



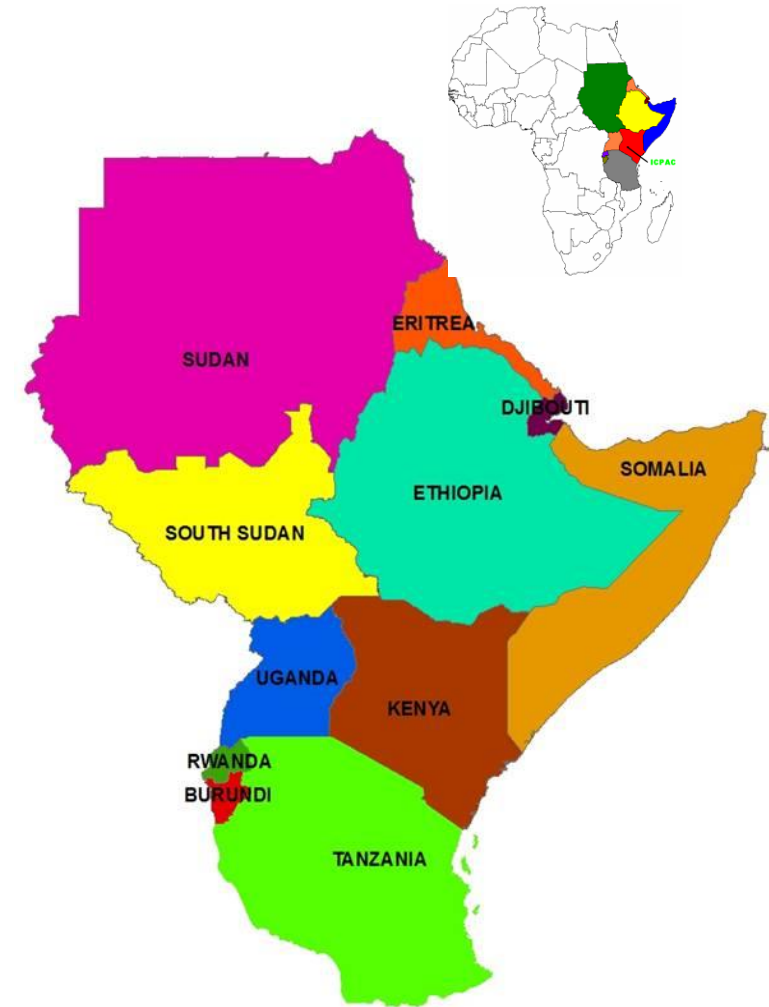
PEACE, PROSPERITY AND
REGIONAL INTEGRATION

THE GREATER HORN OF AFRICA CLIMATE OUTLOOK FORUM (GHACOF)

Zewdu T. Segele (zsegele@icpac.net)
GFCS Climate Modeling and Diagnostics Expert
IGAD Climate Prediction & Applications Centre (ICPAC)

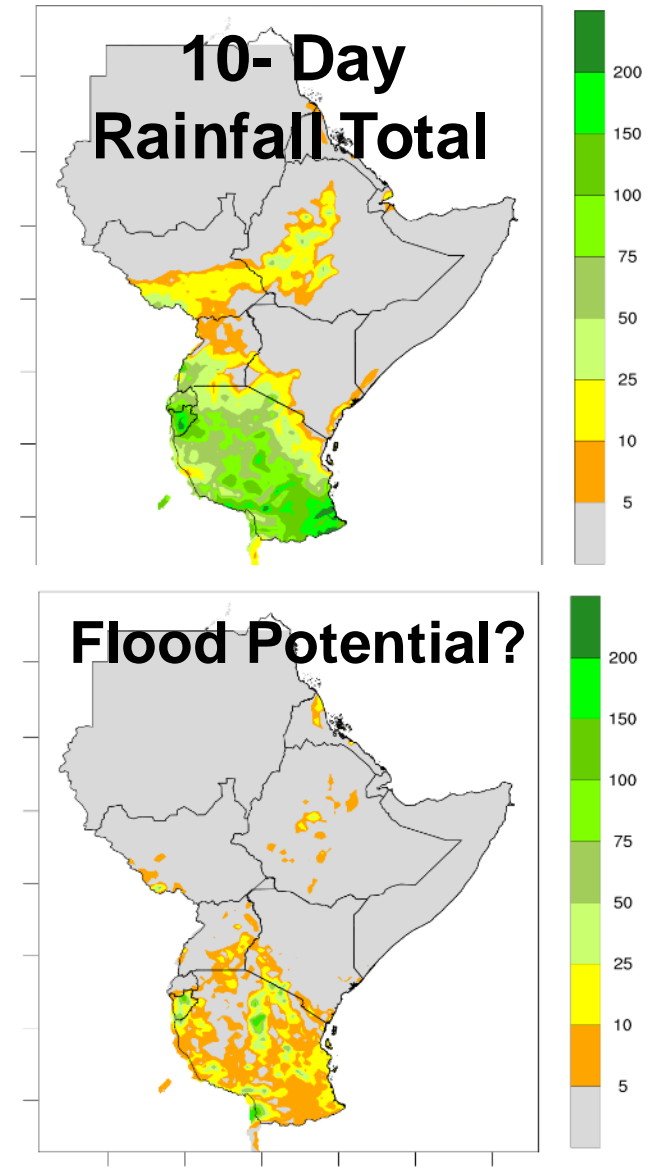
IGAD CLIMATE PREDICTION AND APPLICATIONS CENTRE

- ICPAC became a specialized institution of the Intergovernmental Authority on Development (IGAD) in 2007 with a distinct mandate to support the formulation of development policy by providing relevant, timely, actionable climate early warning information
- ICPAC has 11 member States (8 IGAD and 3 non IGAD countries)



EARLY WARNING INFORMATION

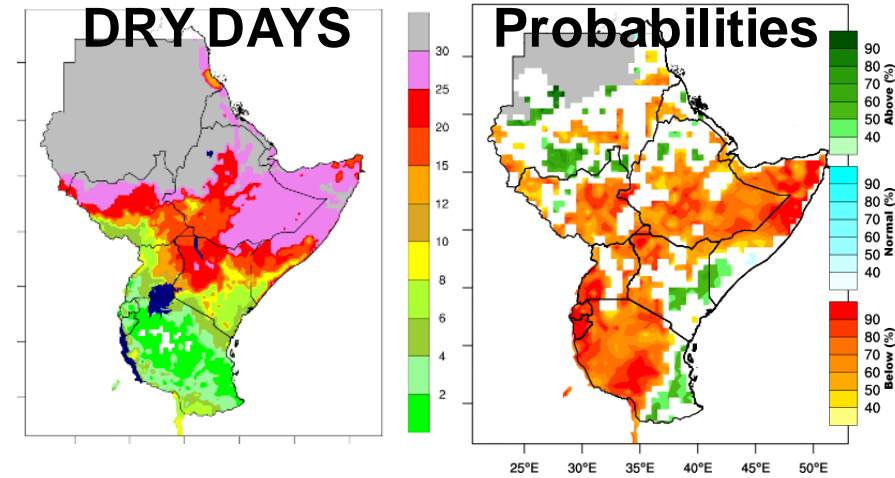
- ICPAC provides advisories every 10-day. Such forecasts are based on in-house Numerical Weather Prediction Model runs (WRF). The type of EW information provided are:
 - Extreme winds (gust winds)
 - Extreme cold (minimum temperature)
 - Extreme heat (maximum temperature)
 - Rainfall totals and Maximum rate



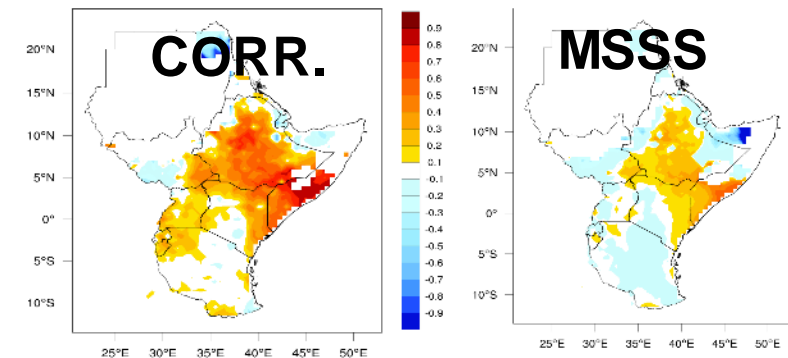
EARLY WARNING INFORMATION (CONTD.)

- Monthly and three-month running statistical and dynamical forecasts and warnings provided every month:
 - Seven GCM outputs downscaled statistically for the region (CMC1, CMC2, CCSM4, NASA, GFDL, CESM1, NCEP)
 - One GCM dynamically downscaled for the region
- Forecast accuracy metrics are also issued

FORECASTS



SKILL



GHACOFS

- The concept behind GHACOFs is to deliver consensus-based and user relevant products:
 - First GHACOF was organized in February 1998
 - Develop consensus climate regional outlook (Three times a year)
 - Formulate mitigation strategies to the implications of the consensus outlook in key sectors
 - Provide a platform for policy makers, producers and user to interact (user driven CIS)
 - Review lessons learnt on the use of products provided

MAIN COMPONENTS OF GHACOFS

- Pre-COF: Capacity building training workshop
 - Improve skills of national (NMHSs) and regional climate scientists
 - Bring NMHSs' climate scientists up to date in the latest state of the atmosphere-ocean climate system and of the diverse forecasting technologies and methodologies
 - Production of Consensus Forecasts
- Climate outlook Forum:
 - Consensus forecasts presented to users
- Side events and outreaches for multisectoral users
- National Dissemination forums
 - Downscaling of regional forecasts
 - Dissemination to national users

GHACOF MECHANISMS

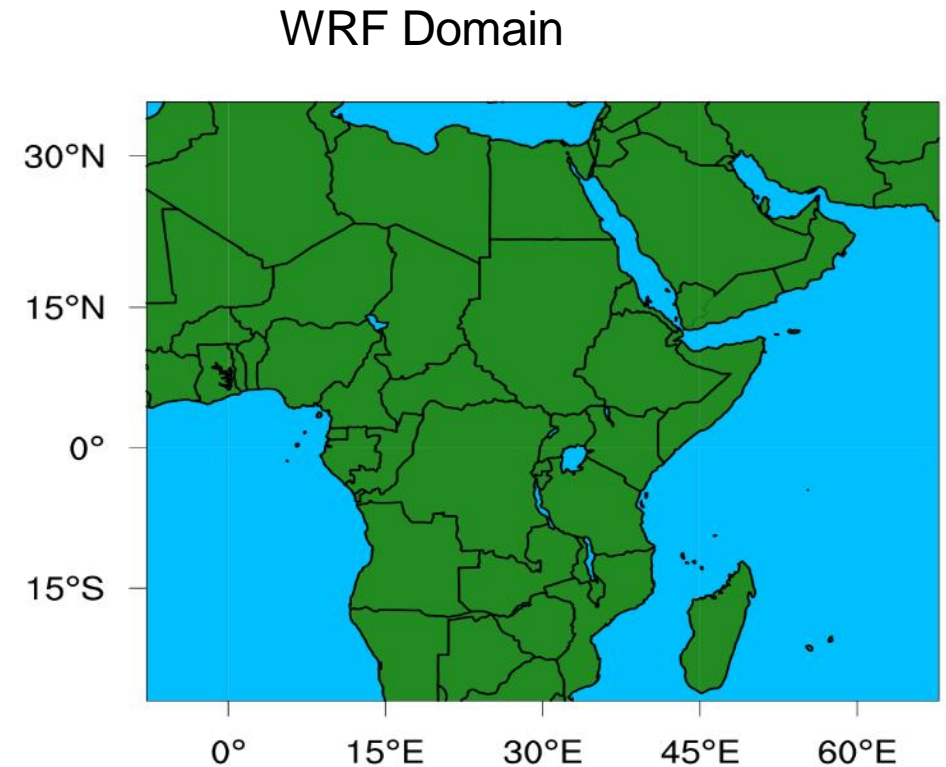
- At ICPAC, diverse sources of seasonal forecasting technologies and methodologies are used
 - International Institutions and Experts are integral parts of PreCOFs (UKMO, IRI, UCSB, FEWSNET) ==> Improved GHACOF products
 - Statistical downscaling of 7 General Climate Model (GCM) outputs
 - Objective selection of the top few best analogue years for ENSO and IOD
 - Dynamical Downscaling of CFSv2
 - User tailored forecasts of onset, cessation, dryspell, wetspell, and the duration of season
 - Operational Research to improve forecasting

DYNAMICAL FORECASTING AT ICPAC: NCEP CLIMATE FORECAST SYSTEM VERSION2 (CFSV2)

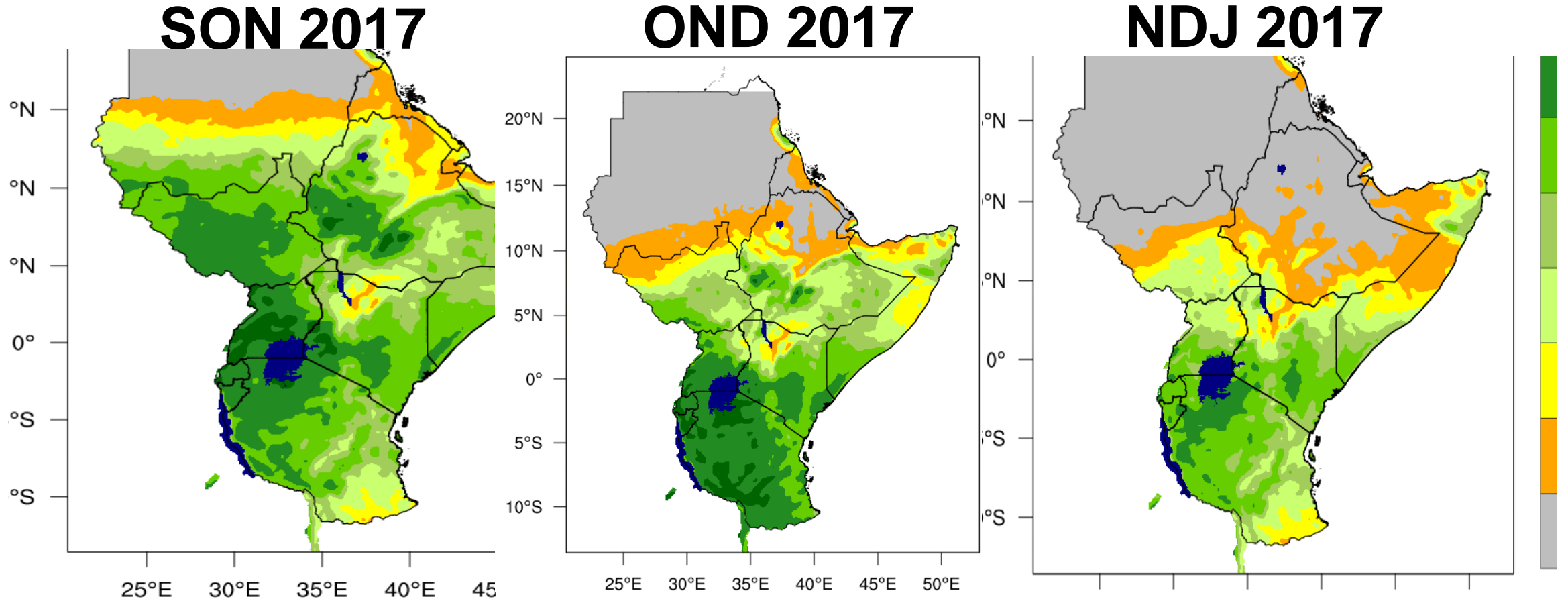
- CFSv2 is a fully coupled atmosphere–ocean–land model used for seasonal prediction at NCEP. It is one of the participating models in the North American Multi-Model Ensemble (NMME) Project (<http://www.cpc.ncep.noaa.gov/products/NMME/>)
- Unlike other GCMs, seasonal forecasts are available online at 6 hours interval on a 7-day rotating basis at <http://nomads.ncep.noaa.gov/pub/data/nccf/com/cfs/prod/cfs/>

DYNAMICAL DOWNSCALING AT ICPAC

- ICPAC dynamically downscale one member of CFSv2 runs for up to 3 seasons ahead monthly and seasonal forecasts every month and every season for GHACOF
- The Weather Research and Forecasting (WRFv3.8.1) model is used for dynamical downscaling
- The model is run at 30 km horizontal resolution.



DYNAMICALLY DOWNSCALED WRF FORECASTS



GHACOF INPUTS - TAILORED PRODUCTS BASED ON DYNAMICALLY DOWNSCALED WRF FORECASTS

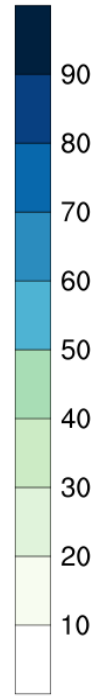
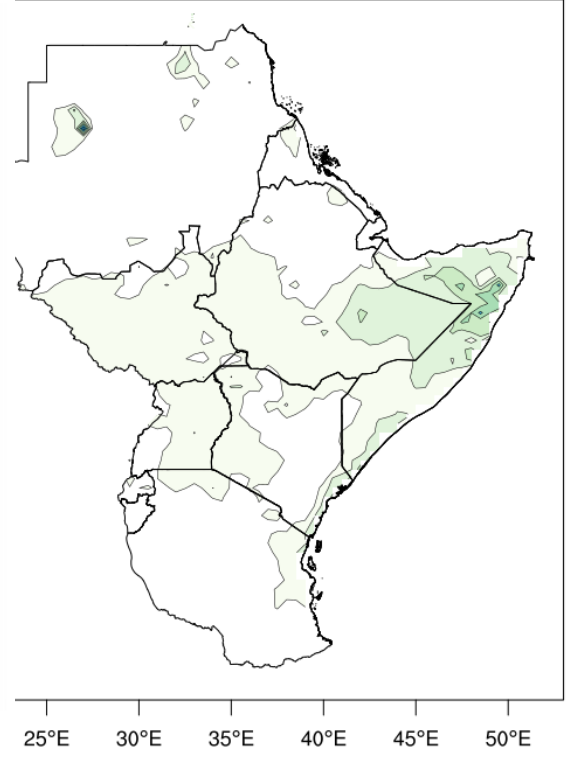
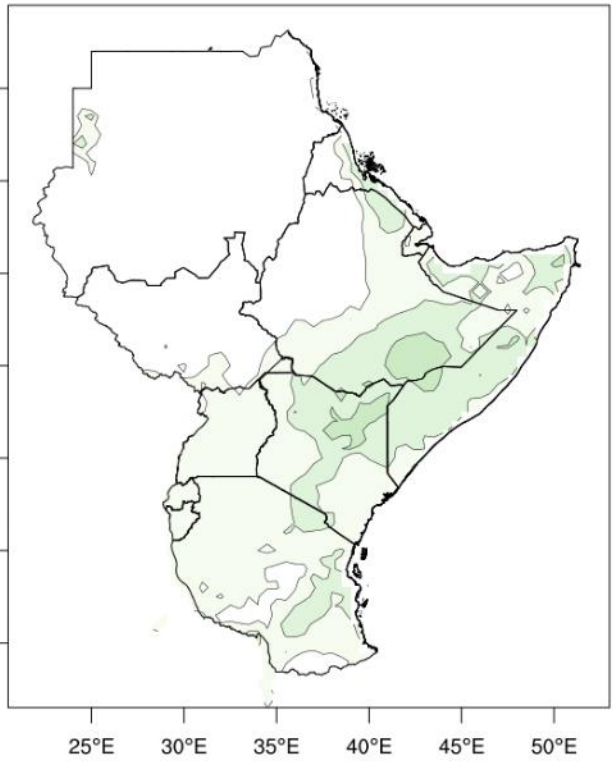
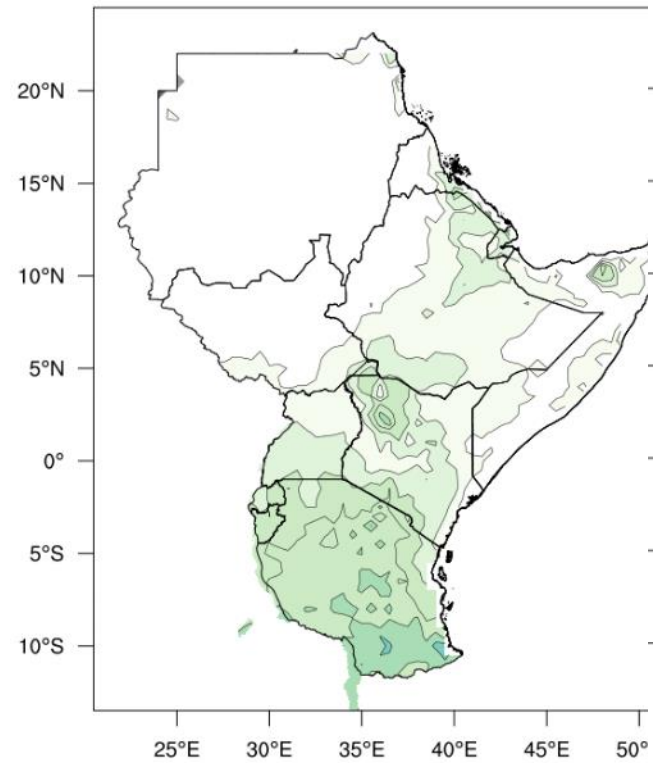
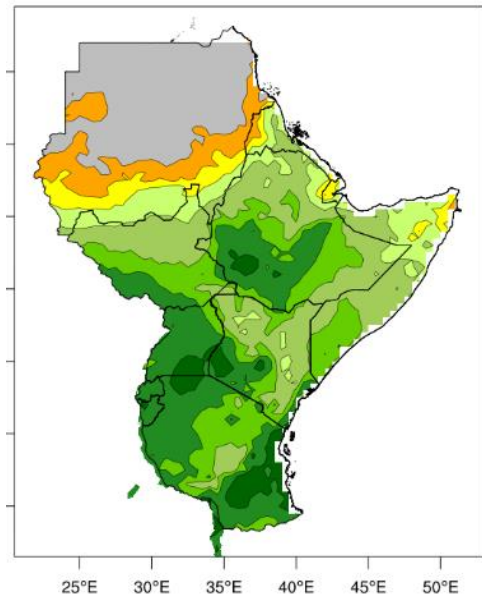
SIGNIFICANCE OF THE LONG RAINS

March

April

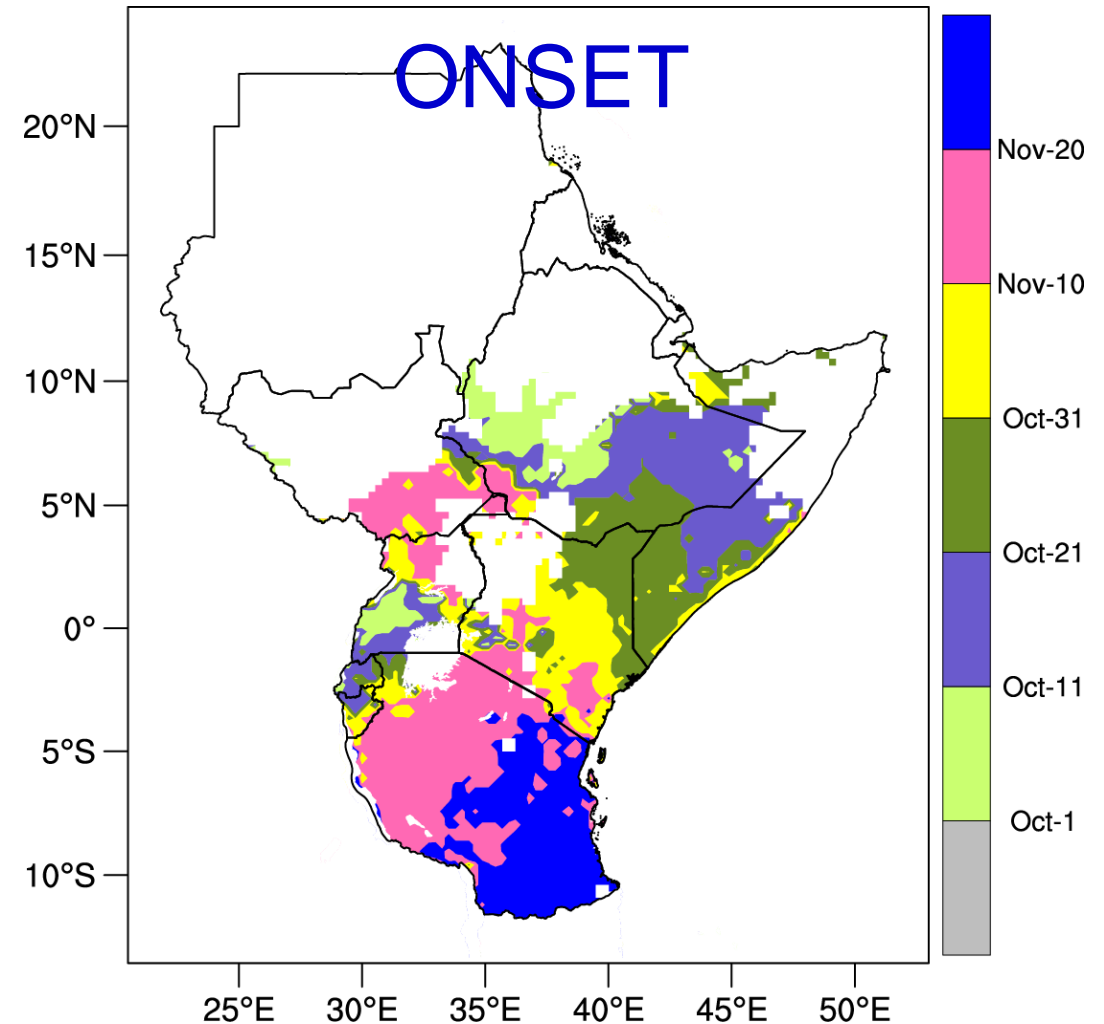
May

March-May



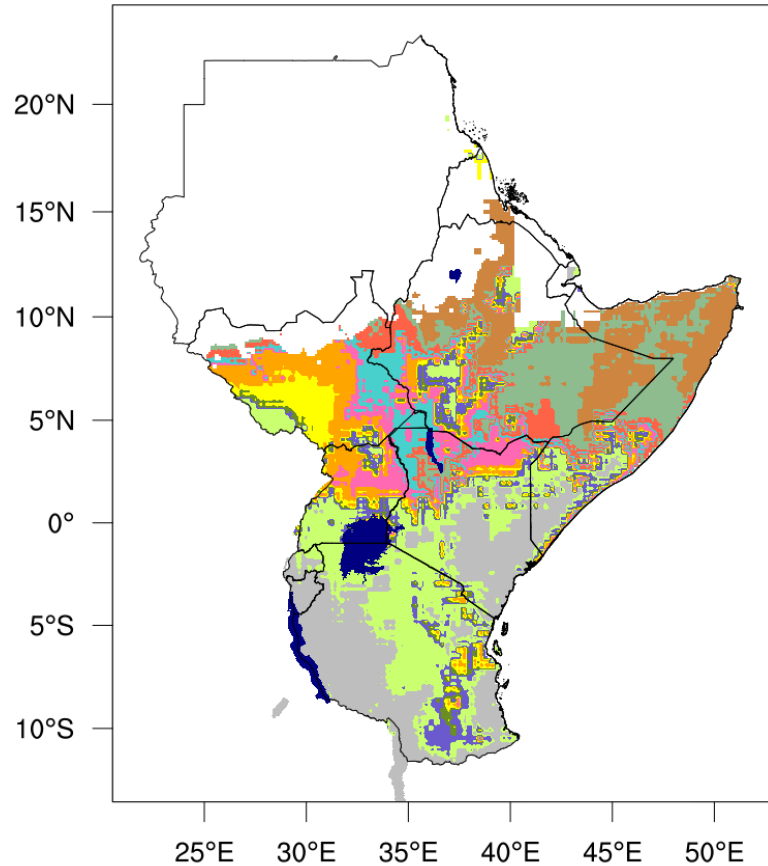
REGIONALIZED PRODUCTS

- When will the rain begin?
- How likely is a late or early onset of the rainy season?
- Use regionally uniform criteria
- Establish observational and model baselines

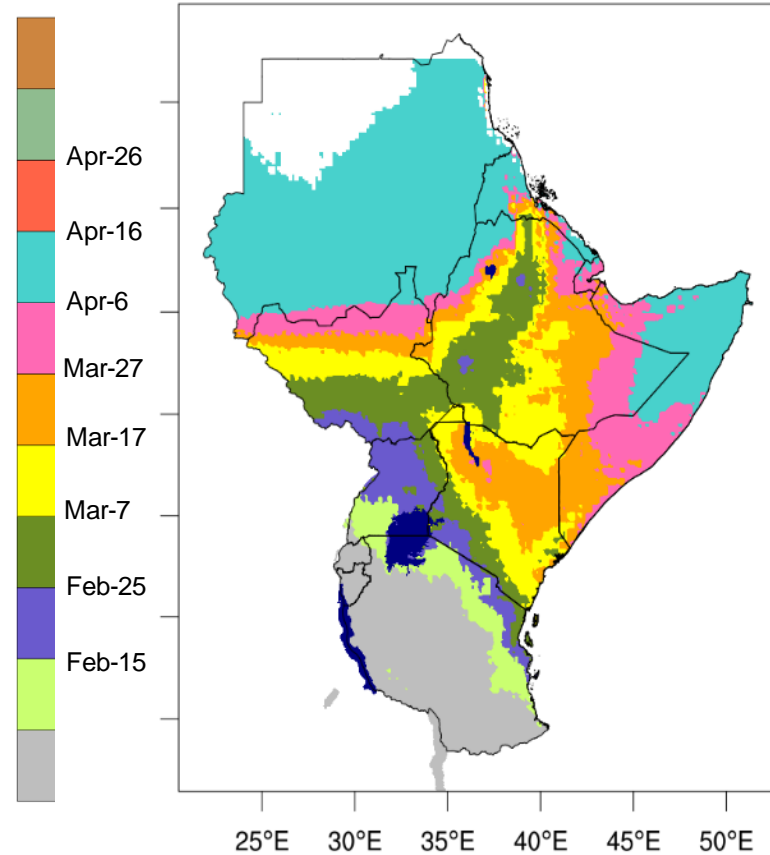


MAM 2018 SEASONAL CHARACTERISTICS

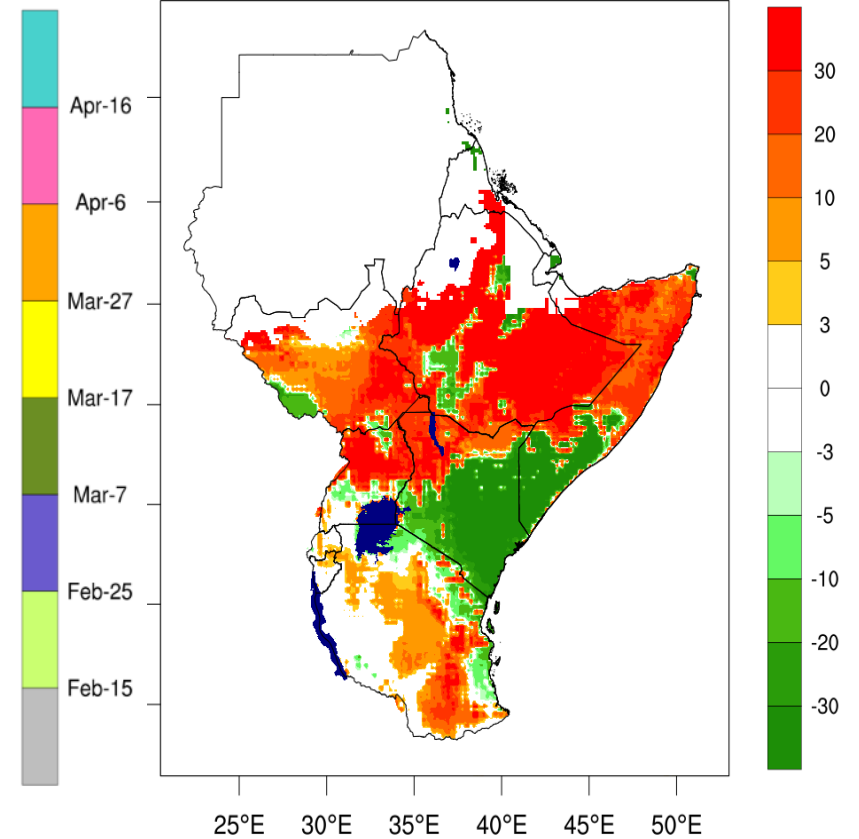
ONSET FORECAST



CLIMATOL.



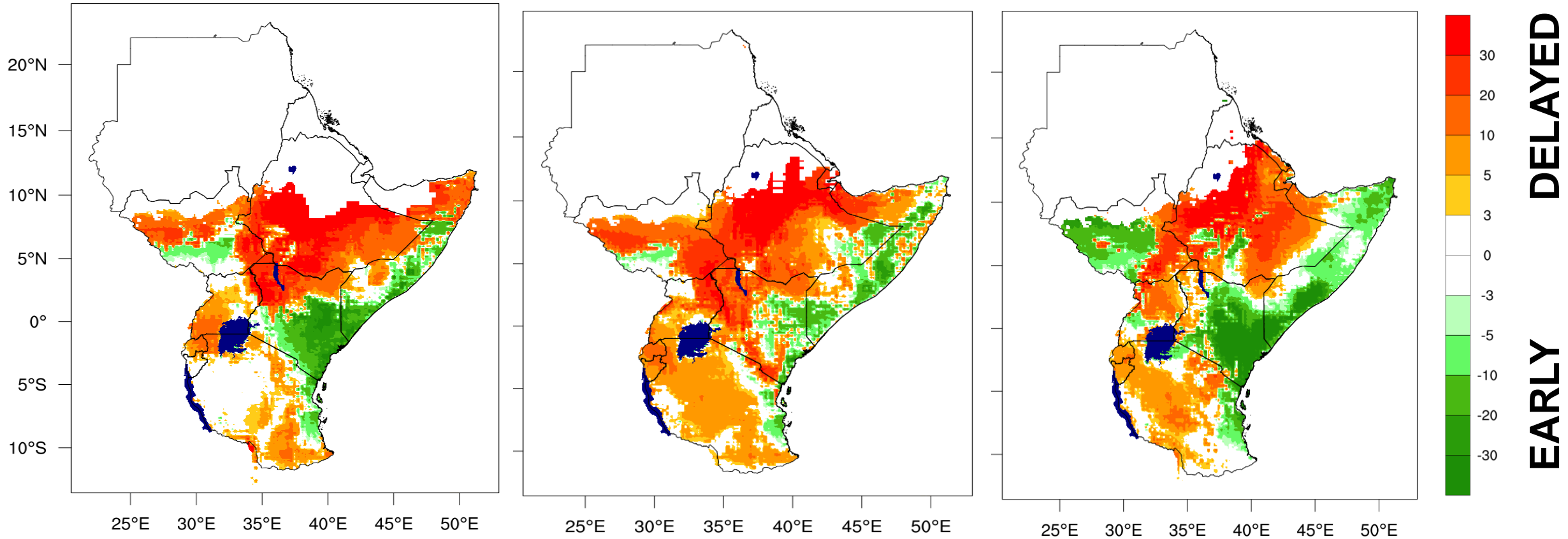
ANOMALY (DAYS)



DELATED
EARLY

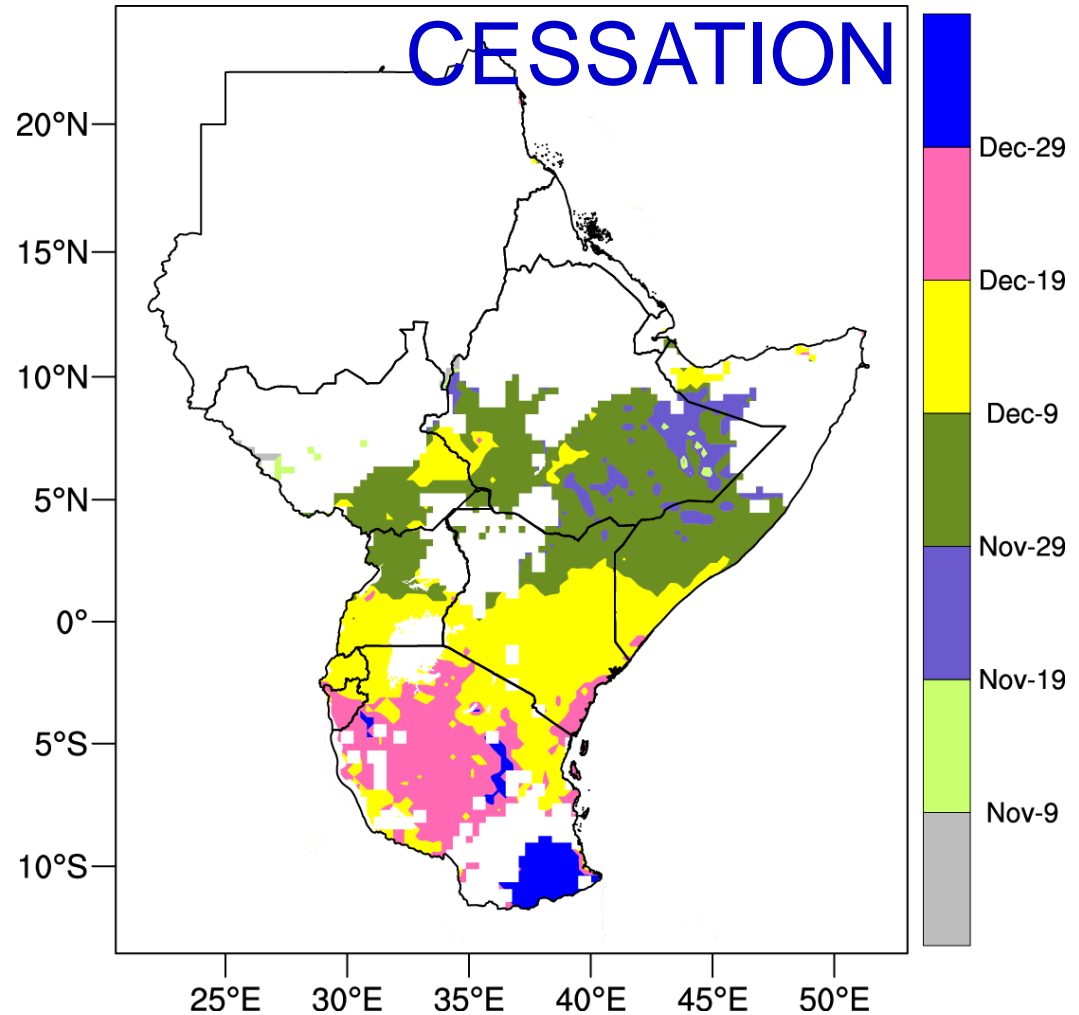
MAM 2018 SEASONAL CHARACTERISTICS

ONSET ANOMALIES (DAYS – Ensemble Members)

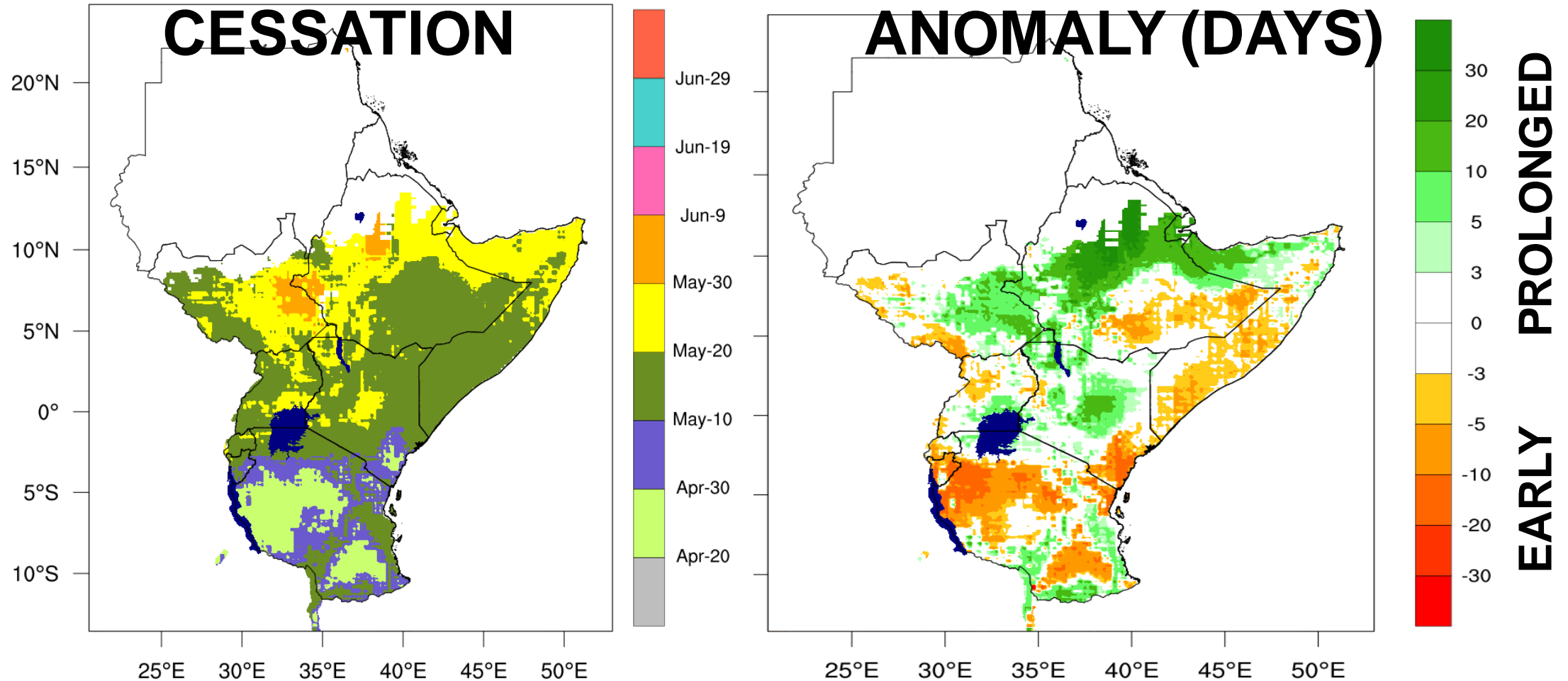


REGIONALIZED PRODUCTS

- When will the rain end?
- How likely is an early or late withdrawal?
- Establish a baseline for rainfall withdrawal for all seasons

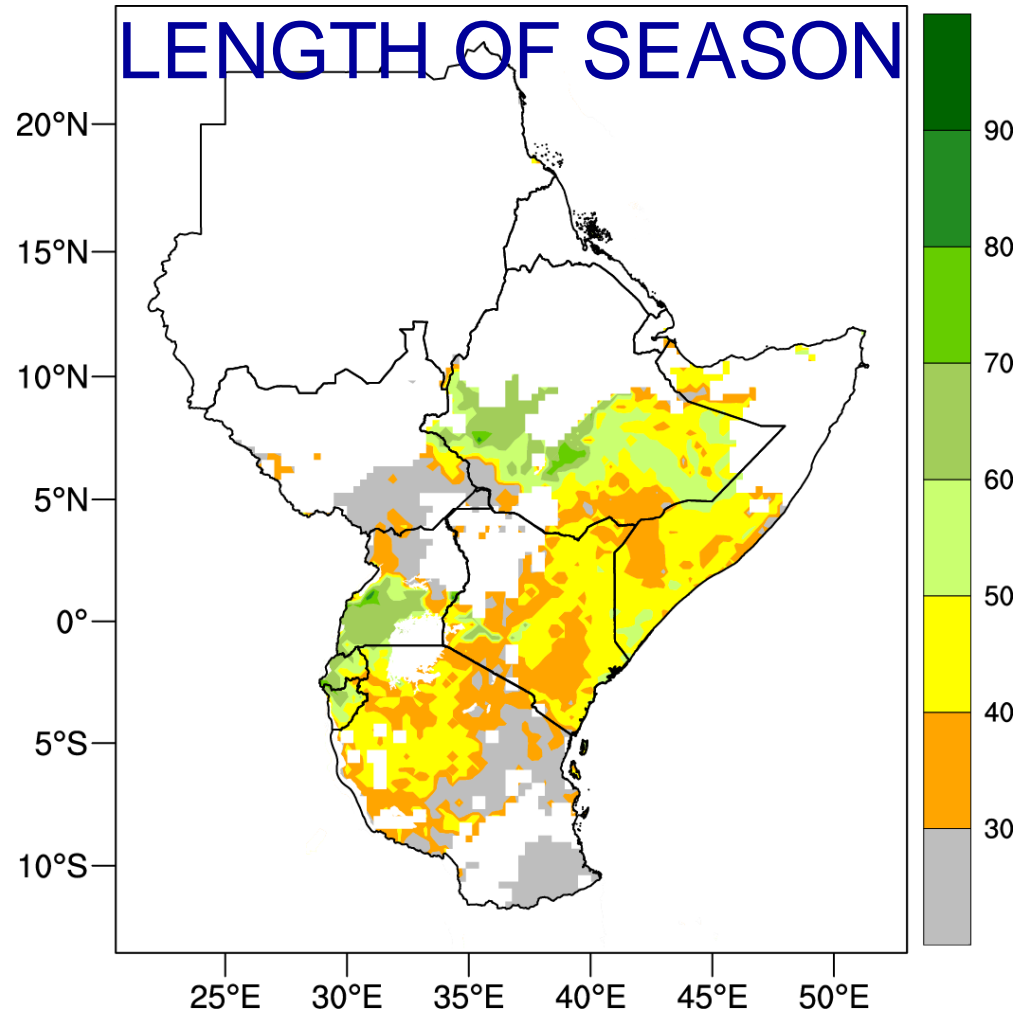


MAM 2018 SEASONAL CHARACTERISTICS



REGIONALIZED PRODUCTS

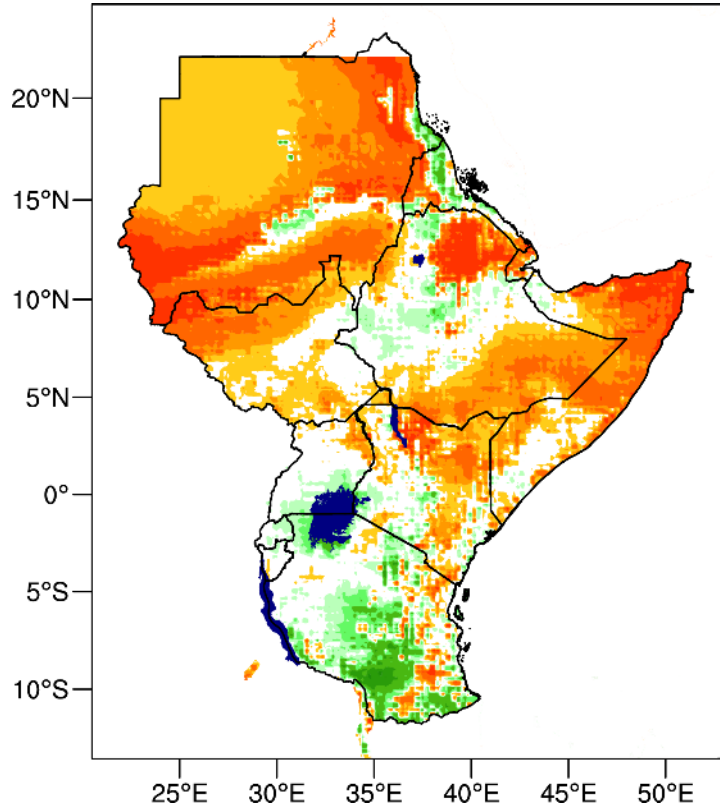
- How long is the length of the season?
- How does it compare with the long-term normal?
- Establish a baseline at each grid point over GHA to compare it with the long term normal



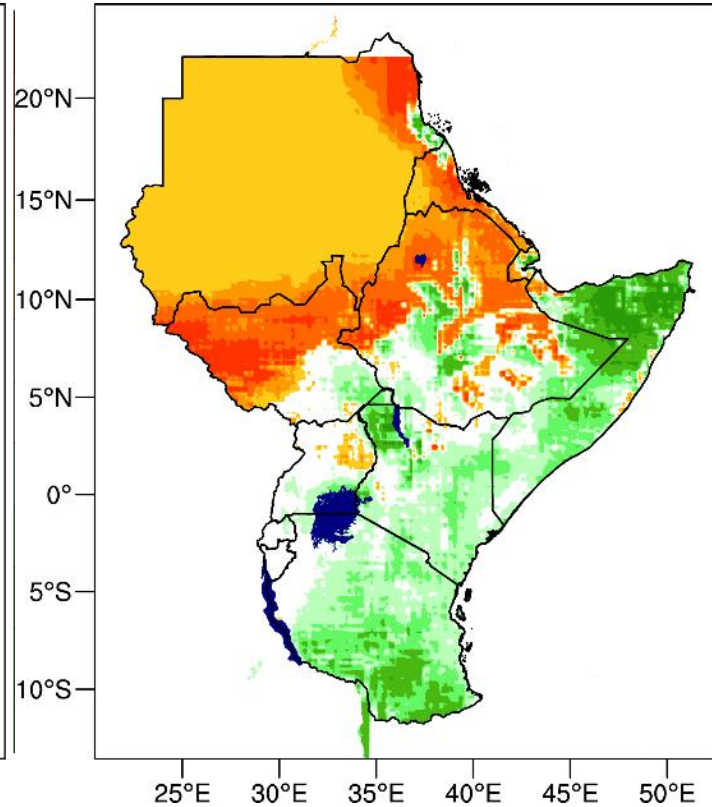
EXTENDED DRY ANOMALIES FOR OND 2017

Continuous days with < 1 mm/day

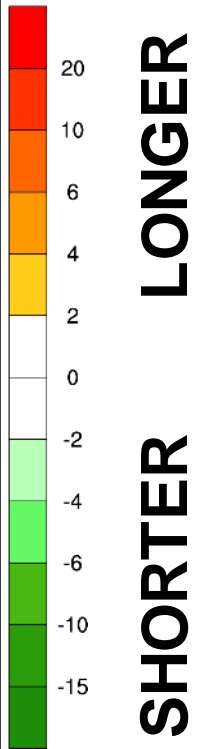
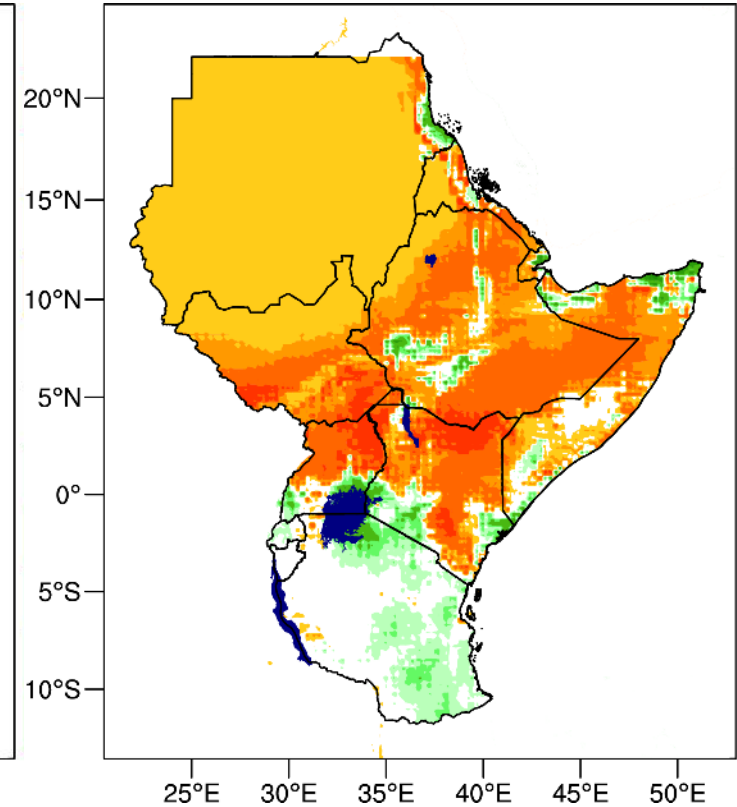
October



November



December



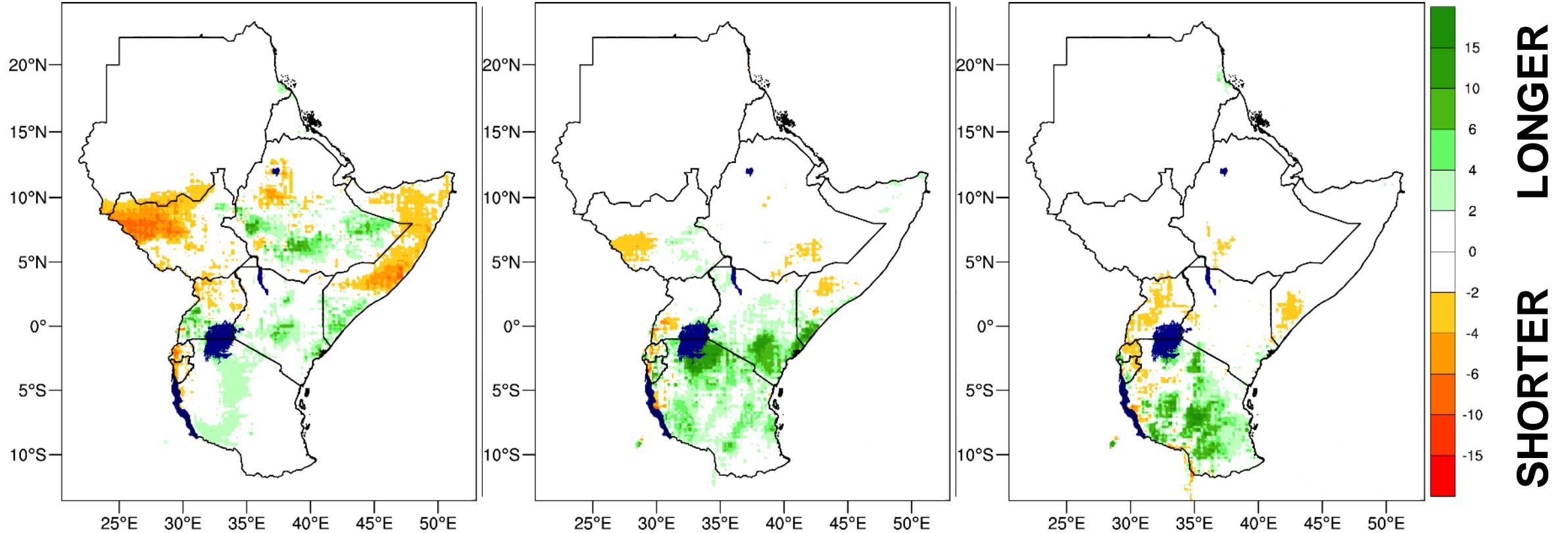
EXTENDED WET ANOMALIES FOR OND 2017

Continuous days with > 5 mm/day

October

November

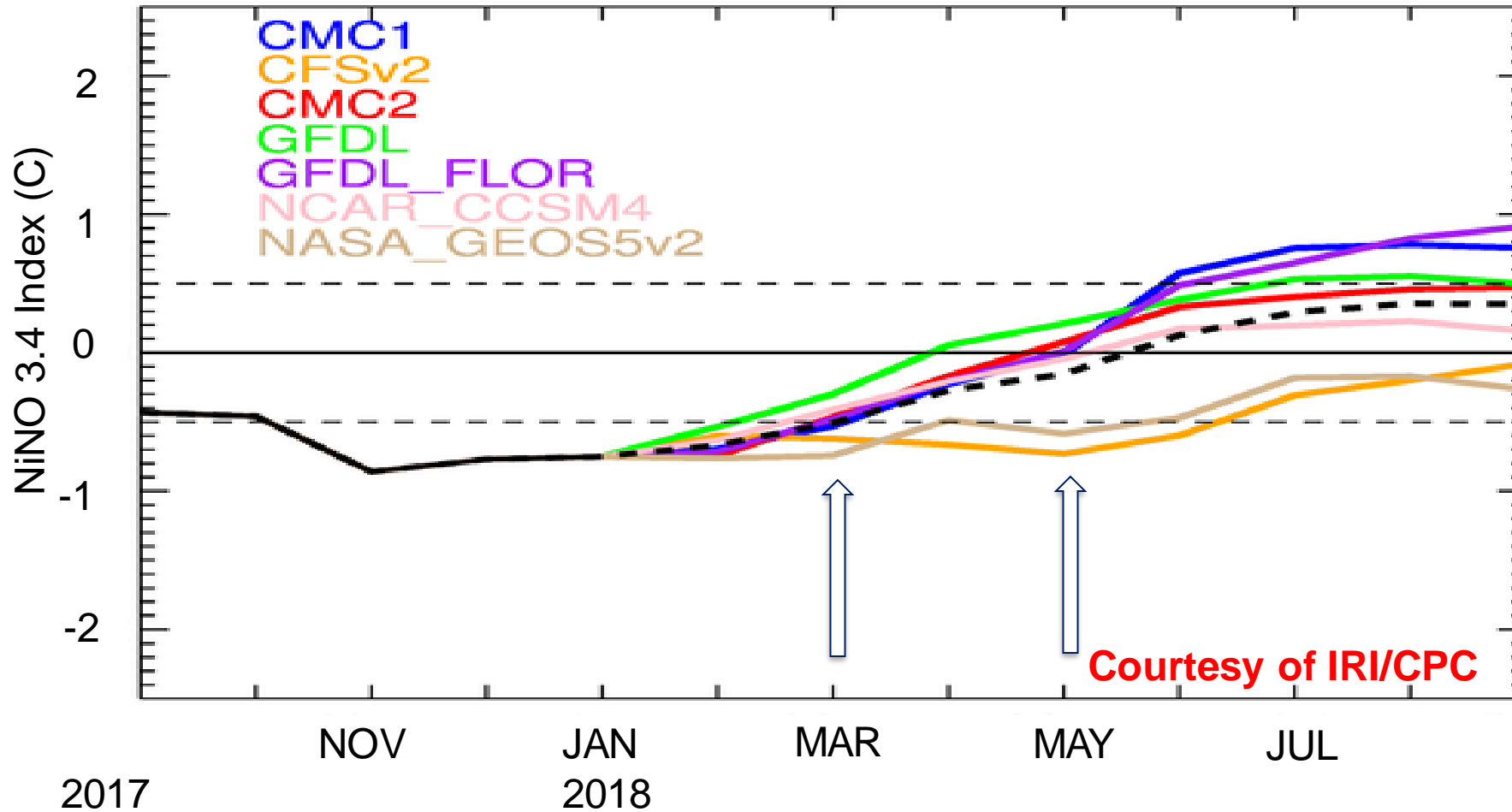
December



GHACOFs – STATISTICAL and ANALOGUE-based FORECASTS

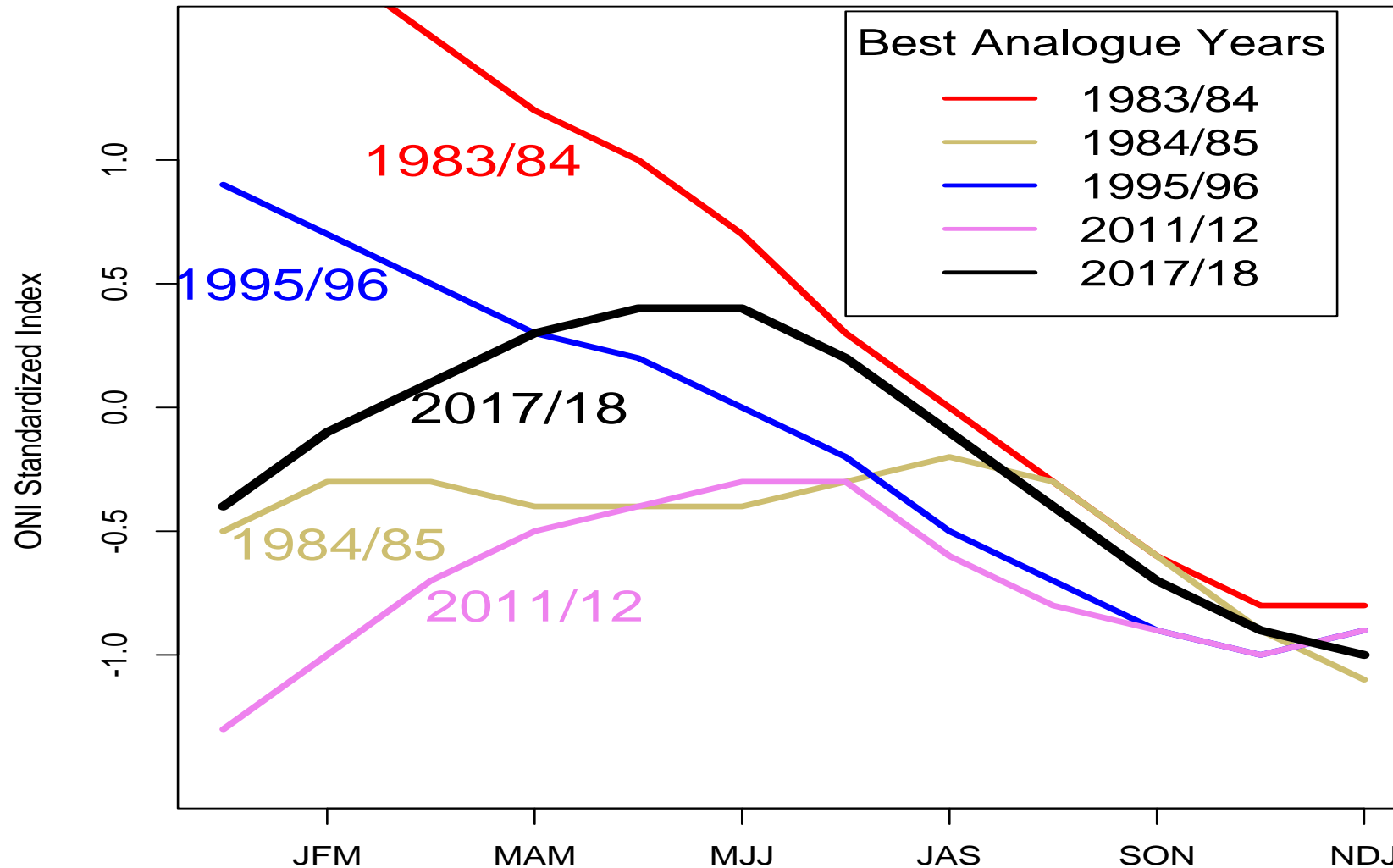
NINO 3.4 SST FORECAST FOR 2018

NMME scaled Nino3.4, IC=201802

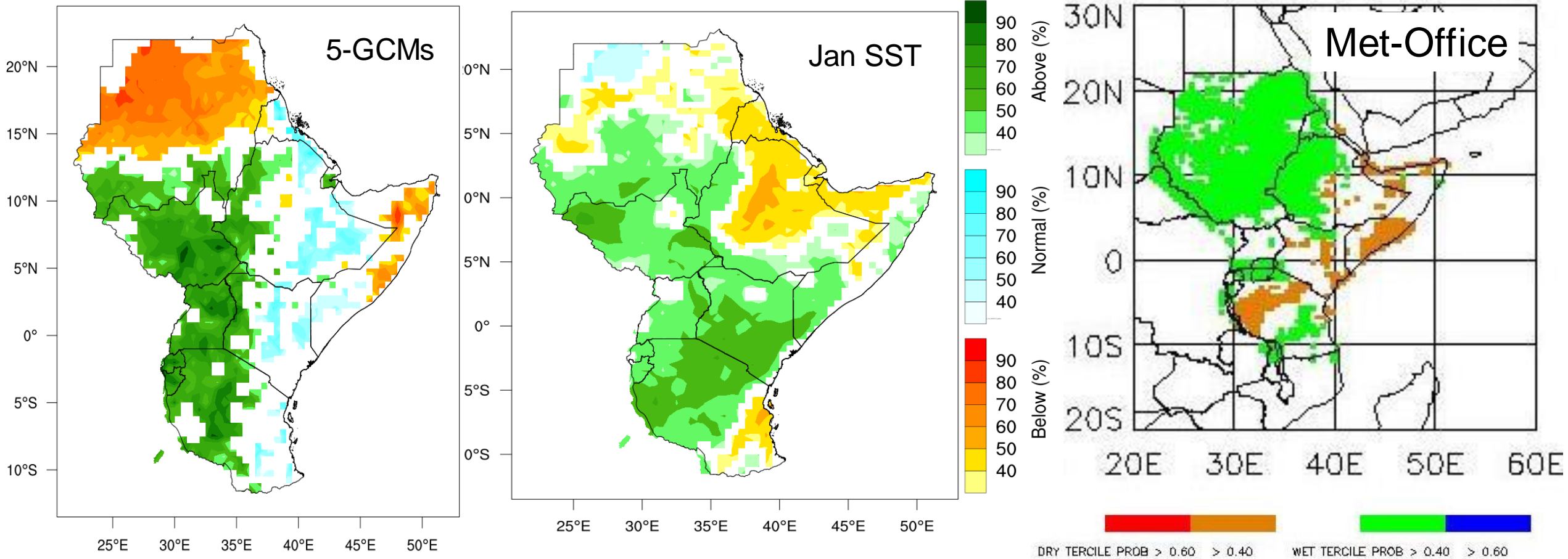


Cooler SSTs over the Central Pacific changing into neutral phase through May

COMPARISON OF CENTRAL PACIFIC SSTS

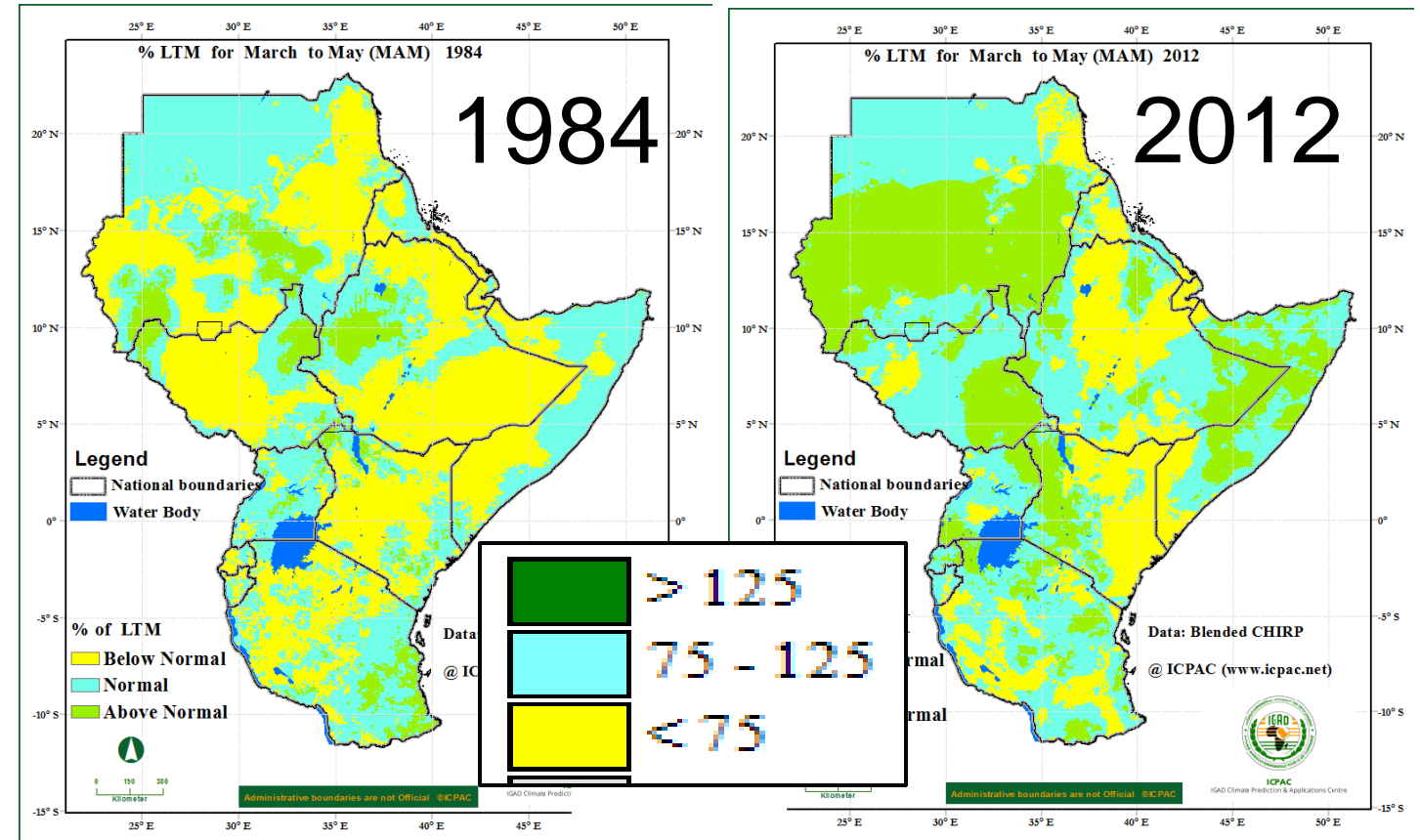
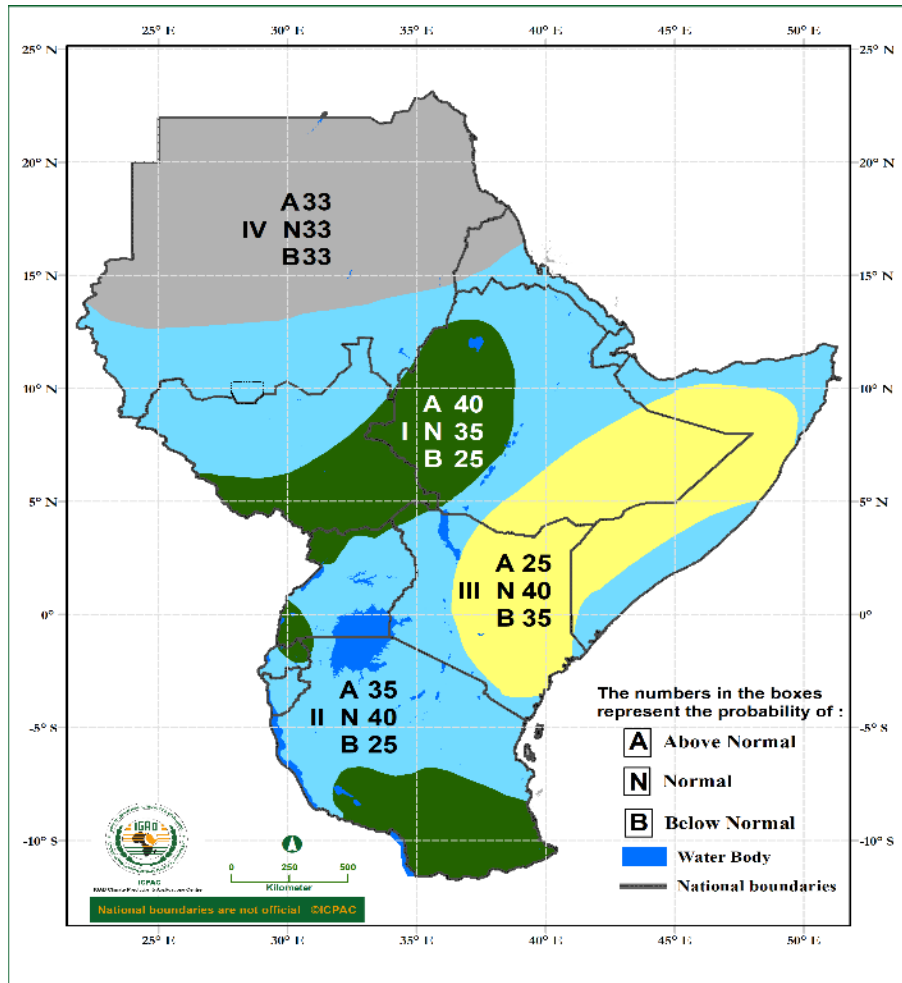


INPUTS FOR CONSENSUS FORECASTS



CONSENSUS MAM 2018 RAINFALL OUTLOOK

Analogue Years

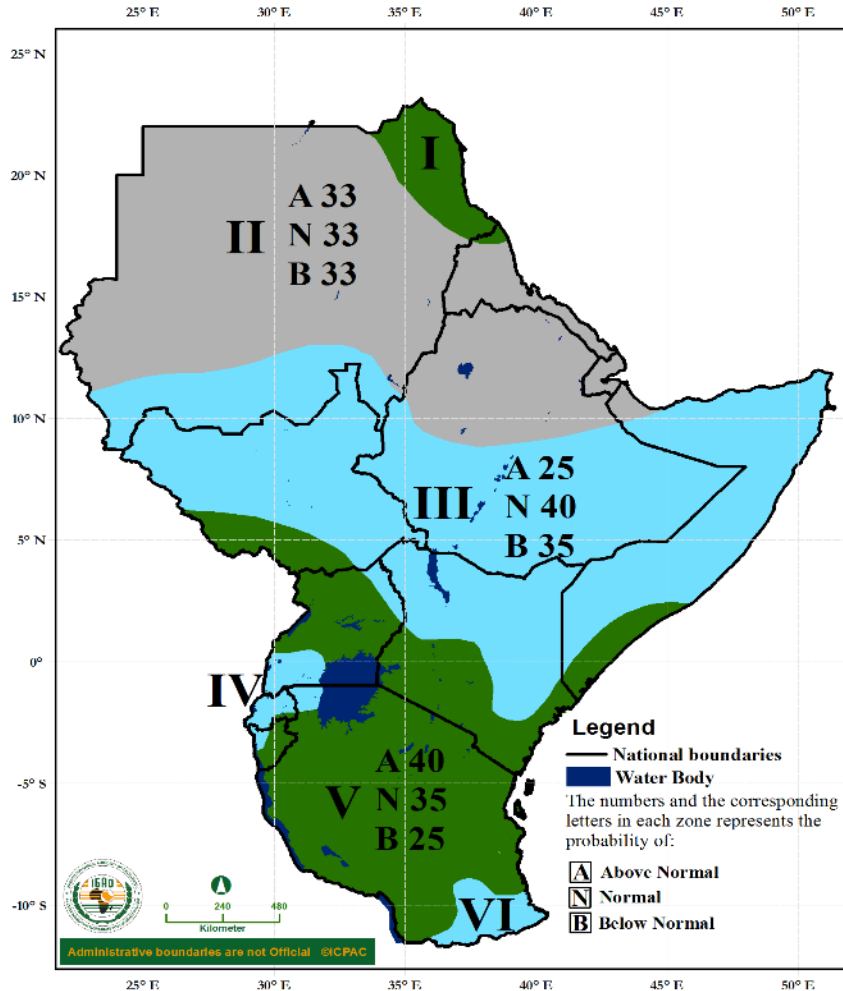




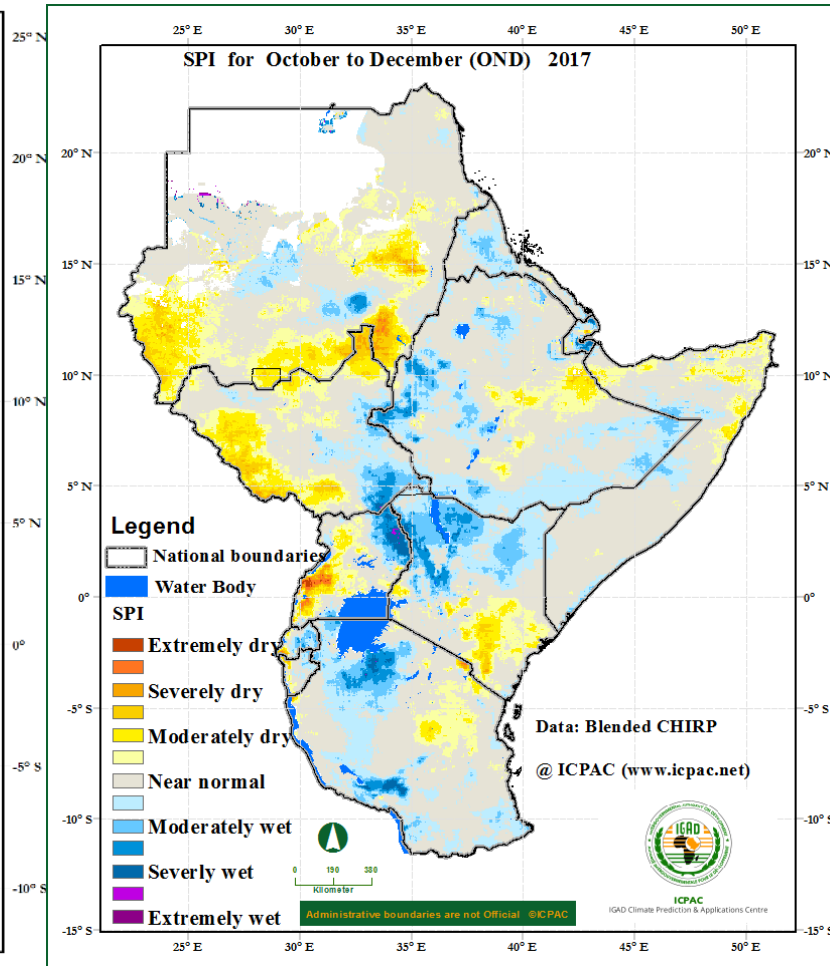
PEACE, PROSPERITY AND
REGIONAL INTEGRATION

SECTORAL ANALYSIS: IMPLICATION AND MITIGATION STRATEGIES OF SEASONAL FORECAST

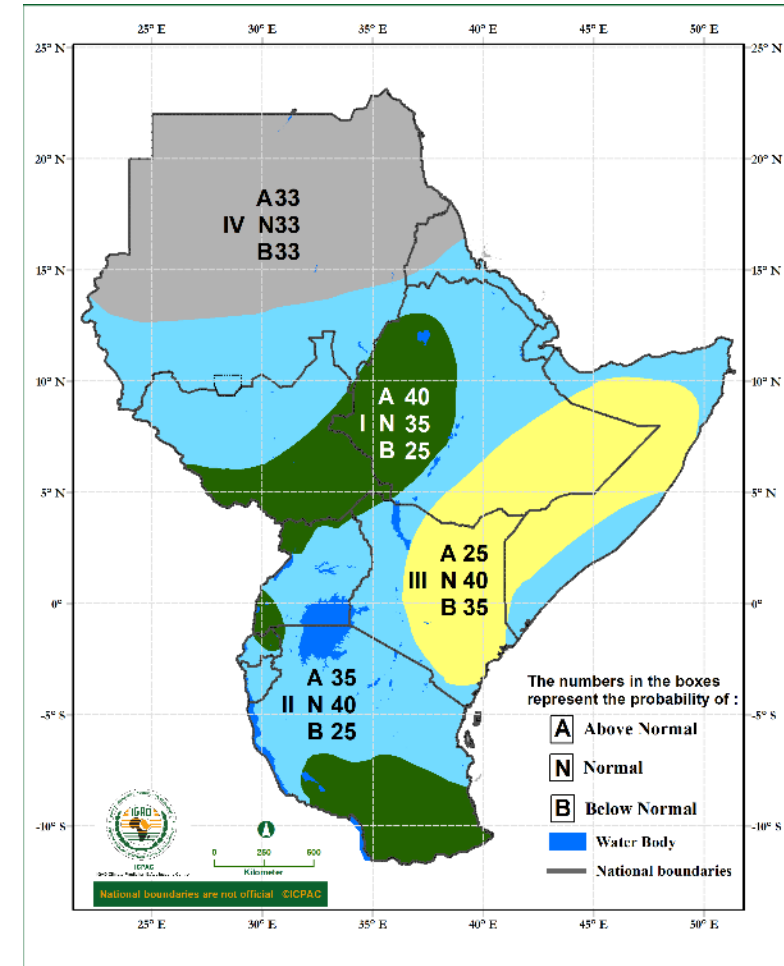
Previous Consensus climate Outlook e.g., October – December 2017



Previous SPI e.g., Oct – Dec 2017



Current Consensus climate Outlook e.g., March – May 2018



Sectoral analysis of implication and mitigation strategies for season (sector working groups) – Mitigation and Response

- **Agriculture & Food Security**
- **Water & Energy**
- **Livestock**

- **Disaster Risk Management**
- **Health**
- **Media**

REPORTING TO PLENARY

Sector analysis:

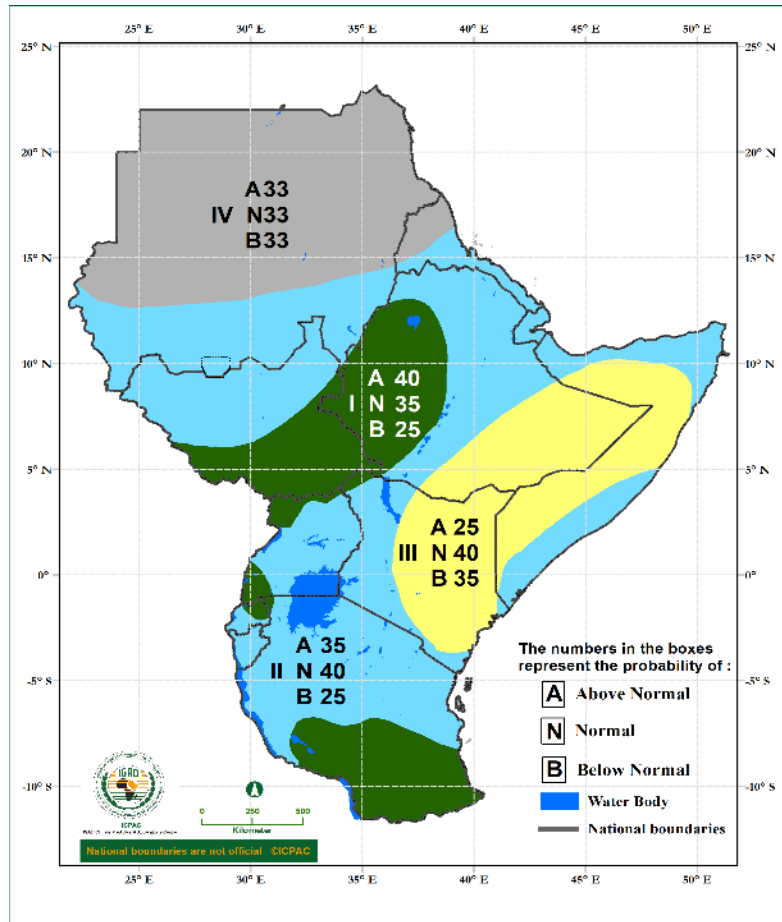
- Performance and measures that were taken to lessen impacts of the previous seasonal forecast
- Implications and mitigation strategies for Climate Outlook season



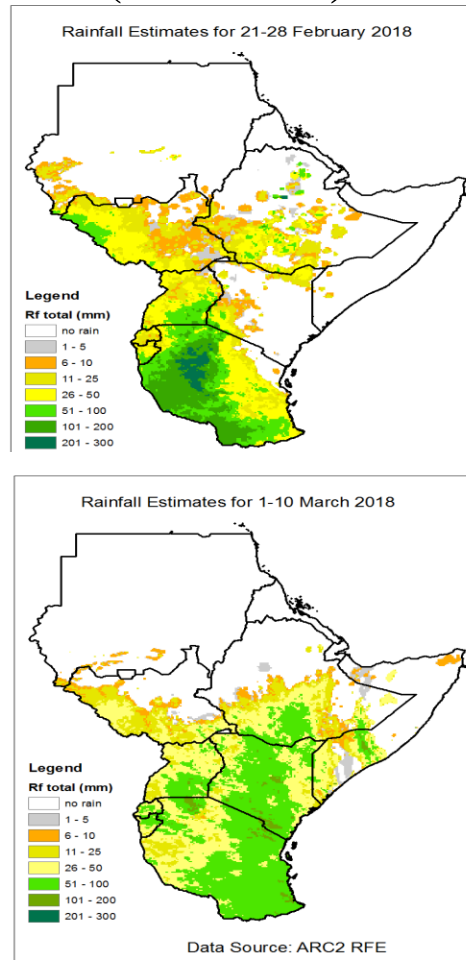
PEACE, PROSPERITY AND
REGIONAL INTEGRATION

UPDATE OUTLOOK

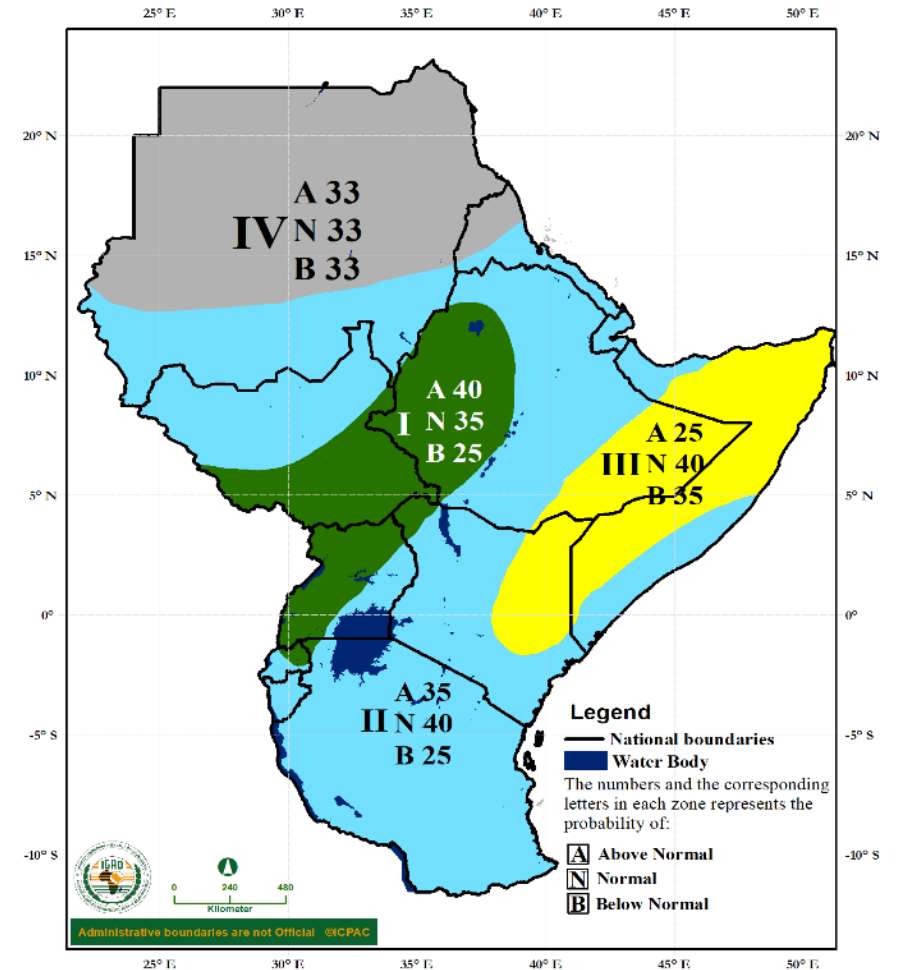
GHACOF MAM Outlook



OBSERVED (Feb-Mar)



Update MAM





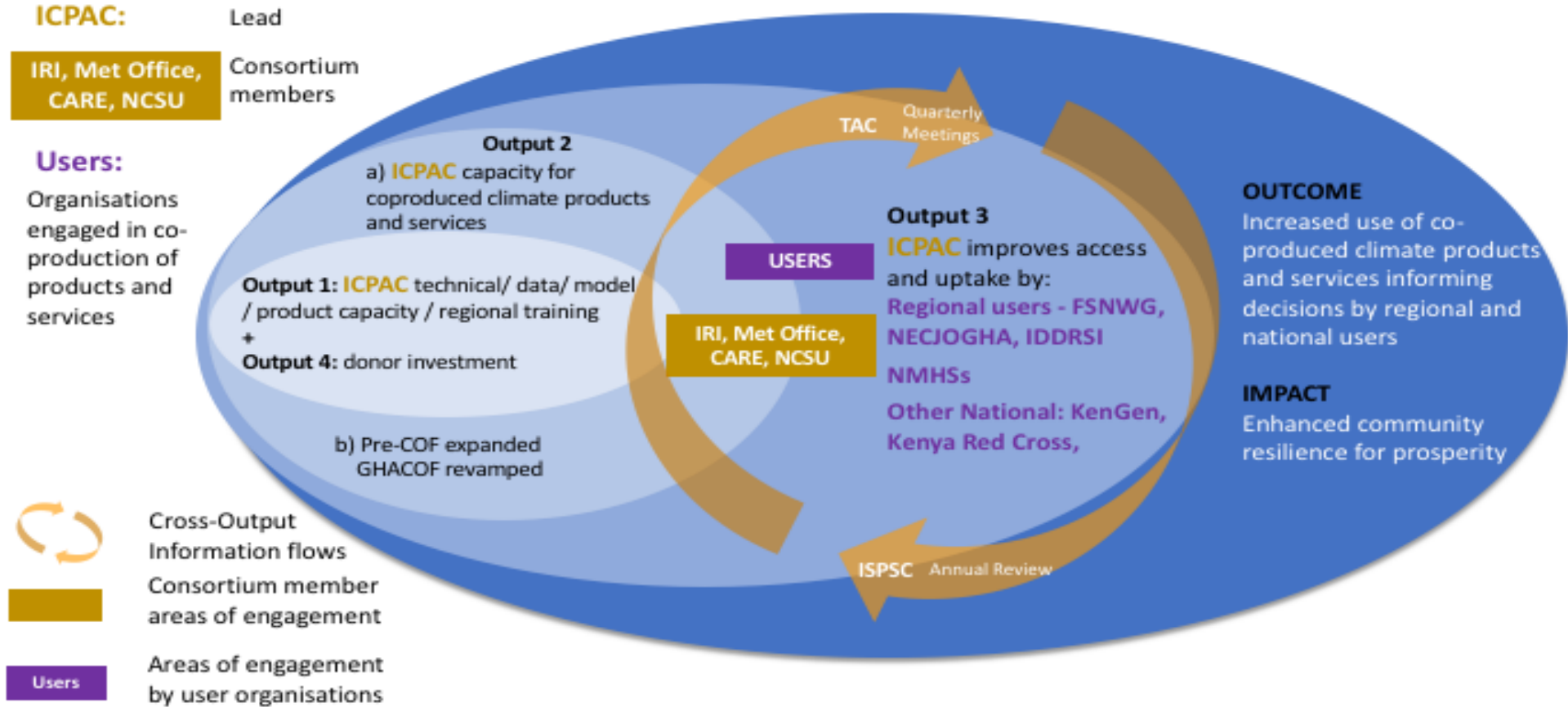
PEACE, PROSPERITY AND
REGIONAL INTEGRATION

CHALLENGES AND FUTURE ENDEAVORS

CHALLENGES

- Funding:
 - Expand multisectoral involvements
 - Conduct specific sectoral training sessions
 - Skilled manpower to perform operational research to improve forecast products
- Computing resource
- GCM Outputs

FUTURE ENDEAVOURS -- WISER SUPPORT TO ICPAC PROJECT (W2-SIP)

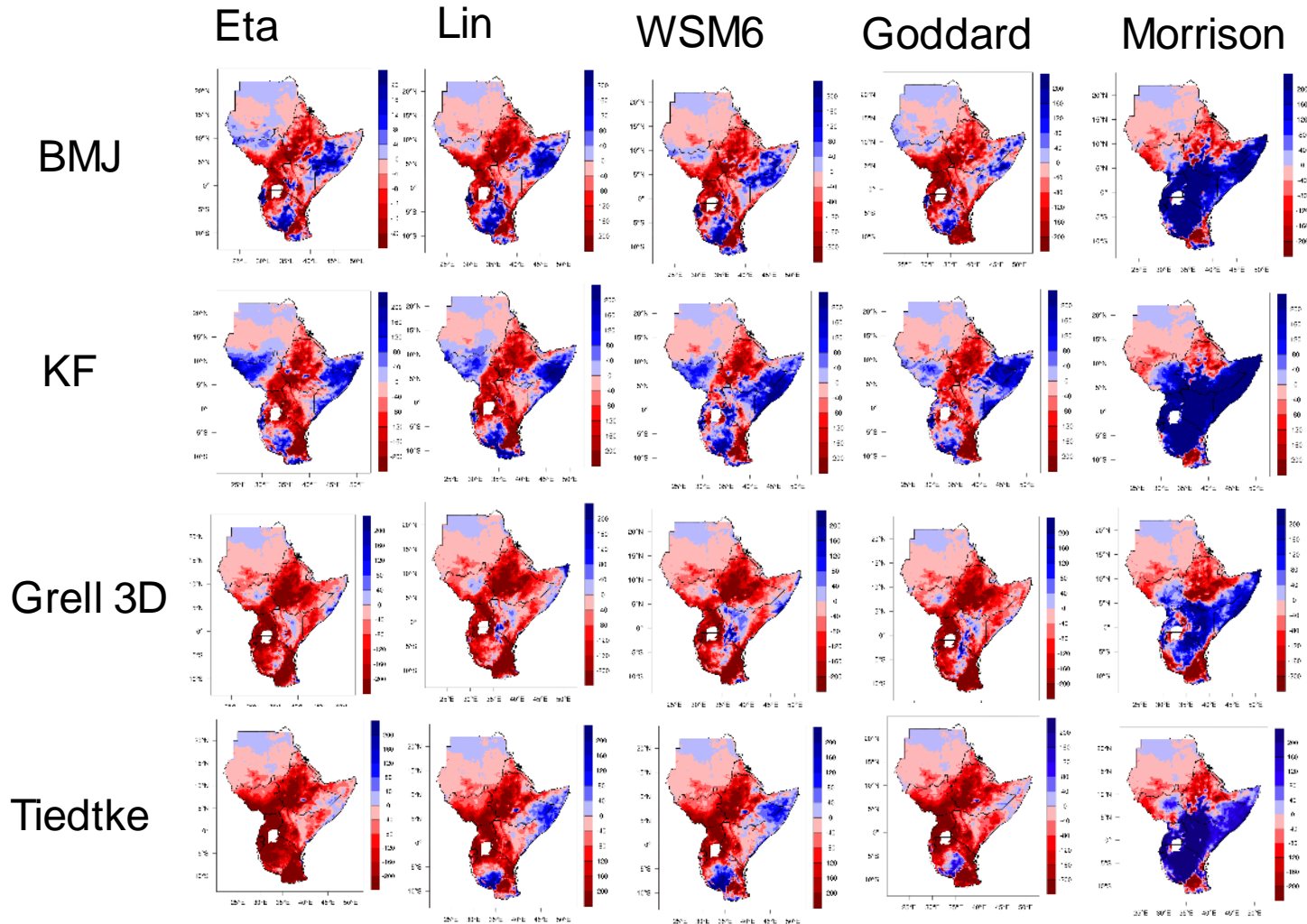


FUTURE ENDEAVOURS

- Develop a system that enables NMHSs to access ICPAC's computing resources to analyze high resolution model forecasts
 - Co-produce downscaled products that are relevant locally and nationally
 - Update forecasts from three-month rolling model outputs
- Ensemble forecasting for risk management
- Advance the use of climate information in critical areas of regional importance (user needs identification, coproduction, and research)

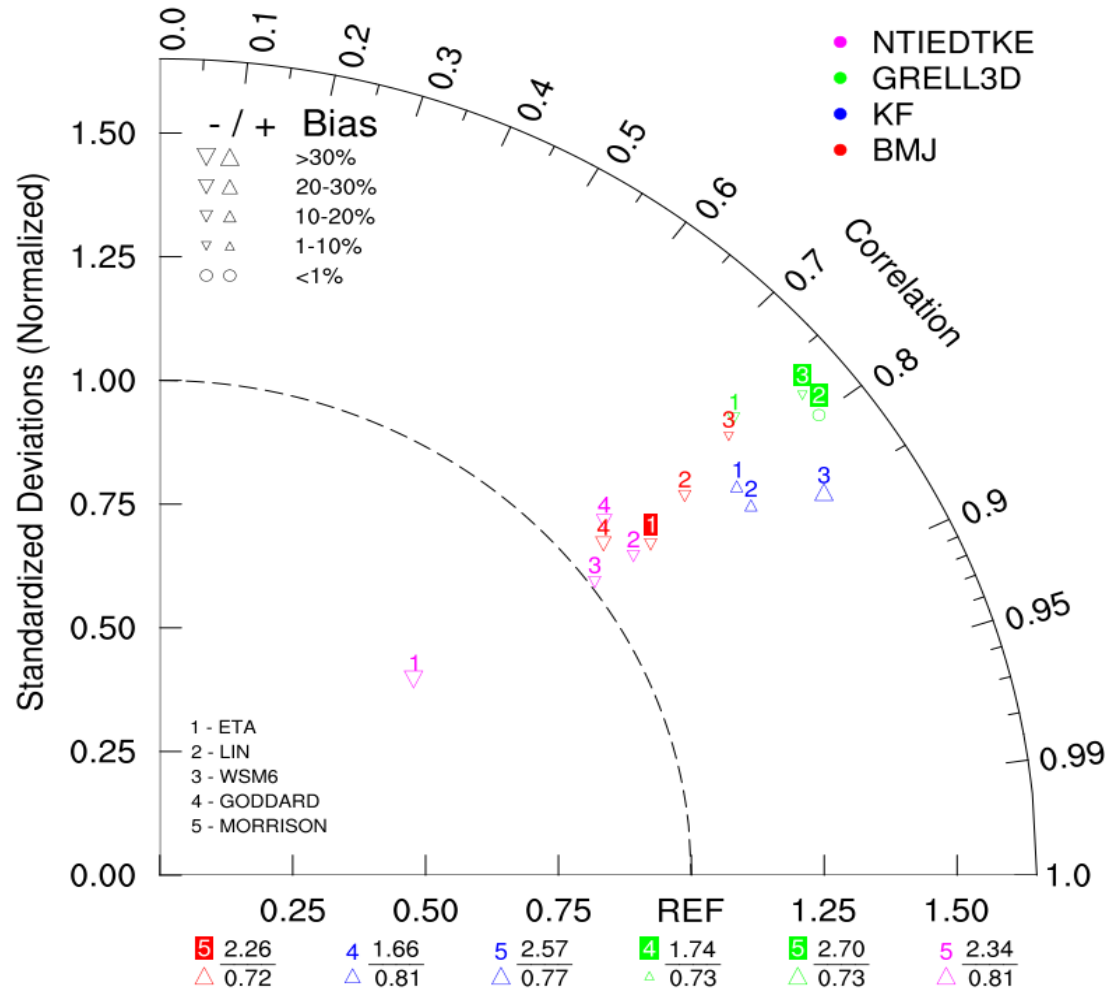
Research to Improve Forecasts

WRF SENSITIVITY WORK AT ICPAC



- Different physics parameterization schemes yield different results
- Sensitivity study crucial to improve the WRF model applicable for GHA
- Current consideration is for convection and microphysics sensitivities of WRF

WRF SENSITIVITY WORK AT ICPAC



- Skill of combination of sensitivity simulations for MAM
- Best model configuration should yield high correlation (1), low bias(0), and same variance as observed (1)
- KF has the highest correlation, but excessive over estimation, while Eta largely underestimate observation
- Final customization work will produce consistent and better forecasts

CURRENTLY WORKING ON

- Customize a state-of-the-art Regional Climate Model for the region
 - Reproduce past observations
 - Year-to-year variabilities captured
 - Establish baselines for user relevant products
- Continue engaging NMHSs and stakeholders to identify needs and improve products
 - Advance the use of climate information in critical areas of regional importance

SUMMARY

- Ensemble Forecasts to improve accuracy and identify uncertainty
- Coproduction will be future focus in GHACOF
- Improved and extended GHACOFs
- Understanding of local rainfall response to SST variability forcing in different ocean basins will improve seasonal forecasting in the region

THANK YOU VERY MUCH!