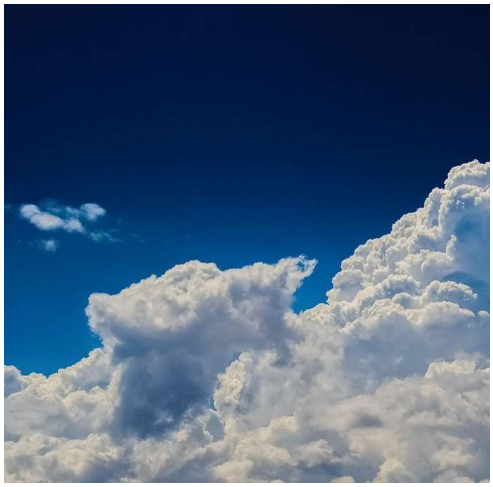
GHRSST
GROUP FOR HIGH RESOLUTION SEA SURFACE TEMPERATURE

# Sea surface temperature:
## An introduction to users on the set of GHRSST products

Group for High Resolution Sea Surface Temperature (GHRSST) https://www.ghrsst.org/
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## Introduction

To measure sea surface temperature (SST), scientists deploy temperature sensors on satellites, drifting and moored buoys, ships, Argo floats, gliders, marine mammals, for example seals, and ocean reference stations (Merchant et al., 2019). In situ measurements from drifting buoys, moorings, Argo floats, and ships are commonly used to calibrate and validate the satellite-derived SST data. SST measurements benefit a wide spectrum of operational applications, including **ocean, weather, climate and seasonal monitoring/ forecasting, military defense operations, validation of atmospheric models, sea turtle tracking, evaluation of coral bleaching, tourism, and commercial fisheries management** (Beggs, 2010; O'Carroll et al., 2019; Merchant et al., 2019).



In this short document we have collected a list of valuable resources for you to use several **GHRSST products** https://www.ghrsst.org/ghrsst-data-services/products/

The Group for High Resolution SST (GHRSST) provides SST products in prescribed formats (GHRSST Science Team, 2012) – Level 2 pre-processed ("L2P") on the original swath projection, Level 3 composite (gridded) products formed using SST from a single swath/scene ("L3U"), single sensor and multiple swaths/scenes ("L3C") or multiple sensors ("L3S"), and Level 4 gap-free SST from multiple sensors/platforms ("L4"). These global and regional spatially-mapped SST products are available for research and operational applications (Beggs, 2010; Donlon et al., 2009).

We refer in this document to **GHRSST product<u>s</u>** because there is no ONE GHRSST product, but a wide range of products that suit different applications, and there are several web-tools available to assist a user to select an SST product, including validation sites.

## How to select a satellite SST product?

To select from an increasingly wide array of SST products, you need to consider which of the following parameters are most important for the application and analyses being undertaken (Beggs, 2021):

- Depth—skin, subskin, or foundation?
- Time—are the dataset duration, local time of measurement, and latency suitable?
- Temporal resolution—what is the characteristic time period of the process you wish to measure?
- Spatial resolution—what is required for the feature/ process of interest?
- Spatial coverage—L3S composite versus L4 gapfree?
- Do you need microwave data to measure SST under cloud, for example during or after a tropical cyclone?
- Quality level (cloud contamination)—what is the minimum acceptable level?
- Geolocation accuracy—native projection (L2P) or gridded (L3 or L4)?
- SST accuracy and stability—with respect to what reference?
- Stability of sensor and orbit—what deviation is acceptable?

Further Information: *Dash et al. (2012), Fiedler et al. (2019), Beggs et al. (2018), Rayner et al. (2019), and Yang et al. (2021)*

## Tools for quick-looks at SST

- A particularly useful web tool for quick-looks at a range of GHRSST L2P, L3U, L3S and L4 SST products over defined ocean regions is the **NOAA/NESDIS/STAR ACSPO Regional Monitor for SST website v2.1 (ARMS)**: https://www.star.nesdis.noaa.gov/socd/sst/arms/
- **CEOS COVERAGE** website https://coverage.ceos.org/ displays GMPE and JPL MUR 25km SST data along with a wide range of other satellite and in-situ ocean data.
- **NOAA/NESDIS/STAR OceanView web tool** displays NOAA GeoPolar Blend L4 SST and fronts https://www.star.nesdis.noaa.gov/socd/ov/ along with other satellite and in-situ ocean data.
- The **Copernicus Marine Service** displays and distributes a suite of L4 and L3S GHRSST products for the European Seas and also global ocean https://marine.copernicus.eu, along with other ocean parameters.
- A web-based visualization tool with many products and ocean variables is the **Ocean Data Laboratory** https://ovl.oceandatalab.com/.
- A list of available L4 GHRSST SST products for visualization over the last 7 days and monitoring is available through the **GMPE tool** https://ghrsst-pp.metoffice.gov.uk/ostia-website/gmpe-monitoring.html.
- Only applicable over Australia and surrounding countries, the **IMOS OceanCurrent** website is really useful for a quick-look at SST, ocean current and ocean color conditions http://oceancurrent.imos.org.au/.

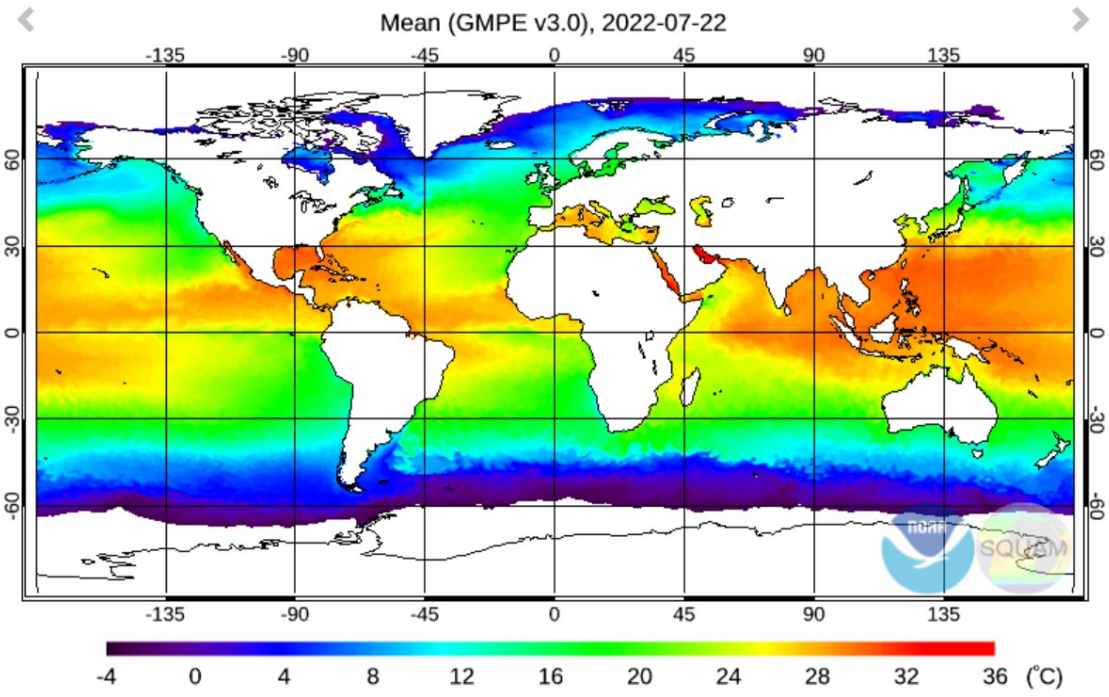



*Figure 1: SST map over the global domain of the GHRSST daily 0.25 degree Multi-Product Ensemble (GMPE). YouSource: NOAA/NESDIS/STAR SQUAM L4 website at https://www.star.nesdis.noaa.gov/socd/sst/squam/analysis/l4*

GHRSST provides its products through the Global Data Assembly Center (GDAC) and Long Term Stewardship and Reanalysis Facility (LTSRF).

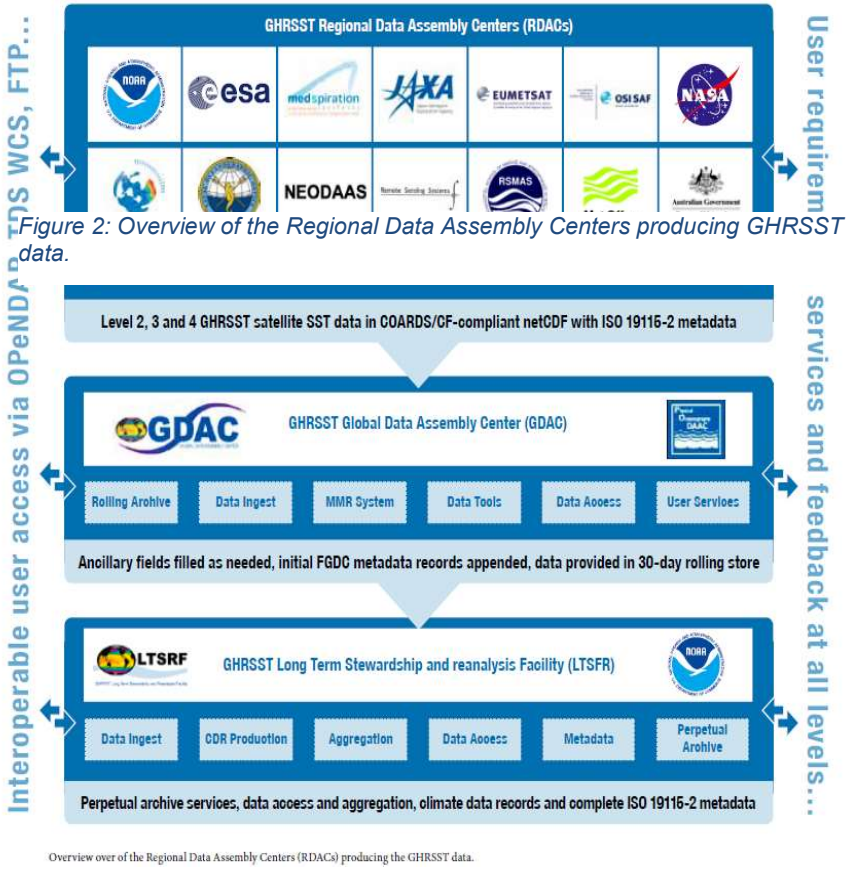



*Figure 2: Overview of the Regional Data Assembly Centers producing GHRSST data.*

**GHRSST Global Data Assembly Center (GDAC):**

https://podaac.jpl.nasa.gov/ghrsst is located at NASA's Physical Oceanography Distributed Active Archive Center (PO.DAAC), and it serves as the near real time clearinghouse for all GHRSST data sets. Here all near real time data can be accessed. The GDAC provides services and tools for accessing all data products, including FTP, HTTP, and OPeNDAP. *Since 2021 PO.DAAC is in the process of migrating its data archive to the Earthdata Cloud, hosted in Amazon Web Services (AWS). During this transition, some data will continue to be available from the on premise archive, while some data will also be available from and within the Earthdata Cloud https://podaac.jpl.nasa.gov/cloud-datasets/migration*

After 30 days, the data are sent to the GHRSST Long Term Stewardship and Reanalysis Facility (LTSRF) at the NOAA National Oceanographic Data Center (NODC), for permanent archive. The LTSRF routinely ingests, formally archives, and provides access to, all GHRSST products: https://www.ncei.noaa.gov/access/ghrsst-long-term-stewardship-and-reanalysis-facility A large metadata transformation process to international standards is also completed at the LTSRF, where robust FGDC and ISO 19115-2 geospatial metadata records are maintained and provided to users. The LTSRF provides both the GHRSST long-term archive and forms the central hub of the distributed GHRSST re-analysis (RAN) system.

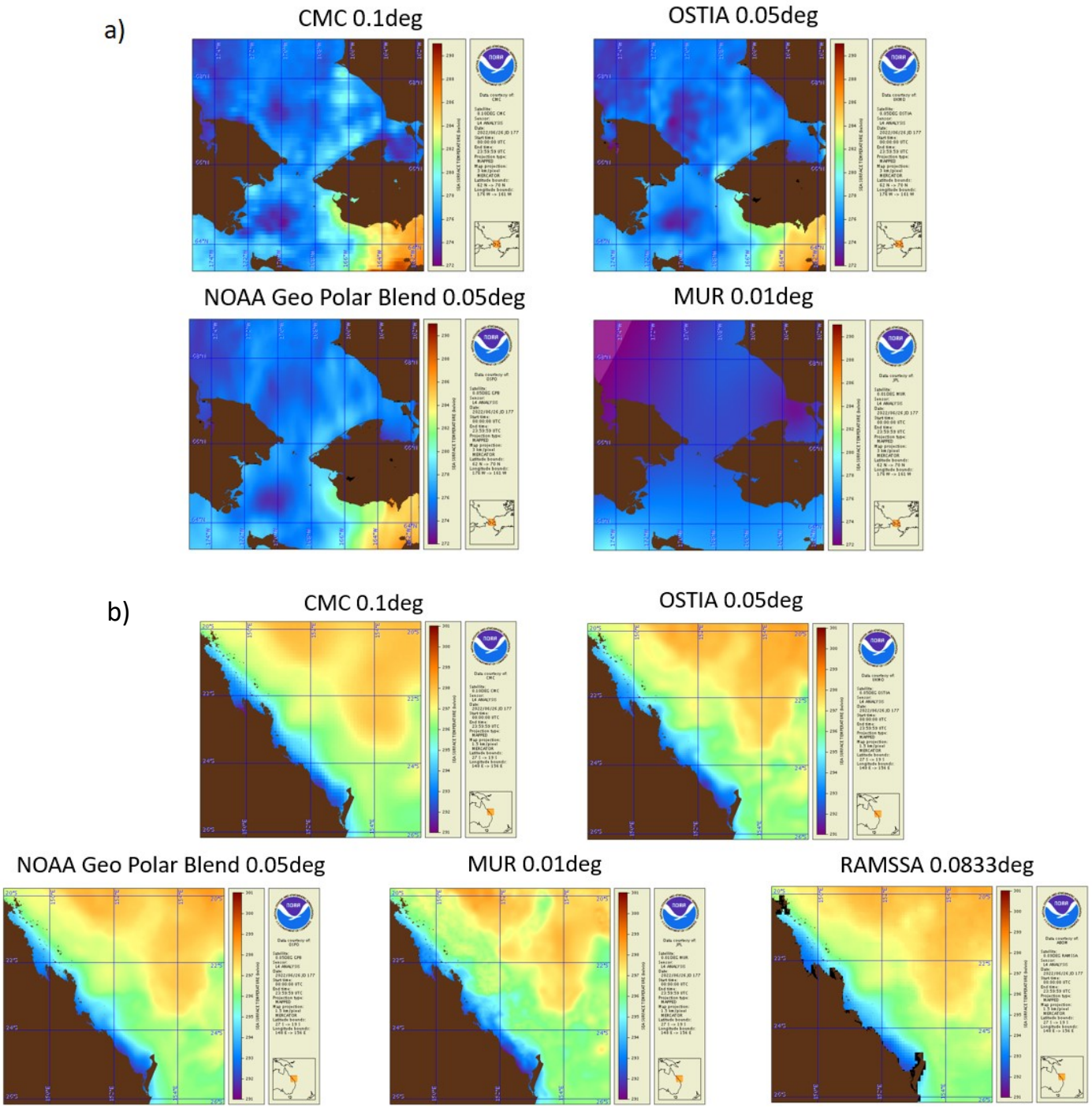
Additional access mechanisms include:

- A THREDDS Data Server providing OGC Web Mapping Service (WMS) and Web Coverage Service (WCS), https://thredds.jpl.nasa.gov/thredds/catalog.html and
- An online analysis, visualization, and sub-setting service based on the Live Access Server (LAS), the PO.DAAC LAS service, found at https://podaac.jpl.nasa.gov/dataaccess (2nd row, 1st option). Direct link: https://podaac-tools.jpl.nasa.gov/las/UI.vm

**Validation of SST products in near real time**

- EUMETSAT L2P: http://metis.eumetsat.int/sst
- JAXA AMSR-2 L2P: https://suzaku.eorc.jaxa.jp/cgi-bin/gcomw/validation/gcomw_validation_ssti1.cgi
- NOAA/NESDIS SQUAM L2P/L3U/L4: SST Quality Monitor 2.1: http://www.star.nesdis.noaa.gov/sod/sst/squam
- NOAA/NESDIS iQUAM: in situ SST Quality Monitor v2.10: https://www.star.nesdis.noaa.gov/socd/sst/iquam/
- UK Met Office L4 validation: https://ghrsst-pp.metoffice.gov.uk/ostia-website/gmpe-argo-stats.html

*Figure 3: Comparison a) Four high-res L4 SSTs plotted over Bering Strait on 26 June 2022 show significant differences; b) Five high-res L4 SSTs plotted over southern Great Barrier Reef and EAC on 26 June 2022 show lesser differences. Source: https://www.star.nesdis.noaa.gov/socd/sst/arms (Courtesy of H. Beggs)*



**More resources for you**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