

Further composite rainfall records for the United Kingdom

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Summary

Details concerning further composite rainfall series are presented for England and Wales. Together with previously produced series the new series will provide a basis for many studies including water resources.

Introduction

By far the best source of composite rainfall records for the United Kingdom is that put together by Tabony (1980). This gives composite series of monthly observations back to before 1860 for 39 sites in the United Kingdom and Eire. The 39 sites are listed, together with seven others constructed by the author, in Wright and Jones (1982). Tabony's (1980) data set also includes a number of records for continental Europe particularly for France, Italy, Sweden, the Netherlands and the Federal Republic of Germany. Further details of this data set and some analyses of it may be found in Tabony (1981). The method of construction of a composite record is described by Craddock and Wales-Smith (1977), Craddock (1977) and Jones (1981).

The composite series have been produced for a diversity of regions and, in the author's opinion, for most sites within the UK it should be possible to produce a composite rainfall record extending back to at least 1870 within 40 km of the chosen site. The apparent lack of long-period records on site compilations such as RAINMASTER produced by the Meteorological Office should not prove a hindrance. Consultation of the annual volumes of the excellent publication *British Rainfall* from 1865 will enable records for earlier years to be found.

The new rainfall series

As a result of recent work the author has produced homogeneous composite records for a further 15 sites. This note contains details about each site, duration of individual site records, corrective factors, etc. It is impracticable to publish all the monthly rainfall totals, but, copies can be obtained from the author in an appropriate computer media form e.g. computer listing or magnetic tape. Copies of the series will also be lodged with the Meteorological Office.

The author's work has concentrated on specific river catchments, so the new series are centred on three main regions—Devon (River Exe), south-eastern parts of Wales and neighbouring parts of England (River Wye) and northern England (Rivers Eden and Tees). Site locations and length of records for the 15 new sites are given in Table I. The Carlisle site is also given by Tabony (1980), but the record has now been extended back to 1757 making Carlisle the third longest homogeneous rainfall series in the UK.

In Appendix A the individual site records used, years of observations, heights etc. are listed for all 15 composite sites. In Appendix B the stations used to produce the composite records are given, together with the corrective factors used to adjust the older rain-gauge sites to the key site. These appendices contain the basic information for each site. For each composite record the time and effort required can be judged from the record for Cirencester (Jones, 1980). The author has also produced homogeneous

Table I. *New homogeneous rainfall records for sites commencing before 1860*

Gauge No.	Gauge name (Key site)	First year of monthly records	National Grid reference	Height metres
1	Carlisle	1757	NY390544	35
2	Darlington	1843	NZ285134	30
3	Barnard Castle	1856	NZ056164	171
4	Banbury	1850	SP458418	91
5	Bedford	1846	TL081463	29
6	Taunton	1859	ST229238	22
7	Tiverton	1854	ST035103	79
8	Cullompton-Bradninch	1837	SS994034	69
9	Ross-on-Wye	1859	SO606235	50
10	Leominster	1831	SO501587	72
11	Kington	1841	SO339576	155
12	Penrith	1851	NY497259	191
13	Appleby	1857	NY684198	146
14	Patterdale	1860	NY391163	146
15	Newton Rigg	1846	NY493310	171

Table II. *Homogeneous rainfall records for sites commencing after 1860*

Gauge No.	Gauge name (Key site)	First year of monthly records	National Grid reference	Height metres
1	Winsford	1897	SS906348	189
2	Bulland Lodge	1864	ST054273	229
3	Honeymead	1871	SS797392	378
4	Clayhanger	1865	ST022230	165
5	Exford (Lower Thorne)	1875	SS843383	290
6	Huntsham*	1874	SS990180	241
7	Dulverton	1911	SS912280	134
8	Crediton	1865	SS832006	91
9	Monmouth	1867	SO507126	16
10	Hereford*	1861	SO482433	82
11	Sarnesfield	1870	SO368509	122
12	Hay-on-Wye	1884	SO181393	84
13	Talgarth	1899	SO136354	183
14	Brecon	1867	SO037276	168
15	Evancoyd*	1885	SO261630	227
16	Llanddewi-Ystradenay	1885	SO107685	234
17	Builth Wells	1896	SO038530	229
18	Llysdinam	1882	SO009584	197
19	Llanbadarn	1895	SO097777	297
20	Llwyn Madoc	1881	SN903524	223
21	Tremothic Farm	1873	SO359317	198
22	Broadfield House	1875	NY440443	155
23	Haresceugh	1887	NY610428	244
24	Blencarn	1876	NY637312	170
25	Kirkby Stephen	1865	NY771077	191
26	Askham Hall	1865	NY515239	186
27	Wasdale Pike	1869	NY537084	564
28	Mosedale Cottage	1867	NY496095	440
29	Kidmoor	1869	NY479193	335
30	Nunwick Hall (Penrith SW)	1872	NY568352	99

* Sites where earlier rainfall records are available but which do not form a continuous link with the present series.

rainfall records for a further 30 sites with starting dates between 1861 and 1911. The names, length of record and location of these sites are given in Table II.

Some details concerning the rainfall series

Where possible, in forming a composite rainfall series, it is best to use as few as possible different gauge records, preferring those nearest the key site. For all the sites this criterion was adhered to. It can be seen from the Appendices that for most sites more gauge records were collected than necessary. The extra gauge records were used to verify the 'catch at the site records' used in the composite record.

Some of the key sites are relatively close together and it proved necessary on three occasions to use part of the same source record for two composite series. Cullompton and Tiverton both use the Halberton record for the year 1957 while the series for Barnard Castle and Darlington both use years from Catterick (Tunstall), although in this case the years used in each series are not the same. Kington and Leominster both use the years 1856 and 1857 of the Orleton record.

At Kington the source record from Lynhales (Robinson) has two corrective factors caused by a change of site. In this case the site change was documented in the 10-year rainfall books at the Agriculture and Hydrometeorology Branch of the Meteorological Office. Where a site change or gauge change was suspected, but not documented, the particular record was rejected and replaced by an alternative. This proved possible in most cases because of the abundance of gauge records. The major exception to this was the Castle Road record for Bedford. It appears from comparisons with other gauges that this site was at Castle Road only since 1904. The record shows a distinct inhomogeneity before 1902.

By far the longest series produced is the extension of Tabony's (1980) record for Carlisle back to 1757. Apart from the records used from Dumfries and Applegarth Manse (Dumfriesshire) all the records for producing the Carlisle series are from within 10 miles of Carlisle. Unfortunately, only annual values are available for some years in the 1780s for the Dumfries record. The main bases of the extended record are the two records from Carlisle, those kept by Dr J. Carlyle between 1757-1783 in Abbey Street and by Mr Pitt at Shaddongate between 1801-24. The latter observer also took daily air temperature readings for the same period and these are also available.

Conclusions

The new composite series presented here together with previous published series, particularly those given by Tabony (1980), facilitate studies of the long term spatial variability of rainfall and its spectral behaviour (e.g. Tabony 1977, 1981), as well as riverflow reconstruction (e.g. Wright and Jones, 1982).

Acknowledgements

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Appendix A. Individual site records collected at each key site.

Gauge No.	Gauge name	Years of observations (Missing years in parentheses)	Observer(s)*	Height metres
1	<i>Carlisle</i>			
	Carlisle (Tabony)	1845 →	Carlisle Council	35
	Athenacum	1841-1848	N. Fisher	?
	Harraby	1840-1846	J. Atkinson	?
	Carlisle (Elliot)	1835-1842	Dr Elliot	?
	Wigton	1822-1826	J. Pemberton	?
	Wigton, Aikbank	1792-1809	Revd J. Golding	?
	Carlisle, Shaddongate	1801-1824	Mr Pitt	12
	Carlisle, Abbey Street	1757-1783	Dr J. Carlyle	25
	Dumfries	1775-1789	Dr Copeland	?
	Whinfell Hall	1829-1833	W. Robinson	?
	Applegarth Manse	1827-1850	Revd W. Dunbar	55
	Scaleby House	1863-1940	R. A. Allison	34
2	<i>Darlington</i>			
	South Park	1923 →	Mr J. Morrison	30
	Public Park	1898-1922 (1907/9/12)	Mr J. Morrison	46
	Hummersknott	1898-1930 (1919)	Mr J. Short	61
	Elcott Hurworth	1890-1903	Revd W. E. Short	37
	Hurworth Grange	1890-1915	Mrs Backhouse	49
	Cleveland Parade	1874-1917	S. Hare (W. W. Willmott)	49
	South-east Gardens	1859-1897 (1873/4)	J. Richardson	43
	Catterick (Tunstall)	1866-1888	H. G. Marshall	107
	Richmond	1843-1872	J. Miller	168
3	<i>Barnard Castle</i>			
	Bowes Museum	1922 →	Curator	171
	County School	1888-1950	E. Wells (Bursar)	168
	East Layton	1875-1913	Miss Maynard (Miss Proud)	175
	Whorlton	1879-1894 (1880)	Miss Dodgson	129
	Greta Bridge	1869-1974	T. Dodgson	131
	Catterick (Tunstall)	1866-1888	H. G. Marshall	107
Winston	1856-1867	T. Dodgson	140	

Appendix A. *continued*

Gauge No.	Gauge name	Years of observations (Missing years in parentheses)	Observer(s)*	Height metres
4	<i>Banbury</i>			
	Grimsbury	1886 →	Superintendent	91
	West Adderbury	1892-1967	Lt.-Gen. Sir E. Graset	103
	High Street	1852-1887	T. Beesley	105
	Wroxton	1876-1885	A. R. Tawney	149
	Cotefield Bodicote	1876-1891	T. E. Cobb	117
	Parson's Street	1850-1872	J. E. Jarvis	104
	Bodicote	1894-1924	J. F. Starkey	118
	Bloxham Grove	1890-1914	Revd G. Warriner	118
5	<i>Bedford</i>			
	Observatory	1831-1843 (incomplete)	Admiral Smyth/Mr Glanville	?
	Bedford	1851-1865	Dr H. Barker	32
	Western Street	1869-1893	D. Roble	34
	Castle Road	1878-1960 (1903)	Newbury family	30
	Tempsford Hall	1873-1892	Col. W. Stuart	24
	Clapham Park	1875-1888	J. Howard	67
	The Park (Mowsbery)	1906-1973	Borough Engineer	36
	Bedford (Meteorological Office)	1957 →	Meteorological Office staff	85
	Cardington (Meteorological Office)	1953 →	Meteorological Office staff	29
	St. Peter's Street	1888-1908	W. Godfrey	35
	Amphill Road	1902-1908	T. Pearse	27
	Cardington Village	1846-1890	J. McLaren	27
	Cardington Village (Post)	1848-1869	J. McLaren	27
The Grove	1888-1899	W. B. Graham	33	
6	<i>Taunton</i>			
	Vivary Park	1910 →	Taunton Borough Council	22
	Milverton Old Halls	1877-1944	Bere family	76
	Cothelstone House	1875-1921	C. E. J. Esdaile	131
	Blagdon Hill Reservoir	1894-1921	H. J. Coles	179
	Claremont	1891-1901	E. Ball	24
	Norton Fitzwarren	1888-1894	H. Ruddle	43
	Bishop's Lydeard House	1872-1889	C. Smith	56
	Fulland's School	1865-1884	N. Reed	?
	Castle	1855-1874 (incomplete 1858-9)	G. Gillett	15
7	<i>Tiverton</i>			
	Willand, Losinga	1972 →	Mrs M. Godfrey	79
	Willand	1958-1971	I. M. Godfrey	75
	Halberton	1940-1962	Miss M. G. Izat	91
	Halberton	1906-1929 (1917-20)	Capt. G. Izat	73
	Blundell's School	1929-1941	E. G. Pierce	82
	Hartnolls	1913-1930	Maj.-Gen. Bowles	69
	St. Aubryn's Park	1921-1940	Mr Fox-Strangeways	120
	Ivy Place, St. Peter's Street	1880-1909	H. S. Gill	82
	Cove	1862-1894	W. N. Row	140
Hayne	1854-1864	W. H. Gamber	122	

Appendix A. *continued*

Gauge No.	Gauge name	Years of observations (Missing years in parentheses)	Observer(s)*	Height metres
8	<i>Cullompton-Bradninch</i>			
	Bradninch, Westfield	1959 →	C. W. Beer	69
	Halberton	1940-1962	Miss M. G. Izat	91
	Bradninch	1905-1956	Miss H. R. Hepburn	91
	Cullompton	1881-1952	T. Turner (Foster, Trezise)	62
	Bradninch Vicarage	1877-1887	Revd W. A. Strong	96
	Strathculme	1864-1882	C. R. Collins	48
	Clyst Hydon	1847-1880	Revd J. Huyshe	61
	Bradninch	1842-1873	C. Matthews	71
Broadhambury	1837-1873	Revd W. Heberden	122	
9	<i>Ross-on-Wye</i>			
	Alton Court	1966 →	Welsh Water Authority	50
	Ross, Perrystone Court	1890-1973	Mr T. Greenaway	158
	Ross, Graig	1859-1943	H. Southall	65
10	<i>Leominster</i>			
	Leominster	1966 →	Welsh Water Authority	72
	Kimbolton, Grantsfield	1913-1968	Miss D. W. Hutchinson	129
	Farm	1883-1912	E. H. Southall	79
	West Lodge	1858-1882	E. H. Southall	76
	Orleton	1831-1896	T. H. Davis	59
	Pembridge, Weobley	1888-1929	T. L. Hall	88
11	<i>Kington</i>			
	Lyonshall	1942 →	R. H. Green	155
	Lynhales	1927-1944	Mrs R. F. Hibbert	189
	Sunset	1919-1936	H. Langston	151
	Pembridge, Weobley	1888-1929	T. L. Hall	88
	Lynhales	1867-1917	S. Robinson	173
	Orleton	1831-1896	T. H. Davis	59
	Titley	1841-1855	R. B. Boddington	180
12	<i>Penrith</i>			
	Tirrill	1969 →	R. F. Porter	191
	Castle Park	1938-1974	Borough Engineer	149
	Benson House	1913-1956	A. B. Sinclair	152
	Fell Lane, Fir Bank	1866-1930	H. Lester	175
	Nordana	1887-1908	G. V. Smith	198
	Brougham Hall	1851-1885	Mr A. Lodge	149
Penrith	1835-1854 (1840-50)	Mr Bird	?	
13	<i>Appleby</i>			
	Castle Bank	1890 →	Lady Holmes	146
	Bongate	1941 →	J. F. Whitehead	151
	Appleby	1857-94	Dr Armstrong	135
14	<i>Patterdale</i>			
	Patterdale Hall	1835 → (1957-60)	Mr A. Milne/Miss C. Marshall	146
	Greenside Mine	1872-1961	Basinghall Mining Syndicate Ltd	335
	Grisdale Ruthwaite Lodge	1889-1935	Mr A. Milne/Miss C. Marshall	534

Appendix A *continued*

Gauge No.	Gauge name	Years of observations (Missing years in parentheses)	Observer(s)*	Height <i>metres</i>
15	<i>Newton Rigg</i> Newton Rigg	1883 → (1950, 1894-99)	Cumbria College of Agriculture and Forestry	171
	Hutton John	1916-1968	F. Huddleston	210
	Blencowe	1871-1896	T. Fawcett	183
	Greystoke Castle	1887-1925	A. Tremayne-Butler	198
	Greystoke Castle	1846-1874	T. G. Benn	213

* Where there has been more than one observer, only the observer who took the readings over the longest period is given.

Appendix B. *Individual site records used to form composite series together with corrective factors*

Gauge No.	Gauge name	Years used	Factor
1	<i>Carlisle</i>		
	Carlisle (Tabony)	1845 →	1.0
	Harraby	1840-1844	0.864
	Carlisle (Elliot)	1835-1839	0.946
	Applegarth Manse	1834	0.842
	Whinfell Hall	1829-1833	0.582
	Applegarth Manse	1827-1828	0.842
	Wigton	1825-1826	0.969
	Carlisle, Shaddongate	1801-1824	1.019
	Wigton, Aikbank	1792-1800	0.869
	Dumfries	1784-1791	0.703
Carlisle, Abbey Street	1757-1783	1.112	
2	<i>Darlington</i>		
	South Park	1923 →	1.0
	Hummersknott	1920-1922	1.0094
	Public Park	1919	1.0
	Hummersknott	1918	1.0094
	Cleveland Parade	1877-1917	0.9993
	Catterick (Tunstall)	1873-1876	1.0083
Richmond	1843-1872	0.8789	
3	<i>Barnard Castle</i>		
	Bowes Museum	1922 →	1.0
	County School	1895-1921	1.0204
	Whoriton	1881-1894	1.0918
	East Layton	1875-1880	1.0833
	Greta Bridge	1869-1874	1.0906
	Catterick (Tunstall)	1868	1.2295
Winston	1856-1867	1.2585	

Appendix B. *continued*

Gauge No.	Gauge name	Years used	Factor
4	<i>Banbury</i>	1968 →	1.105
	Grimsbury	1925-1967	1.0
	West Adderbury	1894-1924	0.964
	Bodicote	1890-1893	1.009
	Bloxham Grove	1886-1889	0.993
	Cotefield Bodicote	1873-1885	0.997
	High Street	1850-1872	1.0
	Parson's Street		
5	<i>Bedford</i>	1969 →	1.0
	Cardington (Meteorological Office)	1968	1.17
	Cardington (Meteorological Office)	1954-1967	1.0
	Cardington (Meteorological Office)	1904-1953	0.948
	Castle Road	1900-1903	0.973
	St. Peter's Street	1891-1899	0.962
	The Grove	1846-1890	0.936
	Cardington Village		
6	<i>Taunton</i>	1910 →	1.0
	Vivary Park	1894-1909	0.8485
	Blagdon Hill Reservoir	1888-1893	0.9346
	Norton Fitzwarren	1884-1887	0.9792
	Bishop's Lydeard	1865-1883	1.1533
	Fulland's School	1859-1864	1.1116
	Castle		
7	<i>Tiverton</i>	1972 →	1.0
	Willand, Losinga	1958-1971	0.965
	Willand	1942-1957	1.0161
	Halberton	1929-1941	0.9383
	Blundell's School	1921-1928	0.8665
	Halberton	1917-1920	0.8906
	Hartnolls	1906-1916	0.9744
	Halberton	1892-1905	0.9189
	Ivy Place	1862-1891	0.8768
	Cove	1854-1861	0.8768
	Hayne		
8	<i>Cullompton-Bradninch</i>	1859 →	1.0
	Bradninch, Westfield	1957-1958	1.035
	Halberton	1953-1956	1.026
	Bradninch	1881-1952	0.9771
	Cullompton	1847-1880	1.1051
	Clyst Hydon	1837-1846	1.0455
	Broadhambury		
9	<i>Ross-on-Wye</i>	1974 →	1.0
	Alton Court	1936-1973	0.9625
	Ross, Perrystone Court	1859-1935	0.982
	Ross, Graig		
10	<i>Leominster</i>	1969 →	1.0
	Leominster	1913-1968	1.0338
	Kimbolton, Grantsfield	1896-1912	1.0513
	Farm	1883-1895	0.9459
	Farm	1858-1882	1.1226
	West Lodge Orleton	1831-1857	0.9964

Appendix B. *continued*

Gauge No.	Gauge name	Years used	Factor
11	<i>Kington</i>		
	Lyonshall	1945 →	1.0
	Lynhales	1927-1944	1.069
	Sunset	1919-1926	1.0765
	Pembridge, Weobley	1918	1.211
	Lynhales	1874-1917	1.0237
	Lynhales	1867-1873	1.1566
	Orleton	1856-1866	1.1616
	Titley	1848-1855	1.199
12	<i>Penrith</i>		
	Tirrill	1975 →	1.0
	Castle Park	1954-1974	1.233
	Benson House	1931-1953	1.2208
	Fell Lane, Fir Bank	1874-1930	1.3212
13	<i>Appleby</i>		
	Castle Bank	1890 →	1.0
14	<i>Patterdale</i>		
	Patterdale Hall	1961 →	1.0
	Greenside Mine	1957-1960	0.9453
15	<i>Newton Rigg</i>		
	Newton Rigg	1951 →	1.0
	Hutton John	1950	0.7285
	Newton Rigg	1926-1949	1.0226
	Greystoke Castle	1887-1925	0.8517
	Blencowe	1874-1886	0.9218
	Greystoke Castle	1846-1873	0.9265

Notes and news

Retirement of Dr Gwyn James

Dr D. G. James, Chief Meteorological Officer, Meteorological Research Flight, Farnborough, retired from the Meteorological Office on 17 September 1982 after a career of 32 years.

Gwyn James was educated at Barry County School and University College, Cardiff. After two years working at the Telecommunications Research Establishment (Malvern) and in industry, he returned to Cardiff to complete the honours course in mathematics and in 1950 obtained a Ph.D. for research into flow over two-dimensional aerofoils. He joined the Meteorological Office later that year as a Scientific Officer and after a period of forecasting training was posted to the Meteorological Research Flight at Farnborough. There he did pioneer work on the measurement of the fine scale structure of convection.