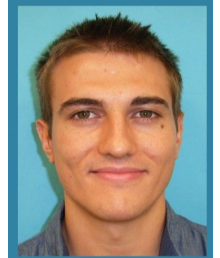




# Monana

THE OFFICIAL PUBLICATION OF THE AUSTRALIAN  
METEOROLOGICAL ASSOCIATION INC  
April 2016

## Chasing Tornadoes in USA – Jonathan Fischer



As a forecaster in the SA regional office I don't often get to see the kind of extreme weather that occurs in some parts the globe. So in 2013 and 2014 I went on holidays to the USA, travelling thousands of miles in the infamous "tornado Alley" getting up close to some of the most deadly weather systems on earth.

Storm chasing as defined by the *American Meteorological Society*, is the pursuit of any severe weather condition, regardless of motive, which can be curiosity, adventure, scientific investigation, or for news or media coverage. For many the goal is to witness a violently rotating column of air that is spawned from a cumuliform cloud, known as a tornado. The best place to see this rare phenomenon is the USA, where on average over 1000 tornados occur annually. Compare this to Australia where the total number of tornadoes recorded from 1795-2012 is around 1200.



*TIV: Tornado Intercept Vehicle as seen in Discovery Channel's Storm Chasers and the IMAX movie Tornado Alley*

Global hotspots for tornado development are located in the mid-latitudes where cold air masses from the poles clash with warm air masses from the tropics. This creates fast moving and dynamic weather systems, which peak in intensity during spring and early summer. In the Great Plains regions of the USA, cold dry air from the Rocky Mountains

clashes with warm moist air from the Gulf of Mexico, creating the perfect conditions for supercell thunderstorms and tornadoes.

It was the devastating tornadoes in this region that inspired "Ted" Fujita to develop the F (Fujita) Scale that rates tornadoes based on the damage they inflict. There is now an updated EF (Enhanced Fujita) Scale; however in Australia we still use the original F Scale. To date 59 F5/EF5 tornadoes have been recorded in the USA, while the strongest tornado recorded in Australia was an F4 on 29 Nov 1992 in Bucca Queensland.

To many storm chasing may seem like a non-stop action packed adventure, but the reality is very few thunderstorms produce a tornado and being there at just the right time is a big challenge. On my 2 trips I averaged around 800-900 km/h a day, so in my 5 weeks of storm chasing that's 30,000 km or  $\frac{3}{4}$  of the earth's circumference! Despite all this travelling I only observed a handful of tornadoes, but I'll never forget those few moments.



*My view of the El Reno tornado as we were racing to get out of its path!*

One of the more memorable and scary moments occurred on 31<sup>st</sup> May 2013 near El Reno Oklahoma, when we found ourselves a bit too close to the erratically moving tornado that went on to become the largest in recorded history at 4.2 km wide. Mobile Doppler radar measured max winds of 486 km/h, which correlates to an EF5, however as it largely moved over open fields the damage was limited and it was rated an EF3. The storm also caused flash flooding with 139 mm of rain in the nearby Oklahoma City and tragically 8 fatalities occurred, but it could have been much worse if not for the excellent forecasts from the National Weather Service and the Storm Prediction Center.

One big question is what effect a warming climate will have on future occurrences of severe weather and tornadoes? What we can say is increased heat and thus moisture leads to greater instability and theoretically more thunderstorm activity. Complicating the issue is that higher latitudes are warming at a faster rate than lower latitudes, resulting in weaker temperature gradients and thus a weaker jet stream, which is a big driver of severe weather. Initial research indicates a trend towards fewer days with tornadoes, but when outbreaks do occur we are seeing more and stronger tornadoes.

## Adelaide in January 2016: Warm month with a wet finish

Day and night temperatures through January were warmer than average across Adelaide. Very little rainfall was recorded during the first three weeks of the month, however wet periods and thunderstorm activity later in the month resulted in daily rainfall totals of 10 to 30 mm at several locations across the Adelaide region. Intense rainfall at some locations at the end of the month caused localised flash flooding in the southern suburbs and resulted in above average totals for most locations.

- Nine days of 35 °C or more, though no days reaching 40 °C
- Despite a milder finish, daytime temperatures were warmer than average for the month
- Above average rainfall, despite a dry first half of the month
- Below average relative humidity

Little rainfall was recorded during the first three weeks of the month, but low pressure systems and thunderstorm activity over southern South Australia towards the end of the month saw Adelaide end the month with above average rainfall overall. 8.0 mm recorded on 22 January was the highest daily rainfall in Adelaide since mid-September 2015. Mount Bold Reservoir to Adelaide's south has record highest January daily rainfall. Nine days reached 35 °C or more, compared to the average of six. No sites in the Adelaide area recorded 40 °C or more this January, with the last time this happened being January 1989. With nine nights having minimums of 20 °C or more, compared to the average of six, overall minimum temperatures were up to 2 °C above average, though no nights stayed warmer than 25 °C; the first January without a hot night since 2013.

### Extremes in January 2016

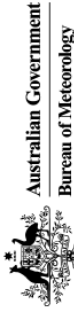
Hottest day	39.8 °C at Adelaide (Kent Town) on the 12th
Warmest days on average	31.7 °C at Parafield Airport
Coollest days on average	25.5 °C at Mount Lofty
Coldest day	12.4 °C at Mount Lofty on the 29th
Coldest night	6.9 °C at Mount Lofty on the 15th
Coollest nights on average	13.9 °C at Mount Barker
Warmest nights on average	18.1 °C at Adelaide (Kent Town)
Warmest night	26.3 °C at Mount Crawford AWS on the 11th
Warmest on average overall	24.7 °C at Adelaide (Kent Town)
Coollest on average overall	19.8 °C at Mount Lofty
Wettest overall	101.8 mm at Uraidla
Driest overall	16.8 mm at Edinburgh RAAF
Wettest day	44.0 mm at Uraidla on the 30th
Strongest wind gust	89 km/h at Adelaide Airport on the 22nd

**All the detail you could possibly want and more is available on the**

**BoM website.** Visit <http://www.bom.gov.au/climate> and wander through the various archived climate reports and summaries which are available in text and graphical forms.

# Adelaide, South Australia January 2016 Daily Weather Observations

Observations are from Kent Town, about 2 km east of the city centre.



Date	Day	Temps		Rain mm	Evap mm	Sun hours	Max wind gust			9am					3pm						
		Min °C	Max °C				Dirn	Spd km/h	Time	Temp °C	RH %	Cid eighths	Dirn	Spd km/h	MSLP hPa	Temp °C	RH %	Cid eighths	Dirn	Spd km/h	MSLP hPa
1	Fr	21.7	35.0	0			WNW	31	13:34	27.4	31	SSE	2	1014.0	34.1	24	W	19	1012.6		
2	Sa	17.1	26.6	0			SE	35	15:23	19.9	52	SSE	11	1016.3	25.8	34	SE	17	1013.1		
3	Su	15.5	29.3	0			W	43	16:45	21.4	60	SSE	9	1014.5	28.3	39	S	13	1013.5		
4	Mo	18.0	31.8	0			SE	33	16:50	23.5	48	SSE	6	1016.3	30.6	27	SE	11	1012.3		
5	Tu	17.1	30.2	0			WSW	30	15:35	23.0	49	WNW	4	1016.0	28.9	34	SW	15	1014.5		
6	We	17.5	29.7	0			SE	37	00:36	21.7	49	SE	7	1018.5	28.8	27	S	15	1016.9		
7	Th	17.4	30.9	0			E	39	02:03	21.4	55	S	2	1020.5	29.6	26	S	13	1019.8		
8	Fr	13.8	31.1	0			WSW	26	15:58	20.0	50	SSW	4	1023.5	30.0	25	WSW	15	1020.2		
9	Sa	16.3	34.8	0			WSW	22	14:32	22.9	45	WSW	4	1020.2	33.8	13	WSW	15	1017.7		
10	Su	19.3	37.6	0			NNW	28	15:25	24.7	49	NNW	6	1015.5	34.8	14	E	6	1013.0		
11	Mo	22.4	37.9	0			SSW	33	09:04	32.7	23	NNE	7	1007.7	36.8	21	W	9	1007.3		
12	Tu	22.5	39.8	0.2			W	24	16:10	30.2	37	E	7	1010.9	38.2	21	W	11	1009.2		
13	We	23.2	35.1	0			WSW	43	17:40	29.8	30	NE	9	1009.3	35.0	28	W	11	1009.9		
14	Th	17.3	23.7	0			SSE	41	15:09	18.1	55	S	15	1023.0	21.1	33	SE	17	1024.8		
15	Fr	13.5	25.7	0			ENE	35	11:56	16.7	38	E	4	1031.7	25.5	19	SE	13	1027.3		
16	Sa	15.8	30.1	0			E	35	04:47	19.0	42	SE	6	1026.0	28.9	24	WSW	17	1022.0		
17	Su	15.9	36.6	0			WNW	28	15:40	24.7	30	SW	6	1018.9	34.9	11	WSW	15	1015.9		
18	Mo	19.0	38.5	0			WSW	28	16:11	28.5	23	WSW	2	1014.2	38.2	12	W	13	1012.3		
19	Tu	21.7	35.9	0			NW	37	14:28	31.6	14	NNE	11	1011.2	34.4	24	NW	13	1009.8		
20	We	24.3	34.3	0.4			SW	31	14:02	28.1	58	WSW	15	1009.9	33.5	40	WSW	17	1009.0		
21	Th	23.8	36.7	0.2			W	26	11:48	25.9	46	SE	6	1010.0	35.7	25	WSW	9	1008.7		
22	Fr	21.5	29.9	8.0			WSW	61	13:32	24.5	77	N	9	1008.9	20.4	93	ESE	9	1008.0		
23	Sa	18.7	25.9	7.6			W	37	15:09	21.0	61	SSE	11	1016.1	25.0	48	WSW	17	1015.9		
24	Su	15.2	28.5	0			SE	37	18:29	19.3	64	ESE	2	1017.2	27.1	34	SSE	11	1013.9		
25	Mo	15.5	30.0	0			SE	28	18:39	20.8	61	SE	9	1016.9	30.0	29	S	11	1014.7		
26	Tu	17.5	33.3	0			SW	31	15:20	23.7	39	SW	6	1015.7	32.0	24	WSW	13	1012.0		
27	We	21.5	33.1	0			SW	37	14:03	26.6	26	N	6	1009.4	29.2	28	SW	19	1008.0		
28	Th	18.3	25.9	0			WSW	57	13:13	20.8	60	WSW	11	1010.1	21.1	66	SW	20	1008.4		
29	Fr	12.6	19.5	17.8			W	50	15:45	14.7	86	SSW	6	1008.2	18.1	54	W	15	1004.0		
30	Sa	13.8	24.2	18.6			SW	35	16:47	17.7	67	S	9	1006.4	21.5	48	SW	15	1005.4		
31	Su	14.5	25.3	0			WSW	33	12:18	18.6	72	NNE	7	1006.6	23.7	45	SW	13	1005.8		
<b>Statistics for January 2016</b>																					
Mean		18.1	31.2							23.3	47		6	1015.0	29.5	31		13	1013.1		
Lowest		12.6	19.5							14.7	14			1006.4	18.1	11	E	6	1004.0		
Highest		24.3	39.8	18.6			WSW	61		32.7	86	#	15	1031.7	38.2	93	SW	20	1027.3		
Total				52.8																	

Observations were drawn from Adelaide (Kent Town) station 023050

LC16JAN5093.201691 - Report 11 15:36 GMT on 2 Feb 2016  
Copyright © 2016 Bureau of Meteorology

Users of this product are deemed to have read the information and accepted the conditions described in the notes at <http://www.bom.gov.au/climate/dwo/IDCJDW00000.pdf>

## South Australia in January 2016: Warm start to the year

Intermittent thunderstorm activity produced patchy rainfall that was focussed in central and northern South Australia for the first half of January. The second half of the month saw widespread thunderstorm activity across the State extend further south, and a strong cold front ended the month with milder conditions. Warm days in the south.

- Cooler than average in a small area of the Far North
- Average to above average rainfall for most areas despite a drier than normal start to the month

Despite a generally drier than normal first half of the month, many locations finished with average to above average rainfall for the month. Parts of southern pastoral areas, and the lower southeast districts tended to be drier for the month. In early January, heavy rain and hail was reported in the Flinders Ranges, the northeast and southeast of the State. In the 24 hours to 9am on 1 January, Kalamurina in the State's north reported its highest January daily rainfall on record with further rainfall resulting in a 2-day total of 179.4 mm (compared to a January monthly average for the site of 24.2 mm). Widespread thunderstorm activity produced daily totals of 10 to 30 mm across the agricultural districts on the 22 January.

For South Australia as a whole, January mean temperatures were 0.83 °C warmer than normal. Despite a milder first week of the month, and a cold front on the last few days bringing cooler conditions, both daytime and night time temperatures were above average (0.38 °C and 1.28 °C respectively) for South Australia as a whole.

The agricultural areas and the southern pastoral districts tended to be warmer than average by 1 to 2 °C, with the Far North up to 1 °C cooler than average due to increased tropical cloud.

### Extremes in January 2016

Hottest day	45.5 °C at Nullarbor on the 12th
Warmest days on average	37.2 °C at Moomba Airport
Coollest days on average	21.9 °C at Cape Willoughby
Coldest day	12.4 °C at Mount Lofty on the 29th
Coldest night	4.8 °C at Padthaway South on the 15th
Coollest nights on average	12.3 °C at Naracoorte Aerodrome
Warmest nights on average	24.3 °C at Moomba Airport
Warmest night	31.8 °C at Roxby Downs on the 13th
Warmest on average overall	30.7 °C at Moomba Airport
Coollest on average overall	18.9 °C at Parawa (Second Valley Forest AWS)
Wettest overall	179.4 mm at Kalamurina
Driest overall	0 mm at Roxby Downs (Olympic Dam Aerodrome)
Wettest day	130.8 mm at Kalamurina on the 1st
Strongest wind gust	113 km/h at Cape Willoughby on the 29th

### Record highest January daily rainfall

	New record (mm)	Old record	Years held
Mount Bold Reservoir	39.0 on the 30th	34.2 on the 15th in 1977	65
Kalamurina	130.8 on the 1st	70.2 on the 10th in 2015	32

### Record highest January total rainfall

	New record (mm)	Old record	Years held	January Average
Adelaide (Kent Town)	52.8	42.2 in 1996	39	20.2
Blackwood (Wittunga)	57.3	56.3 in 2007	37	23.8
Kalamurina	179.4	108.9 in 1885	31	24.2

### Record lowest January total rainfall

	New record (mm)	Old record	Years held	January Average
Wrattobully (Joeville)	2.0	2.6 in 2000	49	28.1

### Record lowest January temperature

	New record (°C)	Old record	Years held	January Average
Stenhouse Bay	11.2 on the 29th	11.3 on the 23rd in 2009	20	16.7

***For more information on January's temperatures and rainfall plus a summary of statistics please see:***

*<http://www.bom.gov.au/climate/current/month/sa/archive/201601.summary.shtml>*

## ***Interested in water information?***

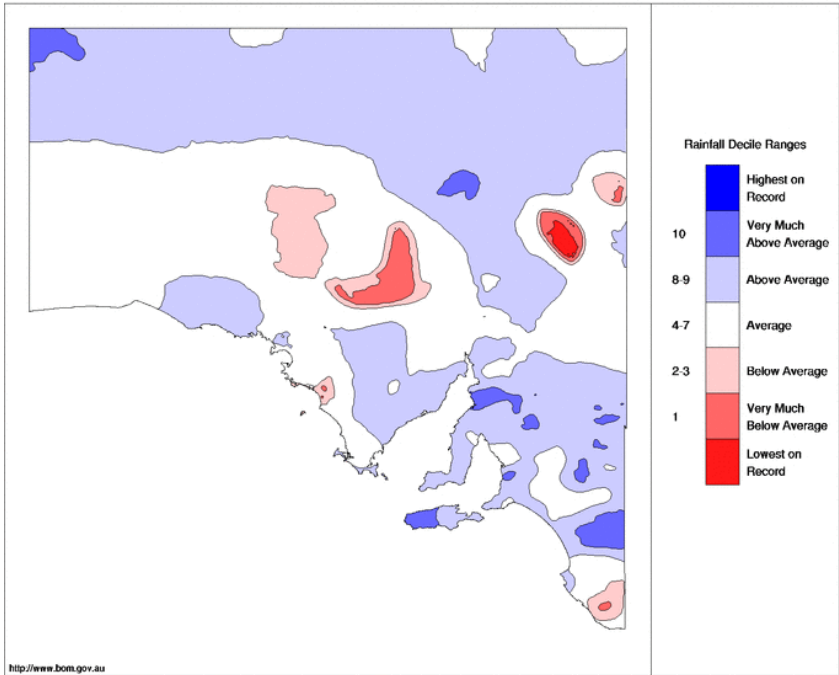
*Over recent years the Bureau of Meteorology has been given the task of bringing together water observations and data from hundreds of organisations around Australia, and making this available for water reporting and analysis.*

*<http://www.bom.gov.au/water/>*

*The Bureau of Meteorology Water Information page has many different tools and products related to water information. The latest is the Australian Water Resource Assessment Landscape water balance modelling. This takes rainfall, temperature and other parameters, doing daily calculations on a 5km grid of soil moisture levels, run-off, evapotranspiration and making them available through the tool below:*

*<http://www.bom.gov.au/water/landscape/>*

Distribution Based on Gridded Data  
Australian Bureau of Meteorology

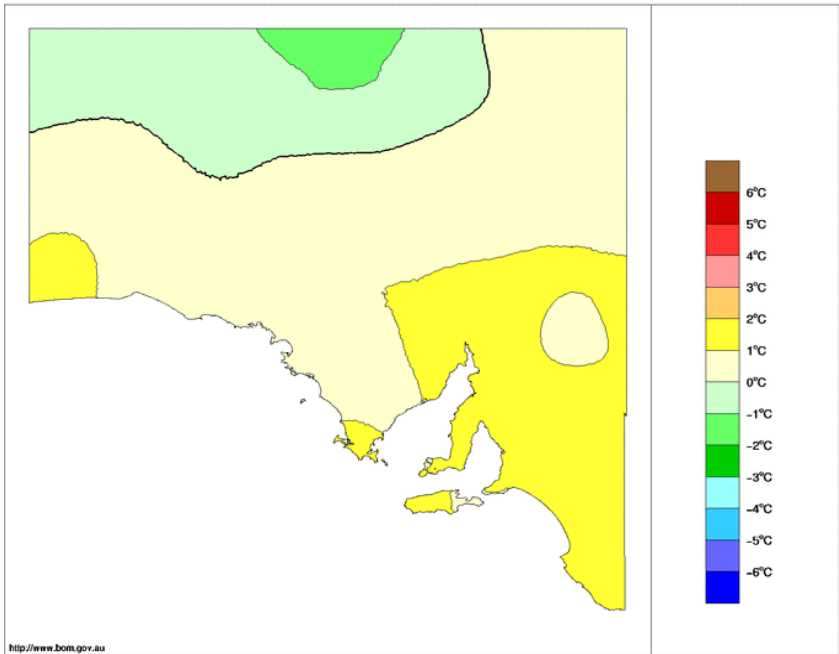


© Commonwealth of Australia 2016, Australian Bureau of Meteorology ID code: AWAP

Issued: 01/01/2016

Maximum Temperature Anomaly (°C) January 2016

Australian Bureau of Meteorology



© Commonwealth of Australia 2016, Australian Bureau of Meteorology ID code: AWAP

Issued: 01/02/2016

## Adelaide in February 2016: Mild days and cool nights

February rainfall was average to above average across the Adelaide area, though the majority of falls were recorded in just two days at the beginning of the month. Daytime temperatures were generally mild on the plains, while nights tended cooler than normal.

- Near average to above average rainfall
- Moderate falls on the 2nd and 3rd
- Generally mild days
- Coolest February nights since 2008

With the passage of ex-tropical cyclone Stan across southern parts of South Australia at the beginning of the month, several locations across the Adelaide region recorded most of their monthly rainfall total in the 48 hours to 9am on 3 February. There was very little rainfall recorded throughout the rest of the month, with only light rainfall being recorded at some locations on the 16th and on the 24th.

Daytime temperatures were generally mild in February, with just 3 days of 35 °C or above. Typically, the city would record about 6 days of 35 °C during February. A warm spell between 21 and 24 February saw temperatures exceed 7°C above normal across the Adelaide region. No sites in the Adelaide area recorded a daily maximum temperature of 40 °C this February. Nights were generally cool during the month, with the overall minimum temperatures 0.9 °C below average at Adelaide (Kent Town), resulting in the coolest February nights since 2008. It was the first February without a hot night of 25 °C or more since 2006.

### Extremes in February 2016

Hottest day	40.4 °C at Edinburgh RAAF on the 22nd
Warmest days on average	29.9 °C at Parafield Airport
Coolest days on average	23.5 °C at Mount Lofty
Coldest day	14 °C at Mount Lofty on the 3rd
Coldest night	6.8 °C at Mount Barker on the 21st
Coolest nights on average	12.2 °C at Mount Lofty
Warmest nights on average	16.4 °C at Adelaide (Kent Town)
Warmest night	25.5 °C at Mount Crawford AWS on the 23rd
Warmest on average overall	22.8 °C at Adelaide (Kent Town)
Coolest on average overall	17.8 °C at Mount Lofty
Wettest overall	69.8 mm at Heathfield Works Depot
Wettest day	30.8 mm at Sellicks Beach on the 3rd
Strongest wind gust	76 km/h at Adelaide (Kent Town) on the 11th

***For more information on February's temperatures and rainfall plus a summary of statistics please see:***

***<http://www.bom.gov.au/climate/current/month/sa/archive/201602.adelaide.shtml>***



# Adelaide, South Australia February 2016 Daily Weather Observations

Observations are from Kent Town, about 2 km east of the city centre.



Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am					3pm							
		Min	Max				Dirn	Spd	Time	Temp	RH	Cid	Dirn	Spd	MSLP	Temp	RH	Cid	Dirn	Spd	MSLP	
		°C	°C	mm	mm	hours	Dirn	Spd	Local	°C	%	eighths	Dirn	Spd	hPa	°C	%	eighths	Dirn	Spd	hPa	
1	Mo	15.1	33.1	0			E	48	22:13	21.1	63		NE	6	1007.1	31.4	20		NW	9	1003.7	
2	Tu	19.3	24.8	13.2			E	46	07:47	23.3	61		NNE	17	995.5	23.0	76		S	15	998.8	
3	We	16.8	22.9	4.8			S	37	16:47	19.1	66		S	11	1013.5	21.9	46		S	13	1014.9	
4	Th	15.8	24.1	0			S	39	14:47	17.7	58		SSE	15	1020.9	23.5	42		S	15	1018.5	
5	Fr	13.8	29.5	0			ESE	30	13:44	16.4	67		Calm	Calm	1019.6	27.8	36		SE	11	1015.4	
6	Sa	16.2	33.1	0			SSW	31	16:20	21.9	59		Calm	Calm	1015.6	30.4	40		SW	15	1013.6	
7	Su	17.9	31.3	0			WSW	28	16:33	22.9	59		N	6	1017.5	30.0	41		SW	17	1016.7	
8	Mo	15.0	29.5	0			SE	31	21:37	20.4	61		SE	2	1022.3	28.2	33		ESE	9	1019.9	
9	Tu	16.2	34.8	0			WSW	24	13:32	22.8	52		SSW	7	1019.7	34.0	25		SW	15	1016.1	
10	We	16.9	34.7	0			WSW	30	14:31	24.2	32		SW	6	1015.2	33.4	25		WSW	15	1012.3	
11	Th	15.8	32.2	0			E	76	10:51	21.2	55		NNW	6	1016.4	31.3	24		SSE	11	1013.6	
12	Fr	15.3	33.9	0			SW	30	18:38	21.6	56		SSW	6	1015.5	32.4	24		WSW	11	1012.5	
13	Sa	16.8	29.3	0			SW	28	16:28	21.7	62		NNE	7	1012.5	26.4	39		SW	13	1012.0	
14	Su	15.6	24.8	0			WSW	30	15:36	19.3	65		SW	9	1016.5	24.4	37		SW	15	1015.6	
15	Mo	15.5	24.3	0			WSW	33	20:53	18.2	58		SSW	9	1017.8	23.3	41		WSW	15	1016.5	
16	Tu	15.4	24.4	0			SSE	35	20:35	17.9	67		SSE	11	1020.0	23.7	33		SE	11	1019.3	
17	We	13.1	26.0	0			WSW	41	14:26	16.8	56		SE	6	1020.7	25.5	43		W	20	1017.0	
18	Th	14.0	27.5	0			SW	31	18:01	18.6	69		SE	2	1014.1	26.3	44		NW	9	1011.1	
19	Fr	15.6	24.5	0			SSE	37	20:33	19.2	66		S	4	1014.7	23.1	51		SW	15	1015.4	
20	Sa	13.9	25.9	0			ESE	33	16:35	17.2	44		E	9	1023.5	24.3	28		E	11	1021.2	
21	Su	17.1	37.0	0			N	26	11:58	24.0	30		ENE	11	1020.7	34.7	15		N	7	1018.0	
22	Mo	23.9	39.5	0			SE	31	23:46	26.2	37		W	4	1019.1	36.7	13		W	9	1015.8	
23	Tu	22.2	37.0	0			S	37	14:52	27.2	39		S	2	1011.8	33.8	30		SW	13	1011.5	
24	We	22.6	27.7	0			SW	26	15:09	25.2	62		Calm	Calm	1011.0	25.2	64		SW	9	1010.1	
25	Th	19.7	26.2	0.4			SW	35	16:17	20.9	73		SW	7	1014.0	24.9	44		WSW	15	1016.0	
26	Fr	14.7	24.9	0			SW	37	15:57	19.8	63		SSW	9	1022.2	24.4	46		WSW	20	1021.4	
27	Sa	13.5	25.4	0			WNW	31	14:29	18.2	72		SSW	4	1023.8	24.7	49		WSW	17	1020.9	
28	Su	13.2	29.7	0			SE	31	17:20	18.7	62		SW	4	1022.6	27.1	40		WSW	15	1019.8	
29	Mo	13.8	31.4	0			WSW	26	13:30	19.9	59		SW	4	1020.5	29.7	30		SW	13	1018.0	
<b>Statistics for February 2016</b>																						
Mean		16.4	29.3							20.7	57			6	1016.7	27.8	37			13	1015.0	
Lowest		13.1	22.9							16.4	30					21.9	13			N	7	998.8
Highest		23.9	39.5	13.2			E	76		27.2	73		NNE	17	1023.8	36.7	76		#	20	1021.4	
Total				18.4																		

Observations were drawn from Adelaide (Kent Town) (station 023090)

IDCJDW5002.201602 Prepared at 13:06 GMT on 21 Mar 2016  
Copyright © 2016 Bureau of Meteorology  
Users of this product are deemed to have read the information and accepted the conditions described in the notes at  
<http://www.bom.gov.au/climate/dw/IDCJDW0000.pdf>

## South Australia in February 2016: Cooler and wetter across the south, warmer and drier in the north

- Cooler on the coasts and agricultural areas
- Warmer and drier in the pastorals
- A wet start for southern coasts

Despite a mostly dry month, agricultural locations had average to above average rainfall overall. The passage of ex-tropical cyclone Stan resulted in some locations in southern districts recording their highest February daily rainfall on record on the 2nd or 3rd, but there was very little rain elsewhere in South Australia. A weak cold front and southerly airstream on the 16th, and the passage of a low pressure trough on the 23rd, brought light to moderate totals, again to southern districts. For some locations on southern coasts, monthly totals were highest on record for February or highest for at least 20 years. Elsewhere across the State, it was a very dry month, with parts of the Murray Valley and large areas of the pastoral districts recording very little or no rainfall for the month. Renmark Aero reported it's driest February since 2008.

Despite generally cooler days across southern districts, February's daytime temperatures were warmer than normal when averaged across South Australia as a whole. Hot temperatures late in the month resulted in some locations reporting daily maximum temperatures at least twelve degrees above average. Mean maximum temperatures across agricultural areas and the southern pastoral districts tended to be cooler than average, whereas the maximum temperatures in northeast of the State were much warmer than average. Minimum temperatures followed a similar pattern, with coastal and agricultural areas having cooler than normal nights, and inland pastoral areas recording generally warmer nights.

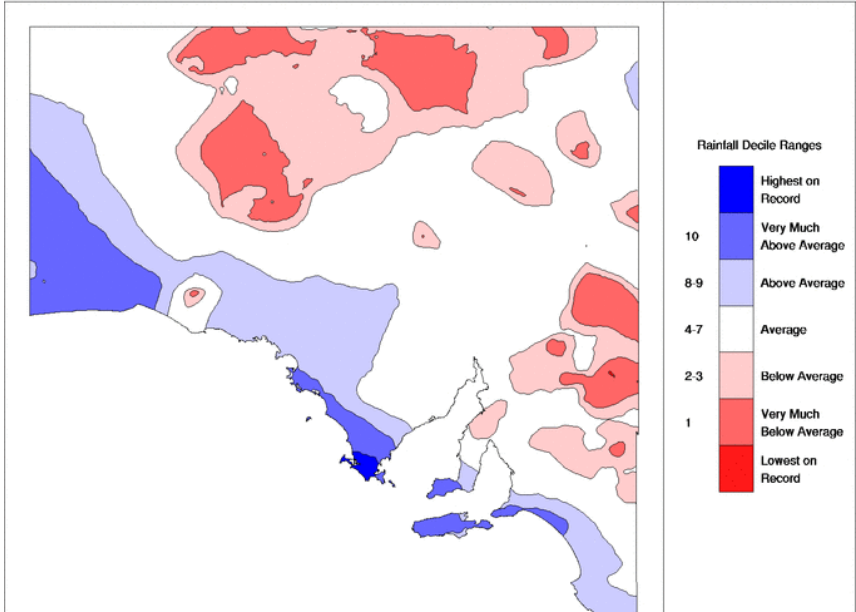
### Extremes in February 2016

Hottest day	44.9 °C at Renmark Aero on the 23rd
Warmest days on average	38.9 °C at Moomba Airport
Coollest days on average	21.1 °C at Cape Willoughby
Coldest day 1	6.4 °C at Mount Lofty on the 3rd
Coldest night	4.4 °C at Keith (Munkora) on the 20th
Coollest nights on average	11.7 °C at Naracoorte Aerodrome
Warmest nights on average	24.6 °C at Moomba Airport
Warmest night	30.7 °C at Arkaroola on the 24th
Warmest on average overall	31.8 °C at Moomba Airport
Coollest on average overall	17.8 °C at Mount Lofty 17.8 °C at Parawa (Second Valley Forest AWS)
Wettest overall	99.4 mm at Coffin Bay
Wettest day	75.8 mm at Coffin Bay on the 2nd
Strongest wind gust	83 km/h at Neptune Island on the 2nd

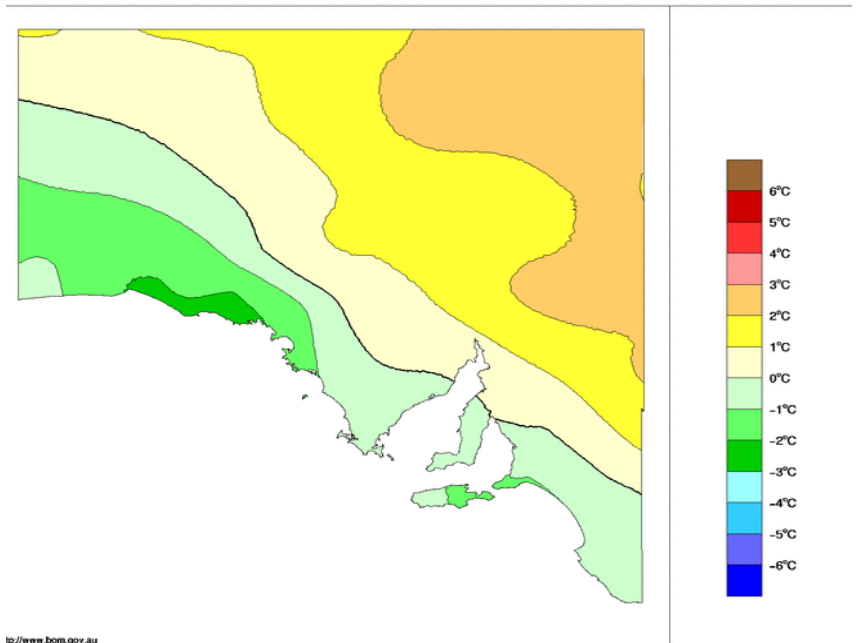
*Many other rainfall records were also set in February. For more information plus a summary of statistics please see:*

*<http://www.bom.gov.au/climate/current/season/sa/archive/201602.summary.shtml>*

South Australian Rainfall Deciles February 2016  
 Distribution Based on Gridded Data  
 Australian Bureau of Meteorology



Maximum Temperature Anomaly (°C) February 2016  
 Australian Bureau of Meteorology



## Adelaide in summer 2015-16: temperatures above average; rain-fall near average

- Dry for most of the summer period
- A few wet days ensure average totals
- Temperatures above average
- Fourth warmest summer for the city

It was generally a dry summer, but the summer total for most locations came in average or above average because of some very wet days. Nearly half of the summer total for most locations in the Adelaide region was recorded in just 3 days (between 29 and 31 January) as a low pressure trough moved across southern parts of the State. Uraidla was the wettest station in the area with a summer total of 157 mm, 44 mm of which was recorded on 30 January.

All stations across the Adelaide region recorded mean maximum temperatures that were warmer than the long-term summer average, in some cases by more than two degrees. Minimum temperatures were also warmer than average, with most locations reporting nights that tended one or two degrees warmer than normal. High temperatures occurred in December, that saw city record 7 days over 40 °C. Record December heat and a hotter than average January resulted in a summer daytime average for Adelaide of 31 °C, ranking summer 2015-16 as the fourth warmest summer on record for the city, and warmest since 2000-01. A vigorous cold front at the beginning of December saw Adelaide (Kent Town) record its lowest summer temperature on record.

### Extremes in summer 2015-16

Hottest day	43.5 °C at Edinburgh RAAF on 19 Dec 2015
Warmest days on average	31.4 °C at Parafield Airport
Coollest days on average	25.1 °C at Mount Lofty
Coldest day	11.7 °C at Mount Lofty on 1 Dec 2015
Coldest night	4.6 °C at Mount Barker on 2 Dec 2015
Coollest nights on average	13.3 °C at Mount Barker
Warmest nights on average	17.5 °C at Adelaide (Kent Town)
Warmest night	31.7 °C at Edinburgh RAAF on 7 Dec 2015
Warmest on average overall	24.3 °C at Adelaide (Kent Town)
Coollest on average overall	19.3 °C at Mount Lofty
Wettest overall	157.0 mm at Uraidla
Wettest day	44.0 mm at Uraidla on 30 Jan 2016
Strongest wind gust	94 km/h at Edinburgh RAAF on 19 Dec 2015

### Record lowest summer temperature

	New record (°C)	Old record	Years of record	Summer Average
Kent Town	7.9 on 2 Dec 2015	8.0 on 3 Dec 1987	40	16.7

*For more information on Summer's temperatures and rainfall plus a summary of statistics please see:*

*<http://www.bom.gov.au/climate/current/season/sa/archive/201602.adelaide.shtml>*

## **South Australia in summer 2015-16: Warm days and nights, average rainfall**

- Average rainfall across the state, dry in central parts
- Very warm days in the east
- Warm nights

Overall, summer rainfall for South Australia was close to average. Parts of southern agricultural areas recorded above average rainfall, while it tended drier than average in the central and eastern pastoral areas. Despite locations in the southern and far north recording their highest summer daily rainfall on record or having their highest total summer rainfall on record, there were extended periods of days without rain that resulted in some sites in the northwest Pastoral and Flinders districts having their lowest total summer rainfall for at least 20 years.

South Australia's overall mean temperature for summer was more than 1 °C above the long-term average. The mean maximum temperature for South Australia was in the top ten warmest on record. High temperatures occurred in early summer, that saw several locations report an extended period of extreme heat. Further details can be found in Special Climate Statement 53. Most South Australian sites observed maximum temperatures above their long-term average for summer. Coonawarra reported its highest summer mean daily maximum temperature on record.

Overall, summer nights tended warmer than average across South Australia, particularly in eastern districts. In the Riverland, Loxton and Renmark both recorded their warmest summer night (highest daily minimum temperature) on record in December. A cold spell in early December also saw some sites in the southeastern of the State have their lowest summer temperature on record.

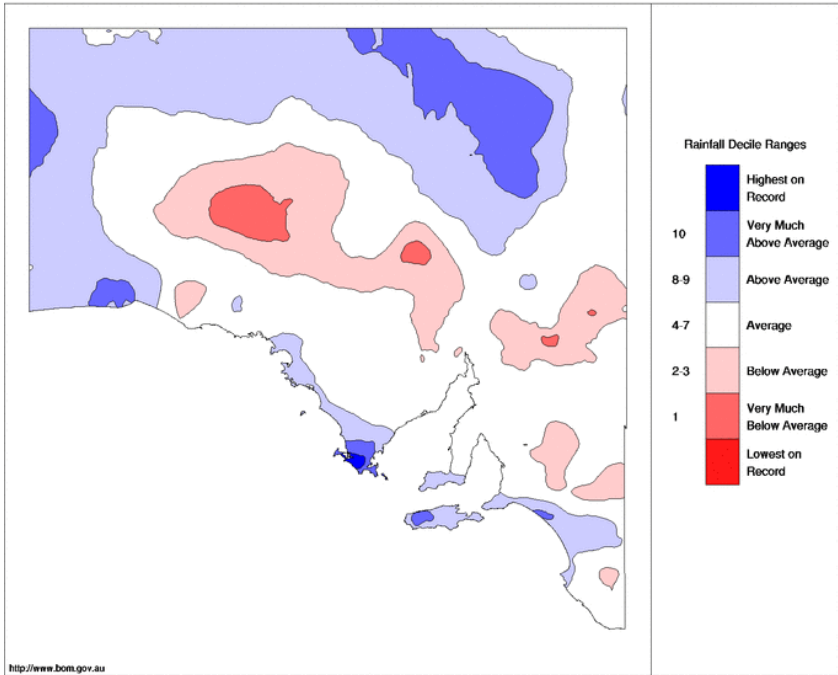
### **Extremes in summer 2015-16**

Hottest day	47.2 °C at Port Augusta Aero on 19 Dec 2015
Warmest days on average	38.1 °C at Moomba Airport
Coollest days on average	22.3 °C at Cape Willoughby
Coldest day	11.7 °C at Mount Lofty on 1 Dec 2015
Coldest night	0.2 °C at Coonawarra on 2 Dec 2015
Coollest nights on average	11.6 °C at Naracoorte Aerodrome
Warmest nights on average	24.4 °C at Moomba Airport
Warmest night	34.1 °C at Moomba Airport on 7 Dec 2015
Warmest on average overall	31.2 °C at Moomba Airport
Coollest on average overall	19.1 °C at Robe Airfield
Wettest overall	159.8 mm at Parawa (Sharon)
Wettest day	130.8 mm at Kalamurina on 31 Dec 2015
Strongest wind gust	122 km/h at Woomera Aerodrome on 7 Dec 2015

*Many other rainfall and temperature records were also set in Summer. For more information plus a summary of statistics please see:*

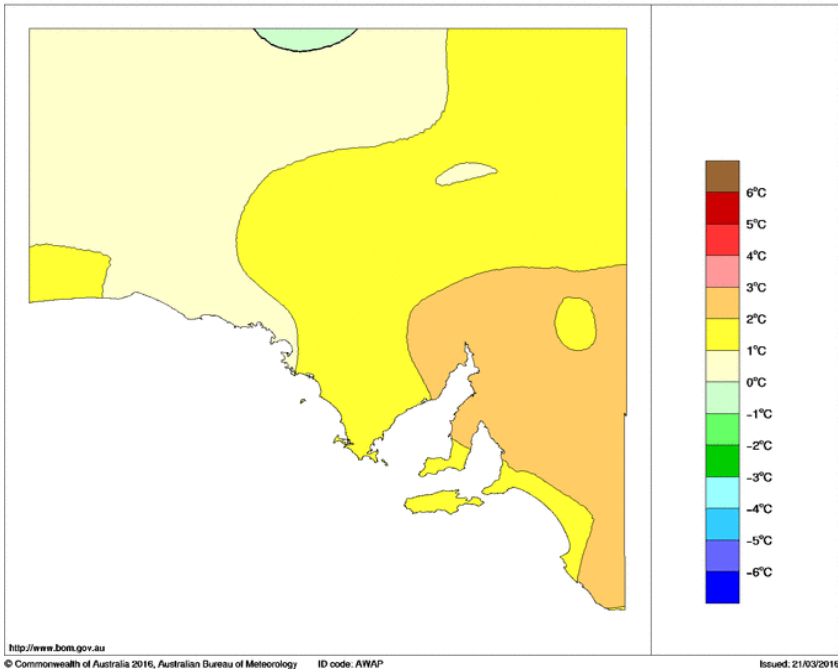
*<http://www.bom.gov.au/climate/current/season/sa/archive/201602.summary.shtml>*

Distribution Based on Gridded Data  
Australian Bureau of Meteorology



Maximum Temperature Anomaly (°C) 1 December 2015 to 29 February 2016

Australian Bureau of Meteorology



## **Adelaide in March 2016: A warm month with above average rainfall**

Most of the Adelaide region recorded a warmer and wetter than normal March. Day-time and night time temperatures were particularly warm in the first half of the month. There were a few days of heavy rain throughout the month, resulting in well above average monthly rainfall for most locations in the region.

- Well above average daytime and night time temperatures
- Well above average rainfall
- Adelaide had record run of warm nights
- Warmest March days since 2008

Rainfall totals were generally in excess of 100% of the long term monthly average, with Adelaide (Kent Town) receiving about double its monthly average, the wettest March in 4 years. The wettest days in the Adelaide region occurred on the 7th and 10th as a broad trough of low pressure slowly moved over South Australia.

All sites around the Adelaide region recorded March mean maximum and minimum temperatures that were well above average. Mean maximum temperatures for the month ranged from +1.2 °C above average at Kuitpo Forest Reserve to +4.1 °C at Mount Lofty. Mean minimum temperatures were also warmer than usual, with most locations reporting monthly mean minimum temperature in excess of 1.2 °C above average. Adelaide had 18 consecutive days with minimum temperatures of 15 °C or more ending on 18 March, which was a record run for the month of March for the city. The previous record run with minimum temperatures of 15 °C or more was 17 days, ending on 19 March 2008. The monthly mean maximum temperature for Adelaide was 28.6 °C, which was the warmest March (with respect to monthly mean maximum temperatures) since 2008, and is equal sixth warmest March on record.

### **Extremes in March 2016**

Hottest day	39.8 °C at Parafield Airport on the 6th
Warmest days on average	28.9 °C at Parafield Airport
Coollest days on average	23.1 °C at Mount Lofty
Coldest day	13.9 °C at Mount Lofty on the 30th
Coldest night	6.0 °C at Mount Barker on the 30th
Coollest nights on average	12.5 °C at Mount Lofty
Warmest nights on average	16.8 °C at Adelaide (Kent Town)
Warmest night	23.5 °C at Noarlunga on the 17th
Warmest on average overall	22.7 °C at Adelaide (Kent Town)
Coollest on average overall	17.8 °C at Mount Lofty
Wettest overall	61.4 mm at Blackwood (Wittunga)
Wettest day	31.6 mm at Eden Valley (Mt Adam) on the 10th
Strongest wind gust	72 km/h at Adelaide Airport on the 18th 72 km/h at Mount Crawford AWS on the 18th

***For more information on March's temperatures and rainfall plus a summary of statistics please see:***

***<http://www.bom.gov.au/climate/current/month/sa/archive/201603.adelaide.shtml>***

## Adelaide, South Australia March 2016 Daily Weather Observations

Observations are from Kent Town, about 2 km east of the city centre.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am					3pm						
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours	local	km/h	km/h	°C	%	eighths	km/h	km/h	hPa	°C	%	eighths	km/h	km/h	hPa
1	Tu	17.3	33.3	0			12:06	24	WNW	24.8	42		4	WNW	1015.7	32.8	19		9	WSW	1014.5
2	We	18.1	34.8	0			17:36	24.9	S	24.9	36		Calm	1016.5	32.8	24		9	SW	1015.5	
3	Th	17.6	33.6	0			13:03	21.8	W	21.8	53		7	SW	1020.0	32.2	33		15	WSW	1016.6
4	Fr	17.7	33.2	0			16:35	22.9	WSW	22.9	50		2	E	1015.7	31.1	34		11	SW	1014.1
5	Sa	18.9	38.7	0			16:46	23.1	SE	23.1	52		2	WSW	1017.3	36.6	26		7	SW	1014.7
6	Su	22.8	38.0	0.2			15:48	25.9	NNW	25.9	65		6	NNW	1015.6	34.4	32		2	SSW	1012.7
7	Mo	21.8	30.7	21.6			22:34	25.4	SE	25.4	63		4	WNW	1016.3	27.6	55		17	WSW	1016.8
8	Tu	22.1	37.1	0			00:34	27.1	E	27.1	53		4	SW	1014.2	35.8	27		11	WNW	1012.1
9	We	22.4	30.3	0			23:44	24.1	NNW	24.1	75		2	N	1015.8	29.3	47		9	NNE	1015.3
10	Th	21.1	29.0	20.0			16:07	21.9	SW	21.9	93		Calm	1018.4	27.5	65		9	WSW	1015.9	
11	Fr	20.3	31.4	2.4			16:10	23.9	WSW	23.9	98		Calm	1016.8	29.9	51		13	SW	1015.2	
12	Sa	20.1	30.8	0			15:00	22.3	SSE	22.3	75		6	SW	1019.9	29.3	49		4	ESE	1018.2
13	Su	17.6	32.2	0			14:58	21.9	W	21.9	69		Calm	1018.9	31.7	38		15	WSW	1016.7	
14	Mo	18.4	26.7	0			03:43	20.3	SE	20.3	62		11	SE	1019.8	25.5	47		11	SE	1017.8
15	Tu	15.5	30.2	0			23:26	18.6	E	18.6	57		4	SSE	1018.7	28.3	35		6	SSW	1015.7
16	We	16.9	33.3	0			12:06	23.8	SSW	23.8	53		Calm	1015.0	32.7	27		13	WSW	1011.4	
17	Th	23.2	35.4	0			15:35	28.4	W	28.4	44		9	NE	1008.0	34.8	30		11	NW	1003.6
18	Fr	15.9	21.0	8.0			02:14	17.1	SW	17.1	49		20	SW	1010.8	19.4	37		20	SSW	1012.7
19	Sa	12.3	21.7	0.4			15:00	15.9	SW	15.9	63		Calm	1019.3	19.7	55		15	SW	1018.6	
20	Su	12.0	23.6	0			13:57	16.4	SW	16.4	55		6	NNE	1021.3	22.3	41		15	SW	1019.0
21	Mo	11.9	24.5	0			16:13	17.1	WSW	17.1	56		Calm	1020.7	23.4	39		13	SW	1017.6	
22	Tu	11.7	30.3	0			12:18	19.0	N	19.0	53		Calm	1016.7	29.2	19		15	WSW	1014.9	
23	We	17.7	25.3	0			12:56	21.1	SW	21.1	54		7	SSW	1017.3	22.1	62		15	SW	1018.8
24	Th	18.4	27.7	0			16:34	19.6	WSW	19.6	66		E	E	1020.6	26.5	45		19	SW	1017.9
25	Fr	13.6	23.4	1.2			14:57	16.7	W	16.7	61		9	SE	1023.9	22.2	45		9	WSW	1021.3
26	Sa	12.5	21.4	0			14:33	17.1	WSW	17.1	53		6	SSE	1023.6	20.8	53		11	SW	1022.3
27	Su	15.5	21.7	0			21:34	16.4	ESE	16.4	68		E	E	1023.1	20.5	43		7	SE	1020.5
28	Mo	14.7	22.7	0			07:02	15.4	SE	15.4	50		E	E	1019.9	22.0	36		2	SE	1017.9
29	Tu	14.3	21.7	0			15:17	15.4	SSE	15.4	56		6	SW	1022.7	21.2	34		15	S	1020.7
30	We	9.2	20.3	0			16:05	14.1	SW	14.1	67		N	N	1024.5	19.4	49		7	WSW	1023.2
31	Th	9.9	23.9	0			11:14	14.0	WNNW	14.0	75		4	NNE	1022.3	23.7	36		11	NW	1019.3
<b>Statistics for March 2016</b>																					
Mean		16.8	28.6							20.5	59		4		1018.4	27.2	39		11		1016.5
Lowest		9.2	20.3							14.0	36		Calm	1008.0	19.4	19		#	2		1003.6
Highest		23.2	38.7	21.6					SW	28.4	93		20	SW	1024.5	36.6	65		20	SSW	1023.2
Total				53.8																	

Observations were drawn from Adelaide (Kent Town) (station 023090)

IPC:DJWS005.201603 Prepared at 13:07 GMT on 1 Apr 2016

Copyright © 2016 Bureau of Meteorology

Users of this product are deemed to have read the information and accepted the conditions described in the disclaimer at <http://www.bom.gov.au/climate/dw/IDC/DJWS005.pdf>



## South Australia in March 2016

Most of South Australia recorded a warmer and wetter than normal March. Daytime and night time temperatures were particularly warm in the first half of the month. There were several days of heavy rain in pastoral areas and northern parts of the agricultural districts resulting in well above average monthly rainfall, but rainfall was near-average across some coastal regions.

- Warm nights, especially at the start of the month
- Warm days, particularly in the eastern districts
- Above average rainfall across most of the State
- Seventh wettest March for the State as a whole

A broad trough of low pressure and a middle-level disturbance over South Australia brought localised heavy rain to southern districts on 7 March, Streaky Bay recorded 48.4 mm (a March record for the site), also resulting in the wettest March for the site since 1983. With the trough moving slowly across the State for several days, heavy rainfall was recorded in central districts, resulting in record high daily rainfall at Bute and Tarlee. Isolated showers and thunderstorms continued over pastoral and Flinders districts through to the 18th as the moist tropical airmass lingered over the north of the State. The wet period resulted in some sites reporting their highest total March rainfall on record with several other locations reporting their wettest March for at least 20 years. Tarcoola (Mobella) was the wettest location in the State, recording 151.8 mm for the month, resulting in the location having its wettest March since 1989. Large areas of South Australia recorded rainfall totals in excess of 200% of the long-term March average.

The month began with a continuation of the above-average temperatures that had been observed across South Australia during late February. A heatwave that initially developed in northern Australia spread into northern and eastern districts of South Australia at the beginning of March. Both maximum and minimum temperatures were in excess of 10 °C above average for the month, with Moomba having it's warmest March night (highest daily minimum temperature) on record and some other locations in the eastern parts of the State observing their hottest March daytime maximum temperature on record. The heat persisted across much of the State for several days, resulting in several locations having their warmest March nights on record. More information about the heat can be found in Special Climate Statement 55 - prolonged March heatwave affects many parts of Australia. Both daytime and night time temperatures became mild in the latter part of the month. However, both monthly mean maximum and monthly mean minimum temperatures were well above average for the State as a whole for March 2016.

## Extremes in March 2016

Hottest day	43.9 °C at Oodnadatta Airport on the 2nd
Warmest days on average	34.9 °C at Moomba Airport
Coollest days on average	20.3 °C at Cape Willoughby
Coldest day	13.9 °C at Mount Lofty on the 30th
Coldest night	3.9 °C at Kyancutta on the 30th
Coollest nights on average	11.9 °C at Naracoorte Aerodrome
Warmest nights on average	22.8 °C at Moomba Airport
Warmest night	30.6 °C at Moomba Airport on the 2nd
Warmest on average overall	28.6 °C at Moomba Airport
Coollest on average overall	17.4 °C at Parawa (Second Valley Forest AWS)
Wettest overall	151.8 mm at Tarcoola (Mobella)
Wettest day	77.5 mm at Bute on the 10th
Strongest wind gust	93 km/h at Roseworthy AWS on the 17th

## Record highest March daily rainfall

	New record (mm)	Old record	Years of record
Bute	77.5 on the 10th	49.0 on the 5th in 1910	127
Tarlee	50.0 on the 10th	46.0 on the 16th in 1946	133
Streaky Bay	48.4 on the 7th	46.0 on the 14th in 1971	136

## Record highest March total rainfall

	New record	Old record	Years of record	March Average
Bute	118.6	71.1 in 1910	129	17.3
Cowell	110.0	97.2 in 1983	47	22.4
Coober Pedy	75.8	43.2 in 2012	21	12.2

## Record highest March temperature

	New record	Old record	Years of record	March Average
Leigh Creek	42.0 on the 2nd	41.5 on the 6th in 1986	33	31.2
Loxton	41.5 on the 6th	41.2 on the 12th in 2006	32	28.1
Renmark	42.2 on the 6th	41.9 on the 12th in 2006	21	28.8

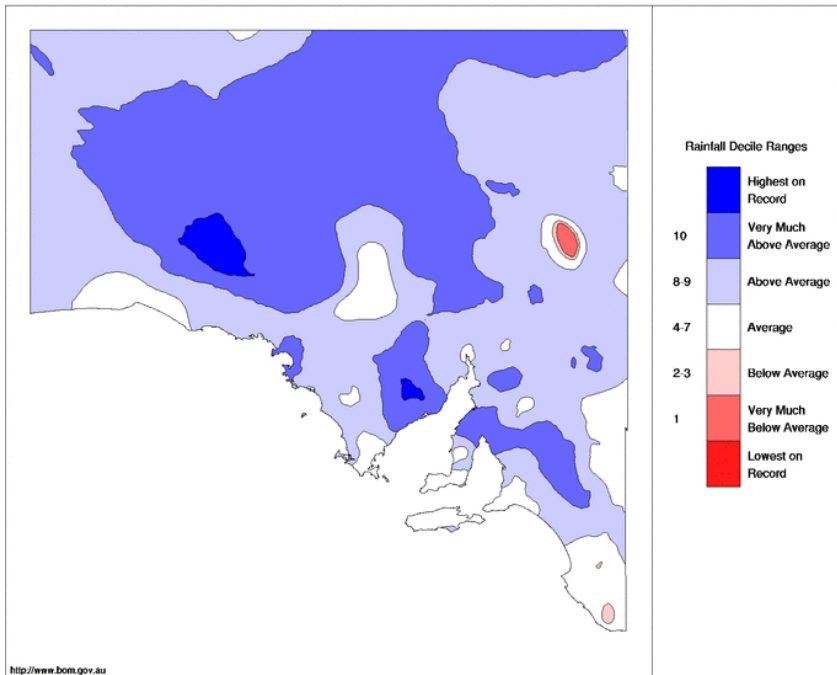
## Record highest March daily minimum temperature

	New record	Old record	Years of record	March Average
Moomba	30.6 on the 2nd	30.2 on the 3rd in 2009	21	20.3

***Many other rainfall and temperature records were also set in March. For more information plus a summary of statistics please see:***

***<http://www.bom.gov.au/climate/current/month/sa/archive/201603.summary.shtml>***

Distribution Based on Gridded Data  
 Australian Bureau of Meteorology

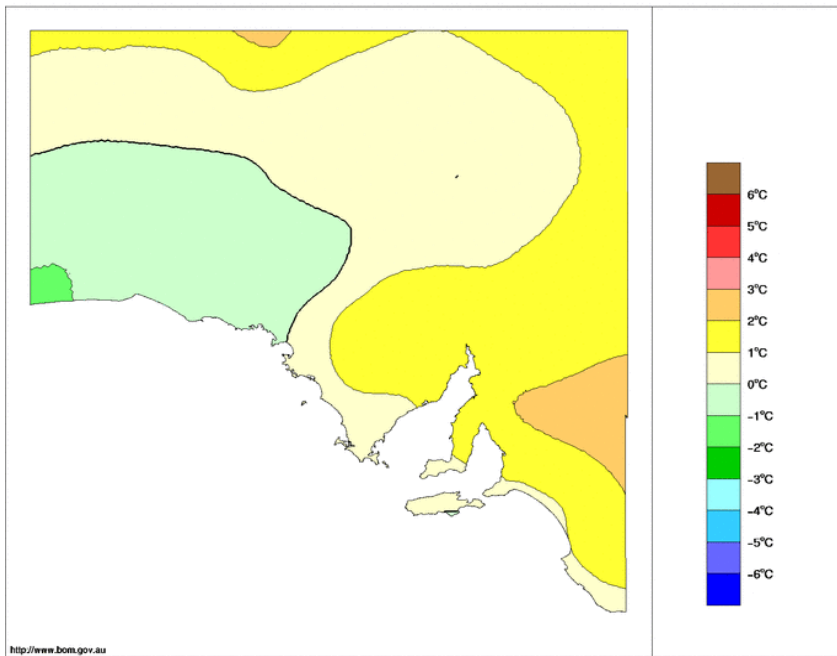


© Commonwealth of Australia 2016, Australian Bureau of Meteorology ID code: AWAP

Issued: 31/03/2016

Maximum Temperature Anomaly (°C) March 2016

Australian Bureau of Meteorology



© Commonwealth of Australia 2016, Australian Bureau of Meteorology ID code: AWAP

Issued: 01/04/2016



Australian Meteorological Association Inc (AMeta)  
www.ameta.org.au

## **NEXT MEETING**

**6.00 PM TUESDAY 19 April 2016**

*Bureau of Meteorology offices, Level 4, corner of South Terrace & King  
William Street , Adelaide*

*Please meet in the ground floor lobby to be let upstairs*

**Subject:** *A perfect storm: climate change and natural variability  
influencing South Australia climate*

**Speaker:** *Darren Ray Senior Climatologist, South Australian  
Region Bureau of Meteorology & AMETA Secretary*

*2015 has seen both near record strength El Niño conditions and record hottest global temperatures. South Australia experienced record October and December heat, with early bushfire season onset, and strengthening drought conditions in the south-east. How much of this is climate change or normal natural variability will be explored, and what this might mean for coming decades.*

*Following last years presentation on installing your own weather station, a short session will also be devoted to automatic weather stations, and the experiences of users in setting them up and connecting to the web.*

*We look forward to seeing you.*

*For further information contact:*

<i>Secretary:</i>	<i>Darren Ray</i>
<i>Phone:</i>	<i>8366 2664</i>
<i>Fax:</i>	<i>8366 2693</i>

*Inquiries or suggestions, please contact the Secretary on the phone number listed above.*