



**Australian Government**  
**Bureau of Meteorology**

**HEAD OFFICE**  
Bureau of Meteorology  
GPO Box 1289 Melbourne VIC 3001 Australia

## **SPECIAL CLIMATE STATEMENT 10**

### **Climate conditions preceding the December 2006 southeast Australian bushfires**

*Issued 19<sup>th</sup> December 2006*  
*National Climate Centre*

Cite: National Climate Centre, 2006. Climate conditions preceding the December 2006 southeast Australian bushfires, Bureau of Meteorology, Special Climate Statement 10.

## Introduction

Southeast Australia has experienced highly unusual widespread bushfire activity in December 2006. These fires were preceded by exceptionally dry conditions, over both the short and long term, in all of the major fire regions (Victorian Alps, Tumut, and eastern Tasmania). In the two mainland regions, exceptionally high daytime temperatures also occurred during the months leading up to the fires. This statement describes the antecedent climatic conditions in the fire-affected regions.

Severe and extensive bushfires in southeast Australia are usually a result of an extended drought which leads to the drying of forests and grasslands. In most summers, there are a number of days on which high temperatures combine with low humidity and high winds to produce dangerous fire weather conditions. When combined with ignition, the antecedent dry and extreme weather set the stage for potentially severe bushfires.

The short-term weather conditions during the fire period itself are not within the scope of this statement, and will likely to form part of a separate report on meteorological aspects of the fires to be released at a later date.

Most of the affected areas are mountainous, with relatively sparse meteorological station networks. In addition, the networks in the affected regions have changed substantially over time, with a number of automatic weather stations recently being installed at high elevations. The changes in the station network mean that the gridded analyses are likely to underestimate the severity of the current dry period at high elevations, while the shorter-duration station records miss some previous exceptional drought episodes (such as 1902 and 1914). For these reasons, this report uses a mix of station and gridded data sets. The gridded datasets are the Bureau's operational 0.25 degree (~25 km) resolution analyses dating back to 1900 and experimental new 0.05 degree (~5 km) analyses which currently extend back to 1941.

## Long-term rainfall deficits in SE Australia

Rainfall has been generally below normal in most of south-eastern Australia (including Tasmania) for the 10-year period starting late 1996 (see Special Climate Statement 9). An analysis of rainfall deciles for the 10 years ending November 2006 (**Figure 1a**) shows that a number of areas have experienced their driest 10-year period on record, including the area east of Melbourne, around Tumut, and in parts of eastern Tasmania. Virtually all of southeast Australia has experienced its driest 10-year period since at least the 1940s (**Figure 1b**).

Over most of the region, mean annual rainfall since 1996 has been 10-20% below the long-term average, with anomalies exceeding 20% over areas east of Melbourne.

## Acute shorter-term rainfall deficits and depleted snow cover in 2006

After near average rainfall during 2005, acute drought conditions began across southeast Australia in January 2006. Over the period from January to November 2006, rainfall has been at or near record low levels over most of the area of interest, both on the mainland and in Tasmania (**Figure 2, Table 2**). At some locations in the core of the alpine region, including Cabramurra, Harrietville, Mount Buffalo, and Dartmouth Dam, as well as sites in or near the Melbourne water supply catchments such as O'Shannassy and Marysville, the January-November 2006 rainfall has broken previous records (many set in 1967) by a substantial 80-200 millimetres.

At most mainland locations, January-November 2006 rainfall has been 50-65% below normal (**Figure 3**). The anomalies have been particularly acute at most of the higher-elevation stations,

with Mount Buffalo and Charlotte Pass 66% below normal, and Cabramurra 65% below normal. In the vicinity of St. Marys (Tasmania) January-November rainfall has been generally near 50% below normal. We note that the streamflows across this region have been at record low levels, in many cases far below previously observed lows, indicating the severity of the current drought episode. For instance, winter inflows to the Murray River system were around 100 GL per month below that of the previously lowest inflows, which occurred in the Federation drought of 1902. (Further details are available from the Murray-Darling Basin Commission website, [www.mbdc.gov.au](http://www.mbdc.gov.au)).

Rainfall anomalies have been less extreme on the Gippsland side of the Victorian fire region, although January-November 2006 is still in the driest 10% of years (i.e., decile 1) at most locations, with many areas 35-50% below the 1961-90 average.

Snow cover was also abnormally light throughout south-eastern Australia during winter 2006. Reliable long-term snow cover data are only available from the NSW Snowy Mountains. These data indicate that the peak depth of the 2006 snowpack was the lowest recorded in the 50 years (all records) since records began at the three major Snowy Hydro monitoring sites (Spencers Creek, Deep Creek and Three Mile Dam), although the snow cover during the early part of the season was not as light as it was in 1973 and 1982. Virtually all snow had melted or sublimated by the first week of October, not only indicative of the warm spring, but also suggesting a longer period of exposure for alpine grasses. Whilst no long-term objective data exist for the Victorian snowfields, anecdotal reports indicate that similar snowpack anomalies occurred there. For instance, the ski resort of Mt Baw Baw experienced a maximum natural snow depth of 15 cm during winter.

### **Exceptionally high mainland temperatures, August-November 2006**

After a relatively cool autumn and early winter, daytime maximum temperatures were well above average over most of the south-eastern mainland from August onwards. August-November maximum temperatures were 2-4°C above normal over most mainland fire regions (**Figure 4a**), and were the highest on record over almost all of this region (**Figure 4b, Table 3**).

The temperatures were particularly exceptional at the high-elevation alpine sites. Mount Buller, Mount Hotham and Cabramurra all set record high mean maximum temperatures for the August-November period by between 1.4 and 1.8°C. Whilst these sites (except for Cabramurra) only have data for relatively short periods, all were operating in 2002 when temperatures at longer-term low-elevation stations were near record levels, and therefore it is likely that the 2006 temperatures are extremely unusual in the context of the last century. The warm temperatures of 2006 are consistent with the long-term warming trend over Australia (**Figure 5**). In addition the lack of snow cover during spring 2006 provided a positive feedback to maximum temperatures at the higher-elevation sites.

Abnormal warmth was not such a significant feature of the Tasmanian fire regions. August-November maxima were generally 0 to 1°C above normal and did not approach record levels.

### **Further Information**

The following climate meteorologists in the National Climate Centre – Dr David Jones (03 9669 4085), Dr Blair Trewin (03 9669 4623) – can be contacted about this statement.

## Tables

Station number*	Location	State	Mean annual rain Dec 1996-Nov 2006 (mm)	Rank of 1996-2006 rain	Deviation from long-term average (%)	Previous record#	Years of record
72000	Adelong	NSW	710	6	-11	660 (1894-1904)	123
72004	Batlow	NSW	994	1	-23	1099 (1894-1904)	116
72043	Tumbarumba	NSW	863	1	-12	866 (1894-1904)	119
73007	Burrinjuck Dam	NSW	819	8	-13	776 (1935-45)	97
82024	Koetong	VIC	965	1	-12	994 (1975-85)	89
82058	Yackandandah	VIC	845	5	-11	794 (1939-49)	115
82076	Dartmouth Dam	VIC	888	1	-13	922 (1975-85)	53
83012	Harrietville	VIC	1232	1	-14	1260 (1935-45)	106
83025	Omeo	VIC	582	1	-14	592 (1900-10)	127
85050	Lindenow	VIC	591	3	-14	586 (1936-46)	103
85072	East Sale	VIC	475	1	-23	574 (1976-86)	64
86090	O'Shannassy Reservoir	VIC	1120	1	-21	1244 (1935-45)	92
88044	Marysville	VIC	1121	1	-18	1165 (1904-14)	100
92034	St. Marys	TAS	865	1	-16	928 (1905-15)	96

Table 1. Rainfall for December 1996-November 2006 at selected locations.

Station number*	Location	State	Rainfall Jan-Nov 2006 (mm)	Rank of 2006 rain	Deviation from long-term average (%)	Previous record	Years of record
71003	Charlotte Pass	NSW	713.1	1	-66	1061.7 (2005)	17
72000	Adelong	NSW	317.4	3	-59	270.2 (1967)	123
72004	Batlow	NSW	383.8	1	-68	468.1 (1967)	116
72043	Tumbarumba	NSW	405.0	1	-55	411.2 (1967)	119
72044	Tumut	NSW	317.8	2	-58	300.9 (1902)	120
72141	Yarrangobilly Caves	NSW	480.8	1	-56	626.5 (1914)	42
72161	Cabramurra	NSW	552.6	1	-65	694.2 (1967)	52
73007	Burrinjuck Dam	NSW	337.5	1	-61	376.2 (1944)	97
82024	Koetong	VIC	453.9	2	-56	450.5 (1982)	89
82058	Yackandandah	VIC	381.2	1	-57	409.3 (1902)	115
82076	Dartmouth Dam	VIC	387.1	1	-58	463.0 (1982)	53
82169	Corryong	VIC	334.4	1	-53	337.8 (1967)	113
83012	Harrietville	VIC	493.9	1	-63	664.4 (1967)	106
83019	Mansfield	VIC	300.6	1	-54	354.9 (1902)	102
83025	Omeo	VIC	345.2	1	-44	377.9 (1907)	127
83032	Whitlands	VIC	511.8	1	-61	514.8 (1963)	76
83033	Woods Point	VIC	714.9	2	-48	682.1 (1967)	114
83073	Mount Buffalo Chalet	VIC	598.2	1	-66	687.1 (1967)	91
85034	Glenmaggie	VIC	344.8	3	-40	336.6 (1972)	68
85050	Lindenow	VIC	395.8	7	-35	349.8 (1940)	103
85072	East Sale	VIC	287.6	1	-48	326.3 (1972)	64
85277	Noojee	VIC	757.2	2	-26	727.8 (1997)	25
86090	O'Shannassy Reservoir	VIC	704.8	1	-46	801.4 (1997)	92
88001	Alexandra	VIC	316.2	1	-52	336.4 (1902)	124
88023	Lake Eildon	VIC	389.0	1	-51	423.4 (1914)	117
88044	Marysville	VIC	695.1	1	-45	780.5 (1967)	100
92009	Cullenswood	TAS	322.8	1	-58	371.4 (1940)	102
92034	St. Mary's	TAS	408.6	2	-56	399.1 (1982)	96
92038	Swansea	TAS	308.7	4	-42	241.6 (1908)	103
92045	Eddystone Point	TAS	378.0	2	-46	326.2 (1997)	97
92052	Gray	TAS	603.0	4	-46	444.4 (1968)	40
92120	St. Helens	TAS	352.4	1	-50	366.7 (1908)	104

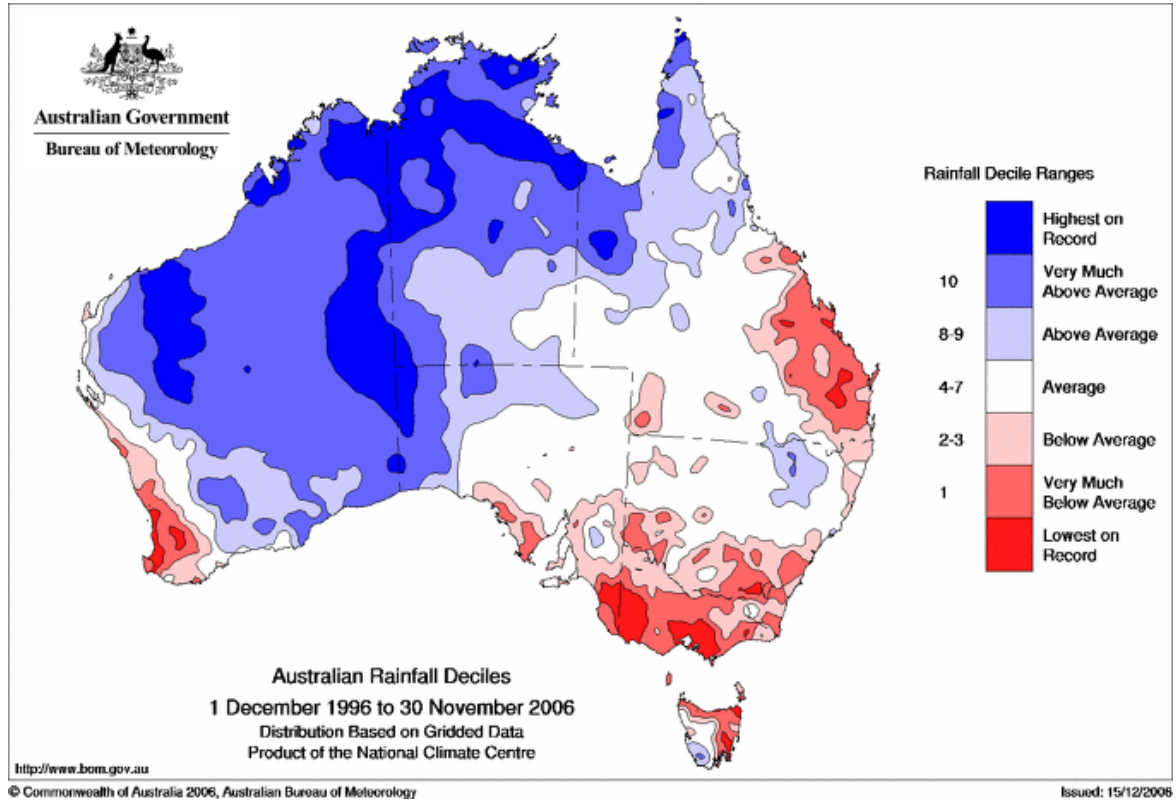
Table 2. Rainfall for January-November 2006 at selected locations.

Station number*	Location	State	Mean max temp Aug-Nov 2006 (°C)	Rank of 2006 max temp	Anomaly from long-term average (°C)	Previous record	Years of record
70014	Canberra	ACT	21.3	1	3.6	21.0 (1982)	68
72043	Tumbarumba	NSW	20.2	1	3.0	19.1 (1977)	41
72161	Cabramurra	NSW	12.8	1	3.4	11.4 (1982)	45
73007	Burrinjuck Dam	NSW	22.9	1	4.4	22.2 (1914)	87
82138	Wangaratta	VIC	22.2	1	2.9	21.5 (2002)	20
82169	Corryong	VIC	22.3	1	3.2	21.1 (2002)	35
83024	Mt. Buller	VIC	9.4	1	2.8	7.6 (2002)	21
83025	Omeo	VIC	18.5	3	1.8	19.7 (1914)	97
83085	Mt. Hotham	VIC	7.8	1	2.6	6.2 (2002)	16
85072	East Sale	VIC	19.7	3	1.7	20.0 (1980)	61
85279	Bairnsdale	VIC	19.3	6	0.8	20.0 (2002)	26

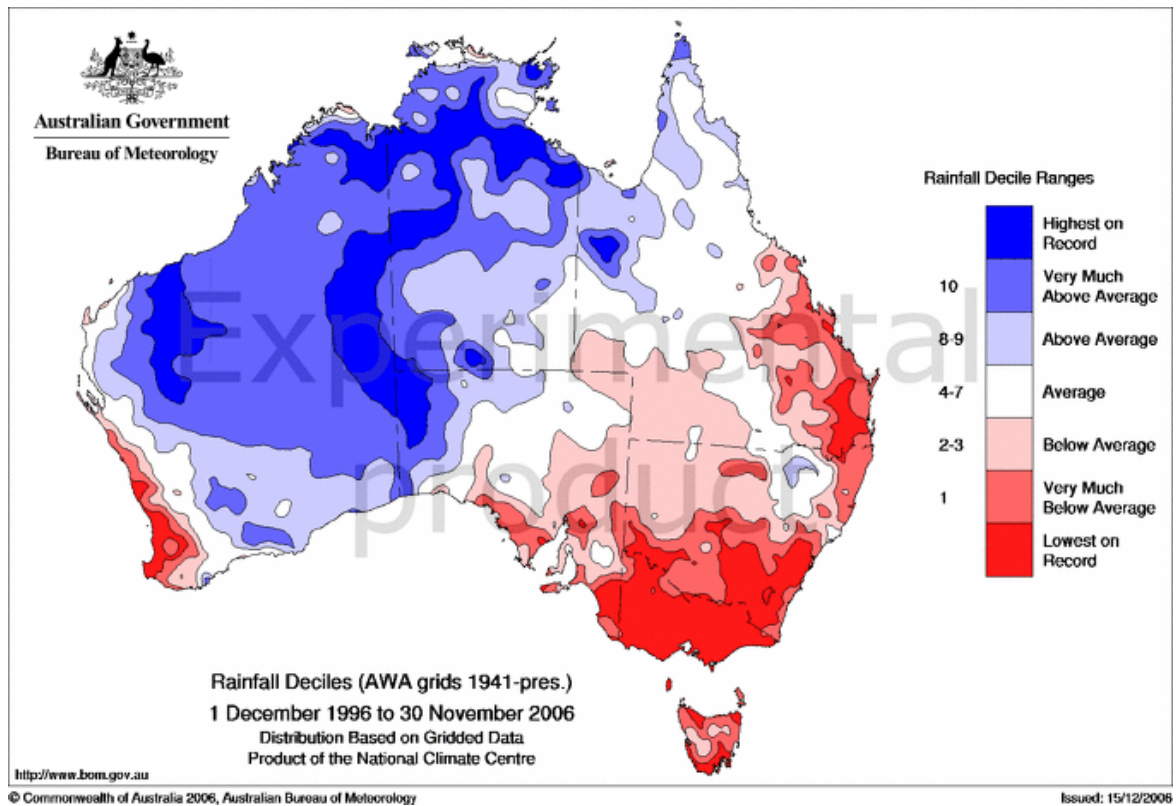
Table 3. Mean maximum temperature, August-November 2006 at selected locations. (Pre-1910 data from non-standard screens excluded at Omeo).

(# - excludes periods overlapping with 1996-2006; \* - data from former stations included at some locations)

## Figures



(a)



(b)

Figure 1. Rainfall for December 1996–November 2006 relative to (a) the full historical record from 1900, and (b) from 1941.

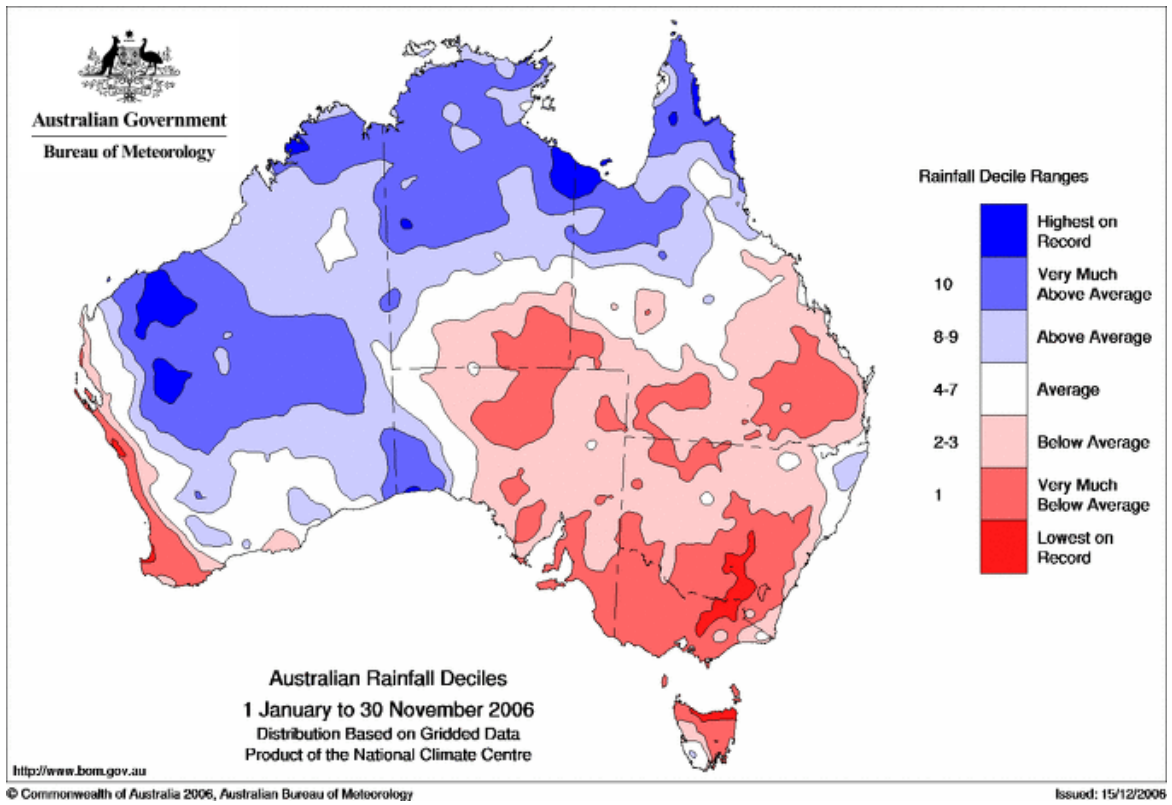


Figure 2. Rainfall for January-November 2006 relative to the full historical record from 1900.

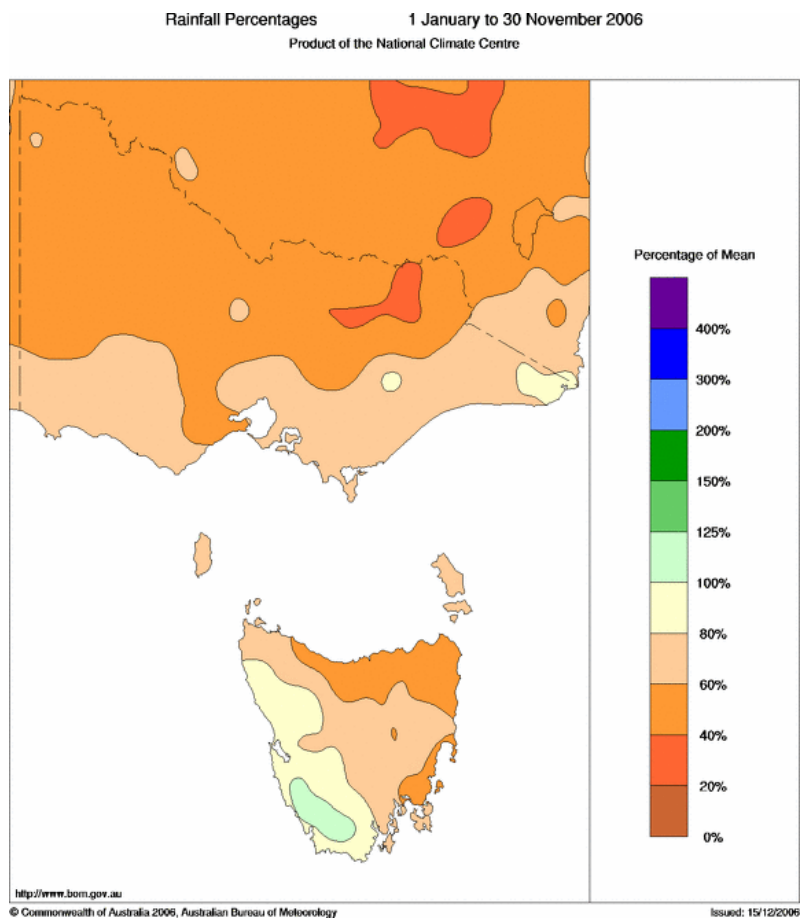
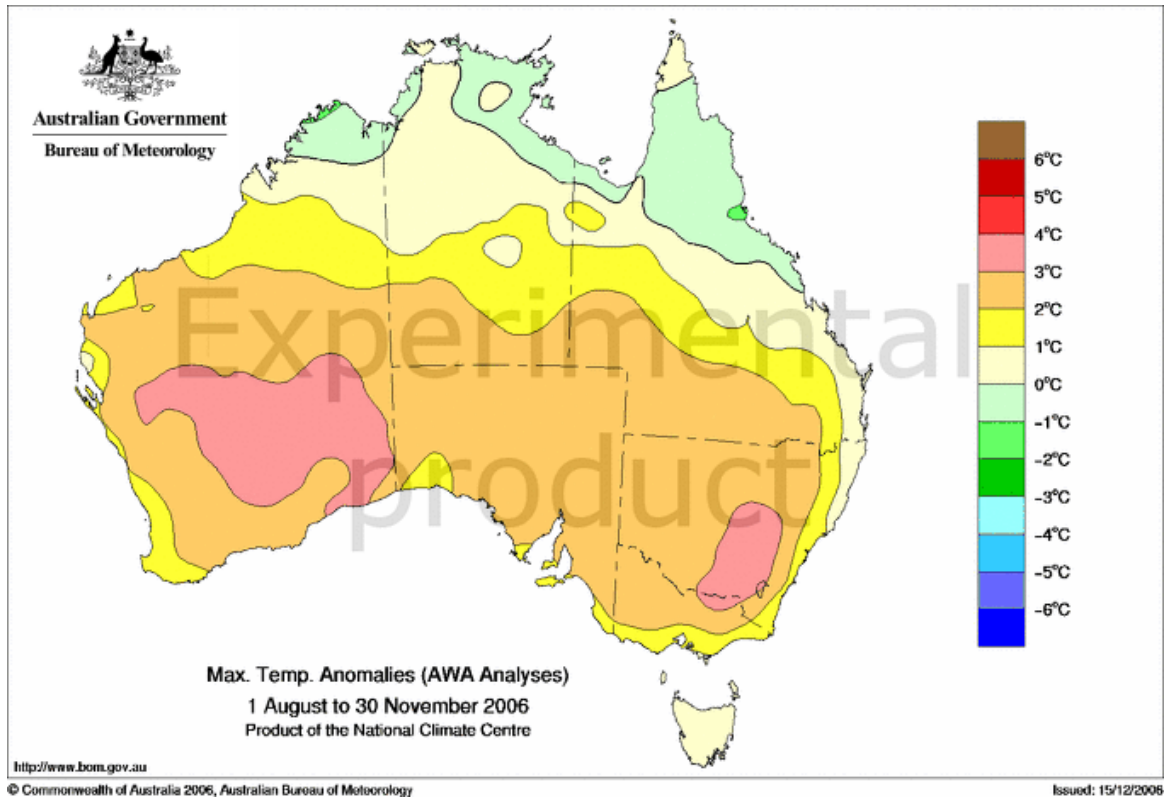
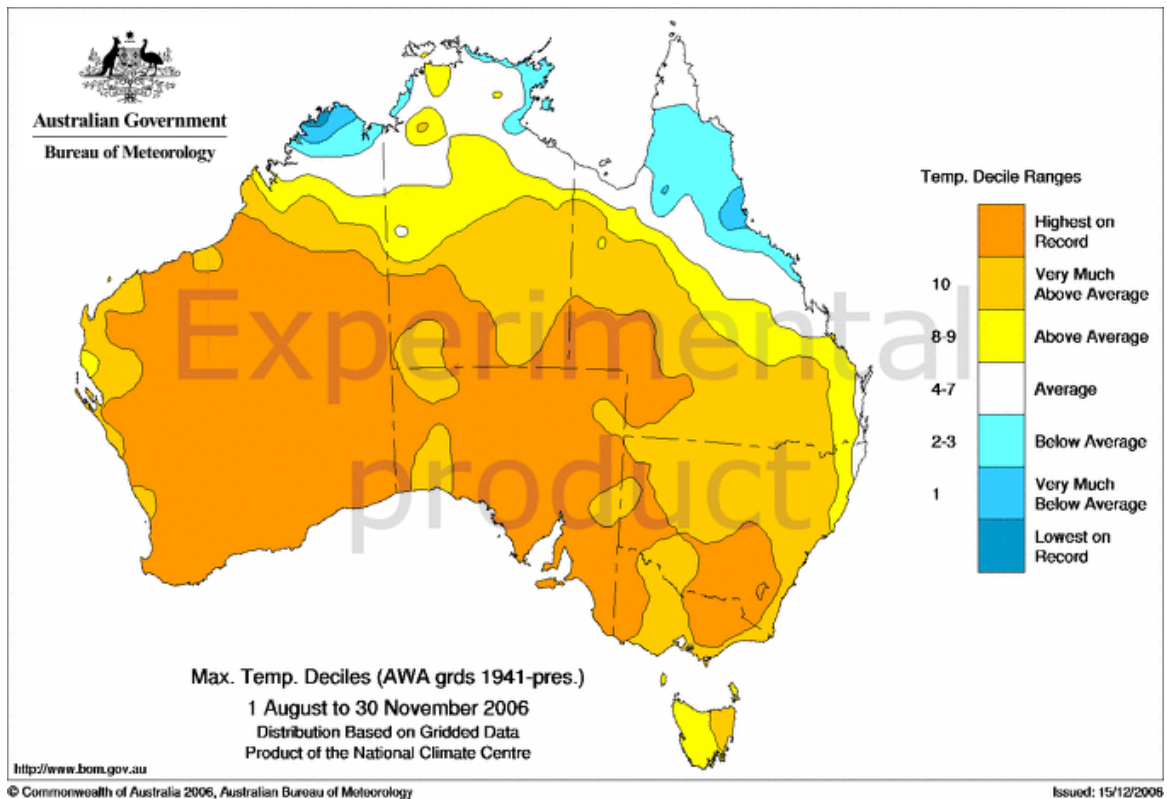


Figure 3. Rainfall for January-November 2006 as a percentage of the 1961-90 mean.





(a)



(b)

Figure 4. Mean maximum temperatures for August-November 2006: (a) anomalies from the 1961-90 mean; (b) relative ranking in the historical record.



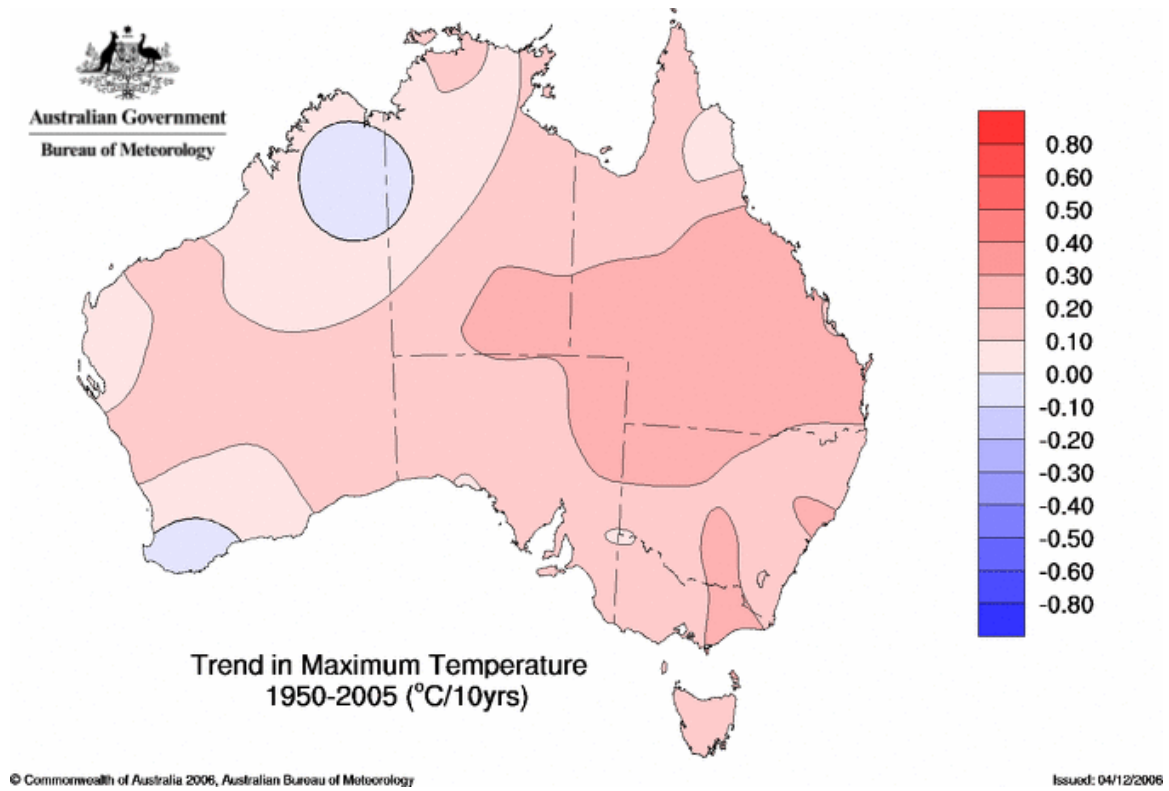


Figure 5. Maximum temperature trends for Australia, 1950-2005.