

The EUMETSAT  
Network of  
Satellite Application  
Facilities



**OSI SAF**

Ocean and Sea Ice

# **OSI SAF High Latitudes L2 Sea and Sea Ice Surface Temperature Product User Manual**

*OSI-205-a and OSI-205-b  
Version 1.3*

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## Document Change Record

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## 1 Introduction

### 1.1 EUMETSAT Ocean and Sea Ice SAF

For complementing its Central Facility capability in Darmstadt and taking more benefit from specialized expertise in Member States, EUMETSAT created Satellite Application Facilities (SAFs), based on co-operation between several institutes and hosted by a National Meteorological Service. More on SAFs can be read from [\[www.eumetsat.int\]](http://www.eumetsat.int).

The Ocean & Sea Ice Satellite Application Facility (OSI SAF) is producing a range of air-sea interface products on operational basis, namely: wind, sea ice characteristics, Sea and Ice Surface Temperatures and radiative fluxes.

Since the Continuous Development and Operation Phase (CDOP) 2007 to 2012 - the OSI SAF consortium is hosted by Météo-France. The sea ice processing is performed at the High Latitude processing facility (HL centre), operated jointly by the Norwegian and Danish Meteorological Institutes, MET Norway and DMI.

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### 1.2 Scope

This product user manual presents the High Latitude L2 Surface Temperature products, OSI-205-a and OSI-205-b, from the EUMETSAT Ocean and Sea Ice Satellite Application Facility (OSI SAF). The focus of the manual is to present an overview of how this product is produced and describe technical details about the product format to enable users to understand and use the product.

### 1.3 Overview

The EUMETSAT OSI SAF is producing a range of operational air-sea interface products, namely: wind, sea ice characteristics, Surface Temperatures and radiative fluxes. More details on the products and OSI SAF project are available at <http://www.osi-saf.org>.

Surface Temperature (ST), Surface Solar Irradiation (SSI) and Downward Long-wave irradiance (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.

The OSI-205-a/b products consist of stand-alone High Latitude Level-2 Surface Temperature products. High They are integrated surface temperature (ST) products

that consists of Sea and Ice Surface temperatures (SST and IST) and an unvalidated temperatures of Land Ice Surfaces for the Greenland and Antarctic ice caps.

The OSI-205-a covers the sea and ice areas polewards of latitudes 50N and 50S with 3 minute data segments in level2, with data processed and archived continuously throughout the day, as data comes available. Approximately 110 3-minute segments per day. The production use AVHRR data from Metop-B from EUMETCast and cloud mask data using the PPS software from NoW-Casting Satellite Application Facility (NWC-SAF).

The OSI-205-b covers the sea and ice areas poleward of 50N with orbital files, up to 15 per day, based on NPP VIIRS data from the EUMETCast EARS data stream.

Chapter 2 presents a brief description of the algorithms and chapter 3 gives an overview of the input data processes; chapter 4 explains the processing scheme and chapter 5 provides detailed information on the product variables; finally, chapter 6 is explaining file format, conventions and overall product specifications.

## 1.4 Glossary

Acronym	Description
AVHRR	Advanced Very High Resolution Radiometer
CDOP	Continuous Development and Operations Phase
CMEMS	Copernicus Center for Marine Services
DLI	Downward Longwave Irradiance
DMI	Danish Meteorological Institute
GTS	Global Telecommunication System by World Meteorological Organization
HL	High Latitudes
IST	Ice Surface Temperature
LIST	Land Ice Surface Temperature
MDB	Match-up Data Base
MET	Norwegian Meteorological Institute
NOAA	National Oceanic and Atmospheric Administration
NESDIS	The National Environmental Satellite, Data, and Information Service
NWC	Nowcasting
RTM	Radiative Transfer Model
RTTOV	Radiative Transfer for TOVS
SAF	Satellite Application Facility
SSES	Sensor Specific Error Statistics
SSI	Surface Solar Irradiance
SST	Sea Surface Temperature

Acronym	Description
TAC	Thematic Assembly Center
Tb	Brightness Temperature
TOVS	TIROS Operational Vertical Sounder

### 1.5 Applicable document

- [RD.1] OSI SAF CDOP-3 Product Requirement Document, v1.0.
- [RD.2] OSI SAF Algorithm theoretical basis document for the OSI SAF Sea and Sea Ice Surface Temperature L2 processing chain.  
SAF/OSI/CDOP/DMI/SCI/MA/223, product OSI-205-a/b, Version 1.4 - February 2018.
- [RD.3] OSI SAF High Latitude L2 Sea and Sea Ice Surface Temperature Validation Report, SAF/OSI/CDOP2/DMI/TEC/RP/247, v1.0 – Dec 2015.
- [RD.4] OSI SAF Validation report for the High Latitude L2 VIIRS Sea and Sea Ice Surface Temperature Product, SAF/OSI/CDOP2/DMI/TEC/RP/315, v1.0 – Feb 2018.
- [RD.5] The EUMETSAT OSI SAF Sea Ice Concentration Algorithm Theoretical Basis Document v1.2
- [RD.6] OSI SAF project team (2014). Low earth orbiter sea surface temperature product user manual. Version 2.6 Prepared by Météo France.
- [RD.7] OSI SAF products. <http://osisaf.met.no/p/ice/index.html>

Several of these documents are available at <http://osisaf.met.no/docs>.

## 2 Algorithms Description

The OSI-205-a/b algorithm is a suite of algorithms that are applied for different domains of surface temperature and sun-zenith angles. These algorithms are:

- An Ice Surface Temperature (IST) algorithm, which consists of three specific algorithms for different temperature domains together with specific algorithm coefficients. These are:  $IST_{cold}$ ,  $IST_{medium}$ , and  $IST_{warm}$ .
- A Sea Surface Temperature (SST) algorithm, which consists of two specific algorithms and a combined algorithm correspond to different sun-zenith angles. These are:  $SST_{day}$ ,  $SST_{night}$ , and  $SST_{twilight}$ .
- A Marginal Ice Zone Surface Temperature (MIZT) algorithm, which is a linearly scaled average of the IST and the SST algorithms, i.e. it computes average temperatures for mixed ice and water surface areas.

The primary choice of algorithm lies in the distinction between sea and ice surfaces. This distinction is based on a brightness temperature threshold, which is an approach adapted from the integrated IST/SST algorithm, CASSTA, introduced by Vincent et al. (2008).

### 2.1 Surface temperature algorithm decision logic

The algorithm selection and surface temperatures calculations are based the following inputs:

- $T37$ , near infrared brightness temperature from AVHRR channel 3b with center wavelength at ~3.7 microns.
- $T11$ , thermal infrared brightness temperature from AVHRR channel 4 with center wavelength at ~11 microns.
- $T12$ , thermal infrared brightness temperature from AVHRR channel 5 with center wavelength at ~12 microns.
- $T_{clim}$ , first guess of SST, use the most recent SST values from the DMI Optimal Interpolation SST product (Hoyer and She 2007, Hoyer et al. 2014).
- $satza$ , sat-zenith angle (view angle).
- $sunza$ , sun-zenith angle (solar elevation angle).

#### 2.1.1 The IST Algorithm

The *IST* algorithm, see Equation (1) is a split window algorithm, working within three domains as suggested by Key et al. (1997). The algorithm coefficients  $a$ ,  $b$ ,  $c$ , and  $d$  for three  $T11$  temperature intervals,  $IST_{cold}$ ,  $IST_{medium}$  and  $IST_{warm}$ . are shown in 2 for Metop-A and -B AVHRR and NPP VIIRS.

$$IST = a + bT_{11} + c(T_{11} - T_{12}) + d((T_{11} - T_{12})(1.0/\cos(\text{satza})) - 1.0) \quad (1)$$

The *IST* algorithm domains are:

- *IST<sub>cold</sub>*, cold ice calibration for  $T_{11} < 240K$
- *IST<sub>medium</sub>*, medium ice calibration for  $240K \leq T_{11} < 260K$
- *IST<sub>warm</sub>*, warm ice calibration for  $T_{11} \geq 260K$

### 2.1.2 The SST Algorithm

The sea surface temperature algorithms *SST<sub>day</sub>*, *SST<sub>night</sub>* and *SST<sub>twilight</sub>* (equations 2, 3 and 4, respectively) are, calibrated for for the *day* and *night* domains:

- *SST<sub>day</sub>*, day time calibration for  $\text{sunza} \leq 90 \text{ degrees}$ . The day time algorithm formalism is a slightly modified version of the operational day time algorithm used in the OSISAF SST product [RD.2] to deal with a bias for the North Atlantic area (Le Borgne et al., 2014).
- *SST<sub>night</sub>*, night time calibration for  $\text{sunza} \geq 110 \text{ degrees}$ . The night time algorithm formalism is identical to the operational night time algorithm used in the OSISAF Global SST product [RD.2].
- *SST<sub>twilight</sub>*, twilight calibration for  $110 \text{ degree} > \text{sunza} > 90 \text{ degree}$ . *SST<sub>twilight</sub>* is a linear scaling of *SST<sub>day</sub>* and *SST<sub>night</sub>*, in accordance with the *sunza* [RD.2].

The *SST<sub>day</sub>* and *SST<sub>night</sub>* algorithm coefficients (*a* to *g*) are shown in 1 for Metop-A and -B AVHRR.

$$SST_{day} = (a + b \text{ steta})T_{11} + (c + d \text{ steta} + e T_{clim})(T_{11} - T_{12}) + f + g \text{ steta}, \quad (\text{Eq.2})$$

$$SST_{night} = (a + b \text{ steta})T_{37} + (c + d \text{ steta})(T_{11} - T_{12}) + e + f \text{ steta}, \quad (\text{Eq.3})$$

$$SST_{twilight} = 0.05(\text{sunza} - 90)SST_{night} - 0.05(\text{sunza} - 110)SST_{day}, \quad (\text{Eq.4})$$

where  $\text{steta} = (1/(\cos(\text{satza}))) - 1$

### 2.1.3 The MIZT Algorithm

Finally, the surface temperature is also defined for the marginal ice zone, *MIZT* (see equation 5 and 6+7). The *MIZT* is linearly scaling of *SST* and *IST* in the  $T_{11}$

temperature interval  $268.95\text{ K} \leq T_{11} < 270.95\text{ K}$ . This is adapted from Vincent et al. (2008)

- $MIZT_{\text{day}}$  for  $\text{sunza} \leq 90^\circ$
- $MIZT_{\text{night}}$  for  $\text{sunza} \geq 110^\circ$

$$MIZT = \begin{cases} MIZT_{\text{day}} & \dots \text{sunza} \leq 90^\circ \\ MIZT_{\text{night}} & \dots \text{sunza} \geq 110^\circ \end{cases} \quad (5)$$

$$MIZT_{\text{day}} = 0.5 * (T_{11} - 268.95) * SST_{\text{day}} - 0.5 * (T_{11} - 270.95) * IST \quad (6)$$

$$MIZT_{\text{night}} = 0.5 * (T_{11} - 268.95) * SST_{\text{night}} - 0.5 * (T_{11} - 270.95) * IST \quad (7)$$

## 2.2 Algorithm tuning method

There are basically two ways to calibrate the surface temperature algorithms used in this data set: 1) To compare satellite measurements to in situ observations, and 2) to relate modeled surface temperatures with modeled top-of-atmosphere brightness temperatures, determined by a radiative transfer model (RTM). However, each sensor has slightly different response functions to incoming radiation, which demands a large number of in situ observations to obtain statistically robust calibration data for each of the instruments used here. It is not feasible to collect sufficiently and well distributed in situ observations from all areas of interest, to obtain sufficient calibration statistics for the applied and new sensors. Calibration of both the IST and SST algorithms is therefore carried out using the RTM approach (see [RD.2]).

### 2.2.1 SST calibration

Coefficients for the SST algorithms were generated using a simulated brightness temperature ( $T_b$ ) dataset in turn generated from a dataset containing 31,673 Arctic profiles (Francois et al., 2002). The simulated  $T_b$ 's were generated from RTTOV (RTTOV) using 10 different satellite zenith angles (0.0, 36.87, 48.19, 55.15, 60, 63.61, 66.42, 68.68, 70.53, 72.08). Coefficients for each sensor and algorithm were determined using least squares regression. The coefficients derived and applied for the SST *day* and *night* algorithms are listed in table 1. More details on the SST calibration procedure is given in the products ATBD [RD.2] .

Satellite	Algorithm	a	b	c	d	e	f	g
Metop-A (02)	SST day	1.030	0.017	-0.300	0.255	0.006	-8.132	-3.737
	SST night	1.019	0.036	1.200	0.058	-4.453	-8.877	0.000
Metop-B (01)	SST day	1.033	0.019	0.326	0.261	0.004	-8.871	-3.951
	SST night	1.019	0.037	1.180	0.062	-4.384	-8.857	0.000
NPP	SST day	1.031	0.017	0.815	0.284	0.003	-8.083	-3.531
	SST night	1.019	0.033	1.393	0.048	-4.240	-7.953	0.000

Table 1: SST algorithm coefficients.

### 2.2.2 IST calibration

Like the calibration of the SST algorithms, the IST algorithm calibrations are carried out using modeled surface and TOA brightness temperatures. The basis for the coefficients tuning is an Arctic profile database covering one year (2011) of ERA Interim atmospheric data (ERAint, 2014-09).

Satellite	Algorithm	a	b	c	d
Metop-A (02)	IST cold	-3.216	1.014	0.866	0.036
	IST mid	-3.200	1.013	1.443	0.024
	IST warm	-3.877	1.015	1.461	0.311
Metop-B (01)	IST cold	-3.295	1.014	0.749	0.015
	IST mid	-4.017	1.016	1.417	-0.030
	IST warm	-4.612	1.018	1.378	0.307
NPP	IST cold	-3.540	1.015	0.748	0.025
	IST mid	-4.806	1.019	1.525	-0.048
	IST warm	-6.189	1.024	1.523	0.352

Table 2: IST algorithm coefficients.

The initial profile database has 8,695 profiles. Profiles were picked from a sample of 960 locations each day of the year, at times 0, 6, 12 and 18 UTC. Each profile complies with a land-ratio of zero, surface temperatures less than 272K, and a cloud cover of less than 10%. Simulated TOA brightness temperatures associated with the ERA-interim surface temperatures for over 10 different satellite zenith angles (0.0, 36.87, 48.19, 55.15, 60, 63.61, 66.42, 68.68, 70.53, 72.08), where generated using RTTOV11 (RTTOV). Ultimately, the simulated IST calibration data set consisted of 86,950 data points. The coefficients derived and applied for the IST *cold*, *mid* and *warm* algorithms are listed in table 2. More details on the IST calibration procedure is given in the product ATBD [RD.2].

### 3 Input Data

The primary input data used in the OSI-205-a production are brightness temperature (T<sub>b</sub>) data from the Metop-B AVHRR instrument, and for OSI-205-b data from the NPP VIIRS instrument. The surface temperature product is calculated from the T<sub>b</sub>'s and the associated view and sun elevation information and a climatological SST temperature. In addition, data from the visible channels are used for the calculation of sea, ice and water probability fields. Metop and NPP complete 14 full orbits per day and provides therefore approximately bi-hourly passages over polar regions. The input data, i.e., T<sub>b</sub> data, cloud mask and satellite-sun-earth geometry data are generated by the Polar Platform System (PPS) cloud processing software, from NWCSAF (NWCSAF, Dybbroe et al., 2005a+b).

In addition, the most recent daily SST data from an independent HL SST processing chain (Høyer and She 2007) provided by DMI are used by the daytime SST algorithm as a first SST guess (see equation 2). All other data are ancillary fields of information that can be used as filters or to customize data selection. The data flow is illustrated in Figure 1. The individual input data fields are described further below.

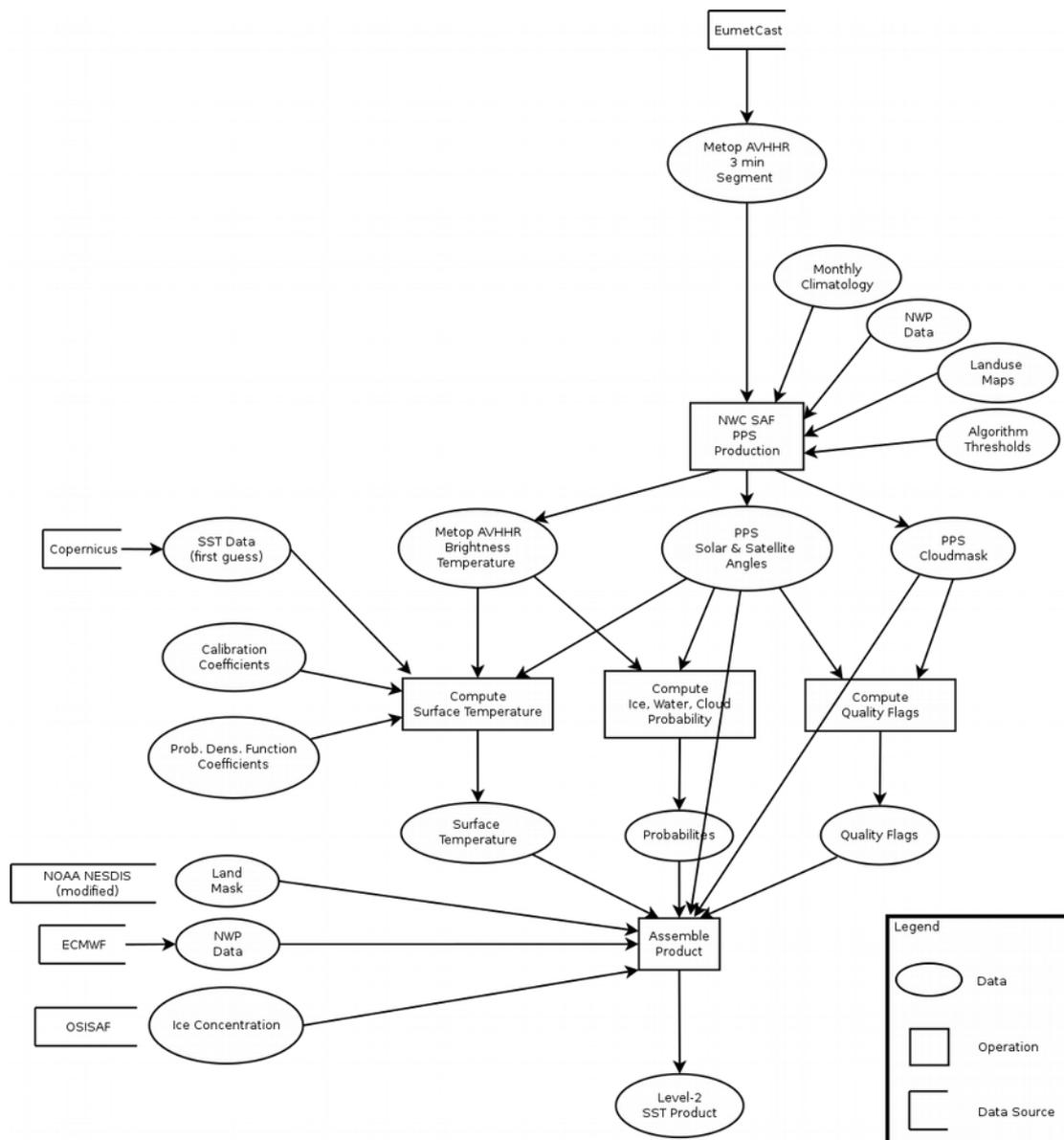
#### 3.1 Satellite data

Satellite input data are brightness temperatures and associated data from Metop-B AVHRR and NPP VIIRS level 1 and 2 data:

- Brightness Temperatures (T<sub>b</sub>) from 3 bands with centre wave length at ~3.7 microns (mid infrared), ~11 and ~12 microns (thermal infrared). Continuously on-board calibrated measurements.
- For the additional water and ice probability calculations the visible channels are also used.
- Cloud mask from the Polar Platform System (PPS, version 2014) cloud processing software (Dybbroe et al., 2005a+b),
- Solar and Satellite geometry. Some geometrical data are used in the surface temperature algorithms and others are added to the output data set for post processing purposes, see section *output data* and *algorithms*.

#### 3.2 Sea Ice concentration

The OSI SAF Sea Ice Concentration [RD.5] product is used to provide a sea ice concentration mask with the L2 SST/IST product. This is mainly for the users convenience when filtering data. The most recent sea ice concentration product is used



**Figure 1: Overview of the Ice and Sea Surface Temperature (IST/SST) L2 processing chains (OSI-205-a/b).**

### 3.3 NWP data

Data from Numerical Weather Prediction models are not used to calculate surface temperatures, however, it is used in the PPS software to produce cloud mask data for the OSI-205-a/b processing chain, NWP data are passed-on to the output file for data filtering and customization purposes, NWP data are not used in any of the ST calculations.

The applied NWP model is the current operational deterministic model at ECMWF.

Data are spatially re-sampled to a 0.5 degree grid. The nearest NWP data in time and space is passed on the OSI-205-a/b grid. The NWP fields used are 12h–24h prognosis in 3h steps from 2 daily analysis, at 00z and 12z.

The applied parameters are 2m temperatures (variable 167; ECMWF-table128) and 10m wind speed (calculated from variable 165 and variable 166; ECMWF-table128).

### 3.4 Static Land, Sea and Land-Ice mask

LAND, SEA and LAND-ICE mask is produced from combining the ‘ice\_surface’ and ‘bedrock’ ETOPO1 data sets from NOAA NESDIS NGDC global relief maps (NOAA\_ngdc, 2014-09). Elevation thresholds of 10m and -5m are used on “ice\_surface”/”bedrock” differences data to distinguish between Ice-Cap and Water/Sea-Ice, to minimize noise in the relief maps. Following procedure is used to classify the 3 surfaces:

- LAND ICE: ‘ice\_surface’ - ‘bedrock’ > 10 m
  - i) SEA/SEA ICE: ‘ice\_surface’ - ‘bedrock’ <= -5 m
- LAND: Where NO ICE CAP and NO WATER/SEAICE.

This is an add-on data set for stratification of land, water and ice caps (See ‘output data’). It is not used for surface temperatures calculations.

## 4 Processing scheme

### 4.1 Overview

A schematic overview of the full algorithm decision tree is given in Figure 2. The input data is the spectral Metop AVHRR or NPP VIIRS data and the satellite-sun-earth geometry information, from the NWC SAF PPS system. Firstly, the processing chain checks if the Metop AVHRR or NPP VIIRS data lies within the area of interest, i.e. if the three minute segments are north of 50°N or south of 50°S. Only for data within this area the OSI-205-a/b surface temperature is computed. The algorithms for computation of ice surface temperature and the algorithms for computation of sea surface temperature are executed on the input data based on testing the sun zenith angles (*satza*) and the brightness temperature (*T11*), see figure 2. If *T11* is lesser than 240K the  $IST_{\text{cold}}$  algorithm is applied, if it is in between 240K and 260K the  $IST_{\text{medium}}$  algorithm is applied, and for *T11* larger or equal to 260K the  $IST_{\text{warm}}$  algorithm is applied. If the sun zenith angle *satza* is lesser or equal to 90° the  $SST_{\text{day}}$  algorithm is applied, if it is in between 90° and 110° the  $SST_{\text{twilight}}$  algorithm is applied, and for *satza* larger or equal to 110° the  $SST_{\text{night}}$  algorithm is applied. In case of invalid values for *satza* no SST is computed. Subsequently, based on another test of the brightness temperature *T11*, the final surface temperature is set to the previously computed IST if *T11* is lesser than 268.95K, to the previously computed SST if *T11* is larger or equal to 270.95K, or it is set to the result of the MIZT algorithm if *T11* is in between 268.95K and 270.95K. Finally, a 'reality check' is applied to the resulting surface temperature value (*Ts*). The surface temperature *Ts* is rejected as unrealistically, if the difference between the brightness temperatures *T11* and *T12* is larger than 2K and *T11* is larger than 268.95K. Similarly, if the surface temperature *Ts* is lesser than *T11*, lesser than 150K or larger than 350K, *Ts* is rejected as unrealistic.

#### 4.1.1 Preprocessing

The Metop AVHRR data are received through EUMETCAST in 3 minute segments, while the NPP VIIRS data are received through the EUMETCast EARS service in segments of with varying length. These satellite data are subsequently passed to the NWC-SAF PPS software (PPScloud) for generation of cloud mask data. This preprocessing step is not part of the OSI SAF processing chain, but a part of the basic satellite processing at DMI and MET Norway. The output data stream from the PPS processing chain is a data package of 3 files, containing the VIS and IR data, cloud mask information and sun/satellite/earth-grid geometry information. These 3 files are passed to the OSI-205-a/b processing chain as indicated in figure Feil: Fant ikke kilden til referansen.

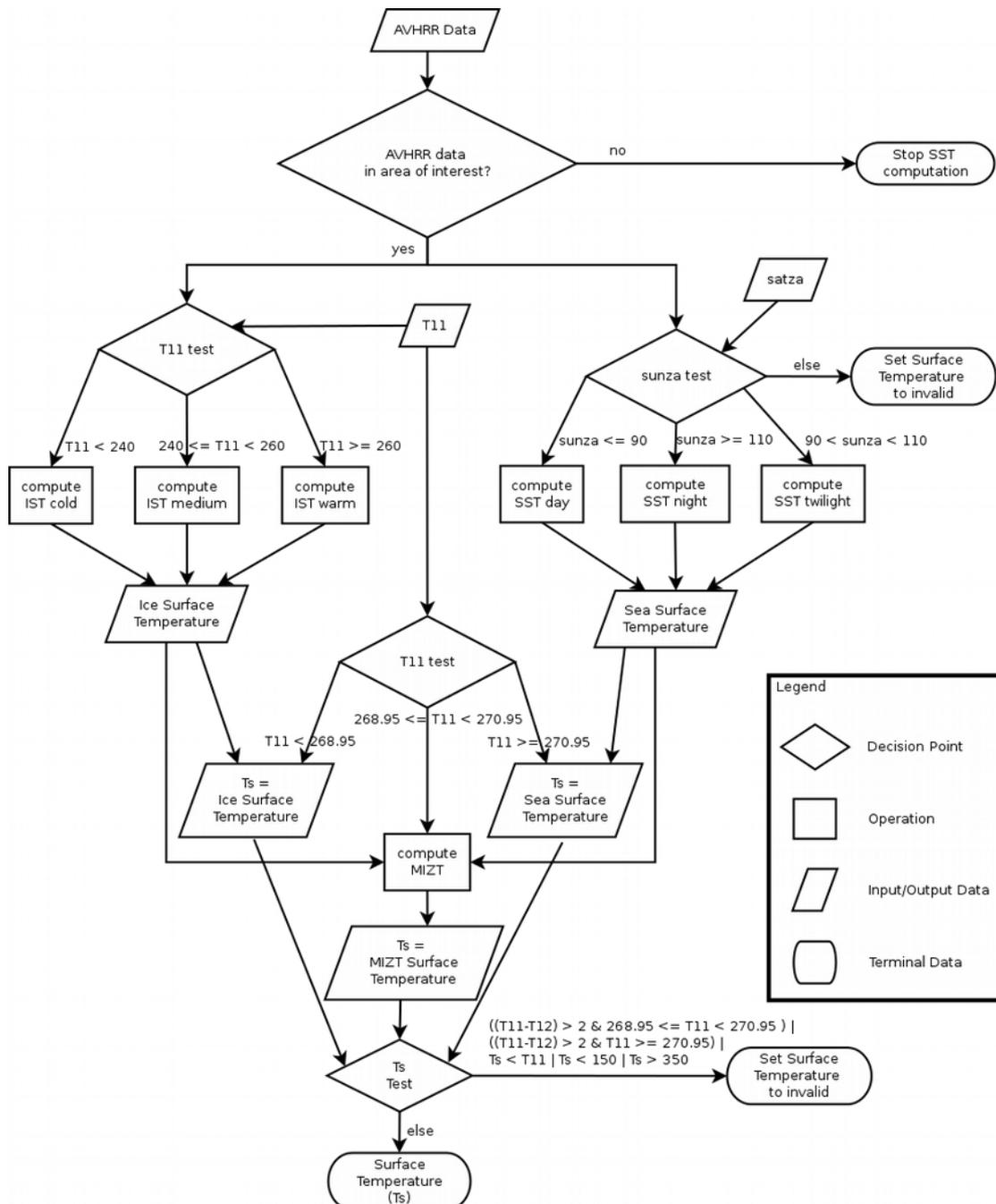


Figure 2: OSI-205-a/b surface temperature algorithm decision tree

#### 4.1.2 Cloud masking

The applied cloud mask is computed from the PPS software (version v2014 ) package with patch 20150327 from NWC-SAF.

Cloud mask values are:

- Cloud mask quality high or low.

- Cloud mask not processed
- Cloud free - no contamination by snow/ice covered surface or clouds
- Cloud contaminated - partly cloudy or semitransparent.
- Cloud filled - opaque clouds completely filling the FOV
- Snow ice contaminated
- Undefined - containing no data or corrupted data.

Of these categories “Cloud Free” and “Snow ice contaminated” are considered cloud free – the latter for IST data only.

## 4.2 Validation

A match-up database (MDB) is built monthly from collocated in situ measurements (buoys and ships) and satellite estimates of IST and SST. The in situ data are collected from the GTS network at ECMWF and from the CMEMS In Situ TAC, for drifting buoys, moored buoys and ships. These observations are partly quality controlled and will subsequently be checked against NWP data. The observations are collocated with satellite surface temperature data within a time constrain of +/- 30 minutes and within vicinity of 5 km.

From the match-up database various statistics are made to validate the accuracy and precision of the products, mainly by investigating the bias and standard deviation of the estimated surface temperatures compare to the in situ measurement. Initial validation results are presented in the OSI-205-a and -b validation reports [ [RD.3] and [RD.4] ] and in the half-yearly reports from the OSI SAF, available at <http://www.osi-saf.org>.

## 4.3 Quality control

The quality of the delivered products is controlled through examination of the half-yearly validation statistics. The quality control is done by the OSI SAF R&D team. The automatic control is based on monthly statistics. On a monthly basis the standard deviation and bias estimates satellite ST are compared with observed in situ surface temperatures. For the daily quality control warnings are issued to the production team if production alarms are called. All these statistics are reported in the half-yearly report.

## 5 Product Variable description

The content of the OSI-205-a/b products largely follows the recommendations from the Group for High Resolution Sea Surface Temperature (GHRSSST) Science Team, as described in the GHRSSST Data Specification document (GDS, version 2.00 - revision 5). GHRSSST is the driving organization for satellite sea surface temperature algorithm and product development and production, and for that reason the OSISAF team decided to comply to the GDS product format for this product. The obvious benefits are that this format is acknowledged and implemented by most satellite-SST user communities. However there are minor differences between this data format and GDS, since the OSI-205-a/b products also covers ice surface temperatures. We have included additional information and data fields to the standard GDS description and, some of the features of the standard GDS format are not relevant for the IST part of this product. For users of the ordinary SST field, this product comply fully to the GDS format, where IST users may want to use some of the ancillary information of the IST field for filtering before use. In section 5.1 and 5.2 is a description of each field contained in the OSI-205-a/b products and appendix A is a header dump of an actual NetCDF data file.

### 5.1 Geophysical and calculated variables

#### 5.1.1 Sea ice fraction

The Sea ice fraction field that is added to the products is the nearest neighboring sea ice concentration (SIC) value from the OSI SAF OSI-401-b product [RD.5]. OSI-401-b is a daily SIC field at 10km spatial resolution, based on passive microwave data.

#### 5.1.2 Surface temperature

The integrated surface temperature field, including SST, IST and MIZT, calculated from equations 1 to 7.

#### 5.1.3 Sea Surface Temperature

A conventional SST field using equations 2, 3 or 4. This field is a subset of the surface temperature field above, included for traditional SST data use only that it comply completely to GHRSSST GDS conventions.

#### 5.1.4 Quality\_level

The quality level (QL) is the overall quality indicator used for all IST, SST and MIZT values.

The QL uses an incremental scale from 0 to 5 to provide the user with an indication of the quality of the L2P SST data. QL = 0 indicate missing data and QL = 1 is assigned SST data that are NOT cloud free and IST/MIZT data that are NOT cloud free OR Snow/Ice contaminated. QL values between 2 and 5 are assigned to the data based on

the number of strikes they have received in a penalty system. Each data pixel undergoes a series of tests and each time the data fails to comply the test, the data gets an additional strike (penalty). If a given pixel comply to all tests, i.e. number of strikes=0, this data is of highest quality, QL = 5.

The accumulative penalty system is as follows:

- +1 strike** if the cloud mask quality level is low (see pps quality flag, PPScloud).
- +1 strike** if at least one of the surrounding 8 pixels is NOT *cloud free* or *Snow/Ice contaminated* (for IST only).
- +1 strike** if satellite zenith angle > 60°
- +1 strike** if sun zenith angle > 80° (IST only, there are consequently no QL5 IST data during the polar night.)
- +1 strike** if the absolute difference between SST and the first guess SST value is larger than 10K (SST only)
- +1 strike** if 95° > sun zenith angle > 80° (SST only)

The Quality Levels are thus given according to following rules:

**QL = 0;** No data: No data or surface temperature failed sanity check (see section xx in algorithm description)

**QL = 1;** Bad data: NOT *cloud free* or NOT *Snow/Ice contaminated* (for IST).

**QL = 2;** Worst quality: 3 *strikes* or more.

**QL = 3;** Low quality : 2 *strike*.

**QL = 4;** Acceptable quality : 1 *strike*.

**QL = 5;** Best quality: if zero *strikes*.

### 5.1.5 Uncertainties

The total uncertainty ( $U_{total}$ ), the *sses\_standard\_deviation* variable in the OSI-205-a product file, is the root of the summed squares of 3 uncertainty variables (see below): *large\_scale\_correlated\_uncertainty* ( $U_{global}$ ), *uncorrelated\_uncertainty* ( $U_{random}$ ) and *synoptically\_correlated\_uncertainty* ( $U_{synoptic}$ ) (see sections 3.2.3, 3.2.1 and 3.2.2 in the product ATBD [RD.2], respectively). All three uncertainties and the total uncertainty are included in the product file (see appendix A).

$$U_{total} = \sqrt{U_{global}^2 + U_{random}^2 + U_{synoptic}^2}$$

The product bias, the *sses\_bias* variable is fixed to 0 (zero). The bias has not yet been determined.

### 5.1.6 Probability\_of\_water, probability\_of\_ice

The probability of cloud free water and cloud free ice/snow and cloud are produced in a three-way classifier and the probabilities of water and ice are added to the output data set to provide additional filtering means for the user, to minimize further the risk

of using cloud contaminated surface temperature values. The probability of cloud is not included, but can be retrieved as the three probabilities of water, ice and cloud summarize to 1.0 for each pixel. This information is not included in the quality level assessment, due to lack of statistics at this stage of the product. At present the probabilities are not provided for night time data.

The procedure calculating these probabilities is fully explained in Killie et al. (2011) and a comparison with the PPS cloud mask is shown in Dybbroe et al. (2014).

### **5.1.7 Land\_mask**

A binary land mask is set where there is land in the pixel.

### **5.1.8 dt\_analysis**

This variable is the deviation from last SST analysis. Not applied to ice surfaces.

### **5.1.9 NWP data**

Wind speed and air temperatures data are interpolated on to OSI-205-a/b. These fields are 2m temperatures (variable 167; ECMWF-table128) and 10m wind speed (calculated from variable 165 and variable 166; ECMWF-table128) from the current operational deterministic model at ECMWF.

## **5.2 Other Variables**

### **5.2.1 Latitude**

Latitude units are in degrees North and valid polewards of 50N and 50S.

### **5.2.2 Longitude**

Longitude units are in degrees East and valid between -180 and 180.

### **5.2.3 L2p\_flags**

A 2-BYTE bit-field including miscellaneous information in accordance with GDS format descriptions (GDS):

- Bit 0: microwave [not in use; not relevant]
- Bit 1: land [from cloud mask conditions]
- Bit 2: ice [if ice-concentration is > 15%]
- Bit 3: lake [not in use]
- Bit 4: river [not in use]
- Bit 5: reserved\_for\_future\_use [not in use]
- Bit 6: ice-cap [from land/sea/land-ice mask, see section 3.4]
- Bit 7: water [from land/sea/land-ice mask, see section 3.4]

- Bit 8: land [from land/sea/land-ice mask, see section 3.4]
- Bit 9: cloudmask\_quality\_high [from PPS cloud mask stream]
- Bit 10: cloudmask\_not\_processed [from PPS cloudmask, see section 4.1.2]
- Bit 11: cloud\_free [from PPS cloudmask, see section 4.1.2]
- Bit 12: cloud\_contaminated [from PPS cloudmask, see section 4.1.2]
- Bit 13: cloud\_filled [from PPS cloudmask, see section 4.1.2]
- Bit 14: snow\_ice\_contaminated [from PPS cloudmask, see section 4.1.2]
- Bit 15: undefined [not in use]

#### 5.2.4 *Processing\_flags(time, nj, ni)*

The processing flag is not a standard GDS data field. This flag carries information specifically related to the ice surface temperatures:

- Bit 0: noalgorithm [No temperature data are associated with this label]
- Bit 1: sstday [see eq. 2]
- Bit 2: sstnight. (see eq. 3)
- Bit 3: ssttwilight (see eq. 4)
- Bit 4: istwarm (see eq. 1)
- Bit 5: istmid (see eq. 1)
- Bit 6: istcold (see eq. 1)
- Bit 7: miztsstdayist (Linearly scaled IST and SST)
- Bit 8: miztsstnightist (Linearly scaled IST and SST)
- Bit 9: miztssttwilightist (Linearly scaled IST and SST)
- Bit 10: Ts is less than T11 then Ts value equals 140
- Bit 11: for  $268.95 \leq T11 < 270.95$  and  $T11 - T12 > 2$  then Ts value equals 141 (assumed atmospheric ice crystals)
- Bit 12: for  $T11 \geq 270.95$  and  $T11 - T12 > 2$  then Ts values equals 142 (assumed atmospheric ice crystals)
- Bit 13: undefined [not in use]
- Bit 14: undefined [not in use]
- Bit 15: undefined [not in use]

#### 5.2.5 *Satellite\_zenith\_angle*

Field of satellite zenith angles.

#### 5.2.6 *Solar\_zenith\_angle*

Field of solar zenith angles.

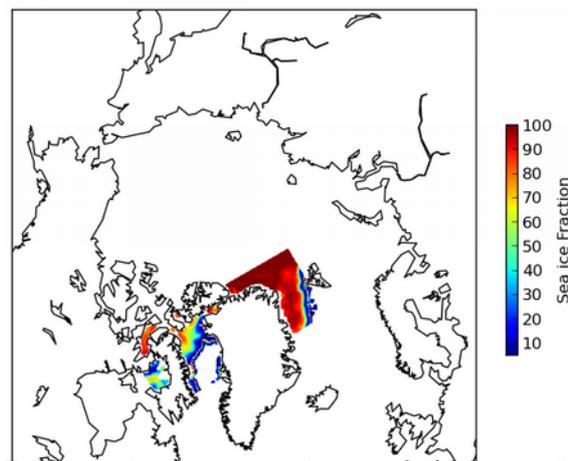
## 6 Data description

### 6.1 Overview

The OSI-205-a/b products are computed with a timeliness of 3 hours from time of recording. The products are made available continuously as they are processed. The area covered by the products are polewards of latitudes 50° N and 50° S for OSI-205-a and poleward of 50N for OSI-205-b.

For OSI-205-a, each full Metop swath takes approximately 100 minutes thus consisting of 33 3-minute segments of which ~15 segments per full swath cover the polar areas of interest (see figure 3 and 4). Each 3-minute segment that contains data inside the area of interest is processed.

For OSI-205-b, the NPP data are collected from the EARS data stream on the northern hemisphere and processed in orbital files instead of 3-minute segments. The length of each orbit varies, depending on how many EARS station that can see that orbit.



**Figure 3: An ice concentration field from a 3 minute segment of a OSI-205-a product.**

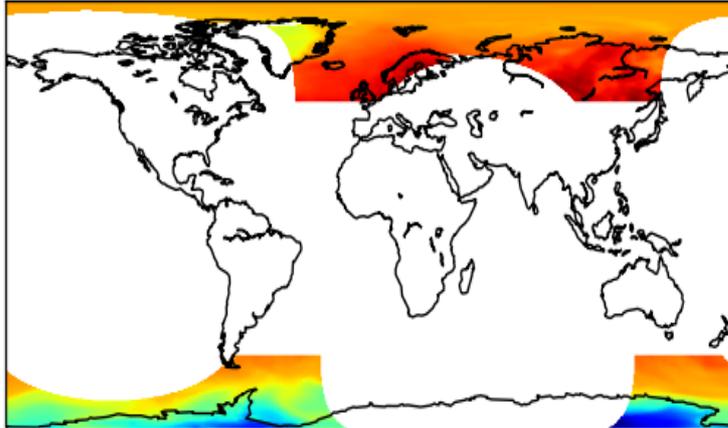


Figure 4: Product coverage is polewards of latitudes 50N and 50S. The data field is 2m Temperatures from ECMWF, corresponding to a full AVHRR swath.

## 6.2 Coverage

The area of interest for OSI-205-a is illustrated in figure 4 by a full Metop AVHRR swath cut off at the Northern and Southern latitude limits, 50N and 50S, respectively. Here the swath is represented by a NWP based 2m temperature field (ECMWF).

## 6.3 File format

The file format of the OSI-205-a/b products is NetCDF4. The product file follows the GHRSSST Data Specification (GDS, version 2.00 -revision 5). The meta data are compatible with CF conventions (CF).

## 6.4 File name convention

The OSI-205-a/b file name convention for the files on the FTP server follows the GDS file format description (GDS, 2014-09):

<Indicative Date><Indicative Time>-<RDAC>-<Processing Level>\_GHRSSST-<SST Type>- <Product String>-<Additional Segregator>-v<GDS Version>-fv<File Version>.<File Type>

where:

- Indicative Date: The data set, acquisition start date
- Indicative Time: The data set, acquisition start date
- RDAC: Place of creation
- Processing Level: Processing level code
- ST Type: Type of surface temperature

- Product String: The data set identification
- Additional segregator: optional text – here describing the area of interest.
- GDS Version: Version 2
- File Version: The version of the output data set
- File Type: Type of output file.

OSI-205-a file name examples:

*20180302131300-DMI-L2P\_GHRSST-STskin-AVHRR\_nh\_SST\_IST-metopb\_00000-v02.0-fv01.0.nc*

*20180302123100-DMI-L2P\_GHRSST-STskin-AVHRR\_sh\_SST\_IST-metopb\_00000-v02.0-fv01.0.nc*

The equivalent files available on EUMETCast have file names like these:

*S-OSI\_-DMI\_-MTOP-\_NH\_IST\_\_\_-201803021313Z.nc.gz*

*S-OSI\_-DMI\_-MTOP-\_SH\_IST\_\_\_-201803021231Z.nc.gz*

where NH is northern and SH is southern hemisphere.

OSI-205-b file name example:

*20180302130600-METNO-L2P\_GHRSST-STskin-VIIRS\_nh\_SST\_IST-npp\_00000-v02.0-fv01.0.nc*

The equivalent files available on EUMETCast have file names like this:

*S-OSI\_-MET\_-NPP-\_NH\_IST\_\_\_-201803021306Z.nc.gz*

## 6.5 Data distribution

There are two main sources for collecting the OSI SAF OSI-205-a/b IST/SST product; by FTP or through EUMETCast. At the OSI SAF High Latitude FTP server the products are available here:

- OSI-205-a: [ftp://osisaf.met.no/archive/sst/l2p/avhrr\\_metop\\_b](ftp://osisaf.met.no/archive/sst/l2p/avhrr_metop_b)
- OSI-205-b: [ftp://osisaf.met.no/archive/sst/l2p/viirs\\_npp](ftp://osisaf.met.no/archive/sst/l2p/viirs_npp)

The files are in year/month/day directories.

Through the EUMETSAT EUMETCast service the OSI SAF OSI-205-a/b SST/IST products are available on the same file format as on FTP, but with different file names (see section 6.4). The files are available through the SAF-Europe channel, PID: 500 and Multicast Address: 224.223.222.28. More information about the EUMETCast service can be found at: <http://www.eumetsat.int>.

## 7 References

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## Appendix A:

Sea and Sea Ice Surface Temperature products in NetCDF format.  
A header dump of a OSI-205-a data set:

```
netcdf 20180125104300-DMI-L2P_GHRSSST-STskin-AVHRR_nh_SST_IST-metopb_00000-v02.0-fv01.0 {
```

```
dimensions:
```

```
time = 1 ;
ni = 2048 ;
nj = 1080 ;
```

```
variables:
```

```
double time(time) ;
    time:units = "seconds since 1978-01-01 00:00:00" ;
    time:long_name = "reference time of ST fields" ;
    time:standard_name = "time" ;
    time:calendar = "Gregorian" ;
    time:axis = "T" ;
    time:comment = " " ;
float lat(nj, ni) ;
    lat:units = "degrees_north" ;
    lat:long_name = "latitude coordinate" ;
    lat:standard_name = "latitude" ;
    lat:valid_min = -90.f ;
    lat:valid_max = 90.f ;
    lat:_FillValue = -200.f ;
    lat:comment = " " ;
float lon(nj, ni) ;
    lon:units = "degrees_east" ;
    lon:long_name = "longitude coordinate" ;
    lon:standard_name = "longitude" ;
    lon:valid_min = -180.f ;
    lon:valid_max = 180.f ;
    lon:_FillValue = -200.f ;
    lon:comment = " " ;
short land_mask(time, nj, ni) ;
    land_mask:units = "1" ;
    land_mask:long_name = "Land" ;
    land_mask:standard_name = "Land" ;
    land_mask:coordinates = "lon lat" ;
    land_mask:valid_min = 0s ;
    land_mask:valid_max = 1000s ;
    land_mask:_FillValue = -32768s ;
    land_mask:comment = " " ;
short sea_surface_temperature(time, nj, ni) ;
    sea_surface_temperature:units = "kelvin" ;
    sea_surface_temperature:long_name = "sea surface subskin temperature, 1 to 1.5 millimetres" ;
    sea_surface_temperature:standard_name = "sea_surface_subskin_temperature" ;
    sea_surface_temperature:coordinates = "lon lat" ;
    sea_surface_temperature:depth = "1 to 1.5 millimetres" ;
    sea_surface_temperature:scale_factor = 0.01 ;
    sea_surface_temperature:add_offset = 0. ;
    sea_surface_temperature:valid_min = 25300s ;
    sea_surface_temperature:valid_max = 32300s ;
    sea_surface_temperature:_FillValue = -32768s ;
    sea_surface_temperature:comment = " " ;
short sst_dtime(time, nj, ni) ;
    sst_dtime:units = "seconds" ;
    sst_dtime:long_name = "time difference from reference time" ;
    sst_dtime:coordinates = "lon lat" ;
    sst_dtime:scale_factor = 0.1666666666666667 ;
    sst_dtime:add_offset = 0. ;
    sst_dtime:valid_min = -32767s ;
    sst_dtime:valid_max = 32767s ;
```

```

sst_dtime: FillValue = -32768s ;
sst_dtime:comment = "reference time plus st_dtime gives seconds after 1978-01-01 00:00:00 UTC" ;
byte sses_bias(time, nj, ni) ;
  sses_bias:long_name = "SSES bias estimate" ;
  sses_bias:units = "kelvin" ;
  sses_bias:coordinates = "lon lat" ;
  sses_bias:scale_factor = 0.01 ;
  sses_bias:add_offset = 0. ;
  sses_bias:valid_min = -127b ;
  sses_bias:valid_max = 127b ;
  sses_bias: FillValue = -128b ;
  sses_bias:comment = " " ;
byte sses_standard_deviation(time, nj, ni) ;
  sses_standard_deviation:long_name = "SSES standard deviation" ;
  sses_standard_deviation:units = "kelvin" ;
  sses_standard_deviation:coordinates = "lon lat" ;
  sses_standard_deviation:scale_factor = 0.01 ;
  sses_standard_deviation:add_offset = 0. ;
  sses_standard_deviation:valid_min = -127b ;
  sses_standard_deviation:valid_max = 127b ;
  sses_standard_deviation: FillValue = -128b ;
  sses_standard_deviation:comment = " " ;
byte dt_analysis(time, nj, ni) ;
  dt_analysis:units = "kelvin" ;
  dt_analysis:long_name = "Deviation from last SST analysis" ;
  dt_analysis:comment = " " ;
  dt_analysis:coordinates = "lon lat" ;
  dt_analysis:grid_mapping = "polar_stereographic" ;
  dt_analysis:scale_factor = 0.1 ;
  dt_analysis:add_offset = 0. ;
  dt_analysis:valid_min = -127b ;
  dt_analysis:valid_max = 127b ;
  dt_analysis: FillValue = -128b ;
byte wind_speed(time, nj, ni) ;
  wind_speed:units = "m s-1" ;
  wind_speed:long_name = "10m wind speed" ;
  wind_speed:standard_name = "wind_speed" ;
  wind_speed:comment = "10m wind speed from ECMWF" ;
  wind_speed:coordinates = "lon lat" ;
  wind_speed:height = "10 m" ;
  wind_speed:scale_factor = 1. ;
  wind_speed:add_offset = 0. ;
  wind_speed:valid_min = -127b ;
  wind_speed:valid_max = 127b ;
  wind_speed: FillValue = -128b ;
float t2m(time, nj, ni) ;
  t2m:units = "kelvin" ;
  t2m:long_name = "air temperature, 2m" ;
  t2m:standard_name = "air_temperature" ;
  t2m:comment = "2m Temperature from ERA-INTERIM reanalysis, ECMWF" ;
  t2m:coordinates = "lon lat" ;
  t2m:scale_factor = 1. ;
  t2m:add_offset = 0. ;
  t2m:valid_min = 150.f ;
  t2m:valid_max = 350.f ;
  t2m: FillValue = -1.f ;
byte sea_ice_fraction(time, nj, ni) ;
  sea_ice_fraction:units = "1" ;
  sea_ice_fraction:long_name = "sea_ice_concentration" ;
  sea_ice_fraction:standard_name = "sea_ice_area_fraction" ;
  sea_ice_fraction:coordinates = "lon lat" ;
  sea_ice_fraction:scale_factor = 1. ;
  sea_ice_fraction:add_offset = 0. ;
  sea_ice_fraction:time_offset = -22s ;
  sea_ice_fraction:valid_min = 0b ;
  sea_ice_fraction:valid_max = 100b ;
  sea_ice_fraction: FillValue = -128b ;
  sea_ice_fraction:source = "OSI SAF reprocessed sea ice concentration product (OSI-409) v1.1" ;
  sea_ice_fraction:sea_ice_treatment = "Use unmodified (one source)" ;
  sea_ice_fraction:comment = " " ;

```

```

short l2p_flags(time, nj, ni) ;
  l2p_flags:long_name = "L2P flags" ;
  l2p_flags:comment = "These flags are important to properly use the data. The land-water-ice mask is produced from
    the NOAA NESDIS NGDC GLOBAL RELIEF MAPS, ETOPO1 Ice Surface and ETOPO1
    Bedrock (http://www.ngdc.noaa.gov/mgg/global/global.html). Cloud mask data is from the
    PPS cloud mask. " ;
  l2p_flags:coordinates = "lon lat" ;
  l2p_flags:flag_meanings = "microwave land ice lake river reserved_for_future_use ice-cap water land
    cloudmask_quality_high cloudmask_not_processed cloud_free cloud_contaminated
    cloud_filled snow_ice_contaminated undefined" ;
  l2p_flags:valid_min = 0s ;
  l2p_flags:valid_max = 32767s ;
  l2p_flags:flag_masks = "1s, 2s, 4s, 8s, 16s, 32s, 64s, 128s, 256s, 512s, 1024s, 2048s, 4096s, 8192s, 16384s, 32768s" ;
byte quality_level(time, nj, ni) ;
  quality_level:long_name = "quality level of st pixel" ;
  quality_level:comment = "These are the overall quality indicators and are used for all SIST and SST values" ;
  quality_level:coordinates = "lon lat" ;
  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:valid_min = 0b ;
  quality_level:valid_max = 5b ;
  quality_level:_FillValue = -128b ;
byte satellite_zenith_angle(time, nj, ni) ;
  satellite_zenith_angle:long_name = "satellite zenith angle" ;
  satellite_zenith_angle:units = "angular_degree" ;
  satellite_zenith_angle:comment = "Calculated satellite zenith angle based on the satellite geometry at the time of data
    acquisition" ;
  satellite_zenith_angle:coordinates = "lon lat" ;
  satellite_zenith_angle:valid_min = -90b ;
  satellite_zenith_angle:valid_max = 90b ;
  satellite_zenith_angle:_FillValue = -128b ;
  satellite_zenith_angle:scale_factor = 1. ;
  satellite_zenith_angle:add_offset = 0. ;
byte solar_zenith_angle(time, nj, ni) ;
  solar_zenith_angle:units = "angular degree" ;
  solar_zenith_angle:long_name = "solar zenith angle" ;
  solar_zenith_angle:standard_name = "zenith_angle" ;
  solar_zenith_angle:coordinates = "lon lat" ;
  solar_zenith_angle:valid_min = -90b ;
  solar_zenith_angle:valid_max = 90b ;
  solar_zenith_angle:_FillValue = -128b ;
  solar_zenith_angle:comment = " " ;
  solar_zenith_angle:scale_factor = 1. ;
  solar_zenith_angle:add_offset = 90. ;
short surface_temperature(time, nj, ni) ;
  surface_temperature:units = "kelvin" ;
  surface_temperature:long_name = "sea and sea ice temperature" ;
  surface_temperature:standard_name = "surface_temperature" ;
  surface_temperature:coordinates = "lon lat" ;
  surface_temperature:comment = "Temperature of the skin of the ocean and ice" ;
  surface_temperature:scale_factor = 0.01 ;
  surface_temperature:add_offset = 0. ;
  surface_temperature:valid_min = 14000s ;
  surface_temperature:valid_max = 32315s ;
  surface_temperature:_FillValue = -32768s ;
short processing_flags(time, nj, ni) ;
  processing_flags:_FillValue = -32768s ;
  processing_flags:long_name = "processing and algorithm flags" ;
  processing_flags:coordinates = "lon lat" ;
  processing_flags:valid_min = 0s ;
  processing_flags:valid_max = 4096s ;
  processing_flags:flag_meanings = "no_algorithm sst_day sst_night sst_twilight istwarm istmid istcold miszt_day
    miszt_night mizt_twilight Ts<T11 for268.95<=T11<270.95_T11-T12>2
    forT11>=270.95_T11-T12>2 " ;
  processing_flags:comment = "These flags are important to properly use the data." ;
  processing_flags:flag_masks = "1s, 2s, 4s, 8s, 16s, 32s, 64s, 128s, 256s, 512s, 1024s, 2048s, 4096s" ;
byte probability_of_water(time, nj, ni) ;
  probability_of_water:long_name = "probability of water" ;
  probability_of_water:units = "1" ;
  probability_of_water:comment = "Sum of pwater, pice, and pcloud (not included) is 100" ;

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probability_of_water:coordinates = "lon lat" ;
probability_of_water:valid_min = 0b ;
probability_of_water:valid_max = 100b ;
probability_of_water:FillValue = -100b ;
byte probability_of_ice(time, nj, ni) ;
probability_of_ice:long_name = "probability of ice" ;
probability_of_ice:units = "1" ;
probability_of_ice:comment = "Sum of pwater, pice, and pcloud (not included) is 100" ;
probability_of_ice:coordinates = "lon lat" ;
probability_of_ice:valid_min = 0b ;
probability_of_ice:valid_max = 100b ;
probability_of_ice:FillValue = -100b ;
short large_scale_correlated_uncertainty(time, nj, ni) ;
large_scale_correlated_uncertainty:long_name = "Uncertainty from errors likely to be correlated over large scales" ;
large_scale_correlated_uncertainty:units = "kelvin" ;
large_scale_correlated_uncertainty:coordinates = "lon lat" ;
large_scale_correlated_uncertainty:valid_min = 0s ;
large_scale_correlated_uncertainty:valid_max = 5000s ;
large_scale_correlated_uncertainty:scale_factor = 0.01 ;
large_scale_correlated_uncertainty:add_offset = 0. ;
large_scale_correlated_uncertainty:comment = "Component of uncertainty that is correlated over large scales; can be
combined with other uncertainty estimates to form a total uncertainty" ;
large_scale_correlated_uncertainty:FillValue = -32768s ;
short uncorrelated_uncertainty(time, nj, ni) ;
uncorrelated_uncertainty:long_name = "Uncertainty from errors unlikely to be correlated between surface
temperatures" ;
uncorrelated_uncertainty:units = "kelvin" ;
uncorrelated_uncertainty:coordinates = "lon lat" ;
uncorrelated_uncertainty:valid_min = 0s ;
uncorrelated_uncertainty:valid_max = 5000s ;
uncorrelated_uncertainty:scale_factor = 0.01 ;
uncorrelated_uncertainty:add_offset = 0. ;
uncorrelated_uncertainty:comment = "Component of uncertainty that is uncorrelated between SSTs; can be combined
with other uncertainty estimates to form a total uncertainty" ;
uncorrelated_uncertainty:FillValue = -32768s ;
short synoptically_correlated_uncertainty(time, nj, ni) ;
synoptically_correlated_uncertainty:long_name = "Uncertainty from errors likely to be correlated over synoptic scales"
synoptically_correlated_uncertainty:units = "kelvin" ;
synoptically_correlated_uncertainty:coordinates = "lon lat" ;
synoptically_correlated_uncertainty:valid_min = 0s ;
synoptically_correlated_uncertainty:valid_max = 5000s ;
synoptically_correlated_uncertainty:scale_factor = 0.01 ;
synoptically_correlated_uncertainty:add_offset = 0. ;
synoptically_correlated_uncertainty:comment = "Component of uncertainty that is correlated over synoptic scales; can
be combined with other uncertainty estimates to form a total
uncertainty" ;
synoptically_correlated_uncertainty:correlation_length_scale = "100 km" ;
synoptically_correlated_uncertainty:correlation_time_scale = "1 day" ;
synoptically_correlated_uncertainty:FillValue = -32768s ;

// global attributes:
:topcategory = "Oceans Climatology Meteorology Atmosphere" ;
:keywords = "Sea Ice Skin Temperature, Sea Surface Temperature, Sea Ice, Oceanography, Meteorology, Climate,
Remote Sensing" ;
:gcmd_keywords = "Cryosphere > Sea Ice > Sea Ice Surface TemperatureOcean > Sea Surface > Sea Surface
Temperature" ;
:activity_type = "Space borne instrument" ;
:Conventions = "CF-1.6" ;
:spatial_resolution = "1.1km at nadir" ;
:file_quality_level = 0 ;
:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
:uuid = "9a963eb4-5a83-45b9-baf7-38a18a84623d" ;
:source = "AVHRRMTB" ;
:metadata_link = "N/A" ;
: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 = 0.009f ;
:geospatial_lon_units = "degrees_east" ;
:geospatial_lon_resolution = 0.015f ;

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:creator_name = "OSI SAF" ;
:creator_email = "osi-saf.helpdesk@meteo.fr" ;
:creator_url = "www.osi-saf.org" ;
: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 and Sea Ice used in this study are
accessible through the SAF's homepage www.osi-saf.org" ;
:history = "osisaf-ist_1.0-46" ;
:publisher_name = "The GHRSSST Project Office ACDD" ;
:publisher_url = "www.ghrsst.org" ;
:publisher_email = "ghrsst-po@nceo.ac.uk" ;
:processing_level = "L2P" ;
:cdm_data_type = "swath" ;
:date_created = "20180125T123500Z" ;
:product_version = "v1.00" ;
:gds_version_id = "2.0" ;
:netcdf_version_id = "4.1.3" ;
:area = "North of 50N and South of 50S" ;
:PI_name = "Gorm Dybkjaer" ;
:contact = "gd@dm.dk" ;
: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." ;
:project = "Group for High Resolution Sea Surface Temperature" ;
:references = "OSI SAF High Latitudes L2 Sea and Sea Ice Surface Temperature Product User Manual, www.osi-
saf.org" ;
:title = "High Latitude Sea and Sea Ice Surface Temperature" ;
:summary = "Sea and Sea Ice Surface Temperature fields obtained from infrared satellite imagery. The product
resolution is approximately 1 km, for Metop AVHRR data. This dataset is intended mainly for data
assimilation/validation, due to large data gaps caused by opaque atmosphere. Multiple daily 3 minute
products are freely available from the EUMETSAT data distributing system, EUMETCAST. This product
is based on IR swath data, in 3 minute segments with at least 1 data value position higher/lower than 50
degree N/S, from the EUMETSAT Metop satellite." ;
:product_name = "OSI-205-a" ;
:id = "AVHRRMTB-OSISAF-L2P-HL-v1.0" ;
:product_status = "File has some empty statistical variables and non-tested probability variables." ;
:naming_authority = "org.ghrsst" ;
:institution = "OSISAF" ;
:satelliteID = "metopb" ;
:date = "2018-01-25 10:43:00 UTC" ;
:start_time = "20180125T104303Z" ;
:stop_time = "20180125T104603Z" ;
:time_coverage_start = "20180125T104303Z" ;
:time_coverage_end = "20180125T104603Z" ;
:platform = "metopb" ;
:sensor = "AVHRRMTB" ;
:northernmost_latitude = 66.183f ;
:easternmost_longitude = 21.232f ;
:southernmost_latitude = 48.697f ;
:westernmost_longitude = -32.111f ;
: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." ; }

```