# DEKADAL TECHNICAL NOTE FOR SECOND DEKAD OF JUNE, 2021
# AND PRECIPITATION FORECAST FOR WEEK 3 AND 4

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Edited by: **Hubert KABENGELA**

# Content of the Technical Note

1. Monitoring Climate Element
   - Percent of precipitation
   - Temporal variation of precipitation
   - Precipitation deviation
   - RH anomaly
2. Global Driver Review and Assessment
   - Weekly and monthly SST anomaly assessment
   - Dekadal velocity potential with MJO, Kelvin and Rossby Wave
   - Weekly PWAT observed and outlook
   - Dekadal OLR anomaly
   - MSLP anomaly
   - Wind anomaly at 850 and 700 hPa
   - Relative humidity anomaly

3. Weekly Climate outlook
   - Monthly MJO forecast
   - Two week wind anomaly and divergent forecast
   - GFS total precip weekly forecast
   - GEFS weekly precip exceedance forecast
   - Weekly wind forecast
   - Monthly tercile prob precip anomaly forecast
   - NCEP/GFS bias corrected ensemble forecast
   - IRI SubX precip forecast
   - Two week climatology
   - Two weeks precip forecast

# Estimated Cumulative  Precipitation in % of average for the Second Dekad of June 2021

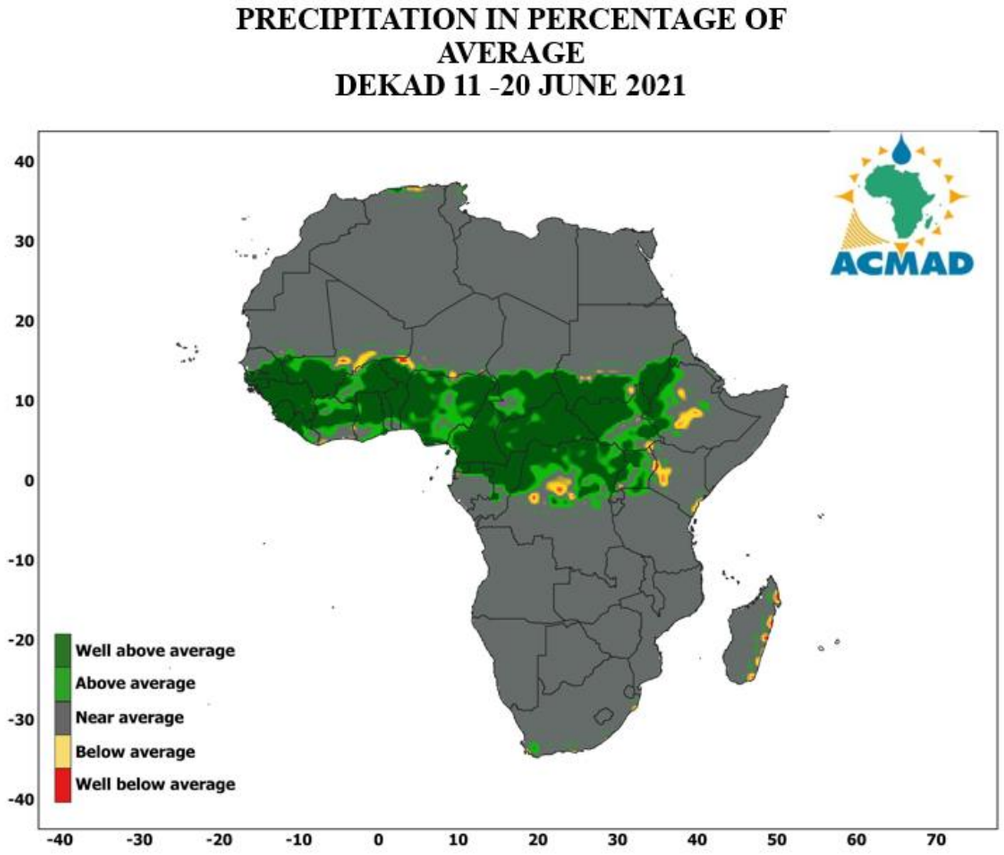


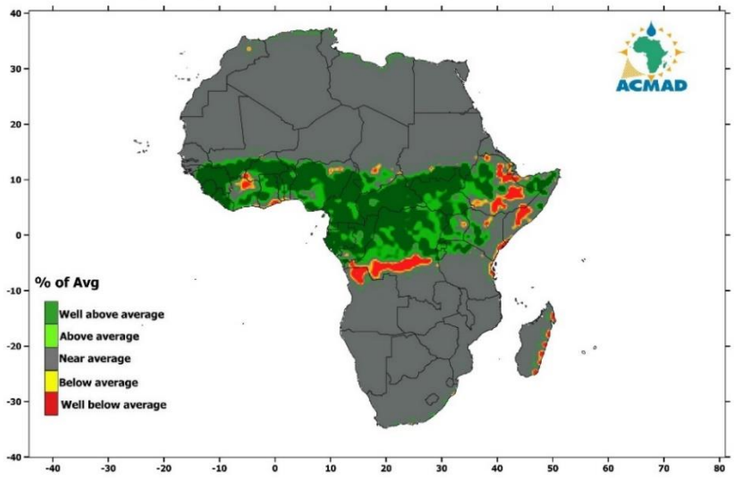

**Figure 1**: **This map displays decadal average precipitation in percent of average**

**The figure shows that well above to above average précipitation prevailed over the countries around the equator, with  central Ethiopia, western, southern Mali and the northern part of the Democratic Republic of Congo receiving below average rainfall during the 2nd Dekad of June 2021.**

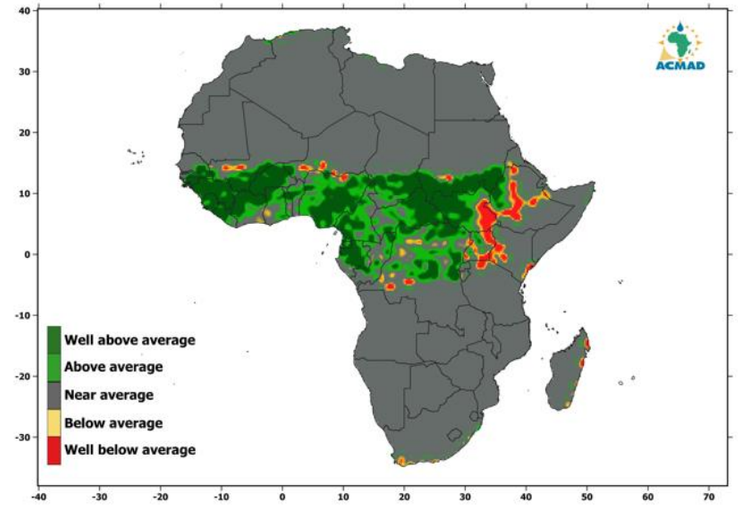
**Data** : SOURCES/.NOAA/.NCEP/.CPC/.FEWS/.Africa/.DAILY/.ARC2/.daily/.est_prcp/X/-20/0.5/70/GRID/Y/-40/0.5/40/GRID/T/%2821-31%20Jul%202014%20%29RANGE/T/SUM/

# Temporal and Spatial Change of % of Average Precip for the Last Four Dekads

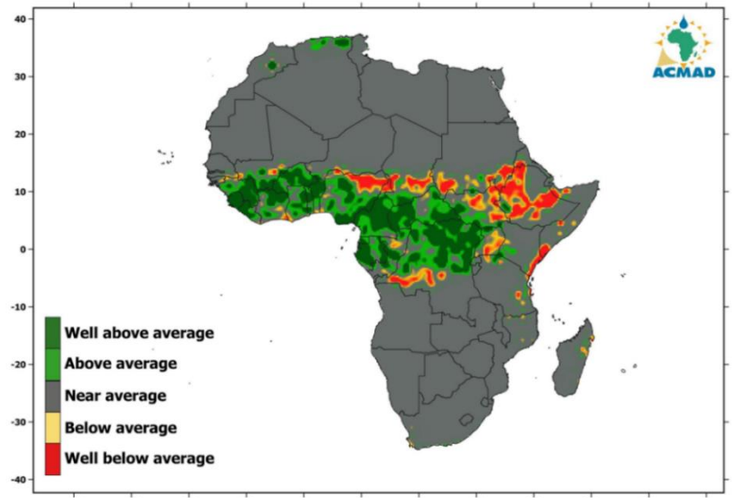
Map Showing Precipitation % of Average during the 2nd Dekad of May 2021




1st Dekad of June 2021 % of average of Precipitation




The maps displayed show during the second Dekad of May, the rainfall situation worsened over eastern Africa. The eastern parts of Ethiopia, Kenya and southern Somalia experienced below-average rainfall. Extreme northern Angola extending into central DRC received well below normal rainfall, including northern parts of Cote D'Ivoire, Nigeria, and the extreme southern parts of Chad, Ghana and Togo. Otherwise, most Countries over the Equator and latitude of 10N received above to well above average rainfall. The rainfall situation worsened during the third dekad of May over eastern parts of Africa, whereby all the countries experienced well below normal rainfall. Central African and Gulf of Guinea Countries continued to experience above to well above average rainfall. The first dekad of June shows that well above to above-average précipitation was observed over the countries around the equator, while western Ethiopia and eastern Uganda and Sudan received well below average rainfall. There was an improvement in areas the observed rainfall deficit in the first dekad of June. No country observed well below average rainfall condition during the dekad under review.




2nd Dekad of June 2021 % of Average Precipitation

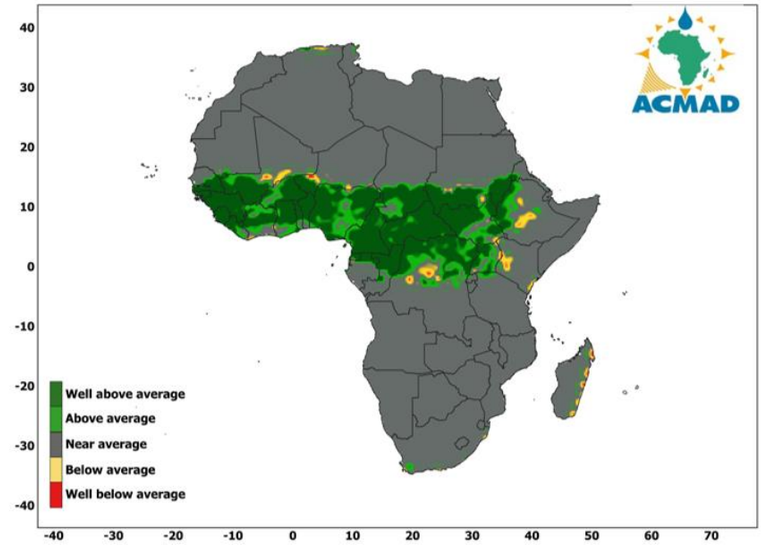
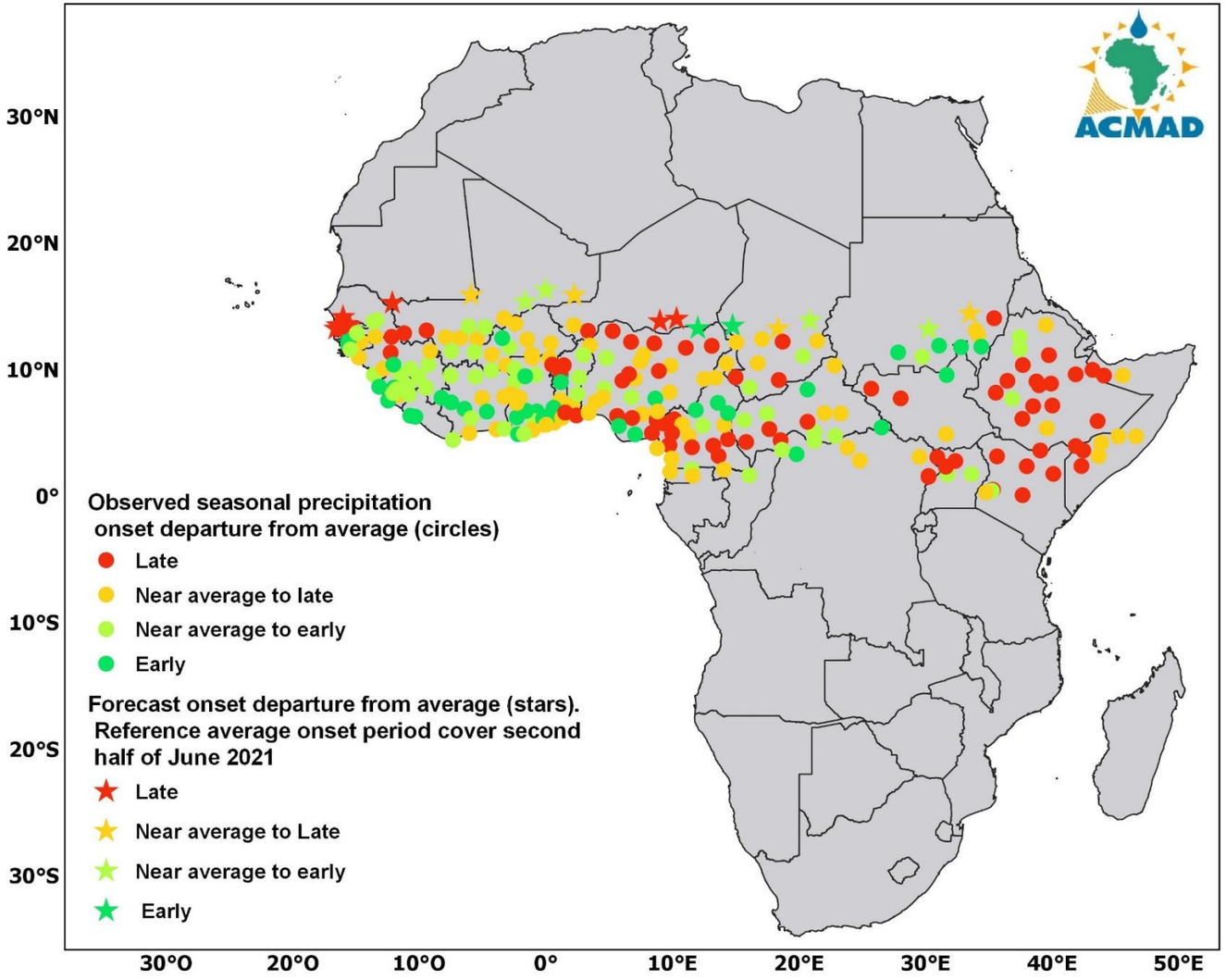
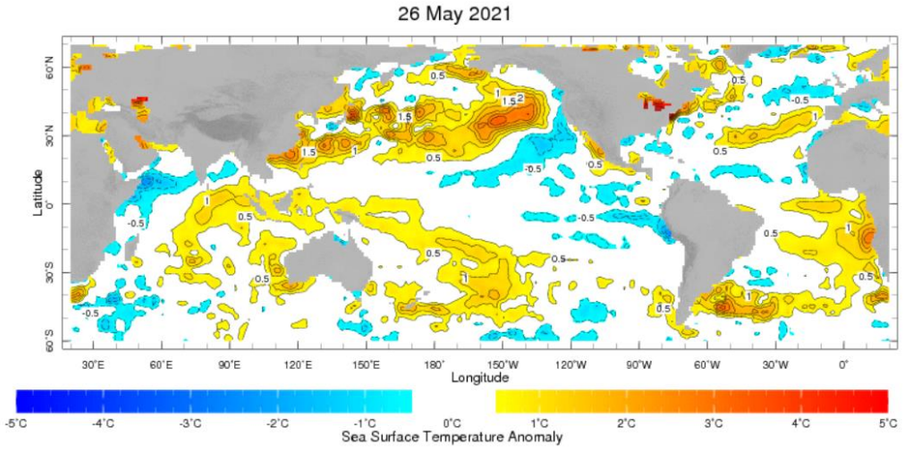



**Figure 2**: **This maps display decadal average precipitation in percent of average**

PRECIPITATION ONSET OBSERVATION AND OUTLOOK VALID FOR THE NEXT 2 WEEKS: JUNE 16 TO 30, 2021.
ISSUED: JUNE 16, 2021

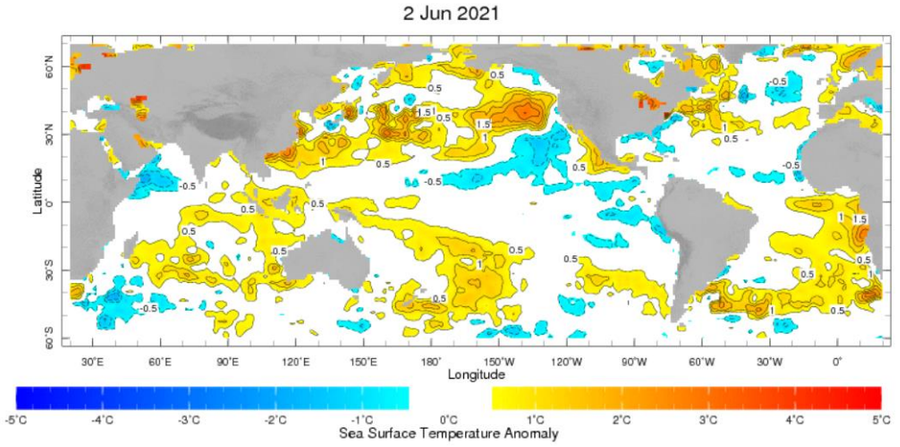


# Weekly Sea Surface Temperature Anomaly

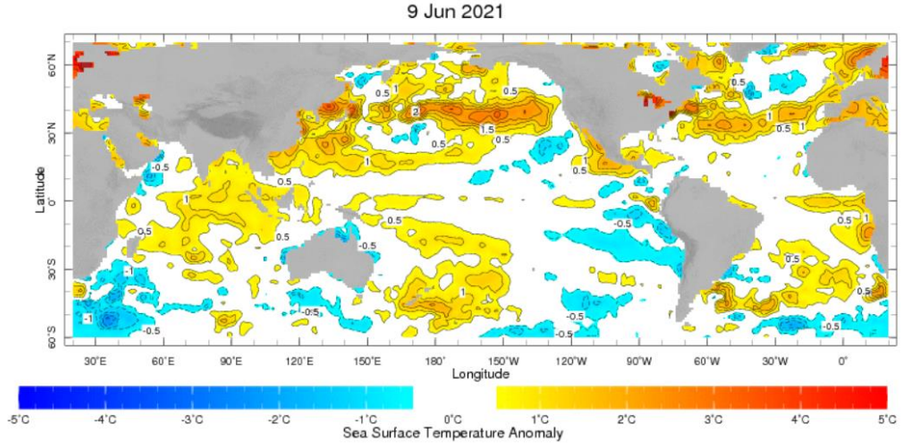



These maps display weekly sea surface temperature anomalies over the globe, and they depict mostly normal to cooling conditions over the equatorial Pacific with warm SSTs observed over northern Atlantic and the south-western Indian ocean.

https://psl.noaa.gov/map/clim/sst.shtml




11 June – 20 June 2021 http://iridl.ldeo.columbia.edu/maproom/Global/Ocean_Temp/Weekly_Anomaly.html?



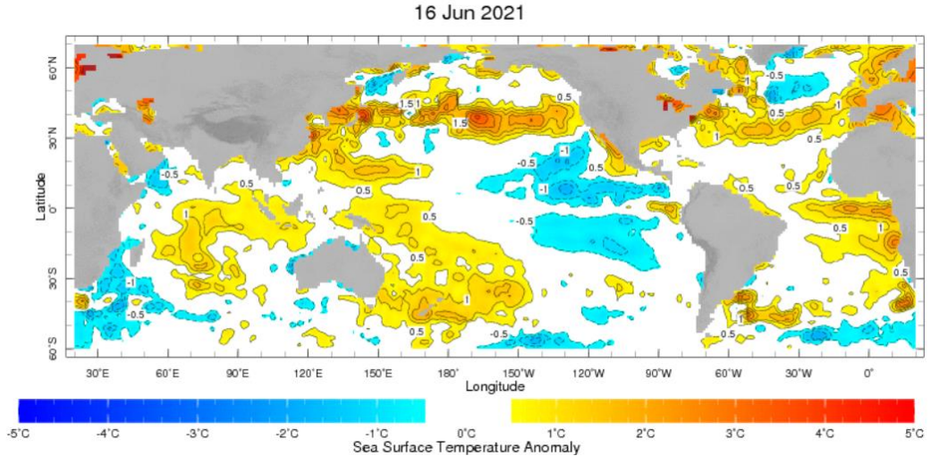
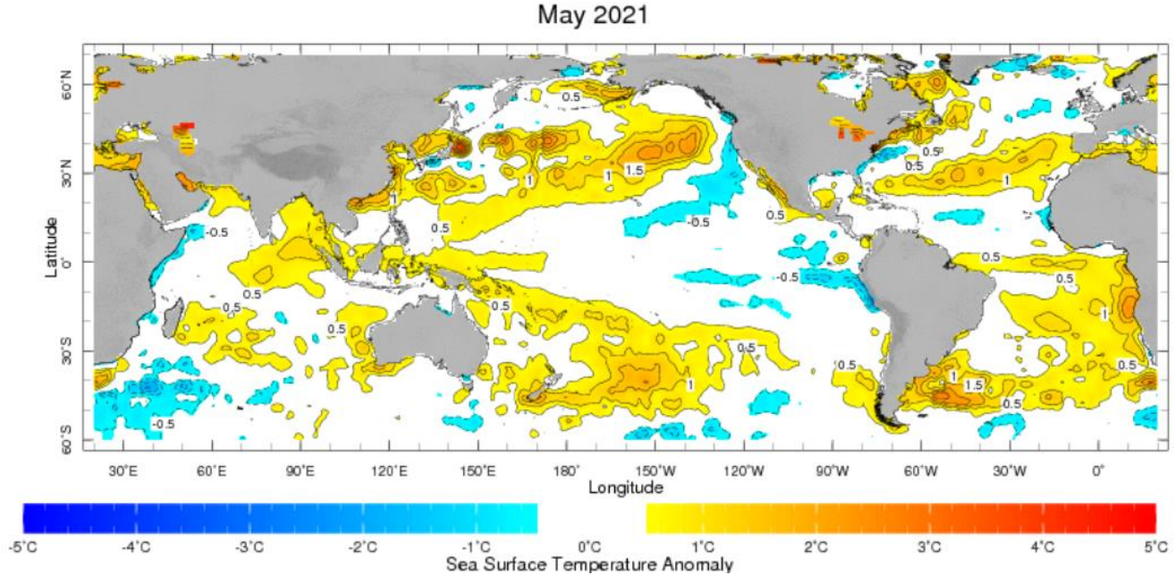
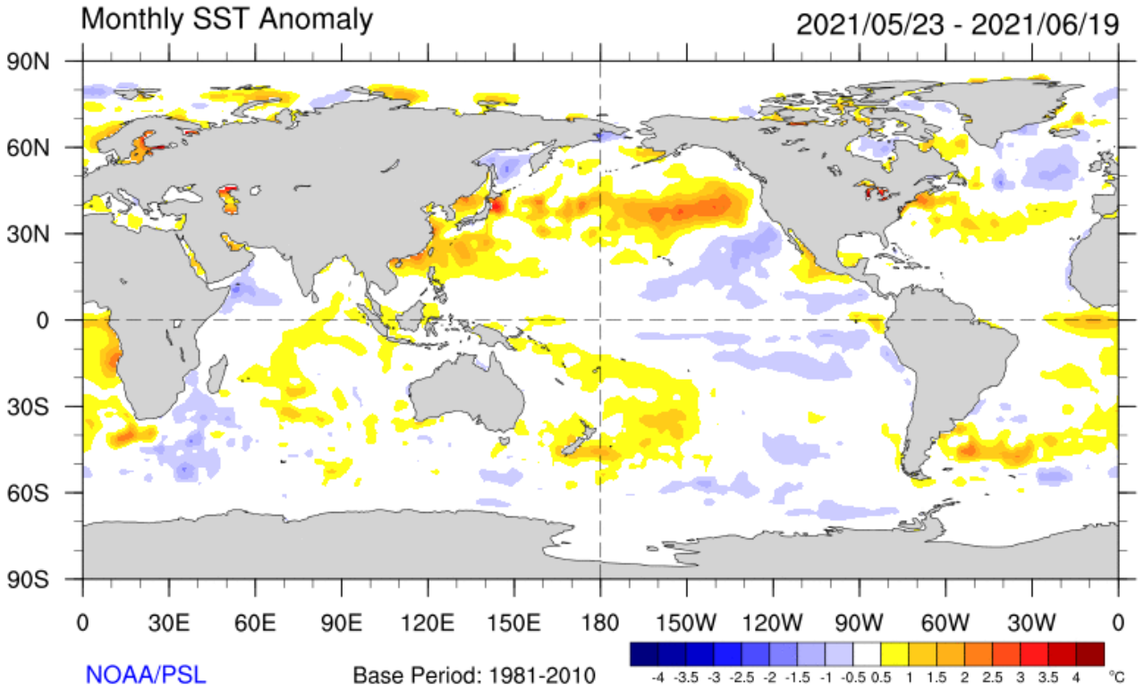




**Figure 3: Maps display weekly sea surface temperature anomalies over the globe for last four weeks**

# Last Month's Sea SurfaceTemperatures (SST) Observed




*During 16th of May to 12th of Jun 2021, the cooling persisted over eastern Equatorial Pacific, and the South-Western Indian Ocean, whereas the Tropical South Atlantic, and western pacific continued warming.*

***Figure 4 : Maps display monthly sea surface temperature anomalies over the globe.***

https://psl.noaa.gov/map/clim/sst.shtml

http://iridl.ldeo.columbia.edu/maproom/Global/Ocean_Temp/Anomaly.html.

# SST OBS AND FCST FOR TWO WEEKS

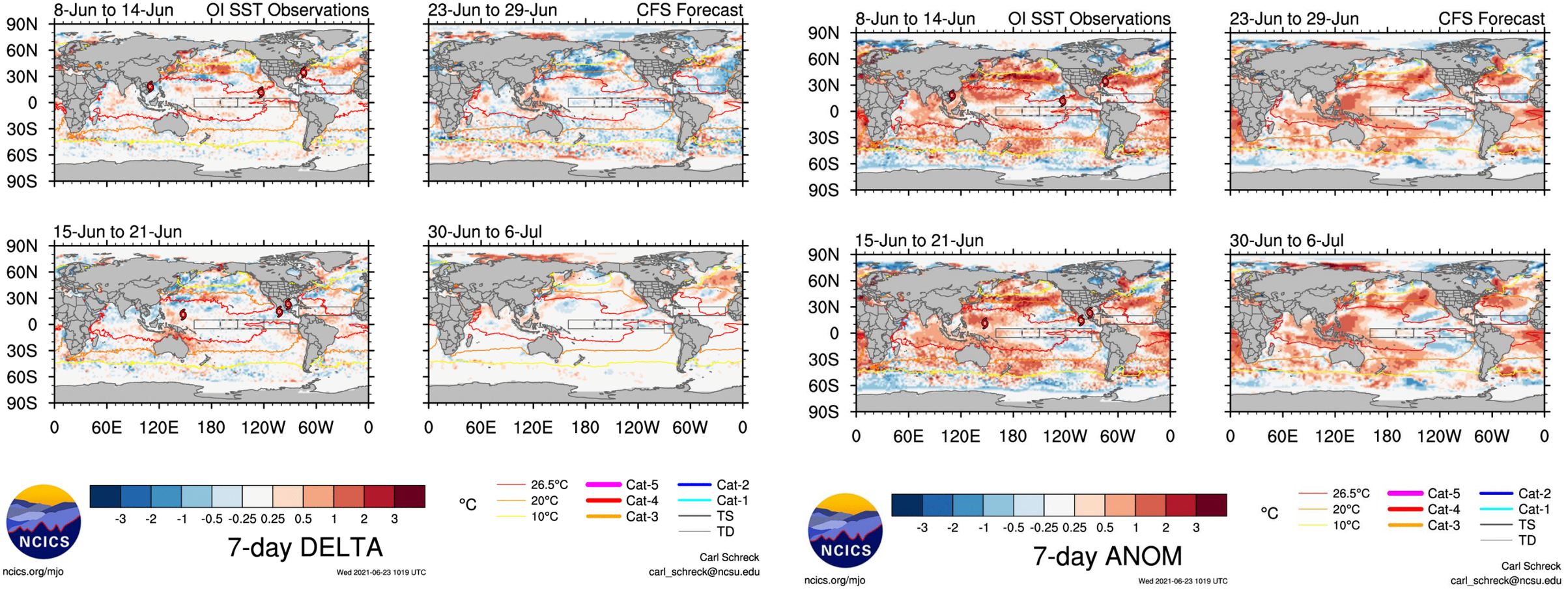



**Figure 5: Sea Surface Temperature and FCST for two week**

https://ncics.org/pub/mjo/v2/sst/global.delta.14.png;
https://ncics.org/pub/mjo/v2/sst/global.anom.14.png

# Past 4 Weeks Precipitable Water and Outlooks for Africa and Globally

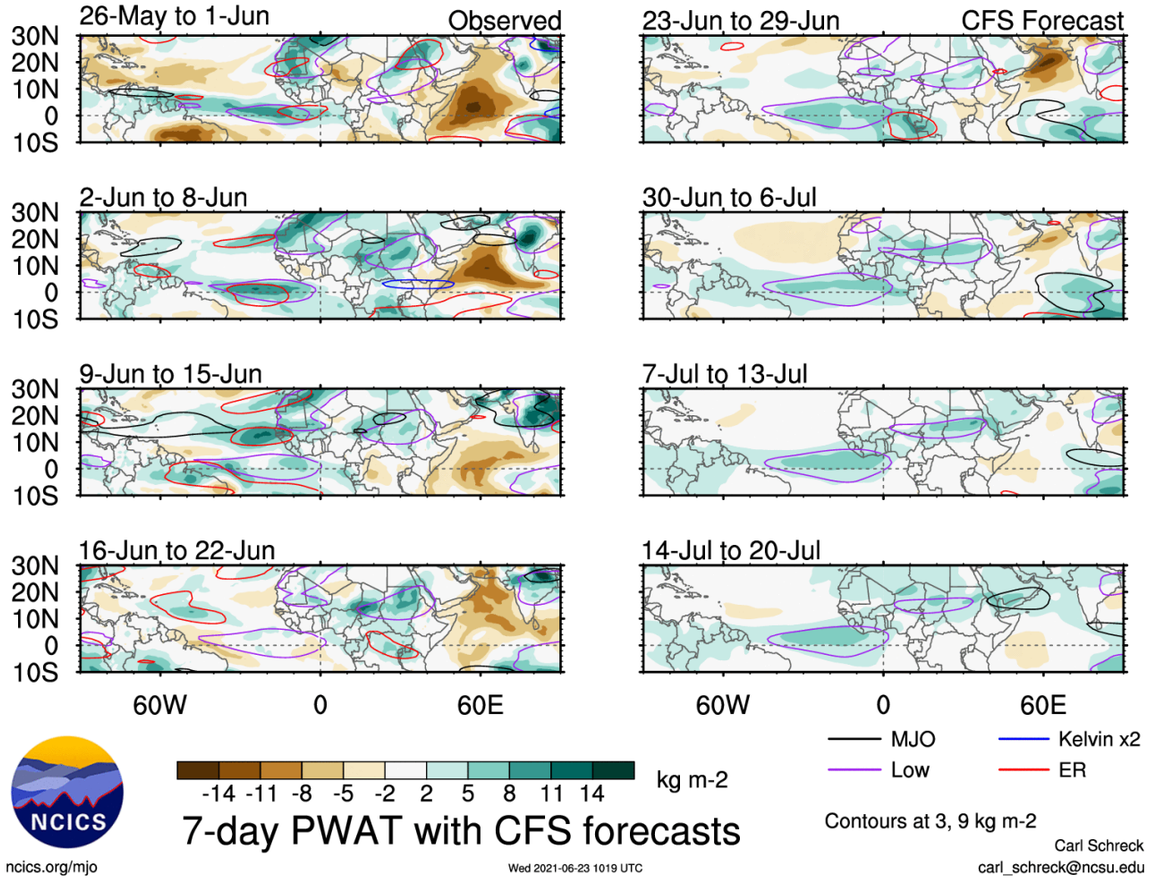



**Figure 7a: Africa**

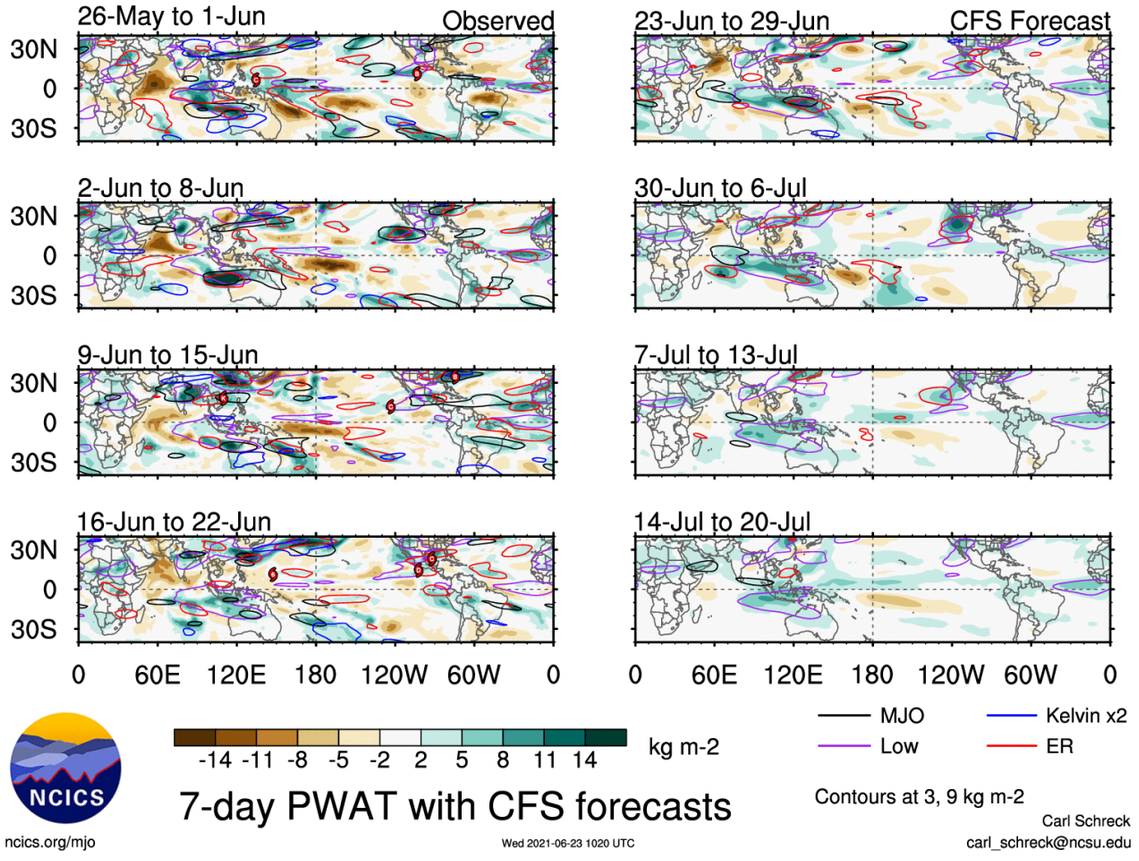


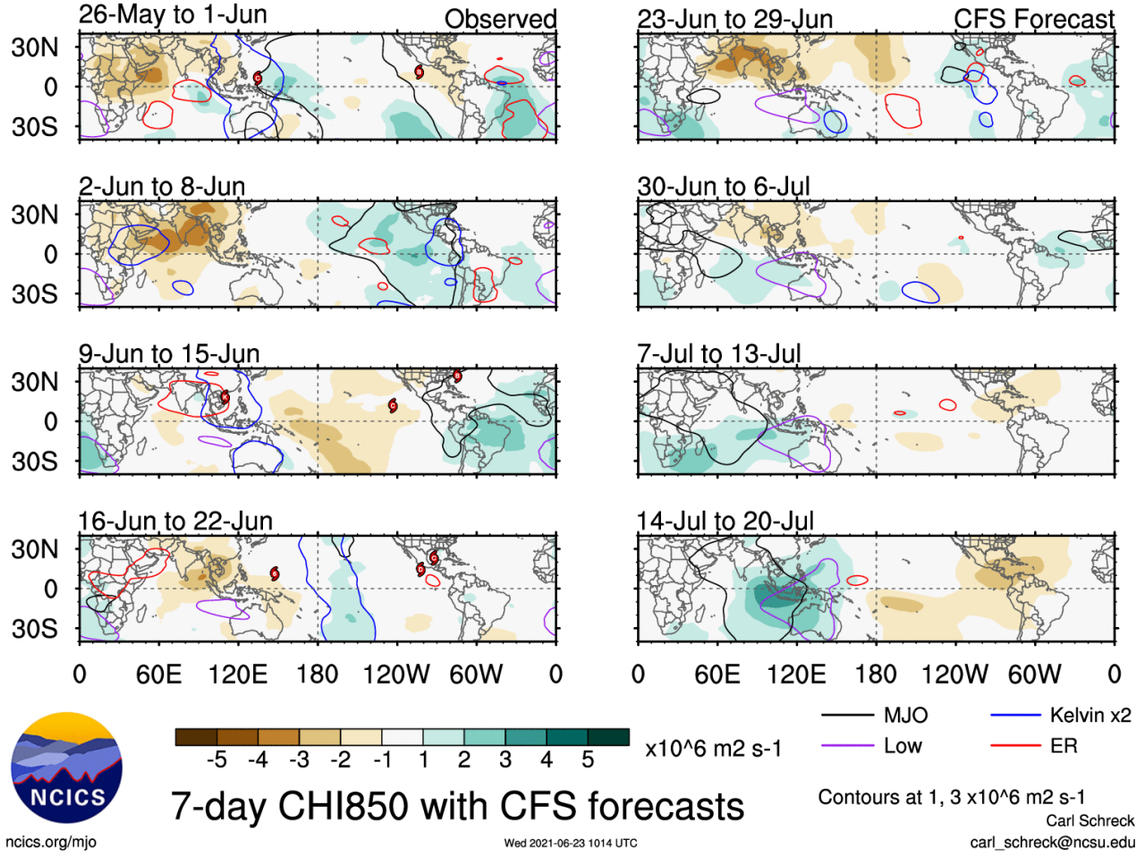

**Figure 7b: Global**

**Figure 6: Past four week Precipitable Water and Outlooks**

https://ncics.org/pub/mjo/v2/map/pwat.cfs.all.Africa.10.png

https://ncics.org/pub/mjo/v2/map/pwat.cfs.all.global.10.png

# Past Four Weeks Velocity Potential with MJO, Kelvin and Rossby Wave overlaid on Global Maps at 850mb and 200mb



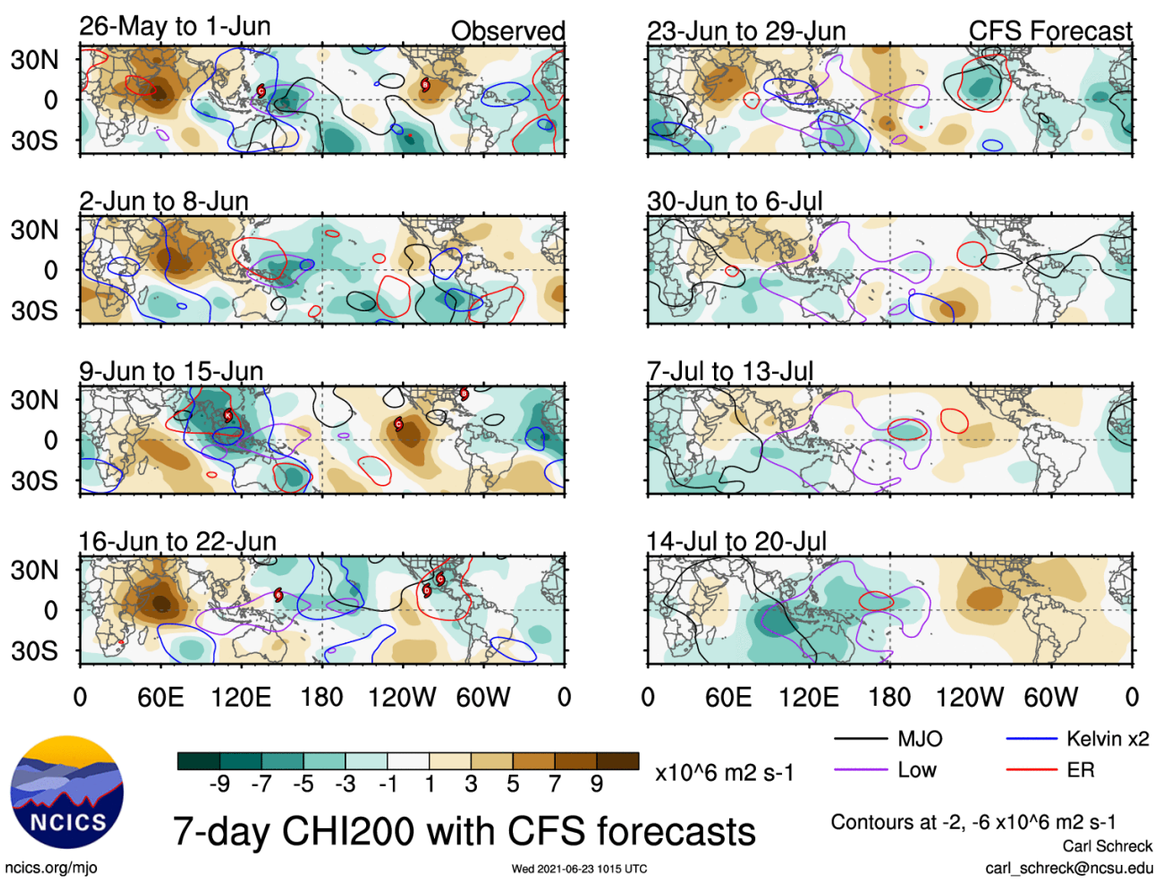
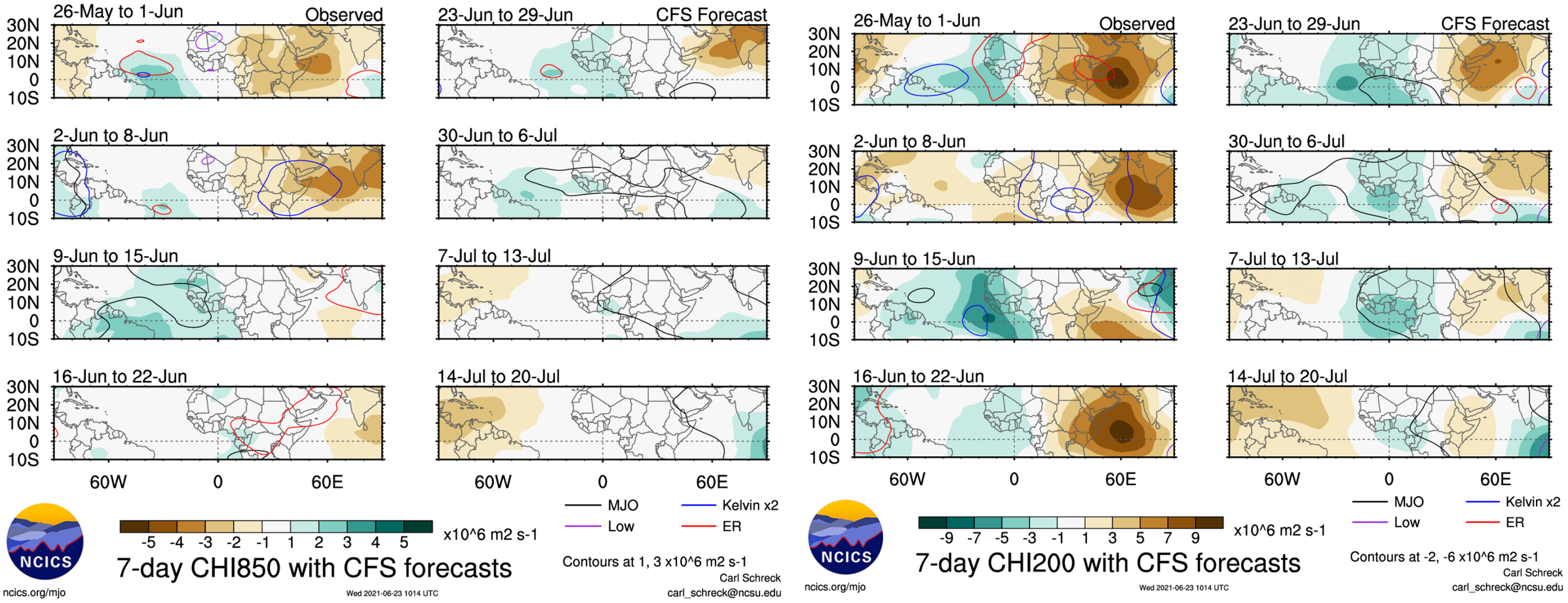




**Figure 7a and b: Past four week and month velocity potential**

https://ncics.org/pub/mjo/v2/map/chi850.cfs.all.global.10.png

https://ncics.org/pub/mjo/v2/map/chi200.cfs.all.global.10.png

# Past Four Weeks Velocity Potential with MJO, Kelvin and Rossby Wave overlaid on Africa Maps at 850mb and 200mb

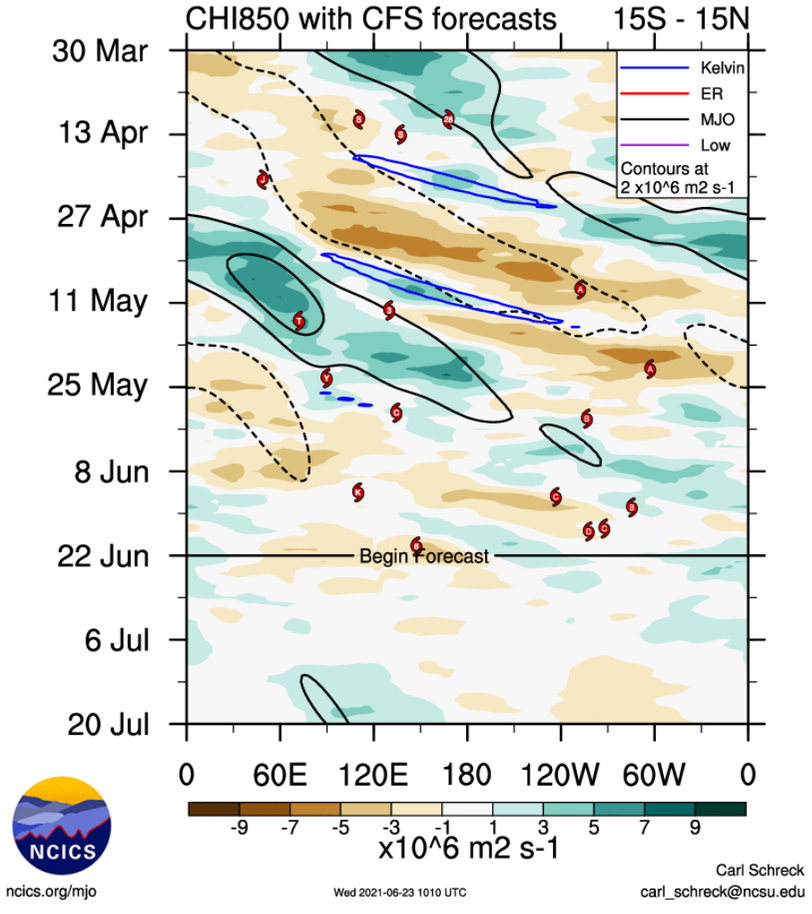



https://ncics.org/pub/mjo/v2/map/chi850.cfs.all.africa.10.png

https://ncics.org/pub/mjo/v2/map/chi200.cfs.all.africa.10.png

**Figure 8a and b: Past four week and month velocity potential**

# Hovmoller diagram of Velocity Potential, Anomalies for 15N-15S with Waves overlay including Outlook



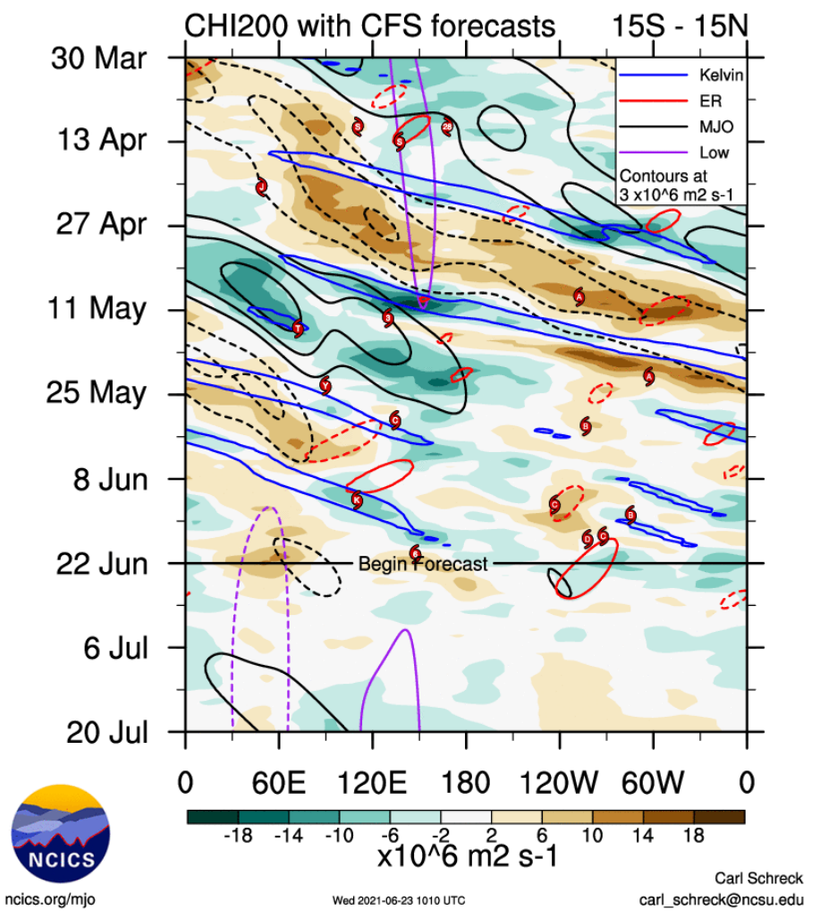
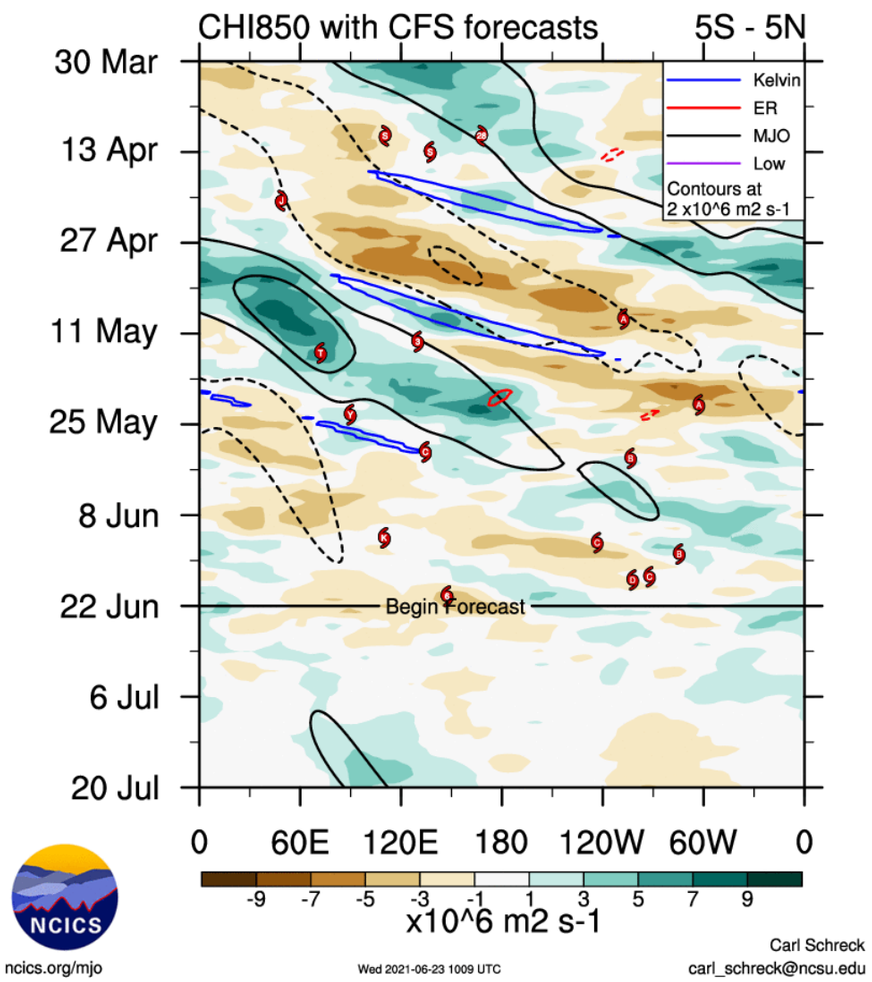




***Figure 9:*** **Anomalies for 15n-15s with waves overlay including outlooks**

https://ncics.org/pub/mjo/v2/hov/chi850.cfs.wide.png

https://ncics.org/pub/mjo/v2/hov/chi200.cfs.wide.png

# Hovmoller diagram of Velocity Potential, anomalies for 5n-5s with waves overlay including outlooks



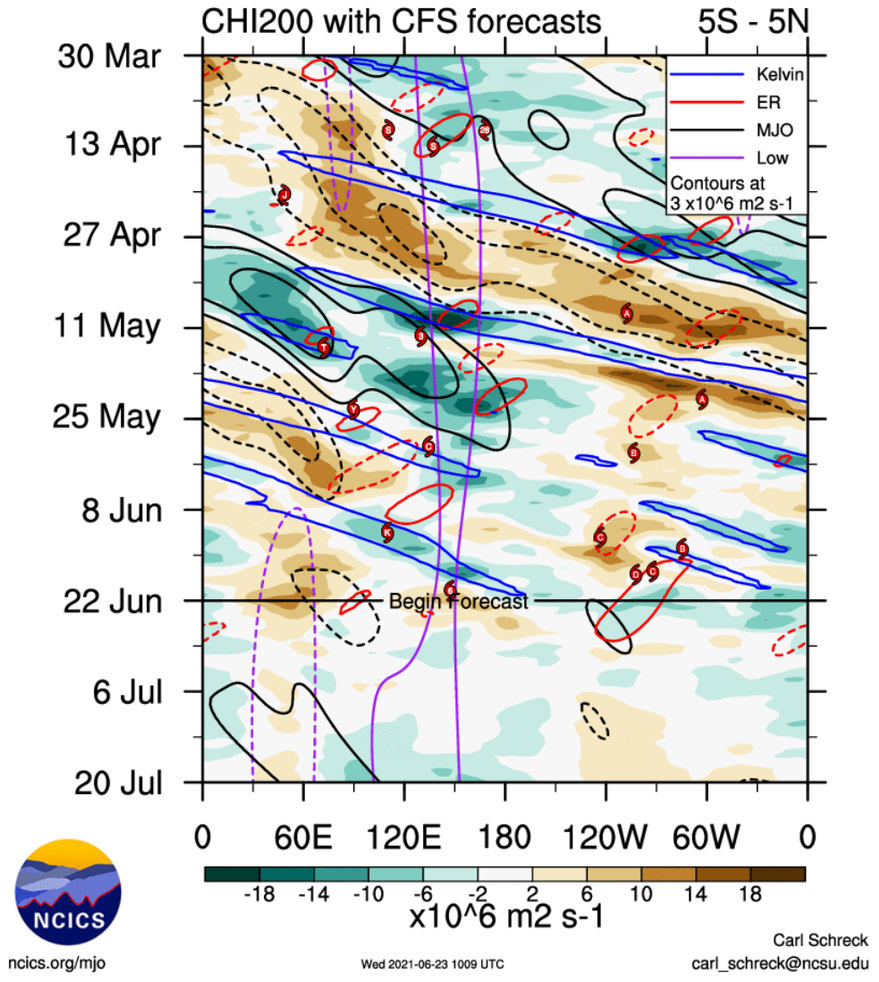
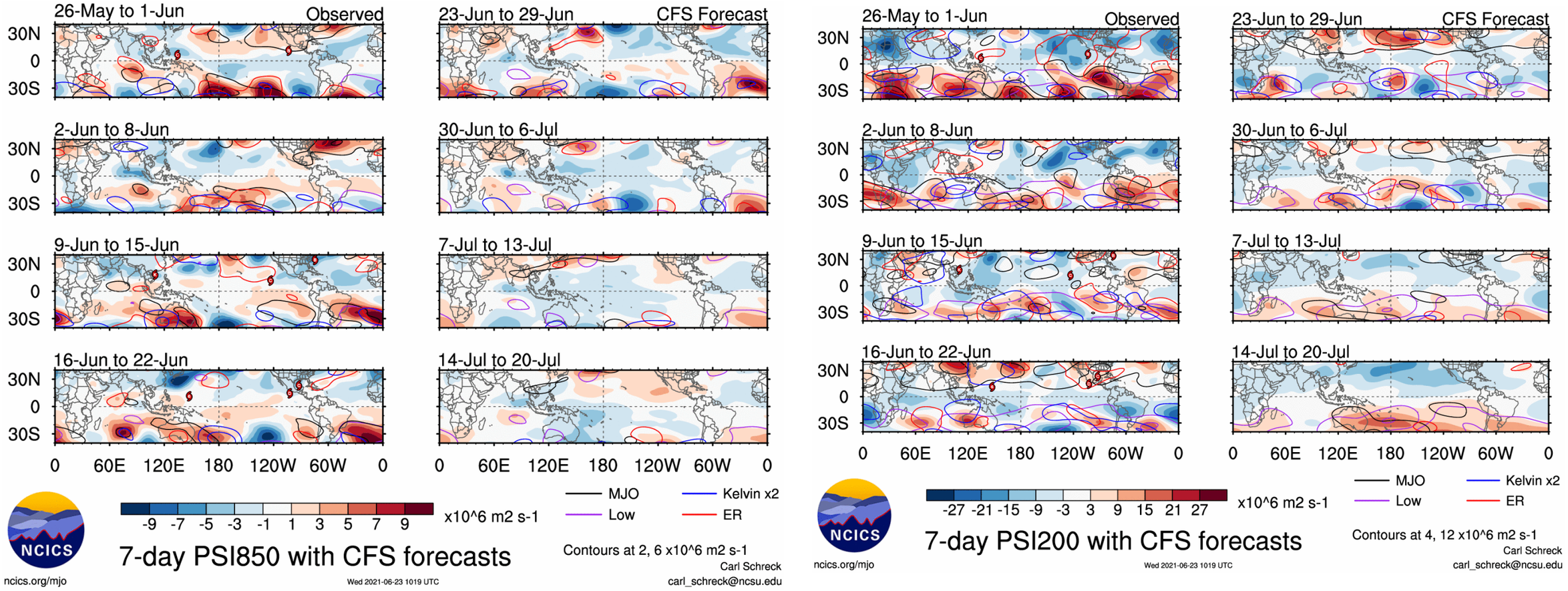




***Figure 10:*** **Anomalies for 5N-5S with waves overlay including outlooks**

https://ncics.org/pub/mjo/v2/hov/chi200.cfs.eqtr.png

https://ncics.org/pub/mjo/v2/hov/chi850.cfs.eqtr.png

# Past 4 Weeks Stream Function Anomalies with MJO, Kelvin and Rossby wave overlaid on Global Maps 850hpa and 200hpa

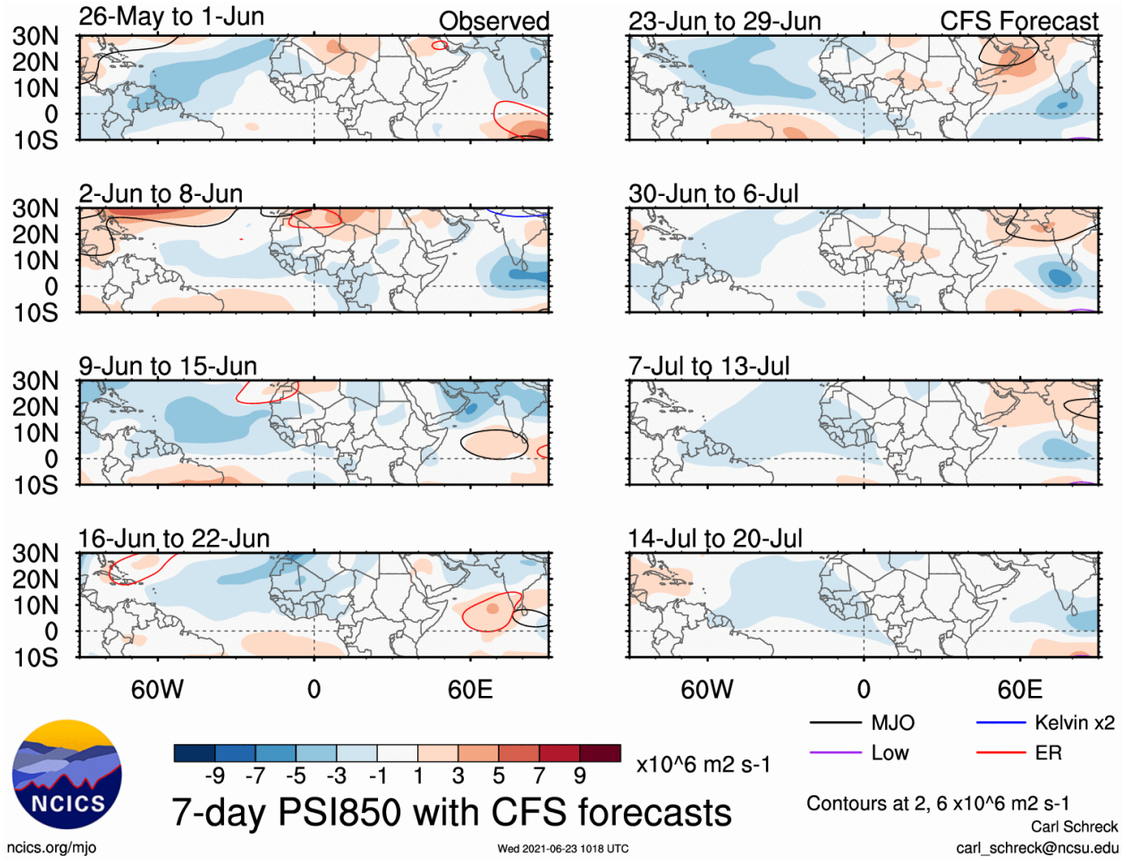


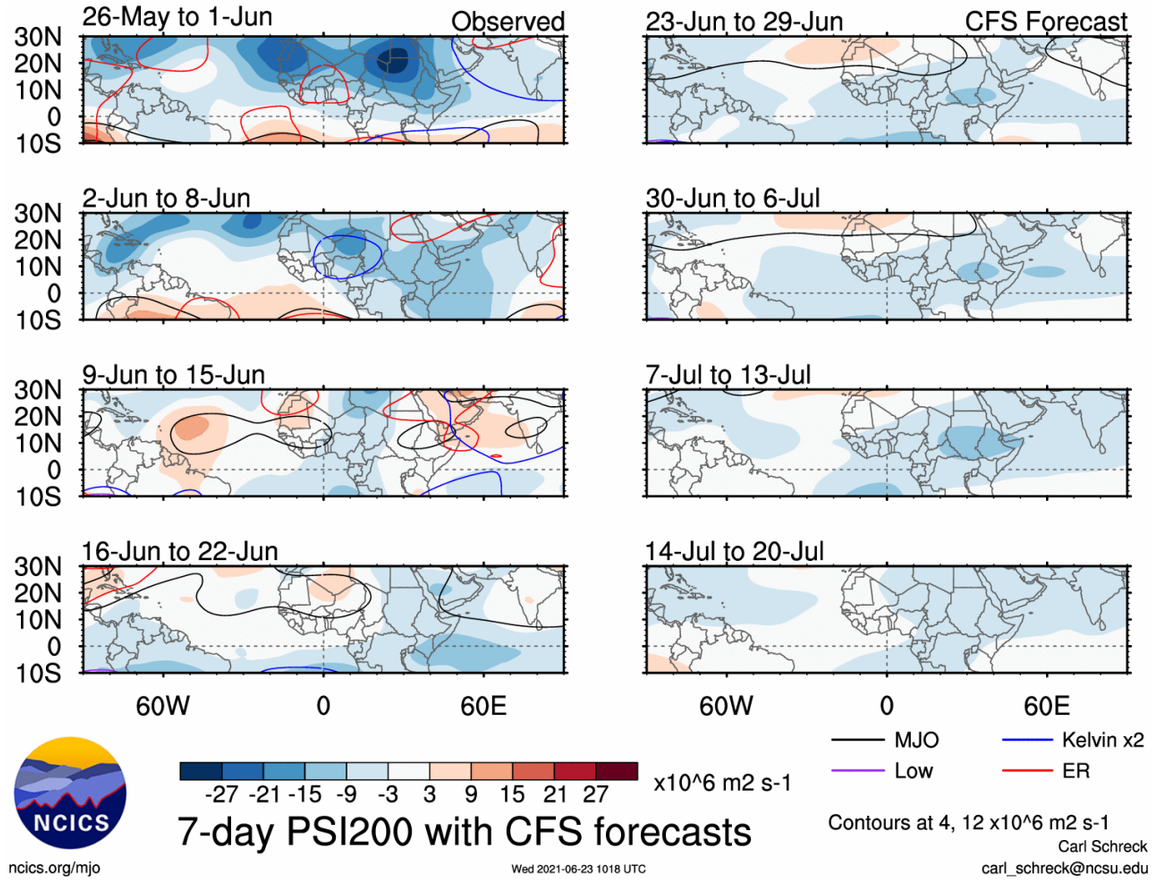

https://ncics.org/pub/mjo/v2/map/psi200.cfs.mjo.global.10.png

https://ncics.org/pub/mjo/v2/map/psi850.cfs.mjo.global.10.png

***Figure 11:*** **Past 4 weeks stream function anomalies with MJO, Kelvin & Rossby wave on Global Maps**

# Past 4 weeks Stream Function Anomalies with MJO, Kelvin and Rossby wave overlaid on Africa Maps 850hpa and 200hpa

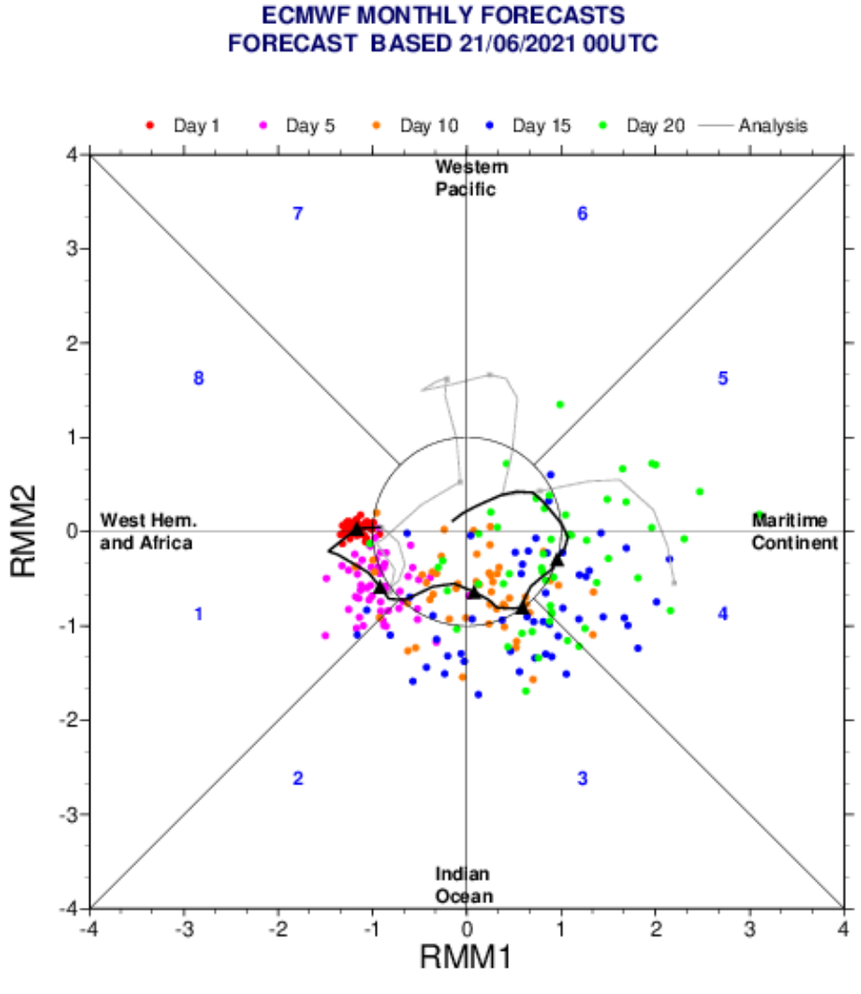



https://ncics.org/pub/mjo/v2/map/psi200.cfs.mjo.africa.10.png

***Figure 12:*** **Past 4 weeks stream function anomalies with MJO, Kelvin & Rossby wave on Africa maps** https://ncics.org/pub/mjo/v2/map/psi850.cfs.mjo.africa.10.png

# ECMWF Madden-Julian-Oscillation (MJO) Forecast



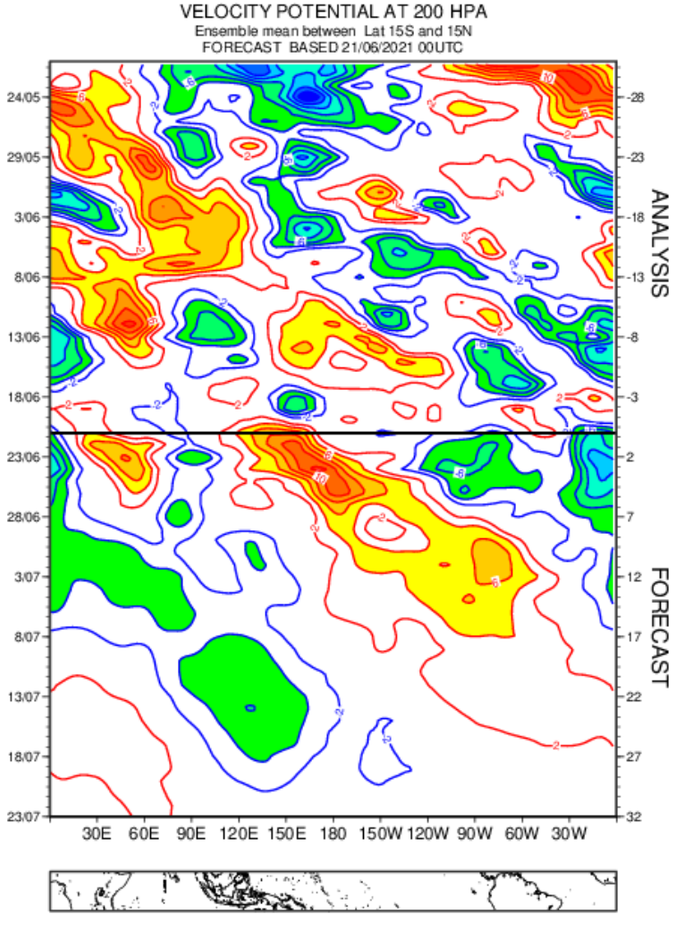




***Figure 13:*** **ECMWF MJO Forecast**

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_mjo_family_index?facets=undefined&time=2019080500,0,2019080500

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_mjo_family_time_longitudes?facets=undefined&time=2019112500,0,2019112500

# Infra-Red (IR) and Velocity Potential Anomaly

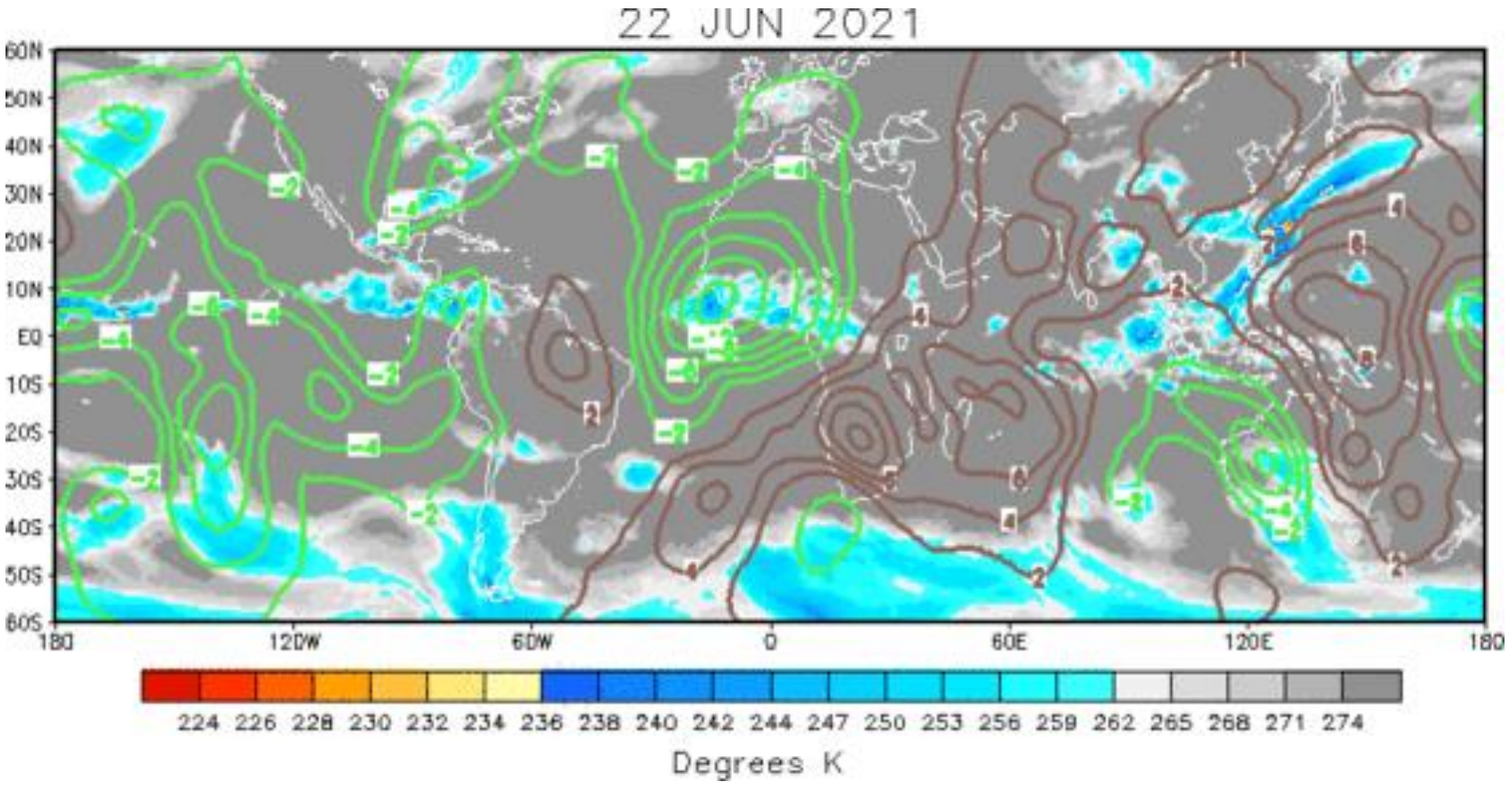



***Figure 14:*** **IR image and Velocity Potential anomalies**

CPC - Climate Weather Linkage: Madden - Julian Oscillation (noaa.gov)

# PAST 3 DEKADS OLR ANOMALIES

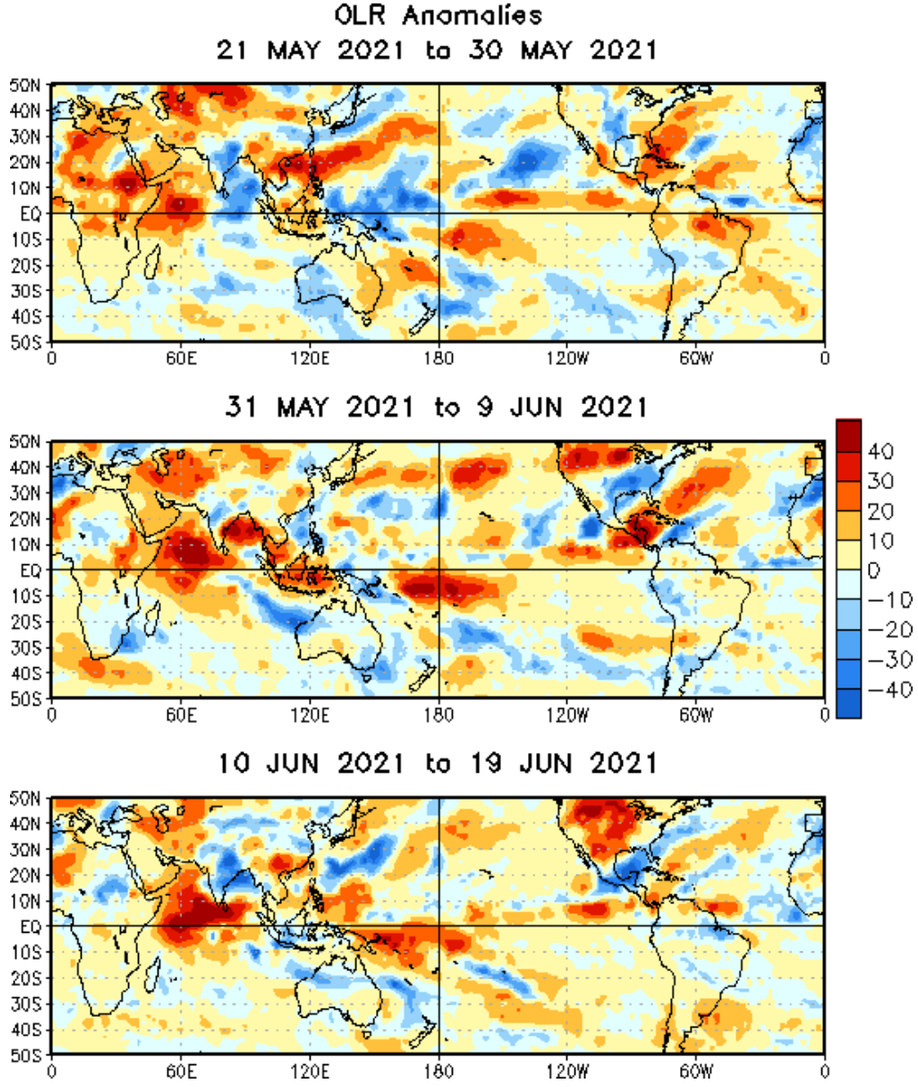



***Figure 15:*** **Past 3 weeks OLR anomalies**

https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/olra_last30days-3plots.gif

# Mean Sea Level Pressure (MSLP) for the 1st Dekad of June 2021 and its anomalies (1971-2000)

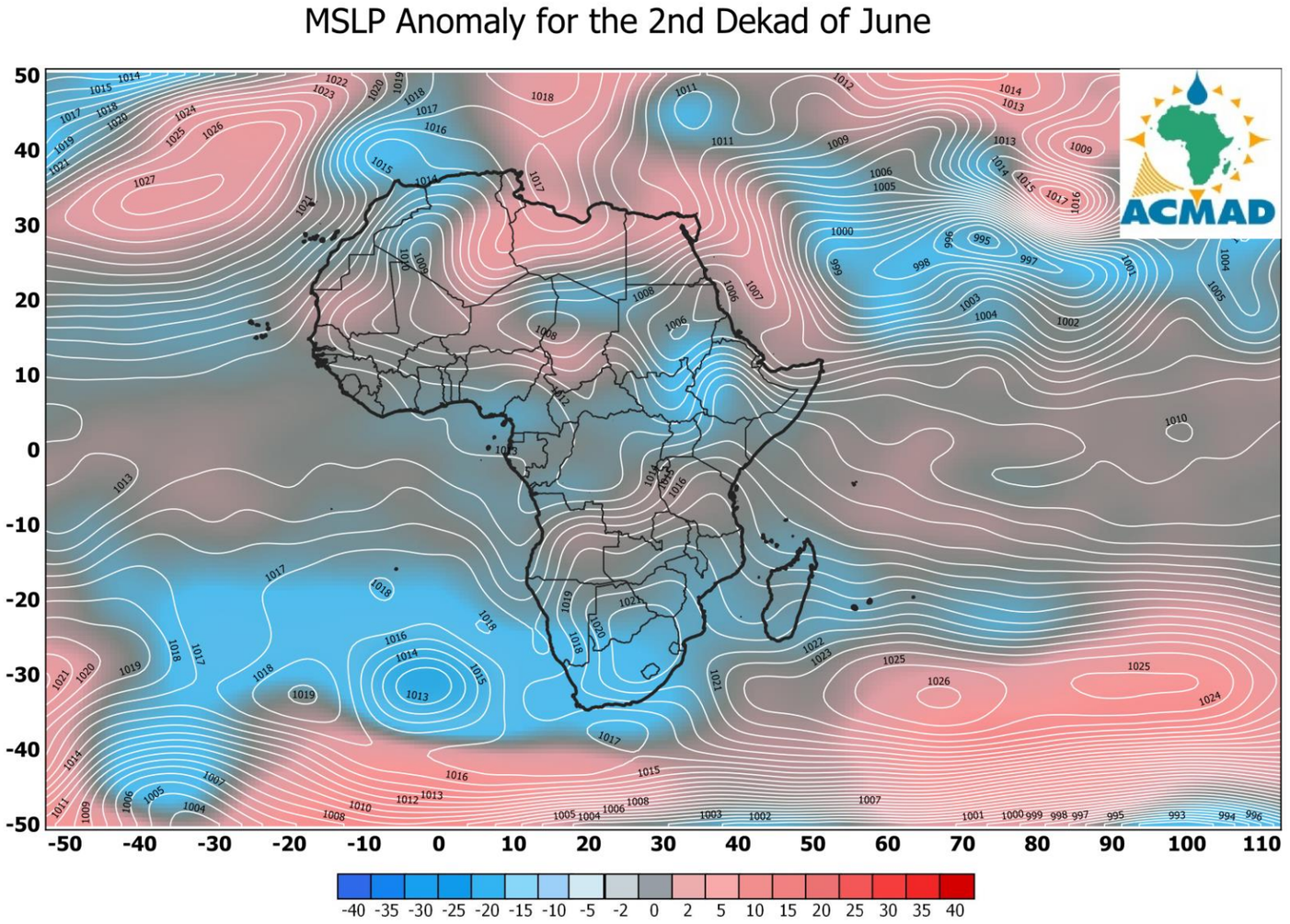



***Figure 16:*** **MSLP observation versus anomaly**

**Data source:** [http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.DAILY/.Intrinsic/.MSL/.pressure](http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.DAILY/.Intrinsic/.MSL/.pressure)

# Wind Anomalies for the Second Dekad of June 2021 @ 850hpa and 700hpa

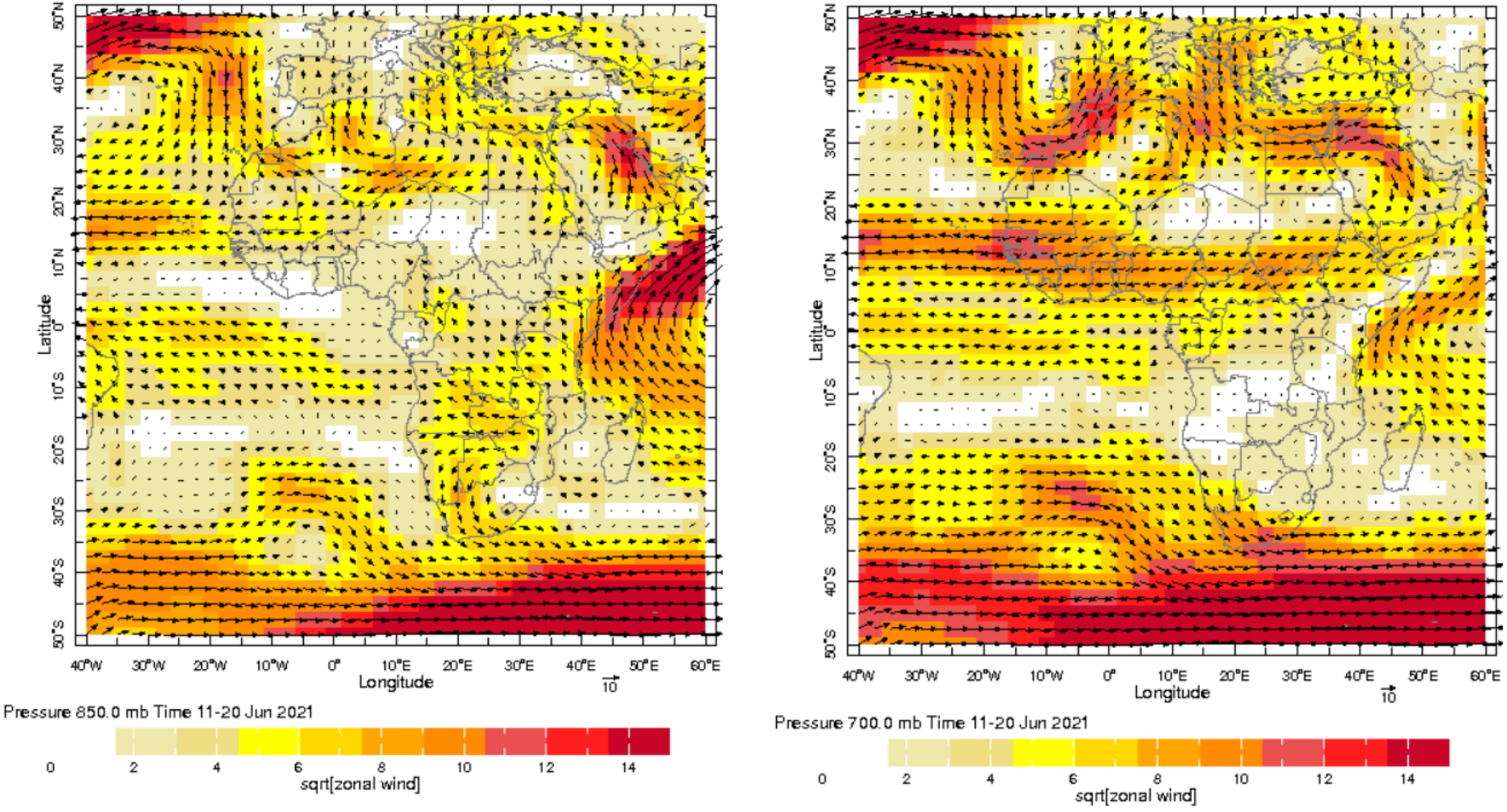
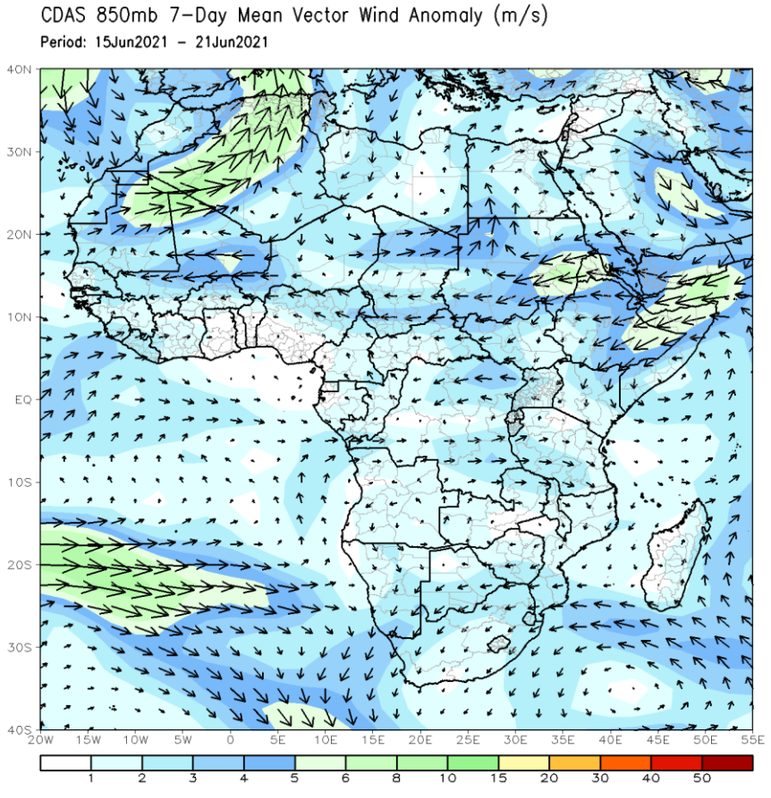
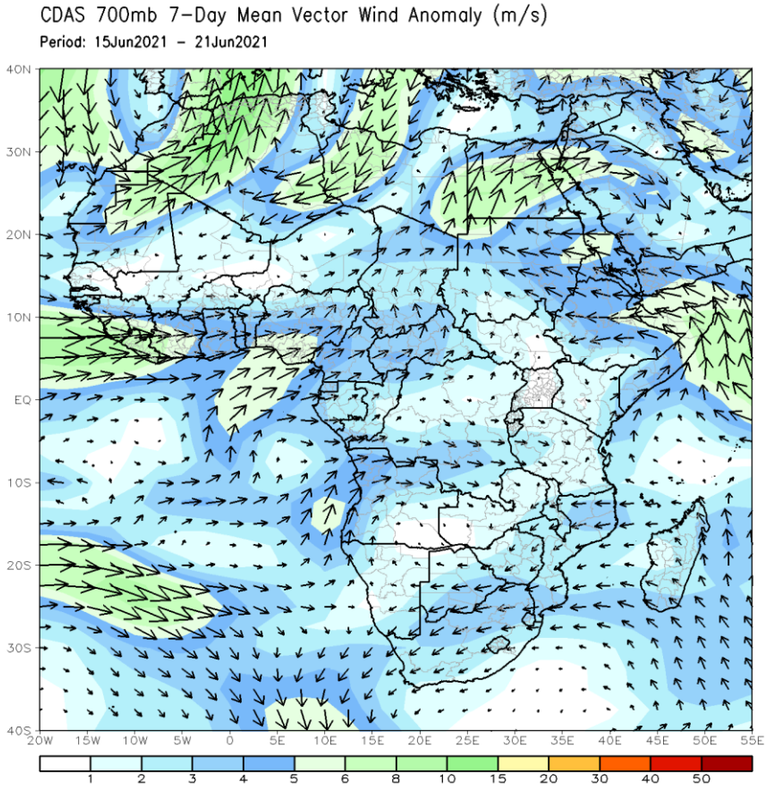



***Figure 17:*** **Wind anomalies for 850hpa and 700hPa**

# Wind Anomalies for the last 7 day period 850hpa, 700hpa and 200hpa



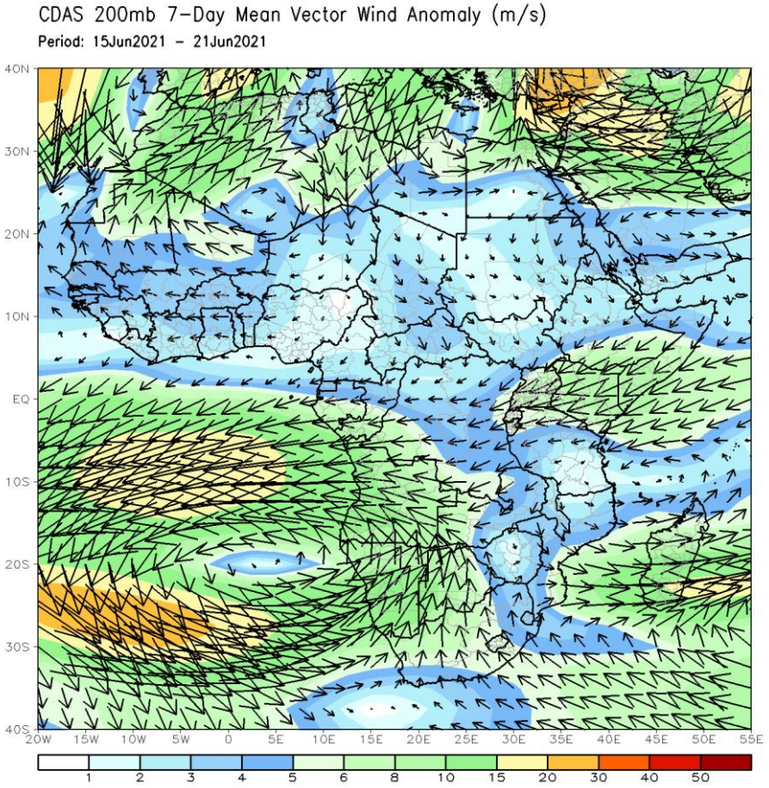
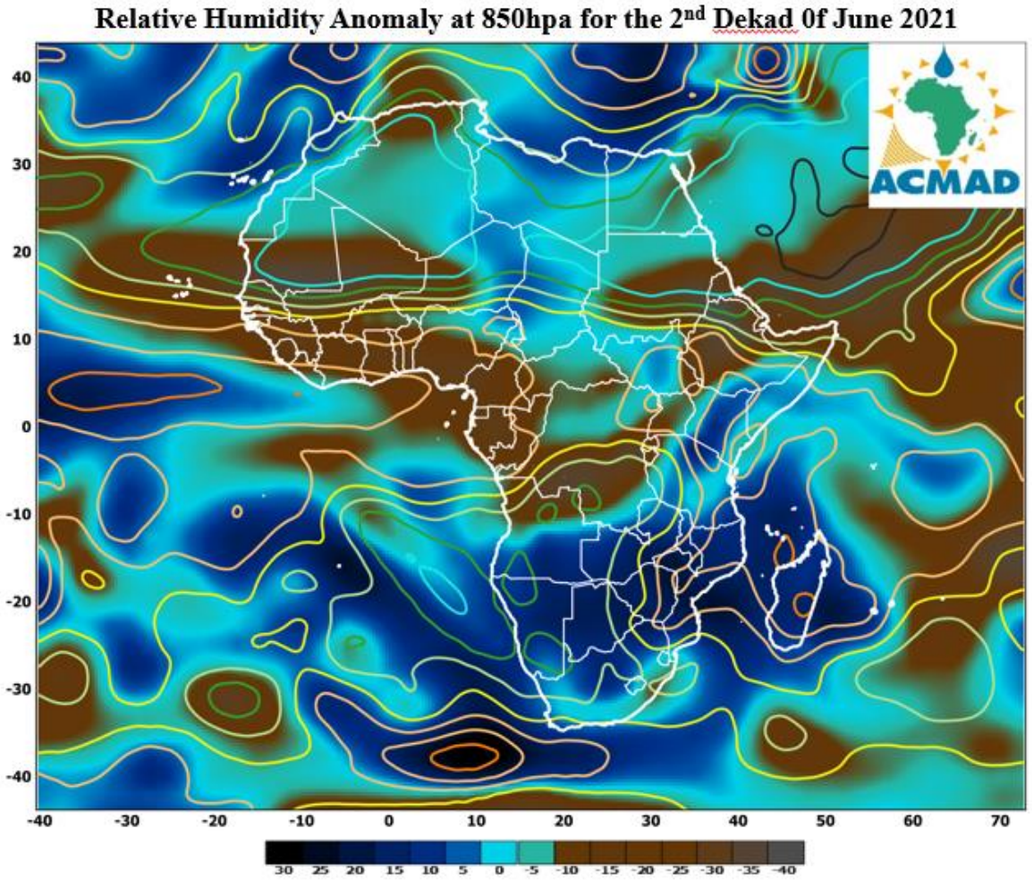




***Figure 18:*** **Wind anomalies for 850hpa, 700hPa and 200hpa**

Climate Prediction Center - African Desk: SWFDP GFS FORECASTS (noaa.gov)

# Relative Humidity (RH) Anomalies at 850hpa and 700hpa for the 3rd dekad of May 2021



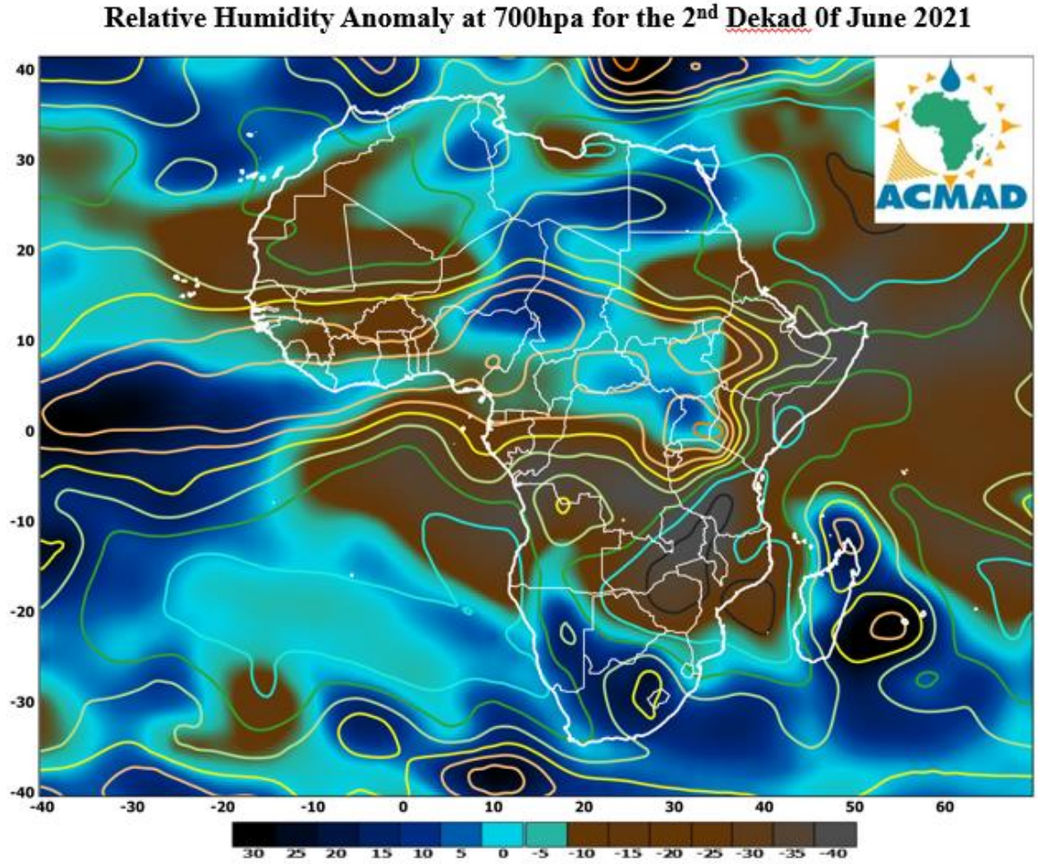



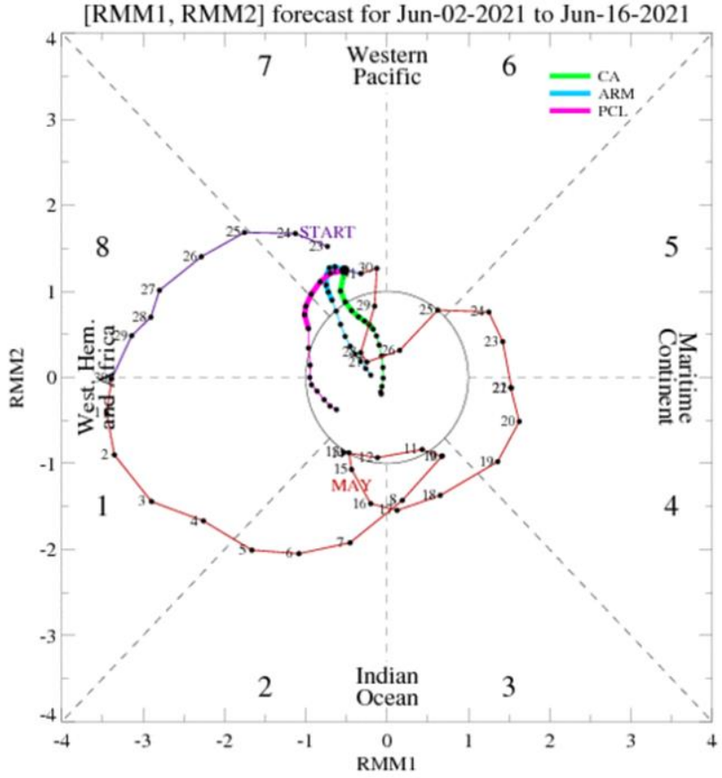

***Figure 19:*** **Relative Humidity Anomaly at 850hPa (left) and 700hPa (right)**

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.DAILY/.Intrinsic/.PressureLevel/.rhum

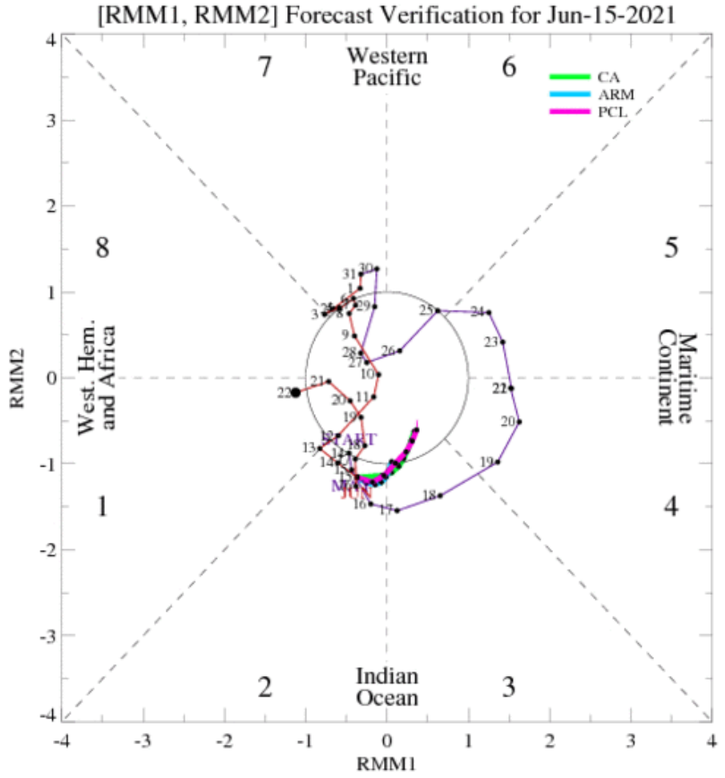
# WEEKLY FORECAST

# MJO Forecast and Verification for the Previous 7 and 14 days

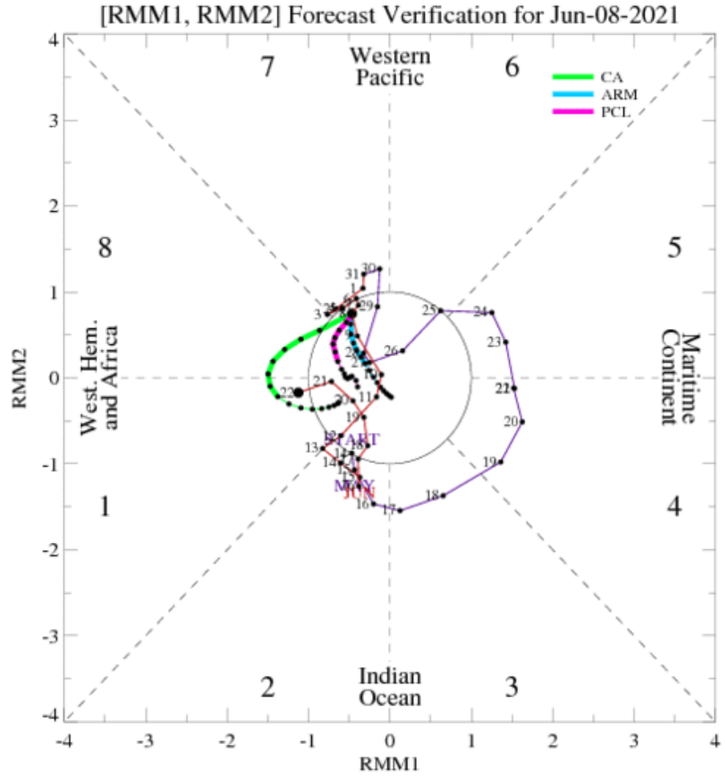
**MJO FORECAST for 2 – 16 June 2021**



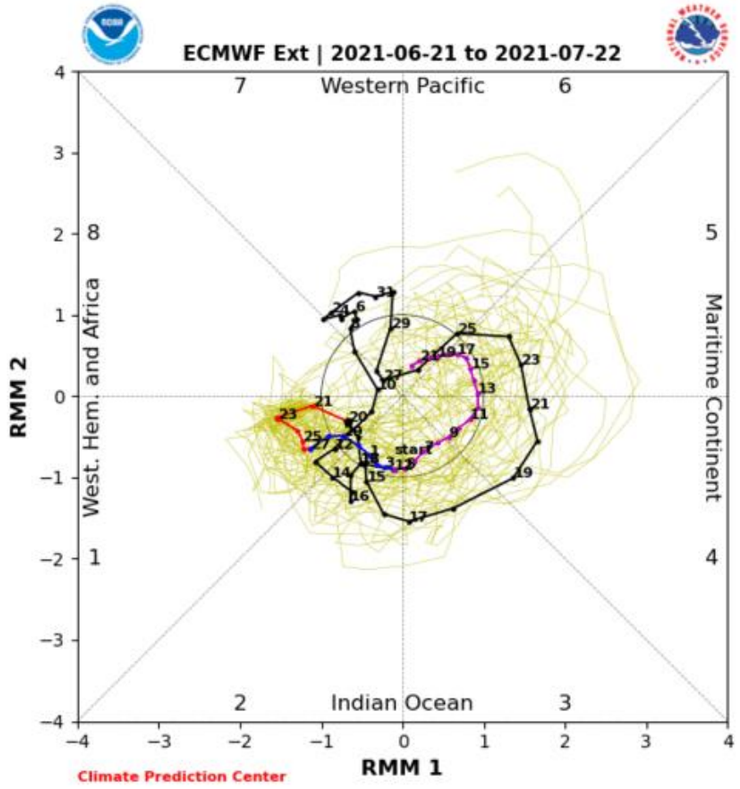

**Verification for the previous 7 days**

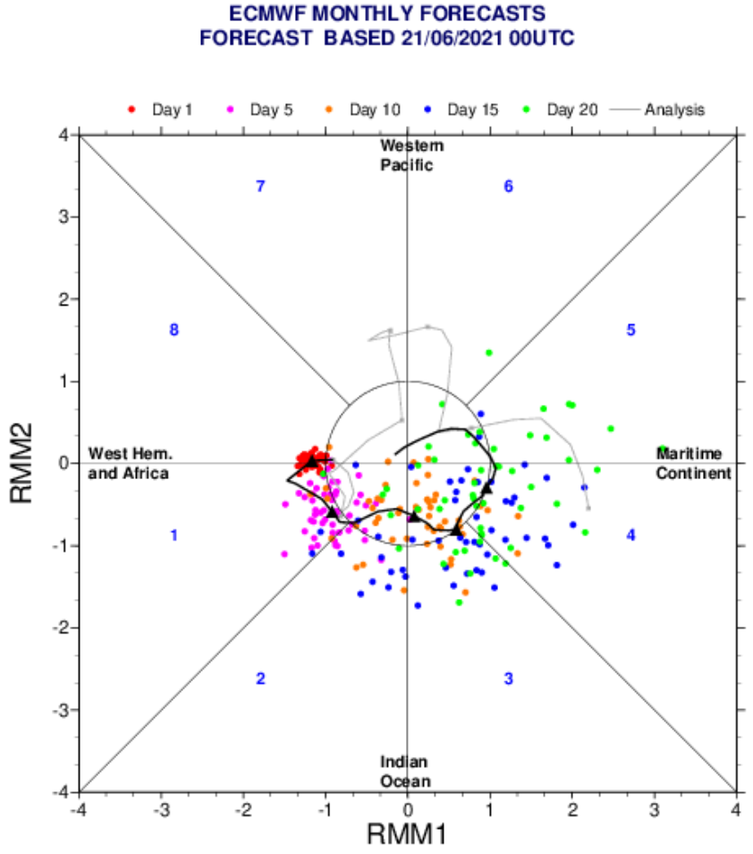



**Verification for the previous 15 days**



# MJO monitoring and forecasts for ECMWF, NCEP and UK Met Office from MJO working group website



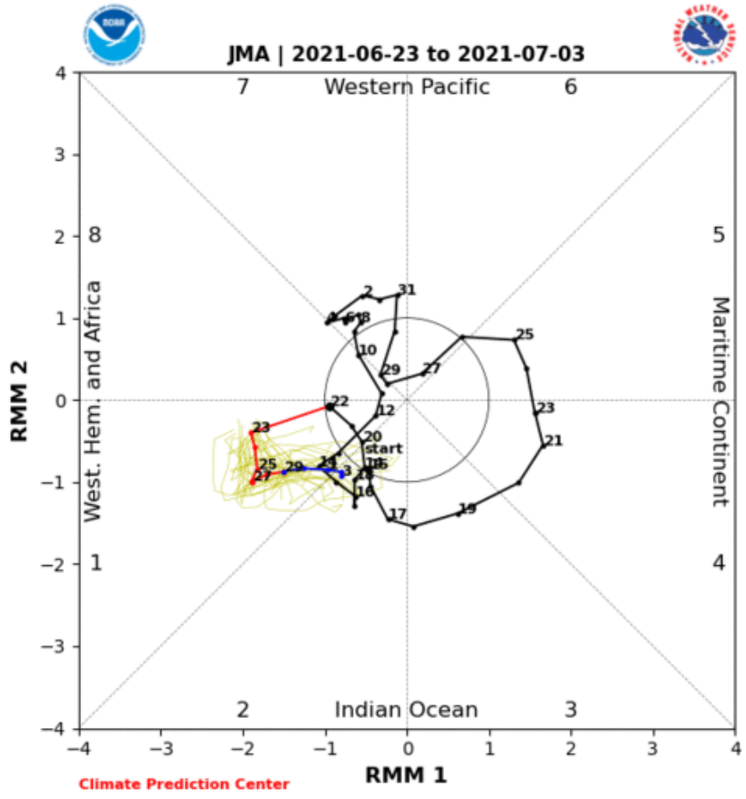




**Figure 20: Forecasts for ECMWF, NCEP and UK Met Office**

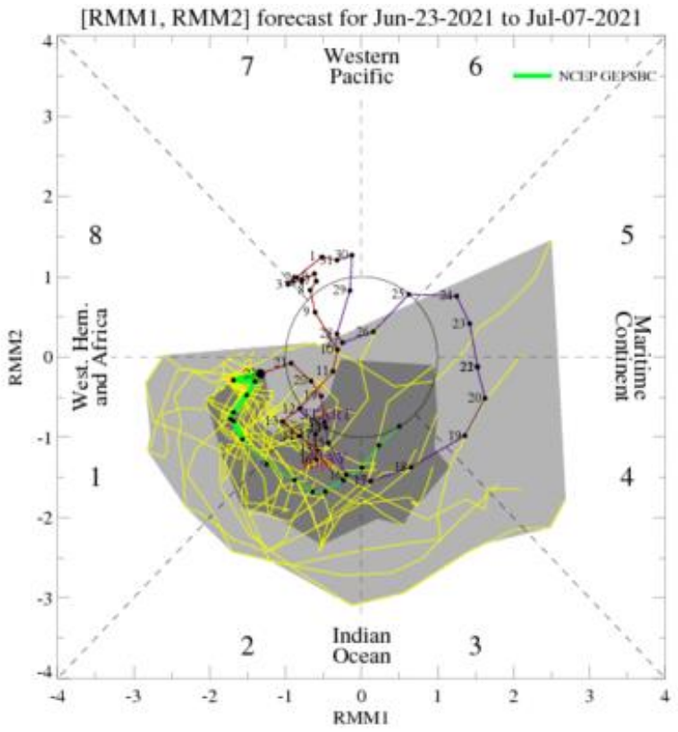
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/emon.shtml

https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/jman.shtml

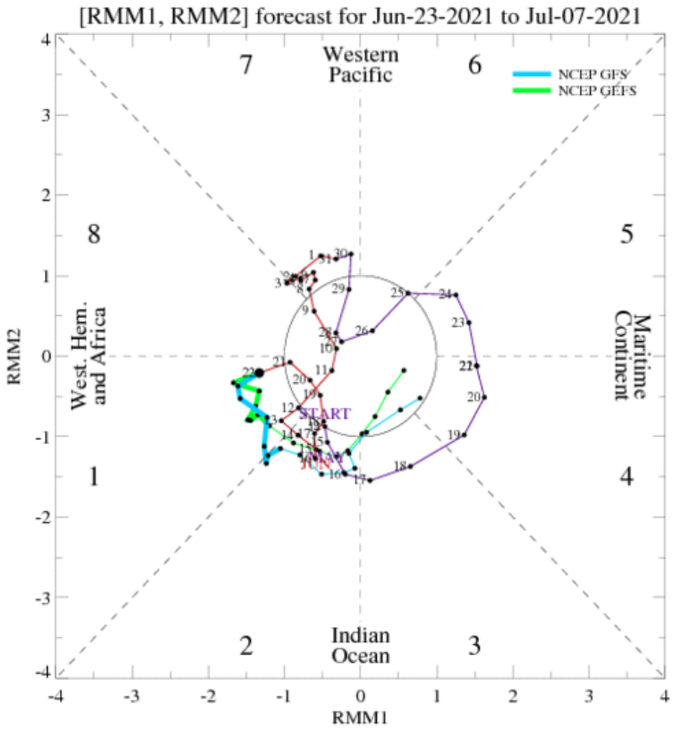
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_mjo_family_index?facets=undefined&time=2019081500,0,2019081500

# MJO FORECAST

## Ensemble GFS Phase Diagram




## Operational GFS Phase Diagram




## Statistical GFS Phase Diagram

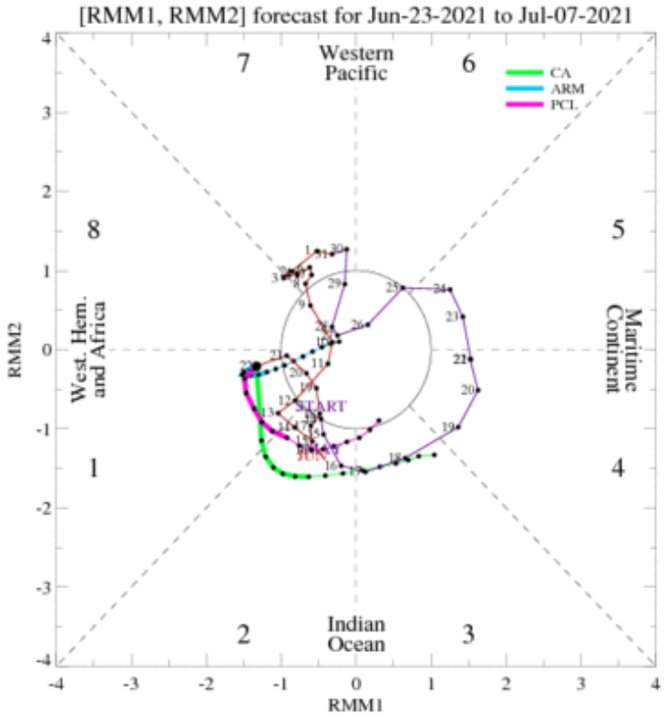



**Figure 21: MJO forecast**

https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/foregfs.shtml

https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/foroper.shtml

https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/forca.shtml

# The EWP, NCEP/GFS and CFSv2 models Predicting the MJO 40 day Forecast

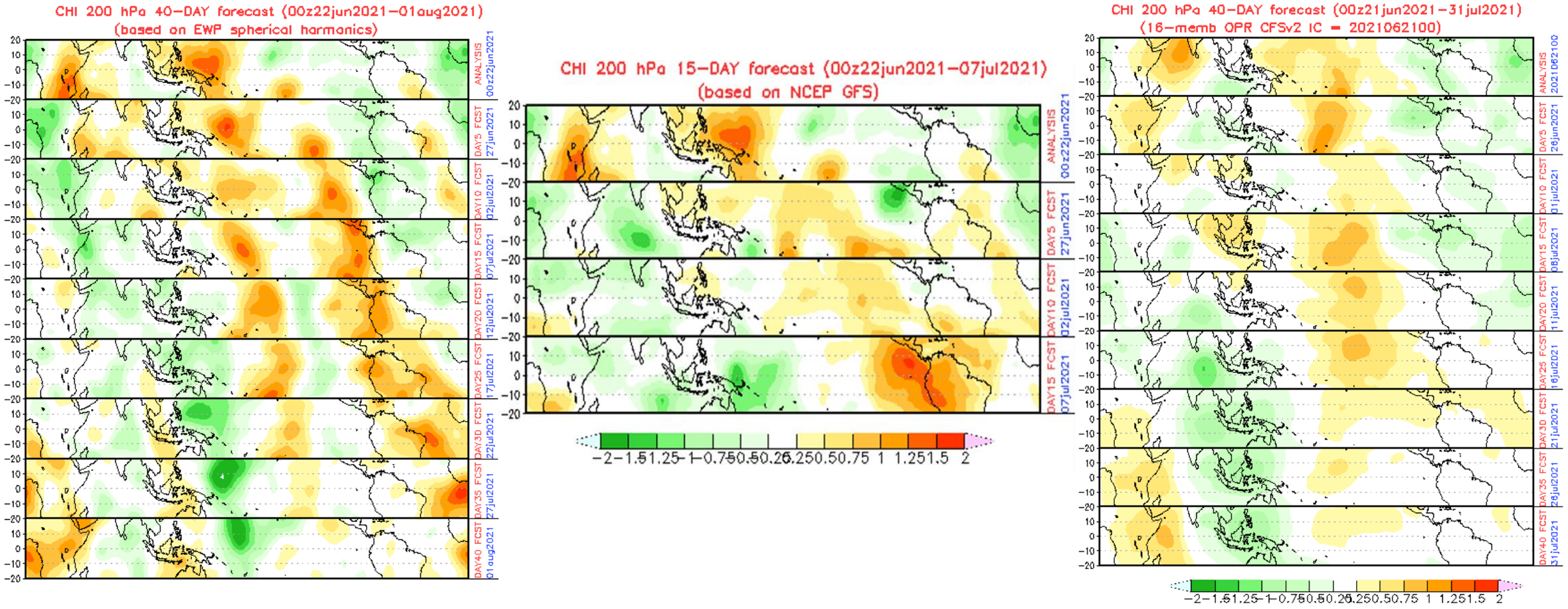


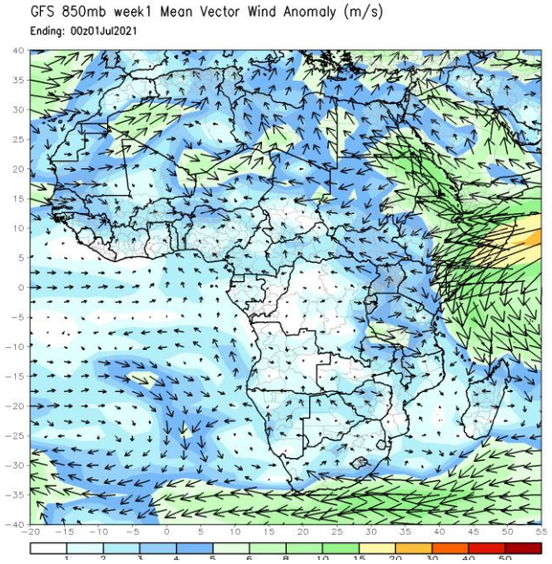

**Figure 22: MJO forecast**

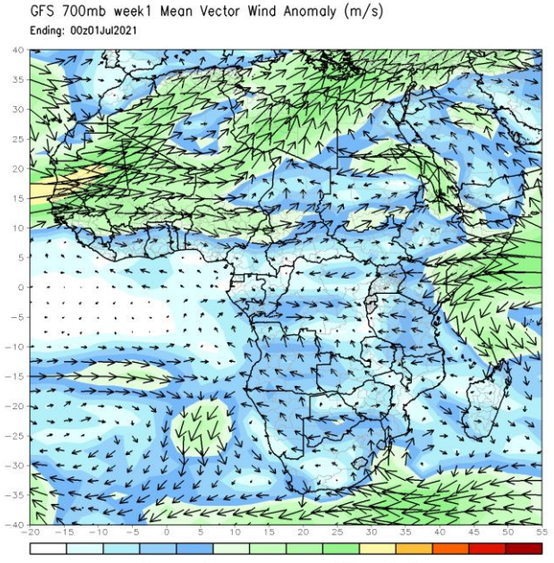
https://www.cpc.ncep.noaa.gov/products/people/wd52qz/mjo/chi/ewp.gif

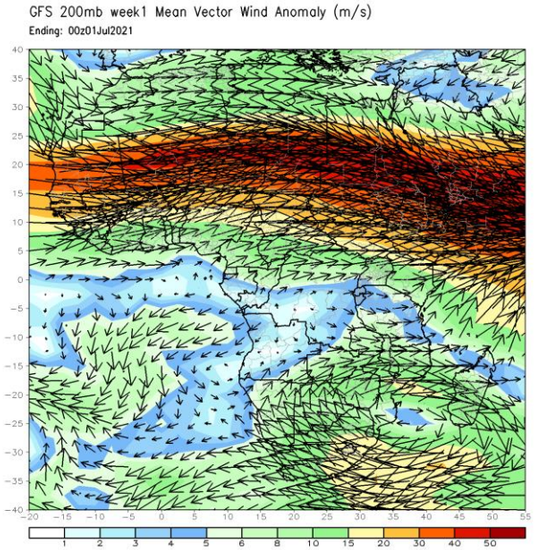
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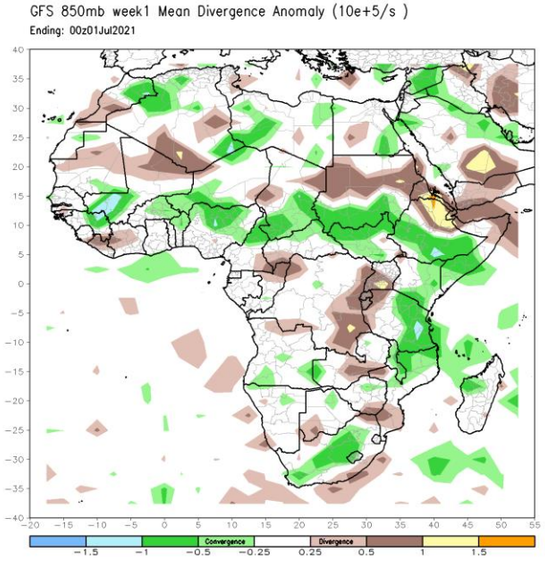
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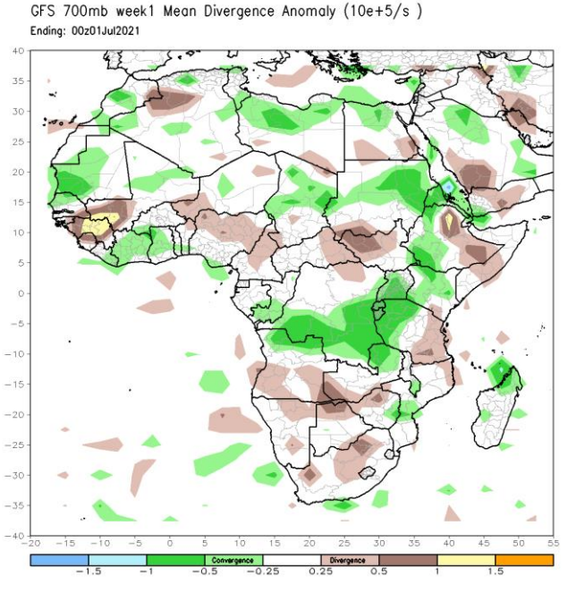
# Wind Anomaly and Divergence Forecast from GFS week1



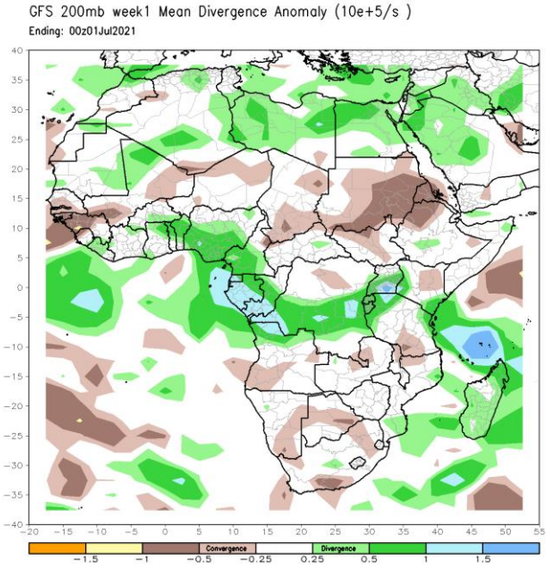
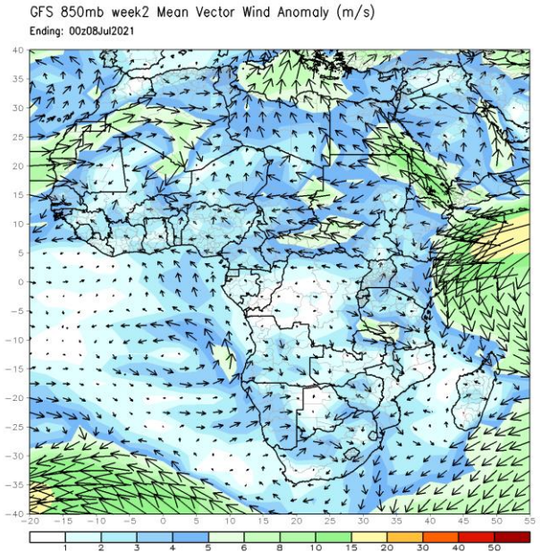
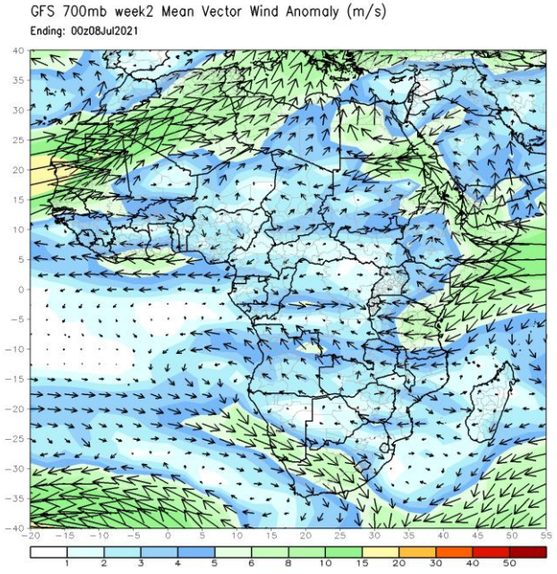



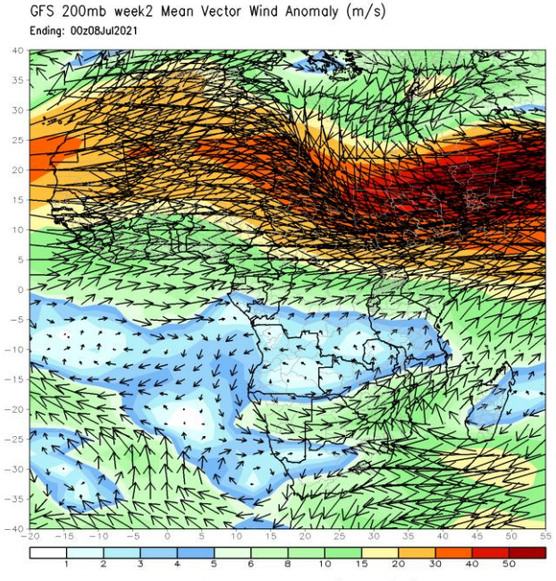

**Figure 23 : Forecast from GFS**

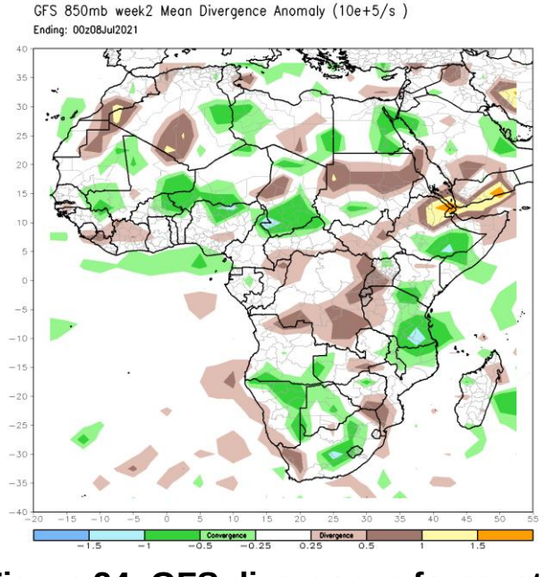
https://www.cpc.ncep.noaa.gov/products/international/africa/africa.shtml

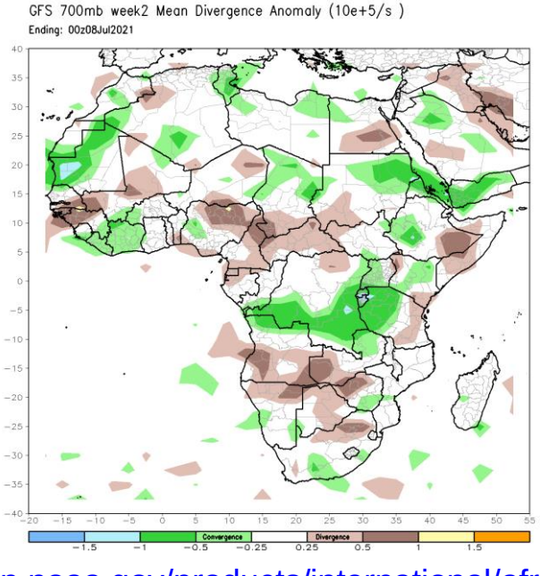
# Wind Anomaly and Divergence Forecast from GFS week2



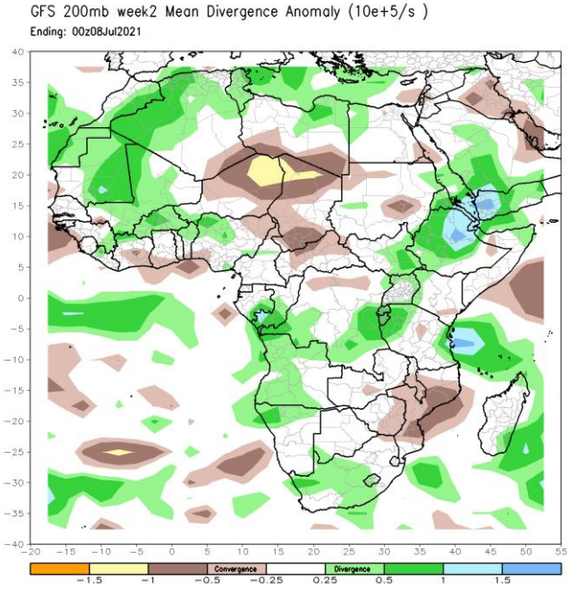
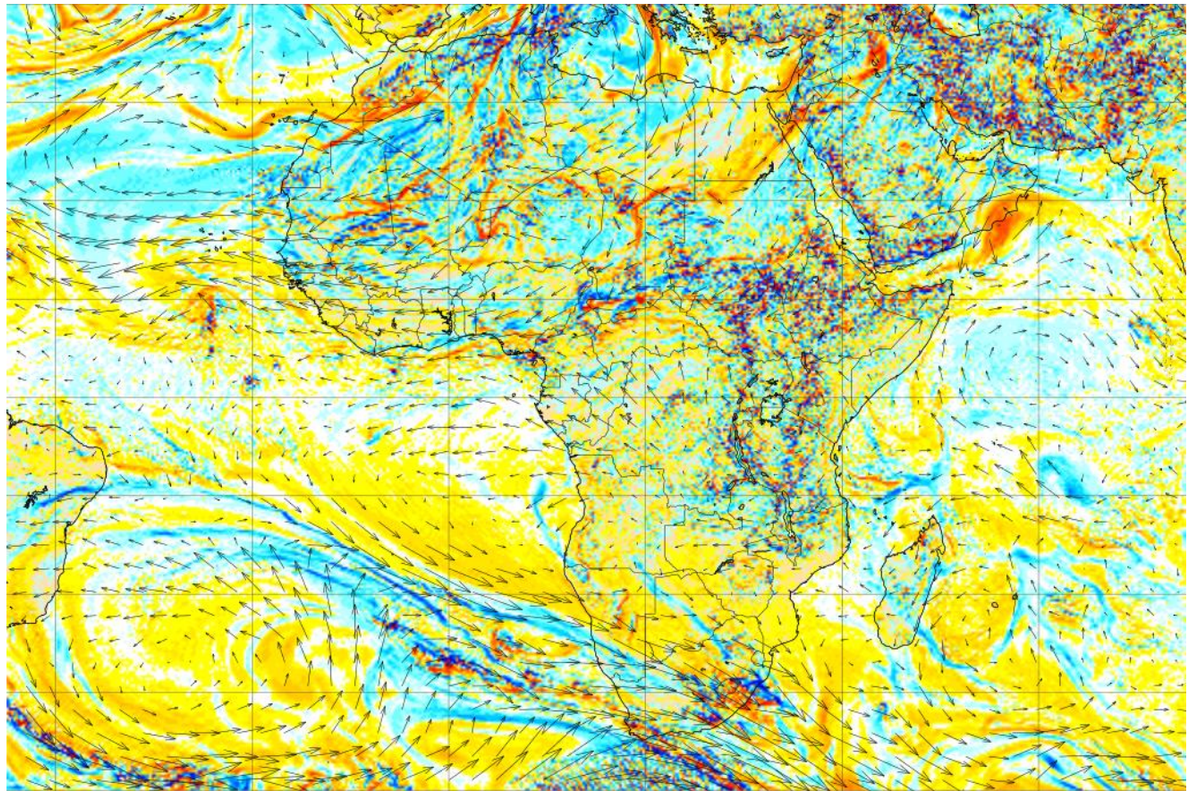



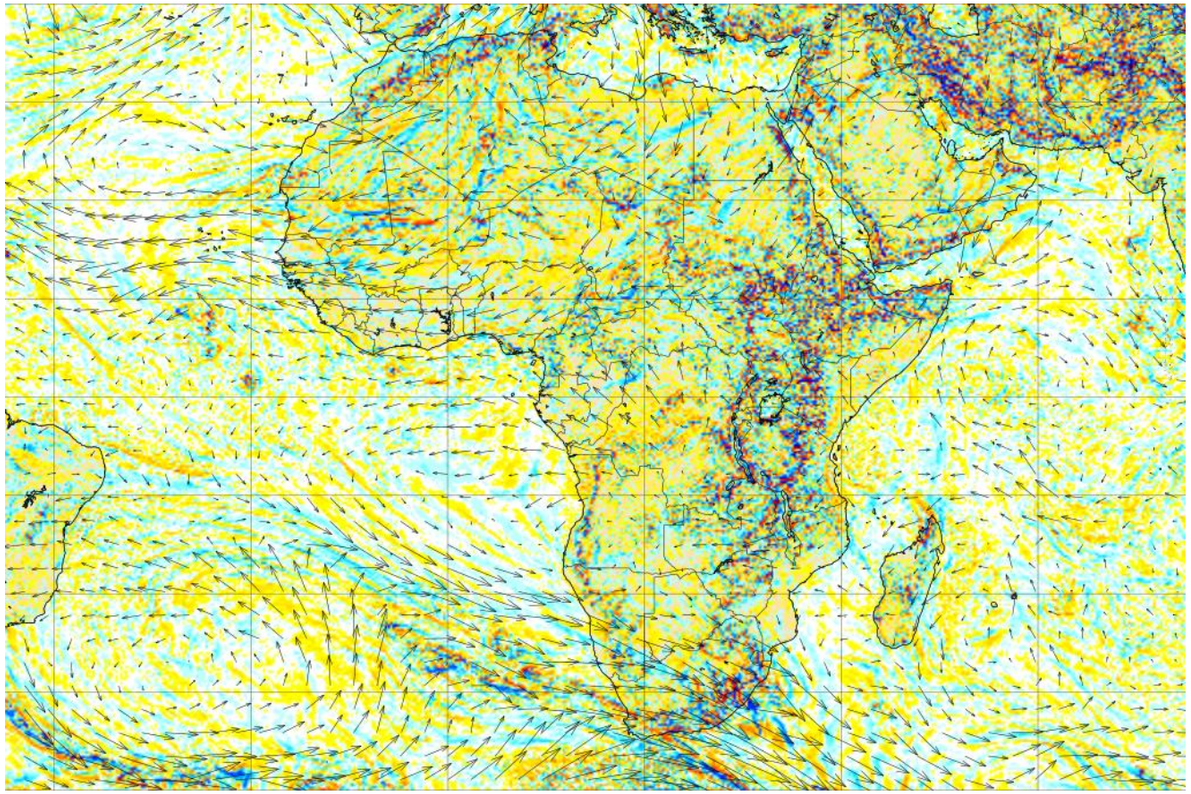

**Figure 24: GFS divergence forecast**

https://www.cpc.ncep.noaa.gov/products/international/africa/africa.shtml

# Week 1 at 700hpa Relative Vorticity and Divergence Wind Forecast from CFS and ECMWF

Relative vorticity at 700hPa / Wind at 700hPa
Thursday 24 Jun, 00 UTC T+108 Valid: Monday 28 Jun, 12 UTC





Divergence at 700hPa / Wind at 700hPa
Thursday 24 Jun, 00 UTC T+180 Valid: Thursday 1 Jul, 12 UTC

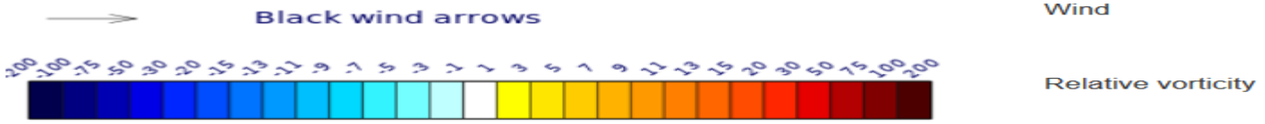
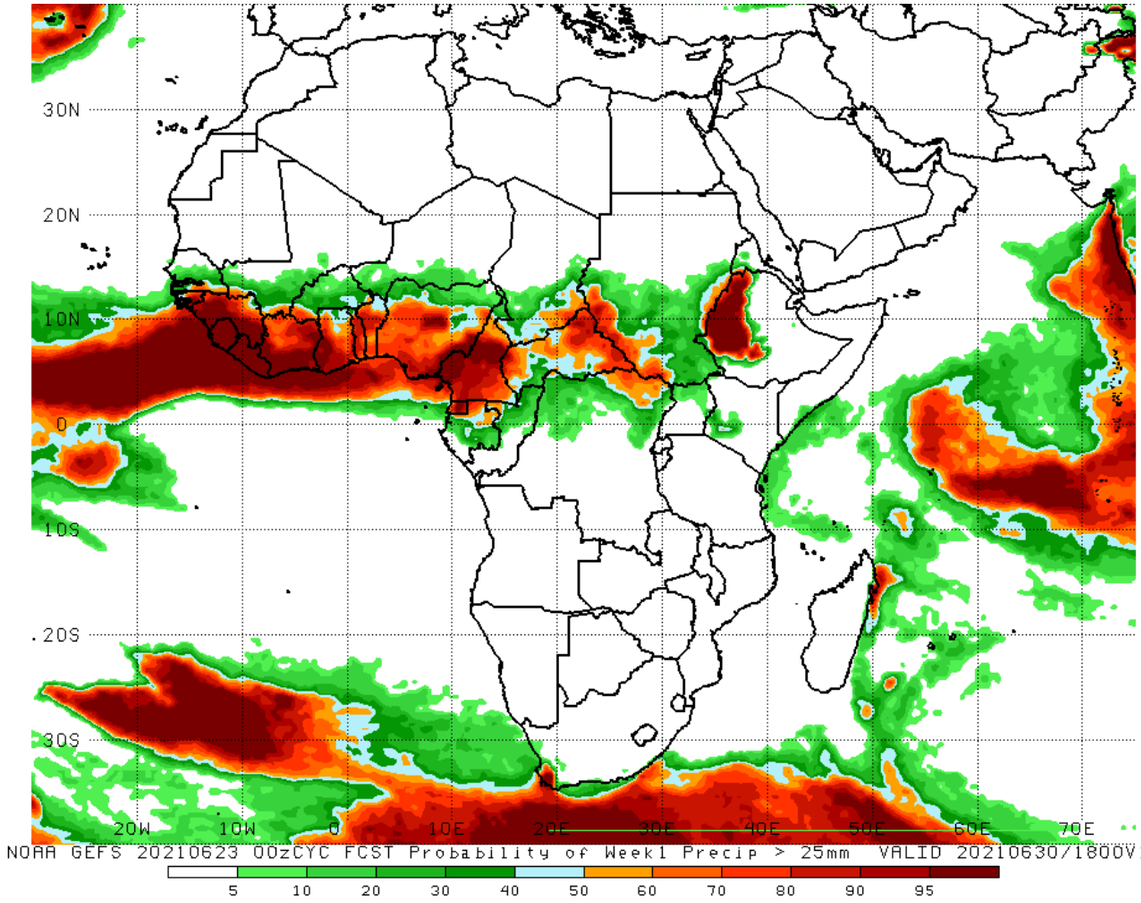



**Figure 25: Relative Vorticity and Divergence forecast from CFS and ECMWF**

https://www.ecmwf.int/en/forecasts/charts/catalogue/medium-rv-div-uv?facets=undefined&time=2019102300,144,2019102900&projection=africa&layer_name=rv_custom

# Probability of week-1 precip > 25 (left) and 50mm(right)

**Week-1 (17 – 23 June 2021) Precip > 25mm 2021**




**Week-1 (17 – 23 June 2021) Precip > 50mm**

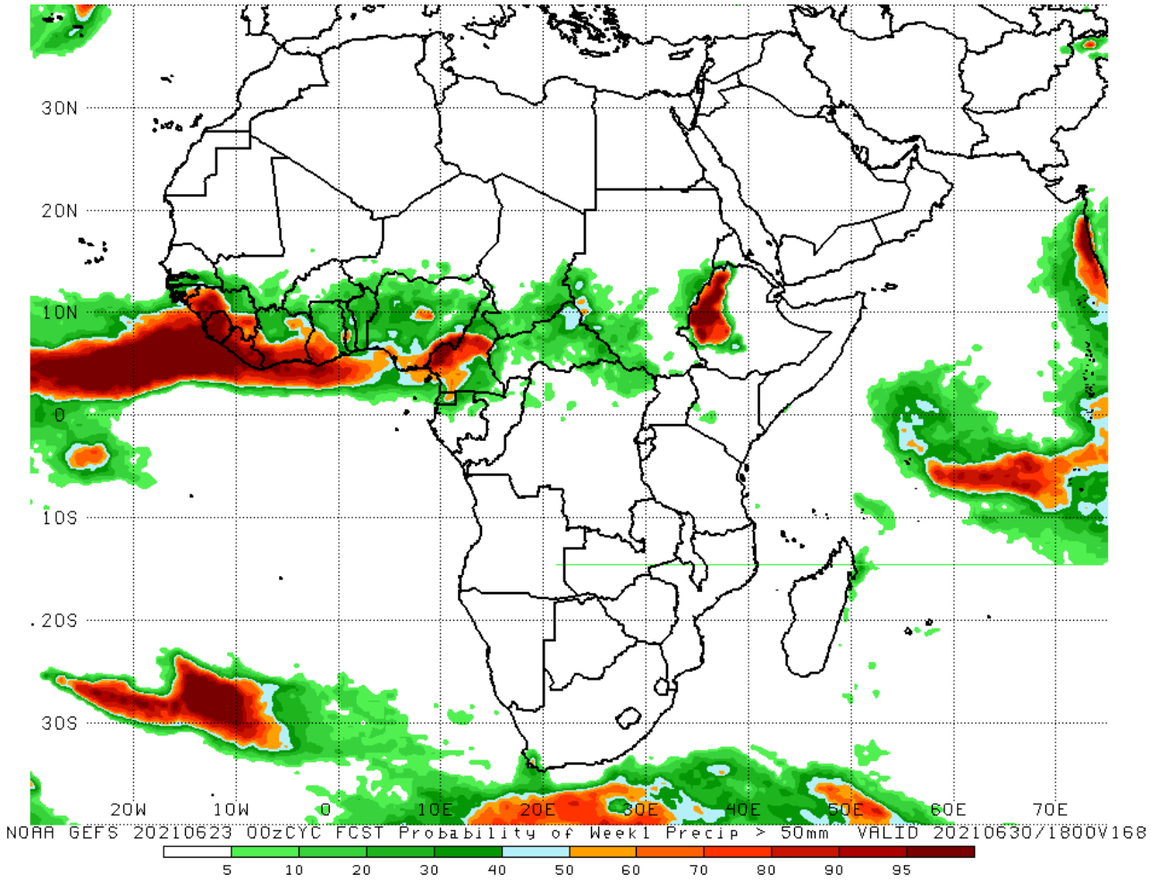


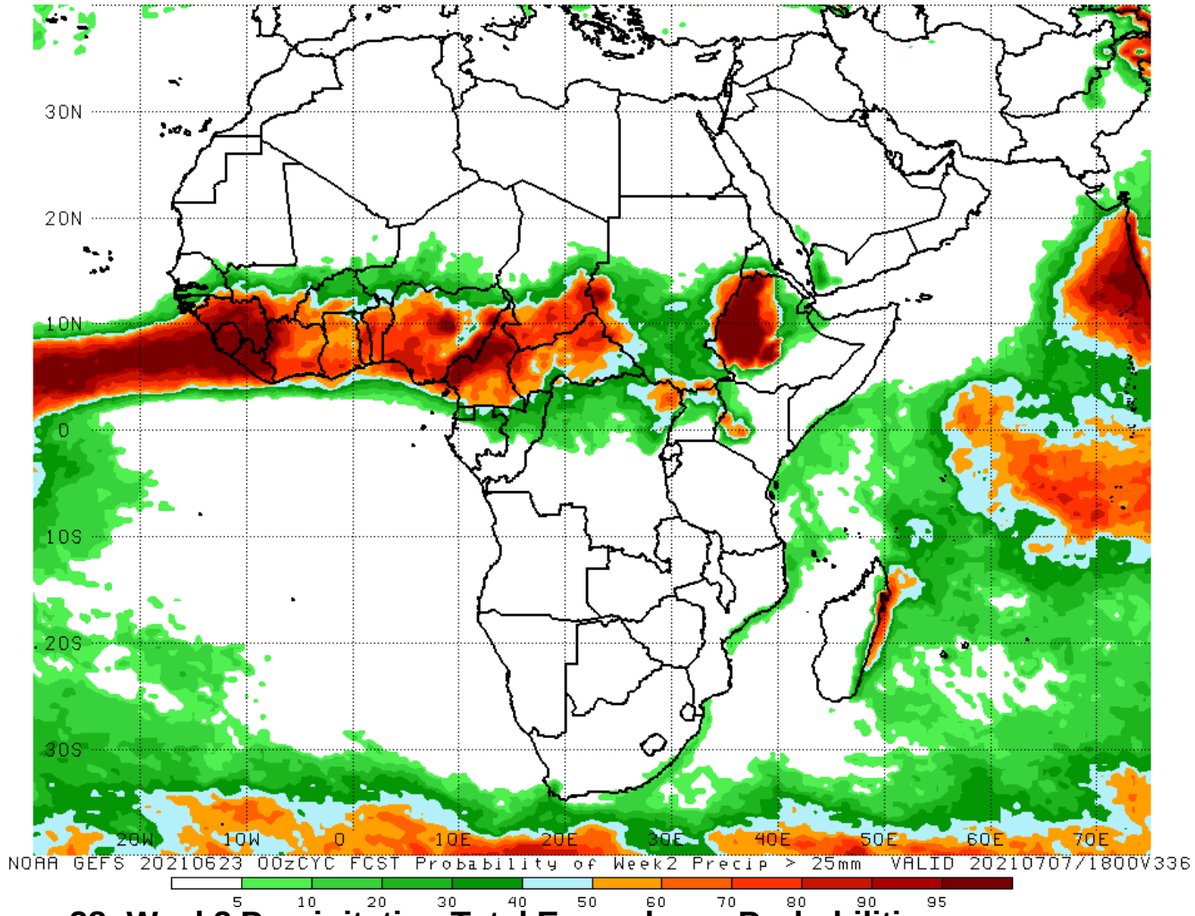

**Figure 27: Week1 Precipitation Total Exceedance Probabilities**

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/18/gefs_wk1_precip25mm_prob_africa.html

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/18/gefs_wk1_precip50mm_prob_africa.html

# Probability of week-2 precip > 25 and 50mm

**Week-2 (24 June - 30 Jun 2021) Precip > 25mm 2021**




**Week-2 (24 June – 30 Jun 2021) Precip > 50mm**

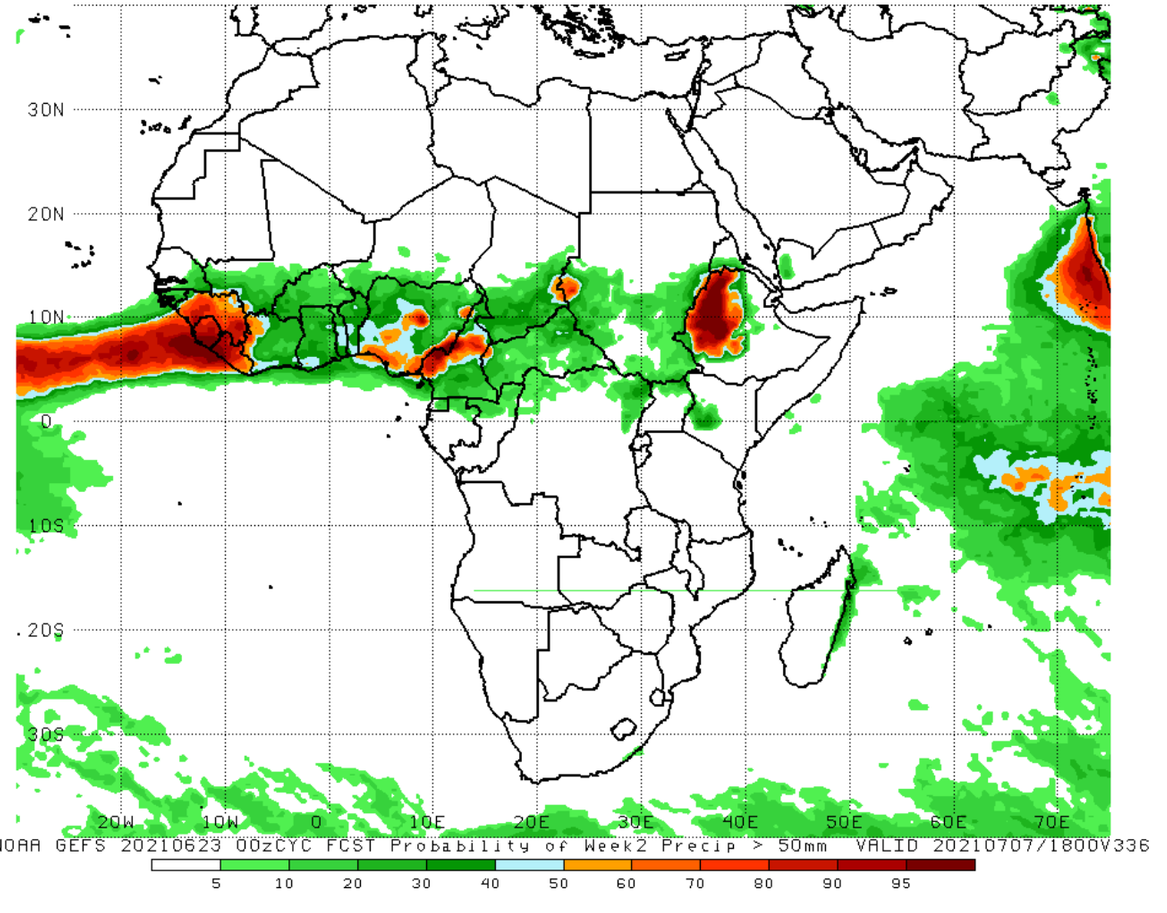



**Figure 28: Week2 Precipitation Total Exceedance Probabilities**

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/18/gefs_wk2_precip25mm_prob_africa.html

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/18/gefs_wk2_precip50mm_prob_africa.html

# Monthly Forecast from WMO Lead Centre Multi-Model Ensemble

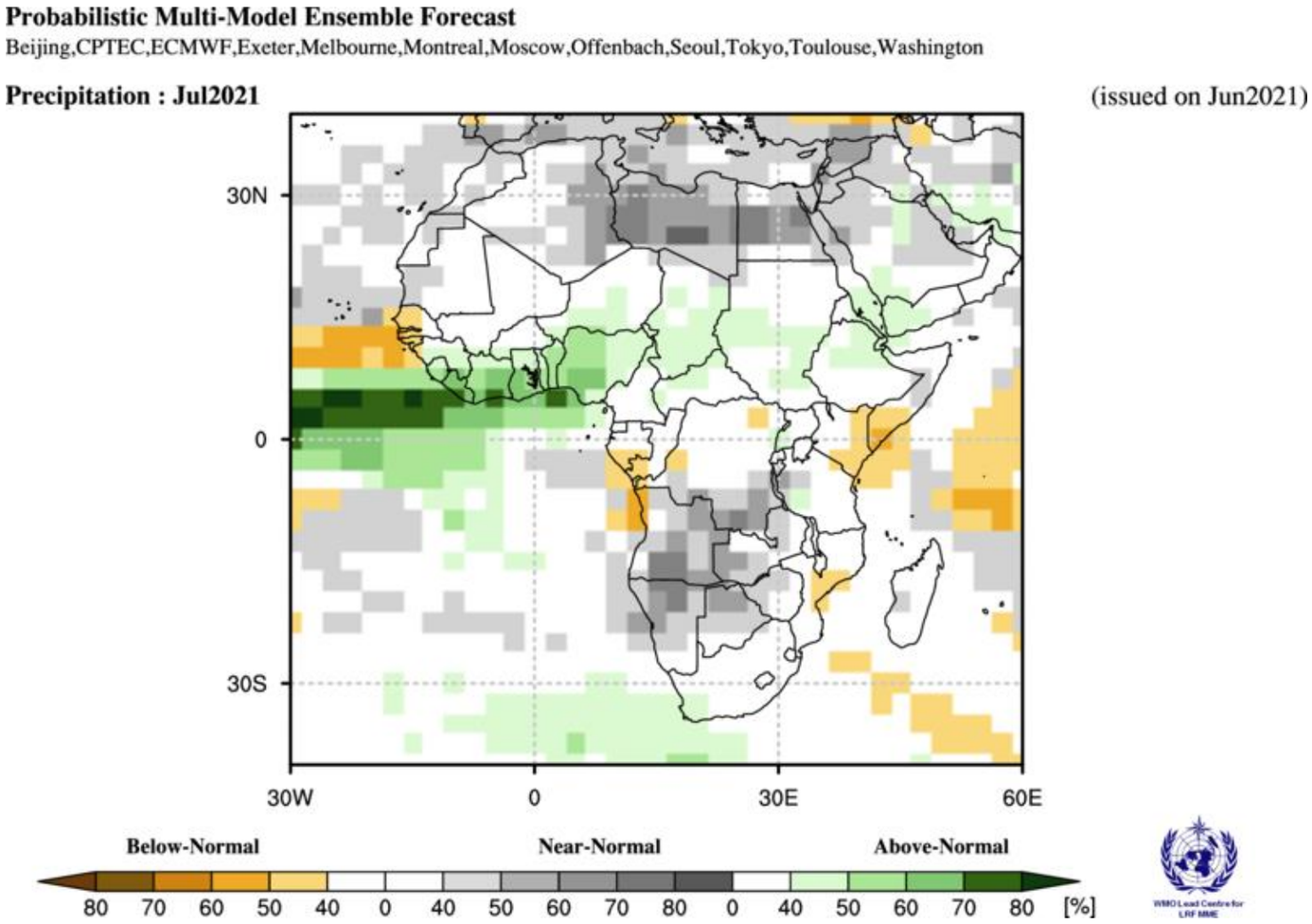
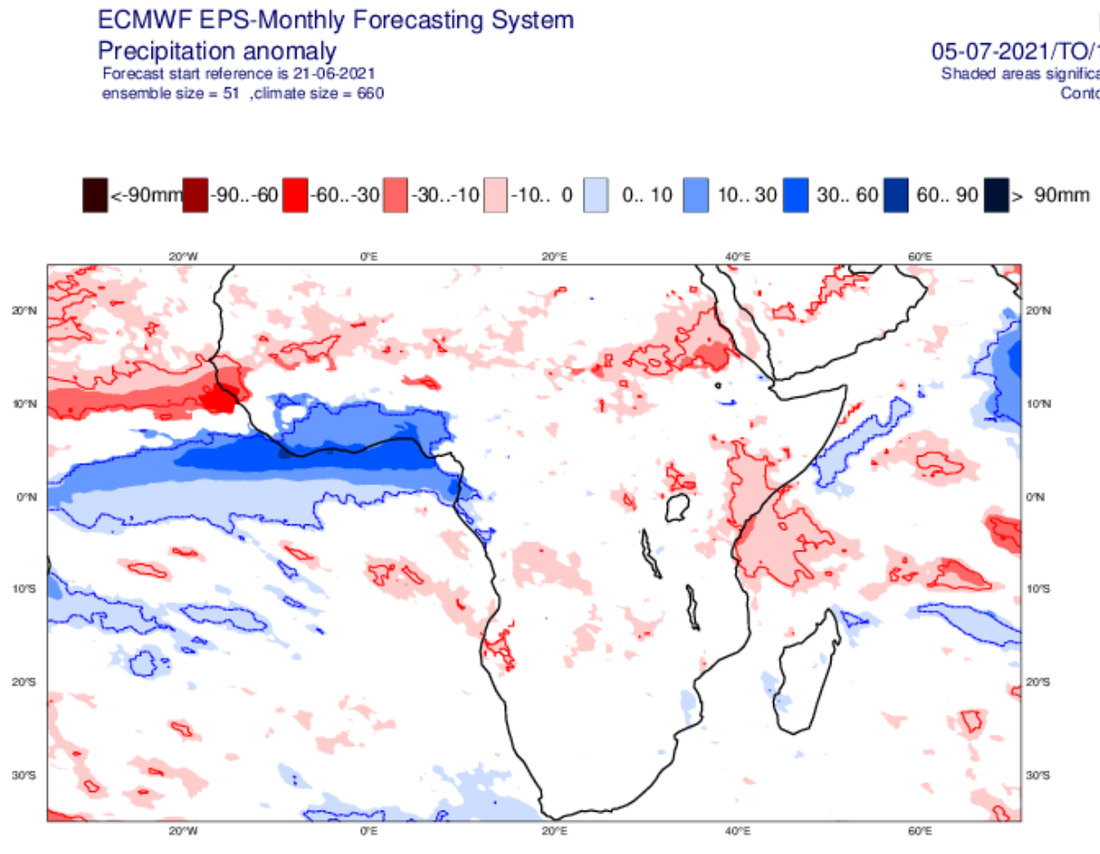



**Figure 29: Monthly Precipitation forecast**

The LCMM-level model set tells us that part of the Africa region will have average to higher than average rainfall.

https://www.wmolc.org/seasonPmmeUI/view?winName=PlotView1566209968309

# Precipitation Anomaly Forecasts from ECMWF for week 3 and 4



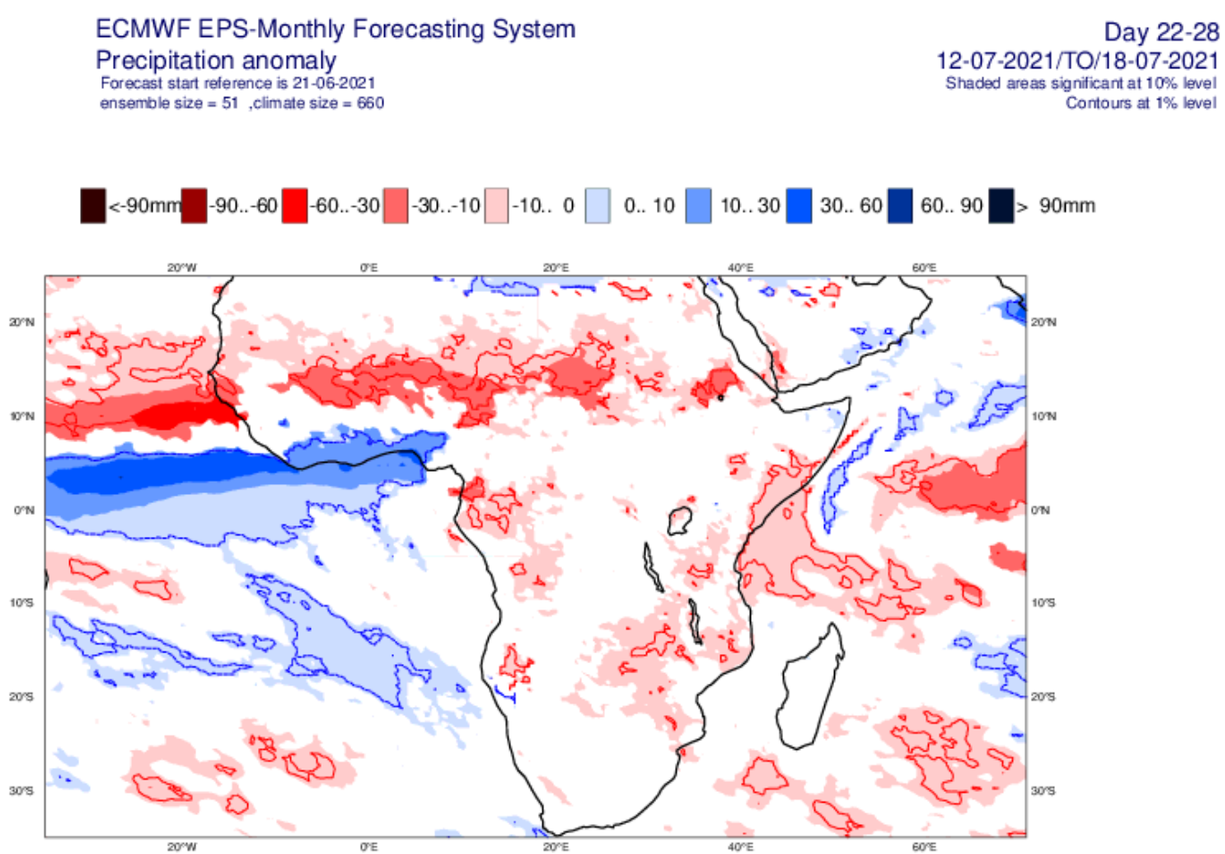
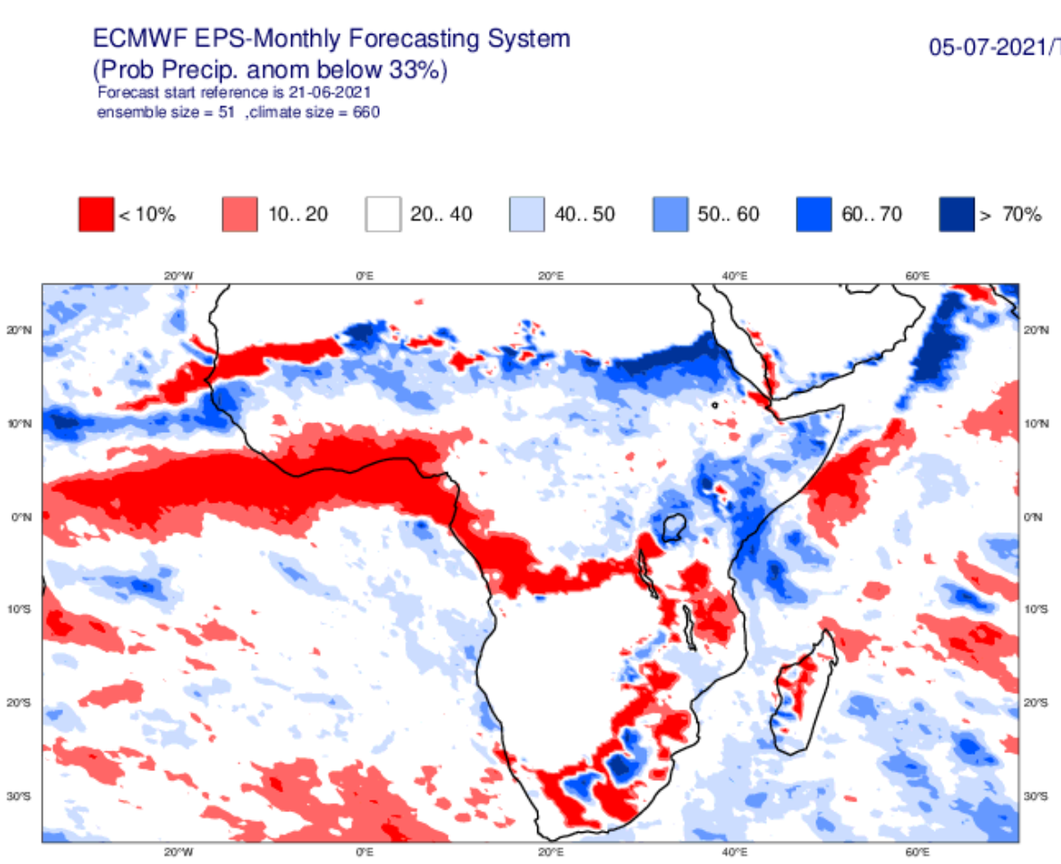




**Figure 30: Monthly Precipitation Anomaly forecast from ECMWF**

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_anomaly?facets=undefined&time=2019081500,408,2019090100&parameter=precipitation&area=Global

# Probability Precipitation Forecasts from ECMWF for week 3 & 4: weekly tercile at above 33%



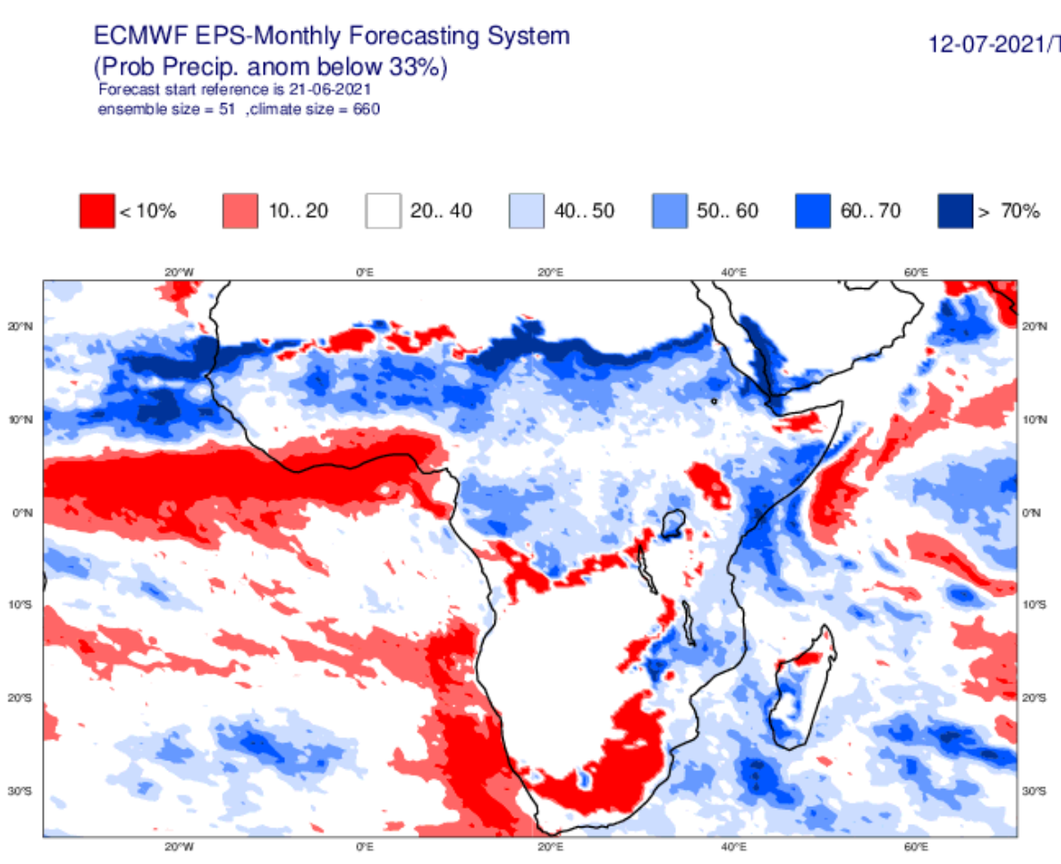
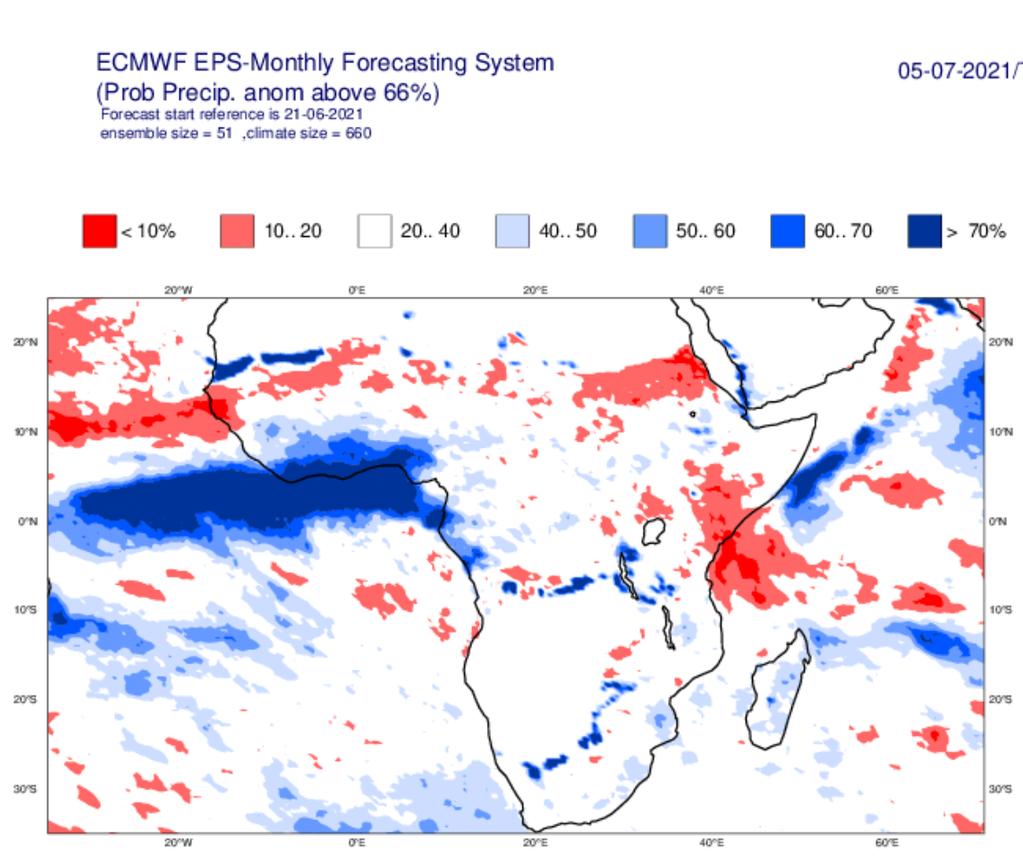




**Figure 31: Weekly tercile probability forecast below 33%**

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_anomaly?facets=undefined&time=2019112100,408,2019120800&parameter=precipitation&area=Global

# Probability Precipitation Forecasts from ECMWF for week 3 & 4: weekly tercile at above 66%



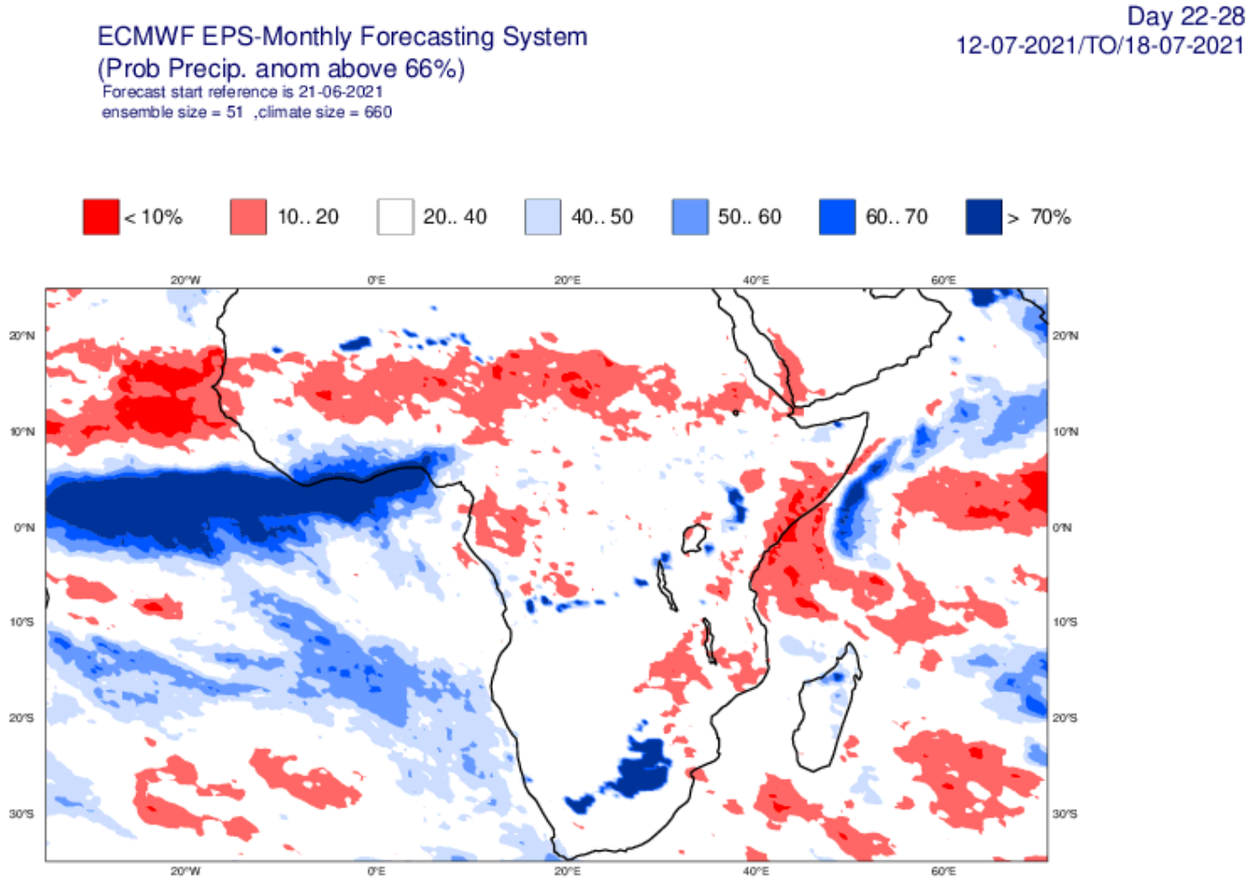
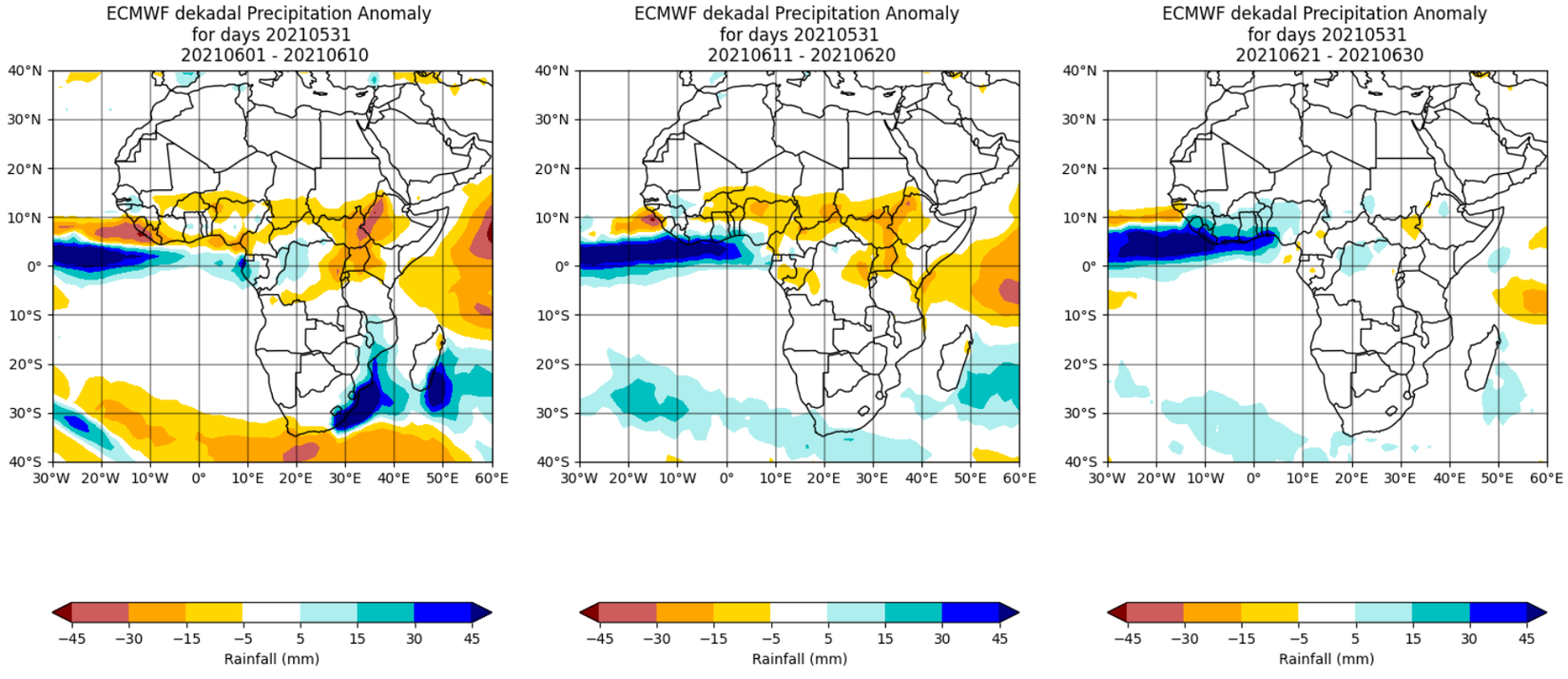
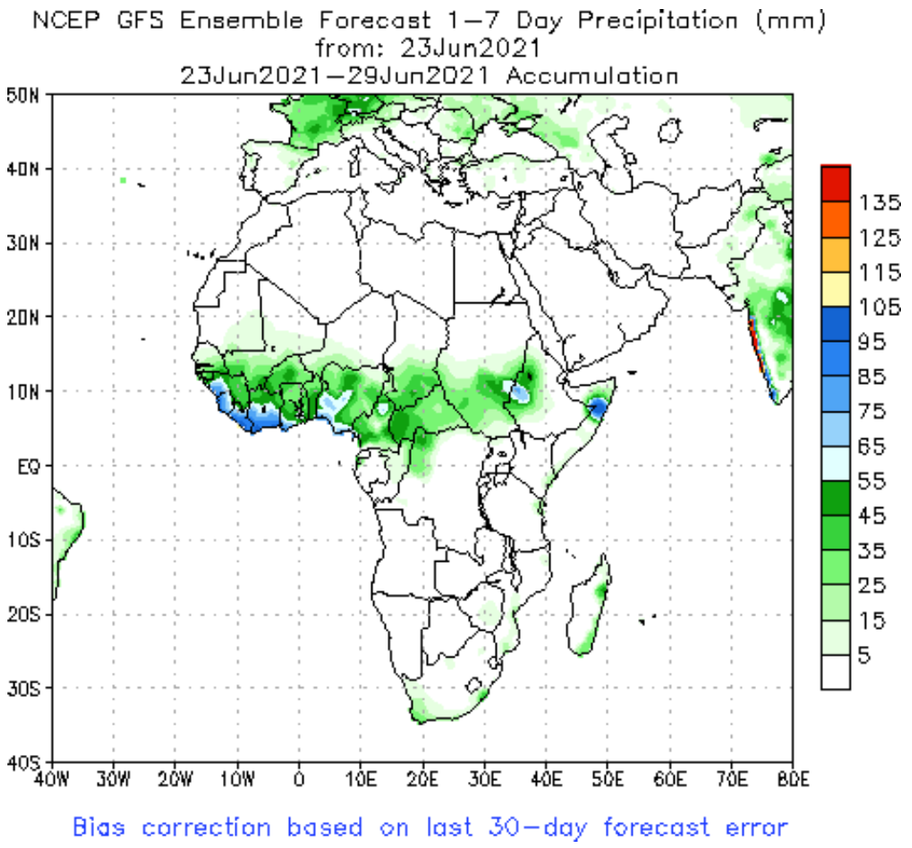




**Figure 32: weekly tercile probability forecast below  above 66%**

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_anomaly?facets=undefined&time=2019112100,408,2019120800&parameter=precipitation&area=Global


ECMWF dekadal Precipitation Anomaly
for days 20210531
20210601 - 20210610
ECMWF dekadal Precipitation Anomaly
for days 20210531
20210611 - 20210620
ECMWF dekadal Precipitation Anomaly
for days 20210531
20210621 - 20210630
40°N
30°N
20°N
10°N
0°
10°S
20°S
30°S
40°S
30°W 20°W 10°W 0° 10°E 20°E 30°E 40°E 50°E 60°E
−45 −30 −15 −5 5 15 30 45
Rainfall (mm)

# African Precipitation NCEP/GFS Bias-Corrected Precipitation and Anomaly Forecasts for week one



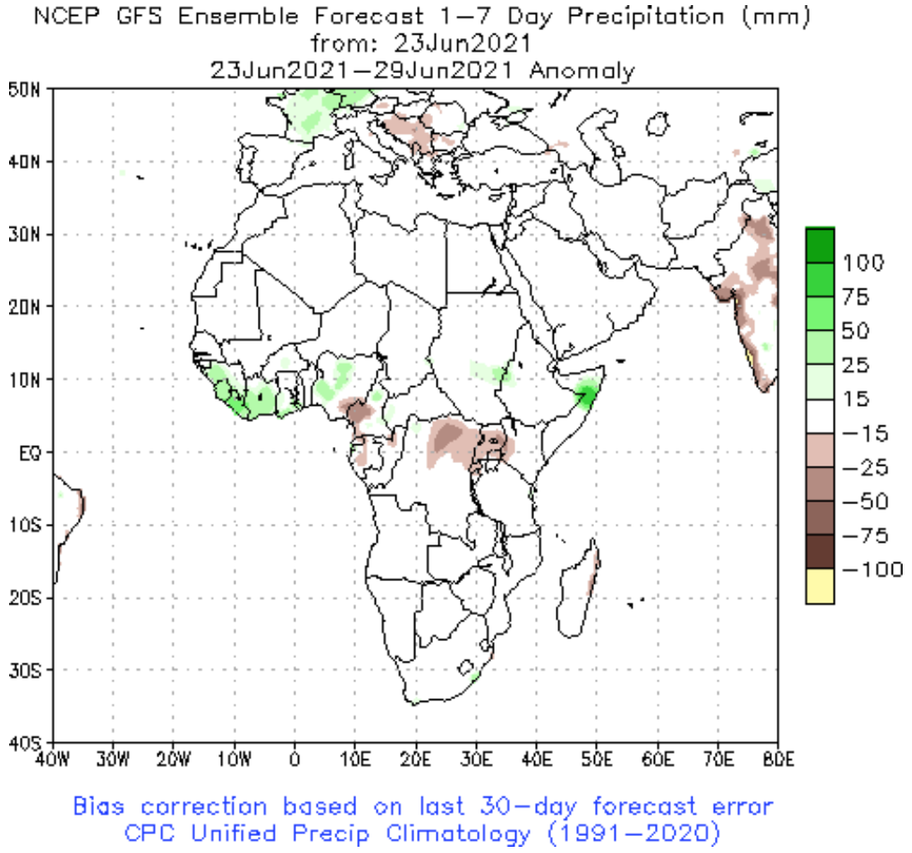
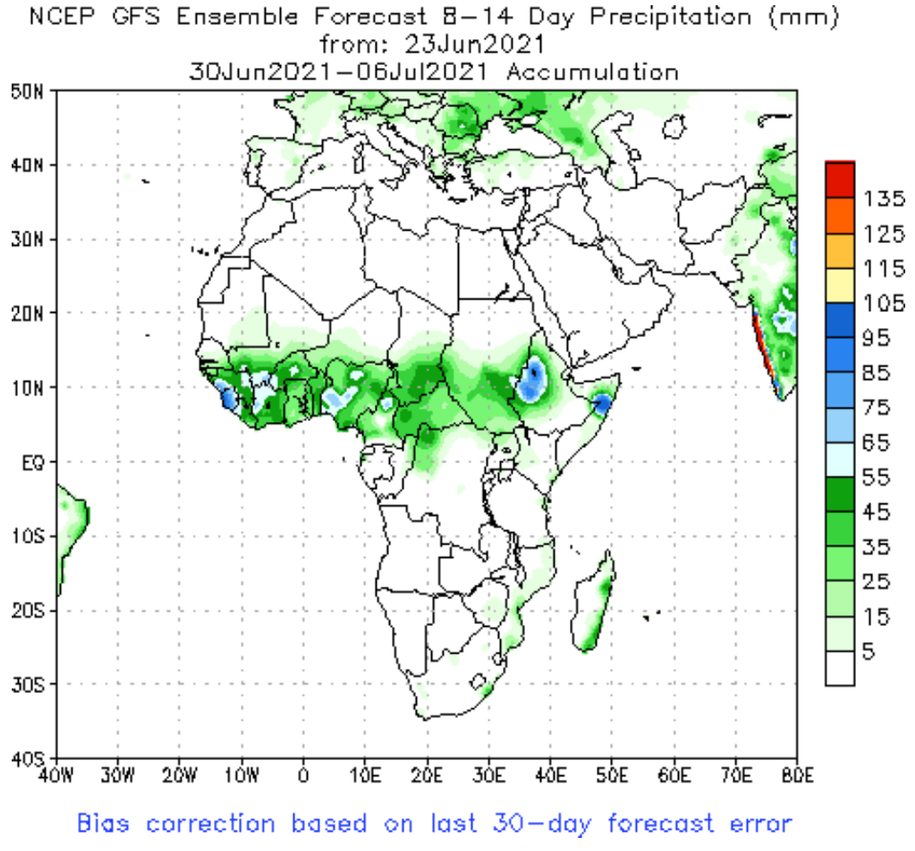




**Figure 33: NCEP/GFS Précipitation and Anomaly forecast.**

https://www.cpc.ncep.noaa.gov/products/Global_Monsoons/African_Monsoons/gfs_model.shtml

http://www.cpc.ncep.noaa.gov/products/people/wwang/gfs_precip/gfs_wk1.gif

# African Precipitation NCEP/GFS Bias-Corrected precipitation and anomaly forecasts for week two



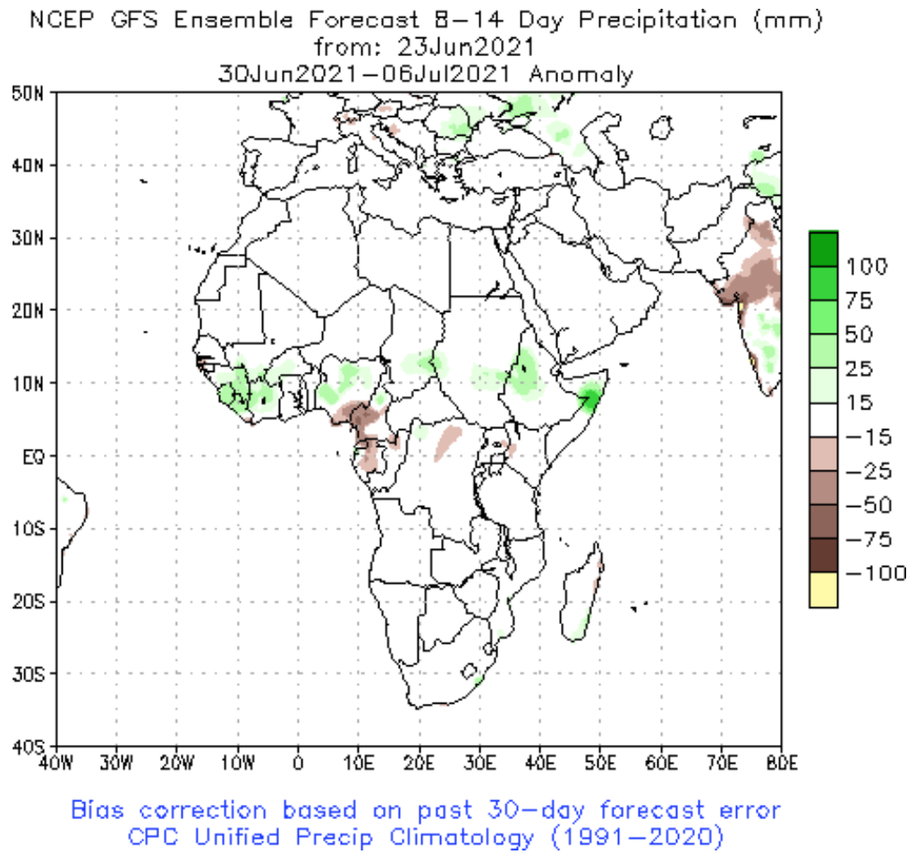
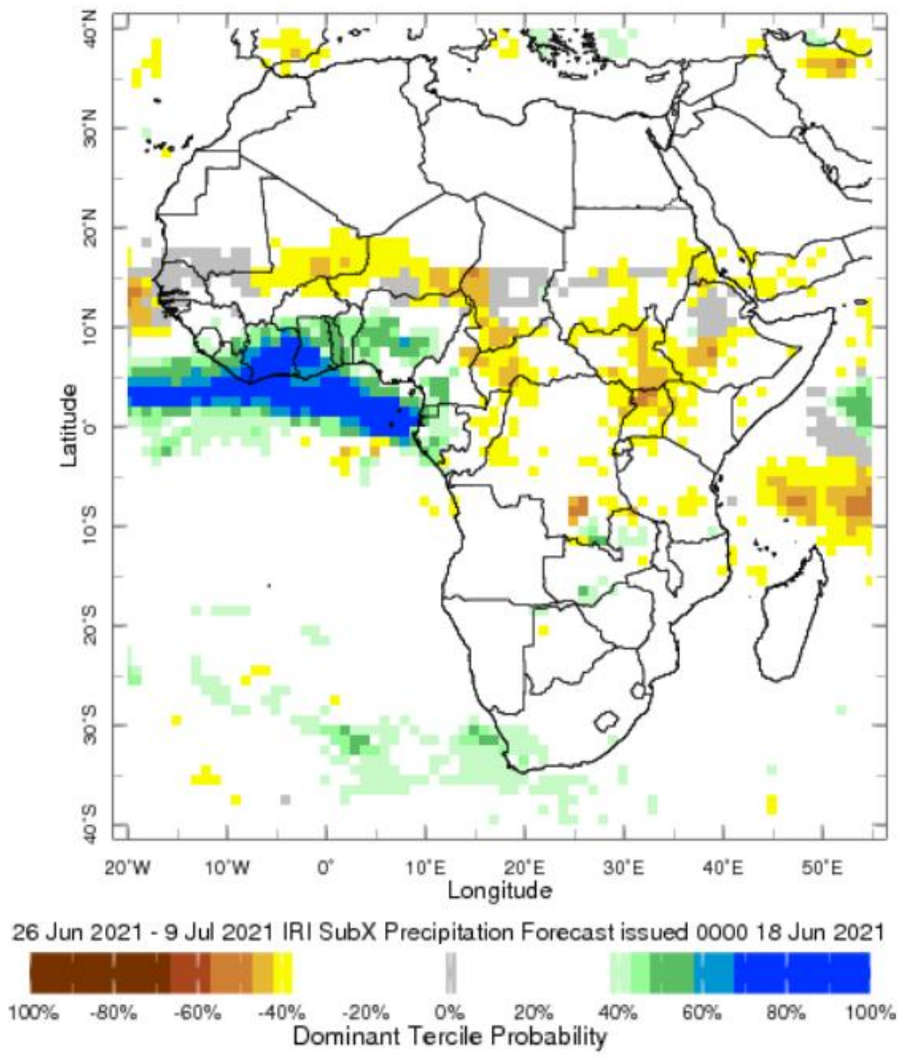




**Figure 34: Précipitation and Anomaly forecast**

https://www.cpc.ncep.noaa.gov/products/Global_Monsoons/African_Monsoons/gfs_model.shtml

# PRECIPITATION PROBABILITY FORECAST 26 June – 3 Jul 2021



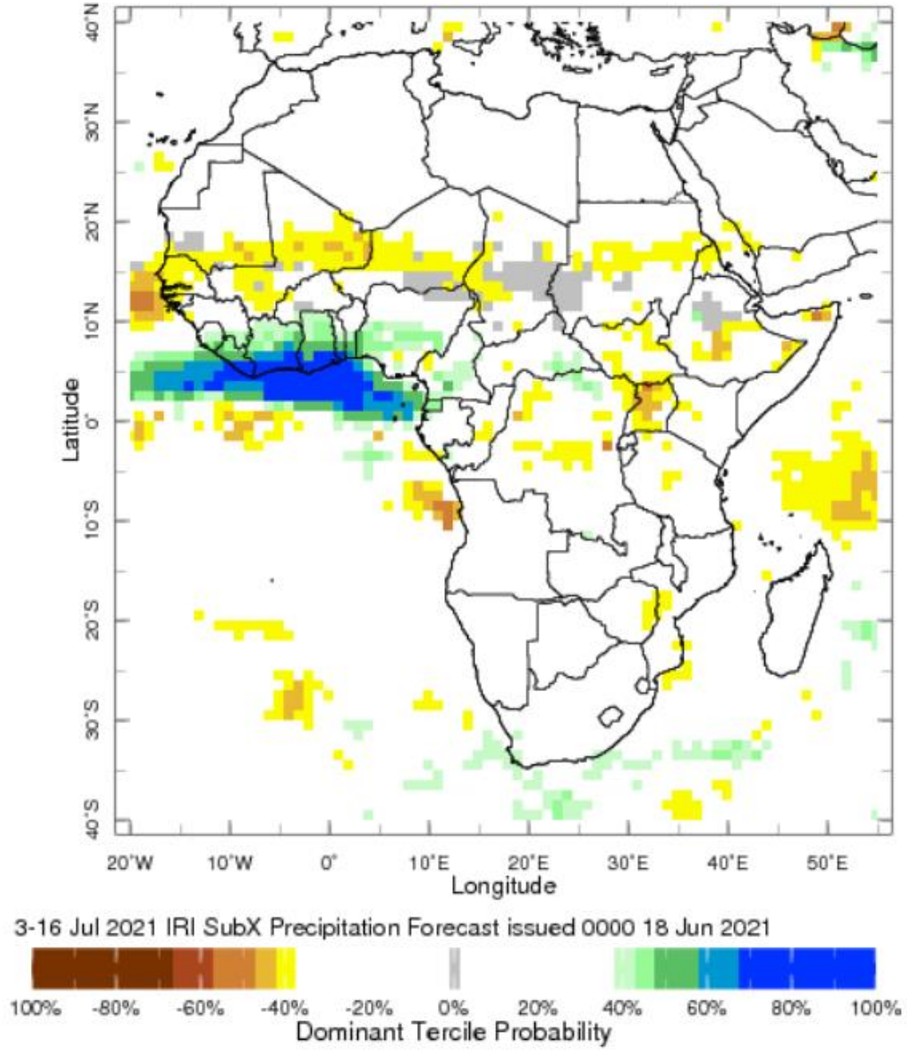




**Figure 35: Précipitation and Anomaly forecast**

https://iridl.ldeo.columbia.edu/maproom/Global/ForecastsS2S/precip_subx.html?Set-Language=en&bbox=bb%3A-20%3A-40%3A55%3A40%3Abb&S=0000%205%20Feb%202021&region=bb%3A-2%3A30%3A-1%3A31%3Abb

# CLIMATOLOGY OF PRECIPITATIONS FOR UPCOMING WEEK 3 & 4

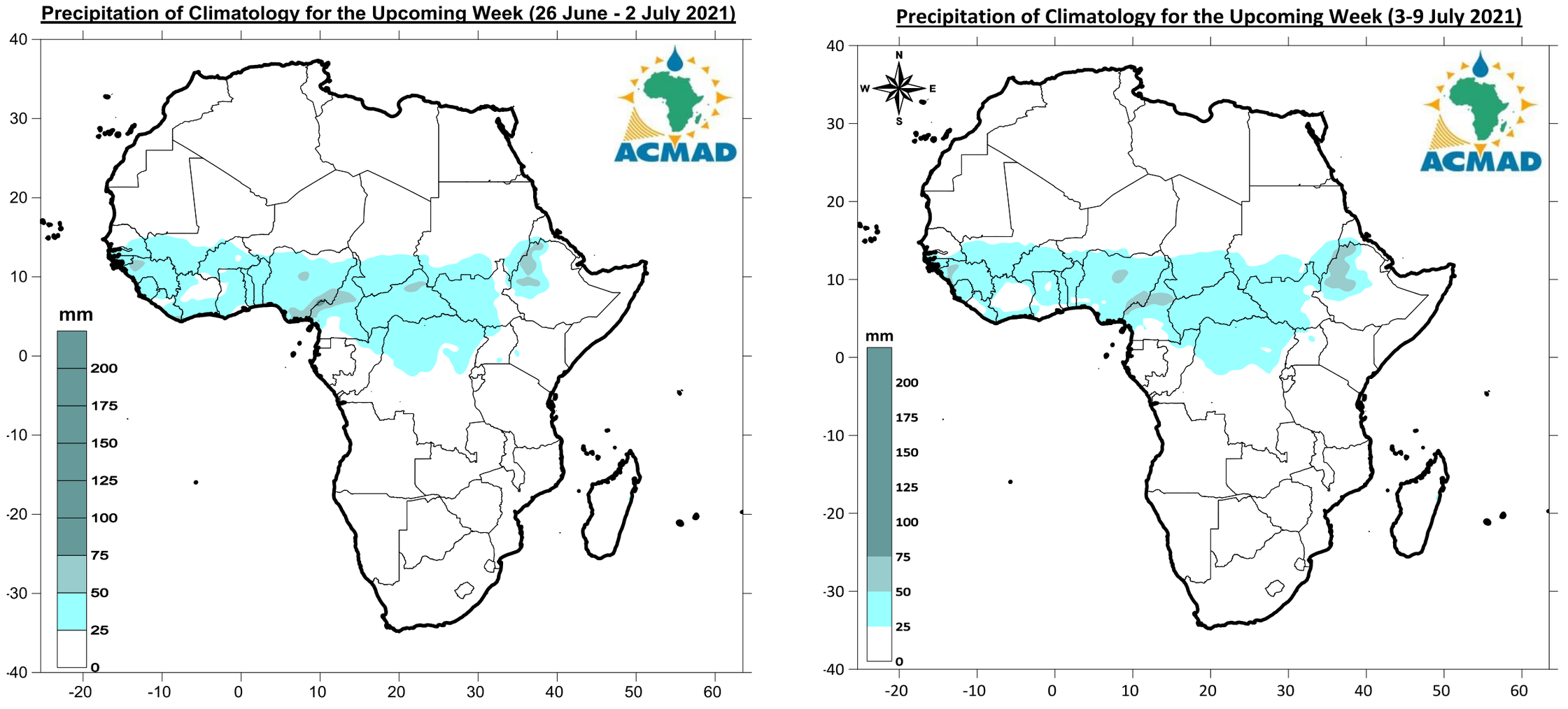



**Figure 36: Climatology of Precipation for week-1(left panel) and week-2 (right panel)**

# PRECIPITATION FORECAST FOR THE COMING TWO WEEKS

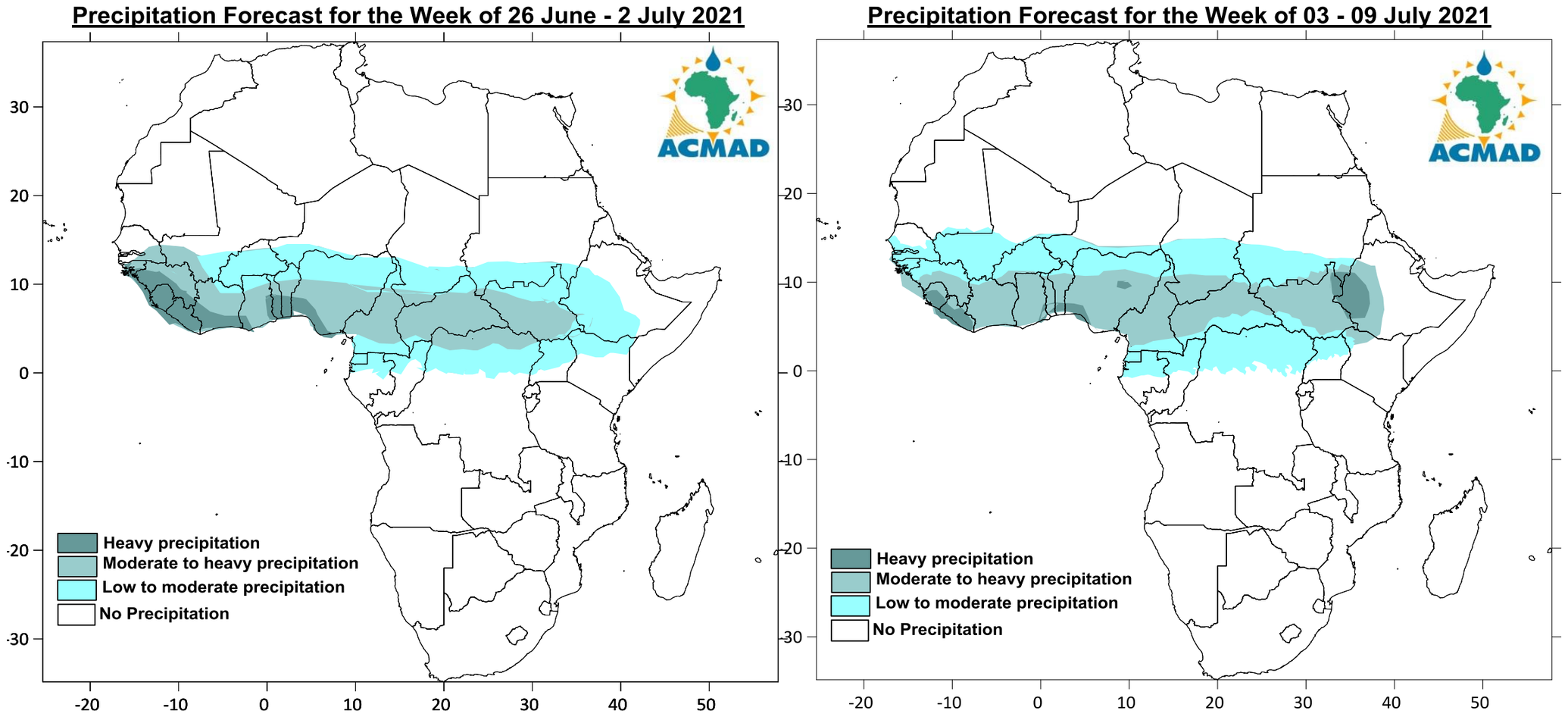



**Figure 37: Climatology of Precipation for week-2 (left panel) and week-3 (right panel)**