

METEOROLOGICAL OFFICE.

BRITISH METEOROLOGICAL AND MAGNETIC YEAR BOOK, 1917,
PART III., SECTION 2.

GEOPHYSICAL JOURNAL, 1917,

COMPRISING

DAILY VALUES OF THE METEOROLOGICAL AND GEOPHYSICAL ELEMENTS

AT THREE OBSERVATORIES OF THE METEOROLOGICAL OFFICE;

DAILY VALUES OF SOLAR RADIATION AT SOUTH KENSINGTON;

WIND COMPONENTS AT FIXED HOURS AT FOUR ANEMOGRAPH STATIONS;

TABULATIONS OF OCCASIONAL SOUNDINGS OF THE UPPER AIR;

AND RESULTS OF OBSERVATIONS OF CLOUD AND AURORA;

TOGETHER WITH AN ANNUAL SUPPLEMENT.

Published by Authority of the Meteorological Committee.



LONDON:

To be purchased from
THE METEOROLOGICAL OFFICE, EXHIBITION ROAD, LONDON, S.W. 7.

Price Ten Shillings Net.

1919.

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METEOROLOGICAL OFFICE.

BRITISH METEOROLOGICAL AND MAGNETIC YEAR-BOOK: GEOPHYSICAL JOURNAL.

INTRODUCTION TO THE TABLES FOR 1917.

THE Geophysical Journal gives daily values for the meteorological and geophysical elements observed at the three observatories of the Meteorological Office (Kew Observatory, Richmond, Surrey; Valencia Observatory, Cahirciveen, Co. Kerry; and Eskdalemuir Observatory, Dumfriesshire) and at the St Louis Observatory, Jersey. Data are given for Solar Radiation, Meteorology, Atmospheric Electricity, Terrestrial Magnetism, and Seismology. Wind components are given for four additional anemograph stations.

The results of ascents at Upper Air Stations at Aberdeen, Benson (which replaced Pyrton Hill in April 1914), Eskdalemuir, Cahirciveen, and South Farnborough, together with nephoscope observations made at Aberdeen, and tables showing the occurrences of Aurora, are included in the Journal.

Greenwich Mean Time is used in all cases, and the hours are counted from midnight and numbered 0 to 23; the second midnight of the day is referred to as 24 h.

All the units employed are based on the C.G.S. system. Data to which the letters x and z are attached represent the maximum and minimum values in the column.

The tables are as follows:—

1. **Sunshine and Solar Radiation.** The total number of hours of bright sunshine as measured by the Campbell-Stokes Recorder is given for South Kensington, Richmond, Eskdalemuir, and Cahirciveen; also the percentage this represents of the "possible," regarded as the number of hours from sunrise to sunset. The Campbell-Stokes instrument records only bright sunshine, no trace being obtained in thick haze or when the sun is very near the horizon. Thus the total it gives is less than the number of hours during which the position of the sun is visible to the naked eye. While the result is somewhat arbitrary, the records from different instruments of this pattern show a close agreement. The normal values for Richmond and Cahirciveen are from the 35 years 1881 to 1915; those for South Kensington and Eskdalemuir from the 5 years 1911 to 1915.

Solar radiation results are given for South Kensington, Richmond (Kew Observatory), and Eskdalemuir. At the two latter stations use is made of the Ångström pyrheliometer, which gives the radiation received from the sun by a unit surface which is normal to the line drawn from the instrument to the sun. This is

described as the intensity of radiation at Richmond and Eskdalemuir, to distinguish it from its vertical component, the two being connected by the formula

$$\text{vertical component} = \text{intensity} \times \cos Z,$$

where Z is the zenith distance of the sun. At Richmond the observations are made within half an hour of noon, and the vertical component is given as well as the intensity of radiation, to facilitate comparison with South Kensington. The hour of observation at Eskdalemuir being more variable is given explicitly, and the value is also given of $(p/p_0) \sec Z$, where p is the barometric pressure at the observatory in millibars at the time of the observation, while p_0 is 1000 millibars. Thus $(p/p_0) \sec Z$ affords a measure of the mass of atmosphere through which the solar radiation has had to travel before reaching the earth. The entries in the columns headed "sky" at Richmond and Eskdalemuir are intended to show the presence or absence of any visible obstruction, such as haze, mist, or cloud, in the direct path of the solar radiation recorded. Observations are taken so far as possible in the absence of cloud; but upper cloud, when there is a great deal of it, cannot always be avoided. Unless the cloud is very thin, the fall in the radiation recorded is conspicuous.

At South Kensington the radiation is measured by the Callendar Radiograph, which records the amount received on a horizontal surface from all sources. In bright sunshine the greater part of the radiation consists of the vertical component of the direct solar radiation, but even then an appreciable part comes from the general atmosphere and from clouds. Thus if a Callendar and an Ångström instrument were simultaneously recording side by side, one would naturally expect the radiation recorded by the former to exceed the vertical component of that recorded by the latter. The intensity of radiation, whether at South Kensington, Richmond, or Eskdalemuir, is expressed in milliwatts per square centimetre. For conversion to the unit more ordinarily employed abroad, we may use

$$1 \text{ mw. per sq. cm.} = 0.01435 \text{ gramme-calorie per sq. cm. per minute.}$$

At South Kensington two measurements are given for the maximum radiation—the highest value shown on the trace of the Callendar instrument at whatever hour it occurs, and also the highest value recorded between 11 h. 30 m. and 12 h. 30 m. It is the latter that is most appropriate for comparison with Richmond. The daily total radiation at South Kensington, representing the integrated value of the radiation throughout the 24 hours, is also given, being expressed in joules (j) per sq. cm. A watt equals 1 joule per second, and therefore a uniform radiation at the rate of 1 milliwatt amounts in 24 hours to 86.4 joules. The daily total at South Kensington is also expressed as a percentage of the "planetary" radiation, *i.e.* the radiation that would be received if the earth's atmosphere were non-existent, assuming the average intensity of direct solar radiation in space at the earth's mean distance from the sun to be 135 milliwatts per sq. cm. This accepts Dr Abbot's result, 1.93 gramme calories per sq. cm.; but it should be remembered that the scales of the Callendar and Ångström* instruments undoubtedly differ from that accepted at Washington.

2. Meteorology and Magnetism:—Cahirciveen (Valencia Observatory). This table is in the form adopted for Part III., Section I., of the Year-Book (Daily Readings at Meteorological Stations of the First and Second Orders). Pressure, temperature

* Ångström No. 24 was in use at Richmond during the year 1917. It is hoped that a discussion of a comparison between the scale of this instrument and that of an Abbot silver disc pyrheliometer will be published shortly.

wind velocity, and rainfall are taken from the self-recording instruments at the observatory. Some account of these instruments will be found in the Introduction to Hourly Values from Autographic Records, Meteorological Section, 1913. It may be noted here that the temperatures refer to a large louvered screen on the north wall of the Observatory, not to the Stevenson Screen, which contains the thermometers used for the observations printed in the Daily Weather Report.*

Pressure is given in "millibars" (1000 millibars = one megadyne per square centimetre). One millibar is approximately equivalent to the pressure of 0.75008 mm. or 0.02953 inch of mercury under standard conditions (273a, lat. 45°). Conversion Tables will be found in Hourly Values from Autographic Records, 1913, and in the Computer's Handbook. The name is used in the Year-Book, following the example of Professor Bjerknes of Christiania in his work for the Carnegie Institution of Washington. The necessary reductions of the readings of the barometer on account of temperature and latitude have been made.

Temperatures are given in units on the Kelvin Absolute Scale, *i.e.* in centigrade degrees measured from a zero 273° below the normal Freezing Point of water. Temperatures at or below 273a (0° C.) are printed in small type.

Vapour-Pressure, deduced from the readings of the dry and wet bulb thermometers by Glaisher's Tables, is given in millibars. For the comparison of Vapour Pressure and Relative Humidity, tables depending on Glaisher's hypothesis, that the depression of the wet-bulb readings below the air-temperature is proportional to the depression of the dew point below the same temperature, are utilised.

Wind-Speed is expressed in metres per second. The values are estimated for periods of 60 minutes centering at the hours named. The Robinson anemograph † (9-inch cups, 24-inch arms, factor 2.2) is used for this purpose.

Wind-Direction is given in points of the Compass, from N by E (1) through East (8), to True North (32). The general direction for the 60 minutes is estimated from the anemogram. ‡ No direction is given when the anemogram shows a smaller velocity than 1.6 metres per second.

Precipitation is given in millimetres of equivalent rainfall. Values of rainfall are for the 24 hours beginning at 9 h.; previous to May 1st, 1914, they were for the 24 hours beginning at 10.30 a.m. It may be noted here that for 1918 the period 0 h. to 24 h. is being adopted.

The normals for Pressure, Temperature, and Precipitation are from the 45 years 1871 to 1915; those for Humidity from the 30 years 1886 to 1915; and those for Wind from the 35 years 1881 to 1915. Except in the case of Pressure, no allowance has been made for the removal of the observatory from Valencia Island to Cahirciveen in 1892.

The estimation of **cloud** amount and the symbols for **weather** are in accordance with the conventions of the International Meteorological Committee.

A summary of the weather for each day is given in the column headed **Remarks**, the international weather symbols and the letters of the Beaufort Notation being used as far as possible. These symbols and letters are as follows:—

* At Richmond and at Eskdalemuir the thermograph screens contain the thermometers used for the Daily Weather Service.

† See below, p. vi.

‡ Formerly it was the practice to take the direction at the exact hour. The present rule was adopted as from 1st May 1915. The Introductions to the *Geophysical Journal*, 1915, 1916, should be amended in this sense.

BEAUFORT NOTATION AND INTERNATIONAL WEATHER SYMBOLS.

b.	blue sky. (Cloud amt. 0, 1, 2, 3	x.	— hoar frost.	h.	▲ hail.
bc.	some cloud. „ 4, 5, 6		← ice crystals.		△ soft hail.
c.	cloudy. „ 7, 8		V rime.	t.	T thunder.
o.	overcast. „ 9, 10)		~ glazed frost.	l.	⚡ lightning.
g.	gloomy, dull appearance.	e.	water deposited copiously on exposed surfaces, without rain falling.	⚡	thunderstorm.
u.	ugly, threatening appearance.	y.	dry air.	↘	gale (17·2 m/s and over).
v.	visibility, unusually clear atmosphere.	p.	passing showers.	q.	squally.
z.	∞ haze.	d.	drizzling rain.	⊙	solar corona.
m.	≡ ⁰ mist, light fog.	r.	● rain.	⊕	solar halo.
f.	≡ fog.	s.	* snow.	☾	lunar corona.
fe.	≡: wet fog, <i>i.e.</i> fog which deposits water copiously on exposed surfaces.		⊕ snow drift.	☾	lunar halo.
w.	☁ dew.		⊗ snow lying (more than half the surrounding country covered with snow).	—	rainbow.
				☀	aurora.
				☾	zodiacal light.

The figure ⁰ attached to a symbol indicates very slight, whilst the figure ² indicates strong or heavy: thus ●⁰ = slight rain, ●² = heavy rain. When economy of space is necessary, morning, afternoon, and night are denoted by *a.*, *p.*, *n.* respectively. ↘ is used in the Remarks Column when the wind as recorded by the anemometer averages 17·2 m/s or more for an hour.

Table 2 also contains results for **Magnetic Horizontal Force, Declination, and Inclination** from absolute observations, usually two a month. The observations* are made at fixed hours on days not subject to abnormal magnetic disturbance, and may be regarded as referring: Horizontal Force to 11 h. 35 m., Declination to 10 h. 20 m., and Inclination to 14 h. 30 m. The unit of force employed, 1γ, represents 0·00001 C.G.S. magnetic unit. It is equal to the magnetic force due to an electrical current of 5 amperes in an infinitely long straight conductor a kilometre away.

Tables 3 and 4 contain corresponding observations for **Richmond (Kew Observatory)** and **Eskdalemuir, Dumfriesshire**, with the exception of the magnetic data. At Eskdalemuir the velocity of the wind is determined from the readings of a Dines Pressure-tube Anemograph. The periods from which the Richmond normal values are derived are: Pressure and Temperature 1871 to 1915, Humidity 1886 to 1915, Wind 1881 to 1915, and Rain 1871 to 1915. The normals for Eskdalemuir all refer to the 5 years 1911 to 1915.

5. **Geophysics, Richmond (Kew Observatory).** In addition to magnetic and electrical data, this Table contains the readings at 9 h. of thermometers placed in the ground at depths of 0·3 m. (1 ft.) and 1·2 m. (4 ft.) below the surface at Richmond. The mean level of underground water is also given for each day, together with the highest and lowest levels recorded during the month. A description of the apparatus used will be found in the Annual Supplement for 1914.

Magnetic Data for Richmond (Kew Observatory). The magnetic data published in the Geophysical Journal up to 1915 were maxima and minima derived from measurements of the magnetograms. The adoption by the London and South-Western Railway of electric traction for the line which passes some 1000 m. from the observatory has made the records useless for the determination of extreme values. The results of absolute observations* taken usually four times a month are now given.

The magnetic character of the day is determined by examination of the magnetograms, and is given on the scale approved by the International Magnetic Commission, “0” representing quiet, “1” moderately disturbed, and “2” highly disturbed conditions.

* Notes on the observations are to be published in Hourly Values from Autographic Records, 1917.

Values of the **Electrical Potential Gradient** in the open are given for 3 h., 9 h., 15 h., and 21 h., representing means for the sixty minutes centering at the hour. A factor, whose value is given, is applied to the electrograph curve readings to deduce the corresponding potential gradient in the open, *i.e.* the potential gradient as it would be if unaffected by the presence of buildings or apparatus. The gradient is measured in volts per metre. It is positive when the potential in the atmosphere exceeds that of the earth. A negative value is indicated by a short thick "—" before the number. When the fluctuations of potential are too large or rapid to permit of a satisfactory numerical estimate of the hourly mean, "z" is inserted with an appropriate sign to indicate whether the gradient was on the whole positive or negative, or too oscillatory to admit of the dominant sign being determined.

The factor for reduction to the open is usually determined month by month, from a comparison of the absolute values obtained from a standardised electrometer over a flat area with the corresponding readings from the electrograms.

The electric character of the day is indicated by the figures 0, 1, or 2 according to the character of the trace of the electrograph as regards negative potential gradient: thus 0 means no negative potential; 1, one or more excursions of limited duration to the negative side of the scale; 2, negative potential extending in the aggregate over at least three hours.

The charges on the ions, positive and negative, are determined by measurements with Ebert's Aspiration Apparatus, extending over fully half an hour between 14 h. and 16 h. The charge per cc. is multiplied by 10^{16} and given in coulombs to facilitate comparison with the data in neighbouring columns.

In earlier volumes other units have been used for the ionic charges.

In 1911 the number of ions was given. In computing the number the value 3.4×10^{-10} C.G.S. electrostatic unit or 11×10^{-20} coulomb was accepted as the charge upon an ion. Recent research has shown that this value was too low. Millikan's experiments* give 4.77×10^{-10} C.G.S. electrostatic unit, or 15.9×10^{-20} coulomb, for the ionic charge.

To reduce the 1911 entries to the form adopted in the current tables they must be multiplied by 11×10^{-4} .

For the years 1912-1915 the charge per cc. $\times 10^{20}$ is given in terms of the C.G.S. electromagnetic unit, which is equal to 10 coulombs. To reduce the entries for these four years to the present form, which was adopted for the year 1916, they must be divided by 1000.

To derive the number of ions per cc. from the entries in the present volume they must, if Millikan's results be accepted, be multiplied by 629. To derive the charge in C.G.S. electrostatic units per cubic metre multiply by 0.3.

In addition to all the ions with mobilities of the order of 1 cm. per second, the Ebert apparatus captures, it is believed, a very appreciable number of the slow-moving or Langevin ions. If all the Langevin ions were captured the figures given in the Table would probably, in most cases, be largely increased.

The Ebert apparatus is designed to determine not merely the number but also the mobility of the more mobile ions; the results of such determinations were given in the years 1911-1912 together with the deduced values of the conductivity and of the air-earth current. The figures were found, however, to present many incon-

* *Phil. Mag.*, Series 6, vol. xxxiv., 1917, p. 3.

sistencies, and the mobilities are no longer observed. The data now published for the air-earth current are derived from observations made with the apparatus designed by Mr. C. T. R. Wilson, combined with readings from the electrograms. Observations taken with the Wilson apparatus near 15 h. supply a value for the electrical conductivity, and this is combined with the mean value of the potential gradient in the open for the sixty minutes centering at 15 h., as derived from the electrograms. The observations are taken in a uniform way, and should be strictly comparable amongst themselves, but it is believed that multiplication by a factor exceeding unity would be required to give the true air-earth current.

6. Geophysics:—Eskdalemuir. This table contains magnetic and electrical data of the same general character as those for Richmond in Table 5, but with modifications. The Eskdalemuir magnetographs record the three rectangular components North, West, and Vertical. The extreme daily values, and their hours of occurrence, are given for each. In view of the uniformity of the temperature to which the magnetograph is exposed, no temperature correction has been applied.

In the electrical character statistics, 0, 1, and 2 have the same significance as at Richmond, but letters *a*, *b*, *c* are attached according to the range of oscillation of the potential gradient: *a* means that for no hour of the day was there a range as large as 1000 volts; *b* that a range of 1000 volts or more was reached in one hour at least, but in fewer than six hours; *c* that a range of 1000 volts or more was reached in at least six hours. These specifications must not be regarded as absolutely rigid criteria. After longer experience more definite specifications may be found possible.

7. Meteorology:—Jersey (St. Louis Observatory). Readings of pressure, temperature, humidity, wind direction and force, and amount of cloud, with type and direction, are given for 7 h., 14 h., and 21 h., together with the minimum temperature on grass, rainfall, and the duration of appreciable actinic strength of the sun's rays as registered by a Jordan recorder. Remarks on the weather are also given. The normals for the various elements are for different periods all ending in 1917. The number of years utilised in each case is given in the footnote.*

The observations for the years 1914, 1915, and 1916 were published as a special supplement to the Geophysical Journal, 1916.

8. Wind Components for four principal anemograph stations of the Meteorological Office, representing different parts of the country. As in Table 2, the wind velocities are expressed in metres per second, and represent mean values for the sixty minutes centering at the specified hours 3 h., 9 h., 15 h., and 21 h. The data at these four hours are not the resultant wind velocities, but their rectangular components in the North-South and East-West directions. North and South winds are treated separately, and so are East and West. These hourly values are all derived from Robinson cup anemographs recording direction as well as speed. These anemographs at Holyhead, Deerness, and Great Yarmouth are of the same large size as at Valencia and Kew Observatories, the arms being 610 mm., the diameter of the cups 230 mm., and the factor used for deriving the run of the wind from the run of the cups 2·2. The Scilly instrument is smaller, the arms being 305 mm., the diameter of the cups 127 mm., and the factor 2·8.

Recent investigations have shown that the correct factor depends on the speed.

* Pressure, Air Temperature, and Rainfall, 24; Nebulosity, 23; Humidity, 22; Grass Minimum, 21; Sunshine, 20; Wind, 14.

The tabulated speed is probably correct at about 9 m/s. A correction amounting to about +0.7 is required at such low speeds as 2 m/s. A negative correction is necessary at high speeds.

It is not proposed to depart from the use of the constant factor 2.2 until the corrections have been determined with greater certainty. Components are not shown when the tabulated wind-speed is less than 1.6 m/s.

At Holyhead, Scilly, and Great Yarmouth (or rather Gorleston, a neighbouring station) there are also Dines pressure-tube anemographs, and the entries given under the heading "Maximum in a Gust" represent the highest speeds recorded by these instruments in the course of the day. The time of occurrence of the highest gust is also given. At Deerness, where there is only a Robinson cup anemograph, particulars are given as to the largest of the twenty-four mean hourly velocities, and the hour or hours of its occurrence.

9. Seismological Diary. This consists in the main of results given by the **Galitzine Seismographs*** (two horizontal components and the vertical component) at **Eskdalemuir**, but includes data from a **Milne Seismograph** at **Richmond (Kew Observatory)**. The Eskdalemuir data include (i.) particulars of the earthquakes recorded, and (ii.) the amplitude and period of the microseisms shown by the North component Galitzine instrument on each day at 0 h., 6 h., 12 h., and 18 h. Disturbances attributed directly to wind or other purely local circumstance are excluded. The notation employed is as follows:—

P is the time of arrival of the first phase (longitudinal waves). S is the time of arrival of the second phase (transverse waves). L is the time of arrival of the long waves (surface waves).

PR₁, PR₂ . . . are longitudinal waves reflected once, twice . . . at the earth's surface, prior to their arrival at the station. SR₁, SR₂ . . . similarly denote reflected transverse waves. Any times given for reflected waves refer to the beginning of the disturbance at the observatory.

[Y refers to a wave of the type for which the name polychord is proposed by J. J. Shaw (*B.A. Report*, 1915, p. 69). Y is identified provisionally with PR_∞.] †

M₁, M₂ . . . are the times of successive maxima of the displacement of the ground, corrected, if necessary, for the lag of the instrument. [c₁, c₂ . . . are secondary maxima following the principal phase; only the periods and approximate times are given.] †

i is the sudden commencement of a phase. iP means a sudden commencement of the P phase. e means an indistinct commencement of a phase. F is the end.

T, the period in seconds, is the duration of a double oscillation (to-and-fro movement). μ represents a micron (0.001 mm.).

Δ is the distance in kilometres of the epicentre measured along the arc of the great circle passing through the station. α the azimuth of the epicentre (0° to 360°) measured from North through East.

A_x, A_y and A_z are the amplitudes of the components of the true displacement of the ground from the position of rest, and are measured in microns. When the displacement shown by the North-South seismograph is to the North a + sign is shown; for a displacement to the South a - sign is used. Similarly + is used for displacements to the East and upwards, - for displacements to the West and downwards. When the oscillations are of a simple harmonic character no sign is prefixed to the amplitude.

All the microseisms recorded are believed to arise from other than local causes. Microseisms are practically always in evidence, and their period usually remains at least approximately constant during a good many minutes.

The group of waves of greatest amplitude occurring in the 30 minutes centering at the hour in question is selected and the amplitude tabulated is the mean obtained from two or three waves in that group.

The period is derived from a measurement made on the same group.

The data given for Richmond include the times of commencement of the disturbance and the time of the largest displacement shown on the trace. Additional information is given under the heading "Remarks." The boom of the instrument is oriented North-South, and moves when the ground is tilted East to West. It has, however, to be remembered that in reality the boom responds

* Vide *Geophysical Journal*, Annual Supplement, 1913.

† Notation not used in the year 1917.

to ground movements of various kinds, and that the amplitude of the movement shown on the trace depends to a considerable extent on whether the oscillatory movement in the ground has a period near to or remote from the natural period of the boom. At the same time, a really large movement on the trace invariably means a large earthquake. Amplitudes, all measured on the trace in mm., are not recorded unless at least 1.0 mm. Those less than 0.2 mm. are characterised as very small, those between 0.2 and 0.5 mm. as small. During the year the period of the boom was approximately 18 seconds, and a movement of 1 mm. on the trace was produced by a tilting of from $0''\cdot43$ to $0''\cdot46$.

10. Soundings with Pilot Balloons. This table gives the results of **exploration of the free atmosphere** by means of pilot balloons. The soundings available are very numerous; only those at the Meteorological Office stations—Aberdeen, Eskdalemuir, Cahirciveen, Benson, and South Farnborough—are included in this table.

The times refer to the beginning of the sounding; they are given to the nearest five minutes. Wind directions are given in degrees from True North (through East).

The wind velocity is derived from that of the balloon itself. This may be observed with two theodolites at the ends of a known base, or with one theodolite. As a rule, only one theodolite is employed, and the velocities are then deduced in the way explained in the Computer's Handbook, Section II.

During 1917 the vertical velocities were generally calculated from the formula

$$V = 81 L^{\frac{1}{2}} / (W + L)^{\frac{1}{2}},$$

in which

L is the free lift of the balloon, *i.e.* the weight in grammes which the balloon can carry without rising,

W is the weight of the balloon in grammes, and

V is the vertical velocity in metres per minute.

It should be mentioned that the value 84 has been adopted in place of 81 as from 1st September 1918. (M.O. Circular No. 27.)

The "Geostrophic Velocity" shown for each ascent is determined from the prevailing pressure gradient by the formula $v = \gamma / 2\rho\omega \sin \lambda$, in which γ is the horizontal pressure-gradient, ω the angular velocity of the earth, ρ the density of the air, λ the latitude, and v the required geostrophic velocity. The significance of geostrophic velocity is explained in the introduction to the Geophysical Journal for 1915. Reference may also be made to the Meteorological Glossary and to the Computer's Handbook, Section II. iii. The relation between actual winds and geostrophic winds has been discussed with reference to observations by J. S. Dines,* J. Fairgrieve,† and G. Dobson,‡ and from a theoretical standpoint by G. I. Taylor.§

The pressure gradient is derived from the Working Charts of the Office which refer to the hours 7, 13, and 18 respectively. If the hour of an ascent differs decidedly from a chart hour, results are usually calculated from each of the two charts which come nearest in time.

In the deduction of wind components, etc., the calculations are all carried out to 0.1 *m/s* (metre per second), but this degree of accuracy does not appear in the printed results except in the case of observed wind velocities under 5 *m/s*. Observed wind velocities of 5 *m/s* and over are given only to the nearest 0.5 *m/s*. Geostrophic or gradient wind velocities are given only to the nearest 1 *m/s*. Directions are given to

* "Advisory Committee for Aeronautics," *Fourth Report on Wind Structure*, 1914, p. 19.

† *Geophysical Memoir*, No. 9, 1914.

‡ *Q.J. Royal Met. Soc.*, 1914, p. 123.

§ *Phil. Trans. Roy. Soc., A*, 1915, p. 1; *Proc. Roy. Soc.*, 1916, p. 196.

the nearest 5° in the case of observed wind velocities, but only to the nearest 10° in the case of geostrophic or gradient wind velocities.

No data derived from kite observations are available for 1917. Details of the few soundings by registering balloons are to be given in the Annual Supplement, together with certain aeroplane observations.

11. **Nephoscope Observations.** This table gives the results of observations of **Cloud Motion at Aberdeen** taken with Fineman's nephoscope.

The nomenclature used for clouds is in accordance with the specifications given in "The International Cloud Atlas" and in the "Observer's Handbook." Information as to the usual heights of the several forms is given in the following table:—

Form.	Abbreviation.	Height of base (metres).
Cirrus	Ci.	Mean 9000
Cirro-stratus	Ci. st.	"
Cirro-cumulus	Ci.-cu.	3000 to 7000
Alto-stratus	A.-st.	"
Alto-cumulus	A.-cu.	"
Strato-cumulus	St.-cu.	Below 2000
Nimbus	Nb.	"
Cumulus	Cu.	Mean 1400
Cumulo-nimbus	Cu.-nb.	"
Stratus	St.	Below 1000

The observations give what is termed for brevity the "velocity-height-ratio," *i.e.* the true cloud velocity divided by the height of the cloud. The velocity-height-ratio is equal to the instantaneous value of the angular velocity of the cloud about a point vertically beneath it, and on the same level as the observer. It is conveniently expressed in milliradians per second. For comparison with the nomenclature used in previous volumes it may be noted that for a low cloud at the height of one kilometre the velocity in metres per second is the same as the velocity-height-ratio in milliradians per second. A short discussion of the results for the five years 1912 to 1916 will be found in the Supplement to the 1916 volume.

12. **Aurora.** This table, introduced in January 1917, gives Aurora observations at various stations, and also shows the phases of the Moon and the "magnetic character" assigned for Richmond and Eskdalemuir. As "magnetic character" refers to a period of 24 hours beginning at midnight, it is convenient to show the characters for the two calendar days which include the night of the Aurora observations.

An **Annual Supplement** gives a summary of the Observations of the Temperature of the Upper Air made at Benson, Oxon, and of some electrical and magnetic data from Richmond (Kew Observatory) and Eskdalemuir. A discussion of the constants of the seismological instruments at Eskdalemuir is also included, as well as a diagram showing the variation in the level of the underground water at Richmond.

H. G. LYONS,
Colonel,
(Director).

METEOROLOGICAL OFFICE, LONDON, S.W.

1st March 1919.

ERRATA.

Page 13. Wind Components, Scilly, 21 h. S - N, for 9·1 read - 9·1.

Page 37. Wind Components, Great Yarmouth, 15 h. W - E, for - 94·5 read - 93·0.

Page 93. Wind Components, Scilly, 21 h. S - N, for 45·3 read - 45·3.

METEOROLOGICAL OFFICE OBSERVATORIES—GEOPHYSICAL JOURNAL.

DAILY VALUES.—*Solar Radiation, Meteorology, Atmospheric Electricity, Terrestrial Magnetism, and Seismology.*
 Seventh Year.—No. 1. JANUARY 1917.] Units based on the C.G.S. System. [Price 1s.]

1. SUNSHINE AND SOLAR RADIATION.

Day.	SOUTH KENSINGTON.—Lat. 51° 30' N. Long. 0° 10' W.							RICHMOND.—Lat. 51° 28' N. Long. 0° 19' W.					ESKDALEMUIR.—Lat. 55° 19' N. Long. 3° 12' W.					CAHIRCIVEEN.		
	Bright Sunshine.		Radiation received on Horizontal Surface by Callendar Radiograph.					Bright Sunshine.		Radiation at Noon by Ångström Pyrheliometer.			Bright Sunshine.		Radiation by Ångström Pyrheliometer.			Bright Sunshine.		
	Total.	Per cent. of Possible.	Daily Total.	Per cent. of Planetary.	Maximum.			Total.	Per cent. of Possible.	Intensity.	Vertical Component.	Sky.	Total.	Per cent. of Possible.	Time.	Sky.	p sec Z.	Intensity.	Total.	Per cent. of Possible.
					For Day.	11.30 h. to 12.30 h.	Amount.													
1	0° 0'	0	81	12	11	13	13	7	0° 0'	0	...	...	...	0° 3'	4	...	...	...	0° 2'	3
Means	0° 48'	6	122	15	13	—	—	—	0° 77'	9	—	—	—	1° 23'	16	—	—	—	1° 68'	21
Normal	0° 65'	8	156	—	—	—	—	—	1° 39'	17	—	—	—	0° 94'	12	—	—	—	1° 55'	19

2. METEOROLOGY AND MAGNETISM:—CAHIRCIVEEN (VALENCIA OBSERVATORY).—Lat. 51° 56' N. Long. 10° 15' W.
 Heights above M. S. L.:—H=9·1 m. H_b=13·7 m. H_a=26·4 m. Above Ground: h_t=1·3 m. h_r=0·56 m. h_a=13·9 m.

Day.	Air Pressure at Station Level.		Air Temperature in Degrees Absolute.				Humidity.				Wind Direction in Points (8=E, 16=S) with Speed in metres per second.				Cloud Amount (0-10) and Weather.		Rain 24 hours beginning 9 h.	Min. Temp. on Grass.	REMARKS.	Magnetism. Horizontal Force, Declination West, and Inclination.
	9 h.	21 h.	9 h.	21 h.	Max.	Min.	9 h.	21 h.	9 h.	21 h.	9 h.	21 h.	9 h.	21 h.	9 h.	21 h.				
	mb.	mb.	a.	a.	a.	a.	millibar.	%	%	Dir.	m/s.	Dir.	m/s.	Tenths of Sky covered.	mm.	a.				
1	1024° 0'	1024° 3'	84° 0'	84° 3'	85°	84°	12° 0'	12° 9'	92	97	16	6	21	7	10	10	—	83		
31	1019° 1'	1017° 2'	73° 1'	74° 8'	77	71	4° 1'	4° 3'	68	n 63	7	4	8	5	100	1000	—	69		
Means	1013° 5'	1013° 2'	77° 3'	77° 7'	79° 2'	75° 7'	6° 8'	7° 0'	79	80	6° 8'	7° 4'	7° 7'	6° 7'	86° 4'	74° 8'		—		
Normal	1012° 6'	1012° 8'	79° 8'	79° 9'	82° 3'	77° 6'	8° 6'	8° 6'	87	87	6° 4'	6° 4'	—	—	148° 2'	—		—		

α denotes the maximum and η the minimum value in the column.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level:—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground:—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8 = E, 16 = S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level:—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground:—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8 = E, 16 = S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS.

5. GEOPHYSICS:—RICHMOND (KEW OBSERVATORY).

Table with columns: Day, Earth Temperature at 9 h. (0.3 m, 1.2 m), Height above M.S.L. of Surface of Underground Water. (Daily Mean, Extremes), Horizontal Force. (Mean Time), Declination (West). (Mean Time), Inclination (North). (Mean Time), Magnetic Character of Day, Electric Character of Day, Potential Gradient, Volts per metre. Factor 2.44. (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10^16. (+, -), Air-Earth Current. x 10^16. (About 15 h, About 15 h).

6. GEOPHYSICS:—ESKDALEMUIR.

Table with columns: Day, North Component. (Maximum, Minimum), West Component. (Maximum, Minimum), Vertical Component. † (Maximum, Minimum), Magnetic Character of Day, Electric Character of Day, Potential Gradient, Volts per metre. Factor 5.35. (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10^16. (+, -), Air-Earth Current. x 10^16. (About 15 h, About 15 h).

* 25 days. The Potential Gradient data in Italics for Richmond, and some of the "character" figures are derived from the Benndorf electrograph, to which recourse was had when the jet of the Kelvin electrograph was frozen. † Note that the constant part of the Vertical Component is 44,000 γ instead of 45,000 γ, as in previous years. ‡ Mean of 30 days; 4th omitted. § 29 days. x denotes the maximum and n the minimum value in the column. z Indeterminate.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M. S. L. :—H=54 m. H_b=55 m. Above Ground :—h_t=1.48 m. h_r=1.72 m. h_a=8 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Min. Temp. on Grass, Percentage of Humidity, Rain, and REMARKS. Rows include data for days 1 through 31, means, and normal values.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns for Day, Wind Direction and Force, Sunshine, Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming, and Mean Amount. Rows include data for days 1 through 31, means, and normal values.

9. SEISMOLOGICAL DIARY.

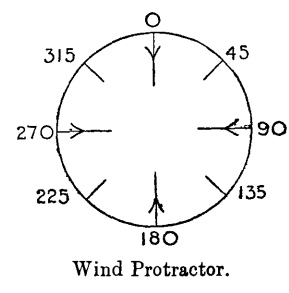
EARTHQUAKES :—ESKDALEMUIR.								MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.											
Day.	Phase.	Time, G. M. T.			Period.	Amplitudes.			Δ.	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
		h	m	s		A _{N.}	A _{E.}	A _{Z.}				A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
4	L M M	17	35	...	...	μ	μ	μ	km.	Preliminary phases masked by strong wind effects.	1	1'4	5'5	0'9	6	1'0	6'5	1'2	6'5
		17	37	58	25	26	...	...	...		2	1'4	6	1'4	7	1'5	7	1'3	7
		17	39	23	22	...	34	...	...		3	1'6	6	0'9	7	1'4	6	0'8	6
											4	1'2	5	1'7	4	2'4	4'5	2'6	5
											5	2'7	5	1'9	5	1'6	5	1'0	4
6	L	18	52	to	17	...	...	...	...		6	0'9	5	0'9	5	0'6	5'5	0'7	5'5
		19			...	...	...	...	...		7	0'8	6	0'6	6	0'7	6	0'9	5
											8	1'0	4'5	1'5	5	1'8	5	2'0	4'5
											9	1'9	5	1'9	5	2'0	4'5	1'3	4'5
											10	0'9	5	0'9	4'5	0'8	4'5	0'8	4
											11	0'7	4'5	0'5	5	0'7	4	0'5	5
7		4	47	to	...	...	...	...	...	Faint disturbance.	12	0'9	5	1'6	5	2'3	6	2'5	5'5
		5	10		...	...	...	...	...		13	2'4	6	2'5	5	2'4	5	1'5	6
											14	1'8	5	1'0	5	1'0	4'5	0'9	4'5
											15	0'8	5	0'5	4'5	0'6	5'5	0'4	4'5
10		14	3	to	...	...	...	...	...	Faint disturbance.	16	0'5	5	0'3	4	0'3	4'5	0'5	6'5
		14	33		...	...	...	...	...		17	0'8	6	0'7	6'5	0'6	6	0'6	6
											18	0'6	7	0'8	6	1'2	6	1'9	6
											19	1'4	6	1'6	6	2'1	5	1'4	5'5
											20	1'7	6	1'1	5	1'1	5	0'8	6
											21	Earthquake	0'9	6	1'3	6'5	1'4	6'5	
											22	1'5	5	0'9	6'5	0'8	6	0'7	7'5
											23	0'9	6'5	1'4	7	1'3	7	1'4	6'5
17		0	6	to	...	...	...	...	...	Faint disturbance.	24	1'4	8	2'1	7	2'7	7	3'0	7'5
		0	30		...	...	...	...	...		25	4'7	7	5'7	7	7'5	7	9'6	6'5
											26	8'3	7	6'2	7'5	8'0	6	4'2	7
											27	4'4	6'5	3'1	6	3'1	6	3'7	5'5
											28	5'5	6	5'3	6	3'0	6'5	3'2	5'5
											29	2'3	6	1'5	5'5	1'4	6	1'7	5'5
17		3	30	to	...	...	...	...	...	Faint disturbance.	30	1'1	5'5	Earthquake	1'4	6	1'3	5	
		4	5		...	...	...	...	...		31	0'9	6	0'8	5'5	0'8	6	0'9	6
20	e (?) e i i M M F	23	31	19	...	...	...	...	...	Preliminary phases ill-defined. Noticeable feature is a sudden cessation of long waves at 0 h. 24 m. and their recommencement 2 mins. later.	Means for Month { A _N =1'8. T=5'7. Normals, 1911-16 { A _N =2'6. T=6'2.								
		23	37	0	...	...	...	...	...		EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).								
		23	38	54	...	...	...	...	...		Times, G. M. T. of		Remarks						
		23	40	35	...	...	...	...	...		Day.	Commencement.	Max. Phase.	Remarks					
		0	16	11	23	16	...	...	...							
		0	20	25	22	21	...	...	...							
		1	45		...	...	...	...	...					
21		23	28	to	...	...	...	...	...	Slight disturbance.									
		0	15		...	...	...	...	...					
24	Pe L M M F	1	10	31	...	...	...	...	...			h m	h m						
		1	25	42	...	...	...	...	...		4	17 39	17 47						
		1	32	13	22	31	...	...	...		20-21	23 36	0 25'5						
		1	32	8	23	32	...	...	...							
		2			...	...	...	...	...					
27	L	15	37	to	...	...	...	...	...		22	...	0 2	Very small.					
		15	49		...	...	...	...	...					
30	P PR ₁ S F	2	56	37	...	...	...	...	7740	Large earthquake. Accurate determination of time, amplitude, and period of maxima impossible owing to rapidity of motion of light spot and consequent faintness of photographic trace.	24	1 32	1 38'5	Amplitude on trace 1'2 mm.					
		2	59	42	...	...	...	...	...		26	...	6 2	Very small.					
		3	5	44	...	...	...	...	...					
		8	30		...	...	...	...	...		27	...	15 43	Very small.					
31	e S (?) M M F	4	18	49	...	...	...	...	...		30	2 57	3 37'5	Amplitude on trace 16 mm.; continued until after 7 h.					
		4	28	16	...	...	...	...	...					
		4	54	36	33	45	...	...	...							
		4	55	34	32	51	...	...	...							
		6	30		...	...	...	...	...		31	4 29	5 9'5						

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.				
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	mr/s.		
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.						
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	
		h. m.																					
2	Benson .	12 0	280	12	250	3'5	275	9'5	280	9'0	280	16'5	...	...	...	...	...	...	...	...	A.-St.	270	...
2	S. Farnboro' .	7 50	300	12	260	4'0	290	12'5	320	17'0	300	17'5	290	17'0	...	...	...	...	...	...	...	...	...
5	Benson .	12 5	?	?	280	2'5	315	9'5	310	8'5	305	11'5	330	14'5	...	...	...	...	...	...	Ci.	315	...
5	S. Farnboro' .	7 40	310	11	280	4'5	320	14'0	335	17'5	335	11'5	...	...	...	...	...	...	...	...	St.-Cu.	315	...
12	"	7 50	310	16	270	5'0	300	12'5	305	14'0	320	16'0	...	...	...	...	...	...	...	...	...	...	...
13	Eskdalemuir .	12 55	30	15	15	6'5	15	11'0	25	11'5	30	11'5	...	...	...	...	...	...	...	...	Ci.	35	2'5
31	"	12 40	0	9	350	7'0	5	10'5	15	9'5	35	10'0	...	...	...	...	...	...	...	...	Cu.	35	5'5

Height of Station above M.S.L. = H.
 Height of Anemometer above ground = h.
 Benson 57 m. 25 m.
 Eskdalemuir 242 m. 15 m.
 S. Farnborough 70 m. 31 m.

Notes on Pressure Distribution.
 January 2 7 h. Depression over Denmark.
 2 13 h. Westerly type.
 5 7 h. Straight isobars ; North-Westerly type.
 5 13 h. V developing over Irish Sea.
 12 7 h. Depression over North Sea.
 13 13 h. Depression over Belgium. Northerly gale over North of Ireland.
 31 13 h. Straight isobars ; Northerly type ; V approaching Ireland.



11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
4	St.-Cu.	335	5'0	mr/s.	mr/s.	Normal St.-Cu. ; some Fr.-Nb. below. Thin type of St.-Cu. Base of cloud measured. Coarse Ci. to Ci.-Cu. ; much internal change. In bands radiant point E.N.E. Fused sheet of normal type St.-Cu.
6	St.-Cu.	267	4'0	+ 2'1	- 4'5	
12	Cu.-Nb.	350	20'0	+ 4'0	+ 0'2	
16	Ci.-Cu.	86	3'0	+ 3'4	- 19'6	
17	St.-Cu.	72	4'3	- 3'0	- 0'2	
18	St.-Cu.	131	5'0	- 4'1	- 1'3	Average velocity given ; cloud rather diffuse. Cu. changing into St.-Cu. Approximate velocity, edge diffuse ; St.-Cuf. of rather high altitude. Stratus cumuliformis ; rather high altitude.
20	Cu.	97	5'0	- 3'8	+ 3'3	
22	St.-Cuf.	147	9'0	- 5'0	+ 0'6	
				- 4'9	+ 7'5	
26	St.-Cuf.	130	12'5	- 9'6	+ 8'0	

12. AURORÆ.

An exceptionally brilliant aurora was observed over a large portion of the British Isles on the evening of January 4, the most southern station reporting it being Oxford. The phenomenon was also observed at Aberdeen and Seskin (Carrick-on-Suir) on the 12th, and at Deerness on the 22nd.

For sketches of the aurora of the 4th and for notes on the phenomenon as seen at Aberdeen, Fethard (Waterford), and Seskin (Carrick-on-Suir), reference may be made to the *Meteorological Office Circular*, No. 10, where also will be found notes on the magnetic disturbances recorded on the same day at Richmond (Kew Observatory) and Jersey (St Louis Observatory). Additional notes may also be found in *Nature*, January 18, 1917, p. 397.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m. Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8 = E, 16 = S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS. Includes data for days 1-28, Means, and Normal values.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m. Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8 = E, 16 = S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS. Includes data for days 1-28, Means, and Normal values.

Temperatures at or below the normal freezing point of water are printed in small type.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W. Heights above M. S. L. :—H=54 m. H_b=55 m. Above Ground :—h_t=1.48 m. h_r=1.72 m. h_a=8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 3 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0 h. to 24 h., and REMARKS. Rows 1-28 and Means/Normal.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h), Sunshine (Mean, Total, Percent of Possible, Tenths), Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming (Upper, Lower, Tenths, Type, Direction), and Mean Amount. Rows 1-28 and Means/Normal.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8.8 m., Ground 13.7 m., M.S.L. 19.2 m. Height of Cups above—Roof 4.6 m., Ground 7.6 m., M.S.L. 15.2 m.

SCOTLAND N.:—DERRNESS.

Height of Cups above—Roof 1.5 m., Ground 4.9 m., M.S.L. 57.3 m.

Main table containing wind component data for Holyhead and Derrness. Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, Time of Gust, and Vel. in Max. Hourly Run. Data is presented in multiple columns with sub-columns for S, N, W, E directions.

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9.8 m., M.S.L. 49.7 m. Height of Cups above—Ground 5.8 m., M.S.L. 45.7 m.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10.7 m., Ground 12.8 m., M.S.L. 15.9 m. Height of Cups above—Roof 3.7 m., Ground 18.3 m., M.S.L. 22.3 m.

Main table containing wind component data for Scilly and Great Yarmouth. Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, Time of Gust, and Vel. in Max. Hourly Run. Data is presented in multiple columns with sub-columns for S, N, W, E directions.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES :—ESKDALEMUIR.									MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.								
Day.	Phase.	Time, G. M. T.	Period.	Amplitudes.			Δ.	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
				A _{N.}	A _{E.}	A _{Z.}				A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
1		h m s 4 3 to 4 17	s ...	μ	μ	μ	km.		μ	s	μ	s	μ	s	μ	s	Very faint disturbance.
1		13 6 to 13 20	...	...	...	...	...		0.8	5.5	0.7	7	1.0	7	0.9	6	Very faint disturbance.
3	L	18 43 to 18 47	...	...	...	...	...		1.2	5.5	1.3	6	1.2	5.5	1.1	6	Slight disturbance. Group of long waves of 23 s. period.
5		13 25 to 13 33	...	...	...	...	...		1.5	6	1.0	5	1.5	5	1.7	5	Faint disturbance.
12	P F	9 22 29 11 30	...	...	...	...	...		...	...	...	...	...	...	...	...	Moderate disturbance. Preliminary phases on horizontal instruments ill-defined and masked by wind-effects. P taken from vertical record.
14		5 56 to 6 23	...	...	...	...	...		2.5	6	2.3	6	2.2	6	1.8	6	Slight disturbance, with no well-marked phases.
15	P PR ₁ S L M M F	1 2 23 1 6 38 1 13 23 1 33 3 1 48 44 1 51 26 3 30	...	...	...	...	10040		2.2	6	2.7	5	1.7	6	1.7	6	Large disturbance.
16		3 11 to 3 30	...	...	...	...	...		0.9	6	0.9	6	0.8	6	0.6	6	Faint disturbance.
17		23 37 to 23 50	...	...	...	...	...		0.7	6	0.7	6	0.5	5	0.5	4.5	Faint disturbance.
18	i F	1 48 6 2 45	...	...	...	...	...		0.5	6	0.3	3.5	0.3	3.5	0.3	4	Slight disturbance, with group of long waves of 33 s. period from 2 h. 13 m. to 2 h. 16 m.
20		16 8 to 16 27	...	...	...	...	...		0.2	4.5	0.4	4.5	0.9	4.5	0.9	6	Faint disturbance.
20	P S M F	19 40 35 19 49 21 19 58 7 23	...	...	...	...	7330		1.5	7	2.1	7	2.2	7	1.6	6	Large disturbance. Photographic trace too faint for determination of other points. F includes oppositely travelling waves. Epicentre 19° N. lat., 79° W. long.
21	P PR ₁ (?) PR ₂ S L M M F	10 5 57 10 8 51 10 10 24 10 14 51 10 27 1/2 10 41 1/2 10 41 1/2 10 44 12	...	...	...	...	7490		0.7	6.5	0.8	6	0.9	5	0.6	7	Moderate disturbance, with fairly well-marked phases.
22		2 54 to 3 7	...	...	...	...	...		0.7	5	0.6	6	0.7	5.5	0.7	6	Slight disturbance, with well-marked group of long waves of period 20 s. at 2 h. 57 m.
22	P PR ₁ S L M M F	9 36 50 9 39 48 9 45 42 9 57 48 10 12 10 14 1/2 11 35	...	...	...	...	7250		0.7	6	0.5	5	0.4	6	0.6	6	
25	e e S(?) L F	5 41 31 5 44 39 5 52 37 6 7 49 8 20	...	...	...	...	...		0.7	6	0.5	5	0.4	6	0.6	6	
25		10 55 to 11 25	...	...	...	...	...		0.3	5	0.6	5	0.6	5	0.7	4.5	Faint disturbance.

Means for Month { A_N=1.1, T=5.8. Normals, 1911-16 { A_N=2.5, T=6.0.

EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).

Day.	Times, G. M. T. of		Remarks
	Commencement.	Max. Phase.	
12	h m ...	h m 10 46	Very small.
15	1 39	1 51	
16	...	17 13.5	Small.
20	19 48	20 12	Amplitude by trace 2.9 mm.
21	...	10 46?	Part during changing time?
22	...	10 19?	Began during changing time.
25	...	6 26	Small.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.					
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	mr/s.			
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.							
3	S. Farnboro'	h. m. 7 25	?	?	...	0'0	325	3'5	360	2'5	210	4'5	165	2'5	280	3'5	...	...	...	...	...	...	...	...
5	"	7 40	?	?	340	4'5	15	14'5	5	15'0	20	8'5	...	...	...	...	...	...	...	...	...	...	...	...
5	Eskdalemuir	12 55	?	?	360	5'5	15	7'5	35	10'0	25	13'0	...	...	...	...	...	...	...	...	...	...	...	...
6	S. Farnboro'	7 25	80	10	20	9'0	60	15'0	75	14'5	80	15'5	...	...	...	...	...	...	...	...	...	...	...	...
7	"	7 20	?	?	350	2'0	70	10'5	60	9'5	60	6'5	60	7'5	...	...	...	...	...	...	...	...	...	...
9	Eskdalemuir	14 40	?	?	...	0'0	45	2'0	185	1'2	165	4'6	140	6'5	135	5'5	140	8'5	Ci.	...	...	0'0	...	...
13	"	7 35	?	?	...	0'0	350	2'9	360	3'1	20	4'7	50	6'0	55	8'0	...	...	...	...	...	...	...	...
15	"	12 45	150	15	360	2'0	80	4'6	145	11'5	155	14'0	...	...	...	...	...	...	...	...	...	...	...	...
16	"	7 20	150	10	360	6'0	65	4'1	155	7'5	170	8'0	185	9'0	...	...	...	...	...	...	...	...	...	...
16	S. Farnboro'	10 15	170	7	80	1'0	145	5'0	190	5'5	215	2'0	205	7'0	...	...	...	...	...	...	...	...	...	...
26	"	7 25	300	8	290	3'5	335	14'0	335	13'5	320	6'5	...	...	...	...	...	...	...	...	...	...	...	...
27	"	12 10	?	?	315	2'0	310	4'0	295	2'0	355	7'0	...	...	...	...	...	...	...	...	...	...	...	...

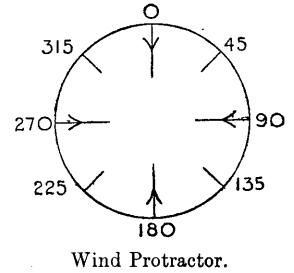
Notes on Pressure Distribution.

Height of Station above M.S.L. = H.
Height of Anemometer

above ground = h.

Eskdalemuir . . . 242 m. 15 m.
S. Farnborough . . . 70 m. 31 m.

- February 3 7 h. Depression off the North of Scotland. No gradient over South of England.
5 7 h. Depression off the North of Norway. Anticyclone spreading over British Isles from the Atlantic.
5 13 h. Anticyclone Westward of British Isles.
6 7 h. Depression over Iceland. Anticyclone over England and North Sea.
7 7 h. Ridge of high pressure from beyond Ireland to Denmark.
9 13 h. Anticyclone over British Isles.
13 7 h. Anticyclone over British Isles.
15 3 h. Anticyclone over North Sea.
16 7 h. Anticyclonic wedge over North Sea. Low West of Ireland.
26 7 h. North-Westerly type.
27 13 h. Anticyclone extending to British Isles from South-West.



11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
			mr/s.	mr/s.	mr/s.	
1	Cu.-Nb.	330	20'0	+ 10'0	- 17'3	Degraded base of cloud measured. Velocity varying in places.
2	Ci.-Cu.	287	2'5	+ 2'4	- 0'7	Cirrus changing into Ci.-Cu.
5	Cu.-Nb.	10	6'3	- 1'1	- 6'2	Apical part of cloud measured.
8	Ci.	345	1'4	+ 0'4	- 1'4	Cirrus changing into Ci.-St. and Ci.-Cu. in places.
16	St.-Cuf.	160	12'5	- 4'3	+ 11'7	
27	St.-Cu.	295	5'0	+ 4'5	- 2'1	
28	Ci.	305	3'1	+ 2'5	- 1'8	False Ci., changing into Ci.-Cu.
	St.-Cu.	315	5'0	+ 3'5	- 3'5	Thin St.-Cu.

Note.—The interval from 16th to 27th was almost continuously occupied by stratus cloud of uniform sheet type.

12. AURORA.

Aurora was observed at Glasgow on the 4th, at Ampleforth on the 12th, and over a very large area north of latitude 54° on the 15th. Another display was seen at Stornoway on the 19th. Faint auroral lights were also observed in some Scottish localities on the 14th and 25th.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5·5 m. Barometer, H_b = 10·4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground :—Thermometers, h_t = 3·0 m. Rain-gauge, h_r = 0·53 m. Cups of Anemometer, h_a = 20 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS. Includes means and normal data.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237·3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground :—Thermometers, h_t = 0·9 m. Rain-gauge, h_r = 0·38 m. Vane of Anemometer, h_a = 15 m.

Table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS. Includes means and normal data.

Temperatures at or below the normal freezing point of water are printed in small type.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M. S. L.:—H=54 m. H_b=55 m. Above Ground:—h_t=1.48 m. h_r=1.72 m. h_a=8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 5 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0 h. to 24 h., and REMARKS.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h), Sunshine (Mean, Total, Percent of Possible, Tenthhs), Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming (Upper, Lower, Tenthhs, Upper, Lower, Tenthhs, Upper, Lower, Tenthhs), and Mean Amount.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8.8 m., Ground 13.7 m., M.S.L. 19.2 m. Height of Cups above—Roof 4.6 m., Ground 7.6 m., M.S.L. 15.2 m.

Table for Holyhead with columns for Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust., and Time of Gust. Includes summary statistics for S+N, W+E and S-N, W-E.

SCOTLAND N.:—DEBRNESS.

Height of Cups above—Roof 1.5 m., Ground 4.9 m., M.S.L. 57.3 m.

Table for Deerness with columns for Day, 3 h., 9 h., 15 h., 21 h., Vel. in Max. Hourly Run., and Time of Max. Includes summary statistics for S+N, W+E and S-N, W-E.

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9.8 m., M.S.L. 49.7 m. Height of Cups above—Ground 5.3 m., M.S.L. 45.7 m.

Table for Scilly with columns for Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust., and Time of Gust. Includes summary statistics for S+N, W+E and S-N, W-E.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10.7 m., Ground 12.8 m., M.S.L. 15.9 m. Height of Cups above—Roof 3.7 m., Ground 18.3 m., M.S.L. 22.3 m.

Table for Great Yarmouth with columns for Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust. (Gorleston.), and Time of Gust. Includes summary statistics for S+N, W+E and S-N, W-E.

* No record.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES :—ESKDALEMUIR.

MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.

Day.	Phase.	Time, G.M.T.	Period.	Amplitudes.			Δ.	Remarks.
				A _{N.}	A _{E.}	A _{Z.}		
		h m s	s	μ	μ	μ	km.	
1		6 27 to 6 51	...	...	...	...	...	Faint disturbance. Period of L at 6 h. 34 m. = 23 secs.
3	P S L M F	10 18 18 10 21 47 10 22 58 10 24 27 11	...	...	...	...	2070	
6		3 28 to 4 15	...	...	...	...	...	Moderate disturbance; phases masked by large microseismal movements.
14		18 22 to 18 45	...	...	...	...	...	Slight disturbance. Long waves at 18 h. 25½ m.
15	P PR ₁ (?) PR ₂ (?) S S SR ₁ (?) L M M M F	0 26 35 0 29 55 0 31 37 0 36 43 0 36 55 0 42 25 0 53 15 1 1 8 1 1 20 1 3 6 2 30	...	...	...	...	8900	Epicentre, Aleutian Islands. Noticeable feature is three isolated groups of long waves, each group including 14 periods. The first and second times given for the S phase refer to the E.W. and N.S. components respectively.
15	L	21 53	...	...	...	...	...
16	S(?) L F	10 22 26 10 28 47 11	...	...	...	...	...	S doubtful. P indistinguishable owing to large microseismal motions. Δ probably 4820.
18		17 53 to 18 10	...	...	...	...	...	Slight disturbance with no well- marked phases.
22	L	3 55 to 4 7	...	...	...	...	...
29		2 30 to 3 14	...	...	...	...	...	Slight disturbance with no well- marked phases.

Day.	0 h.		6 h.		12 h.		18 h.	
	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
	μ	s	μ	s	μ	s	μ	s
1	1.7	6	1.4	6.5	1.6	6	1.7	6.5
2	1.4	6.5	1.4	7.5	2.2	7	2.0	7.5
3	2.0	7	1.8	6	2.0	7.5	1.5	7
4	1.8	5.5	2.2	6	3.1	6	3.7	6.5
5	3.8	6	4.2	7	4.4	6.5	4.7	8
6	3.0	9	3.7	6.5	5.0	5.5	3.9	6
7	3.4	6	4.1	5.5	3.0	6	1.9	6.5
8	1.6	6	1.7	6	1.4	5.5	1.0	6.5
9	1.1	5	0.9	6	0.9	6	1.1	5.5
10	1.0	6	1.0	5	0.9	5.5	0.8	6
11	0.8	6	0.8	5.5	1.0	5	1.5	5.5
12	1.5	5	0.9	5	0.9	5	0.9	4.5
13	0.7	4.5	0.8	4.5	0.6	4.5	0.7	4.5
14	0.9	4.5	0.6	5	0.8	5	0.9	5
15	0.9	5	0.9	5	1.0	4.5	0.8	5
16	1.0	6	1.6	5	1.7	5.5	1.1	6
17	1.5	6	1.1	6	1.2	6.5	1.5	6.5
18	1.6	6	1.7	6.5	1.4	7.5	2.3	6
19	2.1	7	2.6	6	2.8	7	3.6	8
20	3.2	8	4.6	6	3.1	6	2.4	6
21	2.1	5.5	1.7	5.5	1.4	5.5	1.5	5
22	1.1	6	1.6	6	0.7	5.5	0.7	5.5
23	0.6	6	0.3	5.5	0.2	5.5	0.4	6
24	0.3	5	0.2	5	0.2	5	0.2	6
25	0.5	5.5	0.9	6	1.2	6.5	1.6	6
26	1.7	5.5	2.8	6	3.0	6.5	2.8	6.5
27	3.2	6.5	2.8	6.5	1.6	6.5	1.1	7
28	1.1	6	0.7	6.5	0.9	6	0.7	6.5
29	1.0	6	1.7	5.5	2.6	5.5	2.5	5.5
30	1.9	6	2.4	6	2.7	5.5	2.2	6
31	3.5	6	2.3	6	2.1	6.5	1.6	6

Means for Month { A_N = 1.7. T = 6.0. Normals, 1911-16 { A_N = 1.8. T = 5.6

EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).

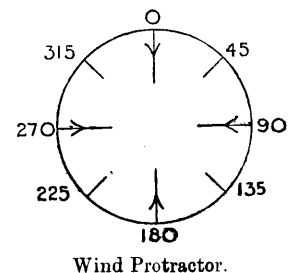
Day.	Times, G.M.T. of		Remarks.
	Commence- ment.	Max. Phase.	
	h m	h m	
3	...	10 24	Very small.
6	3 27	4 0	
14	...	18 25 18 27.5	Very small. Amplitude at two times equal.
15	0 36	1 7.5	Amplitude by trace 1.5 mm.
18	...	18 0	Very small.
22	...	4 9	Small.
29	...	3 5	Very small.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G. M. T.	Horizontal Velocity of Wind.																Cloud Observations.		
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	mr/s.
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.				
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.			
1	Eskdalemuir	h. m. 7 25	?	?	...	0'0	195	2'0	240	1'9	250	3'0	315	6'5	305	8'5	...	...	Ci.	325	2'2
1	"	12 35	180	8	160	3'1	185	2'6	205	2'3	225	2'4	300	2'7	...	...	...	...	Cu.	220	1'8
3	"	7 35	160	10	...	0'0	140	5'5	135	4'5	190	3'6	...	...	...	...	...	...	A.-Cu.	205	2'2
8	"	12 40	360	14	360	3'5	15	4'4	30	3'2	25	7'5	10	9'0	...	...	...	...	Ci.	15	2'8
9	"	7 45	30	12	360	2'1	115	7'5	145	10'5	150	11'5	...	...	...	...	...	...	Ci.	270	3'6
12	"	7 20	?	?	...	0'0	275	1'6	285	3'3	300	3'1	...	...	...	...	...	...	Ci.	235	1'3
12	"	12 40	?	?	270	1'5	210	3'0	235	2'2	245	3'9	240	4'7	215	5'5	230	6'5	b.	...	...
14	"	7 25	?	?	...	0'0	55	0'9	245	1'8	35	1'7	295	3'4	280	10'5	285	13'5	b.	...	...
15	"	7 30	360	8	20	6'0	35	15'0	45	15'0	25	11'5	...	...	...	...	...	...	Fr.-Cu.	80	4'9
15	S. Farnboro'	7 10	360	8	...	0'0	40	6'0	45	6'5	50	2'5	20	6'0	...	...	...	...	Ci.	300	...
16	Benson	12 0	230	9	220	5'5	245	7'5	265	8'5	275	8'5	310	10'0	...	...	...	...	St.-Cu.	315	...
16	S. Farnboro'	7 15	?	?	250	2'0	225	7'5	340	4'5	335	8'5	320	8'5	345	16'0	...	...	...	...	...
16	"	11 30	230	9	215	6'5	230	7'5	280	5'5	310	5'5	...	...	...	...	...	...	...	...	...
17	"	7 5	270	12	225	3'0	270	13'5	275	9'5	295	7'5	...	...	...	...	...	...	...	...	...
17	"	10 25	270	13	225	6'5	260	8'5	260	12'5	290	8'5	275	3'0	240	9'5	270	10'0	Ci.	290	...
21	Eskdalemuir	7 25	360	11	340	7'0	350	8'5	15	9'5	10	17'0	...	...	...	...	...	...	...	...	...
21	S. Farnboro'	7 20	360	12	350	3'5	25	13'0	30	14'5	35	14'5	35	14'0	5	15'5	...	...	...	...	...
23	Eskdalemuir	7 25	?	?	...	0'0	185	2'2	245	3'1	15	12'5	...	...	...	...	...	...	...	...	...
24	Benson	7 10	?	?	...	0'0	30	7'0	15	8'0	45	13'5	...	...	...	...	...	...	...	...	...
24	S. Farnboro'	7 5	?	?	45	1'0	35	5'0	35	8'5	45	11'0	50	17'0	50	18'0	...	...	b.	...	...
27	Eskdalemuir	7 35	360	7	360	5'5	15	9'0	305	2'7	360	10'5	5	17'0	...	...	...	...	Ci.	20	4'7
29	Benson	7 15	270	4	250	6'5	265	15'5	270	18'5	270	17'5	...	...	...	...	...	...	...	...	...
31	Eskdalemuir	7 20	340	11	30	3'6	40	6'5	45	6'5	340	4'2	250	2'9	290	9'0	...	...	Ci.	240	2'5

Notes on Pressure Distribution.

- March 1 7 h. Irregular anticyclone over Western Europe. Depression over Iceland.
 1 13 h. Anticyclone weakened. Highs over N.E. and E. England, W. Channel, Holland, and Denmark.
 3 7 h. Anticyclone over Finland. Depression over Eastern Atlantic.
 8 13 h. Deep depression over N. Germany. Shallow depression between N. Scotland and Farøe.
 9 7 h. Deep depression off W. of Ireland. Ill-defined wedge over E. England.
 12 7 h. Shallow depression off N.W. Ireland. Shallow secondary S.E. England and N.E. France.
 12 13 h. Shallow depression off W. Scotland. Shallow secondary over Low Countries.
 14 7 h. Shallow depression over S. England. Shallow depression over N. Scotland.
 15 7 h. Irregular anticyclone off Iberian Peninsula. Depression over Italy.
 16 7 h. Anticyclone over S. England and France.
 16 13 h. Anticyclone over S. England and France.
 17 7 h. Anticyclone of 16th weakened. Depression over Iceland.
 17 13 h. Anticyclone of 16th weakened. Depression over Iceland.
 21 7 h. Anticyclone over N.E. Atlantic. Depressions over Finland, N. Italy, and Austria.
 23 7 h. Depressions over W. Mediterranean and Spitzbergen.
 24 7 h. Depressions over W. Mediterranean and Iceland. Anticyclone W. of Ireland.
 27 7 h. Depressions over W. Mediterranean and Iceland.
 29 7 h. Deep depression over Orkneys.
 31 7 h. Deep depression over S. Norway; secondary over S.W. England.



Height of Station above M.S.L. = H.
 Height of Anemometer above ground = h.
 Benson 57 m. 25 m.
 Eskdalemuir 242 m. 15 m.
 S. Farnborough 70 m. 31 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
			mr/s.	mr/s.	mr/s.	
2	St.-Cuf.	176	25.0	- 1.7	+ 24.9	Normal type St.-Cu. Direction and velocity both varying slightly.
9	St.-Cu.	157	2.6	- 1.0	+ 2.4	
14	A.-Cu.	360	1.7	0.0	- 1.7	Nb.-Cumuliformis with mammalated under-surface.
15	Nb.-Cuf.	258	0.7	+ 0.7	+ 0.1	
19	Fr.-Cu.	290	12.0	+ 11.3	- 4.1	Apical part of cloud measured.
21	Cu.-Nb.	351	6.0	+ 0.9	- 5.9	
22	Cu.-Nb.	360	8.0	0.0	- 8.0	Base of cloud measured.
24	Cu.	256	5.7	+ 5.5	+ 1.4	Packed sheet of Cu.
26	Cu.-Nb.	3	16.0	- 0.8	- 16.0	Central part of cloud measured.
28	Fr.-Cu.	262	8.0	+ 7.9	+ 1.1	
29	Cu.-Nb.	267	4.5	+ 4.5	+ 0.2	Apex of cloud measured.
30	Cu.	330	15.0	+ 7.5	- 13.0	Cu. changing into small type of Cu.-Nb.
31	Cu.	300	7.0	+ 6.1	- 3.5	Degraded type of Cu.

12. AURORA.

Aurora was observed at Seskin (Carrick-on-Suir) on the 10th, Aberdeen and Paisley on the 19th, and at Glasgow and Donaghadee on the 20th.

METEOROLOGICAL OFFICE OBSERVATORIES—GEOPHYSICAL JOURNAL.

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Seventh Year.—No. 4. APRIL 1917.]

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1. SUNSHINE AND SOLAR RADIATION.

Day.	SOUTH KENSINGTON.—Lat. 51° 30' N. Long. 0° 10' W.								RICHMOND.—Lat. 51° 28' N. Long. 0° 19' W.					ESKDALEMUIR.—Lat. 55° 19' N. Long. 3° 12' W.					CAHIRCIVEEN.		
	Bright Sunshine.		Radiation received on Horizontal Surface by Callendar Radiograph.						Bright Sunshine.		Radiation at Noon by Ångström Pyrheliometer.			Bright Sunshine.		Radiation by Ångström Pyrheliometer.				Bright Sunshine.	
	Total.	Per cent. of Possible.	Daily Total.	Per cent. of Planetary.	Maximum.				Total.	Per cent. of Possible.	Intensity.	Vertical Component.	Sky.	Total.	Per cent. of Possible.	Time.	Sky.	p sec Z. P ₀	Intensity.	Total.	Per cent. of Possible.
					Amount.	For Day.		11.30 h. to 12.30 h.													
1	3.1	24	529	20	44	14	35	17	2.7	21	...	...	...	10.1	78	...	...	...	...	3.9	30
Means	4.30	31	1035	34	64	—		56	5.13	37	—	—	—	3.67	26	—	—	—	—	6.53	48
Normal	5.53	40	1111	—	—	—		—	5.23	38	—	—	—	4.70	34	—	—	—	—	5.33	39

2. METEOROLOGY AND MAGNETISM:—CAHIRCIVEEN (VALENCIA OBSERVATORY).—Lat. 51° 56' N. Long. 10° 15' W.

Heights above M. S. L.:—H=9.1 m. H₀=13.7 m. H_a=26.4 m. Above Ground: h₁=1.3 m. h_r=0.56 m. h_a=13.9 m.

Day.	Air Pressure at Station Level.		Air Temperature in Degrees Absolute.				Humidity.				Wind Direction in Points (S=E, 16=S) with Speed in metres per second.				Cloud Amount (0-10) and Weather.		Rain 24 hours beginning 9 h.	Min. Temp. on Grass.	REMARKS.	Magnetism. Horizontal Force, Declination West, and Inclination.
	9 h.	21 h.	9 h.		21 h.		9 h.		21 h.		9 h.		21 h.		9 h.	21 h.				
	mb.	mb.	a.	a.	a.	a.	millibar.	%	%	Dir.	m/s.	Dir.	m/s.	Tenths of Sky covered.		mm.	200+			
1	1002.2	985.4	74.2	74.0	n 77	72	5.1	6.0	77	91	31	3	11	7	3	10	2.6	n 71	Frequent *▲▲ showers. ☒ q., with *▲▲ showers a. Parhelia 18 h.	
Means	1016.6	1016.8	80.4	79.8	82.8	76.8	8.2	8.3	78	83	5.1	—	—	—	—	37.0	75.2	—	Monthly Totals or Means.	
Normal	1011.6	1011.8	82.1	81.6	85.0	79.1	9.5	9.4	82	84	5.4	—	—	—	—	96.9	—	—	Normals.	

x denotes the maximum and n the minimum value in the column.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS. Includes monthly means and normals.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS. Includes monthly means and normals.

Temperatures at or below the normal freezing point of water are printed in small type.

5. GEOPHYSICS :—RICHMOND (KEW OBSERVATORY).

Table with 17 main columns: Day, Earth Temperature at 9 h (0.3 m, 1.2 m), Height above M.S.L. of Surface of Underground Water (Daily Mean, Extremes), Horizontal Force (Mean Time, Extremes), Declination (West) (Mean Time, Extremes), Inclination (North) (Mean Time, Extremes), Magnetic Character of Day, Electric Character of Day, Potential Gradient (Volts per metre, Factor 2.46) (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10^16 (About 15 h), Air-Earth Current x 10^16 (About 15 h). Rows 1-30 and M.

6. GEOPHYSICS :—ESKDALEMUIR.

Table with 17 main columns: Day, North Component (Maximum, Minimum), West Component (Maximum, Minimum), Vertical Component (Maximum, Minimum), Magnetic Character of Day, Electric Character of Day, Potential Gradient (Volts per metre, Factor 5.57) (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10^16 (About 15 h), Air-Earth Current x 10^16 (About 15 h). Rows 1-30 and M.

* From Benndorf curve.

† 20 days.

‡ The potential gradient is reckoned as positive if the potential increases upwards.

§ 24 days.

x denotes the maximum and n the minimum value in the column.

z Indeterminate.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H = 54 m. H₁ = 55 m. Above Ground:—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 5 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0h. to 24h., and REMARKS. Includes data for days 1-30 and means/normal values.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h, Mean), Sunshine (Total, Percent of Possible), Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming (Upper, Lower, Upper, Lower), and Mean Amount. Includes data for days 1-30 and means/normal values.

8. WIND COMPONENTS : Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES :—HOLYHEAD.

Height of Head above—Roof 8·8 m., Ground 13·7 m., M.S.L. 19·2 m.
Height of Cups above—Roof 4·6 m., Ground 7·6 m., M.S.L. 15·2 m.

SCOTLAND N. :—DUNDEE.

Height of Cups above—Roof 1·5 m., Ground 4·9 m., M.S.L. 57·3 m.

Main data table for Holyhead and Dundee stations, including columns for Day, 3h, 9h, 15h, 21h, Max. Gust, Time of Gust, and Vel. in Max. Hourly Run.

ENGLAND S.W. :—SCILLY.

Height of Head above—Ground 9·8 m., M.S.L. 49·7 m.
Height of Cups above—Ground 5·8 m., M.S.L. 45·7 m.

ENGLAND E. :—GREAT YARMOUTH.

Height of Head above—Roof 10·7 m., Ground 12·8 m., M.S.L. 15·9 m.
Height of Cups above—Roof 3·7 m., Ground 13·3 m., M.S.L. 22·3 m.

Main data table for Scilly and Great Yarmouth stations, including columns for Day, 3h, 9h, 15h, 21h, Max. Gust, Time of Gust, and Vel. in Max. Hourly Run.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES:—ESKDALEMUIR.									MICROSEISMS OF N. COMPONENT:—ESKDALEMUIR.										
Day.	Phase.	Time, G.M.T.			Period.	Amplitudes.			Δ.	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
		h	m	s		A _{N.}	A _{E.}	A _{Z.}				A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
		to	to	to	μ	μ	μ	km.			μ	s	μ	s	μ	s	μ	s	
3	L	13 34	13 53	...	...	...	...	...		1	1'6	6'5	1'6	6	1'6	6	1'7	7
4		13 50	14 10	...	...	...	...	...	Slight disturbance.	2	2'5	6	2'3	5'5	1'3	8'5	1'6	6
5		5 28	5 46	...	...	...	...	...	Slight disturbance.	3	1'5	6	1'5	5	1'6	5	1'0	4'5
12		3 30	4 0	...	...	...	...	...	Moderate disturbance. Preliminary phases masked by wind effects.	4	1'0	4	0'4	6'5	0'3	7'5	0'3?	6'5?
17		14 9	14 32	...	...	...	...	...	Slight disturbance.	5	0'4	6'5	0'4	6	0'4	4'5	0'4	5
20	L	10 5	10 19	...	...	...	...	...	Earlier phases masked by wind effects.	6	0'5	4	0'2	4'5	0'3	5	0'1	4
21	P PR ₁ S SR ₁ SR ₂ M L F	0 58	1 0 37	...	...	...	...	5420	Azimuth 116°. Epicentre in the Caucasus.	7	0'3	4	0'2	4	0'3	4	0'2	4'5
21	L	4 37	4 43	...	...	...	...	...		8	0'4	4'5	0'7	6'5	1'1	6'5	1'6	6
22	P PR ₁ PR ₂ S L F	6 38	6 40 11	...	...	...	...	5200	Slight earthquake with well-defined phases.	9	2'8	7	5'5	6'5	4'8	7	3'1	7'5
26	Pe S L(?)	9 41	9 44 34	...	...	...	...	1660	Slight earthquake. Epicentre in Tuscany.	10	3'7	7'5	2'8	7	2'7	6'5	1'7	7
26		13 27	14 0	...	...	...	...	...	Slight earthquake. Preliminary phases masked by wind effects.	11	2'0	4'5	1'3	6'5	1'4	7	1'9	5
28	L	16 22	16 30	...	...	...	...	...		12	1'9	5	1'2	5	1'5	5	1'5	5
29	Pe S L M M F	12 5	12 13 26	...	...	...	...	6550	Δ doubtful.	13	0'9	6'5	0'7	5'5	...	...	...	...
29	L	17 22	17 33	...	...	...	...	...		14	0'9	...	...	...	...	...	...	...
										15	...	...	...	...	...	...	...	...
										16	...	...	...	...	...	...	...	...
										17	...	...	...	...	1'0	4'5	1'2	4'5
										18	1'0	5	0'9	5	0'9	5	1'0	4'5	
										19	0'9	4'5	0'8	5	1'0	4'5	1'1	4'5	
										20	1'1	5	1'7	5'5	0'9	5	0'6	5	
										21	1'6	5'5	0'8	5'5	...	...	...	...
										22	0'4	4'5	0'2	4	0'2	4'5	0'2	4	
										23	0'2	4'5	0'1	5	0'1	4	0'2	5	
										24	0'2	5'5	0'3	5	0'4	6	0'4	5	
										25	0'5	5	0'4	5'5	0'4	5'5	0'6	5	
										26	0'5	5	0'2	4	0'5	5	0'8	5	
										27	0'7	5	0'7	4'5	0'5	5	0'7	4'5	
										28	0'6	4	...	...	0'6	3'5	0'7	4
										29	0'9	4'5	0'9	4	1'0	4'5	0'8	4'5	
										30	0'5	4'5	0'2	4	0'5	4	0'1	4	

Mean for Month { A_N = 1'0. T = 5'2. Normals, 1911-16 { A_N = 1'3. T = 5'5.

EARTHQUAKES:—RICHMOND (KEW OBSERVATORY).

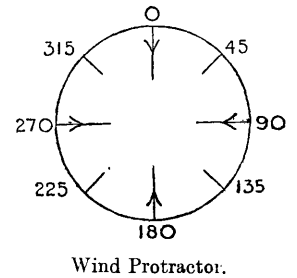
Day.	Times, G.M.T. of		Remarks.
	Commence-ment.	Max. Phase.	
	h	m	
3	13	39	Very small.
4	...	13 55	Very small.
12	...	3 49	Very small.
20	...	10 8'5	Small.
21	1	4	Amplitudes equal. Small.
21	...	4 45	Very small.
26	9	42	
26	...	13 27	Very small.
29	...	12 36'5	

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.														Cloud Observations.				
			Geostrophic.		By Anemometer.		At Heights above M.S.L.										Type.	From N.	mr/s.		
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.					5000 m.	
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.				From N.	m/s.
2	Eskdalemuir	7 25	?	?	...	0'0	175	3'4	185	2'9	180	2'5	170	6'5	185	9'5	...	...	...
3	Benson	7 20	230	8	...	0'0	275	8'0	265	11'5	255	8'5	...	...	...	...	...	...	...
3	S. Farnboro'	7 25	230	10	250	4'5	270	11'0	265	10'5	260	10'0	...	...	...	...	...	...	...
4	Eskdalemuir	12 50	160	6	240	1'5	265	2'8	305	7'5	315	4'6	305	10'0	...	...	...	...	...
5	Benson	7 20	220	8	...	0'0	260	6'5	240	7'0	280	5'0	...	...	...	...	...	...	...
5	S. Farnboro'	7 5	220	8	270	2'0	250	6'0	240	7'0	295	5'0	275	6'0	325	4'0	265	8'0	b.	...	
7	"	7 35	?	?	...	0'0	360	5'0	10	4'5	360	7'5	...	...	...	...	...	...	...
13	Benson	7 15	300	9	...	0'0	270	4'8	280	7'5	270	7'5	265	7'5	270	8'0	...	...	...
13	S. Farnboro'	6 15	320	9	260	1'5	280	4'0	270	7'5	285	9'5	285	9'5	280	5'0	275	7'0	...	...
16	"	6 15	270	9	250	2'0	275	8'0	275	8'5	275	10'0	...	...	...	...	...	...	Ci.	295
17	Eskdalemuir	7 35	360	22	360	7'5	355	8'0	345	7'0	335	16'0	...	...	...	...	...	...	Ci.	355
20	S. Farnboro'	6 15	340	8	305	5'0	345	11'5	360	9'5	335	19'0	...	...	...	...	...	...	...	...
23	Benson	7 10	70	4	40	3'0	30	7'5	35	12'5	30	13'0	...	...	...	...	...	...	...	...
24	"	6 45	50	7	50	1'6	50	3'2	55	8'5	50	7'5	...	...	...	...	...	...	...	...
24	S. Farnboro'	6 25	50	7	35	2'0	25	5'5	50	5'0	65	8'5	50	10'5	...	...	...	...	...	...
25	"	6 20	10	5	25	2'0	45	6'5	40	10'5	355	12'5	...	...	...	...	...	...	...	...
26	"	6 25	?	?	25	2'0	35	3'0	20	11'0	335	7'5	...	...	...	...	...	...	...	...
28	"	6 45	310	8	270	3'0	320	9'0	320	11'5	320	15'0	...	...	...	...	...	...	...	...
30	"	6 40	?	?	270	1'0	315	1'5	260	1'5	265	4'5	...	...	...	...	...	...	...	...

Notes on Pressure Distribution.

March 2 7 h. Depression over Bristol Channel. Shallow secondary over N. Scotland.
 3 7 h. Depression over British Isles, with minima along E. coast, England.
 4 13 h. Shallow depression over North Sea.
 5 7 h. Shallow depression between Orkneys and Norway. Shallow secondary Central N. Ireland.
 7 7 h. Anticyclone off W. of Ireland. Shallow depression over Irish Sea.
 13 7 h. Extensive depression centred over Central Norway. Small anticyclone over Central France.
 16 7 h. Depression over Central Norway. Well-developed secondary over W. Scotland.
 17 7 h. Wedge over British Isles between depressions over S.W. Iceland and Eastern Baltic.
 20 7 h. Anticyclone off S.W. Ireland.
 23 7 h. Anticyclone of 20th had moved north-east. Centre off W. Ireland.
 24 7 h. Anticyclone of 23rd in same position, but had weakened.
 25 7 h. Anticyclone centred off N.W. Ireland.
 26 7 h. Anticyclone over British Isles.
 28 7 h. Small anticyclone off S. Ireland. Shallow depressions N.E. of Farøe and in northern North Sea.
 30 7 h. Small anticyclone off S.W. Ireland. Shallow depression between Farøe and N. Scotland.



Height of Station above M.S.L. = H.
 Height of Anemometer
 above ground = h.
 Benson . . . 57 m. 25 m.
 Eskdalemuir . . 242 m. 15 m.
 S. Farnborough . . 70 m. 31 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
3	Fr.-Cu.	76	mr/s.	mr/s.	mr/s.	St.-Cu. formed from apices of Cu.-Nb. Velocity varying in places. Apex of cloud measured. Ci. to Ci.-St., in striated sheets. ⊕ visible.
4	St.-Cu.	330	14'0	- 13'6	- 3'4	
5	Cu.-Nb.	297	2'5	+ 1'3	- 2'2	
6	Ci.	333	5'0	+ 4'5	- 2'3	
9	Fr.-Cu.	295	3'4	+ 1'5	- 3'0	
10	Cu.	315	14'0	+ 12'7	- 5'9	Cu. of low altitude, degraded type.
11	Cu.	35	10'0	+ 7'1	- 7'1	
12	Fr.-Cu.	1	8'0	- 4'6	- 6'6	
13	Cu.	279	9'0	- 0'2	- 9'0	
14	Cu.	336	5'0	+ 4'9	- 0'8	
17	Cu.-Nb.	340	10'0	+ 4'1	- 9'1	Degraded Cu., below sheet of A.-St. Cu. changing into small Cu.-Nb.
19	Cu.	302	5'0	+ 1'7	- 4'7	
20	Cu.	305	12'0	+ 10'2	- 6'4	
24	Cu.	315	11'0	+ 9'0	- 6'3	
25	St.-Cu.	340	7'4	+ 5'2	- 5'2	
26	Ci.	320	8'0	+ 2'7	- 7'5	Cu. below a fused St.-Cu. sheet. St.-Cu. of thin flat type.
26	Fr.-Cu.	290	3'0	+ 1'9	- 2'3	
27	Cu.	320	12'5	+ 11'8	- 4'3	
27	Cu.	320	9'0	+ 5'8	- 6'9	
30	Nb.-Cuf.	271	6'0	+ 6'0	- 0'1		Cu. in massed sheet. Nb.-Cuf., really small, slightly developed Cu.-Nb.

12. AURORA.

Aurora was observed on the 4th at Seskin, Carrick-on-Suir, on the 9th at Eskdalemuir (arch and streamers), on the 12th at Eskdalemuir (glow type), on the 14th at Seskin (faint), on the 15th at Edinburgh, and on the 17th at Aberdeen (glow type, moderately faint, seen behind clouds).

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m. Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS. Includes monthly means and normals for 45, 30, and 35 years.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m. Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9 h., Min. Temp. on Grass, and REMARKS. Includes monthly means and normals for 45, 30, and 35 years.

Temperatures at or below the normal freezing point of water are printed in small type.

5. GEOPHYSICS :—RICHMOND (KEW OBSERVATORY).

Table with 16 columns: Day, Earth Temperature at 9 h (0.3 m, 1.2 m), Height above M.S.L. of Surface of Underground Water (Daily Mean, Extremes), Horizontal Force (Mean Time), Declination (West) (Mean Time), Inclination (North) (Mean Time), Magnetic Character of Day, Electric Character of Day, Potential Gradient, Volts per metre. Factor 2.49 (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10^16 (About 15 h), Air-Earth Current x 10^16 (About 15 h). Rows 1-31, M.

6. GEOPHYSICS :—ESKDALEMUIR.

Table with 16 columns: Day, North Component (Maximum, Minimum), West Component (Maximum, Minimum), Vertical Component (Maximum, Minimum), Magnetic Character of Day, Electric Character of Day, Potential Gradient, Volts per metre. Factor 5.59 (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10^16 (About 15 h), Air-Earth Current x 10^16 (About 15 h). Rows 1-31, M.

* 27 days. † 23 days. ‡ Instrument out of order. § Mean of 29 days, 24th and 25th omitted. z Indeterminate.
x denotes the maximum and n the minimum value in the column.
Note.—The Water Level values from 21st to 30th are somewhat doubtful.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H = 54 m. H_b = 55 m. Above Ground:—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 5 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0 h. to 24 h., and REMARKS. Rows 1-31 and Means/Normal.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale), Sunshine, Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming. Sub-columns for Upper and Lower clouds, and Mean Amount. Rows 1-31 and Means/Normal.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES:—ESKDALFUIR.

Day.	Phase.	Time, G.M.T.	Period.	Amplitudes.			Δ .	Remarks.
				A_N .	A_E .	A_Z .		
		h m s	s	μ	μ	μ	km.	
1	P i i S F	18 46 12 18 50 37 18 53 56 19 0 55 23 45	...	...	...	...	...	Large earthquake. Displacements too large and rapid for accurate reading of photographic traces.
2	L Pe	2 0 to 7 15 14 30 29	...	...	...	...	...	Numerous groups of long waves of periods 18 to 20 secs. Followed, until 16½ h., by groups of long waves 18 to 24 s. period.
3		6 36 to 7 30	...	...	...	...	...	Prolonged slight disturbance with no identifiable phases.
4	Pe S(?)	1 3 1 1 17 7	...	...	...	...	...	End confused with following disturbance.
4	L	2 8 to 3 13	19	...	...	...	...	Earlier phases confused with preceding disturbance.
6	P PR S SR ₁ L M M F	23 14 39 23 20 24 23 24 59 23 30 7 23 42 23 53 49 23 54 15 0 40	...	...	...	...	9180	
9	P PR S SR ₁ L M M M F	16 13 19 16 16 36 16 23 2 16 28 35 16 39 16 49 53 16 50 35 16 53 3 16 53 44 19	...	...	...	...	8450	Large earthquake. Beginning of long wave phase doubtful.
9		20 10 to 23	...	...	...	...	...	Numerous groups of long waves.
14	L	7 4 to 7 15	17	...	...	...	...
14	Pe L F	22 20 33 22 55 0 20	...	...	...	...	11,000 <i>circa</i>	Pe taken from vertical. Early phases inconspicuous.
18	L	20 20 to 20 50	...	...	...	...	...
21	L	9 33 to 10 0	...	...	...	...	...
23	Pe S L F	5 51 27 5 55 34 5 57 7 6 33	...	...	...	...	2520	
23		22 20 to 23 11	...	...	...	...	...	Faint disturbance.
24	Pe L F	19 39 47 20 5 21 30	...	...	...	...	8350 <i>circa</i>	
26		19 25 to 19 55	...	...	...	...	...	Faint disturbance.
29	Pe F	6 25 45 8 0	...	...	...	...	...	Slight disturbance.
31	L	6 48 to 7 11	...	...	...	...	...
31	P PR ₁ PR ₂ S L M M F	8 58 30 9 0 51 9 3 4 9 7 41 9 21 45 9 22 49 9 27 24 12 45	...	...	...	...	7820	

MICROSEISMS OF N. COMPONENT:—ESKDALEMUIR.

Day.	0 h.		6 h.		12 h.		18 h.	
	A_N .	T.	A_N .	T.	A_N .	T.	A_N .	T.
	μ	s	μ	s	μ	s	μ	s
1	0.1	3.5	0.1	3.5	0.0	...	0.1	4
2	0.4	4.5	0.3	4	0.5	4.5	0.7	4
3	0.7	4.5	0.9	5	0.8	5	0.9	5
4	0.7	5	0.6	5.5	0.6	5	0.5	5
5	0.6	5	0.6	4.5	0.7	5	0.9	5
6	0.9	5	0.9	5	0.8	5	0.7	4.5
7	...	...	0.7	5	0.5	4.5	0.5	5
8	0.4	4.5	0.2	4.5	0.5	4	0.3	3.5
9	0.2	4	0.2	4	0.1	4.5	...	...
10	0.3	3.5	0.3	4	0.6	4	0.7	4
11	0.9	4	0.8	4	0.9	4	0.5	3.5
12	0.3	4	0.6	4	0.5	4	0.6	4
13	0.7	4	0.3	4	0.6	4	0.6	4
14	0.3	4	0.3	3.5	0.1	3	0.1	3.5
15	0.0	...	0.0	...	0.0	...	0.0	...
16	0.0	...	0.0	...	0.0	...	0.1	4
17	0.1	3.5	0.1	3.5	0.3	4	0.2	4
18	0.4	5	0.6	6.5	0.6	4.5	0.5	4
19	0.5	4	0.3	4.5	0.4	4.5	0.2	4
20	0.2	4	0.2	4	0.3	4.5	0.3	4.5
21	0.3	4	0.3	3.5	0.6	4.5	0.8	4.5
22	0.8	5	1.1	4	0.8	4	0.7	4.5
23	0.8	4.5	...	...	0.4	5.5	0.5	5
24	0.3	5	0.6	6	0.5	6	0.3	6
25	0.6	4.5	0.3	5.5	0.5	5	0.6	4.5
26	0.6	4.5	0.5	5	0.6	5	0.5	5
27	0.5	4	0.3	5	0.2	5	0.1	5
28	0.1	4	0.0	...	0.0	...	0.0	...
29	0.0	...	0.0	...	0.0	...	0.0	...
30	0.0	...	0.0	...	0.2	5	0.2	4.5
31	0.2	4.5	0.3	4.5	...	...	1.2	6

Mean for Month $\left\{ \begin{array}{l} A_N = 0.4 \\ T = 4.5 \end{array} \right.$ Normals, 1911-16 $\left\{ \begin{array}{l} A_N = 0.7 \\ T = 4.9 \end{array} \right.$

EARTHQUAKES:—RICHMOND (KEW OBSERVATORY).

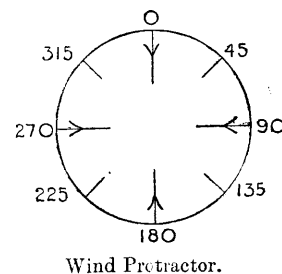
Day.	Times, G.M.T. of		Remarks.
	Commence- ment.	Max. Phase.	
	h m	h m	
1	18 46.5	19 59.5	Amplitude on trace > 17 mm.
2	...	3 1	Small.
		4 40	Series of movements with interludes between.
		6 10	Small.
2	...	15 48	Very small.
3	...	6 43	Very small.
4	...	1 26.5	Very small.
4	...	2 25	Several nearly equal movements from 2 h. 19 m. to 2 h. 26 m.
6	...	23 58	Extended to the 7th.
9	16 12.5?	16 57.5	Amplitude on trace 1.9 mm. Continued until 18½ h. at least.
9	...	21 13	Amplitudes equal.
		21 19	Small. [previous.]
9	...	22 36	Small; may be part of
14	...	7 8	Very small.
18	...	20 36	Very small.
21	...	9 49	Small.
23	...	5 59	Amplitudes equal.
		6 1	
24	...	20 59	Several ordinates nearly equal from 20 h. 59 m. to 21 h. 23 m.
		21 21	
29	...	6 43.5	Very small. [doubtful.]
31	...	7 3	Very small; character
31	9 3.5	9 50.0	Amplitude on trace 3.0 mm. Several ordinates, but little less than maximum after 9 h. 36 m.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.														Cloud Observations.							
			Geostrophic.		By Anemometer.		At Heights above M.S.L.										Type.	From N.	mr/s.					
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.					5000 m.				
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.		
1	Benson .	h. m.	60	7	45	1'2	60	1'4	180	0'1	115	1'7	...	...	...	...	...	...	...	St.-Cu.	135	...
1	S. Farnboro'	6 15	?	?	315	1'0	350	1'0	75	1'5	35	2'5	360	6'5	330	6'5	325	6'5	...	b.	...	...
2	"	6 20	?	?	—	0'0	330	1'0	75	2'0	355	1'5	10	1'5	55	6'0	55	4'5	...	b.	...	...
3	Aberdeen	7 40	?	?	270	1'0	305	4'0	190	4'3	255	9'5	...	...	...	...	...	...	...	b.	...	...
3	Eskdalemuir	7 20	?	?	—	0'0	230	1'8	285	4'5	225	6'0	...	...	...	...	...	...	...	...	...	...
3	"	12 35	170	5	—	0'0	100	1'9	170	3'0	240	4'2	225	5'5	225	6'0	205	8'0	...	Ci.	180	2'2		
3	S. Farnboro'	6 20	?	?	70	2'0	85	9'0	75	11'0	60	6'0	...	...	...	...	...	...	...	Ci.	125	...
4	Benson .	10 55	?	?	40	5'5	75	5'5	88	11'0	110	9'0	...	...	...	...	...	...	...	Ci.	135	...
4	S. Farnboro'	7 20	?	?	45	4'0	95	6'5	95	8'5	100	12'0	...	...	...	...	...	...	...	Fr.-St.	...	...
5	"	6 5	30	5	55	4'0	35	9'0	75	5'0	135	2'5	150	2'5	115	3'5	...	...	...	A.-Cu.	...	...
7	Eskdalemuir	7 20	?	?	—	0'0	285	2'6	110	1'8	285	5'0	255	5'5	...	...	...	...	...	b.	...	...
7	S. Farnboro'	14 30	90	9	45	6'5	85	5'5	125	4'5	140	3'5	140	1'5	170	9'0	155	7'0	...	...	...	...
8	"	8 40	80	14	No record	50	8'0	65	13'0	30	0'5	...	...	...	...	...	...	...	...	Ci.	...	...
9	"	10 25	120	8	55	3'5	75	5'0	120	8'0	180	3'5	235	4'0	205	3'5	240	6'5	...	...	...	...
11	Benson .	6 45	120	5	—	0'0	265	1'1	235	6'5	240	9'5	220	13'5	...	...	...	...	...	Ci.	180	...
12	Eskdalemuir	12 45	130	11	65	5'0	80	3'0	165	7'5	180	6'0	...	...	...	...	...	...	...	Ci.-St.	...	0'0
12	S. Farnboro'	6 10	130	11	55	1'5	125	11'5	120	11'5	150	7'0	200	5'5	...	...	...	...	...	...	...	...
14	Benson .	6 40	?	?	190	1'4	245	5'0	240	7'5	210	8'0	200	11'0	...	...	...	...	...	A.-St.	180	...
14	S. Farnboro'	6 35	?	?	—	0'0	280	2'5	265	2'5	225	6'0	215	7'5	...	...	...	...	...	Ci.	225	...
17	Eskdalemuir	12 40	40	14	55	7'5	45	3'8	95	13'0	100	17'5	...	...	...	...	...	...	...	Ci.-St.	95	2'3
19	S. Farnboro'	6 30	180	7	180	3'5	205	2'5	160	6'0	165	5'0	...	...	...	...	...	...	...	...	...	...
23	"	6 40	180	7	125	2'0	150	8'0	165	8'0	185	10'5	...	...	...	...	...	...	...	A.-Cu.	180	...
24	Aberdeen	7 40	160	8	135	2'0	130	6'5	150	4'7	155	8'5	...	...	...	...	...	...	...	A.-Cu.	143	1'4
25	S. Farnboro'	6 35	220	9	180	5'0	235	9'0	270	9'0	215	6'0	...	...	...	...	...	...	...	Ci.-Cu.	...	...
26	"	6 35	140	8	110	2'5	145	8'5	140	4'5	155	8'5	...	...	...	...	...	...	...	...	...	...
29	Eskdalemuir	7 25	?	?	360	1'0	50	2'7	55	2'0	25	2'8	55	3'6	...	...	...	...	...	Ci.	15	1'9
29	S. Farnboro'	7 15	?	?	340	2'0	45	5'5	55	4'5	65	3'5	25	5'0	20	9'0	355	9'5	...	...	...	...
31	Benson .	11 25	240	8	230	7'0	230	8'5	210	9'0	240	13'5	...	...	...	...	...	...	...	Cu.	245	...
31	S. Farnboro'	6 15	240	7	250	2'5	300	6'0	290	6'5	295	7'5	325	7'5	325	5'5	325	6'5	...	...	...	...
1	S. Farnboro'	6 15	(For observations at lower levels, see above).						350	7'0	5	7'0	20	7'5
2	"	6 20							40	4'0	60	4'5	
7	"	14 30							205	4'0	200	9'5	
9	"	10 25							240	6'0	260	6'0	
29	"	7 15							5	11'0	25	9'5	
31	"	6 15							355	8'5	5	6'0	

Notes on Pressure Distribution.

- May 1 7 h. Anticyclone S.W. of Ireland ; axis of high pressure extending towards Baltic.
- 1 13 h. Anticyclone over S. Ireland.
- 2 7 h. Anticyclone over England.
- 3 7 h. Anticyclone over British Isles.
- 3 13 h. Anticyclone has moved to southern North Sea.
- 4 7 h. Anticyclone over North Sea and N. Germany ; depressions over N. Norway and Azores.
- 4 13 h. Anticyclone over central North Sea.
- 5 7 h. Anticyclone has moved to Russia ; another S.W. of Iceland ; col over North Sea and Channel.
- 7 7 h. Depression over Finland ; anticyclone N.W. of Iceland ; axis extending over North Sea.
- 7 13 h. Shallow depressions over S. France and Sweden.
- 8 7 h. Shallow depression over N.W. France ; deep depression over Finland.
- 9 13 h. Anticyclone E. of Iceland ; axis of high pressure extending over North Sea.
- 11 7 h. Anticyclone E. of Iceland ; depression N.E. of Azores.
- 12 7 h. Shallow depression over and W. of Bay of Biscay.
- 12 13 h. Shallow depression S. of Ireland.
- 14 7 h. Shallow depression over northern North Sea.
- 17 13 h. Depression centred near Corunna ; small secondary over Thames valley.
- 19 7 h. Anticyclone S. and S.W. of Ireland.
- 23 7 h. Depression W. of Ireland ; almost straight isobars over Great Britain.
- 24 7 h. Depression W. of Ireland ; indications of secondary over Irish Sea.
- 25 7 h. Anticyclone over France.
- 26 7 h. Anticyclone over Holland and Baltic.
- 29 7 h. Shallow depression over England and North Sea, centred near the Helder.
- 31 7 h. Depressions N.W. of Ireland and over Baltic.



Height of Station above M.S.L. = H.
 Height of Anemometer
 above ground = h.
 H. h.
 Aberdeen . . . 14 m. 32 m.
 Benson . . . 57 m. 25 m.
 Eskdalemuir . . . 242 m. 15 m.
 S. Farnborough . . . 70 m. 31 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
2	Fr.-Cu.	281	mr/s. 7.4	mr/s. + 7.3	mr/s. - 1.4	Coarse Ci. to Ci.-St., increasing to dense Ci.-St. with fine ⊕ later.
4	Ci.	273	2.4	+ 2.4	- 0.1	
5	Cu.	355	7.6	+ 0.7	- 7.6	Ci. changing to Ci.-Cu., and moving more than twice as fast visibly as the lower A.-Cu. sheet. A.-Cu. arranged in sheet of small cloudlets. <i>Observation at 12 h.</i>
7	{ Ci. A.-Cu.	267 267	3.6 1.4	+ 3.6 + 1.4	+ 0.2 + 0.1	
14	A.-Cu.	260	1.6	+ 1.6	+ 0.3	
18	A.-Cu.	115	3.6	- 3.5	+ 0.9	Fine flotilla of A.-Cu. Some hazy indefinite Ci. with ⊕ above.
21	Fr.-St.	150	25.0	- 12.5	+ 21.7	St.-Cu. in thin diffuse sheets. <i>Observation at 12 h.</i> A.-Cu. small cloudlets, thin and unshaded.
23	St.-Cu.	174	4.5	- 0.5	+ 4.5	
24	A.-Cu.	143	1.4	- 0.8	+ 1.1	
30	St.-Cu.	270	4.0	+ 4.0	0.0	Transition-type between Cu. and St.-Cu.

Note.—On several days no observation could be made on account of the very indefinite type of cloud present. This cloud was associated with apparently thundery conditions, and appeared to consist of stratiform sheets at several levels at the same time, resembling sometimes A.-St., at other times fused A.-Cu. and St.-Cu., and occasionally some degraded A.-Cu. castellatus below A.-St. In addition, stratus films below the upper clouds were unusually frequent. The whole month's cloud observations seem to indicate that the air was, during the whole time, very much stratified.

12. AURORA.

None reported.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS. Rows 1-30, Means, Normal.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS. Rows 1-30, Means, Normal.

Temperatures at or below the normal freezing point of water are printed in small type.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M. S. L. :—H = 54 m. H_b = 55 m. Above Ground :—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max., Min., Mean of 5 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0h. to 24h., and REMARKS.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h), Sunshine (Total, Percent. of Possible), Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming (Upper, Lower), and Mean Amount.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8.8 m., Ground 13.7 m., M.S.L. 19.2 m. Height of Cups above—Roof 4.6 m., Ground 7.6 m., M.S.L. 15.2 m.

SCOTLAND N.:—DEERNESS.

Height of Cups above—Roof 1.5 m., Ground 4.9 m., M.S.L. 57.3 m.

Table with columns for Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust, and Time of Gust for Holyhead and Deerness. Includes wind direction (S, N, W, E) and velocity (m/s) data for each hour.

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9.8 m., M.S.L. 49.7 m. Height of Cups above—Ground 5.8 m., M.S.L. 45.7 m.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10.7 m., Ground 12.8 m., M.S.L. 15.9 m. Height of Cups above—Roof 3.7 m., Ground 18.3 m., M.S.L. 22.3 m.

Table with columns for Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust, and Time of Gust for Scilly and Great Yarmouth. Includes wind direction (S, N, W, E) and velocity (m/s) data for each hour.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES :—ESKDALEMUIR.

MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.

Day.	Phase.	Time, G.M.T.	Period.	Amplitudes.			Δ.	Remarks.
				A _{N.}	A _{E.}	A _{Z.}		
3	L	h m s	s	μ	μ	μ	km.	
		15 34 to	...	...	...	...	...
	L	15 53	...	...	...	...	...
		20 6 to	...	...	...	...	...
4	P	1 40 29	...	...	...	...	7650	P prominent on vertical record.
	S	1 49 31	...	...	...	...	...	Oppositely travelling long waves observed after 4 h. 9 m.
	L	2 3	...	...	...	...	...
	M	2 5 45	30	19	...	...	...
	M	2 9 56	21	21	...	...	...
	M	2 10 40	22	...	II	...	...
	F	3	...	...	...	...	...
4	L	8 34 to	...	...	...	...	...
		8 52	...	...	...	...	...
5		0 58 to	...	...	...	...	...	Slight disturbance.
		1 9	...	...	...	...	...
6		4 29 to	...	...	...	...	...	Prolonged slight disturbance.
		6 40	...	...	...	...	...	Probably consisted of two separate disturbances.
6	Pe	16 9 4	...	...	...	...	...	Prolonged slight disturbance.
	F	18	...	...	...	...	...	Initial phases not well marked.
7	P	2 58 52	...	...	...	...	7650	
	S	3 7 54	...	...	...	...	...
	L	3 21 39	...	...	...	...	...
	M	3 28 22	20	5	...	...	...
	F	4	...	...	...	...	...
8	P	1 3 37	...	...	...	...	8250	Destructive earthquake at San Salvador. Beginning of L phase particularly well marked on E.-W. record.
	S	1 13 9	...	...	...	...	...
	L	1 27 53	...	...	...	...	...
	M	1 29 57	28	...	27	...	...
	M	1 31 22	21	...	26	...	...
	M	1 34 58	20	...	26	...	...
	M	1 39 36	21	15	...	...	...
	M	1 42 29	21	15	...	...	...
	F	4	...	...	...	...	...
9	P(?)	17 17 41	...	...	...	...	...	Groups of well-marked long waves, of periods 15 to 18 seconds.
	F	19 40	...	...	...	...	...
9	L	23 24 to	...	...	...	...	...
		23 40	...	...	...	...	...
10	e	4 43 47	...	...	...	...	...	Moderate disturbance.
	S(?)	4 53 7	...	...	...	...	...
	L	5 3 19	...	...	...	...	...
	F	6 30	...	...	...	...	...
12		18 51 to	...	...	...	...	...	Faint disturbance.
		19 12	...	...	...	...	...
13	P	7 1 41	...	...	...	...	...
	M	7 25 54	20	...	22	...	...
	M	7 35 41	24	17	...	...	...
	M	8 5 17	21	19	...	...	...
	F	11 30	...	...	...	...	...
16		12 29 to	...	...	...	...	...	Slight disturbance.
		12 45	...	...	...	...	...
17	L	9 40 to	...	...	...	...	...
		10 36	...	...	...	...	...
18		22 48 to	...	...	...	...	...	Slight disturbance.
		23 30	...	...	...	...	...
22	L	6 3 to	...	...	...	...	...
		6 15	...	...	...	...	...
24	P	20 8 21	...	...	...	...	8750	P prominent on North and vertical records. Beginning of long wave phase doubtful.
	PR ₁	20 11 56	...	...	...	...	...
	S	20 18 19	...	...	...	...	...
	M	20 30 20	18	...	23	...	...
	F	22 15	...	...	...	...	...
26	P	6 6 34	...	...	...	...	...	Large distant earthquake. Motions too large and rapid to be accurately deciphered.
	F	11 30	...	...	...	...	...
26	L	14 45 to	20	...	...	...	...
		15 30	...	...	...	...	...
27	L	6 26 to	22	...	...	...	...
		6 40	...	...	...	...	...
27	Pe	12 38 31	...	...	...	...	8600	P taken from vertical record.
	S	12 48 21	...	...	...	...	...
	L	13 2	...	...	...	...	...
	F	13 30	...	...	...	...	...
28	L	15 4 to	19	5	4	...	...
		15 30	...	...	...	...	...
29		16 40 to	...	...	...	...	...	Slight disturbance.
		17 14	...	...	...	...	...
30	P	16 25 15	...	...	...	...	2650	
	S	16 29 32	...	...	...	...	...
	L	16 31 27	...	...	...	...	...
30	P	18 2 21	...	...	...	...	8350	
	S	18 11 58	...	...	...	...	...
	L	18 26	...	...	...	...	...
	F	19 40	...	...	...	...	...

Day.	0 h.		6 h.		12 h.		18 h.	
	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
1	μ 1'6	s 6	μ 1'5	s 6	μ 1'4	s 6'5	μ 1'1	s 4
2	0'8	5'5	0'9	5	1'3	5'5	0'7	5'5
3	0'8	5	0'9	4'5	0'8	5	0'7	4'5
4	1'0	4	0'5	4'5	0'7	4	0'5	4
5	0'6	4	0'3	4	0'1	4	0'1	4
6	0'1	4	...	...	0'0	...	0'1	4
7	0'2	4	0'1	4	0'3	4	0'3	4'5
8	0'3	4	0'3	4'5	0'5	4'5	0'5	5
9	0'5	4'5	0'2	5	0'3	5	...	...
10	0'3	4'5	0'2	4'5	0'4	4'5	0'6	6
11	0'8	6	0'7	6'5	0'7	5'5	0'6	5
12	0'4	5'5	0'5	5	0'3	4'5	0'3	5
13	0'3	5	0'2	4	0'1	4'5	0'0	...
14	0'4	5	0'6	5'5	0'7	6'5	0'7	5'5
15	0'6	6	0'5	5	0'3	4'5	0'3	4'5
16	0'2	4'5	0'3	4	0'4	5	0'3	4'5
17	0'2	4	0'1	5	0'2	4'5	0'0	...
18	0'1	4	0'1	4	0'2	4	0'2	4'5
19	0'2	4	0'3	4'5	0'3	4'5	0'4	4'5
20	0'4	4'5	0'3	4'5	0'4	5	0'3	4'5
21	0'5	4	0'1	4	...	...	...	...
22	1'0	3'5	0'6	4	0'7	4	0'4	3'5
23	0'3	4	0'2	4	0'1	3	0'4	3'5
24	0'3	4	0'5	4'5	0'5	5	0'5	5
25	0'8	5	0'7	5	0'6	5'5	0'5	5
26	0'4	6	0'2	5	0'1	4	0'2	4'5
27	0'0	...	0'0	...	0'0	...	0'0	...
28	0'1	4	0'2	3'5	0'3	4	0'4	5'5
29	0'4	5	0'2	4'5	0'2	4'5	0'1	4
30	0'4	3'5	0'1	4	0'1	4'5	0'1	4

Means for Month { A_N=0'4, T=4'6. Normals, 1911-16 { A_N=0'4, T=4'5.

EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).

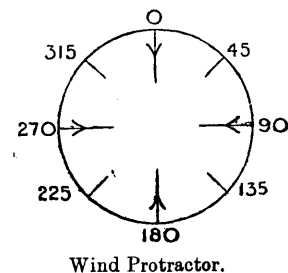
Day.	Times, G.M.T. of		Remarks.
	Commencement.	Max. Phase.	
4	h m	h m	Small.
	2 0	2 16	
4	...	8 50	Very small.
6	...	6 3	Very small.
6	...	17 29	Very small.
7	...	3 33	Very small.
8	1 13	1 40'0	Amplitude on trace 1'3 mm.
9	...	18 38	Small.
10	...	5 15'5	Small.
12	...	18 52'5	Very small.
13	7 13	8 16'0	Amplitude on trace 1'8 mm. Visible until 10 h. 36 m.
16	...	12 33	Very small.
18	...	23 19	Very small.
24	...	{ 20 30'5	Third maximum at 21 h. 22 m. nearly equal other two.
		{ 20 42'5	
26	6 90	7 12'0	Amplitude on trace 12'0 mm.
27	...	13 21	Small.
28	...	15 28	Very small.
29	...	16 59	Very small.
30	...	16 33	Small.
30	...	18 45	Small. May be part of earlier.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.			
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	mr/s.	
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.					
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.
2	S. Farnboro'	h. m.	240	8	200	6.5	220	12.5	230	14.0	225	14.0	225	22.5	...	...	...	...	Ci.	225	...
4	Benson	11 20	210	8	180	5.5	180	6.0	195	6.5	210	13.5	...	...	...	...	...	...	Cu.	225	...
4	S. Farnboro'	6 35	?	?	160	6.5	190	9.0	205	7.5	195	9.0	...	...	...	...	...	...	b.	...	...
5	Eskdalemuir	7 25	?	?	30	3.5	35	4.4	30	4.1	300	5.5	...	...	...	...	...	...	Fr.-Cu.	30	7.5
5	S. Farnboro'	6 25	?	?	290	1.0	15	2.5	270	2.0	280	7.0	240	8.0	240	11.0	235	11.0	b.	...	...
6	Eskdalemuir	7 30	170	20	75	4.9	100	4.9	145	8.0	165	6.5	150	5.5	175	5.5	...	...	Ci.	225	2.2
6	S. Farnboro'	10 15	110	15	55	6.5	105	12.0	135	11.0	160	12.0	...	...	...	...	...	...	A.-Cu.	...	...
7	"	6 50	?	?	70	1.0	205	8.5	205	8.5	215	14.0	...	...	...	...	...	...	A.-Cu.	...	...
8	"	6 25	?	?	290	1.0	280	3.0	235	6.5	225	7.5	230	7.5	205	15.0	...	...	Ci.	205	...
8	"	10 25	?	?	225	1.5	235	5.0	230	7.5	240	7.5	195	8.5	205	11.0	...	...	Ci.-St.	...	...
9	"	6 15	?	?	280	2.5	25	3.5	270	3.0	260	6.5	245	5.5	235	1.0	230	3.5	b.	...	...
11	Eskdalemuir	7 30	?	?	50	4.4	75	0.8	140	3.8	120	2.5	...	...	...	...	...	...	b.	...	...
11	S. Farnboro'	6 50	50	8	55	3.5	50	8.0	65	11.5	65	11.5	...	...	...	...	...	...	b.	...	...
12	Eskdalemuir	7 30	130	5	40	2.5	100	6.5	115	9.5	130	9.5	...	...	...	...	...	...	b.	...	...
12	S. Farnboro'	9 35	70	5	45	2.0	100	4.5	115	6.0	115	6.0	115	3.0	...	...	...	...	b.	...	...
15	Eskdalemuir	7 35	190	11	—	0.0	165	4.1	190	9.5	205	19.0	...	...	...	...	...	...	Ci.	210	2.8
15	S. Farnboro'	6 20	230	7	—	0.0	185	5.0	190	4.5	205	2.5	180	5.5	180	8.5	185	8.0	b.	...	...
16	"	6 30	?	?	—	0.0	200	0.5	215	5.0	215	10.5	210	4.5	220	6.0	210	10.5	Ci.	180	...	
18	"	6 20	?	?	225	1.0	235	7.5	225	10.0	215	12.0	...	...	...	...	...	...	Ci.	270	...
19	Benson	13 15	?	?	160	2.2	210	1.8	205	5.5	210	12.0	210	16.0	...	...	...	...	St.-Cu.	225	...
19	S. Farnboro'	6 20	?	?	225	1.0	270	4.0	245	4.5	215	10.0	225	15.5	...	...	...	...	Ci.	270	...
20	Eskdalemuir	7 20	?	?	—	0.0	15	2.7	10	1.5	185	5.5	240	10.5	...	...	...	...	Ci.	205	4.1
21	S. Farnboro'	6 35	230	7	190	3.0	230	5.5	240	6.0	220	12.0	210	15.5	...	...	...	...	Ci.	180	...
22	"	6 30	310	8	305	1.0	15	5.0	320	5.5	305	3.5	...	...	...	...	...	...	...	...	...
25	Benson	11 20	?	?	260	2.5	250	11.0	250	9.5	270	5.0	...	...	...	...	...	...	Ci.-Cu.	225	...
25	S. Farnboro'	7 10	270	7	270	1.0	275	3.0	255	4.0	240	9.0	...	...	...	...	...	...	St.-Cu.	225	...
26	Benson	11 15	?	?	250	3.4	255	6.0	255	8.5	250	6.0	...	...	...	...	...	...	Cu.	245	...
26	S. Farnboro'	6 25	290	5	270	2.0	290	6.5	280	5.0	230	6.5	...	...	...	...	...	...	A.-Cu.	205	...
28	Eskdalemuir	7 40	...	0	20	2.8	45	3.3	35	4.6	330	1.8	...	...	...	...	...	...	Ci.	...	...
28	S. Farnboro'	6 35	110	8	—	0.0	155	7.0	140	6.5	145	4.0	...	...	...	...	...	...	St.	155	...
30	"	6 25	30	12	20	6.5	40	13.0	45	12.5	40	6.5	...	...	...	...	...	...	St.-Cu.	...	...
5	S. Farnboro'	6 25	(For observations at lower levels, see above.)						245	13.0	240	13.5
9	"	6 15	(For observations at lower levels, see above.)						210	9.0	240	6.0
15	"	6 20	(For observations at lower levels, see above.)						205	7.5

Notes on Pressure Distribution.

- June 2 7 h. Depression W. of Scotland ; anticyclone E. of Azores.
- 4 7 h. Anticyclone over Germany, Azores, and N.W. of Iceland.
- 4 13 h. Anticyclone over N. France and S. England ; shallow depression N.W. of Scotland.
- 5 7 h. High-pressure axis over Great Britain ; shallow depressions over Corunna, Iceland, and Finmark.
- 6 7 h. Anticyclone over North Sea.
- 6 13 h. Anticyclone over North Sea.
- 7 7 h. Anticyclone over northern Norway ; depression W. of Ireland.
- 8 7 h. Anticyclone over Sweden, with extension over English Channel ; depression S. of Iceland.
- 8 13 h. Anticyclone over Sweden, with extension over English Channel ; depression S. of Iceland.
- 9 7 h. Depression S. of Iceland ; anticyclonic ridge from White Sea to Azores, with centres over Baltic and near Scilly.
- 11 7 h. Anticyclones over Scandinavia and Azores ; depression S.W. of Iceland.
- 12 7 h. Anticyclone over Scandinavia ; shallow depression over France.
- 15 7 h. Anticyclone over Baltic and North Sea ; depression N. of Iceland.
- 16 7 h. Anticyclone over Baltic ; extension over England.
- 18 7 h. Depression S.E. of Iceland ; secondary over England.
- 19 7 h. Depression S.E. of Iceland ; secondary over England.
- 19 13 h. Depression over Faröes ; secondary over England.
- 20 7 h. Shallow depression over British Isles and North Sea.
- 21 7 h. Depression over British Isles, centred in North Sea.
- 22 7 h. V-shaped depression over North Sea.
- 25 7 h. Depression centred at Shetlands.
- 25 13 h. Depression N. of Shetlands.
- 26 7 h. Depression N.W. of Norway ; secondary over North Sea.
- 26 13 h. Depression W. of Norway ; shallow secondary over Denmark.
- 28 7 h. Depressions over western Channel and W. of Norway.
- 30 7 h. Anticyclone S.W. of Ireland ; outlying portion over North Sea.



Wind Protractor.

Height of Station above M.S.L. = H.
 Height of Anemometer
 above ground = h.
 H. h.
 Benson 57 m. 25 m.
 Eskdalemuir 242 m. 15 m.
 S. Farnborough 70 m. 31 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
			mr/s.	mr/s.	mr/s.	
1	Cu.	215	10.0	+5.7	+8.2	Cu. to Fr.-Cu.
5	Cu.	330	5.0	+2.5	-4.3	Transitional type between Cu. and St.-Cu.
6	St.-Cuf.	157	18.0	-7.0	+16.0	Approximate values.
7	Nb.	154	8.0	-3.5	+7.2	Nb. film below St.-Cu. sheet. Values approximate.
8	Ci.-Cu.	176	3.7	-0.3	+3.7	Ci.-Cu. in lenticular flotillæ showing rapid internal change.
9	Cu.	287	5.0	+4.8	-1.5	
12	A.-Cu.	166	5.0	-1.2	+4.9	Sheets of A.-Cu., Castellatus type, associated with thundery weather.
13	A.-Cu.	181	5.0	+0.1	+5.0	A.-Cu. to high St.-Cu., with detached heavy A.-Cu. Castellatus below it. (The upper layer was measured.)
15	Cu.	222	8.0	+5.4	+5.9	Thin complete veil of high cloud (? A.-St.) above.
18	A.-Cu.	214	5.0	+2.8	+4.1	A.-Cu. forming from edge of a fused sheet.
19	Cu.	240	4.8	+4.2	+2.4	
22	Cu.	305	8.1	+6.7	-4.6	Cu. in closed sheet.
25	Cu.-Nb.	260	5.0	+4.9	+0.9	Apical part of cloud measured.
27	St.-Cu.	225	2.0	+1.4	+1.4	Thin flat St.-Cu.
28	Ci.	275	2.1	+2.1	-0.2	Fine, rather faint Ci.
	Cu.	290	5.5	+5.2	-1.9	Transitional type between Cu. and St.-Cu.
29	Cu.	345	5.5	+1.4	-5.3	Degraded sheet of Cu.

12. AURORA.

None reported.

METEOROLOGICAL OFFICE OBSERVATORIES—GEOPHYSICAL JOURNAL.

DAILY VALUES.—Solar Radiation, Meteorology, Atmospheric Electricity, Terrestrial Magnetism, and Seismology. Seventh Year.—No. 7. JULY 1917. Units based on the C.G.S. System. [Price 1s.]

1. SUNSHINE AND SOLAR RADIATION.

Table with columns for Day, Location (South Kensington, Richmond, Eskdalemuir, Cahirciveen), Bright Sunshine (Total, Per cent. of Possible), Radiation received on Horizontal Surface by Callendar Radiograph (Daily Total, Per cent. of Planetary, Maximum For Day, 11.30 h. to 12.30 h.), and Radiation by Angstrom Pyrheliometer (Intensity, Vertical Component, Sky, Total, Per cent. of Possible, Time, Sky, p sec Z, Intensity, Total, Per cent. of Possible).

2. METEOROLOGY AND MAGNETISM:—CAHIRCIVEEN (VALENCIA OBSERVATORY).—Lat. 51° 56' N. Long. 10° 15' W. Heights above M. S. L. :—H=9.1 m. Hb=13.7 m. Ha=26.4 m. Above Ground: h1=1.3 m. h2=0.56 m. ha=13.9 m.

Table with columns for Day, Air Pressure at Station Level (9 h., 21 h.), Air Temperature in Degrees Absolute (a., 200+, 200-, 200+), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9 h., 21 h.), Cloud Amount (0-10) and Weather (9 h., 21 h.), Rain 24 hours beginning 9 h. (mm.), Min. Temp. on Grass (200+), REMARKS., and Magnetism (Horizontal Force, Declination West, and Inclination).

a denotes the maximum and n the minimum value in the column.

3. METEOROLOGY:—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level:—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground:—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes monthly means and normals.

4. METEOROLOGY:—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level:—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground:—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes monthly means and normals.

Temperatures at or below the normal freezing point of water are printed in small type.

5. GEOPHYSICS :—RICHMOND (KEW OBSERVATORY).

Day.	Earth Temperature at 9 h.		Height above M.S.L. of Surface of Underground Water.		Horizontal Force.		Declination (West).			Inclination (North).			Magnetic Character of Day.	Electric Character of Day.	Potential Gradient, Volts per metre. Factor 2.35.				Charge per cc. $\times 10^{16}$.		Air-Earth Current $\times 10^{16}$.
	0.3 m.	1.2 m.	Daily Mean.	Extremes.	Mean Time.		Mean Time.			Mean Time.					3 h.	9 h.	15 h.	21 h.	About 15 h.		About 15 h.
	<i>a.</i>	<i>a.</i>	cm.	cm.	h m	γ	h m	°	'	h m	°	'			v/m.	v/m.	v/m.	v/m.	Coulomb.		Amp/cm ² .
1	200+	200+	222	...	...	...	...	...	...	...	...	0	0	190	350	245	255	...	...	...
2	88.0	87.3	223	...	...	...	...	...	...	...	...	2	0	165	405	325	500	.84	.62	...
3	88.2	87.2	224	...	...	...	...	...	...	...	...	1	0	340	420	325	460	.77	.62	...
4	88.9	87.2	224	...	...	...	...	...	...	...	...	0	1	270	325	0	95	...	...	...
5	89.4	87.1	224	...	...	...	...	...	...	...	...	0	0	40	230	300	395	.67	.58	...
6	88.7	87.1	224	...	...	...	...	...	...	...	...	0	0	270	190	300	300	.56	.45	...
7	89.1	87.1	225	...	...	...	...	...	...	...	...	1	0	165	300	420	325	...	...	...
8	89.4	87.1	226	...	...	...	...	...	...	...	...	0	2	165	...	...	...	...	...	...
9	89.4	87.1	227	...	...	...	...	...	...	...	...	0	1	...	...	...	...	...	...	...
10	88.3	87.1	228	...	...	...	...	...	...	...	...	0	0	...	...	...	...	...	...	...
11	87.7	87.1	228	...	...	...	...	...	...	...	...	0	0	...	215	175	340	.58	.32	...
12	88.6	87.1	229	...	...	...	...	...	...	...	...	1	0	190	595	150	135	.41	.28	...
13	89.3	87.1	230	231	...	...	...	...	...	...	...	1	0	15	255	175	190	.41	.13	...
14	90.2	87.1	230	...	...	...	...	...	...	...	...	2	0	190	300	215	230	.71	.52	...
15	90.8	87.2	229	...	...	...	...	...	...	...	...	0	1	190	230	135	135	...	...	...
16	91.6	87.3	227	...	...	...	...	...	...	...	...	0	1	135	190	z +	245	...	...	...
17	90.8	87.4	225	...	...	...	...	...	...	...	...	0	1	245	215	70	380	...	...	...
18	90.4	87.5	223	...	...	...	...	...	...	...	...	0	0	285	255	135	325	.65	.52	...
19	91.0	87.6	222	...	...	...	...	...	...	...	...	0	1	-120	80	z ±	95	...	...	...
20	90.6	87.7	221	...	...	...	...	...	...	...	...	0	0	80	135	120	285	.47	.30	...
21	90.6	87.7	220	...	...	...	...	...	...	...	...	0	1	190	245	95	150	.54	.37	...
22	91.2	87.8	220	...	...	...	...	...	...	...	...	1	0	165	395	215	215	...	...	...
23	91.4	87.7	221	...	...	...	...	...	...	...	...	1	0	80	165	80	120	...	...	...
24	91.6	87.9	222	...	...	...	...	...	...	...	...	0	0	135	255	120	120	.80	.60	...
25	91.9	87.9	221	...	...	...	...	...	...	...	...	0	1	150	245	z -	215	.34	.62	...
26	92.0	88.0	220	...	...	...	...	...	...	...	...	0	0	190	215	165	190	.93	.62	...
27	92.0	88.0	219	...	...	...	...	...	...	...	...	0	1	15	80	135	270	.86	.75	...
28	91.6	88.2	218	...	...	...	...	...	...	...	...	1	0	110	165	215	325	.65	.43	...
29	91.9	88.3	217	...	...	...	...	...	...	...	...	1	0	205	255	95	230	...	...	...
30	91.9	88.4	216	...	...	...	...	...	...	...	...	2	1	165	285	z ±	110	.86	.54	...
31	91.0	88.4	215	...	...	...	...	...	...	...	...	1	1	z ±	190	110	120	...	...	...
M.	90.2	87.6	223	...	...	...	...	...	...	...	...	2	2	z +	245	-55	165	...	...	...
	90.0	87.3	...	...	...	...	...	...	...	...	...	...	...	169*	272*	183*	256*	...	...	...

6. GEOPHYSICS :—ESKDALEMUIR.

Day.	North Component.				West Component.				Vertical Component.				Magnetic Character of Day.	Electric Character of Day.	Potential Gradient, Volts per metre. Factor 5.59.				Charge per cc. $\times 10^{16}$.		Air-Earth Current $\times 10^{16}$.
	Maximum. 15000 γ +.		Minimum. 15000 γ +.		Maximum. 4000 γ +.		Minimum. 4000 γ +.		Maximum. 44000 γ +.		Minimum. 44000 γ +.				3 h.	9 h.	15 h.	21 h.	About 15 h.		About 15 h.
	h m	γ	γ	h m	h m	γ	γ	h m	h m	γ	γ	h m			v/m.	v/m.	v/m.	v/m.	Coulomb.		Amp/cm ² .
1	17 53	1031	958	10 43	13 42	1022	939	8 27	20 55	1090	1070	11 25	0	0 a	90	140	160	290	...	...
2	16 41	1076	937	17 24	17 1	1049	941	4 47	17 38	1113	1048	4 18	2	0 a	335	270	185	375	...	...
3	17 37	1037	938	11 52	14 26	1023	872	7 40	{18 01}	1095	1060	12 30	1	0 a	245	180	170	235	...	...
4	19 40	1025	937	10 19	14 10	1029	922	8 30	{20 3}	1088	1063	12 18	0	0 a	495	145	105	250	...	...
5	19 41	1021	953	{10 21}	14 7	1008	936	8 24	17 0	1084	1067	12 4	0	0 a	130	105	220	170	...	...
6	17 58	1033	948	10 36	13 47	1018	924	7 0	18 50	1090	1041	13 26	0	0 a	75	170	170	350	...	...
7	17 56	1037	925	13 7	15 56	1035	917	8 37	17 15	1084	1049	{11 30}	1	1 a	65	160	250	505	...	...
8	18 34	1012	943	10 31	14 31	1009	932	{7 27}	{4 23}	1082	1065	12 35	0	0 a	120	80	140	95	...	...
9	18 40	1040	945	10 35	16 16	1023	936	8 22	19 35	1092	1054	11 50	0	0 a	75	115	130	160	...	...
10	20 40	1035	948	11 27	14 22	1014	928	8 22	21 10	1080	1041	11 48	0	0 a	80	140	140	50	...	...
11	19 4	1053	939	10 8	19 3	1026	935	6 6	20 45	1101	1060	2 0	1	0 a	40	155	180	115	...	...
12	19 40	1038	920	12 32	{16 31}	1013	934	{8 18}	17 58	1095	1058	{10 13}	1	? 1 a	40	...	80	115	...	...
13	16 20	1163	n 905	11 11	20 16	1067	929	24 0	16 16	1242	1046	7 45	2	0 a	50	170	155	95	...	...
14	20 26	994	928	0 24	14 12	1003	923	2 44	15 3	1090	1022	2 23	1	0 a	225	180	185	575	...	...
15	19 56	1004	925	13 56	{13 8}	1009	947	8 39	15 10	1098	1066	5 14	1	1 a	180	75	245	15	...	...
16	19 9	1004	942	10 45	14 15	1002	930	8 13	6 30	1091	1065	12 15	0	2 c	120	140	-z	245	...	...
17	19 54	1009	947	11 26	15 30	999	930	9 13	19 0	1092	1067	11 49	0	1 b	130	140	95	80	...	...
18	{20 13}	1009	953	{11 20}	13 52	1008	927	8 8	17 30	1089	1057	11 50	0	2 c	0	180	z	235	...	...
19	17 1	1011	950	10 53	13 47	1030	937	8 33	17 30	1100	1070	11 38	0	1 a	180	180	145	80	...	...
20	23 30	1006	942	12 28	14 32	1033	932	8 25	18 3	1087	1068	15 0	0	? 0 a	235	...	130	130	...	...
21	18 14	1066	946	10 23	{18 31}	1019	884	22 55	21 0	1111	1043	22 31	2	? 0 a	260	185	...	250	...	...
22	18 47	1035	913	8 54	13 25	1003	884	3 34	18 25	1102	1023	4 32	2	0 a	560	285	155	270	...	...
23	19 48	1009	928	10 53	14 12	997	933	7 5	20 55	1092	1068	3 0	0	1 b	160	185	170	270	...	...
24	19 37	1019	944	10 57	15 41	1007	928	7 30	16 35	1096	1064	12 35	0	1 b	465	180	170	130	...	...
25	17 22	1029	935	11 24	15 10	1025	926	7 45	19 10	1095	1054	12 35	0	1 b	55	340	80	445	...	...
26	21 16	1028	946	10 22	13 0	1004	937	8 20	18 38	1091	1062	11 45	0	? ...	205	...	...	...	...	...
27	19 4	1061	958	10 8	14 2	1041	939	6 55	21 10	1095	1042	12 20	1	? 1 a	...	...	270	-25	...	...
28	18 55	1050	962	11 34	14 11	1030	928	8 8	19 10	1103	1049	0 4	1	0 a	270	180	170	340	...	...
29	3 24	1064	n 905	10 46	14 55	1011	n 867	2 50	13 3	1132	n 976	5 33	2	1 b	80	130	-195	245	...	...
30	20 33	1031	936	11 16	15 37	1038	943	3 1	16 50	1118	1066	6 25	1	1 a	235	65	140	170	...	...
31	17 18	1252	915	20 13	17 19	1202	912	9 20	17 33	1336	1072	{11 30}	2	1 a	245	245	105	170	...	...
M.	—	1041	938	—	—	1026	924	—	—	1108	1053	—	—	—	191†	167†	145†	228†	—	—	

* 22 days.

† 24 days.

z denotes the maximum and n the minimum value in the column.

z Indeterminate.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H=54 m. H_b=55 m. Above Ground:—h_t=1.48 m. h_r=1.72 m. h_a=8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 5 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0h to 24h, and REMARKS.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h), Sunshine (Total, Percent of Possible, Tenth), Cloud Amount (tenths of Sky covered, Type of Cloud, and Direction whence coming) (Upper, Lower), and Mean Amount.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES:—ESKDALEMUIR.

MICROSEISMS OF N. COMPONENT:—ESKDALEMUIR.

Day.	Phase.	Time. G.M.T.	Period.	Amplitudes.			Δ.	Remarks.
				A _N .	A _E .	A _Z .		
		h m s	s	μ	μ	μ	km.	
1		1 33 to						
2		2 10						
3		3 51 17					9380	Faint disturbance. Exceptionally good record, but P was not sufficiently sharp to determine azimuth. Noticeable group of sinusoidal waves on vertical record from 1 h. 33 m. to 1 h. 39 m.
4	P	1 54 52						
	PR ₁	1 1 46						
	S	1 5						
	SR ₁	1 10 37						
	L	1 28 32	25		89			
	M	1 29 26	22	72				
	M	1 30 41	18		79			
	M	1 36 49	21	131				
	F	3 49 28					9380	Very similar in type to preceding earthquake.
4	P	5 53 6						
	PR ₁	5 59 57						
	S	6 6 6						
	SR ₁	6 15 5						
	L(?)	6 27 52	21	14				
	M	6 28 6	19		16			
	M	6 33 25	25	43				
	F	21 22 to						
		21 33						
4	P(?)	22 21 50						
	S(?)	22 32 14						
	F	23 40						
		1 25 to						
		1 42						
9	L	0 27	17		17			Long waves. Preliminary phases very faint and doubtful.
	F	0 53						
11		3 33 to						
11	Pe	3 55						Long waves. Prolonged slight disturbance, with feebly marked phases. Train of long waves from 23 h. 50 m. to 0 h. 8 m.; noticeable on account of steadiness of direction of displacement, viz. N.W.-S.E.
	F	23 1 12						
		1 0						
12		12 3 to						
		14 30						
13		5 43 to						
		6 0						
15	iN	10 45 18						
	eN	10 54 59						
	iS	11 1 20						
	F	12 50						
15	Pe	18 6 38				4500		
	PR	18 3 9						
	S	18 12 52						
	F	19 15						
15		21 35 to						
		22 10						Faint disturbance.
16		18 36 to						
		19 45						
18		10 16 to						Faint disturbance. Slight disturbance with no well-marked phases.
		9 10						
		16 27 to						Slight disturbance with no well-marked phases.
		17 8						
25	P	3 39 14				7700		
	S	3 39 19						
	SR	3 44 15						
	L	3 53						
	M	3 55 7	30	34				
	M	3 59 52	25	38				
	M	4 0 27	25		18			
	F	5 3						
25	P	22 44 1				7650		
	S	22 53 3						
	L	23 6 4						
	F	24 6						
27	P	1 11 30				6700		End overlaps beginning of following disturbance.
	S	1 19 43						
	L	1 39						
	M	1 32 25	19		46			
27	P(?)	3 17 38				5200		
	PR ₁	3 19 23						
	S	3 24 32						
	SR ₁	3 28 15						
	L	3 32 30						
	M	3 41 7	27	47				
	F	6 30						
27		16 34 to						Slight disturbance. Preliminary phases indiscernible. Well-marked group of sinusoidal waves from 16 h. 45 m. to 16 h. 58 m. on N. and (especially) E. records.
		17 39						
27		21 53 to						
		22 0						
28		0 2 to						Faint disturbance. Slight disturbance with no well-marked phases.
		2 10						
29		2 43 to						
		2 52						
29	P	14 44 34				8850		Long waves.
	PR(?)	14 47 36						
	S	14 54 37						
	SR(?)	14 59 45						
	L	15 11						
	M	15 16 49	21		62			
	M	15 20 5	22		57			
	F	17 39						
29-30	P	22 7 43				11450		
	PR ₁	22 12 2						
	PR ₂	22 14 43						
	S	22 19 42						
	L	22 44						
	M	22 49 54	41		173			
	F	2 0						
30		14 52 to						
		15 20						
30		17 19 to						Long waves.
		17 3						
31	e	0 6 38						Long waves.
	S	0 15 41						
	L	0 29						
	M	0 37 0	21		55			
	M	0 37 13	24		54			
	F	2 39						
31	Pe	3 33 36				8080		P doubtful. No well-marked long waves.
	PR ₁	3 37 0						
	S	3 43 0						
	SR ₁	3 48 29						
	L	3 58						
	F	3 58						

Day.	0 h.		6 h.		12 h.		18 h.	
	A _N .	T.	A _N .	T.	A _N .	T.	A _N .	T.
	μ	s	μ	s	μ	s	μ	s
1	0.1	5	0.2	4.5	0.1	4.5	0.1	4
2	0.1	4	0.0	...	0.0	...	0.0	...
3	0.0	...	0.0	...	0.0	...	0.0	...
4	0.1	4.5	0.1	4	0.0	...	...	...
5	0.1	4	0.2	4	0.3	4.5	0.2	4
6	0.3	4	0.2	4	0.2	4	0.2	4
7	0.1	3.5	0.1	4	0.1	4	0.1	3.5
8	0.1	3.5	0.0	...	0.1	3.5	0.0	...
9	0.1	3	0.1	3.5	0.1	3	0.1	3
10	0.1	3	0.0	...	0.1	3	0.1	3
11	0.0	...	0.0	...	0.1	4	0.1	4
12	...	...	0.2	4	0.4	3.5	0.1	4
13	0.3	4	0.0	...	0.3	3.5	0.1	3
14	0.2	4	0.1	4	0.2	4	0.1	4
15	0.2	4.5	0.2	5.5	0.2	4	0.5	6
16	0.1	4	0.1	4	0.1	3.5	0.1	4
17	0.0	...	0.1	3.5	0.0	...	0.1	3
18	0.0	...	0.1	3.5	0.3	4	0.5	4.5
19	0.7	4	0.7	4	0.6	3.5	1.0	3.5
20	0.7	4	0.3	4	0.2	4	0.1	4
21	0.1	3.5	0.1	4	0.1	4	0.2	4
22	0.1	4	0.1	4	0.0	...	0.1	4
23	0.2	4	0.2	4	0.1	4	0.2	4
24	0.0	...	0.0	...	0.0	...	0.1	4
25	0.3	3.5	0.1	4	0.0	...	0.1	4
26	0.0	...	0.1	4	0.3	3.5	0.4	3.5
27	0.2	4.5	0.1	4	0.2	4	0.2	4
28	0.3	4	0.2	4	0.1	4	0.1	5
29	0.1	3.5	0.1	4	0.0	...	0.0	...
30	0.0	...	0.0	...	0.0	...	...	...
31	0.2	4.5	0.1	3.5	0.1	3.5	0.2	4

Means for Month $\begin{cases} A_N = 0.1. \\ T = 3.9. \end{cases}$ Normals, 1911-16 $\begin{cases} A_N = 0.3. \\ T = 4.5. \end{cases}$

EARTHQUAKES:—RICHMOND (KEW OBSERVATORY).

Day.	Times, G.M.T. of		Remarks.
	Commencement.	Max. Phase.	
	h m	h m	
4	1 1.5	1 33	Amplitude on trace 5.5 mm.
4	5 59	6 36	Amplitude on trace 1.9 mm.
4	...	21 28	Very small; doubtful.
9	...	0 30.5	Small.
12	...	0 6.5	Very small.
12	...	12 45	Very small; doubtful.
13	...	5 59	Very small.
15	...	11 30	Small.
15	...	18 12	Succession of very small waves.
16	...	19 1	Very small.
18	...	8 44	Very small.
25	3 50	4 5	Small.
27	1 11	1 45	Amplitude on trace 6.4 mm. Continued until next began.
27	...	3 58	Amplitude on trace 2.2 mm.
27	...	16 59	Amplitude on trace 1.1 mm.
28	...	0 56	Succession of very small waves.
29	...	2 49	Very small.
29	14 55	15 24.5	Amplitude on trace 5.0 mm.
29	22 14	23 16	Amplitude on trace 2.9 mm.; lasted until at least 1 h. 40 m. on 30th.
30	...	14 59	Very small; doubtful.
30	...	17 46	Very small.
31	0 16	0 43.5	Amplitude on trace 4.4 mm.
31	3 43	3 43.5	

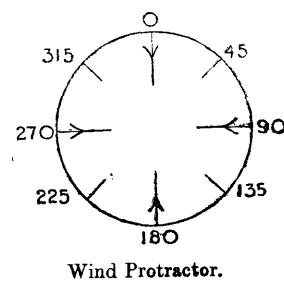
10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.		
			Geostrophic.		By Anemometer.		At Heights above M.S.L.										Type.	From N.	mr/s.		
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.					5000 m.	
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.
2	Aberdeen	7 55	?	?	180	2'0	250	1'6	350	2'5	40	4'2	50	2'6	...	...	...	...	b.	...	...
2	Eskdalemuir	7 40	?	?	55	3'3	35	3'1	50	7'5	85	4'1	...	...	...	...	...	...	Ci.	315	...
3	"	7 30	110	5	50	3'5	110	2'0	135	4'2	125	4'5	...	...	...	...	...	...	Ci.	135	...
5	"	12 35	?	?	60	3'0	60	4'2	80	2'8	270	4'7	285	6'5	275	8'0	280	6'0	Ci., Ci.-St.	330	...
5	S. Farnboro'	16 5	?	?	75	3'0	50	3'5	355	2'5	55	6'0	45	2'5	...	...	...	...	St.-Cu.	...	...
6	"	13 55	100	8	120	4'5	85	8'5	95	8'0	125	5'0	235	4'5	225	5'0	265	8'0	St.-Cu.	...	...
7	"	6 40	130	13	70	4'5	115	12'5	105	11'5	125	9'0	150	6'0	200	6'0	220	7'0	Ci., Ci.-St.	225	...
7	"	10 30	110	11	95	6'0	105	9'0	115	9'0	135	9'5	130	5'5	190	7'5	220	7'5	Ci., Ci.-St.	220	...
11	"	6 30	?	?	100	4'0	160	3'5	275	4'5	310	6'0	...	...	...	...	...	...	A.-Cu., St.-Cu.	...	...
11	"	10 20	?	?	?	?	150	3'0	225	1'0	295	4'5	325	8'0	310	11'0	...	...	Ci.	315	...
13	"	6 30	180	14	?	?	180	12'0	165	12'0	190	10'5	200	10'0	205	11'5	210	15'5	Ci., Ci.-St.	270	...
13	"	10 55	180	9	?	?	175	7'0	160	10'0	195	16'0	215	14'5	210	13'5	215	15'5	Ci., Ci.-St.	...	...
14	"	6 40	?	?	?	?	220	5'5	155	5'0	190	10'0	...	...	...	...	...	...	A.-St., A.-Cu.	...	...
16	"	6 30	250	9	?	?	240	8'5	250	8'5	250	8'5	260	13'0	...	...	...	...	Ci., Ci.-St.	...	...
17	"	6 40	?	?	?	?	260	2'5	265	3'5	210	3'5	270	8'0	...	...	...	...	A.-Cu., St.-Cu.	...	...
21	Eskdalemuir	7 20	?	?	135	0'4	?	?	310	0'8	350	4'9	335	8'0	...	...	...	...	b.	...	...
21	S. Farnboro'	6 35	?	?	300	2'5	360	3'5	335	4'5	320	7'0	...	...	...	...	...	...	A.-Cu.	...	...
23	"	7 0	?	?	220	1'0	245	5'5	235	5'0	210	2'5	30	5'5	335	5'5	305	6'0	b.	...	...
24	"	6 50	?	?	160	1'0	195	6'5	205	9'0	240	6'5	235	10'0	215	9'0	...	...	A.-Cu.	...	...
27	Benson	11 30	250	8	205	4'1	205	5'5	245	8'5	235	8'0	...	...	...	...	...	...	A.-Cu.	225	...
							6000 m.		7000 m.		8000 m.		9000 m.		10,000 m.						
6	S. Farnboro'	13 55	(For observations at lower levels, see above.)				280	8'5	275	10'0	265	15'5	255	14'5	270	15'5					
7	"	6 40					230	6'5	...	...	...	...	...	...	...	...
13	"	6 30					205	17'5	...	...	...	...	...	...	...	...

Height of Station above M.S.L. = H.
 Height of Anemometer above ground = h.
 Aberdeen 14 m. 32 m.
 Benson 57 m. 25 m.
 Eskdalemuir 242 m. 15 m.
 S. Farnborough 70 m. 31 m.

Notes on Pressure Distribution.

- July 2 7 h. Anticyclone over northern part of British Isles and S.W. Norway.
- 3 7 h. Anticyclone over Scotland and Iceland; depression over S. Sweden.
- 5 13 h. Anticyclone over Farøes; depression over Baltic; shallow depression W. of Ireland.
- 5 18 h. Anticyclone over Great Britain and Iceland.
- 6 13 h. Anticyclones over N.E. England and N. of Scotland; depressions over Spain and W. of Ireland.
- 7 7 h. Anticyclone over North Sea; depression over Bay of Biscay and to S.W. of British Isles.
- 7 13 h. Anticyclone over northern part of North Sea; depression over Bay of Biscay and to S.W. of British Isles.
- 11 7 h. Anticyclone over Great Britain and the Bay of Biscay; shallow depression over Atlantic.
- 11 13 h. Anticyclone over eastern England and northern France; depression N.W. of Ireland.
- 13 7 h. Anticyclone over Germany and Denmark; depression W. of British Isles.
- 13 13 h. Anticyclone over Germany; depression W. of British Isles; secondary depression in mouth of Channel.
- 14 7 h. Depression over S.E. England and Midlands, also one over the Bay of Biscay.
- 16 7 h. Depression N. of Scotland; anticyclone over Azores, axis of high pressure stretching to France.
- 17 7 h. Axis of high pressure stretching from Azores to S.W. France; depression E. of Iceland and W. of Paris.
- 21 7 h. Anticyclone over British Isles and France; depression in Baltic.
- 23 7 h. Anticyclone centred over S.E. England and N.E. France, axis of high pressure extending from Azores to Spitzbergen.
- 24 7 h. Anticyclone over Azores; high pressure area extending to N.W. Norway; depression to S.W. of Iceland.
- 27 13 h. Anticyclone centred near Straits of Dover; depression over Farøe Islands.



Wind Protractor.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
		°	mr/s.	mr/s.	mr/s.	
4	Fr.-St.	350	9'0	+ 1'5	- 8'8	Sheet of rather small A.-Cu. Traces of diffuse St.-Cu. A.-St formed by the fusing of rather indefinite A.-Cu. cloudlets. Ci.-St. above with ⊕.
5	A.-Cu.	397	2'3	+ 1'8	- 1'4	
7	Cu.	162	5'0	- 1'6	+ 4'8	
11	St.-Cu.	268	3'3	+ 3'3	+ 0'1	
12	A.-St.	240	2'0	+ 1'7	+ 1'0	
14	A.-Cu.	197	3'5	+ 1'0	+ 3'4	Sheets of A.-Cu. of castellatus type. Base of cloud measured. Measurements approximate; directions and velocity varying slightly.
16	Cu.-Nb.	255	4'0	+ 3'9	+ 1'8	
20	Cu.	325	4'0	+ 2'3	- 3'3	
23	Ci.	208	1'4	+ 0'7	+ 1'2	
24	St.-Cu.	265	1'4	+ 1'4	+ 0'1	Thin flat St.-Cu.
25	St.-Cu.	225	1'8	+ 1'3	+ 1'3	Thin flat type. Normal high type, fusing into sheets. Measurements give averages; some variation noticeable.
26	St.-Cu.	225	6'0	+ 4'2	+ 4'2	
27	Cu.	268	5'0	+ 5'0	+ 0'2	
28	St.-Cu.	257	3'0	+ 2'9	+ 0'7	Thin flat type.

12. AURORA.

None reported.

METEOROLOGICAL OFFICE OBSERVATORIES—GEOPHYSICAL JOURNAL.

DAILY VALUES.—Solar Radiation, Meteorology, Atmospheric Electricity, Terrestrial Magnetism, and Seismology. Seventh Year.—No. 8. AUGUST 1917.] Units based on the C.G.S. System. [Price 1s.

1. SUNSHINE AND SOLAR RADIATION.

Table with 23 columns and 32 rows. Columns include: Day, Bright Sunshine (Total, Per cent. of Possible), Radiation received on Horizontal Surface by Callendar Radiograph (Daily Total, Per cent. of Planetary, Maximum For Day (Amount, Time), 11.30 h. to 12.30 h.), Bright Sunshine (Total, Per cent. of Possible), Radiation at Noon by Ångström Pyrheliometer (Intensity, Vertical Component, Sky), Bright Sunshine (Total, Per cent. of Possible), Radiation by Ångström Pyrheliometer (Time, Sky, sec Z, Intensity), Bright Sunshine (Total, Per cent. of Possible). Rows 1-31 show daily data for South Kensington, Richmond, Eskdalemuir, and Cahirciveen. Means and Normal values are provided at the bottom for 5-year periods.

2. METEOROLOGY AND MAGNETISM :—CAHIRCIVEEN (VALENCIA OBSERVATORY).—Lat. 51° 56' N. Long. 10° 15' W. Heights above M. S. L. :—H = 9.1 m. H₁ = 13.7 m. H₂ = 26.4 m. Above Ground : h₁ = 1.3 m. h₂ = 0.56 m. h₃ = 13.9 m.

Table with 22 columns and 32 rows. Columns include: Day, Air Pressure at Station Level (9 h., 21 h.), Air Temperature in Degrees Absolute (9 h., 21 h., Max., Min.), Humidity (Vapour Pressure, Percentage (9 h., 21 h.)), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9 h., 21 h.), Cloud Amount (0-10) and Weather (9 h., 21 h.), Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS, Magnetism (Horizontal Force, Declination West, and Inclination). Rows 1-31 show daily data with detailed remarks and magnetism readings. Means and Normal values are provided at the bottom for 45-year periods.

x denotes the maximum and n the minimum value in the column.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes monthly totals and normals.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes monthly totals and normals.

Temperatures at or below the normal freezing point of water are printed in small type.

5. GEOPHYSICS :—RICHMOND (KEW OBSERVATORY).

Table with 16 main columns: Day, Earth Temperature at 9 h (0.3 m, 1.2 m), Height above M.S.L. of Surface of Underground Water (Daily Mean, Extremes), Horizontal Force (Mean Time, γ), Declination (West) (Mean Time, °, '), Inclination (North) (Mean Time, h, m, °, '), Magnetic Character of Day, Electric Character of Day, Potential Gradient (Volts per metre, Factor 2.43) (3 h, 9 h, 15 h, 21 h), Charge per cc. (× 10¹⁶) (About 15 h), Air-Earth Current (× 10¹⁶) (About 15 h). Rows 1-31 and M. Summary row.

* 27 days.

6. GEOPHYSICS :—ESKDALEMUIR.

Table with 16 main columns: Day, North Component (Maximum, Minimum), West Component (Maximum, Minimum), Vertical Component (Maximum, Minimum), Magnetic Character of Day, Electric Character of Day, Potential Gradient (Volts per metre, Factor 5.87) (3 h, 9 h, 15 h, 21 h), Charge per cc. (× 10¹⁶) (About 15 h), Air-Earth Current (× 10¹⁶) (About 15 h). Rows 1-31 and M. Summary row.

* Mean of 28 days.

† Mean of 30 days.

α denotes the maximum and η the minimum value in the column.

z Indeterminate.

‡ Insulation bad.

§ No trace.

|| Mean of 17 days.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H = 54 m. H_b = 55 m. Above Ground:—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Main meteorological data table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Min. Temp. on Grass, Percentage of Humidity, Rain, and REMARKS. Includes daily data from 1 to 31 and means/normal values.

JERSEY (ST LOUIS OBSERVATORY).

Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming. Includes columns for Wind Direction and Force, Sunshine, Cloud Amount (Upper/Lower), and Mean Amount. Includes daily data from 1 to 31 and means/normal values.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8.8 m., Ground 13.7 m., M.S.L. 19.2 m. Height of Cups above—Roof 4.6 m., Ground 7.6 m., M.S.L. 15.2 m.

SCOTLAND N.:—DEBNESS.

Height of Cups above—Roof 1.5 m., Ground 4.9 m., M.S.L. 57.3 m.

Table for NORTH WALES:—HOLYHEAD. Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, and Time of Gust. Rows 1-31.

Table for SCOTLAND N.:—DEBNESS. Columns include Day, 3h, 9h, 15h, 21h, Vel. in Max. Hourly Run, and Time of Max. Rows 1-31.

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9.8 m., M.S.L. 49.7 m. Height of Cups above—Ground 5.8 m., M.S.L. 45.7 m.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10.7 m., Ground 12.8 m., M.S.L. 15.9 m. Height of Cups above—Roof 3.7 m., Ground 18.3 m., M.S.L. 22.3 m.

Table for ENGLAND S.W.:—SCILLY. Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, and Time of Gust. Rows 1-31.

Table for ENGLAND E.:—GREAT YARMOUTH. Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, and Time of Gust. Rows 1-31.

Summary statistics for ENGLAND S.W.:—SCILLY. S+N&W+E, S-N&W-E.

Summary statistics for ENGLAND E.:—GREAT YARMOUTH. S+N&W+E, S-N&W-E.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES:—ESKDALEMUIR.								MICROSEISMS OF N. COMPONENT:—ESKDALEMUIR.											
Day.	Phase.	Time, G.M.T.			Period.	Amplitudes.			Δ.	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
		h	m	s		μ _{N.}	μ _{E.}	μ _{Z.}				km.	μ _{N.}	T.	μ _{N.}	T.	μ _{N.}	T.	μ _{N.}	T.
1		2	30	to	...	...	...	...	Faint disturbance.	1	0.3	3.5	0.4	3.5	...	...	...	...
5	P eN eN L M M F	16 10 30 16 15 13 16 22 34 17 17 17 24 17 37 18 50	...	...	...	...	...	...	Distant earthquake. (New Zealand, according to newspaper reports.)	2	0.5	4	0.6	4	0.8	3.5	0.5	3.5
5	L	19 25 to 19 45	...	21	...	...	...	...		3	0.3	3.5	0.5	4.5	0.5	4	0.5	4
5	L	20 32 to 20 52	...	21	...	...	...	...		4	0.1	3.5	0.4	3.5	0.4	3	0.1	4
7		16 25 to 17 30	...	...	...	...	...	...	Slight disturbance, with well-marked group of long waves on E.-W. trace, beginning at 17 h. 4 m.	5	0.1	4	0.1	4	0.2	5	0.0	...
10		22 51 to 23 24	...	...	...	...	...	...	Faint disturbance.	6	0.1	4.5	0.0	...	0.1	4	0.0	...
14-15		23 55 to 0 15	...	...	...	...	...	...	Faint disturbance.	7	0.0	...	0.0	...	0.1	4	0.4	4.5
16-17	P i L(?) M F	23 19 15 23 20 25 23 52 0 13 1 8	...	24	...	...	...	...		8	0.3	4.5	0.2	4	0.2	4	0.2	5
20	P S L M F	23 7 19 23 11 34 23 13 34 23 16 26 23 55	...	15	12	...	...	2620		9	0.4	4.5	0.8	4	0.4	4	0.3	4
21	P S L M F	10 48 6 10 51 11 10 52 28 10 54 17 11 40	...	16	9	...	...	1800		10	0.1	4	0.5	4	0.8	4	0.2	4
21	P S L F	21 58 40 22 3 29 22 7 59 23 0	...	...	...	...	...	3100		11	0.6	4	0.5	4	0.3	4	0.9	5
30	P(?) S L F	3 36 9 3 46 47 4 2 8 30	...	...	...	...	...	8350	P taken from vertical trace. Epicentre, Colombia. Horizontal traces disturbed by wind effects. Two separate earthquakes included. Preliminary phases of second difficult to distinguish.	12	1.0	5	1.3	6	1.9	4.5	1.2	4.5
31	P S M L M M F	11 48 11 11 58 49 12 10 9 12 14 12 15 31 12 16 25 14 30	...	25	41	...	...	8350	Epicentre, Colombia.	13	1.9	4	1.0	4.5	1.0	5	0.8	5
										14	0.2	4	0.1	4	0.2	4.5	0.1	4	
										15	0.2	4	0.1	4	0.0	...	0.0	...	
										16	0.0	...	0.0	...	0.0	...	0.0	...	
										17	0.1	3.5	0.3	4.5	0.8	3.5	0.6	4	
										18	0.6	4	0.5	4	0.3	4	0.5	4	
										19	0.4	4.5	0.8	4	0.4	4	0.3	4	
										20	0.3	4	0.4	3.5	0.3	4.5	0.1	4	
										21	0.2	4.5	0.2	4	0.4	4	0.4	4	
										22	1.0	5	1.3	5	1.2	4.5	1.8	5	
										23	1.9	5	1.8	5	1.7	5.5	1.0	5	
										24	1.1	5.5	0.9	5.5	1.0	6	0.9	5	
										25	1.9	4	1.0	4.5	1.0	5	0.8	5	
										26	1.0	4	0.5	4	0.8	4	0.2	4	
										27	0.1	4.5	0.2	4	0.3	4	0.9	5	
										28	1.6	5	0.9	5	1.6	5	1.2	5	
										29	1.0	5	1.3	6	1.9	4.5	1.2	4.5	
										30	1.2	4	0.0	...	...	...	0.5	5
										31	0.8	3.5	0.3	4	0.5	4.5	0.4	4.5	

Means for Month $\left\{ \begin{array}{l} A_N = 0.5 \\ T = 4.4 \end{array} \right.$ Normals, 1911-16 $\left\{ \begin{array}{l} A_N = 0.4 \\ T = 4.5 \end{array} \right.$

EARTHQUAKES:—RICHMOND (KEW OBSERVATORY).

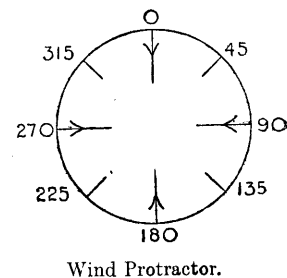
Day.	Times, G.M.T. of		Remarks.
	Commencement.	Max. Phase.	
5	h m 16 28	h m 17 36	
5	...	19 38	Very small.
7	...	16 18	Very small.
20	...	23 11	Small.
21	10 51	10 55	Small.
21	22 6	22 12	
30	3 48	4 37.5	Amplitude on trace 1.6 mm.; several later ordinates nearly equal to maximum. Visible until after 7 h.
31	11 53.5	$\left\{ \begin{array}{l} 12 21.5 \\ 12 25.5 \end{array} \right.$	Amplitude on trace 1.9 mm. Ordinates at 12 h. 19 m. and 12 h. 31 m., almost as large as the maxima.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.														Cloud Observations.				
			Geostrophic.		By Anemometer.		At Heights above M.S.L.										Type.	From N.	nr/s.		
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.					5000 m.	
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.				From N.	m/s.
6	Benson . . .	h. m. 18 15	?	?	...	0'0	40	0'6	290	2'1	285	3'5	15	2'8	25	4'6	65	3'2	b.	...	...
6	S. Farnboro' .	15 20	?	?	220	2'0	185	3'5	190	3'5	205	3'5	200	5'5	215	5'0	180	4'0	b.	...	...
7	Benson . . .	11 30	200	4	210	1'0	205	4'7	205	3'0	235	3'5	...	...	...	...	...	...	Cu.	203	...
8	Eskdalemuir .	7 35	160	6	20	0'6	80	2'0	145	5'7	150	10'8	...	...	...	...	...	...	Ci., Ci.-St.	180	3'0
10	S. Farnboro' .	6 45	250	12	240	5'5	265	12'0	260	14'0	260	10'0	...	...	...	...	...	...	Ci., A.-Cu.	...	...
13	„	11 10	200	8	255	4'0	180	4'5	210	7'0	195	7'5	...	...	...	...	...	...	St.-Cu.	203	...
15	„	7 15	210	7	215	2'0	245	7'0	240	7'5	240	6'0	...	...	...	...	...	...	A.-Cu.	245	...
16	„	6 30	280	12	260	5'0	295	9'5	295	10'5	260	9'0	290	14'5	300	15'5	320	17'0	A.-Cu.	...	...
16	Benson . . .	13 20	290	10	240	4'7	255	8'7	265	8'8	270	11'8	...	...	...	...	...	...	St.-Cu.	270	...
20	Eskdalemuir .	7 30	280	6	145	2'2	265	4'3	270	8'9	285	9'8	275	7'1	...	...	...	...	Ci., Ci.-Cu.	270	1'2
20	S. Farnboro' .	6 20	230	7	240	7'5	290	6'0	285	6'0	260	7'0	275	9'5	265	11'0	270	11'0	b.	...	...
21	„	6 20	225	6	250	4'0	235	8'0	225	8'5	215	7'5	220	8'0	225	8'0	...	...	{ A.-Cu., St.-Cu. }	225	...
22	„	6 25	190	14	?	7'5	185	14'5	185	12'0	200	12'0	200	14'5	...	...	...	...	A.-Cu.	225	...
27	„	6 25	250	16	240	5'5	265	14'0	255	15'0	260	15'5	265	17'0	265	18'5	260	17'0	b.	...	...
6	Benson . . .	18 15					6000 m.		7000 m.		8000 m.		9000 m.		10,000 m.		11,000 m.				
6	S. Farnboro' .	15 20					75	5'4	50	8'3	45	11'0	30	7'3	50	9'4	55	11'9			
20	„	6 20					230	4'0	275	6'5	...	...	...	...	...	...	...	...
27	„	6 25					275	8'0	255	14'0	...	...	...	...	...	...	...	...
							260	16'0	...	...	...	...	...	...	...	...	...	...
			(For observations at lower levels, see above.)				12,000 m.		13,000 m.		14,000 m.		15,000 m.		16,000 m.		17,000 m.				
6	Benson . . .	18 15					345	20'9	340	17'7	330	11'6	330	5'9	300	7'0	280	2'3			

Notes on Pressure Distribution.

- August 6 13 h. Anticyclone over northern Baltic; depression W. of Iceland.
6 18 h. Anticyclone over Finland; depression to N.W. of Ireland.
7 13 h. Anticyclone over Finland; depressions over Iceland to N.W. of Ireland and over Germany.
8 7 h. Depression over the western part of the British Isles.
10 7 h. Depression centred over Scotland.
13 13 h. Depression over the W. of Ireland.
15 7 h. Depression centred over Scotland.
16 7 h. } Depressions over S. Norway and to the S. of Iceland.
16 13 h. }
20 7 h. Axis of high pressure extending from the Azores to the mouth of the Channel; depression to the W. of Norway.
21 7 h. Area of high pressure stretching from Azores to Russia; indications of shallow depression N. of Scotland.
22 7 h. Depression centred to the W. of Ireland.
27 7 h. Depression centred to the W. of the British Isles.



Height of Station above M.S.L. = H.
Height of Anemometer above ground = h.
H. h.
Benson . . . 57 m. 25 m.
Eskdalemuir . . 242 m. 15 m.
S. Farnborough . . 70 m. 31 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
			mr/s.	mr/s.	mr/s.	
10	St.-Cu.	240	2·9	+ 2·5	+ 1·5	St.-Cu. formed from apices of Cu.-Nb.
13	Ci.	180	1·5	0·0	+ 1·5	Observation at 12 h. Some Cu.-Nb. on horizon.
20	Cu. to Cu.-Nb.	260	3·9	+ 3·8	+ 0·6	Cu. developing into Cu.-Nb.
24	{ St.-Cu.	225	3·1	+ 2·2	+ 2·2	
	{ St.-Cuf.	225	20·8	+ 14·8	+ 14·8	
25	{ Cu.	269	7·6	+ 7·6	0·0	Observation at 12 h.
	{ Ci.	270	1·0	+ 1·0	0·0	Observation at 12 h. 30 m.
30	{ St.-Cu.	290	7·8	+ 7·3	- 2·7	Thin high St.-Cu. and A.-Cu.

Note.—Conditions were very much against nephoscope observations all the month. From the 1st to the 10th the clouds were St. in character, alternating with fog. From the 14th to 19th the type was mainly Nb., as was also the case on most of the days after the 24th.

12. AURORA.

A very brilliant display of aurora was seen at many places in the South of England on the 9th, some of the places reporting it being Blackheath, Chingford, Epsom, Norwood, Stowmarket, and Totteridge. It was also observed at Greenwich in the early morning of the 10th. Aurora was also recorded at the following places on various dates: Ipswich and Stowmarket, 13th; Croydon, 14th; Deerness, Orkney, 21st and 25th; Dundee, 21st; Epsom, 21st and 25th; Forfar, 20th and 23rd; and Haroldswick, Shetland, 9th and 22nd.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m. Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max., Min.), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes means and normals for 45 years, 30 years, and 35 years.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m. Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max., Min.), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes means and normals for 45 years, 30 years, and 35 years.

Temperatures at or below the normal freezing point of water are printed in small type.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H = 54 m. H_b = 55 m. Above Ground:—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Main meteorological data table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Min. Temp. on Grass, Percentage of Humidity, Rain, and REMARKS. Includes data for days 1-30 and means/normal values.

JERSEY (ST LOUIS OBSERVATORY).

Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming. Table with columns for Day, Wind Direction and Force, Sunshine, Cloud Amount (Upper/Lower), and Mean Amount. Includes data for days 1-30 and means/normal values.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8.8 m., Ground 13.7 m., M.S.L. 19.2 m.
Height of Cups above—Roof 4.6 m., Ground 7.6 m., M.S.L. 15.2 m.

SCOTLAND N.:—DUNDEE.

Height of Cups above—Roof 1.5 m., Ground 4.9 m., M.S.L. 57.3 m.

Day.	3 h.				9 h.				15 h.				21 h.				Max. in a Gust.	Time of Gust.	Day.	3 h.				9 h.				15 h.				21 h.				Vel. in Max. Hourly Run.	Time of Max.																												
	S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.				S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.																														
	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.				m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.																														
1	1.9	...	4.5	...	6.2	...	9.2	...	1.6	8.0	8.2	...	20.0	6.6	2	6.6

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9.8 m., M.S.L. 49.7 m.
Height of Cups above—Ground 5.8 m., M.S.L. 45.7 m.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10.7 m., Ground 12.8 m., M.S.L. 15.9 m.
Height of Cups above—Roof 3.7 m., Ground 12.3 m., M.S.L. 22.3 m.

Day.	3 h.				9 h.				15 h.				21 h.				Max. in a Gust.	Time of Gust.	Day.	3 h.				9 h.				15 h.				21 h.				Max. in a Gust (Gorleston).	Time of Gust.																									
	S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.				S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.	S.	N.	W.	E.																											
	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.				m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.	m/s.																											
1	2.9	...	6.9	12.1	...	3.4	8.1	8.1	...	14.9	16.5	16	16

9. SEISMOLOGICAL DIARY.

EARTHQUAKES:—ESKDALEMUIR.								MICROSEISMS OF N. COMPONENT:—ESKDALEMUIR.											
Day.	Phase.	Time, G.M.T.			Period.	Amplitudes.			Δ.	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
		h	m	s		A _{N.}	A _{E.}	A _{Z.}				A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
		h	m	s	s	μ	μ	μ	km.		μ	s	μ	s	μ	s	μ	s	
4	P S L F	17	1	19	...	...	...	...	5450	Slight earthquake.	1	0.8	4	0.6	4	1.0	4	0.9	4
		17	8	26	...	...	...	...	...		2	1.0	4.5	0.8	5	0.9	4.5	1.2	5
		17	16	...	...	...	...	...	...		3	0.9	4.5	0.4	5	0.9	4.5	0.3	3.5
		18	0	...	...	...	...	...	...		4	0.3	5	0.5	4	0.8	4	0.8	4
					...	...	...	...	...		5	0.9	4	0.6	4	0.8	4	0.5	4
5		17	50	to	...	...	...	...	...	Long waves of low amplitude.	6	...	...	...	0.1	4	0.3	4	
		18	40	...	...	...	...	...	...		7	0.2	4	0.3	4	0.3	4	0.7	4
					...	...	...	...	...		8	0.6	4.5	0.9	4.5	0.9	4.5	0.5	5
					...	...	...	...	...		9	0.6	6	0.7	7.5	0.8	7	0.9	6
					...	...	...	...	...		10	...	...	...	0.9	6	0.8	6	6
7		23	9	to	...	...	...	...	...	Slight disturbance; no well-marked preliminary phases.	11	0.6	5	0.6	4.5	0.7	5	0.8	5
		23	40	...	...	...	...	...	...		12	0.7	6	0.9	6	0.7	5.5	0.7	6.5
					...	...	...	...	...		13	0.8	5.5	0.7	6	0.8	5.5	0.9	6
					...	...	...	...	...		14	1.5	4.5	1.2	4	1.2	6	1.0	6
					...	...	...	...	...		15	1.0	6.5	1.1	5.5	0.8	5.5	0.8	6
15	Pe (?) S L (?) F	9	24	20	...	...	...	...	6700 (?)	P doubtful, owing to presence of microseisms.	16	0.7	6	0.7	5.5	0.9	4	0.9	5
		9	32	32	...	...	...	...	...		17	0.5	5	0.4	5	0.2	4	0.3	4
		9	40	...	...	...	...	...	...		18	0.2	4	0.3	4	0.7	4	0.5	4.5
		10	50	...	...	...	...	...	...		19	0.9	4	0.8	4	0.5	5	0.7	4
					...	...	...	...	...		20	0.7	4.5	0.5	4.5	1.2	5	2.4	5
					...	...	...	...	...		21	2.2	5	1.8	5	1.5	5	1.3	4.5
					...	...	...	...	...		22	1.3	5	1.8	5	1.7	5	2.2	7
					...	...	...	...	...		23	2.4	7.5	2.1	7	1.7	6.5	0.9	6
					...	...	...	...	...		24	1.2	5	0.8	6	1.1	4	0.7	4.5
					...	...	...	...	...		25	1.1	4.5	0.8	4.5	1.3	7	1.3	7
					...	...	...	...	...		26	1.3	7	1.5	5.5	1.3	6	1.4	6
					...	...	...	...	...		27	1.3	5.5	1.2	6.5	1.9	6	1.9	6
					...	...	...	...	...		28	2.4	6.5	2.2	6	1.5	6.5	1.5	4.5
					...	...	...	...	...		29	1.0	5	0.9	5	0.8	5	0.7	4.5
					...	...	...	...	...		30	0.5	5	0.6	4	0.6	4	0.6	5

Means for Month { A_N=1.0, T=5.1. Normals, 1911-16 { A_N=0.7, T=4.9.

EARTHQUAKES:—RICHMOND (KEW OBSERVATORY).

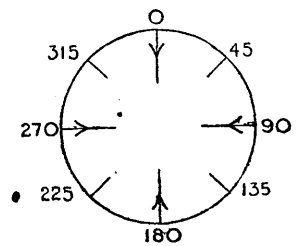
Day.	Times, G.M.T. of		Remarks.
	Commencement.	Max. Phase.	
	h	m	
4	...	17 22.5	Small.
15	9 32	9 48	
17	...	6 50	Very small.
17	...	18 0	Very small; doubtful.
18	...	22 39	Series of very small movements.
20	...	4 26	Small.
26	...	16 27.5	Very small; somewhat doubtful.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.		
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	m/s.
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.				
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.
3	S. Farnboro'	h. m. 6 15	270	6	250	30	310	5.5	275	5.5	305	9.5	...	...	...	...	...	...	Ci., Ci.-Cu.	270	...
4	"	9 15	160	8	150	30	155	7.5	170	7.0	180	6.0	195	6.5	...	...	...	...	Fr.-St.	...	...
5	"	6 30	160	9	50	0.0	125	8.0	125	7.5	170	8.5	170	10.5	170	11.0	...	...	Ci., A.-Cu.	135	...
6	"	11 5	?	?	155	1.0	140	1.0	180	1.5	155	4.0	160	7.0	...	...	...	...	A.-Cu.	180	...
8	"	6 25	?	?	120	1.5	135	4.5	230	2.5	225	6.0	250	3.0	...	...	...	...	b.	...	...
11	"	6 25	?	?	115	2.0	175	1.5	165	1.0	290	0.5	245	3.0	215	5.5	215	3.5	b.	...	...
12	"	6 35	340	13	335	5.0	345	15.0	350	11.5	330	10.0	...	...	...	...	...	...	{ Ci.-Cu., A.-Cu. }	...	...
13	"	6 35	270	9	260	7.0	280	9.0	290	9.0	305	11.5	305	21.0	...	...	...	...	A.-St.	...	...
15	"	6 15	290	6	...	0.0	300	5.5	290	9.5	295	15.0	295	22.5	290	22.0	295	30.5	{ Ci.-Cu., A.-Cu. }	293	...
17	"	7 55	250	10	...	4.5	270	11.5	265	19.0	245	18.5	...	...	...	...	...	...	Ci.	...	...
19	Eskdalemuir	7 35	250	6	...	0.0	260	8.0	270	7.5	260	10.5	...	...	...	...	...	...	Ci.	247	7.6
21	S. Farnboro'	7 30	290	9	...	3.0	305	8.5	300	14.5	295	13.5	285	20.0	295	26.0	...	...	Ci.	315	...
22	"	7 20	250	13	...	2.0	260	11.5	260	10.5	250	12.0	250	15.5	...	...	...	...	Ci.	247	...
24	"	7 35	?	?	...	0.0	205	5.0	200	6.5	215	7.5	...	...	...	...	...	...	...	...	...
24	"	16 0	?	?	...	3.5	200	5.5	210	7.5	225	6.5	235	7.5	270	5.5	...	...	Ci.	360	...
27	"	7 15	?	?	...	0.0	280	6.0	270	7.5	265	10.0	265	9.5	255	10.0	275	15.0	Ci.	315	...
28	"	7 15	260	11	...	0.0	270	8.0	255	9.5	265	10.5	250	7.0	...	...	...	...	St.-Cu.	...	...
29	"	8 25	?	?	...	0.0	15	4.5	340	5.0	325	8.5	305	8.5	310	14.0	310	17.5	b.	...	...
11	S. Farnboro'	6 25	(For observations at lower levels, see above.)														6000 m.		Type.	From N.	m/s.
27	"	7 15															215	8.0			
																	255	10.0			

Notes on Pressure Distribution.

- September 3 7 h. Anticyclone over France; depression over Scandinavia.
- 4 7 h. Anticyclone over Germany; shallow depression W. of British Isles.
- 5 7 h. Anticyclone E. of Iceland; depression over Ireland and S.W. England.
- 6 13 h. Anticyclone over Scandinavia; depressions over Iceland and France.
- 8 7 h. Anticyclone over Azores, extending towards Mouth of Channel; depression N. of Scotland.
- 11 7 h. Depressions E. of Iceland and over Spain.
- 12 7 h. Anticyclone W. of Ireland; depressions W. of Iceland and over Norway.
- 13 7 h. Area of high pressure extending from Azores to France; depressions W. of Iceland and over Finland.
- 15 7 h. Anticyclone over Spain; depression W. of Iceland.
- 17 7 h. Depression N. of Scotland.
- 19 7 h. Depression E. of Iceland; secondary over southern England.
- 21 7 h. Anticyclone over Bay of Biscay; depression over southern Norway.
- 22 7 h. Anticyclone over France; depression over Iceland and the Farøe Islands.
- 24 7 h. Anticyclone stretching from the Azores to Germany; deep depression W. of Iceland.
- 24 18 h. Anticyclone stretching from the Azores to Germany; deep depression W. of Iceland.
- 27 7 h. Area of high pressure over S.W. Europe; depression centred near the Farøe Islands.
- 28 7 h. Area of high pressure S. of Ireland and across Central Europe; depressions centred near the Farøe Islands and North Cape.
- 29 7 h. Anticyclone S.W. of Ireland; depression over southern Sweden.



Wind Protractor.

Height of Station above M.S.L. = H.
 Height of Anemometer above ground = h.
 Eskdalemuir . . . 242 m. 15 m.
 S. Farnborough . . . 70 m. 31 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
4	A.-Cu.	225	2.1	+1.5	+1.5	A.-Cu. in a thin sheet; cloudlets fused.
7	St.-Cu.	235	3.9	+3.2	+2.2	St.-Cu. fused into lenticular masses.
8	St.-Cu.	250	5.3	+5.0	+1.8	
11	Cu.	271	3.5	+3.5	-0.1	
12	Cu.	298	10.0	+8.8	-4.7	
14	Cu.	298	7.4	+6.5	-3.5	Fine small to normal A.-Cu., grouped into flotilla.
15	Cu.	265	8.0	+8.0	+0.7	
17	A.-Cu.	235	5.0	+4.1	+2.9	Coarse Ci., changing into Ci.-Cu.; arranged in bands.
19	{ Ci.	237	4.0	+3.4	+2.2	
19	{ Cu.	245	3.6	+2.8	+1.5	
22	{ Ci.	270	3.3	+3.3	0.0	Ci. changing to Ci.-Cu. ⊕ visible at times.
22	{ Cu.	270	7.1	+7.1	0.0	
25	Ci.-Cu.	232	4.0	+3.2	+2.5	Ci.-Cu. arranged in lenticular bands; radiating point S.W.
28	Ci.-St.	257	6.0	+5.8	+1.4	Sheet of Ci.-St., with straight sharp edge; radiating-point W.S.W.; ⊕ visible. Later the edge of the sheet showed inclination to break up into small Ci.-Cu.

12. AURORA.

Day.	a.m. or p.m.	Moon.	Magnetic Character.		Aurora Observations.	
			Eskdalemuir.	Richmond.	Station.	Remarks.
1	...	○	...	...	Haroldswick (Shetlands) Eskdalemuir Aberdeen Seskin (Carrick-on-Suir)	Glow 1 h. Moderately faint, glow type, and arch, between 22 h. and 23 h.
7	p.	...	1, 1	0, 1		
8	a.	☾	1, 1	1, 1		
8	p.	...	0, 0	0, 0		
13	p.	...	1, 1	0, 1	Haroldswick	20 h.-22 h.
16	p.	●	1, 1	0, 1	Haroldswick	
17	p.	...	1, 1	1, 1	Lerwick Deerness Fort Augustus Haroldswick	Moderately bright, glow type, double arch and streamer curtain, 20 h.-24 h. 18 d. 21 h. 24 m.-19 d. 0 h. 30 m. Very brilliant at 22 h. 15 m.
18	p.	...	1, 1	1, 1	Aberdeen Blacksod Pt. (Mayo) Malin Hd. (Donegal)	
20	p.	...	1, 1	1, 1	Aberdeen (Numerous Scottish stations)		Moderately faint, glow type, 22 h.-24 h.
24	...	☽	...	...
30	...	○	...	...

Note.—The two magnetic "characters" entered in each case refer to the two periods of 24 hours ending and beginning at the midnight of the night in question.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m. Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes means and normals for 45, 30, and 35 years.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m. Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes means and normals for 45 years.

Temperatures at or below the normal freezing point of water are printed in small type. * Mean of 30 days.

5. GEOPHYSICS :—RICHMOND (KEW OBSERVATORY).

Table with 18 columns: Day, Earth Temperature at 9 h, Height above M.S.L. of Surface of Underground Water, Horizontal Force, Declination (West), Inclination (North), Magnetic Character of Day, Electric Character of Day, Potential Gradient (Volts per metre, Factor 2:20), Charge per cc. x 10^16, and Air-Earth Current x 10^16. Rows include days 1-31 and a mean (M.) row.

* Mean of 23 days.

6. GEOPHYSICS :—ESKDALEMUIR.

Table with 16 columns: Day, North Component (Maximum/Minimum), West Component (Maximum/Minimum), Vertical Component (Maximum/Minimum), Magnetic Character of Day, Electric Character of Day, Potential Gradient (Volts per metre, Factor 1st to 28th, 6'46; 29th to 31st, 5'0), Charge per cc. x 10^16, and Air-Earth Current x 10^16. Rows include days 1-31 and a mean (M.) row.

† Instrument out of adjustment.

‡ Mean of 22 days.

z denotes the maximum and n the minimum value in the column.

z Indeterminate.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H=54 m. H_p=55 m. Above Ground:—h_t=1.48 m. h_r=1.72 m. h_a=8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 3 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0h. to 24h., and REMARKS.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h), Sunshine (Total, Percent of Possible), Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming (Upper, Lower), and Mean Amount.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES :—ESKDALEMUIR.

MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.

Day.	Phase.	Time, G.M.T.			Period.	Amplitudes.			Δ.	Remarks.
		h	m	s		A _{N.}	A _{E.}	A _{Z.}		
7	P L F	15	0	35	...	μ	μ	μ	km. 2650	
		15	6	50	...	...	...	...	...
		15	40		...	...	...	...	...
17		1	55	to	...	...	...	...	...	Slight disturbance. Preliminary phases ill-defined.
		2	45		...	...	...	...	...
18		4	36	to	...	...	...	...	...	Faint disturbance.
		4	47		...	...	...	...	...
19		17	0	to	...	...	...	...	...	Slight disturbance; no well-marked phases.
		18	0		...	...	...	...	...
22	L F	7	42		...	...	...	...	...	Early phases too faint for recognition.
		8	30		...	...	...	...	...
28	in in L F	17	10	48	...	...	...	...	...
		17	17	51	...	...	...	...	...
		17	22	14	...	...	...	...	...
		18	0		...	...	...	...	...

Day.	0 h.		6 h.		12 h.		18 h.	
	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
1	0.9	5	0.8	5	0.8	5	0.9	5
2	0.7	5	0.5	5	...	...	...	...
3	...	...	...	...	...	...	...	...
4	1.9	5	1.6	5	1.9	5	1.7	4.5
5	1.5	5	1.8	6	1.8	5.5	1.7	5
6	1.6	5.5	1.6	5.5	1.7	5.5	1.6	5
7	1.3	5	1.1	6	1.6	6	2.5	5.5
8	2.2	5.5	2.5	7	2.8	7	...	...
9	...	...	...	...	1.3	6	1.7	5.5
10	2.5	5	1.9	6	2.3	6	...	...
11	0.9	6	1.0	5	0.9	5	0.9	5.5
12	1.5	5	1.7	5	1.8	5	1.6	6
13	1.5	6	1.6	6	2.5	6	2.1	6.5
14	1.9	6	1.9	6	1.9	6	1.2	6
15	1.0	5	1.2	5.5	0.9	5.5	1.8	5
16	2.7	5	2.6	5	1.9	5	1.4	5
17	0.9	5	0.8	5	0.7	4.5	0.6	4.5
18	0.7	4	0.6	4.5	0.7	4.5	0.8	4
19	0.5	5	0.7	4.5	0.8	5	0.6	5
20	0.5	5.5	0.9	5	0.9	5	1.0	5
21	0.8	5.5	1.0	5	1.7	5	1.0	5
22	1.0	4.5	0.7	5.5	0.9	5	2.0	5
23	1.9	6	3.0	7	4.9	6.5	4.1	7.5
24	3.9	8	3.7	7	2.6	7	2.3	6.5
25	3.5	7	6.2	6	4.4	6.5	4.1	6.5
26	3.4	7	3.6	7	4.1	6.5	4.6	6
27	3.1	6	2.8	5.5	2.1	5.5	2.7	6
28	2.4	6	2.7	5.5	1.9	6	1.4	7
29	1.3	6.5	1.8	5	3.1	6	5.1	6
30	4.6	5	5.2	6	4.1	6	4.5	6
31	2.9	5	1.8	5	1.2	6	1.5	5

Means for Month { A_N=2.0. T=5.6. Normals, 1911-16 { A_N=1.2. T=5.3.

EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).

Day.	Times, G.M.T. of		Remarks.
	Commence-ment.	Max. Phase.	
7	h m 15 6	h m 15 16	Small.
17	...	1 59	Very small.
19	...	17 26	Small.
22	...	8 14	Very small.
28	17 18	17 22.5	

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.		
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	mr/s.
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.				
							From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.	From N.	m/s.			
1	S. Farnboro'	h. m. 11 45	160	3	...	0'0	160	5'5	145	8'0	175	4'5	175	3'5	195	5'0	215	5'5	...	...	...
2	"	11 55	200	6	...	0'0	230	6'5	220	12'5	235	7'5	...	...	...	...	...	...	Fr.-St.	...	...
5	"	7 20	325	14	355	6'5	320	14'5	330	14'0	315	11'5	320	11'0	305	14'0	310	11'5	{ A.-Cu. St.-Cu. }	...	...
8	"	7 35	290	14	...	...	295	16'5	305	17'5	305	14'5	310	16'5	...	...	...	...	Ci., Ci.-St.	315	...
9	"	7 25	290	17	320	6'5	285	18'5	305	22'5	300	15'0	...	...	...	...	...	...	A.-Cu.	270	...
10	"	8 25	290	10	315	0'5	290	7'0	290	5'5	315	7'5	...	...	...	...	...	...	{ St., Cu., Nb. }	...	...
11	"	7 30	340	9	...	0'0	345	8'5	340	12'5	335	9'0	295	11'5	335	11'5	340	13'5	St.-Cu.	...	...
11	Eskdalemuir	7 30	315	8	290	4'8	305	7'0	330	5'5	295	7'5	305	11'0	315	12'5	315	12'5	...	...	...
12	"	7 30	260	8	145	2'4	265	4'0	225	11'5	300	8'0	285	10'5	...	...	...	...	Ci., Ci.-St.	285	7'5
12	S. Farnboro'	7 35	290	12	315	2'5	290	10'5	300	13'0	285	17'0	290	33'0	...	...	...	...	A.-Cu.	...	...
13	"	7 25	245	12	260	3'0	255	11'5	250	12'0	245	17'0	240	19'0	235	22'0	240	21'5	Ci., Ci.-St.	245	(Ci.)
15	"	7 30	290	10	335	0'0	290	4'5	285	9'0	280	7'5	315	9'0	325	7'0	315	9'5	A.-Cu.	...	...
18	"	7 30	300	7	350	0'5	315	7'0	320	7'5	300	7'5	285	7'0	280	9'0	300	12'0	...	...	...
19	Eskdalemuir	7 35	335	?	...	0'0	335	2'0	325	7'5	345	8'0	355	12'5	...	...	...	...	Ci.	315	...
20	S. Farnboro'	7 35	190	7	210	1'0	175	7'0	210	5'5	270	3'5	...	...	...	...	...	...	{ Ci.-St. A.-Cu. St.-Cu., St. }	...	...
22	"	7 45	270	11	270	0'0	290	10'5	290	8'0	270	10'0	305	10'5	305	12'0	310	13'5	Fr.-St.	...	...
23	"	8 30	315	9	360	6'5	320	12'0	320	14'0	285	15'5	250	22'0	...	...	...	...	St.-Cu.	...	...
27	"	7 30	270	12	...	2'5	275	10'0	285	14'0	280	10'5	260	11'5	...	...	...	...	...	...	...
27	"	11 25	245	7	290	3'5	250	7'0	275	10'5	250	9'5	255	12'5	260	15'0	235	17'0	...	...	...
27	Cahirciveen	17 0	315	10	335	1'7	335	9'0	330	10'5	310	12'5	...	...	...	...	...	...	Cu.	...	...
28	"	13 25	340	6	20	3'5	320	4'0	320	8'0	310	5'0	290	6'0	235	3'5	255	6'0	Fr.-Cu.	...	...
29	S. Farnboro'	11 50	235	8	225	1'0	240	7'0	245	6'5	245	9'0	250	9'0	250	10'0	...	...	...	...	...
30	"	11 40	225	18	290	9'0	250	7'5	245	17'5	230	13'0	...	...	...	...	...	...	...	...	...
31	"	7 55	270	7	...	0'0	275	6'5	290	9'0	260	7'5	295	8'0	315	19'0	...	...	...	...	...

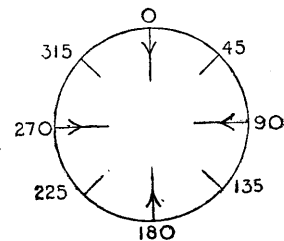
For observations at lower levels, see above.)

6000 m. 7000 m.

255	4'0	265	6'5
300	13'5	...	...
315	10'5	325	15'5
320	12'5	...	...
220	14'0	...	...

Notes on Pressure Distribution.

- October 1 13 h. Depression over Iceland; anticyclone over Germany.
- 2 13 h. Depression centred over Iceland; anticyclone over Western Continent.
- 5 7 h. Straight isobars, N.W. type.
- 8 7 h. Trough from Iceland to Germany.
- 9 7 h. Low over North Sea.
- 10 7 h. Depression over North Sea centred over S. Scandinavia.
- 11 7 h. One depression over Scandinavia, another approaching from Iceland. Anticyclone over Azores.
- 12 7 h. Cyclone centred over the Hebrides.
- 13 7 h. Low centred over the North Sea.
- 15 7 h. Very irregular; depression approaching from Iceland region.
- 18 7 h. Depression over North Sea.
- 19 7 h. British Isles within High centred at Bay of Biscay.
- 20 7 h. Straight isobars from S.S.W.
- 22 7 h. Ridge from Azores to Russia.
- 23 7 h. Ridge from Azores to Russia. Wide V with its blunt point over the Channel.
- 27 7 h. } Low centred between Scandinavia and Iceland.
- 27 13 h. }
- 28 13 h. Trough from Spitzbergen to the Bay of Biscay.
- 29 13 h. Low off Hebrides.
- 30 13 h. Low off Hebrides.
- 31 7 h. Low centred N. of Shetlands. Small gradient in the South of England.



Wind Protractor.

Height of Station above M.S.L. = H.
 Height of Anemometer above ground = h.
 Eskdalemuir . . . 242 m. 15 m.
 S. Farnborough . . . 70 m. 31 m.
 Cahirciveen . . . 30 m. 13 m.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
			mr/s.	mr/s.	mr/s.	
2	Fr.-St.	225	17.0	- 12.0	+ 12.0	Fr.-St. becoming cumuliform.
4	{ Ci.	286	2.0	+ 1.9	- 0.6	"False" cirrus in sheets.
	{ Cu.	282	8.0	- 7.8	- 1.7	
5	Nb.-Cuf.	275	6.2	+ 6.2	- 0.5	Nimbus becoming cumuliform.
6	St.-Cu.	3	2.0	- 0.1	- 2.0	Thin St.-Cu. formed from "false" cirrus sheets.
10	Cu.-Nb.	10	12.0	- 2.1	- 11.8	Apical part measured; cloud of no great altitude.
11	Cu.	240	3.1	+ 2.7	+ 1.6	Small detached cumulus.
12	Cu.	240	2.0	+ 1.7	+ 1.0	Small detached cumulus.
13	Cu.-Nb.	6	10.0	- 1.0	- 9.9	Velocity approximate; some variation.
15	Cu.	229	5.4	+ 4.1	+ 3.5	
16	Ci.-St.	273	3.1	+ 3.1	- 0.2	Ci.-St., changing into Ci.-Cu. in places. ⊕ visible. <i>Observation at 12 h.</i>
17	Fr.-St.	160	12.0	- 4.1	+ 11.3	Average velocity; A.-St. above from S.W.
20	Fr.-St.	192	36.0	+ 7.0	+ 35.0	Velocity approximate, varying somewhat.
26	"False" Ci.	269	3.1	+ 3.1	0.0	"False" cirrus in patches.
29	Cu.	179	10.9	- 0.2	+ 10.9	Degraded Cu. below A.-St.
30	St.-Cu.	197	9.0	+ 2.6	+ 8.6	St.-Cu. formed from apices of Cu.-Nb.
31	Cu.	243	9.1	+ 8.1	+ 4.1	Transitional type between Cu. and St.-Cu.

12. AURORA.

Day.	a.m. or p.m.	Moon.	Magnetic Character.		Aurora Observations.	
			Eskdalemuir.	Richmond.	Station.	Remarks.
7	p.	☾	1, 1	1, 1	Eskdalemuir Lerwick Aberdeen	Glow to N. at 21 h. 13 d. 21 h.—14 d. 2 h. 19 h. onwards. Glow type; colour, greenish-yellow, moderately bright, with slight streamer activity at 23 h.
13	p.	...	2, 2	2, 2	Glasgow Eskdalemuir (Many other Scottish stations) Huddersfield	21 h. 19 h. 30 m.—22 h. 30 m., the first streamer being seen at about 20 h. 20 m.
14	p.	...	2, 0	2, 0	Baltasound (Shetlands)	
15	p.	...	0, 0	0, 0	Baltasound	
16	...	●	...	...	...
23	...	☾	...	...	...
23	p.	...	0, 1	1, 1	Baltasound	
28	p.	...	2, 2	2, 2	Aberdeen Haroldswick (Shetlands)	Streamer type, and moderately bright from 21 h. onwards.
30	...	○	...	...	...

Note.—The two magnetic "characters" entered in each case refer to the two periods of 24 hours ending and beginning at the midnight of the night in question.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m.

Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with 18 columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes monthly means and normals for 45 years.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m.

Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with 18 columns: Day, Air Pressure at Station Level (9h, 21h), Air Temperature in Degrees Absolute (9h, 21h, Max, Min), Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8=E, 16=S) with Speed in metres per second (9h, 21h), Cloud Amount and Weather (9h, 21h), Rain 24 hours beginning 9h, Min. Temp. on Grass, and REMARKS. Includes monthly means and normals for 45 years.

5. GEOPHYSICS:—RICHMOND (KEW OBSERVATORY).

Table with columns: Day, Earth Temperature at 9 h. (0.3 m, 1.2 m), Height above M.S.L. of Surface of Underground Water (Daily Mean, Extremes), Horizontal Force (Mean Time), Declination (West) (Mean Time), Inclination (North) (Mean Time), Magnetic Character of Day, Electric Character of Day, Potential Gradient, Volts per metre. Factor 2.36 (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10¹⁶ (About 15 h), Air-Earth Current. x 10¹⁶ (About 15 h).

* Mean of 26 days.

6. GEOPHYSICS:—ESKDALEMUIR.

Table with columns: Day, North Component (Maximum/Minimum 15000 γ+), West Component (Maximum/Minimum 4000 γ+), Vertical Component (Maximum/Minimum 44000 γ+), Magnetic Character of Day, Electric Character of Day, Potential Gradient, Volts per metre. Factor (1st to 8th, 5.0; 9th to 30th, 5.78) (3 h, 9 h, 15 h, 21 h), Charge per cc. x 10¹⁶ (About 15 h), Air-Earth Current. x 10¹⁶ (About 15 h).

* Instrument earthed.

† Mean of 27 days.

α denotes the maximum and η the minimum value in the column.

z Indeterminate.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M. S. L.:—H = 54 m. H_b = 55 m. Above Ground:—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Main meteorological data table with columns for Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Min. Temp. on Grass, Percentage of Humidity, Rain 0 h. to 24 h., and REMARKS. Includes data for days 1-30 and means/normal values.

JERSEY (ST LOUIS OBSERVATORY).

Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming. Table with columns for Day, Wind Direction and Force, Sunshine, Cloud Amount (Upper/Lower), and Mean Amount. Includes data for days 1-30 and means/normal values.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8·8 m., Ground 13·7 m., M.S.L. 19·2 m.
Height of Cups above—Roof 4·6 m., Ground 7·6 m., M.S.L. 15·2 m.

SCOTLAND N.:—DEERNES.

Height of Cups above—Roof 1·5 m., Ground 4·9 m., M.S.L. 57·3 m.

Table with columns: Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust., Time of Gust. (h m). Rows 1-30.

Summary table for North Wales: Holyhead with columns: S+N&W, W+E, S-N&W, W-E.

Table with columns: Day, 3 h., 9 h., 15 h., 21 h., Vel. in Max. Hourly Run., Time of Max. (hrs.). Rows 1-30.

Summary table for Scotland N.: Deernes with columns: S+N&W, W+E, S-N&W, W-E.

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9·8 m., M.S.L. 49·7 m.
Height of Cups above—Ground 5·8 m., M.S.L. 45·7 m.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10·7 m., Ground 12·8 m., M.S.L. 15·9 m.
Height of Cups above—Roof 3·7 m., Ground 13·3 m., M.S.L. 22·3 m.

Table with columns: Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust., Time of Gust. (h m). Rows 1-30.

Summary table for England S.W.: Scilly with columns: S+N&W, W+E, S-N&W, W-E.

Table with columns: Day, 3 h., 9 h., 15 h., 21 h., Max. in a Gust. (Gorleston.), Time of Gust. (h m). Rows 1-30.

Summary table for England E.: Great Yarmouth with columns: S+N&W, W+E, S-N&W, W-E.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES :—ESKDALEMUIR.									MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.										
Day.	Phase.	Time, G.M.T.			Period.	Amplitudes.			Δ .	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
		h	m	s		A_N .	A_E .	A_Z .				A_N .	T.	A_N .	T.	A_N .	T.	A_N .	T.
		h	m	s	s	μ	μ	μ	km.		μ	s	μ	s	μ	s	μ	s	
4	P PR S L M M M F	12	16	46	...	...	...	...	9750		1	1'0	5	1'2	5	1'2	5'5	1'4	5
		12	20	32	...	...	...	...	...		2	0'9	6	1'2	5	1'0	5	1'1	5
		12	27	35	...	...	...	...	...		3	1'3	5	1'0	5	...	...	...	...
		12	46	43	29	...	...	...	...		4	0'5	5	0'5	4	0'5	5	1'1	4
		12	56	17	24	33	...	...	...		5	1'3	5	1'6	6	1'9	5	1'8	5
		13	2	55	22	...	27	...	...		6	1'2	5'5	1'8	4'5	2'0	4'5	1'7	5
		13	4	11	22	46	...	...	...		7	1'2	6	1'7	4'5	1'3	5'5	1'4	6
		14	40	...	...	...	...	...	...		8	1'6	5'5	1'3	6	1'2	6	1'6	6
											9	1'5	6	2'3	6	4'9	8	3'4	7
											10	2'5	7	1'9	6'5	1'8	6	1'5	5'5
7		2	13	to	...	...	...	...	...	Slight disturbance. Phases obscured by wind effects.	11	1'0	5	0'9	5	0'9	5	0'9	5
		2	25	...	...	...	...	...	...		12	1'1	5'5	1'4	5'5	1'7	6	1'5	5
											13	1'4	6	1'4	5	1'1	6	1'1	6
											14	1'1	6	1'1	6	1'1	6	1'2	5'5
											15	1'3	6	0'9	5'5	1'1	6	1'2	5'5
14		9	38	to	...	...	...	...	...	Prolonged slight disturbance with no well-marked phases. A few long waves of irregular form and period at 10 h.	16	1'0	5	0'0	...	0'8	6	1'1	5'5
		10	30	...	...	...	...	...	...		17	1'0	6'5	...	...	...	...	1'2	6
											18	...	...	...	1'0	6	1'2	7	6
											19	1'2	6	1'0	5'5	1'2	6	1'2	6
											20	1'3	6'5	2'0	7	2'8	6'5	2'9	6'5
											21	2'2	6'5	2'1	7	1'6	6	1'3	6
											22	1'6	5	1'2	6	1'3	6	0'8	6
											23	1'2	6	1'5	7	1'8	8	3'4	6
											24	2'7	7'5	2'3	7	2'8	6	2'9	7
											25	3'3	6'5	4'9	6'5	5'3	7	6'1	7
15		1	36	to	...	...	...	...	...	Faint disturbance.	26	4'4	6'5	3'9	6	3'0	6	3'8	6
		2	17	...	...	...	...	...	...		27	3'6	5	2'7	6	3'1	5'5	3'7	6
											28	3'1	6	2'8	5'5	2'7	5'5	2'1	6'5
											29	1'6	5	1'9	5	1'7	5'5	2'2	5'5
											30	2'4	5	2'6	7	2'0	6'5	2'8	6
											Means for Month $\left\{ \begin{array}{l} A_N = 1'8. \\ T = 5'8. \end{array} \right.$ Normals, 1911-16 $\left\{ \begin{array}{l} A_N = 1'8. \\ T = 5'8. \end{array} \right.$								
EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).																			
Day.	Times, G.M.T. of			Remarks.															
	Commence-ment.	Max. Phase.																	
4	h m 12 45	h m 13 10	S doubtful.																
14	...	10 16	Very small, and doubtful.																
16	3 50	$\left\{ \begin{array}{l} 4 55 \\ 5 19 \end{array} \right.$	Amplitude on trace 2'3 mm. at each of these times.																
16	...	23 28	Small.																
18	...	4 1	Time approximate as hour mark failed.																
28	...	15 12	Small.																

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.														Cloud Observations.						
			Geostrophic.		By Anemometer.		At Heights above M.S.L.										Type.	From N.	m/s.				
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.					5000 m.			
4	S. Farnboro'	h. m. 15 20	80	7	—	2.5	55	7.0	55	5.0	325	5.0	90	4.5	...	...	...	...	A.-Cu.	...	...
5	"	7 45	250	8	—	0.0	250	7.5	245	7.0	270	9.0	265	8.0	...	...	...	...	Ci., A.-St.	...	...
6	"	10 15	290	9	—	6.0	300	8.5	280	11.5	270	15.0	...	...	...	...	...	...	Fr.-Cu.	...	...
7	"	8 10	290	11	—	7.0	290	13.0	300	14.0	285	14.0	265	17.0	...	...	...	...	Fr.-Cu., St.-Cu., Ci., St.	...	...
8	"	7 40	290	12	—	4.0	300	13.5	305	13.5	270	10.5	...	...	...	...	...	...	Ci.-Cu., St., A.-Cu., Ci.	315	(Ci.)
8	"	8 5	290	12	—	4.5	295	13.5	300	14.0	285	13.0	310	12.5	335	25.0	...	...	Ci., Ci.-Cu., A.-Cu., A.-St.	...	...
9	"	8 10	280	14	—	6.5	280	15.5	285	14.0	270	20.5	...	...	...	...	...	...	St.-Cu.	...	...
11	"	13 10	355	9	—	3.0	350	7.5	355	8.0	335	12.0	335	10.0	350	23.5	345	27.0	Ci., Ci.-St., A.-Cu.	349	...		
12	Cahirciveen	12 25	?	?	195	6.5	...	...	152	3.2	295	3.0	255	3.3	275	6.5	...	...	Ci., Ci.-St.	...	...
12	"	16 30	? 190	? 3	265	6.5	215	2.8	225	5.5	220	7.0	230	8.0	...	...	...	...	Ci., Ci.-St., A.-Cu., A.-St.	...	...
13	S. Farnboro'	12 40	250	5	—	—	210	3.5	140	1.0	190	3.0	310	3.5	290	3.5	315	6.5	St.	326	...		
14	Cahirciveen	11 45	?	?	175	7.0	65	3.1	35	2.3	300	3.7	310	10.0	285	8.5	290	12.5	b.	...	...
15	S. Farnboro'	15 10	?	?	—	0.0	310	4.0	325	5.5	335	10.5	340	14.0	...	...	...	...	...	...	...
16	"	7 45	315	7	—	0.0	315	7.0	315	2.5	335	10.0	335	10.5	340	12.5	350	17.5	Ci.-Cu., A.-Cu., St.	...	...
16	"	11 10	? 315	? 5	—	0.0	25	4.0	320	2.0	10	5.5	...	...	...	...	...	...	A.-Cu., St.-Cu.	...	...
23	"	7 35	315	11	—	7.0	310	14.0	310	14.0	320	10.0	320	15.5	...	...	...	...	Ci.	315	...
23	"	10 15	300	12	—	7.5	300	11.5	310	8.5	330	9.5	315	18.5	320	18.0	Ci.	
23	"	11 15			—	6.5	290	12.5	295	10.5	325	10.0	320	18.5	Ci., Fr.-Cu.
23	"	12 45			—	9.5	275	12.0	290	12.0	310	13.0	315	18.0	315	21.0	A.-Cu.	304	...
23	"	15 10			—	7.5	290	12.5	295	19.0	305	12.5	305	19.0
26	"	7 50			340	14	—	5.5	340	12.5	350	8.5	350	18.0	345	21.0	340	21.5	Ci.	...
26	"	10 40	270	10	280	4.0	325	6.5	335	12.0	350	8.0	335	15.5	...	...	...	...	...	...	...
26	"	11 10			275	5.0	315	5.5	325	16.5	340	6.0	340	13.5	340	21.0	360	23.0	
26	"	11 55			270	4.0	290	8.0	315	14.0	325	5.5	325	13.0	340	20.0	340	26.5	
26	"	12 35			260	4.5	285	8.0	315	10.0	310	8.5	330	13.5	340	21.5	
26	"	14 30			235	5.5	265	10.0	285	10.5	285	9.0	
26	"	15 0	220	5.5	260	10.5	270	13.5	270	10.0	...	...	...	...	...	...	...	...	...	...
27	"	9 20	290	20	265	9.0	295	16.5	315	25.0	310	26.0	...	...	...	...	...	...	A.-Cu., St.-Cu.	...	...
28	"	7 40	275	14	250	10.0	290	15.0	305	22.5	285	23.0	280	22.0	...	...	...	...	St., Ci.	...	...
				(For observations at lower levels, see above.)														6000 m.					
11	S. Farnboro'	13 10	355	34.5																			
13	"	12 40	340	8.0																			

The ascents at Eskdalemuir were all below 2000 m.

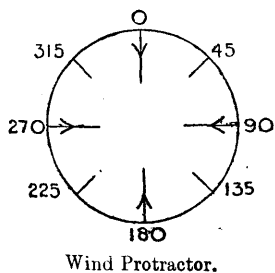
Notes on Pressure Distribution.

The month was remarkable for the large number of depressions which passed eastwards from Iceland to Scandinavia keeping to the north of Scotland.

- November 4 18 h. } Anticyclonic belt from Azores to White Sea.
 5 7 h. }
 6 7 h. Wide V over British Isles.
 7 7 h. Depression over British Isles centered N. of Orkneys.
 8 7 h. One depression filling up over North Sea, another appearing S. of Iceland.
 9 7 h. Depression centered near the Faeroes.
 11 13 h. High over the Bay of Biscay. Lows over Scandinavia and Iceland.
 12 13 h., 18 h. High over the Bay of Biscay and the Channel.
 13 13 h. Anticyclonic ridge stretching from Azores to Baltic.
 14 13 h. }
 15 18 h. } Anticyclone covering the British Isles.
 16 7 h., 13 h. }
 23 7 h., 13 h., 18 h. Deep depression travelling east over N. Scandinavia. Anticyclone over Bay of Biscay, France, and Spain.
 26 7 h., 13 h., 18 h. Depression N. of Scotland, travelling east.
 27 7 h. Depression off the coast of Norway.
 28 7 h. Low over Iceland.

Notes on Ascents.

- 8th, 8 h. 5 m. Cloud rapidly increasing in amount.
 9th, 8 h. 10 m. Clear at zenith, clouded round horizon.
 11th, 13 h. 10 m. Clouds coming over during ascent.
 13th, 12 h. 40 m. St. cleared off just before ascent.
 16th, 7 h. 45 m. Thick ground mist.
 23rd, 7 h. 35 m. Ci. moving rapidly.
 23rd, 10 h. 15 m. Low Ci.
 27th, 9 h. 20 m. Temporary clearing of A.-Cu. and St.-Cu.
 28th, 7 h. 40 m. St. all round horizon, Ci. near zenith.



Wind Protractor.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Velocity-height-ratio.				Remarks.
		Degrees from N.	Milliradians per Second.	Components.		
				W.-E.	S.-N.	
1	Ci.	270	4.6	mr/s. + 4.6	mr/s. 0.0	Ci. bands, changing into Ci.-Cu.; much internal change. Basal portion measured.
2	Cu.-Nb.	2	6.0	- 0.2	- 6.0	
3	St.-Cu.	179	4.0	- 0.1	+ 4.0	
6	False Ci.	240	2.9	+ 2.5	+ 1.4	False Ci., becoming thin A.-Cu. in places. <i>Observation at 11 h.</i>
7	Cu.	314	8.8	+ 6.3	- 6.1	Detached Cu.
8	St.-Cu.	279	2.5	+ 2.5	- 0.4	<i>Observation at 12 h.</i> Thin, high St.-Cu., direction backing rapidly from 325° at 10 h. 30 m.
10	St.-Cu.	349	9.0	+ 1.7	- 8.8	St.-Cu. formed from upper part of Cu.-Nb.
12	Ci.	312	3.8	+ 2.8	- 2.5	Ci., changing to Ci.-Cu. web. <i>Observation at 12 h.</i>
16	St.-Cu.	304	2.8	+ 2.3	- 1.6	
20	Ci.-Cu.	316	6.9	+ 4.8	- 5.0	Ci.-Cu. forming into lenticular sheets. Radiant point 315°. Much internal change.
22	St.-Cu.	276	4.0	+ 4.0	- 0.4	
23	Ci.	285	3.4	+ 3.4	- 0.9	Ci. to Ci.-St.
24	Ci.	280	3.7	+ 3.6	- 0.6	
24	Fr.-Cu.	288	21.0	+ 20.0	- 6.5	
28	Fr.-St.	272	17.0	+ 17.0	- 0.1	Fr.-St. becoming cumuliform.

12. AURORA.

Day.	a.m. or p.m.	Moon.	Magnetic Character.		Aurora Observations.	
			Eskdalemuir.	Richmond.	Station.	Remarks.
6	...	☾	...	...	...	...
12	p.	...	2, 1	2, 1	Baltasound Haroldswick Lerwick Deerness Aberdeen Eskdalemuir Whitby	18 h.-21 h. Glow type, moderately bright, 18 h.-24 h. Glow to N. or N.E. almost all evening. First seen 18 h. 15 m.
13	p.	...	1, 1	1, 1	Baltasound Lerwick Aberdeen	20 h. 15 m.-23 h. Glow, faint, after 22 h.
14	...	●	...	...	...	...
21	...	☽	...	...	...	...
28	...	○	...	...	...	...

Note.—The two magnetic "characters" entered in each case refer to the two periods of 24 hours ending and beginning at the midnight of the night in question.

METEOROLOGICAL OFFICE OBSERVATORIES—GEOPHYSICAL JOURNAL.

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1. SUNSHINE AND SOLAR RADIATION.

Table with 4 main columns for locations: SOUTH KENSINGTON, RICHMOND, ESKDALEMUIR, and CAHIRGIVEEN. Each column contains data for Bright Sunshine (Total, Per cent. of Possible) and Radiation received on Horizontal Surface (Callendar Radiograph, Angström Pyrheliometer).

2. METEOROLOGY AND MAGNETISM :—CAHIRGIVEEN (VALENCIA OBSERVATORY).—Lat. 51° 56' N. Long. 10° 15' W.

Heights above M. S. L. :—H = 9.1 m. H_b = 13.7 m. H_a = 26.4 m. Above Ground : h₁ = 1.3 m. h_r = 0.56 m. h_a = 13.9 m.

Table with 10 columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity, Wind Direction in Points, Cloud Amount, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS, and Magnetism. Includes daily data from Dec 1 to 31 and monthly means.

x denotes the maximum and n the minimum value in the column.

3. METEOROLOGY :—RICHMOND, SURREY (KEW OBSERVATORY).—Lat. 51° 28' N. Long. 0° 19' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 5.5 m. Barometer, H_b = 10.4 m. Cups of Anemometer, H_a = 25 m. Heights above Ground :—Thermometers, h_t = 3.0 m. Rain-gauge, h_r = 0.53 m. Cups of Anemometer, h_a = 20 m.

Table with columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8 = E, 16 = S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS. Includes monthly means and normals for 45, 30, and 35 years.

4. METEOROLOGY :—ESKDALEMUIR, DUMFRIESSHIRE.—Lat. 55° 19' N. Long. 3° 12' W.

Heights above Mean Sea Level :—Rain-gauge Site, H = 242 m. Barometer, H_b = 237.3 m. Vane of Anemometer, H_a = 250 m. Heights above Ground :—Thermometers, h_t = 0.9 m. Rain-gauge, h_r = 0.38 m. Vane of Anemometer, h_a = 15 m.

Table with columns: Day, Air Pressure at Station Level, Air Temperature in Degrees Absolute, Humidity (Vapour Pressure, Percentage), Wind Direction in Points (8 = E, 16 = S) with Speed in metres per second, Cloud Amount and Weather, Rain 24 hours beginning 9 h., Min. Temp. on Grass, REMARKS. Includes monthly means and normals for 45 years.

Temperatures at or below the normal freezing point of water are printed in small type.

7. JERSEY (ST LOUIS OBSERVATORY).—Lat. 49° 12' N. Long. 2° 6' W.

Heights above M.S.L.:—H = 54 m. H_b = 55 m. Above Ground:—h_t = 1.48 m. h_r = 1.72 m. h_a = 8 m.

Table with columns: Day, Air Pressure at Station Level (7h, 14h, 21h, Mean of 3 Readings), Air Temperature in Degrees Absolute (7h, 14h, 21h, Max, Min, Mean of 5 Readings), Min. Temp. on Grass, Percentage of Humidity (7h, 14h, 21h, Mean), Rain 0h to 24h, and REMARKS. Includes data for days 1-31 and means/normal values.

JERSEY (ST LOUIS OBSERVATORY).

Table with columns: Day, Wind Direction and Force (0-12 on the Beaufort Scale) (7h, 14h, 21h), Mean, Sunshine (Total, Percent of Possible), Cloud Amount (tenths of Sky covered), Type of Cloud, and Direction whence coming (Upper, Lower, Tenths, Upper, Lower, Tenths, Upper, Lower, Tenths), and Mean Amount. Includes data for days 1-31 and means/normal values.

8. WIND COMPONENTS: Metres per second at fixed hours, together with the greatest mean hourly velocity, or the greatest velocity attained in a gust, and the time of its occurrence.

NORTH WALES:—HOLYHEAD.

Height of Head above—Roof 8.8 m., Ground 13.7 m., M.S.L. 19.2 m. Height of Cups above—Roof 4.6 m., Ground 7.6 m., M.S.L. 15.2 m.

SCOTLAND N.:—DIBERNES.

Height of Cups above—Roof 1.5 m., Ground 4.9 m., M.S.L. 57.3 m.

Main data table for North Wales (Holyhead) and Scotland N. (Dibernes). Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, and Time of Gust. Rows 1-31.

ENGLAND S.W.:—SCILLY.

Height of Head above—Ground 9.8 m., M.S.L. 49.7 m. Height of Cups above—Ground 5.8 m., M.S.L. 45.7 m.

ENGLAND E.:—GREAT YARMOUTH.

Height of Head above—Roof 10.7 m., Ground 12.8 m., M.S.L. 15.9 m. Height of Cups above—Roof 3.7 m., Ground 18.3 m., M.S.L. 22.3 m.

Main data table for England S.W. (Scilly) and England E. (Great Yarmouth). Columns include Day, 3h, 9h, 15h, 21h, Max. in a Gust, and Time of Gust. Rows 1-31.

9. SEISMOLOGICAL DIARY.

EARTHQUAKES :—ESKDALEMUIR.									MICROSEISMS OF N. COMPONENT :—ESKDALEMUIR.										
Day.	Phase.	Time, G.M.T.			Period.	Amplitudes.			Δ.	Remarks.	Day.	0 h.		6 h.		12 h.		18 h.	
		h	m	s		A _{N.}	A _{E.}	A _{Z.}				A _{N.}	T.	A _{N.}	T.	A _{N.}	T.	A _{N.}	T.
1		10	25	to	...	μ	μ	μ	km.	Faint disturbance.	1	2.5	5.5	2.6	6	2.7	6	...	...
		10	40		...	...	...	...	...		2	...	...	...	...	...	...	4.5	7
5		13	15	to	...	...	...	...	...	Slight disturbance, with long waves of 17 secs. period, beginning at 13 h. 24 m.	3	3.4	7.5	2.4	7	2.9	6	2.5	6
		13	47		...	...	...	...	...		4	2.6	6	2.3	6	3.2	5.5	2.7	6
20		3	12	to	...	...	...	...	...	Faint disturbance. A few long waves at 3 h. 19 m.	5	1.7	5.5	1.7	5.5	0.9	5	0.8	5
		3	30		...	...	...	...	...		6	0.6	5	1.1	4	1.0	5.5	1.0	4.5
21	P	18	5	19	...	...	...	...	7380	Exceptionally clear record. F doubtful owing to occurrence of a second disturbance whose initial phases are merged in end of this earthquake. End of second disturbance about 22½ h.	7	1.2	4.5	1.7	5	1.5	5.5	2.2	7
	PR ₁	(?)			...	...	...	...	...		8	3.2	6	3.6	6	2.9	7	3.2	6
	PR ₂	18	9	40	...	...	...	...	...		9	3.2	6	2.7	6	2.2	5.5	3.0	5.5
	S	18	14	8	...	...	...	...	...		10	1.9	5.5	1.6	6	2.2	5.5	1.8	5
	SR ₁	18	19	17	...	...	...	...	...		11	1.6	5.5	...	...	1.6	5.5	2.0	6
	SR ₂	18	21	43	...	...	...	...	...		12	2.3	7	2.7	7	2.5	7	3.1	7
	L	18	26	49	...	...	...	...	...		13	2.0	7	2.2	8	2.9	7	3.6	7
	M	18	31	25	22	35	...	...	...		14	...	...	...	...	...	...	...	...
	M	18	31	29	21	...	51	...	...		15	...	...	4.8	7	3.6	6.5	2.8	6.5
	M	18	36	44	16	...	42	...	...		16	2.1	6	2.3	6	2.7	6	3.2	6
	F	18	37	22	18	52	...	...	...	17	3.1	6	4.4	6	2.7	6	2.1	6	
		(?)			...	...	...	...	...	18	1.4	6	1.0	6	0.9	6	1.5	5	
24		9	23	to	...	...	...	...	...	Slight disturbance. Preliminary phases obscured by wind effects. P probably at 9 h. 19 m. 9 s., S at 9 h. 23 m. 28 s.	19	1.6	5	1.7	5.5	1.6	6	1.9	6
		9	47		...	...	...	...	...		20	1.4	5.5	1.2	6	0.9	5.5	1.2	6
26		5	0	to	...	...	...	...	...	Prolonged slight disturbance, with no well-marked preliminary phases. Maximum (E.-W. instrument) at 5 h. 15 m. 47 s., with period 19 secs., amplitude 1.5 μ. Also long waves from 6 h. 4 m. to 6 h. 22 m.	21	1.0	6	0.8	5.5	0.9	5.5	0.7	5.5
		6	30		...	...	...	...	...		22	0.4	5.5	0.8	4.5	0.7	4.5	0.9	4.5
26	i	9	26	11	...	...	...	...	...		23	0.7	5	1.0	4.5	0.9	5	0.9	5
	L	9	28	55	18	...	...	...	...		24	1.2	5	1.1	5	1.0	5	1.2	4.5
	M	9	29	28	18	11	...	...	...		25	1.0	5	2.0	4.5	1.0	5.5	1.4	5
	F	9	45		...	...	...	...	...		26	1.0	6	1.1	4.5	0.9	5	1.0	4.5
26	L	14	5	to	...	...	...	...	...		27	0.9	5	0.9	5	0.9	5	0.9	5
		14	15		...	...	...	...	...		28	0.7	5.5	0.7	4.5	0.7	5	0.8	5
27		7	52	to	...	...	...	...	...	Slight disturbance.	29	0.6	4	0.8	5.5	0.9	4	0.7	5.5
		8	8		...	...	...	...	...		30	...	...	...	...	0.8	5.5	0.8	5
28	P	21	24	44	...	...	...	...	8000	Guatemala.	31	0.6	5	0.7	5	0.9	5	0.9	6
	S	21	34	4	...	...	...	...	...					
	L	21	49		...	...	...	...	...					
	M	21	57	34	19	...	...	...	...						
	M	21	58	5	18	...	17	...	...								
	F	24	0		...	...	...	...	...					
29	P	23	2	43	...	...	...	...	...	No record from horizontal instruments. Times are taken from vertical record.									
	S	23	12	39	...	...	...	...	...					
	M	23	37	30	21	...	...	...	...						
30	F	1	30		...	...	...	...	...					
30		16	41	to	...	...	...	...	...	Faint disturbance.									
		17	9		...	...	...	...	...					
31		16	38	to	...	...	...	...	...	Faint disturbance.									
		17	10		...	...	...	...	...					

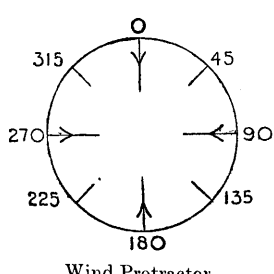
Means for Month { A_N = 1.7, T = 5.6. Normals, 1911-16 { A_N = 2.2, T = 5.8.

EARTHQUAKES :—RICHMOND (KEW OBSERVATORY).

Day.	Times, G.M.T. of		Remarks.
	Commencement.	Max. Phase.	
1	h m	h m	Very small.
	...	10 30	
4	...	9 36	Small.
21	18 3	18 28	Amplitude on trace 1.5 mm. Times approximate as time mark failed.
24	...	9 31	Small.
26	...	5 5	Very small; doubtful.
26	...	14 12	Very small.

10. SOUNDINGS WITH PILOT BALLOONS.

Day.	Station.	Time of Start, G.M.T.	Horizontal Velocity of Wind.																Cloud Observations.						
			Geostrophic.		By Anemometer.		At Heights above M.S.L.												Type.	From N.	m/s.				
			From N.	m/s.	From N.	m/s.	500 m.		1000 m.		2000 m.		3000 m.		4000 m.		5000 m.								
2	Cahirciveen	16 15	360	3	95	3'0	35	5'5	355	8'5	345	10'0	315	8'0	300	24'5	...	...	Ci., St.-Cu.	...	...		
3	"	10 35	150	10	125	6'5	150	11'0	190	12'0	250	8'0	...	...	...	...	...	...	A.-St., St., St.-Cu.	...	...		
3	S. Farnboro'	8 5	290	13	260	7'5	315	17'5	325	16'5	330	11'0	325	22'0	...	...	...	...	Ci.-Cu., St.	...	...		
4	"	12 5	170	9	130	5'0	160	5'0	240	6'0	310	2'5	320	8'5	...	...	...	...	...	...	...
5	"	7 55	200	14	120	5'5	170	11'0	170	12'5	200	7'0	220	7'0	195	9'0	...	...	St.-Cu., A.-St.	...	...		
6	"	7 50	230	8	—	5'0	250	9'0	270	7'0	285	5'0	290	10'0	350	9'0	355	7'0	Ci.	...	...		
7	Cahirciveen	16 15	270	11	255	8'0	275	12'0	270	15'0	265	19'5	270	18'5	...	...	...	...	Cu., St.	...	...		
8	S. Farnboro'	7 50	295	14	260	8'5	285	15'0	280	16'0	280	14'0	270	22'5	260	21'5	...	...	Ci.-Cu., Ci., St.	...	...		
9	Cahirciveen	15 55	360	14	360	3'7	...	...	355	9'0	345	13'0	340	25'0	...	...	...	...	Ci., Cu.-St.	...	...		
10	"	12 30	180	10	140	5'5	150	8'0	155	6'0	115	2'6	...	...	...	...	...	...	St.-Cu.	135	...
10	Eskdalemuir	10 35	—	0	—	0'0	165	3'4	170	3'3	30	2'9	15	14'0	...	...	...	...	Ci.	20	0'8
10	"	15 40	—	0	—	0'0	190	1'9	180	4'7	85	3'3	...	...	...	...	...	...	Ci.	...	...		
11	Cahirciveen	12 50	—	0	15	0'9	...	...	240	2'1	280	4'4	...	...	...	...	...	...	Cu.	...	...		
11	S. Farnboro'	15 25	50	13	10	4'5	30	8'0	15	6'5	5	8'5	360	10'0	10	10'0	360	4'5	St.	...	...		
12	"	10 45	320	2	295	3'5	345	8'0	15	4'5	25	5'5	330	5'5	...	...	...	...	St., Ci.	...	...		
15	"	7 50	310	11	270	8'0	310	15'0	325	17'0	325	20'0	330	28'0	...	...	...	...	Ci.	315	...
17	"	8 5	65	25	10	11'0	30	15'5	35	21'5	45	15'5	...	...	...	...	...	...	Ci., Ci.-St., A.-St., St.-Cu.	...	...		
18	"	12 20	50	11	20	—	60	10'5	55	11'0	65	16'5	...	...	...	...	...	...	Ci., Fr.-St.	...	...		
18	Cahirciveen	10 35	—	0	—	—	...	...	355	7'5	75	4'6	...	...	...	...	...	...	Ci., Ci.-Cu., St.-Cu., St., Cu.	...	...		
19	S. Farnboro'	8 0	80	55	—	—	65	3'5	60	2'5	270	4'0	260	5'5	270	6'5	225	8'5	...	...	...	
21	Eskdalemuir	12 25	45	5	20	0'9	45	6'0	65	9'0	15	6'0	335	6'0	325	2'8	335	1'3	Ci.-St.	...	...		
22	"	12 20	300	4	5	1'0	315	2'9	360	4'2	355	2'4	335	6'0	...	...	...	...	Ci., Ci.-St., Cu., Fr.-Cu.	349	...
22	Cahirciveen	12 50	90	5	100	3'0	84	3'4	67	5'0	90	1'8	50	2'0	62	3'4	73	4'9	A.-Cu., Ci.-Cu.	...	...		
25	S. Farnboro'	15 10	360	9	345	8'0	340	11'5	350	16'0	355	27'0	...	...	...	...	...	...	St.-Cu.	...	...		
26	"	8 30	5	14	355	7'0	5	16'0	20	16'0	15	17'5	...	...	...	...	...	...	Ci.	10	...
27	"	8 5	45	16	360	3'5	25	13'0	35	16'0	35	15'5	...	...	...	...	...	...	Cu., St.-Cu.	...	...		
28	Cahirciveen	12 15	45	8	—	—	50	8'0	50	16'0	35	7'5	25	13'5	35	11'0	40	22'0	Ci.-St., Cu.	45	...				
31	"	8 45	65	13	30	7'0	50	38'2	155	4'7	60	15'5	...	...	...	...	...	...	Cu.	45	...
11	S. Farnboro'	15 25	(For observations at lower levels, see above.)												15	8'5
19	"	8 0													260	7'0	
21	Eskdalemuir	12 25													340	0'3	275	2'8	355	3'2	360	5'5
22	Cahirciveen	12 50													35	3'7	125	1'8	80	7'0	45	12'5	...	55	24'0



Notes on Pressure Distribution.

December 2 18 h. High over Ireland and Bay of Biscay and low over Baltic.
 3 7 h. Anticyclone over British Isles, France, and Spain; low over Baltic.
 4 13 h. Anticyclone moving eastward; an Atlantic depression approaching Ireland and Scotland.
 5 7 h. High over Central Europe; low over Iceland region.
 6 7 h. Do., with the depression moving towards N. Scandinavia.
 7 18 h. High over the Continent; a shallow trough between Iceland and Scandinavia.
 8 7 h. High over Central Europe and Azores. Depression centered off N.W. of Norway.
 9 18 h. Depression over the Channel centered near Paris. High over Ireland and Scotland, and low over Scandinavia.
 10 7 h., 13 h., 18 h. Anticyclone covering British Isles.
 11 13 h., 18 h. Do.
 12 7 h. Do.
 15 7 h. High over Bay of Biscay and Ireland; low over Scandinavia; straight isobars.
 17 7 h. A deep depression centered near Bordeaux; high over Hebrides.
 18 7 h., 13 h.; 19, 7 h.; 21, 13 h.; 22, 13 h.; } Anticyclonic ridge across the British Isles.
 25, 18 h.; 26, 7 h.; 27, 7 h.; 28, 13 h.; 31, 7 h. }

Notes on Ascents.

S. Farnboro'.—6th, 7 h. 50 m. Ci. bands N.N.E.-S.S.W.; moderately thick low mist.
 Cahirciveen.—18th, 10 h. 35 m. A.-St., Cu. sheet developing.
 Eskdalemuir.—21st, 12 h. 25 m. Ci.-St. round horizon.
 Cahirciveen.—31st, 8 h. 45 m. Vertical currents make the velocities at lower levels unreliable.

11. NEPHOSCOPE OBSERVATIONS.

ABERDEEN. Taken at 13 h. (1 p.m.) G.M.T.

Day.	Type of Cloud.	Degrees from N.	Velocity—Height—Ratio.			Remarks.
			Milliradians per Second.	Components.		
				W.-E.	S.-N.	
			mr/s.	mr/s.	mr/s.	
1	{ Ci.	261	4.6	+ 4.6	+ 0.7	Ci. to Ci.-Cu. <i>Observation at 11 h.</i>
4	{ Fr.-Cu.	315	23.0	+ 16.0	- 16.0	Sheets of A.-Cu. (to Ci.-Cu. at edges). <i>Observation [at 12 h.]</i>
5	{ A.-Cu.	328	3.5	+ 1.9	- 3.0	
6	{ Fr.-St.	225	31.0	+ 22.0	+ 22.0	
8	{ St.-Cu.	245	3.6	+ 3.3	+ 1.5	
8	False Ci.	269	3.4	+ 3.4	+ 0.1	Sheets of fused lenticular St.-Cu. Sheets of false cirrus massing into thin St.-Cu.
11	Ci.	315	2.0	+ 1.4	- 1.4	Bands of probably "false" cirrus, rather patchy; radiant point about 315°.
13	St.-Cu.	278	7.0	+ 6.9	- 1.0	Thin high St.-Cu. <i>Observation at 12 h.</i>
14	St.-Cu.	283	4.6	+ 4.5	- 1.0	St.-Cu. very flat and only slightly undulated.
18	St.-Cu.	275	3.7	+ 3.7	- 0.3	Thin diffuse St.-Cu.
19	Ci.-Cu.	259	5.5	+ 5.4	+ 1.0	Long bands of Ci. to Ci.-Cu. inclined to lenticular form. Radiant point about 250°. <i>Observation at 12 h.</i>
21	St.-Cu.	344	2.6	+ 0.7	- 2.5	Ci.-Cu. of normal type.
22	Ci.-Cu.	307	3.0	+ 2.4	- 1.8	
24	{ Ci.	335	5.0	+ 2.1	- 4.5	Ci. very floccular, to indefinite Ci.-Cu., mixed with [thread type].
24	{ Fr.-St.	300	31.0	+ 27.0	- 15.0	
25	St.-Cu.	351	10.0	+ 1.6	- 9.9	Formed from apical parts of Cu.-Nb.
27	Ci.-Cu.	359	2.5	0.0	- 2.5	

12. AURORA.

Day.	a.m. or p.m.	Moon.	Magnetic Character.		Aurora Observations.	
			Eskdalemuir.	Richmond.	Station.	Remarks.
6	...	☾	Aberdeen	Glow type, faint, 18 h.-22 h.
7	p.	...	1, 2	0, 2		
8	p.	...	2, 1	2, 1		
14	p.	●	1, 1	1, 0	{ Baltasound (Shetlands) Haroldswick (Shetlands)	<p>The display of aurora which accompanied the magnetic storm of 16th December was of a noteworthy character, and was seen all over Scotland, in the North of England, and in the North of Ireland.</p> <p>At Aberdeen the aurora was of a comparatively stable character, with curtain arcs, from 16 h. 45 m. to 21 h., after which time the type altered, streamers appearing all over the sky, accompanied by a corona.</p> <p>At Fort Augustus the corona was in the zenith at 21 h. 5 m.</p> <p>The observer at Edinburgh reported that the aurora was first visible at 20 h. 15 m., and appeared as a complete narrow arc from E. to W., with upward streamers at either end, the whole being of a silvery colour. At 21 h. 10 m. a broad twisted stretch of drapery appeared below the E. end of the arc, and the colour changed rapidly from silver to green and yellow, and then to red. Towards 21 h. 30 m. a corona appeared, and the whole northern sky was illuminated with white streamers. At 22 h. only a few short detached streamers were visible just below the Great Bear. By 22 h. 30 m. all that remained was a faint auroral glow.</p> <p>The observer at Rothesay reported extra long streamers with waves of red and white light, the whole centering overhead and forming an immense corona. The red waves came mostly from N.W. and N.E.</p> <p>At Eskdalemuir it was first noticed at 20 h. 30 m., when it appeared as a glow to W.N.W. At 21 h. an arc extended from about N.W. to about N.E., with green streamers towards the zenith. At 21 h. 10 m. the arc had disappeared, but the whole northern half of the sky up to the zenith was glowing brightly. At 21 h. 15 m. the glow was less extensive, and by 21 h. 30 m. the principal illumination had shifted to the W. and W.S.W. A slight glow was still visible in the N.E. at 23 h.</p> <p>The most southerly station from which observations were reported was Seskin, near Waterford, where the aurora was "moderately bright" at 21 h. and "faint" at 22 h.</p> <p>"A very fine display of streamers" was seen between 2 h. 30 m. and 2 h. 45 m.</p>
16	p.	...	2, 2	2, 2	{ Haroldswick Aberdeen Fort-Augustus Edinburgh Rothesay Eskdalemuir Southport Seskin (Carrick-on-Suir)	
17	a.	...	2, 2	2, 2	Southport	
17	p.	...	2, 2	2, 2	Haroldswick	
19	p.	...	1, 1	1, 1	{ Baltasound Deerness	
21	...	☽	...	...
28	...	○	...	...

GEOPHYSICAL JOURNAL, 1917.

ANNUAL SUPPLEMENT.

Upper Air Temperatures.

(a) *Soundings with Registering Balloons.*

There are only three soundings to be recorded for the year 1917.

These ascents were from Benson, Oxfordshire (latitude $51^{\circ} 37' N.$, longitude $1^{\circ} 7' W.$, height above mean sea level 57 m.). The station is close to the river Thames and at the foot of the Chiltern Hills.

The heights reached in the last two ascents were better than any of those of the previous year.

(b) *Aeroplane Ascents: Temperatures recorded at Martlesham Heath.*

The observations utilised in preparing the Table on pp. 100 and 101 were made in aeroplanes by the Testing Squadron, R.F.C., stationed at Martlesham Heath, Ipswich, and were supplied to the Meteorological Office by the Controller of the Technical Department of the Air Ministry. Other sets of similar observations at other stations were received for the year 1917. This one has been selected as the most complete and homogeneous.

The data have been utilised already by Lieut. W. F. Stacey in the preparation of Professional Notes, No. 4, "Upper Air Temperatures at Martlesham Heath, February 1917 to January 1918." In that paper no corrections were applied to the altimeter readings either on account of zero error or air temperature. Such corrections have been made in preparing the present tables.* The observed temperatures were converted to the absolute scale and plotted against the correct heights in feet. Tempera-

* See M.O., 228—"The Estimation of Height from Readings of an Altimeter."

tures corresponding with steps of half a kilometre were then obtained by interpolation from a smooth curve through the plotted points.

The temperatures for the several ascents are set out on pp. 100 and 101. Mean values are tabulated below. All the temperatures have been given to the nearest half-degree. It may be noted that these means differ appreciably from those published by Stacey, but not sufficiently to affect his generalisations. The monthly mean surface temperatures for Martlesham Heath are not available. The mean temperatures ($\frac{1}{2}$ maximum + minimum) of Copdock, a neighbouring station, have been quoted for purposes of comparison. As might be expected, the aeroplane ascents being in the daytime, the temperature at the time of ascent was generally above the mean for the day at ground level. The "Yearly Averages" are the means of the values tabulated for the several months, no attention being paid to the number of observations in each month.

UPPER AIR TEMPERATURES AT MARTLESHAM HEATH—MONTHLY AVERAGES, 1917.

T = Temperature in Degrees Absolute above 200 a. N = Number of Observations.

1917.	SURFACE.		HEIGHT IN METRES ABOVE MEAN SEA LEVEL.											
	COP-DOCK.	MARTLESHAM.	500 m.	1000 m.	1500 m.	2000 m.	2500 m.	3000 m.	3500 m.	4000 m.	4500 m.	5000 m.	5500 m.	
			$\frac{1}{2}$ (Max. + Min.)	T.	N.	T. N.	T. N.	T. N.	T. N.	T. N.	T. N.	T. N.	T. N.	T. N.
January .	a 74·5	a 77·0	a 75·0	a 73·0	a 70·0	a 67·5	a 64·0	a 62·0	a 59·0	a 56·5	a 54·0	a 52·0	a 43·5	
February .	73·5	79·0	77·0	74·0	71·5	70·0	68·5	67·0	64·0	58·0	54·5	51·5	—	
March . .	76·0	78·0	75·5	72·0	69·0	66·5	64·0	61·5	58·5	57·0	56·0	60·5	—	
April . .	78·0	80·5	76·5	73·0	70·0	67·0	65·0	63·0	61·0	59·0	55·5	54·5	54·0	
May . .	86·5	88·5	86·0	84·0	81·0	78·5	75·5	73·5	70·5	67·0	64·0	60·0	57·5	
June . .	89·5	91·0	88·5	85·5	82·0	79·5	76·5	73·5	71·0	68·5	66·0	57·5	55·0	
July . .	89·5	91·5	89·0	86·0	83·0	80·5	78·5	75·5	73·0	70·0	67·0	64·5	60·5	
August .	89·5	92·0	88·5	85·0	81·5	78·5	75·0	73·0	70·5	67·5	65·0	63·5	59·5	
September	87·5	90·0	87·5	84·5	82·5	80·0	77·5	76·0	73·5	71·0	68·0	66·0	62·0	
October .	81·0	83·0	80·0	77·0	73·5	70·5	67·5	64·5	61·5	58·5	57·0	54·0	52·0	
November	80·5	80·5	78·5	76·0	74·0	71·5	69·0	66·5	64·0	61·0	59·0	54·5	—	
December .	74·5	77·0	75·0	72·5	69·5	67·0	64·5	62·0	60·0	57·0	54·5	55·5	—	
Yearly } Range. }	16·0	15·0	14·0	14·0	14·0	14·0	14·5	14·0	15·0	14·5	14·0	14·5	18·5	
Yearly } Average. }	81·5	84·0	81·5	78·5	75·5	73·0	70·5	68·0	65·5	62·5	60·0	58·0	55·5	

x and *n* mark respectively the maximum and minimum values in each column.

(a) Upper Air Temperatures.

SOUNDINGS WITH REGISTERING BALLOONS, BENSON, 1917.

No.	326.	327.	328.							
	Feb. 1.	Aug. 6.	Nov. 1.	HEIGHTS AND TEMPERATURES CORRESPONDING WITH ISOBARIC SURFACES.						
Start G.M.T.	16 h. 3 m.	18 h. 20 m.	13 h. 30 m.							
H _t =Greatest Height.	10·8 km.	16·0 km.	17·0 km.							
T _t =Corresponding Temp.	213° a.	223° a.	219° a.							
P _t =Corresponding Pressure	216 mb.	109 mb.	91 mb.							
Place of Fall	Nuthurst, Horsham	Steventon, Basingstoke	Smeeth, Kent							
Distance	81 km.	46 km.	155 km.							
Bearing	137°	190°	110°							
Geostrophic Wind—										
Time	18 h.	18 h.	13 h.							
Speed	8 m/s.	indefinite	8 m/s.							
Veer from N.	115°	„	205°							
Wind (Anemometer)—										
Speed	☉	☉	3 m/s.							
Veer from N.	...	...	112°							
Upper Wind (<i>vide Geophysical Journal</i>).	...	p. 63	...							
Tropopause Type	I.	II.	I.							
H _c =Height	9·6 km.	10·0 km.	11·3 km.							
P _c =Pressure	260 mb.	269 mb.	221 mb.							
T _c =Temp.	213° a.	224° a.	213° a.							
(P ₉) Pressure at 9 km.	286 mb.	313 mb.	315 mb.							
(P _s) Pressure at M.S.L.	1014 mb.	1013 mb.	1014 mb.							
(T _m) Mean Temp. 1 to 9 km.	241 a.	259 a.	261 a.							
				PRESSURES AND TEMPERATURES AT GIVEN HEIGHTS.						
				HEIGHTS.	P.	T.	P.	T.	P.	T.
				Kilometres.	mb.	a.	mb.	a.	mb.	a.
				17·0	—	—	—	—	91	219
				16·0	—	—	109	223	106	218
				15·0	—	—	126	223	124	217
				14·0	—	—	147	223	145	216
				13·0	—	—	171	223	169	216
				12·0	—	—	199	223	198	214
				11·0	—	—	232	225	233	217
				10·0	243	214	269	224	271	224
				9·0	286	215	313	231	315	233
				8·0	333	222	361	238	364	242
				7·0	387	227	416	244	418	248
				6·0	450	233	477	253	479	257
				5·0	520	242	545	260	546	263
				4·0	598	248	619	267	619	270
				3·0	686	253	704	273	704	276
				2·5	732	256	749	276	748	278
				2·0	783	259	797	280	796	281
				1·5	837	261	847	282	846	282
				1·0	893	266	900	285	898	282
				0·5	953	270	956	288	955	283
				G.L. 0·057	1007	273	1006	293	1007	285

NOTES.

326. Overcast, light E. wind. Well-marked cumulus in south at 12 h. 30 m.

Pressure Distribution. (18 h.)

Band of high pressure Scotland to Holland. "Low" N. of North Sea and over Spain.

327. Clear.

Pressure Distribution. (18 h.)

"Low" over Iceland; shallow "low" over England; high pressure to N.E. and S.W.

328. Misty. Light S.E. wind. Humidity 100 per cent.

Pressure Distribution. (13 h.)

"Low" centred near the Farøe; shallow secondary over Ireland; "High" over Spain and S. France. Barograph very irregular.

LAPSE RATE OF TEMPERATURE BETWEEN GIVEN HEIGHTS.

Degrees Absolute per kilometre.

Height Interval	326	327	328
16 to 17	—	—	° - 1
15 to 16	—	0	- 1
14 to 15	—	0	- 1
13 to 14	—	0	0
12 to 13	—	0	- 2
11 to 12	—	+ 2	+ 3
10 to 11	—	- 1	+ 7
9 to 10	+ 1	+ 7	+ 9
8 to 9	+ 7	+ 7	+ 9
7 to 8	+ 5	+ 6	+ 6
6 to 7	+ 6	+ 9	+ 9
5 to 6	+ 9	+ 7	+ 6
4 to 5	+ 6	+ 7	+ 7
3 to 4	+ 5	+ 6	+ 6
2·5 to 3	+ 6	+ 6	+ 4
2 to 2·5	+ 6	+ 8	+ 6
1·5 to 2	+ 4	+ 4	+ 2
1 to 1·5	+ 10	+ 6	0
·5 to 1	+ 8	+ 6	+ 2
G.L. ·057 to ·5	+ 7	+ 11	+ 5

The Water-Level Recorder at Kew Observatory, Richmond.

A description of this apparatus will be found in the Annual Supplement for 1914.

Regular observations commenced in July 1914. The values of the mean height— $\frac{1}{2}$ (maximum + minimum)—for each day have appeared in the monthly numbers of the Journal, along with the extreme values recorded during the month, and the dates on which these presented themselves. The general nature of the variation will be readily derived from the diagram, in which the graph A A shows the fluctuations in water level, whilst the integrated rainfall (*i.e.* the total fall up to any assigned date) is represented by the graph B B. The scale for rainfall is five times that for the height of the water in the well.

The response of water level to rainfall in the Thames Valley is striking. The heavy cyclonic rains of July 29 to August 1 gave a total fall of 91 mm.: the corresponding rise in water level was 550 mm., the summit being reached on August 9. On the other hand, the thunderstorm of June 16, with a fall of 43 mm. at Kew Observatory (120 mm., the record for London, at Kensington), came at the end of a drought and did not saturate the soil, and the water level was hardly affected.

The last two months of the year were comparatively dry, with a rainfall little more than half the normal, and the underground water remained at summer level until the middle of January 1918, when three or four days of snow introduced a rapid rise.

It may be noted that the well responds to variation in the height of the barometer and to the tides in the neighbouring river. The phenomena have been discussed* by E. G. Bilham. The effect of the alternation of spring and neap tides can be recognised in the diagram.

Notes on Seismological Work at Eskdalemuir Observatory during 1917.

Equipment.—The instrumental equipment consists principally of three Galitzin pendulums, recording galvanometrically the displacements in the direction of the three geographical co-ordinates, north, east, and vertical.

These instruments were restandardised in April 1916, and though no complete standardisation was carried out during 1917, various tests showed that the constants had not undergone any appreciable change since April 1917.

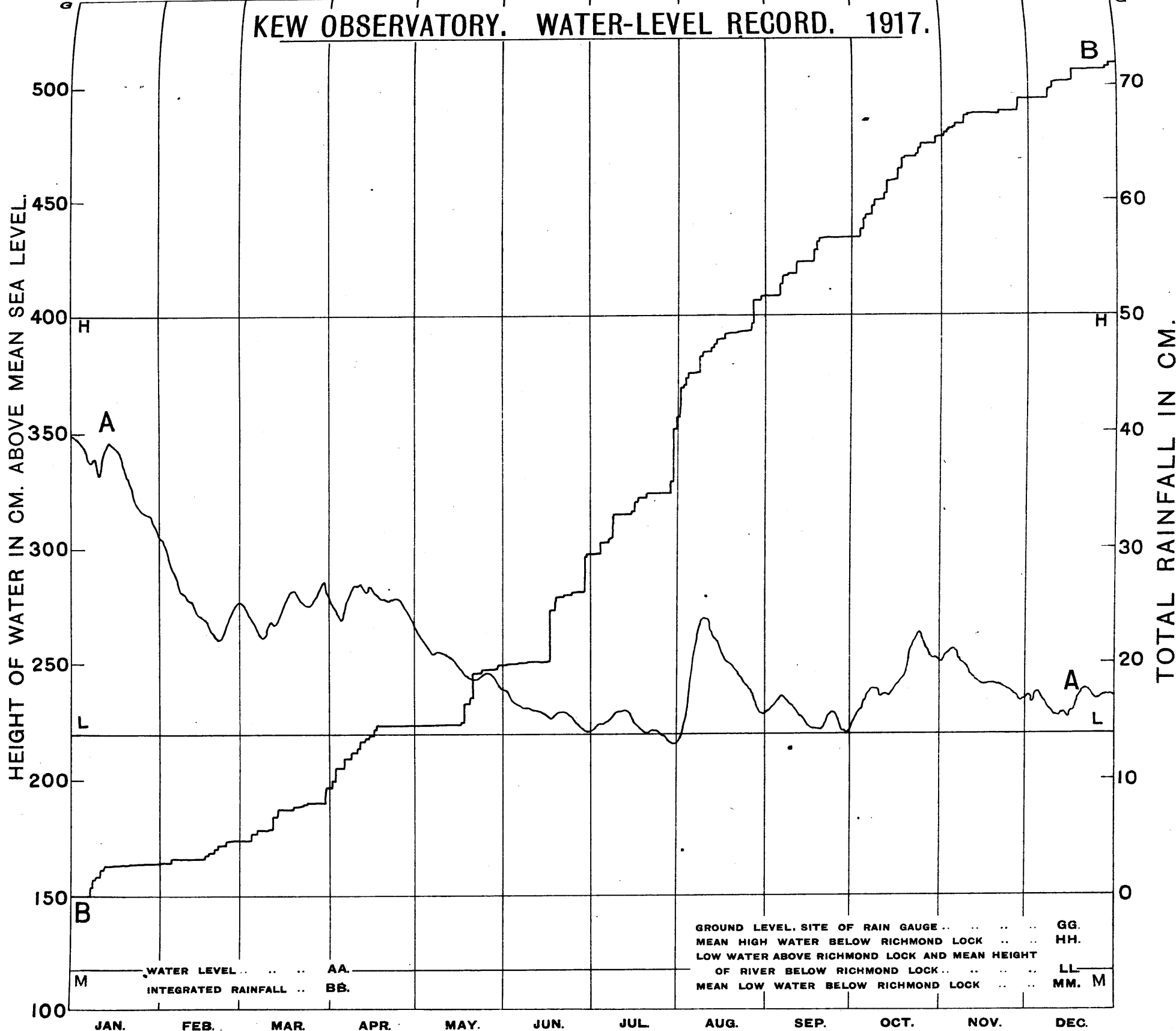
In addition to the above, there is also a Milne seismograph as modified by Mr. J. J. Shaw, an Omori instrument, and a Wiechert inverted pendulum. The first of these was in almost continuous use; the others were not in operation.

Earthquakes.—The number of disturbances recorded during the year was 178. In addition, a number occurred in which the displacement was very small and of which no particulars were published. Epicentral distances were determined in 47 cases.

Microseisms.—The amplitude and period of microseismic motions in the N.—S. direction was measured daily at 0 h., 6 h., 12 h., and 18 h., G.M.T. The mean value for each month of the year, together with the means for each month, based on the years 1911–16, are given in the following table. The amplitude (A) is expressed in terms of $\mu = .001$ mm.: the period (T) is given in seconds.

* *Roy. Soc. Proc.*, A94, 1918, p. 165; and *Q. J. R. Met. Soc.*, vol. xliv., 1918, p. 171.

KEW OBSERVATORY. WATER-LEVEL RECORD. 1917.



GROUND LEVEL, SITE OF RAIN GAUGE GG.
 MEAN HIGH WATER BELOW RICHMOND LOCK HH.
 LOW WATER ABOVE RICHMOND LOCK AND MEAN HEIGHT
 OF RIVER BELOW RICHMOND LOCK LL
 MEAN LOW WATER BELOW RICHMOND LOCK MM. M

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	1917.		Mean 1911-16.	
	A.	T.	A.	T.
January	1·8	5·7	2·6	6·2
February	1·1	5·8	2·5	6·0
March	1·7	6·0	1·8	5·6
April	1·0	5·2	1·3	5·5
May	0·4	4·5	0·7	4·9
June	0·4	4·6	0·4	4·5
July	0·1	3·9	0·3	4·5
August	0·5	4·4	0·4	4·5
September	1·0	5·1	0·7	4·9
October	2·0	5·6	1·2	5·3
November	1·8	5·8	1·8	5·8
December	1·7	5·6	2·2	5·8
Year	1·1	5·2	1·3	5·3

The microseismic activity was therefore, in amplitude and period, of normal character.

Reference was made in last year's *Annual Supplement* to the relation between the amplitude and period, and it was pointed out that it is not a linear one. A closer examination of the seven years' observations shows that while the increase of amplitude with period is slow up to a period of 4·6 seconds, it is faster for longer periods. The results for periods greater than 6 seconds are somewhat irregular. In this connection it is to be remembered that high accuracy in the measurement of microseisms is not possible with the present sensitiveness of the Galitzin seismographs and with the time scale now in use, viz. 30 mm. per minute.

The following table may be taken as giving the mean results of the seven years' measurements, when graphically represented by a curve, drawn *libera manu* :—

Period (seconds)	4·0	4·5	5·0	5·5	6·0
Amplitude (μ)	0·30	0·46	0·87	1·50	2·21

Table of Monthly Means of Electrical Data for Richmond, 1917.

The following table gives mean monthly values of positive and negative electrical charges in the atmosphere as observed with the Ebert apparatus at Richmond. A popular account of the method will be found in a recent paper on "Atmospheric Electricity," by C. D. Stewart.* For the number of days utilised each month reference may be made to the monthly tables, and for a comparison of the units used in corresponding tables elsewhere, to the Introduction. Mean values of potential gradient at Richmond will be printed in *Hourly Values*.

Charge per c.c. $\times 10^{16}$ at about 15 h.

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
Richmond + {	Coulomb. ·48	Coulomb. ·44	Coulomb. ·57	Coulomb. ·61	Coulomb. ·66	Coulomb. ·81	Coulomb. ·65	Coulomb. ·84	Coulomb. ·59 x	Coulomb. ·58	Coulomb. ·27 n	Coulomb. ·47	Coulomb. ·58
Richmond - {	·30	·31	·45	·36	·47	·64 x	·49	·61	·46	·34	·18 n	·32	·41

* *Q. J. R. Met. Soc.*, vol. xliii., 1917, p. 409.

Table of Monthly Means of Magnetic Data for Eskdalemuir.

The following table gives the mean monthly values of the daily maximum and minimum and of the corresponding daily range of the magnetic elements at Eskdalemuir Observatory. The corresponding data published for Kew Observatory in previous years are no longer available. It should be mentioned, however, that the magnetograms for "international quiet days" have been tabulated at that Observatory, and that a summary of the results will be printed in *Hourly Values*.

Month.	North Component.			West Component.			Vertical Component.		
	Max. 15000 γ +.	Min. 15000 γ +.	Range.	Max. 4000 γ +.	Min. 4000 γ +.	Range.	Max. 44000 γ +.	Min. 44000 γ +.	Range.
January . . .	γ 1013	γ 917 -	γ 96 +	γ 1027	γ 931	γ 96	γ 1155 +	γ 1093	γ 62 +
February . . .	1011	933	78	1030	946	84	1143	1099	44
March . . .	1007	930	77	1029	946	83	1096	1057	39
April . . .	1016	920	96	1018	938	80	1081	1037	44
May . . .	1035	938	97	1019	932	87	1109	1057	52
June . . .	1036	940	96	1022	926	96	1109	1063	46
July . . .	1041	938	103	1026	924	102	1108	1053	55
August . . .	x 1065	n 892 -	x 173 +	x 1034	n 889 -	x 145 +	1139 +	n 1015 -	x 124 +
September . . .	1016	927	89	1005	915	90	1123	1078	45
October . . .	1021	925	96	1000	906	94	1129	1076	53
November . . .	1005	939	n 66	983	921	n 62	1112	1084	n 28
December . . .	1011	925	86	987	899	88	1112 +	1058	54
Year . . .	1023	927 -	96 +	1015	923 -	92 +	1118 +	1064 -	54 +

As usual, x and n denote the highest and lowest of the monthly means in the table. The traces passed the limits of registration on six occasions; the value accepted for the maximum or minimum in such a case represents the upper or lower edge of the photographic sheet. Such values have been excluded in the calculation of the monthly means published each month, but are used in obtaining the figures entered in the table above. The mean values of the daily range for the months affected are thus under-estimated, but the differences from the true values are probably small.

The extreme values for the year and the corresponding annual ranges were as follows:—

	Maximum.	Minimum.	Range.
North Component . . .	? 16483 γ (August 14)	< 15630 γ (January 4)	> 853 γ
West " . . .	5232 γ (August 14)	4592 γ (December 16)	640 γ
Vertical " . . .	46381 γ (February 15)	< 45724 γ (August 9)	> 657 γ