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Bureau of Meteorology

Special Climate Statement 67—an extreme heatwave on the tropical Queensland coast

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Table of contents

Introduction	4
1. Evolution of the heatwave	6
2. Meteorological drivers	10
2.1. Large scale drivers	10
2.2. Synoptic evolution	10
3. Impacts	13
3.1. Heatwave index	13
3.2. Fire weather	14
3.3. Other impacts	16
4. Temperature records	17
5. Previous notable events	18
6. Temperature records at individual locations	22
Maximum temperature records	22
Daily maximum temperatures	24
Daily minimum temperatures	26
Record consecutive days over 35 °C	27
Record consecutive days over 38 °C	28
Record consecutive days over 40 °C	29
References and further information	30

Introduction

A heatwave affected the north tropical and central coasts of Queensland from 24 November 2018. Numerous locations reported their highest daily maximum temperature on record for November, or for any month, with some locations breaking their previous record by a large margin.

A deep low to the east of southern New South Wales directed a warm and dry westerly airflow across Queensland, enabling several days of well above average maximum and minimum temperatures. Extreme heatwave conditions were observed in an area from Lockhart River to Shoalwater Bay on the Capricornia coast, extending to adjacent inland districts. Strong westerly winds, high temperatures and low humidity brought elevated fire danger.

High temperatures became established around the central coast of Queensland from 24 November, with the anomalous warmth extending to the north tropical coast by the 25th. Extremely hot days exceeding 40 °C occurred on the 26th around Cooktown, Cairns, Innisfail, Townsville (Mt Stuart), Proserpine and Mackay (Racecourse). Townsville (Mt Stuart) recorded the highest daily maximum temperature in this event, reaching 45.2 °C on the 26th. The anomalous heat was confined to the north tropical coast on the 27th, with both Cairns Aero and Cooktown recording two consecutive days above 42 °C on the 26th and 27th. By the 28th, the heat encompassed an area from around Cooktown, south to Gladstone, with Rockhampton reporting a daily maximum temperature of 44.4 °C, and Yeppoon reaching 42.2 °C. It was the third day in a row that Cooktown, Cairns and South Johnstone recorded daily temperatures in excess of 40 °C and the third consecutive day that Proserpine recorded temperatures above 43 °C. By the 29th, the peak of the heat had eased, but numerous high daily temperature records were still broken. Cairns Aero reached 38.8 °C on the 29th—the fourth day in a row that the site had broken its previous November maximum temperature record.

While overnight records were less common, minimum temperatures were still very much above average, providing no meaningful overnight relief from the heat. Record-warm nights for November occurred at Innisfail (28.3°C), South Johnstone (27.9 °C) and Collinsville (26.9 °C) on the 28th and at Cooktown (28.5 °C) and Low Isles Lighthouse (27.8 °C) on the 29th.

Figures 1 and 9 show locations where new high temperature records were set, and tables 1 to 7 list records at particular locations.

Day to day variability in maximum daytime temperature is smaller along the along the Queensland coast than it is further inland or in southern states. Hence, the departures from average, and the degree to which previous records were broken, is very significant with respect to the local climate along the north tropical and central Queensland coast. Such extreme maximum daytime temperatures and low humidity are typically associated with fire activity in southern states, and this event saw extreme fire weather and bushfires more typical of southern fire prone regions, and less typical of tropical Queensland.

Special Climate Statement 67—an extreme heatwave on the tropical Queensland coast

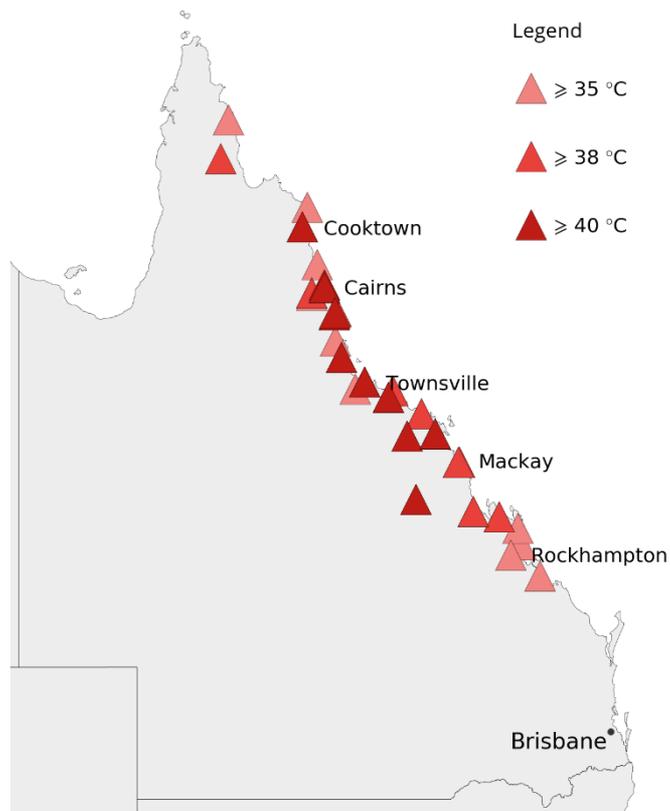
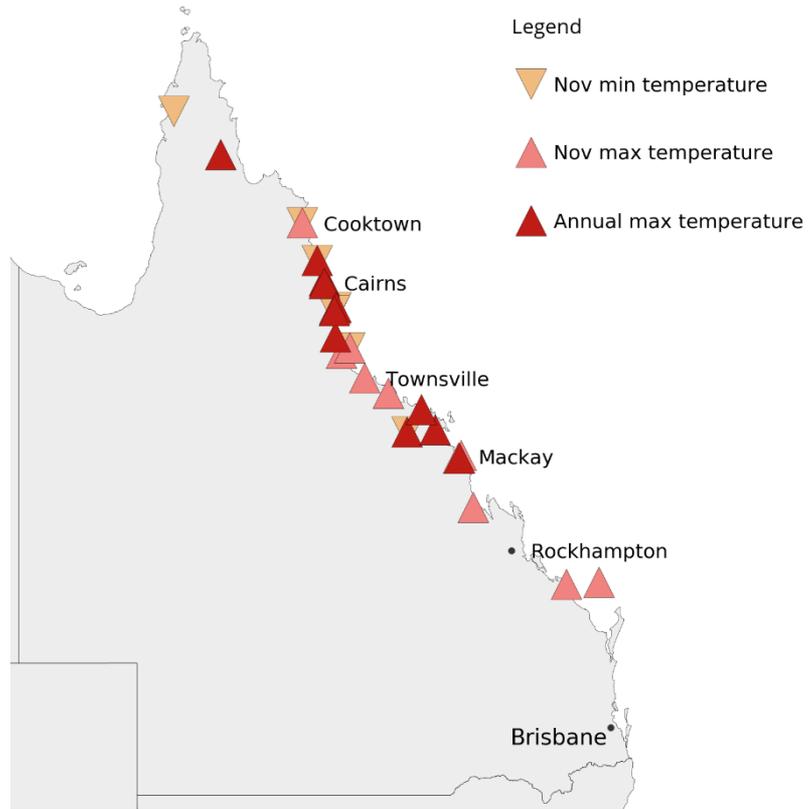


Figure 1: Locations that set new records for high temperature (top) or runs of consecutive November days above various temperature thresholds (bottom) during the event.

1. Evolution of the heatwave

Maps of daily maximum temperature can be seen in figure 2 and maps of daily minimum temperature can be seen in figure 3.

25 November

Maximum temperatures on the 25th were more than 6 °C above average for a large area from near Cooktown on the north tropical coast, south to around Gladstone, extending into northern and southern inland districts. It is unusual to have such large temperature anomalies in these areas.

Minimum temperatures to 9 am on the 26th were more than 2 °C above average for most of the northern half of Queensland

26 November

Extreme heatwave conditions persisted along the east coast from Lockhart River to Shoalwater Bay in central Queensland, and extended to inland districts of the north tropical coast and Atherton Tablelands, and much of the Cape York Peninsula from the 26th.

Maximum temperatures on the 26th were more than 8 °C above the November average along the State's east coast from Cooktown to St Lawrence. Locations with maximum temperatures more than 6 °C above the long-term November average extended from Lockhart River on the Cape York Peninsula, south to Yeppoon, and inland to the Northern Goldfields and eastern parts of the Central Highlands districts. Several locations had their highest daily maximum temperature on record for any month on the 26th, including Cooktown (42.8 °C), Cairns Aero (42.6 °C) and Proserpine Airport (44.9 °C). Mt Stuart (south of Townsville) recorded the highest temperature during this event, and for any Queensland location in November 2018, reaching 45.2 °C on the 26th.

The 45.2 °C at Mt Stuart and Proserpine's 44.9 °C both exceeded Birdsville's highest temperature for the month (44.3 °C). Birdsville, in the far southwest corner of Queensland, is often the State's hottest location during spring and summer.

27 November

From 27 November, the area of extreme heatwave conditions contracted further eastwards to the coastal fringe whilst still covering a similar total area to that on the 26th.

Maximum temperatures on the 27th were more than 10 °C above average around Cooktown, Cairns and Townsville, with large swathes of the north tropical and central coasts of Queensland recording more than 6 °C to 8 °C above average. This continued a run of extremely hot days along the north tropical and central Queensland coasts. Cairns reached 42.1 °C on the 27th, giving two consecutive days above 42 °C; the first time consecutive days above 40 °C had been recorded at this location. Cooktown reached 43.9 °C on the 27th, a new daily maximum temperature record for any month, while South Johnstone (42.2 °C) and Innisfail Aero (42.3 °C) also exceeded 42 °C for the first time in any month.

Minimum temperatures to 9 am on 28 November were more than 2 °C above the November average across most of Queensland away from the southwest, with areas in the northern interior of the State more than 6 °C above average.

28 November

Extreme heatwave conditions contracted further to the far northeast coast from the 28th, but were also observed around Shoalwater Bay on the Capricornia coast. Severe heatwave conditions were observed along most of the east coast north of Gladstone.

Maximum temperatures were more than 12 °C above the November average around central Queensland, encompassing St Lawrence, Rockhampton and Yeppoon. Yeppoon's daily maximum temperature of 42.2 °C on 28 November was the highest temperature for any month at this location. Rockhampton reached 44.4 °C and although it was not a November record, the combination of strong westerly winds, and very low humidity resulted in catastrophic fire danger ratings. It was the first time Rockhampton Airport had recorded catastrophic fire danger conditions since the implementation of the current Queensland fire danger rating system in 2010, with the conditions lasting three and half hours, from about 1:30 pm to 5:00 pm.

Minimum temperatures to 9 am on the 29th were more than 2 °C above average across most of the Cape York Peninsula and along the east coast south to Gladstone.

29 November

From 29 November, extreme heatwave conditions were confined to far eastern parts of Cape York Peninsula, while severe heatwave conditions persisted around the Capricornia district, Townsville and north of Cairns.

Maximum temperatures between 6 °C and 8 °C above the November average were recorded from Lockhart River south to around Bowen, and also around Sarina to Gladstone. On the 29th, Cairns Aero experienced its fourth consecutive day above 38 °C. As the previous highest daily November maximum temperature was 37.2 °C on 15 November 1971 at Cairns Aero and 20 November 1900 at Cairns Post Office, this also meant that the Cairns city maximum temperature record had been exceeded four days in a row. Cooktown also had a record run of four consecutive days above 40 °C from 26 to 29 November. Previously, Cooktown had not recorded even two consecutive days above 40 °C.

Minimum temperatures to 9 am on the 30th returned to near average in northern Queensland, and cooler than average for most remaining parts. The strong westerlies had eased by this time, allowing for cooler, onshore flow.

30 November

Extreme heatwave conditions had eased from 30 November, although heatwave conditions continued to affect most of eastern and northern Queensland

Maximum temperatures on the 30th were still more than 6 °C above the November average around Cairns, along the coast from around Townsville to Bowen extending to adjacent inland districts, and from around Rockhampton to St Lawrence. Although no further daily maximum temperature records were set, the consecutive run of hot days in parts of eastern Queensland culminated in a number of key locations recording their warmest November mean maximum temperature on record, including Cairns, Mackay, Proserpine, Rockhampton and Yeppoon.

Heatwave conditions shifted to the northwest in the first week of December: Normanton reached 43.9 °C on 4 December, the highest temperature ever recorded there at any time of year.

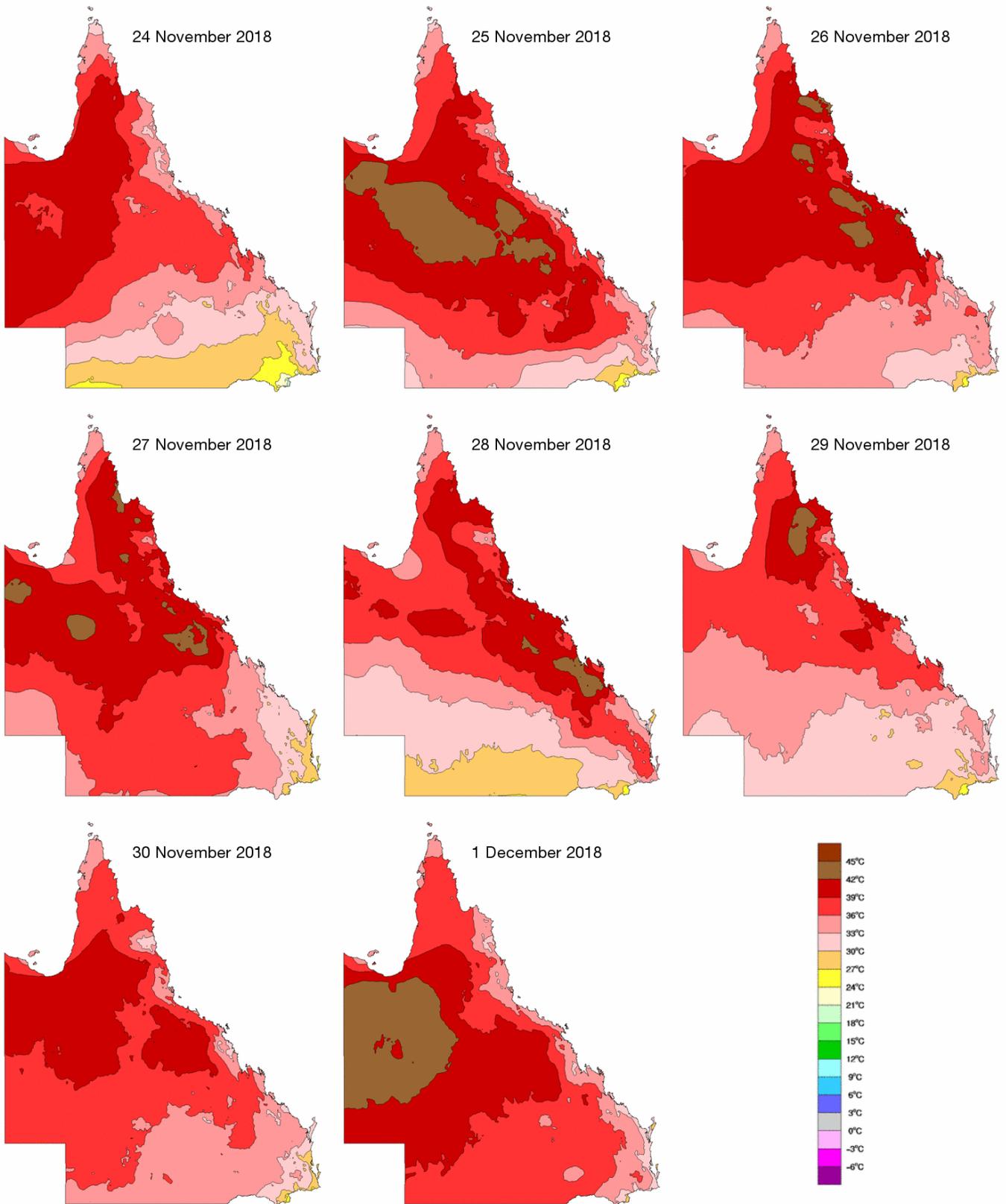


Figure 2: Daily maximum temperature for Queensland, for the days from 24 November to 1 December 2018

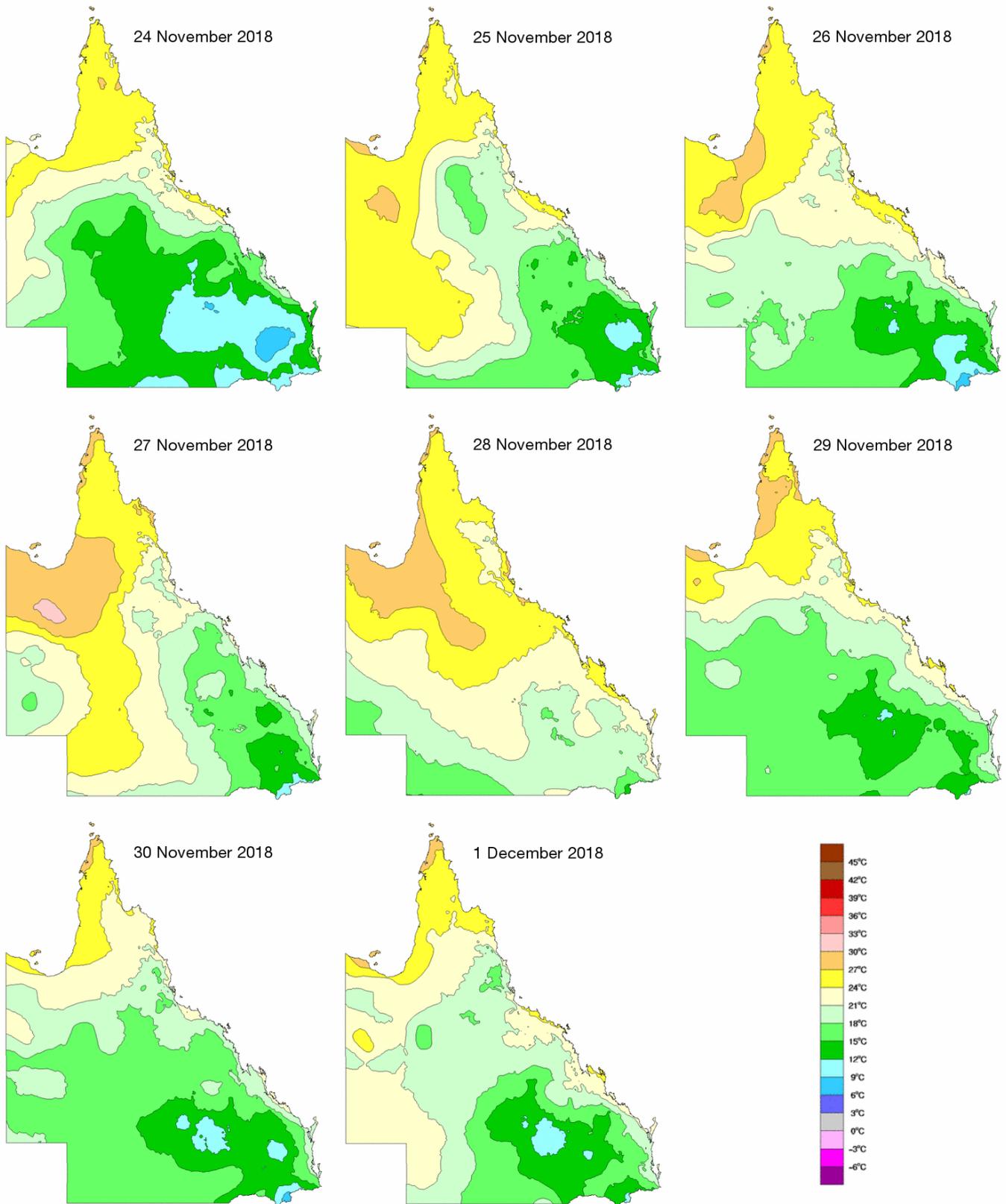


Figure 3: Daily minimum temperature for Queensland, for the days from 24 November to 1 December 2018.

2. Meteorological drivers

2.1. Large scale drivers

In terms of the seasonal climate setting for the extreme temperatures, it is generally instructive to look at the state of large-scale ocean climate drivers, such as the El Niño–Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD). Historically, ENSO is the primary climate influence on temperatures (as a departure from average or anomaly) across Queensland during spring. The tropical Pacific Ocean has seen sea surface temperature patterns that are El Niño-like during the latter half of 2018, but these had not caused shifts in atmospheric circulation that are more typical of El Niño events at this time of year, and an event has not been declared by the Bureau of Meteorology at the time of writing this report. While a positive Indian Ocean Dipole was underway at the time of the heatwave, the IOD is typically not a strong influence on anomalous maximum temperatures over coastal Queensland during November.

Sub-seasonal weather and climate drivers have likely been more significant in the meteorological set up associated with the heatwave. Perhaps most significantly, a pulse of the Madden–Julian Oscillation (a fluctuation of cloud and rainfall which moves over tropical parts of the globe), appears to have partly contributed to the establishment of a broadscale westerly wind-flow across northern Australia during late November.

The most notable antecedent conditions have been the lack of rainfall along relevant parts of the coast, leading to drier soils favouring hotter daytime temperatures. Rainfall across eastern Queensland for the first ten months of 2018 had been near average in the northern half and well below average south of about Townsville. During the previous three months, rainfall had been average to below average across eastern Queensland. This was generally reflected in upper-layer soil moisture: north of about Cardwell, soil moisture in near-coastal areas was predominantly below average.

Background warming trends have also likely influenced the degree of record-setting experienced for this event. Above-average day and night-time temperatures had been a feature throughout Queensland during 2018, consistent with the trend of recent years. Temperatures in the days preceding the heatwave were above average, particularly during the daytime when much of coastal Queensland had maximum temperatures at least 4 °C above average. Further inland, maximum temperatures were more moderate, as widespread rainfall across the State between 21 and 23 November led to below-average temperatures, particularly in southwest Queensland.

2.2. Synoptic evolution

The daily mean sea level pressure (MSLP) analyses for the period from 23 to 30 November (figure 4) show a series of cut-off low pressure systems over southeastern Australia, driving a strong, deep southwest to westerly flow over Queensland. A wind flow with such a trajectory is typically associated with warmer than normal conditions across coastal Queensland as hot, continental air is transported from inland northern Australia. Offshore winds at coastal locations also lead to a delay in the onset of sea breeze conditions which usually develop each afternoon and typically have a cooling effect. At this time of the year, with solar radiation nearing its maximum, the longer a sea breeze is delayed, the more surface heating can occur and the higher maximum temperatures will be.

From 24 November, widespread rainfall over Queensland had stopped and a dry west to southwest flow developed over the State. This wind was synoptically driven by a deep low over the Tasman Sea. A similar synoptic pattern was apparent over the following days and maximum temperatures increased as a warm air mass over Queensland intensified, whilst there was no significant rainfall.

By the 25th, when a deep westerly flow had become established over Queensland, coastal locations including Cairns, Townsville and Mackay, which historically are dominated by easterly winds, were experiencing periods with uncharacteristic westerly winds. The offshore flow maintained warmer than normal conditions and also led to delayed sea breezes.

Winds from the western quadrant are rare in November in coastal tropical Queensland. The frequency of 9am westerly winds (from directions between 220 and 320 degrees) for the 20 years from 1998 to 2017 is 3% of days at Cairns and Townsville, and 2% at Mackay. During this event, such winds occurred on three days at each of Cairns and Townsville, and two days at Mackay. Cairns also recorded a wind from the western quadrant at 3 pm on 27 November, only the second time since 1999 that this wind direction had been observed at this site at 3 pm during November.

As the cut-off low that was first observed over southeast Australia on the 24th drifted further east over the Tasman Sea on the 26th, a second low pressure complex developed over New South Wales on the 27th. This reinforced the synoptic westerly flow and helped to maintain the hot conditions over Queensland. To the west of this low pressure system, cooler air associated with a developing high pressure system over the Great Australian Bight started to move into southeastern Australia.

By the 28th, cooler air had moved into southwestern Queensland, aided by the southerly windflow on the western flank of the low located over New South Wales. Temperatures continued to be above average over coastal Queensland, however the warm temperature anomalies were steadily decreasing as the hottest air continued to erode and inland temperatures fell.

On the 29th, the low pressure system had moved off the coast and over the Tasman Sea. At the same time, the high pressure system over southern Australia had tracked further east and directed a southerly flow into Queensland. Cooler air affected much of Queensland away from the near-coastal zone. While uncharacteristic westerlies still affected coastal locations along much of coastal Queensland, and maximum temperatures continued to be significantly above average, the extreme heat over the broader region had weakened such that record temperatures were no longer observed.

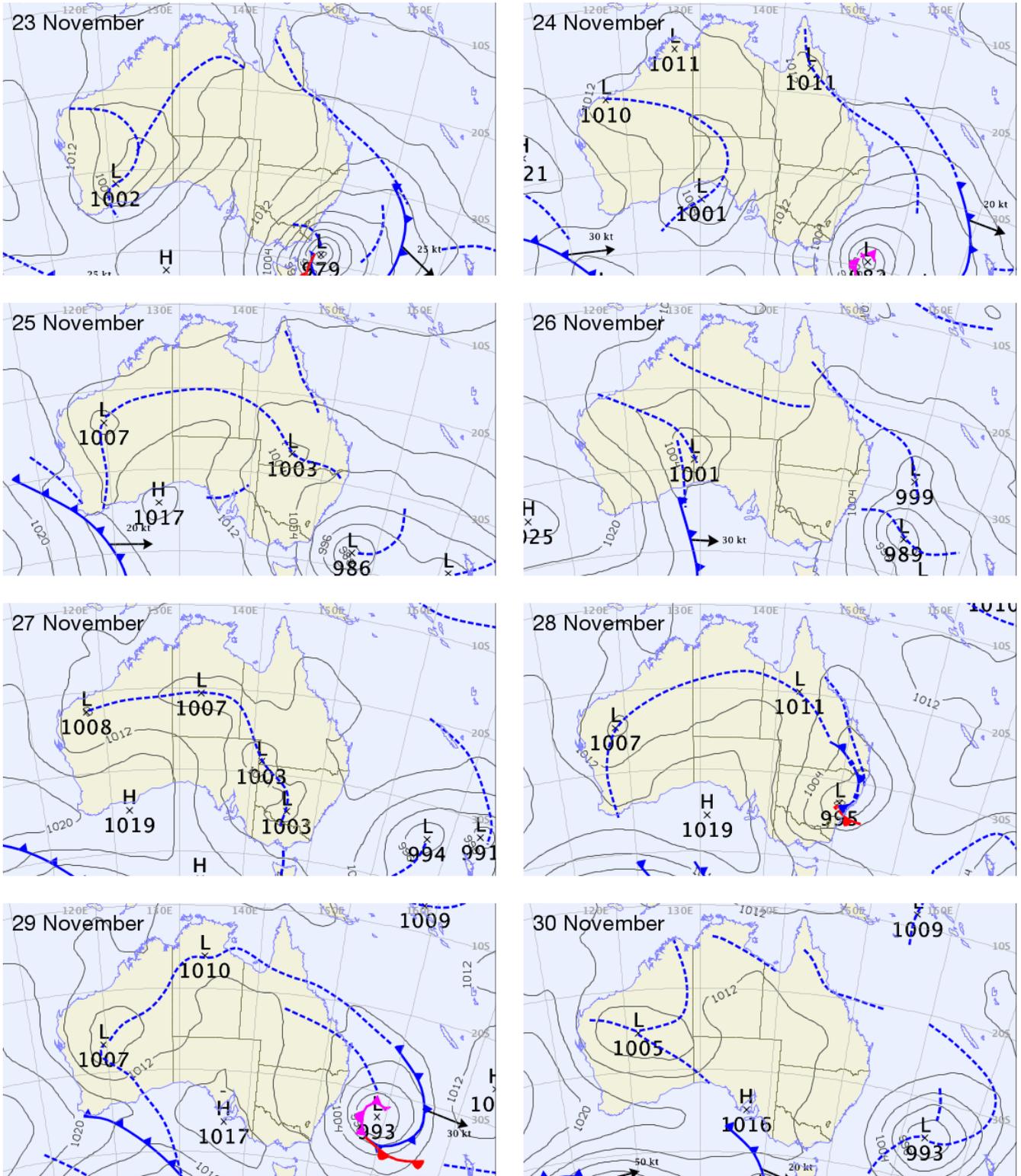


Figure 4: Mean sea level pressure analyses for late November 2018, each at 10 am AEST.

3. Impacts

3.1. Heatwave index

Persistent, high daytime temperatures, combined with very high overnight temperatures, created severe heatwave conditions over and near the tropical Queensland coast from 23 November.

Figure 5 shows the highest heatwave severity category¹ attained during the event. The areas affected by the extreme heatwave encompassed from around Lockhart River in the far north of Cape York Peninsula to the Capricornia coast near Yeppoon, extending to tropical inland districts. Most of northern and eastern Queensland experienced a low intensity heatwave during this period, while much of the far north tropical to central coasts, and adjacent inland districts, experienced a severe heatwave.

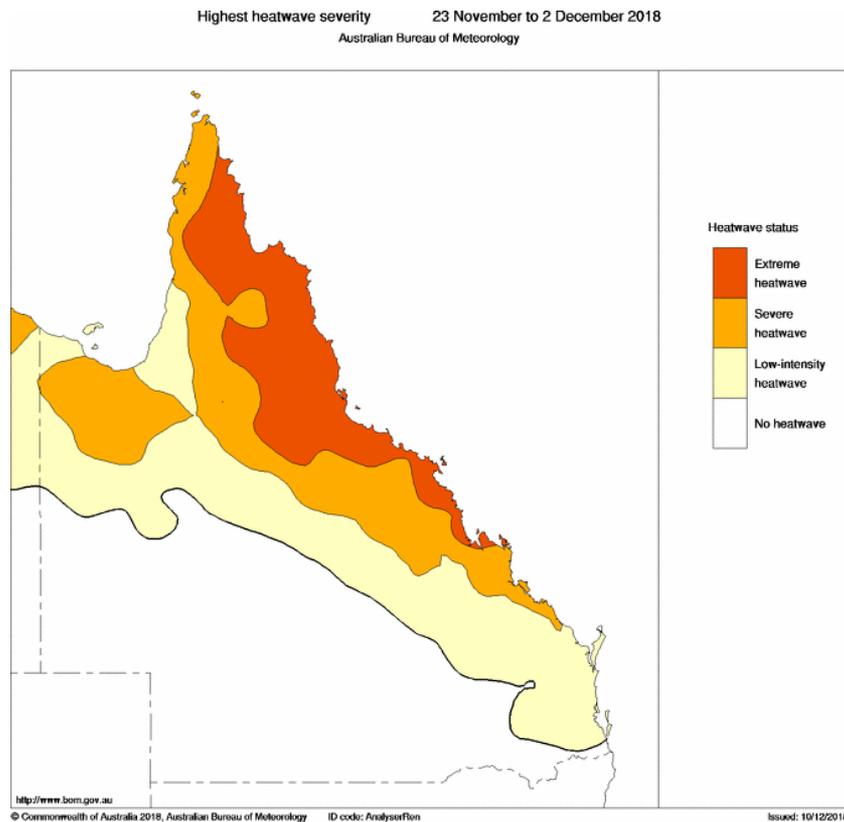


Figure 5: Maximum heatwave severity category during the event.

¹ Nairn and Fawcett 2015

3.2. Fire weather

High temperatures, low humidity and strong westerly winds, coupled with recent dry conditions, led to elevated fire danger across much of Queensland. The measured Macarthur forest fire danger index (FFDI) was extreme (over 75) across large parts of the State, and reached "catastrophic" levels (100 or above) at some locations; for example Rockhampton Aero reached a peak FFDI over 130 (see figure 6).

Figure 7 shows the maximum FFDI during the last week of November 2018, based on a daily gridded model². Individual locations may have reached higher values. For some areas, this was the highest November FFDI in the gridded dataset, which extends back to 1950.

As with surface temperature, Australia has seen trends in fire danger indices in recent decades². In particular, the annual accumulated FFDI (a sum of FFDI across the year) has been increasing across most of eastern Australia, including Queensland. The trend in accumulated FFDI captures both an increase in the frequency and severity of dangerous fire weather conditions.

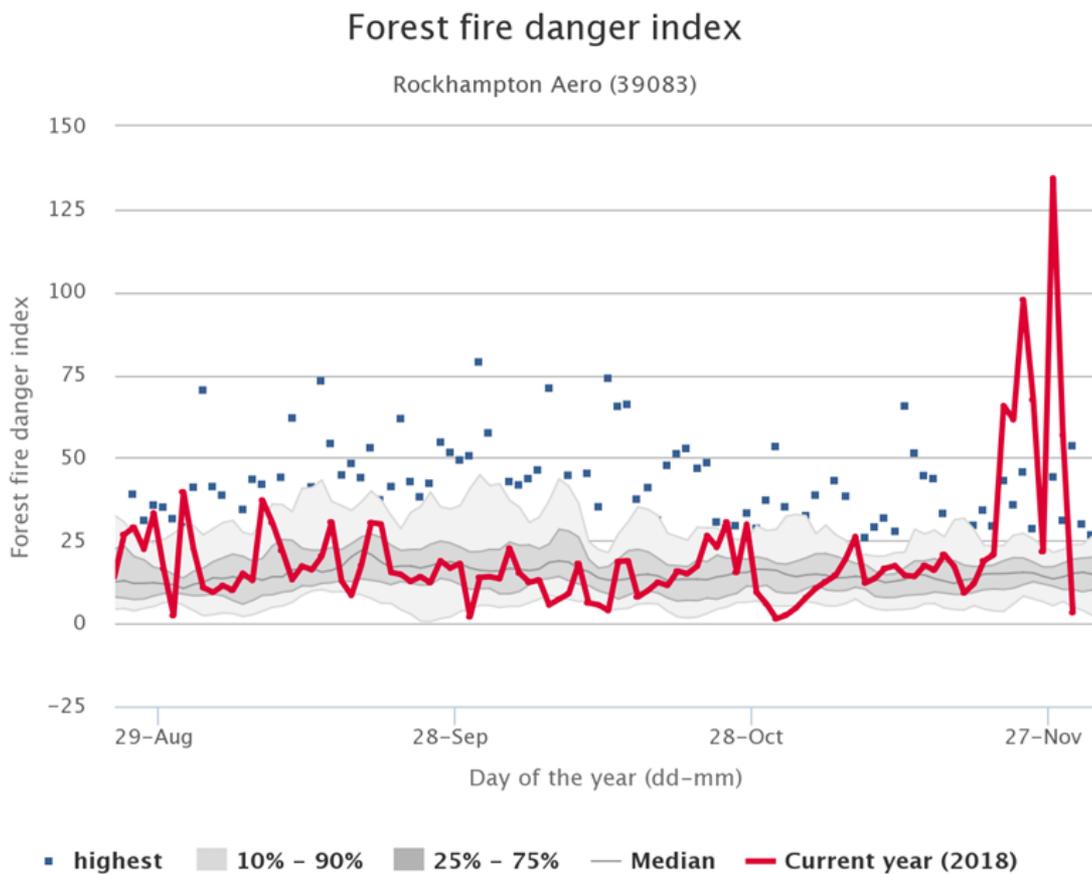


Figure 6: Daily highest forest fire danger index at Rockhampton Aero between late July and late November 2018, based on FFDI calculations from available 1-minute data. The blue dots indicate the previous highest value for that day of the year. Values have fallen in the light grey area on that day in 80% of the previous 18 years.

² Dowdy, 2018

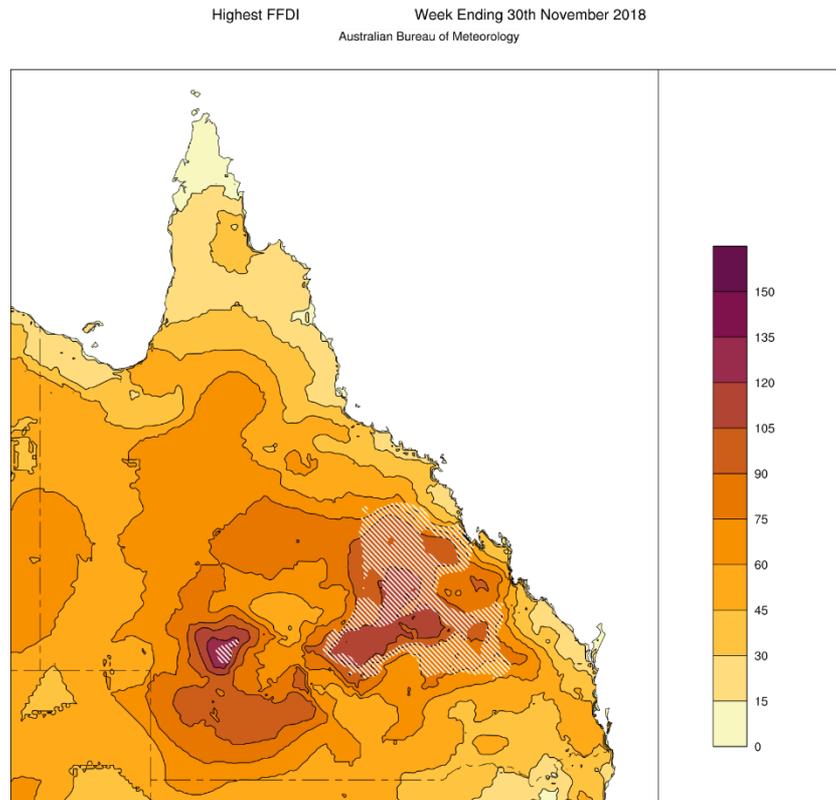


Figure 7: Maximum forest fire danger index (FFDI) between 24 and 30 November 2018, from gridded data. The hatched area shows where this was the highest November value recorded in the dataset, which starts in 1951.

Numerous fires started or flared during the heatwave event. Figure 8 shows the approximate area burnt between 25 and 30 November.

Queensland Fire and Emergency Services (QFES) reported that about 130 bushfires were being attended to in Queensland by 28 November, with over 716 000 ha burnt between 26 and 30 November³. On the 30th there were still 105 fires still burning, and by 6 December over one million hectares had been burnt. Up to 800 residents of Deepwater were urged to evacuate on 26 November, and on the 28th around 4000 residents of Gracemere were evacuated.

QFES, with the assistance of the Queensland Reconstruction Authority (QRA), undertook damage assessments in 35 suburbs across eight local government areas (Central Highlands, Gladstone, Isaac, Livingstone, Mackay, Rockhampton, Whitsunday and Cassowary Coast). Nine dwellings were identified as destroyed and an additional eight damaged, along with dozens of sheds and other structures. Various degrees of damage to crops, horticulture and livestock were also noted.

³ The information and data provided by Queensland Fire and Emergency Services (QFES) relative to the subject event is, to the best of the knowledge of QFES, complete as at the date of provision however no warranty can be provided or construed relative to the completeness of such information

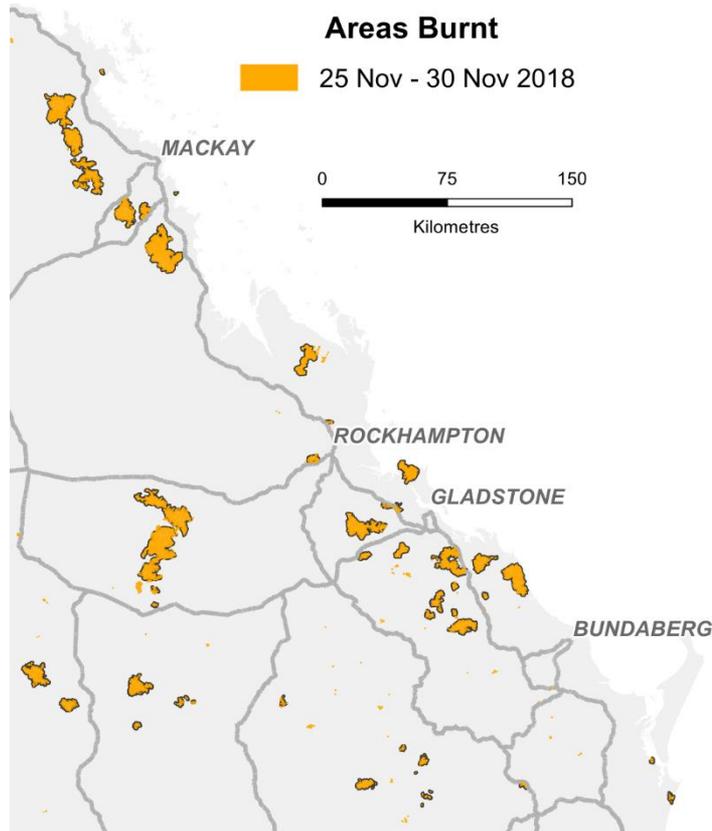


Figure 8: Some of the areas burnt between 25 and 30 November 2018, based on a combination of satellite data and aerial surveys. Prepared by Queensland Fire and Emergency Services.

3.3. Other impacts

There were many direct and indirect impacts of the heatwave, including some on human health. On 26 November, Queensland paramedics attended more than 9% more incidents than on the same day in 2017, including 25 heat-related cases⁴.

There were reports of more than 4000 spectacled flying foxes dying due to heat stress around Cairns, following two consecutive days of above 42 °C in the area. These particular flying foxes are endemic to the Cairns region. Flying fox deaths have been noted in Sydney, Brisbane and Melbourne during previous heatwaves.

⁴ Media statement on 28 November 2018 by the Minister for Health and Minister for Ambulance Services, The Honourable Steven Miles, statements.qld.gov.au/Statement/2018/11/28/queenslanders-urged-to-prepare-for-extreme-weather-events

4. Temperature records

New high temperature records for November, and in some cases for any month, were set at several locations in tropical coastal Queensland late November 2018, as were records for consecutive days above various high temperature thresholds (see figure 1).

This is also apparent in gridded analysis (figure 9), which shows that in some cases the records were broken by over 2 °C. Areas around Cairns and Proserpine show the largest margin, with the previous November record exceeded by more than 4 °C. Areas around Coen, Cooktown, Innisfail to Townsville, Bowen to Sarina, and around St Lawrence exceeded the previous record by 1.5 °C or more. The standard deviation of November daily maximum temperature in tropical coastal Queensland is typically around 1.5 to 2.5 °C, so anomalies this large are highly unusual.

The map is based on gridded analysis, so individual locations may have been warmer: list of records at individual locations are given in tables 1 to 7.

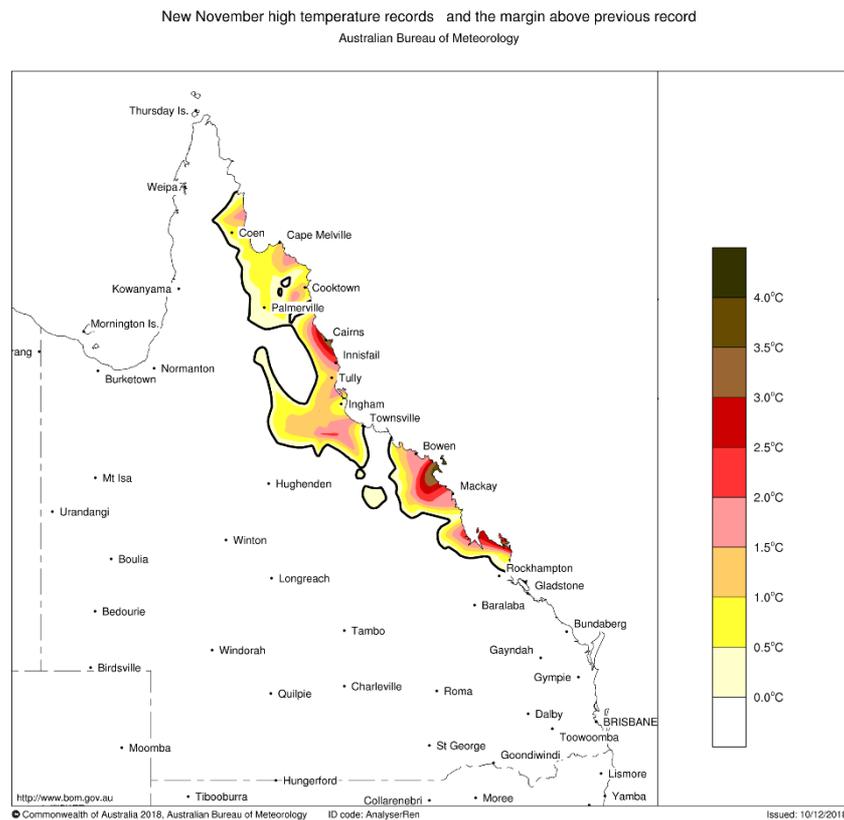


Figure 9: Areas in the gridded analysis which set a new record-high November temperature between 25 and 29 November 2018, and the margin by which the previous record was exceeded.

5. Previous notable events

Heatwaves are not uncommon in Queensland, with most parts of the State having around three heatwaves each year on average⁵. Nonetheless, the November 2018 event ranks as a significantly severe and long-lived heatwave in the area affected. There was a noteworthy heatwave in November 1990, but the highest temperatures in coastal tropical Queensland tend to be between December and January; other noteworthy heatwaves in the area include December 1995, January 1994 and February 1969.

A common thread to all these events was westerly or southwesterly winds bringing hot air from the inland to the coast, as also occurred in November 2018. These winds, which are rare in tropical Queensland at this time of year, were associated with strong low pressure systems to the south, although the locations of those systems varied widely (for example, inland southern Queensland in 1969, south of the continent in 1994, and off the south coast of New South Wales in 1995), with the 1995 event the closest analogue to 2018 from a synoptic perspective. Extreme heat, although not as extensive as in the events above, has also occurred in the region in the circulation on the western or northern side of tropical cyclones (for example, Cardwell's hottest night on record occurred on 28 March 2017 during the approach of tropical cyclone *Debbie* to coastal areas further south). Another feature common to these events, except for 1990, is that the most significant extremes occurred on the coast, with records largely confined to the coastal region and inland areas generally experiencing a low- or medium-intensity heatwave.

February 1969

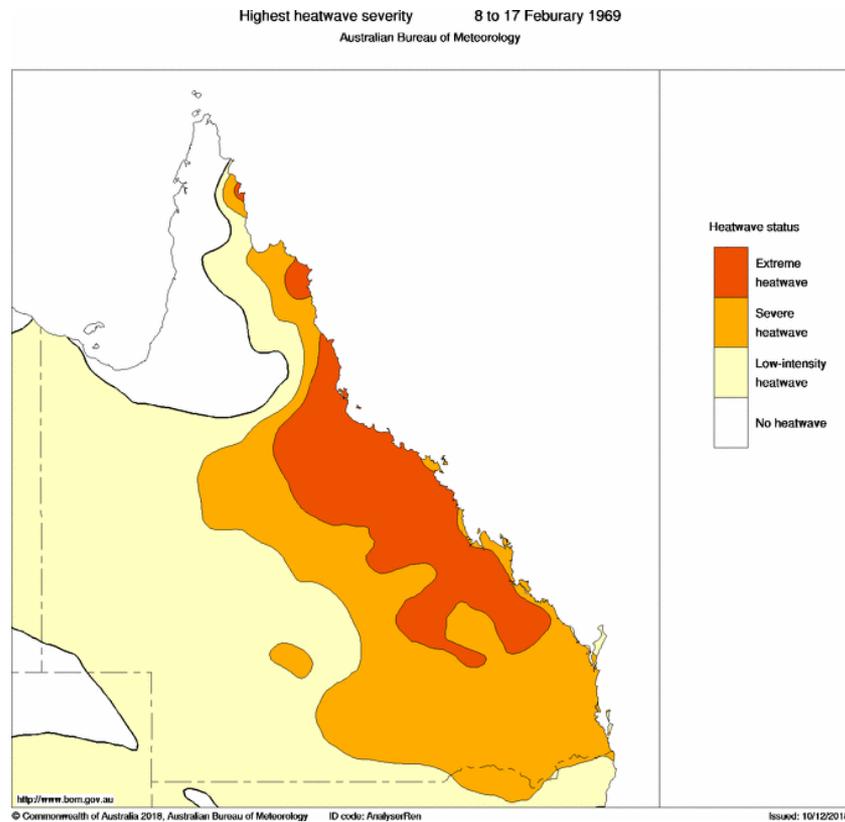


Figure 10: Maximum heatwave severity category during the February 1969 event

⁵ Nairn and Fawcett, 2016

Extreme heat affected many parts of the coastal region from 11 to 13 February. February records included 38.9 °C at Cairns on the 12th, 42.7 °C at Townsville on the 13th (the second-highest for any month) and 43.3 °C at Rockhampton on the 11th. The highest temperature during the event was 44.4 °C at Millaroo, south of Ayr.

This event was associated with a deep low over inland eastern Australia near the border between Queensland and New South Wales, which brought heavy rain on its southern side to much of New South Wales. This event occurred during a severe drought; the 1968–69 wet season (November to April) was Queensland's third-driest on record.

November 1990

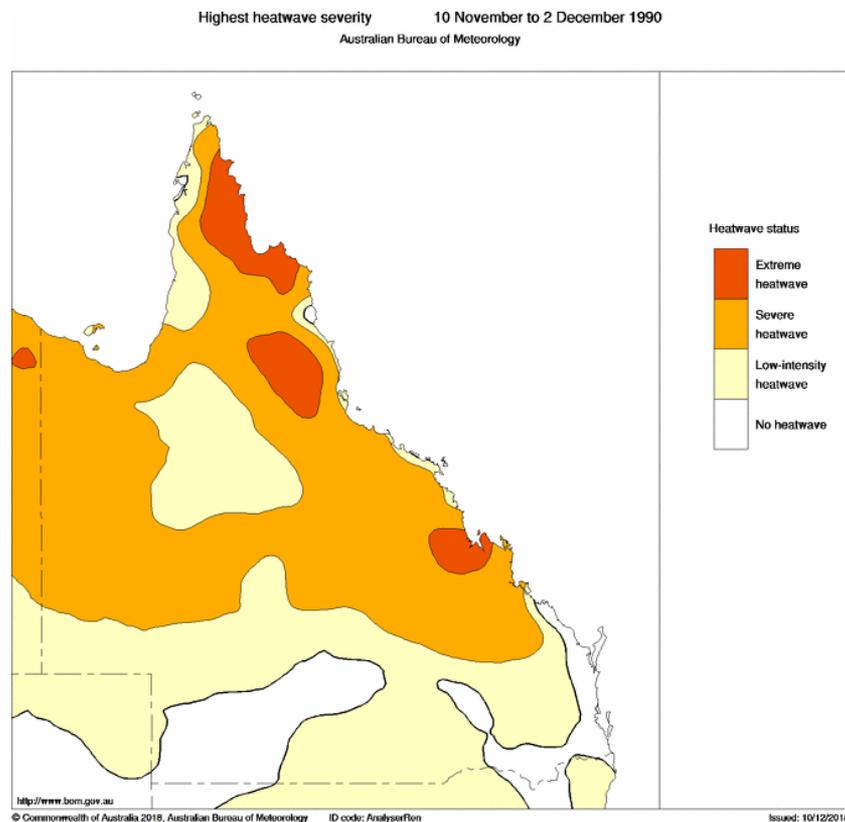


Figure 11: Maximum heatwave severity category during the November 1990 event

This event brought record-high temperatures to parts of central Queensland, with Rockhampton having its hottest day on record with 45.3 °C on the 18th. The extreme heat shifted further north next day with 40.7 °C at Townsville (third-highest temperature on record for November) on the 19th, and 42.0 °C at Ingham the same day, although the heat was largely confined to regions south of Cairns.

This was a relatively short-lived event with most coastal regions having only one or two days of extreme heat. Unlike the 1969, 1994 and 1995 events, there was also record-breaking heat inland during this event, including a Queensland November record of 48.7 °C at Birdsville on the 17th.

January 1994

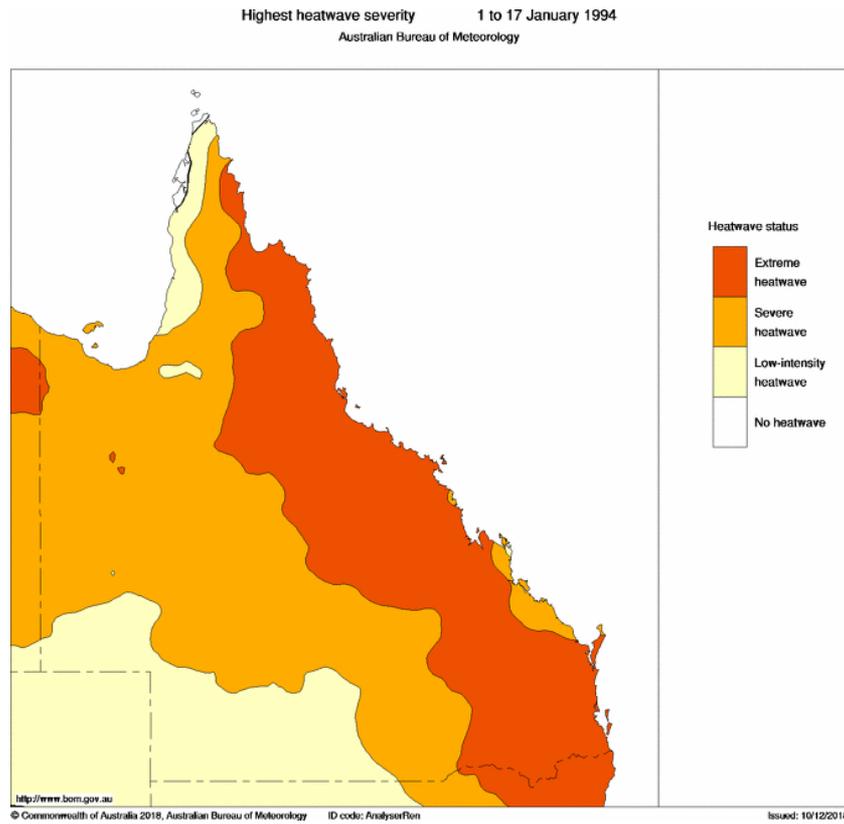


Figure 12: Maximum heatwave severity category during the January 1994 event

This was the most extensive coastal Queensland heatwave, with extremes occurring along almost the entire length of the Queensland coast and well south into New South Wales (where the Sydney region experienced severe bushfires), associated with strong westerly winds from a deep low south of Victoria.

Townsville's hottest day on record, 44.3 °C, occurred on the 7th, whilst Ayr reached 44.0 °C, Ingham 42.7 °C and Cairns 39.1 °C. Townsville had a record seven consecutive days over 36 °C from the 3rd to the 9th, although only the 7th reached 40 °C. Extreme heat extended south to and beyond the Brisbane region; for example, Amberley reached 44.3 °C on the 6th and had six consecutive days of 39 °C or above, both records.

December 1995

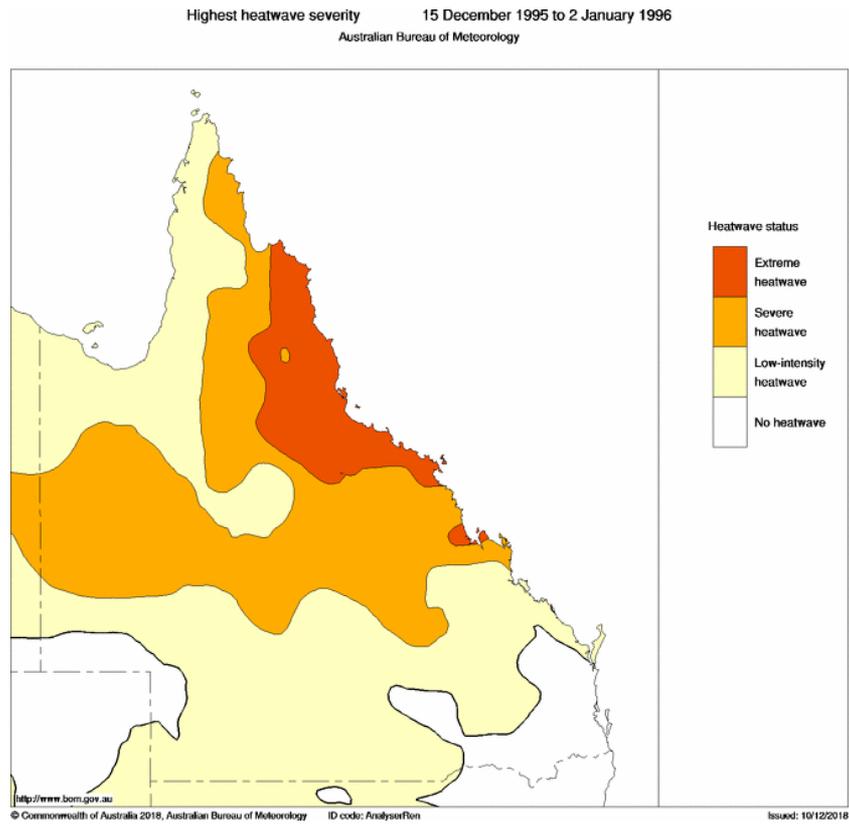


Figure 13: Maximum heatwave severity category during the December 1995 event

The main focus of this event was on the north tropical coast, although extreme heat also extended further south. Cairns reached 40.5 °C on the 20th, the highest temperature on record at Cairns Airport prior to the 2018 event, whilst Townsville exceeded 40 °C on both the 20th and 21st. The highest temperature during this event was 43.4 °C at Ingham on the 20th.

Westerly winds in this event were associated with a deep low off the southern New South Wales coast.

6. Temperature records at individual locations

Maximum temperature records

Station number	Station name	New November record (°C)	Date of new November record	Previous November record (°C)	Date of previous November record (°C)	Previous annual record (°C)	Date of previous annual record
27073	Coen Airport	41.6 *	27 Nov 2018	40.7	16th in 2006	40.7	16 Nov 2006, 29 Oct 2003
31209	Cooktown Airport	43.9 *	27 Nov 2018	41.5	30th in 1992	41.7	22 Jan 1958
31037	Low Isles Lighthouse	38.9 *	26 Nov 2018	37.0	23rd in 2008	38.8	16 Feb 2016
31011	Cairns Airport	42.6	26 Nov 2018	37.2	15th in 1971, 20th in 1900	43.2	31 Jan 1923
31222	Cairns Racecourse	43.6 *	26 and 27 Nov 2018	37.2	15th in 1971, 20th in 1900	43.2	31 Jan 1923
32025	Innisfail	41.0 *	26 Nov 2018	38.8	30th in 1992	40.5	3 Jan 2018
32197	Innisfail Airport	42.3 *	27 Nov 2018	38.8	30th in 1992	40.5	3 Jan 2018
32037	South Johnstone	42.2 *	27 Nov 2018	39.8	30th in 1992	40.4	29 Dec 1971
32004	Cardwell	40.0	28 Nov 2018	37.7	30th in 1992	42.6	20 Dec 1995
32078	Ingham	43.1	27 Nov 2018	42.0	19th in 1990	43.4	20 Dec 1995, 5 Jan 1994
32040	Townsville Airport	41.7	27 Nov 2018	41.0	15th in 1971	44.3	7 Jan 1994
33002	Ayr	41.9	26 Nov 2018	41.0	19th in 1990	44.0	7 Jan 1994
33327	Bowen Airport	41.1 *	28 Nov 2018	38.2	15th in 1971	39.7	1 Jan 1985

Special Climate Statement 67—an extreme heatwave on the tropical Queensland coast

33247	Proserpine Airport	44.9 *	26 Nov 2018	41.2	19th in 1990	42.9	20 Dec 1995
33013	Collinsville	41.9	27 Nov 2018	41.6	23rd in 1992	44.0	6 Jan 1994
33119	Mackay Met Office	38.2	26 Nov 2018	36.3	23rd in 2008	39.4	16 Dec 1964
33329	Mackay Racecourse	40.7 *	26 Nov 2018	36.6	23rd in 2008	38.5	20 Dec 1995, 11 Oct 1955
33045	Mackay Airport	39.7 *	26 Nov 2018	36.6	23rd in 2008	38.5	20 Dec 1995, 11 Oct 1955
33210	St Lawrence	43.5	28 Nov 2018	41.1	14th in 1971	44.0	5 Jan 1994
39059	Lady Elliot Island	31.3	26 Nov 2018	31.0	30th in 1995, 8th in 1994	33.9	16 Jan 1987

Table 1: New November daily maximum temperature records set during the event at locations with at least 40 years of record. Those marked with a * also set a new annual record.

Where relevant, several nearby sites have been combined to create a composite climatology.

Daily maximum temperatures

Station number	Station name	25 Nov	26 Nov	27 Nov	28 Nov	29 Nov	Previous November record (°C)
27073	Coen Airport	38.2	39.9	41.6	39.9	38.6	40.7
31209	Cooktown Airport	39.9	42.8	43.9	41.4	40.6	41.5
31037	Low Isles Lighthouse	35.1	38.9	36.3	37.0	36.6	37.0
31011	Cairns Airport	36.4	42.6	42.1	40.5	38.8	37.2
31222	Cairns Racecourse	36.6	43.6	43.6	41.8	40.1	37.2
32025	Innisfail	36.3	41.0	39.8	39.5	36.5	38.8
32197	Innisfail Airport	37.9	42.0	42.3	41.7	39.0	38.8
32037	South Johnstone	36.6	41.3	42.2	41.6	37.3	39.8
32004	Cardwell	32.0	36.9	37.9	40.0	35.9	37.7
32078	Ingham	39.6	42.2	43.1	41.9	40.2	42.0
32040	Townsville Airport	36.9	39.8	41.7	40.3	38.6	41.0
33002	Ayr	34.1	41.9	40.7	40.9	38.6	41.0
33327	Bowen Airport	33.7	37.4	36.3	41.1	39.3	38.2
33247	Proserpine Airport	36.9	44.9	43.0	44.3	39.1	41.2
33013	Collinsville	40.3	40.6	41.9	40.7	39.1	41.6
33119	Mackay Met Office	34.8	38.2	34.7	36.1	33.0	36.3
33329	Mackay Racecourse	37.3	40.7	38.0	38.7	34.1	36.6
33045	Mackay Airport	37.6	39.7	38.4	38.3	34.0	36.6
33210	St Lawrence	36.5	41.0	34.4	43.5	38.8	41.1
39059	Lady Elliot Island	29.6	31.3	30.2	30.0		31.0

Table 2: Daily maximum temperatures, for locations with at least 40 years of record that set new records during the event.

Values that exceeded the previous November record are marked. Where relevant, several nearby sites have been combined to create a composite climatology.

Minimum temperature records

Station number	Station name	New November record (°C)	Date of new November record	Previous November record (°C)	Date of previous November record (°C)	Previous annual record (°C)	Date of previous annual record
27045	Weipa Aero	28.9	26 Nov 2018	27.8	21st in 1974	29.2	1 Dec 1990
31209	Cooktown Airport	28.5	29 Nov 2018	27.8	24th in 1971	28.9	31 Dec 1959
31037	Low Isles Lighthouse	27.8	29 Nov 2018	27.7	23rd in 2008	29.5	9 Jan 1994
32025	Innisfail	28.3	28 Nov 2018	26.8	20th in 2001	29.7	29 Jan 1967
32037	South Johnstone Exp Stn	27.9	28 Nov 2018	27.6	28th in 1988	29.2	14 Jan 1980
32141	Lucinda Point	28.5	28 Nov 2018	27.3	25th in 1995	29.2	14 Feb 2017
33013	Collinsville Post Office	26.9	28 Nov 2018	25.5	17th in 1976	28.3	12 Jan 1983

Table 3: New November high daily minimum temperature records set during the event at locations with at least 40 years of record

Where relevant, several nearby sites have been combined to create a composite climatology.

Daily minimum temperatures

Station number	Station name	25 Nov	26 Nov	27 Nov	28 Nov	29 Nov	Previous November record (°C)
27045	Weipa Aero	26.7	28.9	27.2	26.8	27.5	27.8
31209	Cooktown Airport	24.9	24.4	27.4	25.2	28.5	27.8
31037	Low Isles Lighthouse	26.4	27.0	27.6	26.6	27.8	27.7
32025	Innisfail	24.1	24.3	25.0	28.3	24.4	26.8
32037	South Johnstone Exp Stn	23.5	23.6	22.8	27.9	24.5	27.6
33013	Collinsville Post Office	23.2	24.1	18.4	26.9	20.8	25.5

Table 4: Daily minimum temperatures, for locations with at least 40 years of record that set new records during the event.

Values that exceeded the previous November record are marked. Where relevant, several nearby sites have been combined to create a composite climatology.

Record consecutive days over 35 °C

Station number	Station name	Number of days	Previous November record	Year of previous November record	Previous annual record	Date of previous annual record
28008	Lockhart River Airport	7	5	2008	10	Dec 1990- Jan 1991
31011	Cairns Airport	6 *	3	2008	6	Dec 1995, Jan 2013
31222	Cairns Racecourse	6	0		13	Jan-Feb 1924
31037	Low Isles Lighthouse	6	4	2008	8	Feb 2016
31108	Walkamin Research Station	7	4	2008	9	Jan 1994
31209	Cooktown Airport	6	5	2008	8	Jan 1994, Dec 1995
32004	Cardwell Marine Pde	4	2	1971	7	Jan 1994
32025	Innisfail	5	0		6	Jan 1994
32040	Townsville Airport	6	3	1971	7	Jan 1994, Feb 2002
32037	South Johnstone	6	4	1971	8	Dec 1995
33045	Mackay Airport	6 *	3	2008	3	Feb 1956
33329	Mackay Racecourse	6 *	0		6	Jan 1960
33210	St Lawrence	4	3	2016	15	Jan-Feb 2002
33247	Proserpine Airport	9	5	1992	12	Dec 2013- Jan 2014
33327	Bowen Airport	5 *	3	2016	5	Feb 1990
39083	Rockhampton Airport	9	7	1994	15	Jan-Feb 2002

Table 5: Record number of consecutive November days over 35 °C. Those marked with a * also set a new annual record. Where relevant, several nearby sites have been combined to create a composite climatology.

Record consecutive days over 38 °C

Station number	Station name	Number of days	Previous November record	Year of previous November record	Previous annual record	Date of previous annual record
27073	Coen Airport	7 *	4	2016	5	Nov 1965, Nov 1971
31209	Cooktown Airport	5 *	3	2008	5	Dec 1995
31210	Mareeba Airport	6 *	2	2006	5	Jan 1994
32025	Innisfail	3 *	0		2	Jan 1958, Jan 1994, Dec 1995
32037	South Johnstone	3	0		4	Dec 1995
32078	Ingham Composite	5	3	1992	6	Jan 1994, Dec 1995
33002	Ayr DPI Research Stn	5	0		14	Dec 1895- Jan 1896
33247	Proserpine Airport	4 *	0		4	Feb 1990, Jan 1994
33013	Collinsville Post Office	6	3	1992	9	Jan 1994
33045	Mackay Airport	3 *	0		0	
33329	Mackay Racecourse	3 *	0		0	
33210	St Lawrence	2 *	0		2	Dec 1964, Feb 1990, Dec 1995
32040	Townsville Airport	4 *	0		3	Dec 1984-Jan 1985
31222	Cairns Racecourse	4	0	2016	5	Dec 1914- Jan 1915
33327	Bowen Airport	2	0		3	Feb 1990

Table 6: Record number of consecutive November days over 38 °C. Those marked with a * also set a new annual record. Where relevant, several nearby sites have been combined to create a composite climatology.

Record consecutive days over 40 °C

Station number	Station name	Number of days	Previous November record	Year of previous November record	Previous annual record	Date of previous annual record
31209	Cooktown Airport	4 *	0		2	Nov-Dec 1992, Dec 1995
32078	Ingham Composite	4	2	1992	6	Jan 1994
33002	Ayr DPI Research Stn	3	0		5	Jan 1896
32040	Townsville Airport	2 *	0		2	Dec 1995
33247	Proserpine Airport	3 *	0		2	Dec 1995
33013	Collinsville Post Office	4	2	1990	7	Jan 1994
31011	Cairns Airport	3 *	0		0	
31222	Cairns Racecourse	4 *	0		3	Jan-Feb 1923
32037	South Johnstone	3 *	0		0	
32197	Innisfail Airport	3 *	0		0	

Table 7: Record number of consecutive November days over 40 °C. Those marked with a * also set a new annual record. Where relevant, several nearby sites have been combined to create a composite climatology.

References and further information

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Media statement on 28 November 2018 by the Minister for Health and Minister for Ambulance Services, The Honourable Steven Miles, <http://statements.qld.gov.au/Statement/2018/11/28/queenslanders-urged-to-prepare-for-extreme-weather-events>

The information and data provided by Queensland Fire and Emergency Services (QFES) relative to the subject event for the period 25 to 30 November 2018 inclusive is, to the best of the knowledge of QFES, complete as at the date of provision however no warranty can be provided or construed relative to the completeness of such information

Further climate information is available from: www.bom.gov.au/climate

Further information on the Bureau of Meteorology's heatwave service for Australia is available from www.bom.gov.au/australia/heatwave/