



**GMES
AND AFRICA**



MONTHLY OCEANOGRAPHY BULLETIN

South West Indian Ocean

May 2021



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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

- High temperature was observed in the southern hemisphere above latitude 20° S during the month of May 2021.
- The average SST dropped by 2-3 °C as compared to the previous month.
- The observed SST for the period of May 2021 is similar to the climatological mean in the region of interest.
- For the month of May 2021, no general deviation was observed from the SST climatology.
- A positive SST was observed around Aldabra atoll (Seychelles) in the north of Madagascar.

Chlorophyll-a Concentration

- A relatively higher Chl-a concentration was observed across the region, being more prominent in localised coastal regions such as off the coast of Somalia.
- Compared to other regions, the Chlorophyll-a concentration in the Mascarene region remained relatively low.
- There was a relatively higher Chl-a concentration off the northern coast of Somalia as compared to the previous month.

3.0 Sea Surface Temperature

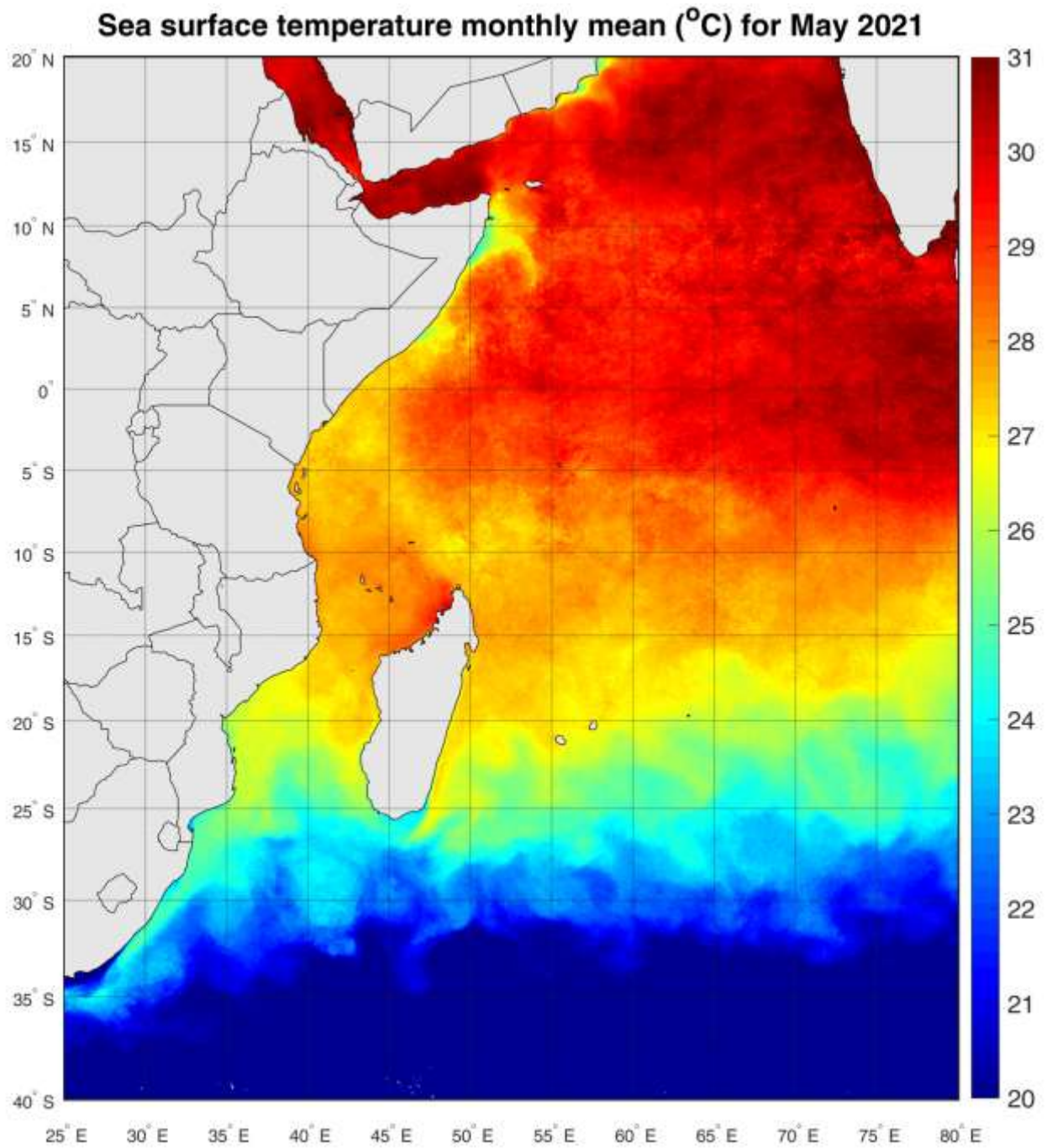


Figure 1: Mean sea surface temperature for the month of May 2021 (°C)

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

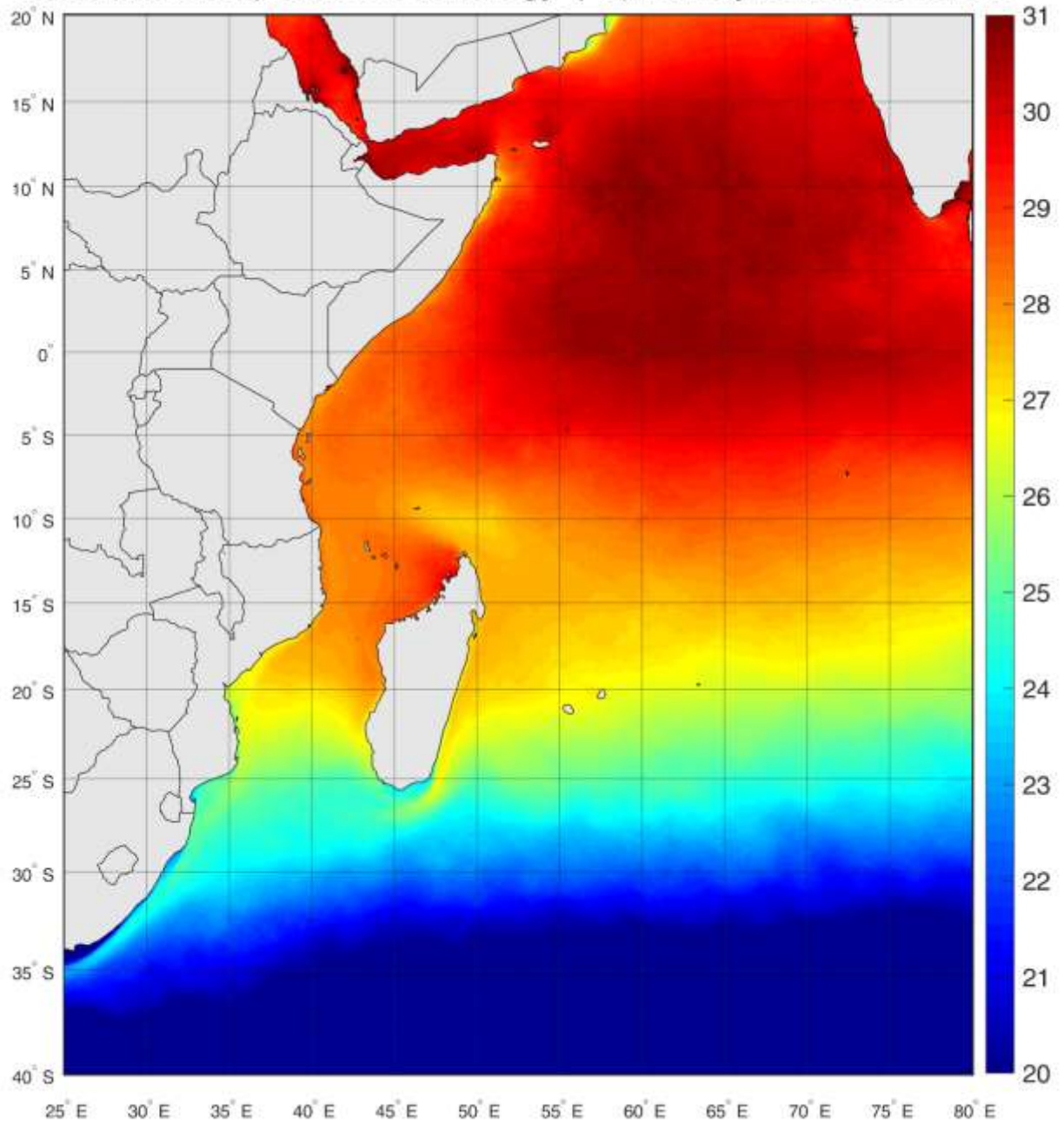


Figure 2: Sea Surface Temperature Climatology (°C) for the month of May (2003 -2019)

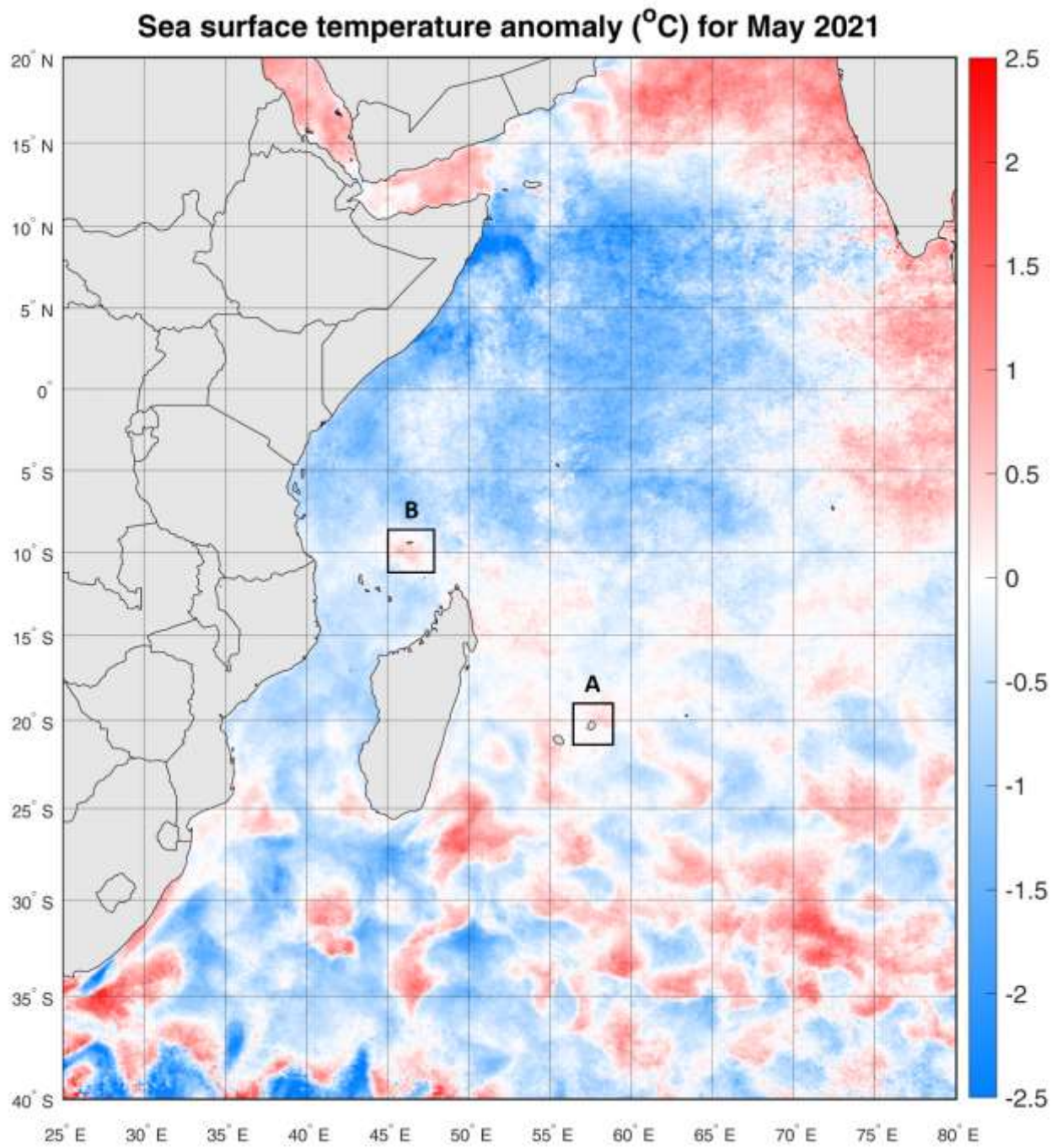


Figure 3: Anomaly of Sea Surface Temperature for May 2021 (°C)

Time series generated from the monthly average for May 2021 and the climatological mean for May 2021 in the region highlighted in Figure 3, namely Region A around Mauritius Island and Region B, around Aldabra atoll (Seychelles) in the north of Madagascar.

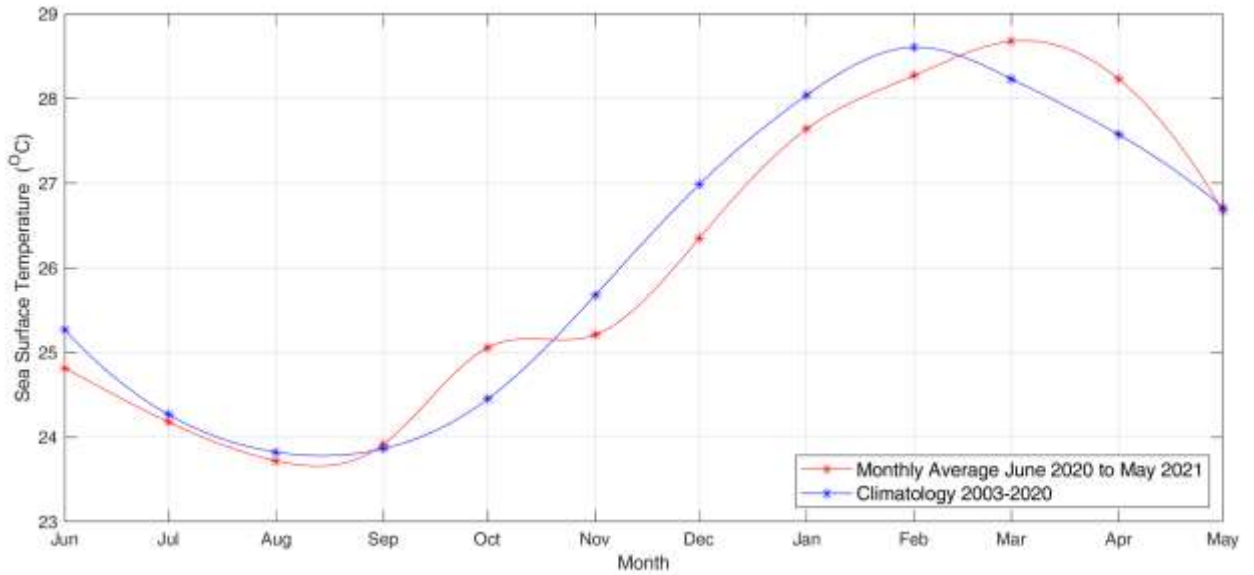


Figure 4: Temporal variation of sea surface temperature (°C) around Mauritius Island (Region A)

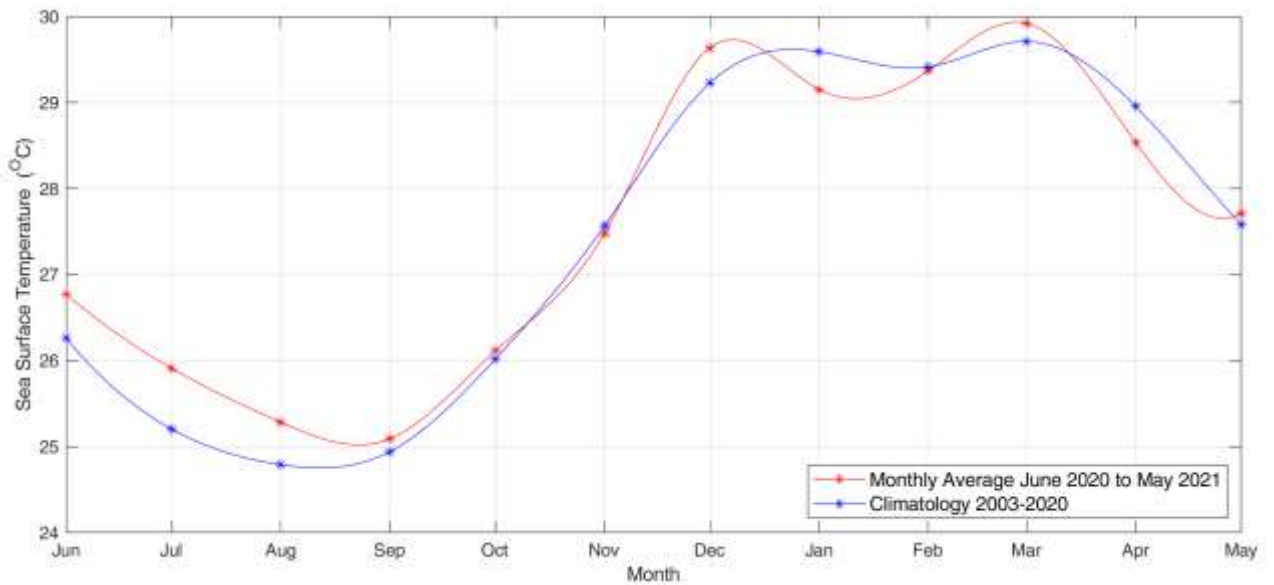


Figure 5: Temporal variation of sea surface temperature (°C) around Aldabra atoll (Region B)

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 May 2021. 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.

Similar to April 2021, a higher temperature was observed in the southern hemisphere above latitude 20° S during the month of May 2021. However, the average SST in the Mascarene region dropped by 2-3 °C to around 25 - 27 °C as compared to the recorded temperature of 28 - 29 °C in the previous month. Figure 2 represents the climatology for the month of May based on the average SST calculated from 2003 to 2019. The observed SST for the period of May 2021 is similar to the climatological mean in the region of interest, as shown in Figures 1 and 2.

Figure 3 shows a temperature anomaly for the period covered in this bulletin. The blue colour on the map represents temperatures that were cooler than the average, the white colour shows near-average temperatures, while the red colour shows temperatures that were warmer than the average. The image shows that the sea surface temperature fluctuated around zero in the Mascarene region but was relatively colder in the Mozambique Channel. The time series analysis for the region around Mauritius (Figure 4, depicted by 'Region A' in Figure 3) confirms this observation.

Figure 5 shows the temporal variation of SST around Aldabra atoll (Seychelles) in the north of Madagascar, between latitude 8 °S to 12 °S and longitude 45 °E to 48 °E (Region B in Figure 3). The graph confirms the slightly positive anomaly observed around the Aldabra atoll. The graph also shows that for the Aldabra region, the average temperature follows the same trend as the climatological mean with minor deviations since last year.

4.0 Chlorophyll-a Concentration

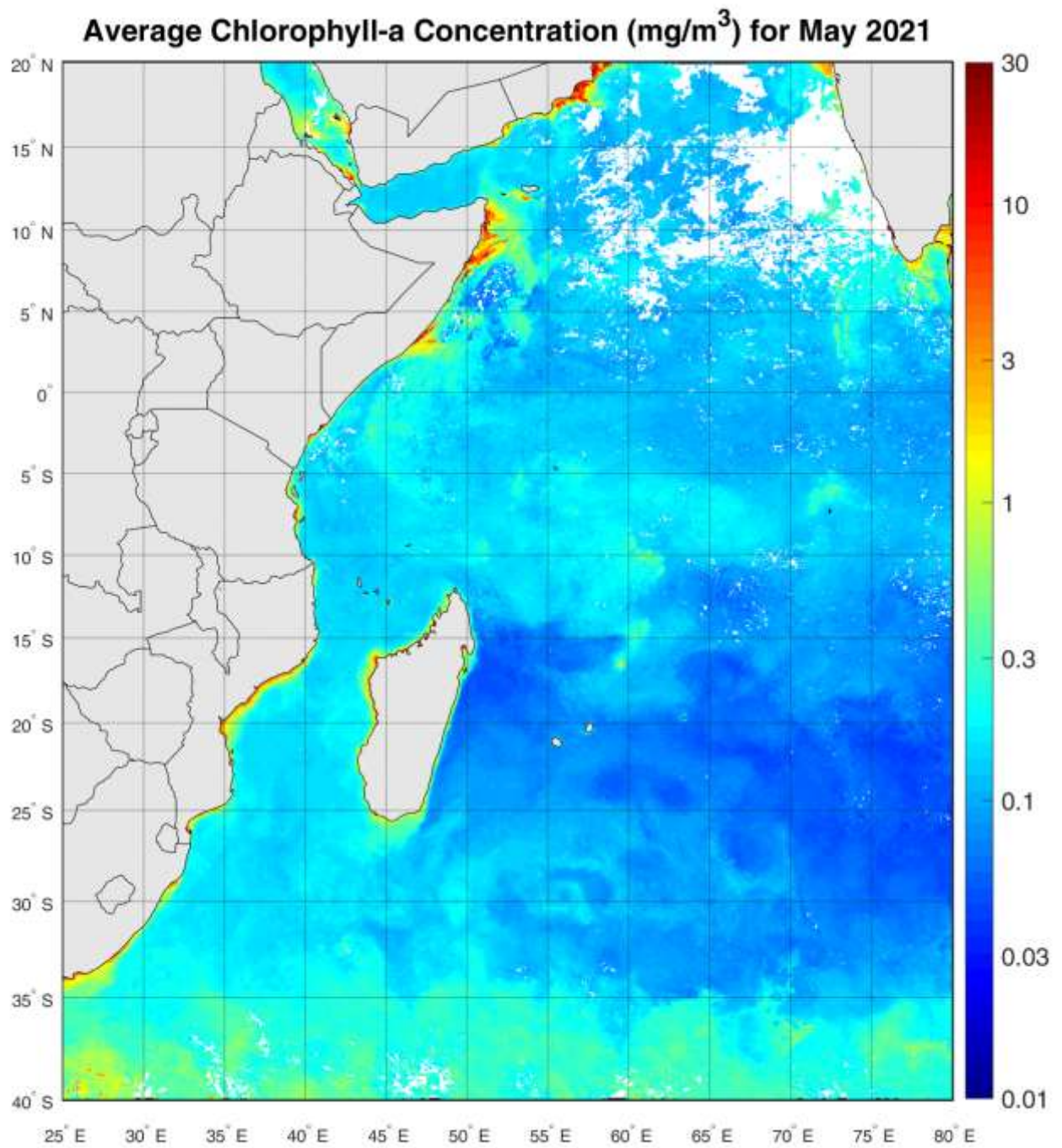


Figure 6: Mean chlorophyll-*a* concentration for the month of May 2021 (mg/m^3)

Climatology of Chlorophyll-a Concentration (mg/m³) for May from 2003 to 2019

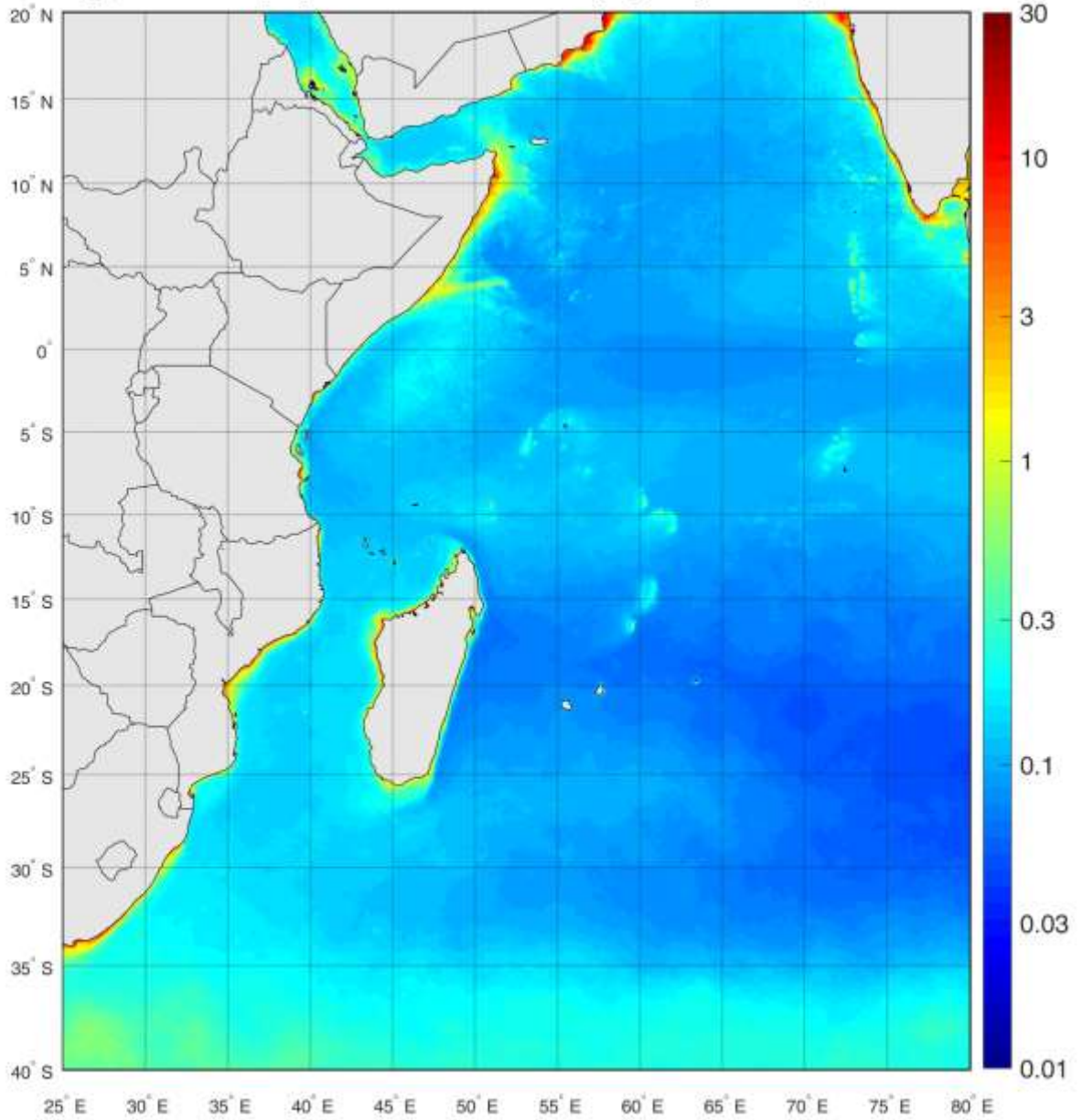


Figure 7: Chlorophyll-a Climatology (mg/m³) for the month of May (2003 -2019)

Chlorophyll-*a* Concentration Anomaly (mg/m^3) for May 2021

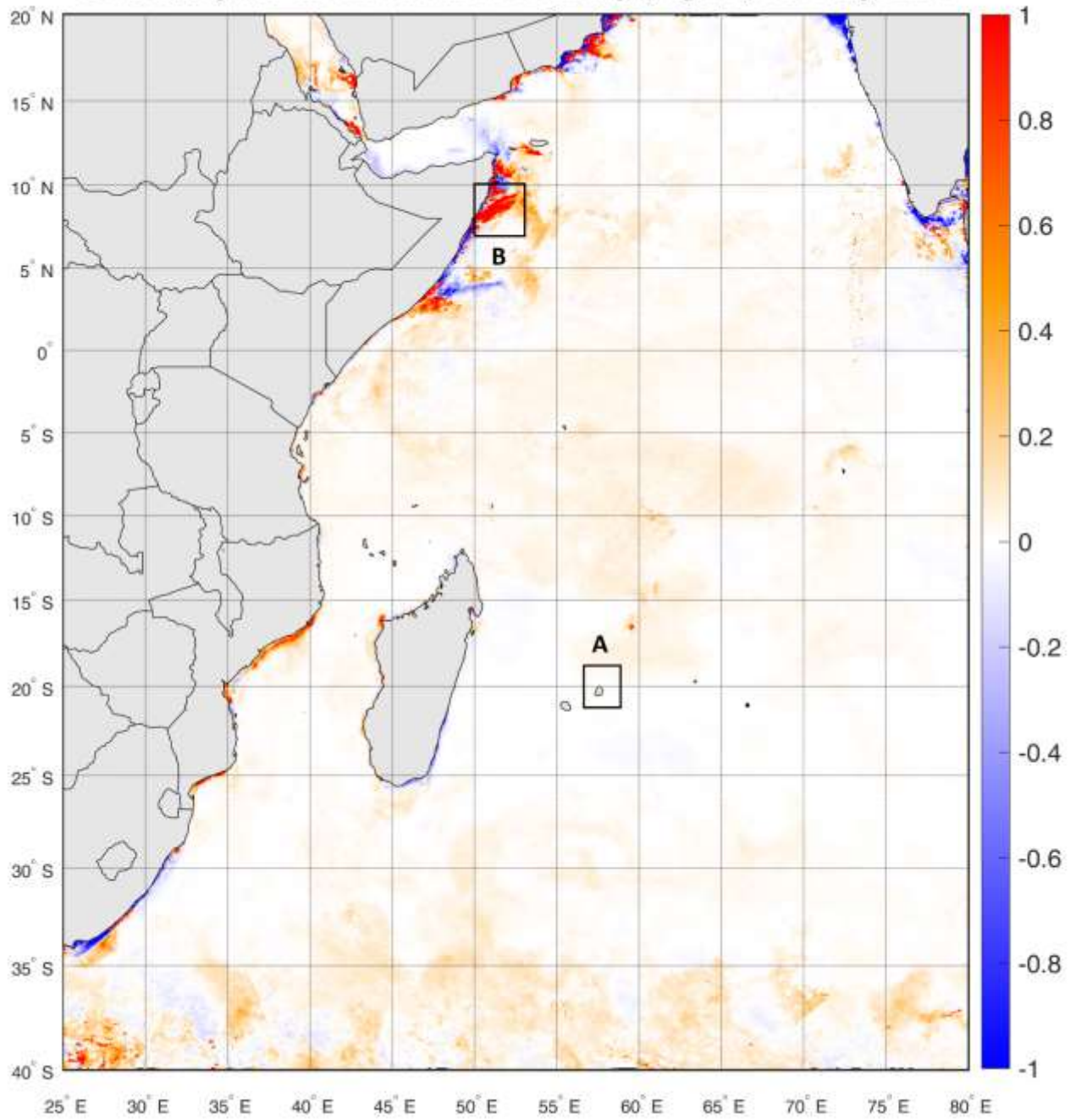


Figure 8: Anomaly of chlorophyll-*a* for May 2021 (mg/m^3)

Chlorophyll-a time series generated from the monthly average for May 2021 and the climatological normal for May 2021 in the regions encircle in Figure 8, namely region A around Mauritius and region B, off Somalia.

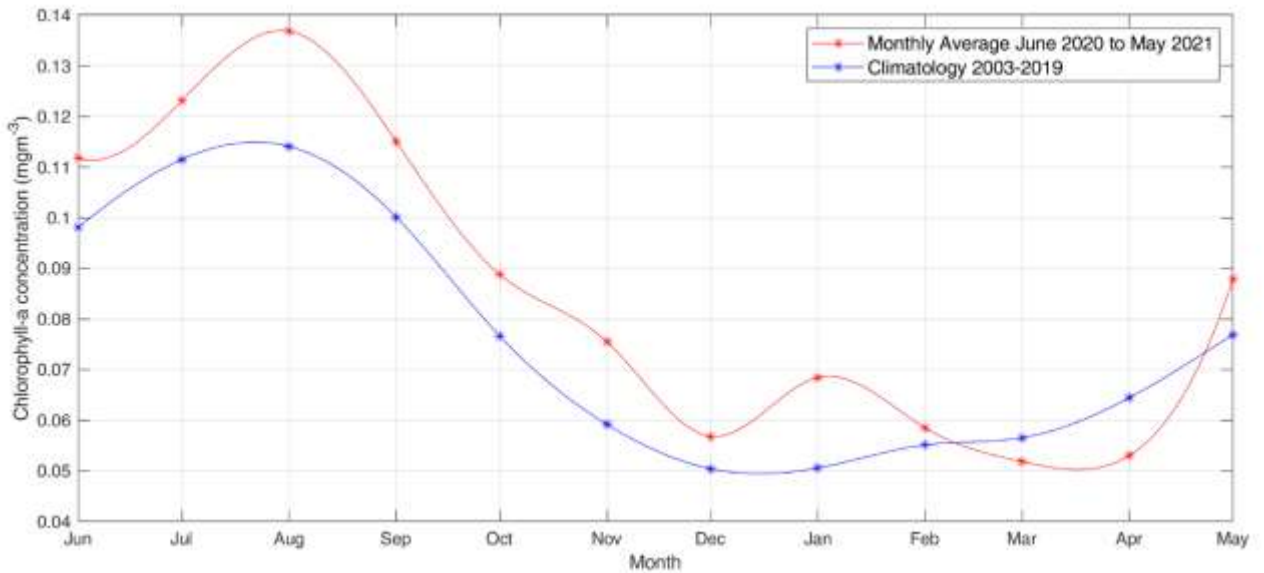


Figure 9: Temporal variation of chlorophyll-a (mg/m^3) around Mauritius Island (Region A)

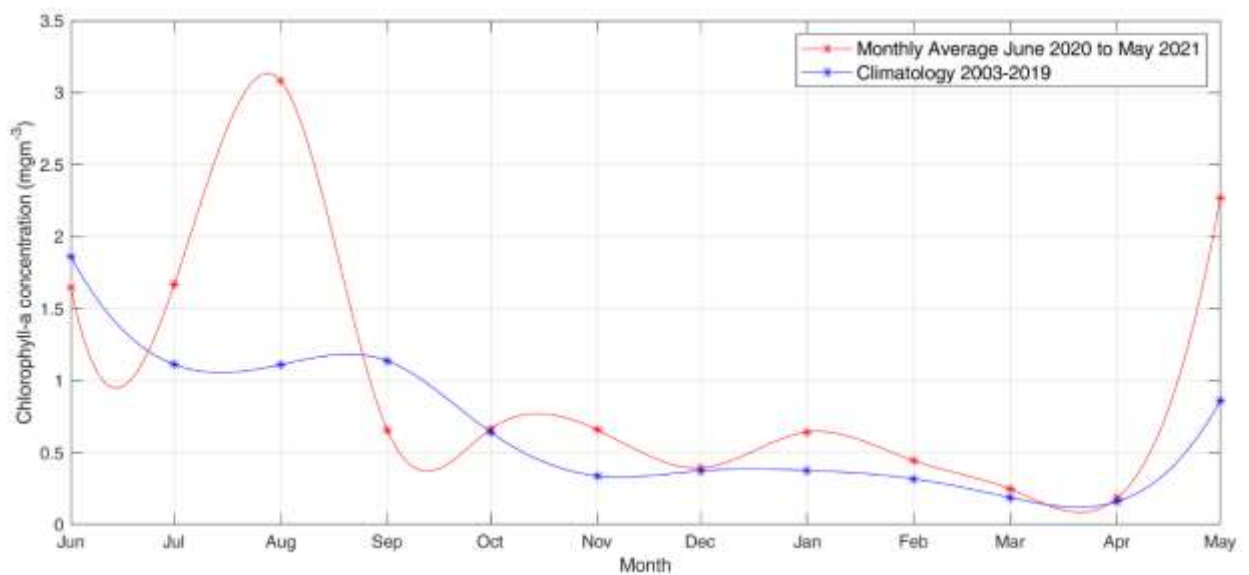


Figure 10: Temporal variation of chlorophyll-a (mg/m^3) for the region off Somalia. (Region B)

4.1 Description of Chlorophyll-a

Figure 6 shows the Chlorophyll-a concentration in milligrams of Chl-a per cubic metre of seawater for the month of May 2021. The regions where the Chl-a concentration was very low, indicating a low abundance of phytoplankton, are in blue and those where the Chl-a concentration was high are shown in red. Land is light grey, and places where there is no data (e.g. cloud cover) is represented in white. A high Chl-a concentration usually indicates a high primary productivity, an essential condition for fish aggregation and fish catch, while a positive Chl-a anomaly shows a higher concentration of Chl-a than the average observed for the same period.

Figures 6 and 7 shows that unlike the previous month, a relatively higher Chl-a concentration was observed across the region, being more prominent in some localised coastal regions such as off the coast of Somalia. This observation is confirmed by the anomaly map obtained for May 2021 (Figure 8).

Figure 9 shows the monthly time series for the region around Mauritius Island (region A on Figure 8). The graph shows a positive Chl-a anomaly being observed for the first time since mid-February 2021. Figure 10 shows the temporal variation of Chl-a for region B in Figure 8, that is, off the northern coast of Somalia. The graph shows a net increase in Chl-a concentration in that region this month. Coupled with a negative SST anomaly in that region, this phenomenon could be attributed to a potential upwelling.

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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.