CHAPTER 2

PHYSICAL GEOGRAPHY AND METEOROLOGY

General description of Australia

Geographical position

The Australian Commonwealth, which includes the island continent of Australia and the island of Tasmania, is situated in the Southern Hemisphere, and comprises an area of 2,967,909 square miles, the mainland alone containing 2,941,526 square miles. Bounded on the west and east by the Indian and Pacific Oceans respectively, it lies between longitudes 113° 9′ E. and 153° 39′ E., while its northern and southern limits are the parallels of latitude 10° 41′ S. and 43° 39′ S., or, excluding Tasmania, 39° 8′ S. On its north are the Timor and Arafura Seas and Torres Strait, on its south the Southern Ocean*. The extreme points are Steep Point on the west, Cape Byron on the east, Cape York on the north, and South-East Cape or, if Tasmania be excluded, Wilson's Promontory, on the south. The difference in latitude between Cape York and Wilson's Promontory is 1,959 miles, and in longitude between Steep Point and Cape Byron 2,489 miles.

Tropical and temperate regions

Of the total area of Australia, nearly 39 per cent lies within the tropics. Taking the latitude of the Tropic of Capricorn as 23° 30′ S., the areas within the tropical and temperate zones are approximately as follows.

AREAS OF TROPICAL AND TEMPERATE REGIONS: STATES AND TERRITORIES

(Square miles)

Area	N.S.W. (a)	Vic.	Qld	S.A.	W.A.	Tas.	N.T.	Total
Within tropical zone	. .	. .	360,642	. .	364,000	. .	422,980	1,147,622
„ temperate zone	310,372	87,884	306,358	380,070	611,920	26,383	97,300	1,820,287
Total area	**310,372**	**87,884**	**667,000**	**380,070**	**975,920**	**26,383**	**520,280**	**2,967,909**

(a) Includes Australian Capital Territory (939 square miles).

Fifty-four per cent of Queensland lies within the tropical zone and 46 per cent in the temperate zone: 37 per cent of Western Australia is tropical and 63 per cent temperate: while 81 per cent of the Northern Territory is tropical and 19 per cent temperate. All the remaining States lie within the temperate zone. The tropical part of Australia thus comprises about 39 per cent of the whole of the continent.

Area of Australia compared with areas of other countries

The area of Australia is almost as great as that of the United States of America excluding Alaska, four-fifths of that of Canada, more than half as large again as Europe excluding the U.S.S.R., and about twenty-five times that of Great Britain and Ireland. The areas of Australia and of certain other countries are shown in the table on the following page. The areas shown are in the main obtained from the *Demographic Yearbook*, 1965, published by the Statistical Office of the United Nations, and the countries have been arranged in accordance with the continental groups used therein.

* The Southern Ocean is a local designation for that part of the Indian Ocean lying between the southern shores of Australia and Antarctica.

AREA OF AUSTRALIA AND OF OTHER COUNTRIES, *circa* 1964

('000 square miles)

Country	Area
Continental divisions—	
Europe(*a*)	1,903
Asia(*a*)	10,661
U.S.S.R. (Europe and Asia)	8,650
Africa	11,683
North and Central America and West Indies	9,365
South America	6,875
Oceania	3,285
Total, World, excluding Arctic and Antarctic continents	**52,422**
Europe(*a*)—	
France	211
Spain (incl. possessions)	195
Sweden	174
Finland	130
Norway	125
Poland	121
Italy	116
Yugoslavia	99
Germany, Fed. Republic of	96
United Kingdom	94
Romania	92
Other	451
Total, Europe(a)	*1,903*
Asia(*a*)—	
China, Mainland	3,692
India	1,176
Saudi Arabia	870
Iran	636
Mongolia	593
Indonesia	576
Pakistan	366
Trucial Oman	301
Turkey	292
Burma	262
Afghanistan	250
Thailand	198
Iraq	173
Other	1,275
Total, Asia(a)	*10,661*
U.S.S.R.—	
Total, U.S.S.R.	*8,650*
Africa—	
Sudan	967
Algeria	920
Congo, Democratic Republic of	906
Libya	679
Chad	496
Africa—*continued*	
Niger	489
Angola	481
Ethiopia	472
South Africa, Republic of	471
Mali	464
Mauritania	398
United Arab Republic	386
Tanzania, United Republic of	363
Nigeria	357
South-West Africa	318
Mozambique	302
Zambia	291
Somalia	246
Central African Republic	241
Madagascar	227
Kenya	225
Other	1,984
Total, Africa	*11,683*
North and Central America—	
Canada	3,852
United States of America(*b*)	3,615
Greenland	840
Mexico	762
Nicaragua	54
Cuba	44
Honduras	43
Other	155
Total, North and Central America	*9,365*
South America—	
Brazil	3,286
Argentina	1,072
Peru	496
Colombia (excl. Panama)	440
Bolivia	424
Venezuela	352
Chile	292
Paraguay	157
Ecuador	109
Other	246
Total, South America	*6,875*
Oceania—	
Australia	2,968
New Zealand	104
New Guinea(*c*)	92
Papua	86
Other	36
Total, Oceania	*3,285*

(*a*) Excludes U.S.S.R., shown below. (*b*) Includes Hawaii. (*c*) Australian Trust Territory. Western New Guinea (West Irian) is included in Other Asia.

AREAS OF STATES AND TERRITORIES AND STANDARD TIMES

State or Territory	Area	Percentage of total area	Standard times	
			Meridan selected	Ahead of G.M.T.
	sq miles			hours
New South Wales	309,433	10.43	150° E.	10
Victoria	87,884	2.96	150° E.	10
Queensland	667,000	22.47	150° E.	10
South Australia	380,070	12.81	142°30′E.	9½
Western Australia	975,920	32.88	120° E.	8
Northern Territory	520,280	17.53	142°30′E.	9½
Australian Capital Territory	939	0.03	150° E.	10
Mainland	*2,941,526*	*99.11*	..	..
Tasmania	26,383	0.89	150° E.	10
Australia	**2,967,909**	**100.00**	..	..

(*a*) Includes Australian Capital Territory.

Geographical features of Australia

The following description is a broad summary of the main physical characteristics of the Australian continent.

A section through the Australian continent from east to west, at the point of its greatest breadth, shows first a narrow belt of coastal plain. This plain, extending north and south along the whole east coast, is well watered by rivers. It is of variable width, seldom more than sixty or seventy miles, and occasionally only a few miles, the average being roughly about forty to fifty miles. Bordering this plain is the Great Dividing Range, which extends from the north of Queensland to the south of New South Wales, and thence one branch sweeps westwards towards the boundary of Victoria and South Australia, and the other, the main branch, terminates in Tasmania. This range, which rises, often abruptly, from the plain, frequently presents bold escarpments on its eastern face, but the descent on its western slopes is gradual, until, in the country to the north of Spencer's Gulf, the plain is not above sea-level and occasionally even below it. Thence there is another almost imperceptible rise until the mountain ranges of Western Australia are reached, and beyond these lies another coastal plain. The mountains of Australia are relatively low, the highest peak, Mount Kosciusko, in New South Wales, being only about 7,300 feet. Three-quarters of the land-mass of Australia lies between the 600 and 1,500 feet contours in the form of a huge plateau, constituting the most distinctive feature of the Australian continent, to which the peculiarities of Australia's climate can probably be largely ascribed.

The rivers of Australia may be divided into two major classes, those of the coastal plains with moderate rates of fall and those of the central plains with very slight fall. Of the former not many are navigable for any distance from their mouths, and bars make many of them difficult of access or inaccessible from the sea.

The two longest rivers of the northern part of the east coast are the Burdekin and the Fitzroy in Queensland. The Hunter is the largest coastal river of New South Wales, and the Murray River, with its great tributary the Darling, drains part of Queensland, the major part of New South Wales, and a large part of Victoria, finally flowing into the arm of the sea known as Lake Alexandrina, on the eastern side of the South Australian coast. The total length of the Murray is about 1,600 miles, 400 being in South Australia and 1,200 constituting the boundary between New South Wales and Victoria. The total length of the Murray-Darling from the source of the Darling to the mouth of the Murray is about 2,300 miles. The rivers of the north-west coast of

Australia (Western Australia), e.g. the Murchison, Gascoyne, Ashburton, Fortesque, De Grey, Fitzroy, Drysdale and Ord are of considerable size. So also are those in the Northern Territory, e.g. the Victoria and Daly, and those on the Queensland side of the Gulf of Carpentaria, such as the Gregory, Leichhardt, Cloncurry, Gilbert and Mitchell. The rivers of Tasmania have short and rapid courses, as might be expected from the configuration of the country.

The 'lakes' of Australia may be divided into three classes: true permanent lakes: lakes which, being very shallow, become mere morasses in dry seasons or even dry up and finally present a cracked surface of salt and dry mud; and lakes which are really inlets of the ocean, opening out into a lake-like expanse. The second class is the only one which seems to demand special mention. These are a characteristic of the great central plain of Australia. Some of them, such as Lakes Torrens, Gairdner, Eyre, and Frome, are of considerable extent.

For further information on the geographical features of Australia earlier issues of the Year Book should be consulted. The list of special articles, etc. at the end of this volume indicates the nature of the information available and its position in the various issues.

Climate and meteorology of Australia

This section has been prepared by the Director of the Commonwealth Bureau of Meteorology, and the various States and Territories have been arranged in the standard order adopted by that Bureau. The section concludes with a brief summary of the weather of 1966.

Introduction

Australia extends from about latitude 10° S. to latitude 44° S., but owing largely to the moderating effects of the surrounding oceans and the absence of very pronounced and extensive mountain masses it is less subject to extremes of climate than are regions of similar size in other parts of the world. The average elevation of the land surface is low—probably close to 900 feet above the sea; while the maximum altitude is just above 7,300 feet. Latitude for latitude the Australian climate is generally more temperate than that of the other large land masses of the earth, although it varies considerably from the tropical to the alpine.

The Australian meteorological seasons are: Summer—December, January, February; Autumn—March, April, May; Winter—June, July, August; Spring—September, October, November.

The following general discussion of the climate of Australia is necessarily brief. However, extensive records of Australian climatic data are held and published in various forms by the Bureau of Meteorology. A programme of regional climatic survey has been in progress for some years, and a large number of studies have been published by the Bureau of Meteorology by the Department of National Development and by State Development Authorities. The Bureau of Meteorology welcomes inquiries for climatic information, which may be made at its Central Office in Melbourne or through the Regional Offices which are situated in each of the State capital cities and in Darwin. Reference may also be made to various bulletins and research papers mentioned in this text for more detailed information on particular topics.

Precipitation

Precipitation of moisture from the atmosphere may take various forms depending chiefly on the thermal conditions existing at the time. Within the Australian region precipitation occurs chiefly as rain because of the generally mild temperatures, but may also occur as snow or hail. Broadly, the immediate physical cause of rainfall may be said to be the lifting of moist air with resultant cooling, condensation into cloud, and eventual precipitation of the heavy water droplets as rain. This process may be achieved by three different means each of which may be combined with either or both of the others:

(*a*) Orographic lifting caused by winds blowing onto rising terrain;

(*b*) convectional lifting resulting in the development of individual rain clouds of the cumulus or cumulonimbus type producing showers and thunderstorms;

(*c*) lifting of a warm air mass as it rises over cooler air—known as a 'frontal' process.

Average annual rainfall. The distribution of the average annual rainfall over Australia is shown in plate 2 (between pages 32 and 33), while plate 3 shows the distribution in 1966.

While Australia is a continent of comparatively low relief, the orographic processes in rain production are very marked in the chain of the Great Dividing Range bordering the whole east coast of the continent, in the ranges of the south-western corner of Western Australia, and in Tasmania. Thus on the east coast the higher rainfall areas lie between the ranges and the Pacific Ocean in the region of prevailing south-east wind circulation. In Tasmania and the south-west of Western Australia the region of high rainfall lies between the ranges and the ocean to the west, these areas lying in a region of predominantly westerly wind flow.

The north-western part of the continent and to some extent the whole region of the Northern Territory and inland north Queensland comes under the influence of the Australian-Asian monsoon. This results in high rainfalls in a summer wet season with the inflow of moist air from the north-west, and a winter dry season with predominantly south-east winds blowing across the dry regions of the interior and producing little rainfall. Tropical cyclones affect the waters adjacent to the north-east and north-west of Australia between December and April. Their frequency varies greatly from season to season, but on the average about three of these disturbances occur in the Coral Sea each season and about two in the eastern Indian Ocean adjacent to the west coast of the continent. When tropical cyclones move close to the tropical coast of the continent they cause very heavy rainfalls over the coastal regions. On occasions these cyclones move over the land and lose intensity, but may still continue to be accompanied by heavy rainfall along their path.

Southern Australia lies in the region of the mid-latitude westerlies for the winter half of the year and is subject to the rain-producing influences of the great depressions of the Southern Ocean and their associated frontal systems. The combined effects of these systems and the topography lead to high winter rainfalls in south-western and south-eastern Australia and in Tasmania, with the highest falls occurring on the windward side of the mountains. The rainfall generally decreases inland with distance from the coast, although the 10-inch isohyet reaches the shore of the Great Australian Bight and the central western coast of Western Australia in regions which are of very flat relief and which because of their position and the orientation of the coastline are only rarely exposed to moist winds.

AREA DISTRIBUTION OF AVERAGE ANNUAL RAINFALL STATES AND TERRITORIES

(Per cent)

Average annual rainfall	W.A.	N.T.	S.A.	Qld	N.S.W. (a)	Vic.	Tas.	Total
Under 10 inches .	58.0	24.7	82.8	13.0	19.7	Nil	Nil	39.0
10 and under 15 inches .	22.4	32.4	9.4	14.4	23.5	22.4	Nil	20.6
15 " " 20 " .	6.8	9.7	4.5	19.7	17.5	15.2	0.7	11.2
20 " " 25 " .	3.7	6.6	2.2	18.8	14.2	17.9	11.0	9.0
25 " " 30 " .	3.7	9.3	0.8	11.6	9.1	18.0	11.4	7.2
30 " " 40 " .	3.3	4.7	0.3	11.1	9.9	16.1	20.4	6.1
40 inches and over . .	2.1	12.6	Nil	11.4	6.1	10.4	56.5	6.9
Total . . .	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Includes Australian Capital Territory.

The region with the highest average annual rainfall is the east coast of Queensland between Port Douglas and Cardwell, where Tully has an annual average of 177 inches. A further very high rainfall region is the mountainous west coast of Tasmania, where Lake Margaret has the highest average annual total of 145 inches. The area of lowest average annual rainfall is that of some 180,000 square miles surrounding Lake Eyre in South Australia, where on the average only 4 to 6 inches are received annually. The lowest average over a long period of record is at Troudaninna—4.13 inches. Rain occurs very irregularly, averaging only about one or two days a month in this region.

Of all the continents (excluding Antarctica), Australia receives the least average depth of rainfall and has the least run-off from its rivers into the oceans. Only in relatively small areas of the continent could the rainfall be described as abundant.

Seasonal distribution of rainfall. The average monthly distribution of rainfall in the various Australian rainfall districts is shown by the histograms of plate 4.

The following are the most marked features.

(*a*) The clearly defined wet summer and dry winter of the monsoon region of northern Australia.

(*b*) The more regular distribution of rainfall throughout the year in south-eastern Australia. In the region to the south and west of the Great Dividing Range a less pronounced maximum of rainfall is noticeable in the winter or early spring. On the Gippsland (eastern Victoria) coast the rainfall is fairly evenly distributed throughout the year but further along the east coast of the continent the rainfall minimum in late winter and early spring begins to appear and becomes more marked as the tropical regions are approached.

(*c*) The marked maximum of rainfall in the south-western districts of Western Australia in winter—the period of the most active southern depressions and frontal systems in this region.

For further information on monthly rainfalls reference may be made to the various Australian rainfall bulletins, to the Climatological Surveys of particular districts and to the annual rain maps and books of normals (standard 30 year periods), all published by the Bureau of Meteorology.

Variability of rainfall. For most agricultural pursuits a more important criterion of the value of rainfall is its variability or reliability. The adequate description of rainfall variability over an extensive geographical area is a matter of some difficulty. Probably the best available measures are to be found in the tables which have been calculated for a number of individual stations in some of the Climatological Survey districts. These tables show the percentage chances of receiving specified amounts of rainfall in monthly seasonal or annual time spans. Statistical indexes of rainfall variation based on a number of different techniques have been used to produce maps which show the main features of the variability of annual rainfall over Australia. A discussion of these methods and the maps is given by F. Loewe in *Some Considerations Regarding the Variability of Annual Rainfall in Australia*, Bureau of Meteorology Bulletin No. 39 (1948).

In general it may be stated that the regions of most reliable rainfall are the south-west of Western Australia, western Tasmania, and western and southern Victoria south of the divide. These areas have one of the most reliable rainfalls in the world. Elsewhere in Australia the degree of variability, in general, increases inland but the region of the highest variability for low average annual rainfalls extends across the central part of the continent from south-western Queensland to the central coast of Western Australia. Some outstanding examples of the numerous instances of high rainfall variability throughout Australia are given below.

At Onslow (Western Australia) annual totals vary from 0.05 inches to 28 inches, and in the four consecutive years 1921 to 1924 the annual totals were 22.25, 2.71, 26.82, and 2.18 inches respectively. At Whim Creek, where 29.41 inches have been recorded in a single day, only 17 points (0.17 inches) were received in the whole of 1924. Great variability can also occur in the heavy rainfall areas, e.g. at Tully the annual rainfalls have varied from 310.92 inches in 1950 to 104.98 inches in 1943.

The following table of annual rainfall for the Australian capital cities for the past thirty years indicates the variation in rainfall at these sites.

RAINFALL: AUSTRALIAN CAPITAL CITIES, 1936 TO 1965

Year	Perth		Adelaide		Brisbane		Sydney		Canberra(*a*)		Melbourne		Hobart(*b*)	
	Amount	No. of days	Amount	No. of days	Amount	No. of days	Amount	No. of days	Amount	No. of days	Amount	No. of days	Amount	No. of days
	in		in		in		in		in		in		in	
1936	30.64	118	19.34	121	21.77	101	30.22	130	26.24	108	24.30	187	19.60	178
1937	35.28	120	23.01	128	34.79	113	52.00	157	20.46	82	21.45	144	20.65	160
1938	29.64	111	19.26	119	43.49	110	39.17	132	19.26	79	17.63	131	31.32	169
1939	45.70	123	23.29	139	41.43	122	33.67	127	27.63	116	33.11	166	27.23	188
1940	20.00	98	16.16	116	42.37	93	39.34	125	17.38	64	19.83	126	17.17	135
1941	34.74	122	22.56	126	31.50	105	26.74	129	19.55	91	31.78	157	23.49	145
1942	39.24	140	25.44	133	44.01	125	48.29	121	25.76	104	29.79	148	19.42	163
1943	31.46	117	17.84	135	50.68	126	50.74	136	24.59	123	18.80	150	20.84	149
1944	27.39	123	17.13	114	27.85	100	31.04	115	12.05	75	21.32	143	26.23	151
1945	52.67	137	17.85	105	48.16	130	46.47	136	22.35	100	19.22	152	16.92	157
1946	41.47	122	22.59	135	38.66	83	36.05	111	22.31	94	29.80	177	39.45	193
1947	43.42	137	21.89	146	60.30	146	41.45	137	27.95	135	30.47	163	38.61	181
1948	34.75	126	21.40	122	41.54	106	38.83	131	32.11	101	20.98	155	23.42	178
1949	27.15	126	18.23	119	47.18	121	66.26	149	27.71	100	31.41	163	22.85	157
1950	32.27	122	16.06	91	63.93	152	86.33	183	43.35	132	26.18	147	19.25	131
1951	34.14	127	25.44	135	33.89	87	53.15	143	22.00	103	29.85	155	24.57	163
1952	39.28	123	19.99	128	33.49	122	59.19	130	37.87	141	34.39	177	30.35	165
1953	37.14	119	20.00	121	43.60	101	40.86	110	19.40	102	28.38	148	28.06	162
1954	28.05	112	16.73	109	61.36	142	41.29	134	18.81	82	33.53	139	27.20	143
1955	46.52	138	24.58	134	50.41	136	72.46	160	30.85	124	30.70	160	22.32	168
1956	37.35	107	27.24	154	59.18	120	67.33	155	40.46	150	30.96	188	36.63	175
1957	33.40	117	16.71	110	20.58	80	27.13	110	14.41	81	20.68	146	28.66	129
1958	32.08	107	17.57	121	46.61	115	59.19	144	30.23	117	26.98	155	36.55	166
1959	24.23	114	11.32	88	45.84	146	59.67	164	34.41	112	25.84	131	19.28	136
1960	28.21	112	23.07	129	27.51	103	51.01	152	30.99	136	33.50	162	29.35	140
1961	32.27	113	14.91	122	42.36	134	57.08	161	32.34	116	22.05	129	18.03	156
1962	28.75	123	17.96	125	41.39	131	44.90	137	28.91	126	23.06	140	25.40	161
1963	39.14	140	24.43	118	49.09	134	80.11	169	25.37	141	29.04	149	15.51	129
1964	38.40	127	21.89	135	48.18	112	43.30	99	28.69	121	27.80	166	28.06	169
1965	40.98	128	13.34	111	41.02	113	36.01	118	16.25	103	23.24	122	20.98	158
Average	34.87	121	20.86	121	44.67	124	47.71	150	25.34	107	25.94	143	24.84	165
No. of years	90	90	127	127	114	106	107	107	38	38	110	110	83	83
Standard 30 years' normal(*c*)	35.99	128	21.09	122	40.09	117	44.80	143	*d*24.53	*d*103	25.89	156	25.03	180

(*a*) Commonwealth Forestry Bureau; records in issues of the Year Book prior to No. 36 were for the station at Acton which closed down in 1939. (*b*) Records taken from present site commenced 1883. (*c*) 1911–1940. (*d*) Thirty years to 1957 inclusive.

Prolonged dry spells are fairly common in much of Australia, particularly in inland areas. A detailed discussion of the history of droughts and the frequency in particular areas may be found in Foley, J. C., *Droughts in Australia*, Bureau of Meteorology Bulletin No. 43 (1957). A shorter account of droughts in Australia will be found in a special article in Year Book No. 45, pages 51–6.

Rainfall and vegetation. In general, the three main climatic zones of the continent exert a particular controlling influence on the general vegetation. These are the northern third of the continent where rainfall is almost always restricted to the warmer months of the year, the southern third where rainfall is predominantly a winter and spring event, and a transitional zone which experiences rainfall from both sources, although in greatly reduced quantity over the interior, which is subject to frequent drought.

The length of the growing season, or conversely the extent of dry periods during the year, decides the type of vegetation which establishes in a region. The climatic influence on vegetative response is primarily through soil moisture and temperature. Thus in colder south-eastern areas the growing season is mainly temperature dependent, but elsewhere the availability of soil moisture is the prime factor. All rainfall is not equally effective in increasing the soil moisture, its availability from the soil storage to plants depending on the extent of surface run-off, seepage beyond the root zone, and loss by surface evaporation. Furthermore, the effectiveness of available soil moisture depends on the evaporative demand of the local climate; for example, an inch of stored moisture may maintain vigorous plant growth for twice as long in Tasmania as in the warmer, drier atmosphere of inland New South Wales Thus it is not a sound practice to assess the agricultural potential of different areas simply by reference to average rainfall.

Generally speaking, the length of the growing season exceeds nine months over the far south-west of Western Australia and in all eastern coastal districts from Cape York Peninsula to Western Victoria, and within this region humid and semi-humid plant formations thrive. Soil types, of course, also play a part in the distribution of vegetation, but they too are, to a considerable extent, the result of climate and weather.

The climate of Arnhem Land (Northern Territory) is such that there is a considerable surplus of moisture for about five months of the warm season, followed regularly by a virtual drought which frequently reaches severe intensity, and this special combination of meteorological conditions results in annual and perennial vegetation adapted to this cycle.

Over the interior the position is more complex because of the lower levels of the rainfall, its greater variability, and the high evaporative power of the drier, warmer atmosphere. In this vast section of the continent the climatic demands are so severe that the vegetative formations of the moister zones (i.e. the mesophytes, requiring about five months or longer growing season) are unable to exist. Thus a plant species adapted to these very dry and variable conditions (xerophytes), e.g. spinifex, salt bush, blue bush and stunted eucalypts, capable of maintaining a cattle population, predominates over the arid interior.

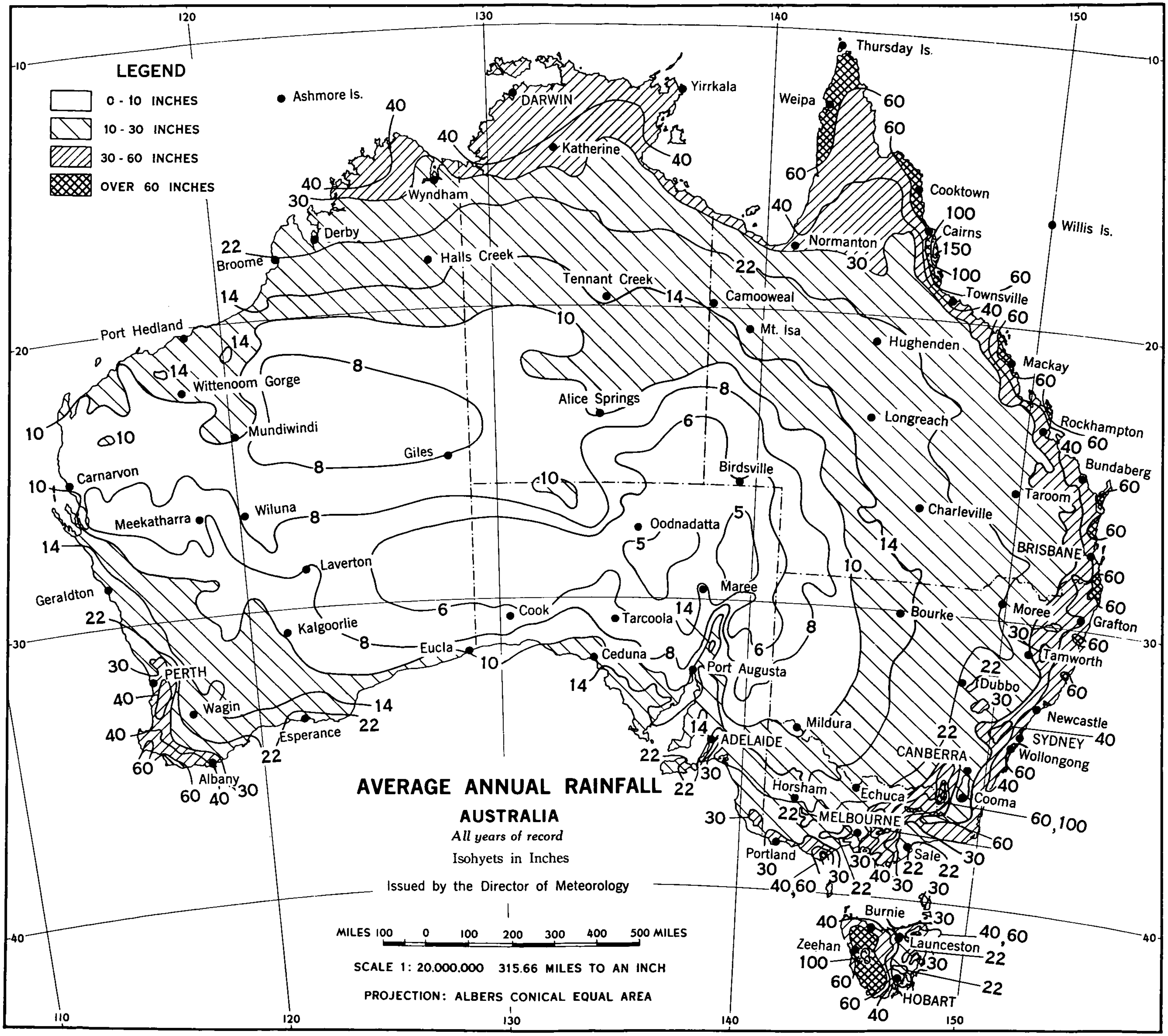
The arid and semi-arid lands of Western Australia and inland New South Wales which border the desert carry the majority of the sheep in these States. In New South Wales the most important vegetative formations in these areas are savannah (treeless plains), savannah woodland mulga scrub, and mallee scrub. In Western Australia sclerophyllous grass steppe and mulga scrub border the deserts and are succeeded to the south by zones of mallee scrub and mallee heath.

Rainfall intensity. The study of extremely high rainfall intensities is important in the investigation of the flow characteristics of river systems and flood prevention measures the design of irrigation works and hydro-electric schemes. Some of the more notable falls in a period of 24 hours are listed for the various States in the following tables. Most of the very high intensities have occurred in the coastal strip of Queensland, where the combination of a tropical cyclone moving close to mountainous terrain provides ideal conditions for spectacular falls. The highest fall recorded in 24 hours, 35.71 inches, occurred at Crohamhurst, Queensland, on 3 February 1893.

Rainfall at most reporting stations in Australia is recorded only for the 24-hour period from 9 a.m. to 9 a.m. The data in this table are based on these records. Where automatic recording gauges are installed, more detailed intensity data are available for shorter and exactly measured time intervals. For other very heavy falls at various localities, reference may be made to Year Books, No. 14, pages 60–4, No. 22, pages 46–8 and No. 29, pages 43, 44 and 51.

HEAVY RAINFALLS TO 1965, INCLUSIVE

Name of town or locality	Date	Amount (inches)	Name of town or locality	Date	Amount (inches)
		WESTERN AUSTRALIA			
Whim Creek	3 Apr. 1898	29.41	Roebuck Plains	5 Jan. 1917	14.01
Fortesque	3 May 1890	23.36	Broome	6 Jan. 1917	14.00
Roebuck Plains	6 Jan. 1917	22.36	Onslow P.O.	8 Feb. 1963	14.00
Widjip	1 Apr. 1934	19.54	Carlton Hill	7 Feb. 1942	12.75
Kimberley (Research)	6 Apr. 1959	16.98	Wyndham	4 Mar. 1919	12.50
Derby	7 Jan. 1917	16.47	Onslow P.O.	3 Mar. 1961	12.38
Boodarie	21 Mar. 1899	14.53	Onslow Aerodrome	3 Mar. 1961	12.29
Balla Balla	21 Mar. 1899	14.40	Towrana	1 Mar. 1943	12.16
Winderrie	17 Jan. 1923	14.23	Marble Bar	2 Mar. 1941	12.00
Pilbara	2 Apr. 1898	14.04	Jimba Jimba	1 Mar. 1943	11.54



LEGEND
0 - 10 INCHES
10 - 30 INCHES
30 - 60 INCHES
OVER 60 INCHES
AVERAGE ANNUAL RAINFALL
AUSTRALIA
All years of record
Isohyets in Inches
Issued by the Director of Meteorology
MILES 100 0 100 200 300 400 500 MILES
SCALE 1: 20.000.000 315.66 MILES TO AN INCH
PROJECTION: ALBERS CONICAL EQUAL AREA
Thursday Is.
Ashmore Is.
DARWIN
Yirrkala
Weipa
Katherine
Wyndham
Derby
Broome
Halls Creek
Tennant Creek
Camooweal
Normanton
Cooktown
Cairns
Townsville
Willis Is.
Port Hedland
Mt. Isa
Hughenden
Mackay
Wittenoom Gorge
Alice Springs
Longreach
Rockhampton
Mundiwindi
Giles
Birdsville
Bundaberg
Carnarvon
Charleville
Taroom
Meekatharra
Wiluna
Oodnadatta
BRISBANE
Laverton
Maree
Geraldton
Cook
Tarcoola
Bourke
Moree
Grafton
Kalgoorlie
Eucla
Ceduna
Port Augusta
Tamworth
PERTH
Dubbo
Wagin
Esperance
Mildura
Newcastle
ADELAIDE
SYDNEY
Albany
CANBERRA
Wollongong
Horsham
Echuca
Cooma
MELBOURNE
Portland
Sale
Burnie
Launceston
Zeehan
HOBART

PLATE 2

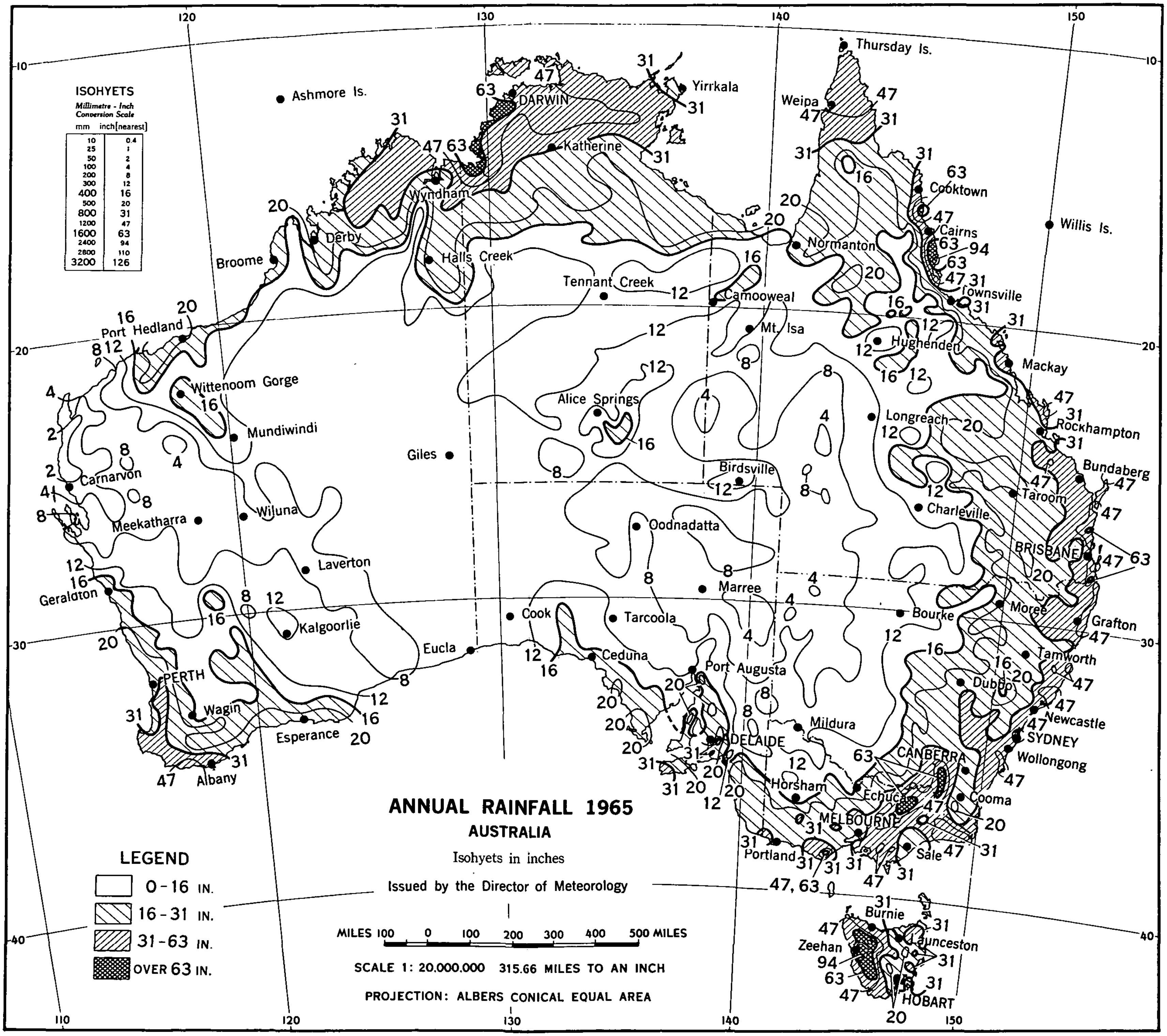

ANNUAL RAINFALL 1965
AUSTRALIA
Isohyets in inches
Issued by the Director of Meteorology
LEGEND
0-16 IN.
16-31 IN.
31-63 IN.
OVER 63 IN.
ISOHYETS
Millimetre - Inch Conversion Scale
MILES 100 0 100 200 300 400 500 MILES
SCALE 1: 20.000.000 315.66 MILES TO AN INCH
PROJECTION: ALBERS CONICAL EQUAL AREA
Thursday Is.
Ashmore Is.
DARWIN
Yirrkala
Weipa
Katherine
Cooktown
Wyndham
Willis Is.
Cairns
Derby
Broome
Halls Creek
Normanton
Tennant Creek
Townsville
Camooweal
Port Hedland
Mt. Isa
Hughenden
Mackay
Wittenoom Gorge
Alice Springs
Rockhampton
Mundiwindi
Longreach
Giles
Birdsville
Bundaberg
Carnarvon
Taroom
Meekatharra
Wiluna
Charleville
Oodnadatta
BRISBANE
Laverton
Marree
Geraldton
Moree
Cook
Tarcoola
Bourke
Kalgoorlie
Grafton
Eucla
Ceduna
Tamworth
Port Augusta
PERTH
Dubbo
Wagin
Newcastle
Esperance
Mildura
SYDNEY
ADELAIDE
Wollongong
Albany
CANBERRA
Horsham
Echuca
Cooma
MELBOURNE
Portland
Sale
Burnie
Launceston
Zeehan
HOBART

PLATE 3

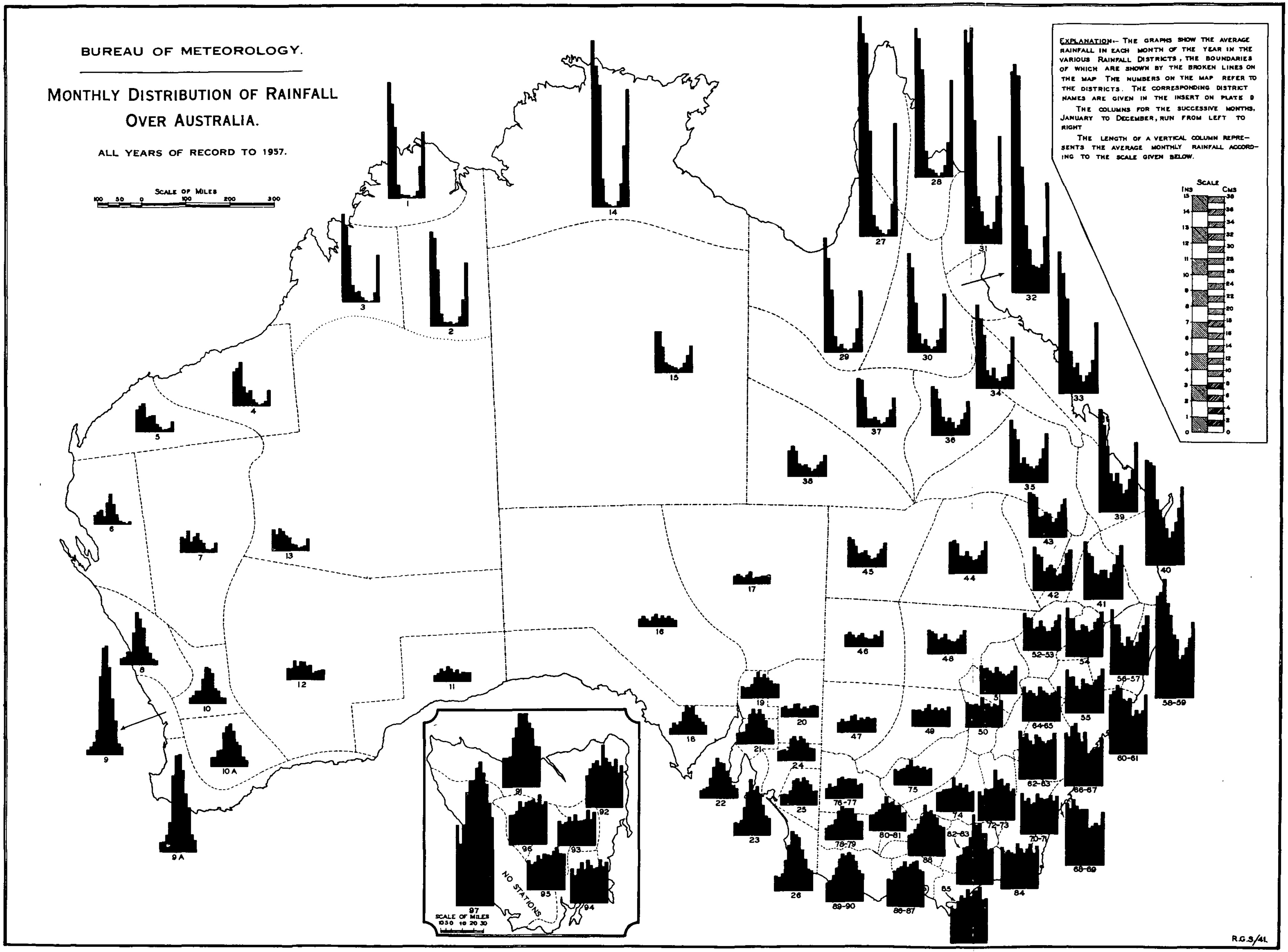

BUREAU OF METEOROLOGY.
MONTHLY DISTRIBUTION OF RAINFALL OVER AUSTRALIA.
ALL YEARS OF RECORD TO 1957.
SCALE OF MILES
100 50 0 100 200 300
EXPLANATION.– THE GRAPHS SHOW THE AVERAGE RAINFALL IN EACH MONTH OF THE YEAR IN THE VARIOUS RAINFALL DISTRICTS, THE BOUNDARIES OF WHICH ARE SHOWN BY THE BROKEN LINES ON THE MAP THE NUMBERS ON THE MAP REFER TO THE DISTRICTS. THE CORRESPONDING DISTRICT NAMES ARE GIVEN IN THE INSERT ON PLATE 9
THE COLUMNS FOR THE SUCCESSIVE MONTHS, JANUARY TO DECEMBER, RUN FROM LEFT TO RIGHT
THE LENGTH OF A VERTICAL COLUMN REPRESENTS THE AVERAGE MONTHLY RAINFALL ACCORDING TO THE SCALE GIVEN BELOW.
SCALE
INS
CMS
NO STATIONS
SCALE OF MILES
10 5 0 10 20 30
R.G.S/41.

PLATE 4

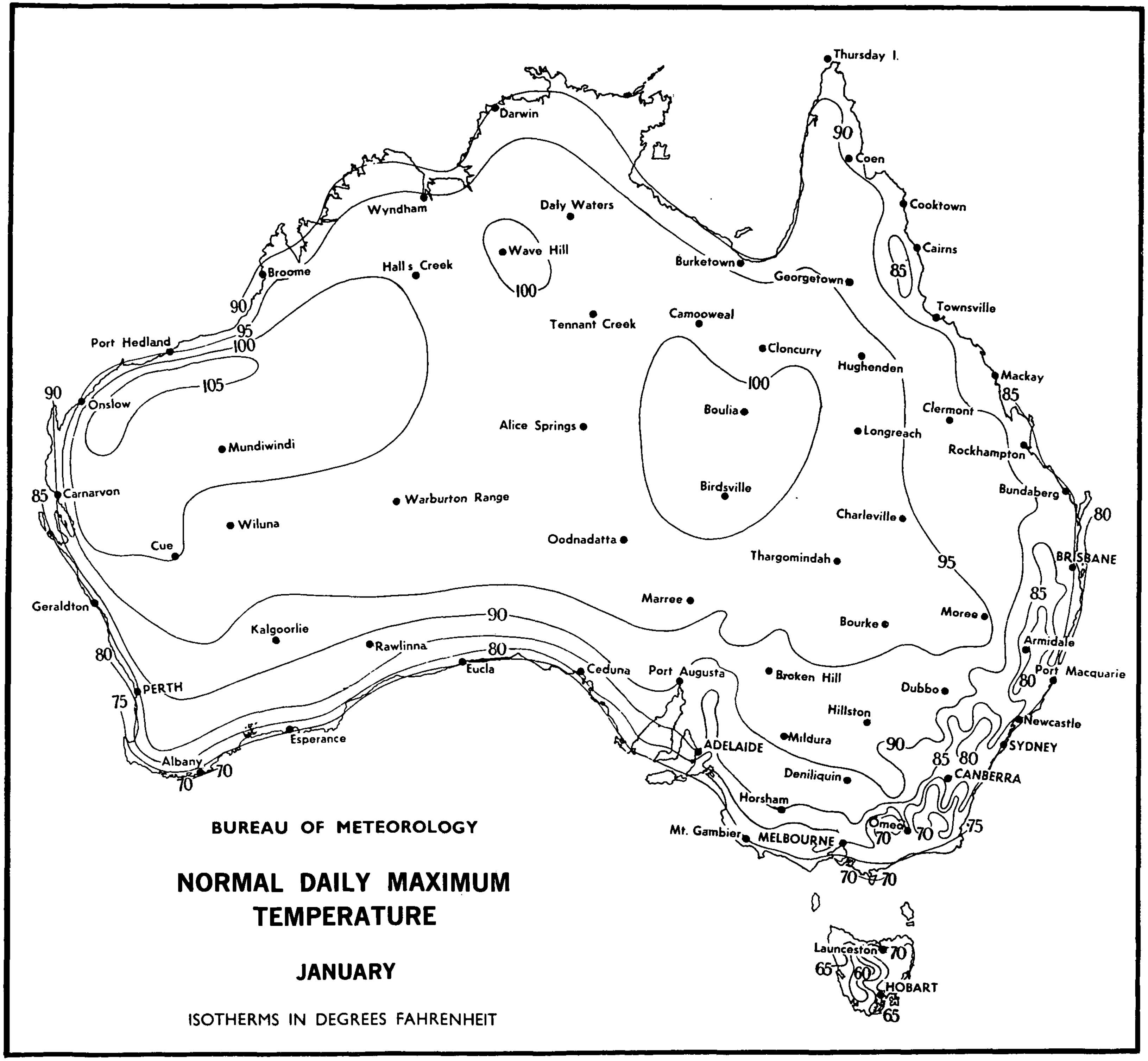

BUREAU OF METEOROLOGY
NORMAL DAILY MAXIMUM TEMPERATURE
JANUARY
ISOTHERMS IN DEGREES FAHRENHEIT
Thursday I.
Darwin
Coen
Cooktown
Cairns
Townsville
Wyndham
Daly Waters
Wave Hill
Burketown
Georgetown
Halls Creek
Broome
Tennant Creek
Camooweal
Cloncurry
Hughenden
Port Hedland
Mackay
Onslow
Clermont
Boulia
Alice Springs
Longreach
Rockhampton
Mundiwindi
Birdsville
Bundaberg
Carnarvon
Warburton Range
Charleville
Wiluna
Cue
Oodnadatta
Thargomindah
BRISBANE
Geraldton
Marree
Moree
Bourke
Kalgoorlie
Rawlinna
Armidale
Eucla
Ceduna
Port Augusta
Broken Hill
Port Macquarie
PERTH
Dubbo
Hillston
Newcastle
Esperance
Mildura
ADELAIDE
SYDNEY
Albany
Deniliquin
CANBERRA
Horsham
Omeo
Mt. Gambier
MELBOURNE
Launceston
HOBART
105
100
95
90
85
80
75
70
65
60

PLATE 5

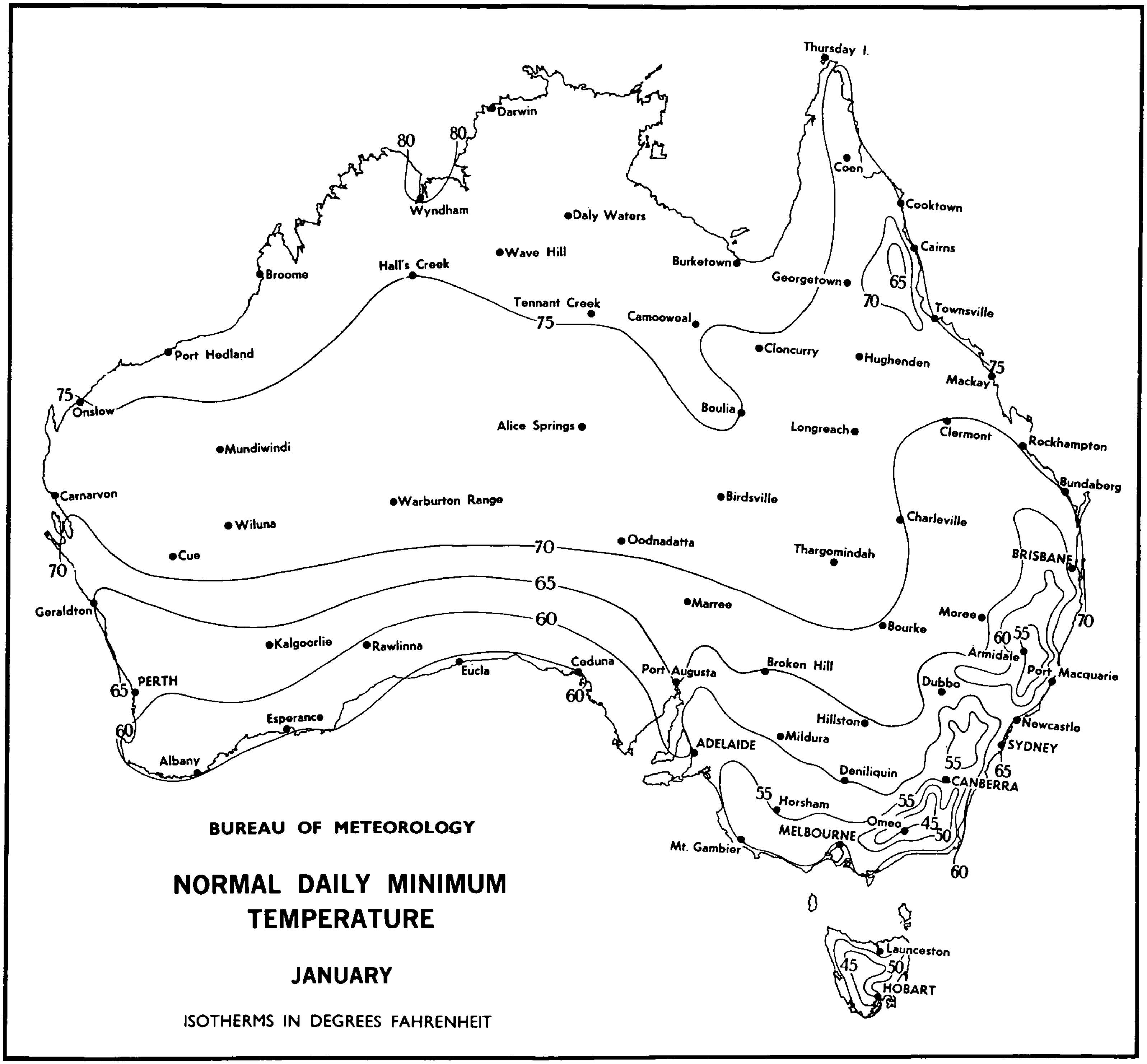

BUREAU OF METEOROLOGY
NORMAL DAILY MINIMUM TEMPERATURE
JANUARY
ISOTHERMS IN DEGREES FAHRENHEIT
Thursday I.
Darwin
Wyndham
Coen
Cooktown
Daly Waters
Wave Hill
Burketown
Cairns
Broome
Hall's Creek
Georgetown
Townsville
Tennant Creek
Camooweal
Port Hedland
Cloncurry
Hughenden
Mackay
Onslow
Boulia
Alice Springs
Longreach
Clermont
Rockhampton
Mundiwindi
Bundaberg
Carnarvon
Warburton Range
Birdsville
Wiluna
Charleville
Oodnadatta
Cue
Thargomindah
BRISBANE
Geraldton
Marree
Moree
Bourke
Armidale
Kalgoorlie
Rawlinna
Port Augusta
Broken Hill
Port Macquarie
PERTH
Eucla
Ceduna
Dubbo
Esperance
Hillston
Newcastle
Mildura
ADELAIDE
SYDNEY
Albany
Deniliquin
CANBERRA
Horsham
Omeo
MELBOURNE
Mt. Gambier
Launceston
HOBART
80
80
75
75
75
70
70
70
70
65
65
65
65
60
60
60
60
60
55
55
55
55
50
50
45
45

PLATE 6

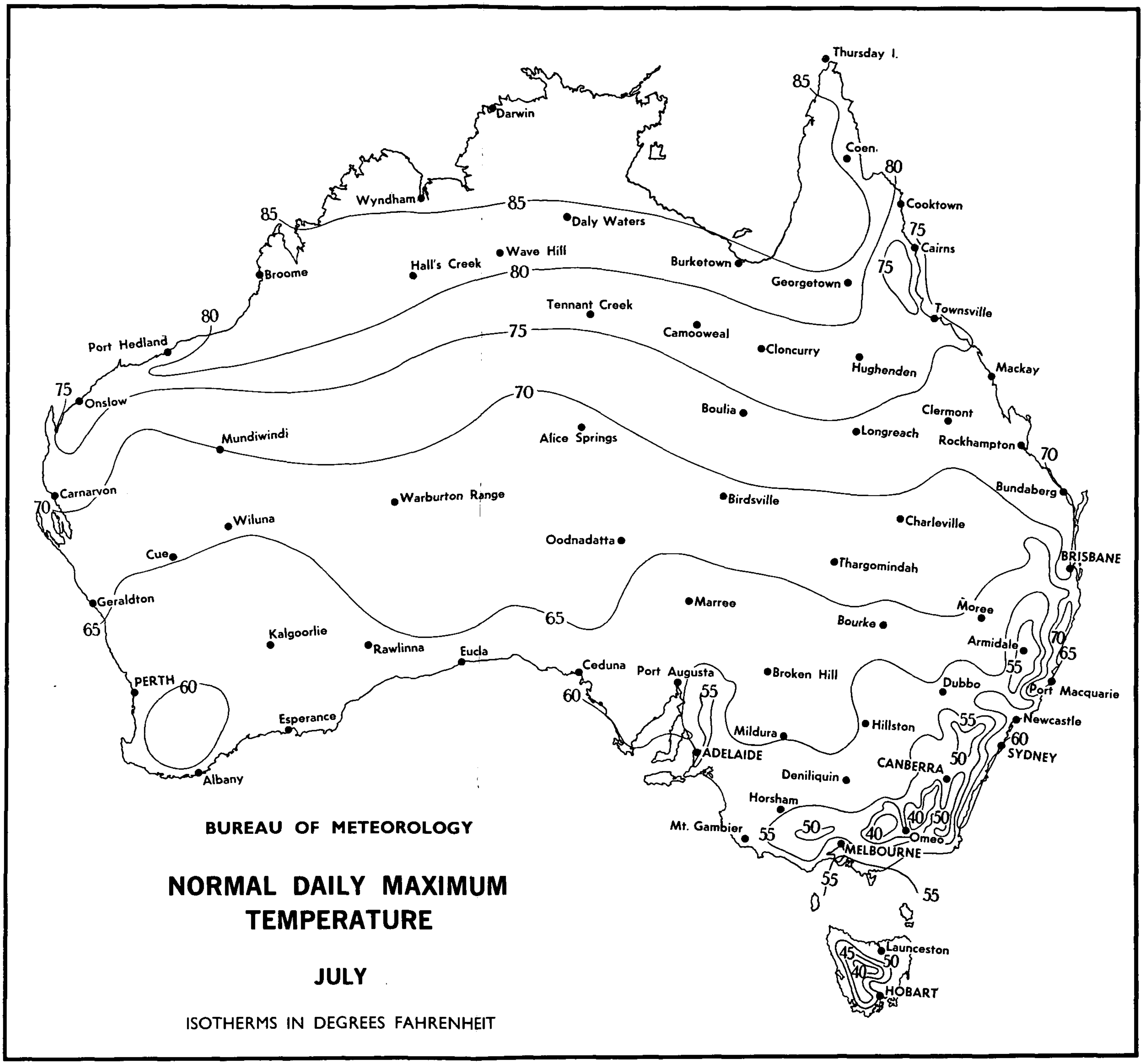

BUREAU OF METEOROLOGY
NORMAL DAILY MAXIMUM TEMPERATURE
JULY
ISOTHERMS IN DEGREES FAHRENHEIT
Thursday I.
Darwin
Coen
Cooktown
Wyndham
Daly Waters
Wave Hill
Hall's Creek
Burketown
Georgetown
Cairns
Broome
Townsville
Tennant Creek
Camooweal
Cloncurry
Hughenden
Mackay
Port Hedland
Onslow
Boulia
Clermont
Alice Springs
Longreach
Rockhampton
Mundiwindi
Bundaberg
Carnarvon
Warburton Range
Birdsville
Charleville
Wiluna
Oodnadatta
BRISBANE
Cue
Thargomindah
Geraldton
Marree
Moree
Bourke
Kalgoorlie
Armidale
Rawlinna
Eucla
Ceduna
Port Augusta
Broken Hill
Port Macquarie
Dubbo
PERTH
Esperance
Mildura
Hillston
Newcastle
ADELAIDE
SYDNEY
CANBERRA
Deniliquin
Albany
Horsham
Mt. Gambier
Omeo
MELBOURNE
Launceston
HOBART
85
80
75
70
65
60
55
50
45
40

PLATE 7

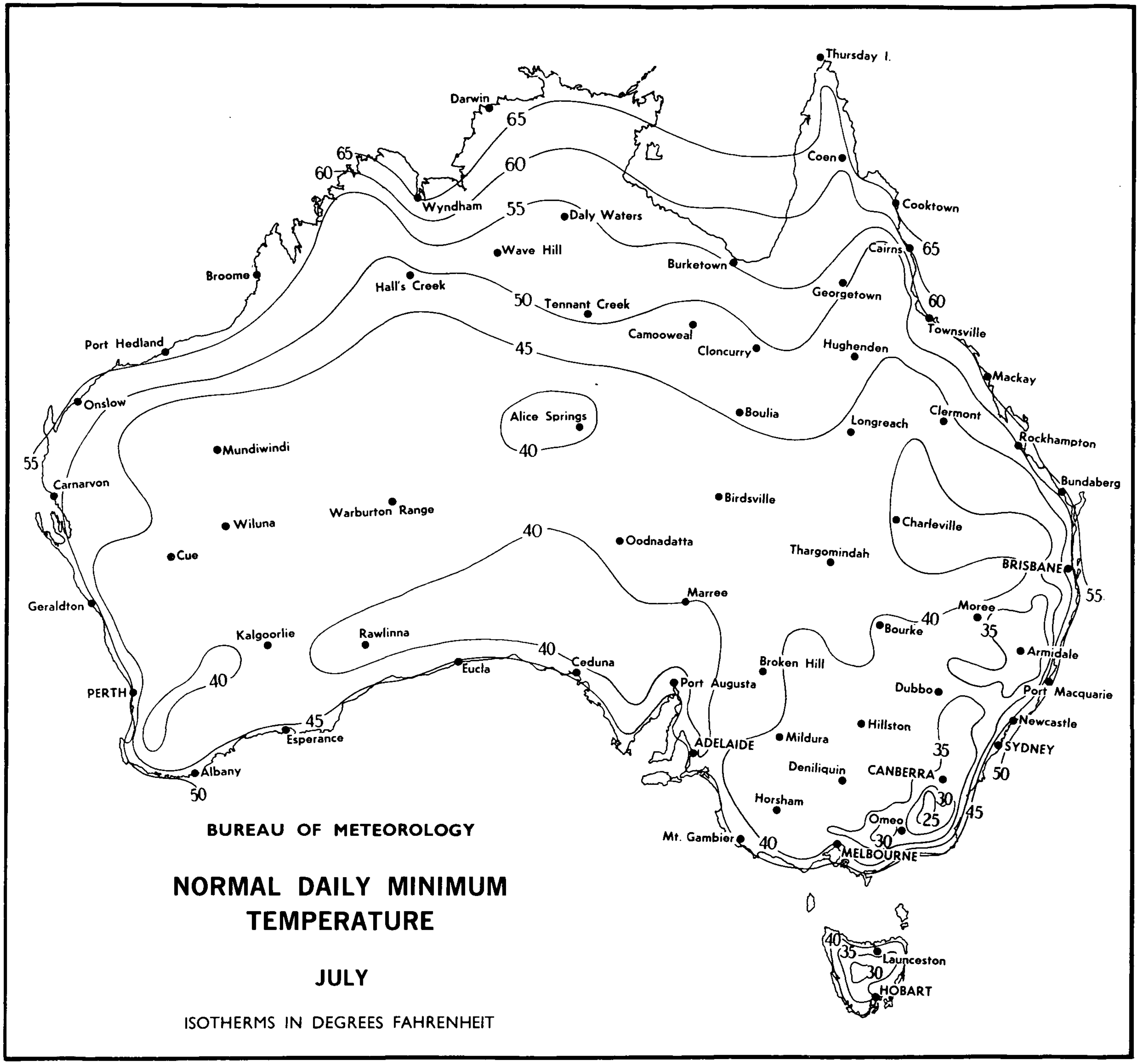

Thursday I.
Darwin
Coen
Wyndham
Daly Waters
Cooktown
Wave Hill
Burketown
Cairns
Broome
Hall's Creek
Georgetown
Tennant Creek
Townsville
Camooweal
Port Hedland
Cloncurry
Hughenden
Mackay
Onslow
Alice Springs
Boulia
Clermont
Longreach
Rockhampton
Mundiwindi
Carnarvon
Bundaberg
Birdsville
Warburton Range
Wiluna
Charleville
Oodnadatta
Cue
Thargomindah
BRISBANE
Geraldton
Marree
Moree
Bourke
Kalgoorlie
Rawlinna
Armidale
Ceduna
Broken Hill
Eucla
PERTH
Port Augusta
Dubbo
Port Macquarie
Hillston
Newcastle
Mildura
Esperance
ADELAIDE
SYDNEY
Deniliquin
CANBERRA
Albany
Horsham
Omeo
Mt. Gambier
MELBOURNE
Launceston
HOBART
BUREAU OF METEOROLOGY
NORMAL DAILY MINIMUM TEMPERATURE
JULY
ISOTHERMS IN DEGREES FAHRENHEIT

PLATE 8

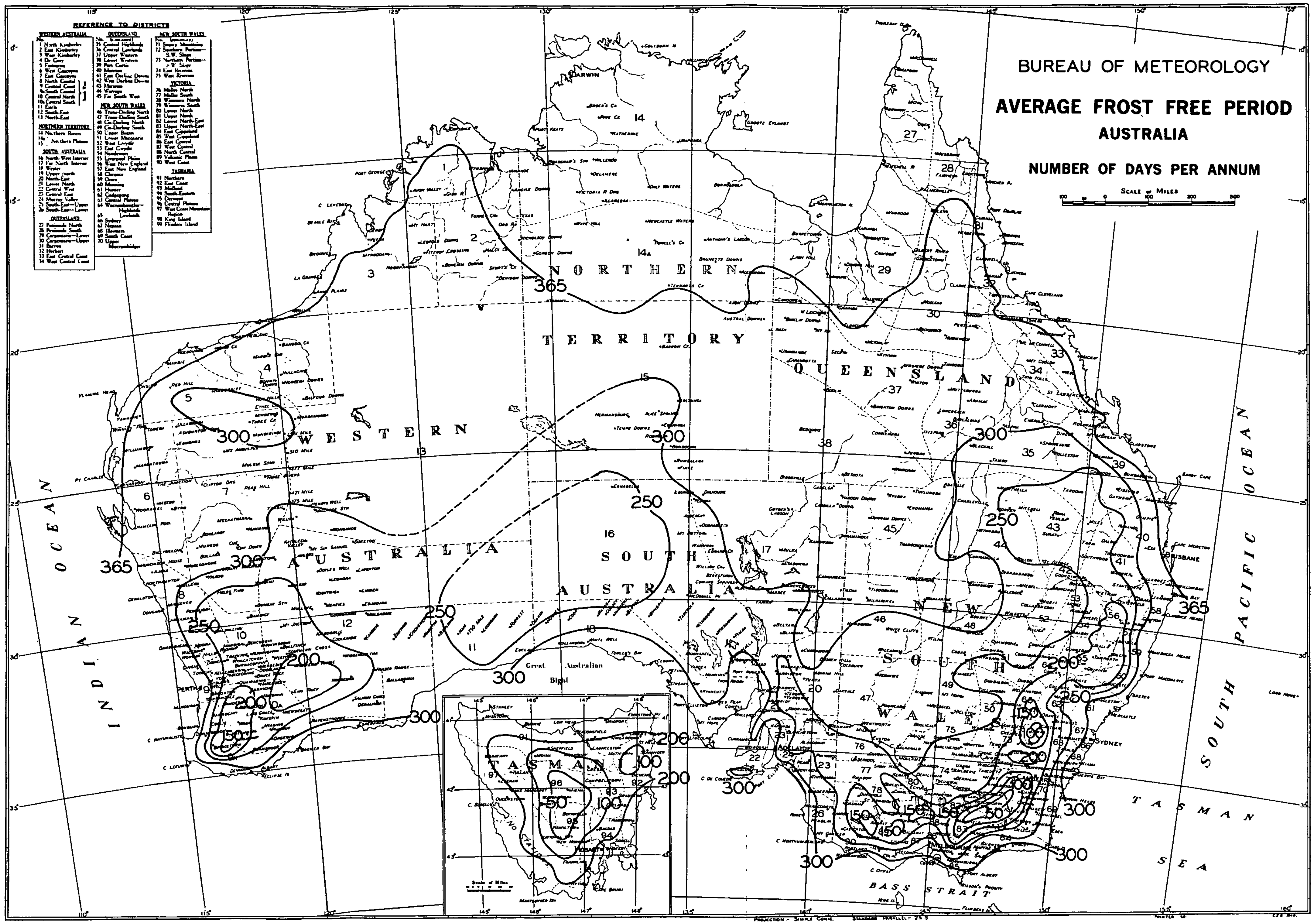

BUREAU OF METEOROLOGY
AVERAGE FROST FREE PERIOD
AUSTRALIA
NUMBER OF DAYS PER ANNUM
REFERENCE TO DISTRICTS
NORTHERN
TERRITORY
WESTERN
AUSTRALIA
SOUTH
AUSTRALIA
QUEENSLAND
NEW
SOUTH
WALES
TASMANIA
INDIAN OCEAN
SOUTH PACIFIC OCEAN
TASMAN SEA
BASS STRAIT
Great Australian Bight
DARWIN
PERTH
ADELAIDE
BRISBANE
SYDNEY
365
300
250
200
150
100
50

PLATE 9

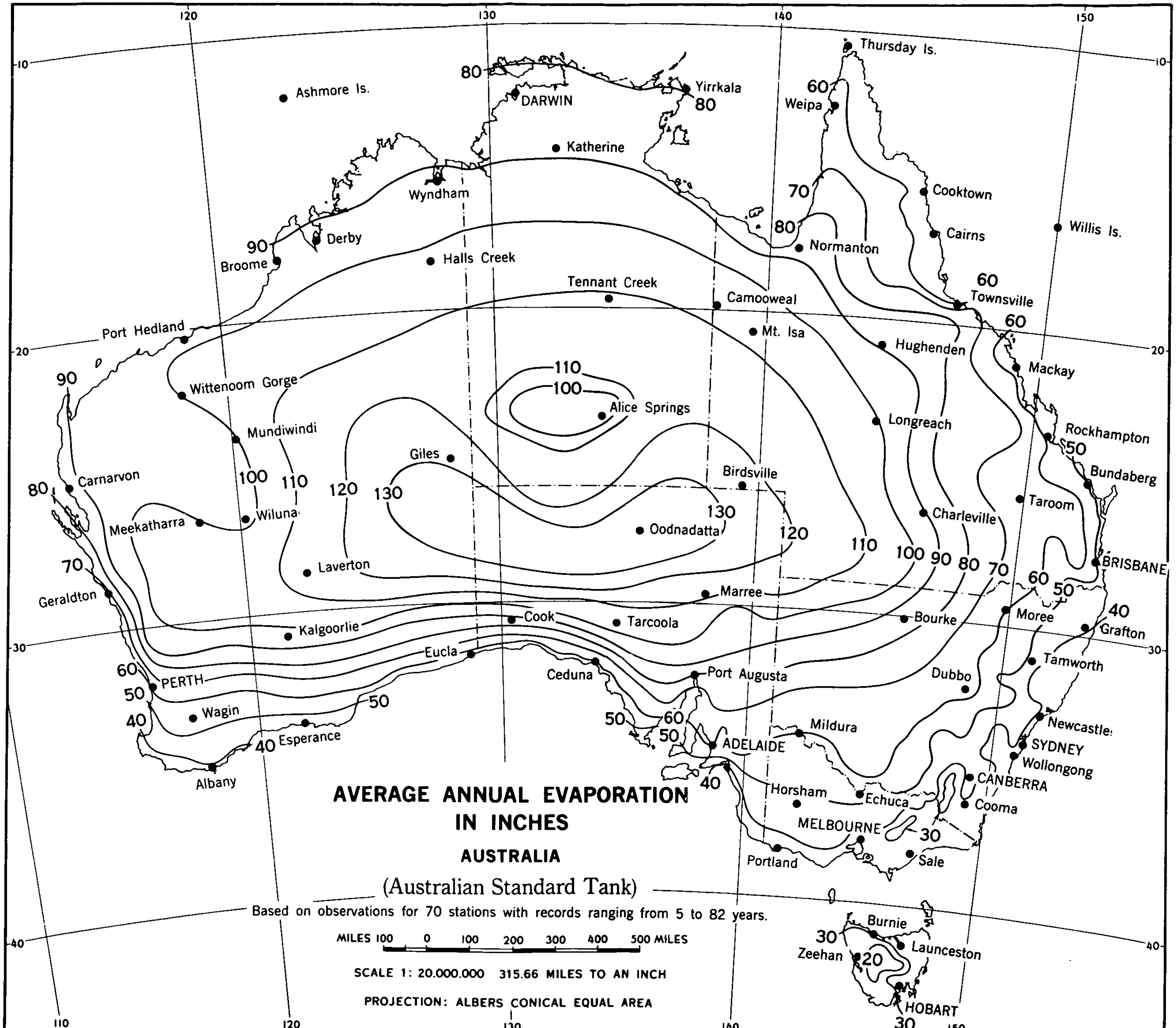

AVERAGE ANNUAL EVAPORATION
IN INCHES
AUSTRALIA
(Australian Standard Tank)
Based on observations for 70 stations with records ranging from 5 to 82 years.
MILES 100 0 100 200 300 400 500 MILES
SCALE 1: 20.000.000 315.66 MILES TO AN INCH
PROJECTION: ALBERS CONICAL EQUAL AREA
Thursday Is.
Ashmore Is.
DARWIN
Yirrkala
Weipa
Katherine
Wyndham
Cooktown
Derby
Cairns
Willis Is.
Normanton
Broome
Halls Creek
Tennant Creek
Camooweal
Townsville
Port Hedland
Mt. Isa
Hughenden
Mackay
Wittenoom Gorge
Alice Springs
Longreach
Rockhampton
Mundiwindi
Giles
Birdsville
Bundaberg
Carnarvon
Taroom
Wiluna
Charleville
Meekatharra
Oodnadatta
BRISBANE
Laverton
Geraldton
Marree
Cook
Tarcoola
Bourke
Moree
Kalgoorlie
Grafton
Eucla
Tamworth
Ceduna
Port Augusta
PERTH
Dubbo
Wagin
Newcastle
Mildura
Esperance
SYDNEY
ADELAIDE
Wollongong
Albany
CANBERRA
Horsham
Echuca
Cooma
MELBOURNE
Portland
Sale
Burnie
Launceston
Zeehan
HOBART

PLATE 10

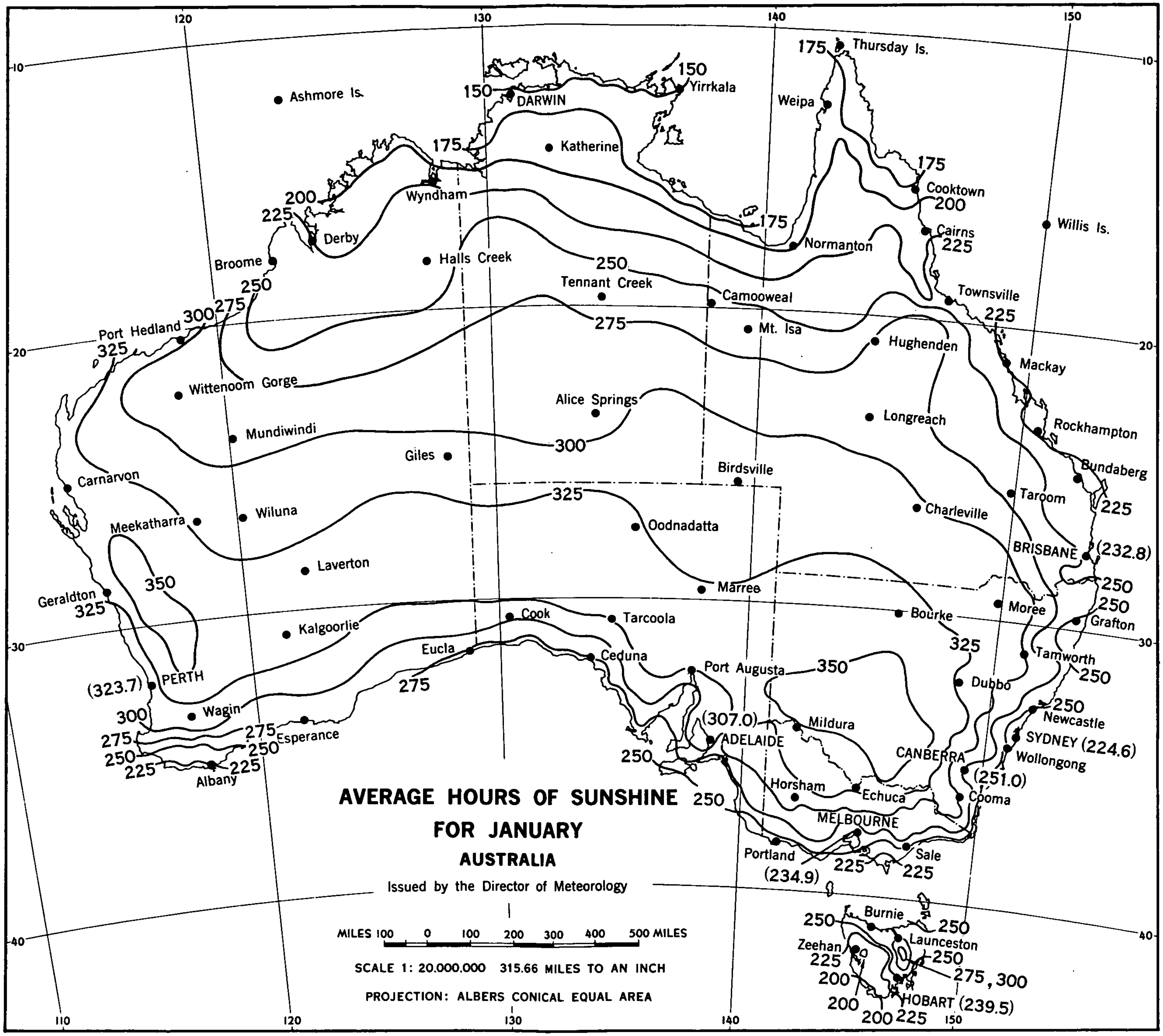

AVERAGE HOURS OF SUNSHINE
FOR JANUARY
AUSTRALIA
Issued by the Director of Meteorology
MILES 100 0 100 200 300 400 500 MILES
SCALE 1: 20,000,000 315.66 MILES TO AN INCH
PROJECTION: ALBERS CONICAL EQUAL AREA
Thursday Is.
Ashmore Is.
DARWIN
Yirrkala
Weipa
Katherine
Wyndham
Cooktown
Derby
Cairns
Willis Is.
Broome
Halls Creek
Normanton
Tennant Creek
Camooweal
Townsville
Port Hedland
Mt. Isa
Hughenden
Mackay
Wittenoom Gorge
Alice Springs
Longreach
Rockhampton
Mundiwindi
Giles
Birdsville
Bundaberg
Carnarvon
Taroom
Meekatharra
Wiluna
Oodnadatta
Charleville
Laverton
BRISBANE (232.8)
Geraldton
Marree
Moree
Kalgoorlie
Cook
Tarcoola
Bourke
Grafton
Eucla
Ceduna
Tamworth
PERTH
(323.7)
Port Augusta
Dubbo
Wagin
Mildura
Newcastle
(307.0)
ADELAIDE
SYDNEY (224.6)
Esperance
CANBERRA
Wollongong
Albany
Horsham
Echuca
(251.0)
Cooma
MELBOURNE
Portland
(234.9)
Sale
Burnie
Launceston
Zeehan
HOBART (239.5)
150
175
200
225
250
275
300
325
350
275, 300

PLATE 11

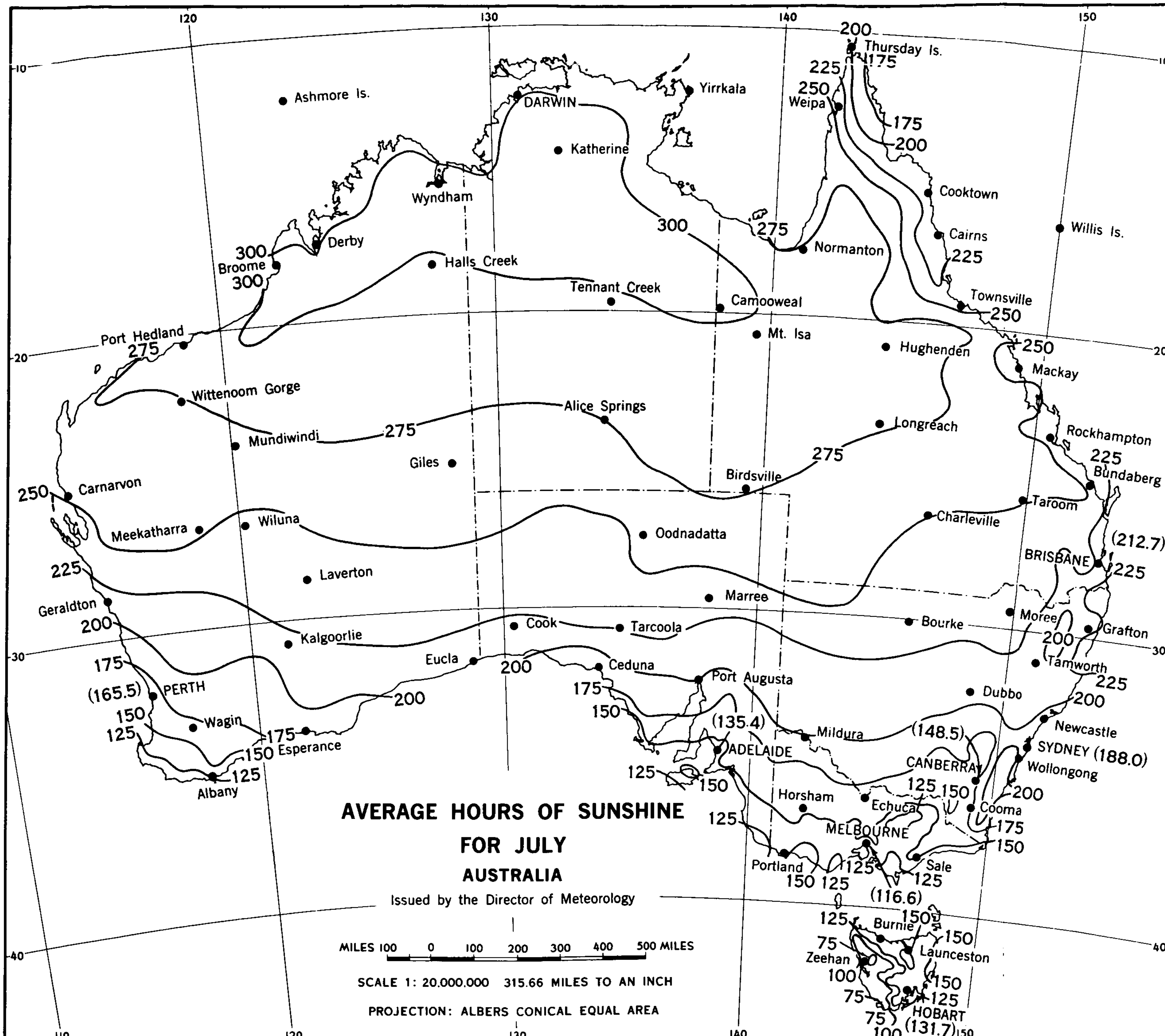
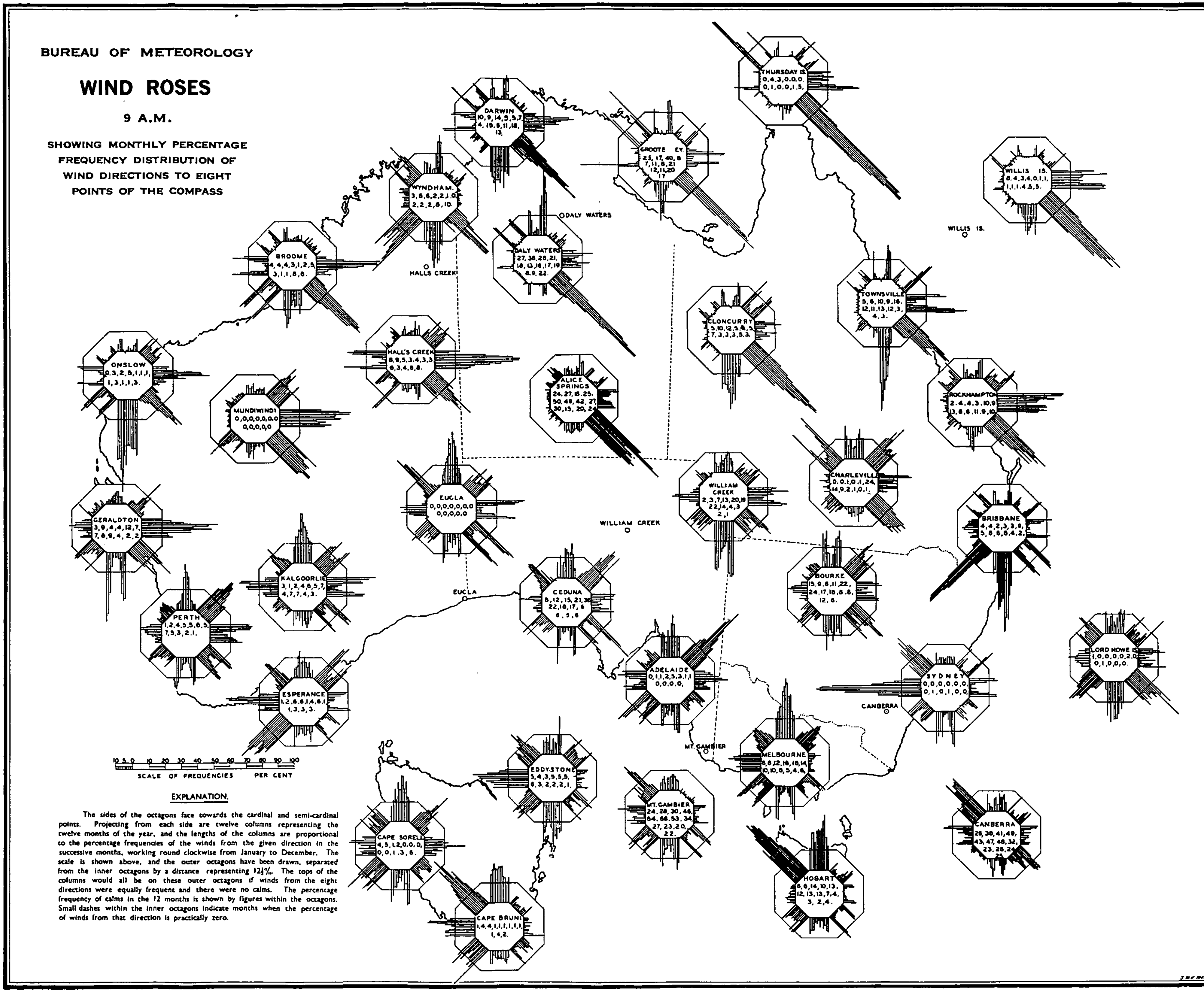

AVERAGE HOURS OF SUNSHINE
FOR JULY
AUSTRALIA
Issued by the Director of Meteorology
MILES 100 0 100 200 300 400 500 MILES
SCALE 1: 20,000,000 315.66 MILES TO AN INCH
PROJECTION: ALBERS CONICAL EQUAL AREA
Ashmore Is.
DARWIN
Yirrkala
Thursday Is.
Weipa
Katherine
Wyndham
Derby
Broome
Halls Creek
Tennant Creek
Camooweal
Normanton
Cooktown
Cairns
Willis Is.
Townsville
Port Hedland
Mt. Isa
Hughenden
Mackay
Wittenoom Gorge
Mundiwindi
Alice Springs
Longreach
Rockhampton
Giles
Birdsville
Bundaberg
Carnarvon
Taroom
Meekatharra
Wiluna
Oodnadatta
Charleville
BRISBANE
(212.7)
Laverton
Marree
Geraldton
Moree
Bourke
Grafton
Kalgoorlie
Cook
Tarcoola
Eucla
Ceduna
Tamworth
PERTH
(165.5)
Port Augusta
Dubbo
Wagin
Esperance
(135.4)
Mildura
(148.5)
Newcastle
ADELAIDE
SYDNEY (188.0)
Albany
CANBERRA
Wollongong
Horsham
Echuca
Cooma
MELBOURNE
Sale
Portland
(116.6)
Burnie
Launceston
Zeehan
HOBART
(131.7)
300
275
250
225
200
175
150
125
100
75

PLATE 12



BUREAU OF METEOROLOGY
WIND ROSES
9 A.M.
SHOWING MONTHLY PERCENTAGE FREQUENCY DISTRIBUTION OF WIND DIRECTIONS TO EIGHT POINTS OF THE COMPASS
THURSDAY IS.
DARWIN
GROOTE EY.
WILLIS IS.
WYNDHAM.
DALY WATERS
BROOME
HALLS CREEK
TOWNSVILLE
CLONCURRY
HALL'S CREEK
ONSLOW
ALICE SPRINGS
ROCKHAMPTON
MUNDIWINDI
CHARLEVILLE
EUCLA
WILLIAM CREEK
GERALDTON
BRISBANE
KALGOORLIE
BOURKE
CEDUNA
PERTH
LORD HOWE IS.
ADELAIDE
SYDNEY
ESPERANCE
CANBERRA
MT. GAMBIER
MELBOURNE
EDDYSTONE
CANBERRA
CAPE SORELL
HOBART
CAPE BRUNI
10 5 0 10 20 30 40 50 60 70 80 90 100
SCALE OF FREQUENCIES PER CENT
EXPLANATION.
The sides of the octagons face towards the cardinal and semi-cardinal points. Projecting from each side are twelve columns representing the twelve months of the year, and the lengths of the columns are proportional to the percentage frequencies of the winds from the given direction in the successive months, working round clockwise from January to December. The scale is shown above, and the outer octagons have been drawn, separated from the inner octagons by a distance representing 12½%. The tops of the columns would all be on these outer octagons if winds from the eight directions were equally frequent and there were no calms. The percentage frequency of calms in the 12 months is shown by figures within the octagons. Small dashes within the inner octagons indicate months when the percentage of winds from that direction is practically zero.

PLATE 13

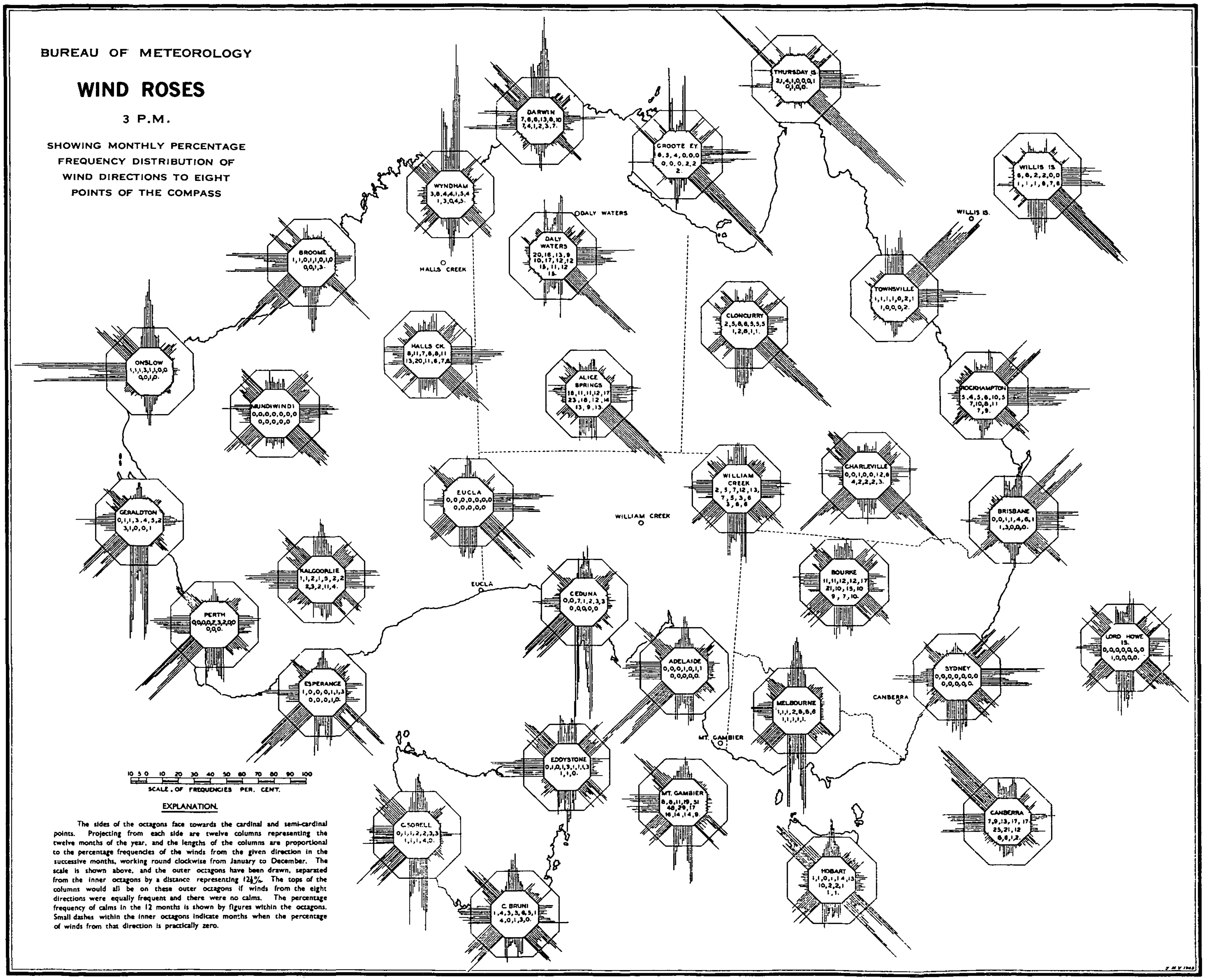
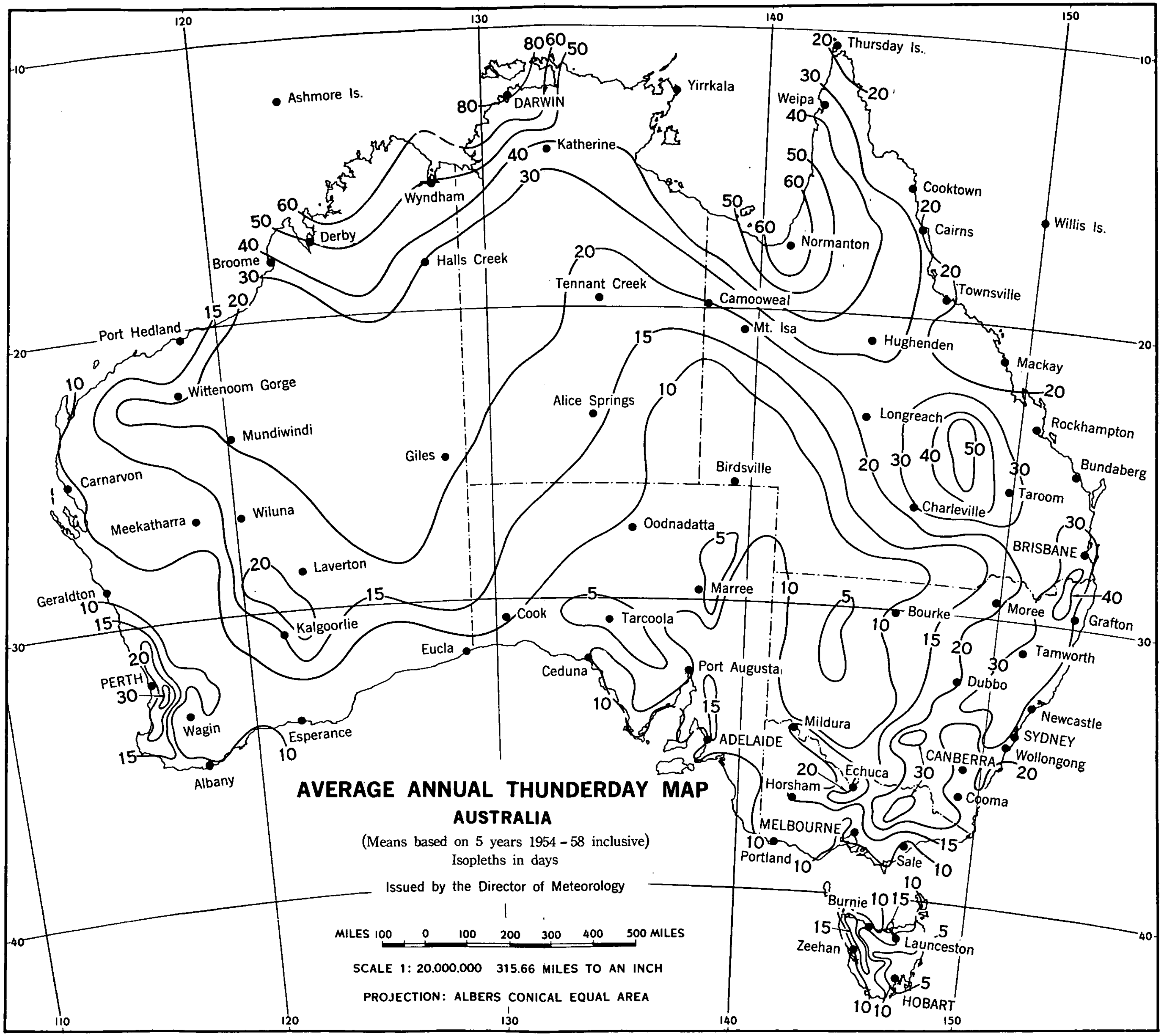

BUREAU OF METEOROLOGY
WIND ROSES
3 P.M.
SHOWING MONTHLY PERCENTAGE FREQUENCY DISTRIBUTION OF WIND DIRECTIONS TO EIGHT POINTS OF THE COMPASS
THURSDAY IS. 2,4,1,0,0,0,1 0,1,0,0.
DARWIN 7,6,8,13,8,10 7,4,1,2,3,7.
GROOTE EY. 8,5,4,0,0,0 0,0,0,2,2 2.
WILLIS IS. 8,8,2,2,0,0 1,1,1,8,7,8
WYNDHAM 3,8,4,4,1,3,4 1,3,0,4,3.
DALY WATERS 20,18,13,9 10,17,12,12 15,11,12 15.
DALY WATERS
BROOME 1,1,0,1,1,0,1,0 0,0,1,3.
HALLS CREEK
TOWNSVILLE 1,1,1,1,0,2,1 1,0,0,0,2.
WILLIS IS.
CLONCURRY 2,5,8,6,5,5,5 1,2,8,1,1.
HALLS CK. 8,11,7,6,8,11 13,20,11,6,7,8
ONSLOW 1,1,1,3,1,1,0,0 0,0,1,0.
ALICE SPRINGS 18,11,11,12,17 23,18,12,14 13,9,13
ROCKHAMPTON 5,4,5,6,10,5 7,10,8,11 7,9.
MUNDIWINDI 0,0,0,0,0,0,0 0,0,0,0,0
CHARLEVILLE 0,0,1,0,0,12,8 4,2,2,2,3.
WILLIAM CREEK 2,5,7,12,13, 7,5,3,8 3,6,6
EUCLA 0,0,0,0,0,0,0 0,0,0,0,0
GERALDTON 0,1,1,3,4,5,2 3,1,0,0,1
BRISBANE 0,0,1,1,4,6,1 1,3,0,0,0.
WILLIAM CREEK
KALGOORLIE 1,1,2,1,5,2,2 2,3,2,11,4.
BOURKE 11,11,12,12,17 21,10,15,10 9,7,10.
EUCLA
CEDUNA 0,0,7,1,2,3,3 0,0,0,0,0
PERTH 0,0,0,0,2,3,2,0,0 0,0,0.
LORD HOWE IS. 0,0,0,0,0,0,0 1,0,0,0,0.
ADELAIDE 0,0,0,1,0,1,1 0,0,0,0,0.
ESPERANCE 1,0,0,0,1,1,3 0,0,0,1,0.
SYDNEY 0,0,0,0,0,0,0 0,0,0,0,0.
CANBERRA
MELBOURNE 1,1,1,2,8,8,6 1,1,1,1,1.
MT. GAMBIER
EDDYSTONE 0,1,0,1,3,1,1,3 1,1,0.
10 5 0 10 20 30 40 50 60 70 80 90 100
SCALE. OF FREQUENCIES PER. CENT.
MT. GAMBIER 8,8,11,19,31 48,29,17 16,14,14,9.
CANBERRA 7,9,13,17,17 25,21,12 8,8,1,2.
C. SORELL 0,1,1,2,2,3,3 1,1,1,4,0.
HOBART 1,1,0,1,14,13 10,2,2,1 1,1.
C. BRUNI 1,4,3,3,6,5,1 4,0,1,3,0.
EXPLANATION.
The sides of the octagons face towards the cardinal and semi-cardinal points. Projecting from each side are twelve columns representing the twelve months of the year, and the lengths of the columns are proportional to the percentage frequencies of the winds from the given direction in the successive months, working round clockwise from January to December. The scale is shown above, and the outer octagons have been drawn, separated from the inner octagons by a distance representing 12½%. The tops of the columns would all be on these outer octagons if winds from the eight directions were equally frequent and there were no calms. The percentage frequency of calms in the 12 months is shown by figures within the octagons. Small dashes within the inner octagons indicate months when the percentage of winds from that direction is practically zero.

PLATE 14



AVERAGE ANNUAL THUNDERDAY MAP

AUSTRALIA

(Means based on 5 years 1954 - 58 inclusive)
Isopleths in days

Issued by the Director of Meteorology

MILES 100 0 100 200 300 400 500 MILES

SCALE 1: 20.000.000 315.66 MILES TO AN INCH

PROJECTION: ALBERS CONICAL EQUAL AREA

PLATE 15

HEAVY RAINFALLS TO 1965, INCLUSIVE—*continued*

NORTHERN TERRITORY

Name of town or locality	Date	Amount (inches)	Name of town or locality	Date	Amount (inches)
Brocks Creek	24 Dec. 1915	14.33	Borroloola	7 Jan. 1940	12.68
Groote Eylandt	9 Apr. 1931	14.29	Borroloola	4 Feb. 1938	12.00
Borroloola	14 Mar. 1899	14.00	Bathurst Island Mission	7 Apr. 1925	11.85
Timber Creek	5 Feb. 1942	13.65	Darwin	7 Jan. 1897	11.67
Cape Don	13 Jan. 1935	13.58			

SOUTH AUSTRALIA

Name of town or locality	Date	Amount (inches)	Name of town or locality	Date	Amount (inches)
Ardrossan	18 Feb. 1946	8.10	Port Victoria	18 Feb. 1946	7.08
Carpa	18 Feb. 1946	7.83	Wynbring	28 Feb. 1921	7.00
Edithburgh	18 Feb. 1946	7.46	Mannum	25 Jan. 1941	6.84
Hesso	18 Feb. 1946	7.36	Wirrabarra Forest Reserve	7 Mar. 1910	6.80
Maitland	18 Feb. 1946	7.21	Cape Willoughby	18 Feb. 1946	6.80
Wilmington	1 Mar. 1921	7.12			

QUEENSLAND

Name of town or locality	Date	Amount (inches)	Name of town or locality	Date	Amount (inches)
Crohamhurst	3 Feb. 1893	35.71	Springbrook	21 Feb. 1954	27.04
Finch-Hatton	18 Feb. 1958	34.58	Mt. Jukes	18 Feb. 1958	26.40
Port Douglas	1 Apr. 1911	31.53	Buderim Mountain	12 Jan. 1898	26.20
Yarrabah	2 Apr. 1911	30.65	Byfield (Parnass Vale)	3 Mar. 1949	25.43
Mt. Charlton	18 Feb. 1958	29.95	Flat Top Island	21 Jan. 1918	25.18
Mooloolah	3 Feb. 1893	29.11	Landsborough	3 Feb. 1893	25.15
Kuranda	2 Apr. 1911	28.80	Harvey Creek	31 Jan. 1913	24.72
Calen	18 Feb. 1958	27.84	Kuranda	1 Apr. 1911	24.30
Harvey Creek	3 Jan. 1911	27.75	Babinda (Cairns)	2 Mar. 1935	24.14
Sarina	26 Feb. 1913	27.75	Goondi	30 Jan. 1913	24.10
Plane Ck. (Mackay)	26 Feb. 1913	27.73	Banyan (Cardwell)	12 Feb. 1927	24.00
Deeral	2 Mar. 1935	27.60	Carruchan	24 Jan. 1934	24.00
Yarrabah Mission	24 Jan. 1916	27.20	Tully Mill	12 Feb. 1927	23.86
Springbrook	24 Jan. 1947	27.07			

NEW SOUTH WALES

Name of town or locality	Date	Amount (inches)	Name of town or locality	Date	Amount (inches)
Dorrigo	24 June 1950	25.04	Tallowood Point	21 Feb. 1954	19.87
Cordeaux River	14 Feb. 1898	22.58	Buladelah	16 Apr. 1927	19.80
Morpeth	9 Mar. 1893	21.52	Orara Upper	24 June 1950	19.80
Broger's Creek	13 Jan. 1911	20.83	Dorrigo (Townsend)	11 July 1962	19.18
South Head (Sydney Harbour)	16 Oct. 1844	20.41	Tallowood Point	24 June 1950	18.82
,, ,,	29 Apr. 1841	20.12	Madden's Creek	13 Jan. 1911	18.68
Mount Pleasant	5 May 1925	20.10	Condong	27 Mar. 1887	18.66
Broger's Creek	14 Feb. 1898	20.05	Candelo	27 Feb. 1919	18.58
Towamba	5 Mar. 1893	20.00	Tallowood Point	22 Jan. 1959	18.55
Viaduct Creek	15 Mar. 1936	20.00	Mt. Kembla	13 Jan. 1911	18.25
			Bega	27 Feb. 1919	17.88

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HEAVY RAINFALLS TO 1965, INCLUSIVE—*continued*

Name of town or locality	Date	Amount (inches)	Name of town or locality	Date	Amount (inches)
AUSTRALIAN CAPITAL TERRITORY					
Jervis Bay . .	29 Apr. 1963	7.15	Uriarra (Woodside).	27 May 1925	6.57
Cotter Junction .	27 May 1925	7.13	Land's End . .	27 May 1925	6.35
Canberra (Acton) .	27 May 1925	6.84			
VICTORIA					
Balook . . .	18 Feb. 1951	10.81	Blackwood (Green-hill) . . .	26 Jan. 1941	8.98
Hazel Park . .	1 Dec. 1934	10.50	Tambo Crossing .	13 July 1925	8.89
Kalorama . .	1 Dec. 1934	10.05	Corinella . .	28 June 1948	8.75
Cann River . .	16 Mar. 1938	9.94	Erica . . .	1 Dec. 1934	8.66
Tonghi Creek .	27 Feb. 1919	9.90	Mt. Buffalo . .	6 June 1917	8.53
Cann River . .	27 Feb. 1919	9.56	Korumburra . .	1 Dec. 1934	8.51
Tanybryn . .	7 June 1952	9.16			
Olinda . . .	1 Dec. 1934	9.10			
TASMANIA					
Mathinna . .	5 Apr. 1929	13.25	Riana . . .	5 Apr. 1929	11.08
Cullenswood . .	5 Apr. 1929	11.12	Triabunna . .	5 June 1923	10.20

Snow and hail. For varying periods from late autumn to early spring snow usually covers the ground to a great extent on the Australian Alps above a level of about 4,500 to 5,000 feet, where in both New South Wales and Victoria ski-ing resorts operate throughout the season.

In Tasmania also the highlands are frequently covered above the 3,500 feet level for extended periods of the winter. There are, however, some years when snowfalls are much lighter than normal and even fail completely. Light snow has been known to fall occasionally as far north as the New England plateau in New South Wales (latitude 31° S.), and in exceptional seasons much of the dividing range from Victoria to Toowoomba (Queensland) has been covered above a level of about 4,000 feet. In ravines around Mount Kosciusko small areas of snow may persist throughout the summer after a heavy winter fall. This winter snowfall of south-eastern Australia is important in aiding the reliable flow of many streams which are utilised in the hydro-electric schemes of the Snowy Mountains, northern Victoria, and Tasmania. Snowfall at low terrain elevations occurs from time to time, particularly in Tasmania and Victoria, but falls are usually light and rarely lie more than a few days.

Hail is most frequent in winter and spring along the south-eastern coastal region of the continent and in Tasmania, where it is usually of a relatively small size. Summer storms, however, which are quite frequent, particularly in the highland plateau regions of eastern Australia, often produce stones of large size and of destructive intensity. Very large stones capable of piercing light gauge galvanised iron are reported from time to time, and damage to fruit crops in south-eastern Australia from large hail stones is quite frequent.

Floods. In general, flooding in Australia is most pronounced on the shorter streams flowing from the Great Dividing Range into the Pacific Ocean along the seaboard of Queensland and New South Wales. These floods are particularly destructive on the more densely populated coast of New South Wales. The chief rivers in this area are the Tweed, Richmond, Clarence, McLeay, Nepean, Hawkesbury, Hunter, and Shoalhaven, all of which experience quite frequent and considerable flooding. These floods occur chiefly in summer but may occur at any time of the year.

The great Fitzroy and Burdekin river systems in Queensland are also subject to floods during the summer wet season, while much of the heavy monsoon rain in northern Queensland flows southward through the normally dry channels of the network of rivers draining into Lake Eyre. This water may cause extensive floods over a vast area, but it is soon lost by seepage and evaporation and rarely reaches the lake in any quantity. The Condamine and the other tributaries of the Darling also carry considerable volumes of water south through western New South Wales to the Murray, and flooding along their courses occurs from time to time.

Flooding also occurs from time to time, usually in autumn, winter and spring, in the Murray-Murrumbidgee system of New South Wales and Victoria and on the smaller coastal streams of southern Victoria. In Tasmania, flooding of the north coast streams, particularly the South Esk system, is common in the same seasons. In South Australia some flooding has occurred in the lower reaches of the Murray owing to rainfall as far away as Queensland and south-eastern New South Wales. In the north of Western Australia and the Northern Territory, flooding of the coastal streams occurs frequently in summer but is not of such economic importance as the flooding of the eastern coastal streams of the continent, where many localities are more vulnerable to damage.

Temperature

The accurate measurement of the temperature of the air is not easy, as temperature sensitive devices also absorb radiant heat or can lose heat by radiation. Following international practice, air temperature measurements in Australia are made by thermometers freely exposed in a double louvred box (the Stevenson screen). Maximum and minimum air temperatures during each day are measured by means of special thermometers exposed in the Stevenson screen. The minimum air temperature at the surface of the earth as the ground cools at night by outgoing radiation (the terrestrial or grass minimum) is also measured at many stations. Such temperature recordings measure a theoretical physical quantity which bears only an indirect relation to the comfort or discomfort a person feels. Temperature measurements alone may be regarded only as a first approximation to a measurement of personal comfort. The actual degree of personal comfort is related to a number of meteorological factors such as air temperature, wind speed, humidity, exposure to the sun's rays, and the temperature of surrounding surfaces (i.e. the radiation balance of the body).

In addition to these quantities, which are all physically measurable, a number of personal quantities are involved which vary greatly from person to person and which cannot be precisely expressed, e.g. race and acclimatisation, age and state of health, type of clothing, and degree of physical activity in work and recreation. Conditions thus vary greatly for a particular individual even in a fixed location, so that it is difficult to describe general comfort variability uniquely throughout a region as varied climatically as Australia. A number of indexes which attempt to incorporate some of the factors described above have been used experimentally from time to time, and further research continues on this very difficult problem. Generally speaking, there is an increase in discomfort northwards within the tropical regions of Australia in summer, owing to the heat and high absolute humidity which reach a maximum in the extreme north of the continent. Such conditions are, however, ameliorated to a large extent in highland areas such as the Atherton Tableland in Queensland. No part of Australia is uncomfortably hot in winter, and only in a small area of the Australian Alps and highland Tasmania does bodily strain due to cold exist in winter. The history of the settlement of the northern regions of Queensland and the Northern Territory indicates that with accelerating development of studies and experience in the arrangement of living and working accommodation, clothing, and general way of life, the effects of extremes of climate can be minimised.

For some further discussion of the problems of temperature and comfort conditions reference may be made to Ashton, H. T., *Meteorological Data for Air Conditioning in Australia*, Bureau of Meteorology Bulletin No. 47 (1964).

Average seasonal temperature distribution. Plates 5 to 8 show the normal daily maximum and minimum temperatures for January and July, which may be taken as indicative respectively of the summer and winter seasons in Australia. Further detailed temperature data are presented on pages 41–50 for the capital cities and more important country towns of the Commonwealth.

On the basis of average annual mean temperatures, and latitude for latitude, Australia is somewhat cooler than the other land masses of the southern hemisphere and considerably cooler than the same latitudes in the large continental areas of the northern hemisphere. This is due to the insular nature of Australia and the stronger general circulation of the atmosphere in the southern hemisphere resulting in the transport of higher latitude (cooler) air into the subtropical regions.

July is the month with the lowest mean temperature in all parts of the continent, while the month with the highest mean temperature varies from February in Tasmania and southern Victoria to December in the northern part of the continent and November in Darwin. The lateness of the month of highest average temperature in the extreme south of the continent is due in part to the effect of the Southern Ocean, where the sea surface temperature reaches its maximum in February. The cooler period of the late summer in the north is due largely to increased cloudiness associated with the inflow of north-west winds with the onset of the monsoon season.

In January average maximum temperatures exceed 95° F. over a vast area of the interior of the continent, and over large areas exceed 100° F. The hottest part of Australia is situated in the north of Western Australia around the Marble Bar and Nullagine area, where the daily maximum screen temperature during the summer frequently exceeds 100° F. for weeks at a time.

The marked change of maximum temperature in summer with distance from the sea, in areas close to the coasts, particularly along the Great Australian Bight and the Indian Ocean coast of Western Australia, is due to the penetration inland of the vigorous sea breezes which are initiated by the considerable temperature contrast between land and sea surface temperatures. The 75° F. isotherm of January mean maximum temperature skirts the southern coast of the continent from south-western Western Australia to Gippsland.

In January the mean minimum temperatures in the tropics, except for some highland regions, exceed 72° F., with a gradual decrease southward to values of 55° F. in Victoria and 50° F. in Tasmania. Highland regions in the south have mean values of 45° F. and lower. In July a more regular latitudinal distribution of mean maximum temperature is evident, only the extreme north of the continent having mean maxima higher than 80° F. Values lower than 60° F. are general over the south-eastern part of the continent, with mean maxima falling below 40° F. in small alpine areas. Average night minimum temperatures in July fall below 45° F. in areas south of the tropics and away from the coast. Alpine regions again record the lowest temperatures with some areas experiencing means lower than 25° F.

Extreme variation and daily range. Only at a few inland places in Australia does the absolute range of temperature (i.e. the range from the highest maximum to the lowest minimum) exceed 100° F. Generally it is in the range 70° F. to 90° F. in the inland areas and somewhat less on the coasts. The highest temperature recorded in Australia was 127 5° F. at Cloncurry (Queensland) on 16 January 1889 and the lowest −8° F. at Charlotte Pass in the southern Alps on 14 July 1945 and again on 22 August 1947. The world record maximum temperature is 136° F. at Azizia (Tripoli) on 13 August 1922 and the world record minimum temperature −126.9° F. at Vostok on the Antarctic plateau on 24 August 1960.

High temperatures. Heat waves with a number of successive days higher than 100° F. are relatively common in many parts of Australia. With the exception of the north-western coast of Western Australia, however, most coastal areas do not usually experience more than a few days in succession of such conditions. The frequency of such conditions increases inland, and periods of up to twenty days have been recorded over most of the settled areas. This figure increases in western Queensland and north-western Western Australia to more than sixty days in places. The central part of the Northern Territory and the Marble Bar-Nullagine area of Western Australia have recorded the most prolonged heat waves for the Australian region. The longest consecutive period of daily maxima greater than 100° F. was 160 consecutive days recorded in Marble Bar during the summer of 1923–24.

Frosts. Injury to the tissues of growing plants is not caused until the temperature has fallen considerably below the freezing point of water (32° F.), and a ground frost is regarded as having occurred when the grass thermometer has fallen below 30.4° F. However, as terrestrial minima are not recorded at all stations, it is usual for statistical purposes to regard the registration of a screen thermometer of 36° F. as indicating a 'light' frost. A map showing frequency of days with screen minima higher than 36° F. (i.e. the frost free period) is reproduced in plate 9. A 'heavy' frost is taken as a screen reading of less than 32° F. A 'black' frost occurs with a combination of low temperature and low humidity, and, although frost crystals are not observed on the ground, damage takes place to the plant cells by the freezing and expansion of the moisture they contain.

The frequency of frost depends largely on altitude, latitude, and proximity to the sea, and locally, to a very large extent, on even minor variations in contour of the land. The parts of Australia which are most subject to frost are the eastern highlands from north-eastern Victoria to the western Darling Downs in southern Queensland. Most stations in this region experience more than ten nights a month with readings of 32° F. or under for three to five months of the year. On Tasmania's Central Plateau similar conditions occur for three to six months of the year. Heavy frosts are comparatively infrequent in Western Australia, except in parts of the south and south-west. In South Australia frosts are most frequent in the agricultural areas of the south-east.

Frosts may occur within a few miles of the coast over the whole continent except the Northern Territory and most of north Queensland. Regions subject to frost at all times of the year comprise the whole of Tasmania, the tablelands of New South Wales, much of inland Victoria, particularly the north-east, and a small part of south-western Western Australia. Over most of the interior of the continent, and on the highlands of Queensland as far north as the Atherton Plateau, frosts commence in April and end in September, but they are infrequent in these months. Minimum temperatures below 32° F. are experienced in most of the sub-tropical interior in June and July.

For further details of frost conditions in Australia reference should be made to Foley, J. C., *Frost in the Australian Region*, Bureau of Meteorology Bulletin No. 32 (1945).

Humidity and saturation deficit

The amount of water vapour in the atmosphere is determined mainly by the temperature. The higher the temperature the more water vapour may be contained in a given mass of air. Vapour pressure is the pressure exerted by the water vapour of the atmosphere. At any given temperature there is a definite upper limit to the amount of water that can exist as vapour in the air. When this limit is reached the air is said to be saturated and the pressure of the water vapour is the saturation vapour pressure. Both these quantities may be expressed in millibars or in inches of mercury. The usual measure of humidity or moistness of the air is the relative humidity (which is measured by means of wet and dry bulb screen thermometers). This term is applied to the ratio of the existing vapour pressure to the saturated vapour pressure at the existing temperature and expressed as a percentage. However, from the point of view of physical comfort and in many industrial and agricultural problems, the more important measure of atmospheric water vapour is the absolute humidity or the actual mass of moisture contained in a fixed mass of air.

The annual variation of vapour pressure for regions outside the tropics closely follows that of temperature. However, the mean relative humidity in the temperate regions is generally highest in winter and lowest during the summer. In northern Australia the highest relative humidity occurs during the rainy summer season. The relative humidity variation during the day closely follows the diurnal variation of temperature, being highest with low temperatures and lowest with high temperatures. The relative humidity at 9 a.m. for Australian conditions may be considered as a close approximation to the mean for the whole day. In the tables for the capital cities, pages 41–8, the mean monthly vapour pressure and relative humidity for 9 a.m., together with the monthly extremes, are listed. The order of the stations in descending values of mean annual vapour pressure at 9 a.m. is Darwin, Brisbane, Sydney, Perth, Melbourne, Adelaide, Canberra, and Hobart, while the annual mean of the 9 a.m. relative humidities diminishes in the order Darwin, Sydney, Hobart, Melbourne, Brisbane, Canberra, Perth, and Adelaide.

Another method of humidity measurement which may be employed is the saturation vapour deficit. This may be defined as the difference between the saturation vapour pressure and the actual vapour pressure both referred to the dry bulb temperature. It is thus a measure of the drying power of the air and like vapour pressure may be expressed in millibars or inches of mercury.

In January the mean saturation deficit at the mean temperature for the month has a maximum value of over 0.90 inches in the central parts of Western Australia and in south-eastern Queensland. Gradual decreases occur towards the coast, where values close to the north, east, and south coastlines are around 0.20 inches. On the western coast values are somewhat higher, and a strong gradient exists in the saturation deficit in the narrow region bordering the Indian Ocean. In July the variation is less, with maxima of 0.40 inches in the dry north of the Northern Territory and Western Australia, slowly decreasing generally to the south, with values over most of the south-east and extreme south-west of the continent being less than 0.10 inches. Extremely low values (less than 0.025 inches) exist in July over the highlands of south-eastern Australia and Tasmania.

Evaporation

Evaporation is a process which results in the transfer of water vapour from the surface of the earth into the atmosphere and takes place from free water surfaces, from moist soil, and by the process of transpiration from plants. The figures quoted in this section, however, refer to evaporation as measured from an Australian standard evaporation tank. This instrument consists of a copper tank surrounded by a 6-inch water jacket sunk in the ground to a depth of 36 inches and exposing at ground level a water surface 36 inches in diameter from which the evaporation loss of water is measured. Earlier estimates of Australian evaporation data were supplemented by calculations based on an empirical formula dependent on saturation deficit, but more recent measurements have enabled charts of monthly and annual evaporation to be constructed wholly from observational records. Such a map is plate 10. The rate and quantity of evaporation in any territory are influenced by the net radiation, prevailing temperature, vapour pressure, and turbulent diffusion by wind.

In Australia the study of evaporation is of great importance, since in its drier regions water conservation must be practised by the use of tanks and dams. The magnitude of the economic loss by evaporation may be appreciated from plate 10, which shows that the yearly amount varies from 20 inches over the highland areas of central Tasmania to more than 130 inches in the northern and north-western part of South Australia.

Over an area of some 70 per cent of the continent, comprising most inland districts and extending to the coast in the north-west of Western Australia and to the head of the Great Australian Bight, the rainfall does not exceed the evaporation loss in any month of the year. The central and north-western portions of the continent experience evaporation far in excess of their rainfall. Vegetation over these areas is characterised by acacia, scrub steppe, and arid scrub, while many areas are merely sand hills and stony desert. Over many of the drier areas, however, particularly in the inland areas of south-eastern Australia, the loss of rainfall by evaporation is made good to some extent by the development of irrigation schemes. Some of these schemes, such as those at the Murrumbidgee Irrigation Area in New South Wales and at Mildura in Victoria and Renmark in South Australia, have been very successful. The Snowy Mountains Hydro-electric Scheme will also result in the large-scale supply of water from the south-eastern highlands of Australia for use in the drier areas to the west of the ranges in New South Wales and Victoria. The future development of such schemes as these holds promise for the reclamation of many marginal areas in Australia, which because of low rainfall and high evaporation are at present of little economic value.

Since the loss by evaporation depends largely on the net radiation absorbed and consequently on the extent of the exposed area, tanks and dams so designed that the surface area shall be a minimum are advantageous. Further, the more protected they are from the direct rays of the sun and from winds by means of suitable tree planting the less will be the evaporation loss. The Mansfield process for the treatment of tanks and dams by a mono-molecular chemical film which materially reduces evaporation is a recent development which is already giving beneficial results, particularly on large water storage areas. Such improvements are of considerable importance to the pastoralists of the drier regions of Australia and to water supply authorities.

Further information on evaporation may be found in Hounam, C. E., *Evaporation in Australia*, Bureau of Meteorology Bulletin No. 44 (1961).

Sunshine and cloud

The proportion of the sky covered by cloud is of considerable meteorological and climatological importance. A cloud cover inhibits both incoming and outgoing radiation and thus profoundly affects the temperature distribution and other factors at the earth's surface. Cloud amount is measured in eighths of the sky covered.

In Australia the seasonal changes in cloudiness correspond closely to that of rainfall. In the southern or more temperate parts of the continent, particularly in the coastal and low lying areas, the winter months are generally more cloudy than the summer. This is due to the formation of extensive areas of stratiform cloud and fog during the colder months, when the structure of the lower layers of the atmosphere favours the physical processes resulting in this type of cloud. A particularly strong annual periodicity exists in the monsoonal regions of northern Australia, where it is heavily clouded during the summer wet season and practically cloudless during the winter 'dry'. Cloudiness is higher near coasts and on the windward slopes of the mountains of eastern Australia and is least over the dry interior parts of the continent.

A close relationship exists between cloud amount and number of sunshine hours, and it is possible to estimate from cloud data the equivalent number of sunshine hours over a given period. These data can be incorporated with records of direct measurement of sunshine hours, and approximate distribution maps produced for Australia. Maps of the mean sunshine distribution for January and July are reproduced in plates 11 and 12 and indicate the main features of the variation over Australia in these months.

Except for Tasmania and a narrow fringe bordering the southern, eastern and northern coasts, the greater part of the continent receives more than 3,000 hours of sunshine each year, and in Central Australia and the mid-western coast of Western Australia totals in excess of 3,500 hours occur. The extreme south coast receives in the main 2,000 to 2,500 hours annually, while the east coast regions of New South Wales and Queensland receive 2,500 to 3,000 hours. A minimum of less than 1,750 hours occurs on the west coast and highlands of Tasmania.

Mean amounts of cloud for each month at the capital cities are included in the tables on pages 41–8 as are the mean daily hours of sunshine. The latter figure is a good single measure of the relative climatic characteristics of the individual cities for different months of the year.

Wind

Australia lies in those latitudes of the southern hemisphere where it is influenced largely by two wind systems:

(*a*) the south-east trade winds blowing on the equatorial side of the mid-latitude anticyclones; and

(*b*) the westerlies south of the mid-latitude anticyclones in which successive low pressure systems move eastward over the Southern Ocean.

The only pronounced seasonal variations of atmospheric pressure in the middle and high latitudes of the southern hemisphere are related to the latitudinal shift in the axes of the subtropical high pressure systems and to the change in the tracks of the migratory anticyclones. The latter systems move generally from west to east in the Australian region between the semi-permanent oceanic anticyclones of the Indian and Pacific Oceans. The mean path of these systems lies over southern Australia during the summer but moves northwards during the winter with the thermal equator. The movement is only of a few degrees of latitude but it is of very great importance to the climate of the Australian continent. During the summer months, when the anticyclones move on a more southerly track, the south-east trades affect the whole coast of eastern Australia north of around latitude 30° S., the westerlies retreating to higher latitudes, and conditions are more settled over southern Australia which then lies close to the axis of the anticyclones. In winter the anticyclones move further north, the trades affect only the northern parts of the continent, and southern Australia is exposed to the westerlies of the Southern Ocean.

In summer, with the retreat of the anticyclones to the south, the whole of northern and north-western Australia is exposed initially to light wind systems, and then during the period from December to April to the effects of the north-west monsoon. This process, which is associated with an inflow of north-west winds and intensive rains, is not as regular or persistent as the south-west monsoon of south-east Asia. However, it is a sufficiently regular feature of the climate of northern Australia to be designated as the north-west season, or, as it is best known in the area, 'the wet'. Its influence affects areas as far south as central Queensland, but southern Queensland and the area east of the Great Dividing Range are largely still under the influence of the south-east trades. Fringe or marginal areas on the southern limits of the monsoonal penetration over the continent have a shorter and more uncertain 'wet' season, which in some years fails to appear at all. With the northward advance of the anticyclones in autumn, the monsoon gives way again to the trades, and 'the dry' of northern and north-western Australia commences.

The general features of these wind patterns may be seen in the wind rose diagrams of plates 13 and 14. It is important, however, to note the dynamic nature of the atmosphere, and that the continual growth, decay and motion of the pressure systems result in a wide diversity of wind-flow types. Descriptions of wind conditions for particular geographical areas and seasons can thus be only of a very generalised kind. Further, local features can also be imposed on the overall wind pattern — channelling of winds due to topography (e.g. the high frequency of north-west winds in Hobart) and the marked summer sea breeze characteristics of most of the Australian coast, particularly near the Great Australian Bight as shown in the diagrams of 3 p.m. wind frequencies.

Storms and tropical cyclones

In general there are two types of weather systems in Australia which produce very strong winds and heavy rainfalls over large areas of the continent:

(*a*) the active depressions which move westwards over the Southern Ocean; and

(*b*) the tropical cyclones or hurricanes of north-eastern and north-western Australia.

During the winter the southern shores of the continent are subject to the deep depressions of the southern low pressure belt. They are felt most severely over the south-west of Western Australia, the south-east of South Australia, southern Victoria, and Tasmania, and may move inland in all these regions bringing strong winds and heavy rainfall. Further extensions of this type of system frequently develop close to the coast of New South Wales, often bringing severe weather to this region and to southern Queensland. These are generally known as 'east coast lows'.

The frontal systems (i.e. the narrow zones characterised by cloud and bad weather separating two air masses of different density) which are associated with these depressions vary widely in character. A common type in south-east Australia is a cold front located in a Λ shaped trough. Such a system usually brings very strong north to north-west winds in advance of the front with a very abrupt backing of the wind to colder west to south-westerly winds after the frontal passage. Such frontal passages are, in their most severe form, associated with thunderstorms and line squalls, heavy rain, and a change to cold winds and showers. These violent changes with the passage of a cold front and strong southerly winds frequently affect the New South Wales coast as far north as Newcastle during the winter, and are popularly known as 'southerly busters'.

The most extensive rains of inland Australia occur when moist tropical air which has moved inland is lifted by convergence ahead of a slow moving colder air mass moving from the southern Ocean. The coast of Queensland, particularly the section from Cooktown to Mackay and the adjacent waters, is subject to visitations by tropical cyclones (the 'hurricanes' of the Caribbean and 'typhoons' of the China Sea). These destructive systems can affect this region from December to April, normally forming in the Coral Sea, moving south-west close to the coast and then passing away to the south-east into the Pacific. They may, however, cross the coast from time to time and bring torrential rain and violent winds (often more than 100 mph) to the coastal regions.

Similar systems affect the north-west coast of Western Australia where they bear the local name of 'willy willies', a name which is, however, often used generally in Australia for minor local whirlwinds or dust devils. The season in this region generally lasts from November to April, the storms originating in the Timor or Arafura Seas travelling usually south-west and approaching the coast most commonly between latitudes 20° S. and 22° S. Thence the systems may move southward following the coast, or sometimes cross inland bringing high rainfalls to the otherwise dry interior of the continent. A further region which is affected somewhat less frequently by tropical cyclones is the coast of Arnhem Land in the Northern Territory and the waters and coasts of the Gulf of Carpentaria.

Tropical cyclones, in general, soon lose their intensity on crossing from sea to land, but although the wind force rapidly abates, they are still capable of producing the heavy rainfall which leads to flooding of coastal rivers, damage to stock and property, and general disruption of transport.

Thunderstorms which bring local heavy rain and strong winds are common to most of Australia. They are also of particular importance because of the lightning damage which they cause to power transmission lines, and have been extensively studied for the purpose of siting electrical installations as far as possible in areas of low thunderstorm occurrence. Plate 15 shows the number of days annually on which thunder is heard, which is a better observational criterion than lightning observed. The region of maximum thunderstorm activity is the extreme north-west of the continent and the region south-east of the Gulf of Carpentaria. In the more settled areas maximum thunderstorm occurrence is in central western and south-eastern Queensland and the highland areas of New South Wales. The minimum number of storms occur over the interior of South Australia, western New South Wales, and eastern Tasmania.

Climatological tables

The averages and extremes for a number of elements which have been determined from long series of observations at the Australian capitals up to and including the year 1965 are given in the following pages, together with more limited data for the larger country towns of the Commonwealth. The following points apply throughout.

(*a*) Where records are available, prevailing winds have been determined over a standard period of thirty years from 1911 to 1940.

(*b*) Other averages and extremes, including evaporation, temperature and rainfall records for which thirty years normals have been published for a number of years past, have been extracted from all available years of actual record, but the number of years quoted does not include intervening periods when observations were temporarily discontinued.

CLIMATOLOGICAL DATA: PERTH, WESTERN AUSTRALIA

(Lat. 31° 57′ S., Long. 115° 51′ E. Height above M.S.L. 210 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind (Height of anemometer 71 feet)					Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m., 9 p.m.(a)	No. of clear days
		Average miles per hour	*Highest* mean speed in one day (miles per hour)	High-*est* gust speed (miles per hour)	*Prevailing* direction 9 a.m.	*Prevailing* direction 3 p.m.				
No. of years of observations.	81	30(*b*)	66	53	30(*b*)	30(*b*)	67	69	30(*b*)	30(*b*)
January	29 904	10.9	26.3 *27/98*	50	E	SSW	10 29	2	2.3	14
February	29 915	10.7	21.5 6/08	54	ENE	SSW	8 65	1	2.5	13
March	29 980	10.1	21.5 6/13	70	E	SSW	7.56	2	2.8	12
April	30 060	8.5	31.5 25/00	63	ENE	SSW	4 65	1	3.4	9
May	30 060	8.4	27.3 29/32	74	NE	WSW	2.78	3	4.3	6
June	30 057	8.4	30.2 17/27	80	N	NW	1 83	2	4.7	5
July	30 086	8.8	33.5 20/26	85	NNE	W	1.79	2	4.5	5
August	30 083	9.4	31.9 15/03	97	N	WNW	2.42	1	4.5	6
September	30 072	9.4	28.5 11/05	68	ENE	SSW	3.49	1	3 9	8
October	30 033	10.0	26 7 6/16	65	SE	SW	5.36	1	3.8	8
November	29 989	10.7	25.7 *18/97*	63	E	SW	7 55	1	3.1	9
December	29.924	11.0	25.6 6/22	64	E	SSW	9.59	2	2.6	13
Year — Totals	. .	. .	. .	. .	. .	. .	65.96	19	. .	108
Year — Averages	30.014	9.7	. .	. .	E	SSW	. .	. .	3.5	. .
Year — Extremes	. .	. .	33.5 20/7/26	97	. .	. .	. .	. .	. .	. .

(*a*) Scale 0–8. (*b*) Standard thirty years normal (1911–1940).

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.)			Extreme shade temperature (°Fahr.)		Extreme range	Extreme temperature (°Fahr.)		Mean daily hours of sunshine
	Mean max.	Mean min.	Mean	Highest	Lowest		Highest in sun	Lowest on grass	
No. of years over which observation extends .	69	69	69	69	69	69	63(*a*)	67	68
January	85.1	63.5	74.3	110.7 29/56	48.6 20/25	62.1	177.3 22/14	39.5 20/25	10 4
February	85.5	63.8	74.6	112.2 8/33	47.7 1/02	64.5	173.7 4/34	39.8 1/13	10 0
March	82.0	61.6	71.8	106.4 14/22	45.8 8/03	60.6	167.0 19/18	36.7 8/03	8 8
April	76.1	57.2	66.6	99.7 9/10	39.3 20/14	60.4	157.0 8/16	30.8 26/60	7.3
May	69.1	52.7	60.9	90.4 2/07	34.3 11/14	56.1	146.0 4/25	25 0 31/64	5 8
June	64.4	49.7	57.0	81.7 2/14	34.9 22/55	46.8	135.5 9/14	25.9 27/46	4 8
July	62.9	47.9	55.4	76.4 21/21	34.2 7/16	42.2	133.2 13/15	25.1 30/20	5.2
August	64.1	48.3	56.2	82.0 21/40	35.4 31/08	46.6	145.1 29/21	26.7 24/35	6.1
September	66.8	50.1	58.4	90.9 30/18	36.7 6/56	54.2	153.6 29/16	27.2 (*b*)	7 1
October	69.8	52.4	61.1	99.0 26/61	40.0 16/31	59.0	161.2 19/54	29.8 16/31	8 1
November	76.1	56.7	66.4	104.6 24/13	42.0 1/04	62.6	167.0 30/25	35.0 3/47	9.5
December	81.1	60.7	70.9	107.9 20/04	47.5 29/57	60.4	168.8 11/27	38.0 29/57	10.4
Year — Averages	73.6	55.4	64.5	. .	. .	. .	. .	. .	7.8
Year — Extremes	. .	. .	. .	112.2 8/2/33	34.2 7/7/16	78.0	177.3 22/1/14	25.0 31/5/64	. .

(*a*) Records discontinued 1963. (*b*) 8/1952 and 6/1956.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches) Mean 9 a.m.	Rel. hum. (%) at 9 a.m.			Rainfall (inches)					Fog
		Mean	Highest mean	Lowest mean	Mean monthly	Mean No of days of rain	Greatest monthly	Least monthly	Greatest in one day	Mean No of days of fog
No. of years over which observation extends.	30(*a*)	30(*a*)	69	69	90	90	90	90	90	69
January	0.438	51	63	41	0 33	3	2.17 1879	Nil (*b*)	1.74 *27/79*	0
February	0.434	51	65	43	0.44	3	6.55 1955	Nil (*b*)	3.43 17/55	0
March	0.432	57	66	46	0 80	4	5.71 1934	Nil (*b*)	3.03 9/34	1
April	0.397	61	75	51	1.80	7	5.85 1926	Nil 1920	2.62 30/04	1
May	0.365	70	81	61	4.97	14	12.13 1879	0.77 1949	3.00 17/42	1
June	0.337	75	85	68	7.28	17	18.75 1945	2.16 1877	3.90 10/20	2
July	0.322	76	88	69	6.89	18	16.73 1958	2.42 1876	3.00 *4/91*	1
August	0.316	71	83	62	5.60	18	12.53 1945	0.46 1902	2.91 14/45	1
September	0.341	66	75	58	3.17	14	7.84 1923	0.34 1916	1.82 4/31	0
October	0.345	60	75	52	2.18	12	7.87 1890	0.15 1946	1.73 3/33	0
November	0.374	52	63	41	0 83	7	2.78 1916	Nil 1891	1.54 29/56	0
December	0.409	51	63	39	0.58	4	3.17 1951	Nil (*b*)	1.84 3/51	0
Year — Totals	. .	. .	. .	. .	34.87	121	. .	. .	. .	7
Year — Averages	0.376	62	. .	. .	. .	. .	. .	. .	. .	. .
Year — Extremes	. .	. .	88	39	. .	. .	18.75 6/1945	Nil(*c*)	3.90 10/6/20	. .

(*a*) Standard thirty years normal (1911–1940). (*b*) Various years. (*c*) November to April, various years.
Dates in italics relate to nineteenth century.

CLIMATOLOGICAL DATA: DARWIN, NORTHERN TERRITORY

(Lat. 12° 28′ S., Long. 130° 51′ E. Height above M.S.L. 97 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind: Average miles per hour	Wind: Highest mean speed in one day (miles per hour)	Wind: Highest gust speed (miles per hour)	Wind: Prevailing direction 9 a.m.	Wind: Prevailing direction 3 p.m.	Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m., 9 p.m.(*a*)	No. of clear days
No. of years of observations.	84	14	..	15(*b*)	..	..	8	30	30	30
January	29 709	6.1	..	66	NW & S	W & NW	6.04	16	5.7	1
February	29 718	6.7	..	63	W & S	W & NW	5 61	16	5.6	1
March	29 749	5.3	..	98	SE	W & NW	6.14	14	5.0	3
April	29 802	6.1	..	42	SE	E	6.49	6	2.8	11
May	29 853	6.5	..	39	SE	E	7.27	1	1.7	19
June	29 889	6.5	..	40	SE	E & SE	6.97	0	1.3	22
July	29 907	6.2	..	39	SE	E & SE	7.05	0	1.1	23
August	29 903	5.9	..	45	SE	NW & N	7.73	0	1.0	23
September	29 877	6.2	..	40	SE & S	NW & N	8.07	1	1.6	18
October	29 840	6.2	..	53	S	NW & N	9.17	8	2.6	10
November	29.788	5.5	..	58	W & S	NW & N	8.20	17	3.8	4
December	29.734	6.2	..	66	NW & S	NW & N	7.18	17	4.8	2
Year: Totals	..	..	..	..	..	..	85.92	96	..	137
Year: Averages	29.814	6.1	..	..	SE	NW	..	..	3.1	..
Year: Extremes	..	..	..	98	..	..	..	..	..	..

(*a*) Scale 0–8. (*b*) Several incomplete years.

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.): Mean max.	Mean temperature (°Fahr.): Mean min.	Mean temperature (°Fahr.): Mean	Extreme shade temperature (°Fahr.): Highest	Extreme shade temperature (°Fahr.): Lowest	Extreme range	Extreme temperature (°Fahr.): Highest in sun	Extreme temperature (°Fahr.): Lowest on grass	Mean daily hours of sunshine
No. of years over which observation extends	84	84	84	84(*a*)	84(*a*)	84	25(*b*)	..	14
January	89.9	77.0	83.5	100.0 *2/82*	68.0 *20/92*	32.0	168.0 26/42	..	5.8
February	89.5	76.6	83.1	100.9 *20/87*	63.0 25/49	37.9	163.6 (*c*)	..	6.2
March	90.4	76.6	83.5	102.0 (*d*)	66.6 31/45	35.4	165.6 23/38	..	6.9
April	91.7	75.5	83.6	104.0 *7/83*	60.8 11/43	43.2	163.0 1/38	..	8.3
May	90.2	72.2	81.2	102.3 *8/84*	59.1 14/64	43.2	160.0 5/20	..	9.5
June	87.7	68.9	78.3	98.6 17/37	53.8 23/63	44.8	155.2 2/16	..	9.8
July	86.9	67.2	77.1	98.0 *17/88*	50.7 29/42	47.3	156.0 28/17	..	9.8
August	88.7	69.3	79.0	98.0 19/00	56.4 11/63	41.6	156.2 28/16	..	10.4
September	90.9	73.6	82.3	102.0 *20/82*	62.1 9/63	39.9	157.0 (*e*)	..	9.9
October	92.6	77.0	84.8	104.8 *17/92*	67.4 25/60	37.4	160.5 30/38	..	9.5
November	92.9	77.6	85.3	103.3 *9/84*	66.8 4/50	36.5	170.4 14/37	..	8.2
December	91.7	77.6	84.7	102.0 *9/83*	65.0 4/60	37.0	169.0 26/23	..	6.9
Year: Averages	90.3	74.1	82.2	..	..	..	..	..	8.4
Year: Extremes	..	..	..	104.8 17/10/1892	50.7 29/7/42	54.1	170.4 14/11/37	..	..

(*a*) Years 1882–1941 at Post Office, 1942–1965 at Aerodrome; sites not strictly comparable. (*b*) Records discontinued 1942. (*c*) 5/1938 and 23/1938. (*d*) 26/1883 and 27/1883. (*e*) 28/1916 and 3/1921.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches): Mean 9 a.m.	Rel. hum. (%) at 9 a.m.: Mean	Rel. hum. (%) at 9 a.m.: Highest mean	Rel. hum. (%) at 9 a.m.: Lowest mean	Rainfall (inches): Mean monthly	Rainfall (inches): Mean No. of days of rain	Rainfall (inches): Greatest monthly	Rainfall (inches): Least monthly	Rainfall (inches): Greatest in one day	Fog: Mean No. of days of fog
No. of years over which observation extends.	84	84	57(*a*)	57(*a*)	97	68	97(*b*)	97(*b*)	97(*b*)	30
January	0.918	80	89	69	15 09	19	27.86 *1896*	2.67 *1906*	11.67 *7/97*	0.0
February	0.918	81	88	71	12 81	18	28.23 1956	0.53 1931	11.00 18/55	0.0
March	0.907	80	84	69	10 52	17	23.42 1965	0.81 1911	7.18 6/19	0.0
April	0.797	72	80	60	3 98	8	23.74 *1891*	Nil 1950	6.22 4/59	0.0
May	0.644	65	76	49	0.52	1	10.27 *1882*	Nil (*c*)	2.19 6/22	0.0
June	0.552	63	75	52	0.11	0	1.53 1902	Nil (*c*)	1.32 10/02	0.4
July	0.520	62	71	47	0.05	0	2.56 1900	Nil (*c*)	1.71 2/00	1.1
August	0.608	66	73	53	0.10	0	3.30 1947	Nil (*c*)	3.15 22/47	0.7
September	0.729	68	73	54	0.57	2	4.26 1942	Nil (*c*)	2.78 21/42	0.2
October	0.818	68	72	60	2.15	5	13.34 1954	Nil (*c*)	3.74 18/56	0.0
November	0.865	70	75	62	5.20	11	15.72 1938	0.40 *1870*	4.73 9/51	0.0
December	0.901	75	83	65	9.60	16	22.94 1965	0.98 1934	7.87 28/10	0.0
Year: Totals	..	..	..	..	60.70	97	..	..	..	2.4
Year: Averages	0.765	71	..	..	..	..	..	..	..	..
Year: Extremes	..	..	89	47	..	..	28.23 2/1956	Nil (*d*)	11.67 7/1/1897	..

(*a*) 1882 to 1938 at Post Office. (*b*) The figures below are the highest or lowest recorded at either the Post Office or Aerodrome sites. (*c*) Various years. (*d*) April to October, various years.

Dates in italics relate to nineteenth century.

CLIMATOLOGICAL DATA: ADELAIDE, SOUTH AUSTRALIA

(Lat. 34° 56′ S., Long. 138° 35′ E. Height above M.S.L. 140 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind (Height of anemometer 75 feet)					Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m. 9 p.m.(a)	No. of clear days
		Average miles per hour	Highest mean speed in one day (miles per hour)	Highest gust speed (miles per hour)	Prevailing direction 9 a.m.	Prevailing direction 3 p.m.				
No. of years of observations.	109	14(b)	14(b)	49	30(c)	30(c)	94	94	98	51
January	29.920	7.8	18.2 3/55	72	SW	SW	9.29	2.2	2.9	12.4
February	29.953	7.4	17.7 1/64	66	NE	SW	7.52	1.5	2.9	10.8
March	30.038	6.9	19.1 24/64	78	S	SW	6.25	1.8	3.2	11.0
April	30.118	6.9	23.2 10/56	81	NE	SW	3.77	1.5	4.1	7.0
May	30.120	7.0	23.5 19/53	70	NE	NW	2.30	1.6	4.7	4.7
June	30.112	7.3	18.4 12/53	67	NE	N	1.45	1.5	5.0	4.0
July	30.118	7.2	20.4 13/64	92	NE	NW	1.46	1.5	4.8	3.7
August	30.092	7.8	23.7 8/55	75	NE	SW	2.08	1.8	4.1	5.0
September	30.050	8.0	21.7 16/65	69	NNE	SW	3.16	1.8	4.2	5.9
October	30.000	8.4	21.9 6/62	75	NNE	SW	5.03	2.7	4.2	5.4
November	29.977	8.4	20.6 8/52	81	SW	SW	6.78	3.0	3.9	6.8
December	29.923	8.2	17.9 6/52	75	SW	SW	8.64	2.2	3.3	9.1
Year — Totals	..	..	..	..	..	..	57.73	23.1	..	85.8
Year — Averages	30.035	7.6	..	..	NE	SW	..	..	3.9	..
Year — Extremes	..	..	23.7 8/8/55	92	..	..	..	..	..	..

(a) Scale 0–8. (b) Records taken from a Munro Anemometer 1952–1965. (c) Standard thirty years normal (1911–1940).

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.)			Extreme shade temperature (°Fahr.)		Extreme range	Extreme temperature (°Fahr.)		Mean daily hours of sunshine
	Mean max.	Mean min.	Mean	Highest	Lowest		Highest in sun	Lowest on grass	
No. of years over which observation extends	109	109	109	109	109	109	54(a)	105	84
January	85.5	61.4	73.5	117.7 12/39	45.1 *21/84*	72.6	180.0 *18/82*	36.5 *14/79*	9.9
February	85.0	61.7	73.3	113.6 *12/99*	45.5 23/18	68.1	170.5 10/00	35.8 23/26	9.4
March	80.6	58.9	69.8	110.5 9/34	43.9 21/33	66.6	174.0 *17/83*	32.1 21/33	7.8
April	72.9	54.5	63.7	98.6 5/38	39.6 *15/59*	59.0	155.0 *1/83*	28.0 14/63	5.9
May	65.7	50.4	58.1	89.5 4/21	36.9 (b)	52.6	148.2 *12/79*	25.6 19/28	4.7
June	60.5	46.8	53.7	78.1 4/57	32.5 (c)	45.6	138.8 *18/79*	21.0 24/44	4.1
July	59.0	44.9	51.9	74.0 11/06	32.0 24/08	42.0	134.5 *26/90*	22.1 30/29	4.3
August	61.7	46.0	53.8	85.0 31/11	32.3 *17/59*	52.7	140.0 *31/92*	22.8 11/29	5.2
September	66.2	48.1	57.2	95.0 30/61	32.7 *4/58*	62.4	160.5 *23/82*	25.0 25/27	6.1
October	71.9	51.5	61.7	102.9 21/22	36.1 *20/58*	66.8	162.0 30/21	27.8 (d)	7.1
November	77.6	55.2	66.5	113.5 *21/65*	40.8 2/09	72.7	166.9 *20/78*	31.5 2/09	8.5
December	82.4	58.8	70.6	114.6 29/31	43.0 (e)	71.6	175.7 *7/99*	32.5 *4/84*	9.4
Year — Averages	72.4	53.2	62.8	..	..	..	..	..	6.9
Year — Extremes	..	..	..	117.7 12/1/39	32.0 24/7/08	85.7	180.0 18/1/1882	21.0 24/6/44	..

(a) Records incomplete 1931–1934. Discontinued 1934. (b) 26/1895 and 24/1904. (c) 27/1876 and 24/1944. (d) 4/1931 and 2/1918. (e) 16/1861 and 4/1906.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches)	Rel. hum. (%) at 9 a.m.			Rainfall (inches)					Fog
	Mean 9 a.m.	Mean	Highest mean	Lowest mean	Mean monthly	Mean No. of days of rain	Greatest monthly	Least monthly	Greatest in one day	Mean No. of days of fog
No. of years over which observation extends.	98	98	98	98	127	127	127	127	127	66
January	0.343	39	59	29	0.76	4	3.31 1941	Nil (a)	2.30 *2/89*	0.0
February	0.365	43	57	30	0.76	4	6.09 1925	Nil (a)	5.57 7/25	0.0
March	0.349	47	58	29	0.95	5	4.59 1878	Nil (a)	3.50 *5/78*	0.0
April	0.336	56	72	37	1.73	10	5.81 1938	Nil 1945	3.15 *5/60*	0.0
May	0.319	67	76	49	2.71	13	7.75 1875	0.10 1934	2.75 *1/53*	0.5
June	0.291	75	84	63	2.90	15	8.58 1916	0.23 1958	2.11 1/20	1.1
July	0.278	76	87	66	2.61	16	5.44 1890	0.39 1899	1.75 *10/65*	1.3
August	0.286	70	78	54	2.44	16	6.20 1852	0.33 1944	2.23 *19/51*	0.6
September	0.294	60	72	44	2.01	13	5.83 1923	0.27 1951	1.59 20/23	0.2
October	0.302	50	67	29	1.75	11	5.24 1949	0.17 1914	2.24 16/08	0.0
November	0.308	44	58	31	1.22	8	4.45 1839	0.08 1922	2.96 12/60	0.0
December	0.326	40	56	31	1.02	6	3.98 1861	Nil 1904	2.42 23/13	0.0
Year — Totals	..	..	..	..	20.86	121	..	..	..	3.7
Year — Averages	0.316	53	..	..	..	..	..	..	..	..
Year — Extremes	..	..	87	29	..	..	8.58 6/1916	Nil(b)	5.57 7/2/25	..

(a) Various years. (b) December to April, various years.
Dates in italics relate to nineteenth century.

CLIMATOLOGICAL DATA: BRISBANE, QUEENSLAND
(Lat. 27° 28′ S., Long. 153° 2′ E. Height above M.S.L. 134 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind (Height of anemometer 105 feet): Average miles per hour	Wind: Highest mean speed in one day (miles per hour)	Wind: Highest gust speed (miles per hour)	Wind: Prevailing direction 9 a.m.	Wind: Prevailing direction 3 p.m.	Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m. 9 p.m.(a)	No. of clear days
No. of years of observations.	79	50	50	50	30(b)	30(b)	57	79	75(c)	58
January	29 906	7.7	19.7 23/47	58	SE	NE	6 89	6.6	4.7	3 4
February	29 897	7.5	23.2 21/54	67	SE	NE	5 47	5 3	4.8	2.5
March	29 962	7.2	20.3 1/29	66	S	E	5.23	4 0	4.7	5.5
April	30 042	6.5	16.7 3/25	64	S	E	4 35	3.3	3.6	7.7
May	30 077	6.2	17.9 17/26	49	SW	SE	3.40	3 0	3.4	10.0
June	30 074	6.3	19.0 14/28	59	SW	W & SW	2 74	2.0	3.3	10.3
July	30 083	6.1	22.0 13/54	69	SW	W & SW	2 94	2 0	2.9	13.3
August	30 089	6.3	14.8 4/35	62	SW	NE	3 77	3 2	2.6	13.8
September	30 051	6.6	16.1 1/48	63	SW	NE	4 59	4.8	2.7	12.8
October	29 997	6.9	15.7 1/41	62	S	NE	5.81	6 2	3 4	8.4
November	29 950	7.3	15.5 10/28	69	SE & N	NE	6 48	7.7	3.9	5.8
December	29.885	7 5	19.5 15/26	79	SE	NE	7.19	8 8	4 3	4.1
Year: Totals	..	..	..	..	..	..	58.86	56.9	..	97.6
Year: Averages	30.001	6.8	..	..	SW	NE	..	..	3.7	..
Year: Extremes	..	..	23.2 21/2/54	79	..	..	..	..	..	..

(a) Scale 0–8. (b) Standard thirty years normal (1911–1940). (c) July to December inclusive, seventy-four years.

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.): Mean max.	Mean min.	Mean	Extreme shade temperature (°Fahr.): Highest	Lowest	Extreme range	Extreme temperature (°Fahr.): Highest in sun	Lowest on grass	Mean daily hours of sunshine
No. of years over which observation extends	79	79	79	78	78	77	50(a)	77	57
January	84.9	68.9	76.9	109.8 26/40	58.8 *4/93*	51.0	169.0 2/37	49.9 *4/93*	7.6
February	84.1	68.7	76.4	105.7 21/25	58.5 23/31	47.2	165.2 6/10	49.1 22/31	7.1
March	82.1	66.6	74.3	101.8 13/65	52.4 29/13	49.4	162.5 6/39	45.4 29/13	6.8
April	78.8	61.5	70.2	95.2 (b)	44.4 25/25	50.8	153.8 11/16	36.7 24/25	7.1
May	73.6	55.5	64.5	90.3 21/23	40.6 30/51	49.7	147.0 1/10	29.8 *8/97*	6.9
June	69.3	51.2	60.3	88.9 19/18	36.3 29/08	52.6	136.0 3/18	25.4 *23/88*	6.5
July	68.4	48.8	58.7	84.3 23/46	36.1 (c)	48.2	146.1 20/15	23.9 *11/90*	7.1
August	71.2	50.1	60.6	91.0 14/46	36 9 13/64	54.1	141.9 20/17	27.1 *9/99*	7.9
September	75.2	54.8	65.0	100.9 22/43	40.7 *1/96*	60.2	155.5 26/03	30.4 *1/89*	8.3
October	79.0	60.1	69.4	105.3 30/58	43.3 *3/99*	62.0	157.4 31/18	34.9 *8/89*	8.3
November	81.9	64.3	73.1	106.1 18/13	48.5 2/05	57.6	162.3 *7/89*	38.8 1/05	8.2
December	84.6	67.3	75.8	105.9 *26/93*	56.3 5/55	49.6	165.9 28/42	49.1 *3/94*	8.2
Year: Averages	77.8	59.8	68.8	..	..	..	..	..	7.5
Year: Extremes	..	..	..	109 8 26/1/40	36.1 (c)	73.7	169.0 2/1/37	23.9 11/7/1890	..

(a) From 1887 to March 1947, excluding 1927 to 1936. (b) 9/1896 and 5/1903. (c) 12/7/1894 and 2/7/1896.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches): Mean 9 a.m.	Rel. hum. (%) at 9 a.m.: Mean	Highest mean	Lowest mean	Rainfall (inches): Mean monthly	Mean No of days of rain	Greatest monthly	Least monthly	Greatest in one day	Fog: Mean No of days of fog
No. of years over which observation extends.	64(a)	79	78	78	114	106	113(b)	113(b)	113(b)	79
January	0.639	66	79	53	6 23	13	27.72 1895	0.32 1919	18.31 *21/87*	0.5
February	0.649	69	82	55	6 41	14	40.39 1893	0.58 1849	10.61 6/31	0.6
March	0 617	71	85	56	5 79	15	34.04 1870	Nil 1849	11.18 14/08	1.3
April	0.516	71	80	56	3 50	12	15.28 1867	0.04 1944	5.46 5/33	2.3
May	0 423	71	85	59	2 69	9	13.85 1876	Nil 1846	5.62 *9/79*	3.3
June	0.356	72	84	54	2 61	8	14.03 1873	Nil 1847	6.41 15/48	3.1
July	0 326	70	88	53	2 21	7	9.10 1963	Nil 1841	7.60 20/65	3.2
August	0 345	67	80	53	1 83	7	14.67 1879	Nil (c)	4.89 *12/87*	3.8
September	0 405	63	76	47	1 96	8	5.43 1886	0.10 1907	3.13 12/65	2.7
October	0 472	60	72	48	2 70	9	11.41 1949	0.03 1948	5.34 25/49	1.2
November	0.534	60	73	45	3 66	10	12.40 1917	Nil 1842	4.46 *16/86*	0.5
December	0.593	62	70	51	5.08	12	17.36 1942	0.35 1865	6.60 *28/71*	0.3
Year: Totals	..	..	..	..	44.67	124	..	..	..	22.8
Year: Averages	0.490	67	..	..	..	..	..	..	..	..
Year: Extremes	..	..	88	45	..	..	40.39 2/1893	Nil (d)	18.31 21/1/1887	..

(a) All records up to and including 1950. (b) Records incomplete for various years between 1846 and 1859. (c) 1862, 1869 and 1880. (d) Various months in various years.

Dates in italics relate to nineteenth century.

CLIMATOLOGICAL DATA: SYDNEY, NEW SOUTH WALES

(Lat. 33° 52′ S., Long. 151° 12′ E. Height above M.S.L. 138 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind (Height of anemometer 58 feet): Average miles per hour	Wind: Highest mean speed in one day (miles per hour)	Wind: Highest gust speed (miles per hour)	Wind: Prevailing direction 9 a.m.	Wind: Prevailing direction 3 p.m.	Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m., 9 p.m.(a)	No. of clear days
No. of years of observations.	56	25(b)	25(b)	25(b)	25(b)	25(b)	85	106	104	55
January . .	29 903	7.6	18 8 10/49	93	NE	NE	5.31	4 7	4 7	5.1
February .	29 942	7.2	18 8 18/57	63	NE	ENE	4.20	4 2	4 8	4.6
March . .	30 015	6.5	20 7 10/44	58	WNW	ENE	3.64	3 6	4.4	5.9
April . .	30 071	6.3	22 5 24/44	72	W	ENE	2 70	3 4	4 1	7.0
May . .	30 080	6 5	21 0 18/55	63	W	ENE	1 93	2 7	3.9	7.9
June . .	30 083	7 2	22 4 10/47	84	W	WSW	1 49	2 0	4.0	8.3
July . .	30 071	7 1	21 3 20/51	66	W	WSW	1.56	2 1	3.5	10.4
August . .	30 060	7 5	24 6 9/51	68	WNW	WNW	2 02	2 8	3.3	10.6
September .	30 036	7 2	21 8 23/42	70	WNW	NE	2 74	3 6	3.5	9.1
October . .	29 971	7.6	24 5 1/57	95	WNW	ENE	3 91	4 4	4 1	6.8
November .	29 927	7.7	19 8 21/54	71	WNW	ENE	4 69	5 2	4 5	5.5
December .	29.882	7.6	22.5 11/52	75	NE	ENE	5.37	5.6	4.6	5.0
Year: Totals .	..	..	..	..	..	..	39.56	44.3	..	86.2
Year: Averages	30.003	7.2	..	..	WNW	ENE	..	..	4.1	..
Year: Extremes	..	..	24.6 9/8/51	95	..	..	..	..	..	..

(a) Scale 0–8. (b) Years 1938–1962 inclusive.

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.): Mean max.	Mean min.	Mean	Extreme shade temperature (°Fahr.): Highest	Lowest	Extreme range	Extreme temperature (°Fahr.): Highest in sun	Lowest on grass	Mean daily hours of sunshine
No. of years over which observation extends .	107	107	107	107	107	107	84(a)	107	45
January	78.2	65.0	71.6	113.6 14/39	51.1 18/49	62.5	164.3 26/15	43.7 6/25	7.3
February . . .	77.8	65.2	71.5	107.8 8/26	49.3 *28/63*	58.5	168.3 14/39	42.8 22/33	6.7
March	76.0	63.2	69.6	102.6 *3/69*	48.8 *14/86*	53.8	158.3 10/26	39.9 17/13	6.3
April	71.6	58.0	64.8	91.4 1/36	44.6 *27/64*	46.8	144.1 *10/77*	33.3 24/09	6.1
May	66.2	52.2	59.2	86.0 1/19	40.2 *22/59*	45.8	129.7 *1/96*	29.3 25/17	5.9
June	61.7	48.4	55.1	80.4 11/31	35.7 22/32	44.7	125.5 2/23	28.0 22/32	5.3
July	60.4	46.1	53.3	78.3 22/26	35.9 *12/90*	42.4	124.7 *19/77*	24.0 *4/93*	6.1
August . . .	63.3	47.7	55.5	86.8 24/54	36.8 *3/72*	50.0	149.0 *30/78*	26.1 4/09	6.8
September . . .	67.3	51.4	59.3	94.2 26/65	40.8 2/45	53.4	142.2 *12/78*	30.1 17/05	7.2
October . . .	71.3	55.9	63.6	99.4 4/42	42.2 6/27	57.2	152.2 20/33	32.7 9/05	7.3
November . . .	74.3	59.6	67.0	104.5 6/46	45.8 1/05	58.7	158.5 *28/99*	36.0 6/06	7.6
December . . .	77.0	62.9	69.9	108.0 20/57	48.4 3/24	59.6	164.5 *27/89*	41.4 3/24	7.4
Year: Averages . .	70.4	56.3	63.3	..	..	..	..	..	6.7
Year: Extremes . .	..	..	.	113.6 14/1/39	35.7 22/6/32	77.9	168.3 14/2/39	24.0 4/7/1893	..

(a) Records discontinued 1946.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches): Mean 9 a.m.	Rel. hum. (%) at 9 a.m.: Mean	Highest mean	Lowest mean	Rainfall (inches): Mean monthly	Mean No. of days of rain	Greatest monthly	Least monthly	Greatest in one day	Fog: Mean No. of days of fog
No. of years over which observation extends.	90	90	90	90	107	107	107	107	107	107
January	0 555	68	78	58	3.73	13	15.26 1911	0.25 1932	7.08 13/11	0.3
February . . .	0 570	71	81	60	4.39	13	22.22 1956	0.12 1939	8.90 *25/73*	0.7
March	0 541	74	85	62	5 01	14	20.52 1942	0.42 1876	11.05 28/42	1.6
April	0.448	75	87	63	5.06	13	24.49 1861	0.06 1868	7.52 *29/60*	2.3
May	0.360	77	90	63	5.01	14	23.03 1919	0.14 1957	8.36 *28/89*	3.4
June	0 302	76	89	63	5.18	12	25.30 1950	0.16 1962	5.17 *16/84*	2.7
July	0 275	74	88	59	4.36	12	13.23 1950	0.10 1946	7.80 7/31	2.3
August . . .	0 286	69	84	54	3.13	11	14.89 1899	0.04 1885	5.33 *2/60*	2 0
September . . .	0 330	65	79	49	2.76	11	14.05 1879	0.08 1882	5.69 *10/79*	1 0
October . . .	0 386	62	77	46	3.00	12	11.13 (a)	0.21 1867	6.37 13/02	0.5
November . . .	0 443	62	79	42	2 97	12	20.36 1961	0.07 1915	5.24 27/55	0.5
December . . .	0.513	65	77	51	3 11	13	15.82 1920	0.23 1913	4.75 13/10	0.4
Year: Totals . .	..	..	..	..	47.71	150	..	..	..	17.8
Year: Averages .	0.417	70	..	..	..	..	..	..	..	..
Year: Extremes .	..	..	90	42	..	..	25.30 6/1950	0.04 8/1885	11.05 28/3/42	..

(a) 1916 and 1959.

Dates in italics relate to nineteenth century.

CLIMATOLOGICAL DATA: CANBERRA, AUSTRALIAN CAPITAL TERRITORY

(Lat. 35° 18′ S., Long. 149° 6′ E. Height above M.S.L., 1,906 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind (Height of anemometer 20 feet)					Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m. and 3 p.m. (a)	No. of clear days
		Average miles per hour	Highest mean speed in one day (miles per hour)	Highest gust speed (miles per hour)	Prevailing direction 9 a.m.	Prevailing direction 3 p.m.				
No. of years of observations.	26	36	36	26(b)	27	27	37	20	35	36
January . .	29.856	4 4	14.9 23/33	65	NW	NW	7 93	1.5	3 9	6 4
February. .	29.900	3.9	15.3 24/33	64	E	NW	6 18	2.3	4 1	5 6
March . .	30 009	3.4	18.2 28/42	69	E	NW	5 07	0.2	4 2	6 0
April . .	30.059	3 2	18.6 8/45	61	NW	NW	3 27	0.3	4 3	4 5
May . .	30.126	2 9	13.2 27/58	64	NW	NW	1 90	0.2	4 5	5.6
June . .	30.120	3.2	16.1 2/30	60	NW	NW	1 23	0.1	4 9	4 5
July . .	30.133	3.2	23.4 7/31	63	NW	NW	1 22	0.0	4 5	5.0
August . .	30.065	3.7	15.7 25/36	70	NW	NW	1 73	0.1	4 4	5 0
September .	30.057	4.0	17.4 28/34	61	NW	NW	2.80	0.4	4 2	5.7
October . .	29.954	4.2	14.7 12/57	74	NW	NW	4 33	1.0	4 5	4.5
November .	29.885	4.5	17.2 28/42	79	NW	NW	5 77	1.1	4.4	4.1
December .	29.834	4.4	16.1 11/38	66	NW	NW	7.29	0.7	4.1	5.7
Year Totals .	..	..	..	..	..	..	48.72	7.9	..	62.6
Year Averages	30.000	3.7	..	..	NW	NW	..	..	4.3	..
Year Extremes	..	..	23.4 7/7/31	79	..	..	..	..	..	..

(a) Scale 0–8. (b) Maximum gust data are for Canberra Aerodrome.

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.)			Extreme shade temperature (°Fahr.)		Extreme range	Extreme temperature (°Fahr.)		Mean daily hours of sunshine
	Mean max.	Mean min.	Mean	Highest	Lowest		Highest in sun	Lowest on grass	
No. of years over which observation extends .	38	38	38	38	38	38	—	38	26
January . . .	82.2	56.1	69.1	107.4 11/39	38.0 1/56	69.4	..	30.1 10/50	9.0
February . . .	80.7	56.0	68.4	99.8 13/33	35.0 (a)	64.8	..	26.5 23/43	8 3
March . . .	76.2	52.5	64.3	99.1 6/38	34.8 31/49	64.3	..	26.4 26/35	7 4
April . . .	67.0	45.5	56.3	89.7 6/38	29.0 29/34	60.7	..	19.0 18/44	6.9
May	59.3	38.9	49.1	72.6 1/36	22.5 (b)	50.1	..	15.6 (c)	5 6
June	53.2	35.5	44.3	68.8 3/57	18.1 20/35	50.7	..	8.9 25/44	4 6
July	51.8	33.8	42.8	63.5 16/34	20.0 (d)	43.5	..	10.8 9/37	5.0
August . . .	55.1	35.5	45.3	71.0 24/54	21.0 3/29	50.0	..	10.1 6/44	6.0
September . . .	61.2	39.0	50.1	83.6 26/65	25.2 6/45	58.4	..	13.0 6/45	7 5
October . . .	67.0	44.3	55.7	90.0 13/46	28.0 26/61	62.0	..	18 2 2/45	8.0
November . . .	73.1	48.9	61.0	101.4 19/44	32.2 (e)	69.2	..	25.9 6/40	9.0
December . . .	79.0	53.4	66.2	103.5 27/38	36.0 24/28	67.5	..	28.1 11/64	9.1
Year Averages . .	67.2	44.9	56.1	..	..	..	..	..	7.2
Year Extremes . .	..	..	..	107.4 11/1/39	18.1 20/6/35	89.3	..	8.9 25/6/44	..

(a) 22/1931 and 23/1931. (b) 9/1929 and 15/1957. (c) 13/1937 and 15/1946. (d) 19/1929, 9/1937 and 27/1943. (e) 11/1936 and 6/1960.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches) Mean 9 a.m.	Rel. hum. (%) at 9 a.m. Mean	Rel. hum. (%) at 9 a.m. Highest mean	Rel. hum. (%) at 9 a.m. Lowest mean	Rainfall (inches) Mean monthly	Rainfall Mean No of days of rain	Rainfall Greatest monthly	Rainfall Least monthly	Rainfall Greatest in one day	Fog Mean No of days of fog
No. of years over which observation extends.	37	37	28	28	38	38	38	38	38	34
January . . .	0.381	53	69	39	2.14	7	6.69 1941	0.02 1932	3.22 30/58	0.1
February . . .	0 405	60	71	40	2.11	7	6.03 1948	0.01 1933	3.24 17/28	0.2
March . . .	0 384	67	82	48	2 49	7	12.69 1950	0.01 (a)	2.72 1/61	1.5
April . . .	0 319	74	81	54	2 13	8	5.19 1952	0.07 1942	2.52 9/45	2.6
May . . .	0 257	79	89	67	1.91	8	6.13 1948	0.06 1935	3.88 3/48	5.4
June . . .	0 216	82	90	71	1 83	10	6.09 1931	0.18 1944	2.32 25/56	6.2
July . . .	0 201	81	91	73	1.80	11	5.08 1960	0.27 1940	2.02 13/33	6.1
August . . .	0 214	76	88	60	1.93	11	4.71 1939	0.36 (b)	2.07 12/29	3.1
September . .	0 241	67	78	51	1 84	10	4.52 1960	0.13 1946	1.78 16/62	2.1
October . . .	0 285	62	72	46	2.86	11	6.98 1959	0.34 1940	5.19 20/59	0.4
November . .	0 310	55	67	38	2 15	9	5.98 1961	0.28 1936	2.45 9/50	0.2
December . .	0.350	53	70	37	2.15	8	8.80 1947	0.16 1938	2.29 28/29	0.1
Year Totals . .	..	..	..	..	25.34	107	..	..	..	28.0
Year Averages .	0.297	67	..	..	..	..	..	..	..	..
Year Extremes .	..	..	91	37	..	..	12.69 3/50	0.01 (c)	5.19 21/10/59	..

(a) 1940 and 1954. (b) 1944 and 1949. (c) 2/1933, 3/1940 and 3/1954.

CLIMATOLOGICAL DATA: MELBOURNE, VICTORIA

(Lat. 37° 49′ S., Long. 144° 58′ E. Height above M.S.L., 114 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity from 9 a.m. and 3 p.m. readings	Wind (Height of anemometer 93 feet)					Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m., 9 p.m.(*a*)	No. of clear days
		Average miles per hour	Highest mean speed in one day (miles per hour)	Highest gust speed (miles per hour)	Prevailing direction 9 a.m.	Prevailing direction 3 p.m.				
No. of years of observations.	109	26(*b*)	53	56	47	47	93	58	108	58
January	29.909	8.6	21.1 27/41	66	S	S	6.48	1.8	4.1	6.6
February	29.950	8.2	19.0 13/47	74	S & SW	S	5.08	2.4	4.0	5.9
March	30.024	7.5	18.0 3/61	66	N	S	4.10	1.5	4.4	5.4
April	30.092	7.2	19.9 16/43	67	N	S	2.49	1.2	4.8	4.2
May	30.093	7.5	20.5 4/61	72	N	N & S	1.54	0.5	5.2	2.9
June	30.086	7.7	22.8 16/47	64	N	N	1.15	0.4	5.3	2.7
July	30.080	8.2	22.7 22/60	68	N	N	1.12	0.4	5.2	2.5
August	30.051	8.2	21.3 20/42	65	N	N & S	1.52	0.7	5.0	2.7
September	30.003	8.3	21.1 15/64	69	N	S	2.36	1.0	4.8	3.6
October	29.962	8.4	18.6 12/52	69	N	S	3.40	1.6	4.9	3.4
November	29.962	8.7	21.2 13/58	71	SW	S	4.52	2.2	4.9	3.2
December	29.894	8.7	21.0 12/52	61	S & SW	S	5.78	2.2	4.5	4.4
Year Totals	..	..	..	..	..	..	39.54	15.9	..	47.5
Year Averages	30.009	8.1	..	..	N	S	..	..	4.8	..
Year Extremes	..	..	22.8 16/6/47	74	..	..	..	..	..	..

(*a*) Scale 0–8. (*b*) Early records not comparable.

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.)			Extreme shade temperature (°Fahr.)		Extreme range	Extreme temperature (°Fahr.)		Mean daily hours of sunshine
	Mean max.	Mean min.	Mean	Highest	Lowest		Highest in sun	Lowest on grass	
No. of years over which observation extends	110	110	110	110	110	110	86(*a*)	106	50
January	78.4	56.9	67.6	114.1 13/39	42.0 *28/85*	72.1	178.5 *14/62*	30.2 *28/85*	8.1
February	78.0	57.3	67.6	109.5 7/01	40.2 24/24	69.3	167.5 *15/70*	30.9 *6/91*	7.6
March	74.7	54.9	64.8	107.0 11/40	37.1 *17/84*	69.9	164.5 *1/68*	28.9 (*b*)	6.6
April	68.1	50.7	59.4	94.8 5/38	34.8 *24/88*	60.0	152.0 *8/61*	25.0 *23/97*	5.0
May	61.6	46.8	54.2	83.7 7/05	29.9 29/16	53.8	142.6 *2/59*	21.1 26/16	3.9
June	56.9	44.0	50.4	72.3 2/57	28.0 *11/66*	44.3	129.0 *11/61*	19.9 30/29	3.4
July	55.8	42.1	48.9	69.3 22/26	27.0 *21/69*	42.3	125.8 *27/80*	20.5 12/03	3.7
August	58.7	43.4	51.0	77.0 *20/85*	28.3 *11/63*	48.7	137.4 *29/69*	21.3 14/02	4.6
September	62.9	45.6	54.2	88.6 28/28	31.0 3/40	57.6	142.1 *20/67*	22.8 8/18	5.5
October	67.1	48.4	57.8	98.4 24/14	32.1 *3/71*	66.3	154.3 *28/68*	24.8 22/18	5.9
November	71.3	51.3	61.3	105.7 *27/94*	36.5 *2/96*	69.2	159.6 *29/65*	24.6 *2/96*	6.4
December	75.5	54.5	65.0	110.7 *15/76*	40.0 *4/70*	70.7	170.3 *20/69*	33.2 1/04	7.3
Year Averages	67.4	49.6	58.5	..	..	..	..	..	5.7
Year Extremes	..	..	..	114.1 13/1/39	27.0 21/7/1869	87.1	178.5 14/1/1862	19.9 30/6/29	..

(*a*) Records discontinued 1946. (*b*) 17/1884 and 20/1897.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches) Mean 9 a.m.	Rel. hum. (%) at 9 a.m.			Rainfall (inches)					Fog
		Mean	Highest mean	Lowest mean	Mean monthly	Mean No of days of rain	Greatest monthly	Least monthly	Greatest in one day	Mean No of days of fog
No. of years over which observation extends.	58	58	58	58	110	110	110	110	110	108
January	0.384	58	68	50	1.87	8	6.92 1963	0.01 1932	4.25 29/63	0.1
February	0.416	63	77	48	1.90	7	7.72 1939	0.02 1965	3.44 26/46	0.3
March	0.393	65	79	50	2.09	9	7.50 1911	0.14 1934	3.55 5/19	0.8
April	0.345	72	82	66	2.33	11	7.67 1960	Nil 1923	3.15 23/60	1.9
May	0.307	79	88	70	2.21	14	5.60 1942	0.14 1934	1.85 *7/91*	3.8
June	0.274	83	92	73	2.02	14	4.51 1859	0.61 1958	1.74 21/04	4.8
July	0.263	81	86	75	1.94	15	7.02 1891	0.57 1902	2.71 *12/91*	4.5
August	0.266	75	82	65	1.93	15	4.35 1939	0.48 1903	1.94 26/24	2.4
September	0.280	68	76	60	2.34	14	7.93 1916	0.52 1907	2.62 *12/80*	0.9
October	0.307	62	71	52	2.69	14	7.61 1869	0.29 1914	3.00 *17/69*	0.4
November	0.334	60	69	52	2.33	12	8.11 1954	0.25 1895	2.86 21/54	0.2
December	0.363	58	69	48	2.28	10	7.18 1863	0.11 1904	3.92 4/54	0.2
Year Totals	..	..	..	..	25.93	143	..	..	..	20.3
Year Averages	0.328	69	..	..	..	..	..	..	..	..
Year Extremes	..	..	92	48	..	..	8.11 11/1954	Nil 4/1923	4.25 29/1/63	..

Dates in italics relate to nineteenth century.

CLIMATOLOGICAL DATA: HOBART, TASMANIA

(Lat. 42° 53′ S., Long. 147° 20′ E. Height above M.S.L. 177 ft)

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS AND CLEAR DAYS

Month	Bar. corrected to 32° F. mn sea level and standard gravity (from 9 a.m. and 3 p.m. readings)	Wind (Height of anemometer 40 feet)					Mean amount of evaporation (inches)	No. of days of lightning	Mean amount of clouds, 9 a.m., 3 p.m., 9 p.m.(a)	No. of clear days
		Average miles per hour	Highest mean speed in one day (miles per hour)	Highest gust speed (miles per hour)	Prevailing direction 9 a.m.	Prevailing direction 3 p.m.				
No. of years of observations.	30(b)	30(b)	72	74	30(b)	30(b)	30(b)	30(b)	30(b)	30(b)
January	29.819	8.0	20.8 30/16	76	NNW	SSE	4.84	0.9	5.1	1.9
February	29.913	7.2	25.2 4/27	67	NNW	SSE	3.71	1.0	5.0	2.3
March	29.961	6.8	21.4 13/38	79	NW	SSE	3.10	1.2	4.9	2.4
April	29.997	6.7	24.1 9/52	74	NW	W	1.98	0.7	5.2	1.7
May	30.009	6.3	20.2 20/36	84	NNW	NW	1.37	0.4	4.9	2.4
June	29.986	6.2	23.7 27/20	82	NW	NW	0.91	0.4	5.0	2.4
July	29.958	6.5	22.9 22/53	80	NNW	NNW	0.94	0.3	4.9	2.0
August	29.906	6.8	25.5 19/26	87	NNW	NW	1.28	0.4	4.9	2.1
September	29.860	7.9	26 7 28/65	93	NNW	NW	1.97	0.7	5.0	1.5
October	29.833	8.2	20 0 3/65	89	NNW	SW	3.05	0.6	5.3	1.0
November	29.831	7.9	21.2 18/15	84	NNW	S	3.77	0.7	5.1	1.3
December	29.816	7.6	23.4 1/34	70	NNW	SSE	4.37	0.5	5.4	1.1
Year — Totals	..	..	..	..	..	..	31.29	7.8	..	22.1
Year — Averages	29.907	7.2	..	..	NNW	W	..	..	5.0	..
Year — Extremes	..	..	26.7 28/9/65	93	..	..	..	..	..	..

(a) Scale 0–8. (b) Standard thirty years' normal (1911–1940).

TEMPERATURE AND SUNSHINE

Month	Mean temperature (°Fahr.)			Extreme shade temperature (°Fahr.)		Extreme range	Extreme temperature (°Fahr.)		Mean daily hours of sunshine
	Mean max.	Mean min.	Mean	Highest	Lowest		Highest in sun	Lowest on grass	
No. of years over which observation extends	95	95	30(a)	95(b)	95(b)	95(b)	57(c)	77(b)	30(i)
January	70.9	52.6	61.0	105.0 (d)	40.1 (e)	64.9	160.0 (f)	30.6 *19/97*	7.7
February	70.8	52.9	62.2	104.4 *12/99*	39.0 *20/87*	65.4	165.0 *24/98*	28.3 *—/87*	7.1
March	68.0	50.7	59.4	99.1 13/40	35.2 31/26	63.9	150.9 26/44	27.5 30/02	6.4
April	62.5	47.4	55.1	87.1 1/41	33.2 14/63	53.9	142.0 *18/93*	25.0 *—/86*	5.0
May	57.4	43.9	51.2	77.8 5/21	29.2 20/02	48.6	128.0 (g)	20.0 19/02	4.4
June	52.9	41.0	47.0	69.2 1/07	29.2 28/44	40.0	122.0 *12/94*	18.1 24/63	4.0
July	52.2	39.6	46.6	66.1 14/34	27.7 *11/95*	38.4	121.0 *12/93*	18.7 *16/86*	4.4
August	54.9	40.9	48.7	71.6 28/14	28.9 9/51	42.7	129.0 *—/87*	20.1 7/09	5.1
September	58.9	43.0	51.4	81.7 23/26	31.0 *16/97*	50.7	138.0 *23/93*	18.3 16/26	5.9
October	62.4	45.4	54.3	92.0 24/14	32.0 *12/89*	60.0	156.0 *9/93*	23.8 (h)	6.1
November	65.6	48.1	56.6	98.3 26/37	35.0 16/41	63.3	154.0 *19/92*	26.0 1/08	7.2
December	68.8	51.0	59.6	105.2 *30/97*	38.0 3/06	67.2	161.5 10/39	27.2 *—/86*	7.4
Year — Averages	62.1	46.4	54.4	..	..	..	..	..	5.9
Year — Extremes	..	..	..	105.2 30/12/1897	27.7 11/7/1895	77.5	165.0 24/2/1898	18.1 24/6/63	..

(a) Standard thirty years normal (1911–1940). (b) Records 1855–1882 not comparable. (c) Period 1934–1938 not comparable; records discontinued 1946. (d) 1/1900 and 19/1959. (e) 9/1937 and 11/1937. (f) 5/1886 and 13/1905. (g) —/1899 and —/1893. (h) 1/1886 and —/1899. (i) 1921–1950.

HUMIDITY, RAINFALL AND FOG

Month	Vapour pressure (inches)	Rel. hum. (%) at 9 a.m.			Rainfall (inches)					Fog
	Mean 9 a.m.	Mean	Highest mean	Lowest mean	Mean monthly	Mean No. of days of rain	Greatest monthly	Least monthly	Greatest in one day	Mean No. of days of fog
No. of years over which observation extends.	30(a)	55	71	71	83	30(a)	82(b)	82(b)	82(b)	30(c)
January	0.309	59	72	46	1.96	13	5.91 1893	0.17 (d)	2.96 30/16	0.0
February	0.342	63	77	48	1.60	10	6.72 1964	0.11 1914	2.20 1/54	0.0
March	0.323	67	77	52	1.85	13	10.05 1946	0.29 1943	3.47 17/46	0.3
April	0.290	72	84	58	2.18	14	9.75 1960	0.07 1904	5.25 23/60	0.2
May	0.263	78	89	65	1.93	14	8.43 1958	0.14 1913	1.75 *2/93*	0.9
June	0.233	80	91	68	2.42	16	9.38 1954	0.28 1886	5.80 7/54	0.8
July	0.227	80	94	72	2.05	17	6.02 1922	0.17 1950	2.51 18/22	1.0
August	0.232	76	92	60	1.89	18	6.32 1946	0.30 1892	2.28 *14/90*	0.4
September	0.240	67	85	58	2.06	17	7.93 1957	0.38 1951	6.15 15/57	0.1
October	0.258	63	73	51	2.51	18	7.60 1947	0.39 1914	2.58 4/06	0.0
November	0.274	60	72	50	2.15	16	7.39 1885	0.33 1921	3.70 *30/85*	0.1
December	0.306	58	67	45	2.24	14	7.72 1916	0.17 1931	3.33 5/41	0.0
Year — Totals	..	..	..	..	24.84	180	..	..	..	3.8
Year — Averages	0.275	69	..	..	..	..	..	..	..	..
Year — Extremes	..	..	94	45	..	..	10.05 3/1946	0.07 4/1904	6.15 15/9/57	..

(a) Standard thirty years' normal (1911–1940). (b) Records prior to 1883 not comparable. (c) 1922–1951. (d) 1915 and 1958.

Dates in italics relate to nineteenth century.

Rainfall and temperatures, various cities

Year Book No. 34, page 28, shows rainfall and temperature, and No. 38, page 42, temperature, for various important cities throughout the world and for the Australian capitals.

Climatological data for selected Australian country towns

The following table shows some of the more important climatological data for selected Australian country towns, based on standard thirty years normals (1911–1940).

CLIMATOLOGICAL DATA FOR SELECTED AUSTRALIAN COUNTRY TOWNS

Town	Rainfall		Temperature				Relative humidity			
	Average annual rainfall	Average number of wet days	Mean maximum, January (°F.)	Mean maximum, July (°F.)	Mean minimum, January (°F.)	Mean minimum, July (°F.)	Average index of mean relative humidity,(a) January	Average index of mean relative humidity,(a) July	Mean 3 p.m., January (%)	Mean 3 p.m., July (%)
WESTERN AUSTRALIA										
Albany	39.67	172	73.8	60.9	58.5	46.3	73	76	65	70
Broome	22.87	38	91.3	81.8	79.2	57.0	75	52	67	43
Bunbury	33.22	125	82.1	62.5	59.1	47.1	66	78	57	71
Carnarvon	9.01	35	87.2	71.7	72.1	51.6	64	66	61	57
Esperance	26.73	124	76.6	62.1	59.9	45.4	70	77	63	65
Geraldton	18.58	80	84.5	67.7	66.3	51.7	61	68	60	60
Kalgoorlie	9.46	62	93.2	62.5	64.2	42.9	43	66	27	50
Meekatharra	9.17	36	100.4	67.5	73.1	44.0	31	59	21	44
Narrogin	21.38	108	87.3	57.9	56.3	41.3	..	..	..	..
Port Hedland	11.01	20	94.3	79.3	79.4	55.6	67	49	63	47
Wyndham	25.15	55	95.9	85.0	80.2	66.2	66	38	54	35
NORTHERN TERRITORY										
Alice Springs	9.93	31	95.3	66.9	69.8	38.9	33	49	26	32
Tennant Creek	13.85	30	98.5	75.4	75.9	51.1	41	36	27	25
SOUTH AUSTRALIA										
Ceduna	10.50	68	81.5	62.6	58.8	43.8	..	..	..	..
Mount Gambier	26.86	192	74.2	56.2	53.5	42.4	65	79	50	69
Oodnadatta	4.44	20	99.0	66.4	72.1	42.7	27	49	17	34
Port Augusta	9.28	62	89.5	62.8	65.3	43.9	50	66	33	52
Port Lincoln	18.24	119	77.4	60.2	58.5	46.4	64	76	53	70
Port Pirie	12.99	78	89.2	61.7	62.6	45.4	51	72	..	..
QUEENSLAND										
Atherton	53.99	116	83.8	70.9	65.0	50.0	78	79	..	..
Bundaberg	42.37	84	86.1	71.6	69.7	49.2	74	72	63	55
Cairns	86.35	140	89.7	78.1	74.2	61.0	77	74	69	63
Charleville	17.97	49	97.6	68.3	70.8	40.1	44	61	28	39
Charters Towers	23.26	59	92.9	76.0	71.3	51.6	65	64	46	47
Cloncurry	16.89	35	98.7	76.4	76.5	51.5	40	40	30	27
Ipswich	28.97	76	90.4	70.0	67.8	43.8	65	65	..	..
Longreach	15.54	37	99.6	73.2	73.3	44.3	49	56	29	35
Mackay	63.16	116	86.2	71.0	73.6	53.4	80	77	..	..
Maryborough	45.43	122	87.9	71.5	68.8	47.6	73	74	..	..
Normanton	37.56	56	94.3	84.0	77.0	58.6	70	48	52	34
Rockhampton	37.36	93	90.0	73.7	72.3	51.2	68	65	55	45
Roma	20.43	52	94.4	67.4	68.3	39.3	51	64	32	40
Toowoomba	35.19	105	82.7	61.1	61.2	40.7	73	79	..	..
Townsville	43.06	75	87.3	76.0	76.2	59.8	75	64	69	59

For footnote *see* next page.

CLIMATOLOGICAL DATA FOR SELECTED AUSTRALIAN COUNTRY TOWNS —*continued*

Town	Rainfall		Temperature				Relative humidity			
	Average annual rainfall	Average number of wet days	Mean maximum, January (°F.)	Mean maximum, July (°F.)	Mean minimum, January (°F.)	Mean minimum, July (°F.)	Average index of mean relative humidity,(a) January	Average index of mean relative humidity,(a) July	Mean 3 p.m., January (%)	Mean 3 p.m., July (%)
NEW SOUTH WALES										
Albury . . .	27.66	99	89.9	56.4	59.8	38.2	47	74	29	64
Armidale. . .	28.98	107	80.8	54.0	56.5	33.8	60	61	44	57
Bega . . .	35.92	80	81.2	62.9	57.3	34.5	72	70	..	..
Bourke . . .	11.74	44	98.0	63.8	69.3	40.8	37	64	24	48
Broken Hill . .	9.20	46	90.5	59.5	64.5	41.2	36	67	24	49
Cooma . . .	18.85	88	78.8	50.4	52.2	30.2	55	67	38	56
Dubbo . . .	20.91	72	92.1	59.7	63.8	37.5	48	74	32	56
Goulburn . .	24.27	112	81.5	52.4	56.2	35.8	59	74	43	67
Grafton . . .	34.68	105	89.1	70.6	67.2	43.9	..	..	..	..
Katoomba . .	53.17	126	73.9	48.4	54.6	36.7	61	71	54	68
Leeton . . .	15.76	78	88.9	56.8	63.2	38.9	44	76	..	..
Moree . . .	21.43	56	96.0	64.8	67.4	39.0	..	..	..	..
Newcastle . .	41.36	132	77.7	61.4	66.6	47.7	74	70	69	61
Orange . . .	31.52	95	83.9	51.6	53.7	31.4	..	..	..	..
Tamworth . .	24.41	67	91.0	60.4	63.4	36.8	..	..	..	..
Taree . . .	47.48	110	83.9	64.5	62.0	42.7	..	..	..	..
Wagga . . .	21.42	86	89.8	57.1	61.5	37.8	50	77	31	65
Wollongong . .	44.04	112	78.4	61.7	62.6	47.1	78	71	..	..
VICTORIA										
Ballarat . . .	27.38	170	75.7	49.8	50.5	38.4	60	81	41	75
Bendigo . . .	20.27	111	83.0	54.2	56.5	39.4	47	75	30	64
Geelong . . .	21.32	133	76.2	56.5	55.4	42.0	65	81	52	70
Horsham . .	17.57	104	85.1	56.0	55.2	38.8	50	77	33	67
Mildura . . .	10.37	61	89.8	59.5	61.0	40.5	48	71	..	..
Sale . . .	23.70	128	77.5	56.8	54.4	38.6	65	79	51	68
Seymour . .	22.17	94	84.7	55.2	54.6	37.4	56	79	..	..
Shepparton . .	19.94	103	86.3	55.7	58.8	39.3	49	77	32	63
Wangaratta . .	25.57	104	86.7	55.2	58.5	38.1	41	75	26	66
Warrnambool . .	25.79	153	69.9	55.6	54.7	43.6	73	83	69	77
TASMANIA										
Burnie . . .	38.99	170	67.6	53.7	51.9	41.7	70	82	65	74
Launceston . .	28.56	149	75.8	53.7	52.1	36.9	60	77	..	
Zeehan . . .	94.06	246	66.3	51.6	48.0	38.2	73	81	61	74

(*a*) The average index of mean relative humidity has been derived from the ratio of the average 9 a.m. vapour pressure to the saturation vapour pressure at the average mean temperature of the month. Being thus related to the mean temperature this value of relative humidity is a good approximation to the daily mean.

The table on the next page gives the latitude, longitude, and altitude of the weather recording station at each of the above towns.

LOCATION CO-ORDINATES FOR SELECTED AUSTRALIAN COUNTRY TOWNS

Station	Lat.	Long.	Altitude (ft)	Station	Lat.	Long.	Altitude (ft)
				Queensland—*continued*			
Western Australia—				Toowoomba	27° 33′	151° 57′	1,921
Albany	34° 57′	117° 48′	226	Townsville	19° 15′	146° 46′	10
Broome	17° 57′	122° 13′	39				
Bunbury	33° 19′	115° 38′	3	New South Wales—			
Carnarvon	24° 53′	113° 39′	12	Albury	36° 06′	146° 54′	600
Esperance	33° 51′	121° 53′	14	Armidale	30° 32′	151° 38′	3,215
Geraldton	28° 48′	114° 42′	92	Bega	36° 40′	149° 50′	50
Kalgoorlie	30° 46′	121° 27′	1,180	Bourke	30° 05′	145° 58′	350
Meekatharra	26° 36′	118° 29′	1,697	Broken Hill	31° 57′	141° 28′	978
Narrogin	32° 54′	117° 09′	1,150	Cooma	36° 13′	149° 08′	2,749
Port Hedland	20° 23′	118° 37′	20	Dubbo	32° 10′	148° 37′	861
Wyndham	15° 31′	128° 09′	20	Goulburn	34° 45′	149° 43′	2,074
				Grafton	29° 41′	152° 56′	21
Northern Territory—				Katoomba	33° 43′	150° 19′	3,280
Alice Springs	23° 48′	133° 53′	1,790	Leeton	34° 33′	146° 24′	496
Tennant Creek	19° 38′	134° 11′	1,229	Moree	29° 28′	149° 51′	680
				Newcastle	32° 55′	151° 49′	122
South Australia—				Orange	33° 18′	149° 06′	2,850
Ceduna	32° 08′	133° 42′	57	Tamworth	31° 05′	150° 56′	1,279
Mount Gambier	37° 45′	140° 47′	206	Taree	31° 54′	152° 28′	30
Oodnadatta	27° 33′	135° 29′	371	Wagga	35° 08′	147° 25′	719
Port Augusta	32° 33′	137° 47′	14	Wollongong	34° 25′	150° 56′	150
Port Lincoln	34° 47′	135° 53′	13				
Port Pirie	33° 11′	138° 01′	10	Victoria—			
				Ballarat	37° 35′	143° 50′	1,433
Queensland—				Bendigo	36° 46′	144° 17′	730
Atherton	17° 17′	145° 27′	2,466	Geelong	38° 07′	144° 22′	57
Bundaberg	24° 52′	152° 21′	6	Horsham	36° 40′	142° 12′	437
Cairns	16° 35′	145° 44′	10	Mildura	34° 14′	142° 05′	156
Charleville	26° 25′	146° 17′	950	Sale	38° 06′	147° 08′	15
Charters Towers	20° 03′	146° 08′	1,004	Seymour	37° 02′	145° 08′	464
Cloncurry	20° 40′	140° 30′	621	Shepparton	36° 23′	145° 24′	372
Ipswich	27° 38′	152° 44′	64	Wangaratta	36° 22′	146° 19′	493
Longreach	23° 26′	144° 15′	612	Warrnambool	38° 24′	142° 29′	33
Mackay	21° 07′	149° 10′	9				
Maryborough	25° 32′	152° 42′	20	Tasmania—			
Normanton	17° 39′	141° 05′	34	Burnie	41° 04′	145° 54′	13
Rockhampton	23° 23′	150° 29′	26	Launceston	41° 33′	147° 13′	546
Roma	26° 36′	148° 42′	1,000	Zeehan	41° 54′	145° 23′	592

The weather of 1966 (December 1965 to November 1966)

The following is a brief summary of weather experienced during the four seasons ended in November 1966. Plate 3 (between pages 32 and 33) shows the rainfall distribution for 1966.

Summer 1965–66. Summer commenced with a broad tract from the Kimberleys to New England and the Hunter River in the grip of a drought and ended with the drought stricken area reduced mainly to south-western Queensland, the northern part of New South Wales on and west of the Divide and the Hunter Valley.

Tropical cyclones were absent from the east coast of Australia, but three affected the Northern Territory and Western Australia, giving beneficial rains; one decaying cyclone caused a swathe of rain to the coast of the Great Australian Bight. The monsoon low was active, and generally the north had a good ' wet ', except for the base of Cape York Peninsula and the adjacent Gulf of Carpentaria coastal districts, which were outside the area. In the south of the continent easterly winds had been general. The humidity had not been low nor had temperatures been markedly above normal for lengthy periods; therefore conditions for serious bushfires did not continue for many days at a time.

The total summer rainfall in the eastern States was mainly below normal, and in New South Wales and southern Queensland was largely confined to December. Water storages in New South Wales west of the Great Dividing Range and in the Hunter Valley were low, and there was concern that the supplies would become completely exhausted.

By the end of summer the pastoral situation was good in all States except New South Wales and south-western Queensland. Agriculture in southern areas, except for much of New South Wales, had good harvests, and prospects for preparation for sowing were satisfactory. In the Murray River districts the vine crops suffered from rain on the ripe fruit.

There were floods on the Clarence River in New South Wales and in southern central Western Australia, but the greater part of the flooding that occurred was in the north, and this was consistent with a good wet season.

Autumn of 1966. There were no tropical cyclones near Queensland, and rainfall there and in northern New South Wales was below normal, so that hopes at the end of summer of a break in the drought in south-western Queensland and northern inland New South Wales were not realised. One cyclone crossed the coast of Western Australia and brought heavy rain to the De Grey and Fortescue districts. Elsewhere the rainfall was adequate in the better watered areas, but the lower rainfall areas remained dry.

Early in autumn conditions fluctuated markedly from hot to cool. On the average Queensland was the only State where temperatures were much above normal for autumn.

In parts of the south there were bushfires early in March, but rain later in the month reduced the hazard and the fire season ended in March or early April. An aftermath of the drought conditions in New South Wales was that fuel for bushfire occurrence was lacking.

Thunderstorms early in autumn gave many places in the east useful rain. With the advance of the season there were a few fogs and frosts. In Tasmania and on the Australian Alps there were light falls of snow.

Away from the drought areas stock were in fair to good condition. In many places farmers were waiting for rain before sowing wheat. In Queensland summer grain and seed crops were good but the sugar crop was adversely affected by dry conditions.

In New South Wales irrigation water storages were low. In Victoria and Western Australia they were satisfactory for the season.

Winter of 1966. The winter commenced with a considerable portion of all mainland States except Western Australia and Victoria suffering from drought. The season ended with the drought-affected areas in the inland reduced to sections of far western Queensland and western New South Wales. By the end of winter cereal crop prospects were good.

There was an absence of marked extremes during winter. Inland, except for a few areas, rainfall ranged from adequate to abundant. Daily maximum and minimum temperatures were variable, owing largely to the periods of considerable cloud cover. In the eastern States and South Australia there were a few periods of cold conditions, but they were not as numerous as in many winters. Snow in Tasmania and on the Alps was slightly above average.

The only bushfire was in the Sydney metropolitan area, and fire restrictions were applied in some coastal districts north of Sydney.

In Central Australia there was widespread flooding following the drought-breaking rains; the only other floods were minor and of short duration.

Except in Queensland and New South Wales, stock were in good condition and only in these two States were storages of irrigation water low.

Spring of 1966. Spring rainfall in the temperate parts of Australia was adequate and in many places was well above normal. North of the tropic, rainfall was scattered and the general dry conditions of spring prevailed.

The circulation during the season had many periods of south-north or north-south movements of air producing periods of colder or warmer weather than normal in southern and south-eastern regions.

Pasture and other growth in temperate areas was very good, and in warm, dry periods during November there were outbreaks of grass and scrub fires. The abundance of vegetation was causing fire prevention authorities to warn of danger ahead.

Minor flooding occurred in all States except Western Australia and the Northern Territory; there were drownings in swollen streams. Although there were strong winds at times, no State was affected by prolonged periods of such winds.

The numbers of occurrences of meteorological phenomena—frost, snow, hail, thunderstorms and fog—were near usual for the season; none of the phenomena was of unusual severity.

Pastoral conditions deteriorated in many places in the tropics; elsewhere there was improvement and prospects were generally good. The cereal harvest in almost every area promised to be good. Other crops were in good condition.

The water held in dams for irrigation purposes increased markedly during spring, but the dams in the northern half of New South Wales held less water than desirable at the end of spring.