

The ODYSSEA Multi-Sensor Sea Surface Temperature Analysis



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The ODYSSEA processing chain described here produces daily gap-free maps of sea surface temperature, referred as L4 product, using satellite data from both infra-red and micro-wave radiometers. They aim at feeding global ocean models within Mersea and next within MyOcean.

This work is the result of a close collaboration with Météo-France for data selection and correction procedures.

1 Data collection

ODYSSEA uses multiple sources of satellite sea surface temperature (SST) observations. Only SST data complying to GHRSSST standard model have been considered as input for their homogeneous format and content. Self contained ancillary fields are particularly useful for the selection and filtering process.

All these datasets have been selected to complement each other in order to get a maximum sampling of ocean surface through :

- different coverage areas (depending on the sensor orbit and swath width or limited acquisition by ground stations)
- different sampling time and frequency (once or twice per day for polar orbiters to every 30 minutes for geostationary satellites)
- different resolution (1 km for infra-red radiometer to 25 km for microwave radiometers)
- different sensitivities (e.g. microwave instruments such AMSRE and TMI are not sensitive to clouds unlike the infra-red radiometers, but have a coarser resolution)

2 Selection and filtering

The data in original full-resolution swath format are screened in order to remove all bad measurements and select the best ones :

- ancillary fields are used to removed data possibly contaminated by sea ice, aerosols, clouds or other effects
- error statistics available within the L2P files are used to correct sensor bias
- adjustment to subskin temperature is applied if necessary (a dedicated statistical model has been developed in ODYSSEA for AATSR)
- day time data are removed. The night time subskin SST is considered as the best proxy to the foundation SST, which can be described as the SST unaffected by diurnal cycle and which is used by modellers. No model for subskin to foundation SST conversion is satisfying so far.

3 Correction

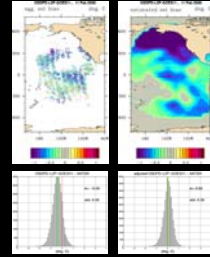


Illustration of the correction step.
 Top : aggregated local SST biases between the sensor to be calibrated and the reference within +/- 10 days around the processing date (left) and estimated bias (right).
 Bottom : histogram of difference between SST observations of the day and the reference before (left) and after (right) correction.

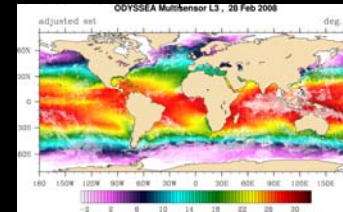
The correction step aims at removing any large scale bias from each datasets, making all observations consistent and homogeneous before merging them together. It is performed by computing daily a bias field between the dataset to correct and a reference dataset (currently AATSR onboard ENVISAT). This bias field is then subtracted to the sensor observations

4 Fusion

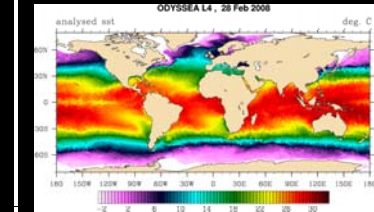
A multisensor gridded file (L3) is the result of the merging of all the native sensor files of the day.

It provides the most complete field of SST observations for a given day, selecting for each grid point the best and most accurate observation available.

It constitutes both an input for the ODYSSEA L4 step and an output product (L3) of our processing chain since it is of high interest for some applications, such as assimilation into ocean circulation models.



5 Optimal interpolation



A geostatistical analysis method (optimal interpolation) constructs a gap-free SST field from the observations set (L3) and a priori statistics. Casey climatology is used as first guess.

ODYSSEA products

Multisensor gridded observation (L3), daily, global, 0.1° degree resolution : contains at each grid point the best observation among all available sensors within +/- 3 days around the product time (and taking into account proximity to this time as selection criteria). The product contains for each pixel the source of the data, time difference to actual product time, original and corrected SST value.

Multisensor interpolated product (L4), daily, global, 0.1° degree resolution : gap-free foundation SST field computed from the above product. Contains also an estimation of error.

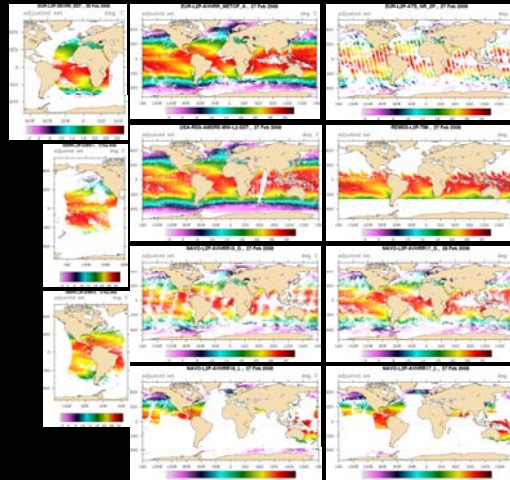
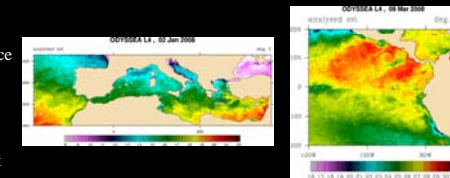
All data are available in NetCDF format and comply to GHRSSST format specification.

Odyssea dedicated web site :
http://www.mersea.eu.org/Satellite/sst_validation.html
 The web site provides many resources for the daily control of input data and the assessment of ODYSSEA products quality.

Ftp data server :
<ftp://ftp.ifremer.fr/ifremer/medspiration/data/4hrsstfnd/eurdac/glob/odyssea>

Regional products

ODYSSEA processing chain is also used to produce higher resolution products (2km) over regional areas in the context of ESA/MEDSPIRATION project (www.medspiration.org). Mediterranean sea, North-West European shelves and Pacific South and Central America are available so far but new areas will be opened soon.



| Input product | Source | Resolution | Status |
|--------------------------------------|-----------|------------|----------|
| ENVISAT/AATSR | ESA | 1 km | Enabled |
| METOP-A/AVHRR | O&SI SAF | 1 km | Soon |
| NOAA17/AVHRR-LAC NOAA18/AVHRR-LAC | NAVOCEANO | 1 km | Enabled |
| NOAA17/AVHRR-NAR NOAA18/AVHRR-NAR | O&SI SAF | 2 km | Enabled |
| NOAA17/AVHRR-GAC NOAA18/AVHRR-GAC | NAVOCEANO | 1 km | Enabled |
| GOES11 | NOAA | 3-4 km | Disabled |
| GOES12 | NOAA | 3-4 km | Disabled |
| MSG/SEVIRI | O&SI SAF | 10 km | Enabled |
| AMSRE | REMSS | 25 km | Enabled |
| TMI | REMSS | 25 km | Enabled |

