DEKADAL TECHNICAL NOTE FOR SECOND DEKAD OF MAY, 2021
AND PRECIPITATION FORECAST FOR WEEK 2 AND 3

Drafted and Presented by **Esther Verena Jansen**

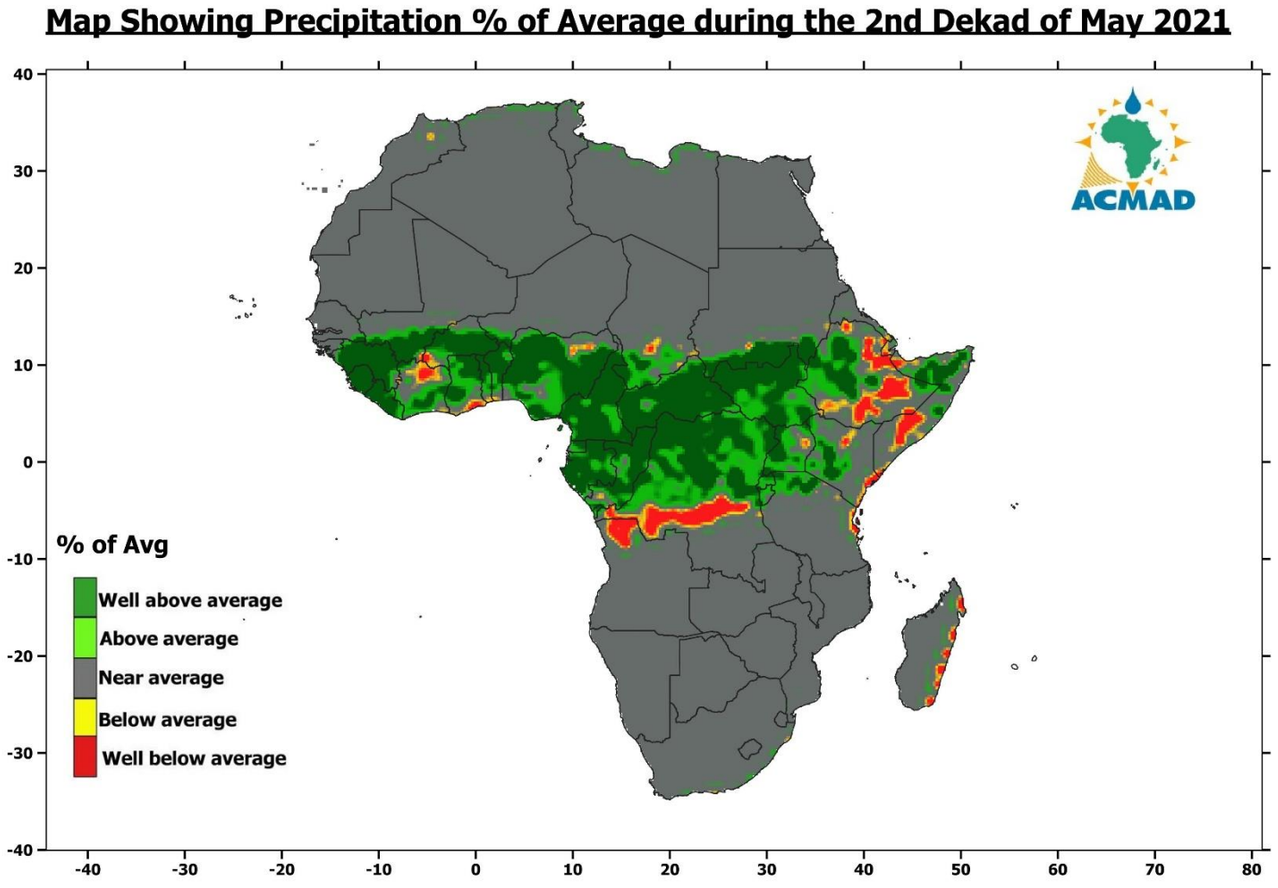
Edited by: **Hubert KABENGELA :**

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

Estimate Cumulative Precipitation in % of average for the second dekad of May 2021



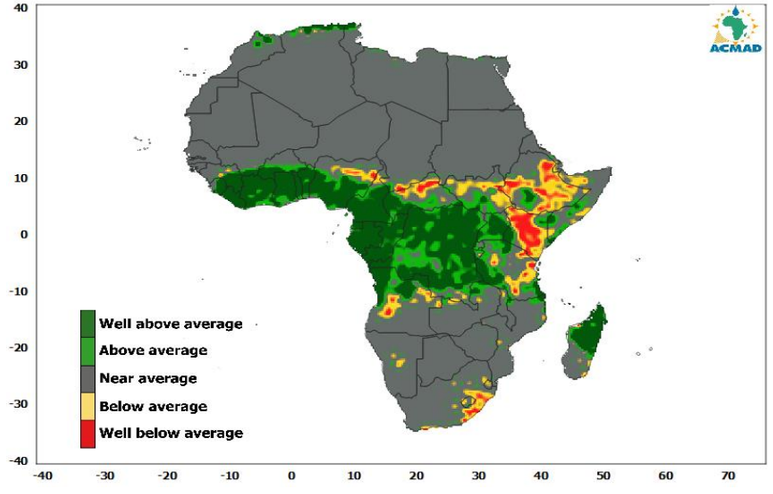
The figure shows that well above to above average précipitation prevailed over the countries around the equator, with central to eastern Kenya receiving well below average rainfall during the 1st Dekad of May 2021.

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

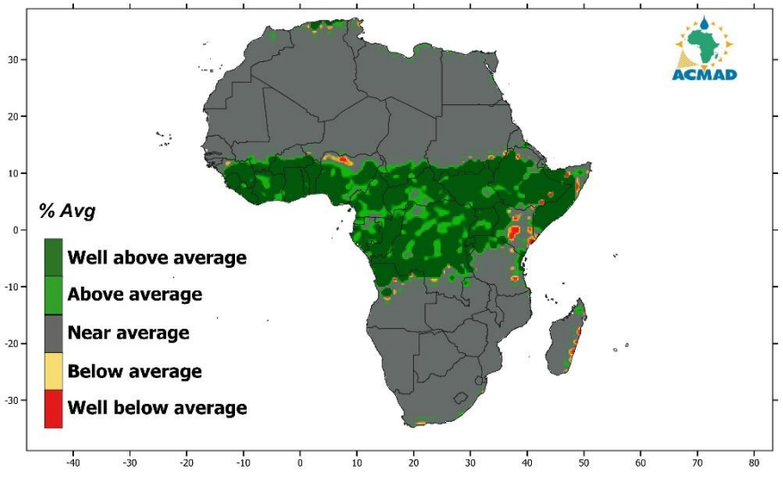
Data : SOURCES/.NOAA/.NCEP/.CPC/.FEWS/.Africa/.DAILY/.ARC2/.daily/.est_prcp/X/-20/0.5/70/GRID/Y/-40/0.5/40/GRID/T/%2821-31%20Jul%202014%20%29RANGE/T/SUM/

Temporal and spatial change of % of average precip for the last four consecutive dekads

2nd dek _ April 2021_% of Average Precipitation

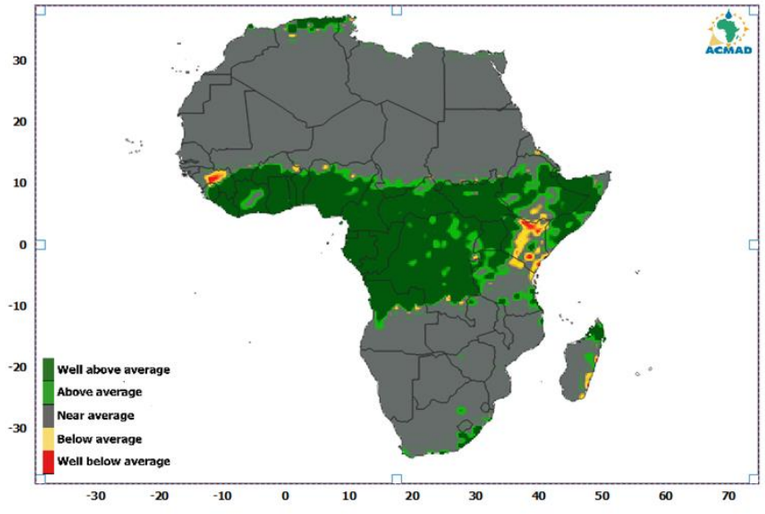


1st Dekad of May 2021 % of Average Precipitation



The maps displayed show that from the second dekad of April, there was a slight improvement over Tanzania, but Kenya and Ethiopia continued to receive well below average rainfall. By the third dekad, there was a lot of improvement over Tanzania, and Ethiopia, but Kenya was still experiencing dry conditions for a months, or below average rainfalls, whereas the rest of the countries received above to well above average rainfall. During the first dekad of May, there was a slight improvement in the rainfall over Kenya despite some pockets still experiencing well below average rainfall. 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. The extreme northern Angola extending into central DRC received well below normal rainfall, including northern parts of Cote D'voire, 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.

3rd dek _ April 2021_% of Average Precipitation



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

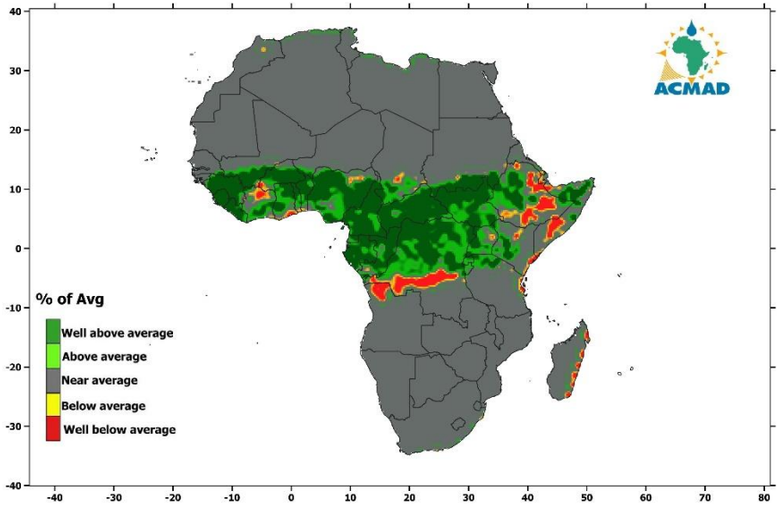
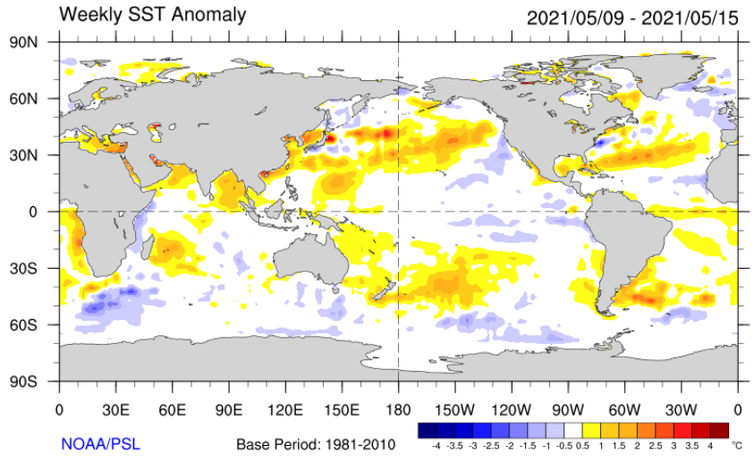


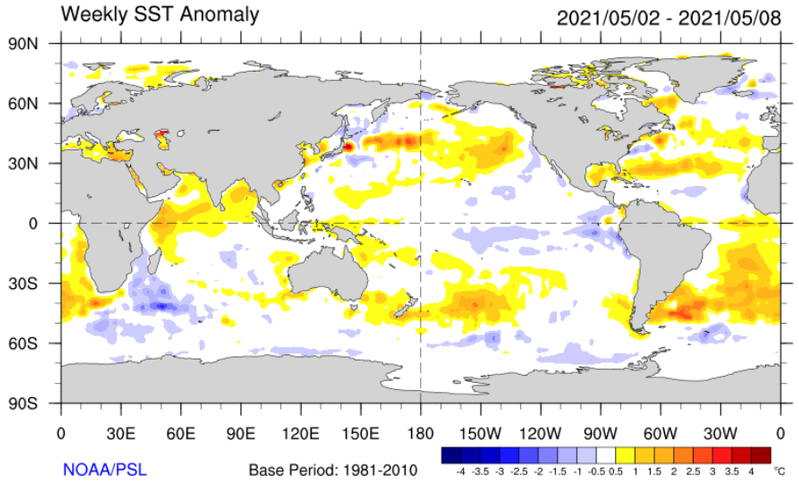
Figure 2: **This map displays decadal average precipitation in percent of average**

Weekly Sea Surface Temperature Anomaly



These maps display weekly sea surface temperature anomalies over the globe, and they depict a gradual decreasing of SST observed over the equatorial Pacific, northern Atlantic, and the south-western Indian ocean.

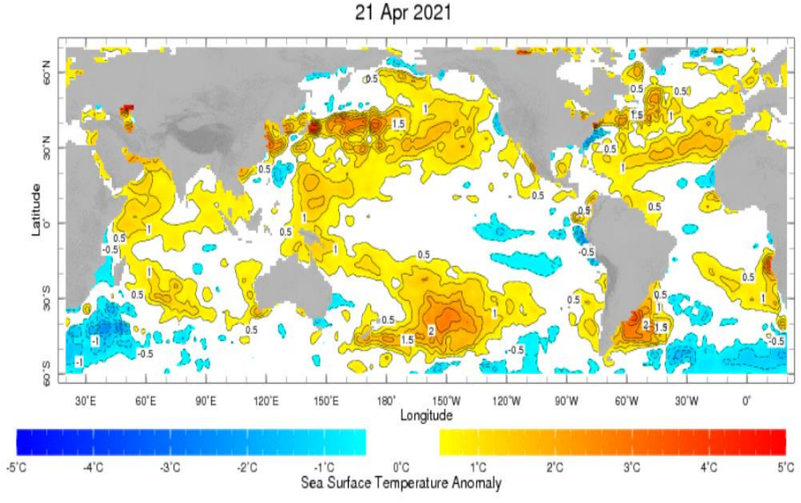
https://psl.noaa.gov/map/clim/sst.shtml



18– 24 April 2021

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

25 April – 01 May 2021



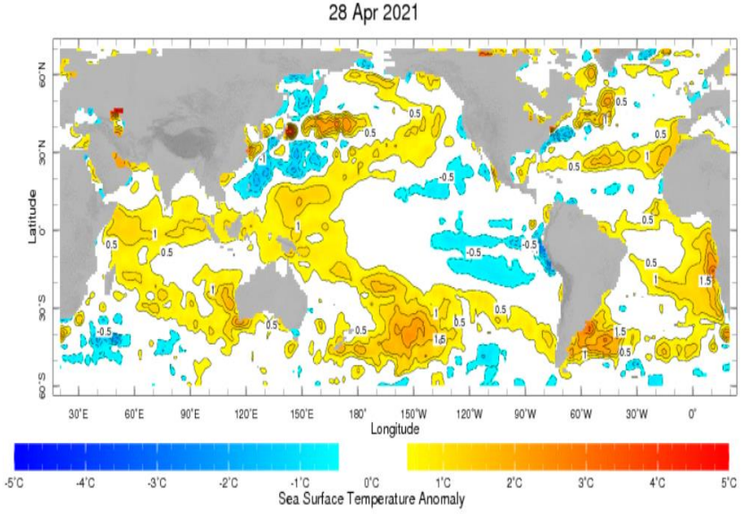
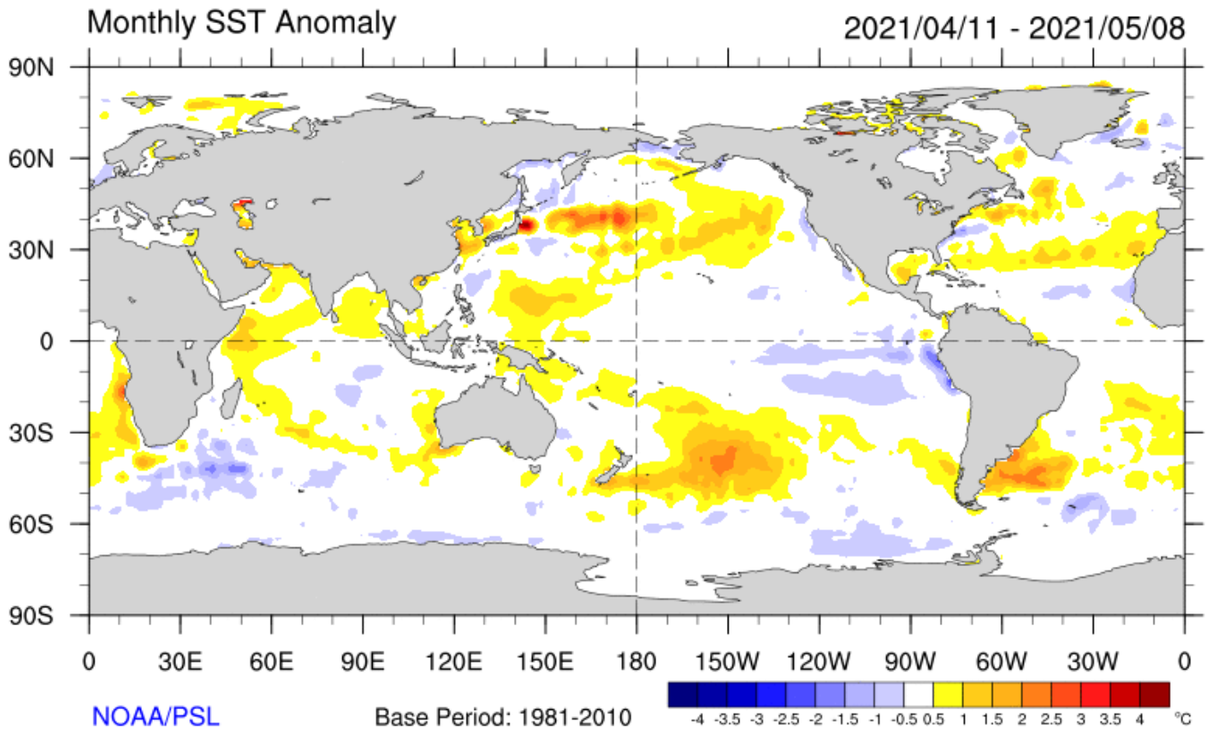
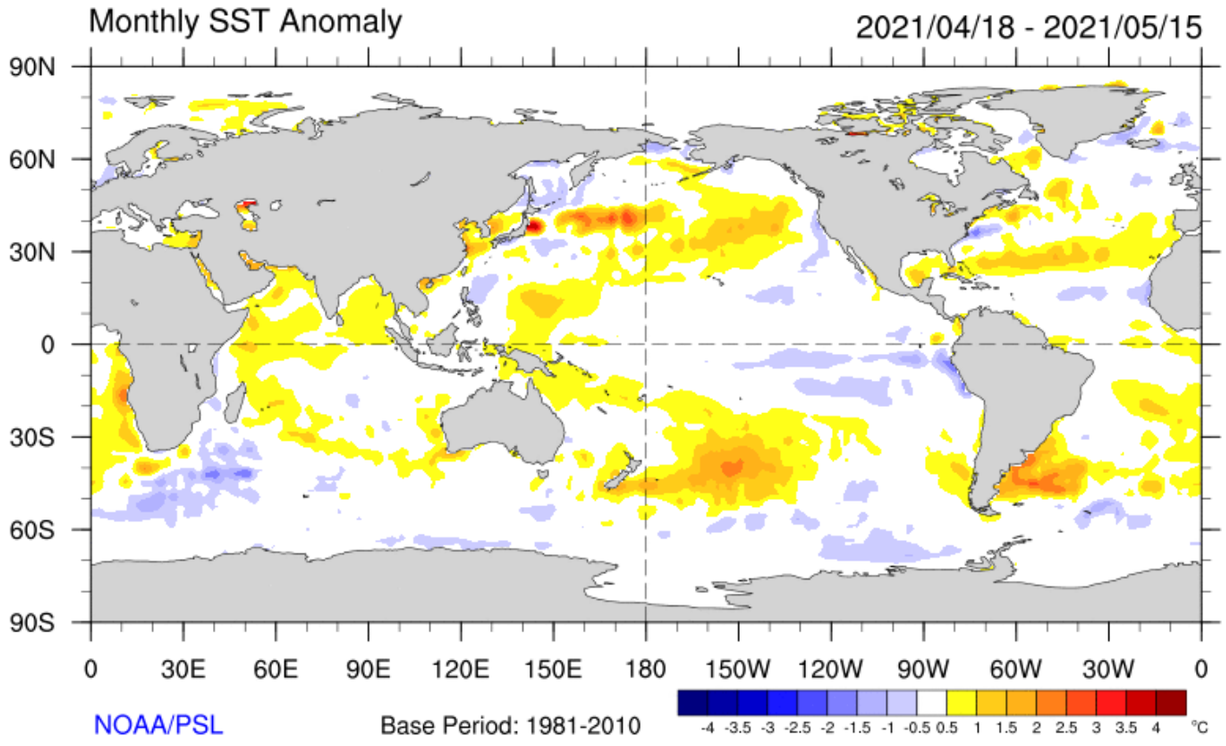


Figure 3: Maps display monthly sea surface temperature anomalies over the globe

Last months Sea SurfaceTemperatures (SST) Observed





During April to 8th of May 2021, the cooling persisted over eastern Equatorial Pacific, and the South-Western Indian Ocean, whereas the Tropical South Atlantic, and western pacific started warming.

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

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

SST OBS AND FCST FOR TWO WEEKS

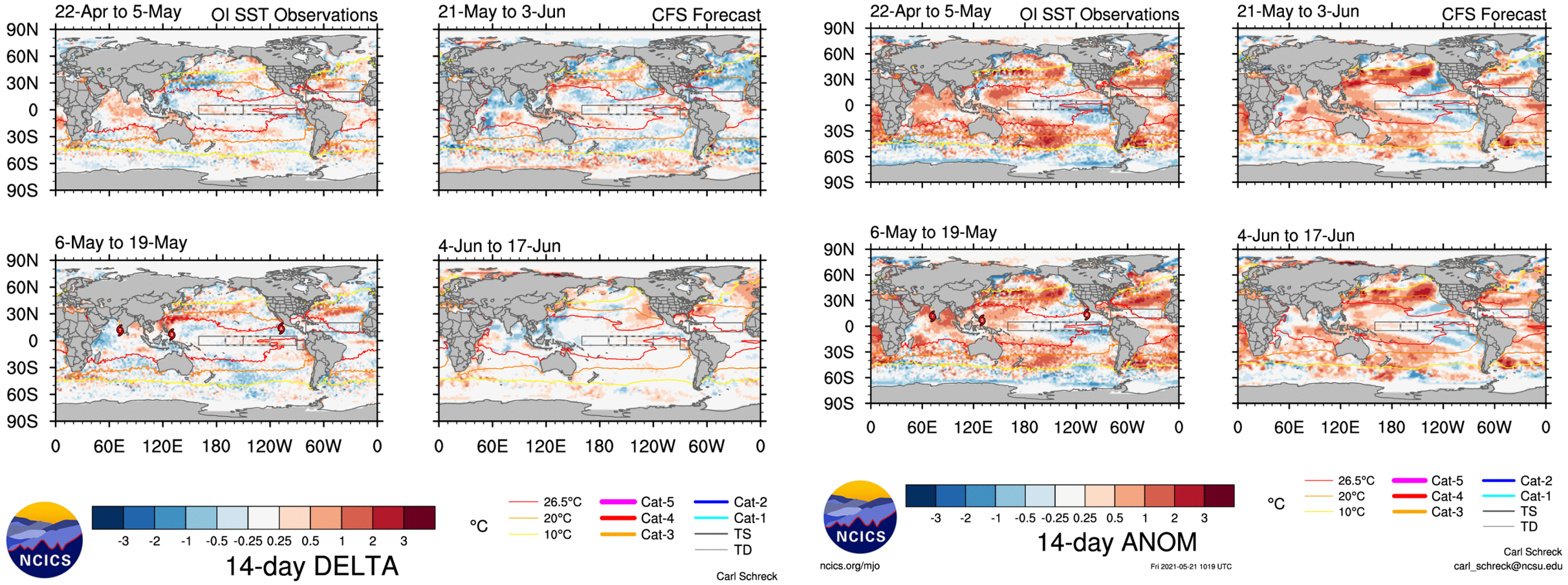


Figure 5: Sea Surface Temperature and FCST for two week

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

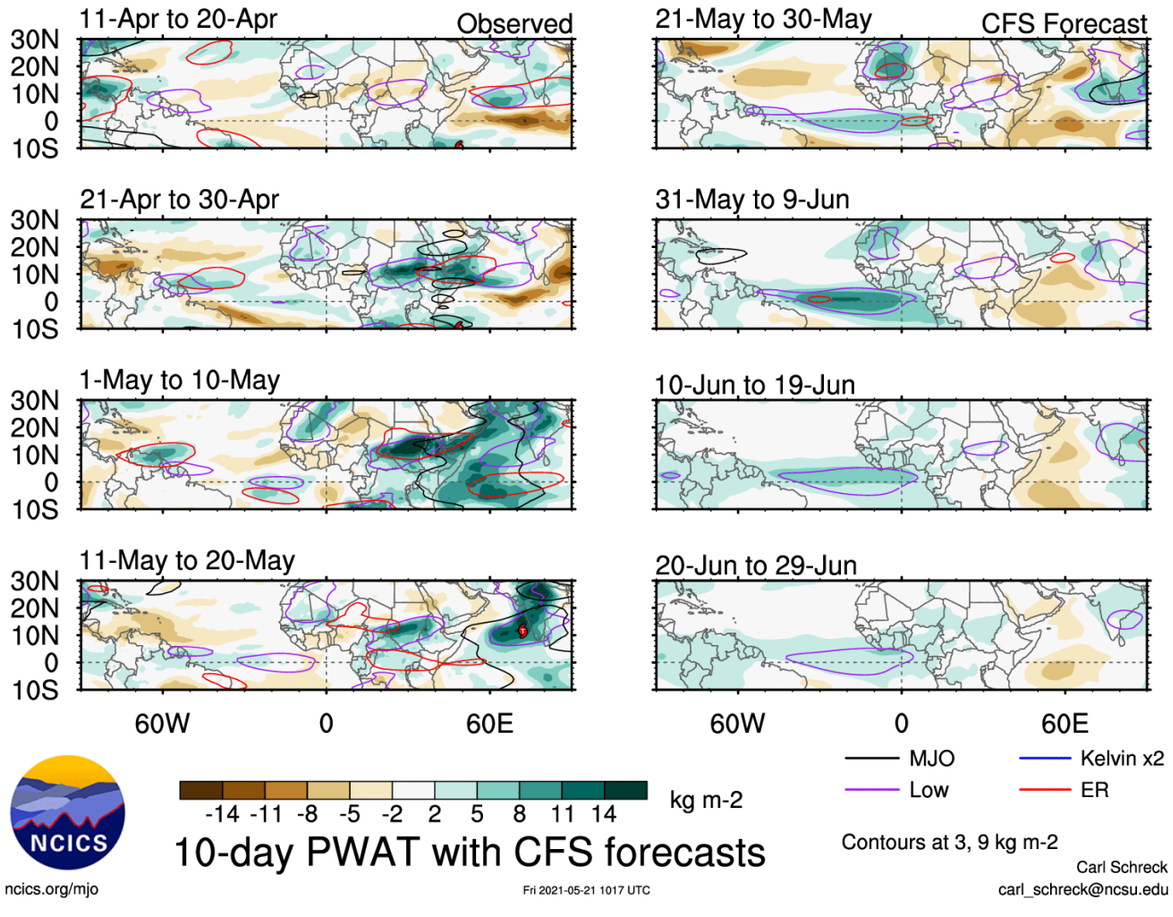


Figure 7a: Africa

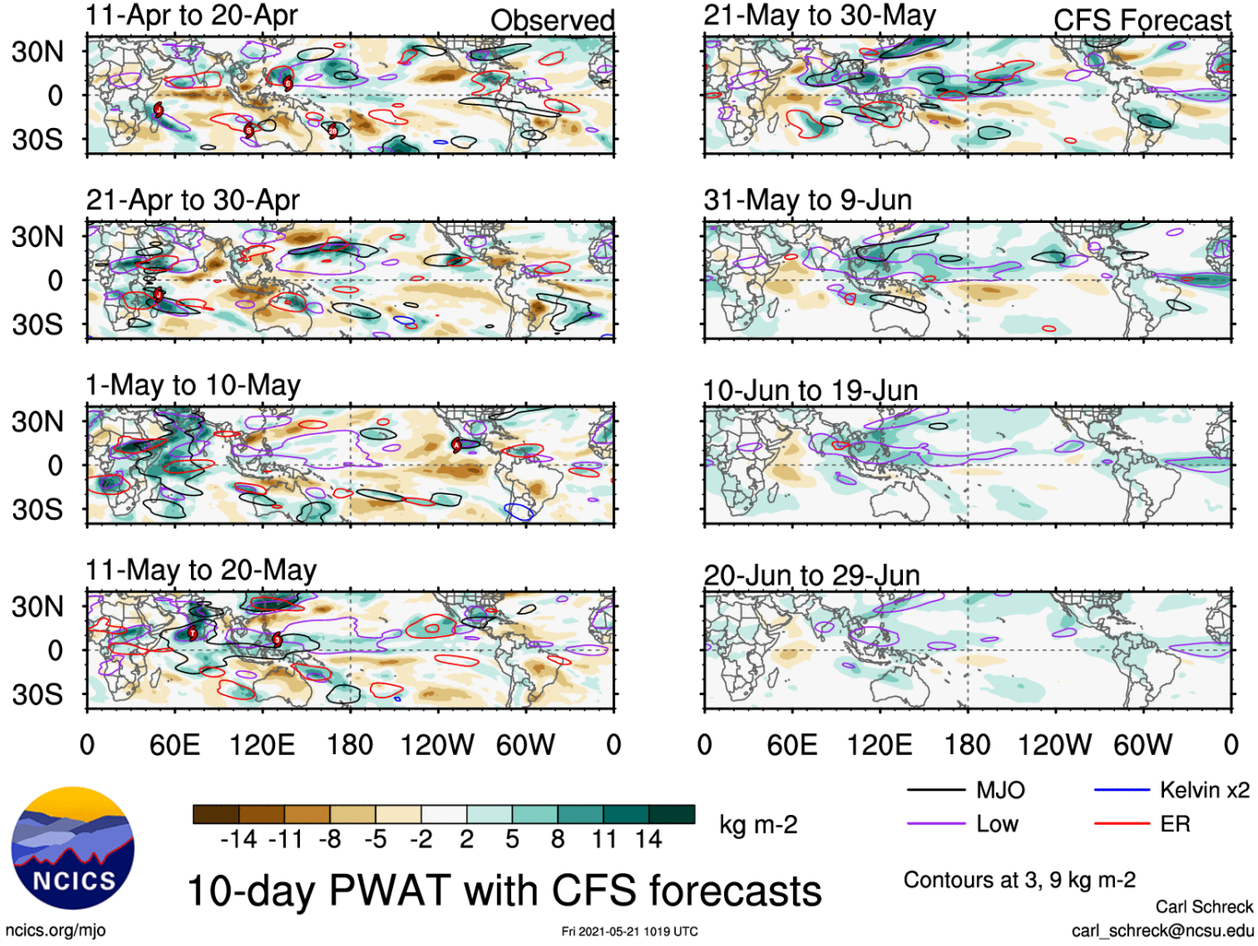


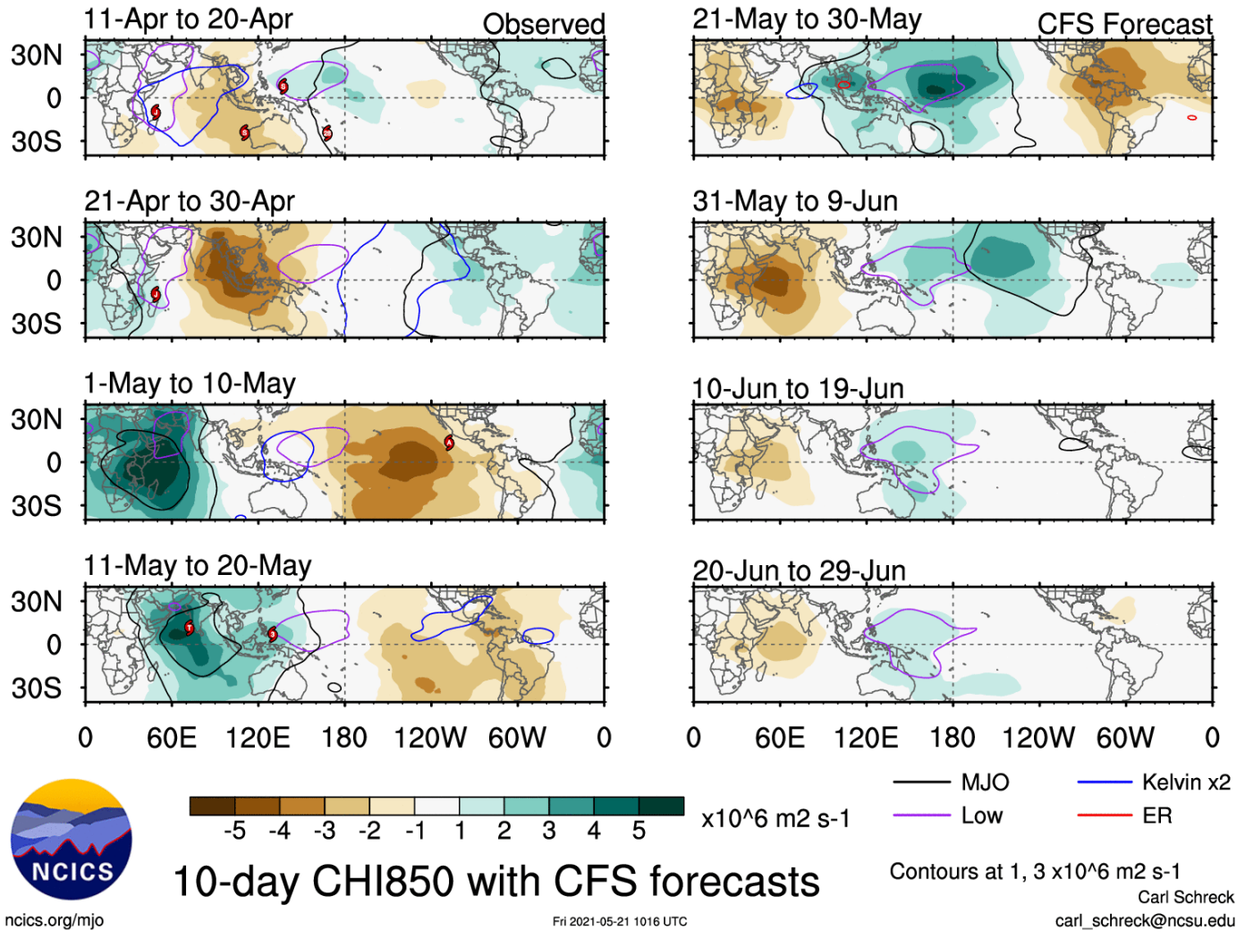
Figure 7b: Global

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 Week and Month Velocity Potential with MJO, Kelvin and Rossby Wave overlaid on global maps 850mb and 200mb



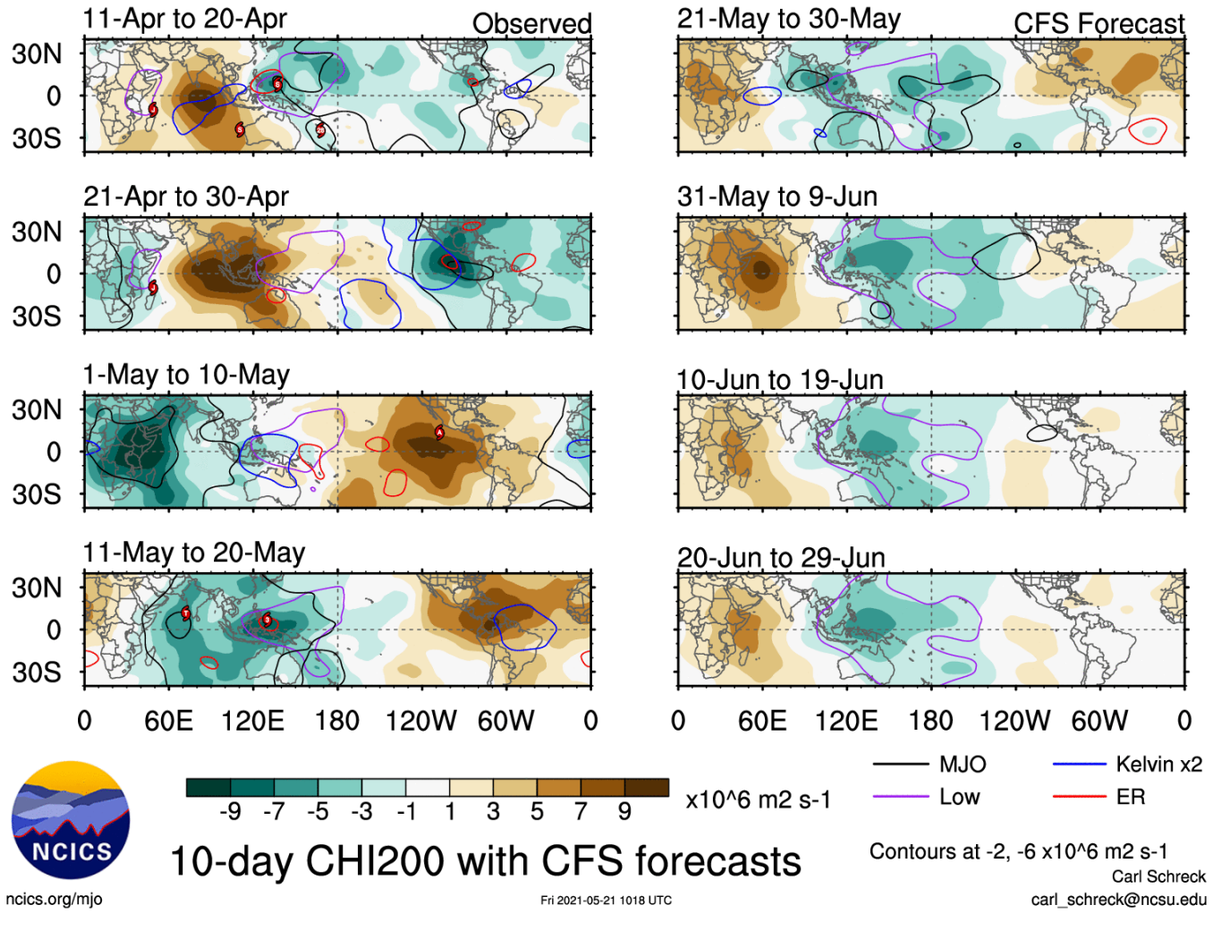
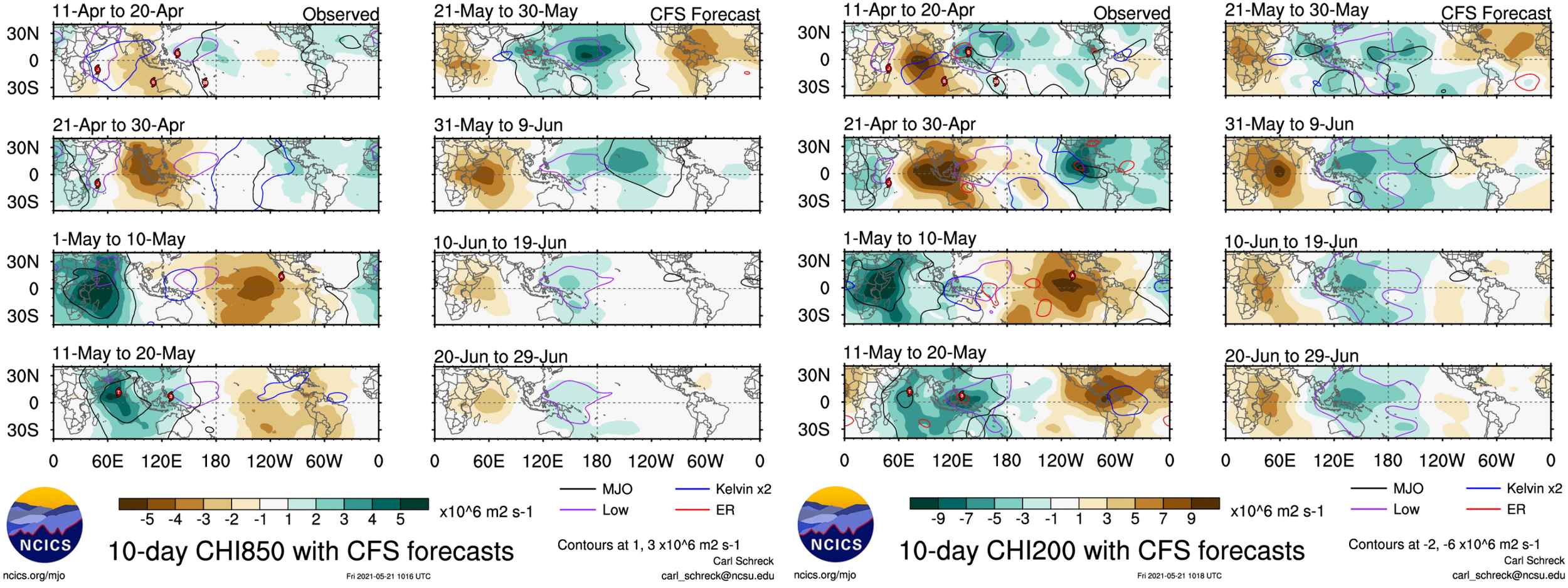


Figure 7a and b: Past four week and month velocity potential

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 Week and Month Velocity Potential with MJO, Kelvin and Rossby Wave overlaid on Africa maps 850mb and 200mb

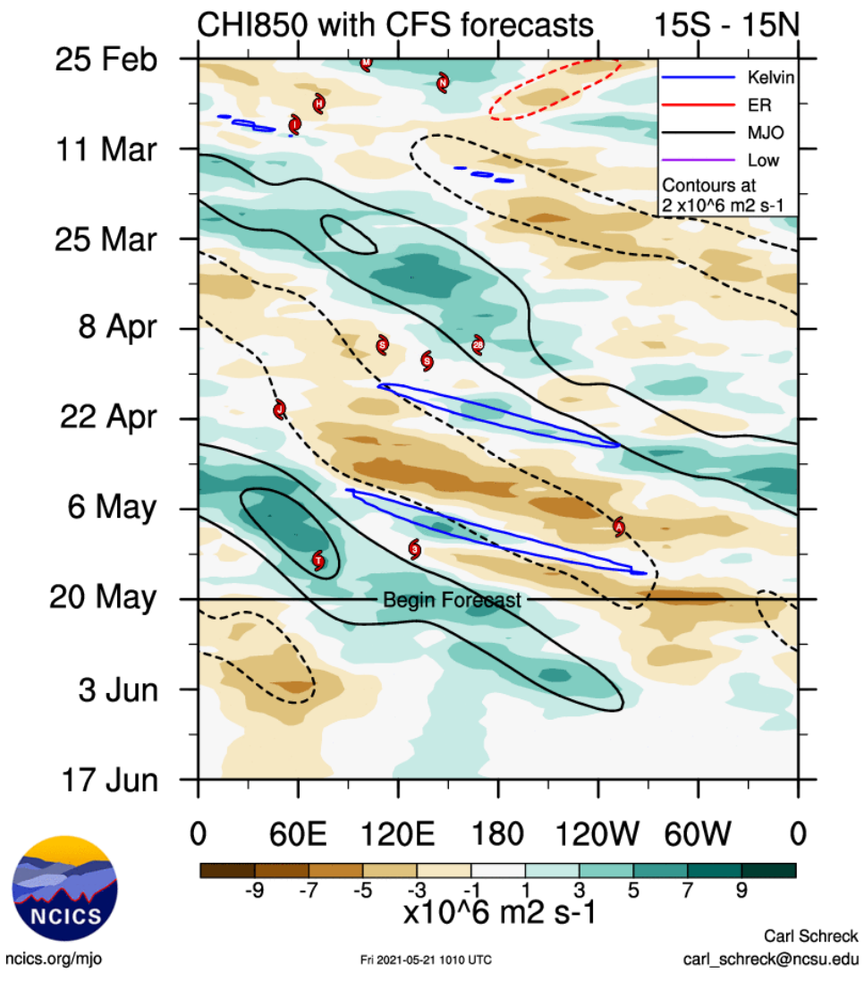


https://ncics.org/pub/mjo/v2/map/chi850.cfs.all.global.10.png

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

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

Hovmoller diagram of Velocity Potential, Anomalies for 15N-15S with waves overlay including outlooks



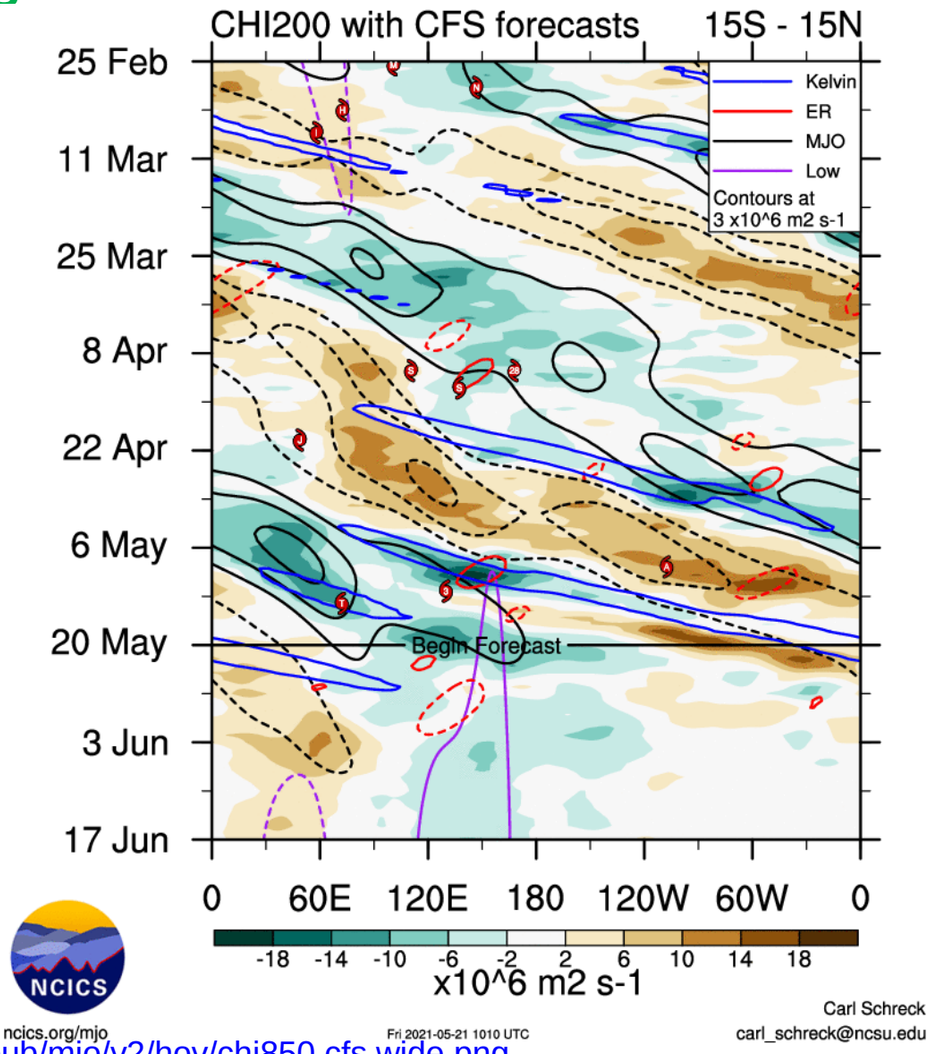
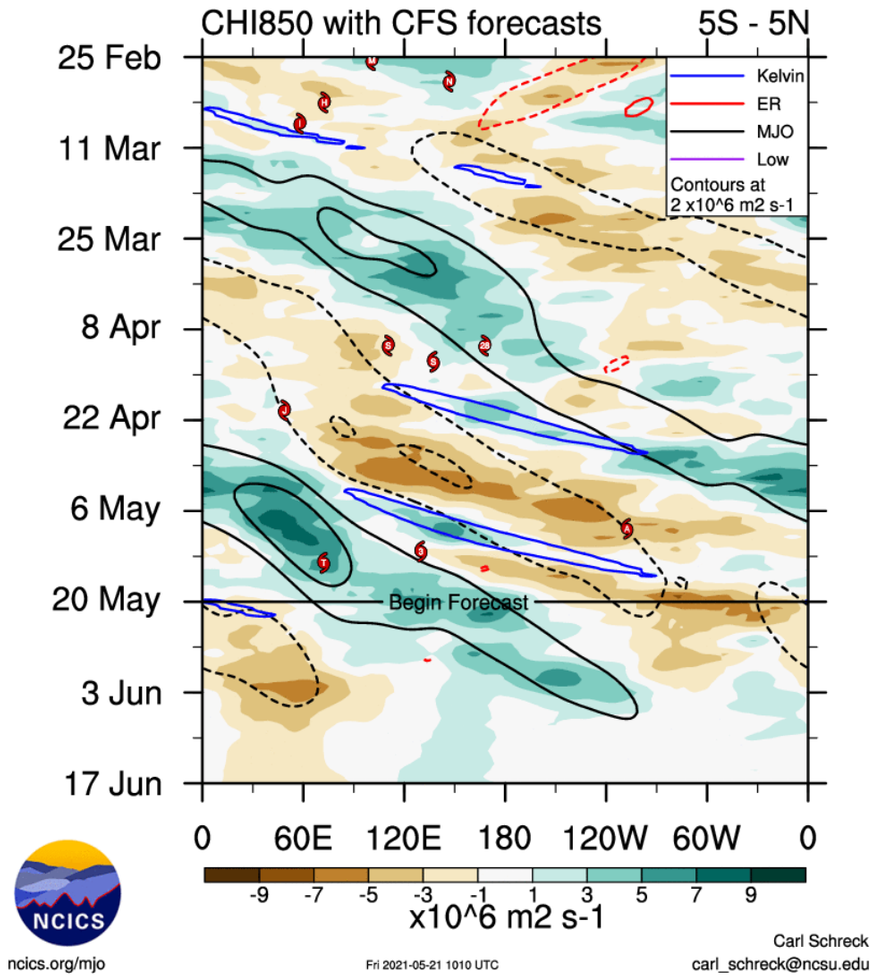


Figure 9: **Anomalies for 15n-15s with waves overlay including outlooks**

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



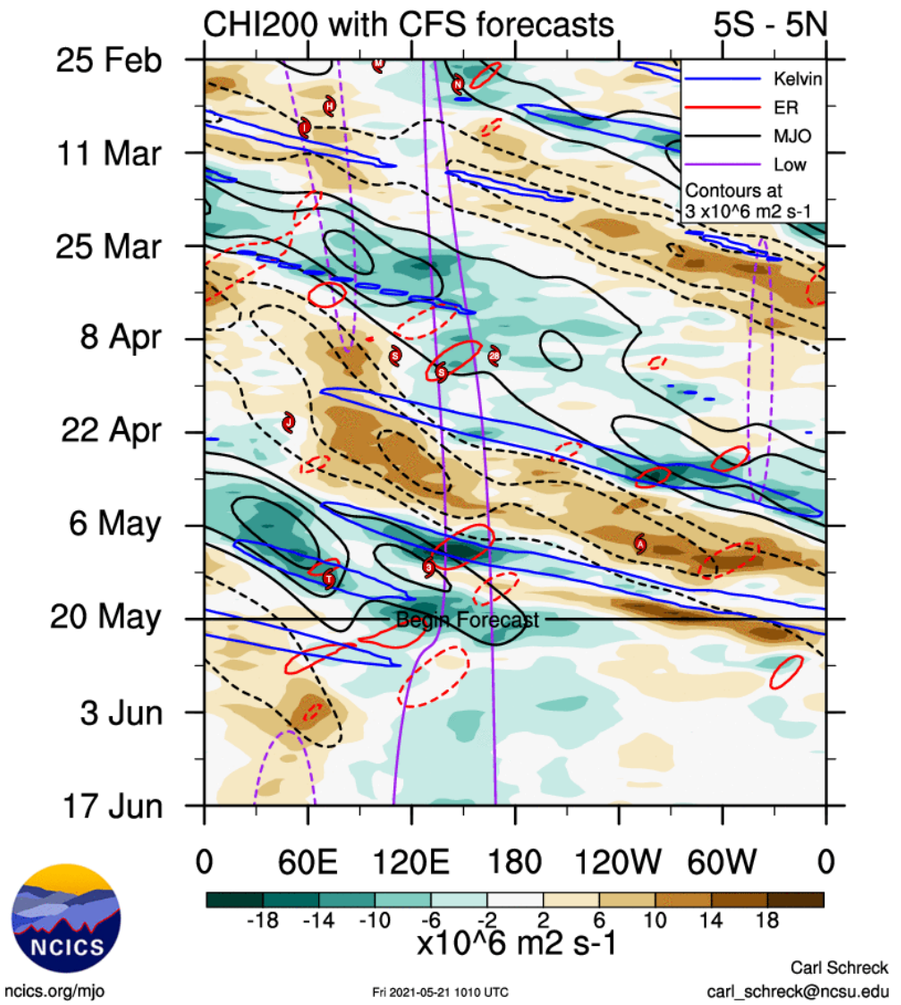
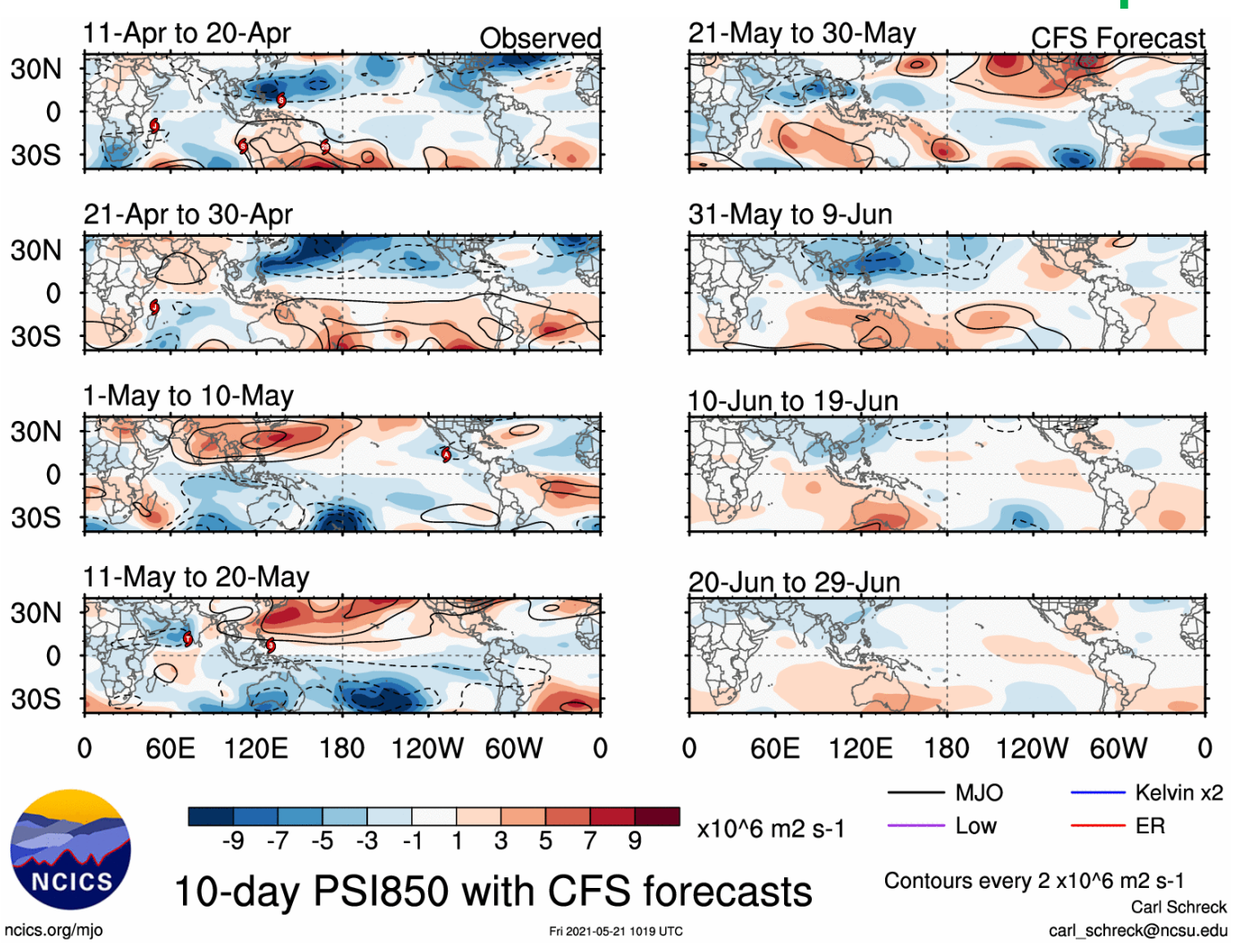


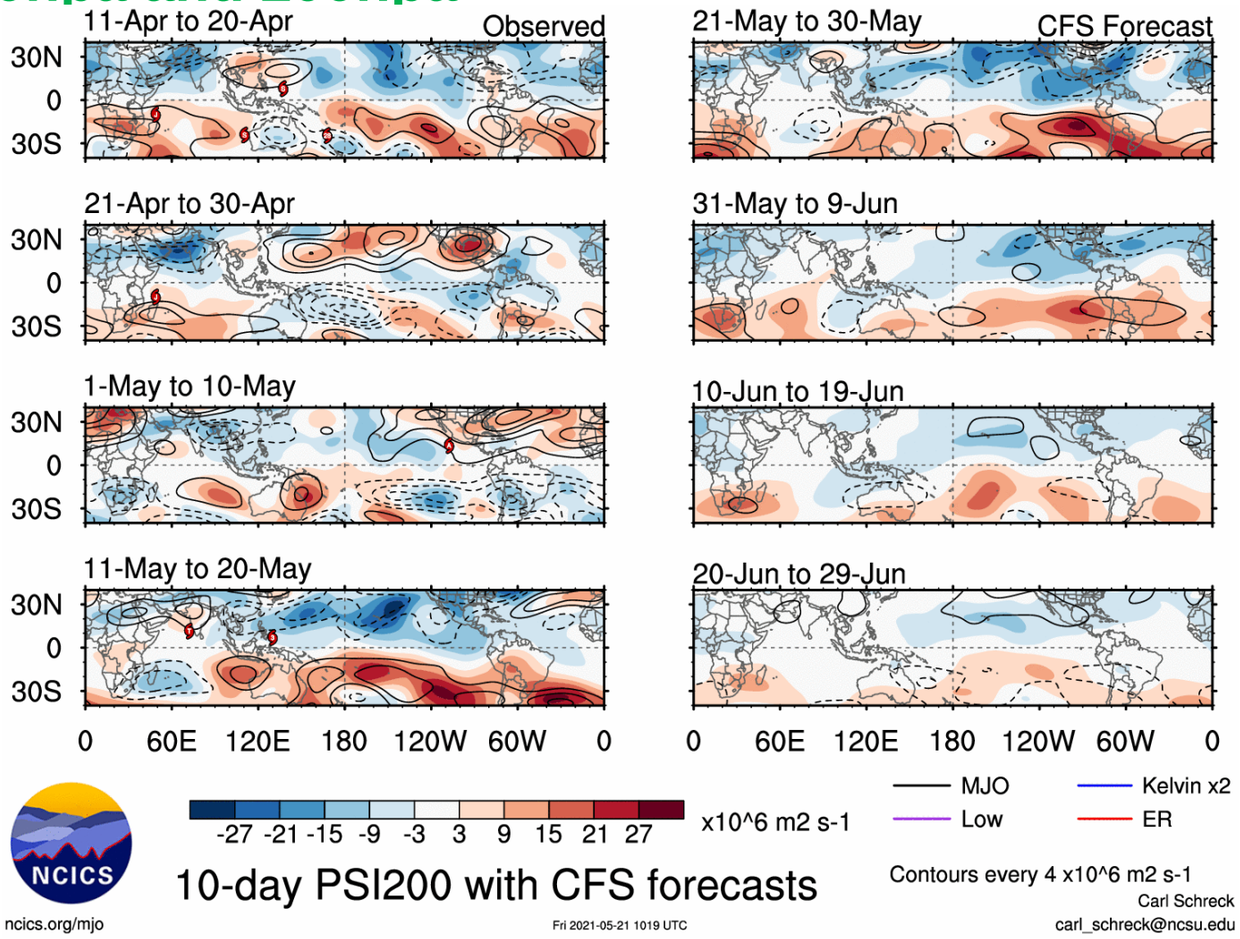
Figure 10: **Anomalies for 5N-5S with waves overlay including outlooks**

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, Month Stream Function Anomalies with MJO, Kelvin and Rossby wave overlaid on Global Maps 850hpa and 200hpa



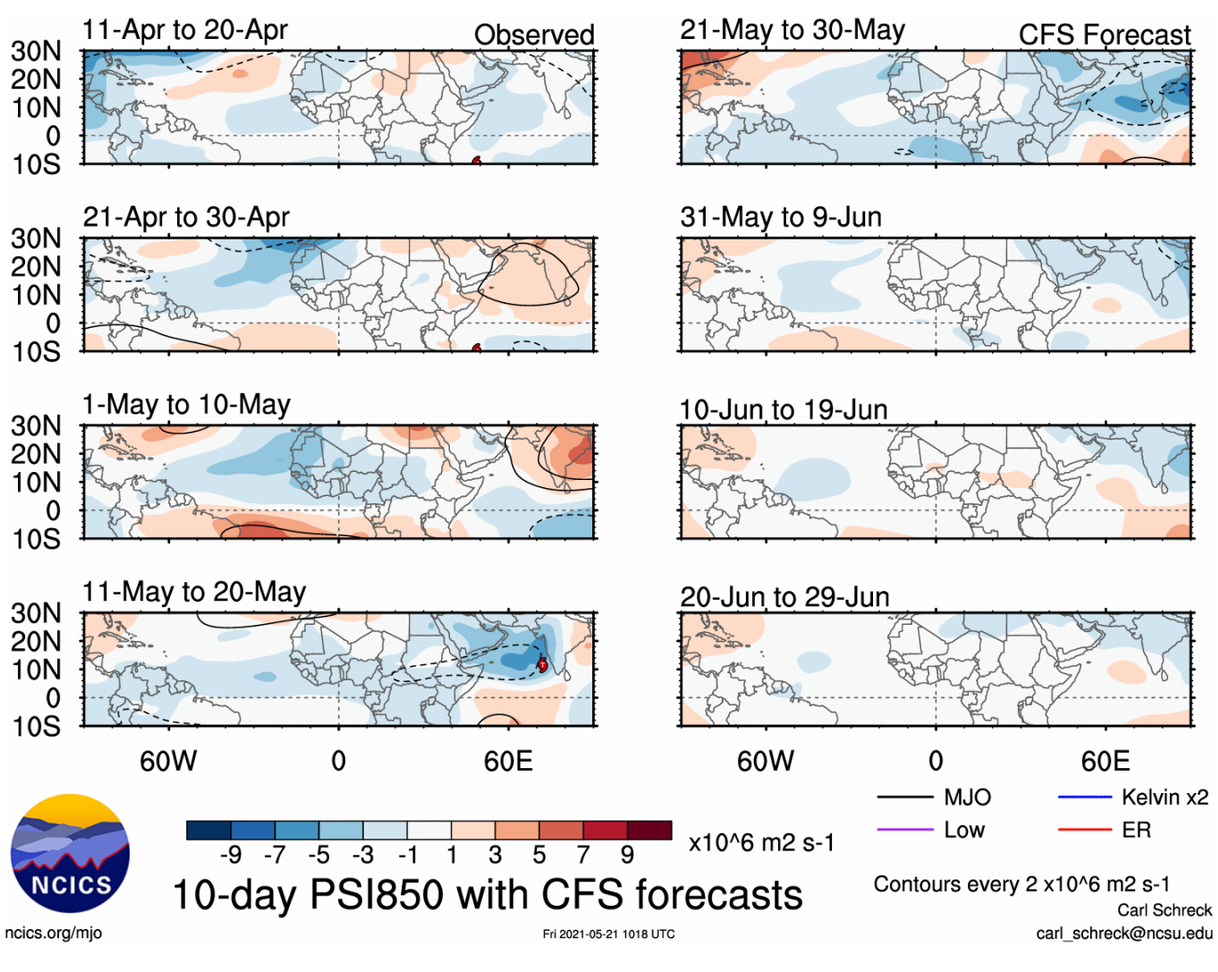


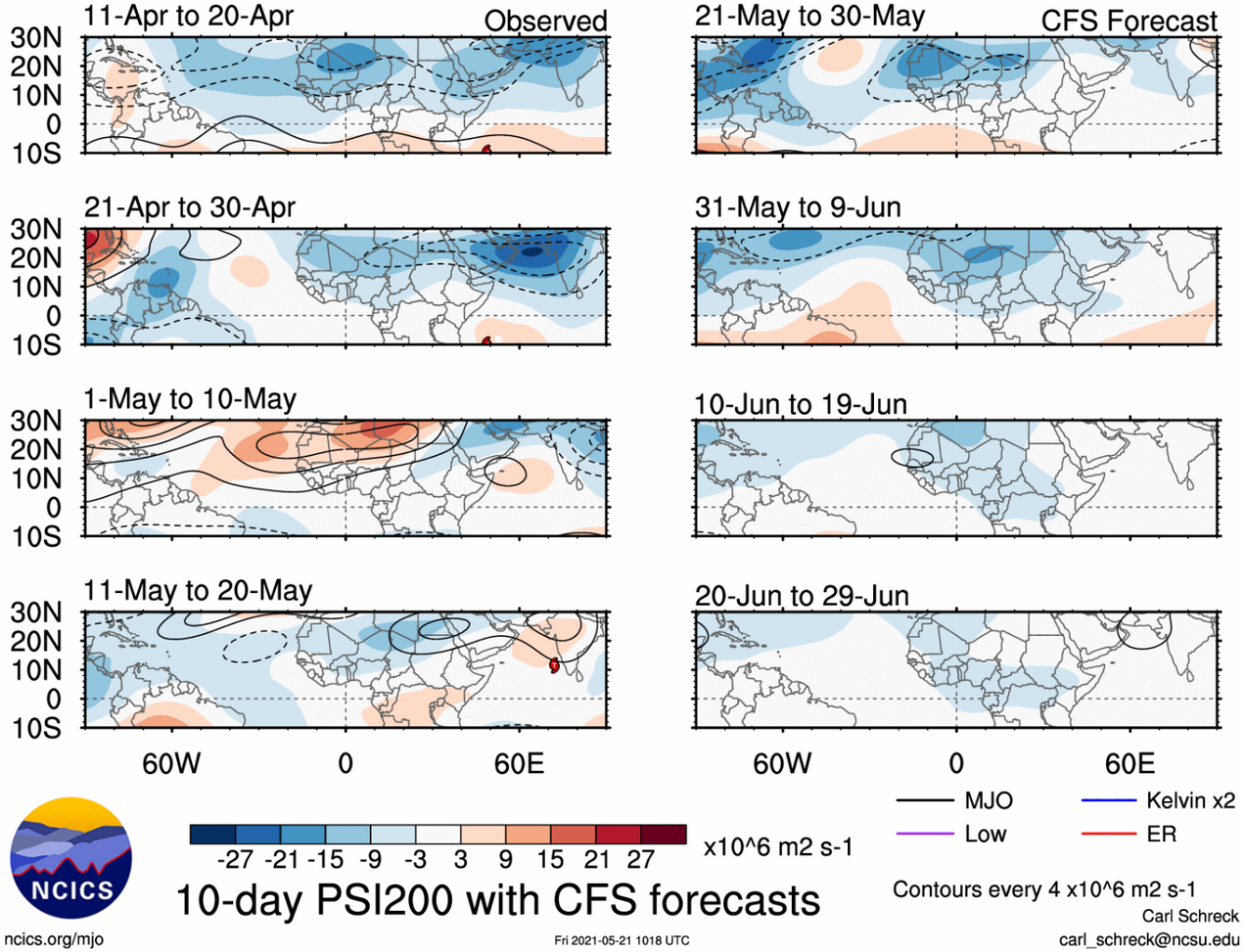
https://ncics.org/pub/mjo/v2/map/psi200.cfs.mjo.global.10.png

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 Africa Maps 850hpa and 200hpa

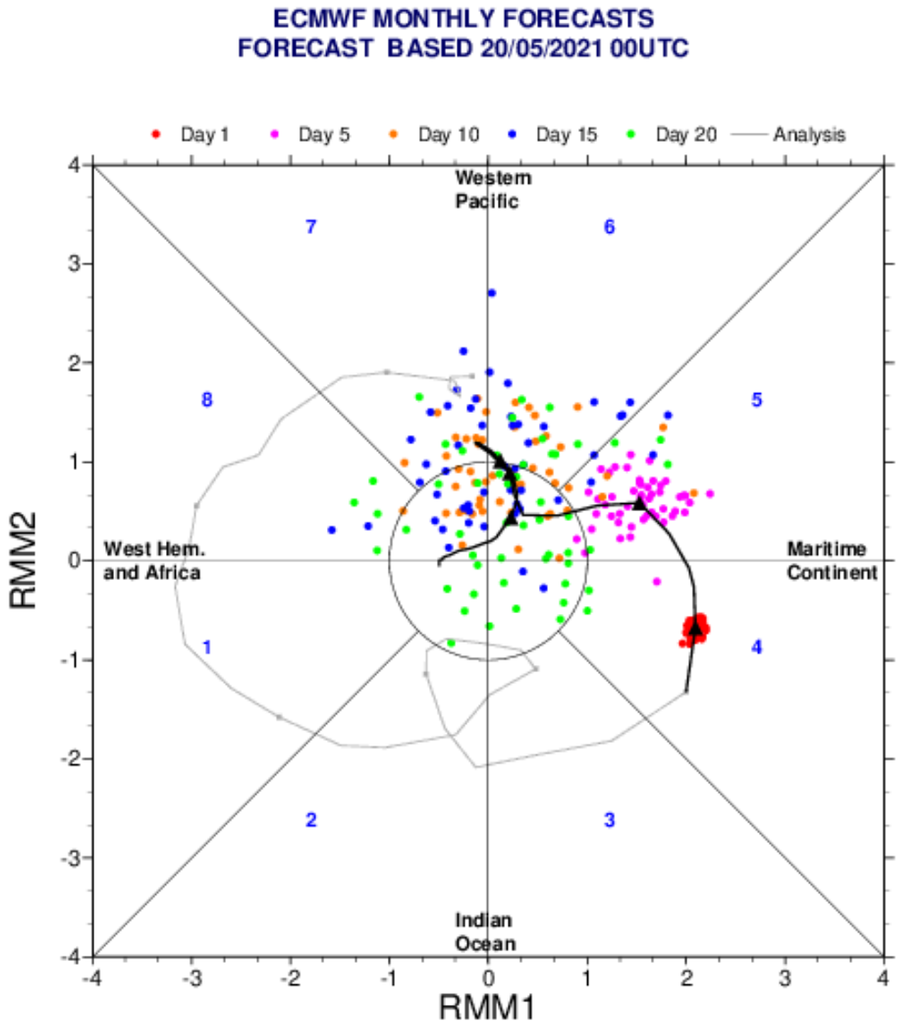




https://ncics.org/pub/mjo/v2/map/psi200.cfs.mjo.africa.10.png

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



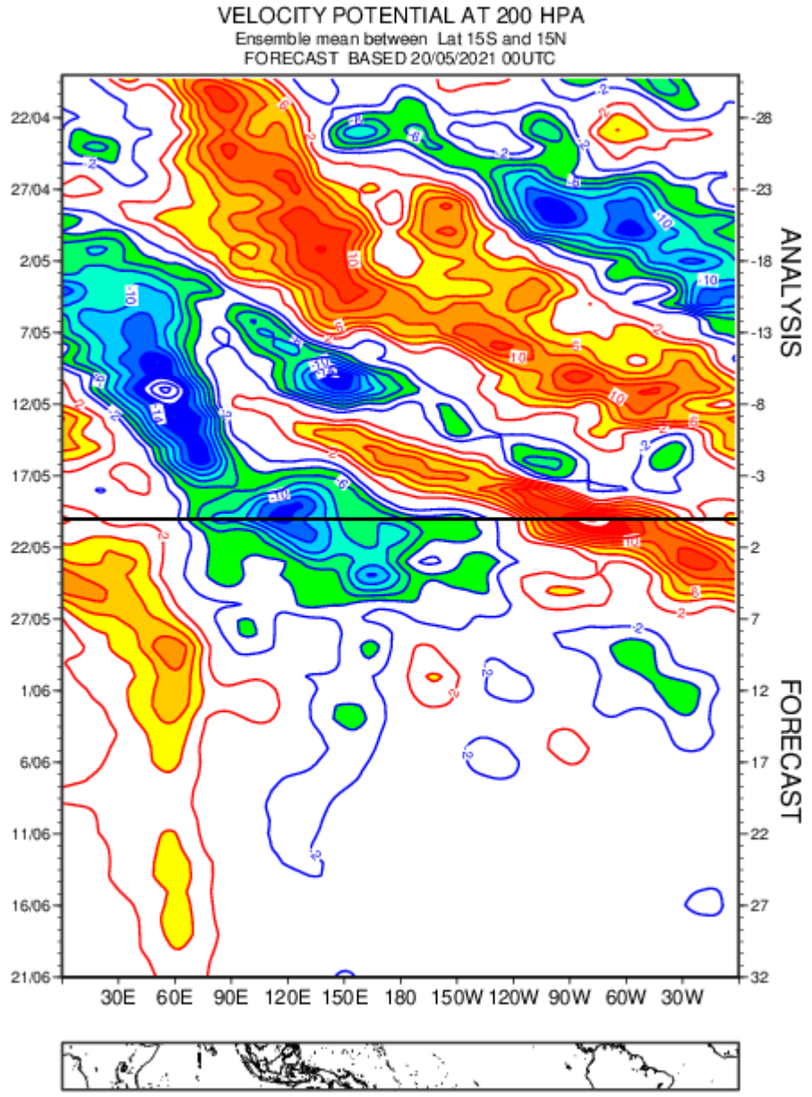


Figure 13: **ECMWF MJO Forecast**

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

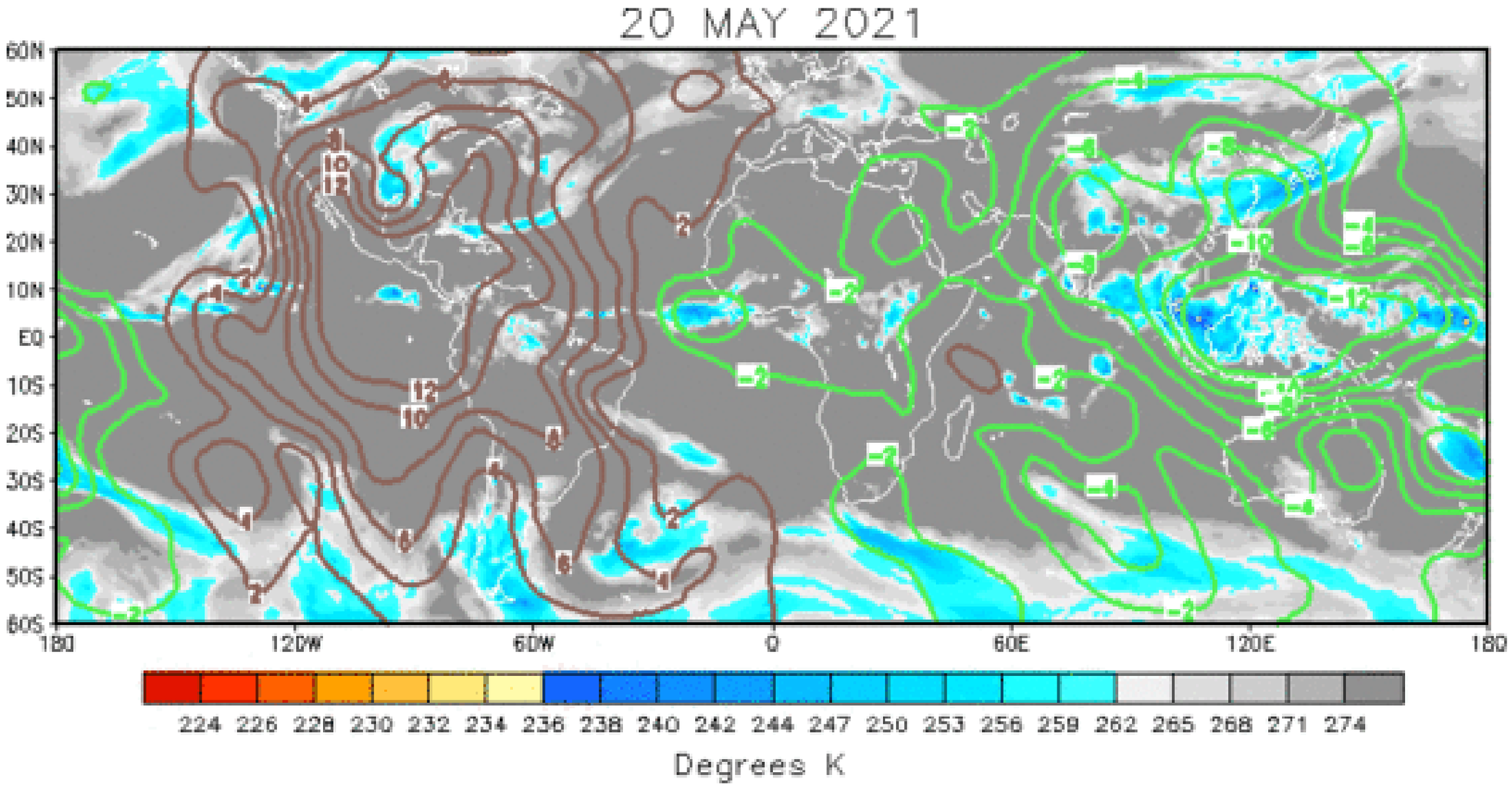


Figure 14: **IR image and Velocity Potential anomalies**

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

PAST 3 WEEKS OLR ANOMALIES

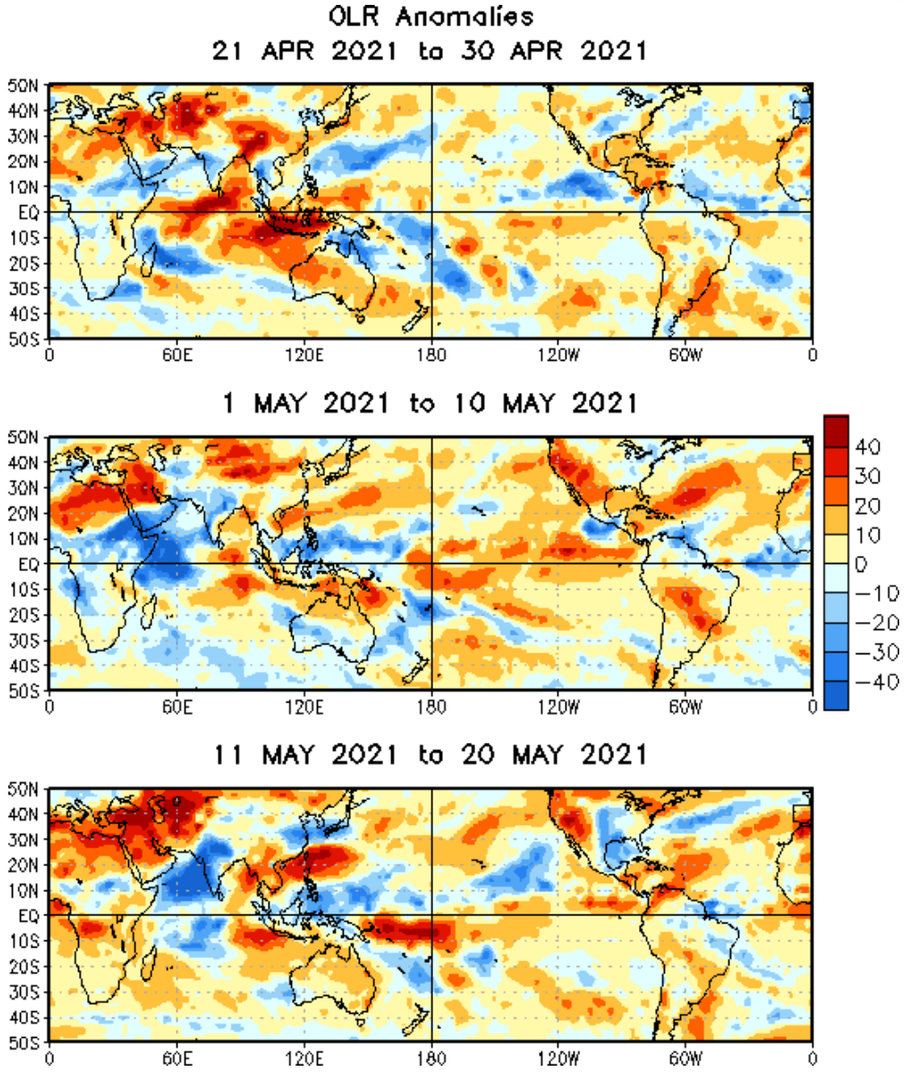


Figure 15: **Past 3 weeks OLR anomalies**

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

Mean Sea Level Pressure (MSLP) for the 2nd dekad May 2021 and its anomalies (1971-2000)

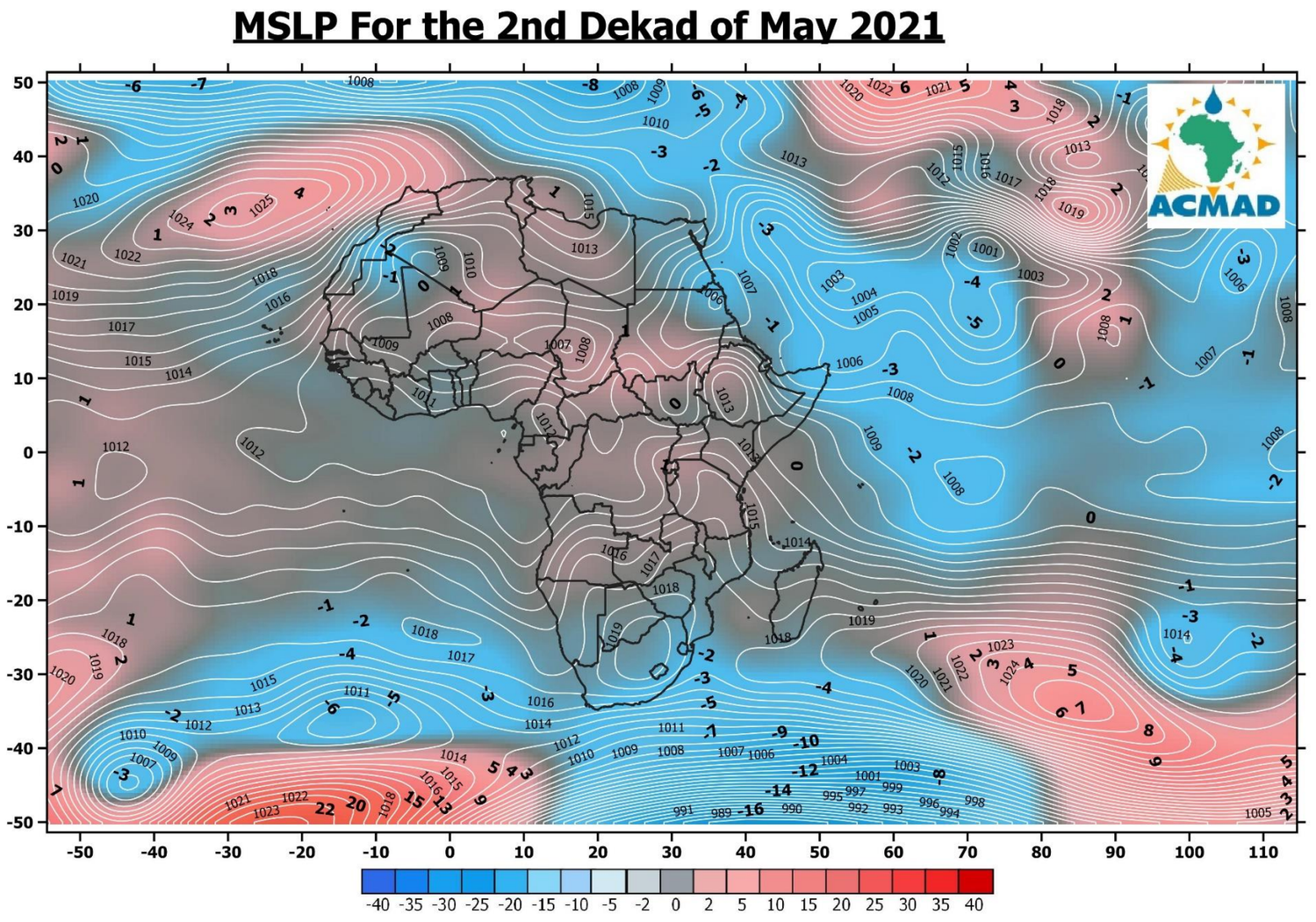


Figure 16: **MSLP observation versus anomaly**

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

Wind Anomalies for the recent 10 day period @ 850hpa and 700hpa

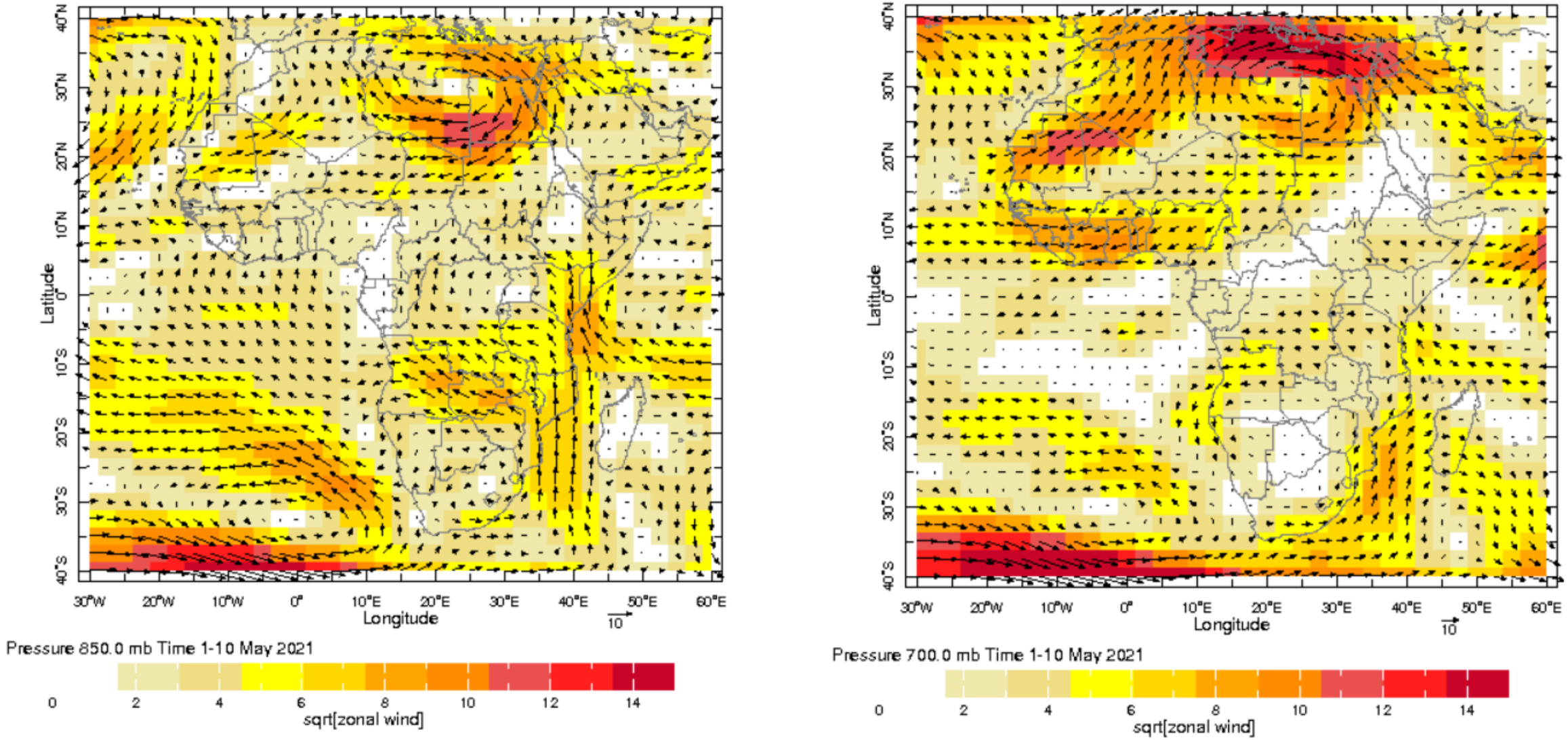
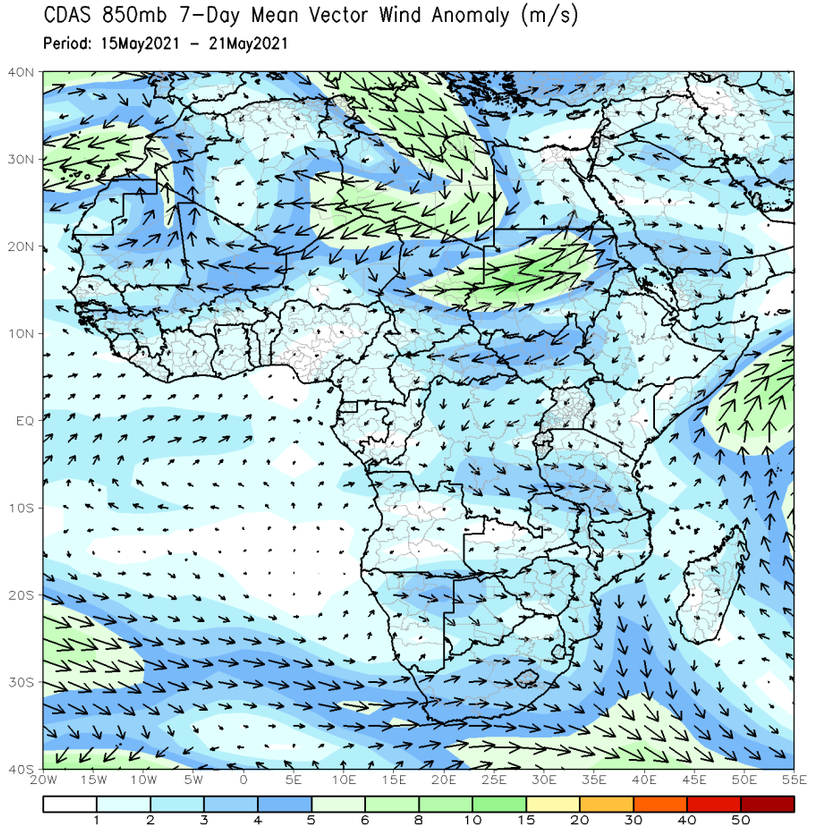
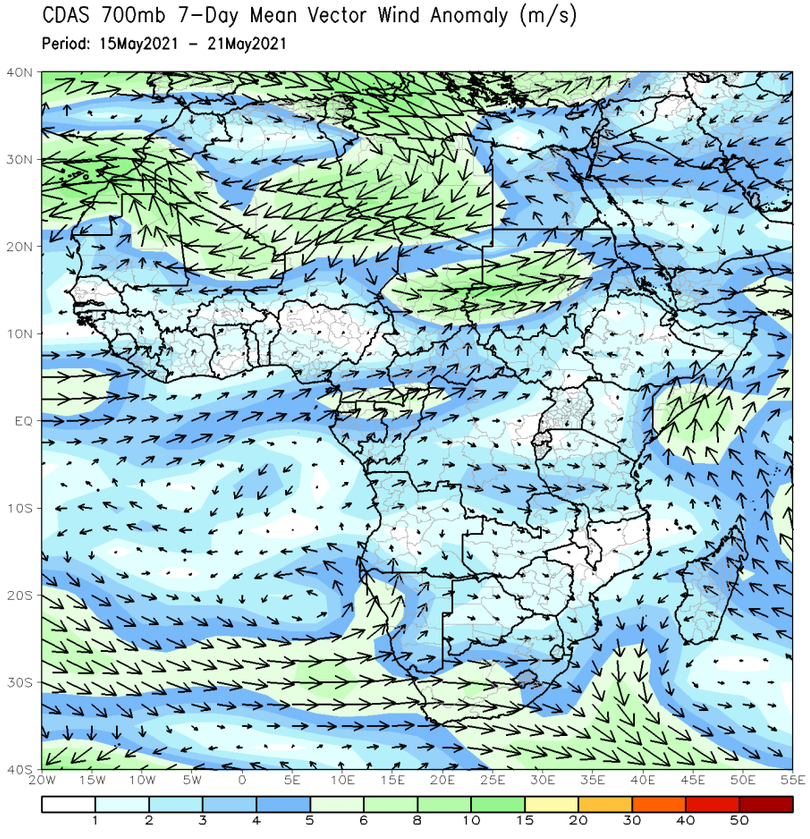


Figure 17: **Wind anomalies for 850hpa and 700hPa**

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





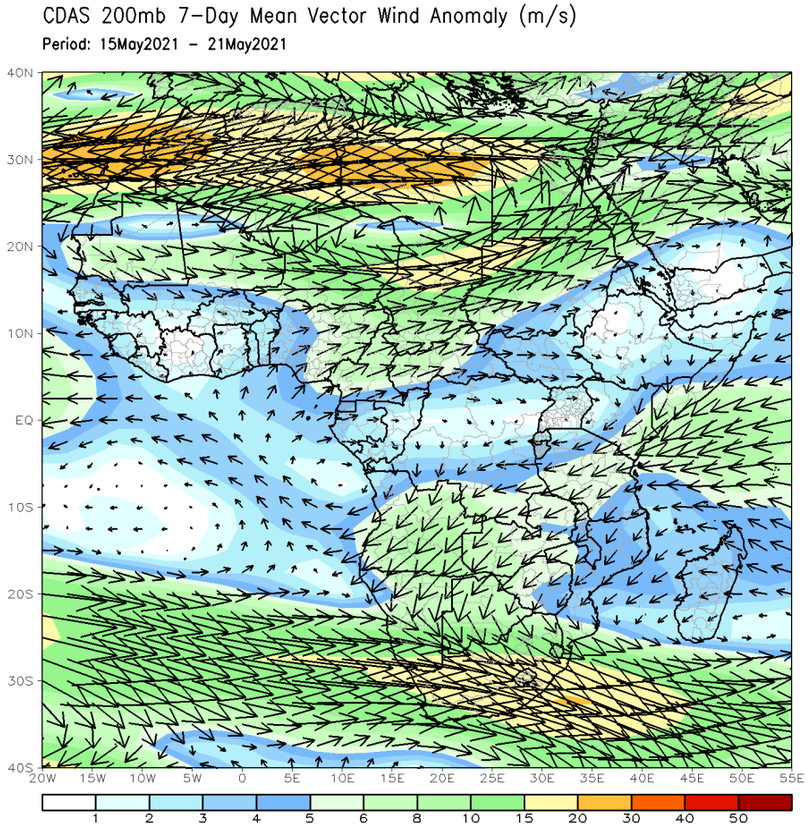
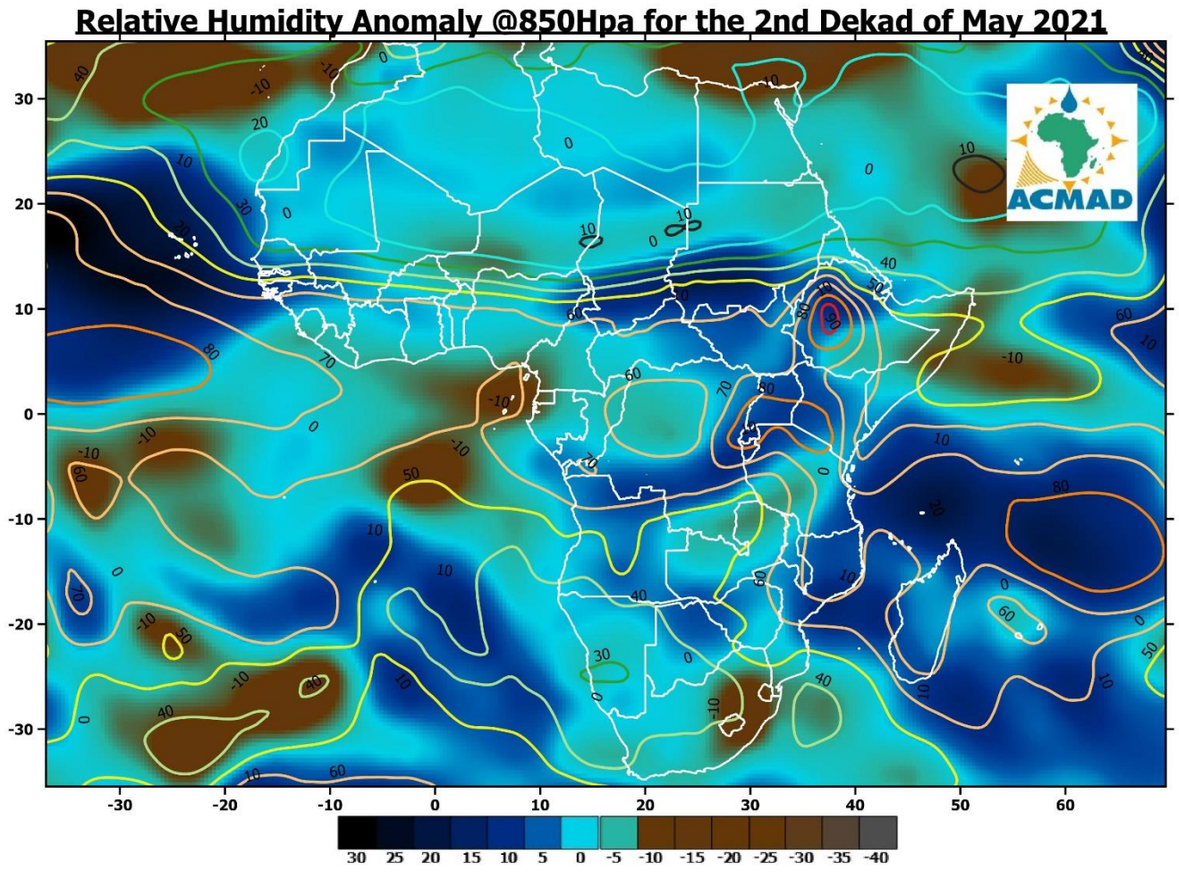


Figure 18: **Wind anomalies for 850hpa, 700hPa and 200hpa**

Relative Humidity (RH) Anomalies at 850hpa and 700hpa for the 1st dekad of May 2021



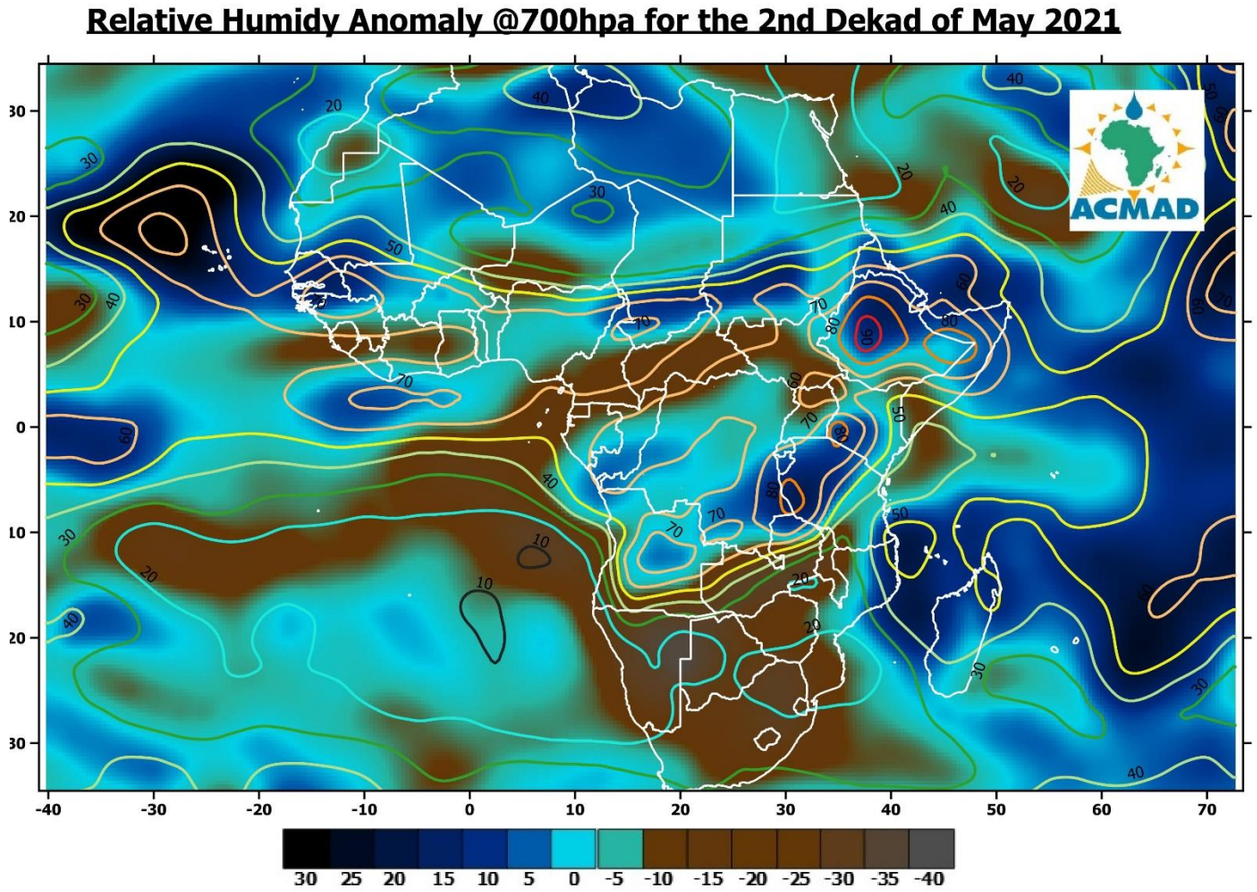


Figure 19: **Relative Humidity Anomaly at 850hPa (left) and 700hPa (right)**

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

WEEKLY FORECAST

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

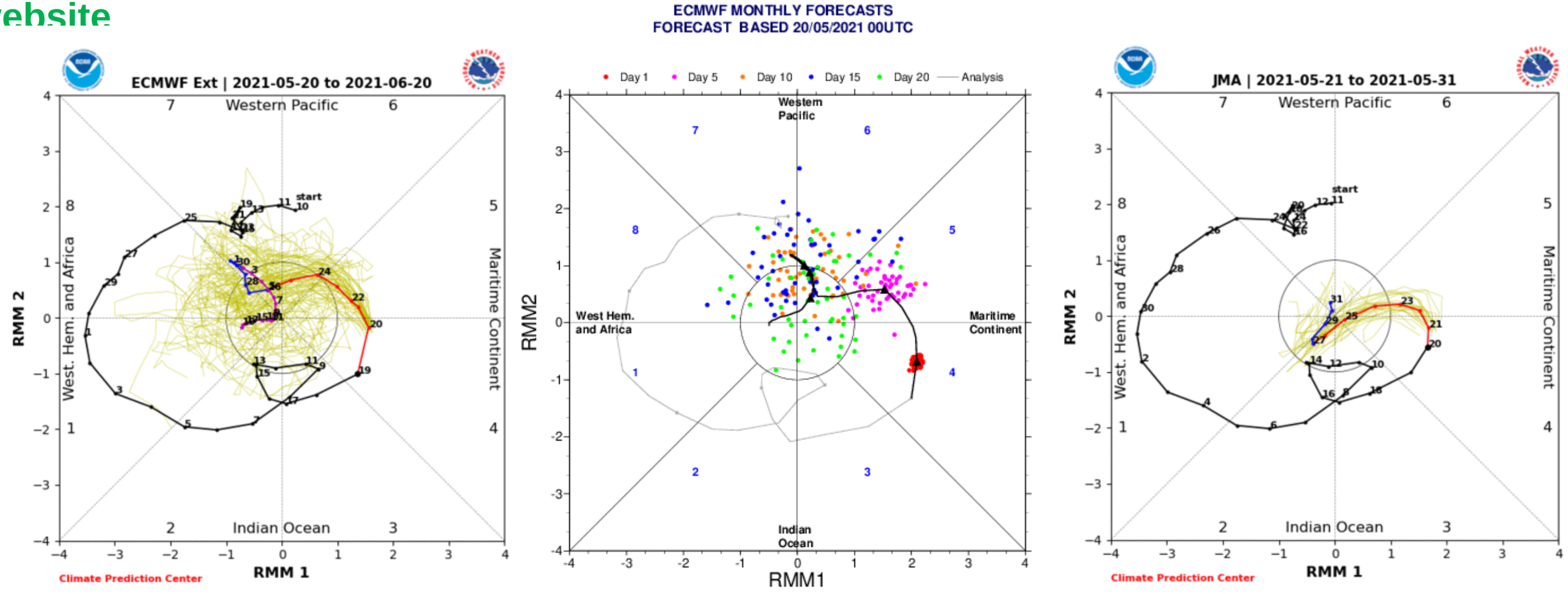


Figure 20: Forecasts for ECMWF, NCEP and UK Met Office

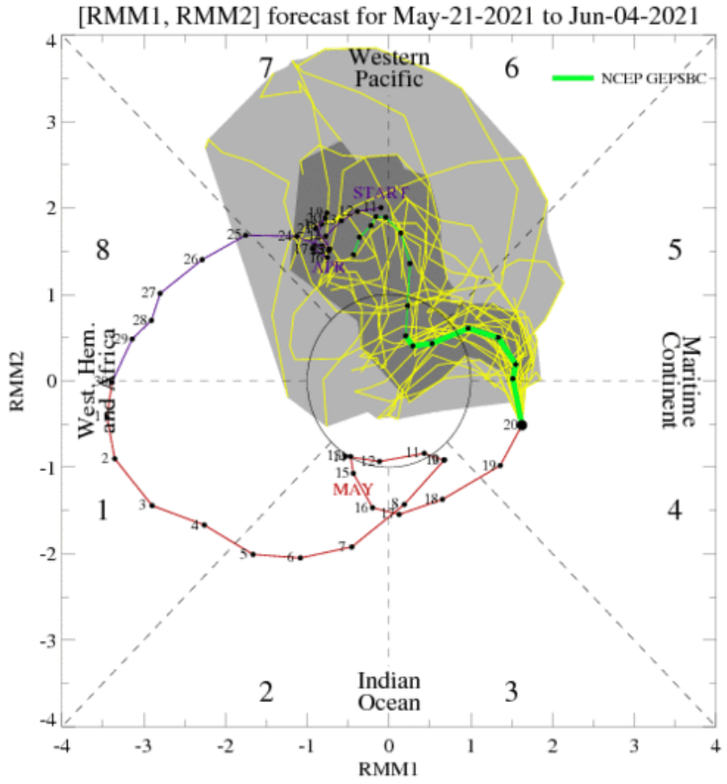
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/emon.shtml

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

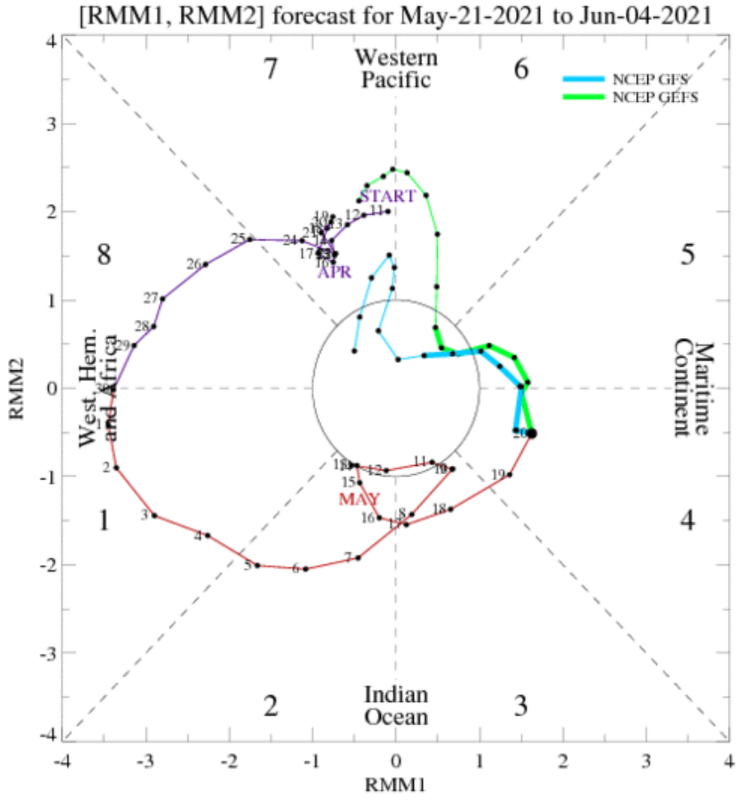
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_mjo_family_index?facets=undefined&time=2019081500,0,2019081500

MJO FORECAST

Ensemble GFS Phase Diagram



Operational GFS Phase Diagram



Statistical GFS Phase Diagram

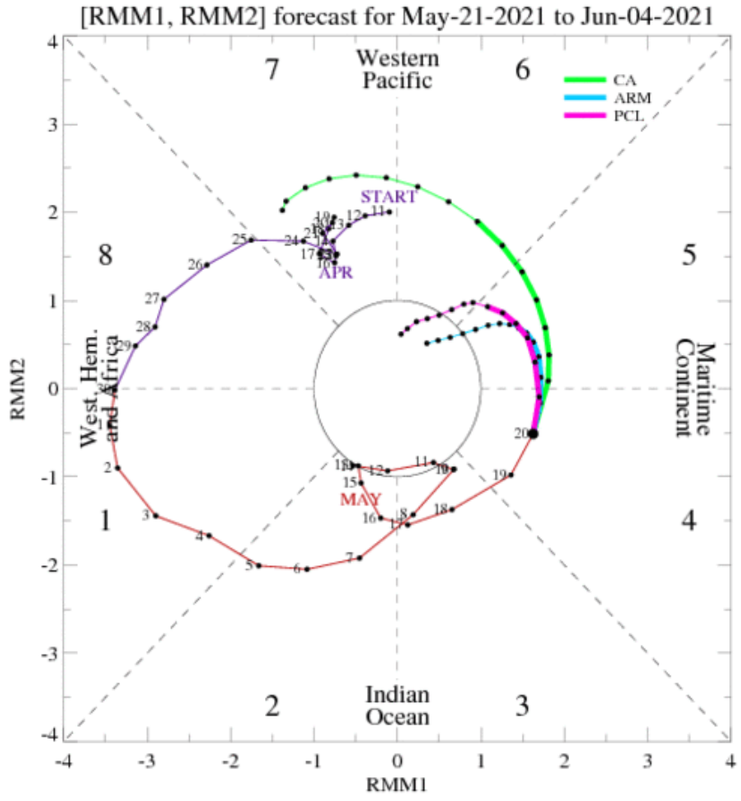


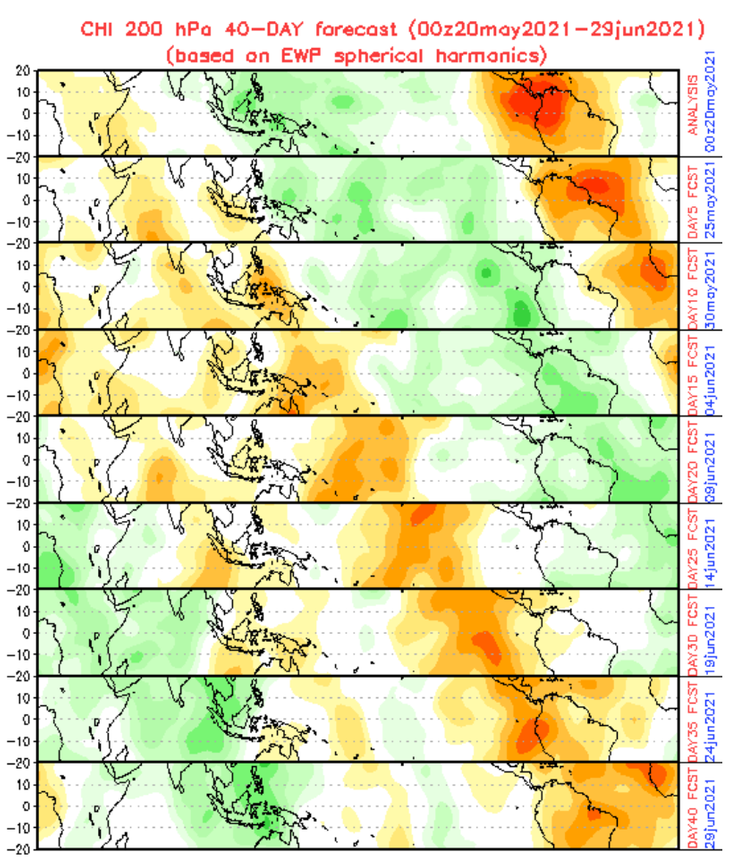
Figure 21: MJO forecast

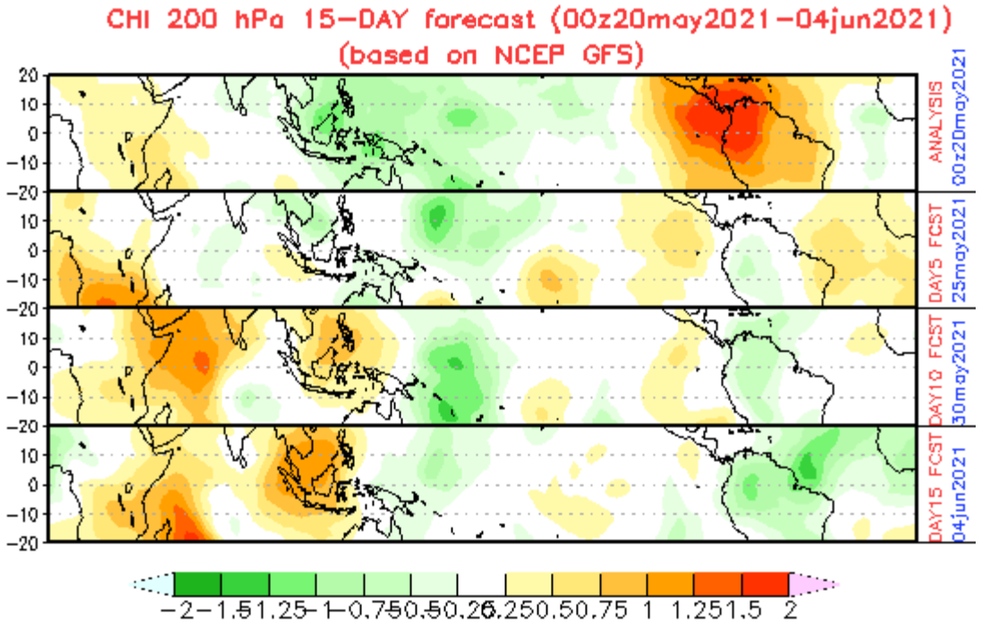
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/foregfs.shtml

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





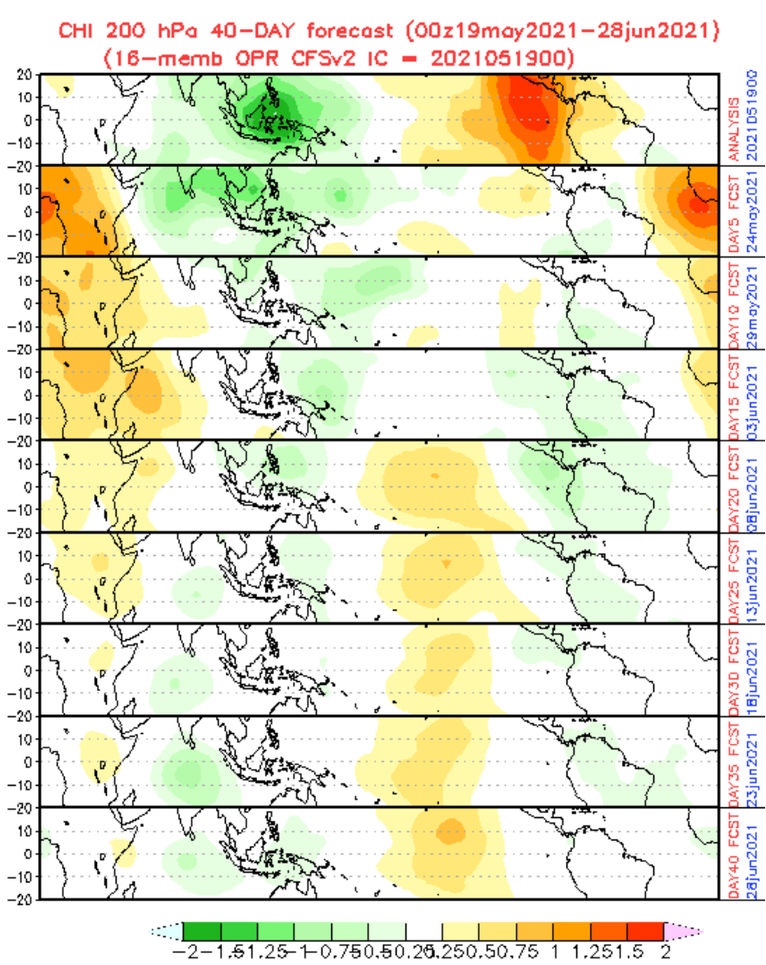


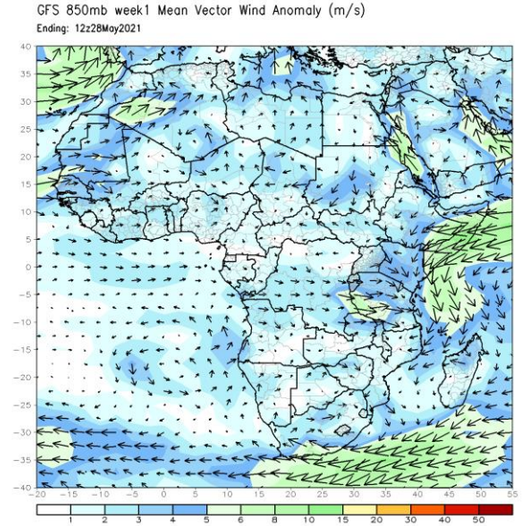
Figure 22: MJO forecast

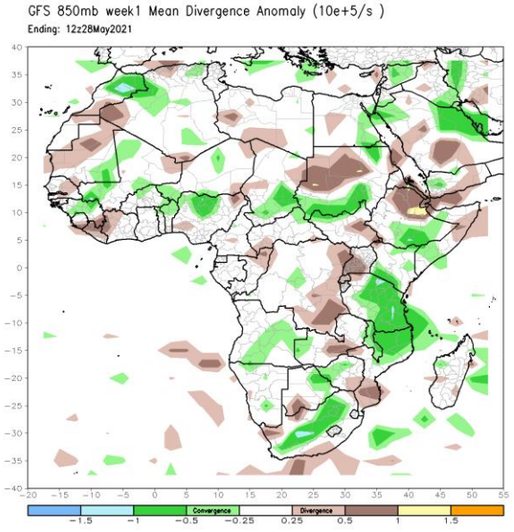
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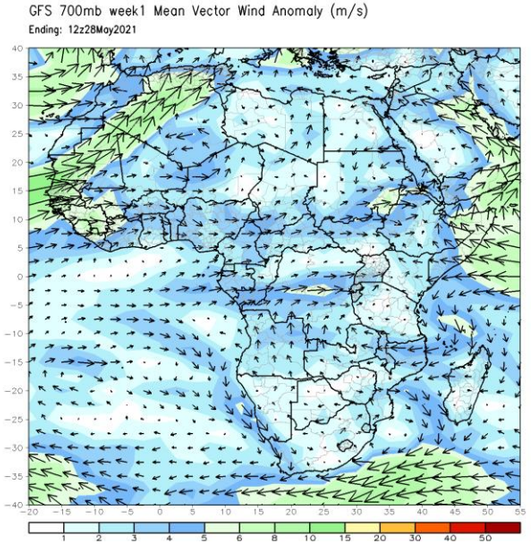
https://www.cpc.ncep.noaa.gov/products/people/wd52qz/mjo/chi/gfs.gif

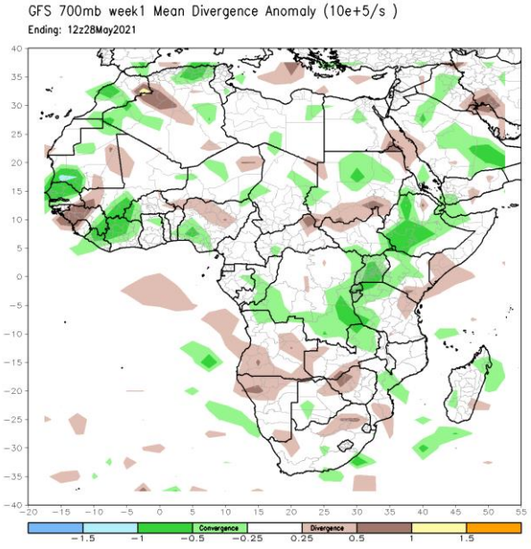
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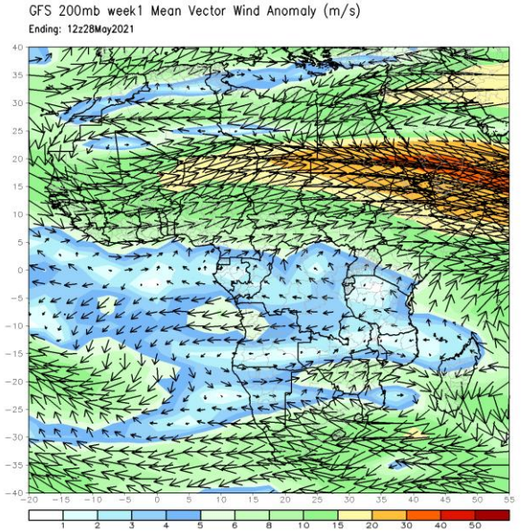
Wind Anomaly and Divergence Forecast from GFS week1: 21-28 May 2021











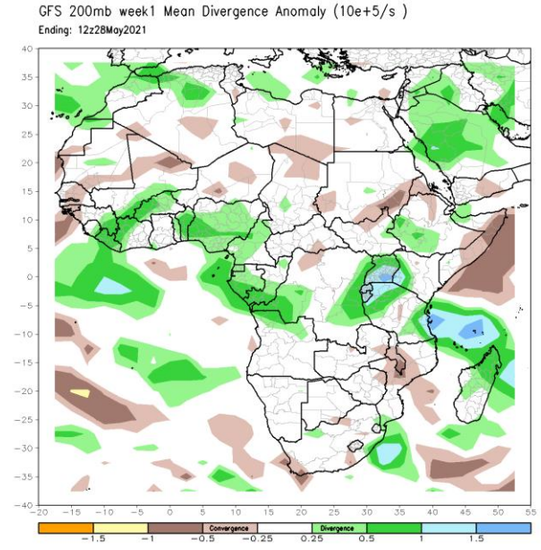
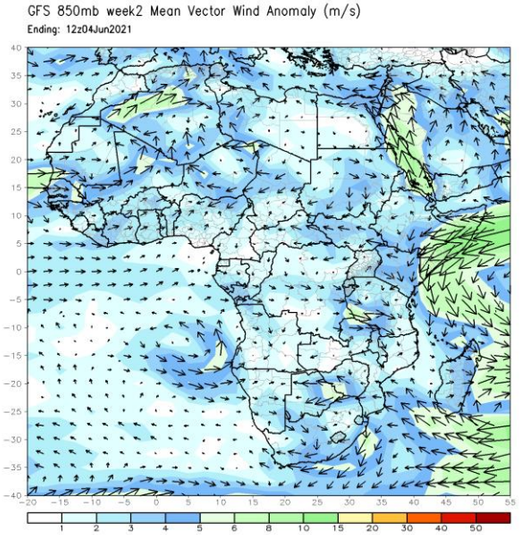
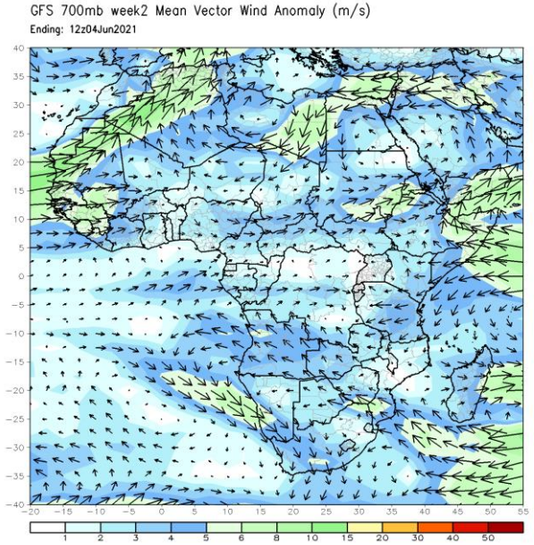


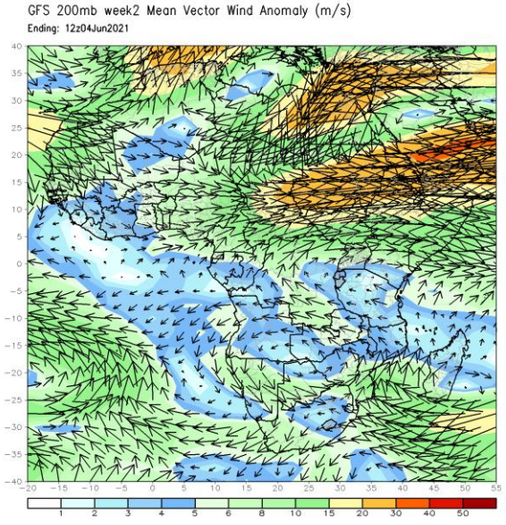
Figure 23 : Forecast from GFS

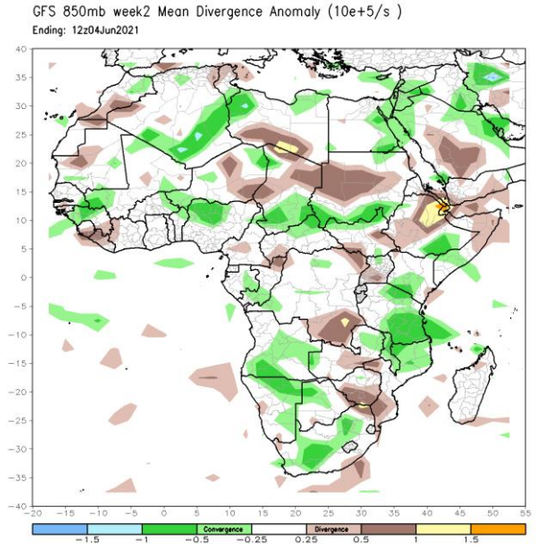
https://www.cpc.ncep.noaa.gov/products/international/africa/africa.shtml

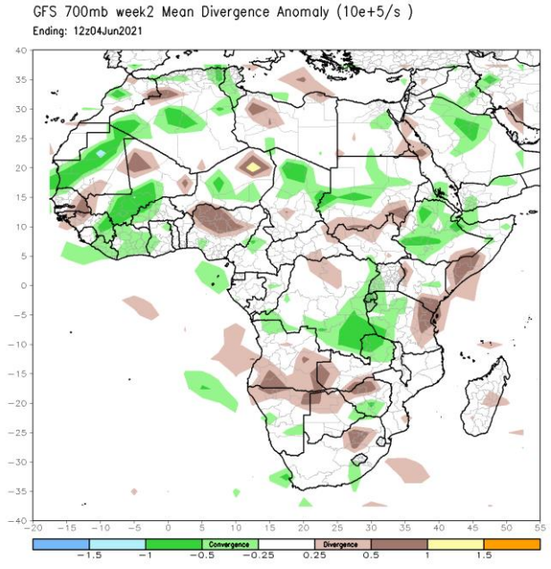
Wind Anomaly and Divergence Forecast from GFS week2: 28-04 June 2021











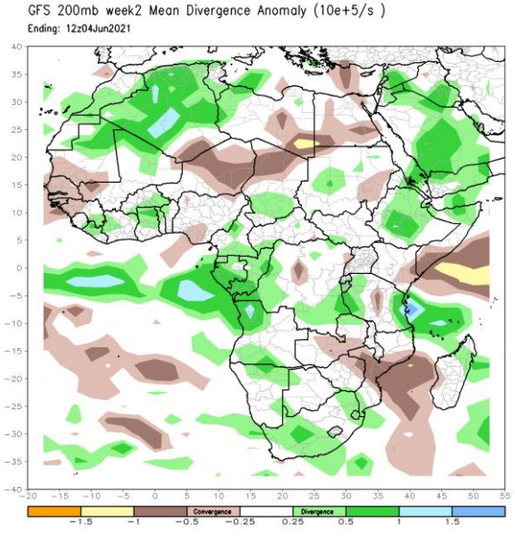
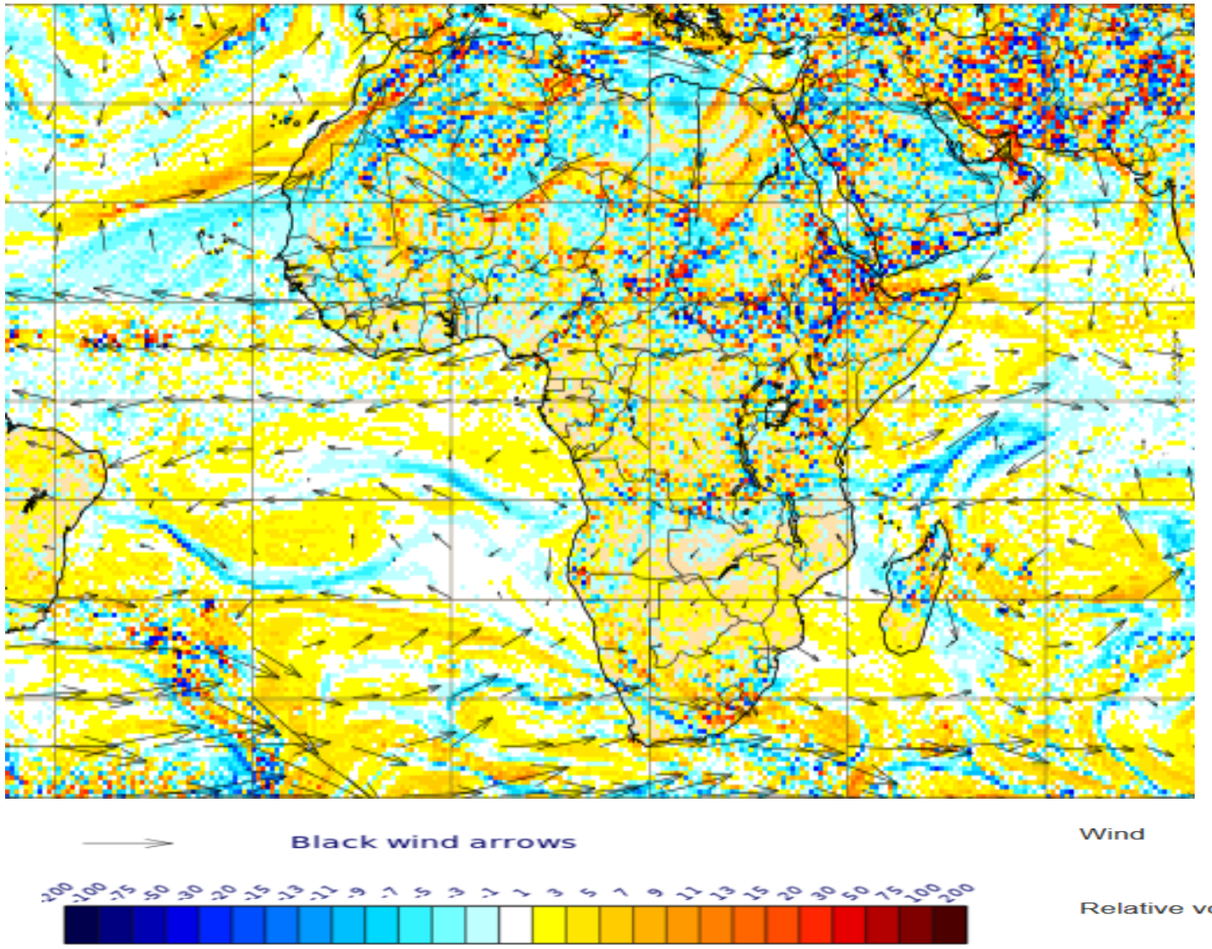
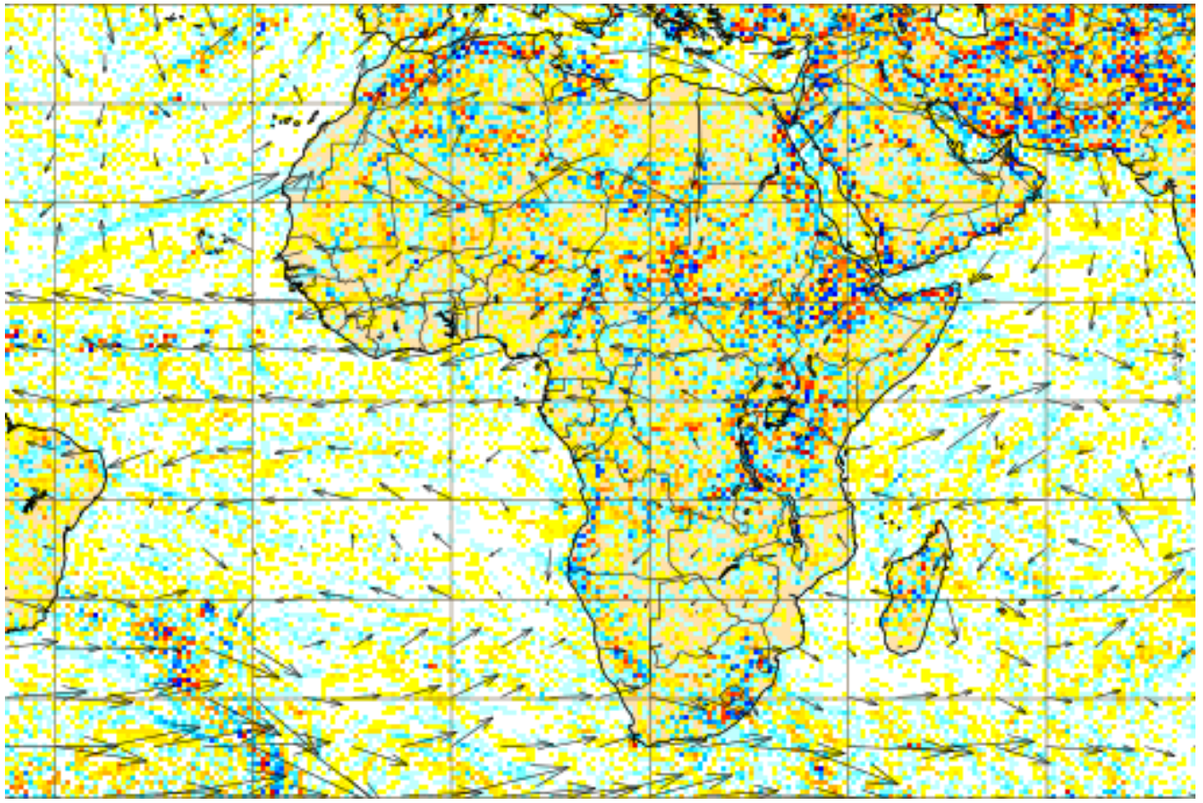


Figure 24: GFS divergence forecast

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

Week 1 (21-28 May 2021) at 700hpa Relative Vorticity and Divergence Wind Forecast from CFS and ECMWF





Divergence

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

GFS total precipitation forecast week1: 21 – 28 May 2021

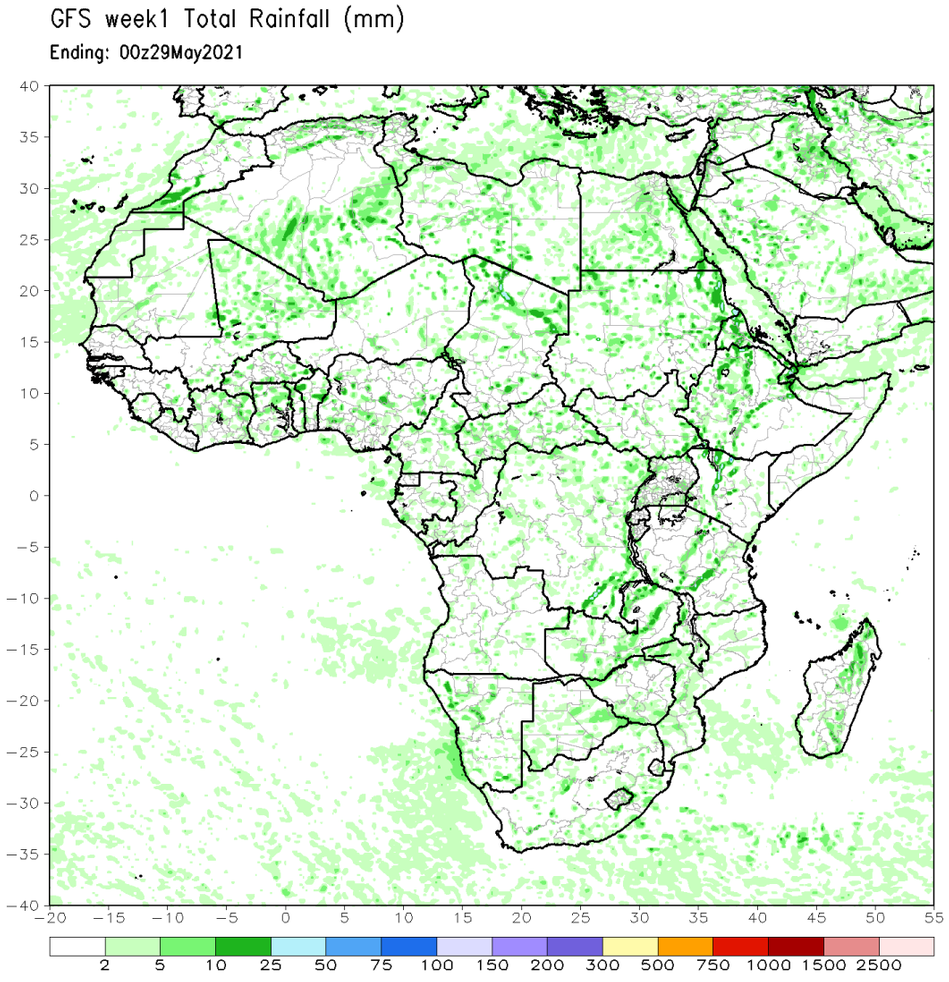


Figure 26: GFS total precipitation forecast week1

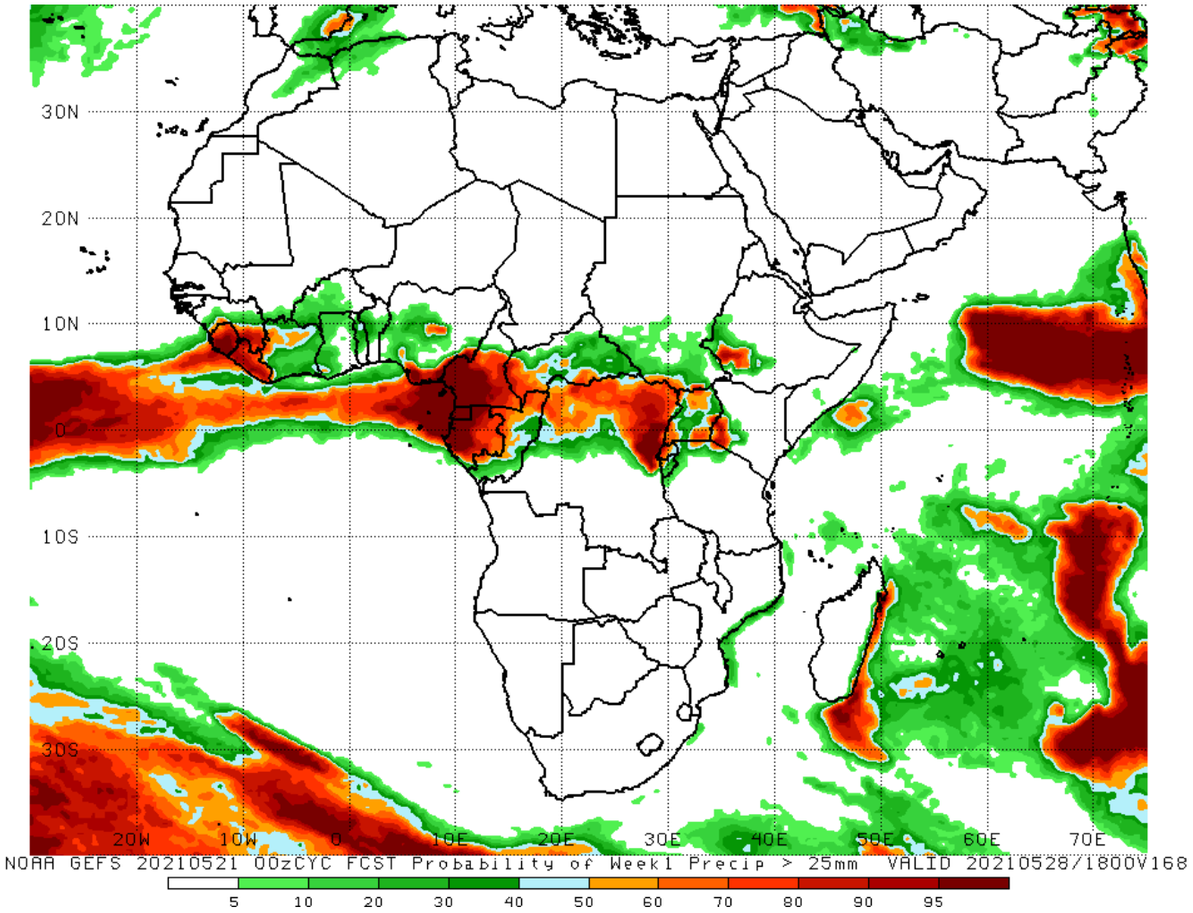
The GFS Model predicts low precipitation of 25mm or less over all of Africa .

https://www.cpc.ncep.noaa.gov/products/international/gfs/gfs_week1_af_precip_obs.gif;

https://www.cpc.ncep.noaa.gov/products/international/gfs/gfs_week2_af_precip_obs.gif

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

Week-1 (22 – 28 May 2021) Precip > 25mm 2021



Week-1 (22 – 28 May 2021) Precip > 50mm

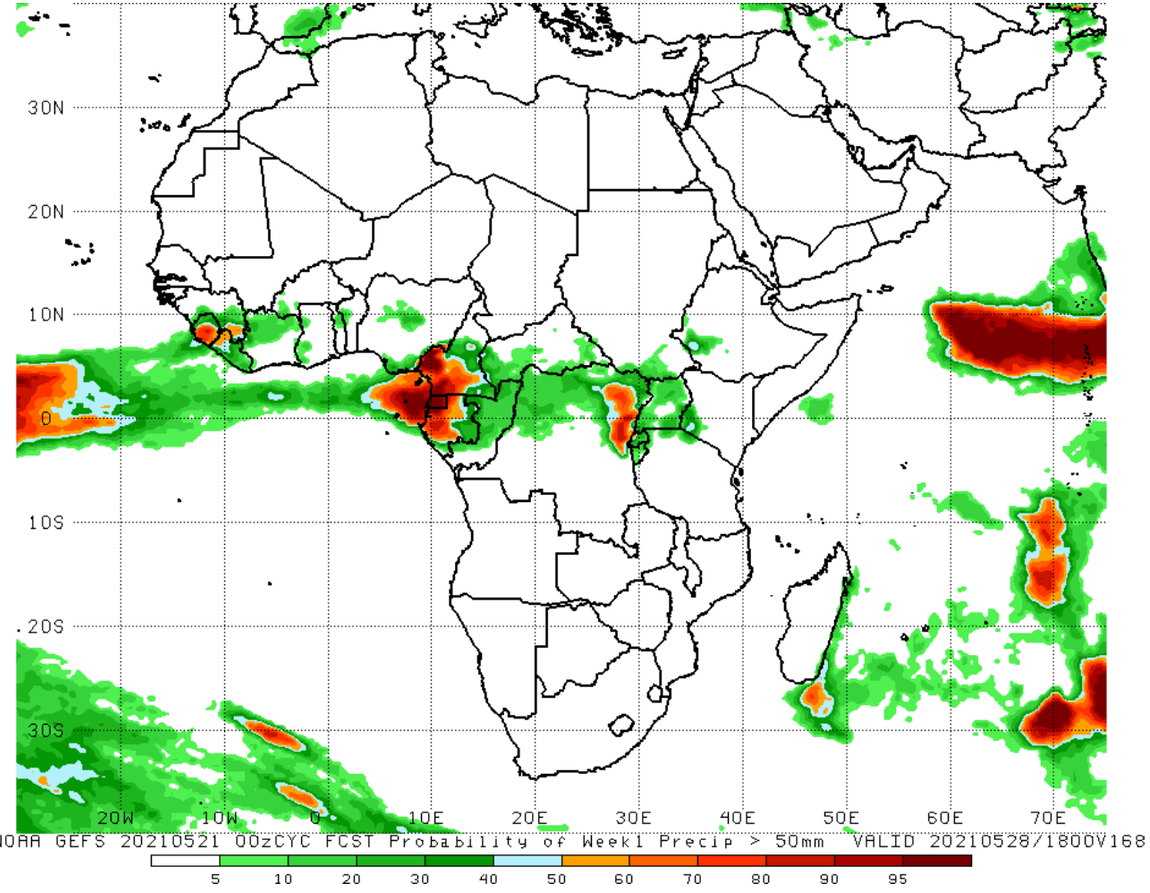


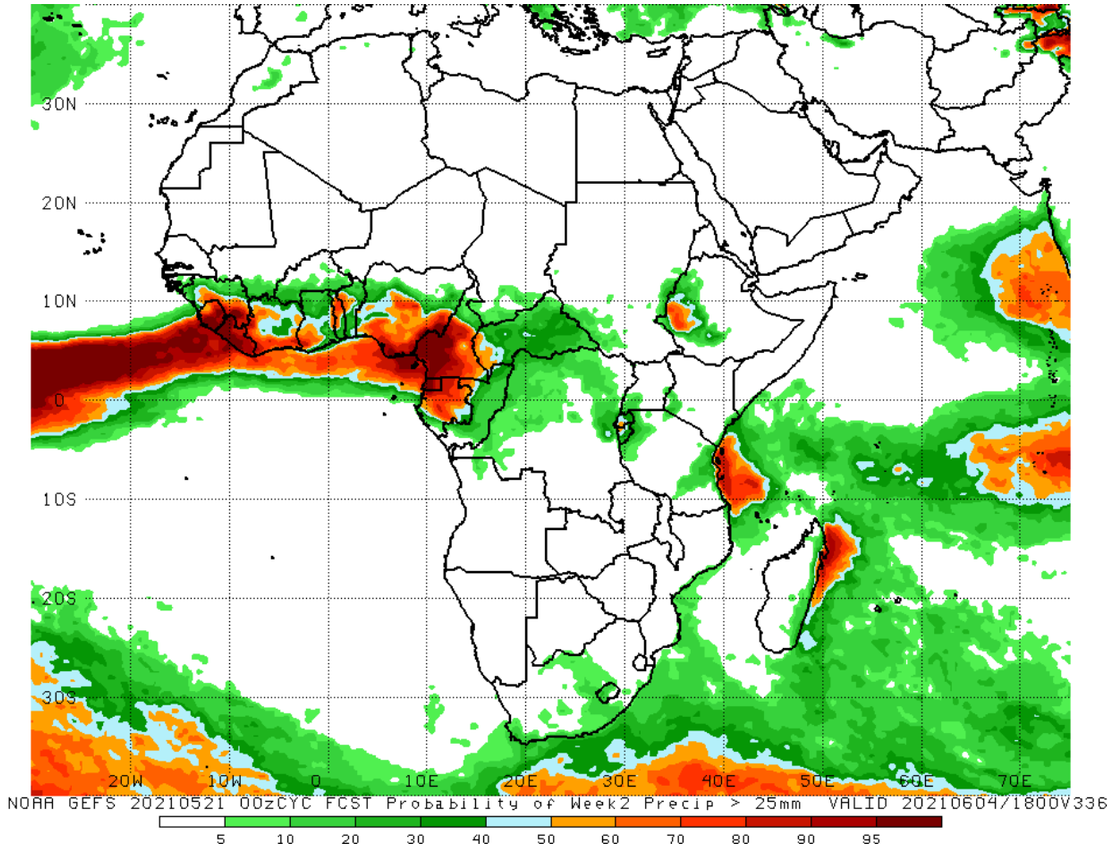
Figure 27: Week1 Precipitation Total Exceedance Probabilities

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 (29 May - 04 Jun 2021) Precip > 25mm 2021



Week-2 (29 May – 04 Jun 2021) Precip > 50mm

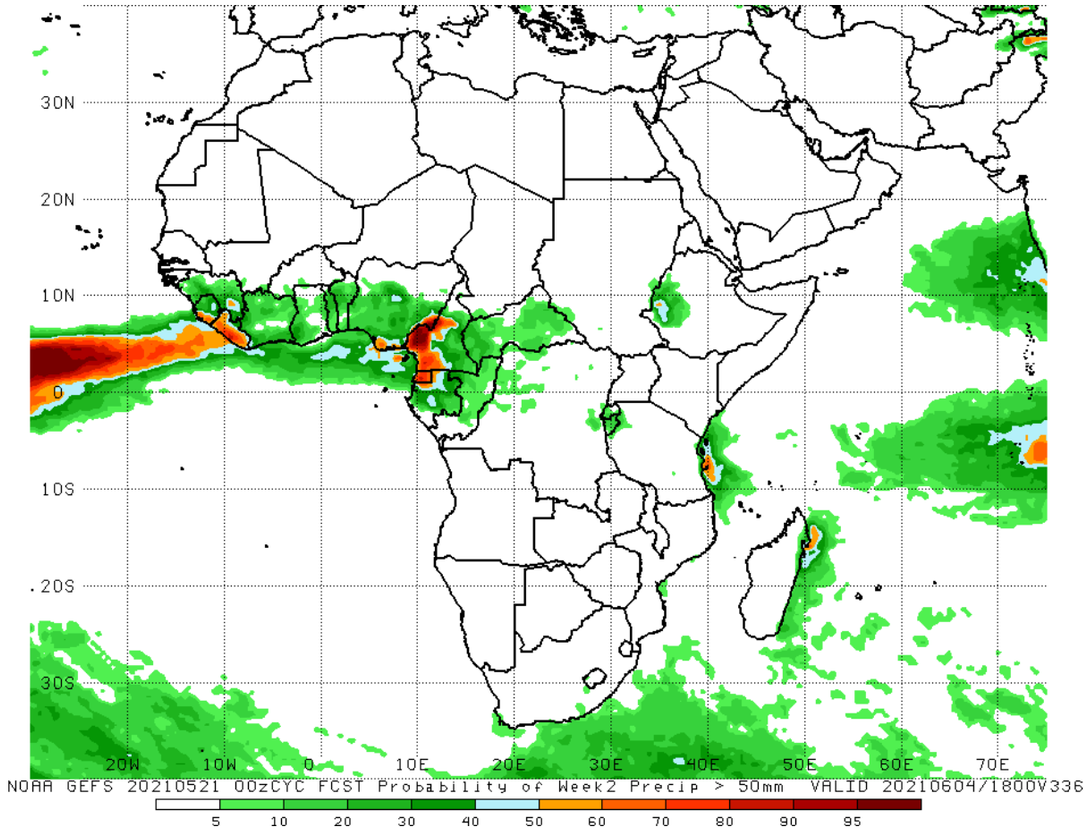
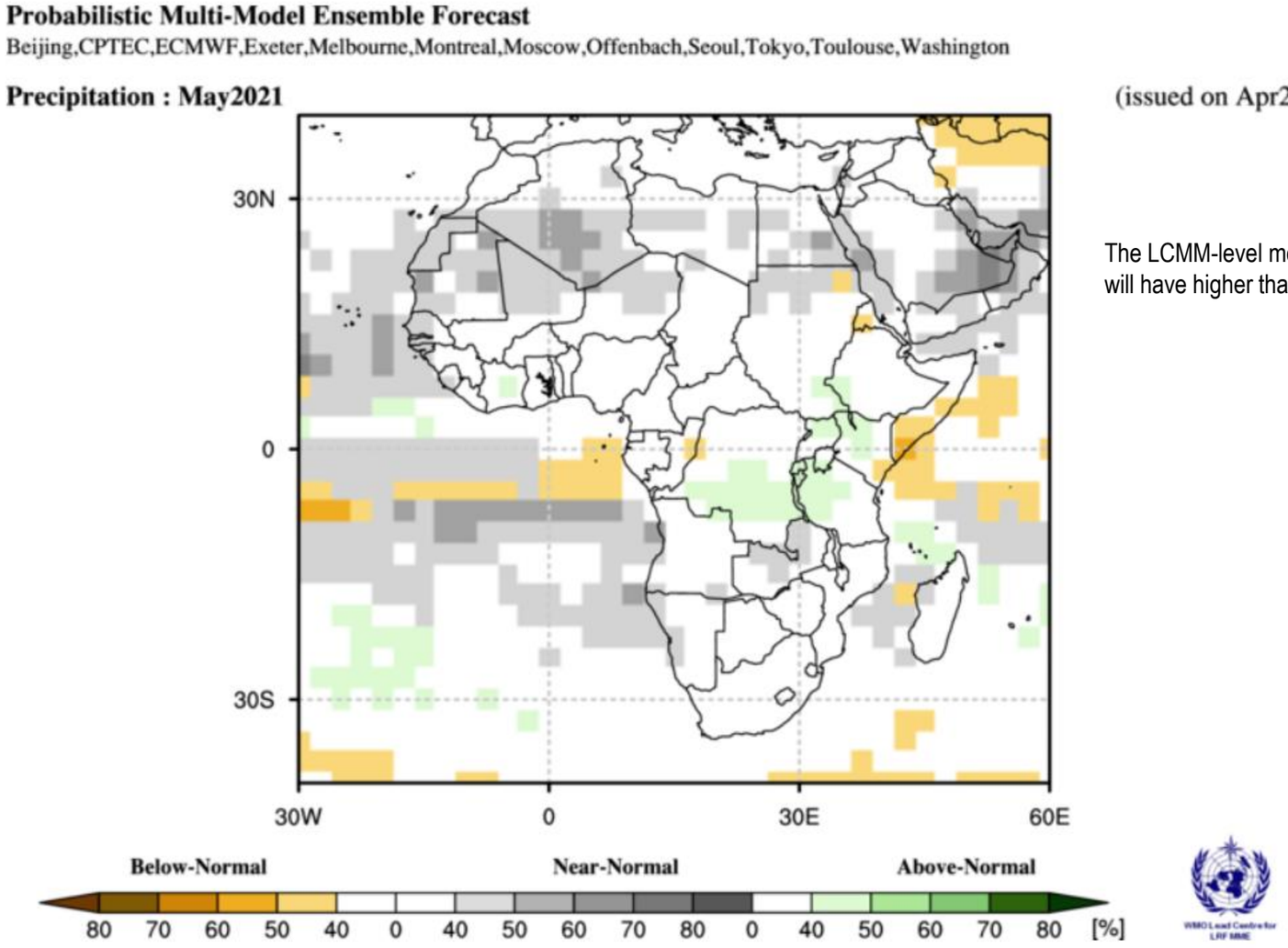


Figure 28: Week2 Precipitation Total Exceedance Probabilities

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

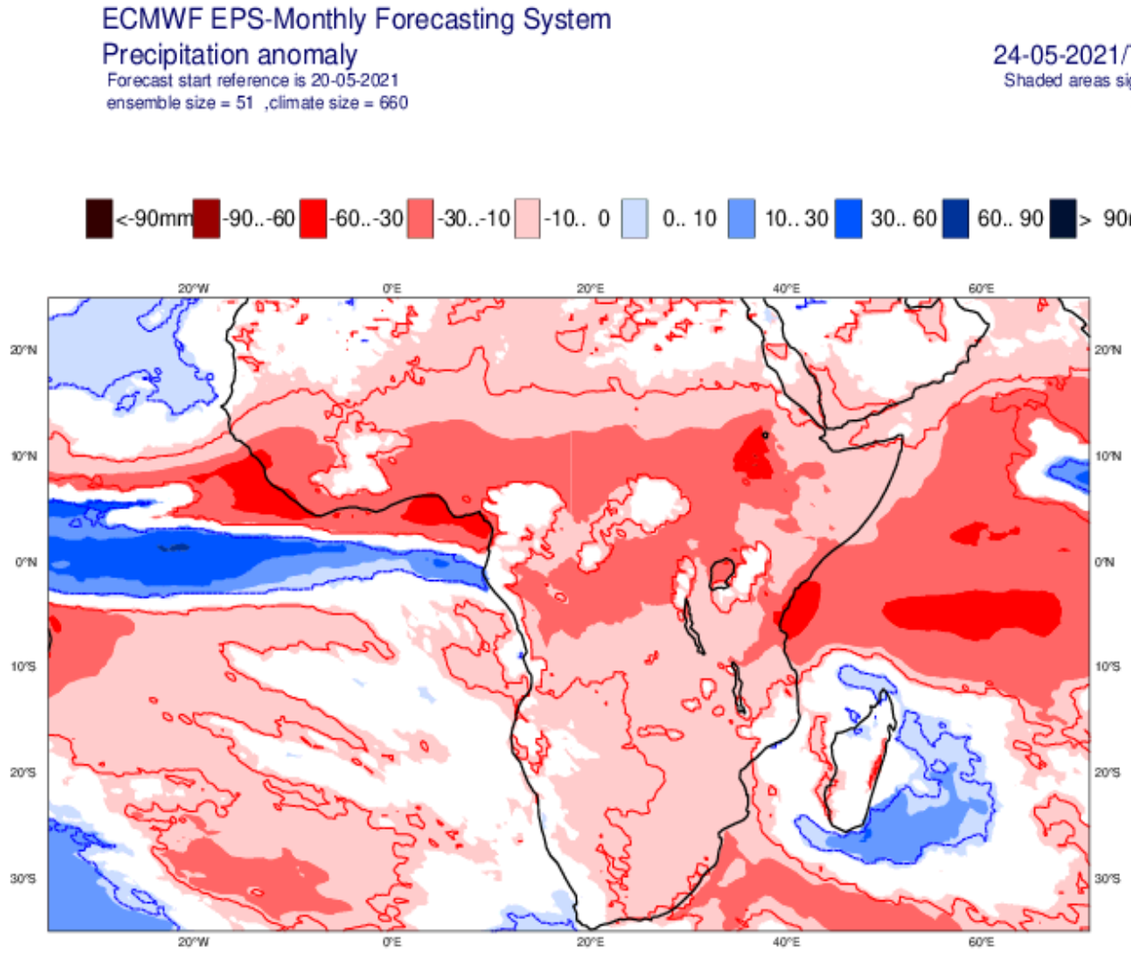


The LCMM-level model set tells us that part of the Africa region will have higher than average rainfall.

Figure 29: Monthly Precipitation forecast

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

Precipitation Anomaly Forecasts from ECMWF for week 1 and 2



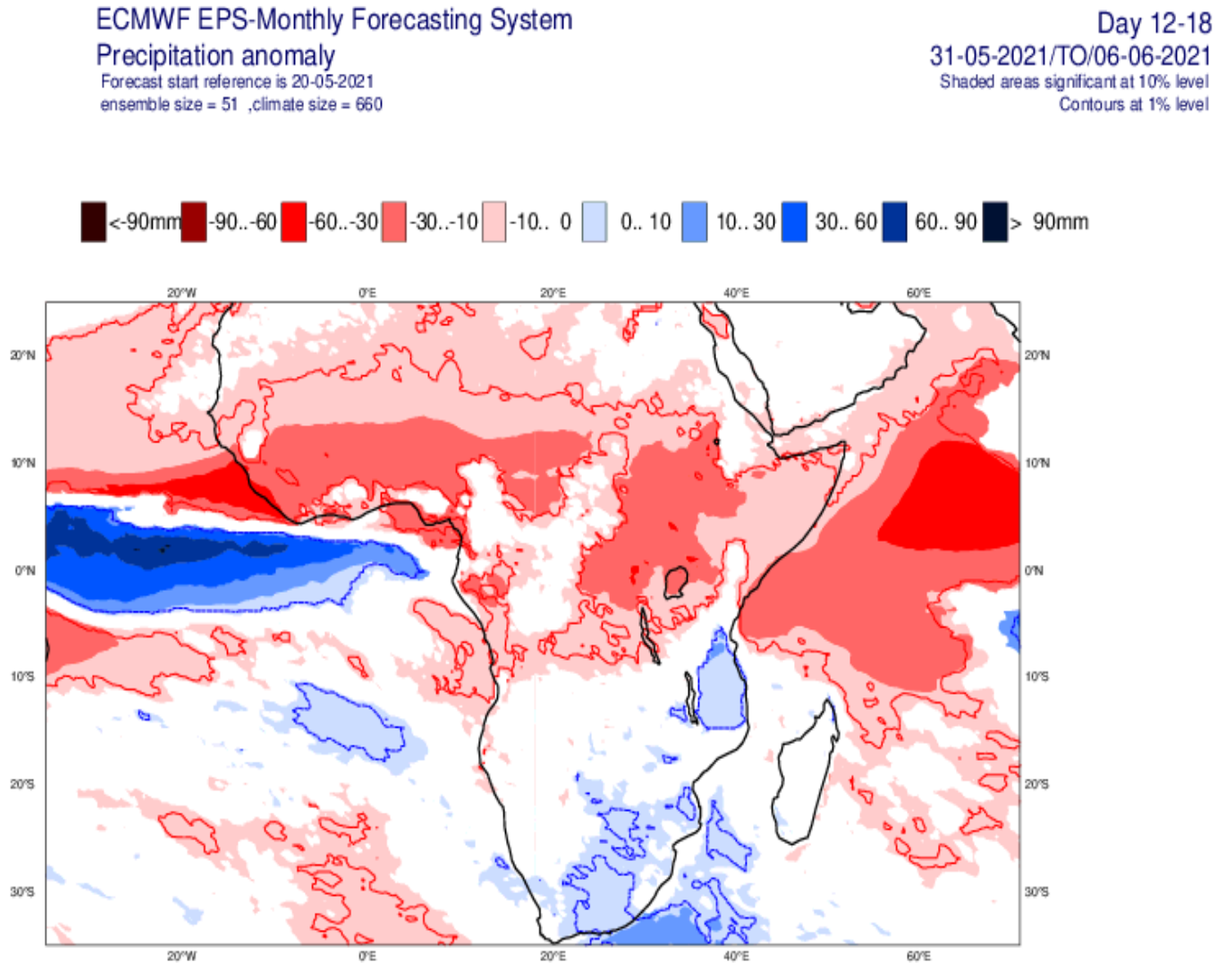
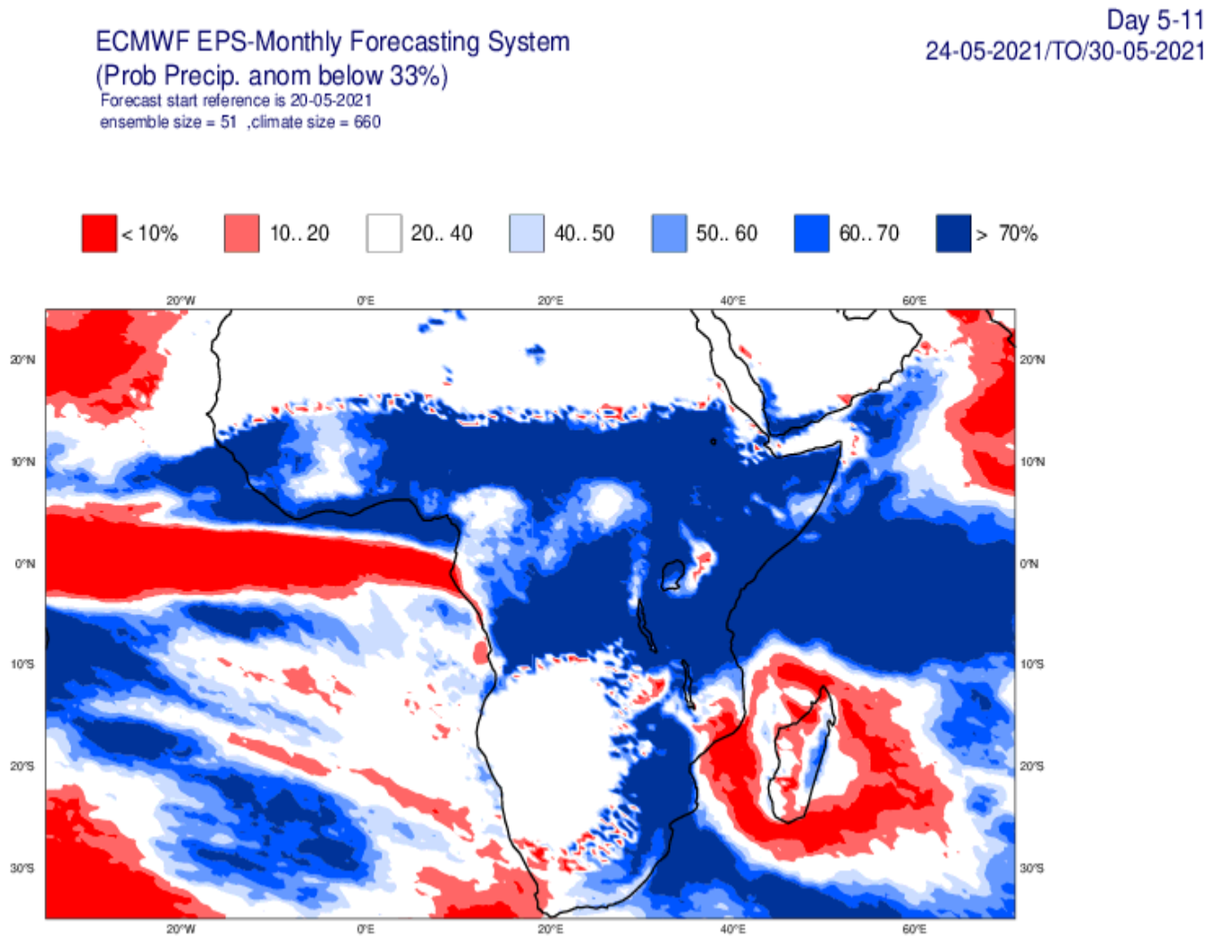


Figure 30: Monthly Precipitation Anomaly forecast from ECMWF

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

Prob. Precip. Forecasts from ECMWF for week 1 & 2: weekly tercile at below 33%



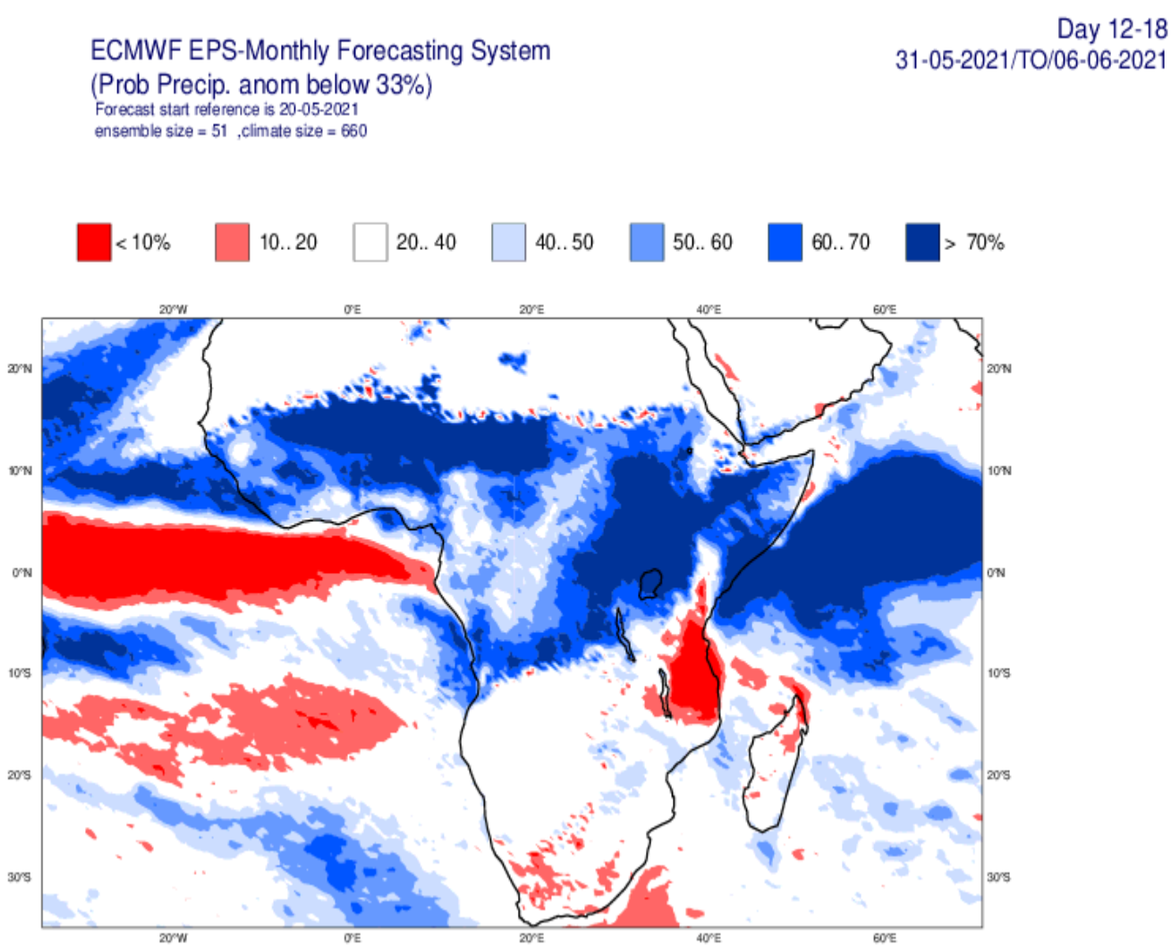
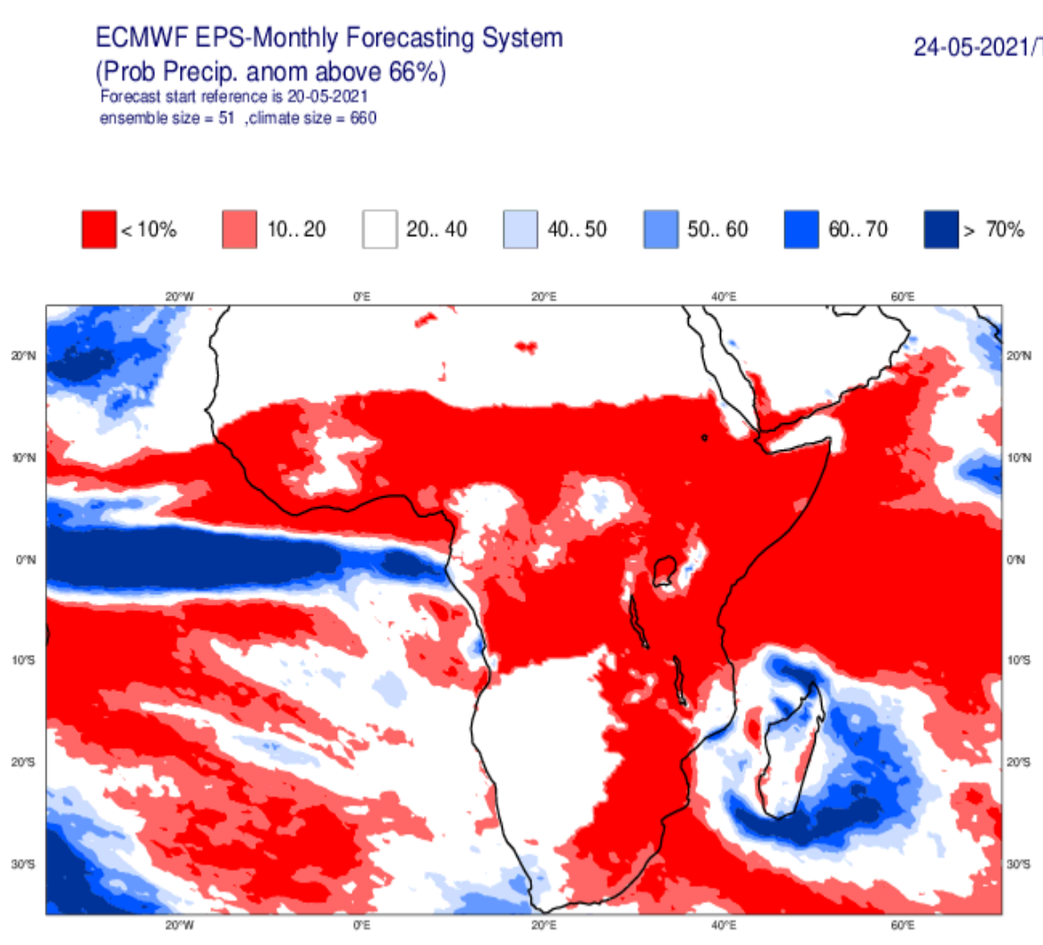


Figure 31: Weekly tercile probability forecast below 33%

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

Probability Precipitation Forecasts from ECMWF for week 1 & 2: weekly tercile at above 66%



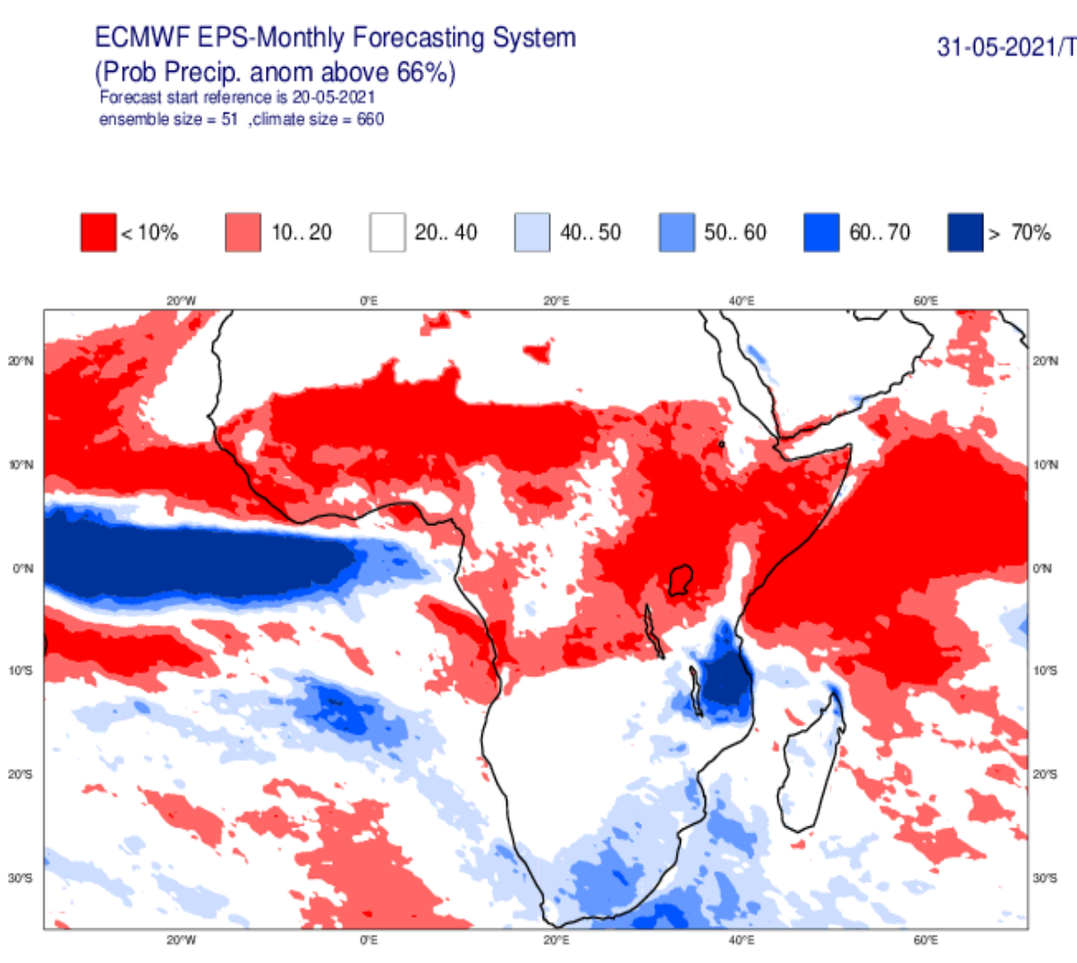
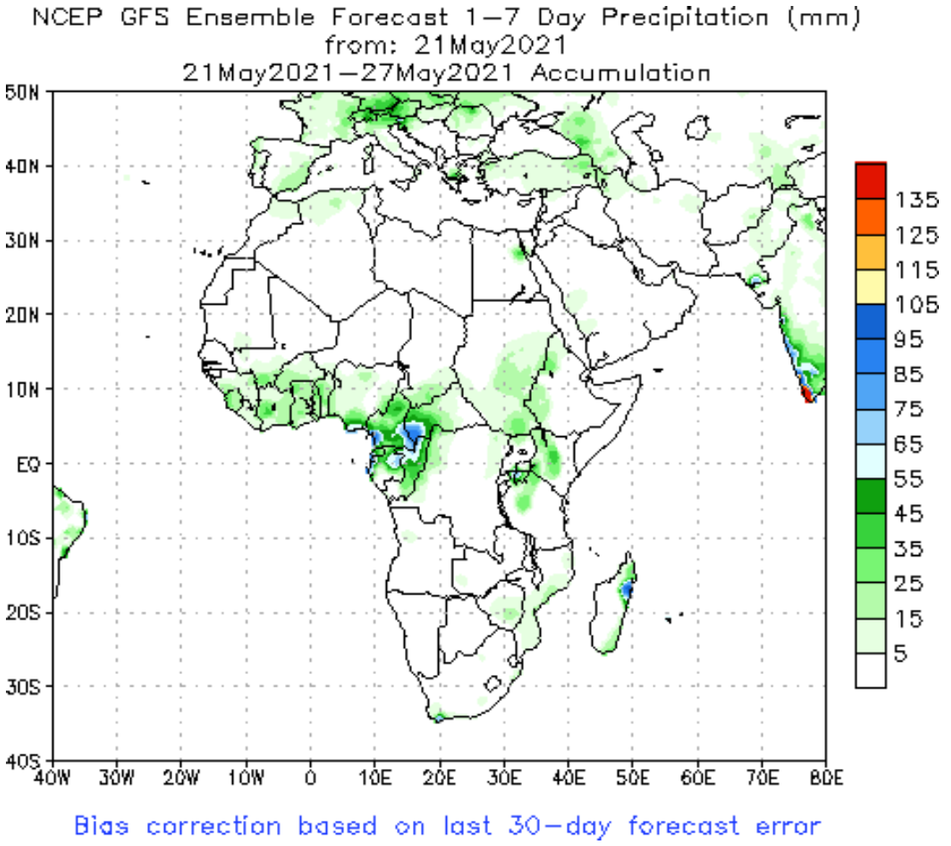


Figure 32: weekly tercile probability forecast below above 66%

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

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



The precipitation forecast shows that during the week of 21st to 27th May, the countries along the Equator and 10N will receive rainfall. Despite these countries forecasted to receive rainfall, the Precipitation anomaly forecast shows that it will be below normal rainfall for most of the central parts of Africa. Only Cameroon, Gabon, Congo and eastern part of Central African Republic (CAR) will receive above normal rainfall.

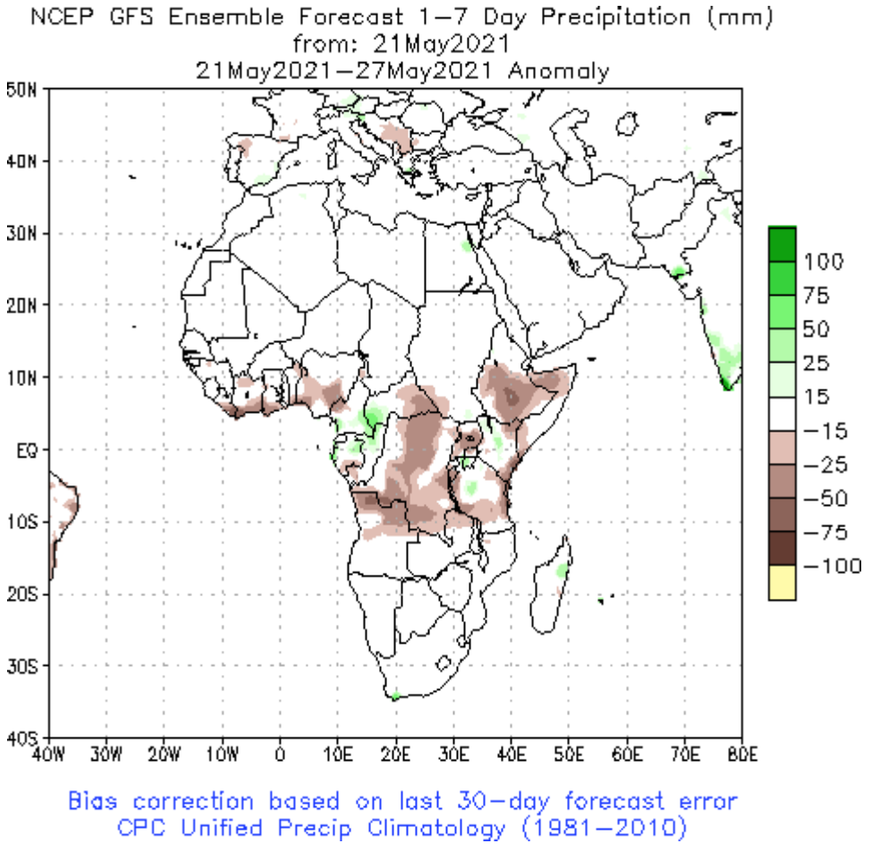
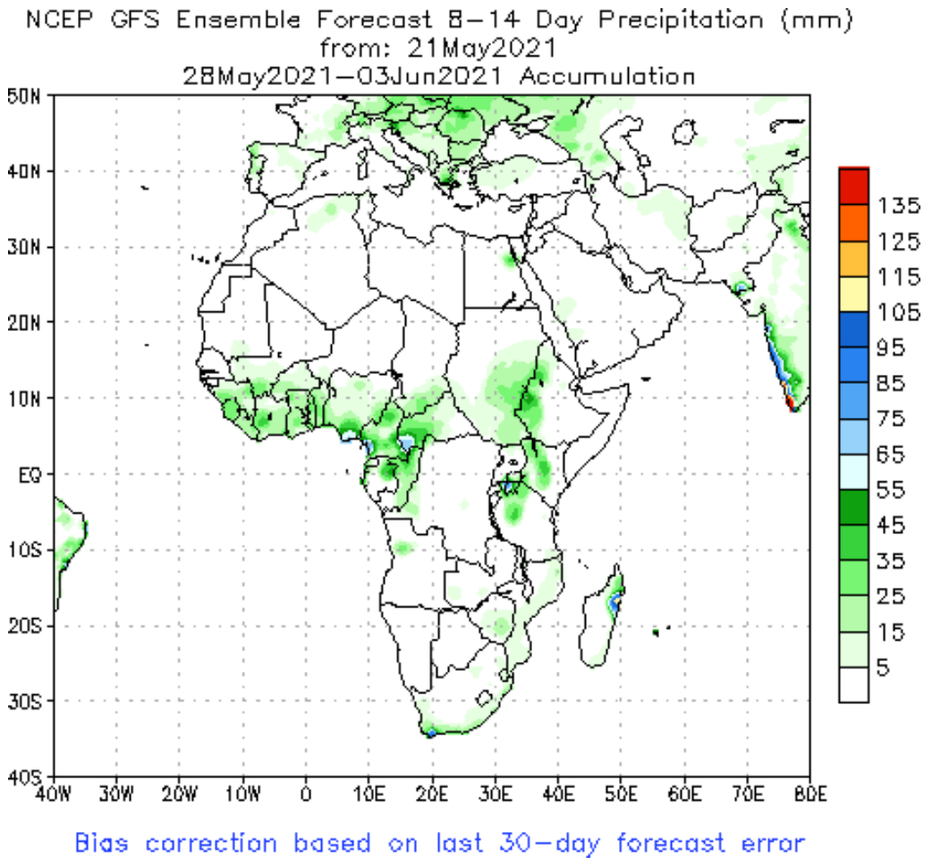


Figure 33: NCEP/GFS Précipitation and Anomaly forecast.

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



The NCEP/GFS forecasts precipitation for the week of 28th of May to 3rd of June over the countries between the Equator and latitude of 15N, but the Precipitation will be below normal as forecasted by the Precipitation anomaly map on the right, except for eastern CAR, Kenya and Tanzania will receive normal to above normal rainfall.

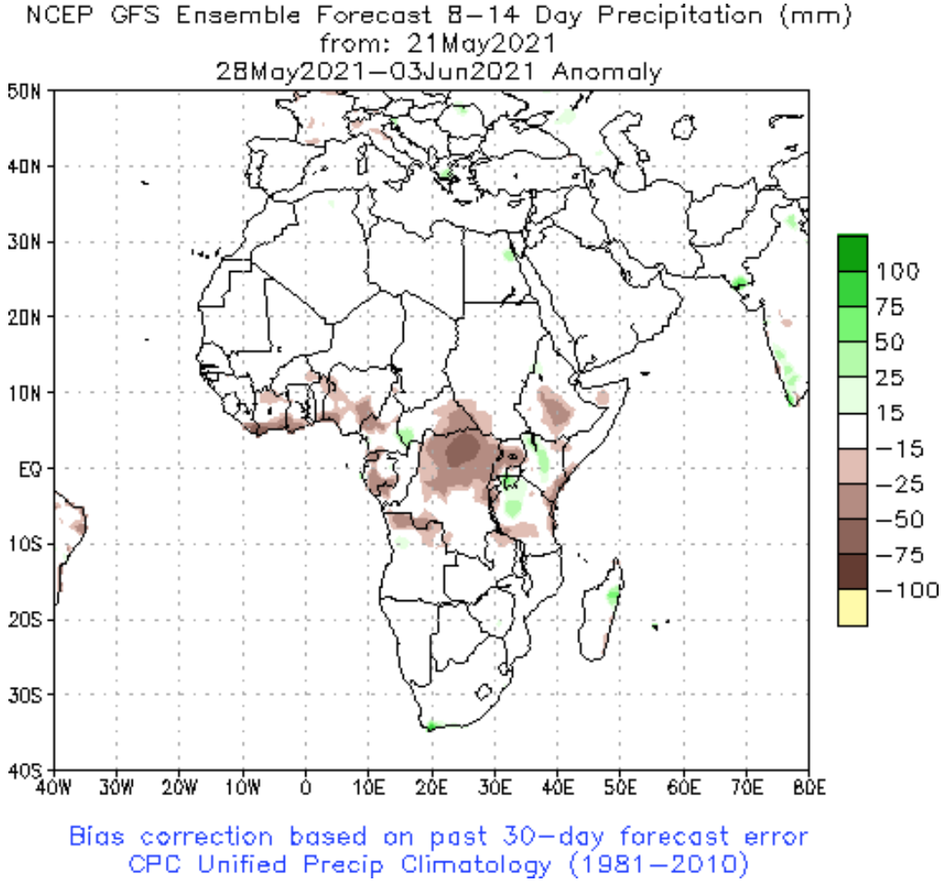
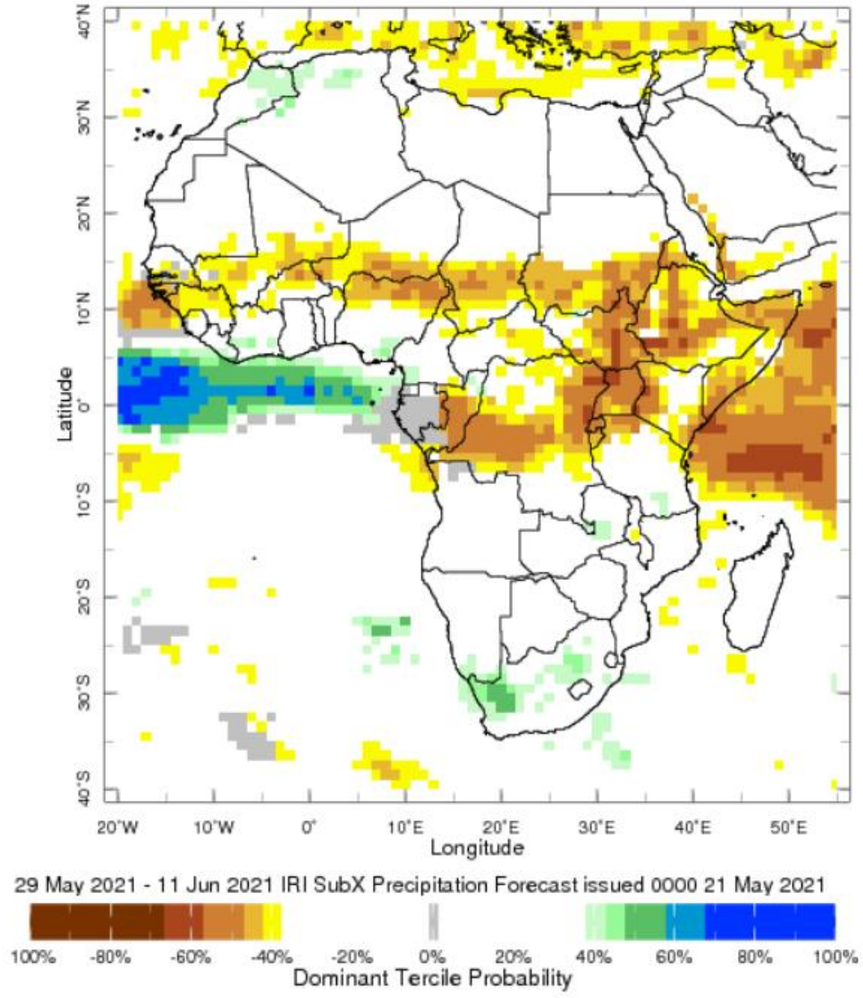


Figure 34: Précipitation and Anomaly forecast

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

PRECIPITATION PROBABILITY FORECAST 29 May 2021 – 18 Jun 2021



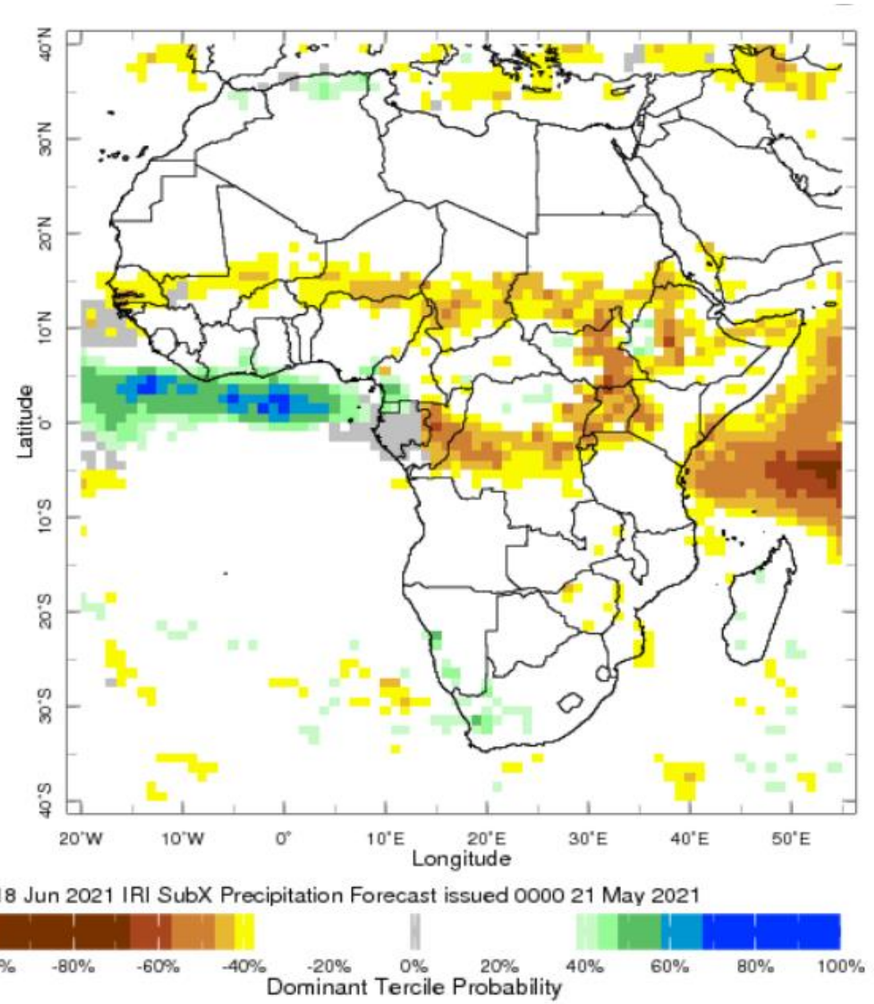


Figure 35: Précipitation and Anomaly forecast

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 1 & 2

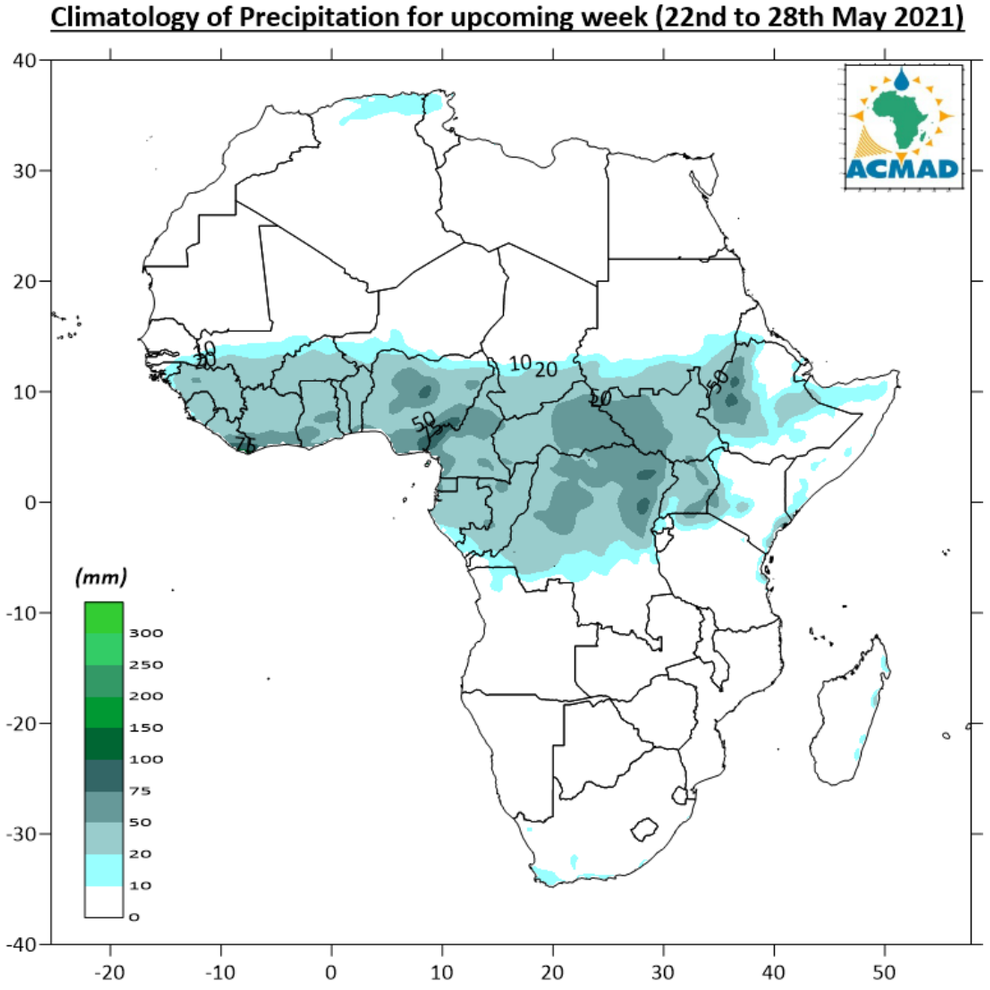
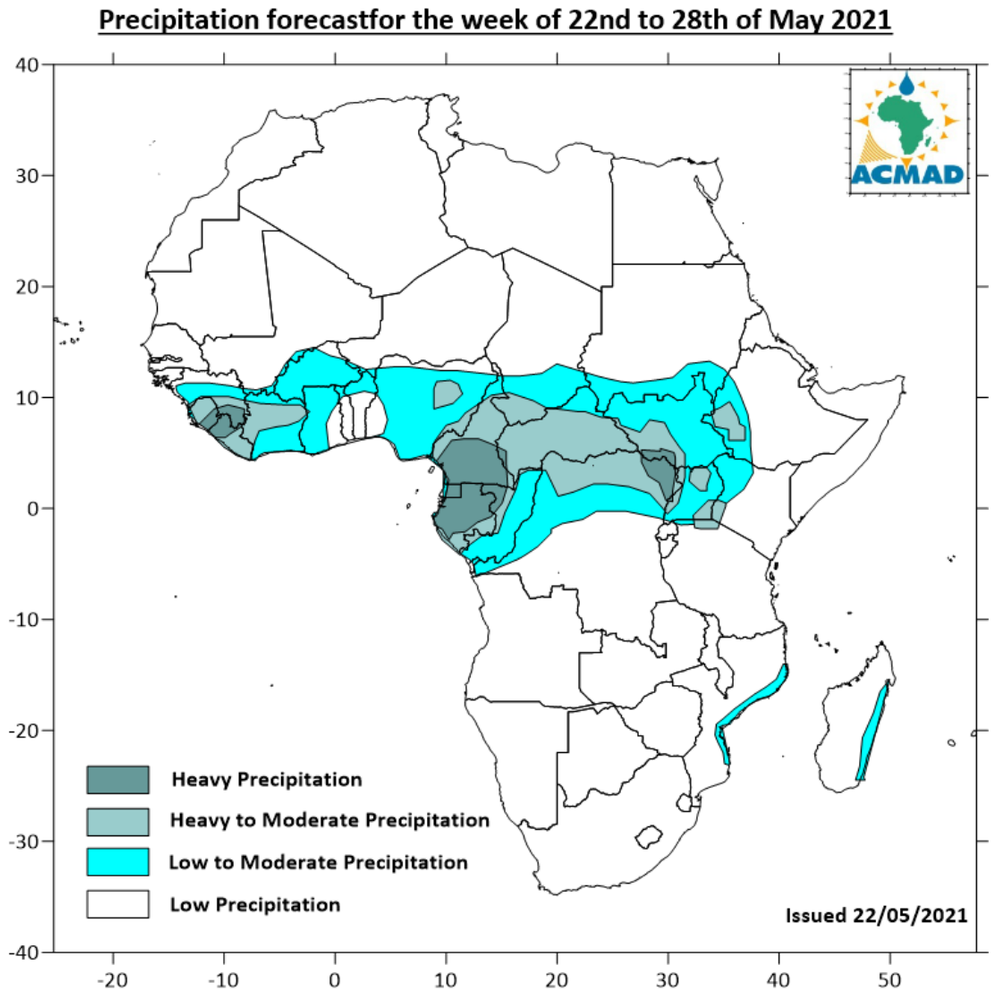


Figure 36: Climatology of Precipation for week-1(left panel) and week-2 (right panel)

PRECIPITATION FORECAST FOR THE COMING TWO CONSECUTIVE WEEKS



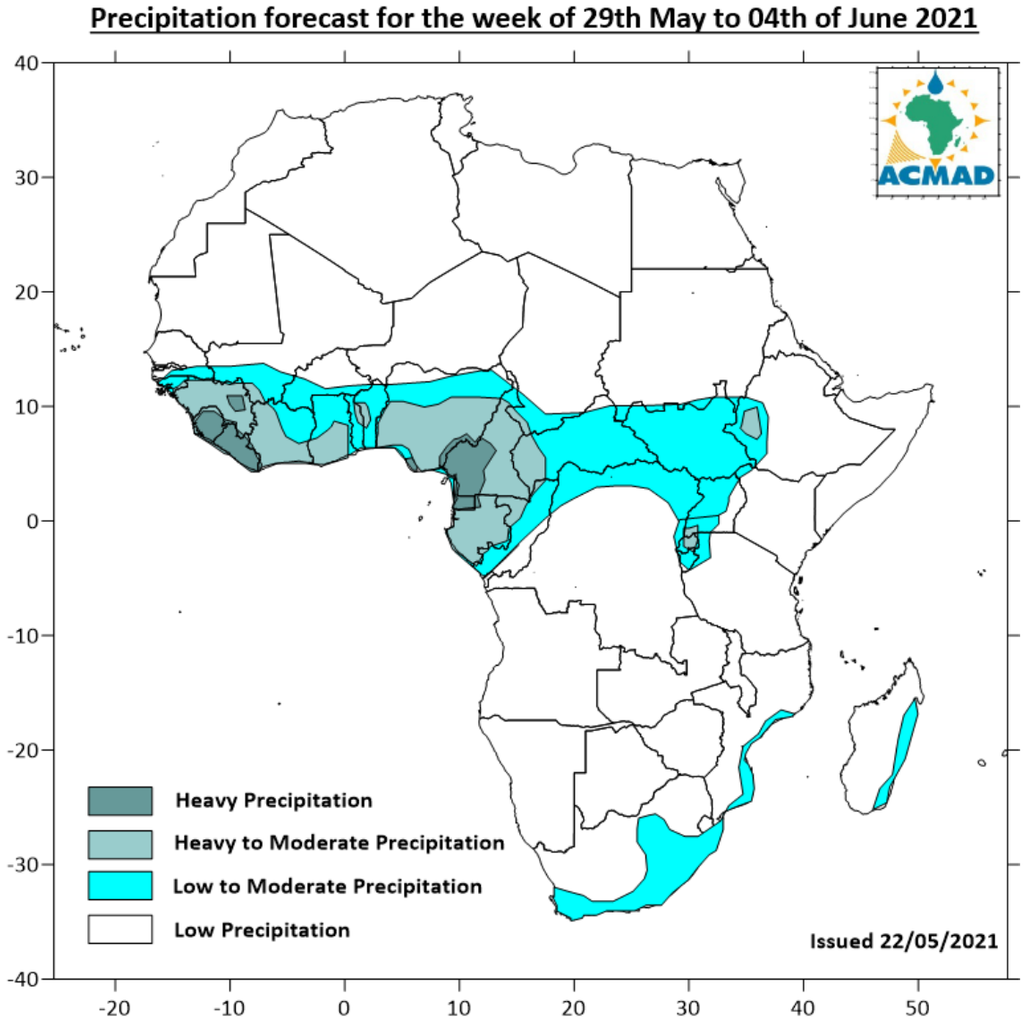


Figure 37: Climatology of Precipation for week-1(left panel) and week-2 (right panel)