A CONTRIBUTION TO THE STUDY OF THE RAINFALL
MAP OF SOUTH AFRICA.*

By J. R. SUTTON.

(With thirteen Maps.)

"When the clouds shake their hyssops, and the rain
Like holy water falls upon the plain,
'Tis sweet to gaze upon the springing grain
And see your harvest born."—*Ledwidge*.

I. INTRODUCTION.

In the rainfall tables at the end will be found full particulars of the mean monthly and mean annual rainfall for 567 stations in South and East Africa. These have been computed from all the information available in the published reports of the meteorological services of the various States. Occasional items have been extracted from the 'Meteorologische Zeitschrift,' the 'Quarterly Journal of the Royal Meteorological Society,' Symons's 'Meteorological Magazine,' and the *Northern News*. Besides this the directors of some of the services have kindly furnished special information on request; friends have obtained and forwarded returns from stations in the Bechuanaland Protectorate; and resident magistrates and police officers have helped materially. Consequently it is now possible to give a very much larger and truly representative account of South African rainfall than it was possible to give in a previous discussion.†

The tabulated averages now given, dealing with some 8800 years of record altogether, have, with few exceptions, been computed by me alone. The work has been gone over two or three times in order to ensure accuracy, but with such a mass of material it would be a wonder if there were no mistakes at all. Certainly there are not many.

The aim throughout has been to use all existing records running into ten years or more, and in areas where gauges are numerous this rule has been

* The tables and maps here given were prepared five years ago; but, for various reasons, it has not been possible to publish them before.

† J. R. Sutton, "An Introduction to the Study of South African Rainfall," 'Trans. Phil. Soc. S. Afr.,' May, 1904. This dealt with 160 stations having records of long periods.

adhered to. But in areas not well supplied with gauges records of shorter period have had to be admitted, since it has seemed better to get an approximation to the average rainfall at such places than to ignore them altogether. Naturally the means given in the table are not all of the same value; short-period records cannot be expected to give such good mean values as long-period records do, and all observers are not equally faithful.

A common fault in every country is the omission to register small falls of rain, because, forsooth, the observer thinks them too contemptible to bother about. A scrutiny of the returned number of days of rain is sufficient in most cases to reveal this fault; and when there are two or three gauges in one town the record containing the greatest number of rainy days is usually taken as the standard. When there is only one gauge, even when the number of days of rain reported seem to be rather too few, the record of quantity has been used for what it is worth. It is a pity that some observers do not realise that the trouble they take in measuring the heavy falls of rain is largely labour in vain, in a scientific sense, unless they take pains over the smaller falls. Generally speaking the longer records are the most trustworthy, especially when they are the work of one observer. This is because the observer who has enough intelligent energy to go on recording the rainfall year after year does not shirk the measurement of the smaller quantities. Nevertheless there is at least one long-period record in the Cape Province of little scientific value simply because only the heavy falls of rain have been regarded as worth bothering about. It cannot be insisted upon too often that the lighter rains must be as carefully looked after as the heavier ones. For one thing, if there be a secular change of climate anywhere it must proceed very slowly, and the facts can only be discovered by a uniform system of observation which does not neglect small things.

The latitudes, longitudes and altitudes stand, as far as possible, for the latest determinations. In a few cases they have been measured off roughly from maps. The numbers under the heading "years" do not necessarily stand for an unbroken period, although they mostly do. Sometimes they represent two or more periods of observation alternating with longer or shorter intervals during which no records were kept. In such cases the number of years is really the quotient of the number of months divided by twelve. Thus at Lilyfontein (III A, 44) from 1885 to 1908 only ten full years of observation are known; but there were further odds and ends running into fifty-eight months, making 178 months in all, which we call fifteen years.

Occasionally a rain record has been started at one spot, and continued at another not far away. If the aspects and altitudes of the two places are not materially different such a record has been regarded as continuous. For instance a part of the Dumbiedykes rainfall was really observed at Geelbeks Vley a few miles off; and the means for Sea Point have been made

up from quite a number of separate records from here and there in a small area. One or two combinations of this sort have been done for East African stations, but some amount of caution will be requisite before accepting the results.

In only one instance has any interpolation been attempted, namely, for the Devil's Peak lower gauge, in which an eleven years' record period, 1896 to 1906, has been proportionally reduced in harmony with the Nursery and Blockhouse gauges to the thirteen years' period 1896 to 1908.

With some slight modifications, the rainfall areas I to XVII are those used by the late Meteorological Commission of Cape Colony, and established, so to speak, under those numbers by many years of use. Some of these areas are large, and it has been thought best to subdivide them. Thus Section IX has been subdivided into IX A (West) and IX B (East). Sections XVIII to XXX are additional.

The mean monthly falls for each section, or subdivision, have been computed, not necessarily by way of showing the average fall over the area (though it probably does show that with some degree of precision), but rather to trace the tendency of the monthly variations—which is the wet season and which the dry.

2. NOTES ON THE RAINFALL TABLES.

I. *Cape Peninsula.*

This small area, scarcely larger than the smallest English county, has a distribution of rainfall probably more varied than that of any other equal area in all Africa. From its position on the west side of the Continent it stands within a dry region, but the contour of the land alters the conditions, and transforms the dryness into an abundant precipitation over the greater part, which rises like an oasis out of an arid region. The stations in the table showing the least rainfall are Blaauwberg Strand (I, 2) and Cape Point (I, 3), with annual averages of 13·94 in. and 12·70 in. respectively, these two stations being some thirty miles apart, one near the extreme north and the other near the extreme south of the peninsula. But according to Sparrman it never rains at all on the flats immediately to the south of Table Mountain*—a remarkable fact if true, seeing that Wynberg (I, 19), on the edge of the flats, has no less than 44½ in. a year. Along the Atlantic side of the peninsula the rainfall is only moderate, averaging about 20 in. a year, Signal Hill (I, 13) with 18·52 in. and Sea Point (I, 12) with 21 in. The east, *i.e.* the landward side, is, however, wet, ranging between Rondebosch (I, 10) 42·56 in., Platteklip (I, 8) 45·34 in., Bishop's Court (I, 1) 57·90 in. The effect of altitude is well shown by the Devil's Peak gauges, the lower gauge (I, 4) at something over 1000 ft. 47·02 in., the

* 'A Voyage to the Cape of Good Hope,' Second Edition, 1786, p. 34.

Blockhouse, at 1500 ft., 58·67 in. The slopes of Table Mountain show the same tendency, the rainfall at St. Michael's (I, 71) being not far short of 76 in. a year, while Disa Head, a dry station for its altitude, more than 500 ft. lower, has only 40 in. So far as is known the wettest place in the peninsula is Maclear's Beacon on the top, and near the eastern escarpment of the mountain (I, 16A), with an annual average of 89·30 in.*

The annual curve of rainfall is fairly simple, with a maximum in June and a minimum in February. But there is just a tendency towards a small secondary maximum in August, in response to continental conditions.

II. *South-Western Cape Province.*

This area includes the districts of Caledon, Stellenbosch, Paarl, Robertson, Tulbagh, Ceres, and Worcester south of the Hex River. The mean annual rainfall varies from 11·43 in. at Worcester (II, 38) to 40·89 in. at Ceres (II, 21), only twenty miles away. The majority of the stations have upwards of 20 in. a year. Probably one of the wettest stations in South Africa is situated in this area, *i. e.* at Berg River Hoek, No. 9 Gauge, on the western slope of the Hottentot's Holland Mountains, in lat. 33° 55', long. 19° 4'. The altitude is not given. Two years of observation at this spot gave a mean rainfall of no less than 115 in. a year.

The annual curve of rainfall resembles that of I, but the August maximum is more strongly marked.

III. *Western Cape Province.*

Comprises the whole western side of Cape Colony from Bok Point to the Orange River. It has been subdivided here into III A (Namaqualand), and III B (the districts of Van Rhyns Dorp, Clanwilliam, Piquetberg, and Malmesbury). The rainfall decreases rapidly as we go north, ranging all the way from 24·21 in. at Saron (III B, 57) to 2·28 in. at Port Nolloth (III A, 47). For Namaqualand, Lilyfontein has quite an exceptional rainfall.

The August maximum, though quite obvious, is somewhat more uncertain than it is in II. Also as we go north we find a retrogression of the first maximum into May, and a corresponding retreat of the minimum into January; inland, at Pella (III A, 46), the maxima one in March and October, the minima in July and November.

IV. *Southern Cape Province.*

Comprises the whole of the south coast districts of Cape Colony from Cape Agulhas to Algoa Bay. The rainfall increases gradually on the whole

* See T. Stewart, "The Rainfall of Table Mountain," 'Trans. R. Soc. S. Afr.,' iii, 1913. The averages for the "Additional Stations" are taken from this paper. As much as 36·58 in. in one month (August, 1899) has been recorded at Maclear's Beacon.

from west to east, and from the coast inland to the outer slopes of the Langebergen and Outniquas Mountains. On the other side of the coast ranges, whose spurs, jutting south-east, form the heads of Cape St. Francis and Cape Recife, the fall is again less, as Uitenhage (IV B, 80), 17·09 in., and Dunbrody (IV B, 73), 15·58 in.

In the western half of this area there is a long-drawn-out maximum of precipitation from February to May, and a shorter one in October. In the eastern half there are maxima from March to May and in September–October. In both halves the minima are in January and July.

V. *Southern Karroo.*

The Western half, called the Little Karroo on some maps, of this area is the terrace which lies between the Langebergen and Groote Zwartebergen, forming as it were the first step up from the coast plains. The rainfall is poor, the rain-bearing clouds having deposited much of their excess of moisture on the southern slopes of the first range of mountains inland. There are two maxima in the year, roughly in March and October, but varying in epoch from one station to another. The summer minimum is also of somewhat uncertain epoch, but the winter minimum is fairly sure in July.

The eastern half stretches across the spurs, which strike seawards to the north of Cape St. Francis. If there were any truth in the popular idea of “south-east rain-bearing winds” this area would have a copious rainfall instead of less than Uitenhage and Dunbrody. There are maxima near the times of the equinoxes, minima about the middle and end of the year.

VI. *West Central Karroo.*

The Great Karroo of the maps. It is bounded on the north by the Nieuwveld Range, on the south by the Groote Zwartebergen, and on the west by the Bontebergen, its eastern boundaries being ill-defined along the middle reaches of the Groote River.

The western half, *i. e.* VI A, may be regarded as the second step up from the coast belt to the table-land, and shows the effect of a still further depletion of the clouds in the second range of mountains inland. Only one station in this area has a good rainfall, namely Zwartberg Pass (VI A, 101), in the mountains, with 27·41 in. There are two annual maxima, about the time of the equinoxes, with minima in July and November.

The eastern half, VI B, stretching from the Nieuwveld Range to the Baviaans River, differs from the western half not only in its greater rainfall, but more particularly that it has only one maximum and minimum of precipitation in the year, the former being in March and the latter in July. On this account Beaufort West would perhaps have been more at home in VI B. Nelspoort (VI B, 104) and Lower Nelspoort (VI B, 105) are similarly

situated and only some four or five miles apart, and hence each gives practically the same information.

VII. *East Central Karroo.*

Comprises the districts of Graaff Reinet, Somerset East, Jansenville, and a portion of Aberdeen. The rainfall is of a similar character to that of VI B. Somerset East (VII, 122) is, properly speaking, a sort of salient from X, but the region north, south and west of Somerset East is typical Karroo.

VIII. *Northern Karroo.*

Extending from Namaqualand on the west to the Great and Little Winterberg on the east; is actually the southern portion of the table-land. The western half, VIII A, of this has generally a single maximum and minimum of rainfall in the year, *i.e.* in March and August. Some of the stations on the lower slopes to the west-south-west still show, however, the double maximum and minimum of VI A. In the direction of Namaqualand the country is very sparsely inhabited, and only one record of rainfall, namely that of Brandvlei (VIII A, 129), has so far been discovered in it, and that for only five years. The Gannapan (VIII A, 133) numbers are almost certainly too low. The eastern half, VIII B, has the March maximum, but the minimum is nearly a month early, falling in July.

IX. *Northern Cape Province.*

This area is bounded by Namaqualand on the west to the Orange River Colony on the east, and includes all the northern provinces of Cape Colony. Upington is on the north bank of the Orange River, The Halt is some distance to the north of the river on the border of Great Namaqualand, both these stations being really in Gordonia. Van Wyks Vlei would perhaps be better included in VIII A, excepting that the Karreebergen to the south cut it off from that area. The annual curve of rainfall is of the simple type, with one maximum in March and one minimum in August. The rainfall at Groet Boetsap is exceptionally great considering its position. The Kimberley rainfall includes Kenilworth, and goes back to 1874.

X. *South-Eastern Cape Province.*

This region of abundant mean rainfall, watered by the Buffalo, Keiskama, Kei, Kunap, Great Fish, Kowie and Bushman Rivers is better represented by rain-gauges than any other excepting the Cape Peninsula. And it has been possible to select no less than twenty-eight stations, each having a record extending over more than twenty years of, generally speaking, good observing.

The southern slope of the Amatola Mountains in this area is the wettest

known spot in Cape Colony outside Table Mountain and the Hottentot's Holland, and includes Evelyn Valley (X 190) with 65·17 in. a year, and the Hogsback with 43 in. With the exception of Alicedale (X, 182) and Daggaboer (X, 187) no station in this area has a smaller mean annual rainfall than 20 in.; but these two stations, which are on the extreme west of X, might very well have been included in VII.

On the whole there is a single maximum and minimum in the year, namely, about February or March and July respectively. But several stations, particularly those not far from the coast, show a second maximum in October–November, *e.g.* East London, Port Alfred, and Alexandria (X, 189, 203 and 180 A).

Though well watered on the whole this area is subject to droughts lasting for some weeks. At Alexandria there has been one November with 11 in., and the next November not half an inch. It appears that occasionally the Karroo conditions of VII push right down to the coast.

XI. *North-Eastern Cape Province.*

Includes the high country lying between the Orange Free State and X. It is now fairly well supplied with gauges and good observers, and sixteen have records of over twenty years' duration. It has a pretty good rainfall of the simple type, with its maximum in February and its minimum in July. The rapid increase of quantity from November to December is noteworthy. The area is crossed by the watershed of the Stormbergen, but this range has no such effect upon the rainfall as the ranges further west, the stations to the north of it having at least as good a fall as those to the south.

XII. *Kaffraria.*

The eastern portion of Cape Colony lying between Natal and the Great Kei River. It is separated from Basutoland on the north-west by the Drakensbergen. The rainfall is abundant everywhere, and excepting near the coast has one maximum and minimum in the year, at about midsummer and midwinter. Going inland up the slopes of the river valleys the mean annual rainfall first diminishes and then increases—again, a circumstance which to some extent reverses the effect due to altitude (see under XV and XVI).

XIII. *Basutoland.*

Rainfall stations only exist in this area along the settled valley of the Caledon River. Nothing is known of the rainfall of the highlands lying between the Maluti and Quathlamba Mountains, which form fully three-quarters of the country; but that the fall is considerable is proved by the numerous streams which form the headwaters of the Orange River. We should conclude from the volume and number of these streams that, if anything, considerably more rain falls upon the western slopes of the mountains of Basutoland than upon the eastern slopes facing the sea. And

this conclusion is confirmed by the testimony of the rain-gauges, so far as they go, Mount Fletcher (XII, 237) and Matatiele (XII, 236) having each a less precipitation than Mozeni (XIII, 253) and Qachas Nek (XIII, 254) across the mountains. Every station in Basutoland has a rainfall of at least 30 in., whereas in Kaffraria only six stations, including St. John's, exceed that round value.

Here, again, the rainfall is of the simple type with a January maximum and July minimum.

XIV. *Orange Free State.*

All Basutoland lying between the western slopes of the Maluti Mountains and the Caledon River belongs to the same geophysical area as the Orange Free State, and stations like Wepener (XIV, 272) and Ladybrand (XIV, 267), near the right bank of the river, have rainfalls similar to those of the left bank in XIII. Going towards the west, however, the conditions become more and more arid, Jacobsdal (XIV, 264) and Philippolis (XIV, 269) having mean annual falls not much greater than that of Kimberley.

Mr. F. S. Lynch, the General Manager of the Kimberley Waterworks Company, has kindly given me the following additional information. His letter is dated October 19, 1915.

Vrede: Average rainfall during the past ten years 26·6 in.

Parys: Average rainfall 21·16 in.

Reitz: Average rainfall approximately 30 in.

Senekal: Average rainfall, 1905 to 1913, 26·68 in.

Bethlehem: Average rainfall during the last ten years 28·824 in.

Heilbron: Average rainfall for past five years 25·45 in. •

In each case the information was supplied by the postmaster of the town mentioned.

XV and XVI. *Natal and Zululand.*

Saving the Cape Peninsula this is one of the most interesting rainfall areas in South Africa. It may be divided roughly (and the same division applies also to Kaffraria) into three zones. (1) A zone of heavy precipitation, 40 in. a year and more, along the coast belt; (2) decreasing gradually to a moderate rainfall, 25–30 in., down the centre of the country; and (3) increasing again gradually to upwards of 30 in. under the shadow of the Drakensbergen. Inland there is one maximum near midsummer, and one minimum near midwinter. On the coast there are two maxima, in March and October–November, and two minima, about January and July. According to Mann the rainfall of Natal is caused by two essentially distinct influences: first, by the development in summer of storms more or less of the character of thunderstorms, which most powerfully affect the inland districts and the uplands; and secondly, by the occurrence of sea gales, which fall with most violence upon the coast and the lands in the

close neighbourhood of the sea,* and which come at any season, though perhaps the most pronounced of them have been in the winter. The sea-gale rainfalls are almost invariably associated with a high barometer, while the thunderstorms are as characteristically low-barometer phenomena. Since the winds of Maritzburg, where Mann's observations were taken, are chiefly east to south-east, this observer concluded that Natal must be within the zone of the south-east trade winds, and get its rain from them. Further up the coast, however, in the district of Lourenço Marques, the rainfall becomes less—a fact which does not support Mann's idea. Moreover the same easterly and south-easterly winds blow also in the winter when the interior of Natal is dry.

A typical instance of heavy winter rain occurred on the Natal coast May 31–June 1, 1905, when the following rainfalls were registered in 24 hours—

	Inches.
Umzinto	17·45
Verulam	12·13
Durban	10·70
Maritzburg	4·00
Estcourt	2·05
Utrecht	1·01

showing a progressive decline of intensity as the storm worked inland. It is indeed these sea rains which make up the high mean winter rainfall of the whole eastern coast belt, saving that of Lourenço Marques, from Port Alfred to the tropics.

The following list shows how the annual rainfall varies going from west to east across the Continent, between latitudes 29° and 30° S.:

	Inches.
Port Nolloth III	2·28
Kraaifontein „	5·01
Pella „	3·09
Kenhardt IX	5·50
Prieska „	9·74
Griquatown „	13·66
Kimberley „	17·57
Bloemfontein XIV	21·94
Thaba 'Nchu „	25·13
Ladybrand „	30·60
Maritzburg XV	35·38
Durban „	40·54

This gives an annual average increase of rainfall of about one inch for each 22 miles further east. Between Port Nolloth and Kimberley there is

* R. J. Mann, "Contributions to the Meteorology of Natal," 'Quart. Journ. Met. Soc.,' October, 1878.

an extra inch for each 30 miles; between Kimberley and Durban the increase is 1 in. for each 17 miles.

XVII. *Bechuanaland.*

A remarkable feature here is the exceptionally high rainfall of Mafeking. No very obvious explanation of this circumstance is forthcoming; but the rainfall over the greater part of this area is very variable from year to year, floods alternating with long droughts, and Mafeking may have got more than its share of the former. The run of the averages for Palapye Road and Serowe (XVII, 318, 319) is interesting, and not the less so because no particulars of the rainfall of Chief Khama's headquarters have hitherto been published. Another interesting and new station is Tsau, on the northern border of Lake Ngami. Though the record here summarised is a short one, it suggests that some previous assumptions regarding the rainfall round about the Lake were quite wrong.

XVIII. *Damaraland and Great Namaqualand.*

In this interesting region we have desert conditions on the coast belt, with a gradual improvement from west to east and from south to north. To the north-east the general rain conditions are at least as good as those of Griqualand West (compare XVIII and III with IX). A remarkable feature is the rapidity with which the type changes from a winter to a summer rainfall in the vicinity of the Orange River.

XIX-XXIII. *Transvaal.*

This area is not strictly comparable with the others. The mean January, February and March rainfalls for nearly all the stations are artificial, January counting from 1-30, March from 2-31, and February from January 31 to March 1. Few of the stations have much of a record, the exceptions being the mining areas. The fall increases from west to east on the whole. It is high in the north-east highlands, but falls off over the lower levels adjacent to the Portuguese border and Rhodesia. It is mostly thunderstorm rain, with a summer maximum and minimum.

XXIV and XXV. *Southern Rhodesia.*

This area also shows the increase of rain from west to east. It shows also on the whole a heavier summer and a lighter winter rainfall than the Transvaal and Bechuanaland do.

XXVI. *Portuguese East Africa.*

Most of these stations are on the coast. The rainfall varies very much from one year to another, so that the short records cannot possibly give very good averages. Thus while five years of published observations at Beira gave a mean annual rainfall of nearly 51 in., the inclusion of a further

seven years' record, hitherto unpublished, lowered the mean to less than 45 in. Places near latitude 24° S., especially when they project beyond 35° E., have a large winter fall made up apparently of storms similar to those which assail Natal.

XXVII. *British Central Africa.*

A region of abundant mean summer rainfall. Though entirely within the tropics it shows no definite indication of a double annual period. The maximum of intensity, however, appears to come progressively later as we go north, shifting from January to March in eight or nine degrees of latitude. The Nyassa Highlands are the only places where any rain to speak of falls between May and October. Lauderdale (XXVII, 500) appears to be almost the only station in South Africa which lives up to the traveller's wonders of rainfall described in pen and pencil books.

Nearly all the material in XXVII is now published for the first time.

XXVIII. *East Africa.*

The general tendency is to maxima in April, July and November. Inland the July maximum disappears, and the November maximum comes later. The scheme of distribution of the rain over all this area is evidently most complicated, and requires more gauges to the square mile for its elucidation than any other area south of the equator. Aspect nearly everywhere is of more importance than elevation, some of the loftiest stations being among the driest. Compare, *e g.*, Amani with Kwai (XXVIII, 508, 519), Ruteganio (XXVIII, 531) with Fife (XXVII, 495).

XXIX. *British East Africa.*

These particulars have been transcribed from one of the Government reports, and include only recent observations. There appears to be a dry area protruding inland from near the equator and dividing the wet coast from the wet lakes. Thus we have Mombasa (XXIX, 548) with an annual fall of 55·68 in. and Port Florence (XXIX, 555) with 46·60 in.; whereas Kismayu (XXIX, 539) has but 17·08 in., Athi River (XXIX, 536) 25·08 in., and Nakuru (XXIX, 554) 33·24 in.

Various annual mean falls for longer periods than seven years are:

	Years.	Inches.
Mombasa . . .	18 . . .	54·43
Fort Hall . . .	10 . . .	46·72
Kismayu . . .	15 . . .	15·96
Malindi . . .	13 . . .	40·01
Makakos . . .	13 . . .	35·37
Mumias . . .	11 . . .	70·93
Shimoni . . .	14 . . .	56·23
Takaungu . . .	12 . . .	45·23

3. NOTES ON THE RAINFALL MAPS.

Some preliminary monthly maps of the rainfall of Cape Colony and the Orange Free State were drawn by Gamble and published in the Report of the Meteorological Commission for 1886. As the observing stations were few in those days, and the records of no great length, there was necessarily a good deal of imagination in the maps, and they only show in a rough way which places are wet and which dry on the whole in given months. Buchan constructed some monthly maps of the rainfall of Cape Colony, the Orange Free State, and parts of Natal and the Transvaal, based upon his discussion of the rainfall of the ten years 1885-94. These were published by the Meteorological Commission in 1897 and were a marked improvement upon Gamble's. They have been reproduced in Bartholomew's 'Physical Atlas,' 1899, and in various other publications. Of the 278 stations for which Buchan had the records, however, only about a half extended to the full ten years, the rest running to anything from three years to nine. Knox, in 1911, published a series of elegant monthly maps of the rainfall of Africa in his 'Climate of the Continent of Africa.' These were based upon odds and ends of scrap-book information culled from all sorts of responsible and irresponsible sources; and consequently the beauty of the maps is no guarantee of their accuracy. Fraunberger and Herbertson have dealt with African rainfall at large. Father Goetz published a detailed map of the annual rainfall of Southern Rhodesia in the Meteorological Report of that Colony for 1908.* C. Stewart prepared a very fine map of the average annual rainfall of the Union of South Africa, and another showing the seasonal distribution of rainfall, for the use of the Select Committee of the Senate on Droughts, Rainfall and Soil Erosion.

The rainfall maps now given are intended to represent graphically the broad features of all the results shown by the rainfall tables. In principle the construction of such maps is easy enough. All we had to do is to draw a series of lines, called "isohyets," each one of which shall pass through all stations having a given rainfall. Thus the isohyet of 1 in. (equal to about 25 mm.) will join up in a continuous curve all stations in some particular area whose mean annual (or monthly) rainfall is 1 in. In actual practice it is not so easy to draw these lines as it is to state the way to do it. To begin with, very few stations out of the whole number can be found whose annual (or monthly) rainfall is some given quantity. It becomes a question not so much of joining up places having a given rainfall as of drawing an isohyet so that greater falls are on one side of it and lesser falls on the other. Next we have areas in which the rainfall varies very much over very small distances, as in the Cape Peninsula and in mountainous districts here

* See also E. Goetz, "The Rainfall of Rhodesia," 'Proc. Rhodesia Sc. Assoc.,' vol. viii, 1909.

and there; and it is not always easy to determine whether an isohyet should pass round such a place to the right or to the left. Moreover, in areas where there are few gauges the isohyets are usually drawn too simply straight. So that there is always room for bias, and for criticism, upon the details of any rainfall map, whether those before us or any other.

Looking at the annual map, we see that south of latitude 25° S. the isohyets trend mainly north and south, while north of latitude 20° the tendency of the trend is north-west to south-east. A remarkable feature is the dry belt near the tropic of Capricorn, stretching nearly all across the continent, and only broken by the wet oasis of the mountains in the Eastern Transvaal. The course of the isohyets inland from that part of the east coast lying between the parallels of 24° and 27° is to some extent tentative. When more rainfall records are available from the gauges Lieutenant Teixeira is establishing in Portuguese East Africa, it will probably be found that the isohyets meander more than they have been drawn to show.

At first sight it might appear that the small closed isohyet of 60 in. on the tropic, and that of 50 in. near latitude 27° , ought to be in more intimate communication with one another, and one feels tempted at first to run the isohyet of 30 in. inland from about the place where the parallel of 27° meets the coast, and below the 50-in. isohyet rather than above it. The intrusion of the isohyet of 20 in. from the west, nevertheless, in the immediate neighbourhood, as well as the dry belt pushing westwards from Lourenço Marques, support the map.

It is curious how relatively few conspicuous instances there are in which the mountain ranges show a pronounced influence upon the rainfall. It is evident that the distribution of South African rainfall is of general significance, and that local conditions are quite a secondary matter. Local influence can be traced along the terraces facing the Atlantic, along the Langebergen and Outniquas, in the Amatolas, in the northern end of the Drakensbergen, and, perhaps most strikingly of all, in the Zoutpansbergen, which, as we have seen, is the one obstacle to the uninterrupted course of the tropical dry belt across the continent. Lake Nyassa is an oddity: the Shire Highlands manage to catch the rain; but if the map is to be trusted, the western side of the lake is much wetter than the eastern side in spite of the Livingstone Range.

The most likely explanation of the lack of concordance between the distribution of rainfall and the physical features of the land is that most South African rain falls in thunderstorms, whose origins and tracks are largely independent of the geographical contours, and whose clouds are higher than most of the mountains. Now it is the almost universal custom to fill up by inference the gaps in our actual knowledge of the rainfall, and this usually resolves itself into an effort to make the isohyets and the land contours coincide. Thus if we have a semicircular range of hills with only

two rain-gauges, one at each extremity, and the mean rainfall at the two gauges is about the same, say 20 in., then in nine cases out of ten such the isohyet of 20 in. would be drawn with a semicircular sweep to follow the course of the hills, and in eight cases of the nine the isohyet might prove to be nearly correct. Such a plan has been followed to some extent here; but the facts as we find them show that in the lump inference is a poor substitute for knowledge, and that no such success in guessing can be expected in South Africa as is attained in countries where thunderstorms are fewer. Indeed, even in England, where the mean isohyets are almost entirely of geographical inception, Mill has discovered that *heavy* rain, whether it fall in thunderstorms or during cyclonic disturbances, falls impartially on high or on low ground without any regard to the configuration of the country. "It seems," says Mill, "that the causes determining the fall of rain on these occasions are to be sought in the air alone, and that at a level so far above the surface that inequalities of ground, even amounting to several thousand feet, are without direct influence upon them."* We may understand from this the great want of concordance between the isohyets and the contour of South Africa. If we would discover the reason why our isohyets bend this way or that, we must first discover the reason why thunderstorms form and travel as they do.

The same sort of considerations apply to the monthly maps. If we study them carefully, in order, month by month, we begin to see that the monthly mean rainfall over any area taken at random is not dependent so much upon the impinging of moisture-laden winds from the ocean upon lofty slopes, as upon the more general progressive movements of a rainfall belt to and from the equator.

Consider, *e. g.*, the isohyet of 8 in. In January this bends inland near latitude 17° , follows the course of the Zambesi to near longitude 25° , turns northwards to latitude 10° , crosses and recrosses this parallel, and finally runs down the meridian of 40° to the sea. Over all the land within this line the mean January rainfall exceeds 8 in. In February we find the area enclosed by the same isohyet somewhat further south, its southern boundary crossing the Zambesi and reaching the coast below Beira. In March it has retreated northwards again, its northern boundary being near latitude 8° , its southern boundary about 14° . In April it has nearly disappeared from the map and does not reappear until December.

In January the 4-in. isohyet meanders from west to east between the 7th and 30th meridians above and below the parallel of 21° ; it then turns towards the south-west as far as latitude 27° , from whence it wanders south-east to the sea. To the left of this line the rainfall is greater than 4 in.; to the right it is less, and it gradually tails off to nearly nothing

* H. R. Mill, "Map-studies of Rainfall," 'Quarterly Journ. R. Met. Soc.,' April, 1908.

along the lower half of the west coast. In February the same isohyet has shifted a little south; in March it has edged off to the north-east, while in April it is shown running nearly due west to east along the parallel of 11° . It is not drawn on the December map, but its course can be mentally followed between the isohyets of 3 and 5 in., and from these we see that it is pretty much the same as it is in March.

In January the 1-in. isohyet runs south from near the top left-hand corner of the map to latitude 25° , where it curves more to the east. In February it is rather nearer the Atlantic, and in March still nearer—albeit the 2-in. isohyet in this month has pushed out a long tongue eastwards. In April it has moved considerably northwards, and embraces the whole of the interior. In May it has retreated to the equator. In October it begins to show again north of the 15^{th} parallel; and can be followed in November and December closing down upon its first position near the west coast.

Of the other isohyets much the same may be said. In fact they form together one system which moves north and south as the sun moves, but with a lag of a month or more. That is, in September, when the sun is on the equator, going south, the zone of heaviest rainfall is in the northern hemisphere, and it does not reach the equator for upwards of a month; in March, when the sun is again on the equator, going north, the zone of heaviest rainfall extends along the parallel of about 10° S. This is not to say that the rainfall system retains a uniform aspect as it swings north and south. At one time the isohyets may be closing up together; at another they may be opening out. The isohyets of 1 and 2 in., *e.g.*, are further apart in November than they are in January.

The zero isohyet is interesting. In June it occupies a considerable belt of the country lying between latitudes 5° and 18° . In July it circuits a much larger area, having extended outwards north and south; but its southward progress has evidently received a check in the high land near the tropic, facing the Atlantic—an indication that occasional though trivial rain falls at this place in July. And, curiously enough, as the area within the zero isohyet comes still further south we see that these reluctant rains invade it for a considerable distance from the south, reducing the area of no rain, in August, by many thousand square miles, and nearly obliterating it altogether in September.

Corresponding to the general movements of the main isohyetal system are the movements of the subsidiary systems found on the coast—the winter rains of the south-west, for example, which advance as the summer rains retreat, and *vice versa*, and the rains of the south and south-east coastal belt. The winter rains of the south-west do, indeed, now and then, and the southern coastal belt rains not infrequently, push their way inland as far as Kimberley and Bloemfontein.

4. SOME DETAILS OF RAINFALL.

TABLE A.—*Mean Hourly Variation of Rainfall at Kenilworth.*

Hour (ending).	Frequency (times).	Quantity (inches).	Rate (inches).
I .	13 .	·64 .	·049
II .	12 .	·55 .	·046
III .	11 .	·61 .	·055
IV .	10 .	·48 .	·048
V .	11 .	·47 .	·043
VI .	11 .	·43 .	·039
VII .	9 .	·34 .	·038
VIII .	10 .	·34 .	·034
IX .	9 .	·31 .	·034
X .	8 .	·26 .	·033
XI .	8 .	·27 .	·034
Noon .	8 .	·33 .	·041
XIII .	10 .	·50 .	·050
XIV .	15 .	1·11 .	·074
XV .	18 .	1·05 .	·056
XVI .	19 .	1·15 .	·061
XVII .	19 .	1·52 .	·080
XVIII .	19 .	1·27 .	·067
XIX .	18 .	·94 .	·052
XX .	18 .	1·05 .	·058
XXI .	18 .	1·01 .	·056
XXII .	16 .	·78 .	·049
XXIII .	15 .	·69 .	·046
Midnight .	14 .	·78 .	·056
Year .	319 .	16·88 .	·053

Table A shows how the rate of rainfall varies from hour to hour at Kenilworth (Kimberley). It is deduced from observations made during the 17 years 1897 to 1913—a period in which the annual average fall was an inch or so less than the normal mean used in IX, 178 of the rainfall table.

The numbers under the heading “Frequency” tell how many times on an average it was raining during each given hour throughout the year. Thus for the hour ending 1 a.m. there was, on an average, rain on 13 days of the year; for the hour ending 4 p.m. there was rain on 19 days; and so on. Upon the whole there were 319 hours per annum during which rain was recorded, *i. e.* less than one hour a day. Since the average number of rainy days at Kenilworth is about 70, it follows that an average wet day would run to about $4\frac{1}{2}$ hours of rainfall.

TABLE B.—*Miscellaneous Details of Rainfall.*

Section.	Average number of rainy days per annum.	Greatest rainfall in one year. (inches).	Heavy rainfall in 24 hours.
I	152	126·18	6·00 at Newlands.
II	110	115·47	5·93 „ Berg River.
III	75	34·60	3·14 „ Dassen Island.
IV	138	69·27	16·50 „ Swellendam.
V	59	28·12	4·63 „ Kleinpoort.
VI	51	47·26	5·00 „ Zwartberg Pass.
VII	92	44·17	4·60 „ Somerset East.
VIII	70	34·81	4·30 „ Petrusville.
IX	70	38·47	4·60 „ Campbell.
X	152	103·11	11·33 „ Evelyn Valley.
XI	101	56·53	5·94 „ Ellesmere.
XII	130	68·54	9·29 „ Flagstaff.
XIII	96	49·19	4·25 „ Mafeteng.
XIV	—	43·29	—
XV	162	73·00	17·45 „ Umzinto.
XVII	60	28·44	5·20 „ Vryburg.
XIX to XXIII	86	—	4·09 „ Pretoria.
XXIV	77	45·30	5·45 „ Gwels.
XXV	100	72·15	—
XXVII	123	—	—

The average precipitation for each hour is given under the heading “Quantity.” The driest hour of the day is 9 to 10 a.m. with scarcely more than a quarter of an inch a year; the wettest hour is 4 to 5 p.m. with six times as much. The hourly quantities are somewhat irregular, probably because 17 years is too short a period to produce a smooth curve.

The numbers under the heading “Rate” specify the average hourly intensity of rainfall. It is deduced by dividing the whole fall per hour per annum by the number of hours it took to fall in, or—

$$\text{Quantity} / \text{frequency} = \text{rate}.$$

We see that the hourly average rate of rainfall in wet weather rises and falls as the hourly average frequency increases and diminishes—that is to say, the hour which carries the greatest chance of rain carries the heavier fall when it comes. The lightest rain comes between 7 and 11 a.m., the heaviest in the afternoon.

In Table B some miscellaneous details of rainfall are given, taken mainly from the records of the twelve years 1897 to 1908. The “Average number of rainy days” does not, excepting in a few instances, apply to any one station in a particular section, but is really the average of the greatest

number of rainy days reported, from whatever station in the section, each year. For Section IX the number of rainy days at Kenilworth is used; for XV those of Durban; XIX to XXIII takes Pretoria and Johannesburg; XXIV is for Bulawayo; XXV is for Melsetter; and XXVII is for Zomba. Altogether the section with the greater rainfall has the greater number of rainy days.

A "rainy day" is a day upon which the precipitation is at least $\cdot 01$ in.

The hour at which the rainy day is supposed to end has a curious influence on the number of rainy days in a year. Thus at Kenilworth it makes all the difference whether the day is reckoned from 8 a.m. to 8 a.m., or from 8 p.m. to 8 p.m. In the former case the average number of rainy days for the 14 years 1901 to 1914 is 70, whereas in the latter case the average number is 75. The reason for the difference is that it rains more often (see Table A) at 8 p.m. than it does at 8 a.m. Suppose it to be raining from 7 to 9 p.m. on June 10, and the hourly fall to be

7-8 p.m.	.	.	$\cdot 15$ in.
8-9 p.m.	.	.	$\cdot 12$ in.

This would give us one day's rain of $\cdot 27$ in. for the 24 hours ending 8 a.m. June 11, but one day's rain of $\cdot 15$ in. for the 24 hours ending 8 p.m. June 10, and another of $\cdot 12$ in. for the following 24 hours.

In addition to 75 days (8 p.m. to 8 p.m.) of rainfall in measurable quantities at Kenilworth in a year, there are 25 more days upon each of which only a few drops are noted.

The "Greatest rainfall in one year" (Table B) applies to any station in a given section. Mostly the wettest years occur at places where the mean rainfall is the greatest.

The last column of Table B gives some typical heavy rainfalls in 24 hours. The quantity shown for Section IV is remarkable. Previous to 1906 the average rainfall for December at Swellendam was $2\cdot 36$, derived from 25 years of observation. In December, 1906, there were torrents of rain ("cloudbursts" in the vernacular) experienced over nearly the whole of Section IV, and probably the most intense ever known there. In that month $26\cdot 72$ in. fell at Swellendam and $16\cdot 32$ in. at Heidelberg, of which $65\cdot 01$ in. fell in one day at the former place and $11\cdot 37$ in. at the latter.

5. A NOTE ON SOUTH AFRICAN HAILSTORMS.

A good deal of the South African rainfall occurs in hailstorms.

Lenard has found that raindrops exceeding $0\cdot 1$ in. radius cannot last, but break up into smaller fragments in a very few seconds, while tiny drops can hold themselves intact in strong tumultuous gusts of wind. Hailstones, however, can go on growing even to the size of cricket balls. Some of the

stones which fell at Maritzburg in April, 1874, were too big to go into a breakfast cup, measured $4\frac{1}{2}$ in. in one diameter and $3\frac{1}{2}$ in. in the other and weighed up to $1\frac{1}{2}$ lb. avoirdupois.* These stones, therefore, were a matter of 65,000 times as large as the largest possible raindrop; their terminal velocity must have been very much greater than that of any raindrop, so that it is no wonder that they crashed through corrugated iron roofs as they would through paper.

Two newspaper accounts of heavy South African hailstorms are given below :

(1) From the *Diamond Fields Advertiser* of December 12, 1915 :

“ *Weather Extraordinary : Remarkable Wind and Hail.*—The *Mafeking Mail* on Monday had a report of an extraordinary storm stated to have occurred in the vicinity of Hildavale a few days previously. The full fury of the storm, it was stated, was felt on the farm Raailies Park, while other farms in the neighbourhood to suffer included those of Messrs. Odendaal Van Wijk (De Rust), Adams (Thorn Park), and Greenberg (Crowsley Park). Mr. Durand was reported as having stated that the storm pursued a narrow path about 350 yards wide, and for a distance of a mile every tree and shrub in its course was destroyed. Of the trees many were twisted off at the trunk but the majority were torn out of the ground. Examination of this devastated belt afterwards showed that many of the larger trees were carried away for some 20 yards with their trunks trailing on the ground, and were then lifted clear of the ground and deposited many yards distant. A further and perhaps more telling illustration of the fury of the tornado may be found in the fact that 350 yards of fencing in its path was wholly destroyed—not only were the iron standards twisted in corkscrew fashion and bent, but the strands of wire were broken in many places, doubtless due to the uprooted trees being hurled against them.

“ There followed a hailstorm of exceptional violence. Says the paper named : ‘ For nearly five minutes great isolated chunks of ice fell. We have the authority of Mr. Durand for stating that four of these chunks, weighed collectively, turned the scale at 4 lb., and the measurements of one were : width 4 in., depth 4 in., and length $4\frac{1}{2}$ in. Numerous hail-stones weighing over $\frac{3}{4}$ lb. also fell. Into ploughed land the bigger stones penetrated to a depth of from 2 to 3 in. and it would be better to imagine than experience a bombardment with such missiles had such been accompanied by a heavy wind.

“ ‘ As it was, Mr. Durand’s losses in livestock were considerable. Of one flock of sheep 14 were killed outright and 16 died later, while 30 or 40, though very badly bruised and bleeding, are recovering. An ox had its eye

* Natal. ‘ Commission appointed to Enquire and Report upon the Extent and Condition of Forest Lands in the Colony,’ 1880. Also, Rev. J. D. la Touche in ‘ Quart. Journ., R. Met. Soc.,’ October, 1874.

destroyed, while a two-year-old heifer belonging to Mr. Du Plessis was killed.

“Packing cases outside Mr. Durand’s homestead were smashed to match-wood. The thatch on two rooms adjoining the homestead was completely demolished, a circumstance which rendered the rooms altogether untenable, while at Mr. Odendaal’s homestead one hailstone crashed clean through the verandah roof—of corrugated iron—leaving a hole of about 3 in. in diameter. At the end of five minutes smaller hailstones fell, and continued for some ten minutes. No great quantity of rain fell—in fact just before the water began to “run” on the veldt the storm ceased.’

“Apparently the foregoing details were received with incredulity by the readers of the paper, which on the following day printed a confirmatory letter from the owner of Thorn Park—Mr. A. E. Adams, who wrote :

“On Wednesday we experienced a terrible hailstorm, the like of which I had never before seen. I have often heard of hailstones the size of turkey-eggs, but have not seen them, but some of those that fell on Wednesday afternoon were larger than goose-eggs. The majority were the size of tennis balls. The circumference of one I measured was $13\frac{3}{4}$ in. one way and $9\frac{1}{4}$ in. the other, and many weighed just over a pound. Luckily no wind accompanied the hail. I had three sheep killed, while a number had one or more legs broken and their eyes knocked out. Mr. Durand lost 30 sheep, and Mr. Du Plessis a cow.

“My garden was knocked to atoms ; scarcely anything is left. Galvanised iron was dented all over, and a few holes were knocked in the iron. Any number of springbok and stembok were killed over on the flats.”

(2) From the same paper of January 3, 1916 :

“Mr. J. Allen, of Kildavale, Rhodesia, writes to the Bedford paper as follows : On December 15 we had an exceptionally heavy hailstorm here, in which the hailstones were the largest ever seen by inhabitants of this part of the country. On this farm they were as large as tennis balls. We measured four of them, the largest being $13\frac{1}{2}$ in. in circumference, and weighing little over half a pound, and the remaining three measuring between 10 and 12 in. A neighbour, however, seems to have beaten this, one measuring 18 in. in circumference and weighing a pound. The storm lasted about ten minutes, the hail being small at first, and increasing in size. Luckily the storm was not accompanied by wind, otherwise the losses would have been much greater. As it is, one farmer lost 28 sheep killed, and many with legs broken and minus eyes. The cattle had large lumps on their bodies, some also losing eyes. Many holes in the ground caused by the stones were from 1 to 2 in. deep. Old natives born here say they have not seen hailstones as large as these.”

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TABLE OF MONTHLY MEAN RAINFALL.
I.—Cape Peninsula.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
						In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Bishop's Court . . .	1	33° 58'	18° 27'	250	29	1.45	.82	1.76	4.43	8.43	10.31	8.19	8.51	5.58	4.61	1.97	1.80	57.90
Blaauwberg Strand . .	2	33 47	18 28	10	14	.64	.21	.51	1.26	2.05	2.16	1.68	2.03	1.22	1.15	.49	.44	13.94
Cape Point . . .	3	34 21	18 30	730	9	.42	.38	.44	1.55	1.73	2.15	1.21	1.22	1.20	1.37	.45	.57	12.70
Devil's Peak :																		
Lower Gauge . . .	4	33 57	18 27	1050	13	1.71	.98	1.64	3.68	6.57	8.21	6.72	5.72	4.32	3.88	1.82	1.77	47.02
Nursery . . .	5	33 57	18 27	1200	13	2.05	1.02	1.93	4.04	7.25	9.06	7.48	6.32	4.77	4.33	2.04	2.04	52.32
Blockhouse . . .	6	33 57	18 27	1500	13	2.35	1.17	2.13	4.51	8.10	10.33	8.22	7.23	5.15	4.85	2.35	2.27	58.67
Molteno Reservoir . .	7	33 56	18 24	306	21	.98	.57	1.08	3.03	4.90	5.73	4.72	3.98	2.80	2.26	1.28	1.20	32.53
Platteklip . . .	8	33 57	18 25	550	27	1.34	.97	1.70	3.92	6.46	7.72	6.61	5.59	4.14	3.28	1.86	1.75	45.34
Robben Island . . .	9	33 48	18 23	25	15	.66	.27	.55	1.59	2.46	3.18	2.30	2.71	1.72	1.34	.77	.59	18.14
Rondebosch . . .	10	33 58	18 29	100	22	1.18	.79	1.41	3.31	6.37	7.00	6.83	6.18	3.54	2.84	1.67	1.44	42.56
Royal Observatory . .	11	33 56	18 29	30	73	.70	.59	.96	2.00	3.99	4.45	3.55	3.44	2.29	1.74	1.09	.86	25.63
Sea Point . . .	12	33 56	18 23	15	23	.71	.45	.66	2.12	3.29	3.87	2.77	2.66	2.15	1.60	.77	.77	21.82
Signal Hill . . .	13	33 55	18 24	1143	26	.49	.38	.65	1.75	2.87	3.03	2.41	2.34	1.82	1.37	.76	.65	18.52
Simonsfown . . .	14	34 12	18 26	12	28	1.01	.85	1.38	2.71	4.47	5.07	4.22	4.04	3.00	2.60	1.48	1.17	32.00
Table Mountain :																		
Disa Head . . .	15	33 59	18 24	2496	27	1.20	1.22	1.76	3.86	5.41	6.11	5.32	4.61	3.52	3.27	2.06	1.78	40.11
Kasteel Poort . . .	16	33 59	18 24	2500	24	2.06	1.70	2.71	5.03	8.55	10.48	8.50	7.64	5.32	5.05	2.94	2.45	62.43
St. Michael's . . .	17	33 58	18 25	3050	24	2.53	2.29	3.26	5.94	10.36	12.73	10.34	9.36	6.21	6.06	3.69	3.19	75.96
Waai Kopje . . .	18	33 58	18 25	3100	27	2.27	1.93	2.95	5.41	9.44	10.65	8.85	8.12	5.79	5.32	3.33	3.07	67.12
Wynberg . . .	19	34 0	18 28	235	29	1.09	.63	1.40	3.19	6.69	7.98	6.40	6.58	4.49	3.43	1.32	1.28	44.49
Means . . .						1.31	.91	1.52	3.33	5.76	6.85	5.60	5.17	3.63	3.18	1.70	1.53	40.48

ADDITIONAL STATIONS.

Table Mountain :																		
Dam . . .	14A	—	—	2413	18	2.49	1.48	3.24	4.87	7.50	10.09	8.39	8.07	5.88	5.36	3.22	3.78	64.37
Maclear's Beacon . .	16A	—	—	3586	19	3.16	1.85	3.73	6.67	10.17	14.60	12.77	12.72	8.57	7.34	4.06	3.66	89.30
Waai Vlei . . .	18A	—	—	2900	19	2.63	1.62	3.40	5.88	8.26	11.68	9.74	10.01	6.99	6.07	3.27	3.22	72.77

II.—South-Western Cape Province.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
					In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
20	34° 13'	19° 25'	760	29	.90	.81	1.23	1.98	2.39	2.41	2.10	2.56	1.93	2.06	1.17	1.02	20.56
21	33 22	19 19	1493	29	1.20	.53	1.12	3.33	6.55	6.38	4.95	5.97	4.30	3.54	1.66	1.86	40.89
22	34 37	19 18	64	8	1.07	.79	1.38	2.10	3.56	4.26	2.27	3.56	2.80	2.77	1.21	1.23	27.00
23	34 2	18 44	100	16	.86	.38	.77	1.97	2.97	3.60	2.55	3.62	2.26	1.81	.82	.85	22.46
24	33 29	19 26	—	10	.57	.48	.84	1.66	1.92	1.80	1.71	2.54	1.43	1.02	.54	.56	15.07
25	34 12	19 10	960	14	.88	.65	1.38	2.36	3.03	2.83	3.06	2.89	2.27	1.93	1.01	.72	23.01
26	34 22	19 42	600	10	.81	.88	1.27	1.73	2.46	2.39	1.93	2.74	1.88	2.57	1.16	1.08	20.90
27	33 48	18 51	555	25	.97	.53	1.09	2.66	4.40	4.80	3.73	4.10	2.79	2.39	1.26	.74	29.46
28	33 26	19 11	880	16	.77	.47	.79	2.70	3.63	3.89	2.99	3.70	2.34	2.13	1.17	.60	25.18
29	33 48	20 8	727	25	.51	.69	.60	1.43	1.68	1.34	1.20	1.44	1.40	1.03	.75	.58	12.65
30	33 45	18 57	500	29	.88	.58	1.03	3.05	4.96	5.88	4.26	5.24	3.05	2.34	1.16	.84	33.27
31	33 47	19 53	600	29	.56	.91	.79	1.36	1.27	1.31	1.15	1.20	1.27	1.12	.77	.78	12.52
32	33 6	19 20	2500	18	.56	.40	.62	2.10	4.24	3.34	2.90	3.19	2.50	1.67	.82	.79	23.13
33	34 5	18 51	100	26	.87	.48	1.03	2.12	3.89	4.10	2.93	3.40	2.35	2.10	.93	.65	24.86
34	33 56	18 51	400	29	.76	.62	.96	2.45	4.34	4.33	3.51	3.92	2.75	2.25	1.21	.88	27.98
35	33 18	19 8	490	29	.53	.55	.69	1.82	2.78	2.44	1.95	2.39	2.11	1.59	.84	.64	18.23
36	33 38	18 59	400	29	.89	.65	.89	2.53	3.89	4.49	3.10	3.56	2.48	2.06	.81	.72	26.07
37	33 52	19 1	540	16	1.33	.62	1.28	3.15	5.15	6.29	4.48	4.95	2.96	3.06	1.33	.76	35.37
38	33 39	19 26	780	29	.36	.35	.52	1.18	1.41	1.60	1.23	1.51	1.28	1.06	.42	.50	11.43
			Means		.80	.59	.96	2.19	3.40	3.55	2.74	3.29	2.32	2.03	1.00	.81	23.69

III.—Western Cape Province.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
A. NAMAQUALAND.																		
Anenous	39	29° 15'	17° 34'	Ft. 1774	9	In. .09	In. .11	In. .14	In. .45	In. .64	In. .63	In. .58	In. .60	In. .67	In. .42	In. .31	In. .19	In. 4.83
Garies	40	30 33	18 0	830	19	.06	.06	.10	.65	.72	.64	.75	.70	.46	.33	.22	.16	4.85
Keerom	41	29 58	17 38	1500	4	.05	.68	.19	.39	.52	1.95	1.23	1.00	.61	1.18	.17	.13	8.10
Klipfontein	42	29 12	17 39	3104	23	.15	.33	.36	.83	1.28	.88	.83	1.06	.68	.58	.31	.18	7.47
Kraaifontein	43	29 15	17 44	2700	17	.14	.22	.26	.56	.77	.61	.63	.74	.46	.36	.18	.08	5.01
Lilyfontein	44	30 18	18 5	5000	15	.33	.46	.40	1.25	1.89	1.69	1.51	1.67	1.14	1.09	.59	.39	12.37
O'oktep	45	29 36	17 52	3036	26	.17	.33	.42	.82	1.07	.91	.72	.81	.72	.54	.21	.17	6.89
Pella	46	29 2	19 9	1800	29	.24	.41	.64	.35	.20	.11	.06	.15	.17	.47	.12	.17	3.09
Port Nolloth	47	29 15	16 52	40	27	.04	.05	.12	.27	.46	.29	.28	.30	.18	.12	.10	.07	2.28
Springbok	48	29 40	17 53	3200	29	.18	.34	.56	.76	1.29	1.18	.92	1.09	.90	.69	.28	.19	8.38
			Means			.15	.30	.32	.63	.88	.89	.75	.81	.60	.58	.25	.17	6.33
B. SOUTHERN SECTION.																		
Clanwilliam	49	32° 10'	18° 53'	245	29	.23	.28	.28	.82	1.38	1.33	.97	1.00	.89	.62	.33	.18	8.32
Dassen Island	50	33 24	18 6	15	15	.76	.19	.38	1.26	2.18	2.26	1.64	2.08	1.35	.90	.46	.29	13.75
Ebenezer	51	31 35	18 20	100	7	.02	.04	.24	.86	.57	.49	.54	.56	.82	.21	.15	.14	4.64
Groote Post	52	33 28	18 24	—	17	.41	.52	.52	1.30	3.02	3.28	2.81	2.40	1.61	1.34	.79	.67	18.69
Hopefield	53	33 4	18 21	250	11	.66	.20	.43	1.28	1.72	2.12	1.73	2.24	1.25	.96	.45	.33	13.37
Kersefontein	54	32 53	18 21	15	17	.35	.14	.38	1.19	1.74	2.14	1.71	1.92	1.17	.90	.42	.28	12.35
Malmesbury	55	33 28	18 43	460	29	.49	.41	.63	1.78	2.75	2.74	2.11	2.47	1.87	1.38	.72	.49	17.84
Piquetberg	56	32 54	18 43	700	29	.57	.54	.58	1.72	3.11	2.87	2.55	2.62	2.32	1.89	.91	.69	20.37
Saron	57	33 11	19 0	600	14	.51	.57	.65	2.10	4.41	3.65	2.89	2.91	2.91	2.15	.83	.63	24.21
The Towers	58	33 25	18 28	—	17	.73	.24	.55	1.71	2.75	2.96	2.54	3.02	1.74	1.32	.71	.46	18.72
Van Rhyms Dorp	59	31 35	18 44	400	22	.08	.19	.16	.87	1.00	.87	.75	.70	.54	.40	.17	.11	5.84
Wupperthal	60	32 15	19 13	—	17	.27	.42	.33	1.31	1.57	1.73	1.02	1.45	.84	.68	.40	.30	10.32
			Means			.42	.31	.43	1.35	2.18	2.20	1.77	1.95	1.44	1.06	.53	.38	14.03

V.—Southern Karroo.

	Ref. No.	S. lat.	E. long.	Alt.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
A. WEST.																		
Amalienstein	83	33° 29'	21° 29'	Ft. 1570	29	In. .92	In. 1.24	In. 1.39	In. 1.35	In. 1.13	In. .81	In. .70	In. .84	In. 1.13	In. 1.41	In. .87	In. .95	In. 12.74
Calitzdorp	84	33 32	21 41	750	29	.63	.98	1.12	.99	.58	.41	.29	.50	.85	.88	.60	.70	8.52
Ladismith	85	33 29	21 17	1860	28	1.11	1.28	1.52	1.65	1.18	.92	.79	.98	1.24	1.30	.84	.91	13.71
Oudtshoorn	86	33 35	22 13	1090	28	.55	.80	1.02	.92	.99	.75	.47	.89	1.09	.93	.59	.49	9.48
Pietermeintjes	87	33 15	20 30	3595	9	.51	.42	.84	1.54	1.16	1.30	1.03	1.36	.75	1.09	32	.62	10.94
Touw's River	88	33 20	20 3	2500	27	.44	.47	.74	1.03	1.09	1.24	.99	.89	.77	.61	.33	.27	8.87
Triangle	89	33 26	19 49	3155	9	.47	.86	.58	1.49	1.06	1.23	.76	1.18	.59	.75	.20	.41	9.58
			Means			.66	.86	1.03	1.28	1.03	.95	.72	.95	.91	.99	.54	.62	10.55
B. EAST.																		
Glenconmor	90	33° 24'	25° 10'	730	24	1.22	.89	1.57	1.04	.83	.60	.28	.69	1.46	1.13	1.54	1.30	12.56
Kleinport	91	33 20	24 53	1900	27	1.00	1.00	2.07	1.17	.70	.50	.28	.61	1.36	1.31	1.09	1.26	12.34
Uniondale	92	33 29	23 9	2240	29	.71	1.01	1.43	1.26	1.39	1.17	.96	1.33	1.44	1.20	1.09	.72	13.71
Vlakte Plaats	93	33 30	22 42	1800	12	.82	.98	1.24	.59	1.03	.81	.83	.59	.75	.80	.98	.47	9.89
			Means			.94	.97	1.58	1.02	.99	.77	.59	.80	1.25	1.11	1.17	.94	12.13

VII.—*East Central Karroo.*

Ref. No.	S lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Aberdeen . . .	32° 28'	24° 3'	2400	29	1·61	1·73	2·06	·84	·70	·30	·29	·48	·91	1·13	1·25	1·37	12·67
Aberdeen Road . . .	32 46	24 20	2480	23	1·18	1·30	1·81	·80	·56	·30	·27	·41	·77	·73	1·09	1·23	10·45
Colonies Plaats . . .	31 59	24 50	4750	22	1·91	1·99	2·49	1·11	·87	·42	·32	·54	·70	·79	1·22	1·56	13·92
Cranemere . . .	32 30	25 0	2750	27	1·39	1·50	2·06	1·05	·94	·46	·46	·62	·96	1·08	1·17	1·58	13·25
Goliads Kraal . . .	32 8	24 42	3500	30	1·71	2·20	2·54	1·22	1·08	·31	·55	·74	·62	1·26	1·49	1·36	15·08
Graaff Reinnet . . .	32 16	24 32	2500	29	1·51	1·73	2·40	1·12	1·21	·51	·46	·67	1·17	1·33	1·48	1·68	15·27
Jansenville . . .	32 56	24 40	—	29	1·25	1·20	1·73	·92	·64	·33	·21	·44	·96	·84	1·22	1·31	11·05
Kendrew . . .	32 30	24 30	2015	23	1·43	1·49	1·65	1·01	·75	·26	·32	·46	1·02	1·04	1·26	1·96	12·63
Klipdrift (De Erf) . . .	32 23	24 29	2400	26	1·37	1·53	1·46	·77	·69	·26	·25	·43	·89	1·00	1·15	1·32	11·12
Middleton . . .	32 57	25 49	1672	26	1·36	1·76	1·91	1·61	1·06	·55	·42	·60	·91	1·19	1·48	1·66	14·51
New Bethesda . . .	31 52	24 34	—	23	2·07	2·34	2·14	1·32	·52	·48	·29	·54	·95	1·14	1·43	1·80	15·02
Pearston . . .	32 40	25 7	—	15	1·67	2·15	1·76	1·23	1·09	·56	·25	·60	1·09	1·14	1·05	1·85	14·44
Roodebloem . . .	32 9	24 36	2500	27	1·29	1·66	1·87	·79	·89	·36	·42	·46	·79	·87	1·06	1·31	11·77
Somerset East . . .	32 44	25 35	2400	28	2·85	3·27	3·25	2·04	1·34	·84	·69	1·01	2·03	2·76	2·61	3·19	25·90
Toegedacht . . .	32 44	24 45	1900	15	1·22	1·35	1·29	·68	·53	·23	·11	·44	·85	·76	·94	1·33	9·73
Walsingham . . .	32 28	25 10	—	25	1·87	1·56	2·11	1·28	1·16	·54	·55	·66	1·14	1·26	1·21	1·67	15·00
Wellwood . . .	31 59	24 38	4000	29	1·70	1·77	2·53	1·31	·95	·49	·36	·49	·73	·92	1·24	1·35	13·83
Winterhoek . . .	32 15	24 38	2800	29	1·70	2·15	2·67	1·27	1·24	·62	·52	·71	1·46	1·69	1·91	2·00	17·93
			Means . . .		1·62	1·82	2·10	1·13	·90	·43	·36	·57	1·00	1·16	1·35	1·64	14·09

VIII.—Northern Karroo.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
						In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
A. WEST.				Ft.														
Beyersfontein . . .	127	31° 10'	22° 30'	4500	8	1·61	1·95	1·73	·66	·81	·26	·02	·11	·75	·58	·54	·85	987
Brakfontein . . .	128	31 49	23 2	3947	29	1·30	1·38	1·94	·89	·68	·31	·26	·24	·47	·71	·85	·93	996
Brandvlei . . .	129	30 27	20 32	3050	5	·56	·62	·56	·68	·28	·34	·44	·08	·47	·48	·07	·34	492
Calvinia . . .	130	31 29	19 46	3100	25	·29	·44	·65	·16	1·05	·89	·72	·81	·57	·51	·53	·51	768
Carnarvon . . .	131	30 58	22 8	4060	29	1·30	1·21	1·48	·95	·59	·30	·19	·27	·31	·50	·47	·34	814
Fraserburg . . .	132	31 54	21 31	4200	29	·82	·78	1·05	·94	·47	·11	·08	·09	·28	·30	·37	·31	455
Gannapan . . .	133	30 21	22 0	—	19	·53	·46	·92	·63	·47	·18	·50	·23	·35	·42	·23	·65	627
Loxton . . .	134	31 27	22 25	—	8	·65	·71	1·18	·74	·43	·34	·30	·30	·35	·30	·30	·21	493
Middlepost . . .	135	31 58	20 7	—	20	·32	·32	·81	·81	·57	·19	·40	·06	·81	·16	·41	·87	954
Omdraais Vlei . . .	136	30 6	23 9	3370	9	1·01	1·61	1·91	1·12	·99	·27	·13	·21	·16	·42	·42	·40	522
Rheboksfontein . . .	137	31 24	21 35	—	21	·56	·61	·98	·58	·48	·12	·24	·00	·35	·23	·47	·17	415
Scorpion's Drift . . .	138	31 3	21 34	—	8	·39	·49	·92	·48	·29	·93	·65	·76	·72	·70	·50	·44	925
Sutherland . . .	139	32 25	20 42	4776	28	·50	·67	·96	1·15	1·27	·36	·22	·27	·51	·67	·65	·94	1009
Victoria West . . .	140	31 25	23 7	4100	29	1·10	1·84	1·67	1·01	·85	·24	·23	·20	·38	·77	·80	1·00	996
Wagenaars Kraal . . .	141	31 48	22 48	4500	22	1·32	1·47	1·97	·83	·75	·29	·24	·23	·25	·36	·44	·34	544
Williston . . .	142	31 20	20 50	3460	20	·46	·72	1·08	·58	·45	·29	·30	·26	·44	·47	·46	·53	729
				Means		·80	·95	1·24	·83	·66	·34	·30	·26	·44	·47	·46	·53	
B. EAST.																		
Boschfontein . . .	143	30° 47'	24° 36'	4260	15	1·72	1·65	2·23	1·32	·77	·49	·14	·22	·77	·91	·99	1·35	1256
Britstown . . .	144	30 35	23 33	3680	21	1·15	1·80	2·15	1·55	·78	·42	·27	·17	·64	·70	·83	1·03	1149
Colesburg . . .	145	30 43	25 7	4470	29	2·21	2·23	2·56	1·53	1·09	·53	·33	·46	·70	1·06	1·12	1·57	1549
Cradoek . . .	146	32 11	25 38	2850	29	2·20	2·29	2·10	1·25	·81	·44	·33	·45	·73	1·11	1·25	1·70	1465
De Aar . . .	147	30 38	24 2	4800	18	1·62	2·50	2·27	1·64	·88	·60	·20	·18	·75	·86	1·31	1·10	1391
Hanover . . .	148	31 3	24 26	4500	29	1·72	2·06	2·37	1·61	1·04	·50	·37	·38	·68	·87	1·05	1·23	1388
Kleinhaasfontein . . .	149	31 56	26 28	—	19	3·13	3·20	2·56	1·52	·79	·56	·38	·69	1·04	1·48	1·87	2·78	2000
Middelburg . . .	150	31 30	25 0	4095	29	1·98	2·15	2·35	1·20	·84	·43	·33	·41	·64	1·02	1·23	1·48	1405
Middlemount . . .	151	31 29	24 21	6045	12	1·70	1·96	2·34	1·22	·61	·48	·27	·24	·53	·93	·74	1·55	1257
Murraysburg . . .	152	31 57	23 48	3800	29	1·25	1·78	2·01	·99	·98	·37	·29	·36	·48	·72	·86	1·03	1111
Naauwpoort . . .	153	31 10	24 57	4884	23	1·82	2·29	2·50	1·64	1·02	·57	·33	·40	·64	·82	1·13	1·61	1477
Phillipstown . . .	154	30 25	24 30	4500	29	1·76	2·10	2·46	1·28	1·02	·41	·30	·36	·55	·75	·99	1·30	1328
Richmond . . .	155	31 25	23 57	4700	28	1·62	2·14	2·27	1·39	1·23	·52	·36	·35	·47	·95	·92	1·21	1345
Steynsburg . . .	156	31 18	25 49	4850	29	2·59	2·60	2·88	1·44	·92	·55	·43	·47	·92	1·10	1·38	2·21	1749
Stonehills . . .	157	32 2	25 38	—	18	2·49	2·09	2·46	1·39	·65	·45	·46	·58	·67	1·24	1·40	1·76	1564
Tarkastad . . .	158	32 0	26 15	4300	29	2·75	2·67	2·88	1·55	1·09	·63	·53	·69	·91	1·34	1·55	2·36	1894
Varsch Vlei . . .	159	31 40	25 45	5400	18	2·13	3·13	1·88	1·30	·86	·42	·33	·45	·56	·90	1·28	1·43	1368
Witmoos . . .	160	32 32	25 40	2396	23	1·99	2·08	2·21	1·34	·78	·50	·41	·66	·88	1·20	1·35	1·98	1538
				Means		1·99	2·21	2·36	1·40	·90	·49	·34	·42	·70	1·00	1·18	1·59	1457

IX.—Northern Cape Province.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
A. WEST.																	
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
161	27° 50'	20° 20'	5000	9	.75	1.02	1.34	.82	.14	.04	.09	.00	.03	.27	.33	.59	5.41
162	29 18	21 9	2700	29	.60	1.02	1.08	.76	.37	.17	.15	.08	.12	.42	.21	.54	5.50
163	29 39	22 45	3300	29	1.45	1.27	2.03	1.48	.64	.20	.19	.14	.28	.54	.62	.90	9.74
164	28 40	22 31	—	9	.85	.99	1.52	.69	.32	.08	.25	.00	.17	.36	.23	.64	6.10
165	28 26	21 15	2800	22	.90	.88	1.56	.82	.51	.09	.10	.06	.20	.63	.48	.74	6.97
166	30 23	21 50	3300	23	.73	1.02	1.40	.79	.51	.14	.19	.09	.16	.31	.42	.56	6.32
			Means		.88	1.03	1.49	.89	.42	.12	.16	.06	.16	.42	.38	.66	6.67
B. EAST.																	
					In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
167	29° 4'	23° 53'	3900	25	2.02	2.05	2.82	1.35	.63	.25	.14	.24	.26	.57	.89	1.85	13.06
168	28 30	24 30	3800	26	3.28	3.12	3.16	1.66	.67	.36	.25	.25	.47	.91	1.60	2.89	18.59
169	28 8	24 45	3840	12	4.14	3.02	3.54	1.05	.31	.16	.13	.17	.37	.47	1.35	2.54	17.25
170	27 56	24 25	—	13	3.77	4.18	3.84	2.18	.61	.45	.12	.20	.11	.87	1.86	3.03	21.22
171	28 45	23 43	4100	22	2.08	2.32	2.58	1.56	.46	.26	.14	.23	.34	.66	.92	2.12	13.67
172	29 3	23 47	3500	23	2.55	2.38	2.95	1.46	.74	.31	.19	.18	.33	.59	.90	1.45	14.03
173	28 51	23 16	4300	16	2.09	2.30	2.58	1.89	.66	.28	.27	.14	.43	.58	.81	1.66	13.69
174	29 26	23 58	3500	13	2.31	1.65	2.65	1.34	.58	.44	.19	.16	.40	.68	1.00	1.55	12.96
175	28 52	23 17	3560	24	2.06	2.11	2.45	1.63	.82	.43	.16	.21	.40	.93	.87	1.58	13.66
176	29 36	24 6	3000	29	2.07	1.75	2.83	1.18	.86	.31	.26	.20	.44	.84	.95	1.34	13.03
177	29 48	23 16	3900	8	1.24	1.37	1.36	.69	.56	.08	.26	.05	.76	.51	.39	.96	8.23
178	28 43	24 46	4000	40	2.79	3.06	3.06	1.41	.85	.32	.37	.26	.77	1.00	1.56	2.12	17.57
179	28 20	24 25	—	24	3.19	3.32	3.05	1.54	.57	.31	.17	.16	.35	.80	1.47	2.71	17.64
180	29 38	24 12	3520	14	1.92	1.68	2.05	.87	.61	.22	.18	.13	.50	.51	.65	.98	10.30
181	—	—	—	28	2.88	2.58	2.60	1.60	.77	.32	.20	.17	.44	1.05	1.51	2.41	16.53
			Means		2.56	2.46	2.77	1.43	.65	.30	.20	.18	.42	.73	1.12	1.95	14.76

X.—South-Eastern Cape Province.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
				Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Alexandria	1804	33° 28'	26° 25'	—	24	1·85	1·92	2·07	2·50	2·03	1·82	1·69	2·57	2·76	2·81	3·40	2·16	27·58
Alice	181A	32 47	26 50	1700	27	2·48	2·75	2·99	1·91	1·55	·98	·86	1·06	1·53	2·06	2·65	2·49	23·31
Alicedale	182	33 20	26 5	910	27	1·43	1·10	1·57	1·40	1·26	·84	·72	·85	1·36	1·35	1·53	1·46	14·87
Atherstone	183	33 19	26 23	2250	27	2·09	2·09	2·48	2·01	1·55	1·00	·92	1·22	1·99	2·46	2·24	2·39	22·44
Bedford	184	32 41	26 6	2460	29	3·07	3·40	3·69	2·33	1·47	·90	·81	1·11	1·84	2·74	2·93	3·07	27·36
Cathcart	185	32 18	27 9	3900	29	3·81	4·05	4·04	2·15	·87	·54	·60	·80	1·29	2·27	2·87	3·45	26·75
Cullendale	186	32 39	26 12	—	24	2·85	2·84	3·07	2·31	1·19	·71	·63	·92	1·86	2·59	2·53	3·16	24·66
Daggaboer	187	32 32	25 52	2900	21	2·54	2·10	2·61	1·70	1·13	·86	·27	·73	1·28	1·54	1·73	2·23	18·72
Dohne	188	32 32	27 37	3040	27	3·34	3·46	3·19	1·95	1·22	·67	·48	1·00	1·57	2·92	3·19	3·13	26·12
East London	189	33 2	27 56	104	26	3·14	3·19	3·44	3·07	2·12	1·66	1·00	2·30	2·99	4·04	3·34	3·21	33·50
Evelyn Valley	190	32 35	27 15	4250	22	7·80	7·04	7·33	5·13	3·20	2·47	1·42	3·05	5·27	7·85	7·19	7·41	65·17
Fort Beaufort	191	32 46	26 37	1500	29	2·42	2·73	3·00	2·01	1·23	·64	·60	·85	1·65	2·09	2·43	2·24	21·89
Fort Jackson	192	32 56	27 42	1110	27	2·36	2·27	2·64	2·36	1·39	1·12	·63	1·46	2·14	3·05	2·71	2·80	24·94
Grahamstown	193	33 18	26 32	1800	29	2·24	2·69	2·96	2·32	1·88	1·33	1·00	1·50	2·26	3·13	3·25	2·59	27·16
Hogsback	194	32 36	26 55	3750	24	5·93	6·05	5·54	3·73	2·30	1·56	1·31	2·18	2·75	5·43	4·90	6·37	48·05
Kabuse	195	32 35	27 29	2400	27	3·03	3·22	2·47	1·90	·99	·76	·34	1·11	1·44	2·44	1·99	2·76	22·45
Lower Katberg	196	32 29	26 40	3380	26	5·80	5·52	4·99	3·02	1·75	1·13	·89	1·63	2·81	4·81	4·85	5·75	42·94
Kei Road	197	32 44	27 33	2330	28	3·53	4·13	3·62	2·55	1·41	1·06	·74	1·31	2·23	3·58	3·08	3·47	30·71
King William's Town	198	32 52	27 23	1315	29	2·30	2·90	2·86	2·34	1·41	1·04	·68	1·25	2·05	2·75	2·69	2·64	24·90
Kologha	199	32 31	27 22	2200	24	4·87	5·17	4·66	2·95	1·39	·95	·71	1·49	2·24	3·81	4·21	5·14	37·58
Lovedale	200	32 46	26 51	1720	24	2·81	2·71	2·75	1·92	1·59	·97	·93	1·00	1·60	2·22	2·50	2·45	23·47
Peddie	201	33 13	27 7	500	28	1·74	2·14	2·51	2·22	1·60	1·27	·93	1·46	2·07	2·62	2·59	2·10	23·24
Perie Forest	202	32 27	27 18	1850	27	4·82	4·46	4·51	3·24	1·70	1·24	·85	1·57	3·11	4·53	4·80	4·61	39·44
Port Alfred	203	33 34	26 54	110	27	1·77	1·74	2·16	2·70	2·26	1·76	1·46	2·27	2·88	2·93	2·86	2·33	27·12
Salem	204	33 28	26 30	500	29	1·73	1·81	2·22	2·14	1·54	1·19	·94	1·38	1·91	2·24	2·55	2·13	21·78
Seymour	205	32 33	26 47	2600	28	2·60	2·79	3·23	1·81	1·61	1·23	·88	1·19	1·50	2·05	2·30	2·47	23·66
Stutterheim	206	32 34	27 27	2945	26	3·69	3·81	3·69	2·44	1·10	·77	·50	1·14	1·77	2·98	3·11	3·61	28·61
Thomas River	207	32 28	27 17	3565	29	2·86	3·03	3·18	1·74	·89	·67	·44	·79	1·14	1·70	2·10	2·54	21·08
						Means	3·17	3·34	2·42	1·56	1·12	·83	1·40	2·11	3·03	3·09	3·22	28·55

XII.—Kaffraria.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	
				Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
	225	32° 21'	28° 8'	1990	19	3·04	3·12	2·99	2·59	1·15	1·01	·31	·88	1·80	2·33	2·70	2·93	24·85	
Butterworth	226	31 31	27 40	4500	13	4·04	3·74	3·48	1·54	·51	·38	·44	1·06	1·23	1·49	2·93	3·57	24·41	
Cala	227	31 56	27 48	—	12	4·09	3·95	4·01	1·60	·70	·39	·18	·69	1·06	2·06	1·78	3·74	24·25	
Cofimvaba	228	31 57	28 42	600	17	2·67	2·87	3·43	2·24	1·06	1·25	·36	·68	2·24	2·66	2·85	2·78	25·09	
Elliotdale	229	31 41	28 0	—	18	4·37	4·02	4·38	2·44	1·10	·75	·42	·87	1·82	2·76	3·37	4·94	31·24	
Engcabo	230	31 25	27 39	4100	21	4·23	4·50	3·42	2·00	·86	·44	·50	·96	1·37	1·93	2·95	4·07	27·23	
Ida Xalanga	231	32 2	28 22	—	19	2·67	2·99	2·90	1·92	·88	·49	·29	·64	1·50	2·07	2·42	2·24	21·01	
Indutywa	232	32 30	28 18	—	19	2·43	3·30	3·01	2·64	1·36	1·34	·39	1·15	2·36	3·81	3·35	3·59	28·73	
Kentani	233	30 33	29 26	4285	25	4·41	4·04	3·40	1·61	1·03	·56	·17	·67	1·31	1·86	3·47	4·07	26·60	
Kokstad	234	31 4	28 21	4300	16	5·91	4·88	4·27	2·36	·81	·33	·51	·92	1·84	2·49	3·89	5·48	33·72	
Maclear	235	31 55	27 59	3010	21	3·78	3·37	3·58	2·19	·85	·76	·59	·84	1·60	1·98	2·69	3·61	25·84	
Main	236	30 15	28 46	4900	11	5·46	3·70	3·57	1·67	·84	·36	·10	·81	1·44	2·36	3·52	4·26	28·09	
Matatiele	237	30 42	28 30	5500	18	4·50	4·22	3·66	1·79	·70	·60	·15	·70	1·57	2·16	3·04	4·91	28·00	
Mount Fletcher	238	31 46	28 43	2390	12	3·50	2·98	3·92	2·21	1·09	·88	·62	1·05	2·85	3·24	3·38	3·49	29·21	
Mqanduli	239	32 8	27 58	3500	19	3·77	4·18	3·64	2·74	1·18	1·21	·43	1·26	1·86	2·80	2·61	3·50	29·18	
N'qamakwe	240	31 38	29 35	22	20	4·63	5·59	4·42	4·57	1·81	2·23	·77	2·10	3·85	6·13	5·19	5·37	46·66	
Port St. John's	241	31 10	28 52	3200	13	4·38	4·17	3·80	2·19	1·10	·48	·31	1·21	1·68	3·00	3·72	4·65	30·69	
Qumbu	242	31 12	28 37	3200	15	3·58	3·94	3·36	2·06	·68	·59	·17	·76	2·00	2·39	3·54	4·94	28·01	
Somerville	243	32 8	27 41	—	18	3·34	3·38	2·87	1·89	·68	·55	·29	·87	1·15	1·98	2·25	3·51	22·76	
Tsomo	244	31 35	28 46	2400	26	3·32	3·45	3·40	2·01	1·11	·76	·59	·85	1·68	2·47	2·72	3·07	25·43	
Umtata	245	30 15	29 56	2500	23	3·82	4·00	3·31	1·81	·96	·47	·24	·76	1·47	2·44	3·49	4·30	27·11	
Umzimkulu	246	32 16	28 29	—	17	4·36	4·48	4·39	3·31	1·70	1·53	·49	1·66	3·79	5·61	5·08	5·18	41·58	
Willowvale	247	31 0	28 10	—	14	7·59	6·08	5·40	2·45	·83	·41	·17	·99	2·45	3·22	4·70	5·75	40·04	
Woodcliff																			
						4·08	3·95	3·68	2·25	1·00	·77	·37	·97	1·91	2·75	3·29	4·08	29·12	
						Means													

XIII.—Basutoland.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Butha Buthe	28° 40'	28° 12'	5500	10	6·53	3·95	4·03	2·04	·96	·47	·64	1·20	1·54	2·60	3·83	4·55	32·34
Lerihe	28 54	28 12	5210	14	7·14	3·85	4·52	2·31	1·12	·61	·50	·95	1·37	2·62	3·28	4·86	33·13
Maleteng	29 54	27 7	5600	21	5·48	4·47	4·30	2·85	1·49	·77	·63	·97	1·33	1·94	2·91	4·49	31·63
Maseru	29 17	27 30	5065	20	5·81	4·36	4·48	2·19	1·23	·91	·46	·58	1·66	2·59	3·22	3·23	30·72
Mohalies Hoek	30 8	27 28	—	15	4·64	4·15	4·20	2·25	1·74	·79	·44	·80	1·55	2·34	2·51	4·59	30·00
Moyeni	30 23	27 45	6000	21	5·62	4·70	5·14	3·11	1·87	·96	·47	1·22	1·46	2·72	3·42	5·24	35·93
Qachas Nek	30 20	27 48	6236	15	6·06	6·32	4·32	2·30	1·33	·65	·18	·67	1·87	3·03	3·30	6·00	36·03
Teyateyaneng	29 8	27 45	5690	17	6·25	4·05	4·48	2·49	1·22	·80	·40	·84	1·29	2·86	2·73	4·39	31·80
			Means		5·94	4·48	4·43	2·44	1·37	·75	·47	·90	1·51	2·59	3·15	4·67	32·70

XIV.—Orange Free State.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Alma	28° 53'	27° 28'	—	14	5·57	3·79	3·17	2·09	1·28	·49	·59	·71	1·15	2·15	2·69	4·29	27·97
Bethulie	30 27	25 59	4290	23	2·84	3·11	3·21	1·50	·88	·57	·38	·58	·71	1·26	1·25	2·61	18·90
Bloemfontein	29 7	26 13	4510	31	3·75	3·34	3·59	1·95	1·10	·42	·31	·47	·80	1·65	2·18	2·38	21·94
Boshof	28 31	25 12	4100	8	3·22	3·20	3·89	1·99	·83	·26	·15	·36	·65	1·69	2·16	1·53	19·93
Fauresmith	29 41	25 19	—	7	2·06	2·49	3·45	2·24	1·07	·44	·56	·23	·81	1·28	·95	2·36	17·94
Frankfort	27 15	28 35	4500	6	4·06	3·79	2·88	1·44	1·32	·04	·53	·45	·82	3·07	3·27	4·43	26·10
Harrismith	28 15	29 10	5326	13	4·60	3·76	2·96	1·77	1·04	·36	·20	·64	1·21	2·32	3·95	3·14	25·95
Hoopstad	27 48	25 54	—	12	4·05	3·86	3·34	2·10	·63	·14	·12	·51	·76	1·45	2·59	2·65	22·20
Jacobsdal	29 6	24 49	—	18	2·99	2·77	3·42	1·75	1·36	·57	·31	·36	·58	1·05	1·88	2·85	19·89
Jagersfontein	29 42	25 30	—	13	3·17	2·63	2·98	1·91	1·15	·53	·53	·41	·60	1·22	1·65	1·77	18·55
Kroonstad	27 43	27 18	4500	31	4·39	3·76	3·68	1·92	1·07	·24	·25	·44	·86	1·94	3·19	2·95	24·69
Ladybrand	29 8	27 31	5000	21	5·51	4·28	4·01	2·38	1·31	·60	·59	·78	1·53	2·45	3·64	3·52	30·60
Lindley	27 50	28 0	—	12	4·41	3·31	3·31	1·47	1·24	·19	·39	·40	·95	2·23	2·62	3·47	23·99
Philippolis	30 13	25 18	4700	19	3·28	3·29	3·52	1·70	1·32	·63	·38	·43	·50	·98	1·64	1·73	19·40
Smithfield	30 10	26 21	4400	19	3·90	3·21	3·36	2·15	1·13	·51	·44	·86	·82	1·16	1·77	2·77	22·08
Thaba 'Nchu	29 8	26 51	4920	11	4·66	3·63	3·95	1·91	·94	·50	·56	·47	1·56	2·16	2·21	2·58	25·13
Wepener	29 41	27 1	4700	10	5·37	2·94	4·26	2·24	1·45	·69	·60	·70	·66	1·54	2·27	4·87	27·59
Winburg	28 29	27 2	4600	9	3·10	4·10	4·37	1·81	·68	·20	·23	·60	·20	2·07	2·61	1·99	21·96
			Means		3·94	3·40	3·52	1·91	1·10	·41	·40	·52	·84	1·76	2·36	2·88	23·04

XV.—Natal.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
				Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Dundee	274	28° 10'	30° 14'	4098	13	5.93	4.81	3.76	2.62	1.07	.20	.13	.65	.99	2.92	3.26	4.08	30.42
Durban	275	29 51	31 0	260	32	4.31	4.68	5.06	3.48	1.94	1.07	.79	1.64	3.23	4.93	4.60	4.81	40.54
Estcourt	276	29 1	29 52	3833	15	5.45	4.78	3.62	1.80	.47	.33	.16	.58	1.00	2.35	3.31	4.34	28.19
Greytown	277	29 4	30 35	3416	14	5.53	4.99	4.45	2.02	.99	.30	.15	1.14	1.68	3.63	5.43	5.67	35.98
Howick	278	29 29	30 14	3400	14	5.26	4.78	4.11	2.30	.59	.55	.15	.94	1.67	3.10	4.32	4.56	32.33
Impendhle	279	29 36	29 51	—	6	8.12	5.43	4.63	3.50	.67	.27	.07	.32	.90	2.53	3.46	5.48	35.38
Ladysmith	280	28 33	29 47	3284	7	3.87	4.00	5.15	2.15	.85	.30	.07	.82	.75	2.64	2.44	3.16	26.20
Mapumulo	281	29 12	31 4	3450	7	4.56	4.35	4.85	1.72	1.15	.59	.66	1.35	2.31	2.58	5.54	5.30	34.96
Maritzburg	282	29 36	30 21	2218	37	5.15	5.00	4.53	2.77	.84	.21	.29	1.17	1.84	3.34	4.89	5.35	35.38
Merebank	283	30 0	31 0	30	9	2.58	5.32	6.93	5.48	1.27	1.05	1.07	3.39	2.14	4.51	5.68	4.87	44.29
Ndwedwe	284	29 29	30 51	—	5	4.93	6.02	4.03	2.46	1.06	2.36	.45	.64	2.16	3.30	6.45	5.56	39.42
Newcastle	285	27 46	29 56	3893	14	6.79	5.92	5.16	2.16	.78	.17	.07	.61	1.28	3.00	4.17	5.50	35.61
New Hanover	286	29 21	30 30	2595	14	5.40	5.58	4.16	2.78	1.30	.53	.22	1.07	2.04	3.67	5.09	4.72	36.56
Ottawa	287	29 40	31 3	140	10	4.14	4.82	4.92	4.04	1.15	1.00	1.62	1.23	2.05	3.09	5.78	5.44	38.78
Port Shepstone	288	30 44	30 27	50	13	4.53	4.69	5.00	4.59	1.38	.90	.82	1.78	5.50	5.56	5.96	5.60	46.31
Richmond	289	29 52	30 16	2816	15	5.95	6.02	4.42	3.47	1.30	.51	.26	1.21	2.39	3.73	5.36	6.49	41.11
Stanger	290	29 21	31 17	142	17	4.63	3.71	4.90	2.73	1.81	1.00	.72	1.32	3.74	5.40	5.93	5.46	41.35
Upper Tugela	291	—	—	—	4	5.68	4.26	4.29	2.86	1.08	.17	.18	.60	1.06	2.73	3.15	5.90	31.96
Umsinga	292	28 34	30 27	—	5	5.63	4.19	4.44	1.41	1.00	.19	.07	.41	.93	3.29	2.52	4.74	28.82
Umzinto	293	30 18	30 39	—	15	3.43	4.73	4.98	3.26	2.19	.93	.35	1.08	4.19	6.03	5.15	4.27	40.59
Verulam	294	29 38	31 3	169	17	4.10	4.07	4.77	3.79	1.97	.57	.36	1.12	3.29	5.75	4.56	4.60	38.95
Weenen	295	28 51	30 5	2841	14	5.26	4.25	3.05	2.03	.64	.20	.12	.79	.98	2.32	3.40	3.42	26.47
Winkle Spruit	296	30 4	30 35	—	6	2.90	6.60	4.14	5.93	1.45	2.30	.63	.67	4.45	5.77	6.17	4.69	45.70
			Means			4.96	4.89	4.58	3.02	1.17	.68	.41	1.07	2.20	3.75	4.64	4.96	36.32

XVI.—Zululand.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
297	28° 54'	31° 20'	—	9	7·61	4·54	7·14	3·14	2·00	1·22	·63	1·69	4·11	5·94	7·54	8·04	53·60
298	28 8	31 49	—	7	5·30	5·09	5·74	2·75	·95	·73	·65	1·16	2·05	4·92	5·77	5·17	40·28
299	28 17	31 30	—	6	3·82	4·78	2·41	2·98	·38	·07	·15	·72	1·68	4·50	5·89	4·03	31·41
300	28 35	31 24	—	13	5·31	3·34	3·81	2·01	1·30	·64	·27	1·03	1·66	3·55	4·73	4·86	32·51
301	28 38	31 8	3700	10	4·49	4·10	4·89	2·28	·94	·80	·22	·76	1·70	3·22	5·86	5·08	34·34
302	28 14	30 58	—	4	5·17	3·33	3·80	1·83	1·10	·29	·01	·92	·94	2·16	3·27	3·82	26·64
303	28 10	31 25	—	10	6·14	3·91	5·01	2·11	1·40	·41	·41	·86	1·80	3·40	4·57	4·83	31·85
304	28 18	30 35	—	4	5·27	4·72	4·16	2·29	·32	·63	·14	·29	·76	1·86	4·86	3·14	28·44
305	28 35	30 40	6000	7	8·80	6·26	7·32	3·54	1·78	1·29	·42	1·52	2·12	4·44	7·15	7·18	51·82
306	27 35	32 7	—	6	4·40	4·52	2·35	3·02	1·28	50	·33	1·19	1·90	6·99	5·72	4·56	36·76
			Means		5·63	4·46	4·66	2·60	1·14	·66	·32	1·01	1·87	4·10	5·54	5·07	37·06

XVII.—Bechuanaland.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
307	—	—	—	6	2·59	3·21	2·37	1·42	·53	·15	·30	·06	·72	·97	1·18	1·69	15·19
308	—	—	—	5	2·48	3·46	1·39	·67	·64	·02	·09	·02	·02	1·52	·77	·83	11·91
309	26° 30'	25° 20'	4012	7	2·78	5·15	2·82	1·59	1·10	·25	·15	·23	·14	1·44	1·20	2·50	19·35
310	27 25	23 26	—	10	4·00	3·84	3·03	1·39	·86	·28	·36	·08	·64	·48	1·60	1·97	18·53
311	25 10	25 30	3915	5	5·46	5·26	2·63	1·37	·94	·04	·03	·19	·06	1·64	1·34	2·12	21·08
312	25 40	25 52	4194	24	4·86	4·13	4·66	1·81	·32	·00	·44	·29	·61	1·52	2·57	3·29	24·50
313	26 48	23 40	—	7	2·69	3·09	2·70	1·02	·48	·11	·18	·06	·68	·87	·67	1·45	14·00
314	24 21	26 6	3105	5	3·05	4·02	1·79	·85	1·45	·23	·01	·16	·40	1·71	1·87	3·52	19·06
315	24 24	25 32	3600	4	3·32	2·40	3·16	1·47	·00	·53	·01	·00	·23	1·29	3·47	3·32	19·20
316	—	—	—	4	2·00	2·38	2·15	1·52	1·14	·00	·07	·03	·00	1·73	·95	1·13	13·10
317	27 4	24 33	—	9	2·64	2·53	2·92	1·60	·40	·09	·30	·01	·59	·78	1·37	1·02	14·25
318	22 33	27 10	3011	8	3·41	2·79	3·41	1·18	·45	·05	·00	·00	·22	·95	1·75	2·27	16·48
319	22 24	26 45	—	4	2·36	3·16	4·40	·77	·85	·00	·00	·00	·11	1·28	1·46	1·99	16·38
320	26 16	25 8	—	11	3·48	4·00	2·68	1·39	·76	·02	·19	·15	1·12	1·58	2·00	1·84	19·21
321	27 48	24 47	3589	15	3·78	3·23	3·20	1·45	·38	·22	·12	·11	·58	1·03	1·38	1·96	17·44
322	20 11	22 30	—	4	2·84	5·00	1·60	·71	·22	—	·00	·01	·01	·39	·76	1·05	12·59
323	26 55	24 43	4300	22	4·53	3·53	3·52	1·34	·68	·25	·17	·21	·43	1·01	1·47	2·62	19·76
324	25 52	25 20	—	6	3·15	3·95	2·87	1·18	·75	·01	·20	·07	·84	1·23	2·48	2·39	19·12
			Means		3·30	3·62	2·85	1·26	·66	·13	·15	·09	·41	1·19	1·57	2·05	17·29

XVIII.—*Damaraland and Great Namaqualand.*

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Aminuis . . .	23° 42'	19° 14'	—	15	2·09	2·87	1·61	1·19	·31	·06	·11	·03	·22	·12	·39	1·52	10·52
Berseba . . .	26 0	17 41	3478	12	·51	·98	·83	·36	·02	·00	—	·00	·08	·04	·13	·36	3·31
Bethanien . . .	26 28	16 51	3280	15	1·10	·87	1·10	·53	·07	·10	·02	·04	·04	·10	·17	·37	4·51
Franzfontein . . .	20 9	15 16	—	14	2·15	2·30	2·32	1·10	·10	·02	—	·01	·12	·18	·33	1·38	10·01
Gibeon . . .	25 15	17 47	3707	15	1·57	1·46	1·01	·46	·04	·05	·01	·01	·03	·15	·40	·39	5·58
Gobabis . . .	22 21	19 1	4650	16	4·41	3·58	2·72	1·85	·28	·09	·04	·04	·08	·42	1·11	2·26	16·20
Grootfontein . . .	31 19 44	18 2	—	14	6·10	5·04	3·76	1·85	·18	·14	—	·02	·07	·63	1·57	4·51	23·87
Hasuur . . .	32 26 40	19 50	—	12	1·46	1·50	2·24	·40	·32	·17	·01	·04	·02	·10	·72	·61	7·59
Hohewarte . . .	—	—	—	16	3·27	2·91	2·41	1·32	·39	·03	·07	—	·06	·23	·50	1·83	13·02
Karibib . . .	21 58	15 51	—	12	1·97	2·05	·98	·47	·11	·02	—	·02	·06	·11	·09	1·38	7·20
Keetmanshoop . . .	26 32	18 2	2733	15	·94	1·15	1·13	·67	·08	·04	·07	·00	·04	·15	·20	·33	4·80
Lüderitzbucht . . .	26 40	15 0	—	12	·01	·06	·03	·04	·15	·16	·04	·11	·10	·02	·01	·05	·78
Maltahöhe . . .	24 15	16 55	—	14	1·73	1·14	1·06	·90	·04	·01	·03	—	·08	·07	·18	·38	5·62
Nauchas . . .	23 45	16 15	—	14	2·20	2·01	1·01	·90	·10	·06	·02	·02	·06	·22	·22	1·44	8·26
Okahandja . . .	21 59	16 56	4318	20	3·43	3·82	3·14	1·28	·29	·01	·02	·11	·05	·44	·43	2·34	15·36
Okombahe . . .	21 20	15 35	—	10	1·97	1·14	1·02	·51	·02	·06	·00	—	·24	·26	·19	·87	6·28
Omaruru . . .	21 25	15 59	3904	17	3·46	2·83	1·44	1·26	·14	·06	·00	—	·10	·25	·25	1·30	11·09
Otjimbingwe . . .	22 18	16 5	3773	13	2·09	1·77	1·06	·51	·12	·01	·01	—	·08	·10	·17	·93	6·85
Outjo . . .	20 6	16 10	—	14	4·37	3·45	2·70	1·24	·13	·03	—	·03	·07	·34	·39	2·53	15·28
Rheoboth . . .	23 20	17 3	4528	25	2·60	2·36	1·91	1·00	·18	·04	·01	·09	·08	·22	·46	1·02	9·97
Swakopmund . . .	22 42	14 32	—	14	·10	·06	·10	·03	·04	·02	·01	·02	·02	·04	·02	·14	·60
Ukamas . . .	27 58	19 40	—	13	·59	·83	1·28	·67	·18	·16	·19	·08	·01	·20	·32	·41	4·95
Walvis Bay . . .	22 56	14 30	8	8	·01	·04	·00	·42	·00	·02	·00	·00	·14	·06	·00	·04	·73
Warmbad . . .	28 27	18 40	2361	15	·37	·87	·80	·67	·07	·20	·15	·06	·08	·12	·10	·10	3·59
Windhuk . . .	22 30	17 6	5315	23	3·66	2·90	3·07	1·59	·24	·03	·06	·09	·06	·36	·81	1·97	14·84
Zessfontein . . .	19 20	13 30	—	11	·98	·82	·67	·46	·12	·01	—	—	·03	·15	·04	·68	3·96
Means . . .					2·04	1·88	1·52	·81	·14	·06	·03	·03	·08	·20	·35	1·12	8·26

XIX.—S. W. Transvaal.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
				Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Bloemhof .	351	27° 39'	25° 36'	4050	7	4.92	3.48	3.20	1.46	.58	.12	.26	.22	1.01	.82	2.05	1.77	19.89.
Christiana .	352	27 55	25 10	3970	9	3.18	4.15	3.05	1.61	.67	.08	.12	.10	.66	.61	1.66	1.54	17.43
Kaalfontein .	353	26 26	26 56	4800	5	5.62	4.16	5.04	1.80	.33	.03	.07	.07	.81	1.68	2.78	3.61	26.00
Klerksdorp .	354	26 52	26 40	4350	15	4.79	3.52	3.28	1.97	.71	.11	.18	.21	.55	1.42	2.62	2.85	22.21
Klerkskraal .	355	26 14	27 10	4600	7	6.00	4.09	3.70	1.02	.43	.12	.22	.11	.67	1.86	3.26	3.74	25.22
Koppieskraal .	356	26 54	27 22	4500	6	3.55	4.21	3.21	1.70	.54	.03	.01	.11	.90	1.45	4.34	4.55	24.60
Lichtenburg .	357	26 10	26 10	4950	8	5.43	4.06	3.92	1.64	.65	.03	.28	.03	.75	1.08	2.43	3.64	23.94
Ottoshoop .	358	25 45	25 58	4250	6	5.34	3.86	3.26	1.33	.21	.09	.31	.10	.81	1.12	3.38	2.97	22.78
Potchefstroom .	359	26 43	27 6	4460	9	4.22	4.55	3.09	2.09	.70	.03	.19	.15	.77	1.22	3.32	4.26	24.59
Rickersdam .	360	25 27	26 23	3800	6	6.15	5.35	3.60	1.33	.28	.12	.15	.11	.51	1.34	3.68	4.31	26.93
Schweizer Reneke	361	27 11	25 20	3900	6	3.82	4.93	2.71	1.09	.49	.06	.21	.14	.68	.45	2.05	2.38	19.01
Turffontein .	362	26 25	27 9	4700	7	6.35	3.76	3.16	1.43	.37	.10	.26	.09	.66	1.53	3.19	3.39	24.29
Uitkyk .	363	27 28	25 50	4200	7	4.47	3.42	2.97	1.26	.58	.03	.20	.09	.88	1.20	2.27	2.84	20.21
Vaalbank .	364	27 34	25 55	4140	6	3.70	3.08	3.30	1.01	.56	.06	.15	.10	1.02	.87	1.86	2.51	18.22
Veecht Valley .	365	27 25	25 4	3800	7	4.46	4.04	3.11	1.34	.68	.03	.10	.18	.91	.79	1.77	2.02	19.43
Ventersdorp .	366	26 19	26 50	4870	7	6.33	4.16	2.95	.90	.34	.05	.20	.08	.75	1.52	2.66	3.40	23.34
Wolmaransstad .	367	27 12	25 59	4380	7	4.88	4.78	3.72	1.44	.88	.10	.15	.12	.67	1.38	2.16	2.86	23.14
Wondilla .	368	27 36	26 2	4150	6	3.90	3.90	3.44	1.45	.60	.10	.19	.13	1.00	1.10	2.46	2.76	21.03
Zeerust .	369	25 32	26 5	3940	10	4.87	4.52	3.51	1.59	.92	.05	.15	.13	.38	1.43	3.15	2.78	23.48
			Means		.	4.84	4.11	3.38	1.45	.55	.07	.18	.12	.76	1.20	2.69	3.06	22.41

XX.—S. Transvaal.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Bethal . . .	370	26° 27'	29° 28'	5200	8	4.98	5.27	3.07	1.29	.68	.04	.09	.53	.65	.318	.523	29.45
Gembokfontein . . .	371	25 44	29 40	5400	7	5.68	4.27	2.72	1.46	.29	.22	.04	.33	.81	2.60	5.21	28.89
Heidelberg . . .	372	26 30	28 22	5055	8	4.86	5.77	3.47	1.40	.62	.06	.25	.30	.80	1.81	5.66	28.53
Irene . . .	373	25 53	28 13	4800	7	6.61	4.42	3.78	1.17	.27	.11	.11	.38	.43	2.36	4.72	27.98
Johannesburg . . .	374	26 11	28 3	5750	25	6.19	5.08	4.23	2.06	.72	.13	.24	.35	.88	2.27	4.71	31.10
Keerom . . .	375	25 40	29 28	4690	7	5.28	4.45	3.26	1.34	.18	.18	.01	.36	.74	2.18	5.36	27.94
Middelburg . . .	376	25 46	29 28	4700	10	5.02	4.15	3.43	1.57	.52	.10	.05	.35	.55	2.37	5.59	28.03
Modderfontein . . .	377	26 6	28 9	5500	14	5.53	3.90	3.95	1.82	.60	.19	.15	.32	.73	2.07	4.08	27.27
Panplaats . . .	378	25 41	29 46	5900	7	5.57	4.29	2.40	1.04	.17	.19	.01	.31	.91	2.43	5.77	27.36
Platrand . . .	379	27 6	29 28	5450	7	4.73	4.46	3.21	1.46	.21	.05	.17	.46	.77	2.91	5.06	28.13
Pretoria (70 ft.) . . .	380	25 45	28 11	4392	19	6.17	3.88	3.44	1.11	.71	.13	.06	.24	.82	1.99	4.25	26.63
Do. (Arcadia) . . .	381	25 45	28 12	4387	14	5.60	4.68	3.77	1.51	.62	.16	.21	.30	.80	2.16	3.93	28.02
Schoonord . . .	382	26 0	29 46	5200	6	6.23	4.20	3.56	1.36	.12	.11	.00	.26	.75	2.56	4.16	28.57
Springs . . .	383	26 16	28 24	5350	7	5.33	4.69	3.86	1.18	.15	.10	.16	.31	.88	2.21	4.72	27.09
Standerton . . .	384	26 57	29 15	4988	9	4.31	6.45	3.28	1.61	.50	.04	.19	.55	.93	2.87	4.79	29.99
Vereeniging . . .	385	26 40	27 56	4710	11	5.17	4.92	3.65	2.02	.65	.04	.14	.27	.75	1.86	4.15	26.89
Wagen Drift . . .	386	25 31	28 33	4000	5	6.70	5.43	3.92	1.19	.13	.19	.10	.58	.49	1.89	4.95	29.48
Zuurbekom . . .	387	26 19	27 47	5196	13	5.77	4.20	3.75	1.67	.53	.08	.21	.30	.76	2.27	3.98	27.26
Means . . .						5.54	4.69	3.49	1.46	.43	.12	.12	.36	.75	2.33	4.83	28.26

XXI.—S.E. Transvaal.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
					In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Amsterdam	26° 38'	30° 39'	Ft. 4300	7	7.32	5.95	3.75	1.55	.17	.10	.07	.57	1.45	3.92	5.95	6.13	36.93
Athole	26 36	30 33	4350	10	6.41	6.32	4.65	1.80	.40	.17	.10	.69	1.34	3.74	7.89	6.87	40.38
Barberton.	25 45	31 4	2885	19	6.41	4.51	4.14	2.06	1.05	.19	.14	.52	1.15	2.28	4.54	4.50	31.49
Bremersdorp	26 30	31 18	2200	8	8.77	5.36	4.46	2.86	.81	.25	.05	.54	1.46	3.81	4.74	5.58	38.69
Carolina	26 4	30 7	5620	8	5.62	3.68	3.00	1.86	.30	.09	.05	.23	.86	3.24	5.55	4.43	28.91
Ernelo	26 31	29 59	5570	14	5.17	4.09	3.31	1.63	.57	.13	.08	.31	.59	3.07	4.73	4.51	28.19
Eureka	25 44	31 7	1800	7	5.91	5.89	3.70	1.39	.36	.10	.19	.21	.71	2.33	4.11	4.96	29.86
Hilltop	25 35	31 3	3475	7	8.01	6.53	5.85	2.06	.45	.23	.03	.19	1.17	2.90	5.00	6.14	38.56
Kaapsche Hoop.	25 35	30 46	4300	13	11.47	9.25	7.70	2.79	.70	.40	.37	.83	2.02	3.54	6.24	9.03	54.34
Komati Poort	25 26	31 56	460	9	3.84	5.00	4.57	1.76	.67	.19	.12	.27	.52	1.92	2.38	4.02	25.25
Lake Chrissie	26 17	30 12	5600	7	5.86	4.74	2.73	1.47	.09	.16	.07	.32	1.01	3.10	5.82	5.15	30.52
Mbabane	26 20	31 9	3826	10	9.05	8.10	6.50	3.08	1.16	.45	.62	.67	1.61	3.87	6.22	7.35	48.68
Melalane	25 30	31 30	1035	7	4.68	6.12	3.16	1.56	.29	.10	.03	.16	.78	1.91	3.36	5.15	27.30
Nelspruit	25 28	30 59	2190	7	7.32	5.85	5.87	1.48	.25	.17	.07	.31	1.00	2.32	5.05	5.76	35.45
Piet Retief	27 0	30 48	4000	8	6.28	5.01	4.38	2.54	.69	.11	.26	.47	1.06	4.57	6.23	5.65	37.25
Pigg's Peak	25 56	31 13	3800	7	10.54	8.75	7.32	2.97	.53	.43	.19	.69	1.73	3.39	6.89	7.82	51.25
Rolffontein	26 59	29 56	5250	6	5.07	5.06	3.00	1.35	.07	.09	.16	.36	.62	3.43	6.54	5.03	30.78
Schroedershof	26 35	31 53	2800	11	5.68	4.71	3.55	2.73	.40	.36	.25	.68	1.65	3.04	4.56	4.99	32.60
Volksrust	27 22	29 53	5296	8	6.08	6.31	4.18	1.43	.66	.15	.35	.65	.84	3.05	5.60	4.96	34.26
Wakkerstroom	27 21	30 8	5500	8	6.15	5.04	3.35	2.23	.51	.13	.27	.83	.91	2.94	4.61	4.99	31.96
Waterval Boven	25 39	30 19	4670	6	7.00	4.81	3.80	2.14	.22	.19	.00	.24	1.08	1.84	4.77	4.83	30.92
		Means			6.79	5.77	4.43	2.03	.49	.20	.17	.46	1.12	3.06	5.28	5.61	35.41

XXII.—N.W. *Transvaal.*

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Brakfontein .	24° 13'	28° 4'	3460	7	5·02	5·00	3·43	1·06	·20	·01	·00	·24	1·00	1·54	2·80	4·38	24·68
Geehoutkop .	24 17	28 18	3460	7	6·68	5·27	2·89	·92	·19	·01	·03	·46	·68	1·31	2·84	4·92	26·20
Gemsbokspoort .	24 42	28 9	3780	6	6·39	5·31	3·59	·82	·24	·21	·12	·65	·71	1·86	2·75	6·02	28·67
Kirstenbosch .	23 42	28 18	3000	3	6·07	5·65	3·20	·33	·13	·00	·00	·42	1·08	·98	2·41	3·12	23·40
Lindley's Poort	25 29	26 41	4000	6	6·61	5·90	3·50	1·45	·35	·11	·15	·11	·52	1·13	3·12	4·20	27·15
Naauwpoort .	25 55	27 19	4000	6	5·78	4·10	4·13	·98	·35	·30	·14	·32	·61	1·64	4·58	3·80	26·73
Naboomspruit .	24 32	28 39	3460	6	5·02	4·74	2·85	·78	·22	·01	·07	·22	·82	1·41	2·95	4·53	23·62
Num Num .	24 42	28 31	3500	7	5·36	4·69	2·72	·60	·20	·03	·02	·39	·77	1·58	2·95	5·00	24·31
N.W. New Belgium .	23½	27½	3000	3	5·87	3·23	2·87	·61	·40	·02	·02	·22	·23	1·07	2·22	4·11	20·87
Nylstroom .	24 42	28 20	3735	7	5·03	4·63	3·02	1·07	·26	·27	·01	·31	·76	1·73	3·79	4·90	25·78
Potgietersrust .	24 12	28 57	3700	9	4·69	3·57	3·03	1·10	·45	·01	·05	·23	·54	1·43	3·71	5·06	23·87
Rhenosterpoort	24 38	28 5	3600	7	6·10	4·64	3·63	·99	·19	·09	·08	·52	·71	1·73	2·35	4·10	25·13
Rusland .	24 58	28 30	3460	7	4·51	3·84	2·19	·80	·13	·06	·08	·46	·57	1·60	3·26	5·22	22·72
Rustenburg .	25 40	27 14	3800	10	5·10	4·85	4·52	1·11	·79	·11	·19	·37	·38	1·95	3·11	4·97	27·45
Warmbaths .	24 53	28 13	3650	6	5·20	3·95	2·83	·73	·26	·00	·04	·08	·81	1·98	2·82	3·75	22·45
Zandrivierpoort	24 26	28 2	3750	7	5·91	6·24	3·39	1·18	·23	·05	·02	·42	·73	1·65	2·87	4·46	27·15
Zoutpansdrift .	25 33	27 42	3650	6	6·94	3·91	3·82	·69	·21	·06	·16	·30	·50	1·44	4·96	3·05	26·04
Means .				.	5·66	4·68	3·27	·90	·28	·08	·07	·34	·67	1·53	3·15	4·45	25·07

XXIII.—N.E. Transvaal.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	I n.
				Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	I n.
Belfast	426	25° 40'	30° 3'	6295	9	6.23	3.50	4.02	2.06	.53	.14	.04	.28	1.11	2.93	4.27	6.02	31.13
Blaauwberg	427	22 44	29 10	3400	5	8.53	6.71	3.04	.60	.14	.01	.06	.24	.57	.79	3.89	6.59	31.17
Dwars River	428	23 26	29 41	3600	6	4.12	3.79	1.93	.62	.12	.16	.00	.14	.36	.95	2.46	4.65	19.30
Elim	429	23 7	30 1	2900	7	6.32	7.83	8.00	2.08	.34	.26	.19	.20	.68	1.60	3.44	5.75	36.69
Haenertsburg	430	23 58	29 56	4500	6	11.34	5.84	7.56	1.50	.24	.21	.15	.31	.79	2.30	3.95	6.70	40.89
Klein Australia	431	22 59	30 12	4000	4	10.78	15.33	11.30	1.34	.38	.42	.72	.56	.68	1.42	4.52	10.91	58.36
Klein Letaba	432	23 20	30 49	2100	6	5.89	6.78	2.67	.94	.20	.12	.10	.18	1.20	1.90	1.80	4.52	26.30
Krabbefontein	433	23 48	30 8	2550	7	10.55	10.84	10.03	2.36	.21	.32	.21	.54	1.14	2.60	4.73	10.70	54.23
Leydsdoorp	434	24 0	30 32	2050	9	5.47	6.73	2.93	1.71	.75	.13	.05	.26	.41	1.77	3.57	5.07	28.85
Louis Trichardt	435	23 0	29 51	3120	9	4.78	6.89	4.36	1.97	.92	.39	.43	.23	.53	2.19	3.44	4.63	30.76
Lydenburg	436	25 6	30 27	4100	6	5.76	4.76	2.42	1.18	.15	.01	.00	.21	.67	1.96	3.72	4.53	25.37
Modderspruit	437	23 41	30 12	3800	7	11.62	9.69	11.26	3.09	.53	.43	.26	.44	1.29	2.59	4.85	9.16	55.21
Moddervlei	438	23 10	30 1	3900	6	6.12	7.87	7.13	2.16	.29	.29	.22	.26	.86	1.82	3.78	6.15	36.95
Pietersburg	439	23 56	29 24	4130	10	3.82	3.46	2.50	1.27	.21	.02	.08	.25	.33	1.64	2.66	3.83	20.07
Pilgrim's Rest	440	24 54	30 46	4100	21	8.18	7.73	6.49	2.43	1.15	.34	.33	.46	1.08	2.04	4.13	5.67	40.03
Pont Drift	441	22 7	29 3	1550	3	3.16	5.81	3.03	.09	.03	.25	.00	.23	.17	.41	1.67	3.69	18.54
Sabie	442	25 5	30 47	3900	10	9.30	8.08	7.39	2.34	.38	.31	.20	.49	1.30	2.62	5.23	7.23	44.87
Sibasa	443	22 44	30 28	4500	6	13.41	15.63	12.38	3.74	.41	.17	.27	.52	1.46	2.56	6.11	13.51	70.17
Wilgeboschfontein	444	23 36	29 53	3800	6	6.96	4.72	4.43	.91	.16	.11	.16	.34	.67	1.18	3.22	6.01	28.87
			Means			7.49	7.47	5.94	1.70	.38	.22	.18	.32	.81	1.86	3.76	6.60	36.72

XXIV.—Matabeleland.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
						In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Bulawayo .	445	20° 10'	28° 35'	4469	15	5.83	3.46	3.01	.62	.25	.04	.07	.04	.16	.98	4.15	5.18	23.79
Empandeni .	446	20 42	27 52	3300	13	6.60	3.70	2.59	.53	.24	.02	.02	.01	.07	.86	3.16	4.05	21.85
Filabusi .	447	20 12	29 20	4330	9	5.79	4.13	2.22	.54	.27	.03	.22	.07	.04	1.48	2.45	5.01	22.25
Fort Rixon .	448	20 0	29 20	—	8	4.25	5.13	2.09	.56	.28	.04	.05	.02	.01	1.39	2.14	4.25	20.21
Gwanda .	449	21 4	29 29	3000	8	5.06	3.74	2.18	.37	.09	.04	.06	.01	.06	1.28	2.64	3.83	19.36
Gwelo .	450	19 27	29 49	4645	12	4.91	4.43	2.87	.75	.30	.02	.03	.16	.08	.79	4.21	5.17	23.72
Hope Fountain .	451	20 20	28 45	4500	14	6.84	4.14	3.60	.86	.52	.08	.15	.04	.21	1.21	3.73	4.19	25.57
Matopo Mission .	452	20 25	28 48	5015	7	7.49	6.37	3.83	.40	.48	.02	.22	.02	.09	1.37	3.08	4.17	27.54
Rhodes Park .	453	20 27	28 27	4100	6	5.77	4.07	2.36	.71	.34	.04	.13	.00	.50	1.64	3.53	4.53	23.62
Selukwe .	454	19 35	30 13	4800	9	8.73	10.04	5.36	1.22	.58	.25	.15	.07	.30	1.53	4.43	5.97	38.63
Tegwani .	455	20 25	27 44	4500	10	5.50	3.45	2.73	.58	.11	.00	.01	.00	.05	1.08	3.15	4.30	20.96
Tuli .	456	21 56	29 19	1750	11	3.39	2.24	1.45	.65	.23	.00	.01	.01	.17	.96	1.90	2.43	13.44
Victoria Falls .	457	17 55	25 48	2994	6	7.83	8.27	4.43	.52	.62	.04	.01	.00	.14	1.27	2.69	5.81	31.63
			Means			6.00	4.86	2.98	.64	.33	.06	.07	.03	.14	1.22	3.17	4.53	24.04

XXV.—Mashonaland.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Charter .	19° 0'	31° 6'	—	9	7.04	7.49	2.85	.77	.39	.05	.17	.03	.03	1.56	4.24	4.64	29.26
Chilimanzi .	—	—	—	6	7.25	6.20	4.55	1.18	.37	.03	.29	.03	.08	1.01	4.54	3.99	29.64
Chishawasha	17 46	31 14	4180	12	9.09	8.32	5.96	1.48	.45	.08	.03	.09	.39	1.07	4.49	5.70	37.15
Driefontein	—	—	—	6	6.82	6.50	2.24	1.14	.45	.08	.09	.08	.03	1.45	4.73	4.81	28.42
Enkeldoorn	19 3	31 0	—	7	6.70	8.39	3.11	.83	.50	.06	.14	.05	.03	1.61	3.83	4.99	30.24
Gutu .	19 20	31 25	—	8	5.86	7.06	3.29	1.00	.39	.14	.18	.00	.03	.72	3.47	4.51	26.65
Inyanga .	18 20	32 29	5600	7	9.43	9.34	5.03	.82	.77	.05	.30	.01	.19	1.21	3.48	5.14	35.77
Marandellas	18 10	31 45	5400	12	8.59	7.76	5.33	1.17	.72	.03	.12	.06	.36	1.50	4.61	6.13	36.38
Melsetter .	19 49	32 51	5500	14	9.19	10.69	6.09	1.71	.89	.70	.81	.21	.52	1.68	5.38	6.60	44.45
Mt. Cassino	18 10	31 50	5000	8	7.32	6.69	4.39	.75	.73	.05	.29	.04	.25	1.89	3.34	4.64	30.38
Mt. Darwin	16 40	32 0	3000	11	7.83	5.79	3.35	.41	.89	.01	.01	.01	.06	.34	3.57	5.46	27.73
Mrewa .	17 35	31 40	—	8	8.00	8.97	4.58	.61	.56	.08	.08	.05	.10	1.81	3.29	5.98	34.11
Rusape .	18 30	32 5	4600	8	6.21	7.31	4.32	.84	.53	.21	.07	.04	.04	1.34	4.35	5.41	30.67
Salisbury .	17 49	31 3	4880	15	7.36	7.35	4.74	1.00	.51	.05	.01	.10	.33	1.36	3.79	5.58	32.18
Sinoia .	17 22	30 11	5200	9	7.11	8.08	3.93	.78	.63	.06	.00	.04	.06	1.06	2.71	5.68	30.14
Umtali .	18 59	32 41	3700	14	7.63	7.76	4.08	1.21	.71	.37	.28	.28	.58	1.28	3.36	4.58	32.17
Utopia .	18 56	32 42	3750	11	7.08	6.99	4.61	1.19	.82	.46	.46	.35	.41	1.25	3.80	4.02	31.44
Victoria .	20 4	30 49	3200	14	6.06	5.92	2.99	.48	.32	.08	.17	.06	.12	1.29	3.43	4.76	25.68
Westridge .	—	—	—	11	7.21	6.12	4.85	.91	.56	.03	.02	.10	.22	1.69	3.47	5.14	30.32
			Means	.	7.46	7.52	4.23	.96	.59	.14	.19	.09	.20	1.32	3.89	5.15	31.74

XXVI.—*Lourenço Marques and Mozambique.*

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
						In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Beira .	477	19° 50'	34° 50'	23	12	8.62	9.13	9.50	3.56	2.05	.30	.70	.78	.36	.71	3.59	5.06	44.36
Boroma .	478	16 0	33 39	614	7	5.67	5.83	2.17	.51	—	—	—	—	.08	.59	1.93	5.12	21.89
Ibo .	479	12 20	40 31	33	3	6.54	5.98	4.63	6.37	.26	.54	.30	.08	.16	.59	.58	2.29	28.31
Inhambane .	480	23 52	35 24	10	6	9.15	4.39	5.22	3.41	3.67	2.54	1.67	.69	.89	1.51	3.36	3.21	39.72
Inharime .	481	24 29	35 3	141	5	5.39	3.70	4.65	2.99	3.07	2.31	1.62	1.72	.31	1.53	2.03	2.98	32.29
Lourenço Marques	482	25 57	32 36	174	14	4.97	3.51	2.50	1.54	1.21	.20	.55	.45	1.16	2.55	3.49	4.23	26.66
Massinga .	483	23 19	35 25	358	5	9.74	6.81	5.63	2.79	4.19	2.84	2.32	.22	.58	.59	4.00	3.17	42.87
Mopea .	484	17 58	35 44	82	17	7.09	8.20	4.70	3.09	1.00	.99	1.00	.63	.03	.89	2.78	9.07	39.44
Morrumbene .	485	23 41	35 23	10	5	7.47	5.29	5.57	2.68	2.79	1.25	1.24	.74	.41	1.14	1.93	2.00	32.51
Mozambique .	486	15 1	40 45	—	4	8.06	8.75	5.57	2.40	1.60	1.00	.51	.70	.56	.06	1.57	5.41	36.18
Nhamussua .	487	23 52	35 17	39	7	6.57	5.21	6.45	4.64	1.99	1.50	1.58	.42	1.12	1.76	2.61	3.26	37.11
Panda .	488	24 3	34 43	492	5	6.60	3.38	4.42	1.72	2.32	.71	.44	.91	.94	1.29	1.67	4.39	28.78
Panga .	489	23 40	35 12	—	4	3.31	1.74	6.93	2.09	2.59	1.13	.50	.62	.63	.87	1.61	3.42	25.46
Tete .	490	16 10	33 38	50?	9	6.43	5.31	2.52	.50	.28	.17	.12	.04	.02	.08	2.30	5.61	23.37
Zavala .	491	24 42	34 45	446	5	5.12	4.57	5.44	2.78	5.06	2.36	1.77	1.11	.75	1.07	2.05	2.76	34.84
				Means	.	6.72	5.45	5.06	2.74	2.29	1.30	1.03	.65	.53	1.02	2.37	4.13	33.29

XXVII.—Northern Rhodesia and Nyassaland.

	Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
				Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Broken Hill	492	14° 30'	28° 30'	3880	5	7·76	8·97	3·64	·62	·56	·00	·00	·00	·00	·68	3·64	6·75	32·62
Bwana M'kubwa	493	13 0	28 45	—	5	10·56	9·36	8·07	1·26	·48	·00	·00	·00	·00	·87	2·99	9·98	43·57
Chikuni	494	16 20	27 30	4000	8	7·74	6·44	4·01	·75	·21	·09	·04	·00	·00	·51	3·36	5·11	28·26
Fife	495	9 20	32 50	—	5	8·15	7·90	9·24	4·18	·59	·01	·00	·01	·05	·55	2·84	8·03	41·55
Fort Jameson	496	13 40	32 40	—	5	8·30	10·31	7·95	1·18	·26	·01	·00	·12	·02	·19	2·70	9·84	40·88
Fort Johnston	497	14 27	35 15	1430	5	8·03	5·51	4·33	2·36	·31	·16	·01	·08	·28	1·93	1·93	6·14	31·06
Kalomo	498	17 2	26 30	4100	9	7·87	6·86	3·90	·66	·02	·00	·02	·00	·53	·65	2·78	6·26	29·55
Kasempa	499	13 27	25 50	—	4	8·66	9·96	7·15	·39	·00	·00	·00	·00	·16	1·28	3·38	9·94	40·92
Lauderdale	500	16 1	35 36	2540	5	18·31	19·61	14·02	12·68	5·51	3·82	2·87	1·97	3·35	4·02	7·20	15·16	108·50
Livingstone	501	17 50	25 55	—	9	7·12	8·65	4·89	1·08	·44	·04	·01	·00	·07	·71	2·96	5·63	31·60
Mongu	502	15 15	23 15	—	12	7·68	9·33	5·40	·93	·11	·00	·00	·04	·07	·78	2·70	6·97	34·01
Mumbwa	503	15 0	27 5	—	9	8·23	8·75	3·44	·74	·16	·07	·01	·00	·02	·46	3·25	7·54	32·67
Nkata	504	11 36	34 18	1640	3	8·48	12·07	13·04	13·95	2·14	4·29	2·64	·60	·42	·12	3·19	10·45	71·39
Sesheke	505	17 30	24 37	—	5	7·39	4·59	4·44	·89	·00	·09	·00	·07	·00	·87	1·44	3·84	23·62
Solwezi	506	12 5	26 25	—	7	9·63	9·55	8·01	3·60	·66	·00	·00	·09	·10	1·79	4·17	10·32	47·92
Zomba	507	15 17	35 21	3130	16	12·01	10·66	7·53	4·15	1·17	·67	·27	·12	·44	1·68	5·77	10·88	55·35
			Means			9·12	9·28	6·82	3·09	·79	·58	·37	·19	·34	1·07	3·39	8·30	43·34

XXVIII.—East Africa.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Amami District.	5° 6'	38° 38'	3000	10	4.11	2.56	5.70	16.65	14.77	3.64	5.52	3.90	3.94	7.18	9.62	5.78	83.38
Bagamoyo .	6 25	38 53	59	9	2.82	2.20	2.67	9.48	7.18	1.38	1.50	1.20	1.16	1.34	4.21	4.25	39.39
Bukoba .	1 20	31 52	3900	6	4.00	5.12	10.52	17.76	15.55	1.66	2.92	2.52	3.56	4.73	8.60	6.41	83.35
Daresalam .	5 11	6 49	39 18	15	3.44	1.97	4.72	12.30	7.37	1.43	1.76	1.18	1.18	1.24	2.78	3.76	43.15
Iringa .	7 47	35 37	4860	8	5.19	5.60	5.08	1.62	.25	.03	.00	.00	.03	.05	.96	2.79	21.58
Tosanaganga .	7 52	35 32	5250	4	7.72	9.82	7.29	3.15	.76	.00	.18	.00	.12	.46	1.06	5.26	35.83
Kigonsera .	10 50	35 3	3740	5	5.22	5.11	4.50	5.08	1.67	.14	.94	.37	.24	1.02	2.59	3.27	30.17
Kilossa .	6 48	36 59	1670	4	4.73	2.39	3.11	9.87	2.02	.85	.87	.48	.83	.82	1.62	4.21	31.81
Kilwa .	8 45	39 25	33	4	5.00	1.13	2.20	9.04	4.33	1.19	1.46	.70	1.61	2.15	3.55	6.09	38.45
Kisserawe .	6 54	39 6	1080	4	3.83	4.45	3.27	2.65	.63	.02	.00	.00	.00	.04	1.00	4.41	20.31
Kondoa-Irangi .	4 55	35 57	4660	5	2.57	3.16	4.02	3.37	4.64	.70	1.57	.49	.38	1.59	5.35	2.48	30.32
Kwai .	4 45	38 18	4560	7	6.51	5.62	8.26	6.87	1.58	.03	.42	.24	.48	.50	2.28	5.13	37.90
New Köln .	4 47	38 21	26	7	5.94	3.34	5.00	9.25	3.04	.91	1.11	.98	1.02	1.34	3.41	2.69	38.03
Lindi .	10 0	39 44	269	5	4.72	3.79	3.29	1.20	.28	.04	.05	.02	.00	.00	.31	2.72	52.11
Rosahöhe .	3 19	37 22	3840	10	1.61	2.55	5.16	16.95	12.33	2.14	1.95	.98	.94	1.56	3.21	4.07	17.77
Mohoro .	6 21	36 23	3380	3	3.90	3.67	5.59	7.76	5.26	1.20	.34	1.47	1.57	2.44	4.52	5.79	43.50
Mpapa .	2 31	32 54	3740	6	5.18	2.64	5.43	12.61	4.04	1.02	.57	3.50	1.11	3.89	4.65	7.14	51.78
Muansa .	2 0	33 2	4000	7	2.82	4.08	6.20	6.58	13.22	1.63	3.52	2.29	1.54	2.49	4.13	4.32	52.82
Newied and Marienhof .	5 3	38 37	3120	4	9.35	7.40	10.93	3.46	.25	.02	.05	.06	.22	.00	1.09	5.77	38.61
Ngambo .	10 38	35 29	4265	4	7.90	7.20	9.43	26.76	12.93	1.75	1.83	.78	.84	.12	1.78	6.73	78.06
Peramiho .	10 42	35 39	3970	5	4.67	3.82	4.74	5.24	.27	.10	.00	.00	.02	.28	2.64	4.37	26.14
Ssongea .	9 18	33 41	3740	12	1.17	1.85	3.51	12.01	13.57	2.71	4.42	3.06	2.78	4.16	8.06	2.45	59.75
Rutegeano .	5 3	32 53	4035	14	4.44	2.86	4.94	8.30	1.00	.15	.00	.00	.87	1.01	3.70	4.94	32.21
Tabora .	5 4	39 7	92	4	4.18	3.27	3.12	7.39	2.64	.26	.26	.02	1.13	2.37	3.60	2.84	31.08
Tanga .	5 0	30 0	2800	6	4.63	3.98	5.36	8.97	5.40	.96	1.30	1.01	1.07	1.70	3.53	4.49	42.40
Uji .	3 23	29 20	2625	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Usumbura .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Means	.	.	.	.	4.63	3.98	5.36	8.97	5.40	.96	1.30	1.01	1.07	1.70	3.53	4.49	42.40

XXIX.—British East Africa.

Ref. No.	S. lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Athi River	1° 20'	36° 50'	5800	7	87	130	462	515	291	82	29	68	15	288	391	150	2508
Eldama Ravine.	0 7	35 35	—	7	111	148	326	665	567	436	409	622	225	239	307	226	4281
Fort Hall	1 50	37 5	—	7	119	92	496	1253	603	125	74	92	49	600	766	340	4609
Kismayu	0 25	42 35	—	7	00	05	35	204	741	321	235	64	45	14	33	11	1708
Kisumu	0 7	34 44	3800	7	185	441	571	656	441	305	275	315	74	187	320	659	4529
Kitui	1 22	38 1	3857	7	186	45	419	795	210	19	26	17	05	291	1315	563	3891
Machakos	1 31	37 20	5650	7	130	116	445	769	265	54	35	43	07	265	765	498	3396
Mackinnon Road	3 40	39 0	—	7	189	114	239	425	403	149	187	99	91	189	429	412	2926
Makindu	2 20	37 45	—	7	99	51	278	310	118	00	01	00	01	101	770	476	2205
Malindi	3 15	40 10	—	7	34	06	85	802	1785	608	437	178	191	237	247	68	4678
Mazeras	3 50	39 39	—	7	125	148	279	779	1132	385	506	230	245	558	513	551	5751
Molo	—	—	—	7	176	196	479	1044	629	571	532	1143	544	371	451	306	6442
Mombasa	4 4	39 42	50	7	83	57	254	1123	1625	493	425	209	228	451	347	273	5568
Muhoroni	—	—	—	7	294	484	555	1203	643	532	241	618	445	462	471	565	6513
Mumias	0 25	34 25	—	7	240	293	437	1021	831	672	494	705	582	604	513	489	6881
Mwatate	3 30	38 23	3009	7	156	118	360	552	222	52	49	14	39	84	394	355	2395
Nairobi	1 14	36 44	6000	7	201	146	388	851	514	101	78	101	55	261	545	289	3533
Naivasha	1 40	36 30	—	7	110	110	302	602	313	449	248	288	208	240	316	196	3382
Nakuru	0 15	36 10	—	7	53	61	285	513	421	262	349	468	231	262	268	151	3324
Port Florence	0 5	34 46	—	7	185	413	610	691	437	297	294	312	184	223	335	679	4660
Shimoni	—	—	—	7	126	83	382	1355	1846	567	493	234	176	261	331	160	6014
Takaungu	3 40	39 50	—	7	34	41	145	630	1809	501	513	197	169	337	167	185	4723
Means					146	150	356	762	720	317	270	273	178	297	454	346	4269

XXX.—Various.

Ref. No.	Lat.	E. long.	Alt.	Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
			Ft.		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Bolobo	2° 10'	16° 13'	1080	5	500	697	461	717	563	39	04	268	378	654	957	1024	6260
Vivi	5 40	13 49	—	—	378	268	406	909	197	0	0	0	04	295	933	709	4098
S. Paul de Loanda	8 49	13 13	—	35	91	143	244	492	44	00	—	01	07	25	112	73	1232
Zanzibar	6 10	39 14	—	5	233	300	592	1484	696	209	232	249	186	375	739	806	6101
Antananarivo	18 57	47 43	—	7	1096	1012	686	252	68	35	18	23	71	355	481	1120	5217

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