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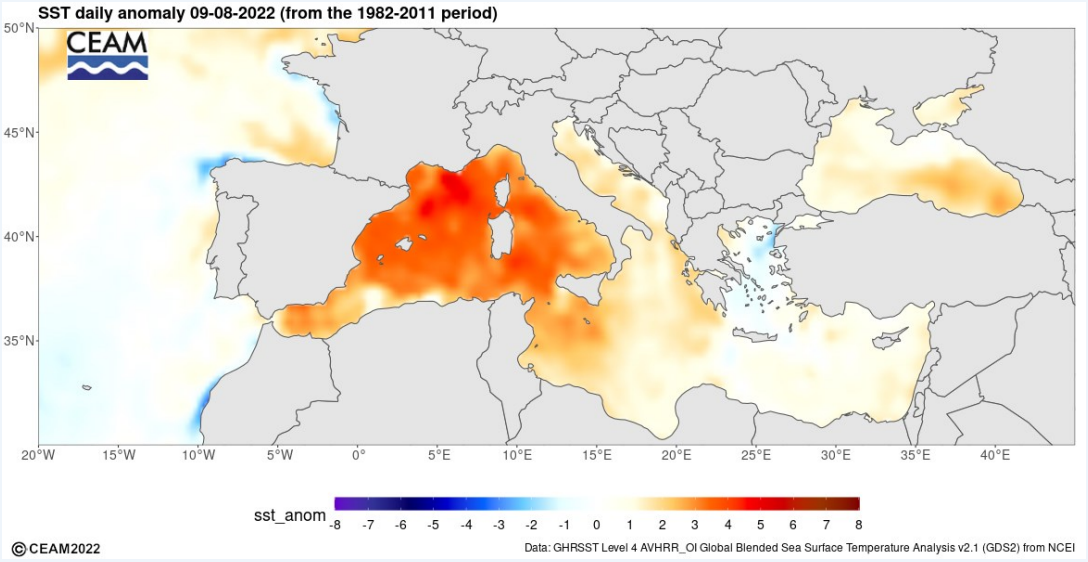
09-2022

Mediterranean SST report

Summer 2022

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) Meteorology and Pollutant Dynamics department 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.



This newsletter is partially funded by the research project the IMAGINA-PROMETEO (PROMETEU/2019/110) financed by the Generalitat Valenciana. SST daily updated information can be found in our web SST-CEAMed at http://www.ceam.es/SST.

All graphics and analysis are based on daily SST data from GHRSST 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.*

CEAM
FUNDACIÓN CENTRO DE ESTUDIOS AMBIENTALES DEL MEDITERRÁNEO

Mediterranean SST report - Summer 2022

SUMMARY

The summer of 2022 has been characterised by high temperatures in the western Mediterranean basin, leading to an intense and persistent marine heatwave. Since the start of June, mean Mediterranean SST has been well above its climatic averages.

These extreme SST values have driven a change in the behaviour of the long-term trend with an increase compared to spring. The cumulative warming over the study period (1982-2022) was 1.4˚C, averaged over the entire Mediterranean basin.

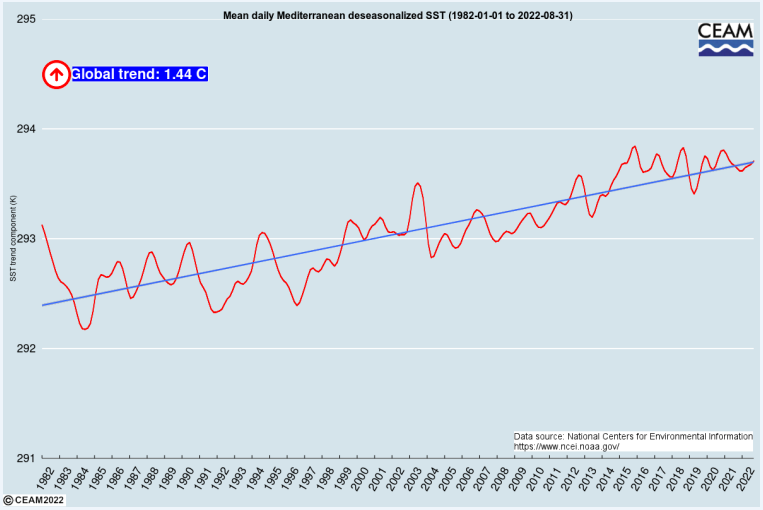


Figure 1. Time evolution for deseasonalized mean Mediterranean SST

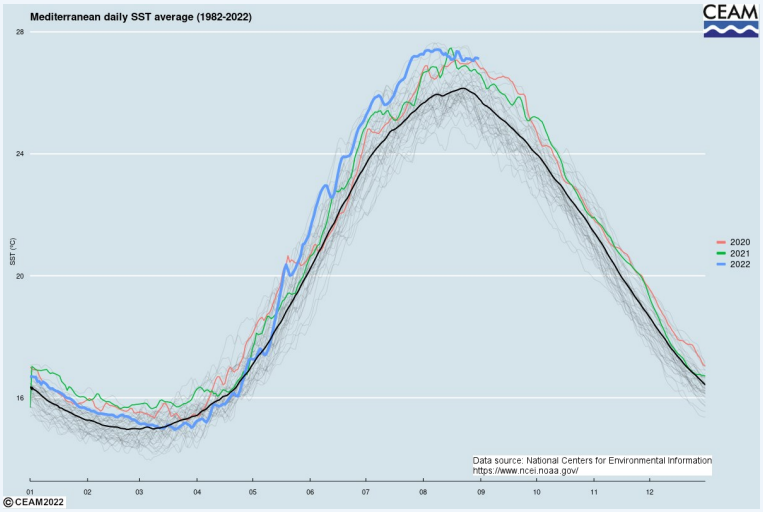


Figure 2. Yearly time series for mean Mediterranean SST

Mean Mediterranean summer season SST was well above its climatic values for the whole season. These behaviour was mainly due to the onset and persistence of an intense marine heatwave affecting most of the western Mediterranean basin for most of the season. It also led to an increase of the long term accumulated SST variation ascending to 1.4°C for the analysis period (January 1982—August 2022) for the deseasonalized SST.

Figure 2 shows the annual series of the daily averaged SST (black line for the 1982-2022 average). Since the start of summer, starting previously in May, mean Mediterranean SST were very clearly above climatic values. Global monthly mean anomalies for the whole basin were almost constant since June to August of 1.4°C for raw SST, with the maximum daily anomaly (1.8° C) on late July, and 0.8°C for deseasonalized data.

Trend summary (1982-2022)	
Global trend	1.44˚ C
Global daily trend	$9.8 \cdot 10^{-5}$ ˚C/day
Monthly anomalies	June 0.8˚ C
	July 0.8˚ C
	August 0.9° C

Global trends and monthly anomalies for deseasonalized SST

Data source: GHRSST Level 4 AVHRR_OI Global Blended Sea Surface Temperature Analysis (GDS version 2) from NCEI available at PODAAC site https://podaac.jpl.nasa.gov/dataset/AVHRR_OI-NCEI-L4-GLOB-v2.1

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Global SST anomalies

The high SST values recorded during summer led to very high anomalies, especially in the western Mediterranean, that were among the highest in the historical record for both raw and desesasonalized SST monthly anomalies shown in figures 3 and 4. It can be seen a clear increasing trend towards higher positive anomalies for the period January 1982-August 2022. Negative SST anomalies have been very rare in the XXI century.

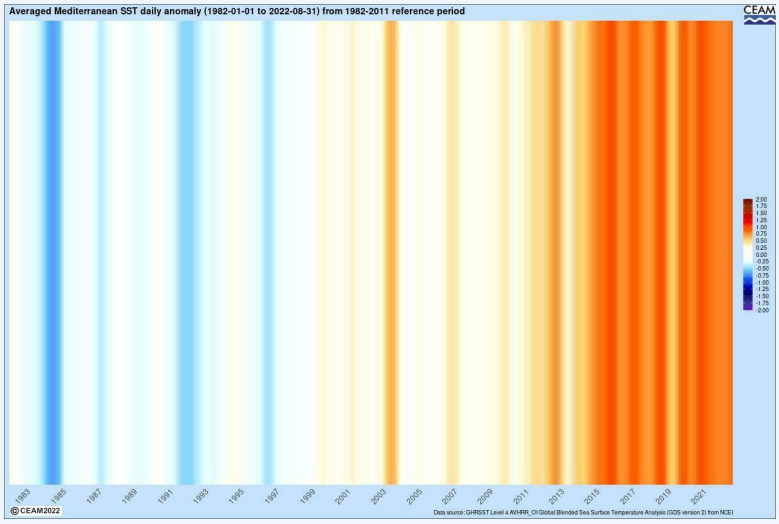

Figure 3. Mean SST daily anomaly

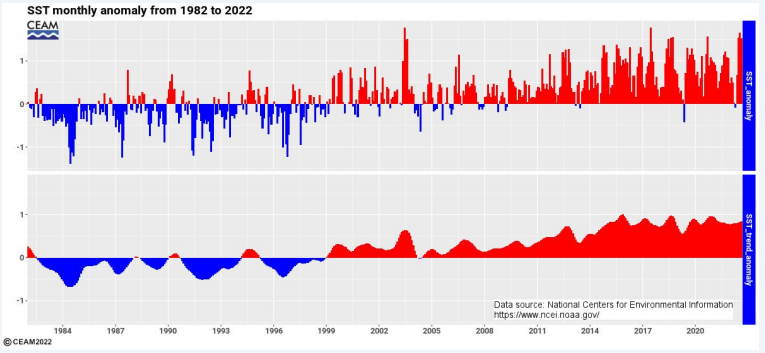

Figure 4. Mean SST monthly anomaly since 1982

SST monthly analysis June 2022

Summer SST spatial regime started across June. Relatively cooler waters were observed in the Gulf of Lions, Alboran Sea and most of the Aegean Sea. Warmest SST were found in the eastern half of the Levantine basin, parts of the Tunisian coast and southeastern Tyrrhenian sea.

Significant monthly anomalies were recorded in areas of the western Mediterranean and the Tunisian coast. Light but still positive values were found in the eastern basin. Only the Aegean sea showed negative anomaly. June mean SST anomalies were in the third position of the analyzed time series while deseasonalized mean SST anomaly was the fourth highest value recorded since 1982.

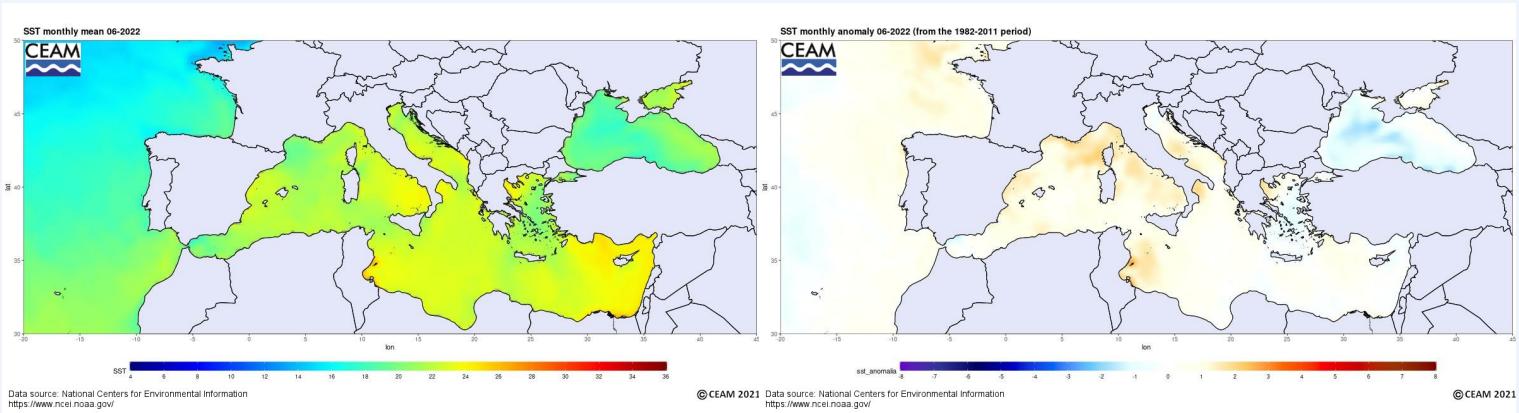

Figure 5. Mean monthly SST (left) and mean monthly SST anomaly (right) on June 2022

June SST	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SST anomaly	1.2	-0.1	0.5	0.7	0.7	1.8	1.5	0.7	0.2	0.7	1.5
SST trend comp. anom.	0.6	0.4	0.6	0.8	0.8	0.8	0.9	0.6	0.8	0.8	0.8

Minimum values in blue/maximum values in red

Data source: GHRSST Level 4 AVHRR_OI Global Blended Sea Surface Temperature Analysis (GDS version 2) from NCEI available at PODAAC site https://podaac.jpl.nasa.gov/dataset/AVHRR_OI-NCEI-L4-GLOB-v2.1

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SST monthly analysis July 2022

Summer SST regime was clearly present across July with very high temperature values in most of the basin. Only the Aegean sea, the Gulf of Lion and the Gibraltar Strait area sere below 23-24°C. Most of the western basin showed anomaly values higher than the 90 percentile of the historical series, with the highest values in the Gulf of Genoa. Regarding mean SST anomalies, July monthly value was the highest of the historical time series while seasonally adjusted mean SST anomaly was the 4th in the study period (1982-2022). The highest daily anomaly was recorded on July 26 with 1.8°C.

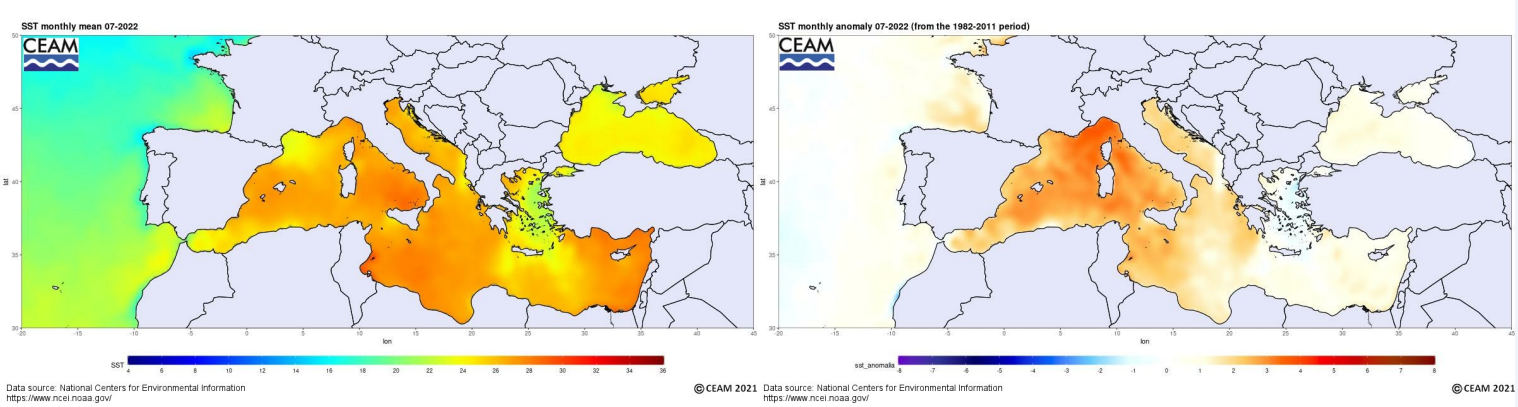

Figure 6. Mean monthly SST (left) and mean monthly SST anomaly (right) on July 2022

July SST	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SST anomaly	1.1	0.3	**0.0**	1.4	0.7	1.2	1.1	1.3	0.7	0.9	**1.6**
SST trend comp. anom.	0.7	**0.4**	0.6	0.9	0.9	0.8	**1.0**	0.7	0.8	0.8	0.8

Minimum values in blue/maximum values in red

SST monthly analysis August 2022

Very high SST values were recorded in the Mediterranean in August. The warmest areas were found between the Valencia coast and the Balearic Islands, Tyrrhenian sea, Tunis-Libya coast and the easternmost Levantine basin. The highest anomalies were found also found around the Valencia-Balearic area, the Gulf of Genoa and the western Tyrrhenian sea. In the historical series, August 2022 presents the second highest value since 1982, almost tied with 2018, while the seasonally adjusted SST holds the 4th position. The maximum value of mean Mediterranean SST was recorded in August wit 27.4°C.

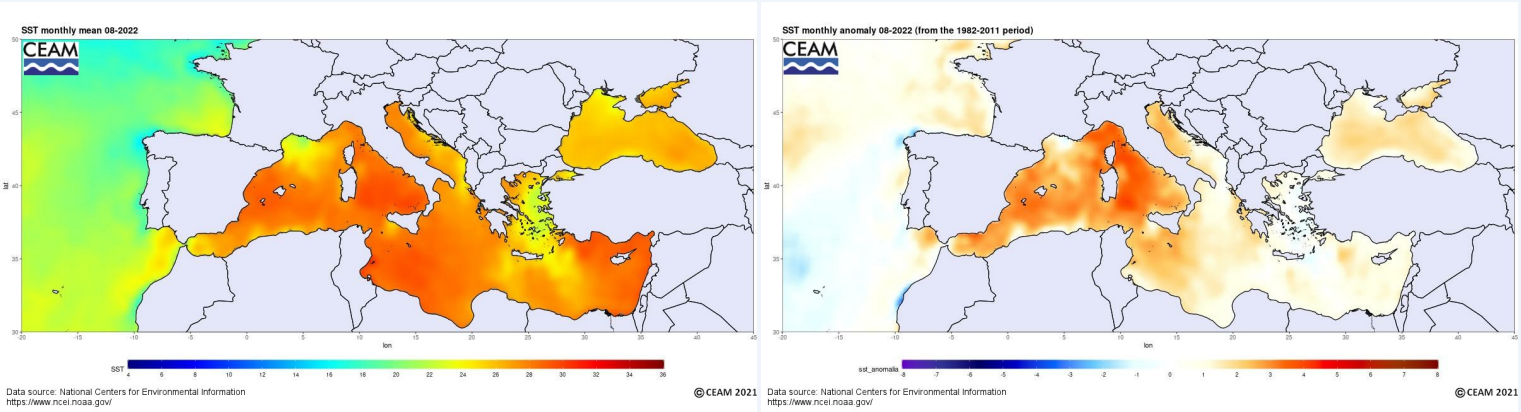

Figure 7. Mean monthly SST (left) and mean monthly SST anomaly (right) on August 2022

August SST	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SST anomaly	1.3	0.4	0.3	1.3	**0.2**	1.0	**1.5**	1.0	1.2	1.2	**1.5**
SST trend comp. anom.	0.7	**0.4**	0.7	0.9	0.8	0.8	**1.0**	0.7	0.9	0.8	0.9

Minimum values in blue/maximum values in red

Data source: GHRSST Level 4 AVHRR_OI Global Blended Sea Surface Temperature Analysis (GDS version 2) from NCEI available at PODAAC site https://podaac.jpl.nasa.gov/dataset/AVHRR_OI-NCEI-L4-GLOB-v2.1

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Mean Mediterranean SST temporal trend heatmaps

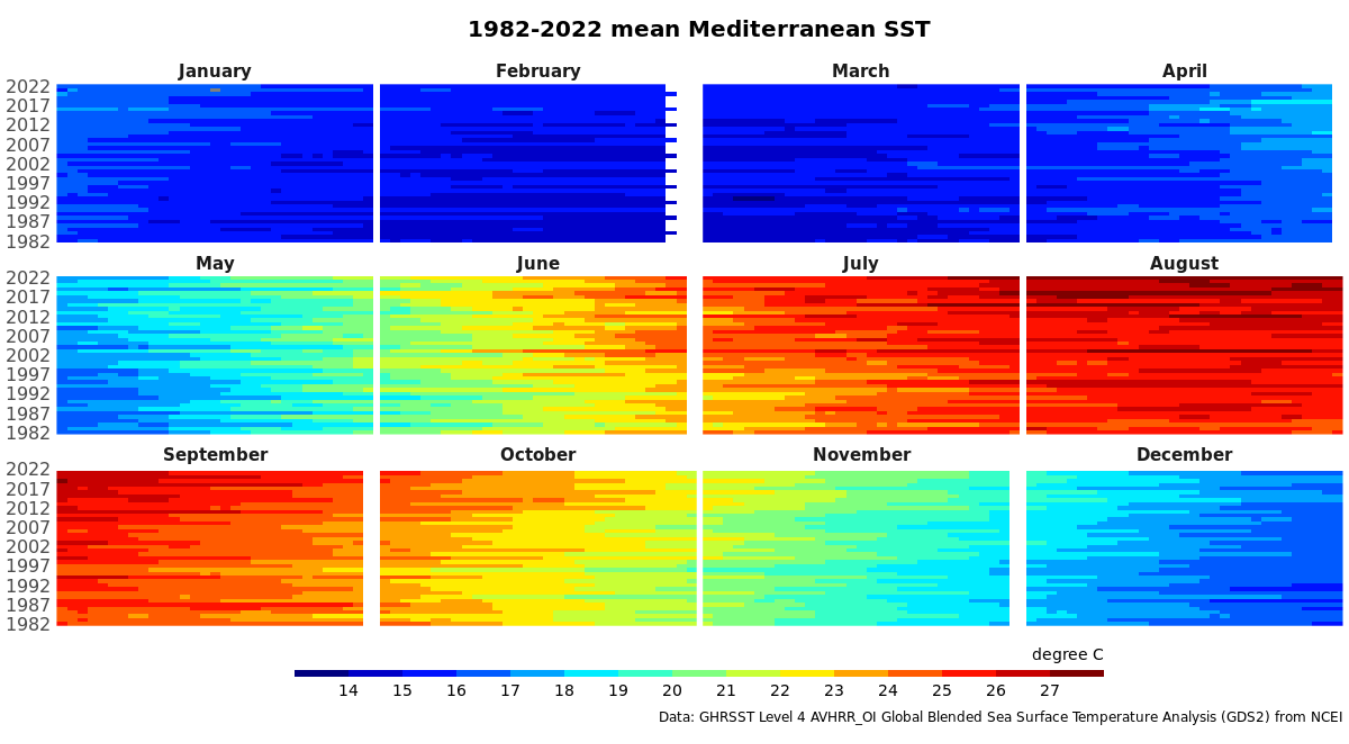

Figure 8. Monthly heatmap for daily mean SST in the Mediterranean (1982-2022)

Figures 8 and 9 show the mean Mediterreanean SST evolution in the 1982-2022 period. It can be seen how warm values have been progressively broadening their annual time range, especially warmer SST in summer season (July-September). Regarding summer 2022, it presents the longest continuous period with mean Mediterranean SST above 27°C with 43 consecutive days.

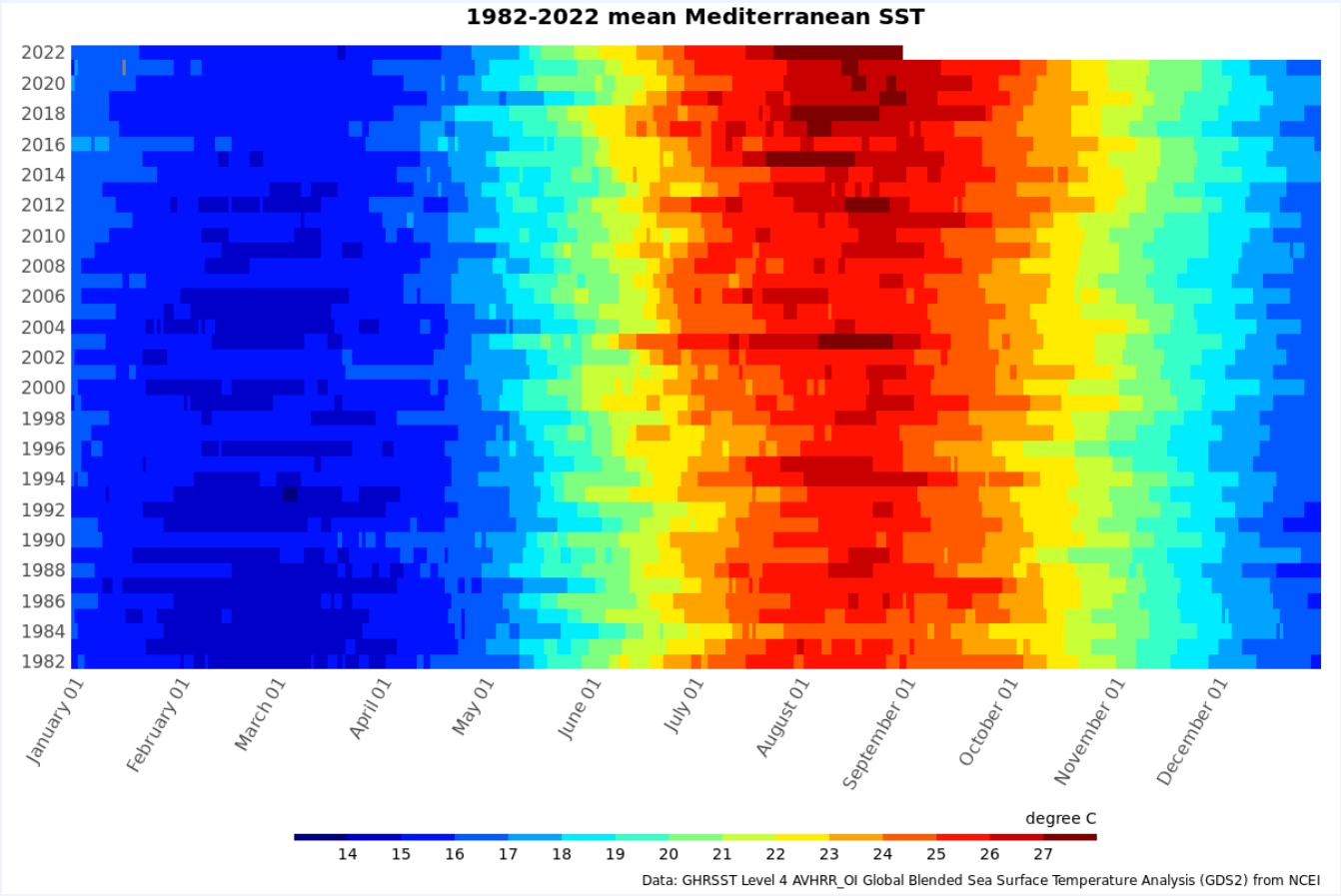

Figure 9. Yearly heatmap for daily mean SST in the Mediterranean (1982-2022)

Data source: GHRSST Level 4 AVHRR_OI Global Blended Sea Surface Temperature Analysis (GDS version 2) from NCEI available at PODAAC site https://podaac.jpl.nasa.gov/dataset/AVHRR_OI-NCEI-L4-GLOB-v2.1

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Mean Mediterranean SST daily anomaly

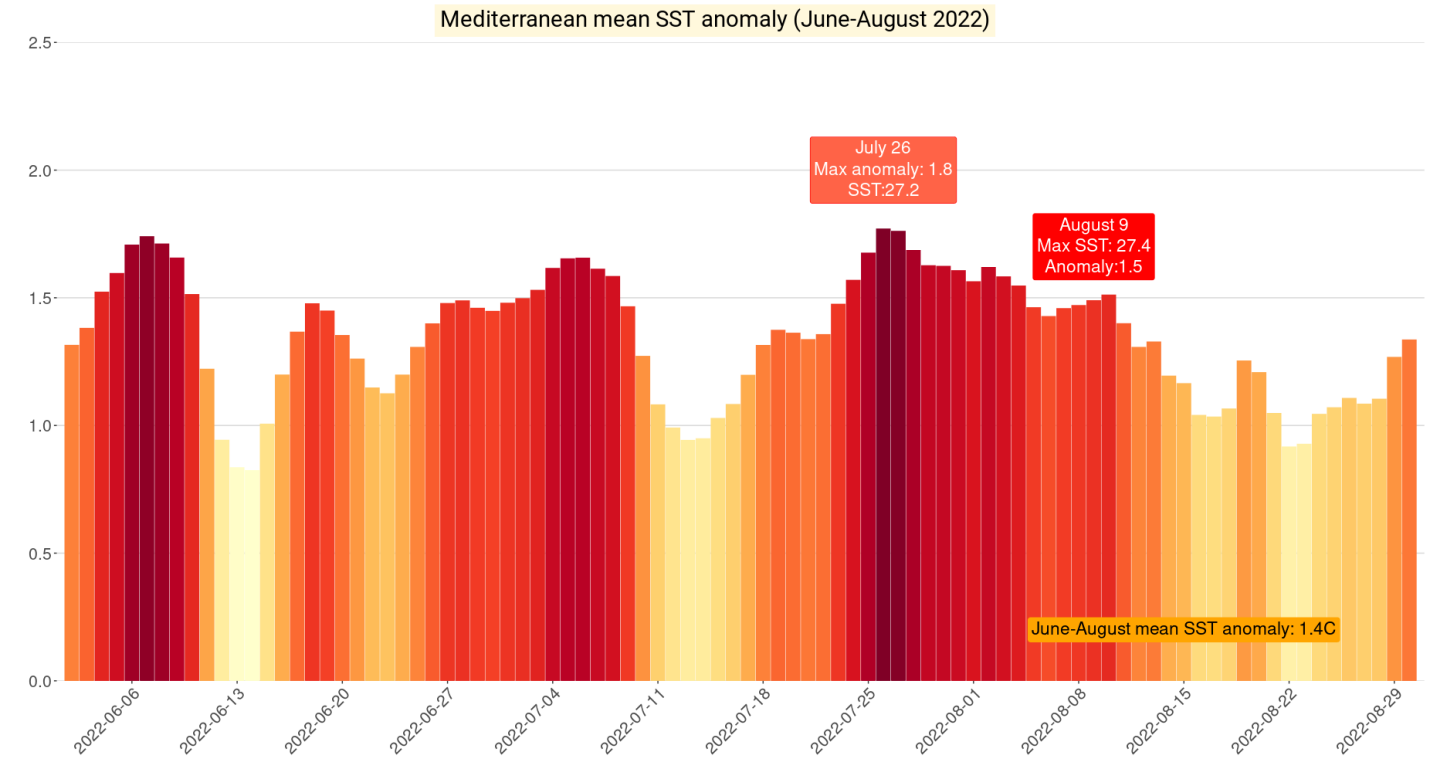

Figure 10. Daily anomaly for mean SST in the Mediterranean (summer 2022)

Figures 10 and 11 show the mean Mediterranean and western Mediterranean SST daily anomaly evolution in summer 2022 with mean values of 1.4 and 2.2°C respectively. The exceptionally an persistent high SST values in the Western Mediterranean were responsible of the intense and persistent marine heat wave recorded this summer.

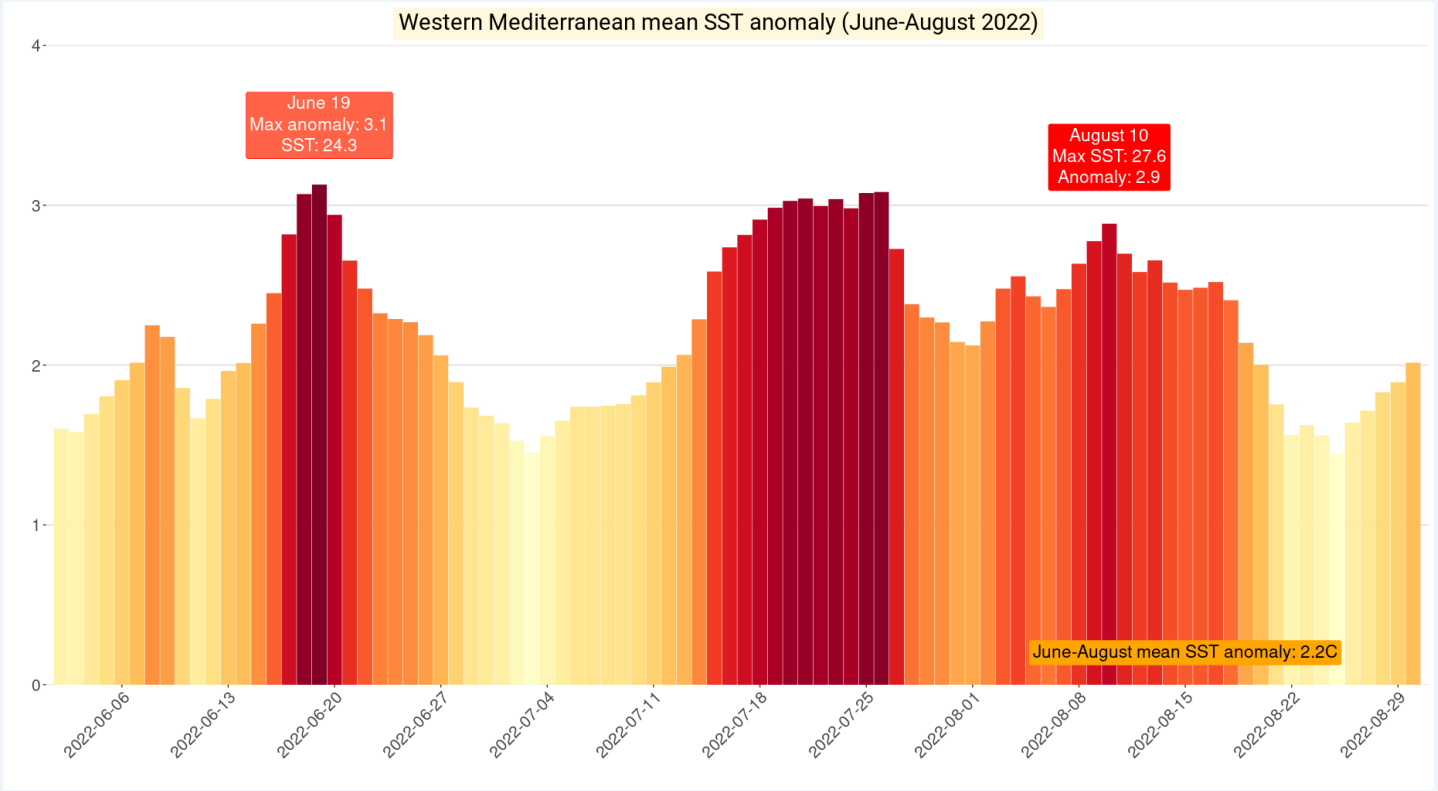

Figure 11. Daily anomaly for mean SST in the Western Mediterranean (summer 2022)

Data source: GHRSST Level 4 AVHRR_OI Global Blended Sea Surface Temperature Analysis (GDS version 2) from NCEI available at PODAAC site https://podaac.jpl.nasa.gov/dataset/AVHRR_OI-NCEI-L4-GLOB-v2.1

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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 (Summer 2022). Meteorology and Pollutant Dynamics Area. Fundación CEAM. 2022.

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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