

Annual State of the Climate of South Africa 2021

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Executive Summary

Surface Temperature

South Africa experienced a somewhat warm year, which was quite mild compared to previous years. This can be ascribed to well-above normal rainfall over most of the country. The annual mean temperature anomalies for 2021, based on the data of 26 climate stations, was on average somewhat higher than the reference period (1981-2010), making it approximately the 13th 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 2021 was the well-above normal rainfall received over extensive parts of South Africa. During 2021/22 ENSO was in a La Nina phase, which is associated with above-normal rainfall over most of the summer rainfall regions. The section of South Africa experiencing drought further decreased over the past year, due to the good rains in the early summer rainfall season of 2021/22, especially from November onwards. However, there were still some areas in the western and southern interior that could be considered to be somewhat dry, which shows some persistence of the long-term drought in parts of the Northern and Eastern Cape (for almost a decade in some places).

Noteworthy climate and weather events

In South Africa, the year started off with very dry conditions in the western and southern interior. However, From January above normal rainfall conditions over especially the western and central interior started to bring alleviation. In February the northern parts of the country received very good rains but this was accompanied by many cases of damage to infrastructure, mainly due to flash floods. In March, while it was hot in the eastern parts, with accompanying heat waves and record high temperatures, the Western Cape received unseasonal high rainfall accompanied by flooding in places in the Cape Town metropole. The still dry conditions in the western and southern interior was exacerbated in April with very low rainfall and abnormally high maximum temperatures. These conditions extended into May, but the winter rainfall seasons started relatively early with good rains recorded in the extreme south and south-west by then.

The winter season (July to August) can be described as quite close to normal, but with unseasonal significant rainfalls in the central and north-western interior, which persisted into spring. The early summer, starting already in October, experienced well above-normal rainfall over especially the drought-stricken western interior, and spread to the south in November. In December, the whole country received above-normal rainfall. In many places, the monthly rainfall received were multiples of the normal rainfall figures. The effect was the early-summer rainfall season could, as a whole, be characterised as above normal, except for some areas in the east and south-east of South Africa.

The very high December rainfall was associated with a number of negative impacts, and just the most noteworthy are mentioned: Hundreds of families in Piet Retief, Mpumalanga were left homeless after flash floods that left a trail of damage and destruction on the 1st. The roofs were blown away and windows of several houses were broken while other houses collapsed. The rain was accompanied by strong winds that blew roofs of houses. The roads were also affected.

A man was swept off a low-lying crossing bridge near Hengelaar and Seekoei roads in the Roodeplaat area in Tshwane, Gauteng on the 4th after heavy rains. The body of a man was found after his SUV he was driving were recovered on the 5th in the morning. The vehicle was found submerged about a km away from where it was last seen.

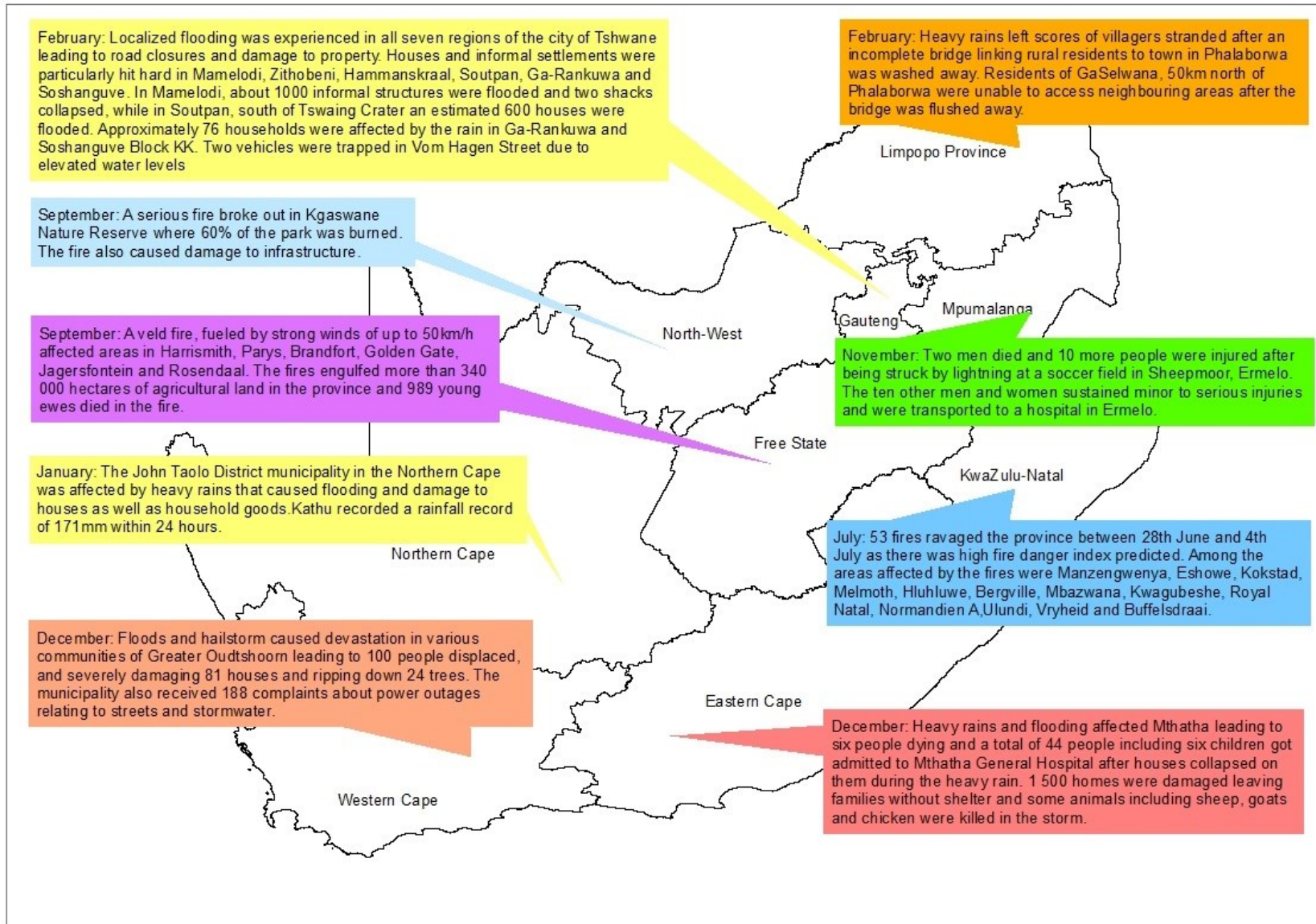
A taxi and another car were swept away by floods along the R577 road near Thorncriff Mine on the border of Mpumalanga and Limpopo Province on the 7th. The cars were both recovered at the river bank but both occupants were missing.

Six people died and a total of 44 people including six children were admitted to Mthatha General Hospital after heavy rain affected Mthatha in the Eastern Cape on the 9th. 77 families in the King Sabata Dalindyebo municipality were left homeless and 15 other families were partially destitute when houses collapsed on them during heavy rain. Some animals including sheep, goats and chicken were killed in the storm. The Siyazama Ntlini Pre School was damaged and infrastructure like electricity power lines and electric meter boxes were also damaged. The Gqunu Bridge in Mhlontlo ward 17 was washed away. the city.

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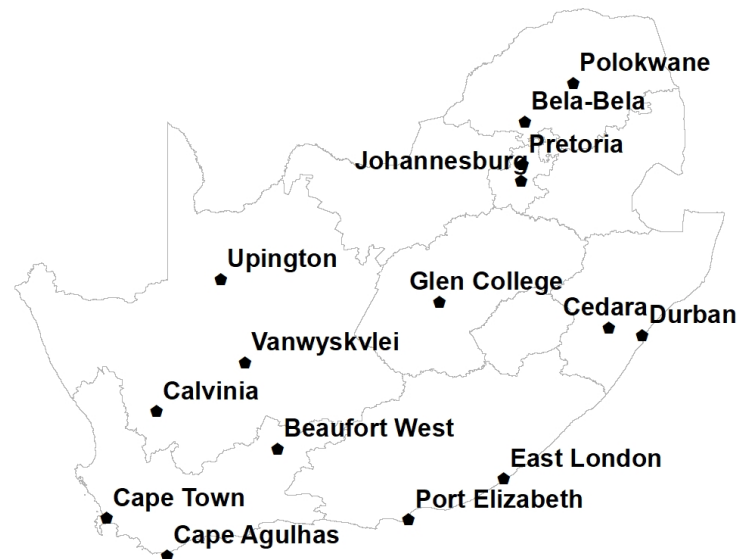
Severe weather events — 2021



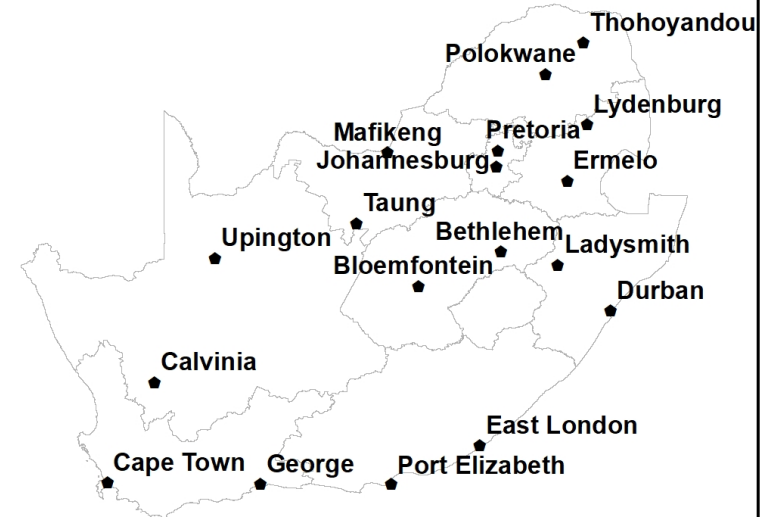
Long-term climate statistics

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.

Stations used in Temperature Table



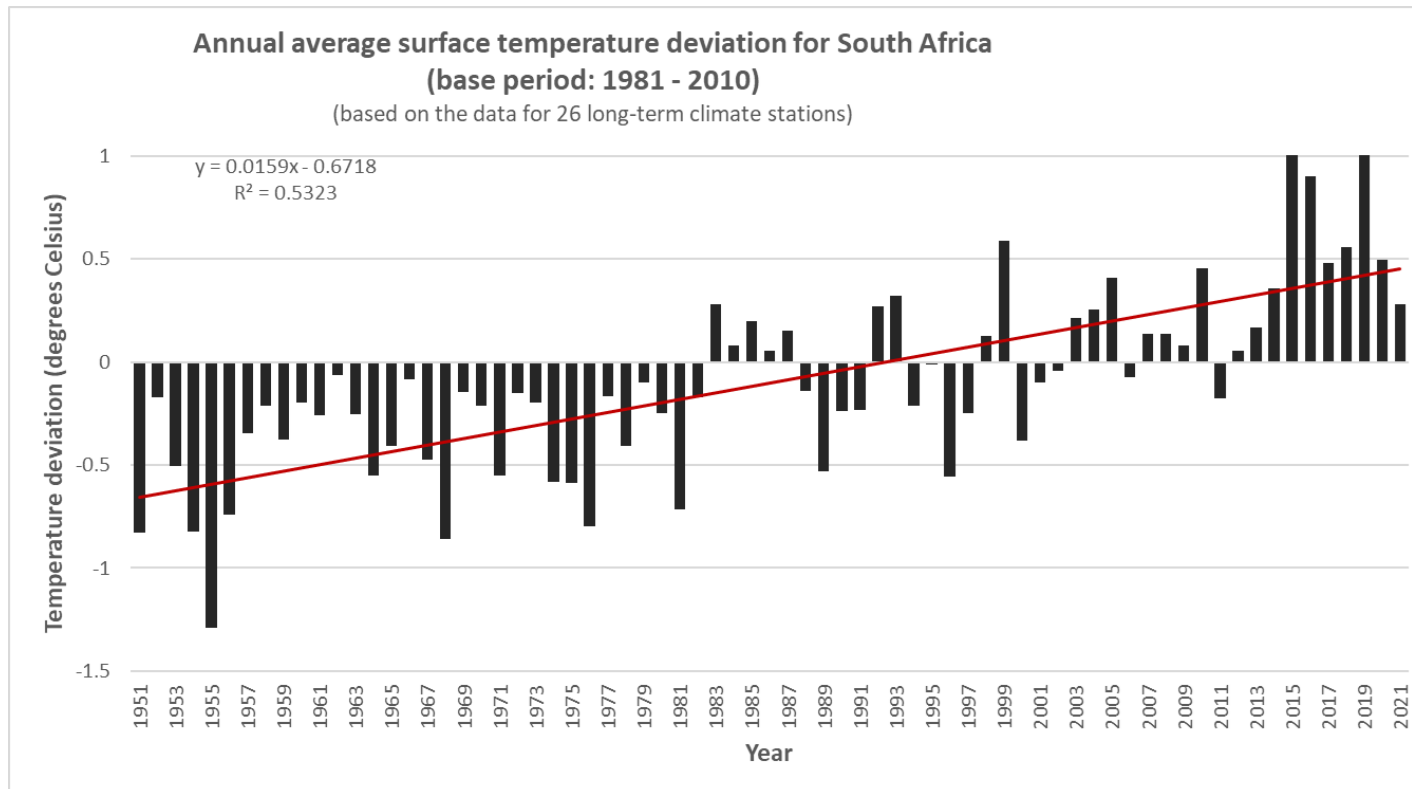
Stations used in Rainfall Table



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 2021 for South Africa was very close to the 1981—2010 average. The long-term trend is estimated to be around 1,6°C per decade, somewhat higher than the average global trend.



Maximum Temperature (°C) overview for some long-term climate stations for 2021									
Station	Average -2021	Normal (1981-2010)	Rank (Highest since 1951)	Highest Annual Average (since 1951)	Lowest Annual Average (since 1951)	Highest Daily - 2021 (Date)	Highest Daily (since 1951)	Lowest Daily - 2021 (Date)	Lowest Daily (since 1951)
Limpopo Province									
Bela Bela	28.6	28.5	12	32.3 (2015)	25.1 (1981)	37.3 (2021-11-02)	43.7	16.3 (2021-07-22)	8.1
Polokwane	25	25.2	36	26.6 (2019)	23.9 (1955)	35.6 (2021-11-02)	38.4	12.9 (2021-10-19)	8.4
Gauteng									
OR Tambo (Jhb)	22.4	22.3	24	24.2 (2015)	21.5 (2001)	31.9 (2021-09-26)	36.2	9.9 (2021-07-22)	2.5
UP Exp Farm (Pta)	25.8	25.6	10	27.6 (2015)	24.3 (1955)	34.4 (2021-09-26)	40.1	14.2 (2021-06-12)	6.8
Free State									
Glen College (Bfn)	26.4	26	12	28.8 (2015)	24.2 (1955)	37.4 (2021-11-16)	42.9	9.4 (2021-08-14)	3.9
KwaZulu-Natal									
Cedara	23.3	22.9	15	24.3 (2015)	21.6 (1968)	36.1 (2021-10-14)	40.1	7.7 (2021-08-13)	5.2
Mt Edgecombe (Dn)	26.5	25.6	5	27.6 (2018)	23.5 (1951)	39.3 (2021-10-14)	42.4	15.0 (2021-09-07)	11.9
Northern Cape									
Calvinia	24.5	24.6	20	26.0 (2019)	23.0 (1955)	39.4 (2021-10-02)	41.9	5.9 (2021-08-27)	2.2
Upington	29.5	29.1	23	30.9 (2019)	27.4 (1976)	40.9 (2021-02-09)	45.3	11.8 (2021-07-13)	6.9
Vanwyksvlei	27.9	27.4	15	29.4 (2019)	25.7 (1955)	41.6 (2021-01-21)	43.9	10.2 (2021-07-13)	7
Western Cape									
Beaufort West	25.7	24.7	15	27.0 (2019)	23.1 (1976)	41.0 (2021-01-23)	44.5	8.7 (2021-07-13)	4.8
Cape Town	22.5	22.2	16	23.4 (1999)	21.0 (1951)	36.9 (2021-04-18)	42.3	12.7 (2021-07-12)	9.4
Cape Agulhas	20.5	20.3	19	20.9 (2019)	19.1 (1955)	28.4 (2021-06-21)	35.6	11.9 (2021-08-27)	10
Eastern Cape									
East London	23.6	23.5	11	24.3 (1999)	22.7 (1971)	43.9 (2021-03-13)	43.9	13.8 (2021-07-23)	9.4
Port Elizabeth	22.8	22.5	21	23.4 (2019)	21.4 (1955)	34.8 (2021-09-23)	40.7	10.8 (2021-07-22)	9.5

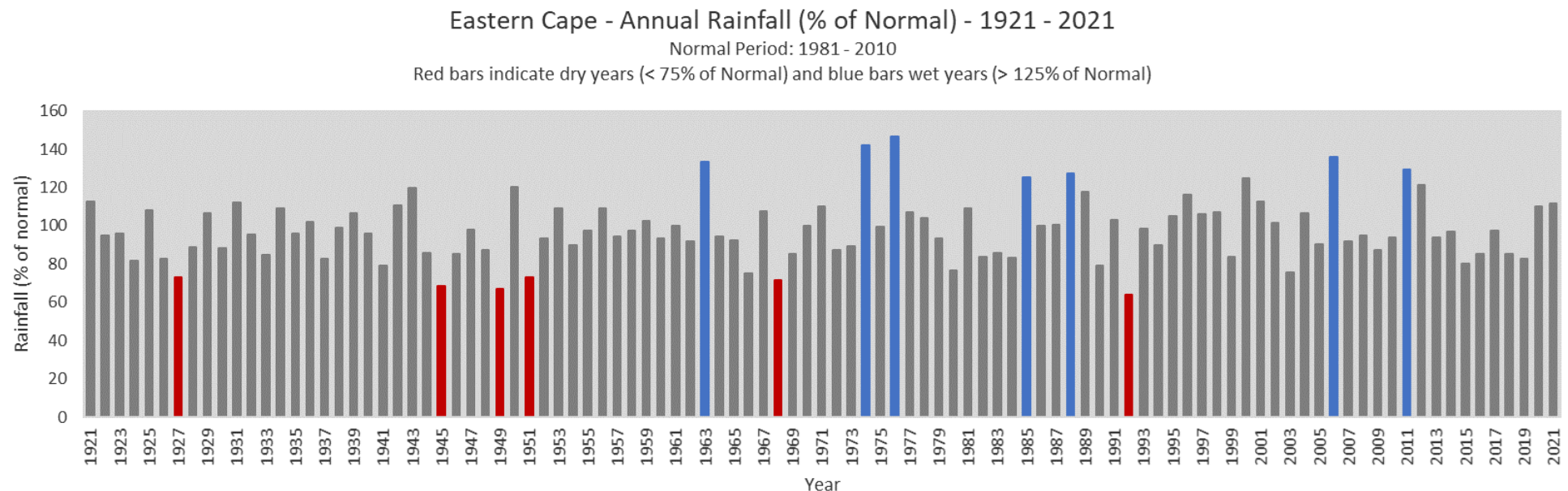
Minimum Temperature (°C) overview for some long-term climate stations for 2021									
Station	Average -2021	Normal (1981-2010)	Rank (Highest since 1951)	Highest Annual Average (since 1951)	Lowest Annual Average (since 1951)	Highest Daily - 2021 (Date)	Highest Daily (since 1951)	Lowest Daily - 2021 (Date)	Lowest Daily (since 1951)
Limpopo Province									
Bela Bela	11.3	11.5	40	14.3 (2015)	10.3 (1953)	18.9 (2021-01-13)	27.4	-5.6 (2021-07-23)	-7.4
Polokwane	11.9	10.4	25	12.9 (2019)	9.4 (1955)	20.6 (2021-01-16)	23.8	0.6 (2021-07-26)	-3.8
Gauteng									
OR Tambo (Jhb)	10.5	9.6	22	11.6 (2019)	8.0 (1951)	18.9 (2021-11-16)	23	-7.0 (2021-07-23)	-9.7
UP Exp Farm (Pta)	11.4	10.3	21	12.4 (2019)	8.0 (1951)	19.6 (2021-01-13)	25.7	-1.5 (2021-07-22)	-6.4
Free State									
Glen College (Bfn)	6.5	7.8	69	10.2 (2018)	6.2 (1955)	18.2 (2021-01-14)	24	-11.2 (2021-07-23)	-11.2
KwaZulu-Natal									
Cedara	9.7	9.1	40	10.8 (2016)	7.7 (1951)	19.1 (2021-12-11)	21.6	-4.6 (2021-07-24)	-7.1
Mt Edgecombe (Dn)	16.3	14.7	22	16.7 (2019)	12.8 (1951)	24.6 (2021-02-14)	24.6	4.7 (2021-07-23)	1.9
Northern Cape									
Calvinia	8.3	8.4	24	10.0 (2018)	7.4 (2003)	19.4 (2021-02-10)	28	-0.3 (2021-08-27)	-9
Upington	12.2	13	39	14.2 (1999)	10.4 (1955)	25.1 (2021-01-23)	29.6	-5.2 (2021-07-14)	-7.9
Vanwyksvlei	10.6	10.1	9	11.7 (1999)	8.7 (1968)	26.2 (2021-01-22)	27.7	-5.5 (2021-07-14)	-9
Western Cape									
Beaufort West	11.3	10.1	19	12.1 (2019)	8.5 (1951)	23.1 (2021-01-22)	25.9	-3.8 (2021-07-24)	-8.8
Cape Town	12.1	11.7	16	12.6 (2014)	10.0 (1951)	20.6 (2021-01-13)	22.4	1.0 (2021-07-23)	-1.9
Cape Agulhas	14.8	14.5	14	15.3 (2004)	13.1 (1955)	22.3 (2021-02-12)	22.6	5.8 (2021-08-27)	0.8
Eastern Cape									
East London	14.4	14.6	39	15.5 (1952)	14.0 (2013)	22.4 (2021-02-14)	26.5	4.4 (2021-07-24)	2.4
Port Elizabeth	12.4	12.6	64	13.5 (1999)	10.1 (1955)	23.2 (2021-02-13)	23.4	1.0 (2021-07-15)	-2.3

Rainfall (mm) overview for some long-term climate stations for 2021

Station	Total 2021	Normal (1981-2010)	Highest Annual Total (since 1981)	Lowest Annual Total (since 1981)	Highest Daily To- tal 2021	Highest Daily Total (since 1981)	Number of days with rain >= 1mm -2021	Average number of days per year with rain >= 1mm (1981-2010)
Limpopo Province								
Thohoyandou	1030	762	1654 (2000)	331 (1983)	90	199 (2000-02-23)	75	58
Polokwane	383	491	939 (1996)	256 (1985)	39	110 (2018-02-19)	44	45
Gauteng								
Pretoria (Irene)	800	687	977 (2014)	340 (2003)	58	122 (2018-03-22)	67	67
Johannesburg	688	750	1089 (2000)	443 (1984)	52	110 (1985-10-30)	80	71
North-West								
Mafikeng	784	541	874 (1997)	293 (2015)	58	128 (1995-11-18)	61	52
Taung	678	439	1008 (1988)	73 (2009)	67	160 (1988-02-20)	49	44
Mpumalanga								
Ermelo	916	710	974 (2000)	454 (2001)	82	108 (2017-01-17)	77	68
Lydenburg	536	480	1067 (1987)	84 (2005)	37	81 (2012-12-25)	60	44
Free State								
Bethlehem	847	712	974 (2000)	465 (2015)	46	116 (1992-11-08)	78	73
Bloemfontein	688	569	1064 (1988)	260 (1992)	71	142 (1988-02-21)	52	58
KwaZulu-Natal								
Ladysmith	620	749	1045 (1996)	300 (1993)	88	141 (1987-09-29)	69	68
Mt Edgecombe (Dn)	1175	1021	1571 (1988)	312 (1992)	124	265 (1996-01-12)	92	87
Northern Cape								
Upington	315	189	481 (2011)	53 (1986)	47	85 (1996-02-29)	28	24
Calvinia	217	208	379 (1995)	68 (1986)	33	59 (2010-10-15)	32	34
Western Cape								
Cape Town	380	456	707 (1996)	323 (210)	23	94 (1993-04-11)	56	68
George	740	631	1220 (1981)	374 (1981)	77	230(2006-08-01)	91	80
Eastern Cape								
Port Elizabeth	505	571	1033 (2012)	308 (1992)	35	224 (1981-03-25)	62	71
East London	810	854	1318 (1985)	560 (1997)	58	313 (2002-08-15)	91	79

Provincial Rainfall

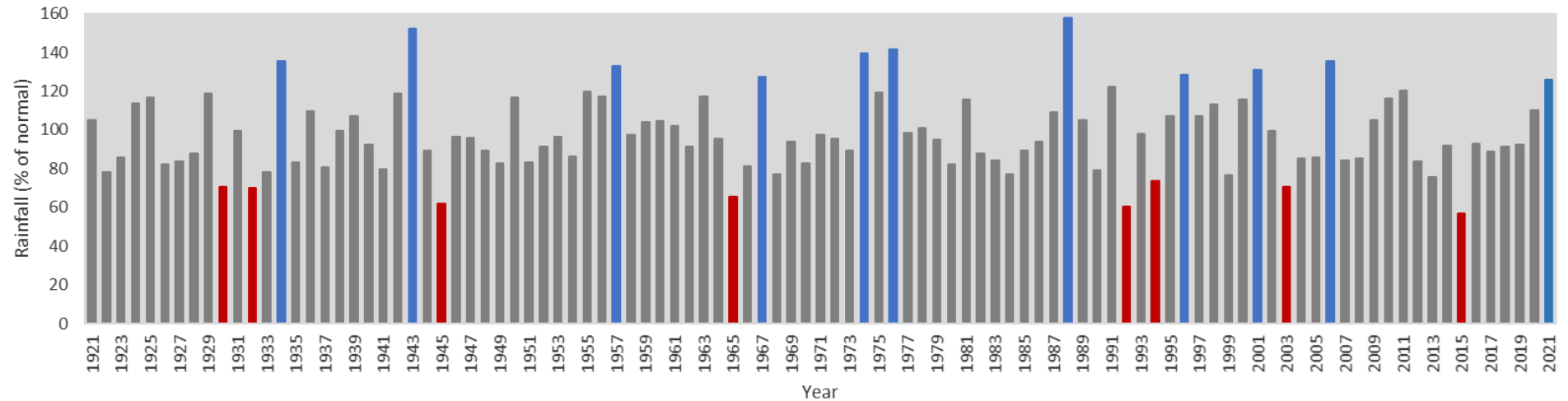
The provincial rainfall statistics are based on the average rainfall of the homogeneous rainfall districts, developed by SAWS, that mostly falls within a particular province. This approach ensures a more even weighting of rainfall stations in the spatial rainfall estimations. South Africa received near-normal rainfall across all the provinces, with a significant improvement in the Northern Cape which has been recording below-normal rainfall in recent years.



Free State - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

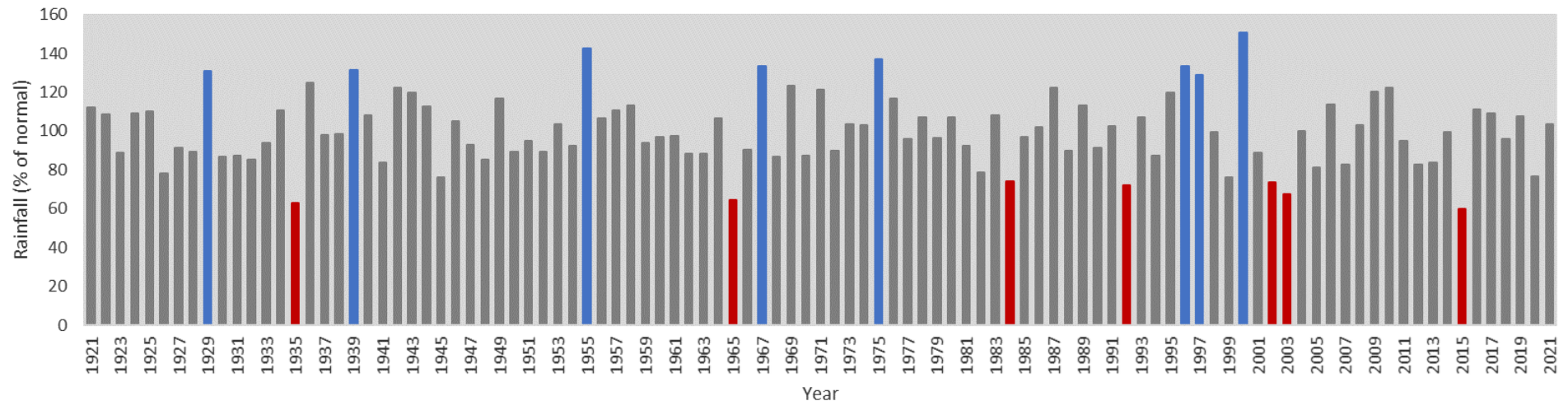
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Gauteng - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

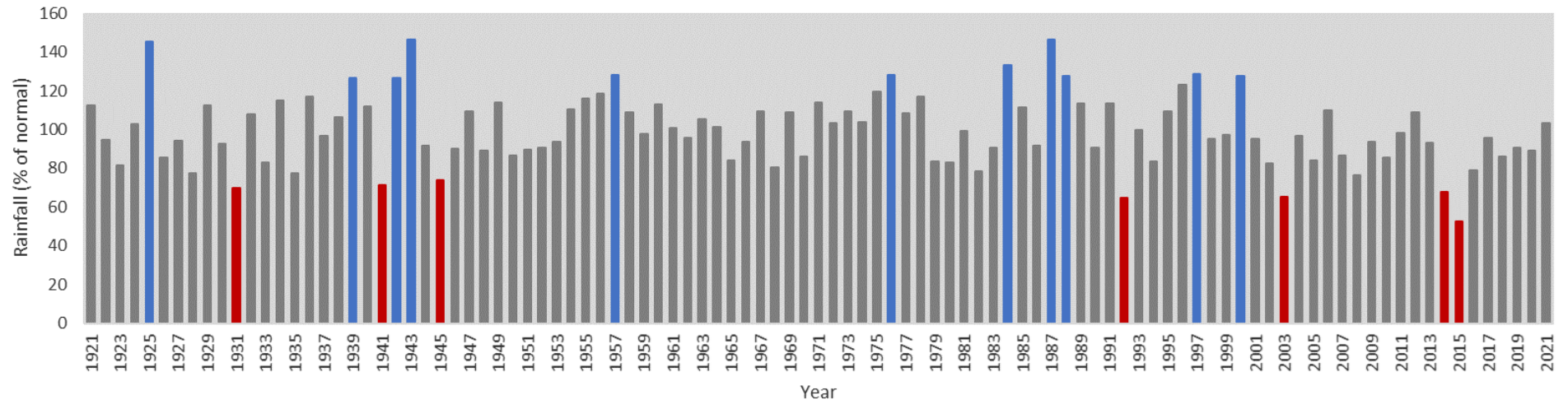
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



KwaZulu-Natal - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

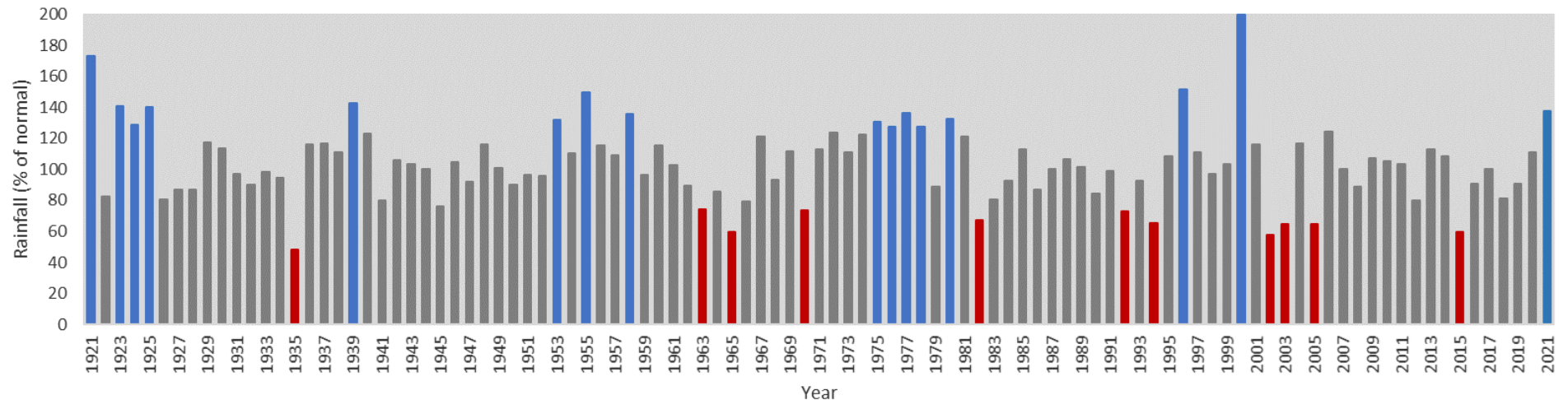
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Limpopo - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

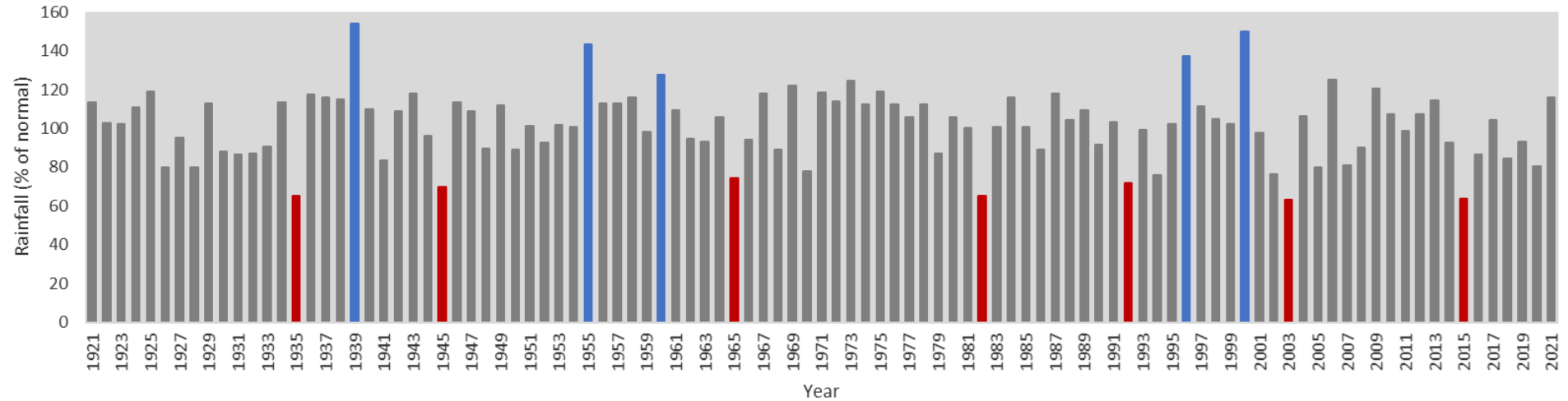
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Mpumalanga - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

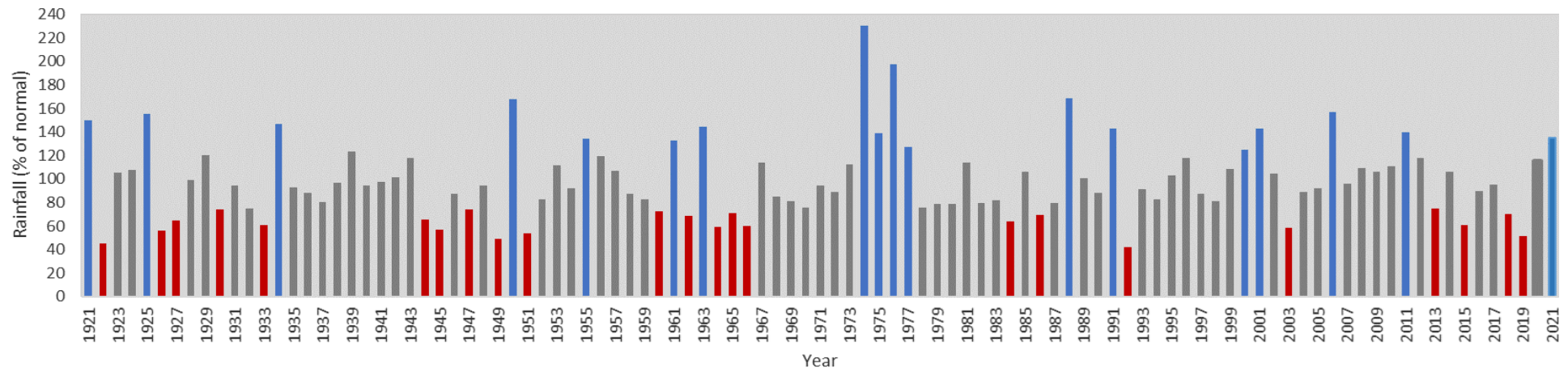
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Northern Cape - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

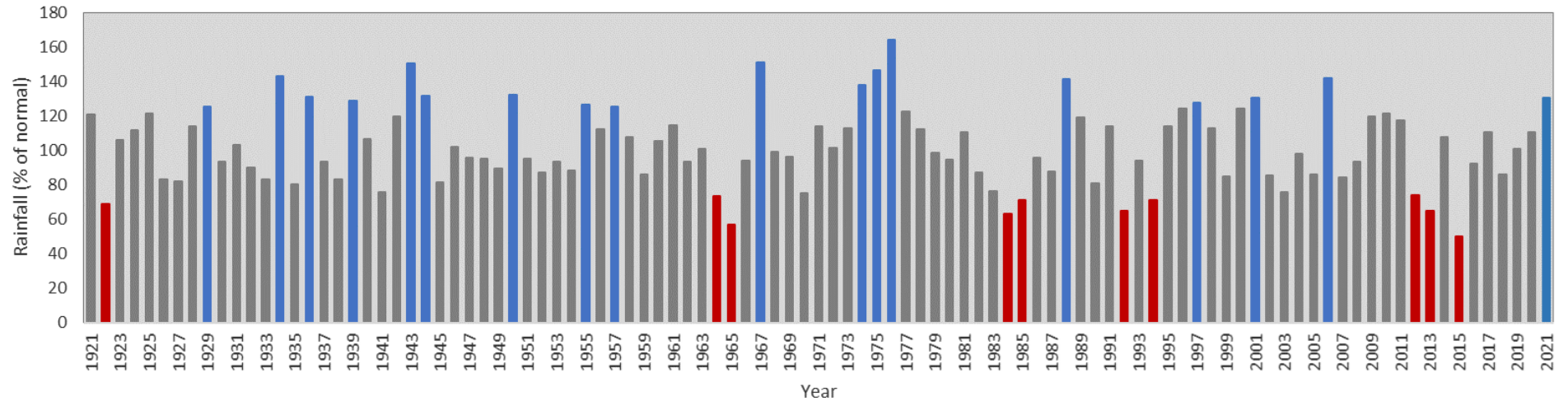
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



North-West - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

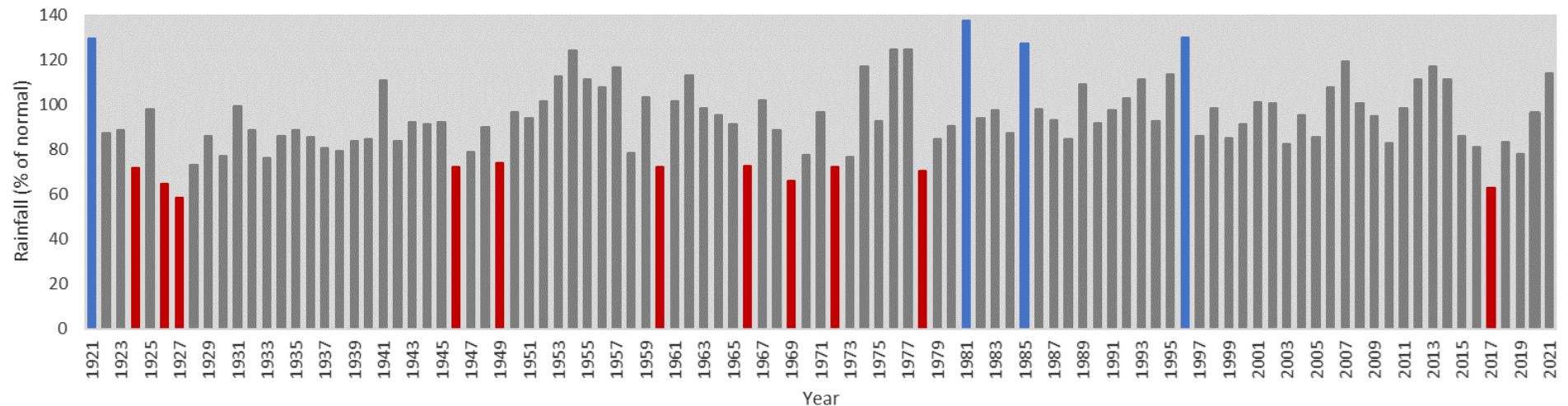
Red bars indicate dry years (< 75% of Normal) and blue bars wet years (> 125% of Normal)



Western Cape - Annual Rainfall (% of Normal) - 1921 - 2021

Normal Period: 1981 - 2010

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

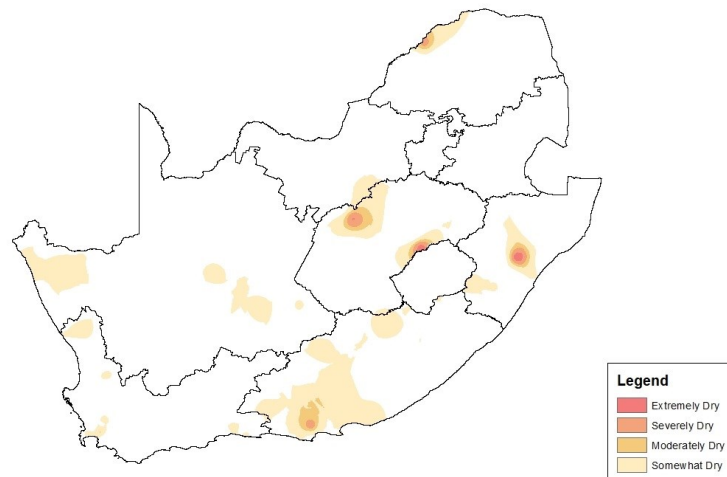


Indications of drought

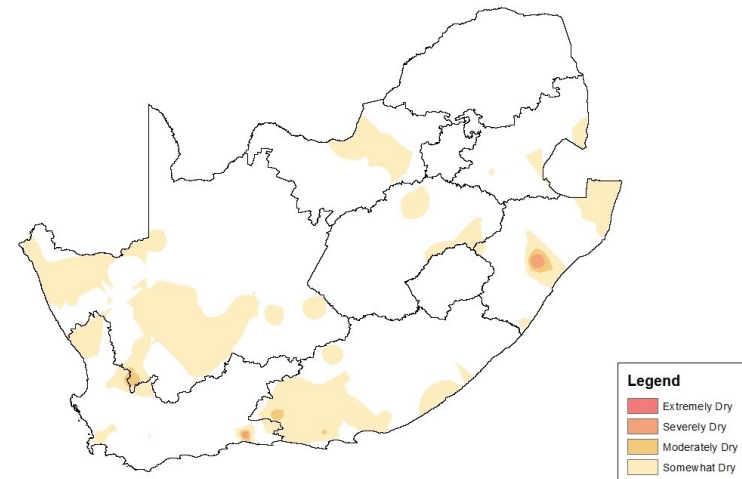
A meteorological drought is defined on the basis of the degree of dryness in comparison to “normal” or average amounts of rainfall for a particular area or place and the duration of the dry period.

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 western parts of the Eastern Cape.

12-month SPI for January 2021 to December 2021



24-month SPI for January 2020 to December 2021



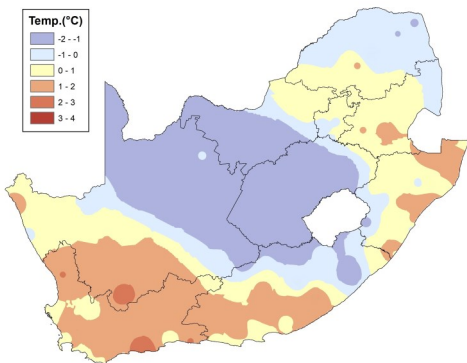
Monthly maps

Following are monthly maps for

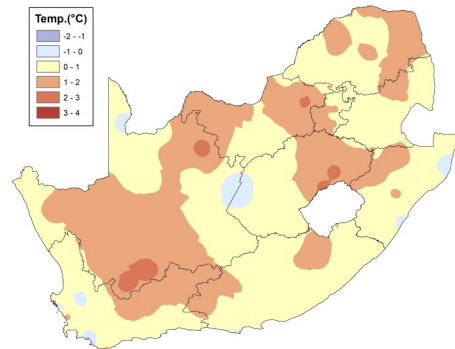
- Maximum temperature deviations from the 1981-2010 normal
- Minimum temperature deviations from the 1981-2010 normal
- Standardized Precipitation Index (SPI), indicating dry areas
- Lightning-stroke density indicating the number of strokes per square kilometer

January 2021

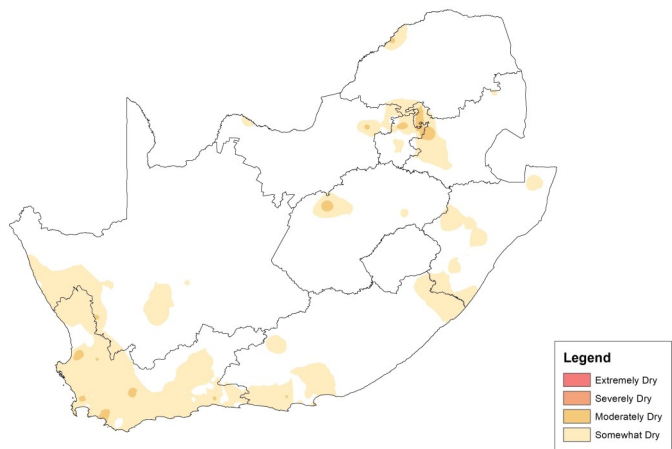
Maximum temperature deviations



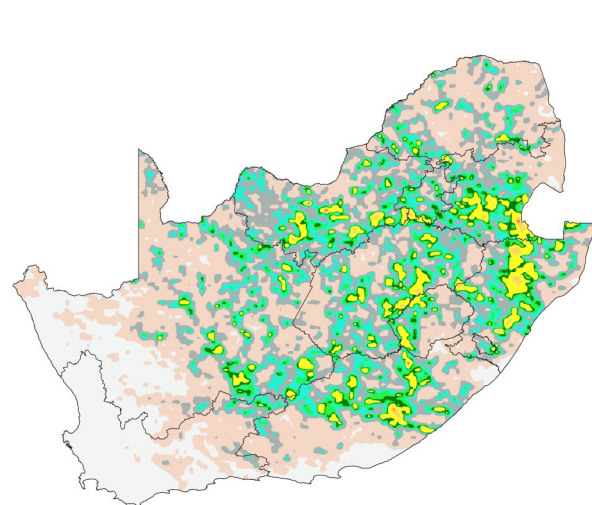
Minimum temperature deviations



SPI

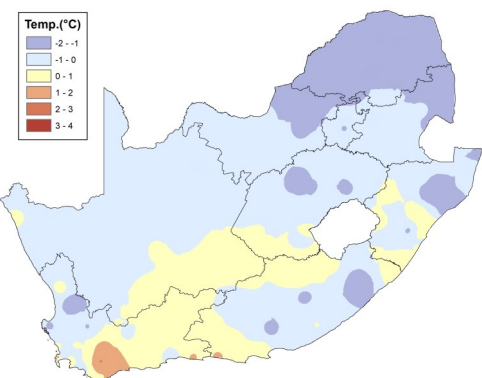


Lightning-stroke density

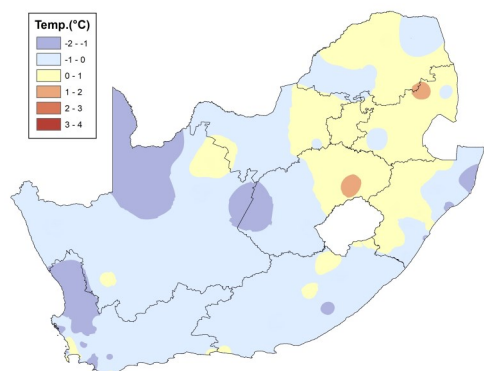


February 2021

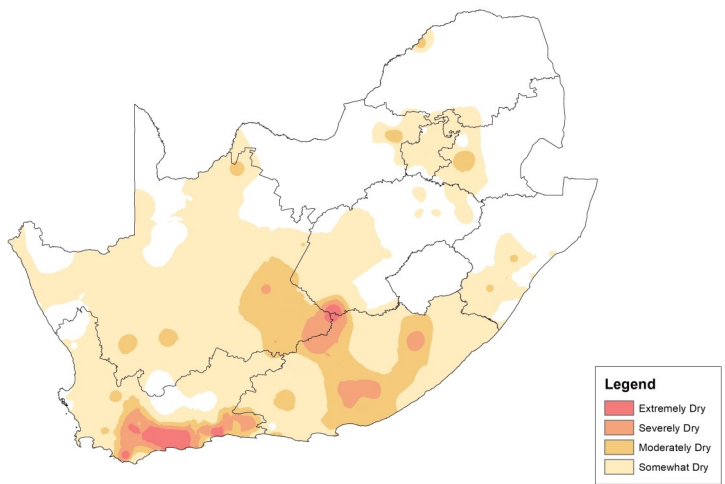
Maximum temperature deviations



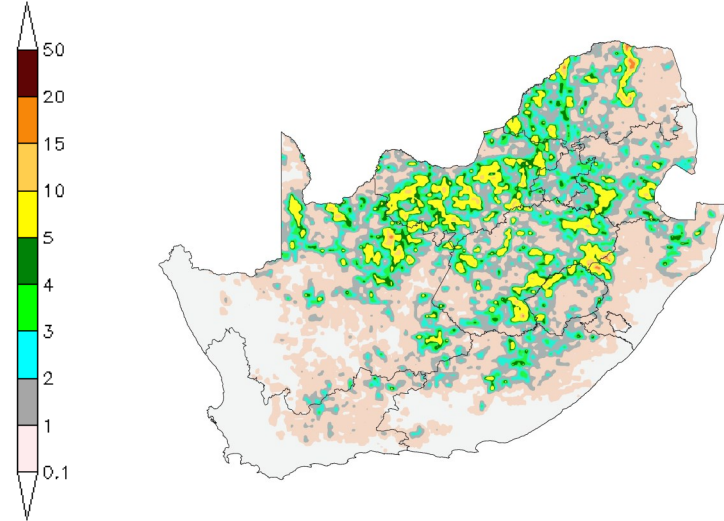
Minimum temperature deviations



SPI

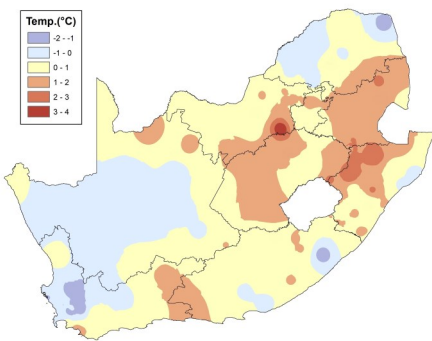


Lightning-stroke density

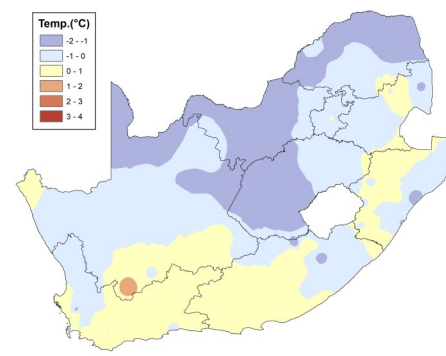


March 2021

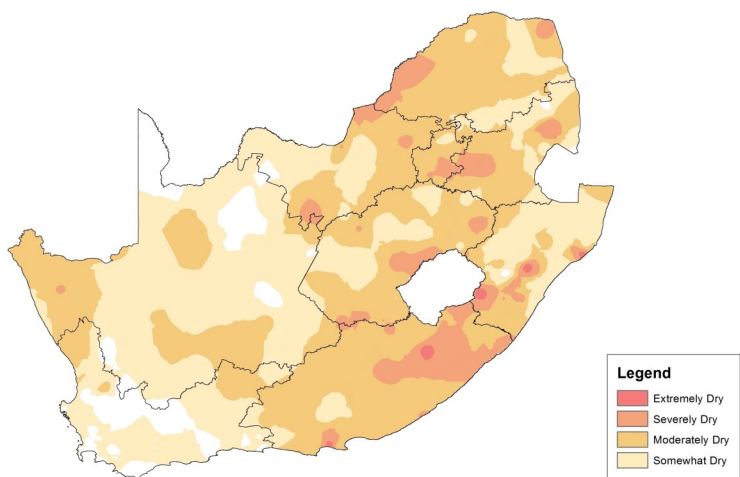
Maximum temperature deviations



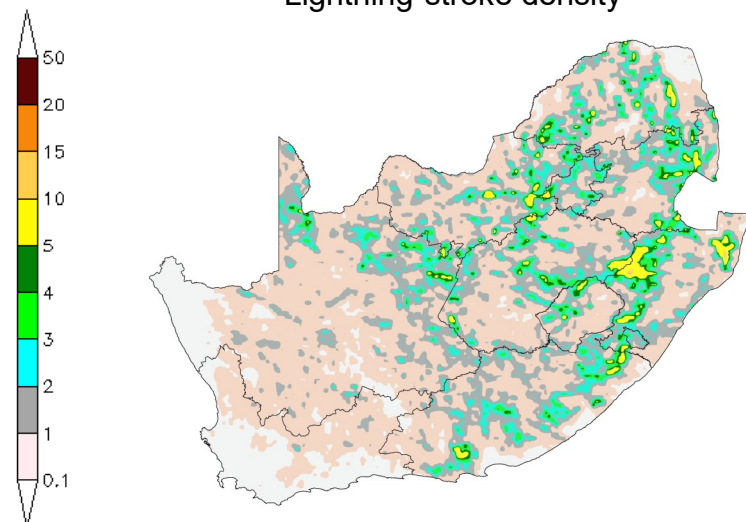
Minimum temperature deviations



SPI

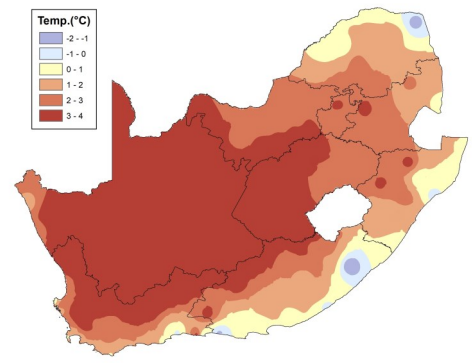


Lightning-stroke density

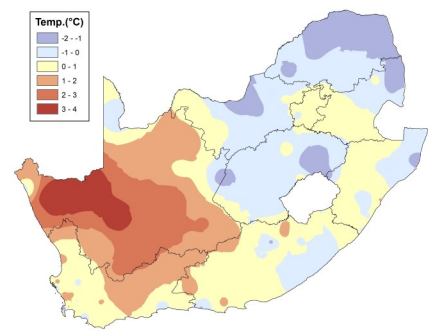


April 2021

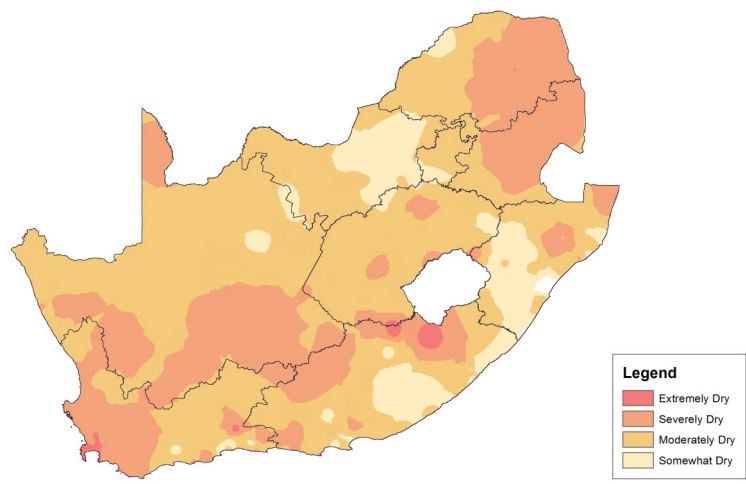
Maximum temperature deviations



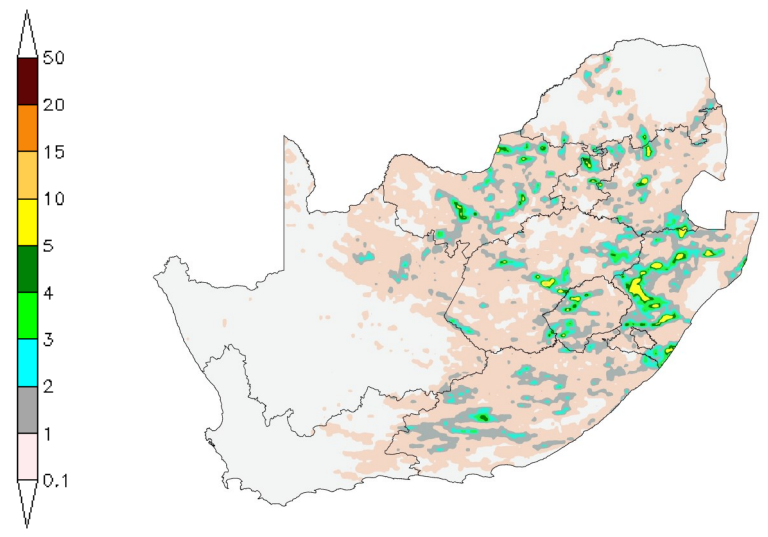
Minimum temperature deviations



SPI

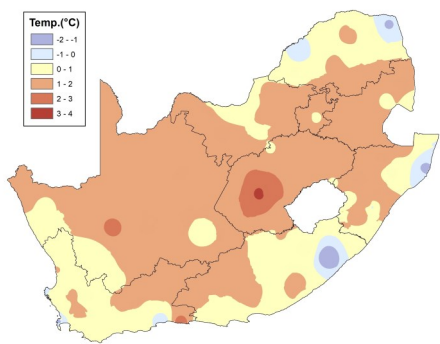


Lightning-stroke density

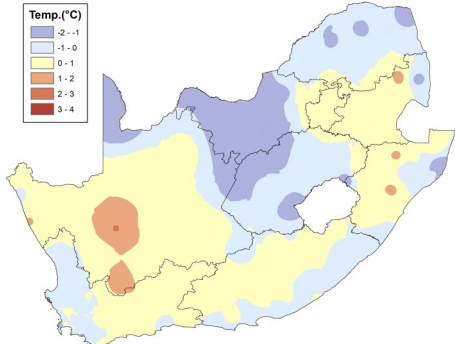


May 2021

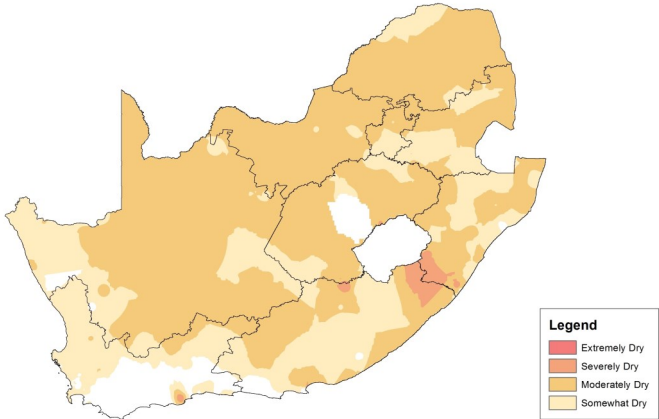
Maximum temperature deviations



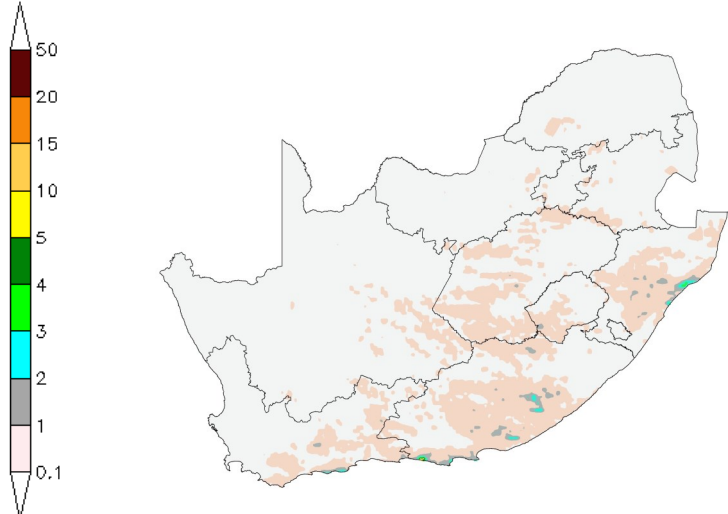
Minimum temperature deviations



SPI

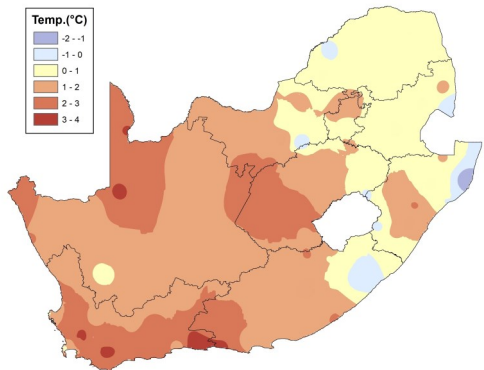


Lightning-stroke density

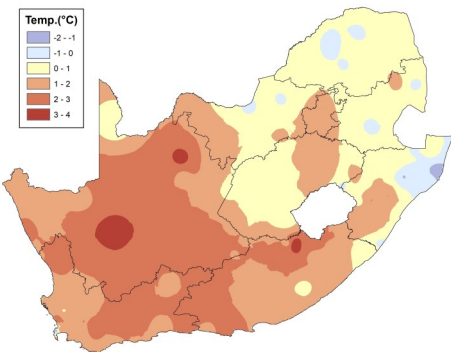


June 2021

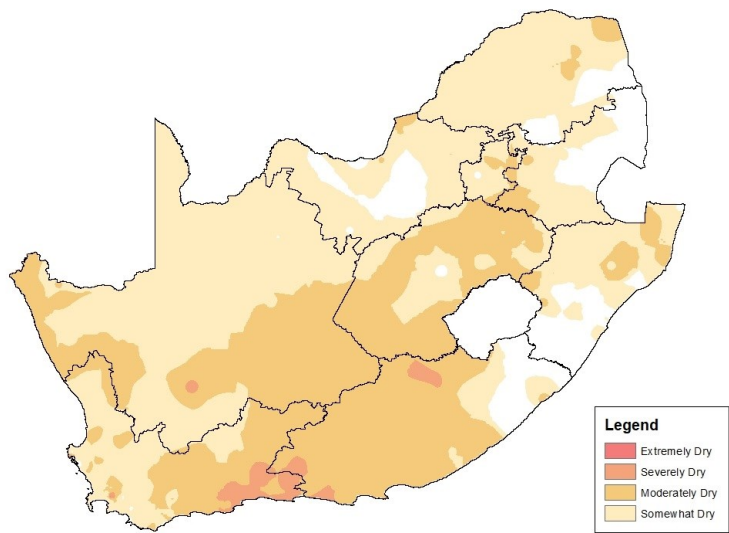
Maximum temperature deviations



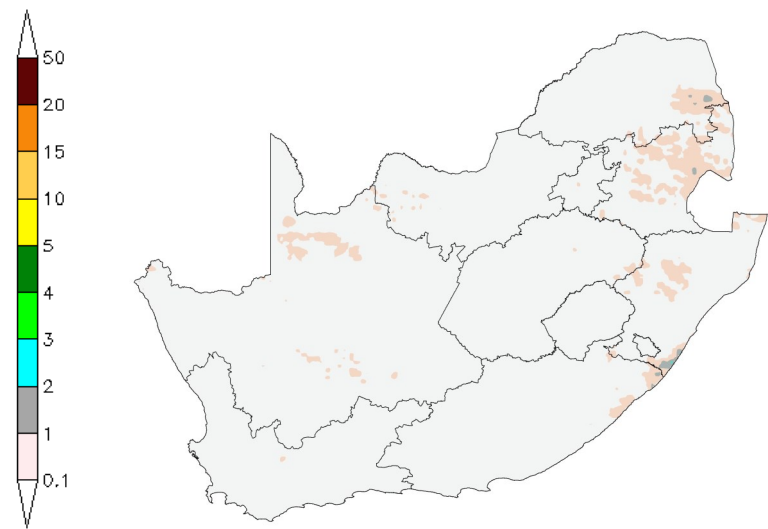
Minimum temperature deviations



SPI

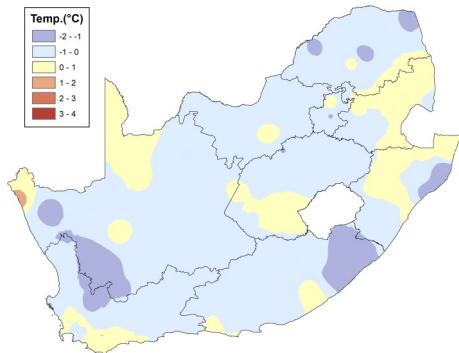


Lightning-stroke density

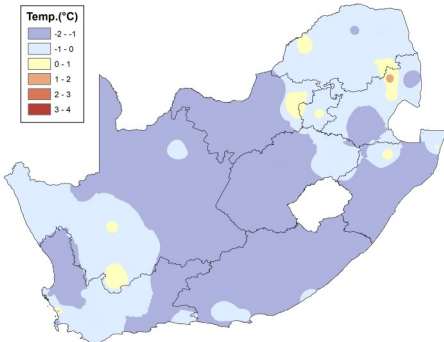


July 2021

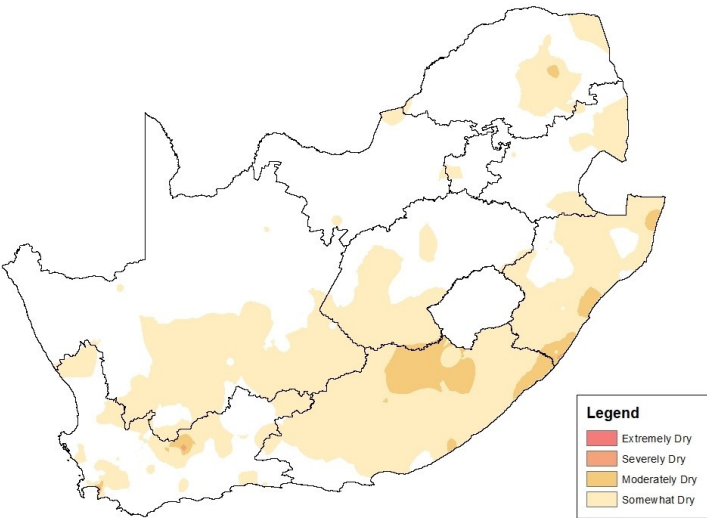
Maximum temperature deviations



Minimum temperature deviations



SPI

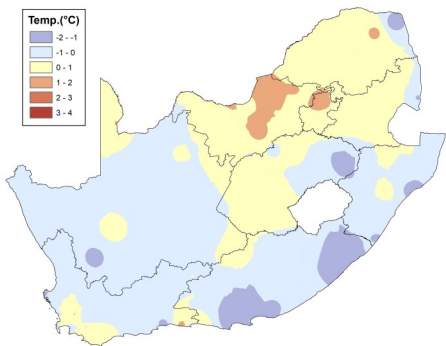


Lightning-stroke density

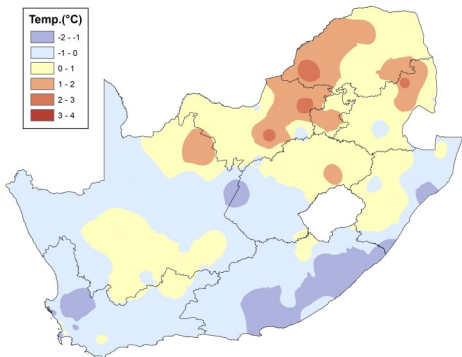


August 2021

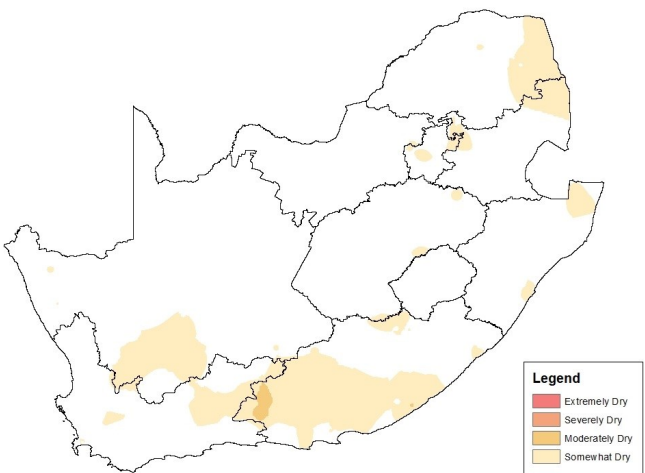
Maximum temperature deviations



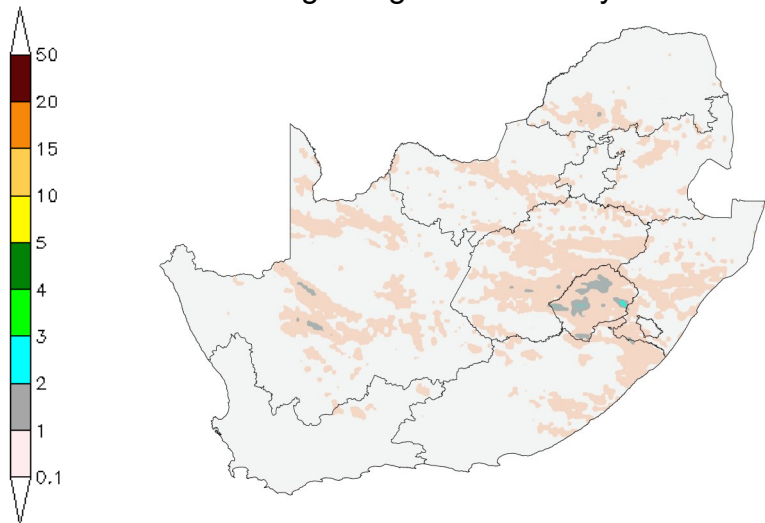
Minimum temperature deviations



SPI

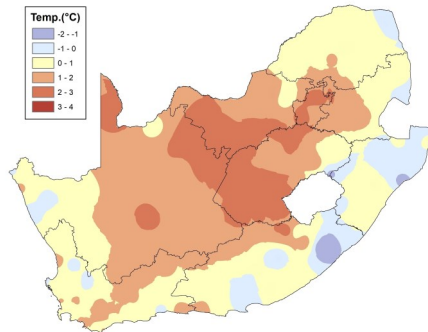


Lightning-stroke density

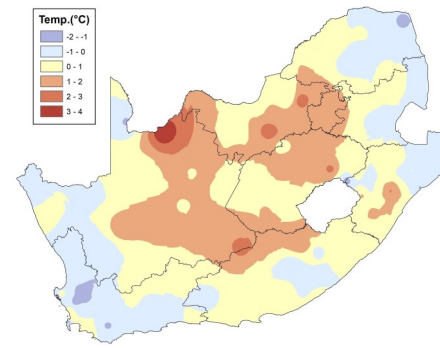


September 2021

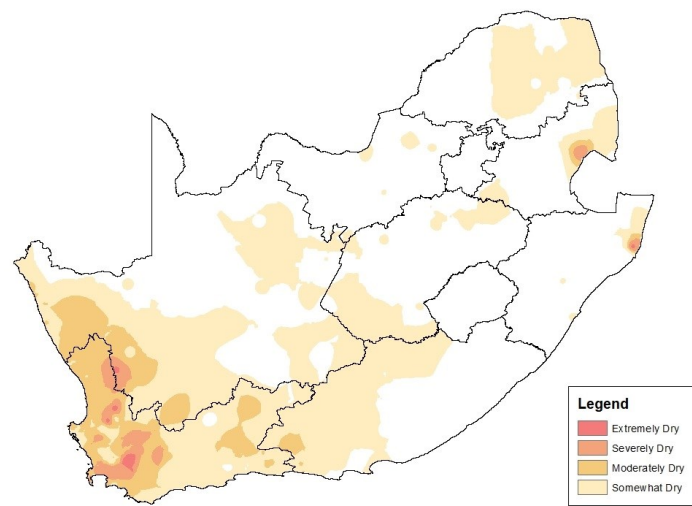
Maximum temperature deviations



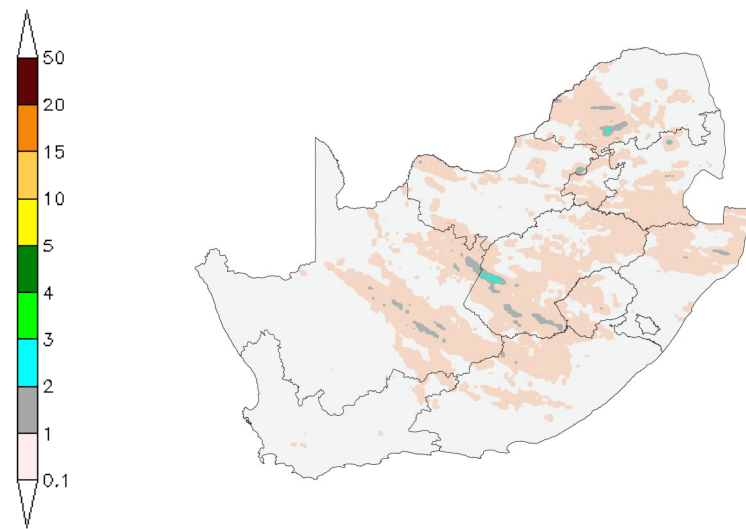
Minimum temperature deviations



SPI

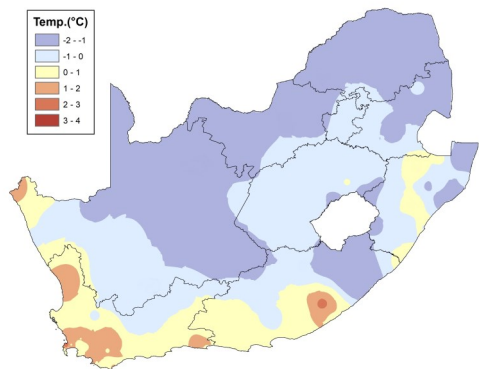


Lightning-stroke density

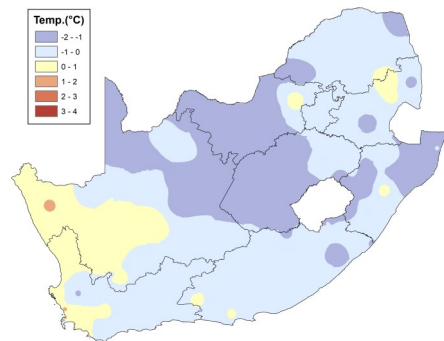


October 2021

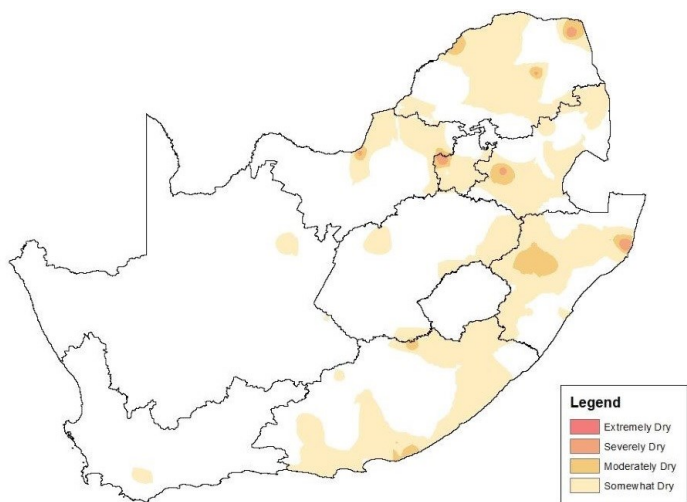
Maximum temperature deviations



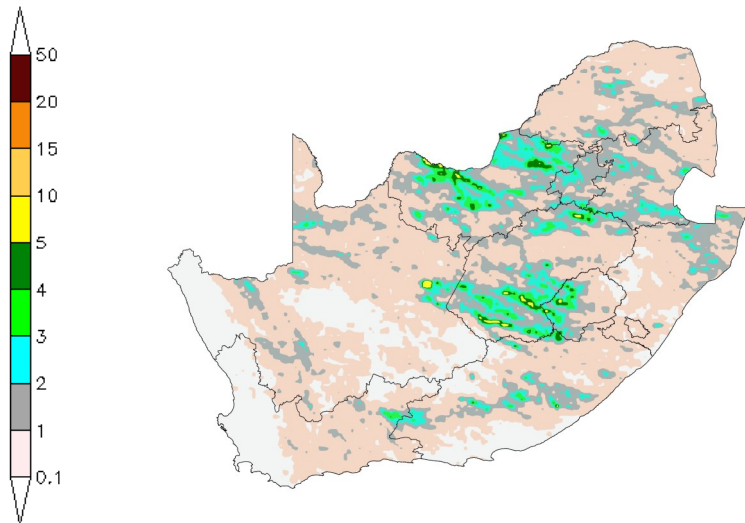
Minimum temperature deviations



SPI

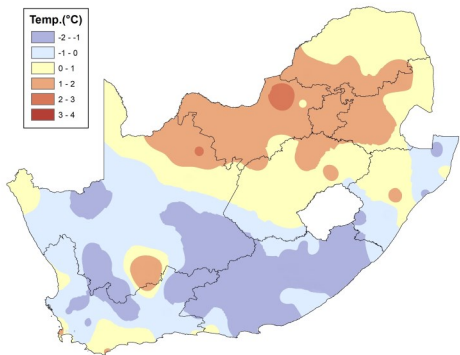


Lightning-stroke density

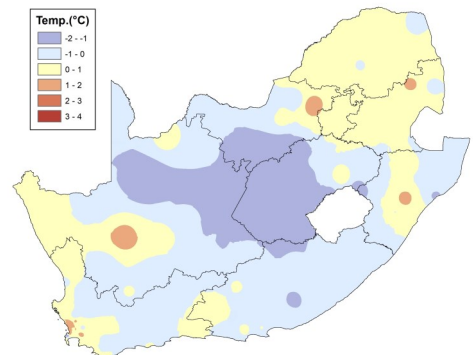


November 2021

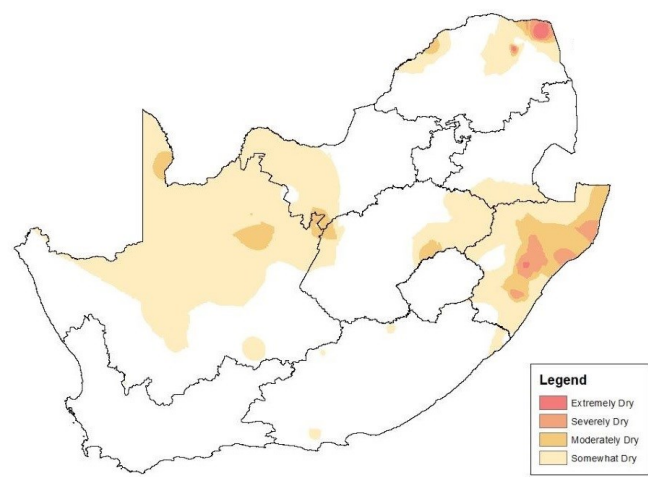
Maximum temperature deviations



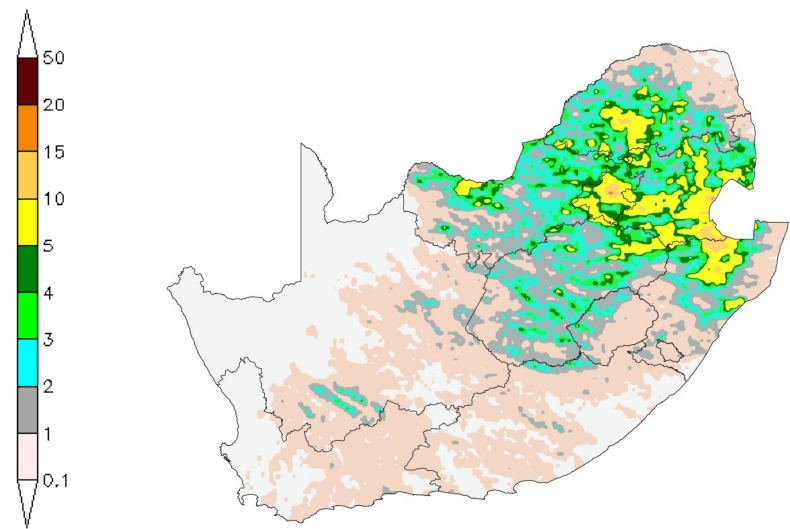
Minimum temperature deviations



SPI

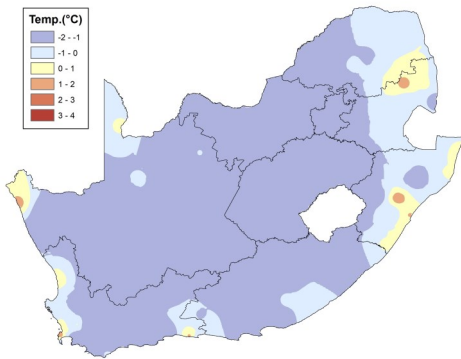


Lightning-stroke density

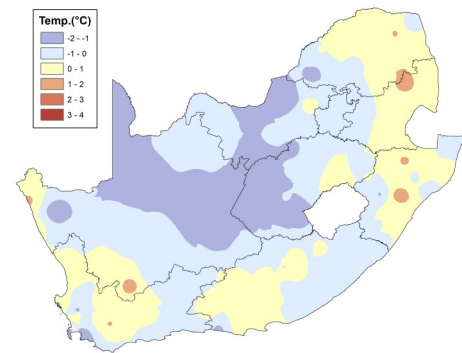


December 2021

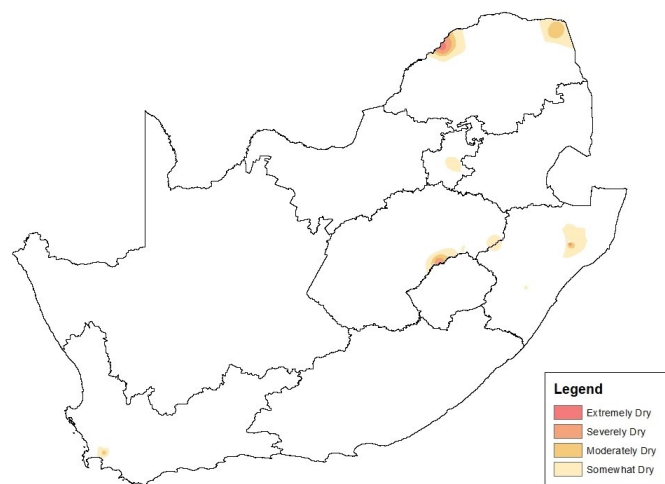
Maximum temperature deviations



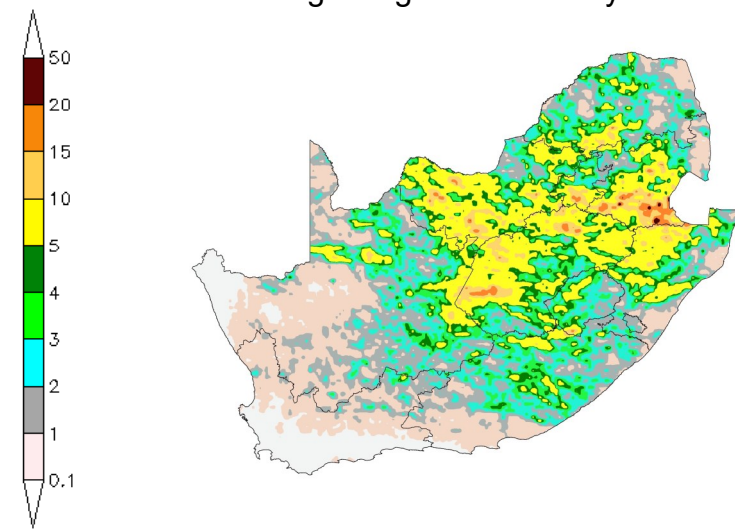
Minimum temperature deviations



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 close to normal expected sunshine. Bloemfontein and Johannesburg received slightly below average sunshine, an indication of the good rainfall received during the summer months.

City	Daily average sunshine in 2021	Daily average sunshine (1981—2010)
Cape Town	8,5	8,2
Port Elizabeth	7,5	7,6
Bloemfontein	8,2	8,9
Durban	6,5	6,4
Johannesburg	8,2	8,5