EUMETSAT OSI SAF
OCEAN AND SEA ICE

Half-Yearly Operations Report

2nd half 2023

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1. Introduction

1.1. Scope of the document

The present report covers the period from July 1 to December 31, 2023.

The objective of this document is to provide EUMETSAT and users, in complement with the web site http://osi-saf.eumetsat.int, an overview on OSI SAF products availability and quality, main anomalies and events, product usage, users' feedback, and updated available documentation.

- Low and Mid latitude (LML) Centre, under Météo-France responsibility, processes and distributes the SST and Radiative Fluxes products covering LML, North Atlantic Regional (NAR) and Global areas. Ifremer contributes to the products distribution and archiving,
- High Latitude (HL) Centre, under MET Norway responsibility with the co-operation of DMI, processes and distributes the Global Sea Ice products, the High Latitude SST and the High Latitude Radiative Fluxes,
- Wind Centre, under KNMI responsibility, processes and distributes the Wind products.

1.2. Products characteristics

The characteristics of the current products are specified in the Service Specification (SeSp) Document [AD.1] available on http://osi-saf.eumetsat.int, the OSI SAF web site.

Three values are usually available for accuracy requirements, for each product:

- The threshold accuracy is the minimum acceptable
- The target (or breakthrough) accuracy is the desired performance level
- The optimal accuracy

In this report, the product performance is compared to the target accuracy. If the values do not meet the target accuracy but are compliant to the threshold accuracy, it is considered useful to distribute the product anyway.

According to OSI-SS-GEN-101 in SeSp [AD.1], operational OSI SAF products accuracy should be better than the value specified as threshold accuracy in the products tables when input satellite data are available with the nominal level of quality (on monthly basis).

1.3. Applicable documents

[AD.1] OSI SAF
Service Specification (SeSp)
SAF/OSI/CDOP3/MF/MGT/PL/003, version 2.03, 21 March 2023

1.4. Reference documents

[RD.1] ASCAT Wind Product User Manual
OSI-102, OSI-102-b, OSI-102-c, OSI-103 (discontinued), OSI-104, 0SI-104-b, 0SI-104-c
SAF/OSI/CDOP/KNMI/TEC/MA/126

[RD.2] ScatSat-1 wind Product User Manual
OSI-112-a, OSI-112-b (discontinued)
SAF/OSI/CDOP2/KNMI/TEC/MA/287

[RD.3] EUMETSAT OSI SAF
Product User Manual (PUM) for the HY-2 winds
OSI-114-a, OSI-114-b, OSI-115-a, OSI-115-b
SAF/OSI/CDOP3/KNMI/TEC/MA/392

[RD.4] ASCAT L2 winds Data Record Product User Manual
OSI-150-a, OSI-150-b
SAF/OSI/CDOP2/KNMI/TEC/MA/238

[RD.5] Product User Manual (PUM) for the Ku-band wind data records
SeaWinds, Oceansat-2, RapidScat (ISS)
OSI-151-c, OSI-151-d, OSI-153-c, OSI-153-d, OSI-159-a, OSI-159-b
SAF/OSI/CDOP3/KNMI/TEC/MA/414

[RD.6] ERS L2 winds Data Record Product User Manual
OSI-152
SAF/OSI/CDOP2/KNMI/TEC/MA/279

[RD.7] Low Earth Orbiter Sea Surface Temperature Product User Manual
OSI-201-b, OSI-202-c, OSI-204-b, OSI-204-c, OSI-208-b
SAF/OSI/CDOP3/MF/TEC/MA/127

[RD.8]Northern High Latitude L3 Sea and Sea Ice Surface Temperature Product User Manual
OSI-203-a, OSI-203-b
SAF/OSI/CDOP3/met.no/TEC/MA/115

[RD.9]High Latitudes L2 Sea and Sea Ice Surface Temperature Product User Manual
OSI-205-a, OSI-205-b
SAF/OSI/CDOP3/DMI/TEC/MA/246

[RD.10]Geostationary Sea Surface Temperature Product User Manual
OSI-206-a, OSI-207-b, OSI-IO-SST
SAF/OSI/CDOP3/MF/TEC/MA/181

[RD.11]MSG/SEVIRI Sea Surface Temperature data record Product User Manual
OSI-250
SAF/OSI/CDOP3/MF/TEC/MA/309

[RD.12]Product User Manual for Atlantic High Latitudes level 3 Radiative Flux products
OSI-301-c, OSI-302-c
SAF/OSI/CDOP3/MET-Norway/TEC/MA/373

[RD.13]Geostationary Radiative Flux Product User Manual
OSI-303-a, OSI-304-a, OSI-305-b, OSI-306-b, OSI-IO-DLI, OSI-IO-SSI
SAF/OSI/CDOP3/MF/TEC/MA/182

[RD.14]Product User Manual for Global Sea Ice Concentration Level 2 and Level 3
OSI-410-a, OSI-401-d, OSI-408-a
OSISAF/DMI/PUM/421

[RD.15]Global Sea Ice Edge and Type Product User's Manual
OSI-402-d, OSI-403-d
SAF/OSI/CDOP2/MET-Norway/TEC/MA/205

[RD.16]50 Ghz Sea Ice Emissivity Product User Manual
OSI-404-a
SAF/OSI/CDOP3/DMI/TEC/MA/191

[RD.17]Low Resolution Sea Ice Drift Product User's Manual
OSI-405-c
SAF/OSI/CDOP/met.no/TEC/MA/128

[RD.18]Medium Resolution Sea Ice Drift Product User Manual
OSI-407-a
SAF/OSI/CDOP/DMI/TEC/MA/137

[RD.19]Product User Manual for the Sea Ice Index, version 2.2
OSI SAF SII (OSI-420)
SAF/OSI/CDOP3/MET-Norway/TEC/MA/387

[RD.20]Global Sea Ice Concentration Climate Data Records Product User Manual
OSI-450-a, OSI-430-a, OSI-458
SAF/OSI/CDOP3/MET/TEC/MA/288

[RD.21] Product User's Manual for the Global Sea Ice Drift Climate Data Record v1
OSI-455
SAF/OSI/CDOP3/MET/TEC/MA/418

1.5. Definitions, acronyms and abbreviations

AHL	Atlantic High Latitude
ASCAT	Advanced SCATterometer
AVHRR	Advanced Very High Resolution Radiometer
BUFR	Binary Universal Format Representation
CDOP	Continuous Development and Operations Phase
CMEMS	Copernicus Marine Environment Monitoring Service
CMS	Centre de Météorologie Spatiale (Météo-France)
DLI	Downward Long wave Irradiance
DMI	Danish Meteorological Institute
DMSP	Defense Meteorological Satellite Program
ECMWF	European Centre for Medium range Weather Forecasts
EDC	EUMETSAT Data Centre
EPS	European Polar System
FTP	File Transfer Protocol
GBL	Global oceans
GOES	Geostationary Operational Environmental Satellite
GOES-E	GOES-East, nominal GOES at 75°W
GRIB	GRIdded Binary format

GTS	Global Transmission System
HIRLAM	High Resolution Limited Area Model
HL	High Latitude
HRIT	High Rate Information Transmission
Ifremer	Institut Français de Recherche pour l'Exploitation de la MER
KNMI	Koninklijk Nederlands Meteorologisch Instituut
LEO	Low Earth Orbiter
LML	Low and Mid Latitude
MAP	Merged Atlantic Product
MET	Nominal Meteosat at 0° longitude
MET Norway or MET	Norwegian Meteorological Institute
Metop	METeorological OPerational Satellite
MF	Météo-France
MGR	Meta-GRanule
MSG	Meteosat Second Generation
NAR	Northern Atlantic and Regional
NESDIS	National Environmental Satellite, Data and Information Service
NetCDF	Network Common Data Form
NMS	National Meteorological Service
NOAA	National Oceanic and Atmospheric Administration
NPP	NPOESS Preparatory Project
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NRT	Near Real-Time
NWP	Numerical Weather Prediction
NIC	National Ice Center (USA)
OSI SAF	Ocean and Sea Ice SAF
R&D	Research and Development
RMDCN	Regional Meteorological Data Communication Network
RMS	Root-Mean-Squared
RSD	Robust Standard Deviation
SAF	Satellite Application Facility
SD	Standard Deviation
SEVIRI	Spinning Enhanced Visible and Infra-Red Imager
SSI	Surface Short wave Irradiance
SSMI	Special Sensor Microwave Imager
SSMIS	Special Sensor Microwave Imager and Sounder
SST/IST	Sea Surface Temperature/ sea Ice Surface Temperature
SST	Sea Surface Temperature
TBC	To Be Confirmed
TBD	To Be Defined
WMO	World Meteorological Organisation

2. OSI SAF products availability and timeliness

As indicated in the Service Specification Document [AD-1], operational OSI SAF products are expected to be available for distribution within the specified time in more than **95%** of the cases where input satellite data are available with the nominal level of quality, on monthly basis.
Section 2.1 shows the measured availability on the OSI SAF FTP servers.
Section 2.2 shows the measured availability via EUMETCast.
The dissemination of the OSI SAF products via EUMETCast implies an additional step, not under the strict OSI SAF responsibility, but general EUMETSAT's one.

Note: The timeliness of the wind products on the KNMI FTP server is not measured separately and therefore the figures in table 1 are copied from table 2 for the wind products. Since the EUMETCast transmission is known to add only a very small delay to the timeliness, the availabilities on the KNMI FTP server are very close to or slightly better than the figures measured via EUMETCast.

The measured availability of the Global **Sea Ice concentration (resp. edge, type)** products corresponds to the situation when a product file is provided within 5 hours, whatever if there are input data or not. The sea ice type is the last product being produced, therefore the most likely to be outside this 5 hour spec.

Please find in section 3 comments on the tables included in section 2.1 and 2.2.

2.1. Availability on FTP servers

Ref.	Product	JUL. 2023	AUG. 2023	SEP. 2023	OCT. 2023	NOV. 2023	DEC. 2023
OSI-102-b	ASCAT-B 25 km wind	100	100	100	99.9	100	100
OSI-102-c	ASCAT-C 25 km wind	100	100	100	99.9	100	100
OSI-104-b	ASCAT-B Coastal wind	99.8	99.9	99.9	99.9	100	100
OSI-104-c	ASCAT-C Coastal wind	99.9	99.9	99.9	99.9	99.8	99.7
OSI-114-a	HY-2B 25 km wind vectors	97.6	98.6	98.5	96.7	83.6	96.3
OSI-114-b	HY-2B 50 km wind vectors	97.4	98.6	98.5	96.9	83.9	96.6
OSI-115-a	HY-2C 25 km wind vectors	99.3	97.6	99.8	99.3	90.5	93.8
OSI-115-b	HY-2C 50 km wind vectors	99.3	97.4	99.8	99.3	90.5	93.8
OSI-116-a	HY-2D 25 km wind vectors	NA	94.6	95.5	94.4	85.9	84.1
OSI-116-b	HY-2D 50 km wind vectors	NA	94.8	95.5	94.3	85.9	84.1
OSI-201-b	GBL SST	100	100	98.3	95.2	100	100
OSI-202-c	NAR SST	100	96.0	93.2	95.2	100	100
OSI-203-a	NHL SST/IST (L3)	100	98.4	100	100	82.5	100
OSI-203-b	NHL SST/IST (L3)	98.4	98.4	100	100	80.7	100
OSI-204-b	MGR SST (Metop-B)	100	99.9	98.1	95.8	99.9	99.9
OSI-204-c	MGR SST (Metop-C)	100	92.1	89.3	99.8	97.4	99.9
OSI-205-a	SST/IST (L2)	99.5	99.4	97.3	100	100	100
OSI-205-b	SST/IST (L2)	99.5	99.1	96.0	100	96.1	99.3
OSI-206-a	Meteosat SST	100	99.6	97.1	99.2	100	99.6
OSI-207-b	GOES-East SST	100	99.9	97.5	99.7	99.9	99.9
OSI-208-b	IASI SST	100	99.5	96.4	99.2	99.8	100
OSI-301-c OSI-302-c	AHL DLI + SSI	100	100	96.4	100	86.2	100
OSI-303-a	Meteosat DLI - hourly	100	98.1	96.9	99.7	99.9	100
	Meteosat DLI - daily	100	96.8	96.7	100	100	100
OSI-304-a	Meteosat SSI - hourly	100	98.1	96.9	99.7	99.9	100
	Meteosat SSI - daily	100	96.8	96.7	100	100	100
OSI-305-b	GOES-East DLI - hourly	99.9	99.1	96.9	99.9	99.9	100
	GOES-East DLI - daily	100	96.8	96.7	100	100	100
OSI-306-b	GOES-East SSI - hourly	99.9	99.1	96.9	99.9	99.9	100
	GOES-East SSI - daily	100	96.8	96.7	100	100	100
OSI-401-d	Global Sea Ice Concentration (SSMIS)	100	100	100	100	100	100
OSI-402-d	Global Sea Ice Edge	100	100	96.4	100	100	100
OSI-403-d	Global Sea Ice Type	100	100	96.4	100	100	100
OSI-404-a	Global Sea Ice Emissivity	100	100	100	100	100	100
OSI-405-c	Low Res. Sea Ice Drift	100	100	96.4	100	100	100
OSI-407-a	Medium Res. Sea Ice Drift	100	100	100	100	100	99.0
OSI-408-a	Global Sea Ice Concentration (AMSR-2)	100	100	93.3	100	100	100
OSI-410-a	Level 2 PMW sea ice concentration	97.8	97.7	94.7	99.2	99.2	98.6
OSI-430-a	Global Reproc Sea Ice Conc Updates	98.9	97.7	91.9	98.1	99.5	98.9

Table 1: Percentage of OSI SAF products available on the OSI SAF FTP servers within the specified time over 2nd half 2023.

2.2. Availability via EUMETCast

Ref.	Product	JUL. 2023	AUG. 2023	SEP. 2023	OCT. 2023	NOV. 2023	DEC. 2023
OSI-102-b	ASCAT-B 25 km wind	100	100	100	99.9	100	100
OSI-102-c	ASCAT-C 25 km wind	100	100	100	99.9	100	100
OSI-104-b	ASCAT-B Coastal wind	99.8	99.9	99.9	99.9	100	100
OSI-104-c	ASCAT-C Coastal wind	99.9	99.9	99.9	99.9	99.8	99.7
OSI-114-a	HY-2B 25 km wind vectors	97.6	98.6	98.5	96.7	83.6	96.3
OSI-114-b	HY-2B 50 km wind vectors	97.4	98.6	98.5	96.9	83.9	96.6
OSI-115-a	HY-2C 25 km wind vectors	99.3	97.6	99.8	99.3	90.5	93.8
OSI-115-b	HY-2C 50 km wind vectors	99.3	97.4	99.8	99.3	90.5	93.8
OSI-116-a	HY-2D 25 km wind vectors	NA	94.6	95.5	94.4	85.9	84.1
OSI-116-b	HY-2D 50 km wind vectors	NA	94.8	95.5	94.3	85.9	84.1
OSI-201-b	GBL SST	100	100	100	90.3	88.3	100
OSI-202-c	NAR SST	100	100	100	92.7	91.5	100
OSI-203-a	NHL SST/IST (L3)	98.4	96.8	100	100	82.8	100
OSI-203-b	NHL SST/IST (L3)	98.4	96.4	100	100	82.8	100
OSI-204-b	MGR SST (Metop-B)	99.9	100	100	92.5	94.0	99.9
OSI-204-c	MGR SST (Metop-C)	Not distributed on EUMETCast					
OSI-205-a	SST/IST (L2)	100	99.8	99.7	100	99.9	100
OSI-205-b	SST/IST (L2)	99.3	97.9	97.8	98.3	95.2	97.5
OSI-206-a	Meteosat SST	99.7	99.9	100	96.1	93.6	99.9
OSI-207-b	GOES-East SST	100	100	100	96.2	92.9	99.9
OSI-208-b	IASI SST	100	99.9	100	98.8	98.4	100
OSI-301-c OSI-302-c	AHL DLI + SSI	100	100	96.4	100	100	100
OSI-303-a	Meteosat DLI - hourly	100	98.1	100	95.8	93.2	100
	Meteosat DLI - daily	100	96.8	100	100	96.7	100
OSI-304-a	Meteosat SSI - hourly	100	98.1	100	95.8	93.2	100
	Meteosat SSI - daily	100	96.8	100	100	96.7	100
OSI-305-b	GOES-East DLI - hourly	100	99.1	100	96.2	93.5	100
	GOES-East DLI - daily	100	96.8	100	100	96.7	100
OSI-306-b	GOES-East SSI - hourly	100	99.6	100	96.2	93.5	100
	GOES-East SSI - daily	100	96.8	100	100	96.7	100
OSI-401-d	Global Sea Ice Concentration (SSMIS)	100	100	100	100	100	100
OSI-402-d	Global Sea Ice Edge	100	100	96.4	100	96.6	96.8
OSI-403-d	Global Sea Ice Type	100	100	96.4	100	96.6	96.8
OSI-404-a	Global Sea Ice Emissivity	100	100	100	100	100	100
OSI-405-c	Low Res. Sea Ice Drift	98.4	96.8	96.4	100	96.6	96.8
OSI-407-a	Medium Res. Sea Ice Drift	100	100	100	100	98.3	100
OSI-408-a	Global Sea Ice Concentration (AMSR-2)	100	100	93.3	100	100	100
OSI-410-a	Level 2 PMW sea ice concentration	98.9	97.7	93.4	98.1	99.5	99.2

Table 2: Percentage of OSI SAF products delivered via EUMETCast within the specified time over 2nd half 2023.

Comment: See next sections 3 and 4 for explanations about the values under 95%.

3. Main anomalies, corrective and preventive measures

In case of anomaly (outage, degraded products…), service messages are made available in near-real time to the registered users through the Web site http://osi-saf.eumetsat.int.

3.1. At Low and Mid-Latitudes subsystem (Météo-France and Ifremer)

Date	Impacted products or services	Anomaly	Corrective and preventive measures
20 July 0000Z to 0900Z	SST-DLI-SSI Meteosat-IO	Spacecraft anomaly	None
17-18 Aug. 2100Z to 1000Z	DLI-SSI Meteosat	Processing blocked by a corrupted file	File Deleted, late production restart
1-5-11-12 Sept.	All data	Intermittent Problem ftp server IFREMER	Users have been informed
23 Oct. to 06 Nov.	All data	Intermittent ftp problem CMS to EUMETSAT	Users have been informed

3.2. At High Latitudes subsystem (MET Norway and DMI)

Date	Impacted products or services	Anomaly	Corrective and preventive measures
31 Aug.-1 Sep.	L2 and L3 AMSR SIC OSI-410-a, OSI-408-a.	Due to missing AMSR input files some products were not produced.	Users notified
14 Sep.	L2 SSMIS SIC OSI-410-a	Due to issues internally at DMI with receiving the SSMIS input files no products were produced	Service message sent and issue solved.
13 Nov.	Timeout on SFTP upload server	MET Norway experienced several days with timeout during the upload of large L2 SST/IST files to the EUMETCast OIDS upload server (see lower timeliness on Nov 2023 for OSI-205-b). This was discussed with EUMETCast people.	Upgraded distribution script to better handling such timeouts.
24 Nov.	Production and distribution of SST and Flux products delayed	Between 24th and 28th Nov the production and distribution of HL MET SST and Flux products had to run on the old backup system due to hardware crash on the main system. The old backup system introduced delays due to lack of processing resources and products were delayed.	Production and distribution code was ported to new production system, which runs on newer operating system.

3.3. At Wind subsystem (KNMI)

Date	Impacted products or services	Anomaly	Corrective and preventive measures
13 July	OSI-115	The HY-2C winds have been unavailable between 11 July 9:00 and 13 July 03:00 UTC sensing time due to an instrument anomaly.	Users have been informed
11 Oct.	OSI-114, OSI-115, OSI-116	The HY-2B/HY-2C/HY-2D winds have been unavailable or delayed between 9 October 9:00 and 10 October 22:00 UTC due to a ground segment anomaly.	Users have been informed
7 Nov.	OSI-114, OSI-115, OSI-116	The HY-2B/HY-2C/HY-2D winds have been unavailable or delayed between 3 November 0:00 and 7 November 0:00 UTC due to a ground segment anomaly.	Users have been informed
21 Nov.	OSI-114, OSI-115, OSI-116	The HY-2B/HY-2C/HY-2D winds have been unavailable or delayed between 17 November 0:00 and 21 November 0:00 UTC due to a ground segment anomaly.	Users have been informed
28 Nov.	OSI-114, OSI-115, OSI-116	The HY-2B/HY-2C/HY-2D winds have been unavailable or delayed between 24 November 6:00 and 28 November 12:00 UTC due to a ground segment anomaly.	Users have been informed

4. Main events and modifications, maintenance activities

In case of event or modification, corresponding service messages are made available in near-real time to the registered users through the Web site http://osi-saf.eumetsat.int.

4.1. At Low and Mid-Latitudes subsystem (Météo-France and Ifremer)

Date	Impacted products or services	Events and modifications, maintenance activities
From Sept.		Ifremer is replacing its mainframe HPC infrastructure, replacing all the disks storage with a new multi-tier system. Though the transition is meant to be as seamless as possible for users, with data being migrated to new disks, occasional and limited (a few hours maximum) disruption of data access services will occur until Summer 2024.
13 Oct. 0700Z to 1400Z	All data	Upgrade of Ifremer FTP
Nov.	Ifremer access statistics	A new system was deployed to record and monitor user access statistics. This report is based on these new statistics, providing additional views on the way data are accessed.
1 Dec.	Ifremer FTP dissemination	A new FTP server with anonymous access was put in operation to access OSI SAF data. Logged access was deemed unnecessary and problematic, following various hacking attempts that forced Ifremer to change regularly the password. Double dissemination with former FTP access was planned until 19th February and notifications sent to users in the form of OSI SAF service messages.
14 Dec.	SST DLISSI	Adjustement of coefficients in the Meteosat SST algorithm

4.2. At High Latitudes subsystem (MET Norway and DMI)

Date	Impacted products or services	Events and modifications, maintenance activities
Nov 2023	MET Norway SST production	Migrating SST production from Centos to Redhat production environment

4.3. At Wind subsystem (KNMI)

Date	Impacted products or services	Events and modifications, maintenance activities
4 August	OSI-116-a and OSI-116-b	The HY-2D winds have pre-operational status since 4 August 2023.

4.4. Release of software and new data records & ICDR

N/A

5. OSI SAF products quality

5.1. SST quality

The comparison between SST products and Match up data bases (MDB) gathering in situ (buoy) measurements is performed on a routine basis for each satellite.

SST values are required to have the following target accuracy when compared to night time and daytime buoy measurements (see Service Specification Document [AD-1]):

	Monthly mean difference (mean difference req. in following tables) in the following ranges	Monthly standard deviation (SD req. in following tables) less than
Global low earth orbit products (GBL, NAR, MGR and IASI SST)	± 0.5 K	0.8 K
High latitudes low earth orbit products (SST in HL SST/IST products)	± 0.7 K	1.0 K
Geostationary products (Meteosat and GOES-East SST)	± 0.5 K	1.0 K

According to GHRSST-PP project, for IR derived products, the normalized Proximity Confidence Value scale shows 6 values: 0: unprocessed, 1: cloudy, 2: bad, 3: suspect, 4: acceptable, 5: excellent. A quality level is provided at pixel level. Those values are good predictors of the errors. It is recommended not to use the confidence value 2 for quantitative use. Usable data are those with confidence values 3, 4 and 5.

The list of blacklisted buoys over the concerned period is available here:
ftp://ftp.ifremer.fr/ifremer/cersat/projects/myocean/sst-tac/insitu/blacklist/

In the following maps, there are at least 5 matchups (satellite and in situ measurements) per box. Sometimes there are not enough collocation due to the lack of input data or because of the cloud cover. Monthly maps of number of matchups in each box are available on the web site.

The number of cases might not be consistent in monthly and half-yearly statistics. There are two reasons responsible for this:

- the monthly statistics are run using the drifting buoy blacklist available for that month, whereas the map is produced at the end of the 6 month period using a more up to date black list.
- The blacklist is periodically update and therefore small differences are expected in the number of points - to produce a map we set up a threshold to the minimum number of records necessary for each 5x5° box.

Robust statistics

In the following, for the LML SST products (OSI-206-a, OSI-207-b, OSI-IO-SST, OSI-202-c, OSI-201-b, OSI-204-b, OSI-204-c), robust statistics (median and Robust Standard Deviation) are computed. The RSD is defined by Merchant and Harris (1999) :

$$RSD = \frac{75^{th}\ percentile\ of\ \Delta SST - 25^{th}\ percentile\ of\ \Delta SST}{1{,}348} \quad \text{with} \quad \Delta SST = SST_{sat} - SST_{insitu}$$

Median and RSD are a little more stable than the mean and SD, and the RSD is lower than the SD.

Please note that the following figures show the map of median SST and the following tables show mean, SD, median and RSD.

For the validation of the Ice Surface Temperature (IST), which is a part of the SST/IST High Latitude products, there are some significant limitations. The only conventional in situ observations are drifting buoys that are placed on the sea ice and automatic weather stations on the Northern Hemisphere. These stations only observe air temperature or the temperature of the snow when they are covered by snow. So they do not directly measure the skin surface temperature that the satellite products estimate. A proper validation is therefore not possible on a routine basis. Still, comparison results are presented in this report, but the results must be read with this in mind. Occasionally, some in situ skin temperature data are available, and will be reported here. No in situ data are available for the Southern hemisphere and hence the IST for SH cannot be validated.

5.1.1. Meteosat SST (OSI-206-a) quality

The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period. Monthly maps are available on https://osi-saf.eumetsat.int/low-and-mid-latitudes-processing-center/charts-display?product=SST.

The operational SST retrieval from Meteosat and GOES-East updated chain validation report v1.1 (https://osi-saf.eumetsat.int/documentation-lml) gives further details about the regional bias observed.

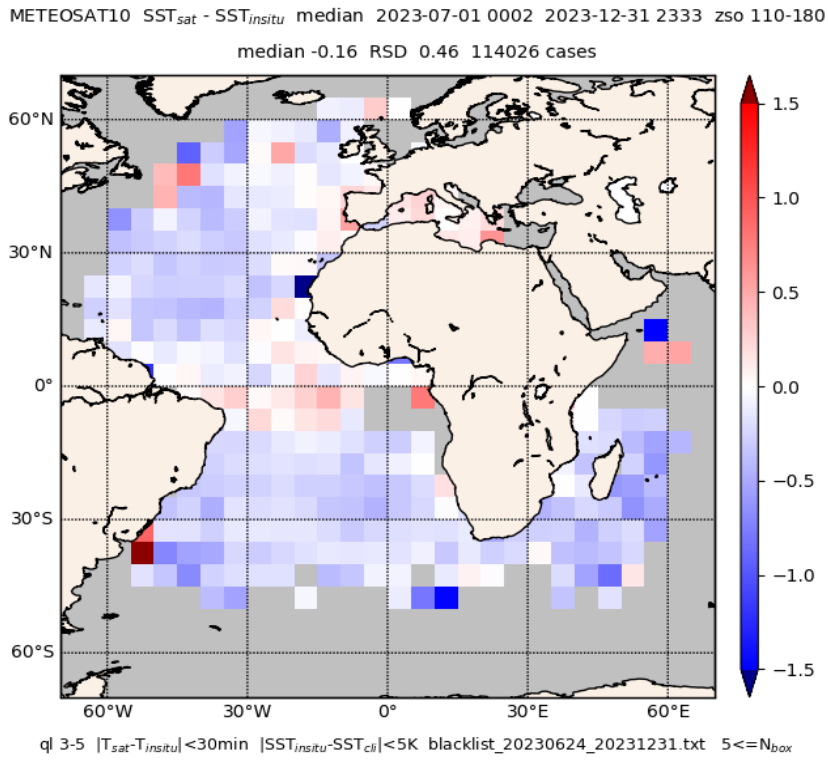

Figure 1: Meteosat night-time SST median difference with respect to buoys measurements for quality level 3,4,5

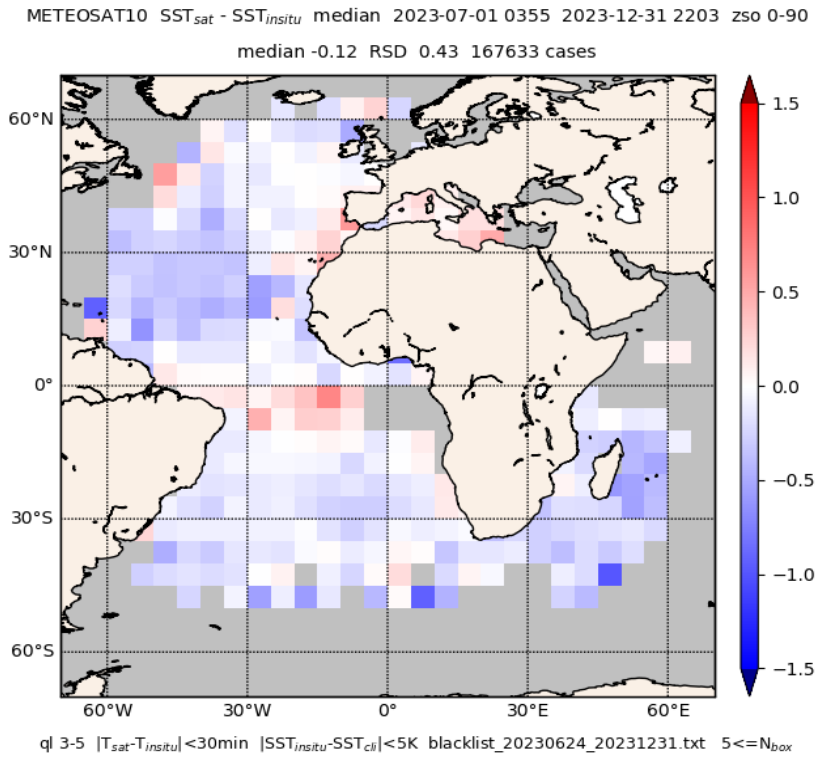

Figure 2: Meteosat day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides the Meteosat-derived SST quality results over the reporting period.

Meteosat night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 1 K)	Median in K	RSD in K
JUL. 2023	16386	-0.17	0.52	-0.15	0.45
AUG. 2023	21245	-0.08	0.54	-0.09	0.47
SEP. 2023	19313	-0.17	0.50	-0.15	0.46
OCT. 2023	16484	-0.19	0.50	-0.16	0.45
NOV. 2023	20301	-0.25	0.49	-0.24	0.46
DEC. 2023	20297	-0.22	0.49	-0.19	0.46
Meteosat day-time SST quality results over 2nd half 2023					
JUL. 2023	28647	-0.14	0.61	-0.11	0.48
AUG. 2023	31832	-0.07	0.56	-0.05	0.46
SEP. 2023	25213	-0.15	0.51	-0.10	0.42
OCT. 2023	20470	-0.18	0.50	-0.14	0.42
NOV. 2023	28728	-0.21	0.46	-0.19	0.41
DEC. 2023	32743	-0.15	0.44	-0.14	0.39

Table 3: Meteosat SST quality results over 2nd half 2023, for 3, 4, 5 quality indexes.

Comments:
Overall statistics are good and within the requirement.

5.1.2. GOES-East SST (OSI-207-b) quality

The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period. Monthly maps are available on https://osi-saf.eumetsat.int/low-and-mid-latitudes-processing-center/charts-display?product=SST.

The operational SST retrieval from MSG/SEVIRI and GOES-East updated chain validation report v1.1 (https://osi-saf.eumetsat.int/documentation-lml) gives further details about the regional bias observed.

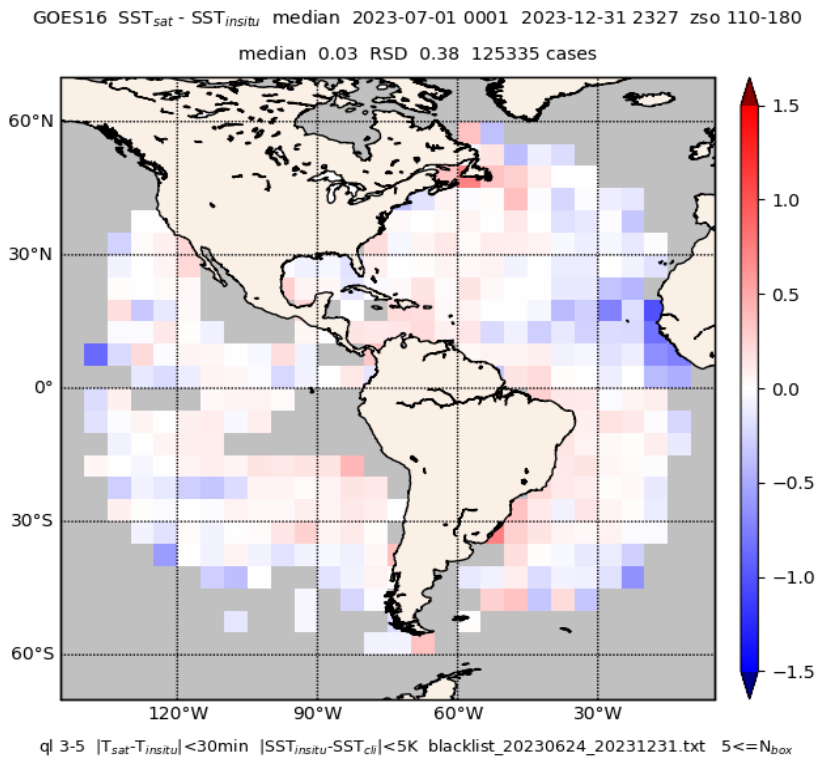

Figure 3: GOES-East night-time SST median difference with respect to buoys measurements for quality level 3,4,5

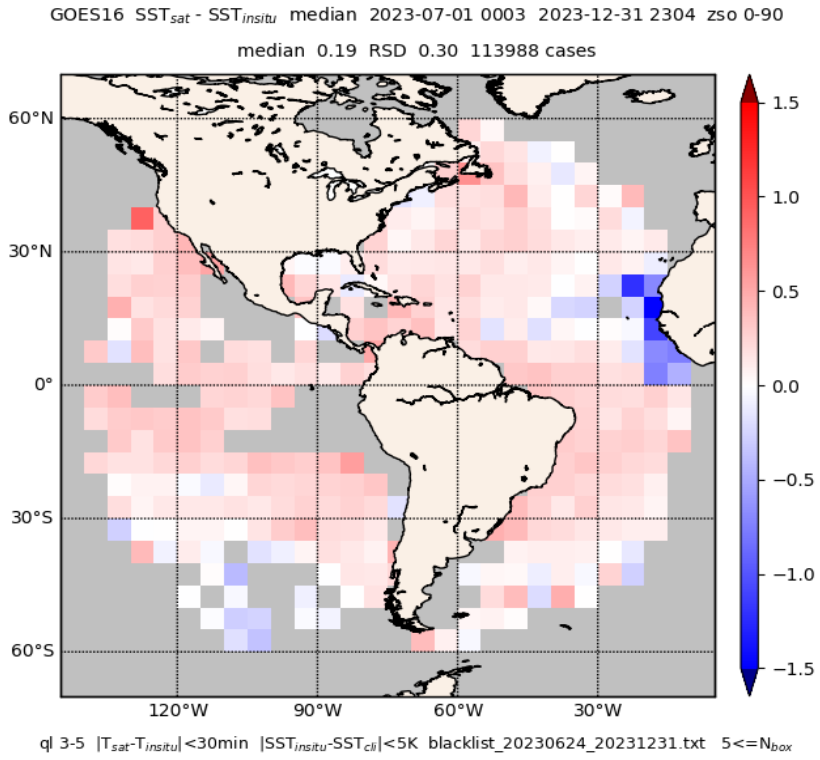

Figure 4: GOES-East day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides the GOES-E-derived SST quality results over the reporting period.

GOES-East night-time SST quality results 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 1 K)	Median in K	RSD in K
JUL. 2023	18692	-0.04	0.46	0.01	0.39
AUG. 2023	23987	-0.06	0.47	0.00	0.37
SEP. 2023	24202	-0.04	0.45	0.02	0.38
OCT. 2023	20289	0.01	0.43	0.06	0.36
NOV. 2023	21534	0.00	0.42	0.06	0.35
DEC. 2023	16631	0.01	0.46	0.06	0.38
GOES-East day-time SST quality results 2nd half 2023					
JUL. 2023	18422	0.10	0.46	0.16	0.34
AUG. 2023	23060	0.11	0.44	0.16	0.32
SEP. 2023	20016	0.15	0.41	0.19	0.30
OCT. 2023	17464	0.20	0.37	0.23	0.27
NOV. 2023	19238	0.17	0.36	0.21	0.27
DEC. 2023	15788	0.17	0.38	0.20	0.30

Table 4: GOES-East SST quality results over 2nd half 2023, for 3, 4, 5 quality indexes

Comments:
Overall statistics are good and within the requirement.

5.1.3. Meteosat Indian Ocean SST (OSI-IO-SST) quality

On the 23 June 2022, Meteosat-9, in position 45.5° East, replaced Meteosat-8 (in position 41.5° East since 2016) for the Indian Ocean Data Coverage (IODC). Sea Surface Temperature is processed as a demonstration product since 2016.

The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period.

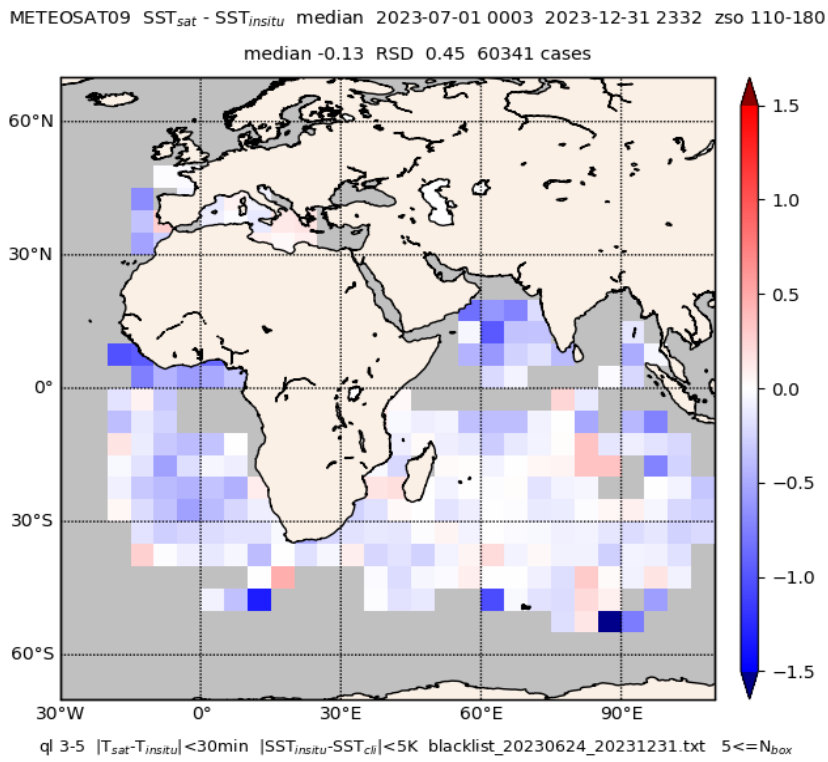

Figure 5: Meteosat Indian Ocean night-time SST median difference with respect to buoys measurements for quality level 3,4,5

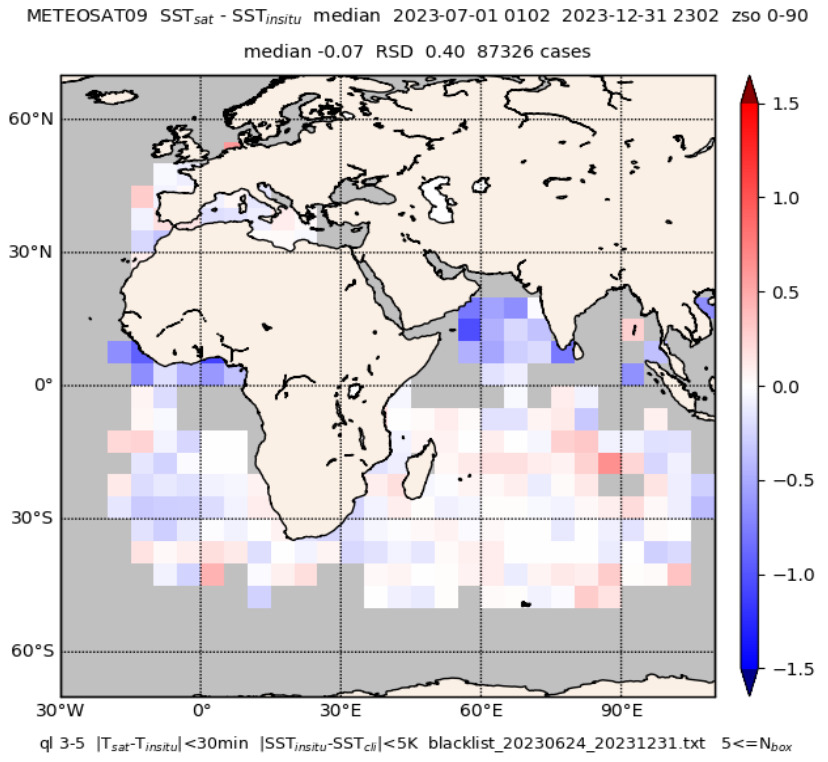

Figure 6: Meteosat Indian Ocean day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides the Meteosat Indian Ocean-derived SST quality results over the reporting period.

Meteosat Indian Ocean night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 1 K)	Median in K	RSD in K
JUL. 2023	9266	-0.12	0.62	-0.05	0.42
AUG. 2023	11121	-0.09	0.55	-0.07	0.42
SEP. 2023	10713	-0.11	0.48	-0.08	0.38
OCT. 2023	8307	-0.21	0.50	-0.15	0.39
NOV. 2023	10470	-0.29	0.59	-0.24	0.52
DEC. 2023	10464	-0.33	0.60	-0.24	0.56
Meteosat Indian Ocean day-time SST quality results over 2nd half 2023					
JUL. 2023	14196	-0.06	0.72	0.03	0.49
AUG. 2023	15394	-0.06	0.55	-0.01	0.42
SEP. 2023	13453	-0.09	0.42	-0.06	0.33
OCT. 2023	10780	-0.11	0.42	-0.08	0.34
NOV. 2023	15298	-0.16	0.45	-0.14	0.39
DEC. 2023	18205	-0.14	0.47	-0.11	0.42

Table 5: Meteosat Indian Ocean SST quality results over 2nd half 2023, for 3, 4, 5 quality indexes.

Comments:
Overall statistics are good and within the requirement.

5.1.4. NAR SST (OSI-202-c) quality

The operational NAR SST is processed with AVHRR and VIIRS data, separately. Currently Metop-B and NOAA-20 are used.

The comparison between NAR SST products and Match up data bases (MDB) gathering in situ (buoy) measurements is performed on a routine basis for each operational Metop and NOAA-20 satellite. It is considered that if the accuracy requirements are met for both AVHRR and VIIRS separately, the accuracy requirements for OSI-202-c are fully met.

5.1.4.1. NOAA-20 NAR SST quality

The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period. Monthly maps are available on https://osi-saf.eumetsat.int/low-and-mid-latitudes-processing-center/charts-display?product=SST.

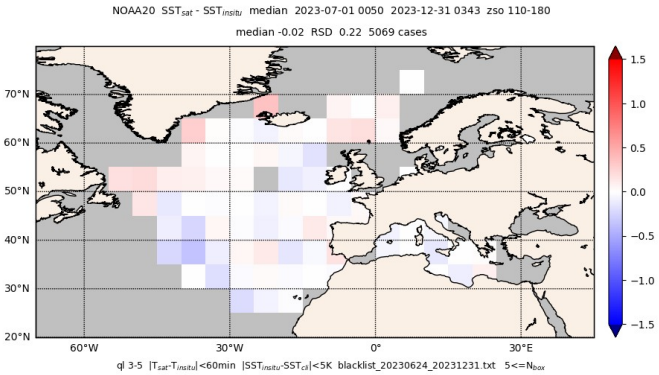

Figure 7: NOAA-20 NAR night-time SST median difference with respect to buoys measurements for quality level 3,4,5

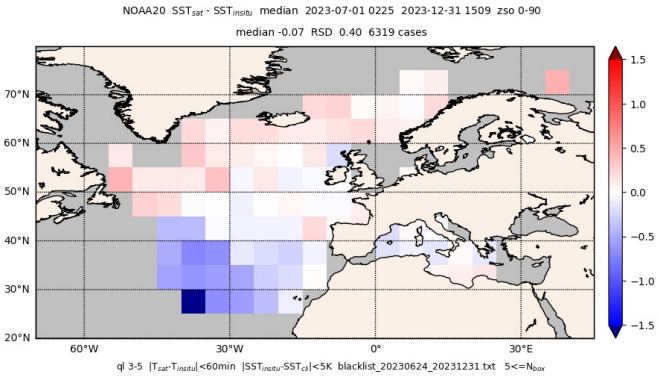

Figure 8: NOAA-20 NAR day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides the NOAA-20-derived SST quality results over the reporting period.

NOAA-20 NAR night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 0.8 K)	Median in K	RSD in K
JUL. 2023	779	-0.08	0.33	-0.03	0.24
AUG. 2023	1130	-0.07	0.30	-0.03	0.23
SEP. 2023	957	-0.05	0.26	-0.01	0.22
OCT. 2023	854	-0.11	0.34	-0.05	0.25
NOV. 2023	658	-0.02	0.26	0.00	0.22
DEC. 2023	691	-0.03	0.26	0.00	0.19
NOAA-20 NAR day-time SST quality results over 2nd half 2023					
JUL. 2023	1535	-0.20	0.56	-0.10	0.48
AUG. 2023	1514	-0.09	0.54	-0.02	0.43
SEP. 2023	1206	-0.24	0.50	-0.18	0.35
OCT. 2023	849	-0.17	0.45	-0.09	0.37
NOV. 2023	631	-0.05	0.41	0.02	0.31
DEC. 2023	584	-0.01	0.41	0.03	0.31

Table 6: Quality results for NOAA-20 NAR SST over 2nd half 2023, for 3, 4, 5 quality indexes

Comments:
Overall statistics are good and within the requirement.

5.1.4.2. Metop NAR SST quality

The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period. Monthly maps are available on https://osi-saf.eumetsat.int/low-and-mid-latitudes-processing-center/charts-display?product=SST.

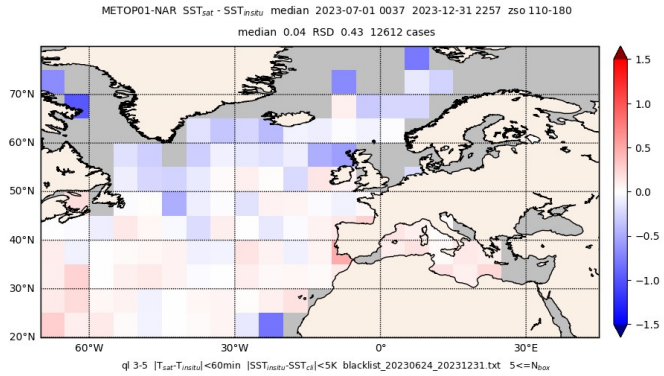

Figure 9: Metop-B NAR night-time SST median difference with respect to buoys measurements for quality level 3,4,5

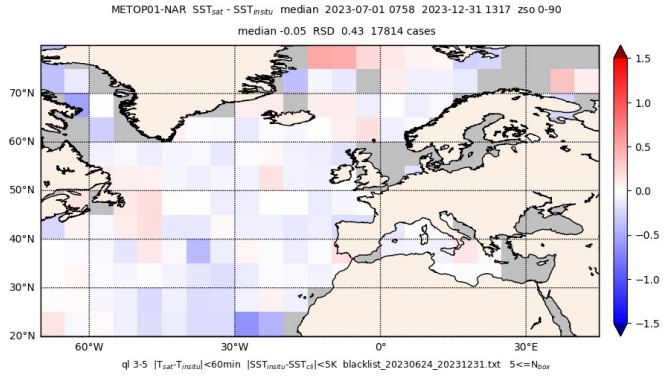

Figure 10: Metop-B NAR day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides Metop-B-derived SST quality results over the reporting period.

Metop-B NAR night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 0.8 K)	Median in K	RSD in K
JUL. 2023	1098	-0.11	0.51	-0.01	0.39
AUG. 2023	1965	-0.02	0.57	0.04	0.49
SEP. 2023	2754	-0.03	0.58	0.09	0.44
OCT. 2023	2629	-0.09	0.57	0.03	0.42
NOV. 2023	2321	-0.07	0.53	0.04	0.42
DEC. 2023	1845	-0.08	0.50	0.01	0.42
Metop-B NAR day-time SST quality results over 2nd half 2023					
JUL. 2023	3481	-0.21	0.69	-0.11	0.44
AUG. 2023	3947	-0.15	0.68	-0.08	0.48
SEP. 2023	3580	-0.07	0.51	-0.01	0.42
OCT. 2023	2769	-0.13	0.52	-0.06	0.43
NOV. 2023	2274	-0.06	0.49	-0.01	0.39
DEC. 2023	1763	-0.05	0.44	-0.01	0.36

Table 7: Quality results for Metop-B NAR SST over 2nd half 2023, for 3, 4, 5 quality indexes

Comments:
Overall statistics are good and within the requirement.

5.1.5. GBL SST (OSI-201-b) and MGR SST (OSI-204-b) quality

The OSI SAF SST products on global coverage (GBL SST and MGR SST) are based on Metop/AVHRR data, currently Metop-B.
The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period. Monthly maps are available on https://osi-saf.eumetsat.int/low-and-mid-latitudes-processing-center/charts-display?product=SST.

The Metop/AVHRR SST validation report, available on http://osi-saf.eumetsat.int, gives further details about the regional bias observed and their origin.

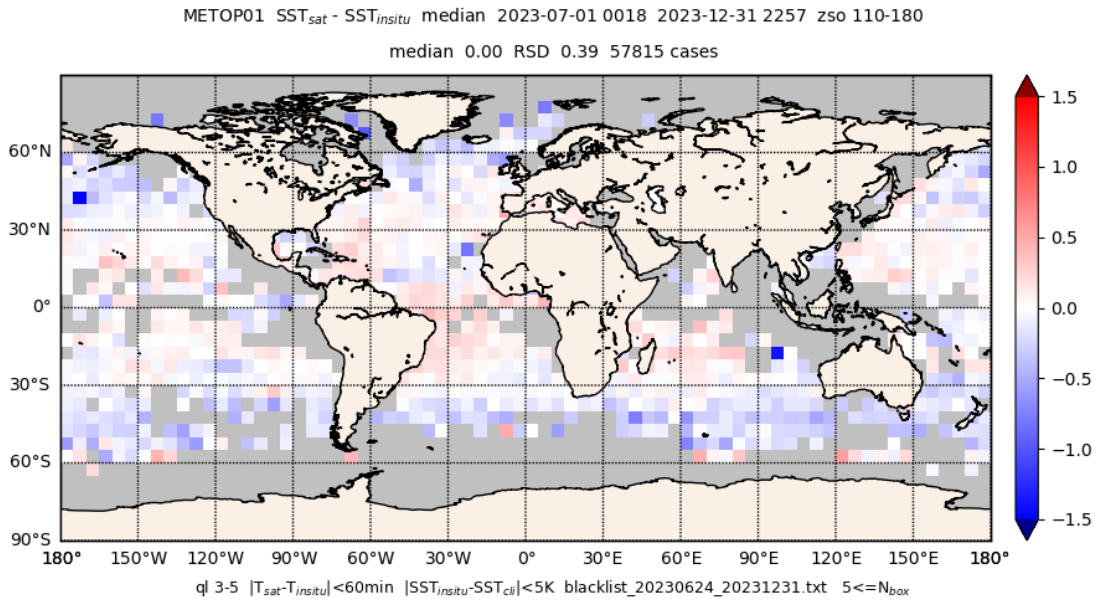

Figure 11: Metop-B night-time SST median difference with respect to buoys measurements for quality level 3,4,5

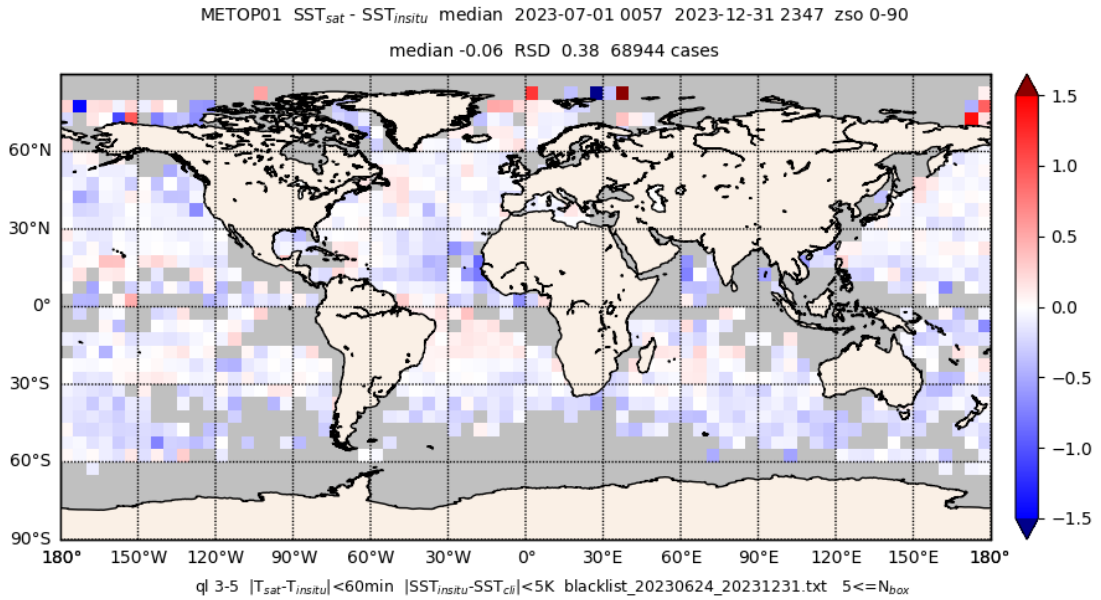

Figure 12: Metop-B day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides the Metop-derived SST quality results over the reporting period.

Global Metop-B night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 0.8 K)	Median in K	RSD in K
JUL. 2023	7763	-0.12	0.51	-0.02	0.39
AUG. 2023	9913	-0.10	0.53	-0.01	0.39
SEP. 2023	10802	-0.08	0.55	0.02	0.39
OCT. 2023	9622	-0.10	0.53	0.01	0.40
NOV. 2023	9903	-0.10	0.53	0.01	0.41
DEC. 2023	9812	-0.12	0.53	-0.02	0.41
Global Metop-B day-time SST quality results over 2nd half 2023					
JUL. 2023	11593	-0.17	0.59	-0.10	0.39
AUG. 2023	13126	-0.12	0.60	-0.08	0.39
SEP. 2023	12546	-0.09	0.49	-0.04	0.37
OCT. 2023	10485	-0.10	0.46	-0.05	0.37
NOV. 2023	10414	-0.09	0.45	-0.05	0.37
DEC. 2023	10780	-0.12	0.46	-0.07	0.39

Table 8: Quality results for global METOP SST over 2nd half 2023, for 3,4,5 quality indexes

Comments:
Overall statistics are good and within the requirement.

5.1.6. MGR SST (OSI-204-c) quality

Following the request of the UK MET Office (for OSTIA in CMEMS) to have the SST from 2 Metops, the Full resolution Metop Sea Surface Temperature metagranules are also processed with Metop-C/AVHRR.
The following maps indicate the median night-time and day-time SST median difference with respect to buoys measurements for quality level 3,4,5 over the reporting period. Monthly maps are available on https://osi-saf.eumetsat.int/low-and-mid-latitudes-processing-center/charts-display?product=SST.

The Metop/AVHRR SST validation report, available on http://osi-saf.eumetsat.int, gives further details about the regional bias observed and their origin.

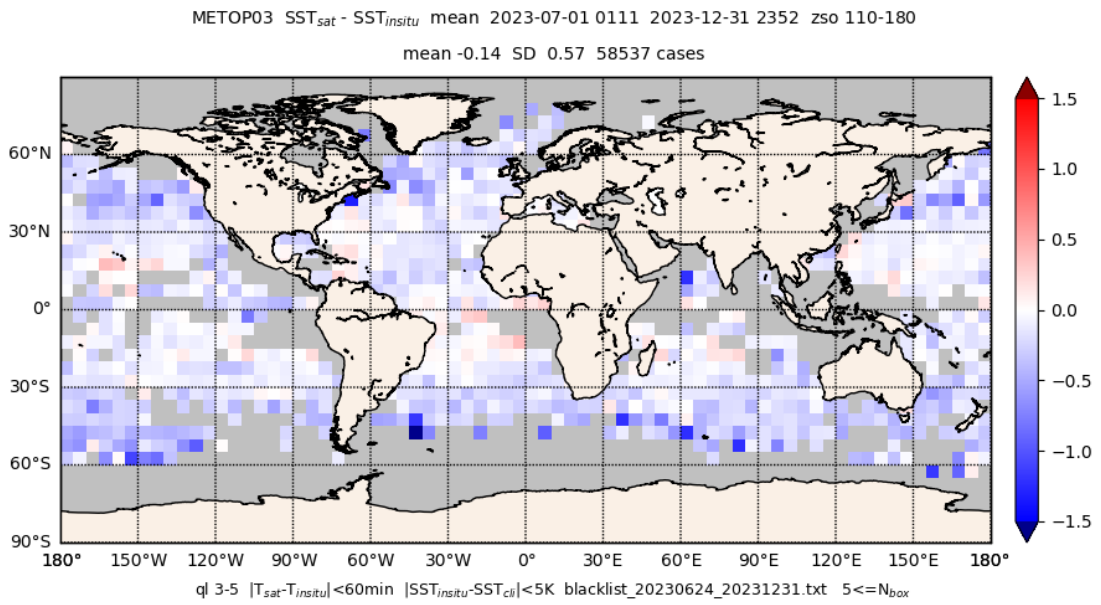

Figure 13: Metop-C night-time SST median difference with respect to buoys measurements for quality level 3,4,5

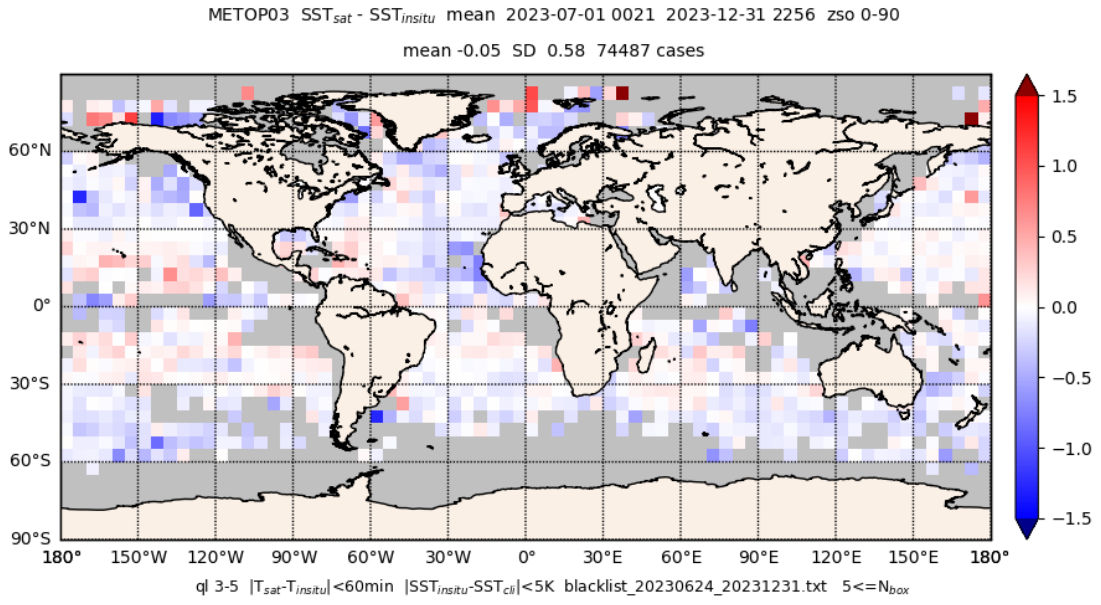

Figure 14: Metop-C day-time SST median difference with respect to buoys measurements for quality level 3,4,5

The following table provides the Metop-derived SST quality results over the reporting period.

Global Metop-C night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	SD in K (req.: 0.8 K)	Median in K	RSD in K
JUL. 2023	7967	-0.16	0.52	-0.05	0.36
AUG. 2023	10108	-0.15	0.57	-0.04	0.36
SEP. 2023	10593	-0.13	0.60	0.01	0.37
OCT. 2023	9628	-0.12	0.56	0.00	0.39
NOV. 2023	10084	-0.12	0.55	0.00	0.40
DEC. 2023	10157	-0.17	0.58	-0.04	0.41
Global Metop-C day-time SST quality results over 2nd half 2023					
JUL. 2023	12573	-0.11	0.68	-0.01	0.44
AUG. 2023	14112	-0.06	0.63	0.00	0.43
SEP. 2023	13176	-0.03	0.55	0.01	0.43
OCT. 2023	11491	-0.04	0.53	0.02	0.43
NOV. 2023	11363	-0.02	0.50	0.03	0.42
DEC. 2023	11772	-0.03	0.51	0.02	0.42

Table 9: Quality results for global Metop-C SST over 2nd half 2023, for 3,4,5 quality indexes

Comments:
Overall statistics are good and within the requirement.

5.1.7. High Latitude SST/IST (OSI-203-a, OSI-203-b, OSI-205-a, OSI-205-b) quality

The OSI-203 and OSI-205 series are high latitude SST and global ice surface temperature (IST) and marginal ice zone surface temperature products.

Conventional measures as Standard Deviation of mean differences (SD) and mean differences are calculated for monthly averages for day-time and night-time. Data with quality levels 3, 4 and 5 are used for both the SST and IST validation. Daytime is defined for data with sun-zenith angles smaller than 90 degrees and night-time data is defined for sun-zenith angles greater than 90 degrees. For the OSI-205 products, the in-situ observations and the centre of the level-2 pixel must be within 3 km of each other and observation times must be within 15 minutes of the satellite crossing time. For the OSI-203 products the in-situ observation must be within the 5 km level-3 pixel and within the 12 hour period that the product covers.
Buoy data used for the SST validation is from the Copernicus Marine Environment Monitoring Service (In Situ TAC).

The IST accuracy requirements are split into two parts in the Product Requirement Document: Namely, surface temperatures from IR radiometers, or similar high quality surface temperature observations, and air temperatures from drifting buoys or similar. The primary reason for splitting IST performance requirements into skin and air temperature requirements is a well documented physical difference between air and skin temperatures (Nielsen-Englyst et al., 2019 (https://tc.copernicus.org/articles/13/1005/2019/)). Secondly, buoy temperatures are often associated with higher uncertainty due to unknown snow conditions around the buoy (discussed in the product ATBDs). In accordance with the OSISAF Product Requirement Document (PRD) the OSI-203 and OSI-205 IST target requirements against air temperature observations are: SD < 3 K and bias < 3.5 K; against surface temperature observations: SD < 2 K and bias < 1.5 K.

The air temperature requirements are applied to buoy reference data, including air temperatures from Ice Mass Balance Buoys (IMB), and air temperatures from land based weather stations, like the PROMICE stations on the Greenland Ice Sheet. The surface temperature requirements are applied for radiometric skin temperature measurements and surface temperature references from IMBs, when such data are available and to calculated surface temperature reference measurements for PROMICE stations. The PROMICE surface temperatures are calculated from Incoming and ourgoing lang wave radiation measurements at the PROMICE stations (https://essd.copernicus.org/preprints/essd-2021-80/essd-2021-80.pdf). These reference surface temperatures are considered of high quality.

Due to a 6 month delay on the release of PROMICE surface temperature data, the HYR reporting contains validation against both surface and air temperatures from PROMICE data. We anticipate to get near real time access to PROMICE surface temperatures soon, in order to cover the entire HYR period with PROMICE surface temperature data for future reportings.

5.1.7.1. Level 2 HL SST/IST based on Metop/AVHRR (OSI-205-a)

The Level 2 HL SST/IST (OSI-205-a) is derived from polar satellites data, currently from Metop-B. The following tables and figures provide the OSI-205-a SST quality results over the reporting period.

The following tables and figures provide, in order, the results for the SST, sea IST and inland IST, respectively.

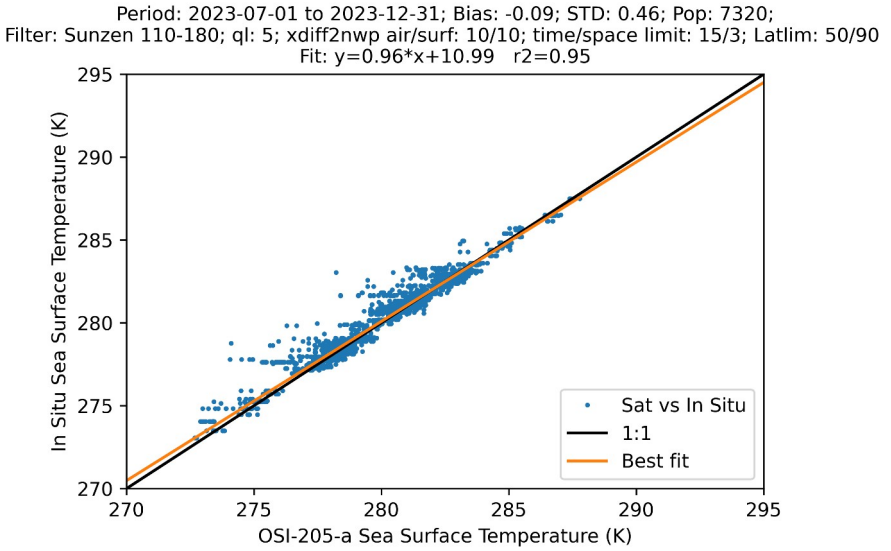

Figure 15: 2nd half 2023 OSI-205-a SST mean difference and bias with respect to conventional buoys measurements from the Copernicus In Situ DB. Only night-time data for the northern hemisphere are shown.

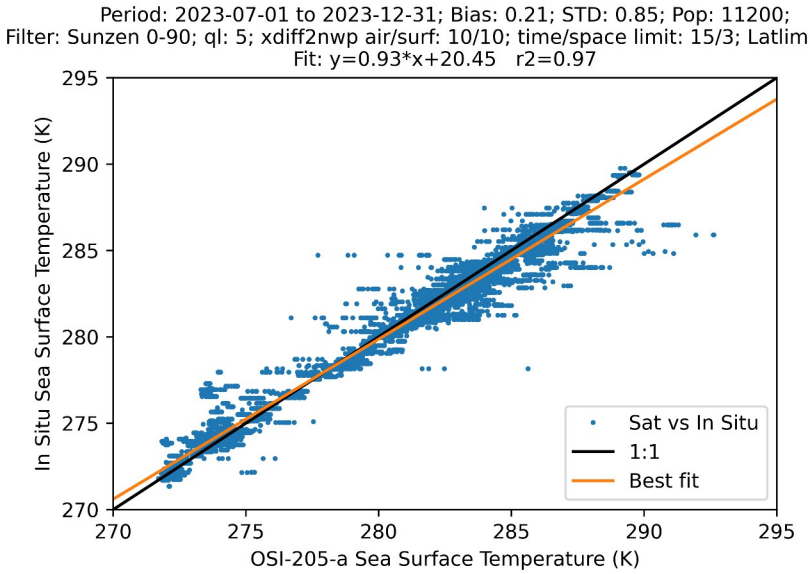

Figure 16: 2nd half 2023 OSI-205-a SST mean difference and bias with respect to conventional buoys measurements from the Copernicus In Situ DB. Only daytime data for the northern hemisphere are shown.

OSI-205-a AVHRR SST quality results over JAN. 2023 to DEC. 2023, night-time, NH					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	870	-0.56	19.65	0.57	42.66
FEB. 2023	792	-0.41	41.80	0.52	48.47
MAR. 2023	109	-0.46	34.59	0.25	74.72
APR. 2023	0	-	-	-	-
MAY 2023	0	-	-	-	-
JUN. 2023	0	-	-	-	-
1st half 2023	*1771*	*-0.49*	*30.48*	*0.54*	*46.16*
JUL. 2023	0	-	-	-	-
AUG. 2023	6	-0.36	47.86	0.21	79.05
SEP. 2023	194	0.02	97.33	0.51	48.56
OCT. 2023	617	-0.13	81.21	0.67	32.71
NOV. 2023	2844	-0.02	97.23	0.50	49.86
DEC. 2023	3659	-0.14	80.31	0.37	63.37
2nd half 2023	*7320*	*-0.09*	*87.53*	*0.46*	*53.79*
OSI-205-a AVHRR SST quality results over JAN. 2023 to DEC. 2023, day-time, NH					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	0	-	-	-	-
FEB. 2023	474	0.05	92.81	0.32	67.61
MAR. 2023	318	-0.60	14.50	0.65	35.13
APR. 2023	2523	-0.19	72.17	0.50	50.19
MAY 2023	4065	-0.18	73.94	0.45	55.00
JUN. 2023	3287	0.13	82.11	1.05	-4.86
1st half 2023	*10667*	*-0.09*	*86.77*	*0.72*	*27.85*
JUL. 2023	3418	0.19	73.49	1.06	-5.74
AUG. 2023	2987	0.36	48.27	0.96	4.25
SEP. 2023	3815	0.17	75.42	0.50	49.81
OCT. 2023	918	-0.01	99.06	0.63	36.94
NOV. 2023	62	0.08	88.36	0.15	84.83
DEC. 2023	0	-	-	-	-
2nd half 2023	*11200*	*0.21*	*69.76*	*0.85*	*15.44*
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|))					
(**) SD margin = 100 * (1 - (SD / SD req.))					
100 refers then to a perfect product, 0 to a quality just as required. without margin.					
A negative result indicates that the product quality does not fulfil the target requirement.					

Table 10: Quality results for OSI-205-a AVHRR SST against Copernicus in situ DB buoys, for the Northern Hemisphere, from January to December 2023, for quality level 5 by night and by day

Comments: For the validation against buoy measurements from the Copernicus In Situ DB in the Northern Hemisphere, the target requirements of are all satisfied with one exception. During daytime, the standard deviation in July is slightly above the target requirement of ±1.0 K, but it is still way below the threshold requirements of ±1.5 K.

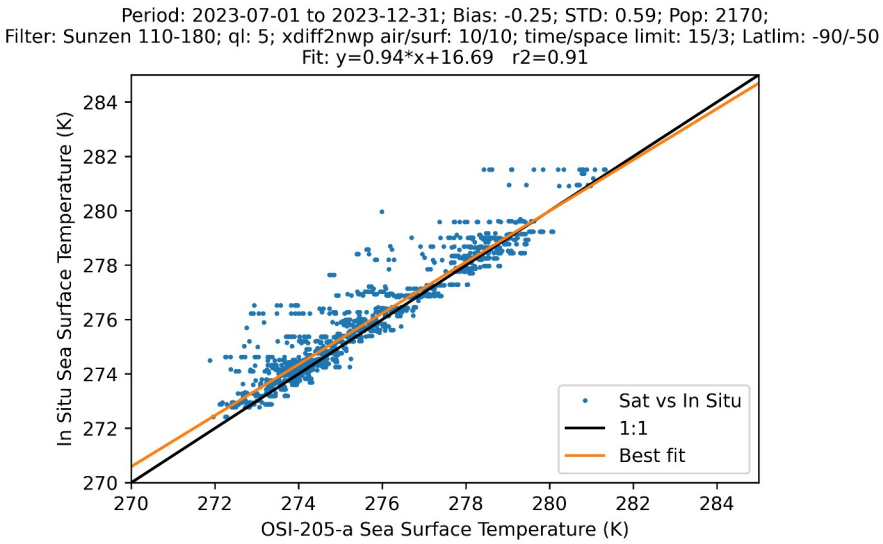

Figure 17: 2nd half 2023 OSI-205-a SST mean difference and bias with respect to conventional buoys measurements from the Copernicus In Situ DB. Only night-time data for the southern hemisphere are shown.

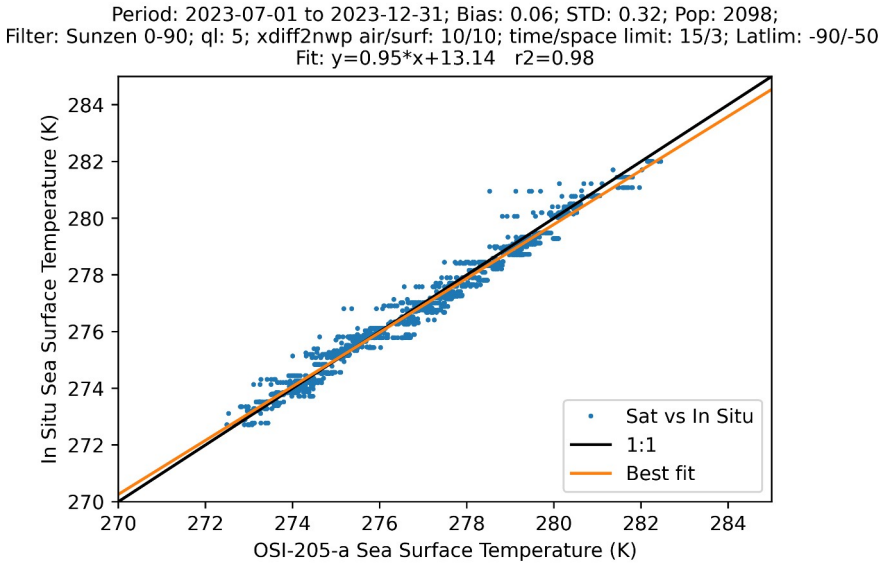

Figure 18: 2nd half 2023 OSI-205-a SST mean difference and bias with respect to conventional buoys measurements from the Copernicus In Situ DB. Only daytime data for the southern hemisphere are shown.

OSI-205-a AVHRR SST quality results from January to December 2023, night-time, SH					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	0	-	-	-	-
FEB. 2023	104	0.03	95.82	0.33	66.74
MAR. 2023	501	-0.13	81.13	0.83	16.68
APR. 2023	500	-0.13	80.97	0.54	46.31
MAY 2023	653	-0.22	68.53	0.48	51.95
JUN. 2023	672	-0.62	11.32	0.75	25.26
1st half 2023	*2430*	*-0.28*	*59.39*	*0.69*	*31.46*
JUL. 2023	581	-0.52	26.20	0.75	25.19
AUG. 2023	552	-0.28	59.35	0.59	40.71
SEP. 2023	505	-0.10	85.11	0.39	60.66
OCT. 2023	530	-0.06	91.13	0.42	57.65
NOV. 2023	2	-0.48	31.43	0.13	87
DEC. 2023	0	-	-	-	-
2nd half 2023	*2170*	*-0.25*	*64.21*	*0.59*	*40.67*
OSI-205-a AVHRR SST quality results from January to December 2023, day-time, SH					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	666	0.11	84.93	0.29	70.9
FEB. 2023	586	0.09	87.58	0.28	71.97
MAR. 2023	542	0.15	78.80	0.35	64.91
APR. 2023	286	0.01	99.20	0.36	64.33
MAY 2023	34	-0.03	95.63	0.94	5.57
JUN. 2023	0	-	-	-	-
1st half 2023	*2114*	*0.10*	*86.34*	*0.34*	*66.28*
JUL. 2023	6	-0.26	63.33	0.16	84.24
AUG. 2023	54	0.01	98.99	0.26	73.6
SEP. 2023	408	-0.15	77.94	0.33	67.45
OCT. 2023	291	0.06	91.44	0.34	65.51
NOV. 2023	480	0.04	94.98	0.27	73.16
DEC. 2023	869	0.19	72.42	0.27	72.85
2nd half 2023	*2098*	*0.06*	*90.74*	*0.32*	*68.02*
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|))					
(**) SD margin = 100 * (1 - (SD / SD req.))					
100 refers then to a perfect product, 0 to a quality just as required. without margin.					
A negative result indicates that the product quality does not fulfil the requirement.					

Table 11: Quality results for OSI-205-a AVHRR SST, for the Southern Hemisphere, from January to December 2023, for quality level 5,4,3 by night and by day

Comments: For the validation against buoy measurements from the Copernicus In Situ DB in the Southern Hemisphere, the target requirements of are all satisfied.

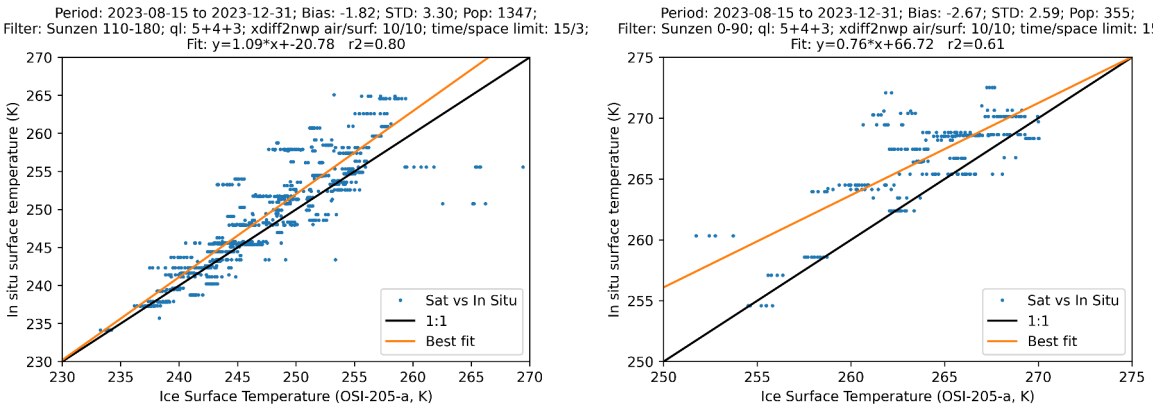

Figure 19: 2nd half 2023 OSI-205-a monthly mean IST mean difference and bias with respect to conventional buoys measurements from the SIMB3 buoys (air temperature). Only data from the Northern Hemisphere and with quality level 3, 4, 5 are shown. The graph on the left shows night-time data, while the plot on the right only shows day-time observations.

OSI-205-a IST quality results over 2nd half 2023, night-time, air temperature, SIMB3					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JUL. 2023	0	-	-	-	-
AUG. 2023	0	-	-	-	-
SEP. 2023	0	-	-	-	-
OCT. 2023	0	-	-	-	-
NOV. 2023	471	-0.87	75.20	2.34	22.07
DEC. 2023	1347	-1.82	47.98	3.30	-10.12
OSI-205-a IST quality results over 2nd half 2023, day-time, air temperature, SIMB3					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JUL. 2023	0	-	-	-	-
AUG. 2023	0	-	-	-	-
SEP. 2023	231	-2.32	33.74	2.79	6.94
OCT. 2023	124	-3.34	4.68	1.99	33.66
NOV. 2023	0	-	-	-	-
DEC. 2023	355	-2.67	23.59	2.59	13.78
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|)) (**) SD margin = 100 * (1 - (SD / SD req.)) 100 refers then to a perfect product, 0 to a quality just as required. without margin. A negative result indicates that the product quality does not fulfil the requirement.					

Table 12: Quality results for OSI-205-a Metop AVHRR IST against SIMB3 for the Northen Hemisphere, over 2nd half 2023, for quality levels 3, 4 and 5, by night and by day.

Comments: For the validation against SIMB buoys, the target requirements of are all satisfied with one exception. During nighttime, the standard deviation in December is above the target requirement of ±3.0 K, but it is still way below the threshold requirements of ±4.0 K.

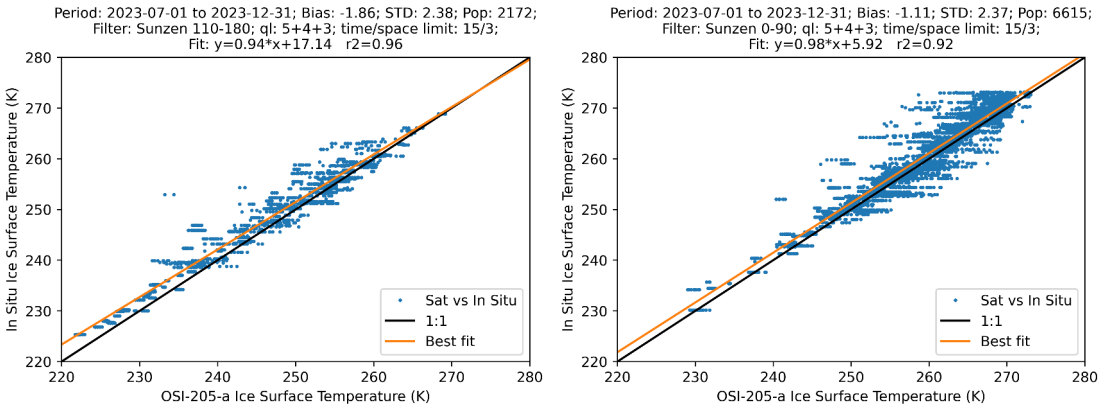

Figure 20: IST PROMICE air: 2nd half 2023 OSI-205-a monthly mean IST with respect to air measurements from PROMICE. The graph on the left shows night-time data with quality flags 5, 4 & 3, while the plot on the right only shows day-time observations

OSI-205-a IST quality results over 2nd half 2023, night-time, air temperature, PROMICE					
Month	Number of cases	Mean diff. in K (target: ±3.5 K)	Mean diff. margin (*)	SD in K (target: 3.0 K)	SD margin (**)
JUL. 2023	0	-	-	-	-
AUG. 2023	0	-	-	-	-
SEP. 2023	5	-0.09	97.37	0.32	89.33
OCT. 2023	250	-0.99	71.74	1.91	36.32
NOV. 2023	695	-1.19	65.88	2.35	21.58
DEC. 2023	2172	-1.86	46.85	2.38	20.61
OSI-205-a IST quality results over 2nd half 2023, day-time, air temperature, PROMICE					
Month	Number of cases	Mean diff. in K (target: ±3.5 K)	Mean diff. margin (*)	SD in K (target: 3.0 K)	SD margin (**)
JUL. 2023	1099	-1.24	64.46	2.05	31.66
AUG. 2023	825	-1.31	62.48	2.11	29.68
SEP. 2023	2292	-0.95	72.97	2.59	13.63
OCT. 2023	1721	-1.02	70.86	2.18	27.31
NOV. 2023	314	-1.56	55.36	3.21	-7.10
DEC. 2023	6615	-1.11	68.16	2.37	20.86
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. target|)) (**) SD margin = 100 * (1 - (SD / SD target)) 100 refers then to a perfect product, 0 to a quality just as targeted. without margin. A negative result indicates that the product quality does not fulfil the target requirement.					

Table 13: Quality results for OSI-205-a Metop AVHRR IST over 2nd half 2023, for quality levels 3, 4 and 5, by night and by day. Compared to PROMICE measured air temperature

Comments: For the validation against PROMICE stations, the target requirements of are all satisfied with one exception. During daytime, the standard deviation in November is above the target requirement of ±3.0 K, but it is still way below the threshold requirements of ±4.0 K.

5.1.7.2. Level 2 NHL SST/IST based on NPP/VIRRS (OSI-205-b)

The Level 2 Northern High Latitude Sea and Ice Surface Temperature (NHL SST/IST, OSI-205-b) is based on VIIRS data from SNPP.

The following tables provides the OSI-205-b SST and IST quality results.

OSI-205-b NHL VIIRS SST quality results from January to December 2023, night-time					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	367	-0,4	42,3	0,93	7.1
FEB. 2023	300	-0,3	57,8	0,89	10.5
MAR. 2023	199	-0,33	52,4	0,81	19.3
APR. 2023	267	-0,38	46,3	0,83	16.7
MAY 2023	178	-0,51	27	0,91	9.4
JUN. 2023	42	-0,33	53,2	0,7	30.1
JUL. 2023	160	-0,32	54,2	1,12	-11,6
AUG. 2023	331	-0,44	37,7	1,03	-3,2
SEP. 2023	435	-0,33	53,2	0,95	4,9
OCT. 2023	436	-0,52	26,1	0,95	4,9
NOV. 2023	396	-0,52	25,9	0,92	8,2
DEC. 2023	491	-0,46	34,3	0,94	5,8
OSI-205-b NHL VIIRS SST quality results from January to December 2023, day-time					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	109	-0,48	31,6	0,74	26,5
FEB. 2023	225	-0,41	41,4	0,69	30,8
MAR. 2023	253	-0,51	27,1	0,75	25,2
APR. 2023	484	-0,25	64,6	0,6	39,5
MAY 2023	449	-0,23	67,4	0,71	29
JUN. 2023	624	-0,02	97,4	0,92	8,4
JUL. 2023	1034	0,06	92,1	1,13	-13,4
AUG. 2023	948	-0,03	95,9	1,03	-2,8
SEP. 2023	662	-0,22	69,2	0,77	23,3
OCT. 2023	403	-0,32	54,8	0,71	29,3
NOV. 2023	284	-0,39	44,8	0,68	31,5
DEC. 2023	283	-0,37	46,7	0,69	30,6
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|))					
(**) SD margin = 100 * (1 - (SD / SD req.))					
100 refers then to a perfect product, 0 to a quality just as required. without margin.					
A negative result indicates that the product quality does not fulfil the requirement.					

Table 14: Quality results for OSI-205-b NHL NPP VIIRS SST, over Northern Atlantic and Arctic Ocean, from January to December 2023, for 3,4,5 quality indexes, by night and by day. Comparison with drifting buoys.

OSI-205-b NHL VIIRS IST quality results from January to December 2023, night-time					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JAN. 2023	18	-4.69	-34.0	2.02	32.6
FEB. 2023	6	-4.36	-24.7	2.51	16.2
MAR. 2023	37	-2.44	30.1	1.46	51.2
APR. 2023	124	-2.94	15.9	2.13	28.7
MAY 2023	20	-2.97	14.9	2.33	22.2
JUN. 2023	-	-	-	-	-
JUL. 2023	3	-1,33	62,1	0,93	69,1
AUG. 2023	37	-2,74	21,7	2,39	20,4
SEP. 2023	177	-2,19	37,6	1,5	49,9
OCT. 2023	289	-2,39	31,7	1,85	38,2
NOV. 2023	21	-2,61	25,4	1,12	62,6
DEC. 2023	27	-2,72	22,3	2,12	29,4
OSI-205-b NHL VIIRS IST quality results from January to December 2023, day-time					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JAN. 2023	7	-3.43	1.8	0.96	67.8
FEB. 2023	14	-2.72	22.2	1.50	49.7
MAR. 2023	57	-2.92	16.4	2.09	30.3
APR. 2023	542	-2.36	32.5	2.00	33.1
MAY 2023	378	-1.82	47.9	1.89	36.9
JUN. 2023	-	-	-	-	-
JUL. 2023	117	-1,85	47,3	2,03	32,4
AUG. 2023	183	-1,68	52	1,95	34,9
SEP. 2023	266	-2,28	34,8	1,71	43,1
OCT. 2023	183	-2,47	29,5	1,36	54,7
NOV. 2023	16	-2,59	26,1	0,94	68,6
DEC. 2023	24	-1,68	52	1,21	59,8
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|)) (**) SD margin = 100 * (1 - (SD / SD req.)) 100 refers then to a perfect product, 0 to a quality just as required. without margin. A negative result indicates that the product quality does not fulfil the requirement.					

Table 15: Quality results for OSI-205-b NHL NPP VIIRS IST, over Northern Atlantic and Arctic Ocean, from January to December 2023, for 3,4,5 quality indexes, by night and by day. Compared to PROMICE measured air temperature on the Greenland ice sheet.

Comments:
For the last half year, the SST part of the OSI-205-b product is within target requirement for mean difference for all months, both day-time and night-time. For standard deviation the product is slightly outside target requirement for standard deviation in July and August, both day-time and night-time.
The IST part of the OSI-205-b product is within target requirement for both mean difference and standard deviation for all months, both daytime and night time.

5.1.7.3. Level 3 NHL SST/IST based on Metop/AVHRR (OSI-203-a)

The Level 3 Northern High Latitude Sea and Sea Ice Surface Temperature (NHL SST/IST, OSI-203-a) is derived from the level 2 SST/IST product OSI-205-a, which is based on AVHRR data from Metop-B.

The following tables provide the OSI-203-a SST quality, then IST quality results.

OSI-203-a NHL AVHRR SST quality results from January to December 2023, night-time					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	4864	-0.89	-28.2	0.81	19.0
FEB. 2023	3890	-0.83	-18.7	0.67	32.1
MAR. 2023	1503	-0.78	-11.4	0.69	31.0
APR. 2023	1456	-0.47	32.4	0.76	23.2
MAY 2023	919	-0.37	46.0	0.85	15.0
JUN. 2023	483	-0.28	59.3	0.98	1.3
JUL. 2023	782	-0,22	68,6	1,33	-33,3
AUG. 2023	1400	-0,38	45,5	1,11	-11,1
SEP. 2023	2479	-0,44	36,7	0,91	8,6
OCT. 2023	2460	-0,52	25,7	0,86	14,2
NOV. 2023	2463	-0,51	27,8	0,8	20,2
DEC. 2023	3495	-0,55	20,7	0,74	26,3
OSI-203-a NHL AVHRR SST quality results from January to December 2023, day-time					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	888	-0.39	44.0	0.71	28.5
FEB. 2023	1497	-0.40	42.7	0.55	44.4
MAR. 2023	2599	-0.66	4.7	0.74	25.7
APR. 2023	3091	-0.38	44.7	0.59	40.5
MAY 2023	3291	-0.42	39.0	0.71	28.4
JUN. 2023	3383	-0.26	61.9	0.93	7.0
JUL. 2023	6754	-0,23	67,2	1,17	-16,9
AUG. 2023	5245	-0,2	71,8	1,03	-2,8
SEP. 2023	4787	-0,08	88,8	0,76	24
OCT. 2023	2893	-0,22	68,7	0,63	37,1
NOV. 2023	2692	-0,27	60,9	0,67	33,2
DEC. 2023	2305	-0,33	53,2	0,75	24,8
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|))					
(**) SD margin = 100 * (1 - (SD / SD req.))					
100 refers then to a perfect product, 0 to a quality just as required. without margin.					
A negative result indicates that the product quality does not fulfil the requirement.					

Table 16: Quality results for OSI-203-a NHL Metop-B AVHRR SST from January to December 2023, for 3,4,5 quality indexes, by night and by day. Comparison with drifting buoys.

OSI-203-a NHL AVHRR IST quality results from January to December 2023, night-time					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JAN. 2023	139	-3.85	-10.2	3.48	-16.1
FEB. 2023	112	-3.04	13.1	3.77	-25.8
MAR. 2023	136	-4.15	-18.6	2.82	5.7
APR. 2023	38	-4.03	-15.3	3.46	-15.6
MAY 2023	-	-	-	-	-
JUN. 2023	-	-	-	-	-
JUL. 2023	7	-2,51	28,2	1,16	61,4
AUG. 2023	34	-5,51	-57,4	1,49	50,5
SEP. 2023	299	-2,65	24,3	2,92	2,6
OCT. 2023	477	-2,75	21,5	2,6	13,3
NOV. 2023	176	-4,08	-16,5	2,83	5,6
DEC. 2023	226	-3,99	-14	3,07	-2,3
OSI-203-a NHL AVHRR IST quality results from January to December 2023, day-time					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JAN. 2023	10	-5.47	-56.4	1.76	41.1
FEB. 2023	7	-4.64	-32.6	0.642	78.6
MAR. 2023	52	-1.90	45.7	1.66	44.4
APR. 2023	257	-0.77	77.9	2.87	4.3
MAY 2023	159	0.11	96.8	2.70	10.0
JUN. 2023	-	-	-	-	-
JUL. 2023	413	-1,83	47,7	2,76	8
AUG. 2023	570	-1,78	49,3	2,73	9
SEP. 2023	1143	-2,8	20,1	2,56	14,6
OCT. 2023	976	-2,87	18,1	2,57	14,4
NOV. 2023	86	-3,51	-0,4	2,51	16,4
DEC. 2023	126	-3,05	12,9	2,46	18
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|))					
(**) SD margin = 100 * (1 - (SD / SD req.))					
100 refers then to a perfect product, 0 to a quality just as required. without margin.					
A negative result indicates that the product quality does not fulfil the requirement.					

Table 17: Quality results for OSI-203-a NHL Metop-B AVHRR IST from January to December 2023, for 3,4,5 quality indexes, by night and by day. Compared to PROMICE measured air temperature on the Greenland ice sheet, averaged over 12 hours.

Comments: For the last half year, the SST part of the OSI-203-a product is within target requirement for mean difference for all months, both daytime and night-time. For standard deviation the product is slightly outside target requirement for standard deviation in July and August, both day-time and night-time.
The IST part of the OSI-203-a product is within target requirement for standard deviation for all months, except in December at night-time (slightly outside). For mean difference it is outside the target requirement at day-time in August, November and December. Still, it is always within the threshold requirement.

5.1.7.4. Level 3 NHL SST/IST based on NPP/VIRRS (OSI-203-b)

The Level 3 Northern High Latitude Sea and Ice Surface Temperature (NHL SST/IST, OSI-203-b) is derived from the Level 2 SST/IST product OSI-205-b, which is based on VIIRS data from SNPP.

The following tables provides the OSI-203-b SST and IST quality results.

OSI-203-b NHL VIIRS SST quality results from January to December 2023, night-time					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	6518	-0.26	62.8	0.80	19.1
FEB. 2023	4407	-0.31	54.4	0.77	22.7
MAR. 2023	1958	-0.19	71.7	1.04	-4.7
APR. 2023	1740	-0.46	33.7	0.82	17.3
MAY 2023	809	-0.59	14.9	1.01	-1.2
JUN. 2023	494	-0.67	3.1	0.92	7.7
JUL. 2023	788	-0.43	38.4	1.15	-15
AUG. 2023	1315	-0.63	10.7	1.06	-5.6
SEP. 2023	1958	-0.50	28.8	0.96	3.6
OCT. 2023	1938	-0.43	38.9	0.81	18.8
NOV. 2023	3661	-0.59	15.0	0.95	4.6
DEC. 2023	4237	-0.42	39.3	0.77	23.4
OSI-203-b NHL VIIRS SST quality results from January to December 2023, day-time					
Month	Number of cases	Mean diff. in K (req.: ± 0.7 K)	Mean diff. margin (*)	SD in K (req.: 1.0 K)	SD margin (**)
JAN. 2023	917	-0.49	29.1	0.62	37.5
FEB. 2023	1373	-0.40	42.3	0.66	33.4
MAR. 2023	2515	-0.67	3.6	0.62	37.2
APR. 2023	2268	-0.53	23.0	0.67	32.9
MAY 2023	2477	-0.40	42.7	0.69	30.8
JUN. 2023	2258	-0.32	53.6	0.81	18.6
JUL. 2023	3441	-0.04	93,8	1.07	-6.8
AUG. 2023	2983	-0.23	67.2	1.01	-1.0
SEP. 2023	2529	-0.19	72.8	0.80	20.3
OCT. 2023	1513	-0.28	60.4	0.61	39.1
NOV. 2023	2720	-0.28	59.6	0.52	48.1
DEC. 2023	2334	-0.30	57.1	0.56	43.6
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|))					
(**) SD margin = 100 * (1 - (SD / SD req.))					
100 refers then to a perfect product, 0 to a quality just as required. without margin.					
A negative result indicates that the product quality does not fulfil the requirement.					

Table 18: Quality results for OSI-203-b NHL NPP VIIRS SST from January to December 2023, for 3,4,5 quality indexes, by night and by day. Comparison with drifting buoys.

OSI-203-b NHL VIIRS IST quality results from January to December 2023, night-time					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JAN. 2023	75	-3.69	-5.7	3.46	-15.4
FEB. 2023	69	-3.49	0.2	3.80	-26.8
MAR. 2023	89	-4.47	-27.8	3.03	-1.3
APR. 2023	72	-4.50	-28.8	3.07	-2.5
MAY 2023	-	-	-	-	-
JUN. 2023	-	-	-	-	-
JUL. 2023	16	-2.92	16.4	2.39	20.3
AUG. 2023	159	-4.00	-14.3	2.07	31.1
SEP. 2023	760	-2.9	17.2	2.53	15.7
OCT. 2023	930	-2.98	15.0	2.57	14.4
NOV. 2023	187	-3.64	-3.9	2.41	19.8
DEC. 2023	276	-3.82	-9.2	2.70	9.9
OSI-203-b NHL VIIRS IST quality results from January to December 2023, day-time					
Month	Number of cases	Mean diff. in K (req.: ± 3.5 K)	Mean diff. margin (*)	SD in K (req.: 3.0 K)	SD margin (**)
JAN. 2023	7	-4.83	-38.2	0.55	81.4
FEB. 2023	6	-3.51	-0.3	2.39	20.3
MAR. 2023	27	-0.41	88.2	1.76	41.2
APR. 2023	156	-1.94	44.5	2.86	4.60
MAY 2023	124	-2.50	28.4	2.63	12.1
JUN. 2023	-	-	-	-	-
JUL. 2023	375	-2.81	19.8	2.44	18.5
AUG. 2023	494	-2.88	17.8	2.30	23.5
SEP. 2023	800	-3.32	5.1	2.69	10.4
OCT. 2023	613	-2.46	29.6	2.50	16.7
NOV. 2023	83	-1.97	43.7	1.82	39.4
DEC. 2023	62	-4.12	-17.9	2.15	28.4
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|)) (**) SD margin = 100 * (1 - (SD / SD req.)) 100 refers then to a perfect product, 0 to a quality just as required. without margin. A negative result indicates that the product quality does not fulfil the requirement.					

Table 19: Quality results for OSI-203-b NHL NPP VIIRS IST from January to December 2023, for 3,4,5 quality indexes, by night and by day. Compared to PROMICE measured air temperature on the Greenland ice sheet.

Comments: For the last half year, the SST part of the OSI-203-b product is within target requirement for mean difference for all months, both daytime and night-time. For standard deviation the product is slightly outside target requirement for standard deviation in July and August, both day-time and night-time.
The IST part of the OSI-203-b product is within target requirement for standard deviation for all months, both day-time and night-time. For mean difference it is outside the target requirement at day-time in August, November and December, and at night-time in December. Still, it is always within the threshold requirement.

5.1.8. IASI SST (OSI-208-b) quality

The product requirements for IASI SSTs are to have a target accuracy of 0.5 K mean difference and 0.8 K standard deviation compared to drifting buoy SSTs.

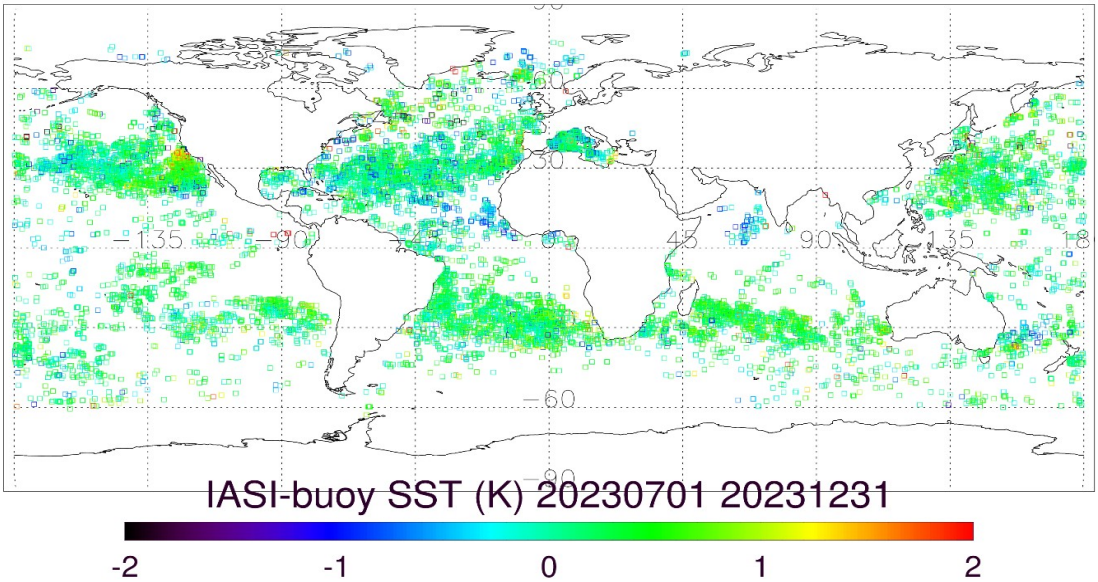

Figure 21: Mean Metop-B IASI night-time SST minus drifting buoy SST for Quality Levels 3, 4 and 5 from January to December 2023.

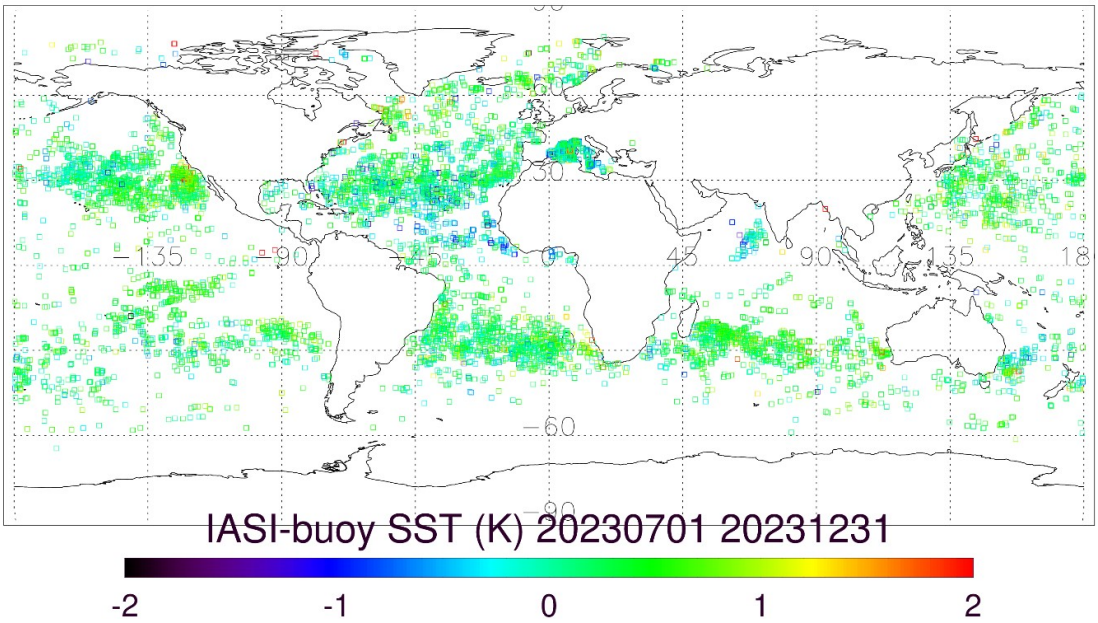

Figure 22: Mean Metop-B IASI day-time SST minus drifting buoy SST for Quality Levels 3, 4 and 5 from January to December 2023

The following table provides the Metop-B derived IASI SST quality results over the reporting period.

Global Metop-B IASI night-time SST quality results over 2nd half 2023					
Month	Number of cases	Mean diff. in K (req.: ± 0.5 K)	Mean diff. margin (*)	SD in K (req.: 0.8 K)	SD margin (**)
JUL. 2023	2146	0.17	66	0.54	33
AUG. 2023	3059	0.20	60	0.56	30
SEP. 2023	2746	0.21	58	0.49	39
OCT. 2023	2278	0.14	72	0.52	35
NOV. 2023	2364	0.17	66	0.52	35
DEC. 2023	2094	0.13	74	0.54	33
Global Metop-B IASI day-time SST quality results over 2nd half 2023					
JUL. 2023	1623	0.22	56	0.48	40
AUG. 2023	1583	0.22	56	0.57	29
SEP. 2023	1426	0.24	54	0.50	38
OCT. 2023	1211	0.22	56	0.51	36
NOV. 2023	980	0.30	60	0.49	39
DEC. 2023	2094	0.13	74	0.54	33
(*) Mean diff. margin = 100 * (1 - (|mean diff. / mean diff. req.|)) (**) SD margin = 100 * (1 - (SD / SD req.)) 100 refers then to a perfect product, 0 to a quality just as required. without margin. A negative result indicates that the product quality does not fulfil the requirement.					

Table 20: Quality results for global Metop-B IASI SST over 2nd half 2023, for Quality Levels 3, 4 and 5

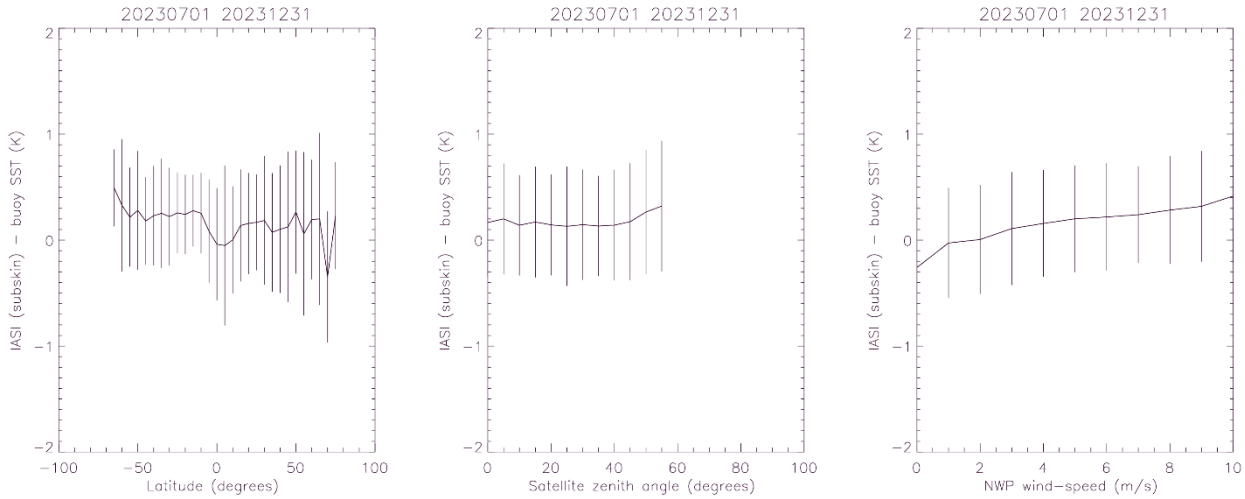

Figure 23: Mean Metop-B IASI night-time SST minus drifting buoy SST analyses for Quality Levels 3, 4 and 5, JAN. 2023 to DEC. 2023

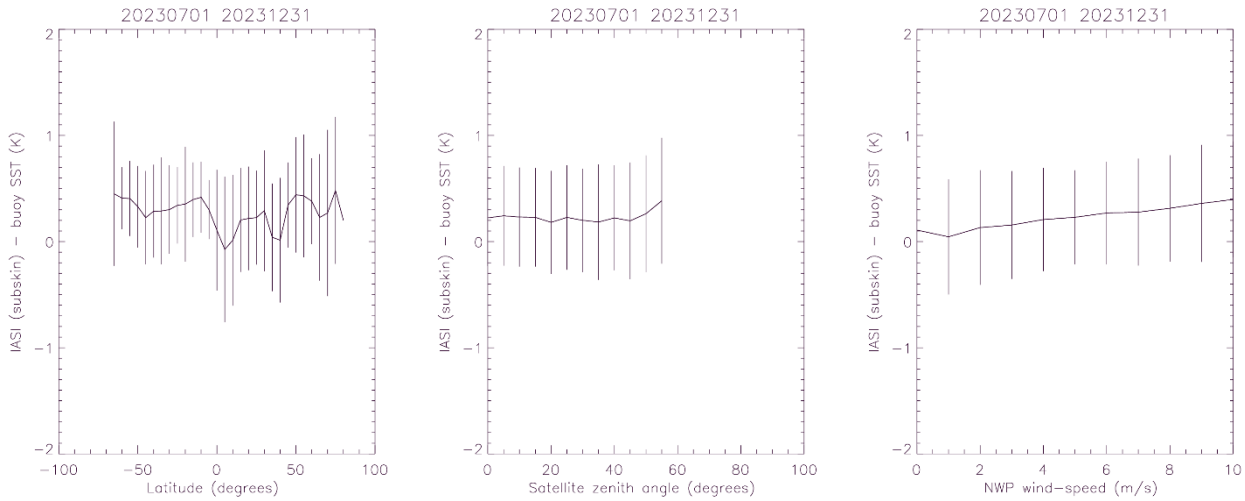

Figure 24: Mean Metop-B IASI day-time SST minus drifting buoy SST analyses for Quality Levels 3, 4 and 5, JAN. 2023 to DEC. 2023

Comments:
Over the six month reporting period the night-time mean IASI bias (for quality levels 3 and above) against drifting buoy SSTs is 0.17K with a standard deviation of 0.53K (n=14687); and the day-time mean bias is -0.23K, standard deviation 0.51K (n=7650). The monthly mean and whole time period results and within the target accuracy.

5.2. Radiative Fluxes quality

5.2.1. DLI quality

DLI products are constituted of the geostationary products (GOES-East, Meteosat 0°, Meteosat Indian Ocean) and the polar ones (Atlantic High Latitude). DLI values are required to have the following accuracy when compared to land pyrgeometer measurements:

- monthly relative mean difference less than 5%,
- monthly difference standard deviation less than 10%.

The match-up data base the statistics are based on is continuously enriched, so that, for the same period, results may evolve depending on the date when the statistics were calculated.

5.2.1.1. GOES-East DLI (OSI-305-b) quality

The list of pyrgeometer stations used for validating the geostationary DLI products is available on the OSI SAF Web Site from the following page:
https://osi-saf.eumetsat.int/files/lml/doc_lml/osisaf_cdop3_ss1_dlissival_user_doc.pdf

The following table provides the hourly and daily DLI quality results over the reporting period.

GOES-East hourly DLI quality results from January to December 2023								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	2953	278.56	-8.76	37.11	17.99	35.42	-6.93	14.84
FEB. 2023	2688	269,23	-3,82	71,62	17,81	33,85	-2,53	14,58
MAR. 2023	2970	275.34	-5.10	62.95	17.96	34.77	-4.05	15.66
APR. 2023	2880	305.08	-2.55	83.28	15.62	48.80	-1.99	14.34
MAY 2023	2866	337.02	0.44	97.39	15.50	54.01	0.05	13.57
JUN. 2023	2755	365.06	1.87	89.76	14.39	60.58	0.89	12.47
JUL. 2023	2944	383.37	1.36	92.91	13.50	64.79	0.91	11.42
AUG. 2023	2970	380.68	2.02	89.39	13.67	64.09	1.97	11.92
SEP. 2023	2880	356.71	1.04	94.17	14.92	58.17	0.75	12.33
OCT. 2023	2780	323.8	-0.17	98.95	16.51	49.01	-1.38	12.72
NOV. 2023	2880	277.26	-3.28	76.34	14.26	48.57	-1.81	11.67
DEC. 2023	2976	274.99	-8.62	37.31	16.14	41.31	-6.51	13.74

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 21: GOES-East hourly DLI quality results from January to December 2023.

GOES-East daily DLI quality results from January to December 2023								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	122	278.53	-8.83	36.60	10.27	63.13	-8.45	9.65
FEB. 2023	112	269,27	-3,8	71,78	9.25	65,65	-1,81	7,97
MAR. 2023	123	274.93	-5.21	62.10	9.97	63.74	-4.81	10.87
APR. 2023	120	305.07	-2.55	83.28	8.38	72.53	-2.59	8.57
MAY 2023	121	336.94	0.50	97.03	8.67	74.27	-0.07	6.62
JUN. 2023	114	365.42	1.83	89.98	7.32	79.97	2.21	6.62
JUL. 2023	122	383.52	1.33	93.06	6.26	83.68	1.81	5.76
AUG. 2023	124	380.56	1.97	89.65	6.63	82.58	2.61	6.76
SEP. 2023	120	356.73	1.04	94.17	9.00	74.77	2.19	7.37
OCT. 2023	116	323.74	-0.18	98.89	9.65	70.19	-0.51	7.57
NOV. 2023	120	277.28	-3.29	76.27	7.94	71.36	-2.37	7.51
DEC. 2023	124	274.99	-8.61	37.38	9.56	65.24	-7.66	8.84

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 22: GOES-East daily DLI quality results from January to December 2023.

Comments:
Overall statistics are good and within the requirement.

5.2.1.2. Meteosat 0° DLI (OSI-303-a) quality

The following table provides the hourly and daily DLI quality results over the reporting period.

Meteosat 0° hourly DLI quality results from January to December 2023								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	744	301.28	-9.69	35.67	18.83	37.50	-8.70	14.72
FEB. 2023	672	281.26	-6.32	55.06	17.43	38.03	-4.99	15.48
MAR. 2023	728	307.51	-4.56	70.34	16.20	47.32	-3.20	13.56
APR. 2023	720	307.74	0.43	97.21	14.87	51.68	0.97	15.05
MAY 2023	744	325.45	4.08	74.93	11.87	63.53	3.98	12.51
JUN. 2023	720	354.45	6.22	64.90	12.00	66.14	5.90	12.37
JUL. 2023	740	360.69	4.18	76.82	10.58	70.67	4.57	10.52
AUG. 2023	718	365.10	1.65	90.96	13.21	63.82	2.22	13.11
SEP. 2023	698	357.07	2.00	88.80	13.56	62.02	2.63	12.96
OCT. 2023	744	332.51	-1.88	88.69	16.73	49.69	-1.31	16.70
NOV. 2023	720	309.04	-6.56	57.55	18.29	40.82	-5.73	16.86
DEC. 2023	744	303.93	-13.92	8.40	21.69	28.63	-12.48	19.78

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 23: Meteosat 0° hourly DLI quality results from January to December 2023.

Meteosat 0° daily DLI quality results from January to December 2023								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	31	301.27	-9.70	35.61	10.74	64.35	-8.97	11.30
FEB. 2023	28	281.18	-6.32	55.05	10.75	61.77	-4.71	10.67
MAR. 2023	30	307.48	-4.49	70.79	7.58	75.35	-3.53	4.66
APR. 2023	30	307.71	0.44	97.14	6.89	77.61	2.39	8.84
MAY 2023	31	325.49	4.10	74.81	5.73	82.40	4.96	6.96
JUN. 2023	30	354.49	6.21	64.96	4.44	87.47	5.81	4.45
JUL. 2023	31	360.49	4.15	76.98	4.30	88.07	3.02	4.33
AUG. 2023	29	366.10	2.53	86.18	6.48	82.30	2.17	4.14
SEP. 2023	28	356.20	1.87	89.50	6.14	82.76	2.30	5.24
OCT. 2023	31	332.51	-1.90	88.57	7.39	77.78	-2.23	7.44
NOV. 2023	30	309.00	-6.57	57.48	9.10	70.55	-6.61	9.81
DEC. 2023	31	303.93	-13.88	8.66	11.94	60.71	-14.62	11.90

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 24: Meteosat 0° daily DLI quality results from January to December 2023.

Comments:
Overall statistics are good and within the requirement.

5.2.1.3. Meteosat Indian Ocean DLI (OSI-IO-DLI) quality

On the 23 June 2022, Meteosat-9, in position 45.5° East, replaced Meteosat-8 (in position 41.5° East since 2016) for the Indian Ocean Data Coverage (IODC). Downward Long wave Irradiance is processed as a demonstration product since 2016.

The following table provides the hourly and daily DLI quality results over the reporting period.

Meteosat Indian Ocean hourly DLI quality results from January to December 2023								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	744	300.65	-10.33	31.28	20.46	31.95	-10.38	18.57
FEB. 2023	672	280.69	-6.89	50.91	22.21	20.87	-4.46	20.59
MAR. 2023	744	308.88	-3.31	78.57	18.10	41.40	-2.92	16.10
APR. 2023	720	309.88	2.58	83.35	18.52	40.23	3.34	17.35
MAY 2023	744	327.36	5.99	63.40	16.87	48.47	7.08	15.81
JUN. 2023	720	359.07	10.85	39.57	15.53	56.75	11.42	12.69
JUL. 2023	731	363.64	7.15	60.68	14.43	60.32	8.23	13.30
AUG. 2023	732	367.75	4.15	77.43	16.06	56.33	5.24	14.62
SEP. 2023	698	359.39	4.32	75.96	15.99	55.51	4.70	16.37
OCT. 2023	744	334.29	-0.10	99.40	19.07	42.95	1.20	20.21
NOV. 2023	720	310.1	-5.5	64.53	21.19	31.67	-5.84	20.32
DEC. 2023	744	301.77	-16.07	-6.50	24.91	17.45	-17.40	26.57

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 25: Meteosat Indian Ocean hourly DLI quality results from January to December 2023.

Meteosat Indian Ocean daily DLI quality results from January to December 2023								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	31	300.63	-10.34	31.21	12.53	58.32	-11.86	16.31
FEB. 2023	28	280.61	-6.89	50.89	13.95	50.29	-2.54	14.63
MAR. 2023	31	308.96	-3.31	78.57	9.18	70.29	-2.95	9.50
APR. 2023	30	309.86	2.59	83.28	8.99	70.99	3.98	11.29
MAY 2023	31	327.38	6.00	63.35	8.43	74.25	7.28	10.03
JUN. 2023	30	359.08	10.81	39.79	6.77	81.15	10.64	7.75
JUL. 2023	31	363.34	7.01	61.41	6.29	82.69	7.02	6.03
AUG. 2023	30	367.94	4.30	76.63	6.30	82.88	4.45	5.62
SEP. 2023	28	358.71	4.38	75.58	6.28	82.49	5.96	4.31
OCT. 2023	31	334.30	-0.11	99.34	9.73	70.89	-0.94	10.79
NOV. 2023	30	310.07	-5.5	64.52	11.59	62.62	-4.13	12.07
DEC. 2023	31	301.76	-16.04	-6.31	14.73	51.19	-15.16	12.51

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 26: Meteosat Indian Ocean daily DLI quality results from January to December 2023.

Comments:
The statistics are good and within the requirement except for the mean difference margin which is negative in December 2023: it is classic in winter, the result is worse.

5.2.1.4. AHL DLI (OSI-301-c) quality

The pyrgeometer stations used for quality assessment of the AHL DLI product are briefly described in the scientific validation report (SVR) available at https://osi-saf.eumetsat.int/products/osi-301-c. More information on the stations is provided in 5.2.2.4

The following table provides the AHL DLI quality results over the reporting period.

AHL DLI quality results from January to December 2023						
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)
JAN. 2023	93	274.34	-8.02	43.2	13.46	52.32
FEB. 2023	110	264.03	0.53	95.94	16.18	38.61
MAR. 2023	122	251.01	4.07	67.04	14.51	41.24
APR. 2023	118	271.23	-3.49	74.56	19.38	29.45
MAY 2023	110	294.89	-2.12	85.70	19.30	35.02
JUN. 2023	118	315.45	-1.59	89.96	19.16	39.55
JUL. 2023	119	322.40	-14.42	14.37	27.43	18.57
AUG. 2023	122	325.45	-22.41	-28.86	18.60	46.54
SEP. 2023	118	314.65	-9.44	41.76	17.08	47.30
OCT. 2023	122	287.52	-1.07	92.58	19.32	33.06
NOV. 2023	118	273.61	-0.55	95.98	22.18	19.08
DEC. 2023	122	265.45	-0.77	94.20	19.52	26.68

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean DLI
and mean diff. req. = 5 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean DLI
with SD req. in % = 10%
Same comment as for Mean diff. Margin.

Table 27: AHL DLI quality results from January to December 2023.

Comments: The AHL DLI product performs as expected and is within target requirement for all months, except for mean difference in August.

5.2.2. SSI quality

SSI products are constituted of the geostationary products (GOES-East, Meteosat 0°, Meteosat Indian Ocean) and polar ones (Atlantic High Latitude). SSI values are required to have the following accuracy when compared to land pyranometer measurements:

- monthly relative mean difference less than 10 %,
- monthly difference standard deviation less than 30 %.

The match-up data base the statistics are based on is continuously enriched, so that, for the same period, results may evolve depending on the date when the statistics were calculated.

5.2.2.1. GOES-East SSI (OSI-306-b) quality

The following table provides the hourly and daily SSI quality results over the reporting period.

GOES-East hourly SSI quality results from January to December 2023

Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	1024	180.46	-25.36	-40.53	74.94	-38.42	-4.91	54.43
FEB. 2023	2246	366.56	-15.36	58.10	89.22	18.87	-7.07	57.34
MAR. 2023	3112	433.75	-10.27	76.32	102.24	21.43	1.28	55.51
APR. 2023	2894	469.97	-7.23	84.62	88.16	37.47	-3.57	55.23
MAY 2023	3529	482.58	-4.33	91.03	77.09	46.75	-8.54	53.30
JUN. 2023	3104	503.18	0.75	98.51	85.26	43.52	-4.36	62.54
JUL. 2023	3283	497.82	1.13	97.73	83.28	44.24	-4.87	59.19
AUG. 2023	3092	514.66	3.68	92.85	79.14	48.74	-6.77	56.19
SEP. 2023	2735	494.33	10.39	78.98	80.93	45.43	-5.96	50.03
OCT. 2023	2566	437.14	2.24	94.88	74.79	42.97	-6.75	43.18
NOV. 2023	2521	396.46	4.36	89.00	63.98	46.21	-1.31	42.45
DEC. 2023	2381	347.50	12.51	64.00	69.98	32.87	1.78	41.74

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 28: GOES-East hourly SSI quality results from January to December 2023.

GOES-East daily SSI quality results from January to December 2023								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	120	58.14	-4.67	19.68	16.10	7.69	0.53	12.41
FEB. 2023	190	152.27	-1.21	92.05	17.88	60.86	0.50	14.64
MAR. 2023	215	194.80	2.06	89.43	18.90	67.66	3.99	13.56
APR. 2023	148	214.50	-0.46	97.86	23.38	63.67	-1.33	18.95
MAY 2023	153	226.70	-2.43	89.28	18.80	72.36	-1.09	15.04
JUN. 2023	116	232.05	-1.11	95.22	19.42	72.10	-0.36	21.78
JUL. 2023	121	228.63	0.75	96.72	21.51	68.64	0.65	18.07
AUG. 2023	133	256.25	5.52	78.46	19.79	74.26	2.19	15.45
SEP. 2023	166	233.59	7.33	68.62	22.21	68.31	4.45	15.50
OCT. 2023	225	182.50	-0.19	98.96	18.04	67.05	-1.47	9.85
NOV. 2023	295	144.38	0.84	94.18	13.80	68.14	-0.60	9.55
DEC. 2023	305	116.61	3.34	71.36	13.58	61.18	1.55	9.07

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 29: GOES-East daily SSI quality results from January to December 2023.

Comments:
The statistics are good and within the requirement except in January for the hourly SSI the mean difference margin is negative: there are few measurements and in winter it is classic that the result is worse.

5.2.2.2. Meteosat 0° SSI (OSI-304-a) quality

The following table provides the hourly and daily SSI quality results over the reporting period.

Meteosat 0° hourly SSI quality results from January to December 2023								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	2282	271.77	4.74	82.56	59.98	26.43	8.79	34.92
FEB. 2023	2060	323.52	8.23	74.56	51.93	46.49	8.62	28.12
MAR. 2023	580	401.00	-6.03	84.96	73.42	38.97	-0.75	53.46
APR. 2023	3043	408.25	6.92	83.05	65.19	46.77	6.24	45.90
MAY 2023	3751	461.55	-2.34	94.93	60.18	56.54	-1.16	39.06
JUN. 2023	3454	501.69	4.80	90.43	65.24	56.65	5.06	42.84
JUL. 2023	3509	451.65	-0.66	98.54	61.01	54.97	0.37	43.08
AUG. 2023	3243	420.74	-6.74	83.98	58.04	54.02	-5.50	39.15
SEP. 2023	2812	426.14	5.92	86.11	53.49	58.16	5.59	35.50
OCT. 2023	2446	343.91	15.51	54.90	62.84	39.09	12.06	36.41
NOV. 2023	1161	508.05	-1.45	97.15	98.33	35.49	-3.45	62.23
DEC. 2023	1770	227.10	5.92	73.93	56.58	16.95	3.19	29.01

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 30: Meteosat 0° hourly SSI quality results from January to December 2023.

Meteosat 0° daily SSI quality results from January to December 2023								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	307	86.69	0.93	89.27	10.76	58.63	1.92	6.63
FEB. 2023	244	117.21	2.07	82.34	11.72	66.67	2.77	6.63
MAR. 2023	58	169.93	-3.37	80.17	16.25	68.12	0.11	14.55
APR. 2023	269	195.40	2.39	87.77	16.05	72.62	2.86	12.84
MAY 2023	308	237.61	-2.10	91.16	15.57	78.16	-1.75	12.94
JUN. 2023	270	271.74	1.88	93.08	18.54	77.26	1.83	15.34
JUL. 2023	278	240.44	-0.83	96.55	15.96	77.87	-0.62	14.43
AUG. 2023	260	208.28	-4.73	77.29	13.76	77.98	-4.51	10.05
SEP. 2023	269	188.72	1.48	92.16	12.27	78.33	1.27	9.24
OCT. 2023	272	131.83	4.99	62.15	15.72	60.25	3.50	8.30
NOV. 2023	118	211.67	-1.39	93.43	25.48	59.87	-4.22	15.68
DEC. 2023	271	65.11	1.12	82.80	11.56	40.82	0.19	5.46

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 31: Meteosat 0° daily SSI quality results from January to December 2023.

Comments:
Overall statistics are good and within the requirement.

5.2.2.3. Meteosat Indian Ocean SSI (OSI-IO-SSI)

On the 23 June 2022, Meteosat-9, in position 45.5° East, replaced Meteosat-8 (in position 41.5° East since 2016) for the Indian Ocean Data Coverage (IODC). Surface Solar Irradiance from Meteosat-8 (in position 41.5 east) is processed as a demonstration product since 2016.

The following table provides the hourly and daily SSI quality results over the reporting period.

Meteosat Indian Ocean hourly SSI quality results from January to December 2023								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	2283	278.89	11.87	57.44	67.65	19.14	9.84	45.52
FEB. 2023	2076	339.04	23.10	31.87	65.23	35.87	17.17	44.20
MAR. 2023	1134	510.03	17.73	65.24	85.77	43.94	13.41	58.48
APR. 2023	3054	405.24	5.02	87.61	70.16	42.29	6.01	50.23
MAY 2023	3755	456.35	-7.15	84.33	68.38	50.05	-1.69	42.92
JUN. 2023	3469	495.85	0.84	98.31	71.91	51.66	3.44	42.13
JUL. 2023	3481	451.25	-2.07	95.41	64.42	52.41	-0.70	44.92
AUG. 2023	3303	416.21	-9.26	77.75	62.00	50.35	-5.51	42.20
SEP. 2023	2821	421.24	2.08	95.06	57.42	54.56	2.94	36.68
OCT. 2023	2451	340.34	12.45	63.42	63.78	37.53	12.07	38.49
NOV. 2023	1160	536.69	26.79	50.08	92.71	42.42	20.97	64.51
DEC. 2023	1775	250.93	30.06	-19.79	64.39	14.46	22.35	50.34

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 32: Meteosat Indian Ocean hourly SSI quality results from January to December 2023.

Meteosat Indian Ocean daily SSI quality results from January to December 2023								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)	Median	RSD
JAN. 2023	307	89.03	3.27	63.27	13.71	48.67	2.27	10.34
FEB. 2023	245	123.32	7.64	38.05	15.44	58.27	5.39	13.26
MAR. 2023	102	209.29	5.74	72.57	17.28	72.48	6.37	15.10
APR. 2023	269	194.79	1.78	90.86	18.03	69.15	1.36	14.53
MAY 2023	308	235.29	-4.42	81.21	17.74	74.87	-1.97	14.66
JUN. 2023	270	269.72	-0.14	99.48	21.83	73.02	2.37	16.59
JUL. 2023	269	239.56	-1.52	93.66	17.62	75.48	-1.19	15.47
AUG. 2023	278	208.41	-5.43	73.95	15.88	74.60	-4.22	13.89
SEP. 2023	269	187.27	0.03	99.84	14.44	74.30	0.38	9.64
OCT. 2023	272	130.98	4.15	68.32	16.14	58.93	2.69	10.12
NOV. 2023	118	223.52	10.45	53.25	23.59	64.82	9.02	15.84
DEC. 2023	271	72.47	8.48	-17.01	14.51	33.26	7.47	11.51

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 33: Meteosat Indian Ocean daily SSI quality results from January to December 2023.

Comments:
The statistics are good and within the requirement except for the mean difference margin in December is negative: there are few measurements for the hourly and in winter it is classic that the result is worse.

5.2.2.4. AHL SSI (OSI-302-c) quality

The pyranometer stations used for quality assessment of the AHL SSI and DLI products are shown in the following table.

Station	StId	Latitude	Longitude		Status
Apelsvoll	11500	60.70°N	10.87°E	SSI	In use, under examination due to shadow effects.
Løken	23500	61.12°N	9.07°E	SSI	Not used currently
Landvik	38140	58.33°N	8.52°E	SSI	In use
Særheim	44300	58.78°N	5.68°E	SSI	Not used currently
Fureneset	56420	61.30°N	5.05°E	SSI	In use
Tjøtta	76530	65.83°N	12.43°E	SSI	Not used currently
Holt	90400	69.67°N	18.93°E	SSI	In use
Bjørnøya	99710	74.52°N	19.02°E	SSI, DLI	In use, Arctic station with snow on ground much of the year.
Hopen	99720	76.51°N	25.01°E	SSI, DLI	Not in use currently, Arctic station with snow on ground much of the year. Strong shadow effect by mountains.
Jan_Mayen	99950	70.93°N	-8.67°E	SSI, DLI	In use, Arctic station with snow on ground much of the year, volcanic ash deteriorates instruments in periods.
Schleswig	10035	54.53°N	9.55°E	SSI, DLI	In use
Hamburg-Fuhlsbuettel	10147	53.63°N	9.99°E	SSI, DLI	Not used currently
Jokioinen	1201	60.81°N	23.501°E	SSI, DLI	In use. DLI was added to this station during the spring of 2016.
Sodankylä	7501	67.37°N	26.63°E	SSI, DLI	In use, temporarily disabled for SSI validation. Problems likely to be connected with snow on ground.
Kiruna	02045	67.85°N	20.41°E	SSI, DLI	Not used currently
Visby	02091	57.68°N	18.35°E	SSI, DLI	Not used currently
Svenska Högarna	02492	59.45°N	19.51°E	SSI, DLI	Not used currently

Table 34: Validation stations that may be used for AHL radiative fluxes quality assessment.

The stations listed in table 34 are owned and operated by the Norwegian Meteorological Institute, University of Bergen, Geophysical Institute, Bioforsk, Finnish Meteorological Institute (FMI), Swedish Meteorological Institute (SMHI) and Deutscher Wetterdienst (DWD). Data from DWD and SMHI are extracted from WMO GTS, data from the other sources are received by email or through other direct connections. More stations are being considered for inclusion.

The pyranometer stations used for validation of the AHL SSI product are the stations listed in table 34. There are some differences in the stations used for SSI validation compared to DLI. The reason for this is partly the observation programme at stations, but also that SSI validation is more sensitive to station characteristics than DLI.

A report from OSI SAF about the validation data used for validating the high latitude surface radiative flux products is available here: https://osisaf-hl.met.no/other-docs

The following table provides the AHL SSI quality results over the reporting period.

AHL SSI quality results from January to December 2023						
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. margin in % (*)	SD in Wm^{-2}	SD margin in % (**)
JAN. 2023	31.00	11.35	-6.38	-259.75	8.41	-58.12
FEB. 2023	120	27.36	-6.65	-95.62	18.14	-77.83
MAR. 2023	209	61.71	-11.17	-53.23	25.06	-14.65
APR. 2023	208	129.17	-8.20	40.29	37.13	9.92
MAY 2023	194	172.21	0.58	96.60	40.53	21.28
JUN. 2023	208	241.87	10.89	52.86	45.27	34.67
JUL. 2023	215	189.50	3.64	80.42	37.98	31.89
AUG. 2023	215	135.34	7.07	44.88	30.06	21.88
SEP. 2023	208	79.71	2.42	68.65	16.17	30.25
OCT. 2023	165	39.03	-3.94	8.28	10.45	18.91
NOV. 2023	79	12.70	-7.57	-273.62	11.90	-95.64
DEC. 2023	-	-	-	-	-	-

(*) Mean diff. margin = 100 * (1 - (|mean diff. in %/ mean diff. req. in %|))
with mean diff. in % = 100*Mean diff/Mean SSI
and mean diff. req. = 10 %
100 refers then to a perfect product, 0 to a quality just as required, without margin.
A negative result indicates that the product quality does not fulfil the requirement.

(**) SD margin = 100 * (1 - (SD in %/ SD req. in %))
with SD in % = 100*SD/Mean SSI
with SD req. in % = 30%
Same comment as for Mean diff. Margin.

Table 35: AHL SSI quality results from January to December 2023.

Comments: The AHL SSI product behaves as usual: the validation results are within requirement for April to October. In the winter months with low sun and snow on the ground at the in situ observations, the satellite product underestimates the irradiance and have a relative high (but absolute low) standard deviation, and the product is outside target requirement in January, February, March and November. In situ observations are missing for December.

5.3. Sea Ice quality

5.3.1. L2 PMW sea ice concentration (OSI-410-a) quality

The OSI-410-a sea ice concentration L2 product on satellite swath for SSMIS and AMSR-2 instruments is delivered with separate product files for the SSMIS (F16, F17 and F18) and AMSR-2 sensors. The product also includes uncertainty estimates and product quality flags.
The OSI SAF sea ice concentration product is validated against navigational ice charts, as these are believed to be the best independent source of reference data currently available. These navigational ice charts originates from the operational ice charting division at the National Ice Center (NIC). The NIC ice charts are primarily based on SAR (RCM, Radarsat-2 and Sentinel-1) data, together with AVHRR and MODIS data in several cases.
Since May 2023 NIC has stopped their production of Southern Hemisphere ice charts. As a replacement ice charts from Arctic Antarctic Research Instute (AARI) is used for the Southern Hemisphere validation.
The quality assessment results are shown separately for the four different sensor products; SSMIs F16, - F17, - F18 and AMSR2.
The requirements on the accuracy of the OSI-410-a ice concentration product are as follows: a *threshold* accuracy of 20%; a *target* accuracy of 10% and 15% for the Northern and Southern hemisphere, respectively; an *optimal* accuracy of 5%. For the quality assessment this means that the product is required to have as minimum an annual mean difference and standard deviation less than 10% ice concentration on the Northern hemisphere and less than 15% ice concentration on the Southern hemisphere.
For each ice chart concentration level the deviation between ice chart concentration and OSI SAF ice concentration is calculated. Afterwards the mean difference (bias) and standard deviation are calculated and reported for ice (100% ice concentration) and for water (0% ice concentration). We use conventional mean difference and standard deviations for all calculations.

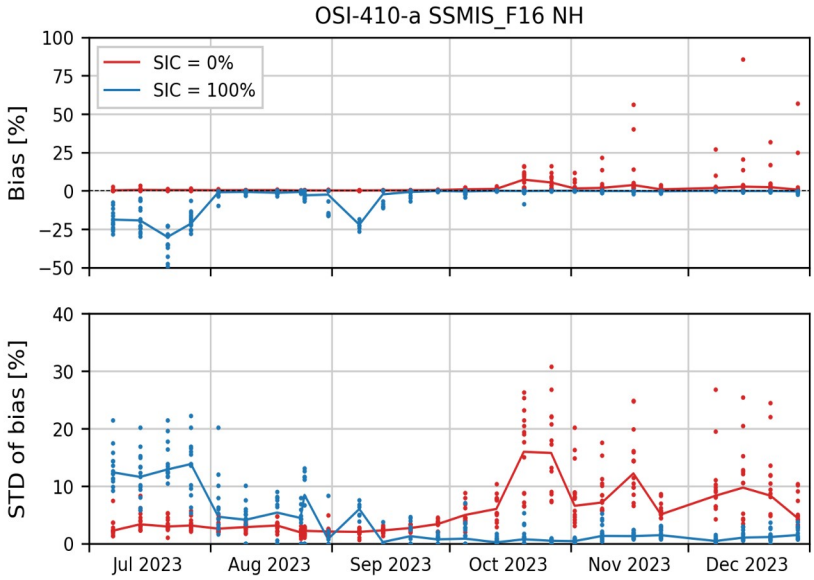

Figure 25: For OSI-410-a SSMIS F16 in the Northern hemisphere:

Top plot: Difference between ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice.

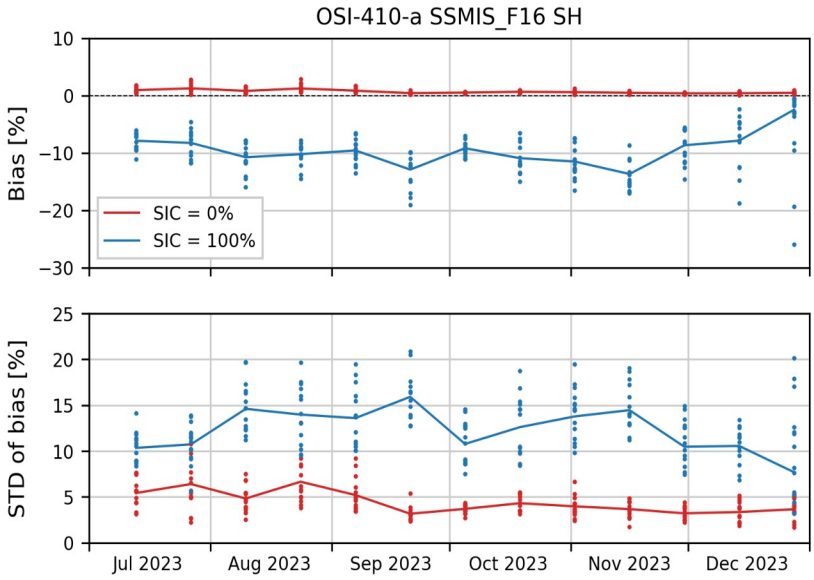

Figure 26: For OSI-410-a SSMIS F16 in the Southern hemisphere:

Top plot: Difference between ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice.

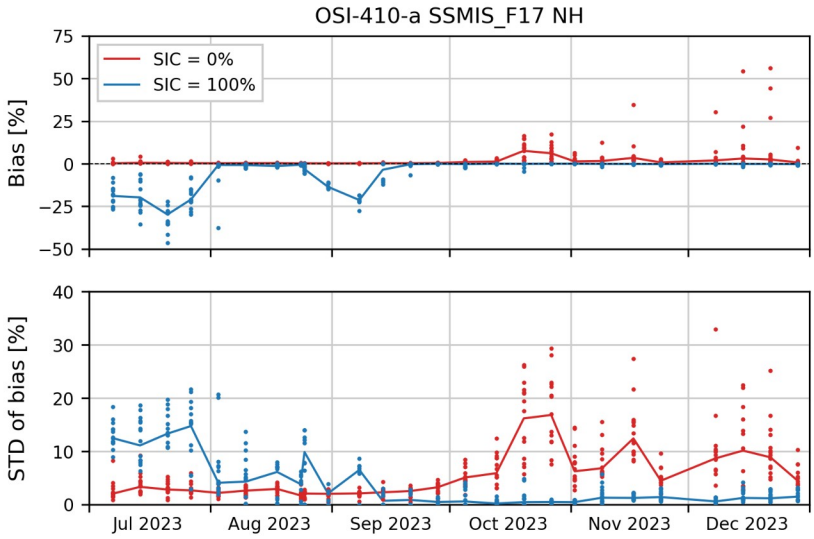

Figure 27: For OSI-410-a SSMIS F17 in the Northern hemisphere:

Top plot: Difference between ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice.

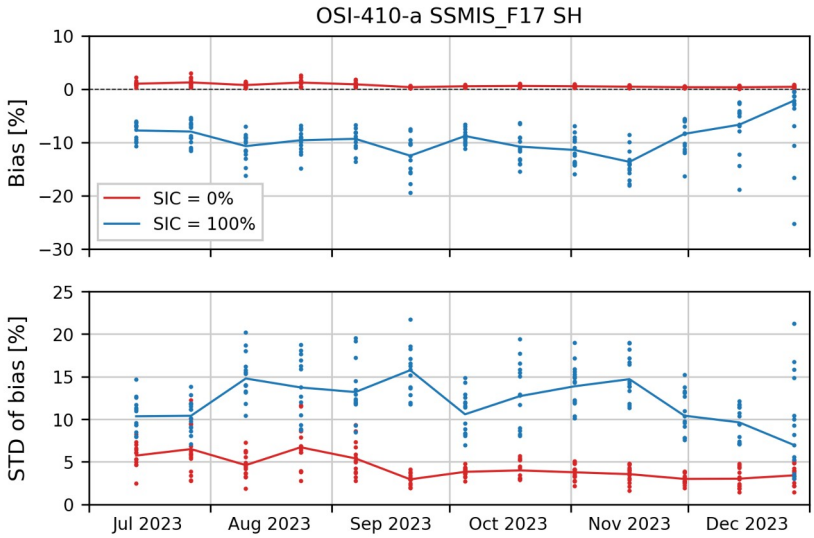

Figure 28: For OSI-410-a SSMIS F17 in the Southern hemisphere:

Top plot: Difference between ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice.

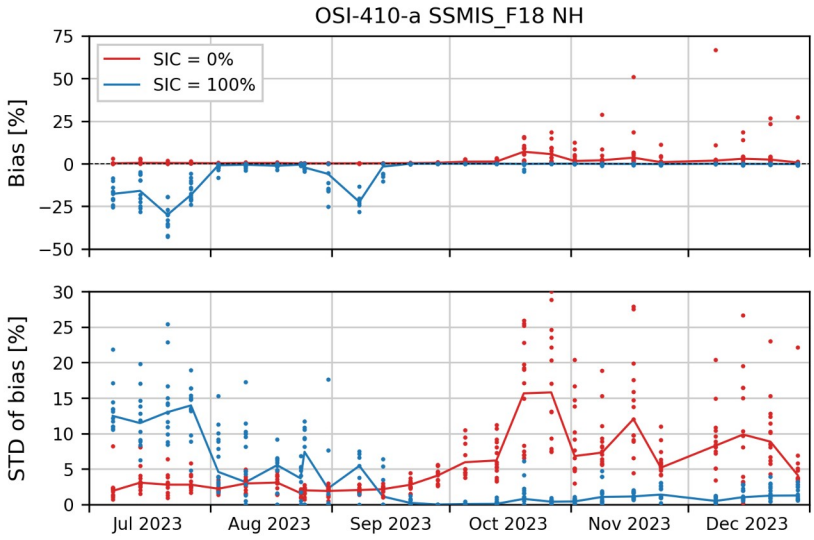

Figure 29: For OSI-410-a SSMIS F18 in the Northern hemisphere:

Top plot: Difference between ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice.

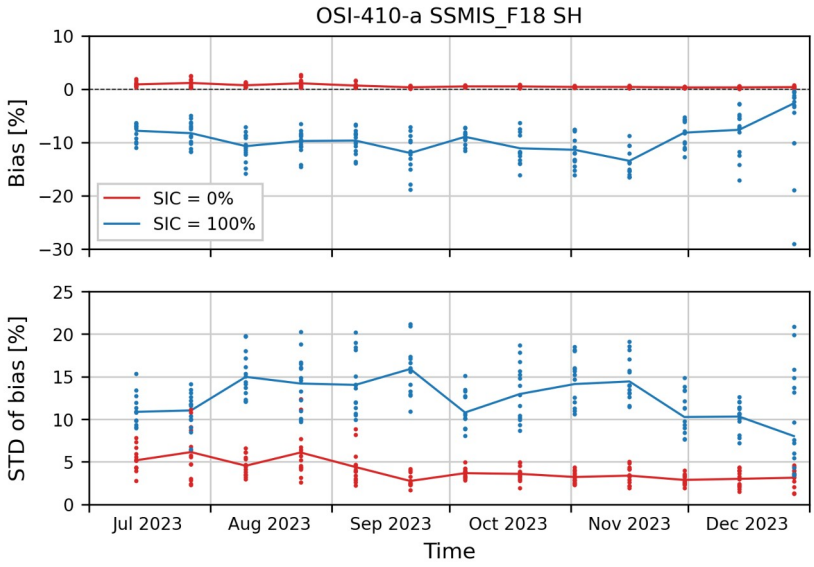

Figure 30: For OSI-410-a SSMIS F18 in the Southern hemisphere:Top plot: Difference between ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice.

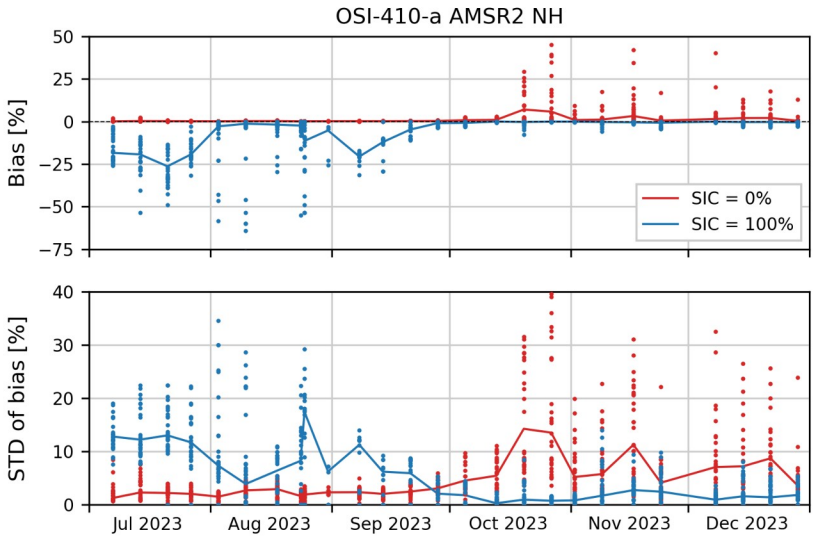

Figure 31: For OSI-410-a AMSR2, in the Northern hemisphere:

Top plot: Difference between ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice.

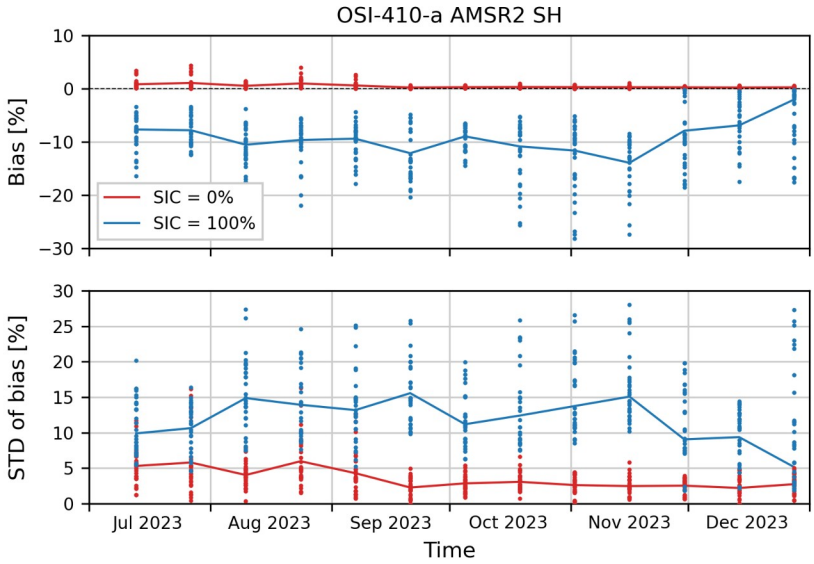

Figure 32: For OSI-410-a AMSR2, in the Southern hemisphere:

Top plot: Difference between ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis.

Bottom plot: Standard deviation of the difference in ice concentrations from AARI ice analysis and OSI SAF concentration product for two categories: water and ice.

Average yearly bias and standard deviation on bias								
OSI-410-a	Northern hemisphere				Southern hemisphere			
Category	Ice		Water		Ice		Water	
Metric (%)	Bias	STD	Bias	STD	Bias	STD	Bias	STD
SSMIS F16	-4.85	3.76	1.37	5.44	-9.53	12.27	0.70	4.43
SSMIS F17	-5.27	3.87	1.36	5.39	-9.22	12.09	0.68	4.35
SSMIS F18	-4.58	3.60	1.35	5.44	-9.35	12.46	0.60	4.00
AMSR2	-5.81	5.43	1.11	4.64	-9.21	11.85	0.45	3.54

Comments: All sensor products perform well in the Northern Hemisphere, where all STD values are below the target accuracy of 10%. Some are even below the optimal accuracy of 5 %. In the Southern Hemisphere, all sensor products performs worse over ice, but still within the target accuracy of 15%.

5.3.2. Global sea ice concentration (OSI-401-d) quality

The OSI SAF sea ice concentration product is validated against navigational ice charts, as these are believed to be the best independent source of reference data currently available. These navigational ice charts originates from the operational ice charting divisions at DMI, MET Norway and National Ice Center (NIC). The ice charts are primarily based on SAR (Radarsat and Sentinel-1) data, together with AVHRR and MODIS data in several cases. The quality assessment results are shown separately for the three different sets of ice charts.

For the quality assessment at the Northern Hemisphere, performed twice a week, the concentration product is required to have a mean difference and standard deviation less than 10% ice concentration on an annual basis. For the weekly quality assessment at the Southern Hemisphere the concentration product is required to have a mean difference and standard deviation less than 15% ice concentration on an annual basis.

For each ice chart concentration level the deviation between ice chart concentration and OSI SAF ice concentration is calculated. Afterwards deviations are grouped into categories, i.e. ±10% and ±20%. Furthermore the mean difference and standard deviation are calculated and reported for ice (100% ice concentration) and for water (0% ice concentration). We use conventional mean difference and standard deviations for all calculations.

In addition, statistics from manual evaluation (on the confidence level of the products) are shown as additional information. There is no requirement on these statistics. The error codes for the manual evaluation are shown below.

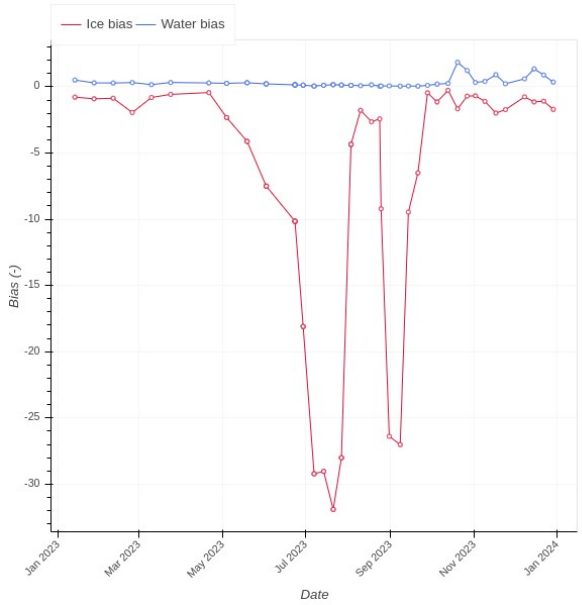

Figure 34: Difference between ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Northern hemisphere.

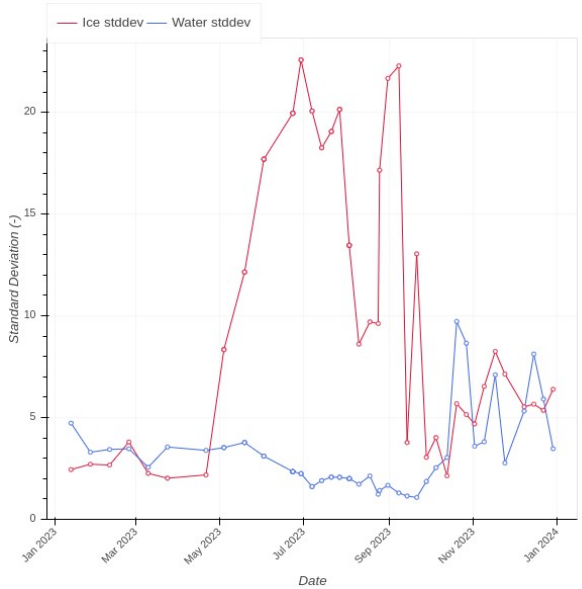

Figure 35: Standard deviation of the difference in ice concentrations from NIC ice analysis and OSI SAF concentration product for two categories: water and ice. Northern hemisphere.

Figure 33: Comparison of ice concentrations from NIC ice analysis and the OSI SAF concentration product. Northern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%.

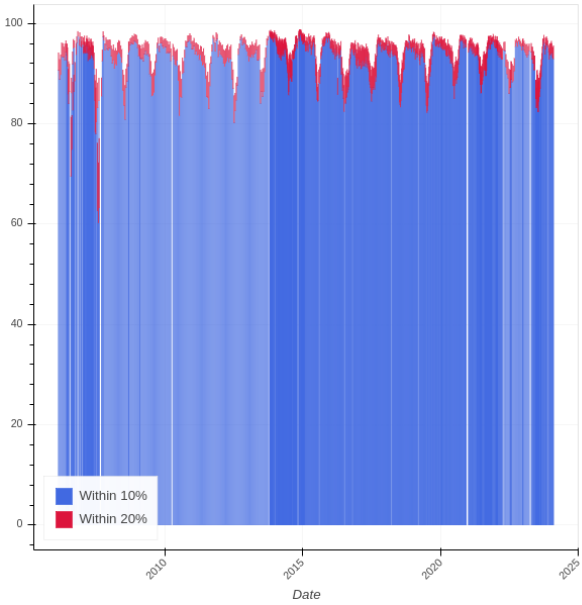

Figure 36: Multiyear variability. Comparison between ice concentrations from NIC ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%. Northern hemisphere.

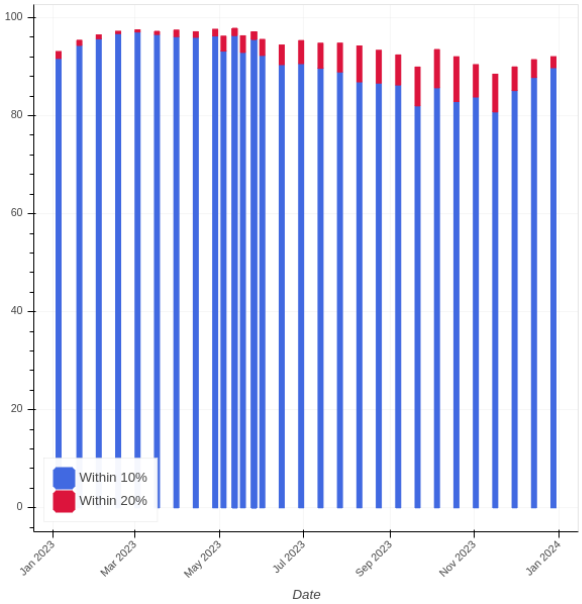

Figure 37: Comparison between ice concentrations from the NIC or AARI ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/-10%, and likewise for +/-20%. Southern hemisphere.

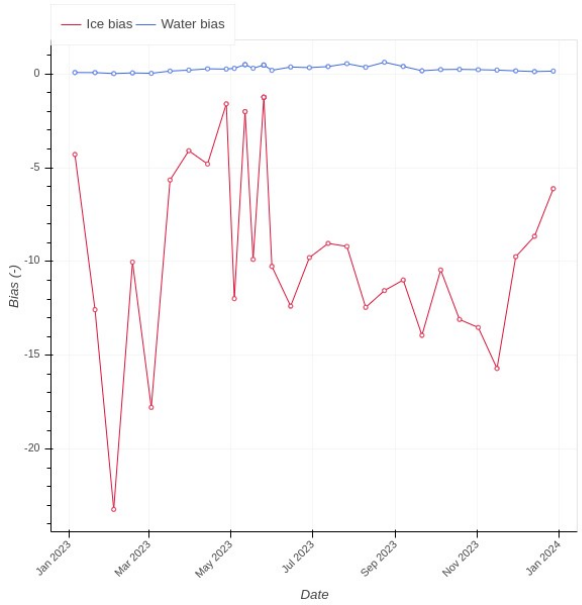

Figure 38: Difference between the ice concentrations from the NIC or AARI ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Southern hemisphere.

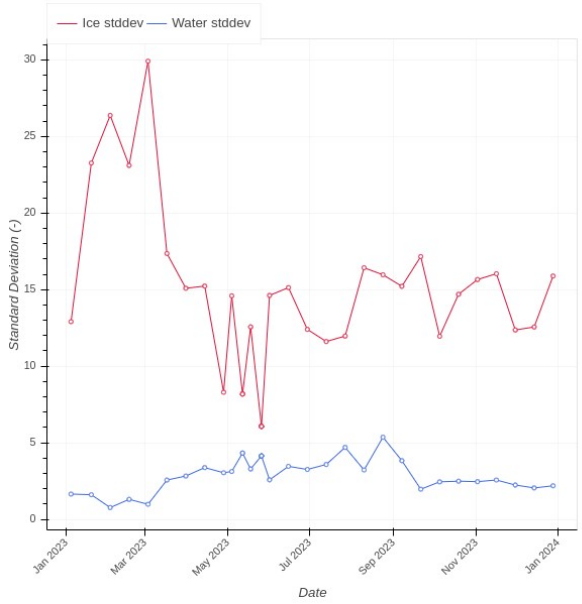

Figure 39: Standard deviation of the difference in ice concentrations from the NIC or AARI ice analysis and OSI SAF concentration product for two categories: water and ice. Southern hemisphere.

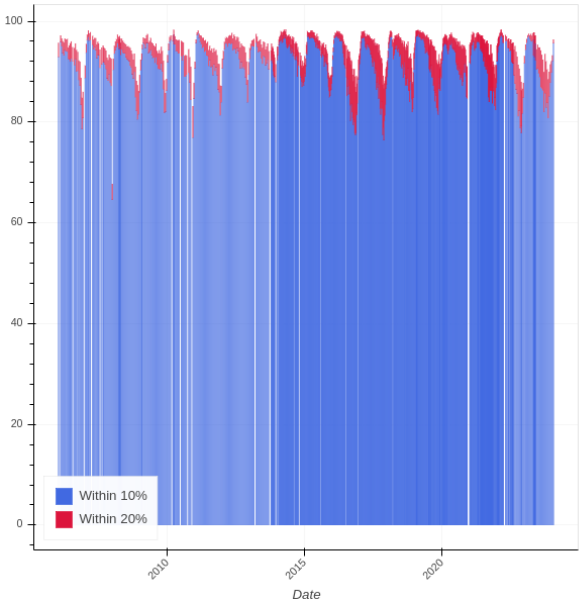

Figure 40: Multiyear variability. Comparison between ice concentrations from the NIC or AARI ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/- 20%. Southern hemisphere.

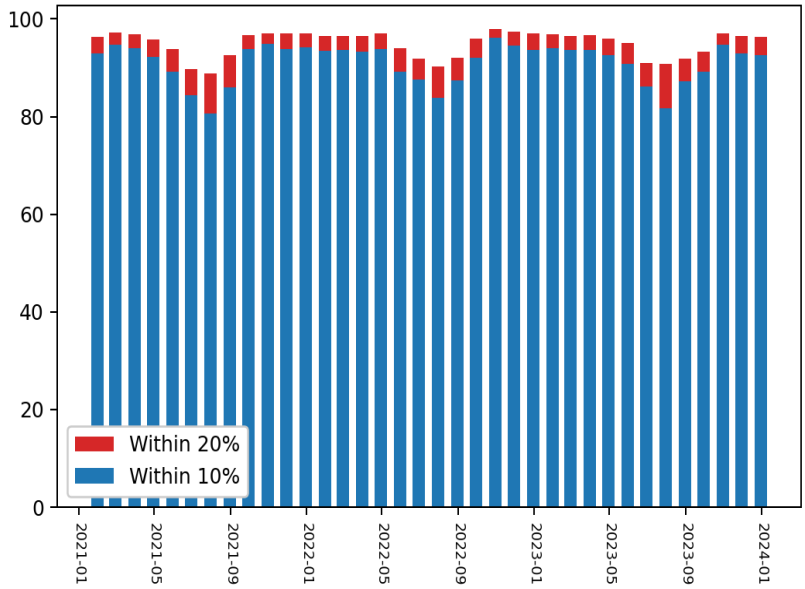

Figure 41: Comparison of ice concentrations from MET Norway Ice Service ice analysis and the OSI SAF concentration product. European Arctic region. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/- 20%.

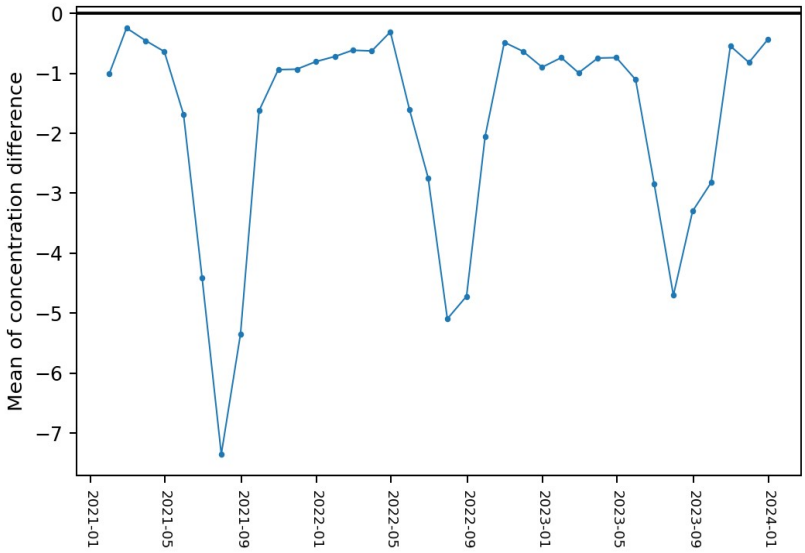

Figure 42: Difference between ice concentrations from MET Norway Ice Service ice analysis and OSI SAF concentration product. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. European Arctic region.

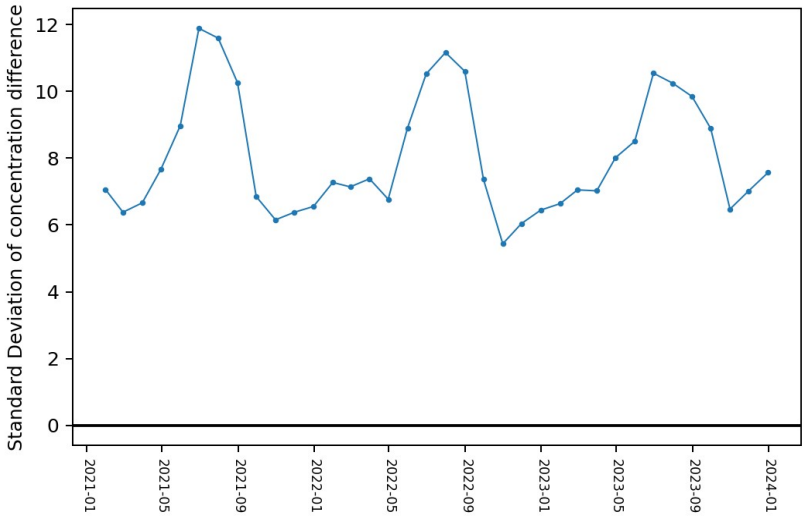

Figure 43: Standard deviation of the difference in ice concentrations from MET Norway Ice Service ice analysis and OSI SAF concentration product. European Arctic region.

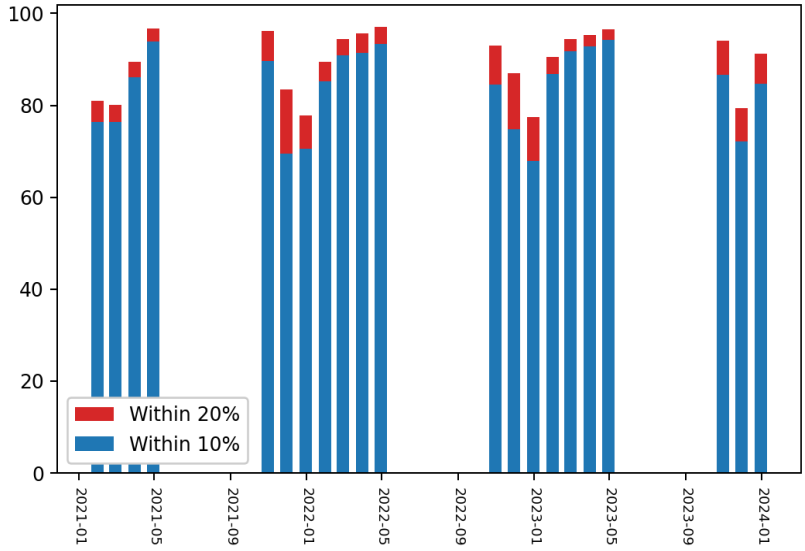

Figure 44: Comparison of ice concentrations from MET Norway Ice Service ice analysis and the OSI SAF concentration product. Southern hemisphere/Weddell Sea. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%.

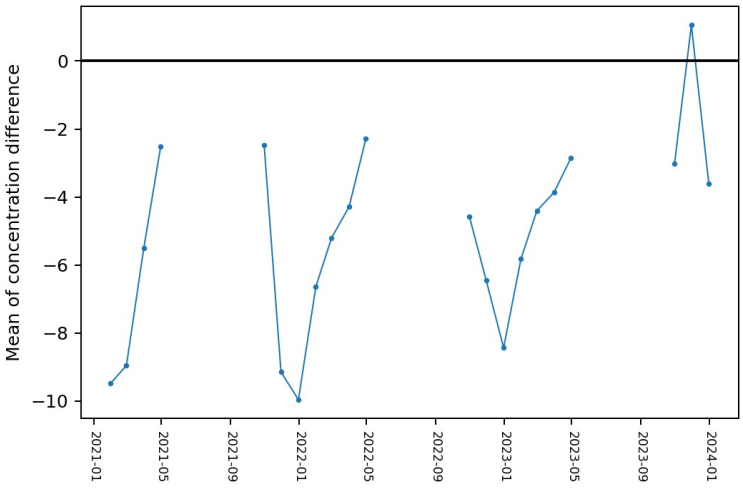

Figure 45: Difference between ice concentrations from MET Norway Ice Service ice analysis and OSI SAF concentration product. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Southern hemisphere/Weddell Sea.

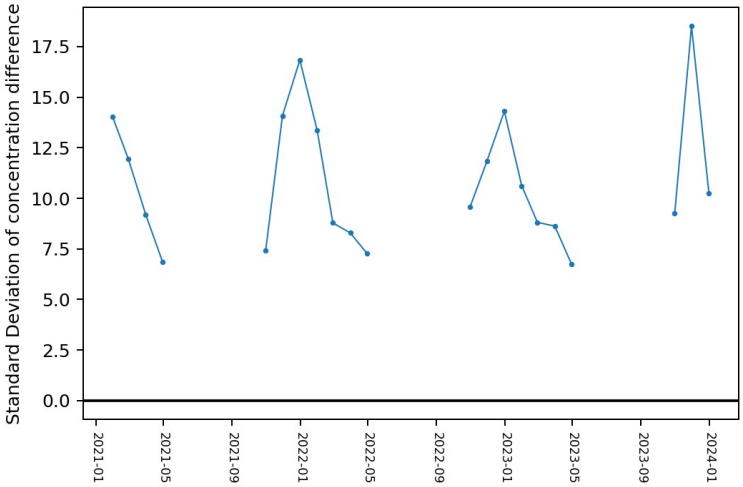

Figure 46: Standard deviation of the difference in ice concentrations from MET Norway Ice Service ice analysis and OSI SAF concentration product. Southern hemisphere/Weddell Sea.

Comments: Figure 35 and Figure 39 provide the essential information on the compliance of the sea ice concentration product accuracy, showing the std. dev. of the difference in ice concentration between the OSI SAF product and the NIC ice analysis for NH and SH, respectively. However the requirement is on the yearly (and not half-yearly) average std. dev. of the difference. As for the Level 2 SIC the validation over the Southern Hemisphere is based on AARI ice charts since May 2023.
In the Southern Hemisphere figures extra data can be seen in May 2023, where we for a short period have both NIC and AARI ice charts. From this it can be seen that the chose of ice charts for the validation will affect the result.
Average yearly SD for the last year can be seen in the table just below. The product are within target accuracy of 10 % and 15 % for the NH and SH products, respectively.

Average yearly standard deviation		
	Average STD Ice	Average STD Water
Northern Hemisphere	11.7	3.1
Southern Hemisphere	14.5	2.9

5.3.3. Global sea ice concentration (OSI-408-a) quality

The OSI-408-a Global Sea Ice concentration is based on AMSR-2 data. Two ice concentration fields are computed: the primary on which is computed with the OSI SAF Hybrid Dynamic (OSHD) algorithm similar to the SSMIS Sea Ice Concentration (OSI-401-d) and a second which is computed using the Technical University of Denmark (TUD) algorithm which utilizes the high frequency channels. It is validated against ice charts as described under the previous section on Global SSMIS Sea Ice Concentration.

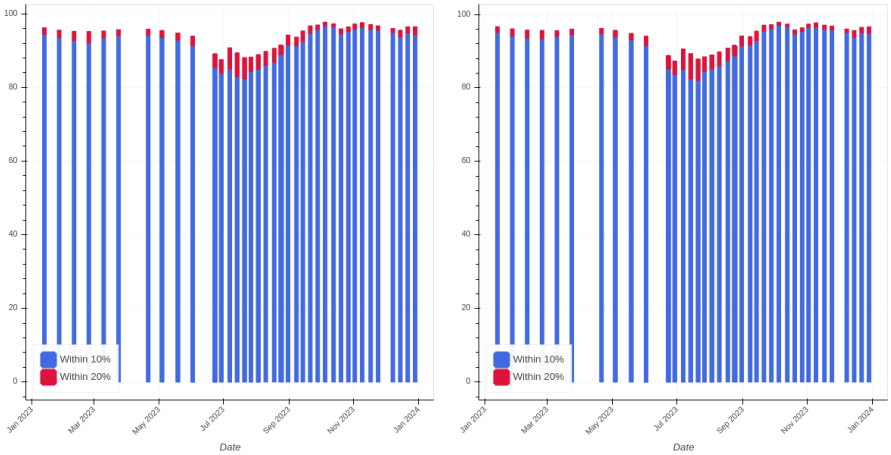

Figure 47: Comparison of ice concentrations from the NIC ice analysis and the OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right. Northern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%

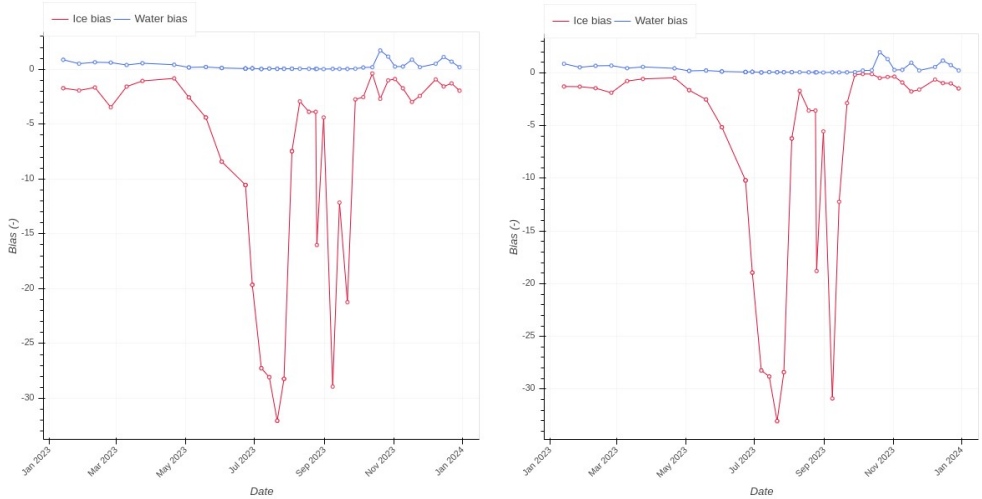

Figure 48: Difference between ice concentrations from the NIC ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Northern Hemisphere

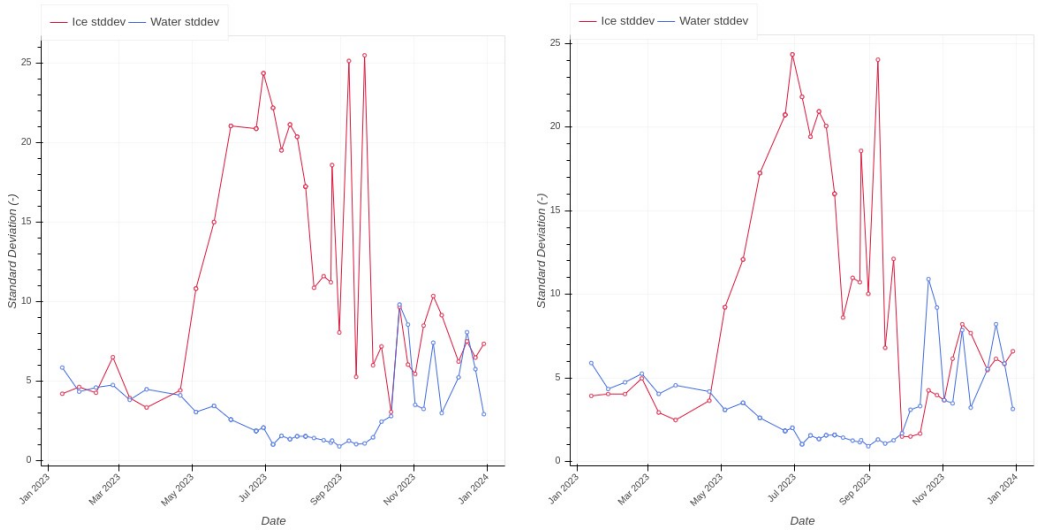

Figure 49: Standard deviation of the difference in ice concentrations from the Greenland overview charts made by DMI and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Northern hemisphere.

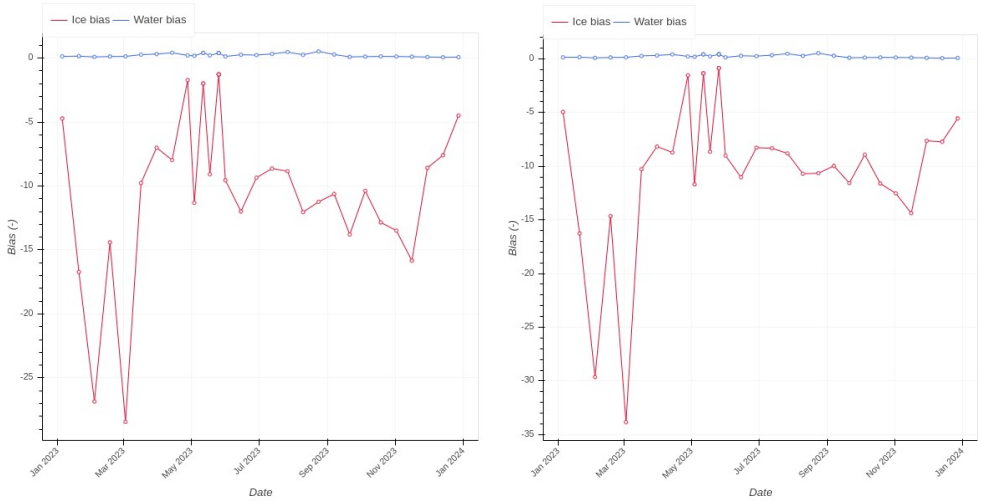

Figure 51: Difference between ice concentrations from the NIC or AARI ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Southern Hemisphere

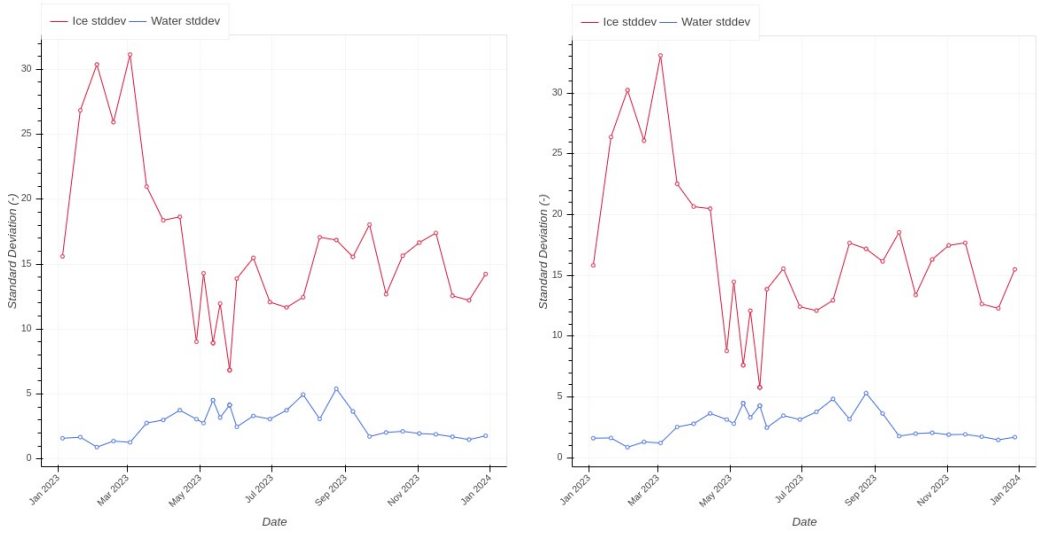

Figure 52: Standard deviation of the difference in ice concentrations from the NIC or AARI ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and, ice. Southern hemisphere.

Comments: Figure 49 and Figure 52 provide the essential information on the compliance of the sea-ice concentration product accuracy, showing the std. dev. of the difference in ice concentration between the OSI SAF product and the NIC ice analysis for NH and SH, respectively. However the requirement is on the yearly (and not half-yearly) average std. dev. of the difference. It seems the AARI ice analysis is affecting the results for the Southern Hemisphere.

Average yearly STD for the period can be seen in the table just below. Both algorithms are above target accuracy for ice of 10 % and 15 % for the NH and SH products, respectively, but below the threshold accuracy of 20 %.

Average yearly standard deviation			
		Average SD Ice	Average SD Water
OSHD algorithm	NH	13.6	3.0
	SH	15.5	2.9
TUD algorithm	NH	12.1	3.1
	SH	15.8	2.8

5.3.4. Global sea ice edge (OSI-402-d) quality

The OSI SAF sea ice edge product is validated against navigational ice charts, as explained under the previous section on ice concentration.

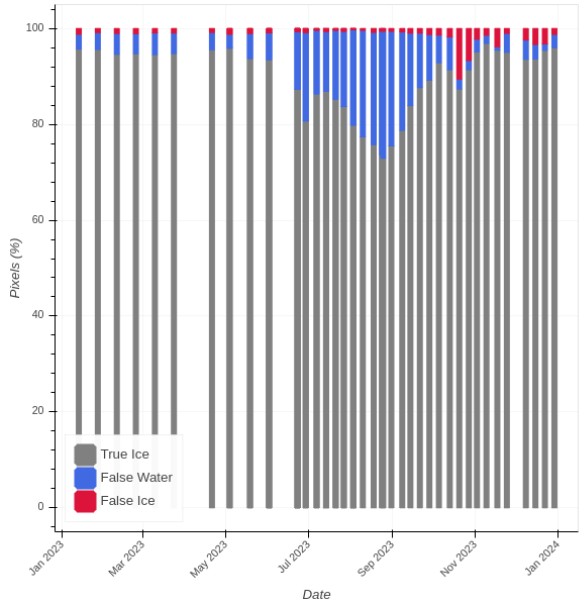

Figure 53: Comparison between the NIC ice analysis and the OSI SAF sea ice edge product. Northern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the DMI ice analysis indicated ice and vice versa for the 'False Ice' category.

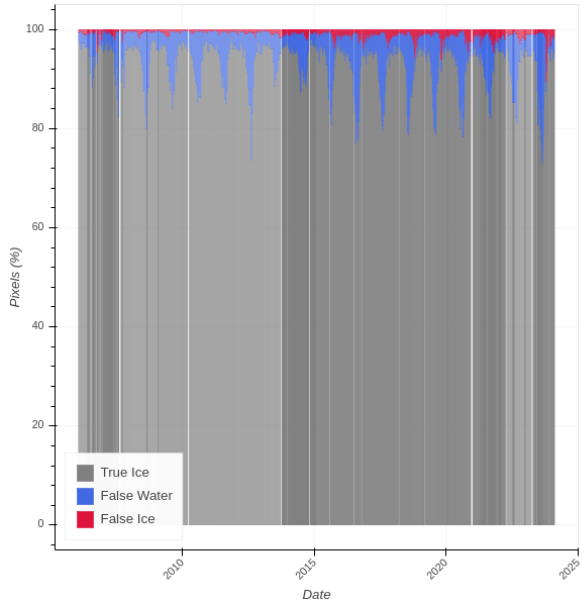

Figure 54: Multiyear variability. Comparison between the NIC ice analysis and the OSI SAF sea ice edge product. Northern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the DMI ice analysis indicated ice and vice versa for the 'False Ice' category.

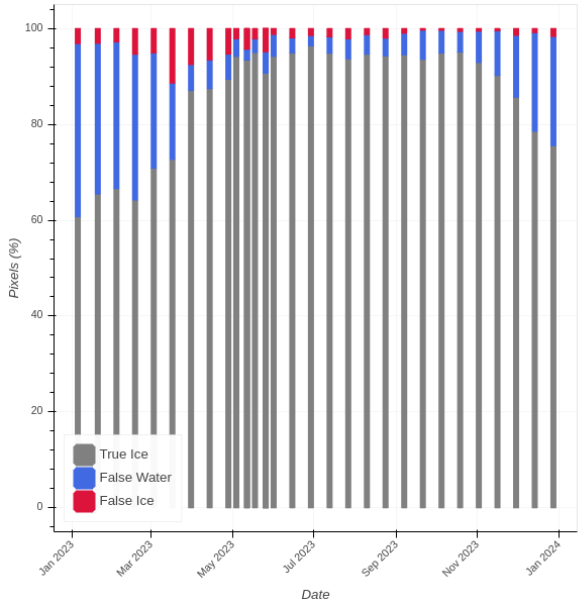

Figure 55: Comparison between the NIC or AARI ice analysis and the OSI SAF sea ice edge product. Southern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the NIC/AARI ice analysis indicated ice and vice versa for the 'False Ice' category.

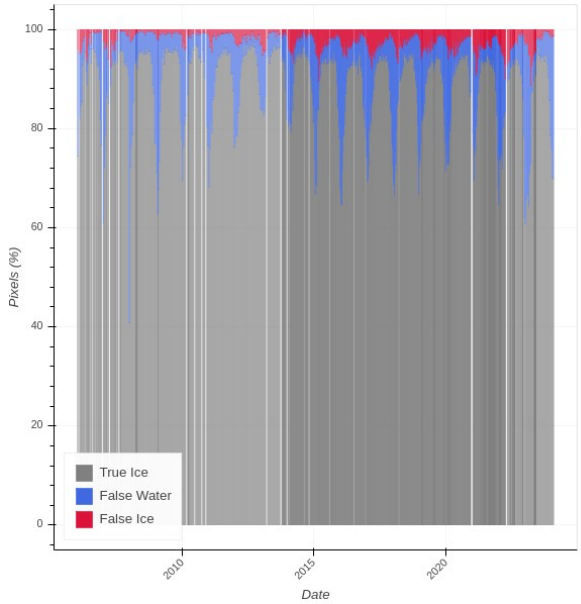

Figure 56: Multiyear variability. Comparison between the NIC or AARI ice analysis and the OSI SAF sea ice edge product. Southern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the NIC/AARI ice analysis indicated ice and vice versa for the 'False Ice' category.

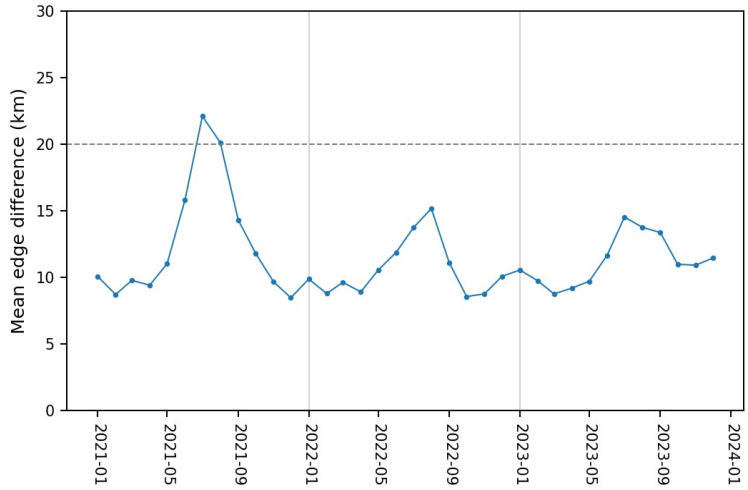

Figure 57: Mean edge difference between the MET Norway ice chart analysis and the OSI SAF sea ice edge product. European Arctic region.

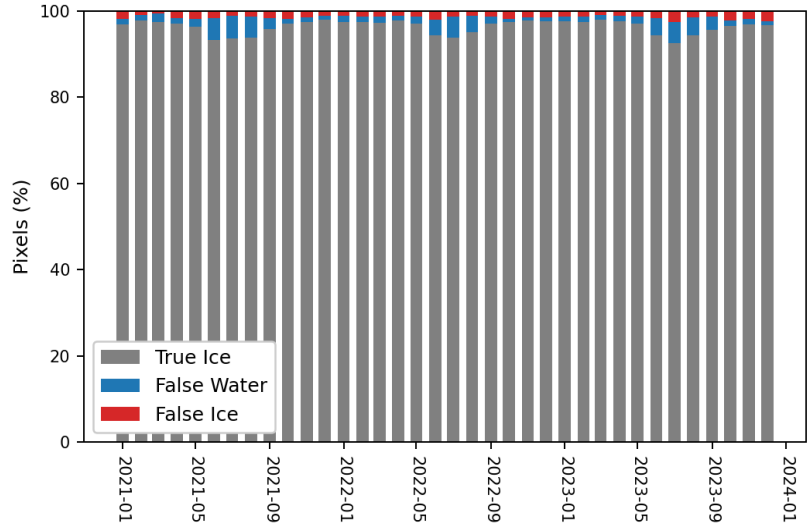

Figure 58: Comparison between the MET Norway ice chart analysis and the OSI SAF sea ice edge product. European Arctic region. 'False Water' means grid points where the OSI SAF product indicated water and the MET Norway ice chart analysis indicated ice and vice versa for the 'False Ice' category.

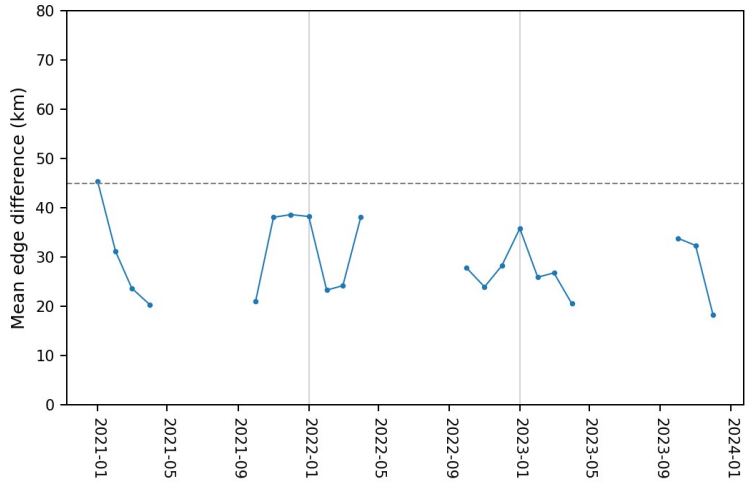

Figure 59: Mean edge difference between the MET Norway ice chart analysis and the OSI SAF sea ice edge product. Weddell Sea region.

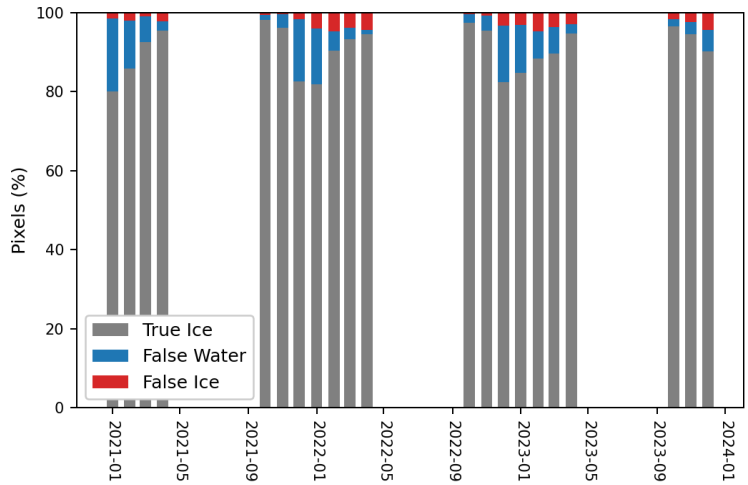

Figure 60: Comparison between the MET Norway ice chart analysis and the OSI SAF sea ice edge product. Weddell Sea region. 'False Water' means grid points where the OSI SAF product indicated water and the MET Norway ice chart analysis indicated ice and vice versa for the 'False Ice' category.

Comments:
In Figure 57 and Figure 58, the northern hemisphere OSI SAF sea-ice edge product is compared with the daily (week days) navigational ice charts from European Arctic region (MET Norway ice charts). The yearly averaged edge difference for the recent 12 months in 2023 is 11.2 km and the target accuracy requirement of 20 km edge difference per year is therefore met.

In Figure 59 and Figure 60, the southern hemisphere OSI SAF sea-ice edge product is compared with the weekly navigational ice charts from the Weddell Sea region (MET Norway ice charts). These ice charts are only produced during the Antarctic summer months October to early April. The yearly averaged edge difference for the seven months with available ice charts in 2023 is 27.7 km, which is well below the target accuracy requirement of 45 km edge difference per year. The requirement is therefore met.

5.3.5. Global sea ice type (OSI-403-d) quality

The sea ice type quality assessment is done as a monitoring of the monthly variation of the multi year ice area coverage, as presented in the table below. The monthly standard deviation (STD) in the difference from the running mean of the multi-year ice (MYI) area coverage shall be below 100.000km^2 to meet the target accuracy requirement.

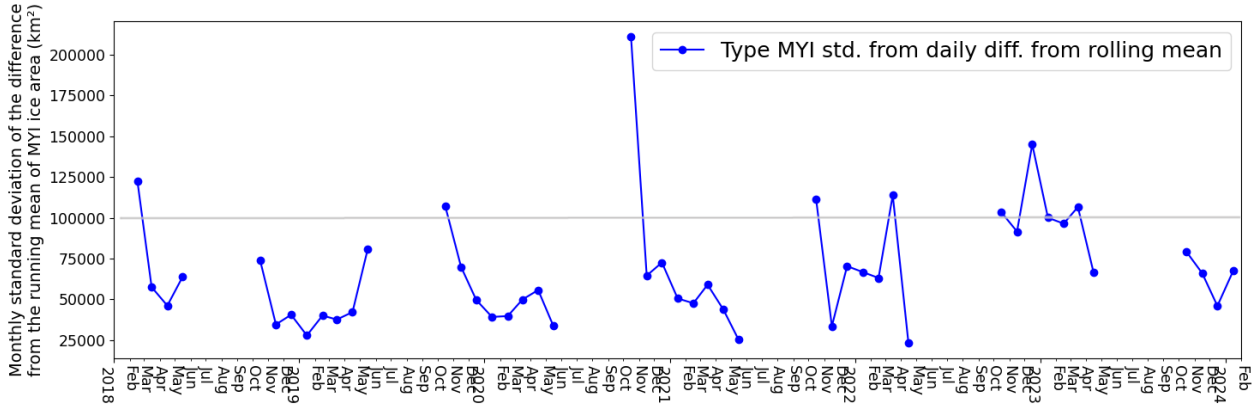

Figure 61: Monitoring of NH sea ice type quality by comparing the multiyear ice coverage with the 11-days running mean, from 2018 to 2023.

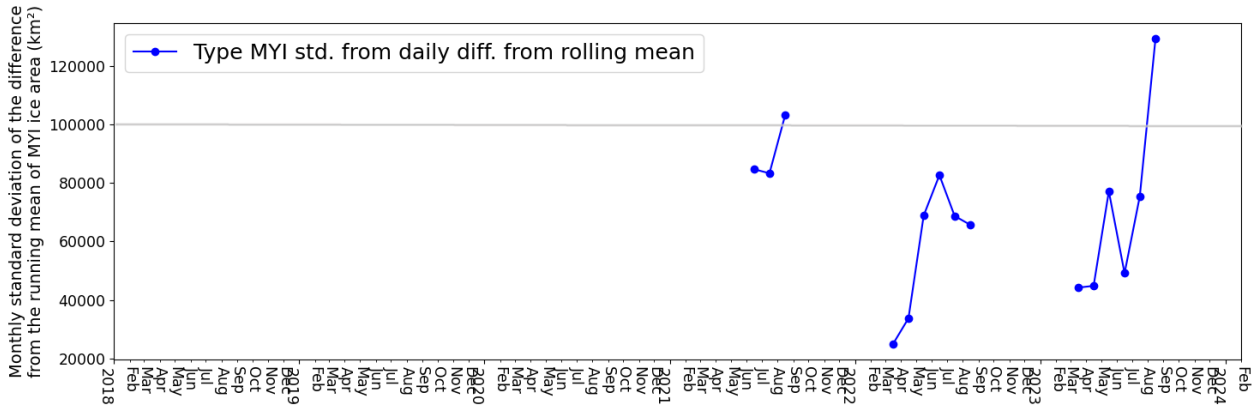

Figure 62: Monitoring of SH sea ice type quality by comparing the multiyear ice coverage with the 11-days running mean, from 2018 to 2023.

Comments:
Figure 61 shows the sea-ice type monitoring for NH. The mid-column represents the monthly standard deviations of the daily MYI coverage variability. Most months have values well below the requirement of 100.000 km2, except January and March 2023 which have values slightly above the requirement.

Figure 62 shows the monitoring of the sea-ice type product for SH. All months have values well below the requirement of 100.000 km2, except August which is above. August marks a period with potentially large uncertainty in the Antarctic sea-ice type product. In the present version of the retrieval, this is handled by activating the ambiguous class more. The high mean standard deviation of MYI in August is due to several intrusions of warmer air over the sea ice which in the product causes that MYI is mapped as ambiguous. Therefore, the requirement is not met for Antarctic ice type in August.

5.3.6. Sea ice emissivity (OSI-404-a) quality

The previous approach to assess the quality of the near-50 GHz sea ice emissivity was based on the comparison of the product emissivity to the 50.3 GHz and 52.8 GHz vertically polarized surface emissivity (which is the same at these two frequencies and called validation emissivity in this section) at an incidence angle at 50 degrees. The update on this approach to get the validation emissivity has been made by obtaining the alternative emissivity only from 50.3 GHz and adjusting the incident angle (from 50 to 53.1 degrees) and polarization (from vertical to horizontal) for better physically sound comparison between product and validation emissivities. This updated method is described in detail in ATBD, PUM, and validation report which are currently under review process. Although the product emissivity covers all incidence angles from nadir to 60 degrees, the validation is done at 53.10 degrees because the validation emissivity is derived from measurements at 53.1 degrees. The validation emissivity is calculated from NWP data and SSMIS satellite data. Both the OSI SAF product emissivity and the validation emissivity cover the entire northern and southern hemisphere sea ice cover, including all ice types and seasons.

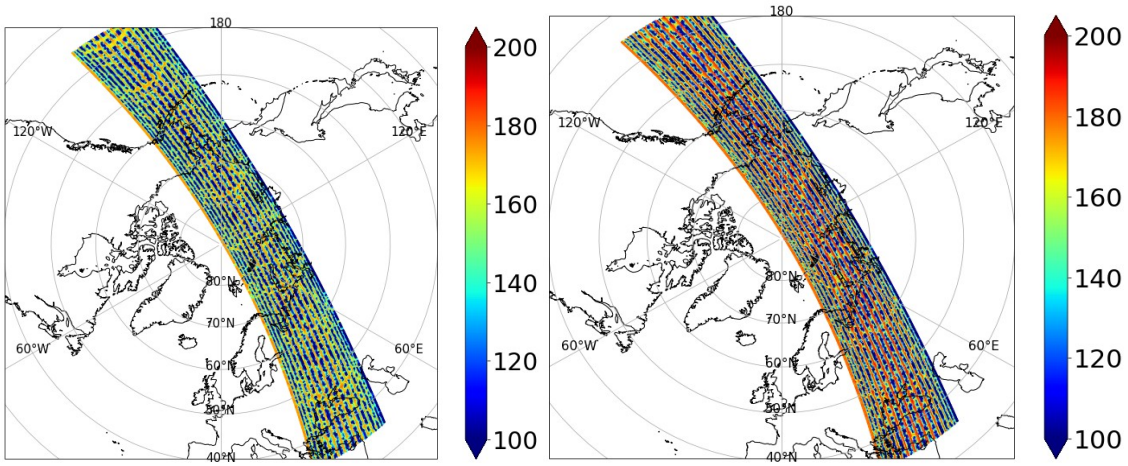

Figure 63: Example of currently available near-50 GHz brightness temperatures from SSMIS onboard DMSP F18 (left: 50.3 GHz, right: 52.8 GHz).

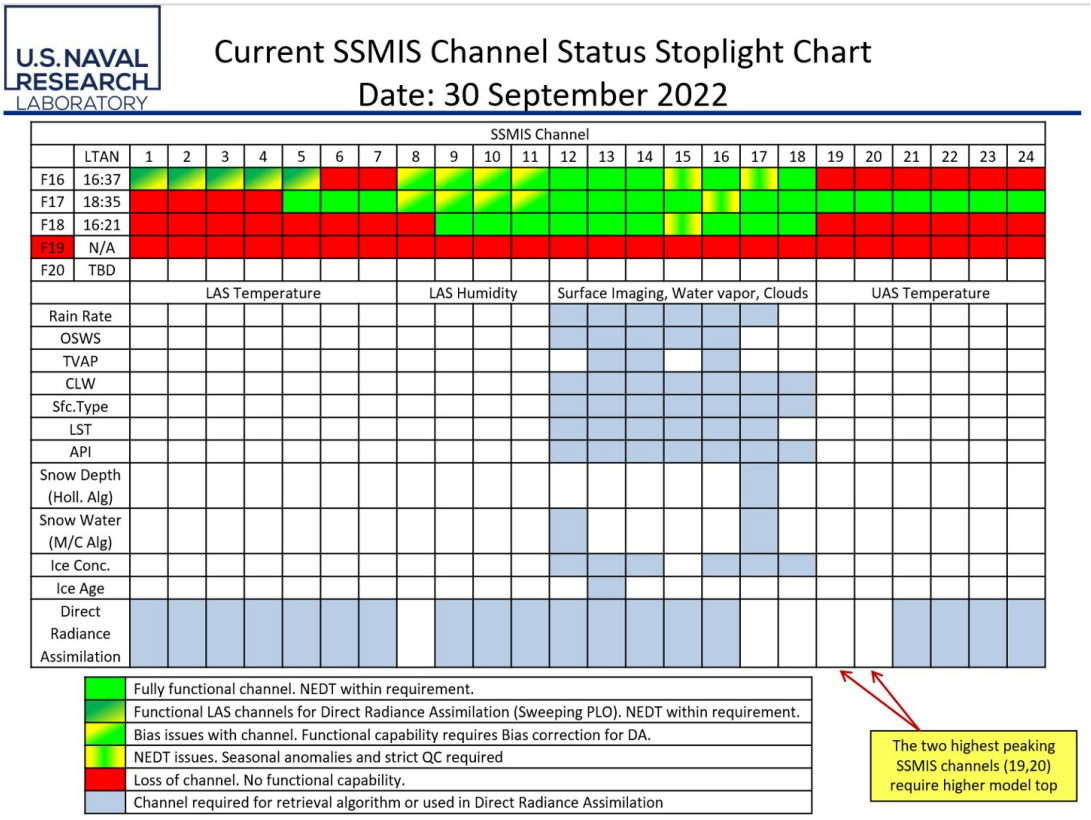

Figure 64: A chart showing the status of SSMIS channels on 30 September 2022. Channel number 1 and 2 are 50.3 GHz and 52.8 GHz channels, respectively.

Comments: An anomaly has been found for brightness temperatures from near-50 GHz SSIMS channels as shown in Figure 63. Further investigation revealed that this issue has existed since the middle of April 2023, and an inquiry to the U.S. National Oceanic and Atmospheric Administration (NOAA) and Department of Defense via EUMETSAT help desk confirmed that the channels used for calculating the validation emissivity are no longer functioning (Figure 64). This is true for F17 and F18, and F16 provides data but with bias issues, thus it is not appropriate for validation purposes. In short, currently, there is no input data available for calculating the validation emissivity, therefore, validation effort cannot be made.

However, this issue is temporal because there will be a new sensor MWI onboard Metop-SG which has near-50 GHz channels, which can be used for calculating validation emissivity products. What is more promising is that, as MWI will provide both vertically and horizontally polarized brightness temperatures, the product emissivity can be validated for both polarizations.

5.3.7. Low resolution sea ice drift (OSI-405-c) quality

Quality assessment dataset

Quality assessment is performed by collocation of the drift vectors with the trajectories of in situ drifters. Those drifting objects are generally buoys (e.g. the Ice Tethered Profilers) or ice camps (e.g. the Russian manned stations) that report their position at typically hourly intervals. Those trajectories are generally made available in near-real-time or at the end of the mission onto the ice. Position records are recorded either via the GPS (e.g. those of the ITPs) or the Argos Doppler-shift system (those of the iABP). GPS positions are very precise (< 50 m) while those obtained by Argos have worse accuracy (approx. 350 m for 'high quality' records) and are thus not used in our reporting.

A nearest-neighbor approach is implemented for the collocation, and any collocation pair whose distance between the product and the buoy is larger than 30 km or the mismatch at start time of the drift is more than 3 hours is discarded. The duration of the drifts must also match within 1 hour.

Reported statistics

Because of a denser atmosphere and surface melting, the OSI-405 accuracy is worse during the summer melt period (from 1st May to 30th September in the Arctic).

The Low Resolution Sea Ice Drift product comprises several single-sensor (e.g. SSMIS F18 or AMSR2 GW1 or ASCAT Metop-B) and a merged (or multi-sensor) products that are all processed and distributed on a daily basis. The quality assessment and monitoring results are thus presented for the multi-sensor product (multi-oi) and a selection of the single-sensor ones.

Most of the ice-drifting buoys are deployed and live in the Arctic Ocean. Only few Southern Hemisphere buoys are available. Hence most of the validation results below are for the NH maps, including monthly statistics. For SH, the number of buoys is insufficient, and we report only statistics over a full year (last 12 months). SH statistics are reported for completeness as the number of buoys is generally not enough to quantitatively assess the performance of OSI-405-c against the target requirements.

Quality assessment statistics

In the following tables, quality assessment statistics for the NH and SH products using multi-sensor (multi-oi) and SSMIS only (SSMIS-F18) are reported upon. In those tables, X(Y) are the X and Y components of the drift vectors. b() is the mean difference and std() the standard deviation of the $\varepsilon(X) = X_{prod} - X_{ref}$. Columns A, B and corr are respectively the slope and intercept of the regression line between Prod and Ref data pairs and the Pearson correlation coefficient. N is the number of collocation data pairs. Maps are also included that show the repartition of ice-drifter data for the given period.

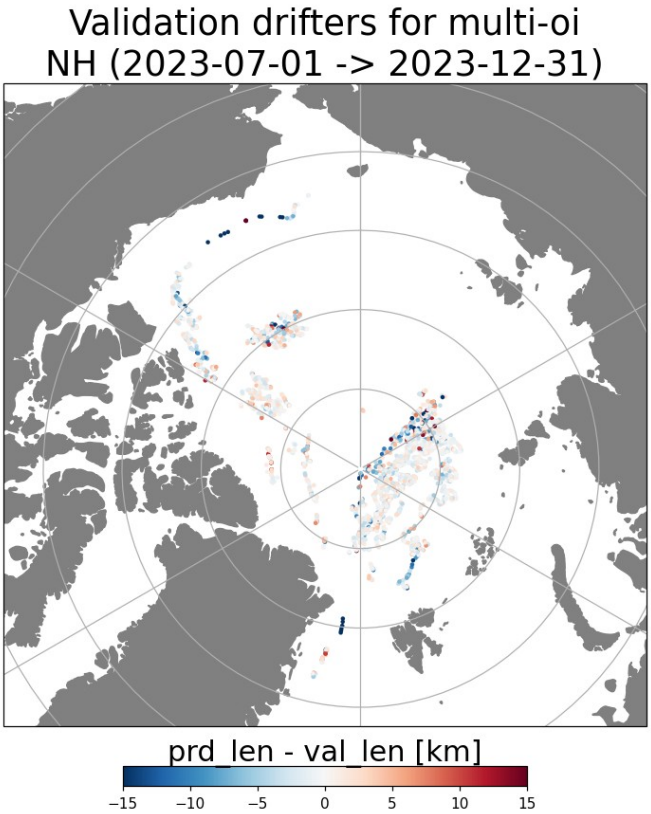

Figure 65: Location of GPS drifters for the quality assessment period (January to December 2023) in NH. The shade of each symbol represents the mean difference (prod-ref) in drift length (km over 2 days) for the multi-oi product.

Month	b(X) [km]	b(Y) [km]	std(X) [km]	std(Y) [km]	A	B[km]	corr	N
JAN. 2023	-0.885	-2.175	4.975	7.783	0.69	-1.582	0.91	418
FEB. 2023	-0.097	-0.569	2.632	4.138	0.81	-0.675	0.94	227
MAR. 2023	-0.16	0.332	2.128	1.761	0.99	0.128	0.98	242
APR. 2023	-0.264	-0.044	1.572	1.483	0.97	-0.163	0.98	285
MAY 2023	-0.025	0.292	2.214	2.241	0.98	0.214	0.95	222
JUN. 2023	0.306	0.529	3.384	3.924	0.91	0.536	0.85	247
JUL. 2023	0.26	0.53	3.71	3.83	0.86	0.49	0.85	238
AUG. 2023	1.36	0.72	7.07	5.56	0.79	1.03	0.76	129
SEP. 2023	0.049	-0.44	5.71	6.9	0.85	0.48	0.88	328
OCT. 2023	-0.087	-0.36	4.49	5.73	0.87	-0.056	0.93	649
NOV. 2023	0.19	0.10	3.56	3.74	0.91	0.52	0.96	790
DEC. 2023	-0.21	0.017	2.56	2.34	0.96	-0.075	0.98	804
Last 12 months	-0.056	-0.184	3.824	4.612	0.88	0.097	0.93	4579

Table 36: Quality assessment results for the LRSID (multi-oi) product (NH) from January to December 2023.

Month	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
JAN. 2023	-0.409	-0.781	4.793	5.457	0.82	-0.978	0.91	372
FEB. 2023	0.337	-0.343	3.447	3.041	0.98	-0.076	0.92	217
MAR. 2023	-0.015	0.216	3.663	4.668	0.98	0.238	0.93	227
APR. 2023	-0.161	-0.086	2.554	2.458	0.96	-0.136	0.95	276
MAY 2023	--	--	--	--	--	--	--	0
JUN. 2023	--	--	--	--	--	--	--	0
JUL. 2023	--	--	--	--	--	--	--	0
AUG. 2023	--	--	--	--	--	--	--	0
SEP. 2023	--	--	--	--	--	--	--	0
OCT. 2023	-0.021	-0.11	5.64	6.50	0.89	0.096	0.9	570
NOV. 2023	0.087	0.088	3.90	4.37	0.92	0.41	0.94	763
DEC. 2023	-0.2	-0.085	3.90	3.84	0.96	-0.12	0.95	789
Last 12 months	-0.071	-0.124	4.237	4.669	0.92	0.006	0.93	3214

Table 37: Quality assessment results for the LRSID (SSMIS-F18) product (NH) from January to December 2023.

Products	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
multi-oi	-	-	-	-	-	-	-	-
ssmis-f18	-	-	-	-	-	-	-	-
amsr2-gw1	-	-	-	-	-	-	-	-

Table 38: Quality assessment results for selected OSI-405-c products (SH) for the last 12 months (January to December 2023).

Comments: OSI-405-c has had nominal quality in the Arctic for the period and is within target requirement for standard deviation of 5km for both X and Y components. In the Antarctic no standard in situ data was available for validation of the product.

5.3.8. Medium resolution sea ice drift (OSI-407-a) quality

Quality assessment dataset

The ice drift quality assessment is performed by collocation of the satellite based drift vectors with the trajectories of in situ drifters. The ice drift reference data set consists of all drifters from the "positive list" used to produce the analysis fields for the global deterministic NWP model at ECMWF and for the local area model running at DMI. The data are stored at DMI.

A nearest-neighbour approach is implemented for the collocation and any collocation pair whose distance between the satellite product and the buoy is larger than 20 km or temporal difference greater than ±60 minutes from the satellite start time and, likewise, satellite end time is disregarded. The temporal mismatch between pairs of satellite ice drift and the corresponding buoy data is thus maximum 2 hours, but zero in average.

The product requirements for the MR ice drift product on threshold accuracy, target accuracy and optimal accuracy is 5 km, 2 km and 1 km yearly standard deviation, respectively.

Reported statistics
The Medium Resolution Sea Ice Drift product comprises two production modes, a summer mode from May to August, and a winter mode from September to April. These modes are using Visible (AVHRR channel 2) and Thermal Infra-Red (AVHRR channel 4), respectively.

Quality assessment statistics
Table 39 below, show selected mean difference statistics against drifting buoys. Mean differences (x-mean, y-mean) and standard deviation of mean differences (x-SD, y-SD) are shown, in meters, for the 2 perpendicular drift components (x, y). Statistics from the best fit between OSI-407-a and buoy data are shown as slope of fit (α) and correlation coefficient (r). N, indicate the number of data pairs that are applied in the mean difference statistics.
A plot of the locations of the used buoys is shown in Figure 66, and it is seen that only buoys from the central Arctic have been used for the validation. The colorbar shows the drift deviations of OSI-407.

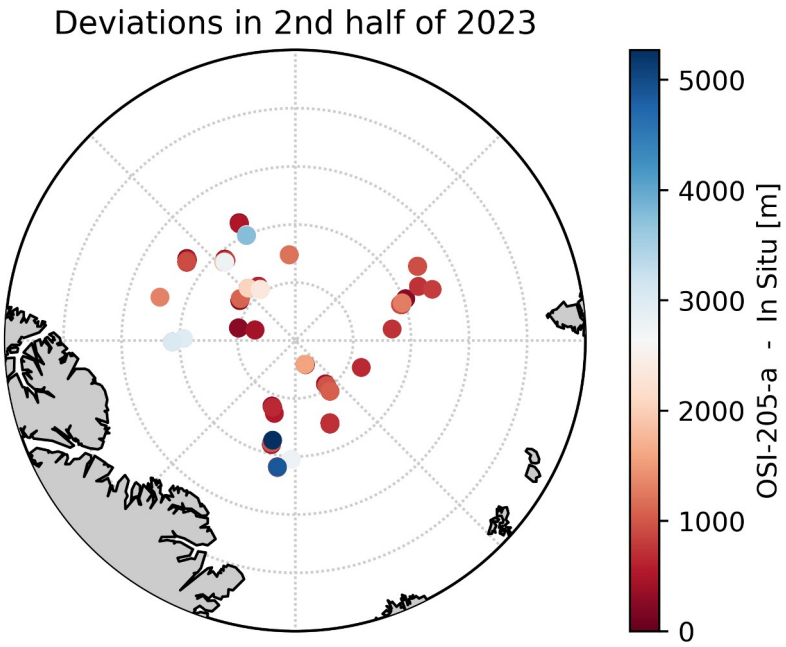

Figure 66: Location of GPS drifters for the quality assessment period (2nd half 2023). The shade of each symbol represents the difference (prod-def) in drift length in meters

Figure 67: Scatter plot for all the observations of the buoys shown in the previous figure (2nd half 2023).

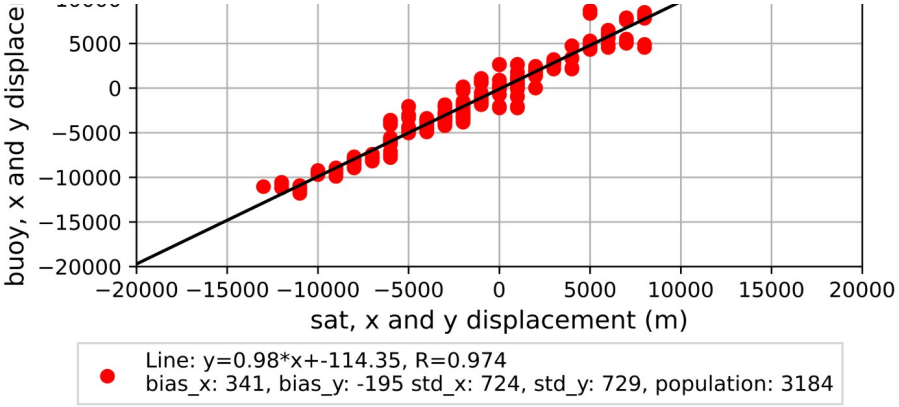

Figure 67: Correlation scatter plot showing the MR sea ice drift product (OSI-407) performance (2nd half 2023).

Month	b(X) [m]	b(Y) [m]	σ(X) [m]	σ(Y) [m]	α	β [m]	ρ	N
JAN. 2023	-129	-128	1047	778	0.97	187.60	0.979	392
FEB. 2023	342	480	528	668	1.02	-503.13	0.994	68
MAR. 2023	-309	-5	1017	708	0.99	144.63	0.967	520
APR. 2023	-445	629	482	621	0.89	-193.74	0.994	92
MAY 2023	198	518	602	407	0.93	-446.44	0.994	56
JUN. 2023	-705	415	582	718	0.93	18.40	0.972	10
JUL. 2023	4	129	451	357	0.99	-80.30	0.996	1104
AUG. 2023	-1073	23	1281	898	0.82	104.84	0.974	152
SEP. 2023	-756	-501	88	122	1.01	650.86	1.000	72
OCT. 2023	-	-	-	-	-	-	-	0
NOV. 2023	700	-394	488	813	0.99	-181.17	0.865	1856
DEC. 2023	-	-	-	-	-	-	-	0
Last 12 months	341	-195	724	729	0.98	-62.09	0.978	4322

Table 39: MR sea ice drift product (OSI-407-a) performance, JAN. 2023 to DEC. 2023

Comments: The optimal accuracy of 1 km standard deviation is met in all months in the second half 2023, except for August where the standard deviation in one direction exceeds it with a couple of hundred meters. Still, these values are well within the target accuracy of 2 km. The same can be said for the yearly standard deviation, so the product requirements are met.
For the whole period, a quality control has been carried out based on close inspection of correlation plots for individual buoys and individual days, relating them to their geographic location. All buoys were used, except for one with the ID: 4802582, as it contained only three measurements with all of them being outliers.

5.4. Global Wind quality (OSI-102-b, OSI-102-c, OSI-104-b, OSI-104-c, OSI-114-a, OSI-114-b, OSI-115-a, OSI-115-b)

The wind products are required to have an accuracy of better than 2.0 m/s in wind component standard deviation with a mean difference of less than 0.5 m/s in wind speed.

The scatterometer winds are monitored against forecast winds of the ECMWF global model. Forecasts of +3 to +15 hours are used and the model winds are interpolated with respect to time and location. The monitoring of relevant quality parameters as a function of time yields a sensitive method of detecting deviations of normal operation. However, one must be careful to regard the difference with reference background NWP model winds as the 'true' accuracy of the product, since both the NWP model winds and the scatterometer winds contain errors. Deviations in product quality usually appear as a step in one or more of the plots. See section 5.4.1 for the monthly averages.

The scatterometer winds are also compared to in situ equivalent neutral wind data from moored buoys, monthly averages are shown in section 5.4.2.

Seasonal weather variations imply differences in mean atmospheric stability, differences in dynamics, and differences in the distribution of wind speeds. These differences cause variations in the spatial representativeness errors associated with scatterometer wind quality assessment and in the difference statistics. Such effects cause seasonal oscillations that appear mainly in the wind speed mean differences plots against both model winds and buoy winds. For more background information we refer to: Hans Hersbach (2010) *Comparison of C-band scatterometer CMOD5.N equivalent neutral winds with ECMWF*, J. Atmos. Oceanic Technol., 27, 721–736.

We have studied the scatterometer wind speed mean differences against buoy winds for the tropics and the Northern Hemisphere mid latitudes separately. It appears that the mean differences in the tropics are fairly constant throughout the year, whereas the wind speed mean differences in the NH are higher in the winter than in the summer. Hence the seasonal cycles are mainly caused by weather variations in the mid latitudes.

5.4.1. Comparison with ECMWF model wind data

The figure below shows the monthly results of January 2022 to December 2023.

It is clear from the plots in this section, that the products do meet the accuracy requirements from the Service Specification Document [AD-1] (mean difference less than 0.5 m/s and wind component standard deviation accuracy better than 2 m/s) in most cases when they are compared to ECMWF model winds. Note that local smaller scale wind variations, which are resolved by the scatterometer but not by the model, contribute to the standard deviations. The scatterometer errors are therefore smaller than what is shown in the plots as we know from triple collocation analysis. The OSI SAF winds are routinely compared to Met Office NWP model data in the NWP SAF project. Monthly statistics of the products are available as e.g. 2D histograms and map plots, see https://nwp-saf.eumetsat.int/site/monitoring/winds-quality-evaluation/scatterometer-mon/.

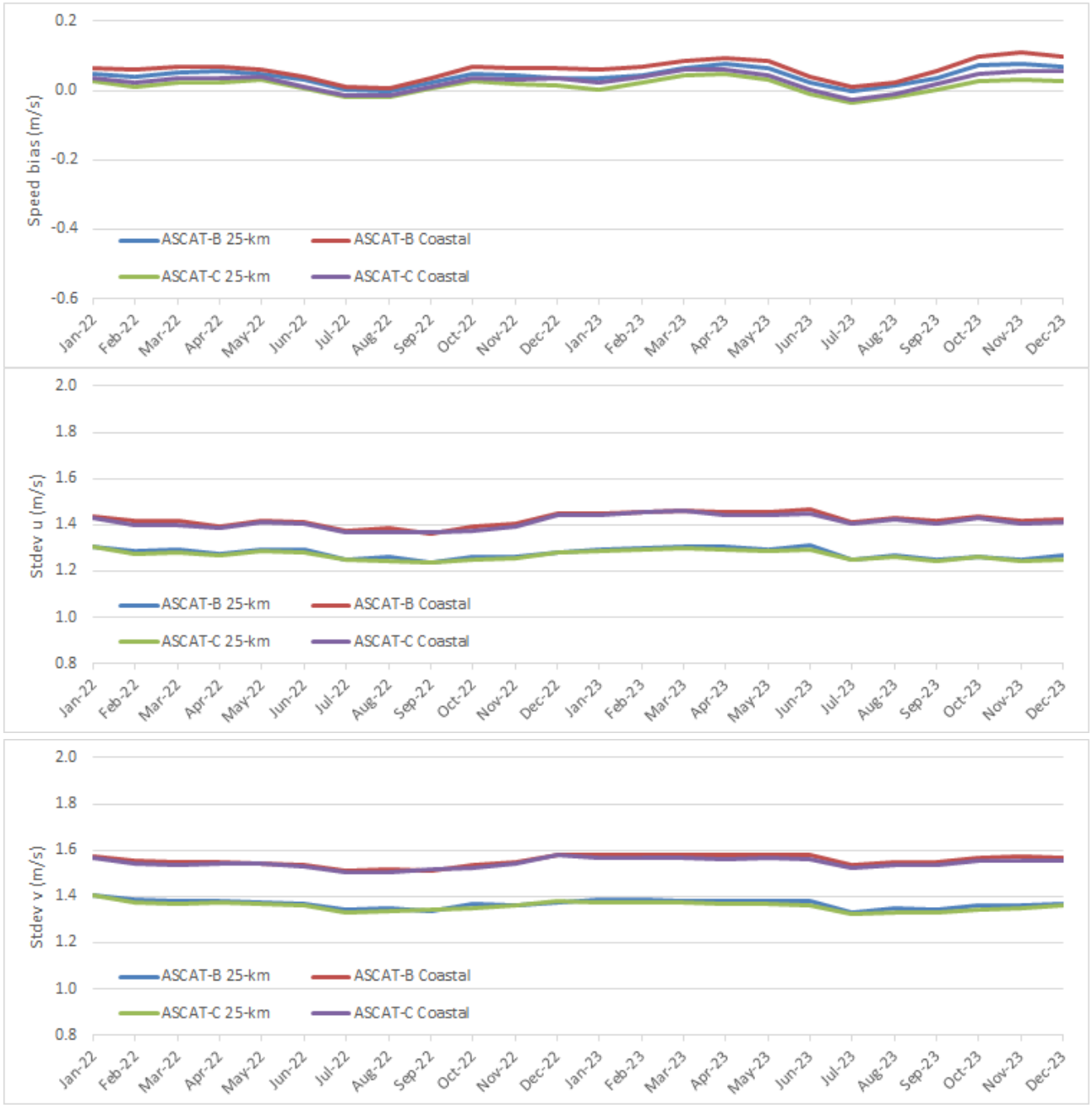

Figure 68: Comparison of ASCAT scatterometer winds against ECMWF NWP forecast winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus ECMWF, top), wind u component standard deviation (middle) and wind v component standard deviation (bottom) are shown.

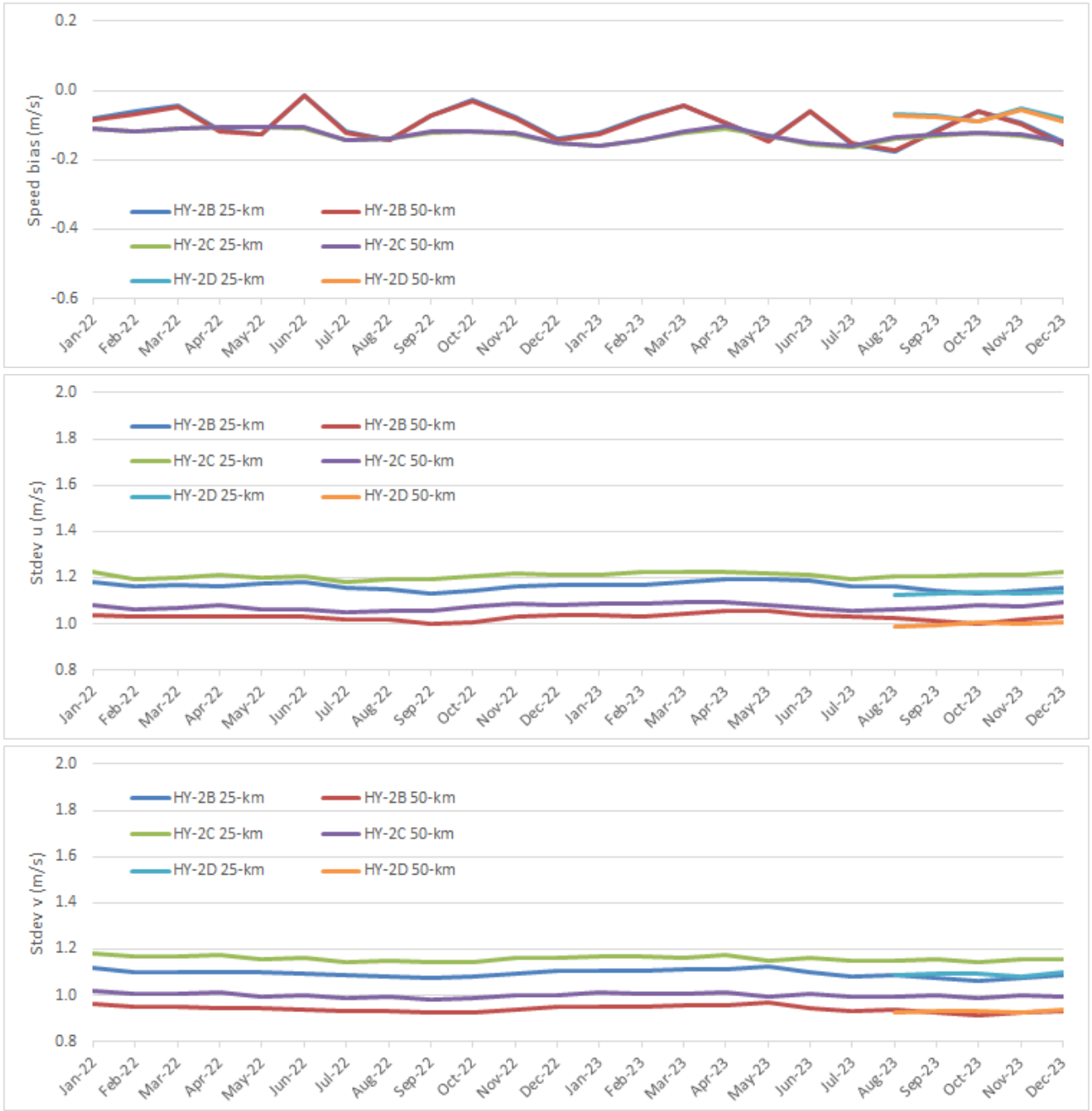

Figure 69: Comparison of HY-2B, HY-2C and HY-2D scatterometer winds against ECMWF NWP forecast winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus ECMWF, top), wind u component standard deviation (middle) and wind v component standard deviation (bottom) are shown.

5.4.2. Comparison with buoys

We compare the scatterometer winds with wind data from moored buoys on a monthly basis. The buoy data of approximately 150 buoys spread over the oceans (most of them in the tropical oceans and near Europe and North America) are retrieved from the ECMWF MARS archive and collocated with scatterometer winds. The buoy winds are converted to 10-m neutral winds using the LKB model, see Liu, W.T., K.B. Katsaros, and J.A. Businger, *Bulk parameterization of air-sea exchanges of heat and water vapor including the molecular constraints in the interface*, J. Atmos. Sci., vol. 36, 1979.

The figure below shows the monthly results of January 2022 to December 2023.

Note that the statistics as shown for the different ASCAT products are not from a common set of buoy measurements. So the number of scat/buoy collocations differs per product, in some cases we do have an ASCAT coastal wind but no 12.5 km or 25 km wind due to (small) differences in quality control. Also the number of available buoys changes over time as is shown in the bottom plot. This sampling issue gives rise to different mean difference and standard deviation scores in the plots below.

It is clear from the plots in this section, that the products do meet the accuracy requirements from the Service Specification Document [AD-1] (mean difference less than 0.5 m/s and wind component standard deviation accuracy better than 2 m/s) when they are compared to buoy winds.

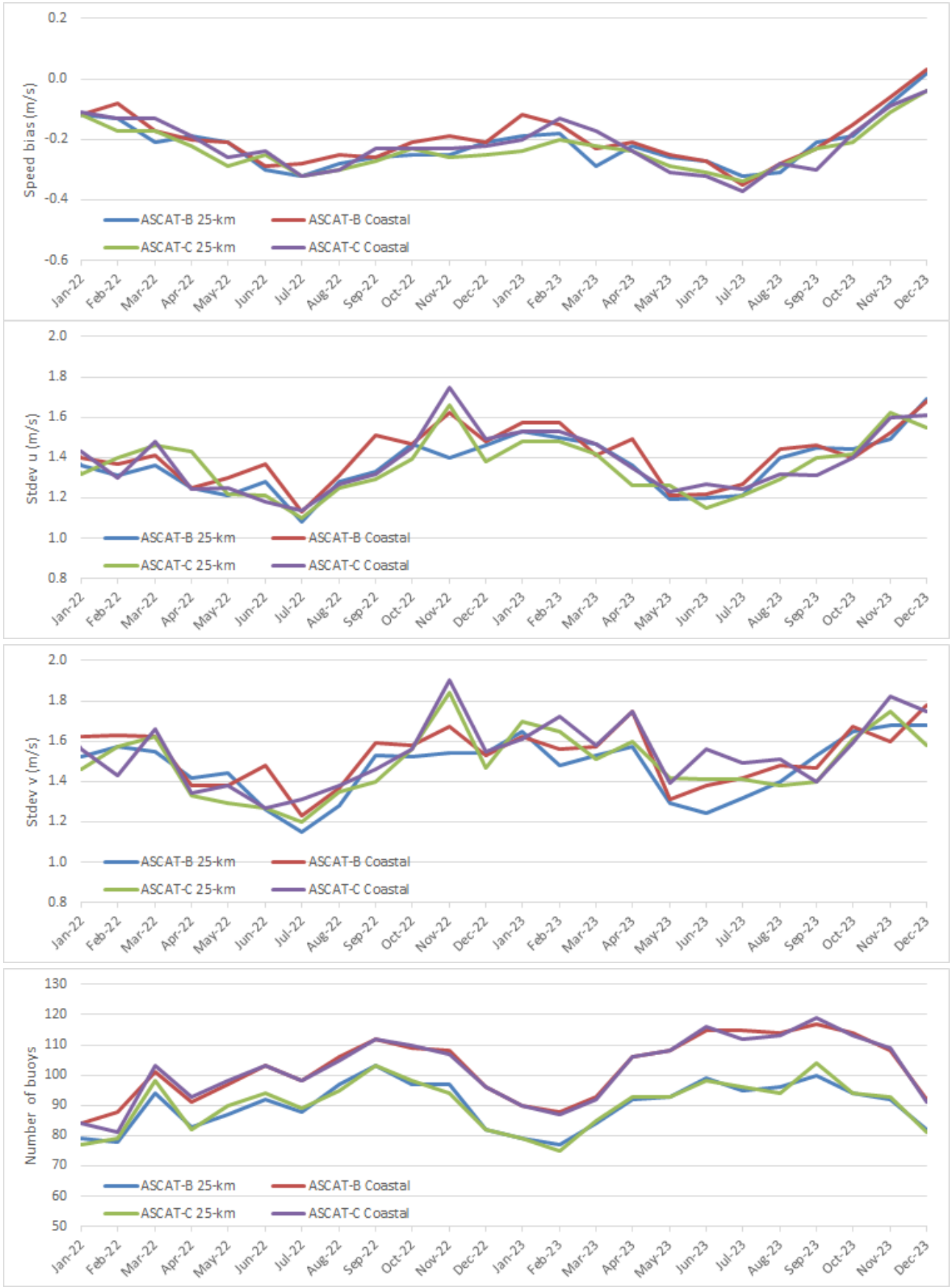

Figure 70: Comparison of ASCAT scatterometer winds against buoy winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus buoy, top), wind u component standard deviation (2nd plot) and wind v component standard deviation (3rd plot) are shown. Also the number of buoys available for the comparisons is shown (bottom).

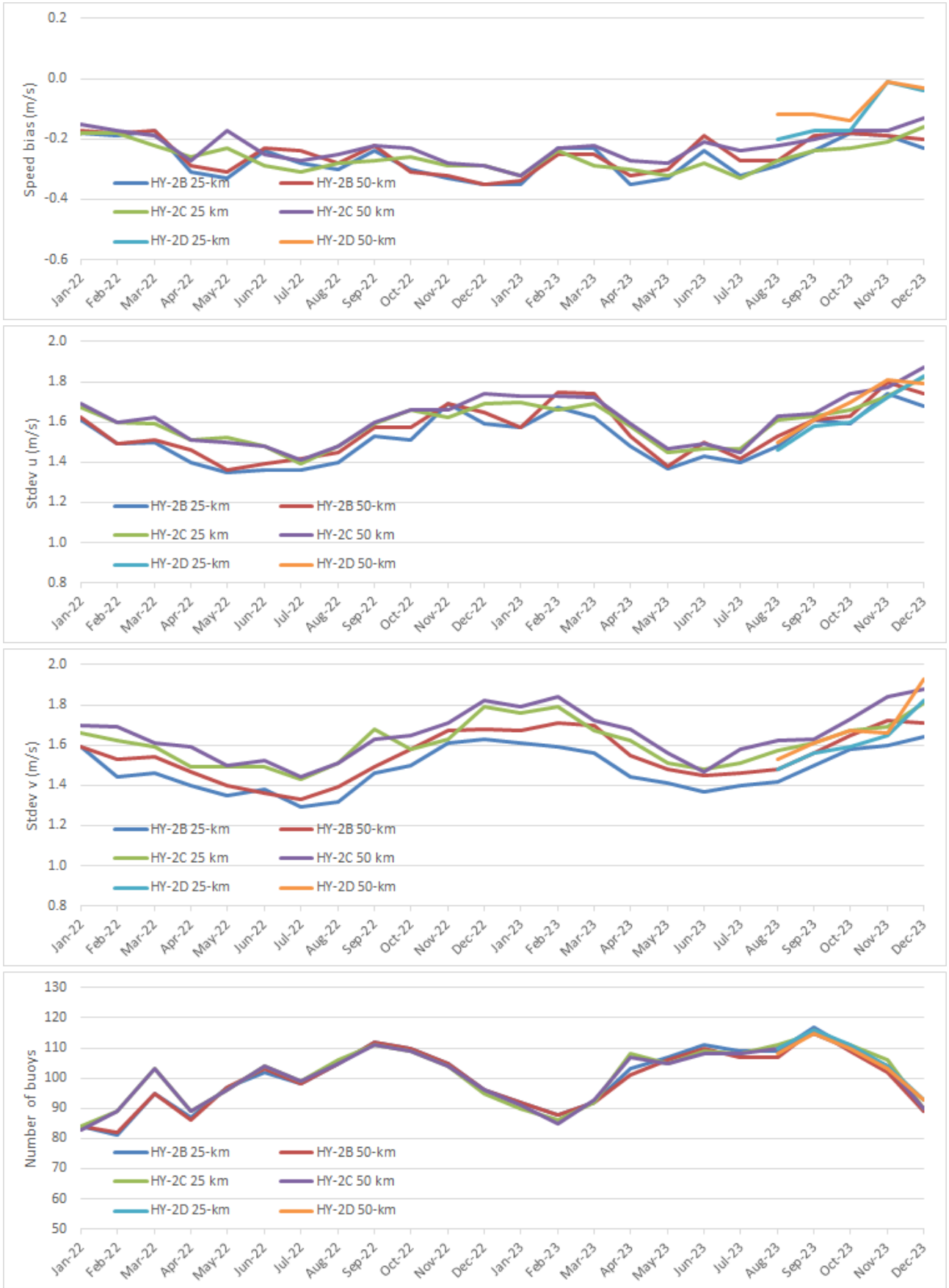

Figure 71: Comparison of HY-2B, HY-2C and HY-2D scatterometer winds against buoy winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus buoy, top), wind u component standard deviation (2nd plot) and wind v component standard deviation (3rd plot) are shown. Also the number of buoys available for the comparisons is shown (bottom).

6. Service and Product usage

6.1. Statistics on the web site and help desk

The OSI SAF offers to the users:

- a central web site, https://osi-saf.eumetsat.int, managed by MF/CMS,
- a web site for LML, https://osi-saf.eumetsat.int/lml/, managed by MF/CMS,
- a web site for HL, https://osisaf-hl.met.no/, managed by MET Norway,
- a web site for WIND, https://scatterometer.knmi.nl/osisaf/ managed by KNMI.

Users are recommended to make requests preferably through the central web site Help desk, with the guarantee that their demand will be acknowledged or answered quickly. However for requests concerning the HL or Wind products they may get access to direct contact points at MET Norway or KNMI.

6.1.1. Statistics on the registered users

Statistics on the central Web site use		
Month	Registered users	Pages
JUL. 2023	2246	5582
AUG. 2023	2251	5360
SEP. 2023	2265	5261
OCT. 2023	2281	6050
NOV. 2023	2290	5667
DEC. 2023	2294	4639

Table 40: Statistics on central OSI SAF web site use over 2nd half 2023.

The following graph illustrates the evolution of external registered users on the central web site.

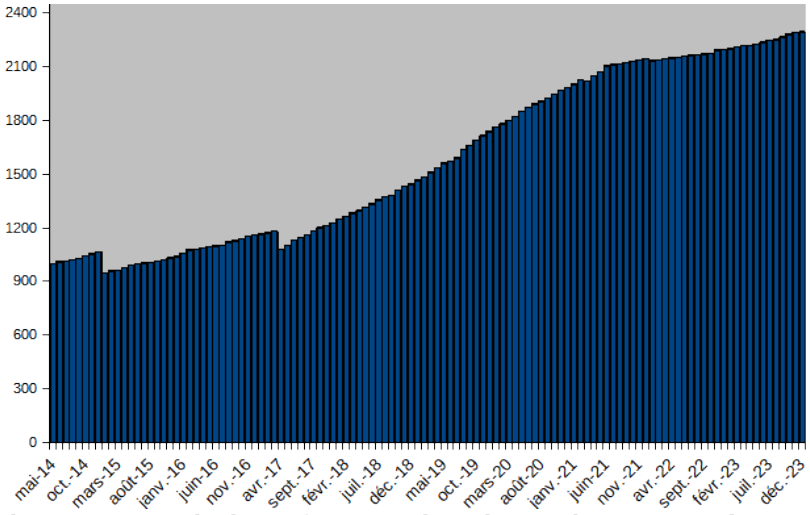

Figure 72: Evolution of external registered users on the central Web Site from April 2014 to DEC. 2023.

Comments: a clean up of the users registered on the web sits is planned for Q1 2024. Inactive users (i.e. the users who did not logged in in the last 3 years and who have not subscribed to service messages) will be deleted from the database.

The following table lists the institutions or companies the new registered users (over 2nd half 2023) are from.

Country	Institution, establishment or company
Argentina	Servicio Meteorologico Nacional - Servicio de Hidrografia Naval
Australia	Royal Melbourne Institute of Technology
Belgium	Université catholique de Louvain
Brazil	Instituto de Meteorologia
Brazil	Universidade Estadual do Ceará
Cameroon	Department of Meteorology
China	Ocean University of China
China	Zhejiang University
China	China University of Geo-science
China	Zhejiang Ocean University
China	Chinese Academy of Meteorological Sciences
China	XiaMen University
China	Nanjing University of Information Science & Technology
Falkland Islands	4C Offshore
France	Météo-France
France	Centre National d'Etudes Spatiales
France	Laboratoire d'Etudes en Géophysique et Océanographie Spatiales
Germany	Deutscher Wetterdienst
Germany	European Organisation for the Exploitation of Meteorological Satellites
India	Anna University Chennai
India	Centre for Incubation
Jordan	Beirut arab university
Korea (South	Korea Meteorological Administration
Lebanon	Centre de soutien météorologique
Madagascar	Direction Generale de la Meteorologie
Morocco	Direction de la Météorologie Nationale du Maroc
Netherlands	Utrecht University
Netherlands	Royal Netherlands Meteorological Institute
Netherlands	Atmospherics and Environmental Research
Norway	University of Bergen
Norway	Norwegian Meteorological Institute
Philippines	National Meteorological and Hydrological Services (Philippines)
Spain	Univeritat de les Illes Balears
United Kingdom	National Oceanography Centre
United States of America	Johns Hopkins University/Applied Physics Laboratory
United States of America	NASA Physical Oceanography DAAC

Table 41: List of institutes of the newly registered users over 2nd half 2023 on the central Web Site

Moreover 27 new individual users, i.e. persons independent from any institute, establishment or company, registered on the period.

The following table gives the list of the newly registered wind users at KNMI.

Country	Institution, establishment or company	Acronym
China	State Key Laboratory of Remote Sensing Science, Chinese Academy of Sciences	
China	Beijing Information Science & Technology University	BISTU
Italy	Private user	
Japan	Weathernews Inc.	
Switzerland	Meteomatics AG	

Table 42: List of institutes of the newly registered wind users at KNMI

6.1.2. Status of user requests made via the helpdesk

The user requests are split into 4 categories:

- Unavailable: one or several product(s) are unavailable
- Anomaly: anomaly in one or several product(s)/services
- Archive: request for archived data
- Information: request for information

	Total number of helpdesk inquiries	Number of inquiries acknowledged within 3 working days	Inquiries categorized as 'information'	Inquiries categorized as 'archive'	Inquiries categorized as 'unavailable'	Inquiries categorized as 'anomaly'
LML subsystem	11	11	5		1	5
HL subsystem	15	14	7		4	3
WIND subsystem	26	26	20	6	0	0

Table 43: Helpdesk inquires over 2nd half 2023

6.1.3. Visitors statistics

Since the respective websites and technologies differ, and also the tools to get the statistics, it is not easy to compare the statistics. The following statistics are mainly useful to see changes over time.

The following graph shows the evolution of number of unique visitors on the central web site (https://osi-saf.eumetsat.int/) which includes the pages for the LML processing center (https://osi-saf.eumetsat.int/lml-processing-center).

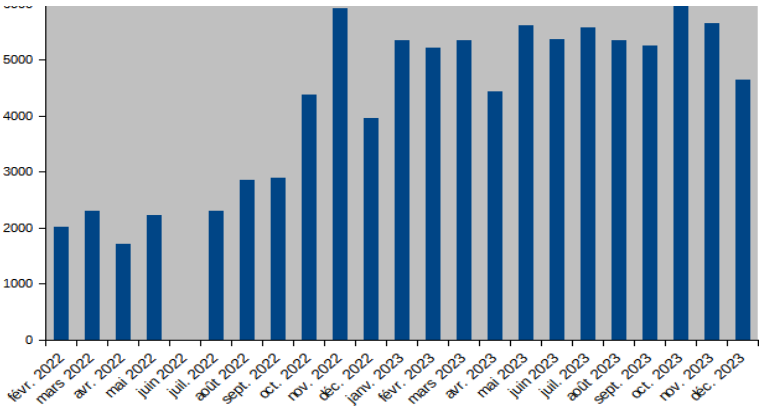

Figure 73: Evolution of page views on the central OSI SAF web site over the past 2 years

The following graph illustrates the evolution of page views on the OSI SAF High Latitude portal (http://osisaf-hl.met.no).

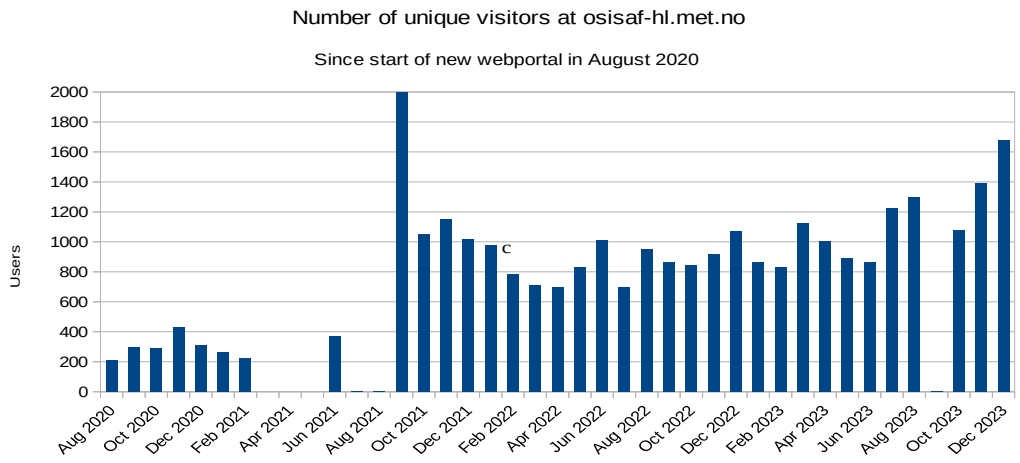

Figure 74: Evolution of page views on the HL OSI SAF Sea Ice portal over the past 2 years

The following graph illustrates the evolution of page views on the KNMI scatterometer web pages (https://scatterometer.knmi.nl/home/), which are partly devoted to the OSI SAF wind products.
Note: each click in a product viewer (to zoom in on a specific region) results in a new page view, That's why there are so many page views.

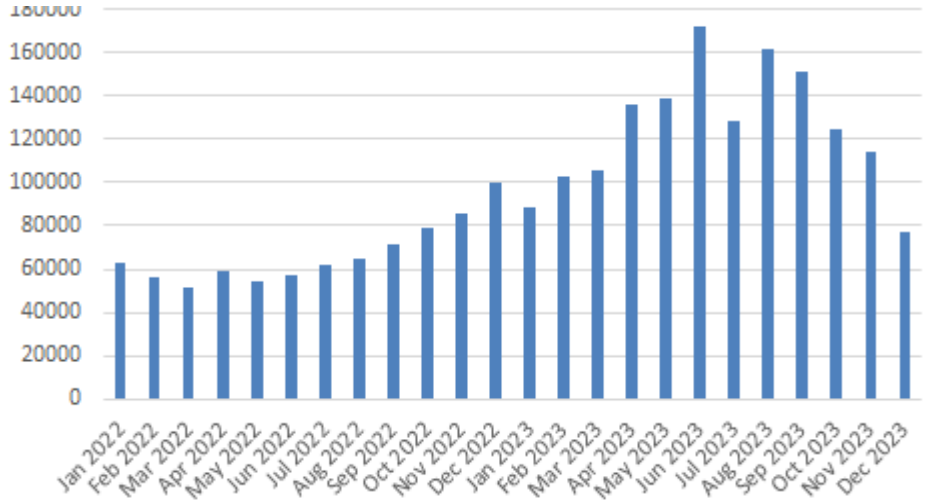

Figure 75: Evolution of page views on KNMI scatterometer website over the past 2 years

6.2. Statistics on the OSI SAF FTP servers use

6.2.1. Downloads statistics from the OSI SAF LML subsystem and from PO.DAAC

SST and Fluxes products are available from Ifremer: by FTP, by HTTP and by Thredds which offers the OpenDap service, the Web Coverage service (WCS) and the Web Mapping Service (WMS). WCS and WMS allow to directly view the data online, WCS allows to access to all the content of the data whereas WMS allows aonly to get the image.

Some SST products are also available at the PODAAC. Although outside the OSI SAF the PODAAC kindly provides the OSI SAF with statistics on the downloading of the OSI SAF products on their server.

		JUL. 2023		AUG. 2023		SEP. 2023		OCT. 2023		NOV. 2023		DEC. 2023	
		Ifremer FTP/ HTTP/ OpenDap WCS/ WMS	PO.DAAC	Ifremer FTP/ HTTP/ OpenDap WCS/ WMS	PO.DAAC	Ifremer FTP/ HTTP/ OpenDap WCS/ WMS	PO.DAAC	Ifremer FTP/ HTTP/ OpenDap WCS/ WMS	PO.DAAC	Ifremer FTP/ HTTP/ OpenDap WCS/ WMS	PO.DAAC	Ifremer FTP/ HTTP/ OpenDap WCS/ WMS	PO.DAAC
SST MAP +LML			x		x		x		x	46	x	10023	x
SSI MAP +LML			x		x		x		x		x	19983	x
DLI MAP +LML			x		x		x		x		x	2374	x
OSI-201 series	GBL SST	840/ 140/ 142	NA	4368/ 4/ 14	NA	173/ 1/ 0/ 1/ 1	NA	799/ 3/ 0/ 1/ 1	221	2557/ 87/ 0/ 0/ 1	203	5492/ 5064/ 0/ 2/ 2	128
OSI-202 series	NAR SST	833/ 66	NA	818/ 62	NA	711/ 36	NA	1531/ 23	221	703/ 114	0	775/ 2108	0
OSI-204 series	MGR SST	206532/ 458	NA	16529	NA	160701/ 390/ 11/ 16/ 21	NA	160771/ 15482/ 0/ 69/ 44	39589	20809/ 2932/ 0/ 113/ 78	37829	43887/ 386/ 0/ 182/ 126	15941
OSI-206 series	Meteosat SST	90139	NA		NA	10	NA	3	2062		1914	76	1041
OSI-207 series	GOES-East SST	3111	NA	3072	NA	2977	NA	2977	0	2763	1204	2977/ 1	621
OSI-IO-SST	Meteosat-8 SST		NA		NA		NA		960		772	1	541
OSI-208 series	IASI SST	46724	NA	45835	NA		NA	4167	0	41614	0	213994/ 1	0
OSI-250	Meteosat SST Data record	86392	NA	28038	NA	43912	NA		0		0	8935	0

OSI-303 series	Meteosat 0° DLI	10286	x	1/ 3349	x	1974	x	27537/ 2	x	317/ 3	x	75957	x
OSI-304 series	Meteosat 0° SSI	10286	x	1/ 3349	x	1974	x	27537/ 2	x	317/ 3	x	75957	x
OSI-305 series	GOES-East DLI	32223/ 266	x	32872/ 6555	x	31287/ 9451	x	51588/ 720	x	29186/ 881	x	31234/ 214579	x
OSI-306 series	GOES-East SSI	32223/ 266	x	32872/ 6555	x	31287/ 9451	x	51588/ 720	x	29186/ 881	x	31234/ 214579	x
OSI-IO-DLI	Meteosat IO DLI		x	522	x		x		x		x	46818	x
OSI-IO-SSI	Meteosat IO SSI		x	522	x		x		x	11	x	46818	x

Table 44: Number of OSI SAF products downloaded from Ifremer FTP server and PO.DAAC server over 2nd half 2023.

Note: PO.DAAC statistics about the NAR SST product is the sum of NOAA-17, NOAA-18, NOAA-19, Metop-A and Metop-B NAR SST products.

Comments: Statistics from PO.DAAC are not available for July, August and September, following their switch to the cloud.

6.2.2. Downloads statistics from the OSI SAF HL subsystem, and from CMEMS and C3S

Sea Ice, SST and Flux products are available on MET Norway FTP server. Some products are also made available through Copernicus CMEMS, and statistics are kindly made available for these products.

OSI SAF HL FTP server		JUL. 2023	AUG. 2023	SEP. 2023	OCT. 2023	NOV. 2023	DEC. 2023
OSI-401 series	Global Sea Ice Concentration (SSMIS)	184902	36562	113730	109302	71177	56294
OSI-402 series	Global Sea Ice Edge	6692	6380	7491	7581	6049	4368
OSI-403 series	Global Sea Ice Type	27730	3113	22185	41694	28612	67902
OSI-404 series	Global Sea Ice Emissivity	24	4	730	0	1	0
OSI-405 series	Low resolution Sea Ice Drift	14130	30876	47525	77582	41012	19335
OSI-407 series	Medium resolution Sea Ice Drift	1263	488	125	10867	10964	3167
OSI-408 series	Global Sea Ice Concentration (AMSR-2)	15522	9217	5245	6622	12821	5408
OSI-410 series	Level 2 PMW sea ice concentration	4197	59275	4083	7507	4271	4101
OSI-409	Ice Concentration Data Record v1.2	11571	19195	67740	0	0	1
OSI-430	Ice Concentration ICDR v1.2	76	6882	7871	0	0	2
OSI-430-a	Ice Concentration ICDR v3.0	5719	4324	11778	5740	3401	3154

OSI-430-b	Ice Concentration ICDR v2.0	11266	17454	18612	26857	38495	26283
OSI-450	Ice Concentration Data Record v2.0	15407	24573	18245	513	32201	7543
OSI-450-a	Ice Concentration Data Record v3.0	154318	162970	169873	183128	160853	13722
OSI-455	Ice Drift Data Record v1.0	764	26306	81100	158883	21651	97412
OSI-458	AMSR Ice Concentration CDR v3.0	23	1356	4385	9278	4186	13
OSI-203 series	AHL SST	329	62	168	0	1093	393
OSI-205 series	L2 SST/IST	367	94	0	35	0	0
OSI-301/2 series	AHL DLI-SSI	493	501	526	502	484	550

Table 45: Number of OSI SAF products downloaded from OSI SAF HL FTP server over 2nd half 2023

Redistribution by CMEMS and C3S		JUL. 2023		AUG. 2023		SEP. 2023		OCT. 2023		NOV. 2023		DEC. 2023	
		CMEMS	C3S	CMEMS	C3S	CMEMS	C3S	CMEMS	C3S	CMEMS	C3S	CMEMS	C3S
OSI-401 series	Global Sea Ice Concentration (SSMIS)	12533	-	12236	-	11715	-	11256	-	7740	-	8103	-
OSI-402 series	Global Sea Ice Edge	5136	-	4714	-	4475	-	3148	-	1404	-	1287	-
OSI-403 series	Global Sea Ice Type	2507	-	2389	-	2326	-	1538	-	594	-	401	-
OSI-405 series	Low resolution Sea Ice Drift	2132	-	2056	-	1908	-	1251	-	289	-	30	-
OSI-408 series	Global Sea Ice Concentration (AMSR2)	3400	-	3266	-	2992	-	1636	-	0	-	52	-
OSI-430-b	Ice Concentration ICDR v2.0	-	18129	-	29738	-	28135	-	26551	-	23058	-	23700
OSI-430-a	Ice Concentration ICDR v3.0	35	-	65	-	17	-	9	-	46	-	47	-
OSI-450	Ice Concentration Data Record v2.0	-	92438	-	107321	-	232421	-	124736	-	186894	-	92592
OSI-450-a	Ice Concentration Data Record v3.0	28	-	83	-	24	-	28	-	61	-	2	-

Table 46: Number of OSI SAF products redistributed by CMEMS (downloads/product/day) and C3S (number of files) over 2nd half 2023

6.2.3. Downloads statistics from the OSI SAF WIND subsystem and from PO.DAAC

Wind products are available on KNMI FTP server. The products are also available at the PODAAC in NetCDF. Although outside the OSI SAF the PODAAC kindly provides the OSI SAF with statistics on the downloading of the OSI SAF products on their server.

The numbers for the KNMI FTP server are the average number of downloads per product file of the near-real time products. The numbers for PO.DAAC are the downloaded number of archived product files (containing one orbit each) which may cover the whole product history. Note that the BUFR products are also disseminated through EUMETCast.

From the KNMI FTP server we get loggings of the number of downloads of a certain product (i.e., all files of a product) per day. These numbers are fairly constant over a period of one month. The reported number of downloads is obtained by dividing the number of downloads per day by the number of product files produced per day. The KNMI FTP server contains a rolling archive of the last 3 days so these numbers reflect the real NRT usage and we believe it should be close to the number of product users.

For PO.DAAC the situation is different since it contains the full history of products. The downloaded files can be recent or they can be from the past. Also, PO.DAAC contains ASCAT files in full orbits whereas the KNMI FTP sever contains ASCAT files in 3 minute PDUs for BUFR format and full orbits for NetCDF format. This makes comparing of the numbers difficult.

Unfortunately, PO.DAAC did not provide ASCAT download statistics for this period, this is due to some internal issues in their infrastructure. They are aware of the situation and working on a solution.

		JUL. 2023		AUG. 2023		SEP. 2023		OCT. 2023		NOV. 2023		DEC. 2023	
		KNMI FTP	PO.DAAC	KNMI FTP	PO.DAAC	KNMI FTP	PO.DAAC	KNMI FTP	PO.DAAC	KNMI FTP	PO.DAAC	KNMI FTP	PO.DAAC
OSI-102-b	ASCAT-B 25 km	18 per file (BUFR), 41 per file (NetCDF)	N/A	18 per file (BUFR), 41 per file (NetCDF)	N/A	18 per file (BUFR), 41 per file (NetCDF)	N/A	22 per file (BUFR), 41 per file (NetCDF)	N/A	22 per file (BUFR), 41 per file (NetCDF)	N/A	22 per file (BUFR), 41 per file (NetCDF)	N/A
OSI-102-c	ASCAT-C 25 km	19 per file (BUFR), 26 per file (NetCDF)	N/A	19 per file (BUFR), 26 per file (NetCDF)	N/A	19 per file (BUFR), 26 per file (NetCDF)	N/A	22 per file (BUFR), 26 per file (NetCDF)	N/A	22 per file (BUFR), 26 per file (NetCDF)	N/A	22 per file (BUFR), 26 per file (NetCDF)	N/A
OSI-114-a	HY-2B 25 km wind vectors	14 per file (BUFR), 21 per file (NetCDF)		14 per file (BUFR), 21 per file (NetCDF)		14 per file (BUFR), 21 per file (NetCDF)		15 per file (BUFR), 20 per file (NetCDF)		15 per file (BUFR), 20 per file (NetCDF)		15 per file (BUFR), 20 per file (NetCDF)	
OSI-114-b	HY-2B 50 km wind vectors	3 per file (BUFR), 21 per file (NetCDF)		3 per file (BUFR), 21 per file (NetCDF)		3 per file (BUFR), 21 per file (NetCDF)		4 per file (BUFR), 20 per file (NetCDF)		4 per file (BUFR), 20 per file (NetCDF)		4 per file (BUFR), 20 per file (NetCDF)	
OSI-115-a	HY-2C 25 km wind vectors	15 per file (BUFR), 21 per file (NetCDF)		15 per file (BUFR), 21 per file (NetCDF)		15 per file (BUFR), 21 per file (NetCDF)		16 per file (BUFR), 20 per file (NetCDF)		16 per file (BUFR), 20 per file (NetCDF)		16 per file (BUFR), 20 per file (NetCDF)	
OSI-115-b	HY-2C 50 km wind vectors	3 per file (BUFR), 21 per file (NetCDF)		3 per file (BUFR), 21 per file (NetCDF)		3 per file (BUFR), 21 per file (NetCDF)		3 per file (BUFR), 20 per file (NetCDF)		3 per file (BUFR), 20 per file (NetCDF)		3 per file (BUFR), 20 per file (NetCDF)	
OSI-116-a	HY-2D 25 km wind vectors	-		0 per file (BUFR), 7 per file (NetCDF)		0 per file (BUFR), 7 per file (NetCDF)		2 per file (BUFR), 8 per file (NetCDF)		2 per file (BUFR), 8 per file (NetCDF)		2 per file (BUFR), 8 per file (NetCDF)	
OSI-116-b	HY-2D 50 km wind vectors	-		0 per file (BUFR), 7 per file (NetCDF)		0 per file (BUFR), 7 per file (NetCDF)		2 per file (BUFR), 8 per file (NetCDF)		2 per file (BUFR), 8 per file (NetCDF)		2 per file (BUFR), 8 per file (NetCDF)	
OSI-104-b	ASCAT-B Coastal	10 per file (BUFR), 41 per file (NetCDF)	N/A	10 per file (BUFR), 41 per file (NetCDF)	N/A	10 per file (BUFR), 41 per file (NetCDF)	N/A	10 per file (BUFR), 41 per file (NetCDF)	N/A	10 per file (BUFR), 41 per file (NetCDF)	N/A	10 per file (BUFR), 41 per file (NetCDF)	N/A
OSI-104-c	ASCAT-C Coastal	12 per file (BUFR), 26 per file (NetCDF)	N/A	12 per file (BUFR), 26 per file (NetCDF)	N/A	12 per file (BUFR), 26 per file (NetCDF)	N/A	13 per file (BUFR), 26 per file (NetCDF)	N/A	13 per file (BUFR), 26 per file (NetCDF)	N/A	13 per file (BUFR), 26 per file (NetCDF)	N/A

Table 47: Number of OSI SAF products downloaded from KNMI FTP server (average number) and PO.DAAC server(absolute number).

6.3. Statistics from EUMETSAT central facilities

6.3.1. Users from EUMETCast

Here below the list of the OSI SAF users identified by EUMETSAT for the distribution by EUMETCast. The table below shows the overall number of OSI SAF users by country on the 19 January 2024.

Albania	6	Ghana	10	Pakistan	3
Algeria	9	Greece	22	Palestinian Territory, Occupied	1
Angola	3	Guinea	2	Poland	16
Austria	23	Guinea-Bissau	3	Portugal	7
Azerbaijan	3	Hong Kong	1	Qatar	3
Bahrain	1	Hungary	10	Reunion	2
Belgium	14	Iceland	2	Romania	11
Benin	4	India	3	Russian Federation	7
Bosnia And Herzegovina	1	Iran, Islamic Republic Of	37	Rwanda	6
Botswana	6	Iraq	3	San Marino	1
Brazil	5	Ireland	9	Sao Tome And Principe	2
Bulgaria	6	Israel	7	Saudi Arabia	3
Burkina Faso	4	Italy	301	Senegal	9
Burundi	2	Jordan	2	Serbia	2
Cameroon	6	Kazakhstan	5	Seychelles	3
Canada	1	Kenya	13	Sierra Leone	2
Cape Verde	3	Korea, Republic Of	1	Slovakia	9
Central African Republic	2	Kuwait	3	Slovenia	1
Chad	4	Kyrgyzstan	1	Somalia	2
China	4	Latvia	3	South Africa	23
Comoros	2	Lebanon	3	South Sudan	1
Congo	3	Lesotho	4	Spain	53
Congo, The Democratic Republic Of The	5	Liberia	3	Sudan	4
Cote D'Ivoire	6	Libyan Arab Jamahiriya	1	Sweden	6
Croatia	2	Lithuania	3	Switzerland	19
Cyprus	1	Luxembourg	2	Syrian Arab Republic	1
Czech Republic	23	Madagascar	6	Tajikistan	1
Denmark	8	Malawi	4	Tanzania, United Republic Of	6
Djibouti	2	Mali	3	Togo	4
Egypt	6	Malta	2	Tunisia	5
Equatorial Guinea	2	Mauritania	5	Turkey	7
Eritrea	2	Mauritius	8	Turkmenistan	1
Estonia	4	Morocco	10	Uganda	5
Eswatini	4	Mozambique	6	Ukraine	3
Ethiopia	9	Namibia	6	United Arab Emirates	6
Finland	5	Netherlands	31	United Kingdom	147
France	74	Niger	8	United States	6
Gabon	4	Nigeria	8	Uzbekistan	1
Gambia	3	North Macedonia	1	Viet Nam	1
Georgia	1	Norway	5	Yemen	1
Germany	135	Oman	4	Zambia	4
				Zimbabwe	4

Table 48: Overall number of EUMETCast users by country on the 19/01/2024.

6.3.2. Users and retrievals from EUMETSAT Data Center

Orders Summary over the 2nd half 2023

The table below lists the products downloaded from the EUMETSAT Data Center (EDC), the volume of the downloaded data in megabytes (MB) and the number of files over the **2nd half 2023**.

	Item	Volume in MB	Number of files
OSI-404 series	F-18_OSIEMGB_OPE	1596	76
Daily OSI-305/OSI-306 series	GOES-13_ODDLISSI_OPE	23615	88
Daily OSI-305/OSI-306 series	GOES-16_ODDLISSI_OPE	32015	2610
Hourly OSI-305/OSI-306 series	GOES-16_OHDLISSI_OPE	282161	33112
OSI-207 series	GOES-16_OSIHSSTN_OPE	21	2
OSI-408 series	GW-1_OSICOAMSRGB_OPE	20310	1636
OSI-116-a	HY-2D_OHDSW025_OPE	111	2
OSI-116-b	HY-2D_OHDSW050_OPE	33	2
OSI-102-b	M01_OAS025_OPE	61286	25846
OSI-104-b	M01_OASWC12_OPE	150112	48139
OSI-407 series	M01_OMRSIDRN_OPE	42211	5801
OSI-201 series	M01_OSSTGLBN_OPE	6028	167
OSI-203 series	M01_OSSTIST3A_OPE	1668	124
OSI-102-a	M02_OAS025_OPE	31169	12405
OSI-104-a	M02_OASWC12_OPE	131977	46277
OSI-201 series	M02_OSSTGLB_OPE	233	12
OSI-102-c	M03_OAS025_OPE	60836	25607
OSI-104-c	M03_OASWC12_OPE	84751	27728
OSI-401 series	MML_OR2017SICOGB_OPE	3530	358
OSI-450-a	MML_OR450ASICO_OPE	77	76
OSI-455	MML_OR455SIDR_OPE	4	2
OSI-401 series	MML_OSICOGBN_OPE	94980	5063
OSI-405 series	MML_OSIDRGB_OPE	10292	15155
OSI-402 series	MML_OSIEDGBN_OPE	25153	2324
OSI-403 series	MML_OSITYGBN_OPE	37674	3921
Hourly OSI-303/OSI-304 series	MSG2_OHDLISSI_OPE	7790	392
Hourly OSI-303/OSI-304 series	MSG3_OHDLISSI_OPE	5717	720
Hourly OSI-303 series	MSG3_OSIHDLI_OPE	157	24
Hourly OSI-304 series	MSG3_OSIHSSI_OPE	92	24
OSI-206 series	MSG3_OSIHSSTN_OPE	2718	289
Daily OSI-303/OSI-304 series	MSG4_ODDLISSI_OPE	4589	408

	Item	Volume in MB	Number of files
Hourly OSI-303/OSI-304 series	MSG4_OHDLISSI_OPE	34356	4158
OSI-206 series	MSG4_OSIHSSTN_OPE	4246	384
OSI-205-b	NPP_OSSTIST2B_OPE	337595	2189
OSI-153-c	OCEANSAT2_OR2OSW025_OPE	18	2
OSI-153-d	OCEANSAT2_OR2OSW050_OPE	4	2
OSI-151-a	QUIKSCAT_OR1SWW025_OPE	23295	20653
	Miscellaneous	148	
	Total	**1522568**	**285778**

Table 49: Volume of data downloaded (in MB) by products from EDC over 2nd half 2023.

Ingestion Summary over the 2nd half 2023

The next table lists the received percentage of OSI SAF products by month over the period. In red, there was clearly an outage of products as well under the OSI SAF monthly target performance of 95%.

There might be some differences between disseminated values over EUMETCast and the data ingested in the EDC. We assume it is due to how the availability is calculated in both cases. In the EUMETCast case, the statistics are calculated depending on the number of inputs received, while in UMARF the number of expected products is static (it is considered a theoretical number of expected products).

Product id.	Product name	JUL. 2023	AUG. 2023	SEP. 2023	OCT. 2023	NOV. 2023	DEC. 2023
OSI-410-a	Level 2 PMW sea ice concentration (F-16)	98.8	99.8	100	95.7	99.5	97.0
OSI-410-a	Level 2 PMW sea ice concentration (F-17)	100	99.1	99.8	96.6	99.0	97.5
OSI-410-a	Level 2 PMW sea ice concentration (F-18)	96.8	99.1	97.9	95.4	96.9	97.0
OSI-404	Global Sea Ice Emissivity (DMSP-F18)	100	100	100	100	100	100
OSI-305-b	Daily Downward Longwave Irradiance (GOES-16)	96.8	100	100	100	100	100
OSI-306-b	Daily Surface Solar Irradiance (GOES-16)						
OSI-305-b	Hourly Downward Longwave Irradiance (GOES-16)	98.7	99.7	100	96.8	94.6	100
OSI-306-b	Hourly Surface Solar Irradiance (GOES-16)						
OSI-207-b	Hourly Sea Surface Temperature (GOES-16)	98.8	99.7	100	96.8	94.2	100
OSI-408-a	Sea Ice Concentration (AMSR-2)	100	100	100	100	100	100
OSI-410-a	Level 2 PMW sea ice concentration	99.7	95.9	99.9	98.8	99.7	99.3
OSI-114-a	HY-2B 25 km wind vectors	96.8	96.1	97.4	97.5	74.0	89.2
OSI-114-b	HY-2B 50 km wind vectors	97.2	96.1	97.4	97.5	74.3	89.4
OSI-115-a	HY-2C 25 km wind vectors	93.3	96.3	98.6	97.0	71.9	90.3
OSI-115-b	HY-2C 50 km wind vectors	93.1	96.3	98.3	97.2	71.4	90.1
OSI-116-a	HY-2D 25 km wind vectors	NA	NA	NA	100	100	100
OSI-116-b	HY-2D 50 km wind vectors	NA	NA	NA	100	100	100
OSI-102-b	ASCAT 25km Wind (Metop-B)	100	99.8	99.8	100	100	99.8

Product id.	Product name	JUL. 2023	AUG. 2023	SEP. 2023	OCT. 2023	NOV. 2023	DEC. 2023
OSI-104-b	ASCAT 12.5km Coastal Wind (Metop-B)	100	99.8	99.8	100	100	99.8
OSI-407-a	Sea Ice Drift (Multi Mission)	100	99.2	98.3	100	99.2	98.4
OSI-201-b	Global Sea Surface Temperature (Metop-B)	100	100	100	91.9	88.3	100
OSI-205-a	SST/IST L2 (Metop-B)	100	100	100	100	100	100
OSI-203-a	SST/IST L3 (Metop-B)	98.4	100	98.3	100	100	100
OSI-202-c	NAR Sea Surface Temperature (Metop-B)	98.4	100	100	93.5	93.3	100
OSI-102-c	ASCAT 25 km Wind (Metop-C)	100	100	100	99.8	100	100
OSI-104-c	ASCAT 12.5 km Coastal Wind (Metop-C)	100	100	100	99.8	100	100
OSI-301-c	Atlantic High Latitude Downward Longwave Irradiance	100	100	100	100	100	100
OSI-302-c	Atlantic High Latitude Surface Solar Irradiance						
OSI-430-a	Global Sea Ice Concentration ICDR v3	100	100	100	100	100	100
OSI-430-b	Global Sea Ice Concentration ICDR v2	98.4	100	100	100	NA	NA
OSI-401-d	Global Sea Ice Concentration (Multi Mission)	100	100	100	100	100	100
OSI-405-c	Global Low Resolution Sea Ice Drift	100	100	100	100	100	100
OSI-402-d	Global Sea Ice Edge (Multi Mission)	98.4	100	100	100	100	100
OSI-403-d	Global Sea Ice Type (Multi Mission)	100	100	100	100	98.3	100
OSI-303-a	Daily Downward Longwave Irradiance (MSG)	96.8	96.8	100	100	100	100
OSI-304-a	Daily Surface Solar Irradiance (MSG)						
OSI-303-a	Hourly Downward Longwave Irradiance (MSG)	98.7	98.0	100	96.5	94.3	100
OSI-304-a	Hourly Surface Solar Irradiance (MSG)						
OSI-206-a	Hourly Sea Surface Temperature (MSG)	98.8	99.9	100	96.8	94.9	100
OSI-202-c	NAR Sea Surface Temperature (NOAA-20)	98.4	98.4	96.7	0.0	100	100
OSI-205-b	SST/IST L2 (NPP)	99.5	100	99.3	100	97.2	100
OSI-203-b	SST/IST L3 (NPP)	98.4	100	98.3	100	98.3	100

Table 50: Percentage of received OSI SAF products in EDC in 2nd half 2023

7. Training

8. Documentation update

The following table provides the list of documents modified during the reporting period, as well as new documents made available to users. Last version of documents and new documents are available on the central Web Site (http://osi-saf.eumetsat.int).

Name of the Document	Reference	Latest versions	date
Product User Manual (PUM) for the HY-2 winds	SAF/OSI/CDOP3/KNMI/TEC/MA/392	1.1	04/11/2022
Scientific Validation Report (SVR) for the HY-2 winds	SAF/OSI/CDOP3/KNMI/TEC/RP/393	1.1	04/11/2022

Table 51: Documentation updates

Recent publications

Ricciardulli, L., B. Howell et al., Remote Sensing and Analysis of Tropical Cyclones: Current and Emerging Satellite Sensors
Tropical Cyclone Research and Review, 2023, doi:10.1016/j.tcrr.2023.12.003.

Li, Z., A. Stoffelen, A. Verhoef, Z. Wang, J. Shang and H. Yin, Higher-order calibration on WindRAD (Wind Radar) scatterometer winds
Atmos. Meas. Tech., 2023, 16, 20, 4769, doi:10.5194/amt-16-4769-2023.