



Australian Government
Bureau of Meteorology

Special Climate Statement 45 - a prolonged autumn heatwave for southeast Australia

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1 Introduction

A prolonged heatwave affected southeast Australia between 2 and 13 March 2013, breaking numerous records, especially for the duration of persistent hot days and nights.

The event followed Australia's hottest month on record in January, and warmest summer on record from December 2012 to February 2013 (see Special Climate Statement 43)¹. The oceans surrounding Australia were similarly exceptionally warm, with sea surface temperatures also posting their hottest month on record in February, and warmest summer on record. The six months from September 2012 have been characterised by significant heatwaves and record temperatures for the entire Australian region. This heat has continued into March over a very large area of the country.

The exceptionally warm conditions in the southeast during the first half of March were in part related to a near-stationary high pressure system in the Tasman Sea, which directed warm northerly air into southeast Australia. Such "blocking highs" have been associated with several late-season heatwaves in the past, notably the major heatwave of March 2008 which set records for hot spells across southeast Australia (see Special Climate Statement 15). The heatwave was particularly significant in Tasmania, southern Victoria and the Lower Southeast of South Australia where numerous records were set. The warm conditions also coincided with exceptionally high sea surface temperatures extending from the coastal regions of the Great Australian Bight through to Bass Strait, including the South Australian Gulfs and Port Phillip.

The March heatwave was characterised by prolonged sequences of days and nights above threshold temperatures that were, in places, up to 10 °C above the long-term (1961-1990) average for maximum temperature and more than 6 °C above average for minimum temperature. The prolonged heat was accompanied by high relative humidity and generally low wind speeds, contributing to high apparent temperatures (a measure of perceived outdoor temperatures or comfort).

¹ Previous Special Climate Statements are obtainable through <http://www.bom.gov.au/climate/current/special-statements.shtml>.

2 Detailed description of the event

2.1 Prolonged high temperatures

Maximum temperatures were more than 6 °C above normal across Tasmania, Victoria and southern South Australia between 1 and 12 March (Figure 1), reaching up to 10°C above normal near Mount Gambier. Many sites across the three States had their warmest start to March on record (Table 1). Average maximum temperatures for the first 12 days of March were 6.9°C above normal for Tasmania, and 6.8°C above normal for Victoria. A near zero temperature anomaly (i.e., “normal conditions”) for the remainder of the month would be more than sufficient for Tasmania to break its record for the highest March mean maximum temperature, currently at 1.9°C above normal in March 1971.²

Records for consecutive hot days were set at numerous locations across these States (Table 2) but particularly in the Melbourne region. Melbourne recorded 9 consecutive days of 30 °C or above from 4 to 12 March, all of which exceeded 32 °C. This is the longest spell of days of 30°C or above in any month since records began in 1855, and two days longer than the previous March record of 7 days. Melbourne also set a record for any month for consecutive warm nights, with 7 consecutive nights of 20°C or above from 7 to 13 March.

Records for extended hot spells were also broken across southern Victoria, southeast South Australia and northern and inland Tasmania, including a record-breaking 11 days above 30 °C at Mount Gambier and 6 days above 30°C at Launceston Airport. Records were also broken for extended periods of warm nights (Table 3), with much of southeastern Australia experiencing night time temperatures more than 5 °C above normal during this period.

Elsewhere in southeast Australia (e.g. in northern Victoria and most of South Australia) the hot spell fell within the warmest four March events on record, but generally failed to reach the records set in the heatwave of March 2008. For instance, Adelaide recorded 10 consecutive days above 32 °C from 3 to 12 March. This was the second-longest such autumn heatwave on record, following an exceptional 15 consecutive days above 35 °C from 3 to 17 March 2008.

The event was generally less exceptional for individual extreme hot days than for prolonged heat, with only a small number of single-day records set during the event either for maximum or minimum temperature, mostly in Tasmania (see Tables 4 and 5). The hottest day of the event was 12 March, when a number of Tasmanian sites, particularly in the State’s south, fell just short of March records. Bushy Park’s 37.4°C was 0.2°C short of its March record and 0.6°C short of the Tasmanian record for March,

² The Victorian record is 4.0°C above normal, in March 1940. Temperatures would need to remain more than 2°C above normal for the rest of March 2013 for this to be broken.

set at Campania in 2008. The following morning, 13 March, a number of sites in southern Victoria and Tasmania had their highest March minimum temperature on record, including Melbourne with 26.5°C.

The event was generally accompanied by relatively high humidity over southeastern Australia, adding to the discomfort experienced by the population. Peak dewpoints during the event were 20.8°C at Adelaide, 19.8°C at Melbourne and 18.9°C at Hobart, and all three cities had extended periods when the dewpoint was above 15°C. Whilst these dewpoints were not record-breaking, they were significantly above normal.

2.2 Ongoing warm, dry conditions

There have now been three significant heatwave events since September 2012 which have affected various parts of Australia: November 2012 saw numerous spring temperature records broken in southeast Australia, including the warmest spring day on record for Victoria (Special Climate Statement 41), and there were exceptional and protracted hot conditions across the nation in January 2013 (Special Climate Statement 43) including the warmest day on record for Australia.

A further aspect is the lack of especially cool weather in southeastern Australia since September 2012. This can be seen in the ongoing “mildwave” in Melbourne, where there have been 99 consecutive days above 20 °C up to 14 March, its second-longest spell without such cool weather on record behind a spell in 2009-10.

The November and January heatwaves helped ensure that the period from September to February was the warmest on record for Australia, with maximum temperatures 1.6 °C above average across the nation and mean temperatures 1.1 °C above normal.

The frequency of extreme high temperatures, and lack of extreme low temperatures, in Australia in recent months is consistent with long-term trends towards more extreme high temperatures and fewer extreme low temperatures, which in turn is consistent with an overall warming in Australian mean temperatures of about 0.9°C since 1910.

Sea surface temperatures in the Australian region during summer were also 0.5 °C above normal, the warmest since records began in 1900. Sea surface temperatures have been particularly warm off the southern coast of Australia in recent weeks. They were generally 1 to 2°C above normal for the month of February and were the highest on record for that month over an area extending from western Bass Strait to the central Great Australian Bight. They have warmed further in the first half of March and are now more than 3°C above normal in most of the coastal waters of Tasmania and western Victoria, as well as in Port Phillip and the South Australian Gulfs. These warm coastal waters have contributed to the prolonged warm conditions by reducing the potential for

sea breezes to cool temperatures on and near the coast, and by increasing humidity and overnight temperatures near the coast.

Conditions during recent months have also been drier than normal across most of southeastern Australia, with 7-month rainfall totals between August 2012 and February 2013 very much below normal (in the driest 10% of years) across most of South Australia and large areas of western Victoria. The persistent warm, dry conditions during the season are related to a strong high pressure ridge in mid-latitudes of the southern hemisphere, which has also caused significant drought on the North Island of New Zealand.

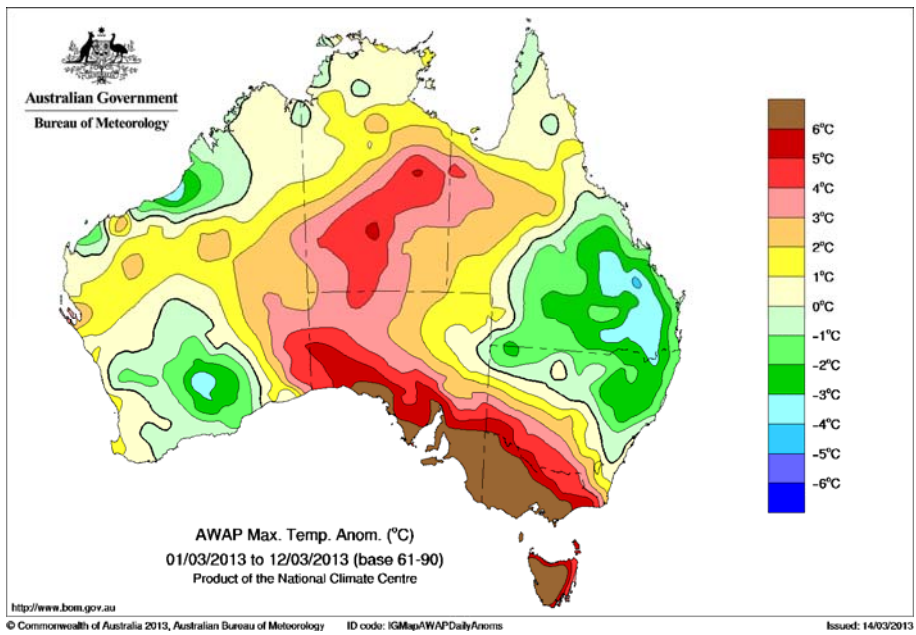


Figure 1. Maximum temperature anomalies across Australia for the period 1-12 March 2013.

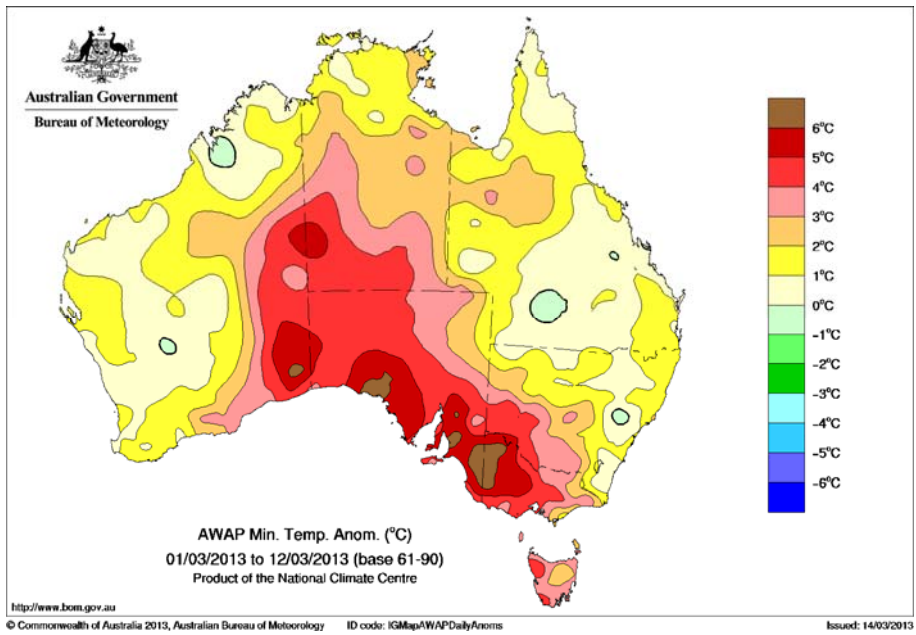


Figure 2. Minimum temperature anomalies across Australia for the period 1-12 March 2013.

Table 1. Sites with 30 years or more of data with their highest mean maximum temperature on record for the period 1-12 March.

State	Name	Station number	Years of data	Temperature (°C)	Previous Record (°C)	Year
SA	Neptune Island	18115	51	26.4	26.1	2008
SA	Meningie	24518	47	34.1	33.5	2008
SA	Mount Gambier	26021	71	33.8	30.1	1966
SA	Robe	26026	122	30.0	26.8	1934
VIC	East Sale	85072	68	29.8	29.3	1974
VIC	Bairnsdale Airport	85279	32	29.8	29.2	1989
VIC	Latrobe Valley Airport	85280	30	32.2	30.0	1989
VIC	Essendon Airport	86038	43	33.0	31.1	1940
VIC	Melbourne	86071	158	32.9	30.7	1868
VIC	Moorabbin Airport	86077	41	32.1	30.0	1989
VIC	Scoresby	86104	44	32.3	30.6	1983
VIC	Wonthaggi	86127	44	31.0	28.3	1989
VIC	Melbourne Airport	86282	43	32.7	30.8	1989
VIC	Bundoora	86351	33	31.6	31.4	1989
VIC	Laverton	87031	69	31.6	29.8	1965
VIC	Portland Airport	90171	30	30.1	25.4	2008
TAS	Burnie	91009	49	23.8	23.0	1992
TAS	Launceston Airport	91104	74	29.8	26.0	1992
TAS	Scottsdale	91219	41	28.0	24.8	1992
TAS	Marrawah	91223	43	25.9	24.4	1989
TAS	Launceston (Ti Tree Bend)	91237	33	29.7	27.0	1992
TAS	Larapuna (Eddystone Point)	92045	56	25.2	23.3	2006
TAS	Hobart Airport	94008	55	24.8	24.2	1992
TAS	Cape Bruny	94010	57	21.2	20.9	1977
TAS	Hobart Maatsuyker Island	94029	118	24.4	24.3	1891
TAS	94041	57	20.9	19.5	1957	
TAS	Mount Wellington	94087	33	19.9	16.9	1992
TAS	Bushy Park	95003	52	29.8	26.0	1983
TAS	Butlers Gorge	96003	41	26.5	21.8	1966
TAS	Strathgordon	97053	31	25.5	22.4	1971
TAS	Flinders Island Airport	99005	50	26.9	25.3	1989

Table 2. Sites with 30 years or more of data with their highest mean minimum temperature on record for the period 1-13 March.

State	Name	Station number	Years of data	Temperature (°C)	Previous Record (°C)	Year
SA	Ceduna	18012	72	19.4	19.3	1989
SA	Elliston	18069	51	19.6	19.5	2008
SA	Neptune Island	18115	51	20.1	18.8	1989
SA	Yongala	19062	57	16.8	16.7	1971
SA	Warooka	22018	46	19.7	18.8	1989
SA	Cape Willoughby	22803	45	19.8	18.7	1989
SA	Eudunda	24511	49	18.5	18.4	1989
SA	Meningie	24518	47	19.0	18.5	1989
SA	Robe	26026	122	18.0	17.6	1989
NSW	Menindee Wilsons	47019	31	20.7	20.1	1971
VIC	Promontory	85096	56	18.3	18.2	1989
VIC	Essendon Airport	86038	43	17.8	15.0	1966
VIC	Melbourne	86071	158	19.6	19.0	1989
VIC	Wonthaggi	86127	44	16.8	16.4	1974
VIC	Cape Otway	90015	141	18.0	16.9	1989
TAS	Marawah	91223	43	15.0	14.8	1989
TAS	Cape Bruny	94010	57	14.9	14.6	1989
TAS	Hobart Maatsuyker	94029	118	15.5	15.0	1989
TAS	Island	94041	57	14.3	13.7	1989
TAS	Mount Wellington	94087	33	10.7	8.2	1992

Table 3. All-time records set during March 2013 for consecutive days at or above maximum temperature thresholds at selected stations. * indicates records that have occurred multiple times, with the most recent instance shown.

State	Name	Station number	Years of data	Threshold (°C)	Days	Dates	Previous record
SA	Mount Gambier	26021	71	30	11 (=)	2-12	11 (31 Jan – 10 Feb 1956)
SA	Meningie	24518	47	30	11	2-12	10 (21-30 Mar 1994)
VIC	Melbourne	86071	158	30	9	4-12	8* (15-22 Feb 1961)
VIC	Essendon Airport	86038	43	30	9	4-12	7* (15-21 Feb 1968)
VIC	Bairnsdale Airport	85279	33	30	7	6-12	6 (9-14 Jan 1998)
VIC	Laverton	87031	71	30	9	4-12	7* (15-21 Feb 1968)
VIC	East Sale	85072	69	30	7	6-12	6 (16-21 Feb 1968)
VIC	Scoresby	86104	48	30	10	3-12	9 (24 Jan – 1 Feb 1974)
VIC	Wonthaggi	86127	45	30	8	5-12	6* (1-6 Feb 1999)
VIC	Melbourne Airport	86282	44	30	9	4-12	8 (24-31 Jan 1974)
TAS	Launceston Airport	91311 91104	74	30	6	5-10	5* (24-28 Jan 1961)
TAS	Bushy Park	95003	57	30	5 (=)	3-7	5* (10-14 Jan 2000)
TAS	Larapuna (Eddystone Point)	92045	57	25	6	4-9	4* (17-20 Jan 2012)
TAS	Butlers Gorge	96003 96071	42	25	8	2-9	7* (25-31 Jan 1974)
TAS	Lake St Clair	96015 91292	57	25	9	2-10	7 (25-31 Jan 1974)
TAS	Smithton	91092 91291	52	25	8 (=)	5-12	8 (28 Feb – 7 Mar 1989)
TAS	Sheffield	91091	49	25	9 (=)	4-12	9 (16-24 Feb 2007)
TAS	Launceston (Ti Tree Bend)	91237	34	30	8	5-12	4 (28-31 Jan 2009)

Table 4. All-time records set during March 2013 for consecutive days at or above minimum temperature thresholds at selected stations. * indicates records that have occurred multiple times, with the most recent instance shown.

State	Name	Station number	Years of data	Threshold (°C)	Days	Dates	Previous record
SA	Lameroo	25509	57	20	7	6-12	6* (28 Jan – 2 Feb 2009)
SA	Neptune Island	18115	51	20	7	4-12	6 (25-30 Jan 1974)
SA	Cape Willoughby	22803	47	20	8	5-12	5 (28 Jan – 1 Feb 2009)
VIC	Melbourne	86071	158	20	7	7-13	6* (29 Jan – 3 Feb 2009)
TAS	Hobart Airport	94008	56	15	7	7-13	6* (27 Feb – 4 Mar 2007)
TAS	Orford	92027	46	15	7	7-13	6* (19-24 Feb 2007)
TAS	Strathgordon	97053	31	15	5	9-13	4* (11-14 Feb 1999)

Table 5. New March daily maximum temperature records set during the event (stations with 30 or more years of historical records).

State	Name	Station number	Years of data	Temperature (°C)	Date	Previous Record (°C)	Date
TAS	Strathgordon	97053	31	33.1	12/3/2013	31.5	14/3/1985
TAS	Launceston (Ti Tree Bend)	91237	34	33.0	7/3/2013	32.9	17/3/2008

Table 6. New March daily minimum temperature records set during the event (stations with 30 or more years of historical records).

State	Name	Station number	Years of data	Temperature (°C)	Date	Previous Record (°C)	Date
SA	Neptune Island	18115	51	22.2	7/3/2013	21.7	9/3/2008
VIC	Melbourne	86071	158	26.5	13/3/2013	26.3	3/3/1927
VIC	Essendon Airport	86038	43	25.3	13/3/2013	25.1	18/3/2008
VIC	Scoresby	86104	48	26.1	13/3/2013	25.2	18/3/2008
TAS	Hobart Airport	94008	54	20.4	13/3/2013	19.8	18/3/1967
TAS	Burnie	91009	48	21.2	12/3/2013	20.7	11/3/1974
TAS	Marrawah	91223	43	20.0	12/3/2013	19.2	3/3/1974
TAS	Launceston (Ti Tree Bend)	91237	34	19.1	10/3/2013	19	21/3/2012

Notes and contacts

Values in this statement are current as of 15 March 2013, and subject to the Bureau's normal quality control processes.

The data set from which area averages and other spatial analyses are drawn commences in 1911. Station data prior to national introduction of standardised instrument shelters in 1910 are used only if they are known to have been measured using standard equipment comparable with current standards.

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