

THE PRELIMINARY STATE OF AFRICAN CLIMATE IN 2020

Updated: October 2020

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This technical note provides a summary of the main weather and climate events that have occurred in Africa in 2020. The major weather and climate events are documented using observed precipitation and temperature data as well as information provided by various UN agencies, news papers and NMHSs across the African continent.

The Technical Note on the state of climate of Africa is issued yearly by ACMAD. The present Technical Note for year 2020 was jointly supported by NORCAP-NRC & ACMAD.

2.1 Data

Temperature:

- GHCN_CAMS (NOAA)
- Period : Jan1950-Sep2020
- Reference period: 1981-2010
- Data source:

http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHCN_CAMS/.gridded/.deg0p5/.temp/

Precipitation:

- CAMS OPI
- Period: Jan1981-Sep2020
- Reference period: 1981-2010
- Data source:

https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAMS_OPI/.v0208/.mean/.prcp/

The information about extreme weather events in 2020 were collected from several sources such as UN agencies, Disaster Risk Management departments across the continent and News Papers.

- **Temperature Anomalies:**

Temperature anomalies (annual, seasonal & monthly) are calculated as the departure from the mean, computed based on the period: 1981-2010 which is a WMO reference period. The annual temperature anomalies are ranked from the warmest to the coolest.

- **Precipitation in percentage of average in 2020:**

Precipitation totals in 2020 (year and season) are divided by their corresponding mean values and expressed as a percentage.

Note:-Temperature analyses are based on January 1950-September 2020 mean values.

-Precipitation analyses are based on January 1981-September 2020 values.



2.3 Tools

Several open source tools were used to generate this technical note:

- Climate Data Operators (CDO, <https://code.zmaw.de/projects/cdo>). CDO was used to compute the temperature anomalies and changes in precipitation.
- QGIS (<http://www.qgis.org/fr/site>), which is an open source version of GIS software. QGIS was used in this technical note to plot the maps of temperature anomalies and the changes in rainfall.
- R software (<https://www.r-project.org/>). Similar to CDO and QGIS, R is a free software. Here we used it to plot the ranked temperature anomalies and calculate the trend in temperature.
- OriginLab software is used to plot the annual cycle of temperature.

3.1 Temperature

Ranked Temperature Anomaly Over Africa[1950-2020]

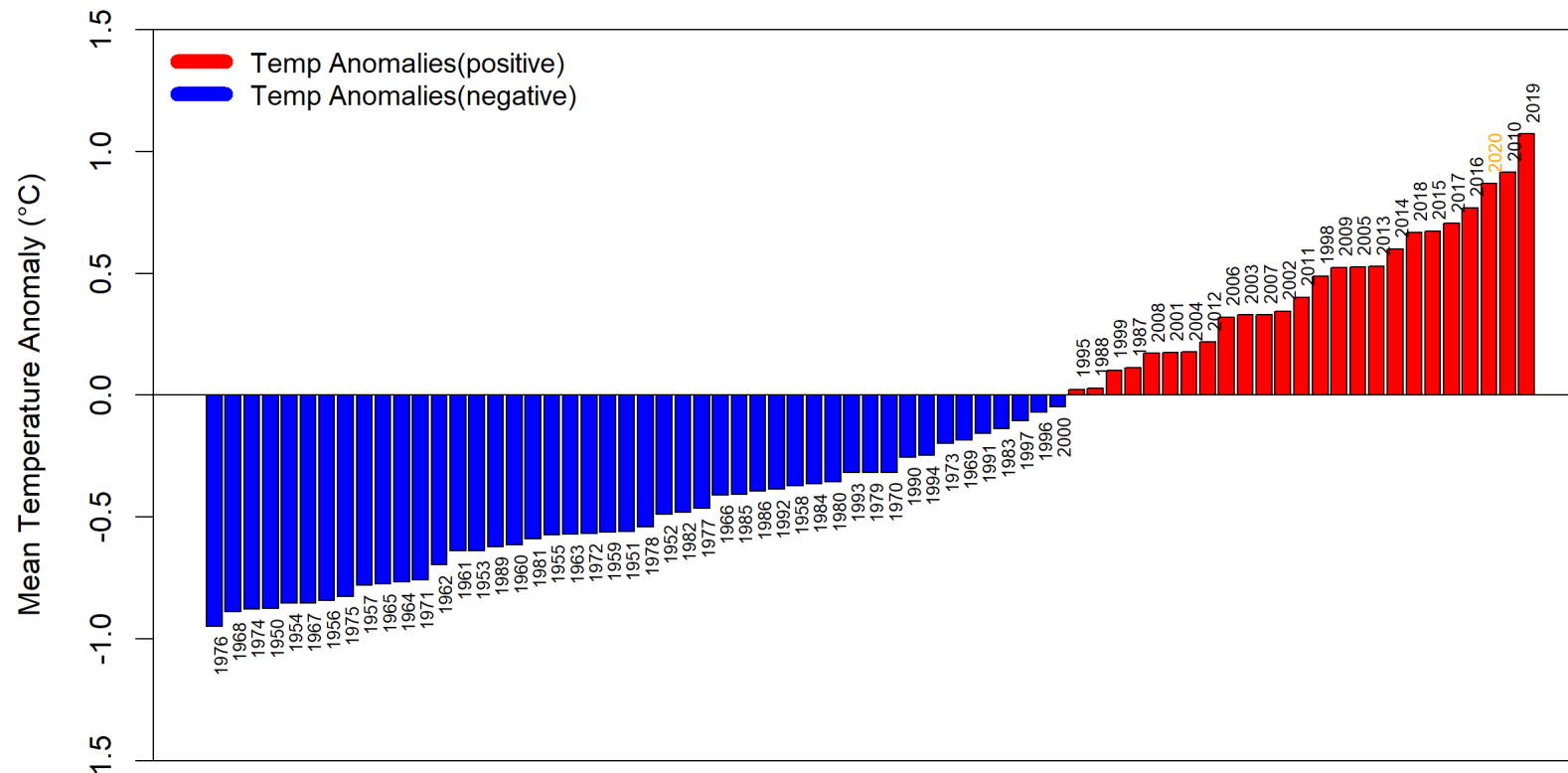


Figure 1: Ranked mean Jan-Sep temperature anomalies (°C) over Africa for 1950- 2020 period, relative to 1981-2010.

Data source: http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHCN_CAMS/.gridded/.deg0p5/.temp/

- 2020 is the third warmest year on record since 1950. 2020 is less warmer than the record breaking year 2010 by - 0.05 °C and 2019 by -0.20 °C
- 2019 is the 1st warmest year on record since 1950.
- 2010 is now the 2nd warmest year on record over the African Landmass based on Jan-Sep datasets.

3.1.2 Trend in temperature over Africa since 1950

Temperature Anomaly Over Africa[1950-2020]

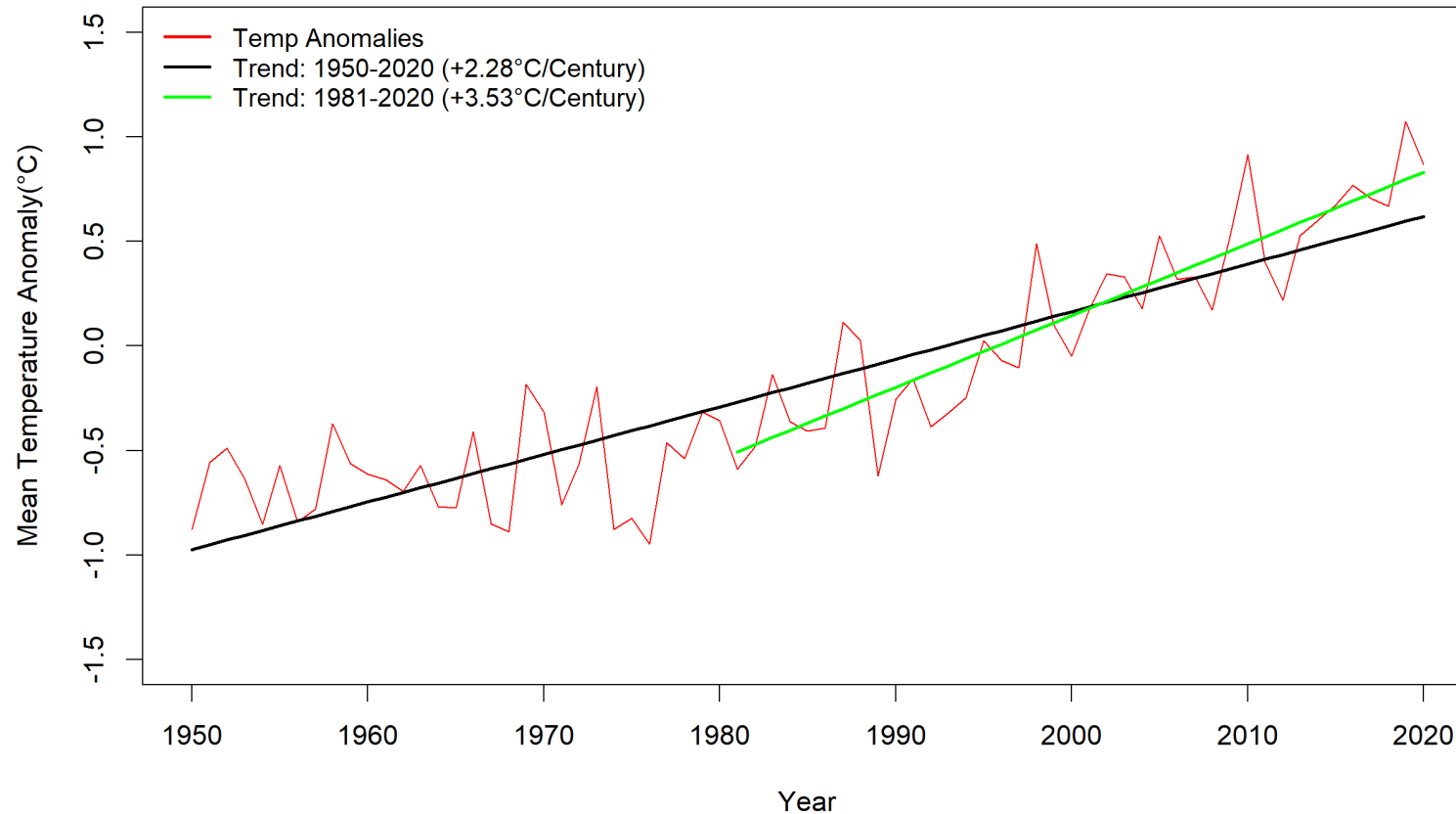
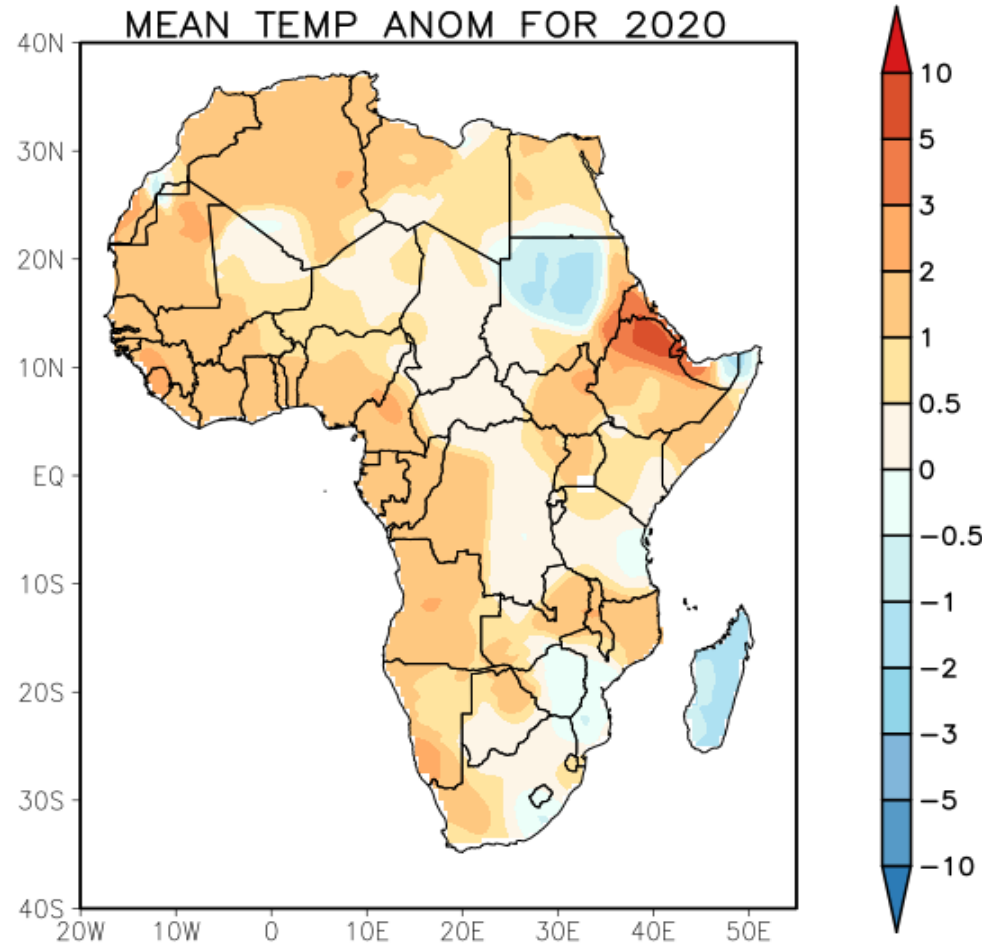


Figure 2: Trends in the mean Jan-Sep temperature anomalies (°C) over Africa for 1950-2020 period. Data source: http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHcn_CAMS/.gridded/.deg0p5/.temp/

There is an increasing trend in temperature at the continental level since the 1950s (Rate: 2.28°C per century). The rate of increase is much higher from the 1980s (Rate: 3.53°C per century).



- Positive temperature anomalies were generally observed over most parts of Africa, with extremely warm conditions ($\geq +3$ °C) recorded over the Horn of Africa (Eritrea, Djibouti and northern Ethiopia)
- Negative anomalies (less warming situation) were recorded over Central to North Sudan, Southern Egypt, southeast Somalia, much of Zimbabwe, central south Mozambique, Lesotho and Madagascar,

Figure 3: Mean Jan-Sep temperature anomalies (°C) over Africa in 2020. Data source:

http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHCN_CAMS/.gridded/.deg0p5/.temp/

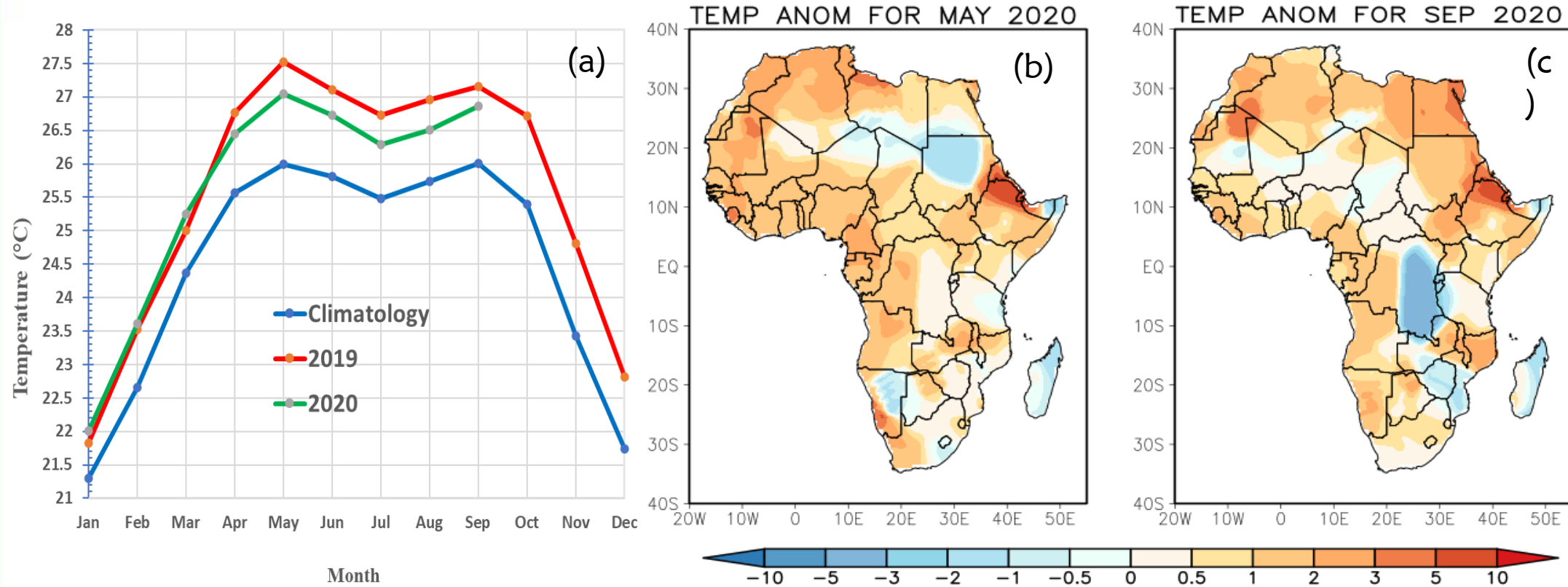
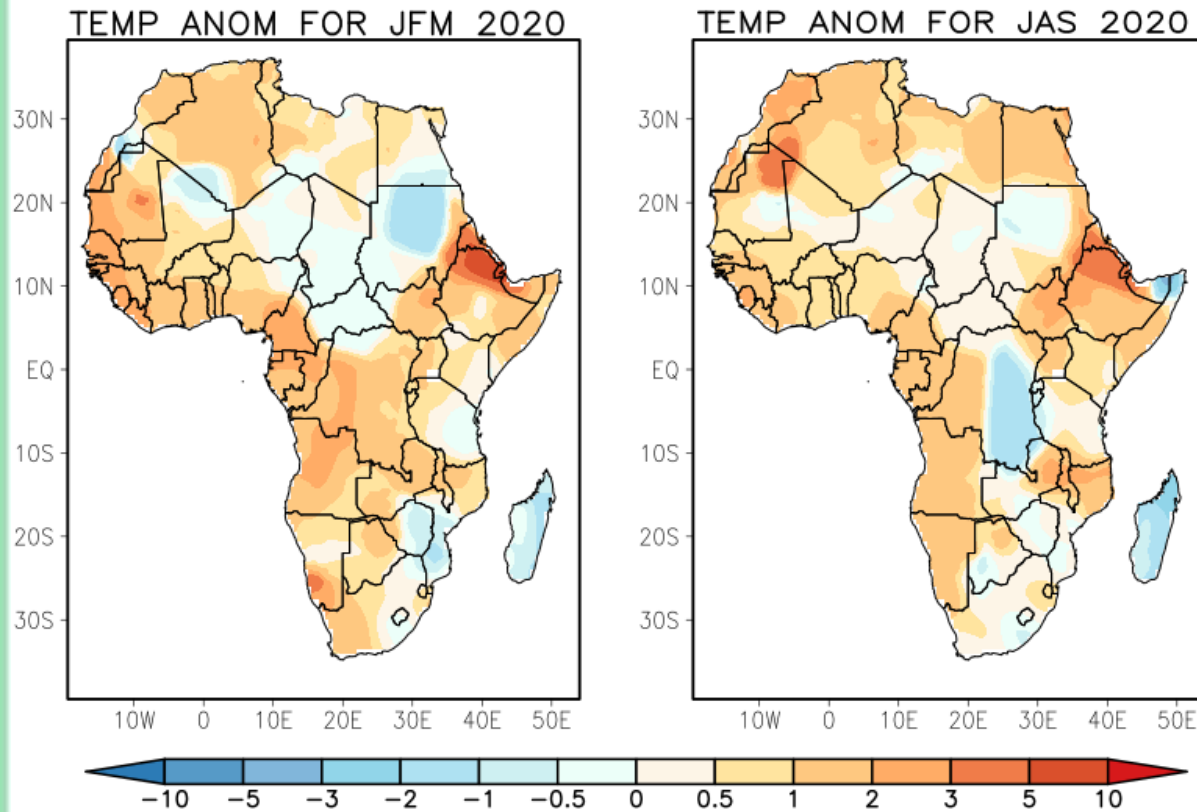


Figure 4: (a) Mean annual cycle of temperature (°C) during 2020 and 2019 and climatology based on the period: 1981-2010. The mean temperature anomalies for the warmest months of 2020 are: (b) May and (c) September. Data source: http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHEN_CAMS/.gridded/.deg0p5/.temp/

May and September are the warmest months so far in 2020 ,with temperature anomalies of 1.05 & 0.85 °C, respectively



The JFM season was characterized by higher temperature anomalies over northeastern Ethiopia, Djibouti, and Eritrea

Lower temperatures were observed over northern Mali, southern Algeria, parts of northeast of Niger, Chad, Central Africa Republic, Sudan, southern Egypt, Eastern Tanzania, much of Zimbabwe, Much of central towards Mozambique during JFM.

During JJA season, higher temperature anomalies were recorded over northeastern Ethiopia, Djibouti, Eritrea, north east Mauritania.

Lower temperatures were recorded over central DRC, north Somalia and Madagascar

Figure 5: Mean seasonal temperature anomalies ($^{\circ}\text{C}$) in Africa during January-February-March (JFM and July-August-September (JAS) for 2020.
Data source: http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHCM/_CAM5/.gridded/.deg0p5/.temp/

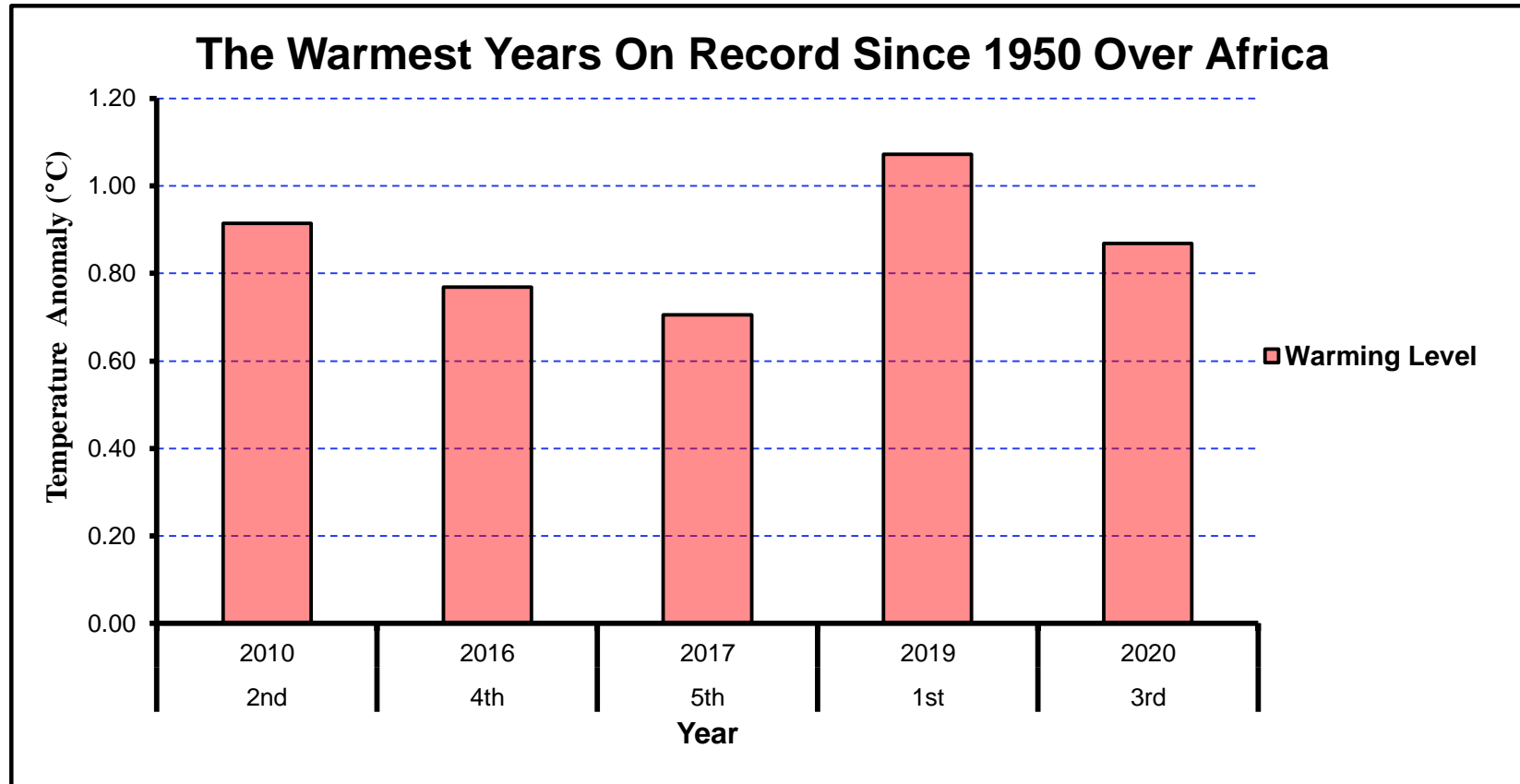
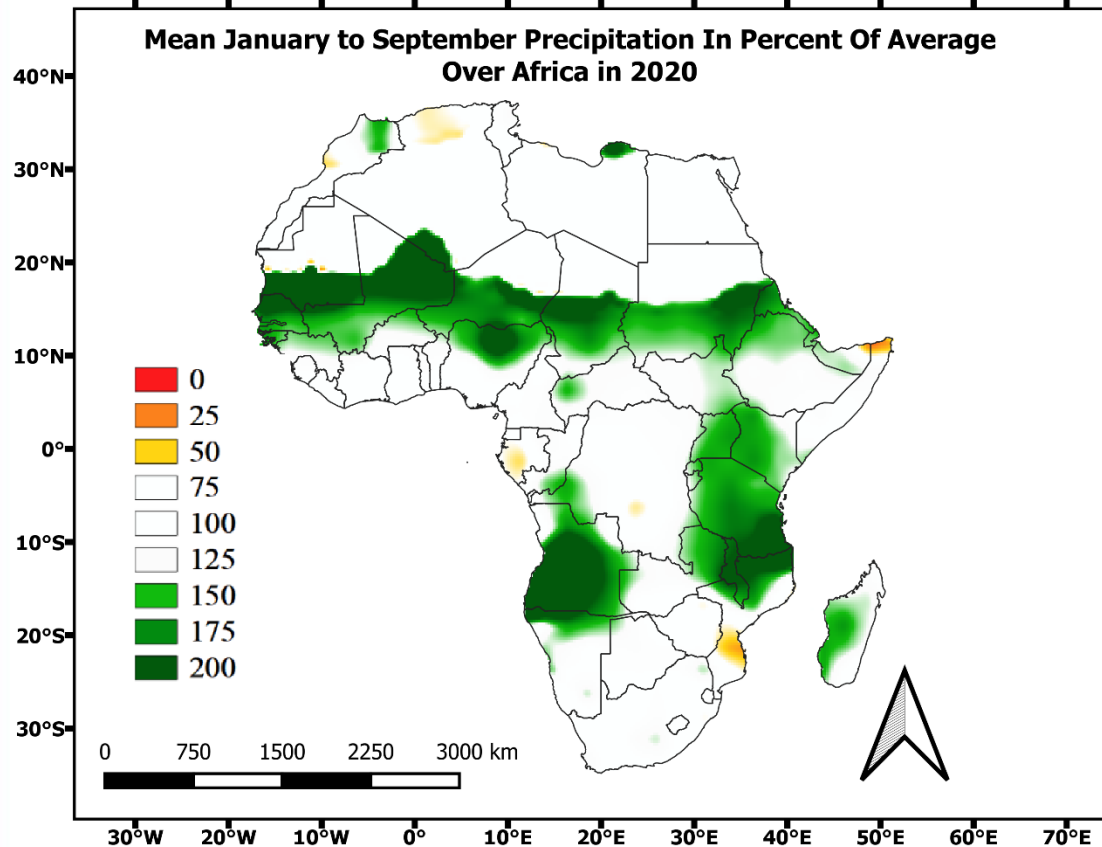


Figure 6: Five warmest years on record since 1950 over Africa, based on the reference period: 1981-2010. Data source: http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHCM_CAMS/.gridded/.deg0p5/.temp/

3.2.1 Mean January to September Precipitation



- Well above average precipitation conditions were observed over south Mauritania, Guinea, Guinea Bissau, Mali, Senegal, much of Niger, North Nigeria, Chad and southern Sudan, East African Community , Malawi, East Zambia and North Mozambique , West Madagascar and much of Angola
- Below average precipitation conditions were recorded over northern Somalia, Gabon, central Mozambique and parts of north Algeria.

Figure 6 : Mean Jan to Sep precipitation in percent of average over Africa in 2020.

Data source:

https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

3.2.2 JFM and JAS precipitation

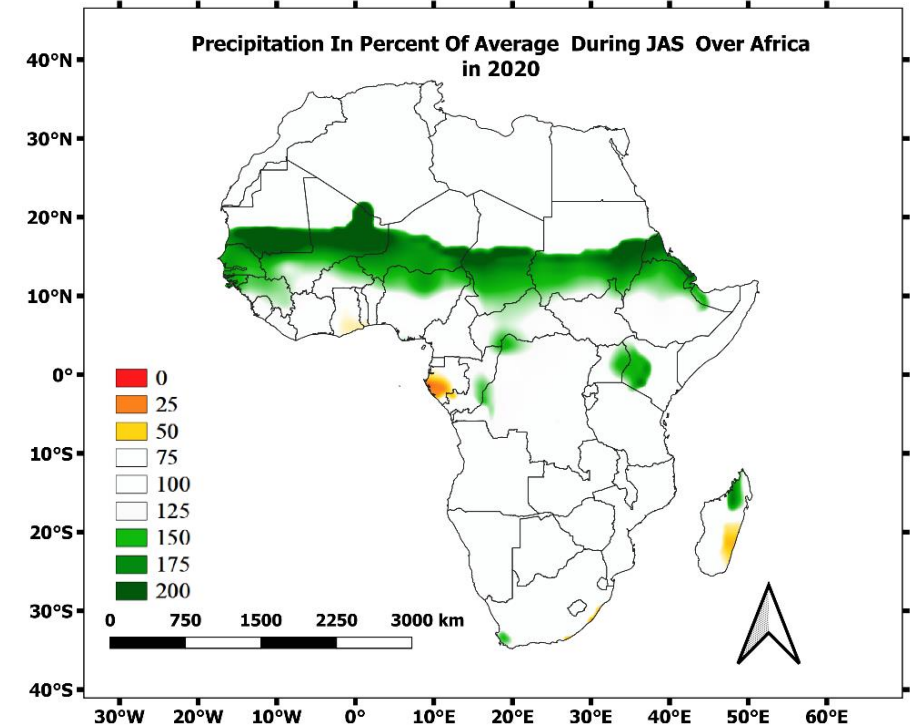
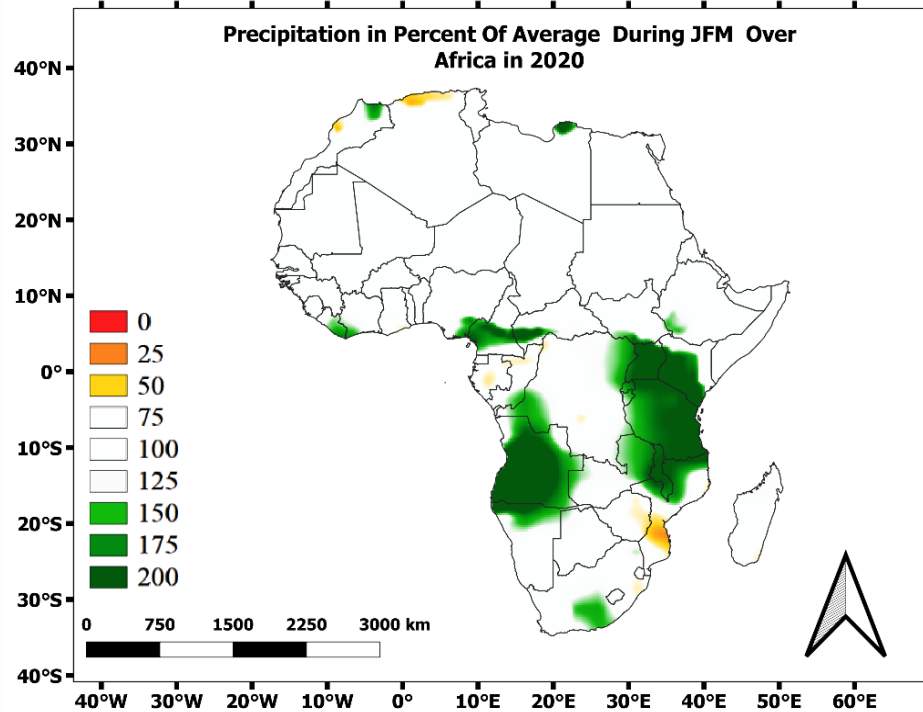
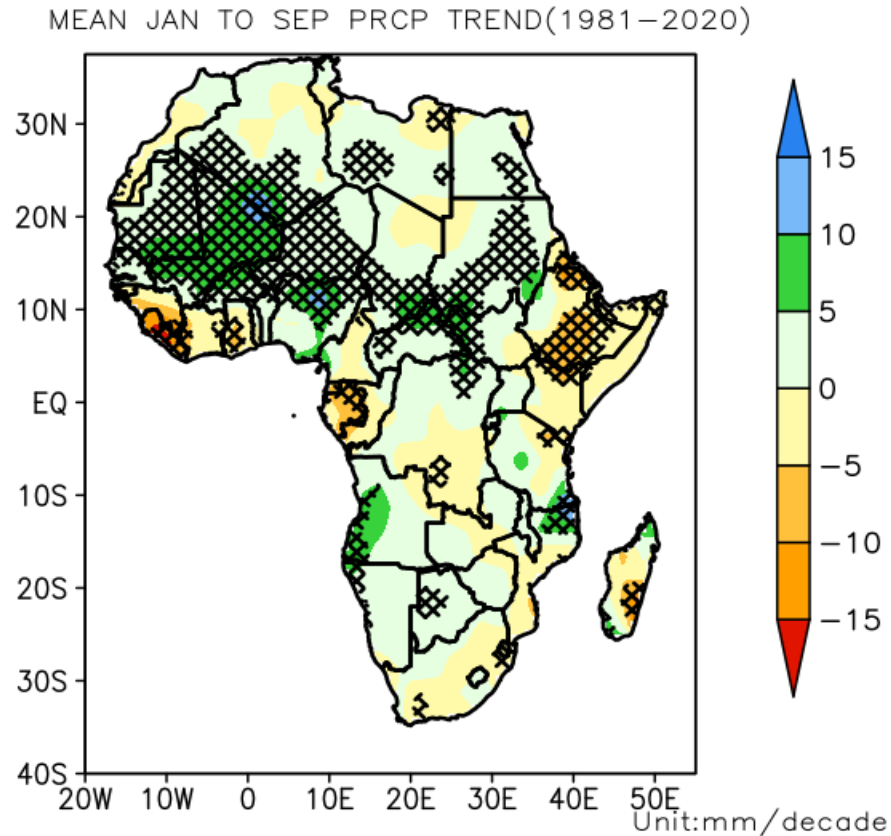


Figure 7a: Precipitation in Percent of average during JFM and JAS seasons over Africa in 2020. Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

- Above average precipitation was observed over central South Africa and East Africa Community, north Mozambique, northernmost Morocco, extreme northwestern Tunisia, South west Liberia, south Cameroon towards east Central Africa Republic during JFM 2020. Precipitation deficit were observed over extreme northern Algeria, parts of Gabon and central Mozambique.
- During JAS season, wet conditions were mainly observed over the Sahel, extreme east Madagascar and eastern Uganda towards west Kenya. Precipitation deficit were recorded over Gabon, southern Nigeria and eastern Madagascar.

3.2.3 Mean Precipitation trend

Mean Jan to Sep Precipitation trend



- There is a significantly increasing trend of the mean Jan-Sep precipitation over most parts of Sahel.
- Decreasing trends are significant over parts of the Horn of Africa, central Madagascar, Gabon and Sierra Leone.

Figure 7b : Mean Jan-Sep precipitation trend in Africa over the period from 1981-2020. Hatched areas show significant increase (positive) or decrease (negative) at 95% level of confidence. Data source:

https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

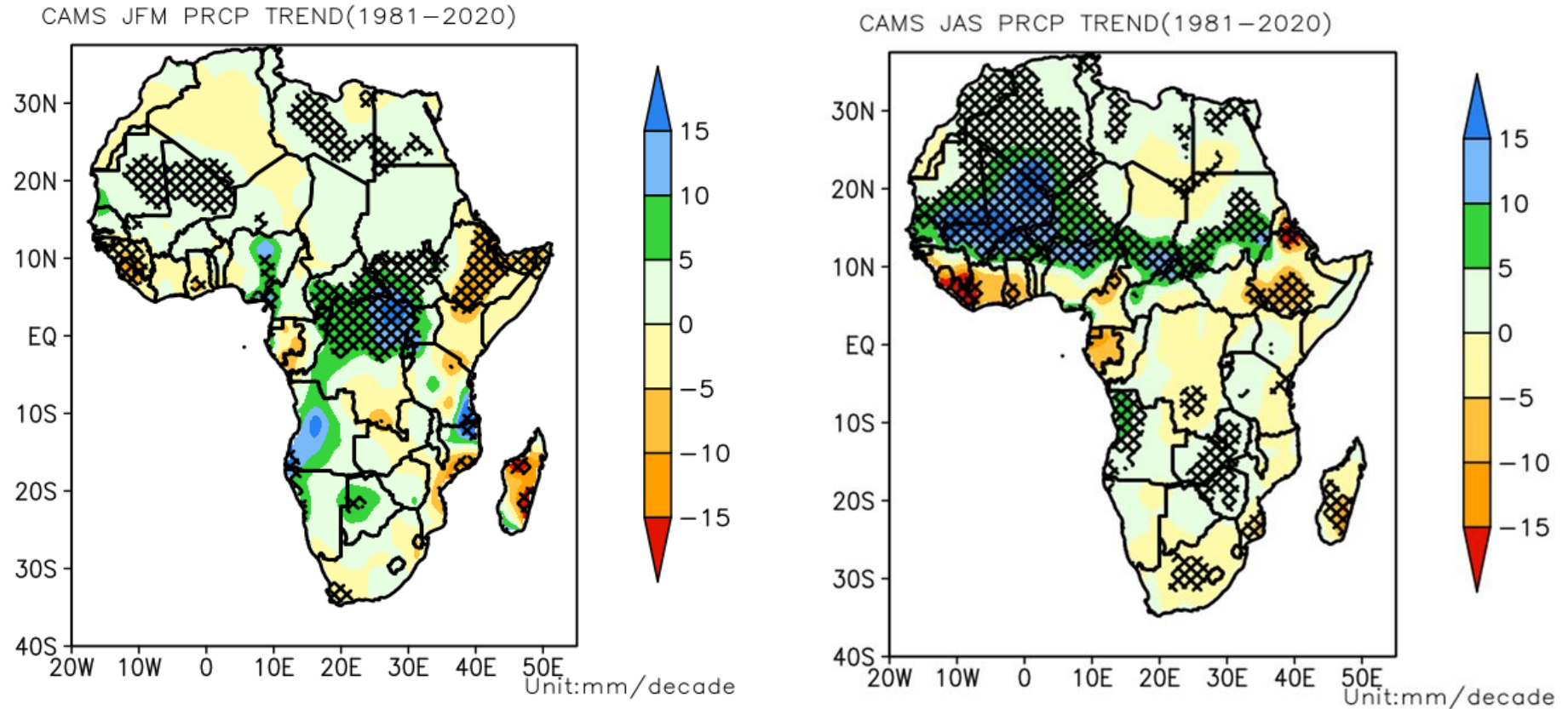


Figure 7c : Mean JFM and JAS precipitation trend in Africa over the period from 1981-2020. Hatched areas show significant increase (positive) or decrease (negative) at 95% level of confidence. Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAMS_OPI/.v0208/.mean/.prcp/

In general, there is a significant increase in precipitation over the Sahel. Significantly decreasing trends are evident over eastern Africa, central Madagascar, southern DRC(much of DRC for JAS) and Mozambique, Gabon, Liberia, Sierra Leone, south east cote d'Ivoire for both seasons.

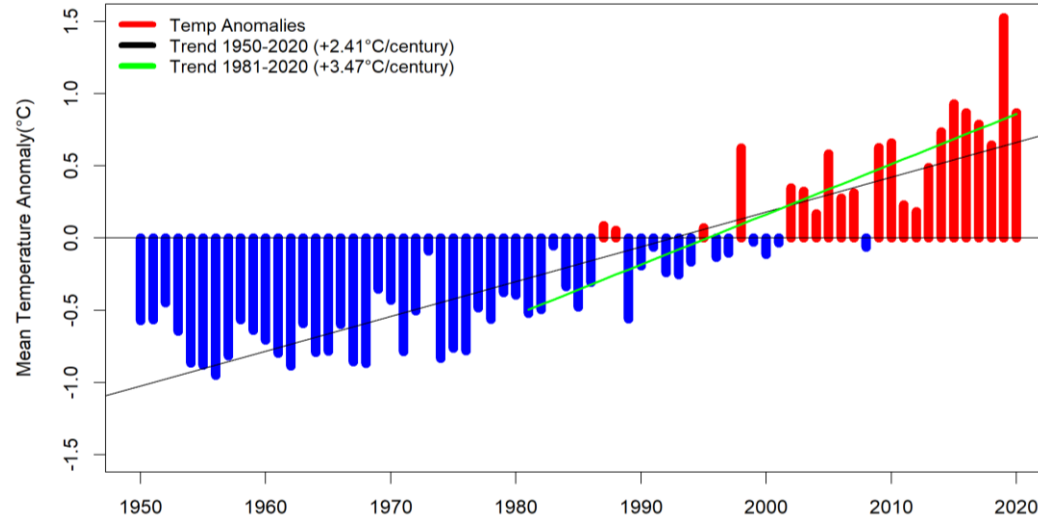
4.1 Temperature

Highlights:

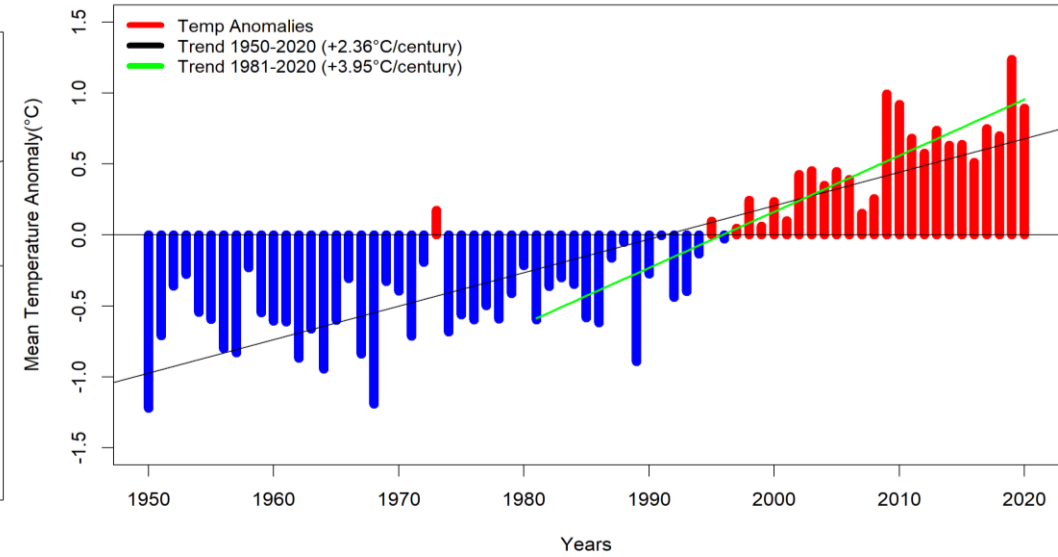
Mean temperature for Jan-Sep 2020 was the:

- **Warmest (3rd)** year over **Eastern Africa**. The rate of increase in temp was 2.36°C (1950-2020) and 3.95°C (1981-2020) per century.
- **Warmest (3rd)** year over **Central Africa**. The rate of increase in temp was 2.41°C (1950-2020) and 3.47°C (1981-2020) per century.
- **Warmest (4th)** year over **Southern Africa**. The rate of increase in temp was 2.07°C (1950-2020) and 2.8°C (1981-2020) per century.
- **3rd warmest** year over **North Africa**. The rate of increase in temp was 2.47°C (1950-2020) and 4.16 °C (1981-2020) per century.
- **2nd warmest** year over **West Africa**. The rate of increase in temp was 2.45°C (1950-2020) and 3.35°C (1981-2020) per century.
- **2nd coldest** year over the **Islands** (Madagascar). The rate of increase in temp was 0.89°C (1950-2020) and rate of **decrease** was 1.2 °C (1981-2020) per century.

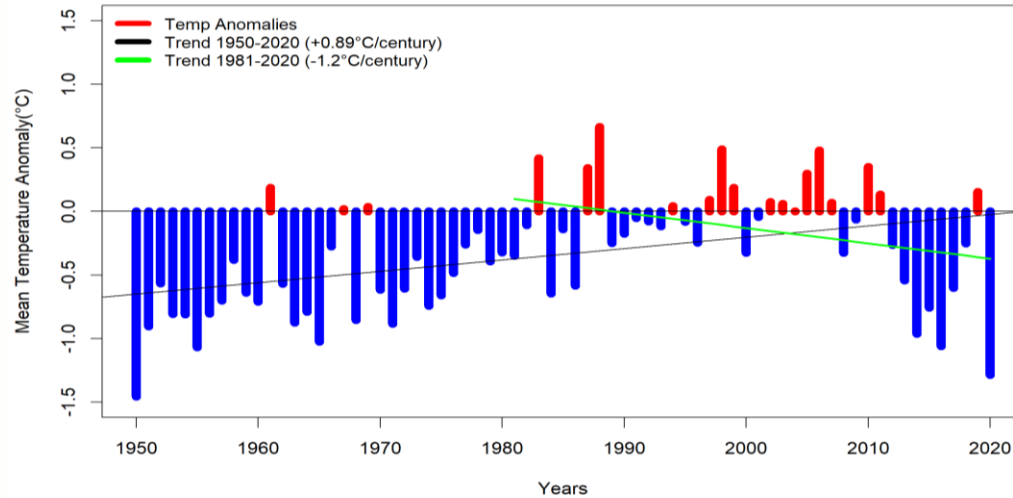
Temperature Anomaly over Central Africa[1950-2020]



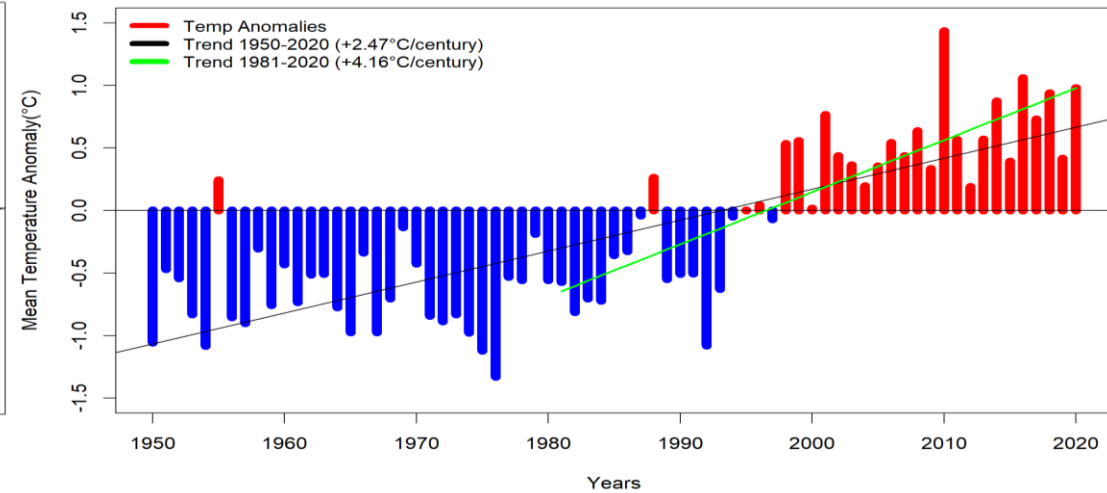
Temperature Anomaly over East Africa[1950-2020]



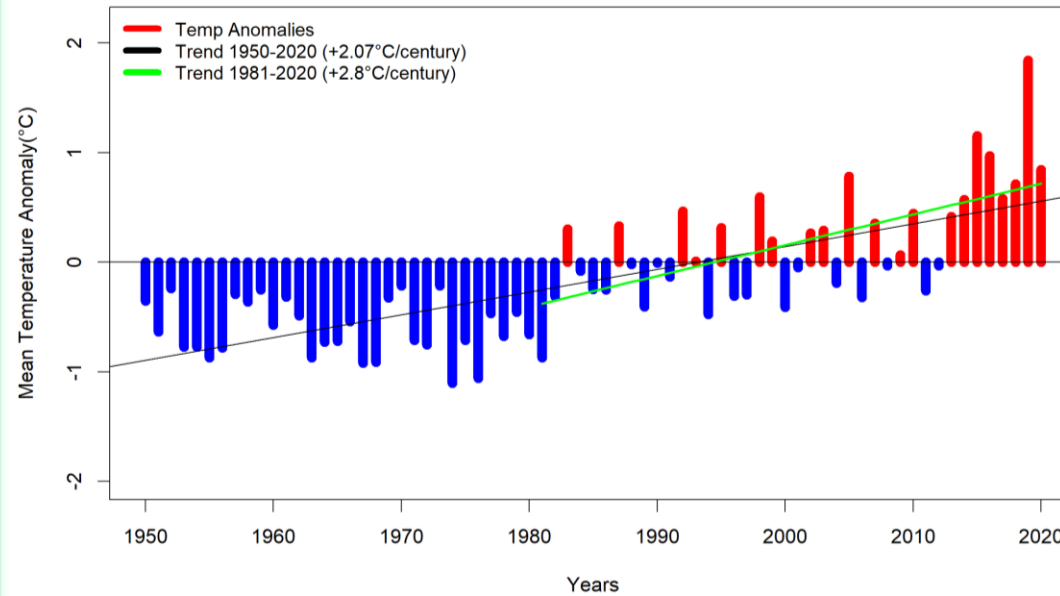
Temperature Anomaly over Madagascar[1950-2020]



Temperature Anomaly over North Africa[1950-2020]



Temperature Anomaly Over Southern Africa[1950-2020]



Temperature Anomaly Over West Africa[1950-2020]

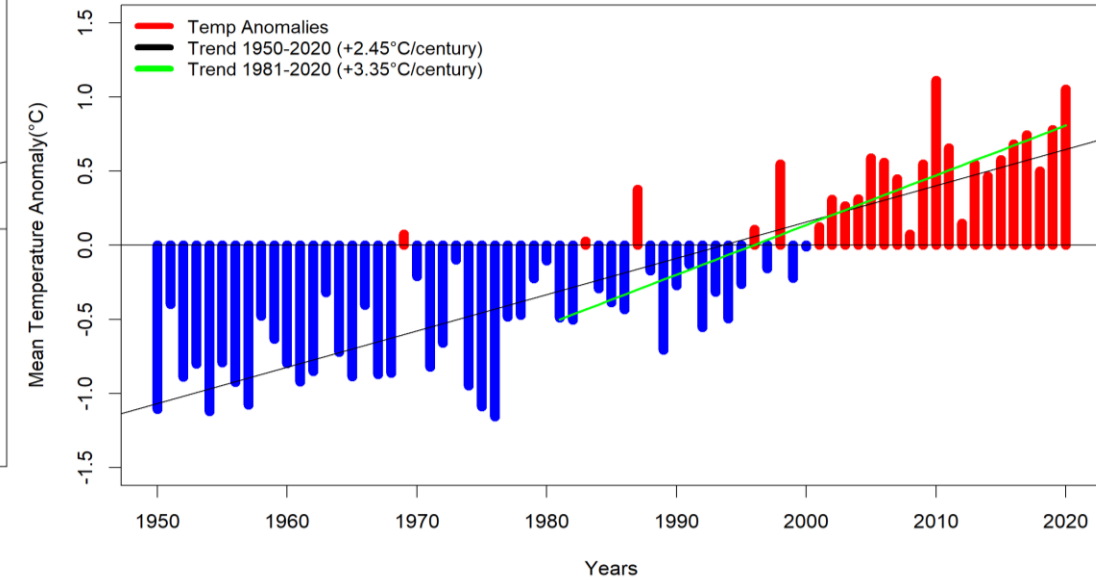


Figure 8: Trend in Jan-Sept temperature anomalies (°C) for the African sub-regions over the 1950-2020 period. Data source:

http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.GHCN_CAMS/.gridded/.deg0p5/.temp/

4.1.3 Summary of temperature anomalies and rankings per sub-region

Table 1: Observed warming levels for the mean January to September 2020 temperature with respect to 1981-2010 reference period and their respective rankings per sub-region

<i>Region</i>	<i>Anomaly (°C)</i>	<i>Ranking per region since 1950</i>
Africa	+2.28°C	3rd
Northern Africa	+2.47°C	3rd
Southern Africa	+2.07°C	4th
Western Africa	+2.45°C	2nd
Eastern Africa	+2.36°C	3rd
Central Africa	+2.41°C	3rd
Madagascar	+0.89°C	2nd Coldest

4. 2 Precipitation

4.2.1 Southern Africa JFM

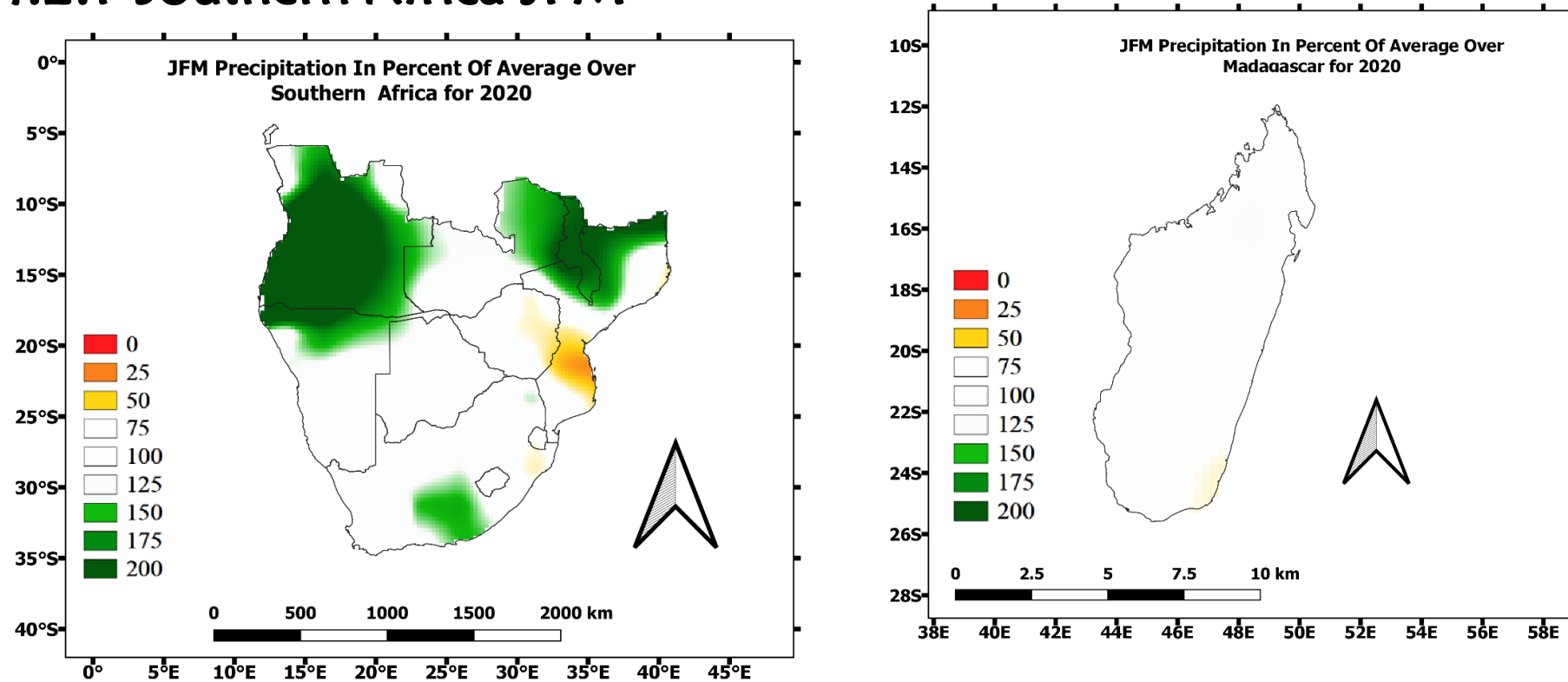


Figure 9: Mean January-February-March (JFM) precipitation in percent of average over Southern Africa for 2020. Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

- While most parts of Southern Africa recorded near normal conditions, above average rainfall was observed over Malawi and northeastern parts of Mozambique, west Zambia, Angola, extreme west Zambia and northern Namibia. Dry conditions were recorded over west Zimbabwe, central Mozambique and southwestern Madagascar.

4.2.2 Southern Africa JAS

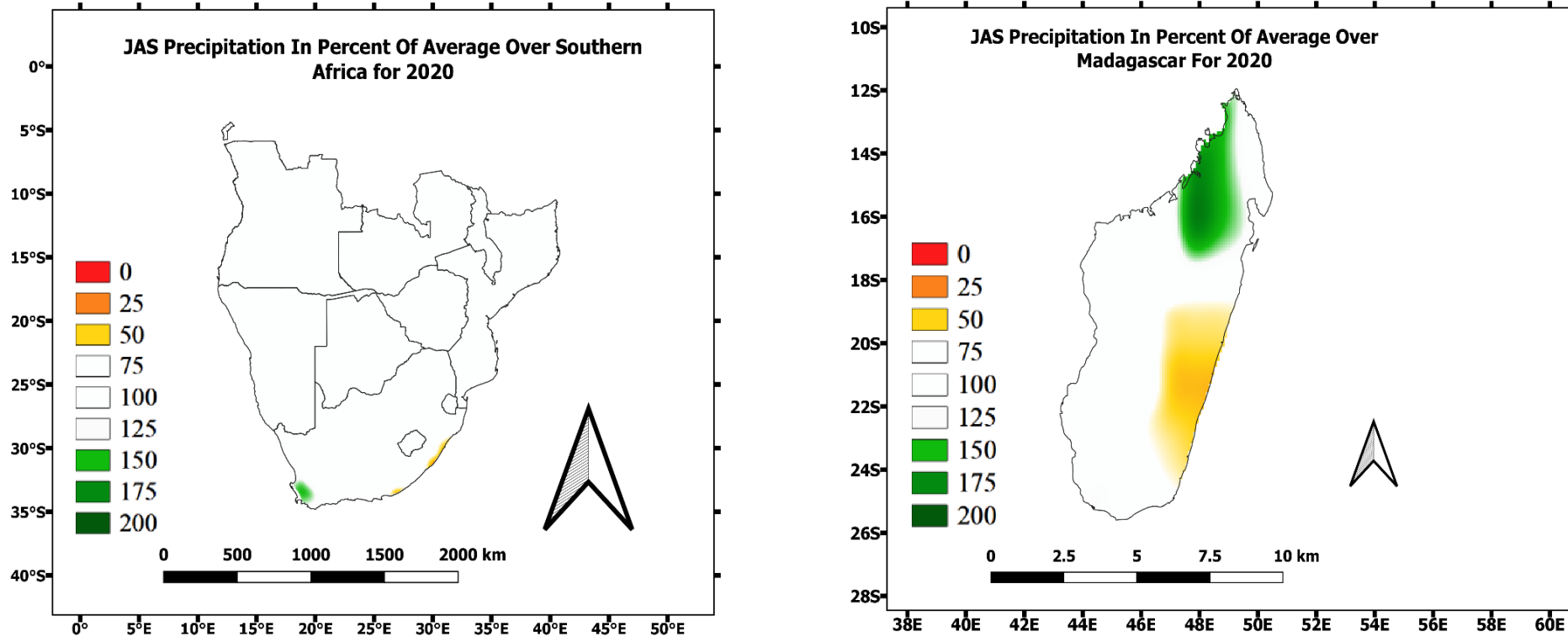


Figure 9: Mean July-August-September (JAS) precipitation in percent of average over Southern Africa for 2020. Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

- Most parts of Southern Africa recorded near normal conditions except northern Madagascar where above average rainfall was observed. Dry conditions were recorded over extreme westernmost South Africa and east Madagascar.

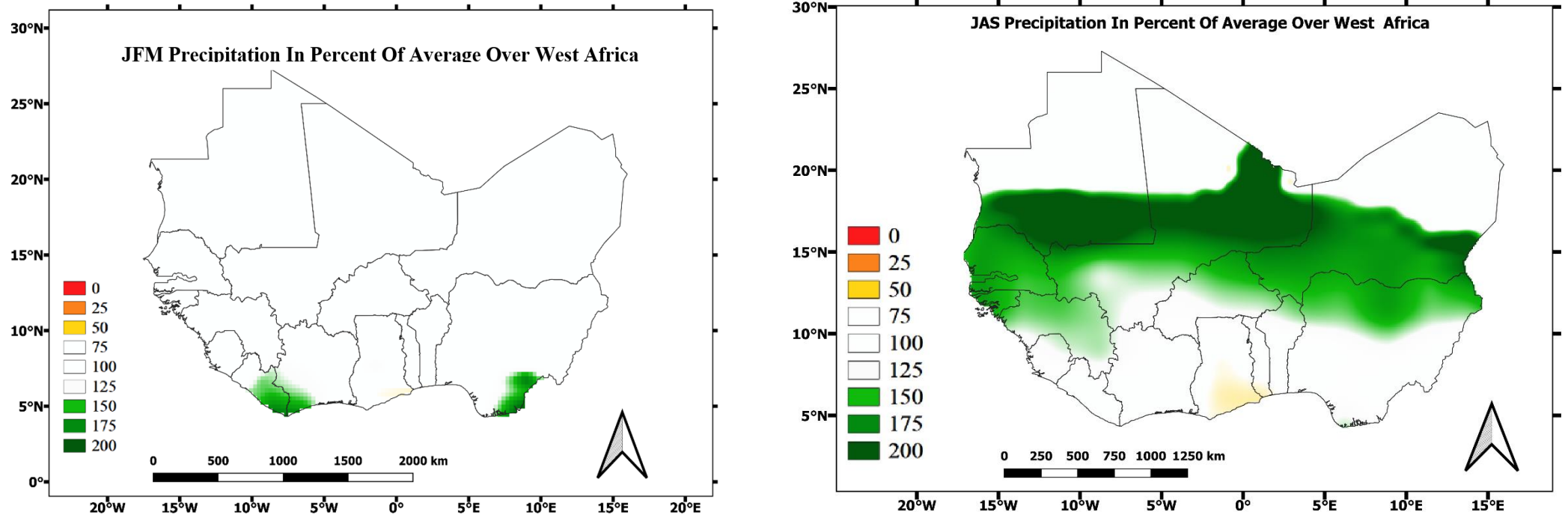


Figure 10: Precipitation in percent of average over West Africa for JFM and JAS seasons. Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

- During JFM, the West Africa region recorded normal rainfall, except ,west Liberia, east Cote d' Ivoire and southern west Nigeria.
- Above average rainfall were recorded over south Mauritania, Senegal, Guinea , Guinea Bissau, Burkina Faso, much of Niger and north Nigeria, with dry conditions over south Ghana and extreme south Togo during JAS.

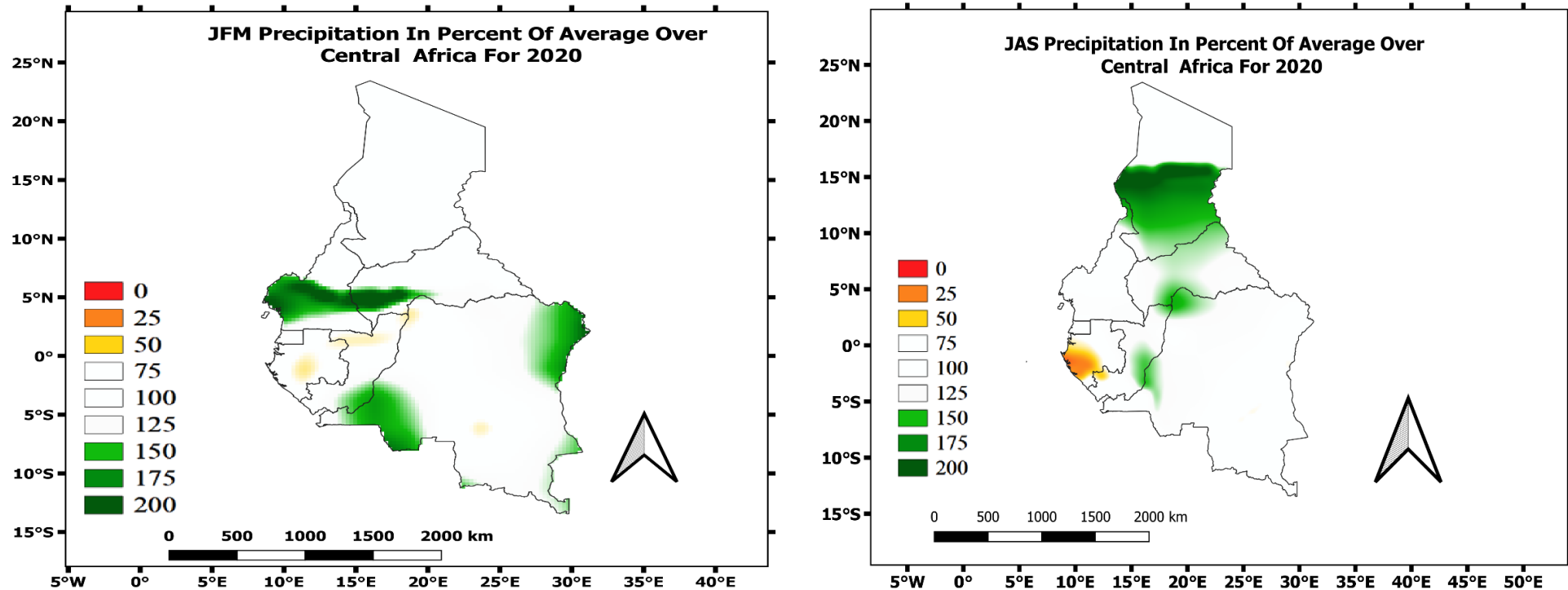


Figure 11: Precipitation in percent of average over Central Africa in 2020 JFM and JAS seasons. . Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAMS_OPI/.v0208/.mean/.prcp/

- While, most parts recorded near normal conditions during JFM season, well above normal rainfall were recorded over south Cameroon, west Central Republic Africa, north east and parts of west of DRC as well as much of Chad during JAS
- Dry conditions were recorded over Gabon, parts of north Congo during JFM.
- During JAS, dry conditions prevailed over Gabon,

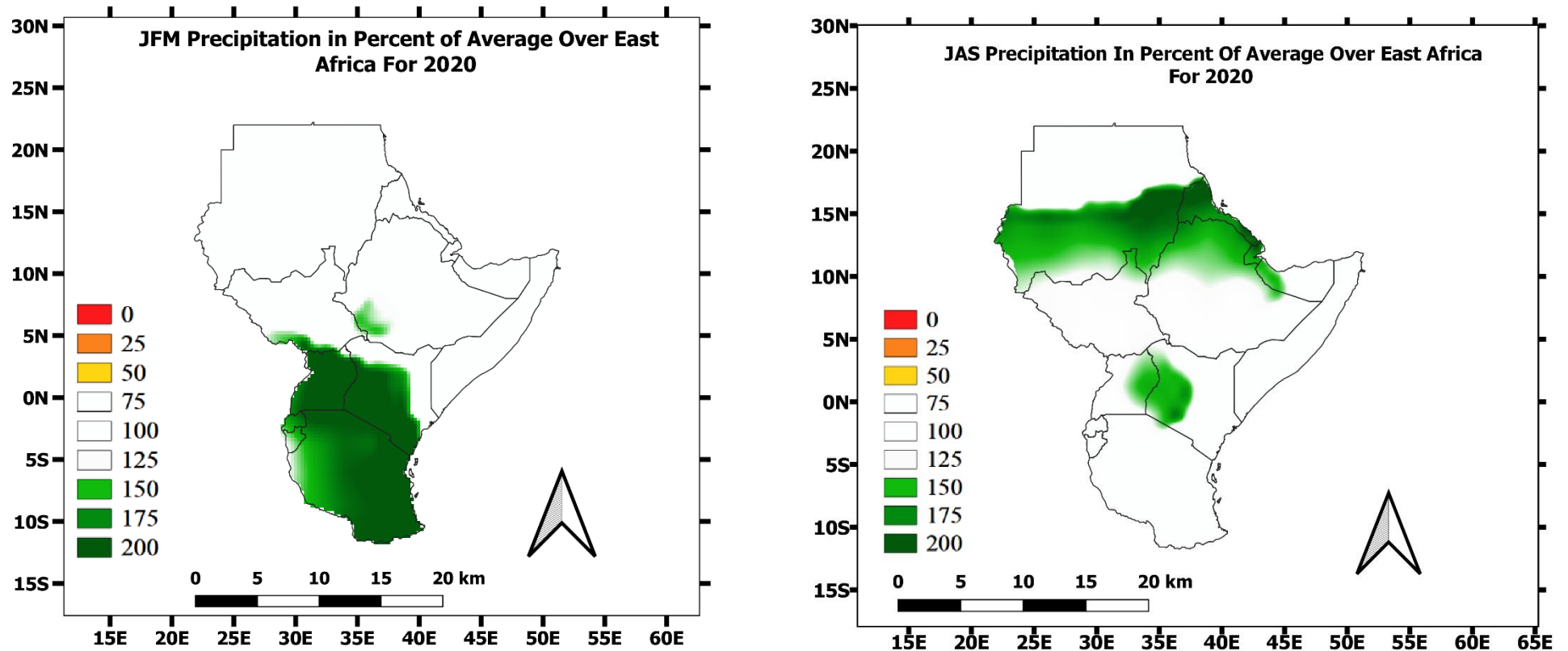


Figure 12: Precipitation in percent of average over East Africa in 2020 for JFM and JAS seasons. . Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

- Eastern Africa sub-region experienced above rainfall over Burundi, Rwanda, Kenya and southernmost South Sudan during JFM season.
- During JAS, south Sudan, eastern Uganda and western Kenya, north Ethiopia, Eritrea and Djibouti experienced wet conditions.

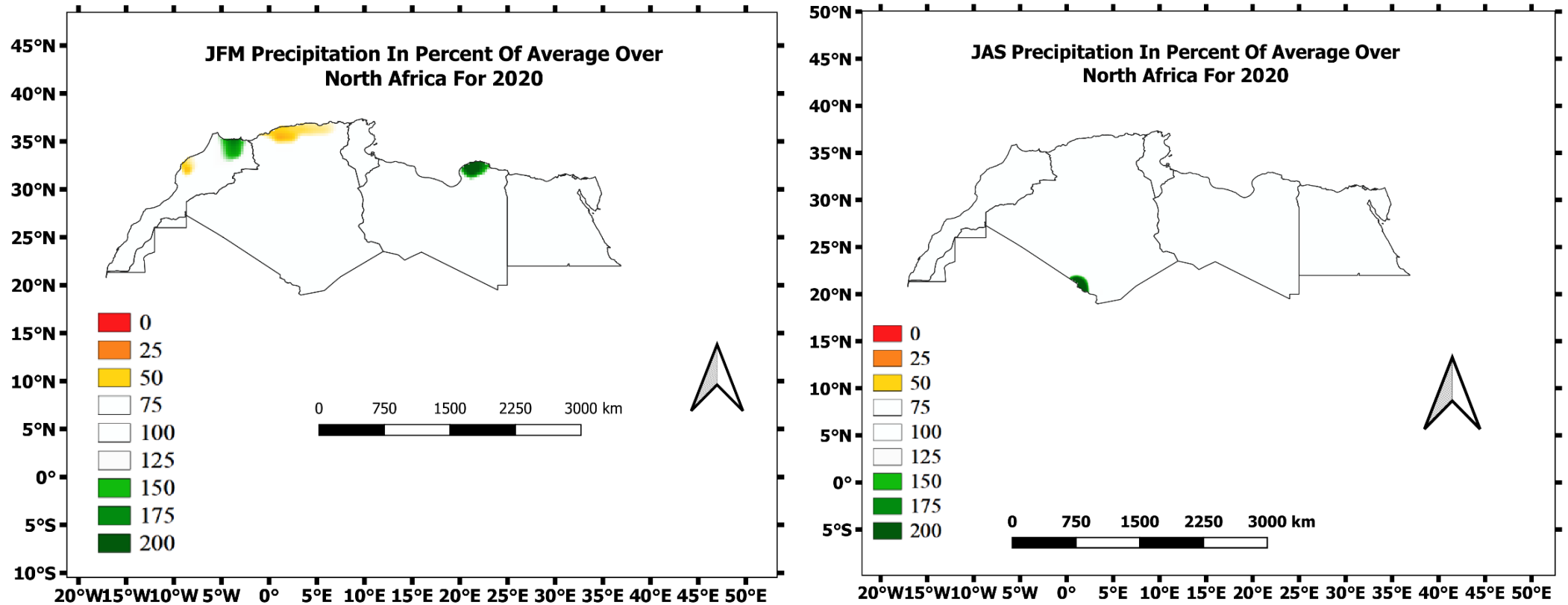


Figure 13: Mean JFM 2020 precipitation in percent of average over North Africa. . Data source: https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.CPC/.CAM5_OPI/.v0208/.mean/.prcp/

- Wet conditions were experienced over extreme northern Morocco and extreme northeast Libya. Dry conditions were observed over north Algeria. The rest of the region had near normal conditions during JFM and JAS seasons.

5. Tropical cyclones in the Southwestern Indian Ocean for 2018-2019 Season

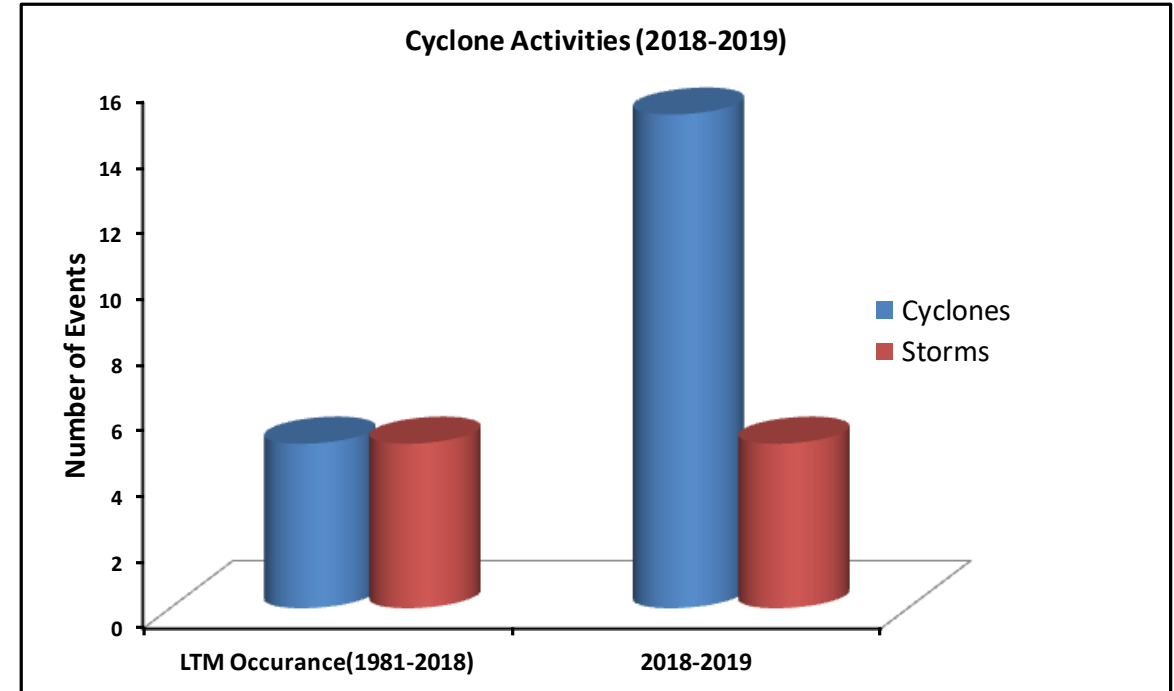
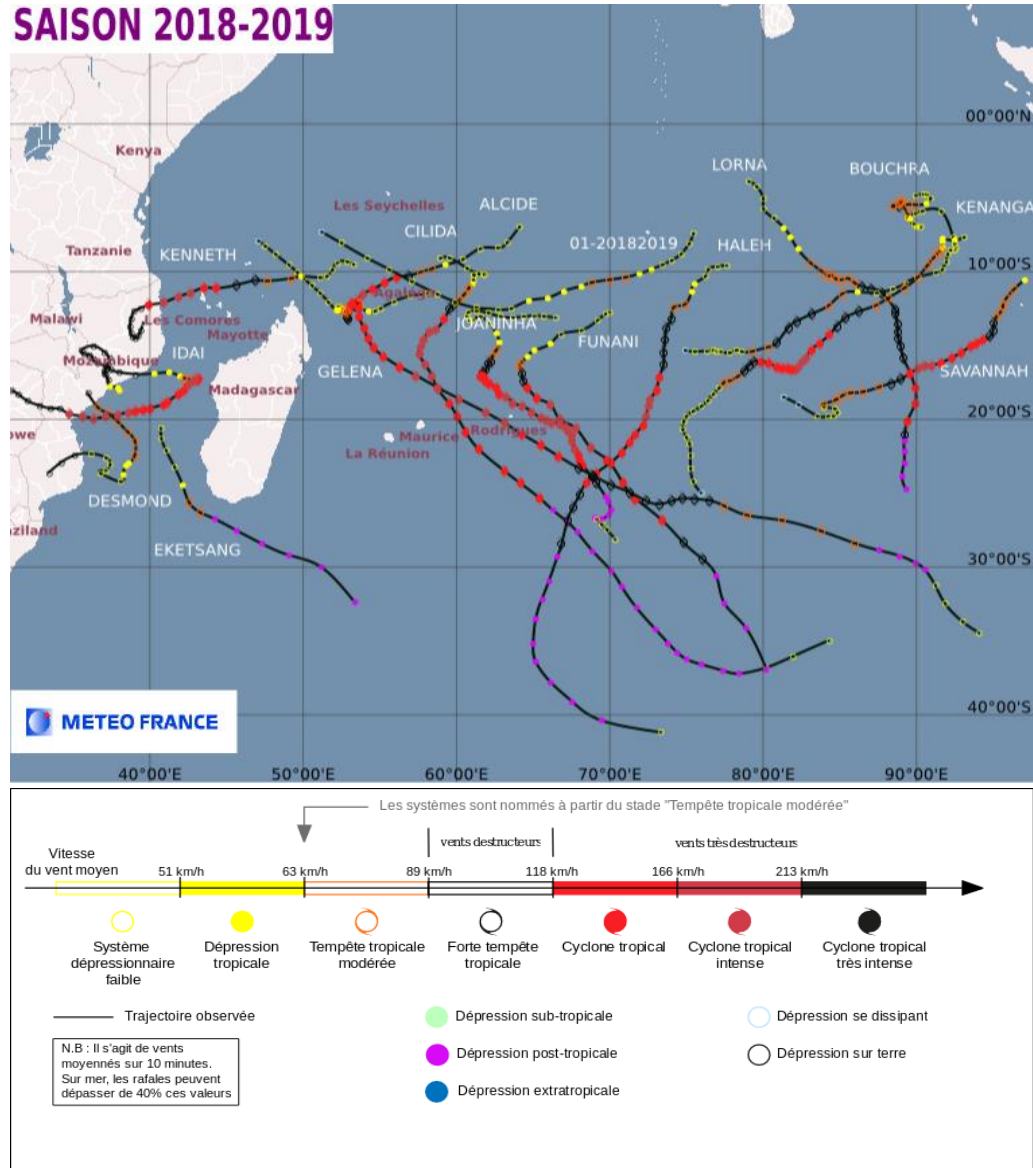
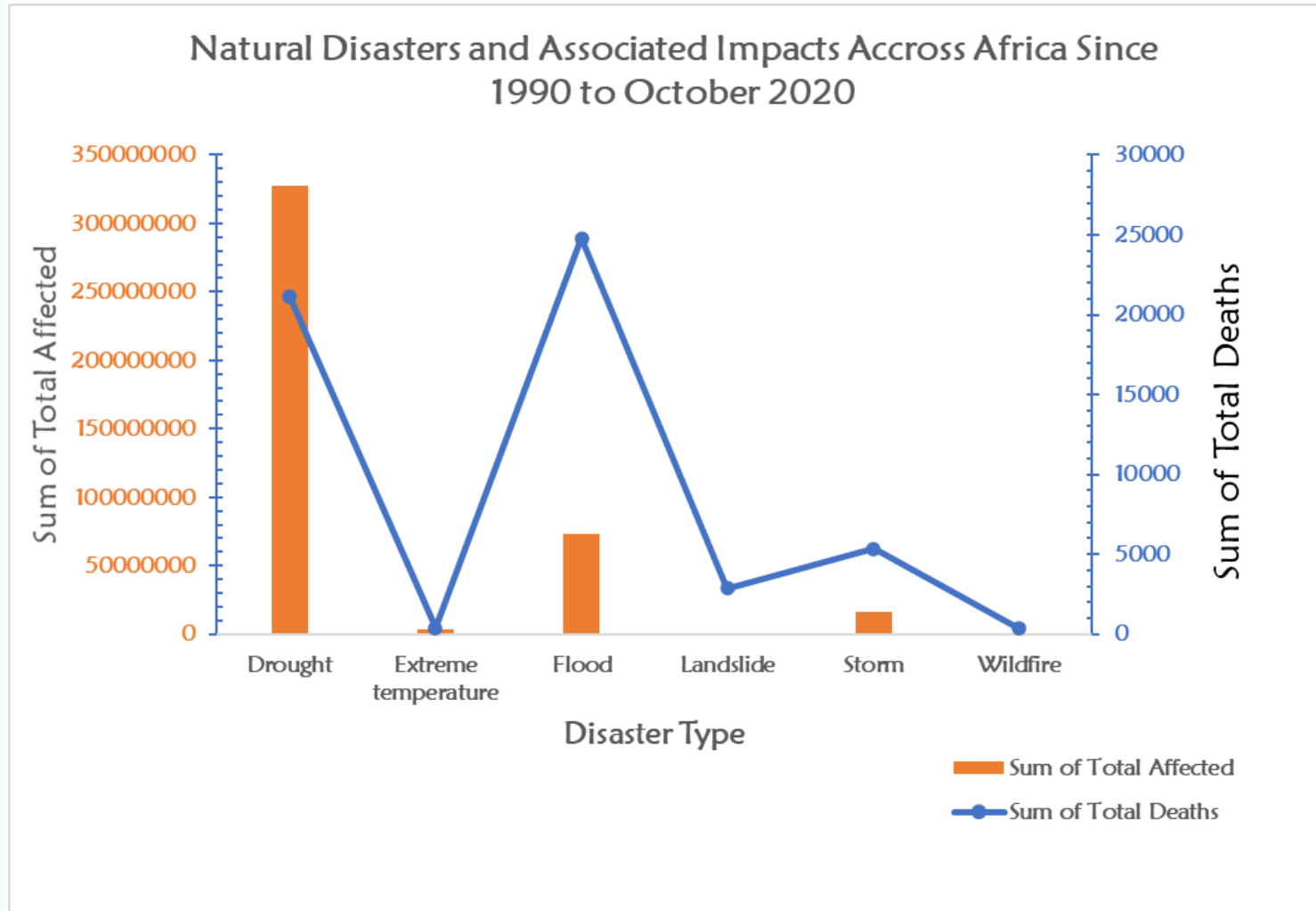


Figure 14: Cyclone activity statistics for 2018-2019 cyclone season compared with the long term mean (LTM) occurrence



Since 1990 to October 2020, drought has affected more people than any other disasters. However, flood is the leading killer compared to the others. Others disasters to be aware of are storm, extreme temperature and wildfire

Figure 15: Natural Disasters and Associated Impacts Across Africa Since 1990 to October 2020 .
 Data: source:<https://public.emdat.be/data>

7. Natural Disasters by types and Associated Impacts Across Africa sub regions during the January to September 2020

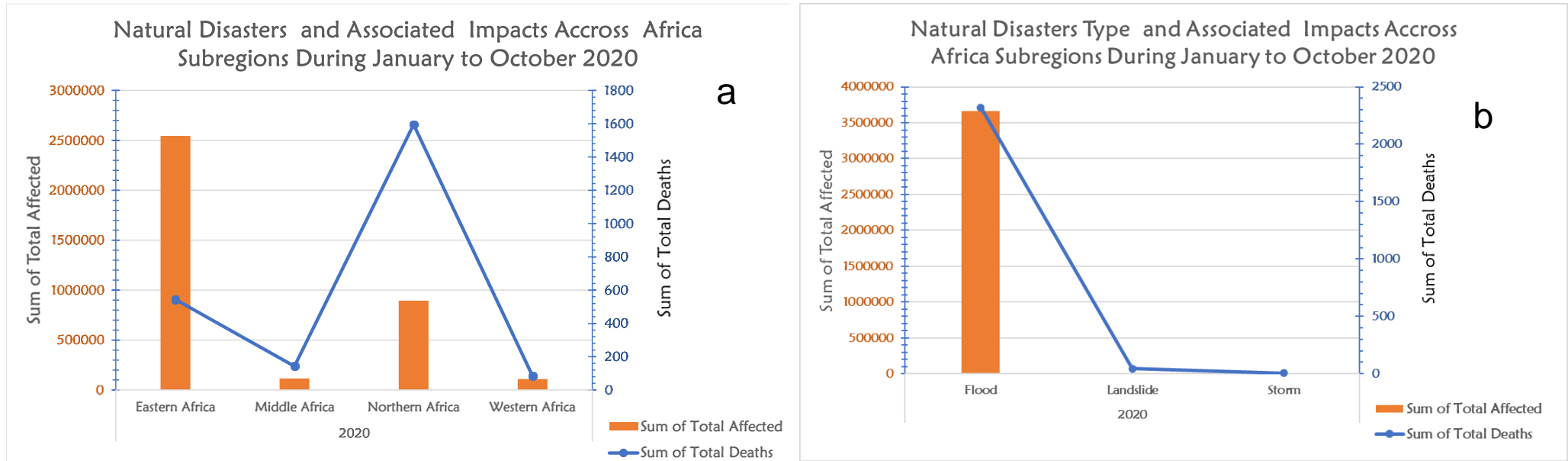


Figure 16: (a) shows Natural Disasters , (b) shows natural disaster by types and Associated Impacts Across Africa sub regions during the January to September 2020 . Data: [source:https://public.emdat.be/data](https://public.emdat.be/data)

Flooding is responsible for more deaths and affected people across African sub region. It has affected a large number of people in the Eastern Africa and caused many deaths in the Northern Africa.

-----THE END-----