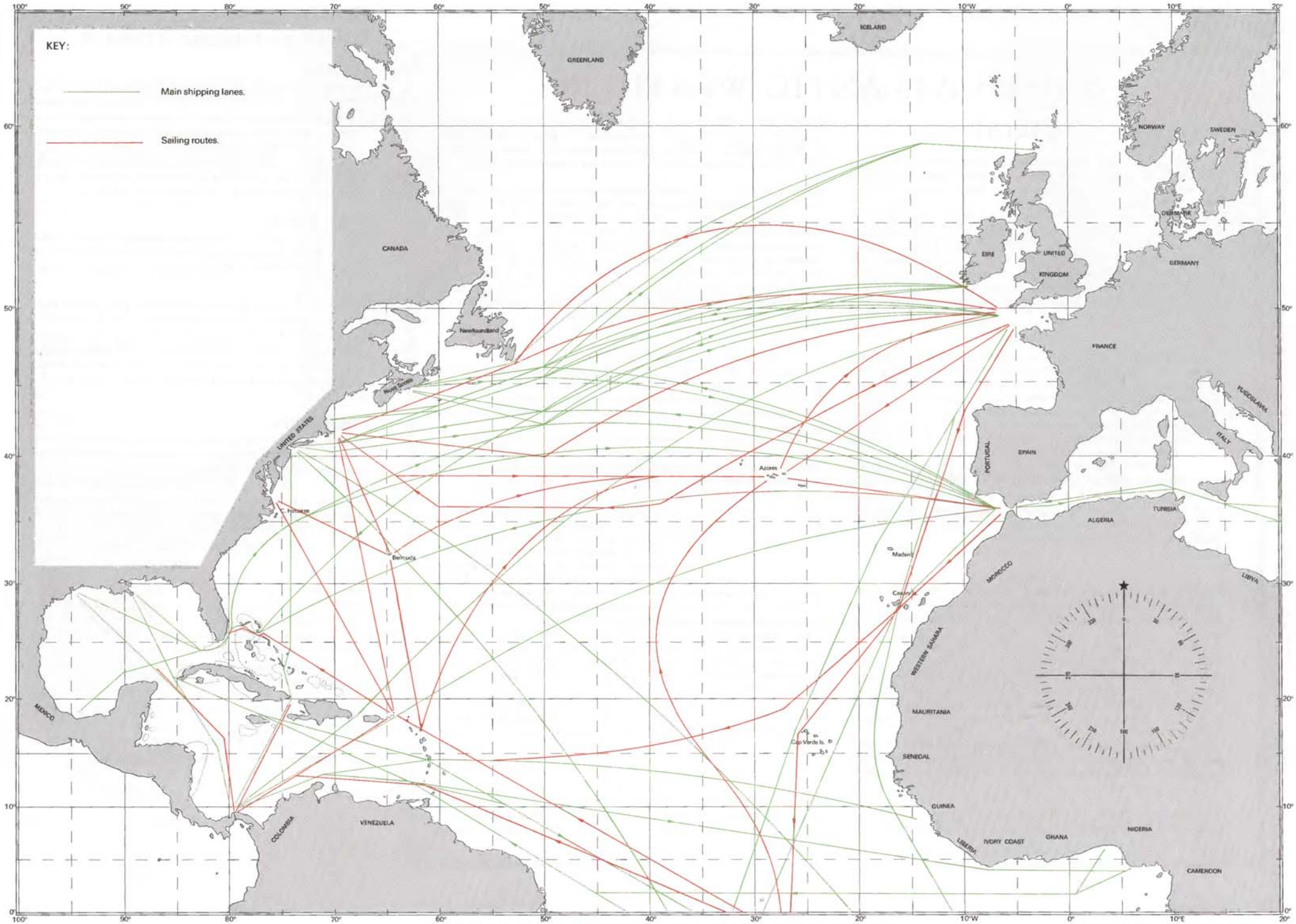
The Great Circle route is the shortest. Some favourable winds might be found if this route is taken early in the season, when depressions track E in lower latitudes, but ice and fog will be met near Newfoundland.

The Northern Route is sometimes taken in an effort to get to the north of the depressions, and thus to experience favourable winds. This is a rough route, but it can be fast. The route curves north of the Great Circle route to a latitude of 55°N in the centre of the ocean.

ROUTES IN THE CARIBBEAN Passages to Panama from the east are fairly direct, although it is wiser to give the Colombia coast a wide berth to avoid the problems of piracy and drug running. November, December, April and May are the best months for these passages, as they are outside the main hurricane season and the trade winds are not blowing at full strength. From January to March, the trade winds cause steep seas off Colombia, which can be dangerous.

Passages from Panama east are rather more problematic, as they are to windward, but are best undertaken at the change of the seasons as above, when the wind lightens. Passages north to the Gulf of Mexico are best made in November or May, between the worst of the hurricanes and "Northers" in the Gulf. Yachts making for the USA usually sail from Panama through the Windward Passage; again, this is best done in November or May. The passage to the Lesser Antilles from Panama is a long windward slog, which can be shortened by calling at the Netherlands Antilles, and then coast hopping along the Venezuela coast, taking advantage of the sea and land breezes. Either way, January to March should be avoided when making these passages, as the trades are then blowing strongly, and the likelihood of hurricanes should be taken into account.

ROUTES TO THE SOUTH ATLANTIC The dominating feature of planning a passage to the South Atlantic is deciding the best position to cross the doldrums, or ITCZ. The aim of passages to the E coast of Brazil, and those to South Africa by the southerly route, is to weather the NE corner of Brazil. As the SE Trades blow more from the S in the northern summer, it is necessary to cross the Equator further east then, than in winter. This requirement is balanced by the fact that the doldrums are more extensive, and rather more turbulent, closer to the Africa coast. There is much discussion on this subject, and it would appear that the best longitude to cross the Equator southbound is 29°W in December and January, and 23°W in August, and intermediate longitudes between those months. Bear in mind that easting can be made up in the SW Monsoon in the summer months.



SHIPPING LANES & SAILING ROUTES – NORTH ATLANTIC OCEAN

N. ATLANTIC ROUTES

SOUTH ATLANTIC WEATHER

General

Weather in the South Atlantic Ocean is dominated by the South Atlantic High, around which there is an anti-clockwise circulation. The doldrum belt does not move into the South Atlantic, and there are no tropical cyclones in this ocean.

In the northern part of the ocean, the SE Trade winds blow with great regularity. These are bordered to the south by a belt of variable winds in the area of the anticyclone, in the so-called Horse Latitudes.

To the south, winds are mainly from the west, but are fairly variable, as they are produced by a series of lows moving eastward from the area of Cape Horn, along the 50th parallel. Gales are frequent here, and visibility is commonly restricted, especially to the east.

PRESSURE

The South Atlantic High is centred in about 28°S 10°E in July, with a central pressure of 1024 millibars. In the austral summer the High moves south a few degrees, to about 32°S, and it has a central pressure of 1020 millibars. As the anticyclone is not as extensive as its North Atlantic counterpart on its east-west axis, there is a more marked circulation at its eastern and western edges. Thus winds from the SE blow off the coast of Africa, and from the NE off South America.

Further S, the pressure falls with increasing latitude; the isobars run more or less E-W but with slightly higher pressures in the W of the ocean. In February the 1000 mb isobar lies in 50°S, in August it passes through Cape Horn and lies in 52°S further east. The low mean pressure is caused by the series of depressions, moving from Cape Horn area eastward in the direction of the South Georgia Islands and thence along, or south of, 50°S.

WINDS

SOUTH EAST TRADE WINDS The SE Trade winds extend from the ITCZ southward to the South Atlantic High. Their extent varies with the seasons and they are to be found between about 0° and 30°S in February, and about 5°N to 25°S in August. The SE Trades blow with great consistency between force 3 and force 6, from SSE in the E side of the ocean to almost E on the W side. North of 10°S and east of 10°W, the strength of the wind diminishes somewhat and the average strength is force 2 or 3. The wind in this area is also diverted by the low pressure over Africa, and blows from the S to SW, especially in the southern winter during the SW monsoon of West Africa.

Winds from the NE blow off the S part of the coast of Brazil, as part of the circulation around the High. These winds are more prevalent from November to April – they are present to a lesser extent in the rest of the year.

VARIABLES Between the SE Trades to the north, and westerlies to the south, lies a band of variable winds in the region of the high pressure area. This extends from about 30°S to 37°S in the southern summer to about 25°S to 35°S in the winter. In these latitudes, west of the Greenwich meridian, winds are mainly from between S and ESE, while in the eastern part NE winds are predominant.

WESTERLIES W'ly winds predominate S of about 35°S, due to the almost continuous procession of lows passing from W to E in more southerly latitudes. The winds are variable in direction and strength consistent with weather in the area of depressions. The strongest winds blow from the NW, as the barometer falls, then back through W to SW with the passage of the depression. Gales are frequent in this area, especially south of a line between the Falkland Islands and the Cape of Good Hope. South of 50°S, the weather moderates a little, although small and vigorous gales occur from time to time, and heavy swells are frequently encountered.

CURRENTS

Generally, the currents in the South Atlantic flow in a large counter-clockwise circulation. North of 6°S, the South Equatorial Current flows westward, flanked to the south by the South Sub-tropical Current extending to 20°S, which is weaker and more variable than the Equatorial Current.

The South Equatorial Current is turned NW at the coast of Brazil, and mean rates of up to 2 knots are encountered on the equator at about 45°W. Most of the South Sub-tropical Current turns SW to become the Brazil Current flowing SW as far as 34°S to 37°S.

The Brazil Current turns S and E in about 36°S to join the east moving Southern Ocean Current, which flows continuously E'ward to the south of the continents. This current flows NE from Cape Horn to 38°N, and then E to pass mostly south of South Africa. The Falkland Current is a branch of the Southern Ocean Current, setting north to the west of the Falkland Islands and continuing north inshore of the Brazil Current, its extent varying with the season. The Sub Tropical Convergence Zone is the area of impingement of the Southern Ocean Current on the current systems to the north. It is a zone of sinking water and variable currents.

The Benguela Current flows NW along the W coast of South Africa, extending to the equator from February through April, but only as far as 23°S from August to October. Further offshore, this current fans out to the west, feeding into the South Sub-tropical Current in the north.

On the S coast of South Africa, the Agulhas Current flows W within at least 100 miles of the coast. South of this, and to the east of 20°E, the Agulhas Current recurves south and east to join the Southern Ocean Current.

VISIBILITY

Visibility in the N part of the ocean is usually good. Poor visibility is more common in the S especially in the summer, when fog is fairly common, and associated with N'ly winds. The S and E of the ocean

SOUTH ATLANTIC SUMMER (DECEMBER – FEBRUARY)

PRESSURE

The mean position of the South Atlantic High has moved slightly south since the spring, and is centred over 32°S 8°W. The mean central pressure has fallen and is now 1020 millibars. The pressure gradients are somewhat steeper to the south of the centre but are much the same off the southern coast of South America. The 1000 mb isobar passes through the north of Terra del Fuego, north of the Falklands, and thence along 50°S to the east. The ITCZ lies at the southern end of its movement at the end of the season, when its western end crosses the S America coast in 2°S or 3°S.

WINDS & GALES

The South East Trade Winds extend from the equator to about 30°S east of 10°W and to 35°S near the Africa coast. In the west of the ocean, north of 30°S, the trades back round to blow from the NE. These NE winds are most prominent in this season.

During the entire year there is a strong increase in gale frequency with distance southward over the South Atlantic Ocean. Data also indicates that gales occur more frequently in the areas south of Cape Horn and South Africa than they do over corresponding latitudes in mid ocean. Gales are less frequent in this season than at any other time in this ocean. North of 30°N, winds of force 8 or more rarely occur in more than 1% of observations.

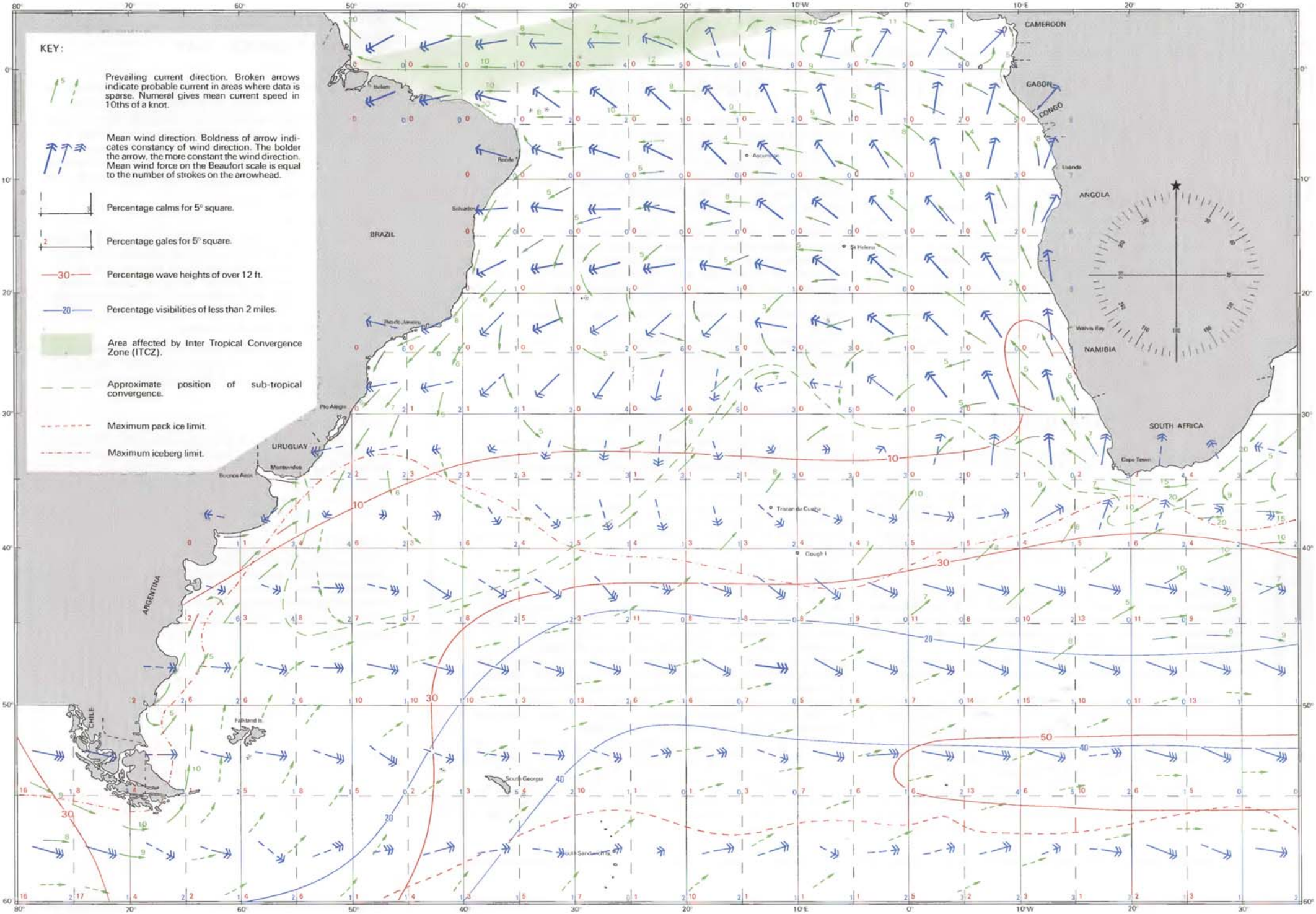
TEMPERATURE

Mean air temperatures in the south have increased considerably over the spring. North of 10°S, temperatures are generally higher than 26°C; this temperature extends south to 25°S on the Brazil coast. In 30°S, mean air temperature is 24°C at the S America coast and west of 20°W, and falls to 18°C at the Africa coast; this coast is cooled by the Benguela Current. In 45°S, the mean temperature is 16°C at the S America coast, and 11°C south of S Africa. Off Cape Horn, mean air temperature is 8°C; this isotherm extends to about 47°S south of Cape of Good Hope.

VISIBILITY

No fog, except along the coasts, occurs north of 20°S, and very little north of 30°S. In general there is thence an increase in the incidence of poor visibility with distance southward. A 10% incidence of visibility of less than 2 miles occurs south of a line close south of Cape Horn and the Falkland Islands, through 40°S 30°W, and 44°S south of the Cape of Good Hope. Poor visibility increases in frequency further south and east, to reach a 30% incidence south of 52°S and east of 40°W.

Visibility is somewhat poor in the Gulf of Guinea and along the Ivory coast, especially in January, when the incidence reaches 10% in places. Poor visibility is also experienced along the western coast of southern Africa, south of about 20°S.



PILOT CHART – SOUTH ATLANTIC OCEAN

S. ATLANTIC DECEMBER JANUARY FEBRUARY

SOUTH ATLANTIC WEATHER

are worst affected by poor visibility. Fog also affects the W coast of Africa, south of about 18°S, associated with the colder water of the Benguela Current.

ICE

The extreme limit of 1/10th cover of the south polar pack ice is shown on the charts. The average position of the pack ice lies to the south of this; the limit recedes in the summer months and advances north in the southern winter to reach its greatest extent in September.

Icebergs in the South Atlantic are usually calved from the ice shelves of the Antarctic, and not, as a rule, from glaciers, as they are in the North Atlantic. They are flat topped and may be of enormous proportions. Icebergs may be found as far north as 31°S near the coasts of Argentina and Brazil, having been carried north by the Falkland Current, but are generally confined south of 35°S. Some concentration of icebergs may be found in the Cape Horn/Falklands area, due to the bergs being deflected northward by Graham Land, projecting north from Antarctica.

Regional

EAST COAST OF SOUTH AMERICA (5°N TO 20°S)

WINDS In the north of this area the winds depend on the position of the ITCZ, which lies to the N of the area from July to October, and moves to its southernmost position in March, when it lies between 2°S and 3°S. North of the ITCZ, the NE Trades blow with an average of force 3, while to the south of the zone, the wind is from E or SE, averaging force 3 or 4 in the W, and force 4 or 5 E of 40°W. This wind is often modified to NE near the coast by a sea breeze.

Further S, between the ITCZ and 20°S, the SE trades blow all year round from between E and SE. South of 10°S, the winds tend to be from between NE and ESE from November to February. The winds tend to be lighter and more variable in the south of the area, averaging force 3 or force 4.

Gales are infrequent in the area, but squalls occur all along the coast, mainly between April and September in the area S of 5°S.

CURRENTS The Guiana Current flows WNW along the NE coast of S America in a band 200 – 300 miles wide. The current is fairly constant and average rates are 1 to 1¼ knots, reaching 2 knots where the current is strongest about 150 miles off the coast.

The South Equatorial Current sets westward towards the coast of Brazil, where it divides to set N or S along the coast. From November to January, the point of division is about 8°S on the coast (6°S further out to sea), N of which the current sets WNW to round Cabo Sao Roque. S of this point the current sets SW. From May to July, the point of division is 11°S on the coast (10°S further offshore).

The south setting part of the South Equatorial Current becomes the Brazil Current, which sets SW along the coast at rates of ½ to ¾ knot, fairly constantly. The current is rather more variable from May to July. Onshore sets of up to 1 knot are comparatively frequent along the Brazil coast south of Cabo Sao Roque, especially north of 10°S from May to July. The main body of the Brazil Current extends 100 to 200 miles off the coast.

VISIBILITY, RAINFALL & TEMPERATURE Fog is rare in this area, although mist and haze can affect visibility.

Between 5°N and 5°S, annual rainfall ranges from 300 cm near the mouth of the Amazon, to 150 cm further E. Most rain falls from January to May, and it is relatively dry from September to December when droughts can occur in the E. South of 5°S, annual falls are rather variable and average about 150 cm. May to September is the driest period in the south.

Temperatures in the north vary little from the mean, which is about 26°C. There is more daily variation in the south; mean temperatures range from 22°C in August to 25°C in December in 20°S.

EAST COAST OF SOUTH AMERICA (20°S TO 40°S)

WINDS This area covers the belt of variable winds between the SE Trades to the N and the westerly winds to the south. Winds from between N and E predominate, especially between September and March. The wind is rather variable at other times of the year, but W'ly winds are common in the south from April to September.

Squalls occur along the coast – "Abrolhos", from the ESE, between Cabo Frio and Cabo Sao Tome are frequent from May to August, and "Terre Altos", with heavy rain occur in the evenings near Rio de Janeiro. Rain squalls moving N or NE are most common in the north of the area from September to November.

Pampero is the name given to the squally wind from between S and W, which follows the passage of a cold front trough moving N or NE in the south of this area, and affecting the coastal areas as far N as 28°S. Pamperos are most common in Rio de la Plata, where about 20 a year occur. They are preceded by a falling glass with a wind shift from N to NE, becoming strong and gusty. A roll of cumulus and cumulo-nimbus cloud heralds the wind shift to SW, which arrives with an occasionally violent squall below the cloud. The ensuing wind from between S and W may last for several days. The initial squall from the SW may contain gusts of over 70 knots, and can cause considerable damage. Pamperos are more common in the winter, but can be more severe in the summer.

Strong SE winds, which may reach gale force, also affect the area of Rio de la Plata. These develop during periods of high pressure, and can last for a day or two, causing high seas in the river mouth.

Gales usually result from a pampero or SE'ly and occur mostly S of 30°S, where gale frequency is 5–10% in the southern winter, and about 5% in the summer. Further north, gales may develop in the NE airstream.

SOUTH ATLANTIC AUTUMN (MARCH – MAY)

PRESSURE

Mean central pressure of the South Atlantic High remains at 1020 mb, and the centre lies at 30°S 2°W. The 1000 mb isobar passes through Tierra del Fuego and 50°S to the south of S Africa. Pressure gradients are similar to those of the summer, except to the west, between the High and the South America coast. Here, the pressure gradient has decreased significantly, indicating a weakening of the NE'ly winds off that coast. The ITCZ moves north over the season, to lie north of the Equator on the South America coast in May.

WINDS & GALES

Winds show a similar circulation as in the summer, except for a weakening in constancy of the NE winds off Brazil. The SE Trades blow with great constancy north of the line between the Cape of Good Hope and the NE extremity of Brazil, becoming lighter and backing SW towards the Ivory Coast and Gulf of Guinea, and becoming more easterly in the western part of the ocean. Winds are more variable between the SE Trades and 40°S, south of which the wind blows from the west.

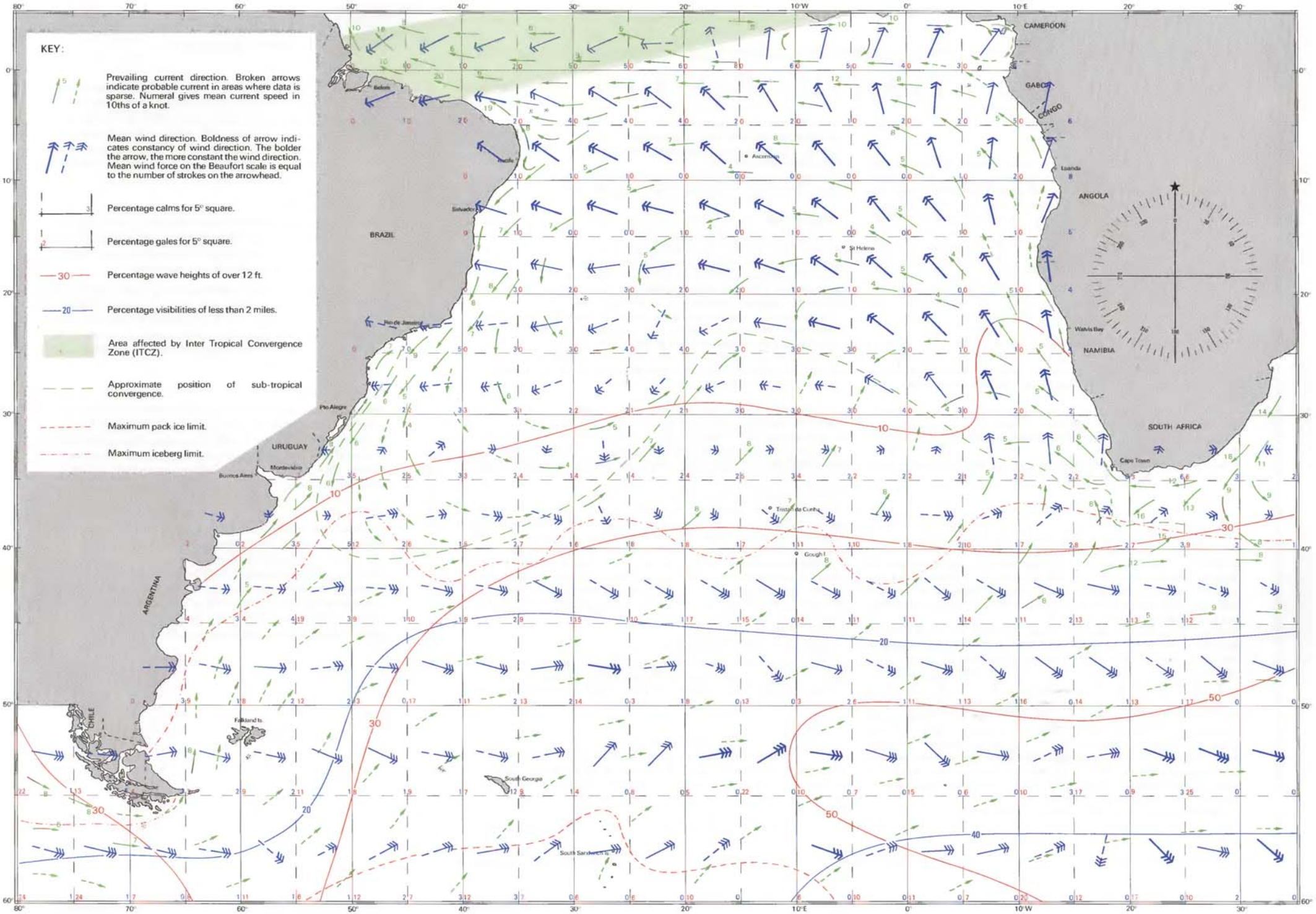
Cooler temperatures and increased cyclonic activity lead to increased incidence of gales in the southern regions of the S Atlantic. Most gales are observed off Cape Horn. North of 30°S, gales are rare; the majority occur south of 35°S.

TEMPERATURE

Mean air temperatures in the south have decreased by about 2°C since the summer. Temperatures range from 28°C in the Gulf of Guinea, to 6°C off Cape Horn and south of 50°S further east. In 30°S, mean air temperature is 22°C at the S America coast and west of 20°W, and falls to 16°C at the Africa coast. In 45°S, the mean temperature is 12°C at the S America coast, and 10°C south of S Africa.

VISIBILITY

Little fog occurs north of 35°S in this season, except in coastal areas. Restricted visibility is encountered along the western coast of southern Africa south of 20°S. Incidence of 10% poor visibility is found south of a line from Cape Horn through the Falklands to 40°S 40°W, and south of 40°S to the east of this. Thereafter visibility deteriorates with distance south and east.



PILOT CHART – SOUTH ATLANTIC OCEAN

S. ATLANTIC MARCH APRIL MAY

SOUTH ATLANTIC WEATHER

The sea breeze effect is well developed in the N of the area, especially in the summer.

CURRENTS The Brazil Current sets SW along the coast, at rates of ½ or ¾ knot, as far as 36°S from November to April. It is replaced inshore by a seasonal extension of the Falkland Current between May and October. Sets inshore are therefore NE along the coast as far N as 24°S in May to July and as far as 30°S from August to October. Mean rates of the inshore current are about ¾ knot, decreasing to the N. Both the inshore current and the Brazil Current become rather variable nearer to the point where they meet. The Falkland Current flows NE along the coast at rates of between ½ and ¾ knot, inside and to the south of the Brazil Current. The Falkland Current extends to about 60 miles off the lie of the coast in July and August, and to about 120 miles off in January and February.

VISIBILITY, RAINFALL & TEMPERATURE Fog reaches a 10% incidence along the coast from Montevideo to Porto Alegre in the winter, and more than 5% south of Rio de la Plata in the summer; most fog occurs in light E or NE winds. Radiation fog affects areas close inshore in the winter.

In the north, January is the wettest month, and July the driest. Annual falls range from 200 cm near Santos, decreasing to 60 cm in the south of the area, where the rain is more evenly distributed through the year.

In 40°S, mean air temperatures range from 9°C in August to 17°C in December. Sharp changes can occur with changes in wind direction.

EAST COAST OF SOUTH AMERICA (40°S TO CAPE HORN) & THE FALKLANDS

WINDS Winds in this area predominate from the west, and are generally from between N and SW, through W. The winds are dictated by the series of depressions moving E, across or to the S of the area. Some shelter from the stronger winds is given by the Andes, but this diminishes to the E of 65°W.

In the N of the area near the coast, winds from N and NW are most frequent, and most of the disturbed weather here is caused by cold front troughs moving N or NE associated with depressions further south, and by depressions moving SE from Rio de la Plata.

Winds are strong in this area; except in the N, winds of force 7 and over account for more than 10% of observations. The incidence rises further S, and is 30%–35% off Cape Horn in both winter and summer. In the winter, 30% incidence of force 7 gales is found around the Falklands; this declines to 15% in the summer. Between the Falklands and the Argentine coast, some shelter is found and gales account for 10%–15% of all winds in both seasons. Gales are usually from between N and SW, and are most frequent from W and SW in the summer in the Falklands.

Violent squalls affect the channels in the vicinity of Tierra del Fuego. Sometimes called williwaws, these squalls can reach savage intensity, and are associated with strong higher level winds which are disturbed on reaching the mountains. They are of short duration and can appear from any direction, but affect the area to the W of Cape Froward most of all.

In the summer the sea breeze gives onshore winds in the N, but further S only serves to slow the prevailing W wind.

CURRENTS The Southern Ocean Current flows E'ward south of Cape Horn, generally at rates of about ½ knot, but at rates of about 1 knot near the Horn. The current sets N and NE toward the Falklands, and the Falkland Current thereafter sets N off the Argentine coast. The N going current occupies the eastern half of the passage between the Falklands and Argentina; closer inshore the currents are rather variable and often set in a southerly direction.

Further north, the western edge of the Falkland Current is about 60 miles off the coast in the winter, and about 120 miles off in the summer, and the current sets N at rates of about ½ knot. Inside this, the currents are variable, and constitute local counter currents. To the east, the current fans out eastward to join the Brazil Current in the eastward circulation in the south of the ocean.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE Fog does not seriously affect the area. In the N, radiation fog can occur in the winter. Fog incidence in the winter is about 5% in the N decreasing to 2% in the S; with the incidences reversing in the summer. Visibility can be restricted by low clouds, sometimes with a base at sea level. Fog may be encountered at any time of the year in the Falklands, and occurs most in the winter.

The E coast of Argentina is quite dry, especially further N, where annual falls are 20 cm or less, and drought is quite common. Annual fall in the Falklands is 65 cm, much of which falls as snow in the winter. Snow may fall in any month in the south of the region.

Mean air temperatures at Cape Horn and in the Falklands range from 4°C in the winter to 8°C in the summer. Further N, the climate is more continental in nature, and greater extremes exist, both over the year (7°C to 16°C in 35°S), and during the course of the day (maximum summer temperatures exceed 40°C, and frost is common in the winter)

Antarctic icebergs may be found in the area round Cape Horn, and they are occasionally found in the Falkland Current, sometimes as far N as Rio de la Plata. The incidence of icebergs to the N of the line between Cape Horn and the Falklands is, however, rare. Pack ice extends from the S with a maximum extent in September.

THE SOUTHERN OCEAN (SOUTH OF 45°S & EAST OF 50°W)

WINDS Depressions move frequently E or SE in the region of the circumpolar trough, between 55°S and 70°S. Strong W'ly winds blow to the north of this, bringing frequent rain or snow with the passage of frontal troughs. Gales occur most frequently in the area between 10°W and 40°W, and 45°S and 50°S, in the summer, when

SOUTH ATLANTIC WINTER (JUNE – AUGUST)

PRESSURE

The South Atlantic High is at its peak in the winter, having a mean central pressure of over 1024 mb in July, and has increased in extent since the autumn. The High is centrally located at about 28°S 3°W. The 1000 mb isobar passes through Cape Horn to 52°S south of S Africa. Pressure gradients are similar to those of autumn. The ITCZ lies in its most northerly position during this season, for the most part lying in the region of 5°N along the South America coast.

WINDS & GALES

Winds show a similar circulation to that of the autumn, except in the north, where the northward movement of the ITCZ means that the winds continue to blow from the SE in the western part of the equatorial region. South of 35°S, winds blow with significantly increased strength.

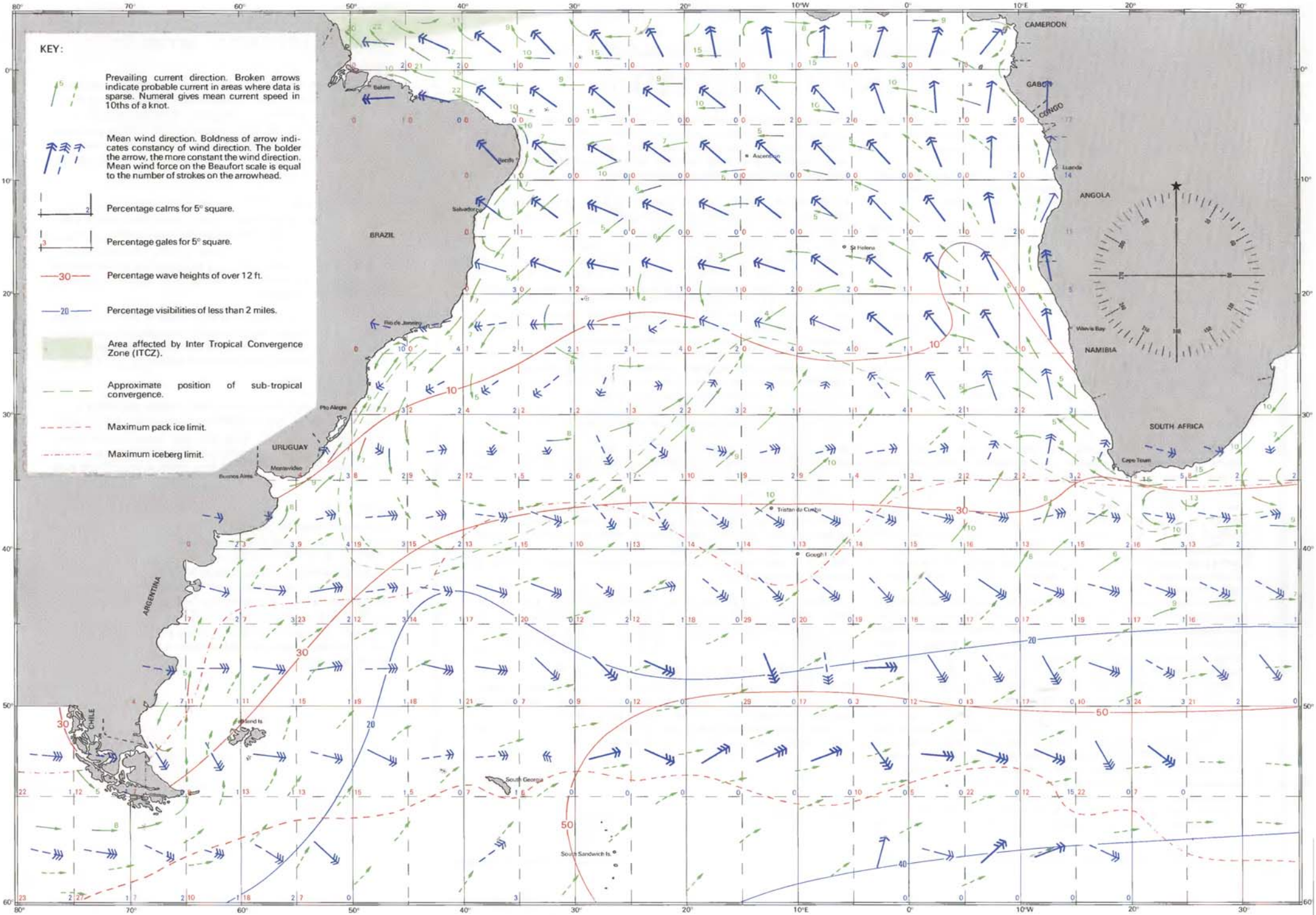
Gale frequencies have increased markedly from the autumn, and are higher than those of other seasons. While gales remain rare north of 25°S, they are much more in evidence south of 35°S, especially off southern Africa. Reported information on gales in the southern and eastern regions of the ocean is rather sparse for this season, and the reported frequencies tend to appear erratic as a result.

TEMPERATURE

Mean air temperatures in the south have decreased by about 3°C since the autumn. Temperatures range from 26°C in equatorial South America to 4°C off Cape Horn and south of 50°S further east. Mean temperatures of below 0°C are found south of 53°S and east of 40°W. In 30°S, mean air temperature is 18°C at the South America coast and west of 20°W, and falls to 14°C at the Africa coast. The 8°C isotherm runs along 45°S.

VISIBILITY

Fog is rare north of 30°S except along the coasts, during the winter. Local radiation fog is found in Rio de Janeiro, and fogs are quite common in Montevideo. Thick fogs are also found on the Africa coast, particularly in Walvis Bay and near the mouth of the Orange River, and poor visibility can be encountered along this coast as far north as 5°S. Incidence of 10% of visibility of less than 2 miles is found off Cape Horn and 200 miles off the S America coast, north to 35°S, extending to about 42°S to the south of S Africa. Visibility deteriorates with distance south and east.


KEY:
Prevailing current direction. Broken arrows indicate probable current in areas where data is sparse. Numeral gives mean current speed in 10ths of a knot.
Mean wind direction. Boldness of arrow indicates constancy of wind direction. The bolder the arrow, the more constant the wind direction. Mean wind force on the Beaufort scale is equal to the number of strokes on the arrowhead.
Percentage calms for 5° square.
Percentage gales for 5° square.
Percentage wave heights of over 12 ft.
Percentage visibilities of less than 2 miles.
Area affected by Inter Tropical Convergence Zone (ITCZ).
Approximate position of sub-tropical convergence.
Maximum pack ice limit.
Maximum iceberg limit.
CAMEROON
GABON
CONGO
ANGOLA
NAMIBIA
SOUTH AFRICA
BRAZIL
URUGUAY
ARGENTINA
CHILE
Belem
Recife
Salvador
Rio de Janeiro
Pto Alegre
Montevideo
Buenos Aires
Ascension
St Helena
Luanda
Walvis Bay
Cape Town
Tristan da Cunha
Gough I
South Georgia
South Sandwich Is
Falkland Is
PILOT CHART – SOUTH ATLANTIC OCEAN
S. ATLANTIC
JUNE
JULY
AUGUST

SOUTH ATLANTIC WEATHER

force 8 winds and over account for 20% of observations. This incidence decreases rapidly further S. In the winter, force 8 gales have a 10% incidence in 50°S, decreasing with distance southward.

CURRENTS The Southern Ocean Current trends generally eastward in the area, usually at mean rates ½ knot or less. Its constancy is moderate, and sets may be experienced in any direction.

VISIBILITY, PRECIPITATION, TEMPERATURE & ICE True sea fog is uncommon in this area, but visibility is often restricted by rain, drizzle, low clouds and spray, and is generally better in the summer months.

Precipitation is annually about 140 cm over the area, most of which falls as rain or drizzle north of 60°S.

Mean air temperatures are about 6°C to 8°C in 50°S in January, falling to 2°C in 60°S. In the winter, the 3°C isotherm lies in 50°S, and the mean temperature is about −5°C in 60°S.

In this part of the Southern Ocean, the pack ice extends north to reach its maximum extent in September/October. The limit of 5/10th ice is then about the latitude of 55°S. The northern limit of an average iceberg spacing of 45 miles lies in about 50°S over most of the area, extending N to about 46°S between 20°E and 30°E.

SOUTHERN AFRICA (SOUTH OF 30°S)

WINDS West of Cape Agulhas, winds from the S and SE predominate in the summer, and increase in strength with proximity to the coast, where they are fresh and sometimes reach gale force. In the winter, winds are variable, those from the SW half of the compass being most common. Troughs passing E produce gales from the NW, backing to SW as the trough passes; these are most common in winter. Gales increase in frequency with distance south, so that the frequency of winds of force 7 and over in the winter is about 5% in 30°S increasing to 30% at Cape Agulhas. Gales are less frequent in summer, having an incidence of 10% to 20%.

Between 20°E and 25°E, winds from between NW and SW predominate from May to September, and gales from these directions are frequent, especially in July, when winds of force 7 and over have an incidence of 30% to 40%. In the summer, from October to April, winds are variable, but blow mostly from the S half of the compass. Gale frequency is 10% to 20%; slightly less in March.

East of 25°E, winds are variable and winds in the opposite direction to those which predominate may be expected. In May to October winds from W and SW show a slight predominance; gales from these directions are frequent, reaching 20–30% in July, September and October. From November to January the wind tends to be either from the NE or SW (or W) in equal amounts, and NE'lies predominate in February and March. Gales in summer are less frequent and make up 10–20% of the winds. Gales and strong winds decrease in frequency with distance NE along the coast.

Winds close to the coast tend to be modified in direction by the local topography, and blow along the coasts. The coastal winds most commonly blow along the coast from a westerly direction in the winter, and from an easterly direction in the summer. The SE winds in the vicinity of Capetown in the summer can be very strong, sometimes reaching gale force, although they are associated with a high barometer and comparatively stable conditions.

CURRENTS, SEAS To the west of the Cape of Good Hope, an upwelling of cold water creates the Benguela Current which sets NW along the coast at a mean rate of ½ knot.

East of the Cape, the Agulhas Current sets in a westerly direction, trending SW along the coast in 30°E, and following the line of the coast to the west. East of 28°E, the current is strongest, and sets at mean rates of up to 2 knots, with sets of 4 or 5 knots being not uncommon between 31½°S and 33½°S. The current is strongest from February to April, and the line of maximum rate lies along the 180 m contour, gradually decreasing shoreward and seaward. Inshore counter currents, usually weak, are found along the coast.

West of 28°E, the Agulhas Current spreads and weakens. Some of the current continues along the coast over the Agulhas Bank, setting westward at mean rates of the order of 1 knot, although some higher rates are encountered. The inner edge of the current in this area has a tendency to set shoreward, and there is often an inshore counter current. A large part of the current follows the 180 m contour of the Agulhas Bank SW'ward, thence setting over the bank to the W, or recurving S and E'ward to join the E bound Southern Ocean Current in about 38°S. Currents are rather variable here, but most sets are of less than 2 knots.

Steep and dangerous seas can occur in the area of the 180 m contour, in the Agulhas Current, during gales from the SW, which oppose the current. These are a result of a combination of wind acting against current and the interaction of wave trains from different directions; the resulting seas have caused serious damage to large ships. It is advisable to remain outside, or well within, the 180 m contour in this area.

VISIBILITY, RAINFALL & TEMPERATURE On the W coast, fog is worst in April, along the coast, appearing on 10% to 30% of days between December and May, but is very much less common at sea. Fog is infrequent to the E of Cape Agulhas at all times of the year.

Mean annual rainfall ranges from 60 cm at Cape Town to 100 cm in the E of the region. In the W, winter is the rainy season, and E of 28°E the wet season comes in the summer. Between Cape Agulhas and East London there is no well defined rainy season.

Mean temperatures range from 14°C in the west to 18°C in the east in August, to 18°C to 22°C in December.

SOUTH ATLANTIC
SPRING (SEPTEMBER – NOVEMBER)

PRESSURE

The South Atlantic High has contracted somewhat since the winter season. Pressure gradients are similar and much steeper south of the High than to the north – a characteristic of all seasons. The High is centrally located over 29°S 4°E, with a mean central pressure of 1022.5 millibars in October. The 1000 mb isobar for October runs from Cape Horn to 52°S south of Cape of Good Hope. Pressures along the equator are of the order of 1012.5 millibars. The ITCZ moves south over the course of the season.

WINDS & GALES

The SE Trades blow south of about 2°N and approximately north of a line between Cabo Sao Roque (the NE'ly point of Brazil) and the Cape of Good Hope, except for the SW winds in the area of the Gulf of Guinea. To the south of this line, and north of 40°S, are variables in the east of the ocean, and winds from the E and NE in the west off Brazil, these latter becoming more prominent this season.

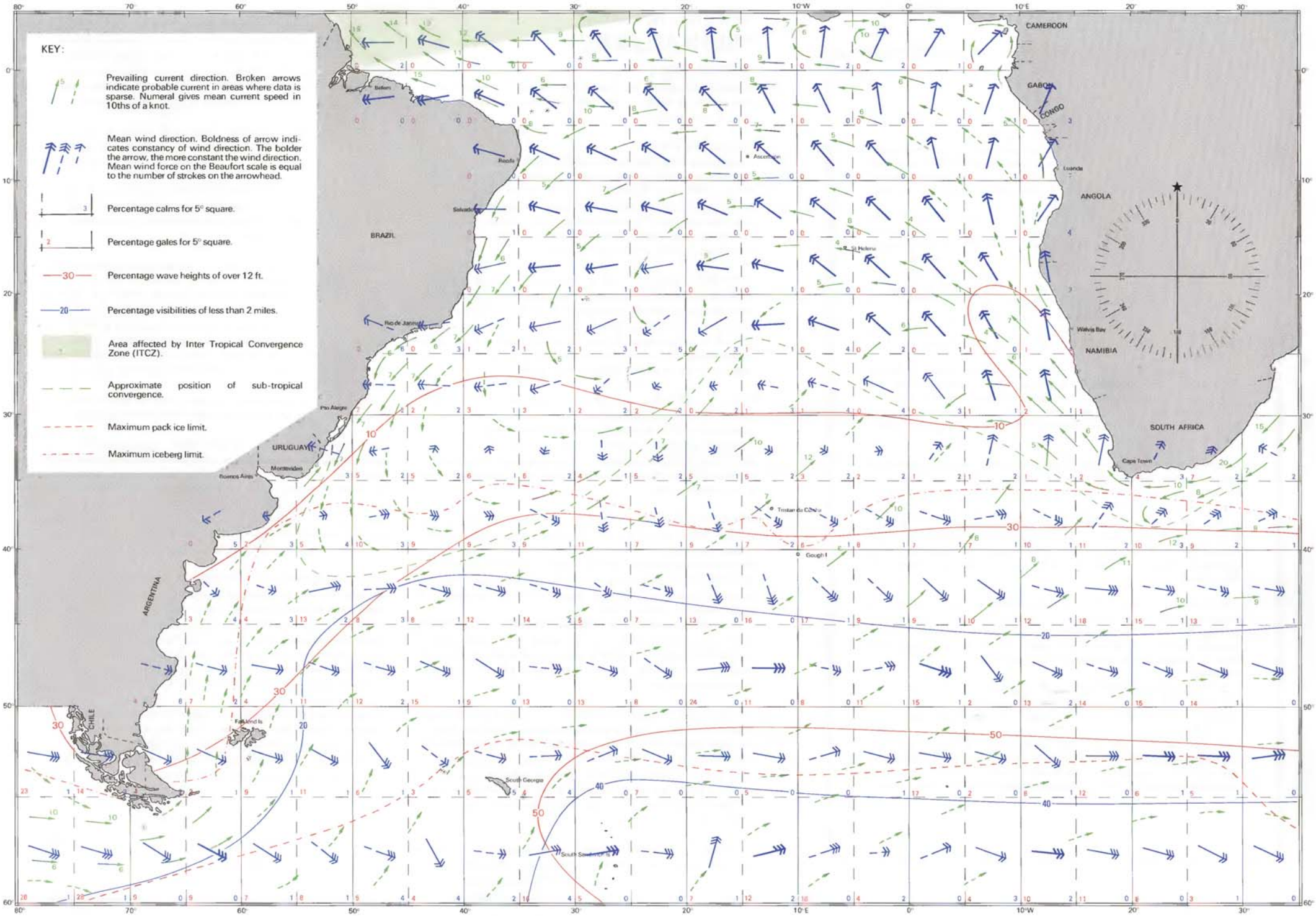
Gale frequencies have declined since winter. North of 30°S, winds of force 8 and over are infrequent, south of this they occur generally 10 to 20% of the time. The area west of Cape Horn experiences 28% incidence of winds of force 8 and over, and gales are still fairly common off S Africa..

TEMPERATURE

Mean air temperatures have increased over the whole ocean since the winter. Temperatures range from 26°C in equatorial South America to 4°C off Cape Horn and along 50°S further east. In 30°S, mean air temperature is 18°C at the S America coast and falls to 14°C at the Africa coast, cooled by the Benguela Current. In 45°S, the mean temperature is 8°C right across the ocean.

VISIBILITY

Fog is more frequent over the South Atlantic, north of 30°S, in spring than any other season, but even so its occurrence is rare at sea; coastal regions suffer more. At sea, a 5% incidence of visibility of less than 2 miles occurs in areas off the western coast of southern Africa as far north as 12°S, in the vicinity of Rio de Janeiro, and south of a line from 32°S on the South America coast to 38°S south of the Cape of Good Hope, with some improvement off the southern coasts of Argentina. Thereafter, visibility deteriorates to the south and east, there being a 10% incidence of poor visibility at Cape Horn and the Falkland Islands, and south of 40°S over most of the ocean.



PILOT CHART – SOUTH ATLANTIC OCEAN

S. ATLANTIC SEPTEMBER OCTOBER NOVEMBER

WEST COAST OF SOUTHERN AFRICA (EQUATOR TO 30°S)

WINDS The SE Trades blow in this area from the SE, and usually veer SSE or S to follow the line of the coast. In the N the wind veers SW to join the SW monsoon, and in the S the wind becomes progressively stronger with distance S'ward, but is variable in the winter.

South of 18°S, the S'ly wind is strong, and may reach gale force at times in the southern part of the region. In summer the sea breeze is particularly well developed along the coast. Winter brings rather variable winds in the south. Hot, dry "Berg" winds sometimes blow from the E or NE off the land, often bringing dust. Gusty and occasionally strong, they occur mainly in the winter, and may last for several days. Gale frequency (force 7) rises from 1% in 18°S to 10% in 30°S in the winter, and to 6% in 30°S in the summer.

Between the Congo estuary and 18°S, winds on the coast are from S to W. The sea breeze is felt but not as strongly as further S. Gales are rare.

North of the Congo estuary, winds are light and mostly from the S. Violent squalls, called "Tornadoes", are experienced in this region, usually accompanied by a large cloud bank approaching from the E'ly quadrant, and bringing heavy rain. In the squalls the wind can attain speeds of up to 50 knots, but they are not long lived. Gales are rare in this region.

CURRENTS Between 30°S and about 18°S, the Benguela Current sets NNW along the coast at mean rates of about ½ knot. Between 18°S and the Congo River, the currents are rather variable along the coast, and sets may be experienced in any direction, although a greater proportion of currents set N or NW between February and July. North of the Congo estuary, the currents are more constant, setting NW at mean rates of between ½ and 1 knot, and sometimes setting at 2 knots. Onshore sets are possible here from January to November.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is often restricted along the coast to the south of the Congo estuary by fog, mist and drizzle caused by condensation in moist air over the cold waters of the Benguela Current. This is most common from May to August north of about 23°S, and from December to April further south.

Annual rainfall is very high on the Equator (up to 280 cm), and falls off rapidly to the south, being 70 cm at the mouth of the Congo. Between 15°S and 30°S, most of the area is desert with insignificant annual falls.

In December, mean air temperatures are 26°C in equatorial regions falling to less than 18°C between 20°S and 30°S, which area is cooled by the Benguela Current. In August this cool area has a mean temperature of 14°C, rising northwards to 24°C on the equator.

SAILING ROUTES SOUTH ATLANTIC

SHIPPING LANES

The main shipping lanes are shown on the chart opposite. Commercial shipping adheres closely to these lanes, and yachtsmen should keep a good watch in their vicinity.

SAILING ROUTES

Sailing routes in the South Atlantic are dominated by the anti- clockwise circulation of wind and current, and the SE Trades blowing in the north and east of the ocean. The SE Trades are steadier and more reliable than the NE Trades of the N Atlantic, and a passage through them is a refreshing experience. There are no tropical cyclones to be concerned about in the South Atlantic. The main trans-ocean sailing routes are shown on the chart opposite, and are outlined below.

CAPE TOWN TO BRAZIL For Rio de Janeiro and ports south, the course leads NW towards St Helena initially to join the latitude of 20°S in about 10°W. Westing is made on this latitude as far as 30°W, where a direct course can be laid for Rio. If heading further south, stay on course for Rio to 35°W, to obtain more favourable winds and currents along the coast. If headed north of Rio, a direct course can be laid from 20°S 10°W. These routes pass north of the South Atlantic High to ensure fair winds.

BRAZIL TO CAPE TOWN From Rio, this route swings south to pass near Tristan da Cunha, avoiding the calms in the South Atlantic High. The route passes through 32°S 30°W, and reaches its southern apex at 37°S 0°; Cape Town is made from the SW. From other ports in Brazil, this route should be joined where appropriate. If continuing on to the Indian Ocean, run down 40°S from the Greenwich Meridian in the winter months, or 45°S in the summer months.

ROUTES BETWEEN CAPE HORN AND THE SOUTH AMERICAN COAST Heading south from the Rio de la Plata estuary, the route leads inshore to avoid the strength of the Falkland current, and to take advantage of the calmer seas in the lee of the land. If coming from further north it is advisable to cross inshore opposite La Plata, after taking advantage of the southerly currents further north, to avoid being blown westward by the strong westerlies south of 40°S.

The northbound route passes slightly further offshore, to take advantage of the Falkland current. North of La Plata, winter is best for an inshore northbound passage, as the inshore current carries further north, and the winds are more favourable. It is best to tack offshore to proceed up the Brazil coast in summer.

RIO DE JANEIRO TO SALVADOR OR RECIFE The winter months are the best for this passage, as NE'ly winds are not then so prominent. From November to February it is best to stand off 500 miles ESE before turning north, to get out of the worst of the NE'ly winds and the strongest part of the current. In October and March, it is not necessary to stand so far off, as the winds are E or E by S, north of about 18°S, which latitude on the coast can be made for. In other months of the year, a coastal passage can be made.

CAPE TOWN TO THE NORTH ATLANTIC These routes pass St Helena and Ascension. The Equator should be crossed in about 32°W if heading to the southern islands in the Lesser Antilles, or 31°W if bound for the northern islands or the USA. Routes to the Azores and Northern Europe cross the Equator in about 27°W (23°W in July for better winds). The Azores should be left to the east if continuing to Northern Europe.

If heading for the Mediterranean, it is convenient to stop at the Azores and then to sail east to the Strait of Gibraltar. This avoids the contrary winds and currents off the NW Africa coast. A stop in West Africa might be considered, in which case the Equator should be crossed further east, but the doldrums to be crossed will then be wider and more turbulent.

BRAZIL TO THE NORTH ATLANTIC From the NE coast of Brazil to Northern Europe, yachts should stand north to pass west of the Azores. If heading to the Caribbean or USA, following winds and currents are found on the direct course.

From Rio de Janeiro, stand SE to about 35°W, and then steer N to cross the Equator in about 29°W if bound for Europe or the USA. The Equator can be crossed further west if bound for the Caribbean. The comments above apply to stops in W Africa.

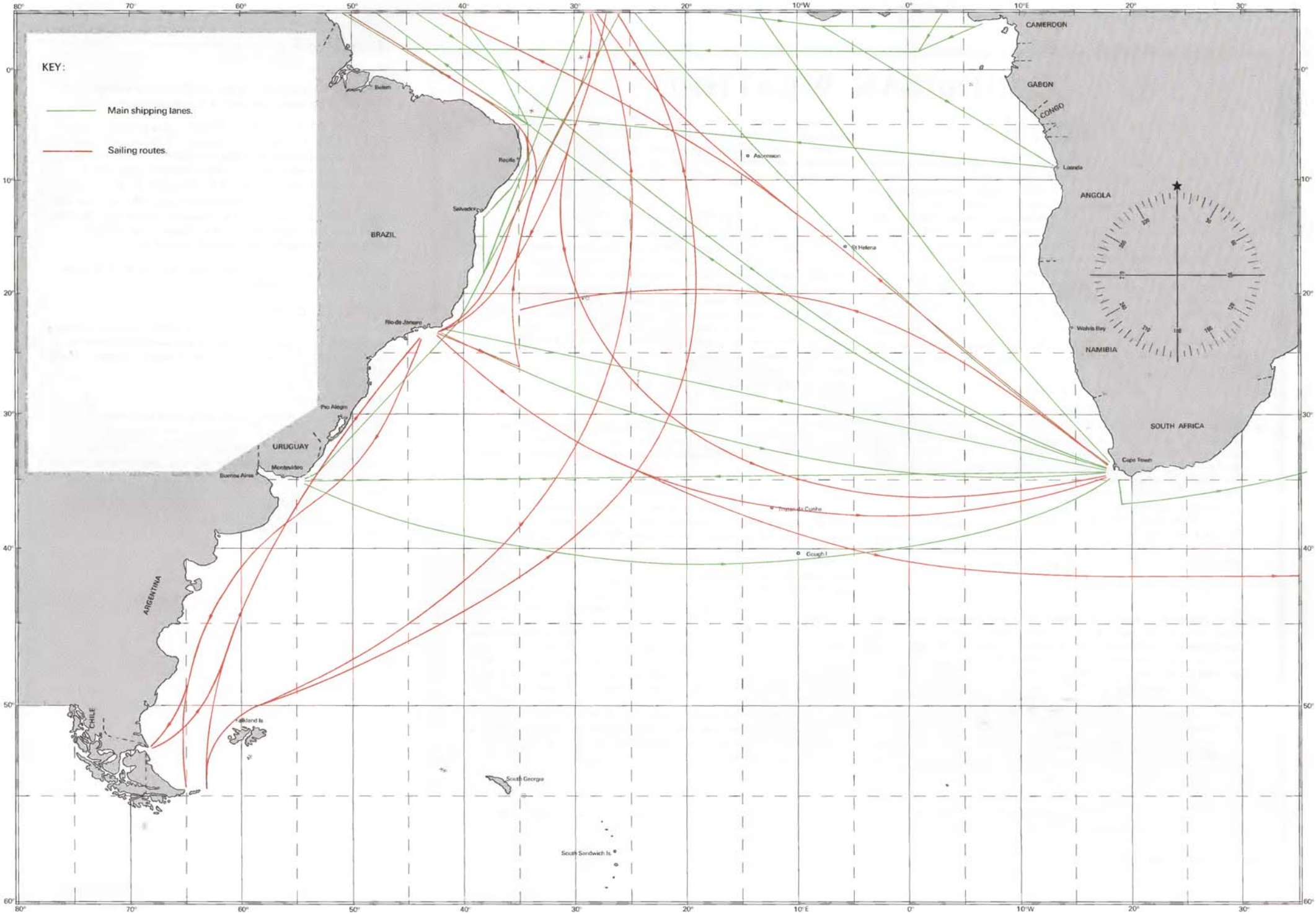
CAPE HORN TO THE NORTH ATLANTIC The direct route north from Cape Horn is not often undertaken. It is very long and icebergs can be encountered for a considerable part of the passage. If heading for Northern Europe or the Azores, the recommended route from April to August is to pass W of the Falklands, or close E of them, to a position W of 35°S 30°W. Thence to 10°S 25°W, keeping to the W as much as possible, to cross the Equator between 25°W and 28°W. From September to March, the route passes east of 35°S 30°W, through 25°S 20°W to cross the Equator between 22°W and 25°W.

Yachts bound for the Caribbean are able to cross the Equator further west, and can diverge from this route once well into the trade winds.

FROM THE NORTH ATLANTIC TO CAPE TOWN Cruising yachts heading south to Cape Town will normally have stopped at the Canary Islands, and should pass south close W of the Cap Verde Islands. Crossing the Equator in the appropriate longitude (see Routes in the N Atlantic), a yacht should stay close hauled on the port tack through the SE Trades. This should enable a yacht to lay Trindade Island, at least in the summer, as the Trades draw E in their southern extremity. From there the route trends SE to pass through 30°S 22°W, and about 36°S on the Greenwich Meridian.

FROM THE NORTH ATLANTIC TO BRAZIL From the Cap Verde Islands, the route to Brazil is much as above until the latitude of 10°S. Here sheets can be eased to proceed down the coast to destination in the summer months, but a yacht may well have to remain close hauled further south in the winter, when the winds along the Brazil coast as far south of 25°S have a certain amount of SE in them. From March to September, in the SE winds, it is wise to stand well off the coast until the destination can be reached with eased sheets bearing in mind the possibility of N going currents along the coast.

It can be seen that the best time to make a southbound passage along the Brazil coast is in the southern summer months from October to February, when the wind is in the NE. The winter months are best for sailing along the coast northward; the winds are then more favourable, and the extension of the Falkland Current can provide extra help.



SHIPPING LANES & SAILING ROUTES – SOUTH ATLANTIC OCEAN

S. ATLANTIC ROUTES

CARIBBEAN WEATHER

General

The Caribbean lies in the NE Trade wind belt, and experiences fairly stable and clement weather, except when disturbed by a tropical cyclone. Winds from the east prevail, generally blowing at their steadiest in the south from December to May, which is the pleasanter season in the Caribbean. In the summer and autumn months, temperature and humidity rises, and clouds, heavy rain and thunderstorms become more frequent. The winds then are less steady, being more frequently light and variable, and tropical cyclones are a possibility. Seas and swells in the Caribbean tend to be rather short.

The winds in the Gulf of Mexico are rather more variable, as only the southern part can be said to be in the NE Trade wind belt. The weather here is sub-tropical, and is affected by the continental weather system of North America. The area is subject to gales from the north in the winter, and to tropical cyclones in the season. The north part of the Gulf of Mexico is very much cooler than the Caribbean in the winter months.

PRESSURE

Barometric pressure in the Caribbean is between that of the Azores High to the north and the Equatorial Trough to the south. Isobars thus run E–W or ESE–WNW as pressures fall with distance from the Azores High in the Atlantic. In the summer and autumn months, the Azores High and the Equatorial Trough is positioned further north than in winter months, and the pressure gradient and mean barometric pressure falls as a result.

One of the signs of the approach of a tropical storm is a marked drop in barometric pressure, and it is prudent to keep an eye on the barometer in these waters. For this reason, details of the mean barometric pressures over the area are given for each month.

WINDS

The Caribbean is in the NE Trade wind belt all year round. The trade winds move north in the summer months, and the steadiest and strongest winds will be found in the centre of the belt. The trade wind belt has its northern limit in about 28°N from July to September; this moves south in the winter to lie in about 24°N from February to April. The northern edge of the Trade winds is not sharply defined, but the winds become more variable closer to it.

All the Caribbean islands thus receive the trade winds throughout the year, blowing from ENE with an average strength of force 4. The wind is at its steadiest in the summer in the northern part of the Lesser Antilles, and in the winter in the more southern islands and along the S America coast, as they are then in the middle of the trade wind belt.

The area to the north of 24°N in the Atlantic is out of the trade wind belt in the winter, and winds are then more variable in direction, and rather lighter. The area is also susceptible to strong northerly winds in the winter. In the summer the Trade winds extend north to include the Bahamas, where the wind veers to E or SE.

The winds in the Gulf of Mexico are lighter and more variable, tending to be from E or SE, but with a significant amount of strong winds from the north in the winter.

TROPICAL CYCLONES

The hurricane season in the Caribbean extends from the beginning of June to mid-November, although tropical cyclones do occasionally occur in May and December. The worst months are August, September and October. There is an average annual occurrence of 12 tropical storms (with winds of force 8 and over) in the North Atlantic and Caribbean, and about half of these reach hurricane strength.

The typical tracks and formation areas of these storms change during the year. It can be seen from the charts that the storms at the start and finish of the season tend to form in the W Caribbean, and move off northwards towards the mainland of the United States. In the middle of the season they can form over the open ocean, sometimes as far east as the Cap Verde Islands, recurving to pass close to Florida or continuing onto the mainland, but they often form locally near or amongst the Caribbean Islands.

It should be borne in mind that the tracks of tropical cyclones are rather unpredictable, and their paths often differ widely from the norm. It is often said that early or late storms tend to be very violent.

CURRENTS

The Antilles Current flows NW on the Atlantic side of the Lesser Antilles to join the Gulf Stream north of the Bahamas. Part of this current flows W along the Old Bahama Channel to join the Florida Current north of Cuba.

The North Equatorial Current flows NW through the Lesser Antilles, through the Caribbean Sea westward and thence north through the Yucatan Channel. Mean rates are of the order of 1 knot in the Caribbean increasing to 1½ knots on the west side of the Yucatan Channel.

In the Gulf of Mexico, part of the current setting north through the Yucatan Channel fans out to set between SW and NW; these currents occupy the western part of the Gulf of Mexico. East of this, the current forms a clockwise eddy ending up between Cuba and Florida to form the Florida Current. Along the W Florida coast is a counter-current flowing N. The currents in the Gulf of Mexico are rather variable, especially in the north, with rates of ½ to 1 knot.

The Florida Current sets east and north along the Florida coastline at mean rates of up to 4½ knots, and emerges into the Atlantic to form the Gulf Stream.

VISIBILITY

Visibility is generally good in the Caribbean, except when reduced by heavy rain, or heat haze during calm weather.

CARIBBEAN JANUARY

PRESSURE

Mean barometric pressures in January range from 1020 mb in the north of the Gulf of Mexico 1010 mb off the Colombia coast east of Panama.

The 1020 mb isobar passes through Galveston, goes eastward through 90°W in 27°N, and crosses Florida in about 30°N. The 1018 mb isobar encircles the eastern half of the Gulf of Campeche, crosses the Yucatan channel to the western end of Cuba, and then trends slightly S of E to pass just north of the Turks & Caicos Islands to 21°N 60°W. The 1016 mb isobar runs from N Belize, between Jamaica and Cuba, along the south coast of Haiti/Dominican Republic and eastward through the Virgin Islands. The 1014 mb isobar runs close to 15°N in the body of the Caribbean to pass eastward through the Lesser Antilles south of Martinique.

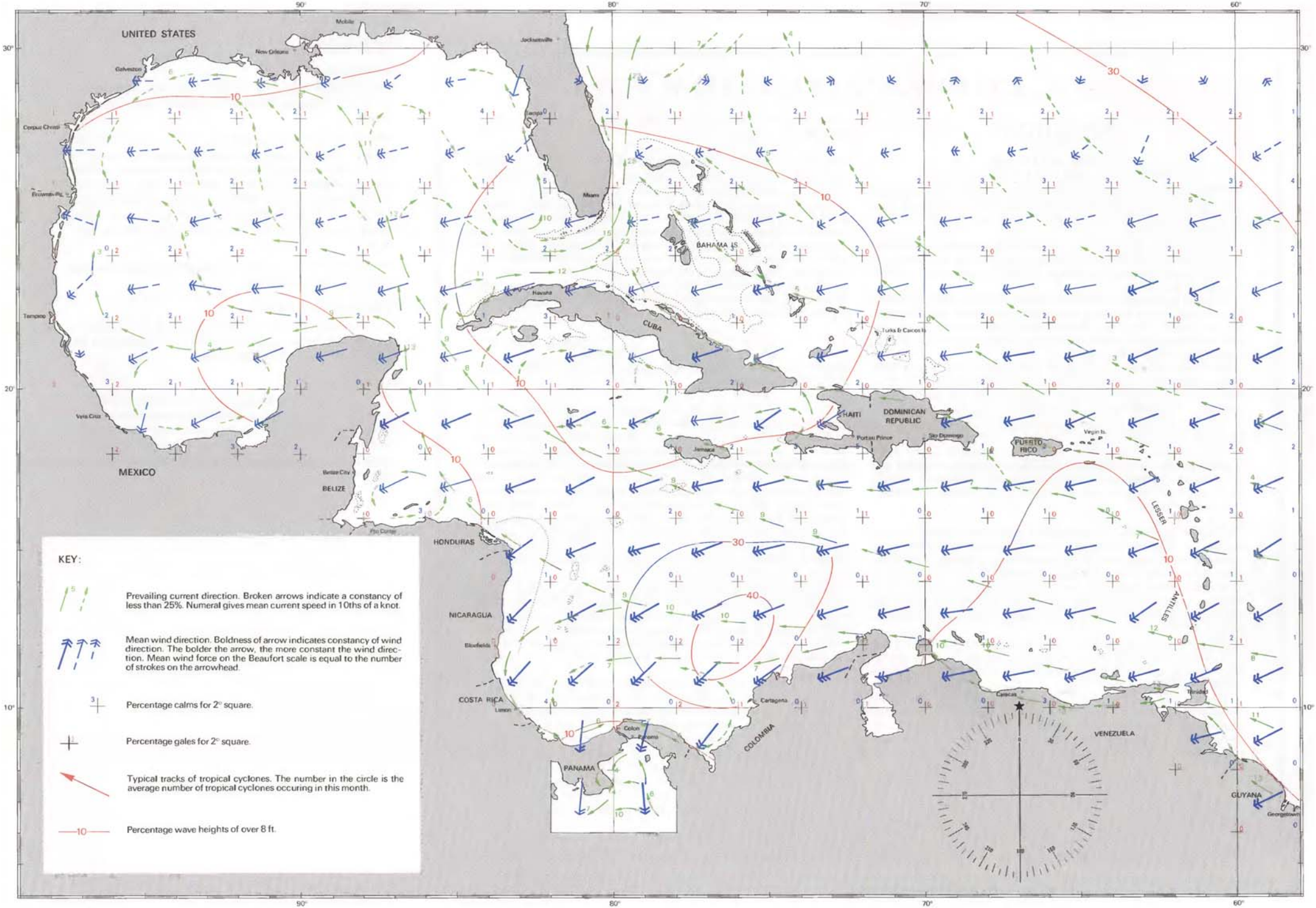
Mean pressures in the Lesser Antilles range from 1016 mb in the Virgin Islands to 1012 mb in Trinidad.

TROPICAL CYCLONES

Tropical cyclones are exceedingly rare in the North Atlantic and Caribbean in January. Only one has been recorded in this month since records were started. This was to the east of the Dominican Republic and between 10°N and 25°N.

TEMPERATURE

Mean air temperatures in the Gulf of Mexico range from 15°C in the north to 22°C along 25°N and in the south of the Gulf of Campeche. Temperatures in Florida range from 16°C in 30°N to 21°C in Miami. Temperatures are about 25°C along 20°N, rising southward to be 26°C in the southern half of the Lesser Antilles and the bulk of the Caribbean Basin.



KEY:

Prevailing current direction. Broken arrows indicate a constancy of less than 25%. Numeral gives mean current speed in 10ths of a knot.

Mean wind direction. Boldness of arrow indicates constancy of wind direction. The bolder the arrow, the more constant the wind direction. Mean wind force on the Beaufort scale is equal to the number of strokes on the arrowhead.

Percentage calms for 2° square.

Percentage gales for 2° square.

Typical tracks of tropical cyclones. The number in the circle is the average number of tropical cyclones occuring in this month.

—10— Percentage wave heights of over 8 ft.

PILOT CHART – CARIBBEAN SEA

CARIBBEAN JANUARY

CARIBBEAN WEATHER

Regional

LESSER ANTILLES (VIRGIN ISLANDS TO TRINIDAD)

WINDS This area is traversed by the NE Trade winds, which blow all year round from ENE, with an average strength of force 4. The wind tends to veer a little in the summer months to blow more from the E.

North of 15°N, the winds are steadiest and strongest in June and July, becoming more variable in direction and weaker in the autumn, when the predominant direction is E, but strengthening again in December and January.

Between 10°N and 15°N, the trade wind is more constant, blowing at an average force 4 when the wind is fully developed, between January and March. The wind blows steadily for the rest of the year, but from August to October, the winds are lighter and more variable, sometimes averaging force 3.

Gales are infrequent, but squalls occur rather more often, especially those associated with thunderstorms in the rainy season. "Northers" are sometimes felt in the north of the area (see Greater Antilles). "Tropical waves" can affect the area; these are troughs of low pressure that can develop into tropical cyclones, and bring northerly winds as they approach from the east.

Hurricanes occur here, more especially in August and September. Typical tracks can be seen on the charts. Hurricanes in the east Caribbean may form locally, but are more often spawned to the east, and curve north west through the islands, more commonly affecting the northern islands.

CURRENTS, SEAS The Equatorial Current sets WNW through the islands. Between 10°N and 14°N the current is derived from the stronger South Equatorial Current, and runs at mean rates (in the open sea) of 1 knot from February to April, 1¼ knot from May to July, and ¾ knot from August to January. Maximum rates are between 1½ and 2 knots except from May to July, when they can reach 3 knots. The current is fairly constant here, setting between W and NNW.

North of 14°N the current sets at mean rates of between ½ and ¾ knot, with maxima of about 1 knot. The constancy of the current is not as high as it is further south, but most currents set between SW and NNW.

The strength of the current can be augmented in the channels between the islands, and tidal flows also have an effect. Tidal streams generally flow west into the Caribbean for 6 hours on the rising tide, and east into the Atlantic for 6 hours on the falling tide. Maximum tidal stream rates are usually 1 to 1½ knots. The resultant net flow between the islands is thus likely to be a west going set for 6 hours at an augmented rate, and then an east going set, or a west going set at a reduced rate, for 6 hours.

Among the islands in the north, a swell from the N or E is a common feature. These swell waves (called rollers) increase in height on reaching shallow water, and refract around the islands to arrive from the N or NW.

VISIBILITY, RAINFALL & TEMPERATURE Fog is virtually unknown in this area over the open sea. Haze can affect visibility on calm days, especially in late summer.

The drier season in the islands is from February to April (January to May in Trinidad), with the wettest period in July to October. Rainfall is variable; the higher islands receive more rain by forcing precipitation from the moist air stream. The windward sides of the islands are relatively dry; most of the rain falls downwind of the mountains. Typical rainfall on the leeward side is about 150 cm.

The area has a mean air temperature of 28°C in August and 26°C in January. The warmth is usually mitigated by the breeze, but it can become oppressive and humid in late summer.

GREATER ANTILLES

This area comprises the islands of Cuba, Jamaica, Haiti/Dominican Republic and Puerto Rico.

WINDS The NE Trade winds dominate the area, blowing steadily from between NE and E in the winter but veering more to the E or ESE in the summer. The winds become lighter in the north of the area in the winter, being in the northern extremity of the trade winds. Winds average force 4 in summer and force 3 or 4 in winter.

The area is affected by "northers", cold NW'ly or N'ly winds which develop ahead of continental anticyclones. These winds sometimes blow at gale force and are preceded by a heavy cloud bank to the NW. Gale force gusts often blow on the passage of the squall line, and the N'ly winds may blow for a few days at a time, usually affecting the north of the area, but sometimes extending further S. Northers occur between November and March, and are most frequent in December and January.

Locally, the winds are affected by the larger land masses, which also create a land and sea breeze effect, especially where the trade wind is weak. Gales are not common south of 25°N. Arch squalls are common in the area, often crossing coastal waters in the evenings.

Hurricanes affect this area, and frequently cross the coast of Florida, or recurve in the area of the Florida Strait.

CURRENTS The Antilles Current flows NW along the northern side of the Leeward Islands and through the Bahamas. The currents in the channels generally follow this trend, but great care should be taken as the currents are sometimes reversed by the wind, or tidal effects. North of Cuba, the current sets WNW along the coast in the east, as far as the Florida Strait, it is there joined by the E going current from the Gulf of Mexico, which turns north along the Florida coast to form the Gulf Stream. Mean rates are about ½ knot to the N of Puerto Rico, increasing to about ¾ knot between Cuba and the Bahamas. North of the western end of Cuba, the current sets E at a mean rate of about 1½ knots.

CARIBBEAN FEBRUARY

PRESSURE

Mean barometric pressure for the month ranges from 1019 mb in the north of the Gulf of Mexico to 1010 mb off the Colombia coast to the east of Panama.

Mean pressure of 1019 mb is found in the north part of the Gulf of Mexico to the east of the Mississippi delta and off both coasts of southern Florida. The 1018 mb isobar runs SE from Galveston, between Florida and Cuba, through the Bahamas to 21°N 60°W. The 1016 mb isobar encircles the Gulf of Campeche and runs along 20°N to Haiti/Dominican Republic thence passing to the S of Puerto Rico and through the Virgin Islands. Along 15°N mean pressure is 1014 mb at 81°W, 1013 mb at 75°W, and 1015 mb at 60°W.

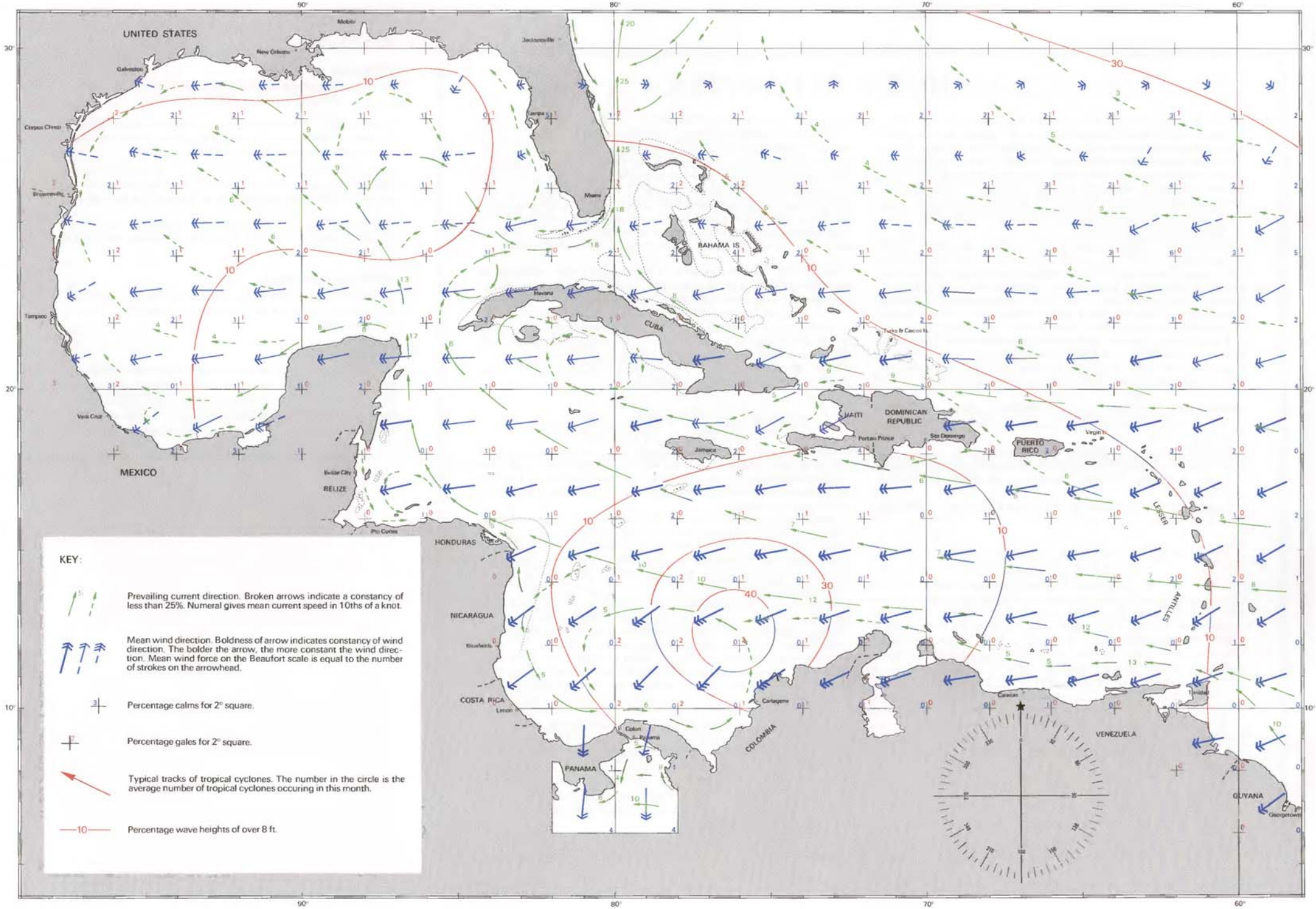
Mean pressures in the Lesser Antilles range from 1016 mb in the Virgin Islands to 1013.5 mb in Trinidad.

TROPICAL CYCLONES

Tropical cyclones are virtually unknown in the North Atlantic during February. Only one has been reported in 100 years; it passed from the Yucatan peninsula to off the Carolina coast.

TEMPERATURE

Mean air temperatures in the month in the Gulf of Mexico range from 15°C in the north to 24°C in the south. Florida experiences temperatures from 18°C in 30°N to 22°C in the south. Mean temperatures of 25°C are found south of Cuba, rising to 26°C in the central Caribbean and Panama. Temperatures in the Lesser Antilles are 25°C or 26°C, being warmer in the south.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN FEBRUARY

CARIBBEAN WEATHER

The westerly current in the north Caribbean sets at rates of between ½ and 1 knot, accelerating west of Jamaica to reach sets of up to 3 knots as it enters the Gulf of Mexico. The constancy of this current increases with distance south of the islands, as the main flow of the current is approached, about 100 miles offshore. East going counter-currents are found in the large bight forming the SW coast of Cuba; they are very variable, with mean rates of about ¾ knot. Counter-currents are also found off the western half of the S coast of Haiti/Dominican Republic.

The set in the Mona Passage is usually SW in mid-channel in the winter, but N or NW currents of 1 to 1½ knots can often be felt on both sides of the passage. This N going current can occupy the whole passage on occasion in the summer. Tides normally set SSW on the rising tide for 6 hours and NNE for the same period on the falling tide, at rates of about 1 knot. The resultant sets are rather uncertain, but can reach rates of up to 3½ knots in a SW'ly direction.

The set of the current in the Windward Passage is SW in mid-channel at rates of up to 2 knots, although they are usually less than ¾ knot. Currents near the coasts on either side are much influenced by the tides, with streams that are strong and irregular.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is usually good in this area; fog is rare, and there is only occasional light haze.

Rainfall in the area is generally between 100 cm and 125 cm a year, most of the rain falling in the summer and autumn months. Variation of rainfall is great on the larger islands, it being wetter on the windward sides.

Mean air temperature over the area ranges from 25°C in January, to 28°C in August.

NORTH COAST OF SOUTH AMERICA (PANAMA TO TRINIDAD)

WINDS The NE trade wind blows over this area. Over most of the area, it is steadiest in the winter months, but becomes light and variable in March and from August to October. Winds tend to be stronger off the NW Colombian coast, especially from January to March. These stronger winds are more often felt within 150 miles of the coast, due in part to nearby mountains. Wave heights are correspondingly higher off this coast during those months (see charts) and can be exacerbated by the counter current.

Although the effect of a hurricane may be felt along the coasts in this area in the form of a swell or rough seas, the area is considered to be out of the hurricane belt. Gales are rare. Land and sea breezes are found along the coasts in the area, modifying the prevailing winds. Squalls are rather common near the land.

CURRENTS The current sets W or WNW through the south Caribbean, and tends to be slightly stronger in winter and spring, than at other times of the year, reflecting the strength and constancy of the trade winds. Mean rates are from 1 to 1½ knots in the east, decreasing to ½ or 1 knot further west.

The main current sets against the Mosquito banks, and some of the flow is deflected S and then E to flow E along the coasts of Panama and Colombia. This Caribbean Counter-current is strongest and most constant from August to October, when mean rates are between ¾ and 1 knot, and the current sets E as far as 72°W. The current is weakest and very variable from February to April, when mean rates are of the order of ½ knot and easterly currents are not felt E of 77°W. The counter-current is felt up to 30 miles off the coast W of 80°W, and further E it fans out northward to rejoin the W going current.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is generally good in this area; reduced visibility is only encountered during heavy rain, and sometimes with haze.

The coasts of Panama are very wet, with annual rainfall of 500 cm in many places. Rainfall decreases eastward to about 50 or 60 cm annually along the north Venezuelan coast. The rainy season lasts from May to December; the spring is usually dry.

Mean temperatures range from 26°C in the winter to 28°C in the summer, with moderately high humidity.

EAST COAST OF CENTRAL AMERICA (PANAMA TO YUCATAN)

WINDS Winds in this area generally blow from between NE and E at an average of force 4. In the summer months, the winds tend to blow more from the E, becoming light and variable in October and September. Winds are stronger in the winter and blow from a more northerly direction.

Northern parts of the area are affected by true "Northers" (see Gulf of Mexico), although they are less severe here than further north. The area is also affected by so called "Northers" south of 15°N. These are really local intensifications in the strength of the NE trade wind, which can be augmented by the sea breeze in the afternoon, to produce fresh winds, which can reach gale force.

Hurricanes do not normally cross this coast, although they have been known to do so, and their peripheral effects could be felt in the area. The north of the Yucatan peninsula is more vulnerable than areas further south. Hurricanes do occasionally form in the W Caribbean, usually to move northwards. Gales are otherwise infrequent. Squalls are common in thunderstorms in the wet season from May to December. Sea and land breezes are well developed along these coasts.

CURRENTS In the body of the west Caribbean, the currents set WNW, at mean rates of ½ to 1 knot. On nearing the Mosquito banks, most of the current is deflected NW and flows over the Rosalind Bank at a mean rate of 1½ knots. The current sweeps round the Gulf of Honduras to set NNE towards the Yucatan channel at rates of 1½ to 2 knots in the summer. In the inner part of the Gulf of Honduras, there is a variable counter-current, setting at rates of up to 1 knot in almost any direction.

CARIBBEAN MARCH

PRESSURE

Mean barometric pressures in March range from 1018 mb in the Gulf of Mexico to 1010 mb off Colombia to the east of Panama.

Mean pressure of 1018 mb is found in the NW part of the Gulf of Mexico, and the 1018 mb isobar runs from Miami ESE through the Bahamas. The 1016 mb isobar runs from the Mexico/US border along the south coast of Cuba through Puerto Rico and the Virgin Islands. The 1014 mb isobar lies along 20°N in the Gulf of Campeche. Along 15°N mean pressures are 1014 mb in 81°W, 1013 mb in 75°W, 1014 mb in 70°W and 1015 mb in 60°W.

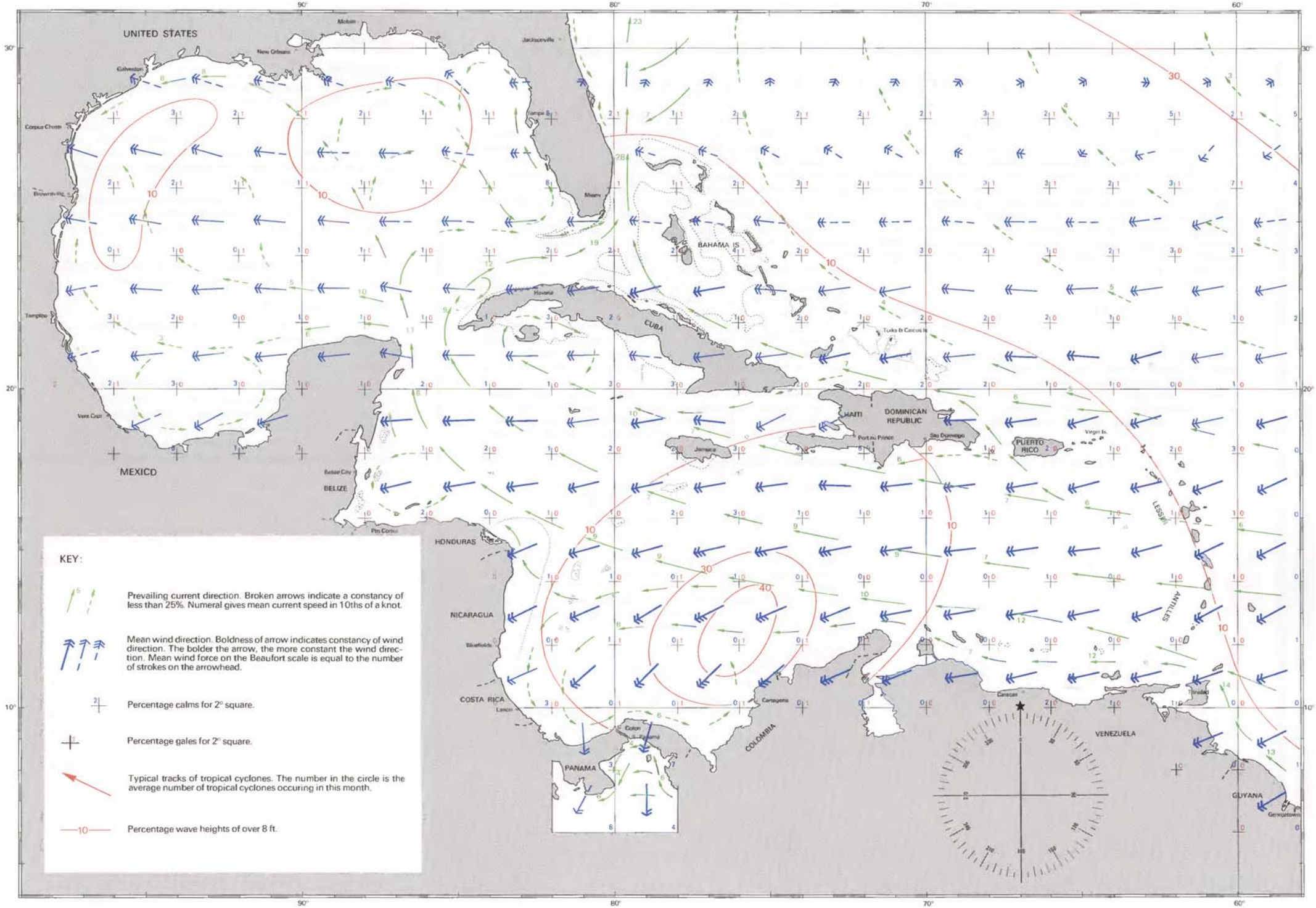
Mean pressures in the Lesser Antilles are 1016 mb in the Virgin Islands, 1015 mb in Dominica, 1014 mb in the northern Grenadines, and 1013.3 mb in Trinidad.

TROPICAL CYCLONES

Tropical cyclones are extremely rare in the North Atlantic and Caribbean during March. Only one has been recorded; a hurricane in the Lesser Antilles in 1908.

TEMPERATURE

Mean air temperatures for the month in the Gulf of Mexico range from 18°C in the north to 25°C in the south. In Florida, temperatures range from 18°C in 30°N to 24°C in the south. Mean temperature of 26°C is found over most of the Caribbean and the southern part of the Lesser Antilles; it is a degree or so cooler in the north part of the Lesser Antilles.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN MARCH

CARIBBEAN WEATHER

Some of the current impinging on the Mosquito banks is deflected southward, to form the Caribbean Counter-current, which sweeps S and E round the Mosquito Gulf. The currents are variable inshore over the Mosquito banks, but generally set southward.

The axis of the current through the Yucatan Channel lies 35 miles off the coast of Yucatan; the current extends from the Banco de Campeche to 20 miles off Cuba, and sets to the north. The mean rate of the current (at the time of maximum daily rate, 9 hours before the moon's transit of the local meridian) is 1 knot 25 miles off the Yucatan coast, and 4 knots 35 miles off; thereafter the current decreases uniformly to its eastern edge. The rates are slightly higher in summer and lower in winter, and show a marked daily variation due to tidal effects.

VISIBILITY, RAINFALL & TEMPERATURE Visibility in this area is good; sea fog is rare though visibility may be restricted in heavy rain.

The rainy season extends from May to December, with high annual falls in the south of 300 to 500 cm. Most of the rain falls in the frequent thunderstorms in the rainy season.

Mean temperatures in the area range from 28°C over the whole area in August to 25°C in the north in January to 27°C in the south. Humidity is rather high, especially in the south.

GULF OF MEXICO

WINDS Winds in the Gulf of Mexico are rather variable, but most wind comes from the E half of the compass. There is a slight tendency for winds to be more prominent from the NE in the autumn months, and from the SE quadrant in the spring and early summer. Winds tend to be light and variable in July and August.

The area is affected by "Northers", cold NW'ly or N'ly winds which develop when a ridge of high pressure extends south over the Gulf from a continental anticyclone. These winds sometimes blow at gale force and are preceded by a heavy cloud bank to the NW, giving some warning. Gale force gusts often blow in the squally unstable airflow. The N'ly winds may blow for a few days at a time, and bring thick cloud and heavy rain. Northers occur between October and April and are most frequent in December and January, when they can be expected with some regularity.

Hurricanes affect the area, more often in the east, but some hurricanes pass W onto the Mexico coast. Gales are infrequent, usually being northers in the winter months. Land and sea breezes are well developed along the coast, and line squalls are quite commonly found.

Along the Mexican coast, coastal northers are quite common between September and April, especially in the south. They bring very heavy squalls. Tornadoes occasionally occur over the inland waters between the Mississippi and Pensacola, generally travelling in a straight line at speeds of up to 50 knots. In clear weather they can be seen 20 miles away.

CURRENTS Currents in the Gulf of Mexico are very variable and dependent on the wind. After setting N through the Yucatan Channel, the current divides into three main streams. One stream sets W to sweep round the Gulf of Campeche, a central stream flows WNW towards the Mississippi delta, turning to flow W along the N coast of the Gulf, and the majority of the water turns east to form the Florida Current. Inshore counter-currents are found in the Gulf of Campeche, off the NW coast of Cuba, and close inshore both N and S of Key West. Rates in the Gulf of Mexico are generally ½ to 1 knot, but slightly stronger N'ly sets are reported off the Mexican coast, N of Tampico, in the summer.

VISIBILITY, RAINFALL & TEMPERATURE Sea fog is rare in the area, but fog sometimes forms in the spring in northern coastal waters. Some radiation fog is found.

Annual rainfall along the shores of the Gulf ranges from 50 to 150 cm, the summer and early autumn months being the wettest.

Temperatures show more seasonal variation here than further south. Mean air temperatures are about 29°C over the whole Gulf in August, but fall to 16°C in the north in January, and to 22°C in the Gulf of Campeche.

CARIBBEAN
APRIL

PRESSURE

Mean barometric pressures in April range from 1018 mb in the Gulf of Mexico to 1010 mb off the Colombia coast.

The NE part of the Gulf of Mexico has a mean pressure of 1018 mb , and the 1018 mb isobar passes from mid-Florida, skirts the north of the Bahamas to 23°N 60°W. The 1016 mb isobar trends south from the Gulf coast in 93°W to pass along the northern edge of Cuba to 18°N 60°W. The 1014 mb isobar passes south from Galveston through 25°N 95°W and then SE to 17°N 82°W. It remains at this latitude to 70°W and then trends ESE to pass through Martinique. 1013 mb is found in the Gulf of Campeche. Pressures along 15°N are 1013 mb at 80°W, 1012.5 mb at 75°W, 1013 mb at 75°W, 1014 mb at 63°W.

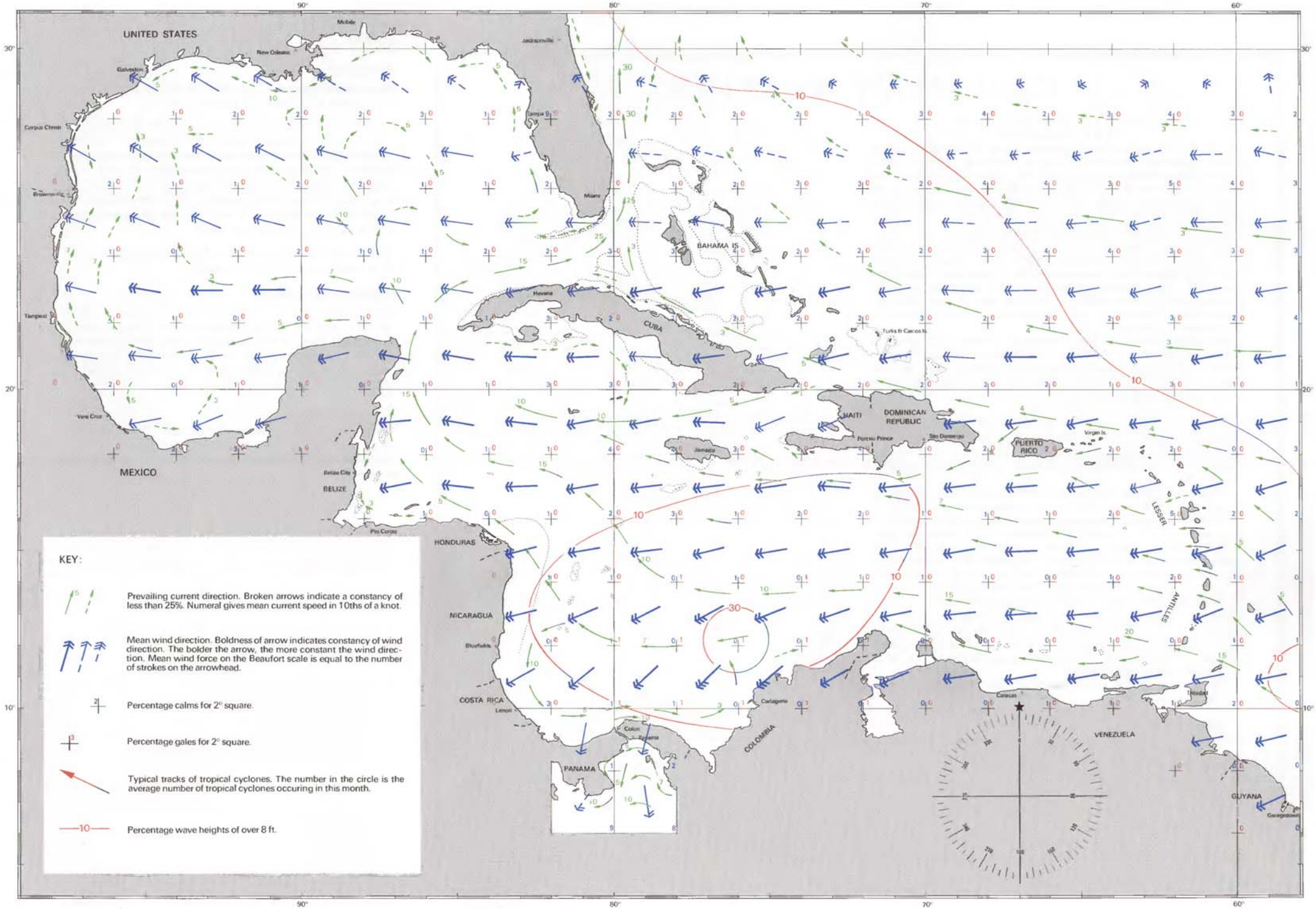
Mean pressures in the Lesser Antilles range from 1015.5 mb in the Virgin Islands through 1014 mb in Martinique, to 1013 mb in Tobago.

TROPICAL CYCLONES

April is the only month in which no tropical storm activity has been recorded in the North Atlantic.

TEMPERATURE

Mean air temperatures in April range from 20°C in the N of the Gulf of Mexico to 27°C in the southern Lesser Antilles, and to the W of Panama. Temperatures in the Gulf of Mexico range from 20°C in the north to 26°C in the south. Florida experiences temperatures from 22°C to 24°C. Mean temperature of 26°C is found over the whole Caribbean, and it is a degree hotter in the southern Lesser Antilles and off Costa Rica.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN APRIL

CARIBBEAN WEATHER

EAST COAST OF FLORIDA (S OF 28°N), THE BAHAMAS

WINDS The southern end of Florida is on the northern edge of the NE Trades in winter and spring, so the winds are rather light, and become markedly more variable with progress north. The wind freshens and tends to veer E or SE in the summer months as the Trade winds move north. The area is affected by troughs from depressions travelling in more northerly latitudes in the winter, bringing strong winds reaching gale force at times.

The area is affected by "northers", cold NW'ly or N'ly winds which develop ahead of continental anticyclones. These winds sometimes blow at gale force and are preceded by a heavy cloud bank to the NW. Gale force gusts often blow on the passage of the squall line, and the N'ly winds may blow for a few days at a time. Northers occur between November and March, and are most frequent in December and January.

Hurricanes affect this area, frequently crossing the coast of Florida, or recurving in the area of the Florida Strait. Gales are rare in the summer, except during a hurricane, but winds of force 7 and over occur 5% of the time in the winter, being more common further north. Arch squalls are common in the area.

CURRENTS The Antilles Current flows northwestward along the northern side of the Leeward Islands and through the Bahamas. The currents in the channels generally follow this trend, but great care should be taken as the currents are sometimes reversed by the wind, or tidal effects.

In the Old Bahama Channel, between Cuba and the Bahamas, the current sets NW at rates of ½ to 1 knot, increasing to the N and W.

The Florida Current enters the Florida Strait from westward, having a mean rate of 1–1½ knots at the centre of the stream 25 miles N of Havana, and from 1–2½ knots 46 miles S of Key West. The current sweeps up the Florida coast, the inshore limit usually being taken as the 90 metre depth contour, and being about 70 miles wide at Cape Canaveral. The maximum mean rate (2–4½ knots) is found 11 miles off Fowey Rocks, where the maximum rate of 6½ knots is occasionally found, and is between 2 and 4 knots off Cape Canaveral. The current sets along the axis of the strait, and the speed of the current shows some seasonal and tidal variations. There is some tide setting on and off the reefs and keys, and great care should be taken when navigating in this vicinity.

A west going counter-current sometimes flows close inshore to the S of the Florida Keys.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is usually good in this area, fog being rare, and only light haze sometimes occurring.

Annual rainfall in the area is generally between 100 cm and 125 cm, most of the rain falling in the summer and autumn months.

Mean air temperature over the area ranges from 21°C in the north to 26°C in the south in January, and is generally 28°C in August.

CARIBBEAN
MAY

PRESSURE

Mean barometric pressure in May ranges from 1017 mb in the NE of the Gulf of Mexico to 1010 mb off the Colombia coast.

The 1017 mb isobar occupies the NE of the Gulf of Mexico and passes across central Florida to pass just north of the Bahamas to 20°N 60°W. The 1015 mb isobar drops S from the Gulf coast in 94°W to pass along the N Cuba coast through Puerto Rico and Guadeloupe. The 1013 mb isobar crosses the southern part of the Gulf of Mexico and leads from Cozumel SE to 17°N 82°W. It then trends eastward to 17°N 75°W and thence ESE to Trinidad. Pressures along 15°N are 1012 mb from the Mosquito coast to 75°W, 1013 mb at 69°W 1014 mb at 64°W.

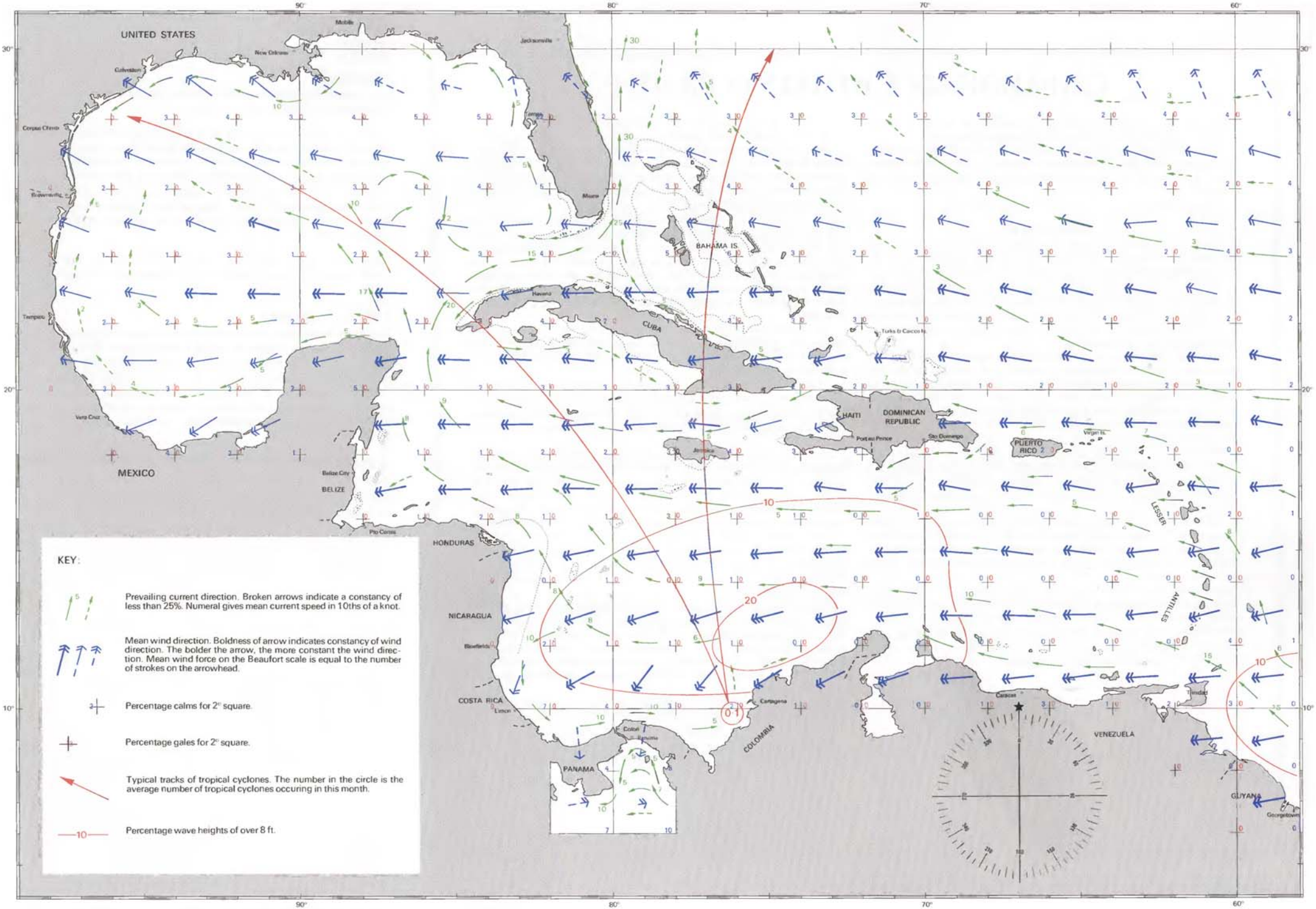
Mean barometric pressure in the Lesser Antilles ranges from 1015.5 mb in the Virgin Islands to 1013 mb in Trinidad.

TROPICAL CYCLONES

The frequency of tropical cyclones begins to increase in May, but they are still rare in this month. Over the hundred years to 1975, only 11 storms were reported in May, of which 3 reached hurricane force. Cyclones that do occur tend to originate off the Colombia coast in about 77°W, to travel either across the western tip of Cuba NW to the Gulf coast, or N over Jamaica and the Bahamas to pass into the Atlantic.

TEMPERATURE

Mean air temperatures are now significantly higher than in the winter months and range from 25°C in the north of the Gulf of Mexico to 27°C over the whole of the Caribbean. Temperatures in Florida are 25°C or 26°C this month.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN MAY

CARIBBEAN CRUISING GUIDE

This guide to the major Caribbean destinations is designed to give cruising yachtsmen some help with planning an itinerary.

The information is ordered geographically, starting with Barbados, and then moving from Venezuela northwards through the Antilles. There is a section on weather forecasts and hurricane tactics on page 66.

BARBADOS

Barbados is very different from the islands further south. It is relatively flat, and therefore much drier than the high islands. The country is well developed, fairly prosperous, and densely populated.

The island lies 100 miles or so to the east of the island chain, and has been chosen in the past for transatlantic landfalls for this reason, as well as the shopping facilities and good international transport connections. Facilities for yachts, however, are not particularly good, and the scope for cruising is limited.

Although Barbados was inhabited by indigenous peoples for a millennium or more, it was found to be all but deserted by the first English settlers, who encountered only pigs left behind on a previous visit by the Portuguese. The island was colonised in the early 17th century by many hopefuls from England, the majority of whom stayed for a limited period. A few remaining whites worked the sugar plantations with African slaves, from whom most of the population is descended.

Barbados did not suffer the usual colonial seesaw between the French and English in the 17th and 18th centuries, as it occupies a commanding position to windward of any approach from the islands. Barbados became an independent member of the British Commonwealth in 1966.

The interior is low undulating country, dominated by the sugar plantations. Excursions in the island tend to cater for the hotel tourist market, and focus on the history of the island. The west coast is overshadowed by the extensive hotel building along the beaches, which are rather narrow.

Entry must be made in the deep water harbour in Bridgetown. Most yachts then anchor in Carlisle Bay, where there is dinghy access ashore, and a couple of friendly yacht clubs. Bridgetown is good for provisioning, and there are facilities for repairs and chandlery, but they are not extensive. The boatyard in Carlisle Bay is a good starting point for any post passage repairs required.

VENEZUELA & THE ABC ISLANDS

Venezuela boasts superb scenery and an individual identity. Simon Bolivar led the long and bloody struggle for independence from Spain in the 1820s; the Republic was founded in 1830. Its long independence and richness in natural resources, has enabled Venezuela to evolve its own melting pot culture of Spanish colonial, indigenous Indian and immigrant European.

The country is not reliant on tourism for income, so Venezuelans will take you as they find you – a welcome change from many cruising destinations. Facilities for visiting yachts are only beginning to develop as an industry, but most needs can be met. It is a huge cruising area, with much variety in the many anchorages along the coast, and of course in the islands. The easternmost ports of entry are Carupano on the mainland, and Porlamar and Pampatar on the island of Margarita.

The area is not in the hurricane belt, although one might feel the effects of one occasionally. Land and sea breezes affect the coast, and the E trade wind tends to blow harder in the day, often falling calm at night along the coast.

There is much to see in the country. The landscape varies from the snow covered peaks of the Andes through tropical rain forest to dry plains, and the mesas sport the world's highest waterfall, the Angel Falls. The rivers through the jungle provide a fascinating way to see the interior.

The Venezuelan offshore islands (Las Aves, Los Roques, La Blanquilla and Los Testigos) make for splendid cruising, especially in the summer, when the wind moderates. The clear water and sheltered sailing within the reefs are delightful. The duty free island of Margarita is a holiday destination for Venezuelans as well as visitors, providing a relaxed atmosphere and fine beaches in a dry climate.

The islands of Aruba, Bonaire and Curaçao have been Dutch possessions since the 17th century, and with St Eustatius, Saba, and St Maarten, form the Netherlands Antilles; a self governing part of Holland. They form a confederation with the exception of Aruba, which is autonomous.

Originally populated by Arawak Indians, the islands were discovered by Spain at the end of the 15th century. The Peace of Nijmegen in 1678 granted the islands to the Dutch, and they have remained so except for a couple of brief incursions by the English in the 19th century. Curaçao was relatively prosperous earlier in this century with the establishment of the Shell refinery and offshore banking facilities.

The islands are low and scrubby, their main attraction being watersports and birdwatching. Bonaire is internationally famous for its diving; Aruba has the best beaches, and is good for windsurfing. Bonaire is also known for its large colony of flamingoes. Facilities for yachts are reasonably good – there are marinas and most technical repairs are possible.

CARIBBEAN
JUNE

PRESSURE

Mean barometric pressure this month ranges from 1017 mb in the NE of the Bahamas to 1010 mb in the Gulf of Darien.

The 1016 mb isobar occupies the NE of the Gulf of Mexico and passes through the southern end of Florida, along the northern coast of the Dominican Republic, south of Puerto Rico to 16°N 60°W. The 1014 mb isobar crosses the Gulf of Mexico from the Gulf coast in 96°W to the tip of the Yucatan peninsula. It then passes through Jamaica, then curving south to pass just north of Trinidad. Pressures along 15°N are 1012 mb from the Mosquito coast to 74°W, 1013 mb at 71°W, 1014 mb at 68°W, 1015 mb at 63°W.

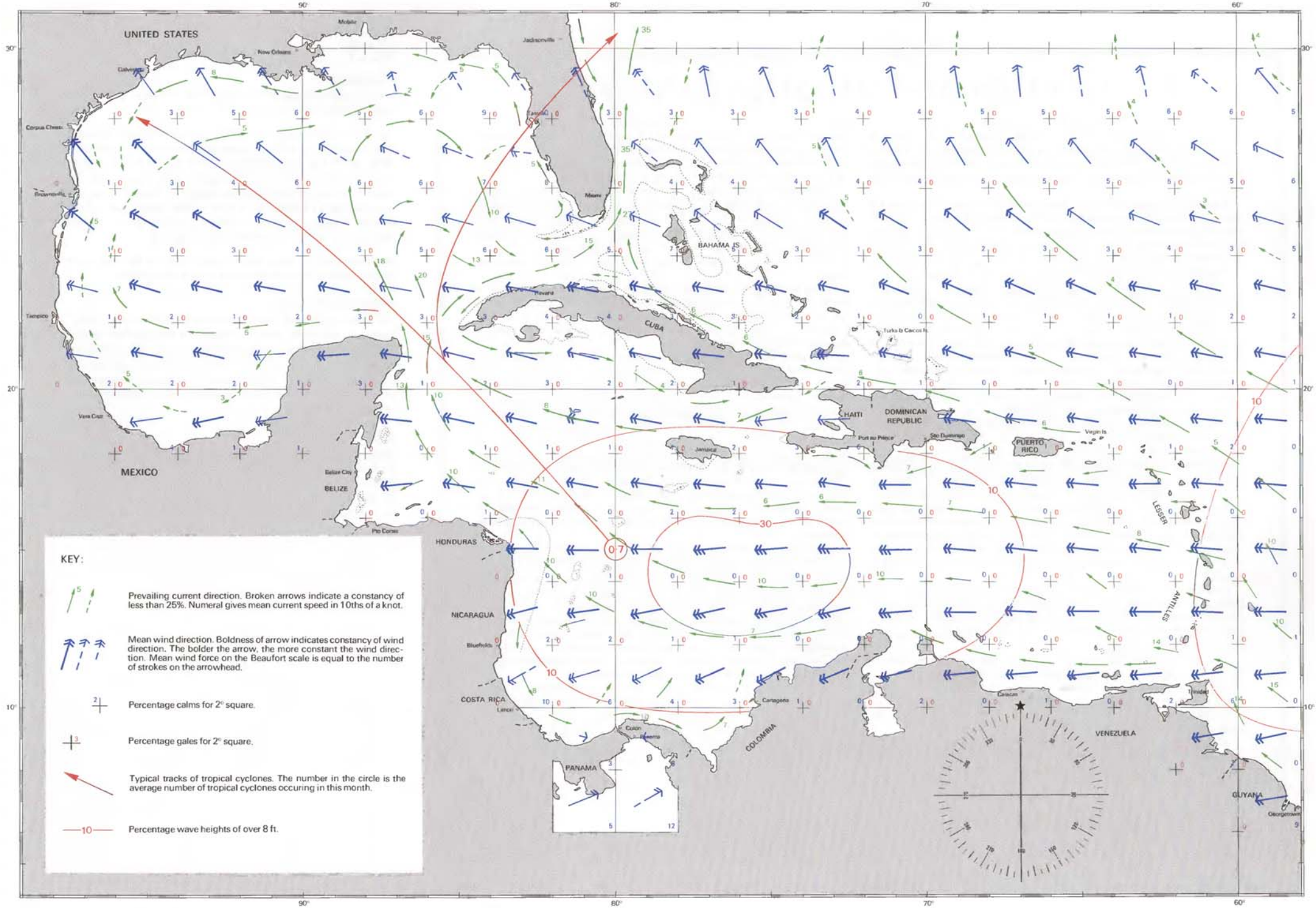
Mean pressures in the Lesser Antilles range from 1016.5 mb in the Virgin Islands through 1015.5 mb in Dominica to 1014 mb between Trinidad and Tobago.

TROPICAL CYCLONES

Warmer sea temperatures in the southern latitudes increase the probability of tropical cyclone development this month. Likely incidence is 0.7 tropical storms in the month, of which about half will develop hurricane force winds. Development in June is usually in the western Caribbean, passing north off the western end of Cuba, where the storms may either proceed north or northwest into the Gulf of Mexico to dissipate over the land, or recurve over Florida, to proceed northeast along the eastern seaboard of the US.

TEMPERATURE

Mean air temperatures are now fairly uniform over the whole area, generally being 28°C over the Gulf of Mexico and the western part of the Caribbean, and 27°C in Florida, the Bahamas and the Lesser Antilles.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN JUNE

CARIBBEAN CRUISING GUIDE

TRINIDAD & TOBAGO

Discovered by Columbus in 1498, Trinidad has had a long history of immigration and is now populated by a well integrated mix of black, brown and white. Trinidadians are friendly, and like Venezuelans, not dependent on tourism, fostering real contact between visitors and locals.

The island hangs off the mountain range along the N coast and is otherwise fairly flat, with low hills on the centre and in the south. The central plain is mainly given to sugar cane, and is bordered on the east and west by coastal swamps. The famous pitch lake lies in the south of the island, which is rich in resources, including oil. The population is concentrated along the E–W corridor from Port of Spain.

British rule was instituted in 1797 after three centuries of colonial warfare, largely between the Spanish and the indigenous population. Large numbers of slaves were brought over from Africa to work the sugar plantations until the abolition of slavery. Thereafter, the island received waves of immigrants from Europe, and indentured labour from East India and China. Many of the labourers stayed on at the end of their indenture in the 19th century, leading to the mixed cosmopolitan society that exists today.

Out of the hurricane belt, Trinidad is beginning to cater extensively to visiting yachts. Marinas are being planned and built, and there are extensive anchorages between Port of Spain and the NW tip of the island. All technical repairs are catered for, and there is safe dry storage aplenty for those who want to leave their yachts in the summer. Chaguaramas, just inside the NW tip of the island, is a port of entry, and most of the facilities are concentrated here or nearby. Trips to the nearby islands and anchorages are easily made for a change of pace.

Excellent beaches can be found along the N coast, a pleasant drive over the mountains. The popular beaches along the Atlantic coast are impressive palm fringed affairs. Trinidad has an abundance of wildlife, and many sanctuaries and national parks. It is especially striking to visit the Caroni swamp to see red ibis returning to roost at sunset.

Carnival in Trinidad reaches its climax in the days before Ash Wednesday every year. It is a truly majestic four-day long party, spectacular for the costumes, music and the party atmosphere. Preparations start months before, and visitors are often welcomed to participate fully in carnival teams.

Tobago, Trinidad's little sister, is more reliant on tourism, quieter and more relaxed than the big island. Getting there from Trinidad can be a struggle – most yachts motor sail along the N coast of Trinidad to get a fetch to Scarborough, the port of entry. Because Tobago is to windward of the main island chain, there are fewer visiting yachts there than on many of the islands.

Tobago is worth considering as a first stop after an Atlantic passage, as you'll avoid a slog to get there later. You can check in, and the island provides a gradual return to the hustle and bustle! There are some picturesque anchorages, some of which can be a bit rolly. Facilities for yachts are limited. The beaches are lovely, with good snorkelling and diving.

GRENADA

Known as the Spice Island, Grenada is beautiful and green, favoured with abundant rainfall in the wet season. The country is an independent state within the British Commonwealth, and takes in the islands of Carriacou and Petit(e) Martinique to the north.

Although the island was discovered by Columbus at the end of the 15th century, the warlike Carib Indians prevented European settlement for 150 years or so. The French colonised the island in the mid 17th century, exterminating the indigenous population. Disputed between the British and the French, the island finally became a British possession in 1783. Grenada was granted full independence in 1974.

More recently, in 1983, the turbulent deposition and murder of Prime Minister Bishop and some of his socialist government prompted joint US/Caribbean military intervention to restore order. The progress of Cuban influence was stopped and democratic elections were held the following year.

The land rises from a rugged coastline to the central mountains which form the backbone of the island. Mount St Catherine rises to almost 3000 ft – it is the mountainous nature of the island that ensures good rainfall. The island is verdant and well cultivated, with a thriving agriculture producing cocoa, vegetables, sugar and spices. Grenada is a major world producer of nutmeg (introduced by the British after failure of the sugar crop) and of cloves and mace. The interior is worth visiting for its forest trails, waterfalls, lush scenery and wildlife. Facilities for diving and other water sports are extensive.

There are a few anchorages along the west coast of the island, but most of the yachting activity takes place in the SW corner of the island, around St George's, the capital, and Prickly Bay, both of which are ports of entry. Entry can also be made in Hillsborough, on Carriacou.

St George's is a delightfully picturesque town, with red tiled roofs and pastel houses tumbling down the promontory overlooked by Fort George. Most yachts moor in the lagoon, where there is a marina, boatyard and yacht club. The extent of facilities for yacht repairs is theoretically good, but variable, so check on the spot.

Prickly Bay is a favourite anchorage amongst yachtsmen, deservedly so. It is a charming spot, and the facilities for all sorts of boat work are available nearby, including a small marina and boatyard with haul out facilities. To the east there are plenty of lovely anchorages in the numerous inlets, and a marina in Mt Hartman bay.

Carriacou is a fascinating little island of 5000 people. It has a strong African heritage as well as roots from Scottish boatbuilders. The Carriacou Regatta in the first week of August every year, started for the locally built boats, has developed to include special events and parties ashore as well as the races.

CARIBBEAN
JULY

PRESSURE

Mean barometric pressure in July ranges from 1018 mb in the extreme NE of the Gulf of Mexico to 1010 mb off the Colombia coast.

The 1018 mb isobar lies in the very NE of the Gulf of Mexico , and passes from the southern tip of Florida through the Turks & Caicos Islands to 20°N 59°W. The 1016 mb isobar sweeps south from the Gulf coast to pass ESE through the Yucatan Channel and through the southern part of Cuba, through the centre of Haiti/Dominican Republic to 16°N 60°W. The 1014 mb isobar trends E from the Belize coast to 75°W, thence trending SE to Trinidad. Pressures along 15°N are 1013 mb at 82°W, 1012.5 mb at 77°W, 1013 mb at 72°W, 1014 mb at 69°W, 1015 mb at 62°W.

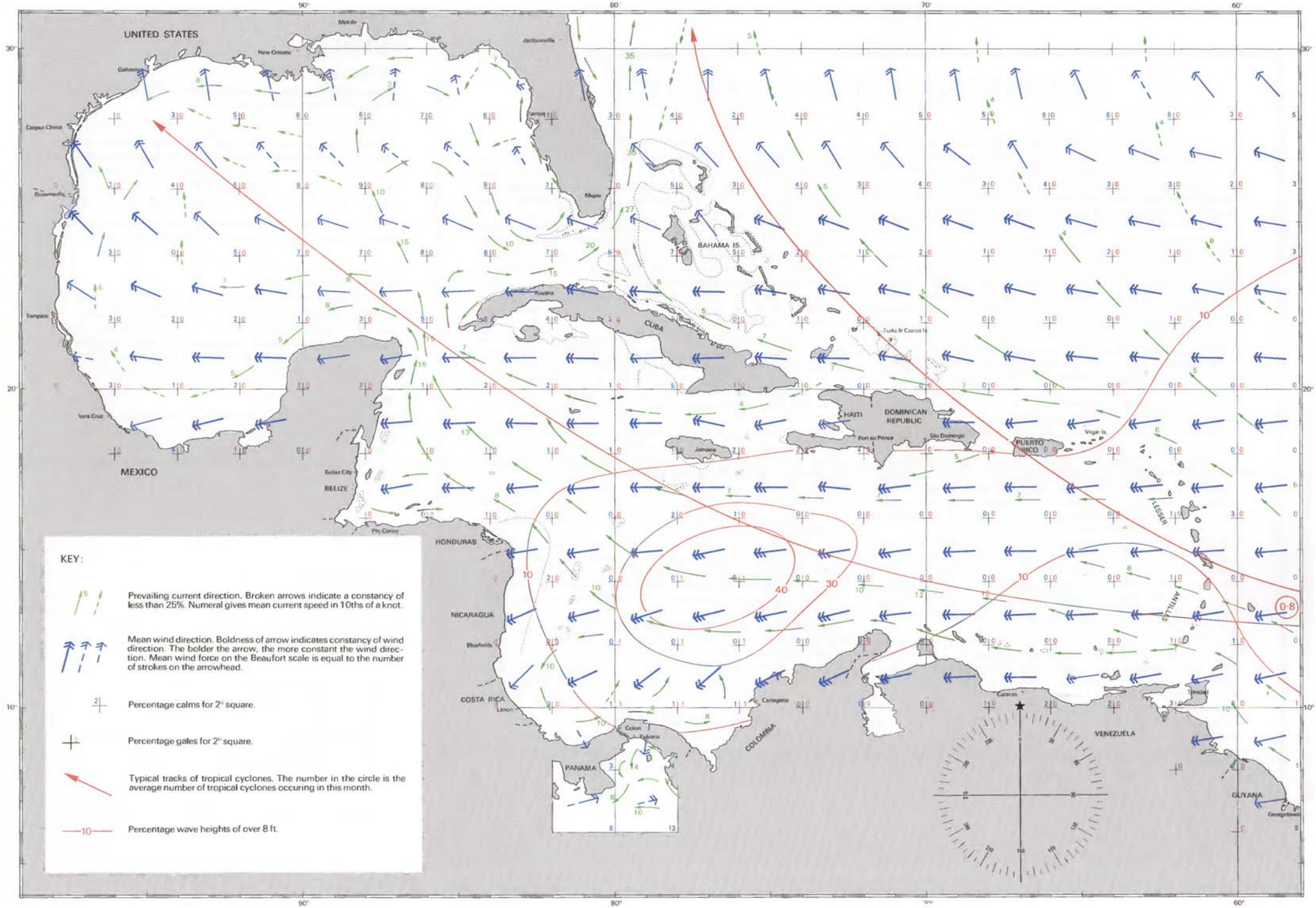
Mean pressure in the Lesser Antilles ranges from 1016 mb in the Virgin Islands through 1015 mb in Martinique to 1014 mb in Trinidad.

TROPICAL CYCLONES

The frequency of tropical cyclones increases slightly from June. Likely incidence is 0.8 tropical storms in the month, of which half will reach hurricane strength. These are generally formed in the eastern Caribbean or western Atlantic and may either traverse the Caribbean, passing through the Yucatan Channel and crossing the Gulf of Mexico northeastward, or pass near Haiti/Dominican Republic recurving east of Florida and running up parallel to the US coast.

TEMPERATURE

Mean air temperatures are yet higher this month, with little variation over the area. The Gulf of Mexico and much of the Caribbean has temperatures of 28°C, rising to 29°C in the north of the Gulf and in parts of southern Florida and the Bahamas. It is a little cooler in the Lesser Antilles and the mean temperature is 27°C along the Venezuela coast and in Trinidad.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN JULY

CARIBBEAN CRUISING GUIDE

ST VINCENT & THE GRENADINES

The country comprises the island of St Vincent and over 30 small islands and cays (The Grenadines) scattered to the south. These islands epitomise yachtsmen's dreams of the Caribbean – white sand beaches and clear blue water with easy sails between the islands. While the Grenadines have not been affected by mass tourism to the extent of the other islands, they are very popular with yachtsmen, and can get crowded.

St Vincent itself is a green and fertile island, dominated by mountains about 3000 ft high, and an active volcano, La Soufrière, which last erupted in 1979. There are no roads across the interior, and the island is relatively unspoiled. Agriculture and tourism are the mainstays of the economy. There are good beaches, some with volcanic sand. Walking in the interior is worthwhile, especially the long haul up to La Soufrière's crater, and there are some fine waterfalls. The diving is excellent, both on St Vincent, and in the islands.

The Caribs on St Vincent proved resistant to colonisation until the 18th century, but did accept numbers of African slaves, who integrated with the native population, and became known as the Black Caribs. Possession was disputed between the French and British, the country coming under British rule at the end of the 18th century. Independence within the British Commonwealth was gained in 1979.

There are several anchorages down the west coast of St Vincent, and clearance is possible at Wallilabou, Barrouallie and Kingstown. Young Island and Blue Lagoon in the south are favourite anchorages. There are places to dock in Kingstown and Blue Lagoon to pick up water and fuel. Most small repairs are possible, and some marine supplies are available in Kingstown. Entry ports in the Grenadines are on Bequia and Union Island.

BEQUIA is an island of great charm, much loved by yachtsmen. As a result, the main anchorage in Admiralty Bay does get very crowded at the height of the season. Bequia has a long seafaring tradition, and local boats are still built by hand on the beach. Shops, restaurants and bars abound, and there is a wide range of marine supplies available. There are several docks for fuel and water. Friendship Bay, in the south, is a good anchorage, and water is available.

MUSTIQUE is a private resort island, well known as a hideaway for the rich and famous. The anchorage is rather open. There are a few shops and boutiques ashore, and plenty of unspoiled beaches to explore. Canouan is a diminutive, quiet, hilly island with excellent beaches. Facilities ashore are limited; there are a few restaurants. A large resort development is planned for the island.

MAYREAU, small and tranquil, has clean beaches and a few watering holes ashore. Cruise ships visit regularly, bringing an influx of passengers. Close by are the Tobago Cays, well known for clear blue water and diving on the reefs. Picturesque, but very popular, the reefs have suffered damage in the past from anchors and overfishing, and the area is now a wildlife reserve. Union Island is the bustling centre for the south Grenadines. There is a small dock for taking on water, and some facilities for yachts.

ST LUCIA

The fine scenery and lovely beaches in typical Caribbean ambience has made St Lucia a popular tourist island. It also has very good anchorages and superb facilities for yachts. The high mountains and the volcanic area in the south, coupled with well cultivated coastal margins combine to give St Lucia outstanding natural scenery.

From about the middle of the 17th century, the French and English vied with each other for supremacy over the island. There were many settlers from both countries, and sovereignty changed about 15 times before St Lucia became a British colony in 1814. There remains much French influence in the architecture, religion, culture and language of the island; patois is often spoken, and is occasionally the only language understood. St Lucia gained full independence in 1979, and remains within the Commonwealth.

The interior is worth visiting, especially the sulphur springs at the volcano, in the south near the Pitons, which are old volcanic plugs. The walks on the island are good, and Pigeon Island is interesting for naval history buffs. St Lucia Carnival is held at the traditional time in the days leading up to Ash Wednesday, with much warm-up activity before that. The diving can be good; visibility is variable after heavy rain.

Yachts may enter at Rodney Bay in the north, Port Castries, Marigot Bay, and Vieux Fort in the south. Rodney Bay is large, with several anchorages in the bay itself. A channel leads to the lagoon containing the marina, and where it is also possible to anchor. The lagoon is base for several charter fleets, and every conceivable type of work and repairs can be carried out on yachts, including lifting out. The chandlery has a huge range and there are many local shops, restaurants and bars.

Port Castries is the busy capital, encircling the natural harbour. The town suffered several serious fires in the past, so most of it has been built since the last one in 1948. There do remain, however, some charming examples of colonial architecture. Towards the airport can be found boatyards and workshops for most jobs, including lifting out.

Marigot Bay is an idyllic anchorage with very good shelter. There is a marina and charter base in the inner lagoon; fuel and water are available, and some repairs are possible.

There are several fine anchorages at Soufrière and the Pitons, and there are some docks for mooring. Soufrière town is delightful and provides basic provisioning; the Pitons provide a dramatic backdrop to the scene.

Vieux Fort, at the south end of the island, is not so frequented, and is worth a visit for a change of pace. The town has a certain charm and is the industrial centre for the island, so it has much local flavour. There is an impressive windward beach on the other side of the causeway.

CARIBBEAN AUGUST

PRESSURE

Mean barometric pressure in August ranges from 1017 mb off the Florida coast to 1011 mb off the Colombia coast.

The 1016 mb isobar trends ESE from the Gulf coast in 93°W to pass between Florida and Cuba, through the Turks and Caicos Islands, to 19°N 60°W. The 1014 mb isobar crosses the SW Gulf of Mexico and passes from the Yucatan peninsula in 20°N along the south coast of Haiti/Dominican Republic to 15°N 60°W. Pressures along 15°N are 1012 mb at 80°W, 1011 mb at 75°W, 1012 mb at 72°W, 1013 mb at 69°W, and 1014 mb at 60°W.

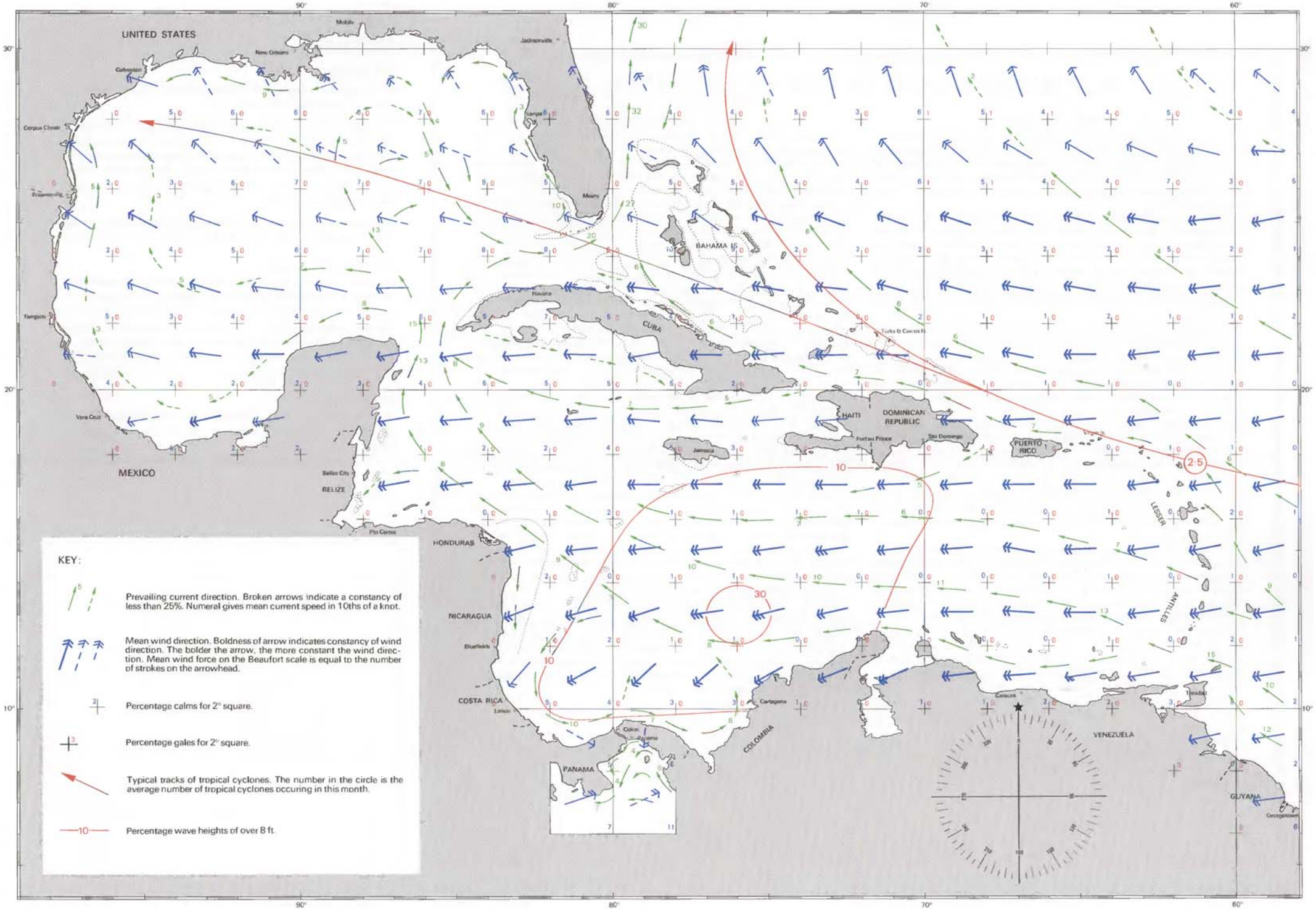
Mean pressure in the Lesser Antilles ranges from 1015 mb in the Virgin Islands through 1014 mb in Dominica, to 1013.2 mb in Trinidad.

TROPICAL CYCLONES

The likelihood of tropical storms increases as August advances. Likely incidence is 2.5 tropical storms in the month, of which 1.5 will reach hurricane strength. These generally form in the mid Atlantic and arrive in the Caribbean in the north of the Leeward Islands, whence they either sweep along the north of Cuba into the Gulf of Mexico, or recurve east of Florida, to head northeast off the coast of the US.

TEMPERATURE

Mean air temperatures are fairly uniform over the whole area this month, being 28°C for the most part, and a degree warmer in the west part of the Gulf of Mexico and between Cuba and the Yucatan Peninsula.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN AUGUST

CARIBBEAN CRUISING GUIDE

MARTINIQUE

Martinique is an administrative region of France and the islanders are French citizens. There is considerable subsidy of public spending on the island by France, so the infrastructure has a European feel about it, somewhat different from neighbouring islands. Agriculture, light industry, and tourism drive the economy, and the cost of living is relatively high.

The Spanish spurned the island after discovering it in the early 16th century. The French arrived soon after, engaging in violent conflict with the indigenous Caribs, who were eventually wiped out. The 17th and 18th century saw the familiar battles for possession between the English and the French. Diamond Rock, off the SW of the island, is well known for being a thorn in Napoleon's side, when it was occupied by the British for over a year at the beginning of the 19th century.

The island is originally volcanic – the active Mt Pelée in the north rises to over 4500 ft, and last erupted in 1902. Smaller mountains are strung along the island interspersed with cultivated plains. In the north, tropical rainforest clads the volcano, and the beaches are of black sand, becoming lighter in the south. It is worth touring the island – good roads make access very easy, and the forest around Mt Pelée is most impressive.

Ports of entry are St Pierre in the north, the capital, Fort de France, and Marin in the south. Most cruising yachts gravitate to the area near Fort de France and the nearby bays. A few yachts cruise the east coast, but this can be perilous.

St Pierre is an interesting anchorage, if a bit open. The town, originally the capital of Martinique, was destroyed by the eruption of Mt Pelée in 1902. There was one survivor, who was in the town jail! Some ruins are still visible, and there is a museum related to the volcano. Water is available.

Fort de France is a large, busy port town. Every conceivable spare and repair is obtainable here, including lifting out, and the shopping is excellent. There are several marinas and plenty of anchorages within 4 miles, some of which are connected to Fort de France by frequent ferries. The anchorage at Fort de France itself is not ideal, and most yachts base themselves in what might be called the suburbs.

There is a marina at Lamentin. There are several anchorages around Trois Islets village, which is served by ferries to Fort de France. There is another marina at Point du Bout, with a ferry service. This is within easy walking from the large anchorage of Anse Mitan, which has a dock for several yachts, and water etc. There is a quieter anchorage in Anse a L'Ane, from where ferries also run. Trois Islets and Point du Bout are good for provisioning, and for repairs and chandlery.

There are pleasant anchorages in the bays (Anses) to the south. St Anne, in the SE of the island is a picturesque stop. It is adjacent to the Marin inlet, where there is a marina, boatyards, chandlers, good provisioning, as well as several anchorages.

DOMINICA

Known as Nature Island, Dominica is a tumble of mountains and lush vegetation, waterfalls, lakes and sulphur springs. The natural beauty of the island is unspoiled, and hard to better. The island does not sport white sand beaches by the mile, so is not a major tourist destination, and herein lies its charm.

The Commonwealth of Dominica is relatively poor by Caribbean standards. There is comparatively little tourism, there has been much hurricane devastation in the recent past, and the island's broken landscape favours the small farmer over large plantations. Development of the island was somewhat overlooked by the British in some periods of colonial rule. The people are friendly and naturally welcoming.

Sovereignty was settled with the British at the beginning of the 19th century, after prolonged three-cornered colonial battles between the indigenous Caribs, the French and the British. Much French influence remains in the island, and many locals speak créole as well as English. Dominica is unusual in having a small number of direct descendants of the Caribs surviving. The language, however, has been lost. Dominica became independent within the Commonwealth in 1978.

The two main attractions of the island are walking and diving. The island has several National Parks with walking trails for enjoying the dramatic scenery. The Boiling Lake, the Valley of Desolation, Freshwater Lake, waterfalls, the rainforest, botany and wildlife are some of the points of interest. The diving off Dominica is widely regarded as excellent. It must be done through a local dive tour operator, or with special permission. Whale watching is possible off the west coast.

Ports of entry are Portsmouth and Roseau. Portsmouth lies in Prince Rupert Bay, which is large and protected. There are plenty of spots in the bay to anchor. The bay is best sheltered in the NE corner, and one may anchor or moor off some of the hotels further south. They have small docks for taking water and basic services. It is worth taking a boat trip up the Indian River while in Portsmouth – it is a tranquil ride through a tunnel of tangled vegetation, and there is a bar at the end! Portsmouth offers basic provisioning.

The W coast of the island is steep and without much natural shelter, but there are some spots where it is possible to anchor. For Roseau, most yachts anchor off the hotels to the south of the town, where water can be obtained. Roseau itself has a comfortable lived in look, with colourful colonial architecture jumbled up with the more modern. Provisioning is reasonably good here, but there's very little in the way of spares and repairs for yachts.

CARIBBEAN SEPTEMBER

PRESSURE

Mean barometric pressure this month ranges from 1015 mb in the Gulf of Mexico to 1010 mb off the Colombia coast.

The 1015 mb isobar runs ESE from the Mississippi through the E coast of Florida in 27°N to 20°N 60°W. The 1013 mb isobar runs east from the Gulf coast along 25°N to 90°W then turns ESE past the western tip of Cuba, close north of Jamaica to 13°N 60°W. The 1011 mb isobar follows 15°N from the Mosquito coast to 75°W, then turns SE to the Venezuela coast near the Netherlands Antilles.

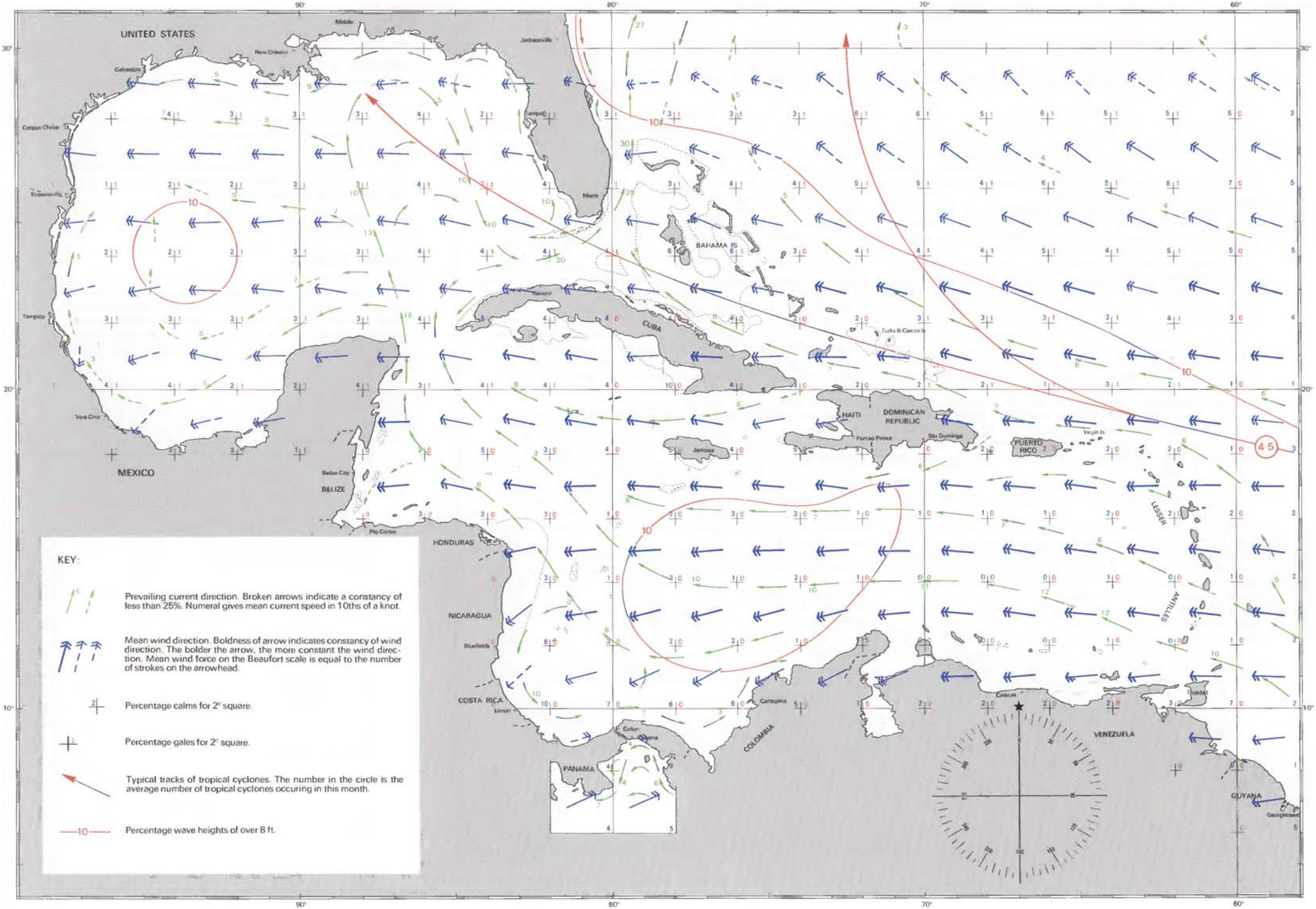
Mean barometric pressure in the Lesser Antilles ranges from 1014.2 mb in the Virgin Islands through 1013 mb in St Lucia, to 1012.2 mb in Trinidad.

TROPICAL CYCLONES

September is the peak season for tropical storm activity. September will average 4.5 tropical storms, of which about half will reach hurricane strength. In the hundred years to 1975 the number of storms occurring in September has ranged from 1 to 8. Storms in this month tend to originate in the mid or east Atlantic (although they may start locally) and pass through the north of the Leeward Islands, either recurving north of Haiti or continuing along the north coast of Cuba, into the Gulf of Mexico.

TEMPERATURE

Mean air temperature over the whole area in the month of September is 28°C except in the very north of the Gulf of Mexico where it is a degree cooler.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN SEPTEMBER

CARIBBEAN CRUISING GUIDE

GUADELOUPE

Guadeloupe is a Département of France, and administers the nearby islands of Les Saintes, La Désirade, and Marie-Galante as well as the islands of St Barts and the French part of St Martin. Similar to Martinique in some respects, the character of the island is somewhat different. Guadeloupe suffers from the reputation of being the less sophisticated sister island to Martinique.

Named after the Spanish Virgin of Guadalupe by Columbus, the island underwent a similar turbulent imperial history to that of Martinique, but Guadeloupe's was, if anything, more troublesome. The economy relies on tourism and agriculture.

The island falls into two parts separated by a natural channel. Basse-Terre is the higher part, with mountains, forest and volcanic fumaroles. Grande-Terre, named with consistent illogic, is slightly smaller in area, low lying and much drier. Much of the centre of Basse-Terre is given over to a national park, with walking trails to waterfalls, sulphur pools, and lakes. The best beaches are along the south coast of Grande-Terre.

Ports of entry are at Deshaies, in the NW of Basse-Terre, Basse-Terre town, the administrative capital in the SW of Basse-Terre, and Point-à-Pitre, which is the commercial centre of the island. It is possible to make a temporary entry at Grand Bourg on Marie Galant.

On the west coast of Basse-Terre, there are several anchorages between Deshaies and Basse-Terre itself. The latter is somewhat exposed – there is a marina with some facilities about a mile south of Basse-Terre. Note the existence of an underwater national park around Ilet Pigeon.

Point-à-Pitre is situated in the large natural harbour at the south end of the channel separating Grande-Terre and Basse-Terre. This channel (Rivière Salée) can be used by yachts of up to about 7 ft draught to shorten a journey between Point-à-Pitre and points north. Point-à-Pitre has a large marina with all facilities, and the area has chandlers and boatyards to carry out lift outs and all types of repairs and refits to yachts of all sizes. Shopping is good in the marina, and excellent in town, which is colourful and charming. There are several pleasant anchorages along the south coast of Grand-Terre.

Les Saints is a favourite stopover for yachts. French sailors have a particular affection for these islands, which have such strong Breton roots. The islands have been off the tourist track, and yachtsmen will see the best of them after the day trippers leave in the evening. There are several anchorages in Terre d'en Haut. Bourg des Saintes is a gorgeous little town, with ample provisioning. In the Baie de Marigot, there are a couple of boatyards, one with a slipway.

Marie Galante is quaint and tranquil. Most yachts anchor off St Louis, which is rather open. It is sometimes possible to get into the small harbour at Grand Bourg, but it is very small.

ANTIGUA & BARBUDA, MONTSERRAT

ANTIGUA is a large low island, and is relatively dry with undramatic landscape. The island is largely dependent on tourism and other service industries for its income. This dependence can cause friction between visitors and locals.

The coastline is heavily indented, and provides rich and varied cruising; some of the navigation is quite challenging. There is a huge number of anchorages, both quiet and more lively, and, as the brochures will tell you, a different beach for every day of the year.

Since colonisation in 1632 by the English, Antigua & Barbuda remained in British hands, apart from a brief foray by the French, until gaining independence in 1981. Antigua was used as a British naval base in the colonial wars of the 17th and 18th centuries, with English Harbour as headquarters and ship repair station. The politics of the island were somewhat tempestuous in the early 1990's.

English Harbour (with Falmouth Harbour next door) is one of the meccas of Caribbean cruising. Nelson's carefully preserved dockyard, nestling in a secure anchorage, provides an attractive traditional backdrop to the modern yachting scene. Antigua Race Week, starting in the last week of April, is an internationally popular spot on the fun racing calendar. Many of the world's premier charter yachts are based here in the winter months.

Needless to say, all manner of facilities are available for yachts in the immediate area, and one can anchor or tie up at several places, both in English Harbour and in Falmouth Harbour. English Harbour, Jolly Harbour, St Johns and Crabb's Marina are all ports of entry.

BARBUDA lies about 30 miles north of Antigua, and is a somewhat reluctant partner to the bigger island. The people are descended from slaves brought over to cultivate food and livestock for the Codrington estates on Antigua. They are few in number, but very independent, and not at all keen on the advent of mass tourism, which they resist.

The island is low, and quite stunning, with mile upon mile of white beaches and turquoise water. There are several anchorages along the south and west coasts. Entry may be made at the Boat Harbour, but only for Barbuda itself.

MONTSERRAT is a delightful lush green volcanic island, peopled by friendly relaxed locals. It is known as the Emerald Isle, for its colour and its Irish heritage, and has its own small cotton industry. Montserrat is a self governing British Colony. There are several worthwhile excursions to make on the island, to waterfall, soufrière and forest, and not least, to experience the tranquil charm of the island and its people.

Entry can be made at Plymouth, the capital, which will provide the basics of water, fuel and provisioning. There are several anchorages up the west coast from Plymouth, although the sand is volcanic except in the far north. The anchorages tend to be rather exposed, so pick and choose with regard to the swell.

CARIBBEAN OCTOBER

PRESSURE

Mean barometric pressure in October ranges from 1017 mb in the NW of the Gulf of Mexico to 1010 mb off the Colombia coast.

The 1016 mb isobar runs ENE from the Gulf coast in 27°N to cross Florida in 30°N. The 1014 mb isobar runs ENE from the Gulf coast in 22°N to pass just south of Florida going E through the Bahamas and then trending ESE to 18°N 60°W. The 1012 mb isobar runs from the head of the Gulf of Honduras through Jamaica and then ESE to 12°N 60°W. Pressures along 15°N are 1011 mb at 82°W, 1010.5 at 75°W, 1011 mb at 72°W, 1012 mb at 65°W.

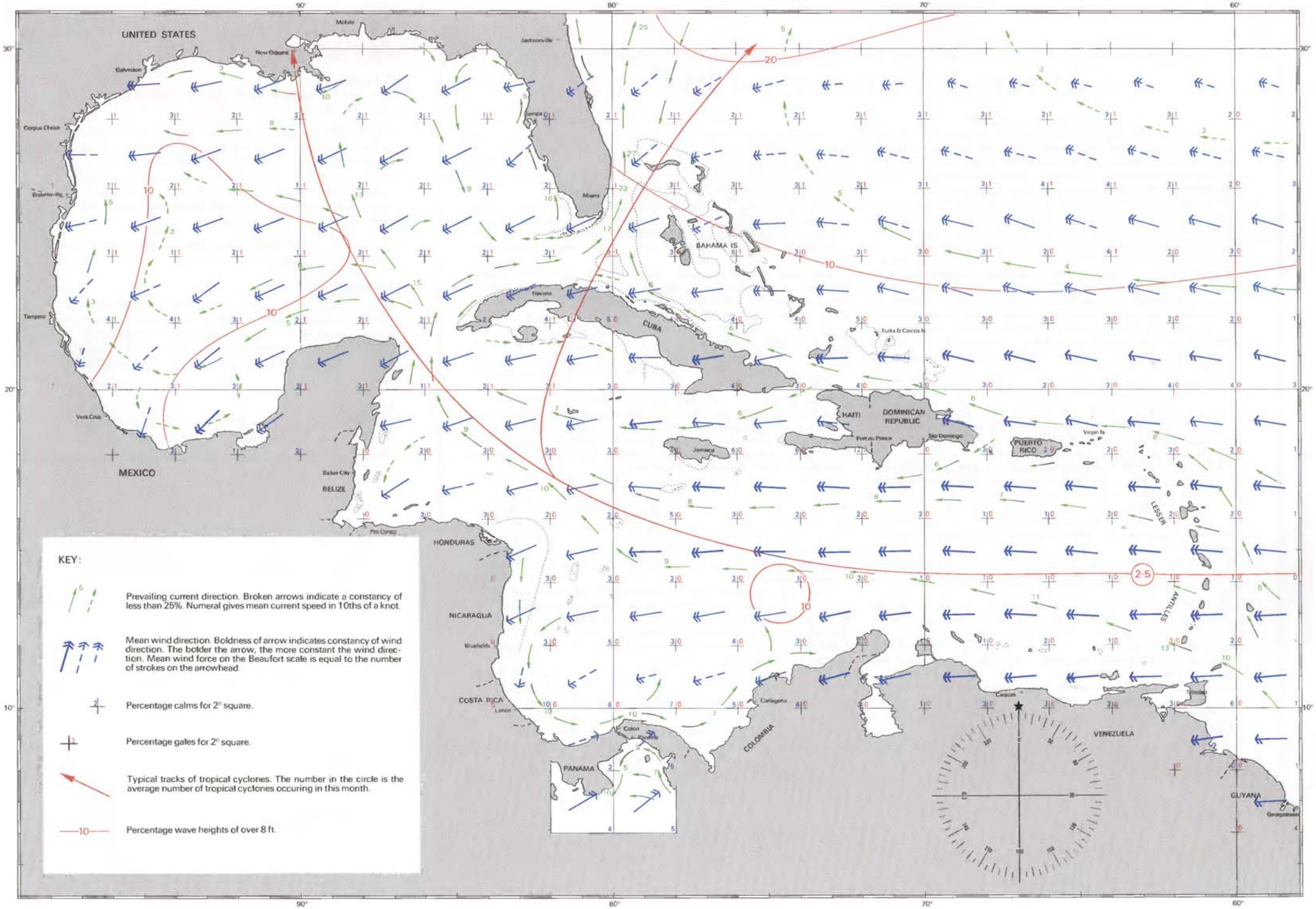
Mean pressures in the Lesser Antilles are 1013.5 mb in the Virgin Islands, 1012 mb in the central Grenadines, and 1011.2 mb in Trinidad.

TROPICAL CYCLONES

The hurricane season continues into October with the frequency of tropical cyclones diminishing significantly from September. An average of 2·5 tropical storms occur during the month, with a little over half of these reaching hurricane strength. Most storms form over the western Caribbean, but a few are spawned near the Lesser Antilles. The preferred storm tracks leading from the Caribbean either head towards the US Gulf coast or recurve across southern Florida towards open water.

TEMPERATURE

Temperatures are significantly lower this month in the Gulf of Mexico, and mean air temperatures range from 24°C in the north of the Gulf of Mexico to 28°C in the Caribbean. Temperatures in Florida are 25°C or 26°C.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN OCTOBER

CARIBBEAN CRUISING GUIDE

ANGUILLA TO NEVIS

ANGUILLA is small and arid, but blessed with many fine white sand beaches, and clear water. The island is possibly best known for its struggle against federation with St Kitts & Nevis, finally leading to Anguilla's chosen status as a British Dependent Territory in 1980. The economy is based on tourism and offshore banking.

It is best to clear in at Road Bay. Much of the island's coastline lies within marine park conservation areas, and there are several restrictions on anchoring, fishing, and nude sunbathing, of which yachtsmen should be aware. Facilities for provisioning are adequate.

St MARTIN/St MAARTEN is divided between the French part in the north, which is administered by Guadeloupe, and the Dutch part in the south, which is part of the Netherlands Antilles. The island is the shopping capital of the Caribbean – huge numbers of tourists visit to take advantage of the duty free shopping, and it is a major cruise ship destination. There are good anchorages around, and within the island. There are many marinas, and full facilities for yacht refits and repairs abound. Ports of entry are Philipsburg, Marigot, and Anse Marcel.

St BARTS is a French free port, governed from Guadeloupe, and is a charming up market island of splendid beaches and lush hills. The locals are mainly of French descent, and are well known for their honesty. Entry is made in Gustavia, an attractive land locked harbour, where there is good provisioning and some repair facilities for yachts. There are a few anchorages on the south and west coasts.

SABA is part of the Netherlands Antilles, a rare unspoiled gem occupied by charming and ingenious people, many of European descent. The rugged coast to this high island has made access difficult, and tourism is small scale. Entry is made in Fort Bay in the SW. Anchoring around the island is restricted for conservation. Facilities for yachts are few. The diving is excellent, and the interior is a delight.

St EUSTATIUS (STATIA), also a part of the Netherlands Antilles, became known as the Golden Rock in the 18th century in its heyday as an entrepôt, trading between the other colonial powers. This was eventually stopped by the British, and subsequent changes in sovereignty led to decline. Tourism has not yet taken hold on the island, and it is pleasant and welcoming. There are some nice walks on the island, and the diving is excellent. Entry is at Oranjestad; this is the best anchorage on the island. Few facilities for yachts, but reasonable day to day provisioning.

St KITTS & NEVIS became independent within the British Commonwealth in 1983, and was the first British settlement in the area. The long history of the sugar industry and colonial wars is reflected in the monuments on the islands. Entry is made in Basseterre on St Kitts and Charlestown in Nevis. There are several anchorages in the south of St Kitts. Basic facilities for yachts and provisioning are available.

THE VIRGIN ISLANDS

The Virgin Islands consist of the British Virgin Islands (BVI) to the east and the US Virgin Islands (USVI). Their different histories give them different flavours; the USVI are more built up, and have long been a tourist destination for the US. By contrast, the BVI are relatively quiet and unspoiled, but nevertheless very popular.

Both groups offer unparalleled cruising in clear blue water, with a vast choice of anchorages. Navigation is generally straightforward, and there are many fine beaches, both busy and quiet. It is not for nothing that the Virgin Island group is the charter capital of the Caribbean.

The British Virgin Islands comprise Tortola, Virgin Gorda, Anegada, Jost van Dyke and over 50 smaller islands. The capital is Road Town on Tortola. The BVI is a British colony, originally settled by the Dutch. The islands are hilly and well covered, but fairly dry.

The diving in the BVI is extensive and highly regarded, with many reefs and wrecks. Much of the coastal areas are within a system of national conservation parks, and there are regulations covering anchoring, fishing and other watersports, of which yachtsmen should be aware.

Ports of entry for the BVI are Road Town and West End on Tortola, Yacht Harbour on Virgin Gorda, and Great Harbour on Jost van Dyke. There are several large marinas in and near Road Harbour, and extensive facilities for yacht repairs and lift outs. The shopping in Road Town is good. Tortola and the nearby islets have many good anchorages, some with docks or marinas.

Jost van Dyke offers numerous attractive anchorages but no marinas. There is a marina on Virgin Gorda (Virgin Gorda Yacht Harbour), and several anchorages including the well known Baths at the south of the island. Anegada is a low island, very different from the rest of the BVI. The island is surrounded by a reef, which makes navigation tricky; some bareboat companies do not allow their yachts there. The reef has been the final port for many a wreck, which makes for interesting diving.

The USVI consists of over 60 small islands and three large ones; St Croix, St Thomas, and St Johns, situated between Puerto Rico and the BVI. The islands were variously settled by the Spanish, English, French, and latterly the Danish, from the mid 18th century. The Danes eventually sold the islands to the US in 1917, and the USVI is now an unincorporated US Territory.

The USVI is fairly industrialised, and the cost of living is high. Ports of entry are in St Thomas Harbour, Cruz Bay on St Johns, and at Christiansted on St Croix. Charlotte Amalie, in St Thomas Harbour, is the capital of the USVI, and there are marinas and full repair and refit services available there and in several other locations on St Thomas. St John is a quieter island, with some facilities in Cruz Bay. St Croix is the largest island in the Virgins and is 35 miles to the south of the rest. There is a marina at Green Cay, to the east of Christiansted.

CARIBBEAN NOVEMBER

PRESSURE

Mean barometric pressure this month ranges from 1019 mb in the N of the Gulf of Mexico to 1010 mb off the coast of Colombia.

The 1018 mb isobar leaves the Gulf coast in 27°N curving through 26°N 92°W to cross Florida in 28°N. The 1016 mb isobar crosses the Gulf of Campeche and the Yucatan channel to pass over the north end of Cuba and through the Bahamas in 25°N 75°W. The 1014 mb isobar runs from the head of the Gulf of Honduras to southern Cuba, thence along the northern coast of Haiti/Dominican Republic eastward. Along 15°N, mean pressures are 1012 mb at 82°W, 1011 mb at 76°W, 1012 mb at 66°W.

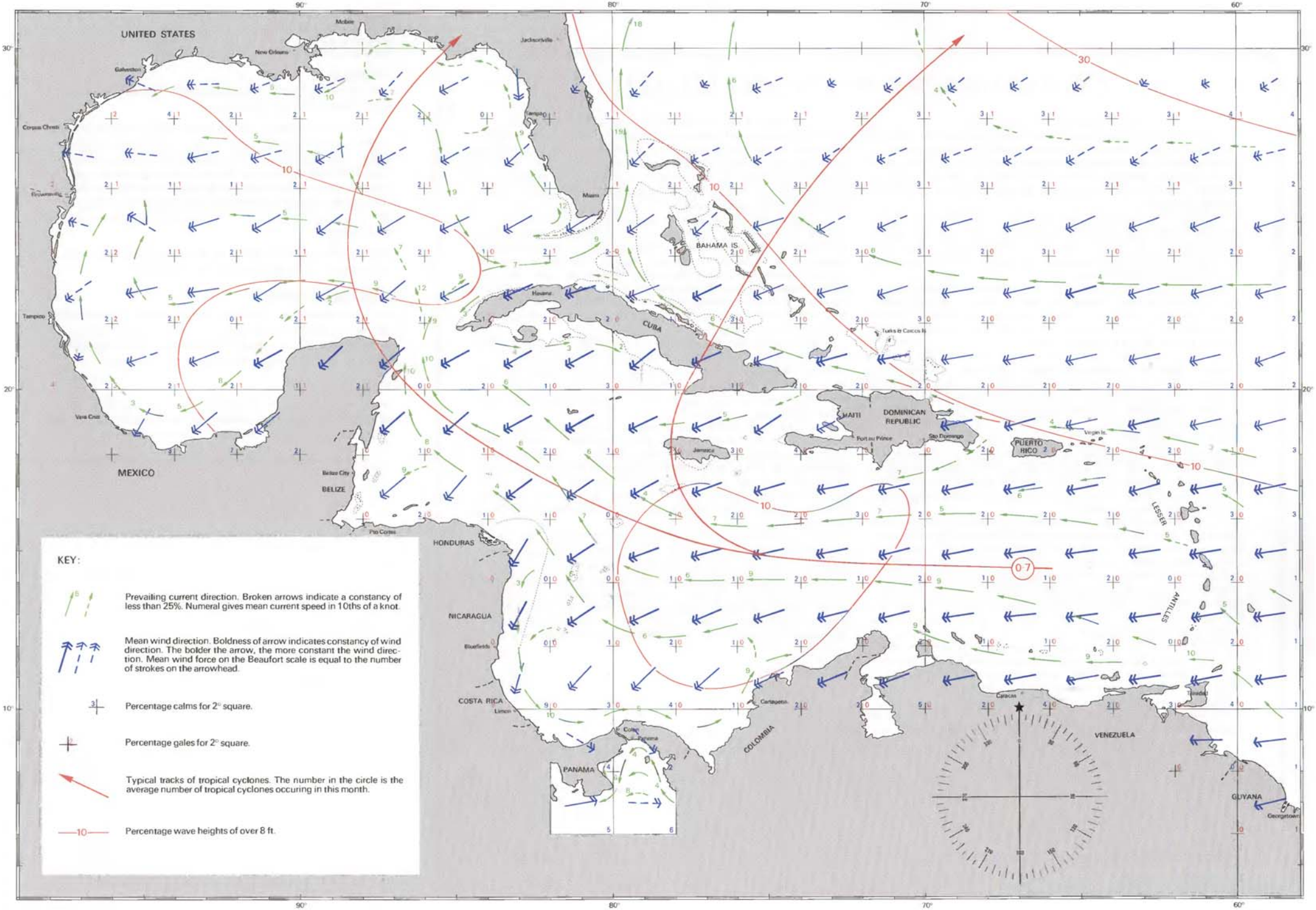
Mean pressures in the Lesser Antilles range from 1013.5 mb in the Virgin Islands through 1012 mb in St Lucia to 1011 mb in Trinidad.

TROPICAL CYCLONES

Tropical cyclone activity has decreased substantially since the warmer months. There is a likelihood of 0.7 tropical storms this month, with 0.3 of these reaching hurricane strength. Most of these storms develop over mid-Caribbean with preferred tracks either crossing the Yucatan peninsula bound for the eastern Gulf States, or crossing Cuba and heading northeast over the Bahamas into open water.

TEMPERATURE

Mean air temperatures range from 20°C in the north of the Gulf of Mexico to 27°C or 28°C in the Caribbean this month. Mean temperatures in Florida range from 20°C to 24°C.



PILOT CHART – CARIBBEAN SEA

CARIBBEAN NOVEMBER

CARIBBEAN CRUISING GUIDE

THE GREATER ANTILLES

The islands of Cuba, Hispaniola (comprising Haiti and the Dominican Republic) and Puerto Rico are less visited by cruising yachts, for various reasons, both political and geographical. Jamaica and Haiti are not popular destinations, but Cuba and the DR especially are relatively unknown, and essentially friendly countries with huge cruising potential.

CUBA is the largest of the islands in the Caribbean. It is blessed with a favourable climate, a varied landscape and an abundance of natural harbours. Cuba welcomes yachts, and there is no theoretical impediment to travelling there, except perhaps for US citizens during the occasional political hiatus.

Spain colonised Cuba during the 16th century; the Spanish ruled until the end of the 19th century brought uprisings and intervention by the US, who handed the country over to the Cubans. Castro's communists have been in power since 1959, and there has been a move to a more mixed economy of late.

It is best to enter the country at a marina, as the staff will assist in clearance. They are: Hemingway Marina (Barlovento near Havana), Acua and Gaviota (in Varadero), Bahia Naranjo (Holguin), Punta Gorda (Santiago de Cuba), and Cayo Largo (in the S cays). Call in on VHF before entry. There are few facilities for yachts, and provisioning is problematic.

The DOMINICAN REPUBLIC has been described as "the undiscovered Caribbean"; the country seems reluctant to sell itself. Columbus discovered the island at the end of the 15th century, so beginning the colonisation process in the Americas. Independence was declared in 1844; since then the country has spent much of the time under the rule of dictators.

It is an extraordinarily varied country. The landscape is almost European Alpine in the mountains, where strawberries are grown. There are rice paddies and tobacco plantations on the plains, and coconut palm ranches on the coast. The people, of mixed Spanish, Amerindian and African descent, are friendly and welcoming.

Yachts may enter at Luperon, Puerto Plata, Samana, La Romana, Santo Domingo and Haina. Facilities specifically for yachts are few, but provisioning is good, and most repairs can be arranged, in Puerto Plata and Santa Domingo.

PUERTO RICO is an Overseas Commonwealth Territory of the US. After playing its part in the colonial wars, the Island was ceded to the US at the end of the 19th century. It is an attractive island and the people are friendly, especially in the country areas.

There are good yachting facilities in and around San Juan and Ponce, and many anchorages around the coast. Yachts may enter in Culebra, Ponce, San Juan, Mayaguez, Guanica and Playa de Fajardo.

WEATHER FORECASTS & HURRICANES

There is a certain risk attached to sailing in the Caribbean during the hurricane season, and it seems to be a risk that is being increasingly taken by sailors. There is the option of heading south. There is extensive cruising to be had in Venezuela and its offshore islands, and the ABC islands. There are many facilities now in Trinidad, and even Grenada is at the southern edge of the hurricane belt.

If a skipper decides to sail in the hurricane belt during the season, then it is essential to listen to a weather forecast every day. In addition to broadcasts transmitted from the US, there are many local stations with forecasts, and some regional ones, such as Radio Antilles, broadcasting from Montserrat. The various ham nets, and VHF nets, provide weather information, and quite a few yachts these days receive regular weather forecasts via satellite. Ask around for the best forecasts in your area. That done, early warning of the approach of a hurricane will be assured.

In the season, one should keep the possibility of a hurricane in mind, and think ahead about strategy in the unhappy event of one arriving. There is a choice – put to sea, or find a hurricane hole. Skippers should be aware of hurricane holes in their area and have a feel for how secure they might be for the various paths that a hurricane might take.

There are many well known hurricane holes spread through the islands – they are documented in cruising guides, as well as being known by many skippers. Therein lies a problem – these anchorages are likely to be very crowded. Recent experience has shown that a well found yacht may well be able to ride out a hurricane at anchor, but is at great risk from damage from other yachts, perhaps less well found or even unattended. This should be borne in mind when considering strategy.

I am reluctant to name specific hurricane shelters for this reason. There may even be a suitable hole nearby which is relatively unknown. Look for shelter from all four points of the compass if possible. Mangrove swamps provide good protection if you can drive your yacht in amongst the trees; especially effective for shallow draught yachts. Think through the points from where the wind will blow and make sure that you're well set to cope with them all, bearing in mind that hurricanes often make unexpected twists and turns.

CARIBBEAN DECEMBER

PRESSURE

Mean barometric pressures in December range from 1020 mb in the N of the Gulf of Mexico to 1010 mb off Colombia.

The 1019 mb isobar passes from the Gulf coast, in 27°N, east to pass just south of Florida. The 1017 mb isobar crosses the Gulf of Campeche and passes from Cozumel to Cuba, where it lies in 22°N, and continues east on that latitude. The 1015 mb isobar curves up from the head of the Gulf of Honduras to pass between Jamaica and Cuba, and through the centre of Haiti/Dominican Republic and Puerto Rico, and thence eastward. Pressures along 15°N are 1014 mb at the Mosquito coast, 1013 mb at 80°W, 1012.2 mb at 77°W, 1013 mb at 70°W, 1013.7 at 60°W.

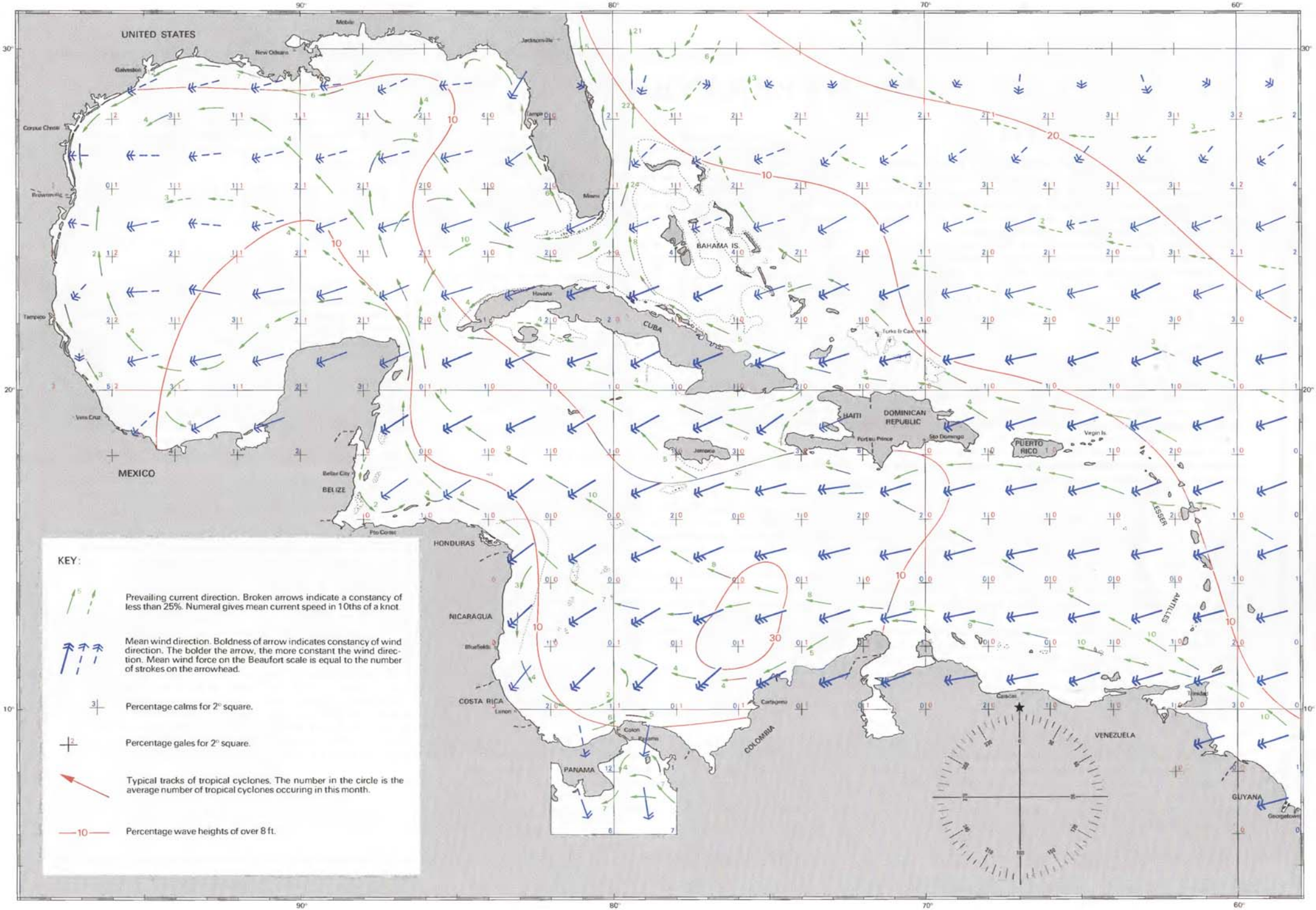
Mean pressures in the Lesser Antilles are 1015 mb in the Virgin Islands, 1014 mb in Guadeloupe, 1013 mb in St Vincent, 1012 mb in Trinidad.

TROPICAL CYCLONES

Few tropical cyclones occur in the North Atlantic in December. Over the hundred years to 1975, only 7 tropical storms have been recorded, and 3 of these occurred in 1887. Of these 7 storms, 5 reached hurricane strength, which supports the adage that early or late cyclones are more likely to be violent ones.

TEMPERATURE

Mean air temperatures in the Gulf of Mexico range from 16°C in the north to 24°C in the south. Temperatures in Florida range from about 18°C to 23°C. Mean temperature in the Caribbean is 26°C, and 27°C in the southern part.



KEY:

Prevailing current direction. Broken arrows indicate a constancy of less than 25%. Numeral gives mean current speed in 10ths of a knot.

Mean wind direction. Boldness of arrow indicates constancy of wind direction. The bolder the arrow, the more constant the wind direction. Mean wind force on the Beaufort scale is equal to the number of strokes on the arrowhead.

Percentage calms for 2° square.

Percentage gales for 2° square.

Typical tracks of tropical cyclones. The number in the circle is the average number of tropical cyclones occuring in this month.

—10— Percentage wave heights of over 8 ft.

PILOT CHART – CARIBBEAN SEA

CARIBBEAN DECEMBER

MEDITERRANEAN WEATHER

General

The Mediterranean has an agreeable climate, with long hot summers and mild winters. Storms are few in the summer, when long periods of fine weather are the norm. In the winter months, depressions are more frequent, generally tracking in an easterly direction. The most unsettled weather occurs in the winter, but there is often a period of calm weather in the middle of the winter months.

The weather in the Mediterranean is often strongly affected by local conditions, such as land and sea breezes, "williwaws", and other disturbances due to local topography. Rainfall is moderate, mostly occurring in the winter months; as the rain is usually fairly concentrated, clear skies are common. Seas in the Mediterranean tend to be short, except when subject to winds of long duration and fetch, which are infrequent.

PRESSURE

The features dominating the weather in the Mediterranean are the extension of the Azores High into the area in the summer, the low pressure area to the east of the Mediterranean in the summer, and the depressions moving eastward through the area, mainly in winter. The ridge of high pressure extending from the Azores High lies over North Africa in the winter, but moves northwards in the summer to lie in the Western Mediterranean Basin, giving rise to prolonged periods of stable conditions with light winds.

WINDS

Winds in the Mediterranean have a reputation for being fickle and erratic, due no doubt to the fact that the winds in summer are often light and variable, the only ample winds deriving from a disturbance of some sort. Overall the winds are light or moderate, and show a slight predominance of wind from the northwest. The winds tend to be local in character, and their regional characteristics are given below.

The area between the Balearics and Sardinia, and northwards, is most subject to gales, which are usually mistrals from the north. Land and sea breezes are a prominent feature of Mediterranean weather, especially in the summer months, and can be quite strong. Katabatic winds occur in coastal waters, sometimes creating strong gusts of wind off high ground in the evenings.

CURRENTS

Currents in the Mediterranean are very variable and much dependent on the wind. With the exception of the east going current through the Strait of Gibraltar and along the Africa coast between Gibraltar and Cap Bon, the currents of the main circulations are general trends only and the surface current will tend to be set up by any moderate or strong winds in the area.

VISIBILITY

Visibility in the Mediterranean is generally good, fog being uncommon over the open sea. Local areas affected by fog are Gibraltar and the Alboran channel, the Balearic islands, off SE Sardinia, and in the Sicilian narrows, especially towards the Sicilian coast.

Radiation fog may be encountered on several days a month in winter in sheltered and low lying regions, especially in conjunction with a source of industrial smoke. Forming on clear calm nights, this fog usually disperses with the sunrise.

With strong southerly winds off the African coast (Sciroccos), visibility may be restricted by sand and dust blown off the land. This gives the surroundings an eerie colouring and orange dust of infuriating tenacity is deposited on the deck.

Regional

REGIONAL WINDS

The regional winds of the Western Mediterranean are characteristic of the area and are summarised below. All these winds are associated with depressions moving eastward along the north, central, or south Mediterranean. Depressions and gales are less common in the summer months, and periods of unsettled weather often occur in the spring and autumn. There are sometimes long periods of settled weather in the winter.

MISTRAL (*MESTRAL* in Italy, *TRAMONTANA* in Spain) A strong cold dry wind from the N or NW associated with a depression in the Gulf of Lions or the Gulf of Genoa. This wind occurs frequently in the winter. It strengthens offshore, and mainly affects the area from the Balearics to Sardinia and northwards.

VENDEVALES (*LIBECCIO* in Sardinia) Strong SW'ly winds which blow between the Spanish and African coasts, associated with depressions moving east into the Mediterranean through Spain or Southern France. Violent squalls and thunderstorms usually accompany the onset of this wind, which sometimes reaches gale force, although it does not usually maintain this strength for long.

SCIRROCCO (*GHIBLI* in Libya, *KHAMSIN* in Egypt) A hot wind from a southerly direction, which may be dry or humid, and sometimes bears red or brown dust from the desert. Usually associated with a depression moving eastward along the N coast of Africa.

LEVANTE (*LEVANTER, LLEVANTADE*) NE'ly wind of long fetch at the Spanish coasts, associated with a depression situated between the Balearics and the northern Sahara. These winds are likely to reach gale force in the spring and autumn months, and affect the central Spanish coasts. Called a Levanter at Gibraltar, where it blows from the E and may be strengthened by a depression to the south, and by funnelling effect.

GREGALE A NE wind prevalent over the Ionian Sea, S Italy, Sicily and Malta, in the winter months, when it sometimes reaches gale force. This wind is associated with depressions moving along the central Mediterranean.

BORA A strong cold dry wind blowing from the N or NE in the Adriatic, from October to May. The Bora is more severe at the head of the Adriatic, and can blow with some violence.

GIBRALTAR TO GREENWICH MERIDIAN

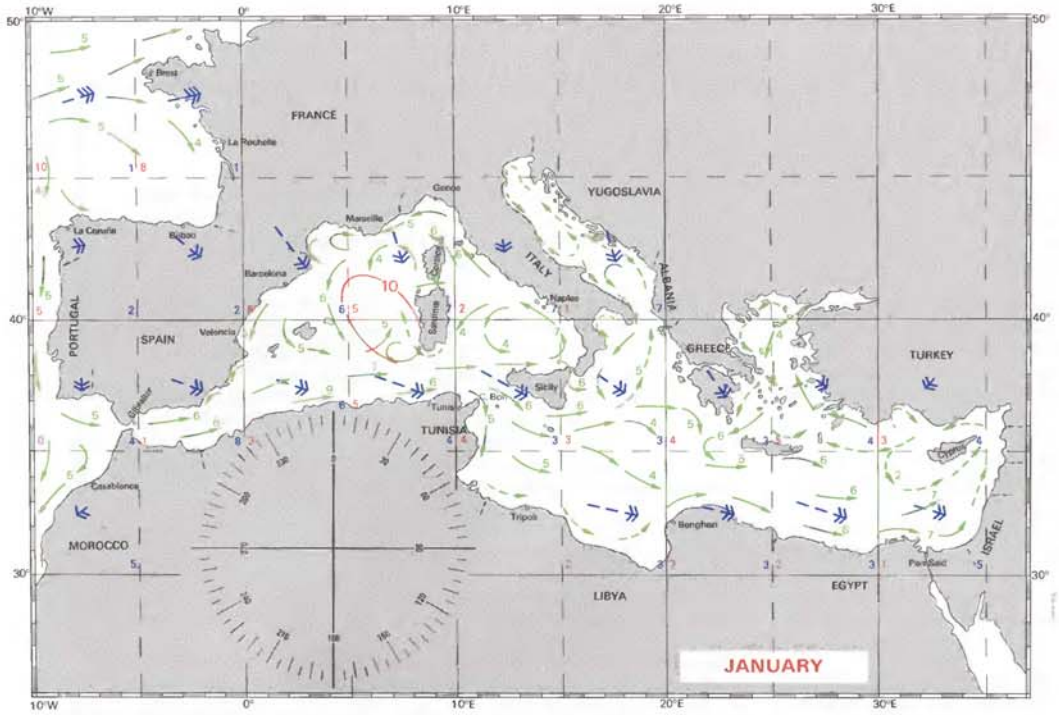
WINDS Winds in the Strait of Gibraltar and the Alboran Channel tend to be either from an E'ly or W'ly quarter, being slightly more common from the W in winter, and from the E in summer. Easterly winds (Levanters) are often accompanied by low cloud or fog, severely reducing visibility. During a levanter, there are often squalls in the Bay of Gibraltar, and steep seas can be caused in the Strait. A passage through the Strait with a contrary wind can be trying, due to the traffic density, the short seas, and the possibility of reduced visibility. Gales are normally from W or E, Vendevales from the W or SW predominating. Gales are most frequent from November to March, when winds of force 7 and over show an incidence of 2% over the area, but the incidence is greater locally. Gales are rare in July and August.

Coastal winds on the Spanish and Africa coast in this area are much affected by land and sea breezes. The winds on the coast of Spain are generally offshore in winter and onshore in summer.

CURRENTS There is a net inflow of surface water through the Strait of Gibraltar, E'ward into the Mediterranean. This current is strongest on the S side of the axis of the Strait, where it runs at mean rates of up to 2 knots, and a maximum rate of up to 4 knots. The current rate decreases at either side to become negligible close to the coasts, and is very dependent on the wind. Strong tides exist in the Strait (up to 2 knots in the axis and 3 knots closer to the coasts), so with an eastward current and an east running tide, surface water movement can attain 6 knots. Navigation charts show tidal streams related to High Water Gibraltar, and traffic zones.

In the Alboran channel, the current is predominantly easterly, at a mean rate of about ¾ knot, but within 50 miles of Gibraltar the current is extremely variable; sets of up to 3 knots setting E or W may be found. There is an inshore westerly current between Ceuta and Cabo Tres Forcas of about 1 knot. West of Cabo de la Nao a weaker SW'ly counter-current is experienced along the Spanish coast, which may extend to Cabo de Gata.

VISIBILITY, RAINFALL & TEMPERATURE Fog is most frequent in this area in summer, observations reaching about 4% in August. Visibility is also restricted by dust haze as a result of a scirrocco wind, especially in the summer.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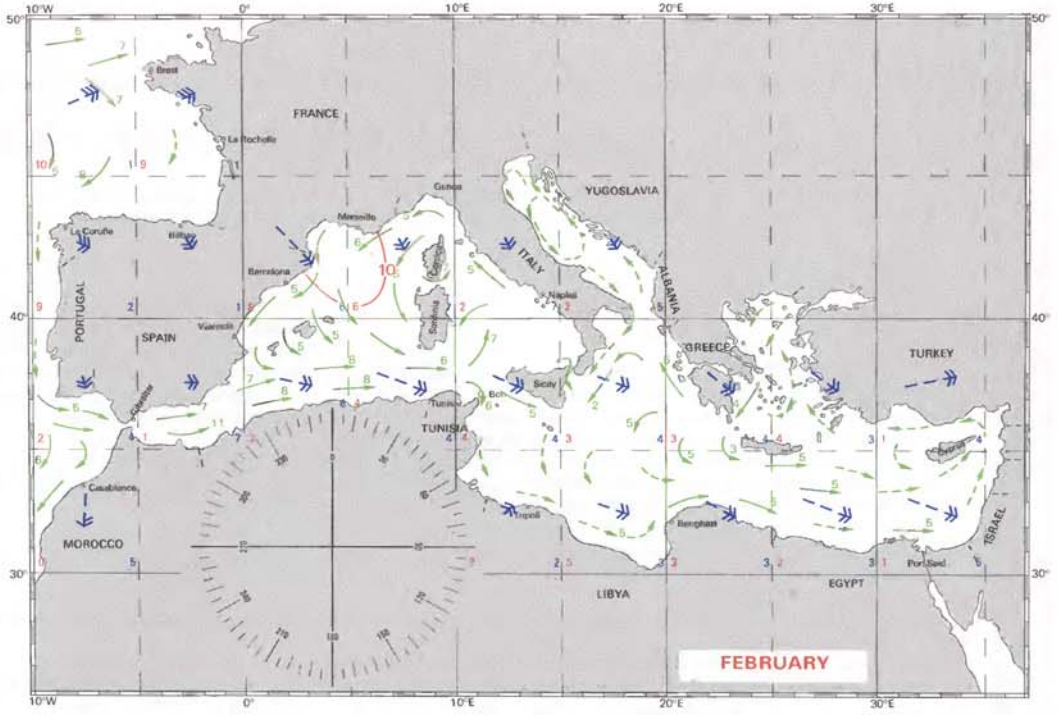
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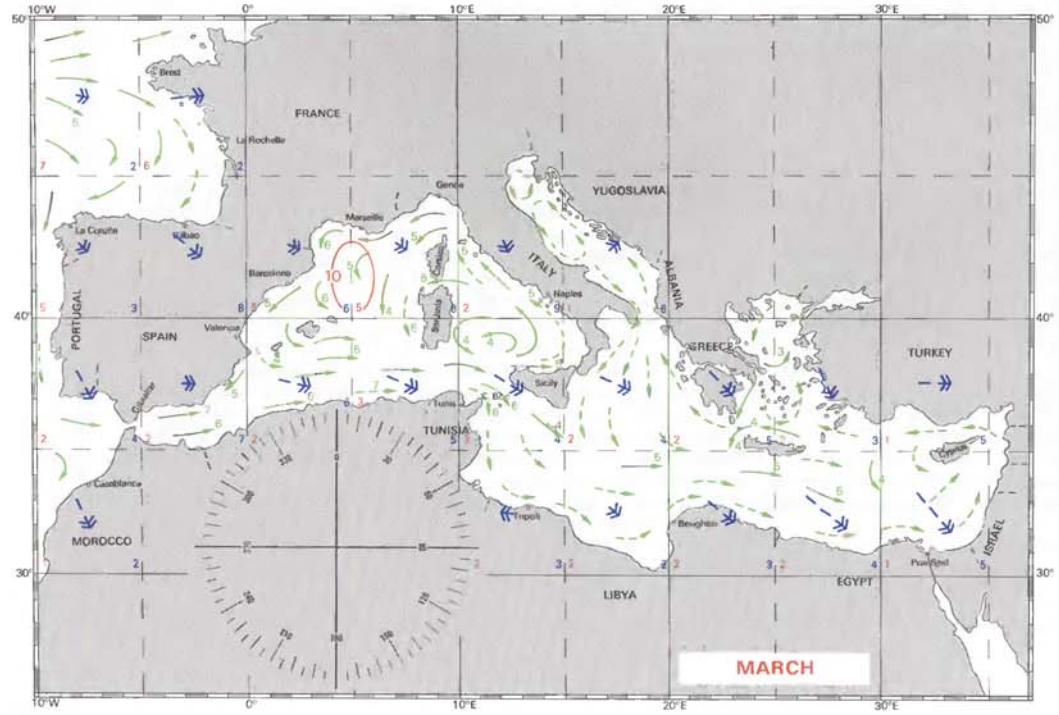
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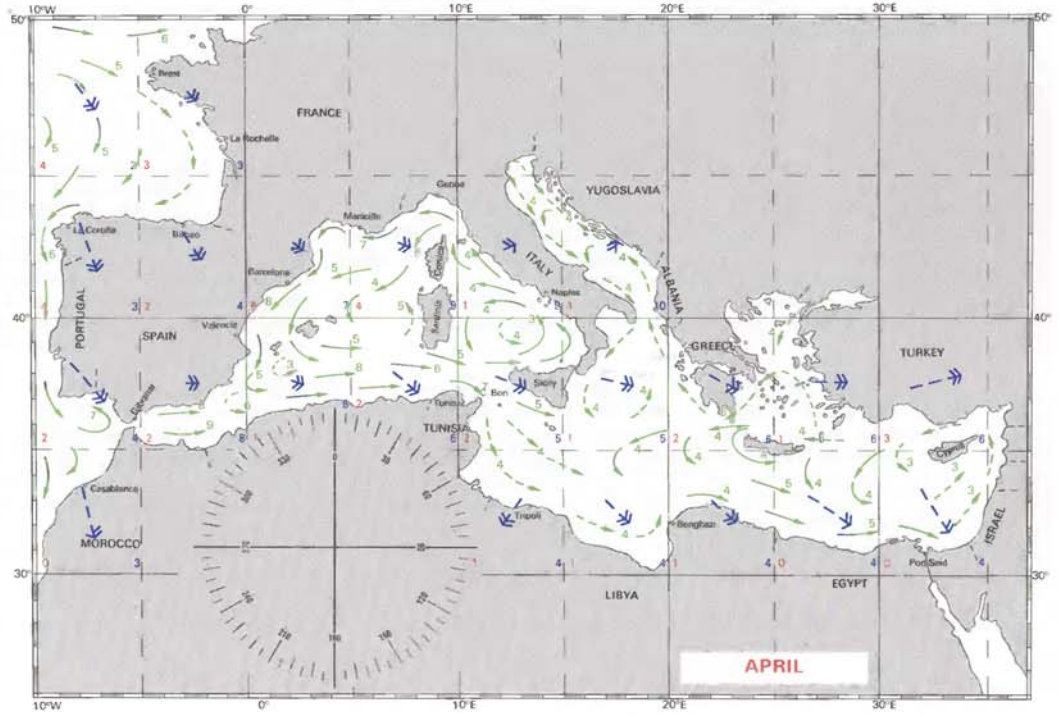
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Gibraltar has about 75 cm of rain over the year, most of it falling in the winter months, especially January. Rainfall is somewhat less in the rest of the area.

Mean air temperatures range from 24°C in August, to 14°C in January, being slightly warmer on the Africa coast.

NORTH AFRICA COAST (GREENWICH MERIDIAN TO CAP BON)

WINDS Offshore, west of 6°E, the wind is mainly from W or SW from November to February. From March to May, and in October, W'lies and SW'lies occur in equal proportion to winds from E and NE. From June to September, winds from E and ENE are most common. Gales occur mainly in the winter months, and are usually from a W'ly direction. East of 6°E, winds from W and NW increase in predominance with distance eastward, being the predominant wind off Cap Bon in all seasons. Gales here are slightly more frequent, and mainly from the N or NW. Winds of force 7 and over show an incidence of up to 5% in January, but are rare in the summer.

In coastal waters, W winds predominate in winter, while in summer, during the day, winds from NE and N prevail. In this area there are strongly developed land and sea breezes, which supersede the prevailing winds. The area is subject to scirocco and levante winds.

CURRENTS The current flows E along the Algerian coast at a mean rate of ½ knot, and may well be reduced or augmented by the wind. East going currents of 4 knots have been recorded after several days of westerly winds. Off Tunisia the currents follow the general easterly circulation; inshore the currents are more variable, and mainly wind driven.

VISIBILITY, RAINFALL & TEMPERATURE Visibility in the area is generally good, although it is sometimes reduced by heat haze in the summer. A Scirrocco from the south can bring a dust haze; this is especially common in the summer months and more frequent in the west of the area.

Thunderstorms are common on this coast, especially at the onset of the wet season in September or October. Annual rainfall ranges from 75 cm in Algiers to 40 cm in Tunis.

Mean air temperatures range from 25°C in August, to 14°C in January. The mean daily maximum at Algiers in August is 30°C.

SOUTH EAST COAST OF SPAIN (N OF CABO DE LA NAO), BALEARICS

WINDS Winds in this area are variable, more often being offshore in winter and onshore in summer, and modified by sea breezes and local topography near the coast. In the Balearics, the dominant wind is from the N and NE especially in the winter. Gales are rare from May to September in the southern part of the area, but become more common closer to the Gulf of Lions, where Mistrals from NW account for up to 2% of observations in July and August. Gales are more frequent in the winter, the area being subject to Mistrals and Lleventades. The gales are usually from between W and NE through NW. Winds of force 7 and over account for 5%–10% of observations in January, the incidence increasing northward.

CURRENTS The trend of the currents in this area is SW at about ½ knot. At Cabo be la Nao and in the Balearics the current turns SE to join the eastward flow off the coast of Africa. From August to October, this eastward flow sometimes broadens to give ENE'ly currents around the Balearics. South of the Balearics the current usually has an easterly component.

VISIBILITY, RAINFALL & TEMPERATURE The Balearic islands are susceptible to fog, which makes up 4% of observations in January and February, less in other months.

Annual rainfall in Palma is 46 cm, and in Barcelona 56 cm, autumn being the wettest season in both places. The southern part of this area on the mainland can be very dry.

Mean air temperatures over the area range from 24°C in August to 14°C in January, being slightly warmer in the south.

SOUTH COAST OF FRANCE, WEST COAST OF ITALY, CORSICA, SARDINIA

WINDS Offshore, in the N of the area, winds in winter show a predominance from the N'ly sector, from between W and NE. Gales are relatively frequent in the Gulf of Lions, from N or NW, becoming less frequent with distance eastward. Between the Balearics, Corsica and Sardinia, winds show a slight predominance from the NW. Gales are most frequent in the winter, reaching a 10% incidence (force 7) in January, and are usually from N or NW.

In the S and W of the Tyrrhenian Sea winds at sea are fairly evenly distributed in the winter, with NW'ly winds becoming predominant in the summer. Gales are not very frequent in winter (up to 3%), and are mostly from between N and W, with a few from the NE.

Closer to the coast, the Gulf of Lions is well known for sudden changes of wind. The area is mainly subject to Mistrals, cold dry and fresh winds from N or NW, and Marins, from E or SE. Mistrals dominate, and typically last from 3 to 6 days, but may be modified by a sea breeze in the summer. Their strength diminishes with distance from the Gulf, the weather improving E'ward along the Riviera to the Gulf of Genoa, where the prevailing winds are N'ly in winter, and S'ly in summer. Gales are not so common here, but Libeccios from the SW and SE'ly Sciroccos do sometimes affect the area.

Coastal winds on the W coast of Italy north of Naples are mainly from N or NE in winter, and gales in this area are chiefly S'ly. Winds from S become more prominent to the S of Naples, where gales are less common. The S part of the Italian coast is subject to land squalls near high ground off open valleys, which can be violent close inshore but are not extensive.

The E coast of Corsica is subject to violent local squalls in a strong W'ly wind, off the mouths of valleys opening eastward. This is especially so in the north, where the Libeccio predominates. The W coast in the summer is subject mainly to W'ly winds, backing SW'ly in the south. In winter there is a slight predominance of E winds, sometimes causing squalls off open valleys.

CURRENTS Currents in this area are generally weak and dictated by the wind, but there is a general circulatory trend anti-clockwise in the Tyrrhenian sea and between Corsica and the Balearics. In the Gulf of Lions, onshore winds cause W going currents off the Rhone delta, and S and SE going currents between Sete and Cap Creux.

The current in the Strait of Bonifacio follows the wind; E going currents here can attain rates of 2 knots after a NW'ly gale. Along the coast of Italy the currents tend to be variable, but between Civitavecchia and Naples often set NE near the land.

VISIBILITY, RAINFALL & TEMPERATURE Visibility in the north of this area is generally good, although radiation fog, especially near industrial areas, can occur on calm mornings. Visibility is good when the north winds are blowing, but is often poor in Marin, Scirrocco and Libeccio winds. The area off the SE coast of Sardinia is sometimes susceptible to fog.

Rainfall is moderate over the area, being greater on the Italian coast. Genoa has an annual fall of 132 cm; this decreases south along the coast. Naples receives 89 cm a year. Annual rainfall is about 60 cm in Sardinia and Corsica; more rain falls on the N and W coasts of these islands.

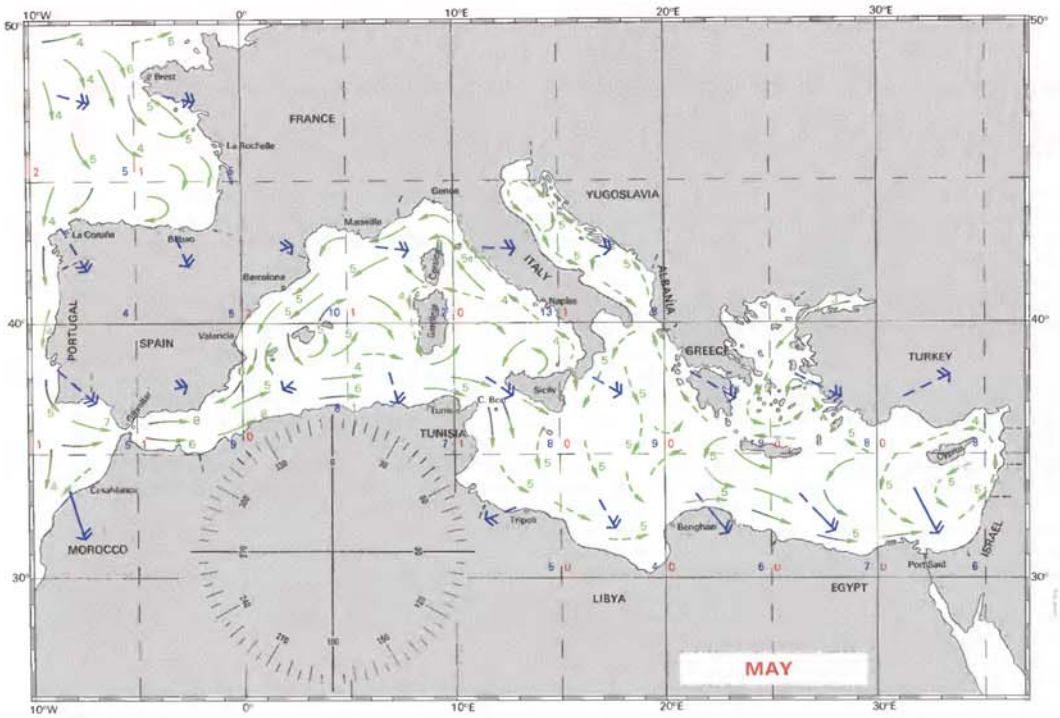
Mean air temperatures over the area vary with latitude, being 11°C in the north and 13°C the south in January, and 23°C in the north and 26°C in the south in August.

SOUTH EAST COAST OF ITALY, SICILY, MALTA

WINDS On the SE coast of Italy, the wind in winter tends to blow from either the N'ly or the S'ly quadrant. In summer the sea breeze becomes dominant and prevails in the daytime. Boras from the N or NE blow in the winter, sometimes reaching gale force, being strong in the afternoons and dying away at night. The SE'ly Scirrocco also affects the area. Off the Golfo di Taranto, the prevailing winds in summer are from NW and N. Further offshore, E of Sicily, the winds are variable in direction. Gales show a 4% incidence in the winter, being mainly from the NE, with a few from the W.

Offshore, SW of Sicily, winds from the W and NW predominate, except in autumn when the winds are variable. Gales, mainly from the W or NW reach a frequency of 3% in the winter months. Some of the winter storms in the Malta area are from the NE or E. The Gregale from the NE is most frequent in February at Malta, and can be somewhat dangerous.

Local winds in Malta are variable, with a slight predominance from the NW. Coastal winds in Sicily are much affected by land and sea breezes, especially in the summer, offshore they are generally from the W'ly quadrant in the winter, and NW'ly in the summer.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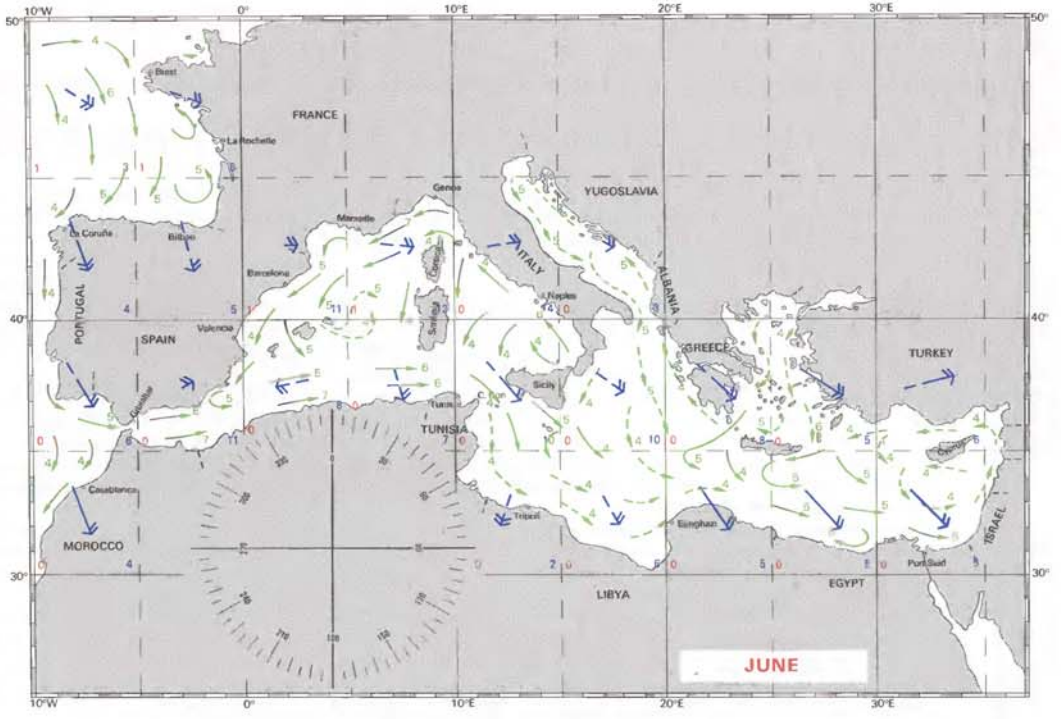
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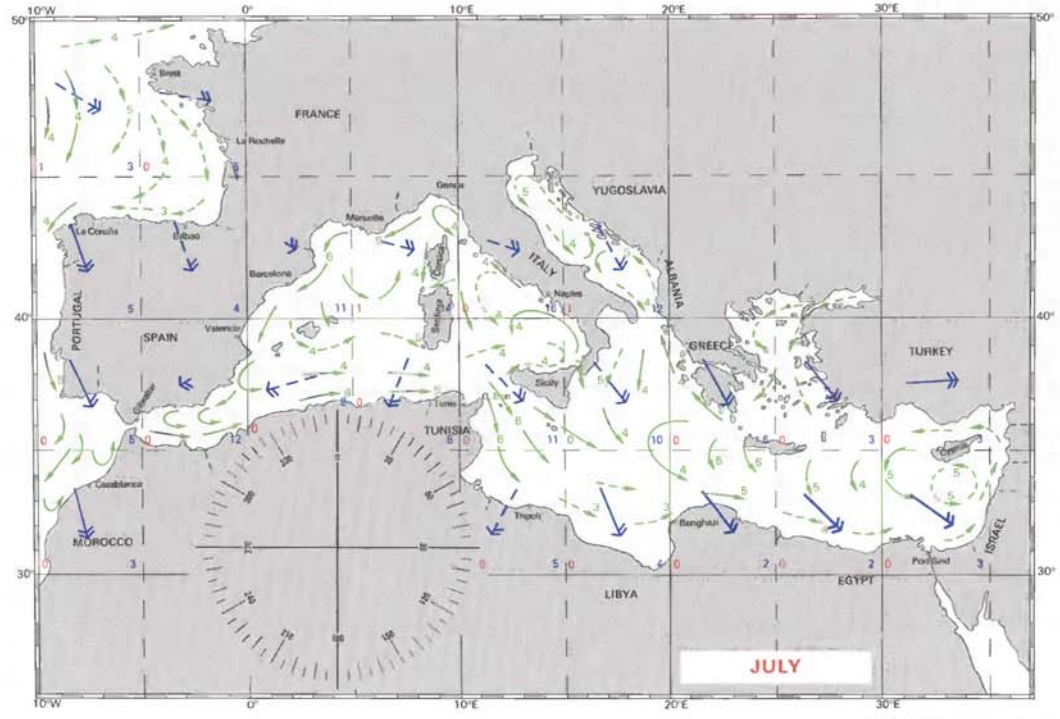
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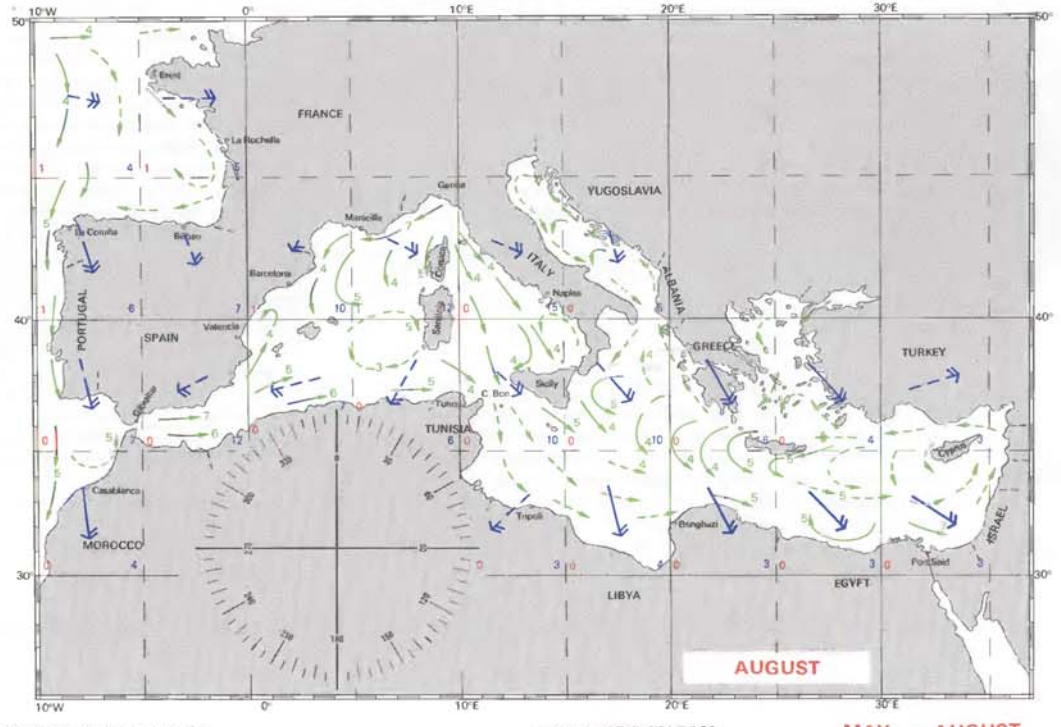
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ISRAEL
AUGUST

In the Strait of Messina the wind is channelled along the strait, being more commonly from N. With the NW prevailing wind outside the north entrance to the strait, there is often a large cloud development associated with violent thunderstorms.

CURRENTS Along and off the S coast of Sicily, part of the main circulatory flow is found, setting SE at about ½ knot, but strong counter- currents and onshore sets can be experienced near the coast. In the Malta channel the current usually sets ESE, but is much affected by the wind. On the northern coast of Sicily, the set is generally eastward, but some westward sets can be experienced. Along the SE coast of Italy the current sets SW towards Sicily, where it divides in the vicinity of Mount Etna, south of which the current flows S at about ½ knot. North of Mount Etna the northerly flow joins the tidal flow of the Strait of Messina.

In the Strait of Messina, salinity and temperature differences cause a southward surface current of ½ knot. This is, however, masked by the tidal flows through the strait, which reach 4½ knots at springs, and 2½ knots at neaps off Punta Pezzo, and last for 6¼ hours in each direction under normal conditions at springs. The strength of the stream diminishes rapidly as the strait widens and deepens. At springs, the north going stream at Punta Pezzo begins 1 ¾ hours before HW Gibraltar; earlier northward, and later southward. The south going stream begins here at 4½ hours after HW Gibraltar, but earlier at neaps, when it runs for about 7 hours, and earlier northward and later southward. A strong N'ly wind can reduce the duration of the north going stream to 3 hours.

Bores (bands of waves, sometimes as high as 4 ft off Punta Pezzo), eddies and whirlpools are features of the Strait of Messina. Some eddies are locally termed "Bastardi", but passage of the Strait presents no great problems to a yacht, provided normal vigilance is exercised.

VISIBILITY, RAINFALL & TEMPERATURE Fog affects the Sicilian Narrows area, especially towards the coast, but to no severe extent. In the Bonifacio Strait, fog is fairly common in the early morning in late spring.

Rain affects the N coasts of the area more than the S coasts, annual falls being 78 cm in Messina and Palermo, but half that in the S.

Mean temperatures in the area are 13°C in January, and 26°C in August.

AFRICA COAST (10°E TO 20°E)

WINDS On the E coast of Tunisia, coastal winds increase in frequency over the NW winds of the north coast with distance south. These winds are offshore in winter and onshore in summer. The Scirrocco from the south also affects this coast, and is often preceded by mirage effects. Offshore, winds from the W and NW predominate, except in autumn when the winds are variable. Gales (force 7 and over), mainly from the W or NW, reach a frequency of about 4% in the winter months.

Off the Libya coast, winds are variable in the winter, and tend to blow from between N and W in the summer, when winds are rather light. The land and sea breezes are well developed along the coast, and often blow at force 4 in the afternoons. Gales are not common, but squalls and strong winds from between N and E occur on the passage of a depression over the land. Sciroccos are here called ghiblis, and can be quite strong along this coast, normally occurring in spring or autumn.

CURRENTS In the channel between Tunisia and Sicily, the main E going circulation is encountered, attaining rates between ½ and 1 knot off Cap Bon, but being very variable in speed and direction in the middle of the channel. The trend of the current over the area is ESE, but a variable counter-current is found in the Gulf of Sirte.

VISIBILITY, RAINFALL & TEMPERATURE Visibility can be affected by Scirrocco winds in this area.

Rainfall is low here; annual rainfall in Tunis is 41 cm, mostly falling from September to April.

Mean air temperatures in the west of the area are 14°C in January, and 26°C in August, and a couple of degrees higher in the east. Temperatures are a little more extreme here; the mean daily maximum at Tunis in July and August is 32°C but the mean daily minimum in January is 7°C.

ADRIATIC & IONIAN SEAS

WINDS Offshore, in the Ionian sea, winds are variable from October to April. In early summer, the Etesian wind from the NW becomes more common, being well established in July and August, when almost all wind is from between W and NE. A gradual return to the winter conditions takes place in September and October.

Over the open sea in the Adriatic, winds in the winter months are variable. Winds from the NW become more frequent in the summer months, but do not attain the consistency to be found further south.

Bora winds affect the Adriatic, especially in winter. This is a cold dry wind, from between N and E, which descends from the mountains with great violence and abruptness. The frequency of boras varies every year, but they are not on the whole very common. The intensity of the boras is greatest in the N of the Adriatic; they are less severe further south, where they tend to be from a more easterly direction. Boras are virtually unknown from June to mid-September.

Scirrocco winds also blow from the SE to SW off the coast of Greece, and from the SE in the Adriatic. This warm damp wind blows in advance of a depression moving eastward, heralded by rising temperature and humidity. It is accompanied by bad visibility, and is most common in the autumn and spring, and least frequent in the summer.

Gales of force 7 and over show an incidence of 4% to 6% in the Ionian sea in the winter months, and about half that in the Adriatic. Gales are rare in the summer.

Coastal winds in the Adriatic are very variable, as the topography is very mountainous and the coastline irregular. Violent squalls can occur in the summer, and are usually associated with thunderstorms. Offshore coastal squalls are also found in the summer in areas bordered by high ground.

CURRENTS The currents in the Adriatic set NW along the eastern shore, in a band 20 to 30 miles wide at ½ knot in the southern half and at ½ knot in the northern half. The current turns W at the north of the Adriatic, and then SE in a band 10 miles wide in the northern part of the western shore, and 6 miles wide in the southern part. The current is rather stronger on the western shores, averaging about 1 knot in the central part, rising to 1 ¾ knots at the southern end. Inshore counter-currents exist to the north and south of Promontorio del Gargano. Currents through the Yugoslavian islands follow the general trend to N and W. The currents north of about 44°N tend to be weak and rather variable.

Tidal streams and wind driven currents modify the general currents described above, more especially in the northern part of the Adriatic, where tidal streams reach speeds of ½ knot. A strong wind and tide working in the same direction as the currents can raise the surface water rate to 3 knots.

The inshore current in the Ionian sea sets NW at about ½ knot, being part of a counter-clockwise circulation between Greece and Sicily.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is generally good over the sea, except when there is a scirrocco blowing. Some coastal fog is to be found in the northern Adriatic.

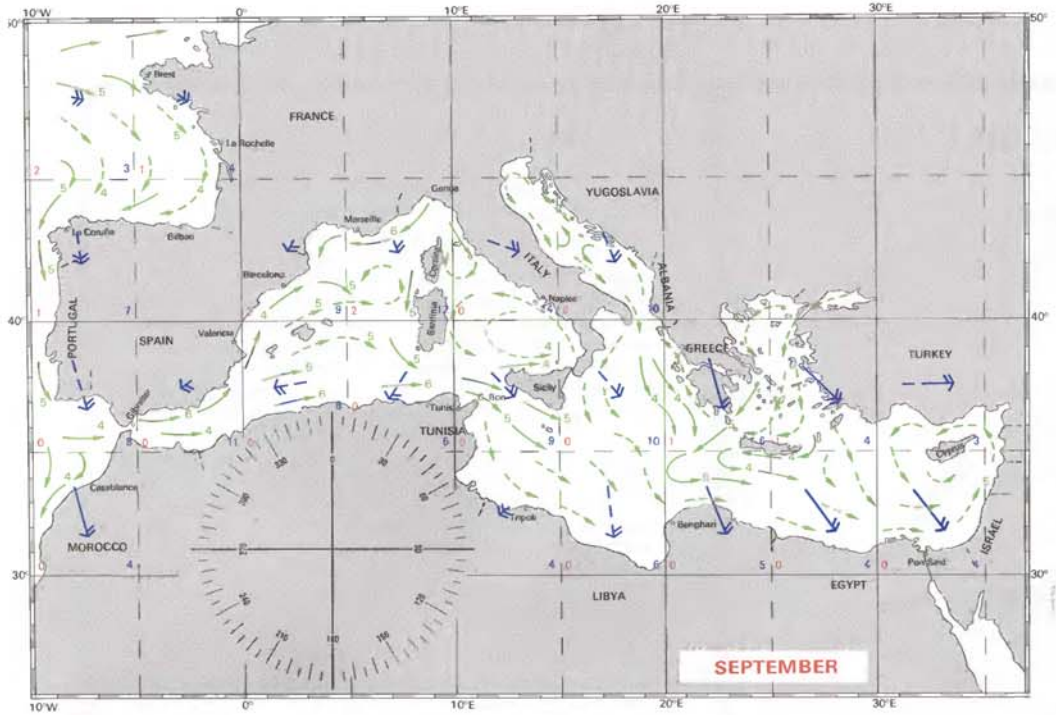
The coasts of Greece are very dry in the summer. Annual rainfall at Corfu is 117 cm, mostly falling between October and March. Rainfall is higher and more evenly distributed over the year further north (Rijeka, 157 cm), but falls are more intense. The Italian coast is somewhat drier (Ancona, 69 cm).

Mean air temperatures vary from 9°C in the north to 13°C in the south in January, and 24°C in the north to 26°C in the south in August. The northern part of the area is rather cold in winter; mean daily minimum at Rijeka in January is 2°C.

EAST MEDITERRANEAN (E OF 20°E)

WINDS The wind in the Eastern Mediterranean is dominated in the summer by the Meltemi, or Etesian wind. This fresh N or NW wind is cool and dry, and blows over the East Mediterranean Basin most of the time from May to September with clear skies. It is associated with the low pressure area east of the Mediterranean and not with any barometric disturbance and is thus more a seasonal than a regional wind.

More NE'ly over the Northern Aegean, the Meltemi is lighter there; in the southern Aegean it blows at an average of force 4 or 5, but can blow stronger over some periods of days. The Meltemi tends to blow stronger in the daytime, reaching a maximum in the afternoon and dying off at night. South of Crete, the meltemi backs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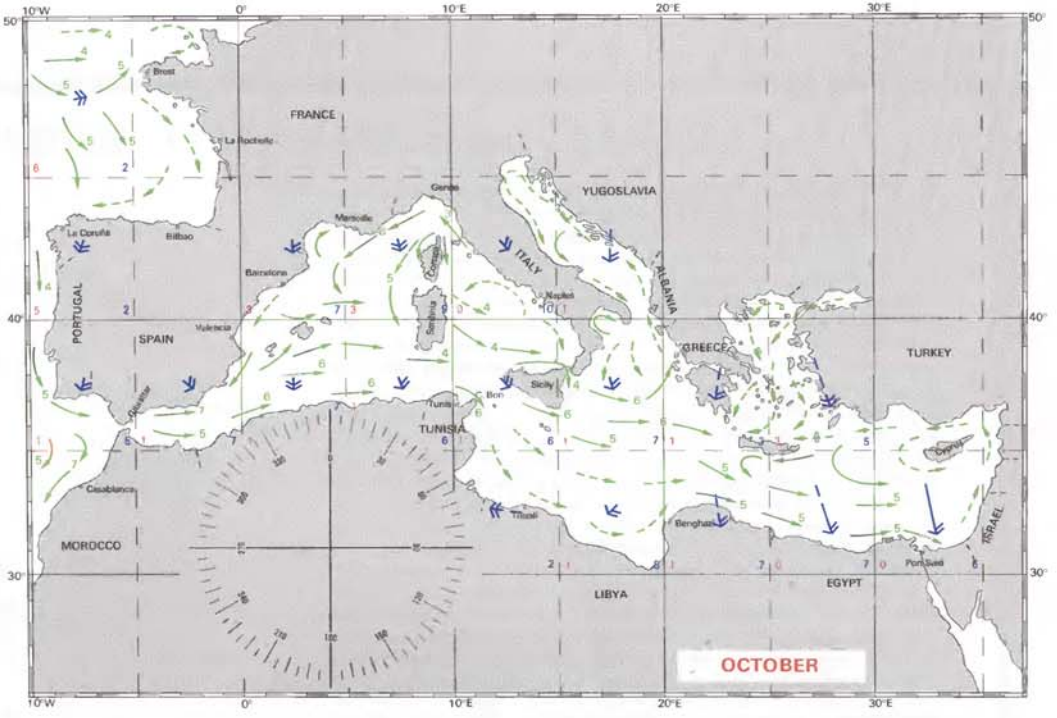
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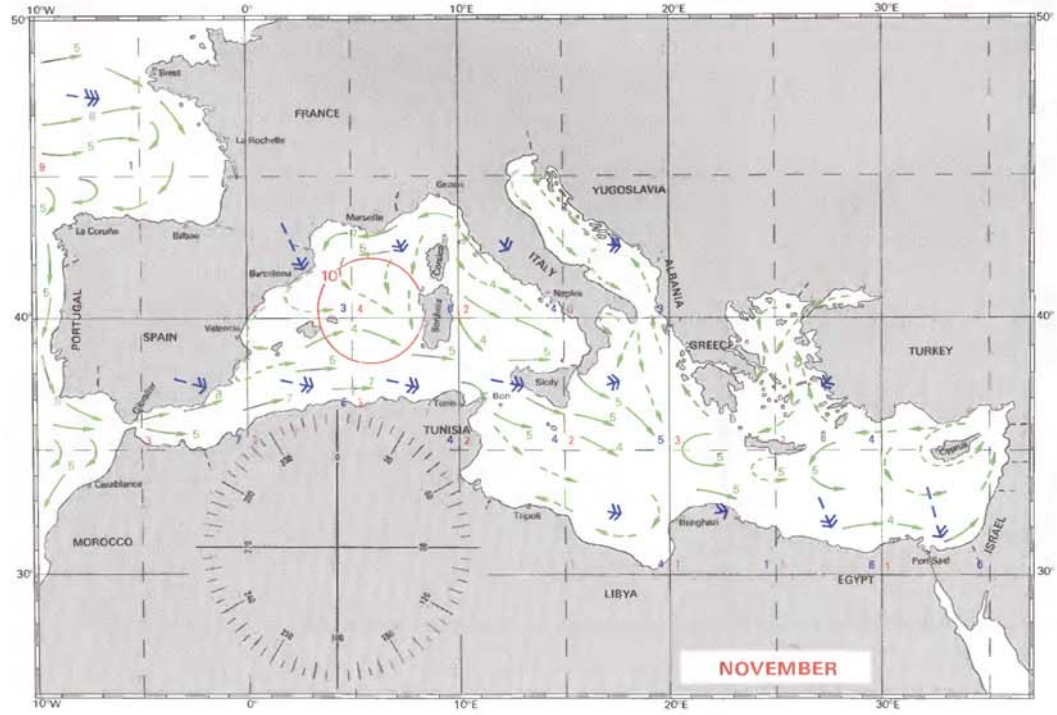
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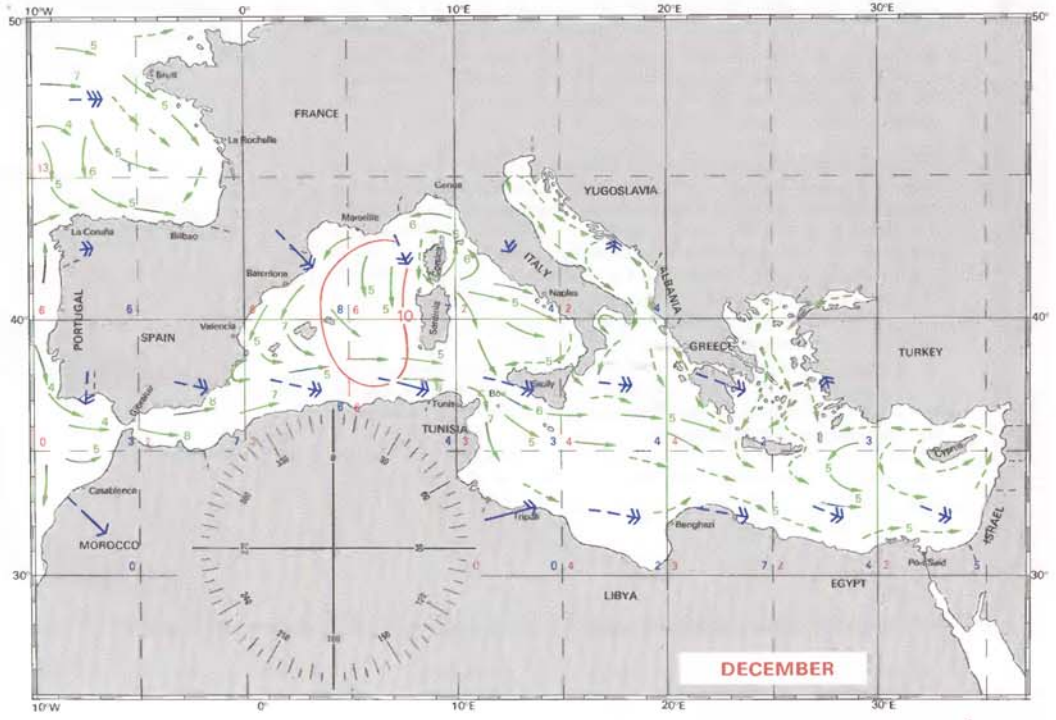
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DECEMBER

to the NW and often strengthens, but dies out before reaching the southern shores of the Mediterranean.

Sciroccos (called Khamsin in Egypt) blow from the south on occasion, bringing dust and sometimes reaching gale force. Generally they are limited to within 50 miles of the Africa coast but can extend further. The winds can last for a few days, and occur most often in April or May, or in the autumn, being rare in the summer.

In the winter, the area is subject to small local depressions, trending eastward from southern Greece towards the Black Sea or Israel, or along the N Africa coast, giving rise to some strong winds from the south. In the Aegean, depressions are often slow moving, and are preceded by southerly winds, which can change quite suddenly to blow from the N on the passage of the depression.

Winds are variable in winter, but show a predominance from the NW half of the compass. Gales are rare in the summer months, and are most common from the N or NE in the winter, when winds of force 7 or more have an incidence of 8% in the Aegean, decreasing to the S and E, to 1% in the SE extremity of the Mediterranean.

Land and sea breezes are well developed along the coasts. The Greek islands are especially prone to "williwaws" (squalls caused by a topographical feature to windward) when the meltemi is blowing strongly. These occur in the lee of high ground, which might otherwise be expected to afford good shelter.

CURRENTS Currents in the Eastern Mediterranean are generally variable, moving eastward along the African coast and in a counter-clockwise circulation in the East Mediterranean Basin and the Aegean. There is a steady outflow from the Black Sea through the Bosphorus and the Dardanelles, which joins the circulation in the Aegean. The current is more constant in a southerly direction on the W side of the Aegean, eastward along the Egypt coast, and westward along the N coast of Crete in the summer.

VISIBILITY, RAINFALL & TEMPERATURE Visibility is generally good in the area, although there is occasional radiation fog in the winter, and some morning mist in the summer along the coasts of Turkey, Cyprus, and Israel. Visibility can be severely reduced in a scirocco, especially in the S and SE of the area.

Most of the rain in this area falls in the winter, and often no rain at all falls from June to September. Annual falls are very variable; the Aegean receives between 20 cm and 70 cm, the S Turkey coast between 50 cm and 100 cm, and the E shore of the Mediterranean about 70 cm. The S shore is much drier with 20 cm or 30 cm annually.

Mean air temperatures range from 10°C in the northern Aegean to 16°C on the Africa coast in January, and rise to 24°C in the Aegean and 26°C further south in August.

DOLPHINS

INTRODUCTION

Many of the 30 or so species of dolphin are to be seen on coastal and trans-ocean passages in the North Atlantic. I hope this brief introduction to the commoner species will be of interest.

Whales and dolphins are members of the order Cetacea. They are thought to have evolved some 50 million years ago from primitive land mammals, taking advantage of increasing aquatic food supplies due to waning populations of amphibious reptiles at the time. All cetaceans are mammals. They have lungs to breathe, so must surface regularly to take oxygen. They give birth to fully formed young which they suckle. Cetaceans are clearly distinguished from fish by their horizontal tail fins.

Cetaceans fall into two main groups – the toothed whales, containing the dolphin family, and the baleen whales, which probably descended from toothed ancestors. Killer whales and pilot whales are part of the dolphin family, while porpoises and narwhals form separate families within the toothed whale group. Many dolphin species are commonly called porpoises, blurring the distinction between the porpoise and dolphin families.

PORPOISES

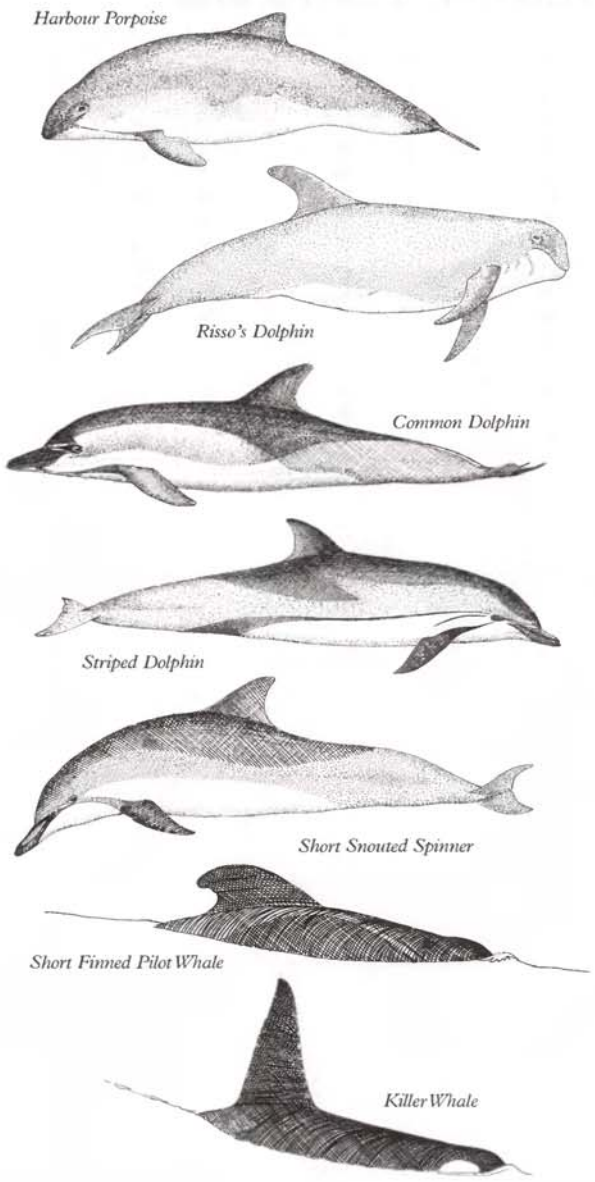
The separate porpoise family comprises 6 species, only one of which is found in the North Atlantic – the **Harbour Porpoise**. This small porpoise is not often seen; it is rather shy and rarely plays around boats. The adult porpoise is about 6 ft (1.8 m) long, with a rotund body, dark grey above merging to white on the belly. It has a smallish dorsal fin and a rounded nose on a small head without the characteristic beak of a dolphin.

The harbour porpoise is most likely to be seen when rising to breathe, making a slow forward rolling motion. Numbers have declined and the porpoise is now most often encountered in colder northern coastal waters.

DOLPHINS

The Bottlenose Dolphin is commonly seen in European coastal waters as well as offshore. A small but distinct beak separated by a crease from a rounded forehead, and subdued grey coloration distinguishes this common dolphin, which can reach 12 ft (3.9 m) in length. The bottlenose is a very active swimmer, often performing acrobatics apparently for the joy of it. These gregarious dolphins have been much studied and sometimes appear to seek out human company.

Risso's Dolphin, also called the Grampus, has a blunt headed appearance, tall dorsal fin and long thin pointed flippers. Older members of this species tend to have a scarred and battered appearance; their colouring becomes lighter with age, fading to a very light grey on old animals. Often seen close to the edges of the continental shelf on both sides of the Atlantic, and near the Cap Verde Islands, the Canaries and the Azores.



The **Common Dolphin** is one of the most abundant of all cetaceans, and is widely seen in the Atlantic and the Mediterranean. Reaching 8 ft (2.4 m), its appearance is variable but distinguished by an hourglass coloration on it sides. A tan or yellowish patch forward of the fin forms the upper part of the hourglass; a pale grey patch further back forms the lower part. At the waist of the hourglass, the two patches form a distinctive V in the dark cape below the fin. These dolphins have prominent beaks and smoothly sloping foreheads. They are highly active and vocal and can often be heard above the water.

Also very abundant and of a similar size are the **Striped Dolphins**, which are to be found in tropical and subtropical waters through the Atlantic. Easy to identify by their distinctive striping, these dolphins are active and acrobatic swimmers. Dark uppersides give way to a pale grey band over a dark stripe from eye to under the tail stock. Below that the belly is white or pink. There are one or two dark bands between eye and flipper. A prominent dark beak gives way to a smoothly sloping forehead. The Striped Dolphin is the warm water cousin of the Common Dolphin, and the commonest dolphin off the SE coasts of the USA and in the Mediterranean.

Spinner Dolphins are the only species that spin on a longitudinal axis while breaching; they can do this up to 7 times in a single leap. **Short Snouted Spinners** are not common. Adult Long Snouted Spinner Dolphins are more common, reach 7 ft (2.1 m) in length, and are to be found mainly in tropical waters. They are characterised by their long thin beaks, erect dorsal fins and their unique aerial behaviour. Their coloration varies around the world, but the common variety in the Atlantic has three colour patches; a dark cape, pale grey mid-line and a white belly.

Spotted dolphins comprise two species – the Pantropical Spotted Dolphin and the Atlantic Spotted Dolphin which are difficult to tell apart. They both occupy mainly tropical waters in the Atlantic and are of similar size, growing to about 8 ft (2.4 m). The pantropical has a slightly bolder coloration and is characterised by a dark band between lower jaw and flippers. Both species are distinguished by their spotting, which increases with age.

Pilot whales are common medium sized species reaching about 20 ft (6.1 m) and are fairly easy to recognize. The Long Finned Pilot Whale occupies the colder subtropical and temperate waters of the North Atlantic, while the **Short Finned Pilot Whale** is more often found in tropical waters. Pilot whales have bulbous heads, low rounded dorsal fins and are black or dark grey often with a white or grey cape around the dorsal fin. Pods may be found motionless at the surface. They have a strong blow on surfacing which can sometimes be heard.

Killer Whales are the largest members of the dolphin family, reaching 32 ft (9.8 m) in length and weighing up to 9 tonnes. The blunt head, jet black colouring with white belly, a white patch behind each eye, and the tall dorsal fin make these creatures unmistakeable. They are more often seen in colder polar waters but range throughout the Atlantic. Usually seen in pods, these whales are approachable and not normally aggressive to humans.

BEAUFORT WIND SCALE

Beafort Scale Number	Description and limit of wind speed in knots.	Sea Criterion
0	Calm Less than 1	Sea like a mirror.
1	Light air 1 – 3	Ripples with the appearance of scales are formed but without foam crests.
2	Light breeze 4 – 6	Small wavelets, still short but more pronounced, crests have a glassy appearance and do not break.
3	Gentle breeze 7 – 10	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.
4	Moderate breeze 11 – 16	Small waves, becoming longer; fairly frequent white horses.
5	Fresh breeze 17 – 21	Moderate waves, taking a more pronounced long form; many white horses are formed. (Chance of some spray).
6	Strong breeze 22 – 27	Large waves begin to form; the white foam crests are more extensive everywhere (probably some spray).
7	Near gale 28 – 33	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind. (spindrift begins to be seen).
8	Gale 34 – 40	Moderately high waves of greater length; edges of crests break into spindrift. The foam is blown in well marked streaks along the direction of the wind.
9	Strong gale 41 – 47	High waves. Dense streaks of foam along the direction of the wind. Sea begins to roll. Spray may effect visibility.
10	Storm 48 – 55	Very high waves with long overhanging crests. The resulting foam in great patches is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes a white appearance. The rolling of the sea becomes heavy and shocklike. Visibility affected.
11	Violent storm 56 – 63	Exceptionally high waves. (Small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.
12	Hurricane 64 – 71	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.

TEMPERATURE CONVERSIONS

°C	°F	°C	°F	°C	°F
−10	14	5	41	20	68
−9	16	6	43	21	70
−8	18	7	45	22	72
−7	19	8	46	23	73
−6	21	9	48	24	75
−5	23	10	50	25	77
−4	25	11	52	26	79
−3	27	12	54	27	81
−2	28	13	55	28	82
−1	30	14	57	29	84
0	32	15	59	30	86
1	34	16	61	31	88
2	36	17	63	32	90
3	37	18	64	33	91
4	39	19	66	34	93

Conversions are to the nearest degree

for Josette

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