CHAPTER II.

PHYSIOGRAPHY.

§ 1. General Description of Australia.

1. **Geographical Position.**—(i) *General.* The Australian Commonwealth, which includes the island continent of Australia proper and the island of Tasmania, is situated in the Southern Hemisphere, and comprises in all an area of about 2,974,581 square miles, the mainland alone containing about 2,948,366 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 39° 8′ S., or, including Tasmania, 43° 39′ S. On its north are the Timor and Arafura Seas and Torres Strait—on its south the Southern Ocean and Bass Strait. The extreme points are "Steep Point" on the west, "Cape Byron" on the east, "Cape York" on the north, "Wilson's Promontory" on the south, or, if Tasmania be included, "South-East Cape."

(ii) *Tropical and Temperate Regions.* Of the total area of Australia nearly 40 per cent. lies within the tropics. Assuming, as is usual, that the latitude of the Tropic of Capricorn is 23° 30′ S. (its mean value for 1944 was 23° 26′ 47.65″), the areas within the tropical and temperate zones are approximately as follows :—

AUSTRALIA : AREAS OF TROPICAL AND TEMPERATE REGIONS.

Area.	N.S.W. (a)	Vic.	Qld.	S. Aust.	W. Aust.	Tas.	N. Terr.	Total.
Within Tropical Zone sq. miles	..	..	359,000	..	364,000	..	426,320	1,149,320
Within Temperate Zone sq. miles	310,372	87,884	311,500	380,070	611,920	26,215	97,300	1,825,261
Total Area sq. miles	310,372	87,884	670,500	380,070	975,920	26,215	523,620	2,974,581
Ratio of Tropical part to whole State	..	..	0.535	..	0.373	..	0.814	0.386
Ratio of Temperate part to whole State	1	1	0.465	1	0.627	1	0.186	0.614

(a) Includes Australian Capital Territory.

Thus the tropical part is roughly about five-thirteenths of the whole of Australia (0.386) or, of the three territories with areas within the tropical zone, about one-half (0.530).

2. **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, four-fifths of that of Canada, more than one-fifth of the area of the British Empire, nearly three-fourths of the whole area of Europe, and about 25 times as large as Great Britain and Ireland.

This great area, coupled with a limited population, renders the solution of the problem of Australian development a particularly difficult one. The areas of Australia and of certain other countries are given in the following table :—

AREA OF AUSTRALIA AND OF OTHER COUNTRIES, *Circa* 1939.

Country.	Area.	Country.	Area.
Continental Divisions—	Sq. miles.	**Africa—*continued.***	Sq. miles.
Europe	4,409,000	Italian East Africa ..	666,000
Asia	16,216,000	Angola	488,000
Africa	11,707,000	Union of South Africa ..	473,000
North and Central America and West Indies ..	8,665,000	Egypt	386,000
South America	6,937,000	Tanganyika Territory ..	374,000
Oceania, etc.	3,301,000	Nigeria and Protectorate ..	373,000
Total, excluding Arctic and Antarctic Conts.	51,235,000	South-West Africa ..	322,000
		Mozambique	298,000
		Northern Rhodesia ..	290,000
		Bechuanaland Protectorate	275,000
		Madagascar	229,000
		Kenya Colony and Protectorate	225,000
		Other	1,130,000
		Total	11,707,000
Europe—		**North and Central America—**	
U.S.S.R. (Russia) ..	2,316,000	Canada	3,695,000
Germany (*a*)	225,000	United States of America ..	3,027,000
France	213,000	Mexico	760,000
Spain (inc. possessions) ..	195,000	Alaska	586,000
Sweden	173,000	Newfoundland and Labrador	163,000
Poland	150,000	Honduras	59,000
Finland	148,000	Nicaragua	49,000
Italy (*b*)	131,000	Other	326,000
Norway	125,000	Total	8,665,000
Rumania	114,000		
Yugoslavia	96,000	**South America —**	
United Kingdom ..	94,000	Brazil	3,286,000
Other	429,000	Argentine Republic ..	1,078,000
Total	4,409,000	Bolivia	421,000
		Peru	482,000
Asia—		Colombia (exc. of Panama)	440,000
U.S.S.R. (Russia) ..	5,868,000	Venezuela	352,000
China and Dependencies ..	4,287,000	Chile	287,000
British India	865,000	Paraguay	153,000
Arabia	1,004,000	Ecuador	176,000
Feudatory Indian States ..	716,000	Other	262,000
Iran	635,000	Total	6,937,000
Netherlands Indies (*c*) ..	735,000		
Turkey	287,000	**Oceania, etc.—**	
French Indo-China ..	286,000	Commonwealth of Australia	2,975,000
Japan and Dependencies ..	262,000	New Zealand and Dependencies	104,000
Afghanistan	251,000	Territory of New Guinea ..	91,000
Burma	234,000	Papua	90,000
Thailand	200,000	Other	41,000
Other	586,000	Total	3,301,000
Total	16,216,000	**British Empire**	13,354,000
Africa—			
French West Africa ..	1,816,000		
Anglo-Egyptian Sudan ..	969,000		
French Equatorial Africa ..	960,000		
Belgian Congo	902,000		
Algeria	851,000		
Libya	680,000		

(*a*) Includes Austria (32,000 sq. miles) and Sudeten Territory (11,000 sq. miles). (*b*) Includes Albania (11,000 sq. miles). (*c*) Includes Dutch New Guinea.

The countries and areas given in the table are those obtaining before the 1939–45 War and were extracted from the *Statistical Year Book of the League of Nations.*

3. **Areas of Political Subdivisions.**—As already stated, Australia consists of six States and the Northern and Australian Capital Territories. The areas of these, and their proportions of the total of Australia, are shown in the following table :—

AUSTRALIA : AREA OF STATES AND TERRITORIES.

State or Territory.	Area.	Percentage on Total.
	Sq. miles.	%
New South Wales	309,433	10.40
Victoria	87,884	2.96
Queensland	670,500	22.54
South Australia	380,070	12.78
Western Australia	975,920	32.81
Tasmania	26,215	0.88
Northern Territory	523,620	17.60
Australian Capital Territory ..	939	0.03
Total	2,974,581	100.00

4. **Coastal Configuration.**—(i) *General.* There are no striking features in the configuration of the coast ; the most remarkable indentations are the Gulf of Carpentaria on the north and the Great Australian Bight on the south. The Cape York Peninsula on the extreme north is the only other remarkable feature in the outline. In Official Year Book No. 1 an enumeration is given of the features of the coast-line of Australia (see pp. 60–68).

(ii) *Coast-line.* The lengths of coast-line, excluding minor indentations, of each State and of the whole continent, and the area per mile of coast-line, are shown in the following table :—

AUSTRALIA : COAST-LINE AND AREA PER MILE THEREOF.

State.	Coast-line.	Area per Mile of Coast-line.	State.	Coast-line.	Area per Mile of Coast-line.
	Miles.	Sq. miles.		Miles.	Sq. miles.
New South Wales(*a*)	700	443	South Australia ..	1,540	247
Victoria	680	129	Western Australia	4,350	224
Queensland ..	3,000	223	Continent (*b*) ..	11,310	261
Northern Territory	1,040	503	Tasmania ..	900	29

(*a*) Includes Australian Capital Territory. (*b*) Area 2,948,366 square miles.

For the entire Commonwealth of Australia this gives a coast-line of 12,210 miles and an average of 244 square miles for one mile of coast-line. According to Strelbitski, Europe has only 75 square miles of area to each mile of coast-line, and, according to more recent figures, England and Wales have only one-third of this, 25 square miles.

(iii) *Historical Significance of Coastal Names.* It is interesting to trace the voyages of some of the early navigators by the names bestowed by them on various coastal features—thus Dutch names are found on various points of the Western Australian coast, in Nuyts' Archipelago, in the Northern Territory, and in the Gulf of Carpentaria ; Captain Cook can be followed along the coasts of New South Wales and Queensland ; Flinders' track is easily recognized from Sydney southwards, as far as Cape Catastrophe, by the numerous Lincolnshire names bestowed by him ; and the French navigators of the end of the eighteenth and the beginning of the nineteenth century have left their names all along the Western Australian, South Australian and Tasmanian coasts.

5. **Geographical Features of Australia.**—In separate issues of earlier Official Year Books fairly complete information has been given concerning some special geographical element. The nature of this information and its position in the various issues can be readily ascertained on reference to the special index following the index to maps and graphs at the end of this issue.

6. **Fauna, Flora, Geology and Seismology of Australia.**—Special articles dealing with these features have appeared in previous issues of the Official Year Book, but limits of space naturally preclude their repetition in each volume. As pointed out in par. 5, however, the nature and position of these articles can be readily ascertained from the special index.

§ 2. Climate and Meteorology of Australia.*

1. **Introductory.**—In Official Year Book No. 3, pp. 79 and 80, some account is given of the history of Australian meteorology, including a reference to the development of magnetic observations. In Official Year Book No. 4, pp. 84 and 87, will be found a short sketch of the creation and organization of the Commonwealth Bureau of Meteorology, and a résumé of the subjects dealt with at the Meteorological Conference in 1907.

2. **Meteorological Publications.**—Reference to publications issued by the Central Meteorological Bureau appears in Official Year Book No. 22, pp. 40 and 41, and No. 34, p. 11. The following publications have since been issued :—Bulletin No. 28, " Duststorms in Australia " ; Bulletin No. 29, " Report on the Divergence Theory of the Formation of Cyclones " ; Bulletin No. 30, " Synoptic Analysis over South-West Pacific Area " ; Bulletin No. 31, " Coastal Fogs in Australia " ; Bulletin No. 32, " Frost in the Australian Region " ; Bulletin No. 33, " Discussion of Seven Years of Aerological Observations by Aeroplane at Sydney " ; Bulletin No. 34, " Bradfield Scheme for Watering the Inland " ; Bulletin No. 35, " A Study of Average Hourly Values of Temperature, Relative Humidity and Saturation Deficit in the Australian Region from Records of Capital City Bureaux " ; Bulletin No. 36, " Weather Conditions Affecting Aviation over the Tasman Sea "—Part IV., " Flying Conditions over the Tasman Sea " (1940–44) ; Bulletin No. 37, " Discussion of Four Years of Aerological Observations obtained by means of Aeroplanes near Perth " ; Studies in Applied Climatology, Western Australia—Pamphlet No. 1, " Climate of the West Australian Wheat Belt with Special Reference to Rainfall over Marginal Areas " ; " Analysis and Forecasting in the South-West Pacific Area " ; and " Set of Typical Summer and Winter Weather-Charts (for use in Schools) ".

3. **Equipment.**—The determination of the climatological data has been made by records of the following instruments :—

(i) *Rainfall.* Rainfall has been measured by a cylindrical gauge generally 8 inches in diameter.

(ii) *Temperature.* Extreme daily temperatures have been recorded by means of self-registering maximum and minimum thermometers which are read and set daily.

(iii) *Humidity.* Humidities have been determined by the aid of tables from readings of dry and wet bulb thermometers.

(iv) *Atmospheric Pressure.* Pressures have been measured by mercurial barometers of the Kew (or Fortin) pattern.

(v) *Evaporation.* The standard evaporimeter in use consists of a cylindrical galvanized iron tank 3 feet in diameter and 3 feet deep, with a water jacket. Concrete tanks of similar form and dimensions are also used.

(vi) *Wind.* Data concerning wind have been obtained either by " Robinson " cup anemometer, " Dines " pressure tube anemometer or by " Machin " cup anemometer.

4. **General Description of Australia.**—A considerable portion (0.530) of three divisions of Australia is north of the tropic of Capricorn—that is to say, within Queensland, Western Australia and the Northern Territory, no less than 1,149,320 square miles belong to the tropical zone and 1,020,720 to the temperate zone. The whole area of Australia within the temperate zone, however, is 1,825,261 square miles ; thus the tropical part is about 0.386, or about five-thirteenths of the whole, or the " temperate " region is half as large again as the " tropical " (more accurately 1.588). By reason of its insular geographical position and the absence of striking physical features whether in marine gulfs or in important mountains, Australia is, on the whole, less subject to extremes of weather than are regions of similar area in other parts of the globe, and latitude for latitude Australia is, on the whole, more temperate.

* Prepared from data supplied by the Director, Commonwealth Meteorological Bureau.

The average elevation of the surface of the land is low, probably close to 900 feet above the sea. The altitudes range up to a little over 7,300 feet, hence its climate embraces a great many features, from the characteristically tropical to what is essentially alpine, a fact indicated in some measure by the name Australian Alps given to the southern portion of the Great Dividing Range.

On the coast, the rainfall is often abundant and the atmosphere moist, but in some portions of the interior is very limited, and the atmosphere dry. The distribution of forest, therefore, with its climatic influence, is very uneven. In the interior, in places, there are fine belts of trees, but there are large areas also which are treeless, and here the air is hot and parching in summer. Again, on the coast, even so far south as latitude 35°, the vegetation is tropical in its luxuriance, and to some extent also in character. Climatologically, therefore, Australia may be said to present a great variety of features.

5. **Meteorological Divisions.**—(i) *General.* Reference to the divisions adopted by the Commonwealth Meteorologist will be found in Official Year Book No. 22, p. 41.

(ii) *Special Climatological Stations.* The latitudes, longitudes and altitudes of special stations, the climatological features of which are graphically represented hereinafter, are as follows :—

SPECIAL CLIMATOLOGICAL STATIONS : AUSTRALIA.

Locality.	Height above Sea Level.	Latitude. S.	Longitude. E.	Locality.	Height above Sea Level.	Latitude. S.	Longitude. E.
	Feet.	deg. min.	deg. min.		Feet.	deg. min.	deg. min.
Perth ..	210	31 57	115 51	Canberra ..	1,906	35 18	149 06
Adelaide ..	140	34 56	138 35	Darwin ..	97	12 28	130 51
Brisbane ..	134	27 28	153 2	Alice Springs ..	1,901	23 38	133 37
Sydney ..	138	33 52	151 12	Dubbo ..	870	32 15	148 37
Melbourne ..	114	37 49	144 58	Laverton, W.A.	1,506	28 40	122 23
Hobart ..	177	42 53	147 20	Coolgardie ..	1,389	30 57	121 10

6. **Temperatures.**—(i) *Comparisons with other Countries.* In respect of Australian temperatures generally, it may be pointed out that the mean annual isotherm for 70° Fahrenheit extends in South America and South Africa as far south as latitude 33°, while in Australia it reaches only as far south as latitude 30°, thus showing that, on the whole, Australia has, latitude for latitude, a more temperate climate than other places in the Southern Hemisphere.

The comparison is even more favourable when the Northern Hemisphere is included, for in the United States of America the 70° isotherm extends in several of the western States as far north as latitude 41°. In Europe, the same isotherm reaches almost to the southern shores of Spain, passing afterwards, however, along the northern shores of Africa till it reaches the Red Sea, when it bends northward along the eastern shore of the Mediterranean till it reaches Syria. In Asia, nearly the whole of the land area south of latitude 40° N. has a higher temperature than 70°.

The extreme range of temperature is less than 100° over practically the whole of Australia, that figure being only slightly exceeded at a very few places ; it is mostly 70° to 90° over inland areas, and somewhat less on the coast. In parts of Asia and North America, the extreme range exceeds 130° and 150° in some localities.

Along the northern shores of Australia the temperatures are very equable. At Darwin, for example, the difference in the means for the hottest and coldest month is only 8.4° maximum and minimum respectively, and the extreme readings for the year, or the highest maximum on record and the lowest minimum, show a difference of under 50°.

(ii) *Hottest and Coldest Parts.* A comparison of the temperatures recorded at coast and inland stations shows that, in Australia, as in other continents, the range increases with increasing distance from the coast.

In the interior of Australia, and during exceptionally dry summers, the temperature occasionally reaches or exceeds 120° in the shade, and, considering Australia as a whole, frosts may occur within a few miles of the coastline over the entire continent except in the Northern Territory and in a considerable area of Northern Queensland. The hottest area of the continent is situated in the northern part of Western Australia about the Marble Bar and Nullagine gold-fields, where the maximum shade temperature during the summer sometimes exceeds 100° continuously for days and weeks. The coldest part of Australia is the extreme south-east of New South Wales and extreme east of Victoria—the region of the Australian Alps. Here the temperature seldom, if ever, reaches 100° even in the hottest of seasons, while in winter, readings slightly below zero are occasionally recorded.

Tasmania as a whole enjoys a most moderate and equable range of temperature throughout the year, although occasionally hot winds may cause the temperature to rise to 100° in the eastern part of the State.

(iii) *Monthly Maximum and Minimum Temperatures.* The normal monthly maximum and minimum temperatures can be best shown by means of graphs, which exhibit the nature of the fluctuation of each for all available years. In the diagram (page 33) for nine representative places in Australia, the upper heavy curves show the mean maximum, and the lower heavy curves the mean minimum temperatures based upon daily observations, while the length of the interval between these two heavy curves shows the average difference between the highest and the lowest temperatures of the twenty-four hours.

7. **Humidity.**—After temperature, humidity is the most important element of climate particularly as regards its effects on human comfort, rainfall supply, and conservation and related problems.

In this publication the humidity of the air has been graphically represented (page 33) by its vapour pressure (i.e., the partial pressure of the water vapour measured in inches of mercury). The humidity has also been expressed by the relative humidity which is the quotient of the vapour pressure divided by the saturation vapour pressure and multiplied by one hundred. The mean 9 a.m. relative humidity, as well as its highest and lowest recorded mean values at 9 a.m., have been given in the tables of climatological data for the capital cities (para. 18). The mean monthly vapour pressure has also been added to these tables.

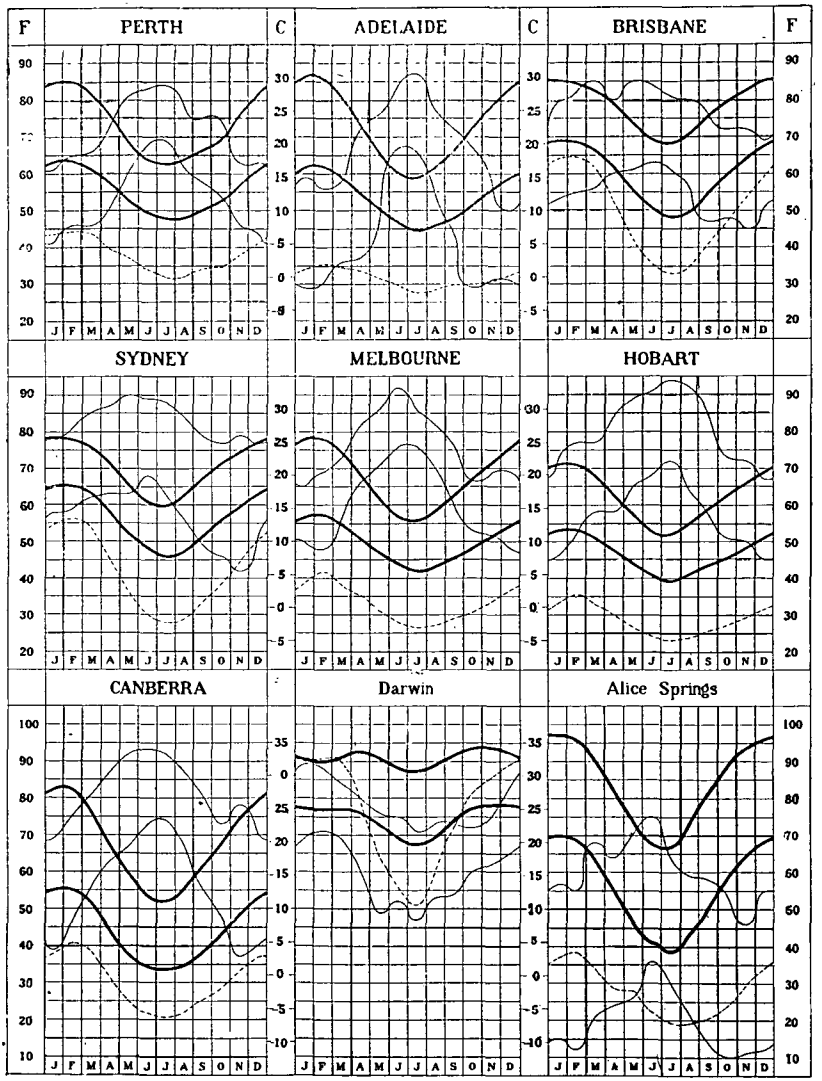
The annual curve of vapour pressure derived from the normal monthly values for this element is comparable with the maximum and minimum temperature curves, but the relative humidities consisting as they do of the extremes for each month do not show the normal annual fluctuation which would be approximately midway between the extremes.

The order of stations in descending values of 9 a.m. vapour pressure is Darwin, Brisbane, Sydney, Perth, Melbourne, Adelaide, Canberra, Hobart and Alice Springs, while the relative humidity diminishes in the order, Sydney, Canberra, Melbourne, Darwin, Hobart, Brisbane, Perth, Adelaide and Alice Springs.

8. **Evaporation.**—(i) *General.* The rate and quantity of evaporation in any territory is influenced by the prevailing temperature, and by atmospheric humidity, pressure and wind movement. In Australia the question is, perhaps, of more than ordinary importance, since in its drier regions water has often to be conserved in "tanks"* and dams. The magnitude of the economic loss by evaporation will be appreciated from the map reproduced herein (see page 41) which shows that the yearly amount varies from about 20 inches over Western Tasmania to more than 100 inches over central and north-western parts of Australia. Over an area of 70 per cent. of the continent, comprising most inland districts and extending to the coast in the North-West and Eucla divisions of Western Australia, during no month of the year does the rainfall exceed the evaporation. The central and north-western portions of the continent, comprising 46 per cent. of the total land mass, experience evaporation more than twice as great as its rainfall; it is noteworthy that the vegetation over most of this region is characterised by acacia, semi-desert,

* In Australia artificial storage ponds or reservoirs are called "tanks."

AVERAGE ANNUAL FLUCTUATIONS OF NORMAL MAXIMUM AND MINIMUM TEMPERATURE AND HUMIDITY.



EXPLANATION.—The upper and lower heavy lines in each graph represent the mean maximum and mean minimum temperatures respectively. The Fahrenheit temperature scales are shown on the outer edge of the sheet under " F " and the centigrade scales in the two inner columns under " C ".

The broken line shows the normal absolute humidity in the form of 9 a.m. vapour pressures for which the figures in the outer " F " columns represent hundredths of an inch of barometric pressure.

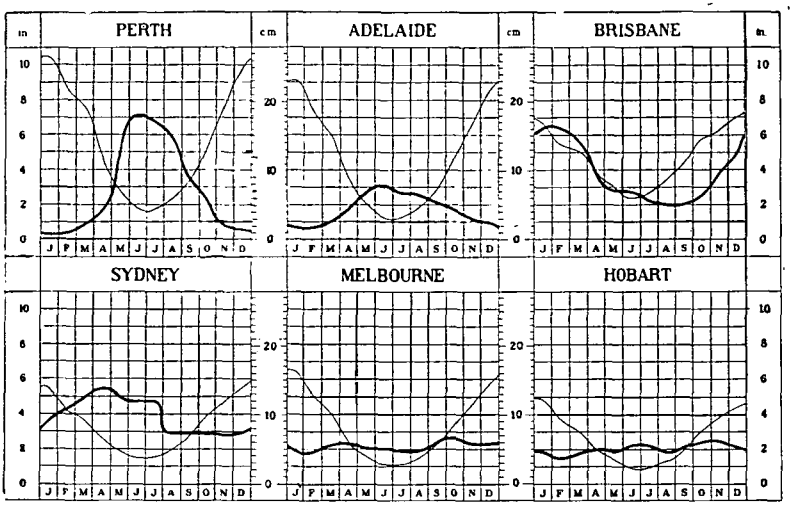
The upper and lower fine lines join the greatest and the least monthly means of relative humidity respectively, the figures under the outer columns " F " indicating percentage values.

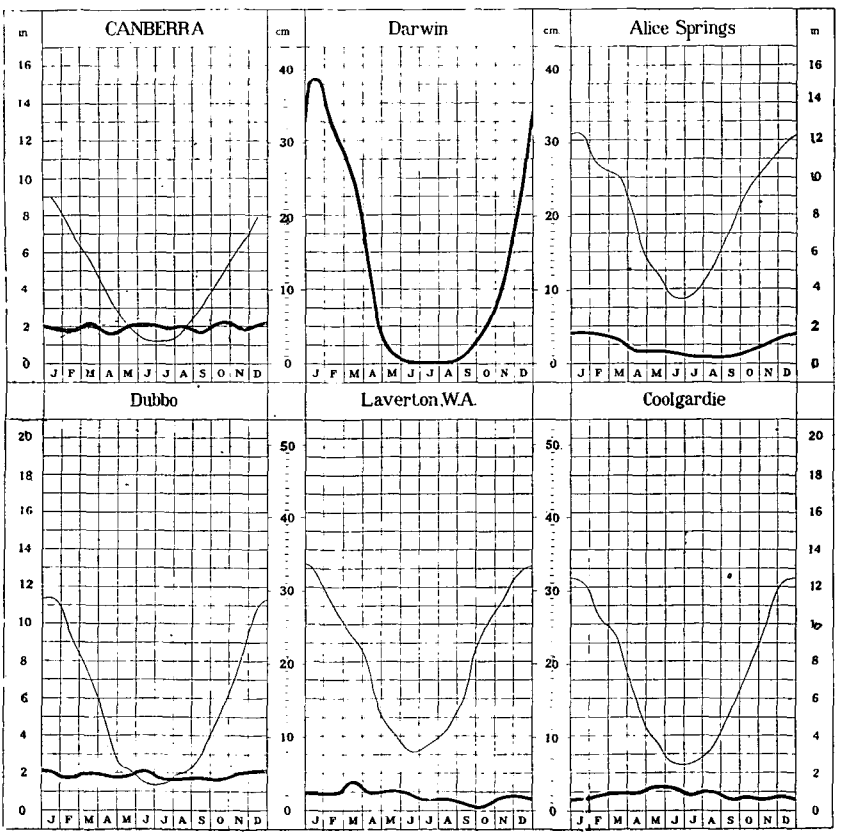
The curves for temperature and vapour pressure joining the mean monthly values serve to show the annual fluctuation of these elements, but the relative humidity graphs joining the extreme values for each month do not indicate any normal annual variation.

Comparison of the maximum and minimum temperature curves affords a measure of the mean diurnal range of temperature. At Perth in the middle of January, for instance, there is normally a range of 21° from 63° F. to 84° F., but in July it is only 15° from 48° F. to 63° F.

The relative humidity curves illustrate the extreme range of the mean monthly humidity over a number of years.

MEAN MONTHLY RAINFALL AND EVAPORATION.





EXPLANATION.—On the preceding graphs thick lines denote rainfall, and thin lines evaporation, and show the fluctuation of the mean rate of fall or evaporation *per month* throughout the year. The results, plotted from the Climatological Tables herein, are shown in inches (see the outer columns), and the corresponding metric scale (centimetres) is shown in the two inner columns. The evaporation is not given for Darwin.

At Perth, Adelaide, Brisbane, Melbourne, Hobart, Canberra, Alice Springs and Coolgardie the results have been obtained from jacketed tanks sunk in the ground. At Sydney and Dubbo sunken tanks without water jackets are used, whilst at Laverton (W.A.) the records are taken from a small portable jacket evaporation dish of 8 inches in diameter.

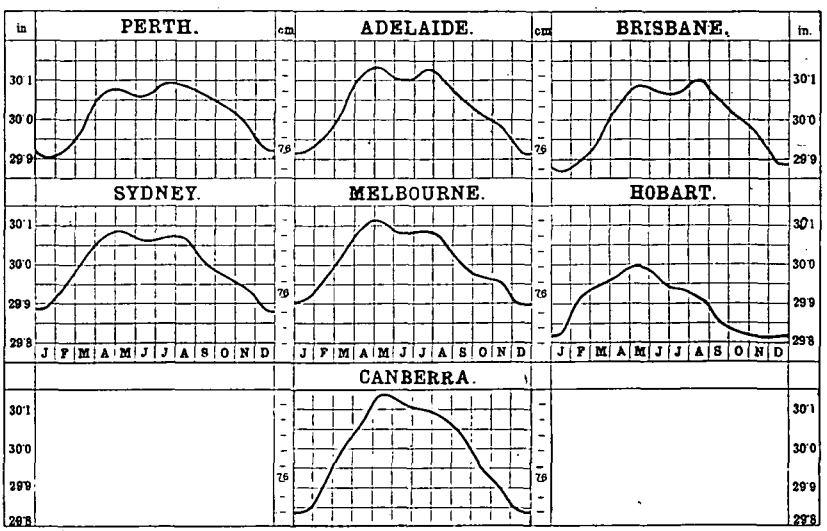
The distance for any date from the zero line to the curve represents the average number of inches, reckoned as per month, of rainfall at that date. Thus, taking the curve for Adelaide in the middle of January, the rain falls on the average at the rate of about three-fourths of an inch per month or, say at the rate of about 9 inches per year. In the middle of June it falls at the rate of a little over 3 inches per month, or, say, at the rate of about 37 inches per year. At Dubbo, the evaporation is at the rate *of nearly 11¾ inches per month about the middle of January, and only about 1¼ inches at the middle of* June.

The mean annual rainfall and evaporation at the places indicated are given in the appended table.

MEAN ANNUAL RAINFALL AND EVAPORATION.

Place.	Rainfall.	Evaporation.	Place.	Rainfall.	Evaporation.
	In.	In.		In.	In.
Perth ..	34.95	65.91	Canberra ..	22.45	54.00
Adelaide ..	21.09	56.04	Darwin ..	60.60	..
Brisbane ..	44.58	56.36	Alice Springs ..	10.55	97.21
Sydney ..	46.35	40.17	Dubbo ..	21.83	66.37
Melbourne ..	25.54	39.15	Laverton, W.A.	9.12	95.80
Hobart ..	24.52	31.21	Coolgardie ..	10.24	84.42

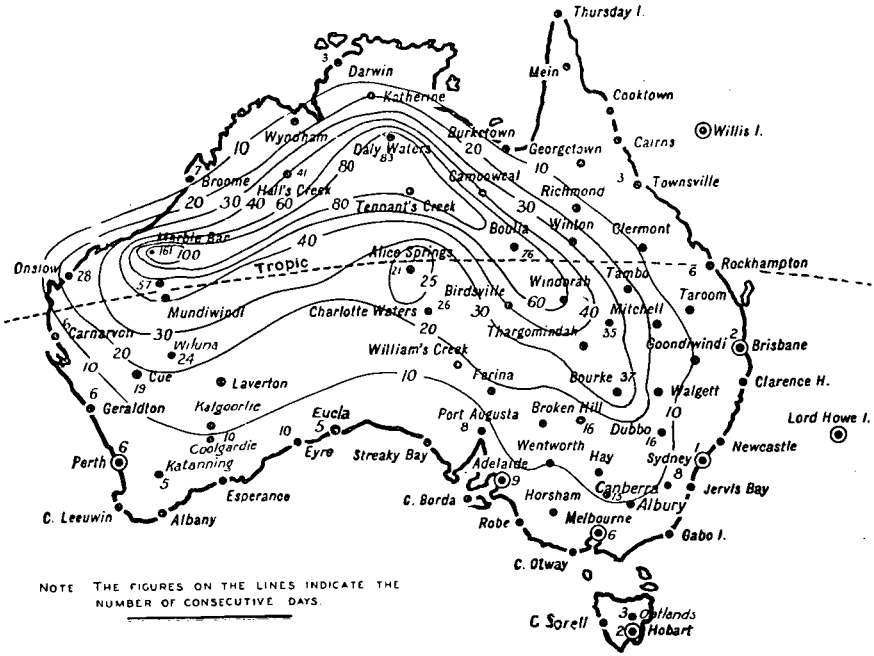
MEAN BAROMETRIC PRESSURE.—CAPITAL CITIES.



EXPLANATION.—The lines representing the yearly fluctuations of barometric pressure at the State capital cities are means for long periods, and are plotted from the Climatological Tables herein. The pressures are shown in inches on about 2½ times the natural scale, and the corresponding pressures in centimetres are also shown in the two inner columns, in which each division represents one millimetre.

Taking the Brisbane graph for purposes of illustration, it will be seen that the mean pressure in the middle of January is about 29.87 inches, and there are maxima in the middle of May and August on about 30.09 inches.

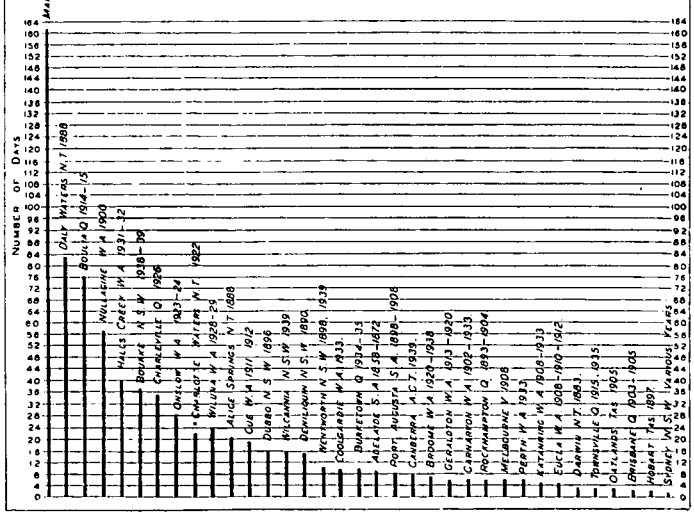
AREA AFFECTED AND PERIOD OF DURATION OF THE LONGEST HEAT WAVES WHEN THE MAXIMUM TEMPERATURE FOR CONSECUTIVE 24 HOURS REACHED OR EXCEEDED 100°F

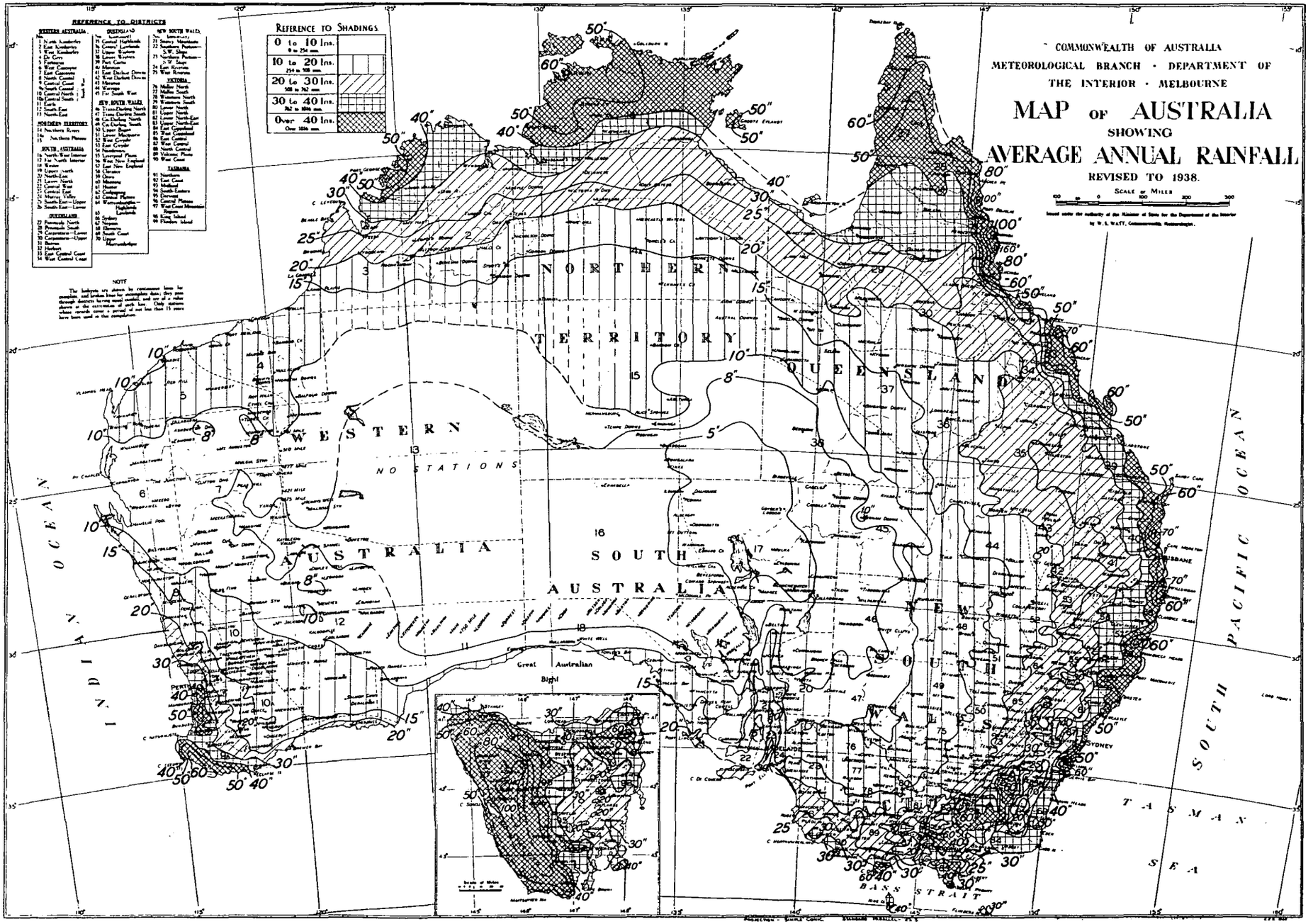


NOTE THE FIGURES ON THE LINES INDICATE THE NUMBER OF CONSECUTIVE DAYS.

DECEMBER, 1942.

GREATEST NUMBER OF CONSECUTIVE DAYS ON WHICH THE SHADE TEMPERATURE WAS 100°FAHR OR OVER AT THE PLACES INDICATED.




COMMONWEALTH OF AUSTRALIA
METEOROLOGICAL BRANCH · DEPARTMENT OF THE INTERIOR · MELBOURNE
MAP OF AUSTRALIA
SHOWING
AVERAGE ANNUAL RAINFALL
REVISED TO 1938.
REFERENCE TO DISTRICTS
REFERENCE TO SHADINGS
0 to 10 Ins.
10 to 20 Ins.
20 to 30 Ins.
30 to 40 Ins.
Over 40 Ins.
NOTE
NORTHERN TERRITORY
WESTERN AUSTRALIA
SOUTH AUSTRALIA
QUEENSLAND
NEW SOUTH WALES
VICTORIA
TASMANIA
NO STATIONS
Great Australian Bight
INDIAN OCEAN
SOUTH PACIFIC OCEAN
TASMAN SEA
BASS STRAIT
PERTH
BRISBANE
SYDNEY

COMMONWEALTH OF AUSTRALIA.

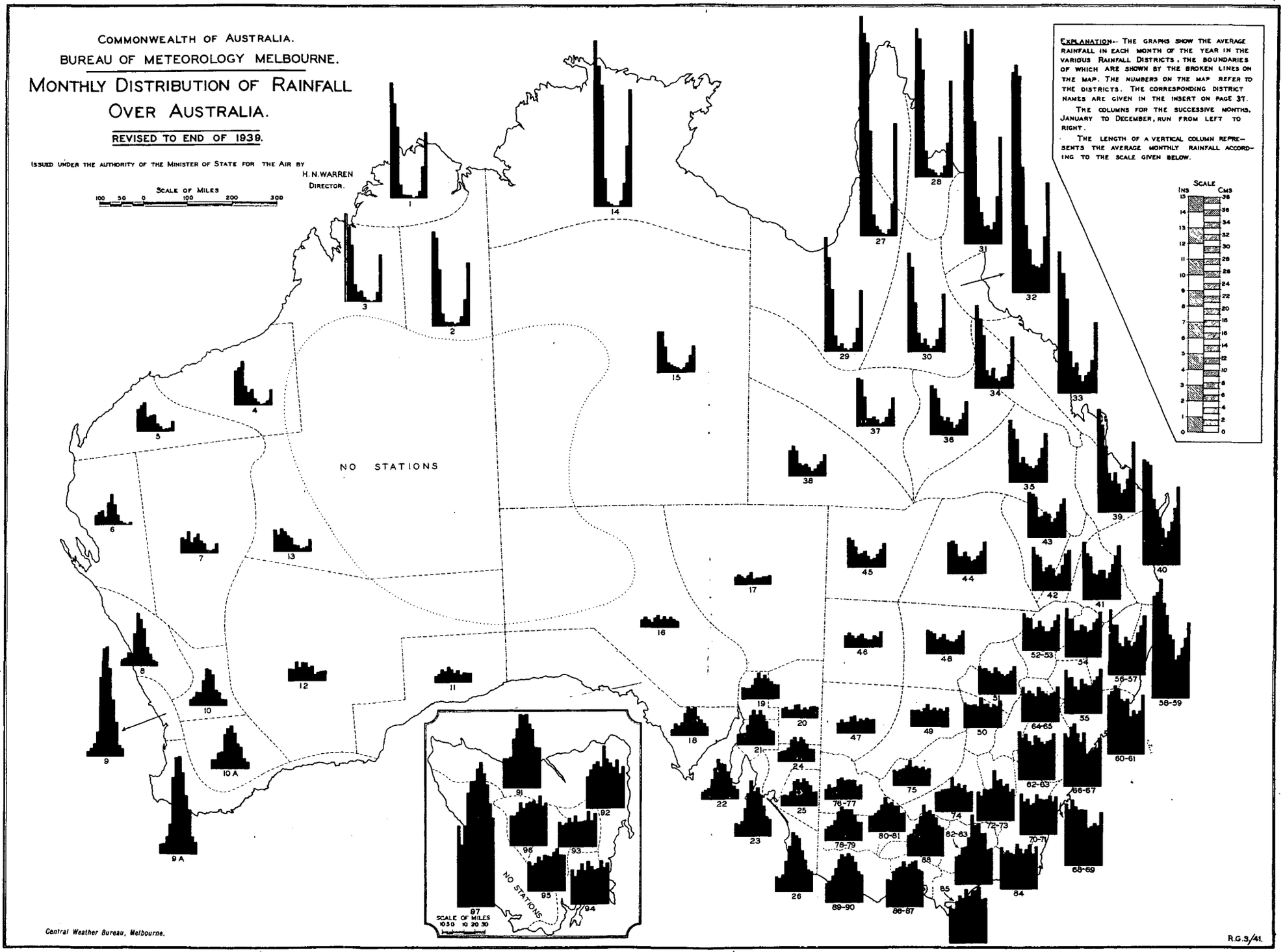
BUREAU OF METEOROLOGY MELBOURNE.

MONTHLY DISTRIBUTION OF RAINFALL OVER AUSTRALIA.

REVISED TO END OF 1939.

ISSUED UNDER THE AUTHORITY OF THE MINISTER OF STATE FOR THE AIR BY H. N. WARREN DIRECTOR.

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 PAGE 37.

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
15	38
14	36
13	34
12	32
11	30
10	28
9	26
8	24
7	22
6	20
5	18
4	16
3	14
2	12
1	10
0	8
	6
	4
	2
	0

Central Weather Bureau, Melbourne.

R.G.S./41.

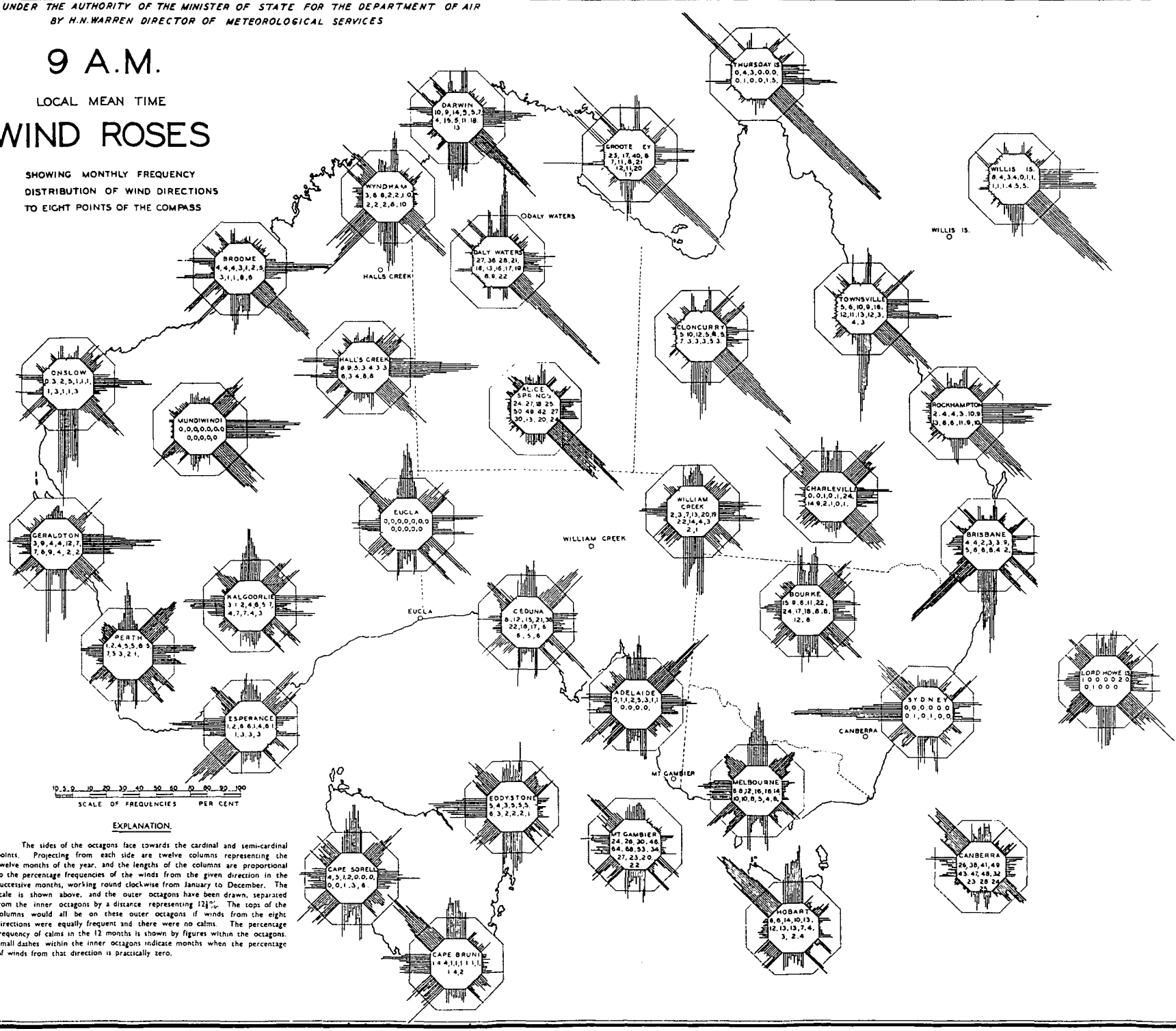
ISSUED UNDER THE AUTHORITY OF THE MINISTER OF STATE FOR THE DEPARTMENT OF AIR
BY H.N.WARREN DIRECTOR OF METEOROLOGICAL SERVICES

9 A.M.

LOCAL MEAN TIME

WIND ROSES

SHOWING MONTHLY FREQUENCY
DISTRIBUTION OF WIND DIRECTIONS
TO EIGHT POINTS OF THE COMPASS



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.

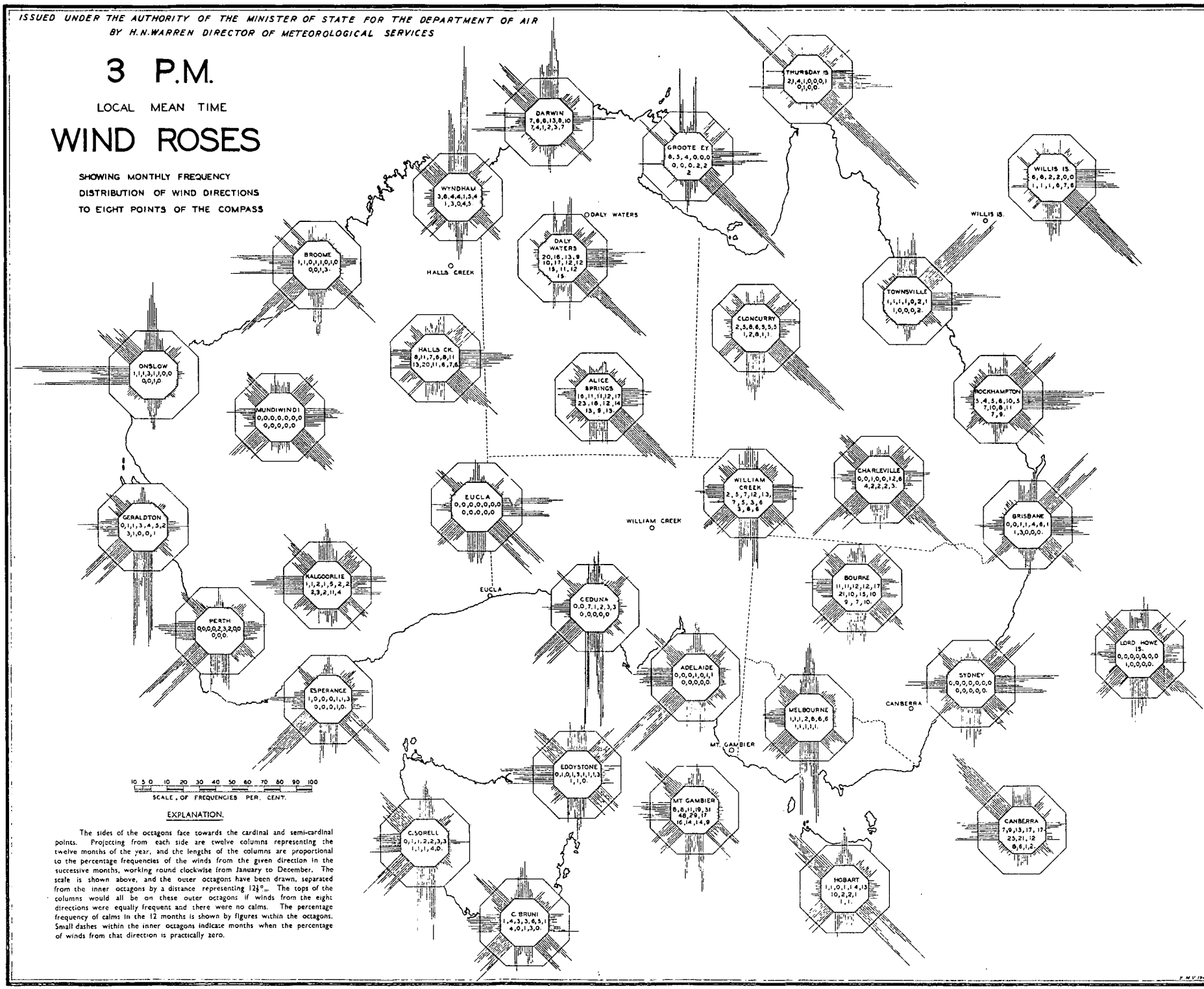
ISSUED UNDER THE AUTHORITY OF THE MINISTER OF STATE FOR THE DEPARTMENT OF AIR
BY H.N.WARREN DIRECTOR OF METEOROLOGICAL SERVICES

3 P.M.

LOCAL MEAN TIME

WIND ROSES

SHOWING MONTHLY FREQUENCY
DISTRIBUTION OF WIND DIRECTIONS
TO EIGHT POINTS OF THE COMPASS



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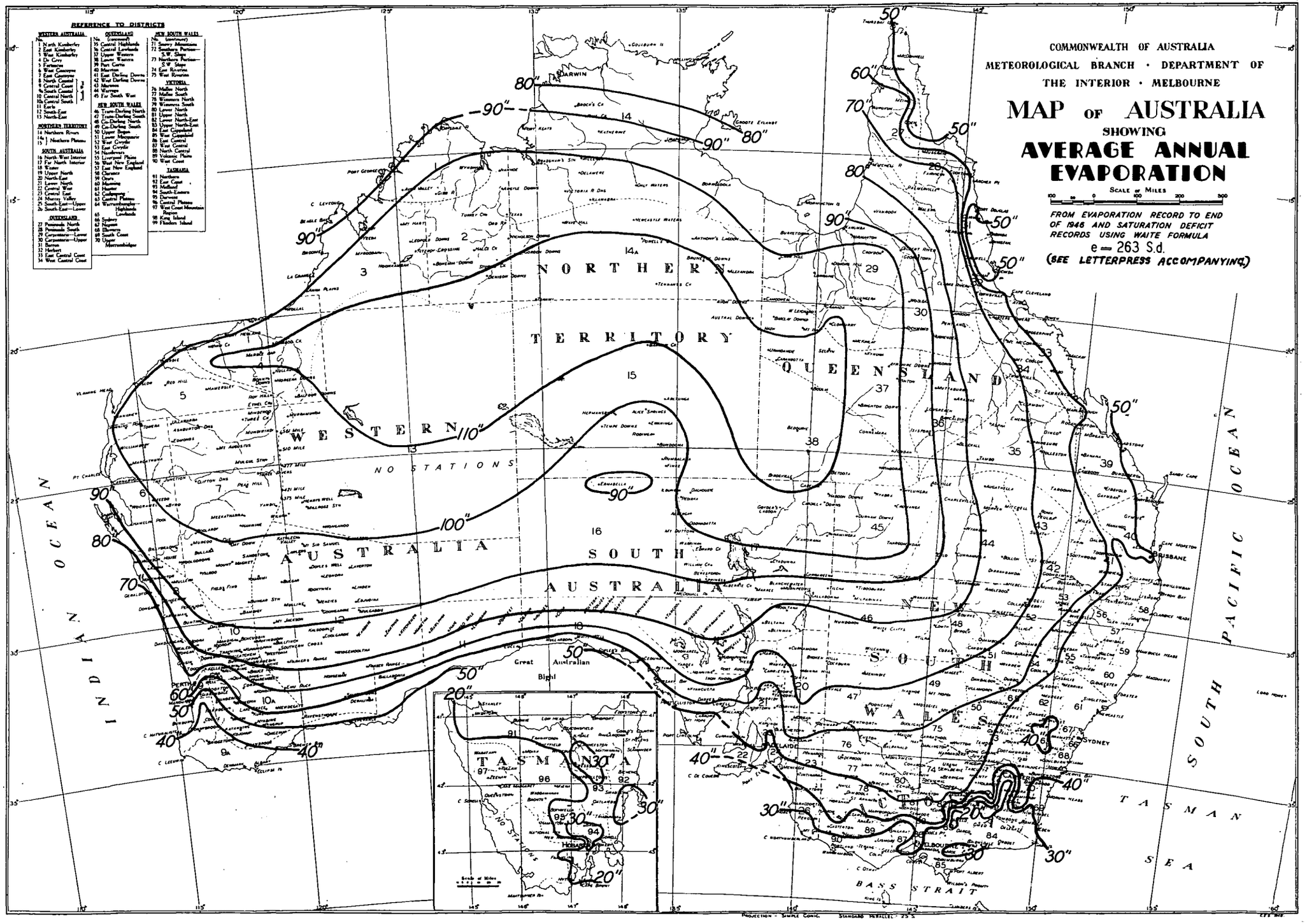
COMMONWEALTH OF AUSTRALIA
METEOROLOGICAL BRANCH · DEPARTMENT OF THE INTERIOR · MELBOURNE
MAP OF AUSTRALIA
SHOWING
AVERAGE ANNUAL EVAPORATION
SCALE OF MILES
FROM EVAPORATION RECORD TO END OF 1946 AND SATURATION DEFICIT RECORDS USING WAITE FORMULA
e = 263 S.d.
(SEE LETTERPRESS ACCOMPANYING)
REFERENCE TO DISTRICTS
WESTERN AUSTRALIA
QUEENSLAND
NEW SOUTH WALES
VICTORIA
NORTHERN TERRITORY
SOUTH AUSTRALIA
TASMANIA
NO STATIONS
INDIAN OCEAN
SOUTH PACIFIC OCEAN
TASMAN SEA
BASS STRAIT
Great Australian Bight
DARWIN
PERTH
ADELAIDE
MELBOURNE
SYDNEY
BRISBANE
HOBART
PROJECTION - SIMPLE CONIC. STANDARD PARALLELS - 25° S.

shrub steppe and porcupine grass. Since the loss by evaporation depends largely on the exposed area, tanks and dams so designed that the surface shall be a minimum are advantageous. Further, the more protected from the direct rays of the sun and from winds by means of suitable tree planting, the less will be the loss by evaporation. These matters are naturally of more than ordinary concern in the drier districts of Australia.

(ii) *Comments on Map of Average Annual Evaporation.* A map of average annual evaporation in Australia (*see* page 41) has been compiled on the basis of records obtained from a number of evaporimeters supplemented by estimates derived from records of saturation deficit by applying the Waite Institute factor of 263 [" Atmospheric Saturation Deficit in Australia "—J. A. Prescott (Trans. Royal Society, S.A., Vol. lv., 1931)]. Some modification of the latter values was found to be necessary in comparison with recordings of evaporimeters.

The standard evaporation tank used in Australia is cylindrical in form and is 36 inches in diameter and 36 inches deep. It is surrounded by a 6-inch water jacket and the whole is sunk into the ground so that the water surface is approximately at ground level.

Saturation deficit is obtained from readings of dry and wet bulb thermometers exposed in a standard Stevenson thermometer shelter. Saturation deficit is the difference between the vapour pressure indicated by the dry and wet bulb readings, and the saturation vapour pressure corresponding to the dry bulb temperature.

The Waite formula, $e = 263$ s.d., is not an exact relationship, but it takes account of one of the major factors in evaporation, i.e., the difference between saturation vapour pressures at the mean dew point and at the mean air temperature. Errors in the formula are found to be fairly consistent in considerable areas of Australia and corrections have been applied accordingly. No evaporation records are available north of latitude 20°, and corrections have been extrapolated for these areas. The evaporation stations on which estimates for the tropics have been based are Alice Springs (N.T.) and Winton (Q'land), and to a lesser degree Blackall (Q'land) and Marble Bar (W.A.).

The map thus presents an estimate of evaporation for which allowance should be made for a certain margin of error (perhaps 10 per cent. or so) on the conservative side. In the absence of definite information, such a map should serve a useful purpose as a basis for many climatic studies.

(iii) *Monthly Evaporation Curves.* The diagrams (page 34) showing the mean monthly evaporation in various parts of Australia disclose how characteristically different are the amounts for the several months in different localities.

9. **Rainfall.**—(i) *General.* The rainfall of any region is determined mainly by the direction and route of the prevailing winds, by the varying temperatures of the earth's surface over which they blow, and by its physiographical features.

Australia lies within the zones of the south-east trades and prevailing westerly winds. The southern limit of the south-east trade strikes the eastern shores at about 30° south latitude, and, with very few exceptions, the heaviest rains of the Australian continent are precipitated along the Pacific slopes to the north of that latitude, the varying quantities being more or less regulated by the differences in elevation of the shores and of the chain of mountains from the New South Wales northern border to Thursday Island, upon which the rain-laden winds blow. The converse effect is exemplified on the north-west coast of Western Australia, where the prevailing winds, blowing from the interior of the continent instead of from the ocean, result in the lightest coastal rain in Australia.

The westerly winds, which skirt the southern shores, are responsible for the reliable, generally light to moderate rains enjoyed by the south-western portion of Western Australia, the agricultural areas of South Australia, a great part of Victoria, and the whole of Tasmania.

(ii) *Distribution of Rainfall.* The average annual rainfall map of Australia (page 37) shows that the heaviest yearly falls occur on the north coast of Queensland (up to over 160 inches) and in Western Tasmania (up to 140 inches), while from 50 to over 60 inches are received on parts of the eastern seaboard from Jervis Bay (New South Wales) to the northern part of Cape York Peninsula, also around Darwin (Northern Territory), on the West Kimberley coast, near Cape Leeuwin (Western Australia), about the

Australian Alps in eastern Victoria and New South Wales, and on the north-eastern highlands in Tasmania. A great part of the interior of the continent, stretching from the far west of New South Wales and the south-west of Queensland to the vicinity of Shark Bay in Western Australia, has a very low average rainfall of less than 10 inches a year. Between these two regions of heavy and very low rainfall are the extensive areas which experience useful to good rains, and in the southern and eastern parts of which are found the best country and most of the population and primary production.

(iii) *Factors Determining Occurrence, Intensity and Seasonal Distribution of Rainfall.* Reference has already been made to the frequent rains occurring in the north-eastern coastal districts of Queensland with the prevailing south-east trade winds and to similar rains in the west of Tasmania with the prevailing westerly winds. Other rains in Australia are associated mainly with tropical and southern depressions.

The former chiefly affect the northern, eastern, and to some extent the central parts of the continent and operate in an irregular manner during the warmer half of the year, but principally from December to March. They vary considerably in activity and scope from year to year, occasionally developing into severe storms off the east and north-west coasts. Tropical rainstorms sometimes cover an extensive area, half of the continent on occasions receiving moderate to very heavy falls during a period of a few days. Rain is also experienced, with some regularity, with thunderstorms in tropical areas, especially near the coast. All these tropical rains, however, favour mostly the northern and eastern parts of the area referred to ; the other parts further inland receive lighter, less frequent and less reliable rainfall. With the exception of districts near the east coast, where some rain falls in all seasons, the tropical parts of the continent receive useful rains only on rare occasions from May to September.

The southern depressions are most active in the winter—June to August—and early spring months. The rains associated with them are fairly reliable and frequent over Southern Australia and Tasmania, and provide during that period the principal factor in the successful growing of wheat. These depressions also operate with varying activity during the remainder of the year, but the accompanying rains are usually lighter. The southern rains favour chiefly the south-west of Western Australia, the agricultural districts of South Australia, Victoria, Tasmania, and the southern parts of New South Wales. They sometimes extend into the drier regions of the interior, but only infrequently and with irregular rains.

The map showing mean monthly distribution of rainfall over Australia (page 38) gives in graphic form information on the amount and occurrence of rain.

(iv) *Wettest and Driest Regions.* The wettest known part of Australia is on the north-east coast of Queensland, between Port Douglas and Cardwell, where Deeral on the north coast-line has an average annual rainfall of 182.01 inches and Tully on the Tully River 177.54 inches. In addition, three stations situated on, or adjacent to, the Johnstone and Russel Rivers have an average annual rainfall of between 143 and 169 inches. The maximum and minimum falls there are :—Deeral, 287.18 in 1945 and 109.74 inches in 1943, or a range of 177.44 inches ; Tully, 234.37 in 1936 and 104.98 inches in 1943, or a range of 129.39 inches ; Goondi, 241.53 in 1894 and 67.88 inches in 1915, or a range of 173.65 inches ; Innisfail, 211.24 in 1894 and 69.87 inches in 1902, or a range of 141.37 inches ; Harvey Creek, 254.77 in 1921 and 80.47 inches in 1902, or a range of 174.30 inches.

On four occasions more than 200 inches have been recorded at Goondi, the last of these being in 1910, when 204.82 inches were registered. The records at this station cover a period of 59 years.

In nineteen years of record Tully has exceeded 200 inches on eight occasions, whilst in a record of 28 complete years Harvey Creek has four times exceeded this figure. At Tully 234.37 inches were recorded during 1936 and at Harvey Creek the total for 1921 was 254.77 inches. At the South Johnstone Sugar Experiment Station 202.52 inches were recorded in 1921.

In Tasmania the wettest part is in the West Coast region, the average annual rainfall at Lake Margaret being 144 inches, with a maximum of 175.12 inches in 1924.

The driest known part of the continent is in the Lake Eyre district in South Australia (the only part of the continent below sea level), where the annual average is only 5 inches, and where the total rarely exceeds 10 inches for the twelve months.

The inland districts of Western Australia were at one time regarded as the driest part of Australia, but authentic observations in recent years over most settled districts in the east of that State show that the annual average is about 10 inches.

(v) *Quantities and Distribution of Rainfall.* The general distribution is best seen from the rainfall map (page 37) which shows the areas subject to average annual rainfalls lying between certain limits. The proportions of the total area of each State and of Australia as a whole enjoying varying quantities of rainfall determined from the latest available information are shown in the following table :—

AVERAGE ANNUAL RAINFALL DISTRIBUTION.

Average Annual Rainfall.	N.S.W. (a)	Victoria.	Queensland.	South Australia	Western Australia.	Tasmania. (b)	Northern Territory	Total. (b)
	%	%	%	%	%	%	%	%
Under 10 inches ..	19.7	Nil	13.0	82.8	58.0	Nil	24.7	37.6
10—15 ,, ..	23.5	22.4	14.4	9.4	22.4	Nil	32.4	19.9
15—20 ,, ..	17.5	15.2	19.7	4.5	6.8	0.7	9.7	10.9
20—25 ,, ..	14.2	17.9	18.8	2.2	3.7	11.0	6.6	9.1
25—30 ,, ..	9.1	18.0	11.6	0.8	3.7	11.4	9.3	7.3
30—40 ,, ..	9.9	16.1	11.1	0.3	3.3	20.4	4.7	6.6
Over 40 ,, ..	6.1	10.4	11.4	Nil	2.1	56.5	12.6	8.6
Total ..	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(a) Includes Australian Capital Territory. (b) Over an area of 2,777 square miles no records are available.

Referring first to the capital cities, the records of which are given in the next table, it will be seen that Sydney, with a normal rainfall of 46.34 inches, occupies the chief place: Brisbane, Perth, Melbourne, Hobart, Canberra and Adelaide follow in that order, Adelaide with 21.09 inches being the driest. The extreme range from the wettest to the driest year is greatest at Brisbane (72.09 inches) and least at Adelaide (19.49 inches).

In order to show how the rainfall is distributed throughout the year in various parts of the continent, average figures for the various climatological districts have been selected. (See map on p. 38). The figures for Northern Rivers, District 14, show that nearly the whole of the rainfall occurs there in the summer months, while little or none falls in the middle of the year. The figures for the Central Coast, south-west of Western Australia (District 9), are the reverse for, while the summer months are dry, the winter ones are very wet. In the districts containing Melbourne and Hobart the rain is fairly well distributed throughout the twelve months, with a maximum in October for both districts. In Queensland, the heaviest rains fall in the summer months, but good averages are also maintained during the other seasons in eastern parts.

On the coast of New South Wales, the first half of the year is the wettest, with heaviest falls in the autumn; the averages during the last six months are fair, and moderately uniform. Generally it may be said that approximately one-third of the area of the continent, principally in the eastern and northern parts, enjoys an annual average rainfall of from 20 to 50 inches or more, the remaining two-thirds averaging from 5 to 20 inches.

(vi) *Curves of Rainfall and Evaporation.* The relative amounts of rainfall and evaporation at different times through the year are clearly indicated in the graphs (page 34). Inspection thereof and of the map on page 41 will show how large is the evaporation when water is fully exposed to the direct rays of the sun and to wind.

(vii) *Tables of Rainfall.* The table of rainfall for a fairly long period of years for each of the various Australian capitals affords information as to the variability of the fall in successive years, and the list of the more remarkable falls furnishes information as to what may be expected on particular occasions.

RAINFALL : AUSTRALIAN CAPITAL CITIES.

Year.	CANBERRA.(a)		PERTH.		ADELAIDE.		BRISBANE.		SYDNEY.		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.	
1920 ..	..	..	40.35	124	26.70	119	39.72	122	43.42	159	28.27	162	18.00	182
21 ..	..	..	41.09	135	22.64	100	54.31	167	43.34	140	29.76	154	18.04	159
22 ..	..	..	31.86	135	23.20	117	35.82	109	39.35	136	25.02	151	28.27	189
23 ..	..	..	44.47	134	29.79	139	23.27	93	37.01	123	22.64	158	32.93	198
24 ..	..	..	33.79	119	23.44	143	41.08	114	37.01	136	36.48	171	28.76	197
25 ..	..	..	31.41	126	21.91	118	53.10	139	50.35	145	17.57	144	22.67	170
26 ..	..	..	49.22	167	22.20	116	30.82	111	37.07	127	20.51	149	25.79	187
27 ..	..	..	36.59	133	16.92	101	62.08	130	48.56	138	17.98	135	20.13	185
28 ..	18.59	90	44.88	140	19.43	107	52.64	145	40.07	130	24.09	151	30.23	205
29 ..	23.12	70	36.77	132	17.51	119	39.78	118	57.90	129	28.81	168	26.55	194
30 ..	17.33	82	39.80	129	18.65	116	41.22	144	44.47	141	25.41	145	19.38	152
31 ..	24.02	103	39.18	118	22.26	145	66.72	136	49.22	153	28.63	164	27.17	179
32 ..	20.18	118	39.40	121	25.04	141	24.79	97	37.47	146	31.08	179	30.29	155
33 ..	20.78	96	32.47	116	22.12	130	49.71	118	42.71	153	22.28	136	23.18	182
34 ..	35.58	131	40.61	120	20.24	125	54.26	117	64.91	183	33.53	157	23.17	194
35 ..	23.78	95	32.28	129	23.45	140	34.64	111	30.97	131	29.98	183	32.22	196
36 ..	26.24	108	30.64	118	19.34	121	21.77	101	30.22	130	24.30	187	19.60	178
37 ..	20.46	82	35.28	120	23.01	128	34.79	113	52.00	157	21.45	144	20.65	160
38 ..	19.26	79	29.64	111	19.26	119	43.49	110	39.17	132	17.63	131	31.32	169
39 ..	27.63	116	45.70	123	23.29	139	41.43	122	33.67	127	33.11	166	27.23	188
40 ..	17.38	64	20.00	98	16.16	116	42.37	93	39.34	125	19.83	126	17.17	135
41 ..	19.55	91	34.74	122	22.56	126	31.50	105	26.74	129	31.78	157	23.49	145
42 ..	25.76	104	39.24	140	25.44	133	44.01	125	48.29	121	29.79	148	19.42	163
43 ..	24.59	123	31.46	117	17.84	135	50.68	126	50.74	136	18.80	150	20.84	149
44 ..	12.05	75	27.39	123	17.13	114	27.85	100	31.04	115	21.32	143	26.23	151
45 ..	22.35	100	52.67	137	17.85	105	48.16	130	46.47	136	19.22	152	16.92	157
46 ..	22.31	94	41.47	122	22.59	135	38.66	83	36.05	111	29.80	177	39.45	193
Average	22.16	96	34.94	121	21.09	124	44.58	125	46.34	152	25.54	141	24.42	153
No. of Years	19	19	71	71	108	108	95	87	88	88	91	91	64	64

(a) Commonwealth Forestry Bureau; records in issues prior to No. 36 were for the station at Acton which closed down in 1939. (b) Records taken from present site commenced 1883.

10. **Remarkable Falls of Rain.**—The following are the most remarkable falls of rain in the various States and Territories which have occurred within a period of twenty-four hours. For other very heavy falls at various localities reference may be made to Official Year Book No. 14, pp. 60–64, No. 22, pp. 46–48 and No. 29, pp. 43, 44 and 51 :—

HEAVY RAINFALLS : NEW SOUTH WALES, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		in.			in.
Broger's Creek ..	14 Feb., 1898	20.05	South Head (near Sydney) ..	16 Oct., 1844	20.41
,, ,, ..	13 Jan.. 1911	20.83	Towamba ..	5 Mar., 1893	20.00
Cordeaux River ..	14 Feb., 1898	22.58	Viaduct Creek ..	15 ,, 1936	20.00
Morpeth	9 Mar., 1893	21.52			

HEAVY RAINFALLS : QUEENSLAND, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		in.			in.
Babinda (Cairns) ..	2 Mar., 1935	24.14	Kuranda (Cairns)..	2 Apr., 1911	28.80
Banyan (Cardwell)	12 Feb., 1927	24.00	Landsborough ..	2 Feb., 1893	25.15
Buderim Mountain	11 Jan., 1898	26.20	Macnade Mill ..	6 ,, 1901	23.33
Carruchan ..	24 Jan., 1934	24.00	Plane Creek (Mackay) ..	26 Feb.. 1913	27.73
Crohamhurst (Blackall Range)	2 Feb., 1893	35.71	Sarina	26 Feb., 1913	27.75
Deeral	2 Mar., 1935	27.60	Tully Mill ..	12 Feb., 1927	23.86
Flat Top Island ..	21 Jan., 1918	25.18	Woodlands (Yepp'n)	3 Jan., 1893	23.07
Goondi	30 Jan., 1913	24.10	Yarrabah ..	2 Apr., 1911	30.65
Harvey Creek ..	3 ,, 1911	27.75			

HEAVY RAINFALLS : WESTERN AUSTRALIA, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		in.			in.
Balla Balla ..	21 Mar., 1899	14.40	Pilbara	2 Apr., 1898	14.04
Boodarie ..	21 Jan., 1896	14.53	Roebuck Plains ..	5 Jan., 1917	14.01
Broome	6 ,, 1917	14.00	,, ,, ..	6 ,, 1917	22.36
Carlton Hill ..	7 Feb., 1942	12.75	Thangoo	17-19 Feb.'96	24.18
Derby	7 ,, 1917	16.47	Towrana ..	1 Mar., 1943	12.16
Fortesque ..	3 May, 1890	23.36	Whim Creek ..	3 Apr., 1898	29.41
Jimba Jimba ..	1 Mar., 1943	11.54	Winderrie ..	17 Jan., 1923	14.23
Marble Bar ..	2 ,, 1941	12.00			

HEAVY RAINFALLS : NORTHERN TERRITORY, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		in.			in.
Bathurst Island Mission ..	7 Apr., 1925	11.85	Cape Don ..	13 Jan., 1934	13.58
Birrimbah ..	6 Mar., 1935	16.50	Darwin	7 Dec., 1915	11.67
Borroloola ..	14 ,, 1899	14.00	Groote Eylandt ..	25 Mar., 1940	11.75
Brock's Creek ..	24 Dec., 1915	14.33	Timber Creek ..	5 Feb., 1942	13.65

HEAVY RAINFALLS : SOUTH AUSTRALIA, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		in.			in.
Ardrossan ..	18 Feb., 1946	8.10	Newcastle Waters	28 Dec., 1945	6.37
Coober Pedy ..	19 Feb., 1938	6.50	Nunjikompita ..	21 Feb., 1938	6.50
Cunnamulla ..	18 Feb., 1946	8.20	Wallaroo ..	18 Feb., 1946	5.74
Edithburg ..	18 Feb., 1946	7.46	Wilmington ..	1 Mar., 1921	7.12
Lobethal ..	18 Apr., 1938	6.44	Winulta ..	18 Feb., 1946	6.61
Maitland ..	18 Feb., 1946	7.21			

HEAVY RAINFALLS : VICTORIA, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		in.			in.
Blackwood "Greenhill"	26 Jan., 1941	8.98	Korumburra ..	1 Dec., 1934	8.51
Cann River ..	16 Mar., 1938	9.94	Mt. Buffalo ..	6 June, 1917	8.53
Cunninghame ..	26 Dec., 1935	8.50	Murrungowar ..	16 Mar., 1938	8.36
Erica	1 Dec., 1934	8.66	Olinda	1 Dec., 1934	9.10
Hazel Park ..	1 ,, ,,	10.50	Tambo Crossing ..	13 July, 1925	8.89
Kalorama ..	1 ,, ,,	10.05	Tonghi Creek ..	27 Feb., 1919	9.90

HEAVY RAINFALLS : TASMANIA, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date	Amnt.
		in.			in.
Cullenswood ..	5 Apr., 1929	11.12	Riana	5 Apr., 1929	11.08
Gould's Country ..	8-10 Mar.,'11	15.33	The Springs ..	30-31 Jan., '16	10.75
Lottah	8-10 ,, ,,	18.10	Triabunna ..	5 June, 1923	10.20
Mathinna ..	5 Apr., 1929	13.25			

HEAVY RAINFALLS : AUSTRALIAN CAPITAL TERRITORY, UP TO 1946, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt
		in.			in.
Canberra (Acton)..	27 May, 1925	6.84	Uriarra	27 May, 1925	6.57
Cotter Junction ..	,, ,,	7.13			

11. **Snowfall.**—Light snow has been known to fall occasionally as far north as latitude 31° S., and from the western to the eastern shores of the continent. During exceptional seasons, it has fallen simultaneously over two-thirds of New South Wales, and has extended at times along the whole of the Great Dividing Range, from its southern extremity in Victoria as far north as Toowoomba in Queensland. During the winter, for several months, snow covers the ground to a great extent on the Australian Alps, where also the temperature falls below zero Fahrenheit during the night. In the ravines around Mt. Kosciusko and similar localities the snow never entirely disappears after a severe winter.

12. **Hail.**—Hail falls most frequently along the southern shores of the continent in the winter, and over eastern Australia during the summer months. The size of the hailstones generally increases with distance from the coast. A summer rarely passes without some station experiencing a fall of stones exceeding in size an ordinary hen-egg, and many riddled sheets of light-gauge galvanized iron bear evidence of the weight and penetrating power of the stones.

The hailstones occur most frequently when the barometric readings indicate a flat and unstable condition of pressure. Tornadoes or tornadic tendencies are almost invariably accompanied by hail, and on the east coast the clouds from which the stones fall are frequently of a remarkable sepia-coloured tint.

13. **Barometric Pressures.**—The mean annual barometric pressure (corrected to sea level and standard gravity) in Australia varies from 29.80 inches on the north coast to 29.92 inches over the central and 30.03 inches in the southern parts of the continent. In January, the mean pressure ranges from 29.70 inches in the northern and central areas to 29.95 inches in the southern. The July mean pressure ranges from 29.90 inches at Darwin to 30.12 inches at Alice Springs. Barometer readings corrected to mean sea level and standard gravity have, under anticyclonic conditions in the interior of the continent, ranged as high as 30.78 inches (at Kalgoorlie on 28th July, 1901) and have fallen as low as 27.55 inches. This lowest record was registered at Mackay during a tropical hurricane on 21st January, 1918. An almost equally abnormal reading of 27.88 inches was recorded at Innisfail during a similar storm on 10th March, 1918. The mean barometric pressure for the Australian capitals is shown on graphs (page 35).

14. **Wind.**—(i) *Trade Winds.* The two distinctive wind currents in Australia are, as previously stated, the south-east trade and the prevailing westerly winds. As the belt of the earth's atmosphere in which they blow apparently follows the sun's ecliptic path north and south of the equator, so the area of the continent affected by these winds varies at different seasons of the year. During the summer months the anticyclonic belt travels in very high latitudes, thereby bringing the south-east trade winds as far south as 30° south latitude. The prevailing westerly winds retreat a considerable distance to the south of Australia, and are rarely in evidence in the hot months. When the sun passes to the north of the equator, the south-east trade winds follow it, and only operate to the north of the tropics for the greater part of the winter. The westerly winds come into lower latitudes during the same period of the year. They sweep across the southern areas of the continent from the Leeuwin to Cape Howe, and during some seasons are remarkably persistent and strong, and occasionally penetrate to almost tropical latitudes.

(ii) *North-west Monsoon.* As the belt of south-east trade winds retreats southward during the summer, it is replaced in the north and north-west of Australia first by a sequence of light variable winds and then by the north-west monsoon. In Australia, the north-west monsoon has not the persistence nor regularity of the Indian south-west monsoon but is sufficiently characteristic for the summer in the north of Australia to be called the " North-west Season ". In Central and Eastern Queensland, the north-west

monsoon in the summer has comparatively little effect and the trade winds, albeit weakened, are still dominant winds. With the migration of the sun northward in the autumn, the north-west monsoon is itself replaced first by light variable winds and then by the trade winds.

(iii) *Land and Sea Breezes.* The prevailing winds next in order of importance are the land and sea breezes. On the east coast the sea breezes which come in from the north-east, when in full force, frequently reach the velocity of a gale during the afternoon in the summer months, the maximum hourly velocity, ordinarily attained about 3 p.m., not infrequently attaining a rate of 35 to 40 miles per hour. This wind, although strong, is usually shallow in depth, and does not ordinarily penetrate more than 9 or 12 miles inland.

The land breezes on the east coast blow out from a westerly direction during the night.

On the western shores of the continent the directions are reversed. The sea breezes come in from the south-west, and the land breezes blow out from the north-east.

(iv) *Inland Winds.* Inland, the direction of the prevailing winds is largely regulated by the seasonal changes of pressure, so disposed as to cause the winds to radiate spirally outward from the centre of the continent during the winter months, and to circulate spirally from the seaboard to the centre of Australia during the summer months.

(v) *Prevailing Direction at the Capital Cities.* In Canberra at 9 a.m. the air is usually calm, particularly during the winter months, but such winds as do occur are predominantly north-westerly, though a proportion of south-easterly winds occur during the autumn. At 3 p.m. the predominant wind is north-westerly.

In Perth at 9 a.m. east to south-east winds prevail from September to March, while from April to August north-north-east to east winds predominate. At 3 p.m. the prevailing wind is south-west from October to May inclusive and westerly at other times.

In Adelaide at 9 a.m., the predominant wind is north-easterly from May to August, but during the rest of the year no particular direction is outstanding. At 3 p.m. the predominant wind is south-westerly for all months except May, June and July. Throughout the year winds with an easterly component are rare in the afternoon.

In Brisbane at 9 a.m. the most frequent winds during the colder two-thirds of the year come from the south or south-west, while in the warmer months south to south-east winds are more usual. At 3 p.m. winds with an easterly component predominate, especially north-easterlies during the warmer half of the year.

In Sydney at 9 a.m., by far the most prevailing wind is a westerly, particularly during the colder two-thirds of the year. At 3 p.m. during the warmer two-thirds of the year, winds with an easterly component are most frequent with a smaller proportion of southerlies and westerlies during the winter months.

In Melbourne at 9 a.m., northerlies are the most frequent winds during the period February to October with a moderate proportion of westerlies in the spring. During the summer months, winds with a southerly component are in evidence to a slightly greater degree than any others. At 3 p.m. southerly winds prevail during the warmer two-thirds of the year with the frequency of northerlies increasing during the colder months.

In Hobart at 9 a.m. the most favoured directions are from the north-west and north with a good proportion of south-easterlies showing up at 3 p.m. during the warmer months.

15. **Cyclones and Storms.**—The "elements" in Australia are ordinarily peaceful, and while destructive cyclones have visited various parts, more especially coastal areas, such visitations are rare, and may be properly described as erratic.

During the winter months, the southern shores of the continent are subject to cyclonic storms, evolved from the V-shaped depressions of the southern low-pressure belt. They are felt most severely over the south-western parts of Western Australia, to the south-east of South Australia, in Bass Strait, including the coast-line of Victoria, and on the west coast of Tasmania. Apparently the more violent wind pressures from these cyclones are experienced in their northern half, or in that part of them which has a north-westerly to a south-westerly circulation.

The north-east coast of Queensland is occasionally visited by hurricanes from the north-east tropics. During the first four months of the year, these hurricanes appear to have their origin in the neighbourhood of the South Pacific Islands, their path being a parabolic curve first to the south-west and finally towards the south-east. Only a small percentage, however, reach Australia, the majority recurving in their path to the east of New Caledonia.

Very severe cyclones, locally known as "willy willies," are peculiar to the north-west coast of Western Australia from the months of November to April, inclusive. They usually originate over the ocean to the north or north-west of Australia, and travel in a south-westerly direction with continually increasing force, displaying their greatest energy near Cossack and Onslow, between latitudes 20° and 22° South. The winds in these storms, like those from the north-east tropics, are very violent and destructive, and cause great havoc amongst the pearl-fishers. The greatest velocities are usually to be found in the south-eastern quadrant of the cyclones, with north-east to east winds. After leaving the north-west coast, these storms either travel southwards, following the coast-line, or cross the continent to the Great Australian Bight. When they take the latter course, their track is marked by torrential rains, as much as 29.41 inches, for example, being recorded in 24 hours at Whim Creek from one such occurrence. Falls of 10 inches and over have frequently been recorded in the northern interior of Western Australia from similar storms.

Some further notes on severe cyclones and on "southerly bursters", a characteristic feature of the eastern part of Australia, appear in previous issues of the Official Year Book (see No. 6, pp. 84–86), and a special article dealing with "Australian Hurricanes and Related Storms" appears in Official Year Book No. 16, pp. 80–84.

16. **Influences affecting Australian Climate.**—(i) *General.* Australian history does not cover a sufficient period, nor is the country sufficiently occupied, to ascertain whether or not the advance of settlement has materially affected the climate as a whole. Local changes have, however, taken place, a fact which suggests that settlement and the treatment of the land have a distinct effect on local conditions. For example, low-lying lands on the north coast of New South Wales, which originally were seldom subject to frosts, have, with the denudation of the surrounding hills from forests, experienced annual visitations, the probable explanation being that through the absence of trees the cold air of the highlands now flows unchecked and untempered down the sides of the hills to the valleys and lower lands.

(ii) *Influence of Forest on Climate.* As already indicated, forests doubtless exercise a great influence on local climate, and hence, to the extent that forestal undertakings will allow, the weather can be controlled by human agency. The direct action of forests is an equalizing one; thus, especially in equatorial regions, and during the warmest portion of the year, they considerably reduce the mean temperature of the air. They also reduce the diurnal extremes of shade temperatures by altering the extent of radiating surface by evaporation, and by checking the movement of air, and while decreasing evaporation from the ground, they increase the relative humidity. Vegetation greatly diminishes the rate of flow-off of rain and the washing away of surface soil, and when a region is protected by trees, a steadier water supply is ensured, and the rainfall is better conserved. In regions of snowfall, the supply of water to rivers is similarly regulated, and without this and the sheltering influence of ravines and "gullies," watercourses supplied mainly by melting snow would be subject to alternative periods of flooding and dryness. This is borne out in the case of the inland rivers, the River Murray, for example, which has never been known to become dry, deriving its steadiness of flow mainly through the causes indicated.

(iii) *Direct Influence of Forests on Rainfall.* Whether forests have a direct influence on rainfall is a debatable question, some authorities alleging that precipitation is undoubtedly induced by forests, while others take the opposite view.

Sufficient evidence exists, however, to prove that, even if the rainfall has not increased, the beneficial climatic effect of forest lands more than warrants their protection and extension. Rapid rate of evaporation, induced by both hot and cold winds, injures crops and makes life uncomfortable on the plains, and, while it may be doubted that the forest aids in increasing precipitation, it must be admitted that it does check winds and the rapid evaporation due to them. Trees as wind-breaks have been successfully planted in central parts of the United States of America, and there is no reason why similar experiments should not be successful in many parts of the treeless interior of Australia. The belts should be planted at right angles to the direction of the prevailing parching winds, and if not more than half a mile apart will afford shelter to the enclosed areas.

17. **Rainfall and Temperatures, Various Cities.**—The Official Year Book No. 34, p. 28, shows rainfall and temperature for various important cities throughout the world, and for the Australian capitals.

18. **Climatological Tables.**—The averages and extremes for a number of climatological elements have been determined from long series of observations at the Australian capitals up to and including the year 1946. These are given in the following tables :—

CLIMATOLOGICAL DATA : CANBERRA, AUSTRALIAN CAPITAL TERRITORY.

LAT. 35° 18′ S., LONG. 149° 06′ 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.) Average Miles per Hour.	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	Prevailing Direction. 3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m. and 3 p.m.(a)	No. of Clear Days.
No. of years observations.	17	19	19	(b)	20	20	19	11	17	18
January ..	29.827	5.2	14.9 23/33	—	NW	NW	9.015	1.0	4.7	7.3
February ..	29.901	4.7	15.3 24/33	—	E	NW	7.034	2.7	4.7	6.5
March ..	30.008	4.2	18.2 28/42	—	E	NW	5.622	0.0	5.0	6.8
April	30.066	4.0	18.6 8/45	—	NW	NW	3.440	0.5	5.4	4.4
May	30.164	3.1	12.6 3/30	—	NW	NW	2.072	0.1	5.3	5.7
June	30.135	3.9	16.1 2/30	—	NW	NW	1.336	0.0	5.9	4.3
July	30.119	3.7	23.4 7/31	—	NW	NW	1.343	0.0	5.7	4.9
August ..	30.065	4.5	15.7 25/36	—	NW	NW	1.898	0.1	5.5	5.0
September ..	30.040	4.9	17.4 28/34	—	NW	NW	3.106	0.4	5.1	5.9
October ..	29.976	4.6	12.4 27/40	—	NW	NW	4.797	0.6	5.2	5.4
November ..	29.902	5.0	17.2 28/42	—	NW	NW	6.221	1.2	5.5	4.2
December ..	29.835	5.1	16.1 11/38	—	NW	NW	7.977	1.1	5.1	5.5
Year Totals ..	—	—	—	—	—	—	53.861	7.7	—	65.9
Year Averages	30.003	4.4	—	—	NW	NW	—	—	5.3	—
Year Extremes	—	—	23.4 7/7/31	—	—	—	—	—	—	—

(a) Scale 0–10. (b) No record.

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. (a)
No. of years over which observation extends.	20	20	20	20	20	20	(b)	18	19
January	83.2	56.4	69.8	107.4 11/39	39.5 8/38	67.9	—	32.4 (c)	8.1
February ..	81.4	56.0	68.7	99.8 13/33	35.0 (d)	64.8	—	26.5 23/43	7.6
March	76.3	52.4	64.3	99.1 6/38	36.5 21/32	62.6	—	26.4 26/35	7.3
April	66.5	45.2	55.9	89.7 6/38	29.0 29/34	60.7	—	19.0 18/44	6.6
May	59.8	38.6	49.2	72.6 1/36	22.5 9/29	50.1	—	15.6 (g)	5.2
June	52.5	35.1	43.8	61.0 (e)	18.1 20/35	42.9	—	8.9 25/44	4.3
July	51.7	33.7	42.7	63.5 16/34	20.0 (f)	43.5	—	10.8 9/37	4.8
August	55.1	35.6	45.3	70.5 28/34	21.0 3/29	49.5	—	10.1 6/44	5.8
September ..	61.1	38.9	50.0	81.5 16/34	25.2 6/45	56.3	—	13.0 6/45	7.2
October	67.7	44.0	55.9	90.0 13/46	29.0 24/28	61.0	—	18.2 2/45	7.8
November	73.8	49.4	61.6	101.4 19/44	32.2 11/36	69.2	—	25.9 6/40	7.9
December	79.6	53.7	66.6	103.5 27/38	36.0 24/28	67.5	—	30.2 2/39	8.1
Year Averages ..	67.4	44.9	56.1	—	—	—	—	—	6.7
Year Extremes ..	—	—	—	107.4 11/1/39	18.1 20/6/35	89.3	—	8.9 25/6/44	—

(a) Mean monthly totals previously published. (b) No record. (c) 8/38 and 18/43. (d) 22/31 and 23/31. (e) 3/27, 28/30 and 30/30. (f) 19/29, 9/37 and 27/43. (g) 13/37 and 15/46.

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.	19	19	19	19	20	20	20	20	20	16
January	0.373	52	69	39	2.03	7	6.69 1941	0.02 1932	2.03 20/37	0.0
February	0.384	57	71	40	1.92	6	4.93 1928	0.01 1933	3.24 17/28	0.0
March	0.375	64	76	48	1.83	6	5.22 1932	0.01 1940	1.82 15/32	0.3
April	0.317	71	81	54	2.16	8	3.75 1935	0.07 1942	2.52 9/45	0.7
May	0.253	79	87	67	1.48	7	5.53 1931	0.06 1935	2.20 26/42	4.0
June	0.211	82	90	72	1.64	9	6.09 1931	0.18 1944	1.65 24/31	5.4
July	0.200	81	87	73	1.59	10	4.09 1933	0.27 1940	2.02 13/33	4.5
August	0.212	75	88	60	2.03	11	4.71 1939	0.36 1944	2.07 12/29	1.6
September	0.235	65	72	51	1.49	9	3.03 1937	0.13 1946	1.75 3/47	0.5
October	0.271	59	72	46	2.25	9	6.59 1934	0.34 1940	2.51 25/34	0.2
November	0.305	54	67	38	2.03	8	4.32 1946	0.28 1936	1.78 7/27	0.1
December	0.341	51	67	37	2.00	8	4.05(b)1936	0.16 1938	2.29 28/29	0.0
Year Totals ..	—	—	—	—	22.45	98	—	—	—	17.3
Year Averages ..	0.277	66	80	37	—	—	—	—	—	—
Year Extremes ..	—	—	—	—	—	—	6.69(b)1/1941	0.01 (a)	3.24 17/2/28	—

(a) 2/1933 and 3/1940. (b) 8.80 in December, 1947.

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.) Average Miles per Hour.	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	Prevailing Direction. 3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m., 3 p.m., 9 p.m.(a)	No. of Clear Days.
No. of years observations.	62	48	48	5 (b)	5 (b)	5 (b)	49	50	39	50
January ..	29.904	10.9	33.2 27/98	48	ESE	SW	10.32	1.9	2.9	14.3
February ..	29.923	10.4	27.1 6/08	46	ESE	SW	8.65	1.5	3.0	12.8
March ..	29.981	9.7	27.1 6/13	64	ESE	SW	7.50	1.7	3.6	12.1
April	30.068	8.3	39.8 25/00	49	ENE	SW	4.71	1.5	4.3	8.3
May	30.067	7.9	34.4 29/32	59	NE	SW	2.74	2.5	5.5	5.6
June	30.058	8.1	38.1 17/27	78	NNE	WNW	1.76	2.5	5.9	4.0
July	30.089	8.4	42.3 20/26	70	NNE	W	1.72	2.1	5.7	5.0
August ..	30.083	8.7	40.3 15/03	77	NE	W	2.35	1.7	5.6	5.6
September ..	30.065	9.0	36.0 11/05	73	E	WSW	3.41	1.0	4.8	6.6
October ..	30.035	9.5	33.7 6/16	52	SE	SW	5.38	1.0	4.7	7.0
November ..	29.990	10.1	32.4 18/97	59	SE	SW	7.64	1.4	3.9	8.8
December ..	29.925	10.5	32.3 6/22	64	SE	SW	9.69	1.8	3.3	12.7
Year { Totals ..	—	—	—	—	—	—	65.87	20.6	—	102.8
Year { Averages	30.016	9.3	—	—	E	SW	—	—	4.4	—
Year { Extremes	—	—	42.3 20/7/26	78	—	—	—	—	—	—

(a) Scale 0–10. (b) Reliable records since installation of Dines anemometer.

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.(a)
No. of years over which observation extends.	50	50	50	50	50	50	47	48	49
January	84.5	63.1	73.8	110.2 12/34	48.6 20/25	61.6	177.3 22/14	40.4 1/21	10.5
February	85.1	63.4	74.3	112.2 8/33	47.7 1/02	64 5	173.7 4/34	39.8 1/13	9.8
March	81.4	61.2	71.3	106.4 14/22	45.8 8/03	60.6	167.0 19/18	36.7 8/03	8.7
April	76.2	57 3	66.7	99.7 9/10	39.3 20/14	60.4	157.0 8/16	31.0 21/14	7.3
May	68.8	52.9	60.8	90.4 2/07	34.3 11/14	56.1	146.0 4/25	25.3 11/14	5.7
June	64.2	49.5	56.8	81.7 2/14	35.0 30/20	46.7	135.5 9/14	26.3 11/37	4.8
July	62.8	47 8	55.3	76.4 21/21	34.2 7/16	42.2	133.2 13/15	25.1 30/20	5.3
August ..	63 9	48.4	56.1	82.0 21/40	35.4 31/08	46.6	145.1 29/21	26.7 24/35	5.9
September	66.5	50.5	58.5	90.9 30/18	38.8 18/00	52.1	153.6 29/16	29.2 21/16	7.0
October	69.4	52.5	60.9	95.3 30/22	40.0 16/31	55.3	157.5 31/36	29.8 16/31	8.0
November	76.2	57.0	66.6	104.6 24/13	42.0 1/04	62.6	167.0 30/25	35.4 6/10	9.7
December	81.7	60.8	71.3	107.9 20/04	48.0 2/10	59.9	168.8 11/27	39.0 (b)	10.5
Year { Averages ..	73.4	55.4	64.4	—	—	—	—	—	7.8
Year { Extremes ..	—	—	—	112.2 8/2/33	34.2 7/7/16	78.0	177.3 22/1/14	25.1 30/7/20	—

(a) Mean monthly totals previously published. (b) 2/10 and 12/20.

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.	49	49	49	49	71	70	71	71	71	50
January	0.432	51	61	41	0.33	3	2.71 1879	0.00 (a)	1.74 27/79	0.2
February	0.438	53	65	46	0.38	3	2.98 1915	0.00 (a)	1.63 26/15	0.3
March	0.430	58	66	46	0.83	5	5.71 1934	0.00 (a)	3.03 9/34	0.5
April	0.394	61	73	51	1.74	7	5.85 1926	0.00 1920	2.62 30/04	0.9
May	0.368	72	81	61	5.04	14	12.13 1879	0.98 1903	3.00 17/42	1.4
June	0.338	76	83	68	7.22	17	18.75 1945	2.16 1877	3.90 6/20	1.6
July	0.319	76	84	69	6.78	18	12.28 1926	2.42 1876	3.00 4/91	1.7
August	0.319	73	81	62	5.70	18	12.58 1945	0.46 1902	2.91 14/45	1.0
September	0.338	67	75	58	3.37	15	7.84 1923	0.34 1916	1.82 4/31	0.2
October	0.346	60	63	52	2.10	12	7.87 1890	0.15 1946	1.73 3/33	0.2
November	0.374	54	63	45	0.80	6	2.78 1916	0.00 1891	1.37 2/38	0.2
December	0.415	50	63	44	0.57	4	3.05 1888	0.00 (b)	1.72 1/88	0.2
Year { Totals ..	—	—	—	—	34.95	122	—	—	—	8.4
Year { Averages ..	0.376	63	—	—	—	—	—	—	—	—
Year { Extremes ..	—	—	84	41	—	—	18.75 6/1945	0.00 (c)	3.90 6/6/20	—

(a) Various years. (b) 1886 and 1924. (c) Various months in various years.

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. Min. Sea Level and Standard Gravity from 9 a.m. and 3 p.m. readings.	Wind. (Height of Anemometer 75 feet.) Average Miles per Hour:	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	Prevailing Direction. 3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m., 3 p.m., 9 p.m.(a)	No. of Clear Days.
No. of years observations.	90	69	69	30	69	69	77	75	79	65
January ..	29.915	10.5	31.6 19/99	72	SW	SW	9.171	2.2	3.6	8.6
February ..	29.953	10.0	28.8 22/96	62	NE	SW	7.468	1.9	3.6	7.8
March ..	30.039	8.8	26.2 9/12	63	S	SW	6.119	2.0	4.0	7.6
April ..	30.120	8.4	32.2 10/96	57	NE	SW	3.612	1.5	5.1	4.6
May	30.126	8.3	31.7 9/80	63	NE	NW	2.139	1.7	5.8	2.5
June	30.107	8.8	31.3 12/78	67	NE	N	1.316	1.7	6.2	1.8
July	30.123	9.0	28.1 25/82	55	NE	NW	1.337	1.7	5.9	1.9
August ..	30.094	9.6	32.2 31/97	57	NE	SW	1.944	2.0	5.7	2.7
September ..	30.044	10.0	30.0 2/87	69	NNE	SW	2.960	2.2	5.3	3.5
October ..	30.003	10.4	32.0 28/98	59	NNE	SW	4.884	3.1	5.1	3.9
November ..	29.979	10.4	28.2 2/04	63	SW	SW	6.726	3.1	4.7	5.4
December ..	29.920	10.5	28.1 12/91	75	SW	SW	8.593	2.5	4.0	6.9
Year Totals ..	—	—	—	—	—	—	56.269	25.6	—	57.2
Year Averages	30.035	9.5	—	—	NE	SW	—	—	4.9	—
Year Extremes	—	—	32.2 (b)	75	—	—	—	—	—	—

(a) Scale 0–10. (b) 10/4/96 and 31/8/97.

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.(a)
No. of years over which observation extends.	90	90	90	90	90	90	55	86	65
January	85.9	61.3	73 6	117.7 12/39	45.1 21/84	72.6	180.0 18/82	36.5 14/79	9.9
February	85.7	61.7	73.7	113.6 12/99	45.5 23/18	68.1	170.5 10/00	35.8 23/26	9.2
March	81.0	58.9	69.9	110.5 9/34	43.9 21/33	66.6	174.0 17/83	32.1 21/33	7.8
April	73.2	54.4	63.8	98.6 5/38	39.6 15/59	59.0	155.0 1/83	30.2 16/17	6.0
May	65.8	50.2	58.0	89.5 4/21	36.9 (b)	52.6	148.2 12/79	25.6 19/28	4.8
June	60.5	46.6	53.5	76.0 23/65	32.5 (c)	43.5	138.8 18/79	21.0 24/44	4.1
July	59.1	44.7	51.9	74.0 11/06	32.0 24/08	42.0	134.5 26/90	22.1 30/29	4.4
August	62.0	45.9	53.9	85.0 31/11	32.3 17/59	52 7	140.0 31/92	22.8 11/29	5.3
September	66.4	47.9	57.2	91.3 29/44	32.7 4/58	58.6	160.5 23/82	25.0 25/27	6.2
October	72.4	51.3	61.9	102.9 21/22	36.0 —/57	66.9	162.0 30/21	27.8 (e)	7.3
November	78.5	55.3	66.9	113.5 21/65	40.8 2/09	72.7	166.9 20/78	31.5 2/09	8.6
December	83.2	58.8	71.0	114.6 29/31	43.0 (d)	71.6	175.7 7/99	32.5 4/84	9.6
Year Averages ..	72.8	53.1	62.9	—	—	—	—	—	6.9
Year Extremes ..	—	—	—	117.7 12/1/39	32.0 24/7/08	85.7	180.0 18/1/82	21.0 24/6/44	—

(a) Mean monthly totals previously published. (b) 26/1895 and 24/1904. (c) 27/1876 and 24/1944
(d) 16/1861 and 4/1906. (e) 2/1918 and 4/1931.

HUMIDITY, RAINFALL AND FOG.

Month.	Vapour Pressure (inches) Mean 9 a.m.	Rel. Hum. (%) 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.	79	79	79	79	108	108	108	108	108	47
January	0.340	39	59	29	0.79	4	4.00 1850	0.00 (a)	2.30 2/89	0.0
February	0.356	41	56	30	0.78	4	6.09 1925	0.00 (a)	5.57 7/25	0.0
March	0.343	46	58	29	1.00	5	4.60 1870	0.00 (a)	3.50 5/78	0.0
April	0.333	56	72	37	1.75	9	6.78 1853	0.00 1945	3.15 5/60	0.0
May	0.317	67	76	49	2.68	13	7.75 1875	0.10 1934	2.75 1/53	0.5
June	0.297	76	84	67	2.99	15	8.58 1916	0.42 1886	2.11 1/20	1.1
July	0.277	76	87	66	2.62	16	5.38 1865	0.37 1899	1.75 10/65	1.4
August	0.284	69	78	54	2.51	16	6.24 1852	0.33 1944	2.23 19/51	0.5
September	0.293	60	72	44	2.07	13	5.83 1923	0.45 1896	1.59 20/23	0.1
October	0.298	51	67	29	1.69	11	3.83 1870	0.17 1914	2.24 16/08	0.0
November	0.309	43	57	31	1.17	8	4.10 1934	0.04 1885	2.08 7/34	0.0
December	0.323	39	50	31	1.04	6	3.98 1861	0.00 1904	2.42 23/13	0.0
Year Totals ..	—	—	—	—	21.09	120	—	—	—	3.6
Year Averages ..	0.309	53	—	—	—	—	—	—	—	—
Year Extremes ..	—	—	87	29	—	—	8.58 6/1916	0.00 (b)	5.57 7/2/25	—

(a) Various years. (b) Various months in various years.

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.	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	Prevailing Direction. 3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m., 3 p.m., 9 p.m.(a)	No. of Clear Days.
No. of years observations.	60	32	32	32	60	60	38	60	55	38
January ..	29.869	7.2	19.7 23/47	51	SE	NE	6.674	7.2	5.7	3.3
February ..	29.903	7.2	21.0 5/31	67	SE	NE & E	5.414	5.6	5.8	2.4
March ..	29.965	6.9	20.3 1/29	50	S	E	5.128	4.4	5.3	5.1
April ..	30.039	6.2	16.7 3/25	57	S	E	4.115	3.7	4.5	7.8
May	30.084	6.0	17.9 17/26	48	S	SE	3.179	3.2	4.3	8.7
June	30.076	5.9	19.0 14/28	58	SW	W	2.515	2.3	4.2	9.5
July	30.078	5.8	15.0 2/23	52	SW	W	2.760	2.4	3.7	12.6
August ..	30.093	6.0	14.8 4/35	53	SW	NE	3.842	3.6	3.3	13.4
September ..	30.050	6.3	14.4 17/44	57	S	NE	4.464	5.3	3.4	12.7
October ..	30.008	6.6	15.7 1/41	62	S	NE	5.758	6.7	4.1	8.3
November ..	29.958	7.0	15.5 10/28	59	N & SE	NE	6.334	8.5	4.9	5.8
December ..	29.888	7.3	19.5 15/26	79	SE	NE	7.044	9.3	5.3	3.7
Year { Totals ..	—	—	—	—	—	—	57.227	62.2	—	93.3
Year { Averages	30.001	6.5	—	—	S	NE	—	—	4.5	—
Year { Extremes	—	—	21.0 5/2/31	79	—	—	—	—	—	—

(a) Scale 0–10.

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.(a)
No. of years over which observation extends.	60	60	60	60	60	60	60	60	38
January	85.4	69.1	77.3	109.8 26/40	58.8 4/93	51.0	160.0 2/37	49.9 4/93	7.6
February	84.4	68.6	76.6	105.7 21/25	58.5 23/31	47.2	165.2 6/10	49.1 22/31	7.3
March	82.2	66.4	74.3	99.4 5/19	52.4 29/13	47.0	162.5 6/39	45.4 29/13	7.0
April	78.8	61.4	70.1	95.2 (b)	44.4 25/25	50.8	153.8 11/16	36.7 24/25	7.2
May	73.6	55.5	64.6	90.3 21/23	41.3 24/99	49.0	147.0 1/10	29.8 8/97	6.7
June	69.3	51.1	60.3	88.9 10/18	36.3 29/08	52.6	136.0 3/18	25.4 23/88	6.3
July	68.5	48.8	58.7	84.3 23/46	36.1 (c)	48.2	146.1 20/15	23.9 11/90	6.9
August	71.3	50.0	60.7	91.0 14/46	37.4 6/87	53.6	141.9 20/17	27.1 9/99	7.8
September	75.5	54.8	65.1	100.9 22/43	40.7 1/96	60.2	155.5 26/03	30.4 1/89	8.3
October	79.1	60.1	69.7	101.4 18/93	43.3 3/99	58.1	157.4 31/18	34.9 8/89	8.4
November	82.3	64.3	73.4	106.1 18/13	48.5 2/05	57.6	162.3 7/89	38.8 1/05	8.2
December	84.7	67.5	76.1	105.9 26/93	56.4 13/12	49.5	164.0 5/46	49.1 3/94	8.2
Year { Averages ..	77.9	59.8	68.9	—	—	—	—	—	7.5
Year { Extremes ..	—	—	—	109.8 26/1/40	36.1 (d)	73.7	169.0 2/1/37	23.9 11/7/90	—

(a) Mean monthly totals previously published. (b) 9/1896 and 5/1903. (c) 12/1894 and 2/1896. (d) 12/7/94 and 2/7/96.

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.	60	60	60	60	95	87	94	94	94	60
January	0.642	66	79	53	6.28	13	27.72 1895	0.32 1919	18.31 21/87	0.5
February	0.648	69	82	55	6.24	13	40.39 1893	0.58 1849	10.61 6/31	0.7
March	0.614	72	85	56	5.65	15	34.04 1870	0.00 1849	11.18 14/08	1.3
April	0.517	71	80	56	3.66	12	15.28 1867	0.04 1944	5.46 5/33	2.6
May	0.424	73	85	61	2.74	10	13.85 1876	0.00 1846	5.62 9/79	3.7
June	0.356	73	84	54	2.59	8	14.03 1873	0.00 1847	6.01 9/93	3.7
July	0.327	71	81	53	2.16	8	8.46 1889	0.00 1841	3.54 (c)	3.7
August	0.345	68	80	55	1.88	7	14.67 1879	0.00 (a)	4.89 12/87	4.3
September	0.405	63	76	47	1.98	8	5.43 1886	0.10 1907	2.46 2/94	2.6
October	0.471	60	72	48	2.59	9	9.99 1882	0.14 1900	3.75 3/27	1.3
November	0.536	60	72	45	3.75	10	12.40 1917	0.00 1842	4.46 16/86	0.5
December	0.594	62	70	51	5.06	12	17.36 1942	0.35 1865	6.60 28/71	0.3
Year { Totals ..	—	—	—	—	44.58	125	—	—	—	25.2
Year { Averages ..	0.489	67	—	—	—	—	—	—	—	—
Year { Extremes ..	—	—	85	45	—	—	40.39 2/1893	0.00 (b)	18.31 21/1/87	—

(a) 1862, 1869, 1880. (b) Various months in various years. (c) 15/1876 and 16/1889.

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 56 feet.) Average Miles per Hour.	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	Prevailing Direction. 3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m., 3 p.m., 9 p.m.(a)	No. of Clear Days.
No. of years observations.	37	80	80	27	80	80	66	87	85	36
January ..	29.879	9.1	26.1 3/93	63	NE	NE	5.330	4.9	5.8	4.8
February ..	29.943	8.8	29.0 12/69	61	NE	NE	4.265	4.0	5.8	5.2
March ..	30.009	7.7	31.4 20/70	58	W	ENE	3.671	3.9	5.5	5.8
April	30.067	7.3	26.7 6/82	72	W	ENE	2.661	3.6	5.1	7.0
May	30.092	7.1	28.4 6/98	63	W	SE	1.847	2.9	4.9	7.3
June	30.080	8.0	26.7 13/08	67	W	W	1.472	2.0	4.9	8.1
July	30.066	8.0	31.0 17/79	68	W	W	1.558	2.0	4.4	10.0
August ..	30.062	7.8	27.0 22/72	68	W	W	1.998	3.0	4.0	10.7
September ..	30.020	8.4	32.1 6/74	70	W	NE	2.747	3.7	4.3	9.4
October ..	29.979	8.8	30.9 4/72	95	W	NE	3.885	4.7	5.1	6.9
November ..	29.933	8.9	24.3 12/87	71	NE	NE	4.632	5.3	5.6	5.3
December ..	29.877	9.1	31.3 3/84	75	ENE	ENE	5.695	5.6	5.7	4.9
Year Totals ..	—	—	—	—	—	—	39.761	45.6	—	85.4
Year Averages	30.001	8.3	—	—	W	NE	—	—	5.1	—
Year Extremes	—	—	32.1 6/9/74	95	—	—	—	—	—	—

(a) Scale 0–10.

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.(a)
No. of years over which observation extends.	88	88	88	88	88	88	83	88	26
January	78.4	65.0	71.7	113.6 14/39	51.2 14/65	62.4	164.3 26/15	43.7 6/25	7.4
February	77.8	65.0	71.4	107.8 8/26	49.3 28/63	58.5	168.3 14/39	42.8 22/33	7.2
March	75.8	63.0	69.4	102.6 3/69	48.8 14/86	53.8	158.3 10/26	39.9 17/13	6.5
April	71.4	57.9	64.7	91.4 1/36	44.6 27/64	46.8	144.1 10/77	33.3 24/09	6.1
May	65.8	52.1	58.9	86.0 1/19	40.2 22/59	45.8	129.7 1/96	29.3 25/17	5.7
June	61.3	48.2	54.7	80.4 11/31	35.7 22/32	44.7	125.5 2/23	28.0 22/32	5.5
July	60.0	46.0	53.0	78.3 22/26	35.9 12/90	42.4	124.7 19/77	24.0 4/03	6.2
August	63.1	47.6	55.3	82.8 12/46	36.8 3/72	46.0	149.0 30/78	26.1 4/09	7.0
September	67.2	51.3	59.3	92.3 27/19	40.4 19/59	51.9	142.2 12/78	30.1 17/05	7.4
October	71.2	55.8	63.5	99.4 4/42	42.2 6/27	57.2	152.2 20/33	32.7 9/05	7.4
November	74.4	59.6	67.0	104.5 6/46	43.2 7/39	61.3	158.5 28/99	36.0 6/06	7.6
December	77.1	62.9	70.0	107.5 31/04	48.4 3/24	59.1	164.5 27/89	41.4 3/24	7.5
Year Averages ..	70.3	56.2	63.2	—	—	—	—	—	6.8
Year Extremes ..	—	—	—	113.6 14/1/39	35.7 22/6/32	77.9	168.3 14/2/39	24.0 4/7/93	—

(a) Mean monthly totals previously published.

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.	71	71	71	71	88	88	88	88	88	27
January	0.541	67	78	58	3.49	13	15.26 1911	0.25 1932	7.08 13/11	0.4
February	0.560	70	81	60	3.99	13	18.56 1873	0.12 1939	8.90 25/73	0.8
March	0.532	72	85	62	4.90	14	20.52 1942	0.42 1876	11.05 28/42	2.0
April	0.442	76	87	63	5.42	13	24.49 1861	0.06 1868	7.52 29/60	3.0
May	0.359	77	90	63	5.02	14	23.03 1919	0.18 1860	8.36 28/89	4.0
June	0.301	77	89	65	4.68	12	16.30 1885	0.19 1904	5.17 16/84	3.7
July	0.276	75	88	63	4.53	12	13.21 1900	0.10 1946	7.80 7/31	3.0
August	0.288	70	84	54	2.94	11	14.89 1899	0.04 1885	5.33 2/68	2.4
September	0.330	65	79	49	2.82	11	14.05 1879	0.08 1885	5.69 10/79	0.9
October	0.383	62	77	42	2.81	12	11.14 1916	0.21 1867	6.37 13/02	0.7
November	0.444	63	79	44	2.85	12	9.88 1865	0.07 1915	4.23 19/00	0.6
December	0.503	65	77	51	2.90	13	15.82 1920	0.23 1913	4.75 13/10	0.4
Year Totals ..	—	—	—	—	46.35	150	—	—	—	21.9
Year Averages ..	0.400	70	—	—	—	—	—	—	—	—
Year Extremes ..	—	—	90	42	—	—	24.49 4/1861	0.04 8/1885	11.05 28/3/42	—

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.) Average Miles per Hour. (a)	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	Prevailing Direction. 3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m., 3 p.m., 9 p.m.(b)	No. of Clear Days.
No. of years observations.	89	7	34	23	28	28	74	39	89	39
January ..	29.905	8.7	21.1 27/41	66	S & SW	S	6.433	1.7	5.1	6.4
February ..	29.956	8.4	17.6 26/44	66	N & S	S	5.047	2.3	5.0	6.4
March ..	30.031	8.0	16.5 (c)	66	N	S	4.052	1.6	5.4	5.3
April	30.099	7.3	19.9 16/43	67	N	S	2.426	1.2	5.9	4.3
May	30.107	7.5	20.0 4/44	72	N	N	1.512	0.5	6.4	3.1
June	30.085	7.6	18.2 3/43	60	N	N	1.138	0.3	6.7	2.5
July	30.086	8.8	27.6 28/43	68	N	N	1.116	0.3	6.4	2.7
August ..	30.059	8.2	21.3 20/42	64	N	N	1.509	0.8	6.3	2.8
September ..	30.001	8.5	17.8 5/42	68	N & W	N & S	2.340	1.1	6.1	3.2
October ..	29.971	8.0	16.3 7/12	69	N	S	3.373	1.6	6.0	3.7
November ..	29.950	8.3	16.9 22/42	65	S & SW	S	4.540	2.3	6.0	3.6
December ..	29.895	8.6	18.9 1/34	61	S & SW	S	5.786	1.9	5.5	4.3
Year Totals ..	—	—	—	—	—	—	39.272	15.6	—	48.3
Year Averages	30.012	8.2	—	—	N	S	—	—	5.9	—
Year Extremes	—	—	27.6 28/7/43	72	—	—	—	—	—	—

(a) Figures previously published taken from Anemometer 60 feet above surface (b) Scale 0–10. (c) 22/31 and 3/41.

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.(a)
No. of years over which observation extends.	91	91	91	91	91	91	86	87	31
January	78.1	56.7	67.4	114.1 13/39	42.0 28/85	72.1	178.5 14/62	30.2 28/85	7.6
February	78.0	57.1	67.6	109.5 7/01	40.2 24/24	69.3	167.5 15/70	30.9 6/91	7.4
March	74.6	54.7	64.6	107.0 11/40	37.1 17/84	69.9	164.5 1/68	28.9 (b)	6.6
April	68.1	50.6	59.3	94.8 5/38	34.8 24/88	60.0	152.0 8/61	25.0 23/97	4.9
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	4.0
June	56.8	43.8	50.3	72.2 1/07	28.0 11/66	44.2	129.0 11/61	19.9 30/29	3.4
July	55.7	41.9	48.8	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 ..	62.8	45.6	54.2	88.6 28/28	31.0 3/40	57.6	142.1 20/67	22.8 8/18	5.4
October	67.2	48.2	57.7	98.4 24/14	32.1 3/71	66.3	154.3 28/68	24.8 22/18	5.8
November ..	71.5	51.3	61.4	105.7 27/94	36.5 2/96	69.2	159.6 29/65	24.6 2/96	6.3
December ..	75.4	54.4	64.9	110.7 15/76	40.0 4/70	70.7	170.3 20/69	33.2 1/04	7.1
Year Averages ..	67.4	49.5	58.5	—	—	—	—	—	5.6
Year Extremes ..	—	—	—	114.1 13/1/39	27.0 21/7/60	87.1	178.5 14/1/62	19.9 30/6/29	—

(a) Mean monthly totals previously published. (b) 17/84 and 20/97.

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.	39	39	39	39	91	91	91	91	91	89
January	0.381	58	65	50	1.94	8	6.66 1941	0.01 1932	2.97 9/97	0.1
February	0.407	62	69	48	1.84	7	7.72 1939	0.03 1870	3.44 26/46	0.3
March	0.382	64	73	50	2.13	9	7.50 1911	0.14 1934	3.55 5/19	0.8
April	0.345	72	82	66	2.32	11	6.71 1901	0.00 1923	2.28 22/01	1.8
May	0.307	78	86	70	2.09	13	5.60 1942	0.14 1934	1.85 7/91	4.1
June	0.275	83	92	75	2.09	15	4.51 1859	0.73 1877	1.74 21/04	4.8
July	0.260	82	86	75	1.86	15	7.02 1891	0.57 1902	2.71 12/91	4.7
August	0.268	76	82	70	1.87	15	4.35 1939	0.48 1903	1.94 26/24	2.6
September ..	0.284	68	76	60	2.28	14	7.93 1916	0.52 1907	2.62 12/80	0.9
October	0.303	61	67	52	2.58	13	7.61 1869	0.29 1914	3.00 17/69	0.4
November ..	0.331	59	69	52	2.25	11	6.71 1916	0.25 1895	2.57 16/76	0.2
December ..	0.364	58	69	48	2.29	10	7.18 1863	0.11 1904	3.20 1/34	0.2
Year Totals ..	—	—	—	—	25.54	141	—	—	—	20.9
Year Averages ..	0.320	68	—	—	—	—	—	—	—	—
Year Extremes ..	—	—	92	48	—	—	7.93 9/1916	0.00 4/1923	3.55 5/3/19	—

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.) Average Miles per Hour.	Highest Mean Speed in One Day.	Highest Gust Speed (miles per hour).	Prevailing Direction. 9 a.m.	3 p.m.	Mean Amount of Evaporation (inches).	No. of Days of Lightning.	Mean Amount of Cloud, 9 a.m., 3 p.m., 9 p.m.(a)	No. of Clear Days.
No. of years observations	62	36	36	62	41	41	36	39	84	40
January ..	29.819	8.0	20.8 30/10	76	NNW	SE	4.785	0.9	6.1	2.1
February ..	29.909	7.2	25.2 4/27	63	N to NW	SE	3.687	1.0	6.0	2.1
March ..	29.949	6.7	21.4 13/38	68	NNW	SE	3.099	1.1	5.9	2.4
April	29.976	6.7	22.2 27/26	74	NWto NNW	SE & NW	2.002	0.6	6.2	1.7
May	29.998	6.3	20.2 20/36	70	NW to N	NW	1.373	0.3	6.1	2.2
June	29.971	6.3	23.7 27/20	64	NWto NNW	NWto NNW	0.911	0.3	6.1	2.4
July	29.934	6.6	20.8 19/35	78	NNW	NNWto NW	0.942	0.4	5.9	2.2
August ..	29.914	6.7	25.5 19/26	87	NNW	NW	1.293	0.4	6.0	2.0
September ..	29.853	8.0	21.5 26/15	74	NNW	NW	1.963	0.6	6.1	1.5
October ..	29.837	8.1	19.2 8/12	74	N to NW	SE	2.993	0.6	6.4	1.1
November ..	29.815	8.0	21.2 18/15	67	N to NW	SE	3.730	0.7	6.4	1.5
December ..	29.813	7.7	23.4 1/34	62	NWto NNW	SE	4.318	0.8	6.4	1.3
Year Totals ..	—	—	—	—	—	—	31.067	7.7	—	22.5
Year Averages	29.899	7.2	—	—	NNW	SE	—	—	6.1	—
Year Extremes	—	—	25.5 19/8/26	87	—	—	—	—	—	—

(a) Scale 0–10.

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.(a)
No. of years over which observation extends.*	63	63	76	78	78	78	57	79	26
January	70.3	52.7	61.9	105.0 1/00	40.1 (b)	64.9	160.0 (d)	30.6 19/97	7.7
February	70.8	53.1	62.1	104.4 12/99	39.0 20/87	65.4	165.0 24/98	28.3 —/87	7.1
March	67.7	50.9	59.3	99.1 13/40	35.2 31/26	63.9	150.9 26/44	27.5 30/02	6.4
April	62.5	47.7	55.1	84.0 17/29	33.3 24/88	50.7	142.0 18/93	25.0 —/86	4.9
May	57.6	44.0	50.7	77.8 5/21	29.2 20/02	48.6	128.0 (e)	20.0 19/02	4.5
June	52.9	41.3	46.9	69.2 1/07	27.2 28/44	38.0	122.0 12/94	21.0 6/87	4.0
July	52.4	39.9	45.8	66.1 14/34	27.7 11/95	38.4	121.0 12/93	18.7 16/86	4.3
August	55.2	41.3	48.1	71.6 28/14	30.5 (c)	41.4	129.0 —/87	20.1 7/09	5.1
September	58.7	43.2	50.9	81.7 23/26	31.0 16/97	51.7	138.0 23/93	18.3 16/26	5.8
October	62.4	45.5	54.0	92.0 24/14	32.0 12/89	60.0	156.0 9/93	23.8 (f)	6.3
November	65.6	48.2	57.1	98.3 26/37	35.0 16/41	63.1	154.0 19/92	26.0 1/08	7.3
December	68.4	51.0	60.0	105.2 30/97	38.0 3/06	67.2	161.5 10/39	27.2 —/86	7.3
Year Averages ..	62.1	46.6	54.3	—	—	—	—	—	5.9
Year Extremes ..	—	—	—	105.2 30/12/97	27.2 28/6/44	78.0	165.0 24/2/98	18.3 16/9/26	—

(a) Mean monthly totals previously published. (b) 9/37 and 11/37. (c) 4/97 and 7/09. (d) 5/86 and 13/05. (e) —/89 and —/93. (f) 1/86 and —/99.

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.*	60	60	60	60	65	65	65	65	80	25
January	0.327	58	72	46	2.10	12	5.91 1893	0.17 1915	2.96 30/16	0.0
February	0.349	62	77	48	1.50	10	4.96 1935	0.11 1914	4.50 27/54	0.0
March	0.326	66	77	52	1.98	12	10.05 1946	0.29 1943	3.47 17/46	0.3
April	0.295	71	84	58	2.03	13	8.50 1935	0.07 1904	5.02 20/09	0.2
May	0.268	77	89	65	1.80	13	6.37 1905	0.14 1913	3.22 14/58	0.8
June	0.238	80	91	68	2.33	16	8.15 1889	0.28 1886	4.11 13/89	0.6
July	0.230	79	94	72	2.07	16	6.02 1922	0.51 1902	2.51 18/22	1.0
August	0.236	75	92	61	1.90	16	6.32 1946	0.30 1892	4.35 12/58	0.4
September	0.250	67	85	58	2.01	16	4.47 1928	0.40 1891	2.75 18/44	0.0
October	0.267	63	73	51	2.42	17	6.67 1906	0.39 1914	2.58 4/06	0.0
November	0.290	59	72	50	2.13	14	7.39 1885	0.33 1921	3.97 7/49	0.0
December	0.315	58	67	45	2.25	12	7.72 1916	0.17 1931	3.33 5/41	0.0
Year Totals ..	—	—	—	—	24.52	167	—	—	—	3.4
Year Averages ..	0.277	67	—	—	—	—	—	—	—	—
Year Extremes ..	—	—	94	45	—	—	10.05 3/1946	0.07 4/1904	5.02 20/4/09	—

* Early records relating to Temperature (Mean Max., Mean Min., Extreme Shade and Extreme Range) and Rainfall have been discarded owing to the use of a faulty instrument. The number of years of observation has therefore been considerably shortened.

§ 3. Standard Times in Australia.

Prior to 1895 the official time adopted in the several colonies was for most purposes the mean solar time of the capital city of each.

In November, 1892, an intercolonial conference of surveyors was held in Melbourne to consider, among other things, the advantages of introducing the system of standard time. In this system it was proposed to make the initial meridian that of Greenwich and to change local standard time by whole hours according to the longitude east or west of that of Greenwich. Thus for every difference of 15° in longitude a change of one hour would be required. The minutes and seconds would then be identical everywhere.

To give effect to this proposal it was suggested that Australia should be divided into three zones, the standard times for which should be respectively the mean solar times of the meridians of 120°, 135° and 150° E. longitude, thus giving standard times 8, 9 and 10 hours respectively ahead of Greenwich time. It was proposed that the 120° zone should comprise Western Australia, that the 135° zone should comprise South Australia and the Northern Territory, and that the 150° zone should comprise Queensland, New South Wales, Victoria and Tasmania.

The matter was also considered by several intercolonial postal conferences, and eventually in 1894 and 1895 legislation was enacted by each of the colonies in accord with the recommendations of the Surveyors' Conference of 1892.

In 1898 the South Australian legislature amended its earlier provision, and adopted the mean solar time of the meridian 142° 30′ E. longitude as the standard time for that colony, thus reducing the difference between the standard time of Adelaide and that of the capitals of the eastern colonies from an hour to half-an-hour. Particulars concerning these enactments are as follows :—

STANDARD TIMES IN AUSTRALIA.

State.	Date when Act came into Operation.	Meridian Selected.	Time Ahead of Greenwich Hours.
New South Wales ..	1st February, 1895 ..	150° E.	10
Victoria	1st February, 1895 ..	150° E.	10
Queensland	1st January, 1895 ..	150° E.	10
South Australia ..	1st February, 1895 ..	135° E.	9
South Australia ..	1st May, 1899	142° 30′ E.	9½
Western Australia ..	1st December, 1895 ..	120° E.	8
Tasmania	1st September, 1895 ..	150° E.	10

The standard time in the Australian Capital Territory is the same as in New South Wales, and in Northern Territory the same as in South Australia.

Consequent upon the opening of the Trans-Australian Railway an arrangement was made by which the change of time between South Australia and Western Australia (namely, 1½ hours) is divided into two changes of 45 minutes each. Going east from Kalgoorlie the first change is made at Rawlinna, 235.18 miles out, where the time is put forward by 45 minutes. The second change of the same amount is made at Tarcoola, 794.05 miles out. Thenceforward South Australian standard time is kept. The Commonwealth Observatory at Mount Stromlo, Canberra, and the State Observatories at Sydney, Adelaide, and Perth derive time by astronomical observations. A Commonwealth Time Service is at present being developed.