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## The Weather of June to November, 1937

The weather of the summer and autumn of 1937, though not strikingly abnormal in this country, shows several features of interest. The regular broadcasts of "Climat" data now provide a means for the rapid and easy discussion of the changes of weather month by month over a considerable area, and the following account is based mainly on the maps regularly prepared in the Meteorological Office from these broadcasts.

The prevailing characteristics of the weather of June to November over most of Europe were general warmth and to a less extent dryness. The high temperatures began in April, when northern Europe was more than 10° F. above normal, while in May most of Europe exceeded the normal by 4° to 8° F., but both these months had an excess of rain in the British Isles. In June and July nearly the whole of Europe enjoyed temperatures a degree or two above normal; rainfall was variable, but deficient in England and the neighbouring parts of Europe. August was very fine and warm in the British Isles, Scandinavia and western Europe. In September the warmth was maintained but apart from Great Britain rainfall was generally in excess. October was again warm and dry, especially in Scandinavia.

The main feature of the pressure distribution during these months was the extension of the Azores anticyclone north-eastwards towards the British Isles. This was well shown in June, when the pressure at

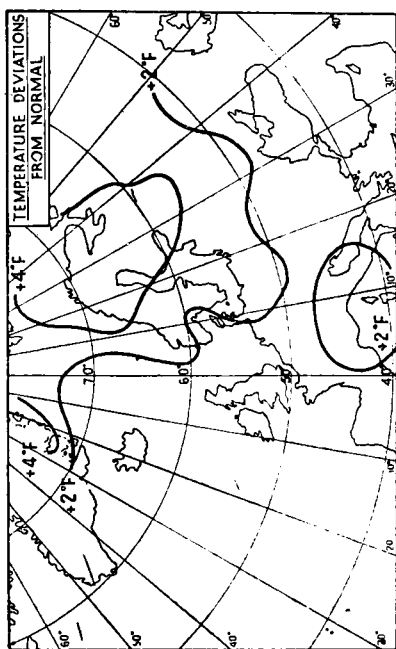


Fig. 3

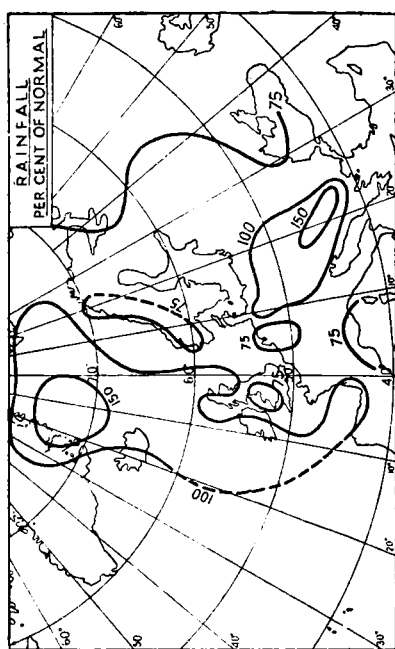


Fig. 4.

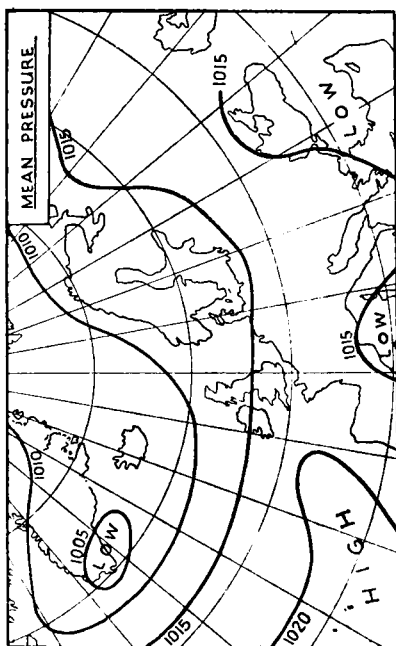


Fig. 1

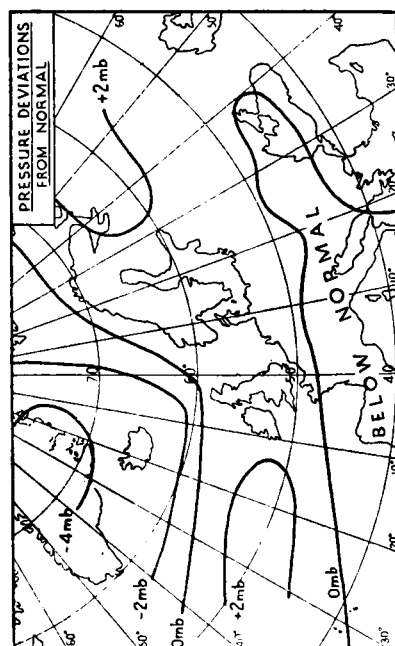


Fig. 2.

THE WEATHER OF JUNE TO OCTOBER, 1937

Valentia, 1020 mb., was only 1 mb. below that of the Azores. The characteristic of this type of distribution is that the isobars, running fairly parallel from west to east over the western Atlantic, open out over southern England, giving divergent winds and very pleasant weather. This feature is clearly seen in Fig. 1, which represents the average pressure distribution during the months of June to October. In July the extension of the Azores anticyclone lay further south, towards the Bay of Biscay, but in August it was again off south-west Ireland. In that month the British Isles and Scandinavia were covered by a ridge of high pressure connecting the Azores anticyclone with another centre over northern Russia. September showed a reversion to a more cyclonic type over the British Isles, but October again gave a slight ridge of high pressure from the Azores across northern England to Russia.

Fig. 2 shows deviations of pressure from normal for the period June to October and brings out clearly the ridge of pressure above normal extending across the British Isles and Scandinavia between centres west of Ireland and in the north of Russia.

Fig. 3 shows the deviations of temperature from normal. The whole area shows an excess, ranging from  $0.2^{\circ}$  F. at Valentia to  $4.9^{\circ}$  at Bodö. Fig. 4 gives a simplified representation of the distribution of precipitation as a percentage of normal. The greater part of Great Britain was below normal, but the deficit exceeded 25 per cent only in Wales and neighbouring parts of England. The distribution over Europe was irregular, but only the central areas showed an excess and there were several areas with a deficit of more than 25 per cent.

It was not possible to include the data for November in the charts of Figs. 1-4, but the generally dry, relatively mild weather continued during that month. The Siberian anticyclone was well developed, pressure near the Gulf of Obi being 20 mb. above normal, while the area of high pressure extended westwards across the British Isles, Lerwick being 10 mb. above normal. Pressure was relatively low over the Atlantic west of Ireland. Temperature was again above normal over the whole of Europe except southern Ireland and England, part of France and the Rhine Valley and a small area in Norway; the excess was above  $5^{\circ}$  F. in Finland and northern Russia. Rainfall was again less than the normal over the whole of the British Isles except Cornwall, the deficient area including the Norwegian coast, the whole of western and central Europe and most of the Mediterranean.

The rainfall over the British Isles generally was below the average in four out of the six months and the rainfall of the other two months, July and September only slightly exceeded the average. The percentage amounts were 81, 63, 80 and 54 during the months June, August, October and November respectively. The general monthly amounts over England and Wales were less than the average during

each of the six months June to November. The amounts for August and November were only 46 and 62 per cent of the respective averages. There were six consecutive dry months over England and Wales as recently as April to September, 1933, but only two occasions since 1870 in which each month June to November gave less than the average, viz., 1919 and 1901. The total rainfall June to November, 1937, was 13·6 in. compared with 15·0 in., 14·3 in. and 11·8 in. in 1934, 1933 and 1921 respectively. The rainfall for the first five months of the year, however, was 21·2 in. so that the total for January to November, 1937, is 34·8 in. or only 0·4 in. short of the average for the whole year.

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## Wind Velocity and Sea Disturbance at Coastal Stations

That land masses, in sheltering coastal seas from the wind, have considerable effect in reducing sea disturbance, and that the length of "fetch" of the wind also plays a major part in the resultant height of waves, is generally accepted; but with the exception of the works of Dr. Cornish\* on the effect of wind in the open sea, there is little data published on the subject, and numerical values connecting wind velocity and sea disturbance around our coasts seem to be entirely absent.

Data regarding the state of the sea and the force of the wind for some twenty odd coastal stations are published each day in the *Daily Weather Report*, and in order to ascertain to what extent exposure affects the sea disturbance for a given velocity, the data from the stations at Tiree, Point of Ayre, Spurn Head and Scilly were extracted from the report each day during the year ending September 30th, 1937.

Tiree is an island station with very open exposure to the west and surrounded by relatively deep water. Point of Ayre, on the Isle of Man, is almost centrally situated in the northern half of the somewhat land-locked Irish Sea. Spurn Head, while entirely sheltered from the west by the mainland of Great Britain, is completely exposed to the east to the comparatively shallow, but relatively extensive North Sea. Scilly, at the entrance to the English Channel, is most exposed to the deep waters of the Atlantic to the south-west, but has shallower water to the east and north.

The state of the sea at these stations was tabulated each day against the corresponding wind direction and force, and the mean disturbance was calculated for each step on the Beaufort Scale for winds from each point of the compass.

The final means of disturbance were then converted into wave amplitude in feet according to the standard scale as defined on p. 151

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\* See *London, Quart. J. R. met. Soc.*, 52, 1926, pp. 145-60.

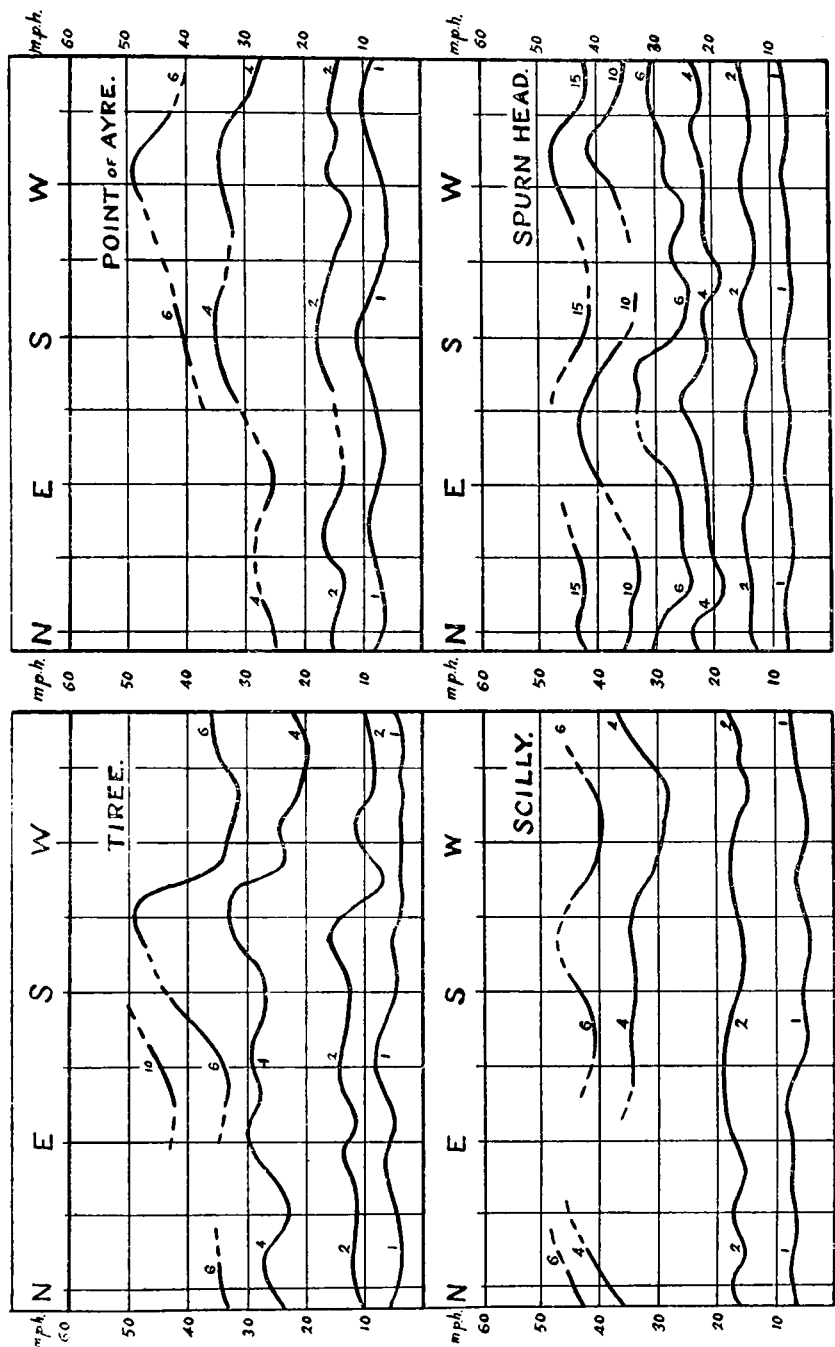


FIG 1.

of the "Meteorological Glossary", 1930 Ed., and the corresponding wind force was converted into velocity in miles per hour according to the scale given on p. 32 of the "Meteorological Glossary", 1930 Ed.

From the figures so obtained, the attached isopleth diagrams (Fig. 1) were prepared. These curves being drawn without smoothing, give a fair representation of the relation between wind velocity and wave amplitude at the respective stations, and are drawn for waves of 1, 2, 4, 6, 10 and 15 ft. amplitude. It will be noted that waves exceeding 10 ft. in amplitude were not experienced at Point of Ayre or at Scilly, and were found at Tiree only with winds above gale force from the south-east. Waves of fifteen or more feet amplitude were recorded with winds of gale force from all directions except the east and south-west at Spurn Point.

In order to ascertain the comparative effect of fetch of the wind on wave amplitude, the mean amplitude for all winds for the whole year was calculated for each station; and the resultant curves are shown in Fig. 2. It will be seen that Point of Ayre, which has the least

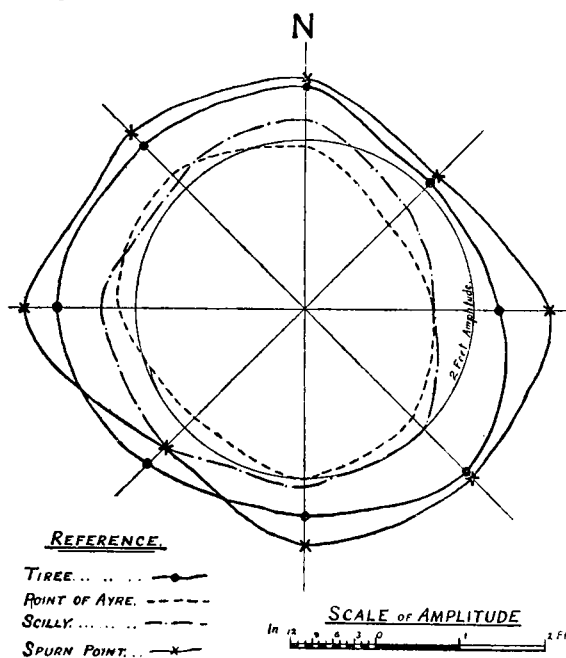


FIG. 2

fetch in all directions, certainly has the least mean amplitude; but in this figure also, it will be seen that the mean amplitude with westerly winds is only a few inches less at Point of Ayre than at Scilly, where the fetch of westerly winds is, in comparison, infinitely greater. It also will be noted that, as a whole, the mean amplitude at Spurn Point exceeds all other stations, and only is exceeded by Tiree with winds from the south-west.

That the coast line in the immediate vicinity of the observing station has much effect on sea disturbance is clearly shown in Fig. 3. In this figure, the mean amplitude for all winds at Spurn Head is plotted on a map of the district, and here, the sheltering effect of the Lincolnshire Coast on winds from the south-west quadrant is as outstanding as is the marked increase in amplitude with winds blowing down the estuary of the River Humber from the west. In the latter case, the increase in sea disturbance is possibly due to

both the wind and the river flowing against the in-coming tides ; in any case, the length of fetch from this azimuth is negligible.

It may be argued that the period under review is far too short for the purpose of the investigation, but, on the other hand, the mean amplitude for a given wind velocity from a specified direction at any station is unlikely to show any appreciable variation from year to

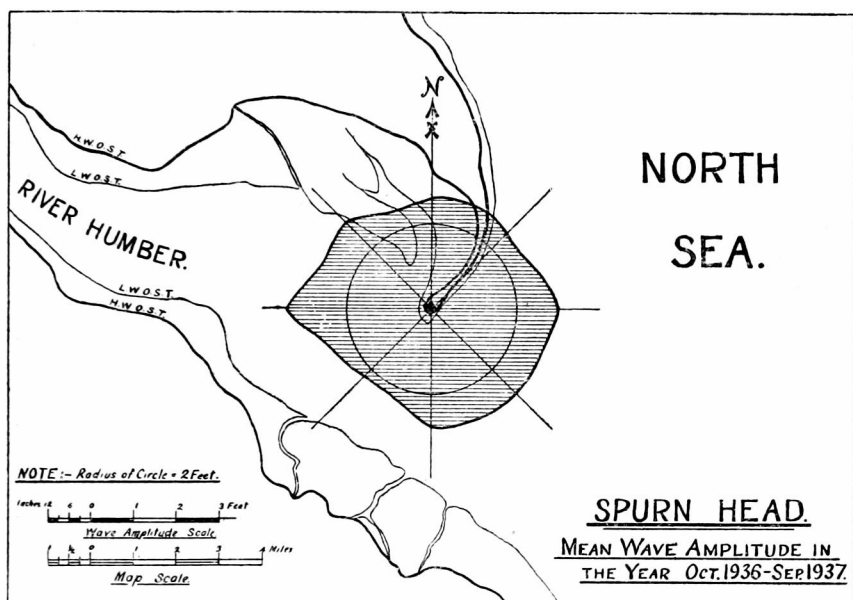


FIG. 3

year, and therefore the ratio between the disturbance at any two or more stations will naturally remain approximately constant ; and it would seem that from the point of view of a coast-wise sailing mariner, there is little difference between the storminess of any of the seas around the coasts of our islands.

From the results obtained, it would seem that the greater depth of sea associated with a longer fetch tends to reduce the sea disturbance, and that the shallower seas are the more easily disturbed by the wind.

In the summary of gales experienced in the several districts of the British and Irish coasts in the forty years, 1876-1915,† it is stated that "the North-West Coast of Ireland is the stormiest and the East Coast of England the least stormy." Doubtless, when considering the frequency of gales, this is correct ; but unless the estimates of sea disturbance from stations on the west coast are unduly modest, it would seem that the North Sea is the more easily disturbed by wind than is the Atlantic, and one is inclined to wonder what happens to the sometimes mountainous seas of the latter, which causes them to lose their amplitude before reaching our western seaboard.

DONALD L. CHAMPION

† See "The Weather of the British Coasts," London, 1918, p. 21.

## Problems of Forecasting

### Persistence of Residual Showers

During the morning of Tuesday, November 16th, 1937, the southern North Sea between East Anglia and Holland was a region of very uniform pressure and light variable wind, with appropriate fine or foggy weather over the adjacent land areas. Over the maritime area between it was natural to expect no low cloud, and nothing worse to the aviator than haze. It was, therefore, disconcerting when a pilot flying over Kentish Knock light-vessel (lat.  $51^{\circ} 39' N.$ , long.  $1^{\circ} 41' E.$ ) at 1000 G.M.T. reported a heavy rain shower from an isolated cumulus cloud, base 1,200 ft., top 6,000 ft. The cloud was at that time stationary as it was met with again without marked change of form or intensity over Kentish Knock by the same pilot at 1100.

The interesting question arises—how could a vigorous shower come to exist under conditions which would normally be associated with no low cloud? A solution is indicated by overnight change of pressure distribution and air motion.

The showery northerly current which prevailed in the North Sea throughout Monday, November 15th, was displaced quickly eastwards during the night of the 15th to 16th, so that by 0700 on the 16th almost the whole of the North Sea was a region of very light winds up to 10,000 ft. at least. It is therefore feasible to suppose that the Kentish Knock shower was one left "suspended" by the rapid retreat eastwards of its means of propulsion—the northerly winds of the 15th. It can conveniently be called a residual shower. With the onset of a south-easterly wind (extending to 6,000 ft. by 1400 at Bircham Newton) during the afternoon of the 16th, this shower "got under way" again, and was presumably the one reported in turn from Felixstowe, Thetford, and King's Lynn, with progressive disintegration into stratocumulus and diminution of intensity.

However, a second problem is immediately raised—how was the shower able to maintain its activity over Kentish Knock after the cessation of the northerly wind, especially as rain appears to have fallen from it continuously? Why did it not quickly die away?

The temperature at North Hinder light-vessel at 0700 on the 16th was  $48^{\circ} F.$  This, taken in conjunction with the Mildenhall upper air temperatures of that morning, indicates instability for saturated air over the southern North Sea up to 6,000 ft. (in accordance with the reported height of the top of the cumulus over Kentish Knock). It now remains to find a mechanism which could produce convergence. Under such stagnant conditions, the mechanism may have been the land breezes arising from the sharp contrast of temperature between land and sea. These were plainly convergent, being from a westerly point along the east English coast, and from an easterly point along the coasts of Holland and Belgium. There would, therefore, be a tendency for forced ascent of the surface layers



of air over the maritime region between the coasts. This tendency would presumably materialise where ascent could most readily take place, i.e., beneath stationary residual shower-clouds, where the air would be saturated by rain. In this way, the life of the shower would be prolonged.

Another shower of slight intensity, from an isolated cumulus cloud (base 2,500 ft.) was reported from Norwich at 1840 on the 16th. In fact, it is quite probable that several residual showers were scattered about in the extreme southern North Sea on the morning of the 16th, and commenced to move north-west during the afternoon, being now resuscitated by turbulence.

In the continental air following behind, showers would be absent. It would then be expected that showers along the east coasts of England and south-east Scotland would be restricted to the first few hours after the establishment of the south-easterly current. This actually was so. Showers at Spurn Head, Tynemouth, and St. Abbs Head were confined to the period 1800 on the 16th to 0700 on the 17th. Thereafter weather was fair.

F. E. LUMB.

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### OFFICIAL PUBLICATION

The following publication has recently been issued :—

#### GEOPHYSICAL MEMOIRS.

No. 74. *On the travel of seismic waves from the Baffin Bay earthquake of November 20, 1933.* By A. W. Lee, D.Sc. (M.O. 419b). A large earthquake which occurred in Baffin Bay late on November 20th, 1933, was recorded by seismographs in all parts of the world. The position in relation to the numerous seismological stations in Europe and America was such as to provide material for a precise determination of the times of travel of the earthquake waves for distances of about 40°. The records of 99 observatories were collected and examined at Kew Observatory, and comparisons were made between the times of travel of the primary and secondary waves and those calculated from various tables. A new table for times of travel of secondary waves was computed for distances between 25° and 50°, which gives satisfactory agreement with the observations.

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### Discussions at the Meteorological Office

The subject for discussion for the next meeting is :—

January 17th, 1938. *An account of the year's meteorological investigations on the North Atlantic Ocean carried out on the s.s. Manchester Port.* Opener, Mr. D. A. Davies, B.Sc.

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## Royal Meteorological Society

The first meeting of the new session was held on Wednesday, November 17th, at 49, Cromwell Road, South Kensington. Dr. F. J. W. Whipple, F.Inst.P., President, was in the Chair.

The Council of the Royal Meteorological Society has awarded the Symons Gold Medal for 1938 to Dr. G. M. B. Dobson, M.A., D.Sc., F.R.S., F.Inst.P., Reader in Meteorology in the University of Oxford. The medal is awarded biennially for distinguished work in connexion with meteorological science, and will be presented at the Annual General Meeting of the Society on January 19th, 1938.

The following papers were read and discussed :—

*T. E. W. Schumann, M.Sc., Ph.D.—The theory of hailstone formation.*

A fairly detailed mathematical analysis is presented of the generally accepted theory that the formation of large hailstones is due to the capture of under-cooled water drops which lie in their path. It is shown that the principal factors which determine the ultimate size of a hailstone are its average density, the height at which its nucleus is formed, the average upward velocity of the air and the concentration of condensed water in the region of the atmosphere where the temperature is below  $0^{\circ}$  C. The interrelation between these various factors is shown by means of a number of curves. It is further demonstrated that the values of water content of the clouds and of upward air velocities, measured or deduced independently, are sufficient to account for the formation of hailstones at least 8 cm. in diameter. The matter of the disposal of the latent heat of the water which solidifies on the surface of the hailstone is also examined in some detail, and it is shown that this heat is disposed of quite effectively, partly by conduction to the surrounding atmosphere and partly by evaporation from the surface of the hailstone. Only in the case where the surface temperature of the hailstone approaches  $0^{\circ}$  C. does its incapability to get rid of its surplus heat act as a factor retarding its rate of growth, and consequently its ultimate size.

*I. D. Margary, M.A.—Report on the phenological observations in the British Isles from December, 1935 to November, 1936.*

The year was remarkable for sunlessness generally, and also for wetness in England and Wales, but temperature after a cool winter remained close to normal. The result was a rather gloomy and inclement year due to lack of sunshine and excess of rain rather than to low temperature. Plants generally flowered late, all in the Midlands, nearly all in south-east and south-west England, and south Ireland, but were earlier in Scotland, especially in west Scotland. Floral isakairs show a late strip across southern Ireland and Wales, the Midlands and north-east England, with slight earliness over a wide area in north-east Ireland, the Scottish Lowlands and east coast. Insects were nearly all late in appearing in England, but

were very erratic in Scotland and in north Ireland. Spring migrants were generally late, save in Scotland, but the earliest arrivals were early as they just escaped the cooling of April. Spring migrant isophenes show a restriction of the usual early landing areas, with a rather slow advance afterwards. The autumn migrants were mostly early in moving.

*H. Fairfield Smith.—Report of a preliminary statistical investigation of flowering dates of plants recorded in the Phenological Reports of the Royal Meteorological Society.*

The phenological data collected by the Royal Meteorological Society are examined statistically with reference to the flowering dates of plants. A few representative parts of the available data are analysed in detail, and suggestions are made with regard to future phenological observations.

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## Correspondence

To the Editor, *Meteorological Magazine*

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### Typhoon at Hongkong, September 2nd, 1937

With reference to the account of this typhoon, published in the *Meteorological Magazine*, November, 1937, p. 235, Mr. C. Fowler has informed us that in a letter to him, Mr. T. E. Pearce of Hongkong says "as a matter of interest I was informed by the Manager of the Hongkong Electric Co. that the local Government Observatory Authorities tested their anemometer and found it set 3 m.p.h. lower than the correct reading. Such being the case, the wind velocity at the Electric Co.'s Works reached a maximum of 167 m.p.h."

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### A Green Moon

With reference to the green moon observed by Dr. Whipple (*Meteorological Magazine*, November, 1937, p. 230), I may state I saw it many times, any time, in fact, when at sunset or sunrise the sky was of a reddish hue or sprinkled with clouds coloured in red by the last (or first) rays of the sun just below the horizon.

As Dr. Whipple rightly surmised, it is only an effect of contrast or, better, of complementary colour. As well known, after looking at a red light, you cast your eyes upon a white surface, you see it of a greenish hue, green and red being complementary colours. The circumstances referred to by Dr. Whipple tally fully with this obvious explanation.

M. MOYE.

*University of Montpellier, France, November 29th, 1937.*

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On October 17th, between 6.45 and 7 p.m., when motoring from Peebles to Edinburgh, Mrs. Cairns, my two boys and I observed that

the moon was a very attractive and indescribable shade of green, and whilst it may have been like that for some time before we noticed the phenomenon, we could certainly vouch for the fact that the moon appeared in this colour for at least 10 minutes.

At the time there was no visible cloud—only a frosty evening haze on the hill tops, but the moon was above that. However, as we approached Edinburgh there was slight cloud movement which seemed immediately to bring the moon back to its normal brightness.

JAMES CAIRNS.

60, Netherby Road, Leith, November 25th, 1937.

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Dr. Whipple's request for information of occasions when the disc of the moon has appeared of a pale green colour prompts me to say that many observations of this phenomenon have been made at Aberdeen, chiefly when the moon is full or nearly so.

Sunsets in this region are often very vivid and the colouring of both sky and cloud is at times very intense and pure. These sunsets are most frequent and best developed with winds between SW. and WNW., and sometimes the colouring endures for an unusually long period and spreads across the whole sky from west to east. At such times the eastern sky becomes suffused with a rose-tinted light superposed upon the normal blue colouring; the resulting tint being a rosy-purple somewhat akin to that of the "purple light" seen in the west after sunset.

Surrounded by a sky of this colour the bright disc of the moon assumes, by the well-known effect of contrast, a colour complementary to the colour of the sky, and this assumed colour varies between pale apple green and pale emerald green according to whether the sky colour tends towards the purple or towards the red respectively.

It may be of interest to remark that, to eastward, a street of light grey granite houses faces the Observatory, and these houses have been seen also to assume the green tint, just as the moon does. The combined effect of green moon and green houses against the warm glow is rather weird and unearthly.

G. A. CLARKE.

The Observatory, King's College, Aberdeen, November 25th, 1937.

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### Exceptionally Good Visibility

In the *Meteorological Magazine* of September, 1937, Mr. Seton Gordon mentions a visibility of about 95 miles. The following case may be of interest.

On September 27th, 1937, as we approached the Canaries during a voyage from the Gulf of Guinea to Germany, the Peak of Teneriffe was clearly visible, 125 statute miles distant, in the light of the rising sun. After passing through the group in the middle of the day we could still see from the bridge the Isle of Palma, on the west of the group, sharply silhouetted against the western sky at sunset,

at a distance of 190 statute miles ; the island rises to about 7,700 ft., long.  $14^{\circ} 50'$  W. But for the oncoming of night the island seemed likely to remain visible for a long time. My own calculation of position and distance was corroborated by the Captain of the vessel.

The conditions were abnormal in the region in many respects. The Trades were found only between lat.  $20^{\circ} 30'$  N. and  $24^{\circ} 30'$  N., and even there they were weak. On each side it was almost calm and cloudless, and the air was remarkably clear, so that the masts of ships below the horizon stood out sharply. The sea surface temperature was abnormally high,  $85^{\circ}\text{F.}$  on the south side of the Trades (mean  $76^{\circ}\text{F.}$ ), and  $75^{\circ}\text{F.}$  on the north side (mean  $71^{\circ}\text{F.}$ ) on September 27th, the day of the extreme visibility mentioned above. The weather might be described as "perfect".

W. G. KENDREW.

*Radcliffe Meteorological Station, Oxford, November 21st, 1937.*

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### Lunar Halo with Paraselenae

At between 22h. and 22h. 10m. on November 14th, I had the good fortune to observe the following. In conjunction with a lunar halo were paraselenae, one on either side of the moon but just outside the halo ; also a distinct white band (corresponding with the parhelic circle) passing through the moon and extending some 10 degrees beyond the paraselenae. The sky was hazy at the time with cirro-nebula. It may also be interesting to record that a coloured corona close to the moon was visible at the same time, and appeared to be in relatively high cloud.

A. E. MOON.

*39, Clive Avenue, Clive Vale, Hastings, November 22nd, 1937.*

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### The Release of Pilot Balloons and Lanterns in turbulent Winds

In the discussion of equipment and methods for the night ascent of pilot balloons I find little reference to the fitting of a paper cap, threaded above the lantern, to obviate the risk of the candle being extinguished on release. I do not know with whom the idea originated but a personal method, using the cap, evolved during five years of regular night ascents at Croydon may be of interest.

With strong winds, eddies between the Administrative Block (from the roof of which the ascents were made) and the hotel to the north, and hangars to the south, frequently carry the balloon and lantern 40 ft. downwards towards the ground and buffet them severely.

A length, about  $3\frac{1}{2}$  ft., of stiffish string is used to suspend the lantern. This has an advantage over thread in that it is easily gripped in the teeth, freeing both hands to light the candle and extend the lantern. In cold weather it is more easily held, and the elimination of any factor likely to cause fumbling at the moment of release is most desirable. On the string is previously threaded a sheet of thin

typing paper, 11 in. by 8 in., rolled into a cone and secured so with a pin. This size allows a minimum overhang of about half an inch when slipped down over the lighted lantern. Incidentally the size of the illuminated objective is increased by about 50 per cent. With the balloon held by the neck, the string held taut with the other hand just above the cap—the lantern being steadied by the outstretched hand—and with an inclined swinging release down the wind, the use of an elastic inset becomes unnecessary.

Using this method, no difficulty was experienced with squally winds of force 5, and ascents were frequently made on occasions of force 6.

Dr. Whipple\* mentions the difficulty of carrying out night ascents from a ship at sea. Some practice in the simultaneous release of balloon and lantern is necessary, but it is thought that, if it has not already been tried, the method described would increase the chances of survival of the first turbulent minute, at the same time affording a larger objective during the earlier part of the ascent, when the apparent motion is greatest and the balloon requires most frequently to be "picked-up."

F. B. SWAIN.

*Meteorological Station, R.A.F., Heliopolis, Egypt, October 8th, 1937.*

## NOTES AND QUERIES

### Ground Rainbows

An interesting correspondence took place in *The Times* for November 17th–23rd on the subject of "ground rainbows". It was begun by Lord Dulverton, who wrote that on November 5th at Tadmarton Heath golf course near Banbury there was a thick fog until about 11.30 a.m. The ground was covered with a dense carpet of cobwebs saturated with particles of moisture. At 11.45 a brilliant sun broke through the fog, and Lord Dulverton and his companion, stepping on the fairway running due north, observed a perfect rainbow flat on the grass. It started at their feet and ran in an elliptical form to both sides of the fairway. It was faint compared with an ordinary rainbow in the sky, but was otherwise identical. When they turned from due north to due west the form of the rainbow also changed and instead of being elliptical became almost rectangular, one branch running north, the other east. The phenomenon lasted for about 1½ hours.

In addition to accounts of ground haloes and of true rainbows, this letter elicited descriptions of two very similar observations. One, made by Mr. J. Hills at Eton, which was almost identical with that described by Lord Dulverton. Mr. Farquharson Robertson, on the other hand, saw the horizontal rainbow at 7.30 a.m. on October 20th near Sevenoaks, when it took the form of a straight line stretching down the fairway in front of him.

Dr. F. J. W. Whipple has sent to the *Meteorological Magazine* the

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\* *London Met. Mag.*, 72, 1937, p. 117.

following comments on Lord Dulverton's observation. The light rays which constitute a rainbow form a circular cone, the axis of which points to the observer's head. With the sun low down (at Banbury on November 5th at midday the elevation would be  $22\frac{1}{2}^\circ$ ) the cone is cut by a horizontal surface in one branch of a hyperbola. It seems that at first Lord Dulverton noticed only the nearer part of the hyperbolic curve, the curve being cut off by the rough ground beyond the fairway. Later he had a chance to look along fairways on appropriate bearings and noticed the more distant parts of the curve. The asymptotes of the hyperbola would have been inclined at about  $70^\circ$ , in close enough agreement with Lord Dulverton's impression that the branches ran to north and east.

It may be added that shortly after sunrise, with the eye of the observer nearly on the level of the water drops, the horizontal rainbow would take approximately the form of two straight lines meeting at an angle of about  $84^\circ$ , and Mr. Farquharson Robertson evidently saw each arm in turn under these conditions.

The horizontal rainbow has been recorded as seen on a water surface on several occasions. Apparently it has not previously been described in detail in meteorological literature as occurring on gossamer, though Pernter and Exner mention its existence under the name *arc-en-terre*. Kokichi Ootobe\* has described a method of constructing an artificial horizontal rainbow by means of a glass plate, about 70 cm. square, coated with lamp black and sprayed with fine drops of water.

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### Naval Meteorology

The Admiralty have established a branch of the Hydrographic Department to take over the administrative duties connected with meteorology in the Fleet. The new Admiralty branch is to be known as the Naval Meteorological Branch of the Hydrographic Department and Captain L. G. Garbett, R.N. (ret'd.), has been placed in charge with the title Chief Superintendent of Naval Meteorology.

The change will involve a reorganization in the Meteorological Office, the remaining duties of the old Naval Division, of which Captain Garbett has been in charge since 1921, being allocated to other Divisions.

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### REVIEWS

*Hann-Süring, Lehrbuch der Meteorologie.* Fünfte vollständig neubearbeitete Auflage. Edited by Prof. Dr. R. Süring. Size,  $10\frac{1}{2}$  in.  $\times$   $7\frac{1}{2}$  in. Part I, pp. 1-96, Part II, pp. 97-192. *Illus.* Leipzig, 1937.

For many years Hann-Süring has served as a mine of information on all aspects of meteorology, so much so that it has always appeared wise to begin any new investigation by first consulting this book.

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\* *Tokyo, J. met. Soc. Japan*, 38, 1917, No. 2.

One could always count that if any earlier work had been done on the subject in question, it would be mentioned in Hann-Süring. And now there is appearing a new edition, under the general editorship of Professor Süring, who is being assisted by seven distinguished meteorologists, Professors Bartels, Mügge, Robitsch, and Weickmann, and Drs. Götz, Möller, and Müller.

The task facing the collaborators who are producing the new edition is no easy one. The earlier editions were encyclopaedic, but since the number of active meteorologists is increasing yearly, the number of papers on meteorological subjects is increasing with great rapidity, and so it becomes increasingly difficult to bring within the covers of one book any complete account of the present state of the subject. The general arrangement of the new edition appears to follow fairly closely that of the last edition. So far, two parts, each of 96 pages, have appeared, and eight further parts are to appear at an early date. From the contents of the two parts in hand it can be seen that an attempt is being made to cover the whole field of meteorology.

It is not the intention of the present reviewer to give a catalogue of the contents of the available parts of the work. They deal with questions of radiation, composition of the atmosphere in its widest sense, and the treatment of observations of temperature. An idea of the way in which completeness is attempted may be gathered from the fact that, in the section dealing with the diurnal variation of temperature are given the equations for the computation of the terms in the Fourier series which represent the daily variation. In practice one would require to know at what stage it would cease to be worth while evaluating any further harmonics in the Fourier series, but no guidance is given in this matter. Now if the standard deviation of the original figures to be analysed is  $\sigma$ , and if the amplitudes of the harmonic terms already computed are, say,  $R_1$  and  $R_2$ , then it is readily shown that the standard deviation  $\sigma'$  of the figures obtained when the original data are corrected for these two terms is given by

$$\sigma'^2 = \sigma^2 - \frac{1}{2}(R_1^2 + R_2^2)$$

If this standard deviation  $\sigma'$  comes out a very small quantity, there can be no further harmonics of appreciable amplitude in the observations. If the book is to serve as a complete guide to the discussion of observations by the method of harmonic analysis, then it would appear desirable that such results as the formula quoted above should be given. It is admittedly difficult to find room in one book for every conceivable result or method of analysis, and the present reviewer is inclined to think that when the sixth edition eventually has to be prepared, in the future, such matter as methods of computation will have to be omitted.

But on other parts of the subject the discussion leaves little to be desired, and the references to original papers are numerous and



up to date, some papers which appeared in 1936 being mentioned in the text. Hann's approximate form of the expression for the saturated adiabatic lapse rate is given, though the correct expression is quite as easy to derive. But everywhere in the text one finds complete references to every work of note on every branch of the subject of meteorology, and it is impossible to overestimate the amount of work which has gone into the making of the book, or its value to the practical meteorologist. And it is no reflection on the appreciation of its utility to add that naturally one does not accept the authors' estimate of all the works cited in the text. Meteorology will however cease to be an interesting subject for study when we all agree on all points.

We shall look forward with some eagerness to the appearance of the remaining parts of the book, which is going to fill a definite want of all active workers in meteorology.

D. BRUNT.

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*Weather Rambles.* By W. J. Humphreys, C.E., Ph.D. Size  $7\frac{3}{4}$  in.  $\times$   $5\frac{1}{2}$  in., pp. vii + 266. *Illus.* London, Baillière, Tindall and Cox, 1937. 11s. 6d. net.

In this pleasant little volume Dr. Humphreys, ensconced in his armchair, lets his pen wander through many odd by-ways of meteorology. He begins with some "tall stories" about tornadoes, changes casually to the "ice-ribbon plant" and the freaks of snow, and then branches off into one of his favourite topics, meteorological noises. The sixth and seventh rambles discuss what would happen if Greenland's icy mountains should happen to melt, and how we are just now "teetering" on the edge of an ice age. A chapter on economic meteorology is followed by a long digression, largely historical, into the composition of the atmosphere, from its main constituents down to the "odds and ends", including dust. Next comes an account of the structure of the atmosphere—troposphere, stratosphere, ionosphere, planetary winds, fronts, inversions and bumps—an impression of the overwhelming heating power of the sun compared with the stars, and a discussion of the origin of dew. There are three rambles among the facts, figures and theories about rain, a chat on hunting, and finally some remarks about "home-made weather".

The book thus covers most of the domain of the weather in an easy haphazard fashion, and at the end the reader will have learnt quite a lot of meteorology without effort. The author has the knack of driving home his lesson with a joke or an epigram, for example, it would be hard to phrase the effect of weather on scent more tersely than "dry dog, nice doggie; wet dog, phew!" It will suffice to add that the book is well printed and illustrated with a variety of beautiful photographs.

C. E. P. BROOKS.

### BOOKS RECEIVED

*Further evidence on the dependence of terrestrial temperatures on the variations of solar radiation.* By C. G. Abbot. Smithsonian. Misc. Coll., Vol. 95, No. 15, Washington, D.C., 1936.

*Klima, Witterung und Wetter in Deutsch-Ostafrika.* By Prof. Dr. G. Castens. Reprinted from the *Deutsch-Ostafrika Gestern und Heute*, Berlin.

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### The Weather of November, 1937

The Siberian anticyclone was very well-developed, pressure exceeding 1030 mb. over the greater part of Siberia between longitudes 55° E. and 120° E. A ridge of high pressure, about 1017 mb. extended westwards across Europe to Great Britain and there was a small anticyclone over east Greenland. Pressure was generally low over the Arctic and North Atlantic, the lowest pressures being 999 mb. north of Labrador, 1004 mb. at Bear Island and 1005 mb. near the Aleutian Islands. Over most of North America pressure was very uniform, about 1019 mb. The greatest deficits of pressure from normal were 9 mb. at the Azores and 7 mb. at Jan Mayen; the greatest excesses were 20 mb. in north-west Siberia, 10 mb. at Lerwick and 6 mb. in Arctic Canada.

The abnormal gradient for south-westerly winds over northern Russia and north-west Siberia was reflected in abnormally high temperatures, 10°–13° F. above normal, in north-west Siberia. Even at Viliousk in north-eastern Siberia, not far from the "cold pole," the mean was –18° F. compared with a normal of –31° F. In northern Canada on the other hand, under anticyclonic conditions, Chesterfield had a mean temperature of –6° F. compared with a normal of 0° F. In southern Siberia and the south-eastern United States temperatures were abnormally low, the deficit reaching 11° F. at Alma Ata, but most of Europe enjoyed a relatively mild month. In the British Isles only a small part of Scotland fell below 40° F. Precipitation was generally moderate, being less than normal over western Europe and most of North America, but above normal in south-eastern Europe and the Atlantic coast of the United States.

No broadcast data were received for Australia, New Zealand and the west Pacific. Data for the East Indies show that pressure did not differ greatly from normal. Temperature was above normal in Siam, reaching 82° F. at Rangsit, but was only about 75° F., 2° F. below normal, over much of the Dutch East Indies. Rainfall was abnormally heavy (several times the average) in parts of Indo China and the Philippines.

The main features of the weather of November over the British Isles were a general deficiency of rain, frequent mist or fog, and temperature considerably below normal in the south but about normal in the north. At Eskdalemuir, Renfrew and Leuchars the

total rainfall for November was the lowest recorded since observations began at these places in 1910, 1921 and 1922 respectively. Sunshine records were very variable; at Valentia and Lymgne the totals were 52 per cent and 36 per cent above normal respectively, while at Aldergrove the total was the lowest for November since records began there in 1927. On the 1st the weather was generally mild and unsettled with considerable rain in south-east England but much sun in west Scotland and west Ireland, 8.1 hrs. bright sunshine at Valentia and 7.9 hrs. at Tiree, but 1.66 in. of rain at Peaslake (Surrey). By the 2nd a ridge of high pressure had developed across the British Isles connecting the anticyclones over Russia and to the south of the Azores. During the next few days this ridge moved south-eastwards, while a deep depression advancing towards the western coasts gave rainy weather there with strong winds and gales on the 3rd and 4th. Elsewhere there was considerable mist or fog, though locally at a few places much sun. Maximum temperatures during this time were mainly between 50° and 60° F. By the 5th an anticyclonic wedge once more covered the British Isles. Conditions continued mainly anticyclonic from then to the 15th, though a shallow depression over the Bay of Biscay brought rain over most of England and Ireland on the 7th and 8th, and depressions over Scandinavia moving south caused northerly gales over the North Sea on the 10th with some rain along the eastern coasts on most days from the 9th to 15th and sleet or snow in north Scotland. Very little sun was experienced between the 5th and 8th, and temperature was generally above normal with some local mist or fog. With the change to northerly winds on the 9th temperature fell considerably, but there was frequently much sun in all districts, 8.5 hrs. at Torquay on the 10th. Towards the end of this period maximum temperatures below 40° F. were experienced at a few places and some sharp ground frosts occurred, 8° F. being registered on the ground at Rhayader and 10° F. at Marlborough on the 14th. Much mist and fog occurred on the 15th and 16th when a deepening depression was approaching the south-west. This caused strong S. to SE. winds or gales on the western coasts and in Scotland from the 16th to 18th and generally unsettled weather with heavy rain at times, 2.58 in. at Holne (Devon) on the 17th, 2.07 in. at Fofanny (Co. Down) on the 18th and 1.36 in. at East Ayton (Yorkshire) on the 19th. Temperature rose above 55° F. in the south-west on the 17th and 18th but remained low elsewhere. From then to the 22nd pressure was low over the country and the weather cold and unsettled with considerable rain at times but long bright periods. Snow occurred in several parts of Scotland and north England on the 19th and 20th, and sleet and hail generally. A thunderstorm was reported from Aberdeen on the 19th, and sharp frost on the 21st when 9° F. was recorded on the ground at Marlborough. On the 23rd a ridge of high pressure to the north of Scotland was moving

south while the depression over the Bay of Biscay brought mild weather temporarily to southern England with slight rain. From then to the 28th the high pressure area moved south and covered the country so that cold mainly dry weather with much mist or fog prevailed generally in the south while in the north the westerly winds until the 26th brought warmer clearer conditions. With the subsequent change to northerly winds the weather became colder temporarily also in the north. On the 28th a deep depression was approaching from the Atlantic, bringing mild unsettled weather with considerable rain at times to the country generally on the 29th and 30th. Strong S. to SW. winds occurred in the west on the 29th. The distribution of bright sunshine for the month was as follows :—

	Total	Diff. from		Total	Diff. from
	(hrs.)	normal		(hrs.)	normal
	(hrs.)	(hrs.)		(hrs.)	(hrs.)
Stornoway ..	41	— 5	Chester ..	61	+ 8
Aberdeen ..	44	— 15	Ross-on-Wye	53	— 10
Dublin ..	52	— 19	Falmouth ..	77	+ 1
Birr Castle ..	52	— 9	Gorleston ..	45	— 21
Valentia ..	96	+ 33	Kew ..	46	— 7

Kew, Temperature, Mean, 41·9, Diff. from average — 2·4.

In consequence of continuous rain, flooding occurred in the Bormida Valley (lying between Piedmont and Liguria) at the beginning of the month. Dense fog was experienced in the eastern English Channel on the 2nd and 3rd. Floods caused by the melting of the abnormally early snows were reported in Andorra on the 4th, and flooding caused a temporary interruption of the Air-France service between Paris and Cannes on the 5th. Gales occurred off the Lisbon Coast on the 18th, and renewed floods caused great damage in Portugal on the 20th. There was dense fog on the Netherlands and north French coasts on the 20th and 21st, causing damage to shipping. (*The Times*, November 4th–23rd.)

On the 10th drought was reported throughout the greater part of South Africa. (*The Times*, November 11th.)

The severe floods recorded in Syria at the end of October were reported to be subsiding on the 1st, although many villages were still cut off. Nine Arabs were reported to have been drowned and 200 to have been rendered homeless by floods in the Beersheba district. A typhoon occurred off the Philippines on the 11th and about 26 lighters were sunk. Heavy rain fell near Shanghai on the 15th and 16th. Gales were experienced off Hokkaido on the 19th. (*The Times*, November 2nd–20th.)

The total rainfall for the month was deficient over Victoria and Tasmania, but generally above normal over the rest of Australia, being about three times the normal on the north-east coast of New South Wales. (Cable.)

The first heavy snowfall of the season occurred in New England,

New York State and Ontario on the 21st, causing the death of eight people and doing much damage to property. In Jamaica 70 people were drowned by extensive flooding due to the heavy rains of the 20th and 23rd—a landslip, 200 acres in extent buried part of the Crown Reservation, and further rain on the 25th–29th caused another landslip. (*The Times*, November 23rd–December 1st.)

Gales were experienced on the North Atlantic on the 1st–3rd, and again on the 16th. (*The Times*, November 3rd–17th.)

### Daily Readings at Kew Observatory, November, 1937

Date	Pressure, M.S.L. 13h.	Wind, Dir., Force 13h.	Temp.		Rel. Hum. 13h.	Rain.	Sun.	REMARKS. (see vol. 69, 1934, p. 1).
			Min.	Max.				
	mb.		°F.	°F.	%	in.	hrs.	
1	1000·8	N.2	48	54	96	0·56	0·0	fe early, r 10h.–18h.
2	1012·3	SSW.1	45	49	95	—	0·0	Fe-f most of day.
3	1018·5	SSW.2	46	50	95	0·01	0·0	Fe-f most of day.
4	1020·4	S.1	43	55	83	—	0·8	Fe early, w late.
5	1021·7	NE.2	42	52	79	—	0·0	w late.
6	1020·8	E.3	44	50	83	0·01	0·0	d <sub>0</sub> f 9h.–11h.
7	1017·6	E.2	47	53	87	0·08	0·0	f 10h.–17h.
8	1017·8	E.2	47	54	79	0·11	0·0	r-r <sub>0</sub> 23h.–24h.
9	1021·9	NNE.4	49	50	59	—	4·0	r-r <sub>0</sub> 0h.–7h.
10	1017·3	NW.4	35	46	72	—	4·7	x early.
11	1021·0	NNW.4	38	48	74	—	1·5	w 18h.
12	1023·7	NW.2	36	49	63	—	5·4	x 21h.
13	1021·8	NW.2	29	42	61	—	6·0	f till 12h., x 21h.
14	1019·6	WNW.2	27	42	61	—	6·2	x early, f 8h.–10h.
15	1020·3	WSW.2	29	46	81	—	2·6	f 8h.–11h., F 21h.
16	1017·7	E.2	37	43	87	—	0·0	Fe-f till 17h.
17	1004·8	E.4	37	42	74	—	0·0	d <sub>0</sub> 13h., r <sub>0</sub> 24h.
18	995·2	ENE.4	39	44	94	0·03	0·0	f 9h.–15h., d <sub>0</sub> 20h.21h.
19	992·9	SW.4	43	48	66	0·13	5·8	r-r <sub>0</sub> 0h.–6h.
20	1006·4	NNW.3	34	41	73	—	1·1	x early, fx late.
21	1011·6	Calm.	25	32	96	—	0·0	Fx all day.
22	1011·0	SE.2	29	47	89	0·09	0·0	f till 11h., r 22h.–24h.
23	1014·0	SE.2	42	52	90	0·20	0·5	r <sub>0</sub> -r 0h.–7h.
24	1019·9	NE.3	44	49	70	—	0·9	
25	1028·8	WSW.1	30	39	93	—	2·3	F-f all day.
26	1025·5	WSW.1	28	43	86	—	3·0	F-f all day.
27	1023·1	NE.1	28	46	96	—	0·0	F till 13h.
28	1033·6	SW.1	30	39	96	—	0·4	Fx all day.
29	1028·9	SW.3	29	45	61	trace	1·2	Fe early, r <sub>0</sub> 23h.
30	1018·1	SSW.3	39	51	95	0·15	0·0	r <sub>0</sub> 0h.–3h., 16h.–22h.
*	1016·9	—	37	47	81	1·38	1·5	* Means or Totals.

### General Rainfall for November, 1937

England and Wales	...	62	} per cent of the average 1881–1915.
Scotland	...	30	
Ireland	...	61	
British Isles	...	54	

## Rainfall : November, 1937 : England and Wales

Co.	STATION.	In.	Per cent of Av.	Co.	STATION.	In.	Per cent of Av.
<i>Lond.</i>	Camden Square.....	1.26	53	<i>Leics.</i>	Thornton Reservoir ...	1.69	75
<i>Sur.</i>	Reigate, Wray Pk. Rd..	2.11	68	"	Belvoir Castle.....	1.23	55
<i>Kent.</i>	Tenterden, Ashenden...	1.18	39	<i>Rut.</i>	Ridlington .....	1.77	77
"	Folkestone, Boro. San.	1.35	...	<i>Lincs.</i>	Boston, Skirbeck.....	2.02	101
"	Margate, Cliftonville...	1.10	46	"	Cranwell Aerodrome...	1.20	64
"	Eden'bdg., Falconhurst	1.51	43	"	Skegness, Marine Gdns.	2.41	112
<i>Sus.</i>	Compton, Compton Ho.	2.61	69	"	Louth, Westgate.....	2.22	86
"	Patching Farm.....	1.89	53	"	Brigg, Wrawby St.....	1.72	...
"	Eastbourne, Wil. Sq....	1.31	37	<i>Notts.</i>	Mansfield, Carr Bank...	1.53	63
<i>Hants.</i>	Ventnor, Roy.Nat.Hos.	2.07	65	<i>Derby.</i>	Derby, The Arboretum	1.53	68
"	Fordingbridge, Oaklands	1.55	45	"	Buxton, Terrace Slopes	1.99	43
"	Ovington Rectory.....	2.62	79	<i>Ches.</i>	Bidston Obsy.....	1.48	59
"	Sherborne St. John.....	1.33	47	<i>Lancs.</i>	Manchester, Whit. Pk.	1.94	73
<i>Herts.</i>	Royston, Therfield Rec.	1.76	76	"	Stonyhurst College.....	1.56	35
<i>Bucks.</i>	Slough, Upton.....	1.20	54	"	Southport, Bedford Pk.	1.37	44
<i>Oxf.</i>	Oxford, Radcliffe.....	1.22	53	"	Ulverston, Poaka Beck	2.34	42
<i>N'hant.</i>	Wellington, Swanspool	1.74	81	"	Lancaster, Greg Obsy.	1.53	38
"	Gundle .....	1.70	...	"	Blackpool .....	1.52	44
<i>Beds.</i>	Woburn, Exptl. Farm...	1.84	82	<i>Yorks.</i>	Wath-upon-Deane.....	1.68	82
<i>Cam.</i>	Cambridge, Bot. Gdns.	1.79	93	"	Wakefield, Clarence Pk.	1.97	93
"	March.....	1.60	78	"	Oughtershaw Hall.....	1.91	...
<i>Essex.</i>	Chelmsford, County Gdns	1.93	86	"	Wetherby, Ribston H..	1.82	78
"	Lexden Hill House.....	1.55	...	"	Hull, Pearson Park.....	2.56	117
<i>Suff.</i>	Haughley House.....	1.29	...	"	Holme-on-Spalding.....	2.07	95
"	Rendlesham Hall.....	1.21	55	"	West Witton, Ivy Ho.	1.74	50
"	Lowestoft Sec. School...	1.46	62	"	Felixkirk, Mt. St. John.	2.27	93
"	Bury St. Ed., Westley H.	1.60	70	"	York, Museum Gdns....	1.92	92
<i>Norf.</i>	Wells, Holkham Hall...	1.63	76	"	Pickering, Hungate.....	2.10	84
<i>Wilts.</i>	Porton, W.D. Exp'l. Stn	1.22	47	"	Scarborough.....	2.30	93
"	Bishops Cannings.....	1.80	63	"	Middlesbrough.....	2.19	103
<i>Dor.</i>	Weymouth, Westham.	2.59	84	"	Baldersdale, Hury Res.	1.38	37
"	Beaminster, East St....	2.39	60	<i>Durh.</i>	Ushaw College.....	1.49	59
"	Shaftesbury, Abbey Ho.	1.60	50	<i>Nor.</i>	Newcastle, Leazes Pk...	1.91	81
<i>Devon.</i>	Plymouth, The Hoe....	2.99	82	"	Bellingham, Highgreen	1.07	31
"	Holne, Church Pk. Cott.	5.52	86	"	Lilburn Tower Gdns....	1.23	37
"	Teignmouth, Den Gdns.	2.72	85	<i>Cumb.</i>	Carlisle, Scaleby Hall...	0.75	25
"	Cullompton .....	2.31	67	"	Borrowdale, Seathwaite	4.50	35
"	Sidmouth, U.D.C.....	1.65	...	"	Thirlmere, Dale Head H.	2.92	31
"	Barnstaple, N. Dev. Ath	2.09	53	"	Keswick, High Hill.....	1.25	22
"	Dartm'r, Cranmere Pool	4.70	...	<i>West.</i>	Appleby, Castle Bank...	0.34	10
"	Okehampton, Uplands.	3.03	57	<i>Mon.</i>	Abergavenny, Larch'd	1.91	50
<i>Corn.</i>	Redruth, Trewirgie.....	3.53	72	<i>Glam.</i>	Ystalyfera, Wern Ho...	4.53	69
"	Penzance, Morrab Gdns.	3.48	76	"	Treherbert, Tynywaun.	4.50	...
"	St. Austell, Trevarna...	3.34	68	"	Cardiff, Penylan.....	2.40	59
<i>Soms.</i>	Chewton Mendip.....	3.11	73	<i>Carm.</i>	Carmarthen, M. & P. Sch.	2.81	55
"	Long Ashton.....	2.05	65	<i>Pemb.</i>	Pembroke, Stackpole Ct.	2.59	59
"	Street, Millfield.....	1.60	59	<i>Card.</i>	Aberystwyth .....	2.01	...
<i>Glos.</i>	Blockley .....	1.46	...	<i>Rad.</i>	Birm W.W. Tyrmynydd	1.92	29
"	Cirencester, Gwynfa...	1.71	57	<i>Mont.</i>	Newtown, Penarth Weir	...	...
<i>Here.</i>	Ross-on-Wye.....	1.19	47	"	Lake Vyrnwy .....	2.40	43
<i>Salop.</i>	Church Stretton.....	1.94	66	<i>Flint.</i>	Sealand Aerodrome.....	1.70	...
"	Shifnal, Hatton Grange	1.56	65	<i>Mer.</i>	Blaenau Festiniog .....	5.20	54
"	Cheswardine Hall.....	1.45	56	"	Dolgelley, Bontddu.....	2.11	34
<i>Worc.</i>	Malvern, Free Library...	1.42	56	<i>Carn.</i>	Llandudno .....	1.36	47
"	Ombersley, Holt Lock.	1.44	63	"	Snawdon, L. Llydaw 9..	6.60	...
<i>War.</i>	Alcester, Ragley Hall...	1.83	79	<i>Ang.</i>	Holyhead, Salt Island...	1.85	45
"	Birmingham, Edgbaston	1.57	66	"	Lligwy .....	2.51	...

## Rainfall : November, 1937 : Scotland and Ireland

Co.	STATION.	In.	Per cent of Av.	Co.	STATION.	In.	Per cent of Av.
<i>I. Man.</i>	Douglas, Boro' Cem....	2.37	50	<i>R&amp;C</i>	Achnashellach.....	2.67	29
<i>Guern.</i>	St. Peter P't. Grange Rd.	2.82	67	"	Stornoway, C. Guard Stn.	2.23	38
<i>Wig</i>	Pt. William, Monreith.	1.68	39	<i>Suth.</i>	Lairg.....	.91	23
"	New Luce School.....	1.48	29	"	Skerry Borgie.....	2.61	...
<i>Kirk</i>	Dalry, Glendarroch.....	1.44	24	"	Melvich.....	2.01	50
<i>Dumf.</i>	Dumfries, Crichton R.I.	.98	28	"	Loch More, Achfary....	4.27	50
"	Eskdalemuir Obs.....	1.19	21	<i>Caith.</i>	Wick.....	1.46	46
<i>Rozb.</i>	Hawick, Wolfelee.....	.76	20	<i>Ork</i>	Deerness.....	1.83	47
<i>Peeb.</i>	Stobo Castle.....	.65	20	<i>Shet.</i>	Leerwick.....	2.13	54
<i>Berw.</i>	Marchmont House.....	.70	23	<i>Cork</i>	Cork, University Coll...	3.57	89
<i>E. Lot.</i>	North Berwick Res.....	.51	23	"	Roches Point, C.G. Stn.	3.87	92
<i>Midl.</i>	Edinburgh, Blackfd. H.	.24	11	"	Mallow, Longueville....	4.59	123
<i>Lan</i>	Auchtyfardle.....	.81	...	<i>Kerry.</i>	Valentia Observatory...	5.61	103
<i>Ayr</i>	Kilmarnock, Kay Park	.61	...	"	Gearhameen.....	6.80	70
"	Girvan, Pinmore.....	.73	14	"	Bally McElligott Rec...	2.84	...
"	Glen Afton, Ayr San. ...	1.14	21	"	Darrynane Abbey.....	3.44	67
<i>Renf.</i>	Glasgow, Queen's Park	.53	14	<i>Wat.</i>	Waterford, Gortmore...	3.14	85
"	Greenock, Prospect H.	1.76	27	<i>Tip</i>	Nenagh, Castle Lough.	1.80	45
<i>Bute</i>	Rothsay, Ardenraig...	1.53	30	"	Cashel, Ballinamona...	2.98	86
"	Dougarie Lodge.....	2.93	56	<i>Lim.</i>	Foynes, Coolananes.....	...	...
<i>Arg.</i>	Loch Sunart, G'dale....	1.95	26	<i>Clare.</i>	Inagh, Mount Callan...	4.11	...
"	Ardgour House.....	2.25	...	<i>Wexf.</i>	Gorey, Courtown Ho...	2.39	68
"	Glen Etive.....	...	...	<i>Wick.</i>	Rathnew, Clonmannon...	2.20	...
"	Oban.....	1.97	...	<i>Carl.</i>	Bagnalstown, Fenagh H.	2.57	77
"	Poltalloch.....	2.15	38	"	Hacketstown Rectory...	2.14	45
"	Inveraray Castle.....	2.50	30	<i>Leix.</i>	Blandsfort House.....	1.84	55
"	Islay, Eallabus.....	2.63	49	<i>Offaly.</i>	Birr Castle.....	1.47	47
"	Mull, Benmore.....	5.20	36	<i>Kild.</i>	Straffan House.....	1.56	50
"	Tiree.....	1.81	37	<i>Dublin</i>	Dublin, Phoenix Park...	2.17	77
<i>Kinr.</i>	Loch Leven Sluice.....	.48	13	"	Balbrigan, Ardgillan...	2.36	82
<i>Fife</i>	Leuchars Aerodrome...	.52	23	<i>Meath.</i>	Kells, Headfort.....	1.60	47
<i>Perth.</i>	Loch Dhu.....	1.10	13	<i>W.M.</i>	Moate, Coolatore.....	1.11	...
"	Crieff, Strathearn Hyd.	.39	9	"	Mullingar, Belvedere...	1.39	38
"	Blair Castle Gardens...	.61	17	<i>Long.</i>	Castle Forbes Gdns.....	1.04	29
<i>Angus.</i>	Kettins School.....	.25	8	<i>Gal.</i>	Galway, Grammar Sch.	2.13	52
"	Pearsie House.....	.45	...	"	Ballynahinch Castle...	3.40	57
"	Montrose, Sunnyside...	.67	25	"	Ahascragh, Clonbrock.	1.44	36
<i>Aber.</i>	Balmoral Castle Gdns...	.78	21	<i>Rosc.</i>	Strokestown, C'node....	1.02	30
"	Logie Coldstone Sch....	1.07	35	<i>Mayo.</i>	Blackad Point.....	3.79	73
"	Aberdeen Observatory.	1.65	56	"	Mallaranny.....	2.73	...
"	New Deer School House	2.15	64	"	Westport House.....	3.11	63
<i>Moray</i>	Gordon Castle.....	1.73	60	"	Delphi Lodge.....	6.76	65
"	Grantown-on-Spey.....	1.11	37	<i>Sligo.</i>	Markree Castle.....	1.61	38
<i>Nairn.</i>	Nairn.....	.62	26	<i>Cavan.</i>	Crossdoney, Kevit Cas.	1.79	...
<i>Inw's</i>	Ben Alder Lodge.....	.68	...	<i>Ferm.</i>	Crom Castle.....	1.97	57
"	Kingussie, The Birches.	.42	...	<i>Arm.</i>	Armagh Obsy.....	1.26	44
"	Loch Ness, Foyers.....	...	...	<i>Down.</i>	Fofanny Reservoir.....	5.05	...
"	Inverness, Culduthel R.	.57	22	"	Seaforde.....	2.11	56
"	Loch Quoich, Loan.....	2.41	...	"	Donaghadee, C. G. Stn.	1.69	55
"	Glenquoich.....	2.71	23	<i>Antr.</i>	Belfast, Queen's Univ...	1.69	50
"	Arisaig House.....	2.42	36	"	Aldergrove Aerodrome.	.69	21
"	Glenleven, Corrour.....	...	...	"	Ballymena, Harryville.	1.45	36
"	Fort William, Glasdrum	1.06	...	<i>Lon.</i>	Garragh, Moneydig....	1.44	...
"	Skye, Dunvegan.....	3.25	...	"	Londonderry, Creggan.	1.59	39
"	Barra, Skallary.....	2.41	...	<i>Tyr.</i>	Omagh, Edenfel.....	2.22	58
<i>R&amp;C.</i>	Alness, Ardress Castle.	...	...	<i>Don.</i>	Malin Head.....	2.59	...
"	Ullapool.....	1.83	34	"	Dunkineely.....	1.53	...

## Climatological Table for the British Empire, June, 1937

STATIONS.	PRESSURE.		TEMPERATURE.							Relative Humidity.	Mean Cloud Am't.	PRECIPITATION.			BRIGHT SUNSHINE.					
	Mean of Day M.S.L.	Diff. from Normal.	Absolute.		Mean Values.							Mean.	Wet Bulb.	Am't.	Diff. from Normal.	Days.	Hours per day.	Percentage of possible.		
			Max.	Min.	Max.	1/2 Max. and Min.	Diff. from Normal	°F.	°F.										°F.	°F.
London, Kew Obsy.....	1018.1	+ 1.4	81	47	68.9	52.3	60.6	+ 1.6	53.4	78	6.7	1.81	11	6.9	42					
Gibraltar .....	1017.3	0.0	80	58	73.3	61.3	67.3	- 3.2	59.7	77	3.7	0.11	2	...	...					
Malta .....	1016.2	+ 1.0	89	64	81.0	69.3	75.1	+ 2.4	68.2	71	3.8	trace	0	10.4	72					
St. Helena .....	1015.8	- 0.5	68	55	64.3	57.7	61.0	+ 1.2	57.7	88	8.8	1.76	13	...	...					
Freetown, Sierra Leone .....	1012.7	+ 2.4	89	69	86.4	73.2	79.8	...	75.7	80	5.5	10.66	24	...	...					
Lagos, Nigeria .....	1012.8	+ 0.4	89	74	85.7	76.3	81.0	+ 1.5	76.3	87	8.2	20.04	17	5.3	43					
Kaduna .....	1012.0	...	93	66	87.8	69.8	78.8	+ 2.3	72.3	84	6.3	5.63	13	7.9	62					
Zomba, Nyasaland .....	1016.2	- 1.5	82	46	75.2	53.6	64.4	+ 1.5	59.4	72	2.5	0.87	2	...	...					
Salisbury, Rhodesia....	1019.6	- 1.0	78	36	72.6	44.0	58.3	+ 1.4	49.1	47	1.3	0.00	0	8.5	77					
Cape Town .....	1019.9	- 0.2	71	43	61.9	50.7	56.3	+ 0.6	51.4	93	6.4	8.05	19	...	...					
Johannesburg .....	1021.2	- 0.5	68	31	62.0	42.4	52.2	+ 1.5	39.7	34	0.1	0.00	0	9.7	92					
Mauritius .....	1018.3	- 0.5	79	54	75.9	61.9	68.9	- 0.5	66.9	77	4.9	1.06	13	6.9	63					
Calcutta, Alipore Obsy. ....	998.5	- 1.2	99	74	91.5	79.4	85.5	+ 0.4	80.4	87	8.2	17.52	13*	...	...					
Bombay .....	1003.6	- 0.4	94	73	88.4	78.9	83.7	- 0.3	78.2	81	6.6	18.32	16*	...	...					
Madras .....	1002.7	- 1.1	105	77	99.9	82.9	91.4	+ 1.4	75.9	56	8.1	1.75	1*	...	...					
Colombo, Ceylon .....	1008.7	+ 0.1	86	74	85.3	78.7	82.0	+ 0.4	78.0	78	7.6	6.17	18	8.0	64					
Singapore .....	1008.8	- 0.1	89	73	86.8	77.8	82.3	+ 0.8	78.2	79	7.6	4.88	12	6.4	53					
Hongkong .....	1004.7	- 1.1	90	71	85.8	78.3	82.1	+ 0.7	78.0	84	8.6	13.27	25	4.0	30					
Sandakan .....	1008.7	...	92	72	89.7	75.9	82.8	+ 1.1	77.5	84	6.8	7.17	13	...	...					
Sydney, N.S.W. ....	1018.9	+ 1.0	68	44	59.7	48.2	53.9	- 0.8	49.9	83	7.3	15.80	20	3.5	35					
Melbourne .....	1022.4	+ 3.9	61	30	54.6	37.8	46.2	- 4.2	40.9	92	5.5	1.25	10	4.4	45					
Adelaide .....	1021.0	+ 1.6	68	38	60.6	45.4	53.0	- 0.6	48.4	77	5.6	1.94	14	4.6	47					
Perth, W. Australia .....	1018.2	+ 0.2	71	36	64.9	48.4	56.7	- 0.1	50.9	73	5.8	8.97	13	5.5	55					
Coolgardie .....	1019.4	+ 0.5	71	34	62.0	42.2	52.1	- 0.7	47.2	77	4.1	1.01	4	...	...					
Brisbane .....	1016.9	- 1.4	71	43	67.4	51.0	59.2	- 1.0	52.1	66	4.0	0.73	8	...	...					
Hobart, Tasmania .....	1025.1	+ 10.8	52	30	48.9	37.3	43.1	- 3.9	38.3	81	5.0	1.31	12	4.2	46					
Wellington, N.Z. ....	1016.6	+ 1.7	60	34	49.5	41.3	45.4	- 4.1	43.0	80	7.2	3.33	21	2.8	30					
Suva, Fiji .....	1013.0	- 0.6	89	67	82.1	71.6	76.9	+ 2.2	72.6	83	5.7	2.23	14	5.4	49					
Apia, Samoa .....	1011.4	- 0.2	86	71	84.9	73.6	79.3	+ 1.5	75.2	76	4.7	0.65	9	8.2	73					
Kingston, Jamaica .....	1013.8	0.0	91	71	88.1	74.2	81.1	- 0.2	73.0	76	5.0	0.70	3	6.0	45					
Grenada, W.I. ....	1011.6	- 1.7	87	70	84	73	78.5	- 0.5	73	74	6	6.00	22	...	...					
Toronto .....	1013.3	- 1.4	84	48	74.5	57.3	65.9	+ 2.1	58.7	76	4.1	3.64	12	9.0	58					
Winnipeg .....	1011.9	+ 0.1	90	36	75.0	49.9	62.5	+ 0.2	51.7	84	4.1	2.32	11	10.1	62					
St. John, N.B. ....	1012.6	- 0.9	78	46	67.4	51.2	59.3	+ 2.8	55.6	84	7.0	4.61	16	6.6	42					
Victoria, B.C. ....	1015.2	- 1.6	82	48	65.9	51.0	58.5	+ 1.5	54.0	77	5.5	2.21	14	7.7	48					