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**Bureau of Meteorology**

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## **SPECIAL CLIMATE STATEMENT 13**

**Exceptional cold and unseasonable rain in the Australian tropics,  
17-22 June 2007**

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## Special Climate Statement 13

### Exceptional cold and unseasonable rain in the Australian tropics, 17-22 June 2007

The period from 17-22 June 2007 saw exceptionally cold conditions in the Australian tropics, as well as widespread unseasonable rain during what is normally the dry season. This event resulted from the combination of an extensive and slow-moving middle-level cloud-band, associated with an upper-level trough, and a south-southeasterly surge over much of the tropics, largely resulting from the circulation associated with an intense low-pressure system off the coast of New South Wales.

#### Overview of the event

The first major rain event occurred during the period 17-18 June. This event principally affected the northern interior of Queensland (Figure 1), with a number of stations receiving daily falls in excess of 50 mm. There was also an isolated heavy fall of 71.4 mm at Oenpelli in western Arnhem Land. Daily maximum temperatures during this period were well below normal, but generally not at record low levels.

The main rain-bearing system started to affect the Kimberley region of Western Australia and adjacent western border regions of the Northern Territory on 19 June. Many parts of the eastern Kimberley district of WA and the Victoria River district of the Northern Territory received 25 mm or more for the 24 hours to 0900 on 20 June, with a few stations exceeding 50 mm. A number of sites had record daily falls for June (Table 4).

By 20 June rain extended across tropical Australia in a band extending from the Kimberley district, across most of the northern two-thirds of the Northern Territory and into most of tropical Queensland, although only light falls (less than 5 mm) occurred in Cape York Peninsula and the northern Top End. Falls were generally lighter than the previous day, with only small areas exceeding 25 mm for the day. This rain band, however, coincided with the peak of the penetration of the cold southerly airstream into the tropics, resulting in record low daily maximum temperatures for June (and, in many cases, for any month) across a vast area of the tropics. It was also notably cold in south-eastern Queensland and north-eastern New South Wales.

The rainband contracted eastwards on 21 June and was largely confined to Queensland, particularly the coast between Mackay and Townsville and adjacent inland. This region also became the focus of record low maximum temperatures. Further west over inland Queensland and the Northern Territory, maximum temperatures were still exceptionally low in many places, but mostly slightly higher than they had been the previous day. Conditions gradually moderated on the 22<sup>nd</sup> and 23<sup>rd</sup>, although temperatures remained generally below normal and some light rain persisted in places.

(There was further widespread rain on 25-26 June, with the heaviest falls in the Kimberley and eastern Queensland, but that event does not fall within the scope of this statement).

#### Extreme temperatures

Record low daily maximum temperatures for June were widespread throughout the tropics (Figure 2), except on Cape York Peninsula, the Pilbara and the Queensland coast north of Townsville. In total, 31% of the land area of Australia was analysed as having its lowest recorded daily maximum temperature for June (over the post-1941 period) on 20 June, and 7.1% (with some overlap) on 21 June. A total of 35 stations with 30 years or more of data had their coldest day on record (Table 1), and a further 29 set records for June (Table 2).

Maximum temperatures below 10°C were widespread on 20 June to an extent never previously seen in tropical Australia (Figure 3). Fourteen stations in the tropics failed to reach 10°C on that day (Table 3). There had only been twelve previous instances of days below 10°C in the tropics (all but one of them in the Northern Territory), no more than two on any one day<sup>1</sup>. Tennant Creek also failed to reach 10°C on 21 June, and set a new record for the northernmost<sup>2</sup> instance of a maximum temperature below 10°C in Australia (19°39' S).

The Monument, 130 kilometres SSE of Mount Isa, only reached 7.7°C on 20 June, the lowest daily maximum temperature recorded in the Australian tropics (the previous record was 8.2°C at Yuendumu (NT) on 5 August 1966).

It was also abnormally cold in south-eastern Queensland and north-eastern New South Wales, with a number of site records for June. Applethorpe set a new Queensland record low maximum temperature for June (4.9°C), breaking the previous record set in 2005. There were widespread light to moderate snowfalls on the central and northern NSW ranges, and light snow and sleet were reported at Toowoomba. Whilst there was some public speculation of possible snowfalls on high ground in central and northern Queensland, these would appear to be unlikely as the air mass in this region was virtually isothermal (no change of temperature with height) in the lower levels and the freezing level was near or above 3000 metres throughout the event, with temperatures fairly constant near 5°C in most of the layer below 3000 metres.

Mean daily maximum temperatures (Figure 4) for the period 19-22 June were 8°C or more below normal over the majority of tropical Australia, and 12°C or more below normal over a large part of the central Northern Territory.

To place the event in a slightly different perspective, occasionally there are events in which an extensive cloud-band with rain and a southerly surge of cool air, combine to produce exceptionally low maximum temperatures for the season within the tropics. Hitherto, the most notable events of this kind have occurred during the warmer months, meaning that the temperatures, whilst far below average, are higher than would be achievable in a winter event. Examples include the events of 24 February 1949 (17.2°C at Boulia, compared with a monthly mean of 37.5°C) and 18 November 1981 (11.0°C at Barrow Creek, compared with a monthly mean of 35.4°C).

### Rainfall

The rainfall during the event, which was a major contributor to the low temperatures, was also sufficient in many areas to be notable (Figure 5). Rainfall in June is low in the tropics away from the east coast, with monthly means below 10 mm in many regions and below 20 mm almost everywhere except the Queensland coastal fringe and the Pilbara.

Significant rain events in the tropics in June are rare but not unprecedented and, despite the low monthly means, many stations within the region have experienced monthly totals exceeding 100 mm. Notable historical wet Junes in various parts of the tropics have included those of 1912 (affecting Queensland), 1935 (Queensland and eastern NT), 1937 (western Queensland and eastern NT), 1941 (Kimberley) and 1973 (NT). However, the June 2007 event is notable for its remarkable east-west extent, extending through the full longitudinal range of the tropics from the Kimberley district to the Queensland coast. The most directly comparable winter month is July 1978, although the heaviest rain was a little further south in 1978 than in 2007. As a result of this recent event, combined with other rain events earlier in the month (especially in Queensland), a new record has been set for the wettest June in tropical Australia, with the area-averaged total of 46.9 mm (as of 27 June) exceeding the previous record of 39.1 mm set in both 1939 and 1973.

Daily record rainfalls from the event were confined to relatively limited areas, the most significant being in the east Kimberley (WA) and Victoria River (NT) districts for the 24 hours to 0900 on 20 June (Table 4). Some records were also set in the Mount Isa-Richmond region of Queensland on 18 June during the first part of the event.

### Notes

1. For the purposes of this analysis, the Tropic of Capricorn (Tropic) is taken to be at its current position of 23°26'22" S. The Tropic moves with wobbles in the Earth's axis (typically at a rate of 10-20 metres per year). Locations not currently within the tropics, i.e. on or south of the Tropic are not considered even if they may have been within the tropics at some point within the historical record (e.g. Longreach PO, which is less than 1 km south of the current position of the Tropic, which recorded a maximum below 10°C in 1908).
2. The previous record was at the old Tennant Creek PO site, 900 metres south of the present site.

### Further information

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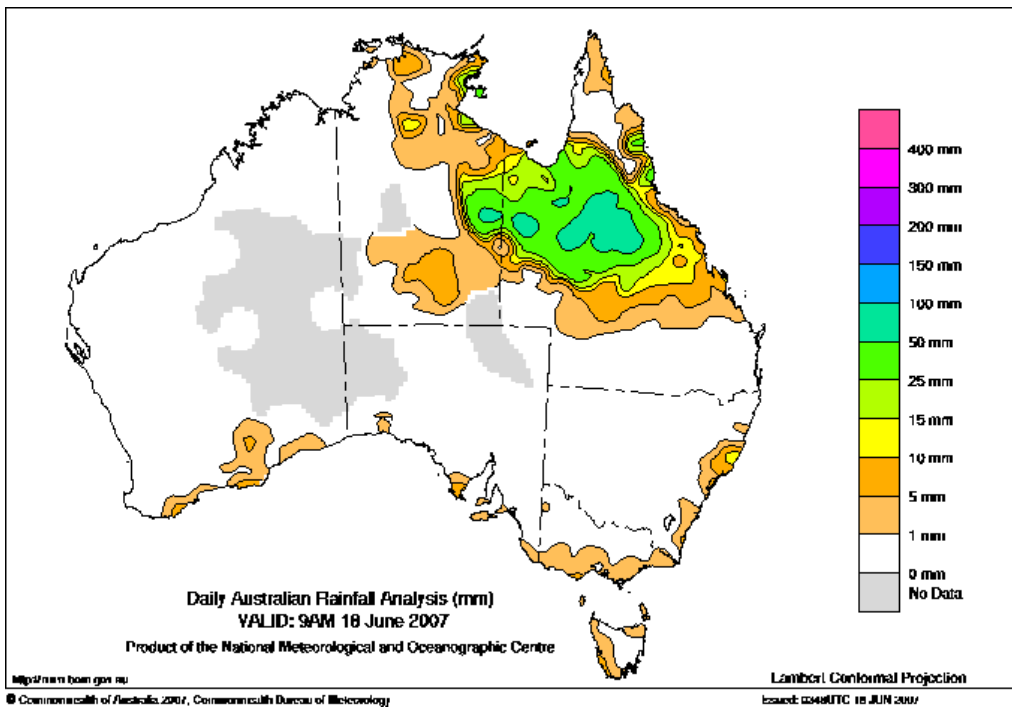


Figure 1. Daily rainfall for 24 hours ending 0900, 18 June 2007

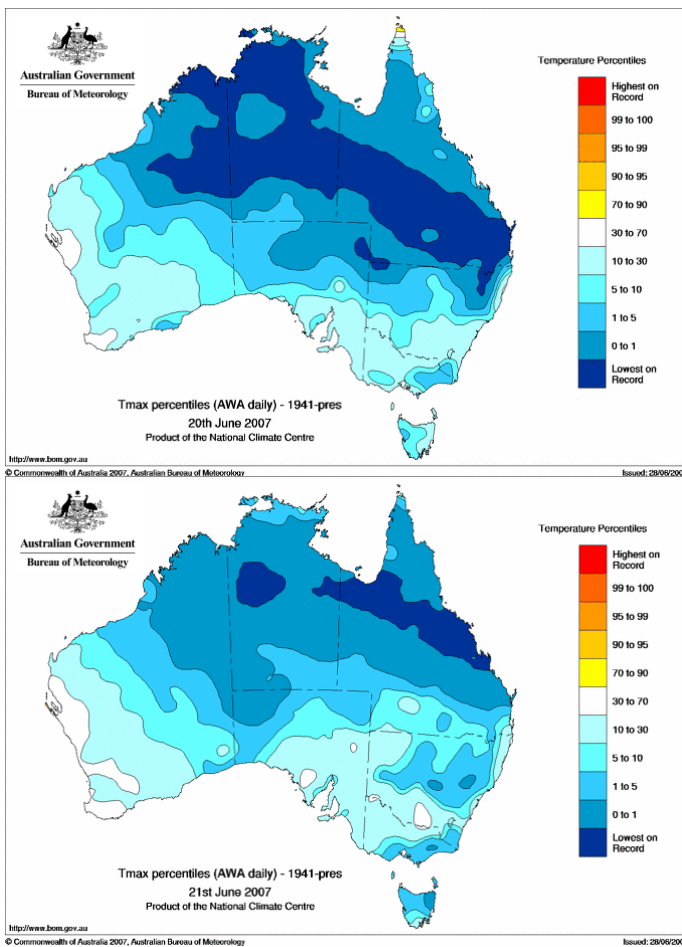


Figure 2. Areas with lowest maximum temperature on record for June on 20 (top) and 21 (bottom) June.

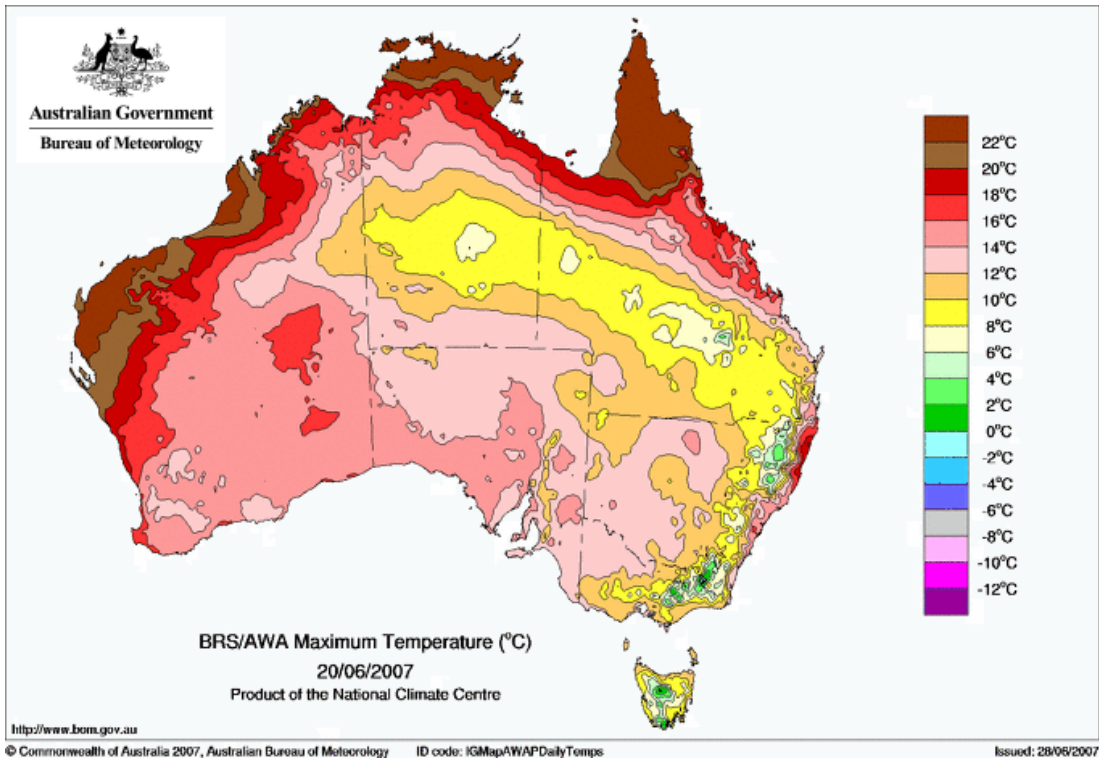


Figure 3. Daily maximum temperatures on 20 June.

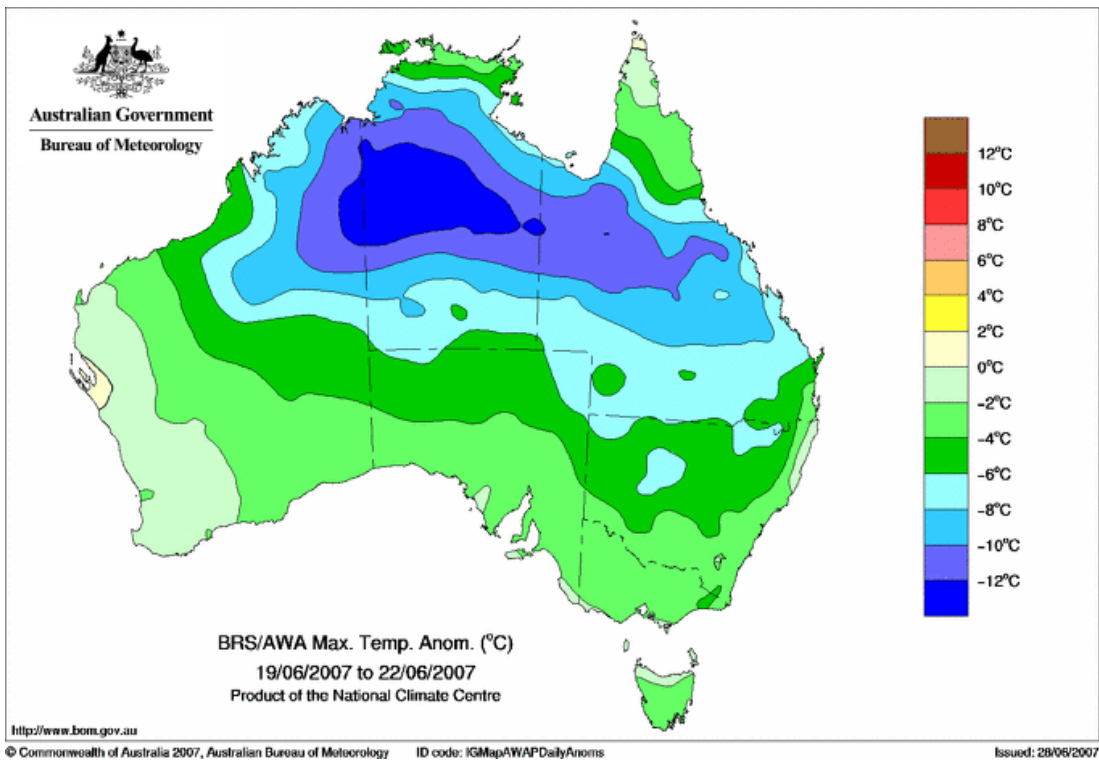


Figure 4. Maximum temperature anomalies for period 19-22 June.



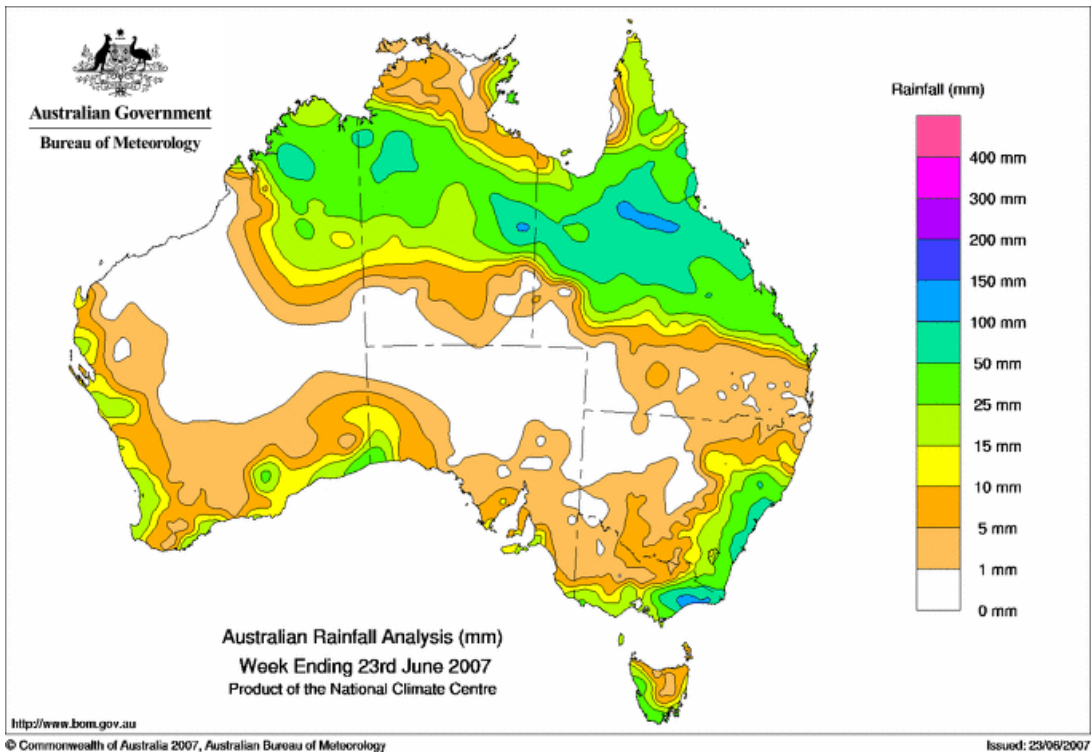


Figure 5. Rainfall for the period 17-23 June.

Station number	Station name	State	Value (°C)	Date	Previous record	Years of data
1013	Wyndham	WA	17.7	20 June	17.9	39
2032	Warmun	WA	15.3	20 June	16.8	45
14612	Larrimah	NT	14.9	20 June	17.4	43
14626	Daly Waters	NT	14.1	20 June	17.8	38
14703	Centre Island	NT	17.2	21 June	18.7	33
14704	McArthur River Mine	NT	17.2	20 June	21.2	30
14840	Wave Hill	NT	13.0	21 June	14.2	33
15085	Brunette Downs	NT	10.8	21 June	13.9	43
15135	Tennant Creek Airport	NT	8.0	20 June	12.8	38
15602	Jervois	NT	10.0	20 June	10.9	40
29012	Croydon	QLD	14.6	21 June	18.4	46
29039	Mornington Island	QLD	15.2	21 June	16.7	33
29090	Toorak Research Station	QLD	11.5	21 June	16.7	30
29127	Mount Isa Aero	QLD	9.4	20 June	13.0	41
32040	Townsville Aero	QLD	13.9	21 June	14.6	67
33002	Ayr DPI Research Stn	QLD	12.4	21 June	15.3	52
33013	Collinsville	QLD	11.0	21 June	13.4	50
33065	St Lawrence	QLD	11.9	21 June	12.8	51
33119	Mackay MO	QLD	11.8	21 June	15.0	48
35065	Springsure	QLD	9.2	20 June	12.0	43
35069	Tambo	QLD	7.3	20 June	11.3	51
35070	Taroom	QLD	9.6	20 June	10.2	51
35149	Brigalow Research Stn	QLD	10.5	20 June	12.5	36
36007	Barcaldine	QLD	7.8	20 June	13.8	45
36031	Longreach Aero	QLD	8.3	20 June	13.1	42
37010	Camooweal	QLD	9.8	20 June	12.2	68
37043	Urandangi	QLD	9.1	20 June	13.9	49
37051	Winton Post Office	QLD	9.6	20 June	12.2	51
38003	Boulia	QLD	9.0	20 June	11.1	118
38024	Windorah	QLD	10.6	20 June	13.8	40
39059	Lady Elliot Island	QLD	14.4	20 June	16.5	50
40043	Cape Moreton Lighthouse	QLD	12.3	20 June	13.2	51
40068	Double Island Point Lighthouse	QLD	11.6	20 June	14.7	47
40428	Brian Pastures	QLD	11.5	20 June	13.5	38
43015	Injune	QLD	8.9	20 June	9.9	40

**Table 1. Locations with 30 years or more of data which, in the period 19-21 June, had their coldest day on record (any month)**



Station number	Station name	State	Value (°C)	Date	Previous record	Years of data
1013	Kuri Bay	WA	20.8	20 June	24.2	38
2014	Kimberley Res. Station	WA	17.8	21 June	18.7	42
14015	Darwin Airport	NT	22.7	20 June	24.2	67
14825	Victoria River Downs	NT	15.1	21 June	16.6	42
15528	Yuendumu	NT	9.1	20 June	11.4	39
29004	Burketown Post Office	QLD	13.4	21 June	15.9	110
30045	Richmond Post Office	QLD	12.5	20 June	13.0	114
32078	Ingham	QLD	17.0	21 June	17.7	39
35019	Clermont	QLD	12.3	21 June	12.5	46
39004	Baralaba	QLD	11.3	20 June	13.3	38
39085	Sandy Cape	QLD	13.3	21 June	14.7	51
39104	Monto	QLD	10.6	20 June	11.1	35
40082	University of Qld Gatton	QLD	12.3	20 June	12.9	42
40093	Gympie	QLD	12.6	20 June	13.4	42
40126	Maryborough	QLD	11.9	20 June	13.9	51
40211	Archerfield Airport	QLD	13.5	20 June	14.4	33
40265	Redlands	QLD	13.2	20 June	13.6	42
41095	Stanthorpe	QLD	6.4	20 June	6.7	45
41175	Applethorpe	QLD	4.9	20 June	6.0	38
43020	Mitchell Post Office	QLD	9.4	20 June	11.1	38
43035	Surat	QLD	10.1	20 June	12.0	46
44010	Bollon	QLD	9.5	20 June	11.1	51
45015	Quilpie Airport	QLD	10.1	20 June	11.8	51
48027	Cobar MO	NSW	6.6	19 June	7.7	46
49019	Ivanhoe Post Office	NSW	8.2	19 June	8.3	47
54104	Pindari Dam	NSW	8.5	20 June	9.4	34
56011	Glen Innes Post Office	NSW	3.7	20 June	4.3	46
56013	Glen Innes Ag Research Stn	NSW	3.5	20 June	4.3	35
56018	Inverell Research Centre	NSW	6.5	20 June	7.3	42

**Table 2. Locations with 30 years or more of data which, in the period 19-21 June, had their coldest June day on record (in addition to those listed above)**

Station number	Station name	State	Value (°C)	Date	Latitude (deg S)
15135	Tennant Creek Airport	NT	8.0	20 June	19.64
15135	Tennant Creek Airport	NT	9.9	21 June	19.64
15502	Ali Curung	NT	8.0	20 June	21.00
15528	Yuendumu	NT	9.1	20 June	22.26
15643	Territory Grape Farm	NT	9.3	20 June	22.45
15666	Rabbit Flat	NT	9.7	20 June	20.18
29127	Mount Isa Aero	QLD	9.4	20 June	20.68
36031	Longreach Aero	QLD	8.3	20 June	23.44
37010	Camooweal	QLD	9.8	20 June	19.92
37034	The Monument AP	QLD	7.7	20 June	21.81
37036	Trepell AP	QLD	8.9	20 June	21.84
37039	Winton AP	QLD	9.1	20 June	22.36
37043	Urundangi	QLD	9.1	20 June	21.61
37051	Winton PO	QLD	9.6	20 June	22.39
38003	Bouli	QLD	9.0	20 June	22.91

**Table 3. Tropical locations recording maxima below 10°C during period 20-21 June.**

Station number	Station name	State	Value (mm)	Date	Previous record	Years of data
2020	Moola Bulla	WA	40.0	20 June	38.6	93
14815	Waterloo	NT	32.0	20 June	21.0	89
14825	Victoria River Downs	NT	56.4	20 June	20.8	116
14042	Oenpelli	NT	71.4	18 June	31.8	95
29090	Toorak Research Station	QLD	66.7	18 June	54.2	51
29126	Mount Isa Mine	QLD	65.4	18 June	49.5	73
30019	Gilberton	QLD	66.0	18 June	48.0	88
36172	Gue	QLD	39.0	18 June	26.0	67

**Table 4. Locations with 50 or more years of data which had their wettest June day on record in the period 18-22 June**