The EUMETSAT Network of Satellite Application Facilities

OSI SAF
Ocean and Sea Ice

Northern High Latitude L3 Sea and Sea Ice Surface Temperature Product User Manual

OSI-203-a and OSI-203-b
Version 3.1

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19. February 2019

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Document Change Record

Version	Date	Change	Description	Responsible
1.0	12.05.2002		First published version	Steinar Eastwood
1.1	30.08.2002	Minor	Upgrades after review.	SE
1.2	10.10.2002	Minor	Change in NOAA-16 SST algorithm coefficients.	SE
2.0	25.03.2011	Major	MAP product superseded by separate LML and HL products. Changed product resolution from 10 to 5km.	SE
2.1	11/28/11	Minor	Some clarifications after product review and operationalization.	SE
3.0-draft	19.06.2017	Major	New chain, using OSI-205 as input, including IST, extended to NHL area. Draft version for review	Steinar Eastwood
3.1-draft	28.02.2018	Major	Replaced OSI-205 with OSI-205-a/b Draft version for review	Steinar Eastwood
3.1	19.02.2019	Minor	Added EUMETCast details, updated NetCDF output example.	Steinar Eastwood

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1 Introduction

1.1 Scope

This product user manual presents the Northern High Latitude (NHL) Level 3 Sea and Sea Ice Surface Temperature (SST and IST) product from the EUMETSAT Ocean and Sea Ice Satellite Application Facility (OSI SAF). The focus of the manual is to present an short overview of how this product is produced and describe technical details about the product format to enable users to understand and use the product.

1.2 Overview

The EUMETSAT OSI SAF is producing a range of operational air-sea interface products, namely: wind, sea ice characteristics, Sea and Sea Ice Surface Temperatures (SST and IST) and radiative fluxes, Surface Solar Irradiance (SSI) and Downward Longwave Irradiance (DLI). More details on the products and OSI SAF project are available at http://www.osi-saf.org.
SST, IST, SSI and DLI products from the OSI SAF are produced using geostationary and polar orbiting satellites and are available in level 2 and level 3 formats, with different timeliness depending on the production setup.
For high latitudes a combined level 2 product for SST and IST is produced, labeled OSI-205-a and OSI-205-b. OSI-205-a is produced using Metop-B AVHRR data and OSI-205-b with NPP VIIRS data, both from EUMETCast. Equivalent level 3 SST/IST products are produced, labeled OSI-203-a and OSI-203-b, using each of the OSI-205 inputs separately. OSI-203-a/b covers the Northern High Latitudes (NHL) north of 50N. OSI-203-a/b are 12 hourly products and this product user manual gives the details for both of these products.

Chapter 2 presents a brief description of the algorithms and chapter 3 gives an overview of the data processing. Chapter 4 provides detailed information on the file format and content.

1.3 Glossary

Acronym	Description
AVHRR	Advanced Very High Resolution Radiometer
CMS	Centre de Météorologie Spatiale
DLI	Downward Longwave Irradiance
DMI	Danish Meteorological Institute
LML	Low and Mid Latitudes
GHRSST	Group for High Resolution Sea Surface Temperature
IST	Ice Surface Temperature
METNO	Norwegian Meteorological Institute

Acronym	Description
MSG	Advanced Very High Resolution Radiometer
NHL	Northern Hight Latitudes
NOAA	National Oceanic and Atmospheric Administration
NPP	NPOESS Prepatory Project
NWC	Nowcasting
OSI SAF	Ocean and Sea Ice Satellite Application Facility
SMHI	Swedish Meteorological and Hydrological Institute
SSI	Surface Solar Irradiance
SST	Sea Surface Temperature
VIIRS	Visible and Infrared Imaging Radiomenter Suite

1.4 Applicable documents

[RD.1] OSI SAF CDOP-3 Product Requirement Document, v1.0.
[RD.2] NHL L3 SST/IST Algorithm Theoretical Basis Document, v1.2.
[RD.3] NHL L3 SST/IST Validation Report, v2.1.
[RD.4] L2 SST/IST Product User Manual, v1.2.
[RD.5] OSI SAF Sea Ice Concentration Product User Manual, v1.6.
[RD.6] GHRSST Science Team, The Recommended GHRSST Data Specification (GDS) 2.0, document revision 5, available from the GHRSST International Project Office and https://www.ghrsst.org/documents/q/category/ghrsst-data-processing-specification-gds/, 2012, pp 123.

Several of these documents are available at (http://osisaf.met.no/docs).

2 Input data

2.1 OSI-205-a/b SST/IST

The OSI-205-a/b L2 SST/IST products are used as the main input to the OSI-203-a/b processing. OSI-205-a is based on METOP-B AVHRR data and OSI-205-b on NPP VIIRS data. They contain the following main variables:

- Sea Surface Temperature (SST, sub skin temperature).
- Ice Surface Temperature (IST, skin temperature).
- Sea ice and water probabilities.
- Confidence level for SST and IST value.

More details about OSI-205-a/b are provided in [RD.4] .

2.2 Sea ice concentration

The OSI SAF Sea Ice Concentration product (OSI.401-b) is used to provide a sea ice concentration mask which is distributed with the L3 SST/IST product. This is mainly for the users convenience when filtering data. The most recent available (closest in time) sea ice concentration product is used. More details about the sea ice concentration product is provided in [RD.5] .

3 Processing chain

3.1 Overview

The OSI SAF Northern High Latitude (NHL) L3 SST/IST processing chain delivers 12-hourly products based on L2 Metop-B AVHRR and NPP VIIRS SST/IST product files. The processing steps from these L2 files to the L3 product are:

- gridding,
- time averaging,
- additional cloud masking,
- quality level determination.

This chapter describes these processing steps in some detail. Figure 1 shows flow charts of both the L2 and L3 processing chains. More details are given in the ATBD ([RD.2]).

The processing is done separately for OSI-203-a and OSI-203-b. OSI-203-a uses only OSI-205-a input and OSI-203-b uses only OSI-205-b input. So the OSI-203-a/b are single sensor products.

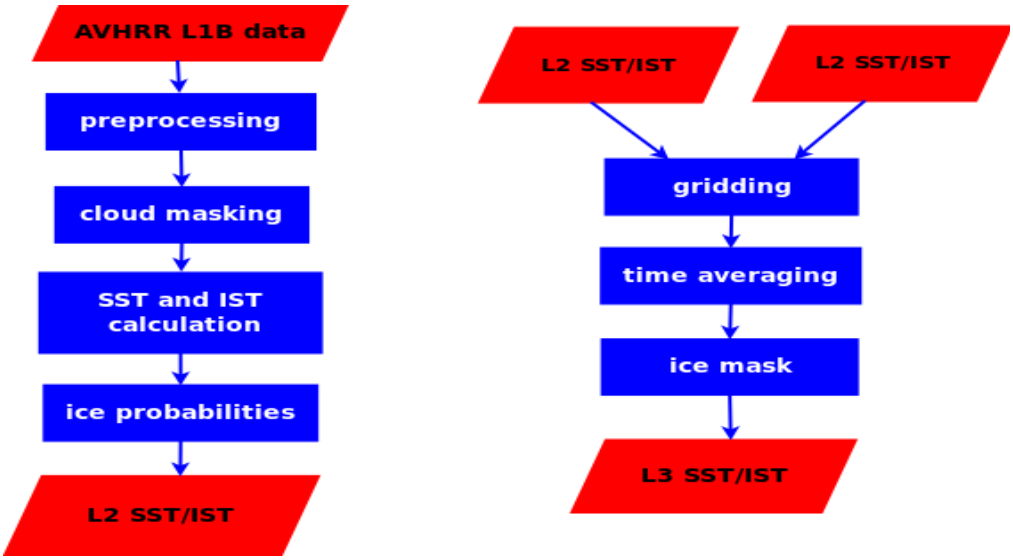

Figure 1: HL OSI SAF Sea Surface Temperature (SST) calculation scheme, both for the L2 and L3 processing chains.

3.2 Gridding

The L3 SST/IST product is produced by combining all available L2 SST/IST products from a 12-hour period. Each L2 SST/IST product is processed one by one. All valid data are gridded to the L3 5km polar stereographic grid using a KDTree and nearest neighbor method. The main variables SST, IST and sea ice and water probability have different coverage, so gridding is done separately for each variable. A fixed land mask

for the 5km grid is used to exclude data over land (shown in Figure 2).

3.3 Time averaging

All valid L2 data for the 12-hour period are then averaged. The two daily 12-hourly products are centered at 00UTC and 12UTC, so that the 00UTC product covers all satellite passes from 18:00UTC the previous day to 05:59UTC the present day, and the 12UTC product covers 06:00 to 17:59UTC.
For SST and IST the averaging within each 5km grid box is done using the quality level of each observation. All the observations inside one grid box are compared and only the observations with the highest available confidence level are used. If one pixel has a quality level higher than the rest, only that pixel is used. The SST and IST value of the grid box is then the mean of all the observations with the highest quality level. This quality level is then assigned to this grid box. In this way no observations with different quality level is mixed within one grid box.

An additional quality control step is applied during the selection of data in the time averaging. This is done by checking the probability of water, sea ice and cloud fields (probWater, procIce and probCloud), and adjusting the quality level if these fields indicate a possibility of the cloud mask has missed clouds or sea ice.
For SST data the following tests are applied:

- if probWater < 90% => reduce quality level with 1
- else if probWater < 50% => reduce quality level with 2
- else if probIce > 90% => set quality level to 0
- if probCloud > 90% => reduce quality level with 2

For IST data the follwing tests are applied:

- if probCloud > 50% => reduce quality level with 2
- else if probCloud > 30% => reduce quality level with 1
- if probIce < probWater and probCloud < 10% => reduce quality level with 1

Similarly to the SST and IST fields, a time value is calculated for each grid point by averaging the times of all data used. This is done both for the SST and the IST fields.

In addition to SST and IST, average fields for the probability of water and sea ice are also calculated. No quality level data are used for this, but one constrain is used. For each grid point, only data with probability of cloud less than 20% and solar zenith angle less than 80degrees are used to calculate the average probability of sea ice and water. These probability fields are only available during daytime conditions. These probability fields can be used by the user to further filter the SST and IST data, or just to monitor the presence of sea ice.

3.4 Sea Ice masking

To enable further filtering of sea ice, the OSI SAF sea ice concentration field is provided with the L3 SST/IST product as well. The sea ice concentration product closest in time is used (usually from the day before) and gridded to the 5km product grid using nearest neighbor interpolation.

3.5 Validation

As a part of the processing a validation matchup database (MDB) is built. In the MDB generation in situ observations from buoys and ships and collocated with the L3 SST and IST data. The L3 SST data are collocated with in situ SST observations and the L3 IST data are collected with in situ air temperature data. All the details on the validation setup and validation results are provided in the validation report ([RD.3]).

The MDB is also used to do the routine validation, and users can access these validation results in the half yearly reports from the OSI SAF, available at http://www.osi-saf.org.

4 Product description

The OSI-203-a/b L3 SST/IST product is available in NetCDF4 format, and follows the GHRSST GDS product file standard v2.0 revision 5 ([RD.6]), with some extensions for IST. The product file contains fields with SST, IST and ancillary information, as defined below. Additional information can be found in the appendixes and the product file meta data.

4.1 SST information

The product file contains the following SST relevant fields:

sea_surface_temperature: SST at each cloud free pixel. This value contains all corrections applied throughout the processing.
quality_level: SST quality level on a 0 to 5 scale. 0: unprocessed; 1 cloudy, 2: qualitative use only: 3, 4, 5: usable data of increasing quality.
SSES_bias and **SSES_standard_deviation**: estimate of the error characteristics at pixel level, derived from exploiting the validation results against drifting buoys measurements.
or_number_of_pixels: for each SST pixel, the number of original pixels that has been used to calculate the SST value.

Example of SST and quality level are given in Figure 3 and Figure 4.

4.2 IST information

The product file contains the following IST relevant fields:

surface_temperature: surface temperature at each cloud free pixel, with IST values of ice and SST values over sea. This value contains all corrections applied throughout the processing.
ist_quality_level: IST quality level on a 0 to 5 scale. 0: unprocessed; 1 cloudy, 2: qualitative use only: 3, 4, 5: usable data of increasing quality.
or_number_of_pixels_ist: for each IST pixel, the number of original pixels that has been used to calculate the SST value.

Example of IST and quality level are given in Figure 3 and Figure 4.

4.3 Ancillary information

The product file contains the following ancillary fields:

probability_of_ice : for each pixel with solar zenith angle lower than 80 degrees, the probability that this pixel is covered by ice.
probability_of_water : for each pixel with solar zenith angle lower than 80 degrees,

the probability that this pixel is covered by open water.
sea_ice_fraction: for each pixel, the fraction of this pixel covered by sea ice, as given in the OSI SAF sea ice concentration product closest in time.
The probability of cloud is not provided in the product, but can be calculated:

$$probability_of_cloud = 100\% - probability_of_water - probability_of_ice$$

Example of probability of water and ice fields are given in Figure 5.

4.4 Geographical definition

Below are given the details of the grid definitions and map of the grid extents, corner coordinates are referenced to pixel center. Projection definitions in the form of PROJ-4 initialization strings are also given (for details, see http://www.remotesensing.org/proj).

Geographical definition for High Latitude Grid, NHL	
Projection	Polar stereographic projection true at 70°N
Resolution	5.0 km
Size	1652 columns, 1807 lines
Central Meridian	45W°
Upper left corner	35.42861N, -179.9683E
Upper right corner	39.35596N , 95.36658E
Lower left corner	35.40265N , -90.0E
Lower right corner	39.32673N , -5.397749E
PROJ-4 string	+a=6378273 +b=6356889.44891 +lat_ts=70 +lon_0=-45 +proj=stere +lat_0=90

The product coverage is shown in Figure 2.

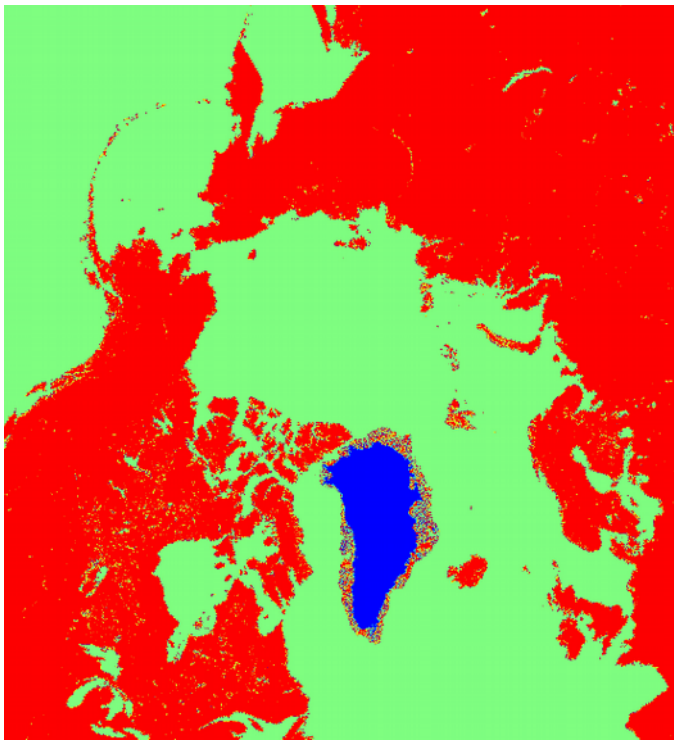

Figure 2: Coverage of OSI-203-a/b L3 SST/IST product, green = ocean, blue = ice sheet, red = land.

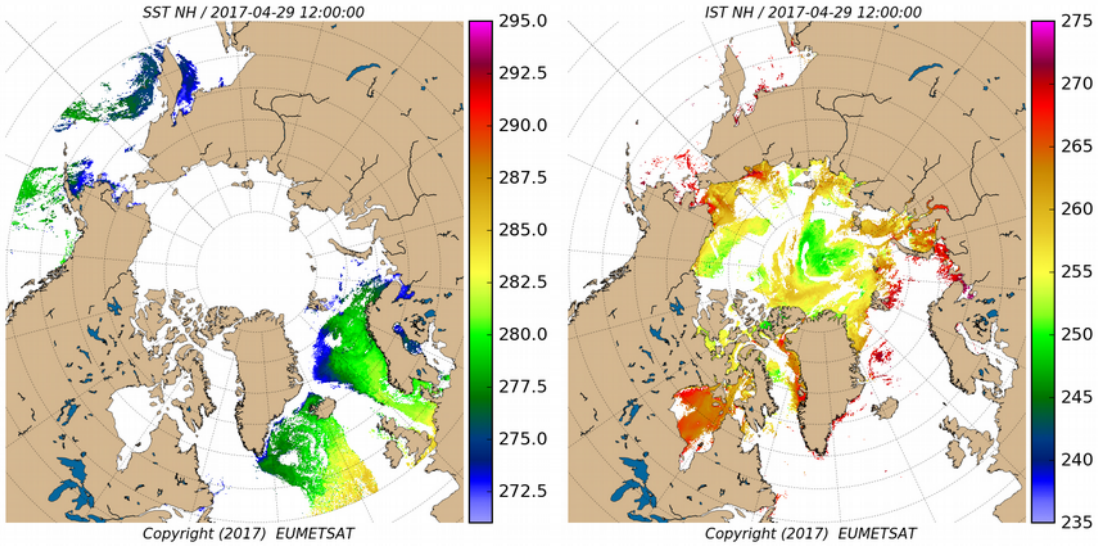

Figure 3: Examples of SST and IST fields from 2017.04.29 12UTC. The colour scales are different.

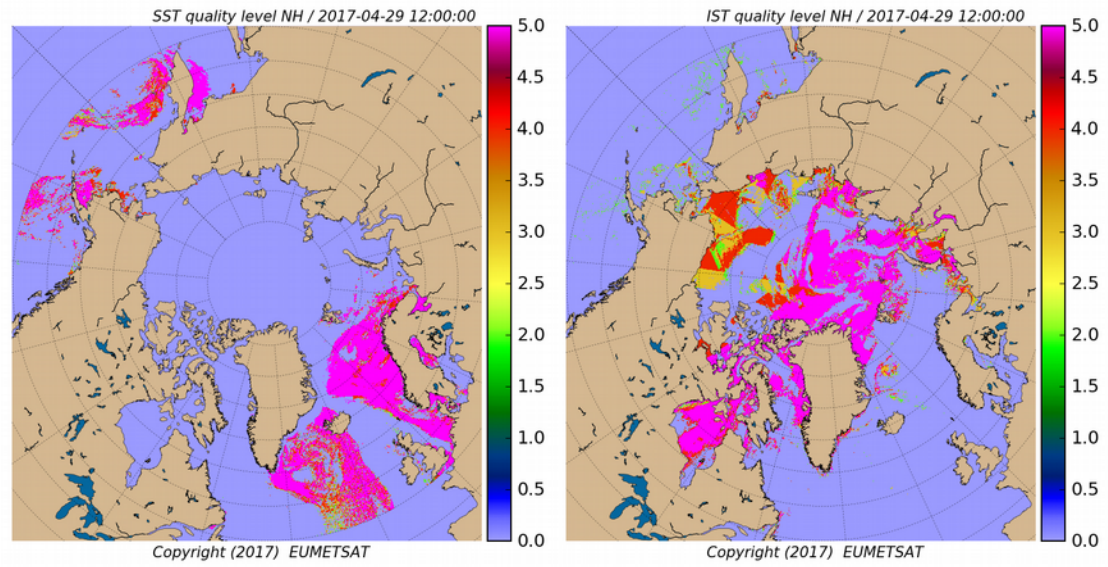

Figure 4: Quality level for SST and IST fields in Figure 3.

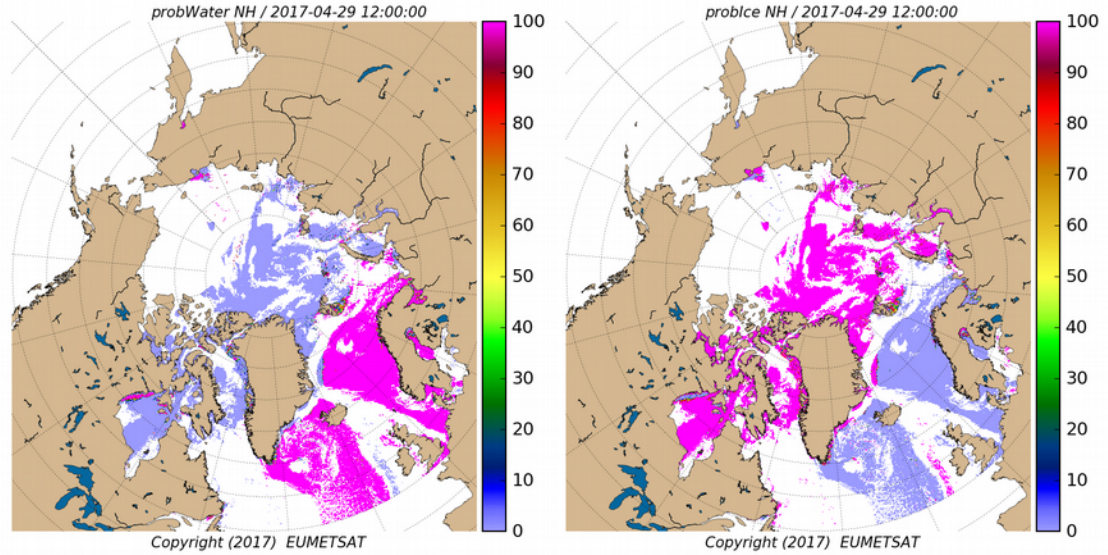

Figure 5: Probability of water and ice from product on 2017.04.29 12 UTC.

5 Access to products

There are three main sources for collecting the OSI SAF HL L3 SST/IST product; by FTP, THREDDS and through EUMETCast.

5.1 Access to near real time products

The near real time OSI-203-a/b L3 SST/IST products are available through three different channels:

- OSI SAF High Latitude FTP server, with the last 30 days of data, open access :
  - OSI-203-a: ftp://osisaf.met.no/prod/sst/l3c/avhrr_metop_b
  - OSI-203-b: ftp://osisaf.met.no/prod/sst/l3c/viirs_npp
- OSI SAF HL THREDDS server, open access: http://thredds.met.no/thredds/osisaf/osisaf.html
- EUMETSAT EUMETCast dissemination:
  SAF-Global channel, PID: TBD, Multicast Address: TBD
  More information available here: http://www.eumetsat.int

5.2 Access to archived products

Archive of the OSI-203-a L3 SST/IST products are also available, through these channels:

- OSI SAF High Latitude FTP server (in YYYY/MM structure), open access:
  - OSI-203-a: ftp://osisaf.met.no/archive/sst/l3c/avhrr_metop_b
  - OSI-203-b: ftp://osisaf.met.no/archive/sst/l3c/viirs_npp
- OSI SAF HL THREDDS server, open access: http://thredds.met.no/thredds/osisaf/osisaf.html
- EUMETSAT Data Center, with more information available here: https://eoportal.eumetsat.int/userMgmt/login.faces

Filename convention for OSI-203-a/b files
Through FTP/THREDDS
OSI-203-a: <date14>-METNO-L3C_GHRSST-SSTskin-AVHRR_METOP_B-v02.0-fv01.0.nc OSI-203-b: <date14>-METNO-L3C_GHRSST-SSTskin-VIIRS_NPP-v02.0-fv01.0.nc
Through EUMETCast
OSI-203-a: S-OSI_-NOR_-MTOP-OSSTIST3A-<date12>Z.nc OSI-203-b: S-OSI_-NOR_-NPP_-OSSTIST3B-<date12>Z.nc

Table 1: File name convention for L3 NHL SST/IST files. <date14>: Date and time of the product on format YYYYMMDDHOMISS, e.g. 20190130120000. <date12>: Date and time of the product on format YYYYMMDDHOMI, e.g. 201901301200.

6 Appendix A: NetCDF product header

Below is given an example of the NetCDF product header for OSI-203-a.

```
netcdf \20190219000000-METNO-L3C_GHRSST-SSTskin-AVHRR_METOP_B-
v02.0-fv01.0 {
dimensions:
        time = 1 ;
        xc = 1652 ;
        yc = 1807 ;
variables:
        int time(time) ;
                time:units = "seconds since 1981-01-01 00:00:00" ;
                time:long_name = "reference time" ;
        double yc(yc) ;
                yc:standard_name = "projection_y_coordinate" ;
                yc:units = "km" ;
                yc:long_name = "y coordinate of projection (northings)" ;
                yc:axis = "Y" ;
        double xc(xc) ;
                xc:standard_name = "projection_x_coordinate" ;
                xc:units = "km" ;
                xc:long_name = "x coordinate of projection (eastings)" ;
                xc:axis = "X" ;
        int Polar_Stereographic_Grid ;
                Polar_Stereographic_Grid:latitude_of_projection_origin = "90" ;
                Polar_Stereographic_Grid:proj4_string = "+a=6378273
+b=6356889.44891 +lat_ts=70 +lon_0=-45 +proj=stere +lat_0=90" ;
                Polar_Stereographic_Grid:semi_major_axis = "6378273" ;
                Polar_Stereographic_Grid:straight_vertical_longitude_from_pole = "-
45" ;
                Polar_Stereographic_Grid:standard_parallel = "70" ;
                Polar_Stereographic_Grid:false_northing = 0.f ;
                Polar_Stereographic_Grid:grid_mapping_name =
"Polar_Stereographic_Grid_NH" ;
                Polar_Stereographic_Grid:semi_minor_axis = "6356889.44891" ;
                Polar_Stereographic_Grid:false_easting = 0.f ;
        float lon(yc, xc) ;
                lon:standard_name = "longitude" ;
                lon:valid_min = -180.f ;
                lon:valid_max = 180.f ;
                lon:units = "degrees_east" ;
                lon:long_name = "longitude coordinate" ;
        float lat(yc, xc) ;
                lat:standard_name = "latitude" ;
                lat:valid_min = -90.f ;
                lat:valid_max = 90.f ;
                lat:units = "degrees_north" ;
```

```
                lat:long_name = "latitude coordinate" ;
        short sea_surface_temperature(time, yc, xc) ;
                sea_surface_temperature:_FillValue = -32768s ;
                sea_surface_temperature:long_name = "sea surface skin
temperature" ;
                sea_surface_temperature:standard_name =
"sea_surface_skin_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 = -200s ;
                sea_surface_temperature:valid_max = 5000s ;
                sea_surface_temperature:coordinates = "lon lat" ;
                sea_surface_temperature:grid_mapping =
"Polar_Stereographic_Grid" ;
        short surface_temperature(time, yc, xc) ;
                surface_temperature:_FillValue = -32768s ;
                surface_temperature:long_name = "sea ice surface skin temperature"
;
                surface_temperature:standard_name =
"sea_ice_surface_temperature" ;
                surface_temperature:units = "kelvin" ;
                surface_temperature:add_offset = 273.15 ;
                surface_temperature:scale_factor = 0.01 ;
                surface_temperature:valid_min = -8000s ;
                surface_temperature:valid_max = 5000s ;
                surface_temperature:coordinates = "lon lat" ;
                surface_temperature:grid_mapping = "Polar_Stereographic_Grid" ;
        short or_number_of_pixels(time, yc, xc) ;
                or_number_of_pixels:_FillValue = -32768s ;
                or_number_of_pixels:long_name = "original number of pixels from the
L2Ps contributing to the SST value" ;
                or_number_of_pixels:standard_name = "or_number_of_pixels" ;
                or_number_of_pixels:units = "1" ;
                or_number_of_pixels:add_offset = 0 ;
                or_number_of_pixels:scale_factor = 1 ;
                or_number_of_pixels:valid_min = 0s ;
                or_number_of_pixels:valid_max = 32767s ;
        short or_number_of_pixels_ist(time, yc, xc) ;
                or_number_of_pixels_ist:_FillValue = -32768s ;
                or_number_of_pixels_ist:long_name = "original number of pixels from
the L2Ps contributing to the IST value" ;
                or_number_of_pixels_ist:standard_name = "or_number_of_pixels_ist"
;
                or_number_of_pixels_ist:units = "1" ;
                or_number_of_pixels_ist:add_offset = 0 ;
                or_number_of_pixels_ist:scale_factor = 1 ;
                or_number_of_pixels_ist:valid_min = 0s ;
                or_number_of_pixels_ist:valid_max = 32767s ;
```

```
        byte quality_level(time, yc, xc) ;
                quality_level:_FillValue = -128b ;
                quality_level:long_name = "quality level of SST pixel" ;
                quality_level:units = "1" ;
                quality_level:coordinates = "lon lat" ;
                quality_level:grid_mapping = "Polar_Stereographic_Grid" ;
                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 ;
        byte ist_quality_level(time, yc, xc) ;
                ist_quality_level:_FillValue = -128b ;
                ist_quality_level:long_name = "quality level of IST pixel" ;
                ist_quality_level:units = "1" ;
                ist_quality_level:coordinates = "lon lat" ;
                ist_quality_level:grid_mapping = "Polar_Stereographic_Grid" ;
                ist_quality_level:valid_min = 0b ;
                ist_quality_level:valid_max = 5b ;
                ist_quality_level:flag_meanings = "no_data bad_data worst_quality
low_quality acceptable_quality best_quality" ;
                ist_quality_level:flag_values = 0b, 1b, 2b, 3b, 4b ;
        short sst_dtime(time, yc, xc) ;
                sst_dtime:_FillValue = -32768s ;
                sst_dtime:long_name = "time difference from reference time" ;
                sst_dtime:units = "seconds since 2019-02-19 00:00:00" ;
                sst_dtime:add_offset = 0 ;
                sst_dtime:scale_factor = 1 ;
                sst_dtime:valid_min = -32767s ;
                sst_dtime:valid_max = 32767s ;
        short ist_dtime(time, yc, xc) ;
                ist_dtime:_FillValue = -32768s ;
                ist_dtime:long_name = "time difference from reference time" ;
                ist_dtime:units = "seconds since 2019-02-19 00:00:00" ;
                ist_dtime:add_offset = 0 ;
                ist_dtime:scale_factor = 1 ;
                ist_dtime:valid_min = -32767s ;
                ist_dtime:valid_max = 32767s ;
        byte probability_of_water(time, yc, xc) ;
                probability_of_water:_FillValue = -128b ;
                probability_of_water:long_name = "probability of water" ;
                probability_of_water:units = "1" ;
                probability_of_water:add_offset = 0 ;
                probability_of_water:scale_factor = 1 ;
                probability_of_water:valid_min = 0b ;
                probability_of_water:valid_max = 100b ;
                probability_of_water:coordinates = "lon lat" ;
                probability_of_water:grid_mapping = "Polar_Stereographic_Grid" ;
        byte probability_of_ice(time, yc, xc) ;
```

probability_of_ice:_FillValue = -128b ;
probability_of_ice:long_name = "probability of ice" ;
probability_of_ice:units = "1" ;
probability_of_ice:add_offset = 0 ;
probability_of_ice:scale_factor = 1 ;
probability_of_ice:valid_min = 0b ;
probability_of_ice:valid_max = 100b ;
probability_of_ice:coordinates = "lon lat" ;
probability_of_ice:grid_mapping = "Polar_Stereographic_Grid" ;
short l2p_flags(time, yc, xc) ;
l2p_flags:long_name = "L2P flags" ;
l2p_flags:units = "1" ;
l2p_flags:valid_min = 0s ;
l2p_flags:valid_max = 32s ;
l2p_flags:flag_meanings = "microwave land ice lake river
reserved_for_future_use" ;
l2p_flags:flag_masks = 1s, 2s, 4s, 8s, 16s, 32s ;
l2p_flags:coordinates = "lon lat" ;
l2p_flags:grid_mapping = "Polar_Stereographic_Grid" ;
byte sses_bias(time, yc, xc) ;
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:coordinates = "lon lat" ;
sses_bias:grid_mapping = "Polar_Stereographic_Grid" ;
byte sses_standard_deviation(time, yc, xc) ;
sses_standard_deviation:_FillValue = -128b ;
sses_standard_deviation:long_name = "SSES standard deviation" ;
sses_standard_deviation:units = "kelvin" ;
sses_standard_deviation:add_offset = 0 ;
sses_standard_deviation:scale_factor = 0.01 ;
sses_standard_deviation:valid_min = -127b ;
sses_standard_deviation:valid_max = 127b ;
sses_standard_deviation:coordinates = "lon lat" ;
sses_standard_deviation:grid_mapping =
"Polar_Stereographic_Grid" ;
byte landmask(time, yc, xc) ;
landmask:_FillValue = -128b ;
landmask:standard_name = "landmask" ;
landmask:long_name = "land_water_ice_mask" ;
landmask:units = "1" ;
landmask:valid_min = 1b ;
landmask:valid_max = 3b ;
landmask:flag_meanings = "Ice_cap water land" ;
landmask:flag_values = 1b, 2b, 3b ;

```
        byte sea_ice_fraction(time, yc, xc) ;
                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 = "1" ;
                sea_ice_fraction:add_offset = 0 ;
                sea_ice_fraction:scale_factor = 1 ;
                sea_ice_fraction:valid_min = 0b ;
                sea_ice_fraction:valid_max = 100b ;
                sea_ice_fraction:time_offset = 0 ;
                sea_ice_fraction:coordinates = "lon lat" ;
                sea_ice_fraction:grid_mapping = "Polar_Stereographic_Grid" ;
                sea_ice_fraction:source = "OSISAF" ;
        byte tempflag(time, yc, xc) ;
                tempflag:units = "1" ;
                tempflag:valid_min = 0b ;
                tempflag:valid_max = 3b ;
                tempflag:flag_meanings = "Daytime_in_all_l2p_pixels
nighttime_in_all_l2p_pixels both_day_and_night_in_all_l2p_pixels" ;
                tempflag:flag_values = 1b, 2b, 3b ;

// global attributes:
                :_NCProperties = "version=1|netcdflibversion=4.4.1.1|
hdf5libversion=1.8.18" ;
                :title = "Level 3 Northern High Latitude Sea and Sea Ice Surface
Temperature" ;
                :summary = "Sea and Sea Ice Surface Temperature data set obtained
from METOP-B AVHRR infrared satellite imagery. Based on multiple global swath
products available from the EUMETSAT data distributing system, EUMETCast." ;
                :references = "OSI SAF Northern High Latitudes L3 Sea and Sea Ice
Surface Temperature Product User Manual, www.osi-saf.org" ;
                :institution = "OSISAF" ;
                :history = "osisat-nhl-sst-ist-l3-v1.0" ;
                :Conventions = "CF-1.6" ;
                :comment = "This product is based on IR swath data that are sensitive
to atmospheric water. Hence, the swath data will contain areas with non valid surface
temperature data." ;
                :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 = "AVHRRMTB-OSISAF-L3C-NHL-v1.0" ;
                :naming_authority = "org.ghrsst" ;
                :product_name = "OSI-203-a" ;
                :product_version = "v1.0" ;
```

:product_status = "Operational" ;
:area = "North of 50N" ;
:category = "Oceans Climatology Meteorology Atmosphere" ;
:uuid = "626ee3af-47e9-4c15-b336-44f32648b604" ;
:file_quality_level = 0 ;
:gds_version_id = "02.0" ;
:netcdf_version_id = "4.4.1.1" ;
:date_created = "20190219T105527Z" ;
:spatial_resolution = "5.00 km" ;
:start_time = "20190218T180000Z" ;
:stop_time = "20190219T060000Z" ;
:time_coverage_start = "20190218T180000Z" ;
:time_coverage_end = "20190219T060000Z" ;
:northernmost_latitude = "89.96736" ;
:southernmost_latitude = "35.40265" ;
:easternmost_longitude = "179.96824" ;
:westernmost_longitude = "-180.00000" ;
:source = "AVHRRMTB" ;
:platform = "metopb" ;
:sensor = "AVHRRMTB" ;
:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
:metadata_link = "N/A" ;
:keywords = "Sea Ice Skin Temperature, Sea Surface Temperature, Sea Ice, Oceanography, Meteorology, Climate, Remote Sensing" ;
:keywords_vocabulary = "NASA Global Change Master Directory (GCMD) Science Keywords" ;
:topiccategory = "Oceans Climatology Meteorology Atmosphere" ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention" ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_units = "degrees_east" ;
:acknowledgment = "In case OSISAF 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 and Sea Ice used in this study are accessible through the OSISAF\'s homepage www.osi-saf.org" ;
:pi_name = "Steinar Eastwood" ;
:contact = "osisaf-manager@met.no" ;
:creator_name = "OSI SAF" ;
:creator_email = "osi-saf.helpdesk@meteo.fr" ;
:creator_url = "www.osi-saf.org" ;
:project = "OSISAF" ;
:publisher_name = "The GHRSST Project Office ACDD" ;
:publisher_url = "www.ghrsst.org" ;
:publisher_email = "ghrsst-po@nceo.ac.uk" ;
:processing_level = "L3C" ;
:cdm_data_type = "grid" ;
}