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## **SPECIAL CLIMATE STATEMENT 15**

### **An exceptional and prolonged heatwave in Southern Australia**

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*National Climate Centre*

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## Introduction

An exceptionally prolonged heatwave affected much of southern Australia in the first half of March 2008. Key regions affected included the southern half of South Australia and adjacent parts of western Victoria and the Nullarbor region of Western Australia, with temperatures well above normal more generally throughout southern Australia (including Tasmania), except near the east and west coasts.

The event was largely the result of a very slow-moving high pressure system in the southern Tasman Sea, which directed north- to north-easterly winds across much of southern Australia. Such 'blocking highs' are not unusual, but the persistence of this system over more than two weeks is almost unprecedented in the summer half of the year. Previous systems<sup>1</sup> with similar longevity have occurred in late autumn and winter and have therefore been associated with much lower temperatures.

## Prolonged heat in many areas

Many centres, especially in South Australia, set records (for any time of year) for numbers of consecutive days with temperatures above specified thresholds. Most significantly, Adelaide had 15 consecutive days of 35°C<sup>2</sup> or above and 13 consecutive days of 37.8°C<sup>2</sup> or above, breaking the previous records of 8 and 7 days respectively. These are both records for any Australian capital city, although much longer runs have occurred at inland locations, both in South Australia (e.g. 46 days of 35°C or above at Marree from 30 December 2000 to 13 February 2001) and elsewhere (e.g. 200 days of 35°C or above at Marble Bar, Western Australia, from 5 October 1923 to 21 April 1924).

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<sup>1</sup> An example of such a system occurred in late May and early June, 1957. This resulted in record high temperatures for June (which still stand today) at many locations in south-eastern Australia, including Adelaide, Melbourne and Canberra.

<sup>2</sup> A heatwave is defined locally in South Australia as a sequence of days above 35°C. A variety of thresholds are used in this report. The 37.8°C threshold is chosen for historical interest as it is equal to 100°F.

Station number <sup>3</sup>	Name	State	Threshold (°C)	Number of days	Dates	Previous record (* : set on more than one occasion; most recent occurrence shown)
11003	Eucla	WA	37.8 <sup>2</sup>	8	2-9 March	5 (23-27/1/1961)
			40	6	4-9 March	5* (17-21/2/1997)
11004/11052	Forrest	WA	35	13	1-13 March	12 (16-27/1/1961)
18012	Ceduna	SA	30	13(=)	1-13 March	13 (18-30/3/1994)
			35	12	2-13 March	11 (28/1-7/2/1975)
			37.8	8	3-10 March	6* (18-23/1/1982)
18044	Kyancutta	SA	40	13	5-17 March	10 (27/2-8/3/1989)
18069	Elliston	SA	35	10	4-13 March	5* (17-21/2/1997)
21046/21133	Snowtown	SA	37.8	13	5-17 March	7* (19-25/1/2001)
23000/23090	Adelaide	SA	35	15	3-17 March	8* (13-20/2/2004)
			37.8	13	5-17 March	7* (18-24/1/1982)
23321/23373	Nuriootpa	SA	35	13	5-17 March	10 (27/2-8/3/1989)
76031	Mildura	VIC	37.8	8(=)	10-17 March	8* (15-22/2/1997)
			35	14	5-18 March	12 (17-28/1/1961)
80023	Kerang	VIC	40	4(=)	13-16 March	4* (29/12/2007-1/1/2008)
			35	11	8-18 March	10* (28/12/2007-6/1/2008)

**Table 1. All-time records set during March 2008 for consecutive days at or above thresholds at selected stations.**

In addition to the all-time records shown in Table 1, many locations set records for longest runs of consecutive days above thresholds for March (for example, Wagga Wagga had 17 consecutive days above 30°C from 4-20 March, breaking the March record of 12 days set in 1989). Meanwhile, on the east coast, whilst onshore winds meant there was no abnormal heat, the exceptional persistence of the weather pattern resulted in long periods with little change in weather conditions. Two examples of this were at Sydney, which recorded maximum temperatures between 25.7 and 26.4°C on each of the eight successive days 10-17 March, and Cairns, which received 755.8 mm of rain between 2 and 17 March, including nine days with 20 mm of more.

A La Niña event has been in progress in the tropical Pacific Ocean for several months. Preliminary research indicates evidence of a link between La Niña events and prolonged hot spells at Adelaide. Further investigation of such links elsewhere in Australia, and possible mechanisms responsible for them, is currently an active area of research.

#### Records at individual locations

While the event has been more exceptional for the prolonged nature of the heat than for its individual extreme high temperatures, some March record high temperatures have been set, both for daily maxima and minima. This is particularly true in Tasmania, where Hobart equalled its March record high temperature with 37.3°C on 14 March. On the same day Campania reached 38.0°C, a new state record for March (breaking the previous record of 37.8 set at New Norfolk on 7 March 1966). A selection of the March records set is shown in Table 2, including all locations with 40 years or more of data and a few other significant locations.

<sup>3</sup> Where two station numbers are shown, data from two nearby stations (in most cases, an automatic station and a former manual station) are combined. This has been done only where the two stations have broadly similar temperature characteristics. At some other locations (e.g. Port Lincoln) there are substantial differences between the old and new sites, precluding the use of combined data in this analysis.

Station number	Name	State	Value (°C)	Date	Previous record	Years of data
<b>Highest March maximum temperature on record</b>						
9789	Esperance MO	WA	44.0	7 March	42.7 (9/3/1992)	39
12071	Salmon Gums	WA	43.2	7 March	42.5 (12/3/1954)	70
18115	Neptune Island	SA	34.6	13 March	32.8 (2/3/1965)	47
22823/22801	Cape Borda	SA	35.2	6 March	34.0 (6/3/1989)	60
24518	Meningie	SA	40.5	17 March	40.0 (6/3/1986)	42
26021	Mt Gambier Airport	SA	41.3	17 March	41.1 (6/3/1986)	67
26099/26023	Naracoorte	SA	42.0	13 March	41.6 (6/3/1986)	45
79028	Longerenong	VIC	40.7	16 March	40.4 (7/3/1991)	44
80023	Kerang	VIC	41.0	14 March	40.8 (12/3/2006)	44
84070	Point Hicks	VIC	37.8	16 March	37.7 (21/3/1980)	42
85096	Wilson's Promontory	VIC	36.9	14 March	36.8 (12/3/1998)	52
90048	Heywood	VIC	41.0	17 March	39.7 (6/3/1986)	42
90135	Casterton	VIC	40.4	17 March	40.1 (7/3/1986)	52
91009	Burnie	TAS	28.9	10 March	28.1 (11/3/1992)	44
92038	Swansea	TAS	36.8	16 March	36.2 (12/3/1998)	52
94008	Hobart Airport	TAS	37.0	14 March	36.5 (12/3/1998)	50
94029	Hobart	TAS	37.3 (=)	14 March	37.3 (13/3/1940)	118
94041	Maatsuyker Island	TAS	32.4	17 March	30.6 (12/3/1998)	52
<b>Highest March minimum<sup>4</sup> temperature on record</b>						
15602	Jervois	NT	29.3	15 March	29.2 (17/3/2004)	40
18040	Kimba	SA	25.8	14 March	25.0 (13/3/1985)	41
18044	Kyancutta	SA	27.4	14 March	26.5 (11/3/1978)	79
18115	Neptune Island	SA	21.7	9 March	21.2 (1/3/1989)	47
22015	Price	SA	25.4	14 March	23.2 (8/3/1983)	44
23000/23090	Adelaide	SA	30.2	14 March	29.7 (13/3/1985)	122
24511	Eudunda	SA	27.6	14 March	24.1 (8/3/1966)	44
24518	Meningie	SA	26.1	14 March	25.0 (13/3/1985)	42
24521	Murray Bridge	SA	25.2	14 March	23.1 (13/3/1985)	42
25507	Keith	SA	26.1	14 March	26.0 (22/3/1982)	46
86104	Scoresby	VIC	25.2	18 March	23.2 (2/3/1974)	41
87031	Laverton	VIC	25.8	18 March	24.0 (19/3/2003)	65
89002	Ballarat	VIC	22.1	18 March	21.6 (4/3/1983)	52

**Table 2. March record high temperatures set at individual locations.**

In addition to these records, a notable record was set at Eyre (on the Nullarbor coast in Western Australia) when a single-day temperature range of 37.4°C (minimum 6.8°C, maximum 44.2°C) occurred on 5 March. This is an all-time Australian record, comfortably breaking the previous record, also at Eyre, of 35.2°C on 16 November 2003.

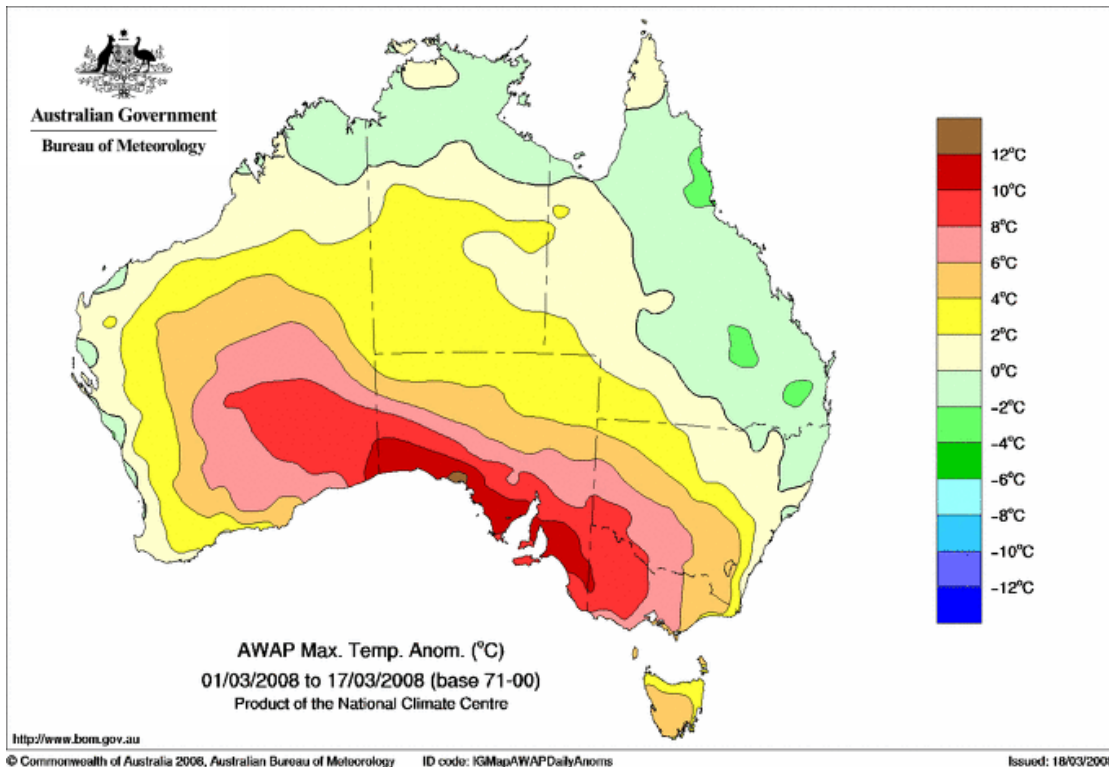
Melbourne set a record high overnight<sup>4</sup> minimum for March on 18 March with a low of 26.9°C, breaking the previous record of 26.7°C on 3 March 1988.

Records were also set for the latest date in autumn on which 40°C has been reached at Adelaide (17 March, previously 13/3/1934), Mount Gambier (17 March, previously 7/3/1966) and Horsham (16 March, previously 12/3/1998 and 12/3/2006), whilst Launceston Airport reached 30°C on 18 March, the latest date on which it has done so (previously 16/3/1976).

<sup>4</sup> The minimum temperatures shown in Table 2 are those measured for a 24-hour period from 9 a.m. to 9 a.m. The overnight minimum is defined as the lowest temperature in the period between 6 p.m. and 9 a.m. and is recorded at only a small number of locations (mostly major cities). Whilst Melbourne's overnight minimum on 18 March was 26.9°C, the 24-hour minimum was 24.0°C (recorded shortly after 9 a.m. the previous morning), which was not a record.

### Average temperatures for the 1-17 March period

Mean maximum temperatures for the period 1-17 March were far above average (Figure 1), with some locations in coastal South Australia 12°C or more above the long-term March average, and much of the southern part of the state 10°C or more above normal.



**Figure 1. Australian temperature anomalies<sup>5</sup> for the period 1-17 March 2008**

Cool conditions developed later in the month, particularly during the final week, when maximum temperatures averaged 6-8°C below normal over most of South Australia, northern Victoria and western New South Wales. As a result of this, relatively few long-term monthly mean records were set, with mean maximum temperatures dropping, by the end of the month, below those recorded in March 1940 and/or 1986 in most locations. However, Victoria had clearly the warmest March of the post-1950 period<sup>6</sup>, with mean maximum temperatures averaging 3.07°C above normal statewide, and monthly anomalies in the 3-5°C range covered most of western Victoria and the southern half of South Australia.

### Number of days above thresholds

In addition to records for consecutive days above thresholds, some stations set records for the most total days above thresholds during March, or in some cases for any month. The most notable of these is at Eucla, which set a record for the most days over 40°C in a month (8), breaking the previous record of 6 set in January 1961.

<sup>5</sup> Anomalies are with respect to the 1971-2000 period.

<sup>6</sup> Comprehensive statewide monthly records commence in 1950 and do not include March 1940, which was an exceptionally hot month at most long-term stations.

Station number	Name	State	Threshold (°C)	Number of days	Previous record (March unless stated)
11003	Eucla	WA	40	8	2 (1961)
			37.8 <sup>2</sup>	10	all months 6 (Jan 1961) 5 (1965)
			35	10	all months 7 (Dec 2005) 8 (1994) all months 10 (Dec 2005)
11004/11052	Forrest	WA	40	8	5 (1979)
			37.8	13	8 (1954)
			35	16	12 (1994)
16001	Woomera	SA	37.8	12	7 (1986, 1989)
			35	15	13 (1953, 1986)
16044/16098	Tarcoola	SA	37.8	14	13 (1986)
18012	Ceduna	SA	40	9	4 (1942)
					all months 9 (Jan 1982)
			37.8	13	7 (1960)
			35	15	all months 10 (Jan 1961) 11 (1996)
18044	Kyancutta	SA	40	13	all months 13 (Jan 1961) 12 (1940)
			37.8	14	13 (1940)
19062	Yongala	SA	37.8	6	2 (1991)
			35	14	8 (1989)
21046/21133	Snowtown	SA	40	7	5 (1934)
			37.8	13	8 (1934)
					all months 13 (Jan 1951)
			35	15	14 (1940)
23000/23090	Adelaide	SA	37.8	13	7 (1934, 1940, 1989)
			35	15	10 (1940)
23321/23373	Nuriootpa	SA	37.8	6	3 (1986)
			35	14	8 (1989)
26021	Mount Gambier	SA	40	2	1 (1966, 1986)
			37.8	3	2 (1942, 1966)
			35	6	4 (1966)
76031	Mildura	VIC	37.8	10	5 (1965)
			35	14	9 (1986)
79023	Horsham	VIC	40	3	2 (2006)
			37.8	6	4 (1989)
			35	10	6 (1965)
80023	Kerang	VIC	40	4	2 (1965)
			37.8	9	5 (1983)
			35	12	8 (1989)
87031	Laverton	VIC	40	3	2 (1991)
					all months 3 (7 times)
			37.8	5	3 (1965, 1966)
			35	5	4 (2007)
89002	Ballarat	VIC	35	5	3 (1989)
			30	11	8 (1989)

**Table 3. Records set in March 2008 for the most days at or above thresholds in a calendar month**

Contacts for further information

The following climate meteorologists may be contacted for further information about this event:

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