CUMULUS

31 March 2022

by J Malherbe, R Kuschke

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Summary

Wetter weather returning

Current forecasts indicate a return to much more inclement conditions over both the summer and winter rainfall region during the next few days. Upper-air instability and strong high-pressure systems ridging around the country will result in several days with scattered to widespread thundershowers over large areas during the coming days. While there are no indications of intense systems that are usually associated with severe weather over the interior, thundershowers in general may produce hail more often by this time of the year when the atmospheric temperatures are lower, especially when the upper air is unstable as expected during the next few days.

Cold fronts are also expected to influence the winter rainfall region and while current forecasts don't indicate frost over the interior, the situation will be monitored as the positions, intensities and interplay between the weather systems during this time of the year can easily result in large adjustments to temperatures and large uncertainty in forecasts a few days out.

Initially, a band of thundershowers will remain present over the central to western interior. This band should shift east during the period, covering most of the summer grain-production region, and be located over the northeastern parts by Sunday and early next week. Also by early next week, a significant cold front may move into the winter rainfall region. Current forecasts don't indicate sufficient inland penetration of cold air for frost to occur over the summer grain-production areas.

Temperatures will remain normal to above-normal over the summer grain-production areas as the summer-like circulation will keep moisture levels relatively high. However, towards the southwest, more significant penetration of cold fronts into the winter rainfall region will result in below-normal temperatures.

The following is a summary of weather conditions during the next few days:

- **General:**
  - Temperatures will on average be normal to above normal over the central to northern and eastern areas, but below normal over the southwestern parts, including the winter rainfall region.
  - Most of the country should receive normal to above-normal rainfall except for the western to northwestern interior.
  - The winter rainfall region is expected to receive normal rainfall for this time of the year.
  - A band of thundershowers will initially be situated over the western to central interior and southeastern parts, slowly moving northeastwards as the weekend approaches.
  - As the upper-air support moves eastwards, it will become partly cloudy to cloudy and cooler over the eastern and northeastern areas by Sunday and Monday with scattered thundershowers. This may also result in lower temperatures over the northeastern and eastern parts should extensive cloud cover develop.
  - A significant cold front may affect the southwestern parts by early next week. The cold front is expected to cause cooler, windy conditions over the winter rainfall region by Tuesday according to current forecasts, with possible showers and cool conditions quite far north up the West Coast. Cooler air should spread into the interior, with fresh westerly winds, over the western to southern parts by Tuesday and Wednesday next week according to current forecasts.
  - While cool air will invade the southwestern half of the country as the front moves through, there are no indications currently of frost over the summer-grain production areas.
  - Strong southeasterlies are expected in the southwest until Saturday.
  - Temperatures over the summer-grain production area are expected to be in the normal to above-normal category for this time of the year, but should decrease during the period as sunny and warm conditions will make way for more extensive cloud cover during the weekend and the cold front next week may also bring cooler conditions:
    - Maximum temperatures over the eastern maize-production areas will be in the order of 17 – 28°C, with lowest temperatures expected from Sunday to Monday if cloud cover is extensive. Minimums will be in the order of 10 – 15°C.
    - Maximum temperatures over the western maize-production region will range between 24 and 31°C, with the higher temperatures earlier in the period. Minimums will be in the order of 13 – 17°C.

Overview of expected conditions over the main agricultural production areas

The presence of an upper-air trough over the central to southern parts, weakening and redeveloping through the period, with ridging of the surface high-pressure system to the south of the country, will result in thundershowers over large parts while somewhat more widespread rain is expected over the southeastern coastal areas.
As a band of thundershowers spread from the western parts northeastwards over the country, the summer-grain production area will receive late-summer thundershowers. Scattered thundershowers and cloudy conditions by Sunday and Monday may result in lower temperatures over large parts according to current forecasts. Following the wetter, cooler conditions during the weekend, it will clear from the west early next week.
A cold front will move into the winter rainfall region, and is expected to reach quite far north up the West Coast by Tuesday. As the system moves into the country however, there are not yet any indications of severe cold conditions to affect the summer-grain production areas. The upper-air trough associated with the system, together with the renewed ridging of a strong Atlantic Ocean High to the southwest and south, may result in a redevelopment of wet conditions later next week.

Maize production region: It will be mild to warm initially. Isolated to scattered thundershowers will invade the region from the west during the first few days. By Sunday and Monday, the main area of activity will be the central to eastern areas of the region, when cloudy conditions may result in lower maximum temperatures over especially the eastern areas. While it should clear by Tuesday next week, there may be a redevelopment of thundershowers especially over the central Free State and surrounding areas. It should be mild and dry over the entire region by Wednesday according to current forecasts, with cloudy and windy conditions invading the eastern areas later. Temperatures will be supportive of agricultural production while being slightly higher than normal for this time of the year:

- Maximum temperatures over the eastern maize-production areas will be in the order of 17 – 28°C, with lowest temperatures expected from Sunday to Monday if cloud cover is extensive. Minimums will be in the order of 10 – 15°C.
- Maximum temperatures over the western maize-production region will range between 25 and 31°C, generally following a warming trend through the period, with the higher temperatures earlier in the period. Minimums will be in the order of 13 – 17°C.

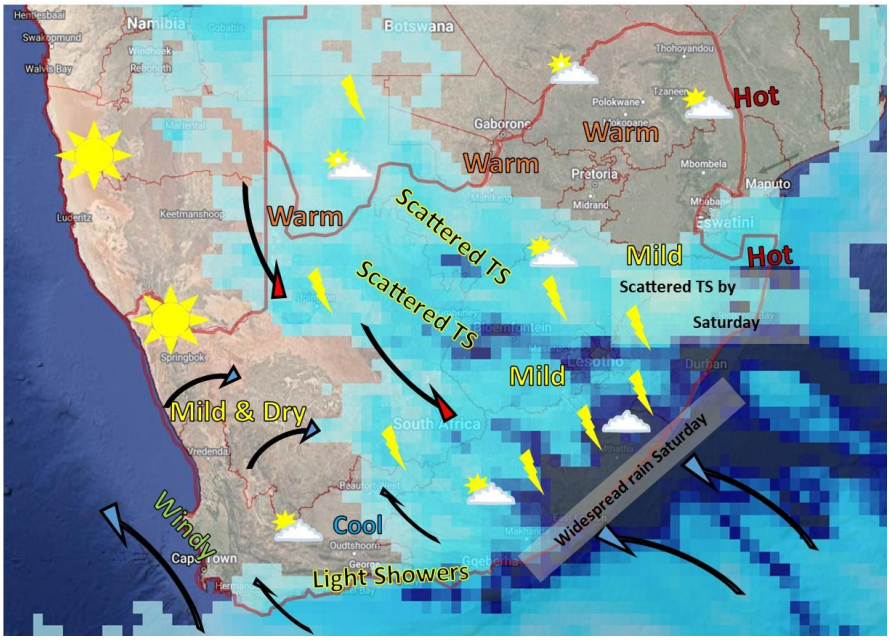
- **Thursday (31st)**: Sunny and mild, but partly cloudy and warm in the west.
- **Friday and Saturday (1st, 2nd)**: Partly cloudy and mild to warm, with isolated to scattered thundershowers over the central to western parts, spreading north-eastwards later Saturday.
- **Sunday and Monday (3rd, 4th)**: Partly cloudy and mild with scattered thundershowers, becoming cloudy and cooler over the eastern parts.
- **Tuesday (5th)**: Partly cloudy and mild. Some thundershowers are expected mainly over the Free State according to current forecasts.
- **Wednesday (6th)**: Sunny and mild, but partly cloudy in the east with possible thundershowers in the far east later.

Cape Wine Lands and Ruens: Southeasterly winds will dominate the southern to southwestern parts until Saturday. This will be associated with cooler conditions in the south and showers along the Garden Route, clearing by Sunday. This circulation pattern will also result in mild to warm conditions in the west over the Swartland and West Coast while it will be mild to cool over the southern parts and the Karoo. Northwesterly to westerly winds will dominate from Monday when a cold front approaches. It will be cloudy, windy and cool over the southwestern parts from Tuesday with showers. Showers may at times also spread up the West Coast and western escarpment on Tuesday and early Wednesday when it will generally be cooler to cold and windy (westerly winds) over the region.

Daily summary of expected conditions

(GFS forecasted rainfall for indicated periods shown in shades of blue, with darkest shading > 50mm)

Thursday to Saturday, 31 March – 2 April



Partly with isolated to scattered thundershowers over the western interior to southeastern parts, spreading towards the central and eastern parts by Saturday.

Cool with light showers over the Garden Route.

It will become cloudy and cool with general rain over the southeastern coastal areas and adjacent interior Saturday.

The western parts of the Northern Cape and northern parts of the Western Cape should remain dry.

No rain expected over the northeastern parts.

It will be hot in the Lowveld.

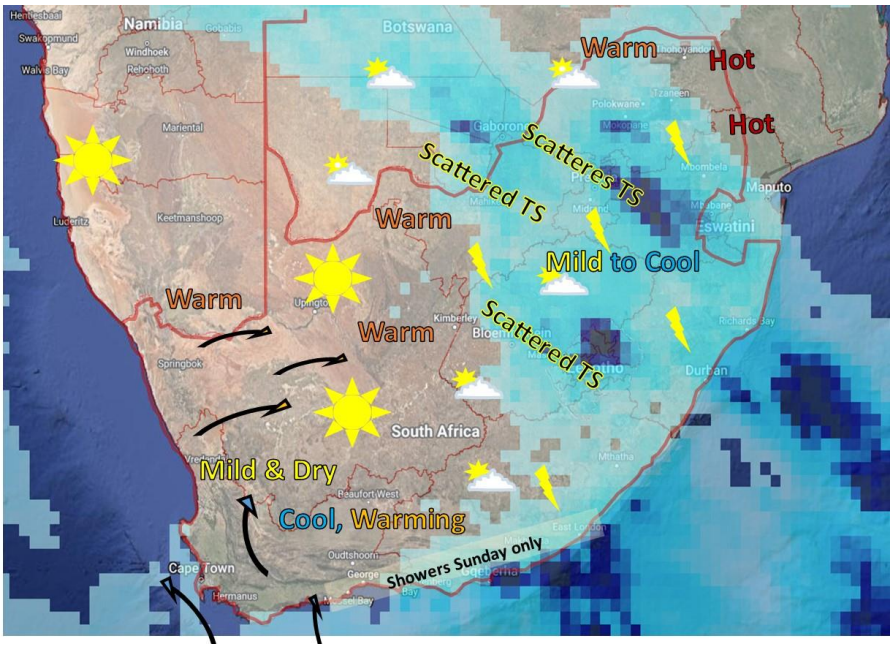
It will be warm over the northern to central parts.

It will be cool in the south, spreading northeastwards along the coast.

It will be mild in the west.

Strong south-easterlies in the southwest.

Sunday and Monday, 3 - 4 April



Partly cloudy with scattered thundershowers over the central to eastern and northeastern parts.

Residual showers over the southeastern parts on Sunday.

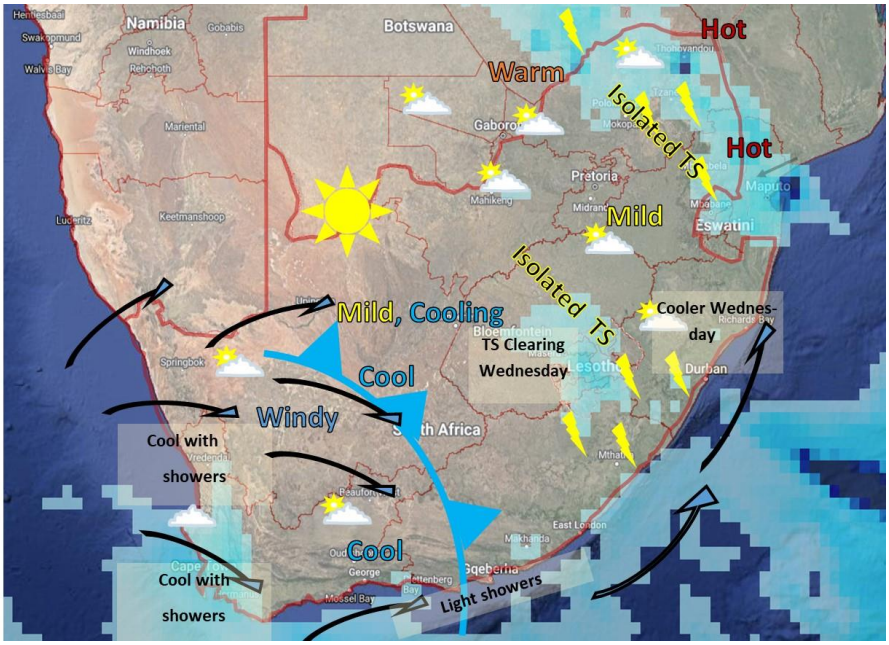
It should be dry over most of the Northern and Western Cape.

The northern to central parts will be warm.

The Lowveld will be hot.

It will warm up somewhat over the southern parts.

Tuesday to Wednesday 5 – 6 April



Dry over most of the interior.

Thundershowers over the far northeastern areas.

Thundershowers on Tuesday only, over the central Free State southeastwards into Lesotho and the eastern parts of the Eastern Cape.

A cold front will result in showers over the southern and southwestern parts of the winter rainfall region.

Light showers should spread along the Garden Route and further east into the KZN coastal belt with cool westerly to southwesterly winds.

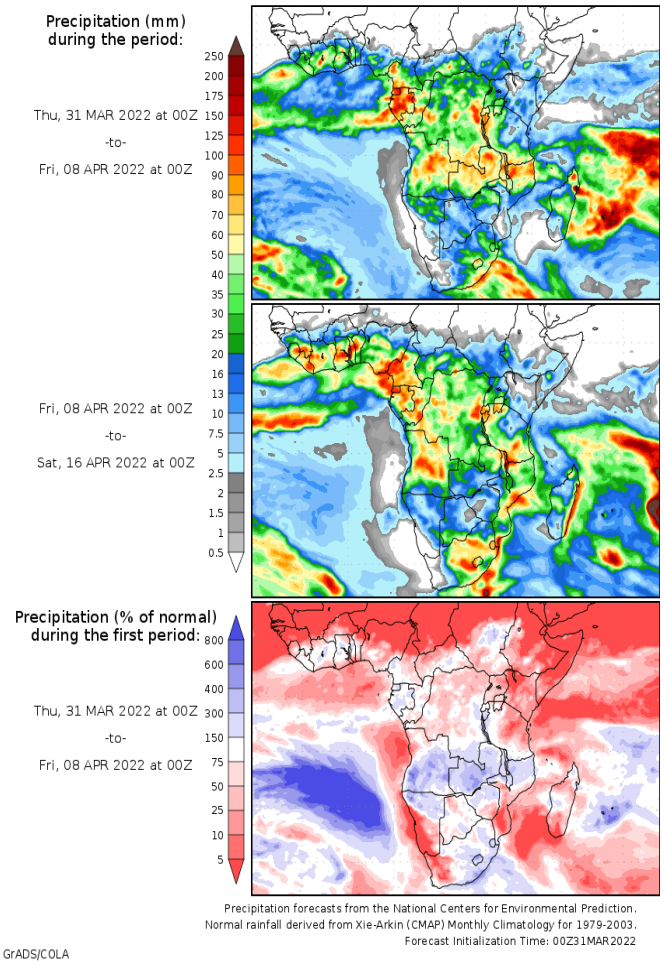
It will be hot over the Lowveld.

It will be cool and windy over the southwestern parts, spreading eastwards.

Strong north-westerlies to westerlies over the southwestern parts Tuesday.

Medium term rainfall and temperature summary

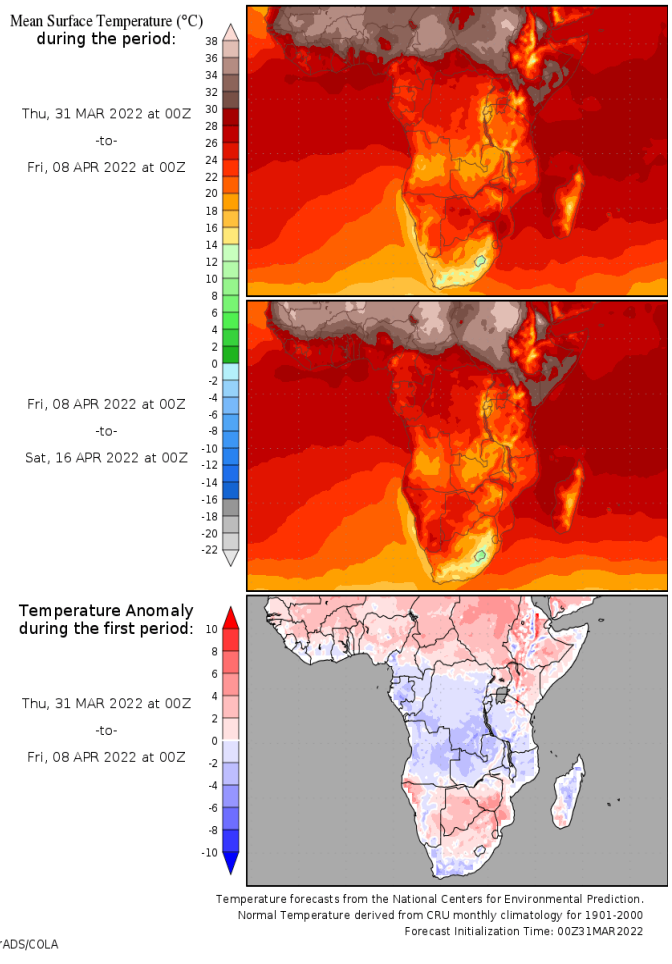
Precipitation Forecasts



Precipitation forecasts from the National Centers for Environmental Prediction.
Normal rainfall derived from Xie-Arkin (CMAP) Monthly Climatology for 1979-2003.
Forecast Initialization Time: 00Z31MAR2022

GrADS/COLA

Temperature Forecasts



Temperature forecasts from the National Centers for Environmental Prediction.
Normal Temperature derived from CRU monthly climatology for 1901-2000
Forecast Initialization Time: 00Z31MAR2022

GrADS/COLA

Possible extreme conditions - relevant to agriculture

The South African Weather Service issues warnings for any severe weather that may develop, based on much more information (and in near-real time) than the output of one single weather model (GFS atmospheric model - *Center for Ocean-Land-Atmosphere Studies (COLA) and Institute of Global Environment and Society (IGES)* – http://Wxmaps.org) considered here in the beginning of a week-long (starting 31 March) period. It is therefore advised to keep track of warnings that may be issued by the SAWS (www.weathersa.co.za) as the week progresses.

According to current model projections (GFS model) of weather conditions during the coming week, the following may be deduced:

- It will be hot:
  - Over the Lowveld on **most days**
  - Over northern KZN on **Tuesday and Wednesday (5th, 6th)**

- Strong south-easterlies over the southwestern parts from **Thursday (31st) to Saturday (2nd)** may be conducive to the spread of wild fires where vegetation is dry.
- Dry and windy conditions over the western to southern parts on **Tuesday (5th)** may be conducive to the spread of wild fires where vegetation is dry.
- Cool to cold, windy conditions over the southern parts of the western escarpment as well as the southwestern to southern high-lying areas by **Tuesday and Wednesday (5th, 6th)** may adversely affect small stock.

Seasonal forecast

Recently, forecasts have shifted from an expectation of a return to neutral conditions, to a longer continuation of La-Niña into the SH winter. Seasonal forecasts for autumn over South Africa once again favor wetter conditions over the summer rainfall region after trending somewhat drier for February.

The Australian Bureau of Meteorology points out that the La Niña retreat stalls as trade winds strengthen

(Updated 29 March): The 2021–22 La Niña event has weakened slightly in the tropical Pacific over the past fortnight. Climate outlooks indicate a return to neutral El Niño–Southern Oscillation (ENSO) levels—neither La Niña nor El Niño—late in the southern hemisphere autumn. Even as La Niña weakens, it may continue to influence global weather and climate.

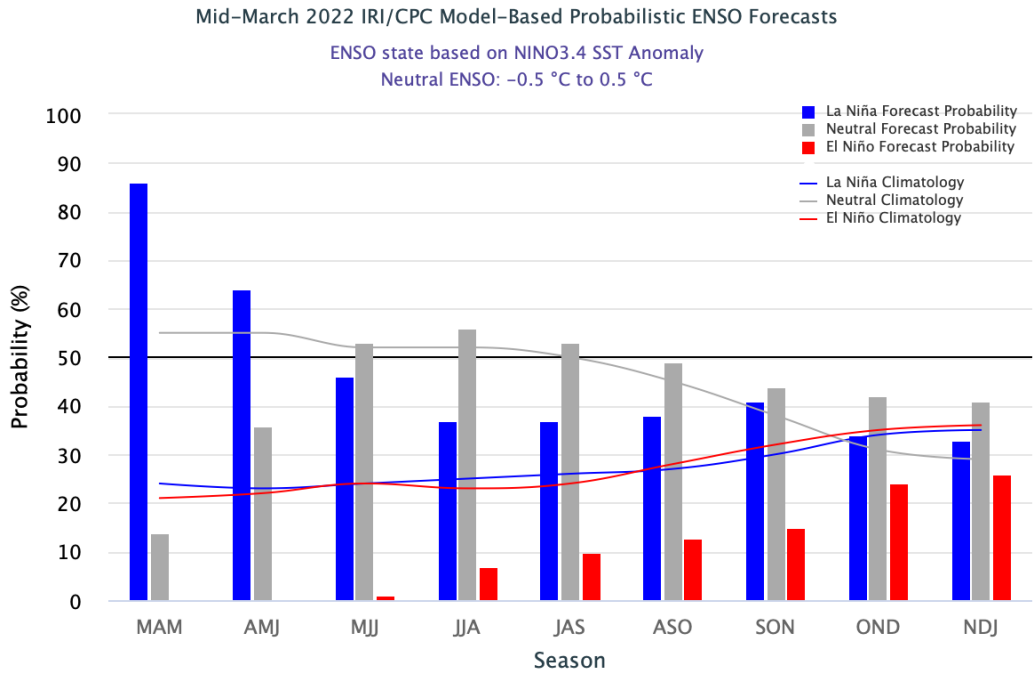
Atmospheric and oceanic indicators of ENSO persist at La Niña levels. Sea surface temperatures remain cooler than average along the equator, but have warmed slightly in the east as previously strong trade winds have eased in strength. Other indicators remain at La Niña levels, with decreased cloudiness persisting along the Date Line and a positive Southern Oscillation Index (SOI).

The Southern Annular Mode (SAM) index has recently been positive. It is forecast to generally remain neutral over the coming three weeks……..*Australian Bureau of Meteorology* - http://www.bom.gov.au

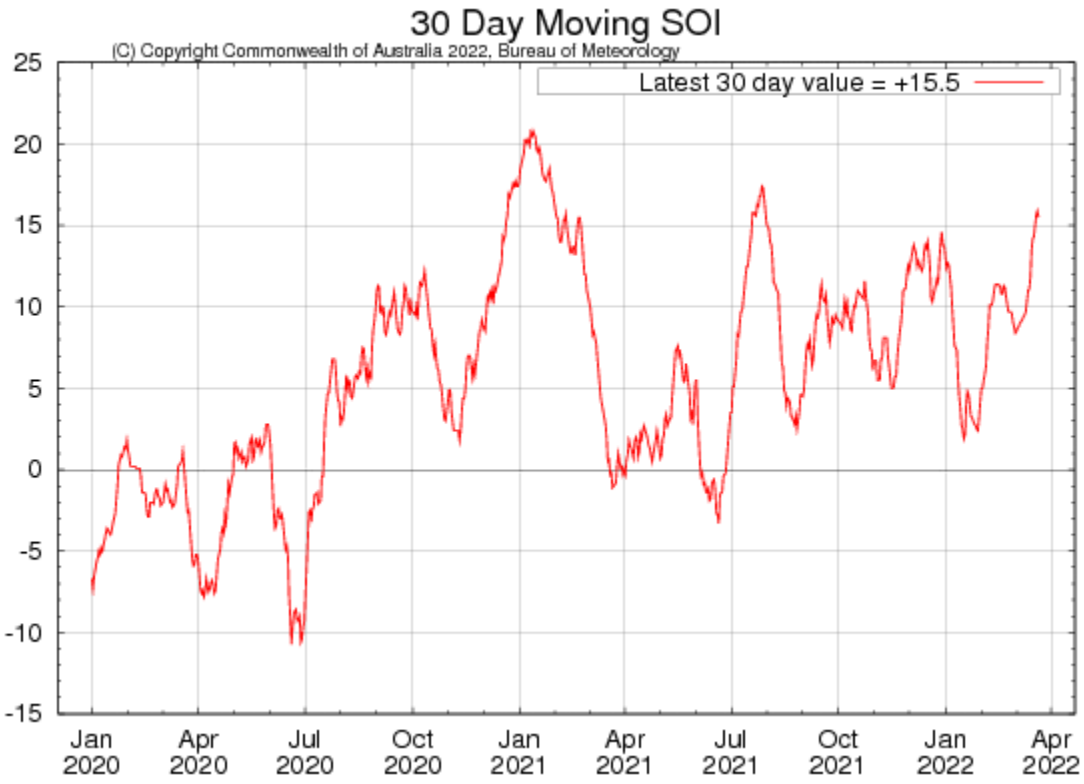
The International Research Institute for Climate and Society (IRI) also expects La Niña conditions to persist until autumn

According to the IRI (Updated 10 March): Below-average sea surface temperatures (SSTs) strengthened during February 2022 across the central and east-central tropical Pacific, with negative anomalies stretching from the central to eastern equatorial Pacific Ocean. In particular, the weekly Niño-3.4 index decreased from -0.6ºC at the beginning of February to -1.1ºC in the last week, while the other Niño SST regions were between -0.6ºC and -1.3ºC in the last week. Subsurface temperatures anomalies (averaged between 180º-100ºW and 0-300m depth) were near zero, as the recent warming associated with the downwelling Kelvin wave has attenuated. Below-average temperatures have expanded near the surface and at depth near ~150ºW. Tropical atmospheric anomalies strengthened during the past month, with the extension of enhanced low-level easterly winds across the equatorial Pacific and upper-level westerly wind anomalies remaining over the east-central and eastern Pacific Ocean. Suppressed convection strengthened around the Date Line, while convection was enhanced near Indonesia. Overall, the coupled ocean-atmosphere system reflected the continuation of La Niña.

The IRI/CPC plume average for the Niño-3.4 SST index continues to forecast a transition to ENSO-neutral during the Northern Hemisphere spring. This month, the forecaster consensus favors a slower decay of La Niña due to the recent renewal of ocean-atmosphere coupling, which contributed to cooler near-term forecasts from several state-of-the-art climate models. For the summer and beyond, there is large uncertainty in the state of ENSO; however forecasters lean toward negative Niño-3.4 index values even if the index does not reach La Niña thresholds. In summary, La Niña is favored to continue into the Northern Hemisphere summer (53% chance during June-August 2022), with a 40-50% chance of La Niña or ENSO-neutral thereafter….*International Research Institute for Climate and Society*- http://iri.columbia.edu/



International Research Institute for Climate and Society- http://iri.columbia.edu/

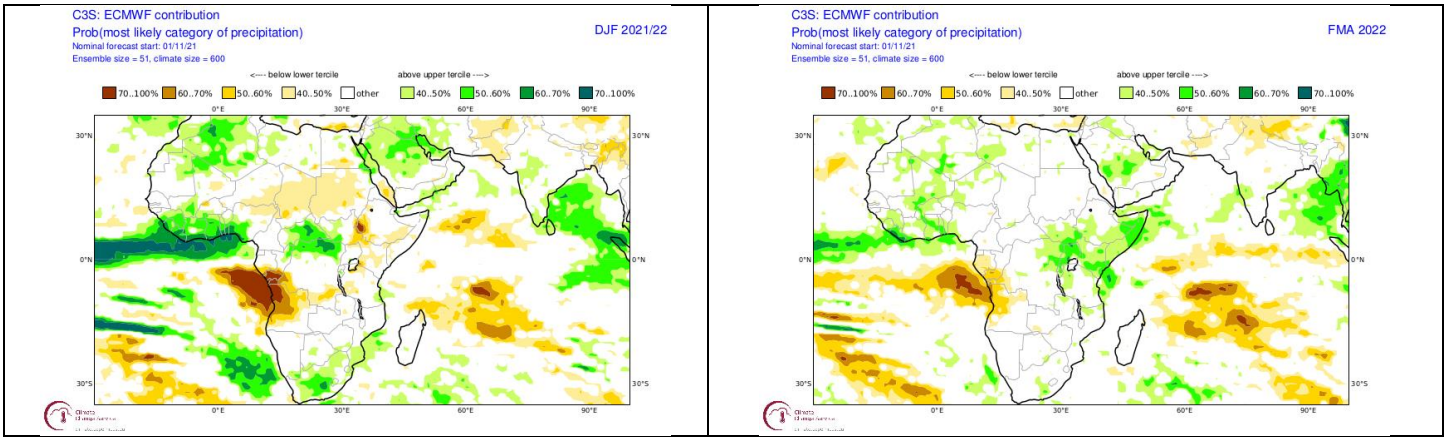


Australian Bureau of Meteorology - http://www.bom.gov.au

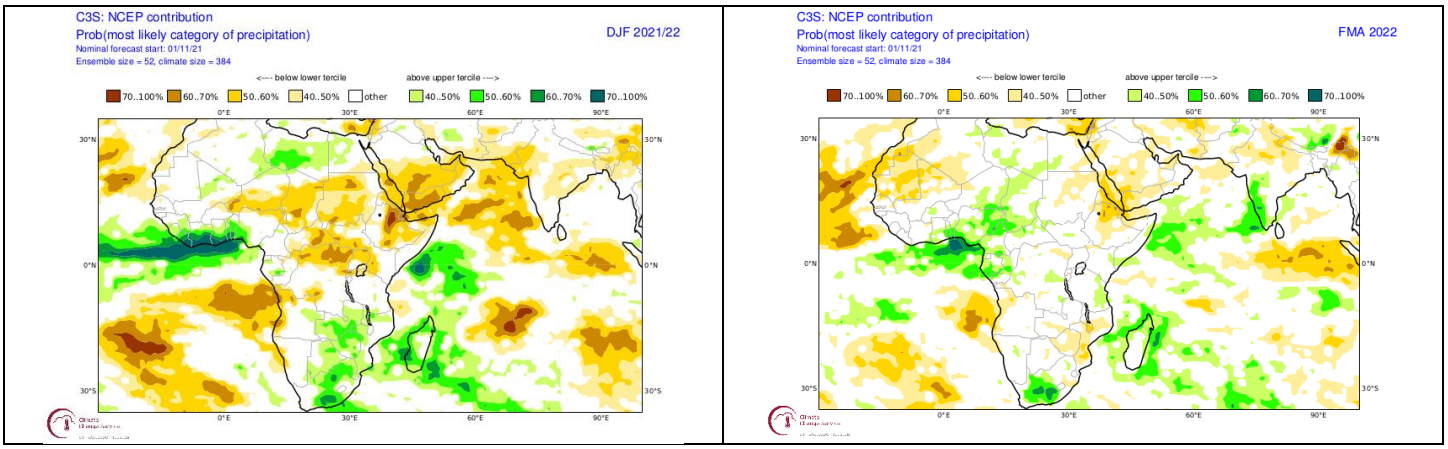
The Southern Oscillation Index is in positive territory (+15.5). This is indicative of atmospheric circulation patterns reflecting La Niña conditions.

Seasonal forecasts issued by various international institutions

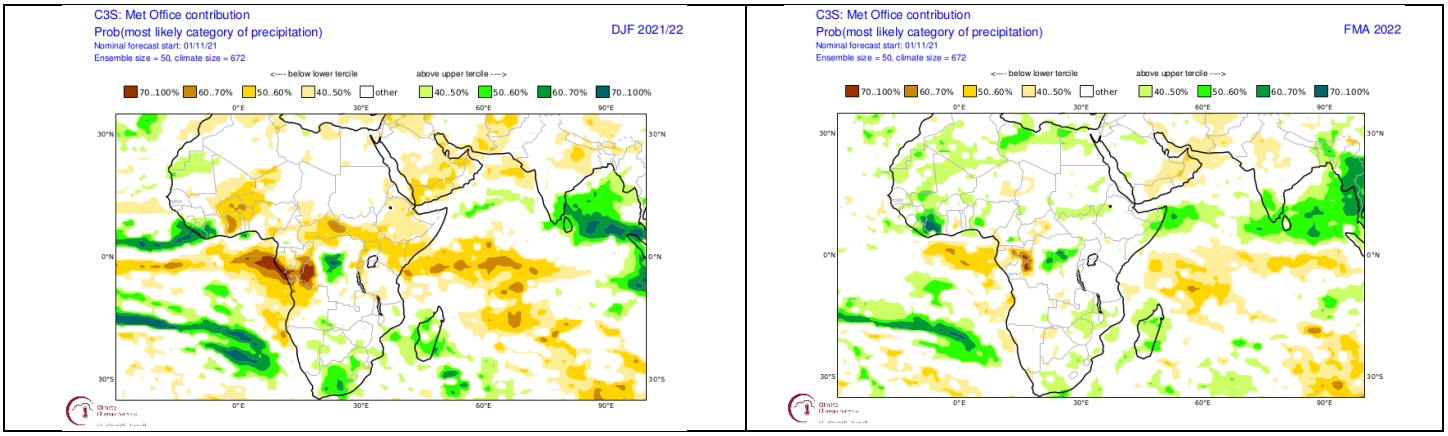
Seasonal forecasts by these institutions, as published by the COPERNICUS Programme (***https://climate.copernicus.eu/seasonal-forecasts***) for both mid-summer and late summer, reflect similar patterns with regards to rainfall for southern Africa as those by the IRI. The signal for relatively wet conditions over the summer rainfall region of South Africa is somewhat stronger for mid-summer than late summer (FMA). This is partly associated with the observed moderate La-Niña.



Probabilistic forecasts by the European Centre for Medium-Range Weather Forecasts for rainfall for mid-to-late-summer (December - February 2021/22; left) and late summer (February-April 2022; right) (Forecasts issued in 2021-11).



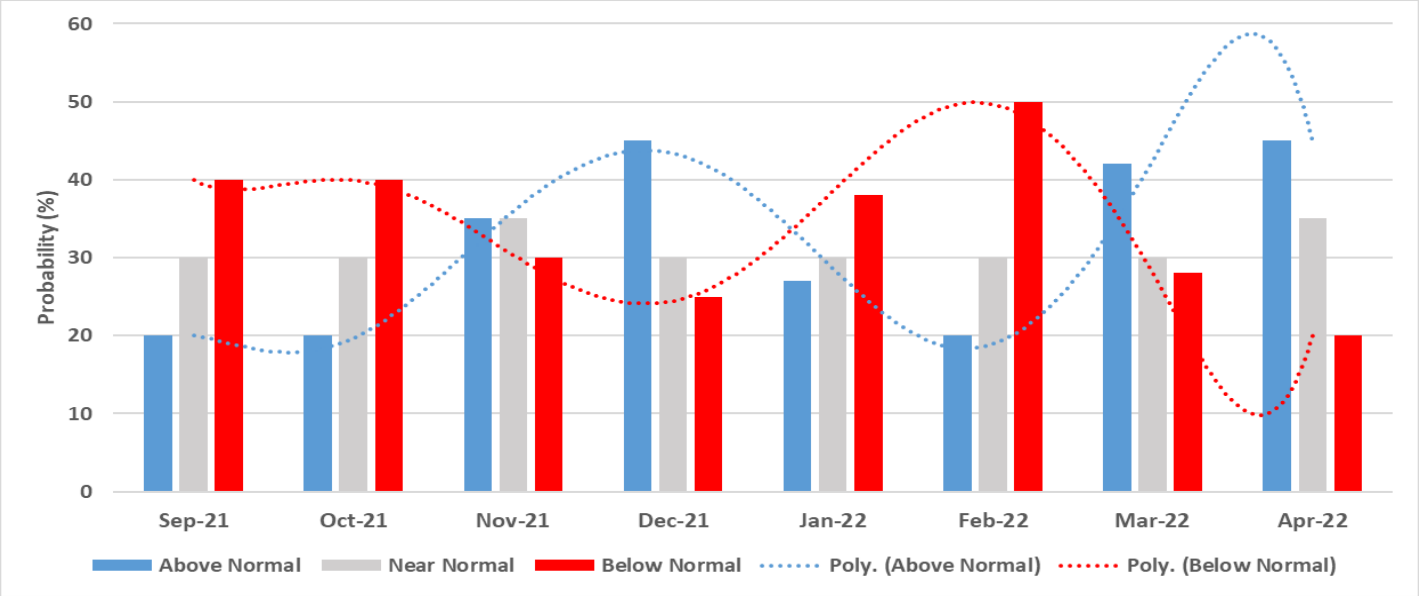
Same as above, but forecasts issued by the National Centres for Environmental Prediction.



Same as above, but forecasts issued by the UK Met Office.

CUMULUS seasonal outlook, based on decadal variability

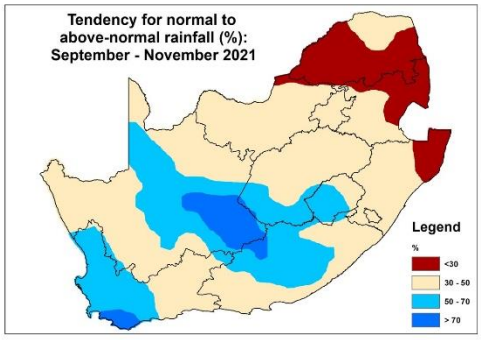
This outlook is based on the typical observed rainfall patterns over the ***north-eastern half*** of the country (including most of the summer grain production region), as associated with the cyclic variability of the global climate system. Summers that are similar to 2021/22 more often experience a seasonal rainfall curve that compares to normal conditions as indicated in the bar graph below, with wetter conditions focussing on December and March while drier than normal conditions focus on October and February:

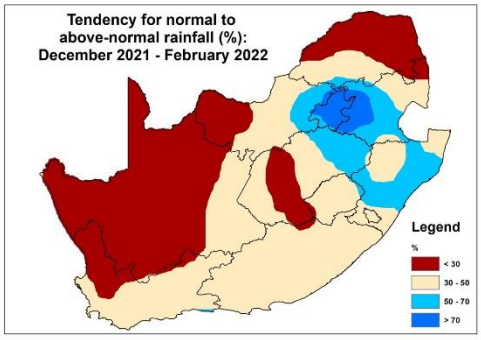


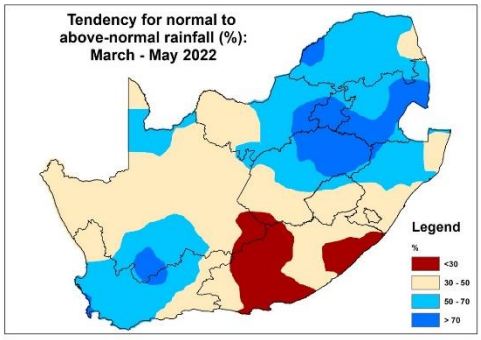
Probabilistic forecast for rainfall over the summer rainfall region, based on the natural cyclic nature of the climate system as seen in decadal variability, per month for the period September 2021 – April 2022 (Forecast issued in 2021-09).

Typical patterns during similar summers, over the north-eastern half of the summer rainfall region, are:

- **September – 20 October:** Relatively dry conditions over the north-eastern half of the summer rainfall region
- **20 October – 20 November:** Near-normal rainfall over the north-eastern half of the summer rainfall region
- **20 November – 15 January:** Near-normal to above-normal rainfall over the north-eastern half of the summer rainfall region
- **15 January – late February:** Below-normal rainfall over the north-eastern half of the summer rainfall region
- **March - April:** Above-normal rainfall over the north-eastern half of the summer rainfall region



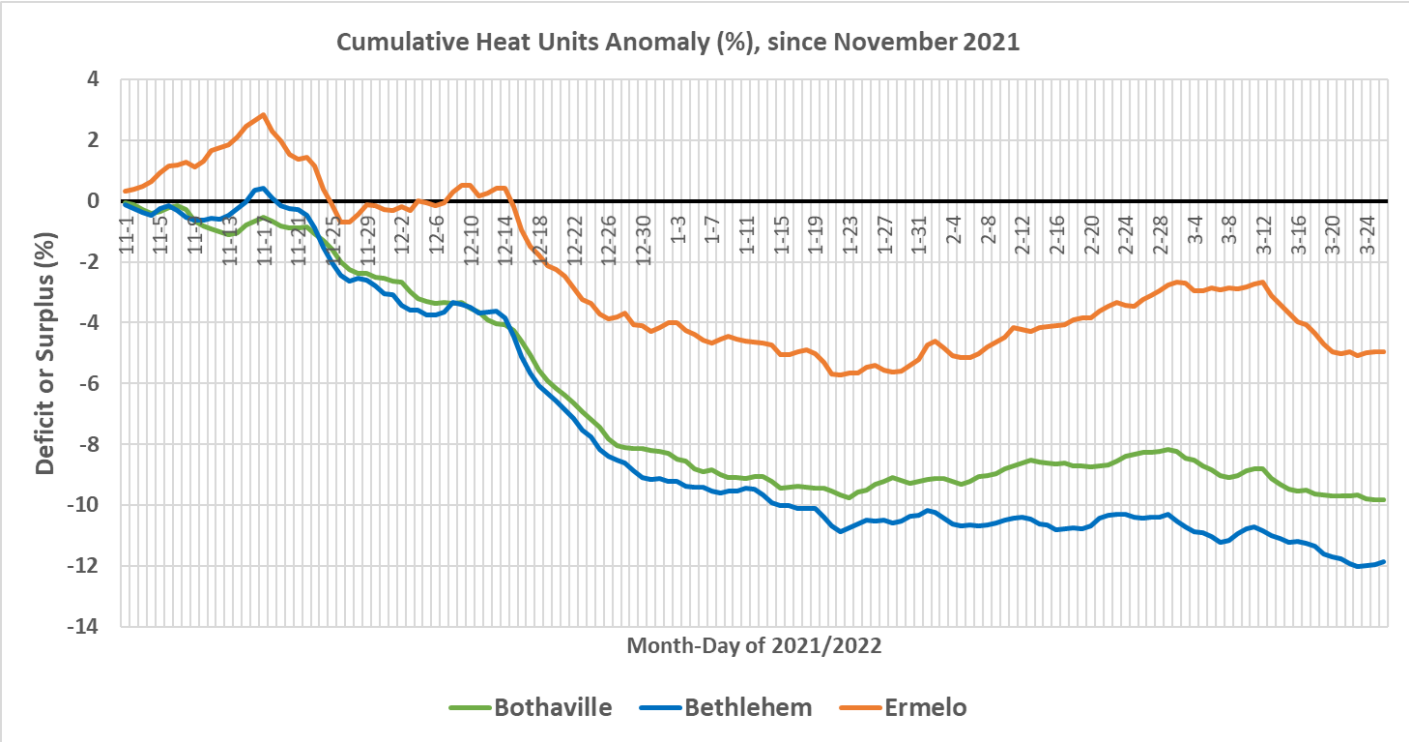




Typical patterns during summers analogous to 2021/22: Early summers during similar years tend to be relatively wet over the western parts of the country while drier than normal over the north-eastern parts of the country (map on the left). During December – February, relatively dry conditions tend to occur over the western and northern parts while rainfall tends to be above normal over parts of the eastern interior and into KZN (map in the centre). By late summer (March – May – map on the right), similar years tend to see above-normal rainfall over large parts of the summer rainfall region.

Observed conditions

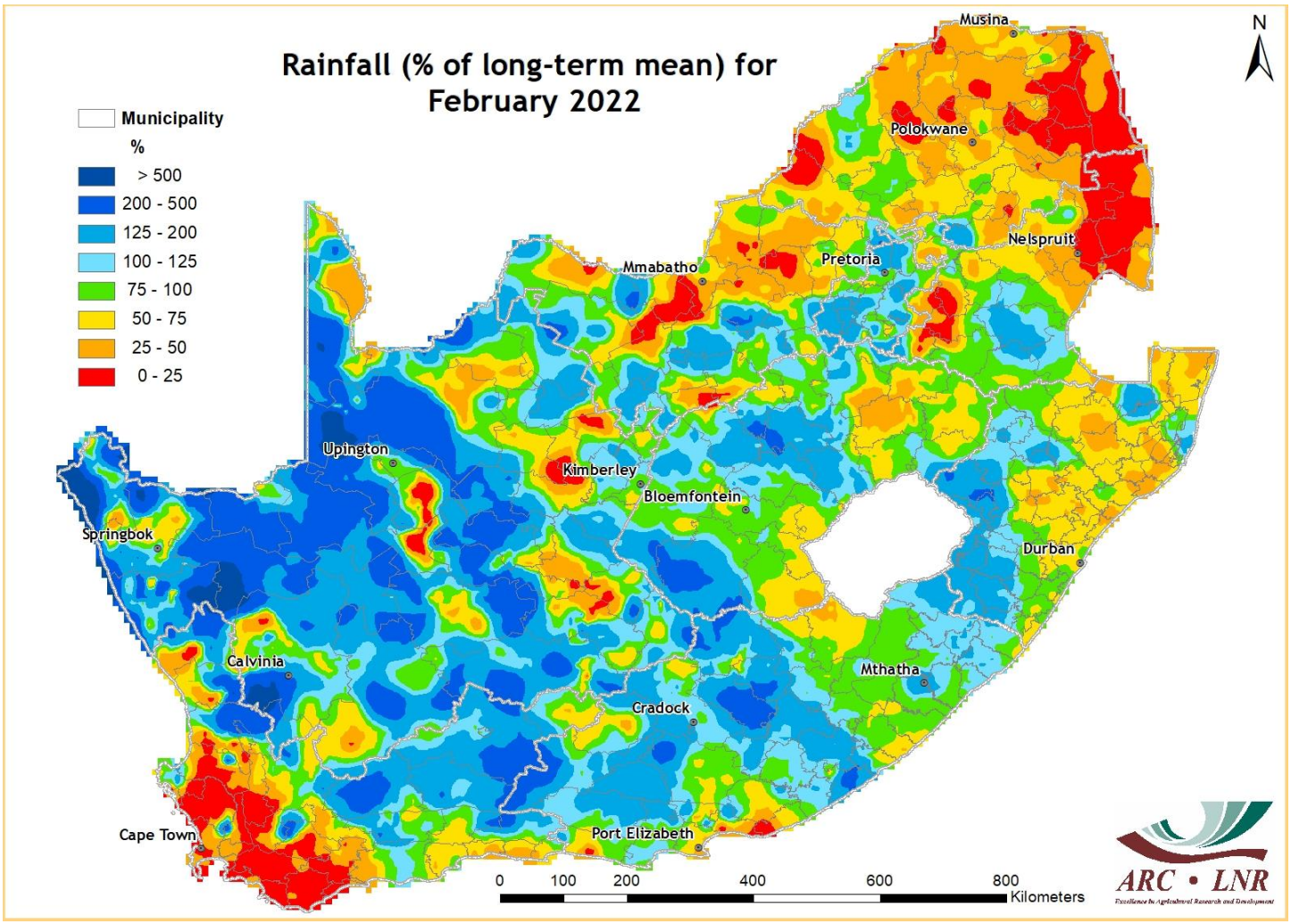
Heat Units: 1 November 2021 – 29 March 2022



Heat units have been less than the 2014 – 2020 norm the November – March period over the summer-grain production region due to long cloudy and rainy spells especially during December and early January. Given somewhat drier and warmer conditions during mid-January to February, deficits have decreased slightly, especially towards the north-eastern parts of the maize-production region. Since early March, cooler, wetter spells have resulted in a further cumulative deficit over the entire production area.

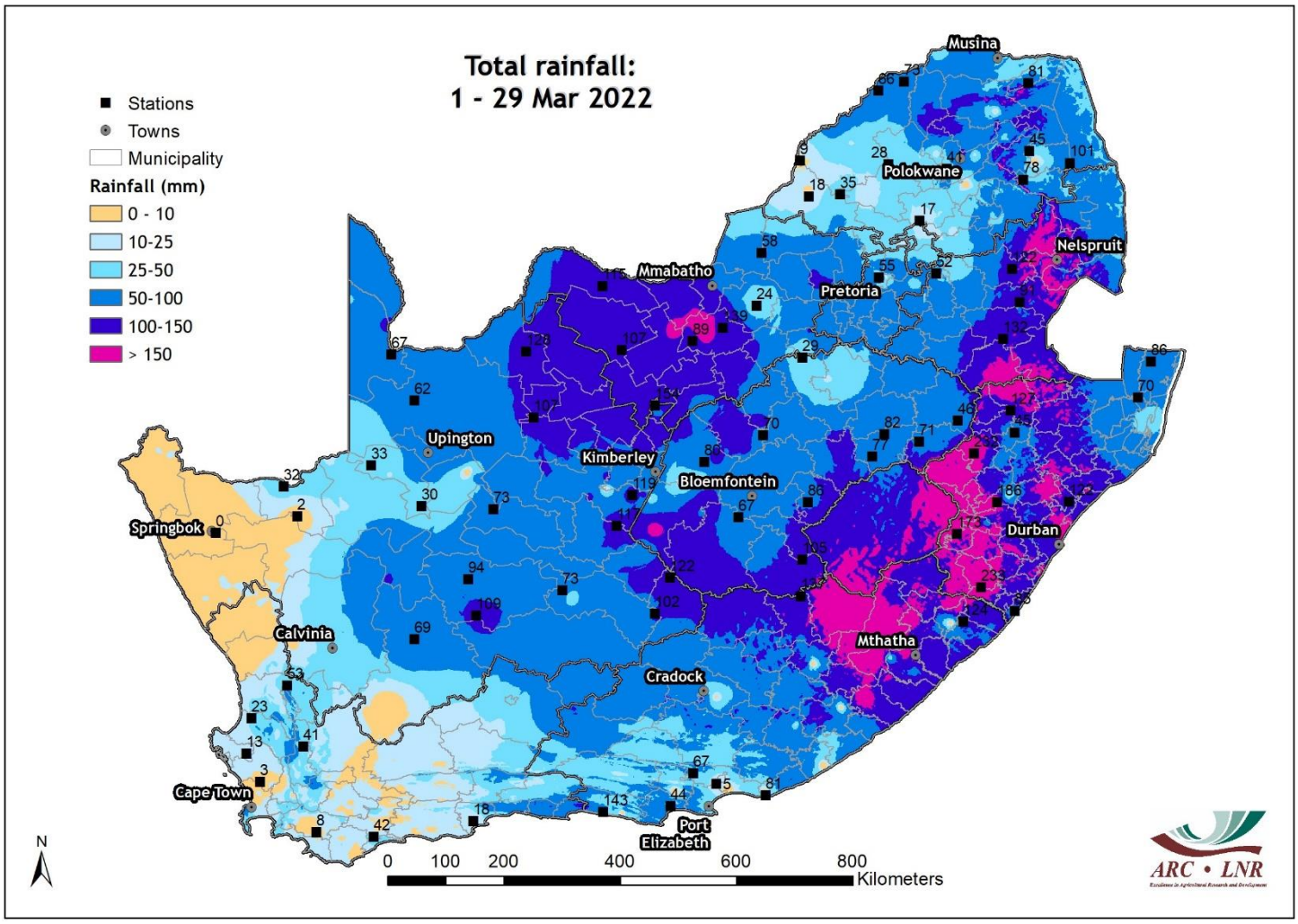
The graph shows the accumulated heat units during November 2021 until 29 March 2022, compared to the median value calculated over the 2014 – 2020 period, expressed as a percentage of the median value over the entire period. Largest negative anomalies are seen over the southern to central and western parts (around 10 – 15 %), with smaller deficits towards the northeast (Ermelo). The largest deficits occurred, at all three locations, during the mid-December to mid-January period, shown by the steeper downward slope in the graph. These deficits exceed 2 standard deviations for the same period during 2014 – 2020 at Bethlehem and Bothaville, and 1 standard deviation at Ermelo according to the recorded data.

Rainfall (% of long-term mean): February 2022



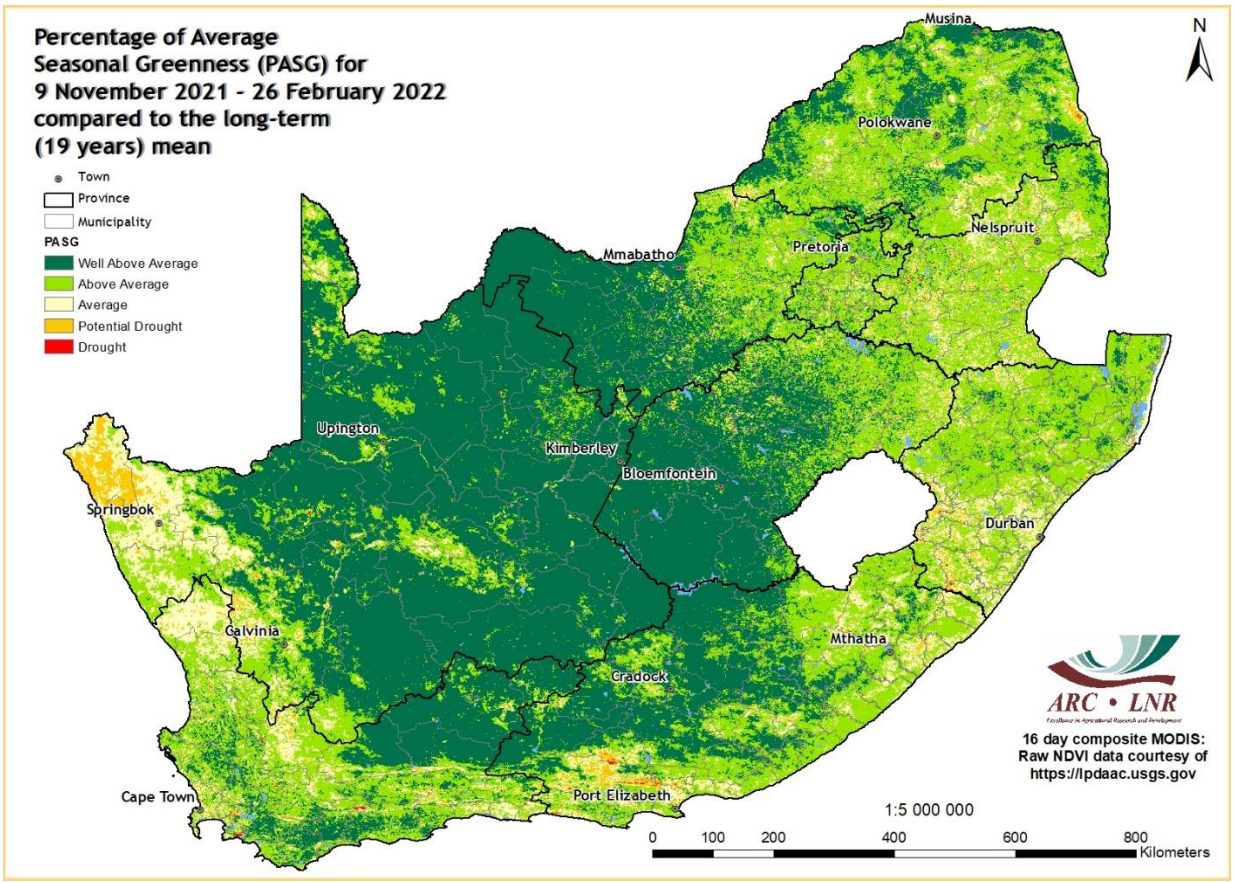
Rainfall was above average over the central to western interior during February, with relatively dry conditions over the winter rainfall region and Garden Route through to the coast of the Eastern Cape. The northeastern parts were relatively dry.

Rainfall (mm): 1 – 29 March 2022



Large of North West, the southern Free State, southeastern half of Mpumalanga and KZN received more than 100 mm of rain during the first 29 days of the month.

Percentage of Average Seasonal Greenness: November 2021 – 26 February 2022



Cumulative vegetation activity since November is largely above normal, especially over the central interior, reflecting the excellent weather conditions in support of vegetation activity.

Sources of information

Seasonal forecasts: Published by the COPERNICUS Programme (***https://climate.copernicus.eu/seasonal-forecasts***)

Rainfall, temperature and wind maps over South Africa for the past week:
Agricultural Research Council - Institute for Soil, Climate and Water (ISCW) – Climate Data Bank. Data recorded by the automatic weather station network of the ARC-ISCW.

Vegetation condition maps: Copernicus Global Land service, distributed by VITO.

Information related to: ENSO, IOD and SOI:
Australian Bureau of Meteorology - http://www.bom.gov.au
Climate Prediction Center - http://www.cpc.ncep.noaa.gov
International Research Institute for Climate and Society- http://iri.columbia.edu/

Information related to the SAM:
The Annular Mode Website - http://www.atmos.colostate.edu/ao/index.html

SST map:
NOAA Climate Prediction Center - http://www.cpc.ncep.noaa.gov

Daily conditions over South Africa:
Accumulations of GFS 6-hourly rainfall fields, done in Google Earth Engine

Tropical cyclone/hurricane/typhoon information:
Weather Underground - http://www.wunderground.com
Cooperative Institute for Meteorological Satellite Studies (CIMMS) - Tropical Cyclone Group -http://tropic.ssec.wisc.edu/
Tropical Cyclone Centre La Reunion -http://www.meteo.fr/temps/domtom/La_Reunion/webcmrs9.0/anglais/index.html

Information on drought conditions over the USA:
NOAA National Weather Service - http://www.weather.gov
United States Drought Monitor - http://droughtmonitor.unl.edu

Precipitation and temperature outlooks for the coming week:
Center for Ocean-Land-Atmosphere Studies (COLA) and Institute of Global Environment and Society (IGES) – http://Wxmaps.org
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