DEKADAL TECHNICAL NOTE FOR THIRD DEKAD OF MARCH, 2021
AND PRECIPITATION FORECAST FOR WEEK 1 AND 2

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Edited by: **Hubert KABENGELA : Tarekegn Abera**

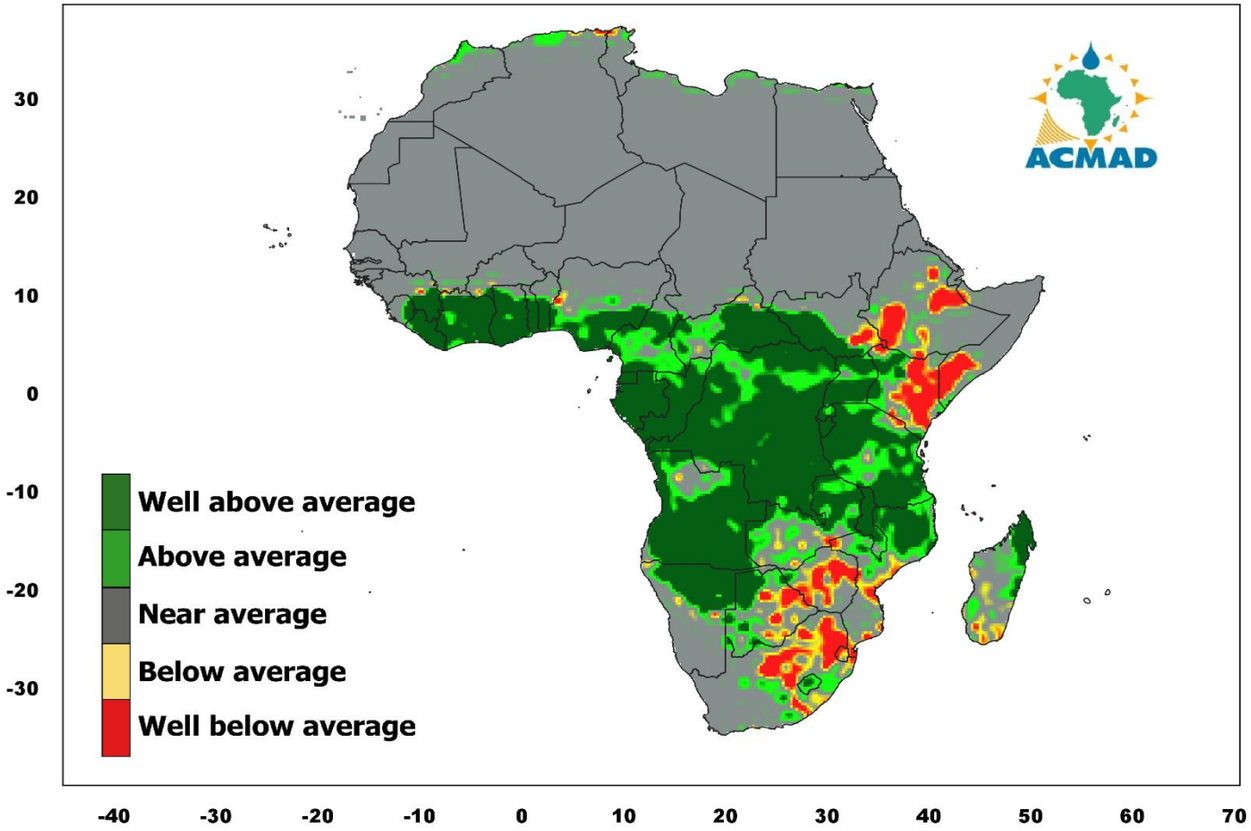
Content of the Technical Note

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 PERCENT OF AVERAGE FOR DEKAD 3 April 2021

3rd dek_March 2021_% of Average Precipitation



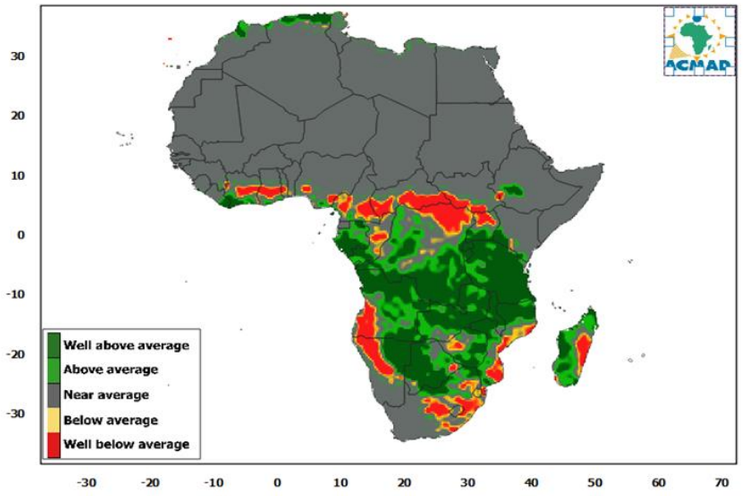
The figure show well above to above average précipitation prevailed over northern, Gulf of Guniea and some parts of central Africa regions. In the North Eastern parts of Africa as well as Central parts of SADC below average to well below average conditions.

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/

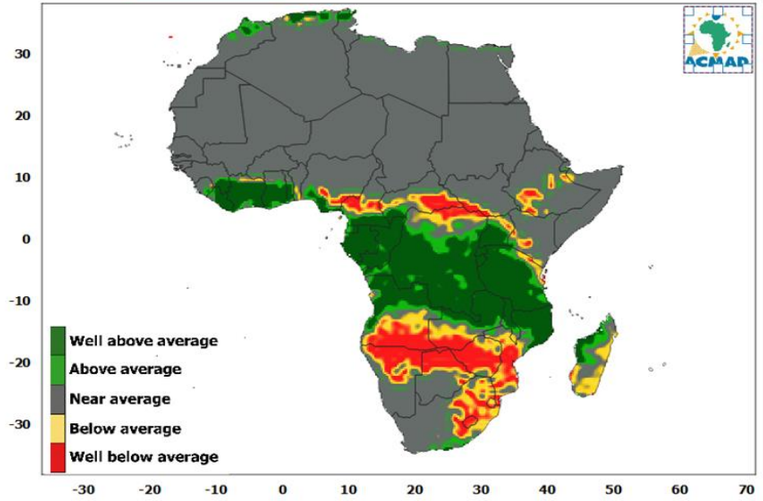
Temporal and spatial change of per cent of average precip for the last four consecutive dek

3rd dek_Feb 2021_% of average Precipitation

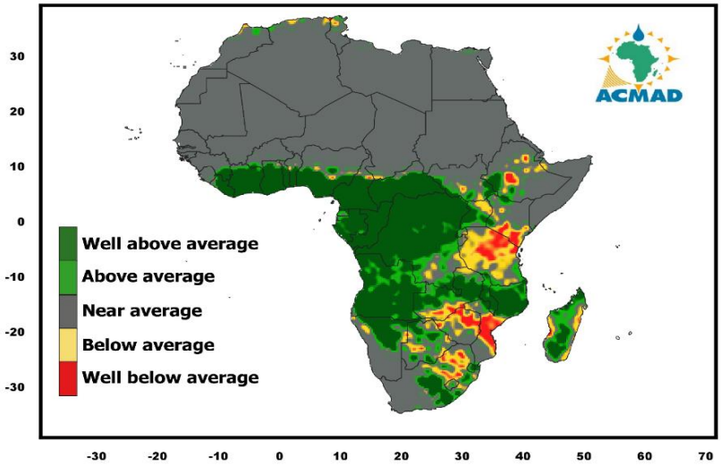


Spatially, Increasing % of average precipitation was observed across Africa, particularly at the Gulf of Guinea and Central African Countries. Comparing the last dekad of March 2021 to the first two dekads of the same month. This might be due to the Increasing SST over the south of the Indian ocean as well the persistent conditions in the Atlantic Ocean.

1st dek_March 2021_% of Average Precipitation



2nd dek_March 2021_% of Average Precipitation



3rd dek_March 2021_% of Average Precipitation

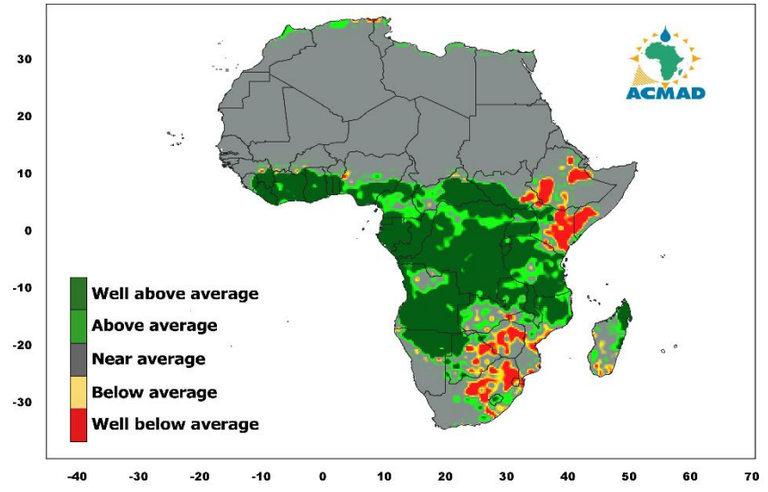
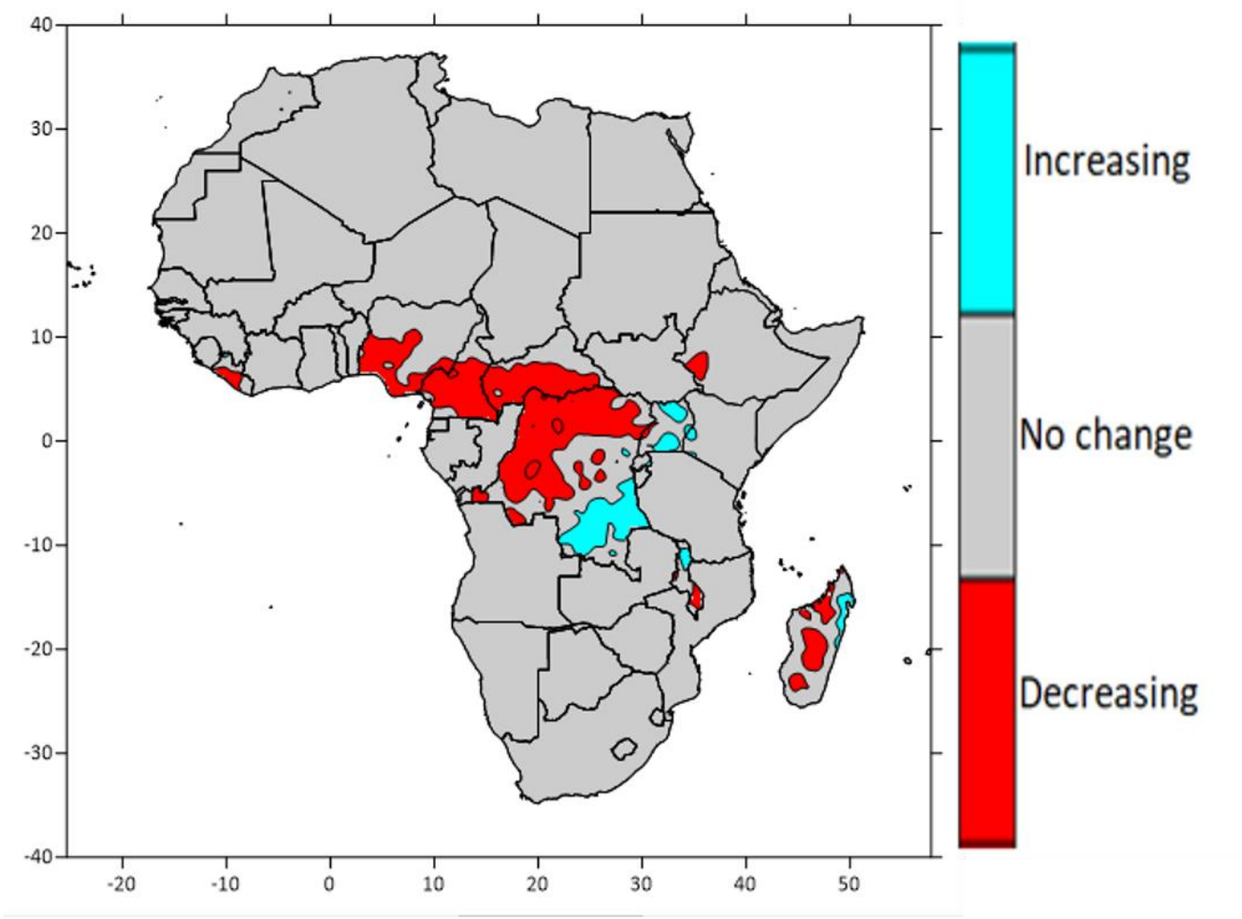


Figure 2: This map displays decadal average precipitation in percent of average

Precipitation deviation

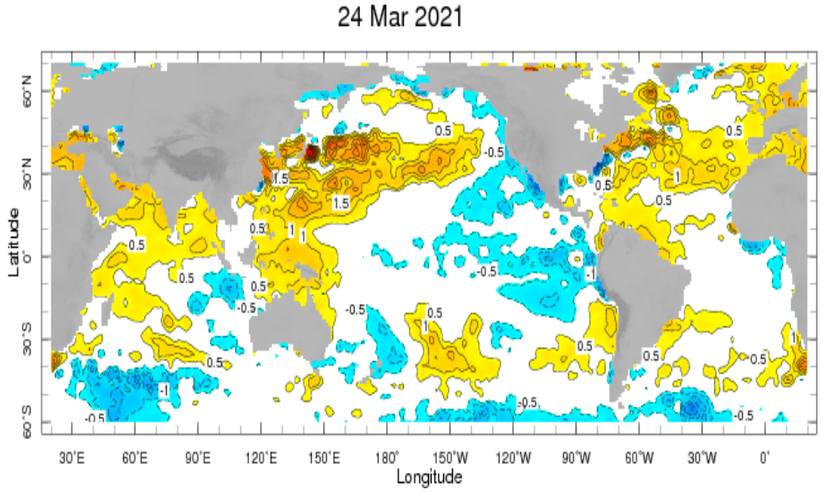


- During the third dekad of March, most parts of central, Madagascar and some of the Gulf of Guinea countries received rainfall deficit as compared to the previous dekad. Most of the entire continent received no change in rainfall except some pockets of places in the central African Region.

Figure 3: This map displays decadal precipitation deviation

Weekly Sea Surface Temperature Anomaly

21 March – 27 Mar 2021



14 March – 20 Mar 2021

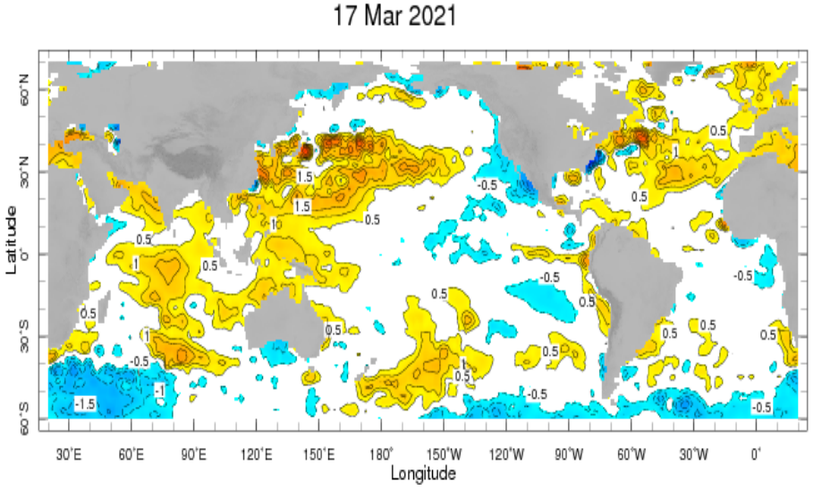
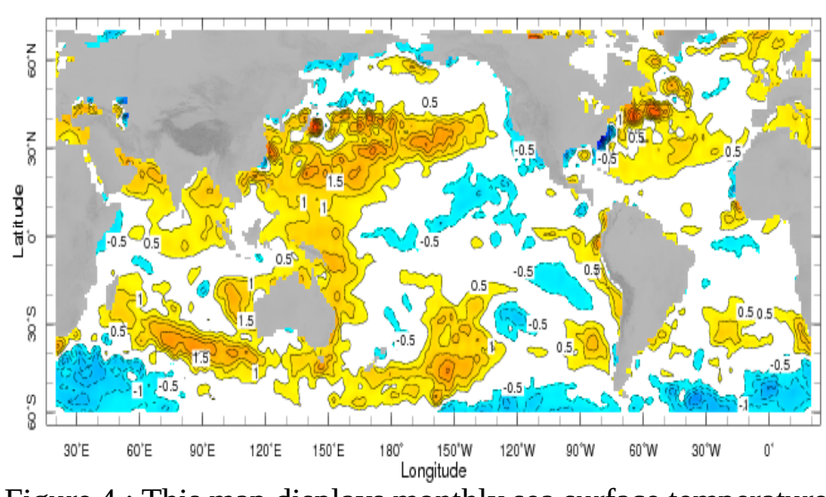
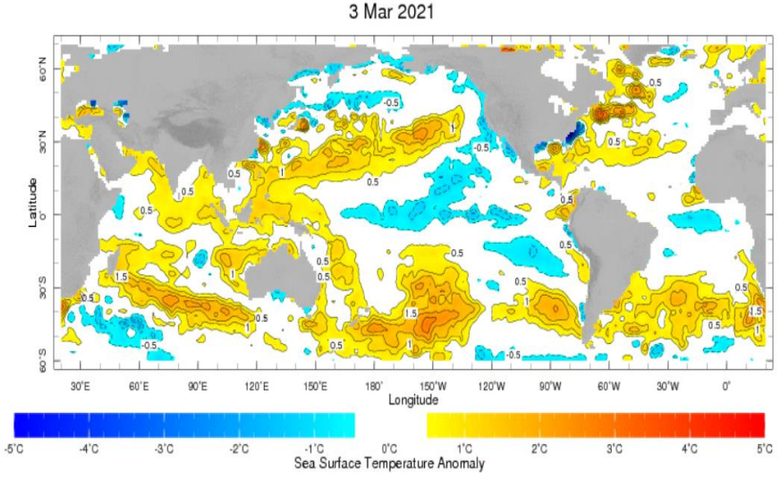


Figure3, these maps display weekly sea surface temperature anomalies for the globe, and they depicts a gradual decreasing of SST observed over the equatorial Pacific, northern Atlantic, and the south-western Indian ocean.

7– 13 Mar 2021



28 Feb – 6 Mar 2021

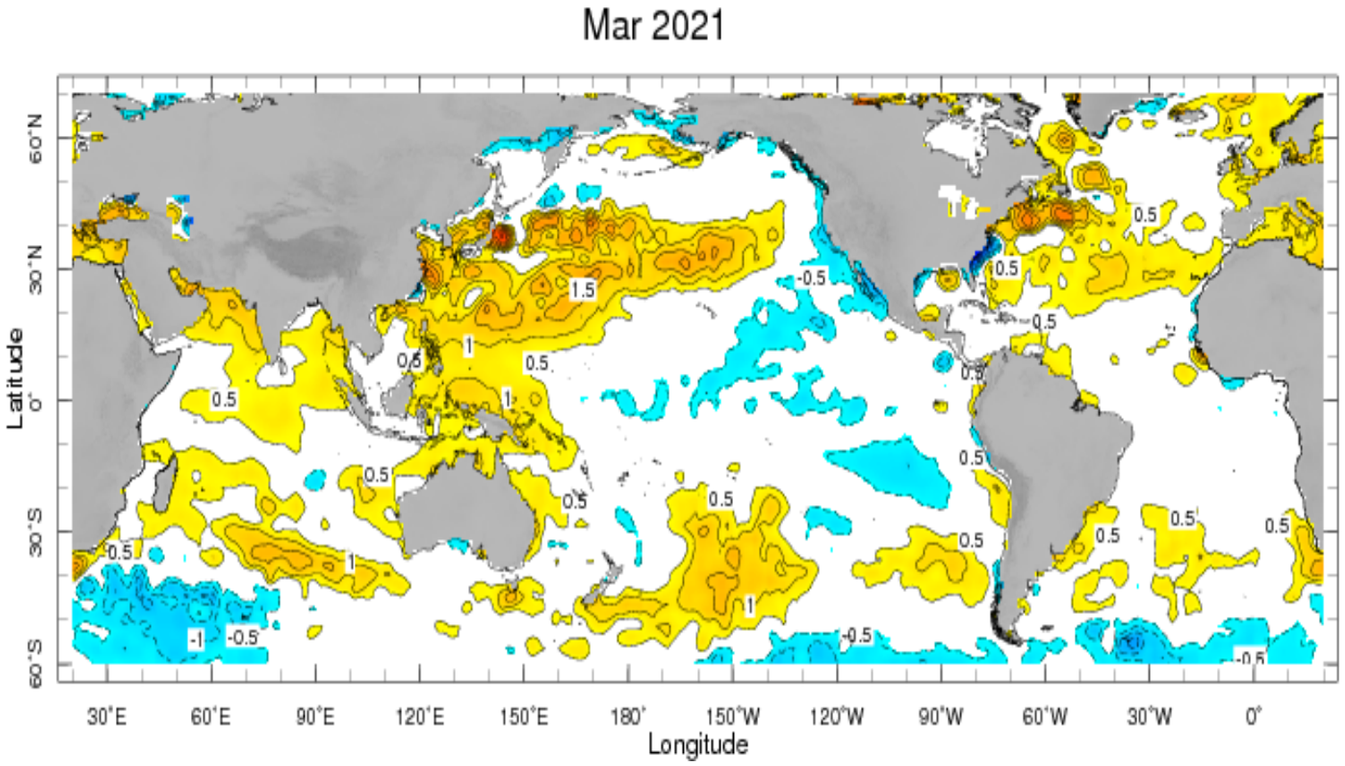


http://iridl.ldeo.columbia.edu/maproom/Global/Ocean_Temp/Weekly_Anomaly.html?

Figure 4 : This map displays monthly sea surface temperature anomalies for the globe

LAST MONTH SST OBSERVED

Not Ready



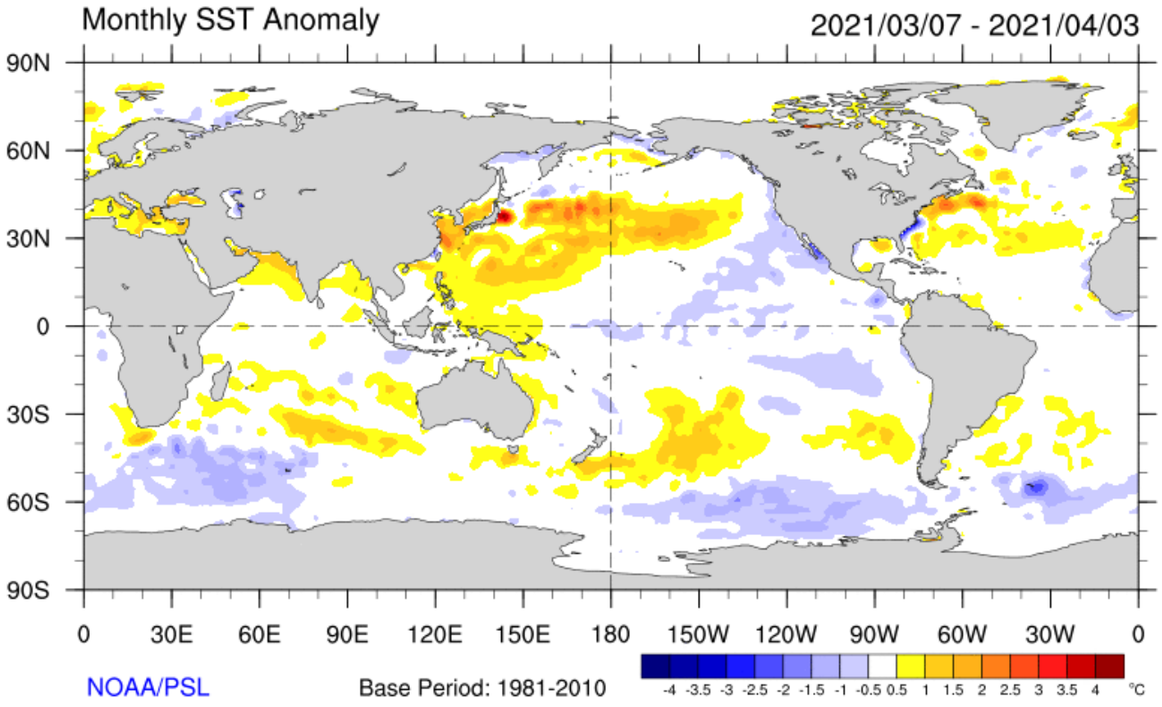


Figure 5 : This map displays monthly sea surface temperature anomalies for the globe.

During February 2021 and last 30 days, the cooling persisted over western Equatorial Pacific, Tropical South Atlantic, whilst the South-Western Indian Ocean started warming,. Source:

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

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

SST OBS AND FCST FOR TWO WEEK

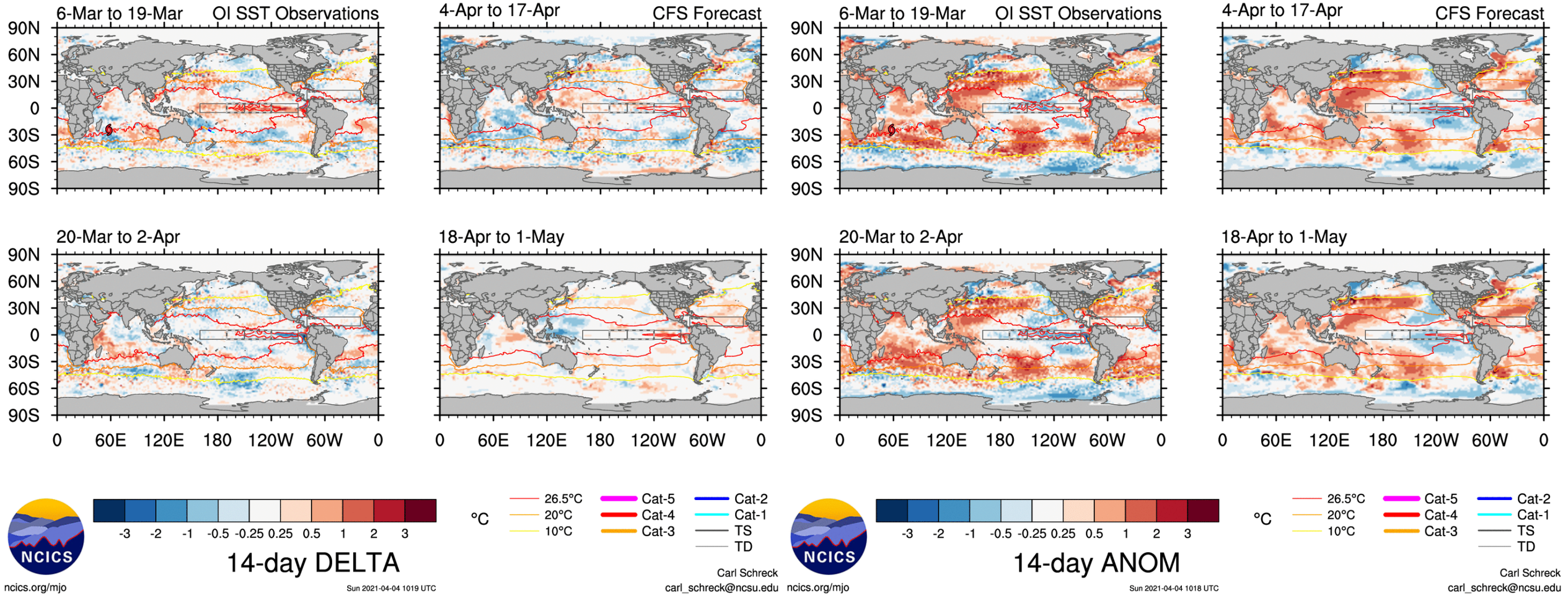


Figure 5: Sea Surface Temperature and FCST for two week

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

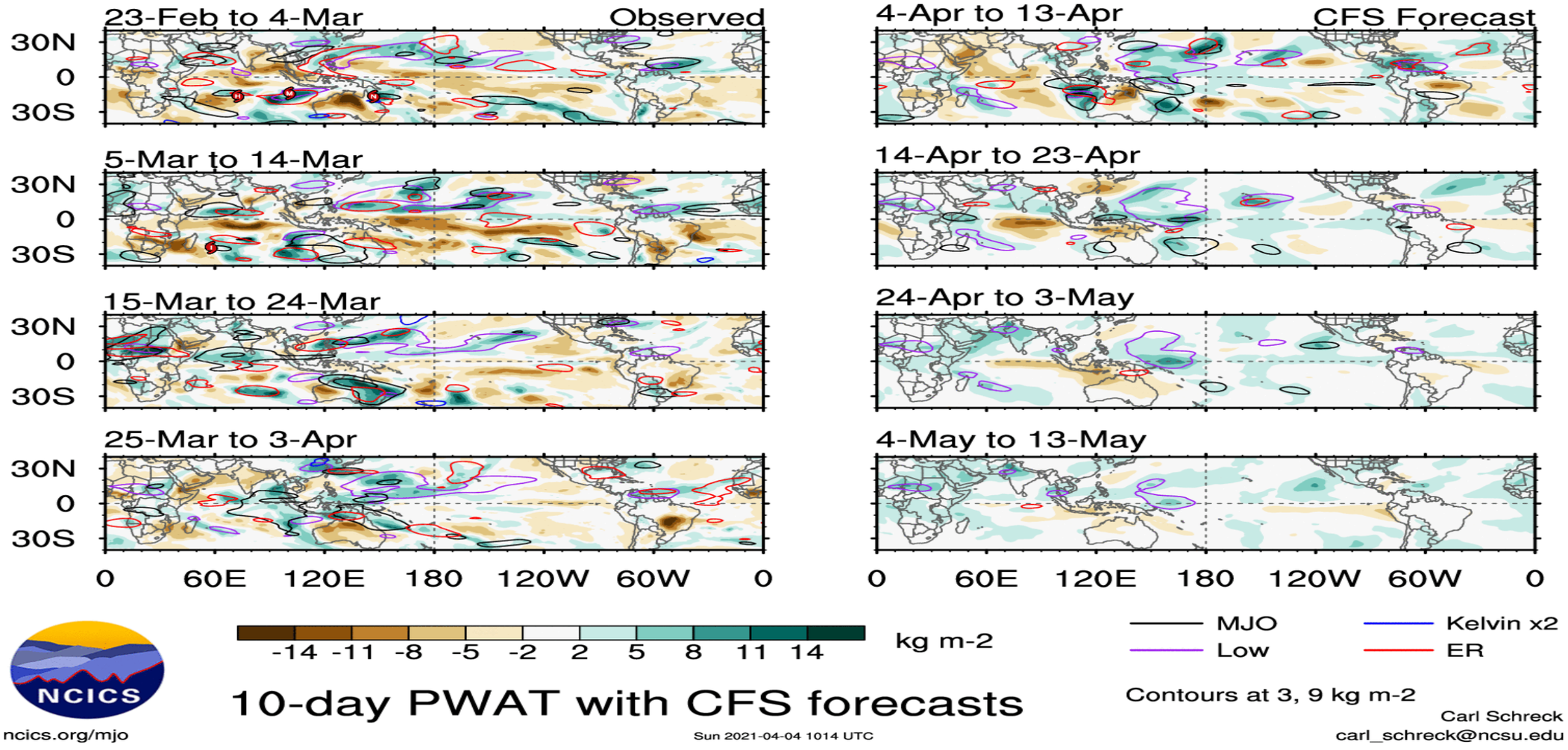


Figure 7: **past 4 week precipitable water and outlooks**

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

https://ncics.org/portfolio/monitor/mjo

PAST FOUR WEEK AND MONTH VELOCITY POTENTIAL WITH MJO, KELVIN AND ROSSBY WAVE OVERLAID ON GLOBAL MAPS 850 and 200

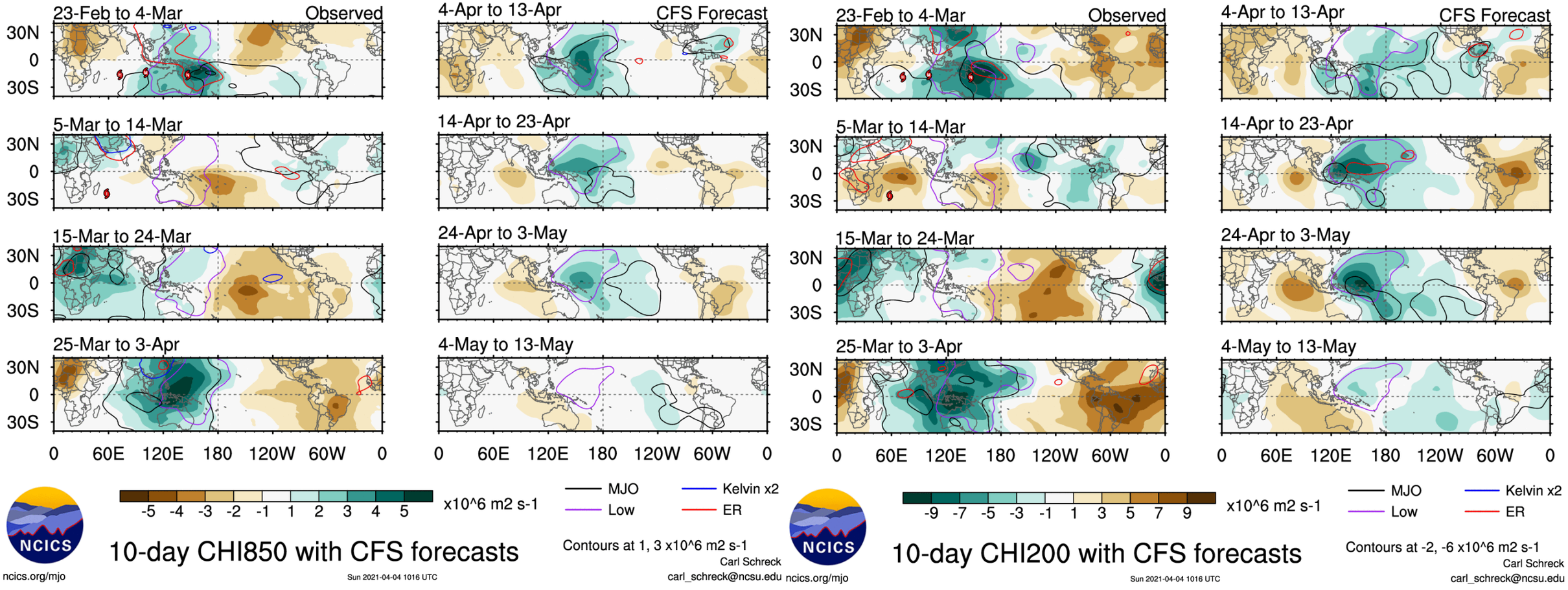
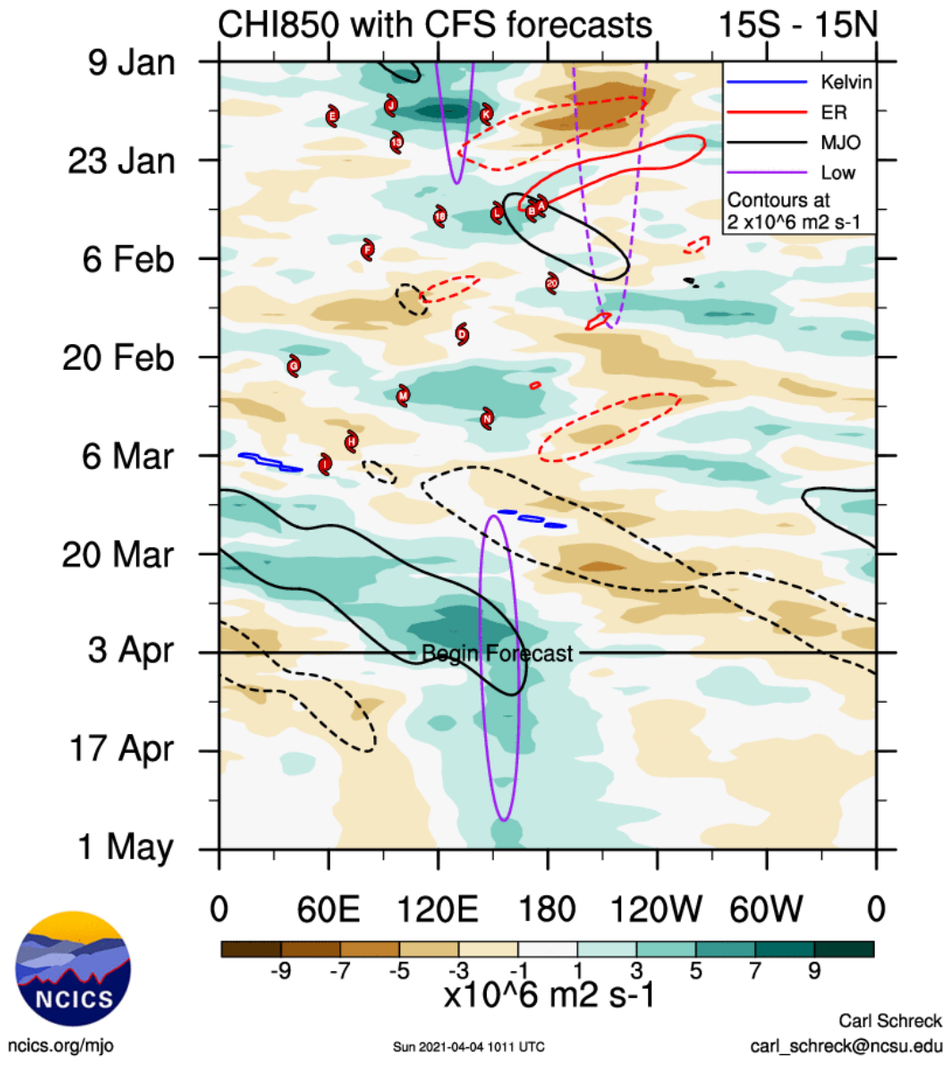


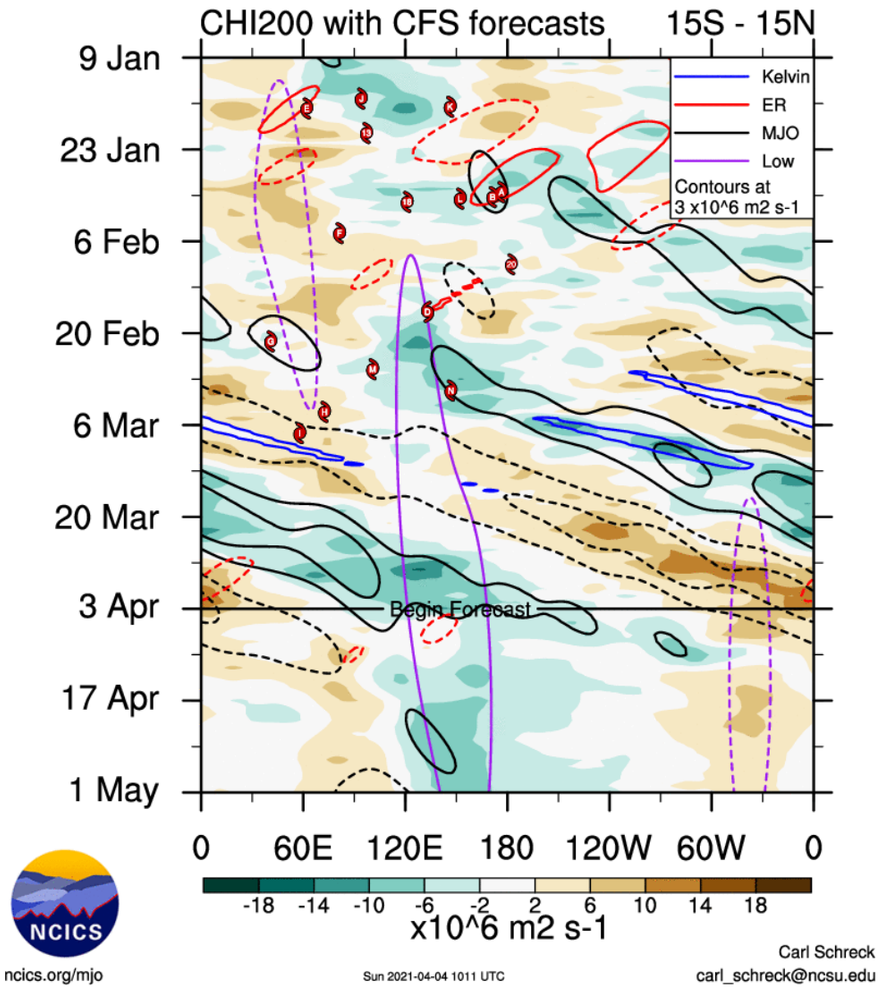
Figure 6a and b: past four week and month velocity potential

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

HOVMOLLER DIAGRAM OF VELOCITY POTENTIAL, ANOMALIES FOR 15N-15S WITH WAVES OVERLAY INCLUDING OUTLOOKS





https://ncics.org/pub/mjo/v2/hov/chi200.cfs.wide.png
https://ncics.org/pub/mjo/v2/hov/chi850.cfs.wide.png

Figure 8: anomalies for 15n-15s with waves overlay including outlooks

HOVMOLLER DIAGRAM OF VELOCITY POTENTIAL, ANOMALIES FOR 5N-5S WITH WAVES OVERLAY INCLUDING OUTLOOKS

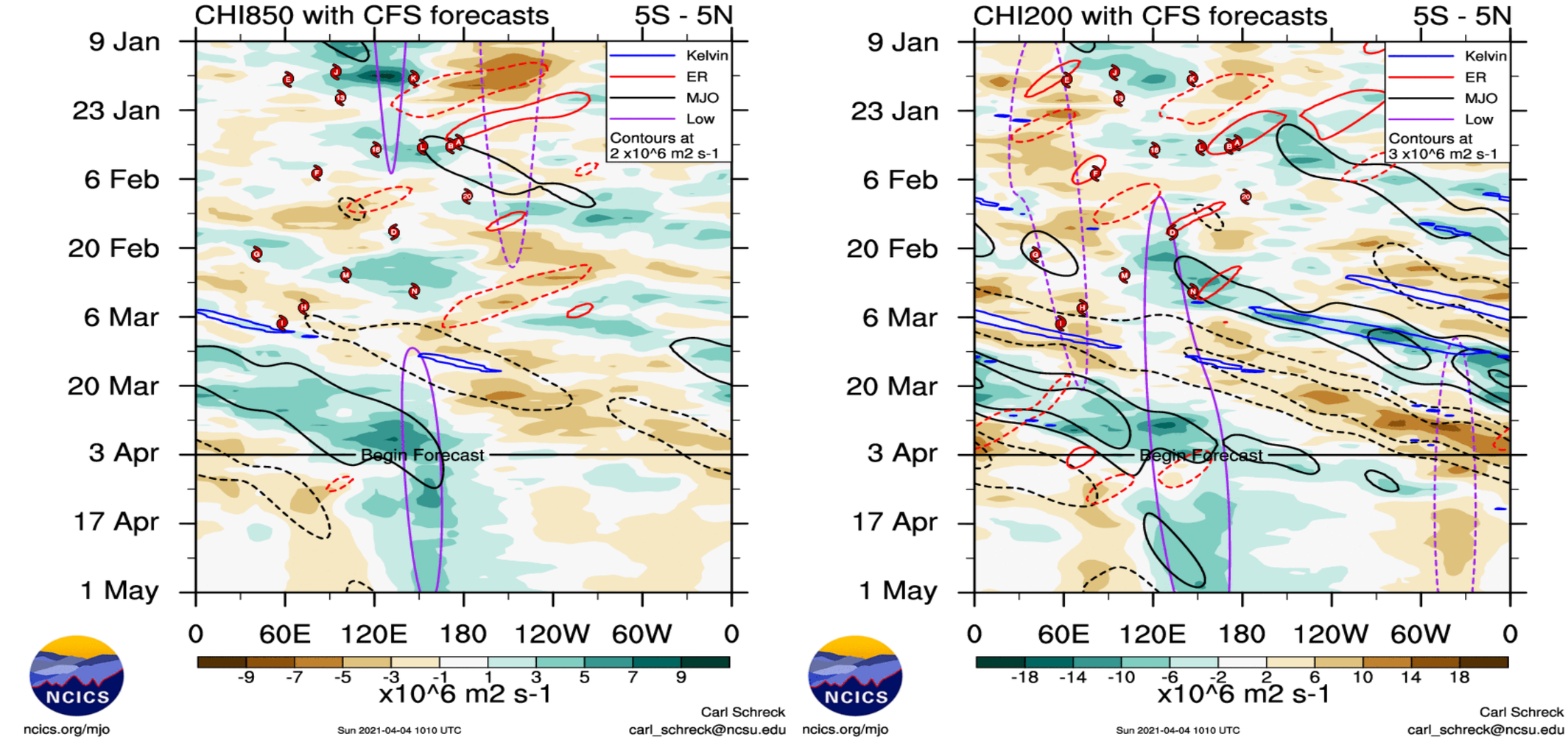
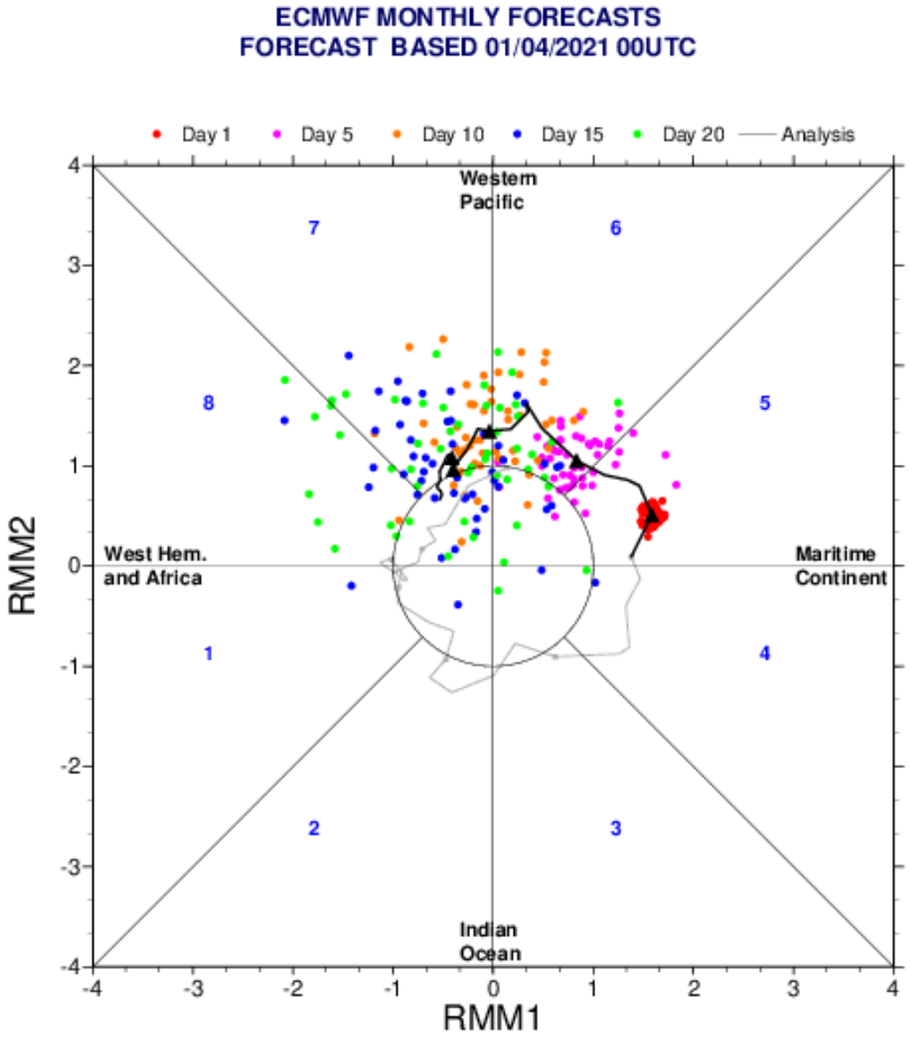


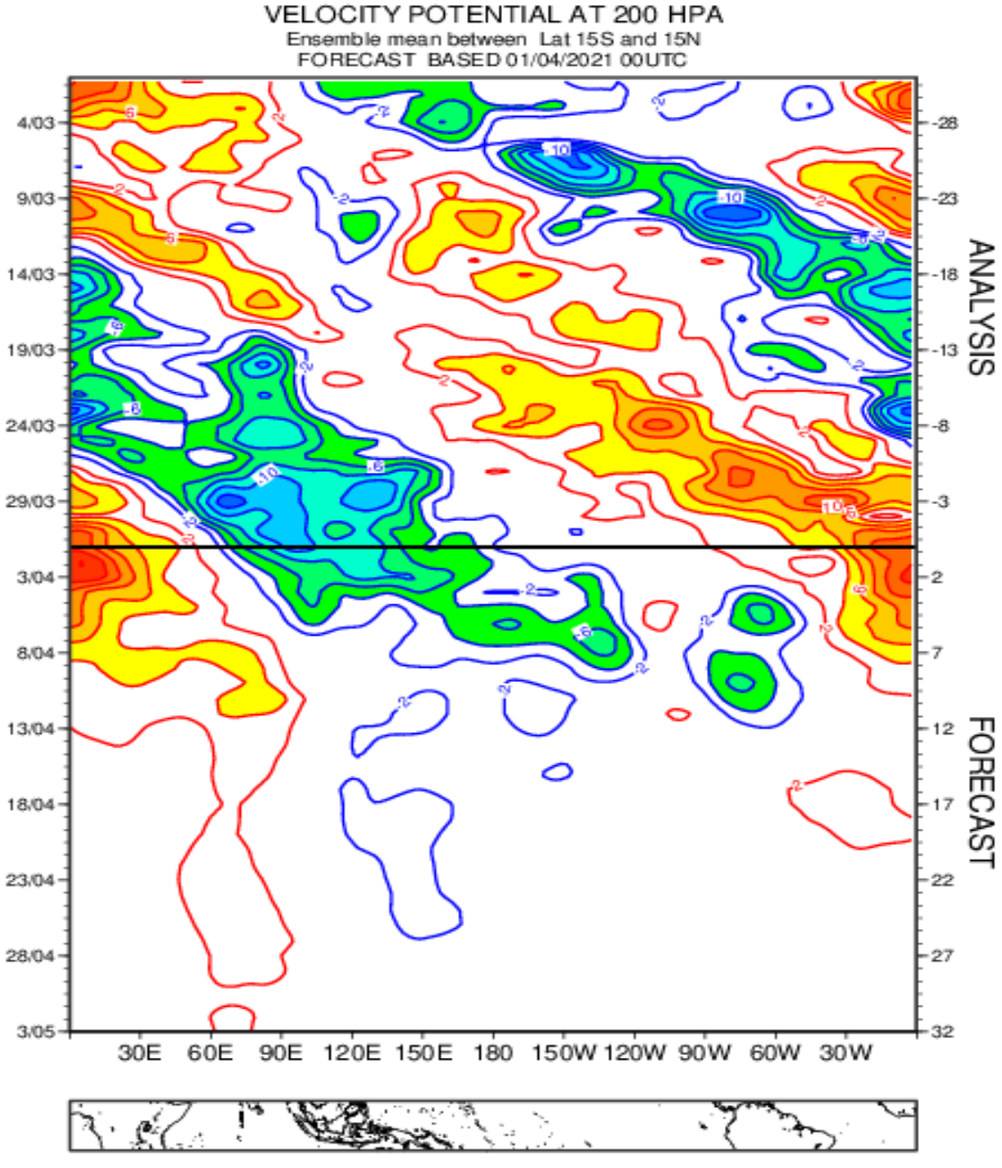
Figure 9: anomalies for 15n-15s with waves overlay including outlooks

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

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

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

PAST 4 WEEKS VELOCITY POTENTIAL AND MONTH STREAM FUNCTION ANOMALIES WITH MJO, KELVIN AND ROSSBY WAVE OVERLAID ON GLOBAL MAPS 850 hPa

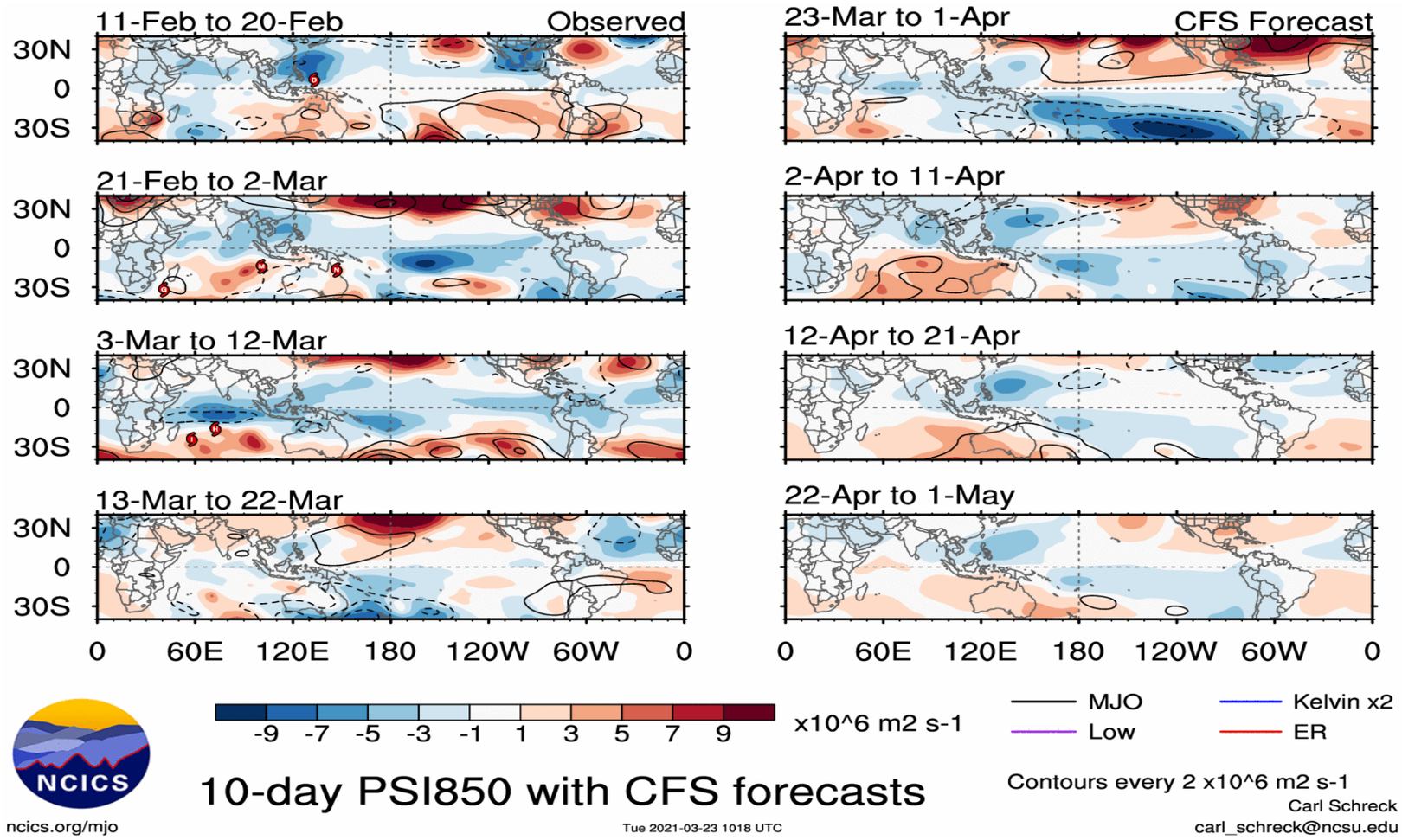


Figure 12: PAST 4 WEEKS VELOCITY POTENTIAL

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

IR IMAGE AND VELOCITY POTENTIAL ANOMALY

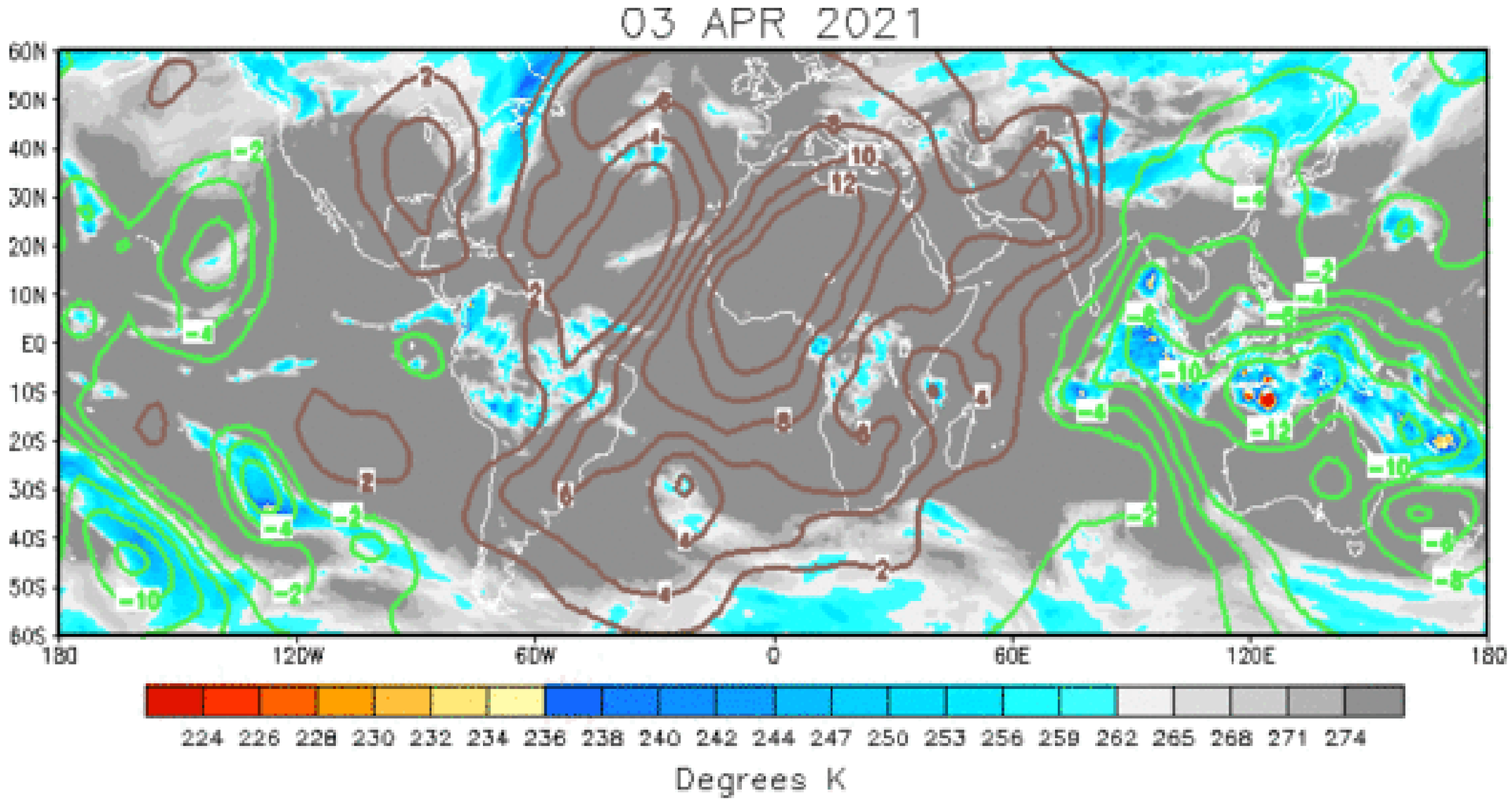


Figure 18: IR image and velocity potential anomaly

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

PAST 3 WEEKS OLR ANOMALIES

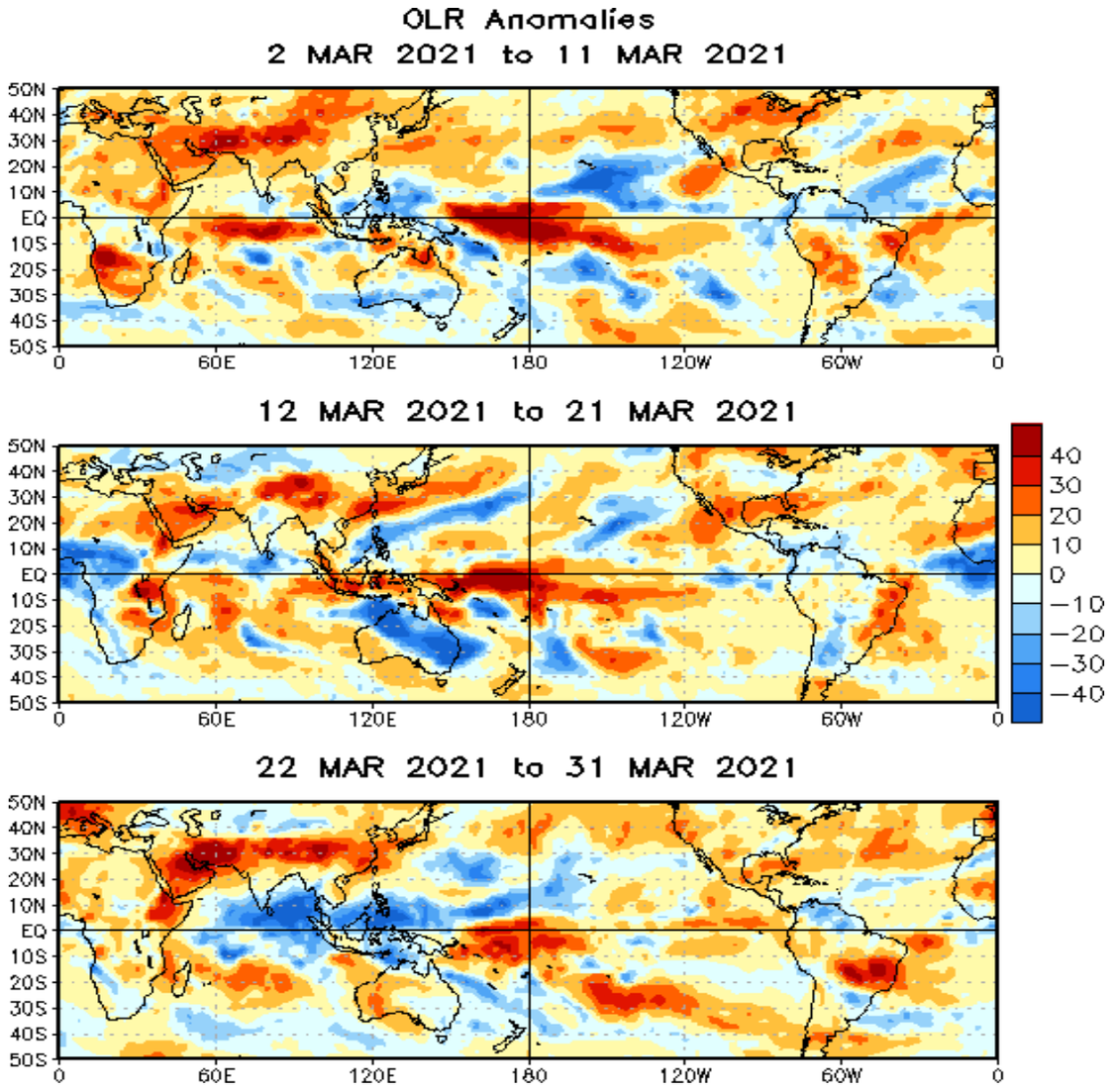


Figure 11: PAST 3 WEEKS OLR ANOMALIES

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

MEAN SEA LEVEL PRESSURE OF THE 3RD DEKAD OF MARCH 2021 COMPARED WITH THE ANOMALIES (THE AVERAGE 1971-2000)

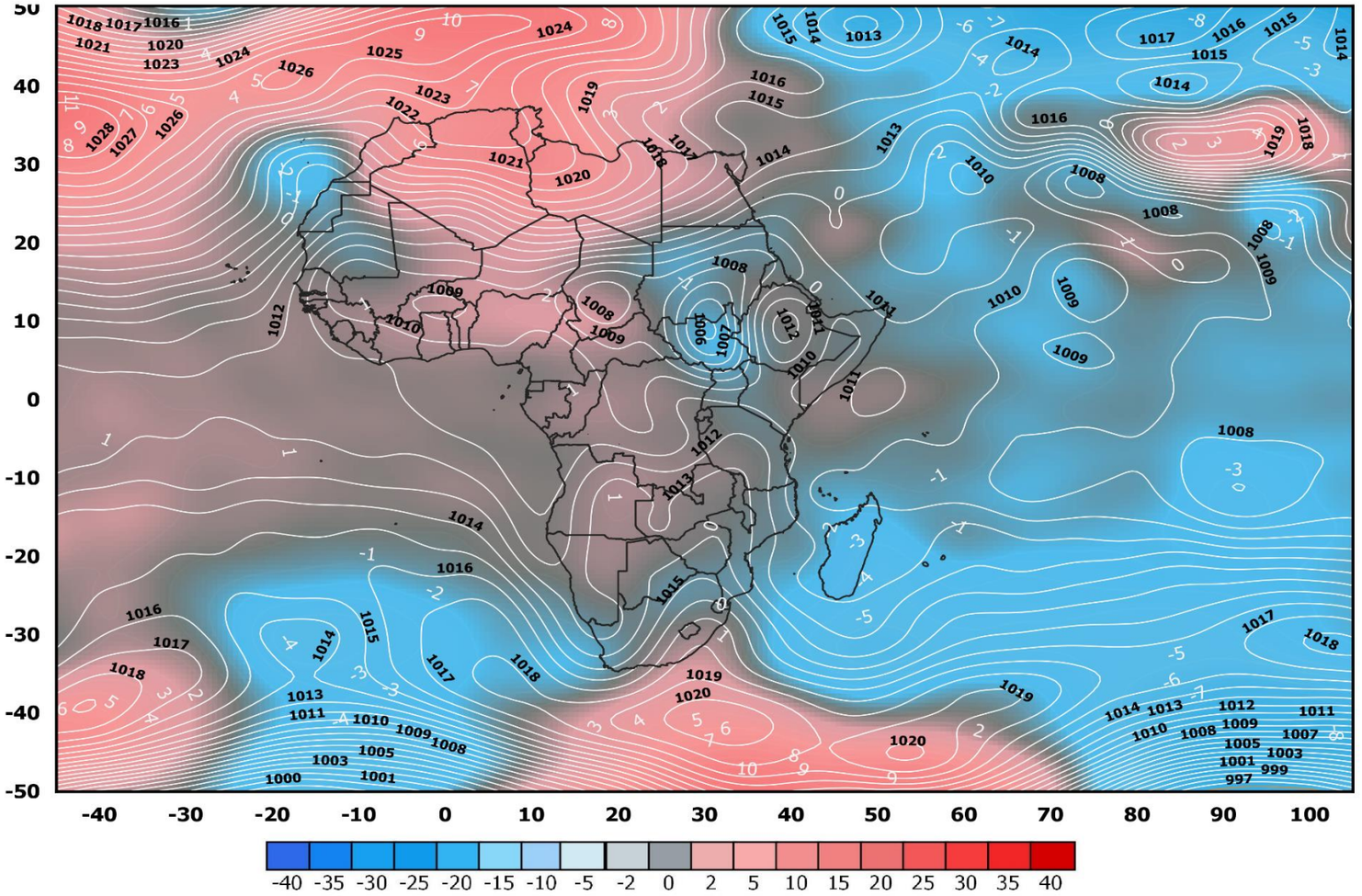
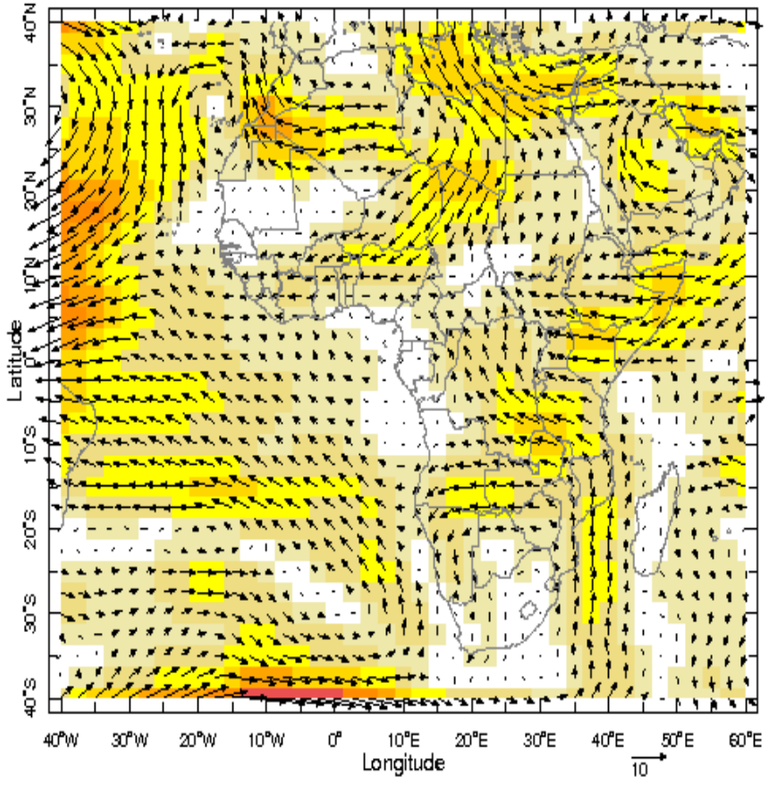


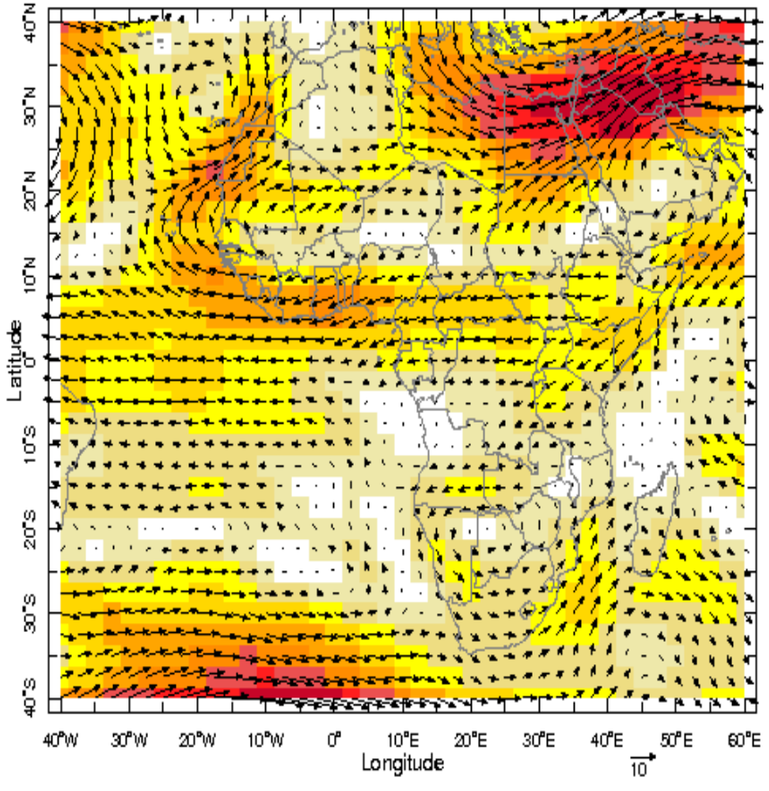
Figure 13: MSLP obs-anom and MSLP-climatology

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

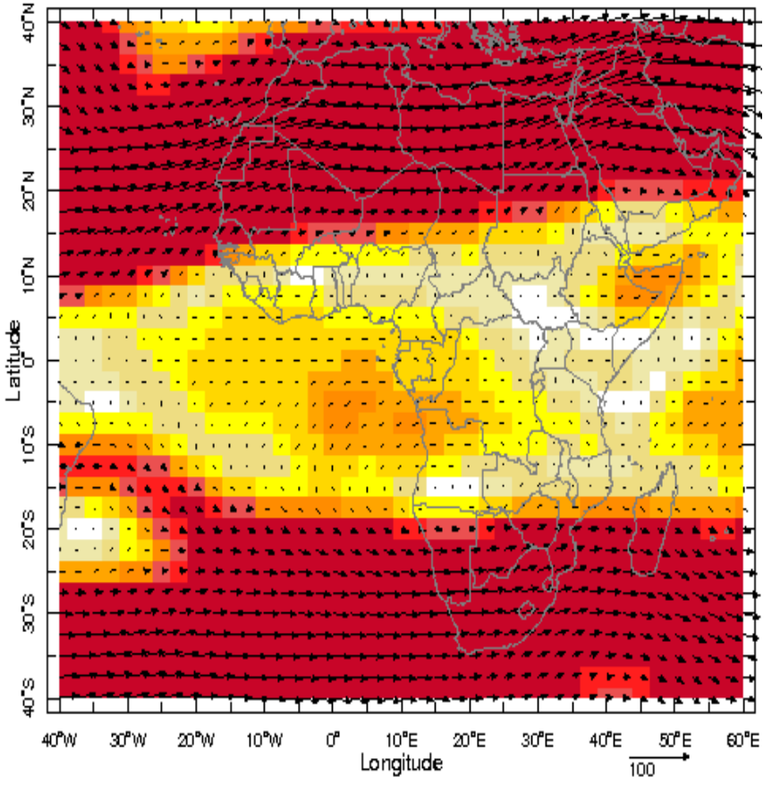
WIND ANOMALIES FOR THE RECENT 10 DAY PERIOD 850 AND 700 hPa



Pressure 850.0 mb Time 21-31 Mar 2021



Pressure 700.0 mb Time 21-31 Mar 2021



Pressure 200.0 mb Time 21-31 Mar 2021

Figure 15: Wind anomalies for 850 and 700hPa

RELATIVE HUMIDITY ANOMALIES at 850 and 700 hPa for the 3rd DEKAD of March, 2021

RH Anomaly at 850 hPa during 3rd dek of March 2021

RH Anomaly at 700 hPa during 3rd dek of March 2021

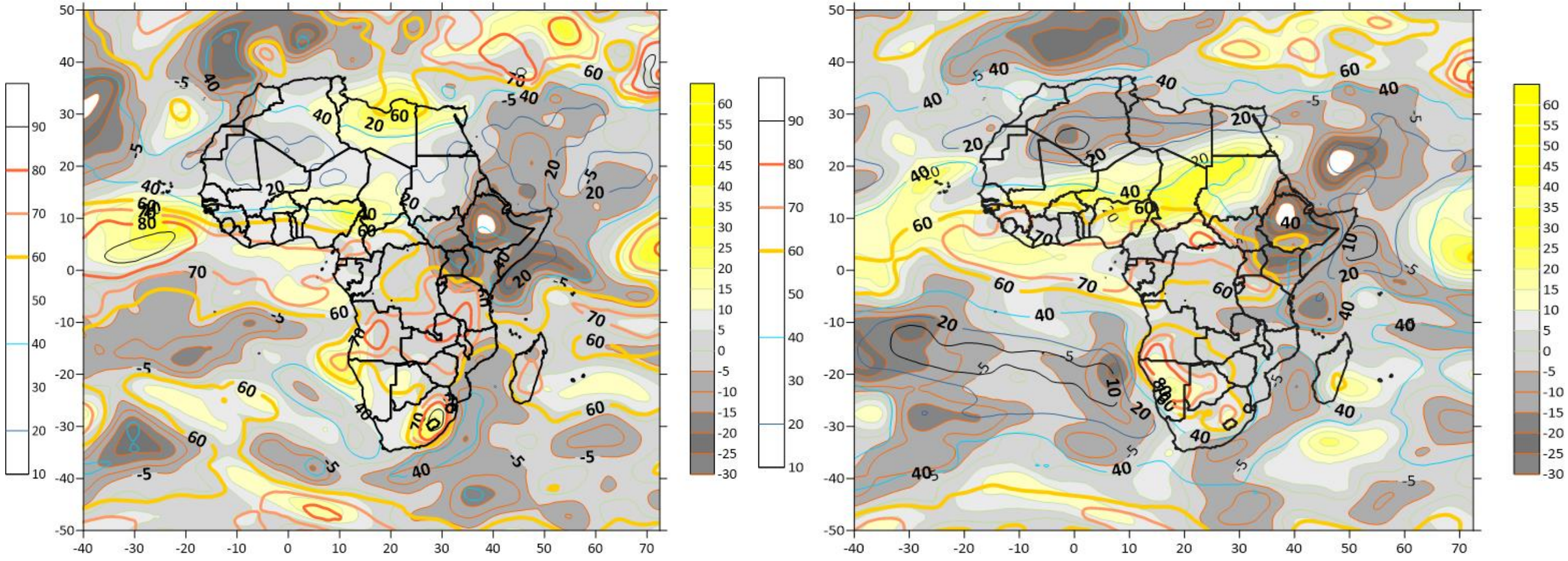
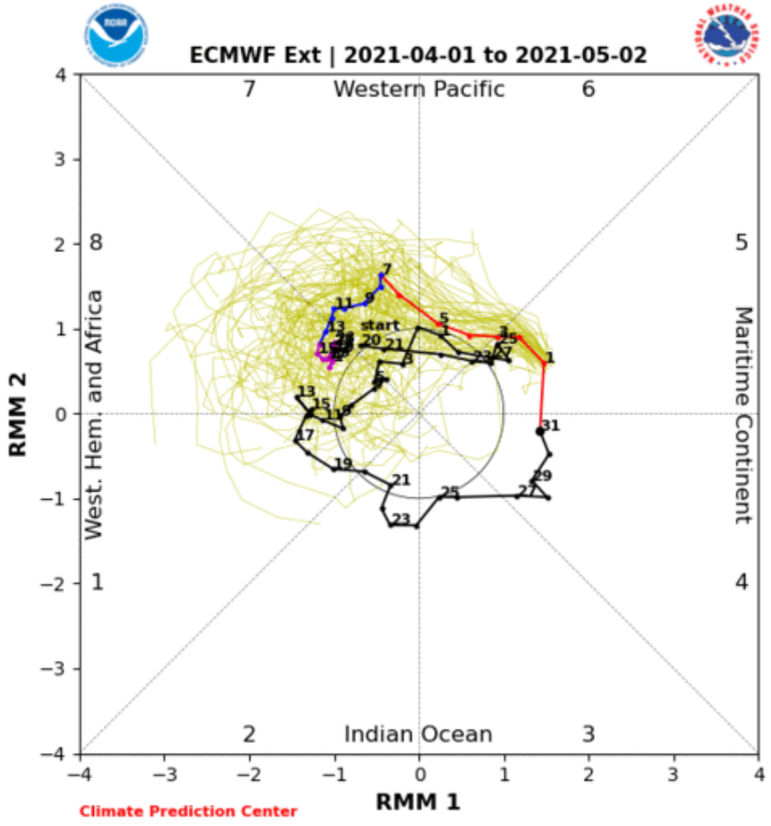


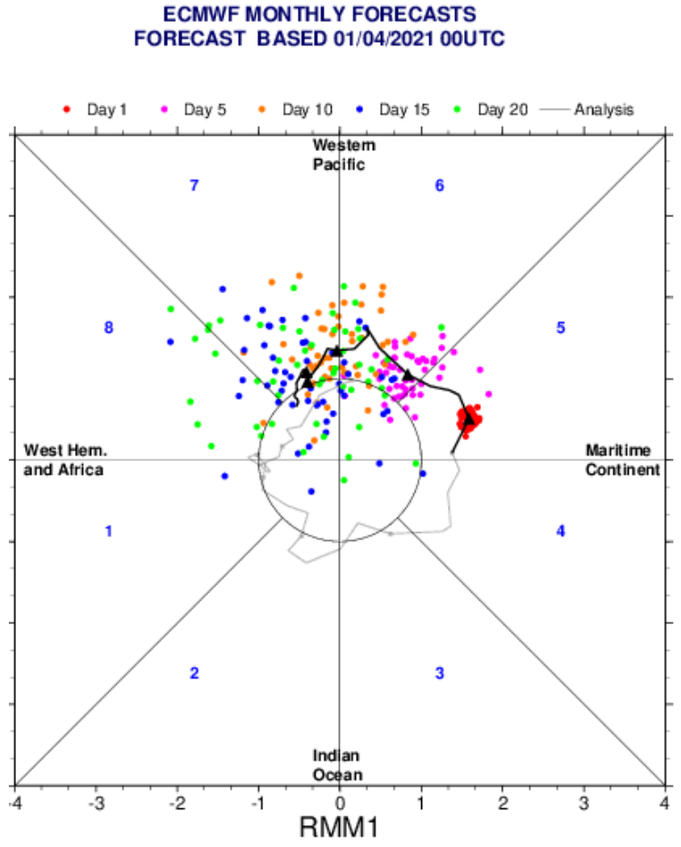
Figure 17 : Relative Anomaly at 850 hPa (left) 700 hPa (right)

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

WEEKLY FORECAST

MJO MONITORING AND FORECASTS FRO ECWF, NCEP, UK MET OFFICE …
FROM MJO WORKING GROUP WEBSITE





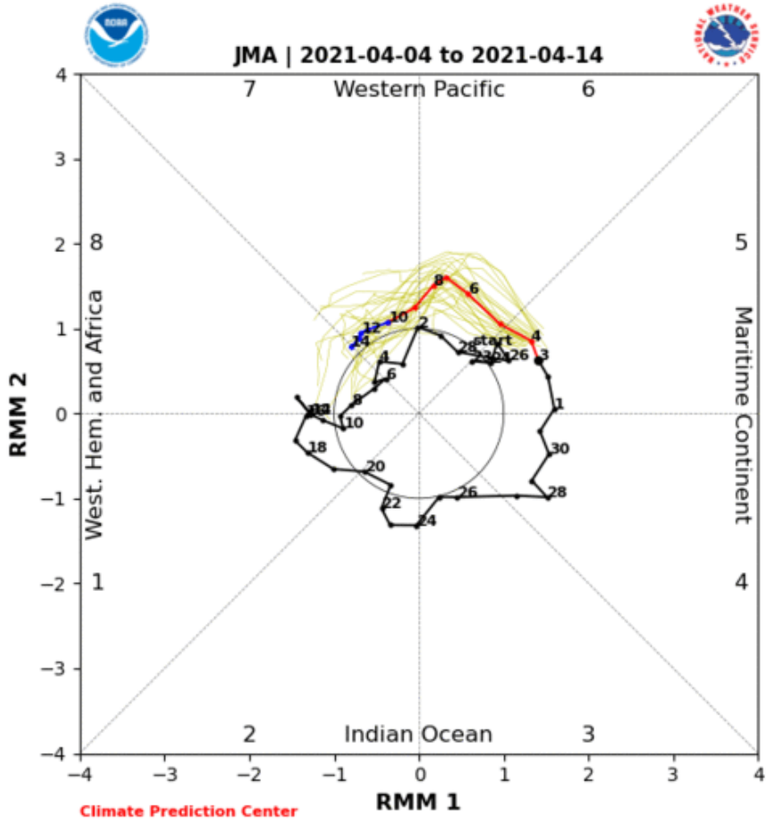


Figure 19:FORECASTS FRO ECWF, NCEP, UK MET OFFICE

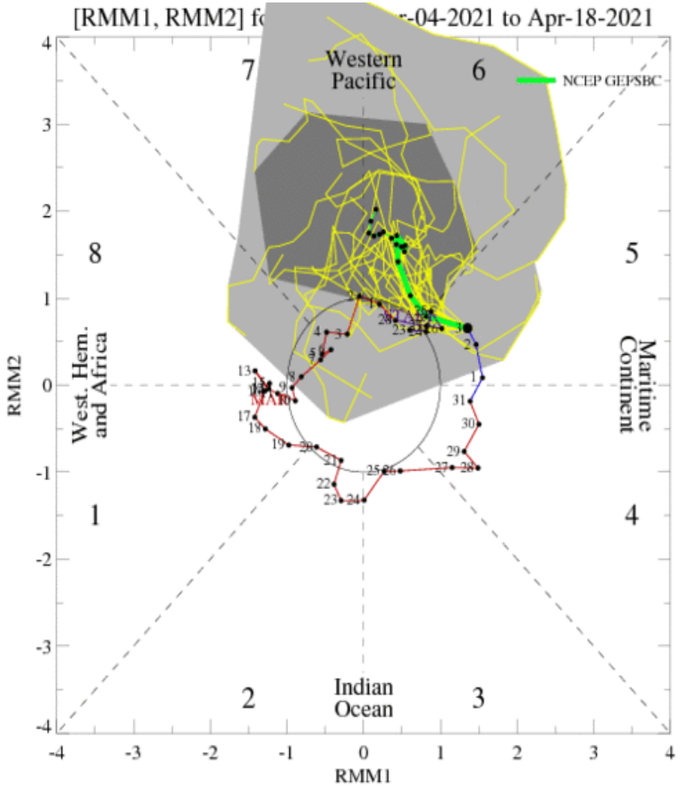
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/emon.shtml

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

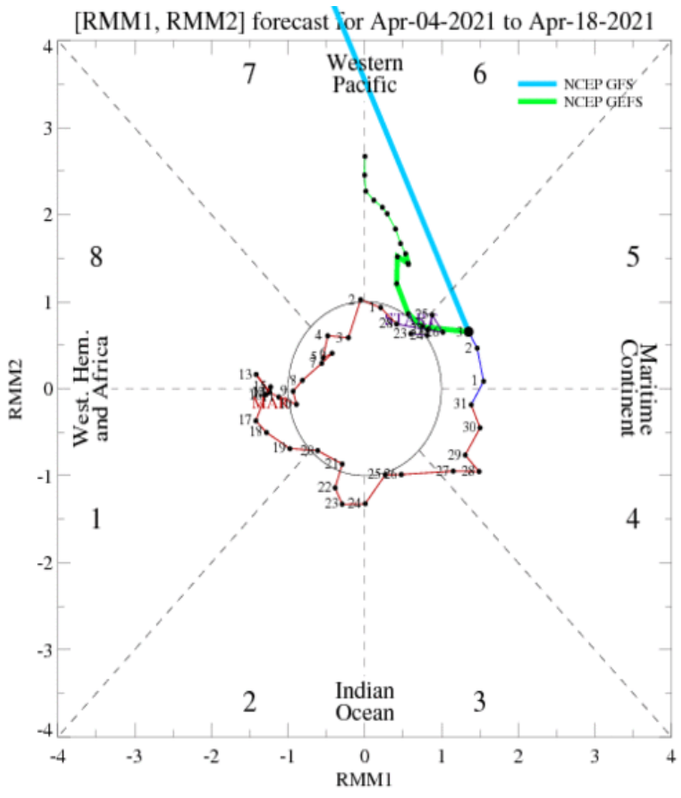
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/jman.shtml

MJO FORECAST

Ensemble GFS Phase Diagram



Operational GFS Phase Diagram



Statistical GFS Phase Diagram

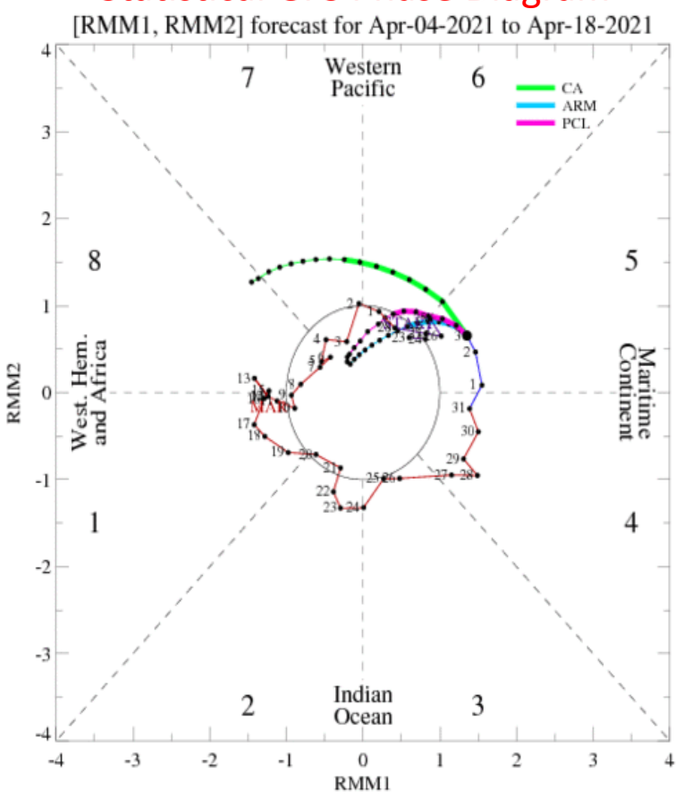


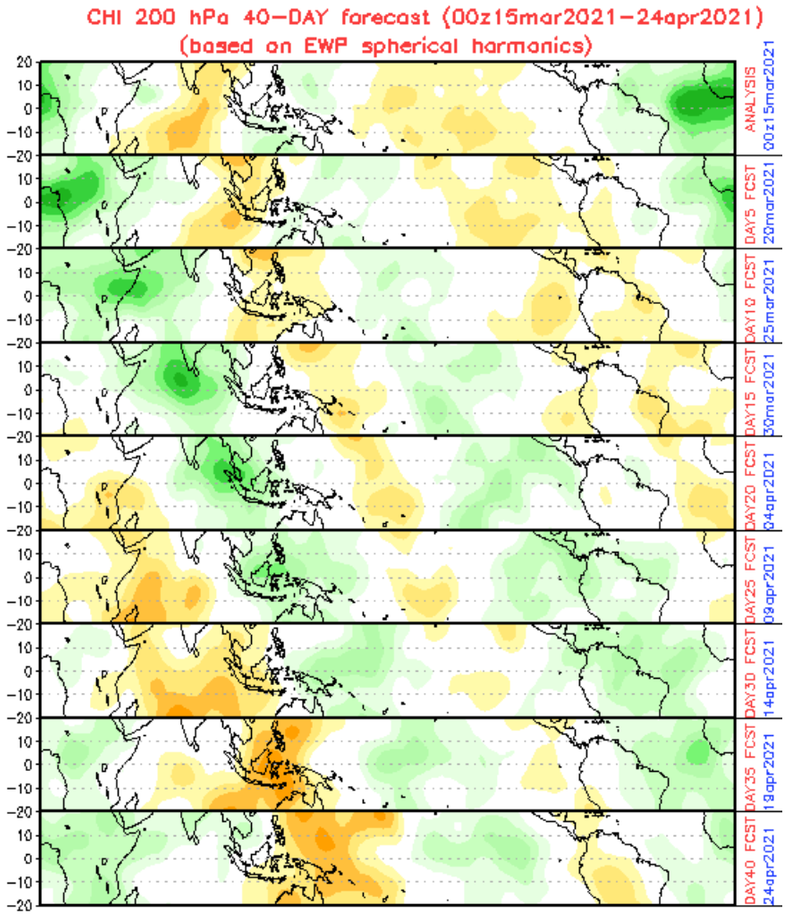
Figure 20: Mjo forecast

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

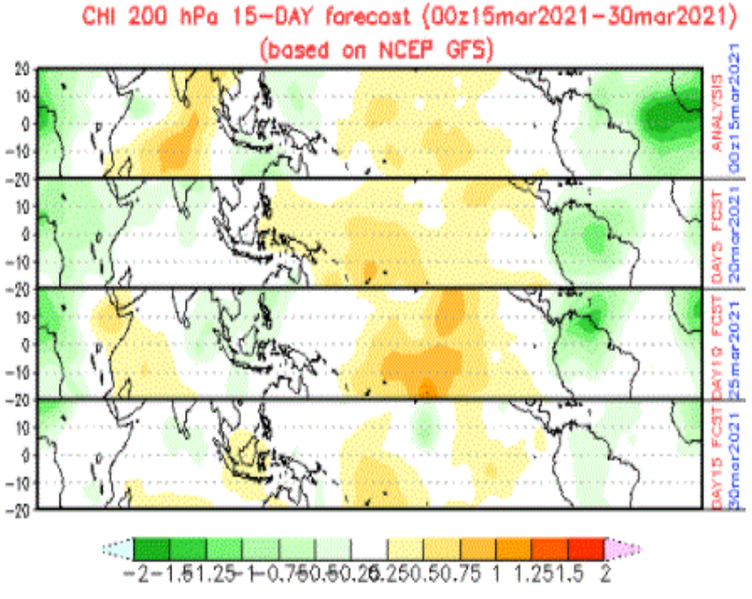
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/foroper.shtml

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

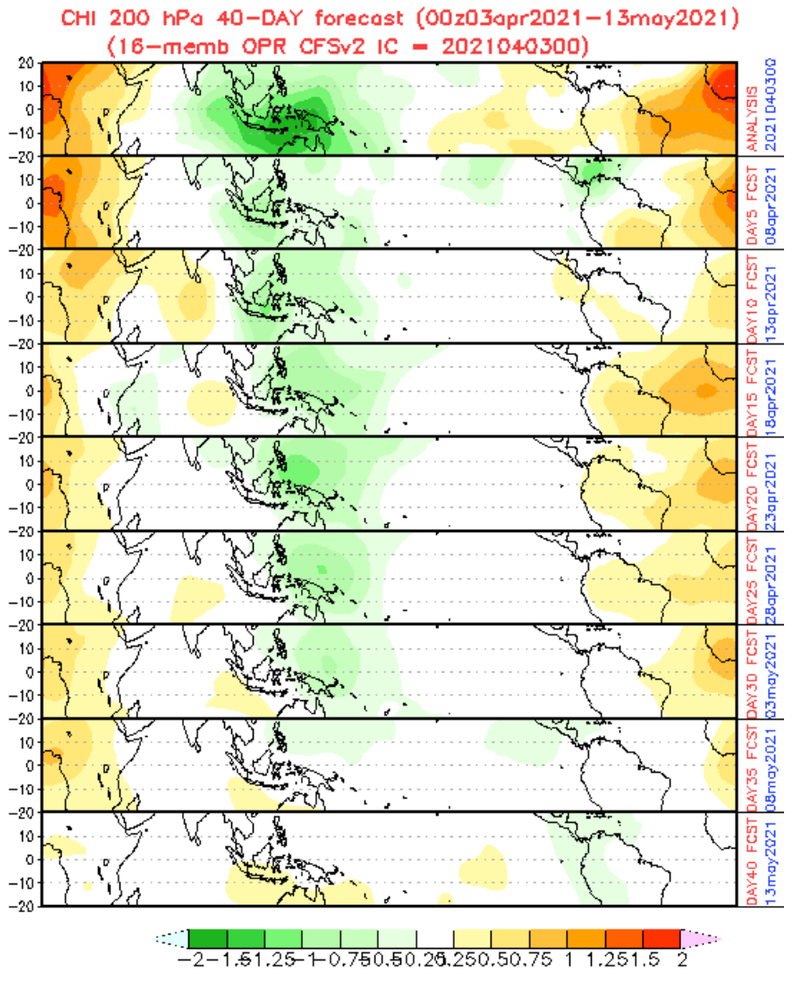
MJO FORECAST



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

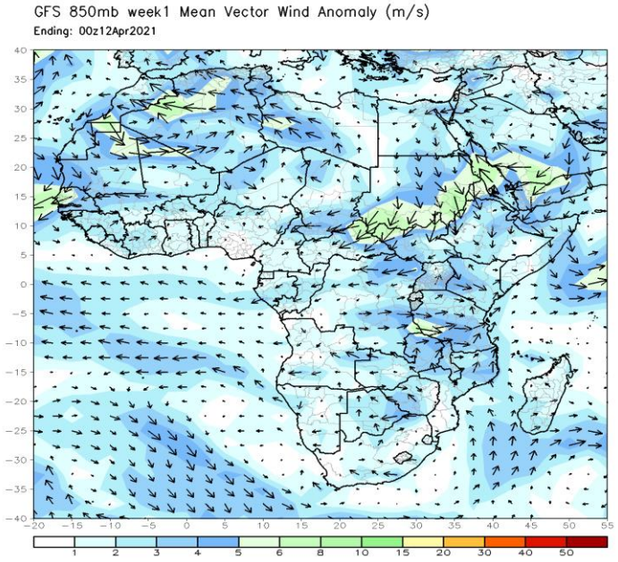


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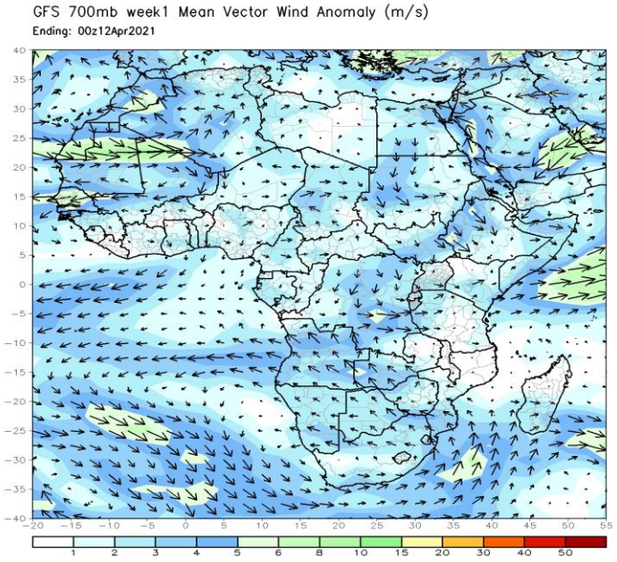


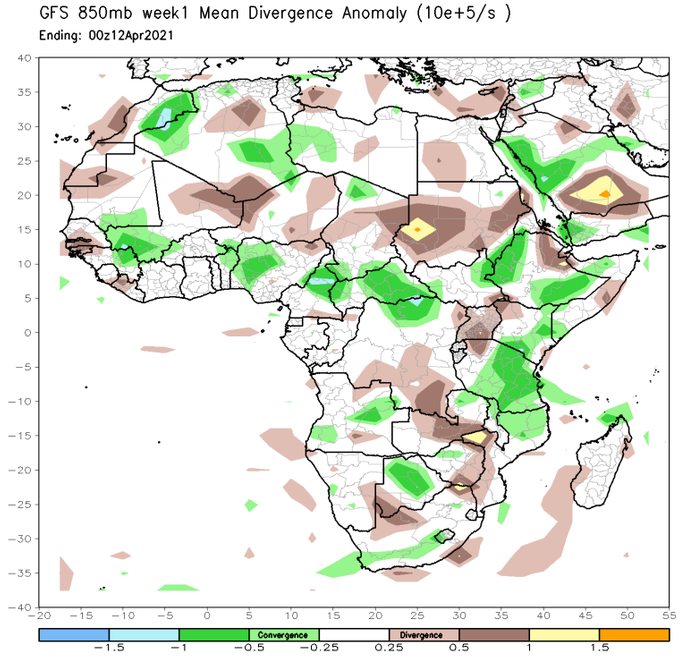
https://www.cpc.ncep.noaa.gov/products/people/wd52qz/mjo/chi/cfs.gif

Figure 21: Mjo forecast



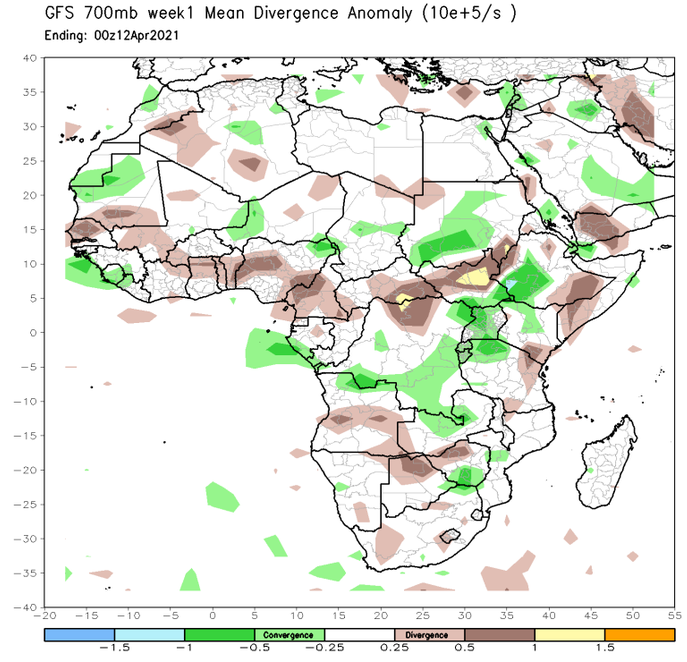
WEEK 1 WIND ANOMALY AND DIVERGENCE FORECAST FROM GFS: Forecast ends - 12Apr 2021

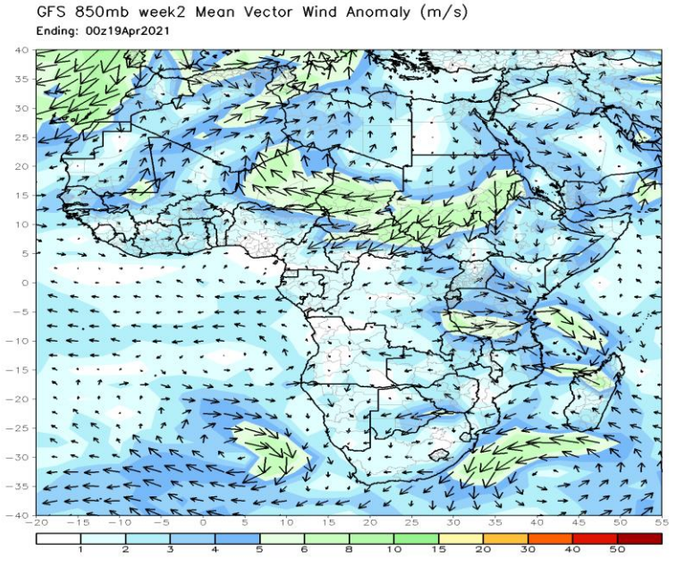


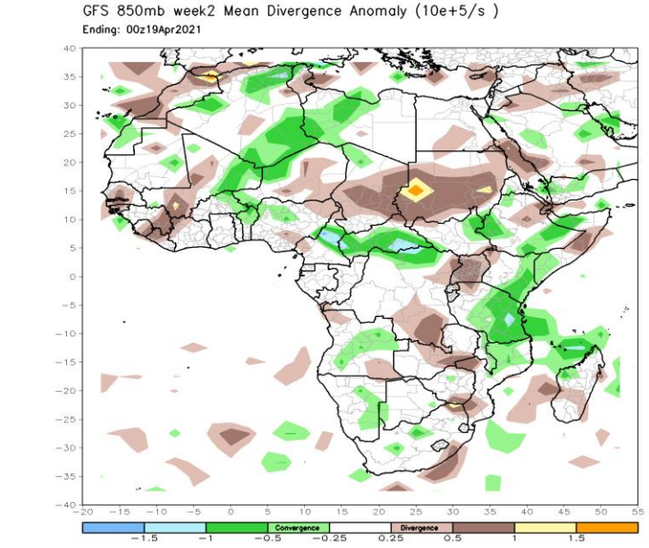


https://www.cpc.ncep.noaa.gov/products/international/africa/africa.shtml

Figure 22 : Forecast from GFS

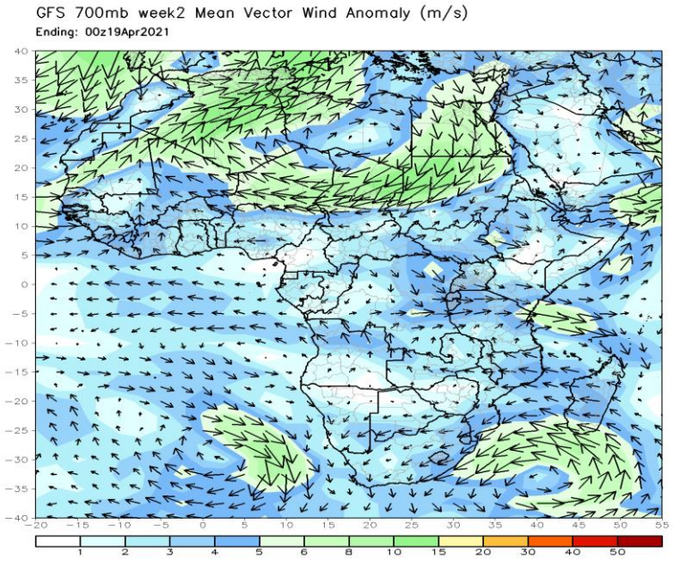






WIND ANOMALY AND DIVERGENCE FORECAST FROM GFS WEEK2: 10-16 Mar 2021

For the forecast of the divergent wind, for the first week at the 850 the wind is converging over the whole area of Africa as well as the 700



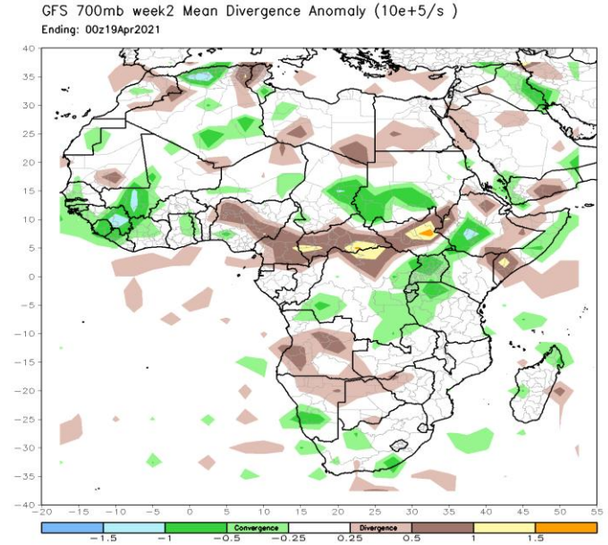
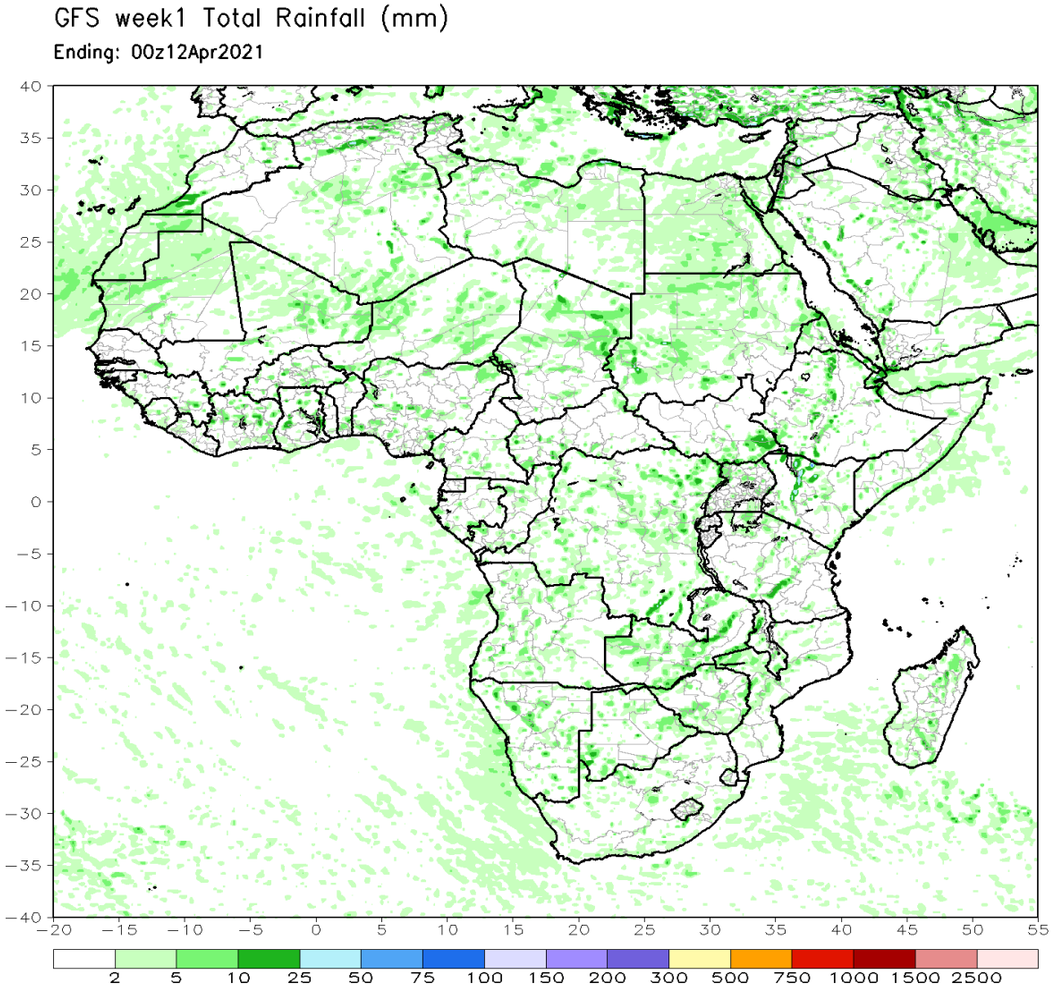


Figure 23 : Gfs divergence forecast,

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

GFS WIND ANOMALY AND DIVERGENCE FORECAST Week1: 5 – 12 Apr, 2021



The map predicts low precipitation of 20mm or less over all of Africa .

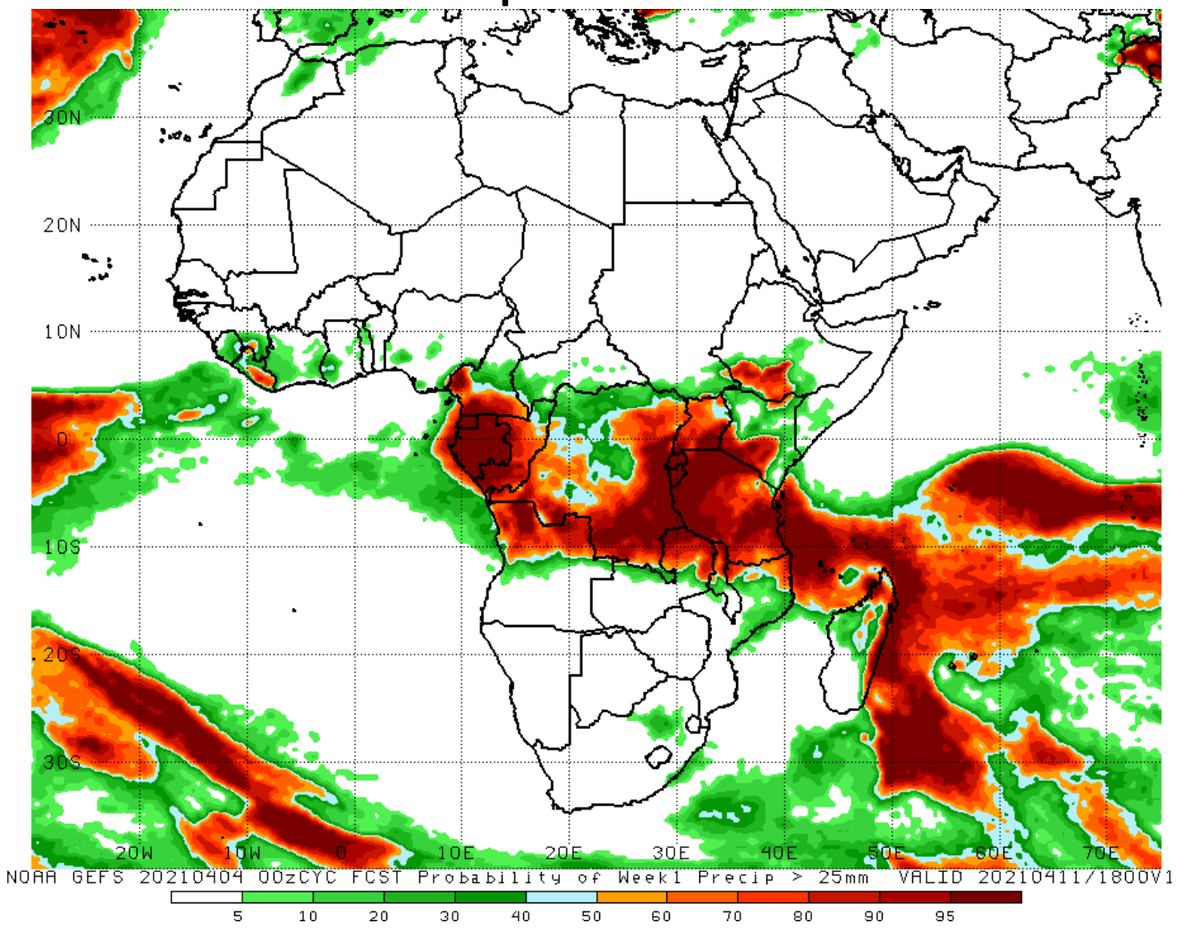
Figure 24 : Gfs total precipitation forecast week1

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

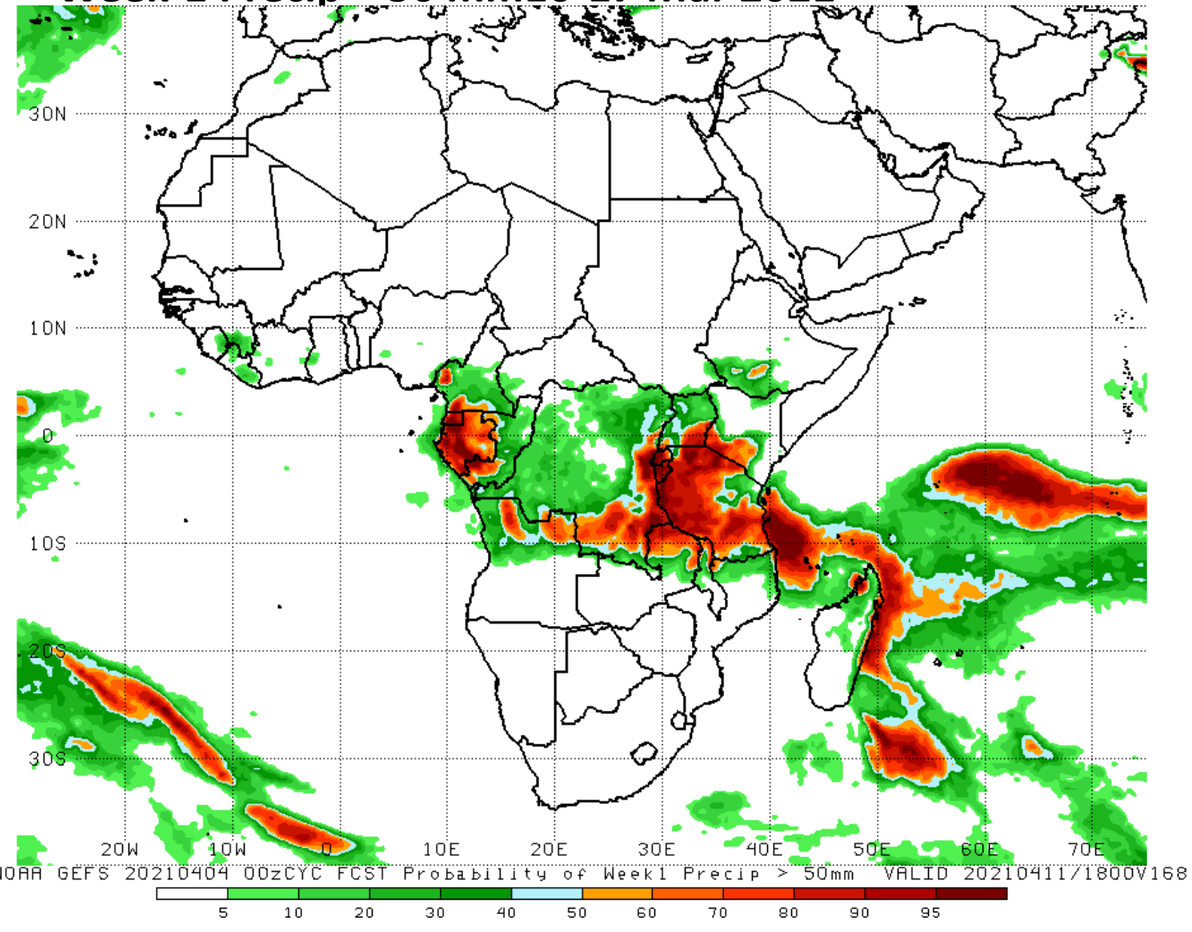
https://www.cpc.ncep.noaa.gov/products/international/gfs/gfs_week2_af_precip_obs.gif

Probability of week-1 precip > 25 and 50mm

Week-1 Precip > 25 mm10-17 Mar 2021



Week-1 Precip > 50 mm10-17 Mar 2021

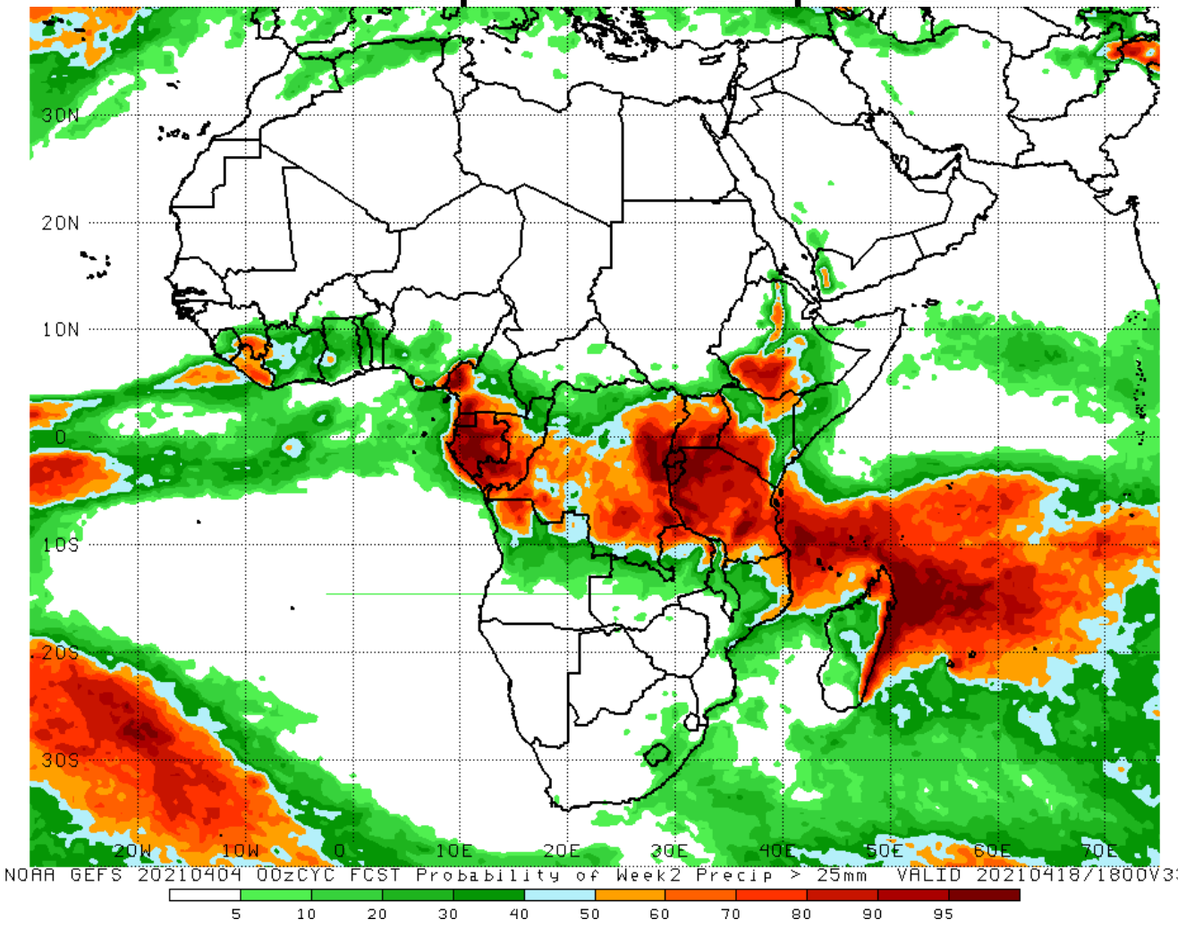


https://www.cpc.ncep.noaa.gov/products/international/cpci/data/18/fcsts_africa.shtml

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 Precip > 25mm 5-11 Apr 2021



Week-2 Precip > 50mm 12-18 Apr 2021

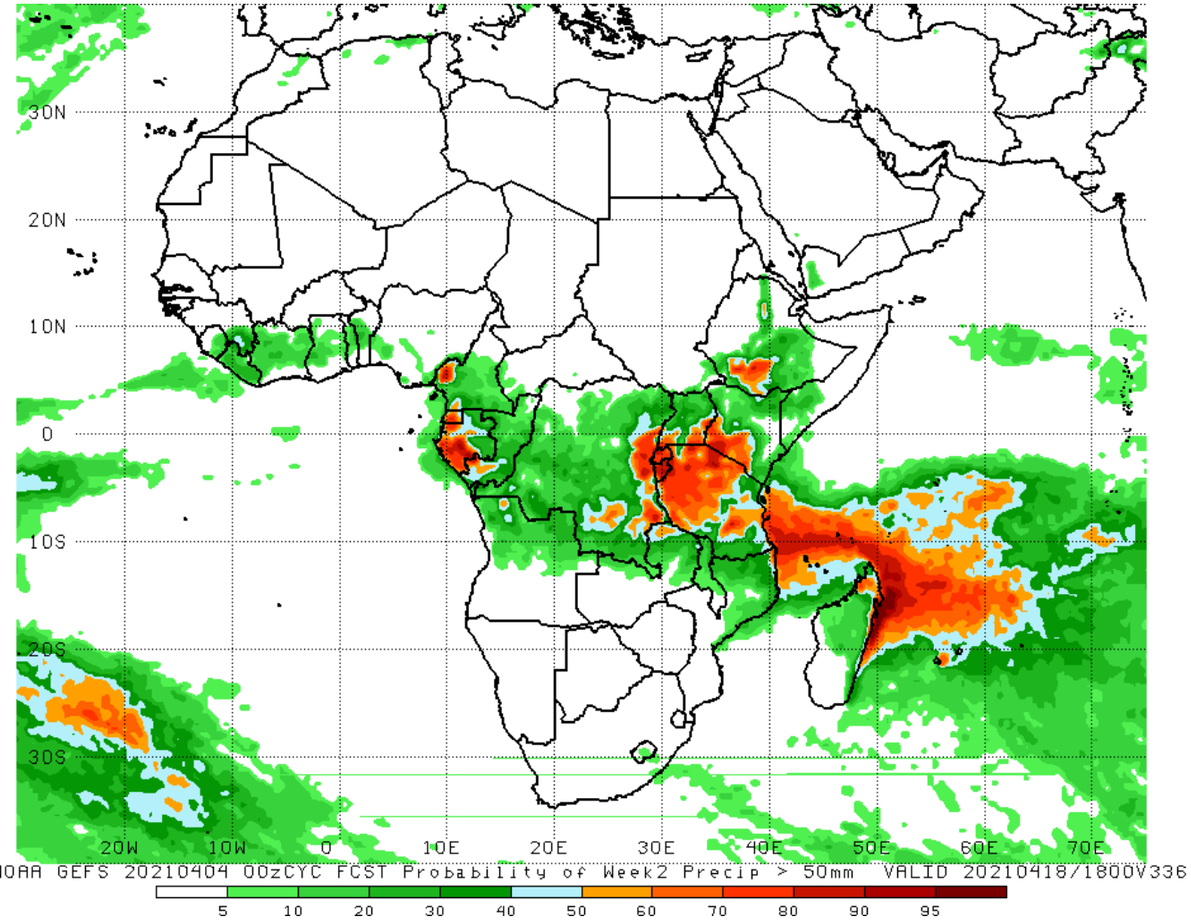
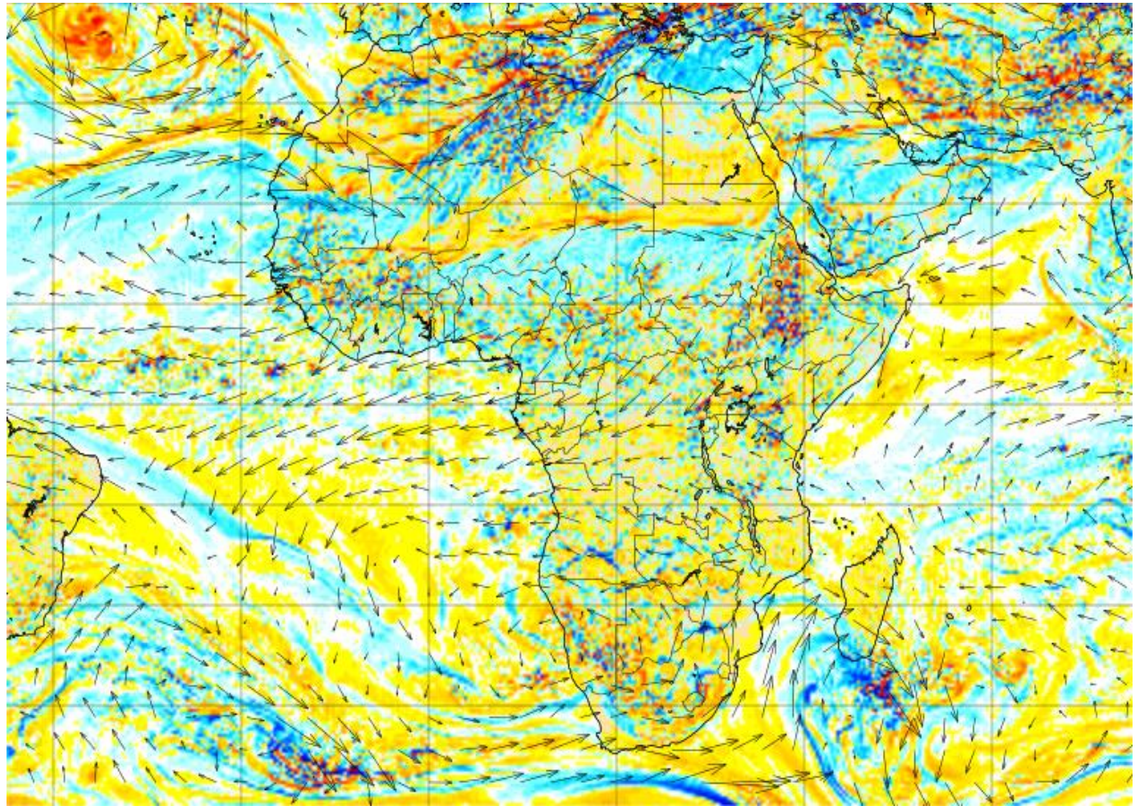


Fig: Week2 Precipitation Total Exceedance Probabilities

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/18/fcsts_africa.shtml

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

WEEK 1 (5-11 Apr 2021) AT 700 hPa RELATIVE VORTICITY AND DIVERGENCE WIND FORECAST FROM CFS ECMWF



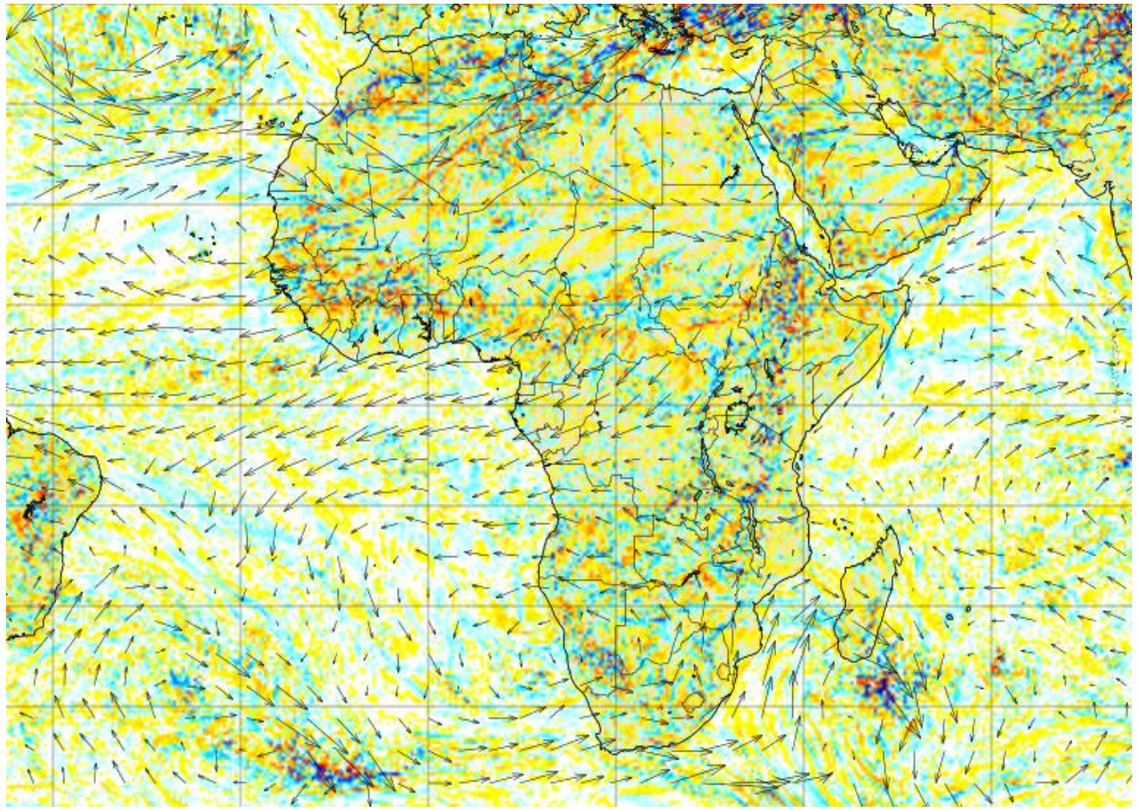


Figure 25: Relative vorticity forecast from cfs ECMWF,

Black wind arrows

Wind

Divergence



Relative vorticity

For the forecast we see that there is an intense forecast in Kenya, Tanzania, Namibia, and South Arica

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

MONTHLY FORECAST FROM WMO LEAD CENTRE MULTI-MODEL ENSEMBLE

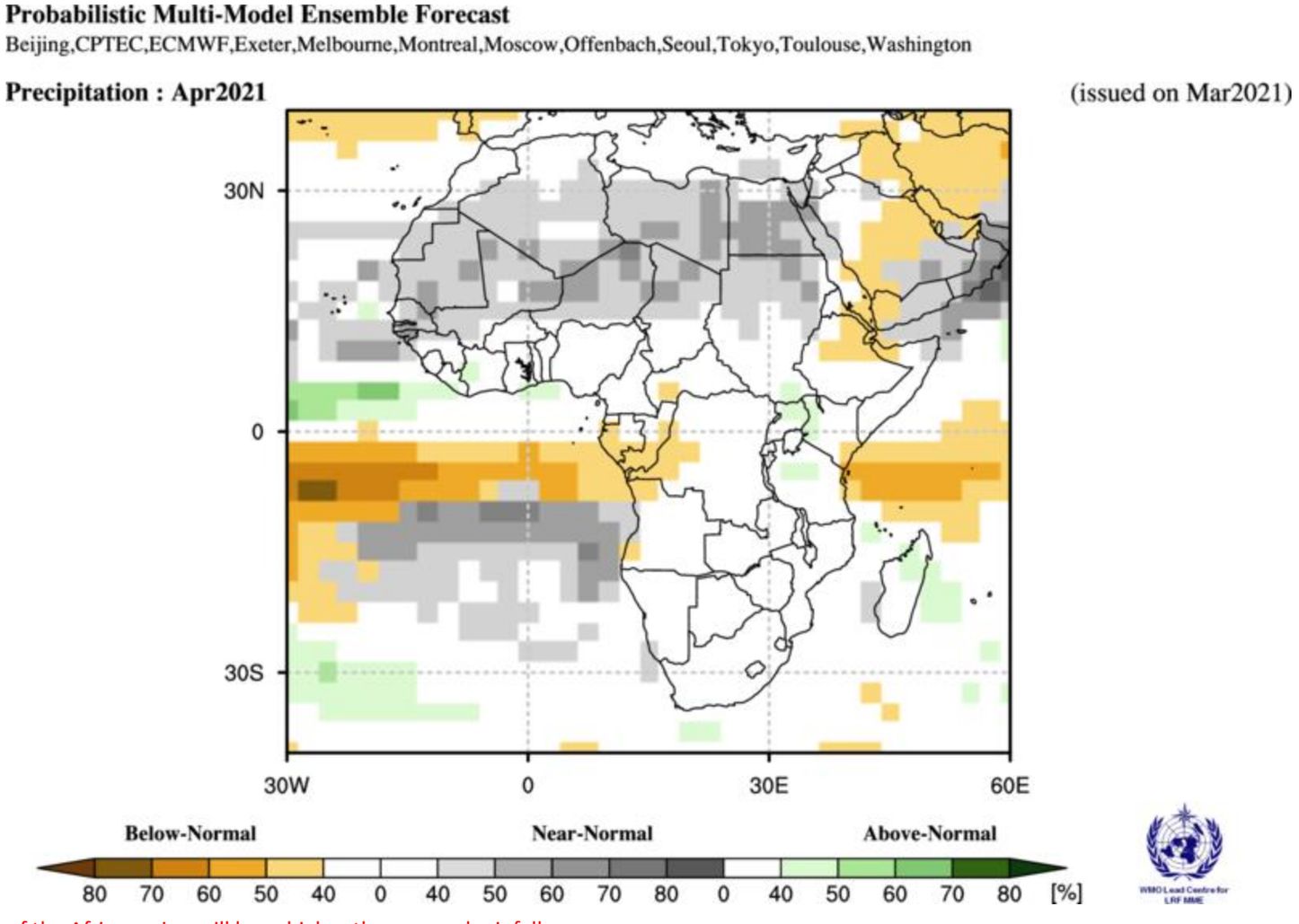


Figure 27: Monthly forecast

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

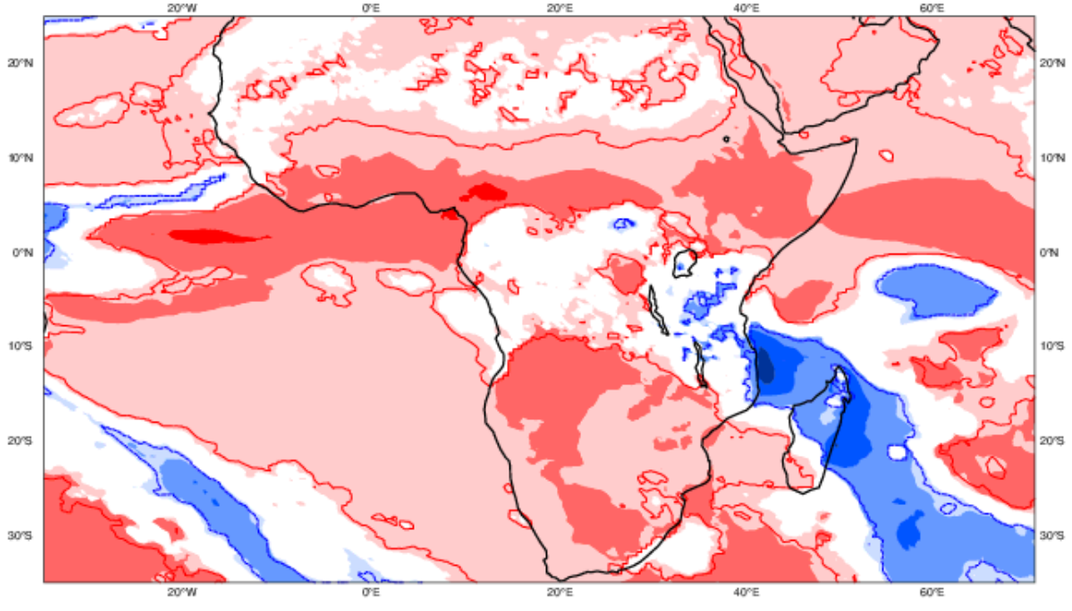
https://www.wmolc.org/seasonPmmeUI/view?winName=PlotView1566209968309

PRECIPITATION FORECASTS FROM ECMWF FOR WEEK 1 & 2

ECMWF EPS-Monthly Forecasting System
Precipitation anomaly
Forecast start reference is 01-04-2021
ensemble size = 51 ,climate size = 660

Day 5-11
05-04-2021/TO/11-04-2021
Shaded areas significant at 10% level
Contours at 1% level

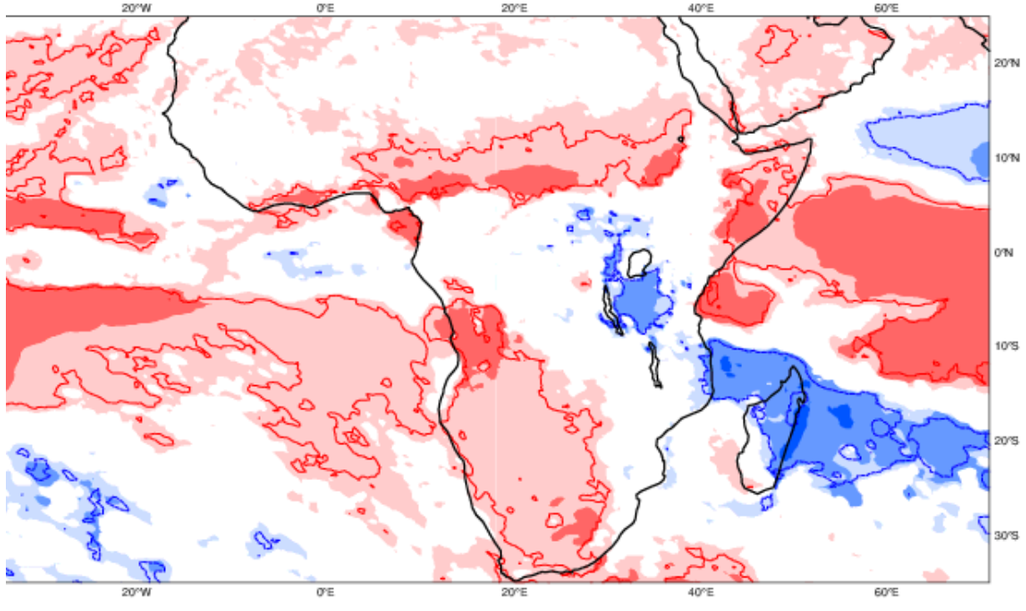
<-90mm -90..-60 -60..-30 -30..-10 -10.. 0 0.. 10 10.. 30 30.. 60 60.. 90 > 90mm



ECMWF EPS-Monthly Forecasting System
Precipitation anomaly
Forecast start reference is 01-04-2021
ensemble size = 51 ,climate size = 660

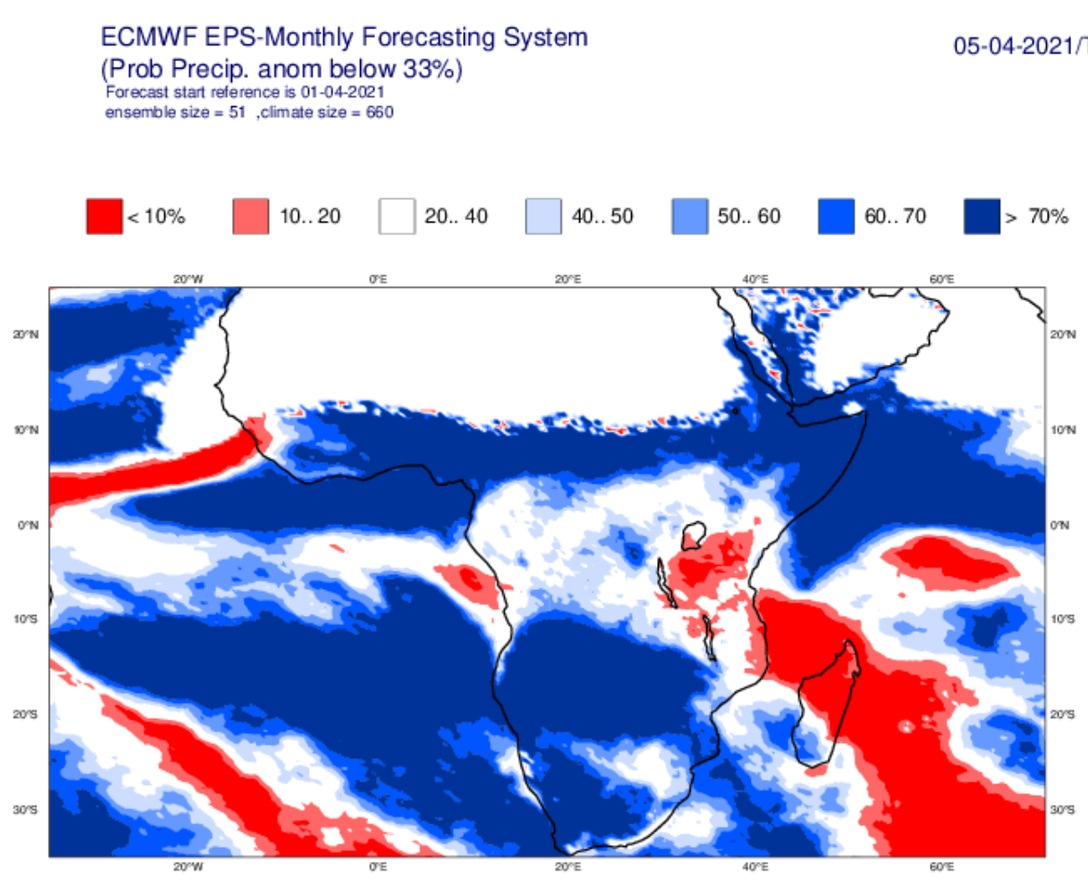
Day 12-18
12-04-2021/TO/18-04-2021
Shaded areas significant at 10% level
Contours at 1% level

<-90mm -90..-60 -60..-30 -30..-10 -10.. 0 0.. 10 10.. 30 30.. 60 60.. 90 > 90mm



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 1:
Weekly Tercile at below 33% and above 66%



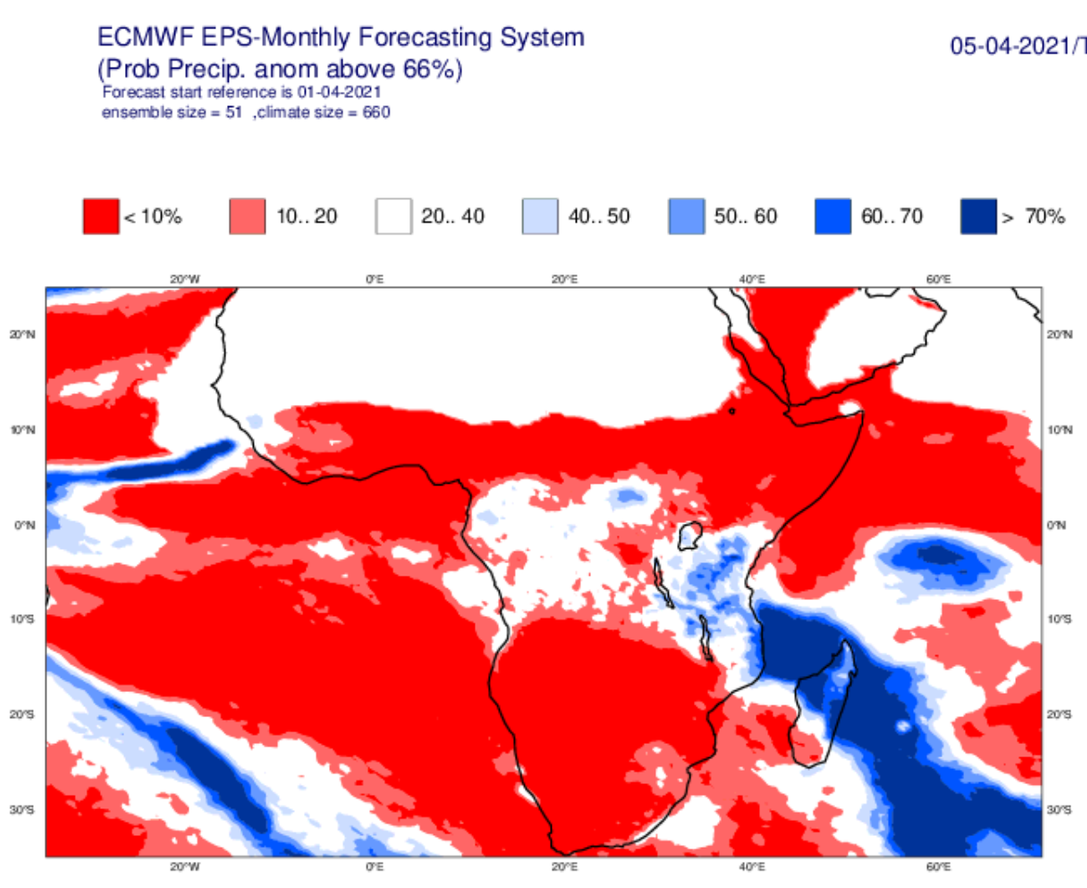
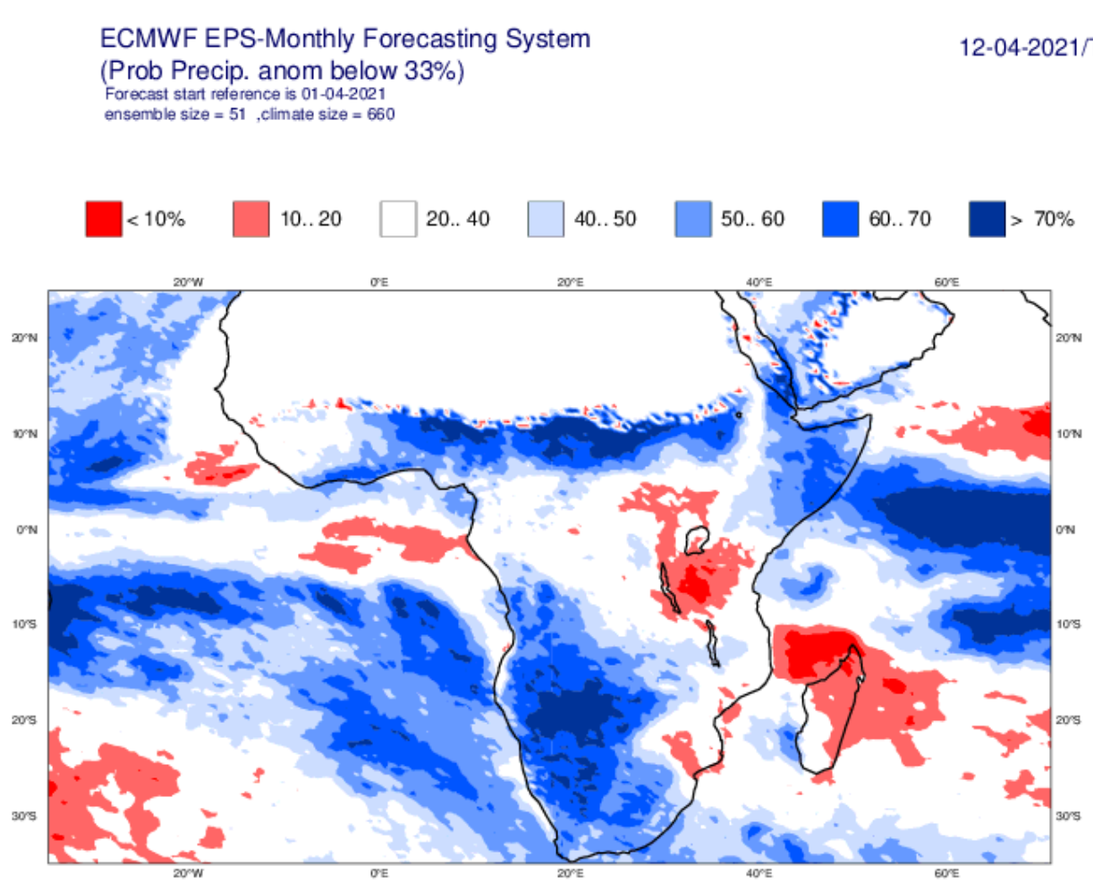


Figure 29: weekly tercil probability forecast below 33%(left) and above 66%(right)

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 2: Weekly Tercile at below 33% and above 66%



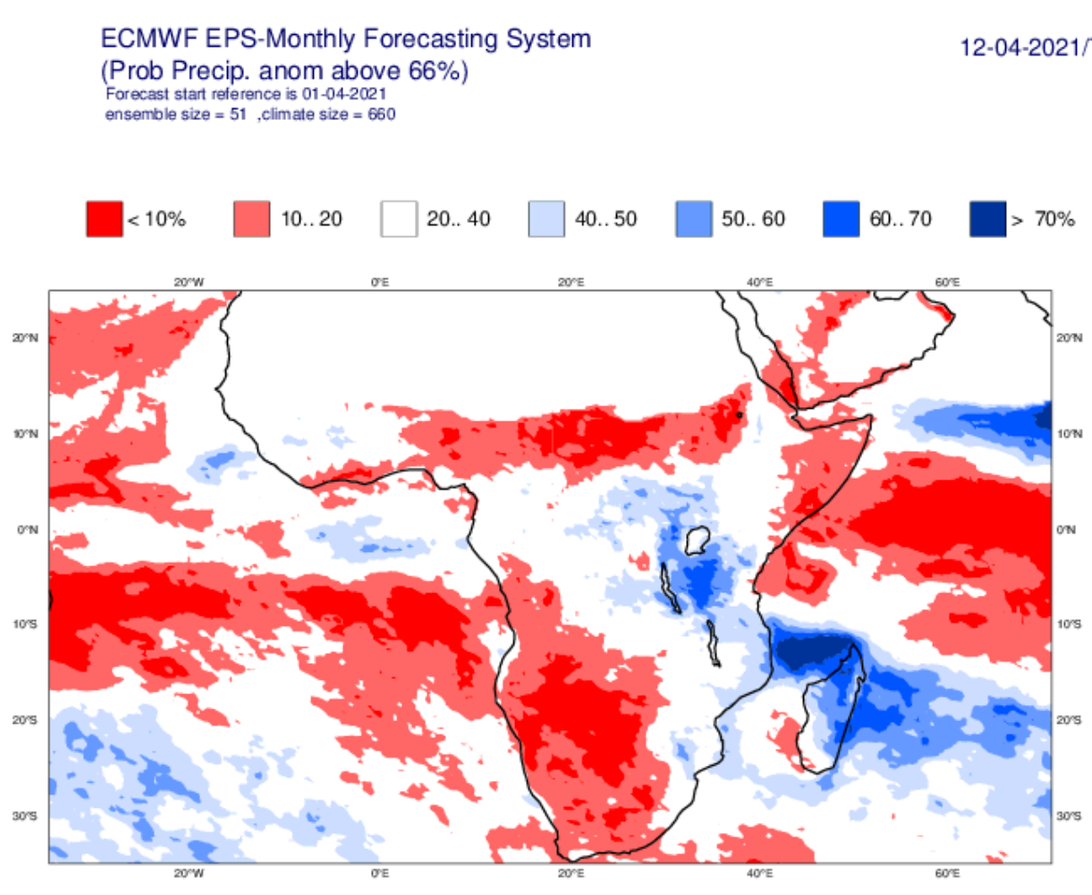
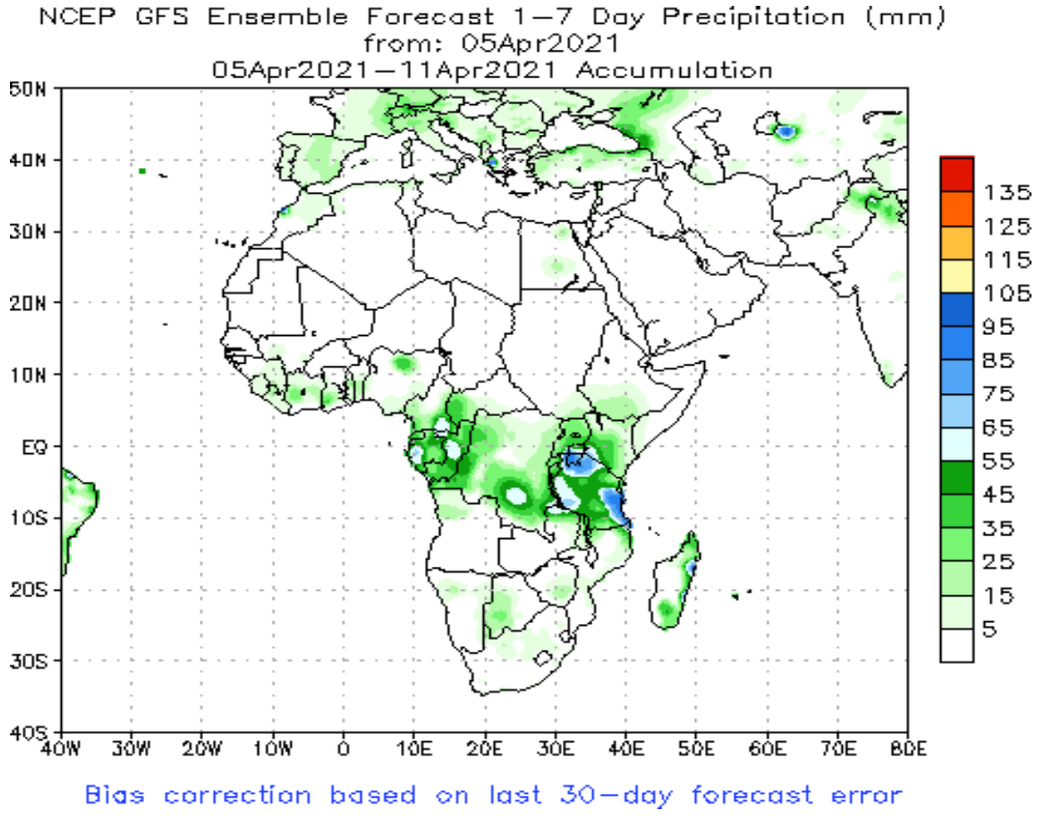


Figure 30: weekly tercile probability forecast below 33%(left) and above 66%(right)

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



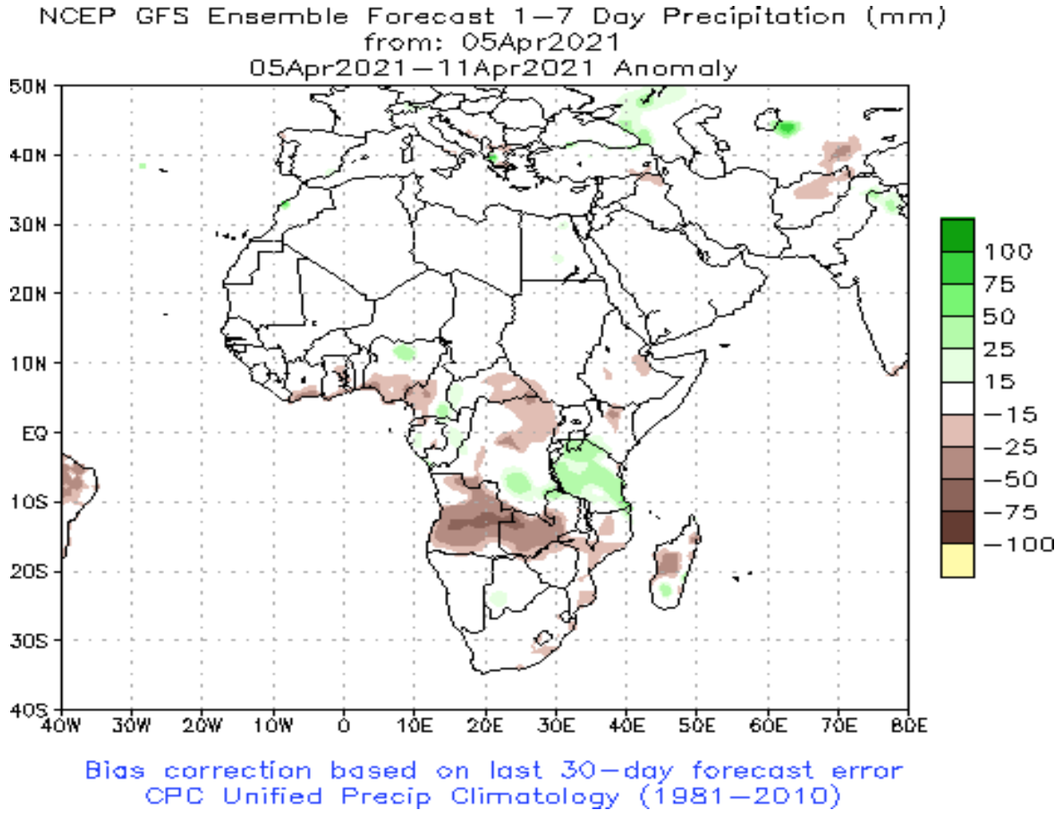
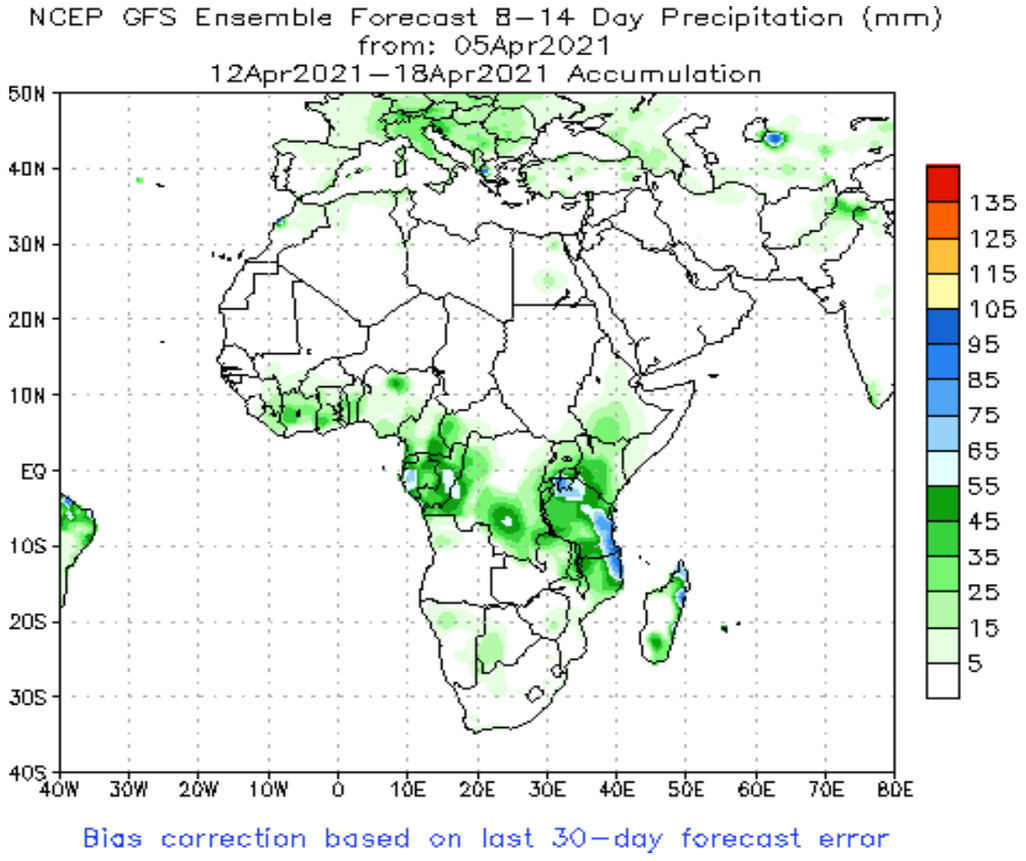


Figure 31- Précipitation and Anomaly forecast
Precipitation of anomalies for the first week will generate more precipitation at the level of East Africa when we look at the level of the anomaly finds that this area is always in surplus.

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



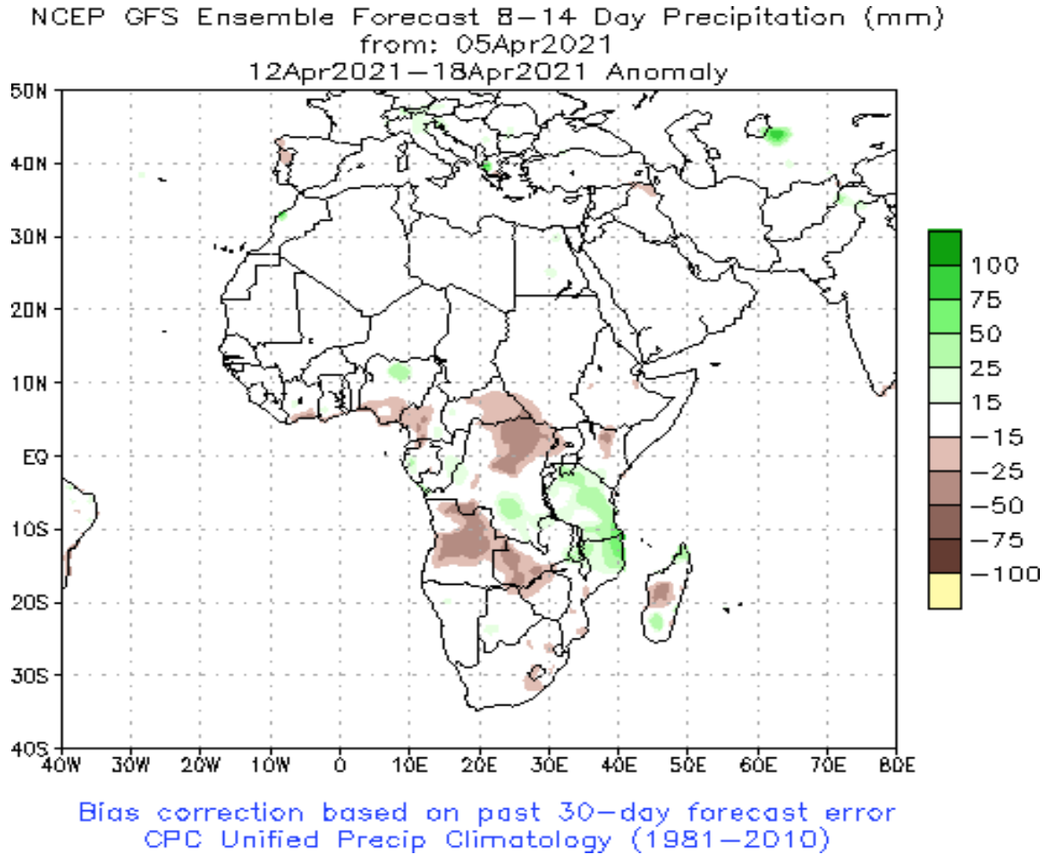


Figure 32: Précipitation and Anomaly forecast

Precipitation of anomalies for the first week will generate more precipitation at the level of East Africa when we look at the level of the anomaly finds that this area is always in surplus.

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

PRECIPITATION PROBABILITY FORECAST 3rd Apr – 23rd April 2021

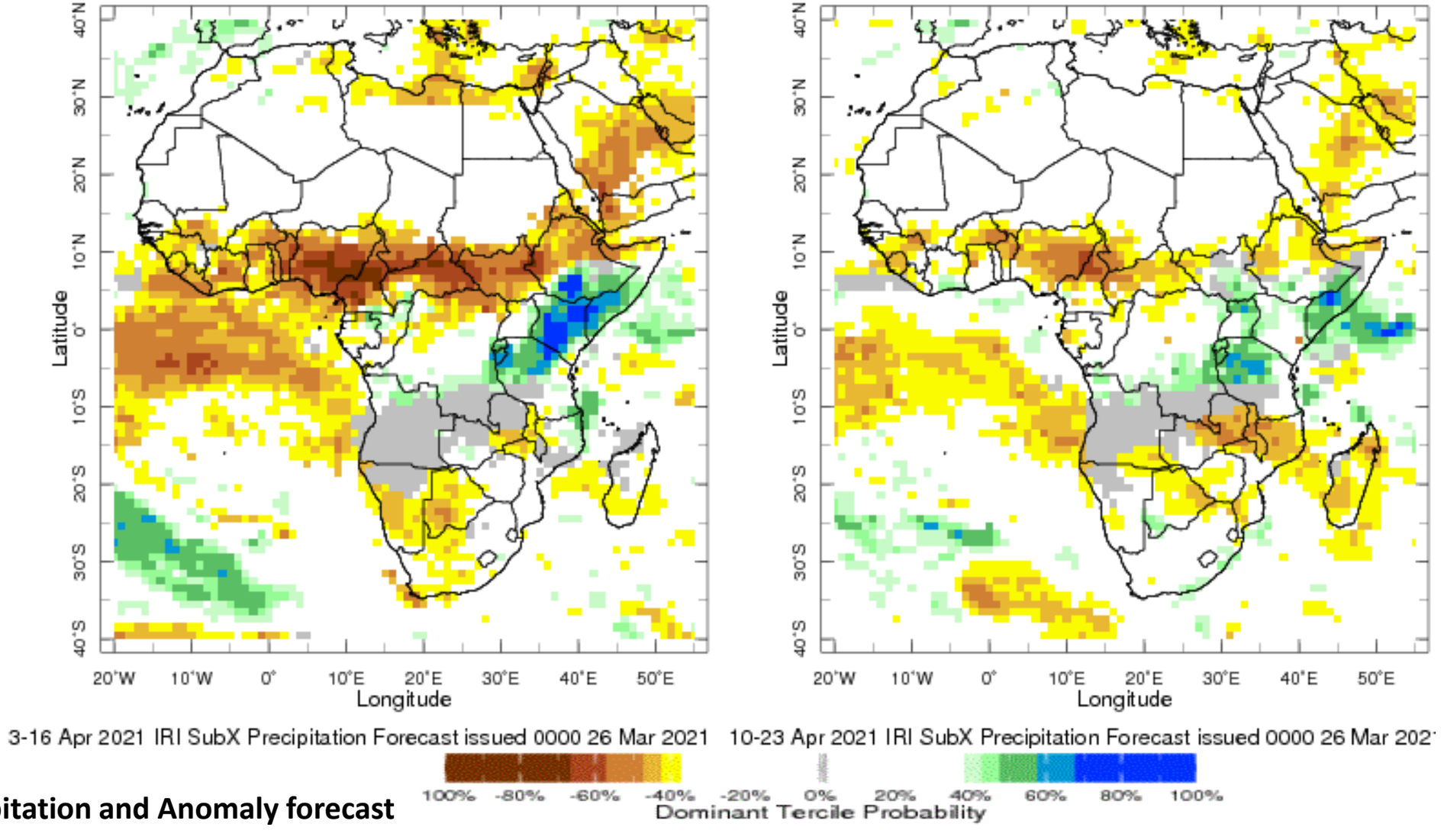


Figure 34- Précipitation and Anomaly forecast

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

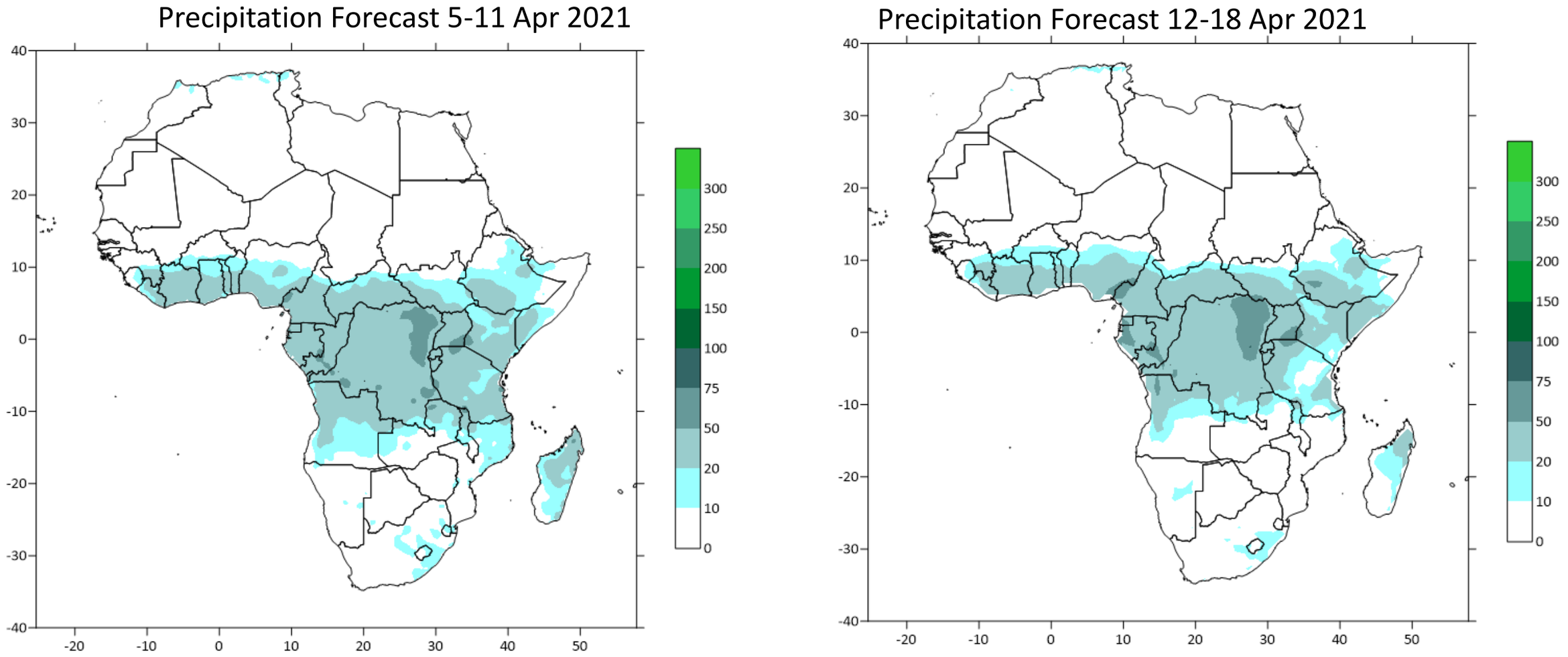


Figure 34: Climatology of Precipation for week-1(left panel) and week-2 (right panel)

PRECIPITATION FORECAST FOR THE COMING TWO CONSECUTIVE WEEKS

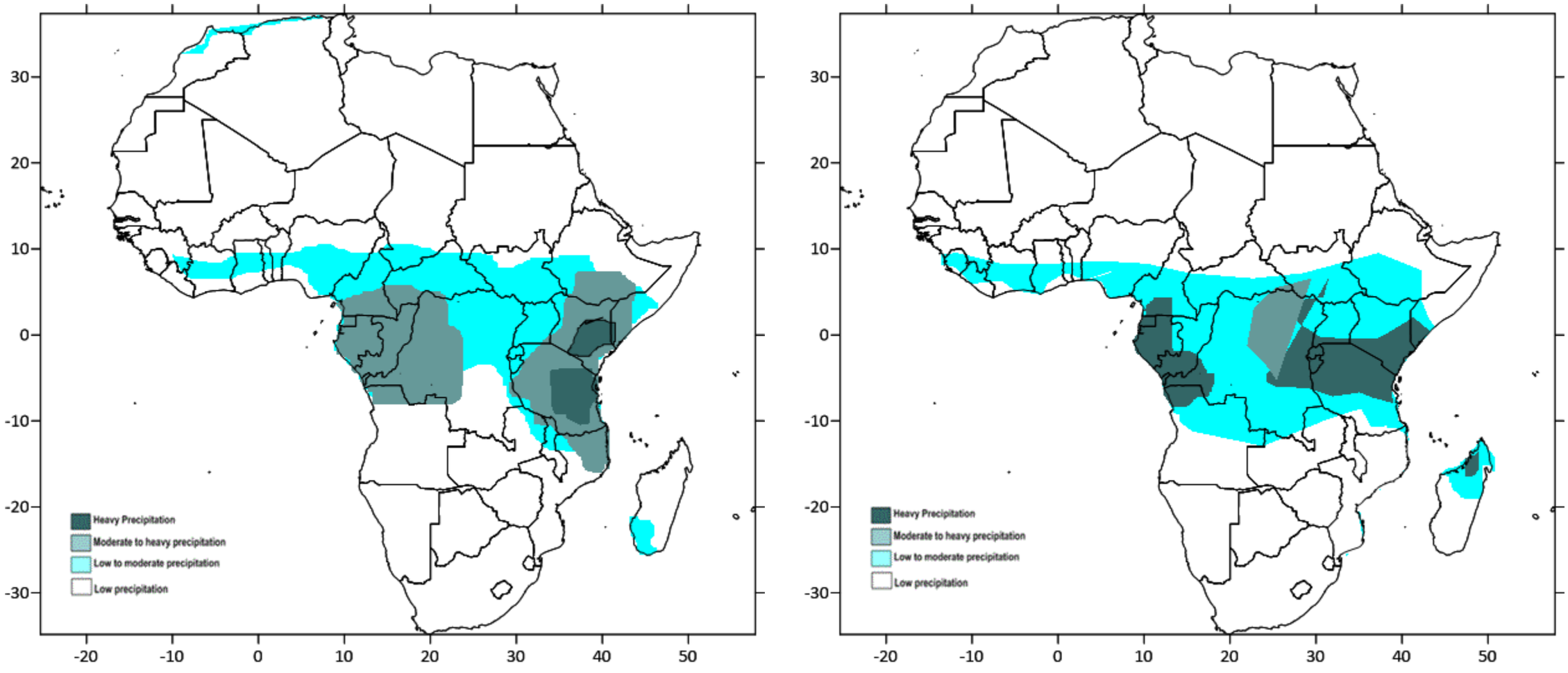


Figure 35: Precipation forecast Analysis