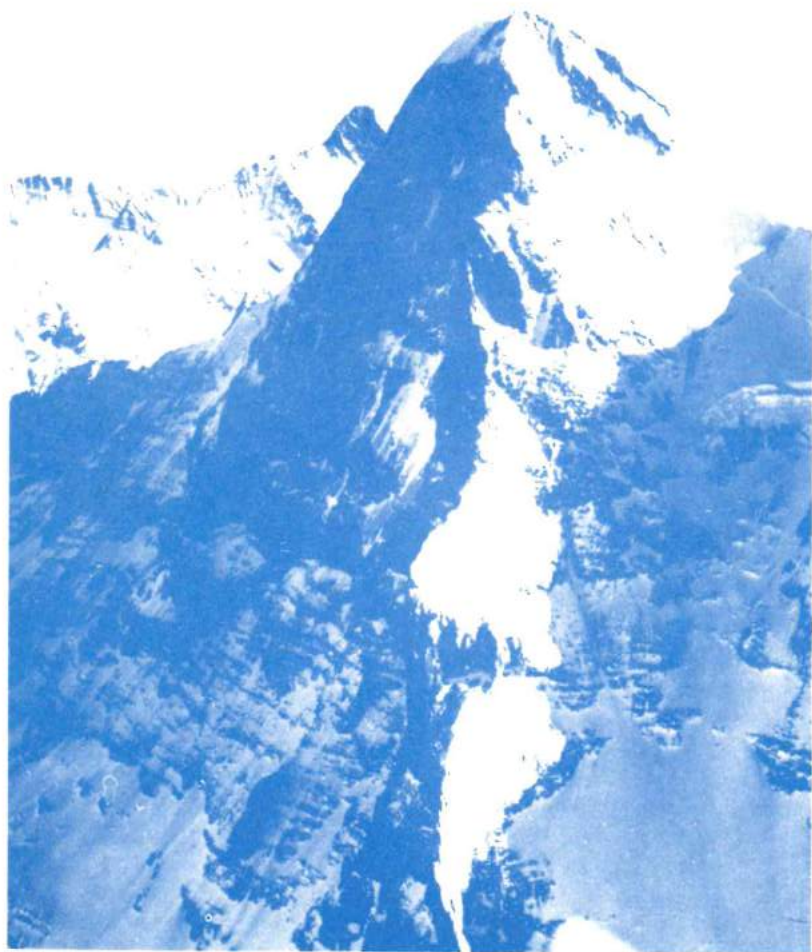


*The*  
*JOURNAL of METEOROLOGY*



*THE EIGER IN WINTER*

**Volume 11, number 109**

**May/June 1986**



# THE JOURNAL OF METEOROLOGY

## LE JOURNAL DE MÉTÉOROLOGIE

Published in association with  
The Tornado and Storm Research Organisation  
*a privately-supported research body, serving the national public interest*

Edited by Dr. G. T. Meaden, 54 Frome Road,  
Bradford-on-Avon, Wiltshire, BA15 1LD, England.  
Telephone: National, 02216.2482; international, +44.2216.2482

Research papers, letters, news items, conference information, and other communications on all aspects of meteorology and climatology are to be addressed to the Editor.

Contributions for publication should be typed, or neatly handwritten, with double spacing and 25 mm wide margins. In the case of typescripts, a duplicate copy would be appreciated. Every paper should commence with a short abstract summarising its significant and/or original content. Recent issues of the journal should be consulted as a guide to the layout of papers. Metric units are strongly recommended. Line drawings may be prepared up to 2 or 3 times oversize, but their quality should be good enough for direct reproduction. They should be drawn with a black pen on good-quality white paper, with lettering symbols large enough to be legible after reduction. Figure captions should be numbered and collected in sequence at the end of the paper. Each table should have a number and a short title, and be on a separate sheet at the end of the manuscript. In the text, references should be made by giving the author's name and year of publication, e.g. Manley (1976).

The usual language of the journal is English but a few contributions will be acceptable in French, Spanish, Italian and German. Correspondence with the Editor's office may be in any of these languages.

Responsibility for the opinions expressed in the signed articles rests with their respective authors, who should also obtain copyright permission where necessary. Please note that page charges may have to be imposed for some articles involving special artwork, complex equations, or numerous photographs or diagrams.

Kindly note that, for citation purposes, the recommended abbreviation for the title of this journal is *J. Meteorology, UK*.

Subscriptions for 1986, Volume 11, including surface post, U.K. £26.00; rest of world £28.00; including airmail £34.00. For personal subscriptions from individuals deduct £10.00 from each of these rates. Students and senior citizens £12.00 upon request.

Back issues are available for purchase either as complete volumes or singly. Volumes 1-6, £4.00 each; volumes 7-9, £8.00; volume 10, £12.00. Single issues, *pro rata*. These prices include postage and packing.

Published by The Artetechnical Publishing Co., 54 Frome Road, Bradford-on-Avon, Wiltshire, BA15 1LD.

Printed by The Dowland Press Ltd., Frome, Somerset.

© Artetechnical Publishing Company

ISSN 0307-5966

# JOURNAL OF METEOROLOGY

"An international journal for everyone interested in climate and weather, and in their influence on man."

Editor: Dr. G. T. Meaden

Vol. 11, no. 109, May/June 1986

## COLD SNAPS AND WARM SURGES AT BIRMINGHAM, 1900-1984

By M. G. HAMILTON

*Department of Geography, University of Birmingham, U.K.*

Cold snaps and warm surges are of particular interest to farmers and others who pursue activities outdoors. Also, cold snaps are of interest to fuel and power suppliers because they are related to a rapid increase in demand. In this discussion, four quantities are considered, namely:

1. The date of the first cold snap of autumn (Davis, 1976);
2. The date of the last cold snap of spring;
3. The date of the first warm surge of spring (Perry, 1973);
4. The date of the last warm surge of summer.

The date of the first cold snap of autumn is defined as the second day of a spell of two or more consecutive days on each of which the day maximum temperature fails to exceed 9.0°C (48°F). Using the same temperature threshold, the date of the last cold snap of spring is defined as the penultimate day of a spell of two or more consecutive days.

The date of the first warm surge of spring is defined as the second day of a spell of two or more consecutive days on each of which the day maximum temperature rises to at least 21.0°C (70°F). The same temperature threshold is used to define the last surge of summer as the penultimate day of a spell of two or more consecutive days.

### COLD SNAPS

Figure 1 gives the raw and smoothed series of dates of the first cold snap of autumn and the last cold snap of spring. The smoothing was effected with a five-point binomial filter. The date of the first autumn snap varies less from year to year than does the date of the last spring snap (see also Table 1). There is little evidence of trend towards later or earlier dates throughout these 85-year series. However, shorter term (c. 10 years) trends are evident, especially in the date of the last spring snap.

Table 2 gives the distribution of dates by pentad. For first autumn snaps the range covered is 12 pentads, from the last week of September to the last week of November. However, 80 percent of first autumn snaps occurred between 18th October - 11th November.

Many of the first autumn snaps occurred when cold air arrived rapidly from high latitudes. Usually, this happened when a depression tracked eastward across the North Sea south of 60°N. There is a notable correspondence between the peak frequency of snaps at pentad 23-27 October and the 'conspicuously' high



Figure 1

## DATES OF COLD SNAPS, 1900-1984

Top: First Autumn; Below: Last Spring

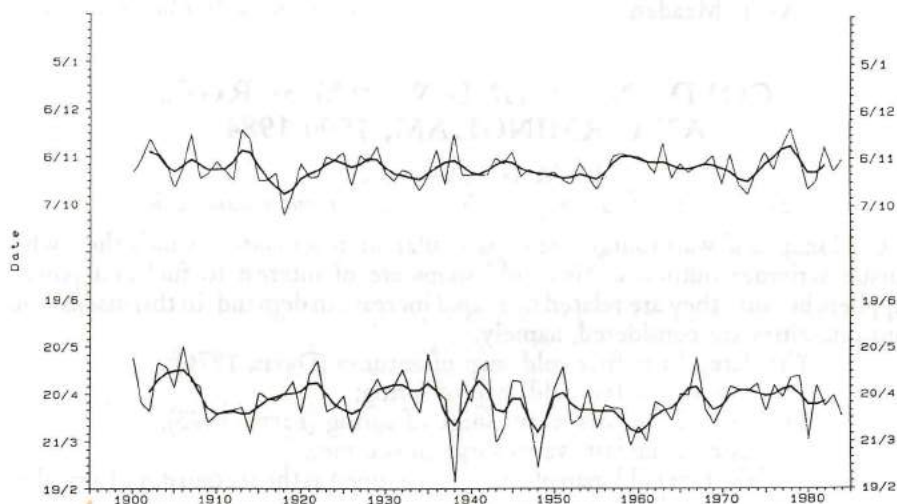


Table 1 Cold Snaps, 1900-1984

## Date of First Autumn Snap

Mean (1900-1979)	: 31st October
Median	: 29th October
Standard Deviation	: 10 days
Range	: 57 days
Earliest Date	: 30th September (1918)
Latest Date	: 26th November (1978)

## Date of Last Spring Snap

Mean (1900-1979)	: 17th April
Median	: 17th April
Standard Deviation	: 16 days
Range	: 86 days
Earliest Date	: 23rd February (1938)
Latest Date	: 20th May (1906)

## Period between Last Spring Snap and First Autumn Snap

Mean (1900-1979)	: 197 days
Shortest	: 162 days (1935)
Longest	: 271 days (1938)

frequencies of 'cyclonic' and 'northerly' circulation patterns (and a low frequency of 'anticyclonic' patterns) which were observed by Lamb (1972) to occur around 23-30 October.

The range for last spring snaps is much greater. 18 pentads, although 70 percent of the dates fell in April. This difference reflects a tendency for the spring rise in day maximum temperature to be slower than its normal autumnal fall. The circulation patterns accompanying last spring snaps varied more widely from year to year. There is a tendency for snaps to occur either when a depression is located over or just east of the United Kingdom or when a dominating anticyclone is located over or near Scotland. Lamb observed 'conspicuously' high frequencies of

Table 2: Frequency Distribution of Cold Snaps, 1900-1984

## First Autumn Snap

Dates	28/9	3/10	8/10	13/10	18/10	23/10	28/10	2/11	7/11	12/11	17/11	22/11
	to	to	to	to	to	to	to	to	to	to	to	to
	2/10	7/10	12/10	17/10	22/10	27/10	1/11	6/11	11/11	16/11	21/11	26/11
	1	0	0	6	9	22	11	13	13	4	4	2

## Last Spring Snap

Dates	17/3	22/3	27/3	1/4	6/4	11/4	16/4	21/4	26/4	1/5	6/5	11/5	16/5
	to	to	to	to	to	to	to	to	to	to	to	to	to
	21/3	26/3	31/3	5/4	10/4	15/4	20/4	25/4	30/4	5/5	10/5	15/5	20/5
	3	2	4	6	13	10	12	10	9	3	5	4	2

Note: Two last spring snaps occurred before 6/3.

north-westerly winds around 4-6 April and 'cyclonic' conditions around 25-27 April.

## WARM SURGES

The dates of first arrival and last departure of warm surges vary more widely than those of the cold snaps; standard deviations are almost twice as great (Table 3). Over the 85 years, there is no trend towards either later or earlier dates in the timing of the last summer surge (Fig.2). But some short-term (c.4 years) oscillation is indicated. The dates of first spring surges appear to undergo oscillations of longer period whereby early or late dates tend to occur in runs of several years. The relatively early arrival of warm surges during the 1940's is especially noteworthy. Figure 2 also shows that the interval between the first and last warm surge in a calendar year varies widely. In two years there was only one surge!

Table 4 gives the distribution of dates by pentad. For first spring surges, the range covered in 22 pentads, from early April to mid-July. The distribution is

Figure 2

## DATES OF WARM SURGES, 1900-1984

Top: Last Summer; Below: First Spring

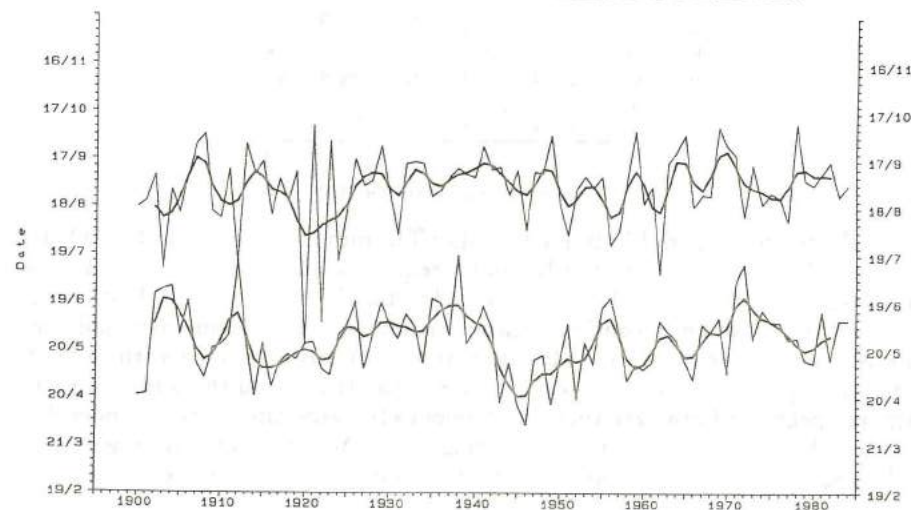




Table 3: Warm Surges, 1900-1984

<i>Date of First Spring Surge</i>	
Mean (1900-1979)	: 26th May
Median	: 27th May
Standard Deviation	: 22 days
Range	: 107 days
Earliest Date	: 3rd April (1946)
Latest Date	: 19th July (1938)
<i>Date of Last Summer Surge</i>	
Mean (1900-1979)	: 31st August
Median	: 5th September
Standard Deviation	: 25 days
Range	: 140 days
Earliest Date	: 24th May (1920)
Latest Date	: 11th October (1978)
<i>Period between First Spring Surge and Last Summer Surge</i>	
Mean (1900-1979)	: 97 days
Shortest	: 0 days (1912, 1920)
Longest	: 170 days (1949)

Table 4: Frequency Distribution of Warm Surges, 1900-1984

<i>First Spring Surge</i>								
Dates	16/4	21/4	26/4	1/5	6/5	11/5	16/5	21/5
to	to	to	to	to	to	to	to	to
20/4	25/4	30/4	5/5	10/5	15/5	20/5	25/5	
4	3	1	4	4	14	2	7	
26/5	31/5	5/6	10/6	15/6	20/6	25/6		
to	to	to	to	to	to	to		
30/5	4/6	9/6	14/6	19/6	24/6	29/6		
11	6	9	3	5	5	2		

Note: First spring surge occurred 16/4 in one year and after 29/6 in four other years.

<i>Last Summer Surge</i>								
Dates	25/7	30/7	4/8	9/8	14/8	19/8	24/8	29/8
to	to	to	to	to	to	to	to	to
29/7	3/8	8/8	13/8	18/8	23/8	28/8	2/9	
1	2	2	4	4	7	6	9	
3/9	8/9	13/9	18/9	23/9	28/9	3/10	8/10	
to	to	to	to	to	to	to	to	
7/9	12/9	17/9	22/9	27/9	2/10	7/10	12/10	
10	9	9	2	6	1	4	3	

Note: Six last summer surges occurred before 25/7.

bimodal with peaks in mid-May and late May. The minimum at pentad 16-20 May corresponds to the conspicuously high frequency of 'northerly' circulation patterns around 15-19 May that was reported by Lamb. Frequently, the first spring surge occurred when a southerly flow within the circulation of a ridge or anticyclone covered the Midlands. Circulation patterns associated with the last summer surge differed more widely; this is partly because of the wide range of dates (28 pentads). However, there is a tendency for later dates to occur under the same conditions that favour the first spring surge. Additionally, a conspicuously high frequency of 'anticyclonic' conditions around 13-19 September has been noted by Lamb.

## REFERENCES

- DAVIS, N. E. (1976): The first cold snap of autumn. *Meteorological Magazine*, 105, 306-324.  
 LAMB, H. H. (1972): British Isles weather types and a register of the daily sequence of circulation patterns 1861-1971. *Meteorological Office Geophysical Memoirs*, No.166, H.M.S.O.  
 PERRY, A. H. (1973): The first warm spell of early summer at Kew 1881-1972. *Weather*, 28, 516-520.

## MORE BALL-LIGHTNING EYE-WITNESS REPORTS

We reproduce here further extracts of eye-witness descriptions of ball-lightning, taken from letters written to Mike Rowe in response to his ever-continuing appeal in the provincial press.

BLca1949. *Castlepollard, Co. Westmeath, Ireland*

"About 1949 I attended the removal of remains of a lady shopkeeper in Castlepollard. At the time I worked for the E.S.B. and lodged in a house on the Finnea Road just outside the town. There was a severe thunderstorm raging, and everybody was very relieved to get inside the church. After the removal, on my way to the lodgings, I was walking on the Finnea Road. There was a field sloping up, gradually, from the road on my right. As far as I can remember the thunderstorm had passed. Then I clearly saw at a distance of about 40 feet (13 metres) a round glowing ball (slightly smaller than a soccer ball) which slowly rose from the ground to a height of about four feet and then shot very rapidly to the sky. That which impressed me most was the absolute glowing intensity of the orb, a light golden colour. As I looked at it, I felt the intensity but I cannot describe how."

BL1970/71Summer. *Northampton, England*

"I encountered ball lightning while I was in the army in 1970-71 in Northampton. I was in the Signals and working on the H.F. band at the time. The radio was in my Land Rover and I was working it from a hut. The radio had a sloping wire aerial. The high-tension wires of the electric national grid were about a mile away. A summer storm started and it blacked out the whole band. Normal lightning started very close to my location so I switched off my radio. I was looking out of my hut at the storm, so I could see the Land Rover and beyond that the grid. Around the grid towers I then saw the ball lightning. The balls, two or three, floated towards the wires and seemed to run up and down the wires. These yellowish-coloured balls finally all went towards one of the towers and disappeared. The storm got worse and I could feel the "static" in the air. Then I again saw more balls floating towards my hut as they got near the mast of my radio. They were about three inches across, tennis-ball size, and were a blueish colour. They ran down the aerial towards the Land Rover, and again disappeared." (From G. J. Bedford)

BL1979December3(probably) *Fleetwood, Lancashire, England (SD 3247)*

"I am writing to you in response to your letter which appeared in the *Fleetwood Chronicle* on 27th January 1984. The following occurrence took place some five years ago last November and I hope that you find it interesting, not least in that it happened indoors.

My house is an old one, built in 1847. It has high ceilings and two large cellars although the rooms themselves are quite small . . .



The front downstairs parlour where the event took place is a bay-windowed room about fourteen feet long by ten. It has a large chimney breast with a tiled open fireplace which contains an imitation-coal electric fire of the sealed element type. The room is carpeted and has a colour television sited against the inside wall opposite the window, and is furnished normally as would be expected. The chimney flue is sealed off with a piece of hardboard about six inches above the fireplace opening.

On the evening in question there was an intermittent thunderstorm with rain in heavy showers. My son Michael had just come in from college and gone into the room and was standing watching the T.V. The time would be a little before six p.m. I said something to the effect that his meal would be ready and he better wash his hands etc., so he turned the television off although it remained plugged in. We continued talking for a minute or so. The room was lit by a sixty-watt table lamp. At this point a spherical object about six inches in diameter floated down the (sealed) chimney and into the room. It appeared to be rather like a soap bubble but was a dull purple in colour covered or rather made up of a furry/spiky emission all over. The coating seemed to be about one inch thick with spikes two inches long here and there but changing all the time. It was quite dim and appeared to be semi-transparent in so much as I could see through to the *inside* of the opposite side which appeared quite smooth, all the spikes pointing outwards from its surface. It appeared to me to be insubstantial and made no sound.

It drifted between the two of us towards the television screen at about thirty inches from the floor, covering the six feet in about four seconds. When about eight inches from the screen it disappeared (imploded?) with a fairly loud crack/pop sound leaving behind a smell as of an electrical discharge.

Upon reflection it appears to me that the object could not have travelled down the chimney, so it must have formed at the bottom of the flue above the open fireplace, the carbon/soot of the inside of the flue acting as a conductor/wave guide for some kind of electrical charge from outside. The two of us standing in the room would be effectively insulated from earth standing on a carpeted, suspended wooden floor.

The nearest electrical earth would be via the chassis of the plugged-in television set, the fire being unplugged. I am certain however that the object did not touch the television before collapsing. Incidentally, the adjacent chimney to the next room had a coal fire in the hearth; being drier, it would probably have had different electrical characteristics."

(The date of this event may well be 3rd December 1979).

27 Kent Street, Fleetwood, Lancashire

JAMES HUNTINGTON

#### BEAD LIGHTNING 1951/53. *Lybster, Highland, Scotland (ND 2435)*

"... Another incident in which I had the (mis)fortune to be concerned was the experience of 'String of Pearls' lightning. The location was Lybster, near Wick (15 miles south of Wick), and I was working in a small direction-finding station which was situated about ¼ mile inland from the cliffs, and on top of a slight hill. The time was about 9.30 a.m., and there was a great increase in atmospheric noise in the earphones, so much so that I took them off. A few

minutes later a spark about six inches long arced from the aerial downtube to the earth equipment rack, at which time I decided I should vacate the building, which I did very smartly, running down the hill towards a small croft about 150 yards away. When I was about half way, a series of joined lights like a string of pearls was visible for a few seconds, followed by an atrocious thunderclap, and believe me, even though the 4 minute mile had not been achieved by then, I must have been near to it! When all the excitement had died down, two cows were found dead in the field about 50 yards from where I had been running; and on returning to the radio station, all the underground control cables which connected the station to an engine-house about 100 yards away had burnt out. Again, I can only say that this occurred some time between 1951 and 1953, but, as the station was out of action for a few days following the display of fireworks, you might find that the Civil Aviation Station at Wick has the old records . . ."

53 Wishart Avenue, Bonnyrigg, Midlothian.

JOHN B. TUKE

#### WORMY BALL LIGHTNING. 1920. *Parkside, Australia*

The last example to be cited in this issue is taken from the collection of William R. Corliss (*Science Frontiers*, No.33) whose address is the Sourcebook Project, P.O. Box 107, Glen Arm, MD 21057, U.S.A.). It is recommended that you should write for a list of Mr. Corliss' books and catalogues of natural anomalies of all kinds.

A loud noise was heard several hundred yards away. "It wasn't long till we heard a hissing noise and, looking up to the western sky, saw an object about 12 inches in diameter slowly moving through the air down towards us - about 12 feet away. It was travelling eastward and came down over Mrs. Harris's wooden fence landing on the cement porch floor about 3 feet behind us. It gracefully bounced along the cement floor in a straight path covering the 30 foot length of the verandah at a walking pace. It bounced three or four times rising to a height of 18 inches on each occasion. Each time the spherical ball touched the cement it was flattened at the point of contact, and deformed, but it quickly resumed its globular shape when it left the ground. It was not transparent but, rather, like a ball of smoke with glowing 'comma shaped' electrical 'worms' wriggling about - sizzling, hissing and flickering. It flattened by ¼ into the egg shape on each bounce. On reaching the far western end of our verandah it accelerated rapidly and rose a steep angle of about 45 degrees clearing the apricot tree, wires, and the house next door. At this stage my mother and I rushed in the back door of the house where we huddled for about 30 seconds before hearing a resounding crack some 250 yards away off to the east. It had hit Green's house at the far eastern end of Campbell Road. It apparently then bounced all the way to the Salvation Army home and demolished a whole house somewhere near Dawson and Florence Streets at Fullarton." The ball rotated slowly and emitted small sparks. (Illert, Theodore Charles; "The Parkside Lightning Ball", personal communication from C. Illert. To be published in "Speak No Evil: A Case Study of Lives and Times of German Settlers in South Australia", by C. Illert).



## QUINTUPLET CIRCLE FORMATION IN 1985

By G. T. MEADEN

*Tornado and Storm Research Organisation*

1985 was another year with several reported cases of quasi-circular, flattened areas in cereal-fields. All the examples known to us for 1985 occurred in southern England in fields on chalk downland in the period June to August. There were six sets of quintuplets and one singlet, basically similar to those of earlier years (see primary references in *J. Meteorology*, vol.9, no.89, 137-146, 1984, and vol.10, no.97, 73-80 1985). The author visited and photographed the circles at four of the sites, viz. Bratton, Cley Hill, Alresford, and Fonthill Bishop, and at Bratton and Cley Hill the circles were fully surveyed as well.

Brief notes are provided for the interest and guidance of readers. Further details will be given to serious investigators, including those with a theoretical or experimental interest in atmospheric vortex formation.

The research is continuing with renewed vigour this year. We hope there will be further cases to study, preferably within a few days of formation, not only in southern England but in other parts of the world too. It would consequently be appreciated if readers would telephone 02216 2482 with news of fresh circles, and would again supply press clippings wherever possible. Do always please be alert for circle sightings when travelling in the country, or when flying over cereal-fields in aeroplanes, helicopters, gliders, hang-gliders, or hot-air balloons.

**SET 1** Set of five circles at ST 842449 below Cley Hill (Wiltshire). Discovered by the author at 0930 BST on Monday 17th June, the circles having been formed since the author's last visit at 10.00 BST on 10th June. The circles lay to the west of Cley Hill on sloping ground, about 100m within the great wheat field. The centre of the principal circle was ex-centric. Four of its radii were 6m70, 6m63, 7m28 and 7m16 (in approximate directions N.E., S.E., S.W. and N.W.). Satellite diameters were about 3 metres. Some 13 metres separated the perimeter of the great circle from its satellites. The circles appeared to be several days old when found, because much of the green corn was standing partly upright again. This site was at a distance of some 250 metres N.W. of the quintuplet site of the previous year. The 1985 circles were very difficult to see, even from Cley Hill. No tracks led to them.

**SET 2.** Set of five circles at ST 902519 below Bratton Castle (the Iron Age hillfort) and close to the Westbury White Horse in Wiltshire. Discovered by the author at 10.00 BST on Monday 17th June, on ground sloping to the N.N.W. The circles were very easy to see from the main road. No tracks led to them. The circles appeared fresh, as though recently formed. A local farmer is said to have first seen the circles the previous day. A very full survey was carried out by L. J. A. Meaden and the author.

**SET 3.** Set of five circles at TQ 105082, Tolmare Farm, Findon, a few kilometres north of Worthing, Sussex. Found by Mr. Ken Johnson and Mr. Martin Moyer at 0550 BST on Saturday 29th June. Mr. Johnson reported that he observed a "hazy mist" rising up in a "series of fountains" from the central circle (BUFORA information from Mr. Paul Fuller).

**SET 4** Set of five circles at SU 543292, near Alresford, on the northern side of Gander Down, 8km east of Winchester (Hampshire). The circles were easily visible from the A31 road, the site being 2km N.E. of the well-known site at Cheesefoot Head. Date of first known sighting: Saturday, 6th July.

**SET 5** Set of five circles at ST 942338, between the A303 and Fonthill Bishop in the south-west of Wiltshire. The circles were on a field sloping to the north-west, close to a minor road and 600 metres from the busy A303. The farmer declared that such a happening had never occurred on his land before. About 16km to the S.S.W. lies the village of Charlton (Wiltshire) where circles, investigated by John Heighes and others, were reported in 1966 or 1967.

The Fonthill Bishop circles were discovered at 0700 BST on Saturday 20th July by Mr. David Carr, farm manager of the Fonthill Estate in which the field lies. It was said that the circles were not there at 0100 BST that same morning, but how this was known in the absence of a moon was not stated. It is perhaps more likely that the circles were formed late on Friday evening. The wind direction was approximately westerly.

**SET 6** Set of five circles at SU 346392, about 3km south of Goodworth Clatford, or 6km south of Andover (Hampshire). The circles, in a nearly flat field, were far from the nearest road; they were discovered from a helicopter by a passenger Mr. Fred Taylor on (it is believed) Saturday 3rd August.

About a week later an additional single circle was formed in the vicinity of the quintuplet set (BUFORA information from Mr. Paul Fuller).

It is certain that other circle sets occurred which never reached the attention of the general public. One such set was in a field at Charlton Woods, east of Winchester, 1985. Another was a quintuplet set just south of Warminster, Wiltshire, in 1984, on a farm, owned by a Mr. Osborne, where photographs were taken before the field was harvested in August (the main diameter was reported as 14 paces, and the satellite diameters as about 4 paces).

## CHRISTMAS 1985: THE FLOODS AND HIGH WINDS IN KENT

By M. J. OLIVER

*Pilgrims Way, Boughton Aluph, Ashford, Kent*

**Abstract:** The 1985 Christmas weather in Kent produced some of the wettest and windiest conditions since the January gales of 1978 which caused widespread damage and flooding. Wind gusts reached 63 knots (72.5 m.p.h.) and Jubilee Corner received 55.7mm of rain on 26th December. This article traces the weather from 24th December to 27th December, when the strong N.E. wind eased off, and rain was replaced by frost.

During December, vigorous Atlantic systems brought mild south-westerly air. Wet and windy weather crossed the country, and frequent incursions of this dreary weather combined to make south-east England very wet and often mild. However, by the 24th a change was in the offing, as the last in a long line of depressions crossed into western Ireland.



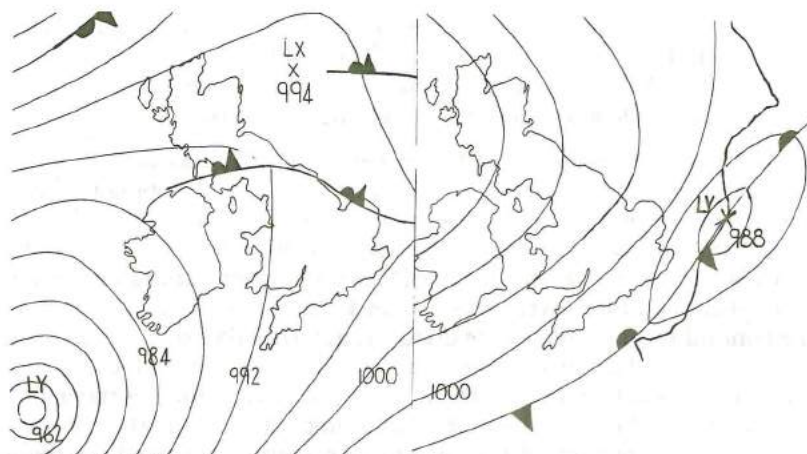


Fig.1 (a) and (b): Synoptic charts for midnight 24/25 December and for 1800 GMT 26 December 1985.

**24th December – Christmas Eve.** An occlusion moved north-east across the country, and a narrow band of rain associated with the front crossed southern counties through the day, clearing the extreme south-east by evening. The minimum daytime temperature of  $7.4^{\circ}\text{C}$  felt lower because the drizzle and rain with a S.-S.W. wind made the day feel cold. The synoptic situation for 2400 hrs is shown in Fig.1(a).

**25th December – Christmas Day.** By 0600 hrs on the 25th, a deep depression with a central pressure of 968mb was  $15^{\circ}$  west of Britain, pushing wet weather eastwards into south-west England. The area of low pressure continued to make progress into southern Britain, and by 2400 hrs its centre of 977mb lay over South Down.

South-eastern areas had received 16mm of rain by 2100 hrs, and the rain throughout the day only stopped for a total of 30 minutes. Once again, the rain was light, and often in the form fine drizzle. However, the total of 16mm of rain, on top of the previous few days' weather, caused the rivers to rise.



Fig.2 (a) and (b): The sea at Hythe, Kent, 26 December, and flooded gardens at Wye, Kent, 27 December 1985.

**26th December – Boxing Day.** The day began wet and windy, and the area of low pressure moved from South Devon to West Sussex by mid-day. At Hythe, the wind became fierce and the spray was terrific (Fig.2a). The wind was S.W. at mid-day, and the temperature  $7^{\circ}\text{C}$ . The worst of the weather then followed. The winds slowly veered to N.W., blowing strongly, and the temperature in Ashford fell to  $2^{\circ}\text{C}$  at 1452. By 1800 hrs, heavy rain was being driven by a gale-force wind, and Langdon Bay in Kent recorded a near-hurricane gust of 63 knots (72.5 m.p.h.). The area of low pressure continued along the Channel, and reached Holland with a centre of 988mb (see Fig.1b). The winds in Kent veered further to a strong N.E. gale and Margate recorded a 46 m.p.h. wind at 1800 hrs. By 2000 hrs, the winds at Margate were between 52 m.p.h. and 57.5 m.p.h. and at 2300 hrs the winds were between 34.5 and 45 m.p.h.

In a twelve-hour period between 0900 hrs and 2100 hrs, 39mm of rain had fallen. This was a remarkable fall because the rain was very fine and driven by near hurricane-force winds at times. The extent of the winds and rain became apparent the next day.

**27th December – The Outcome.** The storms of the previous night had caused severe damage in Kent. Many trees had been blown down, along with fences, garages, greenhouses and sheds. In the author's lane, a total of ten trees had fallen. One tree was bowled over by the wind and pushed 3 metres before collapsing on to a fence.

Flooding was extensive. The River Stour had not flooded so badly since January 1978, and Figure 2(b) illustrates gardens at Wye flooded by the overflowing Stour. These gardens are 30 metres away from the river, and have never before been known to flood like this. The river would normally not be visible at all in this photograph. In South Ashford, many homes near the river were severely flooded, the damage being estimated at £50,000.

## CONCLUSION

Over the Christmas period, Kent suffered high winds and rainfall from a deep depression, which then caused an outbreak of Maritime Arctic Air. Despite this severe weather, the damage that resulted was comparatively slight. It was one of the most miserable Christmas's in Kent for over 150 years, and occurred at a time when the winter storms were at their peak.

**Acknowledgements:** Many thanks to Bob Prichard of the L.W.C. for supplying much of the information from which the charts were drawn. Thanks also to J. C. Oliver for providing the diagrams and photographs, and to D. J. Stanier for helpful advice.

## TORNADOES AND HIGH WINDS KILL FIVE, 10 MARCH 1986

On Monday 10th March 1986 tornadoes and high winds raked Indiana, Kentucky and Ohio, killing 5 people and injuring 70. Dozens of light aeroplanes were destroyed at Cincinnati's airport, and a trailer park on the west side of Indianapolis was 'wiped out' (using the words of the *Daily Oklahoman*) although there were no injuries.



The bad weather was associated with a cold front moving rapidly eastwards across the Ohio Valley. The National Weather Service's Severe Storms Centre in Kansas City reported at least 21 tornadoes, of which 15 touched down in Indiana.

Tornado winds ripped through a 10- to 12-block section of Newport, Kentucky, causing heavy damage and many injuries. Streets had to be blocked off, and about 80 National Guard members were called in. In nearby Covington, which is also across the Ohio River from Cincinnati, a state of emergency was declared after high winds cut electricity power to most of the city and tore roofs from dozens of buildings (time about 1640). In Hancock County, Indiana, a man was crushed to death when the barn in which he and his brother were sheltering collapsed in the winds. Near Evansville, Indiana, a man died when struck by a falling tree-limb while working on a house. Another man was killed in Jasper Township, Ohio, and three other family members injured when a trailer was hit. In McLean County in western Kentucky a man using a chain to hold a barn roof down died when the roof blew off dragging him 25 metres. Another tornado skipped through Austin in southern Indiana injuring 15 people.

Close to Cincinnati's International Airport where over 50 planes were damaged beyond repair, 8-9 homes were damaged, and in nearby Falmouth 10 homes were said to be 'levelled'.

The foregoing information was supplied by Mr. Dana Mack, of Mustang, Oklahoma, who said that his region had had two tornado watches by 10th March this year. A tornado watch covers an area where atmospheric conditions are favourable for tornadoes and severe thunderstorms. A watch typically lasts six hours or so, and usually covers an area 200 to 300km long by 200 to 250km wide.).

#### *Tornadoes in south-east Texas, 5th February 1986*

From the March 1986 edition of the *American Weather Observer* (pp.5,13) we remark that 'the year's first significant tornado outbreak occurred as an upper level and surface storm system approached unseasonably warm, moist air in south-east Texas.' Four to five probable tornadoes were reported just north-west of Houston, primarily in the Tromball area, accompanied with golfball-sized hail and down-burst winds of 100 m.p.h. (60 m/s) in two areas.

### **RECORD RAIN IN SOUTH-EAST FLORIDA, 26-27 MARCH 1986**

The heavy rains which affected the south-east Florida coast during the night of Wednesday/Thursday 26th/27th March 1986 produced a number of new 24-hour rainfall records for March in some localities. Big totals included 263.4mm (10.37 inches) at Miramar, 242.3mm (9.54 inches) at Downtown Fort Lauderdale, 238.8mm (9.40 inches) at Hollywood (old record 179.6mm in 1965), 196.8mm (7.75 inches) at South Hollywood, 187.5mm (7.38 inches) at Miami Beach, and 186.9mm (7.36 inches) at Miami (old record 183.4mm in 1949). Local synoptic features are indicated in Figure 1.

Many long-standing March temperature records were broken too in various parts of the U.S.A. at about the same time of the month. One station in Nebraska

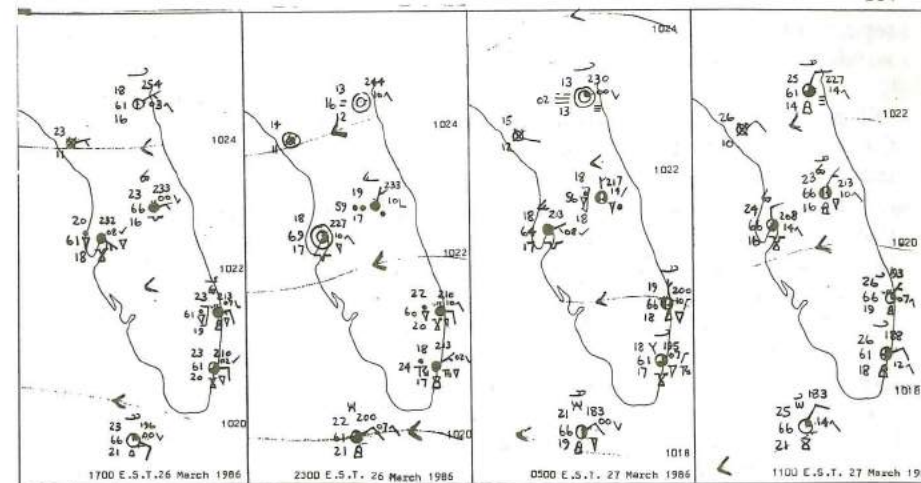


Fig.1: Synoptic charts for Florida on 26-27 March 1986.

even recorded a new March high of about 18.5°C (65°F) on 28th March while reporting 0.75 metre (30 inches) of snow on the ground!

The temperature of 31.5°C (89°F) at St. George, Utah, on 27th March was the highest ever recorded for the month of March; temperature measurements have been made there since 1892. The highs at Helena, 24°C (75°F) and Kalispell (both in Montana) were the highest ever reached so early in the season. At Phoenix a new March record of 36.5°C (98°F) was set. Also in Arizona a record of 38°C (100°F) was made at Yuma on 27th, the previous highest being 35°C (95°F) in 1894. The same day maxima were 33°C (91°F) in Los Angeles (downtown), 31°C (88°F) in Las Vegas (Nevada), and 24.5°C (76°F) in Denver (Colorado).

R. R. O'SULLIVAN

### **WORLD WEATHER DISASTERS: December 1985**

- 1: Gust of wind blew two youths 15 metres down side of Tryfan mountain, Snowdonia, Wales, leaving one dead, the other seriously injured. *Birmingham Evening Mail*.
- 1-3: Gale and snowstorm hit much of U.S.A.'s upper Mid-West area, along with Ontario province, Canada; worst of storm on the 2nd, drifts up to 2 metres deep reported in states of Michigan, Indiana, Ohio, north-western Pennsylvania and western New York State. Along Michigan's Lake Superior shore, 86cm of snow on ground at Houghton, with 75cm at Marquette and 50cm at Sault Ste Marie. The strong winds, gusting to 85 km/h, near Toledo, Ohio, pushed water out of Lake Erie's shallow western basin, dropping lake level by 1.2 metres for a time. At the eastern end of Lake Erie winds up to 93 km/h drove water ashore in waves up to 3.6 metres high, forcing evacuation of beach communities south of Buffalo, New York State, water levels reportedly exceeded anything seen in last 125 years. At least 19 indirect deaths, mainly in traffic accidents reported. In southern Ontario, Canada, heavy damage



reported to lakefront property at Port Colborne and Wainfleet, during fierce winds and snow. *Lloyds List*.

- 1-4: Torrential rains and floods in central Trinidad, several sugar-cane farming villages, including Warrenville, Caroni, Caparo and Piarco, flooded when river Caroni overflowed its banks, several homes washed away, no casualties reported. *L.L.*
- 1-5: Heavy rains and floods forced at least 5,000 people from homes in Pandeglang district, West Java, Indonesia, at least 2,000 hectares of farmland flooded in villages of Pagelaran and Bojong, no casualties reported. *Jakarta Post*.
- 1-5: Heavy rains and flash floods in Labuhan Batu, Asahan and Deli Serdang districts of northern Sumatra, Indonesia, many villages flooded, floods described as worst for 10 years, in Labuhan Batu rivers Kualuh and Bilah overflowed. In provincial capital of Medan 52mm of rain recorded, no casualties reported. *J.P.*
- 1-7: Torrential rains, floods and landslides in Venezuela, at least 38 deaths reported, over 15,000 people made homeless, rains described as worst in 25 years. *L.L.*
- 4 (reported): In last month snowstorms and avalanches on and around the Saichen glacier, Karakoram mountains, Kashmir, left at least 25 soldiers (15 Pakistanis and 10 Indian) dead. *D.T.*
- 10: Flash floods in Kuala Lumpur, Malaysia, after six hours of rain, floods up to 3 metres deep reported, forcing 2,500 people from homes; in one area the water level rose 1.35 metres in an hour, at least two houses destroyed, no casualties reported. *L.L.*
- 11: Yacht *Ti Punch III* ran aground on rocks near Povo de Varzim, Portugal, in thick fog and broke up leaving one dead, three others saved. *L.L.*
- 14: Offshore support vessel *Huicholl II* sank in heavy seas whipped up by very strong northerly wind in Gulf of Campeche, 58km north-east of Ciudad del Carmen, Mexico, leaving 33 dead. *L.L.*
- 16-22: Torrential rains and floods in Tabuk region of northern Saudi Arabia left 32 dead and 31 missing. *D.T.*
- 18: M.v. *Asuncion* sank in heavy seas whipped up by high winds 24km south-west of Calavite, Mindoro Island, Philippines, leaving 11 dead and up to 100 missing, at time of sinking waves up to 5.5 metres reported. *L.L.*
- 19: M.v. *Glenda* capsized in rough seas off Mindanao Island, Philippines, seven rescued, 20 others missing. *L.L.*
- 19 (reported): Water level in the Sea of Galilee, Israel, reported to be the lowest in 37 years, and the current rainy season has been the driest in 60 years. *International Herald Tribune*.
- 21-22: Torrential rains and floods in north-west England, the Lake District being the worst hit, many homes flooded, roads blocked by floods, in some areas surfaces washed away. In Carlisle the rivers Eden and Petteril burst their banks, livestock washed away, heavy rains, high winds in Midlands caused flooding in areas of Birmingham, a number of homes flooded. *B.E.M., Sunday Telegraph*.
- 24: Man washed overboard and lost in heavy seas from M.v. *Geestbay* in Atlantic. *D.T.*

- 26-30: Bad weather in many areas of the United Kingdom, the 26th/27th had heavy rains which brought widespread flooding to the West Country and London, hundreds of homes flooded in Avon, Somerset, Wiltshire and Gloucestershire along with at least 60 roads blocked by floods and landslips, many roads in London and in Thames Valley under water, London had 25mm of rain in 24 hours; later on the 27th, many roads in the West Country became like skating rinks as floods and surface water froze over as temperatures fell, many accidents reported; in south-east strong to gale force winds continued, breaking power lines and bringing down trees. Cold weather spread to most parts of country on the 28th with snow in many areas, one metre drifts reported in Northumberland, roads blocked by snow in north-east Scotland. Many accidents on icy roads in south-east areas, cold weather continued till the 30th, at least six indirect deaths, all in motor accidents on icy roads and on the 28th a fisherman died when his boat sank off Lyme Regis, Dorset, in bad weather. *D.T., B.E.M., Sunday Telegraph, Sunday Express*.
- 26-9 Jan: Cold wave, storms, snow, rain, avalanches in northern Indian states of Bihar, Uttar Pradesh, Jammu and Kashmir, left 225 dead, weather described as worst in area for 20 years. Most victims froze to death or were killed when their flimsy mud houses collapsed in the storms. In the Kashmir Valley temperatures fell below 0°C, freezing the Dal Lake for first time since 1963. Bihar reported 150 dead, Uttar Pradesh 30, and with 45 in Jammu and Kashmir, most of the latter 45 dead in avalanche. *L.L., D.T.*
- 27: M.v. *Kuniei Maru No.18* sank in rough weather, while anchored off Sodegaura, Hionshu, Japan, leaving two dead. *L.L.*
- 28: Helicopter crashed in snow and dense fog near Warsaw, Poland, leaving six dead. *L.L.*
- 28: Small plane crashed near Loakan Airport, Baguio City, Philippines, due to dense fog, 5 dead. *L.L.*
- 28-29: Floods along river Citarik, Bandung regency, West Java, Indonesia, left 2 dead and destroyed 11 houses in village of Dampit, 11 other houses damaged, three other villages also affected, with river bridges damaged. *J.P.*
- 28 (reported): Severe drought in southern Brazil, drought has so far lasted six months, state of emergency declared in Santa Catarina state, drought emergency declared in Sao Paulo state, with water rationing in city of Sao Paulo, losses reported to areas coffee crop. *I.H.T., D.T.*
- 29: A river ferry sank in rough weather in unreported location of Bangladesh, leaving 11 dead. *B.E.M.*
- 30: Two buses carrying soldiers skidded on snow-covered road and overturned in central Spain, leaving four dead, 40 others injured. *L.L.*
- 30: Whirlwind, followed by hail, hit villages of Balangga and Pulu in Dolo sub-district of central Sulawesi, Indonesia, leaving 310 people homeless, 26 homes destroyed in Balangga and 20 in Pulu, trees also uprooted, whirlwind lasted 20 minutes and was immediately followed by heavy hail which lasted five minutes, no casualties reported. *J.P.*

ALBERT J. THOMAS



## LITERATURE REVIEWS AND LISTINGS

### Book Reviews

**WEATHER AND CLIMATE OF THE ANTARCTIC.** By W. Schwerdtfeger, Elsevier 1984, Developments in Atmospheric Science 15, 261pp., US\$46.25.

Although this is not the most eloquently and clearly written book, the authority and detail with which the subject is treated make it essential reading for climatologists and meteorologists interested in Antarctica. It is the author's hope that the text will also prove useful to all "learned or learning natural scientists who are interested in the polar regions". Hence, there are in "several chapters some general remarks . . . not needed by professional meteorologists". Unfortunately, the author seems unclear about the level of explanation he should provide. On the one hand, he defines terms such as 'weather', 'climate', 'blocking anticyclone' and 'front', but equally he introduces without explanation words like 'boundary layer', 'isobaric surface', 'hodograph' and 'polynyas'. Occasionally, the situation is retrieved by defining a term later in the book. Thus, the word 'sastrugi' is mentioned on pp.21 and 38, though it is not defined until p.43. The solution to these inconsistencies would be a thorough rethink of the level of explanation required for a text of this sort. Virtually all the definitions thought necessary could then be included in a glossary near the end of the book, along with the existing appendices.

There are five main parts ('chapters') to the book. The first deals with "radiation and temperature conditions near the surface". This is followed by a discussion of surface winds, the length of which far exceeds that of other chapters, perhaps because in Antarctica "winds are decisive for outside working and living conditions". The next two chapters examine "atmospheric circulation and its disturbances" and "H<sub>2</sub>O, as gas, liquid and solid". Finally, there is a discussion of "selected problems of Antarctic climatology", which includes topics such as "the Antarctic ice mass budget" and "temperature fluctuations". The diagrams and text are well-produced, though very little use is made of photographs. As the author points out, the bibliography is incomplete, but its 350 or so items still represent a valuable aid for those wishing to pursue the subject further. One pleasing aspect is its mention of early work by people like Mawson, Shackleton, Amundsen and Simpson, for many observations of that time were very perceptive.

It is almost niggardly to point out omissions in such an important contribution to our knowledge of Antarctic weather and climate. Nevertheless, some will regret the author's decision not to include a full account of optical phenomena, particularly as these are a notable feature of Antarctic weather. Equally, it is a pity that there are few comments about the possible impact on Antarctica of the 'greenhouse effect'. Also useful would have been a section on the application of Antarctic weather knowledge (e.g. there is nothing about the interesting possibilities for iceberg utilisation). This type of section would have helped stimulate interest among natural scientists who are not professional meteorologists. As it stands, the book will probably achieve a more limited readership than its author would wish. Non-meteorologists may indeed find some sections hard going. This is principally because an authoritative knowledge is not always matched by clarity of communication.

L. T.

**NEW PERSPECTIVE IN CLIMATE MODELLING.** Ed. by A. L. Berger and C. Nicolis. Elsevier 1984, Developments in Atmospheric Science 16, 404pp., US\$57.75.

This volume contains the proceedings of a two-day symposium devoted to problems of climatic change held in Leeds in 1982 by the European Geophysical Society. The objective of the Editors has been to stress the need for a multi-disciplinary approach to climate modelling and the contents are divided into four parts dealing with data on climatic variations, global climate models, general circulation models and stochastic problems in climate dynamics.

The material on climatic variations is very patchy, stressing glaciological and deep sea sediment data. The chapters on modelling are better, but certainly not for the amateur. In none of the sections is any kind of overview or review of the field presented; and the reader is left with a series of contributions of varying length, some of which report modelling experiments, but only a few of which seem to be authoritative enough to be of great interest for years after they were first presented.

In short, a conference volume of very limited interest to all but those meteorologists inhabiting the modelling fraternity, and even for them, probably rather "deja vu" by now.

ALLEN PERRY

## LETTERS TO THE EDITOR

### DEEP DEPRESSION STOPS COAL PRODUCTION

The most rapid fall in atmospheric pressure for many years caused serious problems at several coal mines in the north of England on 24th March 1986.

During a period of 12 hours on 23rd/24th March the pressure fell from 1000mb to a minimum of 960mb as the centre of a vigorous depression crossed the region, roughly on a line from Chester to Doncaster.

As a result of the rapid fall in pressure, methane gas was emitted in large volumes from some of the mined-out areas. The emission of gas was so great at the Allerton Bywater Colliery that all underground operations were stopped until the afternoon of the 25th.

It was fortunate that the pressure fall occurred after the weekend break in mining operations, because otherwise the volumes of gas and the disruption to normal working could have been far more serious. Warnings of pressure falls had been received from the local meteorological office several hours before the steep fall of pressure began.

*Historical Note:* Before the introduction of electric lighting and explosion-proof machinery into coal mines, gas explosions were relatively frequent. The earlier *Transactions of the Institution of Mining Engineers* contain detailed information relating to atmospheric pressures, temperatures and numbers of fatalities at underground coal mines.

Riccall, York.

D. V. RANDON

### IRISH FARMERS BEMOAN HARSH SPRING

Most farmers in Eire have been bemoaning the harsh spring that 1986 has meted out to Ireland following the severe month-long frost of February which lowered soil temperatures so dramatically and burnt off the grass. March brought only a brief respite with a mild spell prior to 17th March when, for a week or so, soil temperatures came anywhere near to their normal levels for the time of year. But this interlude was short-lived and the wintry weather pre-Eastertide continued well into April in most places with air and soil temperatures plunging well below normal again. In early April soil temperatures were 2 degrees C. below normal in much of Eire; only in the south-west were temperatures high enough to encourage any grass growth (i.e. above 6°C). This slow growth has been another major



problem for hard-pressed farmers as it followed a bad summer in 1985 which led to poor-quality winter fodder and indeed a fodder shortage. For many farmers it is a case of trying to keep cattle going on supplementary feed such as dairy nuts and meal and to hope that the situation will improve after mid-April when the weather ought to get milder. Where I farm in the northern foothills of the Ballyhoura Hills at 300 metres or 640 feet above sea-level, I have never in my lifetime seen the countryside in mid-April so bare. It is a scene more reminiscent of February.

*Mount Russell, Ardpatrick, Kilmallock,  
County Limerick, Ireland.*

David MESKILL

### THE COLD OF FEBRUARY 1986

What a splendid February, ranking with 1947 and 1963 for sustained low temperatures. Here in the maritime climate of Humberside my overall mean temperature was slightly higher than in 1947, but almost the same as in 1963. My minimum mean was lower than both those years.

I had to cross the Lincolnshire Wolds on several occasions. The roads were well banked up with snow walls but the immense landscape of this famous wheat-growing area had a tundra-like appearance – just a white desert to the horizon, few trees, an occasional farmstead.

I had hoped once again to witness ice-floes in the Humber as in 1963. Surprisingly there were none; neither was the shore-line encased in ice as in that year. This suggests that inland temperatures in the valleys of the Trent, Ouse and other minor rivers feeding into the Humber were not as low as in 1963. The general ice-thickness last month must have been considerably less.

Yet the stout men of the Fens once again rejoiced in their skating championships in the Spalding area, their long racing-skates propelled by long strides, in the Dutch manner, ringing a joyful sound across the flooded fens. And it was good to read that the Dutch Eleven Towns event, the 200km ice race along canals which has been held only 13 times in the past 100 years, took place again in Friesland.

C. E. P. Brooks refers to the 1929 cold wave from Russia which is shown on a map of Western Europe with the dated progress from 9th–15th February 1929 – a similar situation to the one we have just experienced. It will be recalled that 1929 was another outstanding skating winter. There is something memorable and majestic about Polar outbursts sweeping into Western Europe.

#### REFERENCE

C. E. P. BROOKS (1954): *The English Climate*, pp.148–149.

*Wootton Hall, Thornton, Ulceby, South Humberside.*

P. C. SPINK

### ON THE FRINGES OF DERBYSHIRE'S SNOWFIELDS

In the lowland territory adjacent to the valleys of the River Trent and River Dove, February 1986 was chiefly cold and frosty with little snow on the ground. Only 25km further north, at altitudes exceeding about 200 metres, the scene was quite different with substantial snow depths and glazed frost.

I ventured into the Peak District on 8th February to survey the wintry scene. The main roads had been well cleared fortunately, and fresh snow had smoothed over any rough and broken snow pushed aside by the Council snowploughs to give a curious 'Christmas Card' appearance. Snow drifts deeper than 3 metres were evident alongside the A515 (Ashbourne-Buxton) road, and as one travelled northwards the landscape opened into a virtually uninterrupted wind-smoothed snowfield. Hedges and stone walls had all but disappeared beneath drifting snow. Trees had developed appearances resembling chandeliers, with twigs covered in glaze up to 25mm thick. Every now and again, the branches rustled and clanked as glaze broke off and fell to the ground. In fact, in some lanes where trees were overhanging the way, these lumps of ice could easily have fallen on vehicles and pedestrians. In the Buxton area, a level 38cm of snow was measured on 8th February, with drifts towering well above the writer's head in exposed places. Icicles, perhaps a metre or more in length, hung from many urban rooflines, again posing a danger in busy places. The local fire service attended to some of the more dangerous icicles in Buxton.

It was quite remarkable to drive through the snow boundary. Very little snow was to be seen in Ashbourne and along the A52 towards Derby. As for my two stations at Mickleover and Stretton, the greatest snow depth achieved during February was 2cm, and a 50% or greater snow cover sustained for just three days. Without the snow, temperatures were not of the exceptional order experienced in some other places. The lowest air temperature was  $-8.0^{\circ}\text{C}$ , but perhaps a more interesting statistic concerns daytime maxima. At no time was  $5^{\circ}\text{C}$  achieved between 24th January and 3rd March, and yet there was only one freezing day. Icing on local watercourses was confined to a little bank ice on village brooks.

*33 Pendlebury Drive, Mickleover, Derbyshire.*

D. J. STANIER

### Obituary

#### DR. DEREK J. SCHOVE

We regret to announce the death, in Paris at the beginning of April, of Dr. Derek J. Schove, principal of St. David's College, Beckenham, Kent. Derek was involved in research in several sciences, and made important research contributions in the fields of meteorology and astronomy particularly where historical or archival research was helpful as part of the investigation. His work on Pepys diaries, for example, in which every mention of the weather or allusions to the weather have been noted and extracted, is currently being published in the *Journal of Meteorology*. Derek joined the Royal Meteorological Society in 1939 and the Royal Astronomical Society in 1948. He has subscribed to the *Journal of Meteorology* since its first issue in 1975.

### Product News

#### COMPREHENSIVE FIBRE-OPTIC SPACE LINK

*Earthwatching* is a routine part of the curriculum for science and geography students at Ninestiles comprehensive school in Acocks Green, Birmingham. Signals from Russian, American and European weather and earth resource satellites are helping the students to study all aspects and applications of Remote Sensing including how climate affects worldwide crop production. Various antennae, including a "4-metre" dish aerial, have been installed by the school's physics department together with receiving equipment which outputs a 2.4Khz modulated audio sound wave. This is passed through a digital scan converter and produces a black-and-white video signal, or is recorded on a Fax' machine to give hard copy of the image.

The satellite station, with the receiving equipment, is operated by the Physics Department. This is some distance from the Geography Building where much of the satellite data are used so a 150m link has been installed to connect the two buildings. The work was complicated by the close proximity of high-voltage power cables which, had conventional copper cable been used, would have caused electromagnetic interference and degradation of the video signal. For this reason, a fibre-optic link and optical video transceiver module was obtained from Pilkington Fibre-optic Technologies of Rhyl who also assisted with the cable terminations.

The satellite station is the brainchild of Colin Hall, Head of Physics at Ninestiles comprehensive, who serves on the UK Co-ordinating Committee for Satellites in Education and the Remote Imaging Group (RIG) committee.

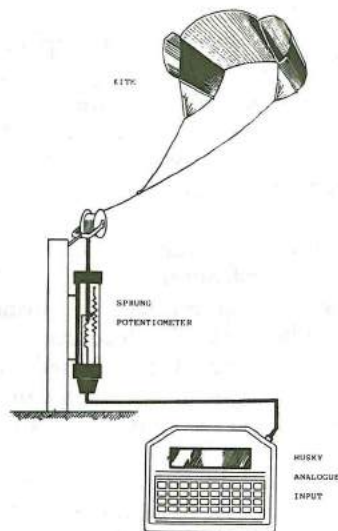
"Remote imagery from satellites has added a new dimension for the geographers. For example, during a large part of 1985 we received live pictures from space of the African continent clearly showing Ethiopia and adjoining countries to be devoid of cloud cover and experiencing drought", says Colin Hall. "My own students have been involved in calculating the orbital co-ordinates of satellites enabling them to set up the receiving equipment to obtain the best signals. We have been pleased with the fibre-optic link which provides the best possible interference-free pictures" he said. "In the near future we hope to upgrade to a 4-colour composite video system and the properties of the fibre-optic link will assist with this endeavour.

*Pilkington has agreed to offer fibre-optic data link kits to schools at a specially reduced price. For further information contact the Sales Office, Pilkington Fibre-optic Technologies Ltd., Kinnel Park, Bodelwyddan, Rhyl, Clwyd LL18 5TY.*



## RUGGED HAND-HELD COMPUTER AIDS KITE-FLYING EXPERIMENTS FOR WIND-GENERATION RESEARCH

Computer specialists often speak of 'flying a kite' when discussing a new application for computer technology, but scientists at the UK's Central Electricity Research Laboratories (CERL) have their feet firmly on the ground with their latest application for the Husky rugged hand-held computer. In a novel measuring technique, using a British-made Husky, a kite is used by CERL at Leatherhead to aid research into wind generation and air pollution from power stations. In the CERL experiments, the kite string is linked to a spring-balance/potentiometer arrangement on the ground which produces a signal proportional to the wind speed. The resulting signal from the potentiometer is connected directly into the analogue input of a Husky A/D hand-held computer which is programmed to take a reading every two seconds and produce a direct display of wind-speed average every two minutes.



The Husky's built-in real-time clock allows readings to be taken automatically, while the combination of Husky BASIC programming and the machine's large LCD display screen means that the operator receives easy-to-follow set-up instructions and displayed results. Provision is also built into the program for entering wind direction if required.

The CERL research programme, which uses a simple transparent plastic kite with two inflated polythene tubes to give rigidity, was set up to look at the possibilities of using windmills for wind power. The wind turbines being considered for power generation have a hub about 60 metres off the ground, which is the height at which the kite is flown. The same technique is also being used to measure the rate of pollution dispersal of smoke plumes from power-station chimneys. Experiments include pilot-balloon wind measurements, where

the Husky A/D is linked to a theodolite/potentiometer combination to record balloon tracks, as well as anemometer recording, where the Husky's parallel port is used to time rotations of a contact-closure anemometer for recording wind speed and turbulence.

Information is available from Husky Computers Limited, P.O. Box 135, 345 Foleshill Road, Coventry CV6 5RW.

## TORRO TORNADO REPORT: August 1985

Six tornadoes were reported in this very unsettled month. This is the highest total for August since 1971, when seven were reported.

FC1985August10. *Skegness, Lincolnshire (TF 5663)*

Mr. M. M. Robertson saw a funnel cloud just west of Skegness at about 1210 GMT. "It was well developed and in the next few minutes extended to about half way between the cloud and the ground". It faded away after being observed for about six or seven minutes. Thunderstorms were in the area, although there was no rain accompanying the funnel cloud.

The funnel cloud was also observed by Mr. Colin Pursglove, but he gave the date as 9th August (information from Mr. John Osborne). From synoptic charts either date seems possible, with perhaps 10th being slightly more probable. On both days a depression was centred to the west of Scotland on the surface and 500mb charts. At 1200 on 9th a cold front had just cleared the country; eastern districts were still dull and wet. On 10th skies were more broken.

TN1985August11/I. *Malvern, Hereford and Worcester (SO 7844)*

This T1 tornado picked up debris from the common at Malvern and tore branches from trees. At the Three Counties Showground (SO 7842) a number of tents were blown down, probably also by a tornado (*Worcester Evening News*, 12th August). A rather vigorous secondary depression was centred over Wales at 1200.

TN1985August11/II. *Stourport, Hereford and Worcester (SO 8171)*

A second tornado hit Stourport, damaging a greenhouse and lifting it 20 feet (six metres) into the air. Slates were torn off roofs. Force: T1 (*Evening News*). Stourport is in line with the two localities affected in Malvern, indicating a track from south to north.

TN1985August13. *Chirton, Wiltshire (SU 073564-075574)*

Mr. Denis Davies, of the Wiltshire Yeoman Inn, described to Dr. Meaden how the building was struck by a T2 tornado at about 0650, during a short period of heavy lashing rain. An unexpected lull made him look out of the south-facing window. In the distance he could see a tornado funnel filled with spiralling straw to a height of 400 to 500 feet (say, 150 metres). As it came over the bungalows opposite, the straw input ceased and Mr. Davies was aware of spiralling vapour to ground level. It hit the Wiltshire Yeoman with a roar like a train. Hundreds of tiles flew everywhere, besides terrace tables, chairs, buckets and other debris, some of it causing secondary damage. The tornado took tiles off two houses beyond the pub, and threw straw stooks around in the field behind them. An asbestos roof was torn off an outbuilding half a kilometre further on. There was no more rain or high



wind, and no thunder or lightning. Known path length was 1.2km; width (at the pub) 30 metres; path direction was from about 15° west of south. Mr. Peter Matthews, from Southampton, also investigated.

Britain was in a rather showery airstream ahead of an occlusion over the Irish Sea. Complex lows were centred to the west and north of Britain on the surface and 500mb charts.

TN1985August14/I. Tallington, Lincolnshire (TF 0908)

The Tallington tornado caused damage estimated at £4,000 to the roof of a factory and then passed through a caravan park, demolishing three sheds, damaging two caravans and throwing two passers-by off their feet. The tornado dissipated over a lake only 20 metres from two windsurfers. The whole incident lasted about 30 seconds, and was accompanied by hail. Force: T2 (*Rutland and South Lincs Classified*, 22nd August).

A low was centred over Eire, 991mb, at 1200. The tornado, which occurred during the afternoon, was either on or just behind an occlusion.

TN1985August14/II. Legbourne, Lincolnshire (TF 3684)

A T2 tornado occurred further north in the same county on the same day, at Legbourne, near Louth. The worst-affected part of the village was a small area of Mill Lane, where a tree was brought down and a caravan and scaffolding planks lifted. Only a few metres away a sun umbrella and a polythene greenhouse remained intact. The tornado was accompanied by "a dark cloud and a few spots of rain" (press cutting; newspaper uncertain).

Belgium and France also experienced tornadoes on 14th August, and a funnel cloud was observed in the Netherlands. Tornado damage occurred in association with very severe thunderstorms in the area around Lille and Ypres in north France and west Belgium. Roofs were ripped off buildings (probably indicating force T4) at Haillicourt, Houdain and Foufflin-Ricametz in France; in Belgium the roof of the Youth Stadium in Ypres was removed. Very serious damage was done to crops by hailstones up to the size of pigeons' eggs. In Belgium alone the total cost of the damage was expected to be tens of millions of francs. (*La Voix du Nord*, 16th August, sent by Jean Lecocq; *Het Volk*, 16th August, sent by Jean-Paul Goethuys). A funnel cloud was seen at Noordseschut in the Netherlands (*Weerspiegel*, 12, 601-606, 1985). These storms were on a cold front which was to the east of the occlusion with which the Lincolnshire tornadoes were associated.

TN1985August16. Annesley Woodhouse to Annesley, Notts. (SK 495537-518534)

The village of Annesley Woodhouse, near Mansfield, was struck by a T3 tornado about 1500 GMT, during a thunderstorm. Most of the damage was to a housing estate, where several houses lost tiles and ridge tiles; fencing panels were sucked up and a window frame and glass were sucked out. Part of the roof and part of the wall of a brick outbuilding collapsed. Two eye-witnesses described the tornado as resembling "a big, revolving saucer with a long tube extending down to the ground" and two inverted ice-cream cones on top of one another". The tornado, which had been moving from west to east, turned to the south-east and reached the village of Annesley, where it destroyed three garages, uprooted three saplings, damaged a fence and a pigeon loft and removed tiles from houses. A

Marina van was reported to have been lifted and deposited on the wing of a Ford Fiesta. A caravan was said to have been moved 200 metres. The length of the track was 2.4 kilometres, but the tornado lifted off the ground for about 25% of this distance. The track width was five to ten metres. (John E. Osborne, *J. Meteorology*, 10, 372-374, December 1985; Peter Matthews, *ibid.*, 375-376; *Nottingham Evening Post*, 17th August; *Chad*, 22nd August; *News of the World*, 18th August).

On 16th the depression which had been over Ireland on 14th had moved north-east to Scotland, 1005mb at 1200. The 500mb situation was very similar. The day was very showery.

M. W. ROWE and G. T. MEADEN

## TORRO THUNDERSTORM REPORT: August 1985

By KEITH O. MORTIMORE

Thunderstorm Division, Tornado and Storm Research Organisation,  
77 Dicketts Road, Corsham, Wiltshire

August was very unsettled throughout the month with westerly winds predominating. As a result of the distinct autumnal character of this late-summer month thunderstorm distribution was abnormal with fewer thunder-days over England and Wales but with an increase in storms of polar origin in the more vulnerable parts of northern and western Britain. Although there were more thunder-days in Scotland than in England, activity was always of an isolated nature and few stations reported more than one or two days. Over England, on the other hand, activity was almost without exception restricted to the eastern and south-eastern counties. East Anglia would appear to have been most frequently affected, with a number of stations reporting five or six days, but there was very little thunder at all in Wales and in the more northern and western counties of England apart from a few isolated reports of thunder during passing showers.

Thunder-days in August 1985 were as follows:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total	Ave.
England			X		X	X				X		X		X		X			X		X				X					X	11	17.0	
Wales			X							X	X													X	X						6	8.9	
Scotland		X			X					X		X	X	X		X			X						X				X	X	X	12	9.3
Ireland			X	X						X	X	X	X	X									X									8	7.8
Total		X	X		X	X				X	X	X	X	X		X			X		X		X	X					X	X	X	18	18.8
Netherlands	X		X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X			X	X					X	20	16
Belgium	X				X	X	X			X	X		X	X		X									X						X	11	

August began quietly with no thunder anywhere on 1st and only a single report of a thundery shower at Fraserburgh (Grampian) around midday on 2nd. After a sunny start showers developed widely on 3rd and many turned thundery in the afternoon. Thundery activity was mostly confined to eastern and southern England with only scattered reports of thunder in northern England and Northern Ireland. Showers and thunderstorms were frequently accompanied by hail but although very few reports mentioned hailstones larger than 5 or 6mm in diameter a number of observers remarked on the intensity of hail. A particularly severe



hailstorm at St. Cross in south Winchester (Hampshire) was described as 'furious', and a motorist spoke of a 'frightening' storm when driving through Compton (5km south-west of Winchester). He was forced to stop his car as hail accumulated 75mm deep on the ground and stripped leaves from trees. A car skidded on the water and ice on the Winchester by-pass and crashed into a tree. A local farmer had his crop of oil-seed rape written off by hailstones the size of marbles and about £100,000 worth of damage was inflicted to crops in and around Cookham (1.2km south of Maidenhead). Our observer at Crowmarsh Gifford (Oxfordshire) reported conical-shaped hailstones, opaque at pointed end and clear at rounded end up to 10mm in diameter. At Donaghadee on the coast of Co. Down (Northern Ireland) five strokes of lightning into the sea were noted in 12 minutes, and one struck amongst yachts in the Donaghadee Regatta just south-east of Copeland Island. At Welling (2km north-east of Sidcup, Kent) lightning struck the chimney of a block of flats. Debris fell into various rooms and a baby was covered in soot, although thankfully otherwise unhurt. With an unstable north-westerly airstream covering the country on 5th scattered thunderstorms broke out in central and eastern counties of England and locally in south-east Scotland but with the most concentrated developments over and to the east of the southern Pennines. A similar situation also existed on 6th when eastern England was again affected by scattered storms from the Thames to the Scottish border in the afternoon. A house was slightly damaged by lightning at Cleadon Village (South Shields), and in another incident at Louth (Lincolnshire) the roofs of adjacent houses were damaged by lightning. A pregnant mother who was struck by lightning at South Shields was knocked unconscious and her 18-month-old daughter was thrown from her push chair. The woman was left bleeding from a wound at the back of her head. A press cutting recently received at this office indicated a successful conclusion to the pregnancy when she gave birth to a healthy baby in January 1986. With a depression to the west of Scotland on 9th showers developed most widely in the west and north of the U.K. and there were scattered thunderstorms in places, mostly in western Scotland. There were also thundery showers in Dyfed (Wales) and in parts of Ireland. During the early hours of 10th an area of heavy rain and scattered thunderstorms moved east across southern counties of England followed in the afternoon by very isolated storms in Ireland and East Anglia. In early hours of 11th there was a storm at Galway (Eire). A very showery south-westerly airstream covered all parts on 12th and thunderstorms developed widely from late morning over much of England and Wales, but particularly in central and eastern areas. There were also storms in central and eastern parts of Eire and in Northern Ireland. Most thunderstorms were brief and had generally dispersed by early evening. At Annaghmore (Northern Ireland) there was a possible ball lightning observation. On 13th thundery showers were confined to eastern parts of central Scotland. Early on 14th an area of thunderstorms moved north from France into south-east England and continued to cross other parts of eastern England during the day ahead of an eastward moving cold front. There were also a few storms in north-west England and south-west Scotland. During a storm at Coningsby (Lincolnshire) there was a 61-kt wind gust but no major lightning incidents were reported anywhere.

A slow-moving, filling depression lying over Scotland induced showers to

develop widely on 16th with thunderstorms in eastern Scotland and central and eastern counties of England. At Louth (Lincolnshire) lightning struck St. James Church damaging electrical items and bringing down some masonry, and in the village of Scone (Perthshire) lightning badly damaged the roof of a house. In Nottinghamshire a tornado damaged property in the mining village of Annesley. A showery trough moved east across the country on 19th and thunderstorms were reported in Warwickshire, East Anglia, Lincolnshire and in the Grampian area of Scotland. An area of heavy rain crossed southern counties of England during the evening of 21st with thunder at Exeter (Devon), and on 24th thunder accompanied showers locally in south Wales and southern Eire. After overnight storms in the Cardiff area of south Wales showers again turned thundery on 25th in parts of south, south-east and north-east England and around Edinburgh in Scotland where the Scottish Professional Golf Championships were held up for 40 minutes. At Boxley Hill in Kent hailstones completely covered the ground for a time. On 29th, with high pressure over the North Sea, a warm front moved north into eastern Scotland during the evening giving some heavy and persistent rain in the Glasgow and Edinburgh areas and thunder near the North Sea coast. On 30th the Shetland Isles had a misty day with rain at times and local thunder in the evening, and on 31st there were scattered thunderstorms in the Western Isles of Scotland, on Merseyside and over the North Downs near Epsom.

*Acknowledgements.* The Directors would like to thank all TORRO observers who have contributed to the compiling of this monthly report. Sincere thanks are also offered to observers of the Thunderstorm Census Organisation, the Climatological Observers Link, and to the London Weather Centre for information published in the *Daily Weather Summary*.

## WORLD WEATHER REVIEW: November 1985

**United States.** *Temperature:* some very marked contrasts. Warm S.E. of a line from New Mexico through S.E. Oklahoma to L. Huron and S. Maine; +5 deg. from C. Alabama to coastal N. Carolina. Cold elsewhere; -5 deg. from N. Washington to Minnesota; -11 deg. in N. Montana. *Rainfall:* mainly wet; over 200% in S. California, W. Arizona, C. Nevada, C. and S.E. Idaho, N. Montana, E. Wyoming to S. Dakota; N. of N. Dakota, N. and C. Colorado, and from C. Texas to Wisconsin and W. New York then S.E. to Carolina. Dry in extreme N.W.; W. Montana; New Mexico and W. Texas to S.E. Nebraska; Louisiana to S. Tennessee; much of Florida. Under 50% in S.E. New Mexico, W. Texas, S.E. Louisiana to N.W. Alabama; locally in E. Florida.

**Canada and Arctic.** *Temperature:* warm in W. and N. Alaska, Baffin Island and adjacent Canadian mainland, W. Greenland; +3 deg. in W. Alaska; +4 deg. in S. Baffin Island. Cold in E. Alaska, most of Canada, E. and N. Greenland, Iceland, Spitzbergen, Franz Josef Land; -4 deg. in Ellesmere Island (N. Canada); -5 deg. W. of a line from S.E. Alaska to S.W. Ontario; -11 deg. in S. Canadian Rockies. *Rainfall:* wet in extreme S. Canada (except British Columbia and Nova Scotia), much of Alaska, Keewatin region to N. Quebec, Canadian Arctic Islands and most of Greenland. Over 200% in Alaska Peninsula, N. Quebec to Keewatin to W. Greenland. Dry elsewhere; under 50% from S.E. Alaska and S. Yukon to British Columbia; C. Saskatchewan to S.E. Quebec; E. Iceland.

**South and Central America.** *Temperature:* warm almost everywhere from C. Chile and C. Argentina to E. Bolivia and C. Brazil; E. and S. Mexico, Belize, N. Guatemala, Honduras; +3 deg. from N.E. Argentina to extreme S. Brazil; N.E. Mexico. Cold in W. Bolivia and W. Mexico (both locally -2 deg.). *Rainfall:* wet in C. and N.W. Argentina, S. Uruguay, N.W. Mexico. Over 200% widely in Buenos Aires province and N.W. Mexico; locally in S. Uruguay and N.W. Argentina. Dry in Chile, N.E. Argentina, N. Uruguay, Paraguay, most of Bolivia, S. Brazil and Mexico to Honduras. Under 50% in N.E. Argentina, most of Paraguay, E. Bolivia, extreme S. Brazil, most of Mexico to Honduras.



**Europe.** *Temperature:* warm only in S.E. European Russia and from S. Romania to Greece, S. Italy and extreme S. Spain; +1 deg. in E. Bulgaria and W. Greece. Cold elsewhere; -2 deg. from Faeroes and British Isles to Scandinavia, N. Ukraine, Czechoslovakia, N.W. Yugoslavia, N. Italy and Pyrenees; -4 deg. in S. Norway, C. Sweden, C. and S.W. Germany, C. France. *Rainfall:* wet in S. Finland, S.E. Sweden, most of European Russia and W. to Balkans, Austria, Italy and extreme E. France; parts of British Isles, especially Scotland; most of Iberian Peninsula. Over 200% in Kola Peninsula, C. Ukraine to S. Urals; locally in Czechoslovakia; E. Austria, W. Hungary, much of Yugoslavia, S. Romania, W. Bulgaria, N. Greece, C. Italy, S.E. and locally in N. Spain. Dry elsewhere; under 50% in S.W. Norway, Crimea, N. Italy, S.E. and C. France; locally in S.W. of British Isles. Provisional sunspot number 17.

**Africa.** *Temperature:* warm in whole area from which data received (N. of Sahara and in and around South Africa); +3 deg. in Algeria, N. Libya, W. Cape Province. *Rainfall:* wet in parts of N. Morocco and N. Algeria; most of Cape Province; E. Namibia, Natal, S. Mozambique. Over 200% locally in Morocco, Algeria and Mozambique; widely in Cape Province. Dry generally N. of Sahara; W. Cape Province, Botswana, Transvaal, Orange Free State; under 50% locally in last area and widely in the others.

**U.S.S.R.** *Temperature:* mostly warm; +7 deg. N. of Kamchatka and W. of Lena Basin. Cold in Ob Basin and European Russia (except S.E.); -3 deg. near N. Urals. *Rainfall:* wet from most of European Russia through S. Urals to L. Baikal; Yenisey Basin through Lena Basin to N.E. Siberia (except N.E. coast); extreme S.E. Over 200% in Kola Peninsula, C. Ukraine to S. Urals; N. of L. Baikal, W. Lena Basin, Bering Sea coast, extreme S.E. Dry elsewhere; under 50% in Crimea, S. Kazakhstan southwards, E. of N. Urals, S. of Barnaul, upper Amur Basin, round Okhotsk.

**Middle and Far East.** *Temperature:* warm from Turkey through Middle East to most of Pakistan and N.W. India; S.E. China, Mongolia, Japan, S.E. Asia, Philippines; +2 deg. from E. Turkey to N. Saudi Arabia and N. Iran. Cold in N.W. Pakistan, W. and E.C. India, most of China, Korea, extreme S. Japan, Burma; -1 deg. locally in all these areas. *Rainfall:* wet in Turkey, Syria, W. Saudi Arabia, extreme S.E. India, most of S.E. and locally in N.E. China; W. Korea, W. Japan, N.W. Thailand, N. Laos. Over 200% locally in all these areas, and more widely in W. Saudi Arabia. Dry in Israel, E. Saudi Arabia to India and Bangladesh; W. and much of N. China; Mongolia, Philippines, E. Korea, S. Japan, N.E. Thailand, C. Laos. Under 50% locally in Korea and Japan, widely elsewhere.

**Australia.** *Temperature:* cold in E. third, otherwise mostly +1 deg. *Rainfall:* wet in N.E. half (except round Brisbane); over 200% widely in Queensland and interior New South Wales; rather wet in far S.W.; elsewhere mostly under 50%.

M. W. ROWE

## WORLD WEATHER REVIEW: December 1985

**United States.** *Temperature:* warm only in S.W., from S. California to W. Colorado and W. New Mexico; +2 deg. locally. Cold elsewhere, especially in N.; -5 deg. from E. Oregon and E. Washington to W. Wyoming and from E. Dakotas to Indiana; -7 deg. from N.E. Iowa to S.W. Minnesota; -10 deg. in C. Idaho. *Rainfall:* wet from Wyoming and C. Colorado to C. Dakotas to L. Superior, L. Michigan and Missouri; in and near N.W. Florida; locally in E. Texas. Over 200% from C. Wyoming to W. Nebraska; S.E. part of N. Dakota; N.W. Michigan. Dry elsewhere; under 50% fairly general; under 25% in N. Montana, N. Washington, N. California, S.E. California to S.E. Utah; S.E. Arizona to W. Oklahoma and W. Texas; locally from C. Tennessee to Long Island.

**Canada and Arctic.** *Temperature:* warm or very warm in Alaska, N. Canada and most of Greenland; +11 deg. in S.W. Alaska; +9 deg. in Yukon; +8 deg. in S. Baffin Island. Cold in S. Canada; E. Greenland and Iceland to Franz Josef Land; -4 deg. from Winnipeg to W. Quebec; N. Iceland, Jan Mayen. *Rainfall:* wet in S. and N.W. Alaska; N.W. Quebec to Baffin Island; locally in E. Alberta, N. Manitoba, S.E. Ontario and Newfoundland. Over 200% in N.W. and S. coastal Alaska, Ungava Bay (N. Quebec), C. Baffin Island. Dry elsewhere; under 50% in interior Alaska; S. British Columbia and S.W. Alberta to Ellesmere Island, Greenland, S.W. Iceland, Jan Mayen and Franz Josef Land; N. Ontario, W. Quebec.

**South and Central America.** *Temperature:* warm in C. and N.E. Argentina, Uruguay, Paraguay, E. Bolivia, S. and C. Brazil, N.W. Mexico, most of Honduras; +2 deg. in C. Argentina, extreme N.E. Argentina to C. Brazil. Cold in N. and C. Chile and adjacent area of Argentina and Bolivia; S.W. of Buenos Aires; parts of E. Brazil; N.E. Mexico; -1 deg. locally in all these areas. *Rainfall:* wet from W.

Bolivia to near Bahia Blanca (Argentina), locally over 200%; locally in E. coastal Mexico. Dry in N. and C. Chile and adjacent parts of Argentina; E. Bolivia to extreme N.E. Argentina, E. Uruguay and most of S. Brazil; S.W. of Buenos Aires; most of Mexico to Honduras; under 50% widely in all these areas.

**Europe.** *Temperature:* warm in most areas; +2 deg. in S.E. European Russia and from S. England and N. France to E. Poland, E. Romania, N.W. Bulgaria and N. Italy; +4 deg. near Dresden (E. Germany), W. Czechoslovakia, S. Hungary, N. Yugoslavia. Cold from Norway and Sweden to N. Urals; -5 deg. from E. Norway to N. Urals; -11 deg. W. of White Sea. *Rainfall:* wet in most of British Isles; Faeroes, Scandinavia (except N. Sweden and N. Finland), European Russia (except S.W. Ukraine), N.W. Romania, Poland, C. Czechoslovakia, most of Germany; Low Countries, W. Spain, N. Portugal. Over 200% in N.W. Scotland, C. Urals to Estonia; N. Denmark, W. Ukraine, near Warsaw, near Vigo (N.W. Spain). Dry elsewhere; under 50% from S.W. Ukraine to E. Yugoslavia and Greece; C. and S. Italy, C. Switzerland, N. Hungary, near Frankfurt and Paris, W. Pyrenees, S.E. and E. coastal Spain, Corsica, Sardinia, Balearics. Under 10% in S.W. Bulgaria and S. Italy. Provisional sunspot number: 7.

**Africa.** *Temperature:* warm generally N. of Sahara; S.W. Namibia, +2 deg. in N.E. Algeria. Cold in S.E. Namibia and most of South Africa; -2 deg. in N. Cape Province. *Rainfall:* over 200% in N.W. Algeria and S.E. Tunisia, otherwise mainly dry from Morocco to Tunisia; wet in most of South Africa and S. Namibia; over 200% from S. Namibia to S.W. Orange Free State. Dry (locally under 50%) in C. Namibia, S.W. and E. Botswana, N.E. Natal to S. Mozambique.

**U.S.S.R.** *Temperature:* warm from S. European Russia to Kazakhstan and upper Ob Basin; Lena Basin eastwards; +4 deg. in C. Kazakhstan; +7 deg. N. of Sea of Okhotsk. Cold elsewhere; -3 deg. N. of L. Baikal; -10 deg. in Kola Peninsula. *Rainfall:* wet in European Russia (except S.W. Ukraine), Ob Basin, W. Kazakhstan to Afghan border; N.E. Siberia; L. Baikal to upper Amur Basin; Sakhalin. Over 200% from Estonia to upper Ob Basin; E. Caspian Sea, N.E. Siberia. Dry elsewhere; under 50% in extreme S.W. Ukraine, W. Caucasus, Taimyr Peninsula to Olenek area; Kamchatka to C. Amur Basin.

**Middle and Far East.** *Temperature:* warm in Turkey, India, Bangladesh, W. China, much of Mongolia, S. Philippines; +2 deg. in N.C. India, S. Bangladesh, N.W. China. Cold from Iraq to Saudi Arabia; Pakistan, Assam, C. and N.E. China, Korea, Japan (except Tokyo area); -2 deg. in E. and N.E. China, much of Korea, S.E. Asia and N. Philippines near normal. *Rainfall:* wet in N. Saudi Arabia, N. Pakistan, extreme N. and part of E. India, upper Yangtze Basin (China), extreme N.E. China, W. Korea, extreme N.W. Japan, S. Thailand, Malaysia. Over 200% locally in N.E. China and W. Korea and more widely in the other areas (except perhaps last three). Dry from Turkey to Persian Gulf; S. Pakistan, most of India; Bangladesh, Burma, most of China and Japan; E. Korea, N. Thailand, Philippines. Under 50% locally in E. Korea and widely in the other areas.

**Australia.** *Temperature:* warm in N. and N.E.; +2 deg. from Darwin to Alice Springs. Cold in W. and S.; -2 deg. in Perth area and interior New South Wales. *Rainfall:* wet from Adelaide to S.E. Queensland and in N.W. round Eighty Mile Beach; also far S.W.; over 200% from S. Victoria to N. New South Wales. Dry elsewhere; under 50% from S.W. (except far S.W.) to L. Eyre to N.E. Queensland.

M. W. ROWE

## WORLD WEATHER REVIEW: January 1986

**United States.** *Temperature:* mostly warm; +5 deg. from N. Oklahoma to W. Minnesota and N. Montana; also C. Nevada and S. California; +11 deg. in N. Montana. Cold only in S.E. from Florida to S. Louisiana and S. Virginia; -2 deg. in N.E. Florida and parts of Carolina. *Rainfall:* an extremely dry month, wet only in N.E. states, Florida, S.W. Texas, N.W. Michigan, W. Minnesota, E. Oregon, much of Washington and a few other isolated patches. Over 200% from N.E. New York to N.W. Maine; E. Florida; locally in E. Oregon and S.W. Texas. Dry elsewhere; under 25% in a vast area from S.E. California and C. Nevada to C. Illinois and W. Carolinas; much of this area below the 1931-60 extreme; rainless from S. Nebraska to N. Texas.

**Canada and Arctic.** *Rainfall:* warm in nearly all Alaska, most of Canada and Greenland, Franz Josef Land; +5 deg. in W. Greenland and from S.E. Alaska through Canadian Rockies to Winnipeg; +10 deg. in S. Alberta. Cold from Spitzbergen and N.E. Greenland to Canadian Arctic islands and adjacent mainland; extreme W. coastal Alaska, E. Ontario and S. Quebec; -5 deg. in N.E. Greenland; -4 deg. locally in Canadian Arctic islands. Iceland near normal. *Rainfall:* wet on W. coast of Canada and from



Great Bear and Great Slave Lakes to Baffin Island, Quebec and most of Maritime Provinces; S.E. Greenland, Iceland. Over 200% on Canadian W. coast, parts of Quebec. Dry elsewhere; under 50% in interior Alaska, S. Alberta, S.W. Saskatchewan, Winnipeg, from N. Canadian Arctic islands to extreme N. Greenland, Spitzbergen and Franz Josef Land.

**South and Central America.** *Temperature:* warm in N. Chile, N. and C. Argentina (except N. of Bahia Blanca), Paraguay, Uruguay, S. Brazil, N.W. and extreme N.E. Mexico; +3 deg. in extreme S. Brazil; +4 deg. in N.W. Mexico. Cold in C. and extreme N. Chile; interior and S. Mexico to Honduras; -2 deg. locally in C. Chile and near Mexico City. *Rainfall:* wet in C. and extreme N.W. Argentina and E. Uruguay; over 200% widely in C. Argentina. Dry in N. and C. Chile, much of N. Argentina, W. Uruguay, Paraguay, Bolivia, most of S. Brazil, almost all of Mexico to Honduras. Under 50% in all these areas, especially Chile, Paraguay, Bolivia and Mexico to El Salvador.

**Europe.** *Temperature:* mostly warm; +4 deg. in S.E. European Russia; +2 deg. as far W. as C. Poland, C. Hungary, E. Yugoslavia; locally in S. Germany. Cold in S.W. Spain, parts of Portugal; N. Ireland and Scotland through Scandinavia to N. Urals; -3 deg. from S.W. Norway to White Sea; -6 deg. in N. Sweden. *Rainfall:* generally wet; over 200% in Kola Peninsula; N.E. Poland and Baltic Republics to S. Urals and S.E. Ukraine; W. Bulgaria, S.E. Yugoslavia, E. Hungary, S. and W. Czechoslovakia, C. Austria, parts of W. and S. Germany through Switzerland to S.E. and S.W. France; W. and N.E. Italy, Corsica, C. Belgium, parts of N. Spain. Dry in Norway and N. Sweden, N. Urals, S.W. Ukraine, C. and N.E. Romania, N. and C. Greece, E. Italy, Portugal, most of Spain. Under 50% in N. Norway, S.W. Ukraine, C. and N.E. Romania, E. Greece, E. Italy, much of Portugal and Spain. Provisional sunspot number: 2.

**Africa.** *Temperature:* warm from E. Algeria to Egypt; Canary Islands; most of South Africa and neighbouring parts of Namibia and Botswana; +2 deg. locally in S. Algeria, N.E. Tunisia and S. Botswana. Cold in W. Algeria and locally in Morocco and Cape Province. *Rainfall:* wet in N. Morocco, N.W. Algeria, Canary Islands, E. Cape Province, W. Botswana; over 200% in Canary Islands and E. Cape Province. Dry generally N. of Sahara, S. Namibia, W. Cape Province, in and near Lesotho, E. Botswana to S. Mozambique; under 50% widespread in all these areas.

**U.S.S.R.** *Temperature:* mostly warm; +5 deg. from lower Volga Basin to Kazakhstan; Yenisey Estuary. Cold from Kola Peninsula to N. Urals; Lena Basin and E. along coast to Bering Sea; Sakhalin and adjacent mainland; -4 deg. near White Sea, upper Lena Basin. *Rainfall:* wet from most of European Russia through Kazakhstan to lower Lena Basin then S.E. to Sea of Okhotsk. Over 200% from Baltic Republics and S.E. Ukraine to S. Urals and S. Ob and Yenisey Basins. Dry elsewhere; under 50% in Arctic islands, N.E. Siberia (including N. Kamchatka), S.W. Ukraine, Caucasus, L. Balkhash to C. Amur and upper Lena Basin.

**Middle and Far East.** *Temperature:* warm from Turkey to Israel; parts of W. and N.E. India; Bangladesh, much of Burma, Mongolia, most of China; +3 deg. in W. Turkey, N.W. China; +4 deg. in Mongolia. Cold in most of Arabia, Pakistan and India; N.E. China, Korea, Japan, N. Philippines, Thailand; -2 deg. locally in E. Arabia and N.E. China. *Rainfall:* wet in W. Turkey, E. India, Sichuan and extreme N.E. China, Philippines; over 200% in all these areas, especially E. India. Dry from E. Turkey through most of Middle East, Pakistan, W. and N. India and Bangladesh to most of China, Mongolia, Korea, Japan, Burma and S.W. Asia. Under 50% locally in S.E. Korea, widely in other areas.

**Australia.** *Temperature:* warm in N.E. and S.W.; cold elsewhere; -2 deg. in S.E. Victoria and near Adelaide. *Rainfall:* wet in N. and on S.E. coast. Dry elsewhere; under 25% in much of S. and S.W.

M. W. ROWE

## FEBRUARY 1986 WEATHER SUMMARY

February 1986 was the coldest February over much of the U.K. since 1947, although conditions were generally not as severe as in 1947 with much less snow. In many central and western areas of the country the lack of any significant snow cover led to considerable frost penetration into the ground. Mean temperatures ranged from 4.5 to 5 degrees C below the normal over England and Wales to around 2 degrees C below in the north of Scotland. Highest maximum temperatures were recorded in the far western parts of the U.K. and Ireland with a very poor 8°C at

Invergordon Harbour (Cromarty Firth) on 24th and only 7.6°C in the traditionally very mild Scilly Isles on 15th. At Galway on the western seaboard of the Irish Republic 7.0°C was reached on 10th. Temperatures rarely exceeded 3.0°C over central and eastern England with highest monthly maxima of only 0.7°C at Middleton (Derbyshire) on 24th and -0.1°C at High Bradfield (South Yorkshire) on 2nd. Virtually all parts of England and Wales reported sub-freezing maxima at some time during the month and in central and south-eastern areas temperatures failed to reach 0.0°C on numerous occasions. The lowest reported maximum was -5.0°C in freezing fog at Church Fenton (Yorkshire) on 10th. Most parts of the country recorded their highest minima during the opening few days with 1.0°C to 3.0°C over a wide area and as high as 4.5°C at Stornoway on 1st. In a few spots there was an air frost on each of the 28 nights, more especially in upland areas, and at High Bradfield frost was continuous, day and night, throughout the month. Night-time temperatures were very low on occasions and particularly in those parts of the country with a substantial snow-cover. The minimum of -21.2°C at Grantown-on-Spey on 27th was a new British record for that date, as also was the -19.0°C at the same station on 28th. Other lows included -20.3°C at Inverdrue on 27th, -21.0°C at Carnwath (Strathclyde) on 22nd, and -16.0°C at St. Harmon (Powys) on 21st. Three minima are particularly worthy of note; -12.1°C at Gibraltar Point (Lincolnshire) on 20th, -15.0°C at Folkestone (Kent) on 9th, and -15.4°C at Dover (Kent) on 10th, the latter being the lowest temperature at Dover since 1881. On the grass/snow surface, -25.2°C was recorded at Inverdrue and -23.0°C at Aviemore (Highland), both on 27th, and -20.5°C at South Farnborough (Hampshire) on 10th. Precipitation totals were well below normal everywhere and the only places to exceed 50 percent were to be found near to the east coast of England and south-east Scotland. In western parts of the U.K. totals below 10 percent were widespread and there was no precipitation at all in parts of south-west Wales and west Cumbria. Highest daily totals were recorded near to North Sea coasts and particularly over the North Yorkshire Moors where 67.1mm fell at Fylingdales during the first four days of the month; and this included 23.7mm on 1st and 27.8mm on 2nd. Other 24-hour totals of note included 18.6mm at Cottingham (Humberside) on 1st, 27.0mm at Braemar on 5th, 19.9mm at St. Catherine's Point (Isle of Wight) on 6th, 31.2mm at Camborne (Cornwall) on 22nd and 18.6mm at Guernsey Airport on 28th. Many parts of Great Britain had a sunny month except near North Sea and English Channel coasts, much of south-west England and the Channel Islands. It was particularly sunny in the shelter of the Pennines and Welsh mountains, and in the Northern Isles of Scotland where the normal was widely exceeded by 50 to 70 percent.

The opening days of February were cold and raw with rain, drizzle or sleet at times, driven along by a penetrating north-east wind and in north-eastern areas of England some of the rain or sleet was quite heavy. Near Middleton (Derbyshire) severe glaze conditions existed on land above 300 metres with 4-6cm of glaze on all windward surfaces accompanied by a north-easterly gale that averaged more than 50kt at times. A small low that moved south-westwards across southern England on 5th/6th produced up to 15cm of snow in parts of south-east England and the Isle of Wight. At Sandhurst (Berkshire) there was a fall of 21cm. This development was associated with the arrival into the British Isles of much colder air from eastern



Europe and initiated a bitterly cold spell with persistent and often severe frost in many parts of England and Wales. Scotland was a little less cold, particularly in the north-west. Freezing fog also became a hazard in central and eastern England as an anticyclone drifted close to eastern areas. Southerly winds freshened in the west on 12th and 13th as Atlantic frontal systems encroached into south-western parts before slipping south-eastwards into France. A little sleet fell in the south-west, and in eastern counties of England and Scotland snow showers developed quite widely for a time, but day temperatures were not quite as low as on recent days and reached 6°C or 7°C in the far south-west around the 15th to 17th. Freezing fog again became a problem on 20th/21st but at the same time a cold front moving south across Scotland brought widespread snow showers to these parts. On 22nd and 23rd frontal systems again pushed north-eastwards towards south-west England with appreciable snowfalls in the Channel Islands and southern parts of Devon and Cornwall, particularly over the moors. The 24th was a little less cold but very much colder air spread westwards from Europe on 25th and continued until the end of the month. Frost was severe at night and some particularly low temperatures were recorded in the less windy parts of northern Britain.

K. O. M.

### MARCH 1986 WEATHER SUMMARY

After the bitterly cold February temperatures were slow to recover in March and mean values were still below the normal over a good deal of the U.K. Greatest negative anomalies were to be found in the more south-eastern counties of England with a mean of around 1.0 to 1.5 degrees C below the normal, although generally over England 0.5 degree below was more widely reported. Scotland was less cold and in the far north and in the Northern Isles it was a little on the mild side. Highest maximum temperatures were recorded after mid-month, the highest being 15.5°C at Jubilee Corner (Kent) on 18th and 15.4°C at Kensington (London) on 16th and Stretton (Burton-on-Trent) on 22nd. In Scotland 14.9°C was reached at Lossiemouth on 14th and 14.6°C at the same station on 15th. Highest minima included 10.0°C around the Moray Firth and the Great Glen on 15th, 9.2°C at Carlisle on the same night, 8.7°C at Exeter (Devon) on 27th, and 8.5°C at Yatton (Avon) and Buxton (Norfolk) on 5th. The extreme cold of February continued into the early days of March and it was at this time that the lowest temperatures were recorded. Lowest maximum temperatures included -2.9°C at Braemar and -1.6°C at Wattisham, Okehampton (Devon) and Horsham (West Sussex), all on 1st, and -1.9°C at Huddersfield on 2nd. Over much of southern England the 1st was the coldest March day since records began. On 24th Fylingdales (North Yorkshire) recorded a maximum of only 0.0°C. Screen minima also set new records locally for March. The -18.2°C at Inverdrue on 1st was the lowest on record in Great Britain for that date and the 2nd was also a bitterly cold morning in Scotland with -17.2°C at Braemar. Lowest minima over England and Wales included -11.0°C at Elmdon and -10.0°C at Gurney Slade (Somerset) on 3rd, a night when -10.0°C or below was recorded at a number of stations in east Wales and the west Midlands with -8.0°C or -9.0°C quite widely over both countries. In Ireland, Aldergrove recorded -8.4°C on 2nd. Grass minima were also very low with -23.8°C at Inverdrue and -19.6°C at

Aviemore, both on 1st, -18.3°C at Glenlee (Dumfries and Galloway) and Braemar, both on 2nd, and -17.0°C at Shawbury (Shropshire) and -15.4°C at Codford (Wiltshire), both on 3rd. Some parts of the British Isles received less rain than normal in March, more especially in north-east England and eastern Scotland where only 50 to 60 per cent was recorded locally, but over the bulk of the U.K. it was a rainy month with 150 per cent in a number of places and around 200 per cent in parts of north-west England and western Scotland. Highest daily totals for the month were 52.8mm at Nantmor (Gwynedd) on 3rd, 32.5mm at Rhoose Airport (Cardiff) on 4th, 31.6mm at Fort William on 21st, 30.4mm at Cellafrith Hill (Shetland) on 27th and 21.7mm at Culdrose (Cornwall) on 30th. Most places had a sunny month and more than 130 per cent of the normal was recorded in parts of central and eastern England and Scotland. Sunshine totals were nearer the normal in the west and in extreme southern counties of England where it was a dull month. A final note on the consequences of the prolonged cold spell: the river Spey at Aviemore was completely frozen over on 2nd March and by 14th March the ground at Aviemore was still frozen to depths of between 35 and 45cm where the surface was clear of snow.

March began with continental air still covering much of the British Isles but, as a ridge of high pressure moved slowly south over the country, the bitterly cold easterly winds were steadily pushed away into the continent to be replaced from the north by much milder south-westerlies. Atlantic frontal systems crossed all parts from the west on 4th and rain was heavy at times in northern and western areas, but this was followed by brighter weather and showers for a few days and the higher temperatures quickly thawed much of the lying snow, at least over lower ground and in the south. Overnight fog persisted all day along parts of the south coast on 8th and, after a short interruption as a cold front and rain crossed the country, fog returned to southern and eastern coasts on 11th and 12th. On the latter day freezing fog was a problem in many inland areas. For the next few days the south-east continued to be mostly dry with fog and frost at night, while the north-west was more changeable with rain at times, but on 18th as a small low on a cold front moved north-east across south-eastern counties thunderstorms spread from the continent into Kent and East Anglia. The passage of this front finally cleared the foggy conditions from all parts but a more mobile regime took over and for much of the rest of the month it was very unsettled, often very windy, and cold enough at time for sleet and snow to fall, even in the south. There were two particularly stormy spells. On 20th, as an intense depression moved north-east off western Scotland, winds gusted to 88kts at Benbecula in the Outer Hebrides and a new U.K. record of 133kts was recorded at 4,000ft in the Cairngorms. On 24th, as an intense and rapidly deepening low moved north-east across central parts of England and Wales, winds frequently reached 60 or 70kts over southern counties of England and Wales and at the Cardiff Weather Centre a gust of 80kts was recorded. Considerable structural damage to buildings was reported, many trees were blown down, and, as well as numerous injuries and narrow escapes, some deaths were directly attributed to the conditions.

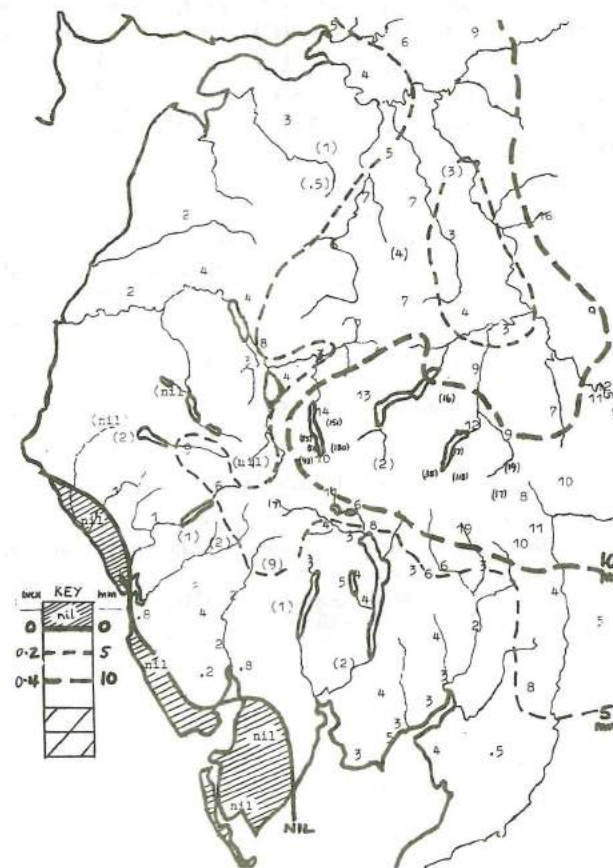
K. O. M.



## TEMPERATURE AND RAINFALL: FEBRUARY 1986

	Mean		Max	Min	Grass Min	Rain	%	Wettest	D	T
	Max	Min								
AUSTRIA: Innsbruck	1.9	-6.8	10.4(1)	-14.5(27)		13.3		5.1(23)	8	0
BELGIUM: Uccle	-0.4	-6.4	3.2(1)	-11.8(10)	-15.9(22)	9.3	17	6.8(28)	7	0
"  Rochefort	-0.5	-10.8	3.4(17)	-19.6(22)		6.0	12	1.6(1)	7	0
"  Houwaart	0.3	-9.0	4.1(1)	-16.8(10)		2.9	5	1.6(6)	5	0
DENMARK: Fanø	-1.4	-7.7	4.3(27)	-13.3(25)		0.9	2	0.5(24)	2	0
"  Frederikssund	-2.4	-10.0	2.0(3)	-17.4(23)	-21.3(25)	5.5	21	3.2(5)	3	0
GERMANY: Berlin	-2.4	-10.1	4.2(1)	-17.0(9)	-26.3(22)	24.0	69	15.3(19)	9	0
"  Hamburg	-1.7	-8.7	1.9(1)	-18.4(26)	-23.2(26)	9.7	24	3.7(18)	9	0
"  Frankfurt	-0.6	-7.5	5.3(1)	-15.4(9)	-17.4(22)	3.6	9	2.3(9)	3	0
"  München	-3.6	-11.5	8.7(1)	-23.4(25)	-29.0(26)	20.7	38	9.2(23)	10	0
"  Sontheim	-3.5	-11.6	3.9(18)	-19.7(10)	-24.5(10)	45.2		32.2(23)	12	0
GREECE: Thessaloniki	10.6	4.1	17.4(20)	-0.5(27)		156.8		54.5(17)	14	2
ITALY: Casalecchio	4.9	1.0	10.0(v)	-3.0(v)						
MALTA: Luqa	15.4	10.1	19.6(18)	5.0(12)	0.9(8)	57.6		20.5(15)	11	6
NETH'L'DS: Ten Post	-1.0	-7.2	2.2(1)	-13.6(23)	-17.8(21)	5.4	12	1.3(9)	7	0
"  Schettens	-0.8	-8.2	1.7(1)	-17.0(23)	-19.9(23)	3.5	7	1.1(21)	5	0
"  De Bilt	0.0	-7.2	3.7(1)	-14.6(21)	-17.5(21)	0.8	1	0.4(23)	1	0
NORWAY: Donski	-2.9	-12.3	2.7(27)	-24.1(20)		3.0		1.3(1)	-	-
SWEDEN: Valla	-4.3	-13.1	1.4(28)	-22.7(23)	-25.8(23)	12.4		4.5(23)	9	0
SWITZ'LAND: Basel	-1.6	-8.0	4.0(3)	-15.8(11)		64.2	160	25.8(23)	12	0
EIRE: Galway	4.4	-1.0	7.0(10)	-6.0(27)		0.6		0.5(4)	1	0
"  Straide	4.1	-1.7	6.3(10)	-8.4(24)	-14.9(21)	2.5	3	2.3(5)	1	0
SHETL'ND: Whalsay	3.9	0.5	5.2(11)	-2.8(26)	-6.7(20)	23.9	31	11.1(18)	10	0
"  Fair Isle	3.9	0.9	5.0(27)	-2.8(21)	-7.4(28)	15.4	34	3.2(14)	10	0
SCOTL'ND: Braemar	-0.3	-6.7	1.6(18)	-18.2(27)	-19.7(27)	79.6	119	27.0(5)	16	0
"  Inverdrue	1.3	-6.4	2.7(16)	-20.3(27)	-25.2(27)	29.7	46	7.9(21)	13	0
"  Rannoch	1.4	-7.0	3.5(1)	-15.0(23)		17.7		2.5(5)	5	0
"  Inchlaggan	6.5	-4.9	10.0(12)	-13.5(27)		2.7		1.8(20)	4	0
"  Edinburgh	2.2	-1.7	4.6(24)	-7.2(27)		26.7		8.6(5)	14	0
WALES: Moel-y-Crio	0.4	-4.4	2.0(24)	-8.6(21)	-12.8(21)	4.1	6		5	
"  Pembroke	2.8	-2.2	5.1(13)	-6.0(22)	-10.1(22)	0.8	1	0.4(2)	2	0
"  Aberporth	2.3	-2.6	5.1(27)	-6.7(21)		0.0	0	0	0	0
"  Aberaeron	2.7	-2.3	4.9(13)	-6.0(20)		0.0	0	0	0	0
"  Lampeter	1.3	-2.6	4.0(3)	-7.2(21)	-9.0(20)	0.5	1	0.5(3)	1	0
"  Velindre	0.7	-4.1	4.3(28)	-10.1(21)	-15.5(9)	14.4	21	6.1(2)	8	0
"  Carmarthen	2.2	-3.3	6.0(13)	-7.7(9)	-13.7(27)	0.3	0.4	0.3(22)	1	0
GUERNSEY: Airport	3.0	0.0	6.7(4)	-3.3(v)		50.6		18.6(28)	13	0
ENGLAND:										
Ilfracombe, Devon	3.1	-1.0	5.2(-)	-5.0(22)		0.2	1	0.2(2)	1	0
Denbury, Devon	2.5	-3.0	5.5(12)	-8.9(9)		15.3	14	5.0(22)	6	0
Bournemouth, Dorset	2.2	-2.6	5.2(4)	-7.5(22)	-12.5(22)	11.6	22		7	0
Gurney Slade, Somerset	0.7	-4.6	4.0(5)	-10.3(9)	-11.7(10)	5.0	4	1.4(1)	7	0
Yatton, Avon	2.4	-3.0	4.4(24)	-8.7(9)	-10.4(22)	6.4	12	2.2(2)	5	0
Congresbury, Avon	2.4	-2.3	4.9(5)	-7.0(9)		5.2		2.7(2)	4	0
Bradford-o-Avon, Wilts	1.7	-3.3	4.3(13)	-9.7(10)	-13.2(10)	6.0	12	1.5(5)	8	0
Codford, Wiltshire	1.8	-4.4	4.6(28)	-11.0(22)	-15.3(22)	3.6	6	2.4(1)	3	0
Corsham, Wiltshire	1.5	-3.7	4.5(13)	-8.9(10)	-12.0(9)	6.4	12	2.2(1)	7	0
Marlborough, Wiltshire	0.9	-3.9	3.8(13)	-10.6(10)		8.4	14	4.0(1)	5	0
Reading, Berkshire	1.3	-3.4	3.9(13)	-11.6(10)	-16.5(10)	10.8	24	5.2(5)	5	0
Sandhurst, Berkshire	2.2	-4.1	4.9(13)	-13.9(10)	-16.7(10)	28.8	59	18.0(5)	4	0
Romsey, Hampshire	2.3	-3.2	5.1(13)	-10.8(22)	-11.4(10)	8.6		2.0(28)	5	0
Newprt, Isle of Wight	2.2	-1.8	5.3(5)	-8.0(22)	-12.2(10)	26.7	39	10.9(6)	7	0
Horsham, Sussex	1.8	-3.5	5.3(13)	-11.3(10)	-12.0(10)	14.7	27	3.8(28)	7	0
Brighton, Sussex	1.3	-3.3	4.6(2)	-10.0(10)	-10.5(10)	14.4		6.8(6)	4	0

	Mean		Max	Min	Grass Min	Rain	%	Wettest	D	T
	Max	Min								
Hastings, Sussex	0.9	-2.7	4.5(2)	-7.2(v)	-11.3(22)	5.3	9	5.3(2)	1	0
Dover, Kent	1.1	-2.7	4.6(2)	-15.4(10)		28.2	50	12.0(8)	10	0
East Malling, Kent	1.2	-2.9	4.5(1)	-11.5(10)	-15.5(10)	18.9	41	7.2(1)		0
Epsom Downs, Surrey	0.9	-4.1	3.6(13)	-13.5(10)		21.0	46	5.9(6)	8	0
Reigate, Surrey	1.2	-3.0	4.0(2)	-13.0(10)		18.7	39	5.7(5)	10	0
Guildford, Surrey	1.3	-3.6	4.4(13)	-11.1(10)	-12.0(10)	24.2	54	8.7(5)	7	0
Sidcup, London	1.2	-2.7	4.0(2)	-11.1(10)	-14.0(10)	25.8	75	5.5(1)	12	0
Hayes, London	1.7	-3.3	4.4(13)	-10.7(10)	-12.9(10)	17.7	45	6.7(5)	6	0
Hampstead, London	0.3	-3.4	2.9(2)	-7.7(21)	-13.3(10)	31.3		11.0(5)	11	0
Royston, Hertfordshire	0.8	-4.0	4.5(24)	-9.5(10)	-14.5(10)	21.1	57	7.1(5)	9	0
Loughton, Essex	1.3	-3.4	4.4(5)	-13.2(10)	-17.9(10)	19.1	50	5.1(5)	10	0
Leigh-on-Sea, Essex	1.1	-2.3	4.0(2)	-9.2(10)	-15.1(10)	25.4	72	5.5(2)	12	0
Needham Market, S'lk	1.1	-3.0	3.9(24)	-8.4(10)	-11.9(10)	15.4		3.7(2)	10	0
Pulham St. Mary, S'folk	2.1	-3.0	4.4(24)	-9.0(20)	-12.0(20)	15.1	36	5.6(2)	7	0
Buxton, Norfolk	1.5	-2.3	5.0(24)	-10.0(21)	-12.0(21)	18.5	47	6.3(2)	7	0
Ely, Cambridgeshire	1.1	-4.4	4.1(28)	-10.0(10)	-12.1(10)	12.5	36	5.5(1)	5	0
Luton, Bedfordshire	0.5	-4.4	3.1(5)	-13.7(10)	-18.7(10)	30.8	69	9.9(5)	12	0
Oxford University	1.0	-4.0	3.5(13)	-10.7(21)	-15.6(10)	7.3	18	3.2(1)	5	0





	Mean		Grass		Rain	%	Wettest	D	T
	Max	Min	Max	Min					
Buckingham, <i>Buck'shire</i>	0.3	-4.7	2.8(28)	-14.3(10)	-17.7(10)	21.4	47	8.2(5)	7 0
Stourbridge, <i>W.M'lands</i>	0.9	-3.4	3.2(24)	-8.9(21)	-14.6(9)	10.0		3.4(5)	7 0
Birmingham Univ'sity	0.7	-3.7	3.2(28)	-10.5(21)	-14.5(10)	12.4	25	3.7(5)	9 0
Kettering, <i>North'shire</i>	0.9	-4.8	5.0(24)	-15.0(10)	-17.2(10)	29.7	60	9.2(1)	12 0
Hinckley, <i>Leicestershire</i>	1.1	-4.1	3.7(24)	-10.0(21)	-12.7(21)	18.6	39	7.0(1)	6 0
Cosby, <i>Leicestershire</i>	0.3	-4.9	2.8(24)	-12.5(10)	-15.0(10)	27.1	58	9.7(5)	10 0
Louth, <i>Lincolnshire</i>	1.6	-2.6	4.3(24)	-8.4(21)		36.5		10.6(5)	9 0
Newark, <i>Nott'hamshire</i>	1.7	-3.3	5.2(24)	-10.1(10)		25.0	52	8.8(1)	10 0
Nottingham, <i>Nott'shire</i>	1.5	-3.1	4.2(22)	-9.0(11)	-11.7(10)	26.8	60	10.9(1)	9 0
Middleton, <i>Derbyshire</i>	-1.6	-4.4	0.7(24)	-8.3(10)		41.6		12.2(2)	12 0
Burton-on-Trent, <i>Staffs</i>	1.5	-3.1	4.1(24)	-8.0(11)	-10.5(21)	14.8	33	6.6(1)	7 0
Keele University, <i>Staffs</i>	0.9	-3.1	4.2(24)	-7.0(21)	-13.0(21)	2.0	5	1.5(5)	3 0
Liverpool, <i>Merseyside</i>	2.6	-2.8	4.7(28)	-8.8(24)		1.4	2	0.8(5)	3 0
Lathom, <i>Merseyside</i>	2.3	-2.3	4.9(24)	-7.6(21)		1.7		0.9(5)	2 0
Huddersfield, <i>W.Yorks</i>	0.3	-3.9	2.8(24)	-8.9(11)	-11.6(10)	38.3		7.8(2)	16 0
Sheffield, <i>S.Yorkshire</i>	0.9	-3.6	4.4(24)	-8.3(11)	-16.2(11)	35.1	55	10.0(2)	14 0
High Bradfield, <i>S.Yorks</i>	-2.7	-4.5	-0.1(2)	-9.5(21)					
Cottingham, <i>Humb'side</i>	2.5	-2.5	5.6(24)	-9.2(21)	-11.5(21)	42.2	99	18.6(1)	13 0
Carlton-in-Cleveland	1.4	-3.9	3.6(4)	-14.9(11)	-18.2(11)	44.7		9.4(5)	17 1
Durham University	1.8	-3.0	3.5(13)	-11.8(11)	-12.0(15)	37.6	99	7.2(2)	17 -
Sunderland, <i>Tyne/Wear</i>	2.7	-1.0	5.0(1)	-6.8(11)		6.0	23	3.5(2)	4 0
Carlisle, <i>Cumbria</i>	2.6	-2.1	4.5(13)	-14.8(22)		4.1	9		
Kendal, <i>Cumbria</i>	2.4	-5.3	4.5(2)	-15.0(22)		1.8	2		
CANADA: Halifax	-1.6	-9.3	3.1(20)	-17.8(4)		111.4	90	50.8(22)	12 0
U.S.: Bergenfield, N.J.	2.3	-5.1	9.4(2)	-13.3(13)	-13.3(13)	94.2		24.9(18)	12 1
JAMAICA: Montego	28.7	20.5	30.5(23)	17.7(15)		6.1		6.1(1)	1 0

## CUMBRIA RAINFALL

Broadfield, 7.0mm (15%); Appleby Castle, 10.5mm (18%); The Nook, Thirlmere, 10.3mm (6%); Sellafield, nil; Coniston, 3.2mm (2%); Hawkshead, 4.0mm (3%); Ulverston, Poaka Beck, nil. "Nil" was also measured at the famous "wet spot" of Seathwaite; however, the gauge there is a monthly gauge, and is unreliable with regard to snow measurements because of (a) the sublimation of snow in the funnel, and (b) the effect of blown snow, in a predominantly dry month. In Fig.1 brackets indicate the doubtful totals.

The exceptional dryness results from a complete absence of winds between S. and N.W. In the Windermere area it seems to have been the driest month this century, and it is the first month without measureable rain or snow at some gauges in S.W. Cumbria. At Coniston and Grasmere only February 1932 was a drier month this century (information and figure supplied by P. Robin Cutforth).

## TEMPERATURE AND RAINFALL: MARCH 1986

	Mean		Grass		Rain	%	Wettest	D	T
	Max	Min	Max	Min					
AUSTRIA: Innsbruck	10.8	0.6	20.9(28)	-4.2(1)		32.5	5.9(7)	12	0
BELGIUM: Uccle	8.7	1.1	17.8(18)	-5.4(3)	-9.4(4)	126.3	231	23.4(27)	18
" Rochefort	8.9	-1.9	16.6(18)	-10.0(4)		87.5	159	18.8(30)	16
" Houwaart	9.9	-1.2	19.4(18)	-9.7(3)	-10.5(3)	113.0	191	15.9(31)	17 3
DENMARK: Fanø	3.6	-1.2	10.5(18)	-12.0(3)		59.4	137	22.4(23)	15 0
" Frederikssund	5.1	-2.1	10.1(30)	-16.7(1)	-21.1(2)	32.3	97	5.4(24)	14 0
GERMANY: Berlin	7.5	0.4	17.0(28)	-10.1(3,4)	-14.9(3)	58.0	181	11.9(31)	15 0
" Hamburg	6.9	-0.0	14.0(20)	-12.4(3)	-18.5(3)	72.8	166	12.2(27)	16 1
" Frankfurt	8.5	1.5	15.3(18)	-3.7(4)	-7.6(4)	83.4	194	16.5(24)	14 1
" Munchen	7.2	-1.0	19.4(28)	-8.9(1)	-11.0(19)	56.5	107	11.0(23)	14 1
" Sonthofen	7.0	-1.5	17.2(28)	-7.0(1)		96.4		22.1(23)	14 3
GREECE: Thess'loniki	12.1	6.3	24.2(31)	-0.4(1)		27.7		11.4(3)	14 0
ITALY: Casalecchio	11.8	4.1	19.0(31)	-1.0(v)					

	Mean		Grass		Rain	%	Wettest	D	T
	Max	Min	Max	Min					
MALTA: Luqa	17.1	11.0	21.3(2)	7.3(13)	2.2(13)	39.5		11.8(19)	11 0
NETH'L'DS: Ten Post	6.7	0.0	14.9(18)	-9.8(4)	-15.0(4)	48.1	106	12.3(23)	17 0
" Schettens	6.4	-0.2	15.4(19)	-11.2(3)	-12.6(3)	41.2	91	15.0(23)	14 0
" De Bilt	8.4	0.5	16.1(18)	-8.1(4)	-11.3(4)	65.4	127	13.9(23)	14 1
NORWAY: Donski	3.0	-2.7	7.9(23)	-16.0(1)		70.1		20.6(22)	12 0
SWEDEN: Valla	7.3	-2.0	9.8(28)	-15.4(2)	-18.0(2)	42.0		8.4(24)	15 0
SWITZ'LAND: Basel	9.6	0.1	16.8(17)	-6.2(3)		35.7	89	5.7(19)	14 1
EIRE: Galway	9.6	3.2	12.6(14)	-5.4(3)		141.4	171	22.6(3)	26 1
" Straide	9.3	2.4	12.0(22)	-10.0(2)	-16.0(2)	149.0	177	15.0(19)	29 0
SHETL'ND: Whalsay	6.6	3.0	8.2(29)	-0.8(1)	-3.7(27)	127.7	219	16.2(22)	23 2
" Fair Isle	6.2	3.1	8.1(15)	-0.1(1)	-3.7(1)	84.4	109	14.2(22)	23 1
SCOTL'ND: Braemar	5.4	-1.8	10.1(22)	-17.2(2)	-18.3(2)	65.0	125	9.9(19)	24 0
" Inverdrue	7.6	-1.1	13.3(15)	-18.2(1)	-23.8(1)	74.2	132	15.1(22)	19 0
" Rannoch	7.1	-0.3	11.2(15)	-16.0(2)	-15.0(3)	163.0		21.4(5)	22 1
" Edinburgh	8.7	1.9	12.8(15)	-7.0(2)	-13.5(3)	44.5		11.4(23)	15 0
WALES: Moel-y-Crio	7.6	0.7	11.3(21)	-6.8(3)	-11.3(3)	62.4	106	9.2(23)	19 1
" Pembroke	9.2	2.6	11.2(21)	-5.0(3)	-8.3(3)	87.2	112	14.1(23)	27 0
" Lampeter	7.6	2.4	10.4(15)	-7.8(2)	-9.2(2)	102.2		17.5(4)	22 -
" Velindre	8.8	1.5	12.3(22)	-8.6(3)	-14.0(3)	61.1	91	11.5(23)	20 0
" Carmarthen	8.3	2.0	10.8(21)	-7.4(3)	-13.2(3)	123.8	149	19.0(23)	22 0
" Gower	8.5	2.6	11.5(21)	-5.2(3)	-10.1(3)	111.0	126	21.3(4)	20 0
GURNSEY: Airport	8.3	3.9	10.9(15)	-1.6(3)		87.0		14.0(22)	22 0
ENGLAND:									
Denbury, <i>Devon</i>	9.5	1.7	12.2(10)	-7.6(3)	-11.0(3)	89.4	77	21.0(23)	24 0
Bournemouth, <i>Dorset</i>	8.4	2.5	12.0(21)	-5.2(3)	-9.7(3)	65.6	117	11.8(23)	17 0
Gurney Slade, <i>Somerset</i>	8.1	0.9	12.0(22)	-10.0(3)	-12.0(3)	105.7	112	19.0(23)	20 0
Yatton, <i>Avon</i>	9.6	2.6	12.9(22)	-6.7(3)	-10.5(3)	66.3	117	11.2(23)	17 1
Congresbury, <i>Avon</i>	9.4	2.6	12.8(22)	-6.7(3)		63.6		11.4(23)	15 1
Bradford-o-Avon, <i>Wilts</i>	9.8	1.2	15.0(27)	-8.0(3)	-12.8(3)	60.3	126	12.2(27)	17 0
Codford, <i>Wiltshire</i>	9.1	1.4	12.6(27)	-9.9(3)	-15.4(3)	67.8	84	14.3(23)	17 -
Corsham, <i>Wiltshire</i>	8.9	1.5	12.7(22)	-7.1(3)		73.1		10.8(23)	18 0
Reading, <i>Berkshire</i>	9.5	1.9	13.6(15)	-5.5(3)	-10.2(3)	46.9	89	8.0(18)	17 0
Sandhurst, <i>Berkshire</i>	9.6	1.0	13.4(27)	-6.7(3)	-11.7(3)	50.4	116	7.8(23)	19 3
Romsey, <i>Hampshire</i>	9.4	1.5	13.4(27)	-6.7(3)	-10.1(3)	58.1		11.5(23)	20 1
Newport, <i>Isle of Wight</i>	9.2	2.8	12.9(19)	-5.0(3)	-9.5(3)	78.2	109	17.5(23)	17 0
Horsham, <i>Sussex</i>	9.3	1.4	14.0(15)	-5.9(3)	-9.1(3)	73.4	150	16.0(4)	19 0
Brighton, <i>Sussex</i>	8.4	1.3	12.2(20)	-6.0(3)	-8.2(3)	90.0		19.1(30)	22 1
Hastings, <i>Sussex</i>	7.3	1.5	12.5(18)	-4.2(3)	-7.8(3)	82.7	138	12.9(30)	17 2
Dover, <i>Kent</i>	8.6	2.0	14.0(18)	-5.9(3)		94.5	205	16.3(27)	18 2
East Malling, <i>Kent</i>	9.3	1.5	15.2(18)	-4.6(3)	-8.5(3)	51.7	120	8.4(23)	19 2
Epsom Downs, <i>Surrey</i>	8.7	1.5	13.0(18)	-9.0(3)	-10.9(3)	53.7	75	8.9(4)	18 0
Reigate, <i>Surrey</i>	9.2	1.1	14.0(27)	-4.8(3)		62.6	120	9.6(4)	20 4
Guildford, <i>Surrey</i>	9.2	2.1	12.9(27)	-5.7(3)	-8.0(3)	57.0	94	9.8(29)	18 1
Sidcup, <i>London</i>	9.9	1.9	16.0(18)	-4.5(3)	-7.1(4)	39.5	87	6.6(18)	18 2
Hayes, <i>London</i>	9.4	1.5	13.6(15)	-5.1(3)	-8.5(3)	45.1	109	8.0(4)	17 4
Hampstead, <i>London</i>	9.0	1.8	12.9(16)	-5.2(3)	-9.8(3)	49.5		8.1(4)	18 2
Royston, <i>Hertfordshire</i>	9.1	1.8	14.4(18)	-6.6(3)	-13.7(3)	52.4	119	11.1(18)	18 2
Loughton, <i>Essex</i>	9.6	1.2	15.1(18)	-5.2(3)	-8.9(3)	44.9	75	9.2(18)	17 0
Leigh-on-Sea, <i>Essex</i>	9.5	2.0	16.0(18)	-4.4(3)	-5.8(3)	41.1	82	7.2(29)	19 1
Needham Market, <i>S'lk</i>	8.9	1.5	13.9(37)	-10.7(3)		47.4		10.3(18)	19 1
Pulham St. Mary, <i>S'folk</i>	8.9	0.8	13.7(18)	-5.6(3)		52.7	133	6.3(23)	17 2
Buxton, <i>Norfolk</i>	9.4	1.2	14.2(18)	-6.0(2)	-9.5(3)	62.2		11.1(27)	15 0
Ely, <i>Cambridgeshire</i>	9.2	0.2	14.4(18)	-8.5(3)		56.8		8.1(4)	18 2
Luton, <i>Bedfordshire</i>	9.1	1.6	13.7(15)	-8.2(3)	-12.2(3)	58.9		9.1(18)	16 2
Buckingham, <i>Buck'shire</i>	9.0	1.0	12.7(27)	-6.6(3)	-10.5(3)	62.4	144	10.3(27)	19 3
Oxford University	9.2	2.1	13.4(27)	-5.6(3)	-7.4(3)	58.2	145	8.9(18)	16 1



	Mean		Max	Min	Grass		Rain	%	Wettest	D	T
	Max	Min			Min	Min					
Stourbridge, W.Midlands	8.2	1.9	13.4(22)	-7.8(3)	-13.6(3)	57.3	91	8.7(23)	18	1	
Birmingham University	8.2	1.6	14.0(22)	-7.4(3)	-10.9(3)	67.3	113	9.4(18)	20	0	
Kettering, Northants	9.1	0.9	12.8(27)	-8.6(3)	-13.9(3)	57.5	114	10.2(18)	18	1	
Hinckley, Leicestershire	8.8	1.3	12.5(22)	-7.7(3)	-12.1(3)	52.8	116	6.8(23)	18	1	
Cosby, Leicestershire	8.6	0.7	12.5(22)	-9.4(3)	-11.0(3)	52.8	112	7.6(18)	20	1	
Louth, Lincolnshire	9.0	1.5	13.3(15)	-5.0(3)		67.1		8.6(23)	17	0	
Newark, Nottinghamshire	9.6	1.6	14.6(22)	-7.8(3)	-11.6(3)	39.1	83	7.9(23)	12	0	
Nottingham, Nottinghamshire	9.8	1.3	14.8(22)	-6.7(3)	-8.7(3)	44.6	102	6.2(18)	17	0	
Middleton, Derbyshire	5.8	0.4	11.0(22)	-6.4(3)		105.7		13.2(23)	19	1	
Burton-on-Trent, Staffordshire	9.2	1.9	15.4(22)	-8.1(3)	-11.0(3)	56.8	131	7.5(18)	18	0	
Keele University, Staffordshire	7.5	2.0	13.1(22)	-6.6(3)	-14.2(3)	65.2	135	8.7(23)	21	1	
Liverpool, Merseyside	8.9	1.4	13.9(22)	-8.2(2)		73.6	157	11.7(23)	19	0	
Lathom, Merseyside	9.2	1.9	11.7(15)	-6.5(3)		90.2		16.3(3)	20	-	
Huddersfield, West Yorkshire	7.3	1.0	11.7(22)	-7.2(3)	-10.0(3)	83.2	124	16.5(22)	20	1	
Sheffield, South Yorkshire	7.8	1.4	13.2(22)	-6.5(3)	-12.0(3)	66.4	88	12.6(23)	19	0	
High Bradfield, South Yorkshire	4.5	-0.2	10.1(22)	-8.5(3)							
Cottingham, Humberside	9.5	1.5	13.7(15)	-6.3(3)	-8.3(3)	48.5	91	8.2(23)	18	0	
Carlton-in-Cleveland	8.1	1.3	11.5(19)	-7.6(3)	-12.0(3)	48.7		13.1(23)	13	0	
Durham University	7.8	0.8	11.8(22)	-9.5(3)	-10.9(3)	38.8	86	9.6(23)	14	-	
Sunderland, Tyne and Wear	8.7	2.0	13.3(22)	-4.8(3)		16.2	36	3.0(31)	15	0	
Carlisle, Cumbria	8.4	2.3	11.6(15)	-7.0(3)		63.0	111	19.3(22)			
Kendal, Cumbria	8.4	-0.3	12.0(21)	-8.0(3)		174.9	180				
CANADA: Halifax	3.1	-5.7	18.8(31)	-14.8(10)		147.8	126	69.3(15)	12	0	
U.S.: Bergenfield, N.J.	12.1	-0.4	26.7(30)	-11.7(8)	-13.3(8)	66.3		15.3(15)	7	2	

#### CUMBRIA RAINFALL

Appleby Castle, 70.3mm, 115%; Hawkhead, 243.1mm, 174%; Coniston, 297.7mm, 161%; The Nook, Thirlmere, 290.8mm, 151%; Scathwaite, 348.0mm, 150%.

#### WEDNESDAY 17th TO FRIDAY 19th SEPTEMBER 1986

##### WATER: MEASUREMENT AND MANAGEMENT

A two-day residential course held in the Department of Geography, University College, Swansea. Joint meetings with the British Hydrological Society. Local organisers Dr. A. H. Perry (ABC) (0792-205678) or Mrs. A. Roberts (BHS) Institute of Hydrology (0491 38800)

Further information about the meeting may be obtained from the Hon. Secretary, Mr. J. Kings, Department of Geography, University of Birmingham, P.O. Box 363, Birmingham B15 2TT (021-472-1301).

#### MAGAZINES FOR SALE:

"Weather" magazines: 1946, Jun-Dec; 1947, 1948, Jan-Oct, Dec; 1949, Jan-May, Aug, Sept, Nov; 1950, Mar-May, Oct, Dec; 1951, Jan-Jun; 1952; 1953; 1954; 1955; 1956; 1957, Jan-Mar, May-Oct; 1958, Jan, Feb, Apr, May, Oct; 1959, Jan-May, Oct; 1962, Aug-Dec; 1963, Feb, Jul, Oct-Dec; 1964, Feb, Mar, Oct, Nov; 1965, Feb-Jul, Sept-Nov; 1966, Jan, Apr-Oct; 1967, Jan, Feb, Apr, Jun, Jul, Sept; 1968, Jan, Mar, May-Sept, Nov, Dec; 1969, Jan-Mar, Jun, Jul, Nov; 1970, Jan, Aug, Nov; 1971, Mar, May, Jun, Aug, Nov, Dec; 1972, Jan-Jun, Aug, Sept, Nov, Dec; 1973, Jan-Mar, May-Oct, Dec; 1974, Jan, Feb, Jun, Sept-Dec; 1975, Feb, Apr-Jul, Sept-Dec; 1976, Feb-May, Aug, Oct, Dec; 1977, Jan, Mar, May-Nov; 1978, Jan, Feb, Apr-Jul, Aug-Nov; 1979, Jan, Jul, Dec; 1980, Nov; 1981, Feb, Apr, Jul, Oct, Dec; 1982, Jan-Mar, May.

"Meteorological Magazine": 1964, Oct-Dec; 1965, Feb, Apr, May, Jul-Nov; 1966, Jan, Feb, May-Aug, Oct-Dec; 1967, Jan, Feb, May-Nov; 1968, Feb, May, Oct, Nov; 1969, Jan, Mar-May, Jul, Sept, Nov; 1970, Jan-Aug, Nov, Dec; 1971, Jan, Feb, Apr, Jun-Nov; 1972, Jan, Feb, Jul, Sept, Dec; 1973, Jan, Feb, Apr, Jul, Oct, Nov; 1974, Apr, Jun, Nov; 1975, Apr, Jul; 1976, Jan, Aug, Oct; 1977, Feb, Aug, Oct; 1978, Jan, Mar, Jul-Sept, Dec; 1979, May, Jun, Aug, Sept; 1980, Feb, Mar; 1981, Jan-Sept, Nov, Dec; 1982, Jan, Feb, Apr-Jun, Nov; 1983, Jan, Feb, Apr-Dec; 1984, Jan.

All magazines priced at 75p each, or 50p each for 10 or more copies. Prices include postage. Thunderstorm Census Organisation, 77 Dicketts Road, Corsham, Wiltshire, SN13 9JS.

# Prepared for all weathers

With a range of meteorological instruments as wide as Casella's, being prepared for all weathers is no problem.

From simple thermometers to computerised rainfall logging systems, Casella can supply it. Whether you are a professional meteorologist or an enthusiastic amateur, next time you need to know about the weather, contact Casella, their range of equipment could tell you a thing or two.

Products for

- Temperature and Sunshine
- Humidity
- Rainfall
- Airflow
- Pressure

To obtain more information on the Casella range complete and return the coupon.

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 \_\_\_\_\_  
 "I want to be prepared for all weathers. Please send me your fact pack(s) on: Temperature and Sunshine ☐ Humidity ☐ Rainfall ☐ Airflow ☐ Pressure ☐ \* (Please tick)

Casella London Limited.  
 Regent House,  
 Britannia Walk,  
 London N1 7ND, UK.  
 Tel: 01-253 8581

**CASELLA**  
**LONDON**

Creating technology to monitor the environment





CONTENTS	PAGE
Cold snaps and warm surges at Birmingham, England, 1900-1984. M. G. HAMILTON . . . . .	145
More ball-lightning eye-witness reports. . . . .	149
Quintuplet circle formations in 1985. G. T. MEADEN . . . . .	152
Christmas 1985: The floods and high winds in Kent. M. J. OLIVER . . . . .	153
Tornadoes and high winds kill five, 10 March 1986. . . . .	155
Record rain in south-east Florida, 26-27 March 1986. R. R. O'SULLIVAN . . . . .	156
World weather disasters: December 1985. A. J. THOMAS . . . . .	157
<i>Literature reviews and listings:</i>	
(1) Weather and climate of the Antarctic . . . . .	160
(2) New perspectives in climate modelling . . . . .	161
Deep depression stops coal production, 24 March 1986. D. V. RANDON . . . . .	161
Irish farmers bemoan harsh spring. DAVID MESKILL . . . . .	161
The cold February of February 1986. P. C. SPINK . . . . .	162
On the fringe's of Derbyshire's snowfields. D. J. STANIER . . . . .	162
Obituary: Derek J. Schove . . . . .	163
<i>Product News:</i> (1) Comprehensive fibre-optic space link. . . . .	163
(2) Rugged hand-held computer aids kite-flying experiments. . . . .	164
TORRO tornado report: August 1985 . . . . .	165
TORRO thunderstorm report: August 1985. . . . .	167
World weather review: November 1985. . . . .	169
World weather review: December 1985. . . . .	170
World weather review: January 1986. . . . .	171
British weather summary: February 1986. . . . .	172
British weather summary: March 1986. . . . .	174
Temperature and rainfall tables: February 1986. . . . .	176
Temperature and rainfall tables: March 1986. . . . .	178

## FRONT COVER:

The Eiger: black mountain in winter dress (Swiss Alps).

## EDITORIAL OFFICE:

Journal of Meteorology, 54 Frome Road, Bradford-on-Avon, Wiltshire,  
BA15 1LD, U.K.