

Warming Oceans: using satellites to monitor sea surface temperature, ocean heat content and marine heatwaves

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** Several slides with thanks to Gary Corlett*

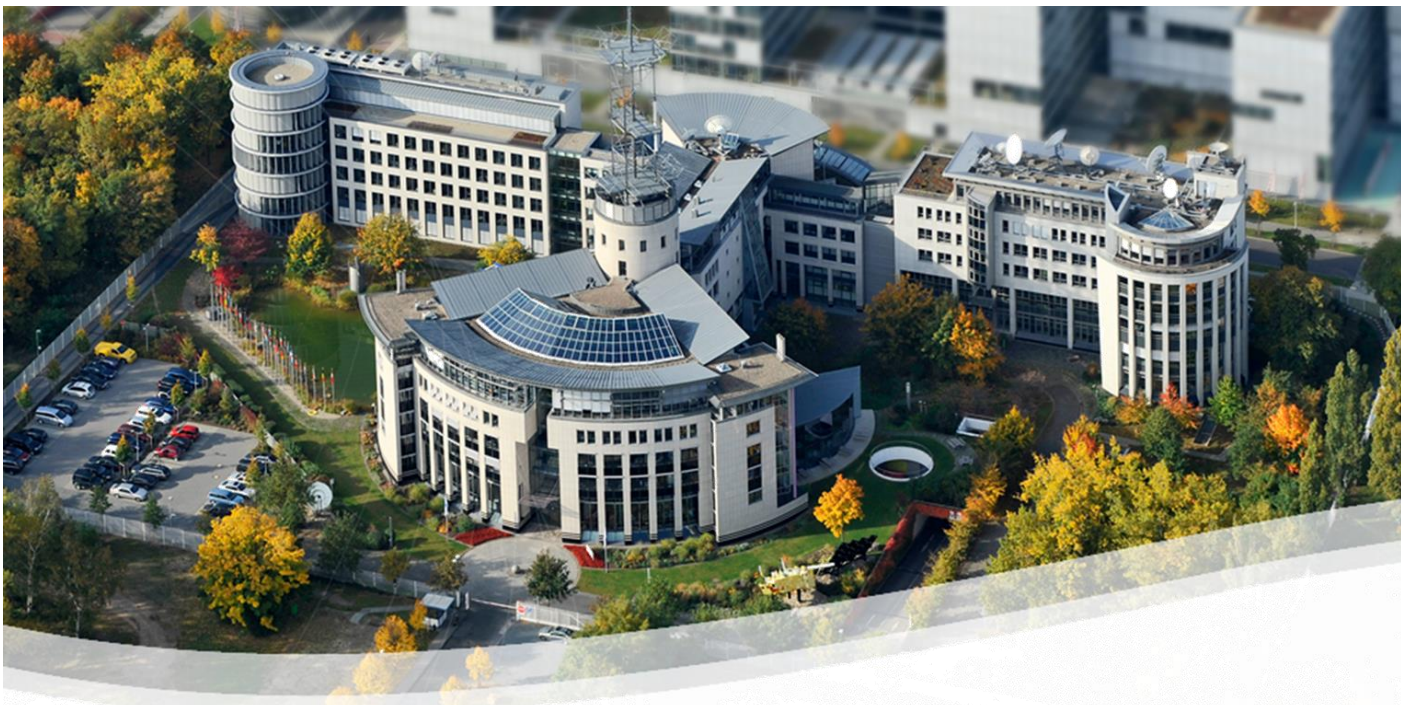
EUMETSAT Short Course 19th July 2023



Today's short course

Theme	Session title	Session time (UTC)	Session content	Presenter
Sea surface temperature	Introduction	11:00 - 11:10	A background to sea surface temperature, ocean heat content and marine heatwaves	Hayley Evers-King (EUMETSAT)
	SST at EUMETSAT: Selecting appropriate products	11:10 - 11:30	What SST products are out there and why/when should you use them?	Olivier Membrive (EUMETSAT OSI SAF / Météo France)
	SST anomalies: a practical demonstration	11:30 - 11:50	Practical session using Jupyter Notebooks	Ben Loveday (EUMETSAT / Innoflair UG)
Break		11:50 - 11:55		
Ocean heat content	Recent ocean heat content signals	11:55 - 12:10	OHC definitions and signals	William Skirving / Eileen Maturi (NOAA)
	Ocean heat content and cyclogenesis	12:10 - 12:25	OHC, TCHP and cyclogenesis	Ibrahim Al Abdulsalam (CAA Oman)
Break		12:25 - 12:30		
Marine heat waves	Marine heat waves: case study #1	12:30 - 12:50	The NOAA Coral Reef Watch programme	William Skirving / Gang Liu (NOAA)
	Marine heat waves: case study #2	12:50 - 13:05	SST responses to heatwaves in France, 2022	Thibault Guinaldo (EUMETSAT OSI SAF / Météo France)
	Marine heat waves: case study #3	13:05 - 13:20	The "Care Heat" project	Ana Oliveira (Colab+ATLANTIC)
	Marine heat wave identification: a practical demonstration	13:20 - 13:40	Practical session using Jupyter Notebooks	Ben Loveday (EUMETSAT / Innoflair UG)
Q&A	Q&A	13:40 - 14:00		Hayley Evers-King (EUMETSAT)

Q&A and feedback survey: [slido.com](https://www.slido.com) #EUMSC42

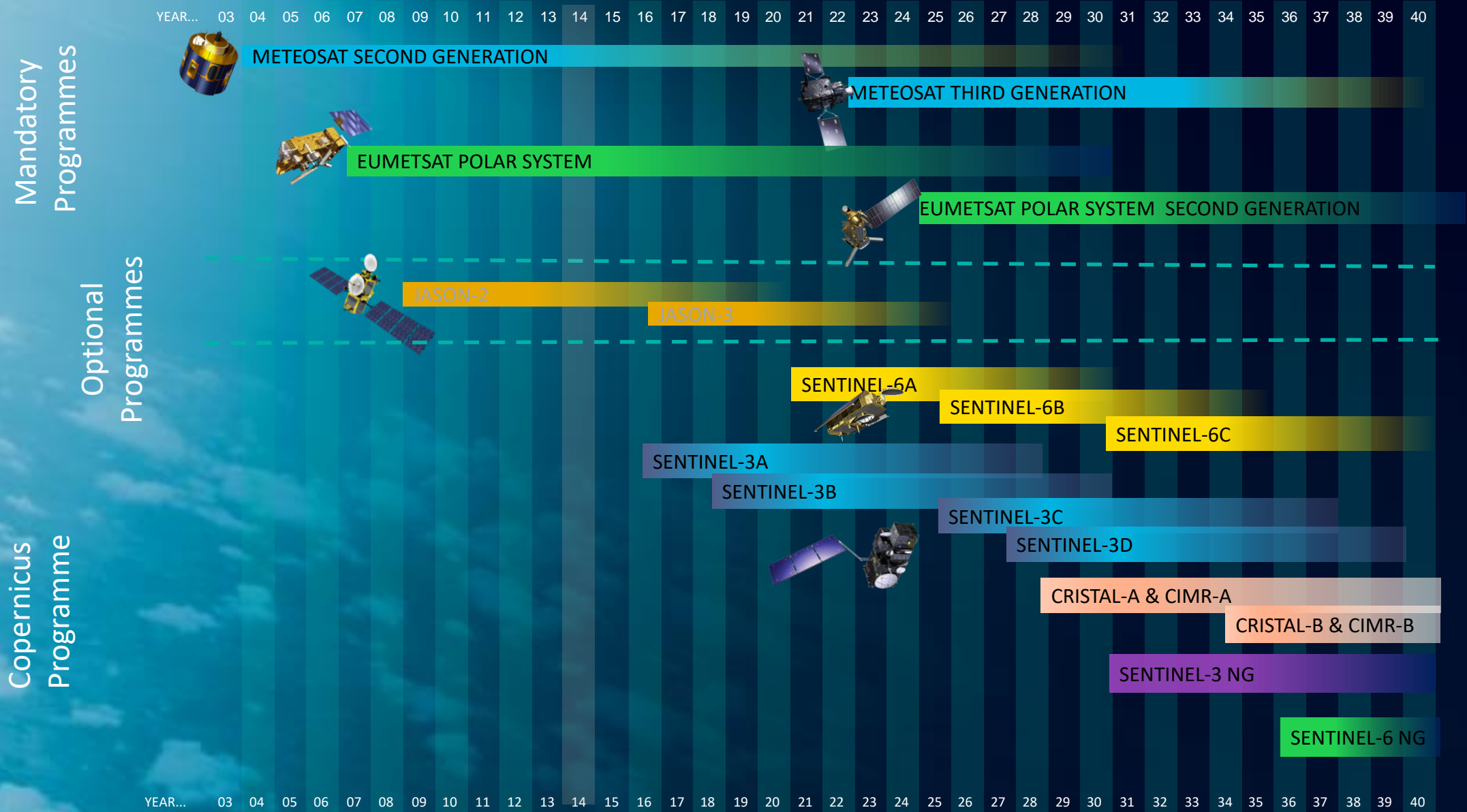


The European Organisation for the Exploitation of Meteorological Satellites.

- An international organisation with 30 member states.
- Providing observations and data services for operational weather and Earth system monitoring and forecasting, and for climate services.
- Establishing additional capabilities in partnerships with the European Union and other satellite operators to achieve synergy with our own satellite missions for the common benefit of Member States and partners.
- Strong international collaborations within Europe, the US, and Africa as well as others.



EUMETSAT missions: current and future

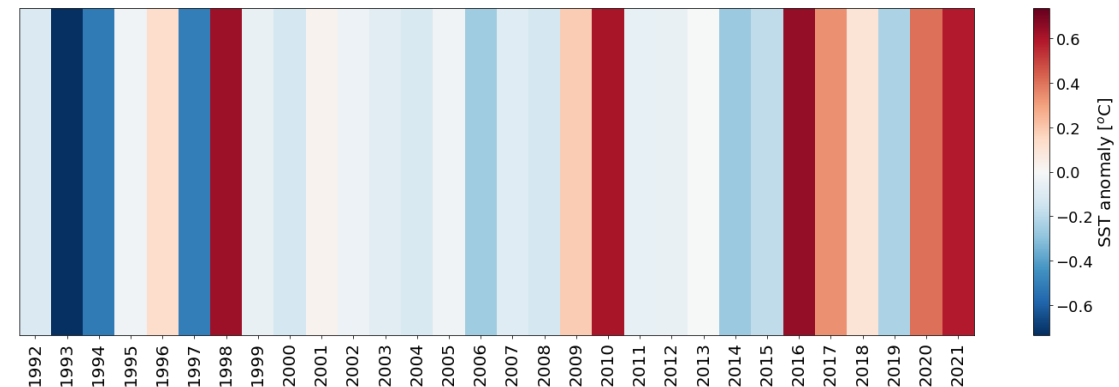
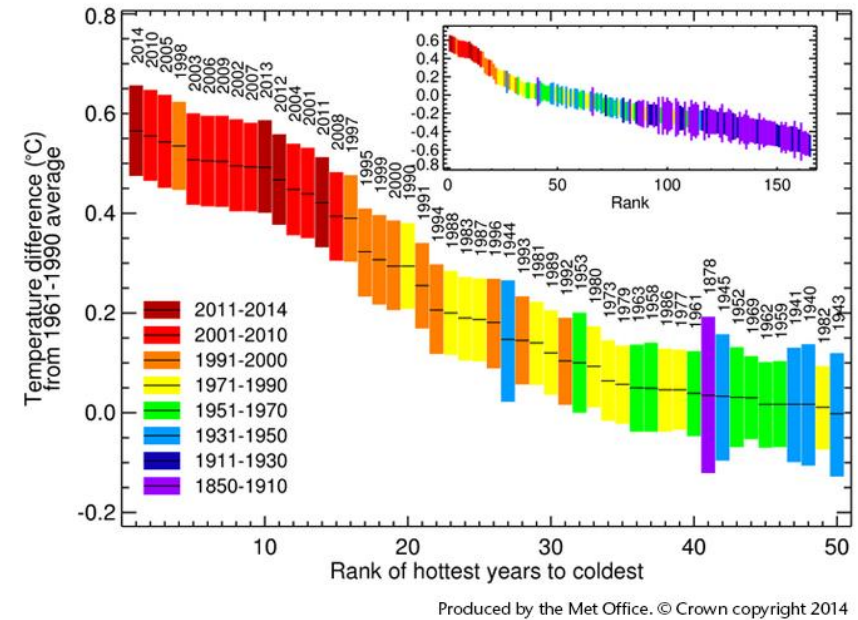




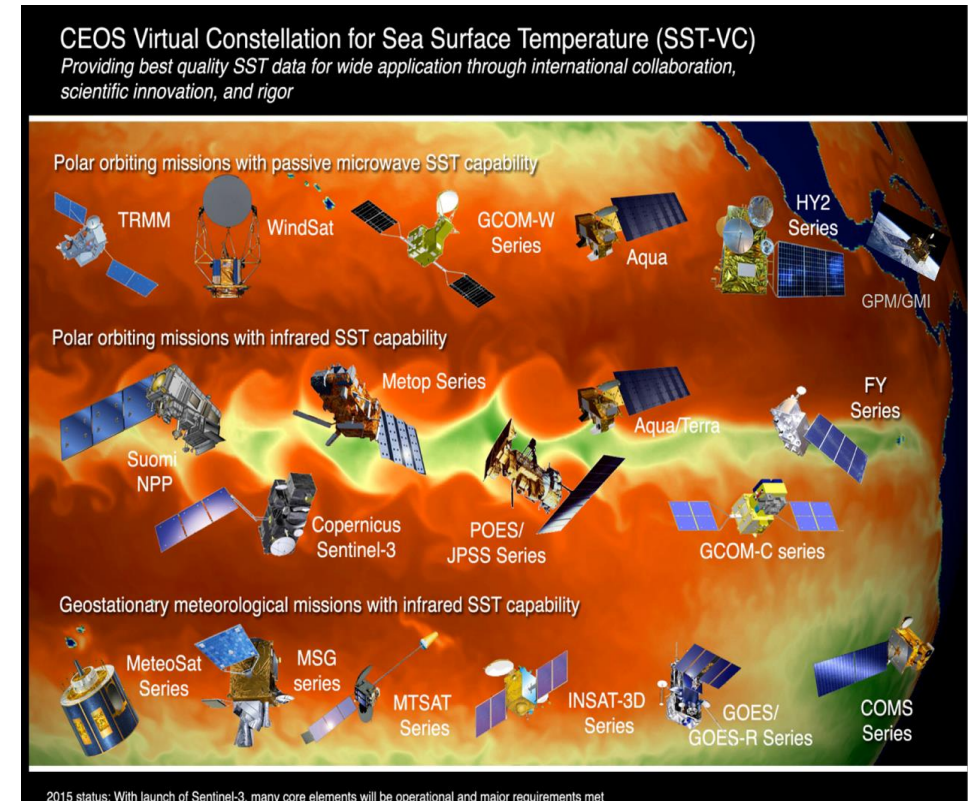
Why do we care about ocean temperatures/heat?

copernicus.eumetsat.int

- SST influences atmospheric circulation
 - NWP boundary condition
- SST influences density and circulation of oceans
 - Operational oceanography
- SST changes can impact ocean biogeochemistry
 - Impact on biodiversity and fishing
- SST is an indicator of climate change
 - Improving seasonal prediction
 - Understanding broader impacts



- Satellites with radiometers, operated by various organisations around the world (including EUMETSAT and NOAA).
- Measuring radiation emitted in infrared and microwave parts of the E-M spectrum.
- Data must be atmospherically corrected and SST values retrieved (corrected, flagged etc).



- If you want to learn more about SST theory – join one of our longer training courses – <https://training.eumetsat.int> including upcoming online series with GHRST – <https://ghrrst.org>



How do we monitor ocean temperatures from space?

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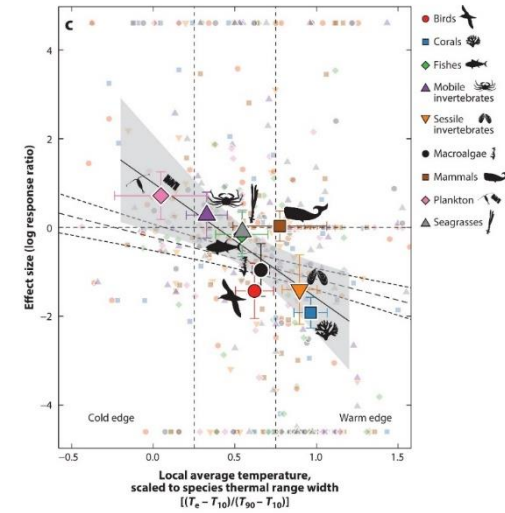
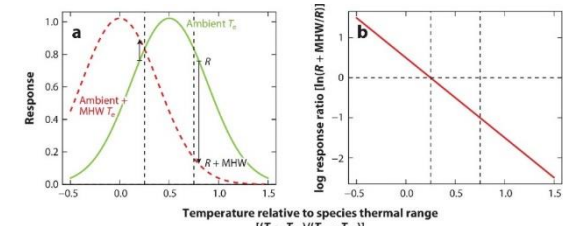
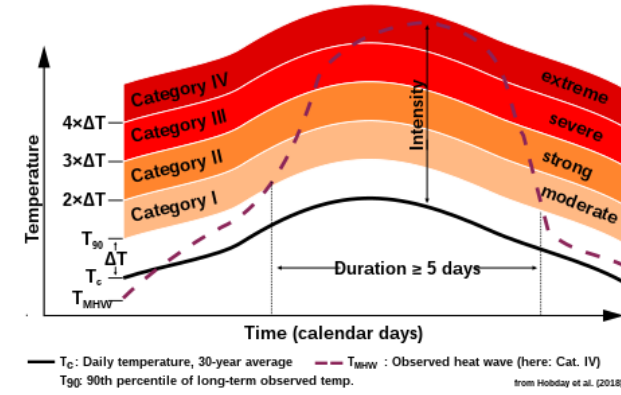
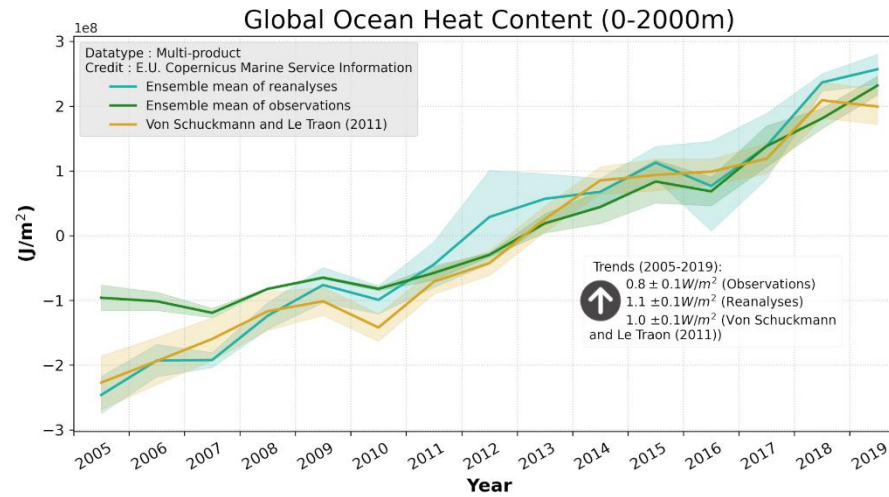
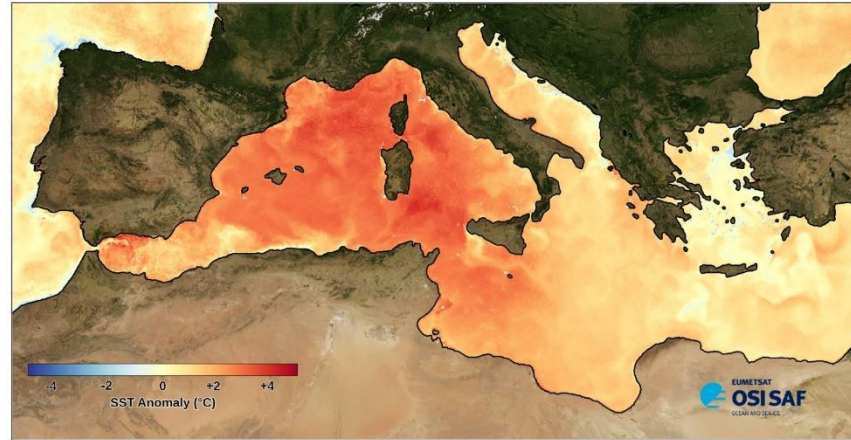
Level	What's provided?	By who?	Best for when...
Level-1	Brightness temperatures	Satellite operators (some redistribution)	You're developing your own retrievals and/or corrections
Level-2	Sea Surface Temperature (depth variable)	Satellite operators (some redistribution)	You need most recent, highest spatial resolution data*
Level-3	Time/space/sensor merged SST (depth variable)	Operators and/or downstream services	You need a long time series*
Level-4	Gap filled SST (depth variable)	Operators and/or downstream services	You need complete data*

*consider application and product specific caveats.....



What are we using SST for now?

- NWP and climate
 - Tropical cyclone heat potential
 - Ocean heat content
- Marine heatwaves
 - Definition relative to impacts on different species





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Thank you!

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