



COMMISSION DE
L'OCEAN INDIEN



GFCS
GLOBAL FRAMEWORK FOR
CLIMATE SERVICES



STATEMENT OF THE ELEVENTH SESSION OF THE SOUTH-WEST INDIAN OCEAN CLIMATE OUTLOOK FORUM (SWIOCOF-11)

Beau Vallon - Seychelles

19-22 SEPTEMBER 2022

SUMMARY

Consensus forecast information for October to January (2022/23):

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.

Over the continental part of the SWIO region, the expected rainfall anomalies pattern for the forthcoming quarters present a north-south graduation, with below normal precipitations expected from northern Mozambique to Tanzania and Malawi, and above normal precipitations expected from southern Mozambique to South-Africa. For all island countries as well as the eastern part of Madagascar, we expect mostly below normal precipitations. The western part of Madagascar is likely to have near normal rainfall conditions. This outlook is more or less similar for OND and NDJ seasons. A delayed onset of the rainy season is likely in most territories of the northern part of the region where below normal rainfall conditions are expected. In these areas, the duration of dry spells is likely to be above normal. Possible impacts on drought-sensitive sectors should be assessed at national level with respect to the present vulnerability of the concerned territories. In southern Mozambique and South Africa, consistently with the above normal rainfall signal, the frequency of heavy rain events is likely to be above normal.

The temperature forecast anomaly pattern present a contrast between the continental and the oceanic part of the region which is prone to cool anomalies of sea surface temperatures (SST) mainly in the northern and central part of the basin. This condition differs slightly from OND to NDJ season with a cooling effect expected over some continental areas.

Concerning Tropical Cyclone activity, it is expected normal to below normal for the next coming season (October to April). For the first part of the season, up to January, the developments of tropical storm or cyclones should be limited and mainly retrained to the eastern part of the basin (east of 70°E).

THE ELEVENTH ANNUAL SOUTH WEST INDIAN OCEAN CLIMATE OUTLOOK FORUM

The Eleventh Southern Western Indian Ocean Climate Outlook Forum (SWIOCOF-11) was hosted by the Seychelles Meteorological Authority at Beau-Vallon, Mahé, Seychelles, from 19 to 22 September 2022 to prepare a consensus outlook for the beginning of the 2022/2023 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 2022 to January 2023. 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 period 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 persisting negative anomalies associated to present La Nina conditions. The Indian Ocean Dipole (IOD) has been rapidly evolving into a negative phase for the last months. Feedbacks and response on the climate system are already visible. Over 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 end of the year.
- El Nino Southern Oscillation (ENSO) is expected to stay in a negative phase (i.e., La Nina event) with possible decay to a neutral phase by the beginning of next year.
- These patterns are likely to drive the regional climate for the coming seasons i.e., OND and NDJ.
- The SIOD index should increase in the coming weeks, possibly reaching positive conditions by the end of the year. Note that this predicted evolution remains quite uncertain at that stage, leading to uncertainties on the possible feedbacks on the atmospheric conditions during the core of the next cyclonic season.

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

Outlooks for OND 2020 and NDJ 2020/2021

The precipitation, temperature and cyclone outlooks for the upcoming seasons: October-November-December (OND) 2022 and November-December-January (NDJ) 2023 were based on the following : SST anomalies, sub-surface temperature patterns, knowledge and the understanding of seasonal climate

variability 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 graduation, with below normal precipitations expected from northern Mozambique to Tanzania and Malawi, and above normal precipitations expected from southern Mozambique to South-Africa. For all island countries as well as the eastern part of Madagascar, we expect mostly below normal precipitations. The western part of Madagascar is likely to have near normal rainfall conditions. This outlook is more or less similar for OND and NDJ seasons. A delayed onset of the rainy season is likely in most territories of the northern part of the region where below normal rainfall conditions are expected. In these areas, the duration of dry spells is likely to be above normal. Possible impacts on drought-sensitive sectors should be assessed at national level with respect to the present vulnerability of the concerned territories. In southern Mozambique and South Africa, consistently with the above normal rainfall signal, the frequency of heavy rain events is likely to be above normal. . - NB: The confidence level associated to these forecast is described in Annex 4

- Detailed outlook:

For **October-November-December** season (OND) – Figure 1, the most likely conditions for the different countries are described below:

Below normal rainfall is expected (80% probability) over the following regions:

- Tanzania, Malawi, North of Mozambique, North ad east Madagascar, Comoros, Mauritius (all islands) and La Réunion

Normal to below normal rainfall is expected (40%+40% probability) over the following regions:

- South-east Madagascar and Seychelles (all islands)

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

- North-west and west of Madagascar

Normal to above normal rainfall is expected (40%+40% probability) over the following regions:

- South of Mozambique

Above normal rainfall is expected (80% probability) over the following regions:

- South Africa

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

- Central Mozambique

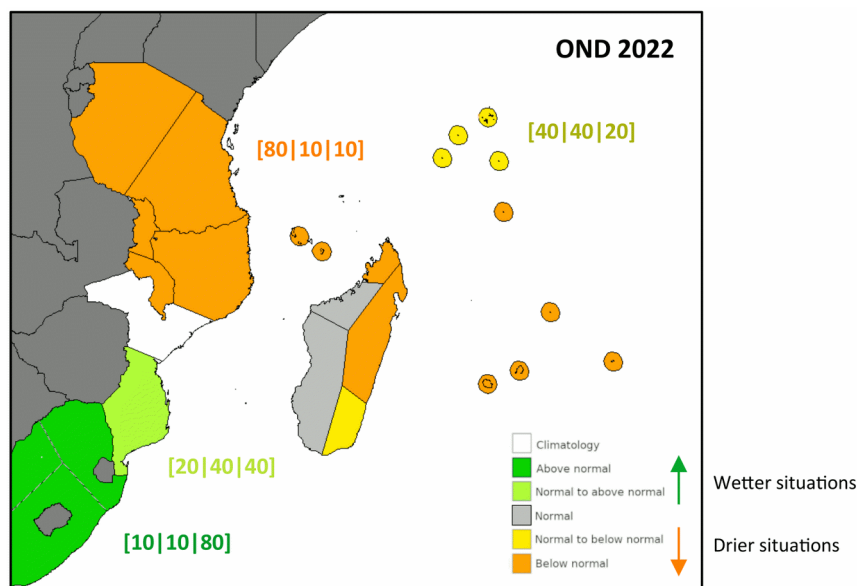


Figure 1 : Consensus forecast of precipitation for OND 2022 in SWIO region

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

Below normal rainfall is expected (80% probability) over the following regions:

- Tanzania, North of Malawi, North and east Madagascar, Comoros, Mauritius (all islands) and La Réunion.

Normal to below normal rainfall is expected (40%+40% probability) over the following regions:

- North of Mozambique, South Malawi, South-east Madagascar and Seychelles (all islands).

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

- North-west of Madagascar.

Normal to above normal rainfall is expected (40%+40% probability) over the following regions:

- West of Madagascar and North-west of South Africa.

Above normal rainfall is expected (80% probability) over the following regions:

- Central and South Mozambique, East and South-east of South Africa.

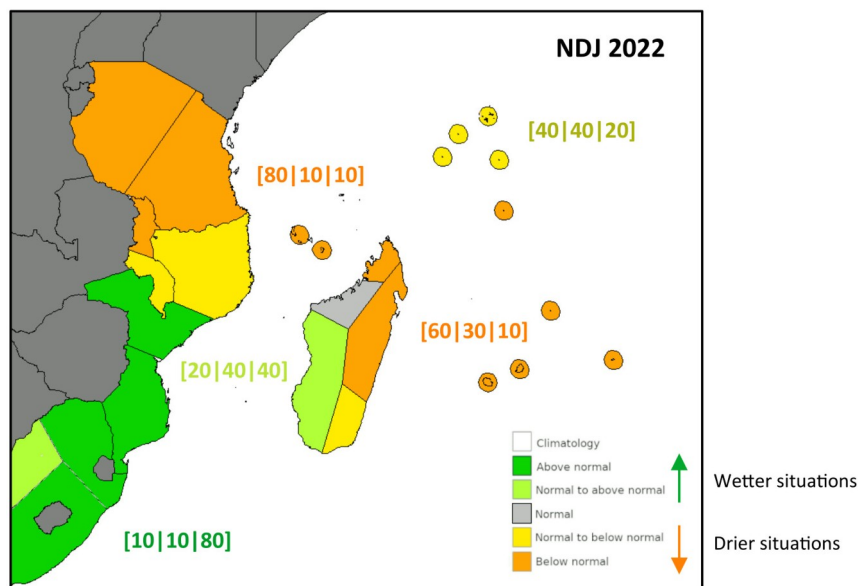


Figure 2: Consensus forecast of precipitation for NDJ 2022/23 in SWIO region

Temperature:

- **General remarks:** The temperature anomalies pattern present a contrast between the continental part and the oceanic part of the region which is prone to cool anomalies of sea surface temperatures (SST) mainly in the northern and central part of the basin. This situation evolves slightly from OND to NDJ season with a cooling effect expected over some continental areas.

- Detailed outlook:

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

Below normal temperatures are expected (60% probability) over the following regions:

- North of Madagascar.

Normal to below normal temperatures are expected (40%+50% probability) over the following regions:

- Seychelles (all islands), Comoros, East and North-west Madagascar, St Brandon, Agaléga and La Réunion.

Normal temperatures are expected (50% probability) over the following regions:

- North-west and south-east of South Africa, Mauritius and Rodrigues.

Normal to above normal temperatures are expected (40%+50% probability) over the following regions:

- South Mozambique, North-east of South Africa and West Madagascar.

Above normal temperatures are expected (70% probability) over the following regions:

- Tanzania, Malawi, North and Central Mozambique and South-east Madagascar.

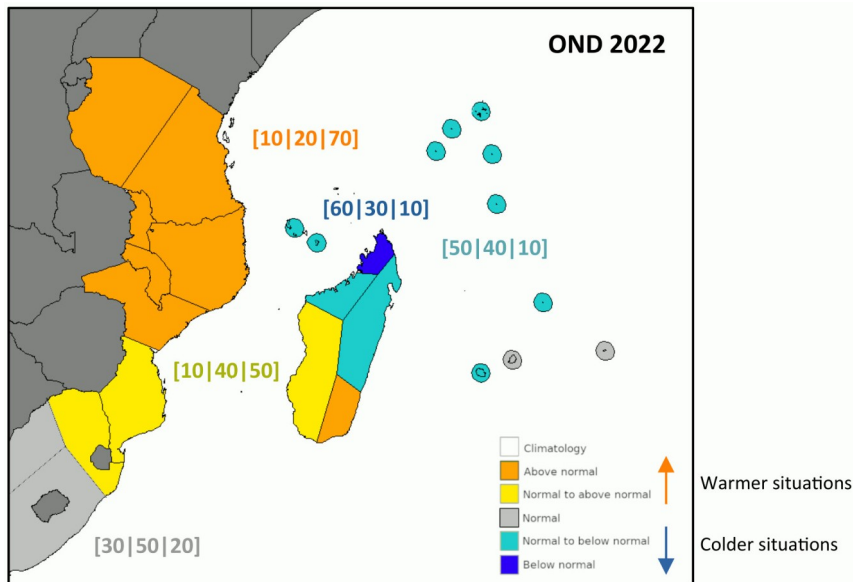


Figure 3 : Consensus forecast of temperature for OND 2022 in SWIO region

For **November-December-January** season (NDJ) – Figure 4, the most likely conditions for the different countries are described below:

Normal to below normal temperatures are expected (40%+50% probability) over the following regions:

- Seychelles (all islands), East, North and North-west Madagascar, St Brandon and Agaléga.

Normal temperatures are expected (50% probability) over the following regions:

- La Réunion and Rodrigues.

Normal to above normal temperatures are expected (40%+50% probability) over the following regions:

- South Mozambique, North-west of South Africa and West Madagascar.

Above normal temperatures are expected (80% probability) over the following regions:

- Tanzania, Malawi, North Mozambique and South-east Madagascar.

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

- South-east of South Africa.

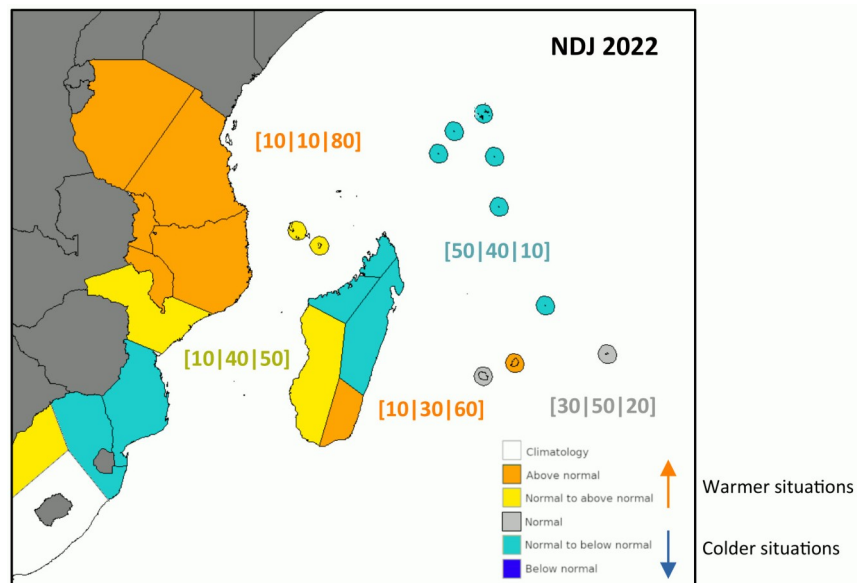


Figure 4 : Consensus forecast of temperature for NDJ 2022/23 in SWIO region

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 2022 to April 2023), normal to below normal cyclone activity is expected over the SWIO basin.

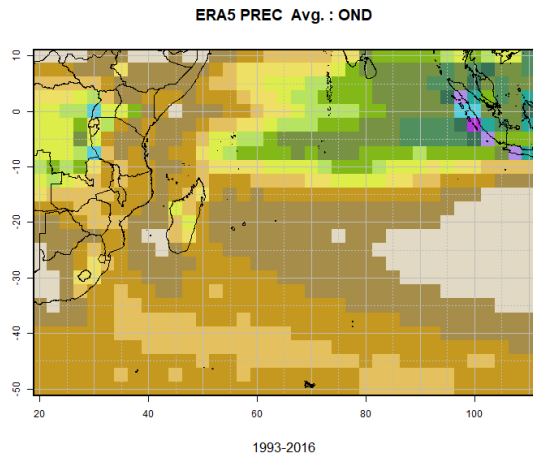
For the first part of the season (up to January), Tropical Cyclone activity is expected to be limited and restrained to the eastern part of the basin, far from inhabited lands, with very low probability for tropical storms or cyclones to develop west of 70°E.

For the second part of the season (beyond January), the activity may develop further west and closer to inhabited lands, but uncertainty is quite high given the considered lead-time and the uncertainty on the evolution of the relevant climate drivers of cyclone activity in the SWIO region.

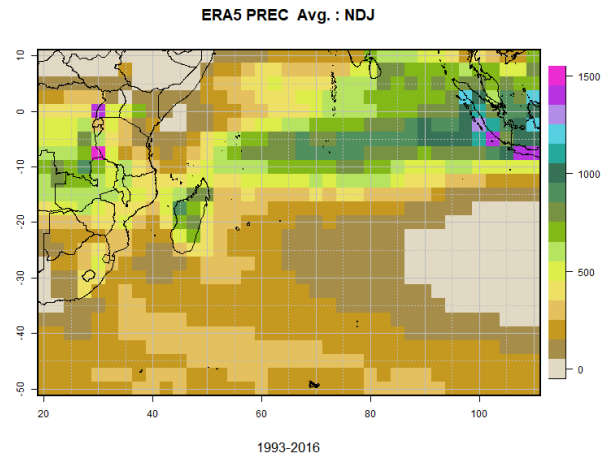
This outlook is produced at the regional scale. Thus, its interpretation should only be for regional use. To cover local and/or country adaptation and its applications needs, countries are encouraged to consult their National Meteorological and Hydrological Services for more details and updates. An outlook 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 late October 2022. Another update will be provided by RSMC Reunion in January 2023 through this weblink:
<http://meteofrance.re/fr/climat/previsions-saisonnières>

Annex 1: NORMAL CONDITIONS

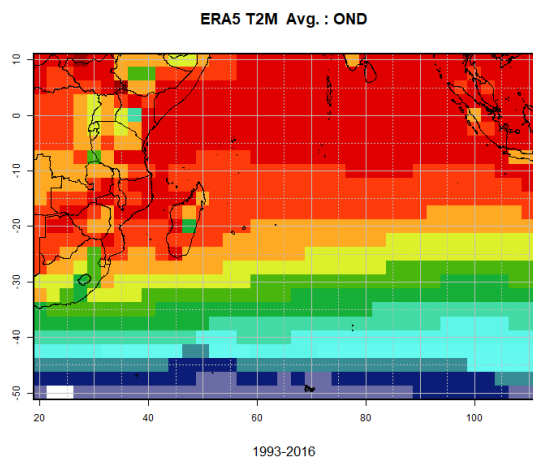
This annex shows the Normal conditions for rainfall and temperature over the South-West Indian Ocean for the considered quarters (OND and NDJ). It consist of climatological averages for the period 1993-2016. The reference dataset used to illustrate these normal conditions is the ERA5 reanalysis¹.



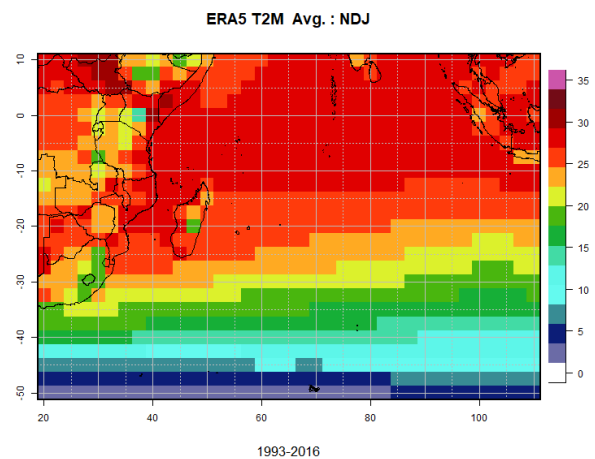
Average rainfall (mm) for OND season



Average rainfall (mm) for NDJ season



Average temperature (°C) for OND season



Average temperature (°C) for NDJ season

¹ 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 process², 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 SEAFORDS³ 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 recommendations⁴. 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.

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

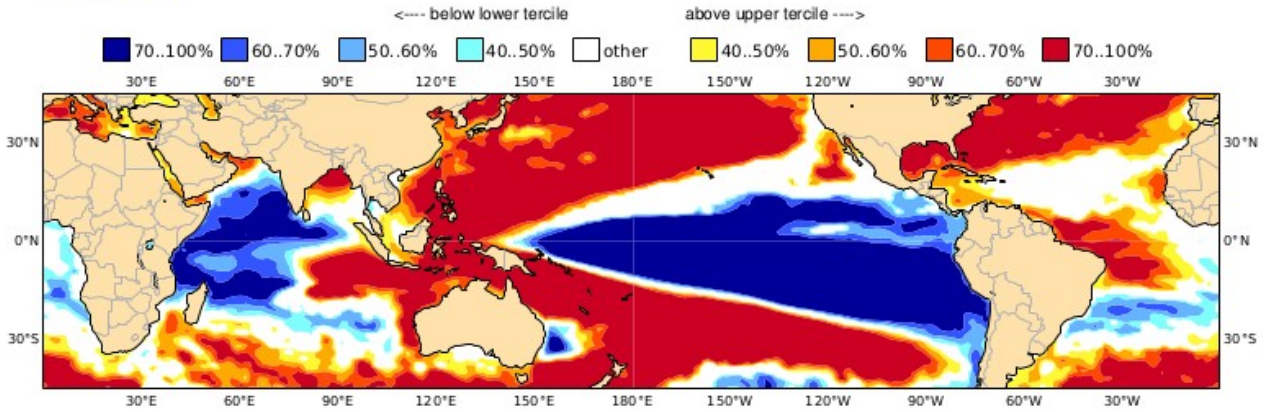
3 SEAFORDS (SEAsonal FORecast DownScaling) is a suite of tools for climate analysis, monitoring and forecast downscaling, written in R language developed and distributed by Meteo-France regional centre for Indian Ocean (La Réunion) – contact: laurent.labbe@meteo.fr

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

Annex 3: Sea Surface Temperature forecasts

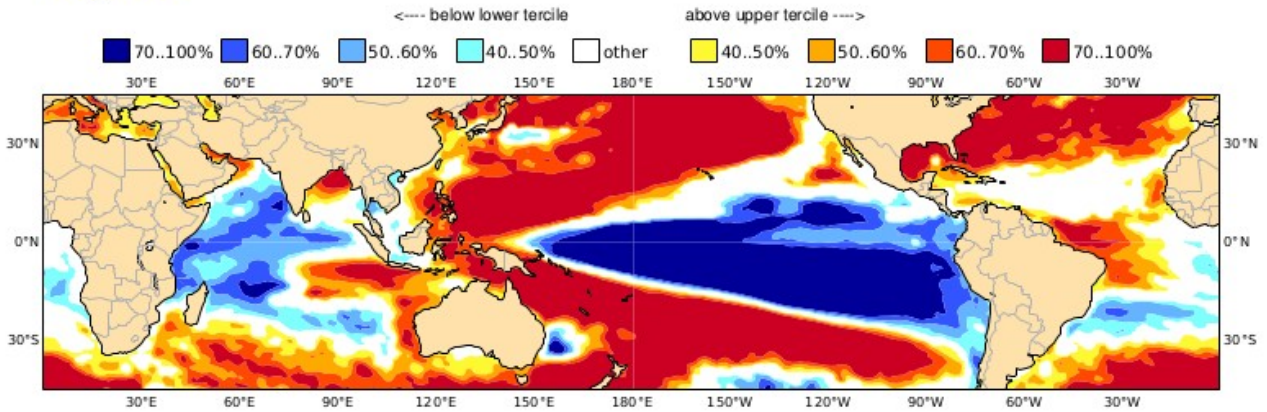
The Sea Surface Temperature forecasts are examined to assess the likelihood of climate drivers like ENSO in the central Pacific basin as well as the IOD and SIOD in the Indian Ocean basin. The maps displayed here are a synthesis of multi-model forecasts given by the Copernicus portal⁵ for the two considered seasons i.e.,: OND and NDJ.

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
 Prob(most likely category of SST) OND 2022
 Nominal forecast start: 01/09/22
 Unweighted mean



Forecast of the Sea Surface Temperature anomalies for OND 2022

C3S multi-system seasonal forecast ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
 Prob(most likely category of SST) NDJ 2022/23
 Nominal forecast start: 01/09/22
 Unweighted mean



Forecast of the Sea Surface Temperature anomalies for NDJ 2022

5 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 %**