Half-Yearly Operations Report

2nd half 2019

Version : 1.1

Date : 10/11/2020

Prepared by Météo-France, Ifremer, MET Norway, DMI and KNMI

Document Change record

Document version	Date	Author	Change description
1.0	13/03/2020	CH	1st version
1.1	10/11/2020	CH	Updated after Operation Review in October

Table of contents

1. Introduction

1.1. Scope of the document

The present report covers from 1st of July to 31st December 2019.

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 (Sub-System 1, SS1), 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 (Sub-System 2, SS2), 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 (Sub-System 3, SS3), 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
CDOP 3 Service Specification (SeSp)
SAF/OSI/CDOP3/MF/MGT/PL/003, version 1.8, 8 July 2019

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] RapidScat Wind Product User Manual
OSI-109 (discontinued)
SAF/OSI/CDOP2/KNMI/TEC/MA/227

[RD.3] ScatSat-1 wind Product User Manual
OSI-112-a, OSI-112-b
SAF/OSI/CDOP2/KNMI/TEC/MA/287

[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] Reprocessed SeaWinds L2 winds Product User Manual
OSI-151-a, OSI-151-b
SAF/OSI/CDOP2/KNMI/TEC/MA/220

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

[RD.7] Oceansat-2 L2 winds Data Record Product User Manual
OSI-153-a, OSI-153-b
SAF/OSI/CDOP3/KNMI/TEC/MA/297

[RD.8] Low Earth Orbiter Sea Surface Temperature Product User Manual
OSI-201-b, OSI-202-b, OSI-204-b, OSI-208-b
SAF/OSI/CDOP3/MF/TEC/MA/127

[RD.9] 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.10]Geostationary Sea Surface Temperature Product User Manual
OSI-206-a, OSI-207-a, OSI-IO-SST
SAF/OSI/CDOP3/MF/TEC/MA/181

[RD.11]Atlantic High Latitude Radiative Fluxes Product User Manual
OSI-301, OSI-302
SAF/OSI/CDOP/met.no/TEC/MA/116

[RD.12]MSG/SEVIRI Sea Surface Temperature data recordProduct User Manual
OSI-250
SAF/OSI/CDOP3/MF/TEC/MA/309

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

[RD.14]Product User Manual for OSI SAF Global Sea Ice Concentration
OSI-401-b
SAF/OSI/CDOP3/DMI_MET/TEC/MA/204

[RD.15]Global Sea Ice Edge and Type Product User's Manual
OSI-402-c, OSI-403-c
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]Global Sea Ice Concentration Reprocessing Product User Manual
OSI-409, OSI-409-a, OSI-430
SAF/OSI/CDOP3/MET-Norway/TEC/MA/138

[RD.20]Global Sea Ice Concentration Climate Data Record Product User Manual
OSI-450, OSI-430-b
SAF/OSI/CDOP2/MET/TEC/MA/288

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 2 are copied from table 3 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. 2019	AUG. 2019	SEP. 2019	OCT. 2019	NOV. 2019	DEC. 2019
OSI-102	ASCAT-A 25 km wind	100	100	99.6	99.9	100	99.9
OSI-102-b	ASCAT-B 25 km wind	99.9	100	99.8	100	100	99.9
OSI-102-c	ASCAT-C 25 km wind	N/A	N/A	N/A	N/A	N/A	99.9
OSI-104	ASCAT-A Coastal wind	99.8	99.9	99.4	99.9	99.8	99.5
OSI-104-b	ASCAT-B Coastal wind	99.9	100	99.8	100	100	99.9
OSI-104-c	ASCAT-C Coastal wind	N/A	N/A	N/A	N/A	N/A	99.8
OSI-112-a	ScatSat-1 25 km wind vectors	80.5	71.5	87.7	77.4	87.1	83.5
OSI-112-b	ScatSat-1 50 km wind vectors	80.5	71.8	87.7	77.2	87.1	83.4
OSI-201-b	GBL SST	95.2	100	100	100	95.0	100
OSI-202-b	NAR SST	97.6	100	97.5	98.4	94.2	100
OSI-203-a	NHL SST/IST (L3)	100	100	96.8	93.5	100	95.2
OSI-203-b	NHL SST/IST (L3)	100	100	96.8	93.5	100	95.2
OSI-204-b	MGR SST	95.3	99.8	98.3	97.7	88.8	99.6
OSI-205-a	SST/IST (L2)	100	100	99.7	99.8	100	100
OSI-205-b	SST/IST (L2)	99.5	96.9	99.3	96.7	99.3	98.9
OSI-206-a	Meteosat SST	96.0	99.9	98.1	97.4	87.8	100
OSI-207-a	GOES-East SST	96.4	99.7	98.5	98.5	93.2	100
OSI-208-b	IASI SST	99.4	99.9	98.7	99.1	90.4	100
OSI-301	AHL DLI	100	96.8	100	96.8	100	100
OSI-302	AHL SSI	100	96.8	100	93.5	96.7	100
OSI-303-a	Meteosat DLI - hourly	96.1	99.9	98.8	92.7	77.5	100
	Meteosat DLI - daily	96.8	100	96.7	93.5	83.3	100
OSI-304-a	Meteosat SSI - hourly	96.1	99.9	98.8	92.7	77.5	100
	Meteosat SSI - daily	96.8	100	96.7	93.5	83.3	100
OSI-305-a	GOES-East DLI - hourly	96.4	99.3	98.6	92.3	81.4	100
	GOES-East DLI - daily	96.8	100	96.7	93.5	80.0	100
OSI-306-a	GOES-East SSI - hourly	96.4	99.3	98.6	92.3	81.4	100
	GOES-East SSI - daily	96.8	100	96.7	93.5	80.0	100
OSI-401-b	Global Sea Ice Concentration (SSMIS)	96.8	100	100	96.8	100	100
OSI-402-c	Global Sea Ice Edge	96.8	100	100	96.8	100	100
OSI-403-c	Global Sea Ice Type	96.8	100	100	96.8	100	100
OSI-404/-a	Global Sea Ice Emissivity	100	100	100	100	100	100

Ref.	**Product**	JUL. 2019	AUG. 2019	SEP. 2019	OCT. 2019	NOV. 2019	DEC. 2019
OSI-405-c	Low Res. Sea Ice Drift	100	100	100	96.8	100	100
OSI-407/-a	Medium Res. Sea Ice Drift	74.6	76.6	54.7	49.0	51.3	89.7
OSI-408	Global Sea Ice Concentration (AMSR-2)	100	100	100	96.8	100	100
OSI-430	Global Reproc Sea Ice Conc Updates	100	100	100	100	100	100

Table 1: Percentage of OSI SAF products available on the OSI SAF FTP servers within the specified time over 2nd half 2019.

2.2. Availability via EUMETCast

Ref.	**Product**	JUL. 2019	AUG. 2019	SEP. 2019	OCT. 2019	NOV. 2019	DEC. 2019
OSI-102	ASCAT-A 25 km wind	100	100	99.6	99.9	100	99.9
OSI-102-b	ASCAT-B 25 km wind	99.9	100	99.8	100	100	99.9
OSI-102-c	ASCAT-C 25 km wind	N/A	N/A	N/A	N/A	N/A	99.9
OSI-104	ASCAT-A Coastal wind	99.8	99.9	99.4	99.9	99.8	99.5
OSI-104-b	ASCAT-B Coastal wind	99.9	100	99.8	100	100	99.9
OSI-104-c	ASCAT-C Coastal wind	N/A	N/A	N/A	N/A	N/A	99.8
OSI-112-a	ScatSat-1 25 km wind vectors	80.5	71.5	87.7	77.4	87.1	83.5
OSI-112-b	ScatSat-1 50 km wind vectors	80.5	71.8	87.7	77.2	87.1	83.4
OSI-201-b	GBL SST	96.8	100	100	100	100	100
OSI-202-b	NAR SST	96.8	100	100	100	99.2	100
OSI-203-a	NHL SST/IST (L3)	100	96.8	96.8	98.3	100	95.2
OSI-203-b	NHL SST/IST (L3)	100	96.8	98.3	95.2	98.3	95.2
OSI-204-b	MGR SST	98.0	99.8	99.8	99.6	99.6	99.5
OSI-205-a	SST/IST (L2)	100	99.8	100	100	100	100
OSI-205-b	SST/IST (L2)	99.5	96.9	99.3	96.7	99.3	98.9
OSI-206-a	Meteosat SST	99.9	100	100	100	99.7	100
OSI-207-a	GOES-East SST	99.9	99.9	100	100	100	99.9

Ref.	Product	JUL. 2019	AUG. 2019	SEP. 2019	OCT. 2019	NOV. 2019	DEC. 2019
OSI-208-b	IASI SST	100	99.7	99.9	100	100	99.9
OSI-301	AHL DLI	96.8	100	100	100	100	100
OSI-302	AHL SSI	96.8	100	100	100	96.7	100
OSI-303-a	Meteosat DLI - hourly	99.7	100	100	99.9	100	99.7
	Meteosat DLI - daily	96.8	100	100	100	96.7	100
OSI-304-a	Meteosat SSI - hourly	99.7	100	100	99.9	99.9	99.9
	Meteosat SSI - daily	96.8	100	100	100	96.7	100
OSI-305-a	GOES-East DLI - hourly	99.7	99.5	100	99.9	99.9	99.9
	GOES-East DLI - daily	96.8	100	100	100	100	96.8
OSI-306-a	GOES-East SSI - hourly	99.7	99.5	100	99.9	99.9	99.9
	GOES-East SSI - daily	96.8	100	100	100	100	96.8
OSI-401-b	Global Sea Ice Concentration (SSMIS)	100	100	100	100	100	100
OSI-402-c	Global Sea Ice Edge	96.8	100	100	100	100	100
OSI-403-c	Global Sea Ice Type	96.8	100	100	100	100	100
OSI-404/-a	Global Sea Ice Emissivity	100	100	100	100	100	100
OSI-405-c	Low Res. Sea Ice Drift	96.8	100	100	100	100	100
OSI-407/-a	Medium Res. Sea Ice Drift	79.7	84.7	65	58.5	56.7	94.2
OSI-408	Global Sea Ice Concentration (AMSR-2)	100	100	100	100	100	100

Table 2: Percentage of OSI SAF products delivered via EUMETCast within the specified time over 2nd half 2019.

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
02 July 01:00Z	MSG 0° and MSG IO SST, DLI-SSI OSI-206-a OSI-IO-SST OSI-303-a OSI-304-a OSI-IO-DLI OSI-IO-SSI	Outage of EUMETCast dissemination	Resumed at 04:00Z
03 July 18:00Z	Metop SST OSI-201-b OSI-202-b OSI-204-b	Issue on cloud mask processing at MF (MAIA4) due to the changed size of MF NWP grib files	Correction 04 July at 06:19Z
24 July 17:20Z	MSG IO SST, DLI-SSI OSI-IO-SST OSI-IO-DLI OSI-IO-SSI	Spacecraft anomaly	24 July at 17:20Z
17 August 06:00Z	GOES-East SST, DLI-SSI OSI-207-a OSI-305-a OSI-305-a	Outage on satellite GOES-East, due to bad datetime in input data	18 August at 04:05Z
23 August	SST products from Metop, NPP, Meteosat and GOES OSI-201-b OSI-202-b OSI-204-b OSI-206-a OSI-207-a OSI-IO-SST OSI-208-b	NAAPS model aerosol output are unavailable to Météo-France. This impacts OSI SAF SST products in two ways: 1- Locally, SST pixels contaminated by dust aerosols may have a quality level higher than they should. 2- The Aerosol Dynamic Indicator is missing the NAAPS information.	Back to nominal for LEO products OSI-201-b, OSI-202-b, OSI-204-b, OSI-208-b on 16 Sept. Back to nominal for GEO products OSI-206-a, OSI-IO-SST, OSI-207-a on 16 Dec.
10 Sept. 13:28Z	All LML data	Outage on LML FTP server (Ifremer)	10 Sept. at 15:32Z

Date	Impacted products or services	Anomaly	Corrective and preventive measures
11 Sept. 20:37Z	All LML data	Outage on LML FTP server (Ifremer)	12 Sept. at 06:05Z
06 Oct. 00:00Z	All LML data	Many FTP error from CMS to Ifremer due to the saturation of MF bandwidth	11 Sept. at 09:00Z
08 Nov. 06:34Z	All LML data	Outage on LML FTP server (Ifremer)	08 Nov. at 14:34Z
09 Nov. 18:20Z	All LML data	Intermittent Outage on LML FTP server (Ifremer)	14 Nov. at 11:00Z
15 Nov. 21:33Z	All LML data	Outage on LML FTP server (Ifremer) due to files saturated disk space	16 Nov. at 07:30Z
20 nov 01:37Z	All data	Outage on LML FTP server (Ifremer) due to error disc mount	20 nov at 06:45Z

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

Date	Impacted products or services	Anomaly	Corrective and preventive measures
10.07.2019	SICO (SSMIS) OSI-401-b	Delay in distributing the product on FTP	The product was uploaded to FTP and users were informed.
10.09.2019	SICO (AMSR-2) OSI-408	Degradation of products on the Northern Hemisphere from 05.09.2019-09.09.2019	The error in the processing chain was fixed and users were informed.
22.09.2019	All HL products	FTP server outage due to internal network problem	Users were informed #1924.
27.09.2019	SST/IST OSI-203-a/b OSI-205-b	Problems with production	Problem fixed and users were informed #1926.
02.10.2019	All HL products	FTP server outage due to internal network problem	Users were informed #1929.
15.10.2019	SST/IST OSI-205-b OSI-203-b	Corrupted input files due to internal problem	Problem fixed and users were informed #1935.
15.10.2019	AHL SSI OSI-302	Missing product due to missing NWP data	Users were informed #1936.
16.10.2019	L2 SST/IST OSI-205-b	No products produced for 6 hours due to missing input files from Metop-B	Users were informed
17.10.2019	MR SIDR OSI-407-a	One product was not generated due to missing input files from Metop-B	Users were informed

Date	Impacted products or services	Anomaly	Corrective and preventive measures
30.10.2019	AHL SSI OSI-302	Missing product due to missing NWP data	Users were informed #1951.
06.11.2019	AHL SSI OSI-302	Missing product due to missing NWP data	Users were informed #1953.
16.11.2019	L2 SST/IST OSI-205-b	Production outage due to internal problem.	Problem fixed and users were informed #1967.
21.11.2019	L2 SST/IST OSI-205-b	Productin outage due to problem with production infrastructure.	Problem fixed and users were informed #1970.
29.12.2019	L3 SST/IST OSI-203-a OSI-203-b	Production outage due to software problem.	Problem fixed and users were informed #1987.

The MR Ice Drift (OSI-407-a) problem with reaching timeliness is mainly due to a very long processing time for the uncertainties. Before the upgrade to OSI-407-a in October 2018 it was tested if timeliness could be reached and it was concluded that it was just doable. Unfortunately the tests were done on data from summer months and hence there were not as many areas to calculate as in the winter months. The product was updated in December 2019, See Section 4.2.

MET Norway experienced some problems with in-house HPC infrastructure in October and November 2019 that affected part of the OSI SAF production and reception of NWP data.

3.3. At Wind subsystem (KNMI)

Date	Impacted products or services	Anomaly	Corrective and preventive measures
30 Jul – 5 Aug	Metop-A winds OSI-102, OSI-104	The ASCAT-A winds have been unavailable between 30 July 17:00 and 5 Aug 18:00 UTC sensing time due to a spacecraft anomaly.	

Frequent outages and delays occur in the provision of ScatSat-1 input data by the Indian Space Research Organisation (ISRO). This leads to lower availabilities for the OSI-112-a and OSI-112-b wind products in the tables in section 2. ISRO is aware of the situation and they are working on improvements.

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)

NA

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

Date	Impacted products or services	Events and modifications, maintenance activities
05.12.2019	MR SIDR OSI-407-a	Updated of the product to reintroduce an ice mask to limit areas in which to compute ice drift. The code has been optimized to reduce processing time. The file-naming and data format remain unchanged.

4.3. At Wind subsystem (KNMI)

Date	Impacted products or services	Events and modifications, maintenance activities
2-Oct	Metop-C winds OSI-102-c, OSI-104-c	ASCAT-C winds have the operational status since 2 October 2019.
28-Nov	Metop-C winds OSI-102-c, OSI-104-c	ASCAT-C winds are available on EUMETCast for all users. Only the wind parameter has operational status - the soil moisture parameter (from the H SAF) currently has demonstration status.

4.4. Release of new data records and off-line products

NA

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

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. 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-a, OSI-IO-SST, OSI-202-b, OSI-201-b, OSI-204-b), 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.

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 http://osi-saf.eumetsat.int/lml/#qua_SST%Metop%20GBL%20SST_monthly%20map_monthly_Night%20time.

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

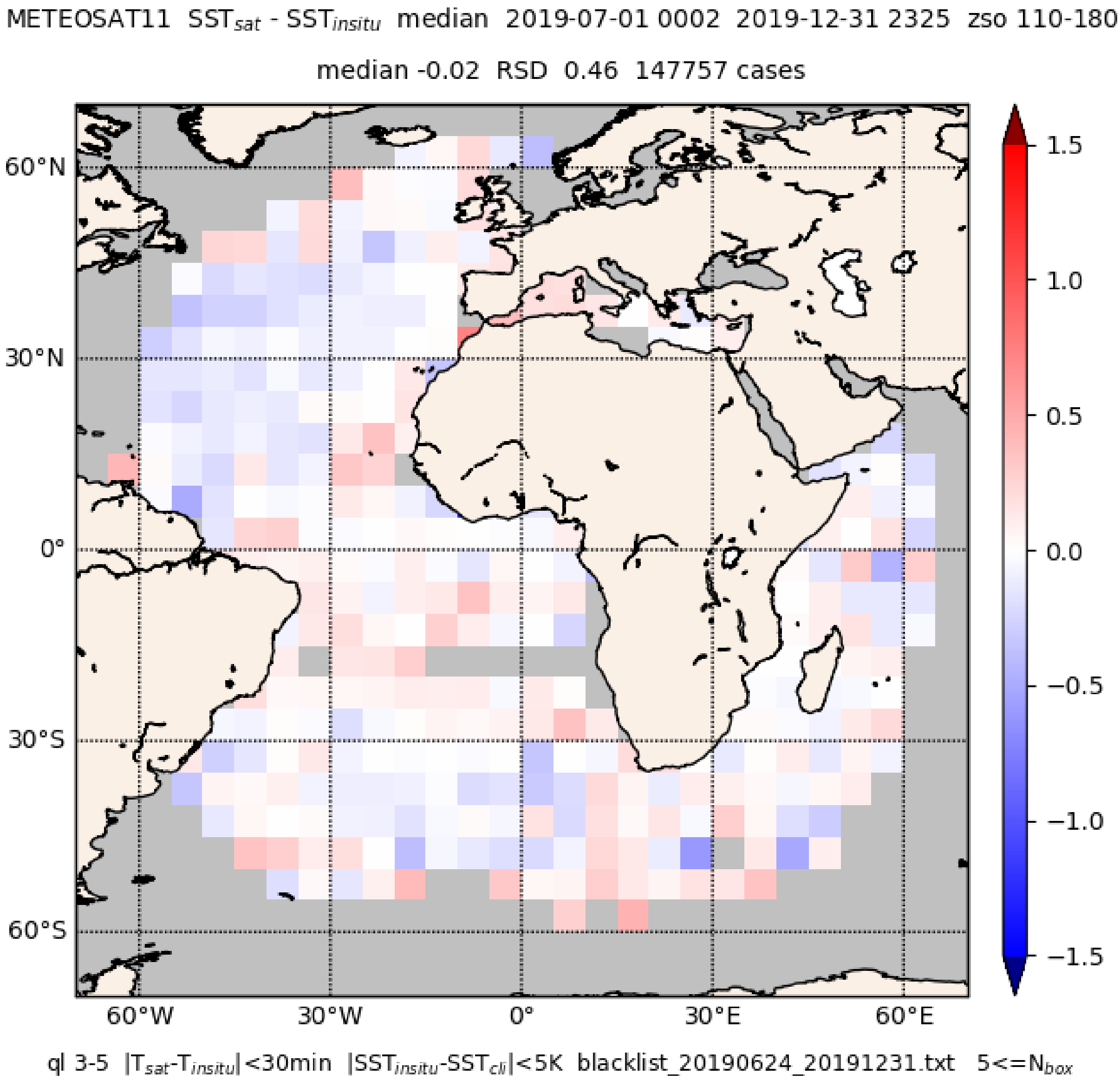


Figure 1: Meteosat night-time SST median difference with respect to buoys measurements for quality level 3,4,5

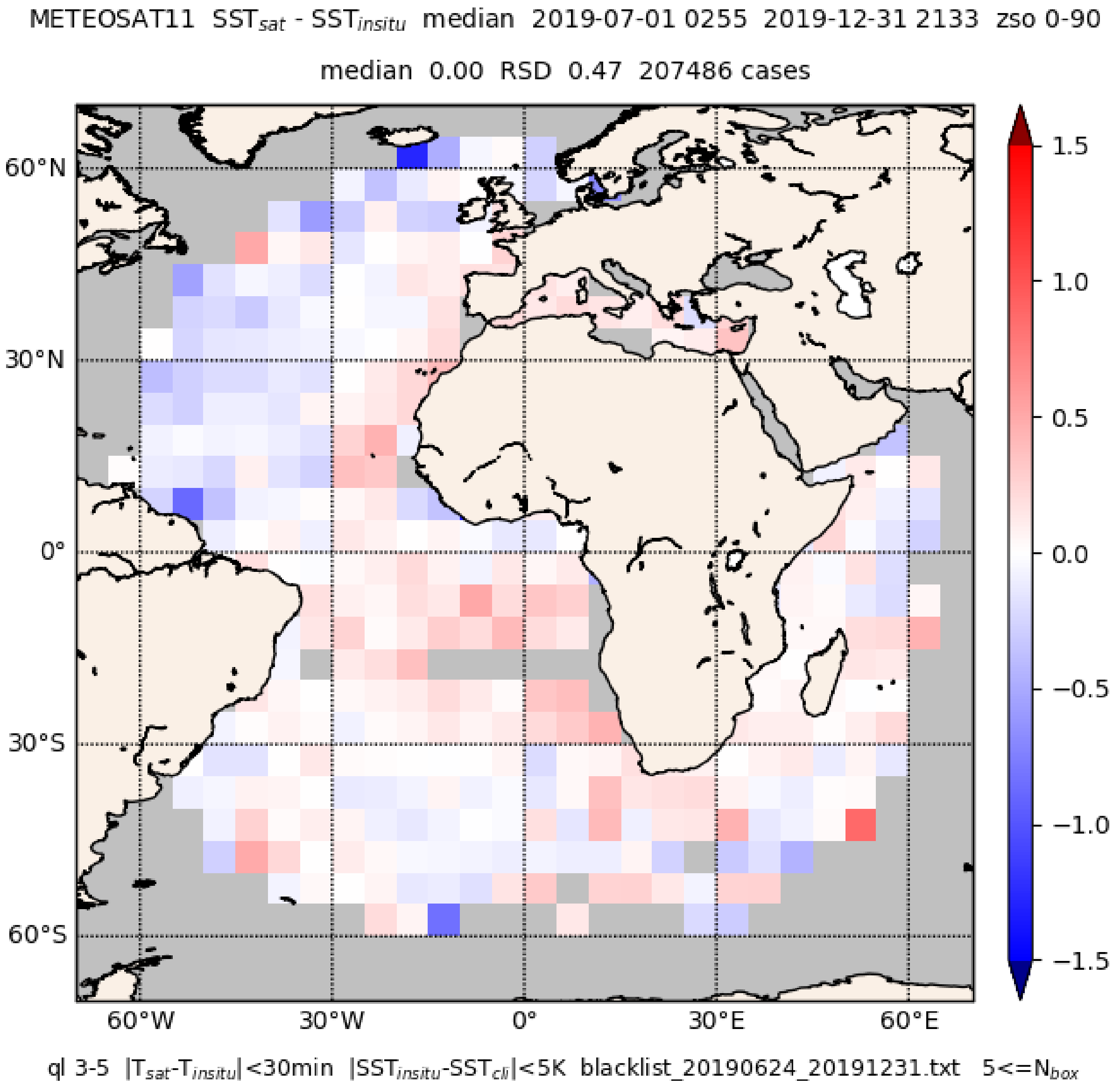


Figure 2: Meteosat day-time SST median difference with respect to buoys measurements for quality level 3,4,5

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

Meteosat night-time SST quality results over 2nd half 2019					
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. 2019	22035	-0.10	0.54	-0.06	0.50
AUG. 2019	27877	-0.14	0.57	-0.08	0.50
SEP. 2019	23227	-0.05	0.55	-0.01	0.47
OCT. 2019	26066	-0.04	0.51	-0.03	0.45
NOV. 2019	24448	0.01	0.50	0.03	0.43
DEC. 2019	24104	-0.03	0.48	0.00	0.43
Meteosat day-time SST quality results over 2nd half 2019					
JUL. 2019	37575	-0.11	0.59	-0.06	0.52
AUG. 2019	40358	-0.10	0.61	-0.04	0.52
SEP. 2019	30313	-0.02	0.56	0.04	0.47
OCT. 2019	34114	-0.01	0.51	0.01	0.44
NOV. 2019	30837	0.00	0.52	0.04	0.43
DEC. 2019	34289	-0.02	0.51	0.01	0.42

Table 3: Meteosat SST quality results over 2nd half 2019, for 3, 4, 5 quality indexes.

Comments:
Overall statistics are good and within the requirement.

5.1.2. GOES-East SST (OSI-207-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 http://osi-saf.eumetsat.int/lml/#qua_SST%GOES-E%20SST_monthly%20map_monthly_Night%20time.

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

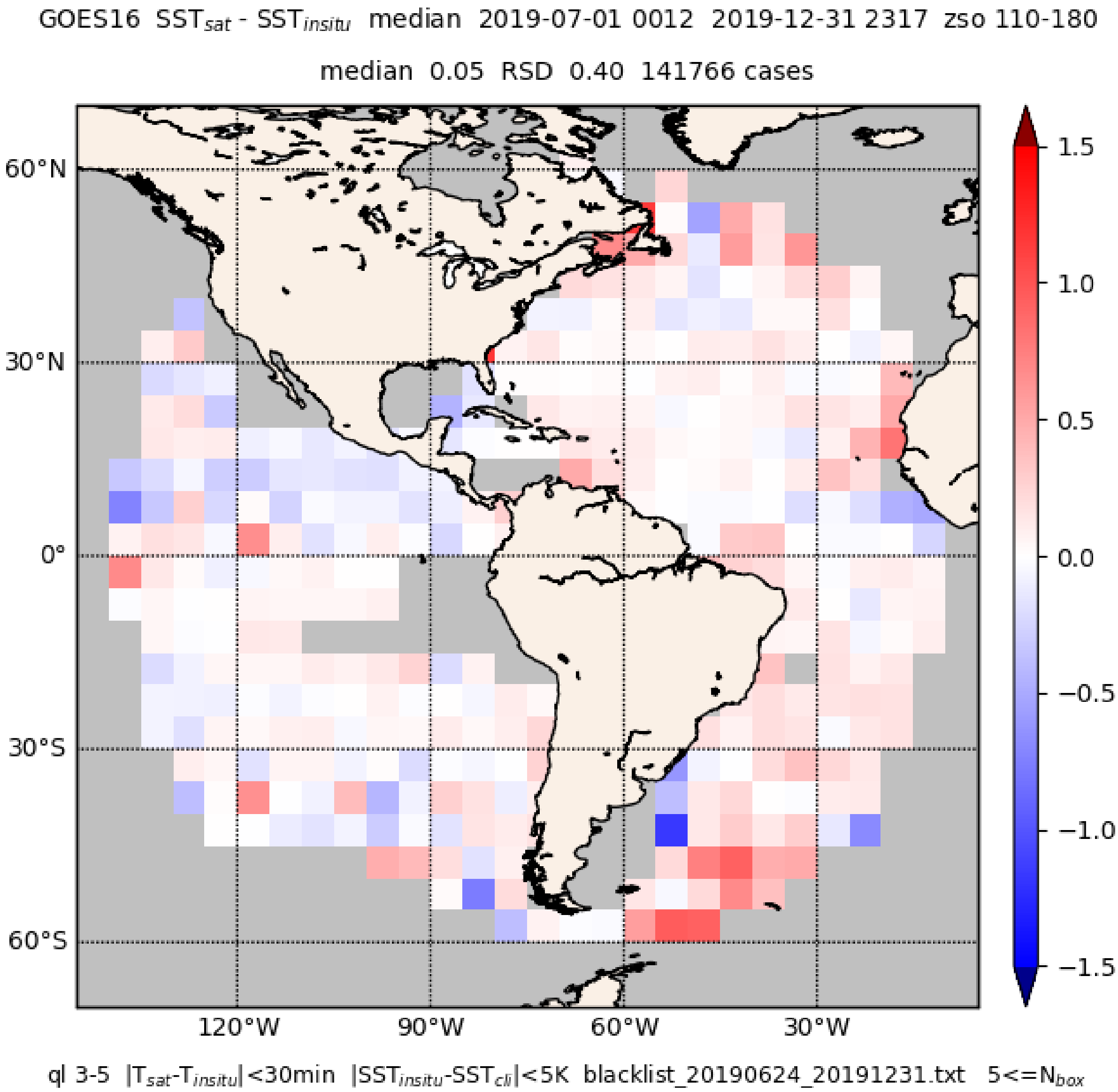


Figure 3: GOES-East night-time SST median difference with respect to buoys measurements for quality level 3,4,5

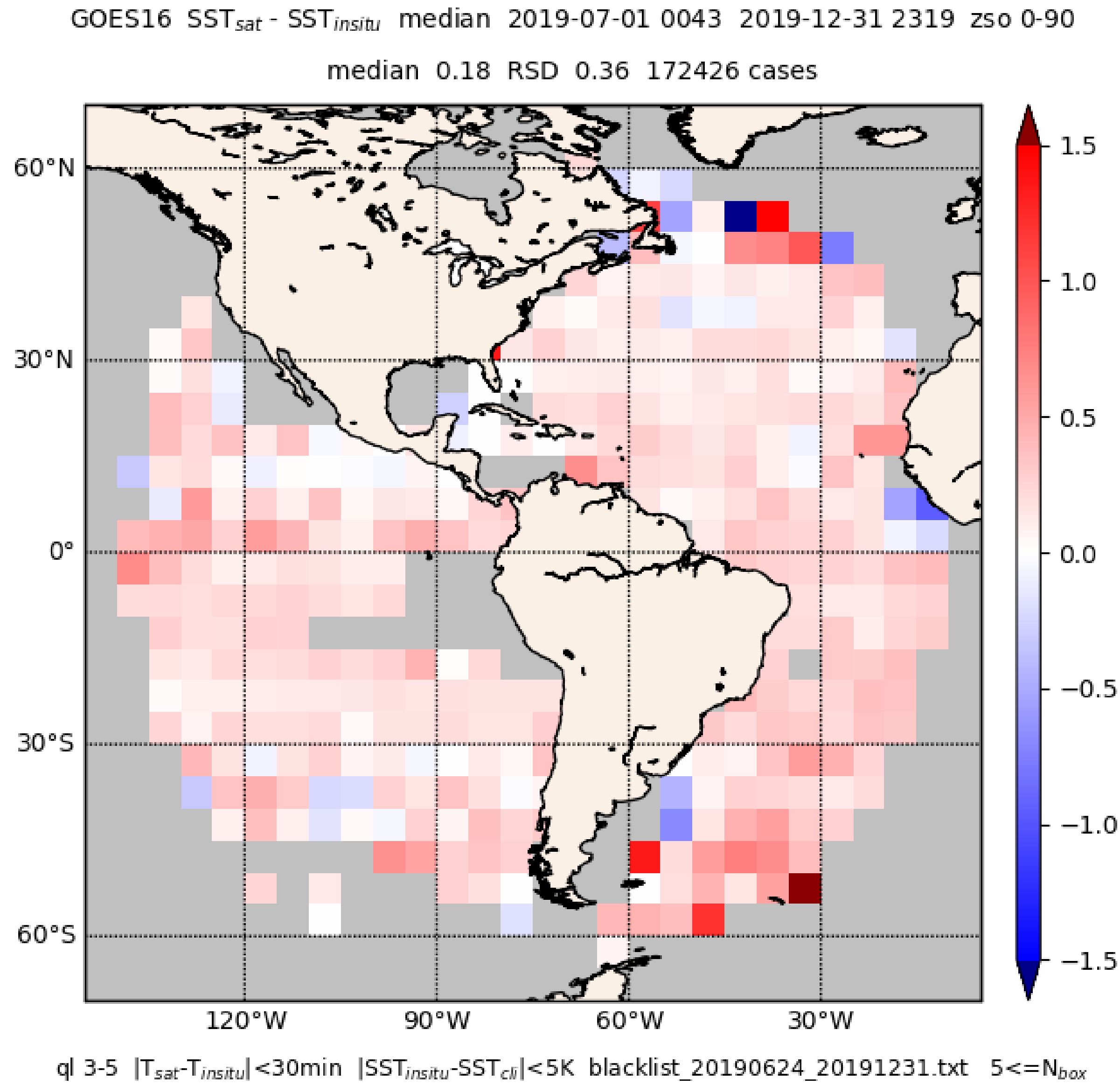


Figure 4: GOES-East day-time SST median difference with respect to buoys measurements for quality level 3,4,5

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

GOES-East night-time SST quality results 2nd half 2019					
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. 2019	25759	-0.07	0.52	-0.01	0.42
AUG. 2019	26467	-0.11	0.57	-0.02	0.45
SEP. 2019	20609	0.01	0.54	0.06	0.42
OCT. 2019	22273	0.08	0.49	0.09	0.39
NOV. 2019	23118	0.09	0.46	0.11	0.38
DEC. 2019	23540	0.04	0.45	0.06	0.37
GOES-East day-time SST quality results 2nd half 2019					
JUL. 2019	37465	0.02	0.54	0.09	0.39
AUG. 2019	33971	-0.01	0.60	0.09	0.43
SEP. 2019	24291	0.19	0.49	0.22	0.37
OCT. 2019	25108	0.24	0.46	0.24	0.33
NOV. 2019	24148	0.25	0.44	0.25	0.33
DEC. 2019	27443	0.18	0.43	0.20	0.32

Table 4: GOES-East SST quality results over 2nd half 2019, 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

Since 2016, Meteosat-8 is in position 41.5 east for the Indian Ocean Data Coverage (IODC). Sea Surface Temperature is processed as a demonstration product.

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.

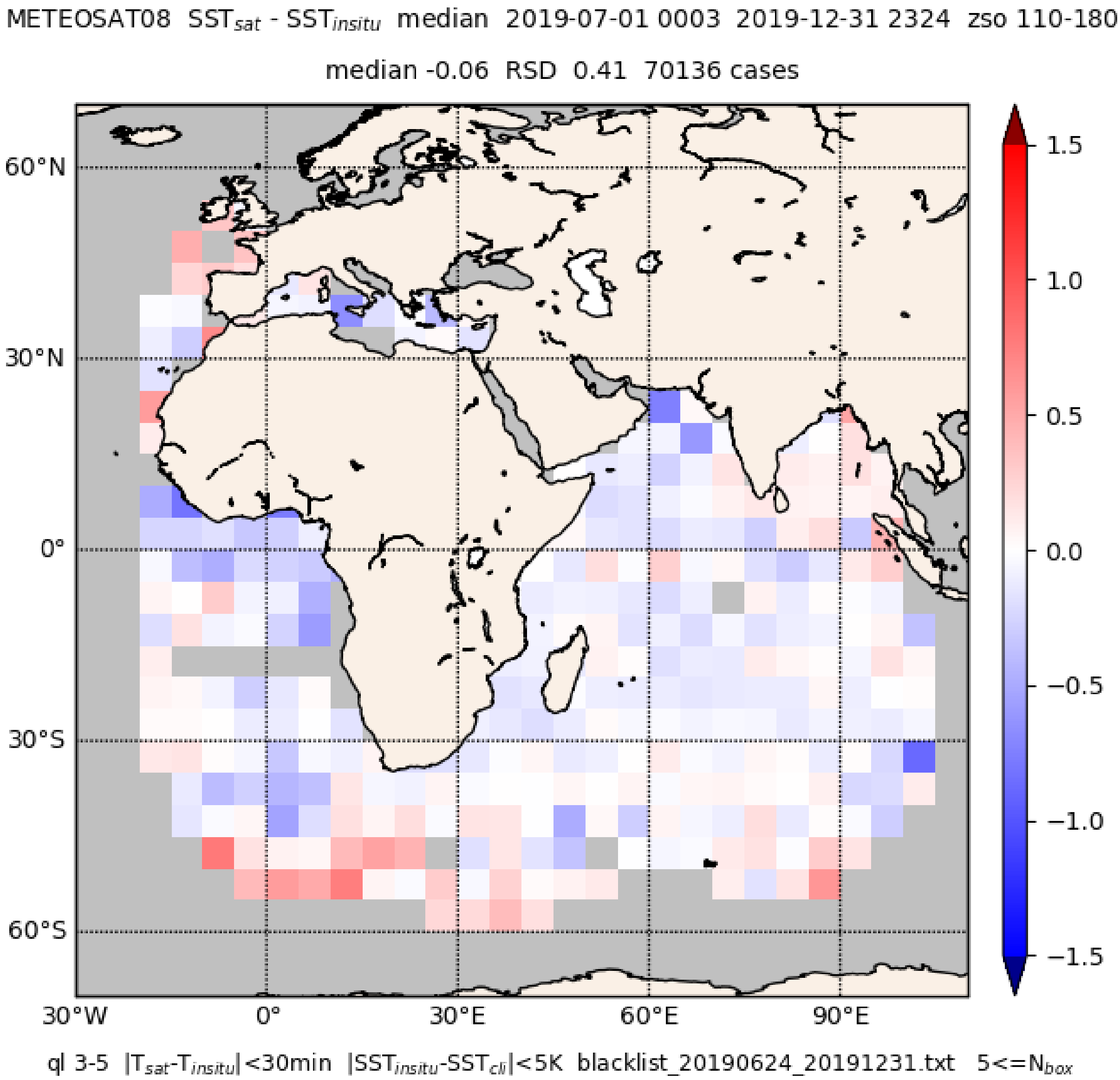


Figure 5: Meteosat Indian Ocean night-time SST median difference with respect to buoys measurements for quality level 3,4,5

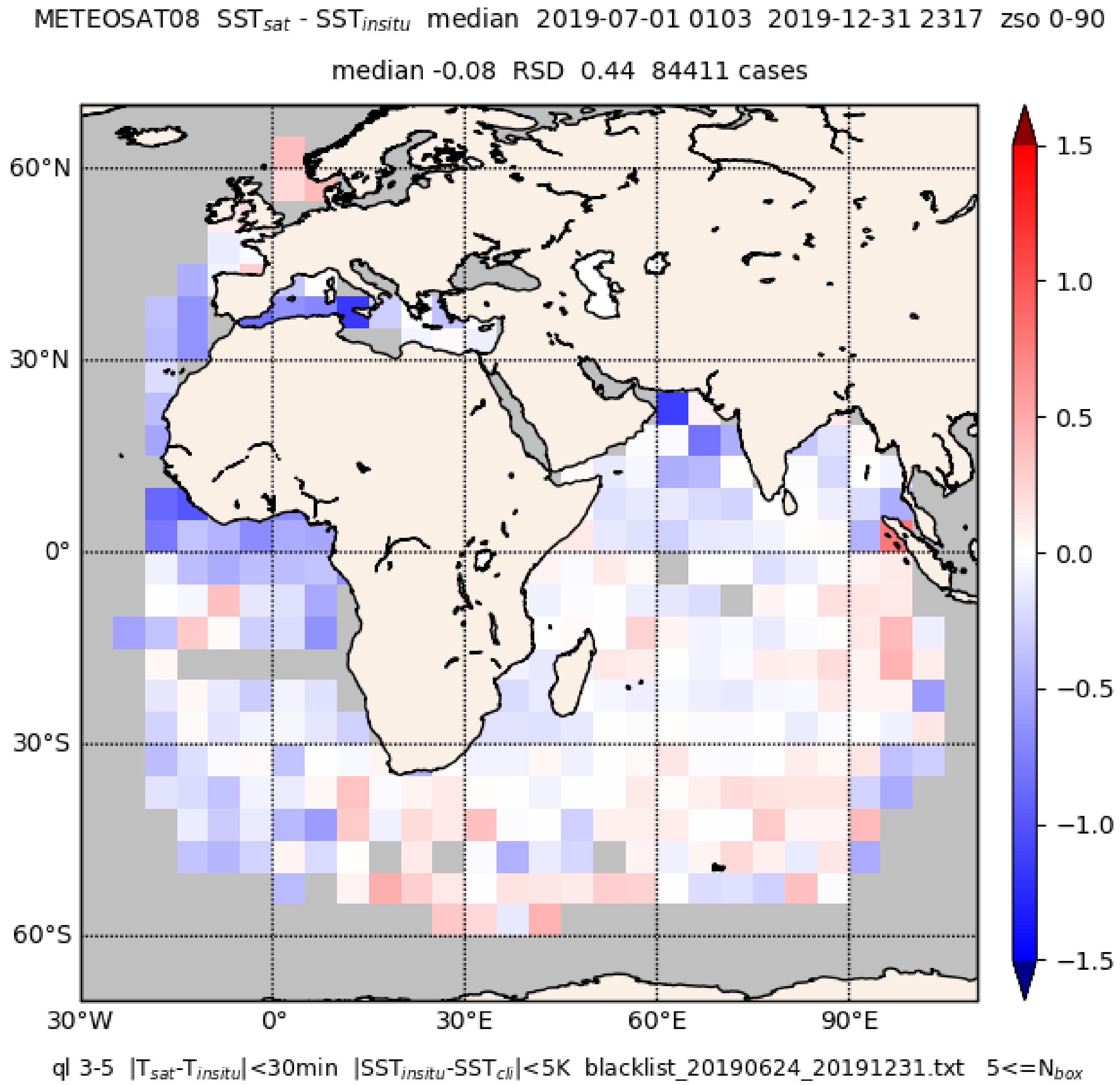


Figure 6: Meteosat Indian Ocean day-time SST median difference with respect to buoys measurements for quality level 3,4,5

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 2019					
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. 2019	10818	-0.02	0.52	0.01	0.42
AUG. 2019	12655	-0.06	0.48	-0.03	0.39
SEP. 2019	10547	-0.14	0.48	-0.11	0.37
OCT. 2019	11492	-0.12	0.49	-0.11	0.41
NOV. 2019	12161	-0.09	0.47	-0.08	0.42
DEC. 2019	12463	-0.08	0.51	-0.05	0.45
Meteosat Indian Ocean day-time SST quality results over 2nd half 2019					
JUL. 2019	13175	-0.17	0.75	-0.03	0.52
AUG. 2019	14501	-0.12	0.66	-0.04	0.42
SEP. 2019	11051	-0.14	0.52	-0.10	0.38
OCT. 2019	12450	-0.14	0.49	-0.11	0.42
NOV. 2019	14888	-0.13	0.49	-0.10	0.42
DEC. 2019	18346	-0.14	0.56	-0.09	0.46

Table 5: Meteosat Indian Ocean SST quality results over 2nd half 2019, for 3, 4, 5 quality indexes.

Comments:
Overall statistics are good and within the requirement.

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

The operational NAR SST is processed with AVHRR and VIIRS data, separately. Currently Metop-B and S-NPP 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 S-NPP satellite. It is considered that if the accuracy requirements are met for both AVHRR and VIIRS separately, the accuracy requirements for OSI-202-b are fully met.

5.1.4.1. NPP 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 http://osi-saf.eumetsat.int/lml/#qua_SST%SNPP%20NAR%20SST_monthly%20map_monthly_Night%20time.

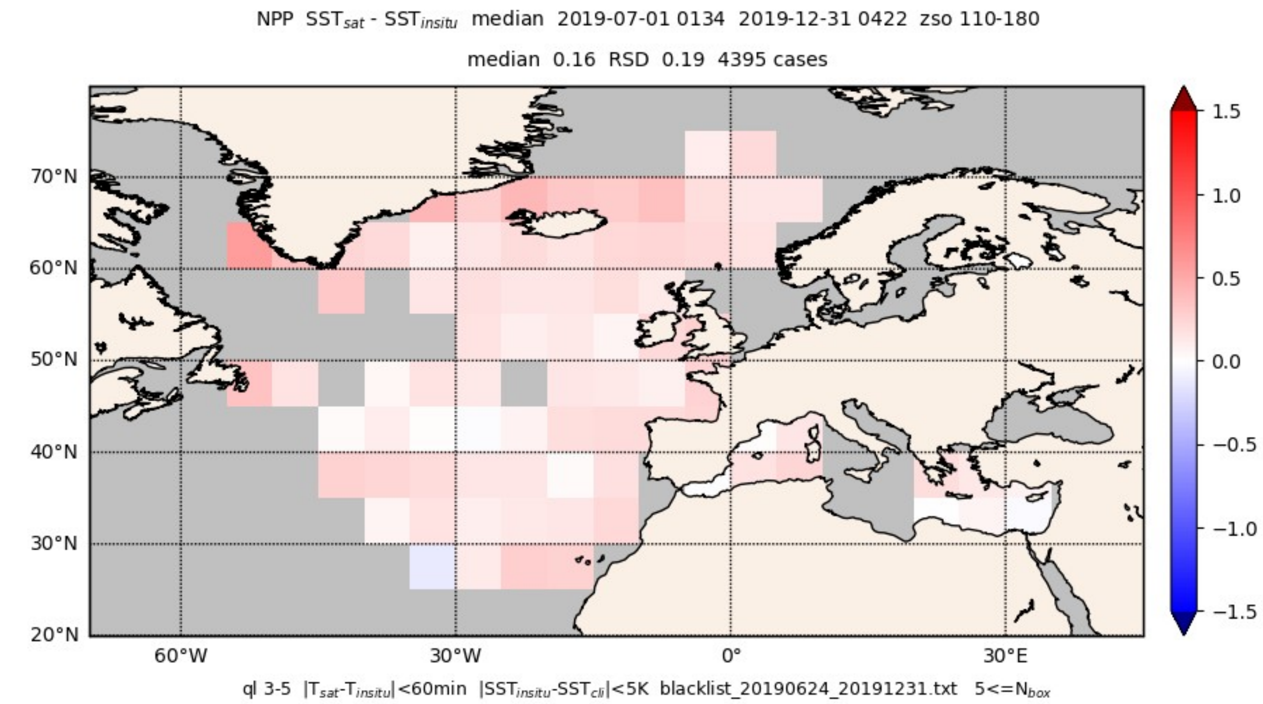


Figure 7: NPP NAR night-time SST median difference with respect to buoys measurements for quality level 3,4,5

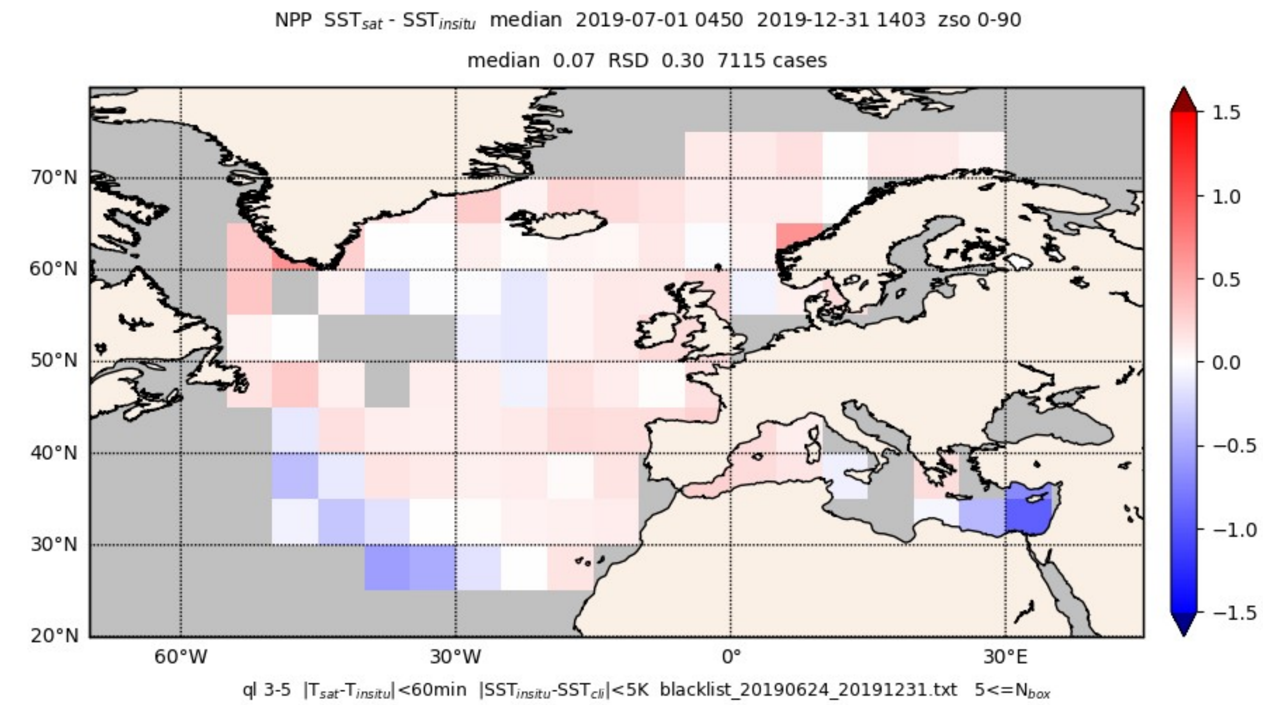


Figure 8: NPP NAR day-time SST median difference with respect to buoys measurements for quality level 3,4,5

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

NPP NAR night-time SST quality results over 2nd half 2019					
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. 2019	578	0.16	0.25	0.17	0.20
AUG. 2019	627	0.07	0.28	0.11	0.22
SEP. 2019	709	0.13	0.32	0.14	0.21
OCT. 2019	1006	0.15	0.24	0.17	0.17
NOV. 2019	851	0.17	0.23	0.19	0.17
DEC. 2019	624	0.22	0.25	0.20	0.18
NPP NAR day-time SST quality results over 2nd half 2019					
JUL. 2019	1572	0.01	0.51	0.08	0.42
AUG. 2019	1722	-0.10	0.46	-0.05	0.30
SEP. 2019	1216	0.05	0.37	0.08	0.27
OCT. 2019	1097	0.11	0.33	0.14	0.22
NOV. 2019	843	0.11	0.34	0.14	0.23
DEC. 2019	665	0.08	0.41	0.12	0.25

Table 6: Quality results for NPP NAR SST over 2nd half 2019, 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 http://osi-saf.eumetsat.int/lml/#qua_SST%Metop%20NAR%20SST_monthly%20map_monthly_Night%20time.

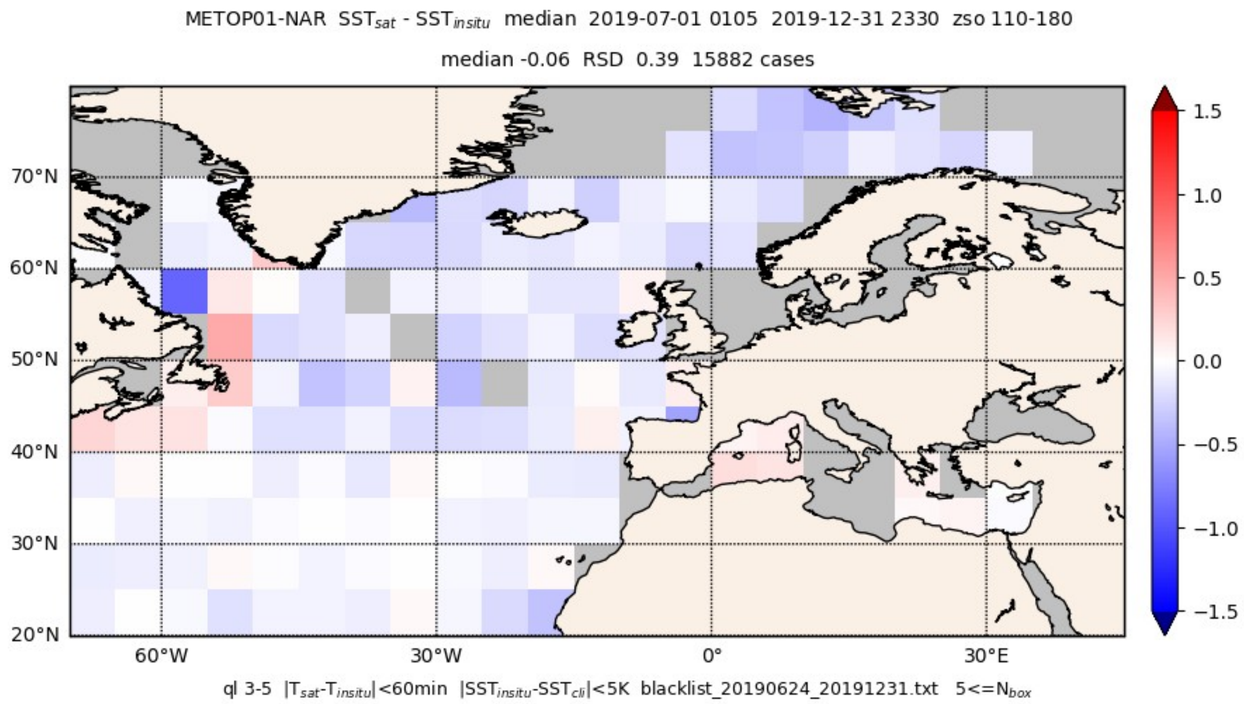


Figure 9: Metop-B NAR night-time SST median difference with respect to buoys measurements for quality level 3,4,5

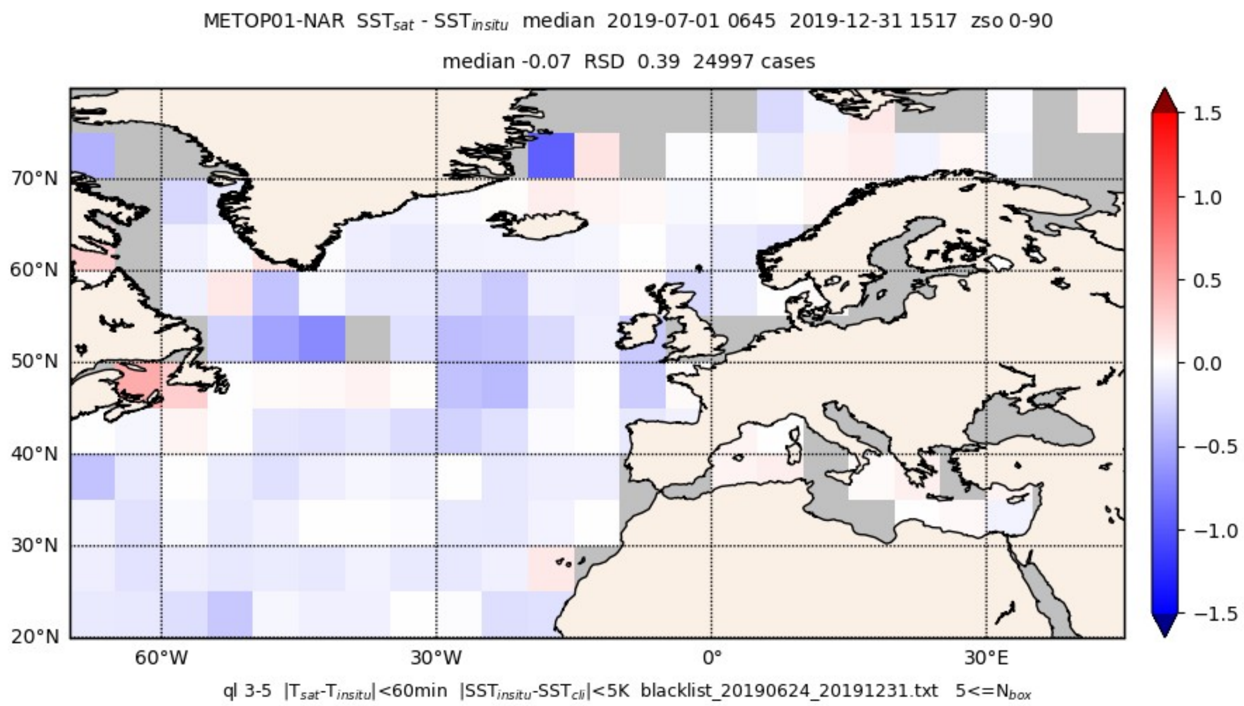


Figure 10: Metop-B NAR day-time SST median difference with respect to buoys measurements for quality level 3,4,5

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

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
Metop-B NAR night-time SST quality results over 2nd half 2019					
JUL. 2019	1689	-0.25	0.40	-0.19	0.31
AUG. 2019	2652	-0.23	0.50	-0.16	0.37
SEP. 2019	2573	-0.10	0.52	-0.01	0.38
OCT. 2019	2919	-0.11	0.51	-0.04	0.41
NOV. 2019	3154	-0.09	0.51	0.00	0.39
DEC. 2019	2895	-0.08	0.51	-0.01	0.39
Metop-B NAR day-time SST quality results over 2nd half 2019					
JUL. 2019	6068	-0.23	0.60	-0.16	0.44
AUG. 2019	5588	-0.24	0.51	-0.17	0.40
SEP. 2019	4188	-0.08	0.48	-0.03	0.37
OCT. 2019	3582	-0.03	0.45	0.01	0.35
NOV. 2019	2999	-0.05	0.43	-0.01	0.35
DEC. 2019	2572	-0.07	0.46	-0.02	0.35

Table 7: Quality results for Metop-B NAR SST over 2nd half 2019, 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 http://osi-saf.eumetsat.int/lml/#qua_SST%Metop%20GBL%20SST_monthly%20map_monthly_Night%20time.

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

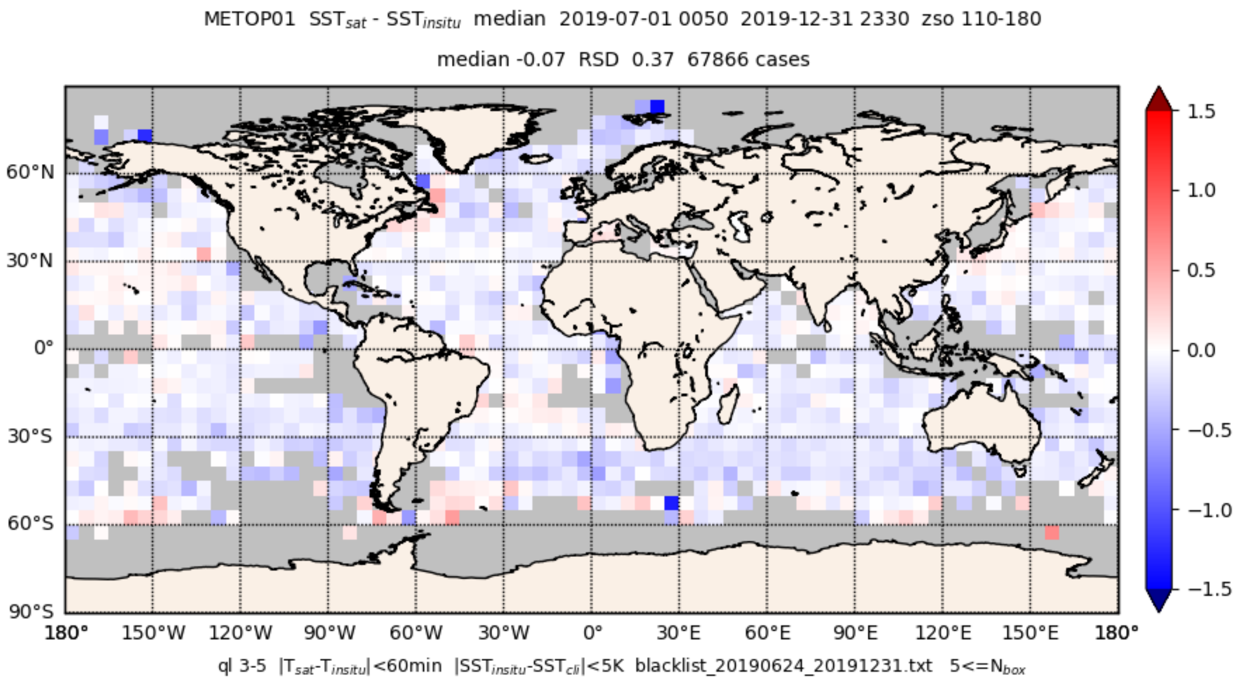


Figure 11: Metop-B night-time SST median difference with respect to buoys measurements for quality level 3,4,5

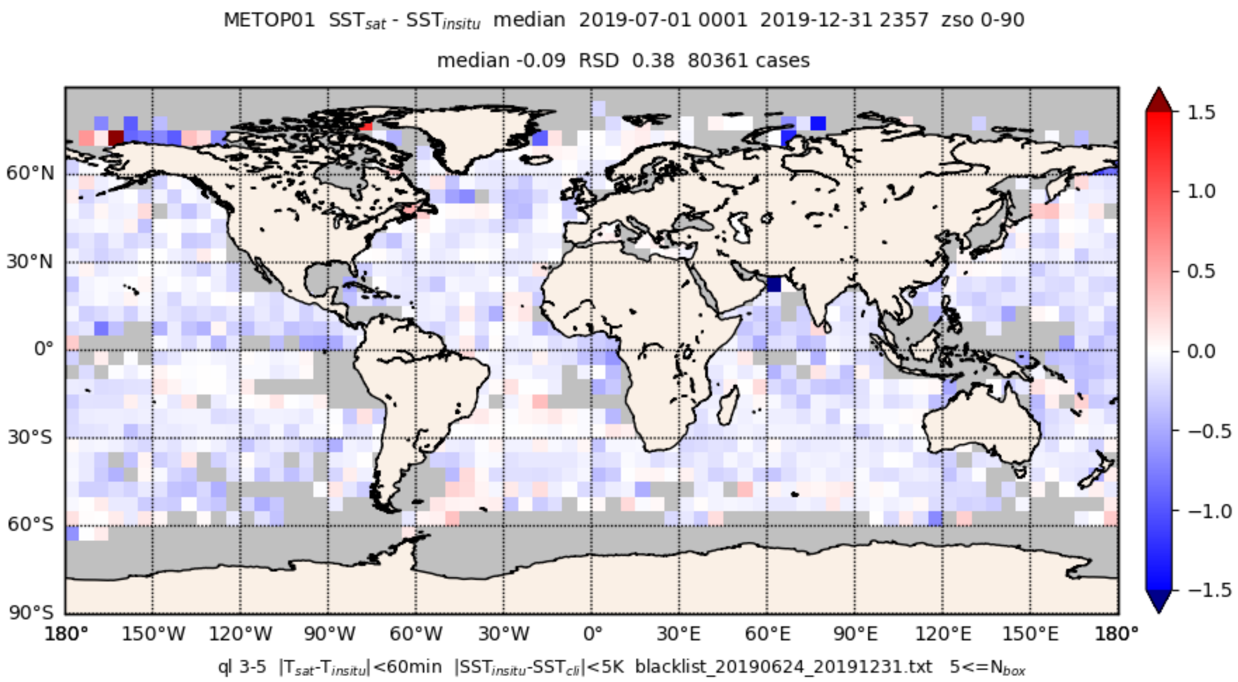


Figure 12: Metop-B day-time SST median difference with respect to buoys measurements for quality level 3,4,5

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 2019					
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. 2019	9684	-0.16	0.48	-0.07	0.36
AUG. 2019	11540	-0.17	0.49	-0.10	0.37
SEP. 2019	11003	-0.14	0.51	-0.05	0.36
OCT. 2019	11718	-0.15	0.49	-0.07	0.37
NOV. 2019	12182	-0.16	0.50	-0.07	0.39
DEC. 2019	11739	-0.15	0.50	-0.07	0.38
Global Metop-B day-time SST quality results over 2nd half 2019					
JUL. 2019	14497	-0.18	0.57	-0.10	0.41
AUG. 2019	15049	-0.17	0.54	-0.12	0.39
SEP. 2019	13172	-0.12	0.49	-0.08	0.36
OCT. 2019	13075	-0.12	0.47	-0.08	0.37
NOV. 2019	12548	-0.13	0.45	-0.09	0.37
DEC. 2019	12020	-0.13	0.46	-0.08	0.37

Table 8: Quality results for global METOP SST over 2nd half 2019, for 3,4,5 quality indexes

Comments:
Overall statistics are good and within the requirement.

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

5.1.6.1. 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 OSI-205-a is a high latitude SST and global ice surface temperature (IST) and marginal ice zone surface temperature product.

Conventional measures as Standard Deviation of mean differences (SD) and mean differences are calculated for monthly averages for day-time (SST and IST) and night-time (SST only). Only best quality data (ql 5) are used as well as acceptable data (ql 4) for the 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 110 degrees. In-situ observations and the centre of the OSI-205-a level-2 pixel must be within 3 km of each other and observation times must be within 15 minutes.
Buoy data used for the SST validation is from the Copernicus Marine Environment Monitoring Service (In Situ TAC). Buoy data used for the IST validation is from Dartmouth (1 buoy) and MOSAiC (4 buoys) deployed SIMB3 buoys.
Following the previous assessment report, a validation with PROMICE data, both air temperatures and calculated surface temperatures has been carried out again.

The IST accuracy requirements are split into two on the Product Requirement Document: Namely, for in-situ IR radiometers, and for traditional in situ buoy data. The reason for this is the higher certainty in IR radiometers, measuring the ice surface skin temperature, compared to the conventional buoy temperature measurements (also discussed in the ATBD for OSI-205-a). The PROMICE data calculated surface data are hence not real radiometer data but we are using the requirements for validation against in situ IR radiometers (1.5 K mean diff & 2 K SD).

At the moment we do not have sufficient valid observational data from the southern hemisphere.
OSI-205 SST/IST.
At the moment quality controlled PROMICE data is only available until end of October.
However, there are observations of (SIMB3) buoys for November and December. These are shown in table 11.

The following tables provide the monthly mean quality results over the reporting period and figures show graphs of comparison results for the half-year reporting periods.

PROMICE data (only including “*_U” stations, located in the upper ablation and lower accumulation zone, around the equilibrium line and the EastGrip station) is generally colder than the observed air temperature, as it is expected.
We have included data from all PROMICE stations near the equilibrium line (“*_U”) (ice cap rim) as well as the EastGrip (central Ice cap). Some of these stations are very close to the ice edge and hence some noise is expected.

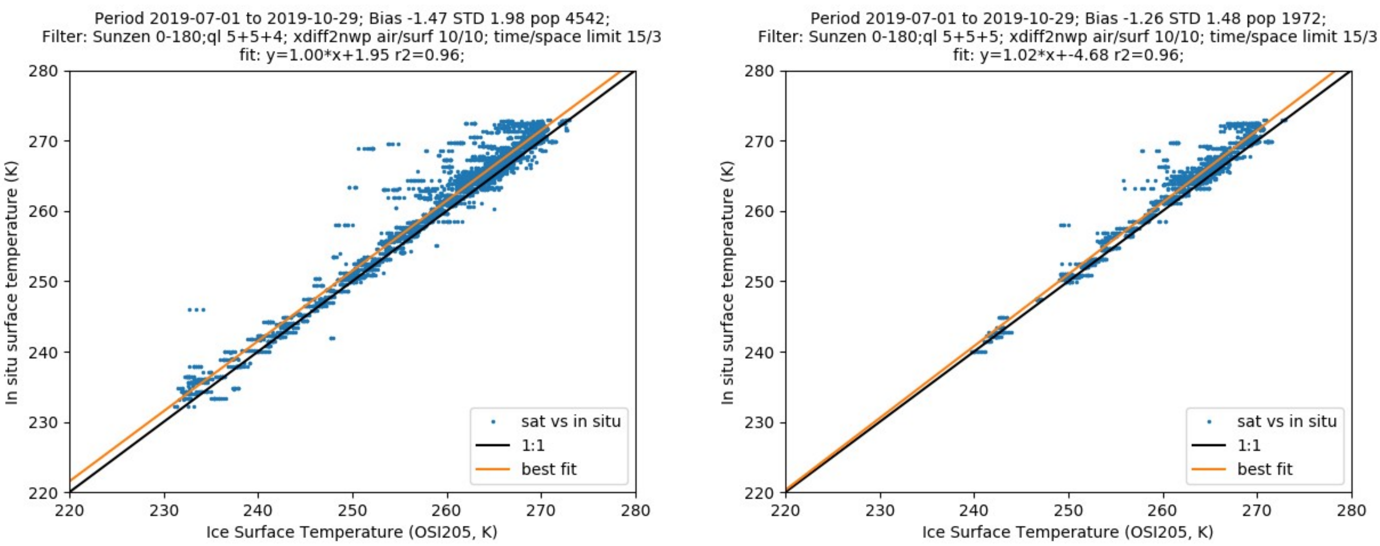
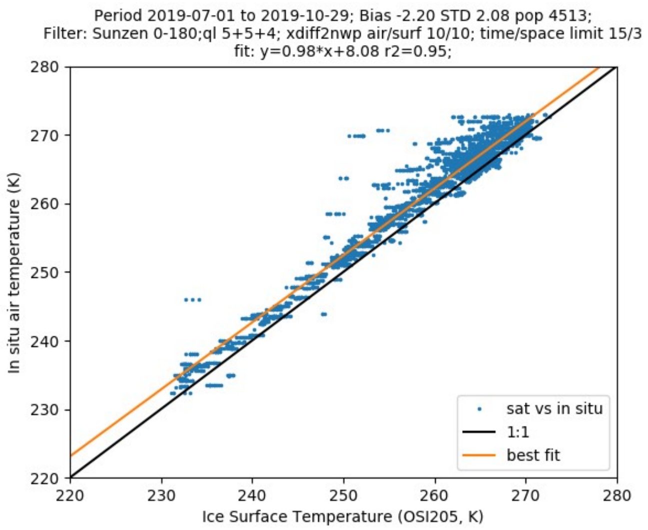


Figure 13: JUL. 2019 to OCT. 2019 OSI-205-a monthly mean IST with respect to calculated surface measurements from PROMICE. The graph on the left shows data with both quality flags 5 &4, while the plot on the right only shows observations with quality flag 5 (= only day-time values)



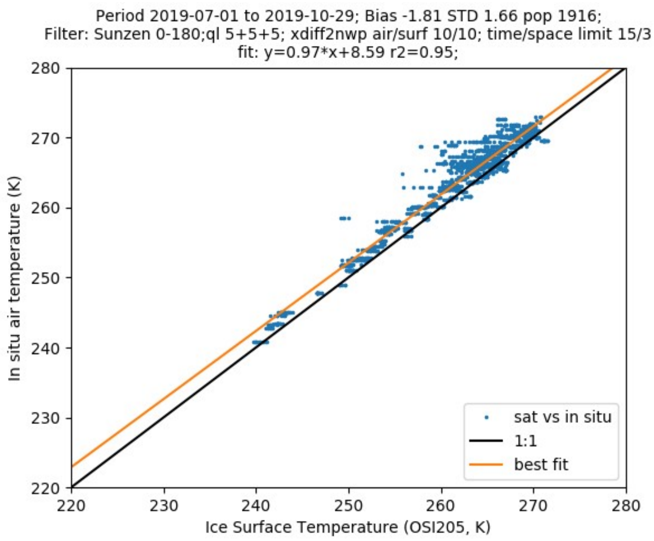


Figure 14: JUL. 2019 to OCT. 2019 OSI-205-a monthly mean IST with respect to air measurements from PROMICE. The graph on the left shows data with both quality flags 5 & 4, while the plot on the right only shows observations with quality flag 5 (= only day-time values).

OSI-205-a IST quality results over 2nd half 2019, night-time, surface temperature, PROMICE					
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. 2019	NA	NA	NA	NA	NA
AUG. 2019	NA	NA	NA	NA	NA
SEP. 2019	7	-0.55	63.33	0.27	86.50
OCT. 2019	12	-1.88	-25.33	6.41	-220,50
NOV. 2019	NA	NA	NA	NA	NA
DEC. 2019	NA	NA	NA	NA	NA
OSI-205-a IST quality results over 2nd half 2019, day-time, surface temperature, PROMICE					
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. 2019	905	-1.45	3.33	1.95	2.50
AUG. 2019	979	-1.48	1.33	1.86	7.0
SEP. 2019	1751	-1.53	-2.00	2.09	-4.50
OCT. 2019	269	-1.47	2.00	1.08	46.0
NOV. 2019	NA	NA	NA	NA	NA
DEC. 2019	NA	NA	NA	NA	NA
(*) 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 9: Quality results for OSI-205-a Metop AVHRR IST over 2nd half 2019, for quality levels 4 and 5 (acceptable and best qualities), by night and by day, compared to PROMICE calculated surface temperature.

Comments:

The target requirements are mostly satisfied except for October 2019, night-time and September 2019, day-time.

It should be noted that there only was a low number of measurements during night-time for this reported period.

OSI-205-a IST quality results over 2nd half 2019, night-time, air temperature, PROMICE					
Month	Number of cases	Mean diff. in K (req.: ± 1.5 K)	Mean diff. margin (*)	SD in K (req. : ± 2.0 K)	SD margin (**)
JUL. 2019	NA	NA	NA	NA	NA
AUG. 2019	NA	NA	NA	NA	NA
SEP. 2019	7	-2.46	-64.0	0.96	52.0
OCT. 2019	12	-2.01	-34.0	6.33	-216.50
NOV. 2019	NA	NA	NA	NA	NA
DEC. 2019	NA	NA	NA	NA	NA
OSI-205-a IST quality results over 2nd half 2019, day-time, air temperature, PROMICE					
Month	Number of cases	Mean diff. in K (req.: ± 1.5 K)	Mean diff. margin (*)	SD in K (req. : ± 2.0 K)	SD margin (**)
JUL. 2019	868	-1.55	-3.33	2.05	-2.50
AUG. 2019	994	-1.67	-11.33	2.02	-1.0
SEP. 2019	1689	-2.67	-78.0	2.08	-4.0
OCT. 2019	263	-2.64	-76.0	1.09	45.50
NOV. 2019	NA	NA	NA	NA	NA
DEC. 2019	NA	NA	NA	NA	NA
(*) 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 10: Quality results for OSI-205-a Metop AVHRR IST over 2nd half 2019, for quality levels 4 and 5 (acceptable and best qualities), by night and by day. Compared to PROMICE measured air temperature.

Comments:
The validation against the measured air temperature performed not as good as the one against the calculated surface temperature, as was expected. The target requirements are not met, but the threshold requirements are mostly satisfied, except for a few observations.
It should be noted that there only was a low number of measurements during night-time for this reported period.

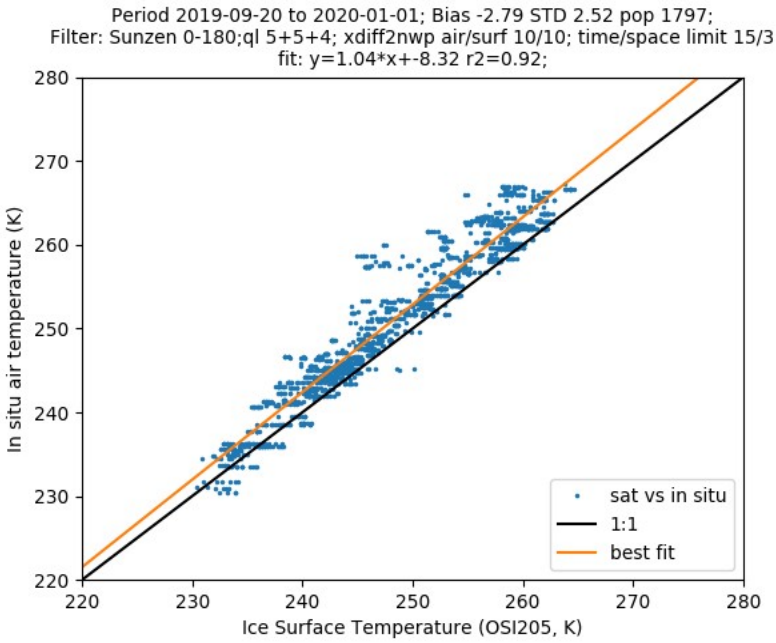


Figure 15: SEP. 2019 to DEC.2019 OSI-205 monthly mean IST with respect to air measurements from the SIMB3 buoys data showing both quality flags 5 & 4

OSI-205-a IST quality results over 2nd half 2019, 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. 2019	NA	NA	NA	NA	NA
AUG. 2019	NA	NA	NA	NA	NA
SEP. 2019	NA	NA	NA	NA	NA
OCT. 2019	NA	NA	NA	NA	NA
NOV. 2019	90	-4.25	-21.43	3.60	-20.0
DEC. 2019	340	-2.40	31.43	1.81	39.67
OSI-205-a IST quality results over 2nd half 2019, 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. 2019	NA	NA	NA	NA	NA
AUG. 2019	NA	NA	NA	NA	NA
SEP. 2019	178	-1.66	52.57	1.00	66.67
OCT. 2019	101	-2.95	15.71	2.31	23.0
NOV. 2019	NA	NA	NA	NA	NA
DEC. 2019	NA	NA	NA	NA	NA
(*) 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 Metop AVHRR IST over July to December 2019, for quality levels 4 and 5 (acceptable and best qualities), by night and by day. Compared to SIMB3 buoys measured air temperature.

Comments:
The target requirements are met except for November 2019, night-time.

OSI-205-a SST:

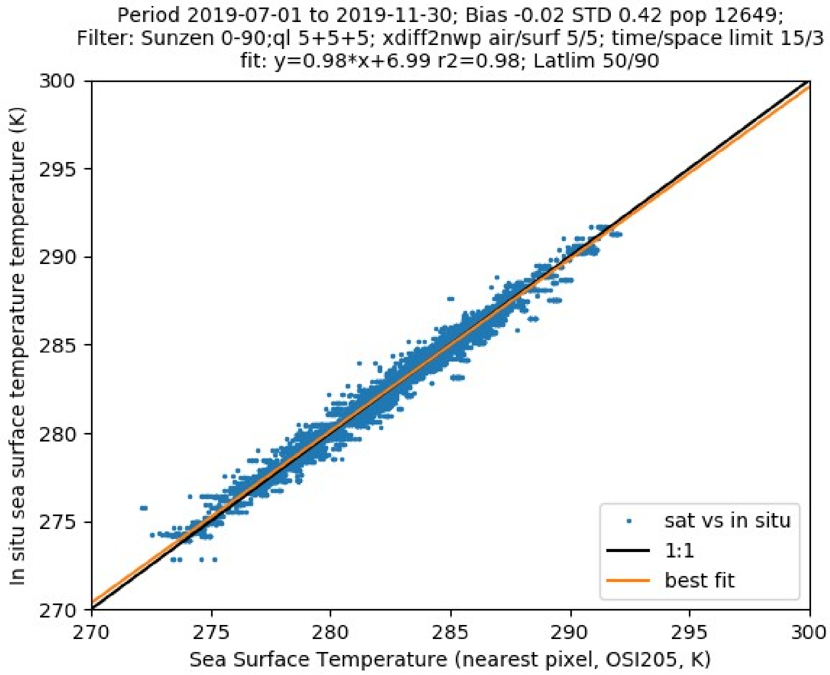


Figure 16: 2nd half 2019 OSI-205-a SST mean difference and bias with respect to conventional buoys measurements from the Copernicus In Situ DB. Only daytime data with quality level 5 are shown.

The Level 2 Sea Surface Temperature (SST, OSI-205-a) is derived from polar satellites data, currently AVHRR on board Metop-B.

The following table provides the OSI-205-a SST quality results over the reporting period.

OSI-205-a AVHRR SST quality results over JAN. 2019 to DEC. 2019, 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. 2019	1247	-0.12	82.9	0.52	48.0
FEB. 2019	1008	-0.27	61.4	0.42	58.0
MAR. 2019	319	-0.34	51.4	0.39	61.0
APR. 2019	45	-0.08	88.6	0.24	76.0
MAY 2019	NA	NA	NA	NA	NA
JUN. 2019	NA	NA	NA	NA	NA
1st half 2019	*2619*	*-0.20*	*71.4*	*0.47*	*53.0*
JUL. 2019	NA	NA	NA	NA	NA
AUG. 2019	9	0.22	68.6	0.26	74.0
SEP. 2019	346	-0.18	74.3	0.66	34.0
OCT. 2019	1272	-0.18	74.3	0.51	49.0
NOV. 2019	2294	-0.30	57.1	0.64	36.0
DEC. 2019	NA	NA	NA	NA	NA
2nd half 2019	*3921*	*-0.25*	*64.3*	*0.61*	*39.0*
OSI-205-a AVHRR SST quality results over JAN. 2019 to DEC. 2019 , 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. 2019	293	-0.15	78.6	0.33	67.0
FEB. 2019	516	-0.17	75.7	0.32	68.0
MAR. 2019	934	-0.06	91.4	0.33	67.0
APR. 2019	2783	-0.04	94.3	0.52	48.0
MAY 2019	1847	-0.05	92.9	0.41	59.0
JUN. 2019	6360	0.02	97.1	0.43	57.0
1st half 2019	*12733*	*-0.02*	*97.1*	*0.44*	*56.0*
JUL. 2019	3384	0.16	77.1	0.53	47.0
AUG. 2019	3083	-0.13	81.4	0.36	64.0
SEP. 2019	3026	-0.04	94.3	0.33	67.0
OCT. 2019	2664	-0.12	82.9	0.34	66.0
NOV. 2019	492	-0.02	97.1	0.28	72.0
DEC. 2019	NA	NA	NA	NA	NA
2nd half 2019	*12649*	*-0.02*	*97.1*	*0.42*	*58.0*
(*) 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 AVHRR SST, both Northern and Southern Hemispheres, over JAN. 2019 to DEC. 2019, for quality level 5, by night and by day

There is no Copernicus data for December available yet.

Comments:
A visual inspection of extreme outliers has been carried out for the whole year of 2019.
For the validation period of July-November 2019 six buoys were disqualified from the validation data, since they are supposedly grounded at coast lines:

- GL_TS_DB_2101547 at the south-east coast of Russia at Bering Sea.
- GL_TS_DB_4101619 at the south-west coast of Ireland.

- GL_TS_DB_4401549 at the west coast of Norway.
- GL_TS_DB_6203570 at the south-east coast of Iceland.
- GL_TS_DB_6203577 at the north coast of Iceland.
- GL_TS_DB_6203711 at the south coast of Iceland.

Validation values for the second half year of 2019 are fully satisfactory and fulfil the requirements on mean error and standard deviation error.

5.1.6.2. 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. The validation of this IST product is based the drifting buoys on the sea ice. These buoys do not provide a good estimate of the sea ice skin surface temperature, but is the only available data source for routine validation on sea ice in the Arctic Ocean. The problem with these buoys is that they sometimes are burried in snow and hence measure temperatures different to the surface skin temperature.

OSI-205-b NHL VIIRS SST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	736	-0.305	56.4	0.840	16.0
MAR. 2019	796	-0.495	29.3	0.932	6.8
APR. 2019	800	-0.164	76.6	0.770	23.0
MAY 2019	384	-0.485	30.7	0.861	13.9
JUN. 2019	371	-0.325	53.5	0.817	18.3
JUL. 2019	325	-0.610	12.9	0.938	6.2
AUG. 2019	667	-0.680	2.8	0.793	20.7
SEP. 2019	1742	-0.495	29.2	0.934	6.5
OCT. 2019	3306	-0.507	27.6	0.900	10.0
NOV. 2019	3030	-0.545	21.6	0.928	7.2
DEC. 2019	2630	-0.440	37.2	0.959	4.1
OSI-205-b NHL VIIRS SST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	2	-	-	-	-
MAR. 2019	270	-0.302	56.9	0.707	29.3
APR. 2019	1511	-0.197	71.8	0.743	25.7
MAY 2019	1397	-0.343	51.1	0.716	28.4
JUN. 2019	2600	-0.187	73.3	0.637	36.3
JUL. 2019	2609	-0.233	66.7	0.770	23.0
AUG. 2019	1862	-0.581	17.0	0.734	26.6
SEP. 2019	2354	-0.353	49.5	0.668	33.2
OCT. 2019	2967	-0.404	42.3	0.648	35.2
NOV. 2019	1157	-0.442	36.9	0.610	39.0
DEC. 2019	532	-0.320	54.3	0.638	36.2
(*) 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 13: Quality results for OSI-205-b NHL VIIRS SST, over Northern Atlantic and Arctic Ocean, over JAN. 2019 to DEC. 2019, for 3,4,5 quality indexes, by night and by day, comparison with drifting buoys.

OSI-205-b NHL VIIRS IST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	164	-2.05	41.3	3.27	-9.2
MAR. 2019	89	-3.45	1.3	3.03	-1.2
APR. 2019	1	-	-	-	-
MAY 2019	0	-	-	-	-
JUN. 2019	0	-	-	-	-
JUL. 2019	0	-	-	-	-
AUG. 2019	0	-	-	-	-
SEP. 2019	15	-0.94	73.2	2.91	2.9
OCT. 2019	171	-2.48	29.1	2.96	1.43
NOV. 2019	217	-5.03	-43.8	3.64	-21.4
DEC. 2019	339	-2.53	27.6	4.39	-46.3
OSI-205-b NHL VIIRS IST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	28	-0.45	87.3	1.56	47.8
MAR. 2019	79	-3.11	11.2	3.47	-15.7
APR. 2019	101	-6.53	-86.8	2.64	12.0
MAY 2019	99	-6.36	-81.8	2.14	28.5
JUN. 2019	5	-	-	-	-
JUL. 2019	0	-	-	-	-
AUG. 2019	23	-3.65	-4.3	2.09	30.3
SEP. 2019	30	-1.94	44.4	3.11	-3.9
OCT. 2019	0	-	-	-	-
NOV. 2019	0	-	-	-	-
DEC. 2019	0	-	-	-	-
(*) 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 VIIRS IST, over Northern Atlantic and Arctic Ocean, over JAN. 2019 to DEC. 2019, for 3,4,5 quality indexes, by night and by day, comparison with air temperature from buoys.

Comments:
SST meets the target requirement for mean difference and standard deviation for all months both daytime and night-time of the reporting period.
IST has few matchups for the reporting period, especially for daytime. The target requirement are met for about half of the months.

5.1.6.3. 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. The validation of this IST product is based the drifting buoys on the sea ice. These buoys do not provide a good estimate of the sea ice skin surface temperature, but is the only available data source for routine validation on sea ice in the Arctic Ocean. The problem with these buoys is that they sometimes are burried in snow and hence measure temperatures different to the surface skin temperature.

OSI-203-a NHL AVHRR SST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	395	-0.668	4.5	0.797	20.3
MAR. 2019	291	-0.840	-20.0	0.797	21.5
APR. 2019	235	-0.486	30.6	0.819	18.1
MAY 2019	80	-0.439	37.3	1.034	-0.4
JUN. 2019	102	-0.336	52.0	0.997	0.3
JUL. 2019	140	-0.456	34.8	0.948	5.2
AUG. 2019	166	-0.581	17.0	0.949	5.1
SEP. 2019	446	-0.596	14.9	0.882	11.8
OCT. 2019	2089	-0.700	0.0	0.812	18.8
NOV. 2019	2602	-0.712	-1.6	0.845	15.4
DEC. 2019	2583	-0.615	12.1	0.784	21.6
OSI-203-a NHL AVHRR SST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	602	-0.351	49.9	0.560	42.0
MAR. 2019	1389	-0.319	54.4	0.551	44.9
APR. 2019	1197	-0.174	75.1	0.616	38.4
MAY 2019	1230	-0.178	74.5	0.604	39.6
JUN. 2019	4944	-0.116	83.4	0.625	37.5
JUL. 2019	4483	-0.298	57.4	0.850	15.0
AUG. 2019	1681	-0.406	42.0	0.764	23.6
SEP. 2019	2119	-0.281	59.9	0.638	36.2
OCT. 2019	2985	-0.331	52.8	0.577	42.3
NOV. 2019	1710	-0.238	66.0	0.482	51.8
DEC. 2019	748	-0.187	73.3	0.545	45.5
(*) 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-203-a NHL AVHRR SST over JAN. 2019 to DEC. 2019, for 3,4,5 quality indexes, by night and by day, comparison with drifting buoys.

OSI-203-a NHL AVHRR IST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	105	-2.59	26.1	3.39	-12.8
MAR. 2019	29	-3.38	3.4	3.36	-12.0
APR. 2019	1	-	-	-	-
MAY 2019	0	-	-	-	-
JUN. 2019	0	-	-	-	-
JUL. 2019	0	-	-	-	-
AUG. 2019	0	-	-	-	-
SEP. 2019	0	-	-	-	-
OCT. 2019	120	-2.51	28.4	2.73	9.1
NOV. 2019	215	-5.39	-54.0	3.12	-4.0
DEC. 2019	324	-2.69	23.2	4.12	-37.2
OSI-203-a NHL AVHRR IST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	29	-1.43	59.0	3.91	-30.3
MAR. 2019	69	-3.35	4.3	3.53	-17.8
APR. 2019	72	-5.01	-43.1	3.88	-29.2
MAY 2019	73	-6.04	-72.7	3.58	-19.4
JUN. 2019	2	-	-	-	-
JUL. 2019	0	-	-	-	-
AUG. 2019	16	-4.75	-35.8	1.86	37.9
SEP. 2019	53	-0.92	73.7	3.26	-8.7
OCT. 2019	5	-	-	-	-
NOV. 2019	0	-	-	-	-
DEC. 2019	0	-	-	-	-
(*) 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 AVHRR IST over JAN. 2019 to DEC. 2019, for 3,4,5 quality indexes, by night and by day, comparison with air temperature from buoys.

Comments:
SST meets the target requirement for mean difference and standard deviation for all months both daytime and night-time of the reporting period, except slightly outside for mean difference in November.
IST has few matchups, with observations only in October-December for nighttime and August and September for daytime. The target requirement are met for about half of the months.

5.1.6.4. *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. The validation of this IST product is based the drifting buoys on the sea ice. These buoys do not provide a good estimate of the sea ice skin surface temperature, but is the only available data source for routine validation on sea ice in the Arctic Ocean. The problem with these buoys is that they sometimes are burried in snow and hence measure temperatures different to the surface skin temperature.

OSI-203-b NHL VIIRS SST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	1510	-0.328	53.1	0.768	23.2
MAR. 2019	1966	-0.525	25.0	0.847	15.3
APR. 2019	1418	-0.371	46.9	0.852	14.8
MAY 2019	671	-0.606	13.4	0.891	10.9
JUN. 2019	1805	-0.374	46.6	0.818	18.2
JUL. 2019	610	-0.866	-23.8	1.050	-5.0
AUG. 2019	1131	-0.719	-2.8	0.814	18.6
SEP. 2019	2401	-0.747	-6.7	0.940	6.0
OCT. 2019	5835	-0.514	26.5	0.808	19.2
NOV. 2019	5230	-0.497	29.0	0.836	16.4
DEC. 2019	4882	-0.428	38.9	0.840	16.0
OSI-203-b NHL VIIRS SST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	3	-	-	-	-
MAR. 2019	390	0.380	45.7	0.578	42.2
APR. 2019	1341	0.266	62.0	0.639	36.0
MAY 2019	1381	0.320	54.4	0.628	37.2
JUN. 2019	5339	0.191	72.7	0.543	45.7
JUL. 2019	2257	-0.334	52.2	0.690	31.0
AUG. 2019	1744	-0.492	29.7	0.631	36.9
SEP. 2019	2126	-0.372	46.9	0.603	39.7
OCT. 2019	3529	-0.395	43.6	0.574	42.6
NOV. 2019	2233	-0.460	34.2	0.553	44.7
DEC. 2019	1389	-0.534	23.7	0.620	38.0
(*) 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-b NHL VIIRS SST over JAN. 2019 to DEC. 2019, for 3,4,5 quality indexes, by night and by day, comparison with drifting buoys.

OSI-203-b NHL VIIRS IST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	100	-2.96	15.4	3.29	-9.7
MAR. 2019	59	-4.11	-17.3	3.63	-21.1
APR. 2019	1	-	-	-	-
MAY 2019	0	-	-	-	-
JUN. 2019	0	-	-	-	-
JUL. 2019	0	-	-	-	-
AUG. 2019	0	-	-	-	-
SEP. 2019	10	-4.95	-41.5	1.43	52.4
OCT. 2019	177	-2.34	33.2	3.35	-11.6
NOV. 2019	210	-3.92	-12.1	3.20	-6.6
DEC. 2019	306	-2.77	20.8	4.21	-40.3
OSI-203-b NHL VIIRS IST quality results over JAN. 2019 to DEC. 2019, 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. 2019					
FEB. 2019	0	-	-	-	-
MAR. 2019	39	-2.57	26.6	3.78	-26.1
APR. 2019	36	-5.95	-70.1	2.07	31.1
MAY 2019	58	-6.55	-87.2	2.43	19.1
JUN. 2019	4	-	-	-	-
JUL. 2019	1	-	-	-	-
AUG. 2019	25	-4.76	-36.0	2.40	20.1
SEP. 2019	41	-2.49	29.0	3.10	-3.5
OCT. 2019	0	-	-	-	-
NOV. 2019	0	-	-	-	-
DEC. 2019	0	-	-	-	-
(*) 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 VIIRS IST over JAN. 2019 to DEC. 2019, for 3,4,5 quality indexes, by night and by day, comparison with air temperature from buoys.

Comments:
SST meets the target requirement at daytime for mean difference and standard deviation for all months of the reporting period. For night-time the requirement is met for all months for standard deviation except for July, while for mean difference it is not met for July, August and September.
IST has few matchups, with observations only in September-December for night-time and August and September for daytime. The target requirement are met for about half of the months.

5.1.7. 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.

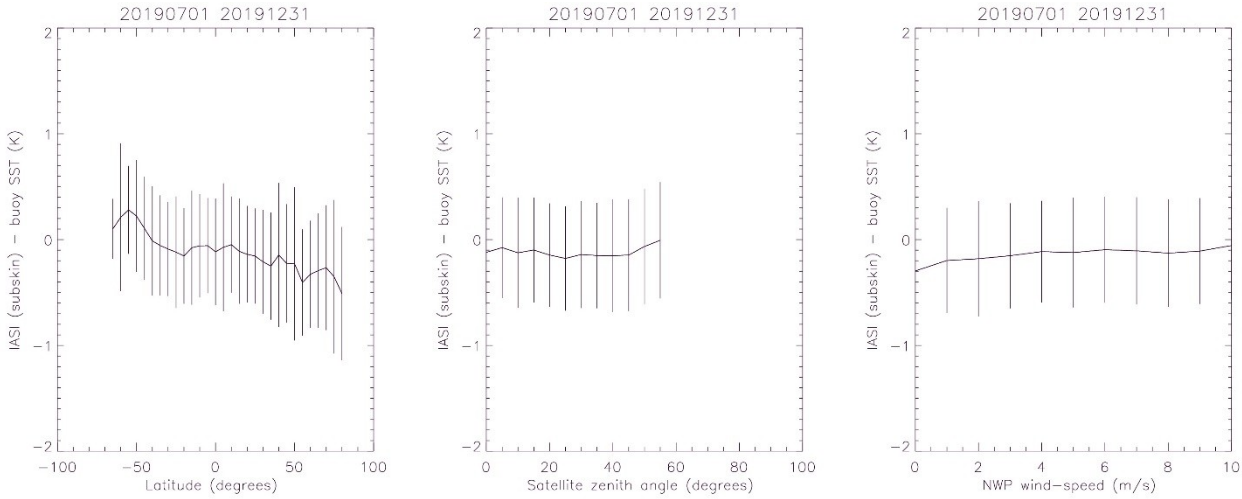


Figure 17: Mean Metop-B IASI night-time SST minus drifting buoy SST for Quality Levels 3, 4 and 5 from JUL. 2019 to DEC. 2019

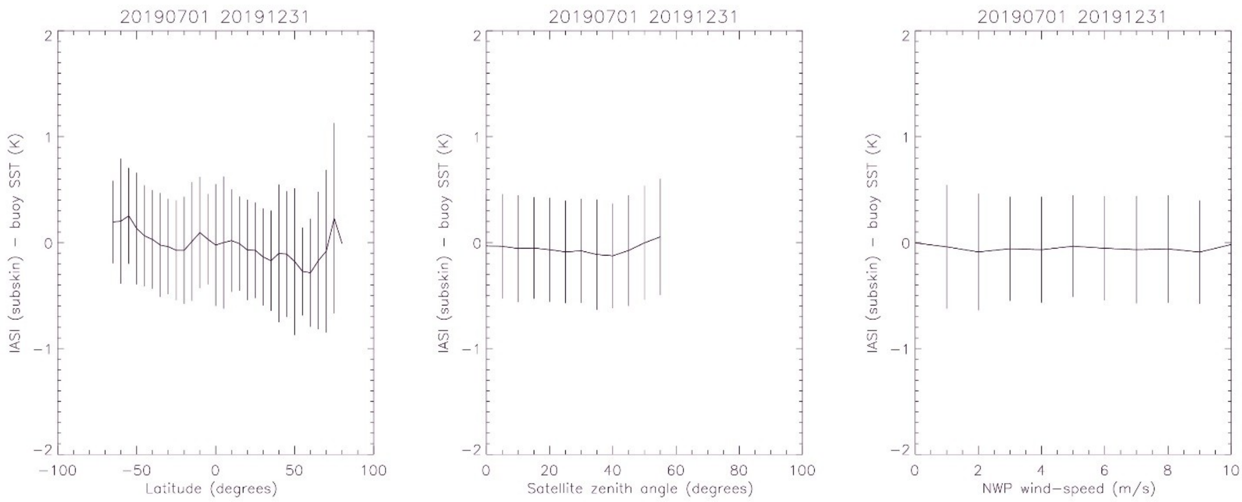


Figure 18: Mean Metop-B IASI day-time SST minus drifting buoy SST for Quality Levels 3, 4 and 5 from JUL. 2019 to DEC. 2019

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 2019					
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. 2019	4452	-0.08	84	0.44	45
AUG. 2019	2545	-0.14	72	0.43	46
SEP. 2019	4425	-0.15	70	0.44	45
OCT. 2019	4298	-0.18	64	0.43	46
NOV. 2019	4464	-0.19	62	0.44	45
DEC. 2019	2674	0.06	88	0.42	47
Global Metop-B IASI day-time SST quality results over 2nd half 2019					
JUL. 2019	4742	-0.02	96	0.44	45
AUG. 2019	2510	-0.08	84	0.43	46
SEP. 2019	4803	-0.10	80	0.44	45
OCT. 2019	4717	-0.10	80	0.43	46
NOV. 2019	4593	-0.10	80	0.43	46
DEC. 2019	1875	0.14	72	0.40	47
(*) 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 global Metop-B IASI SST over 2nd half 2019, for Quality Levels 3, 4 and 5

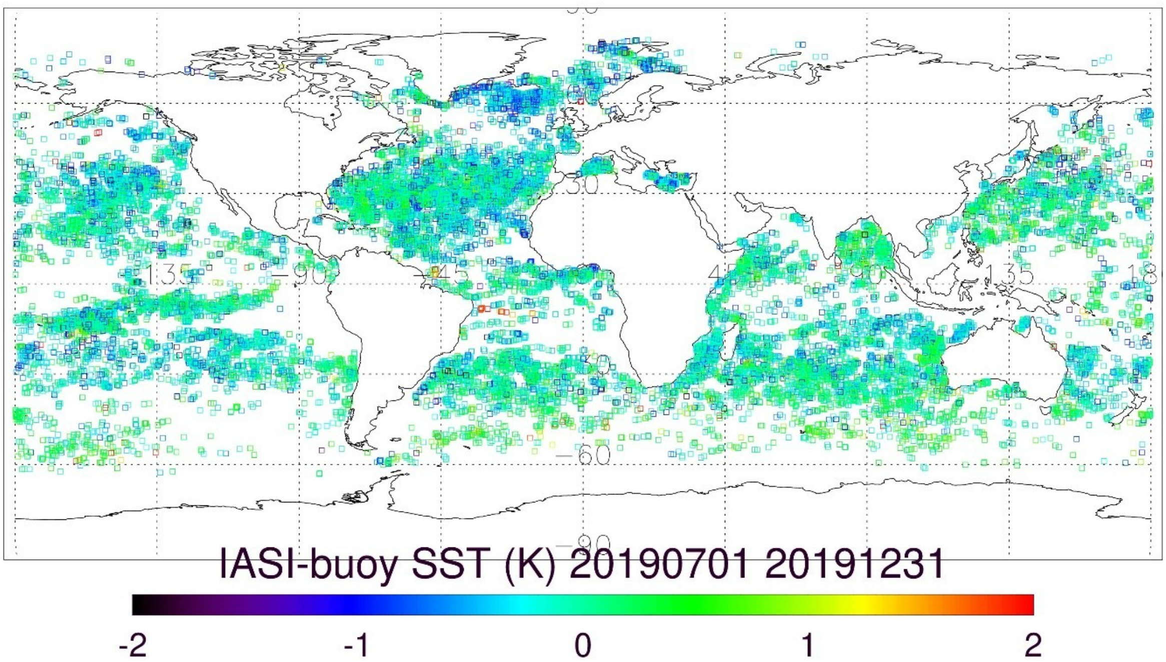


Figure 19: Mean Metop-B IASI night-time SST minus drifting buoy SST analyses for Quality Levels 3, 4 and 5, JAN. 2019 to DEC. 2019

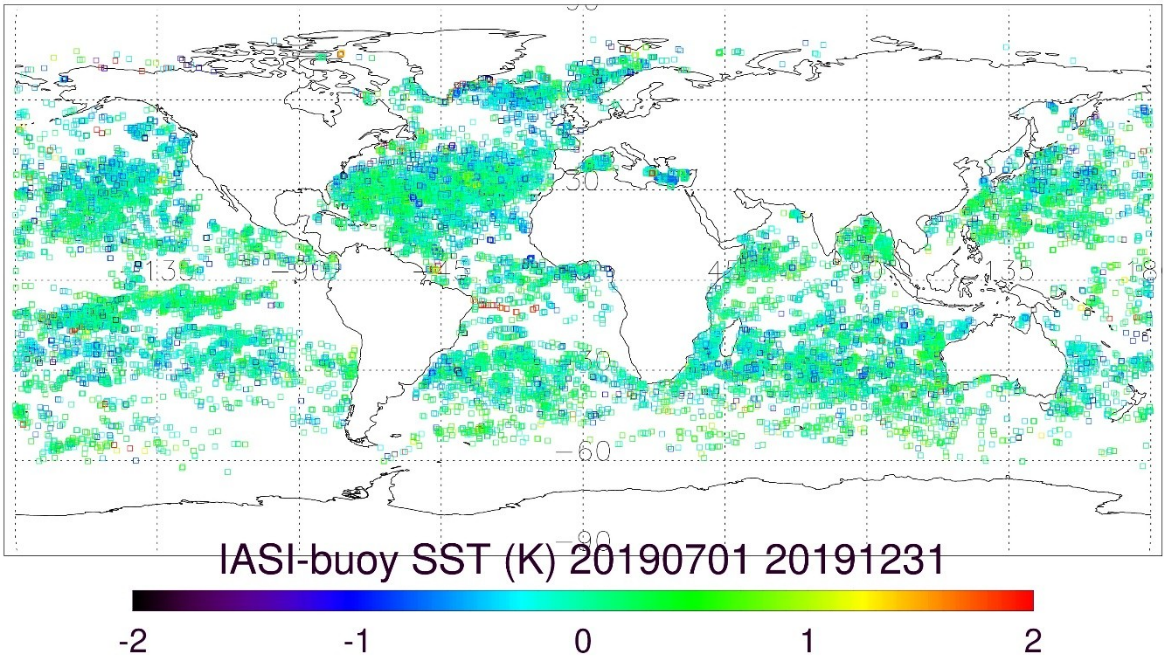


Figure 20: Mean Metop-B IASI day-time SST minus drifting buoy SST analyses for Quality Levels 3, 4 and 5, JAN. 2019 to DEC. 2019

Comments:
Over the six month reporting period the night-time mean IASI bias (for quality levels 3 and above) against drifting buoy SSTs is -0.13K with a standard deviation of 0.44K (n=22852); and the day-time mean bias is -0.06K, standard deviation 0.44K (n=23242). The monthly mean and whole time period results and within the target accuracy. Note that the IASI L2 updated to version 6.5 on the 4th December, hence the change in bias in December 2019. More information and plots can be found from http://metis.eumetsat.int.

5.2. Radiative Fluxes quality

5.2.1. DLI quality

DLI products are constituted of the geostationary products (Meteosat DLI and GOES-East DLI) and the polar ones (AHL DLI). 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. Meteosat DLI (OSI-303) and GOES-East DLI (OSI-305) 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:
http://osi-saf.eumetsat.int/lml/img/flx_map_stations.gif
The list of stations has been updated on the 8 October 2018 : some stations have been removed because they had not provided data for more than one year, some stations have been added after assessment of their quality.

The following table provides the geostationary DLI quality results over the reporting period.
For information, the software validation will be done in the future as for LML SST products with the median and the Robust Standard Deviation (RSD).

Geostationary Meteosat & GOES-East DLI quality results over JAN. 2019 to DEC. 2019								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. in % (req.: ± 5 %)	Mean diff. margin(*) in %	SD in Wm^{-2}	SD in % (req. : ± 10%)	SD margin(**) in %
JAN. 2019	5911	291.02	-7.09	-2.44	51.27	18.48	6.35	36.50
FEB. 2019	5315	290.39	-7.06	-2.43	51.38	18.66	6.43	35.74
MAR. 2019	5942	295.55	-2.62	-0.89	82.27	15.63	5.29	47.12
APR. 2019	5537	316.87	-0.77	-0.24	95.14	15.87	5.01	49.92
MAY 2019	5786	343.39	-1.94	-0.56	88.70	15.21	4.43	55.71
JUN. 2019	5731	362.61	-2.22	-0.61	87.76	19.66	5.42	45.78
JUL. 2019	5948	370.58	-1.41	-0.38	92.39	19.99	5.39	46.06
AUG. 2019	5812	366.56	-1.55	-0.42	91.54	19.43	5.30	46.99
SEP. 2019	4737	352.71	-1.51	-0.43	91.44	16.64	4.72	52.82
OCT. 2019	4951	317.51	-2.72	-0.86	82.87	15.28	4.81	51.88
NOV. 2019	5009	289.09	-6.61	-2.29	54.27	16.92	5.85	41.47
DEC. 2019	4431	280.50	-3.97	-1.42	71.69	19.09	6.81	31.94

(*) 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: Geostationary DLI quality results over 2nd half 2019.

Comments:
Overall statistics are good and within the requirement.

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

Since 2016, Meteosat-8 is in position 41.5 east for the Indian Ocean Data Coverage (IODC). Downward Long wave Irradiance is processed as a demonstration product.

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

Geostationary Meteosat Indian Ocean DLI quality results over JAN. 2019 to DEC. 2019								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. in % (req.: ± 5 %)	Mean diff. margin in %(*)	SD in Wm^{-2}	SD in % (req.: ± 10 %)	SD margin (**) in %
JAN. 2019	1463	282.85	-16.00	-5.66	-13.13	23.26	8.22	17.77
FEB. 2019	1319	283.84	-11.42	-4.02	19.53	20.45	7.20	27.95
MAR. 2019	1486	288.90	-3.86	-1.34	73.28	19.75	6.84	31.64
APR. 2019	1385	284.92	5.31	1.86	62.73	14.09	4.95	50.55
MAY 2019	1432	315.49	4.16	1.32	73.63	14.17	4.49	55.09
JUN. 2019	1440	346.62	7.33	2.11	57.71	13.65	3.94	60.62
JUL. 2019	1348	342.45	10.21	2.98	40.37	15.58	4.55	54.50
AUG. 2019	1463	344.95	11.00	3.19	36.22	19.48	5.65	43.53
SEP. 2019	1267	322.13	6.78	2.10	57.91	17.59	5.46	45.39
OCT. 2019	1425	327.76	-1.98	-0.60	87.92	20.03	6.11	38.89
NOV. 2019	1409	313.82	-13.01	-4.15	17.09	20.68	6.59	34.10
DEC. 2019	711	301.93	-6.01	-1.99	60.19	21.53	7.13	28.69
(*) 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 21: Meteosat Indian Ocean DLI quality results over 2nd half 2019.

Comments:
Overall statistics are good and within the requirement.

5.2.1.3. AHL DLI (OSI-301) quality

The pyrgeometer stations used for quality assessment of the AHL DLI product are briefly described athttp://nowcasting.met.no/validering/flukser/. More information on the stations is provided in 5.2.2.3

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

AHL DLI quality results over JAN. 2019 to DEC. 2019								
Month	Number of cases	Mean DLI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. in % (req.: ± 5 %)	Mean diff. margin in %(*)	SD in Wm^{-2}	SD in % (req.: ± 10 %)	SD margin (**) in %
JAN. 2019	307	262.43	3.22	1.61	67.8	16.36	6.29	37.1
FEB. 2019	277	268.70	3.16	1.83	63.4	16.17	6.14	38.6
MAR. 2019	297	263.35	-3.00	1.66	66.8	16.25	6.33	36.7
APR. 2019	281	274.96	-9.06	4.68	6.4	14.02	5.16	48.4
MAY 2019	302	298.37	-4.69	3.11	37.8	12.43	4.18	58.2
JUN. 2019	297	310.85	-20.52	9.63	-92.6	36.37	13.76	-37.6
JUL. 2019	307	335.88	-4.48	-1.33	73.4	11.32	3.69	66.3
AUG. 2019	288	333.82	-6.52	-1.95	61	11.55	4.01	65.4
SEP. 2019	237	319.98	-2.80	-0.88	82.4	13.43	5.67	58.0
OCT. 2019	245	299.59	-0.41	-0.14	97.2	14.17	5.78	52.7
NOV. 2019	220	289.80	7.30	2.52	49.6	14.34	6.52	50.5
DEC. 2019	237	288.85	8.09	2.8	44	18.62	7.86	35.5
(*) 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 22: AHL DLI quality results over JAN. 2019 to DEC. 2019.

Comments:
The requirements are met in all months for the reporting period.

5.2.2. SSI quality

SSI products are constituted of the geostationary products (Meteosat SSI and GOES-East SSI) and polar ones (AHL SSI). 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. Meteosat SSI (OSI-304) and GOES-East SSI (OSI-306) quality

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

Geostationary Meteosat & GOES-East SSI quality results over 2nd half 2019								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. in % (req.: ± 10 %)	Mean diff. margin(*) in %	SD in Wm^{-2}	SD in % (req.: ± 30 %)	SD margin (**) in %
JAN. 2019	5800	344.36	-4.53	-1.32	86.85	78.03	22.66	24.47
FEB. 2019	5920	386.23	-3.89	-1.01	89.93	79.89	20.68	31.05
MAR. 2019	7346	436.71	0.56	0.13	98.72	79.29	18.16	39.48
APR. 2019	7856	433.00	1.90	0.44	95.61	76.09	17.57	41.42
MAY 2019	8520	439.54	-11.23	-2.55	74.45	72.91	16.59	44.71
JUN. 2019	8374	467.93	-2.79	-0.60	94.04	72.24	15.44	48.54
JUL. 2019	8651	490.32	-2.80	-0.57	94.29	71.23	14.53	51.58
AUG. 2019	8342	473.08	-6.97	-6.89	31.10	72.65	15.36	48.81
SEP. 2019	6930	457.26	0.46	0.10	98.99	69.09	15.11	49.63
OCT. 2019	6593	387.05	2.35	0.61	93.93	71.16	18.39	38.72
NOV. 2019	5573	345.98	5.67	1.64	83.61	76.77	22.19	26.04
DEC. 2019	4801	320.23	0.36	0.11	98.88	73.51	22.96	23.48

(*) 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 23: Geostationary SSI quality results over 2nd half 2019.

Comments:
Overall statistics are good and within the requirement.

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

Surface Solar Irradiance from Meteosat-8 (in position 41.5 east) is processed as a demonstration product since 2016.

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

Meteosat Indian Ocean SSI quality results over 2nd half 2019								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. in % (req. : ± 10 %)	Mean diff. margin(*) in %	SD in Wm^{-2}	SD in % (req.: ± 30 %)	SD margin(**) in %
JAN. 2019	2999	337.41	7.41	2.20	78.04	65.76	19.49	35.03
FEB. 2019	3177	394.65	7.84	1.99	80.13	55.58	14.08	53.06
MAR. 2019	3990	430.44	10.78	2.50	74.96	66.31	15.41	48.65
APR. 2019	4322	437.20	3.61	0.83	91.74	65.81	15.05	49.82
MAY 2019	4668	449.63	-11.38	-2.53	74.69	71.33	15.86	47.12
JUN. 2019	4822	478.05	-0.08	-0.02	99.83	63.22	13.22	55.92
JUL. 2019	4461	506.02	-6.19	-1.22	87.77	60.40	11.94	60.21
AUG. 2019	4649	463.49	-9.89	-2.13	78.66	64.51	13.92	53.61
SEP. 2019	3887	444.77	-4.33	-0.97	90.26	61.38	13.80	54.00
OCT. 2019	3696	361.85	5.75	1.59	84.11	65.44	18.08	39.72
NOV. 2019	3040	329.05	15.65	4.76	52.44	68.40	20.79	30.71
DEC. 2019	2430	321.39	11.28	3.51	64.90	67.51	21.01	29.98
(*) 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 24: Meteosat Indian Ocean SSI quality results over 2nd half 2019.

Comments:
Overall statistics are good and within the requirement.

5.2.2.3. AHL SSI (OSI-302) 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	In use
Fureneset	56420	61.30°N	5.05°E	SSI	In use
Tjøtta	76530	65.83°N	12.43°E	SSI	In use
Ekofisk	76920	56.50°N	3.2°E	SSI, DLI	The station was closed due to change platforms in the position. Instrumentation is recovered and work in progress to remount equipment.
Holt	90400	69.67°N	18.93°E	SSI	Not used currently
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	In use, 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	In use
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	Only DLI used so far.
Visby	02091	57.68°N	18.35°E	SSI, DLI	Only DLI used so far.
Svenska Högarna	02492	59.45°N	19.51°E	SSI, DLI	Only DLI used so far.

Table 25: Validation stations that are currently used for AHL radiative fluxes quality assessment.

The stations used in this validation 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 station at Ekofisk was closed in July 2015, instruments are recovered and work in progress to remount equipment on a new platform. This is however pending financial support. As this was the only pure maritime station available, this is a serious drawback for evaluation of the performance of the flux products.

The pyranometer stations used for validation of the AHL SSI product are selected stations from table 25. 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.
The following stations are currently used:

A report from OSI SAF about the validation data used for validating the high latitude surface radiative flux products is available here: http://osisaf.met.no/docs/osisaf_cdop2_ss2_rep_flux-val-data_v1p0.pdf

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

AHL SSI quality results over JAN. 2019 to DEC. 2019								
Month	Number of cases	Mean SSI in Wm^{-2}	Mean diff. in Wm^{-2}	Mean diff. in % (req.: ± 10%)	Mean diff. margin in %(*)	SD in Wm^{-2}	SD in % (req.: ± 30 %)	SD margin(**) in %
JAN. 2019	431	12.09	6.67	38.42	-284.2	11.04	58.34	-94.5
FEB. 2019	389	34.25	14.76	29.28	-192.8	20.24	55.27	-84.2
MAR. 2019	417	77.91	24.74	32.15	-221.5	24.41	31.22	-4.07
APR. 2019	401	170.90	43.36	24.73	-147.3	31.39	18.67	37.8
MAY 2019	425	193.49	44.82	23.02	-130.2	37.62	19.53	34.9
JUN. 2019	403	223.07	51.85	23.35	-133.5	37.38	16.90	43.7
JUL. 2019	462	198.62	43.22	21.76	-117.6	32.56	7.05	45.4
AUG. 2019	448	150.96	37.51	24.85	-148.5	35.02	7.82	22.7
SEP. 2019	416	88.06	20.86	23.69	-136.9	19.99	4.81	24.3
OCT. 2019	402	40.08	12.18	30.39	-203.9	16.38	4.07	-36.2
NOV. 2019	386	11.17	6.12	54.79	-447.9	10.62	2.75	-216.9
DEC. 2019	420	6.14	9.52	155.05	-1450.5	9.27	2.21	-403.3

(*) 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 26: AHL SSI quality results over JAN. 2019 to DEC. 2019

Comments:
The requirement on bias is not met. The reason for this is an overestimation of SSI on the southernmost stations implying that the atmospheric tuning factor should be modified. Looking at the Arctic stations alone, requirements are met on these. For December too few of the validation stations had enough insolation to create good estimates.

5.3. Sea Ice quality

5.3.1. Global sea ice concentration (OSI-401-b) 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.

Error code	Type	Description
1	area	missing data
2	point	open water where ice was expected
3	area	false ice where open water was expected
4	point	false ice induced from SSM/I processing errors
5	point	other errors
6	point	noisy false ice along coast

Table 27: Error codes for the manual registration

For the Northern Hemisphere, these quality assessment results are given for the Greenland area. This area is the area covered by the Greenland overview ice charts made by DMI used for the comparison to the sea ice concentration data. The charts can be seen at http://www.dmi.dk/hav/groenland-og-arktis/iskort/.

They cover the waters surrounding Greenland including the Lincoln Sea, the Fram Strait, the Greenland Sea, the Denmark Strait and Iceland, the Southern Greenland area including Cape Farewell, the Davis Strait and all of Baffin Bay.

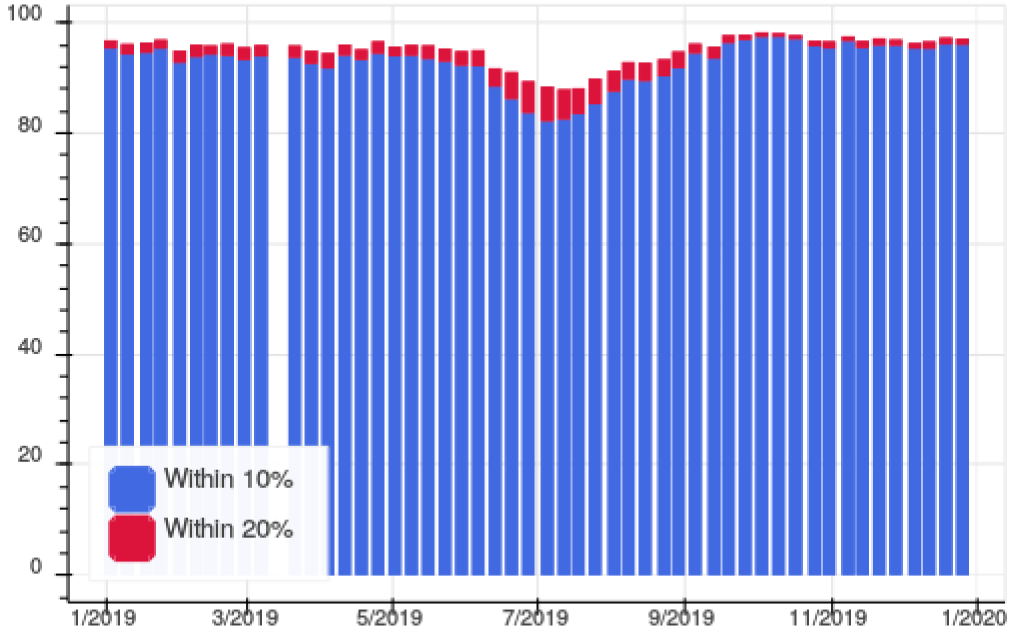


Figure 21: Comparison of ice concentrations from the Greenland overview charts made by DMI and the OSI SAF concentration product. Northern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%.

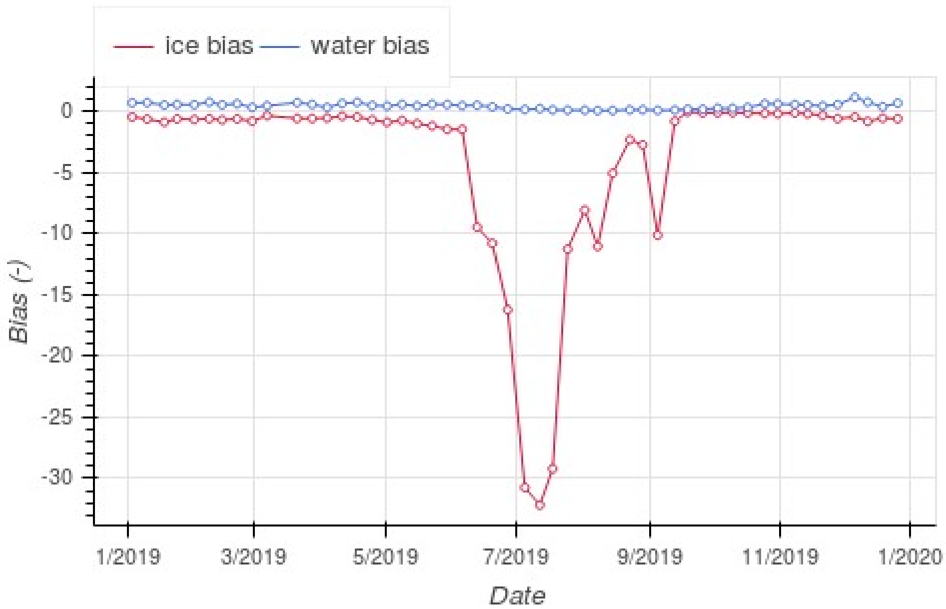


Figure 22: Difference between ice concentrations from the Greenland overview charts made by DMI and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Northern hemisphere.

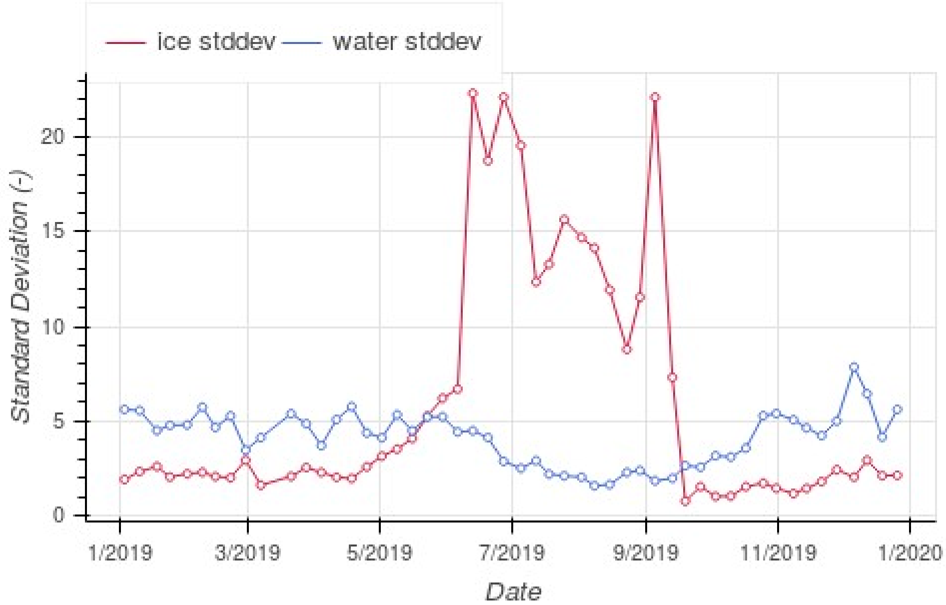


Figure 23: Standard deviation of the difference in ice concentrations from the Greenland overview charts made by DMI and OSI SAF concentration product for two categories: water and ice. Northern hemisphere.

Figure 24: Multiyear variability. Comparison between ice concentrations from the Greenland overview charts made by DMI 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.

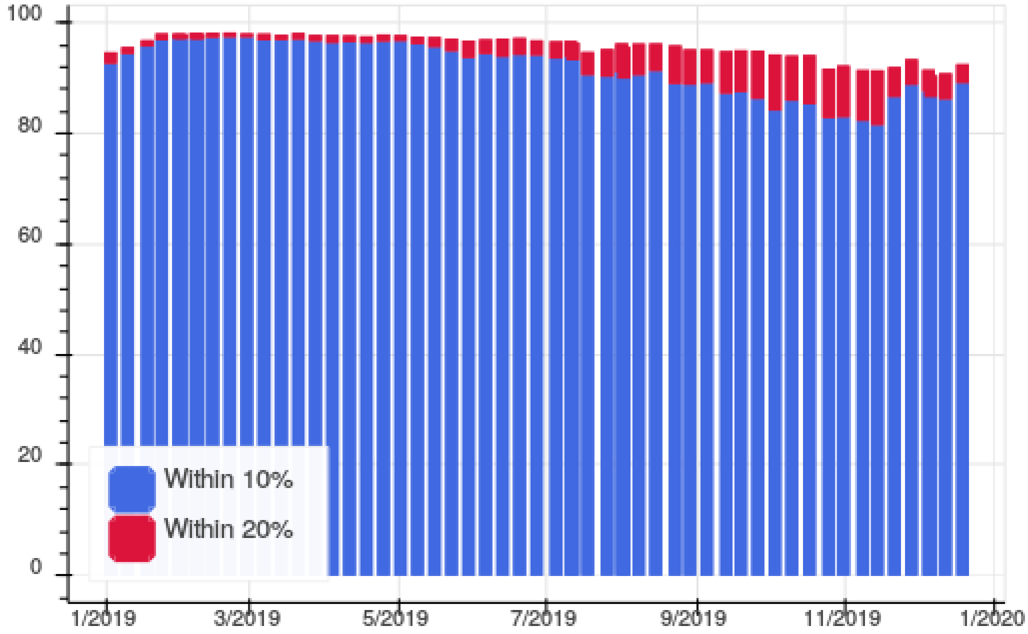


Figure 25: Comparison between ice concentrations from the NIC ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/-10%, and likewise for +/-20%. Southern hemisphere.

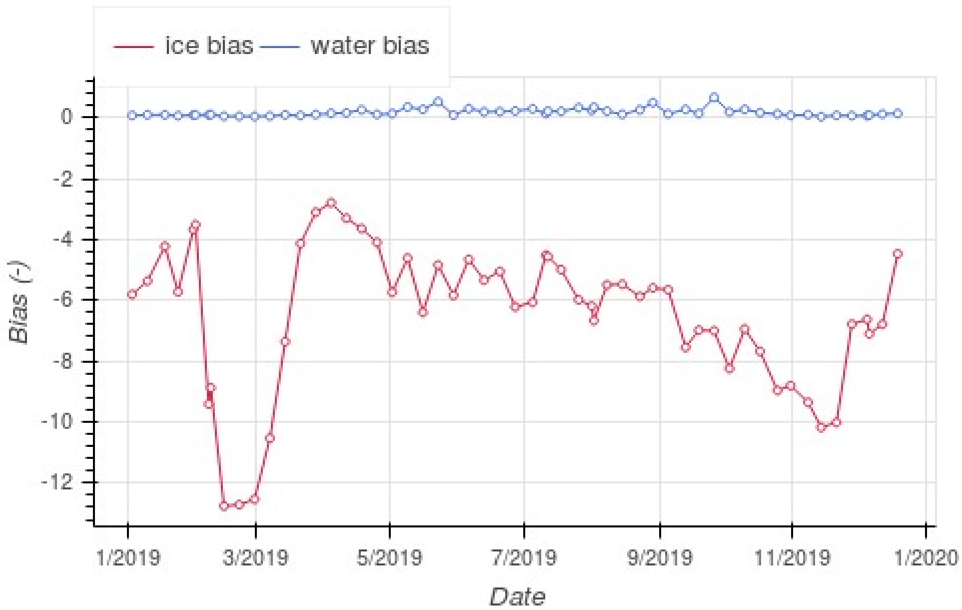


Figure 26: Difference between the ice concentrations from the NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Southern hemisphere.

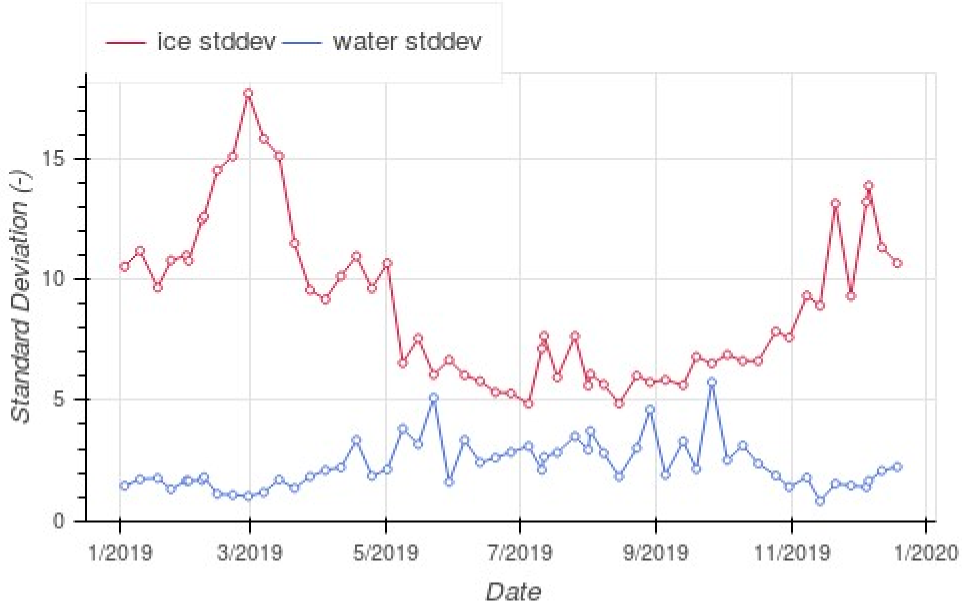


Figure 27: Standard deviation of the difference in ice concentrations from the NIC ice analysis and OSI SAF concentration product for two categories: water and ice. Southern hemisphere.

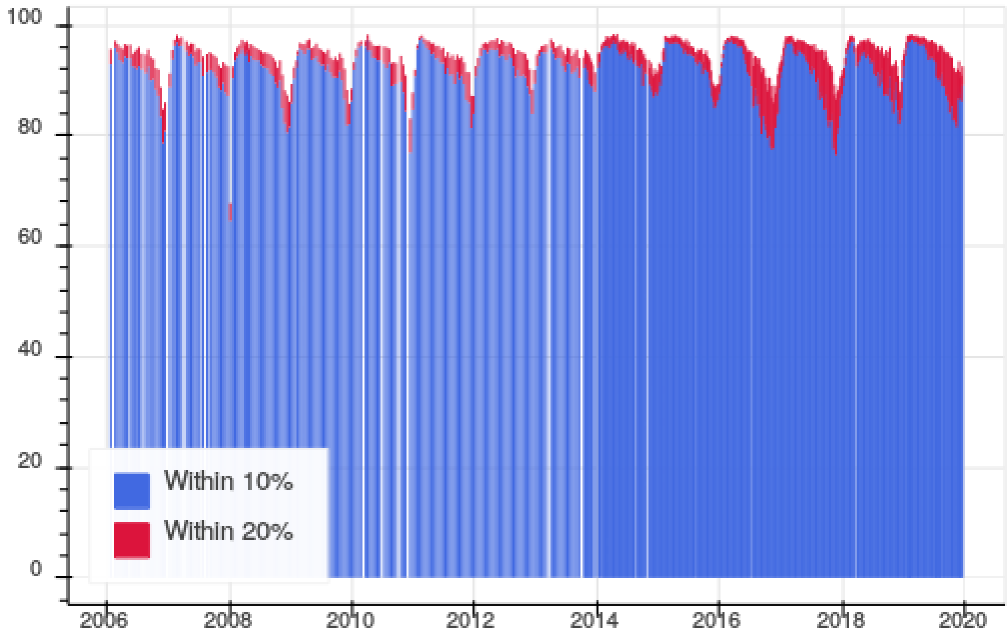


Figure 28: Multiyear variability. Comparison between ice concentrations from the NIC ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%. Southern hemisphere.

Concentration product					
Month	+/- 10% [%]	+/- 20% [%]	Mean difference [%]	SD [%]	Number of obs.
JAN. 2019	95.8	97.1	-1.6	6.2	353016
FEB. 2019	96.6	97.7	-1.3	5.9	299310
MAR. 2019	96.1	97.1	-1.4	5.7	265844
APR. 2019	84.6	95.9	-1.9	7.2	273258
MAY 2019	94.9	96.1	-1.7	6.6	255681
JUN. 2019	93.4	94.8	-2.3	7.4	263748
JUL. 2019	95.67	96.73	-1.5	6.55	444495
AUG. 2019	96.57	97.48	-1.3	6.05	513778
SEP. 2019	97.30	97.90	-1.0	5.25	533137
OCT. 2019	98.25	98.80	-0.6	4.11	554373
NOV. 2019	97.81	98.55	-0.9	4.76	410550
DEC. 2019	97.18	98.07	-1.1	5.61	321765

Table 28: Monthly quality assessment results from comparing the OSI SAF sea ice concentration product to MET Norway ice service analysis for the Svalbard area. From JAN. 2019 to DEC. 2019. First two columns shows how often there is agreement within 10 and 20% concentration.

Based on the quality flags in the sea ice products, monthly statistics for the confidence levels are derived for each product type as Code 0-5: 0 -> not processed, no input data; 1 -> computation failed; 2 -> processed but to be used with care; 3 -> nominal processing, acceptable quality; 4 -> nominal processing, good quality; 5 -> nominal processing, excellent quality'. Code 1-5 is given as fraction of total processed data (code 5+4+3+2+1 = 100%). 'Unprocessed' is given as fraction of total data (total data = processed data + unprocessed data).

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JUL. 2019	74.15	25.85	0.00	0.00	0.00	0.00
AUG. 2019	78.39	21.61	0.00	0.00	0.00	0.00
SEP. 2019	85.17	14.83	0.00	0.00	0.00	0.00
OCT. 2019	83.47	16.53	0.00	0.00	0.00	0.00
NOV. 2019	78.72	21.28	0.00	0.00	0.00	0.00
DEC. 2019	76.98	23.02	0.00	0.00	0.00	0.00

Table 29: Statistics for sea ice concentration confidence levels, Code 0-5, Northern Hemisphere.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JUL. 2019	71.88	28.12	0.00	0.00	0.00	0.00
AUG. 2019	60.25	39.75	0.00	0.00	0.00	0.02
SEP. 2019	64.27	35.73	0.00	0.00	0.00	0.03
OCT. 2019	65.55	34.45	0.00	0.00	0.00	0.03
NOV. 2019	70.45	29.55	0.00	0.00	0.00	0.02
DEC. 2019	80.81	19.19	0.00	0.00	0.00	0.00

Table 30: Statistics for sea ice concentration confidence levels, Code 0-5, Southern Hemisphere.

Comments:
Figure 23 and Figure 27 provide the essential information on the compliance of the sea ice concnetration product accuracy, showing the std. Dev. of the diffence in ice concentration between the OSI SAF product and the DMI ice analysis for NH and NIC ice analysis for SH, respectively. Average yearly SD for the period can be seen in the table just below. The product are with target accuracy of 10 % and 15 % for the NH and SH products, respectively.

Average yearly standard deviation		
	Average SD Ice	Average SD Water
Northern Hemisphere	5.95	4.12
Southern Hemisphere	9.03	2.32

5.3.2. Global sea ice concentration (OSI-408) quality

The OSI-408 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-b) 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.

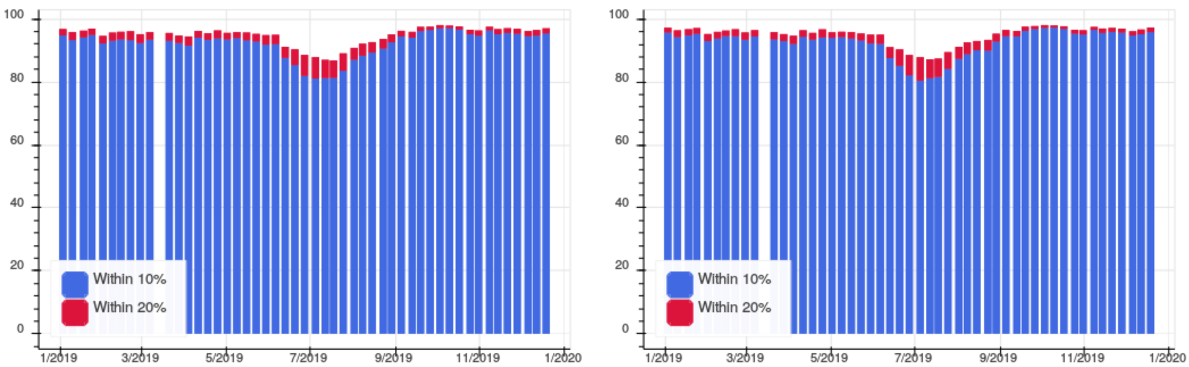


Figure 29: Comparison of ice concentrations from the Greenland overview charts made by DMI and the OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right. Northern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%

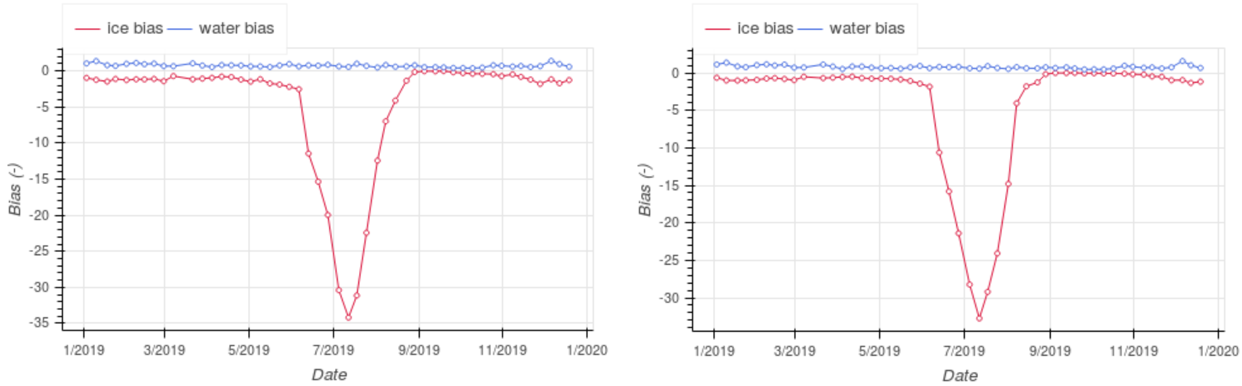


Figure 30: Difference between ice concentrations from the Greenland overview charts made by DMI and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Northern Hemisphere

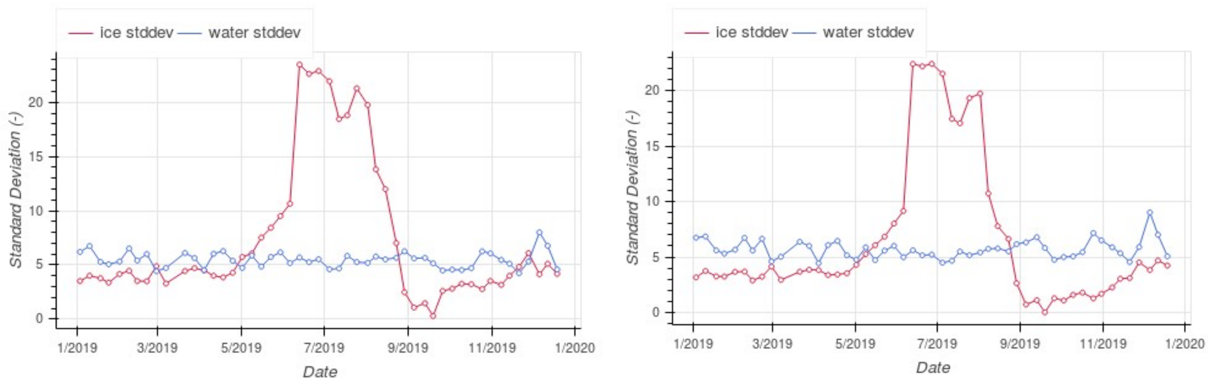


Figure 31: Standard deviation of the difference in ice concentrations from the Greenland overview charts made by DMI and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Northern hemisphere.

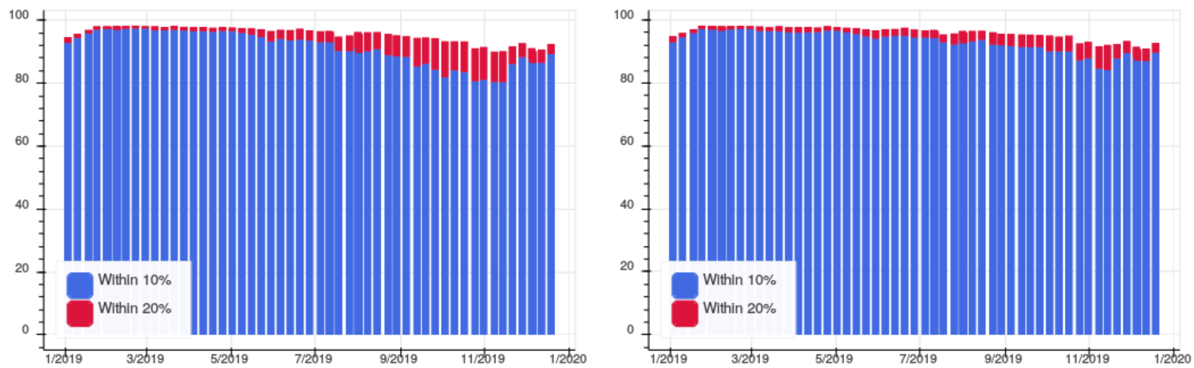


Figure 32: Comparison of ice concentrations from the NIC ice analysis and the OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right. Southern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%

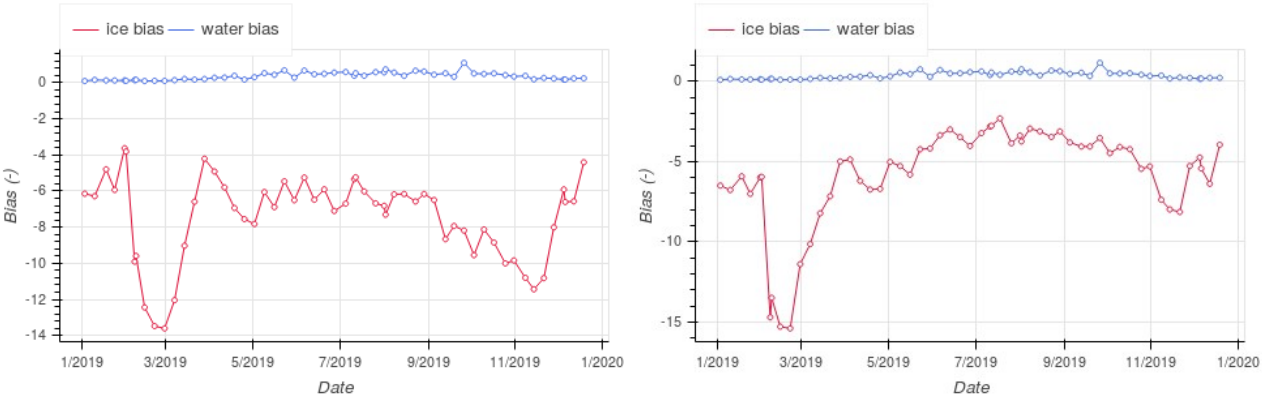


Figure 33: Difference between ice concentrations from the NIC ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Southern Hemisphere

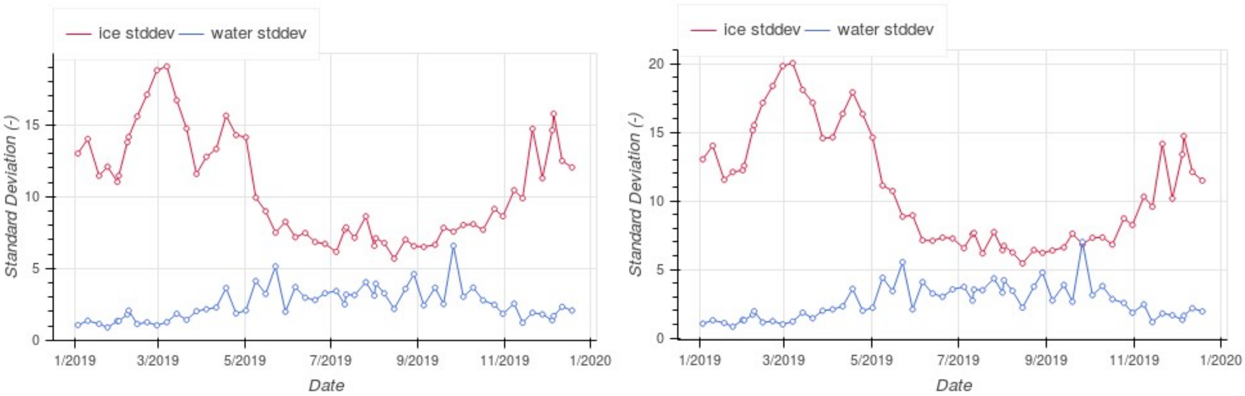


Figure 34: Standard deviation of the difference in ice concentrations from the NIC ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and, ice. Southern hemisphere.

Comments:
Figure 31 and Figure 34 provide the essential information on the compliance of the sea ice concentration product accuracy, showing the std. Dev. of the diffence in ice concentration between the OSI SAF product and the DMI ice analysis for NH and NIC ice analysis for SH, respectively. Average yearly SD for the period can be seen in the table just below. The product are with target accuracy of 10 % and 15 % for the NH and SH products, respectively.

Average yearly standard deviation		
	Average SD Ice	Average SD Water
OSHD algorithm NH	7.33	5.49
TUD algorithm NH	6.43	5.74
OSHD algorithm SH	10.72	2.52
TUD algorithm SH	11.06	2.61

5.3.3. Global sea ice edge (OSI-402-c) quality

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

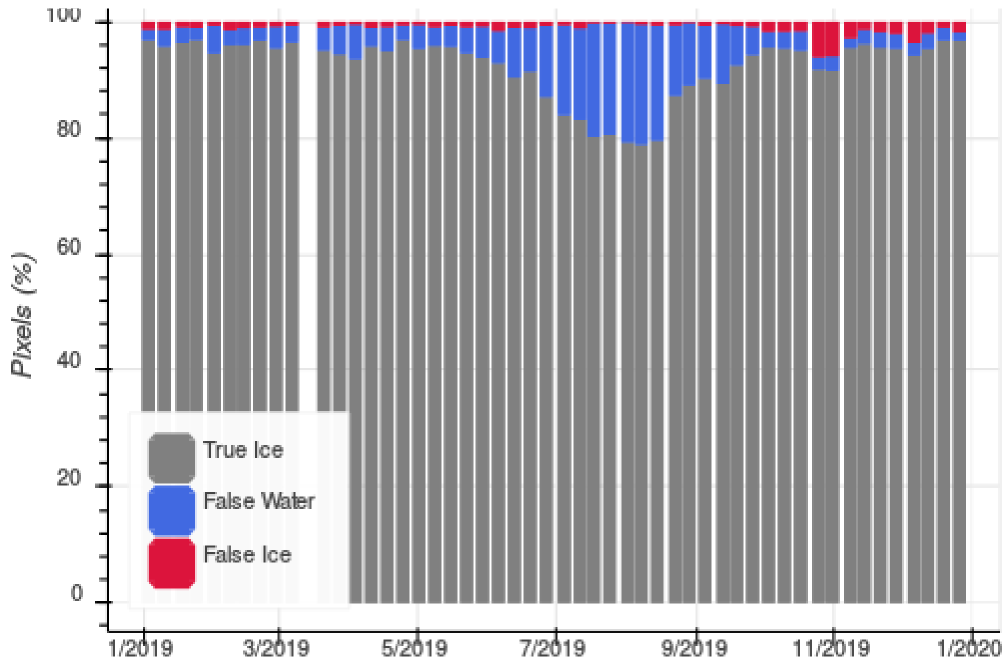


Figure 35: Comparison between the Greenland overview charts made by DMI and the OSI SAF sea ice edge product. Northern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the DMI ice analysis indicated ice and vice versa for the 'False Ice' category.

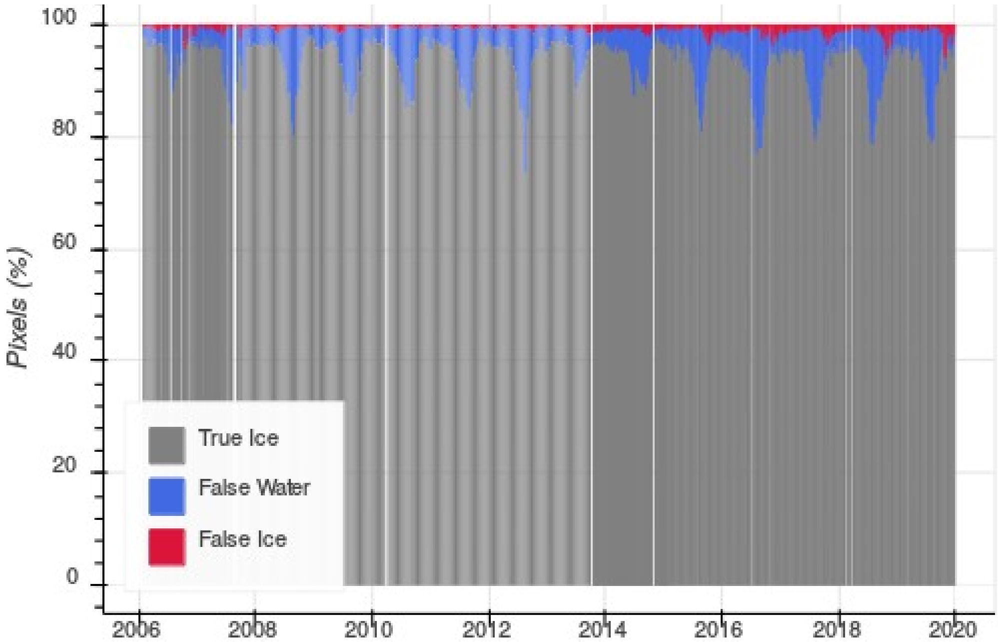


Figure 36: Multiyear variability. Comparison between the Greenland overview charts made by DMI and the OSI SAF sea ice edge product. Northern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the DMI ice analysis indicated ice and vice versa for the 'False Ice' category.

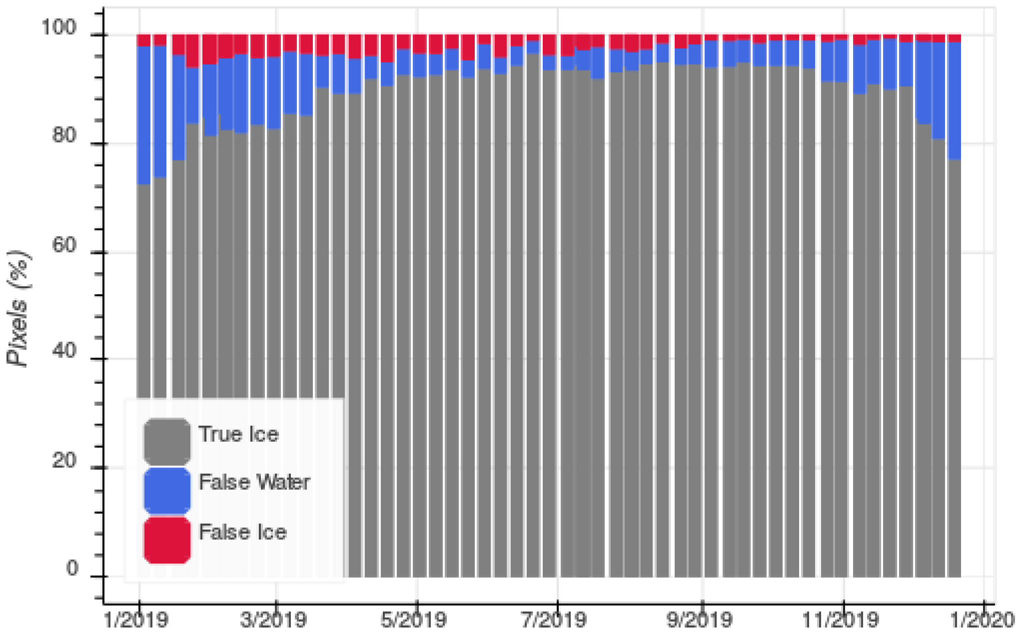


Figure 37: Comparison between the NIC ice analysis and the OSI SAF sea ice edge product. Southern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the NIC ice analysis indicated ice and vice versa for the 'False Ice' category.

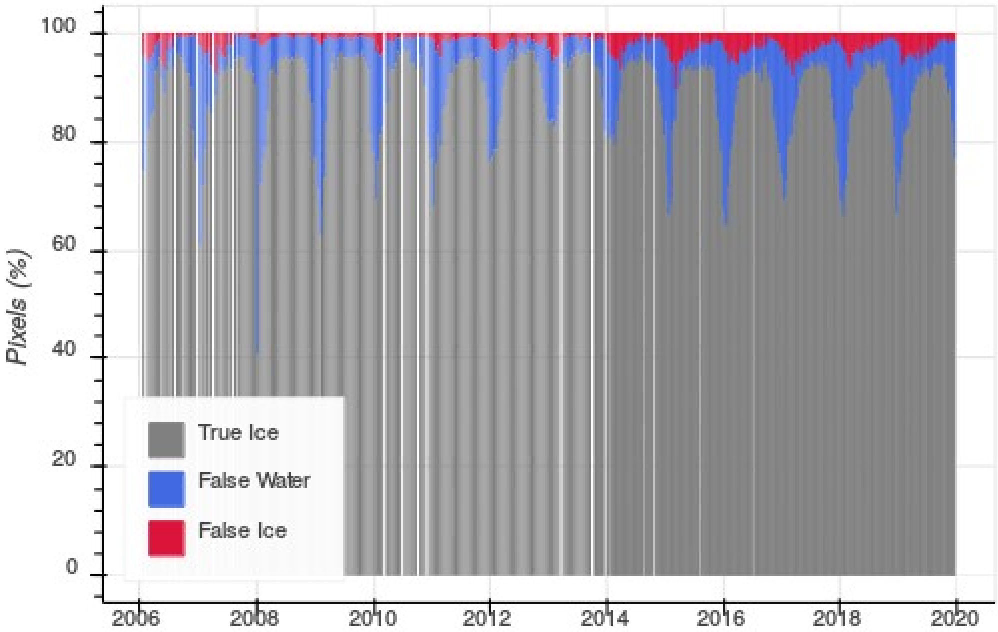


Figure 38: Multiyear variability. Comparison between the NIC ice analysis and the OSI SAF sea ice edge product. Southern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the NIC ice analysis indicated ice and vice versa for the 'False Ice' category.

Month	Correct [%]	SAF lower [%]	SAF higher [%]	Mean edge diff [km]	Number of obs.
JAN. 2019	98.12	1.15	0.73	13.52	657046
FEB. 2019	97.94	1.01	1.05	10.82	611697
MAR. 2019	97.91	1.25	0.84	16.31	563106
APR. 2019	97.59	1.43	0.99	17.75	564863
MAY 2019	97.98	1.05	0.97	18.08	491884
JUN. 2019	96.95	2.20	0.85	20.18	470181
JUL. 2019	97.32	2.07	0.61	17.1	637662
AUG. 2019	98.09	1.34	0.57	16.5	680310
SEP. 2019	98.87	0.67	0.46	19.02	664994
OCT. 2019	98.96	0.37	0.67	10.09	725620
NOV. 2019	98.32	0.68	1.00	9.53	660968
DEC. 2019	98.48	0.78	0.74	10.61	573464

Table 31: Monthly quality assessment results from comparing OSI SAF sea ice products to MET Norway ice service analysis for the Svalbard area, from JAN. 2019 to DEC. 2019. Mean edge diff is the mean difference in distance between the ice edges in the OSI SAF edge product and MET Norway ice chart.

Month	Correct [%]	SAF lower [%]	SAF higher [%]	Mean edge diff [km]	Number of obs.
JAN. 2019	96.94	2.90	0.16	70.34	368716
FEB. 2019	98.81	0.93	0.26	52.66	369104
MAR. 2019	99.03	0.54	0.43	29.57	369416
APR. 2019	99.04	0.71	0.25	20.71	460955
MAY 2019	-	-	-	-	-
JUN. 2019	-	-	-	-	-
JUL. 2019	-	-	-	-	-
AUG. 2019	-	-	-	-	-
SEP. 2019	-	-	-	-	-
OCT. 2019	98.44	1.36	0.2	32.38	184086
NOV. 2019	98.23	1.55	0.22	23.73	368172
DEC. 2019	94.05	5.56	0.38	57.27	460310

Table 32: Monthly quality assessment results from comparing OSI SAF sea ice products to MET Norway ice service analysis for the Weddell Sea area, from JAN. 2019 to DEC. 2019. Mean edge diff is the mean difference in distance between the ice edges in the OSI SAF edge product and MET Norway ice chart.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JUL. 2019	85.71	1.45	6.42	5.13	1.29	51.35
AUG. 2019	91.19	0.95	3.48	3.53	0.85	51.10
SEP. 2019	95.03	0.99	1.95	1.63	0.39	51.56
OCT. 2019	95.03	1.13	2.09	1.34	0.42	52.42
NOV. 2019	88.30	3.03	5.63	2.55	0.48	53.18
DEC. 2019	83.02	3.95	9.46	3.01	0.56	53.70

Table 33: Statistics for sea ice edge confidence levels, Code 0-5, Northern Hemisphere.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JUL. 2019	74.04	7.85	11.49	5.73	0.88	22.41
AUG. 2019	71.53	8.10	12.65	6.76	0.96	22.44
SEP. 2019	68.99	8.52	13.81	7.52	1.16	22.41
OCT. 2019	68.77	7.84	13.37	8.60	1.43	22.41
NOV. 2019	72.46	4.46	12.73	8.45	1.90	22.41
DEC. 2019	82.84	2.79	6.56	5.56	2.24	22.41

Table 34: Statistics for sea ice edge confidence levels, Code 0-5, Southern Hemisphere.

Comments:
In Table 29 the Northern Hemisphere OSI SAF ice edge product is compared with navigational ice charts from the Svalbard region (MET Norway ice service). The yearly averaged edge difference for the 12 months in 2019 is 15.0 km and the target accuracy requirement of 20 km edge difference is therefore met. As previous years, the monthly differences are well below the yearly requirement all months except the summer months of June, when melting of snow and ice makes the product quality worse.
In Table 30 the Southern Hemisphere OSI SAF ice edge product is compared with weekly navigational ice charts from the Weddel Sea region (MET Norway ice service) covering SH

summer period October-April. The 2019 yearly averaged edge difference for the 7 months containing ice charts is 41.0 km and the target accuracy requirement of 45 km edge difference is therefore met. The monthly differences are well below the yearly requirement all months except the SH mid-summer months of December, January and February, when melting of snow and ice makes the product quality worse.

5.3.4. Global sea ice type (OSI-403-c) 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 (st dev) in the difference from the running mean of the multi-year ice (MYI) area coverage shall be below 100.000km2 to meet the target accuracy requirement.

Month	SD wrt running mean [km²]	Mean MYI coverage [km²]
JAN. 2019	27756	1599028
FEB. 2019	39994	1319614
MAR. 2019	37488	1164778
APR. 2019	42094	1018201
MAY 2019	80717	1170443
JUN. 2019	-	-
JUL. 2019	-	-
AUG. 2019	-	-
SEP. 2019	-	-
OCT. 2019	106933	2297619
NOV. 2019	69843	2313436
DEC. 2019	53103	2333853

Table 35: Monitoring of NH sea ice type quality by comparing the multi year coverage with the 11-days running mean

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JUL. 2019	84.96	0.36	0.36	14.10	0.21	51.35
AUG. 2019	89.81	0.23	0.22	9.61	0.14	51.10
SEP. 2019	91.00	0.12	0.12	8.70	0.06	51.56
OCT. 2019	97.45	0.77	1.07	0.64	0.08	52.42
NOV. 2019	97.62	0.54	1.37	0.38	0.10	53.18
DEC. 2019	94.81	0.59	4.02	0.47	0.11	53.70

Table 36: Statistics for sea ice type confidence levels, Northern Hemisphere.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JUL. 2019	70.42	0.23	0.32	28.92	0.12	22.41
AUG. 2019	66.15	0.23	0.34	33.16	0.12	22.44
SEP. 2019	64.42	0.23	0.35	34.88	0.12	22.41
OCT. 2019	65.24	0.26	0.36	33.98	0.16	22.41
NOV. 2019	71.22	0.32	0.38	27.86	0.22	22.41
DEC. 2019	82.69	0.38	0.40	16.15	0.33	22.41

Table 37: Statistics for sea ice type confidence levels, Southern Hemisphere.

Comments:
In Table 33, the mid-column represents the monthly standard deviations of the daily MYI coverage variability. All months have values well below the requirement of 100.000 km2, except October where the variability is just above the requirement. Generally there is a higher variability in October which is in the beginning of the freezing period with very little training data for first-year ice. But also a warm air intrusion over the ice north of Svalbard around the 8 October caused a temporary drop in the multiyear ice coverage which was restored after a couple of days. This resulted in the higher variability for October.

5.3.5. Sea ice emissivity (OSI-404) quality

The near 50 GHz sea ice emissivity product is compared to the 50.3 GHz and 52.8 GHz vertical polarized surface emissivity (which is the same at these two frequencies) at an incidence angle at 50 degrees. The product emissivity covers all incidence angles from nadir to 60 degrees but the validation product is derived from measurements at 50 degrees. The validation emissivity product is derived from NWP data and SSMIS satellite data. Both the OSI SAF product and the validation products cover the entire northern and southern hemisphere sea ice cover, including all ice types and seasons. The total mean difference plot in figure 58 is the difference between the hemispheric OSI SAF product and the validation product. The OSI SAF operational emissivity is higher than the validation product on the southern hemisphere giving a positive bias. The northern hemisphere has a negative bias. The mean annual difference on the northern hemisphere is -0.005 and on the southern hemisphere it is -0.03. There is no clear seasonal cycle neither on the northern nor southern hemisphere.

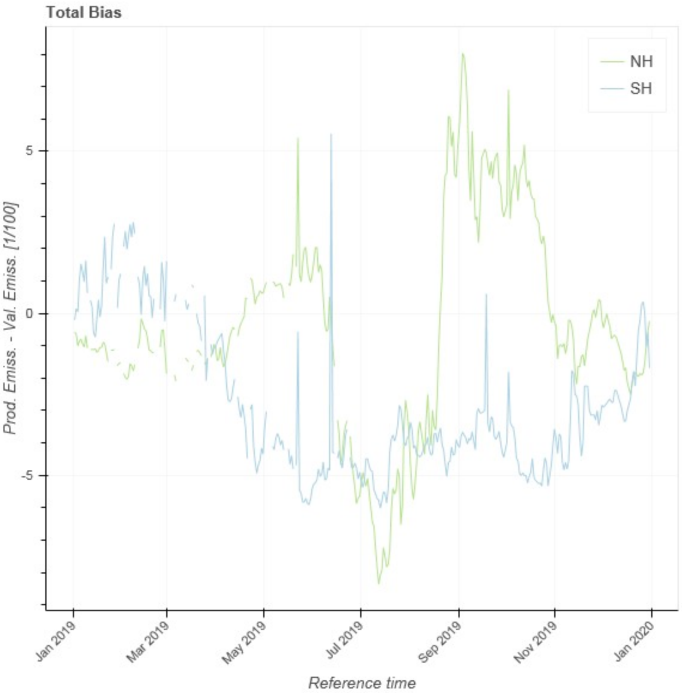


Figure 39: The mean hemispheric difference between the OSI SAF operational product and the validation product derived from NWP and SSMIS data. The y-axis unit is in hundreds (1/100)

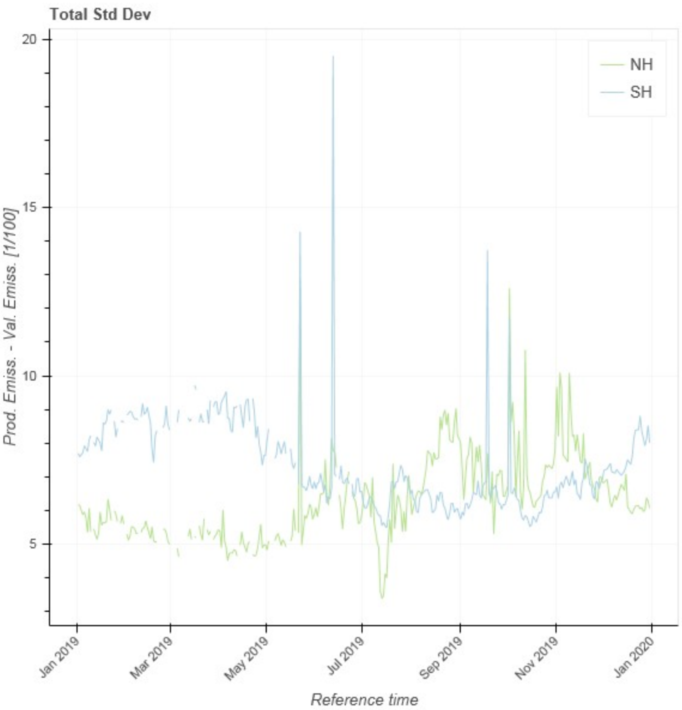


Figure 40: The standard deviation of the difference between the OSI SAF operational product and the validation product for the northern and southern hemispheres. The y-axis unit is in hundreds (1/100)

Comments:
The emissivity mean difference and the emissivity standard deviation are summarized in the table just below and compared to target and threshold accuracies. The emissivity product does not fulfil the target accuracy, but it is well within threshold accuracy.

	Mean difference	SD	Target accuracy	Threshold accuracy
NH	-0.005	0.06	± 0.05	± 0.15
SH	-0.03	0.07	± 0.05	± 0.15

5.3.6. 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-F17) are reported upon. In those tables, X(Y) are the X and Y components of the drift vectors. b() is the mean difference and σ() the standard deviation of the $\varepsilon(X) = X_{prod} - X_{ref}$. Columns α, β and ρ 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.

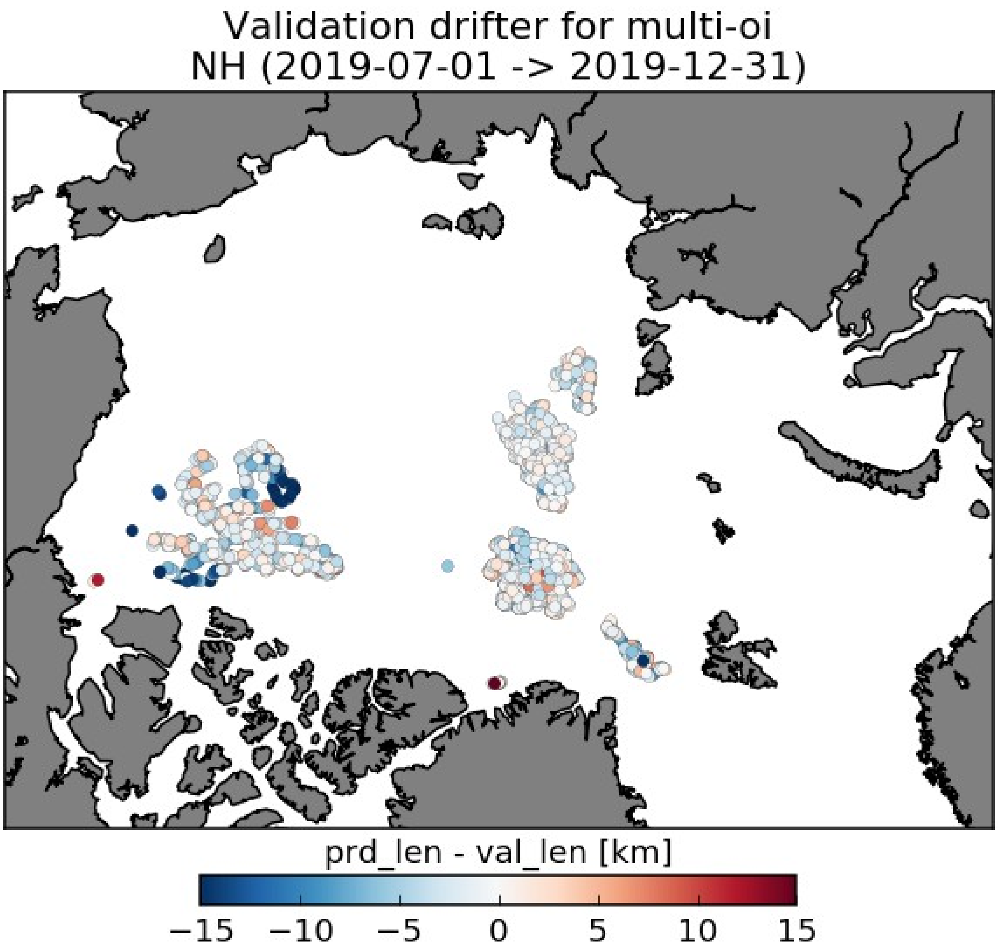


Figure 41: Location of GPS drifters for the quality assessment period (JULY to DEC. 2019). The shade of each symbol represents the mean difference (prod-ref) in drift length (km over 2 days) for the multi-oi product.

Month	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
JAN. 2019	0,19	-0,44	2,19	2,58	0,93	0,16	0,96	594
FEB. 2019	-0,35	-0,48	2,73	2,95	0,88	0,56	0,95	529
MAR. 2019	-0,46	-1,27	2,83	5,14	0,75	0,46	0,93	518
APR. 2019	0,14	0,1	2,22	2,11	0,98	0,16	0,96	436
MAY 2019	0,15	-0,8	2,48	3,33	0,9	0	0,94	441
JUN. 2019	-0,17	-0,54	4,2	4,29	0,86	0	0,93	377
JUL. 2019	-0.194	-0.309	4.617	4.479	0.75	0.015	0.88	342
AUG. 2019	+0.327	+0.900	6.202	5.894	0.78	0.628	0.89	280
SEP. 2019	+0.415	-0.802	4.329	4.358	0.92	-0.238	0.96	317
OCT. 2019	+0.148	-0.216	2.357	2.550	0.96	0.062	0.98	659
NOV. 2019	-0.090	-0.042	2.415	2.122	0.95	-0.023	0.99	752
DEC. 2019	+0.023	-0.224	1.916	1.777	0.97	-0.133	0.99	811
Last 12 months	-0.008	-0.355	3.086	3.398	0.91	0.032	0.96	6056

Table 38: Quality assessment results for the LRSID (multi-oi) product (NH) for JAN. 2019 to DEC. 2019.

Month	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
JAN. 2019	0,22	-0,48	2,68	3,57	0,97	0	0,94	345
FEB. 2019	-0,29	-0,28	3,62	3,84	0,96	0,04	0,91	488
MAR. 2019	-0,17	-0,7	3,33	4,35	0,84	0,29	0,91	469
APR. 2019	0,03	-0,07	3,68	3,76	0,97	0,02	0,9	394
MAY 2019	--	--	--	--	--	--	--	0
JUN. 2019	--	--	--	--	--	--	--	0
JUL. 2019	--	--	--	--	--	--	--	0
AUG. 2019	--	--	--	--	--	--	--	0
SEP. 2019	--	--	--	--	--	--	--	0
OCT. 2019	+0.137	-0.202	4.309	4.181	0.98	0.036	0.94	546
NOV. 2019	-0.162	+0.123	3.829	4.061	0.97	0.030	0.96	683
DEC. 2019	-0.189	-0.331	3.852	3.244	0.99	-0.270	0.96	776
Last 12 months	-0.085	-0.254	3.716	3.860	0.97	-0.078	0.95	3701

Table 39: Quality assessment results for the LRSID (SSMIS-F18) product (NH) for JAN. to DEC. 2019.

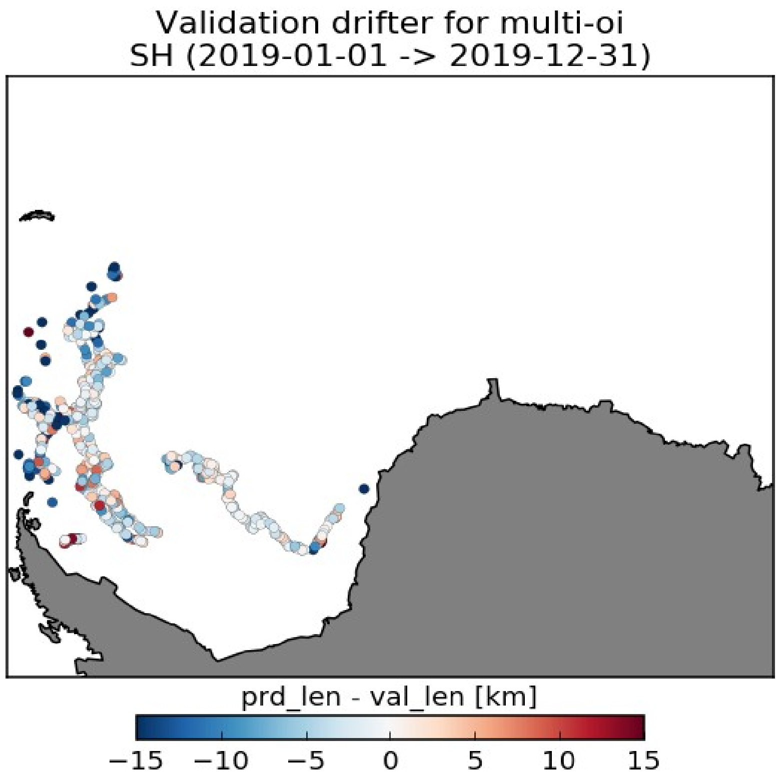
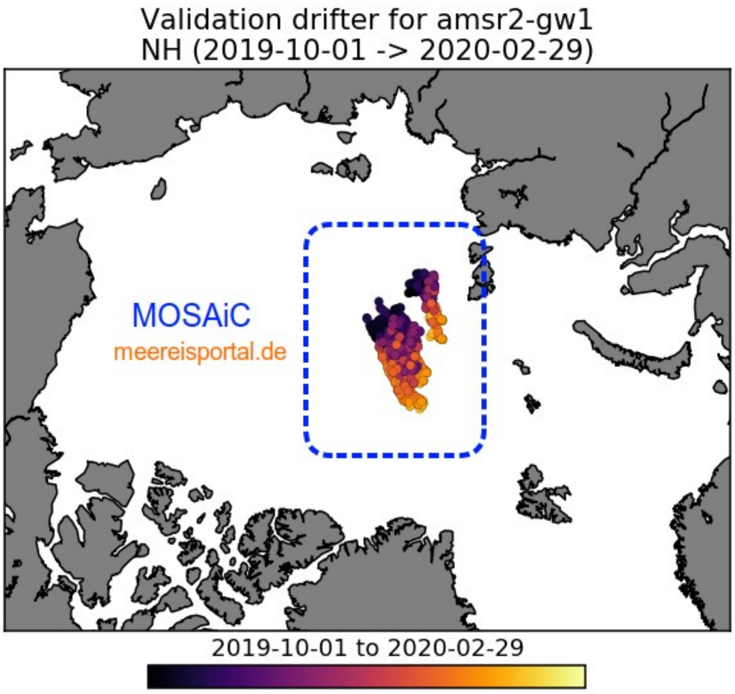


Figure 42: Location of GPS drifters for the quality assessment period (JAN. 2019 to DEC. 2019). The shade of each symbol represents the mean difference (prod-ref) in drift length (km over 2 days) for the multi-oi product.

Products	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
multi-oi	-0.501	+0.612	6.405	6.258	0.85	-0.954	0.93	771
ssmis-f18	+0.012	+0.420	6.402	5.588	0.92	-0.357	0.94	450
amsr2-gw1	-0.126	+0.351	5.368	4.353	0.92	-0.472	0.96	501

Table 40: Quality assessment results for selected OSI-405-c products (SH) for the last 12 months (JAN. to DEC. 2019).

Comments:
In the NH, the OSI-405-c products have performed remarkably well over the recent freezing season (Oct-Dec 2019) and in general over the lat 12 months (Jan-Dec 2019). All NH statistics are nominal and below the thresholds. From Oct 2019 there is a boost in availability of GPS drifters in the Trans Polar Drift, with the MOSAiC expedition (see figure below, that includes GPS records up until 10th February 2020).



In the SH, the yearly evaluation of OSI-405-c products does not result in good statistics. This is mainly because there are too few buoy data available, and a large number of them are in the outskirt of the sea-ice cover (Figure 42), where spatio-temporal variability of sea-ice motion is largest. Because OSI-405-c computes sea-ice drift vectors from daily gridded maps of satellite observations (e.g. brightness temperature, backscatter,…) a significant part of this spatio-temporal variability is blurred during the daily mapping process. It is anticipated that processing sea-ice drift vectors from individual swaths of satellite data (instead of daily maps) will help, which is a product evolution being considered for CDOP4.

5.3.7. Medium resolution sea ice drift (OSI-407) 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 buoys (e.g. the Ice Tethered Profilers) or ice camps (e.g. the Russian manned stations) that report their position at typically hourly to 3 hourly intervals. They are made available in near-real-time via the GTS network at DMI. Argos data in the DMI GTP data have no quality flags and accuracy can be greater than 1500 m. It has been shown that the MR ice drift mean difference statistics improves significantly when validation is performed against high accuracy GPS drifters only (OSI-407 validation report and Phil Hwang, 2013. DOI: 10.1080/01431161.2013.848309). The CDOP3 WP22910 'HL temperature and sea ice drift in-situ validation database' includes work to archive and improve quality control of drifter data to be used in the MR ice drift validation.

A nearest-neighbor approach is implemented for the collocation and any collocation pair whose distance between the 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 satellite pairs 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 41 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 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.

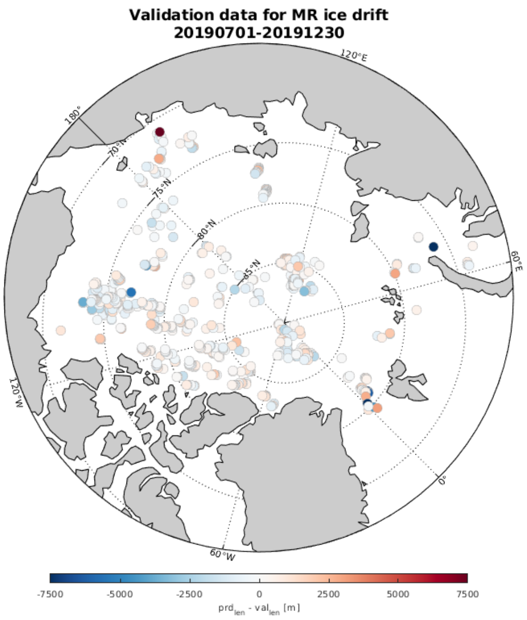


Figure 43: Location of GPS drifters for the quality assessment period (JUL. 2019 to DEC. 2019). The shade of each symbol represents the difference (prod-def) in drift length in meters

Month	b(X) [m]	b(Y) [m]	σ(X) [m]	σ(Y) [m]	α	β [m]	ρ	N
JAN. 2019	48	-42	781	790	0.94	-0.3	0.977	11306
FEB. 2019	-137	37	810	725	0.97	55.3	0.992	4482
MAR. 2019	11	57	756	1085	0.97	0.8	0.986	4026
APR. 2019	43	-98	1260	1725	0.92	31.5	0.926	3986
MAY 2019	192	51	1726	1679	0.93	-173	0.951	3740
JUN. 2019	90	58	596	797	0.98	-61.2	0.989	1928
JUL. 2019	326	-679	776	1200	1.06	194.8	0.963	2440
AUG. 2019	-37	-411	952	1126	0.92	-6.5	0.948	72
SEP. 2019	279	-270	786	406	0.96	-37.7	0.980	236
OCT. 2019	-688	730	2259	3199	0.82	-294.3	0.740	1094
NOV. 2019	39	-117	1024	1140	0.98	43.8	0.977	2722
DEC. 2019	-87	171	1159	1032	0.95	40.8	0.982	5282
Last 12 months	19	-13	1085	1243	0.96	9.5	0.971	41314

Table 41: MR sea ice drift product (OSI-407) performance, JAN. to DEC. 2019

Comments:
The product requirement target accuracy of 2 km standard deviation is met.
Semi-automatic quality control (based on threshold on maximum buoy drift, 20+km difference between observation and product, visual inspection on drift scatter plots (buoy vs. satellite), and inspection of extreme outliers) has been carried out for the second half year of 2019.
Match-ups were found with 169 individual buoys during this period, after carrying out the automated nearest-neighbour approach.
After further quality control 71 buoys were disqualified, and the remaining 98 were used for the statistics shown in the table above.

The following buoys were disqualified because they are supposedly grounded or located too far to the south to be drifting in ice (based on visual inspection of the buoy locations):
2501667, 4401821, 4802504, 6202679, 6203558, 6203578, 6203579, 6203721, 6301548, 6301686, 6301690, 6401783, 6401788, 6401799, 6401800, 6401802, 2501542, 2601624, 2601625, 4101624, 4101660, 4101663, 4101772, 4401549, 4401558, 4401779, 4401824, 4401826, 4402530, 4601550, 4701658, 4701659, 4701660, 4800632, 4800642, 4800726, 4800769, 4800770, 4801632, 4801639, 4801671, 4802503, 4802512, 4802539, 6202676, 6202681, 6202682, 6203527, 6203564, 6203566, 6203570, 6203571, 6203577, 6203711, 6203722, 6301507, 6301536, 6301540, 6301558, 6301684, 6301685, 6301687, 6301689, 6400528, 6401501, 6401546, 6401550, 6401556, 6401780, 6401782, 6401786

5.4. Global Wind quality (OSI-102, OSI-102-b, OSI-104, OSI-104-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 2018 to December 2019. Before computing the statistics, 0.2 m/s is added to the ECMWF winds in order to convert the real model winds into neutral winds. As of 25 September 2018, the products contain stress-equivalent ECMWF model background winds instead of real 10m winds and the 0.2 m/s correction is not applied any more. The scatterometer winds are also stress-equivalent winds.

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 buoy winds. Note that local small scale wind variations, which are resolved by the buoys but not by the scatterometer, 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 http://nwpsaf.eu/site/monitoring/winds-quality-evaluation/scatterometer-mon/.

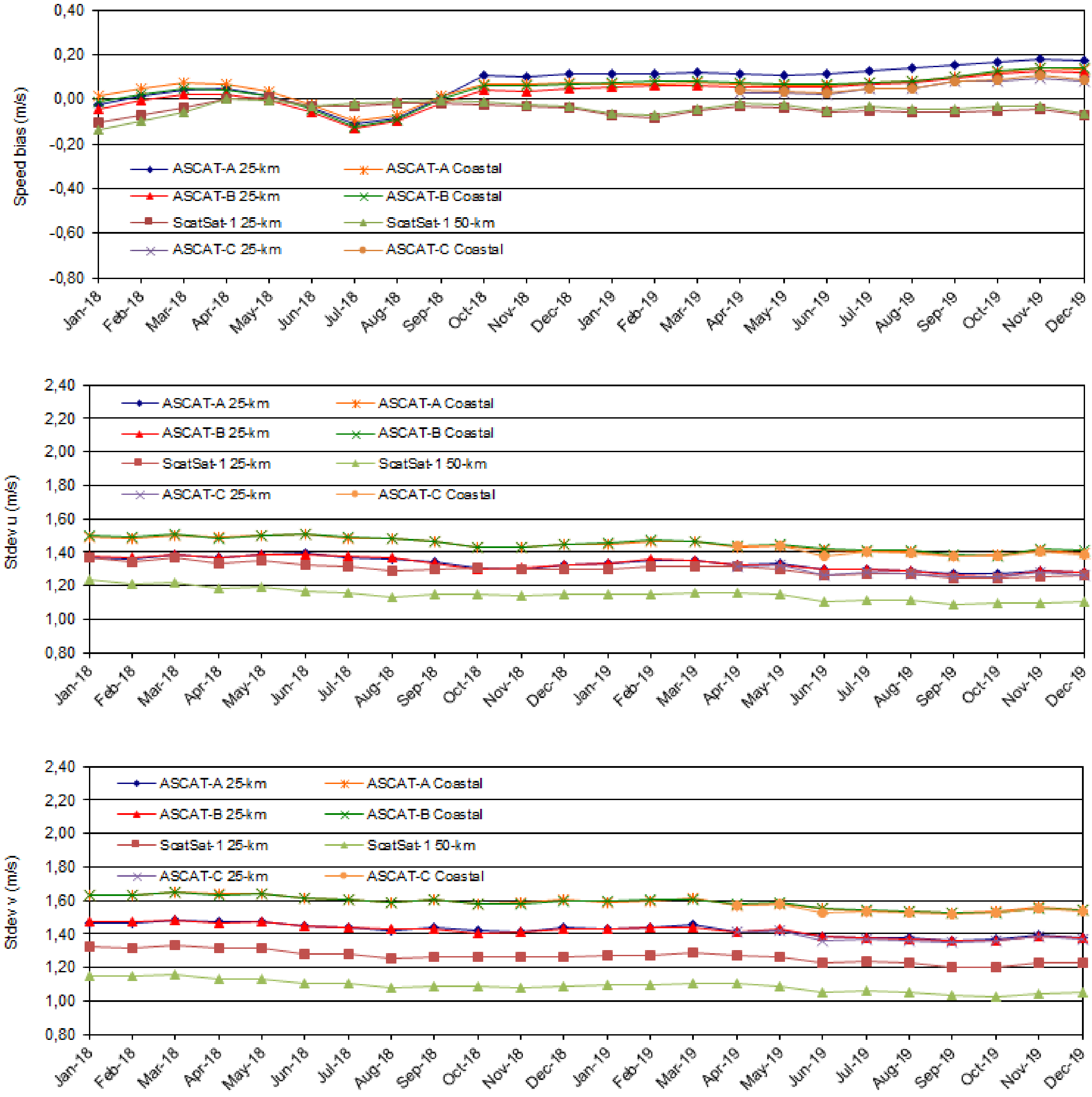


Figure 44: Comparison of scatterometer winds against ECMWF NWP forecast winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus ECMWF, top), wind u component standard deviation (middle) and wind v component standard deviation (bottom) are shown.

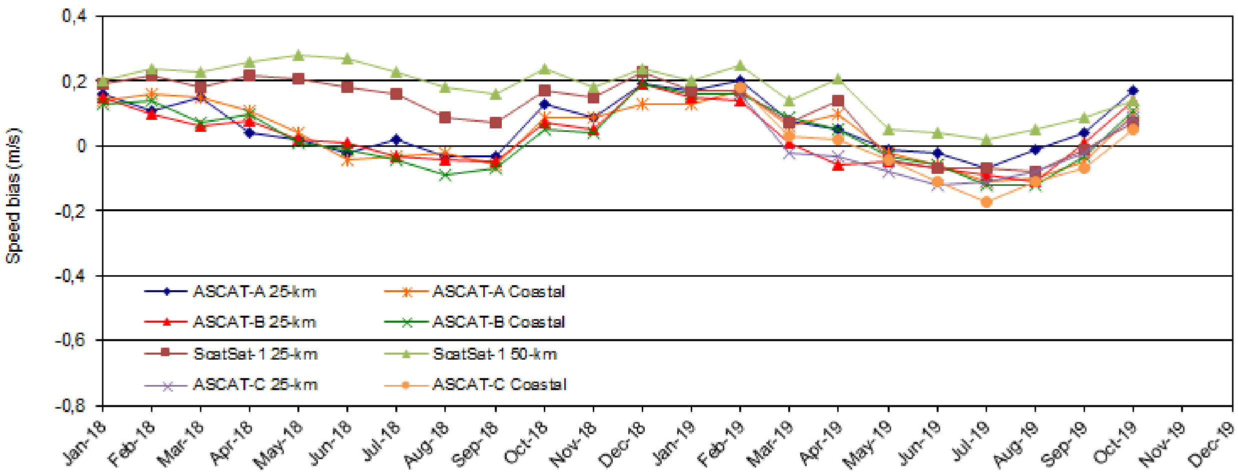
5.4.2. Comparison with buoys

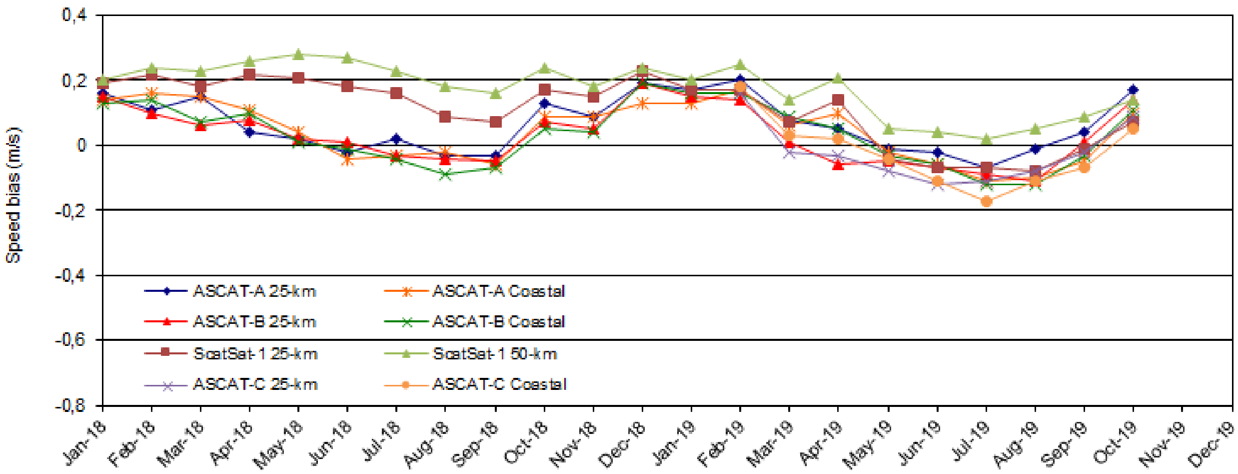
We compare the scatterometer winds with wind data from moored buoys on a monthly basis. The buoy data of approximately 150 buoys spread over the oceans (most of them in the tropical oceans and near Europe and North America) are retrieved from the ECMWF MARS archive and collocated with scatterometer winds. 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 2018 to October 2019. The last months of the reporting period could not be covered since the blacklists from ECMWF were not available yet. These months will be included in the next Operations Report.

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.





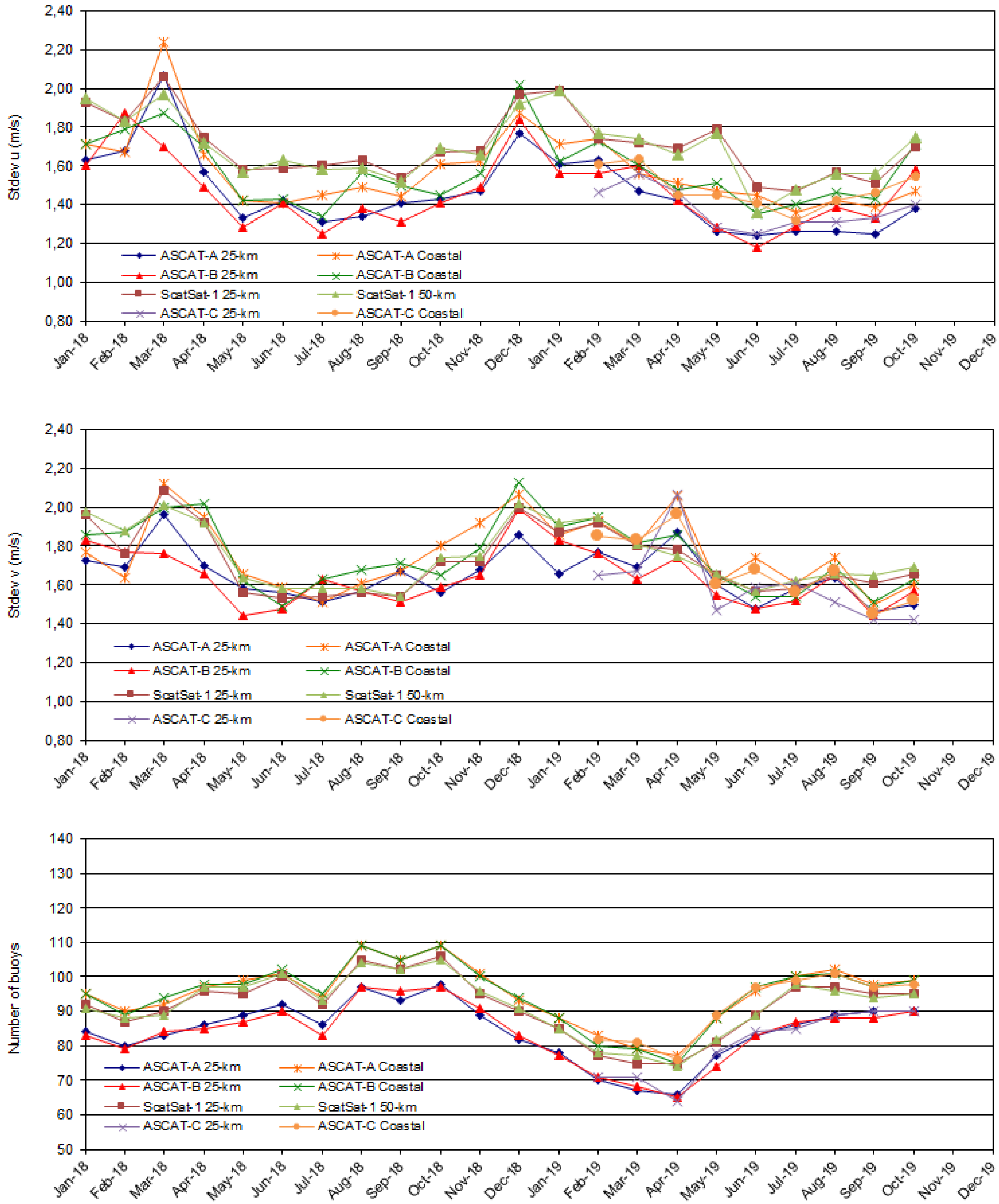


Figure 45: Comparison of scatterometer winds against buoy winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus buoy, top), wind u component standard deviation (2nd plot) and wind v component standard deviation (3rd plot) are shown. Also the number of buoys available 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, http://osi-saf.eumetsat.int, managed by MF/CMS,
- a web site for SS1, http://osi-saf.eumetsat.int/lml/, managed by MF/CMS,
- a web site for SS2, http://osisaf.met.no/, managed by MET Norway,
- a web site for SS3, http://www.knmi.nl/scatterometer/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 central OSI SAF web site and help desk

6.1.1.1. Statistics on the registered users

Statistics on the central Web site use		
Month	Registered users	Pages
JUL. 2019	1591	1313
AUG. 2019	1640	1366
SEP. 2019	1661	1490
OCT. 2019	1691	1759
NOV. 2019	1714	1915
DEC. 2019	1737	1544

Table 42: Statistics on central OSI SAF web site use over 2nd half 2019.

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

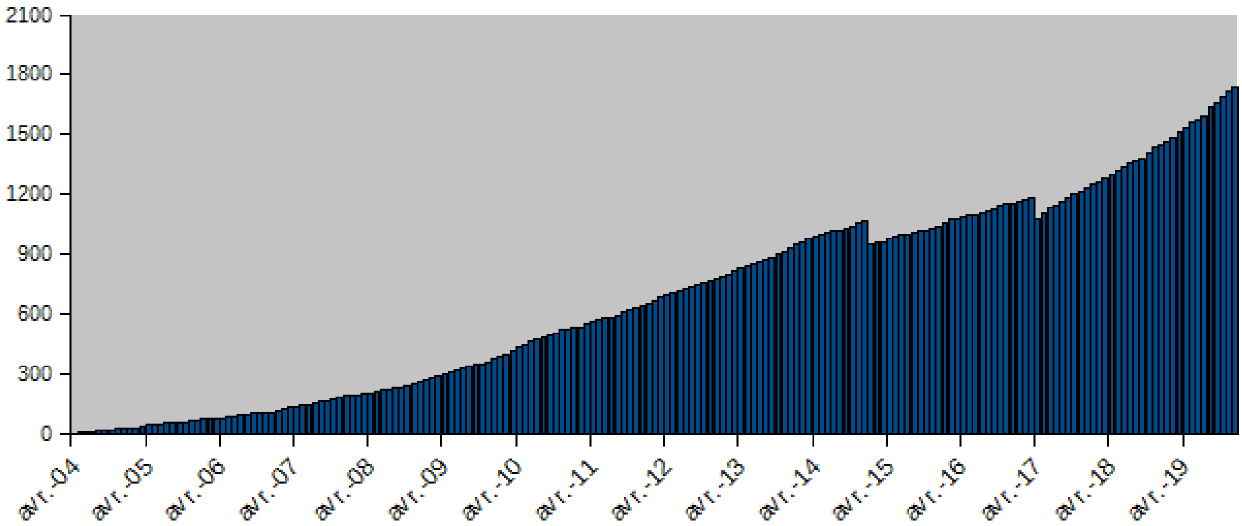


Figure 46: Evolution of external registered users on the central Web Site from April 2004 to DEC. 2019.

Comments:
The number of registered users is progressing continuously.

The following table lists the institutions or companies the new registered users (over 2nd half 2019) are from.

Country	Institution, establishment or company
Algeria	Office National de la Météorologie
Autralia	Engineering Excellence Group
Autralia	University of Western Australia
Autralia	University of Tasmania
Brazil	Instituto Nacional de Pesquisas Espaciais
Brazil	Federal University of Viçosa - BRAZIL
Brazil	Universidade Federal do Rio de Janeiro
Brazil	Universidade Federal Fluminense
Canada	Wood Environment & Infrastructure Solutions
China	Shandong University of Science and Technology
China	Ocean University of China
China	Chinese Academy of Sciences
China	Zhejiang University
China	Xiamen University
China	China University of Geoscience, Beijing
China	Wuhan university
China	Nanjing University of Information Science & Technology
China	National Institute of Meteorological Sciences
China	Numerical Prediction Center of CMA
China	Wuhan university
China	Ocean University of China
China	China Meteorological Administration
Costa Rica	National Center of High Technology of Costa Rica
Egypt	Oceanography Department Alexandria University Egypt
France	Université Grenoble Alpes
France	Laboratoire d'Océanologie et de Géosciences
France	Centre National d'Etudes Spatiales
France	Météo-France
Germany	European Organisation for the Exploitation of Meteorological Satellites
Germany	European Space Agency - European Space Research Institute
Germany	European Organisation for the Exploitation of Meteorological Satellites
Germany	Alfred Wegener Institute for Polar and Marine Research
Germany	Helmholtz Zentrum Geesthacht (HZG), Institute of Coastal Research
Greece	Hellenic National Meteorological Service
Greece	Hellenic Center for Marine Research
India	India Meteeorological Department
India	Banaras Hindu University, Varanasi
India	Indian Institute of Technology, Bombay
Indonesia	Fisheries Research Institute
Indonesia	Indonesian Agency for Meteorology Climatology and Geophysics
Indonesia	Sekolah Tinggi Meteorologi Klimatologi dan Geofisika
Iran	Iranian National Institute for Oceanography and Atmospheric Science

Country	Institution, establishment or company
Iran	Atmospheric Science & MEteorological Research Center of Iran
Italia	Sapienza Università di Roma
Italy	University of Napoli Parthenope
Japan	Japan Meteorological Agency
Korea	Korea Hydrographic and Oceanographic Agency
Maroc	Direction de la Météorologie Nationale du Maroc
Mauritus	Marine and Coastal Management
Myanmar	Myanmar Department of Meteorology and Hydrology
Netherlands	Solar Monkey
Netherlands	Royal Netherlands Meteorological Institute
Norway	Yttersia AS
Norway	Norwegian University of Science and Technology, Trondheim
Norway	Norwegian Meteorological Institute
Norway	Nansen Environmental and Remote Sensing Center
Norway	Prototech AS
Norway	Norwegian Meteorological Institute
Philippines	Makati disaster risk reduction and management office
Poland	University of Gdansk, Institute of Oceanography
Portugal	Universidade do Algarve
Portugal	Instituto Superior Técnico
Solomon Islands	Solomon Islands Met Service
Spain	Agencia Estatal de Meteorología
Spain	Universidad de las Islas Baleares
Spain	Universitat de València
Spain	Institut de Ciències del Mar (CSIC)
Spain	Universitat de València
Sweden	Swedish Meteorological and Hydrological Institute
Sweden	Lund University
Taiwan	Department of Meteorology
Tunisia	National Institute of Meteorology of Tunisa
Turkey	Türkish State Meteorological Services
Turkey	Türkish State Meteorological Services
United Kingdom	London Business School
United Kingdom	Met Office
United Kingdom	University of East London
United Kingdom	Aerospace & Marine International (AMI)
United Kingdom	European Space Agency - European Space Research Institute
United States	Florida State University
United States	Joint Typhoon Warning Center
United States	National Oceanic and Atmospheric Administration

Table 43: List of institutes of the new registered users over 2nd half 2019 on the central Web Site

Moreover 46 new individual users, i.e. persons independent from any institute, establishment or company, registered on the period.

6.1.1.2. Statistics on the use of the OSI SAF central Web site

Usage of the OSI SAF central Web Site by country (top 10) over 2nd half 2019 (pages views)						
Countries	JUL. 2019	AUG. 2019	SEP. 2019	OCT. 2019	NOV. 2019	DEC. 2019
China	337	432	453	545	701	539
United States	306	368	414	506	553	435
France	95	121	132	151	243	111
United Kingdom	84	117	101	83	107	75
Senegal	42	63	61	68	44	91
Japan	40	91	30	34	22	27
Russia	12	21	35	44	29	40
India	16	17	38	36	34	37
Germany	27	24	24	23	28	20
Norway	6	20	22	32	29	31
Others/Commercial	76	110	86	77	64	49

Table 44: Usage of the OSI SAF central Web Site by country (top 10) over 2nd half 2019

6.1.1.3. Status of User requests made via the OSI SAF and EUMETSAT Help desks

The user requests are split into 4 categories:

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

The total number of OSI SAF helpdesk inquiries at the LML subsystem in this half year was 8. All of them were acknowledged or answered within three working days. 6 were categorized as ‘info’, 0 as ‘archive’, 2 as ‘unavailable’ and 0 as ‘anomaly’.

The total number of OSI SAF helpdesk inquiries at the HL subsystem in this half year was 15. 13 requests were acknowledged or answered within three working days. 10 were categorized as ‘info’, 1 as ‘archive’, 4 as ‘unavailable’ and 0 as ‘anomaly’.

The total number of OSI SAF helpdesk inquiries at scat@knmi in this half year was 50. All requests were acknowledged or answered within three working days. 33 were categorized as ‘info’, 13 as ‘archive’ and 3 as ‘unavailable’ (all referring to ScatSat-1 outages), and 1 as ‘anomaly’ (referring to a difference between WMO definition and implementation in the ASCAT BUFR products).

6.1.2. Statistics on the OSI SAF Sea Ice Web portal

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

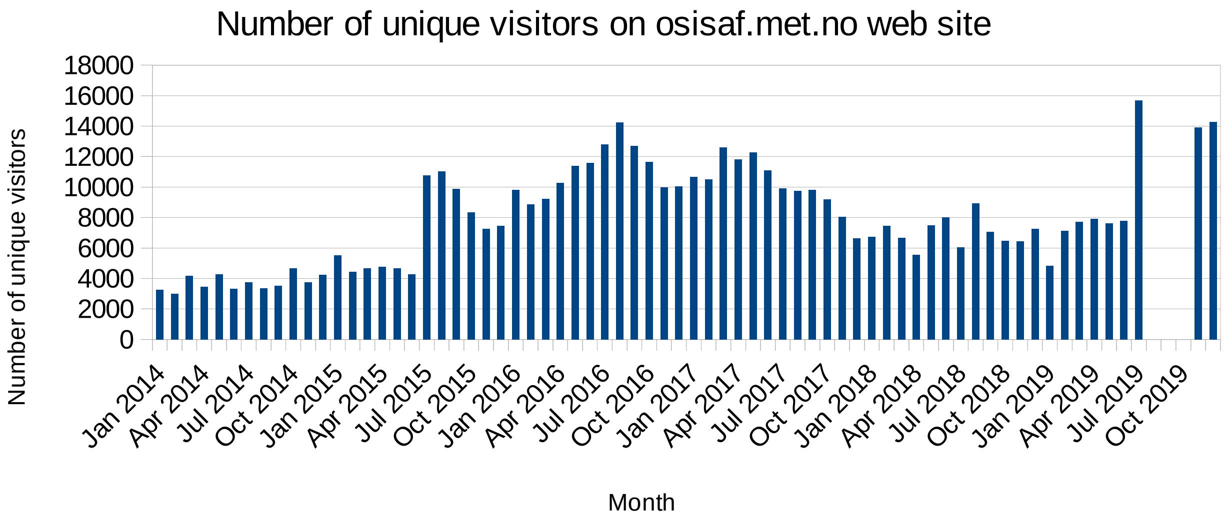


Figure 47: Evolution of unique visitors on the HL OSI SAF Sea Ice portal from January 2014 to DEC. 2019 (http://osisaf.met.no)

6.1.3. Statistics on the OSI SAF KNMI scatterometer web page

The following graph illustrates the evolution of page views on the KNMI scatterometer web pages, which are partly devoted to the OSI SAF wind products, from August 2005 to December 2019. Only external sessions (from outside KNMI) are counted.

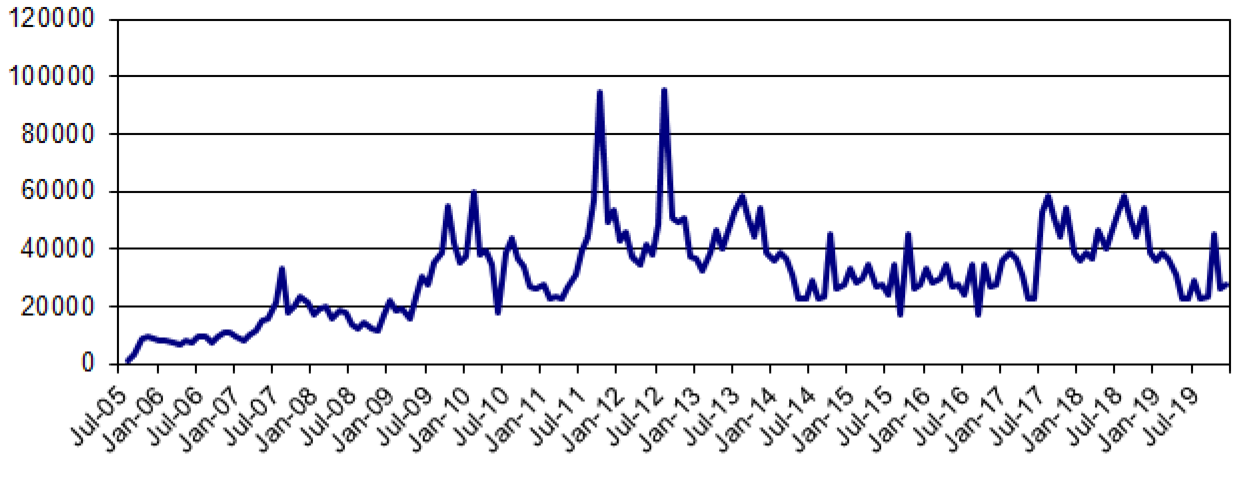


Figure 48: Number of page views on KNMI scatterometer website per month

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

Entity	Shortened name	Country
Météo France		France
Florida State University (2 new users)		USA
Numerical Prediction Center of Chinese Meterological Administration		China
Nanjing Xinda Institute of Meteorological Science & Technology		China
Wuhan University		China
Universitat Politècnica de Catalunya	ETSETB	Spain
Private user		China
IAP RAS		Russia
Aerospace & Marine International		UK
Weather Routing, Inc. (WRI)		USA
University of Alabama in Huntsville		USA
Private user		The Netherlands
US Naval Research Laboratory		USA

Table 45: List of newly registered wind users at KNMI

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 on Ifremer FTP server. 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. 2019		AUG. 2019		SEP. 2019		OCT. 2019		NOV. 2019		DEC. 2019	
		Ifremer FTP/HTTP/WMS/WCS	PO.DAAC	Ifremer FTP/HTTP/WMS/WCS	PO.DAAC	Ifremer FTP/HTTP/WMS/WCS	PO.DAAC	Ifremer FTP/HTTP/WMS/WCS	PO.DAAC	Ifremer FTP/HTTP/WMS/WCS	PO.DAAC	Ifremer FTP/HTTP/WMS/WCS	PO.DAAC
SST MAP +LML		x	x	x	x	x	x	x	x	x	x	x	x
SSI MAP +LML		x	x	x	x	x	x	x	x	x	x	x	x
DLI MAP +LML		x	x	x	x	x	x	x	x	x	x	x	x
OSI-201 series	GBL SST	2013	2642	533	193	433	167	1,394	121	3,310	143	2,986	127
OSI-202 series	NAR SST	1309	453	942	592	576	403	1,313	297	519	340	987	357
OSI-204 series	MGR SST	231106	44212	233,584	50265	229,827	43561	244,242	34187	226,681	38947	396,877	44732
OSI-206 series	Meteosat SST	12444	2150	12,096	2254	9,150	2010	20,996	1321	8,921	1687	15,481	1302
OSI-207 series	GOES-East SST	6298	9	1,582	5	1,429	0	1,455	0	1,355	5	1,492	0
OSI-IO-SST	Meteosat-8 SST	17185	1842	18,884	1446	17,513	1512	18,293	507	16,998	948	19,097	17831
OSI-208 series	IASI SST	59831	12016	65,488	16298	55,493	10281	57,035	16	47,260	0	48,002	0
OSI-250	Meteosat SST Data record	43545		0		0		0		0		3	
OSI-303 series	Meteosat DLI	54316	x	48,905	x	45,569	x	48,752	x	69,299	x	94,315	x
OSI-304 series	Meteosat SSI	54316	x	48,905	x	45,569	x	48,752	x	69,299	x	94,315	x
OSI-305 series	GOES-East DLI	16835	x	16,669	x	17,244	x	3,616	x	4,052	x	7,982	x
OSI-306 series	GOES-East SSI	16,835	x	16,669	x	17,244	x	3,616	x	4,052	x	7,982	x
OSI-IO-DLI	Meteosat-8 DLI	15744	x	3,077	x	1,784	x	2,976	x	2,491	x	16,495	x
OSI-IO-SSI	Meteosat-8 SSI	15744	x	3,077	x	1,784	x	2,976	x	2,491	x	16,495	x

Table 46: Number of OSI SAF products downloaded from Ifremer FTP server and PO.DAAC server over 2nd half 2019.

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.

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.

		JUL. 2019		AUG. 2019		SEP. 2019		OCT. 2019		NOV. 2019		DEC. 2019	
		HL FTP	CMEMS	HL FTP	CMEMS	HL FTP	CMEMS	HL FTP	CMEMS	HL FTP	CMEMS	HL FTP	CMEMS
Downloaded sea ice products													
OSI-401 series	Global Sea Ice Concentration (SSMIS)	63097	35820	46164	36432	NA	43321	NA	35269	45431	37359	191077	37063
OSI-402 series	Global Sea Ice Edge	8841	32108	11664	33994	NA	40700	NA	33941	10005	35362	13627	32551
OSI-403 series	Global Sea Ice Type	4519	32690	42486	35021	NA	40015	NA	34385	30194	37611	25033	32934
OSI-404 series	Global Sea Ice Emissivity	193	x	177	x	NA	x	NA	x	120	x	124	x
OSI-405 series	Low resolution Sea Ice Drift	14282	30977	14253	32213	NA	39317	NA	32282	20326	33982	10100	29953
OSI-407 series	Medium resolution Sea Ice Drift	437	x	4966	x	NA	x	NA	x	5977	x	7298	x
OSI-408 series	Global Sea Ice Concentration (AMSR-2)	3226	x	2788	x	NA	x	NA	x	1890	x	7458	x
OSI-409	Ice Concentration Data Record v1.2	5970	1	236	0	NA	0	NA	0	26946	3	27147	4
OSI-430	Ice Concentration ICDR v1.2	9010	34161	277	36693	NA	52042	NA	36700	6958	40685	1941	41058
OSI-430-b	Ice Concentration ICDR v2.0	2330	x	7835	x	NA	x	NA	x	43686	x	9804	x
OSI-450	Ice Concentration Data Record v2.0	12273	x	32927	x	NA	x	NA	x	148836	x	42116	x
Downloaded SST, DLI and SSI over the OSI SAF High Latitude FTP server													
OSI-203 series	AHL SST	25066	x	1716	x	NA	x	NA	x	379	x	356	x
OSI-205 series	L2 SST/IST	124571	x	9253	x	NA	x	NA	x	9158	x	53289	x
OSI-301 series	AHL DLI	352	x	311	x	NA	x	NA	x	290	x	310	x
OSI-302 series	AHL SSI	363	x	311	x	NA	x	NA	x	280	x	311	x

Table 47: Number of OSI SAF products downloaded from OSI SAF Sea Ice FTP server over 2nd half 2019

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.

We provided archived SeaWinds data to 0 users and archived OSCAT data to 0 users during the reporting period.

		JUL. 2019		AUG. 2019		SEP. 2019		OCT. 2019		NOV. 2019		DEC. 2019	
		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	ASCAT-A 25km	22 per file (BUFR), 23 per file (NetCDF)	181887	22 per file (BUFR), 23 per file (NetCDF)	81260	22 per file (BUFR), 23 per file (NetCDF)	137961	22 per file (BUFR), 23 per file (NetCDF)	77903	22 per file (BUFR), 23 per file (NetCDF)	317555	22 per file (BUFR), 23 per file (NetCDF)	92850
OSI-102-b	ASCAT-B 25km	21 per file (BUFR), 20 per file (NetCDF)	150863	21 per file (BUFR), 20 per file (NetCDF)	83779	21 per file (BUFR), 20 per file (NetCDF)	89101	21 per file (BUFR), 20 per file (NetCDF)	74074	21 per file (BUFR), 20 per file (NetCDF)	192330	21 per file (BUFR), 20 per file (NetCDF)	57760
OSI-102-c	ASCAT-C 25km	N/A	N/A	N/A	N/A	N/A	N/A	10 per file (BUFR), 12 per file (NetCDF)	215	10 per file (BUFR), 12 per file (NetCDF)	857	10 per file (BUFR), 12 per file (NetCDF)	1606
OSI-104	ASCAT-A Coastal	28 per file (BUFR), 32 per file (NetCDF)	137436	28 per file (BUFR), 32 per file (NetCDF)	12056	28 per file (BUFR), 32 per file (NetCDF)	144645	28 per file (BUFR), 32 per file (NetCDF)	126107	28 per file (BUFR), 32 per file (NetCDF)	44899	28 per file (BUFR), 32 per file (NetCDF)	27242
OSI-104-b	ASCAT-B Coastal	29 per file (BUFR), 33 per file (NetCDF)	108210	29 per file (BUFR), 33 per file (NetCDF)	31565	29 per file (BUFR), 33 per file (NetCDF)	45730	29 per file (BUFR), 33 per file (NetCDF)	101112	29 per file (BUFR), 33 per file (NetCDF)	39288	29 per file (BUFR), 33 per file (NetCDF)	27611
OSI-104-c	ASCAT-C Coastal	N/A	N/A	N/A	N/A	N/A	N/A	12 per file (BUFR), 15 per file (NetCDF)	119	12 per file (BUFR), 15 per file (NetCDF)	1109	12 per file (BUFR), 15 per file (NetCDF)	737
OSI-112-a	ScatSat-1 25 km wind vectors	7 per file (BUFR), 13 per file (NetCDF)	N/A	7 per file (BUFR), 13 per file (NetCDF)	N/A	7 per file (BUFR), 13 per file (NetCDF)	N/A	7 per file (BUFR), 13 per file (NetCDF)	N/A	7 per file (BUFR), 13 per file (NetCDF)	N/A	7 per file (BUFR), 13 per file (NetCDF)	N/A
OSI-112-b	ScatSat-1 50 km wind vectors	6 per file (BUFR), 7 per file (NetCDF)	N/A	6 per file (BUFR), 7 per file (NetCDF)	N/A	6 per file (BUFR), 7 per file (NetCDF)	N/A	6 per file (BUFR), 7 per file (NetCDF)	N/A	6 per file (BUFR), 7 per file (NetCDF)	N/A	6 per file (BUFR), 7 per file (NetCDF)	N/A

Table 48: Number of OSI SAF products downloaded from KNMI FTP server and PO.DAAC server over 2nd half 2019

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 4 September 2019.

Albania	5	Greece	14	Pakistan	1
Algeria	8	Guinea	2	Poland	14
Angola	3	Guinea-Bissau	3	Portugal	5
Armenia	1	Hungary	9	Qatar	4
Austria	23	Iceland	1	Romania	8
Azerbaijan	3	India	3	Russian Federation	8
Bahrain	1	Iran, Islamic Republic Of	32	Rwanda	5
Belgium	9	Iraq	1	San Marino	1
Benin	4	Ireland	7	Sao Tome And Principe	2
Bosnia And Herzegovina	1	Isle Of Man	1	Saudi Arabia	3
Botswana	6	Israel	7	Senegal	8
Brazil	6	Italy	287	Serbia	2
Bulgaria	5	Jordan	2	Seychelles	2
Burkina Faso	4	Kazakhstan	5	Sierra Leone	2
Burundi	2	Kenya	13	Slovakia	3
Cameroon	4	Korea, Republic Of	1	Slovenia	1
Canada	2	Kuwait	3	Somalia	1
Cape Verde	2	Kyrgyzstan	1	South Africa	18
Central African Republic	2	Latvia	1	South Sudan	1
Chad	3	Lebanon	3	Spain	48
China	3	Lesotho	4	Sudan	4
Comoros	2	Liberia	2	Swaziland	3
Congo	3	Libyan Arab Jamahiriya	1	Sweden	3
Congo, The Democratic Republic Of The	5	Lithuania	2	Switzerland	14
Cote D'Ivoire	6	Luxembourg	1	Syrian Arab Republic	1
Croatia	2	Macedonia, The Former Yugoslav Republic Of	3	Tajikistan	1
Cyprus	1	Madagascar	6	Tanzania, United Republic Of	5
Czech Republic	20	Malawi	4	Togo	4
Denmark	7	Mali	3	Tunisia	4
Djibouti	2	Malta	2	Turkey	7
Egypt	5	Mauritania	4	Turkmenistan	1
Equatorial Guinea	2	Mauritius	7	Uganda	4
Eritrea	2	Moldova, Republic Of	1	Ukraine	2
Estonia	3	Morocco	7	United Arab Emirates	5
Ethiopia	8	Mozambique	5	United Kingdom	133
Finland	6	Namibia	6	United States	4
France	64	Netherlands	28	Uzbekistan	1
Gabon	2	Niger	7	Viet Nam	1
Gambia	3	Nigeria	6	Yemen	2
Georgia	1	Norway	4	Zambia	4
Germany	101	Oman	4	Zimbabwe	4
Ghana	9				

Table 49: Overall number of EUMETCast users by country on the 4 September 2019.

6.3.2. Users and retrievals from EUMETSAT Data Center

Orders Summary over the 2nd half 2019

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 2019**.

	Item	Volume in MB	Number of files
OSI-152	ERS1_OR1ERW025_OPE	37548	56382
	ERS2_OR1ERW025_OPE	26587	41990
OSI-450	F-08_OR2017SICOGB_OPE	4646	4648
	F-10_OR2017SICOGB_OPE	4646	52
OSI-401 series	F-17_OSICOGB_OPE	67	302
OSI-306 series	GOES-13_OSIHSSI_OPE	821	155
OSI-305-a / OSI-306-a	GOES-16_ODDLISSI_OPE	9196	766
	GOES-16_OHDLISSI_OPE	111911	12831
OSI-207-a	GOES-16_OSIHSSTN_OPE	60207	5333
OSI-408	GW-1_OSICOAMSRGB_OPE	712	40
	ISS_ORSW025_OPE	1109	1818
OSI-103 (with soil moisture)	M01_OAS025_OPE	62949	36292
OSI-104-b	M01_OASWC12_OPE	780073	100630
OSI-407	M01_OMRSIDRN_OPE	47692	2890
OSI-201	M01_OSSTGLB_OPE	68155	655
OSI-201-b	M01_OSSTGLBN_OPE	25258	685
OSI-205-a	M01_OSSTIST2_OPE	2505	225
OSI-202-b	M01_OSSTNARN_OPE	17392	730
OSI-103 (with soil moisture)	M02_OAS012_OPE	5202	1652
	M02_OAS025_OPE	63928	38095
OSI-103	M02_OASW012_OPE	2948	989
OSI-102	M02_OASW025_OPE	1430	1795
OSI-104	M02_OASWC12_OPE	704811	76524
OSI-407	M02_OMRSIDRN_OPE	47692	3770
OSI-150-a	M02_OR1ASW025_OPE	84056	39179
OSI-150-b	M02_OR1ASWC12_OPE	124931	40114
OSI-201	M02_OSSTGLB_OPE	129393	6023
OSI-104-c	M03_OASWC12_OPE	4232	131
OSI-301	MML_ODLIAHL_OPE	8	20
OSI-450	MML_OR2017SICOGB_OPE	7292	7400
OSI-401 series (NetCDF)	MML_OSICOGBN_OPE	20429	1043
OSI-405 series	MML_OSIDRGB_OPE	526	5008

	Item	Volume in MB	Number of files
OSI-402 series (NetCDF)	MML_OSIEDGBN_OPE	153	20
OSI-403 series	MML_OSITYGB_OPE	3	34
OSI-403 series (NetCDF)	MML_OSITYGBN_OPE	530	66
OSI-302	MML_OSSIAHL_OPE	8	20
OSI-203	MML_OSSTAHL_OPE	428	940
OSI-304	MSG1_OSIHSSI_OPE	3983	567
OSI-303-a / OSI-304-a	MSG2_ODDLISSI_OPE	8474	14
	MSG2_OHDLISSI_OPE	128034	697
OSI-250	MSG2_OR1HSST_OPE	436	48
OSI-303	MSG2_OSIHDLI_OPE	14608	2132
OSI-304	MSG2_OSIHSSI_OPE	166	9
OSI-206-a (NetCDF)	MSG2_OSIHSSTN_OPE	48287	167
OSI-303-a / OSI-304-a	MSG3_OHDLISSI_OPE	98247	5675
OSI-304	MSG3_OSIHSSI_OPE	3821	598
OSI-206	MSG3_OSIHSST_OPE	301	72
OSI-303-a / OSI-304-a	MSG4_ODDLISSI_OPE	12512	1040
	MSG4_OHDLISSI_OPE	571267	65337
OSI-206-a (NetCDF)	MSG4_OSIHSSTN_OPE	76566	6280
OSI-450	NIMBUS7_OR2017SICOGB_OPE	1598	1616
OSI-205-b	NPP_OSSTIST2B_OPE	208774	1308
OSI-202-b	NPP_OSSTNARN_OPE	14495	728
OSI-153- a	OCEANSAT2_OR1OSW025_OPE	9590	8802
OSI-112-a	SCATSAT1_OSSW025_OPE	41127	7233

Table 50: Volume of data downloaded (in MB) by products from EDC over 2nd half 2019

Ingestion Summary over the 2nd half 2019
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. 2019	AUG. 2019	SEP. 2019	OCT. 2019	NOV. 2019	DEC. 2019
OSI-404	Global Sea Ice Emissivity (DMSP-F18)	100	100	100	100	100	100
OSI-305-a	Daily Downward Longwave Irradiance (GOES-16)	100	100	100	100	100	100
OSI-306-a	Daily Surface Solar Irradiance (GOES-16)						
OSI-305-a	Hourly Downward Longwave Irradiance (GOES-16)	100	97.8	100	100	100	99.8
OSI-306-a	Hourly Surface Solar Irradiance (GOES-16)						
OSI-207-a	Hourly Sea Surface Temperature (GOES-16)	100	97.7	100	100	100	100
OSI-408	Sea Ice Concentration (AMSR-2)	100	100	100	100	100	100
OSI-102-b	ASCAT 25km Wind (Metop-B)	100	99.5	100	100	100	99.3
OSI-104-b	ASCAT 12.5km Coastal Wind (Metop-B)	100	99.7	100	100	100	99.5
OSI-102	ASCAT 25km Wind (Metop-A)	95.9	99.5	99.5	99.5	96.8	99.7
OSI-104	ASCAT 12.5km Coastal Wind (Metop-A)	95.9	99.7	99.5	100	96.8	100
OSI-201-b	Global Sea Surface Temperature (Metop-B)	100	100	100	100	100	100
OSI-202-b	NAR Sea Surface Temperature (Metop-B)	100	100	100	98.3	100	98.3
OSI-202-b	NAR Sea Surface Temperature (NPP)	100	100	100	100	100	100
OSI-407-a	Global Sea Ice Drift (Multi Mission)	100	100	100	98.3	100	100
OSI-205-a	SST/IST L2 (Metop-B)	100	100	100	100	100	100
OSI-205-b	SST/IST L2 (NPP)	100	100	100	98.6	96.4	100
OSI-203-a	SST/IST L3 (Metop-B)	100	100	100	100	96.7	967
OSI-203-b	SST/IST L3 (NPP)	100	100	100	98.3	98.3	96.7
OSI-301	AHL Downward Longwave Irradiance (Multi Mission)	100	96.7	100	100	100	100
OSI-401-b	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-c	Global Sea Ice Edge (Multi Mission)	100	100	100	100	100	100
OSI-403-c	Global Sea Ice Type (Multi Mission)	100	100	100	100	100	100
OSI-302	AHL Surface Solar Irradiance (Multi Mission)	100	100	100	93.5	96.6	100
OSI-203	AHL Sea Surface Temperature (Multi Mission)	100	100	30	-	-	-
OSI-303-a	Daily Downward Longwave Irradiance (MSG)	100	100	100	100	100	100
OSI-304-a	Daily Surface Solar Irradiance (MSG)						
OSI-303-a	Hourly Downward Longwave Irradiance (MSG)	99.8	99.8	100	100	100	99.8
OSI-304-a	Hourly Surface Solar Irradiance (MSG)						
OSI-206-a	Hourly Sea Surface Temperature (MSG)	99.7	99.8	100	100	100	100
OSI-112-a	ScatSat-1 25 km wind vectors	100	100	100	100	100	100
OSI-112-b	ScatSat-1 50 km Wind vectors	100	100	100	100	100	100

Table 51: Percentage of received OSI SAF products in EDC in 2nd half 2019

Comment: the product OSI-203 was discontinued on 10/09/2019 because superseded by OSI-203-a and OSI-203-b (operational since 03/04/2019).

7. Recent publications

The recent publications can be found on OSI SAF web site in documentation / publications.