

Mediterranean SST report

Winter 2024

The Mediterranean area has been defined as a *hot-spot* for climate change. From a climatic point of view, the Mediterranean Sea and its interactions with the atmosphere play a fundamental role in its environmental conditions. It is, therefore, crucial to study the behaviour of the Mediterranean Sea in the past and to monitor its current situation to understand possible future scenarios in the region.

Mediterranean SST report is an initiative of the Mediterranean Center for Environmental Studies ([CEAM](http://www.ceam.es)) Meteorology and Climatology area to periodically review and update sea surface temperature (SST) climatology and trend in the Mediterranean basin. This newsletter will be issued on a seasonal basis and is intended to disseminate the state of the art about Mediterranean SST but also as information for stakeholders and media interested in climate change. It is also our intention to offer this newsletter as a meeting point for the scientific community involved in the study of Mediterranean SST. SST daily updated information can be found in our web SST-CEAMed at <http://www.ceam.es/SST>.

On 12 January 2024, Dr Millán, founder of the Centre for Mediterranean Environmental Studies, Executive Director and Emeritus (1991-2024), passed away.

Millán used to say,

"The earth functions as an entity, a whole, everything is linked".

He was surely not wrong.

We were fortunate to have had the opportunity to work with him, we will miss him but the memory of his person and his work remains with us. This issue is dedicated entirely to Dr Millán, to the scientific legacy he leaves us and the enthusiasm and tenacity he transmitted to us.



All graphics and analysis are based on daily SST data from GHRSSST Level 4 AVHRR_OI Global Blended Sea Surface Temperature Analysis (GDS version 2) from NOAA National Centers for Environmental Information available at PO-DAAC site (https://podaac.jpl.nasa.gov/dataset/AVHRR_OI-NCEI-L4-GLOB-v2.1).

Mediterranean SST report will be issued in a seasonal basis (4 times a year). If you are interested in receiving upcoming issues please contact Francisco Pastor at paco@ceam.es. Please, feel free to distribute to anyone who might be interested.

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SUMMARY

During the winter, the mean SST in the Mediterranean remained clearly above the mean values of the season, maintaining the trend of the previous months. From mid-February onwards, mean SST values showed the highest anomaly in the historical series for this month at 1.2°C. December and January ranked second since 1982 with 1.3°C and 1.4°C respectively. The long-term trend of the seasonally adjusted Mediterranean SST remained largely unchanged with a cumulative warming (1982-2024) of 1.5°C on average.

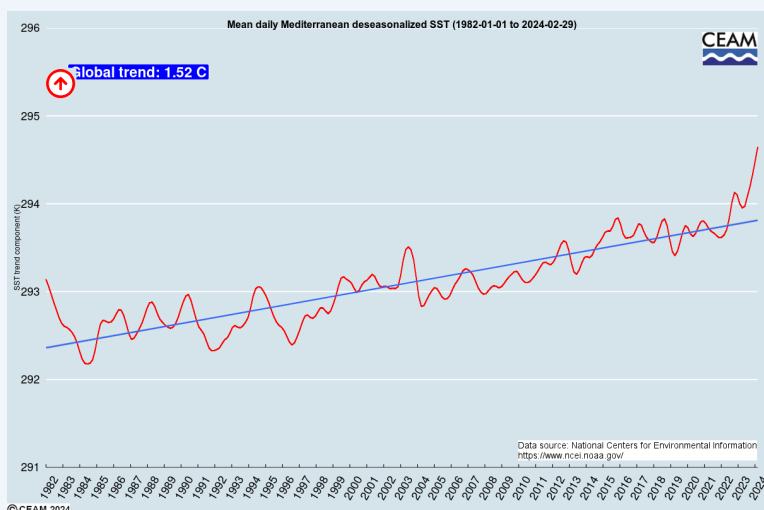


Figure 1. Time evolution for deseasonalized mean Mediterranean SST

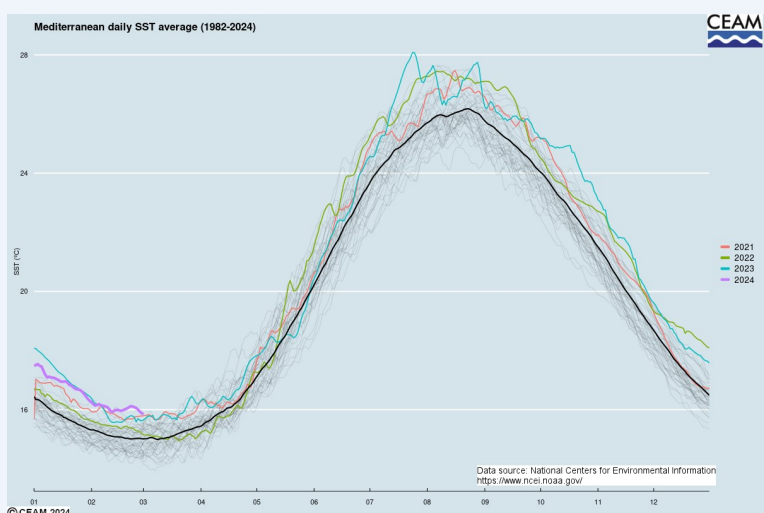


Figure 2. Yearly time series for mean Mediterranean SST

Global trends and monthly anomalies for deseasonalized SST

The mean SST in the Mediterranean showed a positive anomaly with values clearly above the climatological mean throughout the winter. In December and early January the anomaly values were clearly lower than those recorded in 2023. From the second half of January onwards, these values levelled off until mid-February onwards, when a significant increase was recorded, surpassing the maximum values of the historical series. The long-term cumulative increase in SST is 1.5°C for the period of analysis (1982-2024) for the seasonally adjusted SST.

Figure 2 shows the annual series of daily mean SST (black line for the 1982-present mean). The non-seasonally adjusted SST anomaly values were 1.3°C in December, 1.4°C in January and 1.2°C in February. For the unseasonally adjusted SST, the values ranged between 1.6°C and 1.7°C throughout the season.

Trend summary (1982-2024)

Global trend	1.52°C
Global daily trend	$9.8 \cdot 10^{-5} \text{°C/day}$
Monthly anomalies	December 1.6°C
	January 1.7°C
	February 1.7°C

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Global SST anomalies

Over the past winter months, the warming trend in the Mediterranean has continued consistently. February showed the highest anomaly in the historical series for the month since 1982, at 1.2°C. December 2023 ranked second in terms of positive anomaly, second only to 2022, while January also ranked second in the historical series after 2023. The trend towards higher positive SST anomalies since 1982 remained largely unchanged, with mostly positive values since 2000.

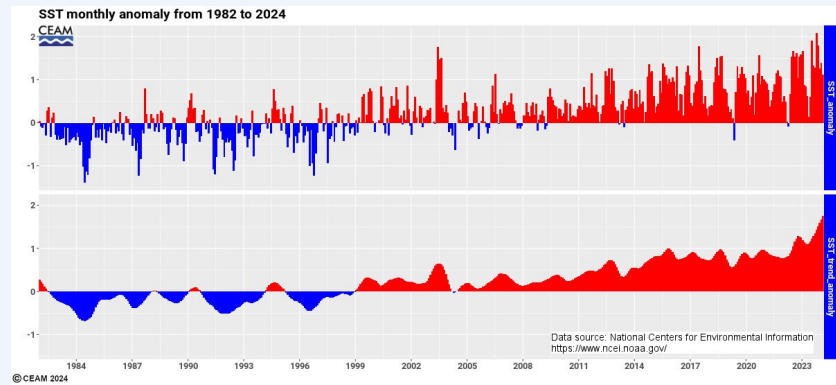
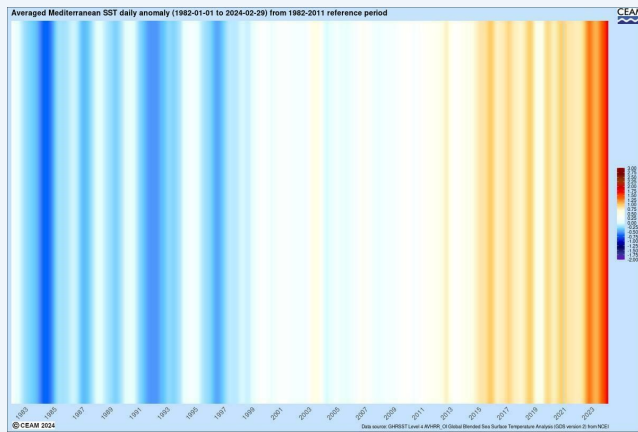


Figure 3. Mean SST daily anomaly

SST monthly analysis December 2023

In December, SST showed a winter spatial distribution with a clear north-south gradient, with higher values towards the south-eastern basin. The highest values were recorded in the eastern Mediterranean, between Turkey, Cyprus and Egypt, while the lowest values were observed in the area of the Gulfs of Leon and Genoa. The most prominent positive anomalies were located in the northern Aegean Sea, with notable values also in most of the eastern and central Mediterranean. In the western Mediterranean, positive anomalies were generally recorded, although of lesser magnitude. The monthly mean SST anomaly in December (1.3°C) was the second highest in the historical series (1982-2024) for this month, but in the case of seasonally adjusted SST it was the highest ever at 1.6°C.

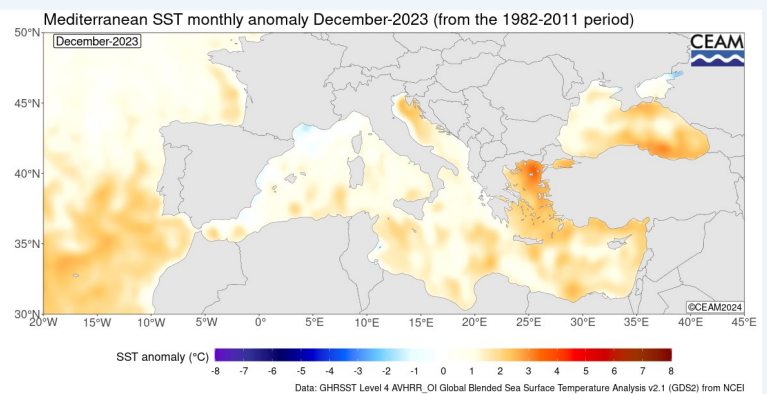
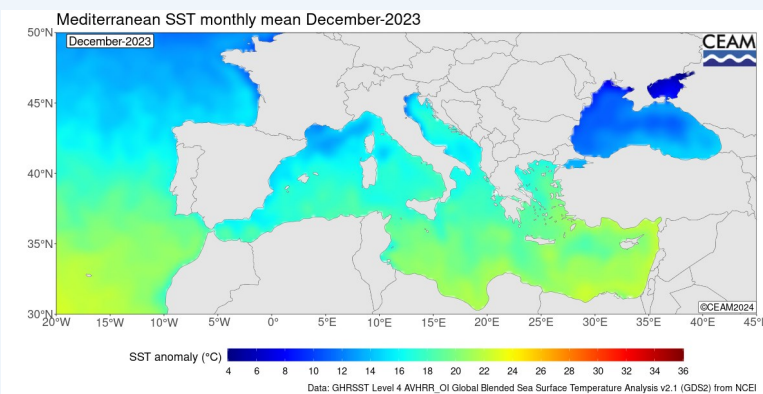


Figure 5. Mean monthly SST (left) and mean monthly SST anomaly (right) on December 2023

December SST	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
SST anomaly	0.3	1.2	0.9	1.1	0.2	0.7	1.0	1.0	0.5	1.6	1.3
SST trend comp. anom.	0.6	0.8	1.0	0.9	0.7	0.7	0.9	1.0	0.8	1.2	1.6

Minimum values in blue/maximum values in red

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SST monthly analysis January 2024

The SST in January maintained a typical winter distribution, very similar to that observed in December. The highest SST values were again recorded in the eastern Mediterranean while the western basin showed lower values, especially in its northern third. As for SST anomalies, the eastern half showed positive values, with the highest values in the northern Aegean. In the western basin the anomalies were positive but with generally negligible values. The monthly mean SST anomaly (1.4°C) was the second highest since 1982 while the seasonally adjusted anomaly (1.7°C) was the highest in the historical series.

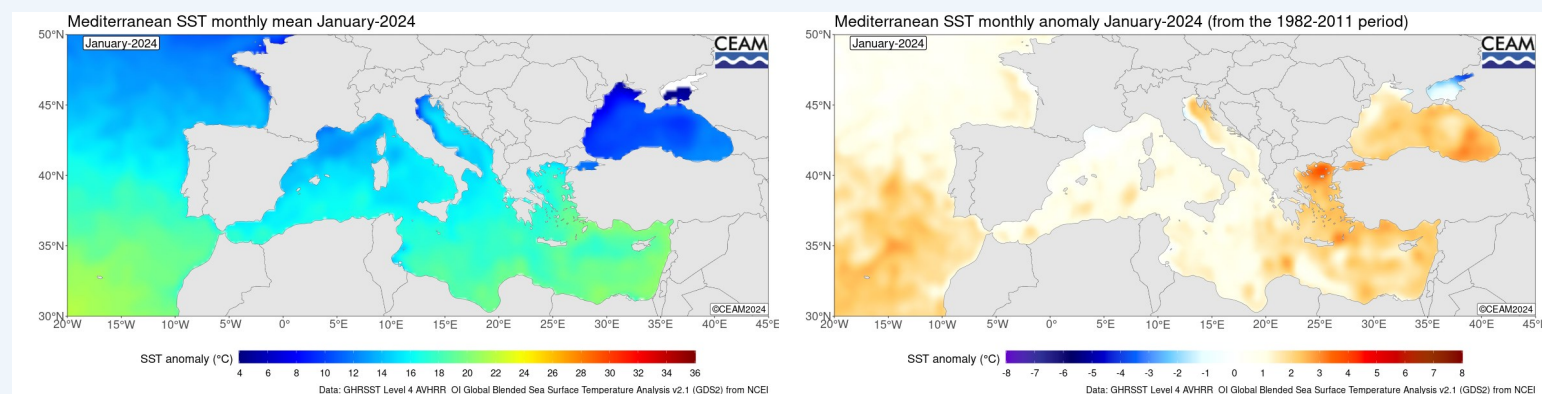


Figure 6. Mean monthly SST (left) and mean monthly SST anomaly (right) on January 2024

January SST	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
SST anomaly	0.7	0.6	1.1	0.5	0.4	0.4	0.7	1.0	0.6	1.7	1.4
SST trend comp. anom.	0.6	0.8	0.9	0.9	0.9	0.7	0.9	0.9	0.8	1.2	1.7

Minimum values in blue/maximum values in red

SST monthly analysis February 2024

In February, the SST continued its descent towards winter lows, following its annual cycle. Values in the western Mediterranean generally remained below 17°C, with the coldest values from the east coast of the Iberian Peninsula to the Gulf of Genoa. The highest values were recorded towards the south-eastern end of the Mediterranean. The SST anomaly was positive throughout the Mediterranean with the highest values in the northern Adriatic and Aegean Sea. For the monthly mean SST anomaly, the raw and unseasonalised SST values were the highest since 1982 at 1.2°C and 1.7°C respectively.

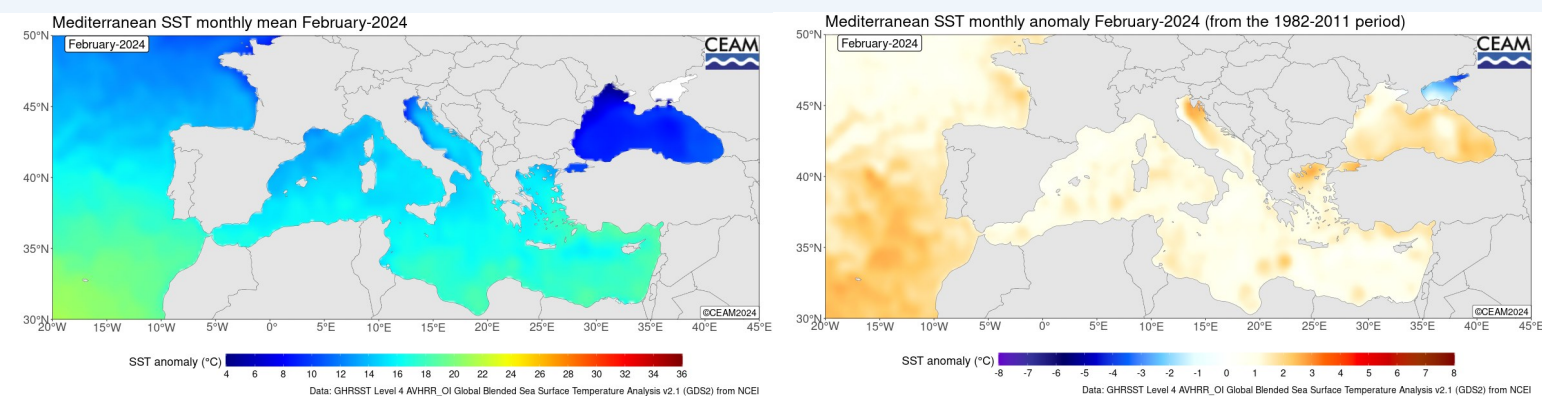


Figure 7. Mean monthly SST (left) and mean monthly SST anomaly (right) on February 2024

February SST	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
SST anomaly	0.7	0.2	1.0	0.4	0.4	0.3	0.8	0.9	0.5	0.9	1.2
SST trend comp. anom.	0.5	0.8	0.9	0.9	0.7	0.6	0.8	0.9	0.8	1.1	1.7

Minimum values in blue/maximum values in red

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Mean Mediterranean SST temporal trend heatmaps

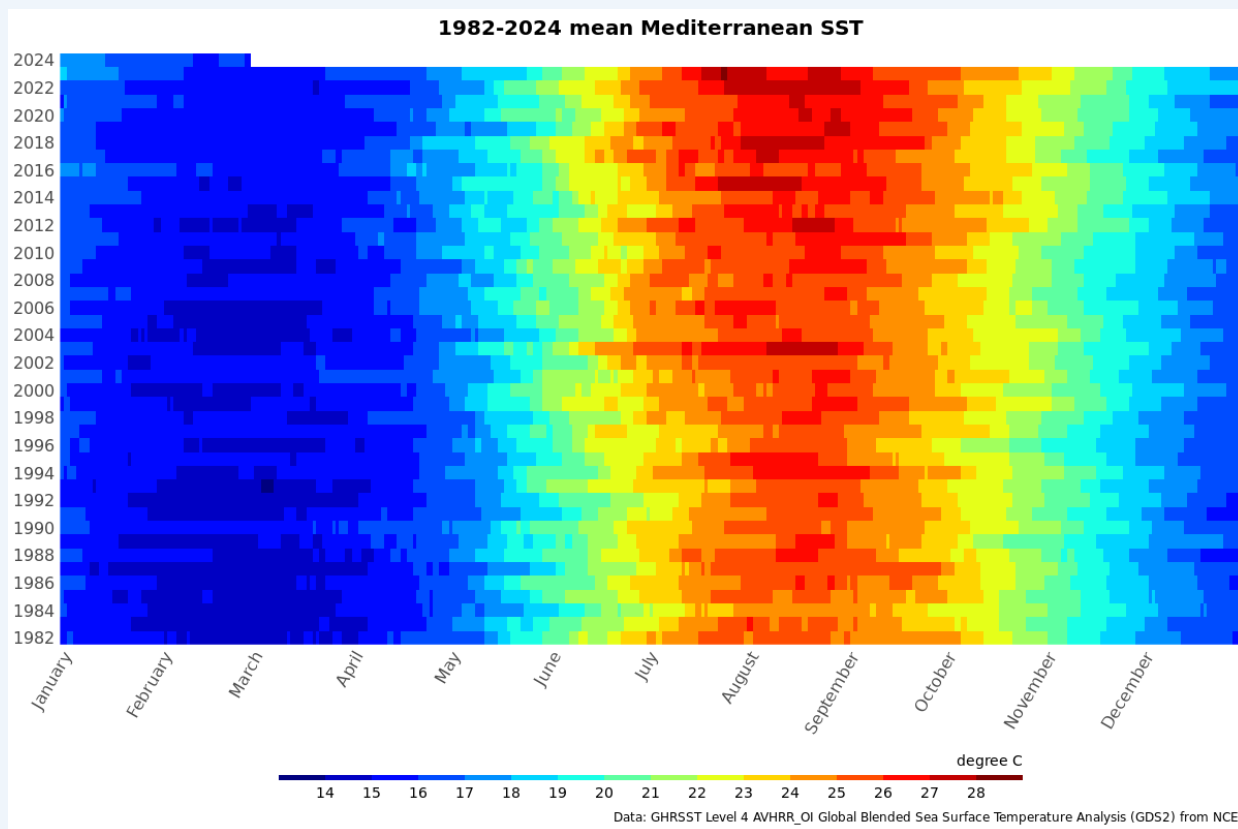


Figure 8. Yearly heatmap for daily mean SST in the Mediterranean (1982-2023)

Figures 8 shows the mean Mediterranean SST evolution in the 1982-2024 period and figure 9 shows its anomaly, with reference period 1982-2011. It can be seen how warm values have been progressively broadening their annual time range, especially warmer SST in summer season.

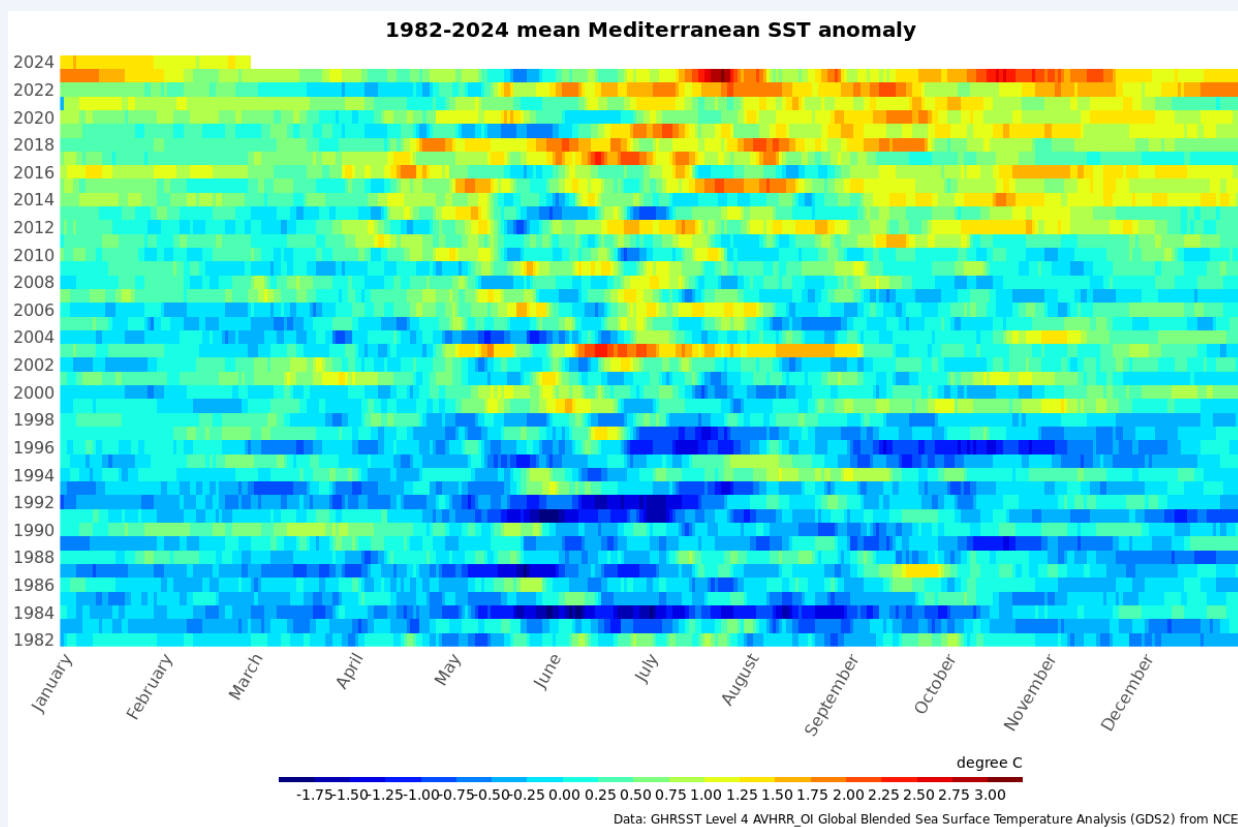


Figure 9. Yearly heatmap for daily mean SST anomaly in the Mediterranean (1982-2023)

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Mediterranean SST report is an initiative of the Mediterranean Center for Environmental Studies (CEAM) Meteorology and Climatology area, funded by the Generalitat Valenciana.

More information about Mediterranean sea surface temperature (daily updates) at our SST CEAMed web portal www.ceam.es/SST

Citation: Mediterranean Sea Surface Temperature report (Winter 2024). Meteorology and Climatology Area. Mediterranean Centre for Environmental Studies. 2024.

Data source: National Centers for Environmental Information. 2021. Daily L4 Optimally Interpolated SST (OISST) In situ and AVHRR Analysis. Ver. 2.1. PO.DAAC, CA, USA. Dataset accessed 2021-06-05 <https://doi.org/10.5067/GHAAO-4BC21>.

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Contact information

Web portal	www.ceam.es/SST
Twitter	@CEAM_Meteo
Mail	pastor_fco@gva.es

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