



Statement from the 64th Greater Horn of Africa Climate Outlook Forum (GHACOF64)

22-24 May 2023; Addis Ababa, Ethiopia

1. Consolidated Objective Climate Outlook for June to September 2023 Rainfall Season

June to September (JJAS) is an important rainy season, especially in the northern regions of the Greater Horn of Africa (GHA), where it contributes to more than 50% of the annual rainfall. The forecast indicates increased chances for drier conditions (below average rainfall) over most parts of the region during JJAS 2023 (Figure 1), specifically, Djibouti, Eritrea, central and northern Ethiopia, western Kenya, northern Uganda, much of South Sudan and Sudan. Probabilities for drier conditions are particularly enhanced (> 50%) over central and north-eastern Ethiopia and parts of central and western South Sudan. On the other hand, coastal parts of Kenya, parts of southern and northern Somalia, isolated areas over the rangelands of eastern Ethiopia, southern Uganda, and Ethiopia-Sudan cross border areas are likely to experience wetter than average (above-normal) conditions. In some regions, forecast probabilities for above-, near- and below-normal rainfall are equal at 33%, for example, over central and western Sudan and in transition zones separating regions where above normal is favoured from regions where below normal is favoured.

The consolidated objective temperature forecast indicates an increased likelihood of warmer than average conditions over the entire region (Figure 2). Probabilities for warmer than average temperatures are most enhanced over northern Sudan, parts of southern and central to western Ethiopia, central and northern Kenya, central and northern Somalia, and coastal parts of Tanzania.

The predicted start dates of the June to September 2023 season are provided in Figure 3. Consistent with the outlook for seasonal rainfall totals (Figure 1), analysis of daily predicted rainfall further indicates delayed or near-normal onset dates over much of Uganda, parts of western Kenya, and parts of southern South Sudan (Fig. 3).

An analysis of the Standardized Precipitation Index (SPI) using both observed and predicted precipitation over 4-, 9-, and 15-month period ending on 30 September 2023 (Figure 4) indicates moderately dry conditions in the northern regions. This is especially over Ethiopia and Sudan for both the predicted 4-month period and the observed/predicted 15-month period. However, recent relatively wet conditions in parts of Ethiopia result in a positive SPI in central Ethiopia for the 9-month period Jan-Sep 2023.

The outlook is relevant for seasonal timescales and for relatively large geographical areas. Local and month-to-month variations might occur as the season progresses. While drier than usual conditions are most probable over much of the GHA region usually receiving rain in the JJAS season, sporadic heavy rainfall may occur in areas with an increased likelihood of near normal to below normal rainfall and vice versa. ICPAC will provide regional updates on a regular basis while the National Meteorological and Hydrological Services (NMHSs) will provide detailed national and sub-national climate updates.

2. The Climate Outlook Forum

The 64th Greater Horn of Africa Climate Outlook Forum (GHACOF 64) was convened on 24th May 2023 by the IGAD Climate Prediction and Applications Centre (ICPAC) and Ethiopian Meteorological Institute (EMI), in collaboration with the National Meteorological and Hydrological Services of IGAD Member States, World Meteorological Organization (WMO), and other partners to document and share the climate impacts across the region and formulate responses to the climate outlook for the June to September 2023 rainfall season. The GHA region comprises of Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania, and Uganda. The forum reviewed the state of the global climate system including the El Niño Southern Oscillation (ENSO) conditions, Sea Surface Temperatures (SSTs) over Atlantic and Indian Oceans, including the Indian Ocean Dipole (IOD) index, and considered their likely impacts on the GHA during the June to September 2023 rainfall season. Climate information users from 5 sectors (disaster risk management, agriculture and food security, water resources and energy, livestock, and media), NGOs, and development partners actively participated in the formulation of mitigation strategies of the potential impacts of the climate forecast in their respective domains. GHACOF 64 was preceded by sectoral co-production meetings from 22nd – 23rd May 2023.

3. Methodology

In line with the recommendation of the World Meteorological Organization (WMO), ICPAC has implemented an objective seasonal forecast procedure to generate climate forecasts for the Greater Horn of Africa. May 2023 initialized seasonal forecasts from seven Global Producing Centres (GPCs) were utilized and processed using three calibration techniques (canonical correlation analysis, linear regression, and logistic regression) to develop the JJAS 2023 seasonal climate outlook. The final consolidated forecast is obtained by averaging the forecasts generated by the three different approaches.

Forecast probability distributions are established objectively to indicate the likelihood of above-, normal, or below-normal rainfall for each zone. Above-normal rainfall is defined as the upper third, below-normal is the lower third, and the normal is the range between the upper and the lower third of the rainfall amounts. Climatology here refers to weather conditions, averaged over a 30-year period (1991-2020). Probability distributions for temperature are also established. The rainfall and temperature outlooks for June to September 2023 for various zones within the GHA region are given in Figure 1 and Figure 2, respectively.

Experts also examined the prevailing and predicted SSTs over the Pacific, Indian, and Atlantic Oceans as well as other global, regional, and local climate factors that affect the rainfall evolution during the JJAS season. These factors were assessed using dynamical and statistical models. SST conditions over the equatorial Pacific Ocean were near average over the past few months. The World Meteorological Organisation (WMO) and major global producing centres have indicated a high likelihood of El Niño formation with a more than 80% chance during the June-September season. The JJAS rainfall interannual variability is strongly linked with the SST conditions in the eastern and central equatorial Pacific, where drier than normal conditions typically occur during the El Niño and above-average rainfall is typical during La Niña years. Furthermore, an increased chance for the development of a positive phase of the IOD is predicted through the coming season. Although the IOD is known to impact rainfall variability during the October-December (OND) season, it has little influence during JJAS rainy season. Those ocean-atmosphere phenomena produce global atmospheric and oceanic circulation changes that influence regional climate conditions by modulating regional circulation patterns, especially monsoonal winds, Tropical Easterly Jet, and the Somalia Low-level Jet. Their effects are also modulated by topography and large inland water bodies. Updates on the ENSO condition will be provided regularly by WMO and the major climate centres.

The seasonal forecast was developed during the PreCOF64, a one-week climate capacity building workshop held from 15th to 19th May 2023. During this workshop, regional scientists and national forecasters from ICPAC Member States used ICPAC’s High-Performance Computing (HPC) cluster and co-developed regional and national-level climate outlooks. GHACOF 64 was preceded by sectoral co-production meetings from 22nd – 23rd May 2023.

4. Rainfall Outlook for June to September 2023

The rainfall outlook for various zones within the GHA region is given in Figure 1 below:

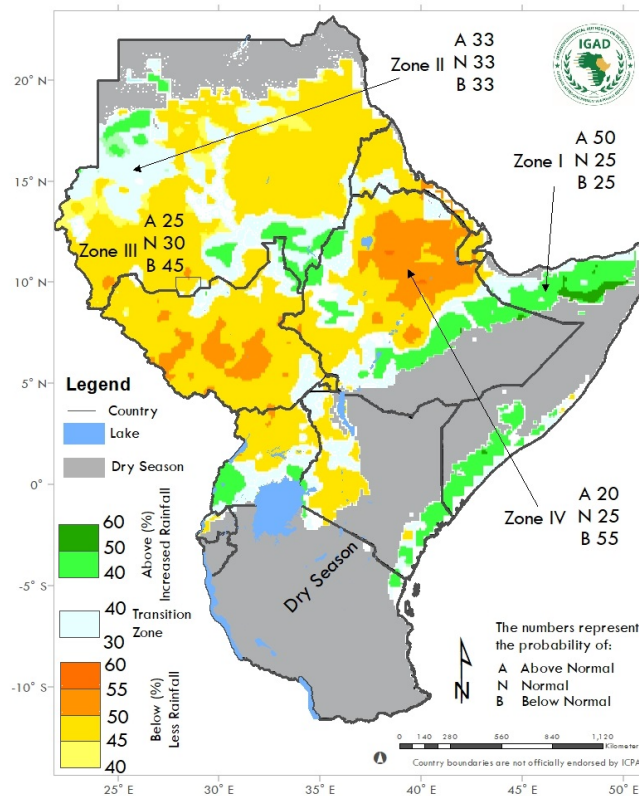


Figure 1: Probability forecast of rainfall for June to September 2023.

- Zone I:** In this Zone (light green), the wetter than normal rainfall category has the highest probability (50%). The probability for near normal and drier than normal categories are at 25% and 25%, respectively.
- Zone II:** In this Zone (cyan), the probabilities of below, normal, and above are equal at 33%. This equal probability zone is also considered a transition zone.
- Zone III:** In this Zone (yellow), the drier than normal rainfall category has the highest probability (45%). The probabilities of the normal and wetter than normal categories are 30% and 25%, respectively.
- Zone IV:** In this Zone (orange), the drier than normal rainfall category also has the highest probability of occurrence (at 55%). The probabilities of the normal and wetter than normal categories are 25% and 20%, respectively.

5. Temperature Outlook for June to September 2023

The temperature outlook for various zones within the GHA region is given in Figure 2 below:

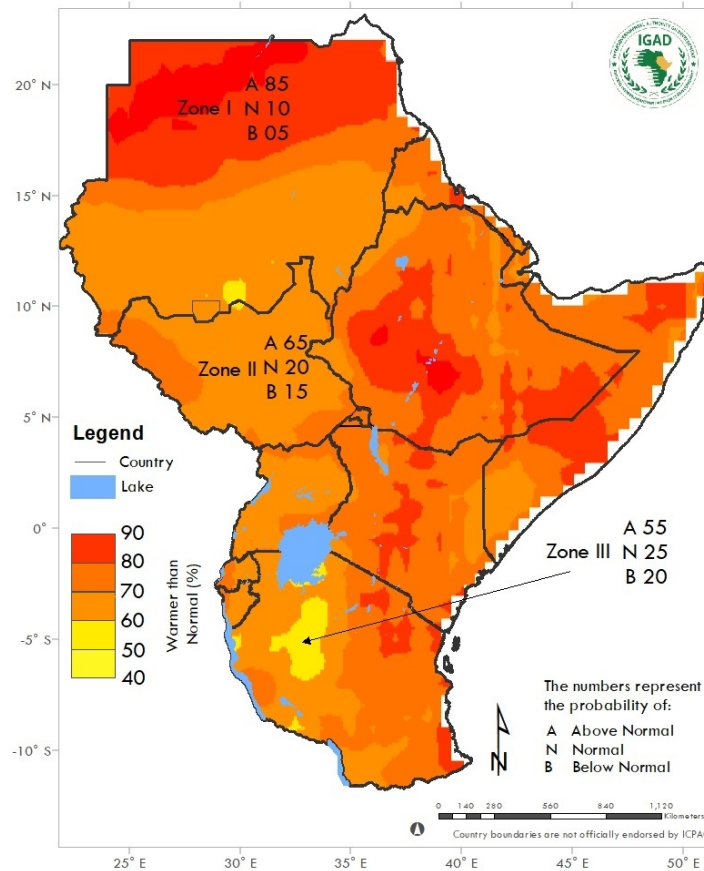


Figure 2: Probability forecast of mean surface temperatures for June to September 2023

Zone I: In this Zone (red), the above normal mean temperature (i.e., warmer) category is most likely at 85%. The probability for near normal and below than normal categories are 10% and 5%, respectively.

Zones II: In this Zone (dark orange), the above normal mean temperature category has the highest probability (at 65%). The probabilities of the normal and below normal categories are 20% and 15%, respectively.

Zones III: In this Zone (yellow) also, the above normal mean temperature category has the highest probability (at 55%). The probabilities of the normal and below normal categories are 25% and 20%, respectively.

Note: In Figs 1 and 2 the 3 numbers (next to A, N and B) for each zone indicate the probabilities of rainfall/temperature in each of the three categories, above-, near, and below-normal. For example, for Fig. 1, the top number (A) indicates the probability of rainfall occurring in the above-normal category; the middle number (N) is for near-normal and the bottom number (B) for below-normal category. In the case of zone I (Fig. 1) for instance, there is 50% probability of rainfall occurring in the above-normal category; 25% probability of rainfall occurring

in the near-normal category; and 25% probability of rainfall occurring in the below-normal category. It is emphasised that boundaries between zones should be considered as transition areas.

6. Probability forecasts of the start of JJAS 2023 season and the expected average onset dates

The average start dates of June to September 2023 season and their probability outlook are provided in Figure 3. The forecast was processed using daily rainfall forecasts from 5 Global Climate Models (ECMWF, Météo-France, CMCC-Italy, DWD-Germany, ECCO-Canada) obtained from the C3S Climate Data Store.

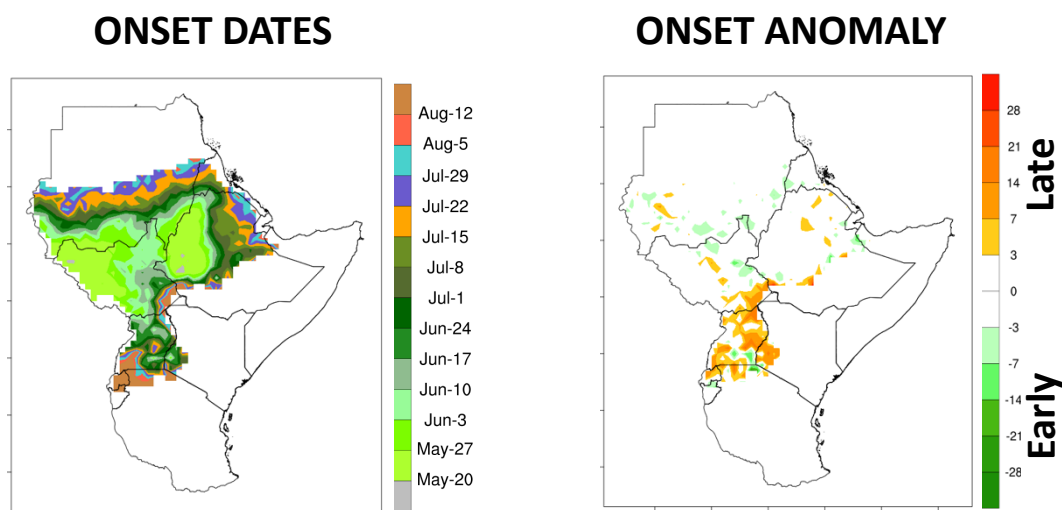


Figure 3: The map on the left indicates the expected rainfall onset dates from model ensemble mean values. The map on the right shows the onset date anomaly (days)

7. Precipitation-based Drought Outlook based on Standardized Precipitation Index (SPI)

The intensity and duration of rainfall deficits and surfeits are indicated in the 4, 9, and 15-month SPI ending on 30 of September 2023 in Figure 4 below.

4-Month SPI
(Jun-Sep 2023)

9-Month SPI
(Jan-Sep 2023)

15-Month SPI
(Jul 2022-Sep 2023)

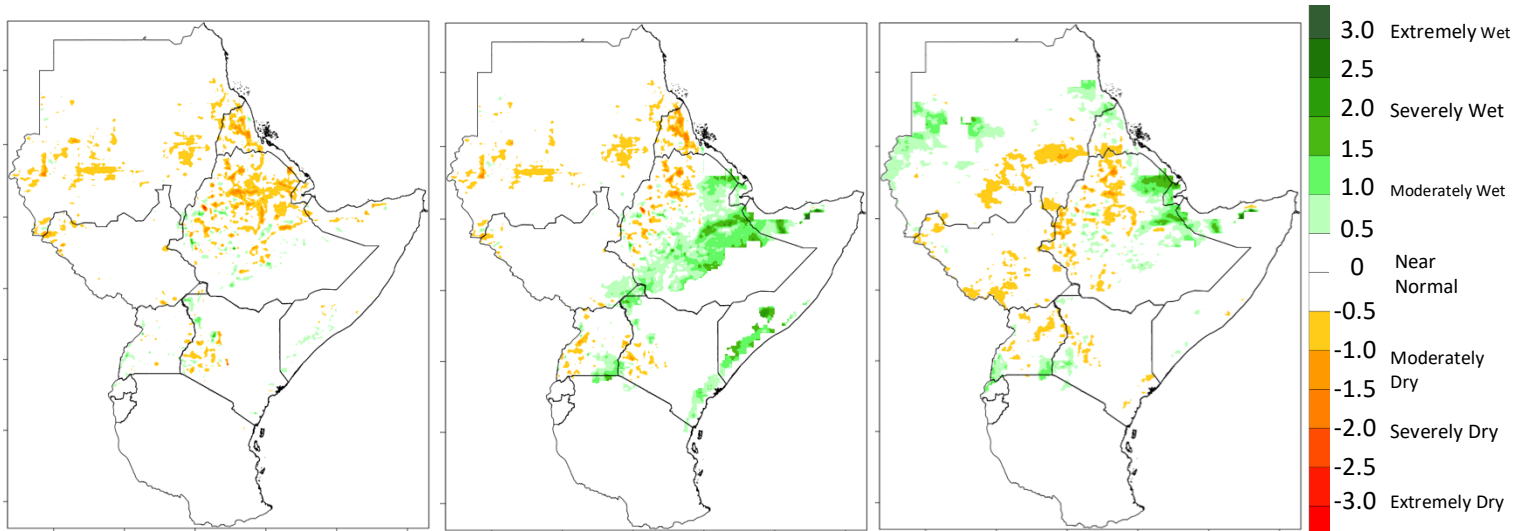


Figure 4: Standardized Precipitation Index (SPI) projections for the 4 (Jun-Sep 2023), 9 (Jan-Sep 2023) and 15 (Jul 2022-Sep 2023)-month periods:

Contributors

GHACOF 64 was organized jointly by IGAD’s Climate Prediction and Applications Centre (ICPAC) and National Meteorological and Hydrological Services of the Greater Horn of Africa. The forum was supported by the ClimSA, CONFER and RICCAMA projects funded by the European Union and the AICCRA-East Africa project funded by the World Bank. Contributors to the regional climate outlook included representatives of NMHSs from GHA countries (Institut Géographique du Burundi, Météorologie Nationale de Djibouti, National Meteorological Agency of Ethiopia, Kenya Meteorological Service, South Sudan Meteorological Service, Sudan Meteorological Authority, Somalia Meteorological Authority, and Uganda National Meteorological Authority) and climate scientists as well as other experts from national, regional, and international institutions and organizations: ICPAC, UK Met Office, and WMO Global Producing Centres (GPCs).