Name: Titike kassa Bahaga
tkkassa@gmil.com/tbahaga@ictp.com
ICTP
ICTP

Strada Costiera, 11

I - 34151, Trieste, Italy.
Country: Italy
Title: Potential Predictability of the SST-Forced Equatorial East African Short Rain Interannual Variabilit
Additional authors: 1) G. Mengistu Tsidu, 2) Fred Kucharski, G. T. Diro
Additional Affiliations: 1) Addis Ababa University, 2) Abdus Salam international center for theoretical physics (ICTP)
Abstract:
In this paper the predictability for the 20th century Sea Surface Temperature (SST) forced East African short rains variability is analyzed using observational data and ensembles of long Atmospheric General Circulation Model (AGCM) simulations. To our knowledge such an analysis for the whole 20th century using a series of AGCM ensemble simulations is done for the first time. The physical mechanisms that govern the SST influence on East African short rains in the model are also investigated. It is found that there is substantial skill in reproducing the East African short rains variability given the SSTs are known. Consistent with recent previous studies it is found that the Indian Ocean and in particular the western pole of the Indian Ocean dipole (IOD) play a dominant role for the prediction skill, whereas sea surface temperatures outside the Indian Ocean play a minor role.

The physical mechanism for the western Indian Ocean influence on East African rainfall in the model is consistent with previous findings and consists of a gill-type response to a warm (cold) anomaly that induces a westerly (easterly) low-level flow anomaly over equatorial Africa and leads to moisture flux convergence (divergence) over East Africa. On the other hand a positive El nino-Southern Oscillation (ENSO) anomaly leads to a spatially non coherent reducing effect over parts of East Africa, but the relationship is not strong enough to provide any predictive skill in our model. The East African short rains prediction skill is also analyzed within a model derived potential predictability framework and it is shown that the actual prediction skill is broadly consistent with the models potential prediction skill. Low frequency variations of the prediction skill are mostly related to SSTs outside the Indian Ocean region and likely due to an increased interference of ENSO with the Indian Ocean influence on East African short rains after the mid-70s climate shift.

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