

STATEMENT OF THE TWELFTH SESSION OF THE SOUTH-WEST INDIAN OCEAN CLIMATE OUTLOOK FORUM (SWIOCOF-12)

Mauritius

18-21 SEPTEMBER 2023

SUMMARY

Consensus forecast information for October to January (2023/24):

The seasonal forecasts for rainfall and temperature conditions are expressed in terms of anomalies from climatological averages for the considered seasons. These averages define what is called hereafter "Normal" conditions, they are presented in Annex 1.

An analysis of the cumulated rainfall amount over a nine months period covering the last rainy season and the beginning of the dry season, (from November 2022 until July 2023) has identified some island territories (Comoros archipelago, Agalega, St Brandon and Rodrigues) as vulnerable zones with respect to drought risk.

Over the continental part of the SWIO region, the expected rainfall anomalies pattern for the forthcoming quarters present a north-south distribution, with above normal precipitations expected over Tanzania to north Mozambique, and below normal rainfall expected over the central Mozambique to South-Africa. For island countries the forecast is more variable. Above normal rainfall is expected over the northern part of the basin and contrasted scenarios in the south, including Madagascar. This outlook varies slightly from OND to NDJ, the forecast displaying similar patterns but with increased anomalies for both above and below normal conditions. It should be noted that the island of St Brandon which was identified as a vulnerable zone for drought is expected to receive below normal rainfall for the coming seasons. This forecast enhances the risk level over this area. Strong anomalies are predicted particularly in some areas. Over the Seychelles islands well above normal conditions are expected while well below normal rainfall is expected over South Africa. Possible impacts of heavy rains or dry spells should be assessed at national level in the above-mentioned zones.

For the two coming seasons OND and NDJ, the pattern of the temperature forecasts is pretty much remarkable since the whole domain is showing a prediction of above normal temperatures. It is important to note that the risk of observing exceptionally above normal values of temperatures is multiplied by more than 4.

For the upcoming cyclonic season (November 2023 to April 2024), below normal cyclone activity is expected over the SWIO basin. The number of named tropical systems is expected between 5 and 9 (climatological value is 10). Due to tracks expected to be mainly oriented southward, the risk of landfall is significantly reduced for the east coast of Madagascar and Mozambique.

THE TWELFTH ANNUAL SOUTH WEST INDIAN OCEAN CLIMATE OUTLOOK FORUM

The twelfth session of the South Western Indian Ocean Climate Outlook Forum (SWIOCOF-12) was hosted by the Indian Ocean Commission at Bagatelle, Mauritius, from 18 to 21 September 2023 to prepare a consensus outlook for the beginning of the 2023/2024 rainy season over the South West Indian Ocean (SWIO) region. Climate scientists from the SWIO National Meteorological and/or Hydrological Services (NMHSs) and Meteo-France, formulated this outlook. Additional inputs were considered from participating models of the World Meteorological Organization Global Producing Centre for Long-Range Forecasts (WMO-GPCLRF) namely, European Centre for Medium Range Weather Forecast (ECMWF), Météo-France, NCEP, South African Weather Service (SAWS), Copernicus Climate Change Services (C3S) and the WMO Lead Centre for Long Range Forecasts Multi-Model Ensemble (WMO-LC-LRFMME). This outlook covers the first part of the rainy season from October 2023 to January 2024. The outlooks are presented in three-monthly rolling seasons as follows: October-November-December (OND) and November-December-January (NDJ).

NOTE: *This Outlook is only relevant to the above-mentioned three-month overlapping seasons. It is also important to note that relatively large areas may not fully account for all factors that influence regional and national climate variability, such as local and month-to-month (intra-seasonal) variations. Users are strongly advised to contact their relevant National Meteorological and Hydrological Services for interpretation of this Outlook as well as additional guidance and updates.*

OUTLOOK

The period of October to January over the SWIO region is typically a transition season before the main rainy season (January to March). The (JFM) season is also being referred to as the peak of the cyclonic season. The present outlook considers the following two overlapping seasons (i.e., OND and NDJ). The methodology used to obtain these forecasts is described in the Annex 2.

Current status of the climate system

The sea surface temperature over the Equatorial Pacific shows growing positive anomalies associated with El Niño conditions. The last months analysis show that the Indian Ocean Dipole (IOD) has been evolving into a positive phase. The atmospheric circulation has already begun to adjust to this constraint. In the south of the basin, the Subtropical Indian Ocean Dipole (SIOD) is in a neutral phase with no present impact on the atmospheric conditions.

Expected evolution of the main climate drivers for SWIO region

The synthesis of global climate models suggests that:

- The IOD is expected to reach its peak during the coming quarter and return to neutral conditions by the beginning of the coming year (2024).
- El Niño Southern Oscillation (ENSO) is expected to strengthen its positive anomalies and will continue to be positive till February 2024.
- These patterns are likely to drive the regional climate for the coming seasons i.e., OND and NDJ.
- The SIOD index is currently in a neutral phase and is expected to remain in this phase for the following quarter. There seems to be some uncertainties in the prediction of the SIOD, therefore there might be unforeseen changes in its predicted status.

NB: The SST forecasts can be seen in the Annex 3

Drought risk present status

An analysis of the rainfall accumulation over a nine month period covering the last rainy season and the beginning of the dry season, (from November until July) is conducted in order to highlight the zones which are prone to rainfall deficits.

The analysis of the rainfall deficits (with respect to normal conditions) for the period running from November 2022 to July 2023 shows that some island territories are vulnerable given the observed deficits in rainfall amounts. The results are displayed in figure 1.

- Rodrigues (Mauritius) : low vulnerability (deficit < 80% from normal)
- St Brandon (Mauritius) : moderate vulnerability (deficit < 70% from normal)
- Comoros archipelago and Agalega (Mauritius) : high vulnerability (deficit < 60% from normal)

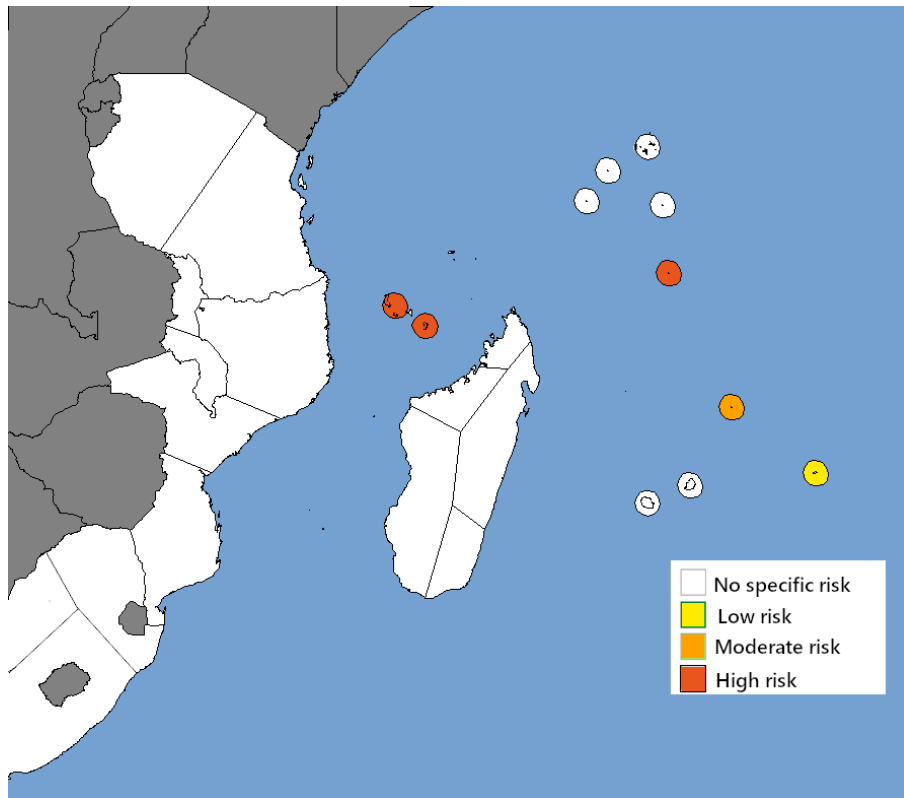


Figure 1: Drought risk map derived from rainfall deficits analysis

Outlooks for OND 2023 and NDJ 2023/2024

The precipitation, temperature and cyclone outlooks for the upcoming seasons: October-November-December (OND) 2023 and November-December-January (NDJ) 2023-24 were based on the following: SST anomalies, knowledge and understanding of seasonal cyclonic typology over the South West Indian Ocean region together with available long range forecasts products.

Precipitation:

- **General remarks:** Over the continental part of the SWIO region, the expected rainfall anomalies pattern for the forthcoming quarters present a north-south distribution, with above normal precipitations expected over Tanzania to north Mozambique, and below normal rainfall expected over the central Mozambique to South-Africa. For island countries the forecast is more variable. Above normal rainfall is expected over the northern part of the basin and contrasted scenarios in the south, including Madagascar. This outlook varies slightly from OND to NDJ, the forecast displaying similar patterns but with increased anomalies for both above and below normal conditions. It should be noted that the island of St Brandon which was identified as a vulnerable zone for drought is expected to receive below normal rainfall for the coming seasons. This forecast enhances the risk level over this area.

Strong anomalies are predicted particularly in some areas. Over the Seychelles islands well above normal conditions are expected while well below normal rainfall is expected over South Africa. Possible impacts of heavy rains or dry spells should be assessed at national level in the above-mentioned zones.

- NB: The confidence level associated to these forecast is described in Annex 4

- Detailed outlook:

For **October-November-December** season (OND) – Figure 2, the most likely conditions for the different countries are described below:

Below normal rainfall is expected over the following regions:

- South Africa, West Madagascar and St Brandon.

Normal to below normal rainfall is expected over the following regions:

- South Malawi, Central and South Mozambique

Normal rainfall is expected (60% probability) over the following regions:

- East and South-East of Madagascar, Mayotte, Réunion, Mauritius

Normal to above normal rainfall is expected over the following regions:

- North Malawi, North of Mozambique, North of Madagascar, Comoros

Above normal rainfall is expected over the following regions:

- Tanzania, Seychelles islands, Agalega, Rodrigues

High uncertainty which prevents defining a specific probabilistic forecast category is observed over the following region:

- North-West Madagascar

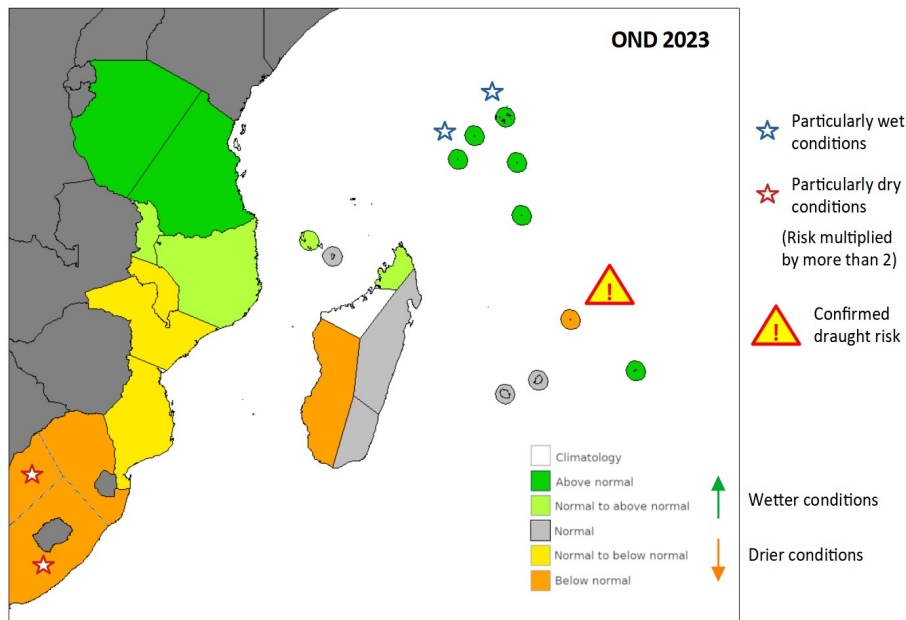


Figure 2 : Consensus forecast of precipitation for OND 2023 in SWIO region

For **November-December-January** season (NDJ) – Figure 3, the most likely conditions for the different countries are described below:

Below normal rainfall is expected over the following regions:

- South Malawi, Central Mozambique, West and North-West Madagascar, Réunion, Mauritius, St Brandon, South Africa

Normal to below normal rainfall is expected over the following regions:

- South of Mozambique, South-East of Madagascar

Normal rainfall is expected (60% probability) over the following regions:

- NA

Normal to above normal rainfall is expected over the following regions:

- North of Malawi, East of Madagascar, Comoros islands

Above normal rainfall is expected over the following regions:

- Tanzania, North of Mozambique, North of Madagascar, Seychelles island, Agalega, Rodrigues

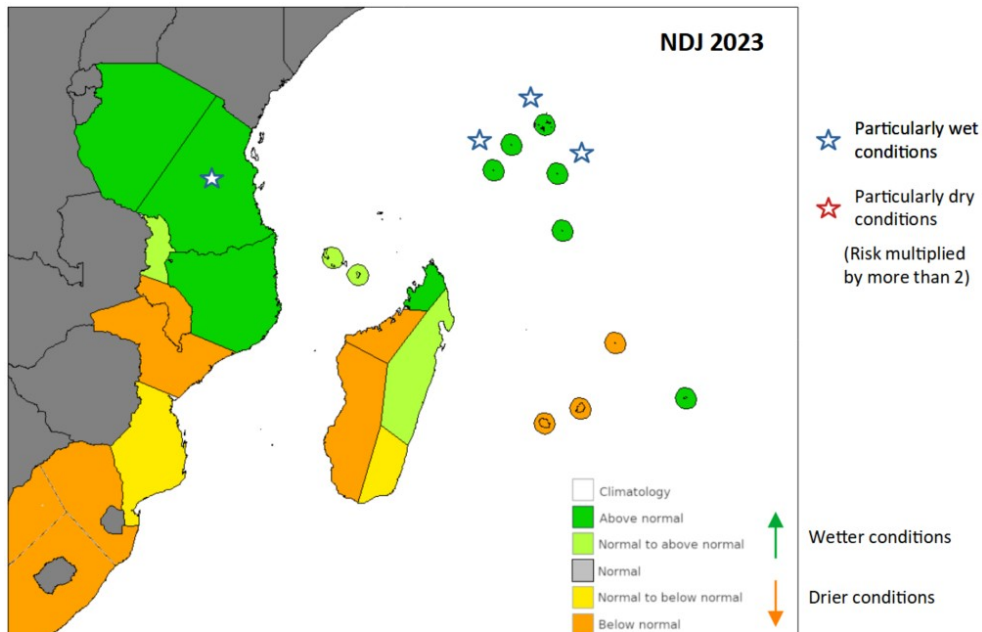


Figure 3: Consensus forecast of precipitation for NDJ 2023/24 in SWIO region

Temperature:

- **General remarks:** For the two coming seasons OND and NDJ, the pattern of the temperature forecasts is pretty much remarkable since the whole domain is showing a prediction of above normal temperatures. It is important to note that the risk of observing exceptionally above normal values of temperatures¹ is multiplied by more than 4. This outlook is displayed in figures 4 and 5. Detailed description is not relevant since all the zones show a similar forecast pattern.

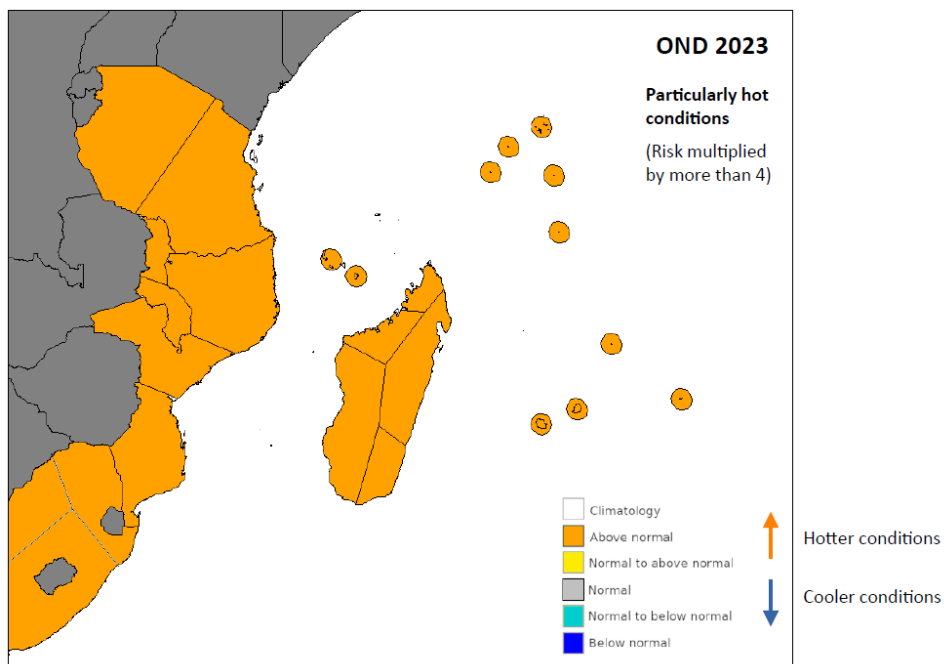


Figure 4: Consensus forecast of temperature for OND 2024 in SWIO region

1 The “exceptional” temperatures threshold is given by the 84th percentile of the statistical distribution of this parameter. The climatological probability to exceed this threshold is 16%

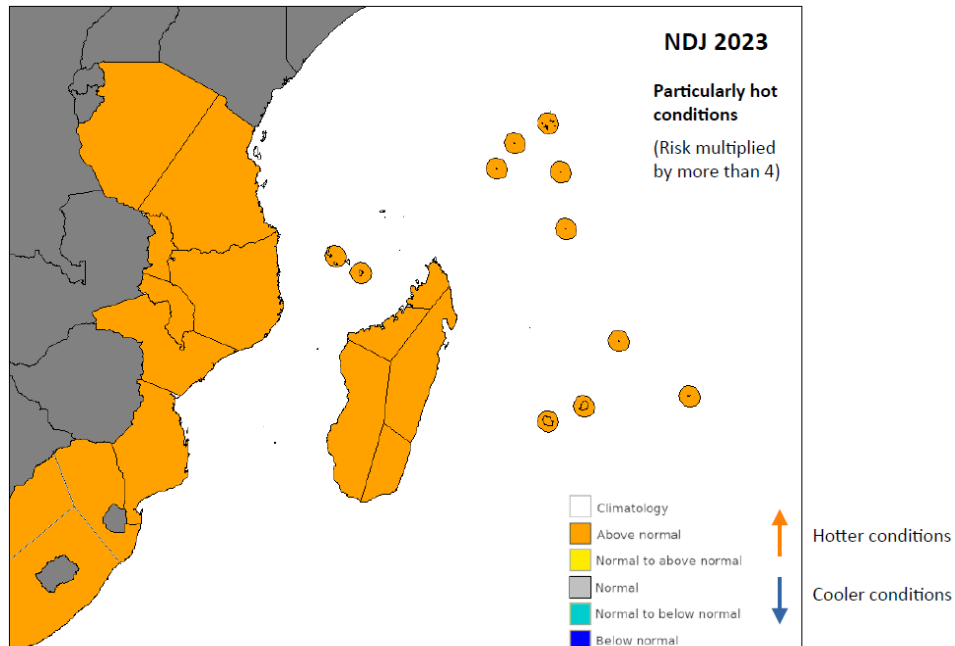


Figure 5: Consensus forecast of temperature for NDJ 2023/24 in SWIO region

Cyclone activity:

- This outlook covers the South-West Indian Ocean cyclonic basin (from 30°E to 90°E, between the equator and 40°S

For the upcoming cyclonic season (November 2023 to April 2024), below normal cyclone activity is expected over the SWIO basin. The number of named tropical systems is expected between 5 and 9 (climatological value is 10). tropical Cyclone tracks are expected to be mainly oriented southward, therefore the risk of landfall is significantly reduced for the east coast of Madagascar and Mozambique.

Under the influence of El Niño and positive IOD scenario, the start of the cyclonic season is expected to be late with very low probability of TC activities to occur before December.

For the second part of the season (beyond January), the level of activity is still uncertain given the considered lead-time and the uncertainty in the evolution of relevant climate drivers of cyclone activity in the SWIO region.

This outlook is produced at the regional scale. Thus, its interpretation should only be for regional use. To cover local and/or country adaptation and its applications needs, countries are encouraged to consult their National Meteorological and Hydrological Services for more details and updates.

An outlook update which is specific to the cyclone activity will be provided during the SWIOCOF-TC mini-forum which will take place as a web conference in October 26th 2023.

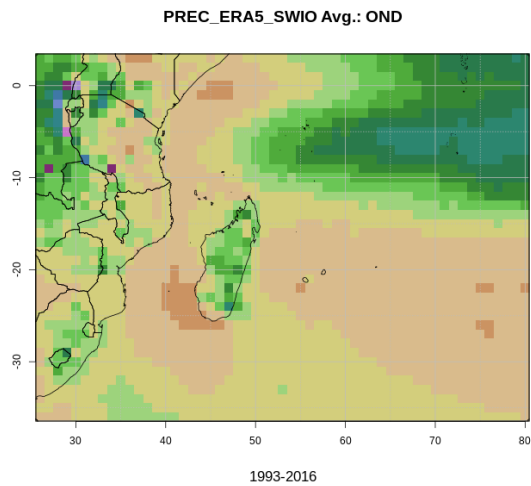
<https://community.wmo.int/en/meetings/fourth-miniforum-tropical-cyclone-outlook-south-west-indian-ocean>

Another update will be provided by RSMC Reunion in January 2024 through this weblink: <http://meteofrance.re/fr/climat/previsions-saisonnieres>

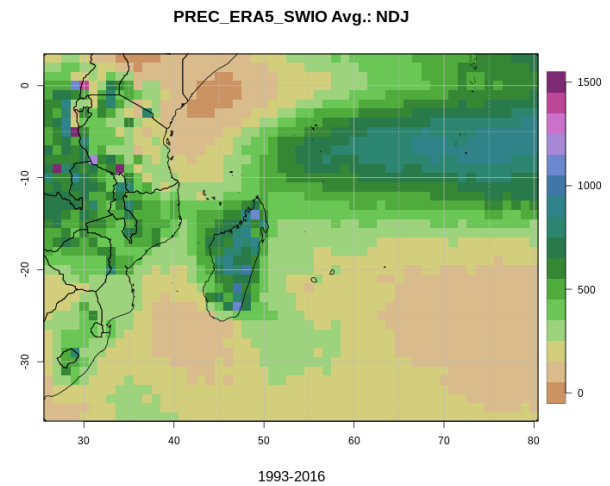
Updates of rainfall and temperature forecasts and other climate products issued by the SWIOCOF workgroup, can be accessed on the dedicated portal: [SWIOCOF data portal](#)

Annex 1: NORMAL CONDITIONS

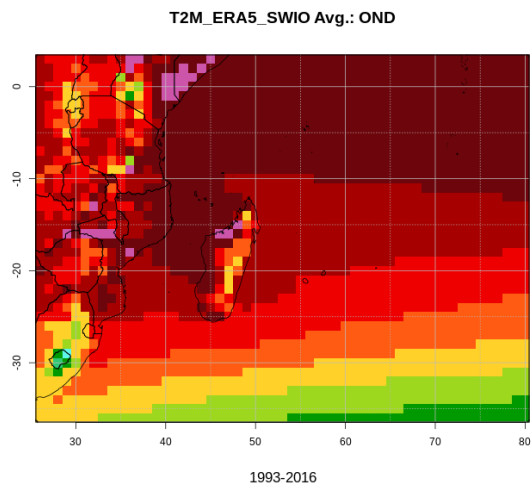
This annex shows the Normal conditions for rainfall and temperature over the South-West Indian Ocean for the considered quarters (OND and NDJ). It consist of climatological averages for the period 1993-2016. The reference dataset used to illustrate these normal conditions is the ERA5 reanalysis².



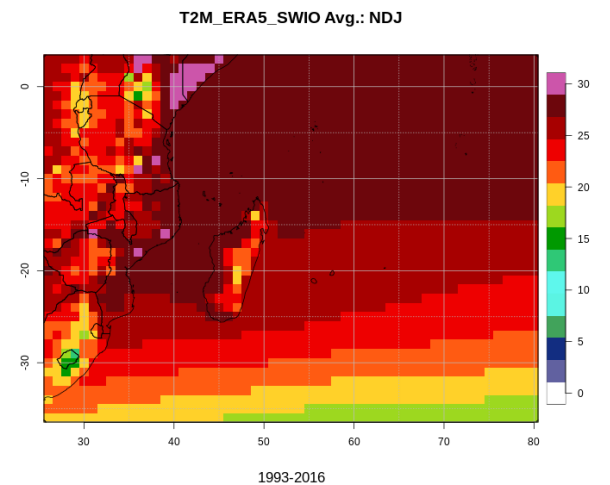
Average rainfall (mm) for OND season



Average rainfall (mm) for NDJ season



Average temperature (°C) for OND season



Average temperature (°C) for NDJ season

² ERA5 is a fifth generation reanalysis from ECMWF covering the period 1950 to present. It is part of the Copernicus Climate Change Service (<https://www.ecmwf.int/en/forecasts/dataset/ecmwf-reanalysis-v5>)

Annex 2: METHODOLOGY

This annex describes the processes implemented during the SWIOCOF technical working sessions for forecast production of the forum.

The rainfall and temperature outlooks are consensus forecasts compiled by the climate scientists of the countries involved in the working group. These outlooks meet the WMO standards regarding seasonal forecast process³, since the regional product is a result of the blending of objective, traceable and reproducible forecasts made for each country as well as for the whole region. The homogeneity of the different individual predictions is ensured using the same processing system based on the SEAFORDS⁴ tool.

The local and regional forecasts are based on a statistical adaptation of Global Climate Models (GCM) outputs. The chosen Global Producing Centres are: ECMWF, Meteo-France and NCEP. The statistical model is build following the “perfect prognosis” assumption. The reference dataset is based on ERA5 reanalysis. The final product consists of a blend of results obtained using the different GCMs. The scores of the statistical model are computed using the Hindcasts available for each GCM. These climatological scores along with those of the GCMs themselves are also examined to understand the predictability for the considered parameters, seasons and region. The reliability of the final forecast is also determined in order to provide users with meaningful indicators of the awaited confidence that can be placed on the displayed forecasts. These indicators are presented in the annex 4.

The forecast process includes the analysis of the climate drivers that are known to have an impact on the climatic system of the region i.e.,: ENSO, IOD, SIOD, SAM. This impact can be illustrated by composite maps. The assessment of the observed and predicted magnitude of the drivers provides some information on the predictability of the present case and constitutes insights for understanding regional patterns of both the present and expected rainfall and temperature anomalies.

During the SWIOCOF working sessions a verification of the past forecast is conducted at both the national scale and regional scale following the WMO recommendations⁵. This process involves local observed data along with ERA5 reanalysis. The work also allows forecast errors to be better understood. These datasets are also relevant to conduct the monitoring of rainfall and temperature over the region for the latest seasons which is useful to identify zones that are at risk regarding drought issues.

The outlook for Tropical Cyclone (TC) activity over the SWIO region (30°E, 90°E/0°S,-40°S) is based on the assessment of the observed and predicted state of the climate drivers. The analysed condition is compared to the known impact of the drivers on the different types of TC tracks and on the cyclogenesis process over the basin. The dedicated forecasts given by ECMWF provide an additional insight that is useful to produce the first outlook for the TC activity during the first part of the rainy season.

3 Guidance on Operational Practices for Objective Seasonal Forecasting – WMO n° 1246

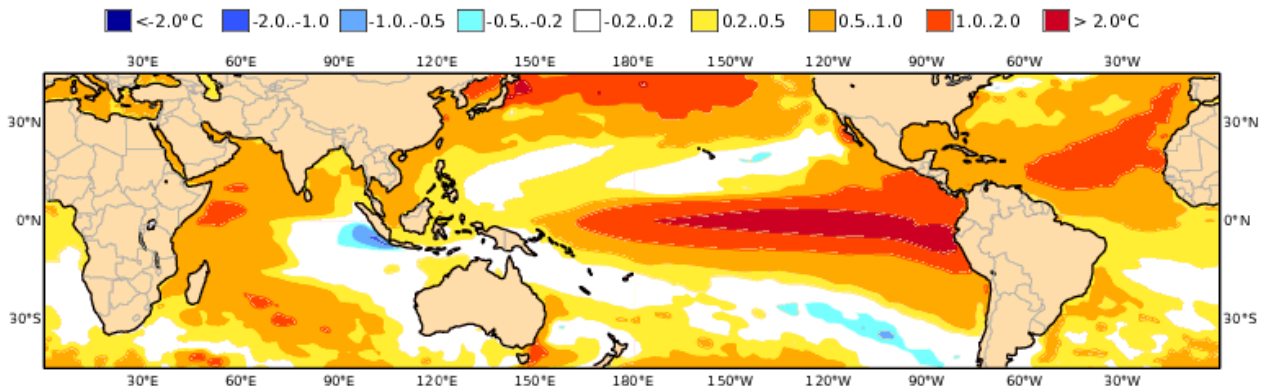
4 SEAFORDS (SEAsonal FORecast DownScaling) is a suite of tools for climate analysis, monitoring and forecast downscaling, written in R language developed and distributed by Meteo-France regional centre for Indian Ocean (La Réunion) – contact: laurent.labbe@meteo.fr

5 Guidance on Verification of Operational Seasonal Climate Forecasts – WMO n°1220

Annex 3: Sea Surface Temperature forecasts

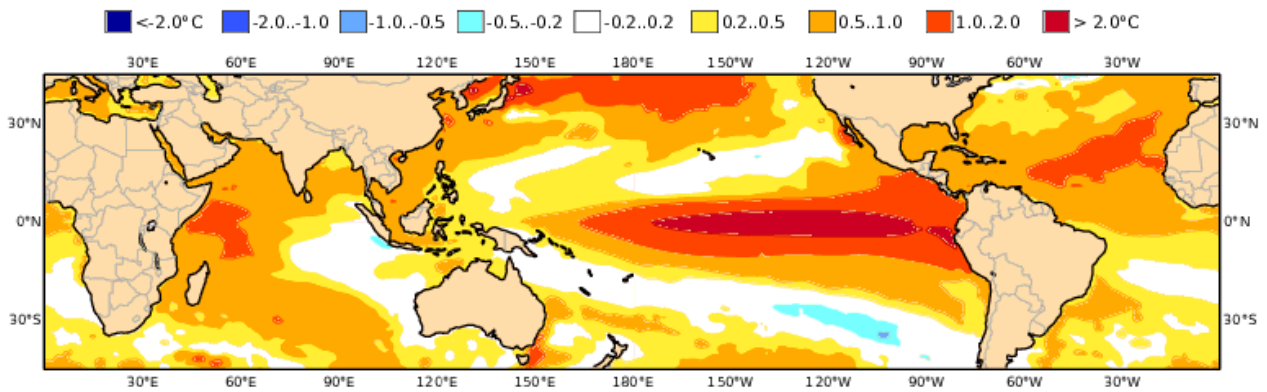
The Sea Surface Temperature forecasts are examined to assess the likelihood of climate drivers like ENSO in the central Pacific basin as well as the IOD and SIOD in the Indian Ocean basin. The maps displayed here are a synthesis of multi-model forecasts from the Copernicus portal⁶ for the two considered seasons i.e.,: OND and NDJ 2023.

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
Mean forecast SST anomaly OND 2023
Nominal forecast start: 01/09/23
Variance-standardized mean



Forecast of the Sea Surface Temperature anomalies for OND 2023

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
Mean forecast SST anomaly NDJ 2023/24
Nominal forecast start: 01/09/23
Variance-standardized mean



Forecast of the Sea Surface Temperature anomalies for NDJ 2023

6 Copernicus Climate Change Service (C3S): <https://climate.copernicus.eu/seasonal-forecasts>

Annex 4: Reliability of the forecasts

The reliability of the rainfall probabilistic forecast is assessed using the 24 years of Hindcast (1993-2016) which is available for each GCM involved in the process (ECMWF, Meteo-France and NCEP).

For the two considered seasons, global statistics concerning the results of the method over the region can be synthesized with the following indicators which illustrate the confidence users may have in the displayed forecasts.

OND:

- Probability of good prediction for positive anomalies (Normal to above normal or Above normal) : **72 %**
- Probability of good prediction for negative anomalies (Normal to below normal or Below normal) : **71 %**
- Probability of missed Above normal cases : **28 %**
- Probability of missed Below normal cases : **25 %**

NDJ:

- Probability of good prediction for positive anomalies (Normal to above normal or Above normal) : **64 %**
- Probability of good prediction for negative anomalies (Normal to below normal or Below normal) : **71 %**
- Probability of missed Above normal cases : **27 %**
- Probability of missed Below normal cases : **34 %**