



**GMES  
AND AFRICA**



# MONTHLY OCEANOGRAPHY BULLETIN

South West Indian Ocean  
August 2020



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## List of Acronyms

AUC	African Union Commission
Chl- <i>a</i>	Chlorophyll- <i>a</i>
EU	European Union
GMES	Global Monitoring for Environment and Security
JRC	Joint Research Centre
MODIS	Moderate Resolution Imaging Spectrometer
MOI	Mauritius Oceanography Institute
SMI	Standard Mapped Image
SST	Sea Surface Temperature
SWIO	South West Indian Ocean

## 1.0 Introduction

This monthly bulletin is produced by the MOI under the GMES & Africa project and provides satellite based oceanographic observations of the South West Indian Ocean region. This issue focuses on remote sensing sea surface temperature and chlorophyll-*a* concentration. It is targeted at users from the marine and fisheries realm for monitoring purposes. It is also a source of information for researchers and the scientific community

## 2.0 Highlights

This bulletin has been produced for the period 01 to 16 August 2020 exceptionally due to data unavailability from OceanColor.

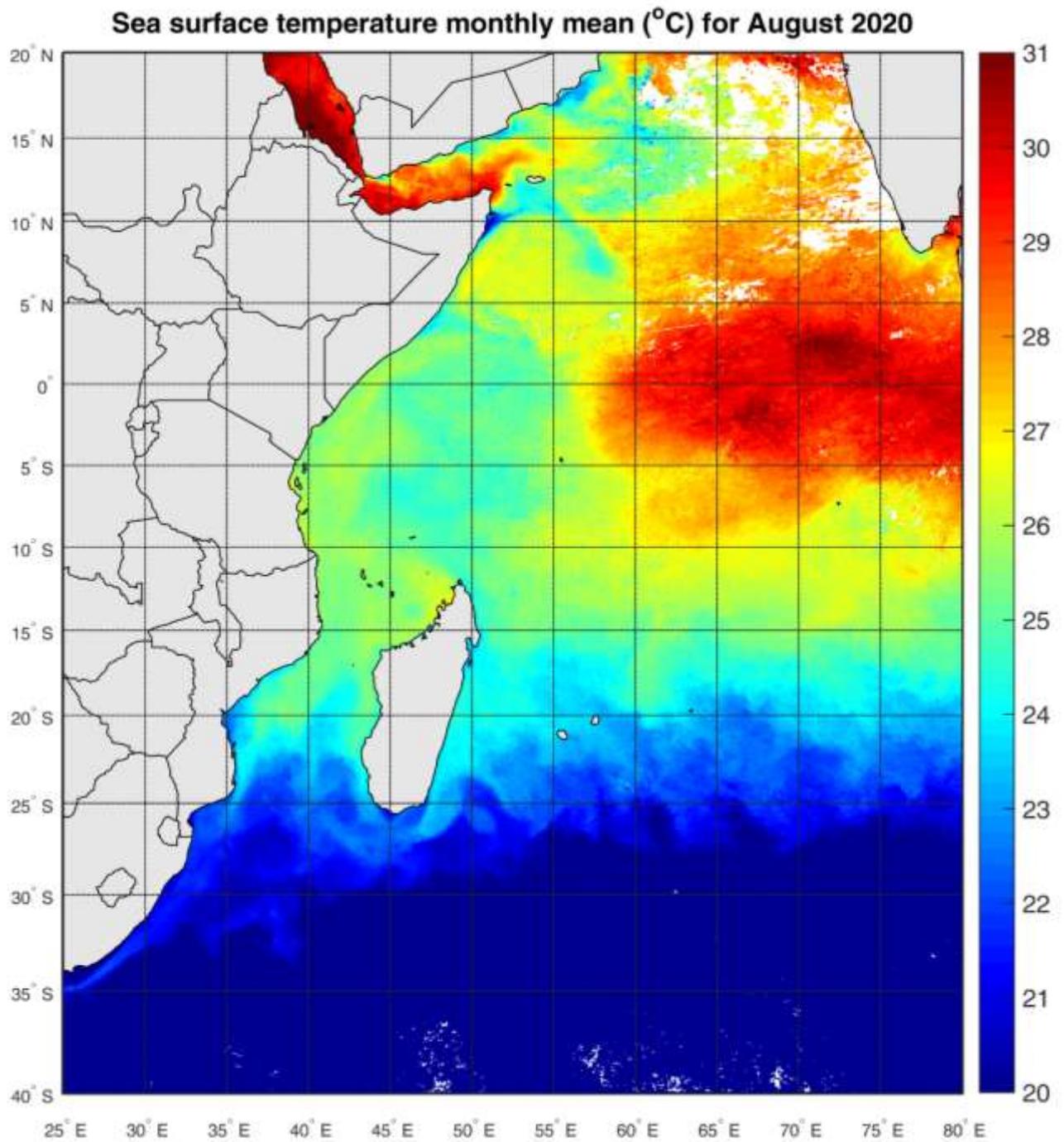
### Sea Surface Temperature

- During the first half of August, sea surface temperature was seen to be higher than usual from latitude 8°S to 15°S and the region north of Chagos Archipelago
- In the Gulf of Aden and the Red Sea, the temperature is slightly lower than the climatology.
- The time series analysis shows that for the month of August 2020, the SST in this region is slightly lower than the monthly climatology.
- The temporal variation of SST for the region west of Madagascar indicates temperature at this region is slightly lower than the climatology.

### Chlorophyll-*a* Concentration

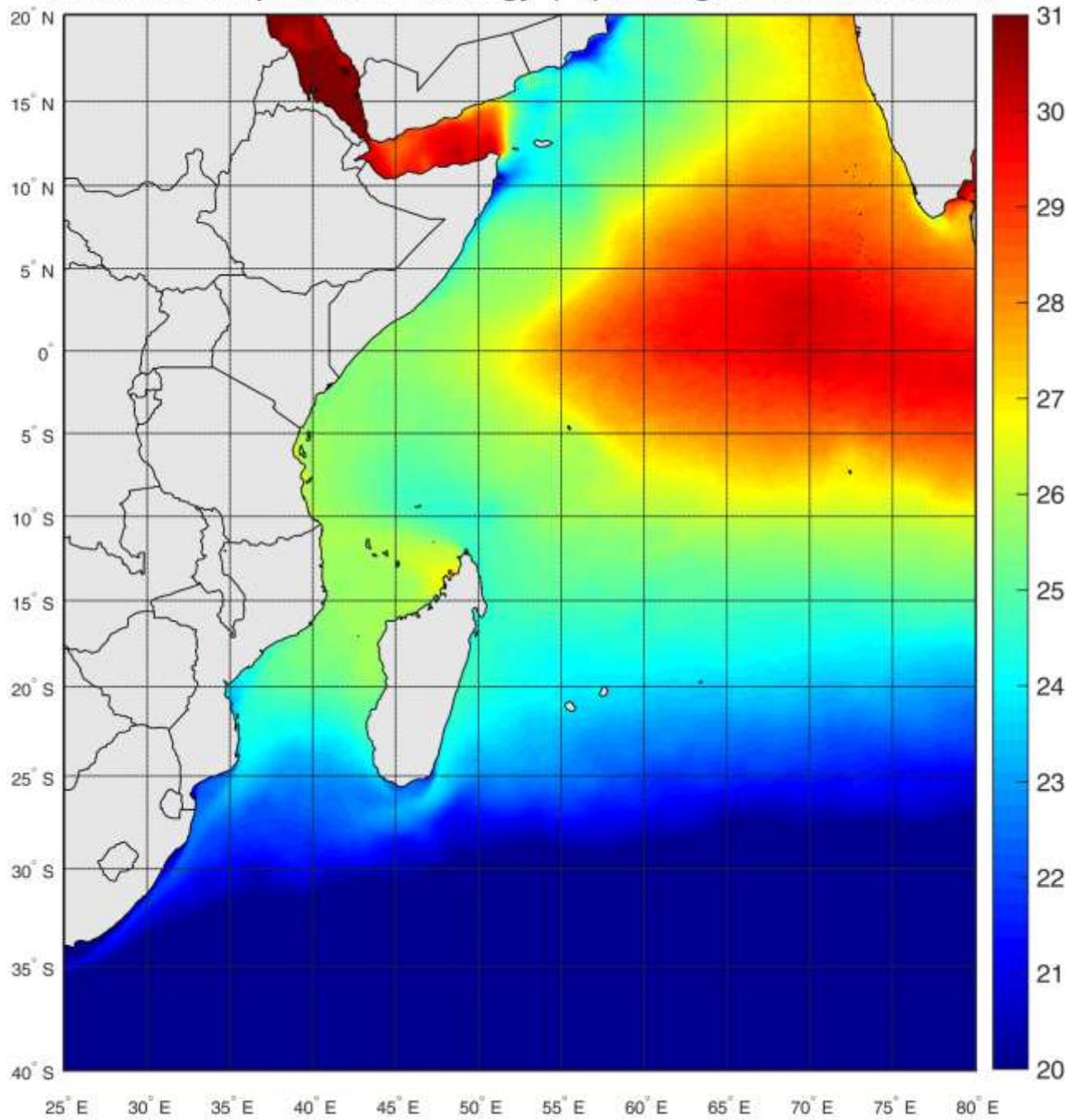
- Higher Chl-*a* concentration were observed in the region south and further north of Madagascar compared to the Mascarene region where Chl-*a* concentration was relatively lower.
- The spatial distribution of Chl-*a* concentrations for the month of August was more or less similar to the monthly mean climatology.
- The monthly time series for the region around Mauritius shows that since January, Chl-*a* in this region has been slightly higher than the monthly climatology, which might have been the result of an upwelling as a result of colder water for this period.

### 3.0 Sea Surface Temperature

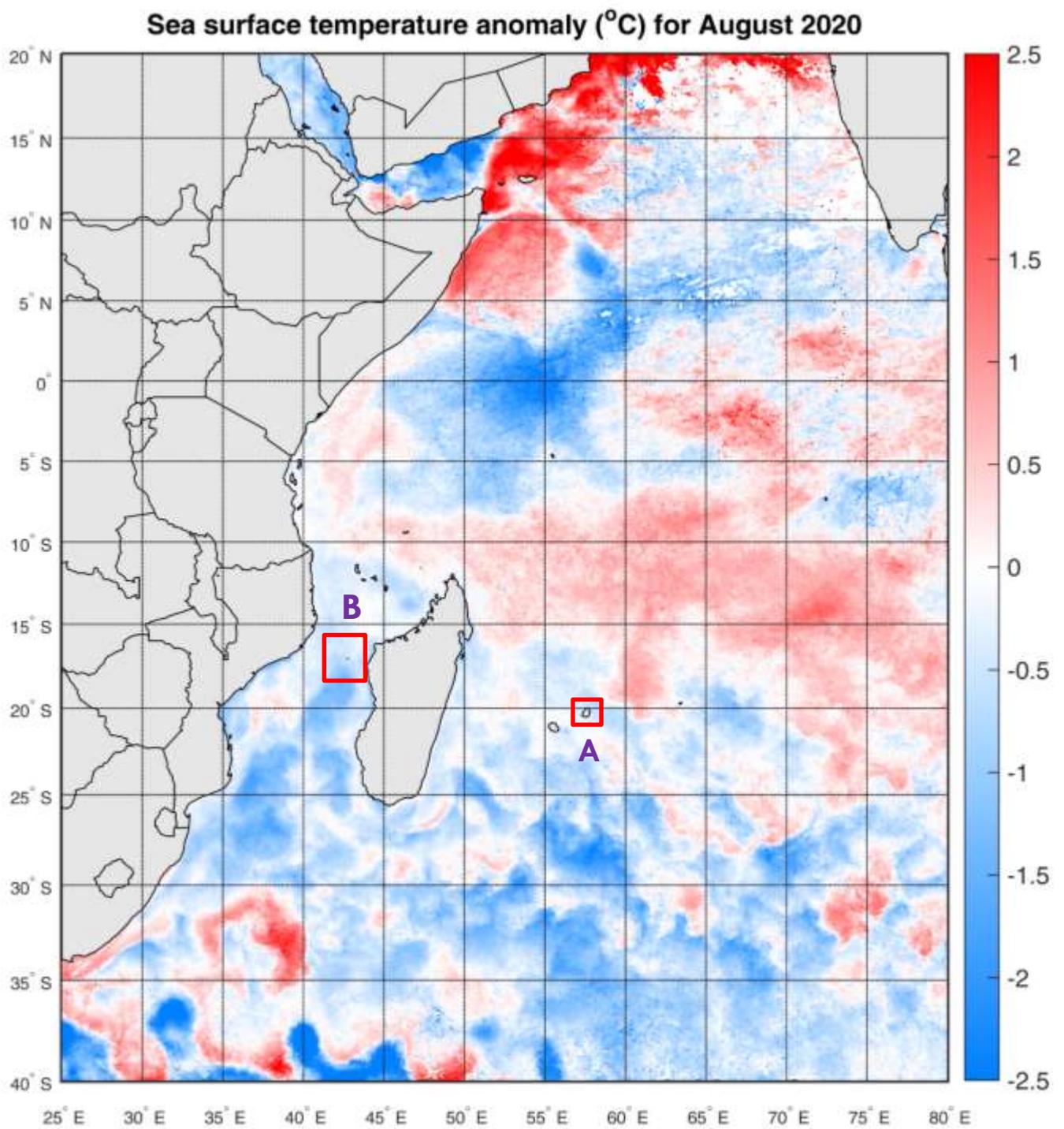


**Figure 1:** Mean sea surface temperature for the period 01 to 16 August 2020 (°C)

### Sea surface temperature climatology ( $^{\circ}\text{C}$ ) for August from 2003 to 2019

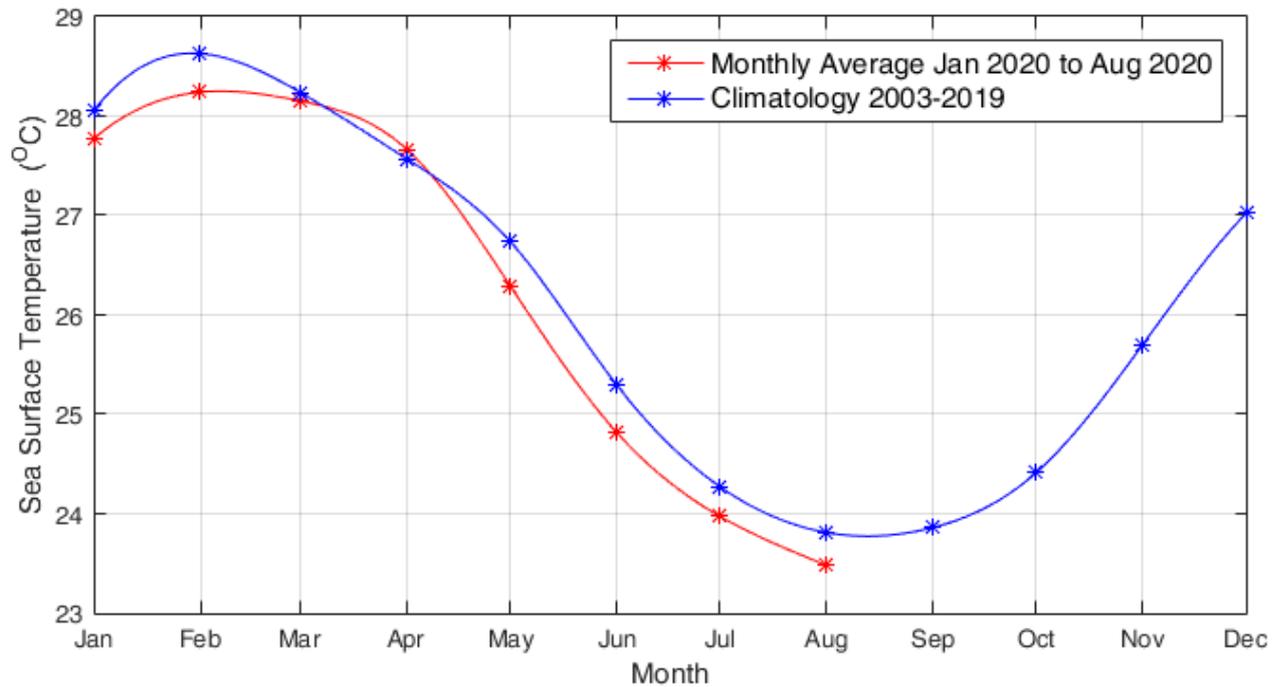


**Figure 2:** Climatology of sea surface temperature for August 2003 to August 2019 ( $^{\circ}\text{C}$ )

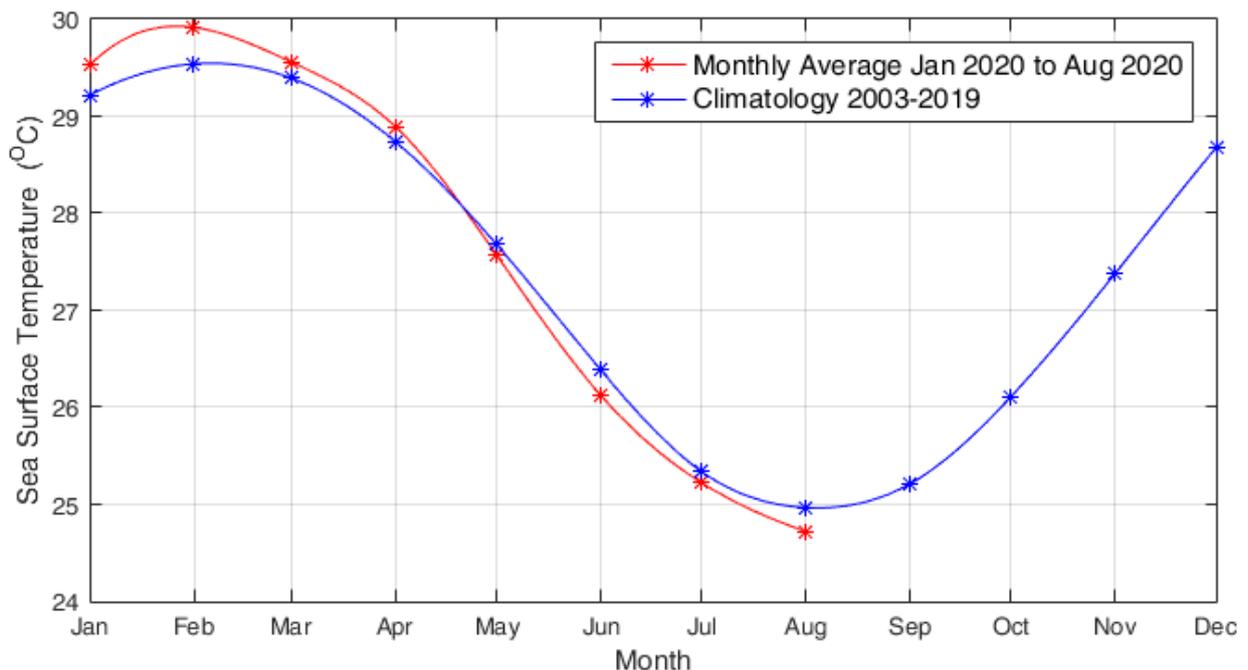


**Figure 3:** Anomaly of sea surface temperature for August 2020 ( $^{\circ}\text{C}$ )

Time series generated from the monthly average for August 2020 and the climatological normal for August in the region highlighted above, namely region A around Mauritius and region B located in the western part of the Madagascar.



**Figure 4:** Temporal variation of sea surface temperature (°C) around Mauritius Island (Region A)



**Figure 5:** Temporal variation of sea surface temperature (°C) for the region West of Madagascar (Region B)

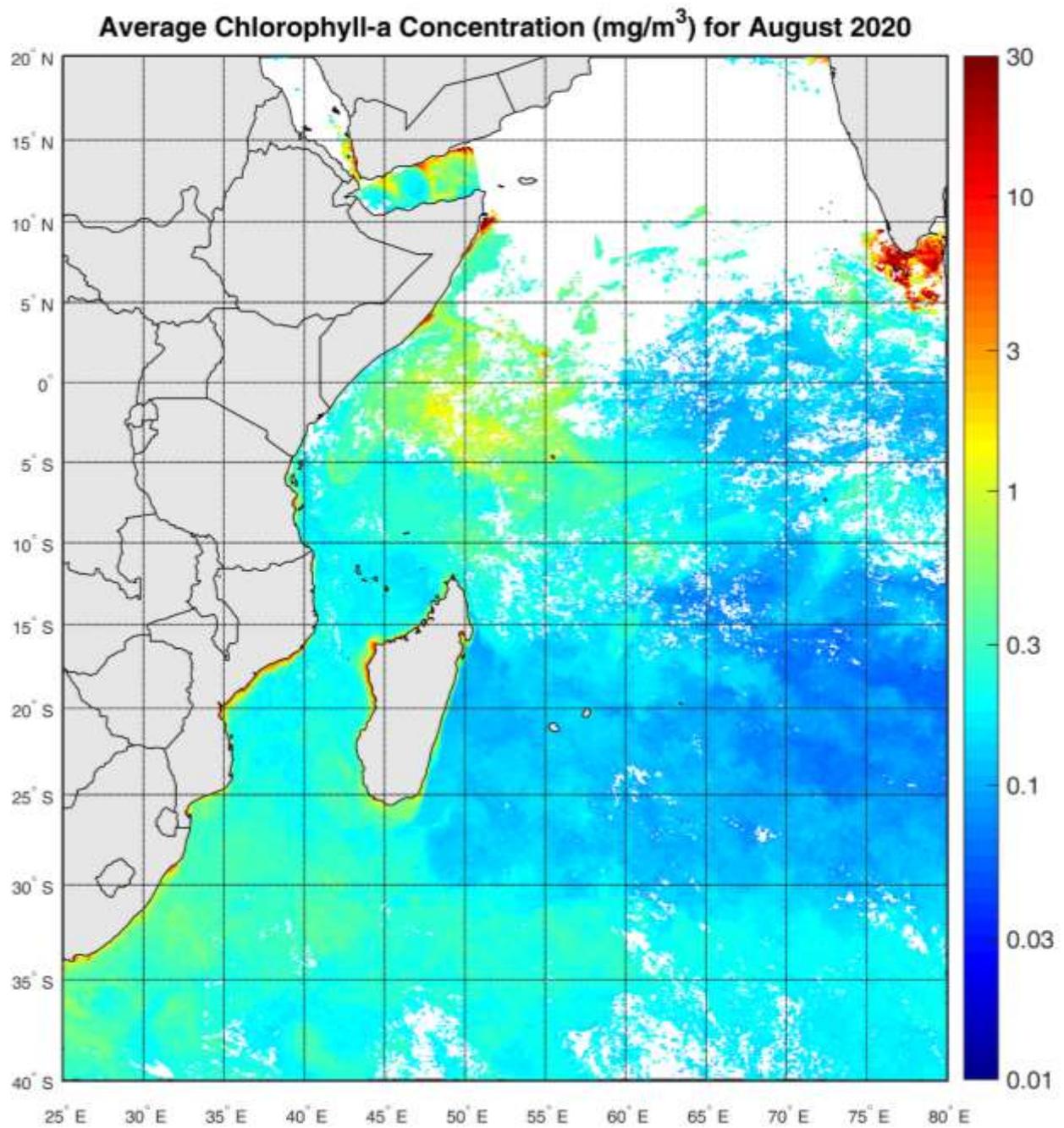
### 3.1 Description of Sea Surface Temperature

Sea surface temperature (SST) is the temperature of the top millimetre of the ocean's surface. Figure 1 displays the SST variation for the month of August 2020. Warmer temperatures are represented in red and yellow, while relatively cooler temperatures are shown in green and blue. SST anomaly is a departure from average conditions. During the month of August (Figure 1), it was observed that the sea surface temperature was warm to much warmer above latitude  $5^{\circ}$  S and longitude  $65^{\circ}$  E while relatively colder below and further west towards the coast of Africa. Figure 3 shows temperature anomaly for August 2020 compared to the long-term average temperature (climatology) of that month from 2003 to 2019 (Figure 2). From the SST anomaly map, the blue colour represents temperatures that were cooler than average, the white colour shows near-average temperatures, while the red colour shows temperatures that were warmer than average.

From observation, the SST was seen to be higher than usual from latitude  $8^{\circ}$ S to  $15^{\circ}$ S and the region north of Chagos Archipelago. Meanwhile in the Gulf of Aden and the Red Sea, the temperature is slightly lower than the climatology.

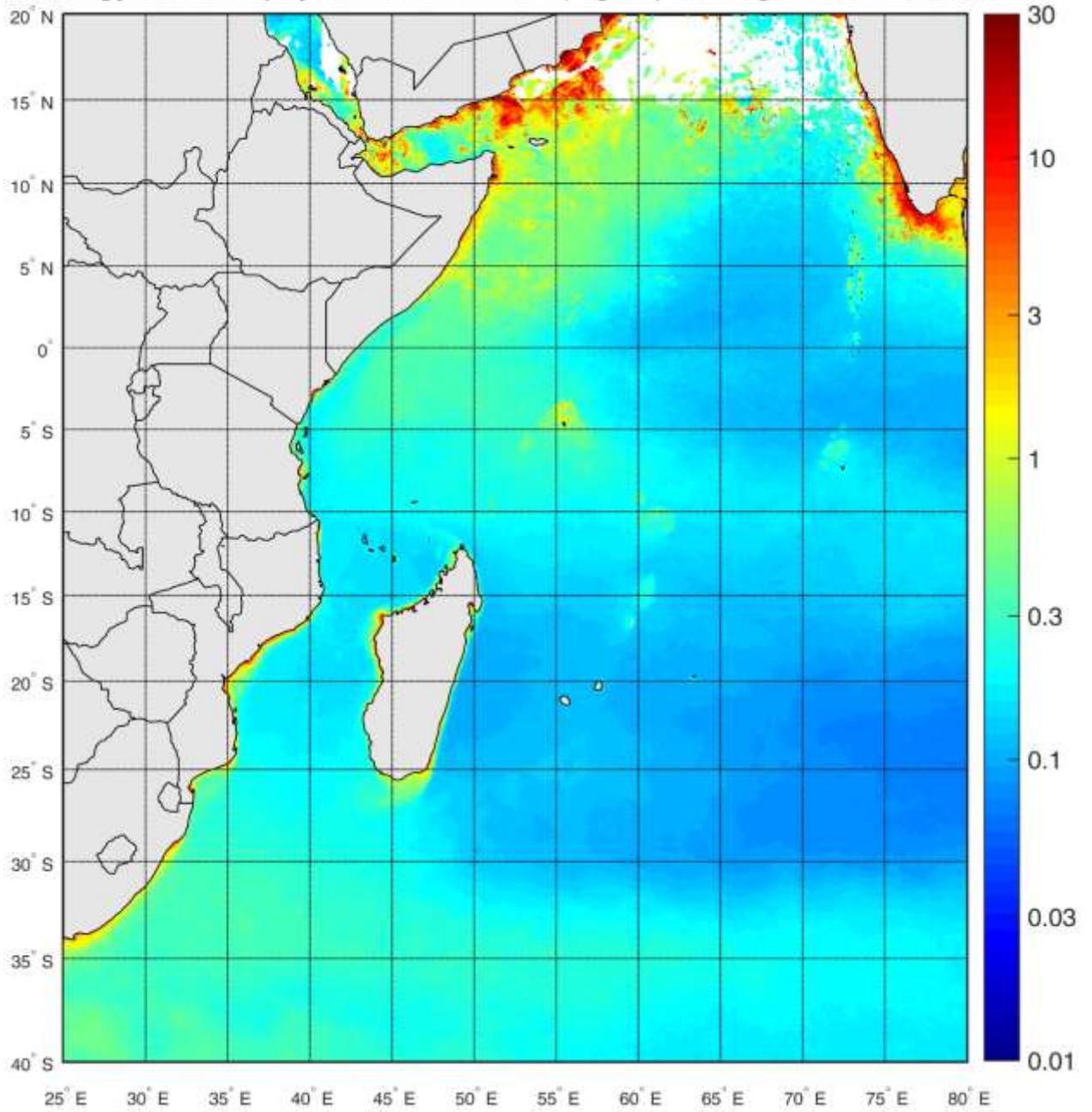
A time series analysis has been carried out for the region around Mauritius as shown in Figure 4 (Region A on Figure 3). The graph shows that for the month of August 2020, the SST in this region is slightly lower than the monthly climatology. Figure 5 shows the temporal variation of sea surface temperature for the region west of Madagascar, between latitude  $15^{\circ}$ N and  $20^{\circ}$ S and longitude  $40^{\circ}$ E to  $45^{\circ}$ E (Region B on Figure 3). From the graph, it can be observed that as from May 2020, temperature at this region is slightly lower than the climatology.

## 4.0 Chlorophyll-a Concentration

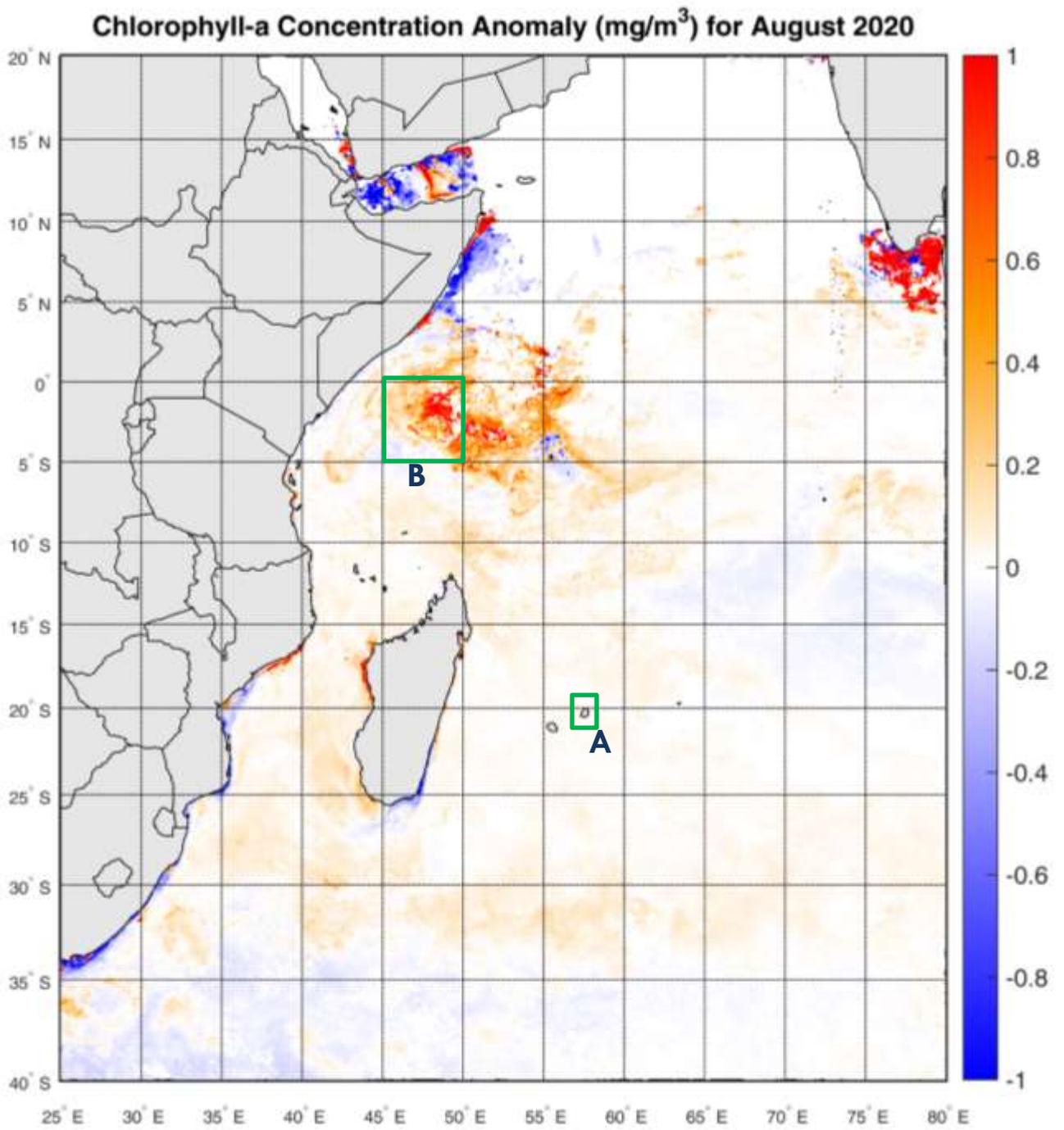


**Figure 6:** Mean chlorophyll-*a* concentration for the period 01 to 16 August 2020 ( $\text{mg}/\text{m}^3$ )

### Climatology of Chlorophyll-a Concentration ( $\text{mg/m}^3$ ) for August from 2003 to 2019

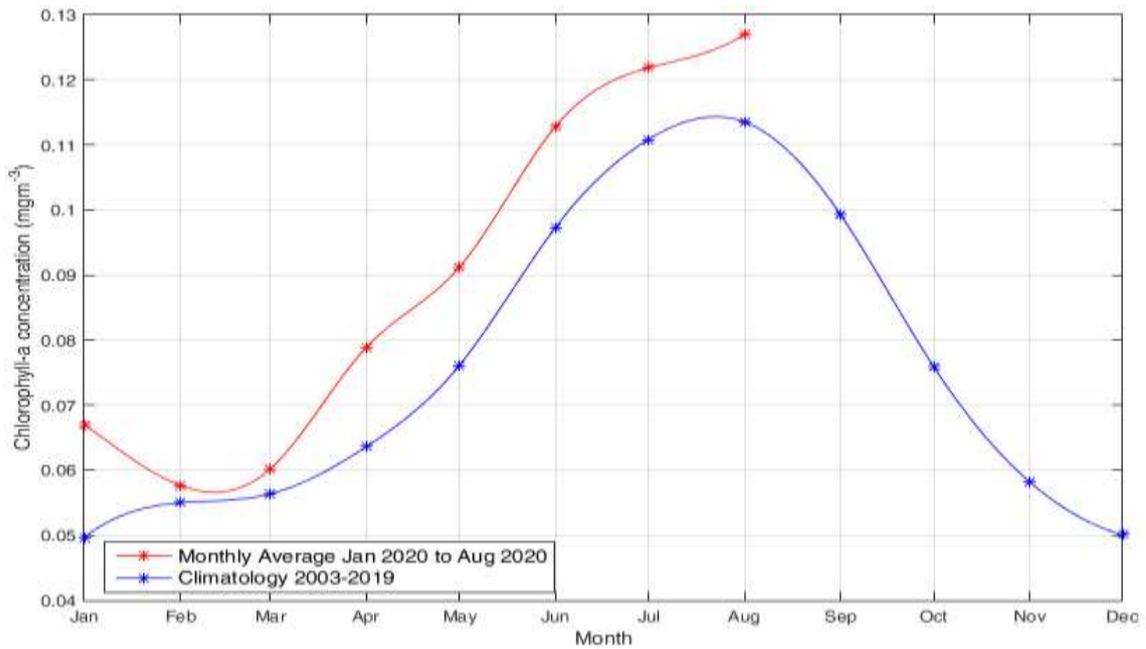


**Figure 7:** Climatology of chlorophyll-*a* for August 2003 to August 2019 ( $\text{mg/m}^3$ )

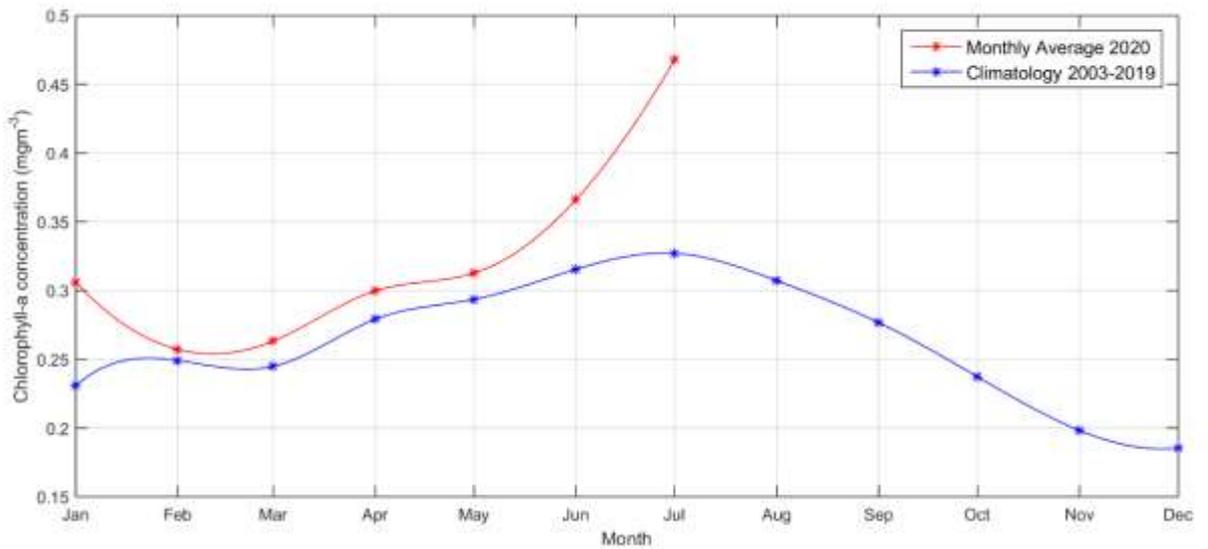


**Figure 8:** Anomaly of chlorophyll-*a* for August 2020 (mg/m<sup>3</sup>)

Time series generated from the monthly average for August 2020 and the climatological normal for August in the region encircle above namely region A around Mauritius and region B located in the east of Kenya.



**Figure 9:** Temporal variation of chlorophyll-*a* (mg/m<sup>3</sup>) around Mauritius Island



**Figure 10:** Temporal variation of chlorophyll-*a* (mg/m<sup>3</sup>) for the region bordering the western coast of Madagascar

## 4.1 Description of chlorophyll-*a*

Figure 6 shows chlorophyll-*a* concentration in milligrams of chlorophyll-*a* (Chl-*a*) per cubic metre of seawater for the month of August 2020. Regions where Chl-*a* concentration were very low, indicating very low numbers of phytoplankton, are blue; and those where chlorophyll-*a* concentrations were high are shown in red. Land is light grey, and places where there is no data is represented in white.

Higher Chl-*a* concentration were observed in the region south and further north of Madagascar compared to the Mascarene region where Chl-*a* concentration was relatively lower. The spatial distribution of Chl-*a* concentrations for the month of August was more or less similar to the monthly mean climatology.

High Chl-*a* indicates high primary production, an essential condition for fish aggregation and fish catch while positive Chl-*a* anomaly shows higher concentration of Chl-*a* than the average observed for the same period

Figure 9 shows a monthly time series for the region around Mauritius (region A on Figure 8). The graph shows that since January, Chl-*a* in this region has been slightly higher than the monthly climatology.

Figure 10 shows the temporal variation of Chl-*a* for the region bordering the eastern coast of Kenya (region B on Figure 8). The graph shows that since June, a higher concentration of Chl-*a* than the monthly climatology was observed, with a difference of more than 0.25 mg/m<sup>3</sup> from the mean in August.

## Acknowledgements

This bulletin was compiled within the framework of the GMES & Africa project. Data used for the processing was obtained from OceanColor. Mauritius Oceanography Institute (MOI) acknowledges the contribution of the Joint Research Centre (JRC) team as well as any other people who collaborated in the issue of this bulletin.

## Disclaimer

The Mauritius Oceanography Institute assumes no legal liability or responsibility for how this information is used. This bulletin has been produced with the financial assistance of the European Union (EU) through the African Union Commission (AUC). The contents of this bulletin can under no circumstances be regarded as reflecting the position of the EU and the AUC.



### Description of Environmental Indicators

*Sea Surface Temperature (SST)* reflects the storage of thermal energy in the upper mixed layer of the oceans. Sea surface temperature anomalies have practical applications to fisheries and coastal waters management, including coral reef monitoring and prediction of red tides or other harmful algal blooms.

*SST Anomaly* means a departure from a reference value or long-term average. A positive anomaly indicates that the observed temperature was warmer than the reference value, while a negative anomaly indicates that the observed temperature was cooler than the reference value.

*Chlorophyll-a (Chl-a)* is the light-harvesting pigment found in marine microscopic photosynthetic plants, known as phytoplankton. Its concentration is widely used as an index of phytoplankton biomass and is also used as a proxy for primary production. Chlorophyll-a absorbs most visible light but reflects some green and near-infrared light. By measuring what kind of light is absorbed and reflected, satellites can measure chlorophyll-a concentrations in the ocean, thus providing valuable insights on the health of the ocean.

*Chl-a Anomaly* is a variation from the mean chlorophyll-a concentration.

### Datasets

Level 3 SST and Chl-a Standard Mapped Image (SMI) dataset was used from the Moderate Resolution Imaging Spectrometer (MODIS) data, with a spatial resolution of 4 km. The Level 3 SMI products are image representations of binned data products obtained from OceanColor.

### Indicator Calculation

Monthly SST anomaly images were created using the processed monthly satellite data and the monthly climatology data. The monthly anomalies were calculated relative to the respective monthly mean. The SST climatology was obtained from MODIS data (2003-2019). The nominal pixel resolution is 4 km. The SST anomalies were calculated from the difference of the monthly composite with its respective monthly climatology based on the interval from 2003 to 2019.

Similarly, the Chl-a anomalies were calculated from the monthly average and the monthly climatology based on the interval from 2003 to 2019.