Seasonal forecasts

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https://tinyurl.com/ybrb3a72

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Seasonal Forecast Worx

Latest Update: 9 April 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).

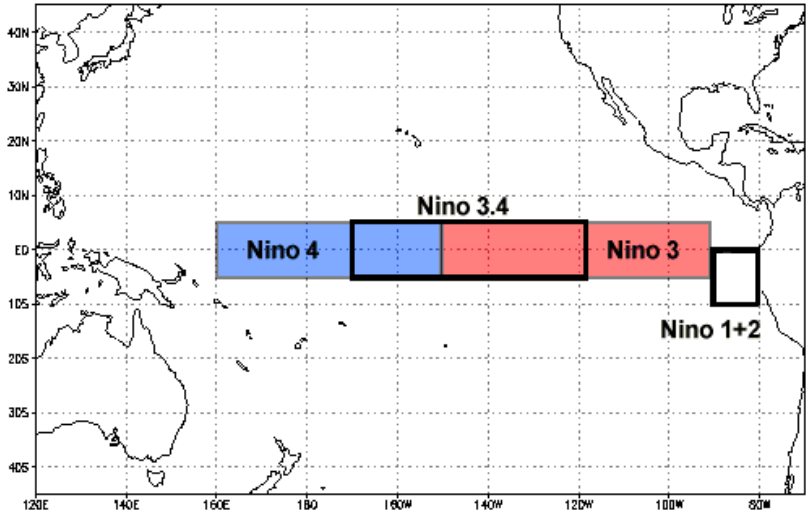
- For the official seasonal forecast for South Africa, visit the South African Weather Service website at http://www.weathersa.co.za/home/seasonal

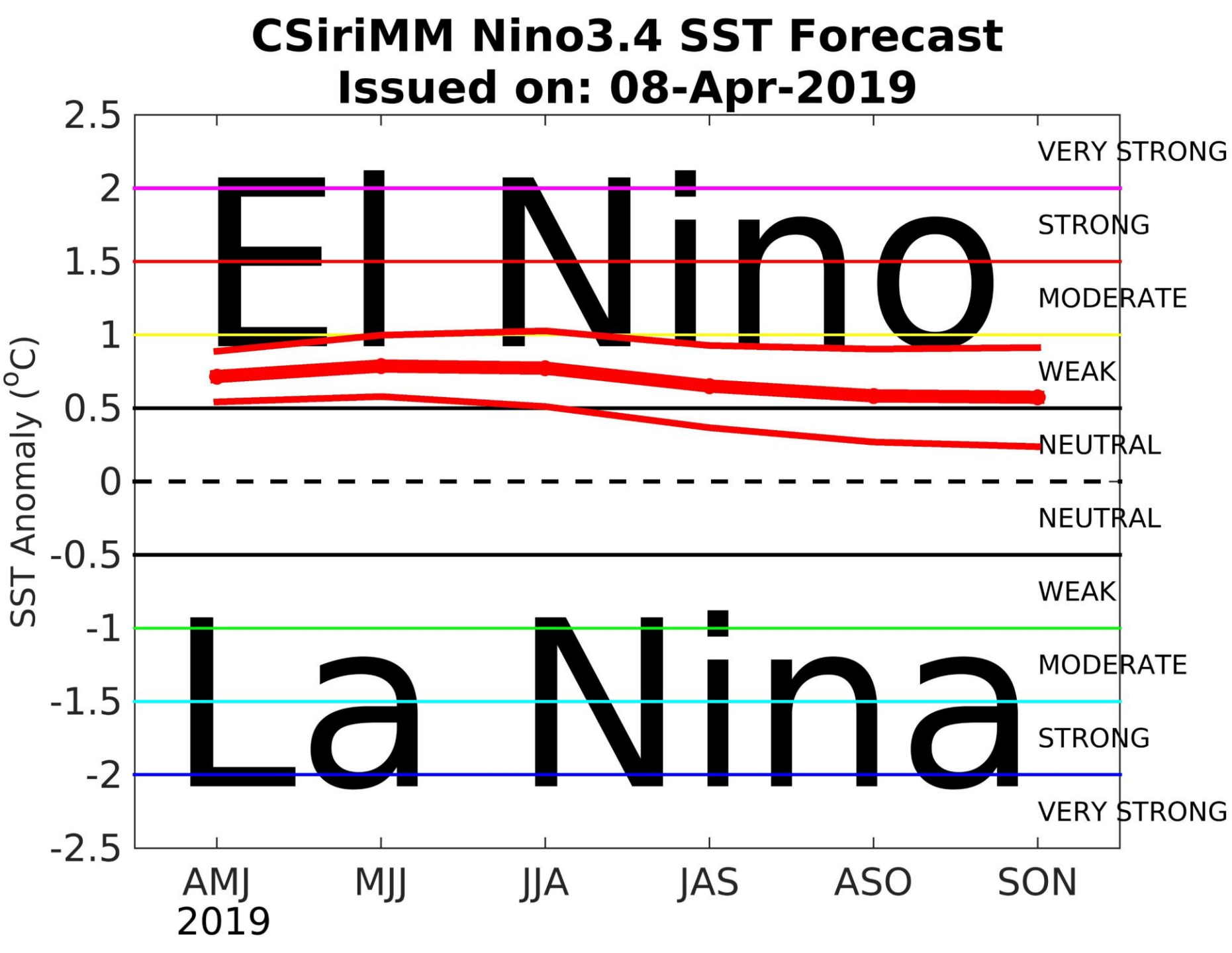
South African Weather Service
ISO 9001 Certified Organisation

ENSO and Global SST Forecasts

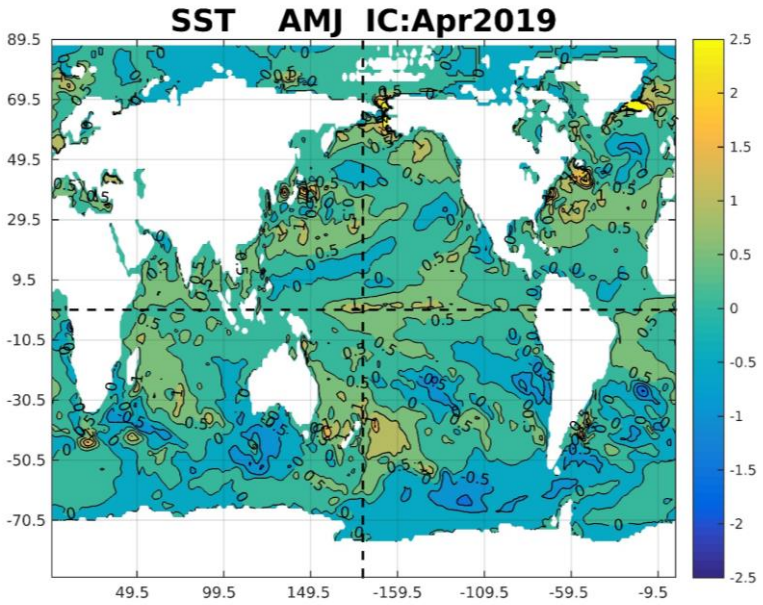
Prediction Method

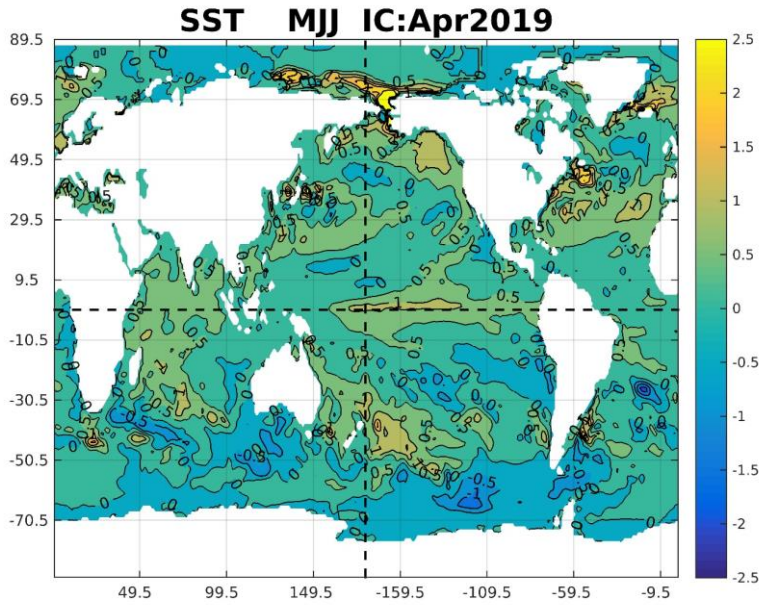
- Forecasts for global sea-surface temperature (SST) fields are obtained through a combination of NMME models and a linear statistical model that uses antecedent SST as predictor (Landman et al. 2011). Forecasts for the Niño3.4 area (see insert) are derived from the global forecasts.
- SST forecasts from the NMME models are variance and bias corrected.
- 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

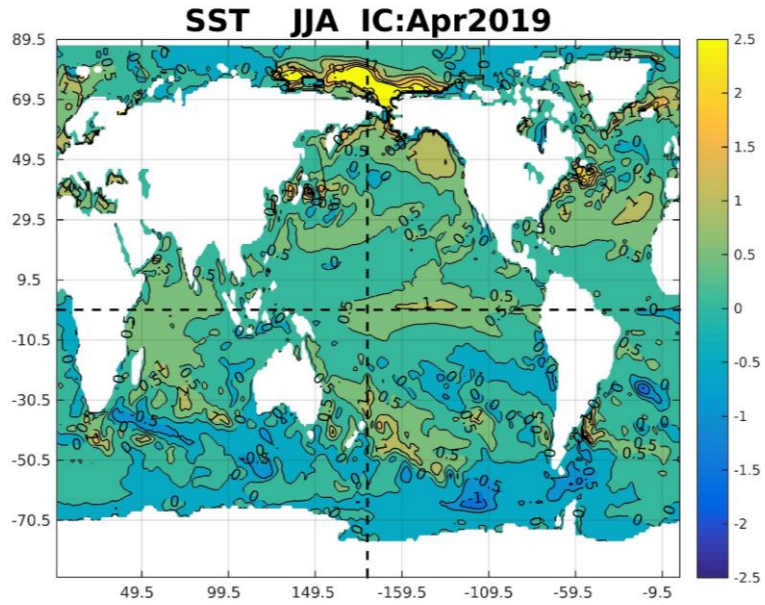


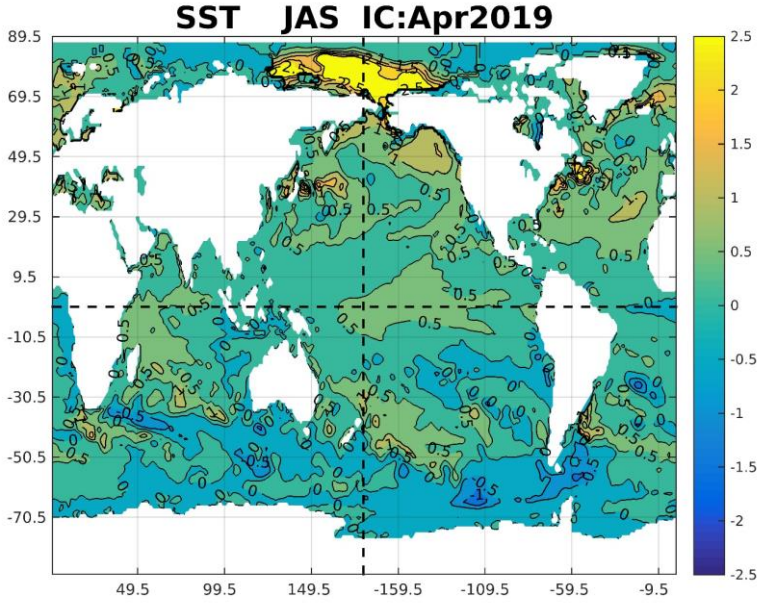

CSiriMM Nino3.4 SST Forecast
Issued on: 08-Apr-2019
SST Anomaly (°C)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
El Nino
La Nina
VERY STRONG
STRONG
MODERATE
WEAK
NEUTRAL
NEUTRAL
WEAK
MODERATE
STRONG
VERY STRONG
AMJ
2019
MJJ
JJA
JAS
ASO
SON

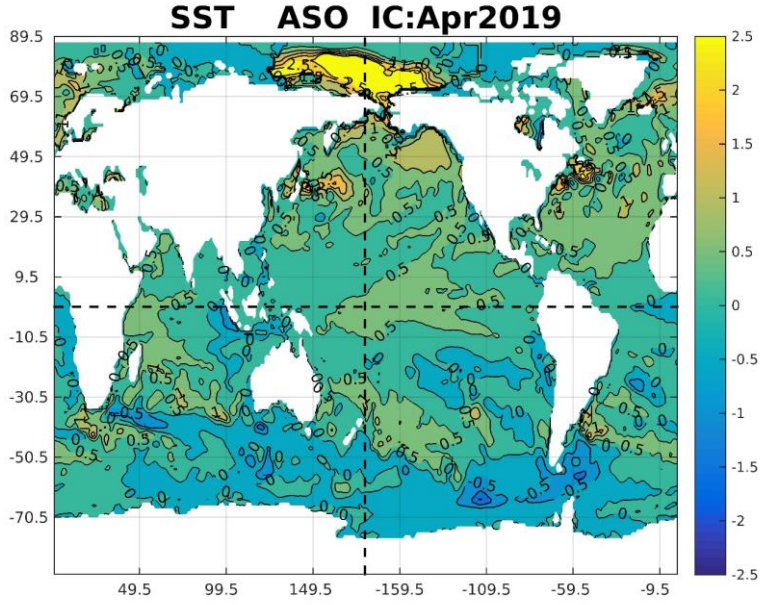
SST anomalies

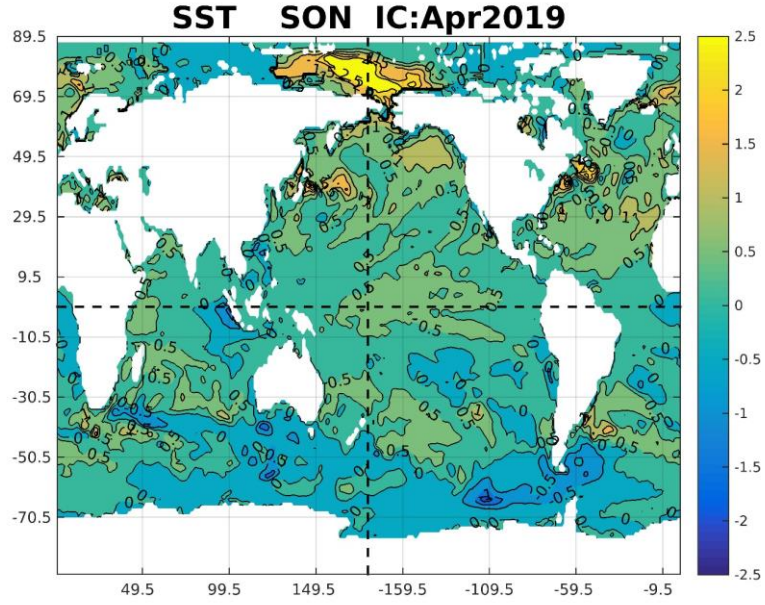












Round-up: ENSO

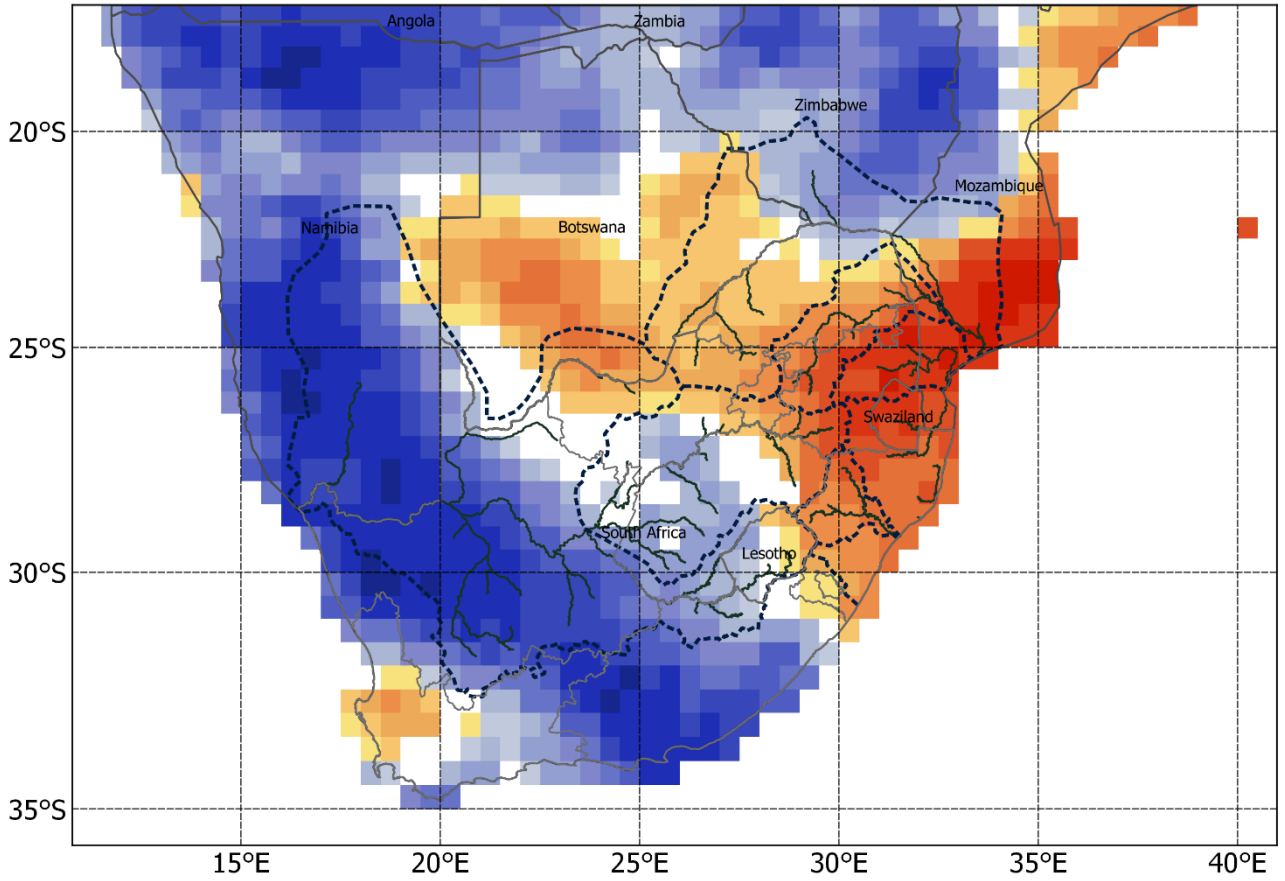
- Weak El Niño predicted into early spring.
- *From the CPC/IRI El Niño Watch in March: …weak El Niño conditions are likely to continue through the Northern Hemisphere spring 2019 (~80% chance) and summer (~60% chance);.*

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.

AMJ 2019 Rainfall; ICs: Apr



Legend

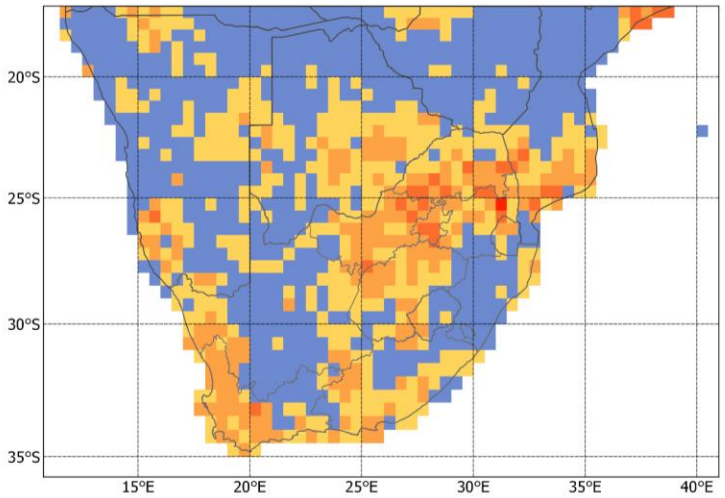
Catchment Area

Main Rivers

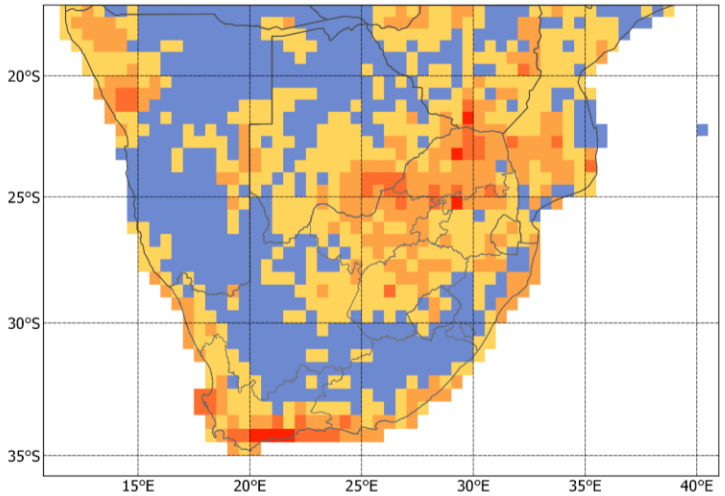
Rainfall Prob

>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	

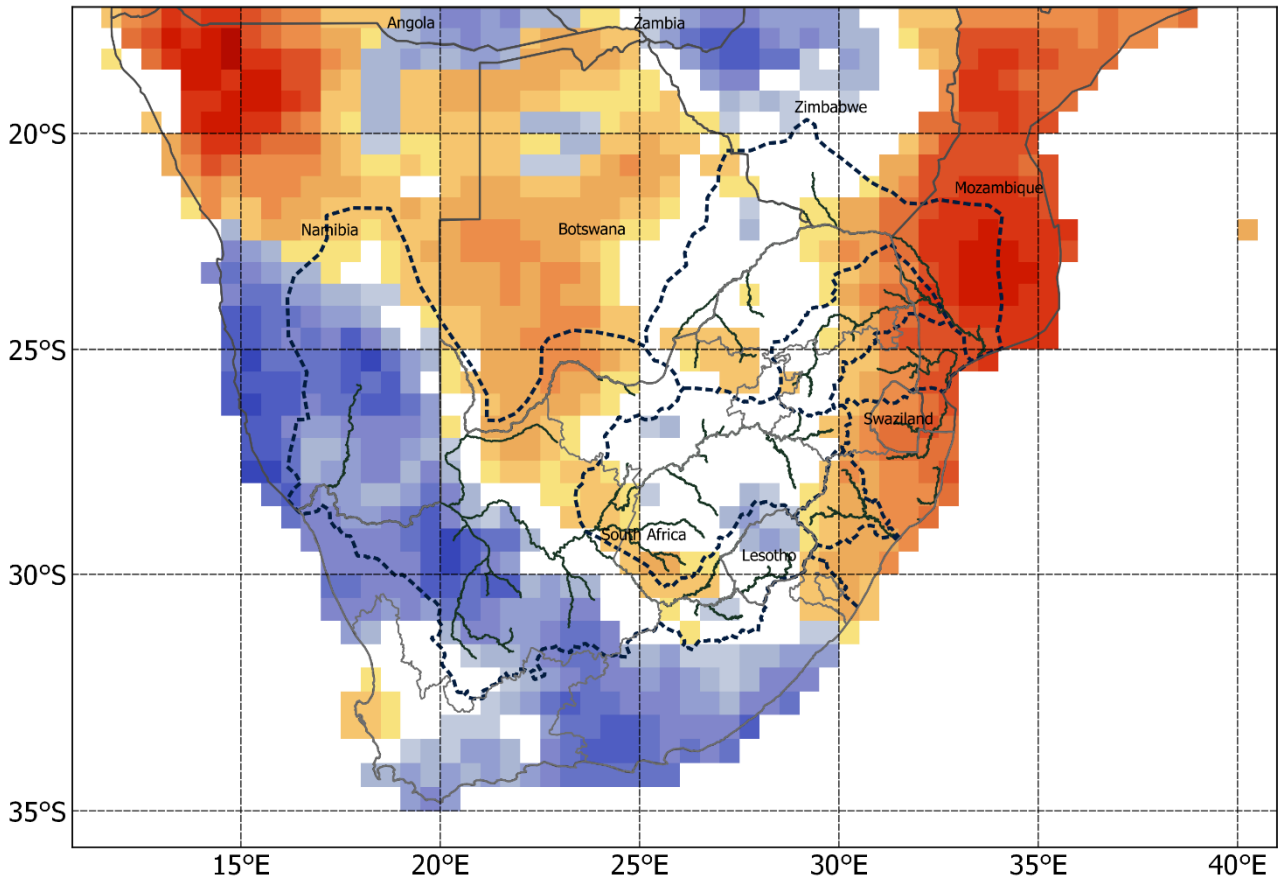
ROC Area (Above-Normal): AMJ Rainfall



ROC Area (Below-Normal): AMJ Rainfall



MJJ 2019 Rainfall; ICs: Apr



Legend

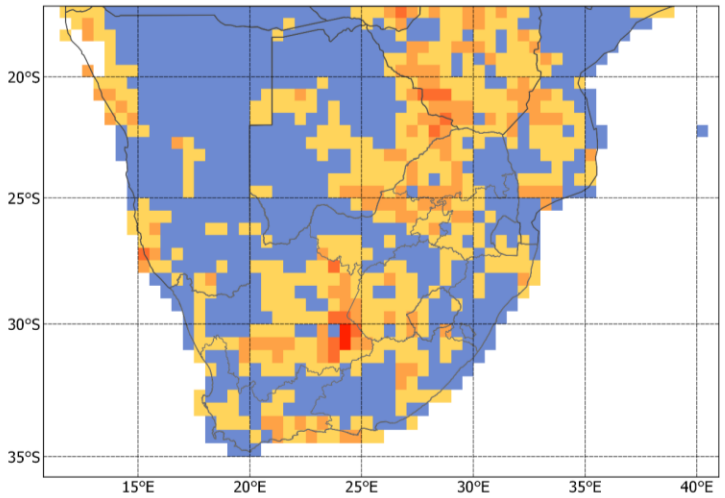
Catchment Area

Main Rivers

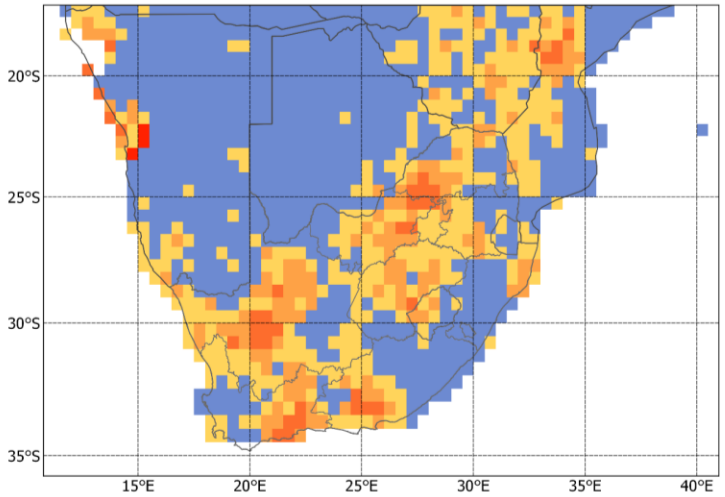
Rainfall Prob

>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	

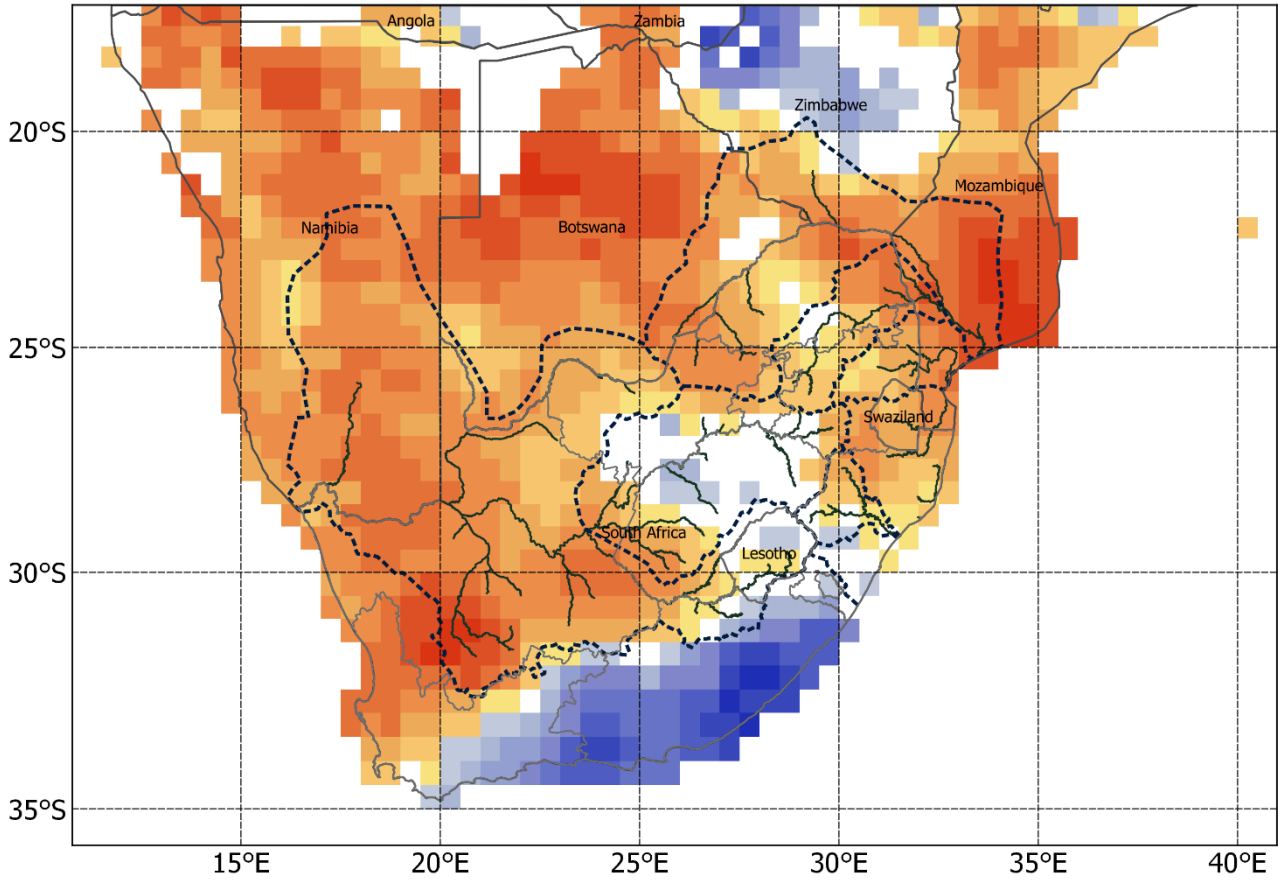
ROC Area (Above-Normal): MJJ Rainfall



ROC Area (Below-Normal): MJJ Rainfall



JJA 2019 Rainfall; ICs: Apr



Legend

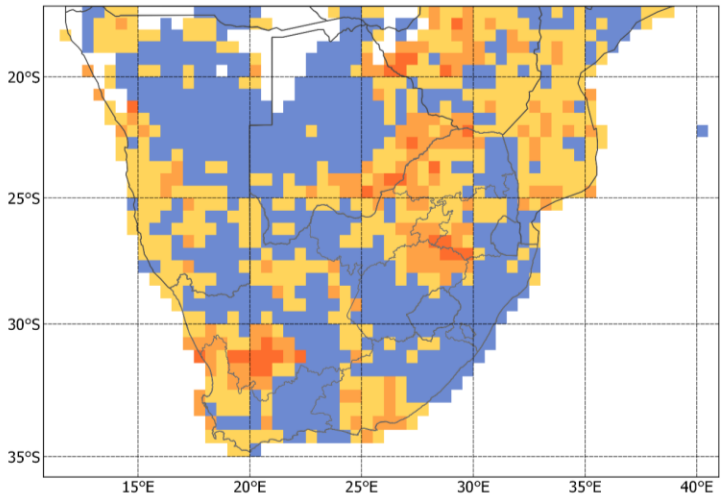
Catchment Area

Main Rivers

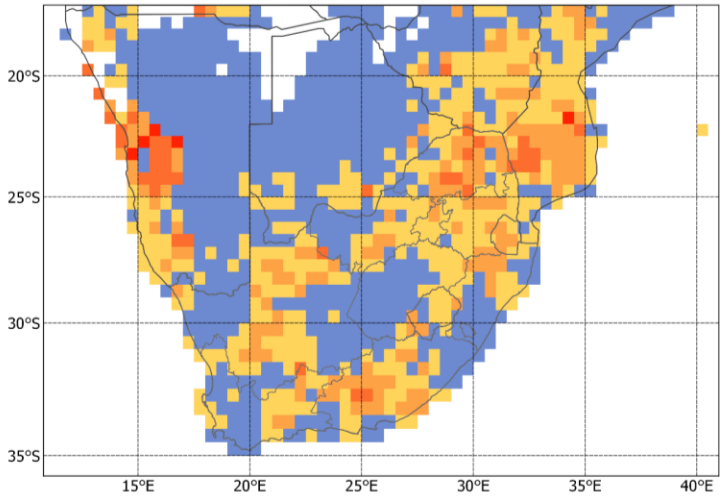
Rainfall Prob

>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	

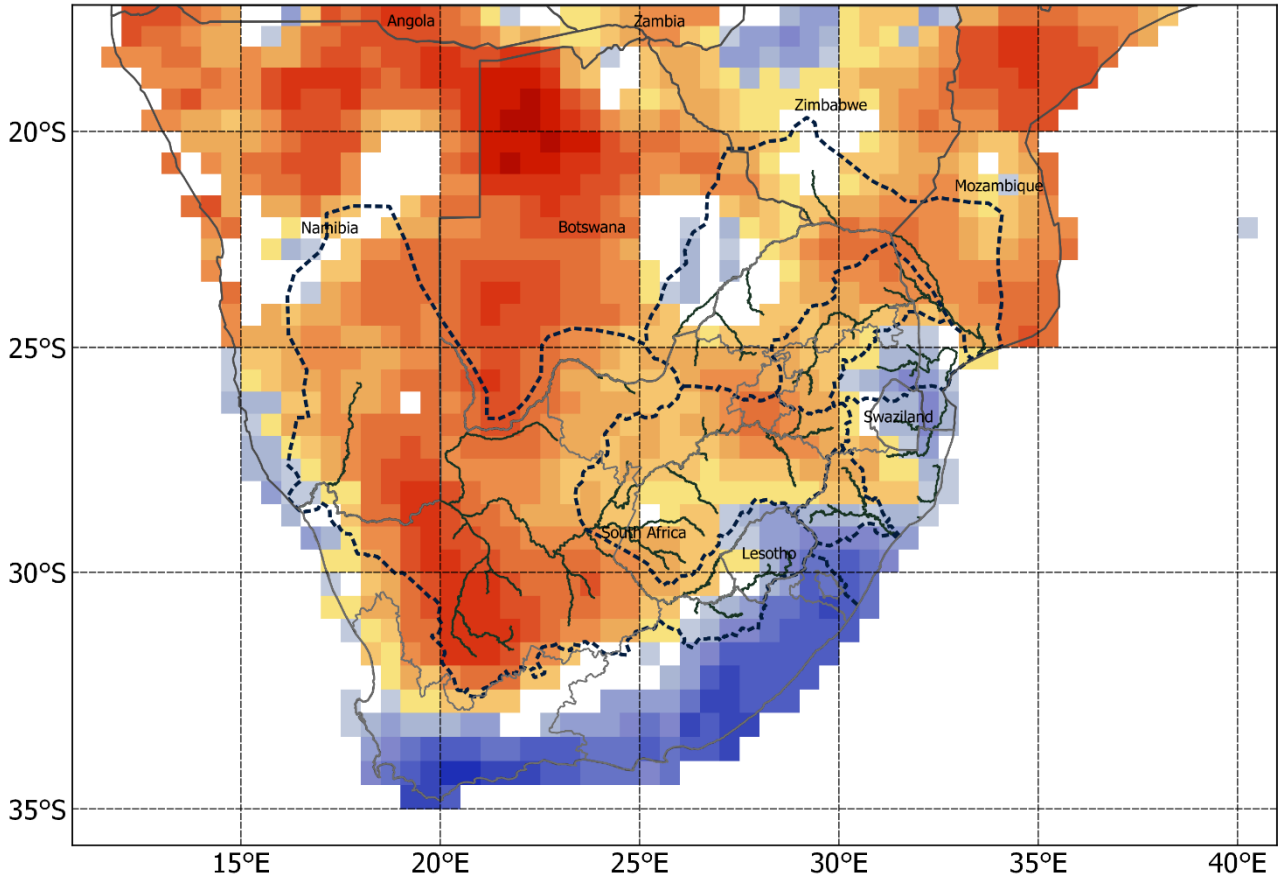
ROC Area (Above-Normal): JJA Rainfall



ROC Area (Below-Normal): JJA Rainfall



JAS 2019 Rainfall; ICs: Apr



Legend

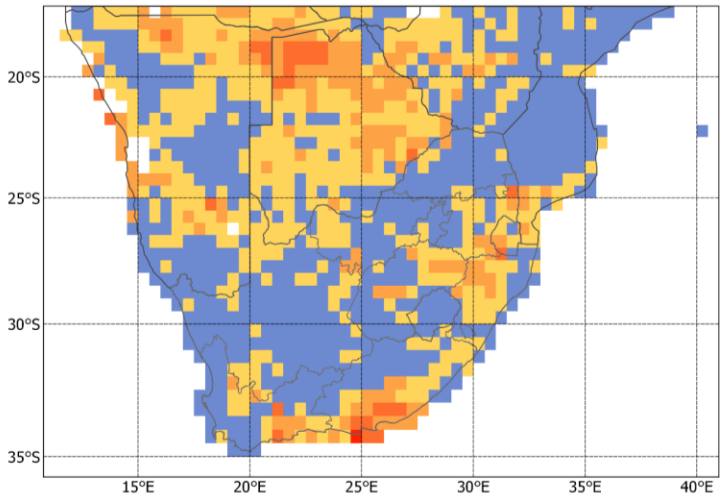
Catchment Area

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): JAS Rainfall

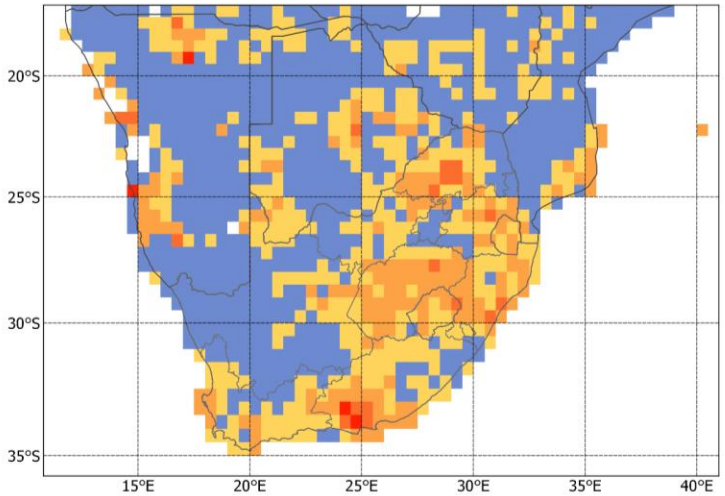


Legend

ROC

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

ROC Area (Below-Normal): JAS Rainfall



Legend

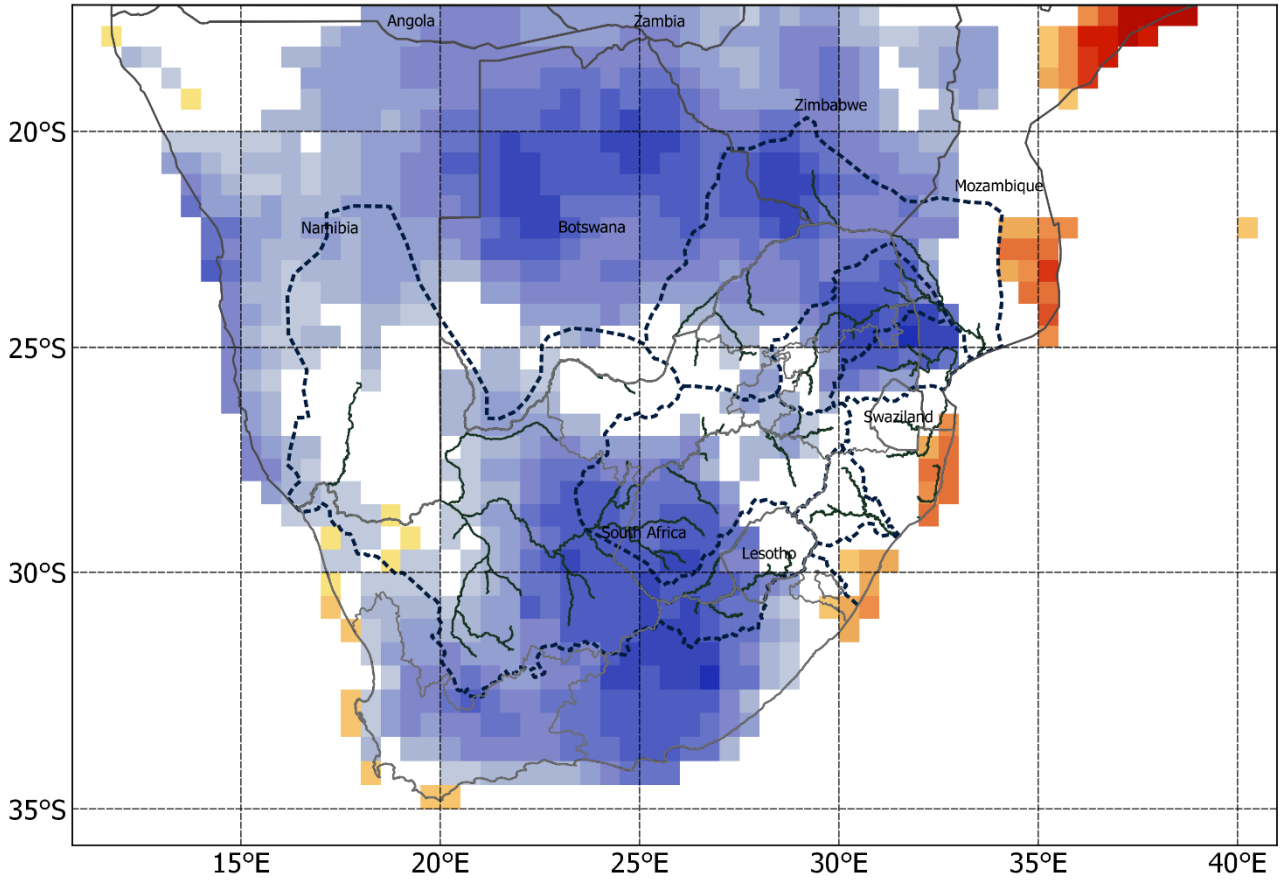
ROC

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

Round-up: SADC Rainfall

- Areas most likely associated with favourable rainfall outcomes are mainly restricted to the southern and southeastern coastal and interior regions.

AMJ 2019 Max Temp; ICs: Apr



Legend

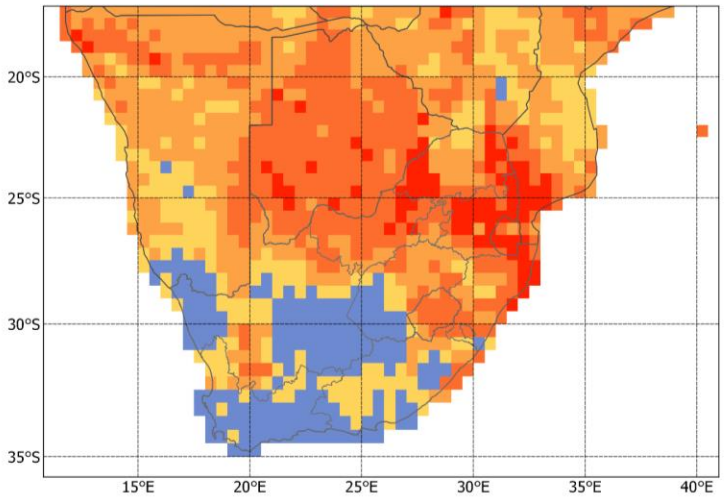
Catchment Area

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

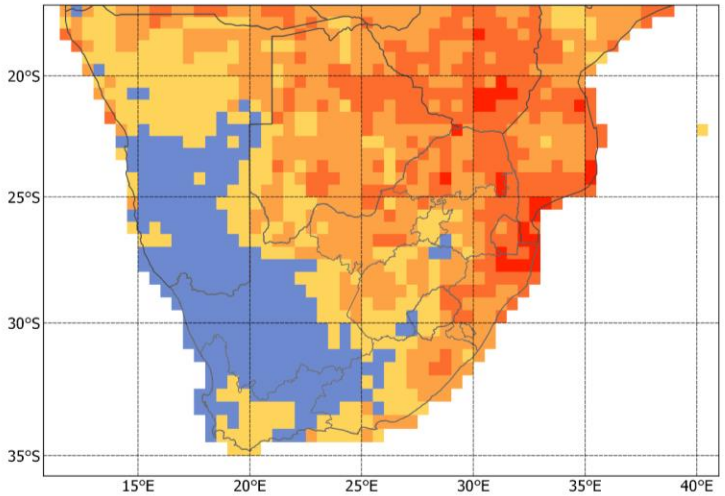


Legend

ROC

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

ROC Area (Below-Normal): AMJ Max Temp

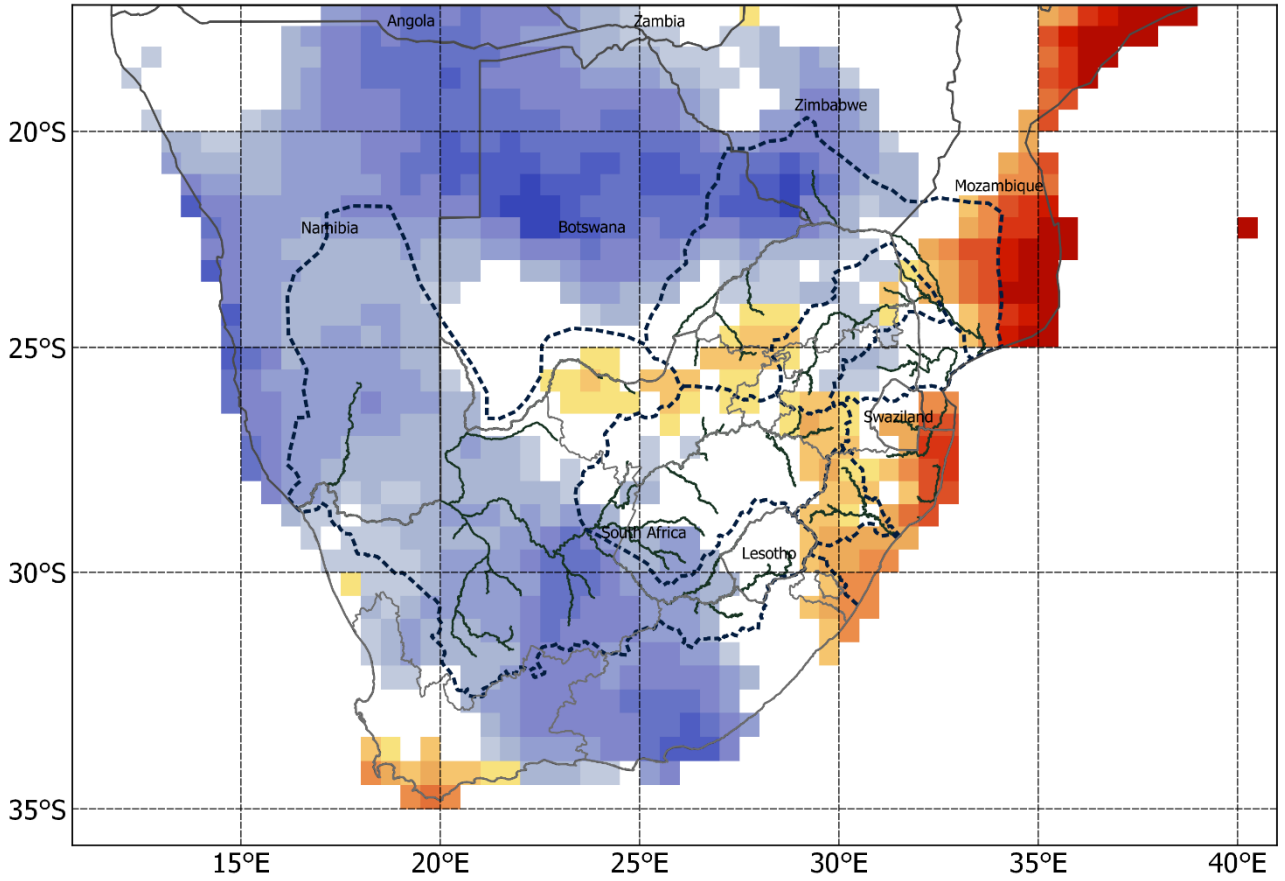


Legend

ROC

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

MJJ 2019 Max Temp; ICs: Apr



Legend

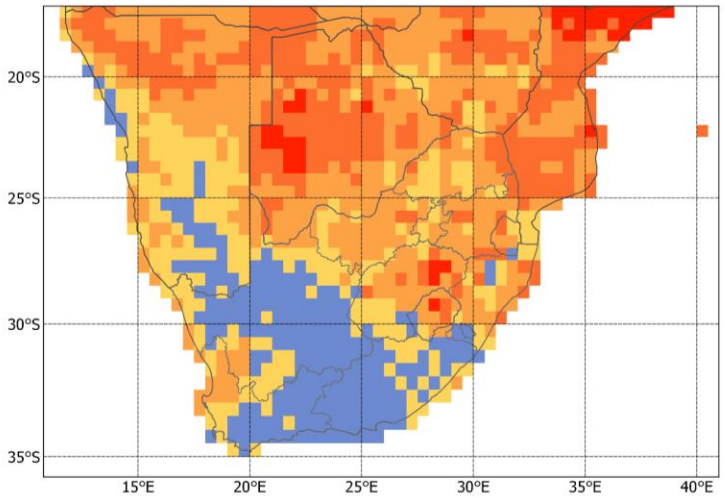
Catchment Area

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

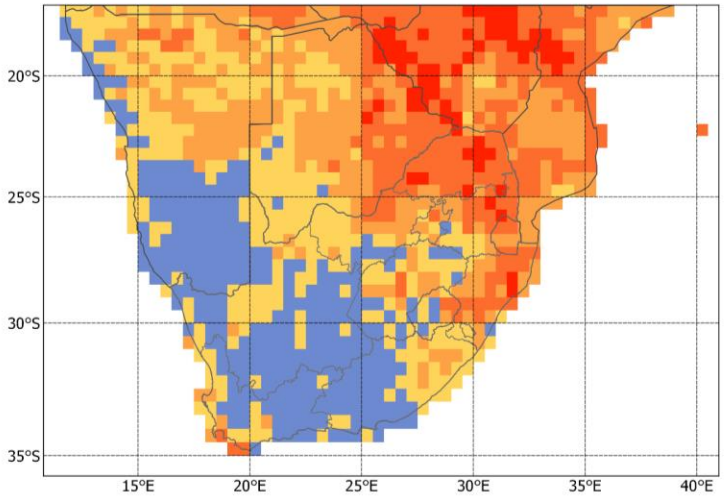


Legend

ROC

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

ROC Area (Below-Normal): MJJ Max Temp

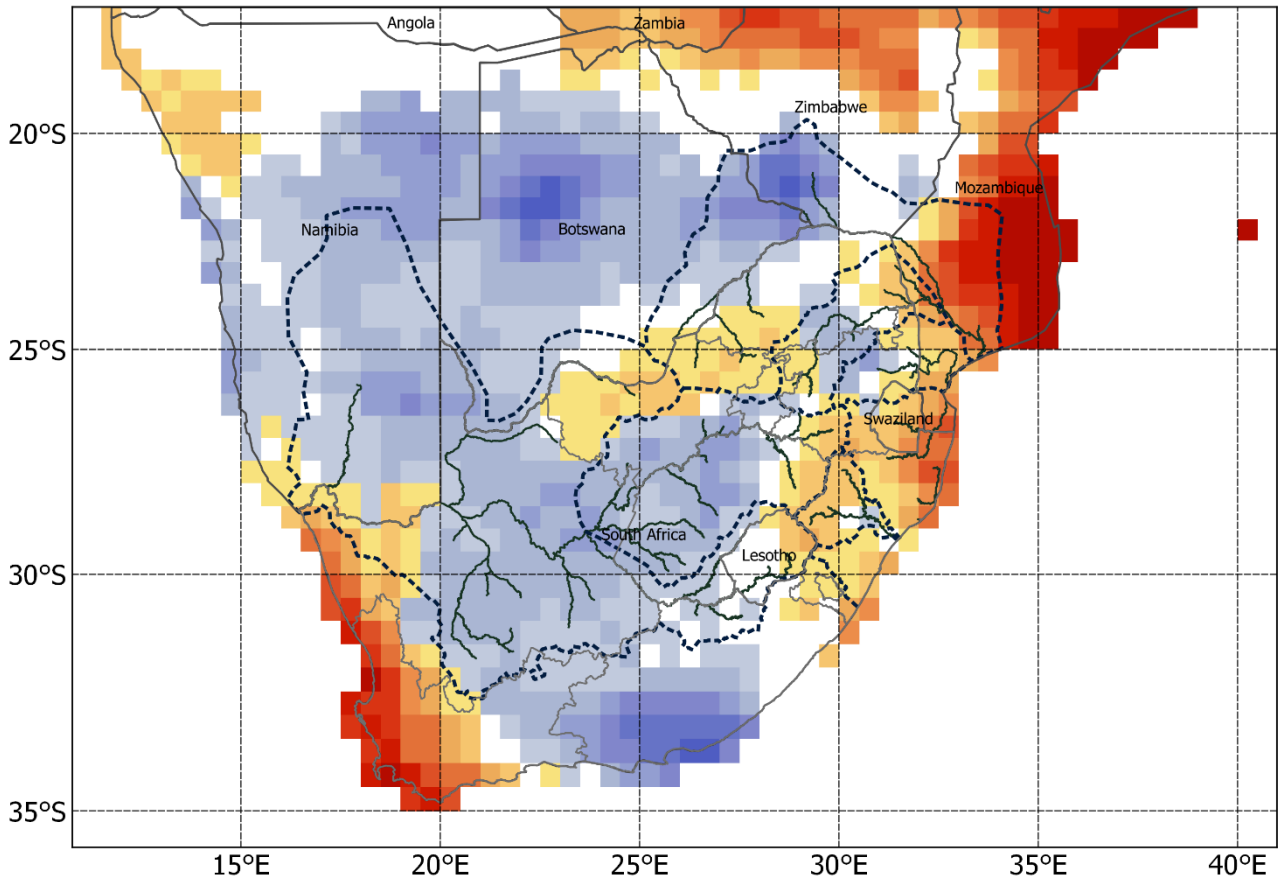


Legend

ROC

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

JJA 2019 Max Temp; ICs: Apr



Legend

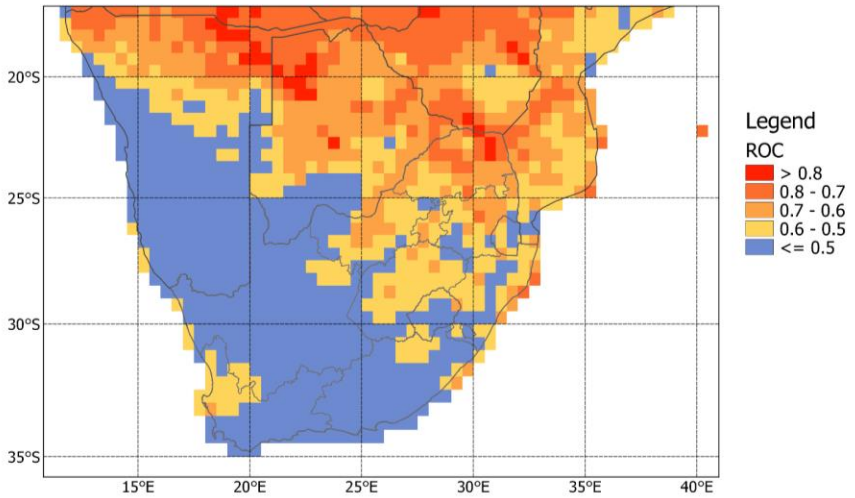
Catchment Area

Main Rivers

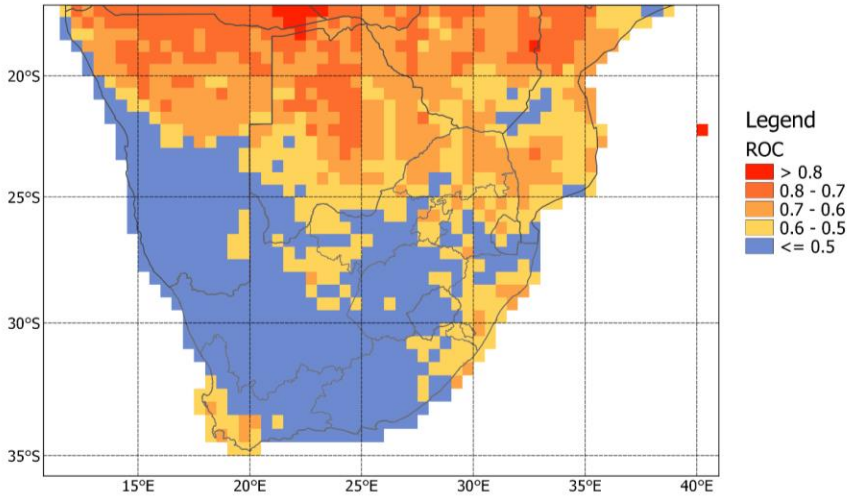
Max Temp Prob

>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	

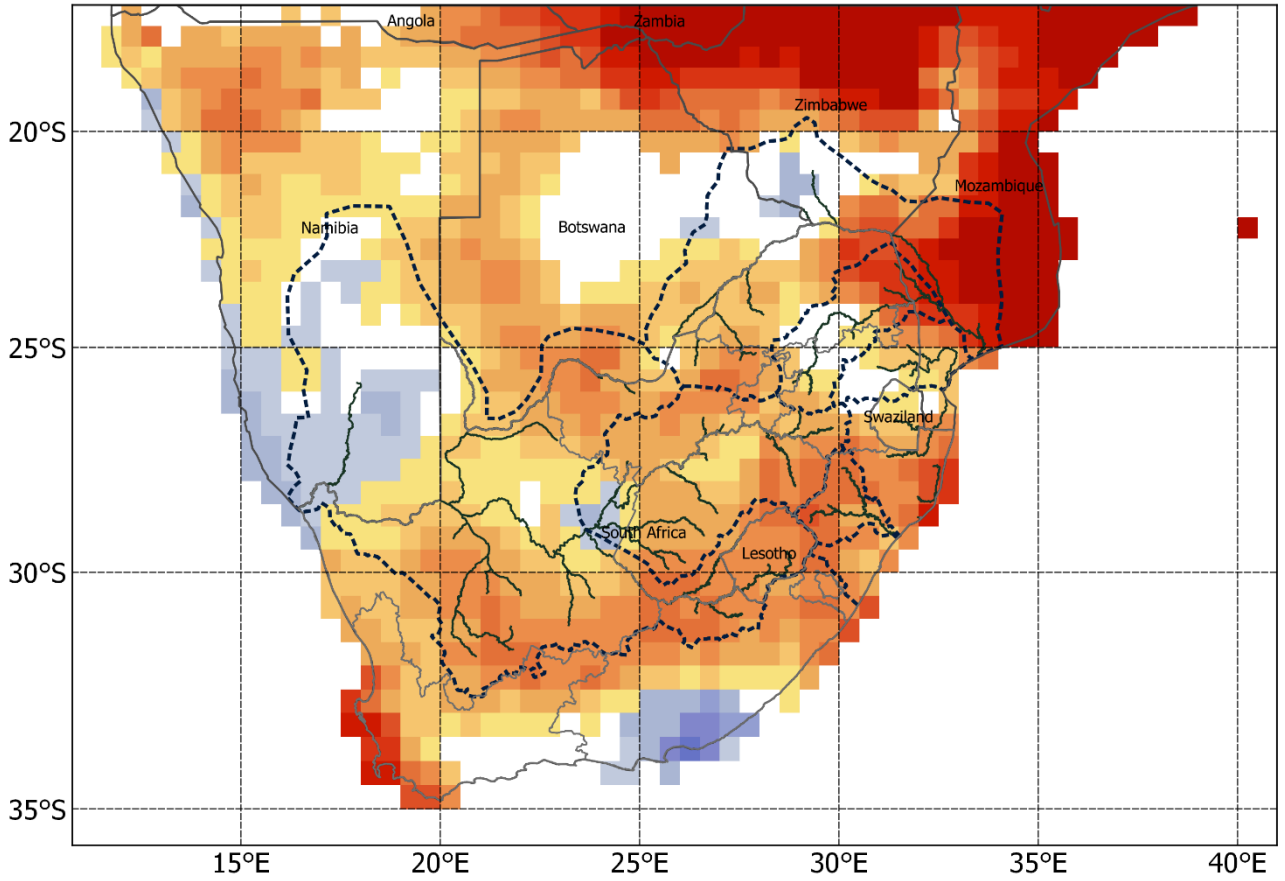
ROC Area (Above-Normal): JJA Max Temp



ROC Area (Below-Normal): JJA Max Temp



JAS 2019 Max Temp; ICs: Apr



Legend

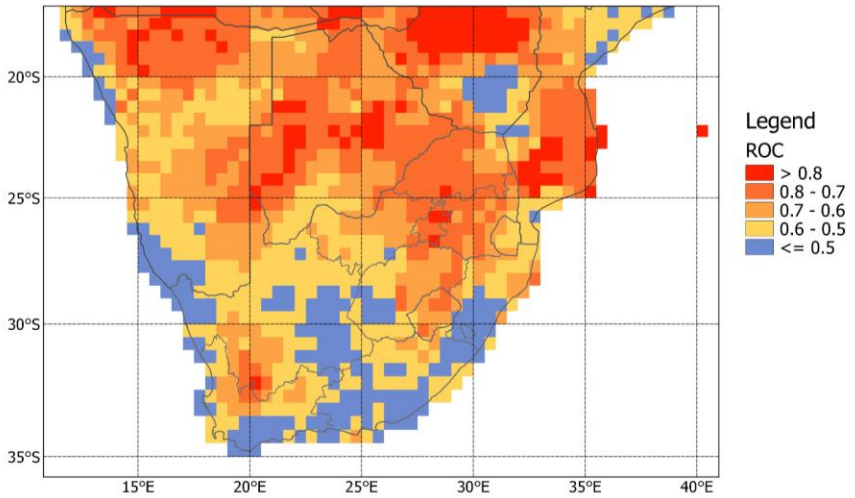
Catchment Area

Main Rivers

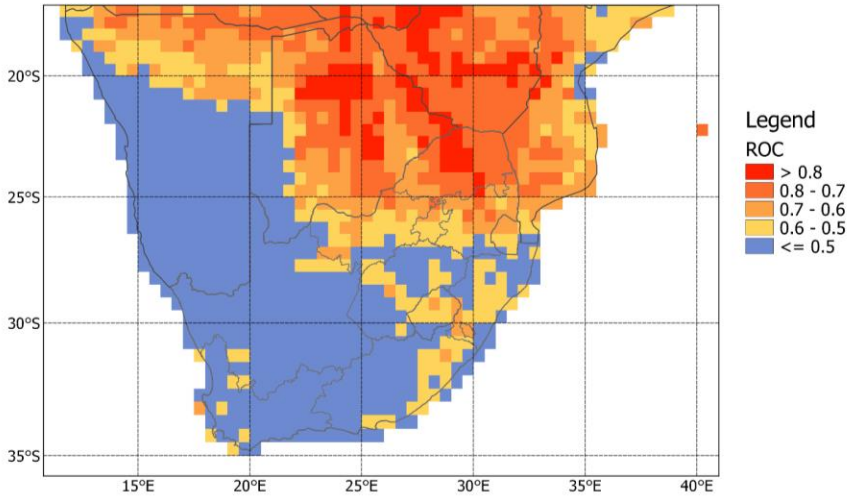
Max Temp Prob

>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): JAS Max Temp



ROC Area (Below-Normal): JAS Max Temp



Round-up: SADC Max Temp

- Mainly cool maximum temperatures at first, replaced by predominantly high maximum temperatures towards the end of the forecast period.

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Financial support from…

- The National Research Foundation through the Incentive Funding for Rated Researchers

- ACCESS (Alliance for Collaboration on Climate and Earth System Science) through the project “Investigating predictability of seasonal anomalies for societal benefit”

National Research Foundation

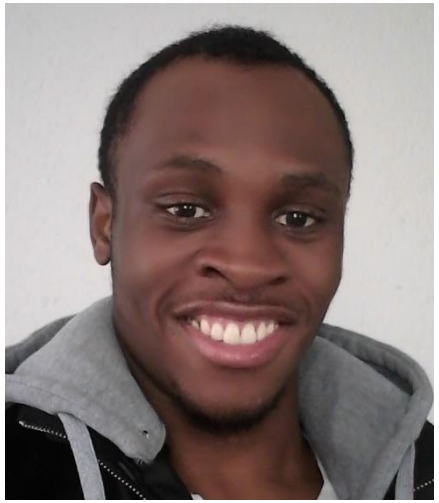
access
Alliance for Collaboration on Climate and Earth Systems Science

science & technology
Department: Science and Technology
REPUBLIC OF SOUTH AFRICA

National Research Foundation

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