EUMETSAT

OSI SAF

OCEAN AND SEA ICE

**MSG/SEVIRI Sea Surface Temperature data record
Product User Manual**

OSI-250

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Documentation change record

Version	Date	Authors	Description
0.1	15/12/2017	MF/CMS	Initial submitted version
0.2	26/1/2018	MF/CMS	Updated version taking into account RIDs from DRR: minor corrections
1.0	23/4/2018	MF/CMS	First public release.

Contents

1   Introduction

The EUMETSAT Satellite Application Facilities (SAFs) are dedicated centres of excellence for processing satellite data. They form an integral part of the distributed EUMETSAT Application Ground Segment. The Ocean and Sea Ice SAF, led by Météo-France/Centre de Météorologie Spatiale (MF/CMS), has the responsibility of developing, validating and distributing near real time products of Sea Surface Temperature (SST), radiative fluxes, wind and Sea Ice for a variety of platforms/sensors.

As part of the Second Continuous Development and Operations Phase (CDOP-2) OSI SAF (more specifically MF/CMS) has engaged into the reprocessing of SST from the MSG/ SEVIRI archive from 2004 to 2012.

1.1   Purpose and scope of the document

The product user manual of the OSI SAF MSG/SEVIRI data record has been written as part of the Delivery Readiness Review process of the EUMETSAT for the reprocessing of the MSG/-SEVIRI archive from 2004 to 2012: product OSI-250.

In this document brief overview of the SST retrieval is provided in section 2, and a detailed description of the data is given in section 3.

This document is complemented by the Algorithm Theoretical Basis Document for MSG/-SEVIRI Sea Surface Temperature data record [RD.1] and the MSG/SEVIRI Sea Surface Temperature data record Scientific Validation Report [RD.2].

1.2   Reference documents

[RD.1]	Algorithm Theoretical Basis Document for MSG/SEVIRI Sea Surface Temperature data record - OSI 250	SAF/OSI/CDOP3/MF/ SCI/MA/256
[RD.2]	MSG/SEVIRI Sea Surface Temperature data record Scientific Validation Report - OSI 250	SAF/OSI/CDOP3/MF/ SCI/RP/310
[RD.3]	Product User Manual SEVIRI cloud mask data set CM-21012	SAF/CM/DWD/PUM/ SEV/CLM v1.1

1.3   Applicable documents

Ref	Title	Code
[AD.1]	OSI SAF CDOP-3. Product Requirement Document version 1.1, 20/11/2017	SAF/OSI/CDOP3/MF/MGT/PL/2-001
[AD.2]	OSI SAF Service Specification version 1.2, 20/11/2017	SAF/OSI/CDOP3/MF/MGT/PL/003

1.4   Acronyms

BT	Brightness Temperature
ECMWF	European Centre for Medium-range Weather Forecasts
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
GHRSST	Group for High Resolution SST
IR	Infra-Red
L2P	Level 2 Pre-processed
L3C	Level 3 Collated

MF/CMS	Météo France/Centre de Météorologie Spatiale
MSG	Meteosat Second Generation
NWP	Numerical Weather Prediction
OSI SAF	Ocean and Sea Ice Satellite Application Facility
OSTIA	Operational Sea Surface Temperature and Sea Ice Analysis
QL	Quality Level
RTTOV	Radiative Transfer for TOVS
SAF	Satellite Application Facility
SDI	Saharan Dust Index
SEVIRI	Spinning Enhanced Visible and InfraRed Imager
SSES	Sensor Specific Error Statistics
SST	Sea Surface Temperature
SD	Standard Deviation
TIROS	Television Infrared Observation Satellite
TOVS	TIROS Operational Vertical Sounder

1.5 Disclaimer

All intellectual property rights of the OSI SAF products belong to EUMETSAT. The use of these products is granted to every interested user, free of charge. If you wish to use these products, EUMETSAT's copyright credit must be shown by displaying the words "Copyright © <YYYY> EUMETSAT" on each of the products used.

1.6 Helpdesk and data availability

Users are welcomed and encouraged to contact the OSI SAF in case of questions or problems with OSI SAF products. OSI SAF supports the users to the extent possible. Please use the helpdesk form available on the OSI SAF web site `osi-saf.eumetsat.int` (you might need to register on the web site to send the form).

The MSG/SEVIRI SST data record is available on IFREMER FTP server (Access right are provided after registration on `osi-saf.eumetsat.int`) and from the EUMETSAT Data Center (EDC) (`http://navigator.eumetsat.int/`).

2 Overview of MSG/SEVIRI data record

2.1 MSG/SEVIRI

MSG1 and MSG2 are geostationary satellites operated by the EUMETSAT renamed Meteosat-8 and Meteosat-9 respectively once operational.

The SEVIRI instrument has the capacity to observe the Earth (full disk) in 12 spectral bands. Infrared channels have a ground sampling of 3km at nadir. MSG satellites spin counter-clockwise at 100 rotations per minute enabling the acquisition of a full disk (slot) every 15 minutes.

2.2 Summary of SST retrieval procedures

SST computation relies on the cloud mask provided by the Climate Monitoring SAF [RD.3], it is computed for all clear sky pixels. The cloud mask control procedure is used to assign a lower quality level to pixels which are dubious (thin cloud, dust aerosols,...). It consists of a series of tests that consider various quantities such as the local values of the gradient, temperature, probability of ice, etc.. These tests ultimately result in the pixel quality level.

For each satellite, computation of SST is based on two quasi-linear algorithms (daytime and night-time algorithms are different) using brightness temperatures from the SEVIRI instrument at 10.8 and $12.0 \mu m$. Coefficients are determined by regression over simulations from a radiative transfer model. The algorithms are de-biased against drifting buoys measurements.

Regional and seasonal biases are corrected for by using the algorithm correction scheme developed by Le Borgne et al. (2011). It relies on pixel-wise brightness temperature simulations from RTTOV radiative transfer model using NWP atmospheric profiles and OSTIA SST analysis (Donlon et al., 2012) and re-analysis (Roberts-Jones et al., 2012).

SST is processed for each slot and an hourly synthesis is performed using best quality and nearest pixels.

Details of the calculation of SST can be found in the Algorithm Theoretical Basis Document [RD.1]. Detailed validation of the data record is presented in the Scientific Validation Report [RD.2], the product target accuracy being defined in the OSI SAF Service Specification Document [AD.2].

2.3 Data record characteristics

The MSG/SEVIRI SST data record is provided for Meteosat-8 and Meteosat-9 for the following periods:

- Meteosat-08: 2004-01-19 to 2007-04-11

- Meteosat-09: 2007-04-12 to 2012-12-31

During the period of reprocessing (2004-2012) the two satellites Meteosat-08 and Meteosat-09 were operational:

However, Meteosat-08 replaced Meteosat-09 for some short periods listed the table below:

Table 1: *Periods when Meteosat-8 replaced Meateosat-9.*

Start	End	Duration
2008-05-14 01:00:00	2008-05-16 12:00:00	2 days and 12 h
2008-12-01 12:00:00	2008-12-09 00:00:00	7 days and 13 h
2009-04-17 19:00:00	2009-04-23 09:00:00	5 days and 13 h
2009-08-17 05:00:00	2009-08-21 08:00:00	4 days and 4 h

The SST product consists of hourly synthesis centred on the hour. It is remapped onto a regular cylindrical equidistant latitude/longitude grid at 0.05° resolution and extends from 60°S to 60°N and 60°W to 60°E.

2.4 SST definition

Infrared channels used in the retrieval are sensitive to skin temperature, however due to the way the algorithm is de-biased, the retrieved SST is a sub-skin temperature comparable to drifting buoy measurements. It is equivalent to bulk SST at night, but during daytime it can be significantly different under favorable (clear sky and low wind) diurnal warming conditions.

Skin SST can be estimated by subtracting 0.17K from the provided SST (Donlon et al., 2002). However this offset is only a very rough conversion term valid at large scale for wind speed exceeding $6\,m\,s^{-1}$.

2.5 Quality level

A method compatible with the recommendations of GHRSST is adopted. For IR derived products, the normalized quality level scale consists of 6 values. A quality level is provided at pixel level, with increasing reliability from 2 (worst quality usable data) to 5 (best quality usable data); 0 means unprocessed and 1 means cloudy.

Users are advised to use quality levels 3 to 5 for quantitative applications.

3 Data description

3.1 File format

The MSG/SEVIRI SST data record is provided as Level 3 collated files (L3C) in NetCDF4 format compliant with GHRSST data specification version 2 (GHRSST Science Team, 2011).

Naming conventions:
YYYYMMDDHHmmss-OSISAF-L3C_GHRSST-SSTsubskin-SEVIRI_SST-ssteqc_<Satellite>_YYYYMMDD_HHmmss-<GDS_version>-<File_version>.nc

<Satellite> is meteosat08 or meteosat09
<GDS version> is the version of the GHRSST data specification applicable to the dataset, 2.0 in this case
<File version> is the version of the processing

3.2 Variables included

The content of the hourly files is given in appendix B for a sample field. The definitions of the variables are:

- **time** : reference time of the file

- **lat/lon**: latitude/longitude grid in degree North/East

- **or_latitude/or_longitude**: Original latitude/longitude of the satellite measurement as provided in the L2P

- **l2p_mask**: describes the land/ice/lake mask

- **satellite_zenith_angle** : The satellite zenith angle at the time of observation

- **solar_zenith_angle** : The solar zenith angle at the time of observation

- **sea_surface_temperature** : SST provided in Kelvin

- **quality_level** : pixel-wise quality level ranging from 0 to 5, see 2.5

- **sses_bias/sses_standard_deviation** :estimate of the error characteristics at pixel level, derived from exploiting the validation results against drifting buoys measurements.

- **dt_analysis** : Difference between the delivered SST and the last available OSTIA SST analysis (previous day).

- **wind_speed** : 10 meter wind speed derived from ECMWF ERA-Interim

- **sea_ice_fraction** : Fractional ice cover from OSTIA analysis

- **aerosol_dynamic_indicator** : Information regarding the aerosol loading of the atmosphere. In our case, it is the SEVIRI derived Saharan Dust Index (SDI, see [RD.1])

- **adi_dtime_from_sst** :age of the aerosol information relative to the time of SST observation

- **sources_of_adi** :nature of the aerosol indicator. This information is essential for using this indicator, since they can be distinct in nature (and units) depending on their origin.

3.3 Data volume

Single hourly files are about 9 Mo which represents about 3.3Go per annum.

References

Donlon, C. J., Martin, M., Stark, J., Roberts-Jones, J., Fiedler, E., and Wimmer, W. (2012). The operational sea surface temperature and sea ice analysis (OSTIA) system. *Remote Sensing of Environment*, 116:140—-158.

Donlon, C. J., Minnett, P. J., Gentemann, C., Nightingale, T. J., Barton, I. J., Ward, B., and Murray, M. J. (2002). Toward improved and validation of satellite and sea surface and skin temperature and measurements and for climate and research. *Journal of Climate*, 15:353–359.

GHRSST Science Team (2011). *The Recommended GHRSST Data Specification (GDS) 2.0*, available from the GHRSST international project office edition.

Le Borgne, P., Roquet, H., and Merchant, C. (2011). Estimation of sea surface temperature from the spinning enhanced visible and infrared imager, improved using numerical weather prediction. *Remote Sensing of Environment*, 115(1):55–65.

Roberts-Jones, J., Fiedler, E., and Martin, M. (2012). Daily, global, high-resolution sst and sea ice reanalysis for 1985-2007 using the ostia system. *Journal of Climate*, 25(18):6215–6232.

Appendices

A Missing dates

List of missing data in MSG/SEVIRI data record.

Start date	End date	Duration
2004-01-20 11:00:00	2004-01-21 09:00:00	23 h
2004-01-24 01:00:00	2004-01-24 01:00:00	1 h
2004-03-28 03:00:00	2004-03-28 06:00:00	4 h
2004-04-15 02:00:00	2004-04-15 03:00:00	2 h
2004-06-23 05:00:00	2004-06-23 05:00:00	1 h
2004-10-04 07:00:00	2004-10-07 06:00:00	3 days 0 h
2004-10-12 22:00:00	2004-10-12 22:00:00	1 h
2004-10-13 08:00:00	2004-10-13 08:00:00	1 h
2005-01-10 14:00:00	2005-01-13 12:00:00	2 days 23 h
2005-04-18 04:00:00	2005-04-18 12:00:00	9 h
2005-06-20 12:00:00	2005-06-20 12:00:00	1 h
2006-01-09 14:00:00	2006-01-12 13:00:00	3 days 0 h
2006-05-18 13:00:00	2006-05-18 15:00:00	3 h
2006-09-23 15:00:00	2006-10-05 10:00:00	11 days 20 h
2007-04-11 14:00:00	2007-04-11 23:00:00	10 h
2007-06-05 07:00:00	2007-06-05 07:00:00	1 h
2007-08-26 09:00:00	2007-08-26 09:00:00	1 h
2007-08-27 14:00:00	2007-08-27 14:00:00	1 h
2007-08-31 22:00:00	2007-08-31 22:00:00	1 h
2007-10-20 02:00:00	2007-10-20 02:00:00	1 h
2007-10-25 16:00:00	2007-10-25 18:00:00	3 h
2008-01-12 03:00:00	2008-01-12 03:00:00	1 h
2008-01-23 11:00:00	2008-01-23 11:00:00	1 h
2008-02-12 09:00:00	2008-02-12 11:00:00	3 h
2008-03-20 23:00:00	2008-03-20 23:00:00	1 h
2008-03-30 22:00:00	2008-03-30 22:00:00	1 h
2008-04-01 20:00:00	2008-04-01 23:00:00	4 h
2008-04-02 18:00:00	2008-04-02 23:00:00	6 h
2008-04-03 18:00:00	2008-04-03 23:00:00	6 h
2008-04-04 18:00:00	2008-04-04 23:00:00	6 h
2008-04-05 18:00:00	2008-04-05 19:00:00	2 h
2008-04-05 21:00:00	2008-04-05 23:00:00	3 h
2008-04-06 18:00:00	2008-04-06 23:00:00	6 h
2008-04-07 18:00:00	2008-04-07 23:00:00	6 h
2008-04-08 19:00:00	2008-04-08 23:00:00	5 h
2008-04-09 18:00:00	2008-04-09 23:00:00	6 h
2008-04-10 18:00:00	2008-04-10 23:00:00	6 h
2008-04-11 18:00:00	2008-04-11 23:00:00	6 h
2008-04-12 18:00:00	2008-04-12 23:00:00	6 h

Start date	End date	Duration
2008-04-13 18:00:00	2008-04-13 23:00:00	6 h
2008-04-14 18:00:00	2008-04-14 23:00:00	6 h
2008-04-15 18:00:00	2008-04-15 23:00:00	6 h
2008-04-16 18:00:00	2008-04-16 18:00:00	1 h
2008-04-16 20:00:00	2008-04-16 23:00:00	4 h
2008-04-17 18:00:00	2008-04-17 23:00:00	6 h
2008-04-18 18:00:00	2008-04-18 23:00:00	6 h
2008-04-19 18:00:00	2008-04-19 23:00:00	6 h
2008-04-20 18:00:00	2008-04-20 23:00:00	6 h
2008-04-21 18:00:00	2008-04-21 23:00:00	6 h
2008-04-22 19:00:00	2008-04-22 23:00:00	5 h
2008-04-23 18:00:00	2008-04-23 23:00:00	6 h
2008-04-24 18:00:00	2008-04-24 23:00:00	6 h
2008-04-25 18:00:00	2008-04-25 18:00:00	1 h
2008-04-25 20:00:00	2008-04-25 23:00:00	4 h
2008-04-26 18:00:00	2008-04-26 23:00:00	6 h
2008-04-27 18:00:00	2008-04-27 23:00:00	6 h
2008-04-28 18:00:00	2008-04-28 23:00:00	6 h
2008-04-29 14:00:00	2008-04-29 23:00:00	10 h
2008-04-30 13:00:00	2008-04-30 23:00:00	11 h
2008-05-05 13:00:00	2008-05-05 23:00:00	11 h
2008-05-13 22:00:00	2008-05-14 00:00:00	3 h
2008-05-16 13:00:00	2008-05-19 09:00:00	2 days 21 h
2008-05-19 14:00:00	2008-05-19 14:00:00	1 h
2008-05-20 06:00:00	2008-05-20 06:00:00	1 h
2008-06-01 20:00:00	2008-06-01 23:00:00	4 h
2008-06-02 19:00:00	2008-06-02 23:00:00	5 h
2008-06-03 20:00:00	2008-06-03 20:00:00	1 h
2008-06-03 22:00:00	2008-06-03 23:00:00	2 h
2008-06-04 19:00:00	2008-06-04 23:00:00	5 h
2008-06-05 20:00:00	2008-06-05 23:00:00	4 h
2008-06-06 20:00:00	2008-06-06 23:00:00	4 h
2008-06-07 21:00:00	2008-06-07 23:00:00	3 h
2008-06-08 21:00:00	2008-06-08 23:00:00	3 h
2008-06-09 20:00:00	2008-06-09 23:00:00	4 h
2008-06-10 20:00:00	2008-06-10 23:00:00	4 h
2008-06-11 20:00:00	2008-06-11 22:00:00	3 h
2008-06-12 19:00:00	2008-06-12 23:00:00	5 h
2008-06-13 19:00:00	2008-06-13 23:00:00	5 h
2008-06-14 20:00:00	2008-06-14 23:00:00	4 h
2008-06-15 21:00:00	2008-06-15 23:00:00	3 h
2008-06-16 21:00:00	2008-06-16 23:00:00	3 h
2008-06-17 21:00:00	2008-06-17 23:00:00	3 h
2008-06-18 20:00:00	2008-06-18 23:00:00	4 h

Start date	End date	Duration
2008-06-19 19:00:00	2008-06-19 23:00:00	5 h
2008-06-20 19:00:00	2008-06-20 23:00:00	5 h
2008-06-21 19:00:00	2008-06-21 23:00:00	5 h
2008-06-22 19:00:00	2008-06-22 23:00:00	5 h
2008-06-23 20:00:00	2008-06-23 23:00:00	4 h
2008-06-24 19:00:00	2008-06-24 23:00:00	5 h
2008-06-25 18:00:00	2008-06-25 23:00:00	6 h
2008-06-26 19:00:00	2008-06-26 23:00:00	5 h
2008-06-27 18:00:00	2008-06-27 23:00:00	6 h
2008-06-28 18:00:00	2008-06-28 23:00:00	6 h
2008-06-29 18:00:00	2008-06-29 23:00:00	6 h
2008-06-30 19:00:00	2008-07-01 00:00:00	6 h
2008-12-09 01:00:00	2008-12-09 11:00:00	11 h
2009-04-17 17:00:00	2009-04-17 18:00:00	2 h
2009-04-20 06:00:00	2009-04-20 06:00:00	1 h
2009-07-09 01:00:00	2009-07-09 01:00:00	1 h
2009-07-09 09:00:00	2009-07-09 09:00:00	1 h
2009-07-09 17:00:00	2009-07-09 19:00:00	3 h
2009-07-21 12:00:00	2009-07-21 13:00:00	2 h
2009-08-15 06:00:00	2009-08-17 04:00:00	1 days 23 h
2009-09-03 21:00:00	2009-09-04 04:00:00	8 h
2011-02-28 13:00:00	2011-02-28 13:00:00	1 h
2011-03-16 21:00:00	2011-03-16 22:00:00	2 h
2011-09-04 22:00:00	2011-09-05 02:00:00	5 h
2012-07-10 09:00:00	2012-07-10 09:00:00	1 h
2012-07-12 10:00:00	2012-07-12 10:00:00	1 h
2012-08-31 01:00:00	2012-08-31 03:00:00	3 h

B   NetCDF data fomat

```
dimensions :
        time = UNLIMITED ;  // (1  currently )
        lon = 2400  ;
        lat = 2400  ;
variables :
        int  time ( time )  ;
                time : long_name = " reference  time  of  sst  file " ;
                time : standard_name = " time "  ;
                time : axis = "T"  ;
                time : units = " seconds  since  1981−01−01  00:00:00 "  ;
        float  lat ( lat )  ;
                lat : long_name = " latitude "  ;
                lat : standard_name = " latitude "  ;
                lat : axis = "Y"  ;
                lat : units = " degrees_north "  ;
                lat : valid_min = −90. f  ;
                lat : valid_max = 90. f  ;
                lat : comment = " geographical  coordinates , WGS84
                    projection "  ;
        float  lon ( lon )  ;
                lon : long_name = " longitude "  ;
                lon : standard_name = " longitude "  ;
                lon : axis = "X"  ;
                lon : units = " degrees_east "  ;
                lon : valid_min = −180. f  ;
                lon : valid_max = 180. f  ;
                lon : comment = " geographical  coordinates , WGS84
                    projection "  ;
        short  sea_surface_temperature ( time ,  lat ,  lon )  ;
                sea_surface_temperature : _FillValue = −32768s  ;
                sea_surface_temperature : long_name = " sea  surface
                    subskin  temperature "  ;
                sea_surface_temperature : standard_name = "
                    sea_surface_subskin_temperature "  ;
                sea_surface_temperature : units = " kelvin "  ;
                sea_surface_temperature : add_offset = 273.15  ;
                sea_surface_temperature : scale_factor = 0.01  ;
                sea_surface_temperature : valid_min = −300s  ;
                sea_surface_temperature : valid_max = 4500s  ;
                sea_surface_temperature : depth = "1  millimeter "  ;
                sea_surface_temperature : source = "SEVIRI"  ;
                sea_surface_temperature : comment = " Temperature  of  the
                    subskin  of  the  ocean "  ;
        int  sst_dtime ( time ,  lat ,  lon )  ;
                sst_dtime : _FillValue = −2147483648  ;
                sst_dtime : long_name = " time  difference  from  reference
                    time "  ;
```

```
        sst_dtime:units = "seconds" ;
        sst_dtime:add_offset = 0. ;
        sst_dtime:scale_factor = 1. ;
        sst_dtime:valid_min = −2147483647 ;
        sst_dtime:valid_max = 2147483647 ;
        sst_dtime:comment = "time plus sst_dtime gives
            seconds after 00:00:00 UTC January 1, 1981" ;
byte sses_bias(time, lat, lon) ;
        sses_bias:_FillValue = −128b ;
        sses_bias:long_name = "SSES bias estimate" ;
        sses_bias:units = "kelvin" ;
        sses_bias:add_offset = 0. ;
        sses_bias:scale_factor = 0.01 ;
        sses_bias:valid_min = −127b ;
        sses_bias:valid_max = 127b ;
        sses_bias:comment = "Bias estimate derived using the
            techniques described at http://www.ghrsst.org/SSES
            −Description−of−schemes.html" ;
byte sses_standard_deviation(time, lat, lon) ;
        sses_standard_deviation:_FillValue = −128b ;
        sses_standard_deviation:long_name = "SSES standard
            deviation" ;
        sses_standard_deviation:units = "kelvin" ;
        sses_standard_deviation:add_offset = 1. ;
        sses_standard_deviation:scale_factor = 0.01 ;
        sses_standard_deviation:valid_min = −127b ;
        sses_standard_deviation:valid_max = 127b ;
        sses_standard_deviation:comment = "Standard deviation
            estimate derived using the techniques described
            at http://www.ghrsst.org/SSES−Description−of−
            schemes.html" ;
byte dt_analysis(time, lat, lon) ;
        dt_analysis:_FillValue = −128b ;
        dt_analysis:long_name = "deviation from SST analysis
            or reference climatology" ;
        dt_analysis:units = "kelvin" ;
        dt_analysis:add_offset = 0. ;
        dt_analysis:scale_factor = 0.1 ;
        dt_analysis:valid_min = −127b ;
        dt_analysis:valid_max = 127b ;
        dt_analysis:reference = "NODATA" ;
        dt_analysis:comment = "The difference between this
            SST and the previous day\'s SST analysis" ;
byte wind_speed(time, lat, lon) ;
        wind_speed:_FillValue = −128b ;
        wind_speed:long_name = "10m wind speed" ;
        wind_speed:standard_name = "wind_speed" ;
        wind_speed:units = "m s−1" ;
        wind_speed:height = "10 m" ;
```

```
        wind_speed:add_offset = 0. ;
        wind_speed:scale_factor = 1. ;
        wind_speed:valid_min = 0b ;
        wind_speed:valid_max = 127b ;
        wind_speed:time_offset = 0. ;
        wind_speed:source = "NODATA" ;
        wind_speed:comment = "These wind speeds were created
            by the ECMWF and represent winds at 10 metres
            above the sea surface. " ;
byte sea_ice_fraction(time, lat, lon) ;
        sea_ice_fraction:_FillValue = −128b ;
        sea_ice_fraction:long_name = "sea ice fraction" ;
        sea_ice_fraction:standard_name = "
            sea_ice_area_fraction" ;
        sea_ice_fraction:units = " " ;
        sea_ice_fraction:add_offset = 0. ;
        sea_ice_fraction:scale_factor = 0.01 ;
        sea_ice_fraction:valid_min = 0b ;
        sea_ice_fraction:valid_max = 100b ;
        sea_ice_fraction:time_offset = 0. ;
        sea_ice_fraction:source = "NODATA" ;
        sea_ice_fraction:comment = "from OSTIA" ;
byte aerosol_dynamic_indicator(time, lat, lon) ;
        aerosol_dynamic_indicator:_FillValue = −128b ;
        aerosol_dynamic_indicator:long_name = "aerosol
            dynamic indicator" ;
        aerosol_dynamic_indicator:units = " " ;
        aerosol_dynamic_indicator:add_offset = 0. ;
        aerosol_dynamic_indicator:scale_factor = 0.1 ;
        aerosol_dynamic_indicator:valid_min = 0b ;
        aerosol_dynamic_indicator:valid_max = 127b ;
        aerosol_dynamic_indicator:source = "sources_of_adi" ;
        aerosol_dynamic_indicator:comment = "" ;
byte adi_dtime_from_sst(time, lat, lon) ;
        adi_dtime_from_sst:_FillValue = −128b ;
        adi_dtime_from_sst:long_name = "time difference of
            ADI data from sst measurement" ;
        adi_dtime_from_sst:units = "hour" ;
        adi_dtime_from_sst:add_offset = 0. ;
        adi_dtime_from_sst:scale_factor = 0.1 ;
        adi_dtime_from_sst:valid_min = −127b ;
        adi_dtime_from_sst:valid_max = 127b ;
        adi_dtime_from_sst:comment = "Difference in hours
            between the ADI and SST data" ;
byte sources_of_adi(time, lat, lon) ;
        sources_of_adi:_FillValue = −128b ;
        sources_of_adi:long_name = "sources of aerosol
            dynamic indicator" ;
        sources_of_adi:valid_min = 0b ;
```

```
        sources_of_adi:valid_max = 2b ;
        sources_of_adi:flag_meanings = "no_data AOD–MACC–ADI
            SDI–OSISAF–ADI" ;
        sources_of_adi:flag_values = 0b, 1b, 2b ;
        sources_of_adi:comment = "This variable provides a
            pixel by pixel description of where aerosol
            optical depth were derived from." ;
    int l2p_flags(time, lat, lon) ;
        l2p_flags:long_name = "L2P flags" ;
        l2p_flags:valid_min = 0s ;
        l2p_flags:valid_max = 15s ;
        l2p_flags:flag_meanings = "microwave land ice lake" ;
        l2p_flags:flag_masks = 1s, 2s, 4s, 8s ;
        l2p_flags:comment = "These flags are important to
            properly use the data." ;
    byte quality_level(time, lat, lon) ;
        quality_level:_FillValue = −128b ;
        quality_level:long_name = "quality level of SST pixel
            " ;
        quality_level:valid_min = 0b ;
        quality_level:valid_max = 5b ;
        quality_level:flag_meanings = "no_data bad_data
            worst_quality low_quality acceptable_quality
            best_quality" ;
        quality_level:flag_values = 0b, 1b, 2b, 3b, 4b, 5b ;
        quality_level:comment = "These are the overall
            quality indicators and are used for all GHRSST
            SSTs" ;
    byte satellite_zenith_angle(time, lat, lon) ;
        satellite_zenith_angle:_FillValue = −128b ;
        satellite_zenith_angle:long_name = "satellite zenith
            angle" ;
        satellite_zenith_angle:units = "angular_degree" ;
        satellite_zenith_angle:add_offset = 0. ;
        satellite_zenith_angle:scale_factor = 1. ;
        satellite_zenith_angle:valid_min = −90b ;
        satellite_zenith_angle:valid_max = 90b ;
        satellite_zenith_angle:comment = "The satellite
            zenith angle at the time of the SST observations."
             ;
    byte solar_zenith_angle(time, lat, lon) ;
        solar_zenith_angle:_FillValue = −128b ;
        solar_zenith_angle:long_name = "solar zenith angle" ;
        solar_zenith_angle:units = "angular_degree" ;
        solar_zenith_angle:add_offset = 90. ;
        solar_zenith_angle:scale_factor = 1. ;
        solar_zenith_angle:valid_min = −90b ;
        solar_zenith_angle:valid_max = 90b ;
```

```
                solar_zenith_angle:comment = "The solar zenith angle
                    at the time of the SST observations." ;
        short or_latitude(time, lat, lon) ;
                or_latitude:_FillValue = −32768s ;
                or_latitude:long_name = "original latitude of the SST
                     value" ;
                or_latitude:standard_name = "latitude" ;
                or_latitude:units = "degrees_north" ;
                or_latitude:add_offset = 0. ;
                or_latitude:scale_factor = 0.01 ;
                or_latitude:valid_min = −9000s ;
                or_latitude:valid_max = 9000s ;
                or_latitude:comment = "Original latitude of the SST
                    value" ;
        short or_longitude(time, lat, lon) ;
                or_longitude:_FillValue = −32768s ;
                or_longitude:long_name = "original longitude of the
                    SST value" ;
                or_longitude:standard_name = "longitude" ;
                or_longitude:units = "degrees_east" ;
                or_longitude:add_offset = 0. ;
                or_longitude:scale_factor = 0.01 ;
                or_longitude:valid_min = −18000s ;
                or_longitude:valid_max = 18000s ;
                or_longitude:comment = "Original longitude of the SST
                     value" ;
// global attributes:
                :Conventions = "CF−1.4" ;
                :title = "Sea Surface Temperature" ;
                :summary = "The L3C product derived from MSG/SEVIRI
                    brightness temperatures." ;
                :references = "Geostationary Sea Surface Temperature
                    Product User Manual, http://www.osi−saf.org" ;
                :institution = "OSISAF" ;
                :history = "METEO−FRANCE/CMS MSG reprocessing" ;
                :comment = "" ;
                :license = "All intellectual property rights of the
                    Ocean & Sea Ice SAF products belong to EUMETSAT.
                    The use of these products is granted to every user
                    , free of charge. If users wish to use these
                    products, EUMETSAT\'s copyright credit must be
                    shown by displaying the words \'Copyright EUMETSAT
                    \' under each of the products shown. EUMETSAT
                    offers no warranty and accepts no liability in
                    respect of the Ocean & Sea Ice SAF products.
                    EUMETSAT neither commits to nor guarantees the
                    continuity, availability, or quality or
                    suitability for any purpose of, the Ocean & Sea
                    Ice SAF products." ;
```

```
:id = "10.15770/EUM_SAF_OSI_0004" ;
:naming_authority = "eumetsat.int" ;
:gds_version_id = "2.0" ;
:file_quality_level = 0 ;
:spatial_resolution = "0.05 degree" ;
:northernmost_latitude = 60.f ;
:southernmost_latitude = -60.f ;
:easternmost_longitude = 60.f ;
:westernmost_longitude = -60.f ;
:source = "SEVIRI" ;
:platform = "MSG1" ;
:sensor = "SEVIRI" ;
:Metadata_Conventions = "Unidata Dataset Discovery v1
    .0" ;
:metadata_link = "N/A" ;
:keywords = "Oceans > Ocean Temperature > Sea Surface
     Temperature " ;
:keywords_vocabulary = "NASA Global Change Master
    Directory (GCMD) Science Keywords" ;
:standard_name_vocabulary = "NetCDF Climate and
    Forecast (CF) Metadata Convention" ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lat_resolution = 0.05 ;
:geospatial_lon_units = "degrees_east" ;
:geospatial_lon_resolution = 0.05 ;
:acknowledgment = "In case SAF data (pre-operational
    or operational) has been used for the study
    described in a paper the following sentence would
    be an appropriate reference to the funding coming
    from EUMETSAT: The data from the EUMETSAT
    Satellite Application Facility on Ocean & Sea Ice
     used in this study are accessible through the SAF
    \'s homepage http://www.osi-saf.org" ;
:creator_name = "O&SI SAF" ;
:creator_email = "osi-saf.helpdesk@meteo.fr" ;
:creator_url = "http://www.osi-saf.org" ;
:project = "Group for High Resolution Sea Surface
    Temperature" ;
:publisher_name = "The GHRSST Project Office" ;
:publisher_url = "http://www.ghrsst.org" ;
:publisher_email = "ghrsst-po@nceo.ac.uk" ;
:processing_level = "L3C" ;
:cdm_data_type = "grid" ;
:uuid = "3224C380-A39C-11E7-A096-B4B52F703130" ;
:netcdf_version_id = "4.3.2" ;
:date_created = "20170927T155452Z" ;
:start_time = "20040201T223044Z" ;
:time_coverage_start = "20040201T223044Z" ;
:stop_time = "20040201T232655Z" ;
```

```
:time_coverage_end = "20040201T232655Z" ;
:product_version = "R1" ;
```