

Predictability of Seasonal Rainfall over the Greater Horn of Africa

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Abstract

The El Nino-Southern Oscillation (ENSO) is a primary mode of climate variability in the Greater of Africa (GHA). The expected impacts of climate variability and change on water, agriculture, and food resources in GHA underscore the importance of reliable and accurate seasonal climate predictions. The study evaluated different model selection criteria which included the Coefficient of determination (R^2), Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC), and the Fisher information approximation (FIA). A forecast scheme based on the optimal model was developed to predict the October-November-December (OND) rainfall. The predictability of GHA rainfall based on ENSO was quantified based on composite analysis, correlations and contingency tables. A test for field-significance considering the properties of finiteness and interdependence of the spatial grid was applied to avoid correlations by chance. The study identified FIA as the optimal model selection criterion. However, complex model selection criteria (FIA followed by BIC) performed better compared to simple approach (R^2 and AIC). Rainfall is modestly predictable based on ENSO during OND season. El Nino typically leads to wetter conditions while correlations of ENSO indices with rainfall are statistically significant. Analysis based on contingency tables shows higher predictability of OND rainfall with the use of ENSO indices derived from the Pacific and Indian Oceans sea surfaces showing significant improvement during OND season. The predictability based on ENSO for OND rainfall is robust on a decadal scale. The negative phase of ENSO (La Niña) leads to dry conditions while the positive phase of ENSO (El Niño) anticipates enhanced wet conditions over GHA. An ENSO-based scheme based on an optimal model selection criterion can thus provide skillful rainfall predictions over GHA.

Key Words: ENSO, Seasonal Rainfall, Greater Horn of Africa