CCDA-V

Africa, sustainable development and climate change

*Prospects of Paris and beyond*

ClimDev-Africa

# PERFOMANCE OF CMIP5 IN SIMULATION OF PRESENT AND FUTURE PRECIPITATION OVER THE LAKE VICTORIA BASIN


**PRESENTER:**

**Maureen A. Wanzala**

**AUTHORS:**

**M. A Wanzala, L. A. Ogallo, F.J. Opijah and J.N. Mutemi**

# Problem statement 1/2

- Lake Victoria produces its own climate with distinct diurnal, seasonal and inter-annual characteristics. The social and economic importance and development of the LVB are highly dependent on rain-fed systems that are often disrupted by abrupt changes in weather and climate, which result to severe hazards such as fluctuating lake levels, frequent floods, prolonged droughts, and disease outbreak.

# Problem statement 2/2

- Despite a number of studies over the region on present-day climate variability, there is still a vast present-day and future climate information gap. This is as a result of the difficulties to represent some of the unique local and regional weather and climate, together with their interaction with global systems by many dynamical models.
- Narrowing the existing climate information gap over the LVB by assessing the performance of CMIP5 models to simulate the much needed accurate seasonal climate forecasts for early warning to reduce climate risks that affect the local livelihoods and life around the lake.

# Methods

- **Trend Analysis-The** Graphical method involves plotting of smoothed and unsmoothed times series using 5 running average filter. Under statistical method a linear polynomial function was fitted and significance of slope tested

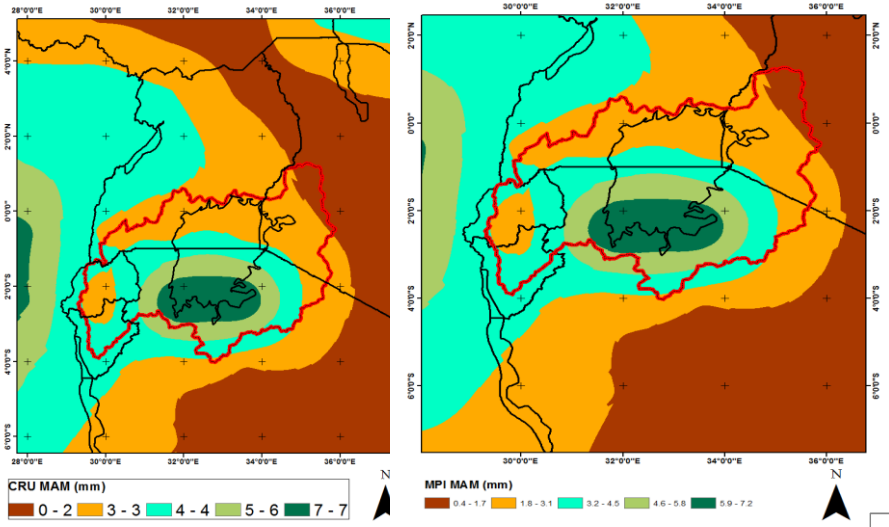
$$y_t = a + b_i x_t$$

- **Empirical statistical downscaling-** mathematical transfer functions or relationships between observed large-scale precipitation and the observed surface precipitation.

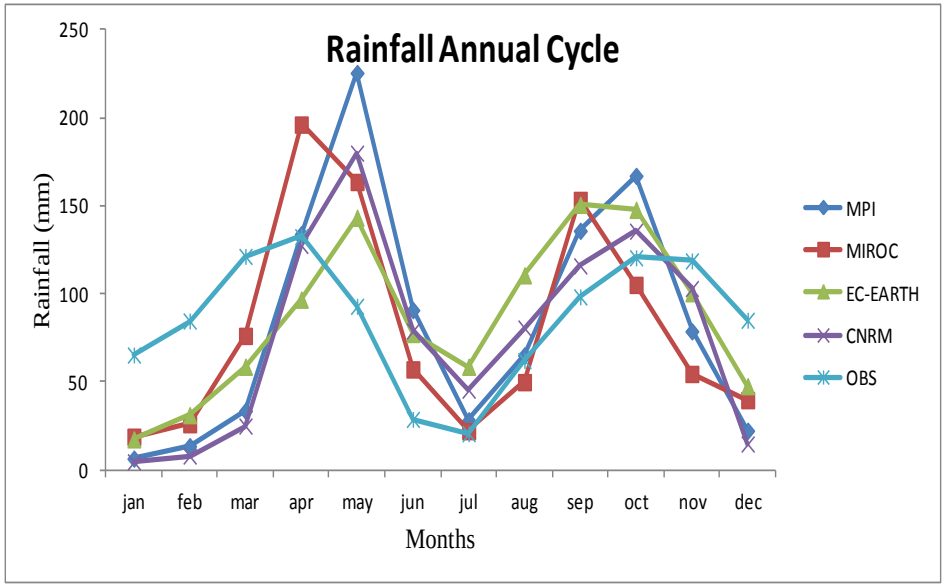
$$y_i = a_o + \sum_{i=1}^{n} b_i x_i + e_i$$

- Principal Components Regression (PCR)
- ln $(P_t) = \beta_0 + \sum_{k=1}^{k} \beta_k + PC_{k,t}$

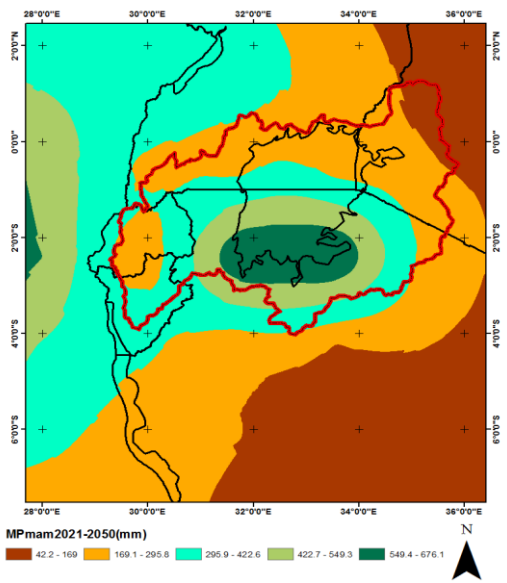
# Key Findings

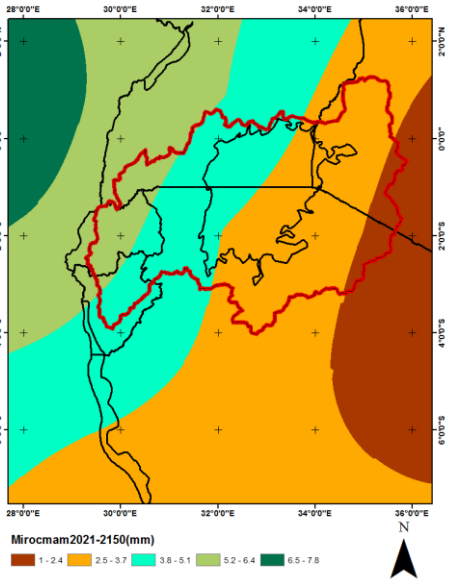


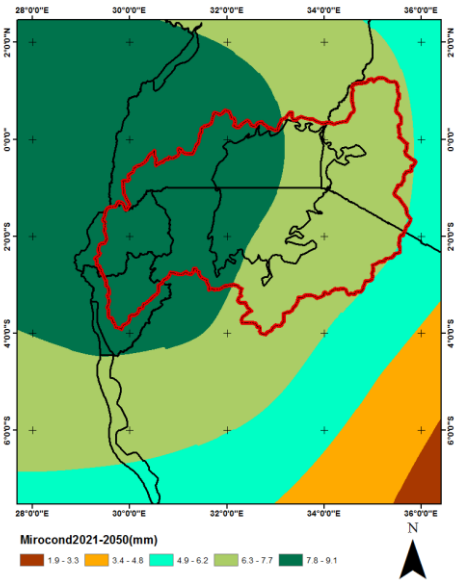

Rainfall decreases towards the eastern part of the region. Over the western part, there are markedly similar patterns in almost all the four plots during this season. The MPI model was able to capture the effect of orographic features and inland water bodies as indicated by the extreme over the water body. From all the spatial plots, the models were able to capture two extremes both on land and over the water body

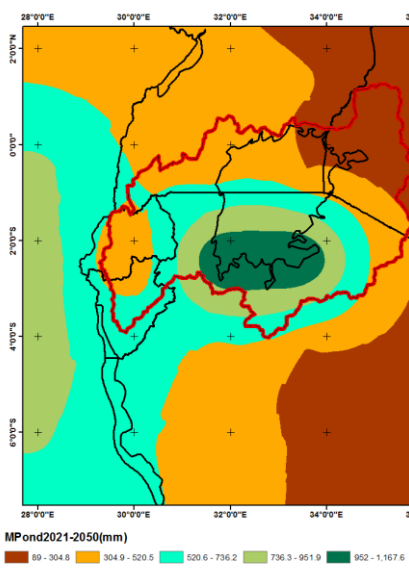


# Key Findings




- Drier conditions for the time period 2021-2050 during MAM over towards the eastern part of the study region and an extreme over the water body and towards the western side of LVB.
- During the OND season, the MIROC model projects enhanced rainfall on the western part with an extreme over land and water, while MPI model projects depressed rainfall with an extreme over the lake only

# Conclusions/Recommendations

- CMIP5 models were able to capture the main features of seasonal mean rainfall distributio, albeit significant biases in individual models depending on region and season. For instance, MPI, MIROC and CNRM were able to replicate the observed annual and seasonal patterns whereas GFDL was not able to capture the center of JJA seasonal rainfall, while EC-EARTH delayed the onset of the same season. NorESM pushed the center of MAM, JJA and OND seasonal rainfall further north.
- The spatial pattern of rainfall modes identified important features over the LVB region. Two centers of enhanced precipitation were identified over land and Lake areas in the first rainfall mode. The center over the Lake Victoria seemed to be enhanced than the center over land which might be a pointer to increasing sea surface temperatures. However, the models seemed to be struggling to capture the observed patterns since for LVB, rainfall events are controlled by the mesoscale systems.
- Further analyses of the future climate projections should be considered for the rcp 8.5 to compare and contrast with the rcp 4.5 considered in the present study.