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# CLIMATE MONITOR

Climatic Research Unit  
School of Environmental Sciences  
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## SUMMARY OF CLIMATIC EVENTS DURING THE PERIOD DECEMBER 1990 TO NOVEMBER 1991

D.A. McKinlay

*December 1990 to February 1991*

The winter season in the Northern Hemisphere (NH) continued the recent trend of warmer than normal winters with an average temperature of  $0.66^{\circ}\text{C}$  above the 1951-70 reference period average. It was the seventh warmest since 1851, and six of the seven have occurred in the last eleven years. Despite this hemispherical warmth, Arctic regions and large areas of Canada were much colder than normal in December and January, as was the eastern Arctic, to a lesser extent, in February.

In the Southern Hemisphere (SH), it was also a warmer than average season ( $0.41^{\circ}\text{C}$  above the 1951-70 reference period average), second only to 1982-83 ( $+0.51^{\circ}\text{C}$ ) in recent times; there were some exceptionally warmer than normal summers in the 1850s (although the record series before the 1880s is not considered to be quite so reliable). The Southern Oscillation Index showed little deviation from the norm over the three-month period but surface and sub-surface oceanic anomaly patterns in the western equatorial Pacific indicated conditions favourable for the development of an El Niño warm event (see article in *Climate Monitor* 17, p. 80).

It was warmer than normal over much of the NH in December 1990, apart from the Arctic, Canada and the western two-thirds of the USA. December 1990 was warmer than normal over much of Eurasia, with the greatest anomalies ( $+5$ ), over northern Scandinavia (Karesuando in northern Sweden had its warmest December on record going back to 1951 with a mean of  $-6^{\circ}\text{C}$ ), western Russia ( $+4$ ), large areas of southern and southeastern Russia ( $+6$ ) and the Central Siberian Plateau ( $+4$ ). The North Pacific was warmer than normal ( $+4$  over the Alaskan peninsula), as was southeastern USA ( $+4$  over the Carolinas). Large areas of North Africa were also warmer than normal, especially in the east ( $+6$  over Sudan). In the SH, much of Australia was warmer than normal, with a centre of  $+3$  over northern New South Wales, and in South America, parts of eastern Brazil were  $+2$ . Interior parts of the Antarctic were warmer than normal, and Vostok recorded its warmest December since records began in 1958 ( $+4.9$ ). Apart from northern Scandinavia and the extreme eastern parts of Greenland, much of the Arctic was cooler than normal, with the greatest negative anomalies ( $-10$ ) over the Kara Sea (Ostrov Vize (former USSR) had its coldest December on record going back to 1951 with  $-31.5^{\circ}\text{C}$ ) and eastern Siberia ( $-6$ ). Much of Canada was colder than normal ( $-6$  over the Hudson Straits and Manitoba), and this cold plunge affected much of the western USA ( $-8$  over Idaho and Montana). Parts of the western Mediterranean registered a cooler than normal December ( $-2$  to  $-3$ ). In the SH, the only significantly cooler than normal weather was recorded over Uruguay, with the remainder of the land masses and southern oceans being near or above normal.

January 1990 was again warmer than normal over much of Eurasia,

and a heatwave affected the extreme eastern Ukraine. Severe drought and heat affected Tyumen Oblast. In contrast, the Baltic States, Belarus and parts of the Ukraine and central region were wetter than usual. Storms brought hail and a tornado to Tajikistan and Turkmenia and a cyclone hit Uzbekistan in June. The rise in the level of the Caspian Sea caused flooding.

Severe storms hit Moldova in early July. For the month two to three times the normal precipitation was received on Moldova and the southwest Ukraine causing flooding. Mid-month the first significant rain since April fell on the southern Urals, Kazakhstan and western West Siberia.

August remained wet in Moldova and southwest Ukraine while hot, dry weather continued in the eastern Ukraine, Northern Caucasus, lower Volga and eastern Voronezh. Cooler damper weather developed during the last 10 days.

Milder than normal weather covered much of the country through the season. Experts considered measures to protect property against the rise in the level of the Caspian Sea. A storm caused flooding in Varandey on the Barents Sea at the end of October. There was a poor grain harvest in Kazakhstan due to drought. Drier than normal weather affected southern Ukraine, northern North Caucasus and the southeastern Voronezh. October was considerably milder than normal over the southern Urals and Kazakhstan (anomaly of  $+5.9^{\circ}\text{C}$  at Orenburg).

November temperatures were above normal over most of the former USSR and much above normal over Kazakhstan (Balkhash mean:  $0.5^{\circ}\text{C}$ ,  $5.1^{\circ}\text{C}$  above normal), central Siberia (Tura:  $-7.7^{\circ}\text{C}$ ,  $6.5^{\circ}\text{C}$  above normal) and eastern Siberia (Anadyr:  $-7.7^{\circ}\text{C}$ ,  $6.5^{\circ}\text{C}$  above normal). Precipitation totals were variable with western crop areas receiving below normal totals. In the far east, Vladivostok totalled only 5mm (17% of normal), while in Tiflis, Georgia, 146mm were recorded (395% of normal).

December mean temperatures were more variable than for November across the former USSR. Central Siberia was warmer than normal (Olenok was  $7.1^{\circ}\text{C}$  above average), as were parts of the south (Balkhash was again  $5.0^{\circ}\text{C}$  above the average). It was much colder than normal over eastern Siberia ( $6.6^{\circ}\text{C}$  below normal in Kamenskoje), and western Siberia and the Urals ( $3.4^{\circ}\text{C}$  below normal in Salekhard). Two cold snaps covered winter grain areas in the west, as far south as the southern Ukraine and north Caucasus, with minimum temperatures from  $-15^{\circ}\text{C}$  to  $-25^{\circ}\text{C}$ . Precipitation totals were again variable over the former USSR; highest totals were recorded in south central and southwestern areas (Tashkent, Uzbekistan, totalled 136mm (239% of normal), and Krasnovodsk, Turkmenistan, 48mm (436% of normal).

Over the year as a whole, most of the former USSR was warmer than normal, with a large area centred over the southern Urals and north Kazakhstan, showing the largest positive anomalies in the Northern Hemisphere (see Figure, p. 11); Kustanay and Omsk were  $2.6^{\circ}\text{C}$  and  $2.4^{\circ}\text{C}$ , respectively, above their mean annual temperatures. Annual precipitation totals varied between 198% of normal at Krasnovodsk on the Caspian Sea coast in the far southwest to 49% of normal at Cape Velen on the far eastern Siberian coast.

BRITISH ISLES DAILY WIND AND WEATHER PATTERNS  
1588, 1781-86, 1972-1991  
AND SHORTER EARLY SEQUENCES (IN 1532, 1570 AND  
OTHER YEARS, NOTABLY 1688, 1689, 1694, 1697, 1703, 1717,  
1783-4, 1791, 1792, 1795, 1822, 1825, 1829, 1845, 1846,  
1849, 1850, 1854-5)

H.H. Lamb

This British Isles daily weather type classification was first published by the Meteorological Office in 1972 with definitions of the seven basic types and the rules followed in recognizing hybrid types (Lamb, 1972, q.v.). The complete sequence of daily weather patterns classified, strictly over the "square"  $50$  to  $60^{\circ}\text{N}$ ,  $10^{\circ}\text{W}$  to  $2^{\circ}\text{E}$ , from 1861 to 1971 was included in the same publication in 1972. The classification has been found useful by a great variety of workers and in many connexions (see Murray and Lewis 1966; Murray and Benwell 1970; Jones and Kelly, 1982 and Briffa et al. 1990). Accordingly, it has been very widely quoted in climatic literature, and has become known as the Lamb classification.

The work of classifying the original 111 years was done in a random order of years so as to avoid possible distortions which, it was feared, might creep in through unconscious changes of practice by the author in the course of the long task. The result was already the longest span of years ever covered by such a study of the day-by-day development and variations of the atmospheric circulation. Other similar classifications applied to other parts of the world, even for shorter periods, may, of course, be of great value too (e.g. Baur, F., 1947; Baur, F., Hess, P. and Nagel, H., 1944; van Bebber, J., 1882; van Bebber, J. and Köppen, W., 1895; Bolotinskaja, M.S. and Ryzakov, L., 1964; Dzerdzeerskij, B.L., 1969; Dzerdzeerskij *et al.*, 1946; Evjen, S., 1943; Girs, A.A., 1960, 1963; Hess, P. and Brezowsky, H., 1952, 1969; Newnham, E.V., 1925; Teisserenc de Bort, L., 1881). Recently, classification by computer has become increasingly popular. Barry and Perry (1973) and Yarnal (1993) review all these types of analysis.

The British Isles region is of special interest since it is one of the two sectors of the northern hemisphere where "blocking of the westerlies" is most frequent (Brezowski, 1951; Rex, 1950, 1951). The other sector similarly prone to the development of blocking anticyclones may be broadly described as the Alaska-N.W. Canada sector. Variations in the frequency of westerly wind and other circulation patterns here may therefore provide indications of wider significance.

The present writer experimented with the possibility of recognizing definable circulation pattern types over wider areas (up to the whole northern hemisphere) before deciding upon the definitions used here for the British Isles region (taken as  $50$  to  $60^{\circ}\text{N}$ ,  $10^{\circ}\text{W}$  to  $2^{\circ}\text{E}$ ). It seemed necessary to conclude that with the use of any pattern types defined over larger areas subjectivity was bound to enter in through attempts to "force" many days into one or other of such larger-scale types. Even with the types

limited to the British Isles region, a significant percentage of days is admittedly unclassifiable: generally about 5% or less of the days in any one year, but in extreme cases, probably always when blocking is particularly frequent, sometimes as many as 8% of the days of a year (28 days) are unclassifiable (e.g. in 1785 and 1981).

Classification of each day's weather map over the region about the British Isles has been continued to the present by the same analyst and has again been much quoted without seeming to arouse suspicions of any creeping change of practice, although, because of constant involvement in other work, there has not been any opportunity to tackle the later years in a random order. Publication of the classification can therefore now be extended to significantly more years than in the original publication (Lamb, 1972). It now includes a very interesting series of six years in the 1780s, mapped by J.A. Kington (1988a,b) and classified jointly by him and the original author. The frequency of westerly days in 1781-6 was found to be very low and unmatched in the original 111-year span, although, curiously, the late 1960s, '70s and '80s have provided the nearest approach to a parallel case.

It has also become possible now to include many shorter fragments of rather earlier circulation history - some of them sequences covering a whole month - from other early years using map analyses performed in the course of studies of great historical storms and of the weather involved in the historic Irish potato famine in the 1840s, which also affected - though less severely - other European countries (Bourke and Lamb, 1984; Lamb, 1988). The storm sequences, whose analysis and other details are set forth in more detail in the author's book (Lamb, 1991), cannot of course be treated for statistical purposes in the same way as the rest of the circulation pattern history here presented, where the great diversity of weather occurred in the order that nature presented it and not in pieces selected by the analyst.

The history presented for the year 1588 may, however, be excepted from this exclusion, since we have as many as sixty days spread over the months from May to late October 1588 here classified. And over that time the storms that afflicted the Spanish Armada were occurring in different parts of our area, not repeatedly in very similar positions. Some of the characteristics of that year can therefore be seen as of more general interest. Notably, it shares with the years here included from the 1780s and 1980s an outstandingly low frequency of westerly days in this part of the world.

#### Note No.1

For an approach to recognition of a global circulation pattern, the so-called Southern Oscillation may be mentioned. The circulation pattern tendencies associated with different phases of the Southern Oscillation, which is marked by higher pressure respectively in the Indian Ocean or in the South Pacific near Easter Island (Berlage *et al.*, 1960, 1966; Walker and Bliss, 1932, 1937), which Bjerknes (1969) professed to write of as the Walker Circulation and to regard as defined by enhanced uplift over the western or eastern sides of the equatorial Pacific Ocean, is also associated with reversals of the winds in the equatorial stratosphere. Because of its

association with different circulation pattern tendencies also over the higher latitudes of both hemispheres these phenomena are probably the nearest we come to observing a circulation type of world-wide coverage. But the phases of the Southern Oscillation are usually identified, and are best identified, by index values, since they allow a great variety of flow patterns over other parts of the world, even though some patterns seem to be favoured or disfavoured.

#### Note No.2

Brackets around classifications for a number of days in early sequences in these tables indicate that knowledge of the maps for those days is not sufficient to give complete certainty about their classification but the indicators can be accepted as most probable.

### ACKNOWLEDGEMENTS

I am indebted to Dr P.D. Jones of the Climatic Research Unit for guiding me as to which references to the more recent numerical/objective classifications (which are certainly desirable in order to provide for continuity and many will think preferable for other reasons) and for writing the statements on their comparisons with the original "Lamb Classification" to go into this report.

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## J A N U A R Y

	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						
1701																																					
1737	(C)	(CN)	(CNR)	(NR)	ANW																																
1739																																					
1740											E	E	(NE)																								
1818											(W)	AW	CW	C	CW	C																					
1825																																					
1839																																					
1849																																					
1850	(W)	(W)	(SW)	(CSW)	(N)	(N)	(N)	(N)	(N)	(NE)	(NE)	(NE)	(E)	(E)	(E)	(E)	(E)	(E)	(SE)	(SE)	(SW)	(CNE)	(NE)	(N)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SW)	(SE)
1855	NW	NW	ANW																																		

# F E B R U A R Y

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

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(CNW) C N

1735

A NE NE N

1736

1791

1825 ANW NW N N A W

# M A R C H

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1625

W (NW)

1661 (N)

1751

W CH C W

1791 AN A A AW AW ANW N A A A A ASW W AW A A A AW C N NW N A A C A A A A A U

1822 (SW) (W) (NW) (W) (SH) CSW NW (ANN) (S)

# A P R I L

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

1795

C SW W C W C

# M A Y

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

1588

A A ASE U (A) A ANW (ANN) NW NW CHW NW N N N AN AN ANE ANE

1795 C U A A A ANE A NE A ANW N AN AN NE U AN SE C C A A A ANE ANE ANE ANE A N N U

# J U N E

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

1588

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1845

A AS S

J U L Y

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
1588	CE	NE	NE	N	NH	NH	A	C	C	C	C	C	CE	C	W	U	C	U	CSE	CE	CE	CN	N	U	CNE	CNE	N	N	C	C
1829																														
1845	CS	CSW	A	S	S	CSW	W																							
1846																														

E ANE A U C CNE NE  
E NE AE ANE AE  
AW A AE E

A U G U S T

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	
1588	N	A	A	A	AW	H	CH	NH	ASH	SH	SH	CSW	C	SW	SH	H	CH	N	AN	A	CE	SE	SE	S	ASE	S	A	U	A	A	AE
1737																															
1829	AN	ANH	C	CN	U	CN	U																								
1846																															

CNE CNE N

CE C

S E P T E M B E R

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
1588	AE	A	A	A	A	A	A	A	A	A	A	S	CSW	W	S	SH	SH	SH	CSW	W	W	A	CSW	SH	CSH	S	C	CN	N
1695																													
1697																													
1740																													
1741																													
1751																													
1786																													
1838																													
1845																													

CN N N CNE N N NE

CH CN N C CH CN CNH CNH C W NH

(S) (CSW) SW CSW C CSW

(C) C (CSW)(SH)

ANH CNH NH (H)

C CH CNW

(S/SE) C C C CNE

CSH SH W















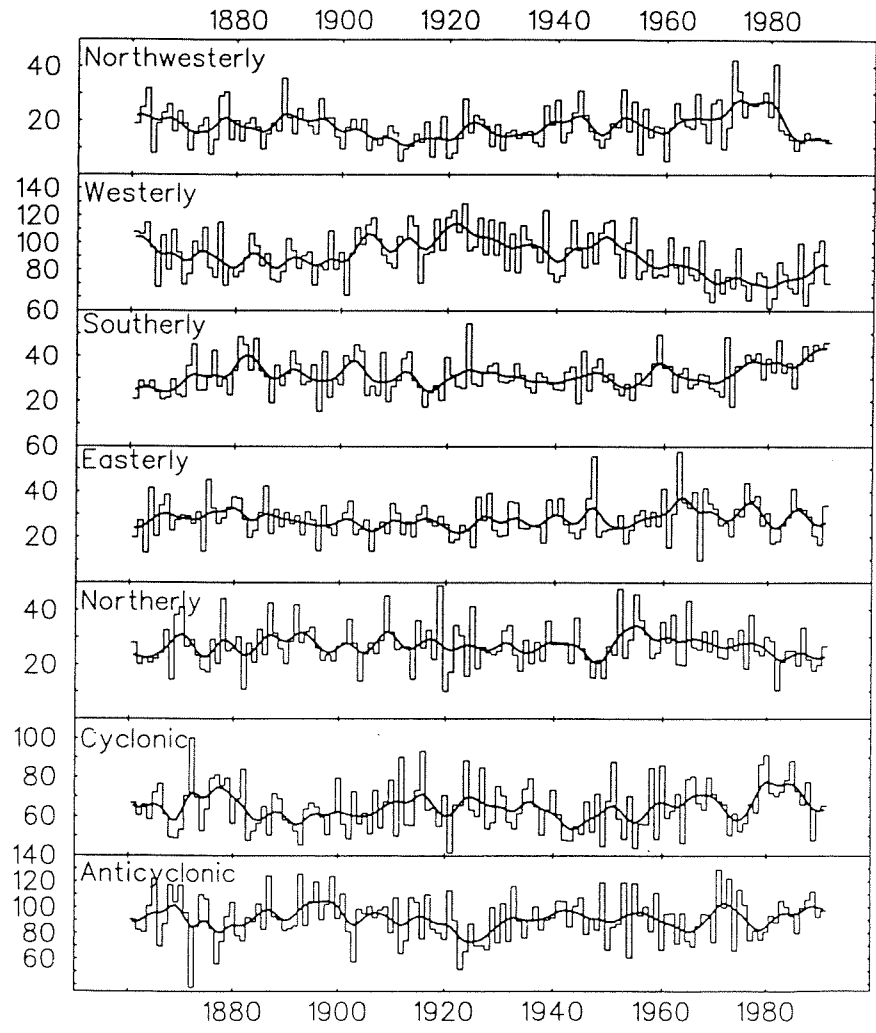


LAMB DAILY WEATHER CLASSIFICATION TYPE OVER U.K. YEAR 1990

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	S	C	CNW	U	ASE	SW	C	A	U	W	NW	A	1
2	S	C	ANW	C	ASE	C	NW	A	AW	W	N	A	2
3	S	W	AW	N	A	CW	W	A	W	W	N	ANW	3
4	S	S	W	A	A	CW	C	AW	W	W	N	AN	4
5	S	S	W	AW	U	SW	C	NW	W	W	ANE	A	5
6	SW	C	W	A	C	C	W	NW	C	C	A	A	6
7	W	C	W	AE	C	C	W	ANW	NW	N	A	C	7
8	W	W	W	A	C	C	W	AW	ANW	A	ASE	C	8
9	W	W	W	A	C	N	W	AW	A	W	SE	U	9
10	W	SW	SW	W	N	N	AW	AW	A	W	C	A	10
11	SW	C	AW	W	AN	N	AW	W	A	SW	U	N	11
12	W	CW	A	CW	ANE	AN	A	W	A	S	S	N	12
13	W	W	S	C	AE	AN	A	W	A	S	CS	A	13
14	W	W	ASW	W	U	A	ASE	W	A	S	CW	A	14
15	W	U	SW	W	SE	A	A	C	A	C	W	A	15
16	W	U	ASW	W	C	AS	A	C	A	S	W	A	16
17	W	SW	S	W	U	S	A	W	NW	CE	W	ASE	17
18	W	SW	S	W	AE	CS	AS	U	W	CE	W	A	18
19	SW	SW	SW	C	AE	S	A	C	NW	E	W	ANW	19
20	SW	SW	SW	E	ANE	C	A	W	W	E	C	C	20
21	SW	ASW	W	E	N	C	A	AW	NW	E	N	W	21
22	SW	S	W	A	A	C	A	AW	C	E	A	W	22
23	W	SW	W	A	NW	CW	A	A	C	E	W	SW	23
24	W	C	NW	A	N	CW	A	U	CN	CSE	C	SW	24
25	C	SW	A	A	ANE	W	ASE	A	N	CSE	CE	W	25
26	W	C	A	AW	A	C	SE	A	AN	C	NE	CW	26
27	C	W	U	A	A	C	C	ASW	A	C	A	W	27
28	C	C	A	A	A	U	S	S	ASW	C	A	W	28
29	S		A	A	ASW	U	S	W	U	C	A	W	29
30	S		A	A	W	C	SW	W	C	C	A	W	30
31	SW		A	A	AS	A	A	W	C	C	A	CW	31

LAMB DAILY WEATHER CLASSIFICATION TYPE OVER U.K. YEAR 1991

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	W	SE	A	W	N	NE	C	C	C	W	CSW	A	1
2	W	SE	S	W	N	U	CE	S	NE	AW	W	A	2
3	W	SE	S	W	N	CN	E	ASW	A	W	CW	A	3
4	W	E	SE	C	N	U	AE	ASW	A	CW	C	A	4
5	C	E	S	C	N	C	E	SW	ANE	W	N	AE	5
6	W	E	E	SW	NW	C	E	C	A	AW	W	A	6
7	C	E	E	W	CN	NE	E	A	A	S	W	AS	7
8	C	E	CE	W	A	A	C	A	A	S	W	A	8
9	SW	E	C	SW	A	C	U	ASW	A	E	NW	A	9
10	SW	N	C	S	A	C	AS	W	A	E	W	ASE	10
11	C	U	S	S	W	W	S	W	ANE	E	W	A	11
12	U	CN	S	C	W	C	W	AW	A	E	C	A	12
13	A	A	S	ANE	C	C	W	AW	S	C	W	A	13
14	ASE	NW	SW	A	ANW	C	CW	A	SW	CN	CN	A	14
15	SE	C	S	AE	AN	C	W	W	W	U	C	S	15
16	SE	N	C	NE	N	N	W	W	W	W	C	SW	16
17	S	U	C	AN	A	N	AW	W	SW	NW	C	W	17
18	S	A	SW	N	AW	CN	C	A	W	N	C	W	18
19	SW	A	W	N	W	C	C	AW	AW	AN	CNE	W	19
20	AW	SW	C	ANW	W	C	U	AW	A	ANW	A	W	20
21	A	C	NW	NW	AW	C	A	S	SW	ANW	A	C	21
22	A	C	N	U	A	C	ASE	CE	W	ANW	ASW	W	22
23	A	SW	N	ASW	A	C	C	C	W	ANW	S	NW	23
24	A	W	A	S	A	C	C	W	W	A	S	A	24
25	A	A	A	C	A	C	N	A	C	A	S	A	25
26	A	S	AE	A	A	C	NW	A	N	SE	SW	W	26
27	A	S	A	ASE	A	C	ASW	A	U	SE	SW	A	27
28	AS	A	A	AE	A	ANW	A	A	E	CE	SW	AW	28
29	C	A	A	C	A	AW	E	A	CNE	S	S	A	29
30	U	A	A	C	ANE	C	E	A	U	S	A	A	30
31	U		AW		NE		C	ASE		S		W	31



Annual counts of Lamb Circulation Types over the British Isles for the period 1861-1991. (Bold line shows decadal scale variations.)

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