DEKADAL TECHNICAL NOTE FOR SECOND DEKAD OF DECEMBER, 2021
AND PRECIPITATION FORECAST FOR WEEK 1 AND 2

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Edited by: Hubert KABENGELA, Pierre KAMSU

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HIGHLIGHTS

Rainfall activity was mostly observed in the central, southern, and eastern regions of the continent during this dekad. Above-average to well above-average precipitation was recorded over Lesotho, Eswatini, Rwanda, the north eastern part of Libya, south eastern Liberia, eastern and western DRC, parts of Congo, Gabon Angola, Zimbabwe, Zambia, Mozambique and Cameroon, northern Tanzania, most of Botswana, Uganda and Kenya, eastern Madagascar, and the eastern half of South Africa. Below-average rainfall was observed over the northern edges of Morocco, Algeria and Tunisia, Equatorial Guinea, southern Tanzania, most of Gabon, parts of Cameroon, Congo, DRC, Madagascar, Mozambique, Malawi, Zambia, Angola, Namibia, Zimbabwe and Botswana.

This dekad was characterized by neutral to cold SSTs conditions in the Gulf of Guinea region, most of north Atlantic and western Indian Ocean with moderate anticyclone wind vector anomalies at 850hPa and 700hPa in the northern part of Africa and easterlies in the Gulf of Guinea into the Atlantic Ocean
The outlook for 24th - 30th December AND 31st December 2021 - 06th January 2022, depict a general tendency of low to moderate precipitation over parts of the central and the southern Africa sub-region of the continent. Moderate to heavy precipitation will likely be observed over Malawi, Eswatini and parts of

1. Monitoring Climate Element

Estimated Cumulative Precipitation in % of average for the First Dekad of December 2021

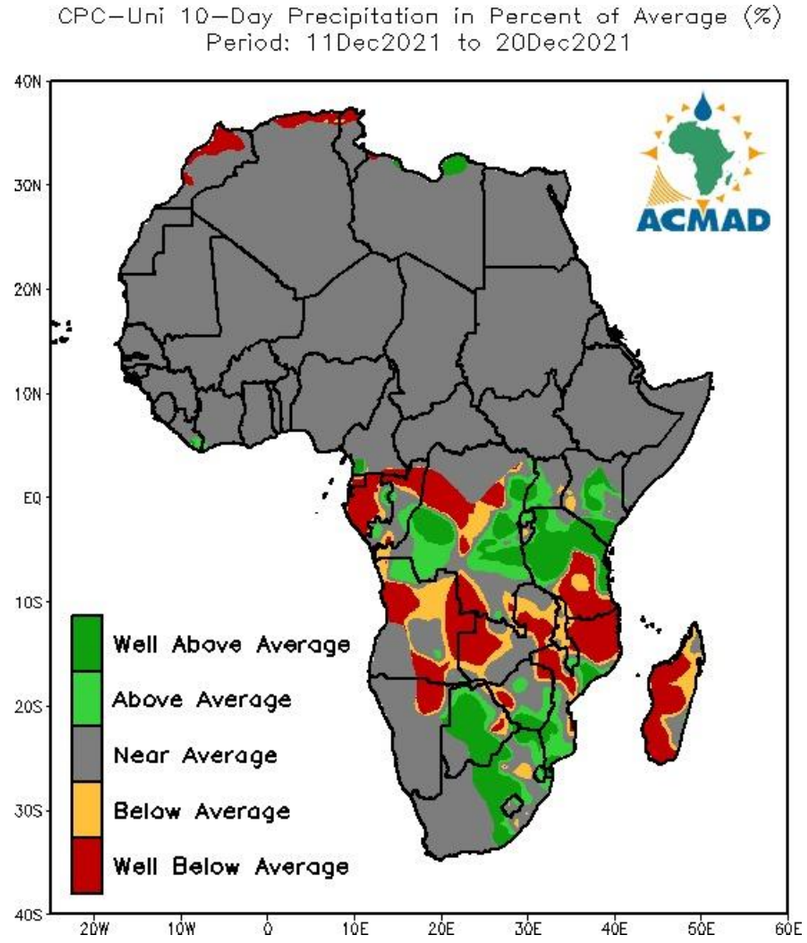


Figure 1: **This map displays decadal average precipitation in percent of average**

Rainfall activity was mostly observed in the central, southern, and eastern regions of the continent during this dekad. Above-average to well above-average precipitation was recorded over Lesotho, Eswatini, Rwanda, the north eastern part of Libya, south eastern Liberia, eastern and western DRC, parts of Congo, Gabon Angola, Zimbabwe, Zambia, Mozambique and Cameroon, northern Tanzania, most of Botswana, Uganda and Kenya, eastern Madagascar, and the eastern half of South Africa. Below-average rainfall was observed over the northern edges of Morocco, Algeria and Tunisia, Equatorial Guinea, southern Tanzania, most of Gabon, parts of Cameroon, Congo, DRC, Madagascar, Mozambique, Malawi, Zambia, Angola, Namibia, Zimbabwe and Botswana.

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

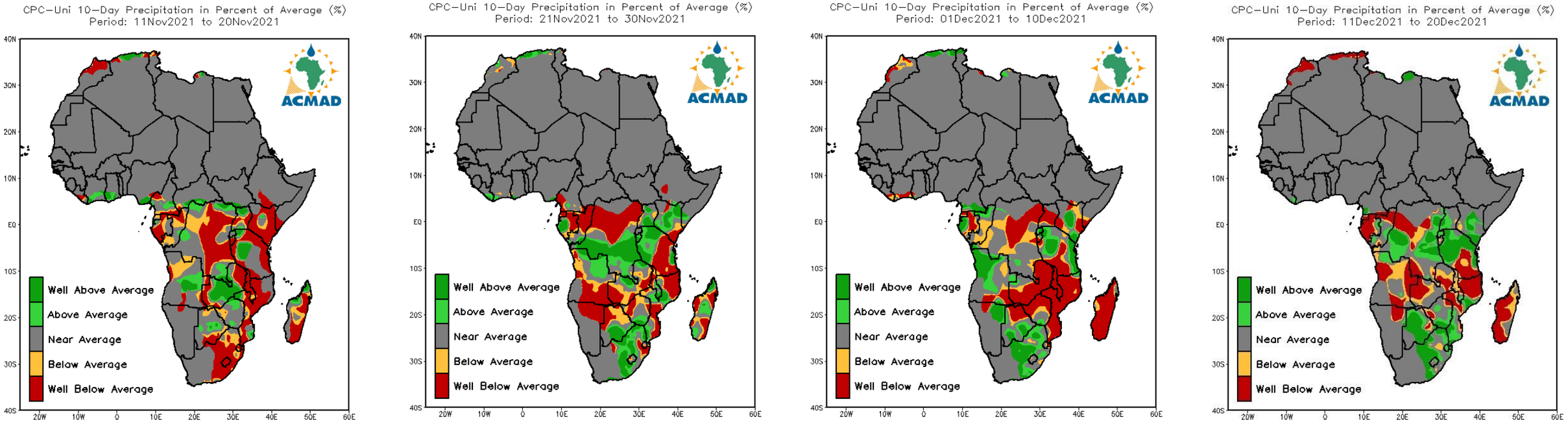
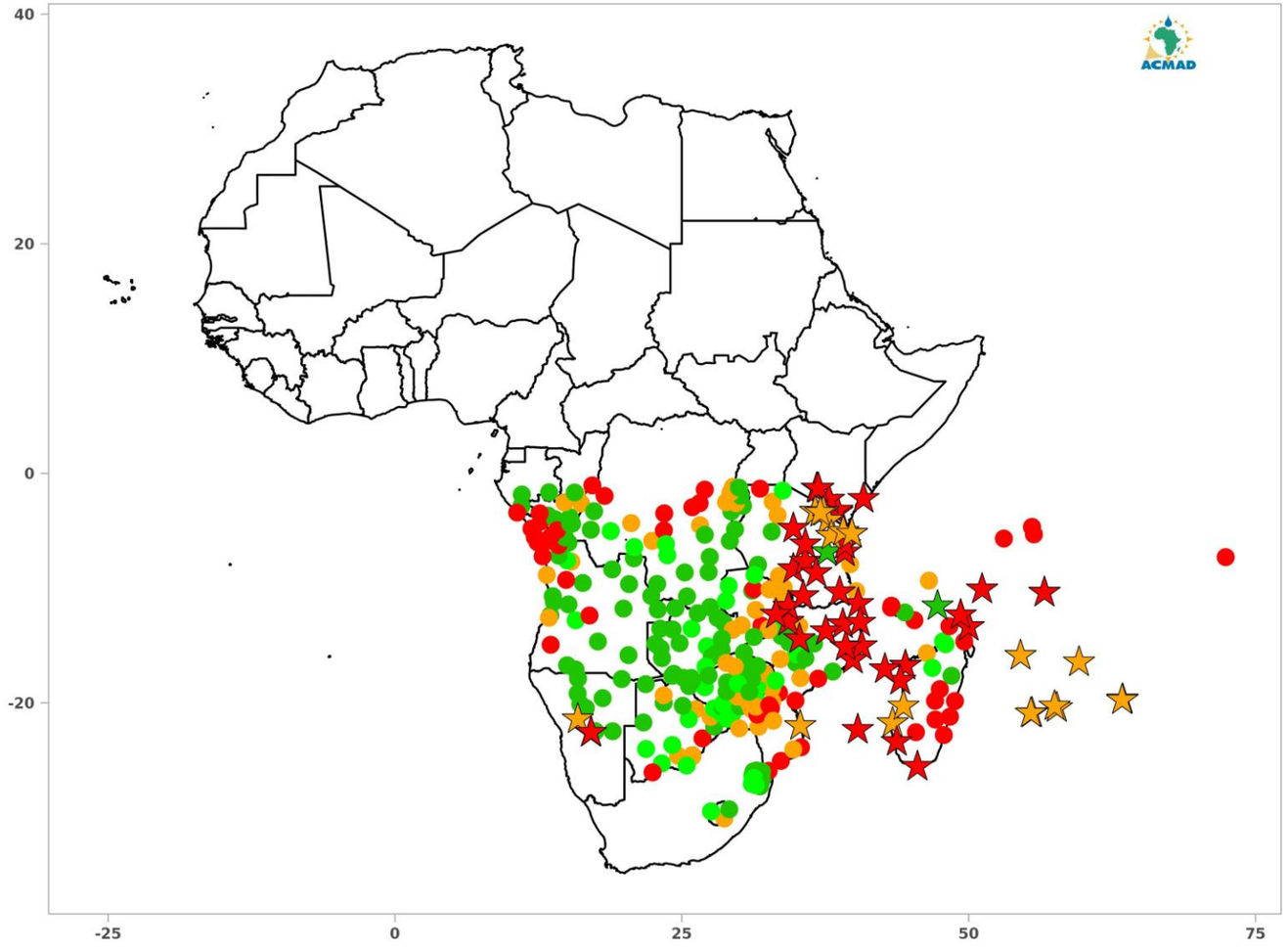


Figure 2: **This maps display decadal average precipitation in percent of average**

Below to well below average precipitation was observed in the two dekads of November and the first dekad of December 2021, with rainfall activities centered below the equatorial belt mostly in the central and southern African region. The deficit persisted into the last three dekads with more spatial coverage dominated by below to well below average precipitation in these two regions of the continent. Enhanced spatial coverage of above average to well above average precipitation was observed mostly in the second dekad of December when compared to the preceding dekads. The Gulf of Guinea countries observed near average precipitation in the dekad under review.

MONITORING OF OBSERVED ANOMALIES ON THE START OF THE AGRICULTURE SEASON AND OUTLOOK.
MONITORING PERIOD: JULY-DECEMBER 2021.
CURRENT MONITORING WEEK: SECOND WEEK OF DECEMBER.
OUTLOOK VALIDITY PERIOD: DECEMBER 11 TO DECEMBER 24 2021.
DATE OF ISSUE: DECEMBER 11-2021.



Forecast start of the agriculture season departure from average.

- **LATE**
- **NEAR AVERAGE TO LATE**
- **NEAR AVERAGE TO EARLY**
- **EARLY**

Observed start of the agriculture season departure from average.

- **LATE**
- **NEAR AVERAGE TO LATE**
- **NEAR AVERAGE TO EARLY**
- **EARLY**

PAST 3 DEKADS OLR ANOMALIES

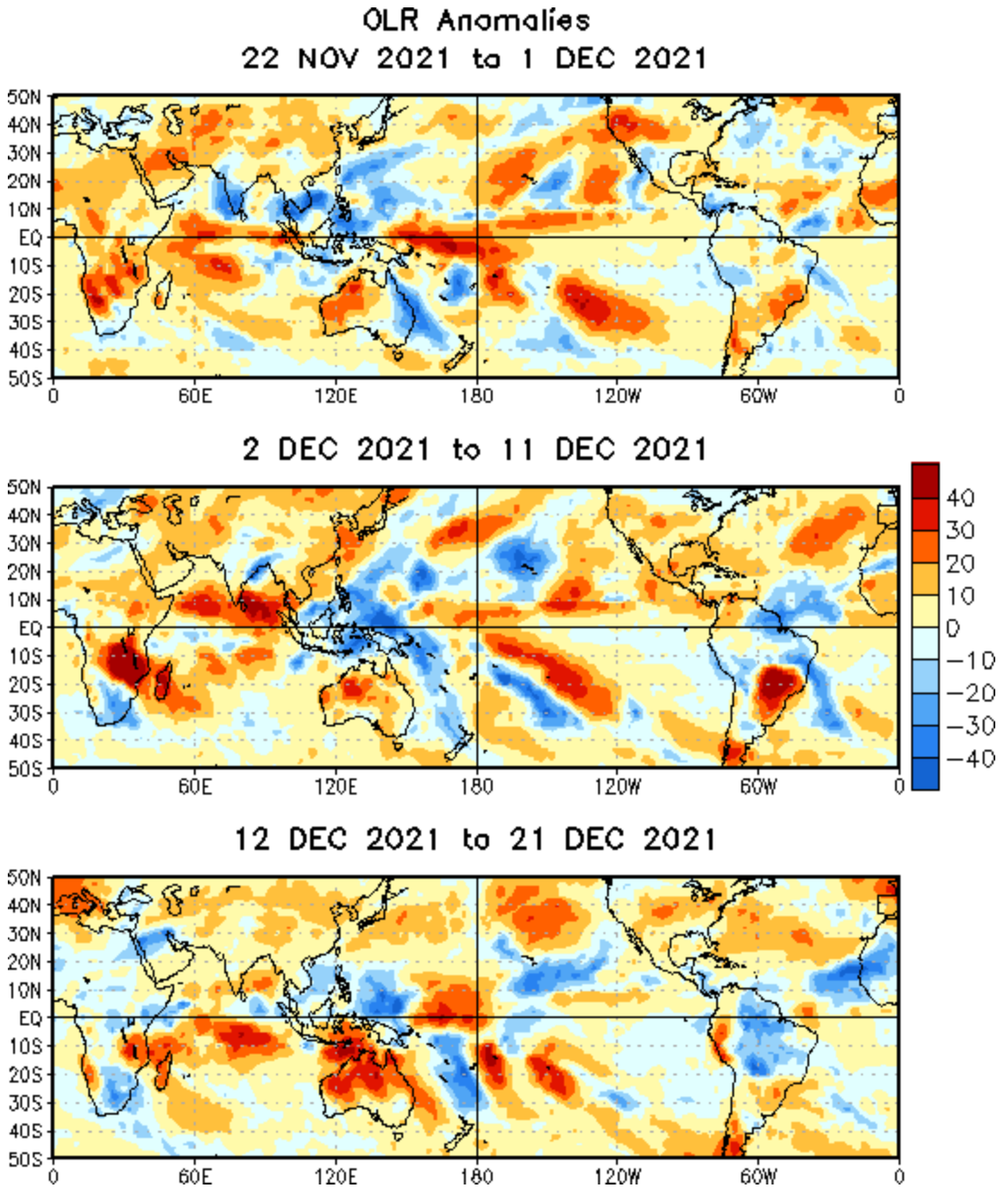


Figure 4: **Past 3 weeks OLR anomalies**

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

Mean Sea Level Pressure (MSLP) Anomalies for the 2nd Dekad of Dec. 2021

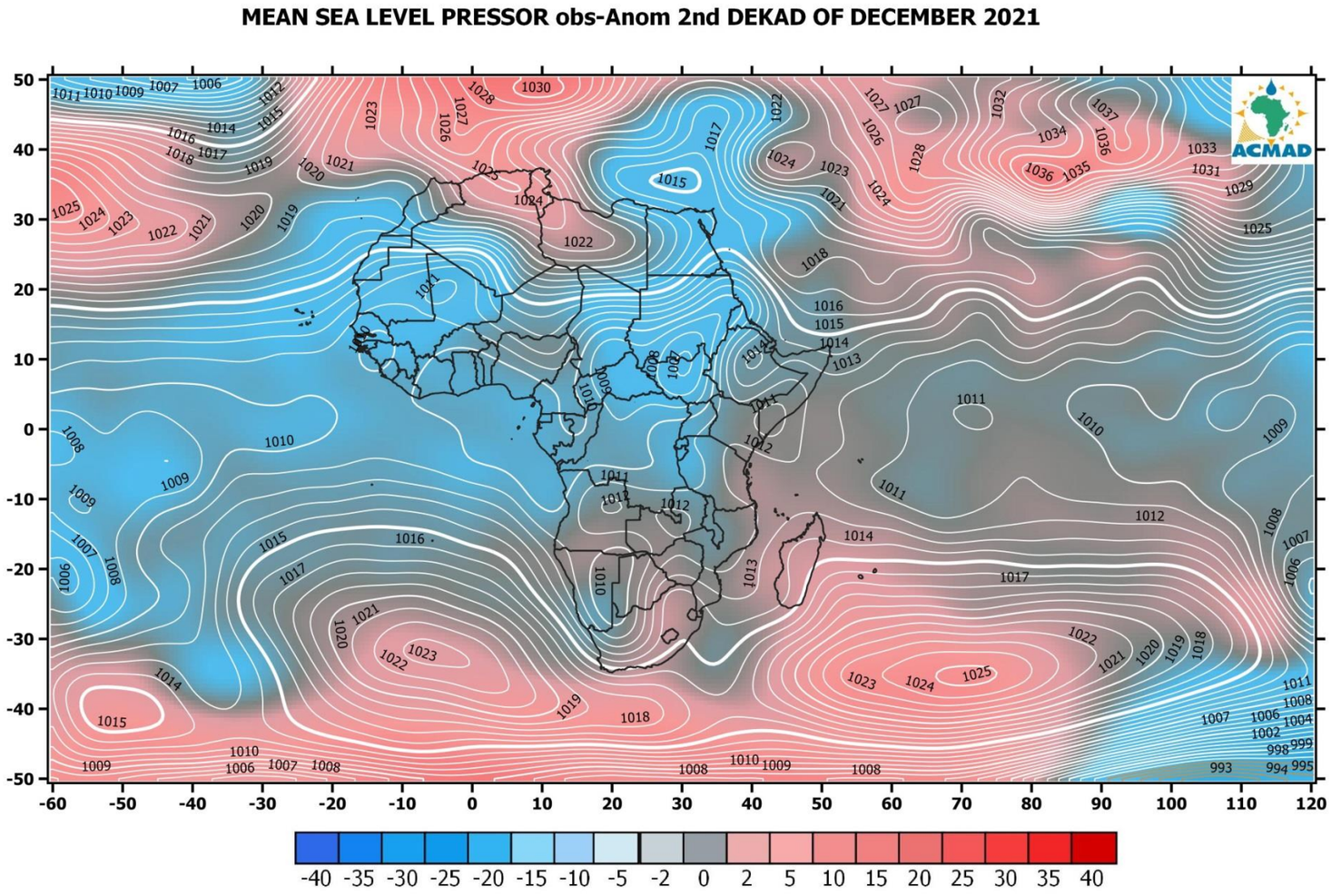
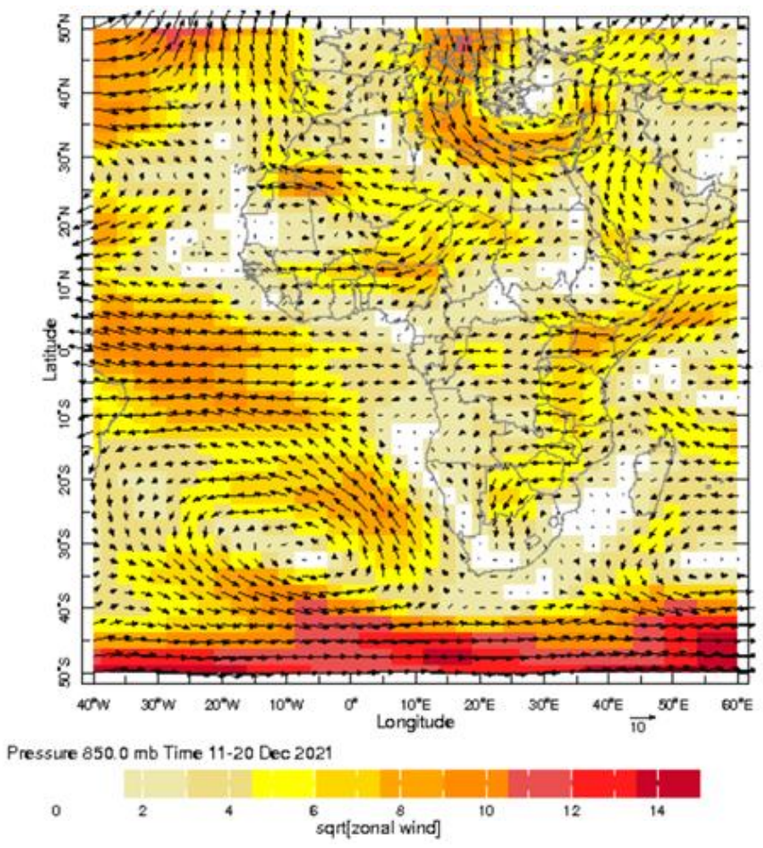
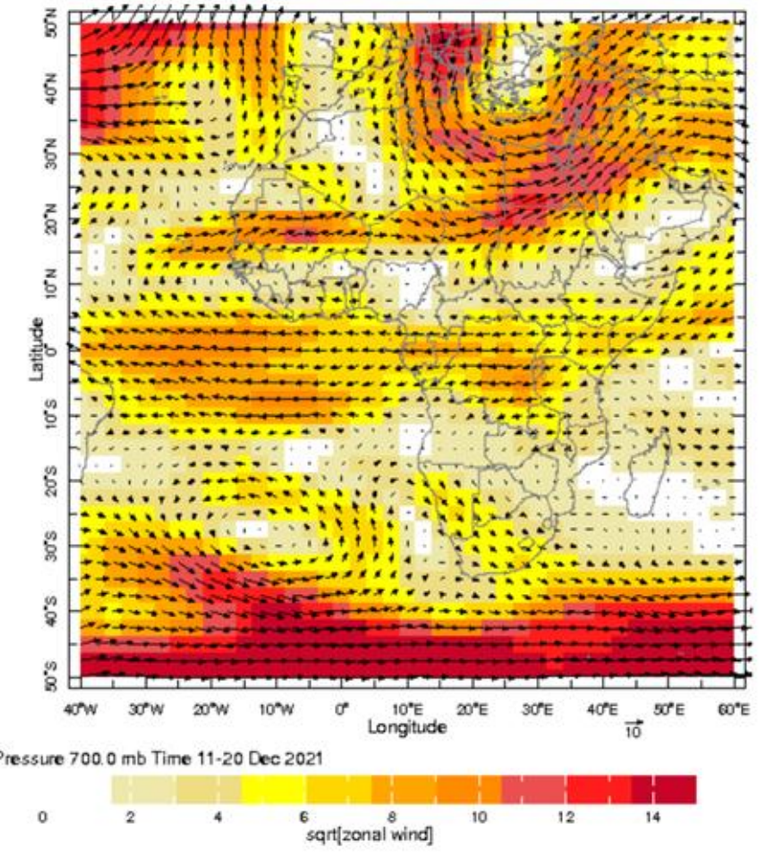


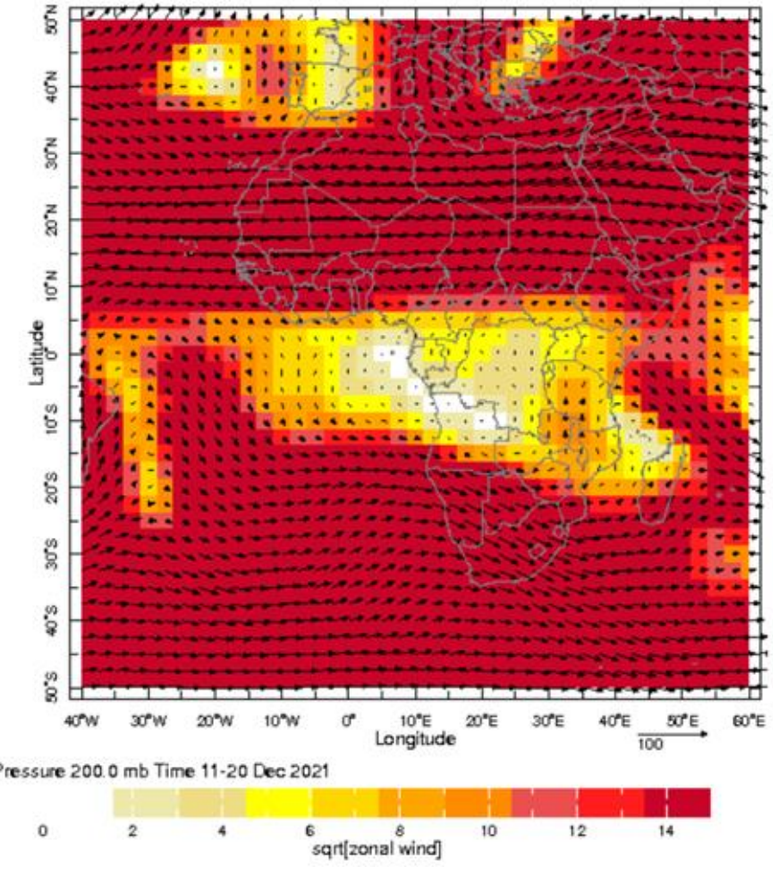
Figure 5: **MSLP observation versus anomaly**

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

Wind Anomalies for the 1st Dekad of Dec. 2021 @ 850hpa, 700hpa and 200hPa



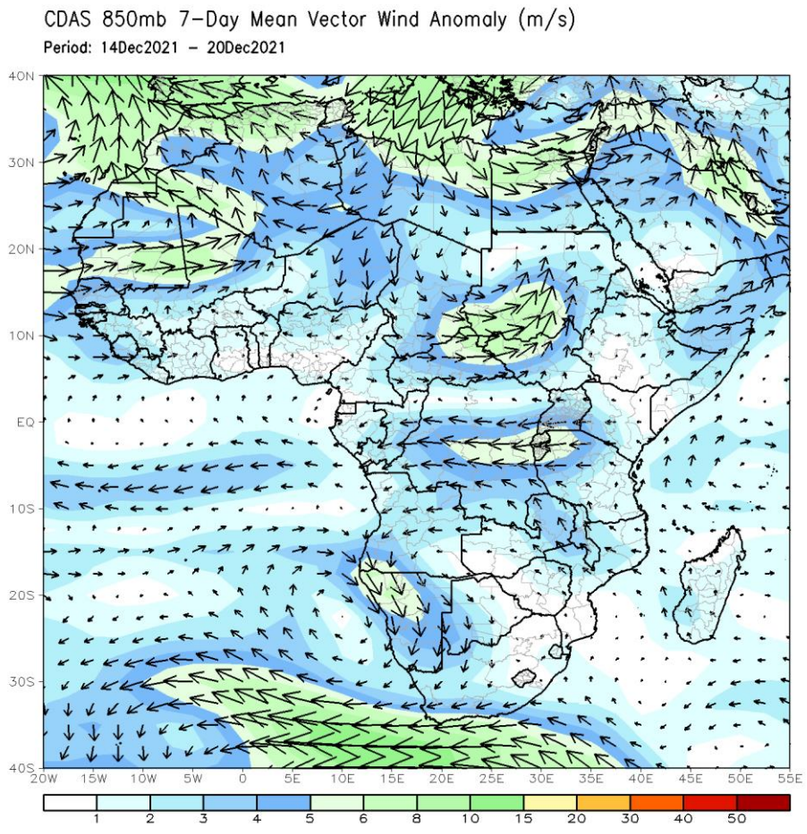


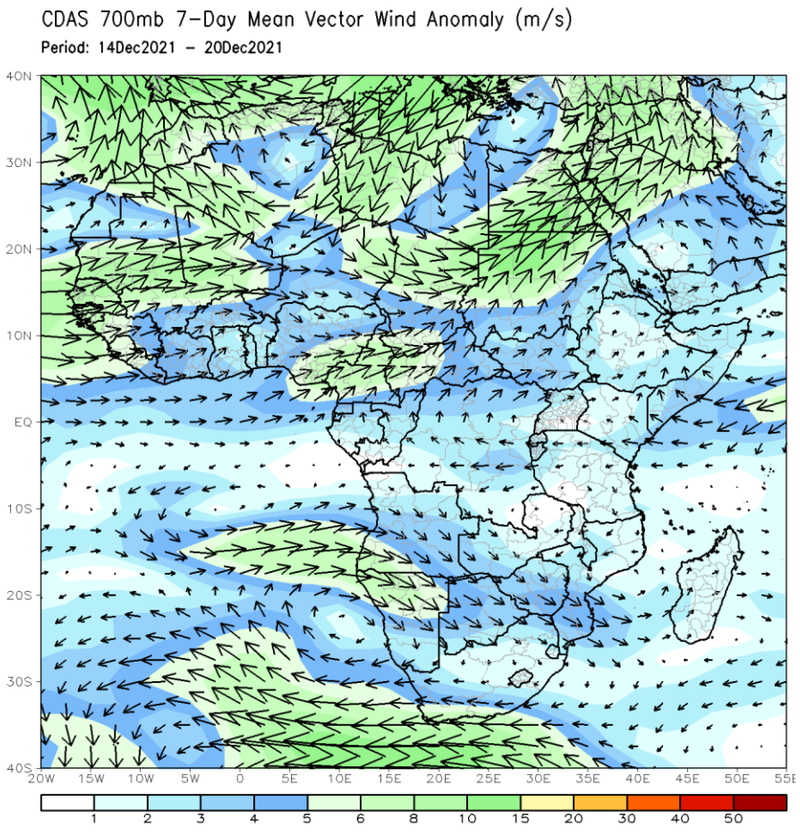


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Figure 6: **Wind anomalies for 850hpa and 700hPa**

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





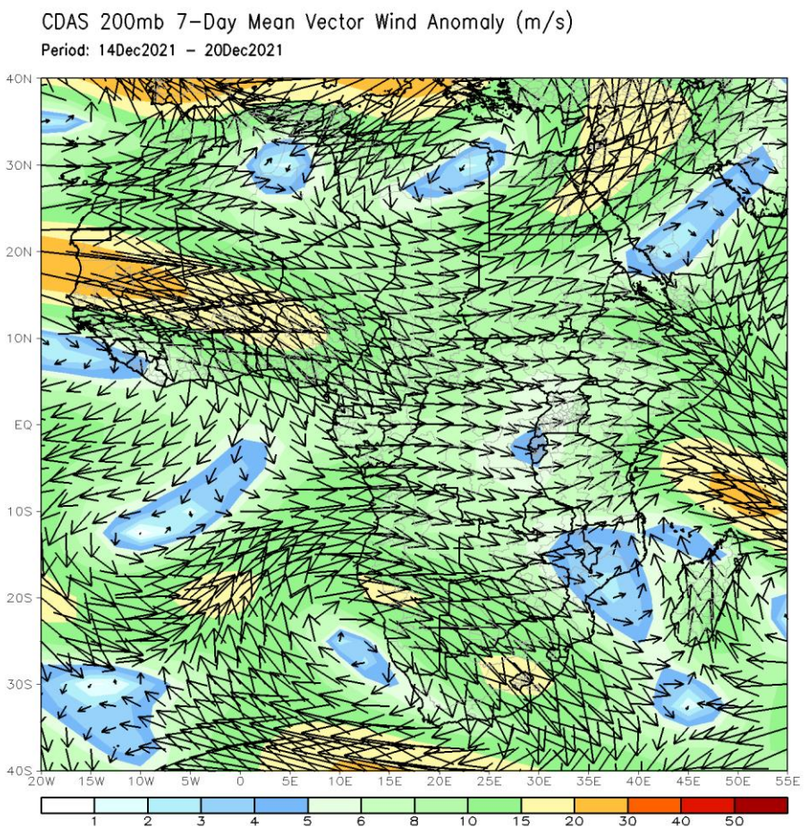
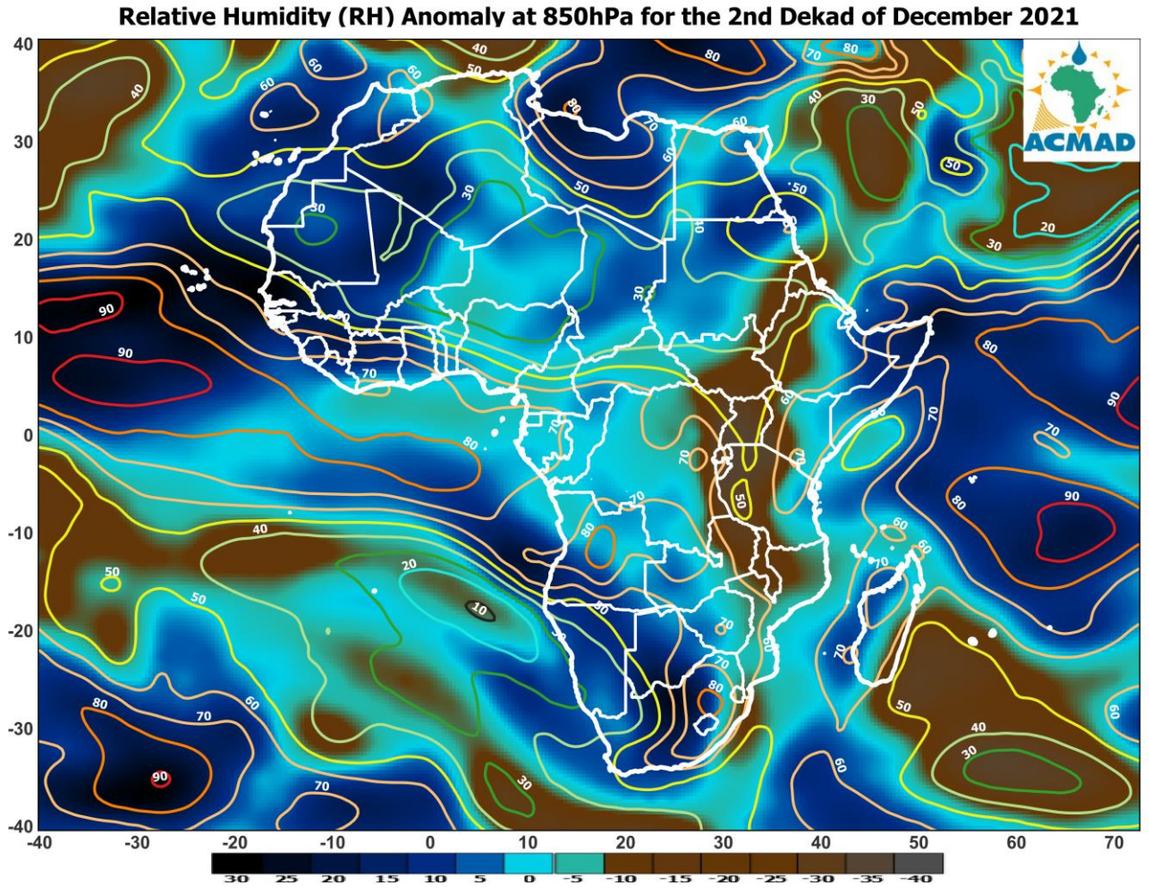


Figure 7: **Wind anomalies for 850hpa, 700hPa and 200hpa**

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

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

Relative Humidity (RH) Anomalies at 850hpa and 700hpa for the 2nd Dekad of Dec 2021



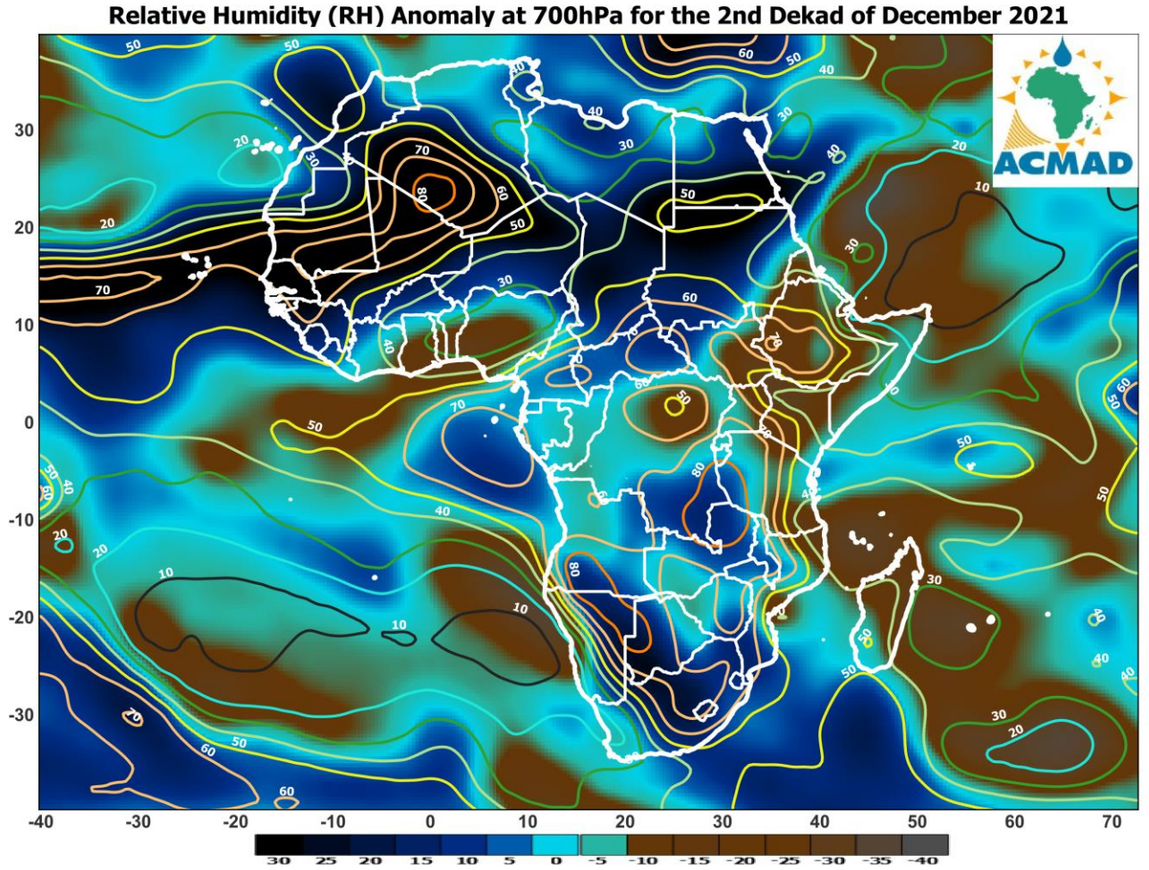
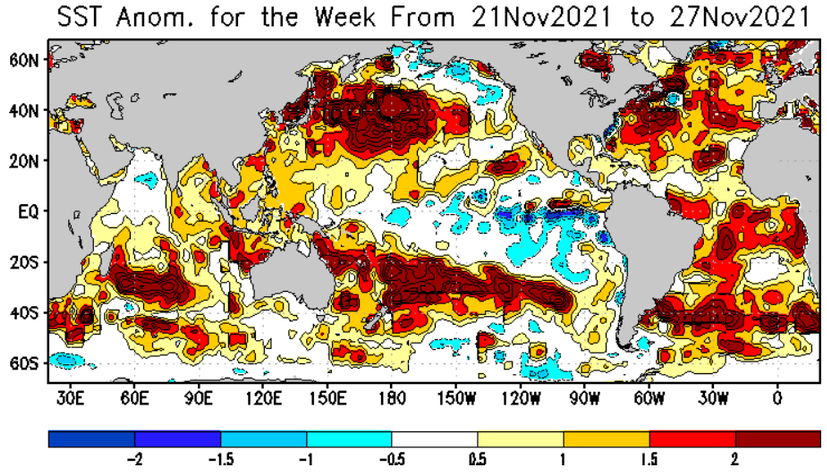


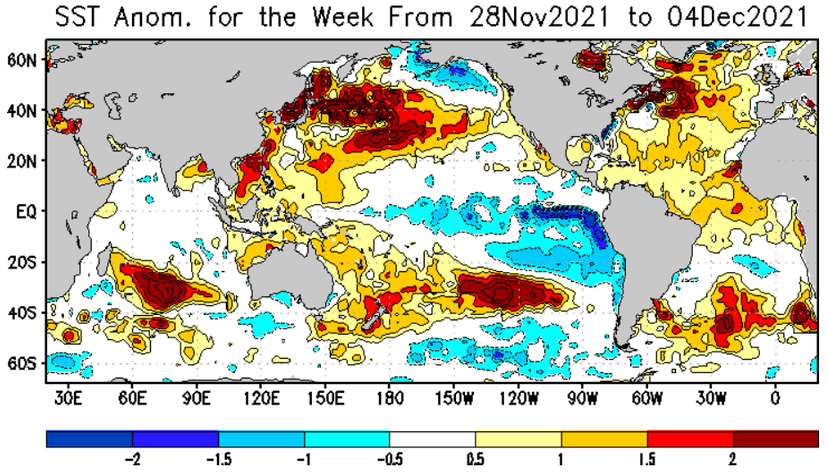
Figure 8: **Relative Humidity Anomaly at 850hPa (left) and 700hPa (right)**

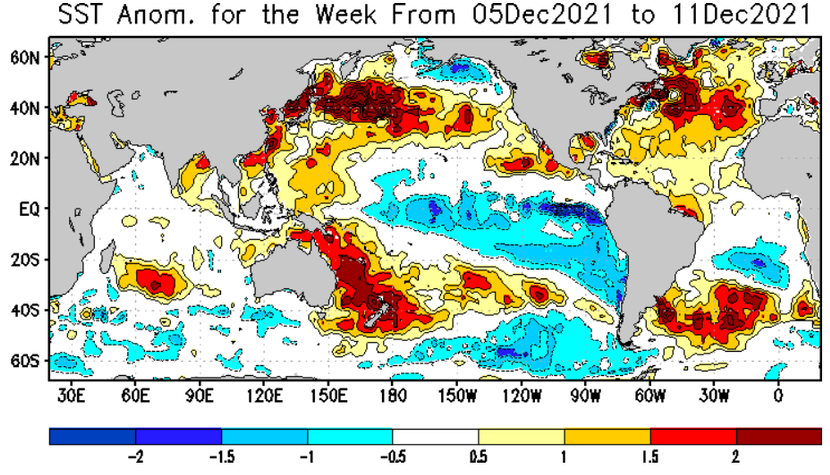
http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.DAILY/.Intrinsic/.PressureLevel/.rhum

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

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 warming observed over northern Atlantic, Gulf of Guinea while neutral to cooling ssts are observed over the south-western Indian ocean.

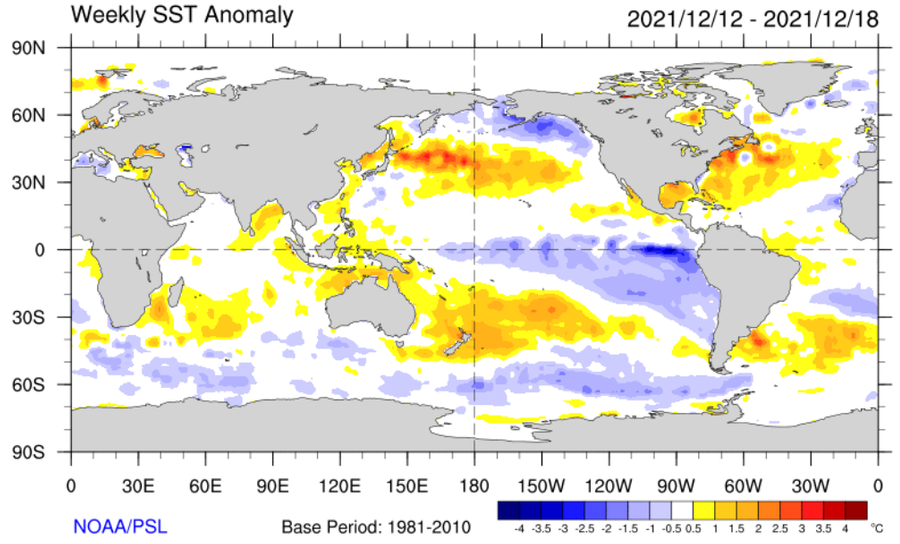
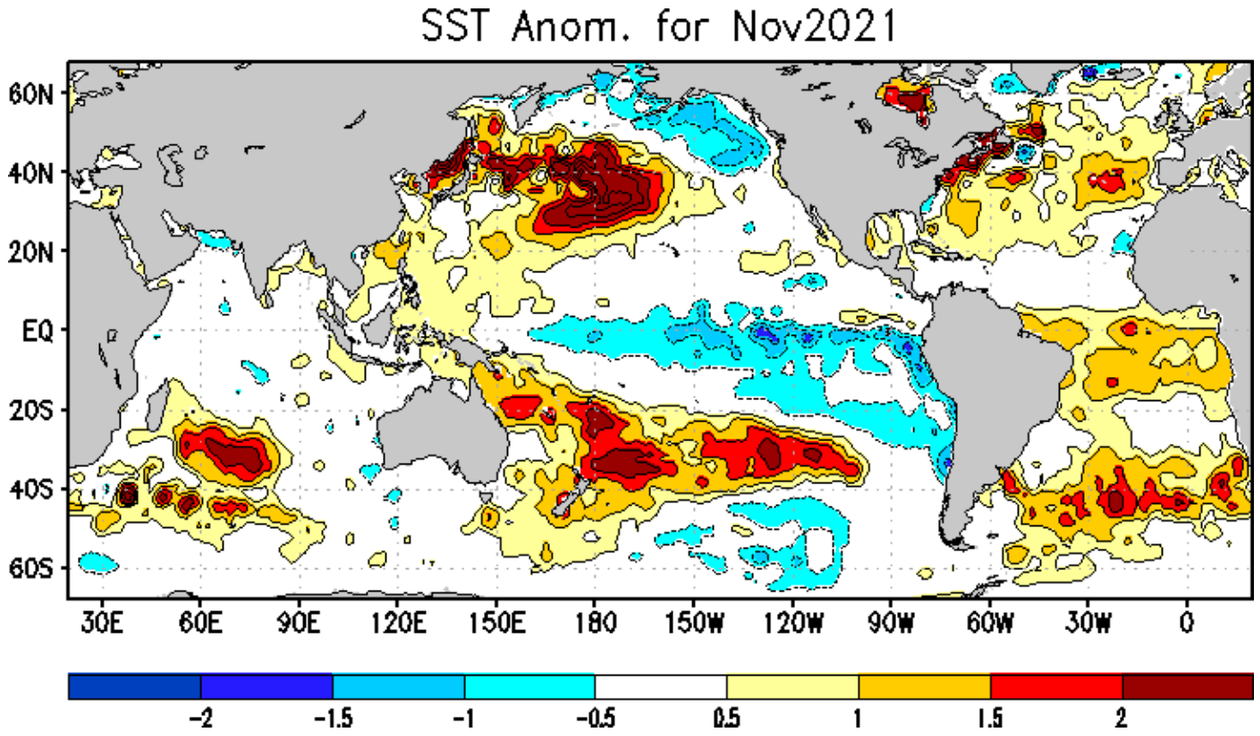


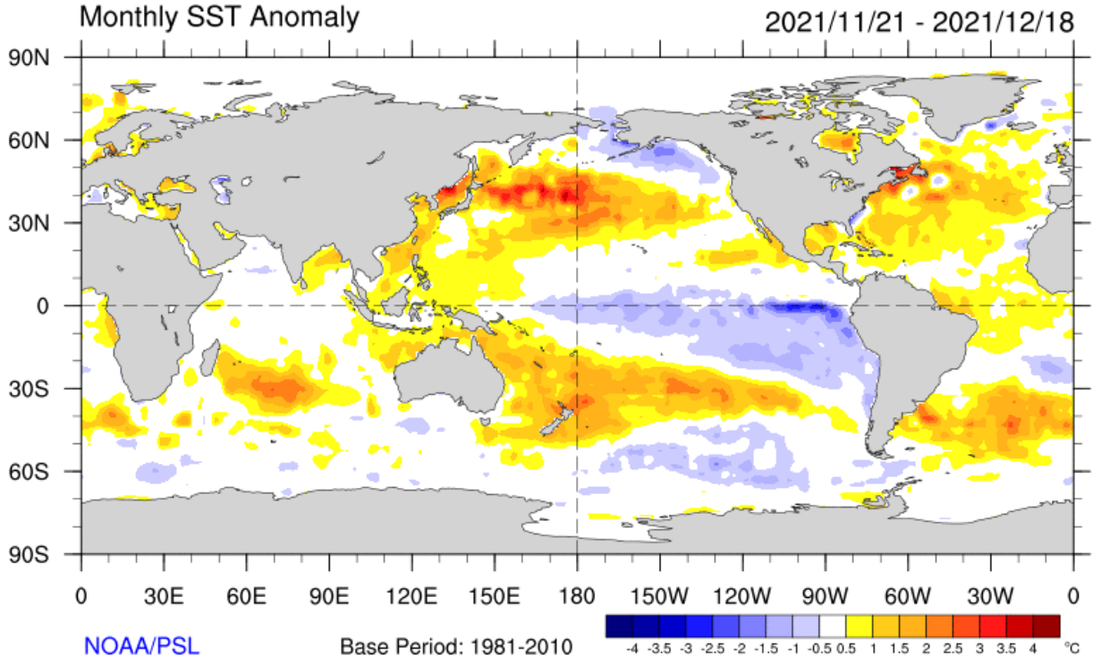
Figure 9: Maps display weekly sea surface temperature anomalies over the globe for last four weeks

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

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

Last Month's Sea SurfaceTemperatures (SST) Observed





During20th 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

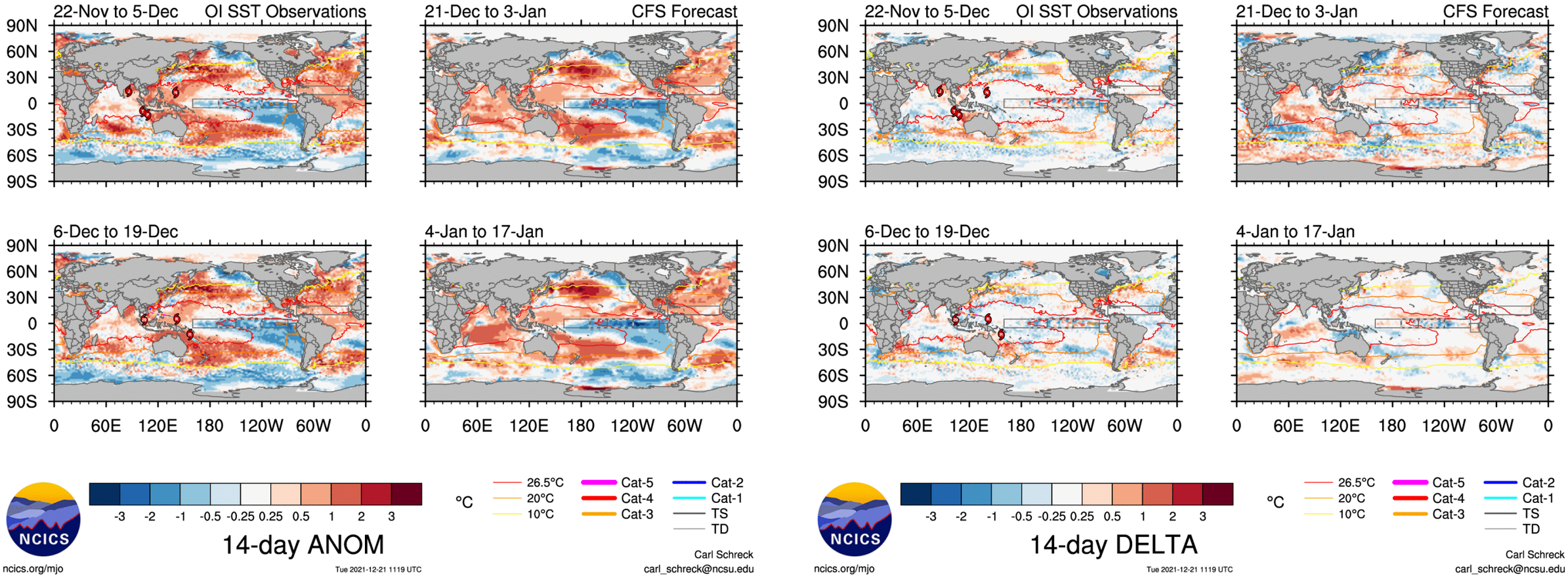


Figure 11: Sea Surface Temperature and FCST for two week

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

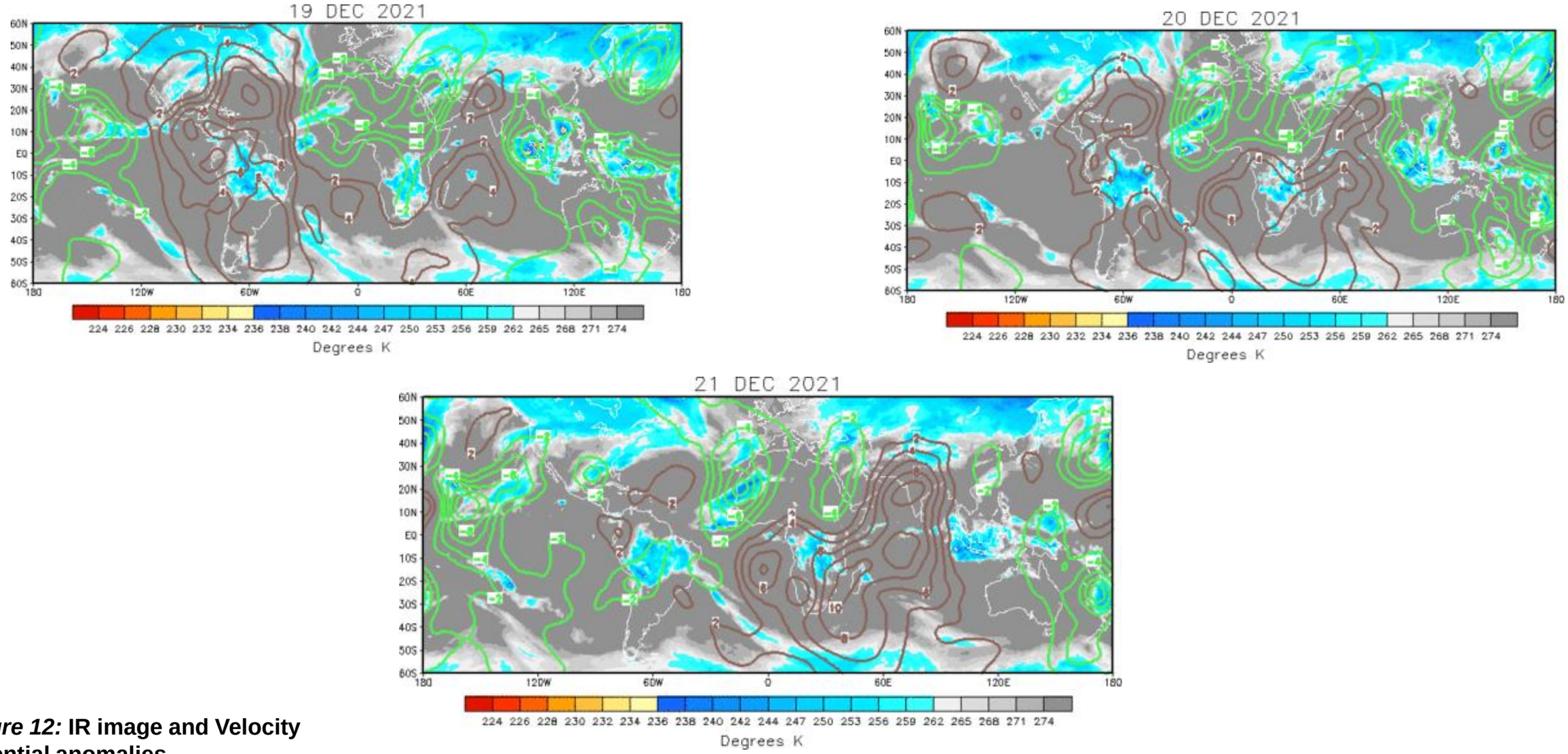
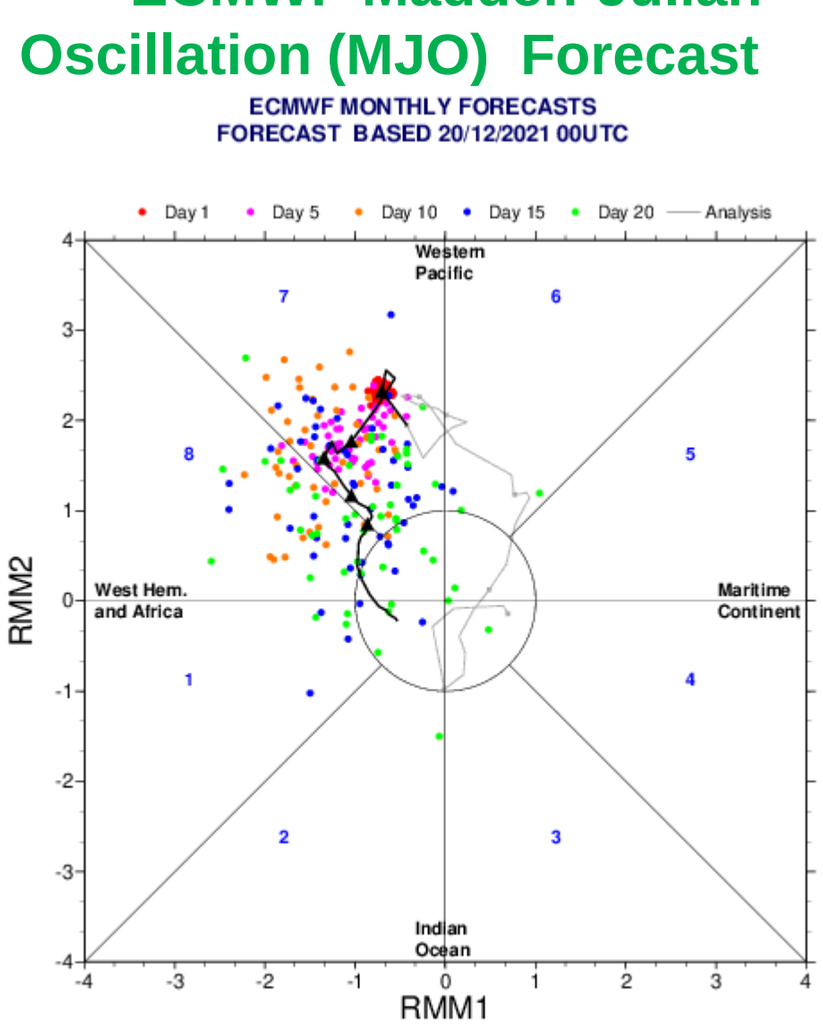
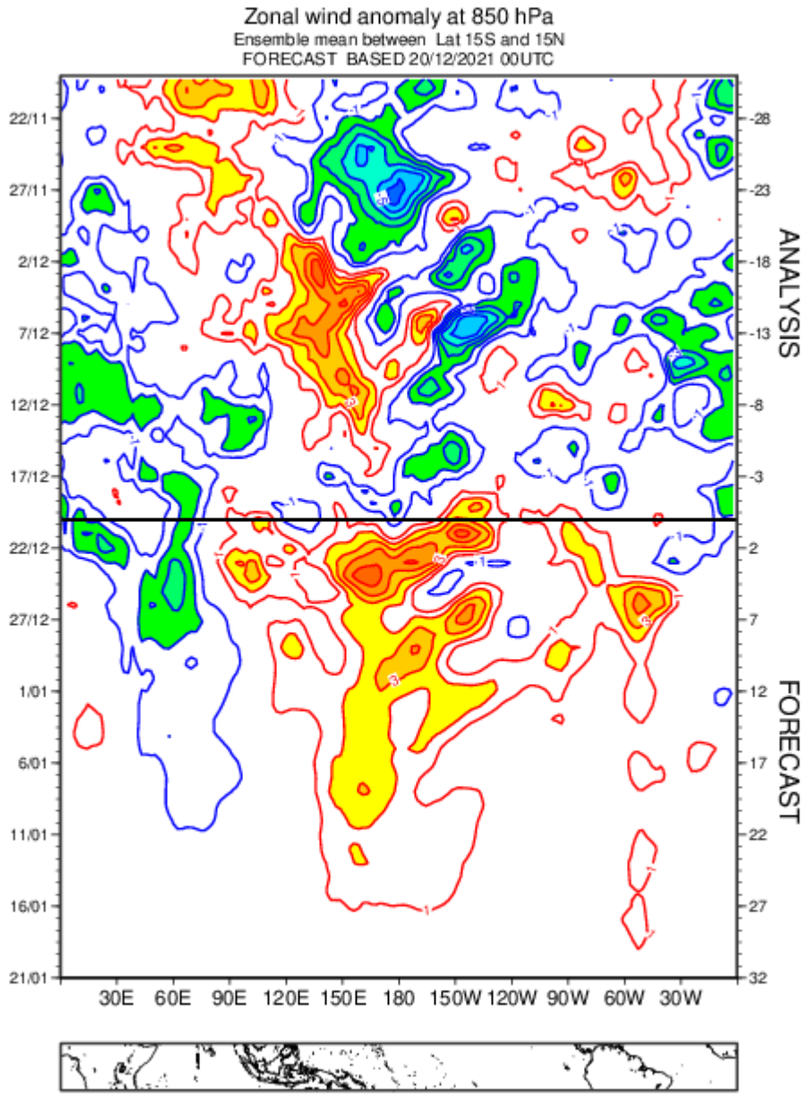


Figure 12: **IR image and Velocity Potential anomalies**

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

ECMWF Madden-Julian-Oscillation (MJO) Forecast





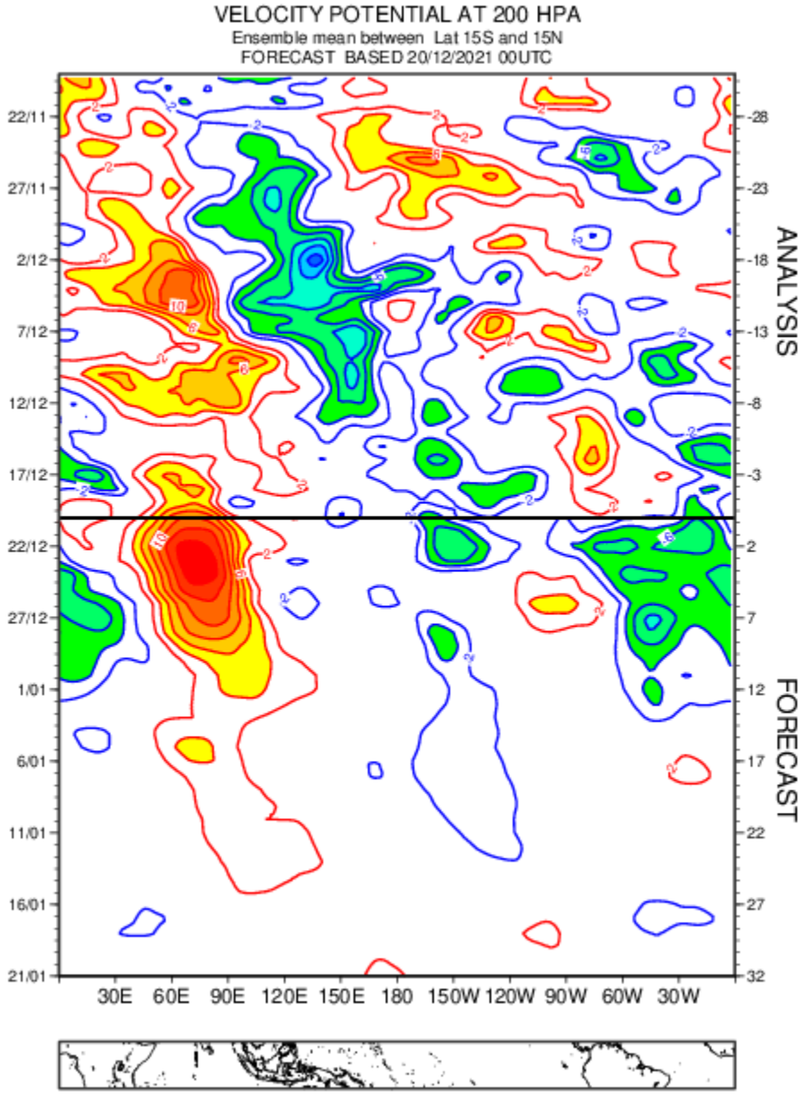
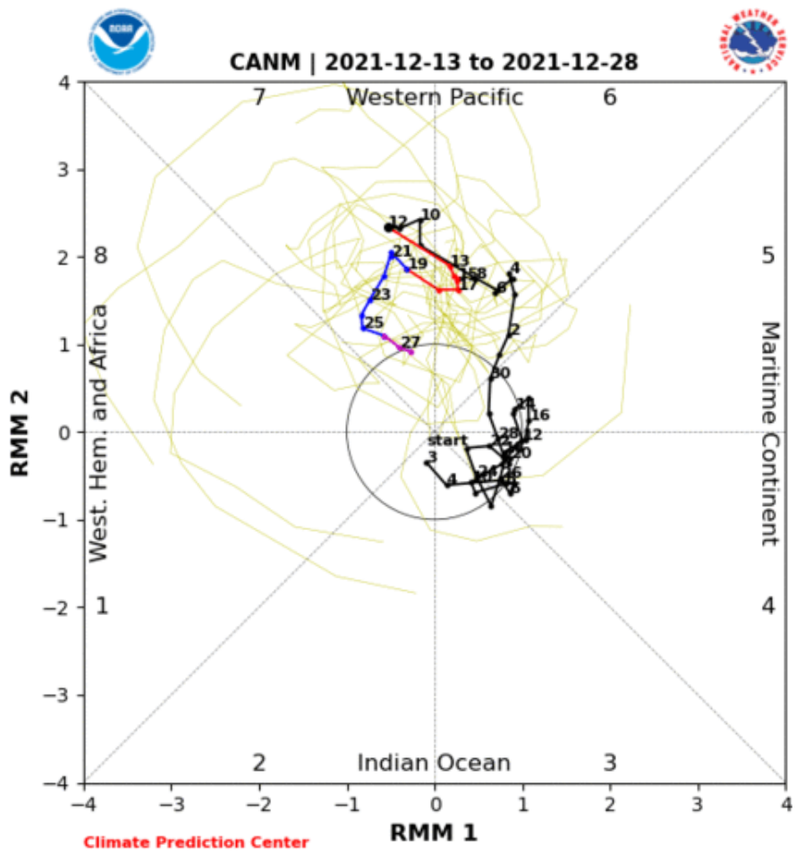
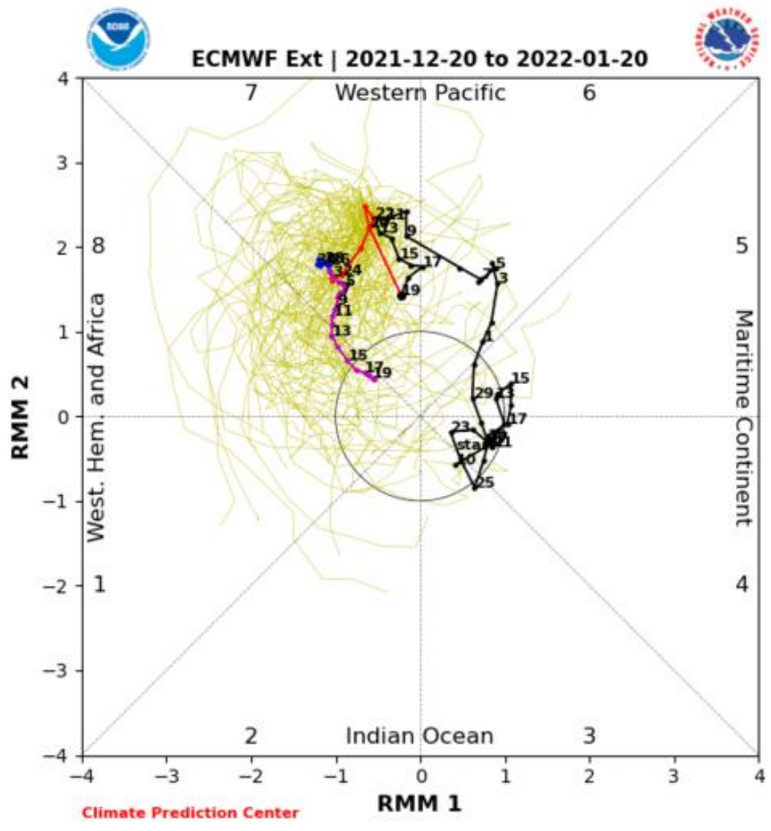


Figure 13: **ECMWF MJO Forecast**

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





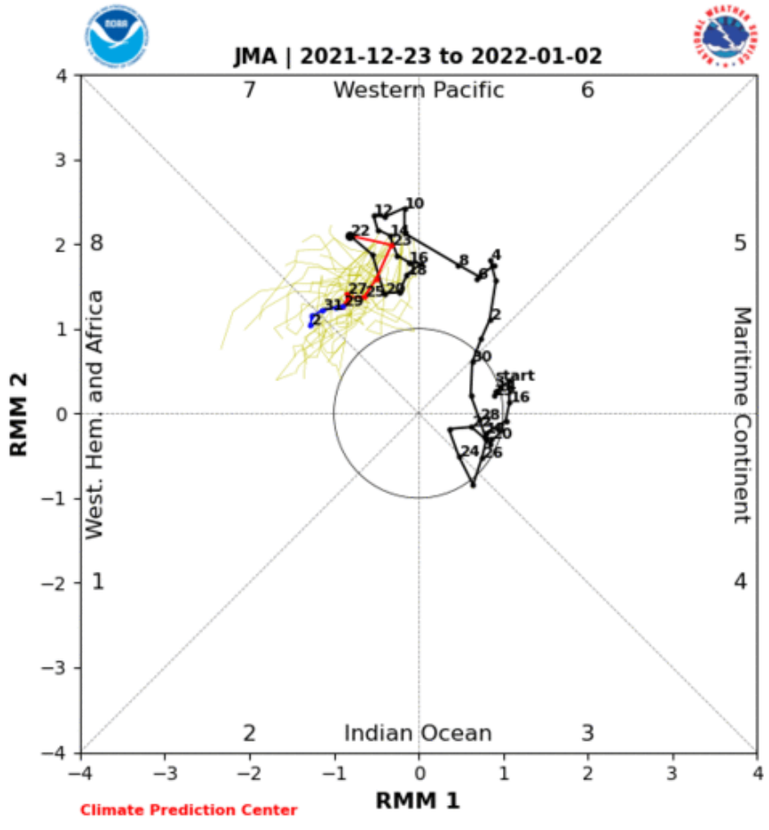


Figure 14: Forecasts for ECMWF, NCEP and UK Met Office

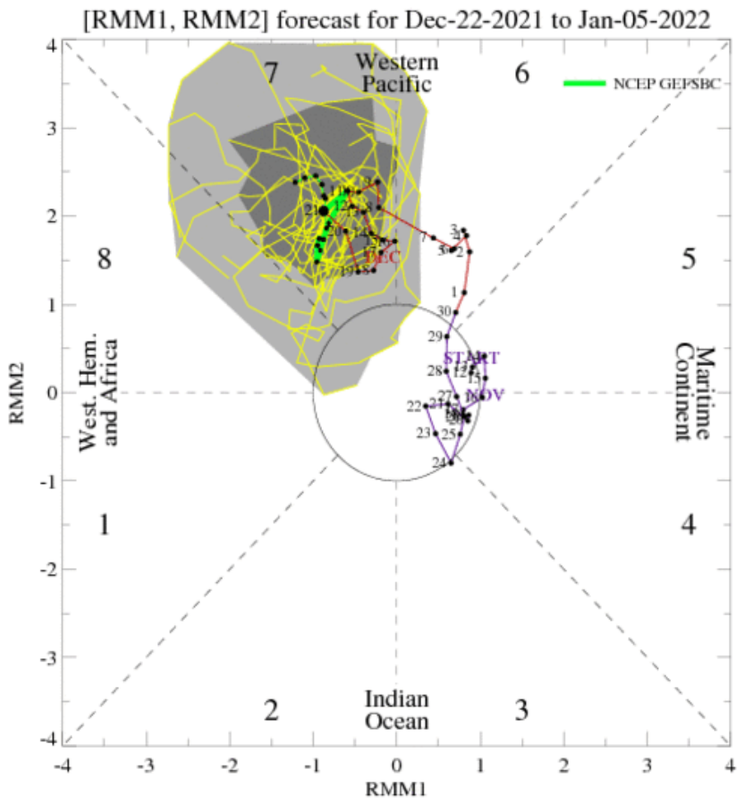
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/emon.shtml

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

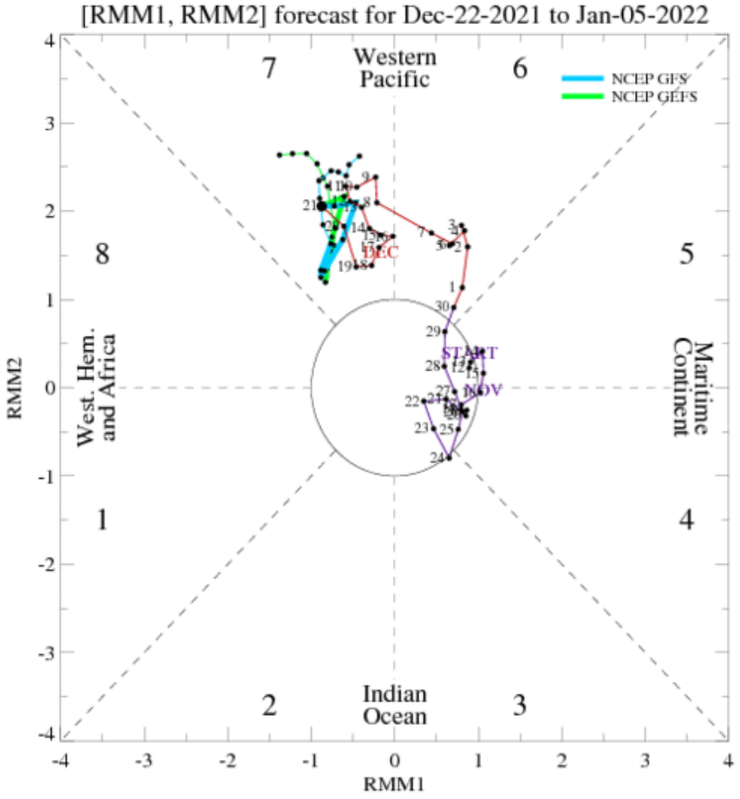
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_mjo_family_index?facets=undefined&time=2019081500,0,2019081500

MJO FORECAST

Ensemble GFS Phase Diagram



Operational GFS Phase Diagram



Statistical GFS Phase Diagram

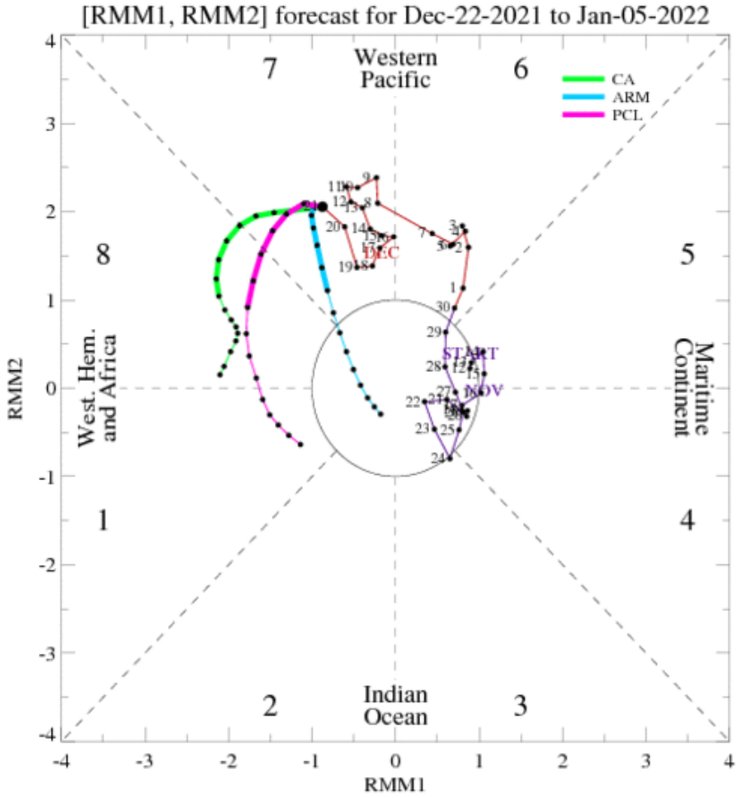


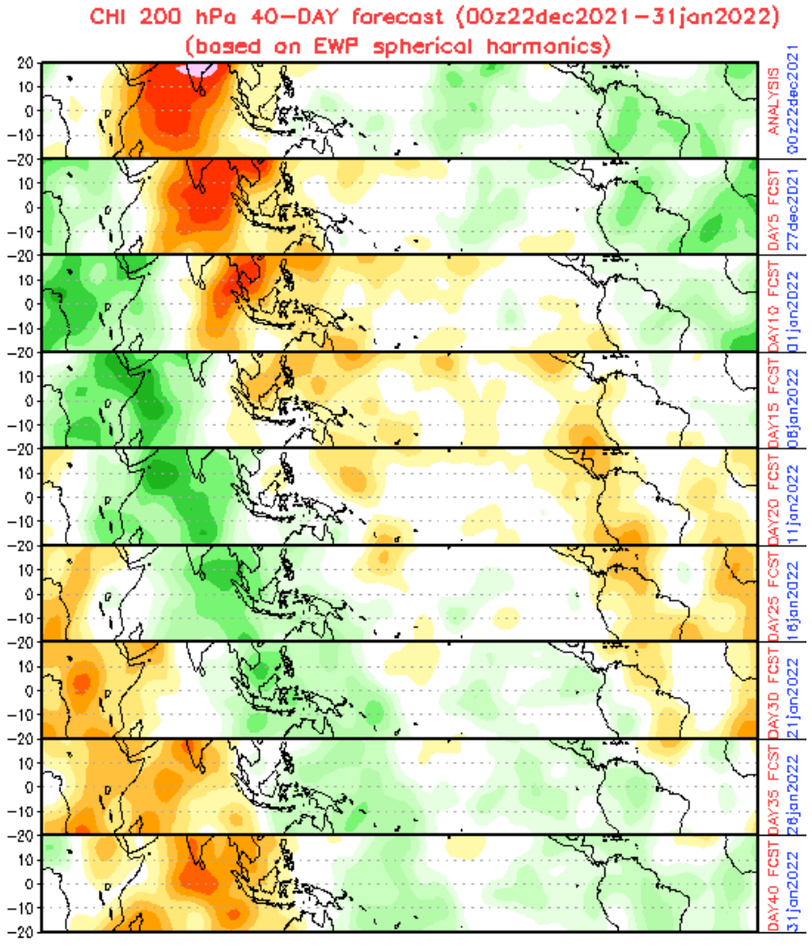
Figure 15: MJO forecast

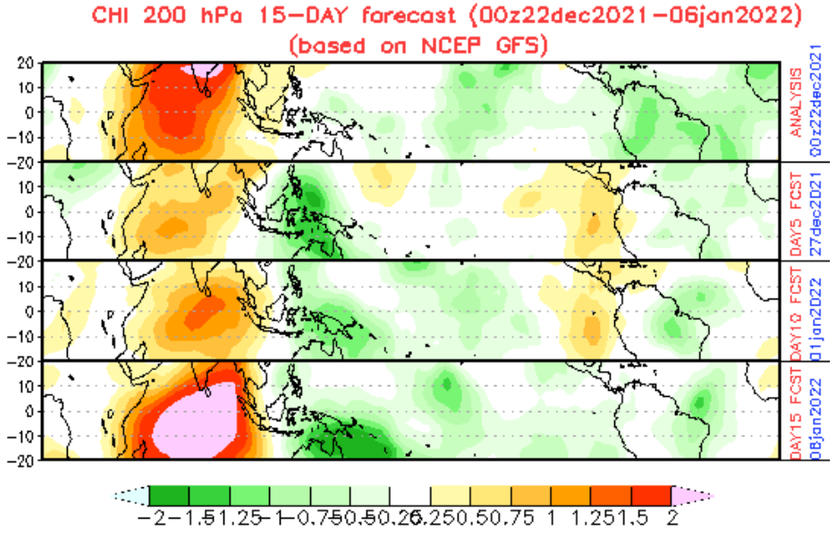
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/foregfs.shtml

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





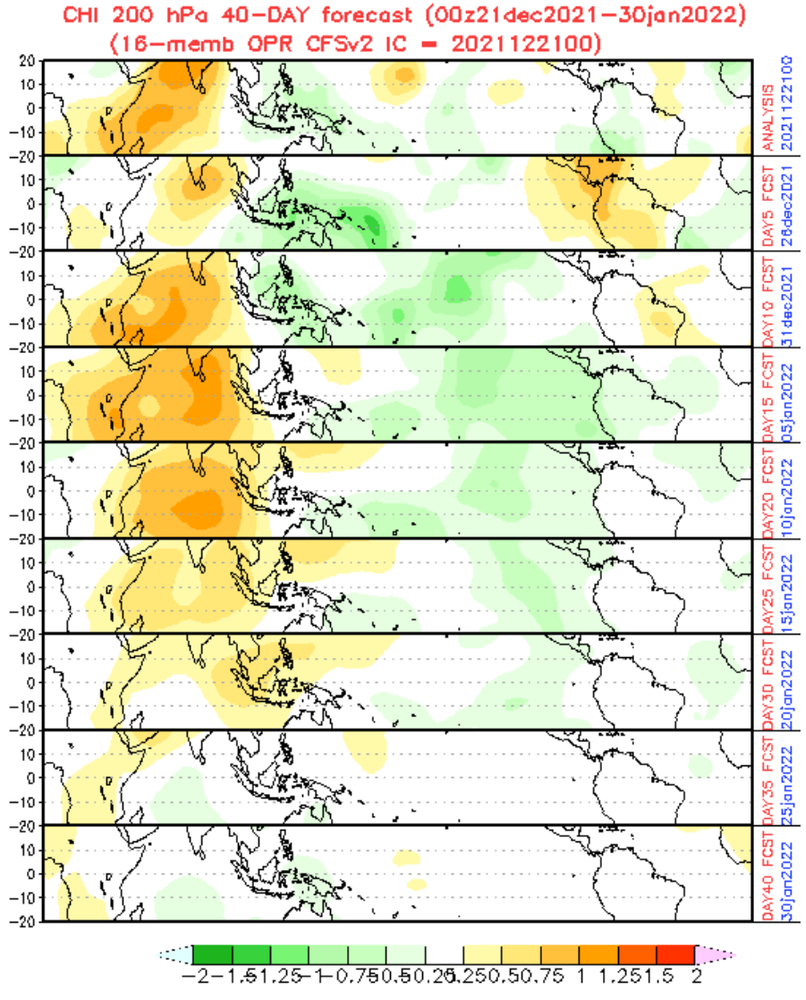


Figure 16: MJO forecast

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

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Past 4 Weeks Precipitable Water and Outlooks for Africa and Globally

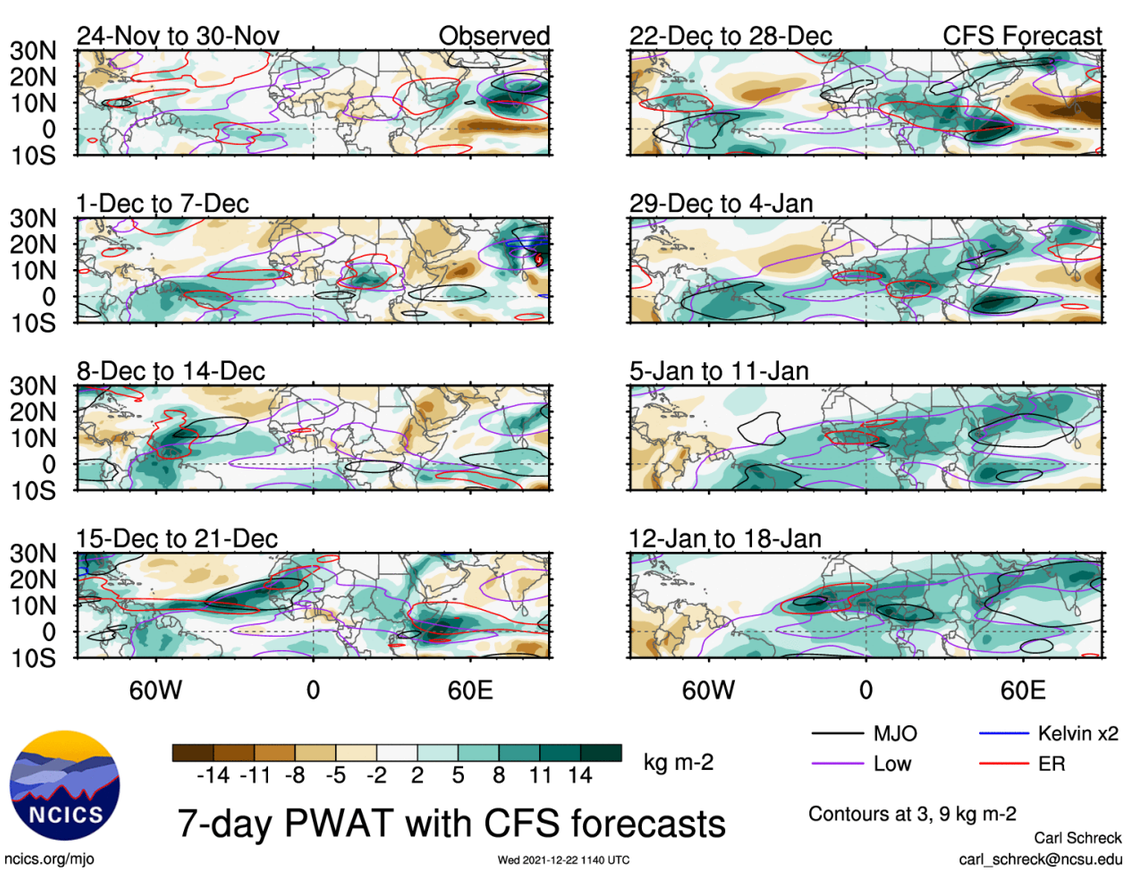


Figure 7a: Africa

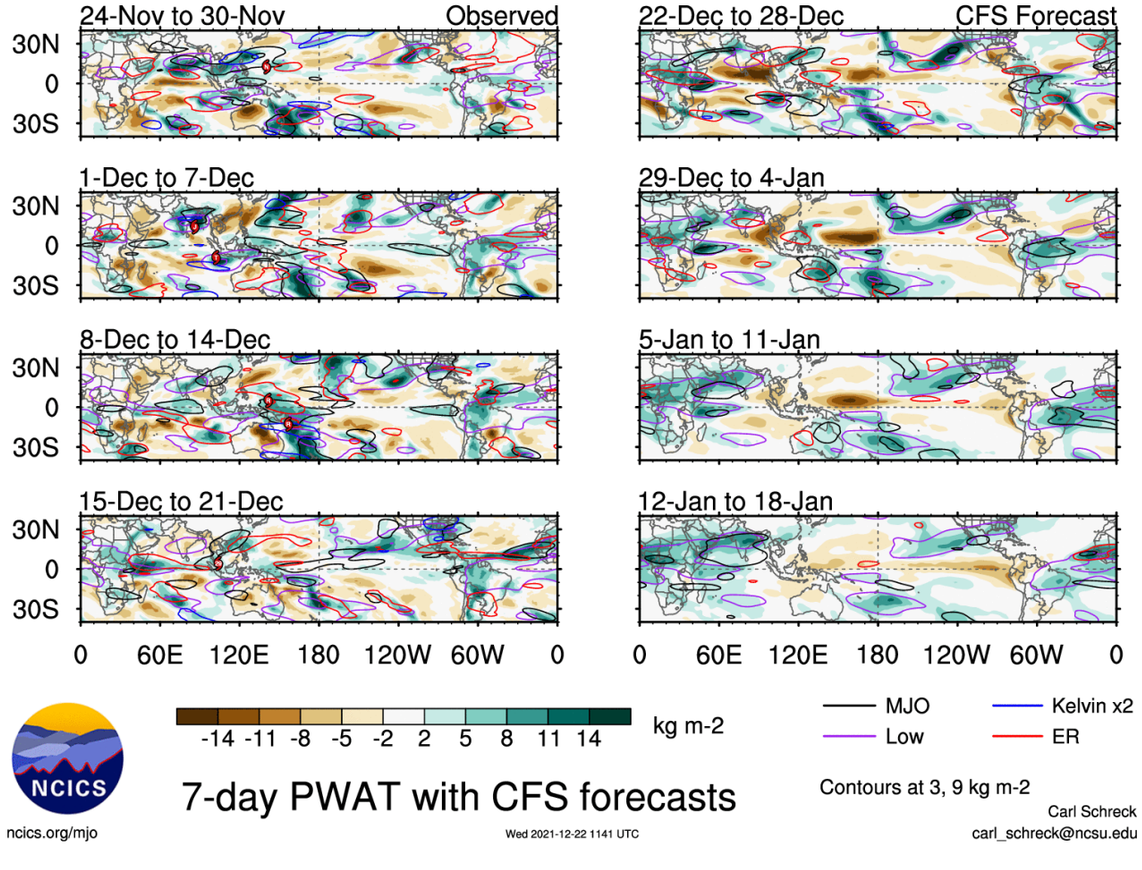


Figure 7b: Global

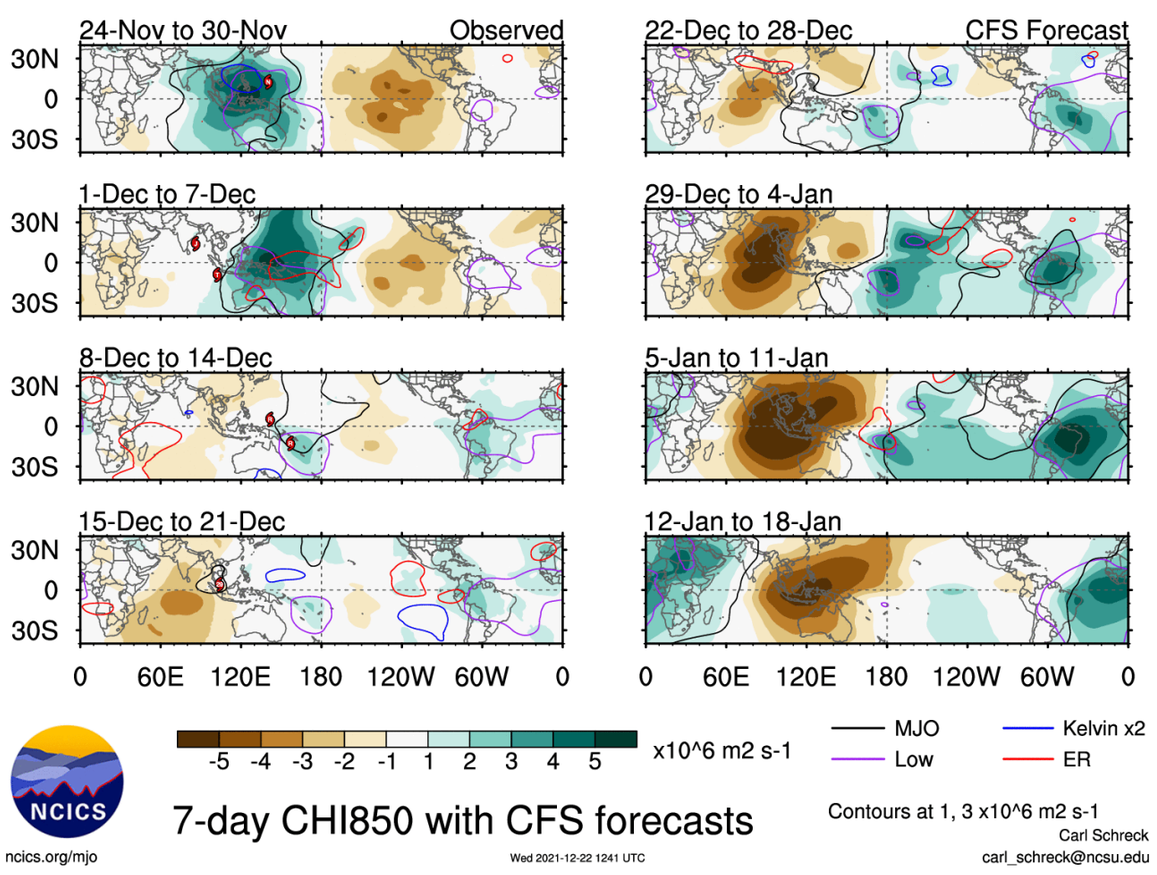
https://ncics.org/portfolio/monitor/mjo/

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



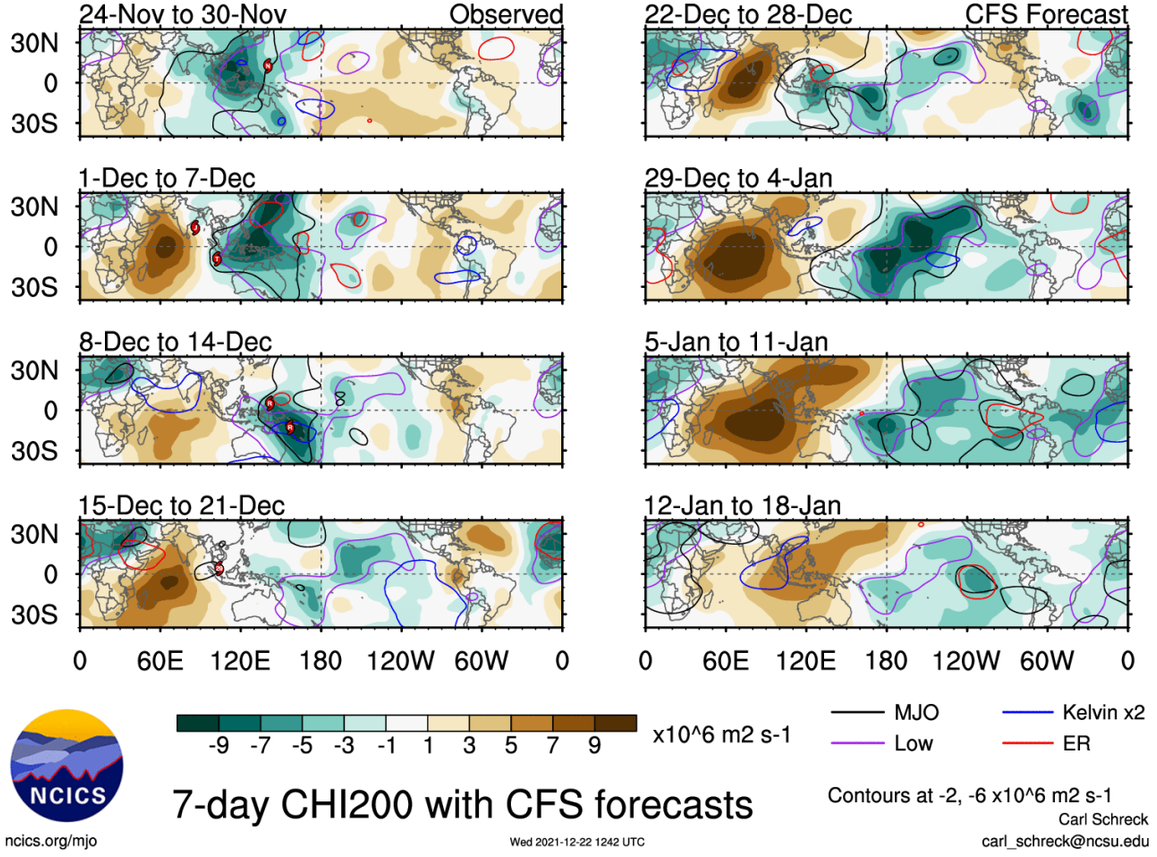
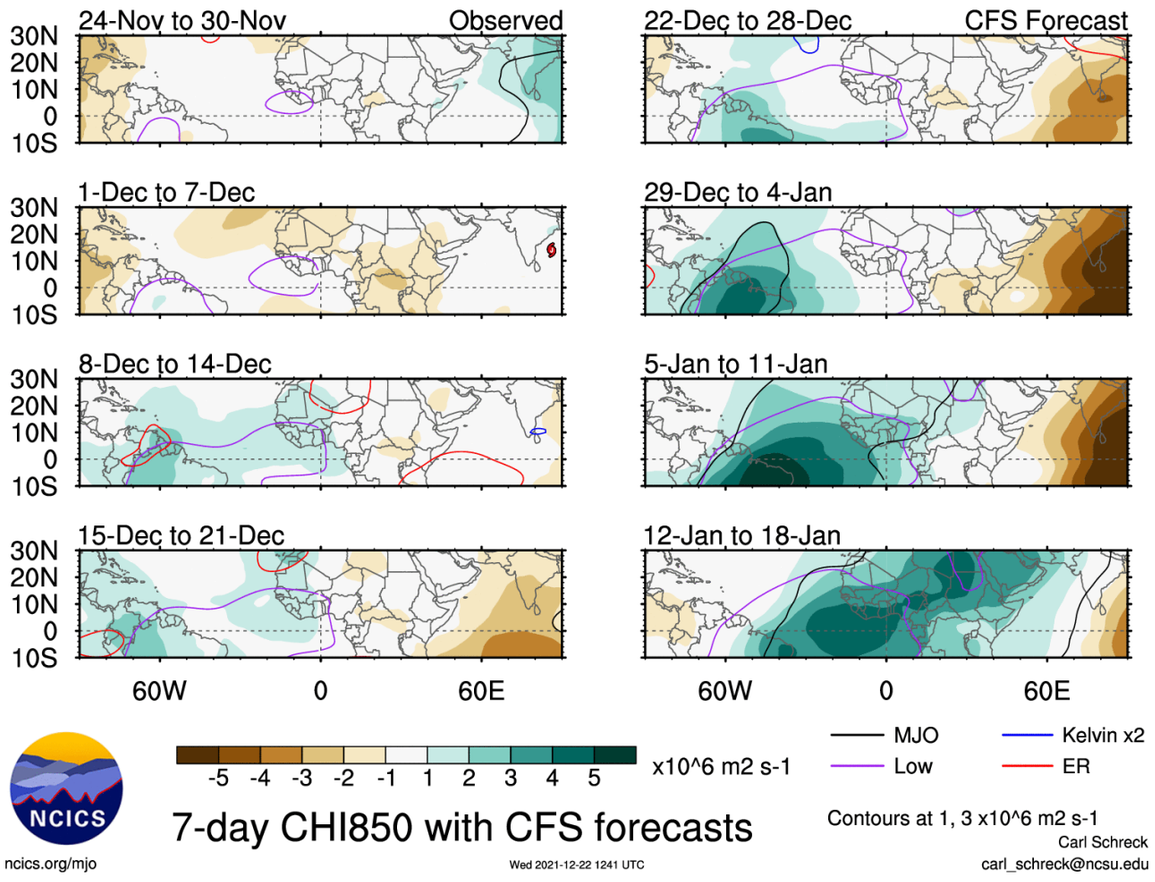


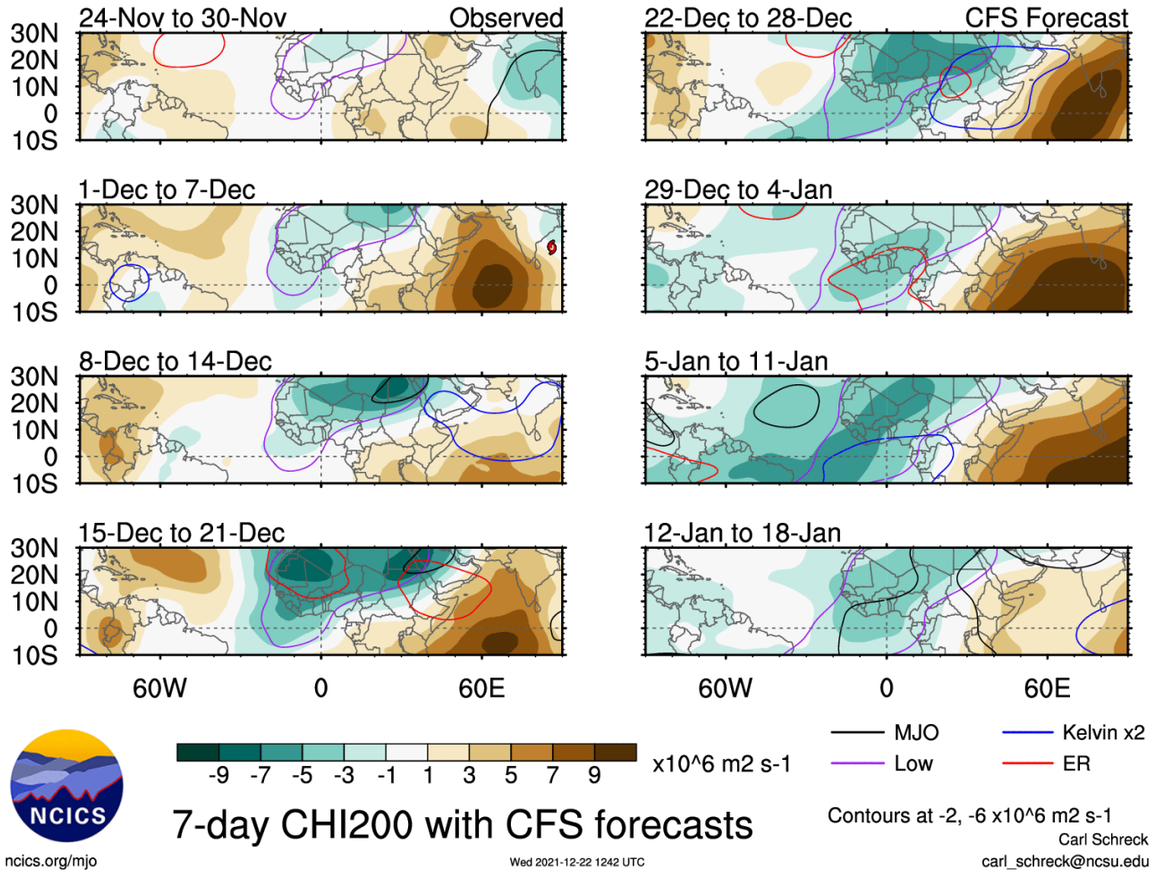
Figure 18a and b: Past four week and month velocity potential

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



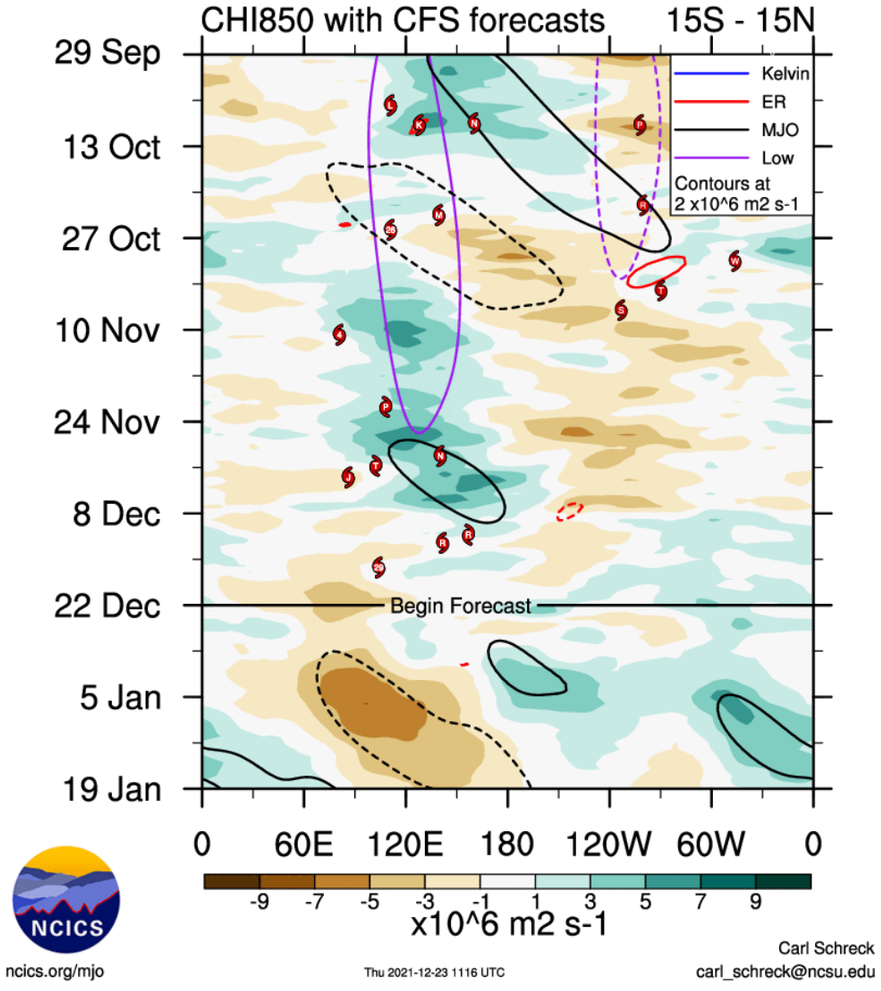


https://ncics.org/pub/mjo/v2/map/chi850.cfs.all.africa.10.png

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



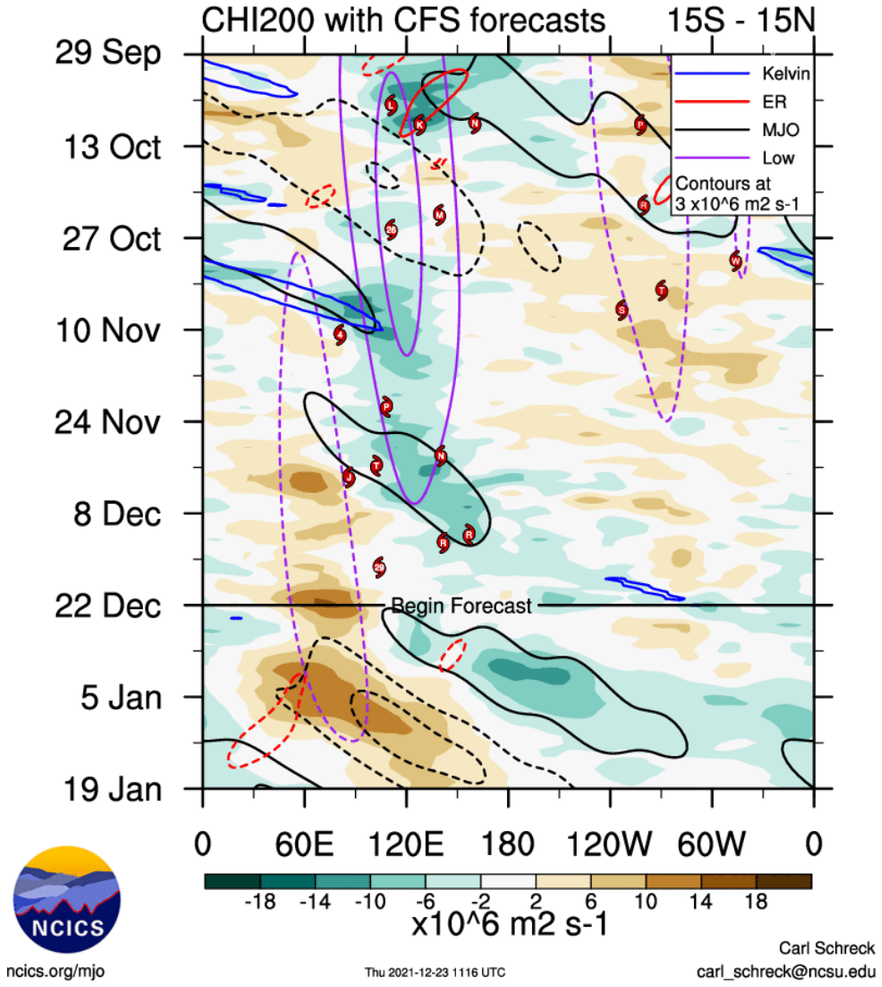
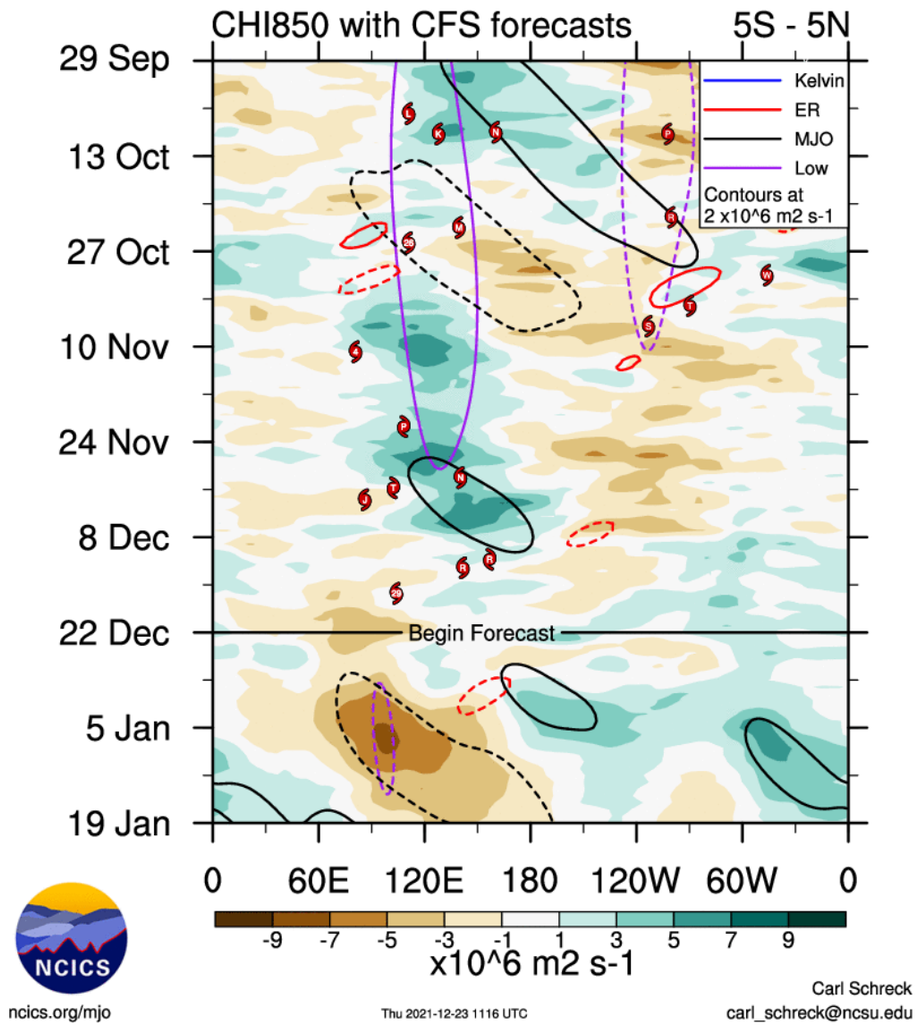


Figure 20: **Anomalies for 15n-15s with waves overlay including outlooks**

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



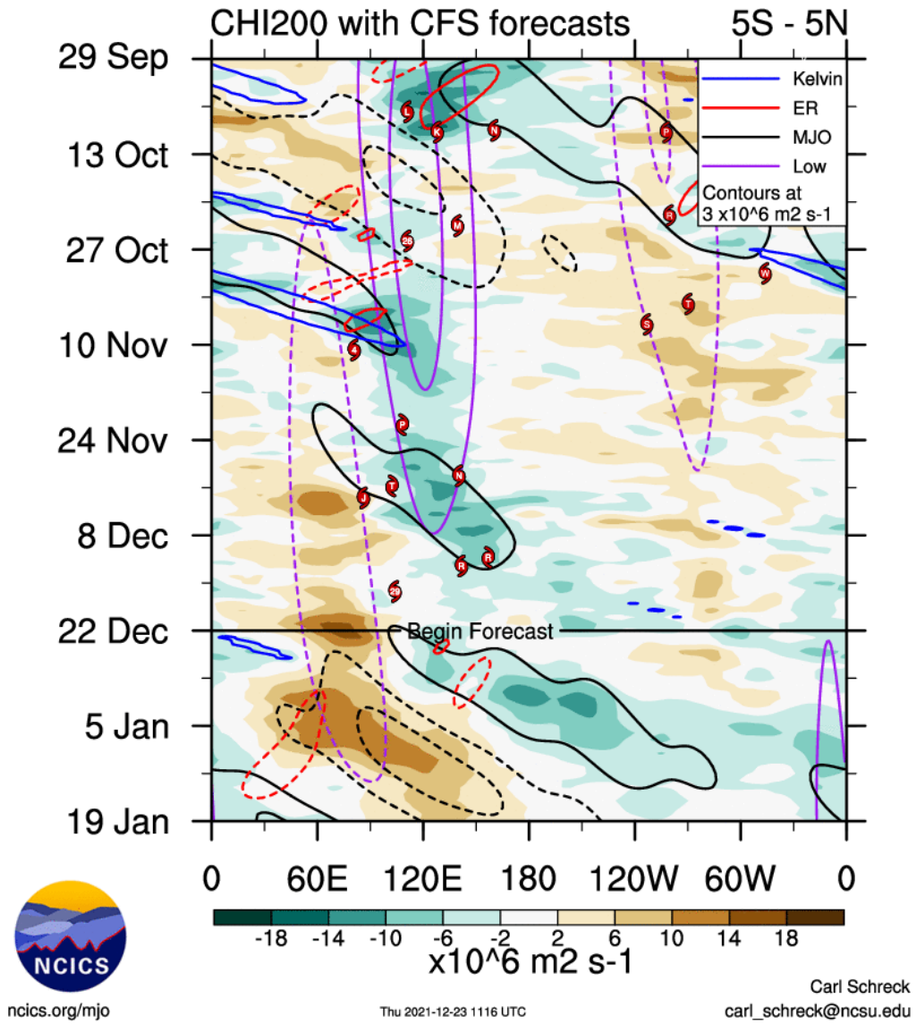
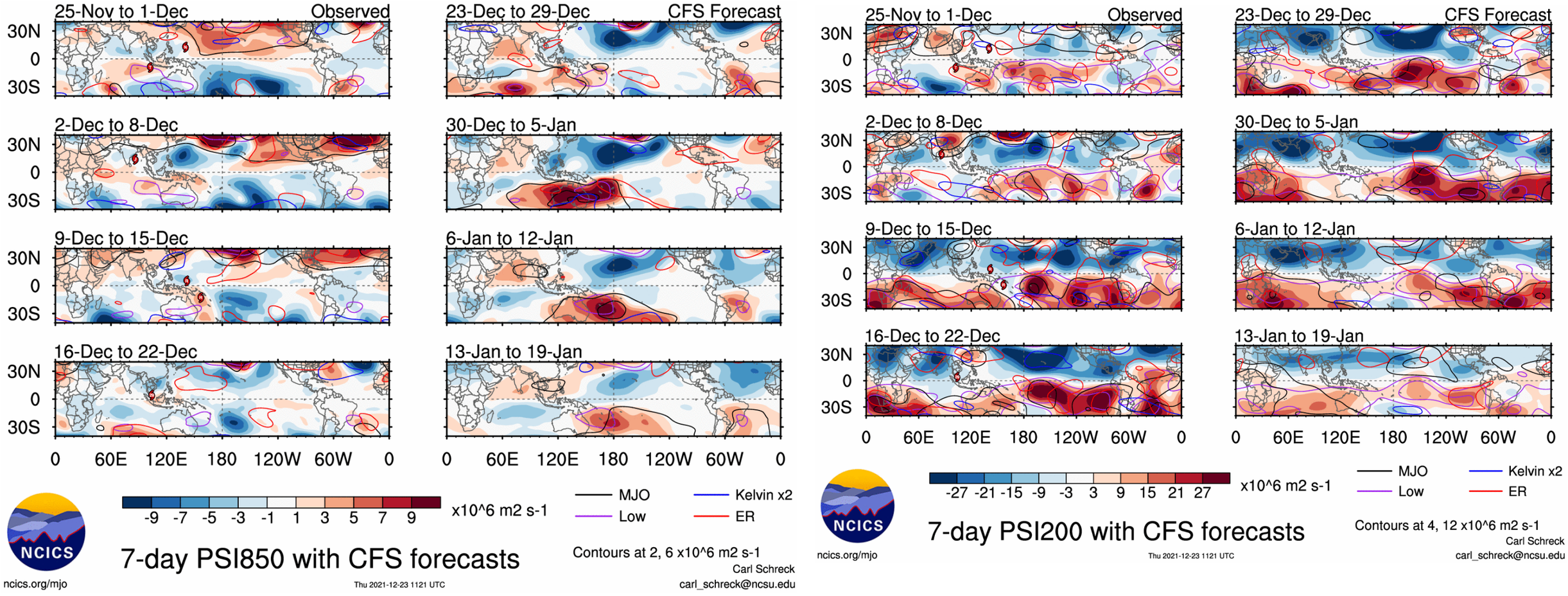


Figure 21: **Anomalies for 5N-5S with waves overlay including outlooks**

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

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

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

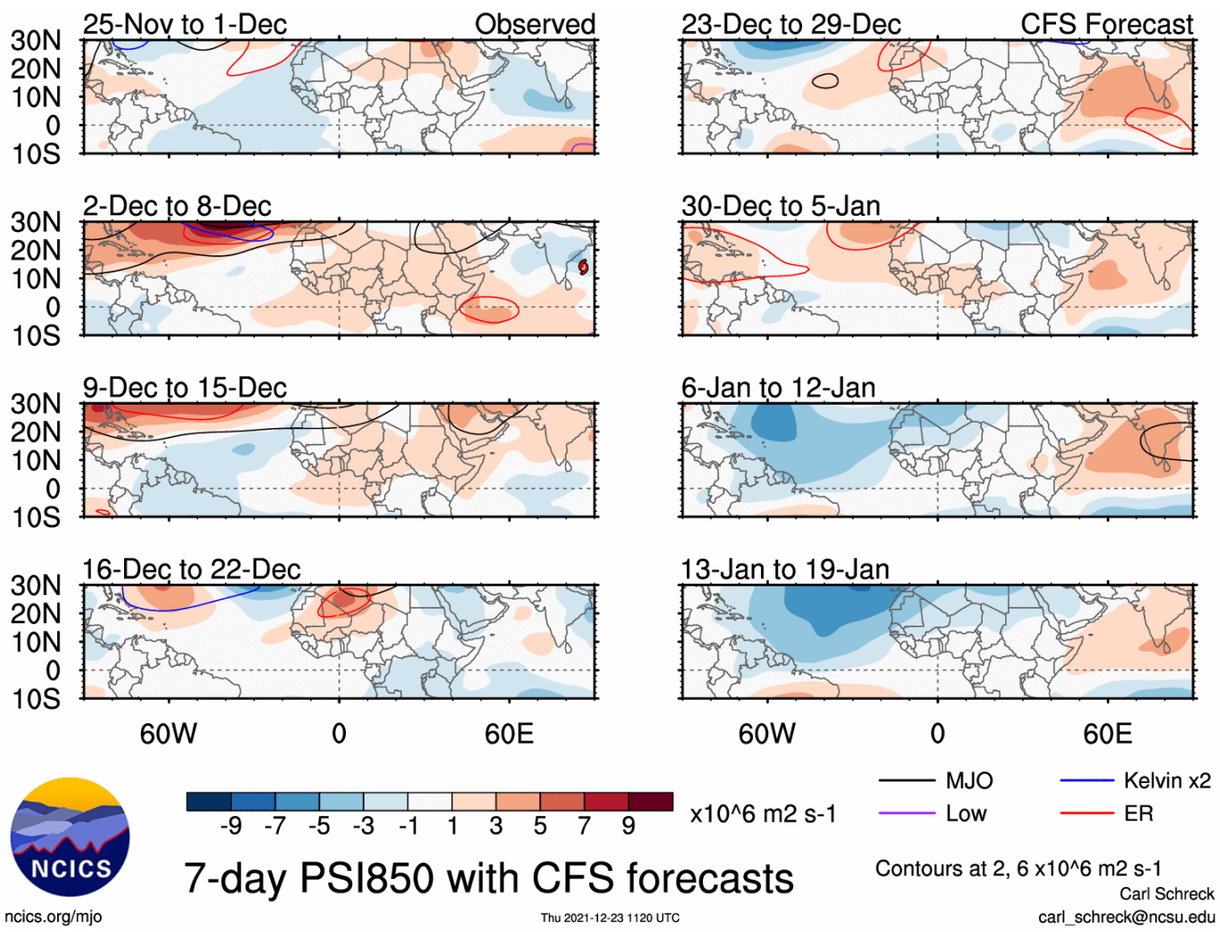


https://ncics.org/pub/mjo/v2/map/psi850.cfs.mjo.global.10.png

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



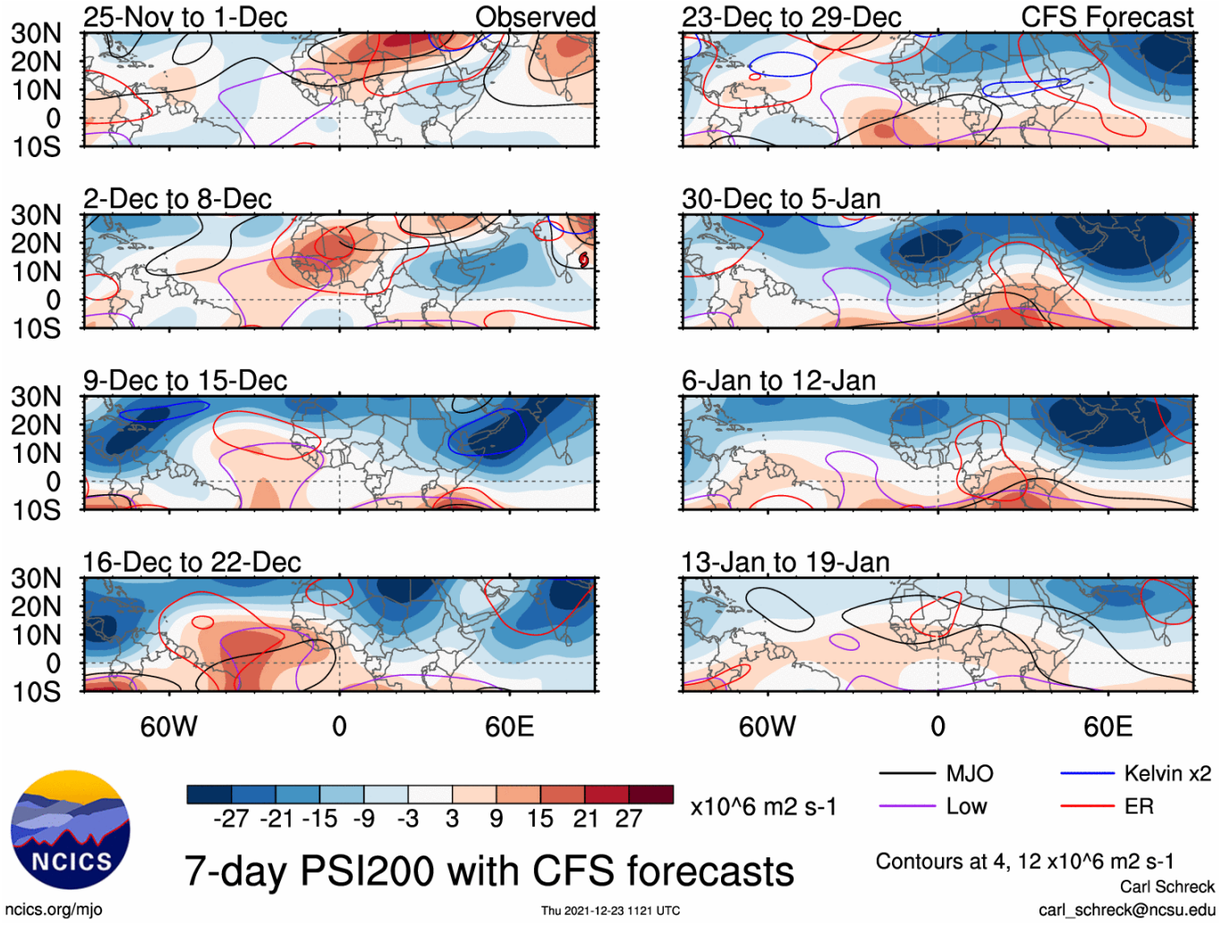


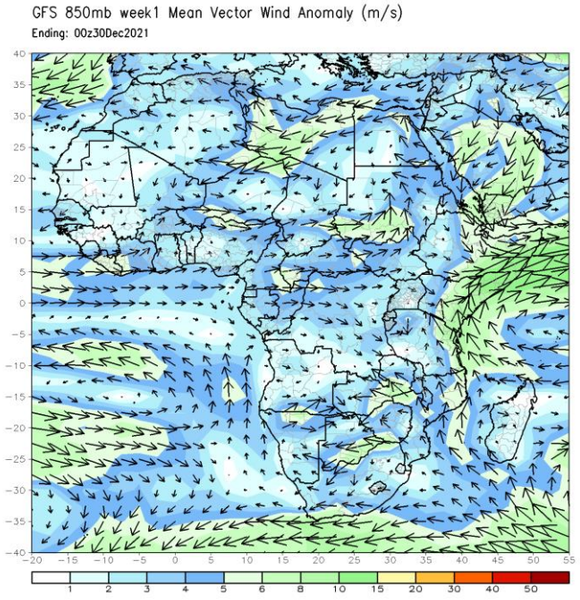
Figure 23: **Past 4 weeks stream function anomalies with MJO, Kelvin & Rossby wave on Africa maps**

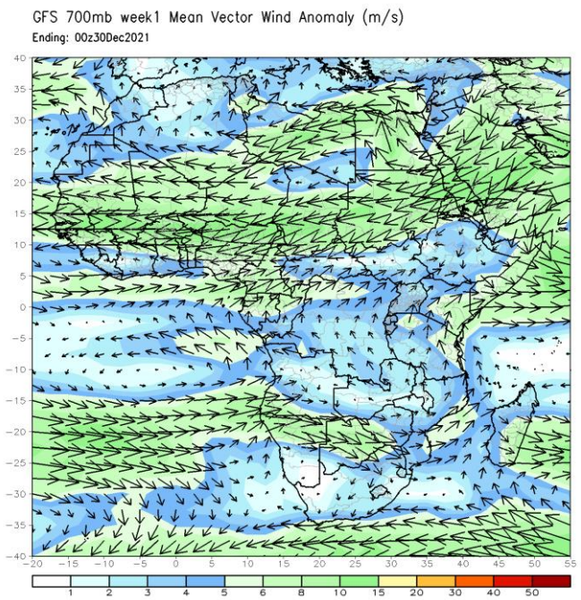
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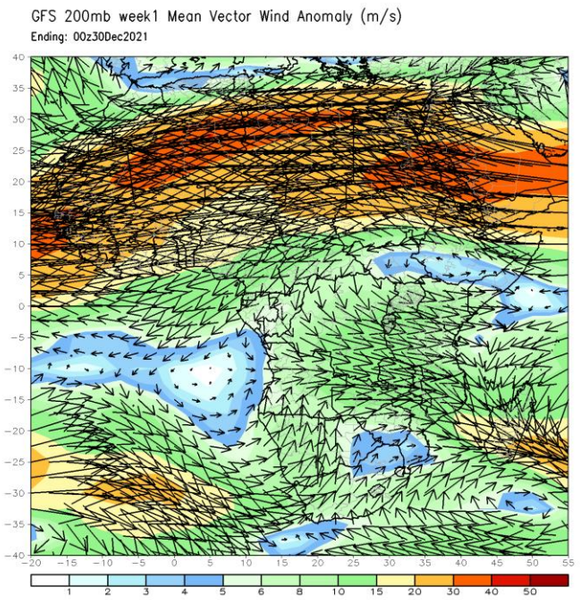
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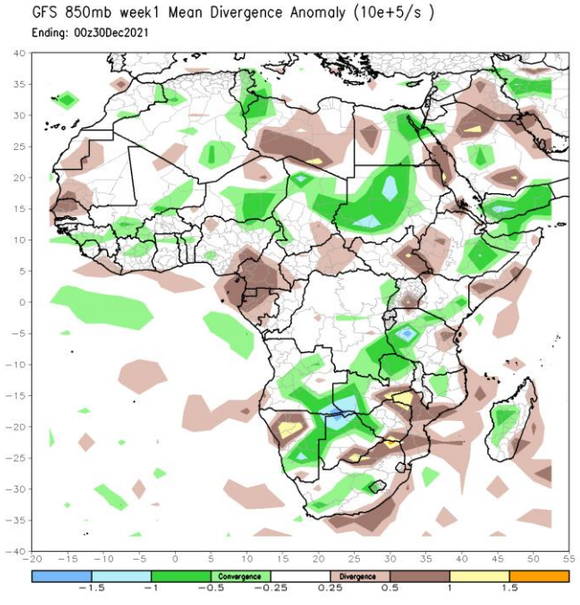
1. Monitoring Climate Element
2. Global Driver Review and Assessment
3. Model Guidance for Weekly Climate outlook

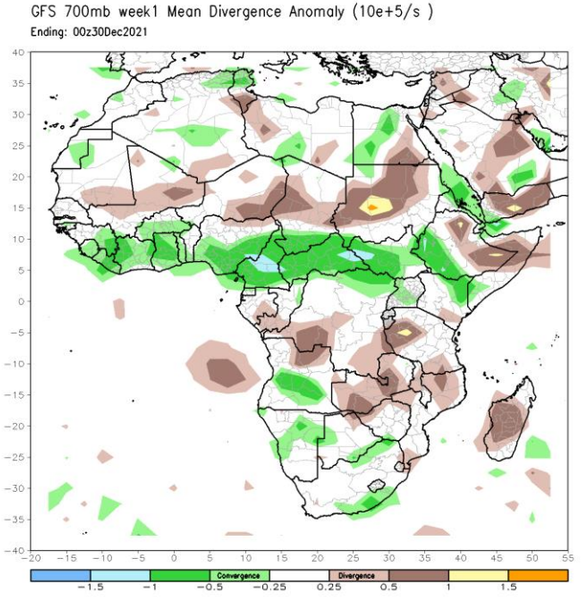
Wind Anomaly and Divergence Forecast from GFS week1











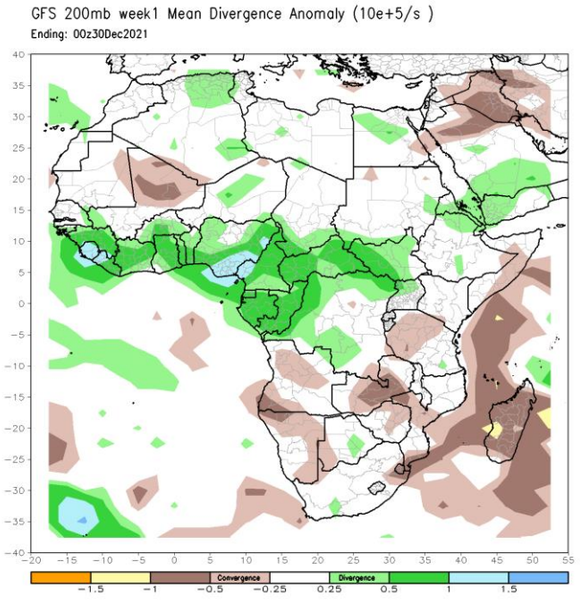
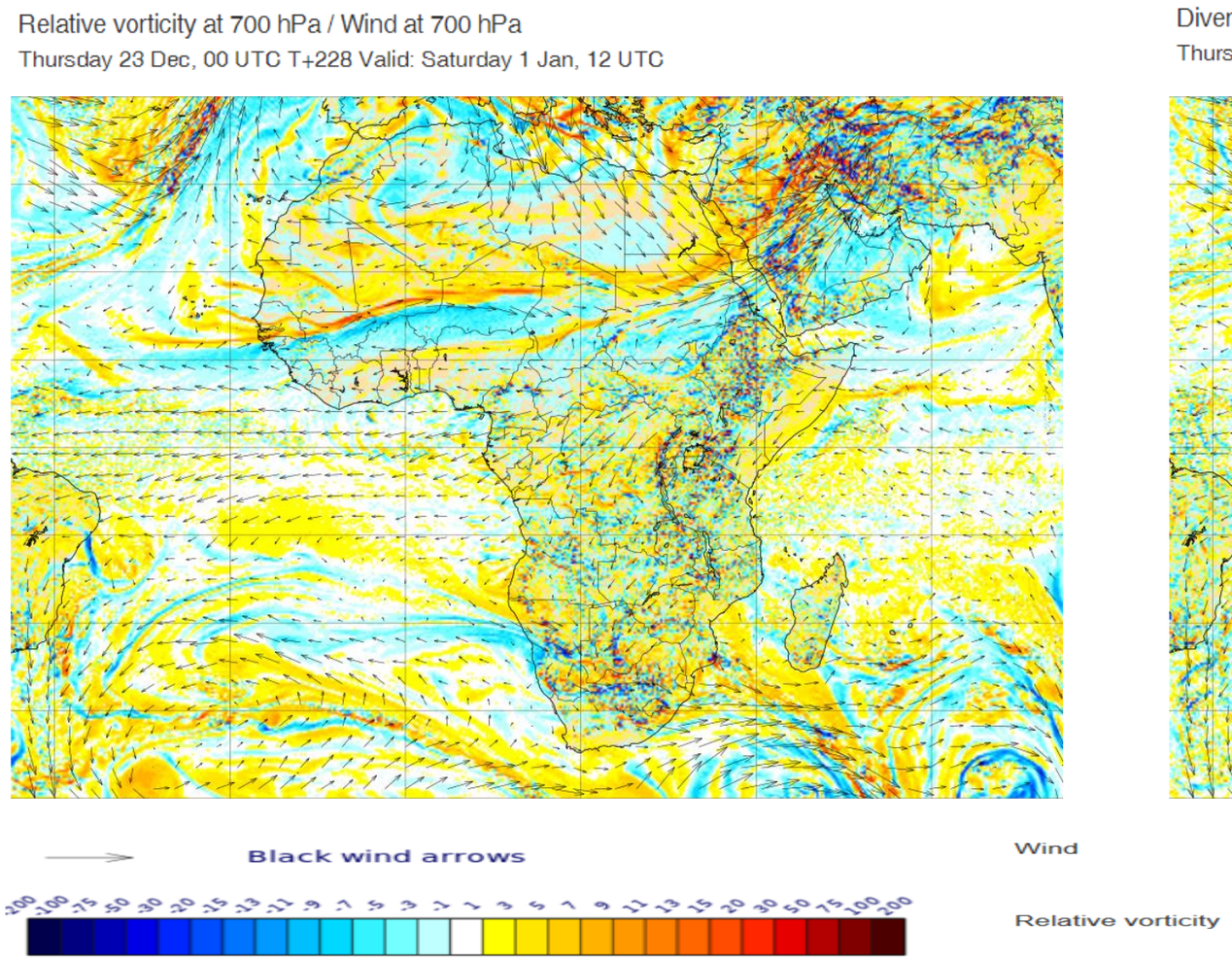


Figure 24 : Forecast from GFS

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



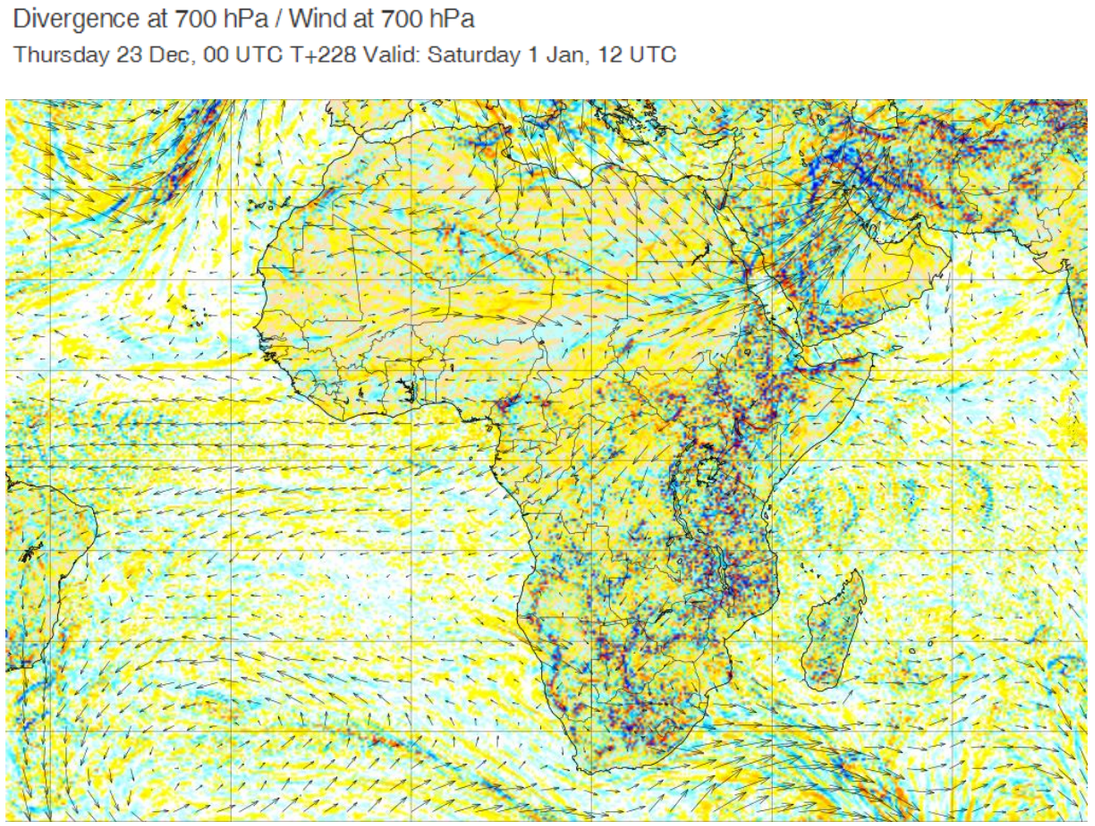
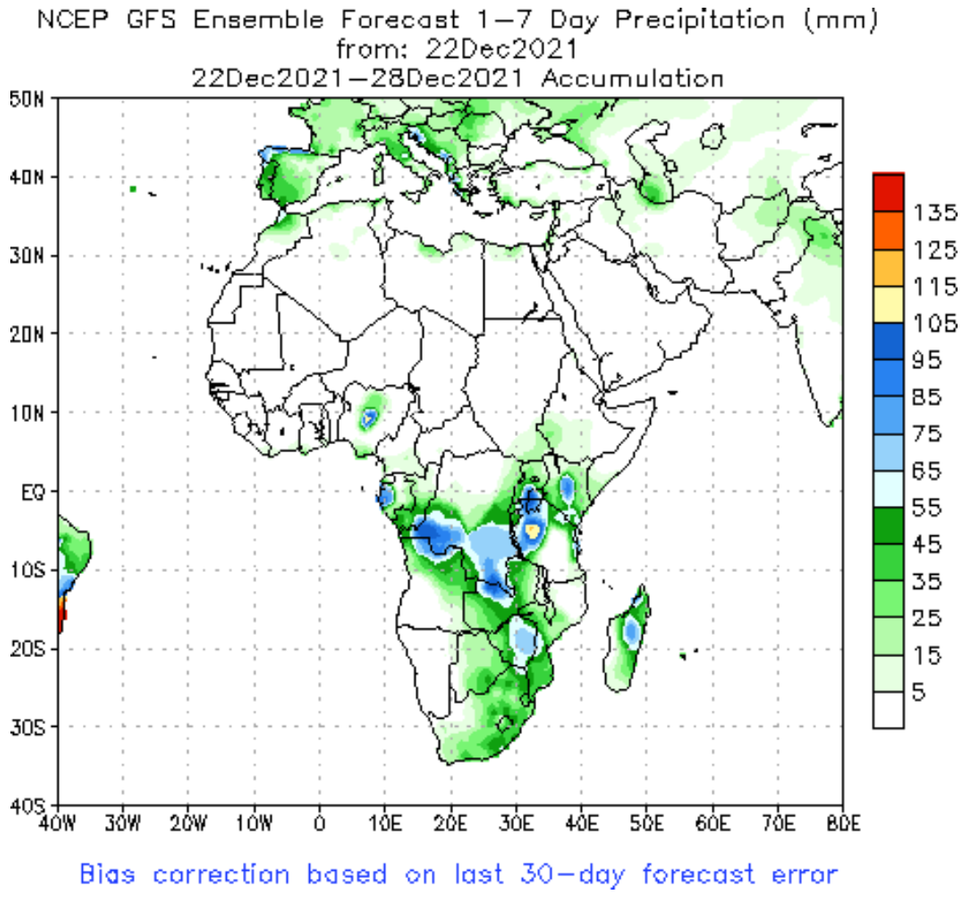


Figure 25: Relative Vorticity and Divergence forecast from CFS and ECMWF

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



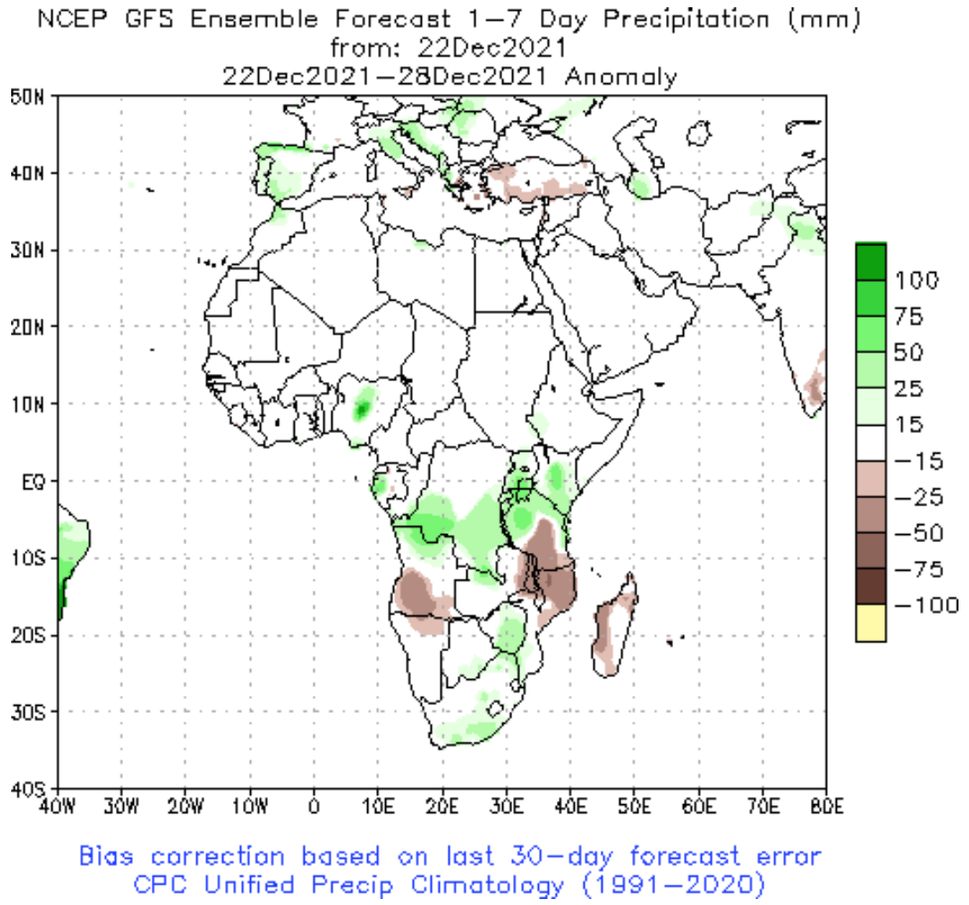


Figure 26: NCEP/GFS Précipitation and Anomaly forecast.

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

Week-1 Precipitation Probability of Exceedance: Forecast and Climatology
24–30 Dec 2021

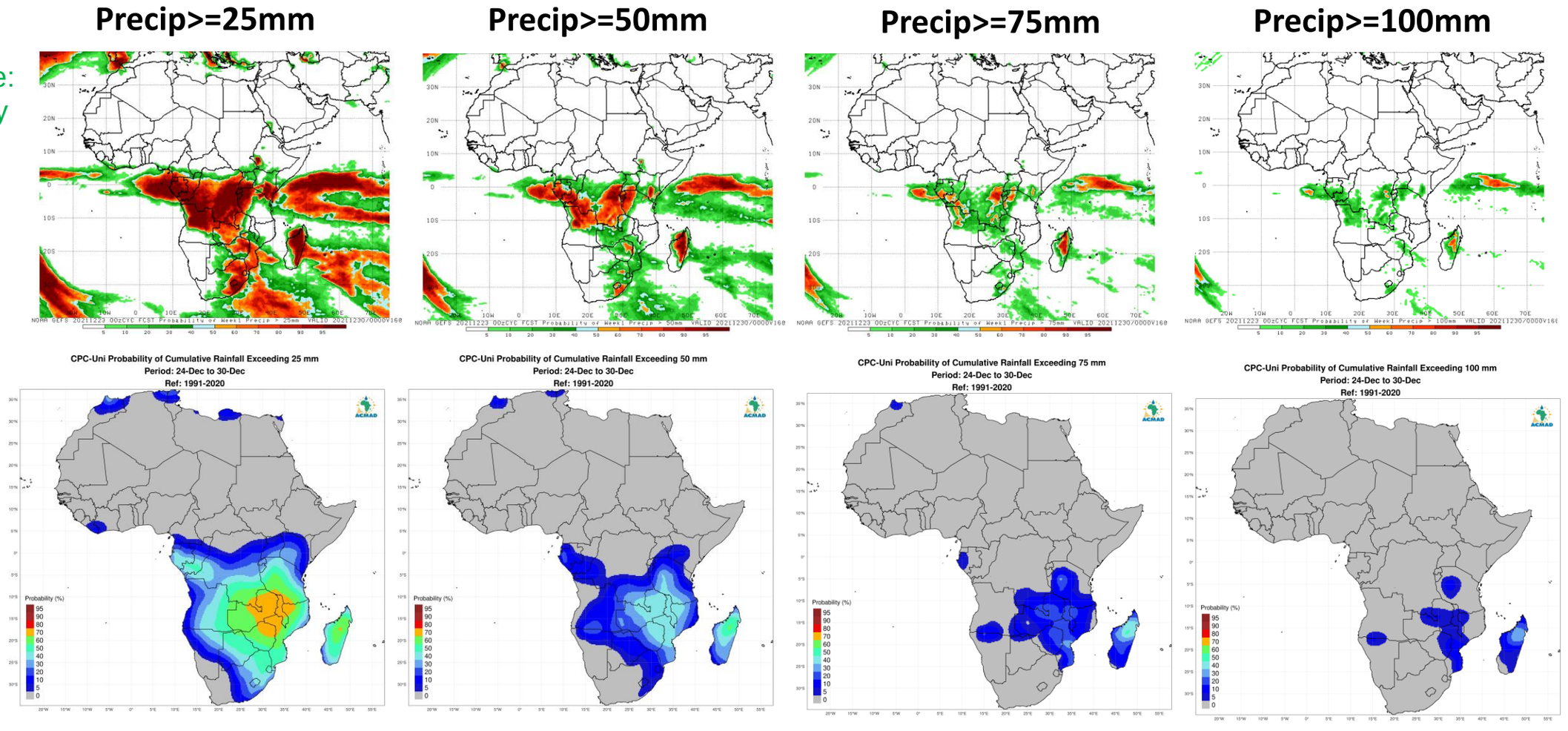


Figure 27: Week1 Precipitation Total Exceedance Probabilities

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
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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

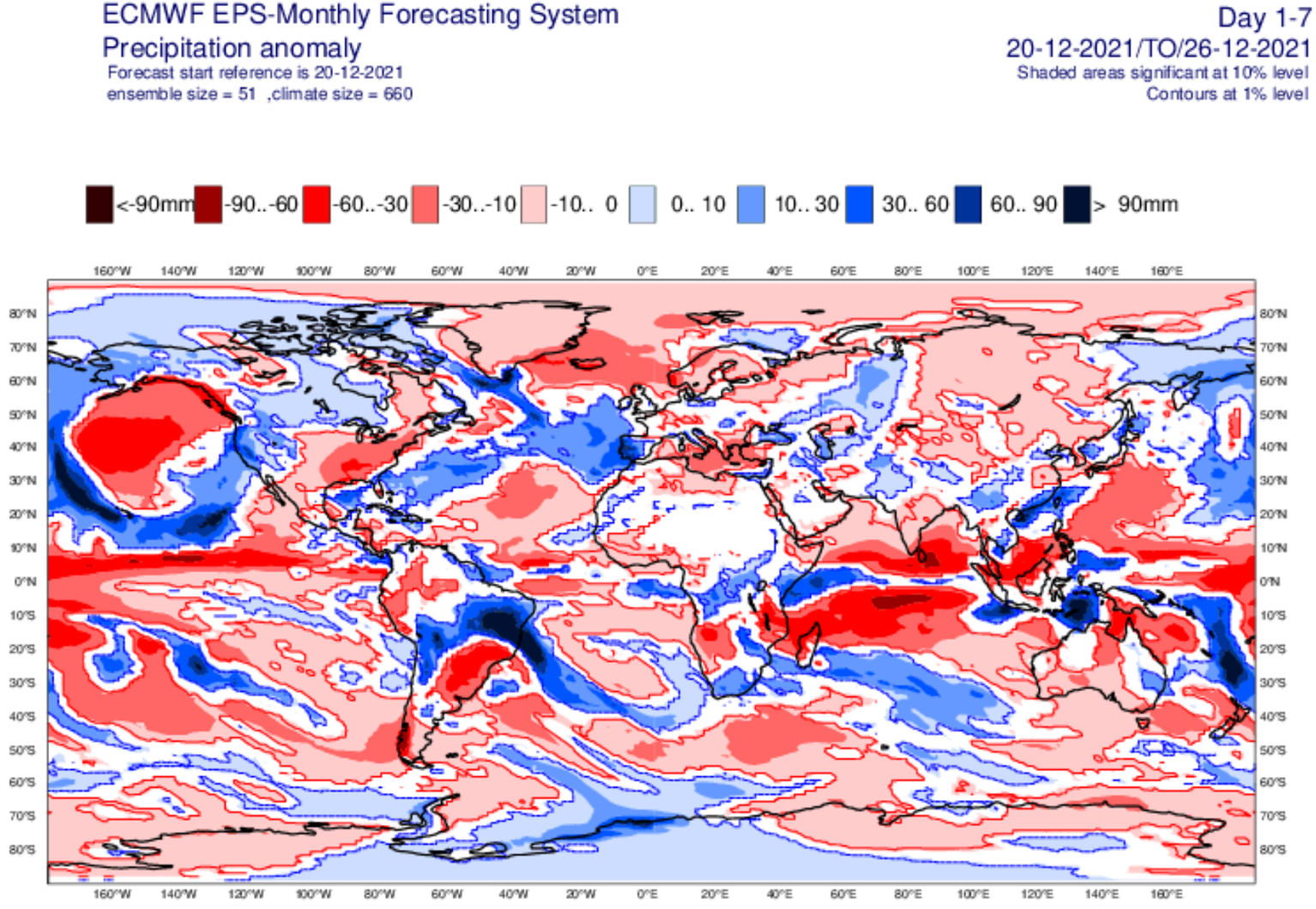
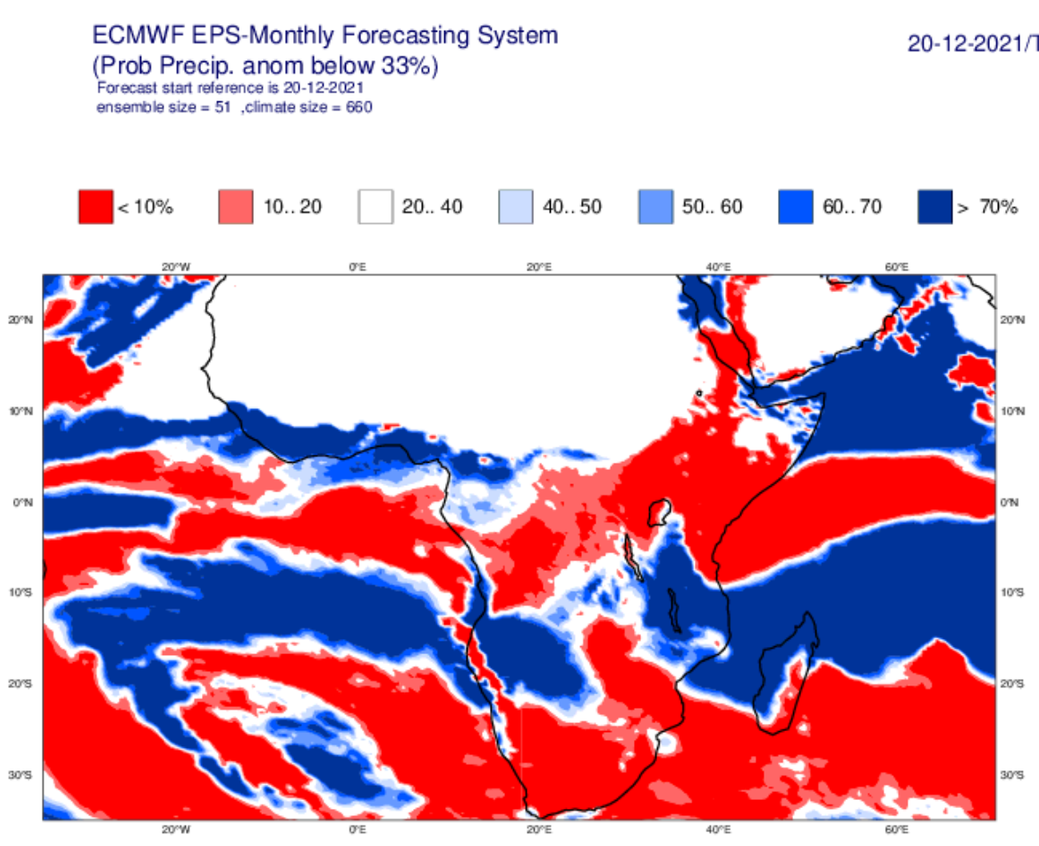


Figure 28: Monthly Precipitation Anomaly forecast from ECMWF

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

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



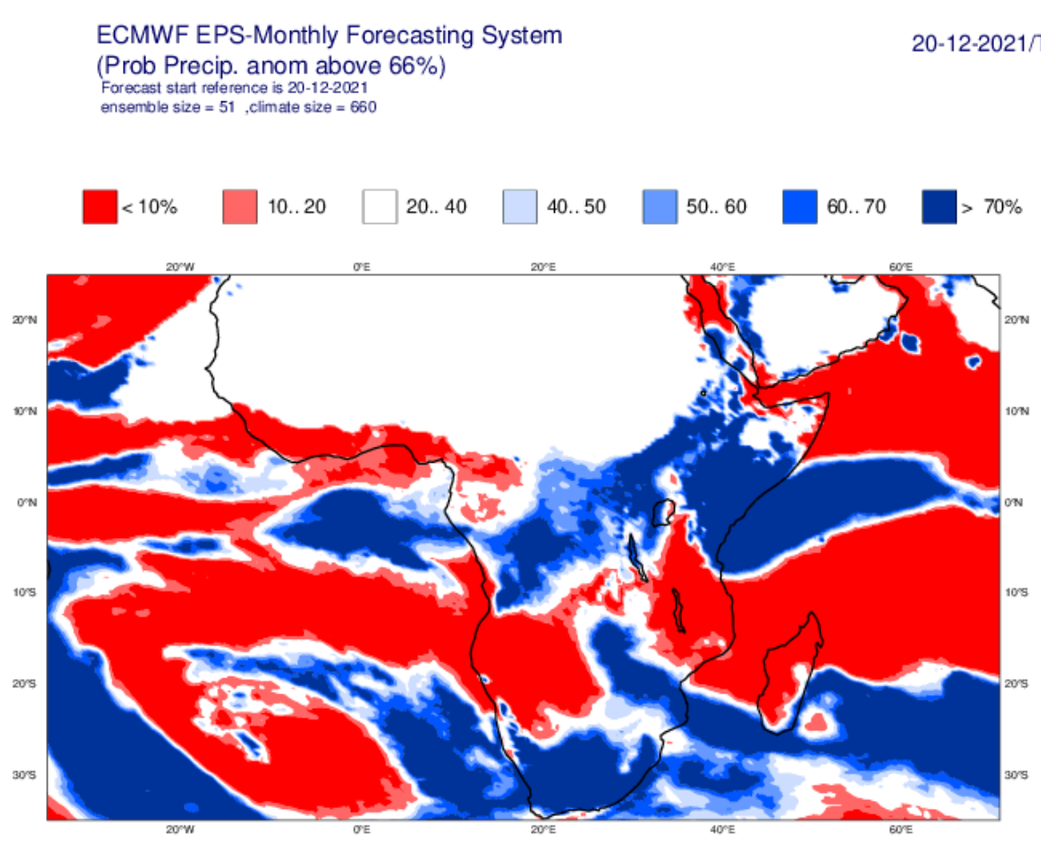
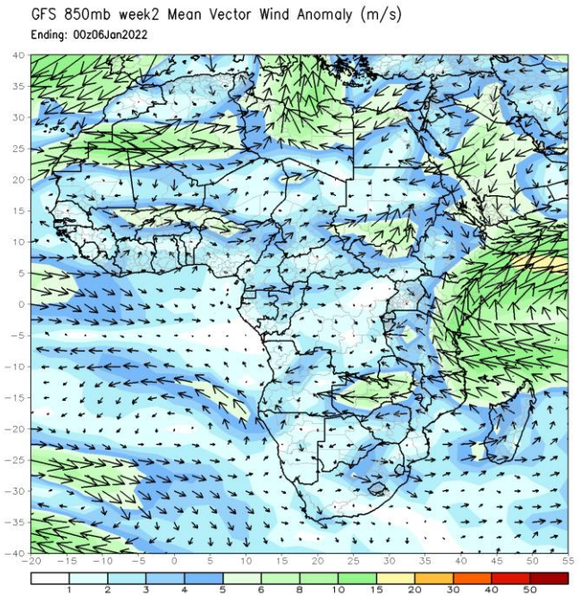
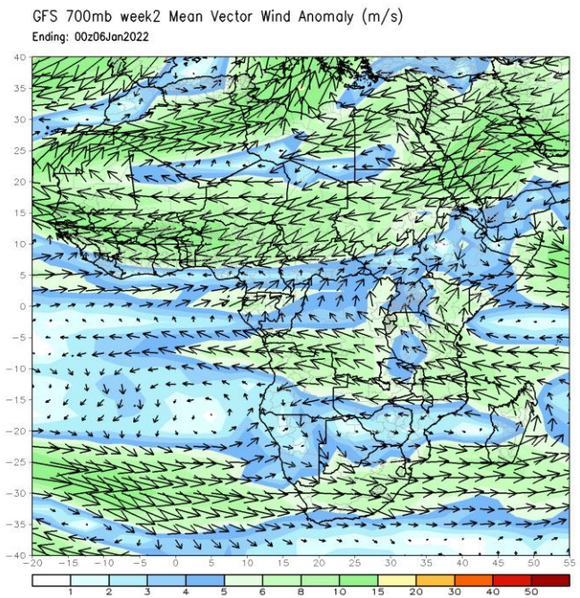


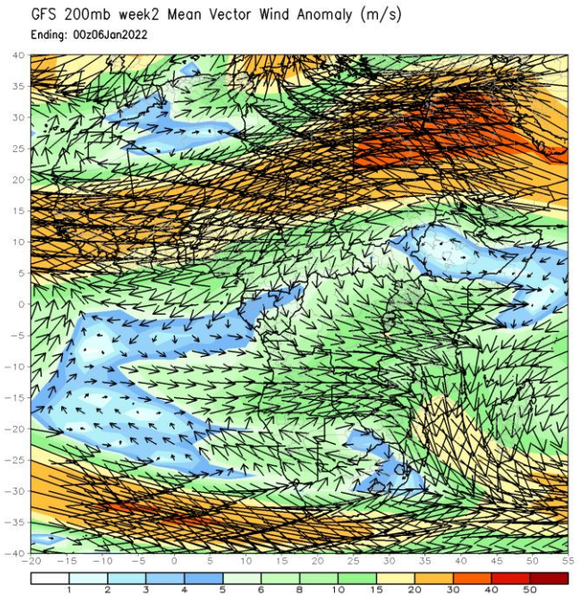
Figure 29: Weekly tercile probability forecast below 33%

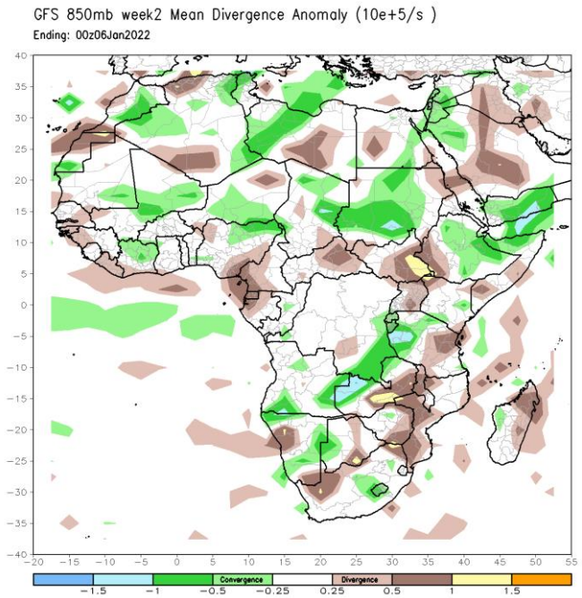
https://www.ecmwf.int/en/forecasts/charts/catalogue/mofc_multi_tercile?facets=undefined&time=2021110100,312,2021111400&parameter=precipitation&tercile=1&area=Africa

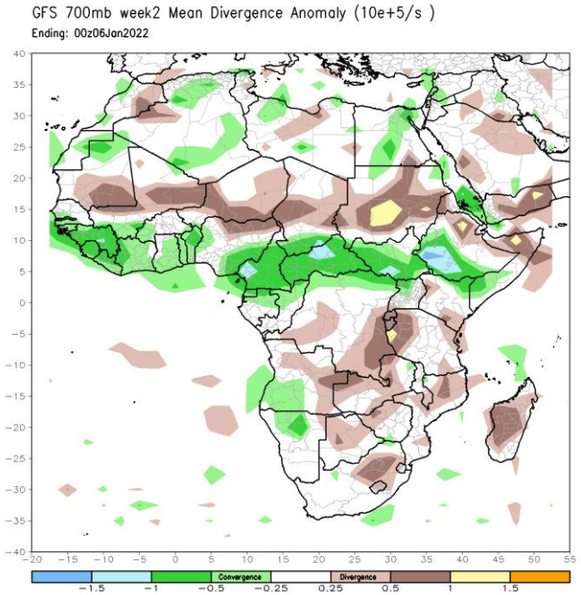
Wind Anomaly and Divergence Forecast from GFS week2











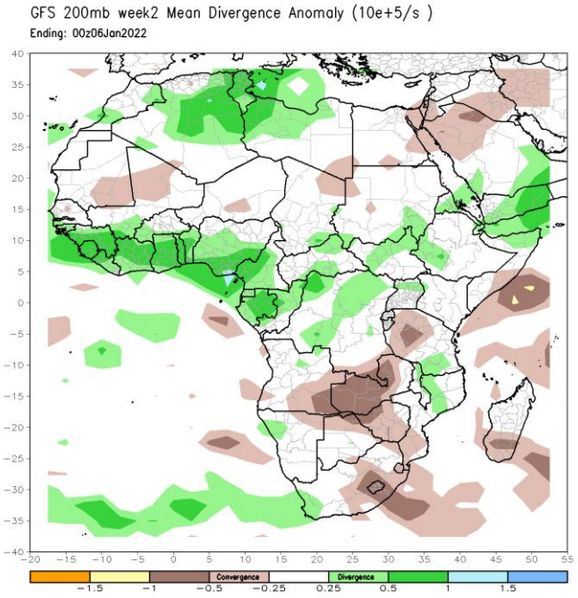
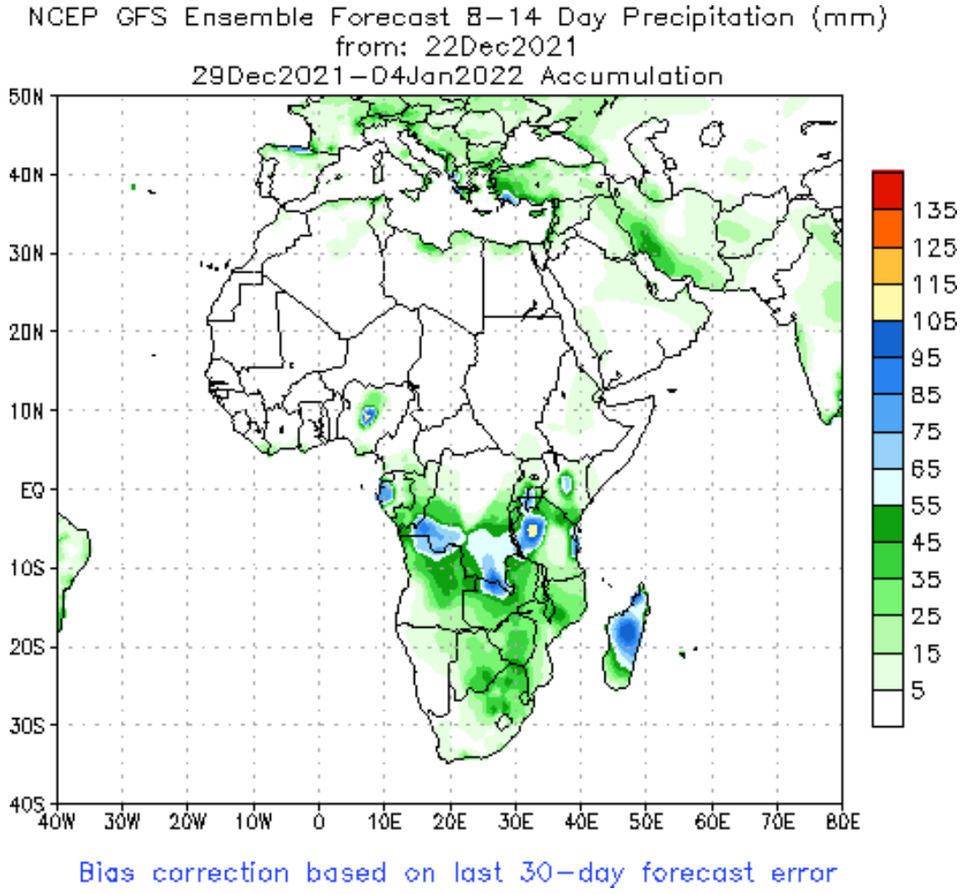


Figure 30: GFS divergence forecast

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

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



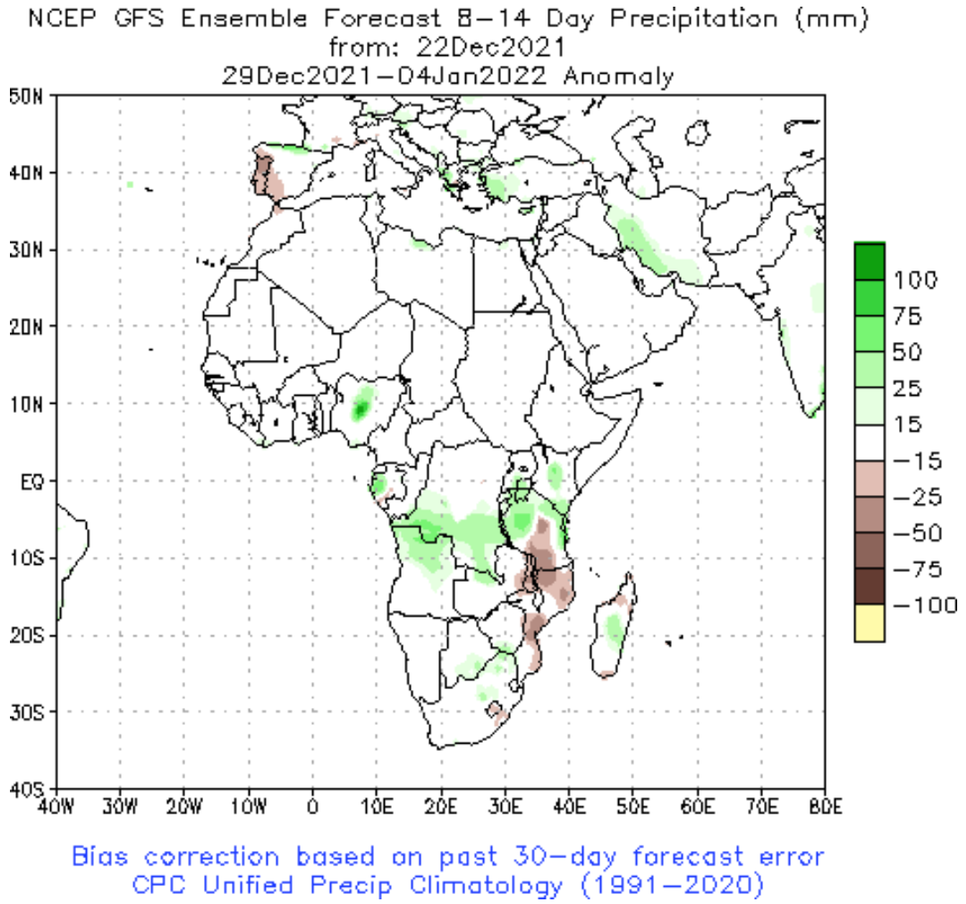


Figure 31: Précipitation and Anomaly forecast

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

Week-2 Precipitation Probability of Exceedance: Forecast and Climo
31 Dec 2021 – 06 Jan 2022

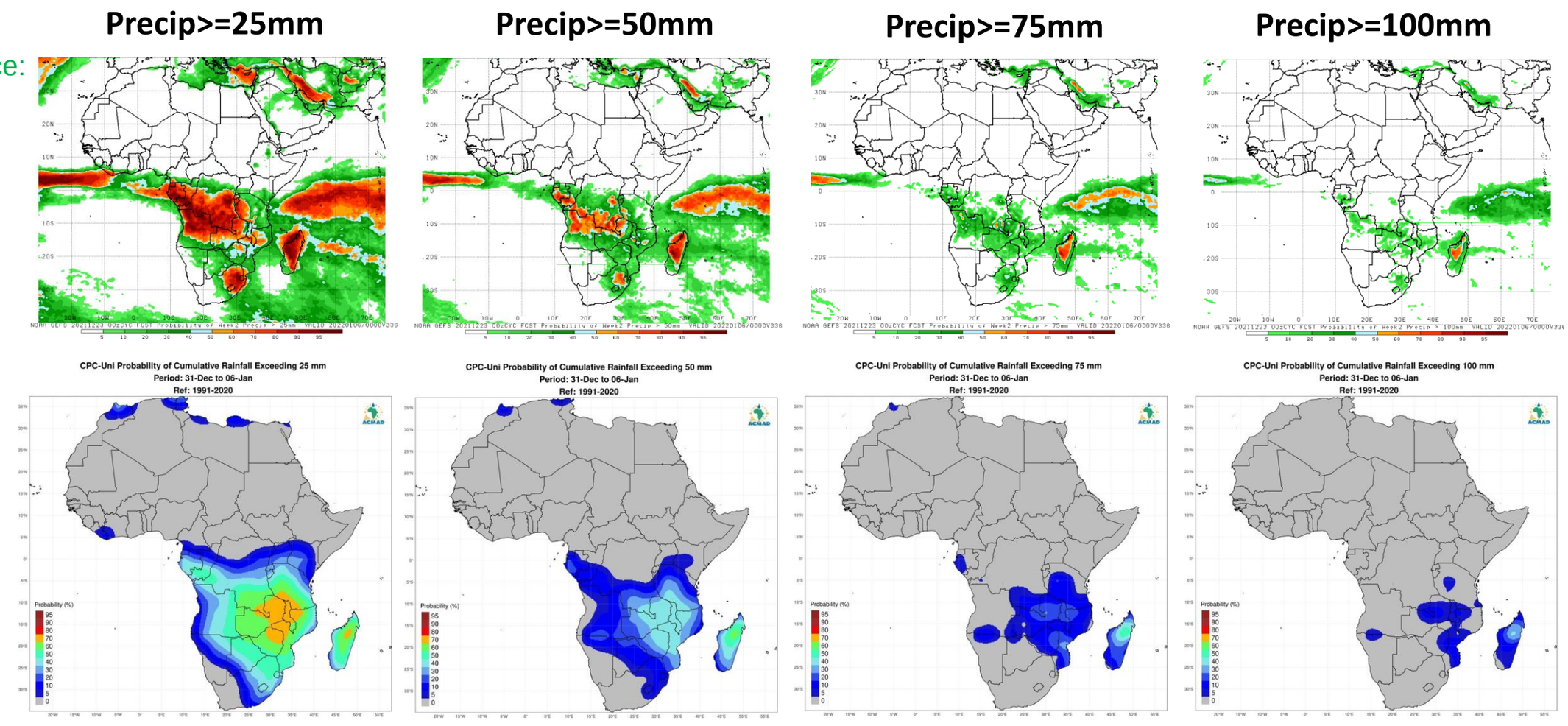


Figure 32: Week2 Precipitation Total Exceedance Probabilities

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
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Precipitation Anomaly Forecasts from ECMWF for week 2

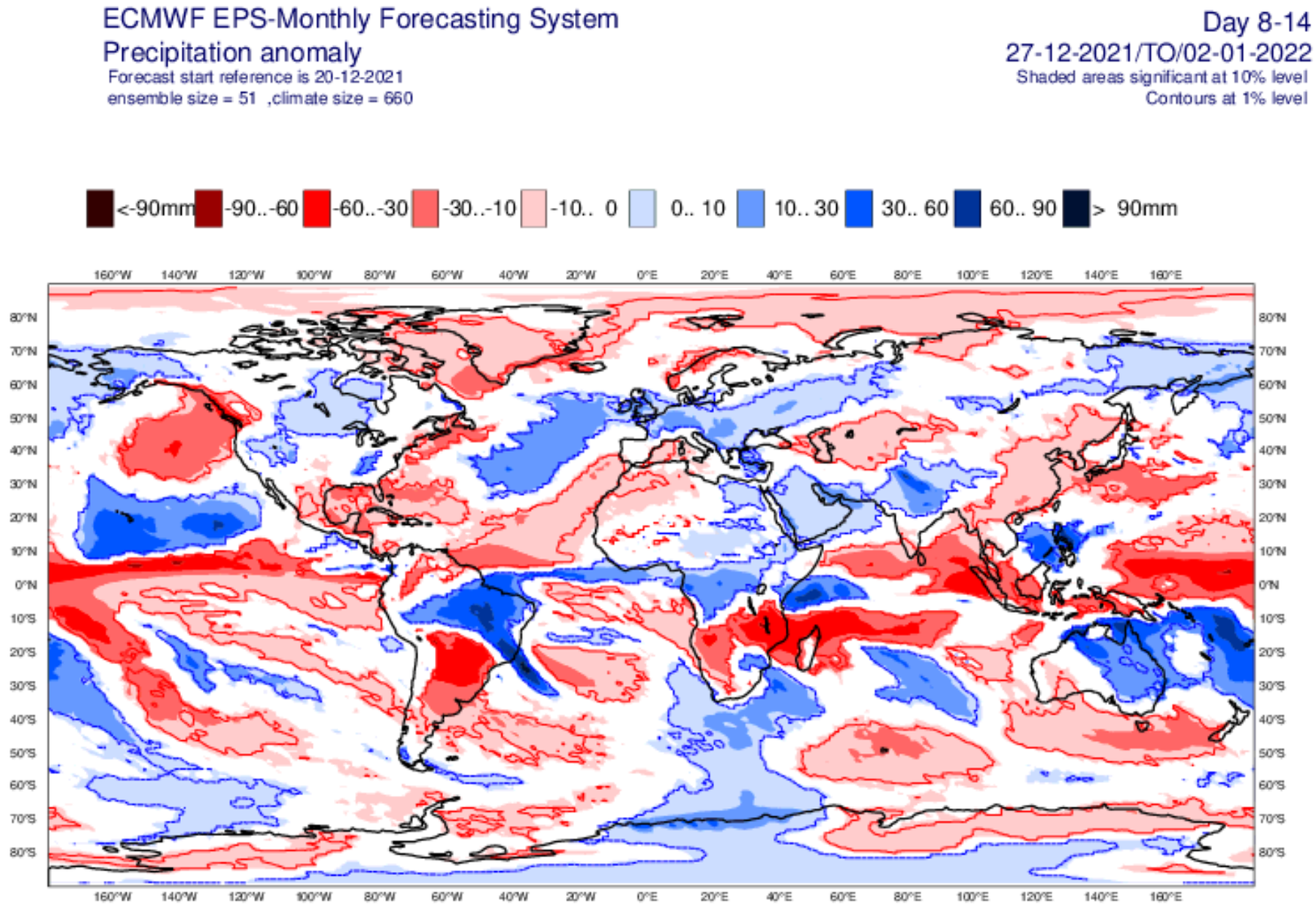
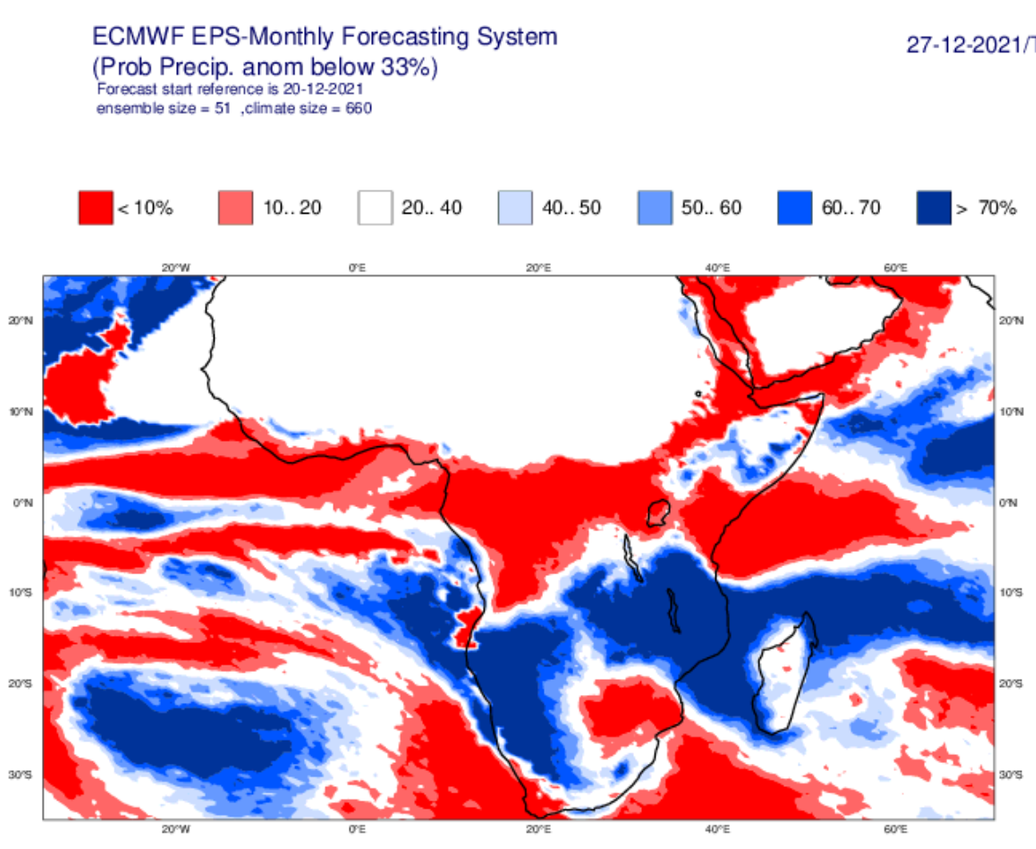


Figure 33: Monthly Precipitation Anomaly forecast from ECMWF

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

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



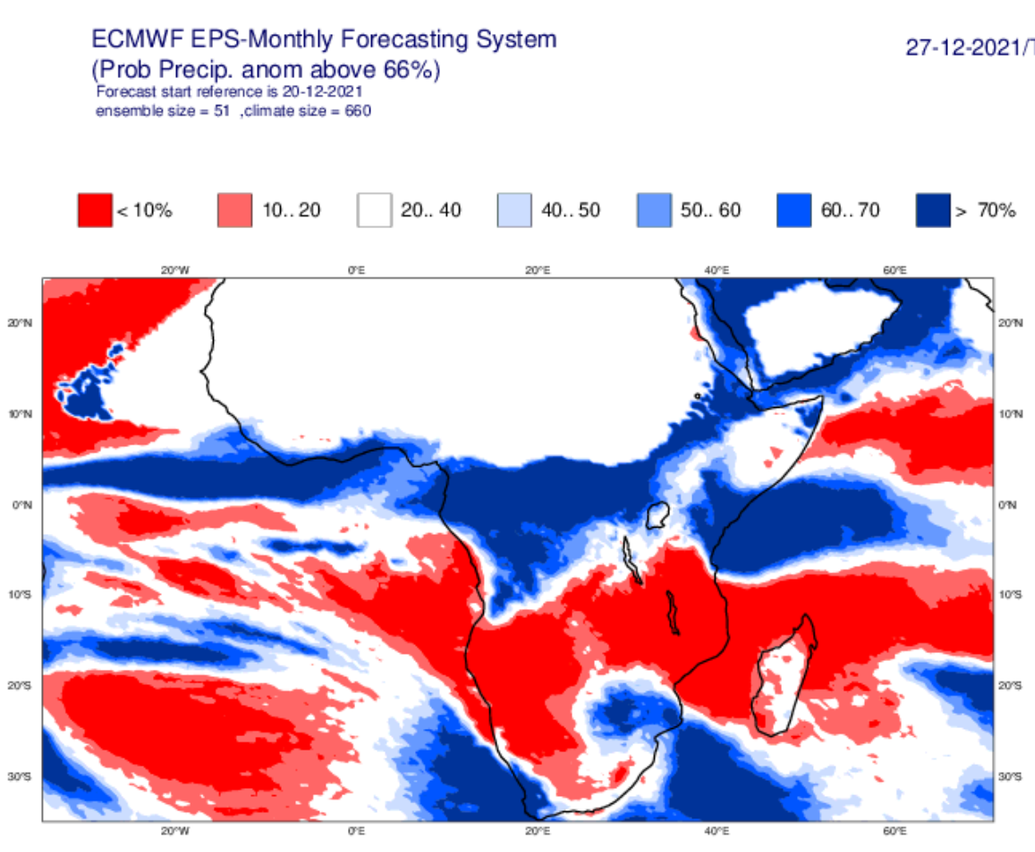
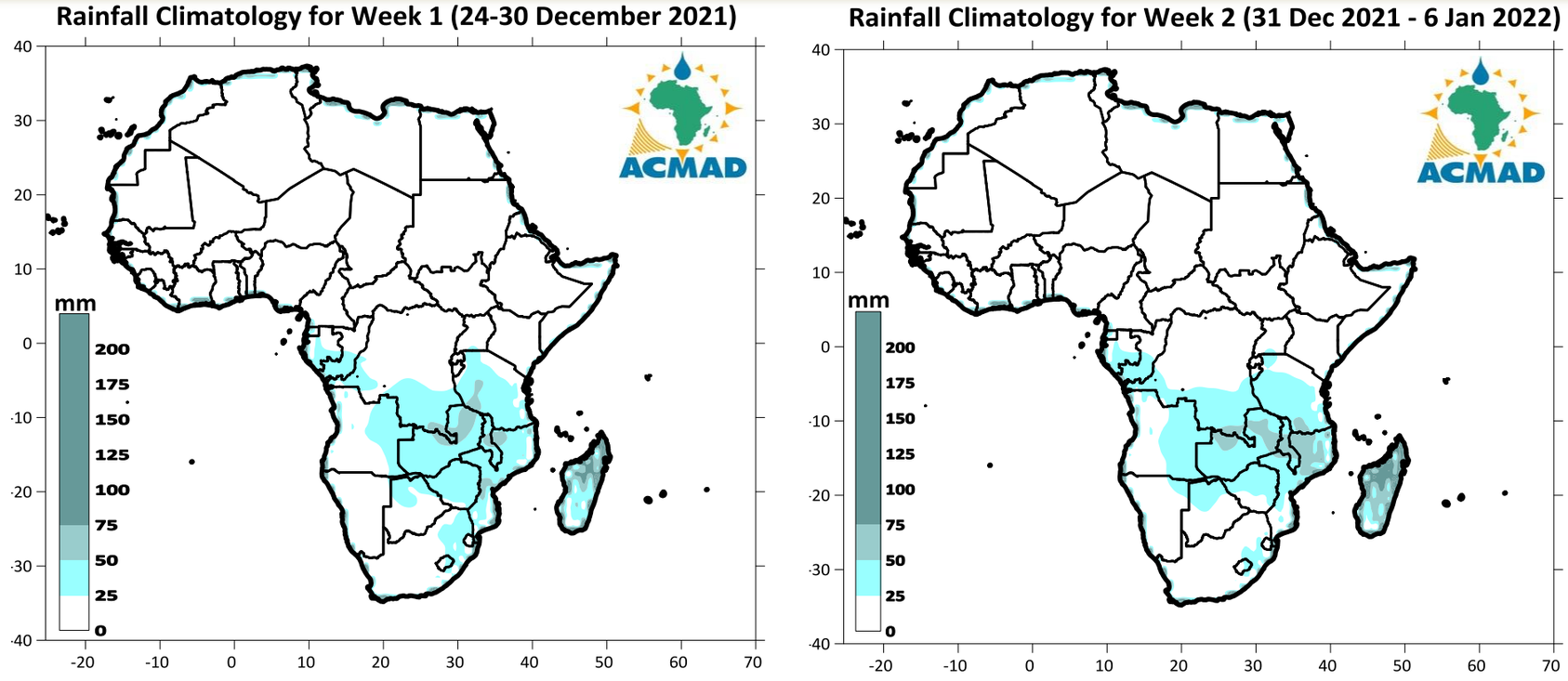


Figure 34: Weekly tercile probability forecast below 33%

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

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

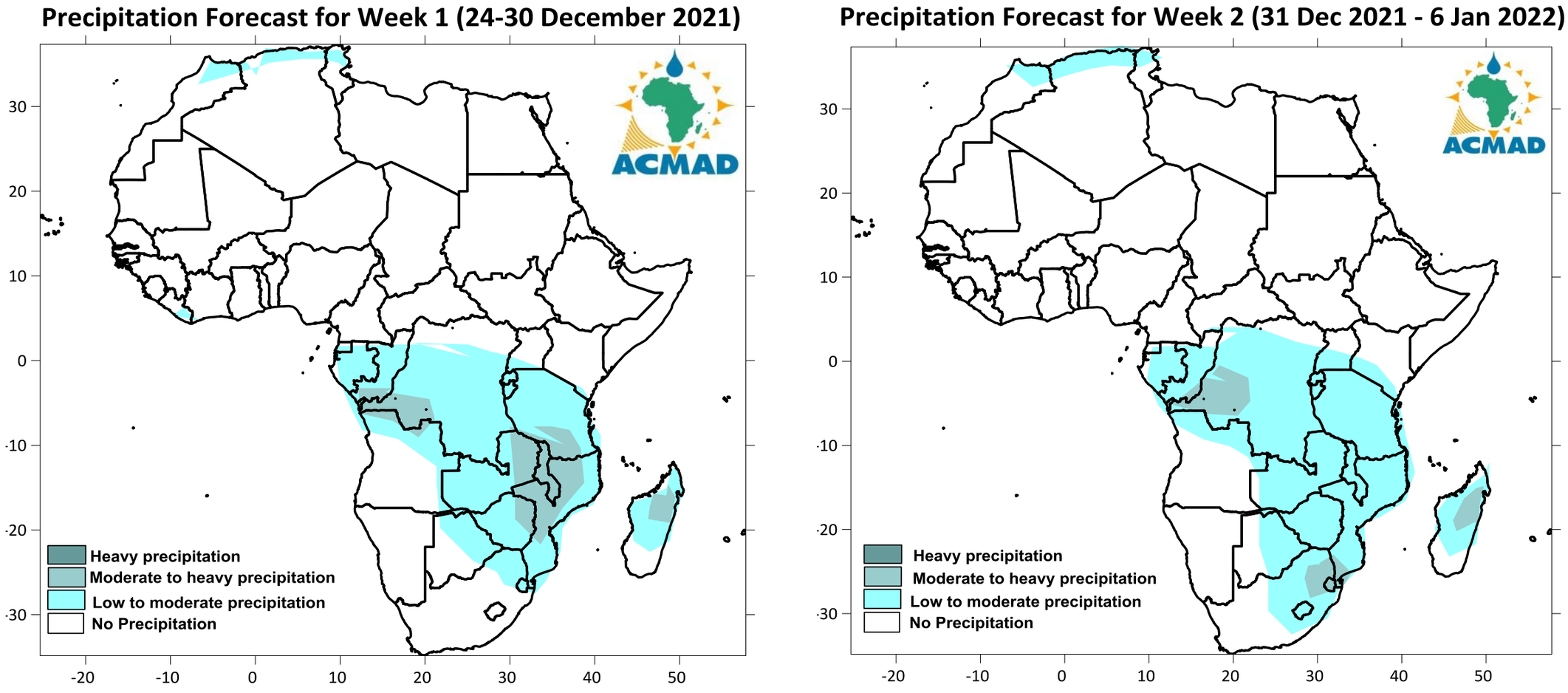


Figure 39: Precipitation Outlook for week-1(left panel) and week-2 (right panel)