Seasonal forecasts

presented by:

Seasonal Forecast Worx

Latest Update: 9 April 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 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](http://www.weathersa.co.za/home/seasonal)
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
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
- 45-50
- 40-45
- 35-40
- 35-40
- 45-50
- 50-55
- Below Normal
- 60-65
- 65-70
- 70-75
- >75

ROC Area (Above-Normal): AMJ Rainfall

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

• Areas most likely associated with favourable rainfall outcomes are mainly restricted to the southern and southeastern coastal and interior regions.
Round-up: SADC Max Temp

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


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”
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