Seasonal forecasts
presented by:

Seasonal Forecast Worx

Latest Update: 10 June 2019

• 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/](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/](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?
  
  “…multi-model forecasts outperform the single model forecasts…” (Landman and Beraki, 2012).

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: 06-Jun-2019

SST Anomaly (°C)

El Nino

La Nina

JJA 2019
JAS
ASO
SON
OND
NDJ
SST anomalies

The images show SST (Sea Surface Temperature) anomalies for different seasons:
- SST_JJA: June, July, August
- SST_JAS: July, August, September
- SST_ASO: August, September, October
- SST_SON: September, October, November
- SST_OND: October, November, December
- SST_NDJ: November, December, January

Each map represents the SST anomalies for the specified period, with color bars indicating the magnitude of anomalies.
Round-up: ENSO

• Predicted warming of central Pacific Ocean SST suggests a weak to moderate El Niño event towards summer.
• From the CPC/IRI El Niño Watch in May: El Niño is likely to continue through the Northern Hemisphere summer 2019 (70% chance) and autumn (55-60% 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.
SON 2019 Rainfall; ICs: June

Legend
- Catchment Area
- Main Rivers

Rainfall Prob
- >75
- 70-75
- 65-70
- 60-65
- 55-60
- 50-55
- 45-50
- 40-45
- 35-40
- 30-40
- 45-50
- 50-55
- Below Normal
- 55-60
- 60-65
- 65-70
- 70-75
- >75

ROC Area (Above-Normal): SON Rainfall

ROC Area (Below-Normal): SON Rainfall
Round-up: SADC Rainfall

• Areas most likely associated with favourable winter rainfall outcomes are mainly restricted to the southern and southeastern coastal and interior regions.
• Favourable spring rain possible over parts of the summer rainfall region.
SON 2019 Max Temp; ICs: June

Legend
- Catchment Area
- Main Rivers

Max Temp Prob
- >75
- 70-75
- 65-70
- 60-65
- 55-60
- 45-50
- 35-40
- 40-45
- 45-50
- 50-55
- 55-60
- 60-65
- 65-70
- 70-75
- <= 50

ROC Area (Above-Normal): SON Max Temp

ROC Area (Below-Normal): SON Max Temp
Round-up: SADC Max Temp

• The larger part of the region can expect high maximum temperatures, but in spring the high temperatures are likely to be restricted to the western half.


• Kirtman, B. P. and Co-authors 2014: The North American Multimodel Ensemble: Phase-1 seasonal-to-interannual prediction; Phase-2 toward developing intraseasonal prediction. Bulletin of the American Meteorological Society. 95, 585–601. doi: http://dx.doi.org/10.1175/BAMS-D-12-00050.1


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