SERVIR and Seasonal Climate Forecasts

The NASA/USAID SERVIR project is dedicated to developing and improving the capacity of several hub regions to incorporate unique NASA satellite and modeling resources into operational environmental monitoring and planning. Recent and currently served hub regions include Mesoamerica, East Africa (EA), and the Hindu Kush-Himalayan region.

Another AST team is focused on the evaluation of climate model simulations and the development of downscaled scenarios to be used by AST projects focused on impact modeling. Results presented here focus on the initial development of downscaled seasonal forecasts from the NASA Global Modeling and Assimilation Office (GMAO) GEOS-5 model contribution to the U.S. National Multi-Model Ensemble (NMME) for use in agriculture and hydrologic modeling over East Africa.

Observed East Africa Rainfall Variability

Figure 1. (Left) Average monthly rainfall (mm) over 2000-2010 for the basin of the Kenyan highlands. The meridional march of seasonal rainfall and of its interannual variability is illustrated. Note the EA seasonal rainfall exhibits strong interannual variability.

Impact Modeling (e.g. Agriculture, Hydrology)

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Preliminary seasonal precipitation forecasts for East Africa are useful for water resource planning and assessing the potential for future droughts and floods. But seasonal forecasts of EA rainfall are not improving, due to a combination of factors including: (1) limited observational data, and (2) a lack of verification data for EA due to the region not being a conventional observational data point. Smoothing of high resolution precipitation data can be used to improve skill of seasonal forecasts. The key to success is identifying high impact regions (e.g. drought) and using the seasonal forecast skill there to guide climate adaptation strategies.

Summary Points

• The NASA/USAID SERVIR Applied Science Team (AST) is currently supporting several projects that will make use of downscaled seasonal forecast scenarios in agricultural and hydrologic modeling applications.

• Interannual rainfall variability in equatorial East Africa is prominent, leading to floods and droughts. Variations in both the short and long rains are influenced by ocean-atmosphere teleconnections.

• Seasonal forecasts from the GMAO model show limited inherent skill for direct forecasts of EA rainfall and must be spatially and temporally downscaled for use in impact modeling.

Matched filter regression, combined with bootstrap resampling of a high quality, historical record, is an ideal approach to the development of refined scenarios for use within the SERVIR AST.