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Recent Studies on the Mean Atmospheric Circulation—II Upper Air Data

By C. E. P. BROOKS, D.Sc.

In the *Meteorological Magazine* for June a number of recent studies of resultant winds and stream lines at the earth's surface were combined to give pictures of the general movements of the lowermost air masses over a considerable area of the earth. When we extend these studies to the upper air it is not practicable to adopt the same procedure, partly because the data available are not yet sufficient, especially over the oceans, and partly because maps of a series of different levels cannot be readily compared unless they are superposed, in the form of a solid model. Hence it seemed better to represent the available data in the form of a series of sections of the atmosphere, running from north to south, for regions where the density of stations is sufficient. This form of diagram was adopted by H. Hubert (1) for the system of upper air currents up to a height of 10 Km. above west Africa, between 22° N. and 5° S., in January and August. Hubert's diagrams are reproduced in Fig. 1.

Hubert shows four main systems of wind, the NE. trade (alizé), which is limited to the extreme north in January and is very shallow, the SW. monsoon (mousson) which is likewise shallow and extends across the equator to about 5° N. in January and 20° N. in August, the great easterly equatorial current, part of which forms the Harmattan, and, in January, the south-westerly anti-trade (contre-alizé). Disregarding the trade wind and monsoon, which are shallow surface phenomena, we find that the great mass of the atmosphere above west Africa is divided into two main systems, an equatorial

current, predominantly easterly, and a current in higher latitudes, predominantly westerly. In January the boundary between these two runs from 20° N. above the trade wind at a height of 2 Km. to 5° N. at a height of 9 Km. In August on the other hand the

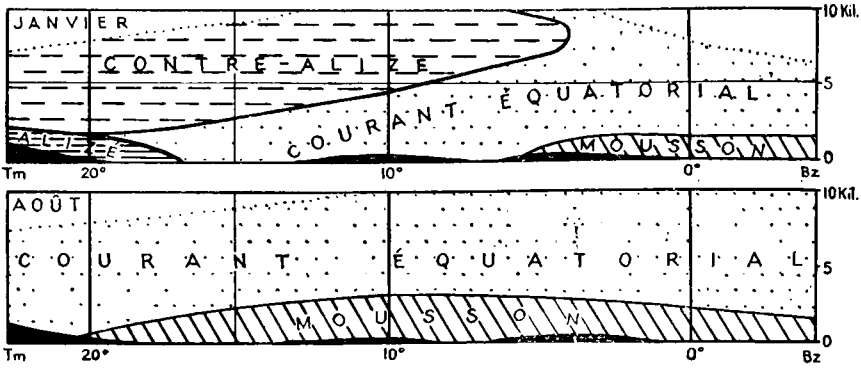

FIG. 1.—WEST AFRICA.
Reproduced from Sur les limites des courants aériens dans l'Afrique de l'Ouest. By H. Hubert, *Paris, C.—R. Acad. Sci.*, **202**, 1936, pp. 1695–7.

easterly current occupies the whole thickness of the atmosphere above the monsoon as far as the limit of the section in 22° N.

Three pairs of diagrams have been prepared for comparison with Hubert's, representing winter and summer conditions over India, eastern North America and eastern Africa. The method of representation was rather a problem. The first attempt was by conventional resultant arrows representing the direction, the plane of the paper being supposed flat and extending from east to west, but since the plane of the paper also represented a vertical section extending from north to south, the result was most confusing. Hubert uses shading and stippling with names of the winds printed across; the shading represents the facts and the names the interpretation, but here it seemed better to give the facts only. The method adopted was accordingly shading in four directions to give the four cardinal points, diagonal for east and west winds, vertical for north, horizontal for south, the closeness of the shading being roughly proportional to the strength and steadiness of the resultant winds. Intermediate directions are shown by the crossing of the shading lines, and definite discontinuities, where such appeared, by broken lines. The solid base represents the smoothed contours on the same scale. The vertical scale is about 275 times the horizontal.

Fig. 2 shows sections over India (2) and Ceylon (3), extending from 35° to 5° N, along the line Peshawar–Agra–Bombay–Madras–Colombo. In winter (December–February) the greater part of the section is occupied by westerly winds, becoming north-westerly near the surface. The boundary between the westerly and easterly

currents extends from about 20° N. near the ground to about 8° N. at 10 Km., agreeing closely with the limits in west Africa. Above 4 Km. it is quite definite, but below that height a belt of southerly winds comes between the two main currents.

In summer (June–August) the boundary between the westerly and easterly currents is nearly vertical above 2 Km. in about 30° N. (outside the limit of Hubert's section) while in the south the westerly monsoon extends as far north as 20° N., separated from the easterly upper current by a belt of rather indeterminate winds. The general conditions over India thus resemble those over west Africa rather closely.

Fig. 3 shows similar sections over eastern North America between latitudes 52° and 10° N., along the line Newfoundland (4)–eastern U.S.A. (5)–Porto Rico (6)–Columbia (7); data for the last are available only for summer. In winter almost the whole section is occupied by the westerly current, the equatorial easterly current extending only from the surface in 28° N. to 5 Km. in about 17° N. In contrast to west Africa and India the boundary of westerly and easterly winds at the surface migrates only a short distance north in summer, but it is nearly vertical instead of sloping southwards as in winter. Above Porto Rico there is a curious intercalation of north-westerly winds above 6 Km. in summer, which may be due to the difference of longitude between Florida and Porto Rico.

Both in India and North America the sections are limited to the northern hemisphere. In eastern Africa (Fig. 4) it is possible to carry them right across the equator along the line Egypt–Sudan–Nairobi (8)–Rhodesia–South Africa (9). The upper diagram shows the conditions in the northern winter (December–February). The solid easterly current on both sides of the equator is clearly seen. The circulation is roughly symmetrical about a vertical in 5° S., but below 3 Km. a belt of northerly winds is intercalated between the easterly and westerly winds in both hemispheres. In the southern hemisphere only there is also a belt of southerly winds in about 24° S. from 3 to 7 Km. In the northern summer (June–August) the centre of the easterly current has moved northwards to about 5° N., but the symmetry is marred by a layer of winds from SSW. from the surface to 2 Km. in the Sudan, while the main westerly current fails to reach the ground even in the north of Egypt. In Rhodesia and South Africa the solid westerly current is well shown.

In eastern Asia the data are not yet sufficient to draw a continuous section, but at Hong Kong in 22° N. (10) results obtained over a long period show that in winter easterly resultant winds extend from the surface to a height of little more than 1 Km., while from 2 Km. upwards westerly winds steadily increase in frequency and strength. In summer on the other hand winds are indefinite up to a height of 3 Km. above which easterly winds predominate to the limit of sufficient observations at 8 Km.

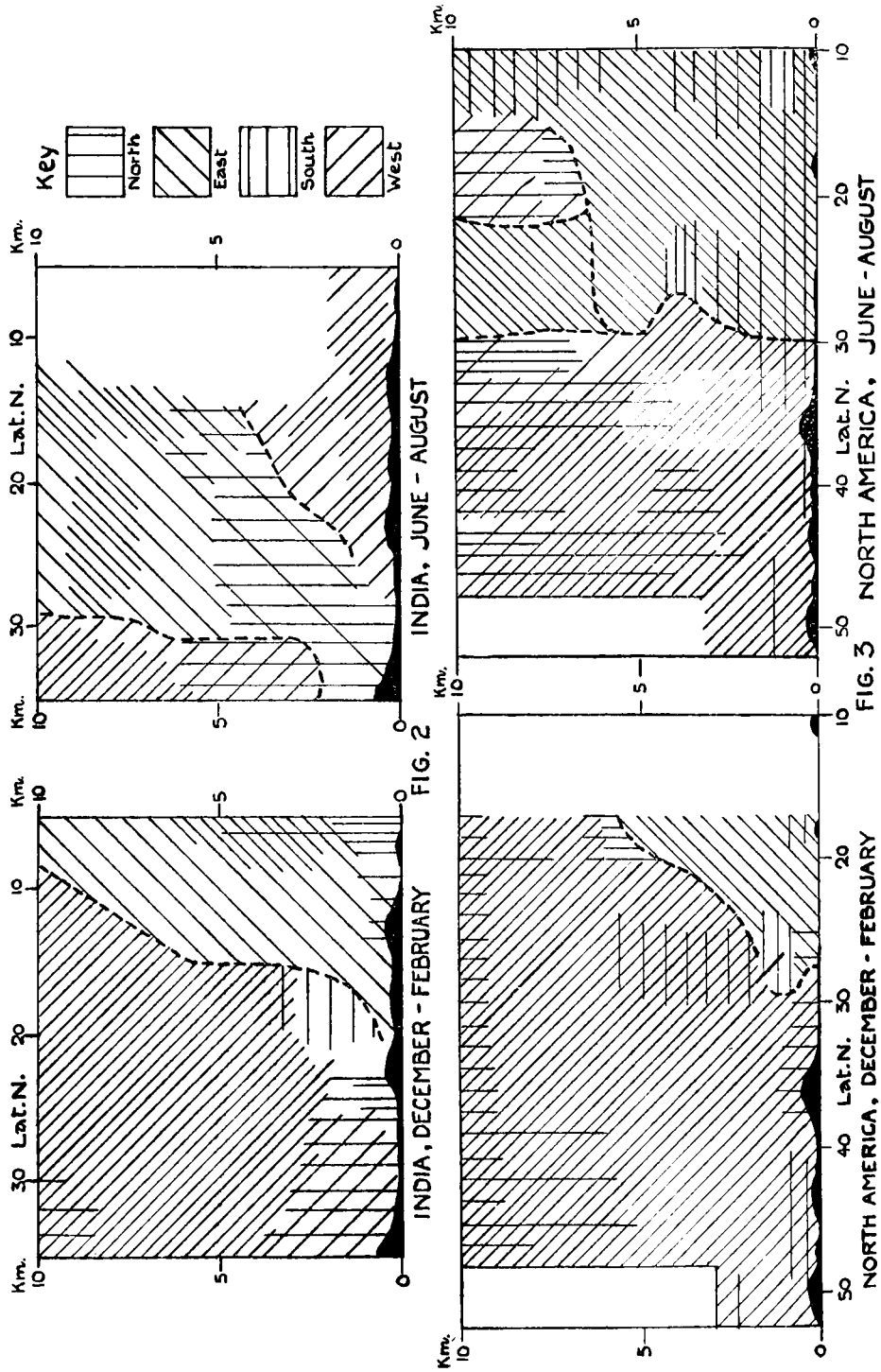
Key
North
East
South
West
Km.
10
5
0
20 Lat. N.
30
40
50
INDIA, JUNE - AUGUST
INDIA, DECEMBER - FEBRUARY
NORTH AMERICA, JUNE - AUGUST
NORTH AMERICA, DECEMBER - FEBRUARY

FIG. 2

FIG. 3

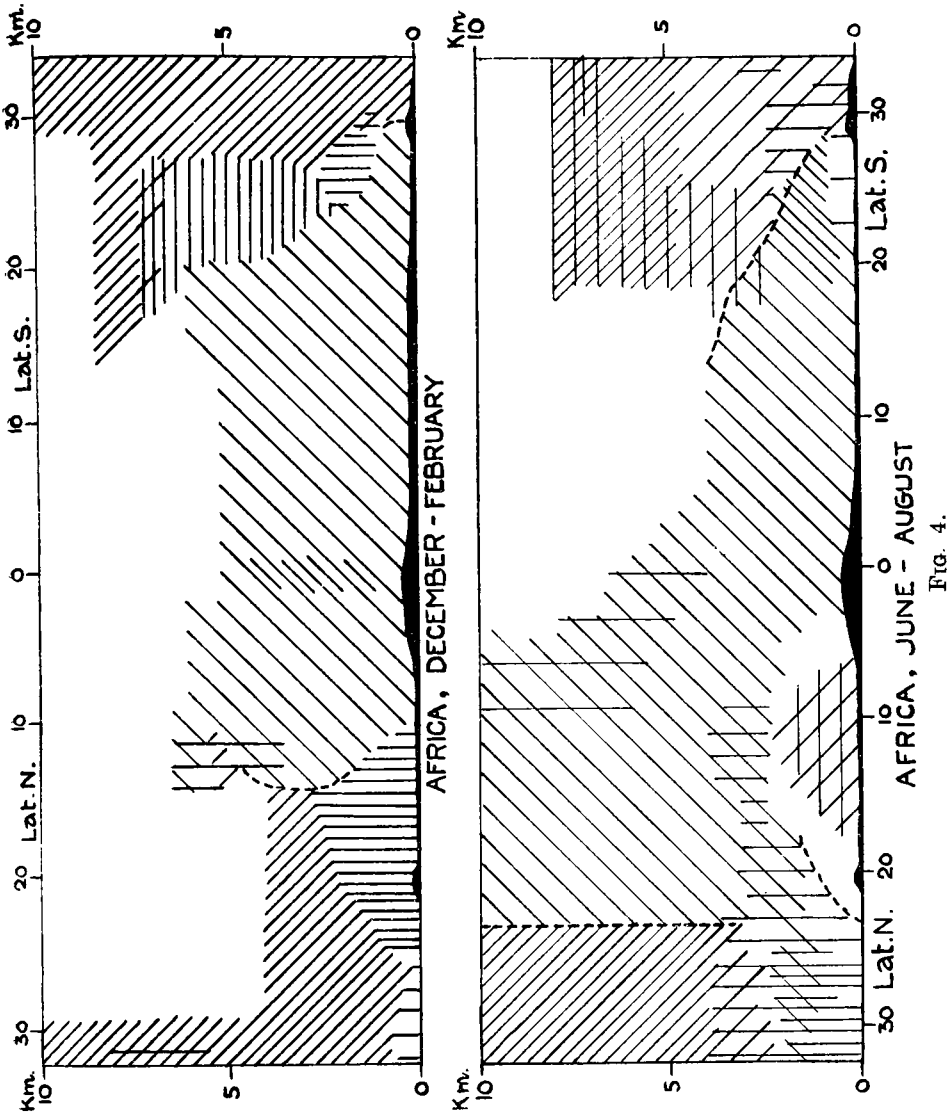

FIG. 4.

Similar changes, with due allowance for the reversal of the seasons, are seen at Samoa in latitude 14° S. in the South Pacific (11). In the southern summer (January–February) the easterly current extends from sea level to a height of 9 Km., above which it is replaced by a wind from north-west. In the southern winter (July–August) the easterly current though much stronger at the surface, is shallower, being replaced by a west wind above 4 Km.

It is evident that all these sections show a great degree of similarity, the boundary between the westerly and easterly currents sloping upwards towards the equator with only relatively slight differences of latitude in different parts of the globe. The approximate limits

in winter (of the hemisphere concerned) are brought together in Fig. 5, in which the heights at which the boundary is crossed above Hongkong and Samoa are also shown. On the average, the boundary seems to extend roughly from 25° lat. at the surface to 7° lat. at a height of 8 Km., at a fairly uniform slope of about one in 250. In summer the limits are all shifted towards the poles, generally by about ten degrees, and the slope apparently becomes steeper, but the material available is not sufficient to construct a diagram similar to Fig. 5 for this season.

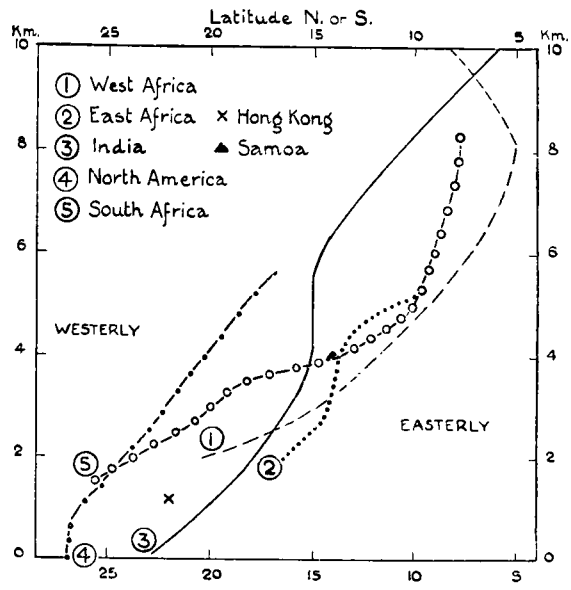

FIG. 5

REFERENCES

1. HUBERT, H.; Sur les limites des courants aériens dans l'Afrique de l'Ouest. *Paris, C–R. Acad. Sci.*, **202,** 1936, pp. 1695–7.
2. BANERJEE, H. C., and K. R. RAMANATHAN; Upper air circulation over India and its neighbourhood up to the cirrus level during the winter and the monsoon. *Poona, Sci. Notes, met. Dep., India,* **3,** No. 21, 1930.
   Monthly normal isobars and wind-roses at 0·5, 1, 2 and 3 Km. above sea-level over India and neighbourhood. *Poona, Sci. Notes, met. Dep., India,* **1,** No. 8, 1931.
3. BAMFORD, A. J.; Notes on the climate of western Ceylon with special reference to the upper winds at Colombo. *Colombo, Ceylon, J.Sci., Sec. E,* 1, 1926–9, pp. 173–205.
4. MIDDLETON, W. E. K.; The climate of the Gulf of St. Lawrence and surrounding regions in Canada and Newfoundland, as it affects aviation. *Ottawa, Canad. Met. Mem.*, **1,** No. 1, 1935.
5. GREGG, W. R.; An aerological survey of the United States. Part 2. Results of observations by means of pilot balloons. *Washington, D.C., Mon. Weath. Rev., Suppl.*, No. 26, 1926.
6. RAY, C. L.; Free-air winds at San Juan, P.R. *Washington, D.C., Mon. Weath. Rev.*, **59,** 1931, pp. 414–6.
7. GEORGII, W., and H. SEILKOPF; Ergebnisse von Pilotaufstiegen in Columbia (S.A.) und über dem Caribischen Meer. *Beitr. Phys. frei Atmos., Leipzig,* **12,** 1926, pp. 183–7.
8. London, Air Ministry, Meteor. Office. Cairo to Capetown air route. Aviation Met. Rep. 4, 1935.

9. Cox, C. W.; The circulation of the atmosphere over South Africa. *Pretoria, Meteor. Off., Meteor. Mem.*, No. 1, 1935.
10. Heywood, G. S. P.; The upper winds of Hong Kong. From observations made with pilot balloons, 1921–1932. Hong Kong, 1933.
11. Thomson, A.; Observations of upper air currents at Apia, Western Samoa. (Second series.) Wellington, N.Z., 1929.

The Smoke Pall of England

On the morning of February 13th, 1936, an anticyclone lay off the north-east coast of England giving very light winds from E. and SE. over almost the whole of England. The night sky had been nearly unclouded except in the south-west and a considerable inversion was present in the lowest layers in the morning (as was shown by an aeroplane ascent at Duxford). Under these conditions smoke spread out to west and north-west of the points at which pollution was being generated. The general distribution of pressure and wind at 7h. on that morning is shown in Fig. 1, the arrows in which figure represent the surface winds with flèches to indicate the speed by the Beaufort Scale. It should however be remembered that the wind at about 1,000 feet will flow more nearly along the isobars. From the observations made at Duxford it appeared that the smoky layer there at any rate was confined to about 1,000 or 1,200 feet, though the inversion extended to greater heights.

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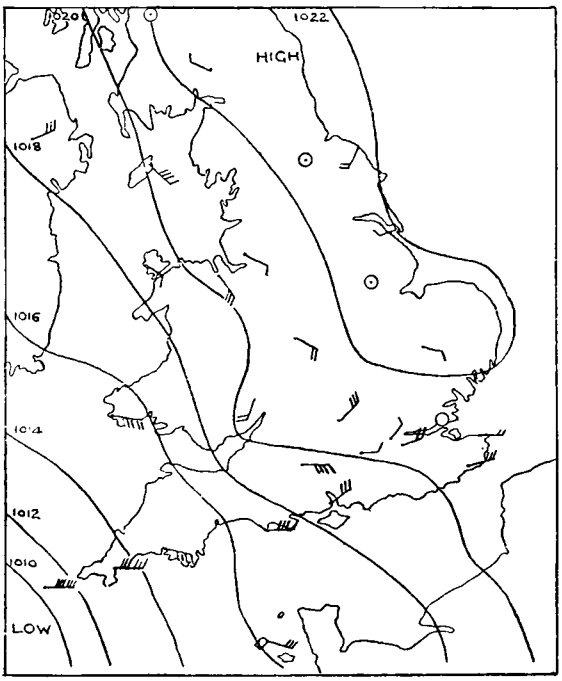


FIG. 1.

In order to see how far the smoke of industrial areas affected the visibility, the individual observations made for the fog and mist investigation were plotted for this day. These observations (a short note on which was published in the *Meteorological Magazine* for May, 1936, p. 83) are made about 9h. each day by a considerable number of observers scattered over the British Isles, and about 800 observations were plotted in the preparation of Fig. 2 in England and Wales alone.

It is thought that the result which represents the first fruits of this investigation is of sufficient interest to warrant reproduction in Fig. 2. In this map the various degrees of visibility prevailing

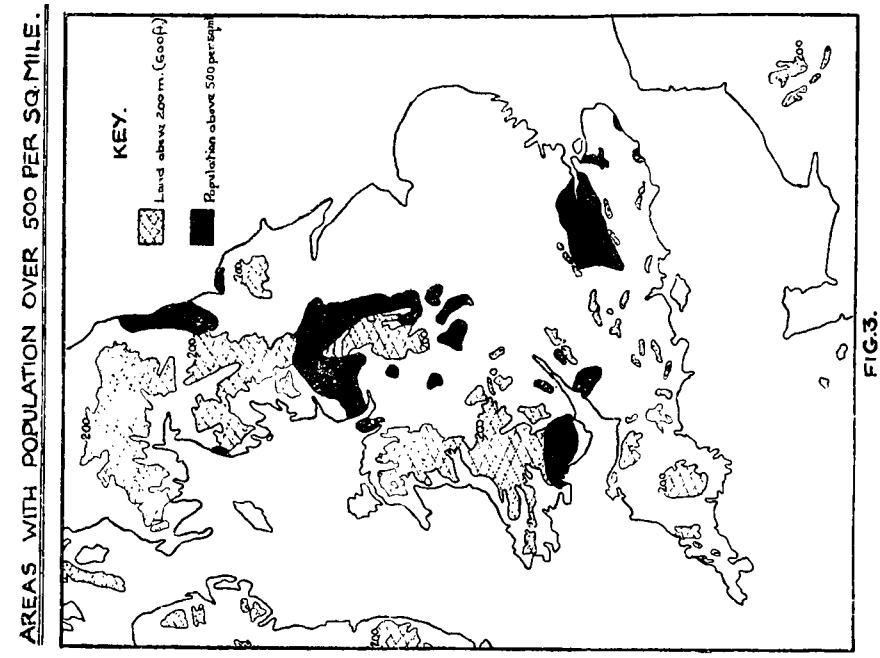


FIG. 3.

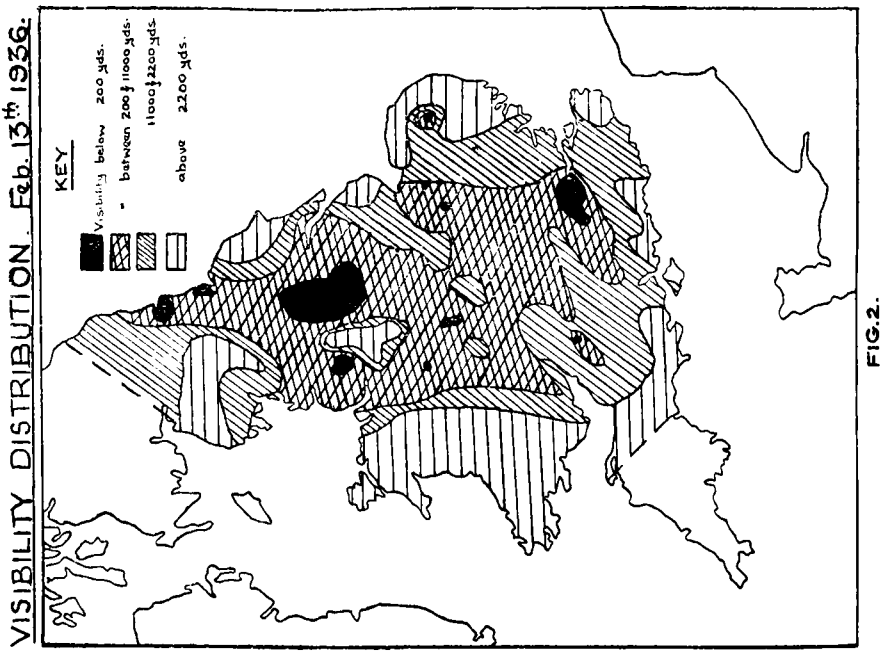


FIG. 2.

in different areas are shown by different shadings, the most intense shading covering those localities where horizontal visibility was below 200 yards, the next most intense where it was generally between 200 and 1,100 yards, a lighter shading those in which it was generally 1,100 and 2,200 yards and the lightest those in which it was more than 2,200 yards. In Fig. 3 is shown those districts where the population exceeds 500 to the square mile and hence shows roughly where pollution chiefly originates.

The comparison of these three figures brings out very forcibly how intimately visibility is associated with smoke.

London on that morning was a black spot but it was very noticeable how rapidly visibility improved in the south-east as soon as the area of dense population was left behind. There was a large area of visibility below 200 yards in the Leeds–Sheffield area and Manchester, Birmingham, Newcastle and Hartlepool each had their own gloom. Even Norwich had a little patch of dense fog with foggy conditions extending a little way outside. It was however noticeable that the Welsh coalfield and the Bristol area were comparatively clear, though Swindon achieved a dense fog patch of its own. In contrast with the industrial areas East Anglia though below the central portion of the anticyclone was free of fog and the same was true of most of the counties south of the Thames except where they were affected by London smoke. Visibility in Wales was almost uniformly above 2,200 yards. Even leaving aside those places where visibility was very bad, such maps as these must impress one how the smoke from densely populated areas is spread far and wide over the countryside, and by contrast between East Anglia and the Midlands one must realise how often we must artificially bring down on even country districts the fog which foreigners imagine is the natural propensity of these islands.

C. S. DURST.

Smoke Abatement Exhibition at the Science Museum

This exhibition has been organised by the National Smoke Abatement Society of Great Britain, with the co-operation of interested Government Departments and industrial associations. Its purpose is to illustrate the nature and effects of the pollution of our atmosphere by coal smoke and the scientific means now available for investigating the pollution and preventing it.

The smoke problem is as old as the use of coal for heating purposes, but research in pure and applied science has now shown ways in which raw coal can be burned smokelessly or can be so treated by high or low temperature carbonisation that a smokeless fuel is produced.

The exhibition is divided into three main sections dealing respectively with the effects, measurement and abatement of atmospheric pollution. The " effects " section includes a number of exhibits

illustrating the destruction wrought by smoke upon vegetation, stonework and metals, while a reminder of the effect upon human beings is given by specimens of polluted lungs and by diagrams showing the effect of smoke pollution upon the death-rate in an industrial town during a severe smoke fog. The amount of sunlight, cut off by the smoke pall over large towns is also well shown.

Exhibits contributed by the Department of Scientific and Industrial Research show the way in which the products of combustion of various fuels are investigated in the laboratory, and how the constituents of polluted atmospheres are measured at a large number of stations distributed all over the country.

In the "abatement" section, methods of smokeless heating for industrial and for domestic purposes are shown in two separate series of exhibits, including, on the domestic side, a group of model houses each fitted with entirely smokeless heating appliances.

The formal opening of the exhibition will take place on Thursday October 1st, 1936, and the exhibition will remain on view to the public from October 2nd to 31st inclusive. A guide to the exhibition has been prepared, price 6*d*., which will contain a description of the exhibits in catalogue form and a series of articles on the most important aspects of the smoke problem, together with communications from correspondents on the progress that is being made in other countries.

Discussions at the Meteorological Office

The series of meetings for the discussion of recent contributions to meteorological literature, especially in foreign and colonial journals, will be resumed at the Meteorological Office, South Kensington, during the session 1936-7. The meetings will be held on alternate Mondays at 5 p.m., beginning on Monday October 19th, 1936, when Sir George Simpson, K.C.B., D.Sc., F.R.S., will open the discussion of a paper by T. Bergeron entitled "On the physics of cloud and precipitation" (*Paris, P.V. Mét. Un. géod. géophys. int. Lisbon*, 1933. *II. Memoires et Discussions*, 1935, pp. 156-70).

The dates for subsequent meetings are as follows:—

November 2nd, 16th and 30th, December 14th, 1936; January 18th, February 1st and 15th, March 1st and 15th, 1937.

The Director of the Meteorological Office wishes it to be known that visitors are welcomed at these meetings.

Correspondence

To the Editor, *Meteorological Magazine*

Diurnal Temperature Range of 50·9° F.

On August 29th, 1936, an exceptionally great diurnal range of temperature was recorded at the Rickmansworth climatological

station, where both the character of the soil (sand and gravel over chalk) and the situation near the bottom of an enclosed valley tend to induce extremes of cold and heat during the prevalence of quiet, clear weather. The lowest and highest readings of the thermometers in the standard screen were, respectively, 34·0° F. and 84·9° F.; from the thermograph exposed in a smaller Stevenson screen, 15 ft. south of the other, they were 35·3° F. and 84·6°F. According to the trace of this instrument, the minimum occurred at about 5h. 45m. (G.M.T.) and the maximum at 14h. 30m. There was thus a variation over 50·9° F. in approximately $8\frac{3}{4}$ hours. Hitherto, the greatest diurnal range registered at the station was one of 47·7° F. on March 28th, 1933 (see the issue of this magazine for April, 1933, p. 64).

On August 29th, 1936, eye observations were made hourly from 9h. to 13h., from 15h. to 19h., and from 21h. to 23h. These are given below, together with corrected values taken from the thermograph chart for the remaining 11 hours of the 24 (the actual figures on the trace are about 1° F. higher to 6h.) :—

Time. G.M.T.	Temp. ° F.	Time. G.M.T.	Temp. ° F.	Time. G.M.T.	Temp. ° F.
1h.	38·8	9h.	70·7	17h.	79·7
2h.	37·9	10h.	74·1	18h.	69·2
3h.	36·2	11h.	78·0	19h.	56·8
4h.	35·1	12h.	80·9	20h.	51·1
5h.	34·4	13h.	83·0	21h.	47·7
6h.	35·5	14h.	84·5	22h	46·6
7h.	46·7	15h.	84·5	23h.	45·7
8h.	58·3	16h.	83·1	24h.	44·1

The extreme readings of the radiation thermometers were 26·3° F. and 150·4° F.

Hertfordshire lay within the central region of a large anticyclone on August 29th. The wind at Rickmansworth was variable in direction and very light, falling dead calm at intervals. Except for a few small patches of lenticular cirrocumulus between about 18h. and 20h., no cloud was seen throughout the day. Ground fog prevailed from before dawn to just after 6h., haze to 10h., and slight haze to 11h.; thereafter, visibility remained good until evening, when some valley mist began to form. Relative humidity decreased from 56 per cent at 9h. to 28 per cent at 13h. The duration of sunshine, 12·6 hrs., represented about 91 per cent of the " possible."

August 30th, 1936, gave a minimum temperature of 39·5° F. and a maximum of 81·3° F. This was the 67th day since May, 1929, on which the diurnal range has reached or exceeded 40° F. at the Rickmansworth climatological station. It is noteworthy that the eight Augusts have accounted for as many as 23, or 34 per cent of these occasions. The next most prolific months have been July with 13 instances, and June with 11.

E. L. HAWKE.

Caenwood, The Valley Road, Rickmansworth, Herts. September 1st, 1936.

The Heat Wave of July 13th, 1808

Mr. J. E. Clark's note on the above reminds me that some years ago a letter appeared in *The Times* signed by the Rev. A. R. Tucker, then at North Thoresby, Lincs, in which he mentions " an interesting conversation which I had recently with an old man concerning the great drought of 1868, who informed me that his grandfather frequently mentioned to him about ' Hot Wednesday ' which he thought was a year or two after 1800, when men and animals in great numbers succumbed under the pressure of the excessive heat. For years afterwards this day was talked of as ' Hot Wednesday '." July 13th, 1808, seems to have been a Wednesday.

CICELY M. BOTLEY.

17, *Holmesdale Gardens, Hastings, August 19th*, 1936.

With reference to the article in this month's *Meteorological Magazine* " The heat wave of July 13th, 1808 " I find the following in " Howard's Climate of London."

" July 13, 1808. Temperature at 9 a.m. 84°. The intense heat of the maximum lasted nearly three hours till about 4 p.m. At 6 p.m. temperature 90° after which it declined rapidly. The shade maximum for the day was 96° ".

The above observations were taken at Plaistow near London.

H. K. G. ROGERS.

Seaforde, Mary Tavy, near Tavistock, Devon, August 20th, 1936.

Low Rainfall Total for August

The total rainfall in August at Hinton St. George, Somerset, was 0·11 in. Although there were only 6 rain-days there was no period of drought. The longest rainless period was the 12 days from the 20th to the end of the month. The largest fall on any one day was 0·03 in. on the 3rd. This very low total is far below any month's record during the past three years here.

It would be very interesting to know if any lower totals for August have been recorded by other observers.*

J. M. BRIERLEY.

Springfield, Hinton St. George, Somerset, September 7th, 1936.

Tree Struck by Lightning

A case of a tree being struck by lightning was brought to my notice last week by Mr. L. J. Cutbill, Chemist at the Cheshire Joint Sanatorium, Market Drayton.

The tree was struck on Sunday, June 21st, 1936, during one of the two severe thunderstorms experienced on that day. The tree was situated in the centre of a wood and a strip of bark three inches wide was torn off for the whole length of the tree. The strip described

* See the August totals for Teignmouth, Weymouth and Sidmouth given on p. 198.—Ed. *M.M.*

one half revolution about the trunk so that at the bottom it was diametrically opposite the point at which the removal of bark commenced. In addition to the removal of bark the wood beneath was torn out for a depth of 1 to 1½ inches. Apart from the removal of bark and wood the tree was not split in any way, nor were there any signs of burning.

W. D. FLOWER.

Meteorological Station, R.A.F., Sealand, Chester, August 18th, 1936.

A Lunar Glory

Last night, September 3rd, going upstairs soon after 10 o'clock, I saw that there was round the moon a marked "glory," 4° or more across, of a clear, rather dark-blue tint, and remarked its exceptionally even tone from centre to circumference.

This morning my sister, Mrs. Edith Hinde, brought me a written description of what she had seen on waking later in the night through her south window, presumably therefore about 2 or 3 a.m. :—"A wonderful circle round the moon, first a bright ethereal dark blue as wide as half the circumference of the moon; then a circle of blue green, followed by a very narrow line of red. It was marvellous, only it was all too soon past." She had gone to the window attracted by the brilliant moonlight. The sky had been very clear down to the horizon at sunset and about 6·45 I had noticed the marked visibility of the Mendips wall, eight miles off where nearest. Clouds supervened later on and smart rain began before 6 (B.S.T.) this morning.

J. EDMUND CLARK.

Portway, Street, Somerset, September 4th, 1936.

"False Dawn"

I write to describe a phenomenon which much interested me. On the night January 6th–7th, 1933, I had occasion to proceed from London to Torquay. I left London at 1 a.m. precisely and travelled by car by the main road, i.e. A.30. The night was very dark and at Bagshot I ran into a storm area, heavy rain and gusts of wind. I reached Shaftesbury, 101 miles, between 4.30 and 5 a.m. I cannot give exact times but I have driven over this road many times and have often had to plan my departure from London so as to reach certain places in Somerset and Devon at certain times, so that in actual fact the times will be only a few minutes out, one way or the other. Descending the hill from Shaftesbury, where in daylight you get such a magnificent view westward, I could see nothing of the surrounding country owing to the darkness. I proceeded for a few miles and then stopped for a short halt, and whilst I cannot name the exact spot it was a small village and geographically would correspond with East Stour, i.e. between Shaftesbury and Milbourne port.

I got out of the car and found the rain had ceased and strolled up and down for a few minutes, when I suddenly realised that it was getting light, and at first I thought it was the dawn, but knowing it was only about 5 a.m. I realised I was mistaken, but very unfortunately I cannot give exact times. But the time was almost certainly about 5.10 a.m. It became so light that I was able to see the surrounding countryside. I could see the Dorsetshire hills sufficiently plainly to see that the clouds lay on their tops and that they were clear below, and I was able to turn off my headlights. The light was a general diffused light with no apparent focal point but I should say it was lighter towards the south and east, although I could quite well see towards the north and west—and here again I failed to note times; but this condition lasted probably for about 20 minutes, after which period, and about as suddenly as it appeared, it became quite dark again. I had to switch on my headlights and keep them on until Fairmile, which is 10 miles short of Exeter, at about 7.30 a.m., when the true dawn commenced. The other I can only call a "False Dawn". I have many times read of it, chiefly in seafaring stories, and have asked many people but found none who have seen it. There was nothing remarkable about it beyond the fact that it became light about two hours before dawn was due, as at that time sunrise is about 8.4 a.m., and then became quite dark again. J. H. CUMMING.

35c, Queen's Gate, London, S.W.7, June 8th, 1936.

NOTES AND QUERIES

Pilot Balloon Ascent near Duststorm.

A rather interesting pilot balloon ascent was made at Heliopolis during the late afternoon of June 11th, 1936. Several small Khamsin depressions with a well-marked cold front were moving eastwards and dust rising had been forecasted for the late afternoon. Temperature was high, the day maximum being 110° F., and the temperature at 16h. G.M.T. (6 p.m. local time) 108° F. A pilot balloon ascent at 12h. 40m. G.M.T. showed very light winds, 5–15 m.p.h. up to 6,000 ft. —the wind had already become almost westerly on the ground but backed to SSW. at 6,000 ft. There was a marked upward current—the average up to 6,000 ft. being 200 ft./min.

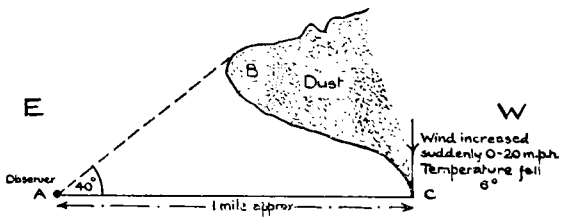


FIG. 1.

At 16h. dust was seen to the west—it had a buttressed appearance similar to that of a Sudan Haboob (vide *London, Quart. J. R. met. Soc.*, 57, 1931, facing pp. 148 and 149). At 16h. 25m. the appearance of the dust was as in Fig. 1. At this time a

balloon was released from A; the dust at B was overhead at 16h. 28m. and the front at C passed at 16h. 31m. The balloon showed that the wind up to 3,000 ft. had changed to NW. and above this height it backed rapidly. Unfortunately it was impossible to see the tail after five minutes, but in order to get reasonable values of the wind above 3,000 ft., i.e., to make them roughly similar to those in the previous ascent, it is necessary to assume an upward current of 400 ft./min.

Complete details of the 16h. 25 m. G.M.T. ascent are as follows :—

Time.	Height.	Vertical Velocity.	Resultant Wind.	
			Direction.	Speed.
min.	ft.	ft./min.	°	m.p.h.
0	0	..	..	Calm
1	620	+120	311	8
2	1,160	+ 40	304	8
3	2,080	+420	299	14
4	3,100	+520	297	10
5	4,060	+460	270	10
6	(5,000)	(+440)	270	8
7	(5,900)	(+400)	225	3
8	(6,800)	(+400)	189	3

This shows that vigorous convection was taking place above 2,000 ft. where the warm air was being pushed up by the advancing wedge of cold. Behind the front at C there was little evidence of any downward movement in the cold air, i.e., the wind increased suddenly from 0–20 m.p.h. in a gust and then continued for some time 10–12 m.p.h. The lack of downward movement may explain why the duststorm did not develop to any extent near Cairo—the visibility not falling below 1,100 metres at any time.

J. DURWARD.

REVIEWS

Probleme der Kosmischen Physik. Edited by Dr. C. Jensen. Band XVI. Die Wolken. By R. Süring. Size 9¼ in. by 6¼ in. pp. x + 122. *Illus.* Leipzig Akademische Verlagsgesellschaft m.b.H. 1936.

The first thing that strikes one on opening this very unusual book is that there are very few photographs, or even diagrams. Indeed the chapter (Ch. II) in which the cloud types are defined is quite unillustrated. But the author has a great contempt—as anyone reading the preface will perceive—for books which degenerate into mere illustrated catalogues of clouds. He refers the reader to the International Cloud Atlas; which is hardly logical. If one has a cloud atlas, Herr Süring's second chapter is superfluous, if one has not, it is, at any rate, not entirely comprehensible, since nobody supposes that it is possible to identify all the cloud types from

definitions, however full and careful. This, however, is no great matter, and the difficulty which the photograph problem presents to a writer on this subject is sufficiently obvious.

The book is volume 16 of the series " Probleme der Kosmischen Physik," edited by Dr. Christian Jensen. It is not intended to be a text-book—is indeed, almost the exact reverse of a text-book. Its object, as stated in the preface is " to attract amateur and professional meteorologists once more to the observation and investigation of clouds." This object the author obviously kept in mind during the writing of every page ; and although the book is in form a short outline of our knowledge of clouds, the author has devoted his energy especially to showing how great and numerous are the gaps in that knowledge, and to suggesting lines for future research.

" Amateur and professional." One has only to study the chapter on instruments and methods of observation to see on which side the author's sympathy lies. There is no account of sounding-balloon or other aerological apparatus such as is necessary (as often pointed out in this book) for the solution of many cloud problems ; but there is much homely advice on the selection of cameras, the use of light filters, and even methods of developing negatives. Indeed the real message of the book is this—that there is a great deal of valuable work awaiting anybody who can use a camera and, perhaps, a home-made nephoscope. This is a somewhat revolutionary doctrine, but salutory. In meteorology, more than in any other science, the lion's share has fallen to the professional in overwhelming measure. In all its most interesting branches it is today practically a Civil Servants' science. To encourage the amateur—which means to show him something that he can feel sure is genuinely useful to do—is one of the great needs of meteorology ; and if this book has anything like the success in this direction which it deserves, it may prove of more importance than many more pretentious works.

It is perhaps further evidence of the author's affection for the amateur that all the usual interruptions of the text of a scientific work—mathematics, tables, complicated diagrams—have been reduced to a minimum. The text has indeed almost the continuity of an essay ; a fact which, combined with the great clarity of the style, makes the whole book exceptionally easy reading for a scientific work. As might be expected in a book which aims at provoking further study, there is a full bibliography at the end of each chapter.

From the professional meteorologist's point of view the best chapters—they form nearly half the book—are II and IV. In these the relationship between cloud form and physical causes is examined. The matter is not new, but it is a very complete and concise account of the subject, and where theory is dealt with the criticisms are admirable. It is unfortunate that Chapter IV contains a diagram (on p. 70) which is, to say the least, inaccurate.

One small complaint about the covers. They are of light grey cloth, and attract dirt in a manner unique in my experience.

B. C. V. ODDIE.

India Meteorological Department, Scientific Notes, Vol. VI, No. 65.—*The thermal structure of the upper air over a depression during the Indian south-west monsoon.* By N. K. Sür.

In this publication the author makes another of his valuable contributions to our knowledge of the thermal structure of depressions which cross the Indian Peninsula during the south-west monsoon.

Four sounding-balloon ascents were made at Agra during the approach of one of these depressions. It was found that as the intensity of the depression increased the temperature at upper levels below the tropopause decreased. As the depression deepened further and became stationary near Agra the fall of temperature between 8 and 12 Km. ceased and the level of the tropopause above the depression was lowered, with an increase of temperature in the lower stratosphere, and a decrease at levels immediately below the tropopause. These phenomena are explained as being due to the divergence of air of the troposphere just below the tropopause and the sucking down, accompanied by heating, of the air of the lower stratosphere.

There were also indications that the cyclone underwent some process of occlusion similar to that experienced by an extra-tropical cyclone, but apart from this there does not appear to be a very close analogy betweeen the two.

It is to be hoped that in the near future the structure of a monsoon depression will be more fully investigated by means of " serial " ascents, as has been done by Prof. J. Bjerknes in the case of the extra-tropical depression.

R. G. VERYARD.

BOOKS RECEIVED

Ergebnisse Aerologischer Beobachtungen, 22, 1933, and 23, 1934, and 22A. Aerologische Beobachtungen und Terminbeobachtungen in Angmagssalik während des Internationalen Polarjahres 1932-1933. K. Ned. Meteor. Inst. (No. 106A) Utrecht 1934 and 1935.

Onweders, optische verschijnselen, enz. in Nederland. Naar vrijwillige waarnemingen in 1932 and 1933. Deel LIII and LIV, Utrecht, 1934 and 1935.

OBITUARY

Dr. Nanabhai Ardesher Framji Moos, L.C.E., F.R.S.E.—We regret to learn of the death on March 12th, 1936, of Dr. N. A. F. Moos at the age of 77. Dr. Moos was born on October 29th, 1859, and took

his degree in Engineering at the Poona College of Science in 1878. For five years he served on the staff of that College after which he came to Europe and took his degree at Edinburgh University. A little time after his return to India he became Professor of Physics at Elphinstone College, Bombay, and in 1896 he was appointed Director of Bombay Observatory, a post which he held until his retirement in 1919.

Dr. Moos was chiefly interested in terrestrial magnetism and seismology, and he published in addition to the usual observational data, a large number of valuable discussions on these and other allied data, amongst which may be mentioned "Colaba Magnetic Data, 1846–1905." It was while he was Director that the magnetic work of the Bombay Observatory was moved from Colaba to Alibagh, about 19 miles to the south-east of Bombay, and he also set up the Time Ball Observatory at Karachi. Besides his official and scientific work, Dr. Moos took a prominent part in the University and civic life of Bombay.

We regret to learn of the death on July 24th, aged 61 years, of Mr. C. F. Talman, meteorologist in the United States Weather Bureau since 1922.

NEWS IN BRIEF

We learn that Dr. Jan Blaton has been appointed Director of the Polish National Meteorological Institute as from May 1st, 1936, in succession to Dr. Ing. Jean Lugeon, who has retired.

The Weather of August, 1936

Pressure was below normal over the central United States, Labrador, Greenland, Iceland, Spitsbergen, northern Scandinavia, eastern Mediterranean, Greece, south-west Asia and in the neighbourhood of Madeira, the greatest deficits being 1·9 mb. near St. Louis, 5·9 mb. at Myggbukta, and 4·1 mb. near Erzerum. Pressure was above normal over most of Canada, western and eastern United States, the North Atlantic including Bermuda and the Azores, most of Europe and north-west Siberia, the greatest excesses being 5·8 mb. at Kodiak, 5·6 mb. at Valentia and 8·6 mb. at Ekaterinburg. Temperature was generally above normal in northern Europe and Spitsbergen but below normal in central and south-west Europe. In Sweden rainfall was in excess in west Norrland and east Svealand but about or below normal elsewhere.

The weather over the British Isles during August was generally dry with cloudy cool conditions at first, becoming warm and sunny later. Rainfall was considerably below normal in most districts, many new low records being set up in the south; at Ross-on-Wye and Holne (Devon) the totals of 0·16 in. and 0·52 in. were the lowest for August since records began in 1859 and 1875 respectively. Sunshine records were above normal in many districts, but early morning mist or fog occurred frequently. From the 1st to 4th depressions

moving across the country gave rise to unsettled weather generally, with strong westerly winds locally on the 2nd and 3rd; 1·49 in. of rain fell at Kirkwall, Orkneys, on the 2nd and 1·14 in. at Falconhurst, Kent, on the 1st. On the 4th thunderstorms occurred at several places in north-east and east England, but locally there was much sunshine. A ridge of high pressure crossed the country on the 5th, followed by shallow disturbances on the 6th to 7th, when dull, cool, unsettled conditions with rain prevailed generally, 1·85 in. was measured at Festiniog (Merioneth) on the 5th and 1·25 in. at East Ayton (Yorkshire) on the 6th, while day temperatures did not exceed 54° F. at Edinburgh and Marchmont on the 6th. On the 8th a wedge of high pressure extended across the south of the country spreading north until the 10th and giving fairer, warmer weather, though some rain was experienced in Scotland and on the 8th in Ireland. The 8th was generally a sunny day with over 12 hours' bright sunshine at most places in north and south-west England—14·0 hrs. at Morecambe. Thunderstorms occurred locally on the 10th accompanied in some cases by heavy rain, 1·97 in. were recorded in just over 1½ hrs., of which 1·50 in. fell between 18h. 15m. and 19h. 15m. at Leyland (Lancashire). From the 11th to 14th the weather was mainly cloudy, somewhat cooler but with some sun each day, while thunderstorms were reported locally on the 11th and 12th, 2·60 in. of rain fell in a thunderstorm between 5.30 and 6.45 on the 12th at Leatherhead (Surrey). The 15th was generally sunny in England, though thunderstorms were again experienced in north England. From the 16th to 24th pressure was high to the south, but a complex low pressure area to the north-west and north with secondaries passing across the British Isles brought alternating periods of rain and sun though only occasionally did these affect the south-east and east where for the most part fine sunny warm weather prevailed with temperatures locally above 80° F. on the 16th and 17th, and sunshine totals in excess of 12 hours at many places on the 16th, 17th and 22nd to 24th—13·4 hrs. at Margate on the 17th and 13·5 hrs. at Weymouth on the 22nd. On the 19th, however, rain was general over the whole country and temperature low, not reaching 60° F. in parts of the Midlands and Scotland, 2·35 in. of rain were measured at Festiniog (Merioneth). In the north and west during the rest of this period the rain, though frequent, was usually slight and there were many hours sunshine, Aberdeen had 12·0 hrs. on the 18th and Tiree 11·5 hrs. on the 21st. From the 25th to 28th the anticyclone to the south spread over the whole country and warm sunny weather was experienced with temperatures exceeding 70° F. generally and rising above 80° F. on the 29th in the south and Midlands, while sunshine records frequently exceeded 11 or 12 hours. On the 29th to 31st a depression to the north-west brought cloudy conditions and slight rain to north Scotland and Ireland, but in the south and east the fine sunny weather continued. The distribution of bright sunshine for the month was as follows:—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway ...	98	−33	Chester ...	180	+26
Aberdeen ...	177	+38	Ross-on-Wye ...	185	+18
Dublin	169	+13	Falmouth ...	230	+32
Birr Castle ...	129	− 9	Gorleston ...	185	−10
Valentia... ...	147	− 3	Kew	185	+ 2

Miscellaneous notes on weather abroad culled from various sources

Drought and intense heat prevailed generally in Russia at the beginning of the month and duststorms were experienced in the neighbourhood of Moscow. During the first two or three days snow fell generally on the Alps down to the 4,200 ft. level and nearly 2 ft. of fresh snow were recorded at 6,000 ft. Many lives were lost and wide-spread damage done as the result of a severe storm which swept across north-east Poland on the 6th. Between the 1st and 10th vast forest fires were reported in the districts of Archangel, Vologda, Kargopol and Komi. Intense heat was also the cause of forest fires in the Moscow district, and of forest and peat fires along great tracts of the Gorky, Kazan, Riazan and Tumskaya railway lines. An unusually severe thunderstorm with torrential rain broke over Grenoble on the 12th and did much harm to the crops. Fine weather occurred generally in the Alps towards the end of the month. (*The Times*, August 3rd–September 1st.)

Exceptionally heavy rain was experienced in the Chercher region of Abyssinia near the beginning of the month. Thirty-eight people were drowned when a steamer capsized off Mostaganem (Algeria) owing to heavy seas. (*The Times*, August 10th–17th.)

Floods occurred in Sivas, Anatolia, at the beginning of the month. Heavy monsoon rain occurred in Bombay city and the coastal belt and also in the United Provinces, Bihar, Bengal and Assam during the first part of the month causing devastating floods of the Ganges and Brahmaputra and their tributaries, while in the Deccan and elsewhere in the Bombay Presidency severe drought was experienced. A break in the rains improved the flood situation in the United Provinces about the 12th and rain had fallen in parts of Gujerat and at Bijapur by the 19th and heavy rain generally in Gujerat and Kathiawar by the 24th, though the drought was still continuing in the Deccan. In consequence of heavy rain the Punjab rivers were in flood about the 23rd. A typhoon wrecked 9 Japanese ships about the 7th off the Pratas Islands south-west of Hongkong. Extensive flooding was reported in Korea on the 14th—96 people lost their lives. A typhoon swept across Hongkong on the night of the 16th–17th causing 10 deaths and doing much superficial damage—a wind speed of 131 m.p.h. was recorded at Hongkong but the centre passed 50 miles away. A typhoon swept across Korea on the 23rd and one on the 27th, together causing 1,939 deaths, while 40,000 houses were destroyed. (*The Times*, August 5th–September 1st.)

The total rainfall for the month in Australia was generally below normal except in Victoria and Tasmania. (*Cable.*)

In the United States temperature was generally about normal at the beginning of the month, but later on it was considerably above normal, while rainfall, except for some local heavy falls, was mainly below normal. The drought also continued in many parts of Canada. Extensive forest fires occurred in the west and middle-west of the United States during the middle of the month. (*The Times*, August 5th–September 1st and *Washington, D.C., U.S. Dept. Agric., Weekly Weather and Crop Bulletin.*)

Daily Readings at Kew Observatory, August, 1936

Date	Pressure M.S.L. 13h.	Wind, Dir., Force 13h.	Temp. Min.	Temp. Max.	Rel. Hum. 13h.	Rain.	Sun.	Remarks. (see vol. 69, 1934, p. 1).
	mb.		°F	°F	%	in.	hrs.	
1	1009·7	NW.2	60	67	76	0·02	0·2	r_0 0h.–2h., 8h. & 13h.
2	1004·8	SW.4	53	69	91	0·09	3·0	r_0 10h.–11h. & 23h.
3	1010·8	W.5	58	66	46	—	3·9	
4	1018·0	W.4	53	66	56	—	6·5	w early.
5	1021·1	SW.3	55	67	54	—	3·9	
6	1017·0	SSW.4	57	66	79	0·11	0·5	ir_0–r, 1h.–18h.
7	1024·2	NNW.3	57	60	80	trace	0·0	r_0 0h.–1h., d_0 17h.
8	1024·2	SE.2	53	69	67	—	3·9	
9	1017·3	E.2	50	72	64	—	4·4	w early.
10	1012·8	E.2	55	72	65	0·03	3·2	t 17h., r_0 23h.–24h.
11	1013·9	N.2	58	69	63	0·19	2·0	r_0–r 0h.–8h.
12	1012·3	WSW.2	54	69	70	—	1·9	w early.
13	1016·3	SW.2	53	68	58	—	3·4	w early & late.
14	1015·6	SW.3	55	69	60	—	6·3	w early & late.
15	1016·0	S.2	48	77	59	—	10·2	fw early.
16	1018·6	WSW.2	55	78	57	—	9·8	F early.
17	1018·7	SW.3	59	76	57	—	11·4	
18	1019·4	W.2	61	71	60	—	6·4	
19	1015·8	SW.4	57	67	59	0·03	0·0	ir_0 15h.–20h.
20	1014·7	WSW.3	59	73	65	—	5·4	
21	1018·0	NW.2	58	71	67	—	3·9	w early.
22	1026·4	NW.2	51	69	53	—	9·8	w early & late.
23	1029·0	WSW.2	47	73	49	—	12·3	w early & late.
24	1029·0	NNW.2	54	78	59	—	12·9	w early.
25	1028·6	NNW.2	56	78	52	—	8·0	m w early.
26	1029·3	NE.3	63	70	56	—	7·8	
27	1027·8	ENE.4	55	69	59	—	10·9	w early.
28	1026·7	NE.2	52	77	59	—	8·6	fe early.
29	1027·7	S.1	48	79	42	—	10·8	Fe early.
30	1023·3	W.3	54	79	41	—	9·0	w early.
31	1022·4	NW.2	60	69	63	—	4·2	
*	1019·7	—	55	71	61	0·47	5·9	* Means or Totals.

General Rainfall for August, 1936

England and Wales	39	per cent of the average 1881–1915
Scotland	70	
Ireland	45	
British Isles	48	

Rainfall: August, 1936: England and Wales

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Lond.	Camden Square.....	·48	22	*Leics.*	Belvoir Castle.....	1·70	65
Sur.	Reigate, Wray Pk. Rd..	·59	24	*Rut.*	Ridlington	·97	39
Kent.	Tenterden, Ashenden...	1·54	67	*Lincs.*	Boston, Skirbeck.....	·98	41
,, .	Folkestone, Boro. San.	1·76	...	,, .	Cranwell Aerodrome...	·80	29
,, .	Margate, Cliftonville....	1·26	65	,, .	Skegness, Marine Gdns.	1·42	58
,, .	Eden'bdg., Falconhurst	1·86	71	,, .	Louth, Westgate.....	1·34	48
Sus.	Compton, Compton Ho.	·91	29	,, .	Brigg, Wrawby St.....	1·41	...
,, .	Patching Farm.....	·72	29	*Notts.*	Worksop, Hodsock.....	1·16	47
,, .	Eastbourne, Wil. Sq....	·76	31	*Derby.*	Derby, L. M. & S. Rly.	·93	36
Hants.	Ventnor, Roy.Nat.Hos.	·21	11	,, .	Buxton, Terr. Slopes...	2·23	51
,, .	Fordingbridge, Oaklnds	·41	16	*Ches.*	Runcorn, Weston Pt....	1·66	46
,, .	Ovington Rectory.....	.37	14	*Lancs.*	Manchester, Whit. Pk.	2·37	69
,, .	Sherborne St. John.....	·89	37	,, .	Stonyhurst College.....	3·45	68
Herts.	Royston, Therfield Rec.	·53	21	,, .	Southport, Bedford Pk.	1·81	52
Bucks.	Slough, Upton.....	·43	20	,, .	Lancaster, Greg Obsy.	3·30	73
,, .	H. Wycombe, Flackwell	·68	28	*Yorks.*	Wath-upon-Dearne.....	1·21	50
Oxf.	Oxford, Mag. College...	·47	21	,, .	Wakefield, Clarence Pk.	1·40	54
N'hant	Wellingboro, Swanspool	·46	19	,, .	Oughtershaw Hall.....	3·17	...
,, .	Oundle	·54	...	,, .	Wetherby, Ribston H..	...	...
Beds.	Woburn, Exptl. Farm...	·34	15	,, .	Hull, Pearson Park.....	1·01	35
Cam.	Cambridge, Bot. Gdns.	·46	20	,, .	Holme-on-Spalding.....	1·77	66
Essex.	Chelmsford, County Gdns	·55	25	,, .	West Witton, Ivy Ho.	1·71	58
,, .	Lexden Hill House.....	·59	...	,, .	Felixkirk, Mt. St. John.	2·96	104
Suff.	Haughley House.....	·77	...	,, .	York, Museum Gdns....	1·95	77
,, .	Campsea Ashe.....	·74	37	,, .	Pickering, Hungate.....	3·26	127
,, .	Lowestoft Sec. School...	1·02	46	,, .	Scarborough.....	2·44	88
,, .	Bury St. Ed., WestleyH.	·98	38	,, .	Middlesbrough.....	2·10	77
Norf. .	Wells, Holkham Hall...	1·46	61	,, .	Baldersdale, Hury Res.	...	...
Wilts.	Calne, Castle Walk.....	·36	...	*Durh.*	Ushaw College.....	1·89	65
,, .	Porton, W.D. Exp'l. Stn	·17	8	*Nor.*	Newcastle, D. & D. Inst.	2·35	88
Dor.	Evershot, Melbury Ho.	·27	9	,, .	Bellingham, Highgreen	1·84	52
,, .	Weymouth, Westham.	·08	4	,, .	Lilburn Tower Gdns....	1·26	45
,, .	Shaftesbury, Abbey Ho.	·28	10	*Cumb.*	Carlisle, Scaleby Hall...	2·11	51
Devon.	Plymouth, The Hoe....	·52	17	,, .	Borrowdale, Seathwaite	5·00	46
,, .	Holne, Church Pk. Cott.	·52	12	,, .	Borrowdale, Moraine...	4·60	53
,, .	Teignmouth, Den Gdns.	·03	1	,, .	Keswick, High Hill.....	1·70	33
,, .	Cullompton	·28	9	*West.*	Appleby, Castle Bank...	1·65	50
,, .	Sidmouth, U.D.C.....	·10	...	*Mon.*	Abergavenny, Larchf'd	·31	10
,, .	Barnstaple, N. Dev.Ath	·60	18	*Glam.*	Ystalyfera, Wern Ho....	3·17	51
,, .	Dartm'r, Cranmere Pool	1·50	...	,, .	Cardiff, Ely P. Stn.....	1·16	27
,, .	Okehampton, Uplands.	·82	19	,, .	Treherbert, Tynywaun.	2·68	...
Corn.	Redruth, Trewirgie.....	·65	20	*Carm.*	Carmarthen, Coll. Rd.	2·24	48
,, .	Penzance, Morrab Gdns.	·47	15	*Pemb.*	St. Ann's Hd. C. Gd. Stn.	·78	25
,, .	St. Austell, Trevarna...	·68	19	*Card.*	Aberystwyth	1·40	...
Soms.	Chewton Mendip.....	1·02	23	*Rad.*	Birm W.W. Tyrmynydd	·80	15
,, .	Long Ashton.....	·56	16	*Mont.*	Lake Vyrnwy	2·37	46
,, .	Street, Millfield.....	·49	...	*Flint.*	Sealand Aerodrome.....	1·31	...
Glos.	Blockley	·45	...	*Mer.*	Blaenau Festiniog ...	10·08	98
,, .	Cirencester, Gwynfa....	·48	16	,, .	Dolgelley, Bontddu.....	3·11	55
Here.	Ross, Birchlea.....	·23	9	*Carn.*	Llandudno	·59	21
Salop.	Church Stretton.....	·62	19	,, .	Snowdon, L. Llydaw 9..	13·53	...
,, .	Shifnal, Hatton Grange	·90	32	*Ang.*	Holyhead, Salt Island...	2·10	66
Staffs.	Market Drayt'n, Old Sp.	1·08	33	,, .	Lligwy	2·40	...
Worc.	Ombersley, Holt Lock.	·52	19	*Isle of Man*			
War.	Alcester, Ragley Hall...	·69	25		Douglas, Boro' Cem....	3·32	87
,,	Birminghm, Edgbaston	·82	30	*Guernsey*			
Leics.	Thornton Reservoir ...	·76	27		St. PeterP't. Grange Rd.	·67	28

Rainfall: August, 1936: Scotland and Ireland

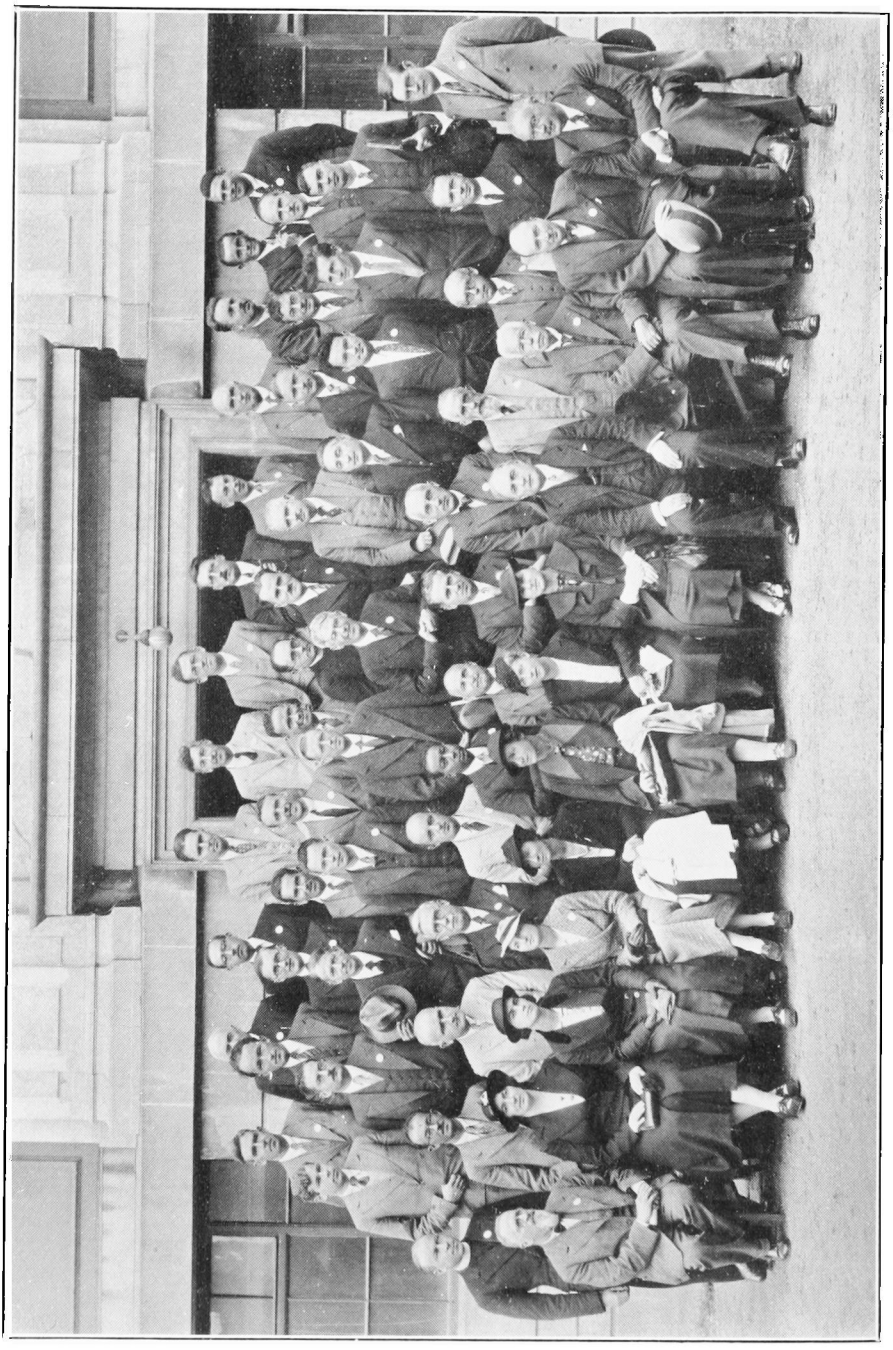
Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Wig .	Pt. William, Monreith.	2·81	73	*Suth* .	Tongue	3·08	96
„ .	New Luce School	4·29	96	„ .	Melvich	3·21	107
Kirk .	Dalry, Glendarroch	2·97	62	„ .	Loch More, Achfary	5·64	97
Dumf.	Dumfries, Crichton R.I.	1·51	40	*Caith* .	Wick	2·53	92
„ .	Eskdalemuir Obs.	3·22	62	*Ork* .	Deerness	3·07	107
Roxb .	Hawick, Wolfelee	1·18	35	*Shet* .	Lerwick	2·00	66
Selk .	Ettrick Manse	2·79	83	*Cork* .	Dunmanway Rectory	1·61	34
Peeb .	West Linton	2·43	...	„ .	Cork, University Coll.	·58	17
Berw .	Marchmont House	1·66	50	„ .	Ballinacurra	·64	17
E.Lot.	North Berwick Res.	2·11	67	„ .	Mallow, Longueville	·57	18
Midl .	Edinburgh, Blackfd. H.	1·19	37	*Kerry.*	Valentia Obsy.	1·76	37
Lan .	Auchtyfardle	2·02	...	„ .	Gearhameen	2·50	33
Ayr .	Kilmarnock, Kay Pk.	4·33	...	„ .	Bally McElligott Rec.	1·20	...
„ .	Girvan, Pinmore	4·15	93	„ .	Darrynane Abbey	1·85	43
Renf .	Glasgow, Queen's Pk.	2·97	84	*Wat* .	Waterford, Gortmore	·96	25
„ .	Greenock, Prospect H.	2·75	51	*Tip* .	Nenagh, Cas. Lough	1·44	37
Bute .	Rothesay, Ardencraig	3·74	...	„ .	Roscrea, Timoney Park	1·73	...
„ .	Dougarie Lodge	2·44	...	„ .	Cashel, Ballinamona	·85	24
Arg .	Ardgour House	6·97	...	*Lim* .	Foynes, Coolnanes	1·28	33
„ .	Glen Etive	...	...	„ .	Castleconnel Rec.	1·75	...
„ .	Oban	3·50	...	*Clare* .	Inagh, Mount Callan	4·27	...
„ .	Poltalloch	4·28	87	„ .	Broadford, Hurdlest'n.	1·47	...
„ .	Inveraray Castle	6·86	104	*Wexf* .	Gorey, Courtown Ho.	·66	20
„ .	Islay, Eallabus	3·36	77	*Wick* .	Rathnew, Clonmannon.	·91	...
„ .	Mull, Benmore	12·70	109	*Carl* .	Hacketstown Rectory	1·25	31
„ .	Tiree	...	...	*Leix* .	Blandsfort House	1·68	43
Kinr .	Loch Leven Sluice	1·76	46	*Offaly.*	Birr Castle	1·92	50
Fife .	Leuchars Aerodrome	·96	31	*Dublin*	Dublin, FitzWm. Sq.	1·15	38
Perth .	Loch Dhu	4·20	62	„ .	Balbriggan, Ardgillan	...	...
„ .	Balquhidder, Stronvar.	4·02	...	*Meath.*	Beauparc, St. Cloud	2·15	...
„ .	Crieff, Strathearn Hyd.	2·04	48	„ .	Kells, Headfort	1·99	48
„ .	Blair Castle Gardens	2·66	79	*W.M* .	Moate, Coolatore	1·73	...
Angus.	Kettins School	1·35	37	„ .	Mullingar, Belvedere	2·11	51
„ .	Pearsie House	1·88	...	*Long* .	Castle Forbes Gdns.	1·57	38
„ .	Montrose, Sunnyside	·89	32	*Gal* .	Galway, Grammar Sch.	2·25	...
Aber .	Braemar, Bank	1·50	44	„ .	Ballynahinch Castle	4·48	82
„ .	Logie Coldstone Sch.	1·92	61	„ .	Ahascragh, Clonbrock.	1·75	42
„ .	Aberdeen, Observatory.	1·41	51	*Mayo.*	Blacksod Point	2·48	54
„ .	Fyvie Castle	1·52	48	„ .	Mallaranny	3·85	...
Moray	Gordon Castle	1·87	59	„ .	Westport House	1·41	35
„ .	Grantown-on-Spey	...	...	„ .	Delphi Lodge	5·78	67
Nairn.	Nairn	2·09	87	*Sligo* .	Markree Castle	2·44	56
Inv's .	Ben Alder Lodge	2·15	...	*Cavan.*	Crossdoney, Kevit Cas.	2·03	...
„ .	Kingussie, The Birches.	1·48	...	*Ferm* .	Newtwnbtlr, Crom Cas.	1·88	45
„ .	Loch Ness, Foyers	1·92	63	„ .	Enniskillen, Portora	...	...
„ .	Inverness, Culduthel R.	2·47	...	*Arm* .	Armagh Obsy.	1·74	48
„ .	Loch Quoich, Loan	6·50	...	*Down.*	Fofanny Reservoir	3·33	...
„ .	Glenquoich	6·52	79	„ .	Seaforde	2·20	59
„ .	Glenleven, Corrour	3·82	70	„ .	Donaghadee, C. G. Stn.	2·65	79
„ .	Fort William, Glasdrum	4·62	...	*Antr* .	Belfast, Cavehill Rd.	2·96	...
„ .	Skye, Dunvegan	4·64	...	„ .	Aldergrove Aerodrome.	2·41	67
„ .	Barra, Skallary	3·67	...	„ .	Ballymena, Harryville.	3·04	71
R&C .	Alness, Ardross Castle.	1·64	56	*Lon* .	Garvagh, Moneydig	2·78	...
„ .	Ullapool	2·70	76	„ .	Londonderry, Creggan.	3·76	81
„ .	Achnashellach	5·05	76	*Tyr* .	Omagh, Edenfel	2·71	64
„ .	Stornoway, Matheson	3·53	89	*Don* .	Malin Head	2·94	...
Suth .	Lairg	2·42	76	„ .	Killybegs, Rockmount.	2·08	...

Climatological Table for the British Empire, March, 1936

STATIONS.	PRESSURE.		TEMPERATURE.							Relative Humidity.	Mean Cloud Am'nt	PRECIPITATION.			BRIGHT SUNSHINE.	
			Absolute.		Mean Values.				Mean.							
	Mean of Day M.S.L.	Diff. from Normal.	Max.	Min.	Max.	Min.	½ Max. and Min.	Diff. from Normal	Wet Bulb.			Am'nt.	Diff. from Normal.	Days.	Hours per day.	Percentage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0–10	in.	in.			
London, Kew Obsy....	1010·7	— 2·7	62	27	51·8	40·3	46·1	+ 2·9	40·8	88	8·4	0·90	— 0·79	11	2·5	21
Gibraltar	1013·5	— 3·6	73	43	59·6	50·7	55·1	...	51·9	90	6·4	5·23	...	16	...	...
Malta.....	1014·5	+ 0·3	69	47	61·8	53·7	57·7	+ 0·6	53·1	75	5·0	0·30	— 1·18	7	7·3	62
St. Helena	1012·7	+ 0·3	71	58	68·2	60·3	64·3	— 2·0	61·3	94	9·3	3·34	— 0·68	25	...	...
Freetown, Sierra Leone	1011·5	+ 2·5	95	71	89·1	74·8	81·9	— 0·5	75·4	74	5·7	1·03	— 0·13	4	...	...
Lagos, Nigeria	1009·9	+ 1·0	93	72	89·0	78·5	83·7	+ 0·3	77·9	83	7·9	5·78	+ 2·03	9	6·8	57
Kaduna, Nigeria	...	...	101	59	96·9	68·1	82·5	+ 1·4	69·7	65	4·2	0·51	— 0·03	4	8·8	73
Zomba, Nyasaland	1009·4	— 0·3	82	62	78·9	65·4	72·1	+ 0·8	70·3	91	8·6	10·08	+ 1·00	30	...	...
Salisbury, Rhodesia...	1010·8	— 1·0	83	54	77·3	59·8	68·5	+ 0·3	62·8	79	7·1	6·06	+ 1·36	21	5·2	43
Cape Town	1014·2	— 0·3	100	51	80·6	60·6	70·6	+ 2·5	60·5	77	3·9	1·19	+ 0·31	6	...	...
Johannesburg	1013·0	— 0·3	82	47	72·0	54·2	63·1	— 0·3	56·0	74	6·3	6·11	+ 1·67	14	6·1	50
Mauritius	1011·6	— 0·4	87	66	84·7	73·6	79·1	+ 1·1	75·4	78	5·5	5·18	— 4·19	21	8·4	69
Calcutta, Alipore Obsy.	1010·6	+ 0·7	100	61	95·9	71·9	83·9	+ 3·7	70·7	75	2·8	0·42	— 0·96	1*	...	...
Bombay	1010·6	— 0·3	101	66	87·2	72·4	79·8	+ 0·3	70·2	69	1·2	0·00	— 0·02	0*	...	...
Madras	1011·0	+ 0·1	90	66	87·5	72·9	80·2	— 0·9	75·3	79	4·9	0·90	+ 0·56	2*	...	...
Colombo, Ceylon	1010·6	+ 0·5	92	70	87·4	74·1	80·7	— 1·1	76·0	73	5·1	5·29	+ 1·01	16	7·4	61
Singapore.....	1010·0	+ 0·3	92	72	86·7	74·8	80·7	— 0·5	76·7	79	7·0	7·77	+ 0·37	15	5·4	45
Hongkong.....	1019·6	+ 3·6	80	43	61·5	53·8	57·7	— 5·6	53·7	78	8·8	0·47	— 2·47	7	2·1	18
Sandakan	1010·3	...	90	72	87·0	75·0	81·0	0·0	77·3	84	8·7	23·86	+ 15·39	21	...	...
Sydney, N.S.W.....	1017·1	+ 0·8	85	55	75·7	62·1	68·9	— 0·4	64·8	75	6·2	3·98	— 1·00	11	6·7	55
Melbourne	1016·5	— 0·4	94	47	79·7	57·3	68·5	+ 4·0	59·6	59	5·2	0·52	— 1·66	7	8·1	66
Adelaide	1017·3	+ 0·2	99	50	82·8	59·0	70·9	+ 1·1	60·8	49	4·4	0·07	— 0·96	3	9·4	77
Perth, W. Australia ...	1015·1	— 0·2	102	54	84·9	64·0	74·5	+ 3·3	62·2	56	4·5	0·21	— 0·60	1	8·7	71
Coolgardie	1014·4	— 0·5	100	52	89·0	61·9	75·5	+ 3·6	63·1	54	4·2	0·09	— 0·85	3	...	...
Brisbane.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hobart, Tasmania.....	1016·2	+ 2·0	83	43	68·8	51·4	60·1	+ 0·8	52·7	61	6·1	0·81	— 0·89	13	6·1	49
Wellington, N.Z.	1013·5	— 3·7	71	43	61·9	50·1	56·0	— 4·6	52·5	73	6·2	4·64	+ 1·31	13	6·3	51
Suva, Fiji	1009·1	+ 0·7	94	73	88·2	75·2	81·7	+ 1·6	76·8	84	6·1	11·56	— 2·93	25	6·6	54
Apia, Samoa	1009·3	+ 0·1	88	72	85·7	74·7	80·2	+ 0·9	76·9	80	5·8	10·92	— 3·06	20	6·5	53
Kingston, Jamaica	1013·0	— 1·9	91	66	85·6	69·8	77·7	+ 0·6	67·7	80	2·9	0·20	— 0·82	3	4·5	38
Grenada, W.I.	1011·4	— 1·6	87	71	85	74	79·5	+ 1·7	75	79	4	0·52	— 2·14	12	...	...
Toronto.....	1011·8	— 5·5	61	6	40·4	28·5	34·5	+ 4·9	...	...	7·7	1·99	— 0·42	8	3·3	28
Winnipeg	1011·9	— 7·3	40	—25	27·0	9·2	18·1	+ 3·1	...	...	6·5	1·89	+ 0·73	14	3·6	30
St. John, N.B.	1014·9	+ 0·8	60	4	43·6	29·1	36·3	+ 7·9	32·1	84	7·9	4·01	— 0·53	16	3·8	32
Victoria, B.C.....	1017·8	+ 1·9	56	27	46·7	37·4	42·1	— 1·4	38·6	79	7·3	2·25	— 0·18	19	4·9	41

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

(33540) Wt. 19/32 1,050 9/36 Hw. G.377



CONFERENCE ON ATMOSPHERIC OZONE, OXFORD, SEPTEMBER 9TH–11TH, 1936