



**GMES
AND AFRICA**



MONTHLY OCEANOGRAPHY BULLETIN

South West Indian Ocean
October 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

Sea Surface Temperature

- For the month of October, an increase in temperature was observed in the Mascareigne region suggesting the imminent arrival of the summer season.
- The sea surface temperature was warm to much warmer above latitude 20° S and still relatively colder below.
- The time series analysis for the region around Mauritius shows that for the month of October 2020, the SST average for the month was above that of the monthly climatology that was being observed since mid-April.
- The temporal variation of SST for the region around Seychelles Island confirms the positive anomaly observed in the region occurring since the last year.

Chlorophyll-a Concentration

- High Chl-a level was observed in the region north of Madagascar and below latitude 30° S.
- Relatively lower Chl-a concentration was detected between latitude 12-30° S.
- The spatial distribution of Chl-a concentrations for the month of October was higher than the monthly mean climatology between latitude 8-12° S.
- The monthly time series for Chl-a for the region around Mauritius shows a lower Chl-a concentration than the climatology unlike previous months.

3.0 Sea Surface Temperature

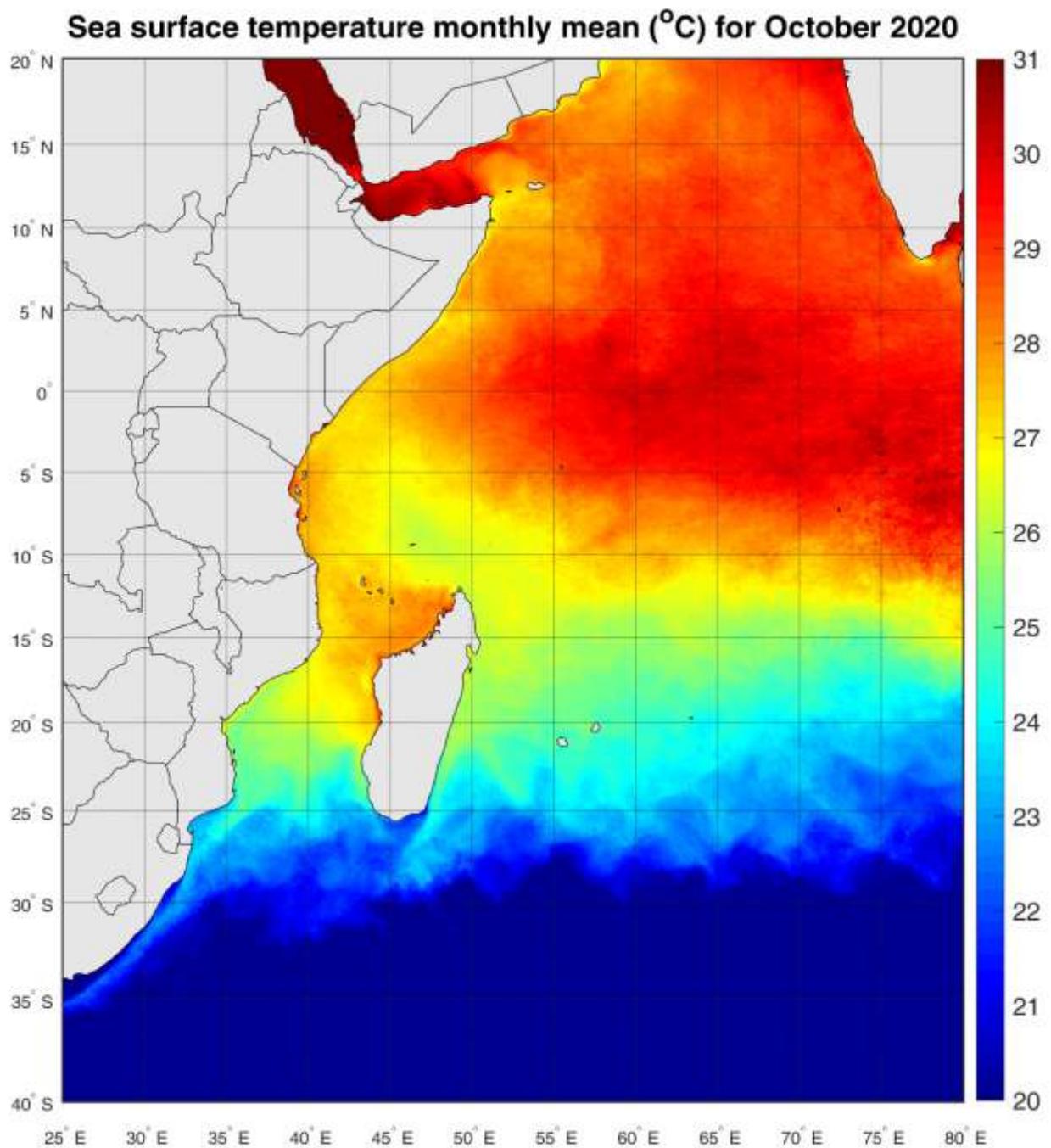


Figure 1: Mean sea surface temperature for the month of October 2020 ($^{\circ}\text{C}$)

Sea surface temperature climatology (°C) for October from 2003 to 2019

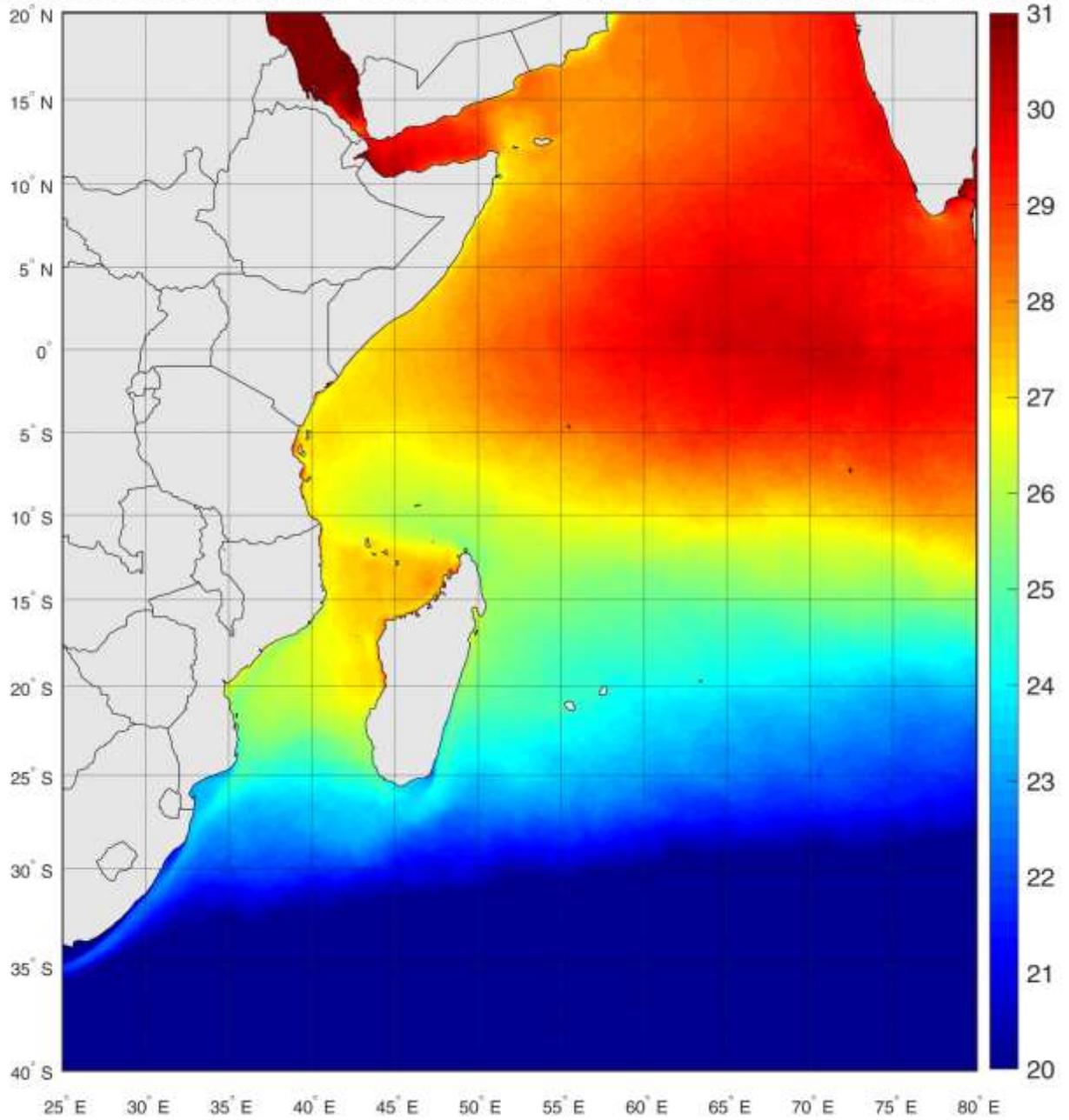


Figure 2: Sea Surface Temperature Climatology (°C) for the month of October (2003 -2019)

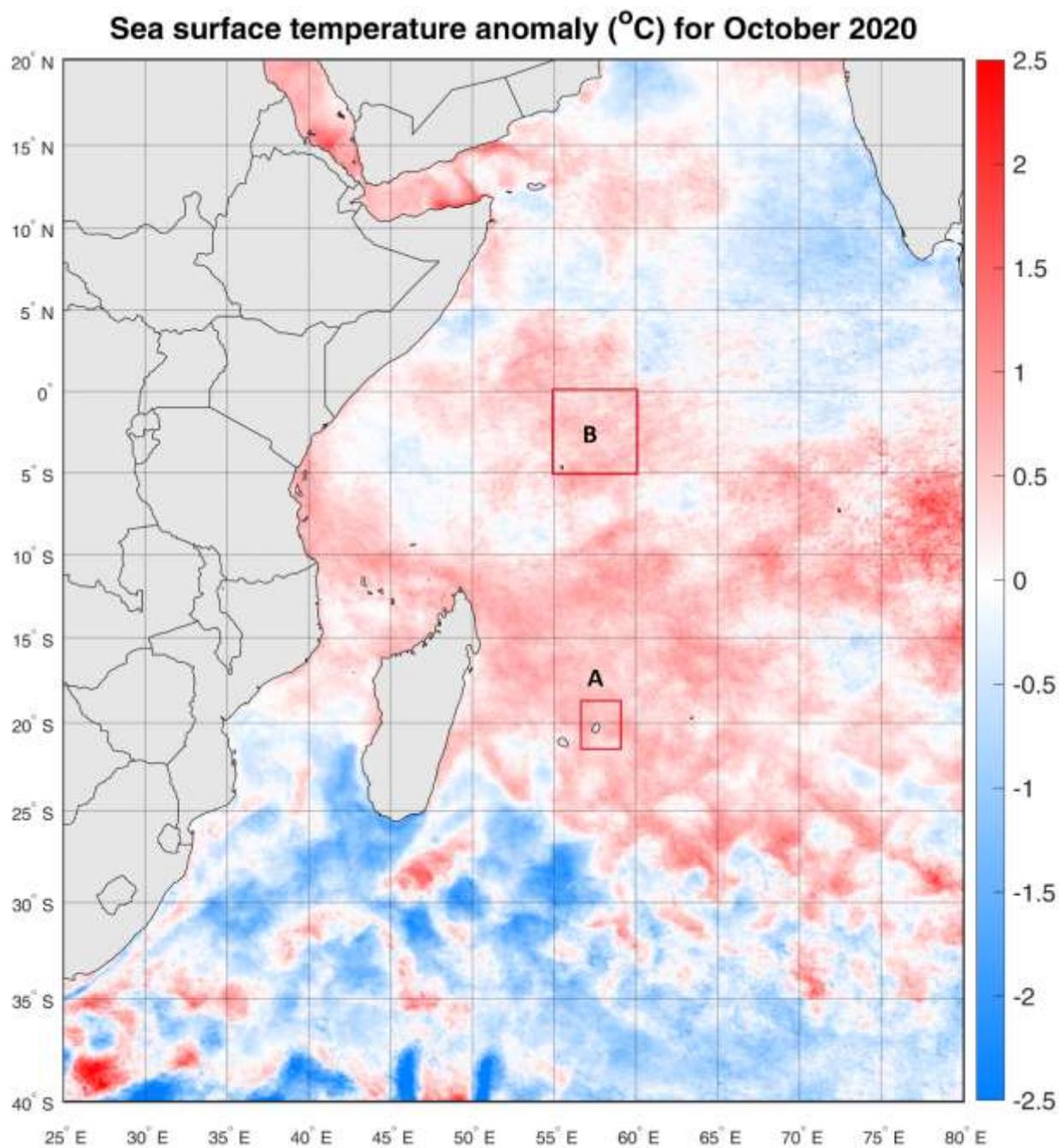


Figure 3: Anomaly of Sea Surface Temperature for October 2020 ($^{\circ}\text{C}$)

Time series generated from the monthly average for October 2020 and the climatological mean for October 2020 in the region highlighted in Figure 3, namely region A around Mauritius and region B around Seychelles Island.

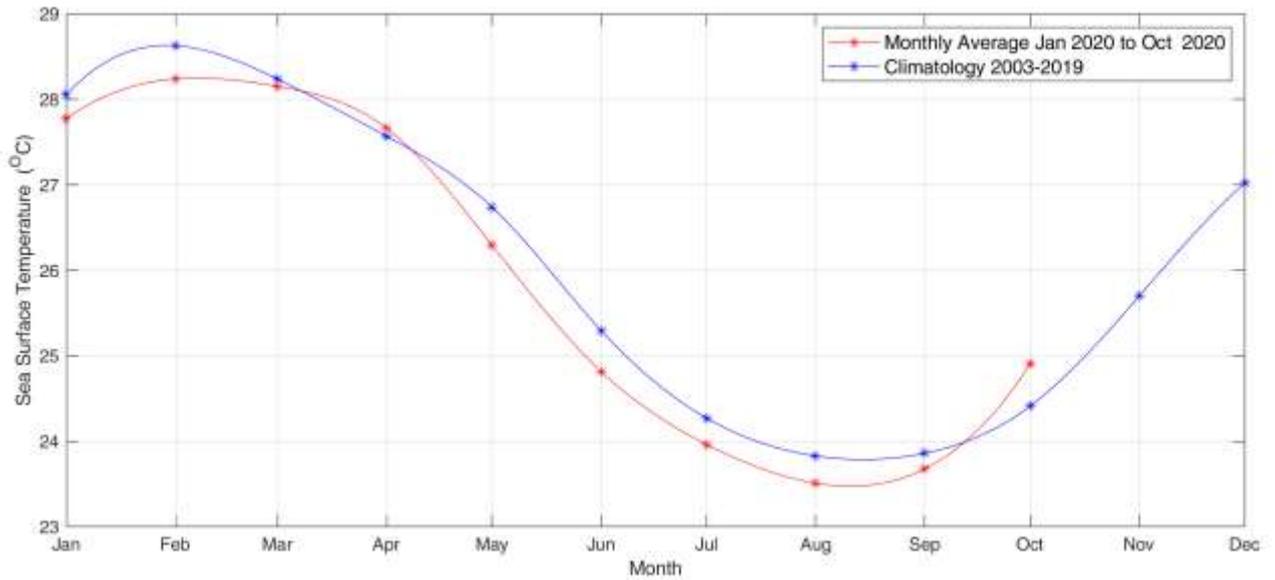


Figure 4: Temporal variation of sea surface temperature (°C) around Mauritius Island (Region A)

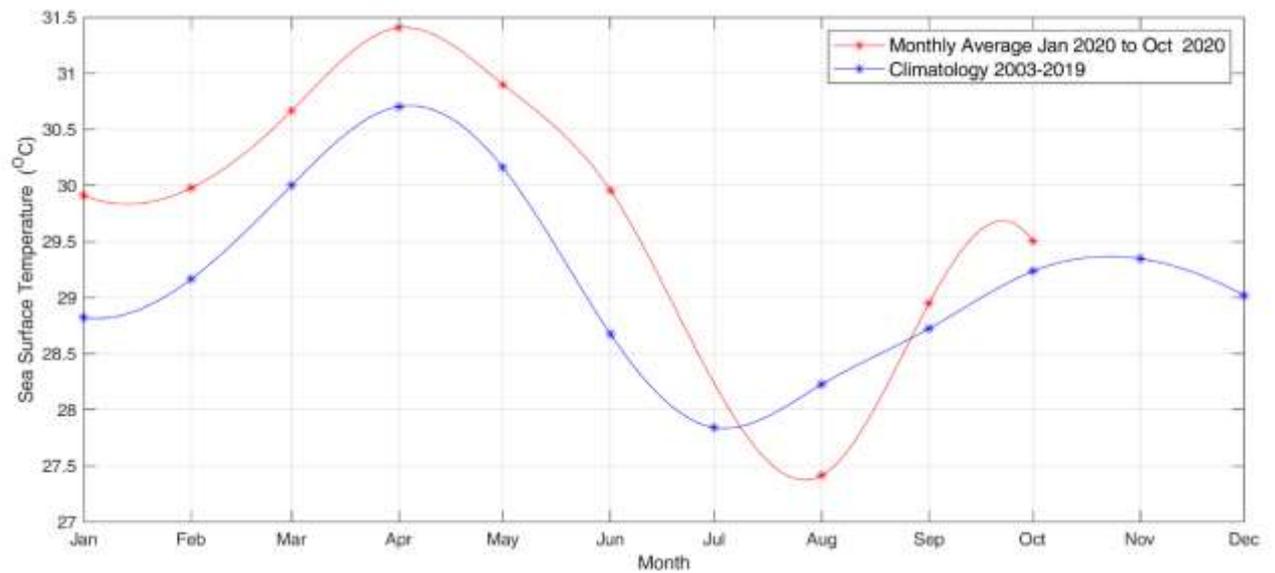


Figure 5: Temporal variation of sea surface temperature (°C) for the region around Seychelles (Region B)

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 October 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. For the month of October, it was observed that there is a rise in SST in the Mascareigne region suggesting the imminent arrival of the summer season. The SST was warm to much warmer above latitude 20° S and still relatively colder below. Figure 2 represents the climatology for the month of October based on average calculated from 2003 to 2019. Figure 3 shows temperature anomaly for the period covered in this bulletin. The blue colour on the map 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, it was seen that there was a positive SST anomaly between latitude 0 to 20° S while there was a negative anomaly in the region south of Madagascar.

The time series analysis for the region around Mauritius (Figure 4) depicted by Region A on Figure 3, shows that for the month of October 2020, the monthly SST average was above that of the climatological mean for the first time since April 2020. Figure 5 shows the temporal variation of SST for the region around Seychelles Island, between latitude 0 -5° S and longitude 55 - 60° E (Region B on Figure 3). The graph confirms the positive anomaly observed in the region occurring since the last year.

4.0 Chlorophyll-a Concentration

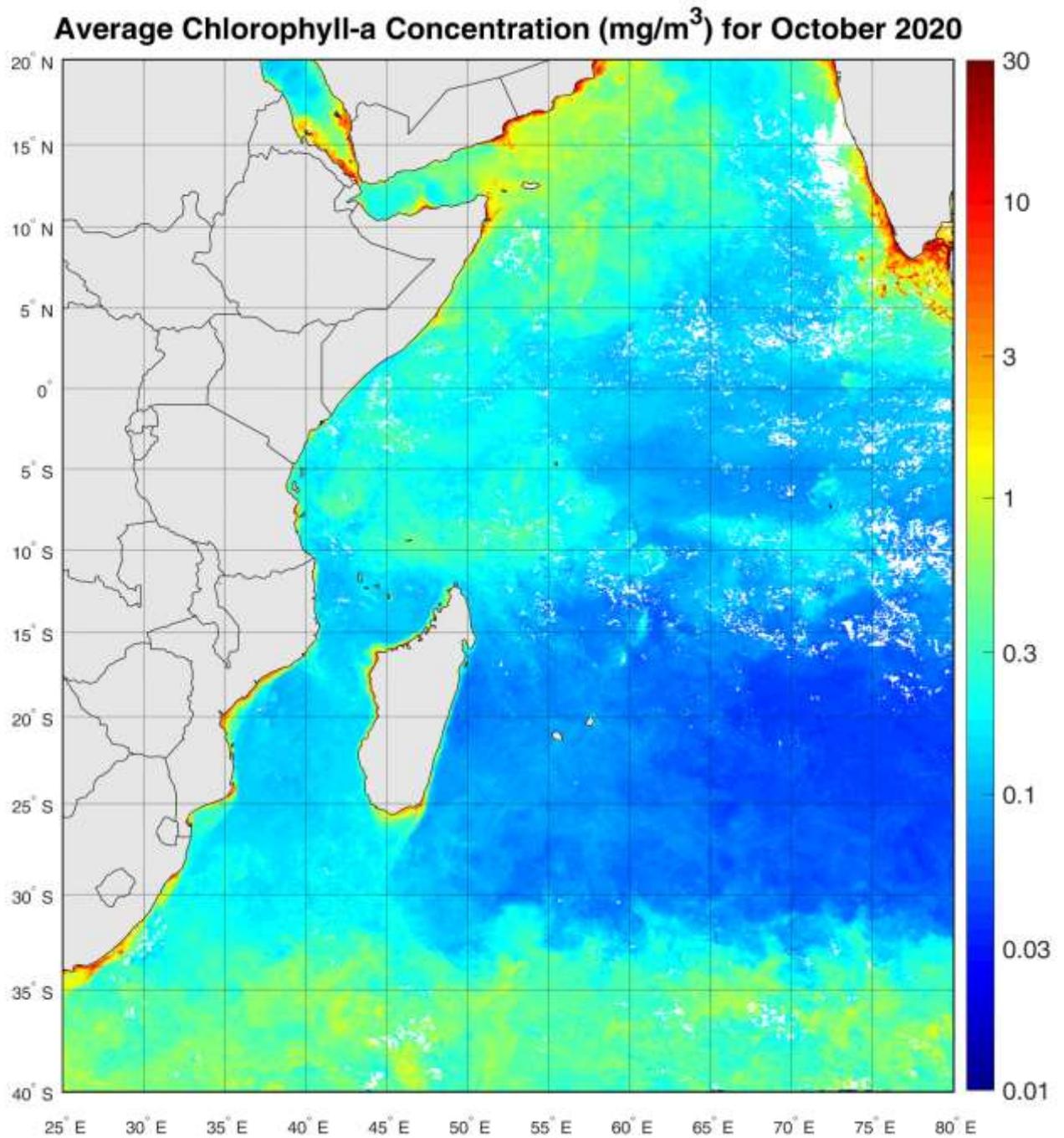


Figure 6: Mean chlorophyll-*a* concentration for the month of October 2020 (mg/m^3)

Climatology of Chlorophyll-a Concentration (mg/m^3) for October from 2003 to 2019

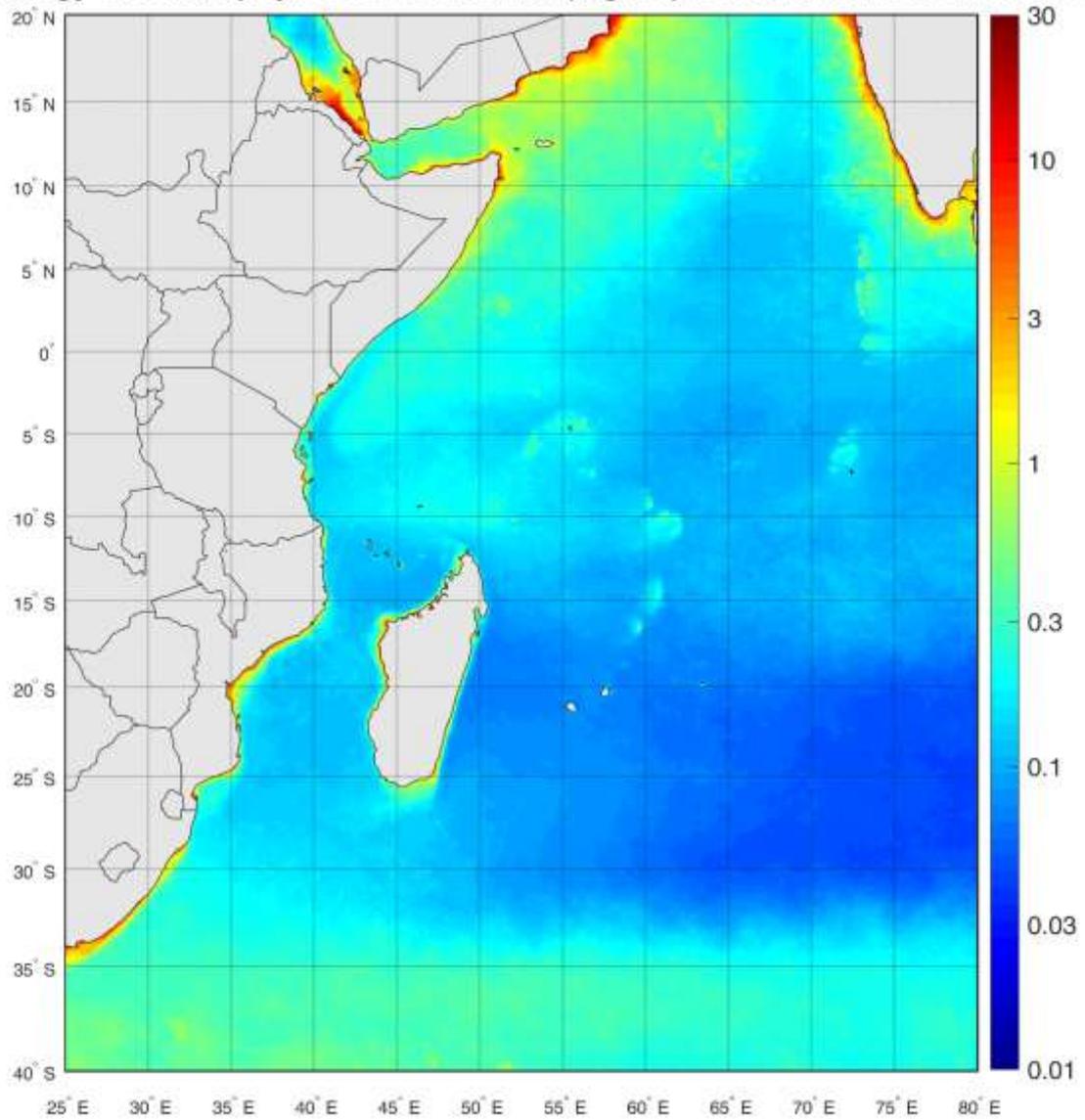


Figure 7: Chlorophyll-*a* Climatology (mg/m^3) for the month of October (2003 -2019)

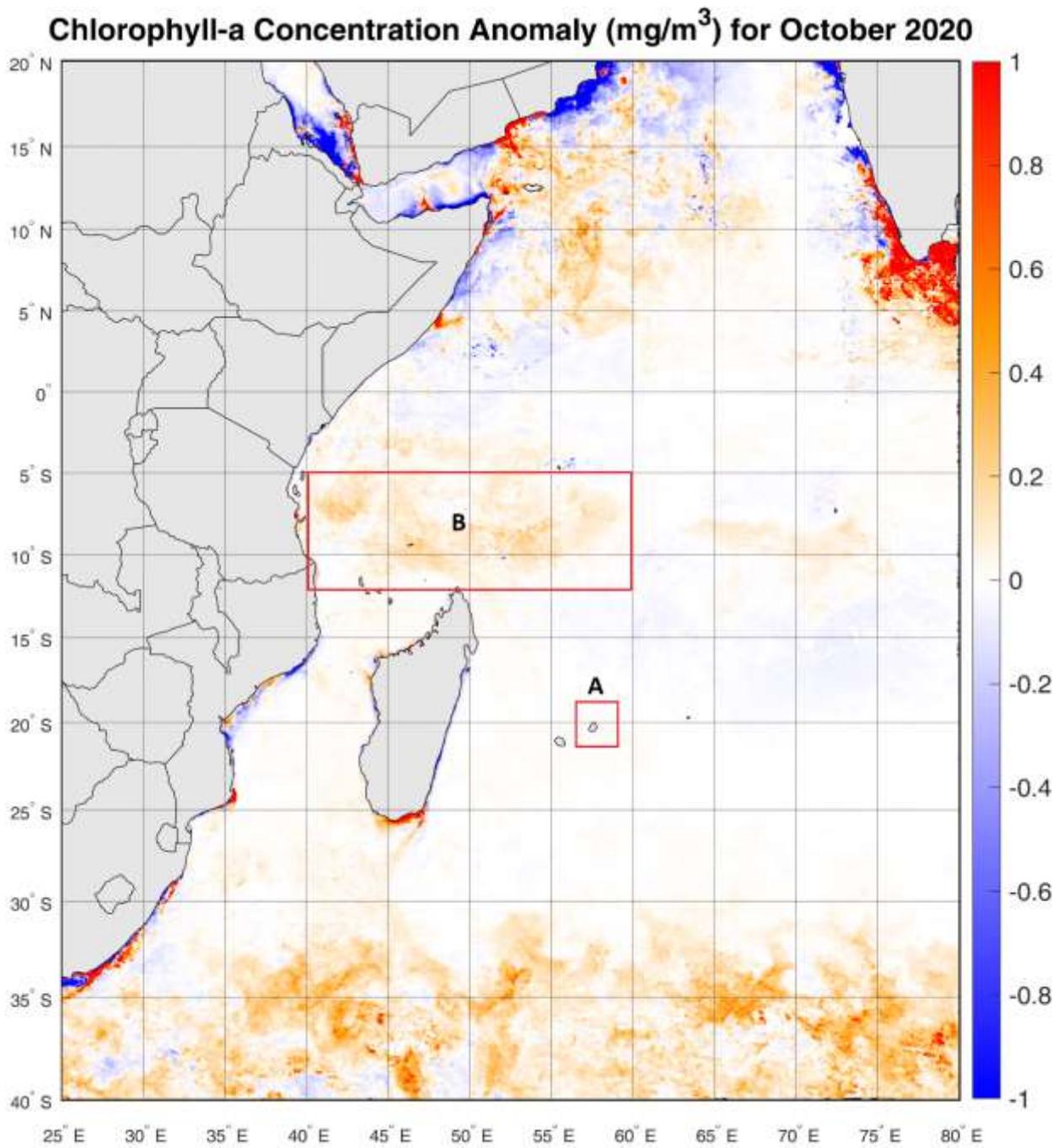


Figure 8: Anomaly of chlorophyll-*a* for October 2020 (mg/m^3)

Chlorophyll-a time series generated from the monthly average for October 2020 and the climatological normal for October in the region encircle in Figure 8, namely region A around Mauritius and region B located in the north of Madagascar.

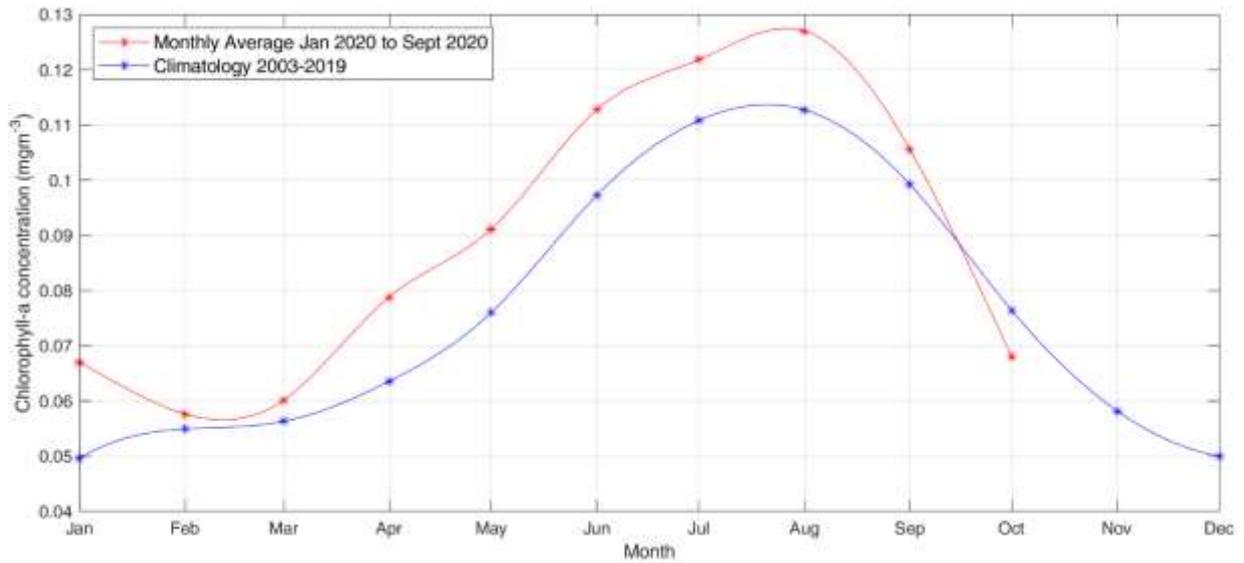


Figure 9: Temporal variation of chlorophyll-a (mg/m^3) around Mauritius Island (Region A)

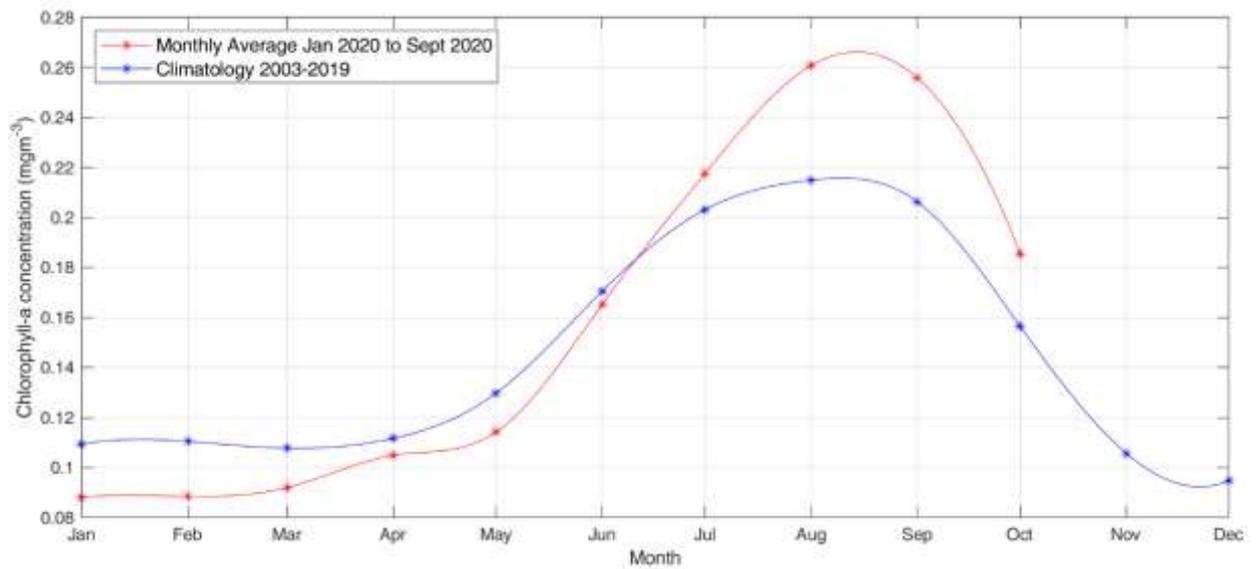


Figure 10: Temporal variation of chlorophyll-a (mg/m^3) for the region north of Madagascar (Region B)

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 October 2020. The 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 (cloud cover) is represented in white.

A high Chl-*a* concentration indicates high primary production which is 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.

High Chl-*a* level was observed in the region north of Madagascar and below latitude 30° S. Relatively lower Chl-*a* concentration was detected between latitude 12-30° S. The spatial distribution of Chl-*a* concentrations for the month of October 2020 was higher than the monthly mean climatology between latitude 8-12° S.

Figure 9 shows the monthly time series for the region around Mauritius (region A on Figure 8). Unlike previous months, a lower Chl-*a* concentration than the climatology was observed for this region.

Figure 10 shows the temporal variation of Chl-*a* for the region north of Madagascar (region B on Figure 8). The graph shows that the peak observed in mid-August 2020 (0.265 mg/m³) has decreased to approximately 0.185 mg/m³. For the month of October 2020, Chl-*a* concentration was still above the climatological mean.

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Disclaimer

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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. *Chl-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 (<https://oceandata.sci.gsfc.nasa.gov/>).

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.