Seasonal forecasts

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Seasonal Forecast Worx

Latest Update: 9 February 2019

- The seasonal forecasts presented here by **Seasonal Forecast Worx** are based on forecast output of the coupled ocean-atmosphere models administered through the North American Multi-Model Ensemble (NMME) prediction experiment (http://www.cpc.ncep.noaa.gov/products/NMME/; Kirtman et al. 2014). NMME real-time seasonal forecast and hindcast (re-forecast) data are obtained from the data library (http://iridl.ldeo.columbia.edu/) of the International Research Institute for Climate and Society (IRI; http://iri.columbia.edu/).
- NMME forecasts are routinely produced and are statistically improved and tailored for southern Africa and for global sea-surface temperatures by employees and post-graduate students in the Department of Geography, Geoinformatics and Meteorology at the University of Pretoria (http://www.up.ac.za/en/geography-geoinformatics-and-meteorology/). Statistical post-processing is performed with the CPT software (http://iri.columbia.edu/our-expertise/climate/tools/cpt/).
- Why do we apply statistical methods to climate model forecasts?

  "…statistical correction methods treating individual locations (e.g. multiple regression or principal component regression) may be recommended for today's coupled climate model forecasts". (Barnston and Tippett, 2017).
- Why do we not use just a single model in our forecasts for southern Africa?

  "…multi-model forecasts outperform the single model forecasts…" (Landman and Beraki, 2012).

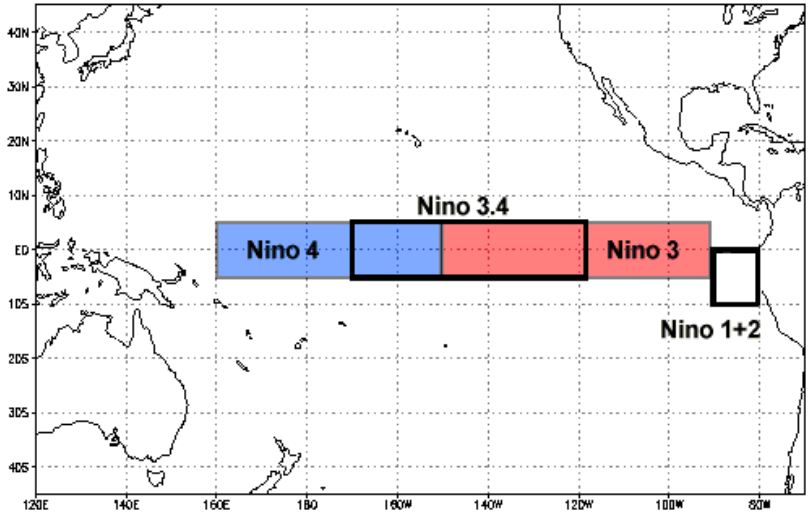
- For the official seasonal forecast for South Africa, visit the South African Weather Service website at http://www.weathersa.co.za/home/seasonal

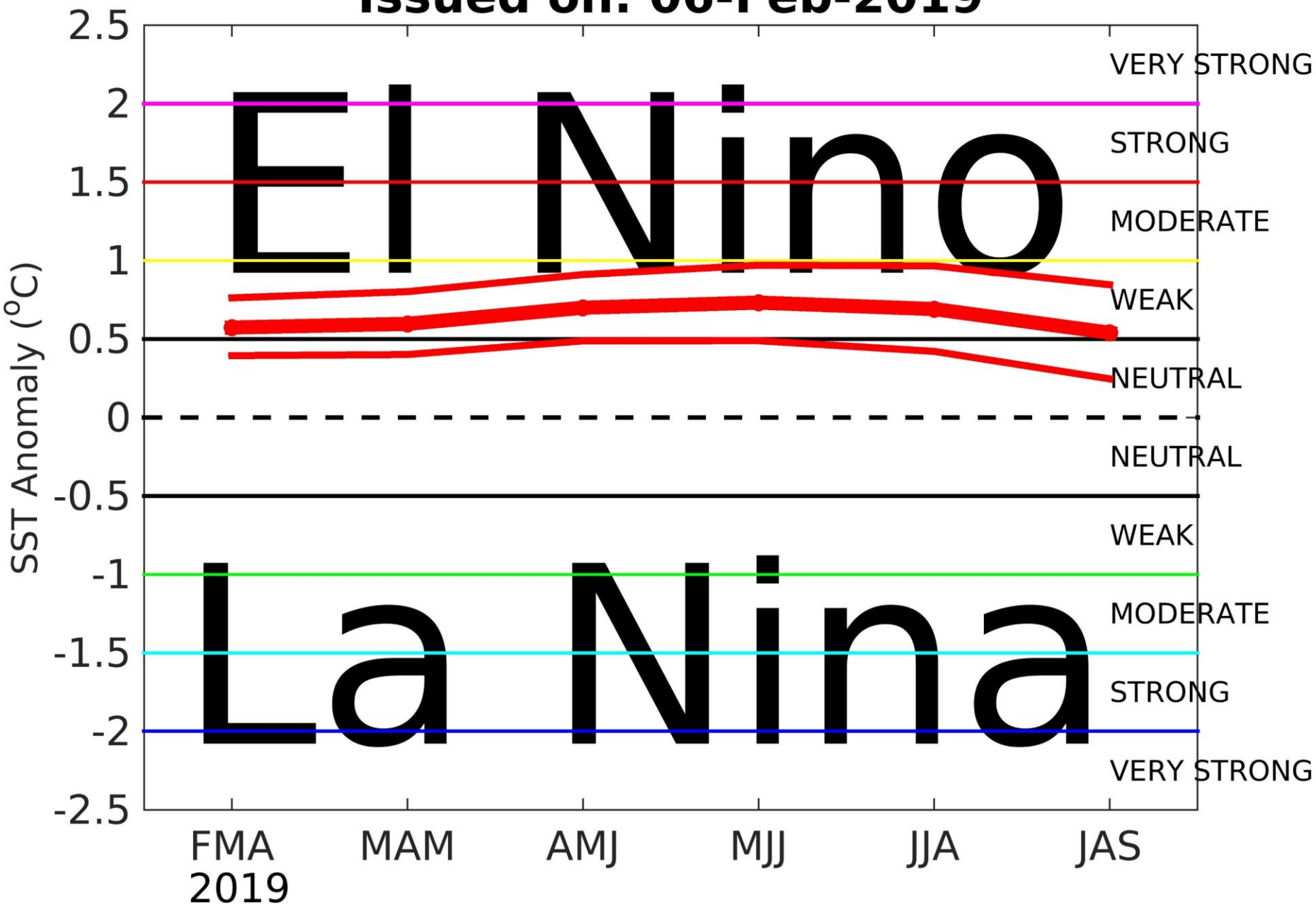
South African Weather Service
ISO 9001 Certified Organisation

ENSO and Global SST Forecasts

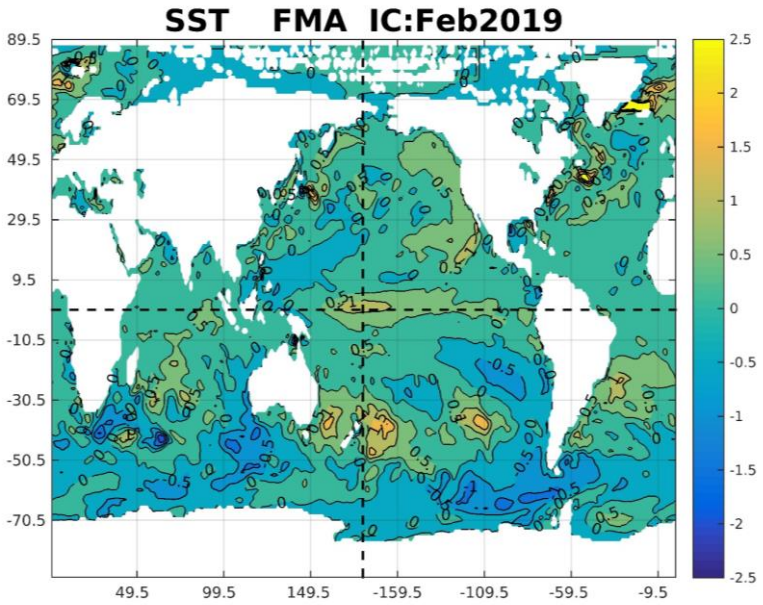
Prediction Method

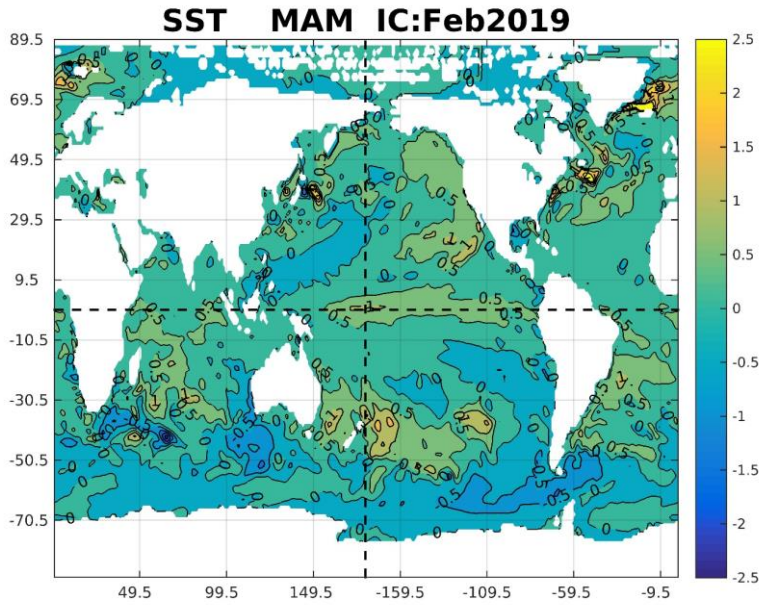
- Forecasts for global sea-surface temperature (SST) fields are obtained through a combination of NMME models and a linear statistical model that uses antecedent SST as predictor (Landman et al. 2011). Forecasts for the Niño3.4 area (see insert) are derived from the global forecasts.
- Three-month Niño3.4 SST forecasts are produced for three categories:
  - **El Niño:** SST above the 75th percentile
  - **La Niña:** SST below the 25th percentile
  - **Neutral:** Neither El Niño nor La Niña

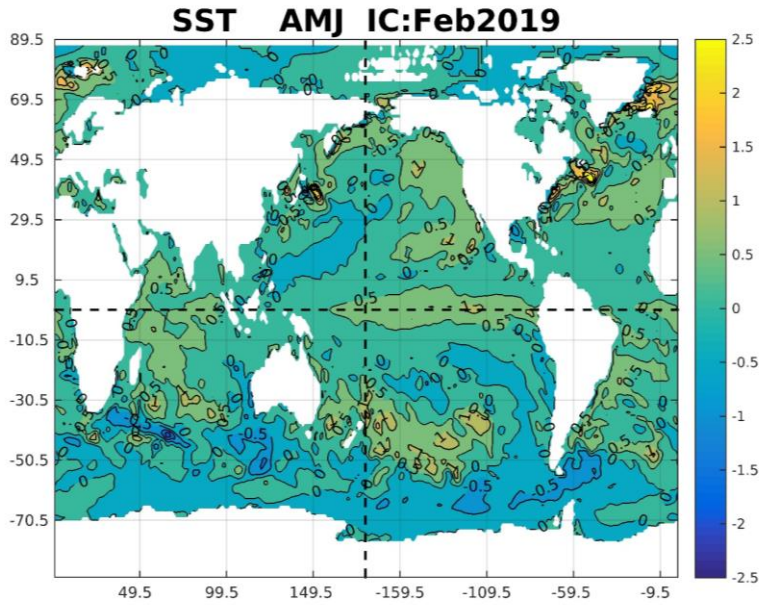


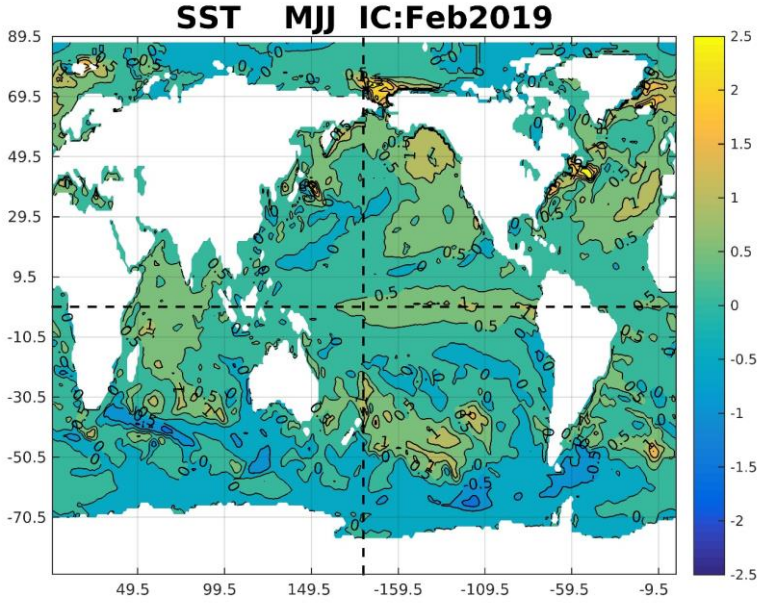

CSiriMM Nino3.4 SST Forecast
Issued on: 06-Feb-2019
SST Anomaly (°C)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
El Nino
La Nina
VERY STRONG
STRONG
MODERATE
WEAK
NEUTRAL
NEUTRAL
WEAK
MODERATE
STRONG
VERY STRONG
FMA
2019
MAM
AMJ
MJJ
JJA
JAS

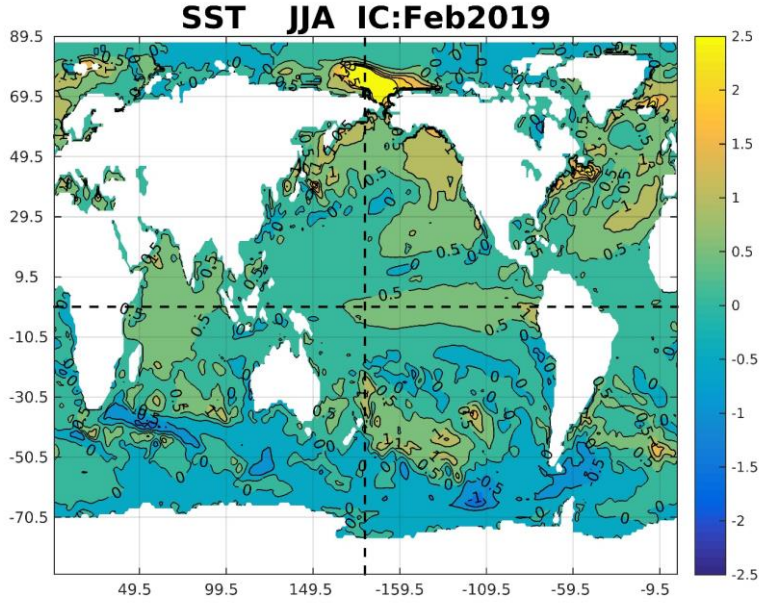
SST anomalies

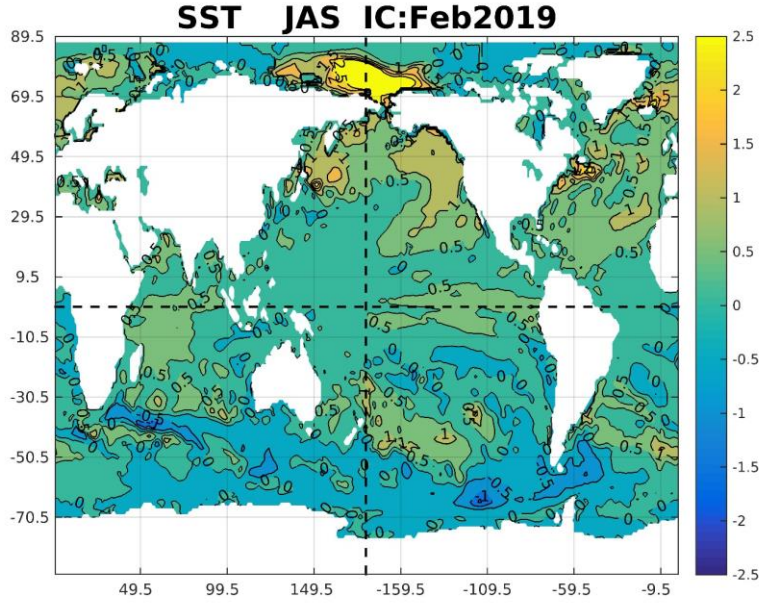












Round-up: ENSO

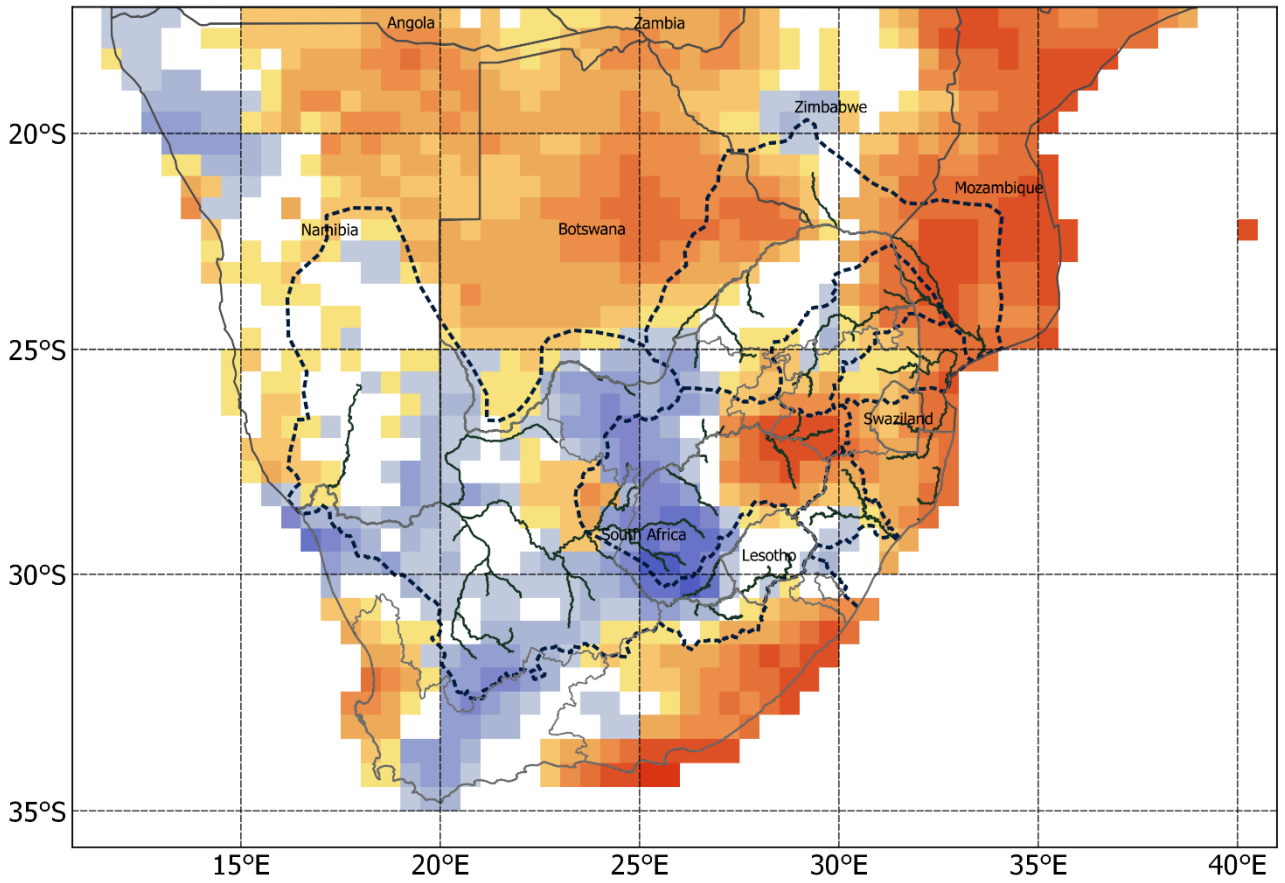
- Weak El Niño into early spring predicted.
- From the CPC/IRI El Niño Watch: *Despite the above-average ocean temperatures across the equatorial Pacific Ocean, the overall coupled ocean-atmosphere system continued to reflect ENSO-neutral*.

Southern Africa Forecasts

Prediction Method

- Three-month seasons for seasonal rainfall totals and average maximum temperatures of NMME ensemble mean forecasts are interpolated to Climatic Research Unit (CRU; Harris et al. 2014) grids (0.5°x0.5°) by correcting the mean and variance biases of the NMME forecasts. Probabilistic forecasts are subsequently produced from the error variance obtained from a 5-year-out cross-validation process (Troccoli et al. 2008). Forecasts cover a 6-month period.
- Forecasts are produced for three categories:
  - **Above:** Above-normal ("wet" / "hot", rainfall totals / maximum temperatures higher than the 75th percentile of the climatological record)
  - **Below:** Below-normal ("dry" / "cool", rainfall totals / maximum temperatures lower than the 25th percentile of the climatological record)
  - **Normal:** Near-normal ("average" season)
- Verification:
  - ROC Area (Below-Normal) – The forecast system's ability to discriminate dry or cool seasons from the rest of the seasons over a 32-year test period. ROC values should be higher than 0.5 for a forecast system to be considered skilful.
  - ROC Area (Above-Normal) – The forecast system's ability to discriminate wet or hot seasons from the rest of the seasons over a 32-year test period. ROC values should be higher than 0.5 for a forecast system to be considered skilful.

FMA 2019 Rainfall; ICs: Feb



Legend

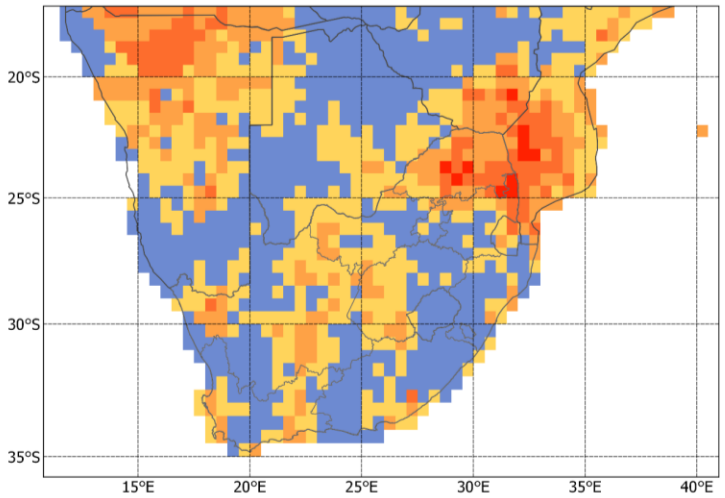
Catchment Area

Main Rivers

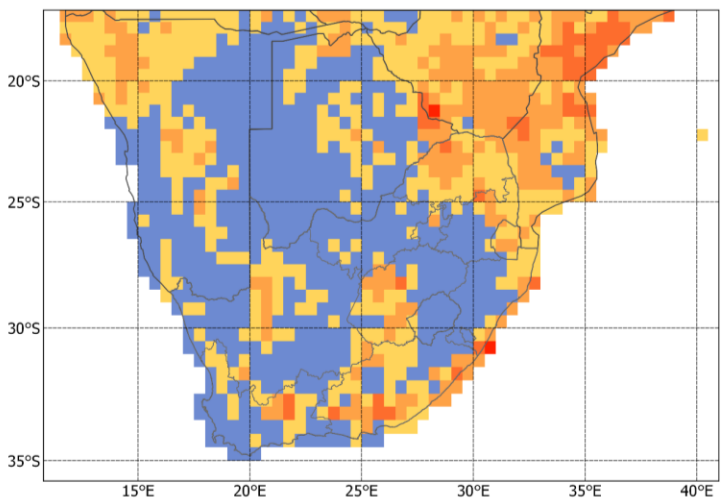
Rainfall Prob

>75	
70-75	
65-70	
60-65	
55-60	
50-55	Above
45-50	Normal
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Normal
60-65	
65-70	
70-75	
>75	

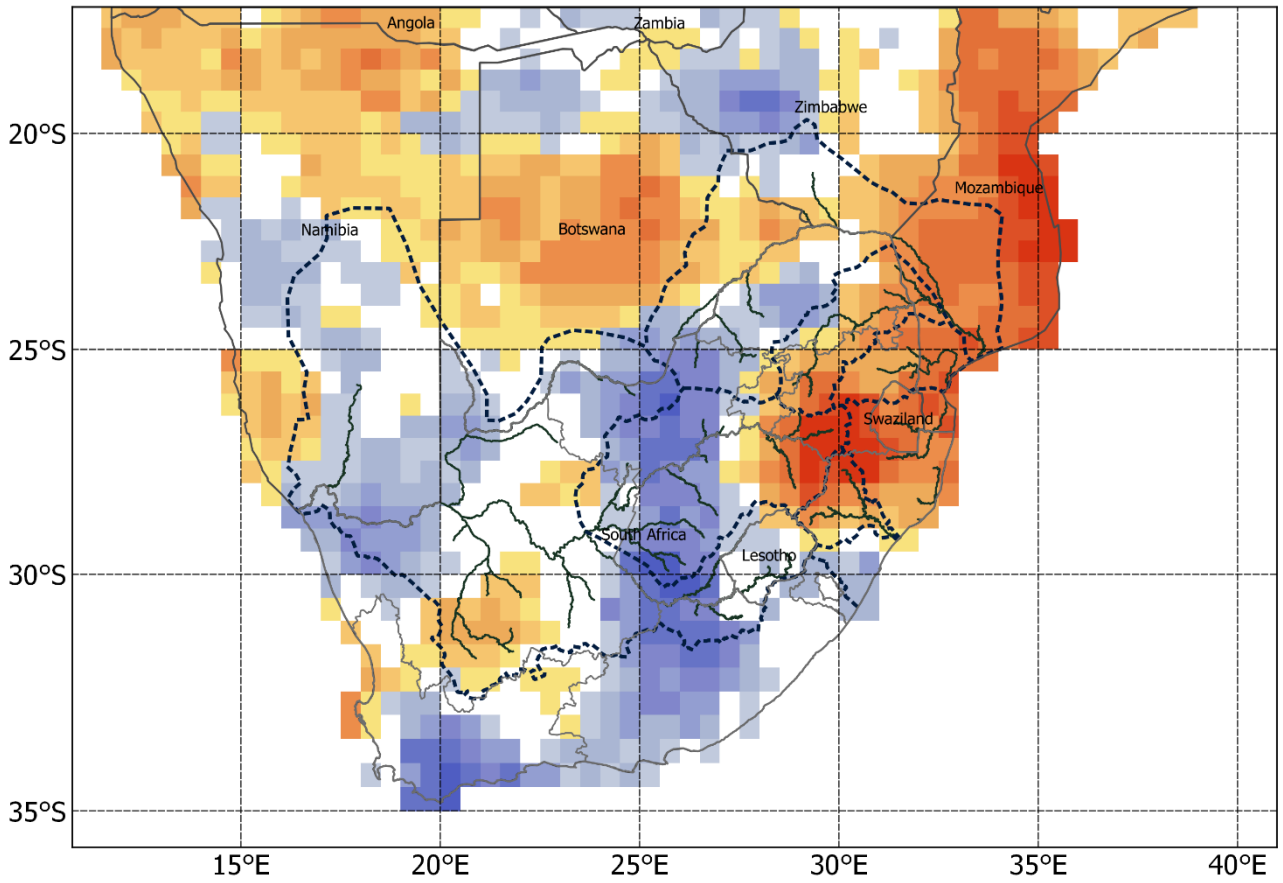
ROC Area (Above-Normal): FMA Rainfall



ROC Area (Below-Normal): FMA Rainfall



MAM 2019 Rainfall; ICs: Feb



Legend

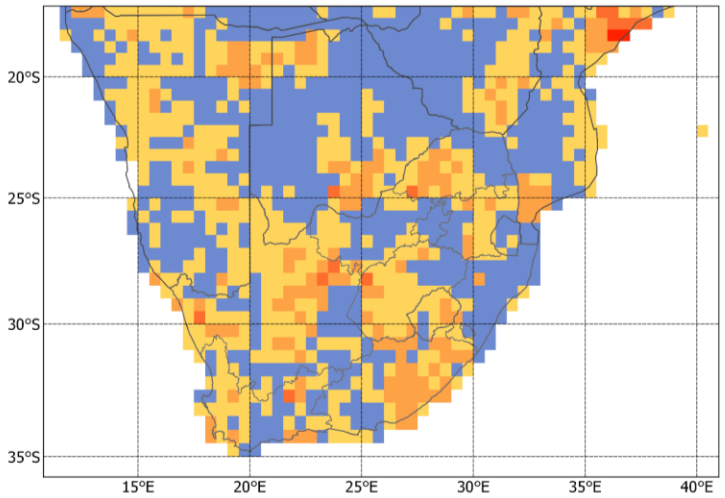
Catchment Area

Main Rivers

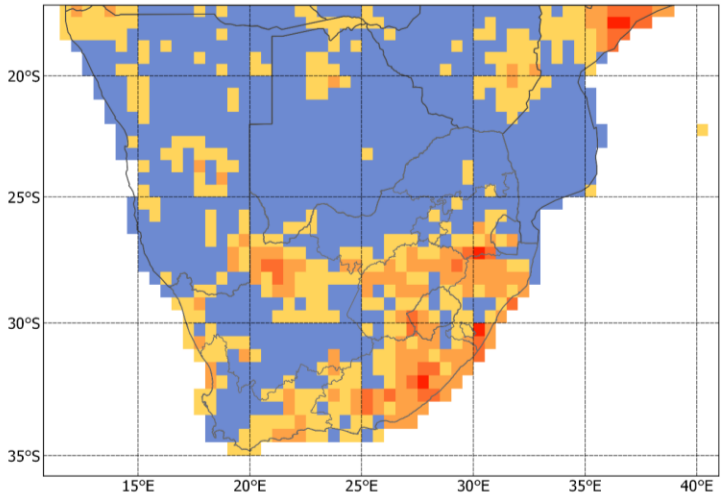
Rainfall Prob

>75	
70-75	
65-70	
60-65	
55-60	
50-55	Above Normal
45-50	
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below Normal
55-60	
60-65	
65-70	
70-75	
>75	

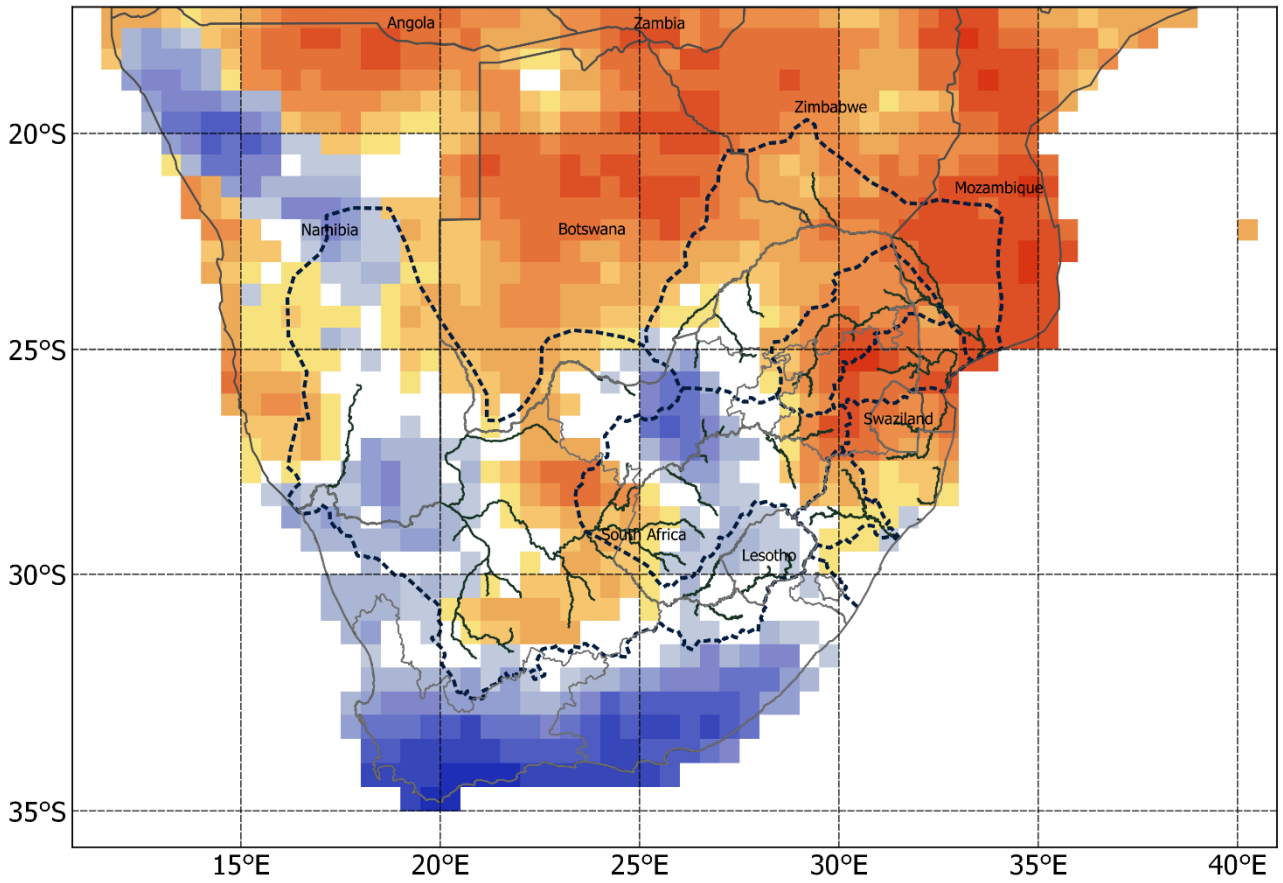
ROC Area (Above-Normal): MAM Rainfall



ROC Area (Below-Normal): MAM Rainfall



AMJ 2019 Rainfall; ICs: Feb



Legend

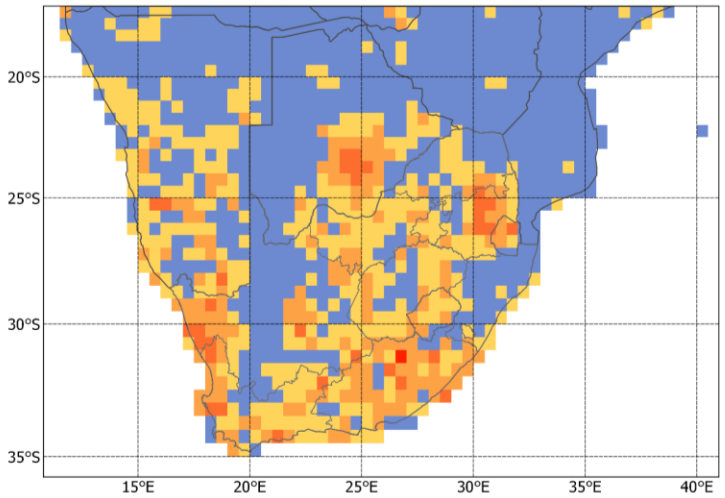
Catchment Area

Main Rivers

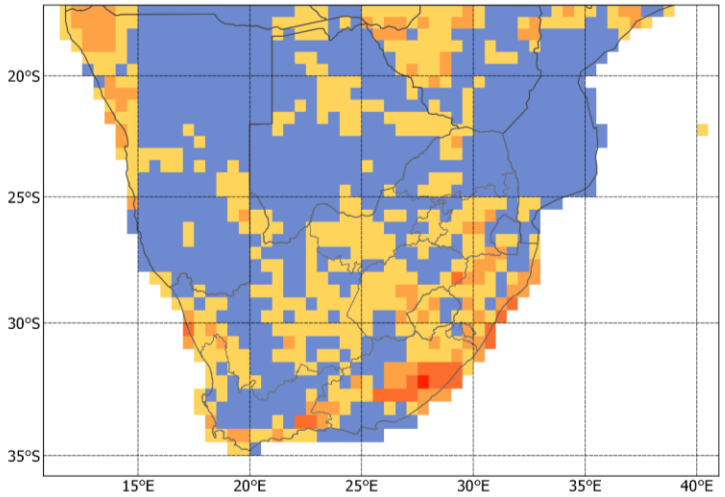
Rainfall Prob

>75	
70-75	
65-70	
60-65	
55-60	
50-55	Above
45-50	Normal
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Normal
60-65	
65-70	
70-75	
>75	

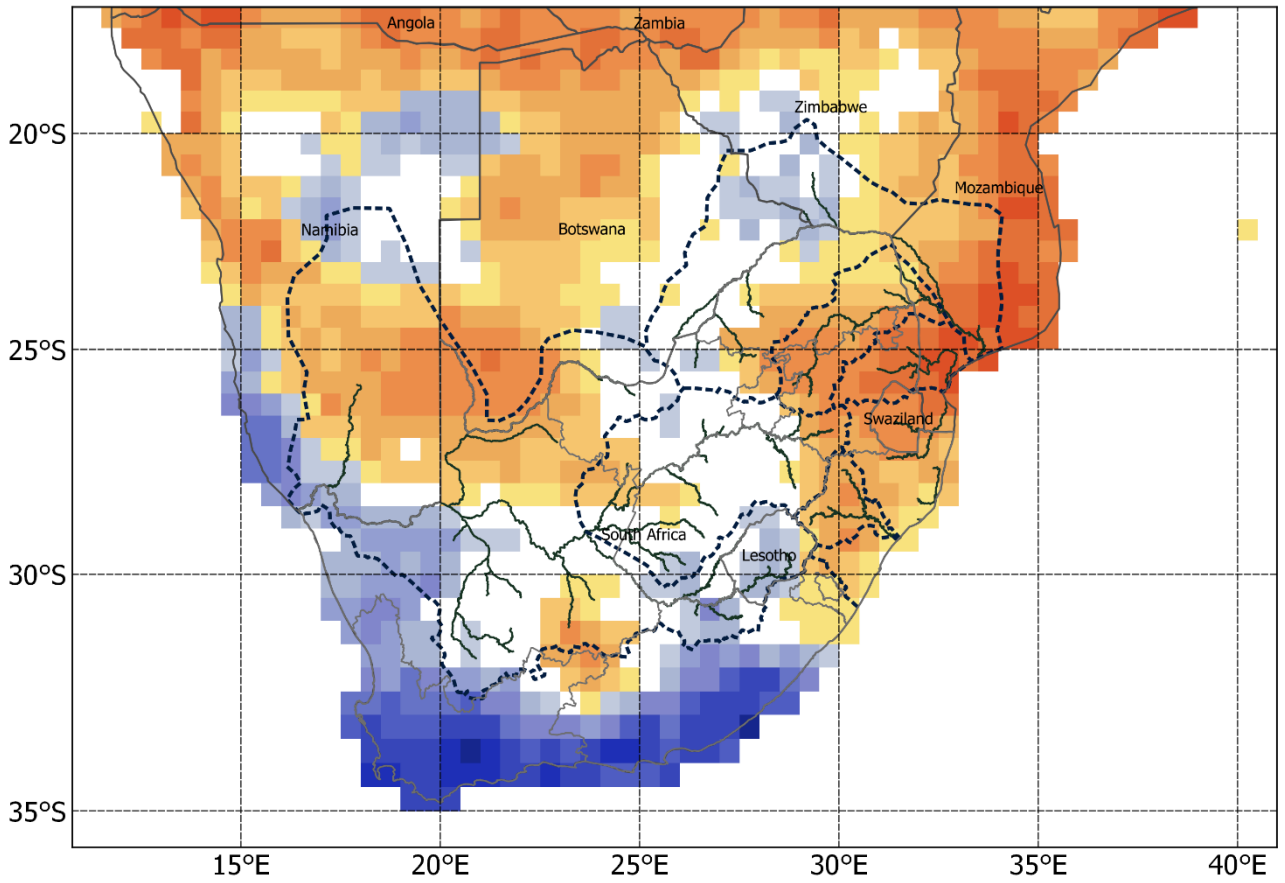
ROC Area (Above-Normal): AMJ Rainfall



ROC Area (Below-Normal): AMJ Rainfall



MJJ 2019 Rainfall; ICs: Feb



Legend

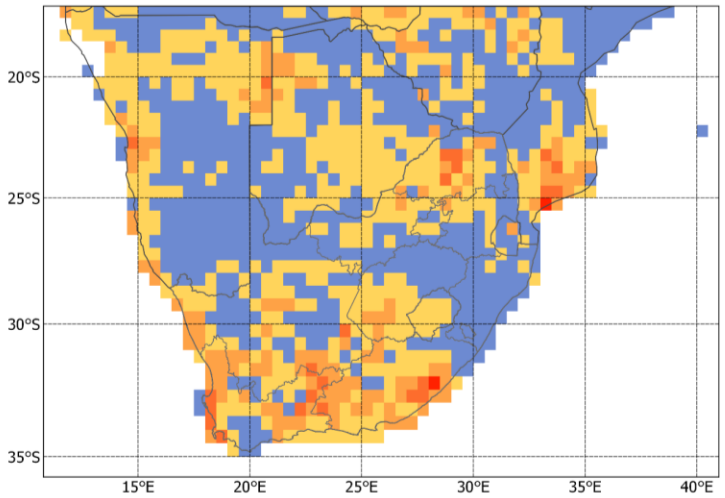
Catchment Area

Main Rivers

Rainfall Prob

>75	
70-75	
65-70	
60-65	
55-60	
50-55	Above
45-50	Normal
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Normal
60-65	
65-70	
70-75	
>75	

ROC Area (Above-Normal): MJJ Rainfall

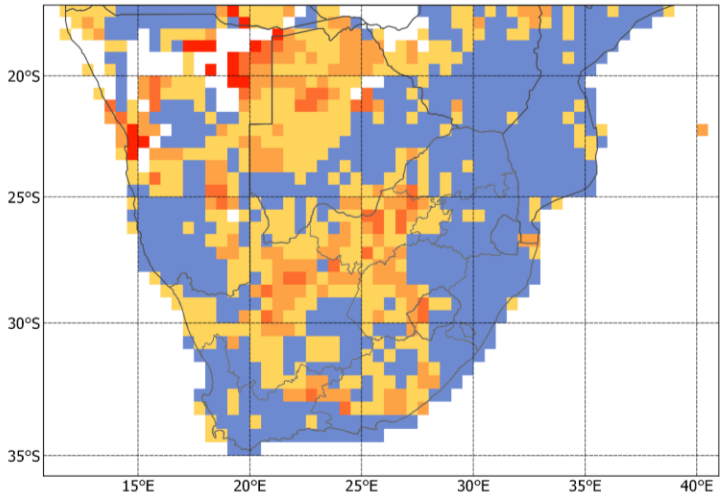


Legend

ROC

> 0.8
0.8 - 0.7
0.7 - 0.6
0.6 - 0.5
<= 0.5

ROC Area (Below-Normal): MJJ Rainfall



Legend

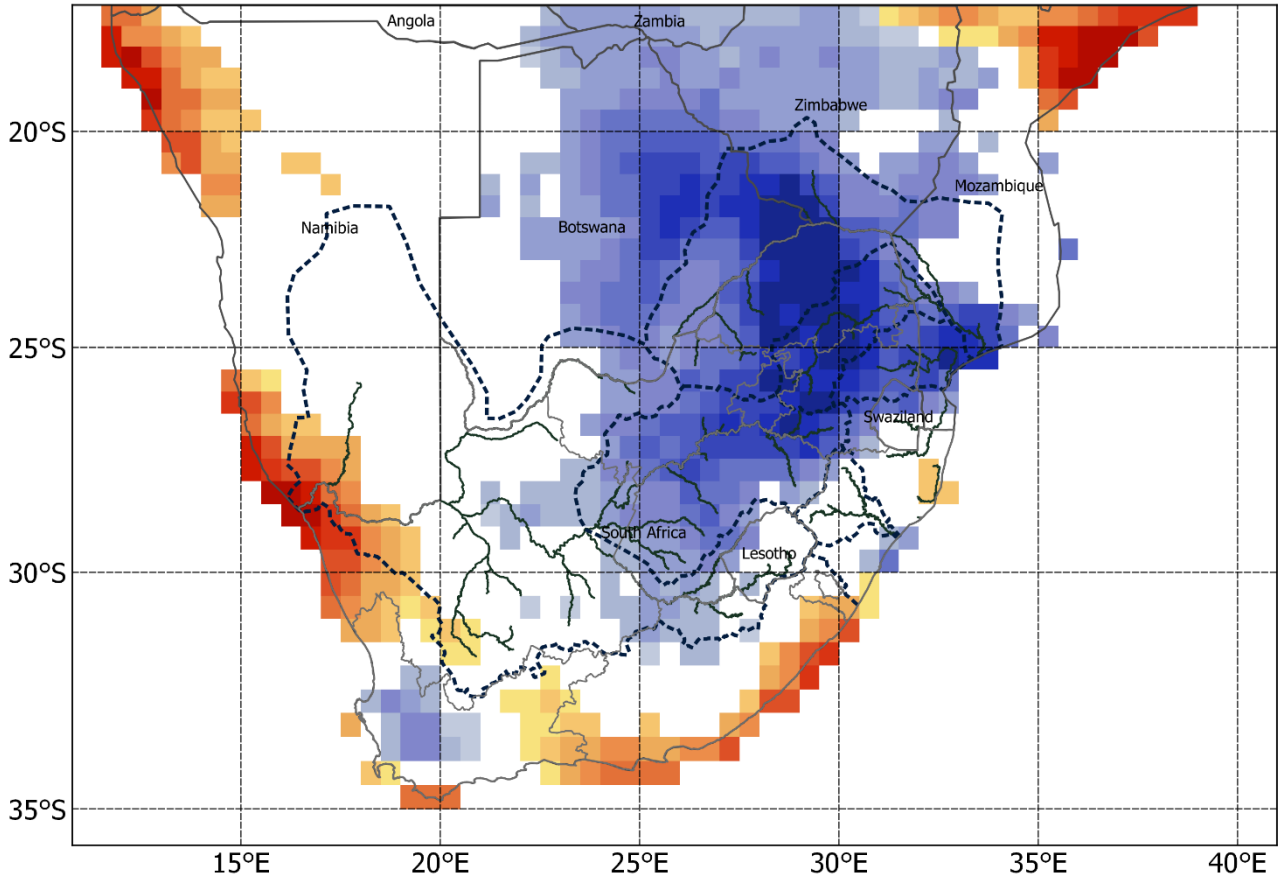
ROC

> 0.8
0.8 - 0.7
0.7 - 0.6
0.6 - 0.5
<= 0.5

Round-up: SADC Rainfall

- From the CPC/IRI El Niño Watch: *The atmospheric anomalies* (across the equatorial Pacific Ocean) *… have not yet shown a clear coupling to the above-average ocean temperatures*.
- The forecasts for the remainder of summer do not show a typical El Niño-type rainfall pattern of mainly below-normal rainfall totals.
- Enhanced probabilities for favourable rainfall outcomes are predicted over the southern and southwestern Cape areas towards the end of the forecast period.

FMA 2019 Max Temp; ICs: Feb



Legend

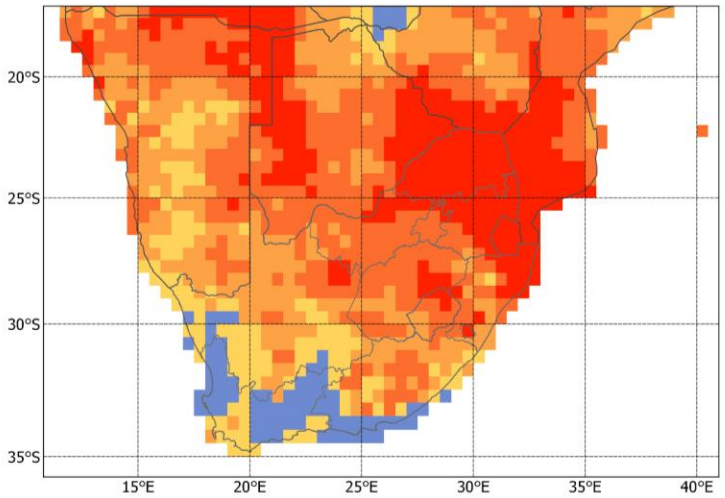
Catchment Area

Main Rivers

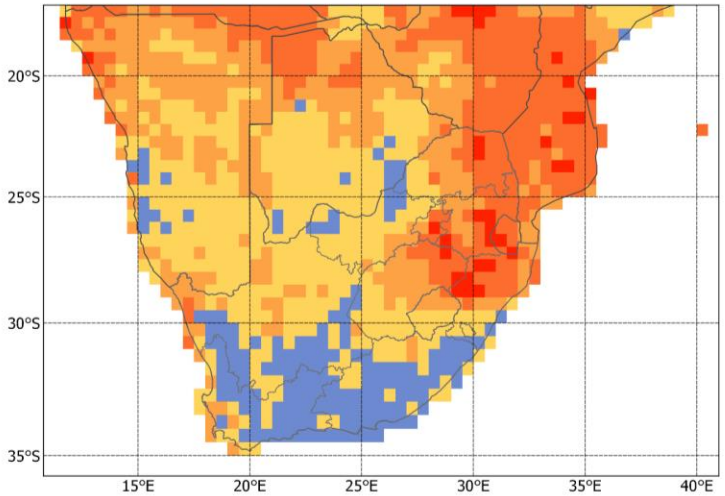
Max Temp Prob

>75	
70-75	
65-70	
60-65	
55-60	Above
50-55	Normal
45-50	
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Below
60-65	
65-70	
70-75	
>75	

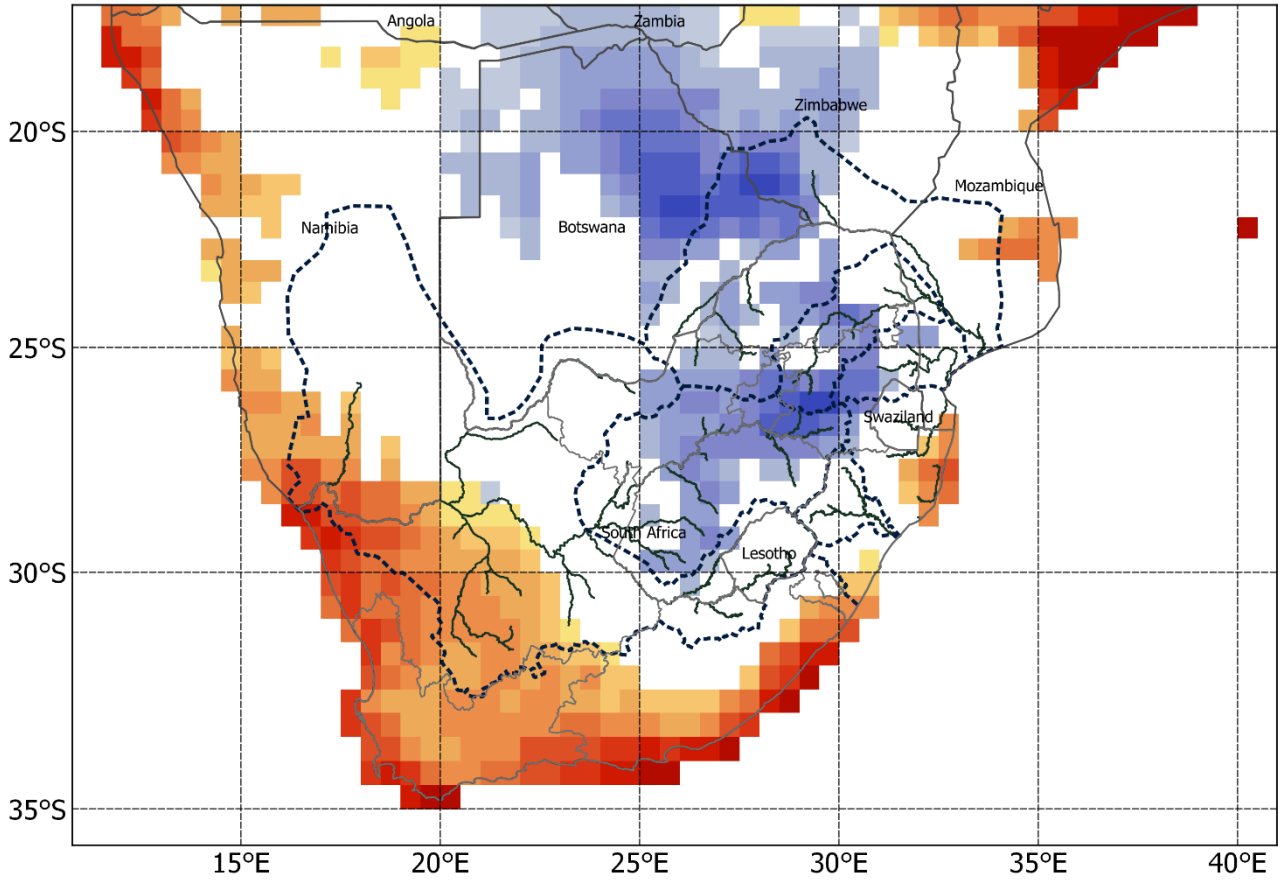
ROC Area (Above-Normal): FMA Max Temp



ROC Area (Below-Normal): FMA Max Temp



MAM 2019 Max Temp; ICs: Feb



Legend

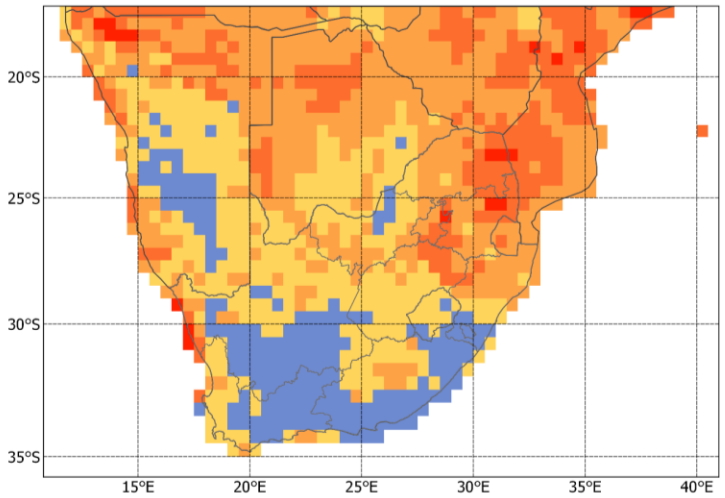
Catchment Area

Main Rivers

Max Temp Prob

>75	
70-75	
65-70	
60-65	
55-60	Above
50-55	Normal
45-50	
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Below
60-65	
65-70	
70-75	
>75	

ROC Area (Above-Normal): MAM Max Temp



Legend

ROC

> 0.8

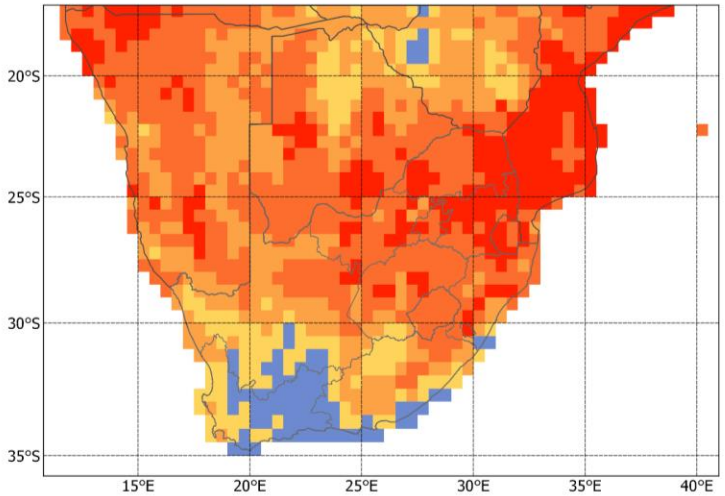
0.8 - 0.7

0.7 - 0.6

0.6 - 0.5

<= 0.5

ROC Area (Below-Normal): MAM Max Temp



Legend

ROC

> 0.8

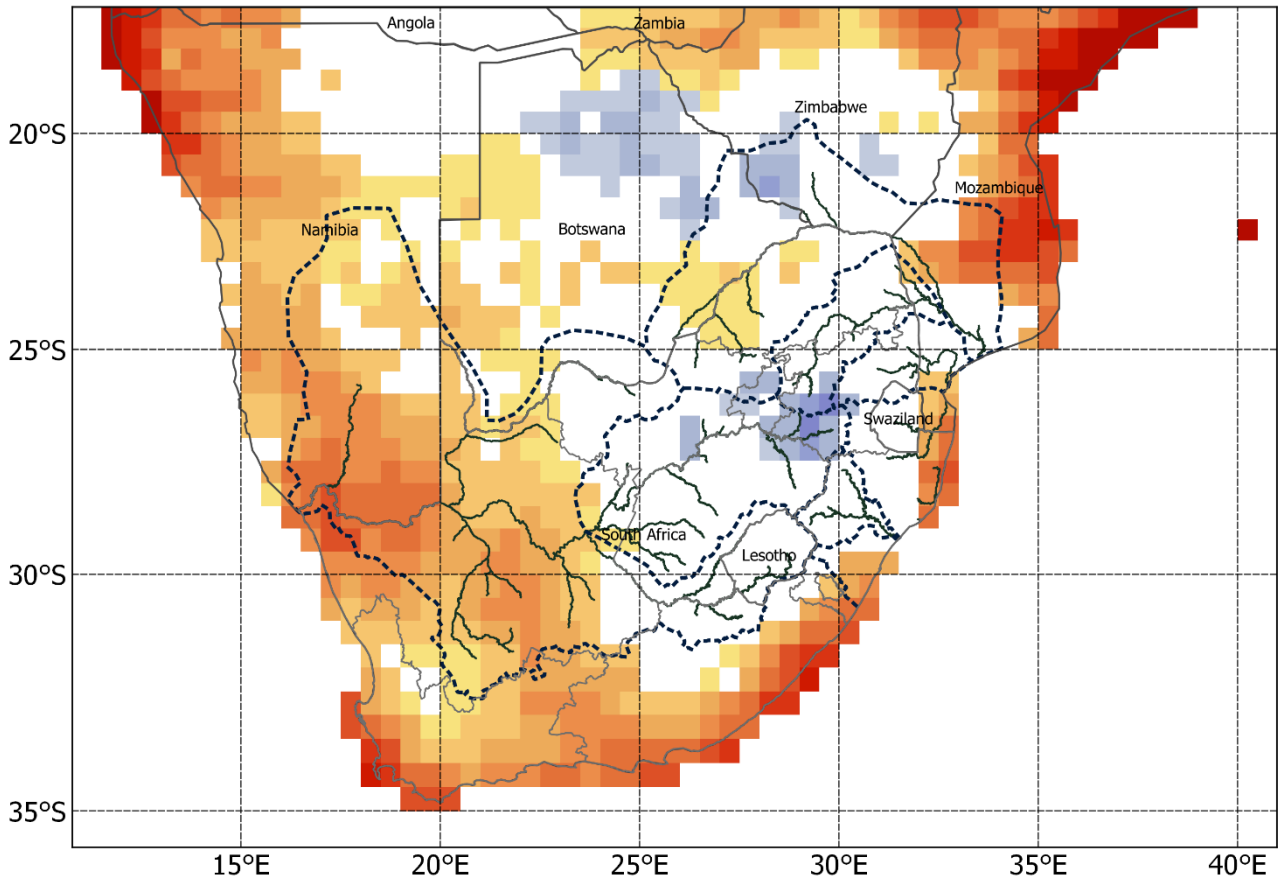
0.8 - 0.7

0.7 - 0.6

0.6 - 0.5

<= 0.5

AMJ 2019 Max Temp; ICs: Feb



Legend

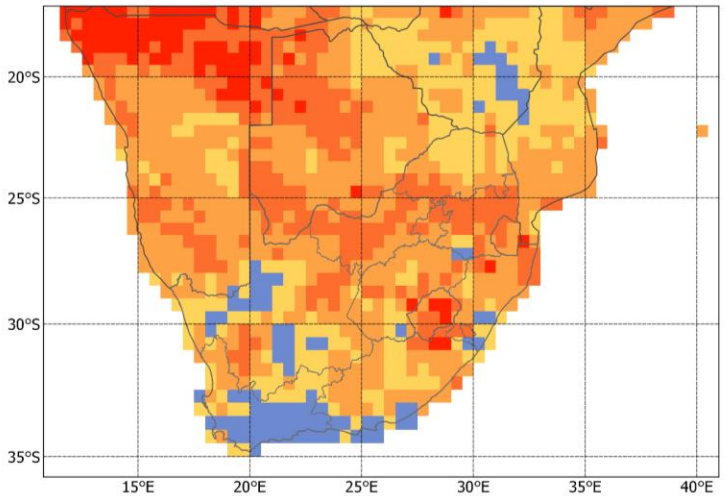
Catchment Area

Main Rivers

Max Temp Prob

>75	
70-75	
65-70	
60-65	
55-60	Above
50-55	Normal
45-50	
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Below
60-65	
65-70	
70-75	
>75	

ROC Area (Above-Normal): AMJ Max Temp



Legend

ROC

> 0.8

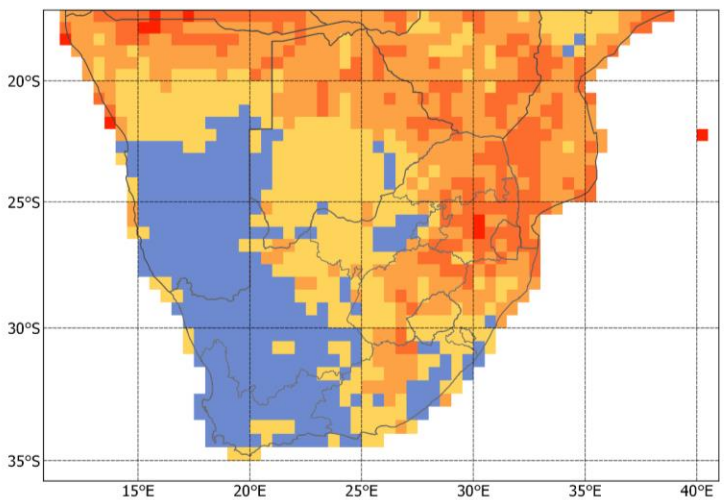
0.8 - 0.7

0.7 - 0.6

0.6 - 0.5

<= 0.5

ROC Area (Below-Normal): AMJ Max Temp



Legend

ROC

> 0.8

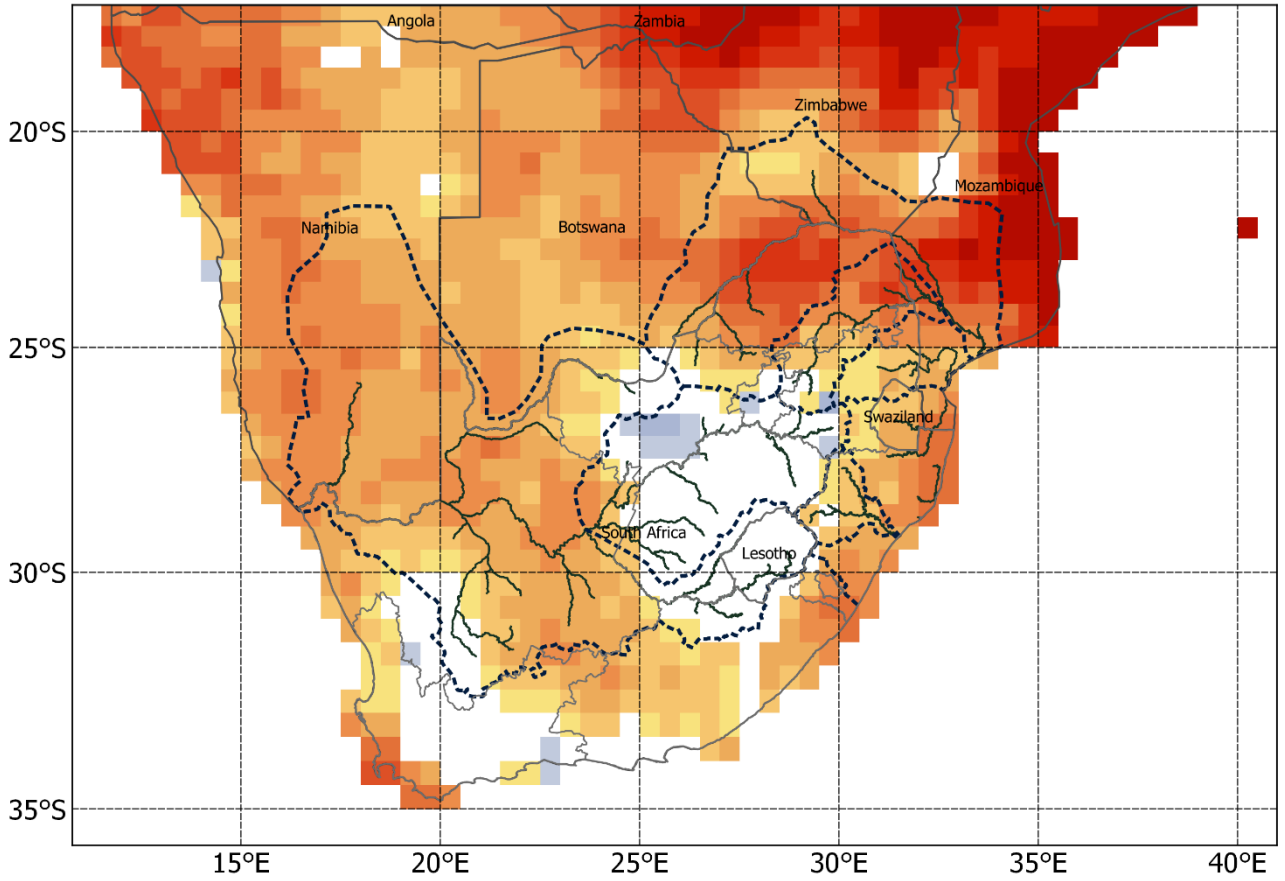
0.8 - 0.7

0.7 - 0.6

0.6 - 0.5

<= 0.5

MJJ 2019 Max Temp; ICs: Feb



Legend

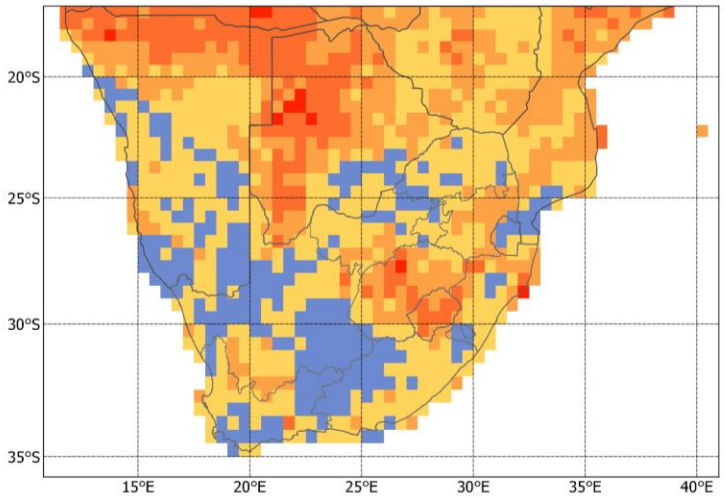
Catchment Area

Main Rivers

Max Temp Prob

>75	
70-75	
65-70	
60-65	
55-60	Above
50-55	Normal
45-50	
40-45	
35-40	
35-40	
40-45	
45-50	
50-55	Below
55-60	Below
60-65	
65-70	
70-75	
>75	

ROC Area (Above-Normal): MJJ Max Temp



Legend

ROC

> 0.8

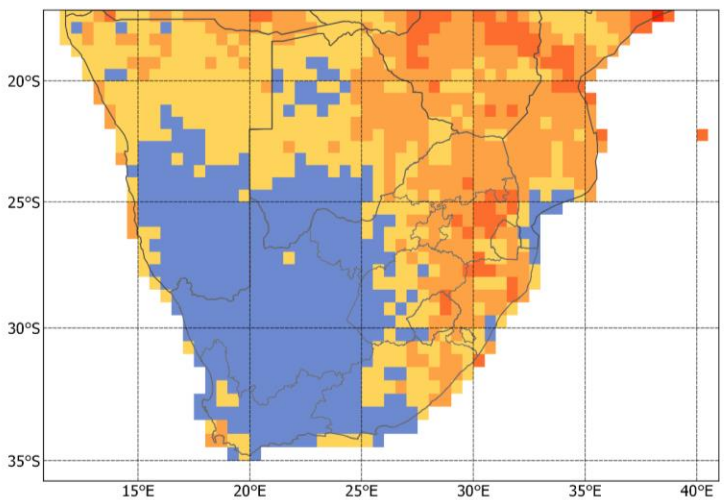
0.8 - 0.7

0.7 - 0.6

0.6 - 0.5

<= 0.5

ROC Area (Below-Normal): MJJ Max Temp



Legend

ROC

> 0.8

0.8 - 0.7

0.7 - 0.6

0.6 - 0.5

<= 0.5

Round-up: SADC Max Temp

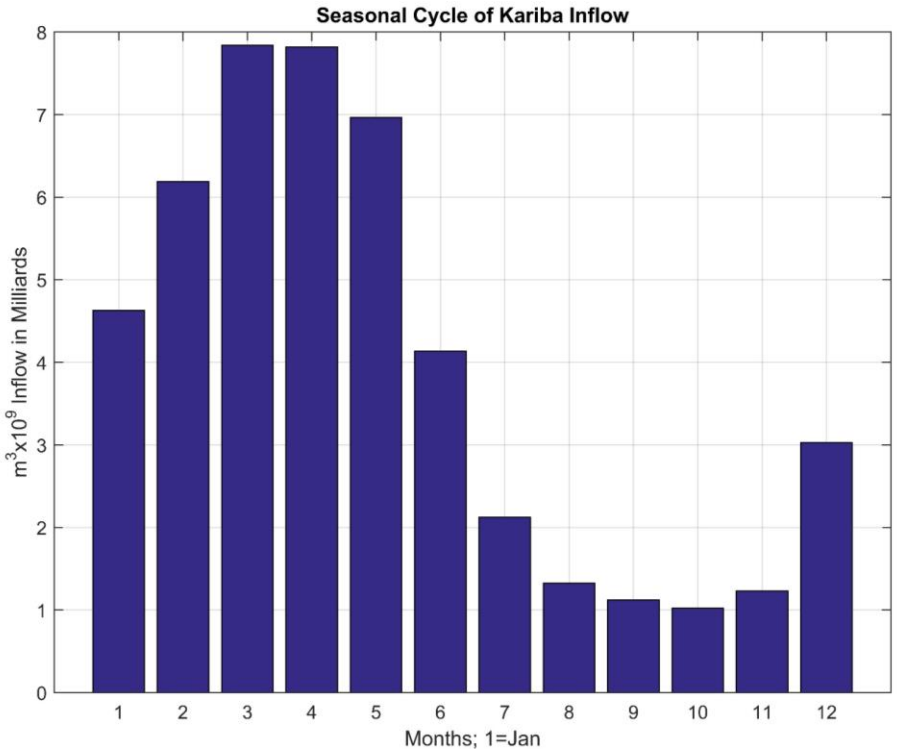
- Mainly cool maximum temperatures predicted over the larger part of the region are replaced by predominantly high maximum temperatures (for that time of the year) towards the end of the forecast period.

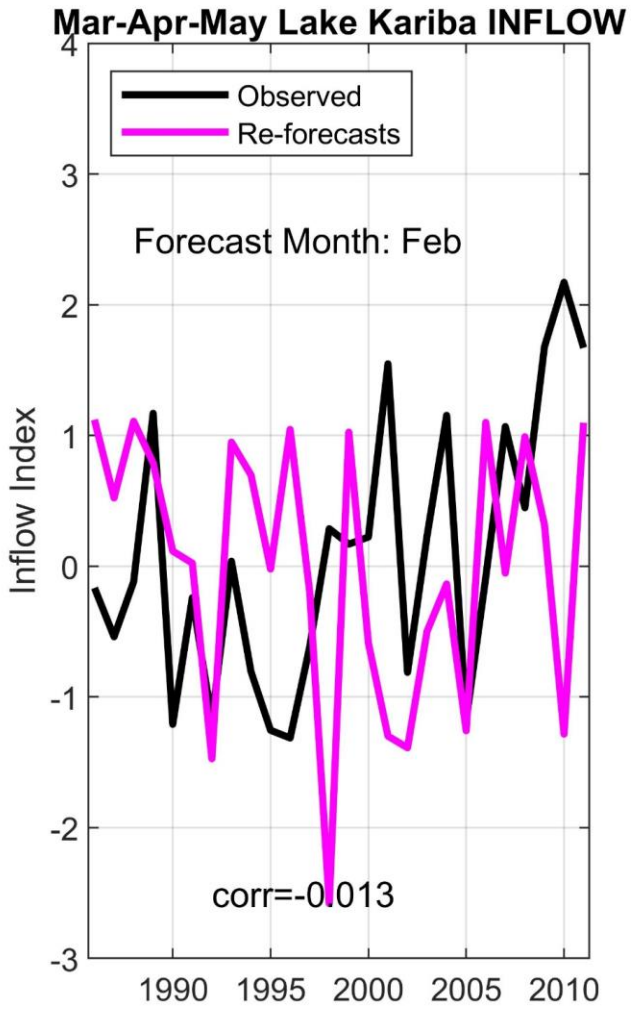
Tailored Forecasts

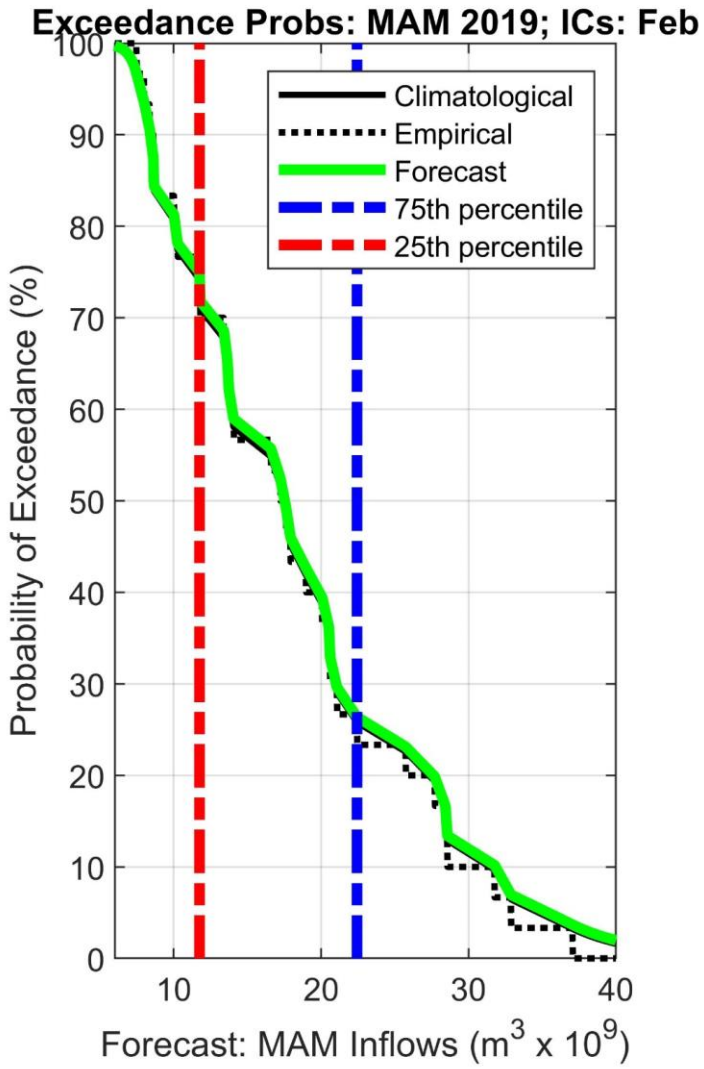
1. **Probability of exceedance Mar-Apr-May 2019 inflow forecast for Lake Kariba, Zambia/Zimbabwe**

Inflow forecast for Lake Kariba: onset season of MAM

Muchuru et al. (2016)







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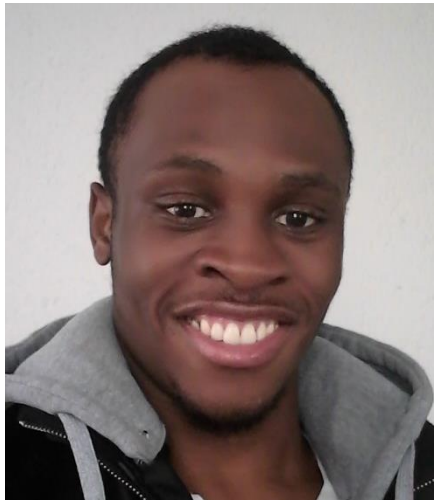
Student participation in forecast system development

Stephanie Hinze, BSc (Honours)(Meteorology):
Statistical downscaling using large and high-resolution data sets, forecast displays for SADC rainfall and maximum temperatures, forecast verification



Surprise Mhlongo, BSc (Honours)(Meteorology):
Improving on SST forecast system through pattern correction, correlation vs covariance approaches, forecast output combination (multi-model approaches), mean and bias correction, and correct for skill