

INTRODUCTION

With the increased tempo of U.S. Navy operations in the Indian Ocean, there has been a matching increase in concern over the environmental support available to the Fleet meteorologists. As part of the NAVENVPREDRSCHFAC effort to improve that support, this Command has reprinted a series of meteorological handbooks -- collectively titled Weather In The Indian Ocean -- that were originally issued by the British Government in the 1940-44 time frame.

These handbooks, published as three volumes in a total of twelve parts, were prepared by the Meteorological Office, Air Ministry, in cooperation with the Naval Meteorological Branch, Admiralty, London. Titles of all volumes/parts in the series are given below.

Because the series has long been out of print, the NAVENVPREDRSCHFAC has obtained permission to reprint and distribute the handbooks to U.S. Navy units. As in the original publication, this new reprinting ultimately will comprise twelve individual books, each marked with volume and part number; the reprint set is distributed as NAVENVPREDRSCHFAC Technical Bulletin 80-02, April 1980. The books are three-hole-punched for collection into ring binders. There has been no editing or changing of the original material.

Users of the series should be alert to the fact that a number of place names used in the original writing have changed over the intervening years.

Volumes/parts titles in the series are as follows:

- Vol. I ---- Weather In The Indian Ocean - General Information (in one part)
- Vol. II --- Weather In The Indian Ocean to Latitude 30⁰S and Longitude 95⁰E including the Red Sea and Persian Gulf (in nine parts; see parts titles below)
- Vol. III -- Weather In The Indian Ocean - Aids To Forecasting (in two parts:
1, Indian Ocean; and 2, North Indian Ocean)

Parts titles, Volume II (local information):

1. Red Sea
2. The Gulf of Aden and West Arabian Sea to Longitude 00⁰E
3. The Persian Gulf and Gulf of Oman
4. The Makran Coast from Gwadar to Karachi and the West Coast of India to Latitude 20⁰N
5. West Coast of India from Latitude 20⁰N to Cape Comorin, with an Appendix on Conditions at Bombay
6. A. East Coast of India from Cape Comorin to the Ganges Delta -- B. Ceylon
7. The Coast of Burma
8. The South Indian Ocean to Latitude 30⁰S.
9. Coast of East Africa from the Equator to Cape Delgado



PART 9
 COAST OF EAST AFRICA
 FROM THE EQUATOR TO CAPE DELGADO

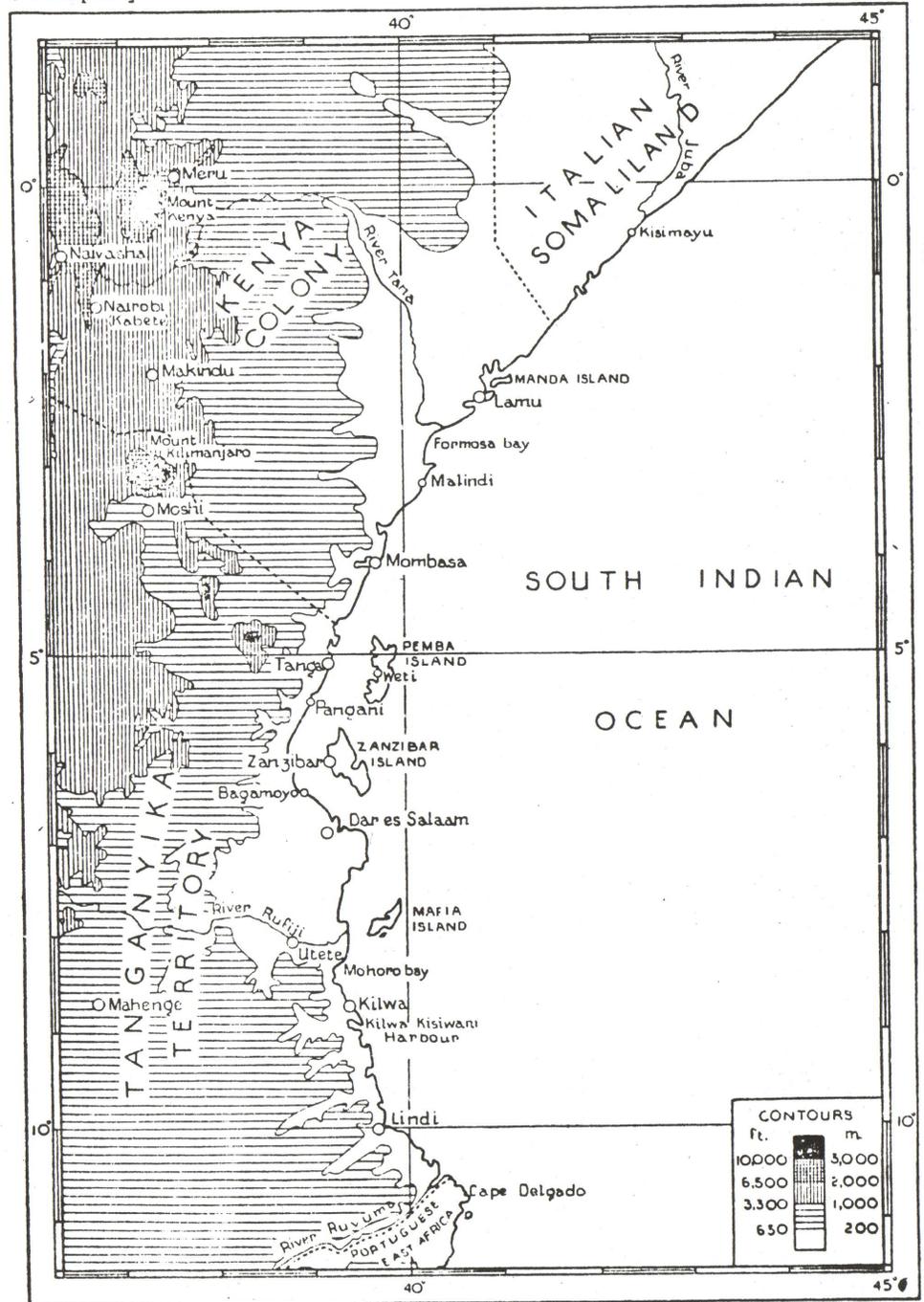


FIG. 1.—THE COAST OF EAST AFRICA FROM THE EQUATOR TO CAPE DELGADO

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COAST OF EAST AFRICA FROM THE EQUATOR TO CAPE DELGADO

COMPRISING

THE COASTS OF KENYA COLONY, TANGANYIKA TERRITORY
AND THE ISLANDS OF THE ZANZIBAR PROTECTORATE

I—GENERAL

The coast of East Africa from the equator to Cape Delgado is about 900 miles in length. In the north it comprises about 150 miles of the coast of southern Italian Somaliland which extends roughly south-westwards to about latitude $1^{\circ} 40' S.$, from there to about latitude $4^{\circ} 41' S.$ is the coast of Kenya Colony which is some 300 miles long; the remainder of the coast is that of Tanganyika Territory which is about 450 miles in length stretching southwards to the mouth of the Ruvuma river in about latitude $10^{\circ} 26' S.$ Off the northern part of the coast of Tanganyika are situated Zanzibar and Pemba, the two islands of the Zanzibar Protectorate. Cape Delgado ($10^{\circ} 41' S.$, $40^{\circ} 39' E.$), the southernmost point of the region under consideration, is situated on the northern part of the coast of Portuguese East Africa.

That portion of southern Italian Somaliland included in the area contains the entrance to the Juba river and the harbour of Kisimayu which is about 9 miles south-westward of the river mouth. There is very little vegetation around Kisimayu which is considered to be a healthy place as fevers are said to be unknown, and at the mouth of the Juba river, where the land is rich and vegetation abundant, fevers are also infrequent. The climate here during the NE. monsoon is very much pleasanter than that of Zanzibar, the nights being almost cool and the air dry at all times, with a mean day temperature of about $85^{\circ} F.$ in April.

The Colony and Protectorate of Kenya is about 225,000 square miles in area, its capital is Nairobi, situated nearly 300 miles inland from Mombasa, the principal port of the Colony, at a height of nearly 6,000 feet above sea level.

The land rises in well-defined steppes from the coastal plain and in the interior there are chains of mountains varying from 5,000 to 10,000 feet, Mount Kenya, over 17,000 feet in height, being the highest mountain. The western boundary of Kenya cuts off the north-eastern portion of Lake Victoria. The largest lake in Kenya, Lake Rudolf, is situated in the north-western part of the territory, and in addition there are several smaller lakes. The Tana is the principal river.

The coastal region has a tropical climate, the effect of which is greatly alleviated by the prevailing SE. trade and NE. monsoon winds, but after a long residence it is likely to be enervating. At higher altitudes the climate is mild and agreeable. Many Europeans have settled in these regions and have resided for considerable periods without ill effect, except from controllable tropical diseases.

The mandated territory of Tanganyika has an area of about 365,000 square miles, approximately three times that of Great Britain; it also includes the island of Mafia which lies off the delta of the Rufiji river. The territory is bounded on the west by Lake Tanganyika and a portion of the shore of Lake Nyasa, and in the north-west by Lake Victoria, about half of which is within the boundary of Tanganyika. The territory may be described as divided into a coastal hinterland and a central plateau separated by ranges of hills and mountains. The central plateau has an average height of about 4,000 feet, bounded on the south and south-east by the southern highlands and on the east by the Mbulu highlands. From the coast near Tanga the land rises sharply to the Usambara and Pare mountains. The large extinct volcano of Kilimanjaro, over 19,000 feet in height, the highest mountain in Africa, stands close to the north-eastern frontier.

The lower lying coastal belt is comparatively narrow and varies in width from 15 to 40 miles, some of the more important places on the coast are:—Tanga, Bagamoyo, Dar es Salaam (the principal port), Kilwa and Lindi. The coastal belt rises to an altitude of about 1,000 feet on its margin, where it reaches the foothills of the Usambara mountains on the north and, in the west, of the mountain ranges which separate the coastal hinterland from the central plateau. This bordering mountain range rises in some parts to 9,000 feet. The two largest rivers are the Ruvuma and Rufiji.

The climate varies greatly according to the altitude and in the coastal belt conditions are tropical although not unpleasant, and as in the case of Kenya they are greatly alleviated by the SE. trade and NE. monsoon winds. The mean annual temperature is about $80^{\circ} F.$

The Zanzibar Protectorate consists of the two islands of Zanzibar and Pemba. Zanzibar island has an area of about 640 square miles, and Pemba island, which lies about 22 miles to the north-eastward, has an area of about 380 square miles. Zanzibar is 440 feet high, having undulating ridges stretching north and south with plains between them; Pemba is about 300 feet high and there is no main ridge, or line of hills, but they are all of about the same height, their ridges radiating out in all directions from a central point, generally in horse-shoe curves. Both islands are extremely fertile.

The climate of Zanzibar and Pemba is on the whole similar to that of the coastal region. In Zanzibar during the coolest months, from July to September, inclusive, the midday temperature is about

82° F. falling to 72° F. at night ; in the hottest months from January to **March**, inclusive, the midday temperature is about 90° F. falling to 76° F. at night. In Pemba the midday temperature ranges from 83° F. in June–August to 89° F. in February.

British East Africa can be divided into five main climatic regions, these are :—

- (1) The coastal strip, a belt of land approximately 100 miles wide stretching along the shore of the South Indian ocean.
- (2) The central hinterland of Tanganyika.
- (3) The high regions of the Kenya and Tanganyika highlands.
- (4) The lake area which may be considered to extend 100 miles from the shores of Lake Victoria.
- (5) The arid regions of the northern frontier provinces of Kenya and the Karamoja district of Uganda.

Each of these regions has its own characteristic features but the climate in all cases is a tropical one. The sun at midday is never more than 35 degrees from the zenith even at its extreme northern and southern limits, while for the greater part of the year the sun's rays are nearly vertical. In this Part only the climate of the coastal strip (region 1) is dealt with.

Depressions similar to those occurring in temperate latitudes are not experienced in the area under consideration and tropical cyclones are extremely rare.

The prevailing winds are the NE. monsoon, which blows from about December to February, and the SE. trade, which blows from about April to October ; March and November are transition months when the winds are light and variable.

The visibility both over the sea and on the coast is on the whole good.

The rainfall is heaviest on the centre portion of the coast between Lamu and Dar es Salaam and diminishes northwards and southwards, the driest part being to the north of Lamu. The whole region is one in which intense convection takes place ; even in the wet seasons rain seldom falls continuously but heavy downpours occur sometimes accompanied by thunder.

The coast of Kenya with the northern part of the coast of Tanganyika has its principal rainy season from April to June and another lesser one in November or December, whilst on the southern half of the coast of Tanganyika the rainy season is from about December to April.

As the area under consideration is in the southern hemisphere the hot season is from December to March and the coolest season from June to September. Owing to the coastal belt being situated close to the Indian ocean it receives north-easterly and south-easterly air currents which have passed over a wide expanse of ocean, there is therefore only a small range of temperature both during the year

and day. The mean temperature of the hottest and coolest months only differs by about 6° or 8° F. and the mean daily range is about 14° F. The most pleasant season on the coast is the period from the end of June until the middle of September when the mean temperature varies between about 76° and 79° F., these are the winter months of the southern hemisphere when the sun is considerably north of the equator and when a temperature not much above 60° F. may at times be experienced at some places. In these regions such a comparatively low temperature may be felt as more than chilly by those who have grown accustomed to the more usual hot, damp, equable climate. These hot, damp days and nights on the East African coast, especially from December to February, can be very trying and for days at this season the temperature may never fall below 80° F.

The relative humidity is high during most of the year and the air is not far from being saturated in the morning. In Tanganyika it is only in the south, at Lindi, where little rain falls from June to October, that the humidity falls below 40 per cent, even in the dry season.

II—TROPICAL CYCLONES AND DEPRESSIONS

Depressions of the type frequent in temperate latitudes, such as those that occur over the British Isles, are not experienced in this area and tropical cyclones are also extremely rare and almost unknown, which is to be expected in this region so near the equator. Cyclonic storms are, however, experienced in the Mozambique channel, south of the area under consideration, during the season November to April. When they occur they are associated with a fresh westerly wind in the southern part of Tanganyika.

There is only one record of a tropical cyclone having occurred in the area and this was at Zanzibar on 14th April, 1872. It commenced at 2100 when the wind was blowing strongly from SSW, accompanied by rain, this increased in force and backed to S. until about 1330 on the 15th, when it suddenly fell calm, the barometer having fallen 30 mb. below the normal height. At 1415 the barometer commenced to rise, and the cyclone then burst upon the town and harbour from NNE., the opposite quarter, the wind backing through N. to WNW., where it remained, but moderating considerably between 1600 and 2000. The cyclone swept over the island of Zanzibar destroying everything in its path but leaving the southern end untouched ; it was not felt in Pemba. At the time of its occurrence it was classified as a "stationary" type of cyclone and there are no records of any track either before or after its appearance over Zanzibar ; this cyclone was also reported to have been felt on the coast of the mainland in the vicinity of Bagamoyo.

Tropical cyclones which occur in the South Indian ocean and pass well to the south of the region under consideration may, however, sometimes affect the winds on the coasts. Winds between

Beaufort forces 7 and 8 have occasionally been reported at Dar es Salaam when tropical cyclones have passed to the southward and in some cases quite a considerable distance away. There was a cyclone in February, 1897 which passed near the Seychelles and the Farquhar islands and then down the Mozambique channel that caused winds with a speed of about 37 knots at Dar es Salaam.

III—WIND

1—SURFACE WINDS

Wind-roses indicating the mean direction and force of the wind for the three 5 degree sea areas 0–5° S., 40–45° E.; 5–10° S., 35–40° E. and 5–10° S., 40–45° E. for each of the twelve months are reproduced in Figs. 2–7, and wind-roses indicating the direction of the wind only in the different months of the year at Mombasa, Tanga, Dar es Salaam, Kilwa and Lindi at the morning hour of observation and at Zanzibar for the mean of two observations a day are also reproduced in Figs. 2–7, the force of the wind for the land stations is not indicated as it is not available. The corresponding data for the sea areas are given in Table II on pages 55–6 and those for the land stations in the general climatological tables on pages 49–54. In the climatological tables are also given additional data of the direction of the wind at the land stations for the afternoon observations and of the mean speed of the wind at both times of observation, except at Zanzibar where the wind speed is the mean of observations throughout the 24 hours.

The prevailing winds in the area under consideration are the NE. monsoon and the SE. trade. The NE. monsoon blows from about December to February and the SE. trade from about April to October, whilst March and November are transition months between these two types of winds and when there is no prevailing wind.

NE. monsoon.—This is a north-easterly wind that blows over the Indian ocean from about October to March. Over the Arabian sea it begins to blow in the middle of October but it does not usually occur on that part of the east coast of Africa under consideration here until the end of November or early in December. Its strength varies somewhat from year to year and in general it blows with less strength than the SE. trade wind.

The NE. monsoon is ushered in by a period of rainy weather, the wind is light and unsteady when it first sets in and its strength gradually increases until it reaches a maximum in January; in February its strength decreases again and it disappears entirely in March. It is not until two or three weeks after the first onset that the monsoon blows steadily; at Zanzibar the average date of its arrival is about the middle of December. As the wind reaches the northern areas first it will prevail there for a longer period than in the south, but the length of time varies somewhat from year to year; as a rule the north-easterly winds will continue to prevail until February and in the north possibly until early in March.

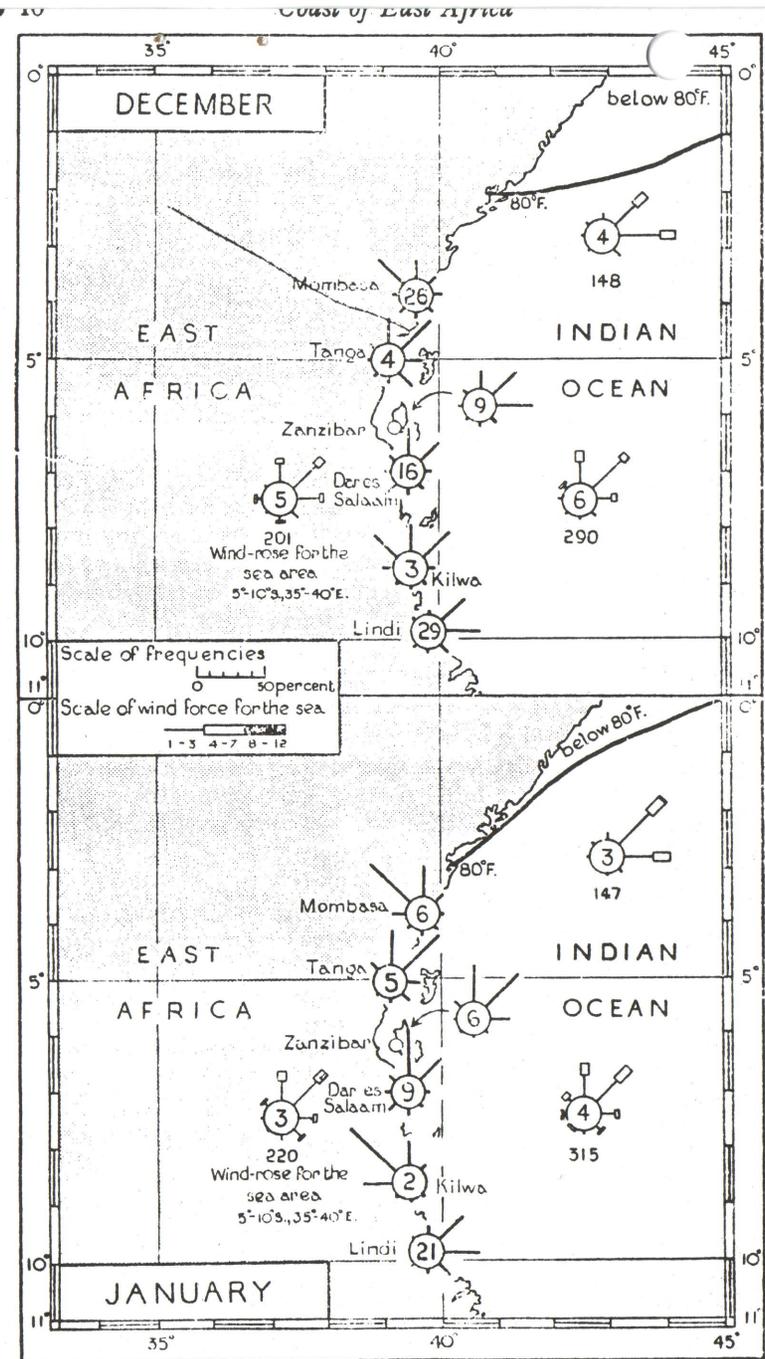


FIG. 2.—SURFACE WINDS—MONTHLY

The figures inside the circles indicate the percentage frequency of calms and those below the roses for the sea areas the number of observations. On the roses for the land stations the wind force is not indicated; they are for the morning hour of observation except at Zanzibar where they are for the mean of 2 observations a day. The isotherm of sea temperature for 80° F. is indicated by the thick line.

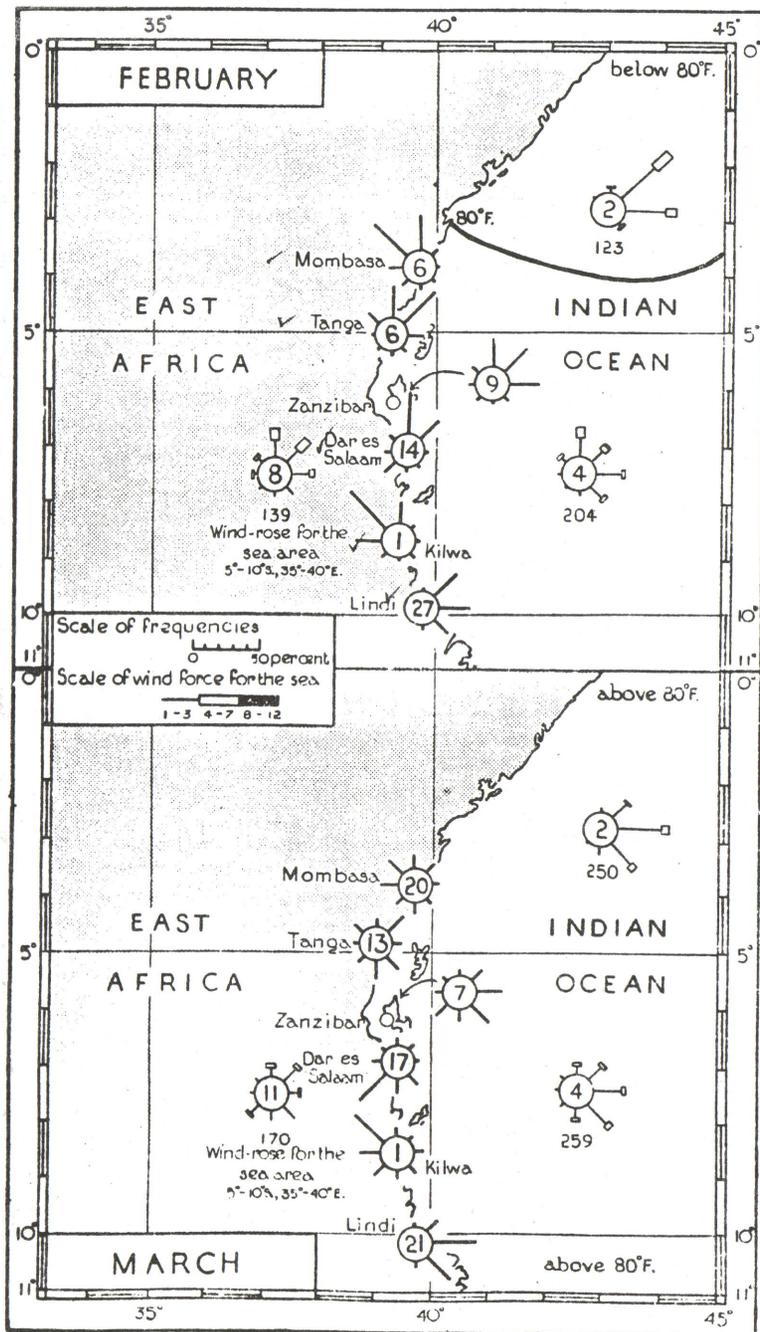


FIG. 3—SURFACE WINDS—MONTHLY

The figures inside the circles indicate the percentage frequency of calms and those below the roses for the sea areas the number of observations. On the roses for the land stations the wind force is not indicated; they are for the morning hour of observation except at Zanzibar where they are for the mean of 2 observations a day. The isotherm of sea temperature for 80° F. is indicated by the thick line.

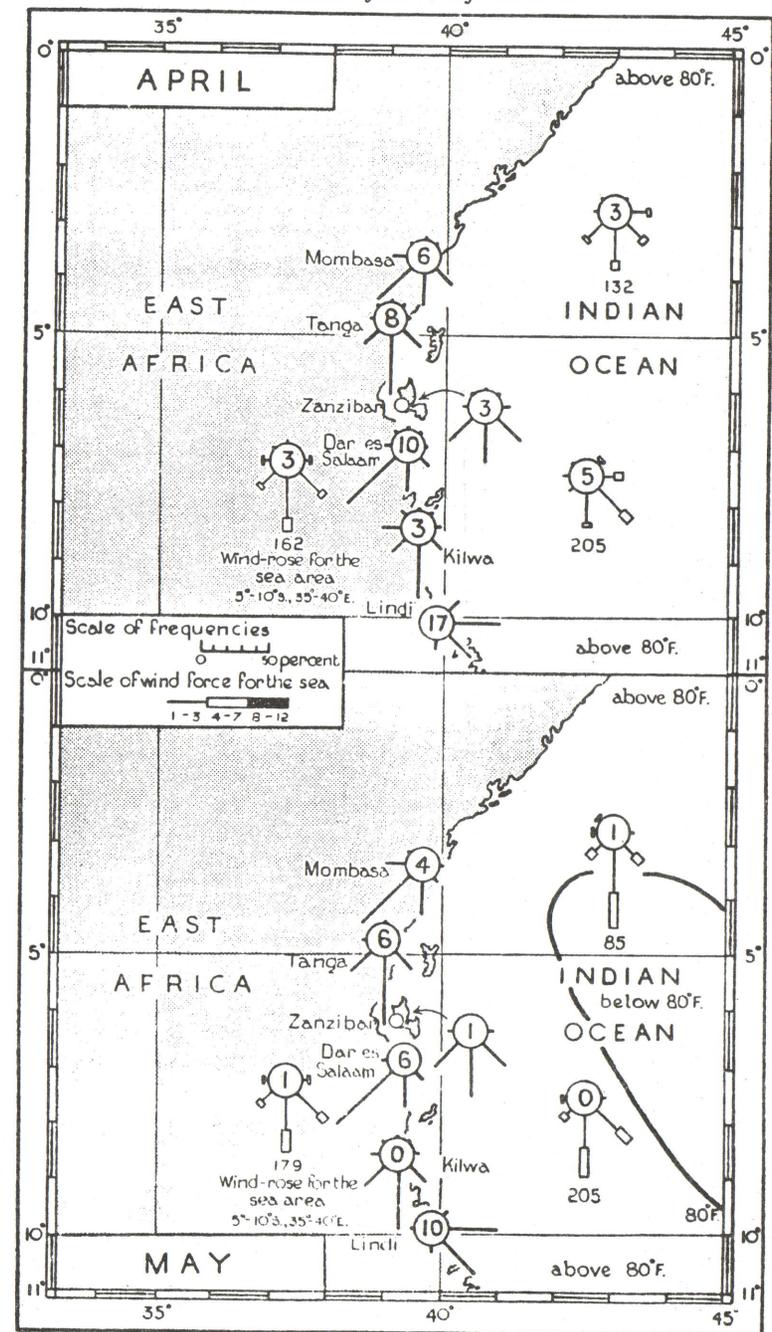


FIG. 4—SURFACE WINDS—MONTHLY

The figures inside the circles indicate the percentage frequency of calms and those below the roses for the sea areas the number of observations. On the roses for the land stations the wind force is not indicated; they are for the morning hour of observation except at Zanzibar where they are for the mean of 2 observations a day. The isotherm of sea temperature for 80° F. is indicated by the thick line.

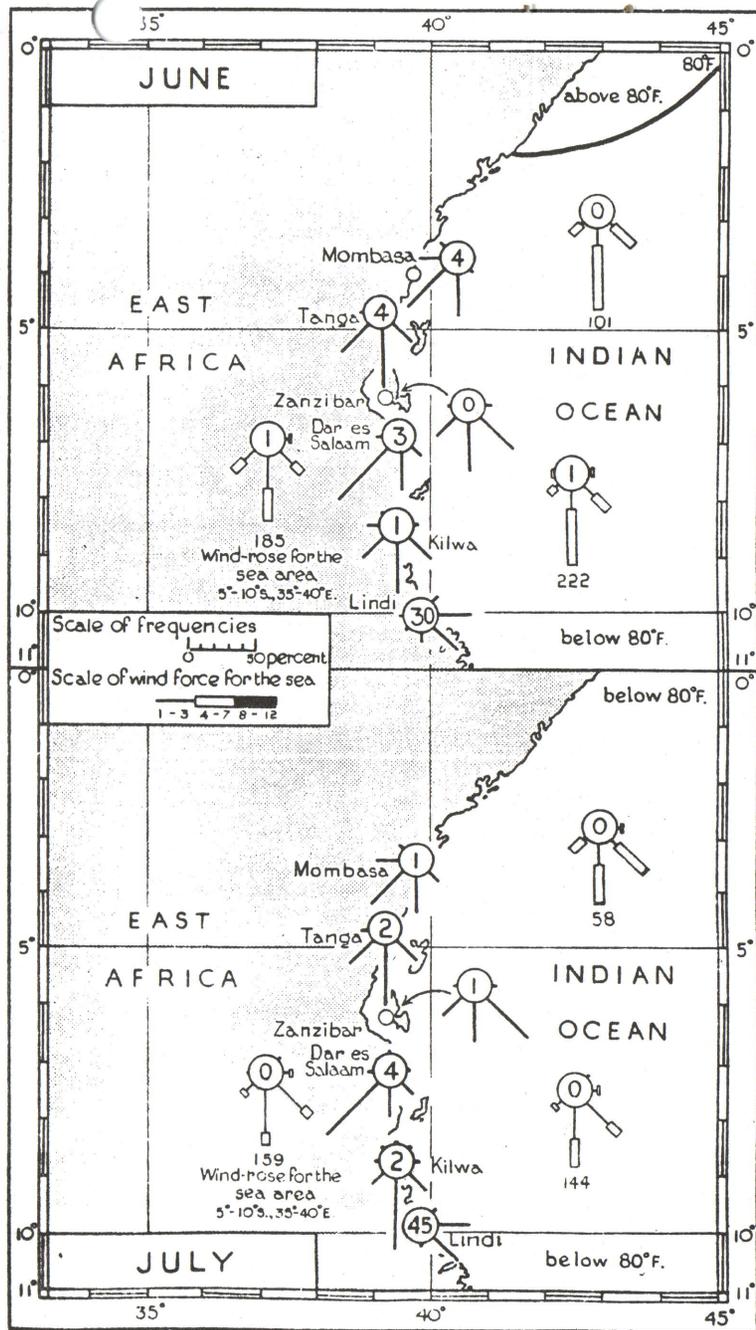


FIG. 5—SURFACE WINDS—MONTHLY

The figures inside the circles indicate the percentage frequency of calms and those below the roses for the sea areas the number of observations. On the roses for the land stations the wind force is not indicated; they are for the morning hour of observation except at Zanzibar where they are for the mean of 2 observations a day. The isotherm of sea temperature for 80° F. is indicated by the thick line.

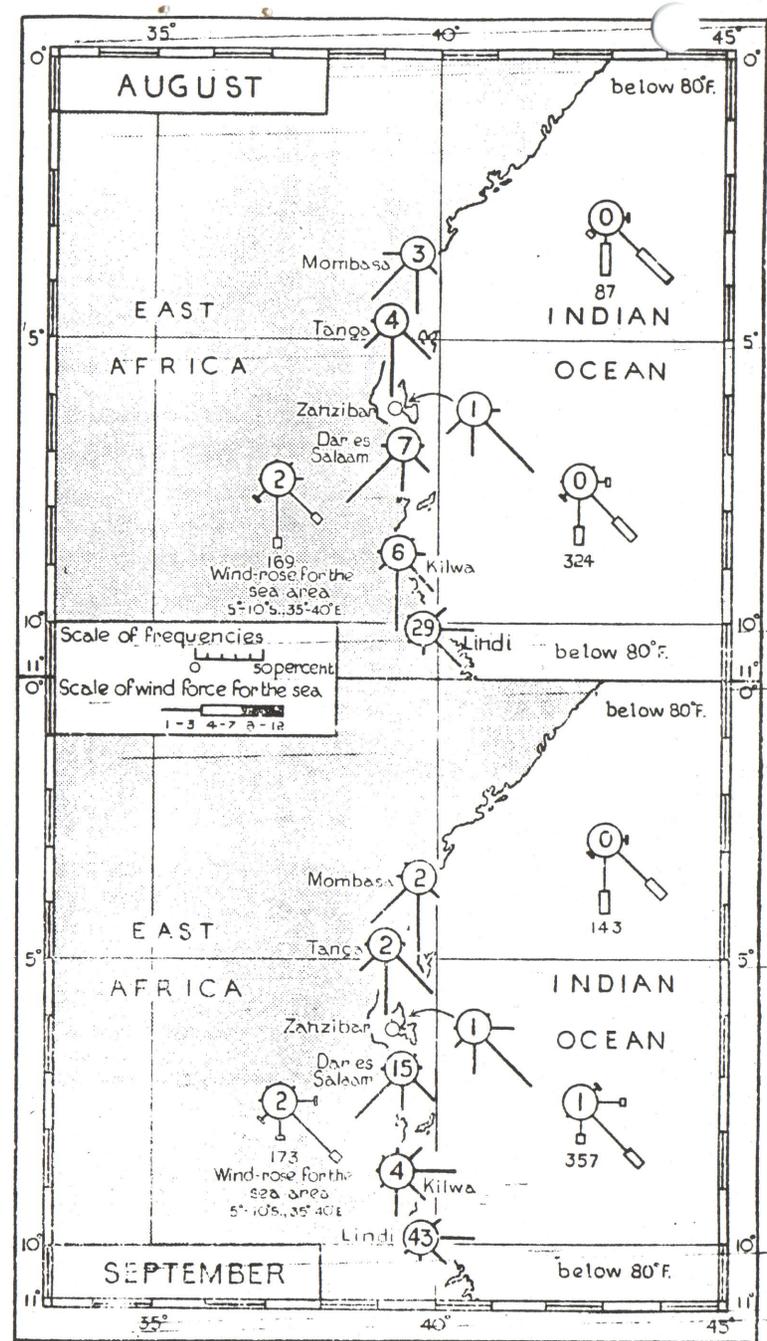


FIG. 6—SURFACE WINDS—MONTHLY

The figures inside the circles indicate the percentage frequency of calms and those below the roses for the sea areas the number of observations. On the roses for the land stations the wind force is not indicated; they are for the morning hour of observation except at Zanzibar where they are for the mean of 2 observations a day.

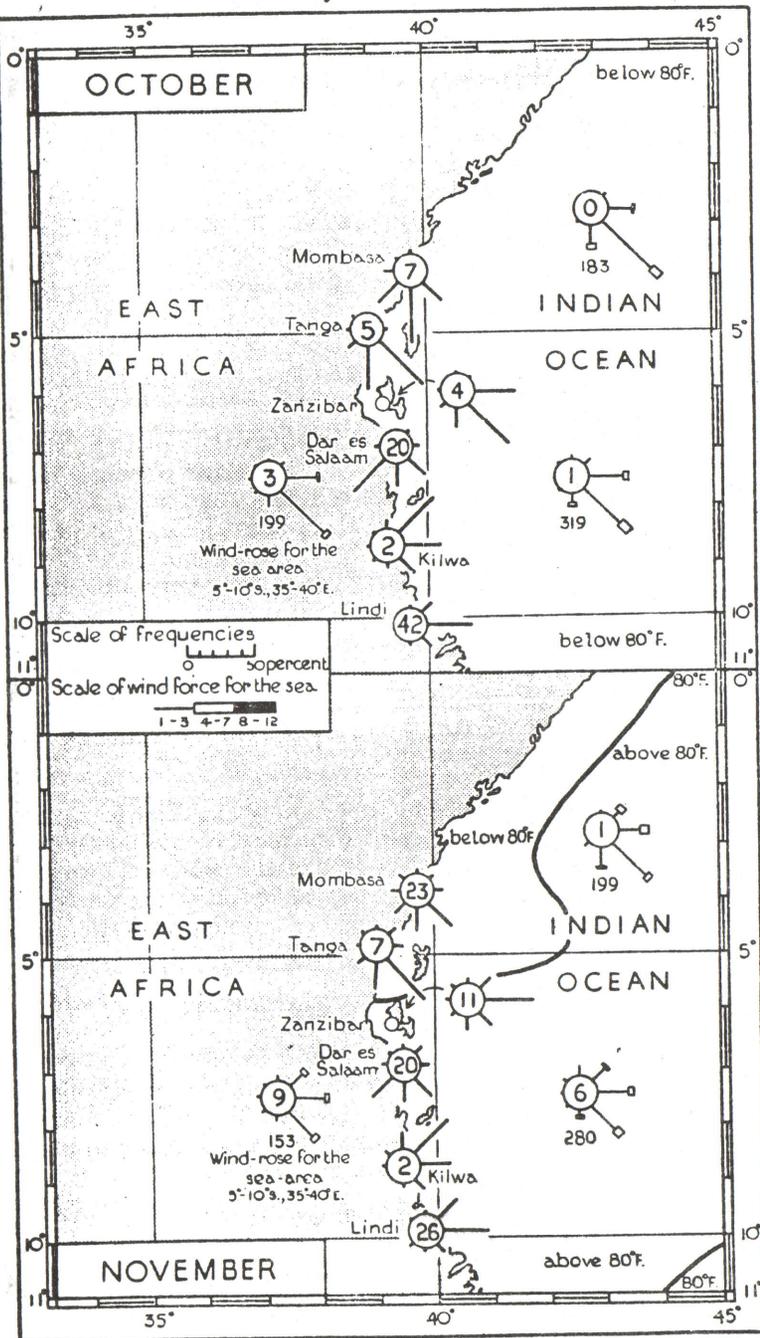


FIG. 7—SURFACE WINDS—MONTHLY

The figures inside the circles indicate the percentage frequency of calms and those below the roses for the sea areas the number of observations. On the roses for the land stations the wind force is not indicated; they are for the morning hour of observation except at Zanzibar where they are for the mean of 2 observations a day. The isotherm of sea temperature for 80° F. is indicated by the thick line.

Over the open sea in the area 0–5° S., 40–45° E. the direction of the wind from December to February is between NE. and E.: E. winds have a slightly greater frequency in December, but in January and February the NE. winds predominate slightly over the E. winds. In the area 5–10° S., 35–45° E. the direction of the wind is mainly between N. and E. in December and January with slightly more northerly winds in January; in February the mean direction of the wind veers to about NE. by E., but all directions from N. through E. to SE. are about equally frequent in the area to the east of 40° E.

On the coast the direction of the wind is affected by the land and sea breezes which are strong enough to deviate the NE. monsoon wind and to predominate when the monsoon is weak; these land and sea breezes are described on page 18.

The force of the NE. monsoon wind over the open sea north of Lat. 5° S. from December to February is on the average between 3 and 4 of the Beaufort scale and south of that latitude between 2 and 3. The highest wind speeds occur in January when some 30 per cent of the winds are of Beaufort force 4 or more, and although the wind usually remains below force 7 it may on very rare occasions attain or even exceed that force.

At Zanzibar the average speed of the wind from November to February is about 5 to 6 knots but sometimes the wind there is very light; at Dar es Salaam the average speed is also about 5 knots, the maximum speed occurring there late in the afternoon at about 1700.

SE. trade.—This wind is sometimes known as the SE. monsoon, and it prevails throughout the year over most of the South Indian ocean. It is only in the winter months of the southern hemisphere (April to September) that it extends sufficiently far northwards towards the equator to affect the region under consideration here.

In the south of the region the SE. wind sets in at the end of March or early in April: by about the end of April it has become established as far north as Lat. 12° N., which is about the latitude of Cape Guardafui.

The SE. trade when established over the region encounters the high plateau of the East African hinterland; this SE. wind appears to slide along the ridge of this high plateau, which tends to make it become more southerly in direction and to follow the trend of the coast. After crossing the equator the wind turns still further to the right and in June continues across the Arabian sea as the SW. monsoon. The area under consideration is exceptional in this season as there is no region of doldrums, which is the narrow zone of light winds separating the NE. trade of the northern hemisphere from the SE. trade of the southern, this is due to this extension of the SE. trade across the equator in the form of the SW. monsoon.

The south-easterly winds continue to blow over the region until the end of October or early in November, but they become lighter in strength and more fitful towards the end of the season. As in the case of the NE. monsoon, the approach and early stages of the SE. trade are marked by a rainy season, the maximum rainfall occurring at Dar es Salaam in April and at Mombasa in May.

Over the open sea there is a slight variation in the direction of the wind during the season. In April the frequency with which the wind blows from SE. and S. is about the same whilst in May and June the wind blows mainly from S. In July the SE. winds increase again in frequency and from August to October the SE. winds are more frequent than those from S.

On or near the coast the direction of the wind is affected by the land and sea breezes which are described on page 18. In the vicinity of Mombasa from about April to October the winds more frequently blow from S. or SW. than from SE. and on the coast to the north of Zanzibar the average direction of the wind is SSW., whilst to the south of Zanzibar it is from between SE. and SW. At Zanzibar from early in May to October the winds are southerly and on the west coast of that island and also in the vicinity of Mafia island the winds are between S. and SW.

The wind, on the whole, at this season is stronger over the open sea than near the land and the average strength of the SE. trade from May to September over the open sea is between about 3 and 5 of the Beaufort scale. The SE. trade wind is stronger than the NE. monsoon wind and its speed is more variable. It blows with greater strength in the early part of the season from May to July and reaches a maximum in June; it is also slightly stronger north of Lat. 5° S. than to the south of that latitude. In the area 0-5° S., 40-45° E. over 80 per cent of the winds in June are of Beaufort force 4 or more, the wind may sometimes blow with force 7 but it rarely reaches gale force. In the areas to the south of Lat. 5° S. the strength of the wind decreases very much in July and it shows a further decrease in September, but to the north of that latitude the most noticeable decrease occurs in September followed by a further decrease in October.

At Zanzibar the speed of the wind is greatest in May and June when the average is about 13 knots, the mean for the year being 9 knots. At Dar es Salaam the average speed from May to August is about 6 knots, only just above the average for the year, but it varies very much from year to year and in one year the average was as high as 16.5 knots; hourly speeds of 33 knots have been recorded but not in recent years. There is a well marked diurnal variation in the speed of the wind at Dar es Salaam where there is a maximum of 9 or 10 knots in the early afternoon between 1400 and 1500 followed by a rapid decrease to a minimum at 2200. There are frequent calms at this place in the evening.

Transition months.—(*March and November.*)—These two months, which come between the seasons of the NE. monsoon and the SE. trade winds, are a period of light and variable winds. They are known locally as "Tanga Mbili" or the "Two Sails" because they are a time of active trade between Zanzibar and the mainland.

In March the NE. monsoon is dying away and the SE. trade is about to set in, the conditions therefore very closely resemble those of the doldrum regions where winds are generally calm or light.

Over the open sea the wind blows mainly from between NE. and SE. and winds from N. and S. may sometimes blow, but westerly winds are rare especially to the north of Lat. 5° S. The winds are very light in force as about 90 per cent are of Beaufort force 3 or less. On the coast the wind blows chiefly from between ENE. and ESE., but the direction and force of the wind are very much affected by the land and sea breezes which are well developed during this period.

In November the wind over the open sea blows mainly from E. or SE. but NE. and S. winds sometimes blow, the direction being slightly more southerly nearer to the equator. The winds on the whole are very light and about 85 per cent of them are of Beaufort force 3 or less. On the coast, as in March, the direction and force of the wind are affected by the land and sea breezes.

Squalls may be experienced during the setting in of the NE. monsoon and also of the SE. trade.

Land and sea breezes.—The land and sea breezes on the coast are strong enough to deviate the NE. monsoon and SE. trade wind and to predominate when these winds are weak. They are particularly prominent in March and November which are the transition months between these prevailing winds.

In Fig. 8 wind-roses are given showing the direction and frequency of the wind in the morning and afternoon at Mombasa, Tanga, Dar es Salaam, Kilwa and Lindi. Four representative months have been chosen—January for NE. monsoon conditions, July for those of the SE. trade, and March and November for the transition periods.

On the coast of Tanganyika Territory so long as the NE. monsoon and the SE. trade winds are strong the land and sea breezes show their influence by a slight change in the direction and force of the wind during the day; on the other hand when the prevailing winds are light there is a land breeze at sunrise which dies away between 0900 and 1000 to be followed shortly after midday by an on-shore wind.

During the transition months of March and November, when the land and sea breezes are well developed, there is usually a calm during the night and early morning but after midday there are light on-shore winds; when the NE. monsoon or SE. trade winds are

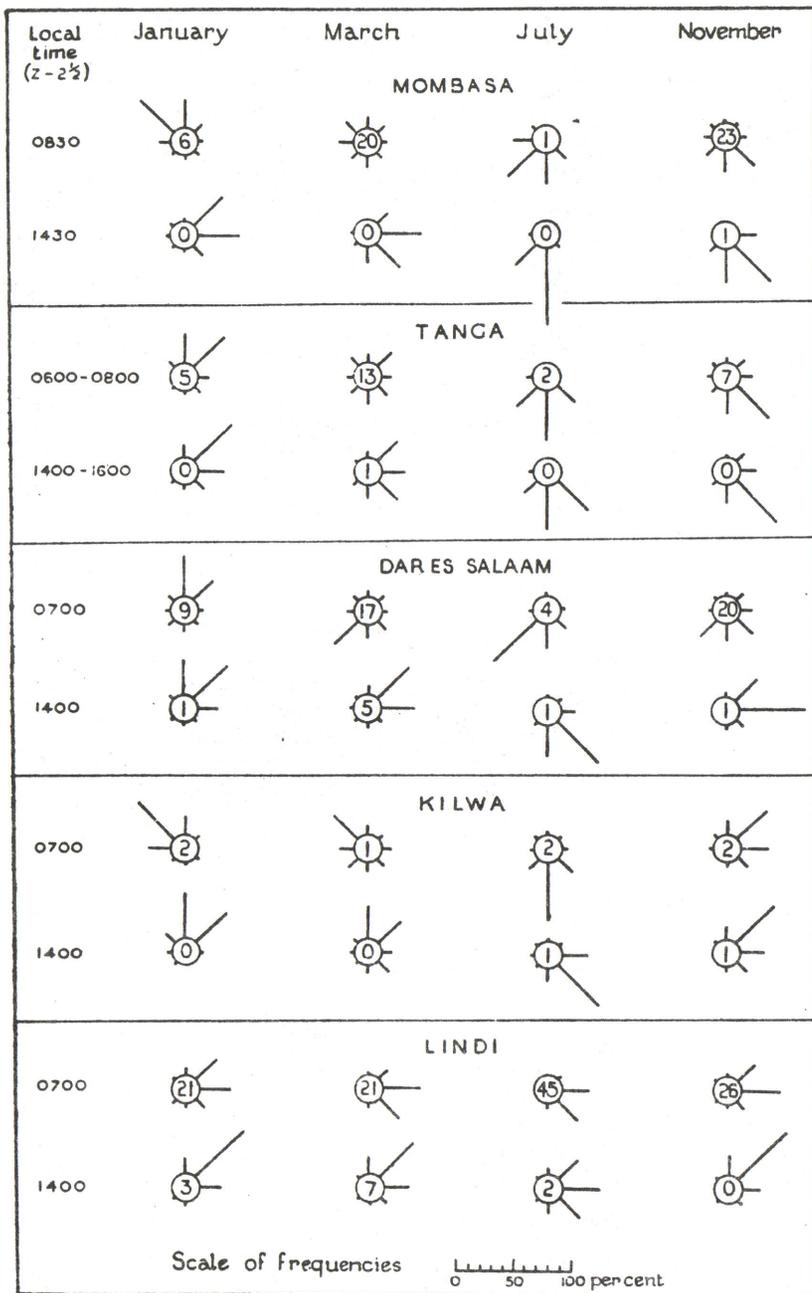


FIG 8—SURFACE WINDS—MORNING AND AFTERNOON—JANUARY, MARCH, JULY AND NOVEMBER

Figures inside the circles indicate the percentage frequency of calms.

blowing the direction of the sea breeze becomes more northerly or southerly according to which is the prevailing wind. During the NE. monsoon, which is from about the end of November to the end of February, there is as a rule very little wind between midnight and sunrise. At sunrise the monsoon wind sets in from N. or from an off-shore direction, and as the day advances the speed of this wind increases slowly; by 1600 the wind direction has changed to east and it blows on-shore, by which time the wind speed is at its maximum, but after this the wind dies away again until midnight. The stronger the monsoon the less will its direction vary during the day, but with a light monsoon the wind remains calm for a longer period at night and in the early morning. This diurnal variation is said to be hardly noticeable 10 to 15 miles from the coast. In the months of the SE. trade, from about April to September, the wind in the morning blows from off the land from a direction somewhere between S. and SSW. whilst in the afternoon an on-shore wind blows from between SSE. and SE. The maximum speed of the wind occurs between 1400 and 1600, and from midnight to sunrise the wind is light or calm.

At Kilwa from April to August the wind at 0700 is chiefly from S., becoming SE. or E. at 1400. From September to November, especially in October and November, there is very little evidence of land and sea breezes but from about December to March the wind at 0700 is usually NW. which by 1400 has veered to N. or NE.

At Dar es Salaam there is a well marked land and sea breeze effect when the SE. trade wind is blowing. The effect of the added land breeze is to give SW. winds at night and in the early morning, whilst that of the added sea breeze is to give south-easterly or even easterly winds by day. The speed of the wind is greatest between 1400 and 1500, averaging 7 knots in April and May and 10 knots from June to October, it falls rapidly to a minimum between about 2100 and 2200 or rather later at the end of the season. During the NE. monsoon the added land breeze at night makes the prevailing wind more northerly and sometimes reduces it to a calm but in the daytime, especially in the late afternoon, the effect of the added sea breeze is to make the wind more easterly and to increase its strength. The wind speed reaches a maximum at about 1700 when it is about 9 knots and a minimum in the early morning at about sunrise. In March and April there is a SW. or S. land breeze after midnight which disappears soon after sunrise, and in the afternoon the winds are chiefly NE. or E. in March, becoming SE. in April. The maximum wind speed is experienced between 1500 and 1600 and the minimum at about 0600.

The land breeze is most frequent and strongest in the channels between the mainland and the islands of Pemba, Zanzibar and Mafia; this is probably due to these channels being sheltered from the general wind currents. The land breeze sometimes extends right across the channel to the coasts of the islands.

At Zanzibar and in the Zanzibar channel, during the NE. monsoon, the wind blows from NNE. in the morning and backs to NNW. at 1200, and then veers to ENE. at about 1700; the speed increases to a maximum shortly before midday, becomes lighter until about 1400 and then increases again to a secondary maximum at about 1700. When the SE. trade wind is blowing, the wind is SSW. in the morning, falling light about 1000 and then hauling to S.; it freshens about 1300 and is SE. by the evening. During the transition months of March and November the winds are light and variable with frequent calms, especially in the early morning, and in November the wind blows from SE. or E. in the afternoon.

The following notes on land and sea breezes experienced at a few places on that part of the east coast of Africa under consideration here have been taken from the Africa Pilot, Part III, 1929:—

Lamu and Formosa Bay.—The wind close in-shore draws in towards the coast during the daytime and a land wind prevails at night. In January the wind varies between NE. and SE. and is generally fresh but at times it is light.

Mombasa.—The day breezes when the NE. monsoon and the SE. trade winds are blowing are leading winds for vessels entering the port and during the night and early morning a light land wind blows which is generally steadiest between 0600 and 0800.

Mafia island.—The wind in the Mafia channel is steadier during the day than in the Zanzibar channel.

Kilwa Kisiwani.—Easterly winds prevail here in the form of strong sea breezes during the greater part of the year and generally cause a considerable swell outside the harbour.

Gales.—Gales are rare in the area under consideration and over the open sea they have only been recorded in January, February, July and August. The Pilot Charts of the Indian ocean published by the U.S. Hydrographic Office show gales to have been recorded in ships' logs in the area 0–5° S., 40–45° E. on only 2 per cent of the observations in July and August and never in the other months. The percentage frequency of gales that have occurred over the sea areas under consideration is given in the tables on pages 55 and 56, and for convenience they are reproduced in the table below:—

Area	January		February		July		August	
	direction	per cent						
0–5° S., 40–45° E.	NE.	0.7	—	0	SSE.	1.7	SE.	1.1
5–10° S., 40–45° E.	—	0	NE.	0.5	—	0	—	0

Note.—Over the sea between the coast and 40° E. no gales have been recorded.

Occasionally winds of gale force are experienced on the coast due to a tropical cyclone and the occurrence of these winds is given in Section II on tropical cyclones and depressions on page 8.

As a rule the winds on the coast are rarely in excess of Beaufort force 5 and in recent years in no case has a gale been recorded by an anemometer.

Records which were kept at Dar es Salaam before 1914 show that gales occurred in all months from April to October, but never from November to March; the months of maximum frequency were August and September when the SE. trade is at its height, but in those months there was on the average only about one day with a gale in each month, whilst for the whole year there were not more than two days. In the records kept from 1896–9 the maximum speed of the wind was 31 knots which according to the Beaufort scale is force 7 and just below that of gale force.

Squalls.—Squalls are said to be most frequent at the setting in of the SE. trade and NE. monsoon especially with the former. On the coast squalls are of short duration and usually occur during thundery conditions. Gusts reaching wind speeds between 50 and 60 knots have been known.

H.M.S. *Nassau*, when surveying the coast in the vicinity of Cape Delgado, experienced heavy squalls from the NW. during the NE. monsoon, and at the change over from the NE. monsoon to the SE. trade in April heavy squalls frequently occurred from S. and SW.

At Zanzibar in the years 1931–9 squalls, Beaufort letter "q", were recorded in all months of the year. The highest number of recorded squalls was in May with an average of 5. The maximum wind speed attained in the squalls was 48 knots in December, 1936. In February and the beginning of March, 1924, several squalls were experienced at Zanzibar and in one of these squalls on February 13th the wind was said to have reached Beaufort force 9 and to have suddenly shifted to SW. and back again to NE. Further squalls were experienced on February 15th, 17th and 19th; the one on the 19th being of the line-squall type in which the force of the wind was said to have reached Beaufort force 10. On March 2nd a heavy rain squall from the NNE. was also experienced at that place.

2—UPPER WINDS

Observations of the upper winds on the coast of the region under consideration are only available for Zanzibar. Monthly wind-roses for this place for heights up to 16,500 feet above mean sea level are reproduced in Figs. 9–12, and the corresponding data are given in Table III on pages 57–59.

The observations were carried out during the period 1931–6 from a position 69 feet above mean sea level. The time of the observations is variable, some were made at 0900 (local time) and others at 1500 (local time). It should be remembered that observations of the upper air obtained by means of balloons usually refer

to fine weather only, as during periods when the clouds are low or when strong winds are blowing the balloon will be lost sight of before any of the higher altitudes are reached.

Zanzibar is situated roughly in about the centre of the coast of the area under consideration so it should give a fairly good representation of the upper air conditions over the region. They may, however, differ slightly in the extreme north near the equator and also in the extreme south in the vicinity of Cape Delgado.

Upper winds at Zanzibar.—Over that part of East Africa under consideration here the general air circulation, at a height sufficiently great not to be directly influenced by surface conditions, is composed of two main air currents, the NE. monsoon and the SE. trade.

In the three months December, January and February the NE. monsoon is blowing at the surface and northerly winds predominate up to at least 6,500 feet. At the surface the direction of the monsoon is between N. and NE. and it is light in force in December when there are frequent calms, but in January and February it increases both in frequency and force, the maximum frequency and strength being experienced in January. Except in December the winds at 1,500 feet are mainly from N., but NE. winds also blow on about 30 per cent of occasions; these N. and NE. winds extend up to 3,000 feet but at 6,500 feet whilst N. winds continue to predominate the NE. winds become less frequent and NW. winds are often blowing. It would appear that the NE. monsoon does not extend much above 6,500 feet in these months. On occasions in January and February, between 1,500 and 6,500 feet, N. winds may be experienced with a speed of over 27 knots. At 10,000 feet the winds are much more variable in direction and it is unusual for their speed to exceed 27 knots; winds from a southerly direction are rare. In December at 13,000 and 16,500 feet, E. winds predominate, although NE., and at 16,500 feet N. winds as well, are sometimes experienced. These easterly winds increase in frequency and strength with increasing height, and at 16,500 feet they have at times exceeded a speed of 27 knots. Their frequency at these heights falls off in January and February and in the latter month light winds from some northerly direction prevail.

In March, which is a transition month between the NE. monsoon and the SE. trade, the winds at the surface and at all heights up to 16,500 feet are very variable. At the surface light SW. winds blow on about 25 per cent of occasions, but at 1,500 and 3,000 feet westerly winds are rare. At 16,500 feet E. winds predominate and blow on nearly 40 per cent of occasions and winds with an easterly component prevail also at greater heights.

In April and May the winds at the surface are mainly SW., S. and SE. with SW. winds slightly predominating in April and S. winds in May; they are on the whole light in force. At 1,500 feet the winds in both months are almost entirely from SE. or S., indicating

ZANZIBAR

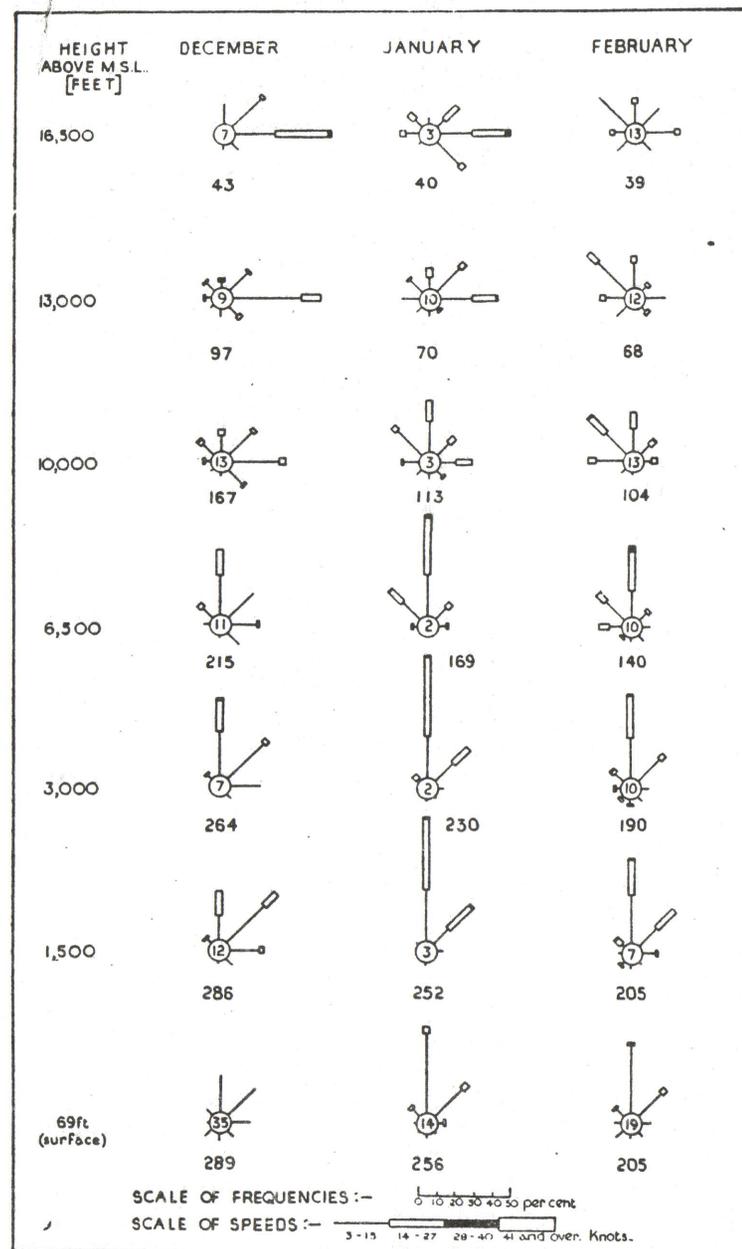


FIG 9—UPPER WINDS—MONTHLY

Figures inside the circles indicate the percentage frequency of calms.
Figures below the roses indicate the number of observations.

Upper Winds
ZANZIBAR

9 25

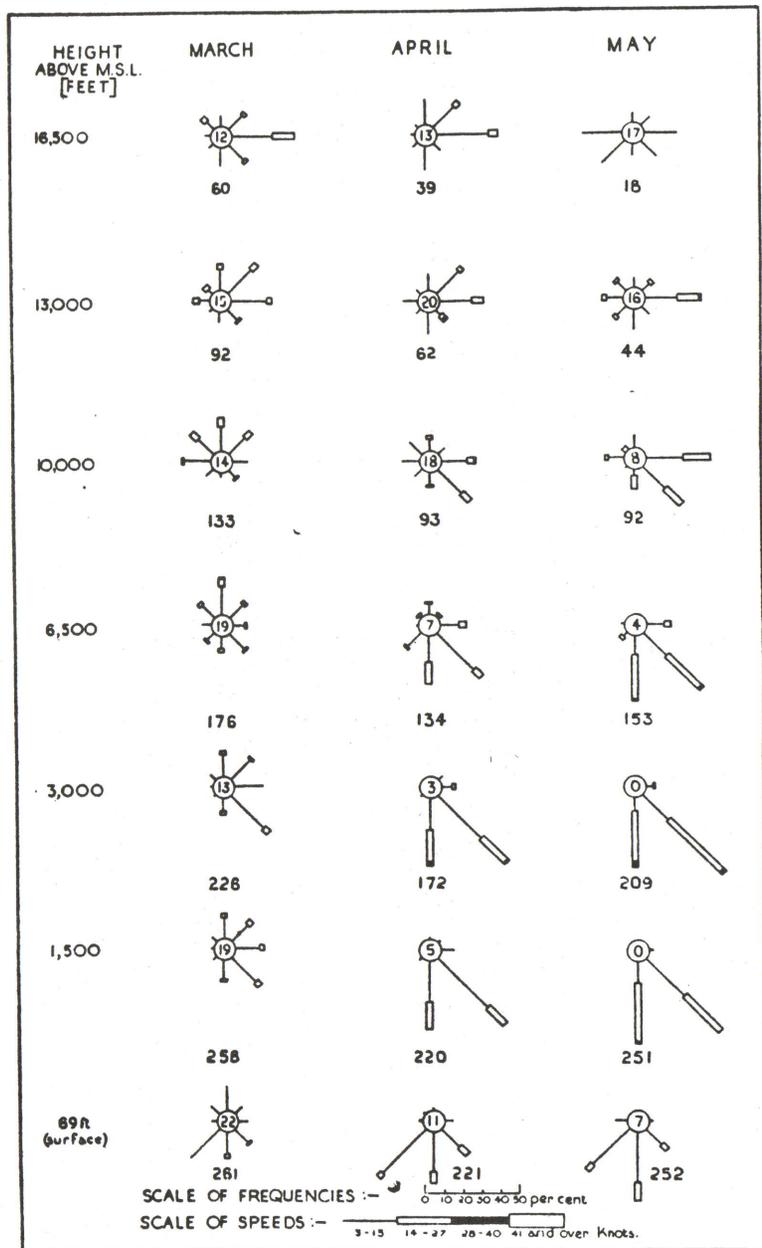


FIG. 10—UPPER WINDS—MONTHLY

Figures inside the circles indicate the percentage frequency of calms.
Figures below the roses indicate the number of observations.

Coast of East Africa
ZANZIBAR

9 26

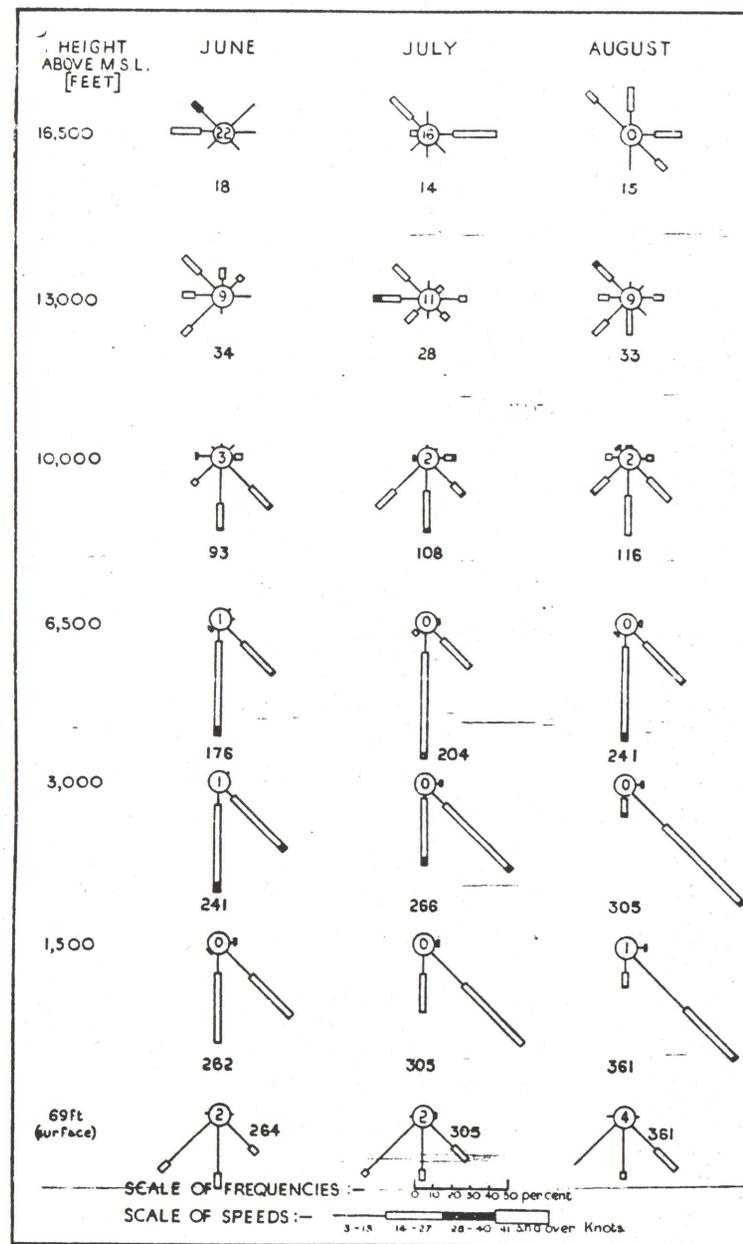


FIG. 11—UPPER WINDS—MONTHLY

Figures inside the circles indicate the percentage frequency of calms.
Figures below the roses indicate the number of observations.

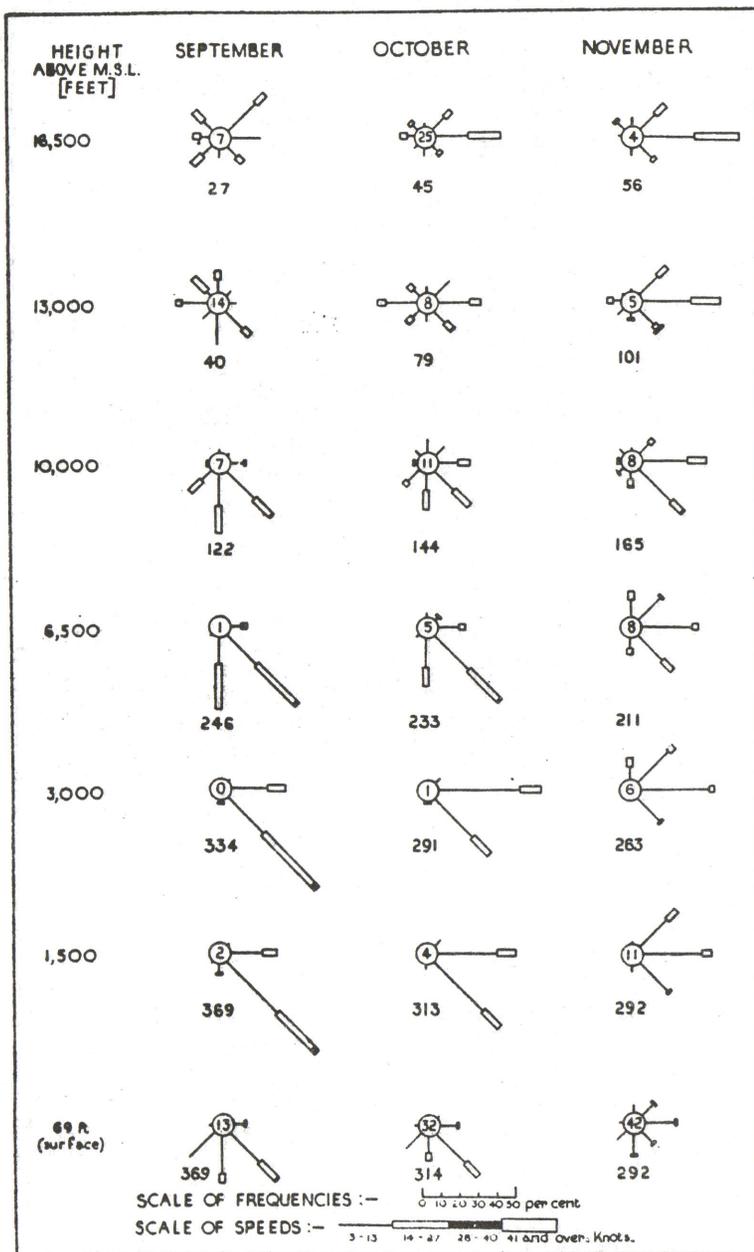


FIG. 12—UPPER WINDS—MONTHLY

Figures inside the circles indicate the percentage frequency of calms.
Figures below the roses indicate the number of observations.

that the SE. trade has set in over the area at this height in April. The thickness of the SE. trade when fully developed is about 10,000 feet but in the later months of the season its direction at the higher levels is more S. than SE. In April the frequency of the S. and SE. winds begins to fall off at 6,500 feet and at 10,000 feet the winds are rather variable but with E. and SE. winds predominating, these winds back to E. and NE. at 13,000 and 16,500 feet. In May the frequency and strength of the S. and SE. winds, from 1,500 to 6,500 feet, show an increase over that of April and wind speeds of over 27 knots may be occasionally reached; the frequency and strength, however, falls off at 10,000 feet and at 16,500 feet the winds in this month are very light and variable.

From June to August the SE. trade blows with great regularity and at the surface the winds are almost entirely from SW., S. or SE. At 1,500 feet the SW. winds have disappeared and S. and SE. winds predominate and they increase in strength with height; between 1,500 and 3,000 feet in June S. winds are most frequent but in July and August, especially in August, the frequency of SE. winds is the greater. At 6,500 feet S. winds predominate in all three months. At 10,000 feet the frequency of S. and SE. winds falls off in all three months and winds from SW. are fairly frequent; this marks the upper limit of the trade wind current. In June at 13,000 feet westerly winds between NW. and SW. may frequently blow; these westerly winds at this height continue to blow in July and August, and may be strong. There is no evidence of any predominating air current at 16,500 feet although it is probable that winds with an easterly component prevail at higher levels.

The winds at the surface in September are very similar to those of the previous three months but at 1,500 and 3,000 feet, although SE. winds predominate, E. winds are also experienced on nearly 30 per cent of occasions. At 6,500 feet the frequency of E. winds drops and S. winds blow nearly as often as SE. winds; at 13,000 and 16,500 feet winds become much more variable. From June to September up to heights of about 10,000 feet northerly winds are extremely rare. Up to heights of 6,500 feet and sometimes higher the S. and SE. winds are often blowing with a speed of over 14 knots and even occasionally with a speed of 28 knots or more.

In October at the surface the SE. trade does not blow with the same intensity as in the previous months and there are frequent calms, but at 1,500 and 3,000 feet light E. and SE. winds prevail whilst winds from other directions are rare. At 6,500 feet S. winds blow more frequently than E. winds but SE. winds predominate and very occasionally reach a speed of over 27 knots. Above 6,500 feet the winds become much more variable which seems to indicate that the SE. trade does not extend much beyond this height. At 13,000 feet although winds may blow from almost any direction both E. and W. winds are experienced on about 25 per cent of occasions and at 16,500 feet E. and NE. winds predominate.

In November, which is a transition month between the SE. trade and the NE. monsoon, the winds at the surface are very variable and there are frequent calms. At 1,500 feet the winds are almost entirely from NE., E. or SE. and these winds continue to blow at 3,000 and 6,500 feet with occasional N. winds at both heights. From this it would appear that the influence of the NE. monsoon is beginning to be felt at these altitudes during this month. At 10,000 feet and above although easterly winds predominate, winds from a westerly direction may also very occasionally blow. At 13,000 feet a SE. wind with a speed of over 40 knots has been experienced.

Upper winds in the equatorial region.—The only observations of upper winds that are available in the equatorial region of the East African coast are some taken at Mogadishu ($2^{\circ} 02' N.$, $45^{\circ} 21' E.$) in 1932–3. They are taken in Lat. $2^{\circ} N.$ and are not therefore actually within the region under consideration here, but the results will serve to give some idea of the conditions that are likely to be experienced in the neighbourhood of the equator; the differences between the two hemispheres have, however, always to be borne in mind.

The results show that the NE. monsoon current prevails at the surface from December to February extending upwards to a height of 5,500 to 7,500 feet. In January when it is most fully developed its speed increases with height to a maximum of 25 knots at about 1,300 feet, decreasing to 17 knots at 6,500 feet. In December and February the maximum speed occurs at a slightly higher level, approximately 1,600 feet, where the average is about 21 knots decreasing to 14 knots at 6,500 feet.

In the transition months of March and April winds are light and variable at all heights.

The SW. monsoon current, which is a continuation of the SE. trade of the southern hemisphere, develops in May and prevails in the lower layers until about the end of September. The thickness of the current in July and August, when it reaches its fullest development, is about 8,000 feet. Its speed increases with height, the maximum occurring at about 2,500 feet in May and at about 4,000 feet in July. The speed at the surface is 16–18 knots and at the level of the maximum is 20 knots in May and 24 knots in July.

In October and November when the SW. monsoon is giving place to the NE. monsoon, the winds at heights up to 5,000 feet are from S. and SE. with persistent northerly winds above, extending to 10,000 feet.

Immediately above the monsoon currents the winds are in general variable. The observations at Mogadishu indicate that above a height of 13,000–16,500 feet in all months, except September, there is a fairly strong wind from due E., which persists up to heights of 30,000 or 40,000 feet. The existence of this steady easterly wind at

high levels along the equator has not, however, been substantiated by observations in British East Africa, and until further information is available all that can be said is that in general the winds at high levels are variable with a marked easterly component dependent on the pressure distribution north and south of the equator.

IV—VISIBILITY

Over the sea and on the coast the visibility as a whole is generally good, but during periods when the NE. monsoon or SE. trade are strong there may be low clouds and drizzle which on the coast come in from the sea, and this may cause local patches in which the visibility may decrease to about 500 yards. This is generally in the early morning and such patches are usually small in extent. Fogs are unlikely to persist far into the day.

Over the land the visibility may deteriorate through rain, radiation fogs or smoke. In places at high altitudes clouds may touch the ground and very thick haze may be caused by smoke from grass or bush fires; this kind of haze, however, is only likely to occur in the dry season and is not generally experienced on the coast.

At Zanzibar during the 7-year period on which the data in the general climatological table on page 51 are based no fogs were reported.

In Table IV on page 60 is given the percentage frequency of different degrees of visibility for Mombasa and Lindi during the two years 1938–9, and the average number of days of poor visibility obtained from that table is included in the general climatological tables. The observations were made at 0830 and 1430 local time. From this table it can be seen that at Mombasa the visibility both in the morning and afternoon is seldom less than five miles and that in more than 70 per cent of the observations it is over ten miles. At Lindi the visibility at both times of the day is over ten miles in more than 90 per cent of the observations and in some months in 100 per cent.

At both Mombasa and Lindi poor visibility, i.e. a visibility of less than two nautical miles is liable to occur both in the morning and in the afternoon although it is comparatively rare. During the two years covered by the observations it was not recorded from July to September although it was recorded at one or other of the stations in all the other months.

The following is a local note on visibility taken from the African Pilot, Part III, 1929:—

“In Tanga Bay ($5^{\circ} 05' S.$, $39^{\circ} 06' E.$), when the SE. trade is blowing, the Bondei mountains are frequently obscured by haze, or, perhaps, only the easternmost of them can be dimly seen; they are generally clear, however, during the NE. monsoon.”

V—CLOUD

The data giving the monthly averages of the cloud amount for Mombasa and Zanzibar for the mean of two hours in the day, and for Tanga, Dar es Salaam, Kilwa and Lindi for the two hours separately, are given in the general climatological tables on pages 49-54. The step diagrams showing the monthly variation in the mean cloud amount are reproduced in Fig. 13 below.

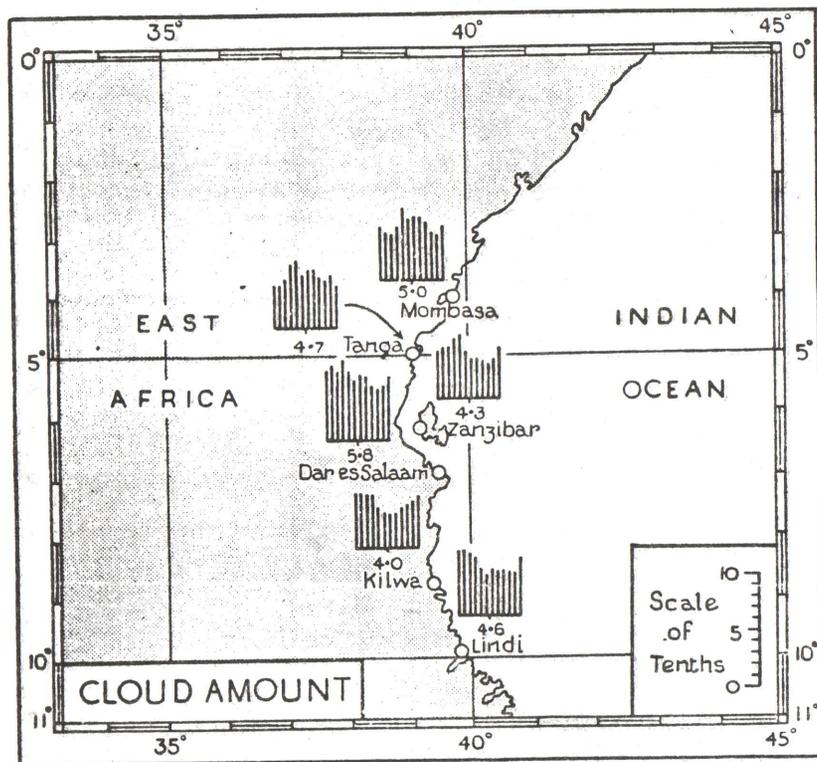


FIG. 13—MONTHLY VARIATION IN MEAN CLOUD AMOUNT

The figures below the step diagrams indicate the mean annual amount of cloud. The step diagrams are the mean of 2 observations a day.

On that part of the coast of East Africa under consideration here there is no well pronounced seasonal variation of cloud amount, the annual range being small. The mean annual amount at most places ranges between 4 and 5-tenths, except at Dar es Salaam where it is nearly 6-tenths; this place appears to be the most cloudy of any on the coast.

Over the sea between the equator and Lat. 10° S. and from the coast of East Africa to Long. 45° E. the mean cloud amount in the summer of the southern hemisphere increases slightly from the equator southwards and ranges from about 3-tenths in the vicinity

of the equator to between 5 and 6-tenths in Lat. 10° S. In the winter months (July to September) the mean cloud amount increases from west to east; off the coast it is between 3 and 4-tenths and in Long. 45° E. it increases to between 4 and 5-tenths.

On the coast from Dar es Salaam to Mombasa the cloudiest skies occur at the height of the rainy season in April or May when cloud amounts are between about 6 and 7-tenths. At Kilwa the cloudiest month is not in April, the rainiest month, but in January and February, when the mean cloud amount is just under 5-tenths. At Lindi the highest cloud amount is in the rainy season from December to April, when it is between about 5 and 6-tenths with a maximum of nearly 6-tenths in January and February.

Owing to the small range in the monthly mean cloud amounts, the months with the clearest skies on the coast are not very clearly indicated, but at Mombasa they seem to occur in February and March, and in October and November when the mean cloud amount is about 4-tenths, these months have very few rain-days with a minimum of one in February; at Tanga the least number of rain-days is experienced from December to February and the smallest mean cloud amounts are also in those months. At Zanzibar the clearest skies are from July to November when the mean cloud amounts are between 3 and 4-tenths and the least amount occurs in October. The clearest skies at Dar es Salaam are in September, October and November when the cloud amount is between 4 and 5-tenths; this is at the end of the dry season. Further south along the coast, at Kilwa, June to August are the least cloudy months with a mean cloud amount of about 3-tenths, these being dry months; at Lindi the smallest cloud amounts, about 4-tenths, are from May to November, which are also dry months.

During four years' observations at Mombasa and Zanzibar, no cloudless days were observed at Mombasa but an average of one a year was observed at Zanzibar. In addition there was one day a year at Zanzibar when the cloud amount did not exceed one-tenth, all these cases occurring in June, August or October. At Mombasa there were on the average two days a year with completely overcast sky, with an additional five days when cloud amount did not decrease below 9-tenths. At Zanzibar there was an average of four completely overcast days per year and a further seven days when cloud amount did not decrease below 9-tenths.

There is a distinct diurnal variation in cloud amount depending on the type of weather. At Mombasa, cloud is generally least in the evening, increasing rapidly in the early hours of the morning, but whereas from May to December there is a fall after 1600 or 1700, during the rest of the year, January to April, the decrease takes place shortly after midday. During these latter months, too, the average daily cloud amount is less than 5-tenths, whereas from May onwards it is generally over 6-tenths. At Zanzibar the diurnal variation is still more marked, the minimum being in the evening

and the time of maximum varying gradually from 0600 in July to 1100 in December, with a secondary maximum in the afternoon during the months of April to September, that is, the period of the SE. trade. On the coast of Tanganyika from Dar es Salaam southwards, the cloud amount is less in the afternoon than in the morning from about September to February and greater from April to August.

At Zanzibar it has been reported that a rather striking cloud phenomenon is sometimes seen during the months of the SE. trade (April to November); this is said to be the appearance in the western sky of a cloud or haze bank, which is rather suggestive of a line-squall cloud; this is sometimes described as the monsoon wall.

From a few observations that have been taken at Zanzibar it appears that throughout the year cumulus and cumulonimbus clouds are the most frequent, but in April, May and June nimbus and stratocumulus clouds are also fairly frequently observed.

Some observations of the height of low clouds have been obtained at Mombasa, Zanzibar, Dar es Salaam and Lindi; these are for the years 1937-8 and from these observations it would appear that low clouds are observed on most days throughout the year and the occasions on which no low clouds were recorded are very few.

There is, however, considerable variability in conditions from year to year, and in some years freedom from low cloud may be experienced occasionally during the months of the SE. trade.

The low clouds that were observed at the four stations during the two years usually had their base between 1,000 and 5,000 feet throughout the year, but at Mombasa in the afternoon in most months the height of the base of the low clouds is often between about 5,000 and 8,000 feet and this also appears to be the case at Lindi from June to October.

During the two-year period clouds with their bases below 300 feet were observed at Dar es Salaam in the afternoon on one occasion in each month in January and February, 1937, and at Lindi in the morning on one occasion in each month in March, April and July, 1938.

VI—RAIN AND HAIL

1—RAIN

Step diagrams showing the monthly averages of rainfall and rain-days are reproduced in Fig. 14 and the corresponding data are given in the general climatological tables on pages 49-54 and for Lamu below.

AVERAGE RAINFALL AND NUMBER OF RAIN-DAYS AT LAMU

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Rainfall (mm.)	6	2	19	132	360	175	67	39	31	36	34	28	929
Rain-days	0.6	<.1	1	6	13	11	6	4	3	2	2	2	51

Authority.—Bibliography No. 39. Periods: Rainfall, 1906-38. Rain-days, 1914-39.

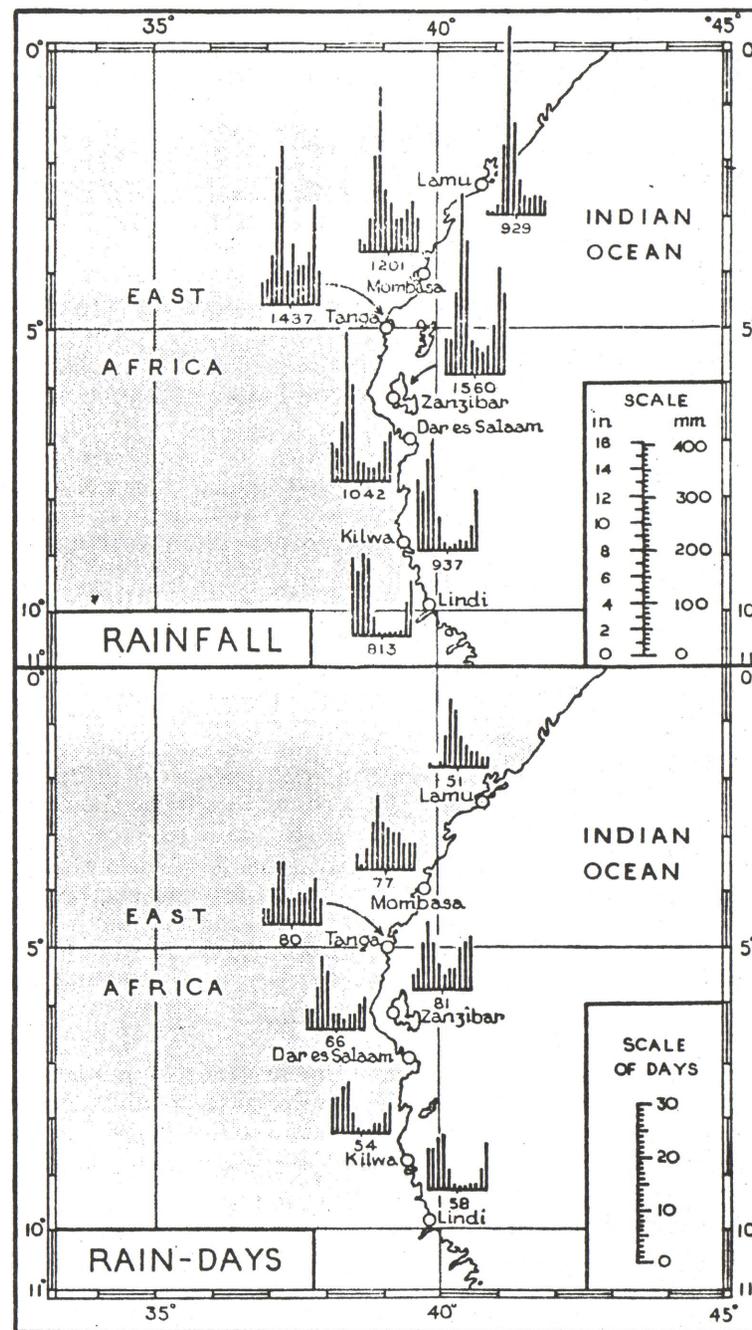


FIG. 14—MONTHLY VARIATION OF RAINFALL AND RAIN-DAYS

The figures below the step diagrams indicate the total annual amount of rain (mm.) and total number of rain-days per year.

A rain-day is taken as one on which 0.1 in. (2.5 mm.) or more of rain fell

The definition of the rain-day that has been used for the area under consideration is that at the India Meteorological Department, namely, a day when one-tenth of an inch (2.5 mm.) or more of rain falls.

The rainy seasons occur mainly when the NE. monsoon and the SE. trade are setting in or in the early stages of their existence. The northern coastal region, the coast of Kenya, has its principal rainy season from April to June and this is called the period of "long rains"; in this area there is a slight increase of rain again in November or December when the NE. monsoon is setting in; this is called the "short rains", but it is more marked on the islands of Zanzibar and Pemba than on the mainland; north of Lamu this second rainy season dwindles to practically nothing.

The southern portion of the coast, from about Dar es Salaam southwards, has only one rainy season which is from November or December to April or May, but the other months of the year are not rainless although in the extreme south the total for the five months June to October is only 37 mm. (1.5 in.).

The rain over the area is mostly in the form of heavy showers and sometimes accompanied by thunder. Even in the wet season it seldom falls continuously throughout the day, but heavy downpours occur particularly about noon. The beginning of the wet season is marked by stormy weather, violent squalls and understorms, when the rainfall is often very heavy. The amount recorded varies very greatly and the rainfall in the wettest months occasionally double its mean value.

Over the sea in the area 0–10° S., 40–45° E. the mean annual rainfall over most of the area is estimated to be between 1,000 and 1,500 mm. (40 and 60 in.), except in the north, from the equator to 5° S., where it is between 500 and 1,000 mm. (20 and 40 in.). On the coast the highest rainfall is experienced between Lamu and Dar es Salaam and the lowest in the north in the vicinity of Kisimayu.

The mean annual rainfall in the vicinity of Kisimayu is between 250 and 500 mm. (10 and 20 in.), further south, to the north of Lamu, it is between 500 and 1,000 mm. (20 and 40 in.), whilst

from Lamu to Dar es Salaam it is between 1,000 and 1,500 mm. (40 and 60 in.); southwards to Lindi it diminishes again to between 500 and 1,000 mm. (20 and 40 in.). There is one small patch in the vicinity of Pangani (5° 26' S., 39° 00' E.) where the annual mean rainfall is between 1,500 and 2,000 mm. (60 and 80 in.). The annual amounts are liable to vary considerably from the mean from year to year. At Mafia island the rainfall is said to be greater on the western point of the island than in the other parts.

The annual average number of rain-days varies from about 50 at Tanga and Zanzibar to between 50 and 60 at Lamu in the north and Kilwa and Lindi in the south.

Seasonal variation

The coast from the equator to Lat. 6° S. including Zanzibar.—The greatest rainfall on this part of the coast, north of Lat. 5° S., is in April, May and June, but at Tanga and Zanzibar, which are south of that latitude, June is not a particularly wet month. The maximum falls of rain occur in May when on the coast from Tanga to Lamu the mean amount is between about 300 and 360 mm. (12 and 14 in.), north of Lamu the amount falls off considerably and at Kisimayu in this month the mean is only between about 130 and 150 mm. (5 and 6 in.). At Zanzibar the greatest amount of rain falls in April when the mean is nearly 350 mm. (14 in.), whilst in May the mean amount is about 260 mm. (10 in.). At Tanga and Zanzibar the rainfall in June decreases to about 60 mm. (2.4 in.); further north, however, the decrease is less rapid.

August and September are comparatively dry months over the area when the mean rainfall at Mombasa is under 65 mm. (2.6 in.), whilst at Zanzibar in August the mean is only 43 mm. (1.7 in.).

The amount of rain increases again in October and there is a smaller second maximum rainfall in November or December when the NE. monsoon is setting in. The mean rainfall at Tanga and Zanzibar in the month of secondary maximum is about 200 mm. (7.8 in.) and at Mombasa it is about 100 mm. (4 in.); the amount, however, decreases rapidly northwards and at Lamu the mean amount is only 35 mm. (1.4 in.) and further north at Kisimayu it does not exceed 20 mm. (0.75 in.). After the NE. monsoon has become established the rainfall decreases and there is a short dry season until March when the rainfall again begins to increase on the approach of the SE. trade. At all places on this part of the coast, except at Zanzibar, January and February are the driest months of the year but at Zanzibar August is the driest month. At Tanga the driest month is January with a mean rainfall of 40 mm. (1.5 in.), and at Mombasa and Lamu the driest month is February with a mean rainfall of 17 and 2 mm. (0.7 and 0.08 in.) respectively, whilst to the north of Lamu the amounts are less.

The number of rain-days varies from about 12 to 14 in April or May, the principal wet season, to three or less in the driest months. The variation in the number of rain-days in a month from one year to another may be quite large owing probably to the late or early arrival of the NE. monsoon or SE. trade. At Lamu in 1936 and 1937 there were 12 rain-days in April whilst in some other years there has been only one day with rain in that month. During the shorter rainy period the average number of rain-days at Mombasa is five in November and December, whilst at Tanga the average is about nine in November and five in December, and further north at Lamu the number in those months is not more than two.

The coast from Lat. 6° S. to Cape Delgado.—The rainfall is fairly heavy along this portion of the coast but it diminishes from north to south. The heaviest rainfall occurs when the SE. trade first begins

to blow, but some rain falls in all months although the amount in the south in some months is very small. In January and February the rainfall is greater in the south than in the north but from March to November the northern part of the coast receives the most rain. The wettest months are from December to April and at Lindi in the south March is the wettest month with a mean of 157 mm. (6.2 in.). The rainfall at Lindi begins to diminish in April, whereas at Dar es Salaam and Kilwa April is the wettest month with mean rainfalls of 281 and 214 mm. (11 and 8.4 in.) respectively. This difference in the time of maximum is probably due to the SE. trade reaching the southern part of the coast earlier than the northern.

The months from June to October are comparatively dry along this portion of the coast and there is no second wet period as there is to the north of about Lat. 6° S. At Dar es Salaam August is the driest month with a mean rainfall of 25 mm. (1.0 in.), and at Kilwa July is the driest month with a mean of about 9 mm. (0.35 in.); at Lindi, however, the driest month is June with a mean rainfall of only 2 mm. (0.08 in.).

The average number of rain-days on this section of the coast varies from 14 at Dar es Salaam in April, the wettest month, to two in August, the driest month. At Kilwa and Lindi there are on the average about 10 days with rain in March and April, the wettest months, and about one day in July and August, the driest months, but in some years there may be none at all in these months. A certain amount of variability in the number of rain-days from year to year is noticeable in November and December as the rain depends a great deal on whether the NE. monsoon arrives on the coast early or late.

Diurnal variation.—The principal falls of rain usually occur between 0900 and noon and at Zanzibar the maximum fall is at 1000 with a minimum at 2300.

Extremes of monthly and annual rainfall.—The table on page 38 gives the greatest and least amounts of rainfall that have occurred in each month and in the year at Mombasa, Tanga, Zanzibar, Dar es Salaam, Kilwa and Lindi.

From this table it will be seen that the amount of rain that falls during the year may vary considerably. In a wet year the total amount may be more than double that of a dry year, whilst at Zanzibar, Dar es Salaam and Kilwa the amount may be three times as much.

As regards the monthly values these may also vary considerably; in the wet season at Mombasa during May as much as 1,043 mm. (41 in.) of rain fell in one year whilst in another year only 56 mm. (2.2 in.) fell in that month; at Zanzibar in April 847 mm. (33.3 in.) has fallen whilst in another year in the same month only 45 mm. (1.8 in.) fell. In the dry season months of January and February, Mombasa, Tanga and Zanzibar have had in some years no rainfall

but during another year there has been as much as 140 to 190 mm. (5.5 to 7.5 in.) in January and 80 to 270 mm. (3.5 to 10.5 in.) in February at those places. At Dar es Salaam, Kilwa and Lindi there has sometimes been no rainfall recorded in June, July, August and September and also in May at Kilwa and Lindi; on the other hand at Dar es Salaam in June as much as 173 mm. (6.8 in.) has been recorded whilst at Kilwa and Lindi in September 81 mm. (3.2 in.) and 58 mm. (2.3 in.) respectively have been measured.

MAXIMUM AND MINIMUM MONTHLY AND ANNUAL RAINFALL

The period over which the observations extend is given in brackets under each place.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	<i>millimetres</i>												
Mombasa (34 yrs.)	142 0(3)	83 0(9)	267 0(2)	515 14	1,043 56	389 13	299 26	127 10	244 9	310 4	215 3	262 5	1,886 845
Tanga (c. 26 yrs.)	140 0(2)	238 0(1)	317 4	814 48	673 53	165 0(1)	224 3	171 8	251 3	405 7	796 25	193 5	2,131 973
Zanzibar (40 yrs.)	192 0(2)	273 0(1)	488 8	847 45	540 10	206 0.5	130 0(1)	115 2	167 8	271 22	481 45	453 10	2,361 699
Dar es Salaam (37 yrs.)	260 0.2	169 0(1)	289 3	603 44	445 11	173 0(1)	86 0(2)	107 0(2)	67 0(1)	134 2	269 4	320 0.6	1,444 493
Kilwa (25-27 yrs.)†	335 1	272 17	757 43	511 24	199 0(1)	67 0(6)	56 0(11)	47 0(3)	81 0(2)	62 2	157 0.1	240 12	1,481 470
Lindi (22-24 yrs.)†	304 43	228 29	351 30	342 56	122 0(2)	29 0(8)	25 0(6)	46 0(2)	58 0(4)	61 0(2)	177 1	231 12	1,058 620

Authorities.—Bibliography Nos. 29, 39, 43, 46, 50.

Notes.—† The period for the annual values is 22 yrs. at Kilwa and 14 at Lindi.

The figures in brackets indicate the number of times during the period that the particular month was rainless. The normal rainfall during the month is given in the general climatological tables.

There is a considerable variation in the rainfall from year to year during the short second rainy period. At Mombasa, where in November and December between about 200 and 250 mm. (7.8 and 9.8 in.) has fallen in one year, there has been in another year only 3 or 5 mm. (0.1 or 0.2 in.) recorded. At Zanzibar in December 453 mm. (17.7 in.) fell in one year and only 10 mm. (0.4 in.) in another, whilst Dar es Salaam has had in December as much as 320 mm. (12.6 in.) and practically none at all in another year.

Intensity of rainfall.—The rainfall in March, April and May at the commencement of the principal rainy season is often very intense. On a small island about 90 miles south of Dar es Salaam a rainfall of 48.3 mm. (1.9 in.) was recorded in 25 minutes during the morning of a day in March. This gives a rate of fall of 115.9 mm. (4.56 in.) per hour.

Maximum rainfall in 24 hours.—The maximum rainfall in 24 hours in each month for Mombasa, Tanga, Zanzibar, Dar es Salaam, Kilwa and Lindi is given in the general climatological tables on pages 49–54. The amount that falls during the 24 hours may be considerable, and at Kilwa as much as 182 mm. (7.2 in.) has been recorded in the course of a day in April and 207 mm. (8.1 in.) at Mombasa in May. Although during the chief rainy season the rainfall, during a particular period of 24 hours, has never reached the amount of the mean for the whole month, this has occurred during the dry season and also during the second or short rainy season. At Mombasa in December 206 mm. (8.1 in.) of rain has fallen in 24 hours although the mean for that month is only 64 mm. (2.5 in.), and Mazeras, a place fifteen miles inland from Mombasa, recorded 356 mm. (14 in.) in 24 hours in October, 1938. At Weti on the island of Pemba to the north-east of Zanzibar a fall of 278 mm. (11.2 in.) during 24 hours was once measured; this is probably the heaviest rainfall that has been recorded on the islands of Zanzibar and Pemba.

2—HAIL

Hail has not been reported on the coast, although it is not uncommon inland at places at an altitude of about 3,000 feet and above.

VII—TEMPERATURE

1—AIR TEMPERATURE

The data of the means and extremes of temperature for Mombasa, Tanga, Zanzibar, Dar es Salaam, Kilwa and Lindi are given in the general climatological tables on pages 49–54, and the following table gives the mean monthly temperature of the air over the sea in those four 5-degree sea areas adjacent to this coast:—

MEAN TEMPERATURE OF THE AIR OVER THE SEA IN THE DIFFERENT 5° AREAS

Areas	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
	<i>degrees Fahrenheit</i>											
0–5° S.												
35–40° E.*	83	(82)	83	83	(81)	78	77	(78)	(77)	(78)	80	82
40–45° E.	81	81	82	83	81	79	77	77	77	79	80	81
5–10° S.												
35–40° E.*	83	83	83	82	81	79	77	77	78	79	81	82
40–45° E.	82	83	83	82	81	78	76	76	77	79	80	82

Authority.—Bibliography No. 40.

Notes.—The figures in brackets are based on less than 50 observations.

* This refers only to the sea in these areas.

The temperature of the air over the sea and on the coast of the area under consideration shows little variation in the different parts. The mean annual temperature both over the sea and in the coastal regions is about 80° F. Inland the temperature decreases with increasing height, the rate of the decrease being rather more than 1° F. for every 400 feet of altitude, and in the highlands of Kenya which are over 5,000 feet above sea level the mean annual temperature is about 65° F. The minimum temperatures show a greater decrease with height than the maximum; therefore, although the day temperatures in the highlands may be high, the nights are cool and fires are usually welcome after dark at those high altitudes.

The temperature on the coast shows only a small range both during the year and during the day. The mean temperature of the hottest and coldest months differs by only about 6° to 8° F. and the mean daily range is about 14° F.

The warmest months are from December to March and the coolest are July and August, which is the winter of the southern hemisphere when the sun is north of the equator and the prevailing winds on the coast are from south-east and come from cooler regions. Whilst, however, throughout the period of the SE. trade cool breezes are constantly blowing on the coast, about 10 to 15 miles inland, where the scrub country begins, the heat is untempered by these breezes and is therefore much less bearable. The most pleasant season on the coast, especially south of Dar es Salaam, is the period from the end of June until the middle of September when the mean temperature over the whole coastal area varies between about 76° and 79° F. During the warmest months the mean temperature varies between 81° and 85° F. A temperature of 99° F. has been experienced at Lindi in December and at Zanzibar in March, and 54° F. has been known at Lindi in July, but at no other place according to present records has a temperature below 60° F. been recorded. It should be borne in mind that those who have lived for some years in a tropical climate usually find even a temperature a few degrees over 60° F. far from warm.

Seasonal variation

December to March.—This is the hot season and the hot damp days and nights on the coast are somewhat trying to Europeans, for days the temperature may never fall below 80° F. and it once remained above 81° F. for 27 successive days in December. The highest temperatures occur rather earlier in the south than in the north, otherwise the temperature conditions are very much the same along the whole coast. In the hottest month the mean temperature is about 83° F., rising to 85° F. at Mombasa in March. The daily range of temperature is not large, the temperature varies from about 75° or 76° F. at night to about 89° or 90° F. by day. The temperature at some time during the hot season usually rises to between

93° and 95° F. and falls to 72° or 74° F., whilst the highest temperatures ever experienced are 98° and 99° F. at Zanzibar in February and March and 99° F. at Lindi in December; the lowest temperature is 66° F. at Kilwa and Lindi.

April and May.—These are the transition months between the NE. monsoon and the SE. trade. In April the mean temperature is between 80° and 81° F., except at Mombasa where it is 83° F., and it falls to 79° F. in most places in May, but the fall of temperature is more noticeable in the maximum temperatures experienced during the day than in the minimum. During this season in the north the day temperature is about 87° F., falling to about 75° F. at night, whilst in the south it is about 88° F. by day and about 72° F. at night. In the south the minimum temperature at night is about 3° or 4° F. lower than that in the north. The extreme range of temperature normally experienced on the coast during this season is from 67° to 93° F. but the temperature at Lindi has been known to fall to just below 60° F. in May and to rise to 98° F. in April.

June to September.—Along the whole coast this is the coolest season and the coolest months are July and August with a mean temperature of 76° or 77° F. The end of June until the middle of September is the most pleasant season especially south of Dar es Salaam where these drier months are a recognisably cooler period. In this region the mean temperature at night falls well below 70° F. and rises to about 85° F. during the day, but further north where more rain falls during the season the range is only from about 72° F. at night to about 82° F. by day. On the northern part of the coast the temperature throughout the season usually varies from about 67° to about 87° F., and the extreme highest and lowest temperatures experienced over a long period of years are 60° and 90° F. respectively. In the south, in extreme conditions, there is a greater range, the temperature having been known to fall to 54° F. and to rise to 97° F., but the more usual extremes are from about 60° to 90° F.

October and November.—Again this is a transition period between the SE. trade and the NE. monsoon and to most people unaccustomed to the tropical coastal climate is considered unpleasant. On the coast there is a rise in the mean temperature when in October it is between 78° and 81° F. and in November between 80° and 83° F. At night the mean temperature is between 71° and 77° F. and by day it is between 84° and 89° F. The extreme lowest temperature recorded is 59° F. at Lindi in October, whereas in November the temperature has not fallen below 67° F. at that place. The extreme highest temperature is 98° F., which also occurred at Lindi in October, but in general the temperature does not usually rise much above 90° F. nor fall much below 67° F.

Diurnal variation.—The rise and fall of temperature throughout the day, as a rule, is greatest in the dry and least during the rainy seasons. The annual mean daily range of temperature on the whole

coast is between 12° and 15° F., but it is much larger, about 25° F., further inland where the climate is more continental in type. At Mombasa the mean daily range of temperature shows very little variation throughout the year; it is least, about 10° F., in May and June, and largest, 13° F., during the hot season. In the south, where the dry season is more pronounced, the mean daily range of temperature is least during the warm rainy period, October to March, when it is between 11° and 14° F., and greatest in the drier cooler months of June to August when at Lindi it is as much as about 20° F., and 14° to 15° F. at Kilwa. At Dar es Salaam the smallest mean daily ranges, between 11° and 12° F., are in December, January and February, and the largest, about 17° F., in July, but a daily range as high as 23° F. and as low as between 1° and 2° F. has been known.

In most places on the coast the lowest temperatures during the 24 hours occur between 0400 and 0600 and the highest temperatures at about 1400.

2—SEA TEMPERATURE

The position of the 80° F. line for the sea temperature, in the different months of the year, is shown on the monthly surface wind charts of Figs. 2-7; on pages 10-15. There is no line shown on the charts for March and April as over the whole area the temperature of the sea is between about 82° and 83° F., nor are any lines shown on the charts for July, August, September and October as in those months the sea temperature in the area is between 76° and 79° F.

The average sea surface temperature over the whole area is about 80° F.; it is highest from February to April and lowest from July to September. The range of temperature between the highest monthly mean and the lowest is about 7° F.

From about November to March there is some indication that the sea temperature decreases northwards along the coast. In January and February the sea temperature is about 83° F. in the south, in the vicinity of Lat. 10° S., decreasing to about 80° F. near the equator. In April the sea temperature is between 82° and 83° F. and after this month the temperature of the sea decreases steadily until August, the decrease being rather more rapid in the south than in the north. In June the sea temperature is between 78° and 81° F. and it falls to between 76° and 77° F. in August and September; after September it begins to increase again until in November and December it is between about 81° and 82° F.

3—RELATIVE VALUES OF SEA AND AIR TEMPERATURE

The difference between the temperature of the surface of the sea and that of the air is not more than between one or two degrees at any time of the year; this is so small that it is not of very much significance.

In January the temperature of the air in the north is slightly warmer than that of the sea whilst in the south, in about Lat. 10° S., the sea tends to be warmer than the air; in July the air is slightly warmer than the sea but by less than 1° F.

VIII—HUMIDITY

The data giving the mean monthly relative humidity for two hours of the day, one in the morning and the other in the afternoon, for Mombasa, Tanga, Zanzibar, Dar es Salaam, Kilwa and Lindi are given in the general climatological tables on pages 49–54. Wet bulb temperatures for two hours of the day for Mombasa, Dar es Salaam, Kilwa and Lindi are also included in the tables for those stations.

It should be noticed that the relative humidities for the different places given in the general climatological tables are not for the same hours of the day in each case, and as the value of the relative humidity depends a great deal on the hour of the day at which it was observed this is an important point. At Mombasa and Zanzibar the hours of observation are 0830 and 1430 local time and at Dar es Salaam, Kilwa and Lindi they are 0700 and 1400 local time; at Tanga the morning observations were taken either at 0600 or 0700 local time, and as the variation in the humidity between these times during the period of observation was not very great, these observations have been combined; the afternoon observations were taken at 1400 local time.

The time of day at which the minimum relative humidity usually occurs is roughly between 1300 and 1500 local time; the afternoon observations should therefore be not far from the minimum value of the day, but the maximum relative humidity most probably occurs some time between about 0300 and 0600 local time so that whilst the values obtained between 0600 and 0700 local time may not be far from the maximum those that have been taken at 0830 local time may be several per cent below it. At Dar es Salaam the average value at 0830 in the months from December to August is about 3 to 5 per cent below the maximum and from September to November about 7 to 9 per cent below, and this should be borne in mind when comparing the data in the general climatological tables.

The relative humidity in the area under consideration is rather high during most of the year. The estimated mean relative humidity over the sea areas in January exceeds 85 per cent and in July is between 80 and 85 per cent. On some parts of the coast, for example at Zanzibar, there is very little variation in the average relative humidity throughout the year, but on the southern part of the coast there is a noticeable reduction in the dry season. The air in the area under consideration is usually not far from being saturated in the early morning and it is only in the south at Lindi that the air is at all dry even in the dry season.

The humidity is greatest in the rainy season and the maximum values occur earlier in the year in the south than in the north. At Kilwa and Lindi they occur from January to April, at Dar es Salaam and Tanga in April and at Mombasa in May. In the south, at Kilwa and Lindi, the humidity is least from June to October and in the north in January and February.

The annual variation in relative humidity in most parts amounts to only about 10 per cent but in the south in the vicinity of Lindi where there is a dry season from June to October the range in the daily minimum values is nearly 25 per cent. It is noteworthy that here even in the dry season the humidity during the night exceeds 90 per cent. The annual variation in the monthly maximum values is not quite the same as that for the minimum values; this is especially noticeable at Lindi where the annual range of the values obtained at 0700 is only about 5 per cent whilst of the values at 1430 it is as much as about 23 per cent; at Dar es Salaam the corresponding figures are 8 and 16; at other places this difference in the annual variation between the maximum and minimum values does not usually exceed 5 per cent.

The humidity never falls to very low values, and the lowest recorded is 25 per cent at Lindi on one day in August, 1898. At that place values of about 40 per cent or below have been recorded in all months, but elsewhere the humidity rarely falls below 40 per cent except from June to August and even then it rarely falls below 35 per cent.

Seasonal variation

December to March.—To the south of Mombasa the average maximum humidity in these months is roughly between 80 and 90 per cent, but at Mombasa and to the north where there is very little rain in January and February, it probably does not exceed 80 per cent. The average minimum humidity varies between about 65 and 75 per cent.

April and May.—These are rainy season months when there is an average maximum humidity of about 90 per cent. In the north the humidity in May increases over that of April but in the south the humidity in May shows a decrease. The minimum humidity in April along the whole coast under consideration is between 70 and 77 per cent and in May at Mombasa, Tanga and Zanzibar is between about 75 and 80 per cent; in the south, however, at Dar es Salaam, Kilwa and Lindi it is between about 60 and 70 per cent.

June to September.—These are dry season months, especially in the south, but nowhere is it very noticeable as regards the maximum humidities, which average between 85 and 90 per cent. In the extreme south, at Lindi, where the driest weather is experienced the average minimum humidity is between about 50 and 55 per cent, but elsewhere the average minimum is roughly between about 65 and 75 per cent.

October and November.—The average maximum humidity in these months is between about 80 and 90 per cent and the minimum humidity is least at Lindi, in the extreme south, where it is between about 50 and 60 per cent. Farther north where there is a short second rainy season the minimum humidity is higher and varies between about 65 and 75 per cent.

Diurnal variation.—In the tables it has not been possible to give the actual values of the maximum and minimum humidities as unfortunately these do not occur at the hours of observation. The two hours of observation, however, that are given one in the morning and the other in the early afternoon, give an approximate value of the maximum and minimum relative humidity, which gives an indication of the diurnal variation that could not be obtained from the mean value or from one observation in the day.

The diurnal variation of humidity depends on the diurnal variation of temperature; it is consequently fairly large in most months of the year. In all months the highest humidity occurs in the early morning between about midnight and 0700, the humidity during that time showing very little change, and the maximum values usually occur between about 0300 and 0600. The lowest humidity occurs in the early afternoon usually at about 1400 the values between about 1300 and 1600 remaining fairly constant. The humidity obtained at 0700 is approximately the maximum value but that obtained at 0830 will be appreciably lower than the maximum.

The average regular daily range of humidity which is the difference between the average values at the hours of maximum and minimum varies according to the season. From October to May at Dar es Salaam this difference lies between about 13 and 22 per cent, but it increases rapidly in the dry season when from June to August it is about 30 per cent, falling to about 24 per cent in September. It should be noted that this diurnal variation in humidity does not conform very closely with the variation of the rainfall, for in May and October, when the rainfall is very different, the range in the humidity is roughly the same.

At Dar es Salaam some rapid changes of relative humidities have been recorded at different times; the most noteworthy is that which occurred on July 16th, 1909, when at 0700 a humidity of 92 per cent was recorded which at 1400 had fallen to 34 per cent, thus giving a range of 58 per cent.

Wet bulb temperature.—The wet bulb temperatures included in the general climatological tables on pages 49, 52–54 for Mombasa, Dar es Salaam, Kilwa and Lindi give an idea of the humidity in its effect on human activity. With a wet bulb temperature beyond 78° F. continuous hard labour is regarded as impracticable. At Dar es Salaam the average number of days in the month when the wet bulb temperature at 0900 is 78° F. or above from December

to March is between 15 and 20; in April and November it is between 5 and 10, and less than one from May to October. The corresponding figures for the early afternoon (1400 and 1500) are 20 to 25 days from December to March, about 15 in April and November, about 5 in May and October and less than one from June to September. These numbers show considerable variation from year to year.

At Mombasa, Kilwa and Lindi the average wet bulb temperature is below 78° F. throughout the year at 0800–0900, but at 1400–1500 at Kilwa and Lindi it exceeds that value from December to March and at Mombasa in December, February, March and April.

IX—MISCELLANEOUS

1—THUNDERSTORMS

The data giving the average number of days with thunderstorms for Mombasa, Tanga, Zanzibar, Dar es Salaam, Kilwa and Lindi are given in the general climatological tables on pages 49–54. As there is very little information about thunderstorms in the area under consideration the figures given in those tables should be treated with a certain amount of reserve. As far as can be ascertained the data refer to actual thunderstorms with both thunder and lightning, if occasions when either thunder or lightning only were heard or observed were included then the figures would probably be very much larger.

Severe thunderstorms occur at times on this coast but not as frequently as inland, the average frequency of storms is 7 to 13 a year and there is apparently little variation on the different parts of the coast.

It is said that westerly winds in the upper air above the surface wind currents are associated with thunder, and that thunderstorms are also likely to develop if the winds are light and variable at high levels.

Thunderstorms occur chiefly in the months from December to April, which is during the period of the NE. monsoon and during the transition season before the SE. trade has become established; on all parts of the coast they are very rare between June and October and in the extreme south, in the vicinity of Lindi, none have been recorded in those months.

In the south where the NE. monsoon is never well established, the maximum frequency of storms is in January with an average of about four days a month; it would appear that they are most likely to occur on the southern limit of the NE. monsoon air current, but thunderstorms also occur on about two or three days a month on the average throughout the wet season of December to April.

From Dar es Salaam northwards the greatest frequency of thunderstorms is in March when the NE. monsoon is withdrawing and before the arrival of the SE. trade. The frequency of storms is

between two and four in that month and they are likely to occur later in the north than in the south as the NE. monsoon withdraws northwards. There is a secondary maximum frequency of storms in December when there is an average of two storms. Throughout the months of December to April, however, one or two storms a month may be expected at most places, except at Mombasa where during the drier months from January to March thunderstorms are less frequent.

The number of thunderstorms that occur varies very much from year to year. At Dar es Salaam there were as many as 16 days with thunderstorms in March, 1911 and 13 in April, 1905, whereas in some years there were none at all in those months. In the other months of the year the maximum number has not exceeded six and during a period of 17 years no storms at all were recorded in June, July, August and October and only two in September.

Very little is known about the diurnal variation but it would seem that storms are probably most frequent in the early afternoon with possibly a secondary maximum at night.

2—SEA AND SWELL

The winds of the NE. monsoon and the SE. trade which usually blow from some direction between NE. and SE., and which prevail during the greater part of the year, generally cause a considerable swell over the open sea; the coasts and harbours of the area under consideration experience this heavy swell when these winds are blowing.

The following are some remarks on sea and swell, for a few of the principal harbours, taken from the Africa Pilot, Part III, 1929:—

Kilwa Kisiwani (8° 50' S., 39° 30' E. approx.)—An easterly wind is said to blow in the form of strong sea breezes during the greater part of the year and generally to occasion a considerable swell outside the harbour.

Dar es Salaam (6° 29' S., 39° 18' E.)—During the SE. trade the bay is well protected, but during the NE. monsoon a considerable swell sets in when the wind is strong.

Bagamoyo (6° 30' S., 39° 00' E. approx.)—There is a heavy swell at this anchorage when the NE. monsoon and the SE. trade winds are blowing.

Kisimayu (0° 22' S., 42° 33' E.)—There is always a heavy swell on the Owen barrier at the entrance to the bay.

3—WATERSPOTS AND TORNADOES

The highly localised whirls manifested by tornadoes on land and waterspouts at sea may no doubt occasionally occur in association with squalls and thunderstorms although they have never been

reported except at Zanzibar where waterspouts have been seen. There is a record of a large waterspout "bursting" in Zanzibar harbour in February, 1859, and H.M.S. *Hawkins* at 0935, local time, on August 15th, 1934, observed a well formed waterspout in the harbour which lasted in a fully formed state for 11 minutes.

4—DEW

Deposits of dew are very frequent at night at both Zanzibar and Dar es Salaam. At Zanzibar dew is apparently most frequent in October and November but uncommon in the months from May to August.

TABLE I—GENERAL CLIMATOLOGICAL TABLES

Mombasa. 4° 04' S., 39° 42' E. 52 ft.

Times of obs.: 0830, 1430 (Z-2½).

Month	Pressure at M.S.L.		Air Temperature						Rain					Wind										Poor visibility †	Relative humidity %	Cloud amount‡	Wet bulb temperature ° F.	
	Average§	Daily range	Average*	Mean of		Mean of		Extreme		Average fall	No. of days†	Max. fall in 24 hours	Thunder	Gale‡	Speed in knots	Percentage of observations from												
				Daily max.	Daily min.	Highest	Lowest	Highest	Lowest							N.	NE.	E.	SE.	S.	SW.	W.	NW.					Calm
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	mm.	in.	No. of days			Observations at 0830 (Z-2½)													
January ..	1010	3-7	82	88	76	91	73	93	70	27	1-1	3			3	25	10	2	3	2	1	10	41	6	0	74	4-7	76
February ..	1009	3-6	83	90	77	93	74	94	70	17	0-7	1			3	27	6	1	2	3	8	11	36	6	0	73	4-3	77
March ..	1009	4-0	85	91	78	94	75	95	71	64	2-5	4			3	11	10	5	6	10	8	15	15	20	2	74	4-1	78
April ..	1010	3-4	83	89	77	93	74	96	69	188	7-4	9			3	1	1	0	19	24	37	11	1	6	1	77	4-8	77
May ..	1013	2-8	79	84	74	88	71	90	67	319	12-5	14			4	0	0	1	4	24	50	16	1	4	5	84	6-5	75
June ..	1015	2-9	78	83	73	87	70	89	61	120	4-7	9			5	0	0	0	3	31	40	17	5	4	2	81	5-5	73
July ..	1016	2-3	77	82	72	84	69	86	65	96	3-8	8			5	0	0	0	12	29	36	18	4	1	0	81	5-7	72
August ..	1016	2-6	77	82	71	85	68	86	64	61	2-4	7			4	0	0	0	10	35	39	13	0	3	0	80	5-6	72
September ..	1015	3-3	78	83	72	86	70	90	64	65	2-6	7			5	0	0	0	10	45	38	4	1	2	0	79	5-1	74
October ..	1013	3-5	80	86	74	88	71	90	64	81	3-2	5			4	1	0	0	20	42	22	7	1	7	1	75	4-3	75
November ..	1011	3-8	82	89	75	91	73	92	69	98	3-9	5			3	2	3	6	24	19	11	7	5	23	1	73	4-1	77
December ..	1010	3-8	82	89	76	92	73	93	69	64	2-5	5			4	15	8	7	6	3	5	5	25	26	0	75	4-9	77
Year ..	1012	3-3	81	86	75	94	68	96	61	1200	47-3	77			4	7	3	2	10	22	25	11	11	9	12	77	5-0	75

Authorities.—Bibliography Nos. 1, 37, 39, 43.

Periods.—Pressure, temp. (average, mean daily max. and min., mean highest and lowest), no. of days of gale, cloud amount, 1931-37. Temp. (extremes), 24 years.

Rain (average fall), 1891-1936; (no. of days), 1914-39; (max. in 24 hrs.), 1894-1900, 1904-20, 1931-7. No. of days of thunder, 8 years.

Wind (direction) at 0830, 1931-7, at 1430, 1934-8; (speed), 1935-9.

Poor visibility, 1938-9. Relative humidity, 1931-6.

Wet bulb temperature, not known.

Notes.—§ Mean of obs. at 0830 and 1430.

|| Difference between means at 0830 and 1430.

* † (max. + min.).

‡ Day with 2.5 mm. (0.1 in.) or more of rain.

† Wind of Beaufort force 8 or more.

‡ No. of days with visibility less than 2 nautical miles.

Month	Observations at 1430 (Z-2½)										Poor visibility †	Relative humidity %	Cloud amount‡	Wet bulb temperature ° F.
Month	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm	Speed in knots				
January ..	11	3	37	37	12	2	3	3	3	0	0	0	69	77
February ..	10	2	31	42	16	7	1	1	0	0	0	66	78	
March ..	9	0	15	37	30	16	1	1	0	0	0	67	79	
April ..	8	0	0	2	23	52	17	5	0	1	0	70	79	
May ..	7	0	0	0	6	51	36	7	0	0	4	78	76	
June ..	10	0	0	1	3	46	37	11	2	0	1	75	75	
July ..	9	0	0	0	2	70	27	1	0	0	0	74	73	
August ..	9	0	0	0	5	72	18	5	0	0	0	73	73	
September ..	8	0	0	0	18	63	15	3	0	1	0	72	74	
October ..	8	0	0	1	22	54	18	3	1	1	0	69	76	
November ..	8	0	0	15	46	31	7	0	0	1	0	67	78	
December ..	8	1	9	33	25	13	3	2	0	14	1	71	78	
Year ..	9	1	8	14	17	40	15	3	1	1	6	71	77	

Table I—General Climatological Tables

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TABLE I—continued

Tanga. 5° 07' S., 39° 07' E. 50 ft. (approx.)

Times of obs.: **0600-0800, 1400 (Z-2½).

Month	Pressure at M.S.L.		Air Temperature								Rain			Thunderstorms	Gales	Wind										Poor visibility	Relative humidity %	Cloud amount	
	Average	Daily range	Average*	Mean of		Mean of		Extreme		Average fall	No. of days†	Max. fall in 24 hours	Percentage of observations from																
				Daily max.	Daily min.	Highest	Lowest	Highest	Lowest				N.			NE.	E.	SE.	S.	SW.	W.	NW.	Calm						
January ..	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	mm.	in.		mm.	in.	No. of days	Observations at 0600-0800 (Z-2½)										0600-0700			
February ..	Data not available	Data not available	82	88	76	91	74	93	69	40	1.6	3	89	3.5	3	†	1.8	28	39	10	8	2	0.5	0.3	8	5		87	4.5
March ..			83	89	76	92	73	95	68	49	1.9	3	124	4.9	2		1.5	25	36	12	4	3	2	1	11	6		88	4.6
April ..			83	89	76	93	72	95	68	94	3.7	7	126	5.0	4		1.3	9	18	8	13	15	8	5	10	13		90	5.0
May ..			81	88	75	92	72	93	68	266	10.5	12	170	6.7	2		1.4	0.9	3	2	20	45	16	3	0.9	8		92	6.4
June ..			79	85	73	88	71	91	67	305	12.0	12	179	7.0	0.3		1.6	0.7	0.4	0.3	19	51	22	0.7	0	6		93	6.4
July ..			77	83	71	87	68	88	64	63	2.5	5	75	2.9	0		1.5	0.1	0	0.2	19	45	30	2	0.1	4		91	5.1
August ..			76	83	70	85	67	88	64	119	4.7	5	83	3.3	0		1.6	0.2	0	0.2	21	46	25	6	0	2		92	5.7
September ..			76	83	69	86	67	90	62	74	2.9	6	72	2.8	0		1.5	0	0.2	0.3	29	46	19	2	0	4		93	5.9
October ..			77	83	70	87	67	88	60	75	3.0	6	130	5.1	0		1.4	0	0	2	39	40	15	2	0	2		93	5.1
November ..			78	85	71	88	68	95	64	100	3.9	7	201	7.9	0.3		1.4	0	0.2	3	46	33	9	2	3	5		92	5.1
December ..			81	88	73	90	69	92	66	190	7.5	9	200	7.9	0.9		1.4	3	8	9	41	20	6	2	3	7		92	5.4
Year ..			82	89	75	91	71	95	68	62	2.4	5	86	3.4	0.9		1.8	20	32	15	15	5	3	0.5	5	4		90	4.4
Year ..			80	86	73	93	66	95	60	1437	56.6	80	201	7.9	13		1.5	7	11	5	23	29	13	2	3	6		91	5.3

Month	††	Observations at 1400-1600 (Z-2½)										1400	
January ..	3.6	11	49	23	11	3	1	0.4	1	0.4		73	3.1
February ..	3.4	10	48	28	10	2	0.3	0.2	1	0.3		70	3.1
March ..	2.9	6	25	21	26	13	6	0.1	1	1		69	3.9
April ..	2.5	0.2	2	4	37	40	12	2	0	2		76	5.4
May ..	2.5	0	0	0	29	53	15	0.1	0	3		75	6.0
June ..	3.1	0	0	0.4	34	51	14	0.4	0.2	0.4		68	4.6
July ..	2.8	0	0	0.2	39	43	16	1	0	0.3		72	4.8
August ..	2.6	0	0	0.2	42	42	14	0.7	0	0.8		71	4.7
September ..	2.8	0	0	2	54	36	8	0	0	0.4		69	3.9
October ..	3.3	0	2	8	53	32	5	0	0	0		68	3.3
November ..	3.0	0.6	11	16	51	17	4	0.4	0.4	0		74	4.0
December ..	3.6	4	33	32	24	4	0.8	0.1	2	0.3		73	3.0
Year ..	3.0	3	14	11	34	28	8	0.4	0.5	0.7		71	4.1

Authorities.—Bibliography Nos. 1, 29, 39, 48, 49, 50.
 Periods.—Temp. (average, mean daily max. and min., mean highest and lowest), 1931-7; (extremes), 1892-1911, 1931-7.
 Rain (average fall), 20-21 years; (no. of days), 1893-1907, 1932-9; (max. in 24 hrs.), 1892-1911, 1931-7.
 No. of days of thunder, 1892-9, 1903.
 Wind (force) and cloud amount, 1893-9, 1906-10.
 Wind (direction), 1892-9, 1902-10.
 Relative humidity, 1894-9, 1906-10.
 Notes.—** After 1918, 0830 and 1430 (Z-2½).
 † (max. + min.).
 † Day with 2.5 mm. (0.1 in.) or more of rain.
 † Observations at 0600-0700 (Z-2½).
 †† Observations at 1400 (Z-2½).

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Coast of East Africa

TABLE I—continued

Zanzibar (Chukwani)** 6° 15' S., 39° 13' E. 69 ft. Times of obs.: 0830, 1430 (Z-2½)

Month	Pressure at M.S.L.		Air Temperature							Rain**			Thunderstorms	Gale†	Speed in knots	Wind									No. of days fog‡	Relative humidity%	Cloud amount		
	Average††	Daily range	Average††	Mean of		Mean of		Extreme		Average fall	No. of days‡	Max. fall in 24 hours				Percentage of observations from													
				Daily max.	Daily min.	Highest	Lowest	Highest	Lowest							N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm →					
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	mm.	in.	mm.	in.	No. of days	††	Observations at 0830 and 1430 (Z-2½)									0830	§			
January ..	1010	4-2	81	89	76	93	74	94	71	69	2.7	3	62	2.5	1	0	6	29	37	17	1	1	1	1	7	6	0	80	4.4
February ..	1010	4-5	81	90	76	95	73	98	72	69	2.7	4	67	2.7	1	0	5	21	26	23	4	1	3	5	8	9	0	81	4.7
March ..	1010	4-4	82	90	77	95	74	99	73	159	6.3	9	98	3.9	2	0	6	6	13	20	19	10	13	7	5	7	0	83	4.7
April ..	1012	3-9	81	86	77	92	73	96	72	346	13.6	13	185	7.3	1	0	10	1	1	7	27	31	26	3	1	3	0	87	5.5
May ..	1014	3-2	79	83	75	88	71	90	70	258	10.2	9	152	6.0	0	0	13	0	0	4	27	39	26	3	0	1	0	82	5.9
June ..	1016	3-2	77	82	74	86	70	88	68	62	2.4	5	140	5.5	0	0	14	0	0	5	35	39	20	1	0	0	0	86	4.3
July ..	1017	3-3	76	82	72	88	70	87	67	50	2.0	3	46	1.8	0	0	11	0	0	3	44	30	20	2	0	1	0	86	3.6
August ..	1017	3-6	76	82	72	85	69	88	68	43	1.7	4	69	2.7	0	0	11	0	0	8	52	24	15	0	0	1	0	85	3.7
September ..	1016	4-1	77	83	72	88	70	91	69	54	2.1	4	63	2.5	0	0	11	0	1	19	48	21	9	1	0	1	0	84	3.5
October ..	1014	4-2	78	86	73	91	71	97	70	93	3.7	8	104	4.1	0	0	8	1	1	31	41	15	6	1	0	4	0	81	3.1
November ..	1012	4-3	80	89	75	93	72	97	72	203	8.1	9	93	3.7	1	0	5	4	12	37	14	11	5	3	3	11	0	80	3.6
December ..	1011	4-3	80	88	76	92	73	93	70	152	6.0	10	157	6.2	2	0	6	16	26	29	6	4	2	3	5	9	0	82	4.6
Year ..	1013	3-9	79	86	75	96	69	99	67	1560	61.5	81	185	7.3	8	0	9	6	10	17	26	19	13	3	2	4	0	84	4.3

Authorities.—Bibliography Nos. 10, 39, 46, 47.

Periods.—Pressure, temp. (average) and wind (direction at 0830 and 1430 combined), 6 years between 1931 and 1937; (direction at 1430), 1935-8.

Temp. (mean daily max. and min., mean highest and lowest, extremes), no. of days of thunder, fog, gales, cloud amount, 1931-7.

Rain (average fall), 45 years; (no. of days), 1920-31; (max. in 24 hrs.), 1922-37. Wind (speed), unknown.

Notes.—** Rainfall data are for Zanzibar Town, 6° 10' S., 39° 11' E., 71 ft. †† Mean of 24 hours.

|| Difference between highest and lowest hourly means.

‡ Day with 2.5 mm. (0.1 in.) or more of rain.

† Wind of Beaufort force 3 or more.

¶ Visibility less than ¼ nautical mile.

§ Mean of obs. at 0830 and 1430.

Month	Observations at 1430 (Z-2½)											1430
January ..	19	43	11	2	5	2	2	14	2	66		
February ..	9	19	9	5	12	12	4	22	8	70		
March ..	10	8	10	23	22	4	5	10	8	72		
April ..	1	0	9	53	19	7	2	3	6	76		
May ..	0	0	2	59	25	10	2	0	2	78		
June ..	0	0	2	77	15	4	2	0	0	71		
July ..	0	0	2	90	8	0	0	0	0	69		
August ..	0	0	1	92	5	1	1	0	0	68		
September ..	0	0	3	83	13	0	0	1	0	66		
October ..	1	0	6	73	17	2	0	0	1	67		
November ..	6	8	11	34	19	5	5	8	4	70		
December ..	11	15	10	18	12	8	6	12	8	73		
Year ..	5	8	6	51	14	5	2	6	3	71		

Table I—General Climatological Tables

TABLE I—continued

Month	Pressure at M.S.T.		Air Temperature		Rain	Thunderstorms	Gales†	Speed in knots	Percentage of observations from								Wet bulb temperature °F.															
	Average 0830, 1430	Daily Range‡	Mean of Extreme	Mean of					Lowest	Highest	Average fall	No. of days†	Max. fall in 24 hours	N.	NE.	E.		SE.	S.	SW.	W.	NW.	Calm									
Year ..	1014	3.1	79	86	73	93	63	96	60	1042	41.0	66	157	6.2	12	2	4	9	7	3	11	17	35	4	1	2	12	90	6.9	75		
January ..	1011	3.4	83	89	77	92	73	89	69	69	2.8	4	103	4.1	1	0	0	0	0	0	3	3	3	6	3	6	4	9	86	7.1	79	
February ..	1011	3.5	83	89	77	92	73	89	69	72	2.8	4	103	4.1	1	0	0	0	0	0	3	3	3	6	3	6	4	9	86	7.1	79	
March ..	1011	3.3	82	88	76	93	72	96	69	113	4.4	4	87	3.7	0	0	0	0	0	0	3	3	3	12	7	14	10	90	6.4	78		
April ..	1012	3.0	80	87	74	91	71	96	66	157	6.2	3	157	6.2	0.1	0	0	0	0	0	3	3	3	13	7	17	17	90	6.4	78		
May ..	1014	2.6	79	88	72	91	64	64	64	116	4.6	3	116	4.6	0.6	0	0	0	0	0	3	3	3	10	5	10	10	93	6.6	77		
June ..	1016	2.6	77	84	69	88	69	65	60	127	5.0	3	127	5.0	0	0	0	0	0	0	3	3	3	10	5	3	6	92	4.9	72		
July ..	1017	2.5	76	84	67	87	84	65	60	47	1.9	0	47	1.9	0	0	0	0	0	0	3	3	3	13	5	4	4	93	5.5	71		
August ..	1017	2.9	76	84	68	87	84	64	60	33	1.3	3	33	1.3	0	0	0	0	0	0	3	3	3	15	4	4	4	93	5.5	71		
September ..	1017	3.1	77	84	69	88	84	66	60	27	1.1	1	27	1.1	0.1	0	0	0	0	0	3	3	3	18	4	4	4	91	5.1	71		
October ..	1015	3.5	78	85	78	88	85	62	63	37	1.5	1	48	1.9	0.1	0	0	0	0	0	3	3	3	18	4	4	4	88	4.8	73		
November ..	1013	3.5	81	87	74	90	70	66	69	4.1	0	4	105	4.1	0	0	0	0	0	0	3	3	3	18	4	4	4	90	5.5	75		
December ..	1012	3.5	81	88	77	91	71	69	69	94	3.7	2	94	3.7	0	0	0	0	0	0	3	3	3	18	4	4	4	88	6.4	79		
Year ..	1014	3.1	79	86	73	93	63	96	60	1042	41.0	66	157	6.2	12	2	4	9	7	3	11	17	35	4	1	2	12	90	6.9	75		
Month	1430	Observations at 1400 (Z-2‡)																														
Year ..	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
January	6	31	43	19	0.8	0.7	0.7	0.7	0.2	4	0.2	4	0.2	4	0.7	0.7	0.7	0.2	4	0.2	4	0.7	0.7	0.7	0.2	4	0.2	4	0.7	0.7	0.7	
February	5	27	48	17	0.4	0.8	1	4	1	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
March	5	9	38	29	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
April	7	7	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
May	9	9	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
June	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
July	10	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
August	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
September	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
October	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
November	8	8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
December	7	15	35	36	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Year ..	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Month	0830	Observations at 0700 (Z-2‡)																														
Year ..	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
January	6	31	43	19	0.8	0.7	0.7	0.7	0.2	4	0.2	4	0.2	4	0.7	0.7	0.7	0.2	4	0.2	4	0.7	0.7	0.7	0.2	4	0.2	4	0.7	0.7	0.7	
February	5	27	48	17	0.4	0.8	1	4	1	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
March	5	9	38	29	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
April	7	7	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
May	9	9	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
June	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
July	10	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
August	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
September	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
October	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
November	8	8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
December	7	15	35	36	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Year ..	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

† Observations at 0900 (Z-2‡). †† Obs. at 1400-1500 (Z-2‡).
 ‡ Day with 2.5 mm. (0.1 in.) or more of rain.
 § (max. + min.). ¶ Definition not known.
 || Difference between means at 0830 and 1430 (Z-2‡).
 ** After 1918, 0830 and 1430 (Z-2‡).
 *** 1893-1912. Wet bulb temperature, 1927-36.
 Wind direction, relative humidity, and cloud amount, 1926-39; (max. in 24 hrs.), 1893-1912, 1923-37.
 No. of days of thunder, 1895-1911.
 Rain (average fall), 35 years; (no. of days), 1895-1912, 1923-37.
 Temp. (average, mean daily max. and min., mean highest and lowest), 1931-7; (extremes), 1895-1912, 1923-37.
 Periods.—Pressure, 4 years after 1931.
 Anomalies.—Bibliography: Nos. 1, 17, 39, 48, 49, 50, 51, 52.

TABLE I—continued

Lindi**. 10° 00' S., 39° 42' E. 131 ft.

Times of obs. : 0700, 1400 (Z-2½).

9 54

Month	Pressure at M.S.L.		Air Temperature						Rain			Thunderstorms	Galest	Wind											Poor visibility †	Relative humidity %	Cloud amount	Wet bulb temperature °F.		
	Average ††	Daily range	Average*	Mean of		Mean of		Extreme		Average fall	No. of days ‡			Max. fall in 24 hours	Percentage of observations from															
				Daily max.	Daily min.	Highest	Lowest	Highest	Lowest						N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm							
January ..	mb. 1011	mb. 81	°F. 87	°F. 75	°F. 91	°F. 71	°F. 97	°F. 68	mm. 149	in. 5.9	8	mm. 99	in. 3.9	No. of days 4	0.3	Observations at 0700											0830	0700	0830	
February ..	1010	82	88	75	92	72	97	66	122	4.8	8	98	3.9	3	0.7	3	8	25	28	12	2	3	0	1	21	2	91	6.1	77	
March ..	1011	81	88	74	92	71	96	67	157	6.2	10	84	3.3	2	0.2	3	2	12	34	25	6	0	0	0	21	0	94	5.1	77	
April ..	1013	81	88	73	93	71	98	68	149	5.9	11	118	4.6	2	0	5	0	13	36	25	9	0	0	0	17	0	94	4.2	75	
May ..	1015	79	88	71	91	67	94	59	34	1.3	4	44	1.7	0	1	7	0.3	6	39	36	8	0.3	0.5	0	10	0	91	3.3	72	
June ..	1019	77	87	67	90	63	92	56	2	∠	1	13	0.5	0	3	7	0	7	26	26	9	1	1	0	30	1	89	2.3	69	
July ..	1019	Data not available	76	86	66	90	60	93	54	7	0.3	0.6	25	1.0	0	2	4	0	3	24	25	3	0	0	0	45	0	90	3.0	67
August ..	1018	76	85	67	89	63	94	57	9	0.4	0.7	19	0.7	0	3	5	0	11	24	27	7	1	0.3	0.9	29	0	91	3.0	68	
September ..	1017	76	84	68	87	65	94	60	9	0.4	1	23	0.9	0	3	4	0	8	28	16	3	2	0	0	43	0	90	3.9	71	
October ..	1015	78	84	71	87	67	98	59	10	0.4	1	40	1.6	0	2	4	0.6	11	34	11	1	0.3	0.3	0	42	0	89	4.5	74	
November ..	1013	80	86	74	89	70	96	67	63	2.5	4	77	3.0	0	0.4	5	2	23	35	9	2	2	0.3	1	26	0	89	4.6	76	
December ..	1012	81	87	75	90	72	99	68	102	4.0	9	89	3.5	2	1	3	3	25	27	10	2	2	0	2	29	1	90	5.4	77	
Year ..	1014		79	87	71	95	59	99	54	813	32.0	58	118	4.6	13	17	4	2	14	30	20	5	1	0.2	0.4	28	6	91	4.3	73

Coast of East Africa

Authorities.—Bibliography Nos. 1, 19, 29, 39, 49.
 Periods.—Pressure, 3-4 years. Temp. (average, mean daily max., mean highest, 1931-7; (mean daily min., mean lowest), 5 years; (extremes), 1891-11, 1931-7. Rain (average fall), 15-18 years; (no. of days), 1918-39; (max. in 24 hrs.), 1891-1902, 1904-11, 1931-7. No. of days of thunder, 6-9 years, 1895-9, 1904-11; gales, 7 years. Wind (speed), 1935-9; (direction), 5-8 years, 1897-1904. Poor visibility, 1938-9. Relative humidity, 7-11 years, 1895-1911. Cloud amount, 10-12 years, 1891-1911. Wet bulb temperature, not known.
 Notes.—* The observations do not all refer to the same site.
 † Mean of obs. at 0700, 1400 and 2100.
 ‡ (max. + min.).
 † Day with 2.5 mm. (0.1 in.) or more of rain.
 † Definition not known.
 † No. of days with visibility less than 2 nautical miles.

Month	1430	Observations at 1400											1430	1400	1430
January ..	10	14	61	19	0.3	1	1	0	0	3	0	0	72	5.8	79
February ..	9	13	55	20	7	3	1	0	0.7	0.7	3	68	5.8	78	
March ..	8	15	43	24	7	1	0.6	0	2	7	0	71	6.0	79	
April ..	8	3	21	39	20	14	1	0	0	2	2	70	6.1	77	
May ..	8	2	18	28	30	15	4	0	0.3	2	0	59	5.0	76	
June ..	8	6	16	27	33	11	3	0	1	3	0	49	5.0	72	
July ..	9	5	24	32	25	10	0.8	0.3	0.5	2	0	53	5.3	71	
August ..	10	15	44	16	16	4	0.3	0.3	0.3	4	0	56	4.9	71	
September ..	12	14	54	22	5	2	0	0	2	2	0	55	4.1	74	
October ..	13	19	59	14	4	1	0	0.3	2	1	0	52	3.2	75	
November ..	12	19	60	15	4	0	0.7	0.3	1	0	0	61	3.0	77	
December ..	10	13	54	18	5	1	2	0.5	1	5	0	66	4.8	78	
Year ..	10	12	42	23	13	5	1	0.1	0.9	3	5	62	4.9	76	

TABLE II—MONTHLY FREQUENCY OF WIND DIRECTION AND FORCE AT SEA

Number of occasions per 100 on which particular winds may be expected

I = Beaufort force 1-3. II = force 4-7. III = force 8-12

0°-5° S., 40°-45° E.

Month	N.			NE.			E.			SE.			S.			SW.			W.			NW.			Calm	Totals of			No. of obs.
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III					
January	7	0	0	34	14	.7	23	12	0	3	0	0	1	0	0	0	0	0	.6	0	0	2	0	0	3	70	26	.7	147
February	5	1	0	36	14	0	31	8	0	2	1	0	.4	0	0	0	0	0	0	0	0	.8	0	0	2	74	24	0	123
March ..	3	0	0	17	1	0	35	5	0	23	3	0	8	.4	0	1	0	0	.4	0	0	.4	0	0	2	88	10	0	250
April ..	.4	.4	0	1	0	0	13	2	0	18	3	0	27	5	0	18	2	0	4	0	0	2	.3	0	3	84	13	0	132
May ..	0	0	0	0	0	0	2	0	0	11	9	0	34	25	0	.8	7	0	.6	.5	0	1	.6	0	1	58	41	0	85
June ..	0	0	0	0	0	0	0	0	0	3	22	0	13	48	0	2	12	0	0	0	0	0	0	0	0	18	82	0	101
July ..	0	0	0	0	0	0	2	.8	0	8	28	.8	18	28	.9	2	13	0	0	0	0	0	0	0	0	29	69	2	58
August ..	0	0	0	0	0	0	2	1	0	24	30	1	8	28	0	.6	5	0	0	0	0	0	0	0	0	35	64	1	87
September	0	0	0	0	0	0	2	.7	0	34	16	0	27	17	0	1	.7	0	0	0	0	0	0	0	0	65	35	0	143
October..	0	0	0	2	0	0	19	.8	0	51	9	0	14	4	0	.8	0	0	0	0	0	0	0	0	0	87	13	0	183
November	.5	0	0	8	5	0	19	6	0	37	3	0	16	1	0	4	.3	0	0	0	0	0	0	0	1	84	15	0	199
December	6	.3	0	22	11	0	32	11	0	9	.3	0	.4	0	0	1	0	0	2	0	0	2	0	0	4	74	22	0	148

Authorities—Bibliography Nos. 2, 40.

Table I—Wind direction and force at sea

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TABLE II—*continued*

Number of occasions per 100 on which particular winds may be expected
 I = Beaufort force 1-3. II = force 4-7. III = force 8-12

5°-10° S., 35°-40° E.

Month	N.			NE.			E.			SE.			S.			SW.			W.			NW.			Calm	Totals of			No. of obs.
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III		I	II	III	
January	17	7	0	27	9	0	11	2	0	9	.5	0	5	0	0	5	0	0	2	0	0	4	1	0	3	77	20	0	220
February	13	8	0	14	10	0	16	3	0	9	0	0	5	.3	0	3	.4	0	2	1	0	5	2	0	8	67	25	0	139
March	8	3	0	15	2	0	19	.9	0	14	0	0	9	0	0	10	1	0	4	0	0	4	.3	0	11	82	7	0	170
April	2	0	0	.3	0	0	4	.9	0	22	5	0	31	10	0	13	2	0	5	.6	0	1	0	0	3	78	19	0	162
May	0	0	0	.3	0	0	5	.5	0	25	7	0	27	14	0	11	5	0	2	.9	0	0	0	0	1	72	27	0	179
June	0	0	0	0	0	0	2	.7	0	15	9	0	26	23	0	12	11	0	0	.3	0	0	0	0	1	54	45	0	185
July	.3	0	0	2	0	0	7	2	0	27	8	0	33	8	0	9	3	0	1	0	0	.4	0	0	0	79	21	0	159
August	1	0	0	4	0	0	7	.3	0	28	7	0	32	7	0	9	1	0	1	0	0	.3	0	0	2	82	16	0	169
September	.9	0	0	3	0	0	14	.8	0	43	7	0	15	2	0	7	.6	0	3	.3	0	.9	0	0	2	88	10	0	173
October	1	0	0	4	.2	0	24	1	0	47	3	0	10	.2	0	2	.3	0	2	0	0	1	0	0	3	92	5	0	199
November	5	0	0	15	2	0	23	2	0	28	3	0	6	.3	0	4	0	0	3	0	0	1	0	0	9	84	7	0	153
December	16	3	0	26	6	0	19	2	0	9	.2	0	5	.8	0	1	0	0	3	.5	0	3	.2	0	5	82	13	0	201

5°-10° S., 40°-45° E.

January	19	8	0	24	14	0	11	2	0	6	.8	0	1	0	0	0	.5	0	1	.6	0	4	5	0	4	66	30	0	315	
February	15	7	0	13	4	.5	20	2	0	14	2	0	6	.2	0	1	.3	0	2	.2	0	6	2	0	4	78	18	.5	204	
March	8	2	0	15	2	0	21	2	0	21	3	0	9	2	0	3	.2	0	3	0	0	4	.4	0	4	84	12	0	259	
April	0	0	0	2	2	0	10	7	0	29	9	0	23	2	0	4	0	0	6	0	0	.7	0	0	5	74	21	0	205	
May	0	0	0	0	0	0	2	.2	0	24	13	0	27	22	0	5	6	0	.8	.5	0	0	0	0	0	58	42	0	205	
June	0	0	0	0	.2	0	.9	2	0	12	16	0	16	40	0	3	7	0	0	.5	0	0	0	0	1	33	66	0	222	
July	0	0	0	2	0	0	6	1	0	25	11	0	25	21	0	5	3	0	0	.4	0	0	0	0	0	0	62	38	0	144
August	.3	0	0	2	0	0	7	3	0	27	19	0	21	14	0	5	1	0	.9	0	0	0	0	0	0	0	64	36	0	324
September	0	0	0	4	1	0	19	3	0	39	12	0	11	8	0	1	.2	0	0	0	0	0	0	0	1	75	24	0	357	
October	2	0	0	7	.3	0	26	4	0	39	8	0	9	2	0	.5	0	0	.1	0	0	.7	0	0	.9	84	15	0	319	
November	9	.3	0	14	1	0	24	3	0	27	6	0	4	2	0	.7	0	0	.7	0	0	2	0	0	6	81	13	0	280	
December	17	8	0	31	6	0	13	3	0	5	.4	0	2	0	0	.9	0	0	3	0	0	3	1	0	6	75	19	0	290	

Authorities—Bibliography Nos. 2, 40.

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Coast of East Africa

TABLE III—MONTHLY FREQUENCY OF WIND DIRECTION AND SPEED IN THE UPPER AIR

Number of occasions per 100 on which particular winds may be expected

I = 3-13 knots (4-15 m.p.h.) II = 14-27 knots (16-31 m.p.h.) III = 28-40 knots (32-47 m.p.h.) IV = over 40 knots (over 47 m.p.h.) C = less than 3 knots (less than 4 m.p.h.)

Zanzibar. 6° 15' S., 39° 13' E. 69 ft. above M.S.L. Time of obs. : 0900 and 1500 (Z-2½) Period : 1931-36

Height (feet)	N.				NE.				E.				SE.				S.				SW.				W.				NW.				C.	No. of obs.				
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV						
JANUARY																																						
Surface ..	43	3	0	0	20	4	0	0	3	1	0	0	1	0	0	0	2	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	5	2	0	0	14	256
1,500 ..	26	37	1	0	11	16	1	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	252
3,000 ..	22	42	1	0	13	11	0	0	3	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	2	230				
6,500 ..	22	31	2	0	8	4	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	13	9	1	0	2	169				
10,000 ..	16	11	0	0	8	5	0	0	8	8	0	0	4	1	0	0	3	0	0	0	3	0	0	0	8	1	0	0	18	3	0	0	3	113				
13,000 ..	6	6	0	0	16	4	0	0	16	13	1	0	1	1	0	0	3	0	0	0	4	0	0	0	9	0	0	0	9	1	0	0	10	70				
16,500 ..	3	0	0	0	5	10	0	0	17	17	3	0	17	3	0	0	0	0	0	0	2	0	0	0	7	3	0	0	5	5	0	0	3	40				
FEBRUARY																																						
Surface ..	36	1	0	0	17	3	0	0	5	0	0	0	3	0	0	0	2	0	0	0	5	0	0	0	3	0	0	0	5	1	0	0	19	205				
1,500 ..	25	19	1	0	13	13	0	0	7	1	0	0	2	0	0	0	2	0	0	0	2	1	0	0	1	0	0	0	2	3	1	0	7	205				
3,000 ..	22	22	1	0	16	4	0	0	4	0	0	0	3	0	0	0	2	1	0	0	1	2	0	0	2	1	0	0	6	2	1	0	10	190				
6,500 ..	14	21	4	0	5	2	0	0	4	0	0	0	4	0	0	0	2	0	0	0	1	1	0	0	6	6	0	0	14	6	0	0	10	140				
10,000 ..	12	8	0	0	6	3	1	0	4	3	0	0	0	0	0	0	1	0	0	0	3	0	0	0	14	5	0	0	15	11	1	0	13	104				
13,000 ..	13	4	0	0	3	2	0	0	12	0	0	0	3	2	0	0	0	0	0	0	7	0	0	0	10	3	0	0	22	7	0	0	12	68				
16,500 ..	10	3	0	0	13	0	0	0	15	3	0	0	7	0	0	0	0	0	0	0	7	0	0	0	5	3	0	0	21	0	0	0	13	39				
MARCH																																						
Surface ..	13	0	0	0	5	0	0	0	5	0	0	0	10	1	0	0	11	2	0	0	21	0	0	0	3	0	0	0	7	0	0	0	22	261				
1,500 ..	11	2	0	0	12	3	0	0	13	2	0	0	18	3	0	0	10	1	0	0	2	0	0	0	1	0	0	0	3	0	0	0	19	258				
3,000 ..	12	2	0	0	14	1	0	0	15	0	0	0	24	4	0	0	7	2	0	0	1	0	0	0	1	0	0	0	4	0	0	0	13	226				
6,500 ..	15	4	1	0	10	2	0	0	6	1	0	0	11	1	0	0	6	2	0	0	5	1	0	0	5	0	0	0	9	2	0	0	19	176				
10,000 ..	13	5	0	0	12	4	0	0	8	0	0	0	5	1	0	0	2	0	0	0	5	0	0	0	14	1	0	0	11	5	0	0	14	133				
13,000 ..	11	3	0	0	17	4	0	0	19	2	0	0	7	1	0	0	5	0	0	0	2	0	0	0	5	3	0	0	3	3	0	0	15	92				
16,500 ..	5	0	0	0	10	2	0	0	21	12	0	0	12	2	0	0	10	0	0	0	3	0	0	0	3	0	0	0	5	3	0	0	12	60				
APRIL																																						
Surface ..	1	0	0	0	0	0	0	0	4	0	0	0	13	5	0	0	21	6	0	0	33	3	0	0	2	0	0	0	1	0	0	0	11	221				
1,500 ..	1	0	0	0	1	0	0	0	6	0	0	0	37	12	0	0	22	14	0	0	2	0	0	0	0	0	0	0	0	0	0	0	5	220				
3,000 ..	0	0	0	0	3	0	0	0	5	2	0	0	32	17	1	0	17	17	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3	172				
6,500 ..	5	1	0	0	1	1	0	0	9	4	0	0	26	7	0	0	13	12	0	0	10	1	0	0	1	0	0	0	1	1	0	0	7	134				
10,000 ..	6	2	0	0	4	0	0	0	13	4	1	0	17	6	0	0	6	1	0	0	5	0	0	0	8	0	0	0	9	0	0	0	18	93				
13,000 ..	8	0	0	0	16	2	0	0	16	6	0	0	3	2	2	0	11	0	0	0	3	0	0	0	8	0	0	0	3	0	0	0	20	62				
16,500 ..	13	0	0	0	15	3	0	0	26	5	0	0	5	0	0	0	13	0	0	0	3	0	0	0	2	0	0	0	2	0	0	0	13	39				

Table III—Wind direction and speed in the upper air 9 57

TABLE III—*continued*

Number of occasions per 100 on which particular winds may be expected

I = 3-13 knots
(4-15 m.p.h.)

II = 14-27 knots
(16-31 m.p.h.)

III = 28-40 knots
(32-47 m.p.h.)

IV = over 40 knots
(over 47 m.p.h.)

C = less than 3 knots
(less than 4 m.p.h.)

Zanzibar—*cont.*

Height (feet)	N.				NE.				E.				SE.				S.				SW.				W.				NW.				C.	No. of obs.
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
SEPTEMBER																																		
Surface ..	0	0	0	0	0	0	0	0	5	1	0	0	22	12	1	0	20	5	0	0	19	0	0	0	2	0	0	0	0	0	0	0	13	369
1,500 ..	0	0	0	0	1	0	0	0	16	8	0	0	38	26	3	0	4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	369
3,000 ..	0	0	0	0	1	0	0	0	19	10	0	0	27	38	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	334
6,500 ..	0	0	0	0	0	0	0	0	5	3	0	0	22	28	2	0	14	24	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	246
10,000 ..	2	0	0	0	1	0	0	0	7	1	0	0	20	13	1	0	17	14	0	0	7	8	0	0	0	2	0	0	0	0	0	0	7	122
13,000 ..	7	5	0	0	3	0	0	0	3	0	0	0	13	5	0	0	16	0	0	0	5	0	0	0	13	3	0	0	3	10	0	0	14	40
16,500 ..	0	0	0	0	20	7	0	0	15	0	0	0	7	4	0	0	4	0	0	0	7	7	0	0	4	4	0	0	7	7	0	0	7	27
OCTOBER																																		
Surface ..	0	0	0	0	1	0	0	0	9	1	0	0	21	10	0	0	8	4	0	0	12	0	0	0	2	0	0	0	0	0	0	0	32	314
1,500 ..	0	0	0	0	4	0	0	0	32	10	0	0	36	12	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	313
3,000 ..	0	0	0	0	3	0	0	0	44	10	0	0	28	13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	291
6,500 ..	2	0	0	0	2	1	0	0	11	3	0	0	25	23	1	0	15	10	0	0	2	0	0	0	0	0	0	0	0	0	0	0	5	233
10,000 ..	7	0	0	0	6	0	0	0	10	6	0	0	14	11	0	0	9	10	0	0	8	3	0	0	1	1	0	0	3	0	0	0	11	144
13,000 ..	3	0	0	0	11	0	0	0	16	6	0	0	8	5	1	0	4	0	0	0	5	3	1	0	16	4	0	0	5	4	0	0	8	79
16,500 ..	2	0	0	0	9	4	0	0	17	17	0	0	4	2	0	0	4	0	0	0	2	0	0	0	4	4	0	0	4	2	0	0	25	45
NOVEMBER																																		
Surface ..	4	0	0	0	8	1	0	0	15	1	0	0	8	1	0	0	10	1	0	0	7	0	0	0	2	0	0	0	0	0	0	0	42	292
1,500 ..	2	0	0	0	20	7	0	0	31	5	0	0	20	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	292
3,000 ..	7	5	0	0	23	3	0	0	36	3	0	0	16	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	263
6,500 ..	9	4	0	0	16	1	0	0	26	3	0	0	18	7	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	211
10,000 ..	1	0	0	0	7	2	0	0	23	10	0	0	24	7	1	0	4	3	1	0	3	1	0	0	1	1	0	0	3	0	0	0	8	165
13,000 ..	2	0	0	0	13	7	0	0	25	17	0	0	11	3	0	1	3	1	0	0	4	0	0	0	4	3	0	0	1	0	0	0	5	101
16,500 ..	4	0	0	0	11	7	0	0	26	24	0	0	9	2	0	0	4	0	0	0	0	0	0	0	2	0	0	0	5	2	0	0	4	56
DECEMBER																																		
Surface ..	19	0	0	0	19	0	0	0	10	0	0	0	4	0	0	0	4	0	0	0	5	0	0	0	1	0	0	0	3	0	0	0	35	289
1,500 ..	13	12	0	0	27	10	0	0	15	2	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	12	286
3,000 ..	24	17	1	0	26	3	0	0	15	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	7	264
6,500 ..	21	14	0	0	18	0	0	0	13	1	0	0	8	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	7	3	0	0	11	215
10,000 ..	8	3	0	0	16	2	0	0	24	4	0	0	10	1	0	0	2	0	0	0	2	0	0	0	3	1	0	0	8	2	1	0	13	167
13,000 ..	3	1	1	0	13	1	0	0	36	11	0	0	6	2	0	0	4	0	0	0	2	0	0	0	3	1	0	0	6	1	0	0	9	97
16,500 ..	12	0	0	0	21	2	0	0	21	28	2	0	5	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	43

Table III—Wind direction and speed in the upper air 9 59

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TABLE IV—VISIBILITY AT COASTAL STATIONS

Percentage frequency of different degrees of visibility

Mombasa. 4° 04' S., 39° 42' E. 52 ft.		Period : 1938-9									
Time (Z-2½)	Limits of visibility Nautical miles	0830					1430				
		0-½	½-2	2-5	5-10	over 10	0-½	½-2	2-5	5-10	over 10
January	0	0	3	7	90	0	0	0	3	97	
February	0	0	11	86	3	0	0	0	89	11	
March	3	3	3	16	75	0	0	3	3	94	
April	0	3	10	50	37	0	0	3	27	70	
May	3	13	10	16	58	6	7	6	23	58	
June	0	7	3	13	77	0	3	3	17	77	
July	0	0	0	23	77	0	0	3	13	84	
August	0	0	3	13	84	0	0	3	23	74	
September	0	0	0	17	83	0	0	3	7	90	
October	3	0	0	7	90	0	0	0	3	97	
November	0	3	10	10	77	0	0	0	3	97	
December	0	0	0	10	90	0	3	3	7	87	
Year	·8	2	4	22	71	·5	1	2	18	78	
Lindi. 10° 00' S., 39° 42' E. 181 ft.		Period : 1938-9.									
January	3	3	0	3	91	0	0	3	0	97	
February	0	7	0	3	90	0	11	4	4	81	
March	0	0	3	0	97	0	0	3	3	94	
April	0	0	3	3	94	3	3	0	3	91	
May	0	0	0	0	100	0	0	0	0	100	
June	3	0	0	3	94	0	0	3	0	97	
July	0	0	0	0	100	0	0	3	0	97	
August	0	0	0	0	100	0	0	0	0	100	
September	0	0	3	0	97	0	0	0	0	100	
October	0	0	3	0	97	0	0	0	0	100	
November	0	0	3	0	97	0	0	0	0	100	
December	0	3	3	3	91	0	0	3	0	97	
Year	·5	1	2	1	95	·3	1	2	·8	96	

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