

Annual State of the Climate of South Africa 2019

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Executive Summary

Surface Temperature

South Africa experienced a very hot year. The annual mean temperature anomalies for 2019, based on the data of 26 climate stations, was on average about 1.1°C above the reference period (1981-2010), making it approximately a tie with 2015 for being the hottest year on record since 1951. A warming trend of 0.16 °C per decade is indicated for the country, statistically significant at the 5% level.

Precipitation

The most significant feature of the rainfall during 2019 was the dry conditions in the west of South Africa with a substantial region receiving less than 50% of the normal, while the south-western part and eastern half of the country received rainfall close to normal. No significant area of South Africa received substantially more than the normal amount of rainfall.

Noteworthy climate and weather events

In South Africa, dry conditions persisted over larger parts of the west of the country. In some parts dry conditions has continued now for approximately seven years. The effects of the prolonged dry conditions are mainly agricultural, resulting in no significant production on many farms, with the subsequent lay-offs of farm workers.

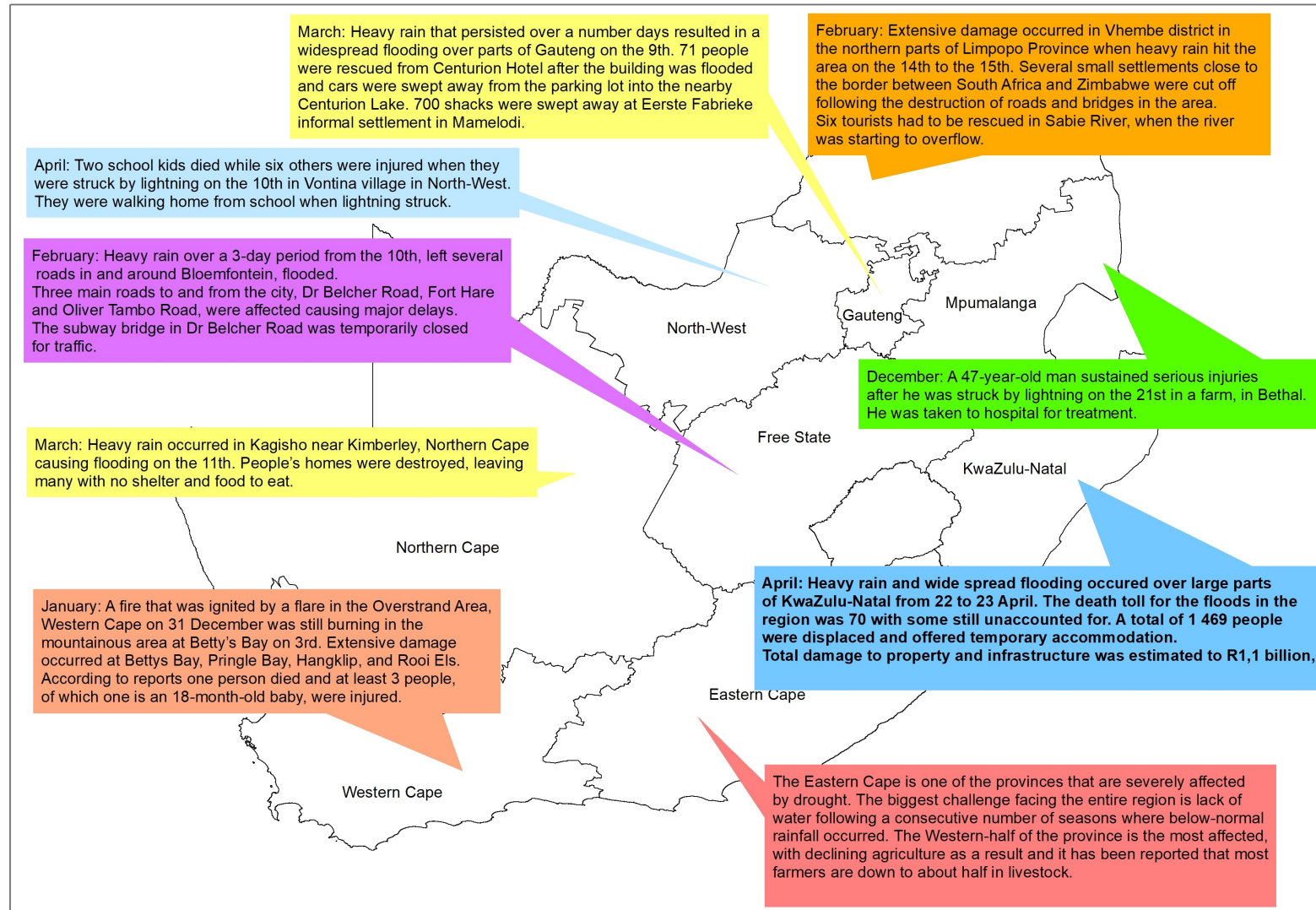
The year started off in January with these dry conditions persisting in most parts of the western interior, with warmer than usual conditions in the central parts. Good rains were received in the Limpopo province with several weather stations breaking daily and monthly rainfall records. By March the eastern parts received good rains which persisted into April. However, heavy rain that occurred in KwaZulu-Natal province on the 22nd and 23rd of April caused severe flooding and extensive damage to infrastructure. Loss of life and injuries also occurred, with about 70 dead and 50 injured. A total of 1 469 people were displaced. The estimated damage was R1, 1 billion, with damage in eThekweni alone estimated to be more than R685 million.

By winter a clear pattern emerged from the previous years' rainfall which was below-normal in most parts of the west and above-normal in most of the eastern half of the country. The temperatures tend to follow the same pattern with very high temperatures recorded in the west, especially in May. June was accompanied with strong cold fronts reaching the south-western Cape with accompanying flooding and displacement of people in the Cape Town metropole. These incidents continued into July. However, in the east high maximum temperatures were experienced, with places in the extreme east more than 3°C above-normal. In August below-normal rainfall occurred over nearly the entire country with normal rainfall falling only in parts of KwaZulu-Natal, Mpumalanga, the Western Cape and the Limpopo Province. The spring months did not bring a lot of noteworthy events. However, the dry conditions remained mainly over the western interior. The early summer months some noteworthy impacts occurred. November saw a number of tornadoes in the eastern parts, with at least four occurring in the KwaZulu-Natal province. On the 12th a tornado destroyed several houses and injured several residents in Mpolweni village near New Hanover in KwaZulu-Natal where 2 people died and 20 sustained injuries. The Mpolweni power substation was also structurally damaged. On the 26th 13 houses along with several schools were damaged after a tornado hit Ulundi in KwaZulu-Natal, with Utrecht being hit only the previous day. In December several large flood events were reported in the east. The worst for the month was probably on the 9th when several parts of northern Gauteng province were under water following rain that persistent over 5 days. Rivers were overflowing causing devastating floods that lead to damages to road infrastructure and local buildings. Hundreds of people were left homeless and infrastructure severely damaged. Several cars were swept away following the intense flooding in Centurion, Pretoria. Several roads were closed due to flooded causing traffic delays in most parts of the city. At least 700 shacks were destroyed in Eerste Fabriek informal settlement in Mamelodi and as a consequence thousands of people were displaced.

Table of Contents

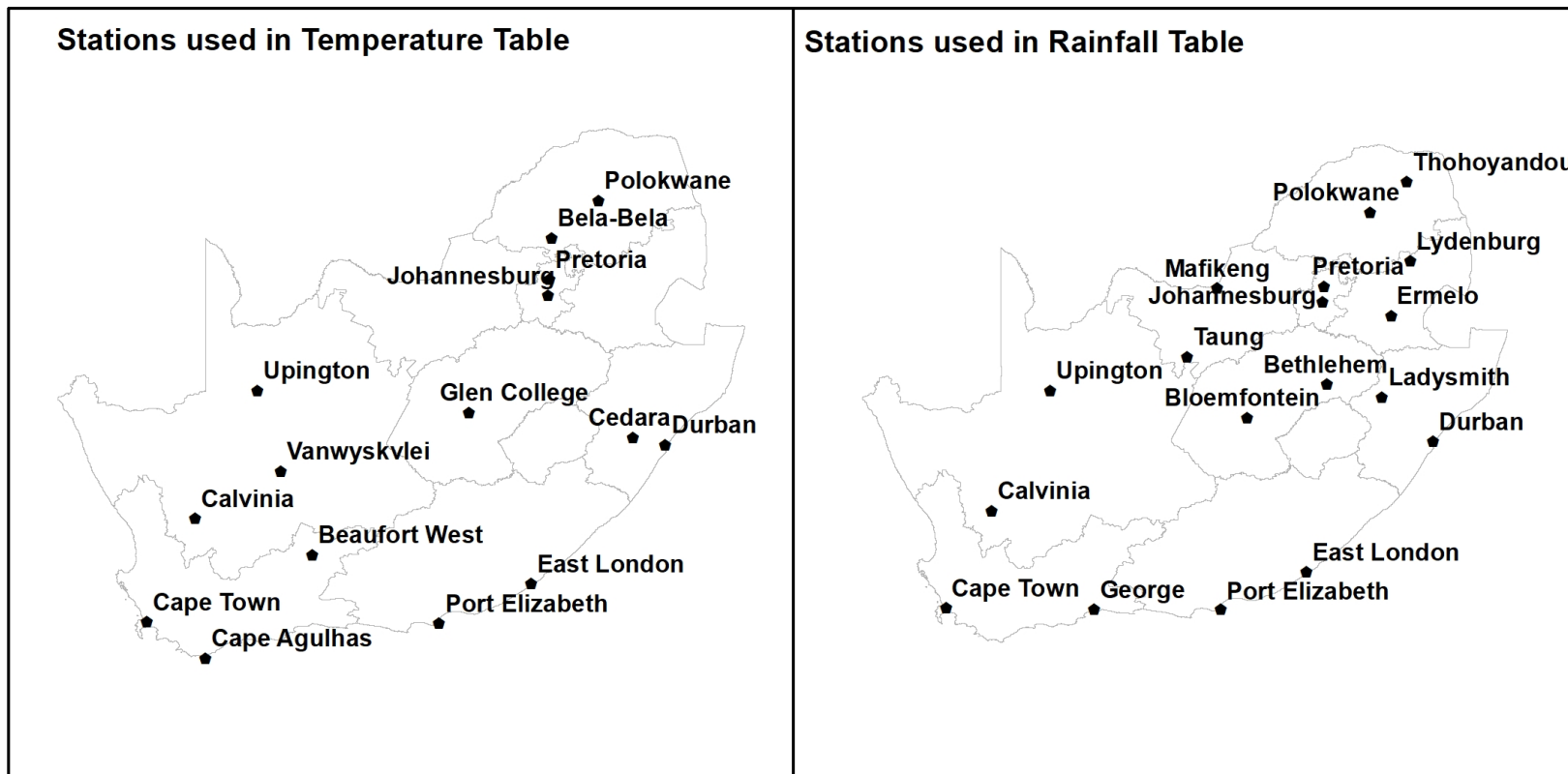
	Page
Executive Summary	iii
Table of Contents	iv
Severe weather events	1
Long-term climate statistics	2
Average Surface Temperature	3
Daily Maximum Temperature (selected stations)	4
Daily Minimum Temperature (selected stations)	5
Rainfall (selected stations)	6
Provincial rainfall	7
Indications of drought	12
Monthly maps	13
Sunshine	26

Severe weather events — 2019



Long-term climate statistics

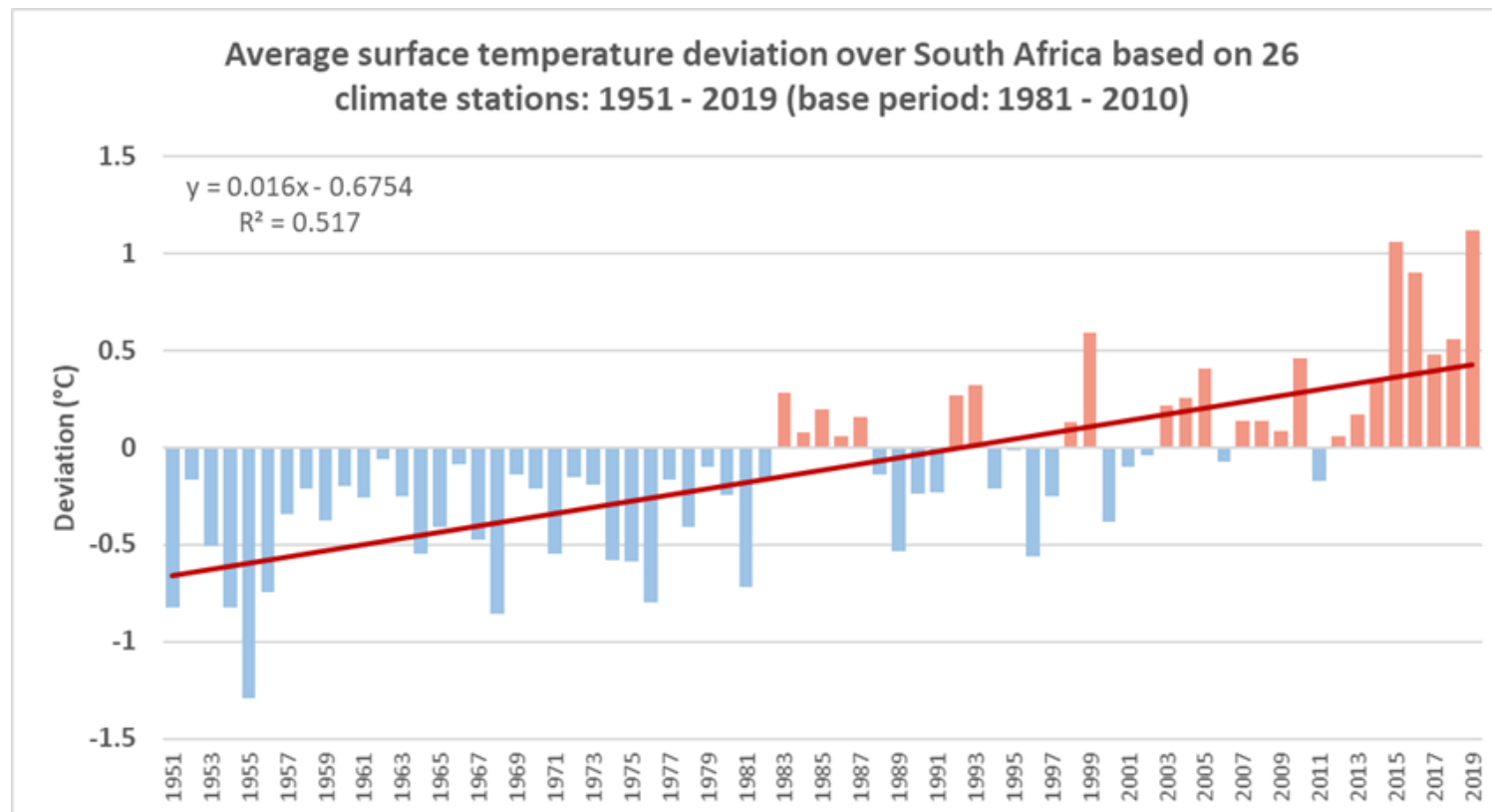
In this section the long term climate statistics are provided for a set of selected weather stations across South Africa, with locations presented in the maps below.



Climate overview

Average Surface Temperature

Mean annual temperature anomalies were calculated from 26 spatially well-distributed and representative climate stations. The annual average temperature for 2019 for South Africa was in the region of 1,1°C higher than the 1981—2010 average. The long-term trend is estimated to be around 1,6°C per decade, higher than the average global trend.



Maximum Temperature (°C) overview for some long-term climate stations for 2019

Station	Average -2019	Normal (1981-2010)	Rank (Highest since 1951)	Highest An- nual Average (since 1951)	Lowest An- nual Average (since 1951)	Highest Daily - 2019 (Date)	Highest Daily (since 1951)	Lowest Daily - 2019 (Date)	Lowest Daily (since 1951)
Limpopo Province									
Bela Bela	30.1	28.5	2	32.2 (2015)	26.9 (2006)	39.4 (2019-10-21)	43.7	15.0 (2019-12-05)	8.1
Polokwane	26.6	25.2	1	26.6 (2019)	23.9 (1955)	38.1 (2019-10-28)	38.4	14.7 (2019-07-21)	8.4
Gauteng									
OR Tambo (Jhb)	23.9	22.3	2	24.2 (2015)	21.5 (2001)	32.1 (2019-10-19)	36.2	12.7 (2019-12-03)	2.5
UP Exp Farm (Pta)	27.4	25.6	2	27.6 (2015)	24.3 (1955)	36.9 (2019-10-18)	40.1	15.1 (2019-05-23)	6.8
Free State									
Glen College (Bfn)	28.3	26.0	2	28.8 (2015)	24.2 (1955)	40.0 (2019-01-12)	42.9	13.8 (2019-06-25)	3.9
KwaZulu-Natal									
Cedara	24.2	22.9	2	24.3 (2015)	21.6 (1968)	39.1 (2019-10-25)	40.1	10.8 (2019-10-22)	5.2
Mt Edgecombe (Dn)	27.4	25.6	2	27.6 (2018)	23.5 (1951)	38.3 (2019-08-25)	42.4	18.1 (2019-10-22)	11.9
Northern Cape									
Calvinia	26.0	24.6	1	26.0 (2019)	23.0 (1955)	41.2 (2019-11-28)	41.9	9.4 (2019-07-24)	2.2
Upington	30.9	29.1	1	30.9 (2019)	27.4 (1976)	42.4 (2019-11-28)	45.3	14.3 (2019-07-01)	6.9
Vanwyksvlei	29.4	27.4	1	29.4 (2019)	25.7 (1955)	42.7 (2019-11-28)	43.9	12.1 (2019-07-24)	7.0
Western Cape									
Beaufort West	27.0	24.7	1	27.0 (2019)	23.1 (1976)	42.3 (2019-11-28)	43.0	10.8 (2019-07-20)	4.8
Cape Town	22.5	22.2	14	23.4 (1999)	21.0 (1951)	37.7 (2019-02-07)	42.3	14.0 (2019-07-20)	9.4
Cape Agulhas	20.9	20.3	1	20.9 (2019)	19.1 (1955)	29.8 (2019-09-08)	35.6	13.7 (2019-07-20)	10.0
Eastern Cape									
East London	24.0	23.5	4	24.3 (1999)	22.7 (1971)	34.9 (2019-09-14)	43.3	13.8 (2019-07-14)	9.4
Port Elizabeth	23.4	22.5	1	23.4 (2019)	21.4 (1955)	38.7 (2019-12-06)	40.7	13.5 (2019-07-20)	9.5

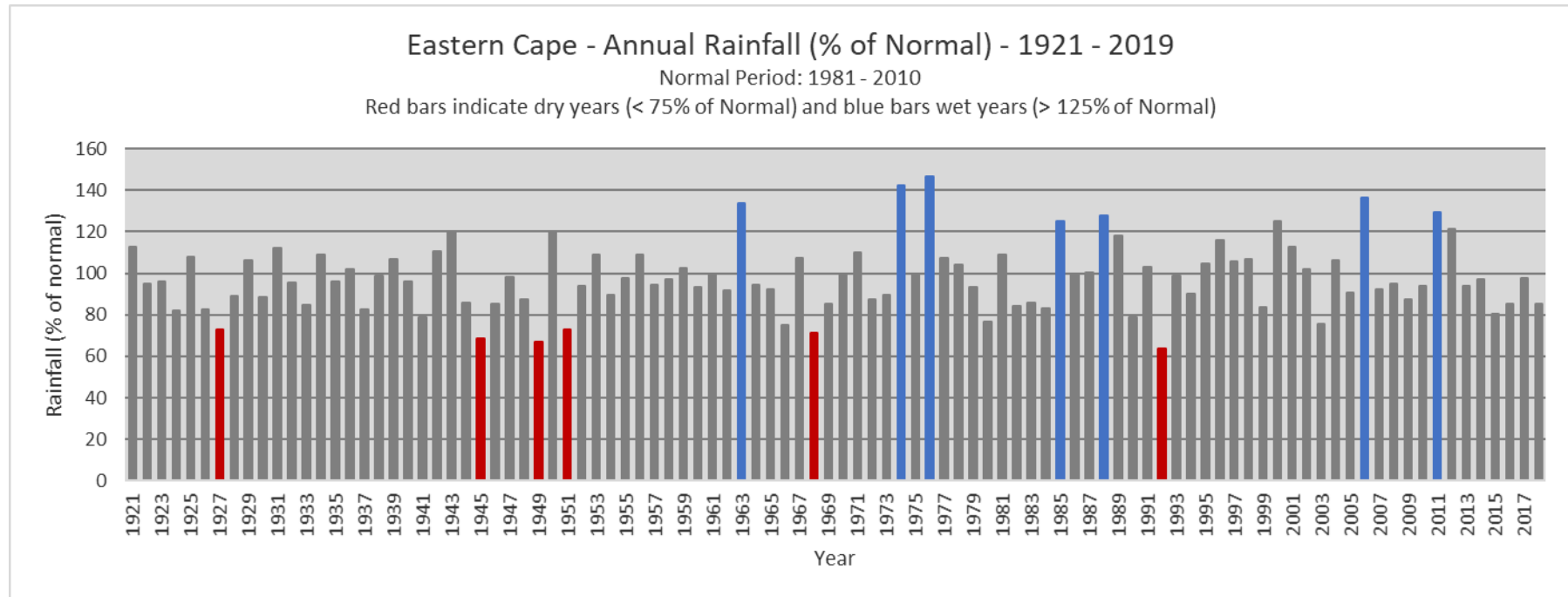
Minimum Temperature (°C) overview for some long-term climate stations for 2019									
Station	Average -2019	Normal (1981- 2010)	Rank (Highest since 1951)	Highest Annual Average (since 1951)	Lowest An- nual Average (since 1951)	Highest Daily - 2019 (Date)	Highest Daily (since 1951)	Lowest Daily - 2019 (Date)	Lowest Daily (since 1951)
Limpopo Province									
Bela Bela	11.3	11.5	43	14.3 (2015)	10.3 (1953)	21.5 (2019-12-31)	27.4	-1.8 (2019-07-06)	-7.4
Polokwane	12.9	10.4	1	12.9 (2019)	9.4 (1955)	23.8 (2019-10-26)	23.8	-0.3 (2019-07-23)	-3.8
Gauteng									
OR Tambo (Jhb)	11.6	9.6	1	11.6 (2019)	8.0 (1951)	20.5 (2019-10-23)	23.0	-1.3 (2019-06-30)	-9.7
UP Exp Farm (Pta)	12.4	10.3	1	12.4 (2019)	8.0 (1951)	20.9 (2019-01-11)	25.7	0.8 (2019-06-30)	-6.4
Free State									
Glen College (Bfn)	7.7	7.8	32	10.2 (2018)	6.2 (1955)	21.4 (2019-11-26)	24	-7.6 (2019-07-15)	-11.0
KwaZulu-Natal									
Cedara	10.1	9.1	3	10.8 (2016)	7.7 (1951)	18.2 (2019-12-25)	21.6	-2.2 (2019-07-21)	-7.1
Mt Edgecombe (Dn)	16.7	14.7	1	16.7 (2019)	12.8 (1951)	23.9 (2019-01-14)	23.9	5.2 (2019-07-22)	1.9
Northern Cape									
Calvinia	8.7	8.4	22	10.0 (2018)	7.4 (2003)	24.6 (2019-04-29)	28.0	-4.3 (2019-06-13)	-9.0
Upington	13.4	13.0	11	14.2 (1999)	10.4 (1955)	27.3 (2019-11-29)	29.6	-2.0 (2019-06-14)	-7.9
Vanwyksvlei	10.8	10.1	6	11.7 (1999)	8.7 (1968)	25.5 (2019-11-29)	27.7	-4.0 (2019-08-05)	-9.0
Western Cape									
Beaufort West	12.1	10.1	1	12.1 (2019)	8.5 (1951)	23.1 (2019-04-12)	23.1	-1.5 (2019-07-21)	-8.8
Cape Town	12.5	11.7	2	12.6 (2014)	10.0 (1951)	19.6 (2019-01-31)	22.4	1.8 (2019-06-14)	-1.9
Cape Agulhas	15.1	14.5	2	15.3 (2004)	13.1 (1955)	21.6 (2019-02-22)	22.6	8.4 (2019-06-07)	0.8
Eastern Cape									
East London	14.6	14.6	35	15.5 (1952)	14.0 (2013)	21.4 (2019-03-11)	26.5	4.7 (2019-06-09)	2.4
Port Elizabeth	13.2	12.6	4	13.5 (1999)	10.1 (1955)	20.3 (2019-01-17)	23.4	1.2 (2019-06-14)	-2.3

Rainfall (mm) overview for some long-term climate stations for 2019

Station	Total 2019	Normal (1981-2010)	Highest Annual Total (since 1981)	Lowest Annual Total (since 1981)	Highest Daily Total 2019	Highest Daily Total (since 1981)	Number of days with rain ≥ 1mm -2019	Average number of days per year with rain ≥ 1mm (1981-2010)
Limpopo Province								
Thohoyandou	622	765	1654 (2000)	331 (1983)	89	199 (2000-02-23)	53	58
Polokwane	376	491	950 (1996)	256 (2002)	71	110 (2018-02-19)	35	45
Gauteng								
Pretoria (Irene)	773	692	977 (2014)	340 (2003)	103	122 (2018-03-22)	51	67
Johannesburg	735	750	1089 (2000)	443 (1984)	41	110 (1985-10-30)	59	71
North-West								
Mafikeng	546	544	874 (1997)	293 (2015)	59	128 (1995-11-18)	48	52
Taung	358	438	1008 (1988)	73 (2009)	39	160 (1988-02-20)	39	44
Mpumalanga								
Ermelo	716	719	974 (2000)	454 (2001)	85	108 (2017-01-17)	55	68
Lydenburg	441	445	1067 (1987)	84 (2005)	44	81 (2012-12-25)	40	44
Free State								
Bethlehem	706	562	974 (2000)	465 (2015)	50	116 (1992-11-08)	67	73
Bloemfontein	527	569	1064 (1988)	260 (1992)	60	142 (1988-02-21)	44	58
KwaZulu-Natal								
Ladysmith	616	749	1111 (1987)	300 (1993)		141 (1987-09-29)	51	68
Durban	936	1021	1422 (1996)	471 (1992)	167	265 (1996-01-12)	96	87
Northern Cape								
Upington	83	189	364 (1991)	53 (1986)	39	85 (1996-02-29)	12	24
Calvinia	68	209	379 (1995)	68 (2019)	19	59 (2010-10-15)	14	34
Western Cape								
Cape Town	348	542	707 (1996)	323 (2010)	48	94 (1993-04-11)	53	68
George	425	716	1220 (1981)	374 (2009)	29	230 (2006-08-01)	65	80
Eastern Cape								
Port Elizabeth	395	581	1033 (2012)	395 (2019)	32	224 (1981-03-25)	66	71
East London	614	855	1318 (1985)	550 (1981)	36	313 (2002-08-15)	61	79

Provincial Rainfall

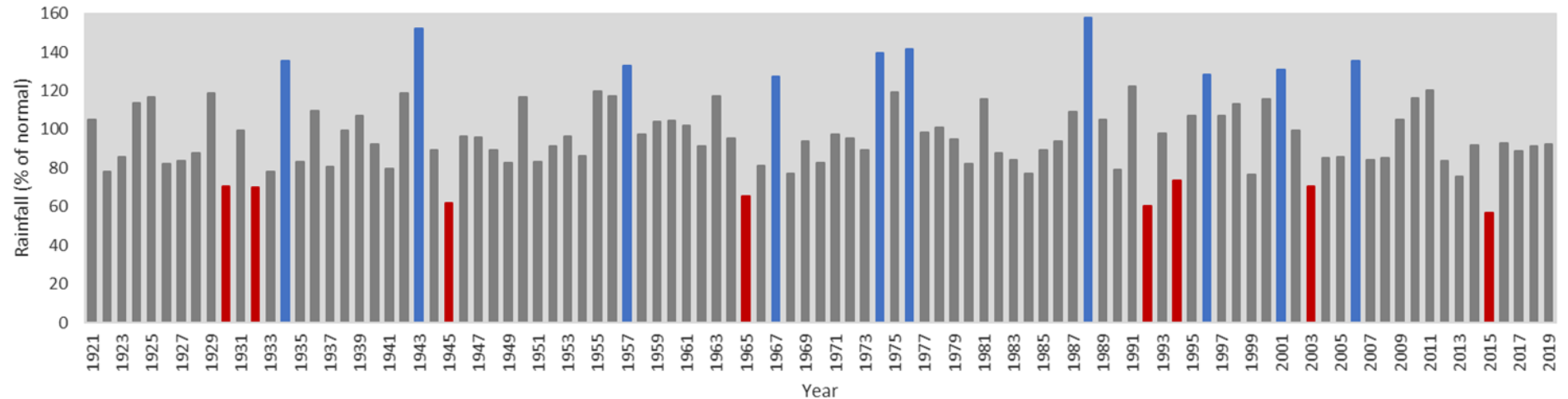
The provincial rainfall statistics are based on the average rainfall of the homogeneous rainfall districts, developed by SAWS, that mostly falls within a particular province. This approach ensures a more even weighting of rainfall stations in the spatial rainfall estimations. In general South Africa received near-normal rainfall on a provincial level with the exception of the Northern Cape, which since 2013 experienced intermittent years of extremely low rainfall.



Free State - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

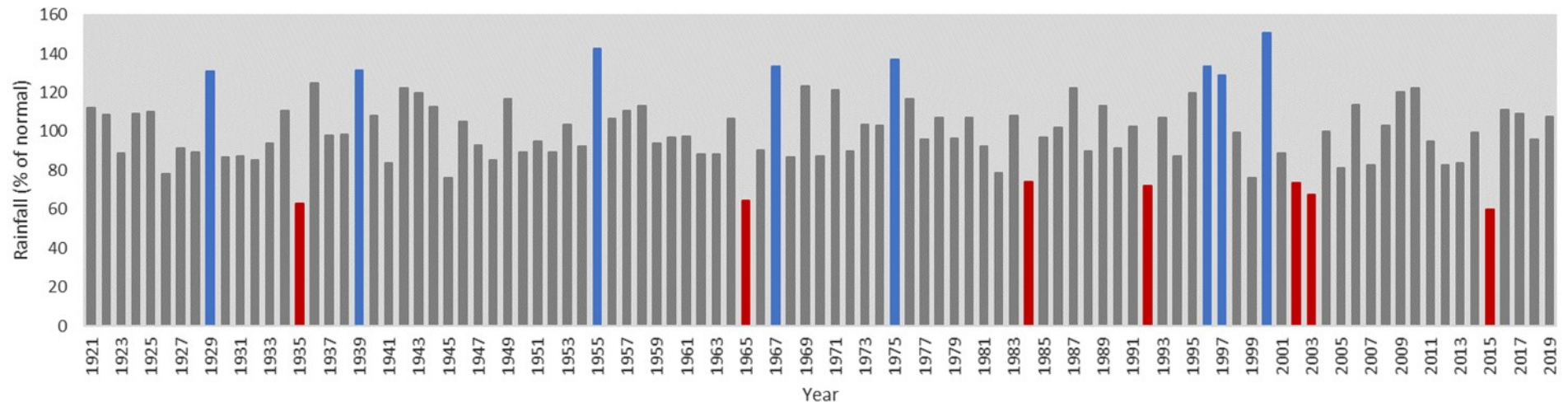
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Gauteng - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

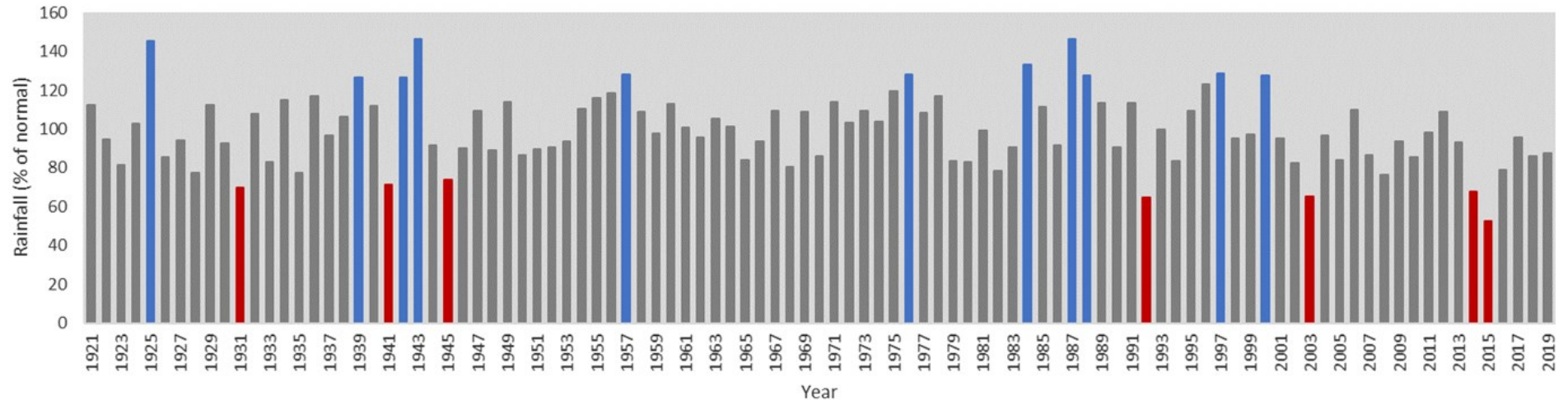
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



KwaZulu-Natal - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

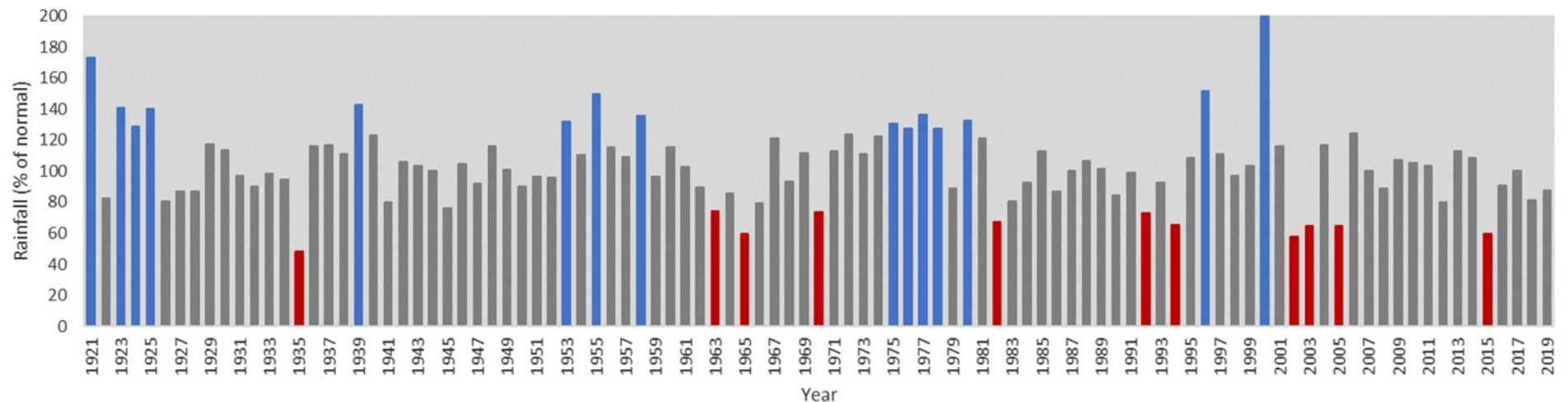
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Limpopo - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

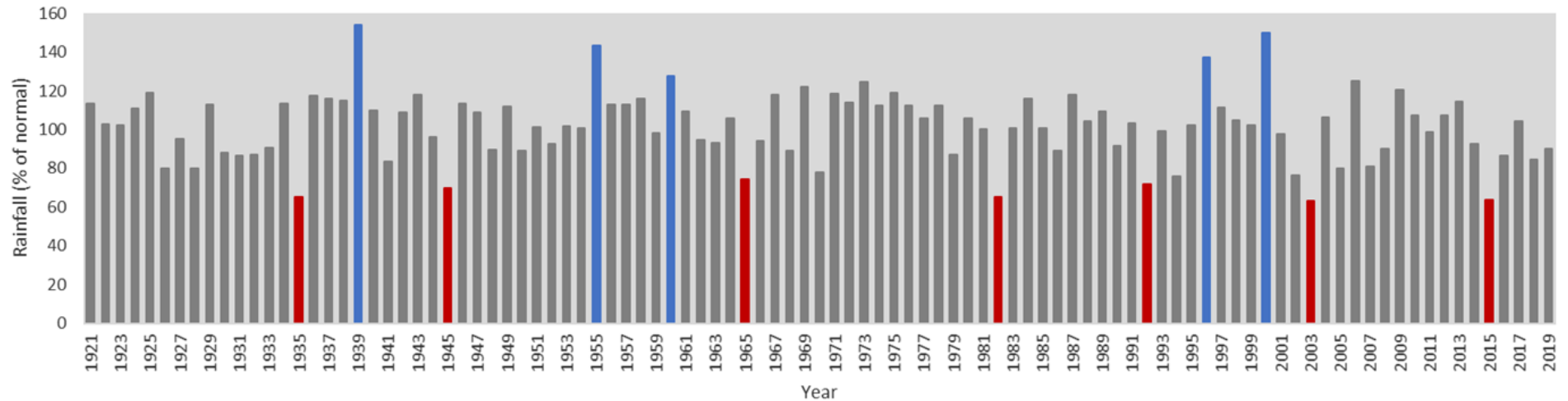
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Mpumalanga - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

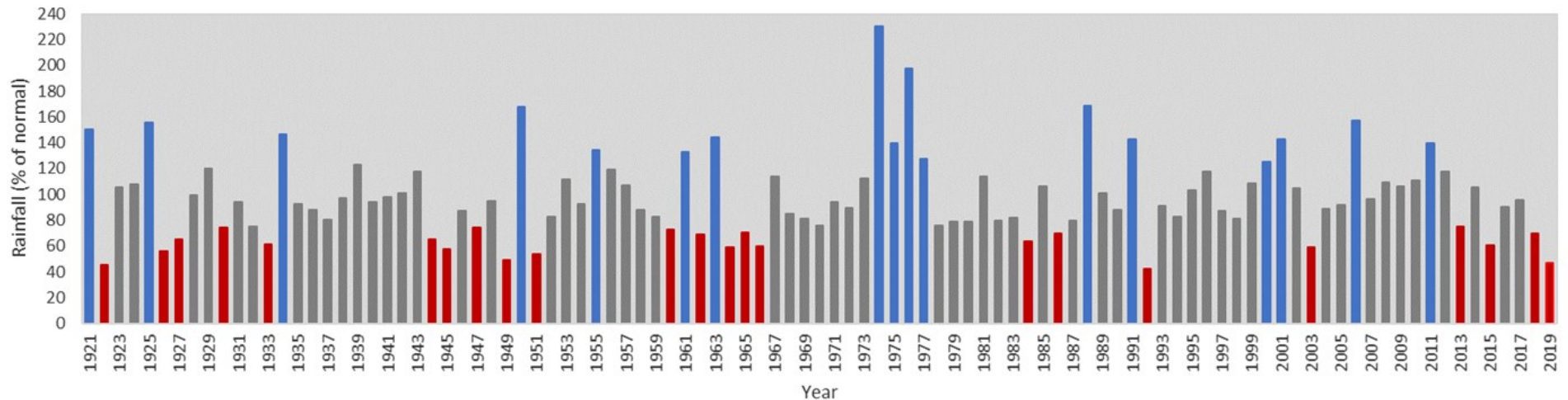
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Northern Cape - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

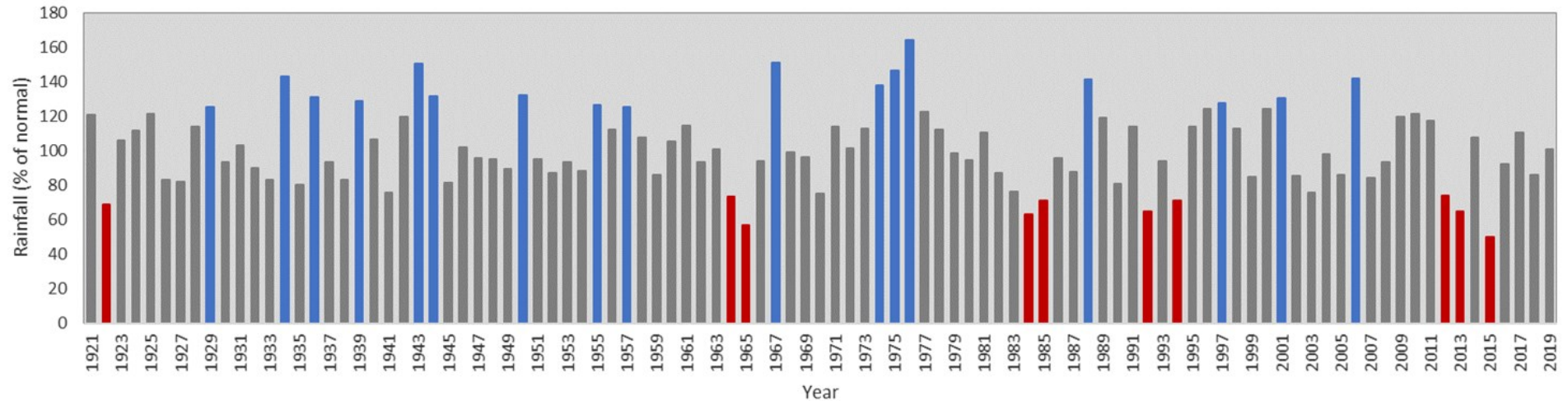
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



North-West - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

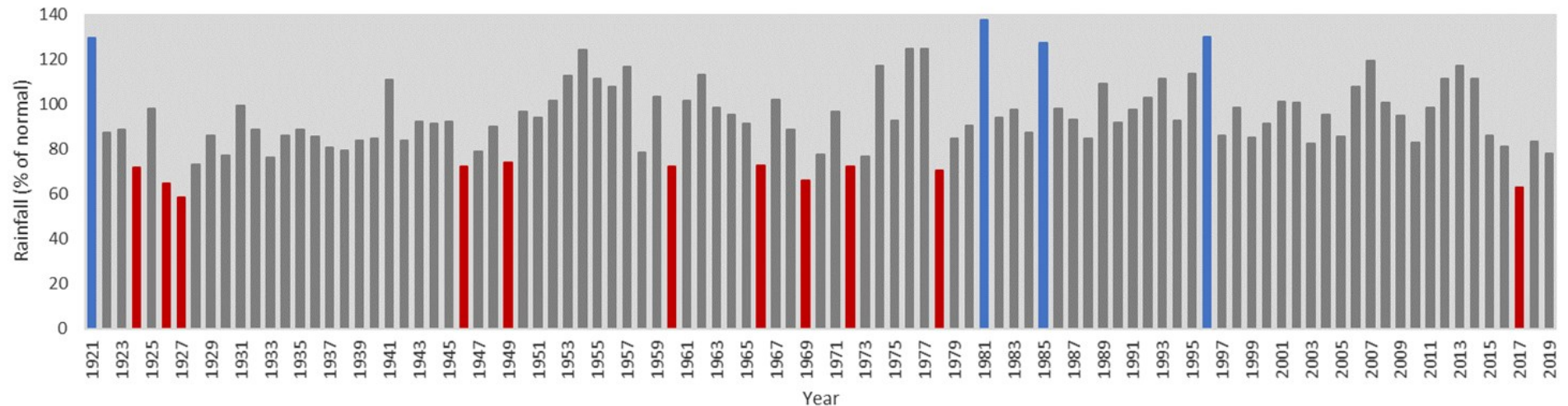
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Western Cape - Annual Rainfall (% of Normal) - 1921 - 2019

Normal Period: 1981 - 2010

Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)

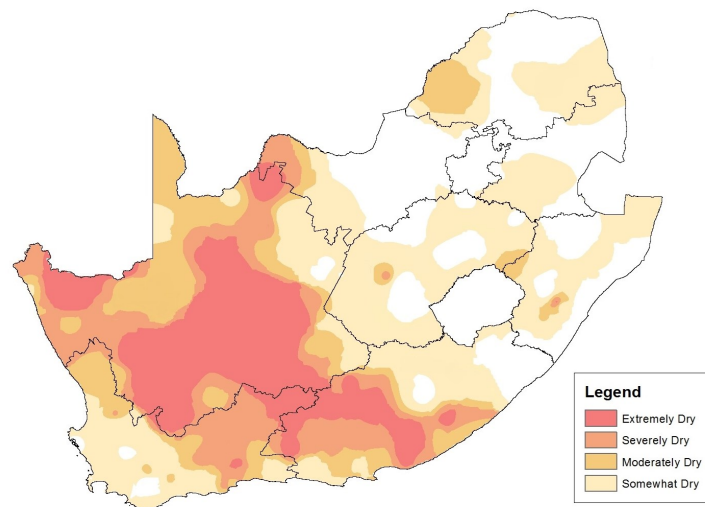


Indications of drought

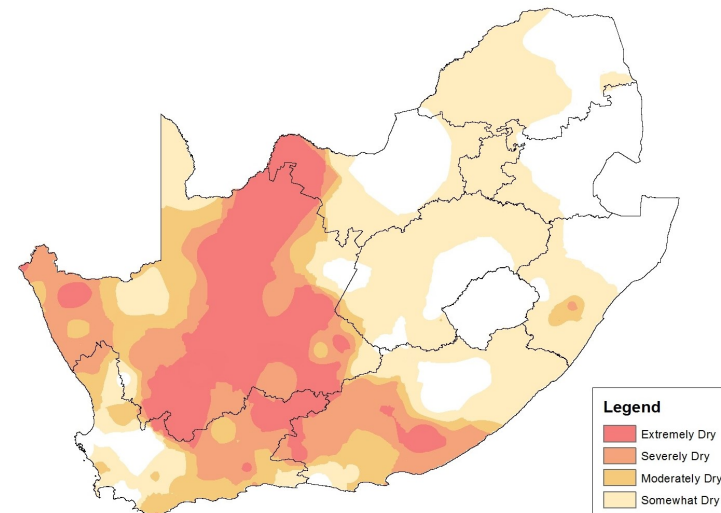
A meteorological drought is defined on the basis of the degree of dryness in comparison to “normal” or average amounts of rainfall for a particular area or place and the duration of the dry period.

The Standardized Precipitation Index (SPI) is an index based on the probability of rainfall for any time scale and can assist in assessing the severity of drought. Long-term drought usually occur when moisture supply is abnormally below average for periods of up to two years, where-after widespread desiccation occurs. A 12-month and 24-month SPI is a comparison of the precipitation for 12 and 24 consecutive months with the same 12 and 24 consecutive months during all the previous years of available data respectively. SPI's of these longer timescales are useful in identifying areas of drought, as they are linked to streamflow, reservoir levels and even groundwater levels. The most noteworthy in the 24-month SPI map below are the moderately dry to extremely dry western parts of the Northern Cape, extending to the Western– and Eastern Cape Provinces.

12-month SPI for January 2018 to December 2018



24-month SPI for January 2018 to December 2019



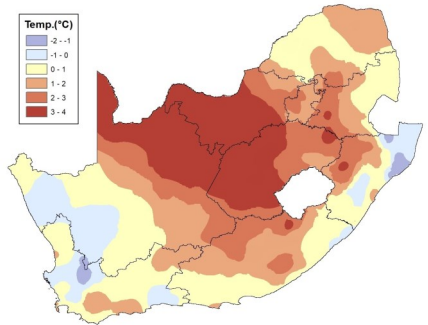
Monthly maps

Following are monthly maps for

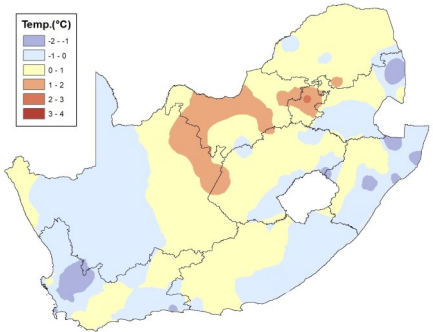
- Maximum temperature deviations from the 1981-2010 normal
- Minimum temperature deviations from the 1981-2010 normal
- Standardized Precipitation Index (SPI), indicating dry areas
- Lightning-stroke density indicating the number of strokes per square kilometer

January 2019

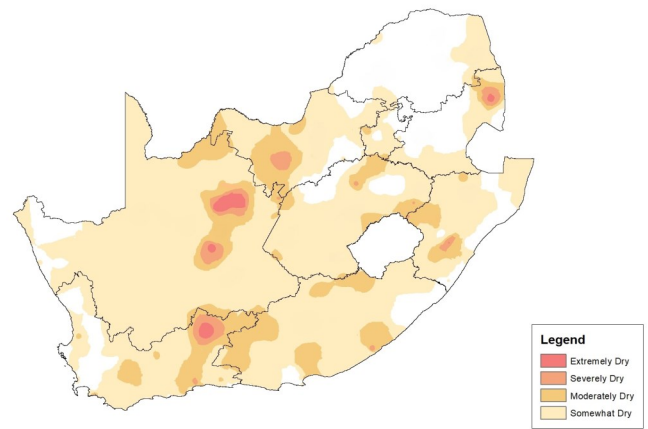
Maximum temperature deviations



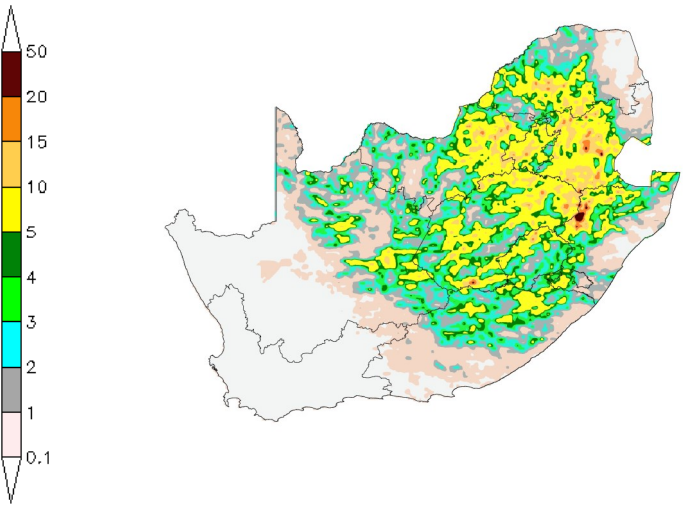
Minimum temperature deviations



SPI

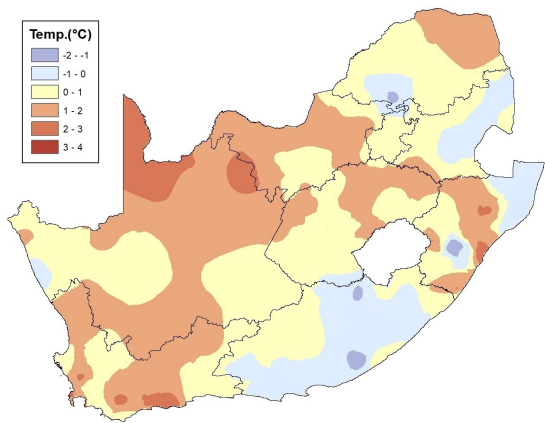


Lightning-stroke density

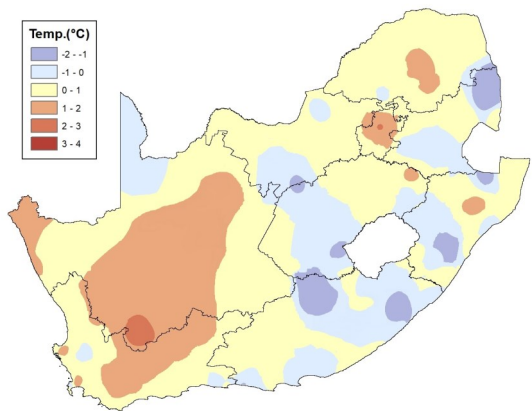


February 2019

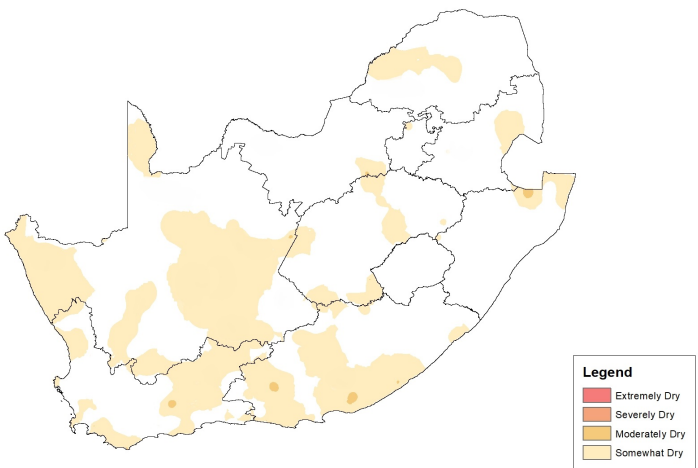
Maximum temperature deviations



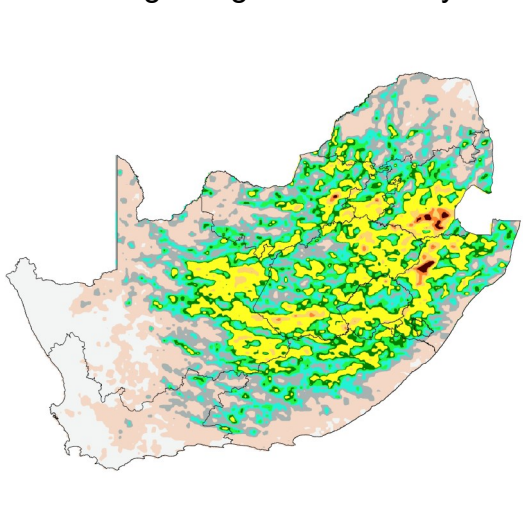
Minimum temperature deviations



SPI

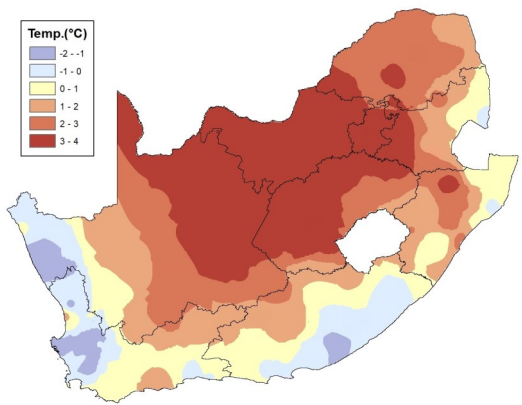


Lightning-stroke density

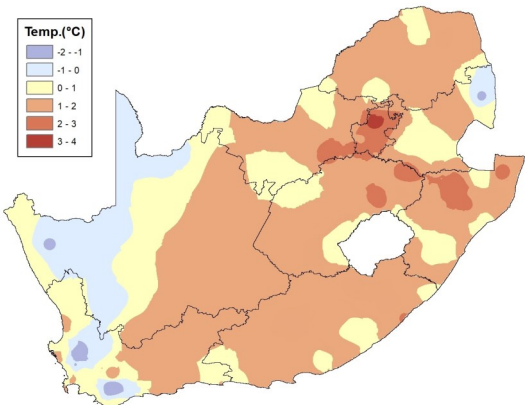


March 2019

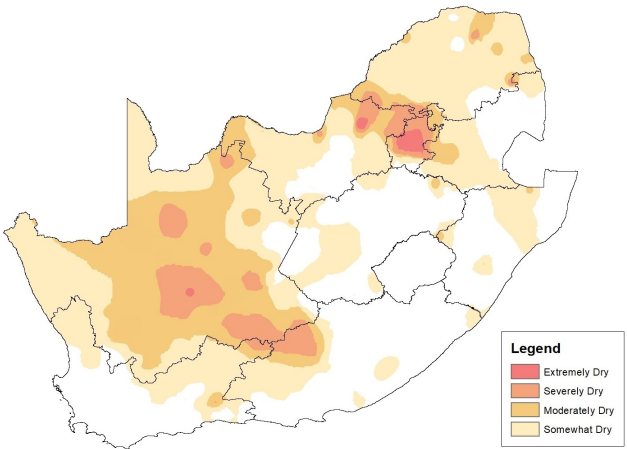
Maximum temperature deviations



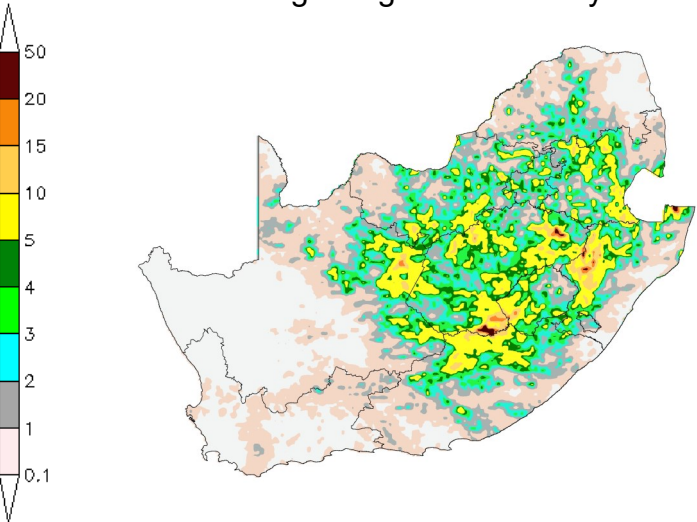
Minimum temperature deviations



SPI

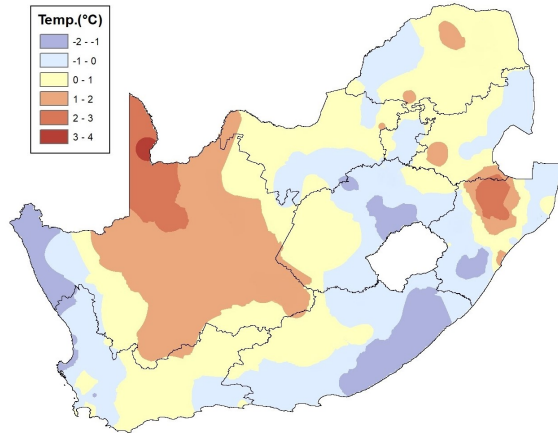


Lightning-stroke density

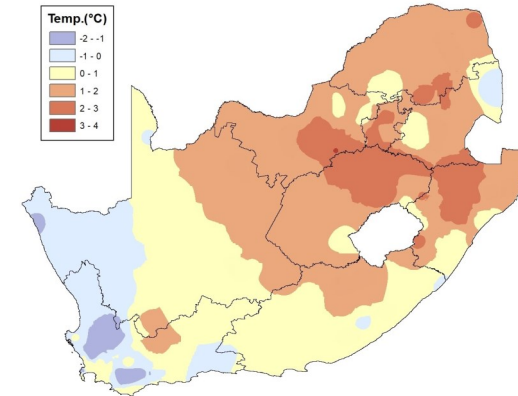


April 2019

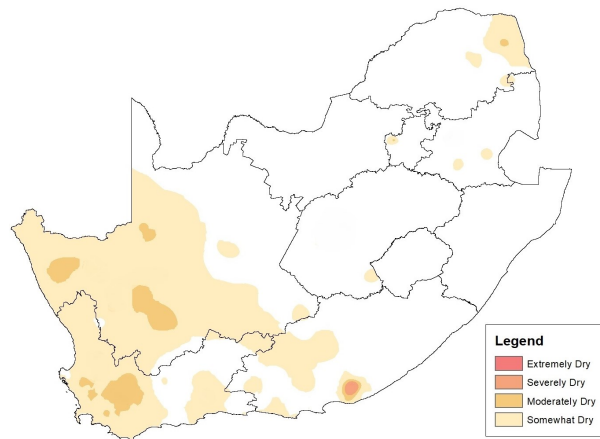
Maximum temperature deviations



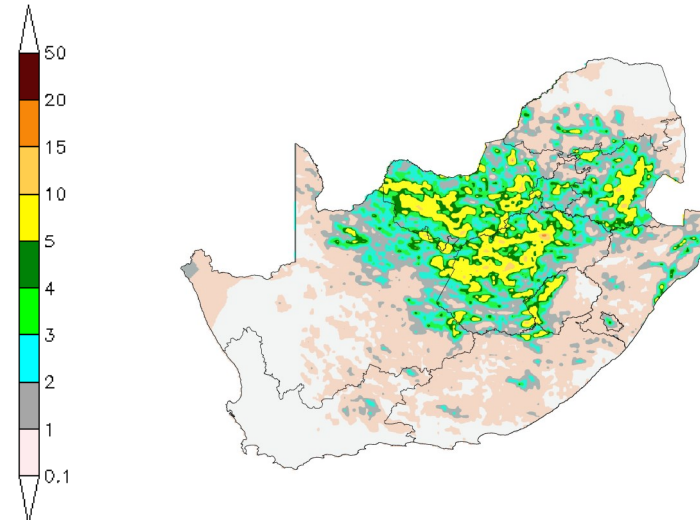
Minimum temperature deviations



SPI

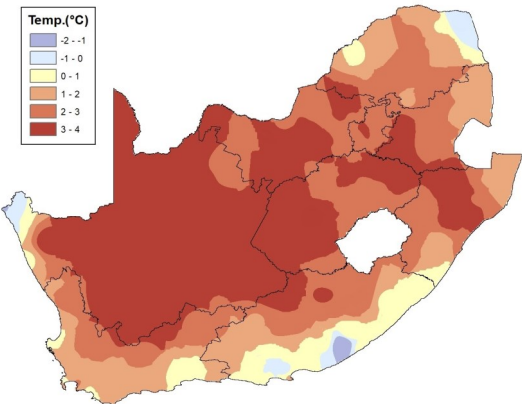


Lightning-stroke density

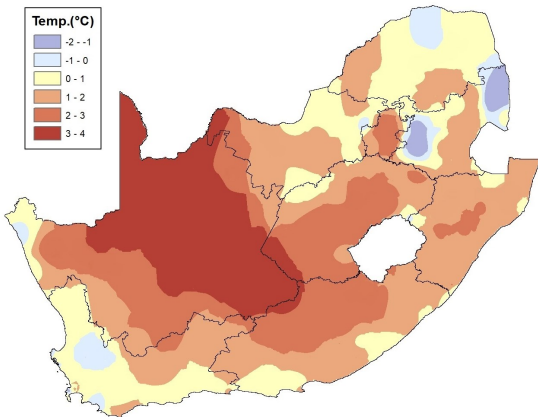


May 2019

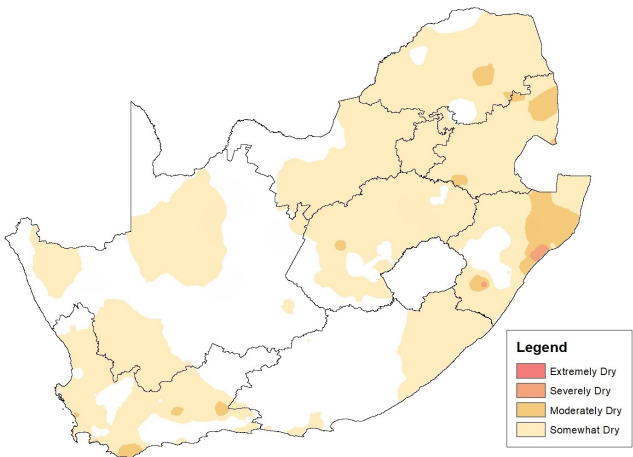
Maximum temperature deviations



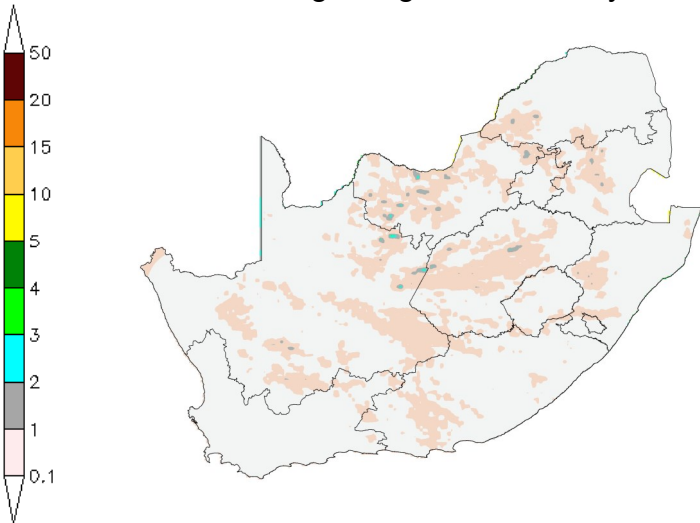
Minimum temperature deviations



SPI

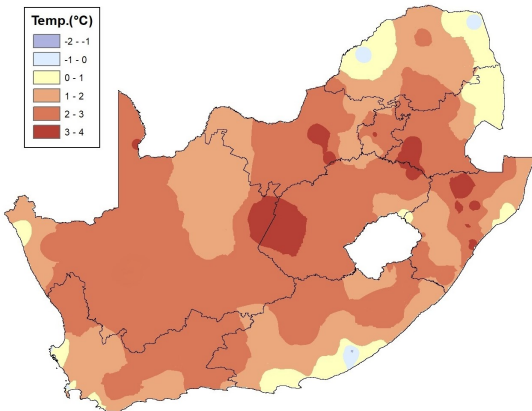


Lightning-stroke density

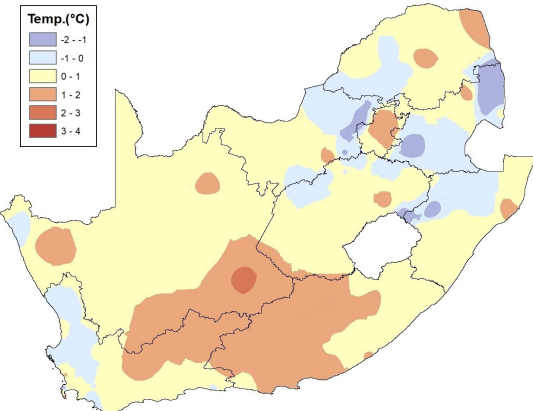


June 2019

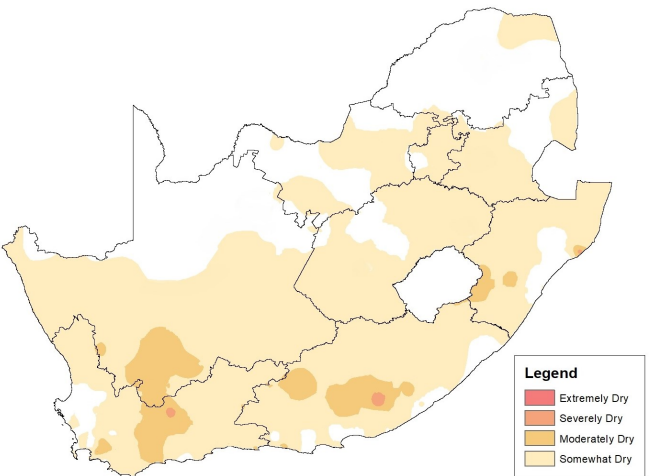
Maximum temperature deviations



Minimum temperature deviations



SPI

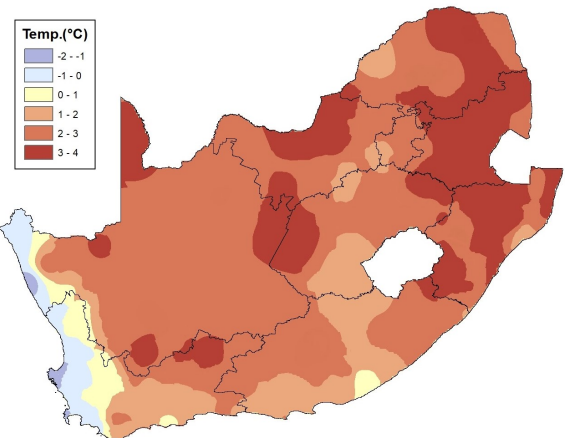


Lightning-stroke density

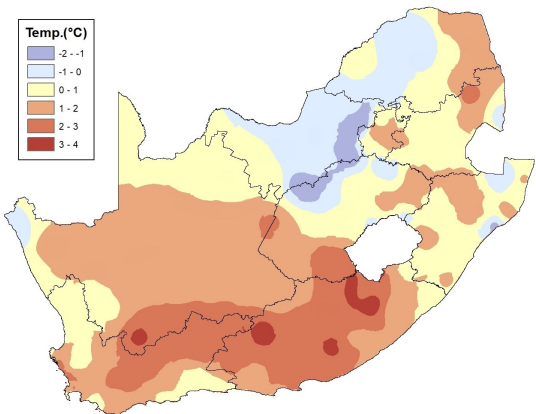


July 2019

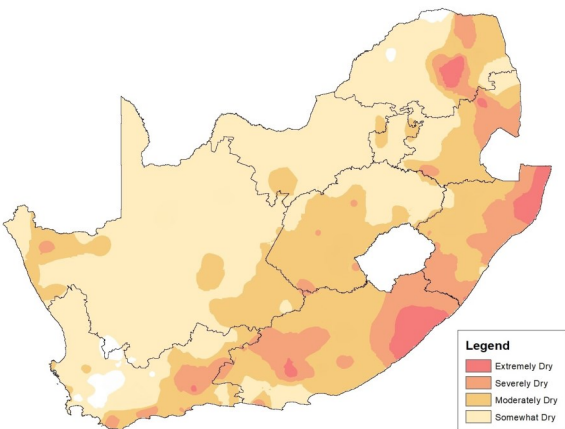
Maximum temperature deviations



Minimum temperature deviations



SPI

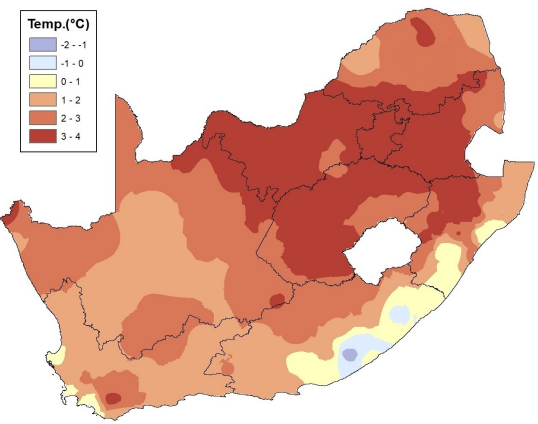


Lightning-stroke density

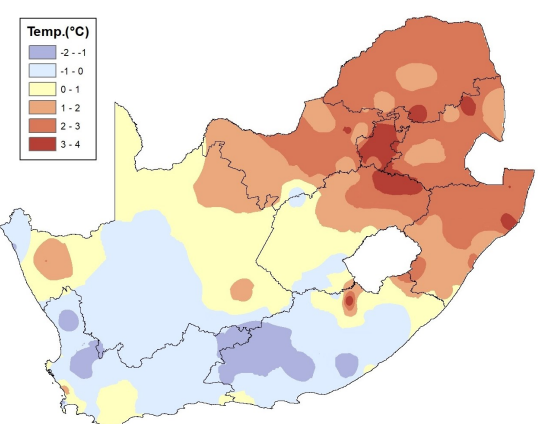


August 2019

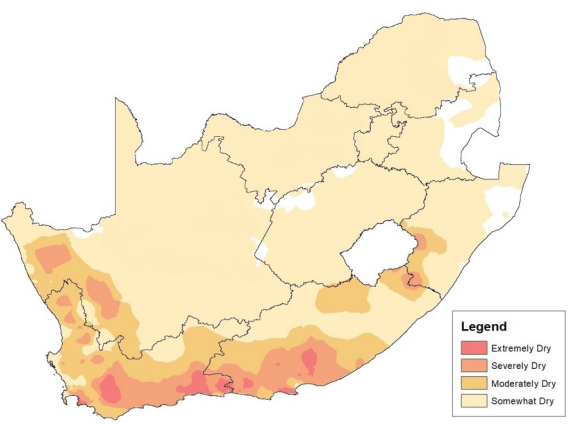
Maximum temperature deviations



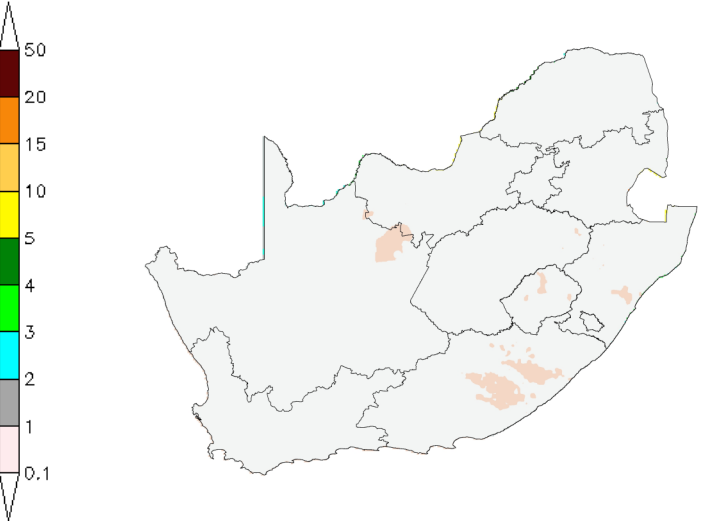
Minimum temperature deviations



SPI

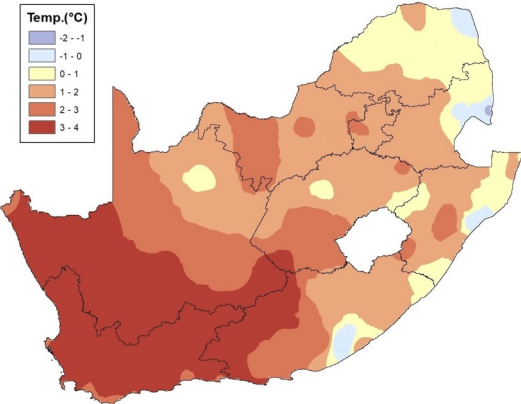


Lightning-stroke density

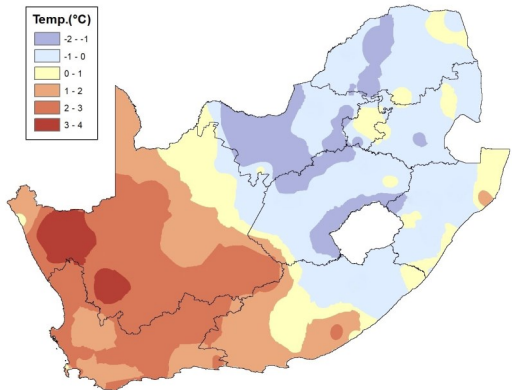


September 2019

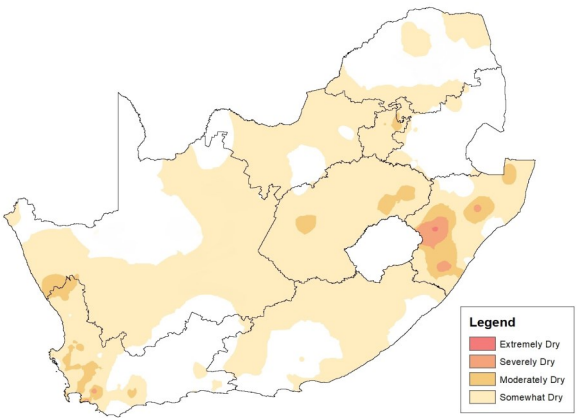
Maximum temperature deviations



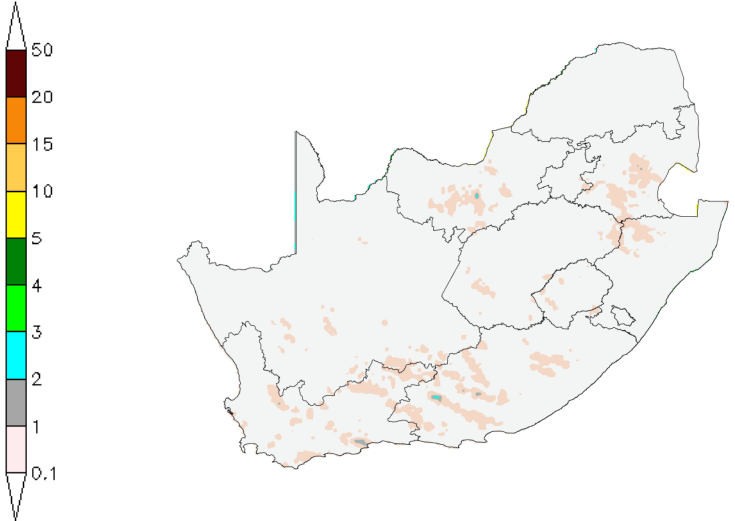
Minimum temperature deviations



SPI

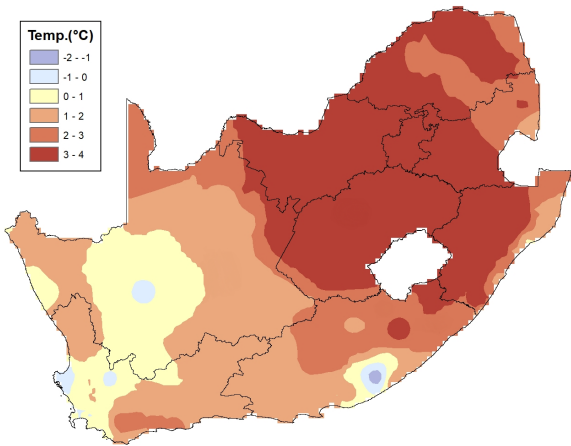


Lightning-stroke density

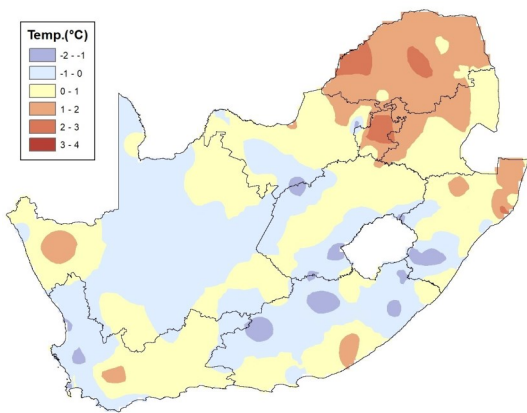


October 2019

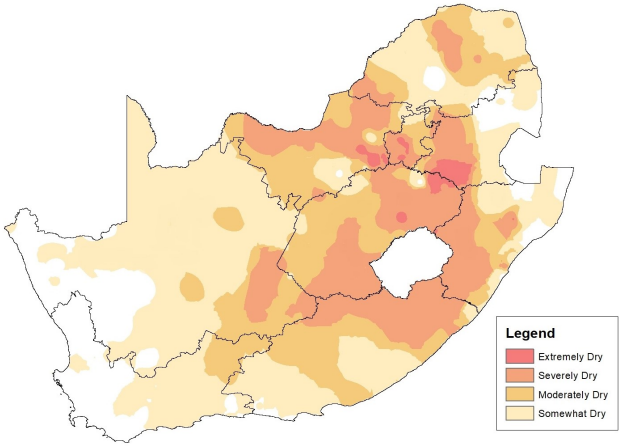
Maximum temperature deviations



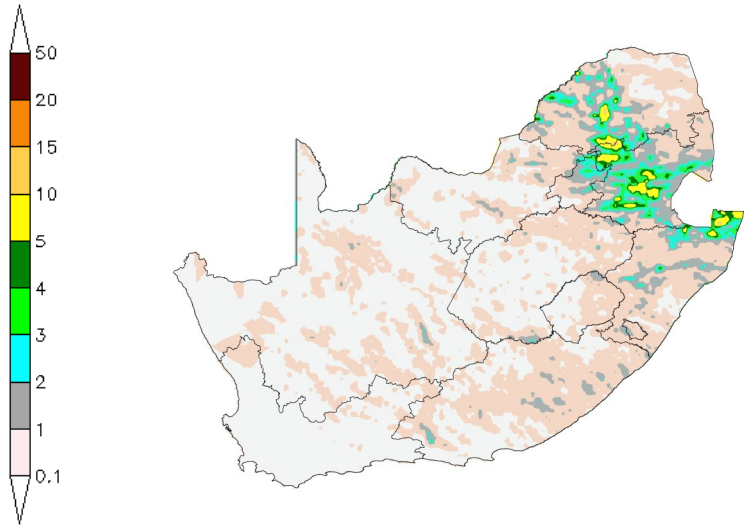
Minimum temperature deviations



SPI

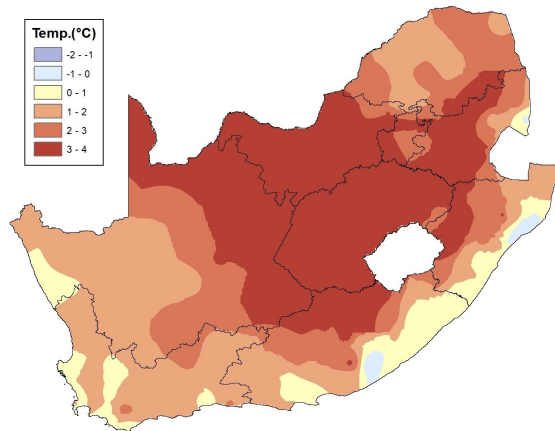


Lightning-stroke density

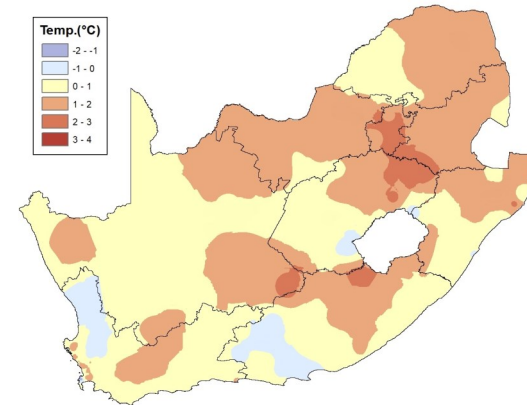


November 2019

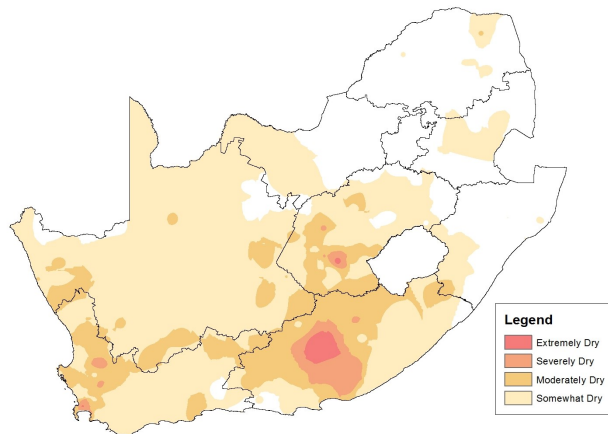
Maximum temperature deviations



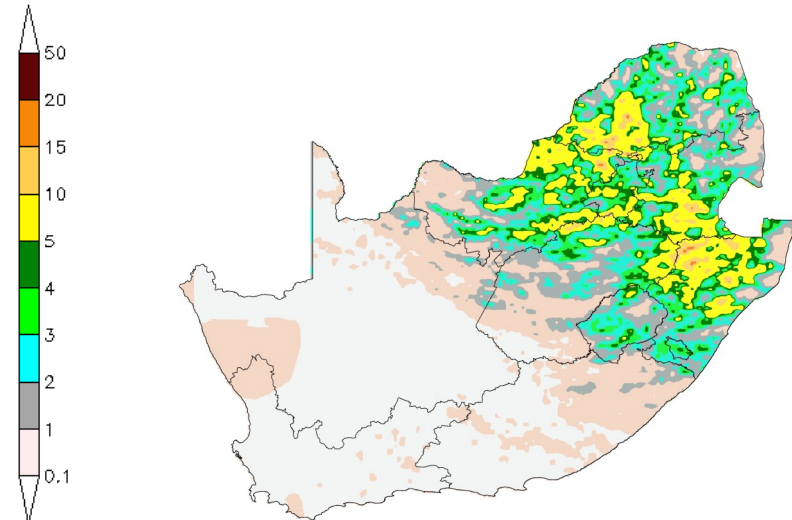
Minimum temperature deviations



SPI

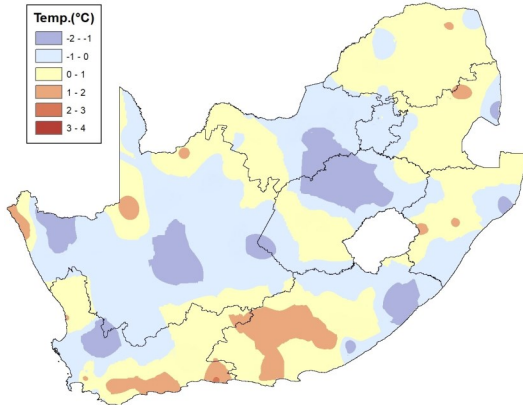


Lightning-stroke density

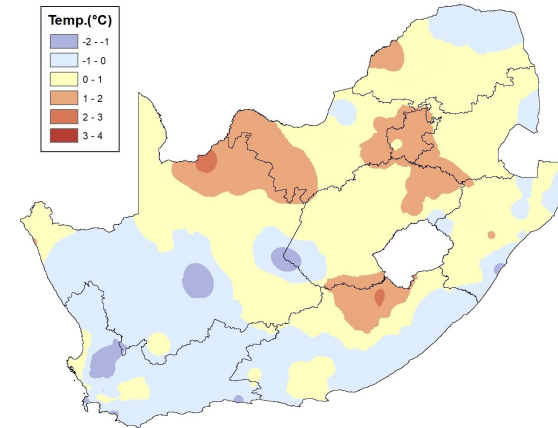


December 2019

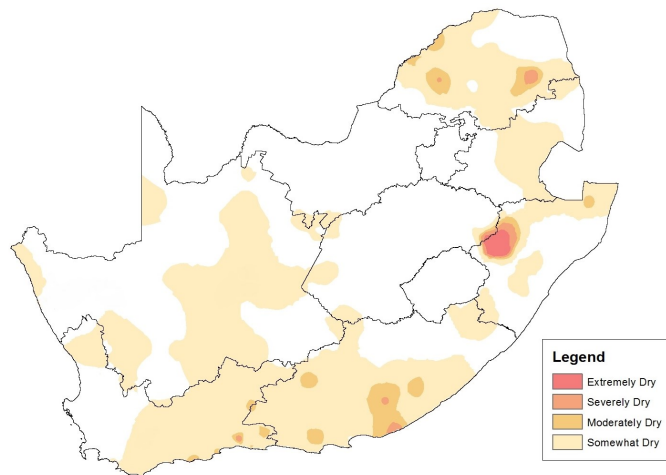
Maximum temperature deviations



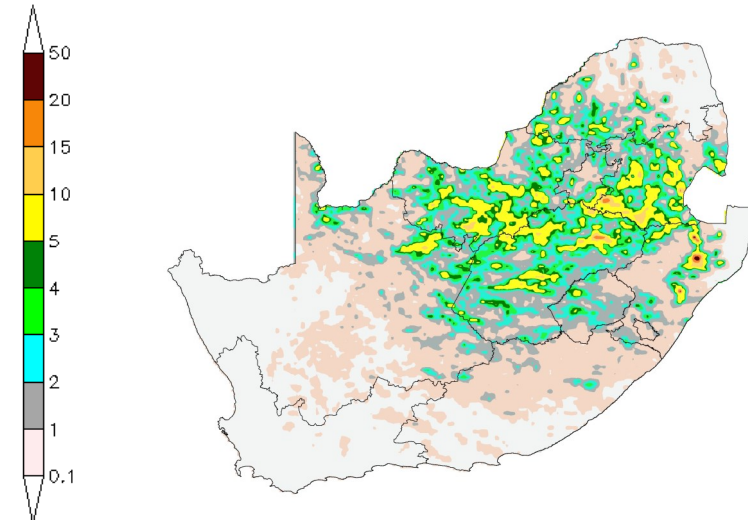
Minimum temperature deviations



SPI



Lightning-stroke density



Sunshine in the main centres

The daily average sunshine in the main centres of Cape Town, Port Elizabeth, Bloemfontein, Durban and Johannesburg is presented in the table below. Compared to the 1981—2010 average all of the large cities experienced somewhat more sunshine than the average, between 0,1 and 0,3 hours (i.e. about 5 to 20 minutes).

City	Daily average sunshine in 2019	Daily average sunshine (1981—2010)
Cape Town	8,4	8,2
Port Elizabeth	7,7	7,6
Bloemfontein	9,0	8,9
Durban	6,5	6,4
Johannesburg	8,8	8,5