Seasonal forecasts

presented by:

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Seasonal Forecast Worx

Latest update: 11 November 2017

- 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

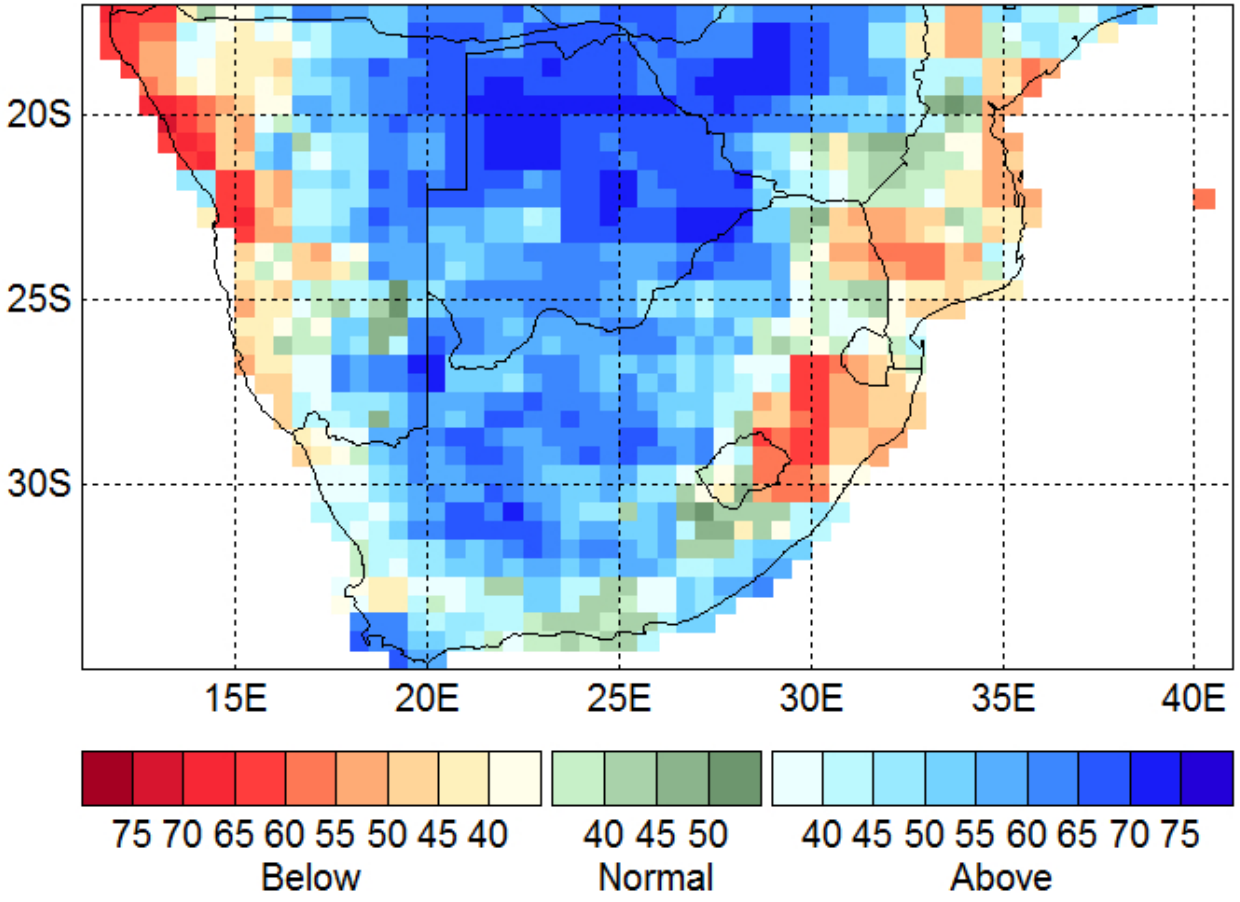
South African Weather Service
ISO 9001 Certified Organisation

Southern Africa Forecasts

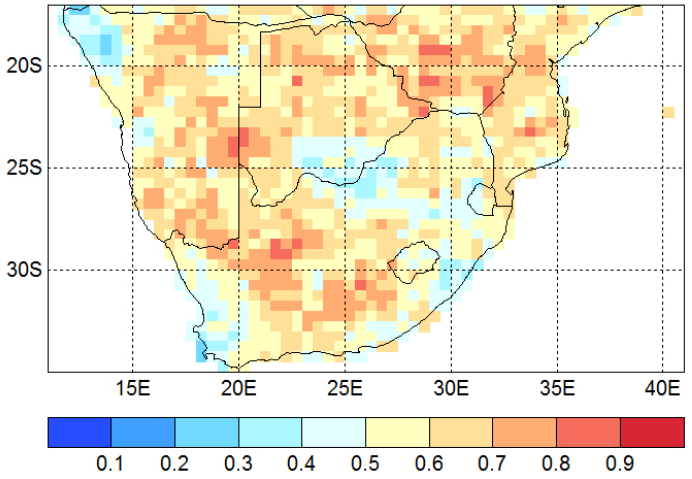
Prediction Method

- 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 are presented up to 3 months ahead in order to 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 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 period. ROC values should be higher than 0.5 for a forecast system to be considered skilful.

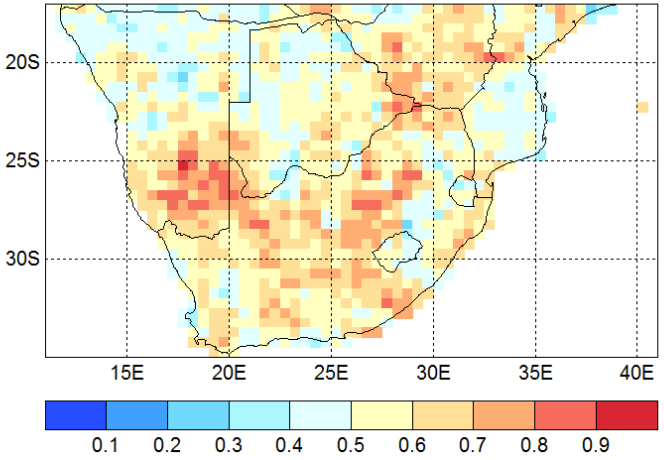
NDJ 2017/18 Rainfall; ICs: Nov



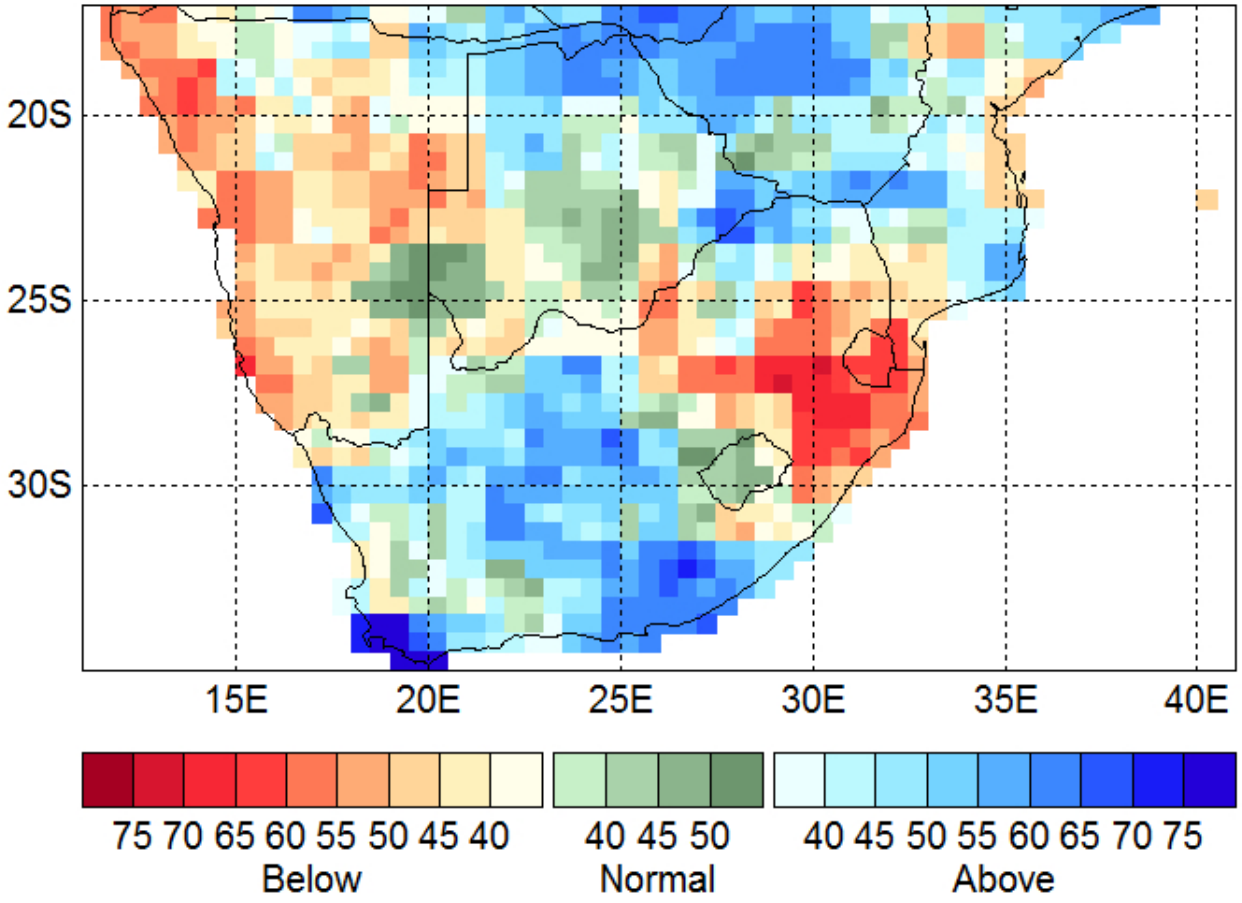
ROC (Above-Normal): NDJ Rainfall



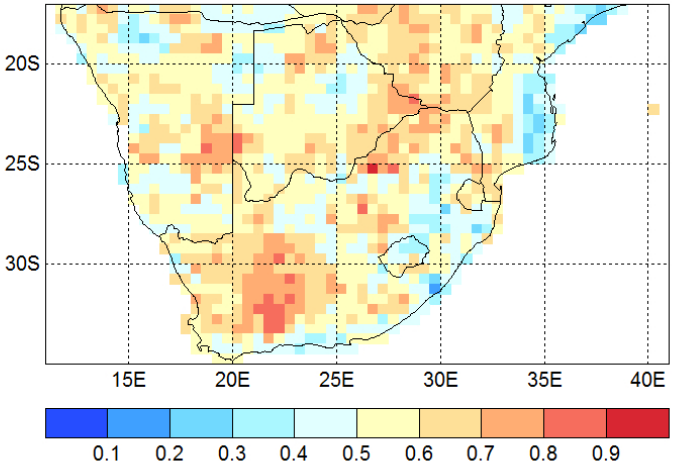
ROC (Below-Normal): NDJ Rainfall



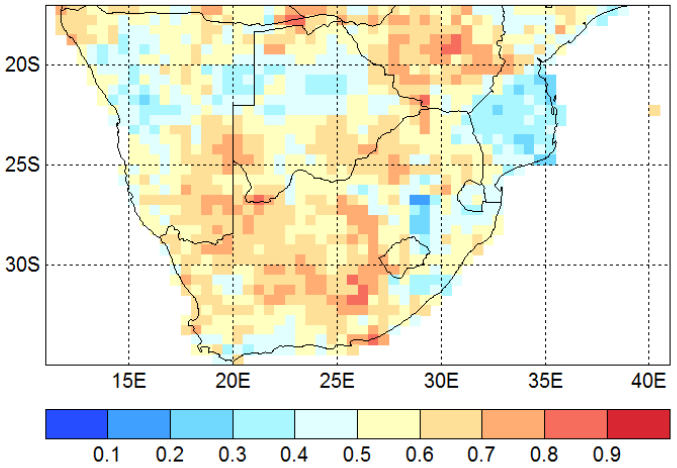
DJF 2017/18 Rainfall; ICs: Nov

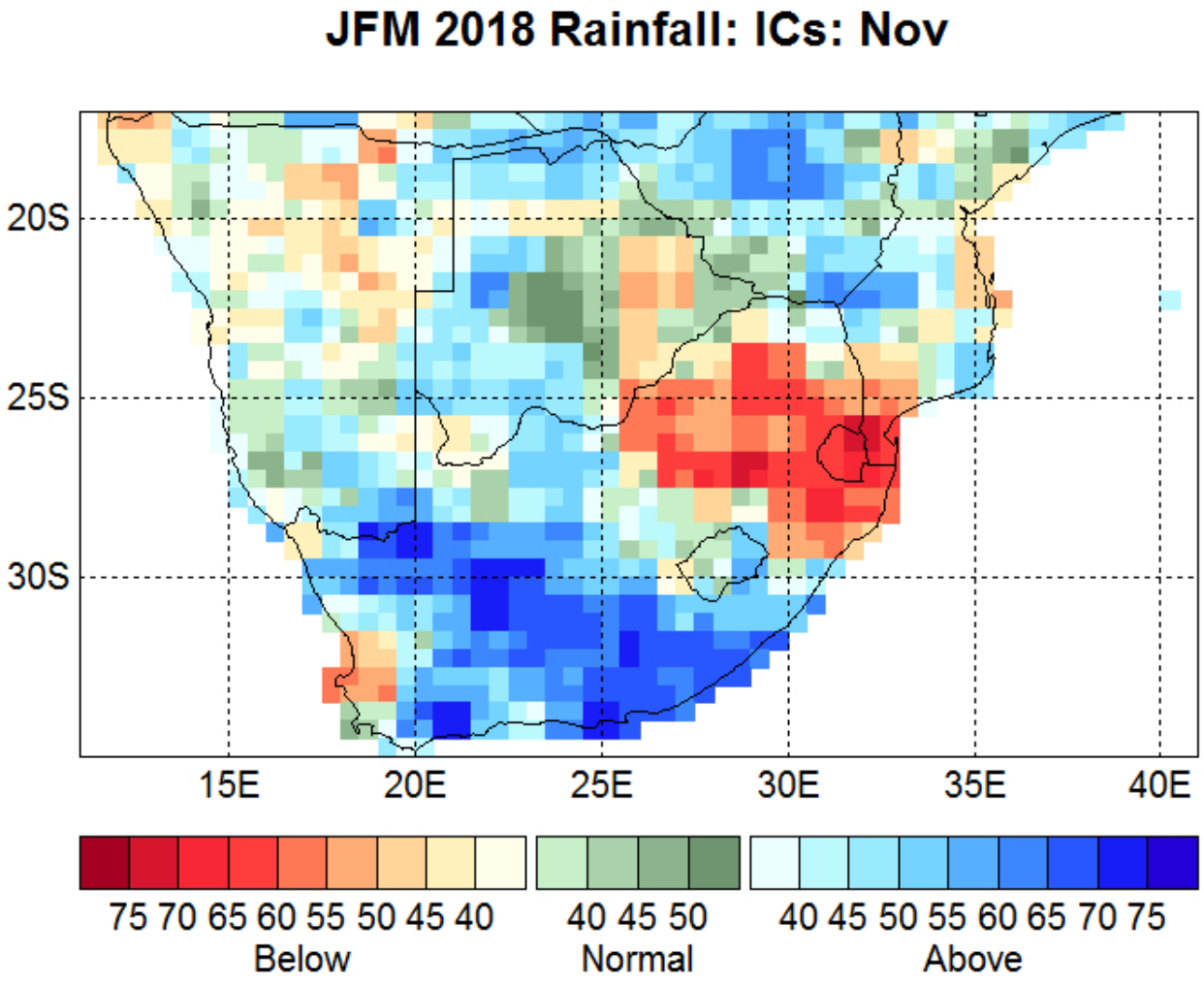


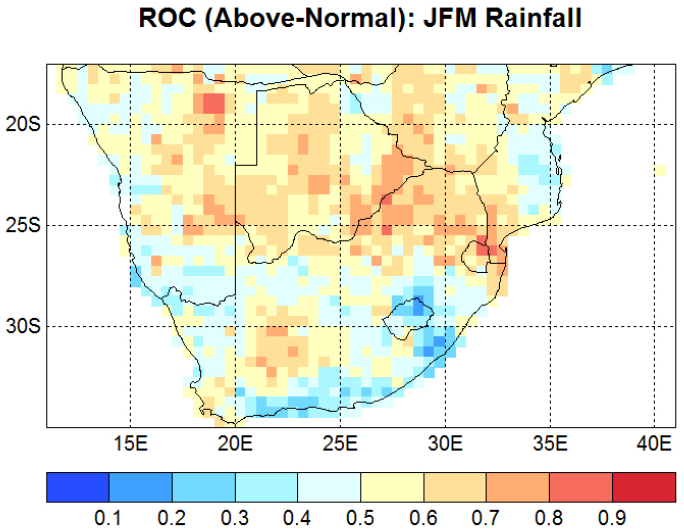
ROC (Above-Normal): DJF Rainfall

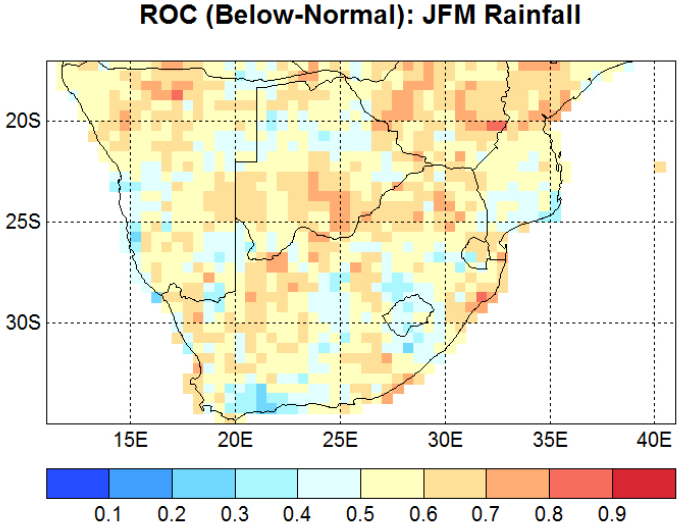


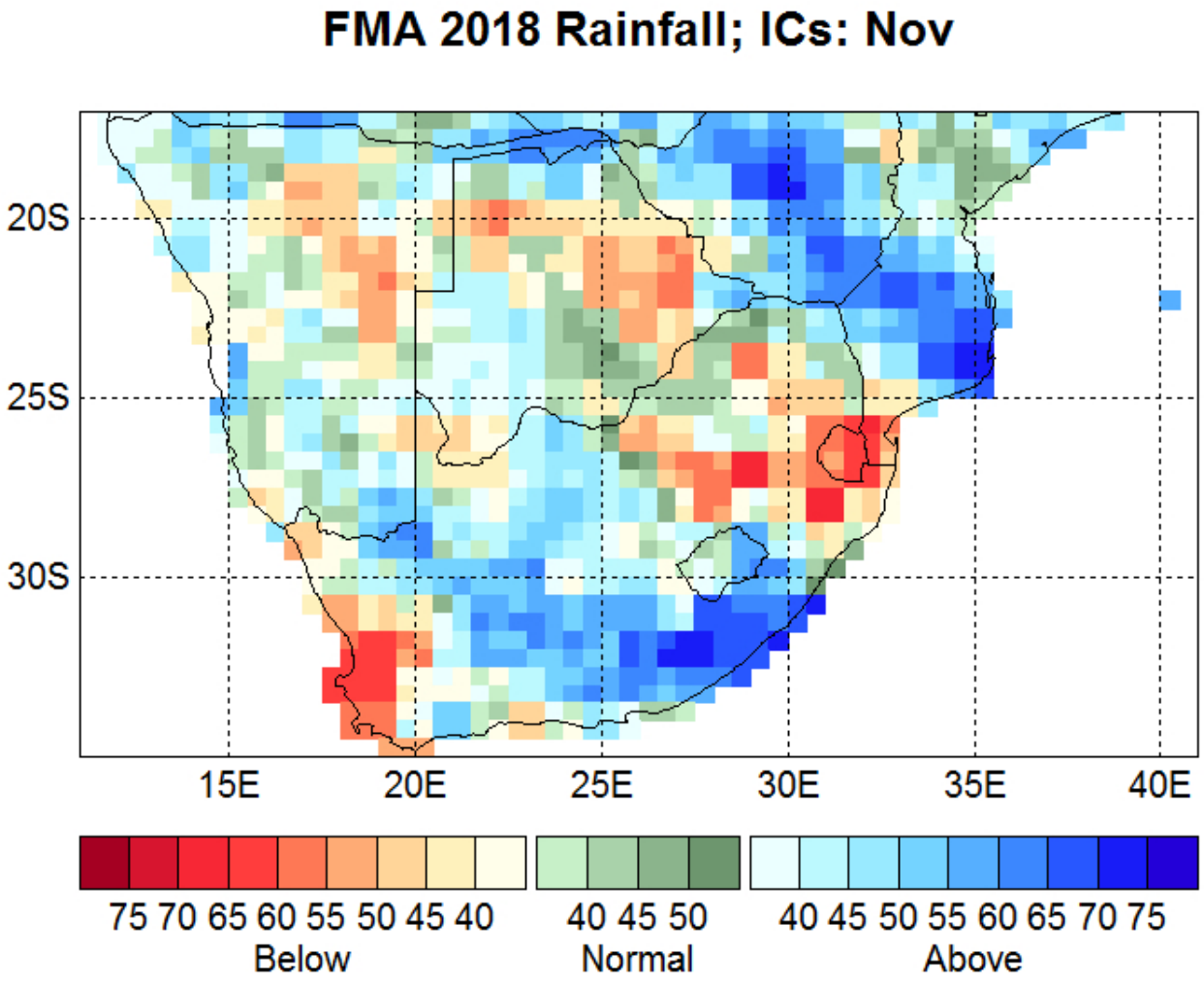
ROC (Below-Normal): DJF Rainfall

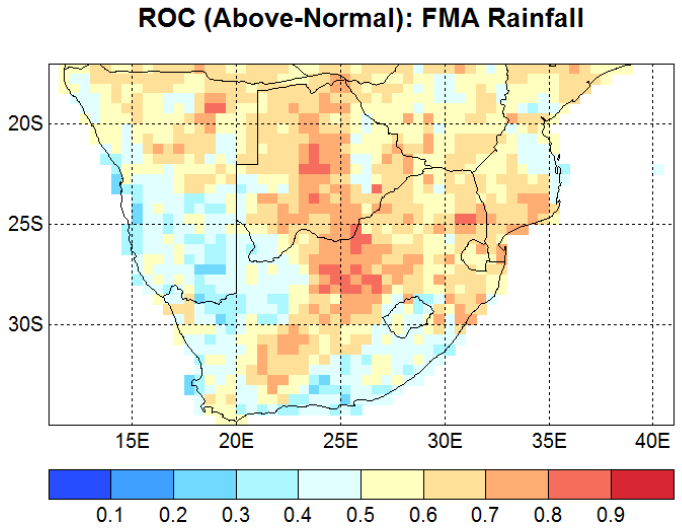


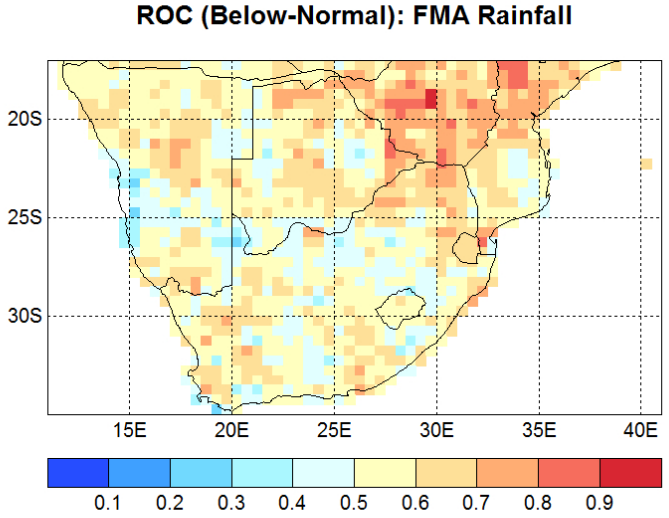

JFM 2018 Rainfall: ICs: Nov
20S
25S
30S
15E
20E
25E
30E
35E
40E
75 70 65 60 55 50 45 40
Below
40 45 50
Normal
40 45 50 55 60 65 70 75
Above


ROC (Above-Normal): JFM Rainfall
20S
25S
30S
15E
20E
25E
30E
35E
40E
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

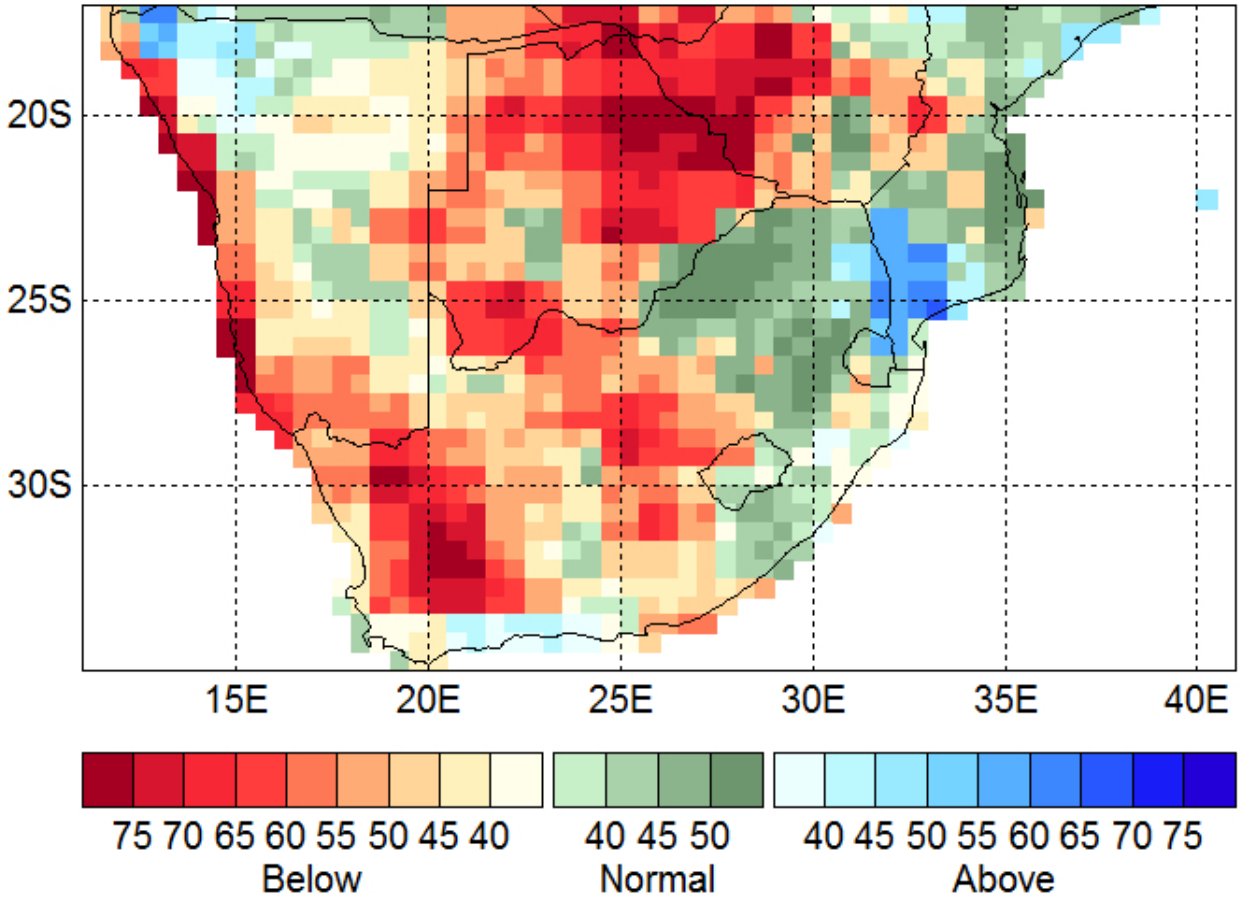

ROC (Below-Normal): JFM Rainfall
20S
25S
30S
15E
20E
25E
30E
35E
40E
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


FMA 2018 Rainfall; ICs: Nov
20S
25S
30S
15E
20E
25E
30E
35E
40E
75 70 65 60 55 50 45 40
Below
40 45 50
Normal
40 45 50 55 60 65 70 75
Above

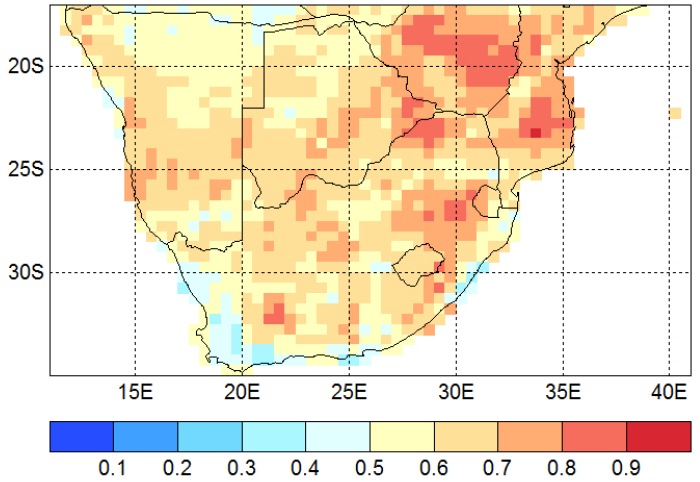

ROC (Above-Normal): FMA Rainfall
20S
25S
30S
15E
20E
25E
30E
35E
40E
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


ROC (Below-Normal): FMA Rainfall
20S
25S
30S
15E
20E
25E
30E
35E
40E
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

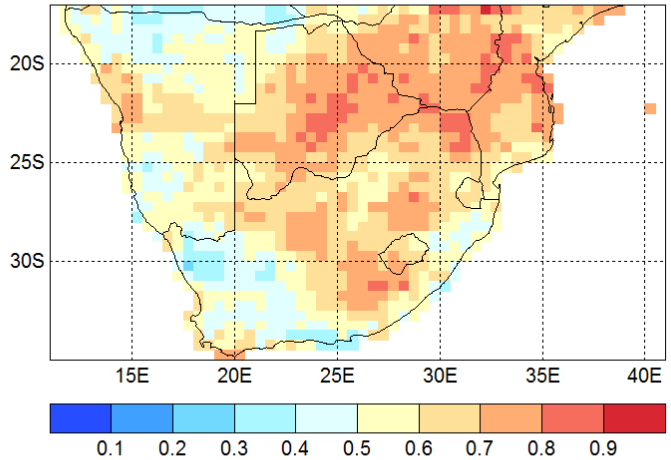
NDJ 2017/18 Max Temp; ICs: Nov



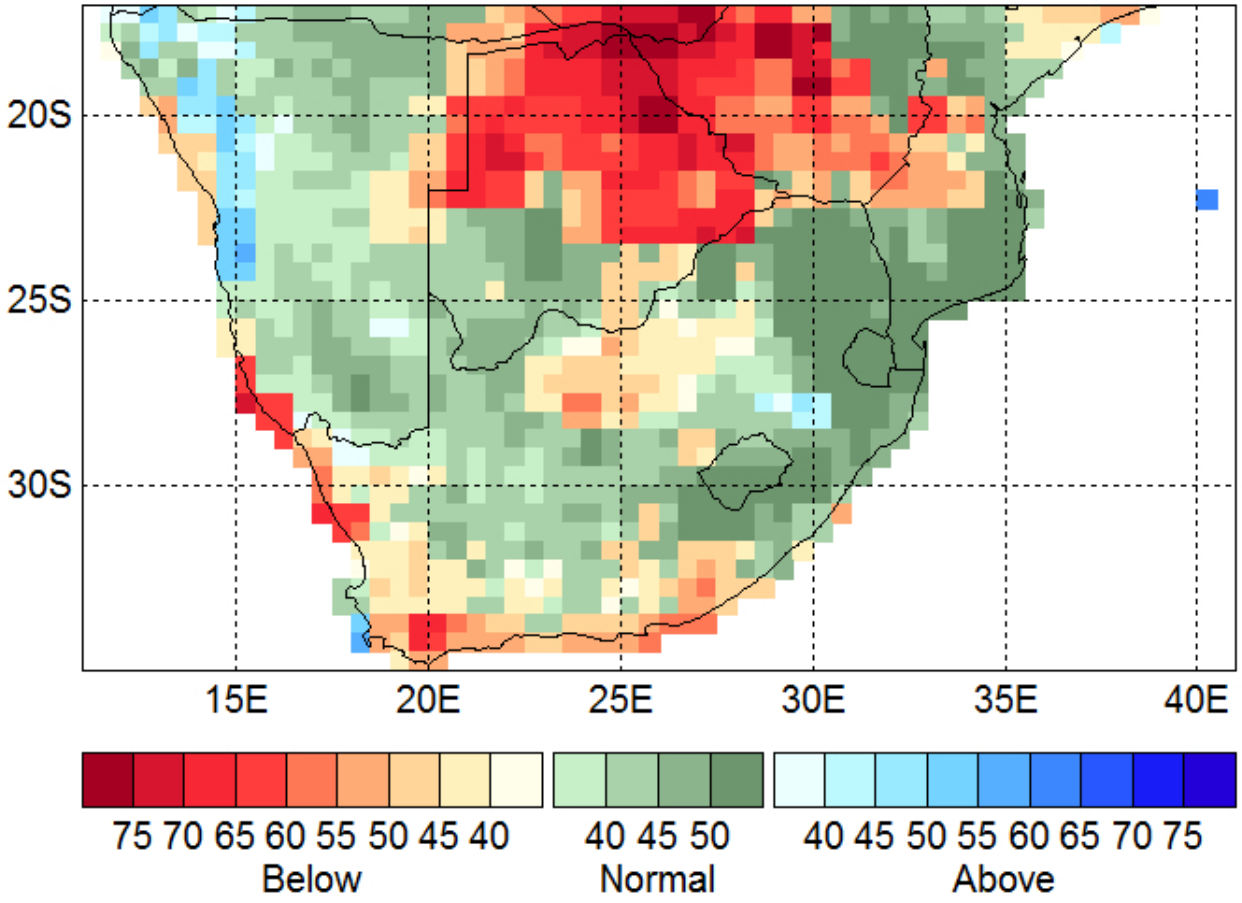
ROC (Above-Normal): NDJ Max Temp



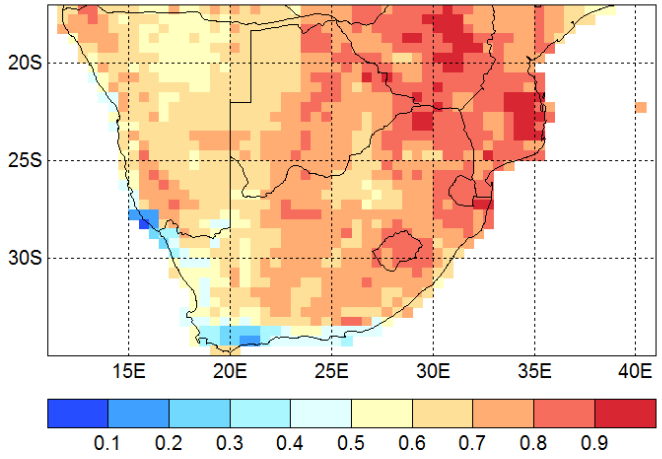
ROC (Below-Normal): NDJ Max Temp



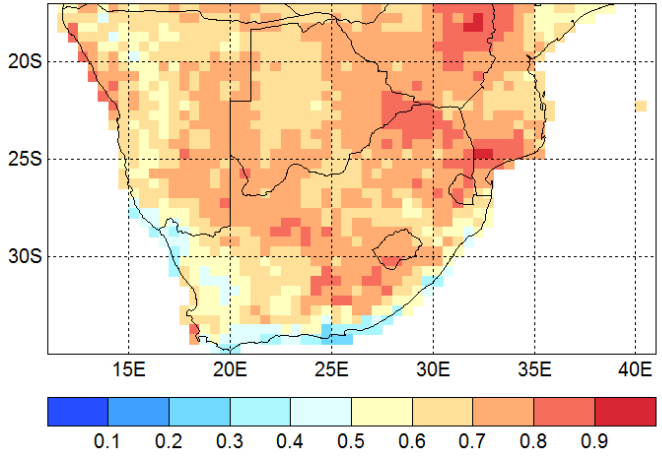
DJF 2017/18 Max Temp; ICs: Nov



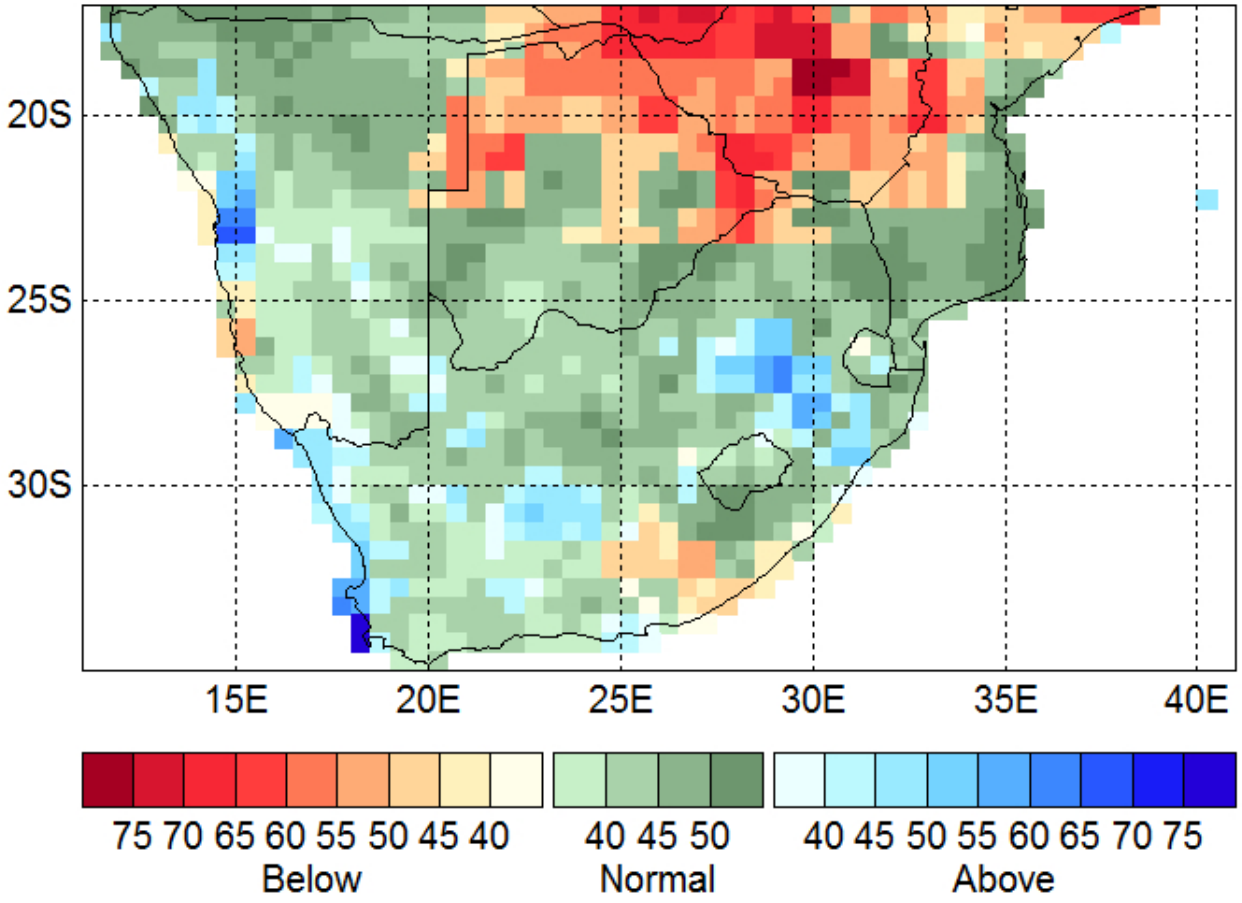
ROC (Above-Normal): DJF Max Temp



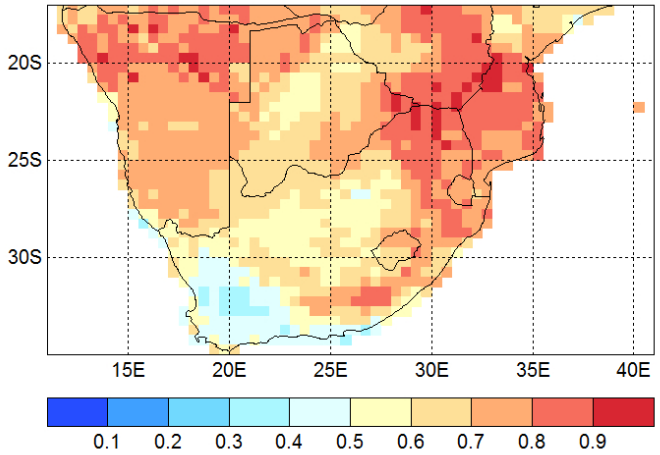
ROC (Below-Normal): DJF Max Temp



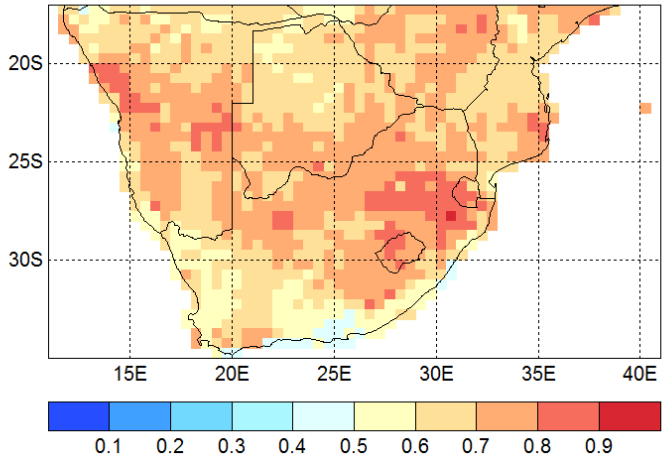
JFM 2018 Max Temp; ICs: Nov



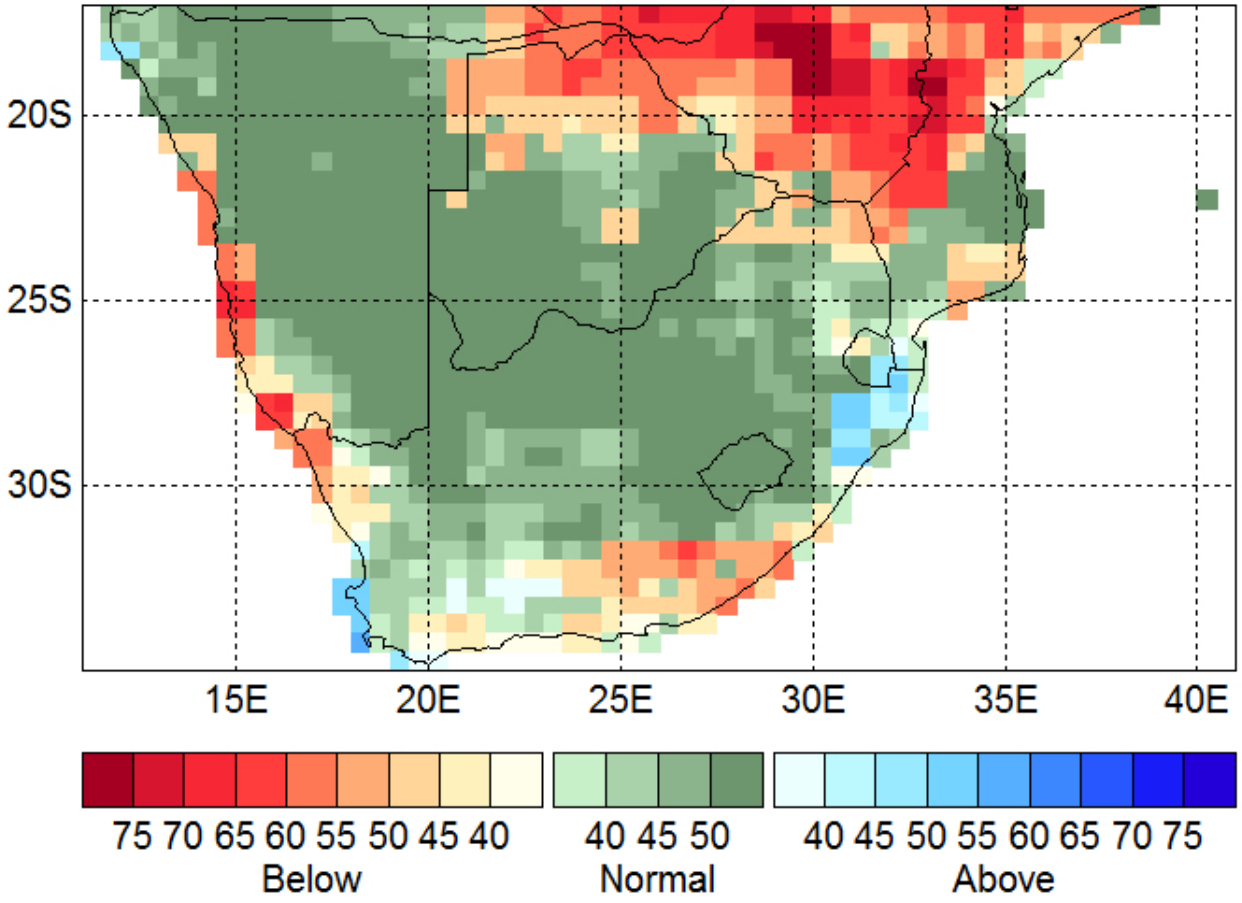
ROC (Above-Normal): JFM Max Temp



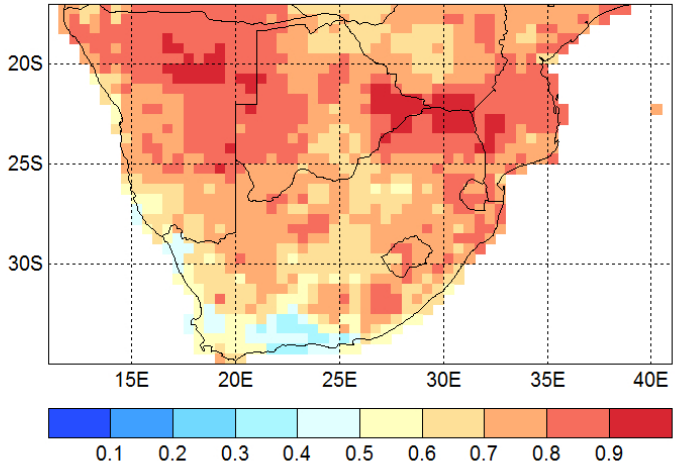
ROC (Below-Normal): JFM Max Temp



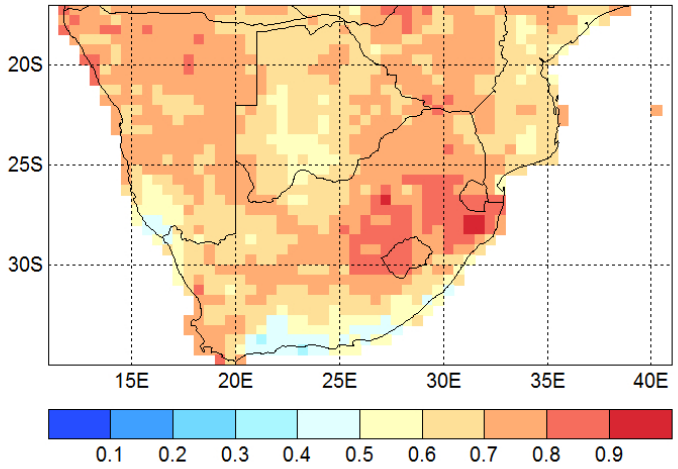
FMA 2018 Max Temp; ICs: Nov



ROC (Above-Normal): FMA Max Temp



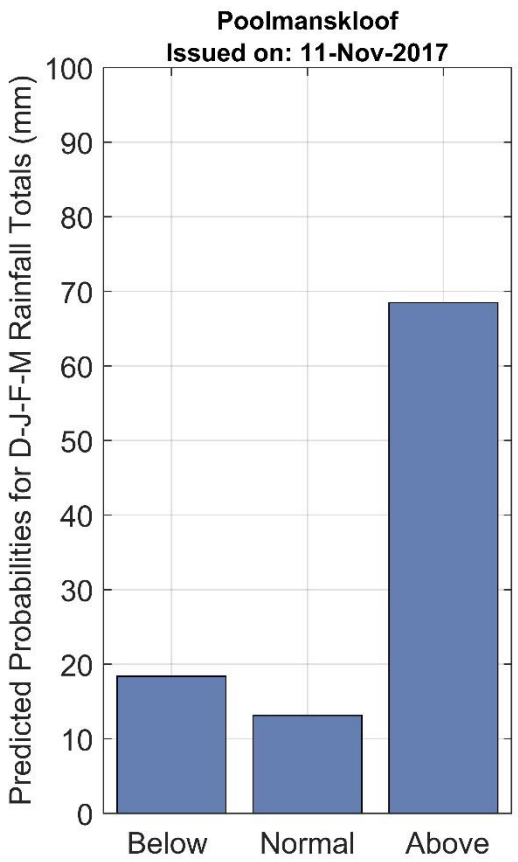
ROC (Below-Normal): FMA Max Temp

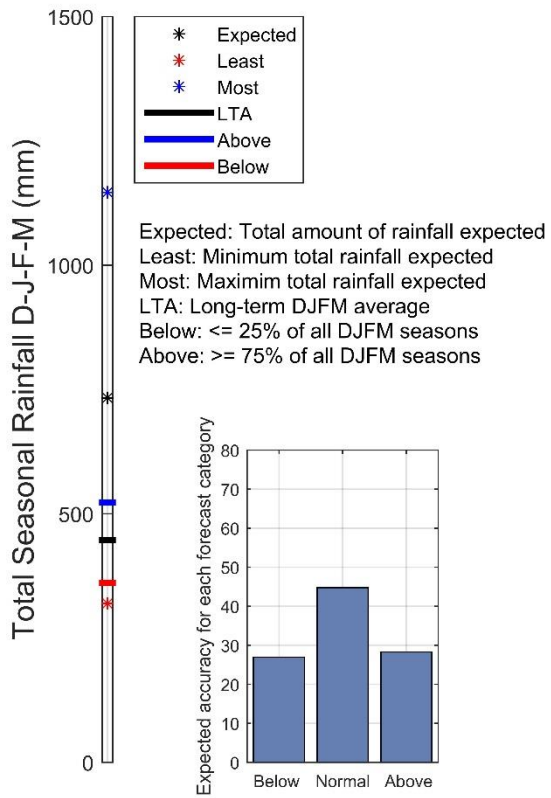


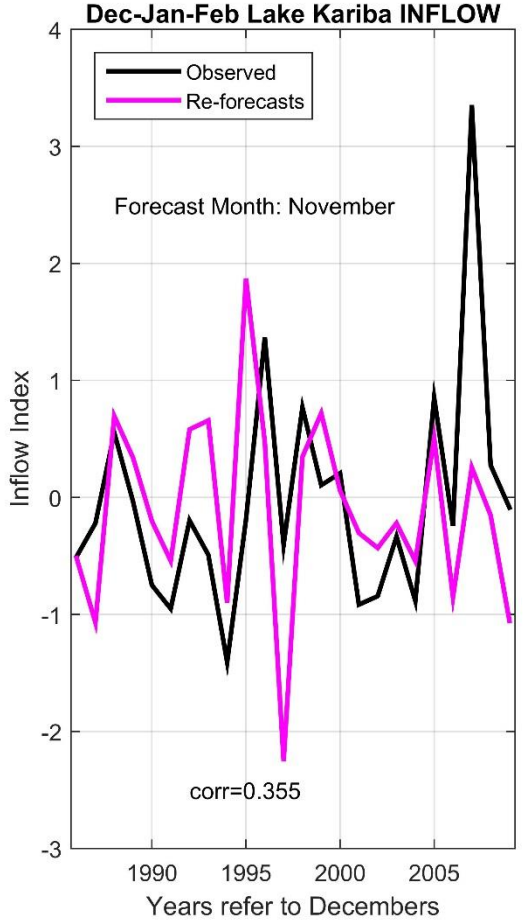
Tailored Forecasts

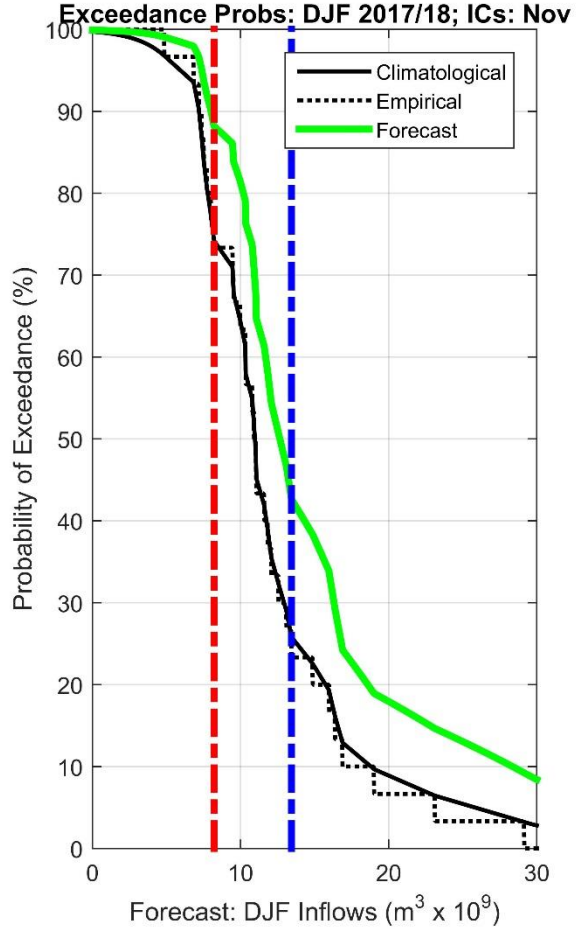
Prediction Method

- NMME ensemble mean forecasts are interpolated to a rain gauge at farm near Grootfontein in northern Namibia (Landman et al. 2016) and to inflows into Lake Kariba on the border between Zimbabwe and Zambia (Muchuru et al. 2014).
- Forecasts are produced for three categories:
  - **Above:** Above-normal (higher than the 75th percentile of the climatological record)
  - **Below:** Below-normal (lower than the 25th percentile of the climatological record)
  - **Normal:** Near-normal (“average” season)


Poolmanskloof
Issued on: 11-Nov-2017
Predicted Probabilities for D-J-F-M Rainfall Totals (mm)
100
90
80
70
60
50
40
30
20
10
0
Below
Normal
Above


Total Seasonal Rainfall D-J-F-M (mm)
1500
1000
500
0
Expected
Least
Most
LTA
Above
Below
Expected: Total amount of rainfall expected
Least: Minimum total rainfall expected
Most: Maximim total rainfall expected
LTA: Long-term DJFM average
Below: <= 25% of all DJFM seasons
Above: >= 75% of all DJFM seasons
Expected accuracy for each forecast category
80
70
60
50
40
30
20
10
0
Below
Normal
Above

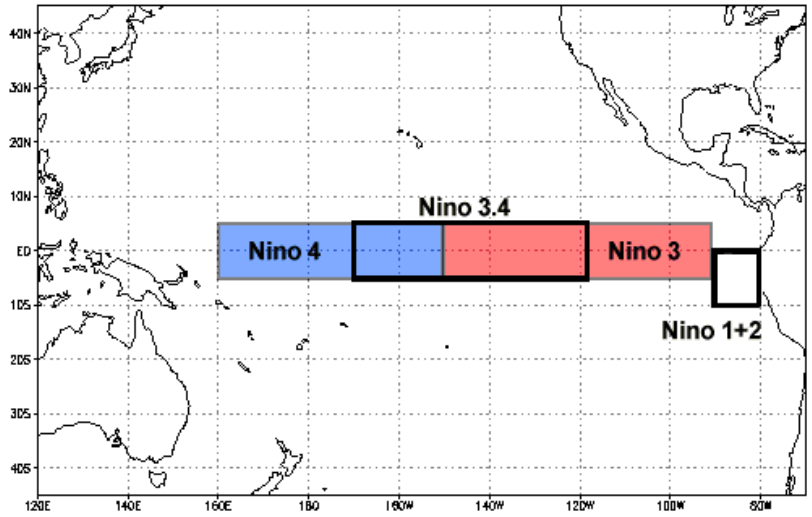

Dec-Jan-Feb Lake Kariba INFLOW
Observed
Re-forecasts
Forecast Month: November
corr=0.355
Inflow Index
4
3
2
1
0
-1
-2
-3
1990
1995
2000
2005
Years refer to Decembers

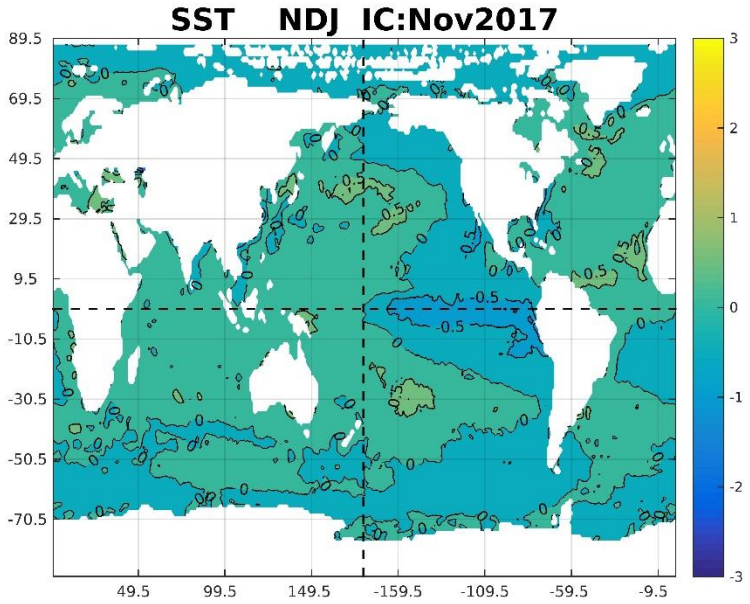

Exceedance Probs: DJF 2017/18; ICs: Nov
Climatological
Empirical
Forecast
Probability of Exceedance (%)
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
Forecast: DJF Inflows (m3 x 109)

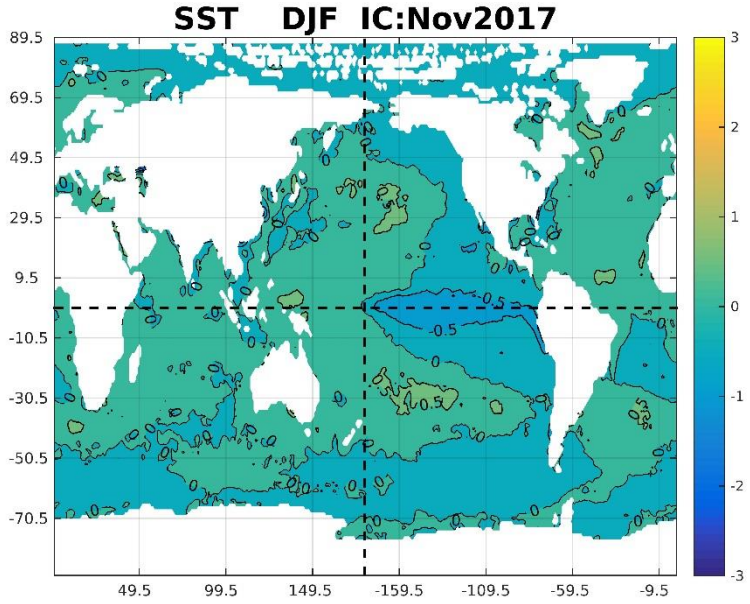
Global SST and ENSO Forecasts

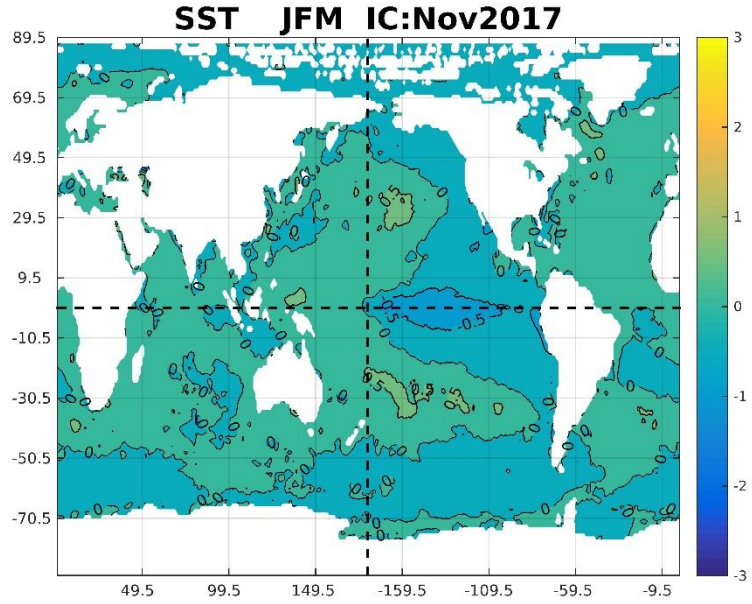
Prediction Method

- 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 deterministic and probabilistic 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

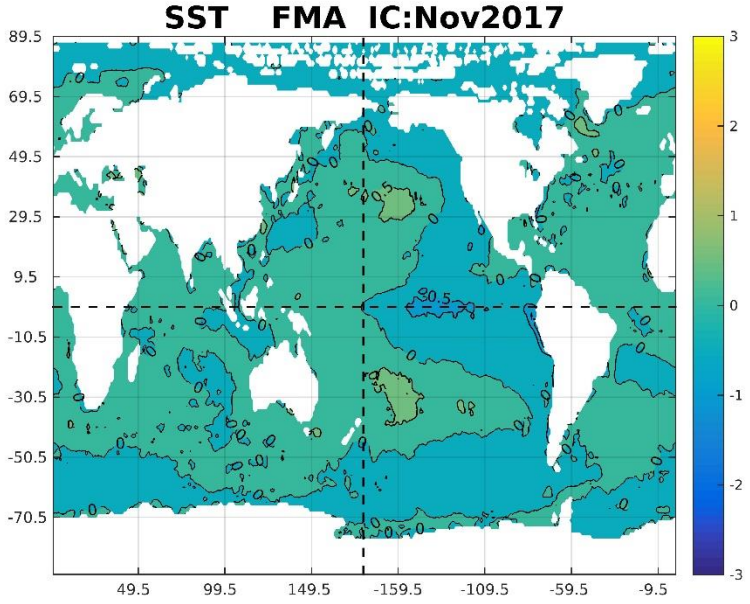


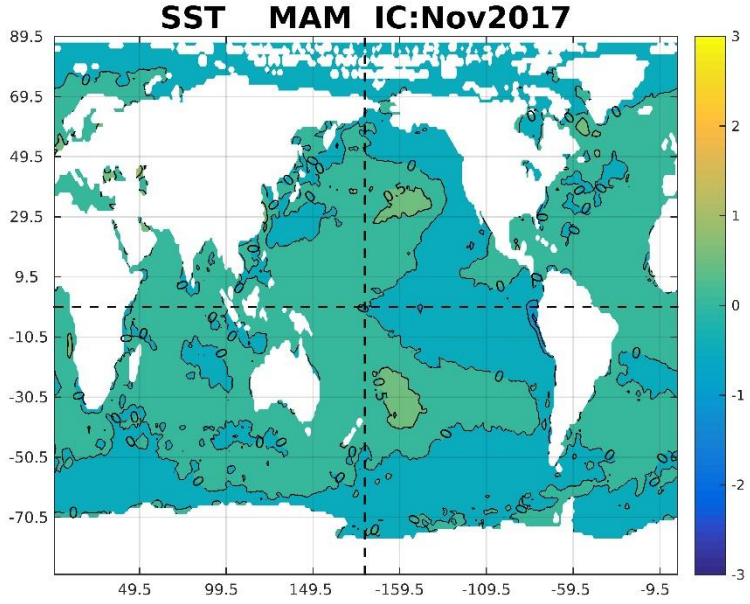


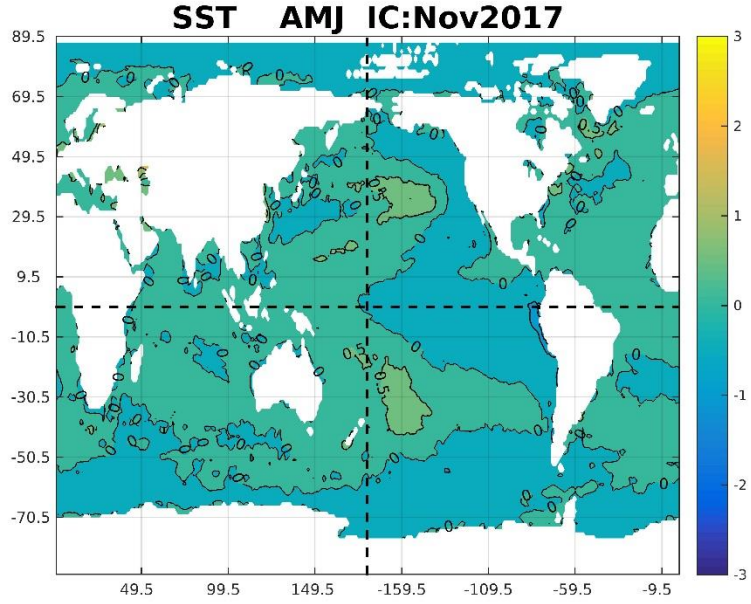


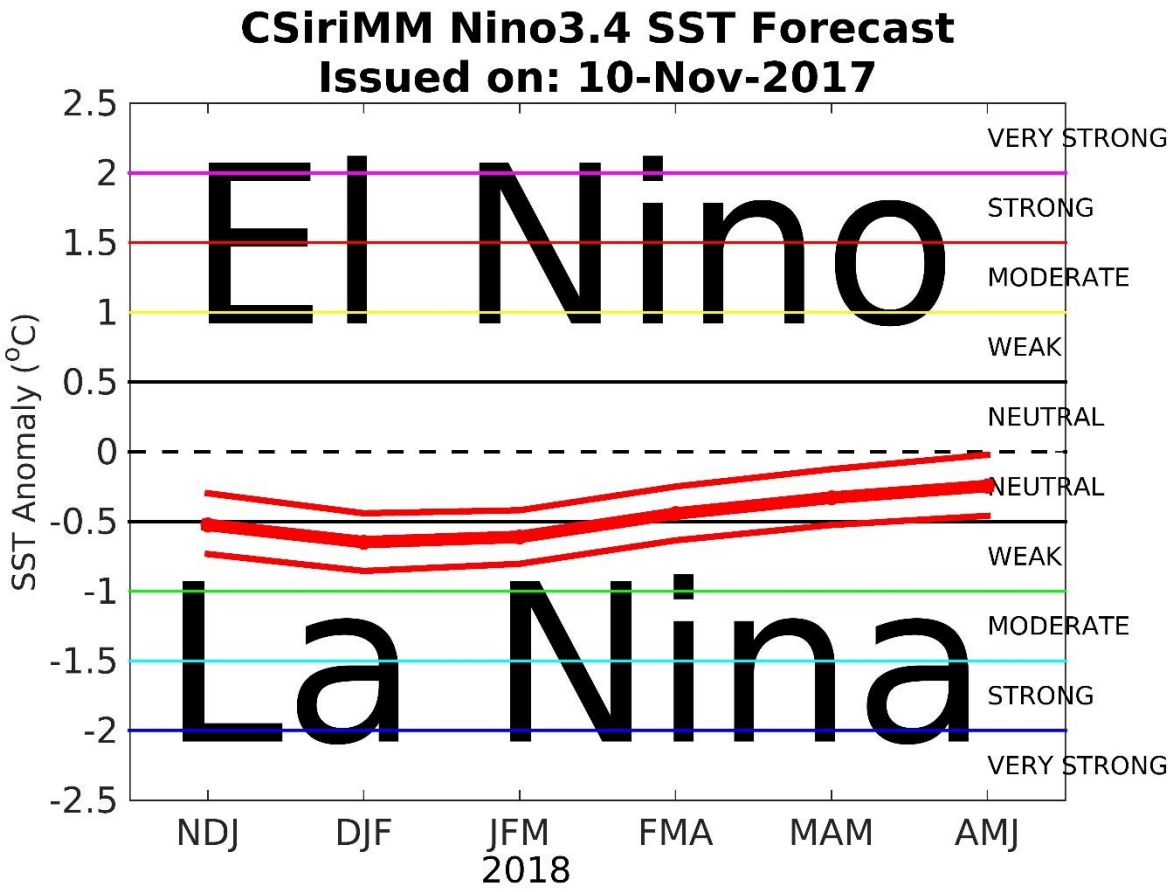


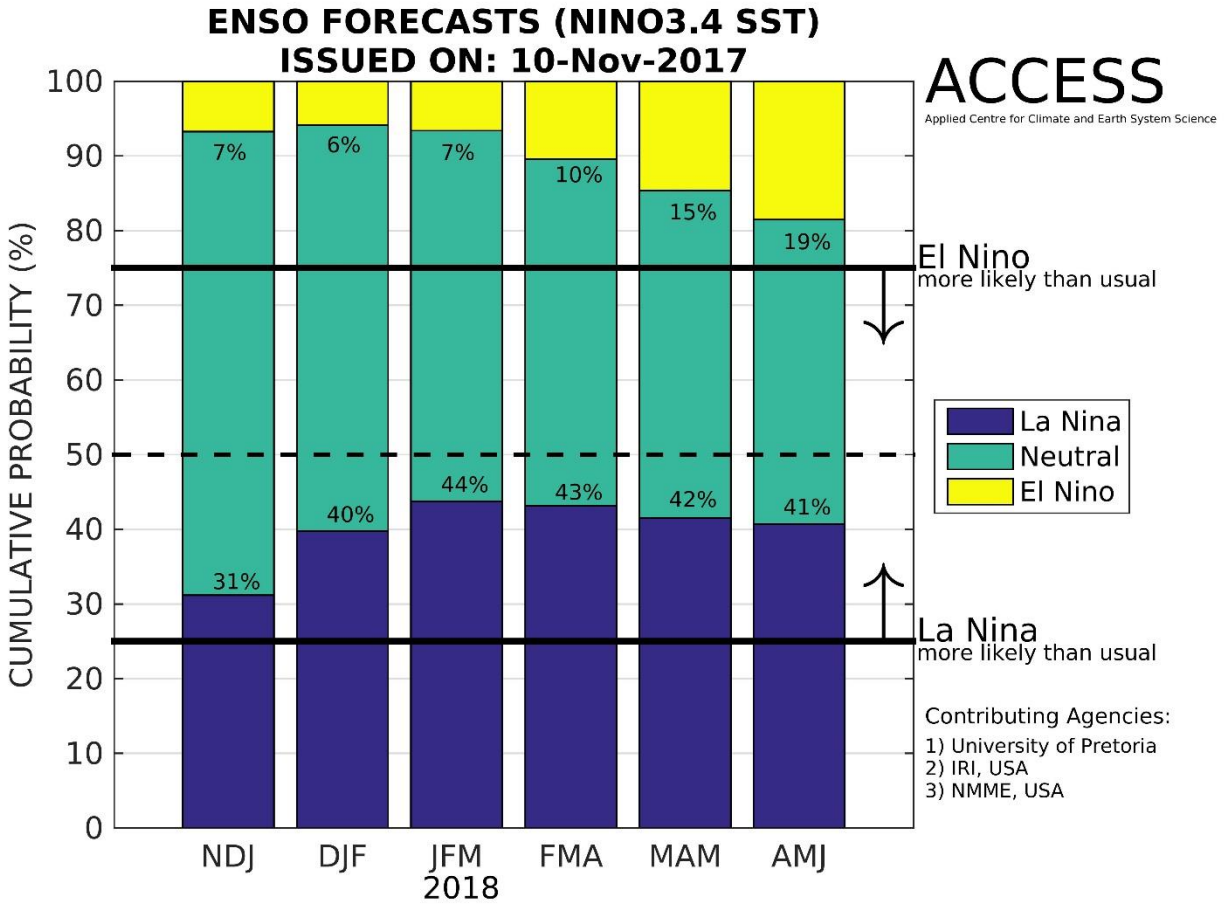
SST anomalies








CSiriMM Nino3.4 SST Forecast
Issued on: 10-Nov-2017
El Nino
La Nina
SST Anomaly (°C)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
VERY STRONG
STRONG
MODERATE
WEAK
NEUTRAL
NEUTRAL
WEAK
MODERATE
STRONG
VERY STRONG
NDJ
DJF
JFM
FMA
MAM
AMJ
2018


ENSO FORECASTS (NINO3.4 SST)
ISSUED ON: 10-Nov-2017
ACCESS
Applied Centre for Climate and Earth System Science
CUMULATIVE PROBABILITY (%)
100
90
80
70
60
50
40
30
20
10
0
7%
6%
7%
10%
15%
19%
31%
40%
44%
43%
42%
41%
El Nino
more likely than usual
La Nina
more likely than usual
La Nina
Neutral
El Nino
Contributing Agencies:
1) University of Pretoria
2) IRI, USA
3) NMME, USA
NDJ
DJF
JFM
FMA
MAM
AMJ
2018

References

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- Landman, W.A., and Beraki, A., 2012: Multi-model forecast skill for midsummer rainfall over southern Africa. International Journal of Climatology, 32: 303-314. doi: 10.1002/joc.2273.
- Landman, W.A., Archer, E. and Tadross, M., 2016: Decision-relevant information on seasonal time scales – the case of a farm in northern Namibia. Conference Proceedings of the 32nd Annual Conference of the South African Society for Atmospheric Science, Cape Town, 31 October to 1 November 2016, pp 69-72. ISBN 978-0-620-72974-1.
- Landman, W.A., DeWitt, D., and Lee, D.-E., 2011: The high-resolution global SST forecast set of the CSIR. Conference Proceedings of the 27th Annual Conference of South African Society for Atmospheric Sciences, 22-23 September 2011, Hartbeespoort, North-West Province, South Africa. ISBN 978-0-620-50849-0
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