



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

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Edited by: Hubert KABENGELA, Pierre KAMSU

Content of the Technical Note

1. Monitoring Climate Element

- Percent of precipitation
- Temporal variation of precipitation
- Precipitation Onset (Observed and Projected)
- Dekadal OLR anomaly
- MSLP anomaly
- Wind anomaly at 850 and 700 hPa
- Relative Humidity anomaly

2. Global Driver Review and Assessment

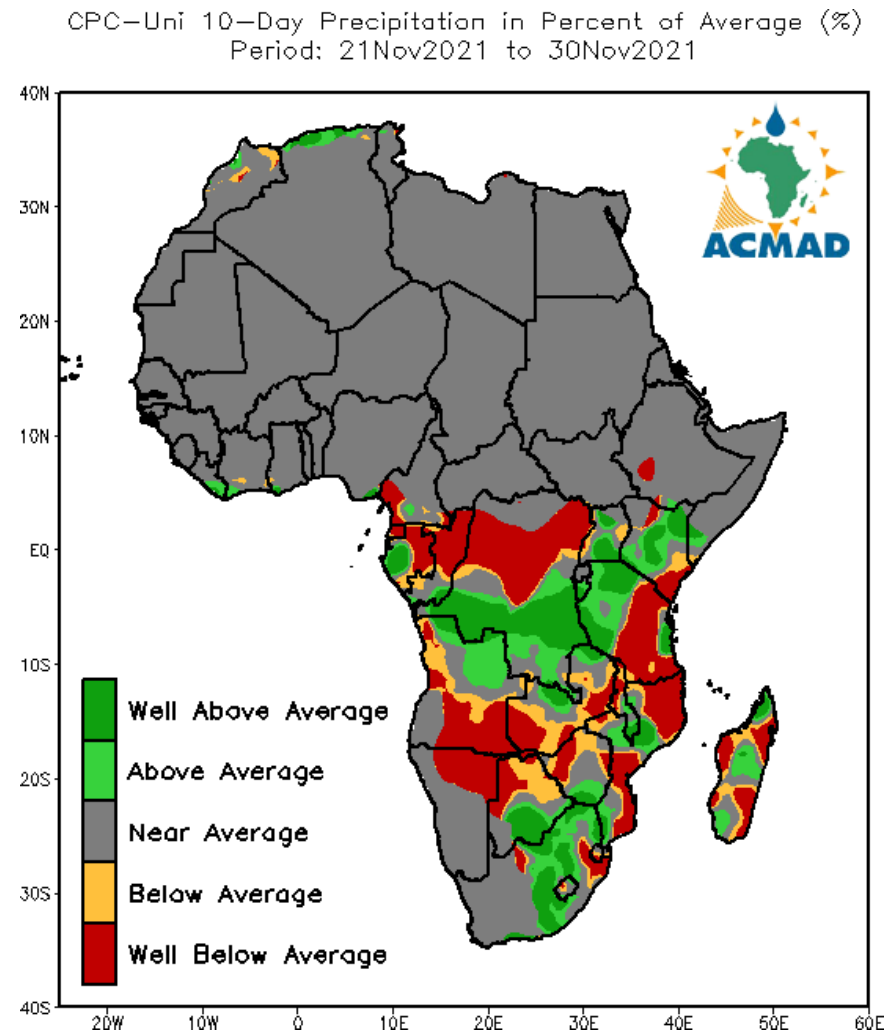
- Weekly and monthly SST anomaly assessment
- Current Velocity Potential at 200hPa
- Current MJO Status and Forecast
- Weekly PWAT observed and outlook
- Dekadal velocity potential with MJO, Kelvin and Rossby Wave
- Dekadal Stream Function with MJO, Kelvin and Rossby Wave

3. Model Guidance for Weekly Climate outlook

- Weekly wind anomaly and divergent forecast
- Weekly NCEP/GFS bias corrected ensemble forecast
- GEFS weekly precip exceedance forecast
- Weekly Precip Forecast from ECMWF (Anom and Prob.)
- Monthly tercile prob precip anomaly forecast
- IRI SubX precip forecast
- Two week climatology
- Two weeks precip forecast

1. Monitoring Climate Element

Estimated Cumulative Precipitation in % of average for the Third Dekad of November 2021



The rains retreated completely from northern and western Africa except over few areas such as the northern edges of North Africa, south west of Ivory Coast and south east of Liberia. The season was effectively implemented further south of the Equator, with above-average precipitation recorded over parts of central, eastern and southern Africa. Below-average rainfall was observed over large portions of the DRC, Congo, Gabon, Angola, Namibia, Tanzania, Mozambique, Zambia, South Africa and Madagascar.

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

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

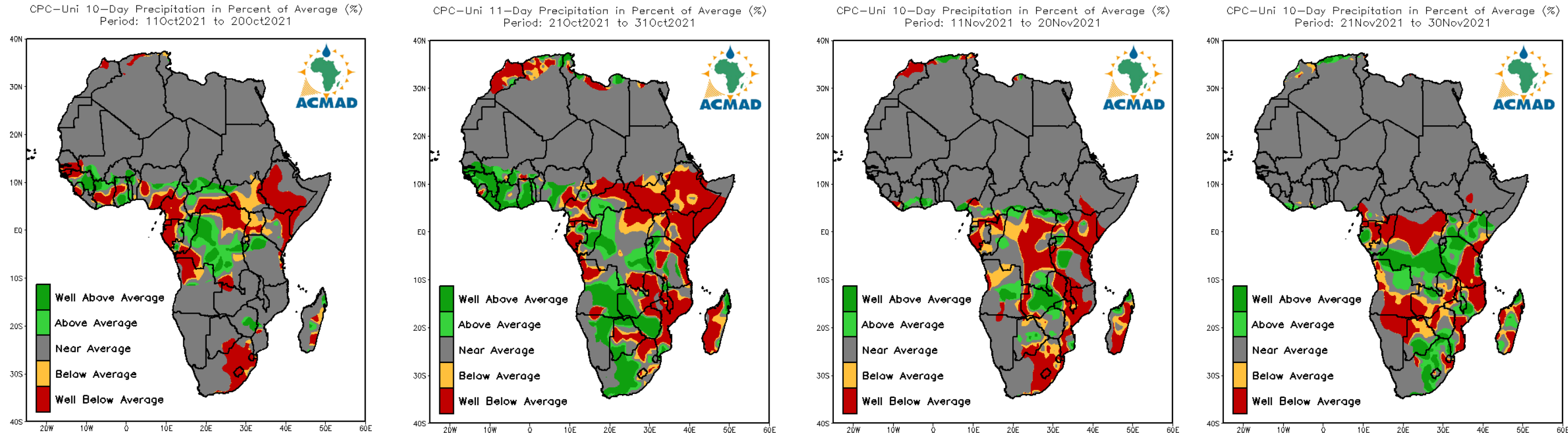


Figure 2: This maps display decadal average precipitation in percent of average

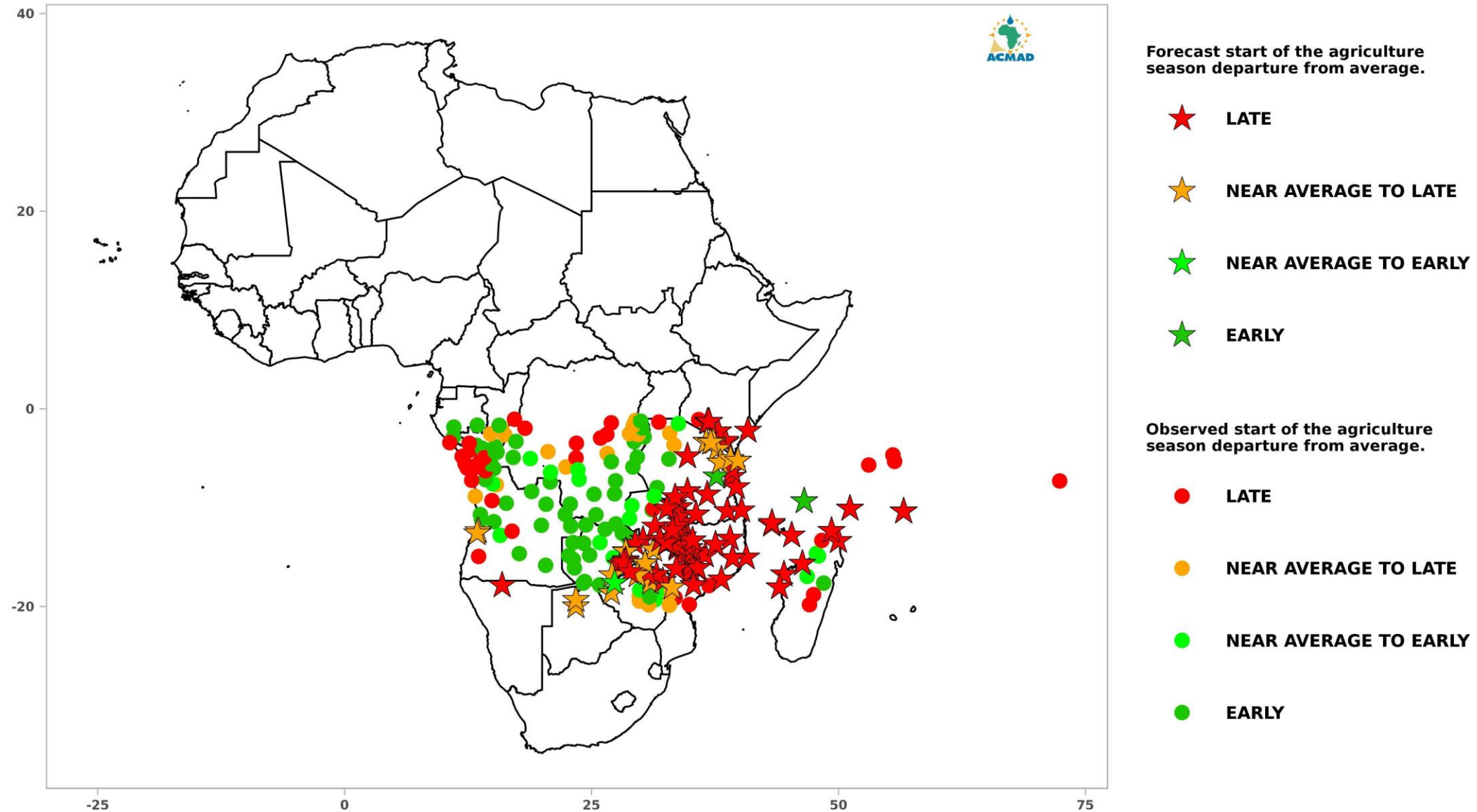
MONITORING OF OBSERVED ANOMALIES ON THE START OF THE AGRICULTURE SEASON AND OUTLOOK.

MONITORING PERIOD: JULY-DECEMBER 2021.

CURRENT MONITORING WEEK: LAST WEEK OF NOVEMBER.

OUTLOOK VALIDITY PERIOD: NOVEMBER 24 TO DECEMBER 07 2021.

DATE OF ISSUE: NOVEMBER 28-2021.



PAST 3 DEKADS OLR ANOMALIES

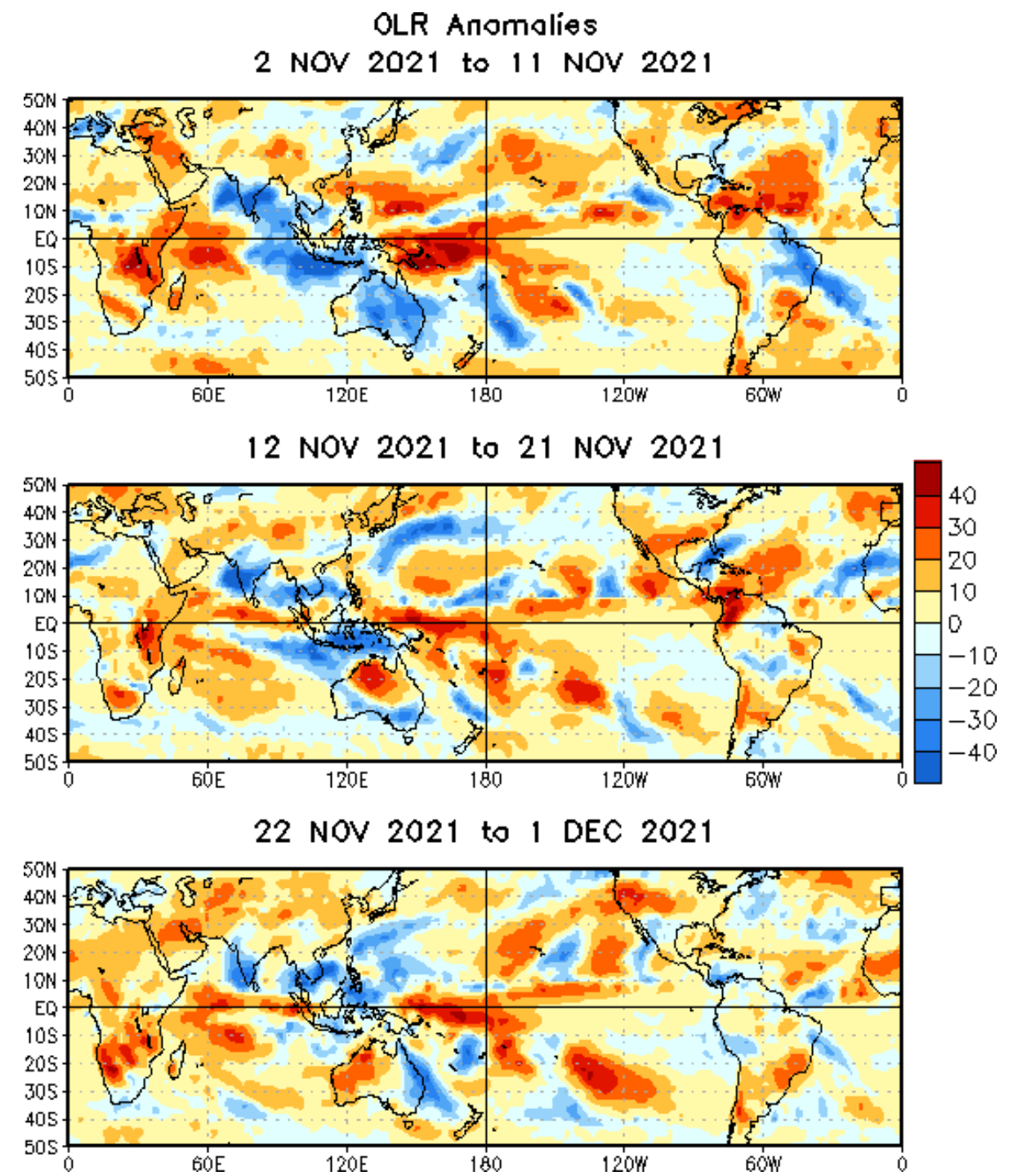


Figure 4: Past 3 weeks OLR anomalies

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

Mean Sea Level Pressure (MSLP)
Anomalies for the 3rd Dekad of Nov. 2021

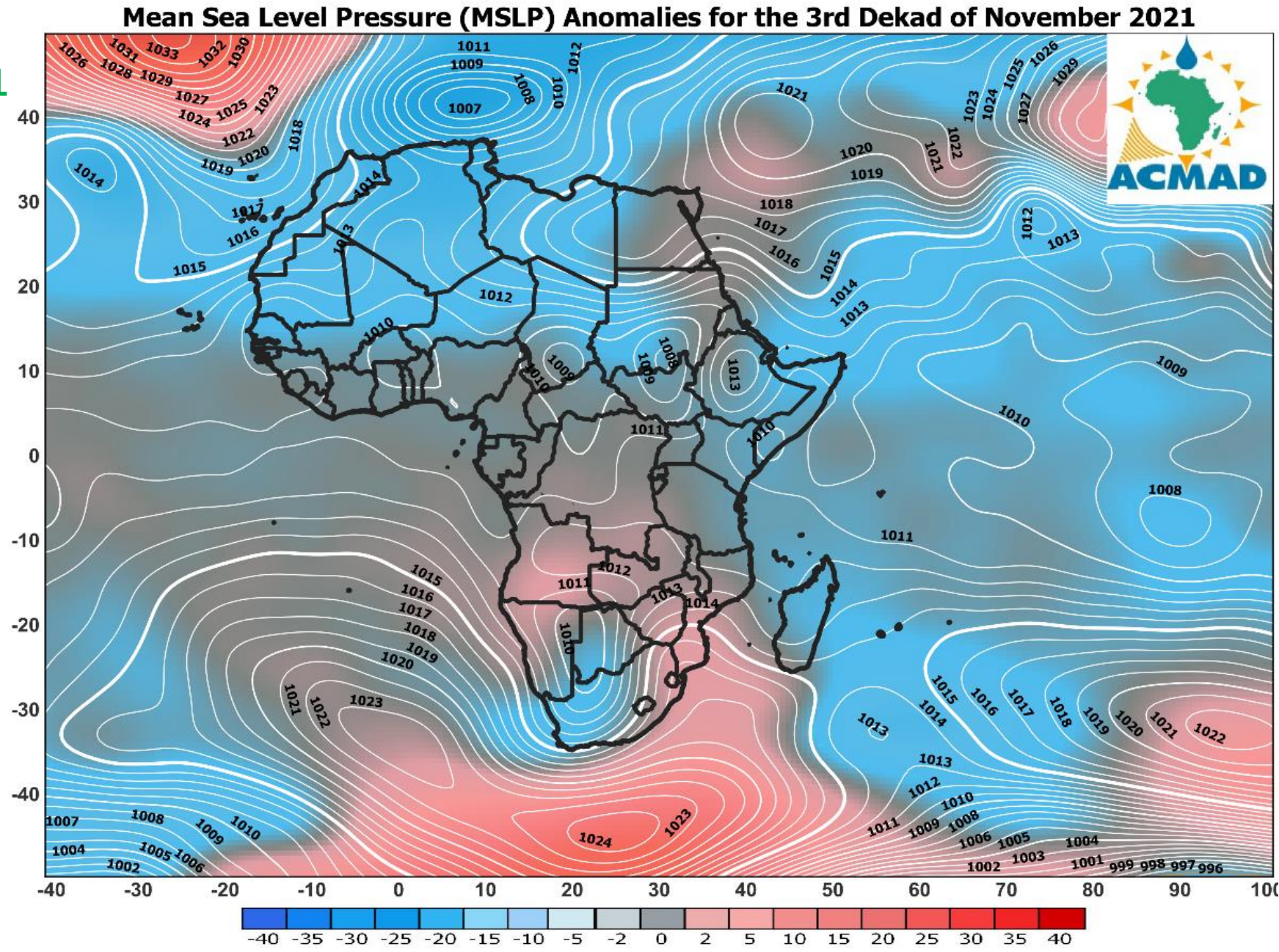
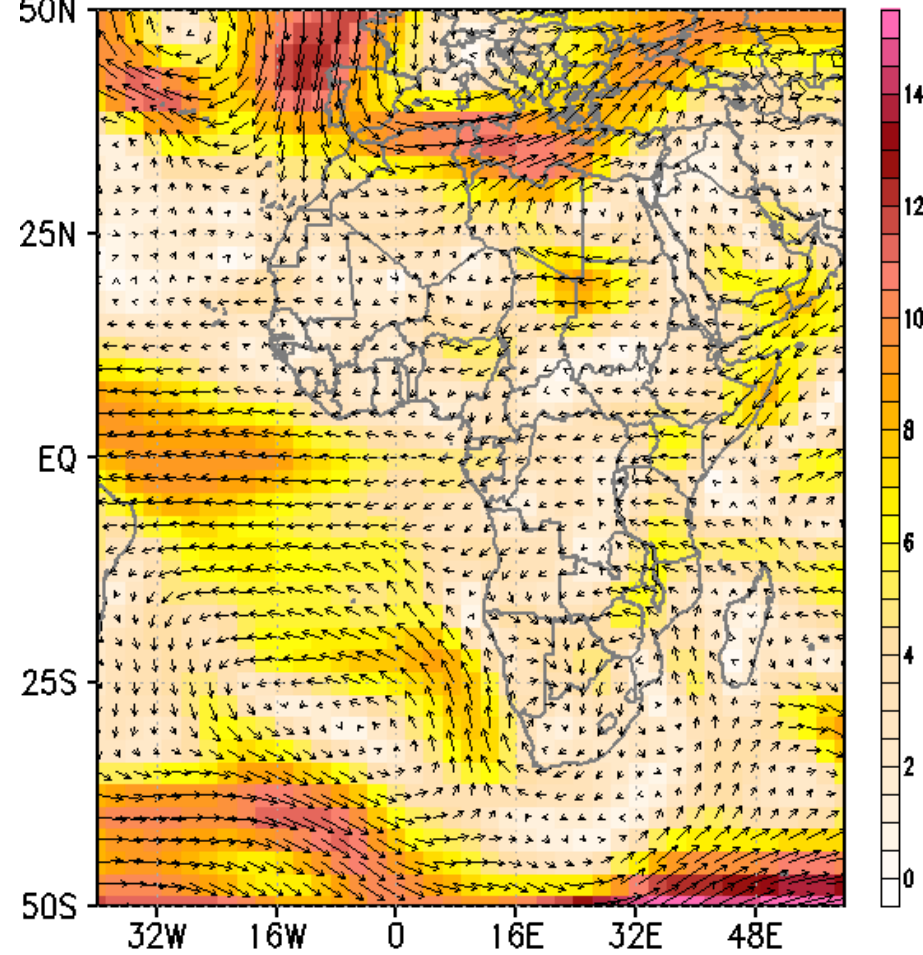


Figure 5: MSLP observation versus anomaly

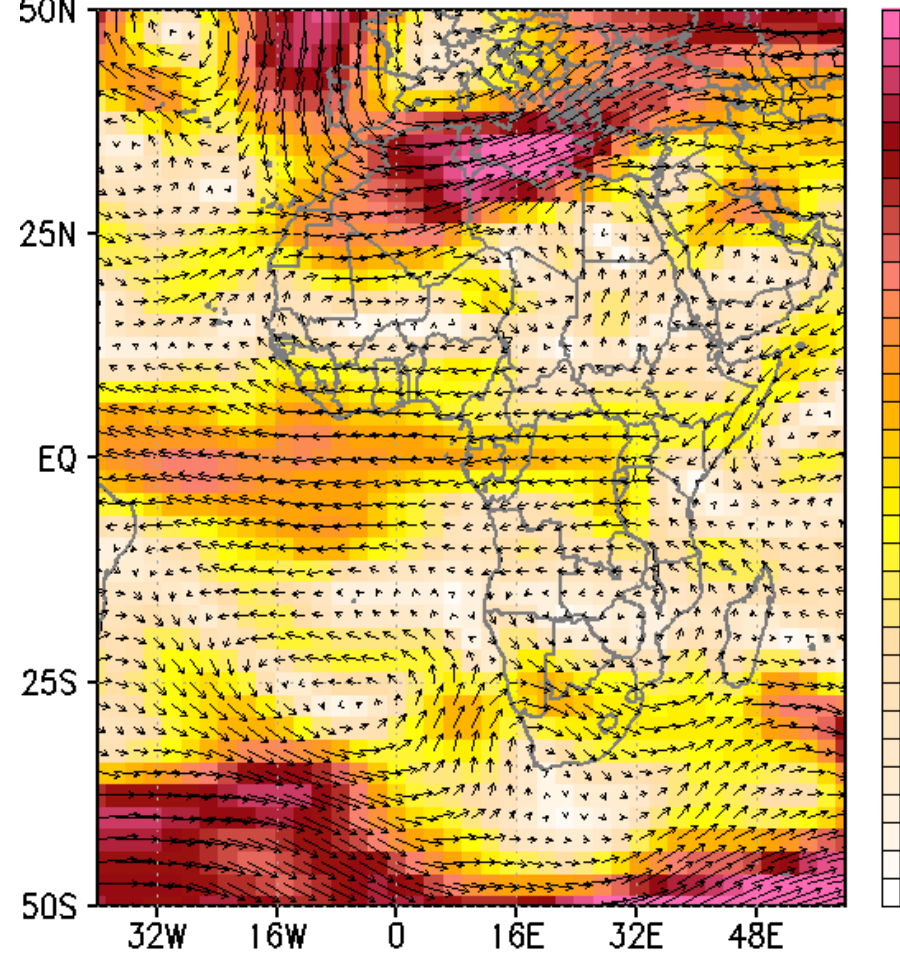
Data source:
<http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-.NCAR/.CDAS-1/.DAILY/.Intrinsic/.MSL/.pressure>

Wind Anomalies for the 3rd Dekad of Nov. 2021 @ 850hpa, 700hpa and 200hPa

850hPa Wind for the Dekad: 21–30 Nov 2021



700hPa Wind for the Dekad: 21–30 Nov 2021



200hPa Wind for the Dekad: 21–30 Nov 2021

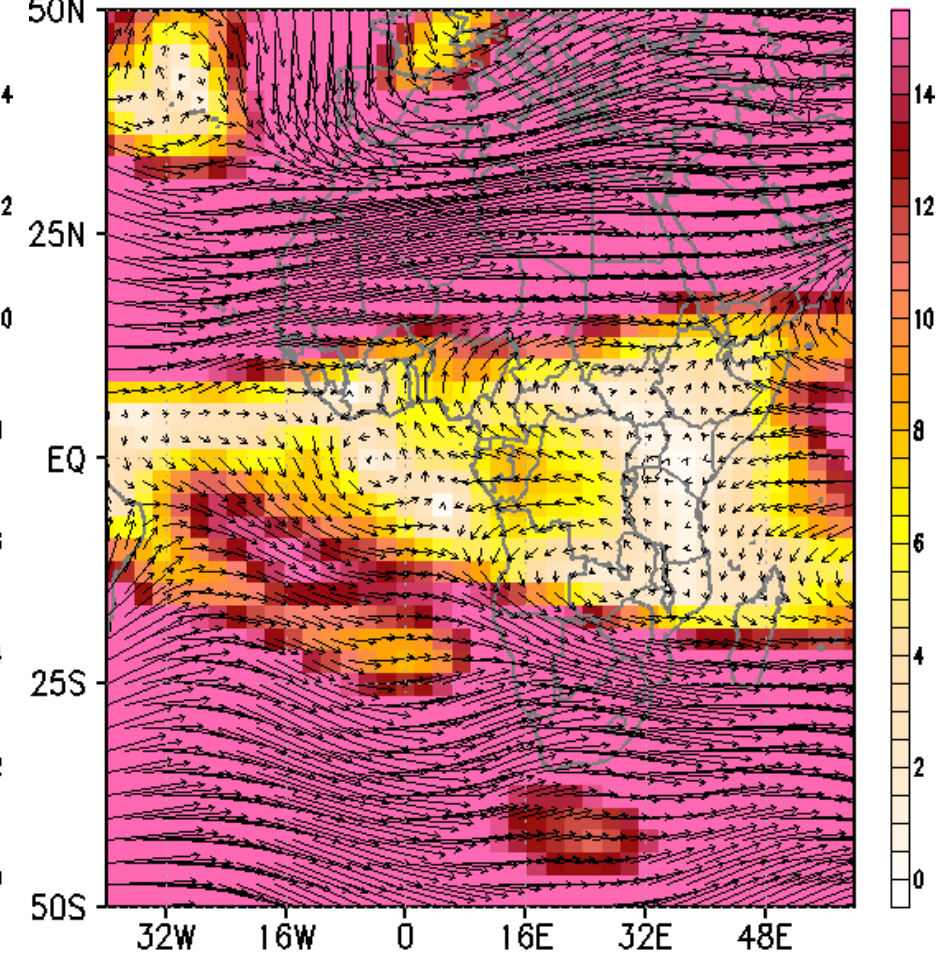


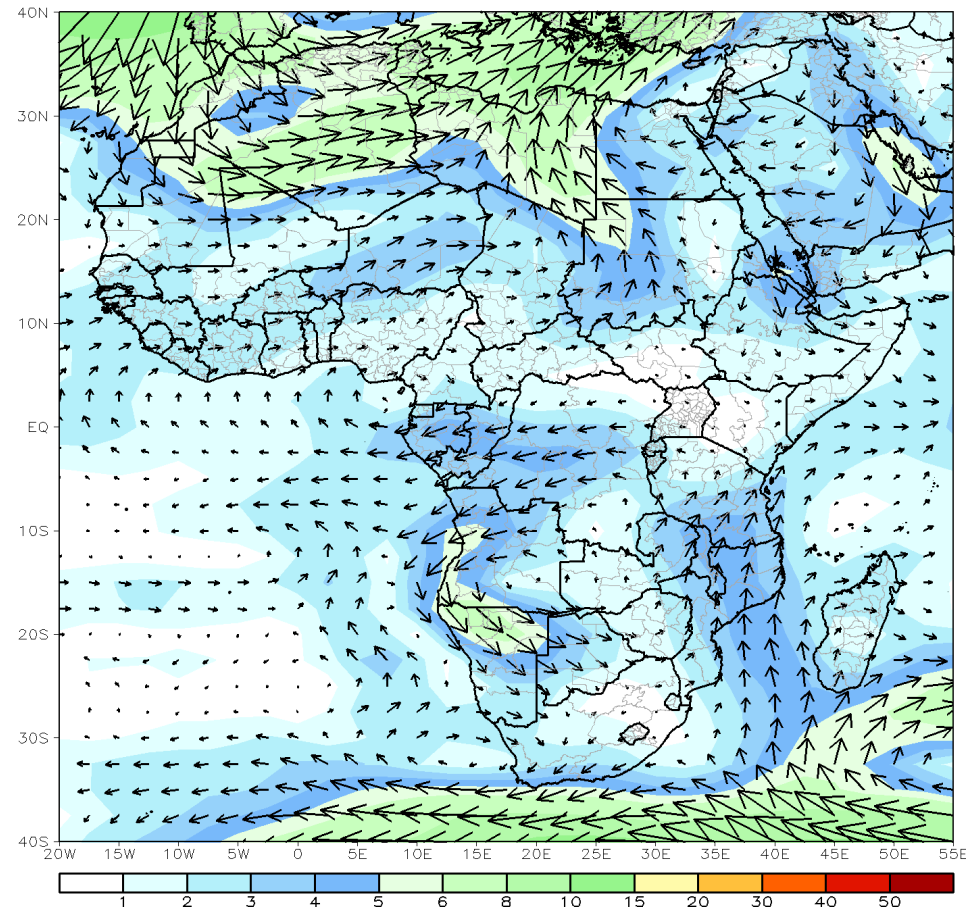
Figure 6: Wind anomalies for 850hpa and 700hPa

9def/long_name/%28Vitesse%29def/windspeed_colors/DATA/0/15/RANGE/u/v/X/Y/fig:/colors/vectors/grey/countries_gaz/:fig//plotaxislength/432/psdef//plotborder/72/psdef//XOVY/null/psdef/

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

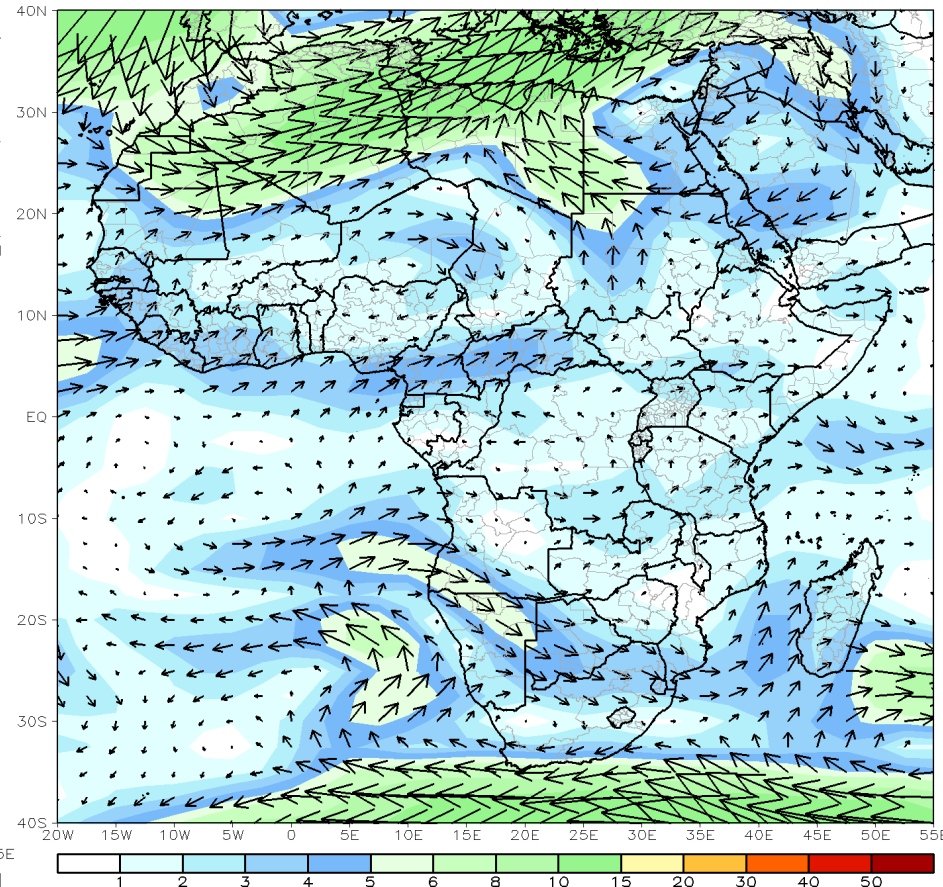
CDAS 850mb 7-Day Mean Vector Wind Anomaly (m/s)

Period: 23Nov2021 – 29Nov2021



CDAS 700mb 7-Day Mean Vector Wind Anomaly (m/s)

Period: 23Nov2021 – 29Nov2021



CDAS 200mb 7-Day Mean Vector Wind Anomaly (m/s)

Period: 23Nov2021 – 29Nov2021

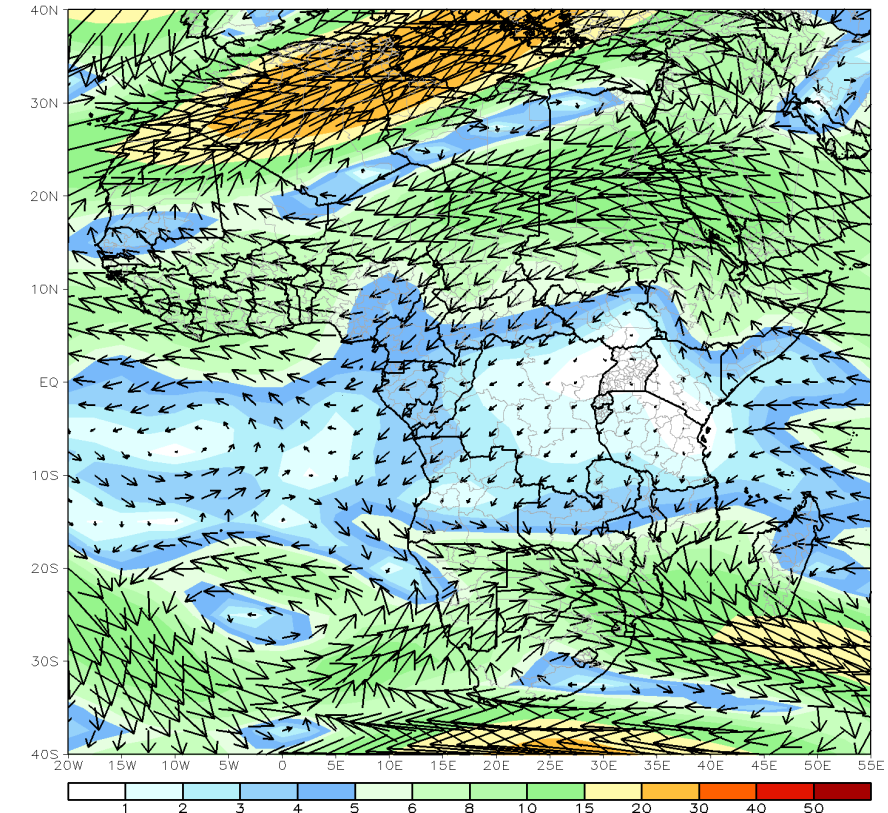


Figure 7: Wind anomalies for 850hpa, 700hPa and 200hpa

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

[Climate Prediction Center - African Desk: SWFDP GFS FORECASTS \(noaa.gov\)](https://www.cpc.ncep.noaa.gov/products/international/africa/africa.shtml)

Relative Humidity (RH) Anomalies at 850hpa and 700hpa for the 3rd Dekad of Nov 2021

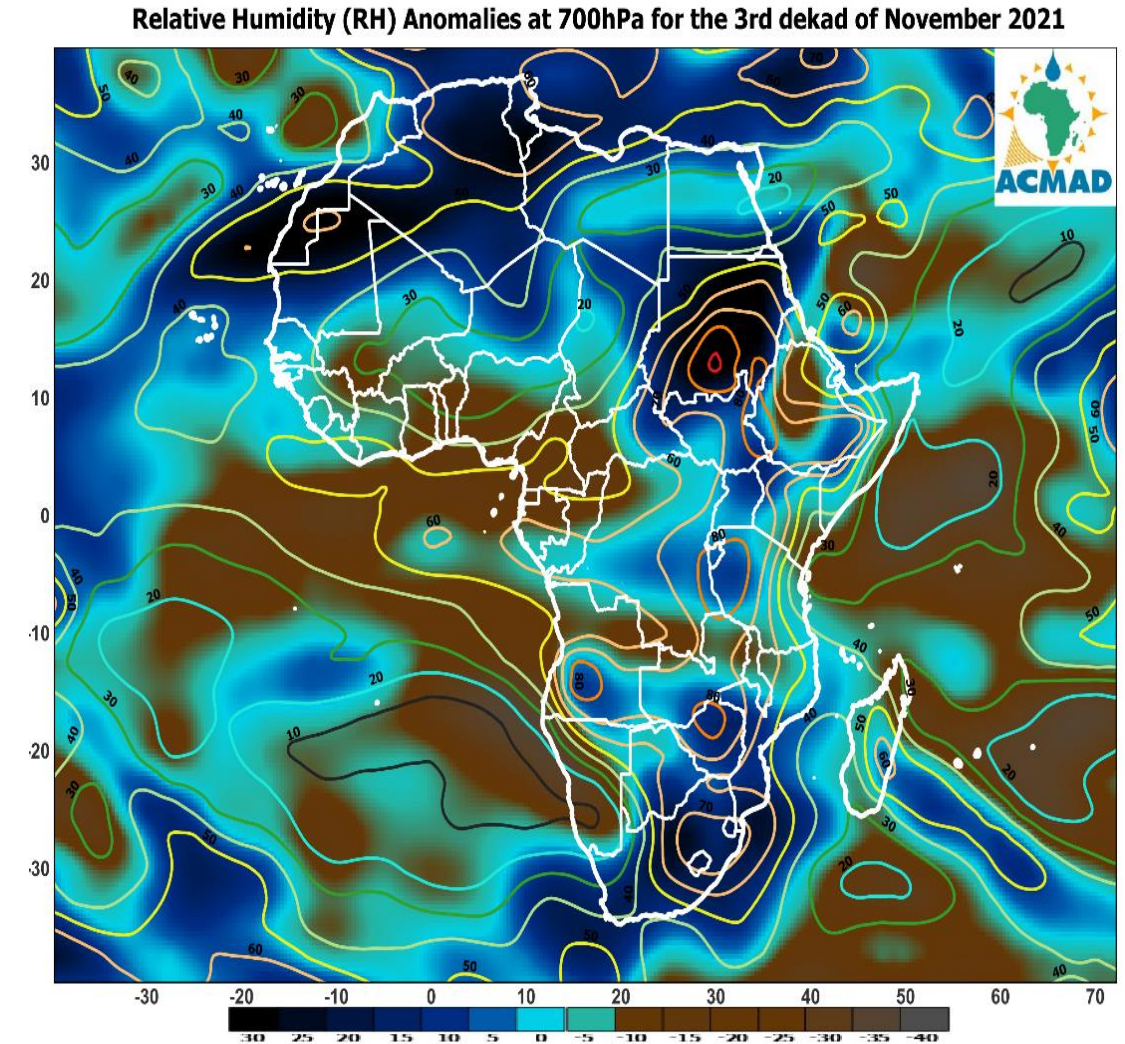
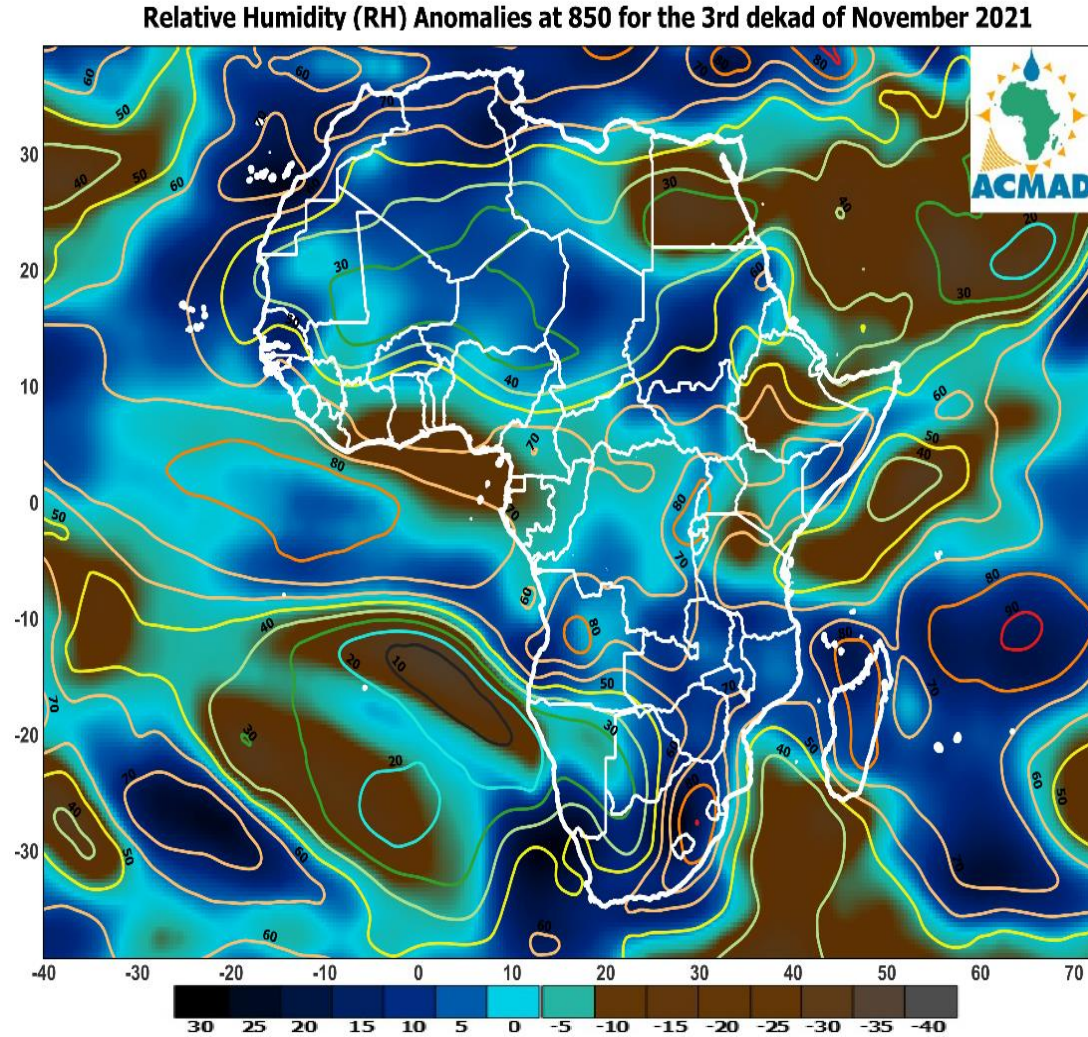
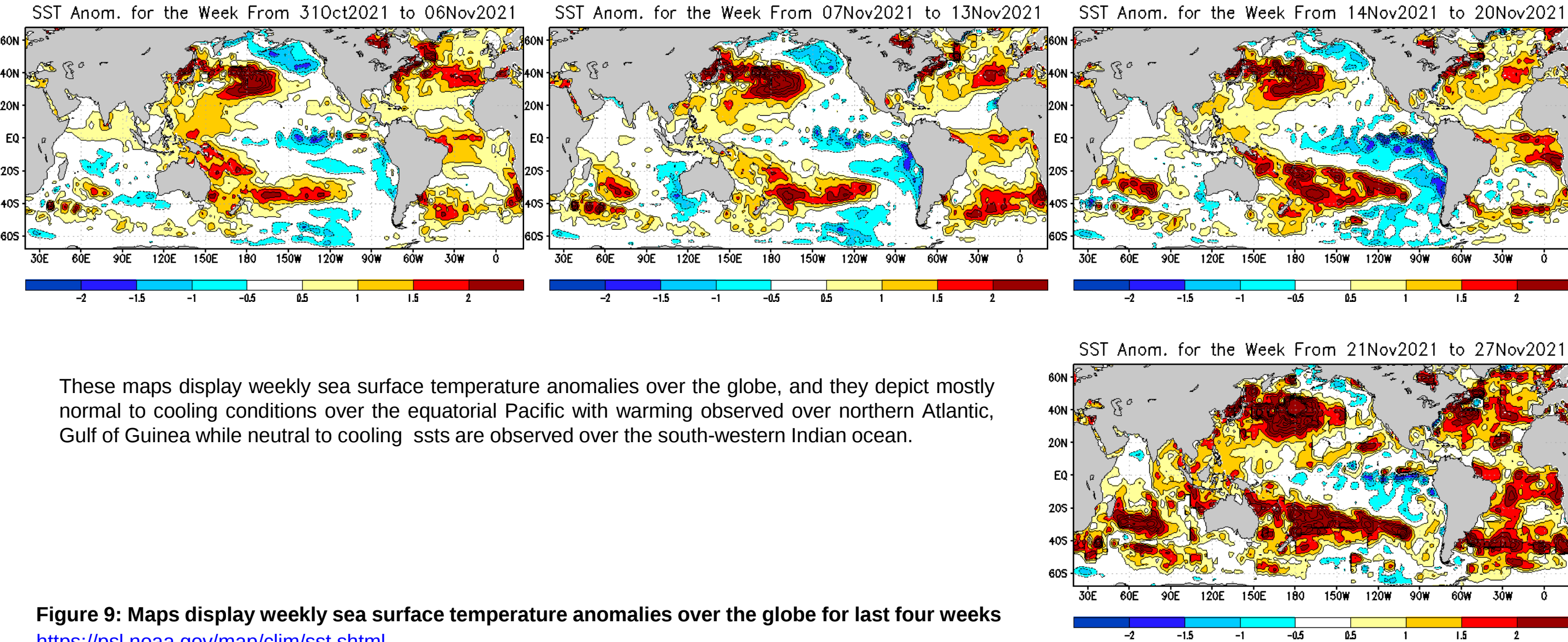


Figure 8: Relative Humidity Anomaly at 850hPa (left) and 700hPa (right)

1. Monitoring Climate Element
2. Global Driver Review and Assessment
 - a. SST
 - b. MJO and other Equatorial Waves

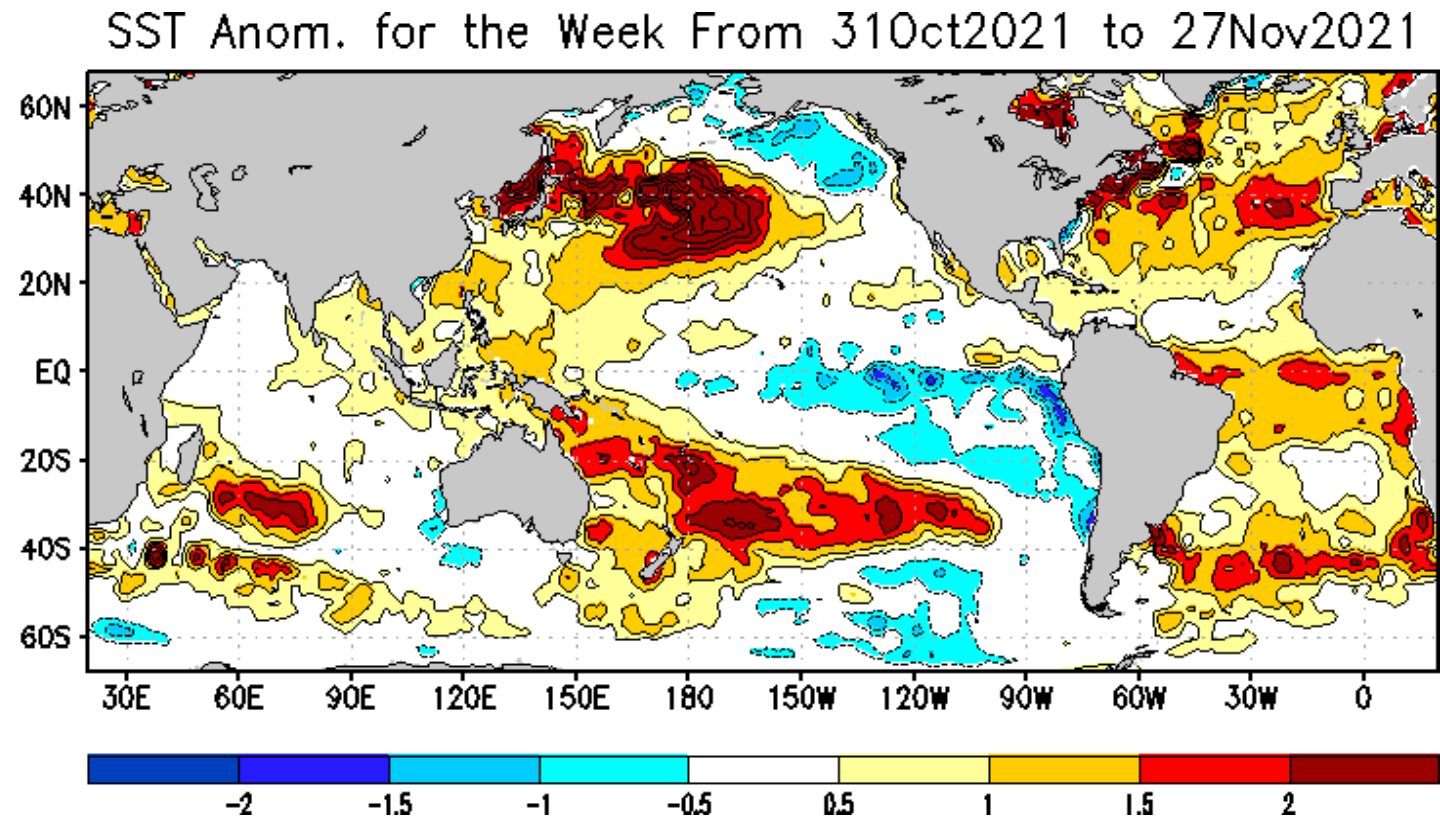
Weekly Sea Surface Temperature Anomaly



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

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

Last Month's Sea Surface Temperatures (SST) Observed



During 20th of Sep to 23rd Oct 2021, the cooling persisted over eastern Equatorial Pacific, and the Western Indian Ocean, whereas the Gulf of Guinea in the South Atlantic, and western pacific continue in warming siyuation.

Figure 10 : 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

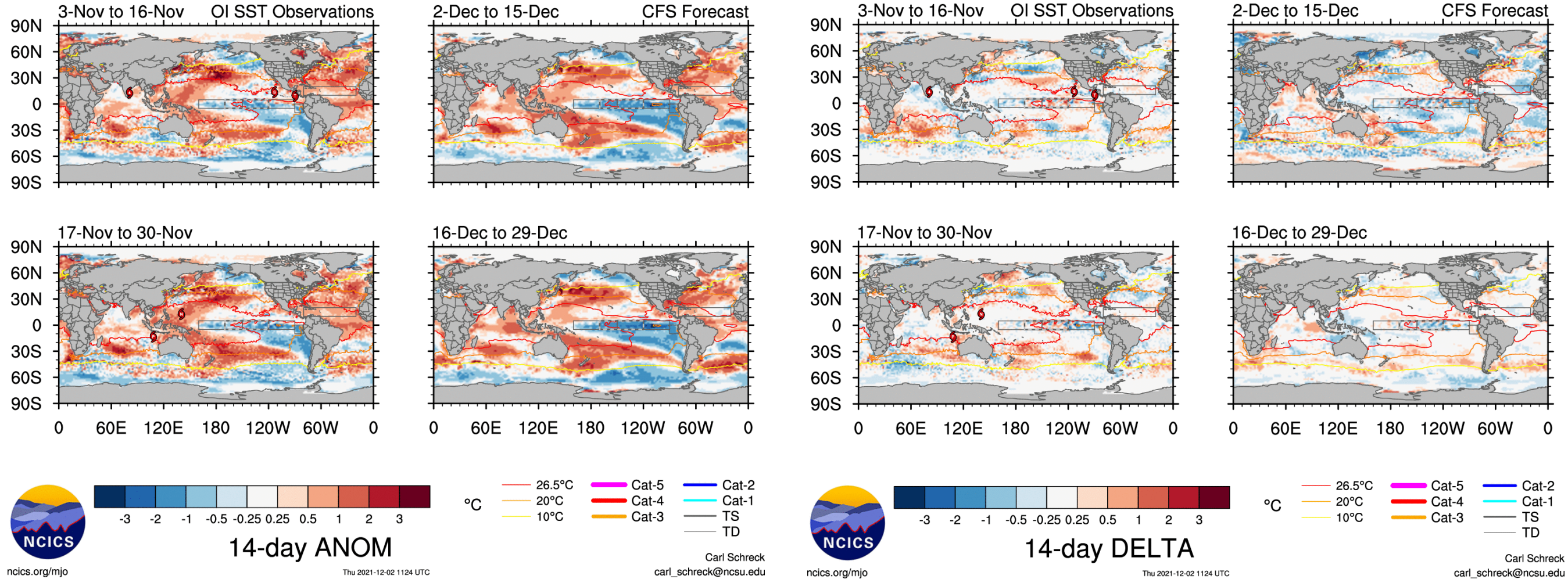


Figure 11: Sea Surface Temperature and FCST for two week

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

3-Days Infra-Red (IR) 200hpa and Velocity Potential Anomaly

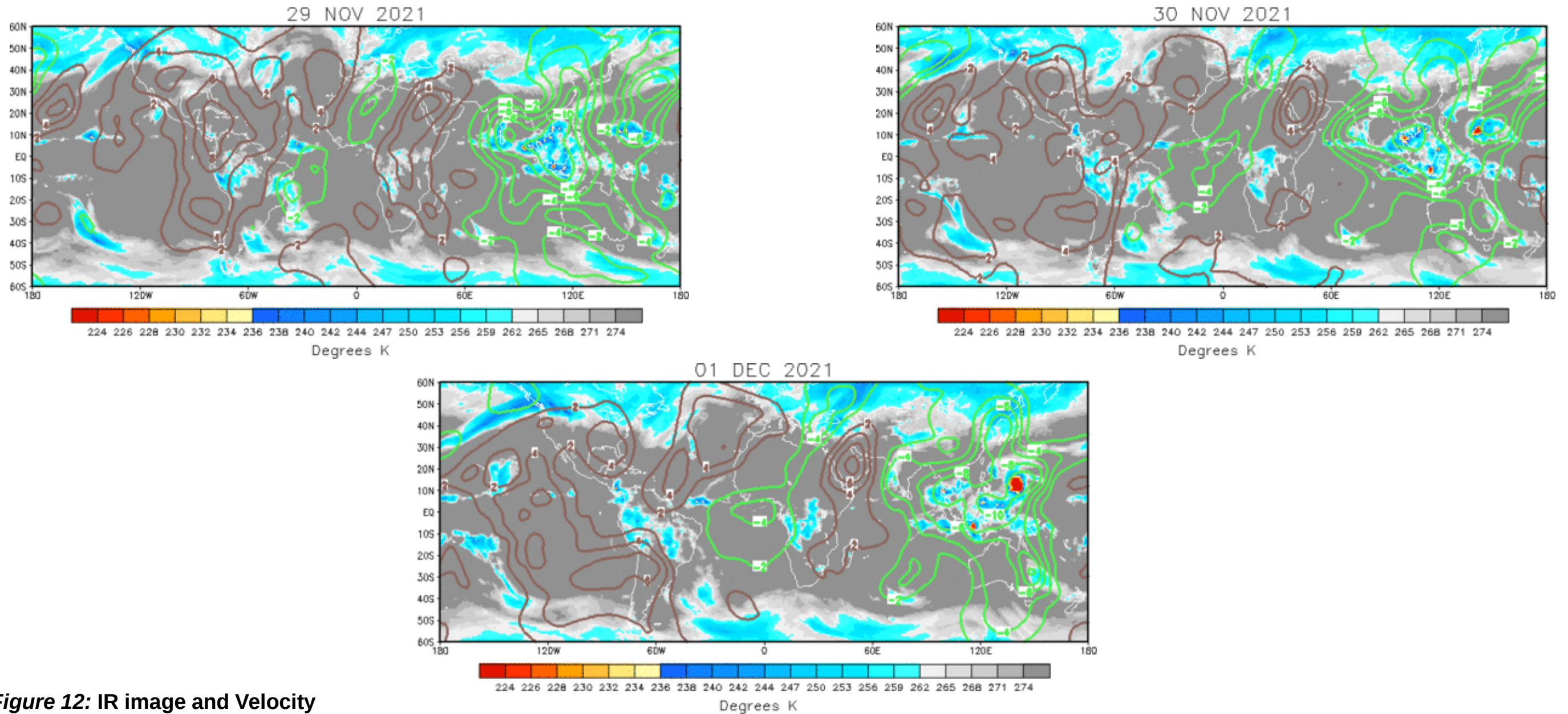


Figure 12: IR image and Velocity Potential anomalies

ECMWF Madden-Julian-Oscillation (MJO) Forecast

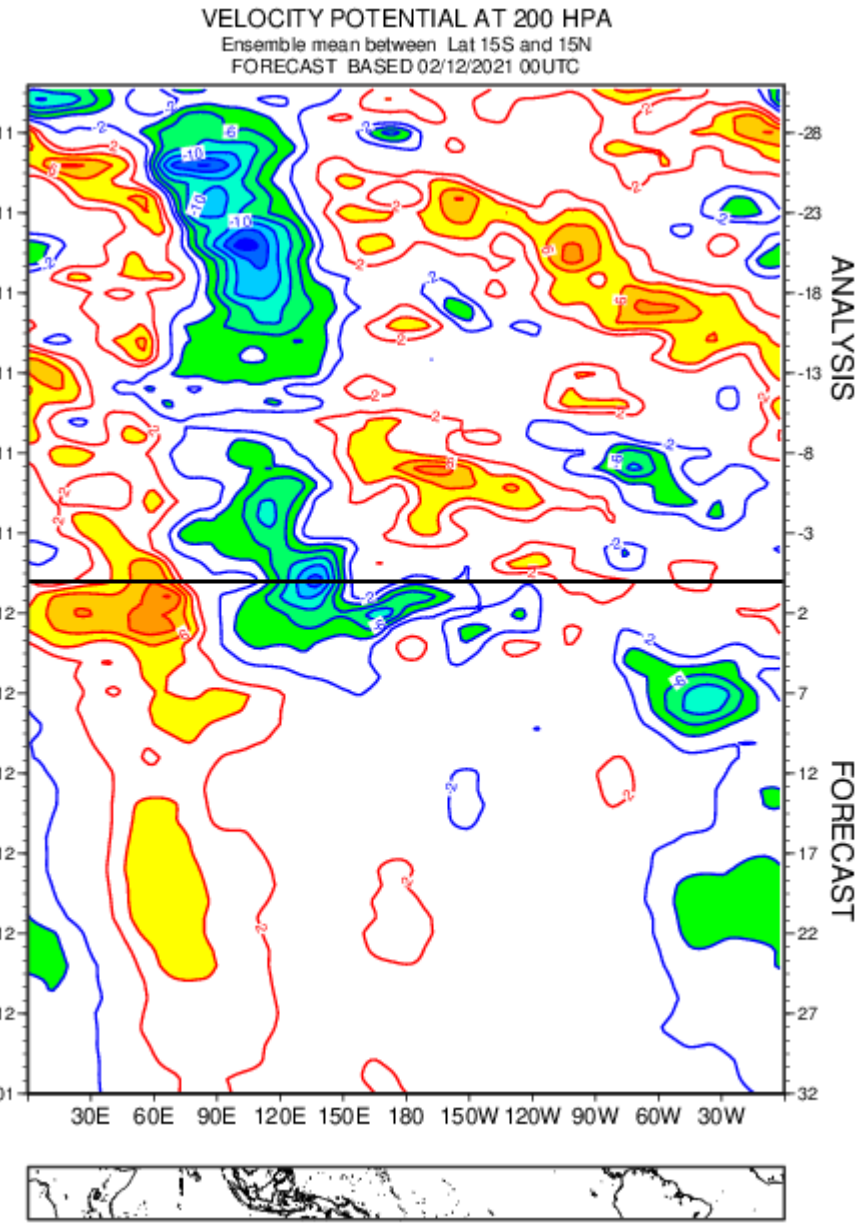
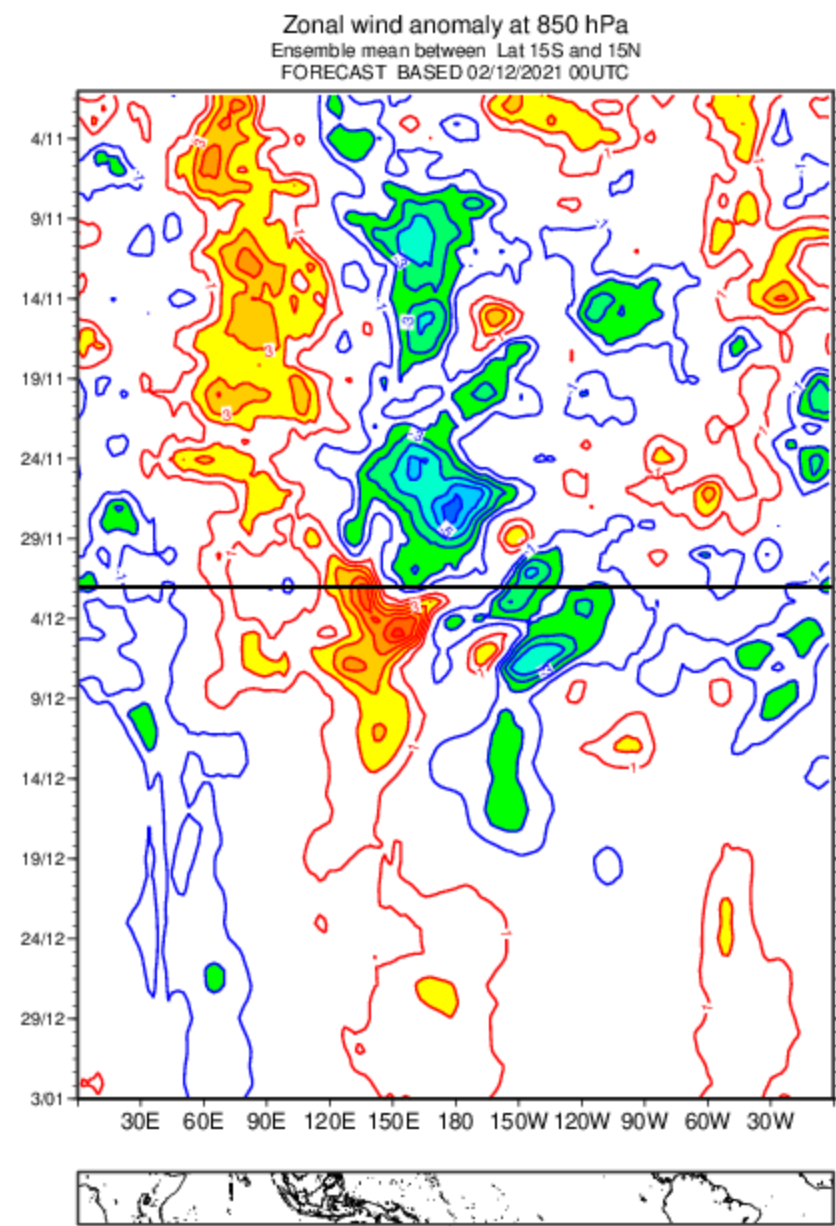
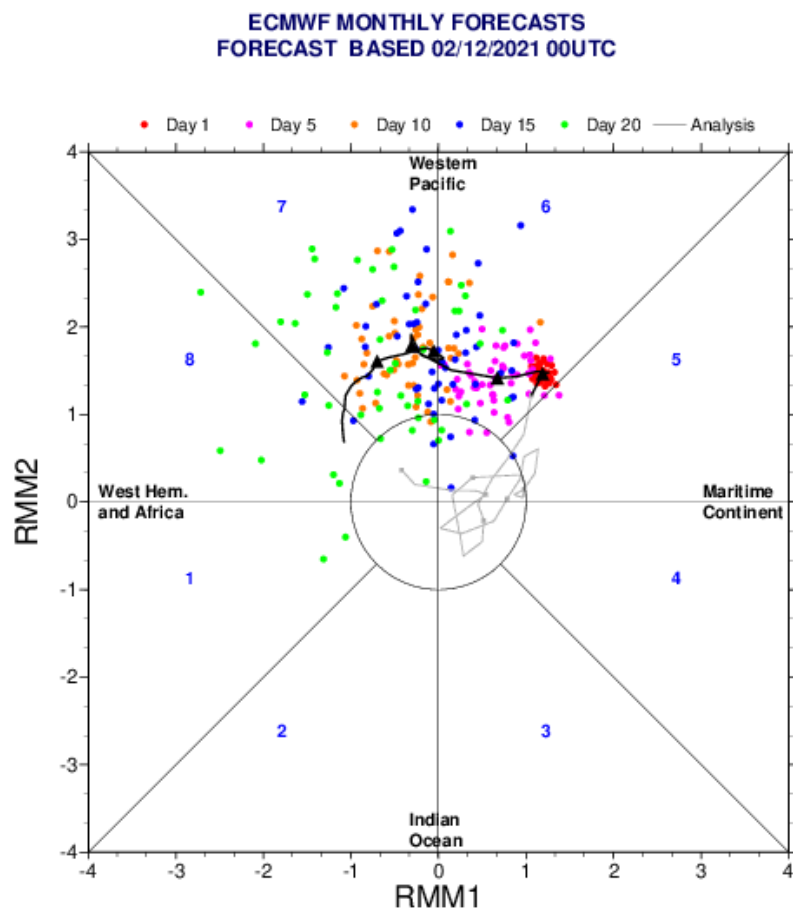


Figure 13: ECMWF MJO Forecast

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

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

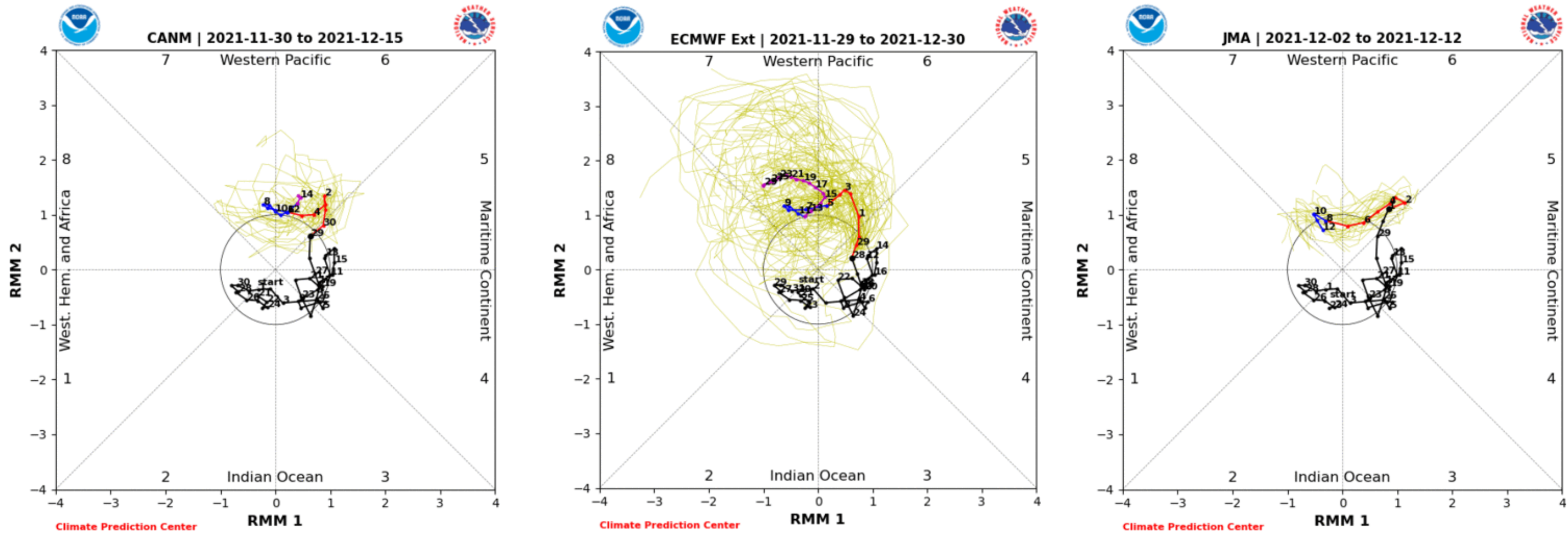


Figure 14: Forecasts for ECMWF, NCEP and UK Met Office

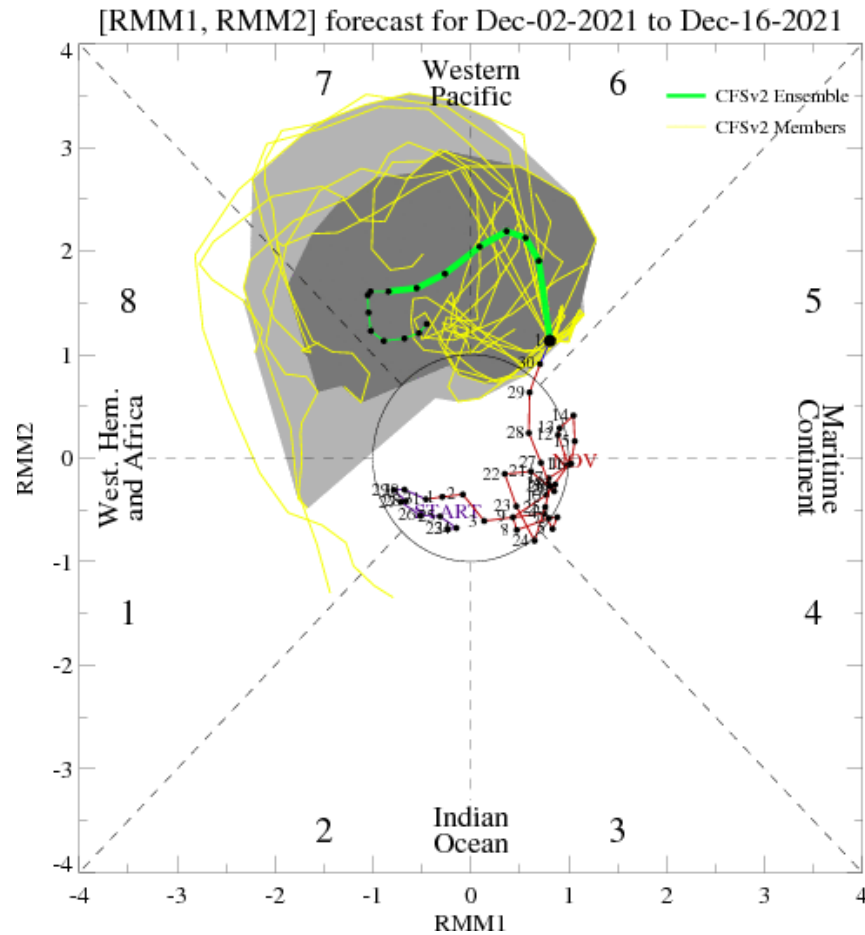
<https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/emon.shtml>

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

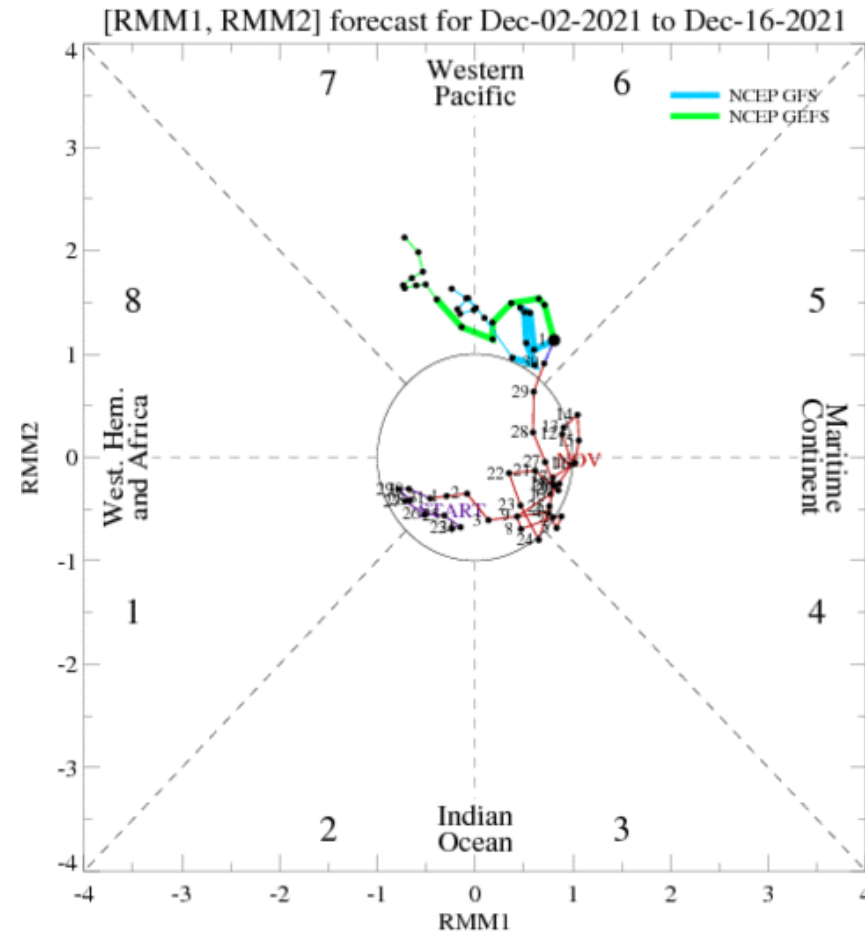
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_mjo_family_index?facets=undefined&time=2019081500,0,2019081500

MJO FORECAST

Ensemble GFS Phase Diagram



Operational GFS Phase Diagram



Statistical GFS Phase Diagram

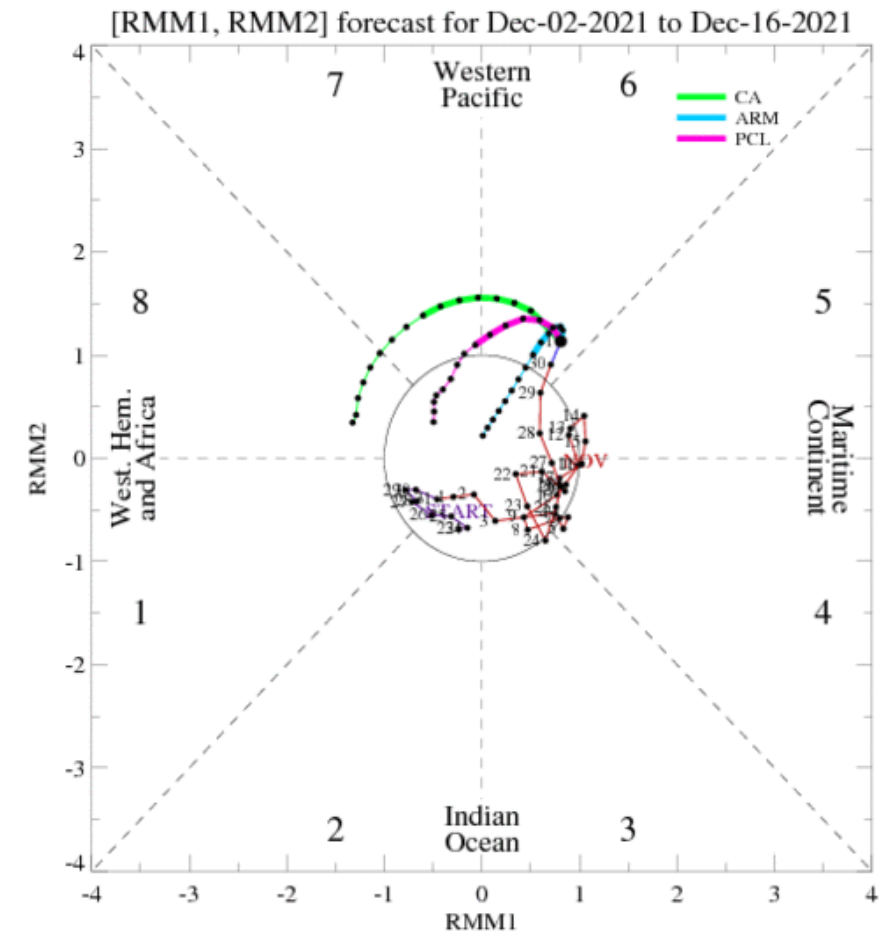


Figure 15: MJO forecast

<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

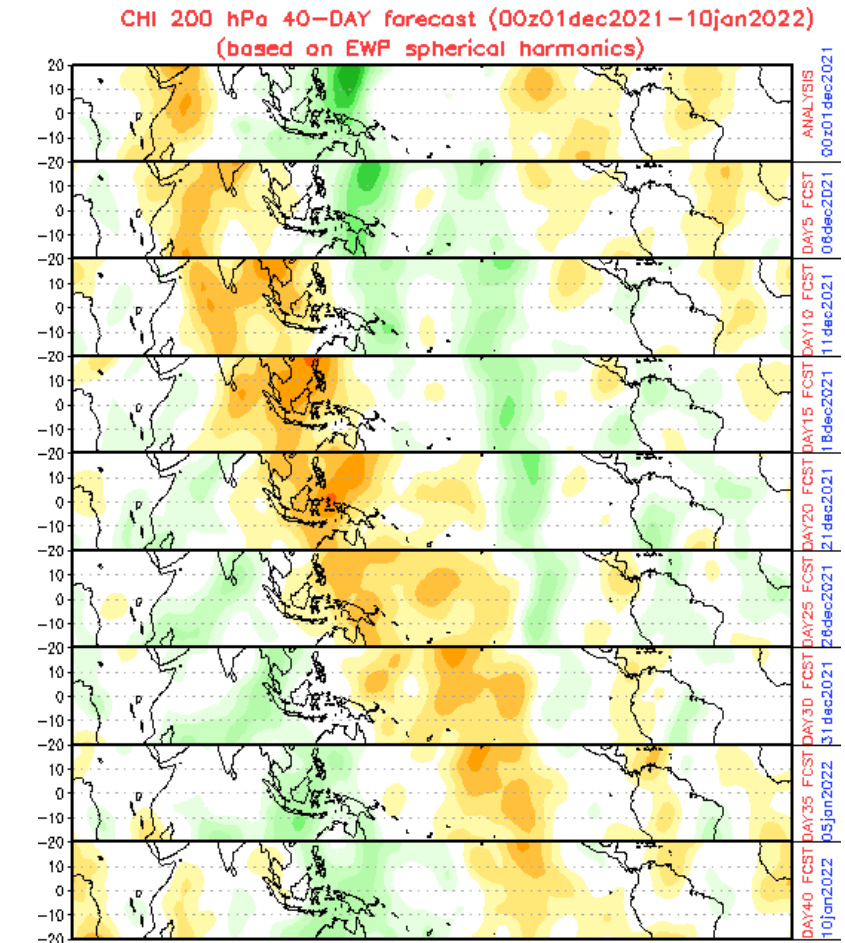
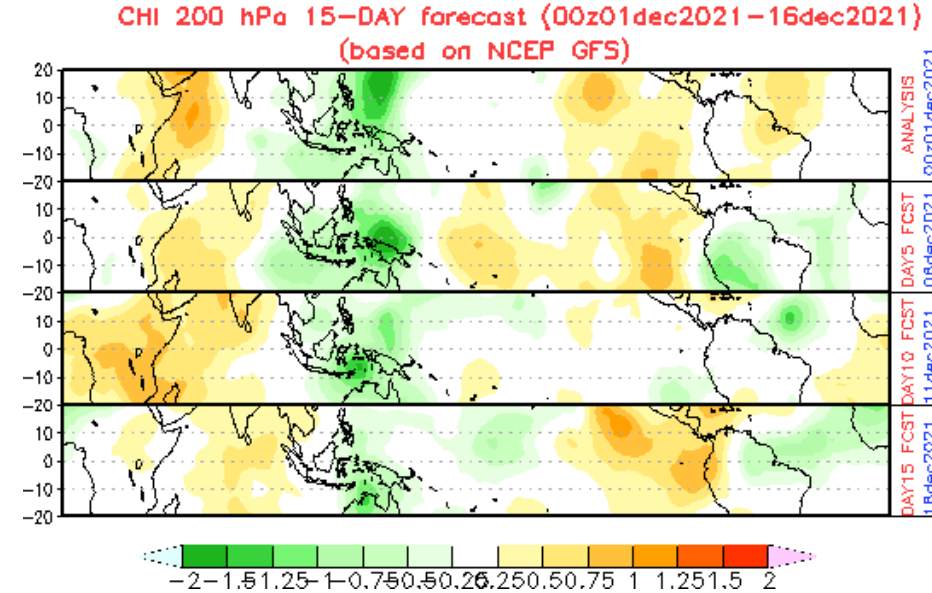
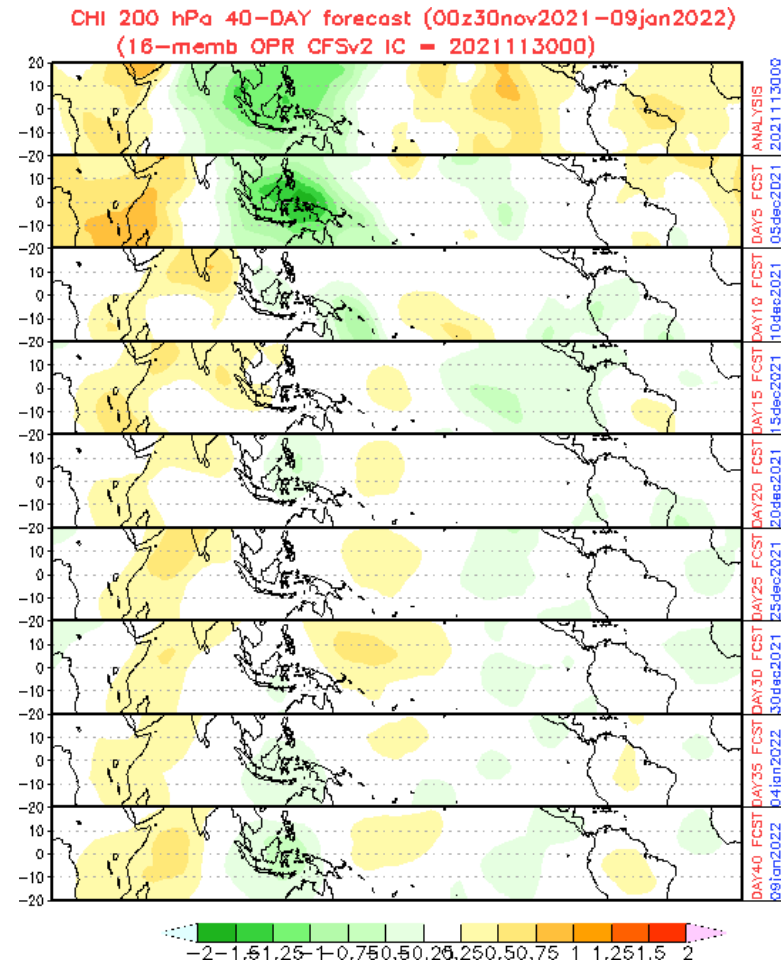


Figure 16: MJO forecast

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

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

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

Past 4 Weeks Precipitable Water and Outlooks for Africa and Globally

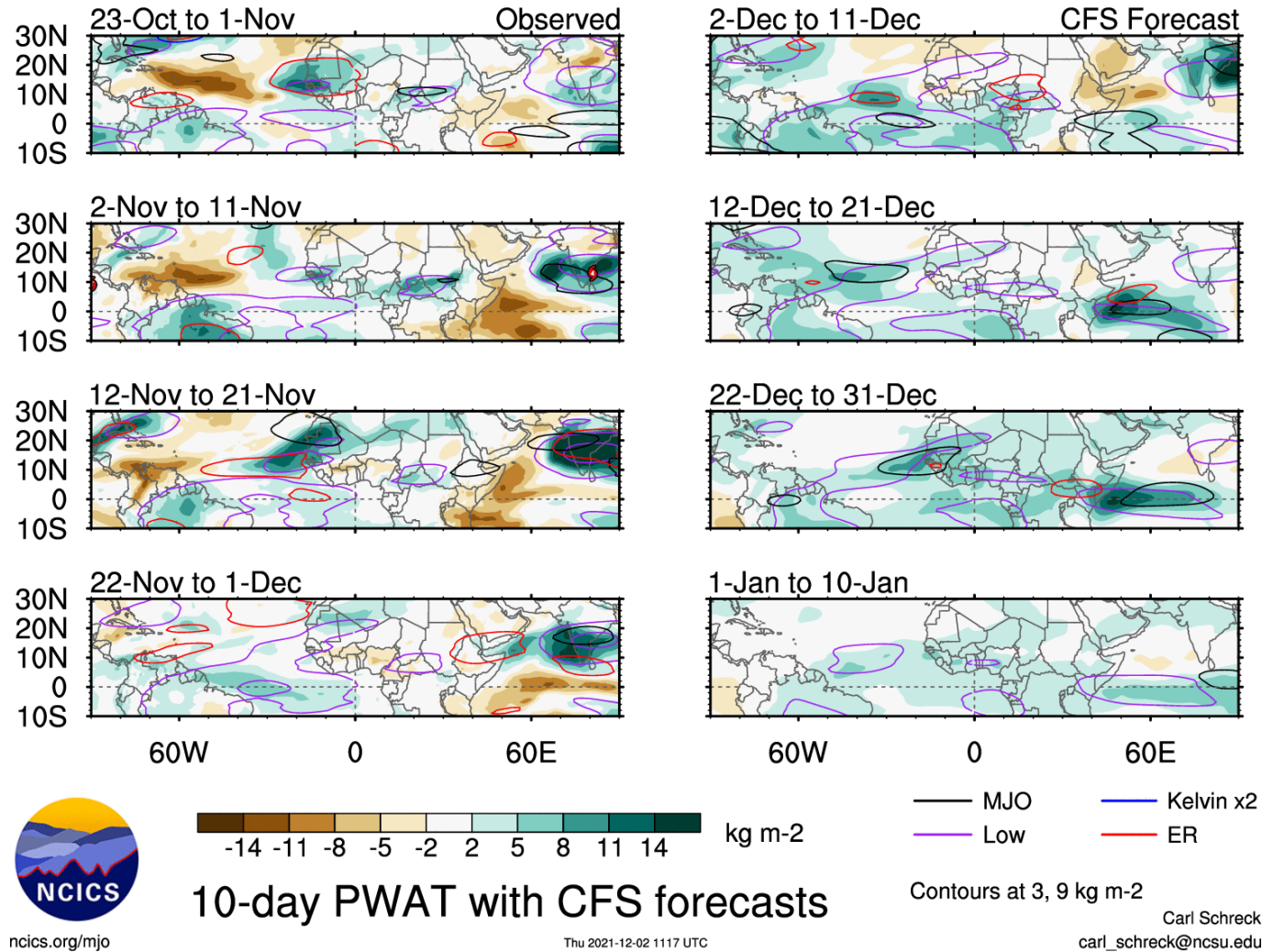


Figure 7a: Africa

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

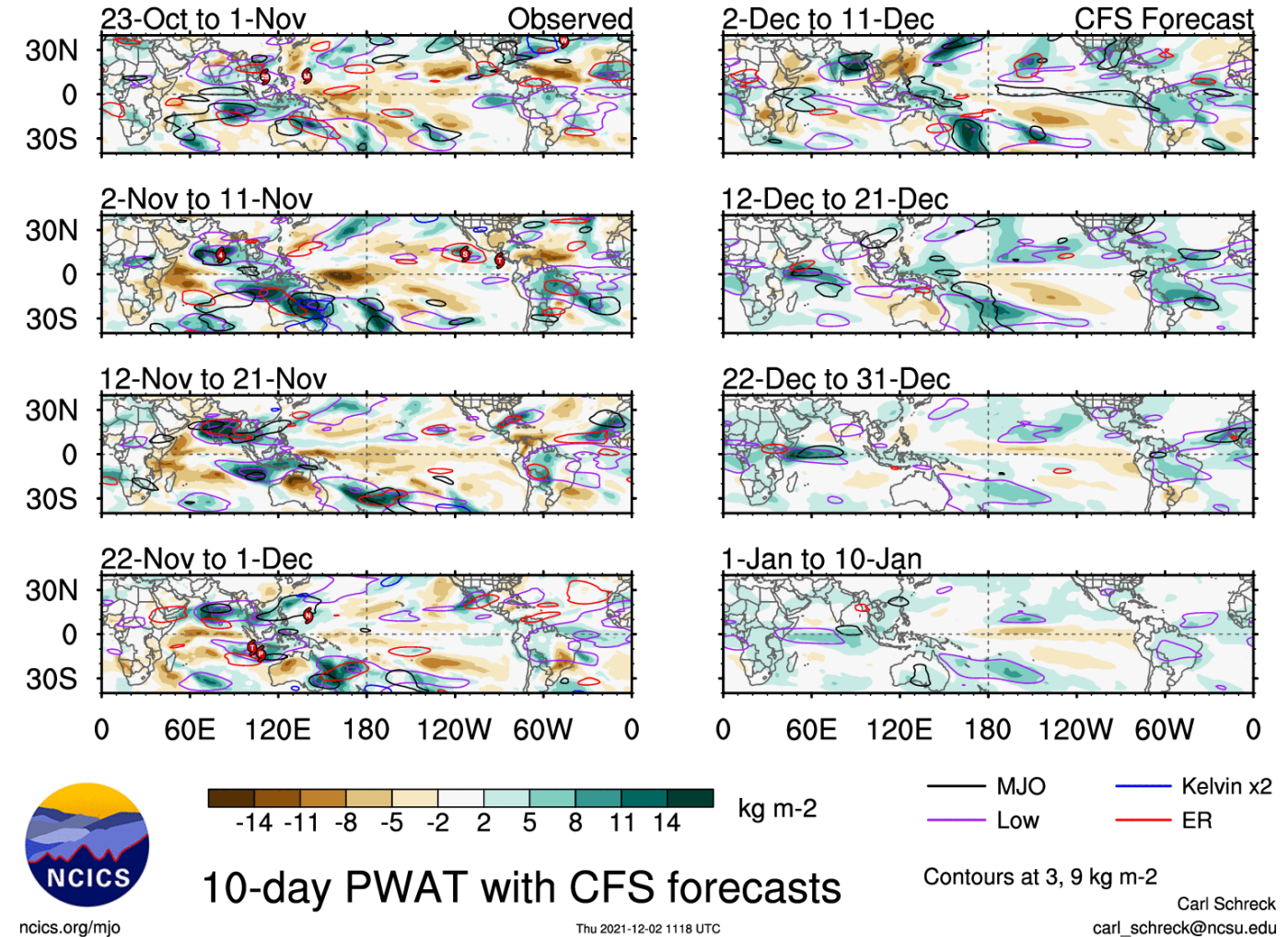


Figure 7b: Global

Figure 17: 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

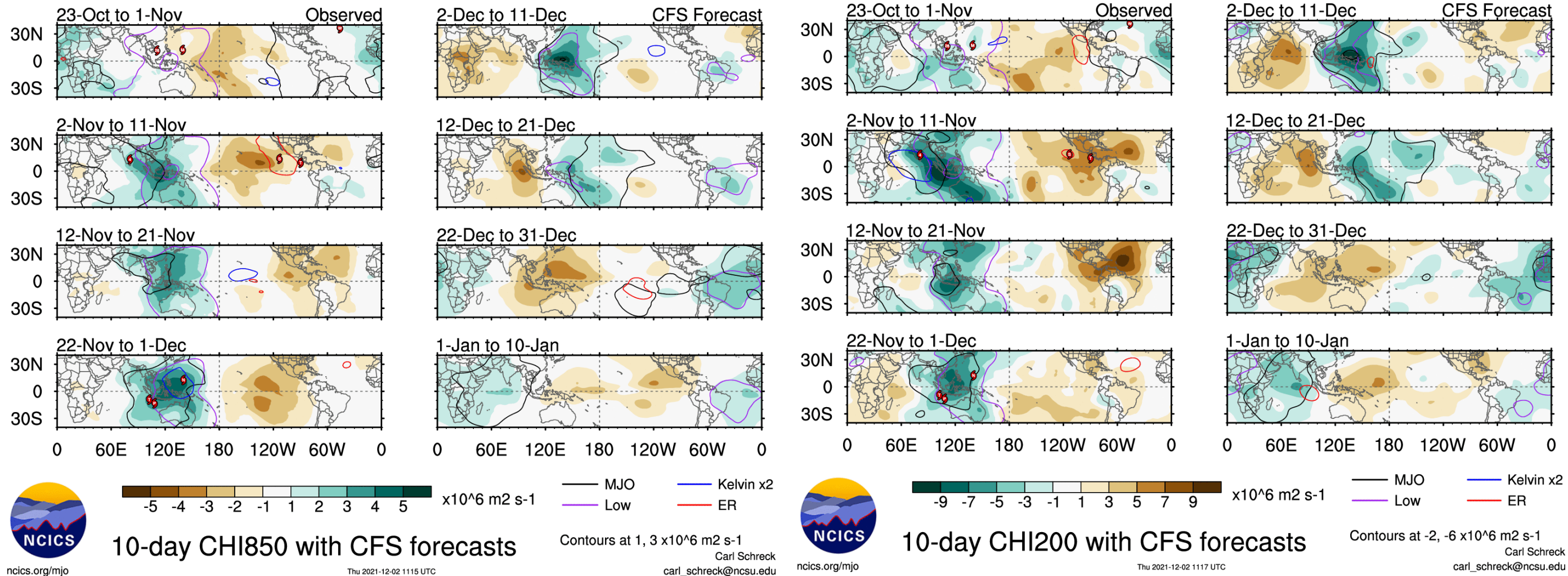


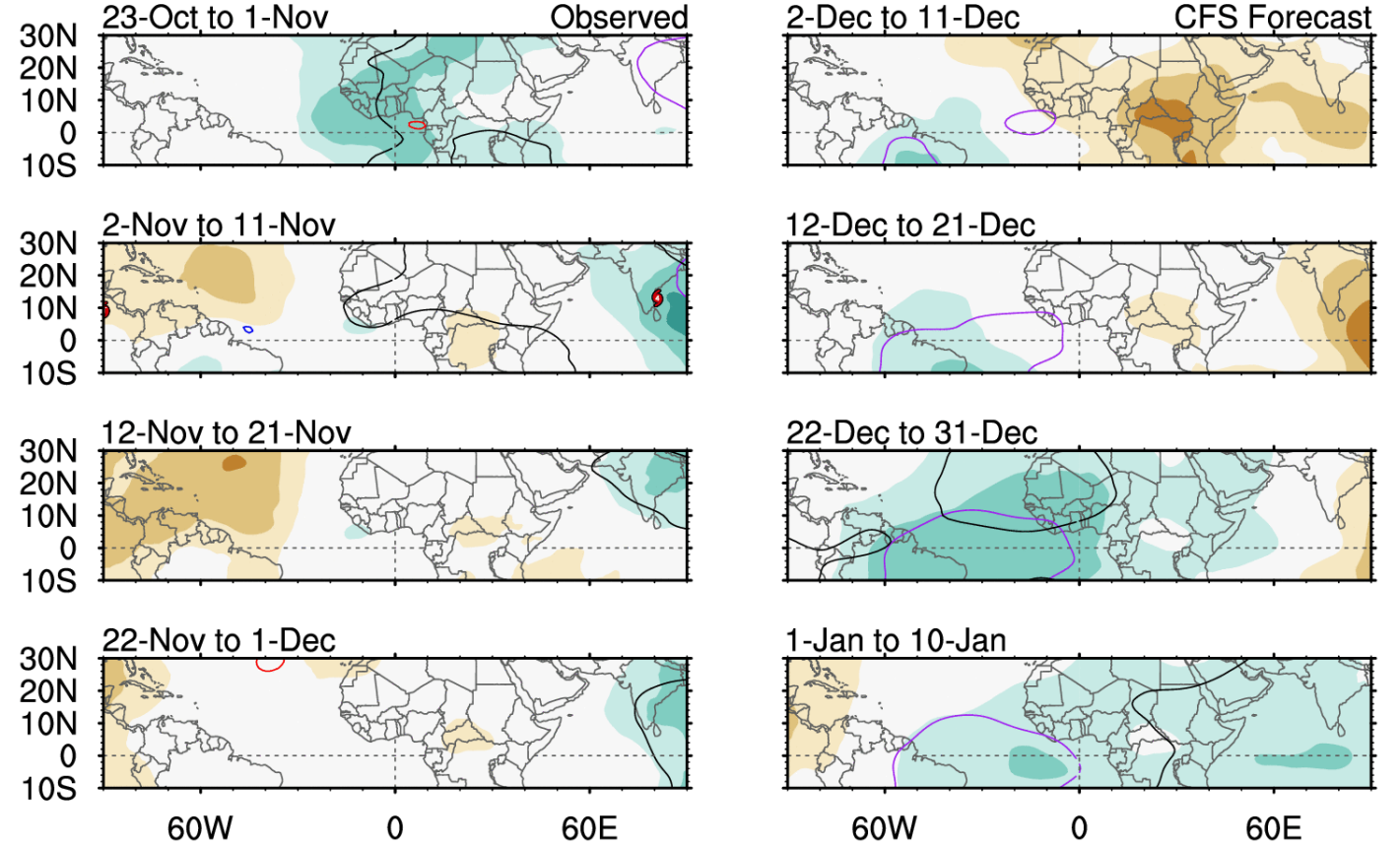
Figure 18a and b: Past four week and month velocity potential

<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



ncics.org/mjo

-5 -4 -3 -2 -1 1 2 3 4 5 $\times 10^6 \text{ m}^2 \text{ s}^{-1}$

10-day CHI850 with CFS forecasts

Thu 2021-12-02 1115 UTC

— MJO — Kelvin x2
— Low — ER

Contours at 1, 3 $\times 10^6 \text{ m}^2 \text{ s}^{-1}$

Carl Schreck
carl_schreck@ncsu.edu



ncics.org/mjo

-9 -7 -5 -3 -1 1 3 5 7 9 $\times 10^6 \text{ m}^2 \text{ s}^{-1}$

10-day CHI200 with CFS forecasts

Thu 2021-12-02 1116 UTC

— MJO — Kelvin x2
— Low — ER

Contours at -2, -6 $\times 10^6 \text{ m}^2 \text{ s}^{-1}$

Carl Schreck
carl_schreck@ncsu.edu

<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 19a and b: Past four week and month velocity potential

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

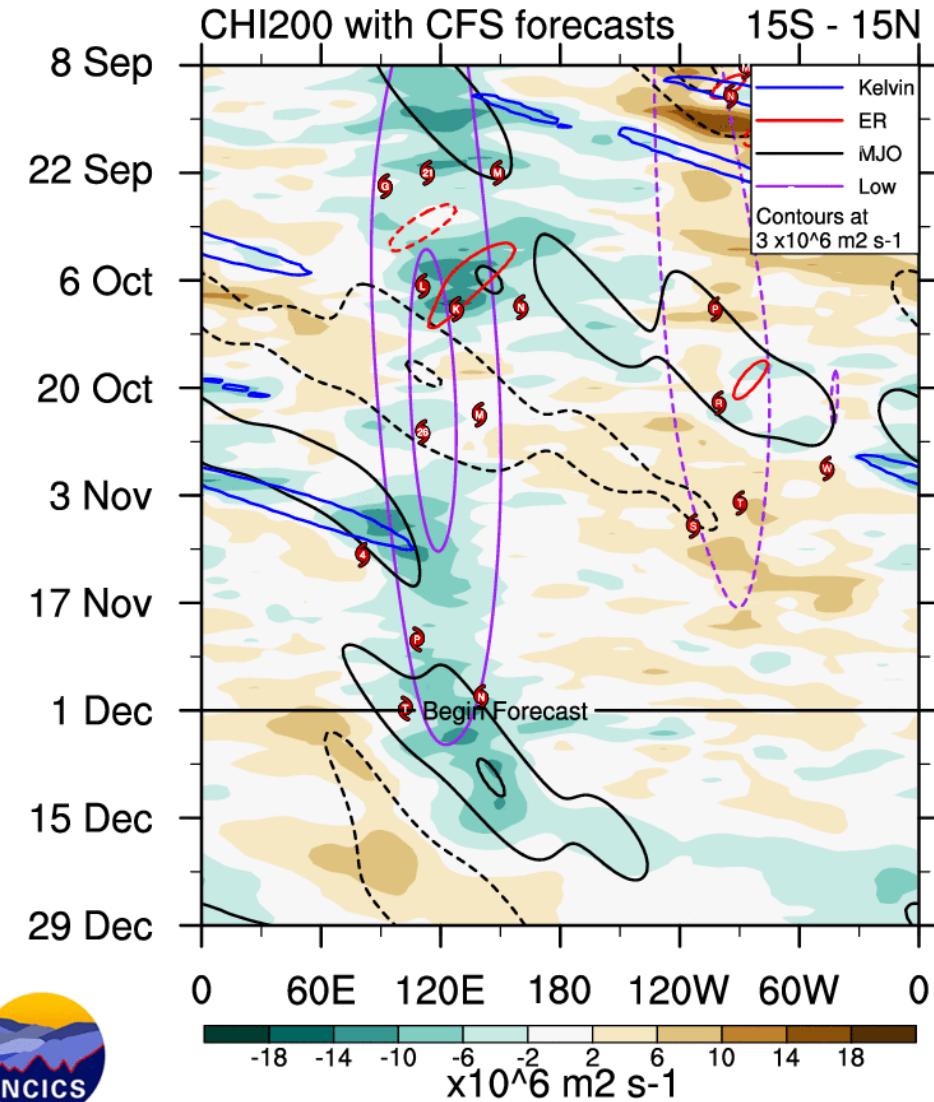
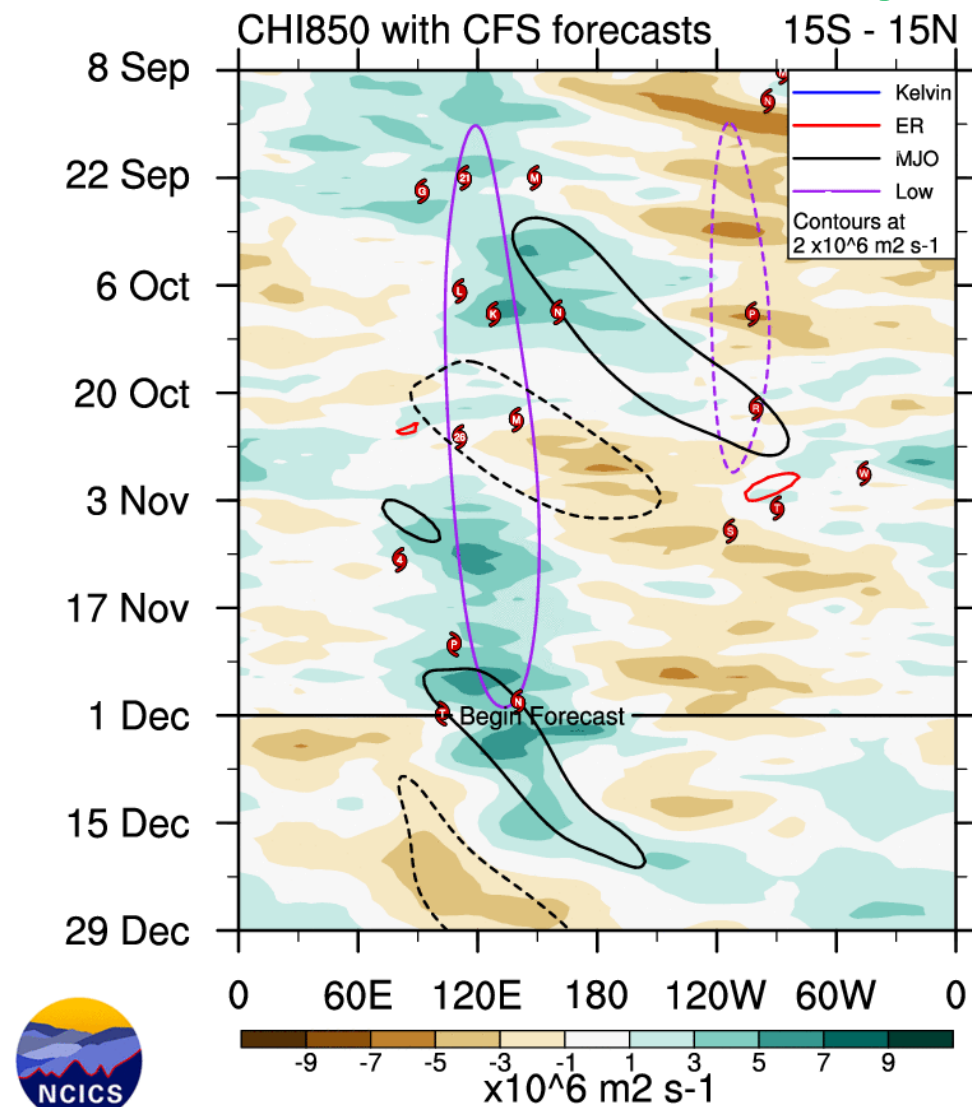
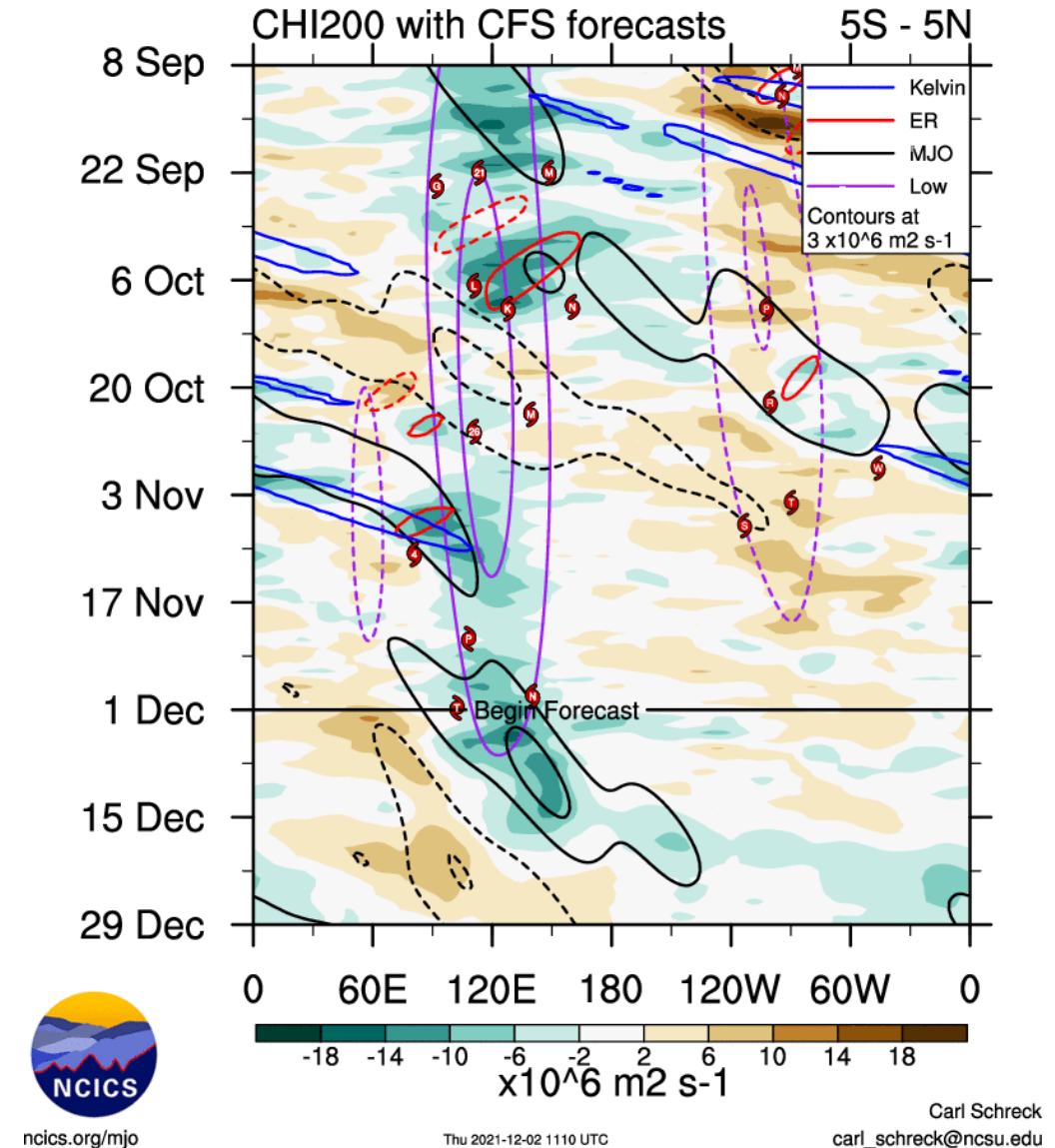
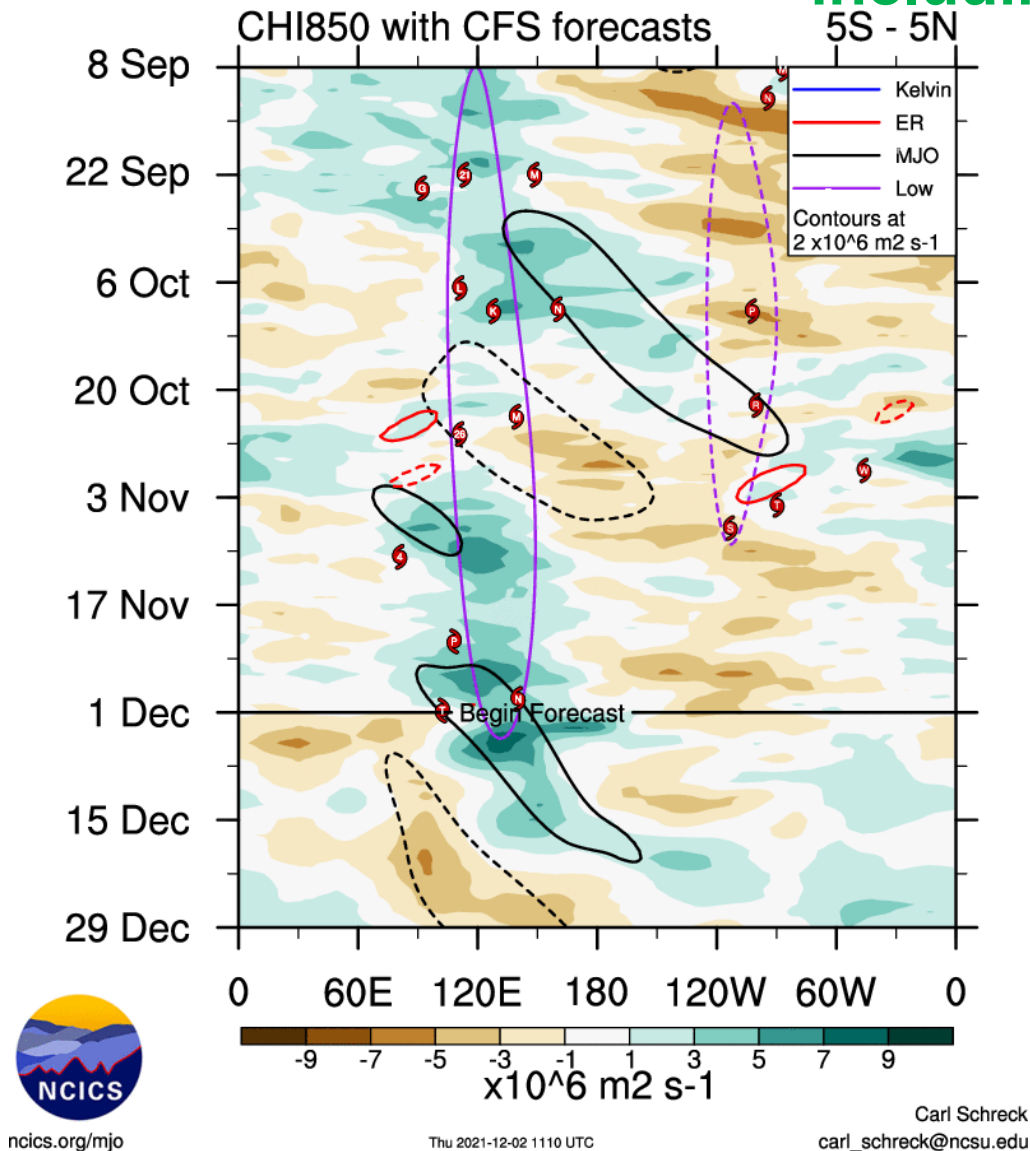


Figure 20: Anomalies for 15n-15s with waves overlay including outlooks

<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

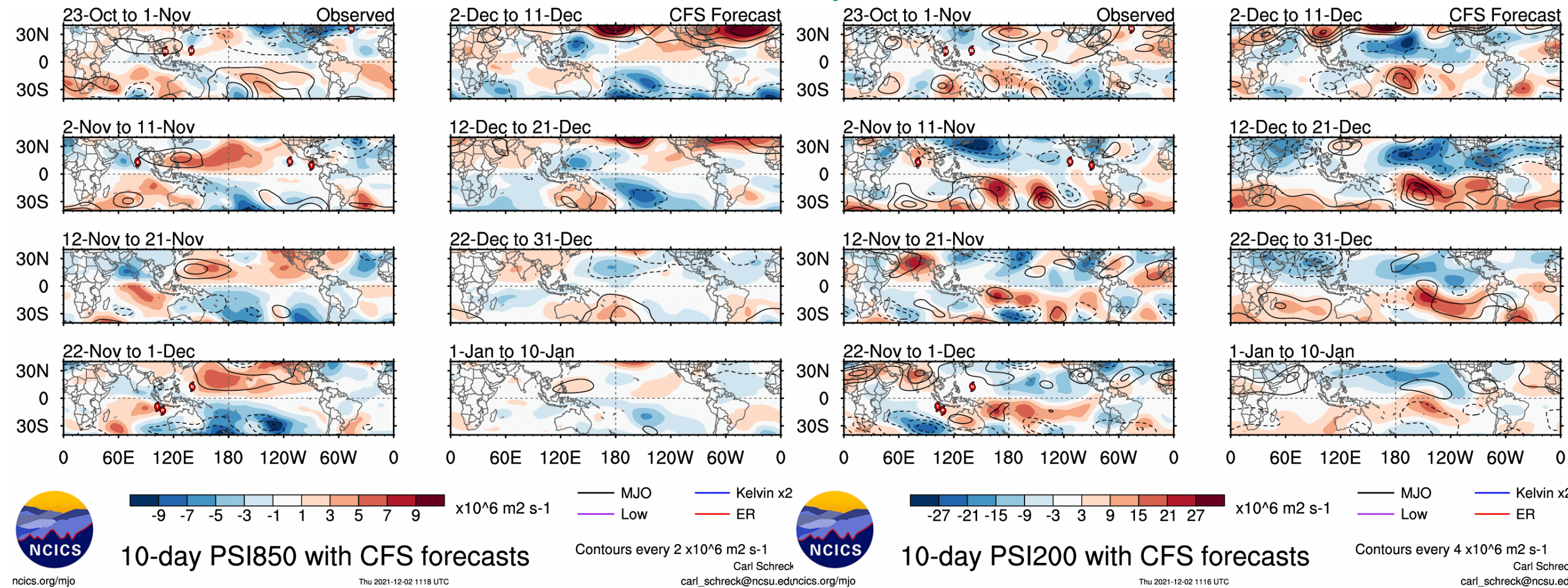


<https://ncics.org/pub/mjo/v2/hov/chi850.cfs.eqtr.png>

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

Figure 21: Anomalies for 5N-5S with waves overlay including outlooks

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/psi850.cfs.mjo.global.10.png>

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

Figure 22: 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

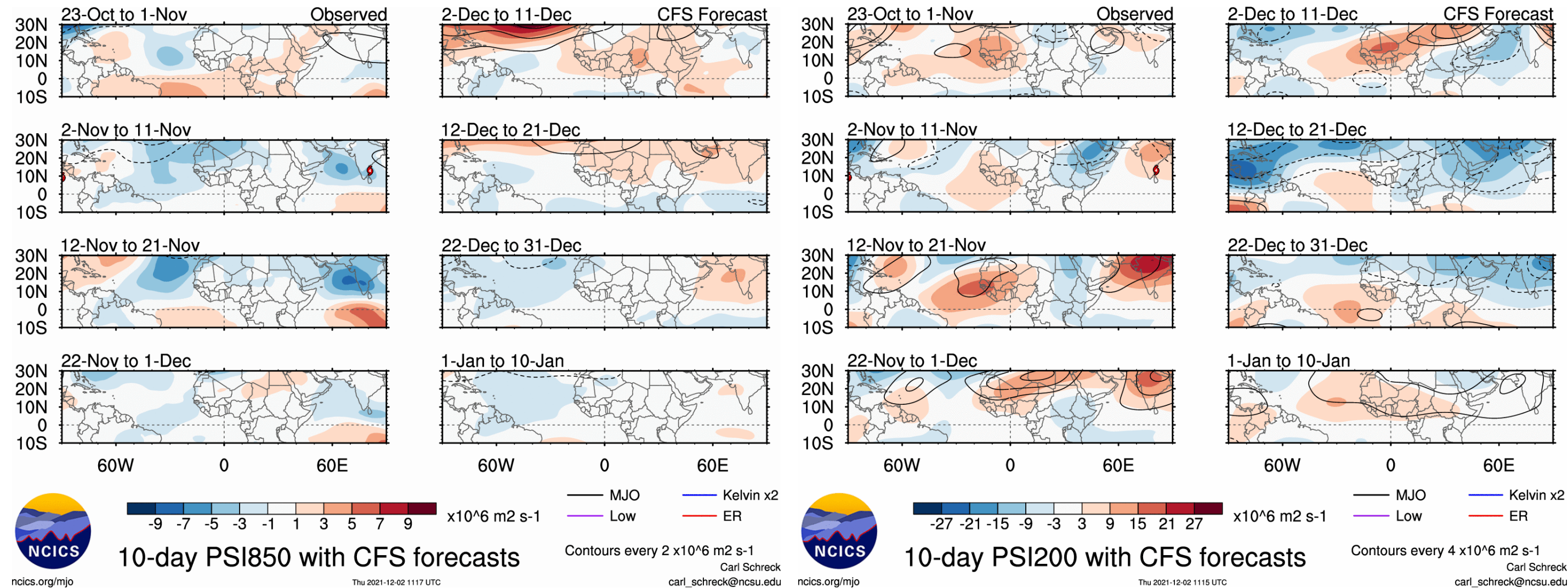


Figure 23: Past 4 weeks stream function anomalies with MJO, Kelvin & Rossby wave on Africa maps

<https://ncics.org/pub/mjo/v2/map/psi850.cfs.mjo.africa.10.png>

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

1. Monitoring Climate Element
2. Global Driver Review and Assessment
3. Model Guidance for Weekly Climate outlook

Wind Anomaly and Divergence Forecast from GFS week1

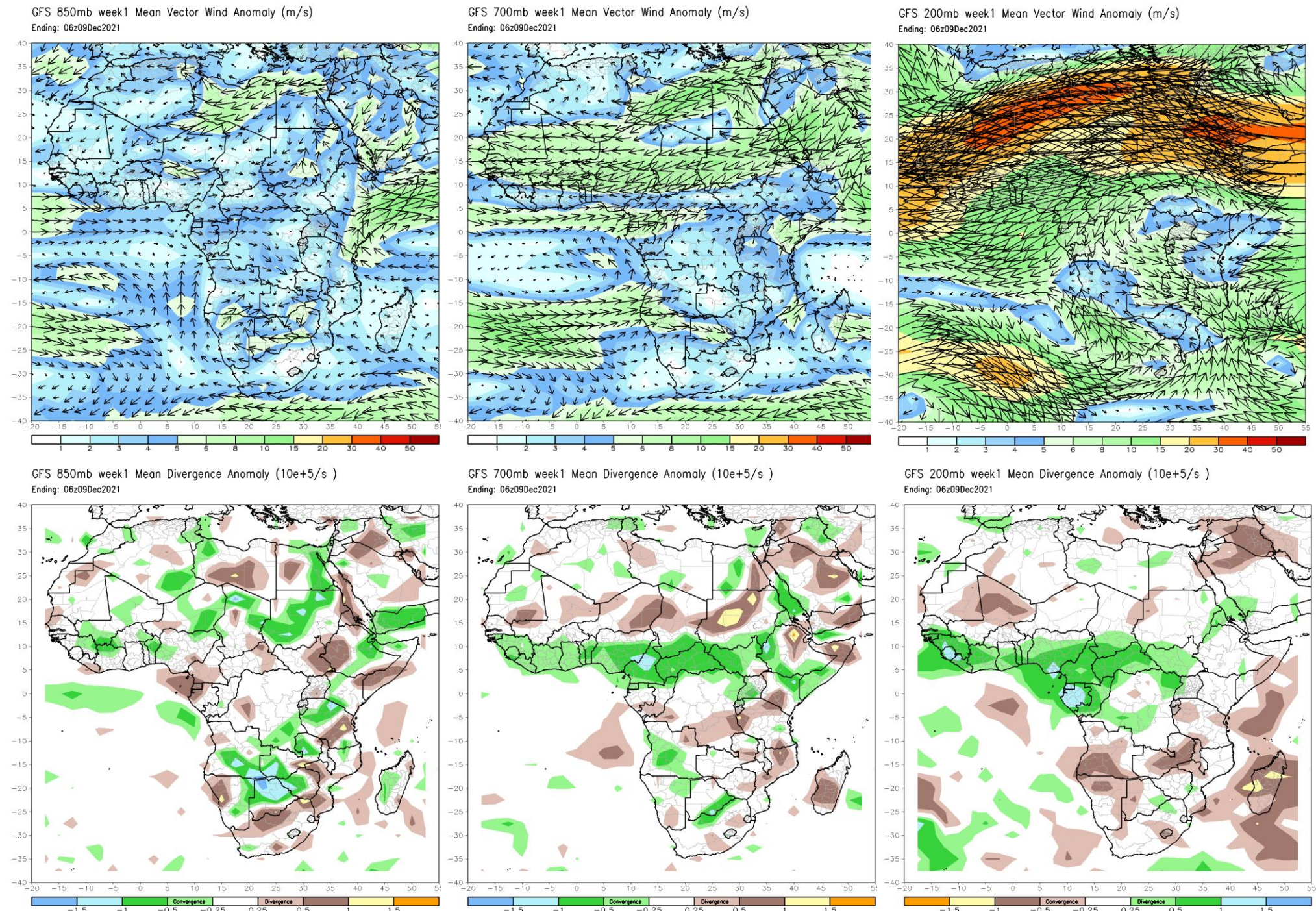


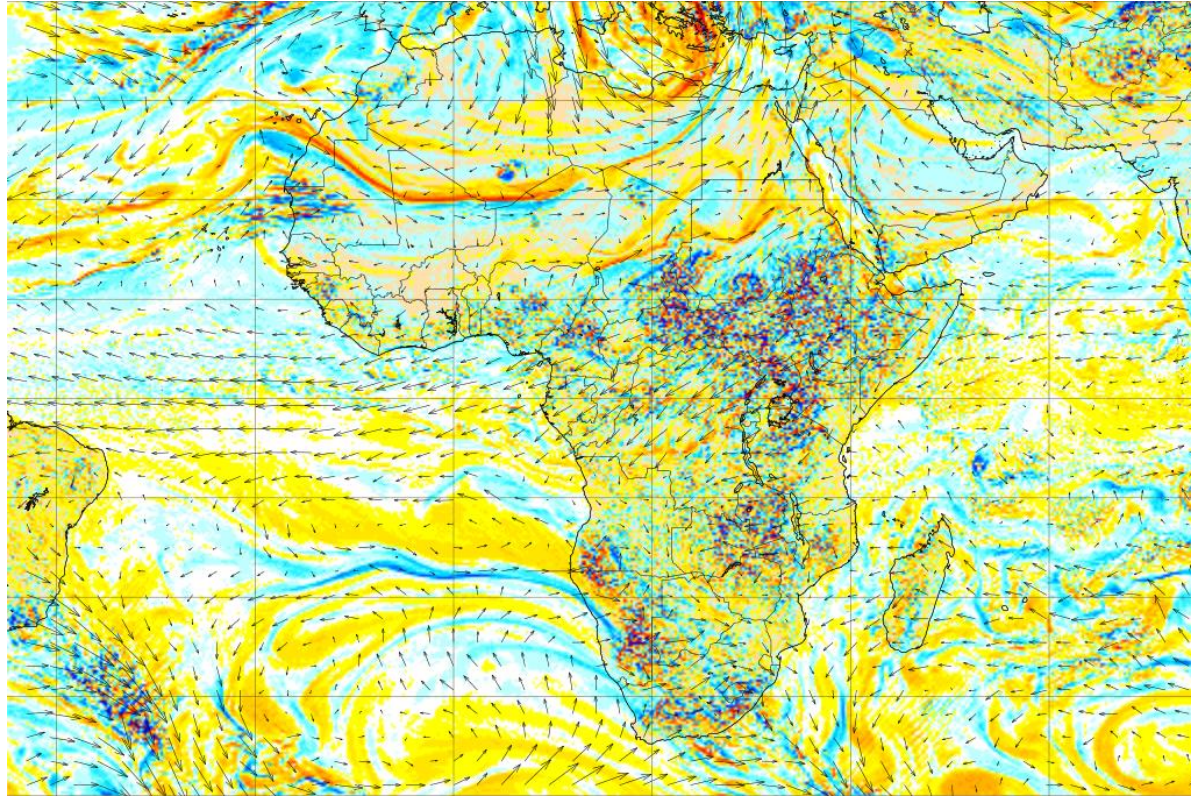
Figure 24 : Forecast from GFS

<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

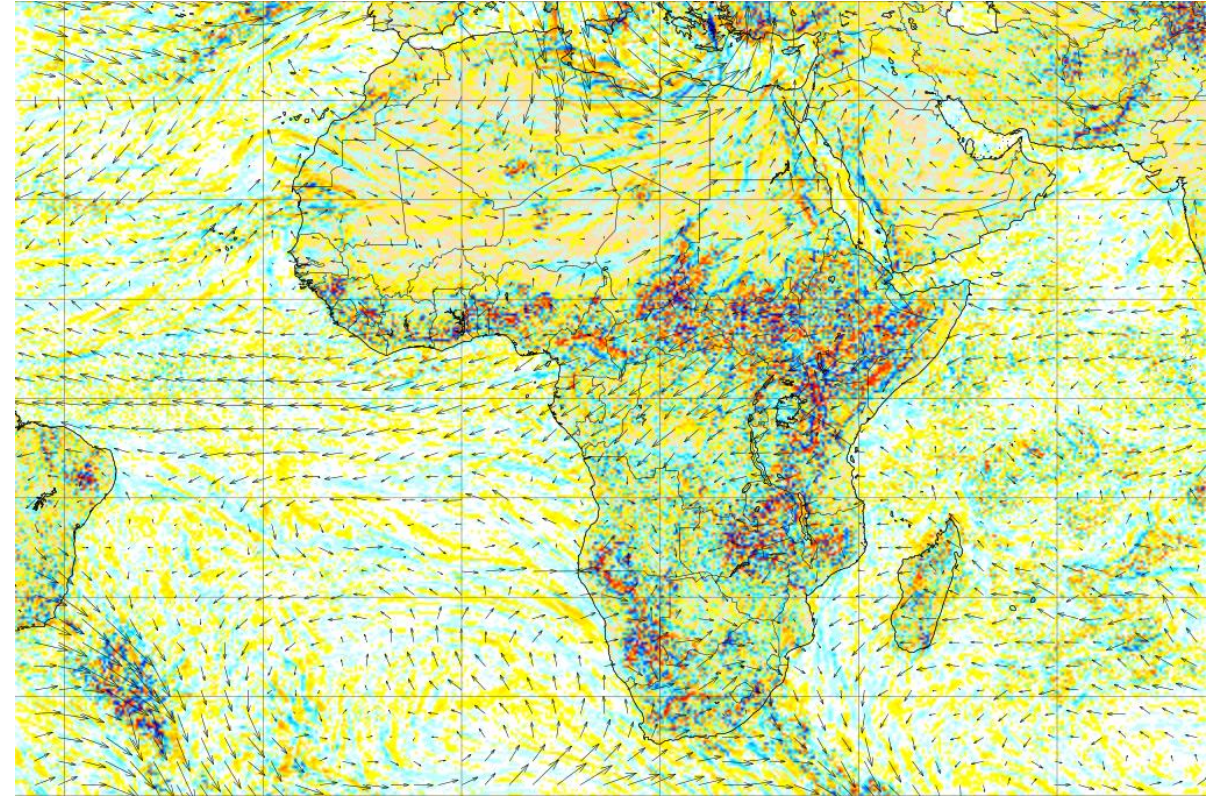
Relative vorticity at 700 hPa / Wind at 700 hPa

Friday 3 Dec, 00 UTC T+234 Valid: Sunday 12 Dec, 18 UTC



Divergence at 700 hPa / Wind at 700 hPa

Friday 3 Dec, 00 UTC T+234 Valid: Sunday 12 Dec, 18 UTC



Black wind arrows

Wind



Relative vorticity

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

African Precipitation NCEP/GFS Bias-Corrected Precipitation and Anomaly Forecasts for week 1

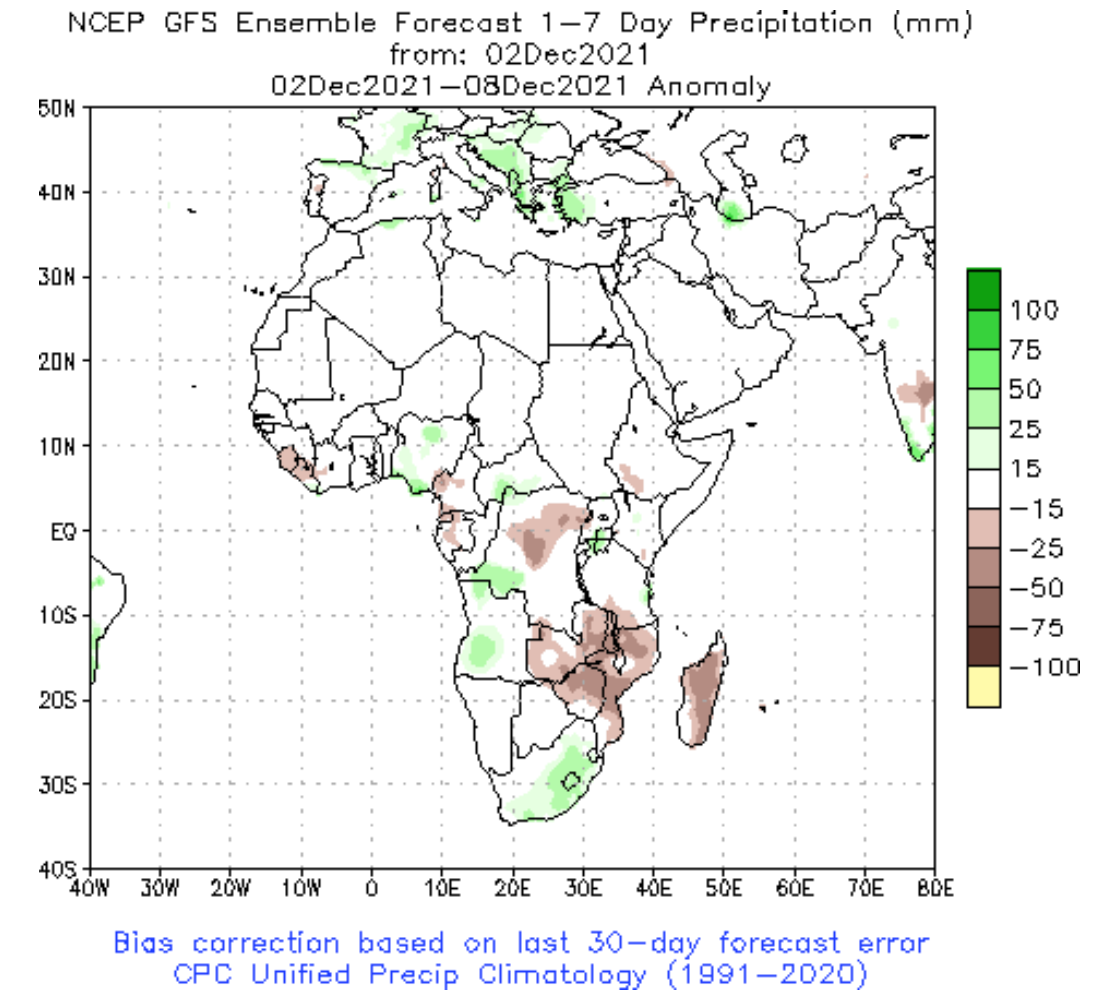
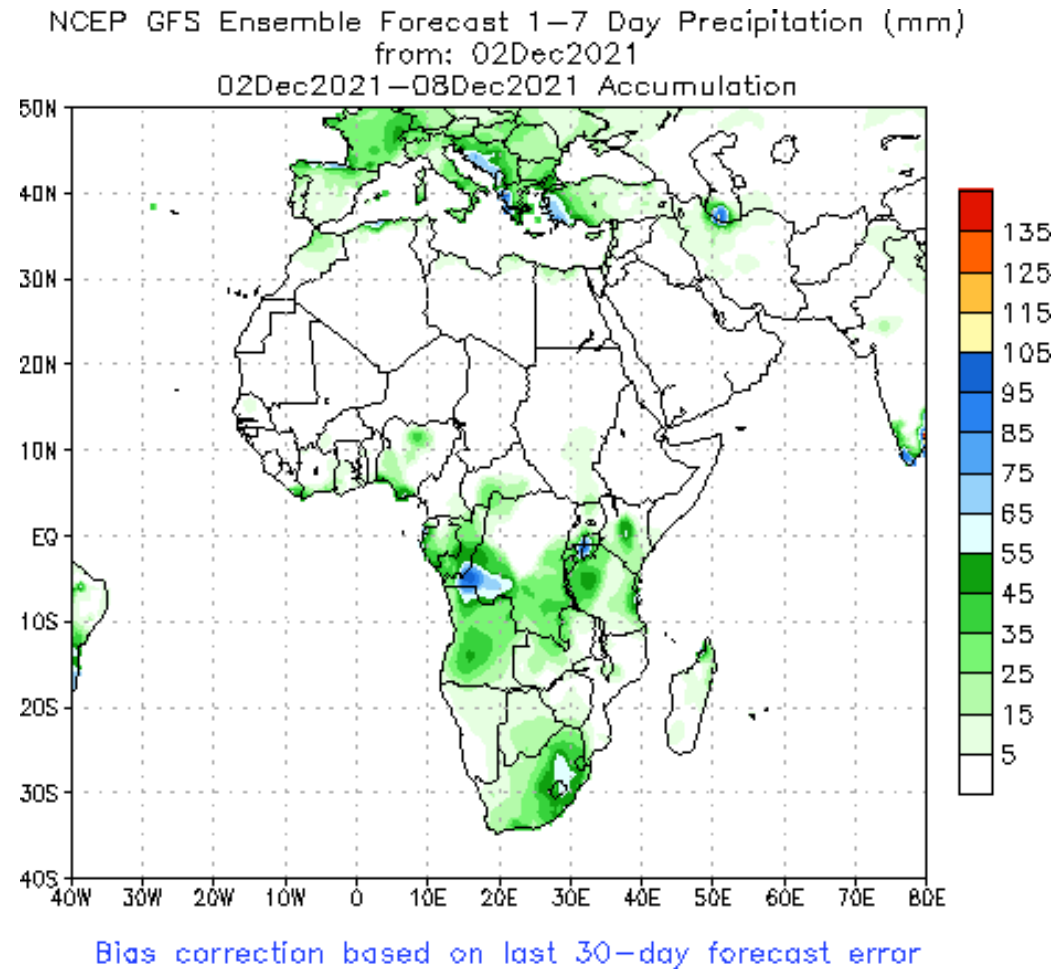


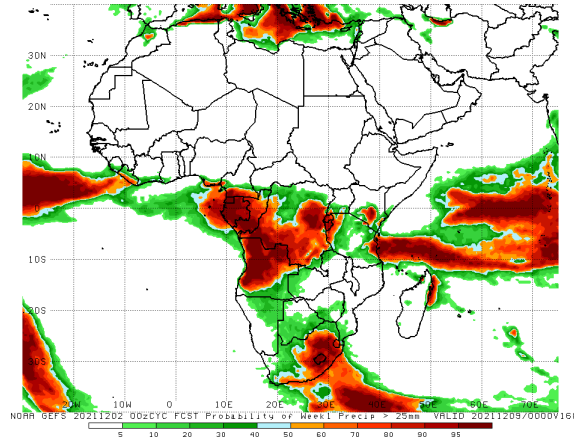
Figure 26: NCEP/GFS Précipitation and Anomaly forecast.

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

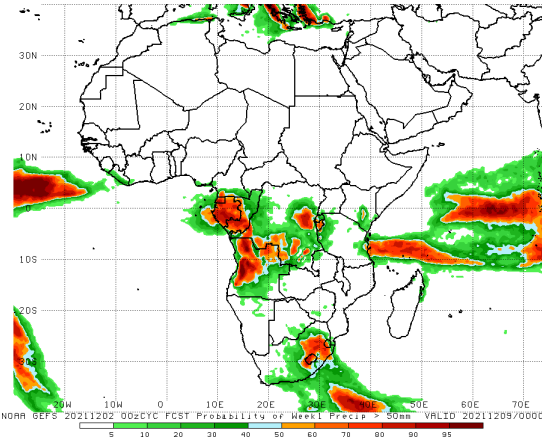
http://www.cpc.ncep.noaa.gov/products/people/wwang/gfs_precip/gfs_wk1.gif

Probability of week-1 precip
> 25 (left), 50mm (middle)
and, 100mm (right)
3rd – 9th Dec 2021

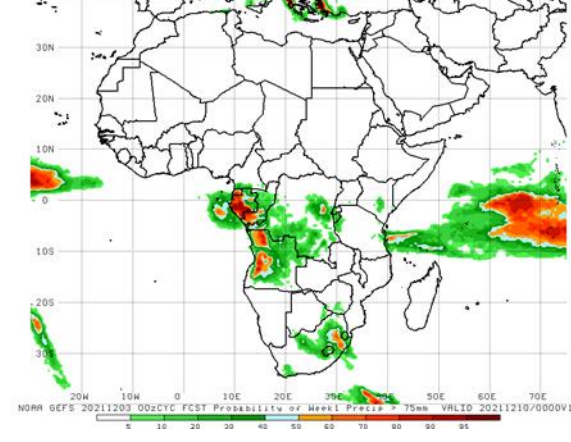
Precip > 25mm



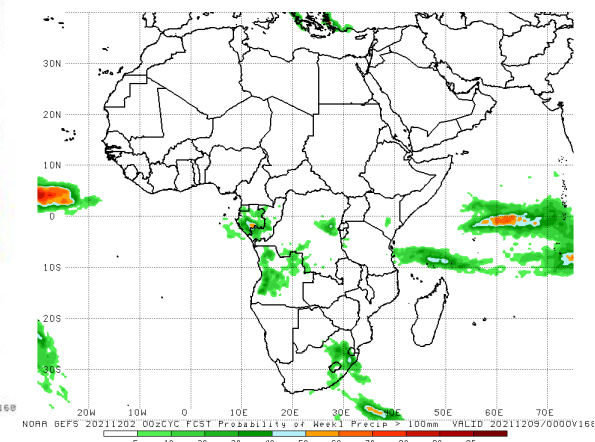
Precip > 50mm



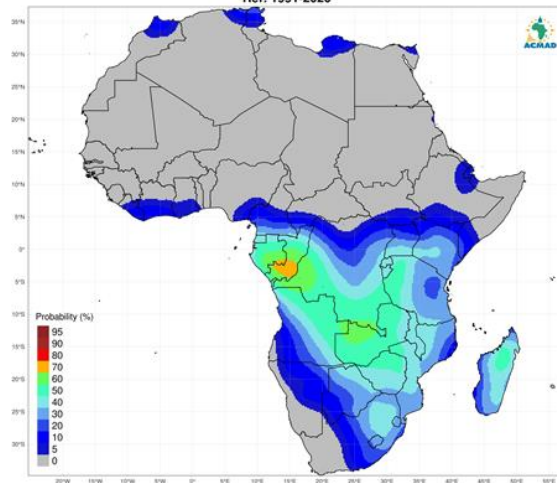
Precip > 75mm



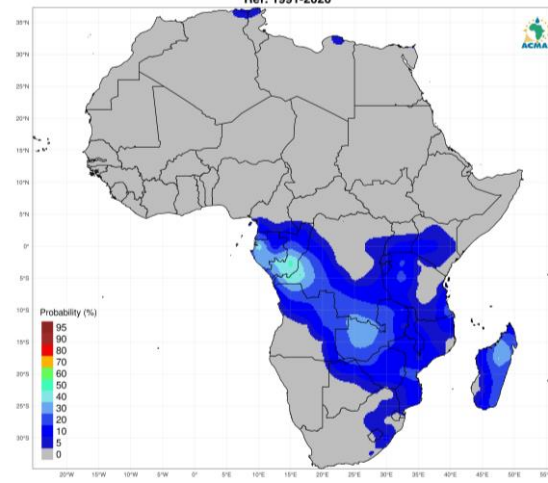
Precip>=100mm



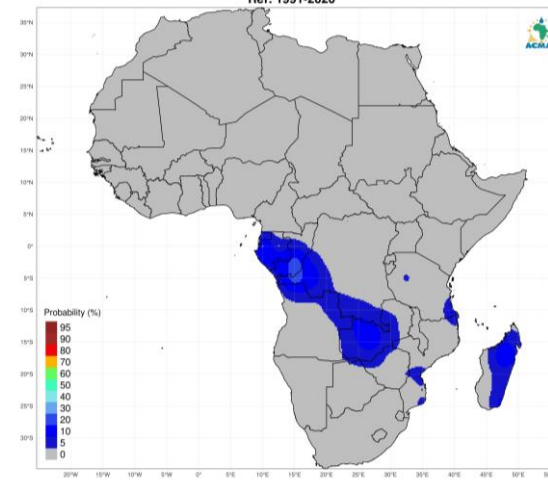
CPC-Uni Probability of Cumulative Rainfall Exceeding 25 mm
Period: 03-Dec to 09-Dec
Ref: 1991-2020



CPC-Uni Probability of Cumulative Rainfall Exceeding 50 mm
Period: 03-Dec to 09-Dec
Ref: 1991-2020



CPC-Uni Probability of Cumulative Rainfall Exceeding 75 mm
Period: 03-Dec to 09-Dec
Ref: 1991-2020



CPC-Uni Probability of Cumulative Rainfall Exceeding 100 mm
Period: 03-Dec to 09-Dec
Ref: 1991-2020

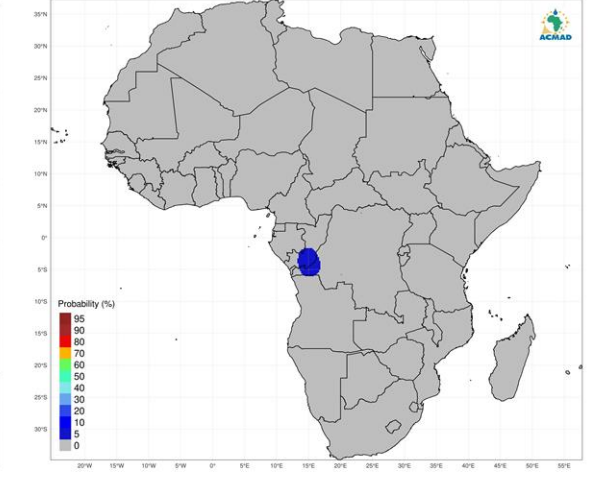


Figure 27: Week1 Precipitation Total Exceedance Probabilities

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk1_precip25mm_prob_africa.html

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk1_precip50mm_prob_africa.html

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk1_precip75mm_prob_africa.html

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk1_precip100mm_prob_africa.html

http://154.66.220.45:8080/thredds/catalog/ACMAD/CDD/climatemonitoringservice/Probability_of_Exceedance/Weekly/Current/catalog.html

Precipitation Anomaly Forecasts from ECMWF for week 1

ECMWF EPS-Monthly Forecasting System

Precipitation anomaly

Forecast start reference is 02-12-2021
ensemble size = 51 , climate size = 660

Day 5-11

06-12-2021/TO/12-12-2021

Shaded areas significant at 10% level
Contours at 1% level

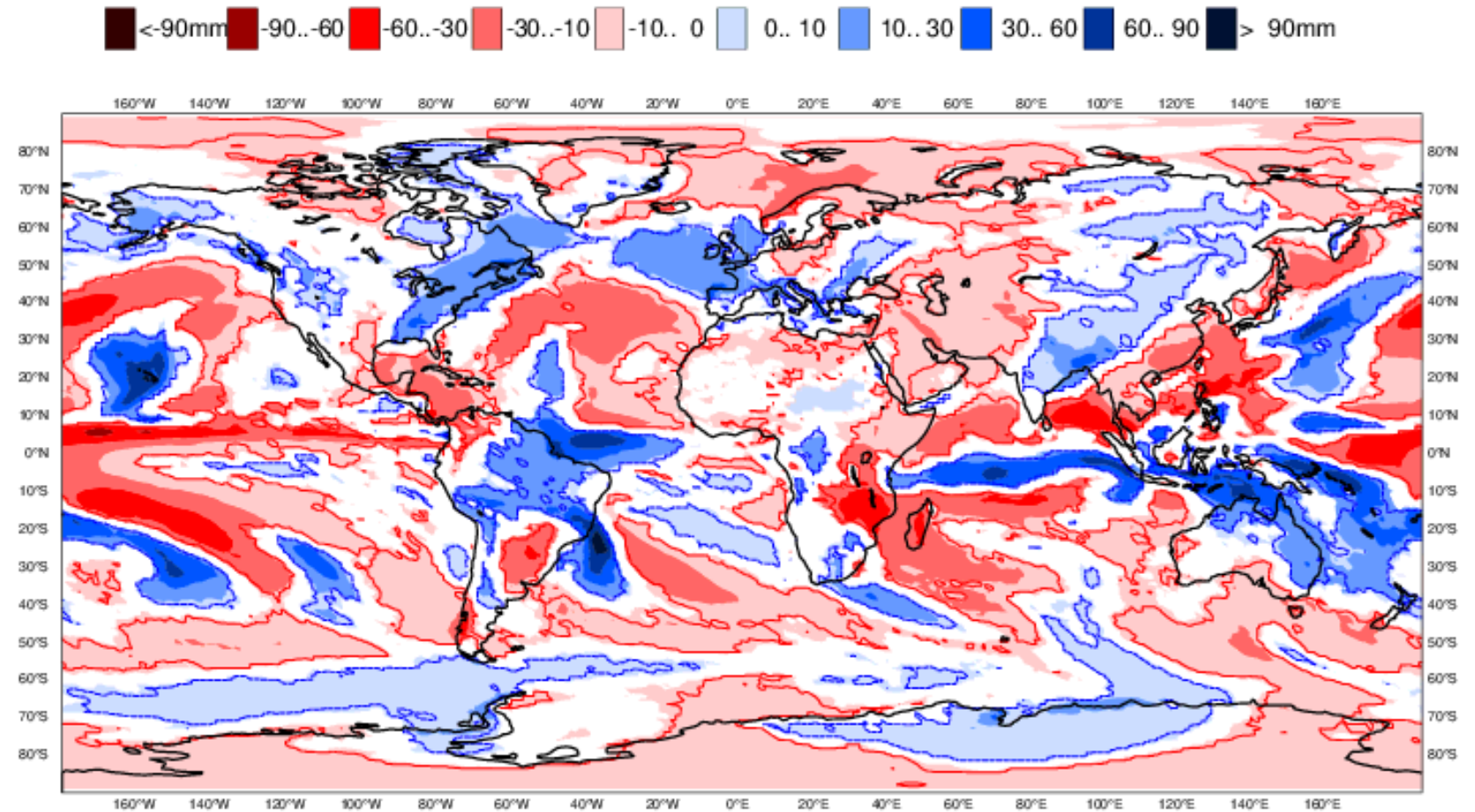


Figure 28: Monthly Precipitation Anomaly forecast from ECMWF

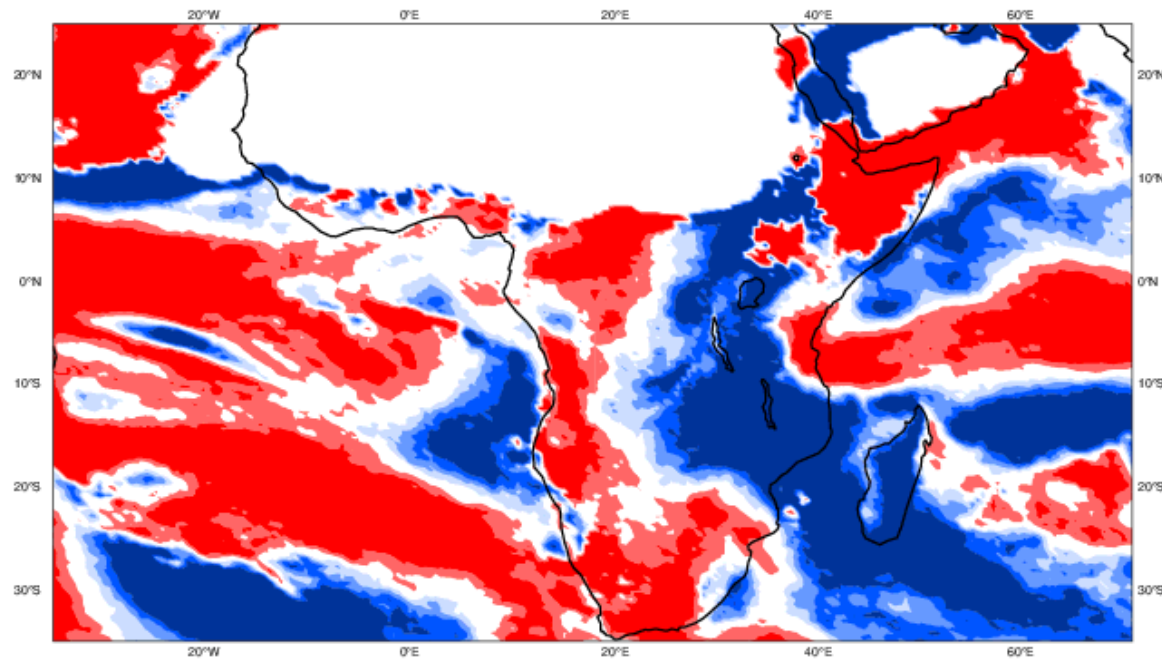
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_anomaly?facets=undefined&time=2019081500,408,2019090100¶meter=precipitation&area=Global

Probability Precipitation Forecasts from ECMWF for week 1 : weekly tercile at below 33% and above 66%

ECMWF EPS-Monthly Forecasting System
(Prob Precip. anom below 33%)
Forecast start reference is 02-12-2021
ensemble size = 51 , climate size = 660

Day 5-11
06-12-2021/TO/12-12-2021

< 10% 10..20 20..40 40..50 50..60 60..70 > 70%



ECMWF EPS-Monthly Forecasting System
(Prob Precip. anom above 66%)
Forecast start reference is 02-12-2021
ensemble size = 51 , climate size = 660

Day 5-11
06-12-2021/TO/12-12-2021

< 10% 10..20 20..40 40..50 50..60 60..70 > 70%

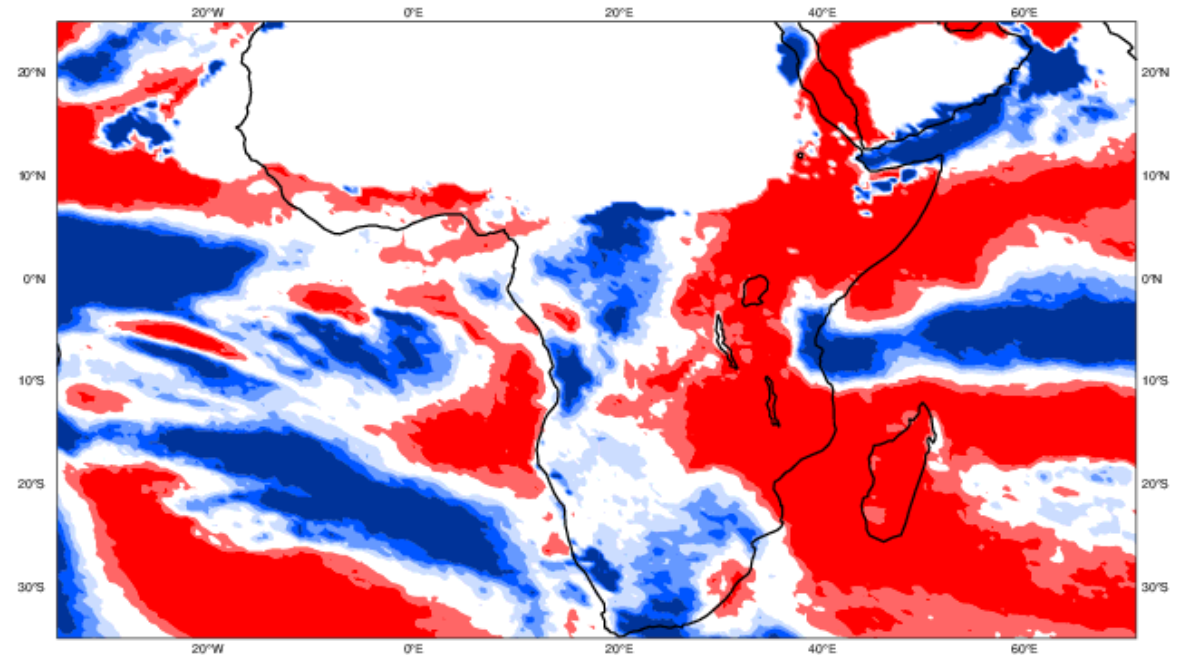


Figure 29: Weekly tercile probability forecast below 33%

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_tercile?facets=undefined&time=2021110100,312,2021111400¶meter=precipitation&tercile=1&area=Africa

Wind Anomaly and Divergence Forecast from GFS week2

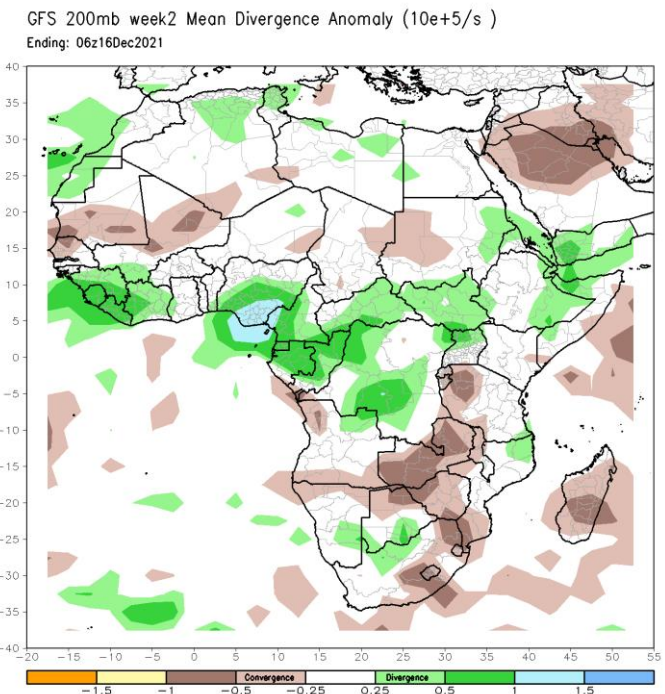
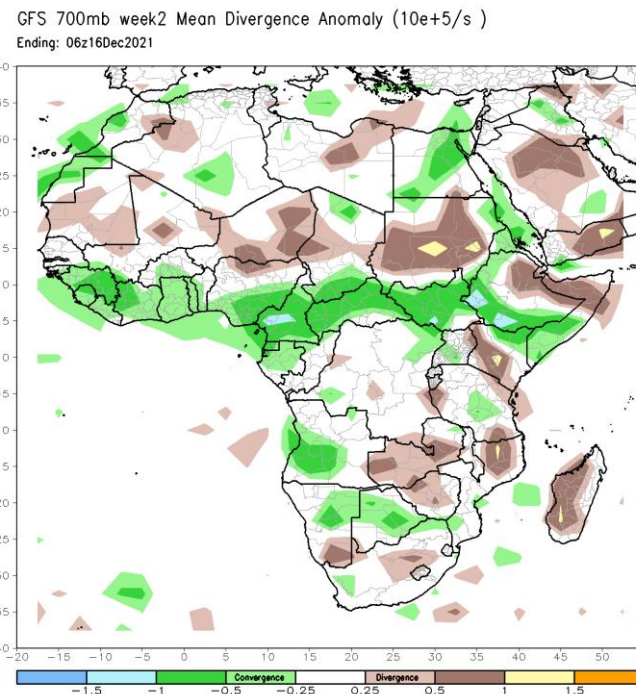
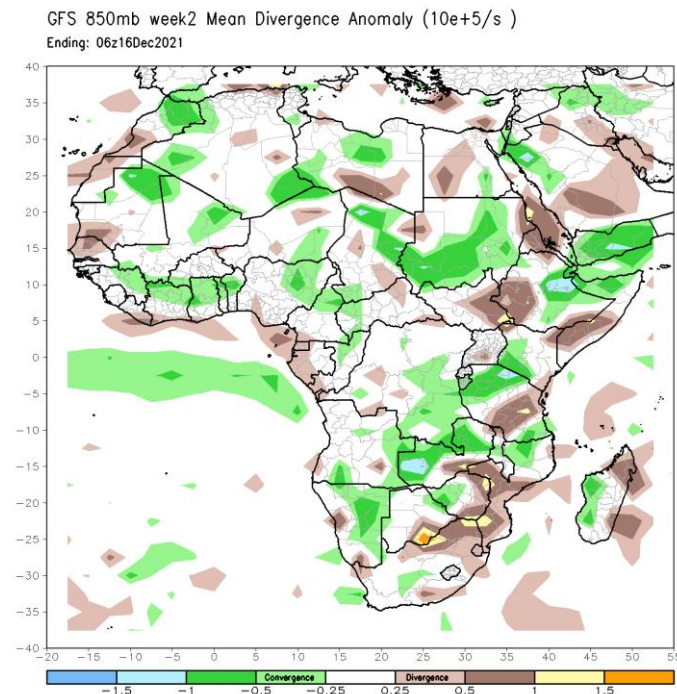
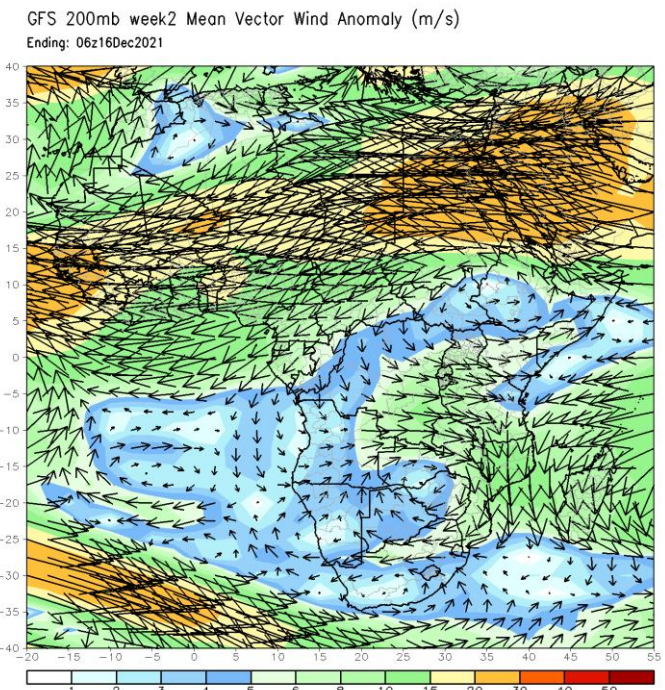
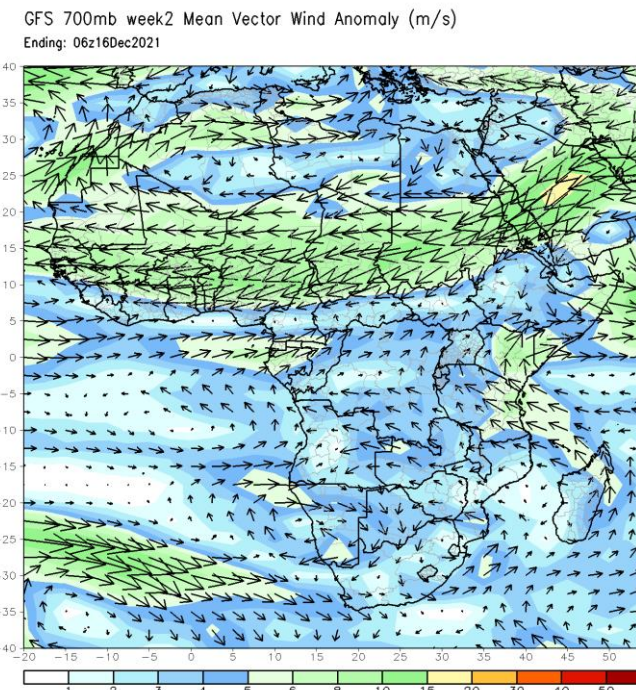
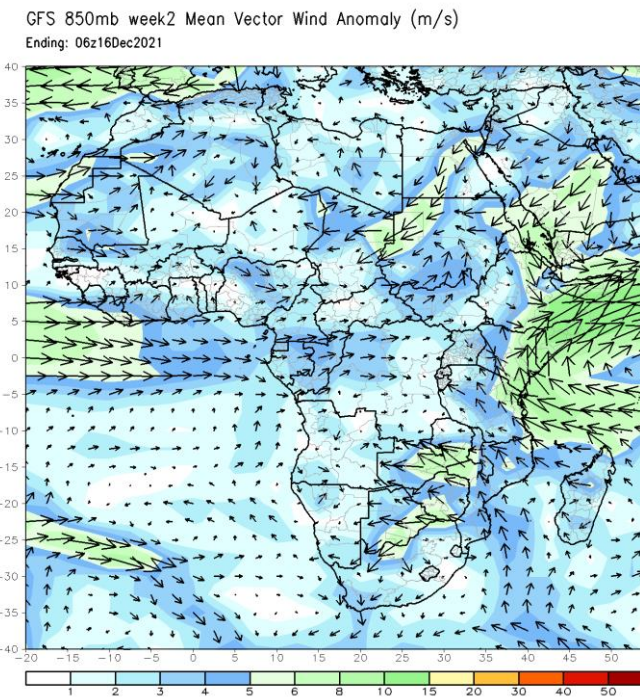


Figure 30: GFS divergence forecast

<https://www.cpc.ncep.noaa.gov/products/inter-national/africa/africa.shtml>

African Precipitation NCEP/GFS Bias-Corrected precipitation and anomaly forecasts for week 2

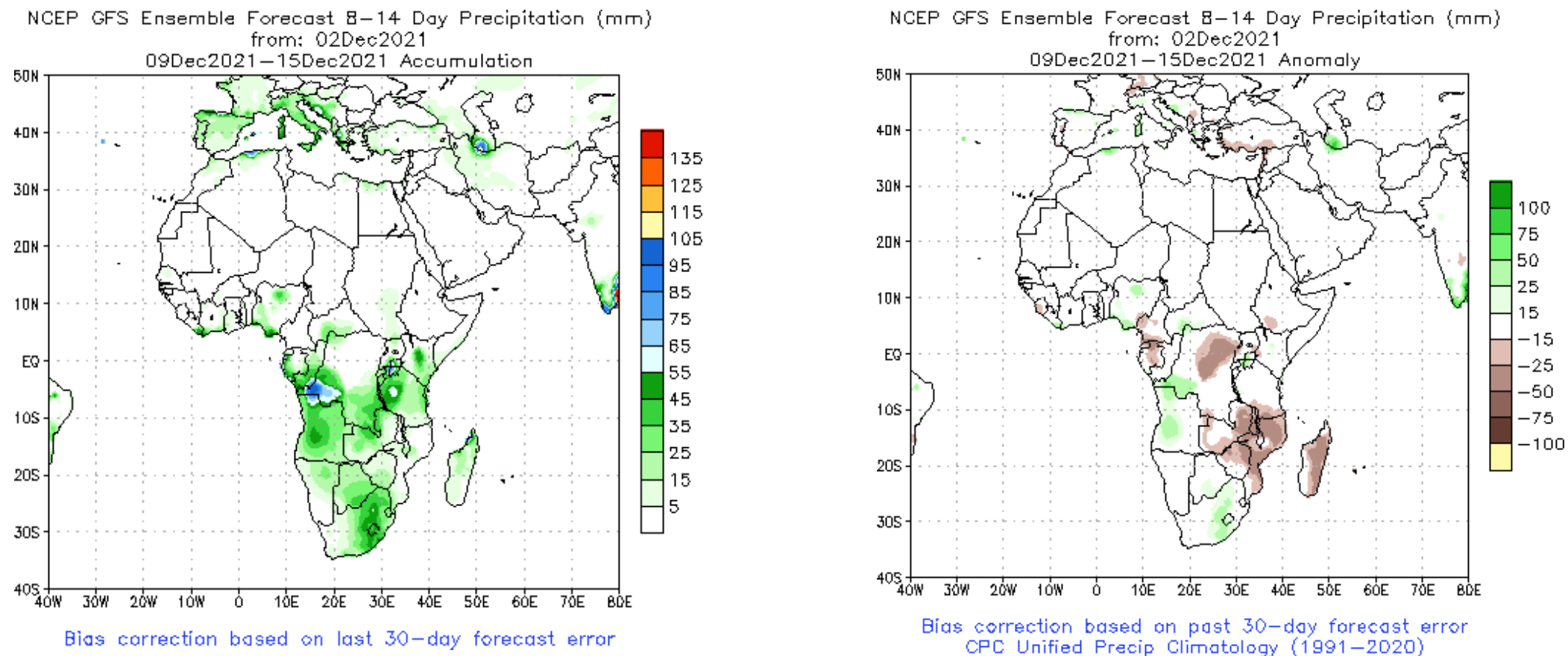


Figure 31: Précipitation and Anomaly forecast

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

Probability of week-2 precip
> 25 (left), 50mm (middle)
and, 100mm (right)
10th – 16th Dec 2021

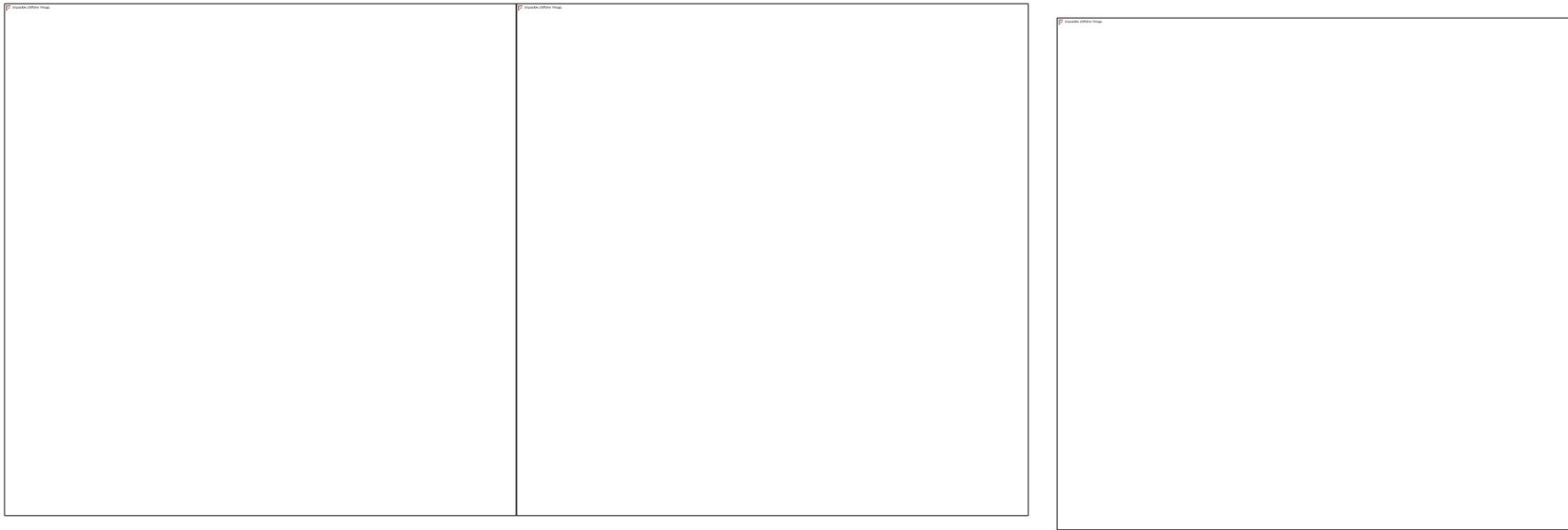
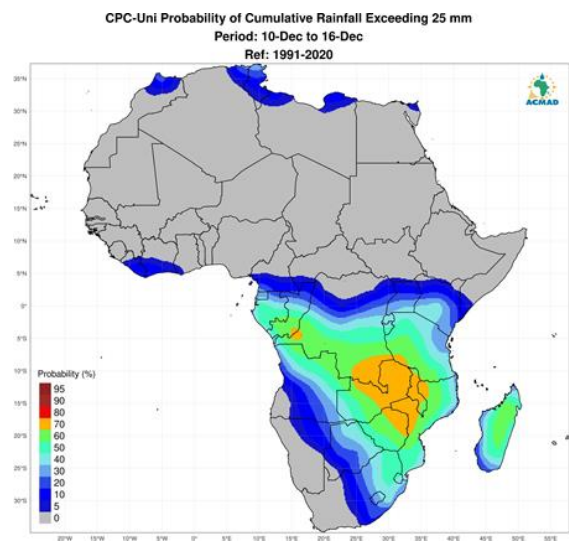
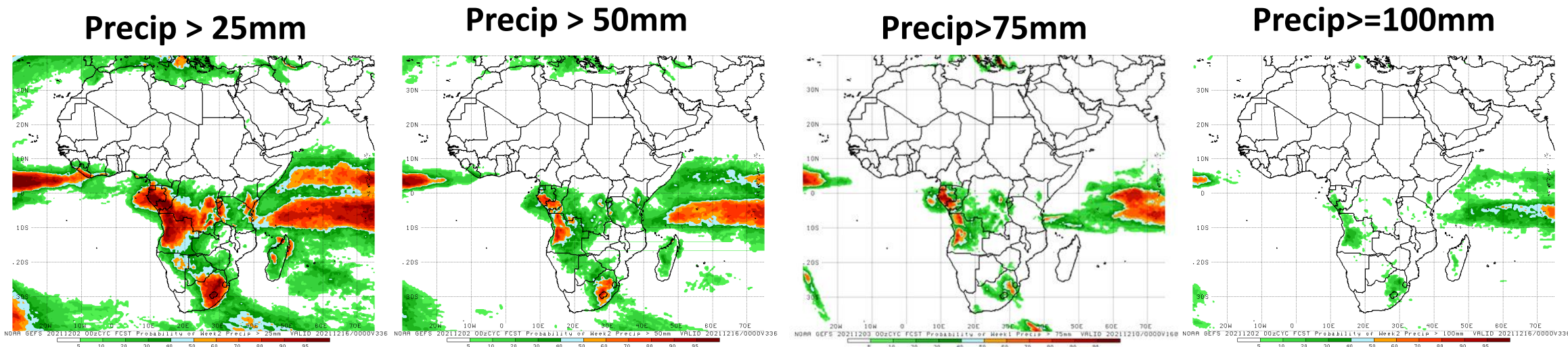


Figure 32: Week2 Precipitation Total Exceedance Probabilities

https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk2_precip25mm_prob_africa.html
https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk2_precip50mm_prob_africa.html
https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk2_precip75mm_prob_africa.html
https://www.cpc.ncep.noaa.gov/products/international/cpci/data/00/gefs_wk2_precip100mm_prob_africa.html

http://154.66.220.45:8080/thredds/catalog/ACMAD/CDD/climatemonitoringservice/Probability_of_Exceedance/Weekly/Current/catalog.html

Precipitation Anomaly Forecasts from ECMWF for week 2

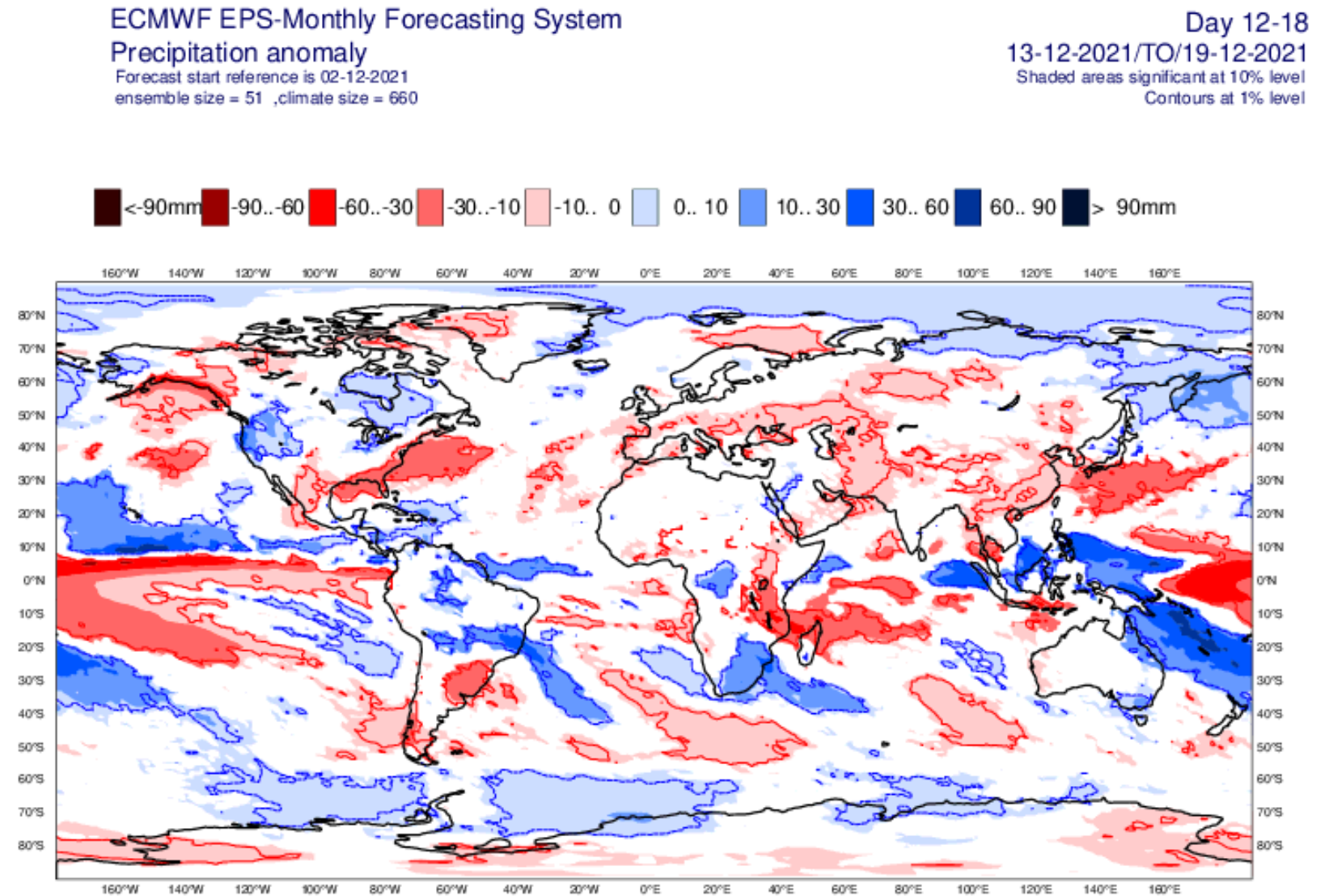


Figure 33: Monthly Precipitation Anomaly forecast from ECMWF

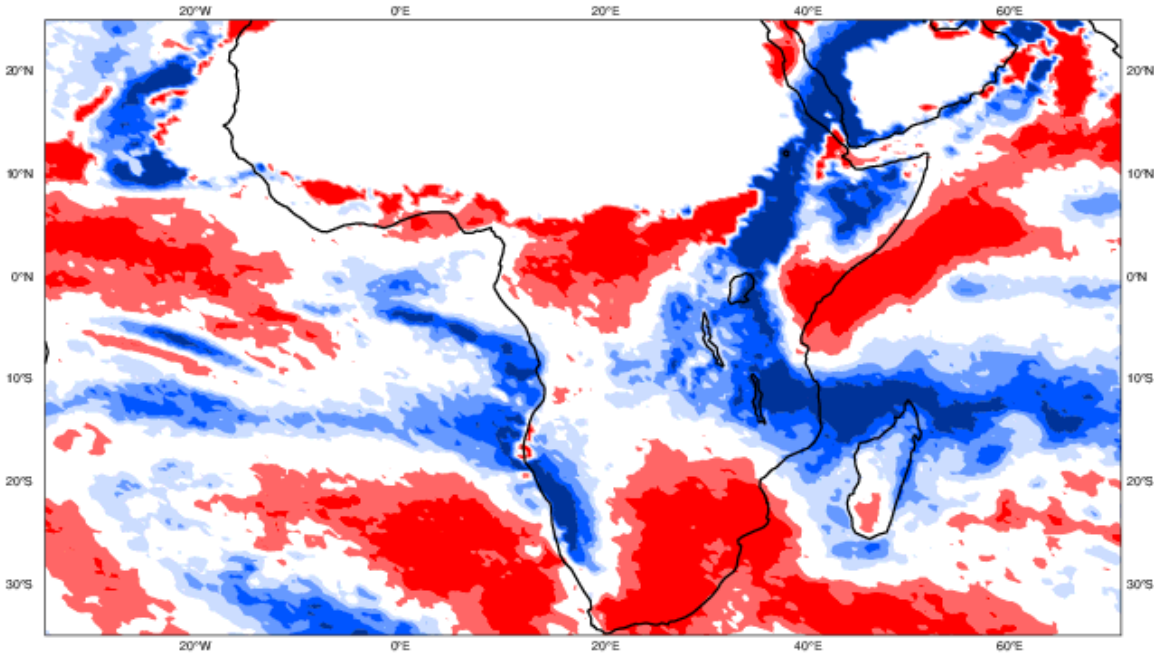
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_anomaly?facets=undefined&time=2019081500,408,2019090100¶meter=precipitation&area=Global

Probability Precipitation Forecasts from ECMWF for week 2 : weekly tercile at below 33% and above 66%

ECMWF EPS-Monthly Forecasting System
(Prob Precip. anom below 33%)
Forecast start reference is 02-12-2021
ensemble size = 51 , climate size = 660

Day 12-18
13-12-2021/TO/19-12-2021

< 10% 10..20 20..40 40..50 50..60 60..70 > 70%



ECMWF EPS-Monthly Forecasting System
(Prob Precip. anom above 66%)
Forecast start reference is 02-12-2021
ensemble size = 51 , climate size = 660

Day 12-18
13-12-2021/TO/19-12-2021

< 10% 10..20 20..40 40..50 50..60 60..70 > 70%

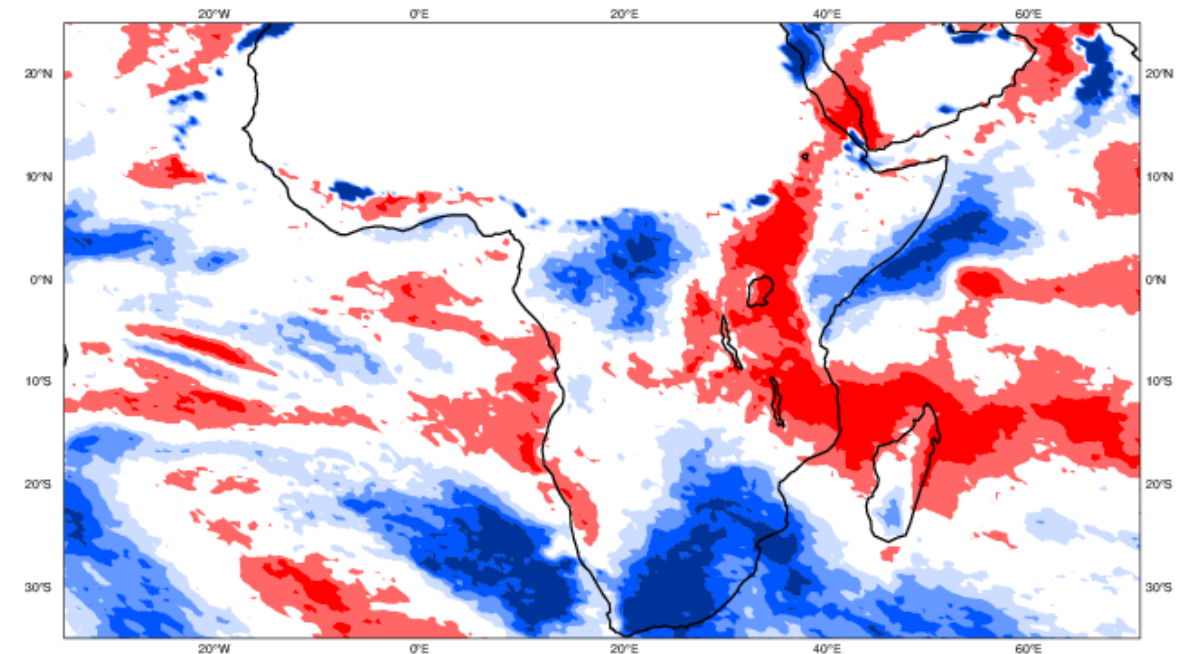


Figure 34: Weekly tercile probability forecast below 33%

https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_tercile?facets=undefined&time=2021110100,312,2021111400¶meter=precipitation&tercile=1&area=Africa

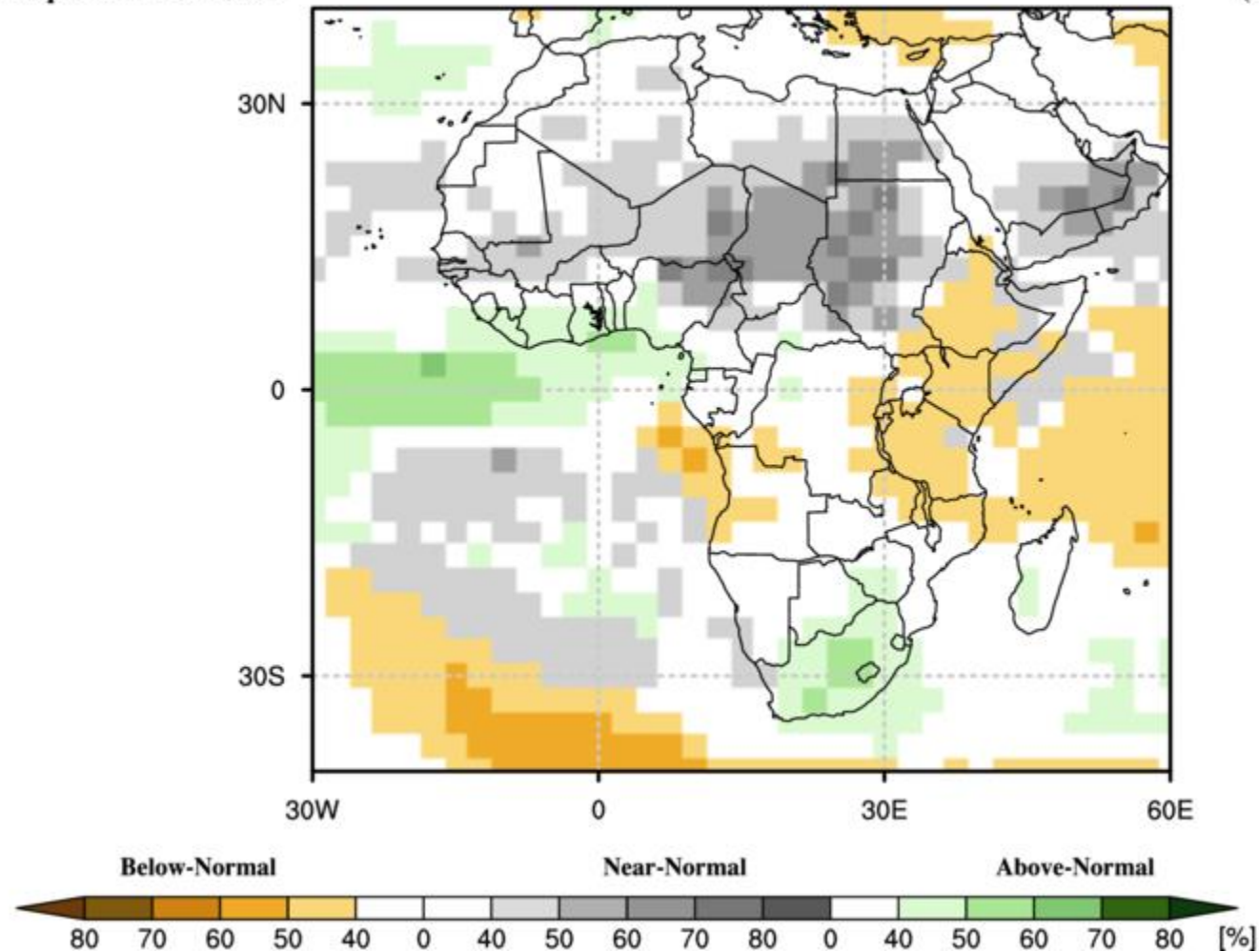
Monthly Forecast from WMO Lead Centre Multi-Model Ensemble

Probabilistic Multi-Model Ensemble Forecast

Beijing,CMCC,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Pretoria,Seoul,Tokyo,Toulouse,Washington

Precipitation : Dec2021

(issued on Nov2021)



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

Figure 35: Monthly Precipitation forecast

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

PRECIPITATION PROBABILITY FORECAST 11 to 30 Dec 2021

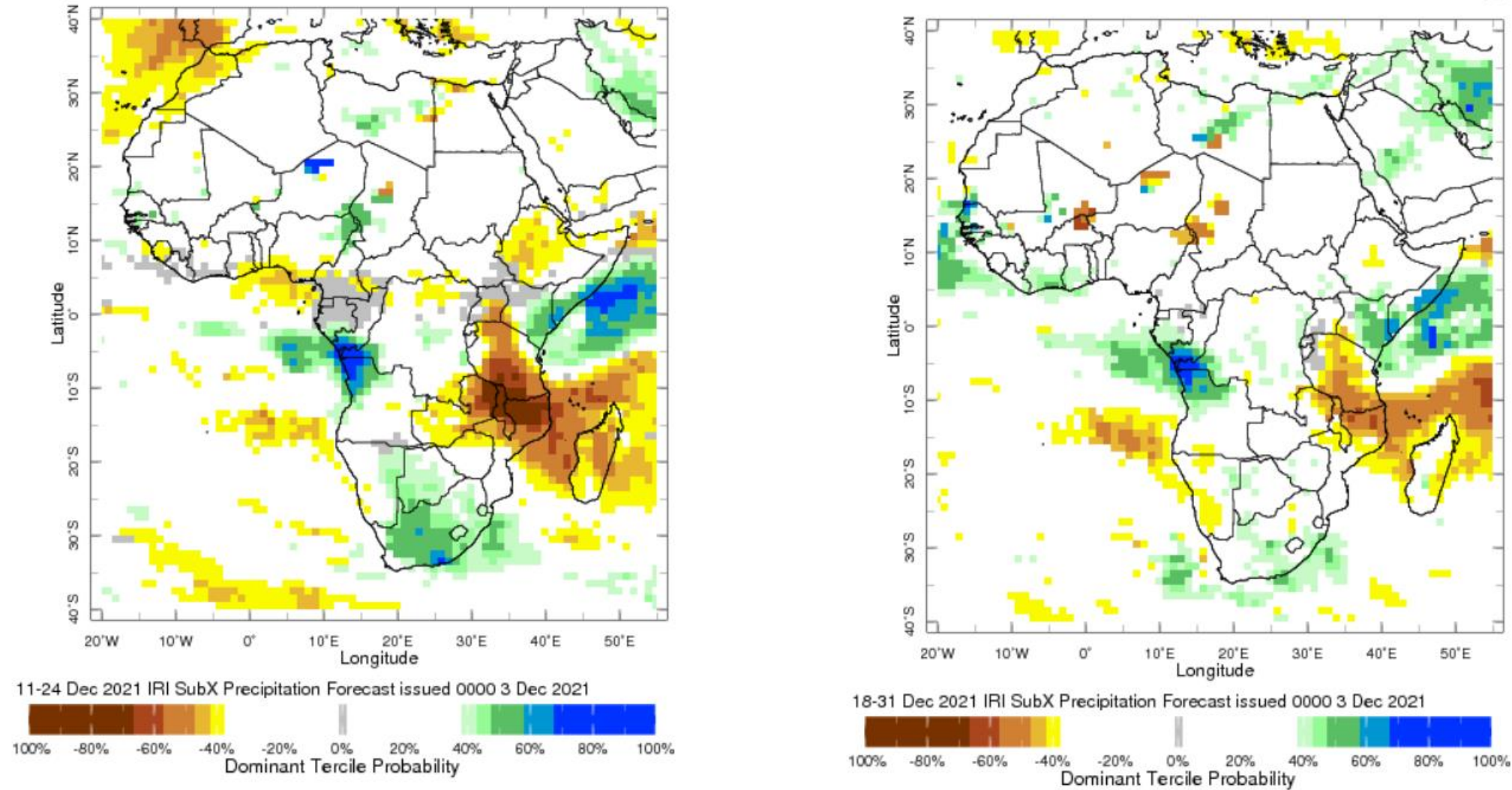


Figure 37: Précipitation and Anomaly forecast

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®ion=bb%3A-2%3A30%3A-1%3A31%3Abb

CLIMATOLOGY OF PRECIPITATIONS FOR UPCOMING 2 WEEKS

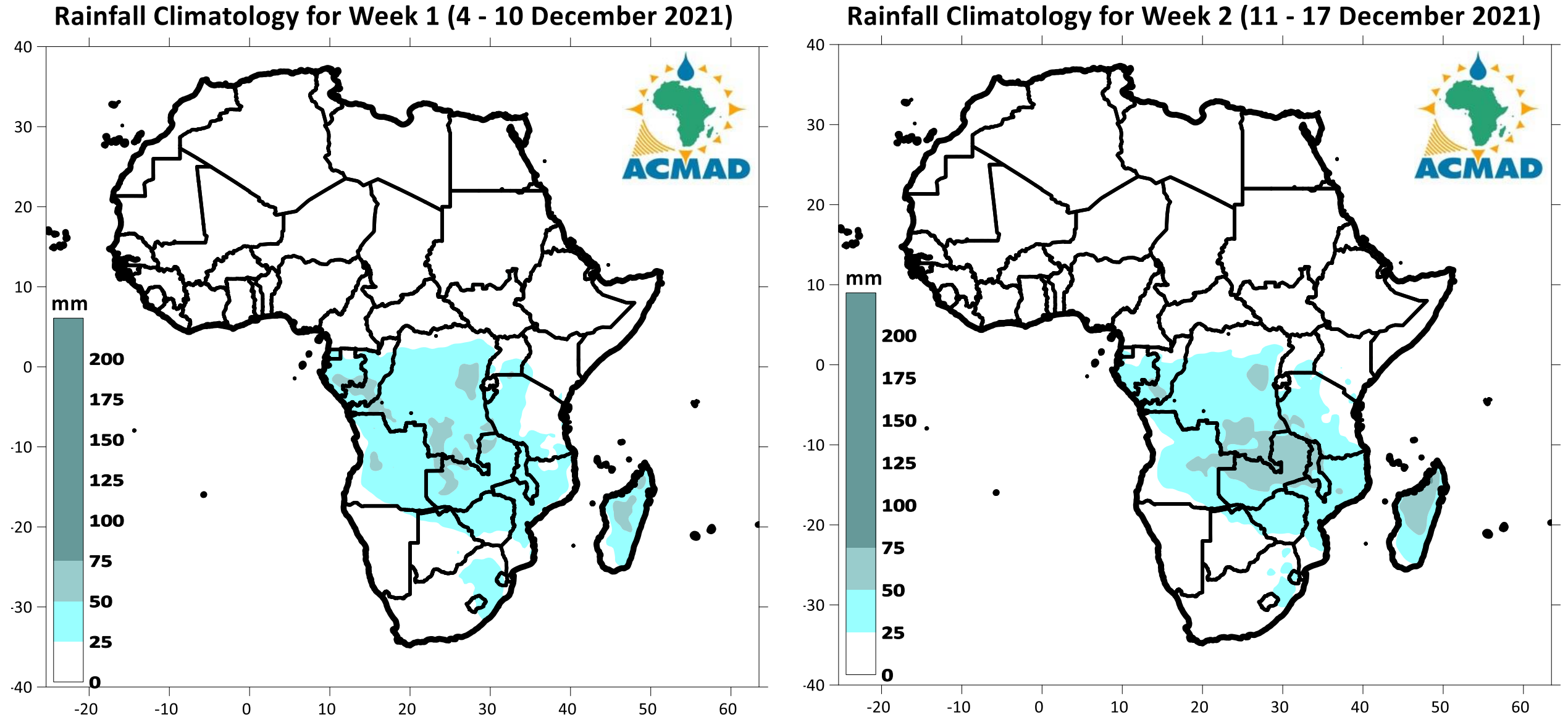
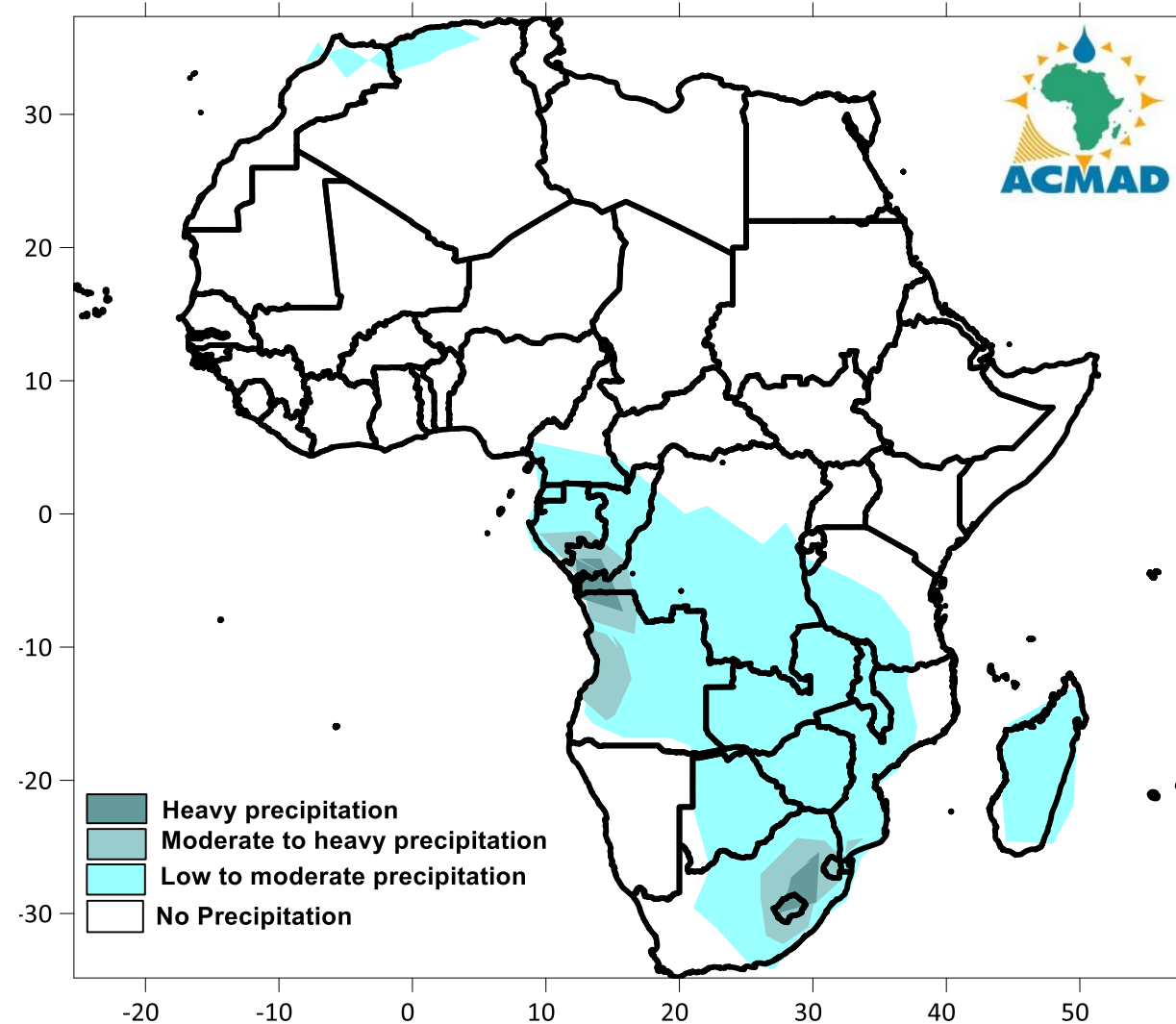


Figure 38: Climatology of Precipitation for week-1(left panel) and week-2 (right panel)

PRECIPITATIONS FORECAST FOR THE UPCOMING TWO WEEKS

Precipitation Forecast for Week 1 (04-10 December 2021)



Precipitation Forecast for Week 1 (11-17 December 2021)

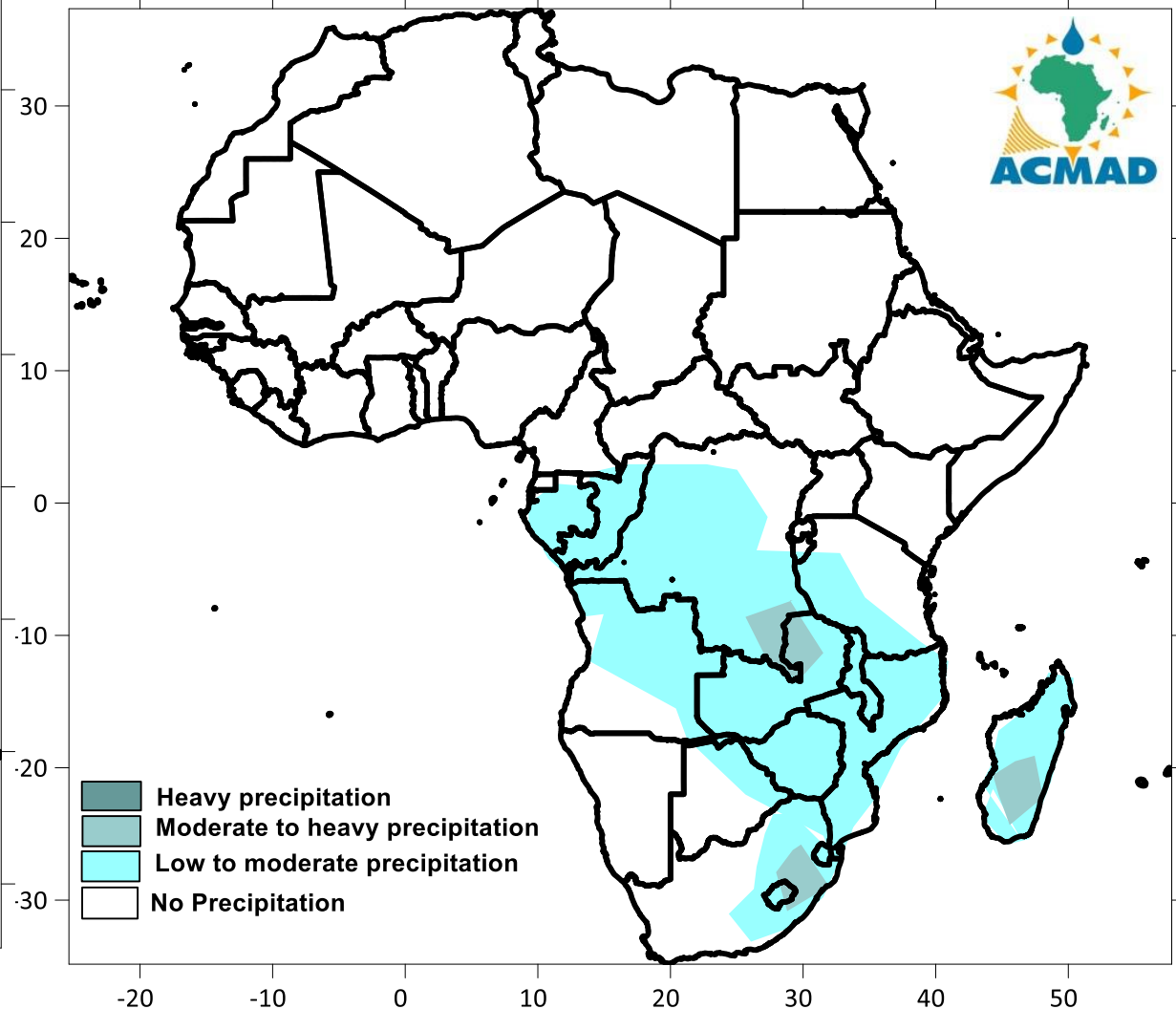


Figure 39: Precipitation Outlook for week-1(left panel) and week-2 (right panel)