Half-Yearly Operations Report

1st half 2019

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Document Change record

Document version	Date	Author	Change description
0.1	25/06/2019	CH	Template to be filled by OSI SAF team
1.0	04/09/2019	CH	Missing • IST validation (issues with not enough data) • MR ice drift validation (can not be done before September)
1.1	29/11/2019	CH	OR 15 RID 027: IST and MR ice drift validation added
			OR 15 RID 009: text added in section 5.1 SST quality to explain that the number of cases in maps and tables can be different.
			OR 15 RID 026: sentence added the results for overlapping period might not be necessarily consistent due to the reference data sets used for each reports.
			OR 15 RID 001: sentence added An optimized product with regards to timeliness is currently running on our staging machine. The final validation and comparison is being done.
			OR 15 RID 006: explanation on the helpdesk request categories added.
			OR 15 RID 008: number of individual users added

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1. Introduction

1.1. Scope of the document

The present report covers from the 1st of January to the 30th of June 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 1.0, 30 May 2017

1.4. Reference documents

[RD.1] ASCAT Wind Product User Manual
OSI-102, OSI-102-b, OSI-103 (discontinued), OSI-104, 0SI-104-b
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] Atlantic High Latitude L3 Sea Surface Temperature Product User Manual
OSI-203
SAF/OSI/CDOP/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]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.13]Product User Manual for OSI SAF Global Sea Ice Concentration
OSI-401-b
SAF/OSI/CDOP3/DMI_MET/TEC/MA/204

[RD.14]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.15]50 Ghz Sea Ice Emissivity Product User Manual
OSI-404-a
SAF/OSI/CDOP3/DMI/TEC/MA/191

[RD.16]Low Resolution Sea Ice Drift Product User’s Manual
OSI-405-c
SAF/OSI/CDOP/met.no/TEC/MA/128

[RD.17]Medium Resolution Sea Ice Drift Product User Manual
OSI-407-a
SAF/OSI/CDOP/DMI/TEC/MA/137

[RD.18]Global Sea Ice Concentration Reprocessing Product User Manual
OSI-409, OSI-409-a, OSI-430
SAF/OSI/CDOP3/MET-Norway/TEC/MA/138

[RD.19]Global Sea Ice Concentration Climate Data Record Product User Manual
OSI-450
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
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	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUN. 2019
OSI-102	ASCAT-A 25 km Wind	99.4	100.0	99.5	100.0	100.0	99.9
OSI-102-b	ASCAT-B 25 km Wind	99.5	100.0	99.6	100.0	100.0	99.9
OSI-104	ASCAT-A Coastal Wind	99.2	99.8	99.1	99.9	99.8	99.7
OSI-104-b	ASCAT-B Coastal Wind	99.3	100.0	99.6	100.0	100.0	100.0
OSI-112-a	ScatSat-1 25 km wind vectors	72.9	71.2	80.5	53.1	37.2	49.1
OSI-112-b	ScatSat-1 50 km Wind vectors	73.3	71.3	81.0	53.4	37.2	50.3
OSI-201-b	GBL SST	95.2	100.0	100.0	96.7	100.0	98.3
OSI-202-b	NAR SST	95.2	99.1	98.4	97.5	100.0	95.8
OSI-203	AHL SST (L3)	100	100	100	100	100	100
OSI-203-a	NHL SST/IST (L3)	-	-	-	98.4	100	100
OSI-203-b	NHL SST/IST (L3)	-	-	-	98.4	100	100
OSI-204-b	MGR SST	94.7	99.8	99.9	96.3	98.3	96.8
OSI-205-a	SST/IST (L2)	100	100	99.51	100	100	99.3
OSI-205-b	SST/IST (L2)	-	-	-	99.8	100	100
OSI-206-a	Meteosat SST	95.0	99.9	99.9	96.1	99.3	97.4
OSI-207-a	GOES-East SST	94.9	99.9	99.9	96.3	99.3	97.2
OSI-208-b	IASI SST	94.8	100.0	100.0	96.9	99.5	97.7
OSI-301	AHL DLI	100	100	96.8	100	100	96.8
OSI-302	AHL SSI	100	100	96.8	100	100	96.8
OSI-303-a	Meteosat DLI - hourly	94.5	99.7	100.0	96.1	99.6	97.5
	Meteosat DLI - daily	93.5	100.0	100.0	96.7	100.0	93.3
OSI-304-a	Meteosat SSI - hourly	94.5	99.7	100.0	96.1	99.6	97.5
	Meteosat SSI - daily	93.5	100.0	100.0	96.7	100.0	93.3
OSI-305-a	GOES-East DLI - hourly	94.2	99.6	99.7	95.4	99.3	97.2
	GOES-East DLI - daily	93.5	100.0	100.0	96.7	100.0	93.3
OSI-306-a	GOES-East SSI - hourly	94.2	99.6	99.7	95.4	99.3	97.2
	GOES-East SSI – daily	93.5	100.0	100.0	96.7	100.0	93.3
OSI-401-b	Global Sea Ice Concentration (SSMIS)	100	100	100	100	100	96.7
OSI-402-c	Global Sea Ice Edge	100	100	100	100	100	96.8
OSI-403-c	Global Sea Ice Type	100	100	100	100	100	96.8
OSI-404/-a	Global Sea Ice Emissivity	100	100	100	100	100	99.6
OSI-405-c	Low Res. Sea Ice Drift	100	100	100	100	100	93.3

Ref.	Product	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUN. 2019
OSI-407/-a	Medium Res. Sea Ice Drift	44.5	50	40.8	40	14.5	70.7
OSI-408	Global Sea Ice Concentration (AMSR-2)	100	100	100	100	100	96.7
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 1st half 2019.

2.2. Availability via EUMETCast

Ref.	Product	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUN. 2019
OSI-102	ASCAT-A 25 km Wind	99.4	100.0	99.5	100.0	100.0	99.9
OSI-102-b	ASCAT-B 25 km Wind	99.5	100.0	99.6	100.0	100.0	99.9
OSI-104	ASCAT-A Coastal Wind	99.2	99.8	99.1	99.9	99.8	99.7
OSI-104-b	ASCAT-B Coastal Wind	99.3	100.0	99.6	100.0	100.0	100.0
OSI-112-a	ScatSat-1 25 km wind vectors	N/A	71.2	80.5	53.1	37.2	49.1
OSI-112-b	ScatSat-1 50 km Wind vectors	N/A	71.3	81.0	53.4	37.2	50.3
OSI-201-b	GBL SST	96.8	100.0	100.0	100.0	100.0	100.0
OSI-202-b	NAR SST	98.4	99.1	98.4	100.0	100.0	99.2
OSI-203	AHL SST (L3)	98.4	100	100	100	100	96.8
OSI-203-a	NHL SST/IST (L3)	-	-	-	100	100	100
OSI-203-b	NHL SST/IST (L3)	-	-	-	100	100	96.8
OSI-204-b	MGR SST	97.6	99.7	100.0	99.5	100.0	99.1
OSI-205-a	SST/IST (L2)	100	99.9	99.7	100	99.9	100
OSI-205-b	SST/IST (L2)	-	-	-	100	99.8	98.8
OSI-206-a	Meteosat SST	99.7	100.0	100.0	99.9	99.5	100.0
OSI-207-a	GOES-East SST	99.7	100.0	100.0	99.4	99.3	100.0
OSI-208-b	IASI SST	97.5	99.7	100.0	100.0	99.7	100.0
OSI-301	AHL DLI	100	100	93.6	100	100	96.8
OSI-302	AHL SSI	96.8	100	93.6	100	100	93.5
OSI-303-a	Meteosat DLI - hourly	99.7	99.9	99.9	99.9	99.5	100.0
	Meteosat DLI - daily	100.0	100.0	100.0	100.0	100.0	100.0
OSI-304-a	Meteosat SSI - hourly	99.7	99.9	99.9	99.9	99.5	100.0

Ref.	Product	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUN. 2019
	Meteosat SSI - daily	100.0	100.0	100.0	100.0	100.0	100.0
OSI-305-a	GOES-East DLI - hourly	99.3	100.0	99.9	100.0	99.3	100.0
	GOES-East DLI - daily	100.0	100.0	100.0	100.0	100.0	100.0
OSI-306-a	GOES-East SSI - hourly	99.3	100.0	99.9	100.0	99.3	100.0
	GOES-East SSI - daily	100.0	100.0	100.0	100.0	100.0	100.0
OSI-401-b	Global Sea Ice Concentration (SSMIS)	100	100	100	100	100	100
OSI-402-c	Global Sea Ice Edge	100	100	100	100	100	93.5
OSI-403-c	Global Sea Ice Type	100	100	100	100	100	93.5
OSI-404/-a	Global Sea Ice Emissivity	100	100	100	100	100	100
OSI-405-c	Low Res. Sea Ice Drift	100	100	100	100	100	93.5
OSI-407/-a	Medium Res. Sea Ice Drift	50.8	59.1	55.9	81.3	54.2	80
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 1st 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
01 Jan.	Meteosat 0° SST OSI-206-a	Possible local degradation of SST quality level (due to a lack of navigation data)	Back to nominal situation on 02 January
18 Jan. 07:36Z	All LML products	No distribution on EUMETCast because of no transmission to EUMETSAT (due to EUMETSAT server running at very high CPU capacity)	Resumption on 18 Jan. at 11:15Z
20 Jan. 01:01Z	All LML products	No distribution on LML FTP server because of no transmission to Ifremer (inaccessible servers)	Resumption on 21 Jan at 11:00Z
28 Feb. 02:00Z	NAR SST (NPP) OSI-202-b	Product unavailable (missing cloud mask MAIA)	Resumption on 01 March at 13:00Z
12 March 13:00z	Metop OSI-201-b OSI-204-b OSI-208-b	Missing or degraded products because of the lack of input data (outage of EUMETCast distribution)	Resumption on 13 March 22:15Z
02 April 08:00Z	Meteosat 0° SST and rad. fluxes OSI-206-a OSI-207-a OSI-303-a OSI-304-a OSI-305-a OSI-306-a	Degraded SST quality_level values and slightly degraded flux values due to an erroneous orbital element set used in OSI SAF processing, inducing erroneous satellite zenithal angle values	Resumption on 05 April at 08:00Z
24 April 08:40Z	Several LML products OSI-204-b OSI-206-a OSI-207-a OSI-IO-SST OSI-IO-DLI OSI-IO-SSI	Products late because of a problem on MF transmission system (saturation due to maintenance)	Resumption on 20 April at 14:16Z

Date	Impacted products or services	Anomaly	Corrective and preventive measures
13 May 02:30Z	GEO SST and rad. fluxes (Meteosat 0°, GOES-East, Meteosat IO)	Products late because of a problem on MF transmission system (saturation)	Resumption on 13 May at 06:30Z
15 June 20:40Z	All LML products	No distribution on LML FTP server because of no transmission to Ifremer (inaccessible servers due to an internal network problem)	Resumption on 16 June at 13:20Z

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

Date	Impacted products or services	Anomaly	Corrective and preventive measures
28.03.2019	OSI-203, 301, 302	Change in format of NWP files from ECMWF unexpectedly stopped generation of cloud masks files.	Flow of NWP data was changed to fix the problem. User were informed (#1804).
17.06.2019	OSI-301, 302, 401, 402, 403, 405, 408	Internal network outage at MET Norway, production and distribution delayed.	Problem was fixed and users were informed (#1849).
19.06.2019	HL rad. fluxes OSI-301, 302	Delayed NWP input, product delayed.	Users were informed (#1852).
07.01.2019	MR SIDR OSI-407-a	Missing Metop-B input data, product unavailable	Users were informed (#1734)
22.01.2019	MR SIDR OSI-407-a	Missing product	Problem fixed and users were informed (#1751)
28.01.2019	AMSR-2 SICO OSI-408	Missing data in the product due to missing level 1 data.	Users were informed (#1761).
20.02.2019	HL L2 SST/IST OSI-205-a	Products unavailable on EUMETCast, due to an outage at EUMETCast	Users were informed (#1769)
12.03.2019	HL L2 SST/IST OSI-205-a	Products missing due to interruption in source data	Users were informed (#1787, #1789)
13.03.2019	MR SIDR OSI-407-a	Product unavailable due to missing input data and anomalies in the processing chain.	Users were informed (#1792, #1793, #1794).
19.03.2019	AMSR-2 SICO OSI-408	Missing data in the product due to missing level 1 data.	Users were informed (#1796).

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 where done on data from the summer months and hence there were not as many areas to calculate as in the winter months. Were are currently working on optimising the production time in order to reach the timeliness.

3.3. At Wind subsystem (KNMI)

Date	Impacted products or services	Anomaly	Corrective and preventive measures
18 January	All wind products OSI-10x	The wind products have been partly unavailable on EUMETCast between 0:00 and 10:00 UTC.	
12 March	ASCAT-A and ASCAT-B wind products OSI-102 OSI-102-b OSI-104 OSI-104-b	The wind products have been unavailable on 12 March between ~11:00 and ~17:00 UTC sensing time due to a ground segment anomaly.	
24 April – 13 May	ScatSat-1 wind products OSI-112-a OSI-112-b	The ScatSat-1 winds have been interrupted and delayed between 24 April and 13 May.	
21 May – 24 June		The ScatSat-1 winds have been unavailable from 21 May until 24 June 2019 due to an instrument 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)

Date	Impacted products or services	Events and modifications, maintenance activities
02 April	All GOES-East products OSI-207-a OSI-305-a OSI-306-a	OSI SAF processing started using input data at H+00 and H+30, instead of H+15, H+45 (GOES-East Full Disk scan every 10 minutes instead of 15 minutes). Hourly products still distributed every one hour.

Date	Impacted products or services	Events and modifications, maintenance activities
23 April	GOES-East radiative fluxes OSI-305-a OSI-306-a	The corrective factor previously applied in OSI SAF processing (0.94) has been reset to 1 (NOAA has applied a correction to the ABI Band 2 (0.64 micron). This correction reduces the 1B radiance by 6.92%)

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

Date	Impacted products or services	Events and modifications, maintenance activities
03 April	HL SST/IST L2/L3 OSI-203-a OSI-203-b OSI-205-b	New high latitude SST/IST OSI-203-a, OSI-203-b and OSI-205-b made operationally available to users on FTP and EUMETCast. OSI-203 announced to be discontinued on 10.09.2019.
18 June	SICO ICDR OSI-430-b	New sea ice concentration ICDR OSI-430-b made operationally available to users on FTP (EUMETCast will follow), after a period as demonstrational product. It is replacing OSI-430, which will be discontinued on 31.01.2020.

4.3. At Wind subsystem (KNMI)

Date	Impacted products or services	Events and modifications, maintenance activities
7 Feb.	ScatSat-1 wind products OSI-112-a OSI-112-b	The ScatSat-1 winds have operational status since 7 February and are available on EUMETCast to all users.

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

OSI-430-b is an automatic extension of OSI-450 (1979-2015) from 2016 onwards, and with a latency of 16 days. OSI-430-b uses SSMIS satellite data, and ECMWF weather forecasts. The same algorithms and processing chains are used for OSI-450 and OSI-430-b, to ensure climate consistency.

OSI-430-b was made available to users as demonstrational product (May 2019) after DRR and, after SG approval, as operational product from 18 June 2019 (service message #1900).

The distribution of the previous ICDR (OSI-430) is planned to be stopped at the end of January 2020.

5. OSI SAF products quality

Please note that the results for overlapping period might not be necessarily consistent due to the reference data sets used for each reports.

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** 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

Daytime statistics are also provided for information.

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.

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

The following maps indicate the mean night-time and day-time SST mean 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.

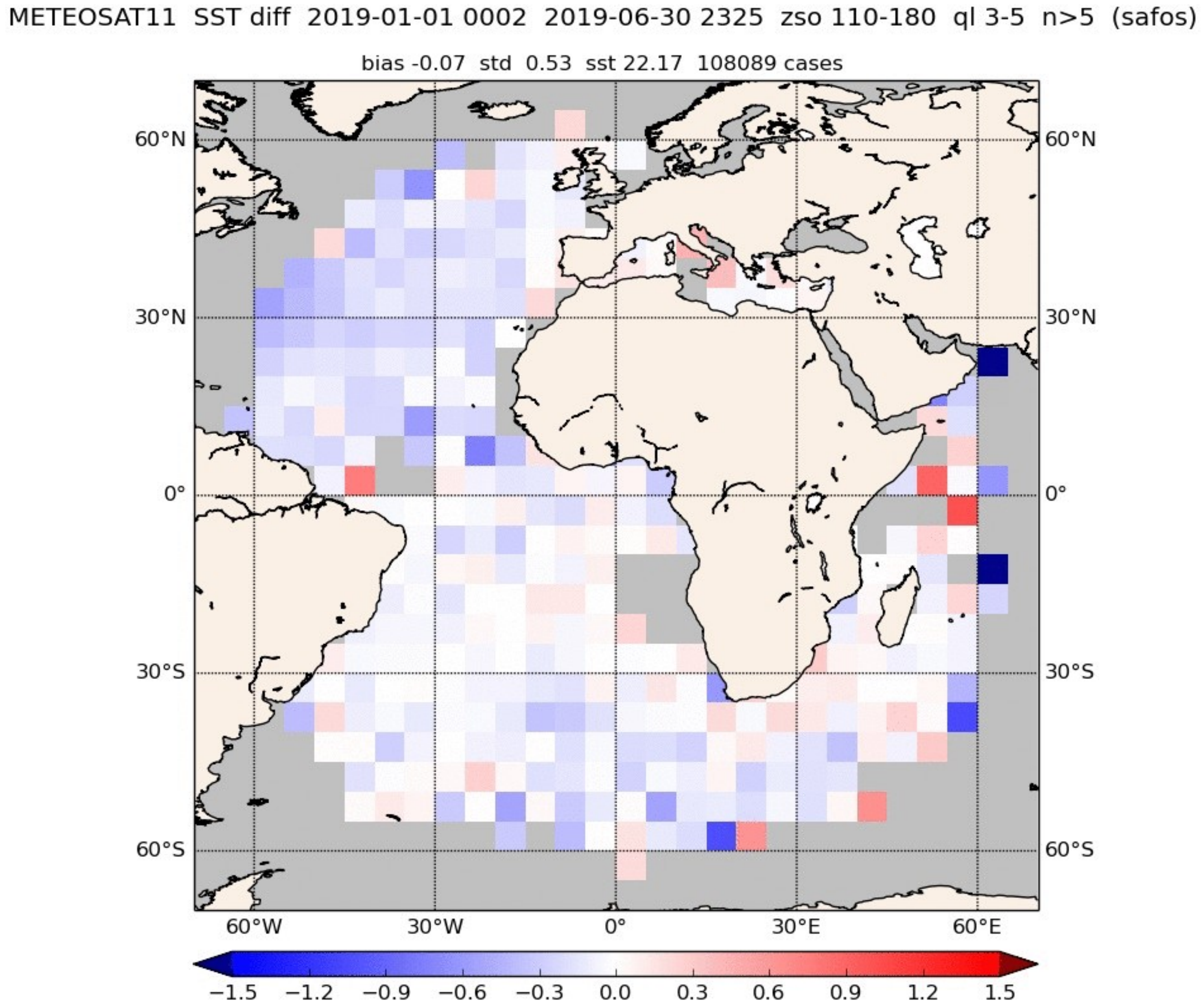


Figure 1: Mean Meteosat night-time SST mean difference with respect to buoys measurements for quality level 3,4,5

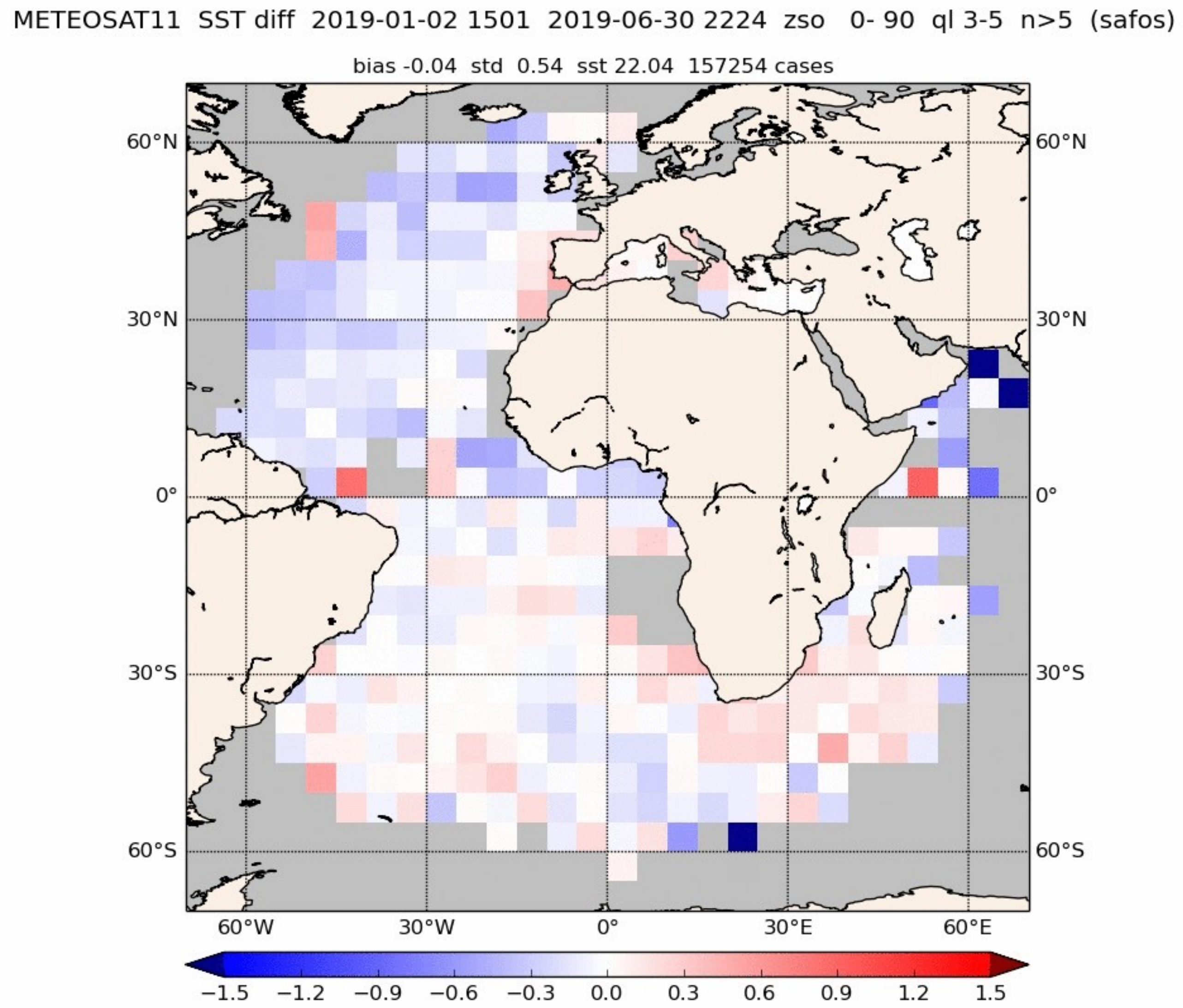


Figure 2: Mean Meteosat day-time SST mean difference with respect to buoys measurements for quality level 3,4,5

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

Meteosat night-time SST quality results over 1st half 2019					
Month	Number of cases	Mean diff. in K (req.: 0.5 K)	Mean diff. margin (*)	SD in K (req.: 1 K)	SD margin (**)
JAN. 2019	13562	-0.12	76	0.48	52
FEB. 2019	8476	-0.08	84	0.51	49
MAR. 2019	19591	-0.10	80	0.51	49
APR. 2019	12638	-0.01	98	0.57	43
MAY 2019	21951	-0.07	86	0.54	46
JUN. 2019	20860	-0.09	82	0.54	46
Meteosat day-time SST quality results over 1st half 2019					
JAN. 2019	19961	-0.10	80	0.48	52
FEB. 2019	12300	-0.05	90	0.52	48
MAR. 2019	26354	-0.05	90	0.51	49
APR. 2019	35070	0.00	100	0.60	40
MAY 2019	33046	-0.02	96	0.53	47
JUN. 2019	33436	-0.06	88	0.54	46
(*) 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 3: Meteosat SST quality results over 1st 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 mean night-time and day-time SST mean 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.

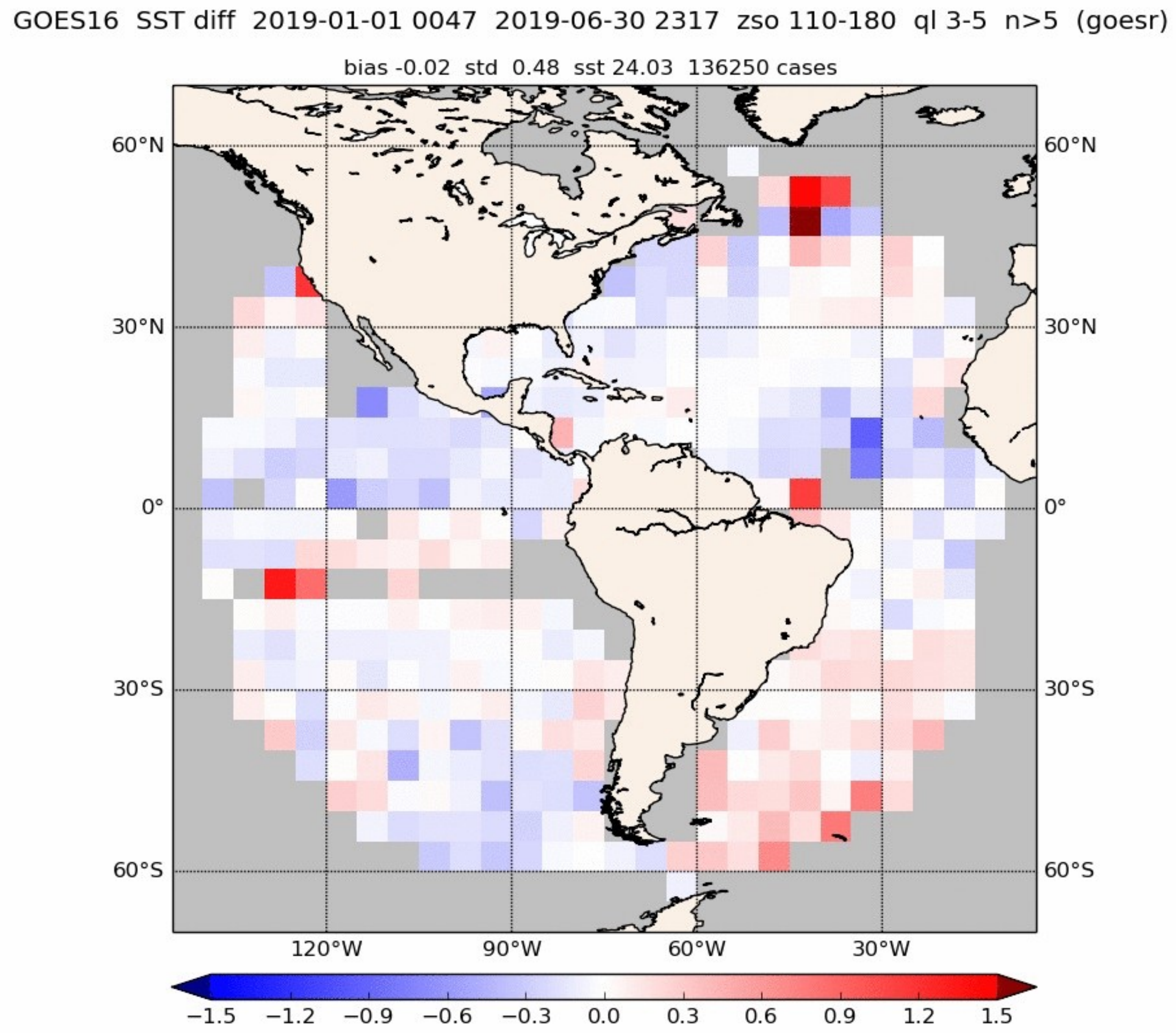


Figure 3: Mean GOES-East night-time SST mean difference with respect to buoys measurements for quality level 3,4,5

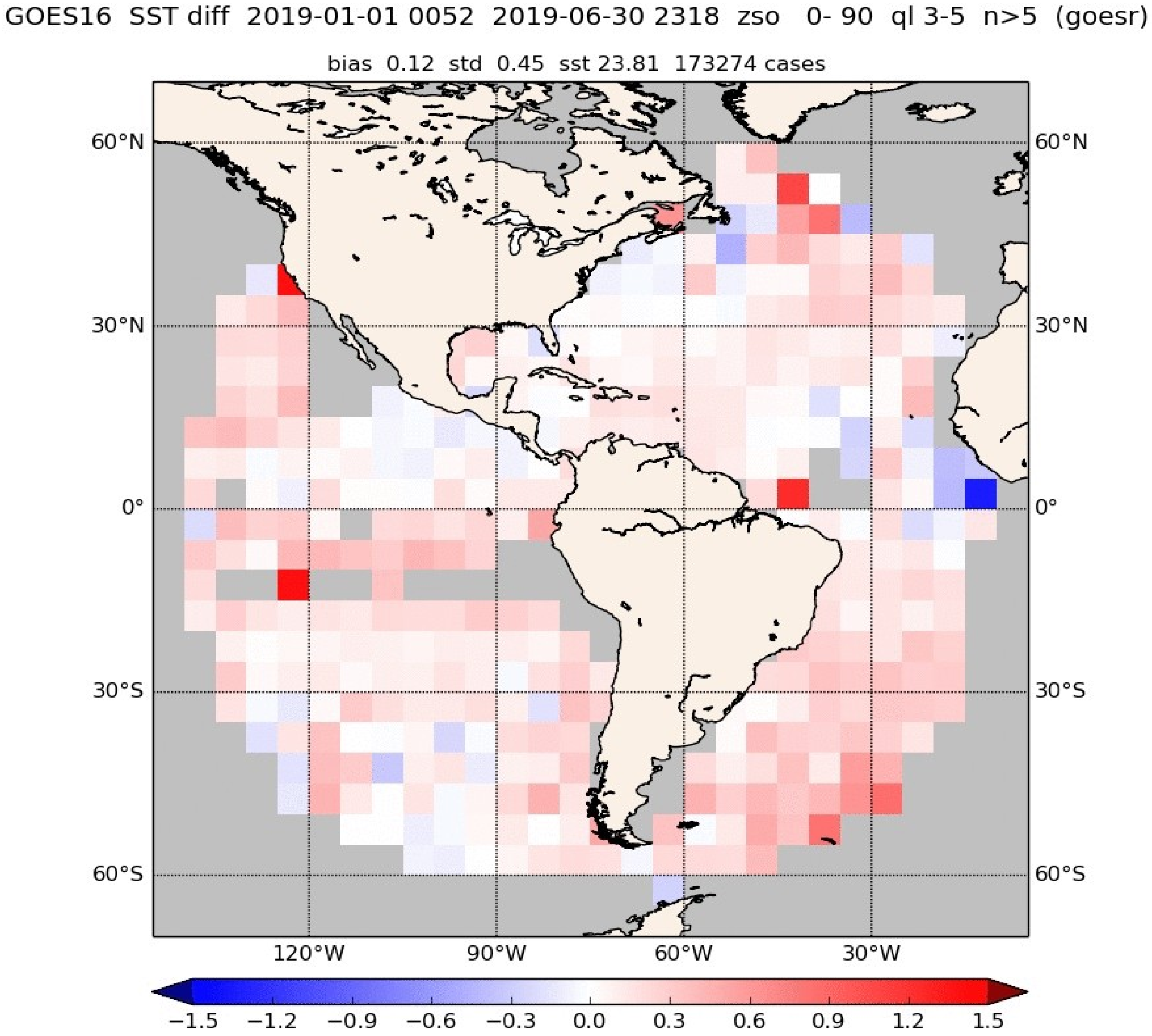


Figure 4: Mean GOES-East day-time SST mean difference with respect to buoys measurements for quality level 3,4,5

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

GOES-East night-time SST quality results 1st half 2019					
Month	Number of cases	Mean diff. in K (req.: 0.5 K)	Mean diff. margin (*)	SD in K (req.: 1 K)	SD margin (**)
JAN. 2019	26247	0.00	100	0.44	56
FEB. 2019	14507	-0.05	90	0.47	53
MAR. 2019	22535	-0.02	96	0.47	53
APR. 2019	30422	0.14	72	0.45	55
MAY 2019	24792	-0.01	98	0.48	52
JUN. 2019	23253	-0.05	90	0.52	48
GOES-East day-time SST quality results 1st half 2019					
JAN. 2019	34716	0.14	72	0.43	57
FEB. 2019	17158	0.12	76	0.44	56
MAR. 2019	26367	0.15	70	0.44	56
APR. 2019	25478	0.00	100	0.49	51
MAY 2019	32725	0.14	72	0.43	57
JUN. 2019	31724	0.06	88	0.51	49
(*) 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 4: GOES-East SST quality results over 1st 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 mean night-time and day-time SST mean difference with respect to buoys measurements for quality level 3,4,5 over the reporting period.

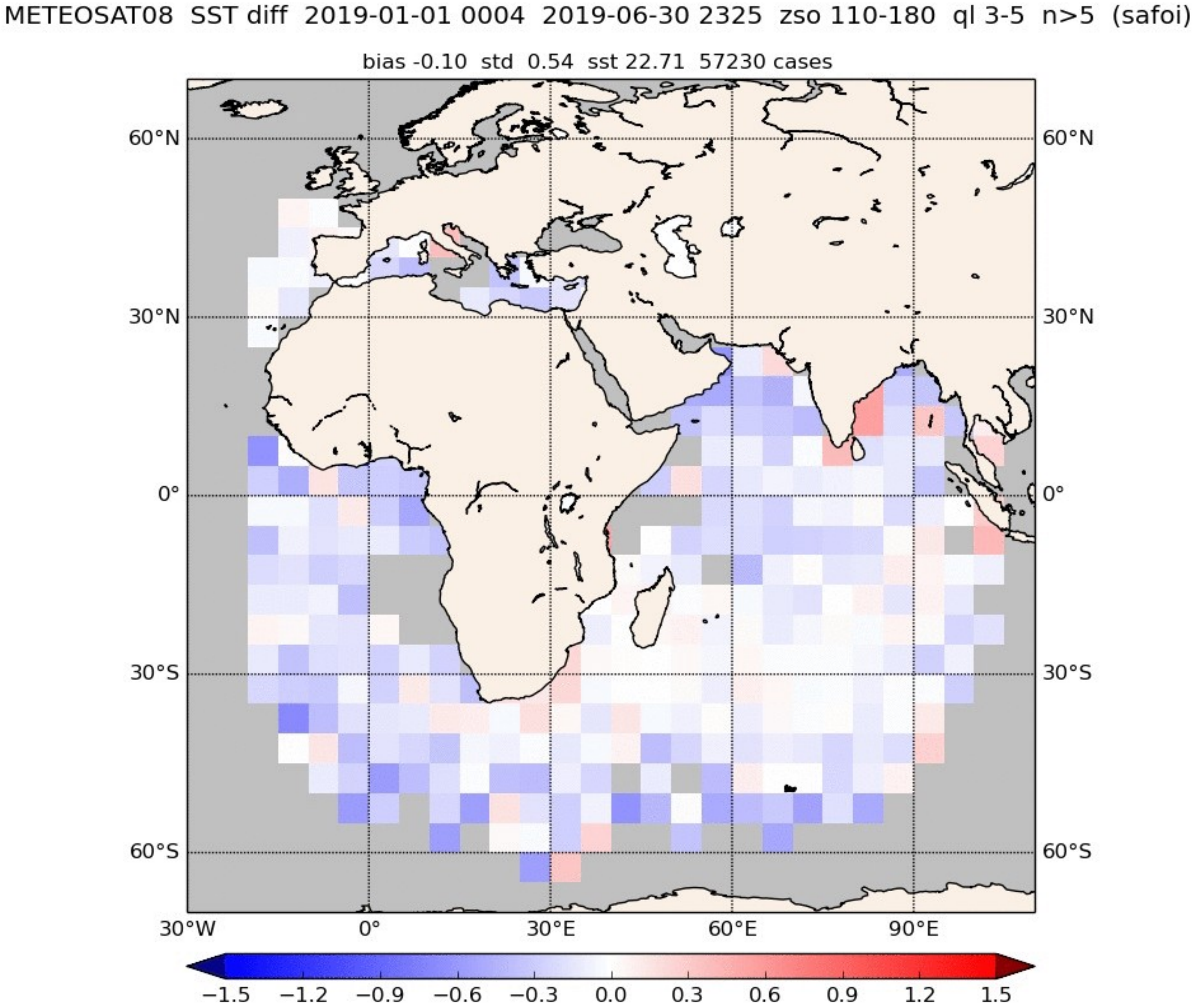


Figure 5: Mean Meteosat Indian Ocean night-time SST mean difference with respect to buoys measurements for quality level 3,4,5

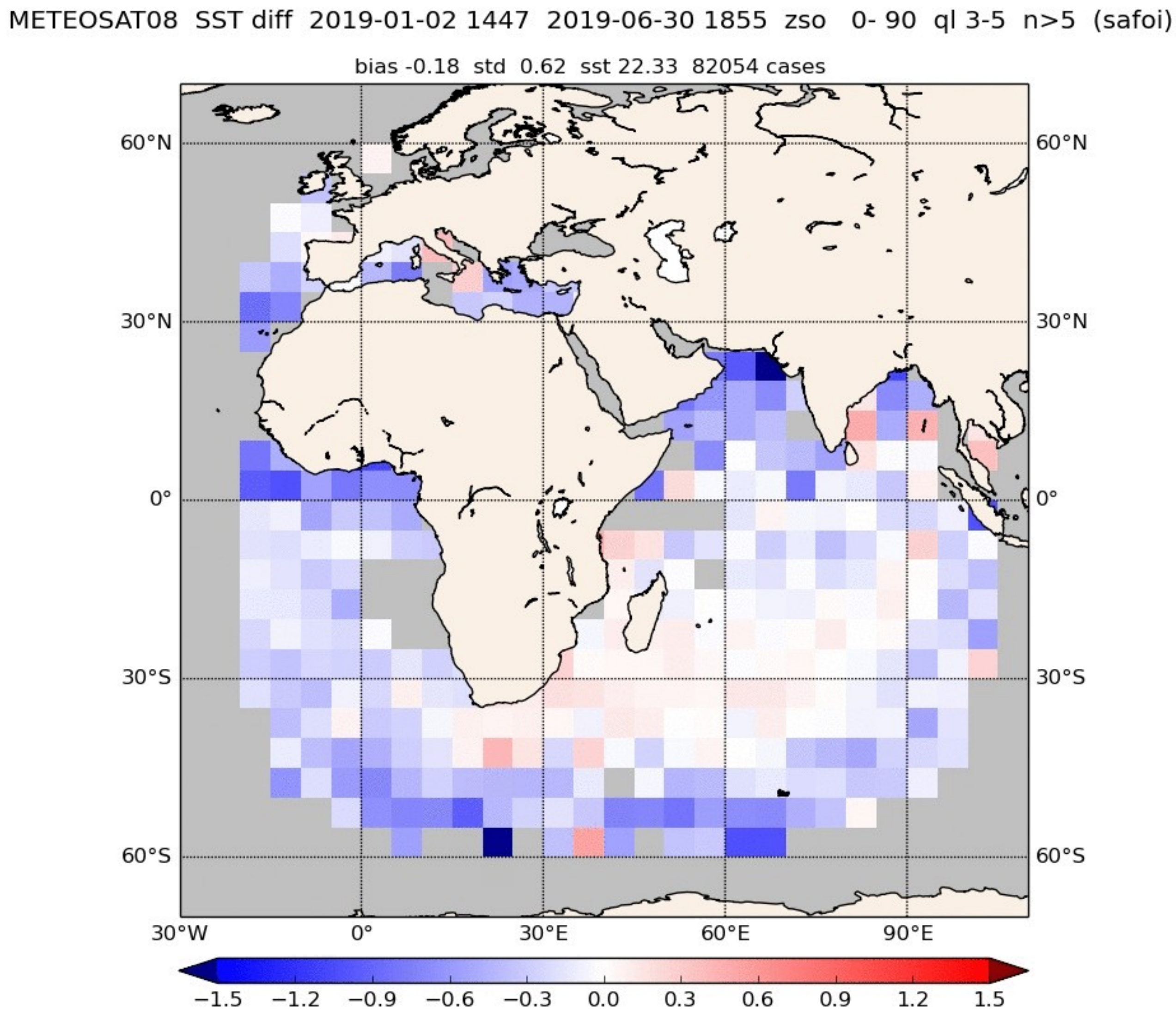


Figure 6: Mean Meteosat Indian Ocean day-time SST mean difference with respect to buoys measurements for quality level 3,4,5

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 1st half 2019					
Month	Number of cases	Mean diff. in K (req.: 0.5 K)	Mean diff. margin (*)	SD in K (req.: 1 K)	SD margin (**)
JAN. 2019	8448	-0.19	62	0.53	47
FEB. 2019	5668	-0.14	72	0.55	45
MAR. 2019	10122	-0.16	68	0.52	48
APR. 2019	13081	-0.08	84	0.53	47
MAY 2019	11150	-0.05	90	0.54	46
JUN. 2019	9010	-0.02	96	0.57	43
Meteosat Indian Ocean day-time SST quality results over 1st half 2019					
JAN. 2019	16166	-0.22	56	0.54	46
FEB. 2019	9431	-0.20	60	0.56	44
MAR. 2019	13307	-0.18	64	0.56	44
APR. 2019	18523	-0.11	78	0.66	34
MAY 2019	14349	-0.18	64	0.65	35
JUN. 2019	11349	-0.22	56	0.75	25
(*) 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 5: Meteosat Indian Ocean SST quality results over 1st 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 mean night-time and day-time SST mean 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.

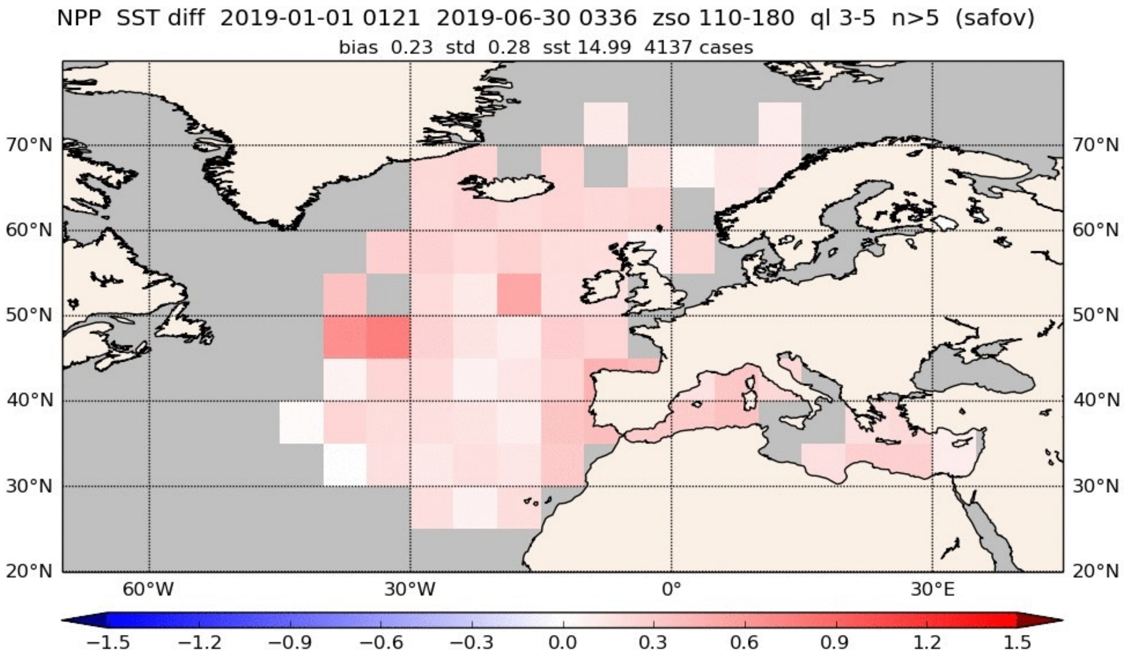


Figure 7: Mean NPP NAR night-time SST mean difference with respect to buoys measurements for quality level 3,4,5

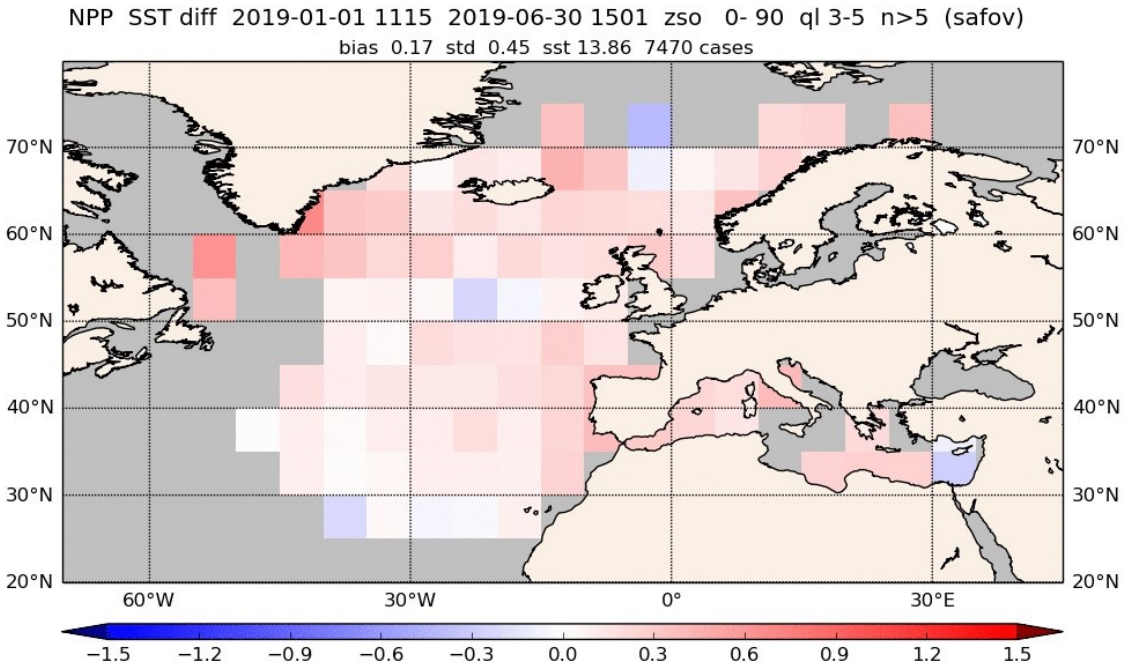


Figure 8: Mean NPP NAR day-time SST mean difference with respect to buoys measurements for quality level 3,4,5

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

NPP NAR night-time SST quality results over 1st 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 (**)
JAN. 2019	711	0.23	54	0.22	73
FEB. 2019	459	0.20	60	0.24	70
MAR. 2019	716	0.21	58	0.25	69
APR. 2019	1088	0.24	52	0.30	63
MAY 2019	618	0.26	48	0.30	63
JUN. 2019	530	0.18	64	0.28	65
NPP NAR day-time SST quality results over 1st half 2019					
JAN. 2019	692	0.17	66	0.38	53
FEB. 2019	446	0.16	68	0.37	54
MAR. 2019	935	0.16	68	0.42	48
APR. 2019	1737	0.24	52	0.53	34
MAY 2019	1510	0.14	72	0.45	44
JUN. 2019	2141	0.15	70	0.41	49
(*) 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 6: Quality results for NPP NAR SST over 1st 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 mean night-time and day-time SST mean 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.

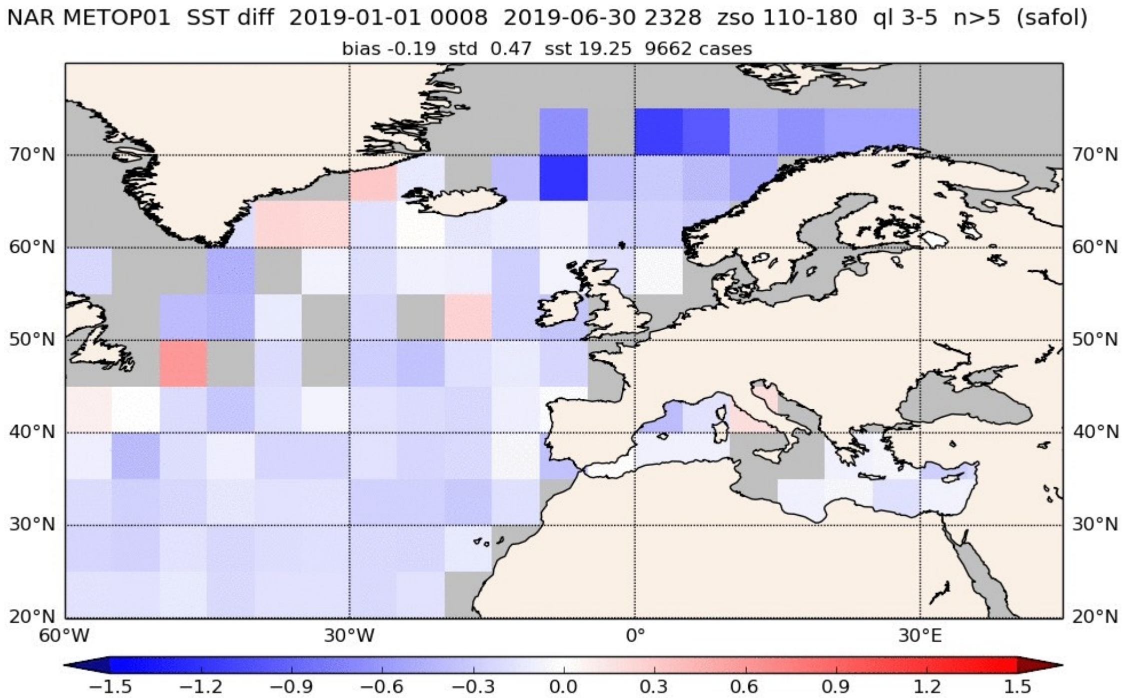


Figure 9: Mean Metop-B NAR night-time SST mean difference with respect to buoys measurements for quality level 3,4,5

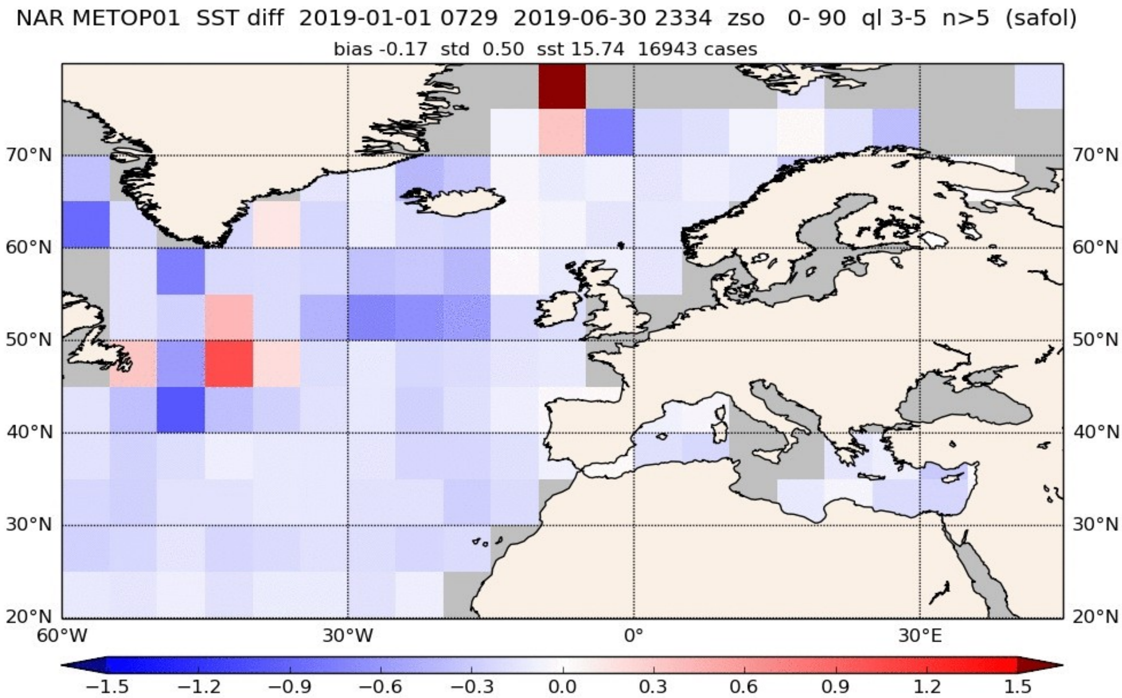


Figure 10: Mean Metop-B NAR day-time SST mean difference with respect to buoys measurements for quality level 3,4,5

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

Metop-B NAR night-time SST quality results over 1st 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 (**)
JAN. 2019	1981	-0.11	78	0.50	38
FEB. 2019	1195	-0.15	70	0.42	48
MAR. 2019	1572	-0.21	58	0.44	45
APR. 2019	1992	-0.17	66	0.46	43
MAY 2019	1599	-0.26	48	0.43	46
JUN. 2019	1292	-0.29	42	0.44	45
Metop-B NAR day-time SST quality results over 1st half 2019					
JAN. 2019	1678	-0.05	90	0.41	49
FEB. 2019	1135	-0.07	86	0.37	54
MAR. 2019	2051	-0.12	76	0.40	50
APR. 2019	3331	-0.14	72	0.53	34
MAY 2019	3297	-0.21	58	0.51	36
JUN. 2019	5449	-0.25	50	0.56	30
(*) 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 7: Quality results for Metop-B NAR SST over 1st half 2019, for 3, 4, 5 quality indexes

Comments:
Overall statistics are good and within the requirement.

5.1.5. GBL SST (OSI-201) and MGR SST (OSI-204) 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 mean night-time and day-time SST mean 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.

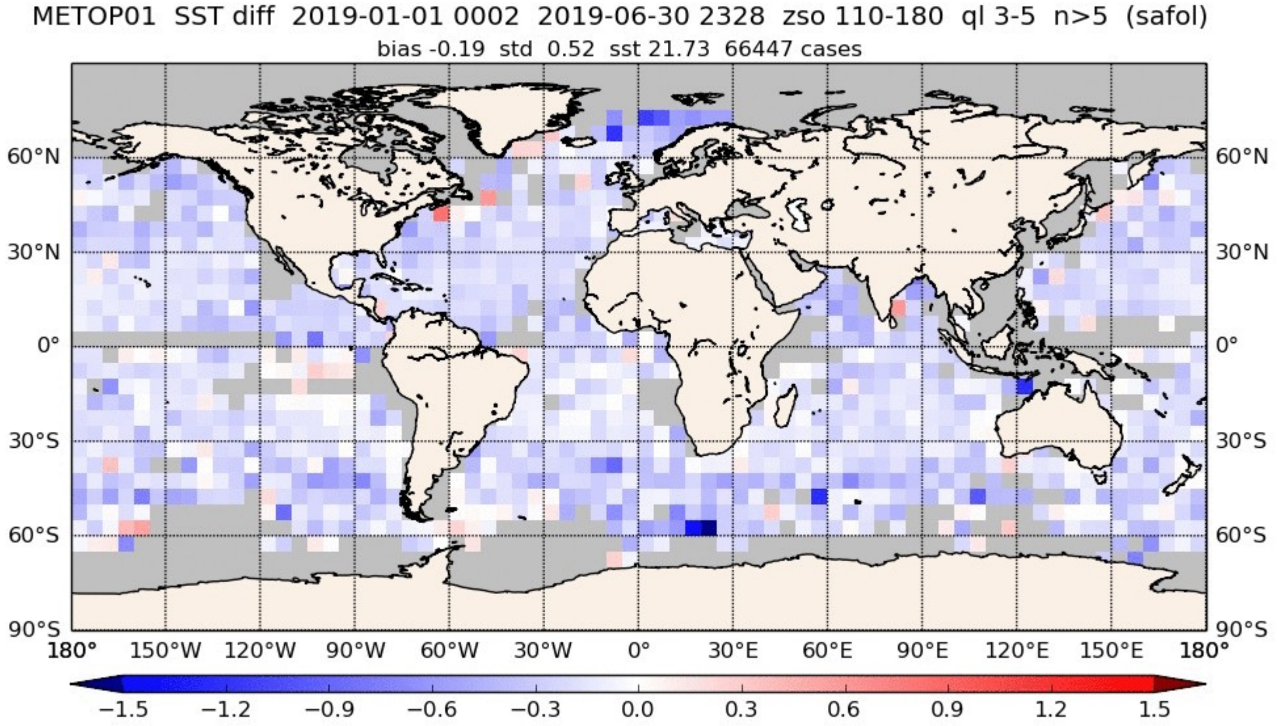


Figure 11: Mean Metop-B night-time SST mean difference with respect to buoys measurements for quality level 3,4,5

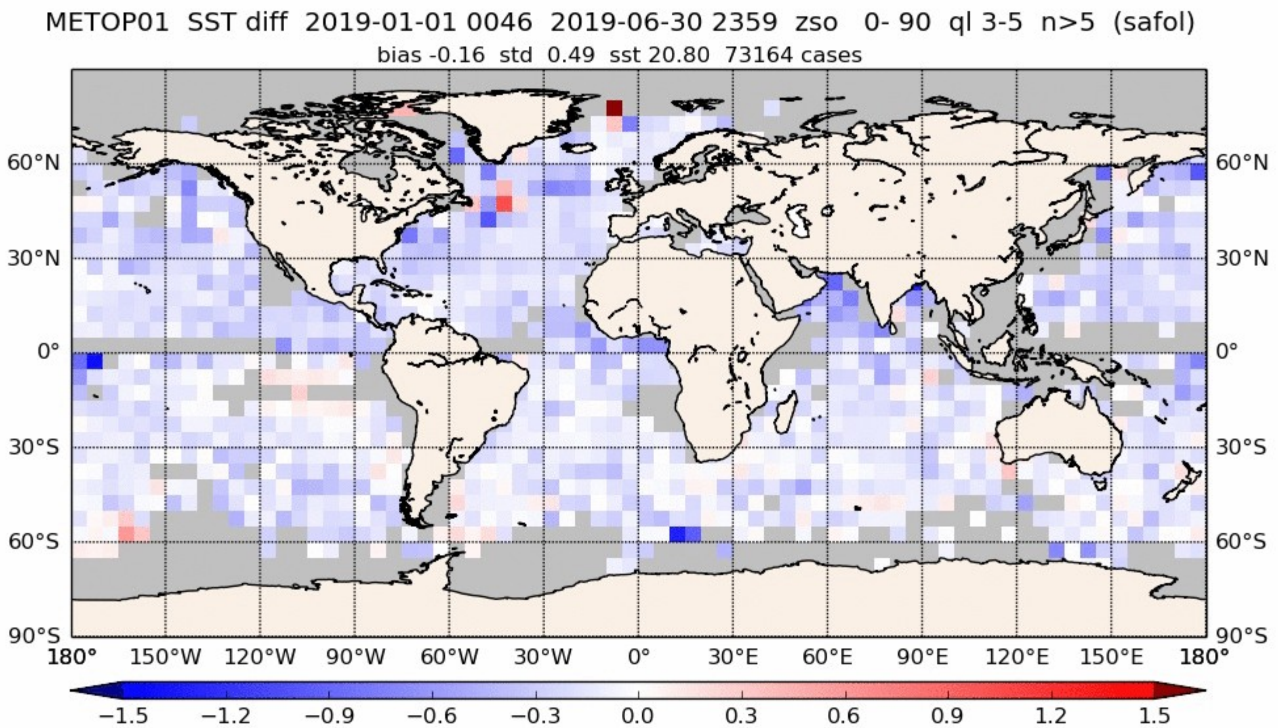


Figure 12: Mean Metop-B day-time SST mean difference with respect to buoys measurements for quality level 3,4,5

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

Global Metop-B night-time SST quality results over 1st 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 (**)
JAN. 2019	11590	-0.19	62	0.51	36
FEB. 2019	7182	-0.20	60	0.51	36
MAR. 2019	11379	-0.22	56	0.55	31
APR. 2019	12638	-0.18	64	0.51	36
MAY 2019	12755	-0.16	68	0.51	36
JUN. 2019	10871	-0.17	66	0.51	36
Global Metop-B day-time SST quality results over 1st half 2019					
JAN. 2019	12044	-0.16	68	0.45	44
FEB. 2019	7099	-0.15	70	0.44	45
MAR. 2019	11371	-0.15	70	0.43	46
APR. 2019	13697	-0.16	68	0.50	38
MAY 2019	14221	-0.14	72	0.51	36
JUN. 2019	14738	-0.18	64	0.57	29
(*) 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 8: Quality results for global METOP SST over 1st 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 the 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 the DMI GTS.

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). At the moment we do not have sufficient valid observational data from the southern hemisphere. OSI-205-a SST/IST SH quality assessment will not be conducted for this report.

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.

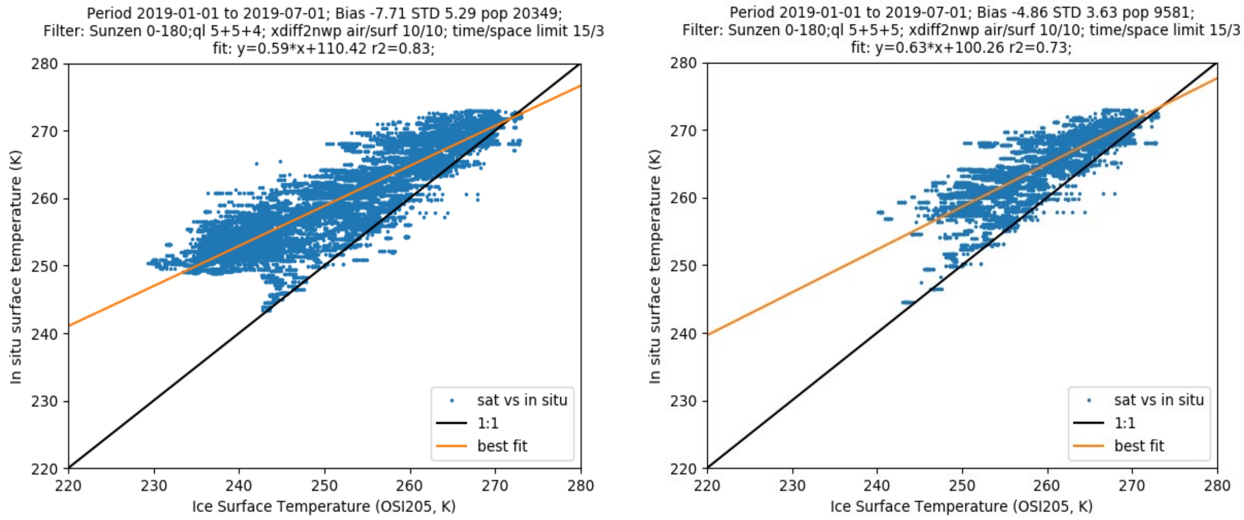


Figure 13: January to June 2019 OSI-205-a monthly mean IST mean difference with respect to conventional buoys measurements from the DMI GTS. The graph on the left shows data with both quality flags 5 &4, while the plot on the right only shows observations with quality flag 5 (= only day-time values).

After decoding of the new GTS format, the data has changed significantly, which has lead to the decision to use PROMICE data, both air temperatures and calculated surface temperatures for the reporting period. It is currently unclear, why the newly decodes GTS observations are extremly biased. We do expect the buoy data to have a warm bias compared to the true skin temperature, but not to the degree seen in figure 13. We are investigation why cold observations are missing from the data. However, we are confident that the IST OSI-205-a product is performing well based on validation results agains PROMICE data.

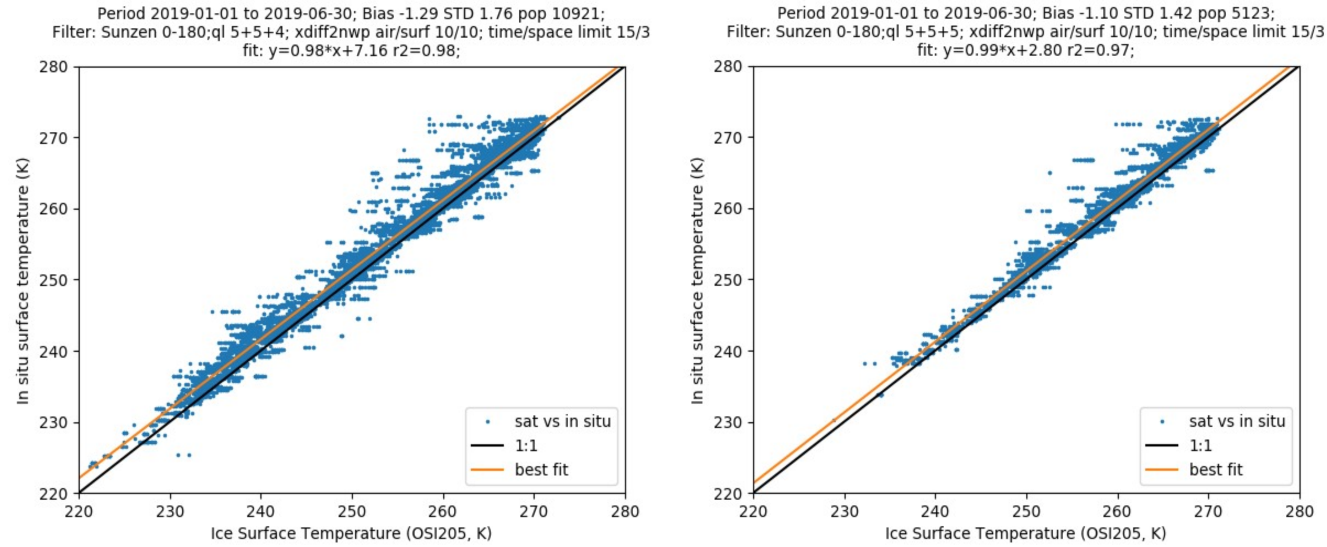


Figure 14: JAN. 2019 to JUN.2019 OSI-205-a monthly mean IST with respect to calculated surface measurements from PROMICE. The graph on the left shows data with both quality flags 5 &4, while the plot on the right only shows observations with quality flag 5 (= only day-time values).

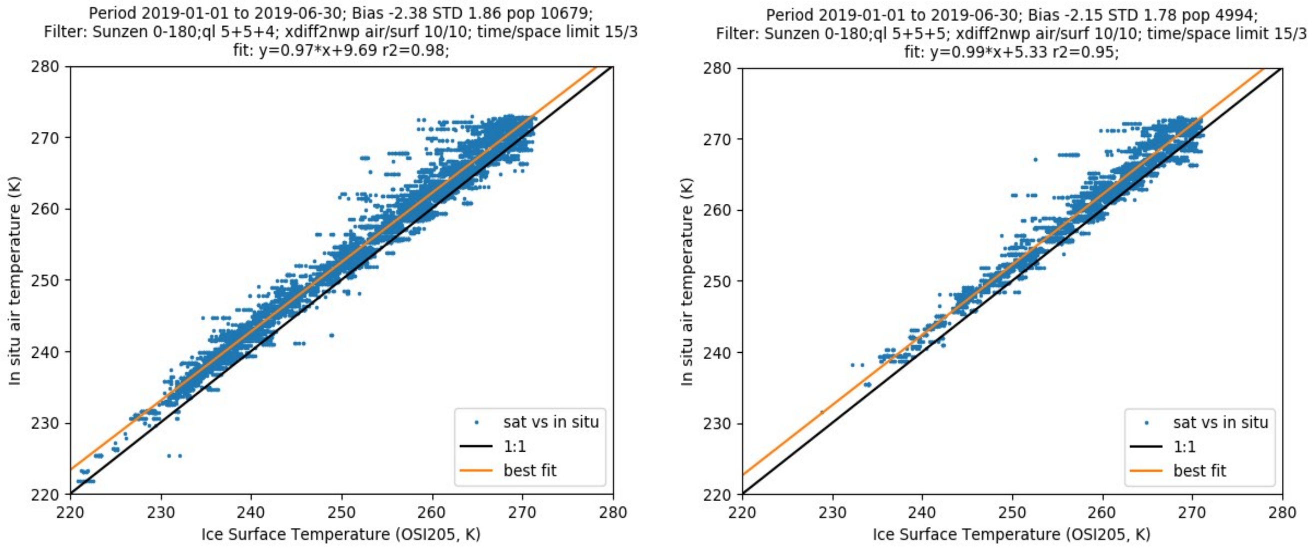


Figure 15: JAN. 2019 to JUN.2019 OSI-205-a monthly mean IST with respect to (air measurements from PROMICE. The graph on the left shows data with both quality flags 5 &4, while the plot on the right only shows observations with quality flag 5 (= only day-time values).

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.

Until we have solved the issues with the GTS data, the validation will be based on PROMICE data.

In the following tables the surface and air temperature data is used to validate the OSI-205-a for the individual months of the reporting period.

In the Service Specification [AD.1] the requirement for IST is split in two requirements: one for validation against in situ IR radiometers and one for in situ buoy data. The PROMICE data calculated surface data and hence not real radiometer data but we are using the requirements for validation against insitu IR radiometers (1.5 K mean diff & 2 K SD).

OSI-205-a IST quality results over 1st half 2019, night-time					
Month	Number of cases	Mean diff. in K (req.: 1.5 K)	Mean diff. margin (*)	SD in K (req. : 2.0 K)	SD margin (**)
JAN. 2019	303	-1.87	-24.67	1.44	28.0
FEB. 2019	16	-1.46	2.67	0.86	57.0
MAR. 2019	NA	NA	NA	NA	NA
APR. 2019	NA	NA	NA	NA	NA
MAY 2019	NA	NA	NA	NA	NA
JUN. 2019	NA	NA	NA	NA	NA
OSI-205-a IST quality results over 1st half 2019, day-time					
Month	Number of cases	Mean diff. in K (req.: 1.5 K)	Mean diff. margin (*)	SD in K (req. : 2.0 K)	SD margin (**)
JAN. 2019	94	0.20	113.33	1.93	3.50
FEB. 2019	246	-1.93	-28.67	3.06	-53.0
MAR. 2019	1071	-1.44	4.0	1.45	27.50
APR. 2019	2835	-1.19	20.67	1.91	4.50
MAY 2019	3222	-0.99	34.0	1.45	27.50
JUN. 2019	1242	-1.41	6.0	1.76	12.0
(*) 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 9: Quality results for OSI-205-a Metop AVHRR IST over 1st half 2019, for quality levels 4 and 5 (acceptable and best qualities), by night and by day. Compared to PROMICE calculated surface temperature.

Comments:
All validation results of against the surface temperature satisfy the requirements, except for the standard deviation of one individual month for SD and two months for mean diff.

OSI-205-a IST quality results over 1st half 2019, night-time					
Month	Number of cases	Mean diff. in K (req.: -1.5 K)	Mean diff. margin (*)	SD in K (req. : 2.0 K)	SD margin (**)
JAN. 2019	306	-2.56	-70.67	1.30	35.0
FEB. 2019	33	-2.53	-68.67	0.77	61.50
MAR. 2019	NA	NA	NA	NA	NA
APR. 2019	NA	NA	NA	NA	NA
MAY 2019	NA	NA	NA	NA	NA
JUN. 2019	NA	NA	NA	NA	NA
OSI-205-a IST quality results over 1st half 2019, day-time					
Month	Number of cases	Mean diff. in K (req.: -1.5 K)	Mean diff. margin (*)	SD in K (req. : 2.0 K)	SD margin (**)
JAN. 2019	69	-2.08	16.80	1.10	63.33
FEB. 2019	241	-3.22***	-28.80***	2.77	7.67
MAR. 2019	1057	-2.64***	-5.60***	1.40	53.33
APR. 2019	2756	-2.44	2.40	1.92	36.0
MAY 2019	3183	-1.88	24.80	1.81	39.67
JUN. 2019	1185	-2.11	15.60	2.05	31.67
(*) 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 January to June 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 for SD are satisfied except for two months. Even if some results are not compliant with the target requirements, the threshold requirements (2.5 K mean diff. & 3 K SD) are satisfied with few exceptions.
It should be noted that there was only a low number of measurements during night-time for this reported period.

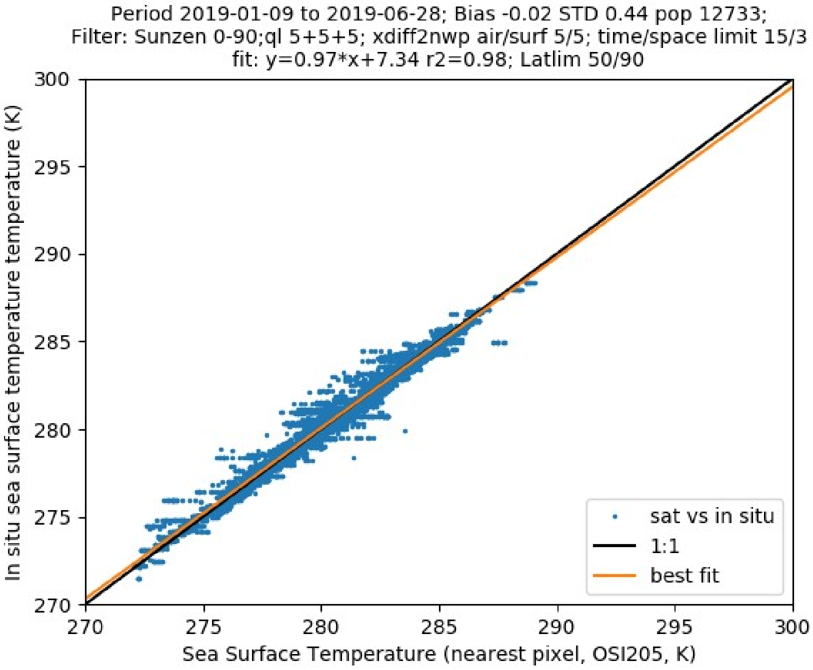


Figure 16: JAN. 2019 to JUN. 2019 OSI-205-a SST scatter plot and mean difference with respect to conventional buoys measurements from the Copernicus In Situ DB. Only daytime data with quality level 5 are shown.

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, 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 (**)
JUL. 2018	NA	NA	NA	NA	NA
AUG. 2018	NA	NA	NA	NA	NA
SEP. 2018	153	-0.24	65.7	0.34	66.0
OCT. 2018	193	-0.84	20.0	1.96	-96.0
NOV. 2018	416	-0.12	82.9	0.87	13.0
DEC. 2018	155	-0.19	72.9	0.73	27.0
JUL – DEC 2018	*917*	*-0.30*	*57.1*	*1.16*	*-16.0*
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
JAN – JUN 2019	*2619*	*-0.20*	*71.4*	*0.47*	*53.0*
OSI-205-a AVHRR SST quality results, 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 (**)
JUL. 2018	2148	-0.20	71.4	1.39	-39.0
AUG. 2018	1305	-0.19	72.9	0.86	14.0
SEP. 2018	1193	-0.32	54.3	0.78	22.0
OCT. 2018	367	0.09	87.1	0.77	23.0
NOV. 2018	277	-0.20	71.4	1.15	-15.0
DEC. 2018	41	1.04	-48.6	1.75	-75.0
JUL – DEC 2018	*5331*	*-0.20*	*71.4*	*1.11*	*-11.0*
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
JAN – JUN 2019	*12733*	*-0.02*	*97.1*	*0.44*	*56.0*
(*) 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 11: Quality results for OSI-205-a AVHRR SST over JAN. 2019 to JUN. 2019, for quality level 5, by night and by day.

Comments: A visual inspection of extreme outliers has been carried out for the first half year of 2019. For the validation period of January-June 2019 eight buoys were disqualified from the validation data, since they are supposedly grounded at coast lines:

- GL_TS_DB_4802539 south of the Beaufort Sea.
- GL_TS_DB_4601668 at the west coast of Britisth Columbia.
- GL_TS_DB_4401619 at the west coast of Ireland.
- GL_TS_DB_4601605 north of the Gulf of Alaska.
- GL_TS_DB_4401605 at the north-west coast of Norway.
- GL_TS_DB_6301560 at the northern coast of Norway.
- GL_TS_DB_4601629 at the west coast of British Columbia.
- GL_TS_DB_4601624 east of the Gulf of Alaska.

Validation values for the first half year of 2019 are fully satisfactory and fulfil the requirements on mean error and standard deviation error.
The values from the previous period, the second half of 2018, had been slightly above the requirements, mostly with respect to the standard deviation.
For the previous period no visual inspection had been carried out, due to the already lower number of observations for this period. The table above also include observations with quality level 4 for the monthly statistics of 2018, due to the low number of observations in the second half of 2018.

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 since the start of distribution of this product in February 2019. The IST product is validated against in situ buoys on the ice, which is not a good validation data source and hence large requirement values and apparent low product performance.

OSI-205-b NHL VIIRS SST quality results over 1st half 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 (**)
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
OSI-205-b NHL VIIRS SST quality results over 1st half 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 (**)
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
(*) 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-b NHL VIIRS SST over 1st half 2019, for 3,4,5 quality indexes, by night and by day.

OSI-205-b NHL VIIRS IST quality results over 1st half 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 (**)
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	-	-	-	-
OSI-205-b NHL VIIRS IST quality results over 1st half 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 (**)
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	-	-	-	-
(*) 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 IST over 1st half 2019, for 3,4,5 quality indexes, by night and by day.

Comments:
The validation results for SST show that OSI-205-b is within the product target requirements. The results are generally better at daytime than night-time, probably due to better cloud masking at daytime.
The validation results for IST show that OSI-205-b is outside the product target requirements for some of the months. Specially the mean difference in April and May show a large negative mean difference.
There are few in situ observations available on the ice, and no validation data available during night time in Arctic summer.

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 since the start of distribution of this product in February 2019. This product together with OSI-203-b has replaced OSI-203. The IST product is validated against in situ buoys on the ice, which is not a good validation data source and hence large requirement values and apparent low product performance.

OSI-203-a NHL AVHRR SST quality results over 1st half 2019, night-time					
Month	Number of cases	Mean diff. in K (req.: 0.5 K)	Mean diff. margin (*)	SD in K (req.: 0.8 K)	SD margin (**)
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
OSI-203-a NHL AVHRR SST quality results over 1st half 2019, day-time					
Month	Number of cases	Mean diff. in K (req.: 0.5 K)	Mean diff. margin (*)	SD in K (req.: 0.8 K)	SD margin (**)
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
(*) 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-203-a NHL AVHRR SST over 1st half 2019, for 3,4,5 quality indexes, by night and by day

OSI-203-a NHL AVHRR IST quality results over 1st half 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 (**)
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	-	-	-	-
OSI-203-a NHL AVHRR IST quality results over 1st half 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 (**)
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	-	-	-	-
(*) 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 IST over 1st half 2019, for 3,4,5 quality indexes, by night and by day

Comments:
The validation results for SST show that OSI-203-a is within the product target requirements for all of the months, except a too negative mean difference in March 2019 at nighttime. The results are generally better at daytime than nighttime, probably due to better cloudmaskin at daytime.

The validation results for IST show that OSI-203-a is outside the product target requirements for some of the months. Specially the mean difference in April and May show a large negative mean difference.
There are few in situ observations available on the ice, and no validation data available during night time in Arctic summer.

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 since the start of distribution of this product in February 2019. This product together with OSI-203-a has replaced OSI-203. The IST product is validated against in situ buoys on the ice, which is not a good validation data source and hence large requirement values and apparent low product performance.

OSI-203-b NHL VIIRS SST quality results over 1st half 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 (**)
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
OSI-203-b NHL VIIRS SST quality results over 1st half 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 (**)
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
(*) 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-b NHL VIIRS SST over 1st half 2019, for 3,4,5 quality indexes, by night and by day

OSI-203-b NHL VIIRS IST quality results over 1st half 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 (**)
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	-	-	-	-
OSI-203-b NHL VIIRS IST quality results over 1st half 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 (**)
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	-	-	-	-
(*) 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 IST over 1st half 2019, for 3,4,5 quality indexes, by night and by day

Comments:
The validation results for SST show that OSI-203-b is within the product target requirements. The results are generally better at daytime than nighttime, probably due to better cloudmaskin at daytime.
The validation results for IST show that OSI-203-b is outside the product target requirements for some of the months. Specially the mean difference in April and May show a large negative mean difference.
There are few in situ observations available on the ice, and no validation data available during night time in Arctic summer.

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.

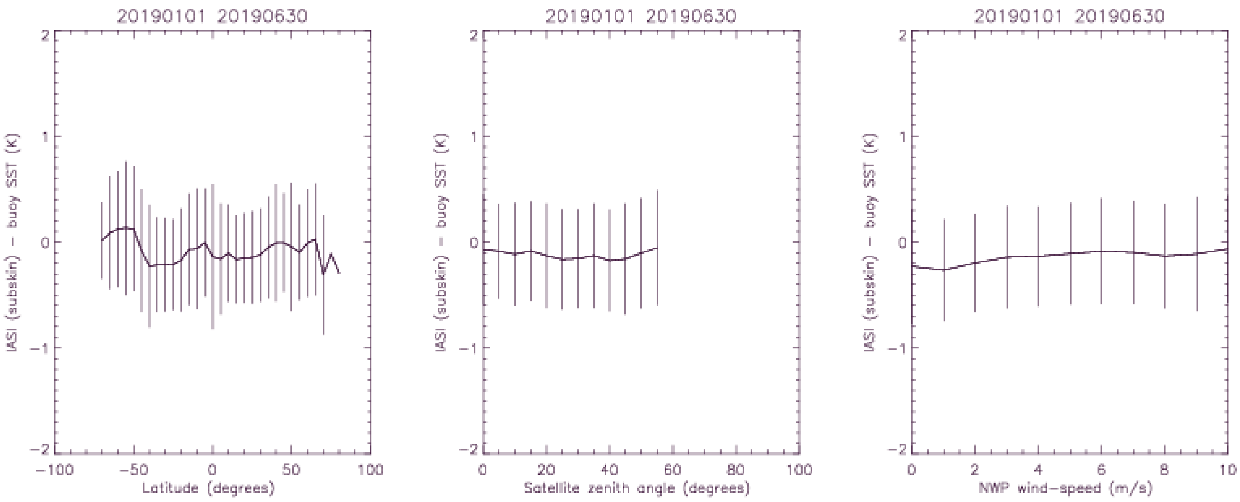


Figure 17: Mean Metop-B IASI night-time SST minus drifting buoy SST for Quality Levels 3, 4 and 5 from January to June 2019

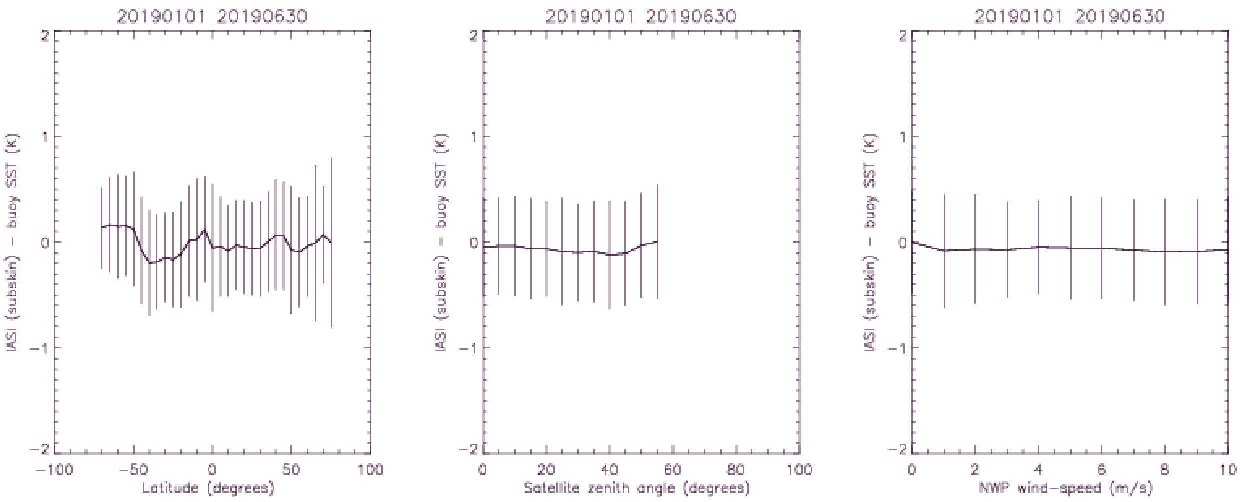


Figure 18: Mean Metop-B IASI day-time SST minus drifting buoy SST for Quality Levels 3, 4 and 5 from January to June 2019

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 1st 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 (**)
JAN. 2019	3930	-0.15	70	0.47	41
FEB. 2019	2462	-0.16	68	0.49	39
MAR. 2019	3843	-0.15	70	0.49	39
APR. 2019	4461	-0.11	78	0.49	39
MAY 2019	4526	-0.11	78	0.50	38
JUN. 2019	3956	-0.10	80	0.52	35
Global Metop-B IASI day-time SST quality results over 1st half 2019					
JAN. 2019	4010	-0.09	82	0.45	44
FEB. 2019	2497	-0.07	86	0.44	45
MAR. 2019	3986	-0.10	80	0.47	41
APR. 2019	4687	-0.05	90	0.50	38
MAY 2019	4734	-0.07	86	0.51	36
JUN. 2019	4554	-0.03	94	0.51	36

(*) 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 global Metop-B IASI SST over 1st half 2019, for Quality Levels 3, 4 and 5

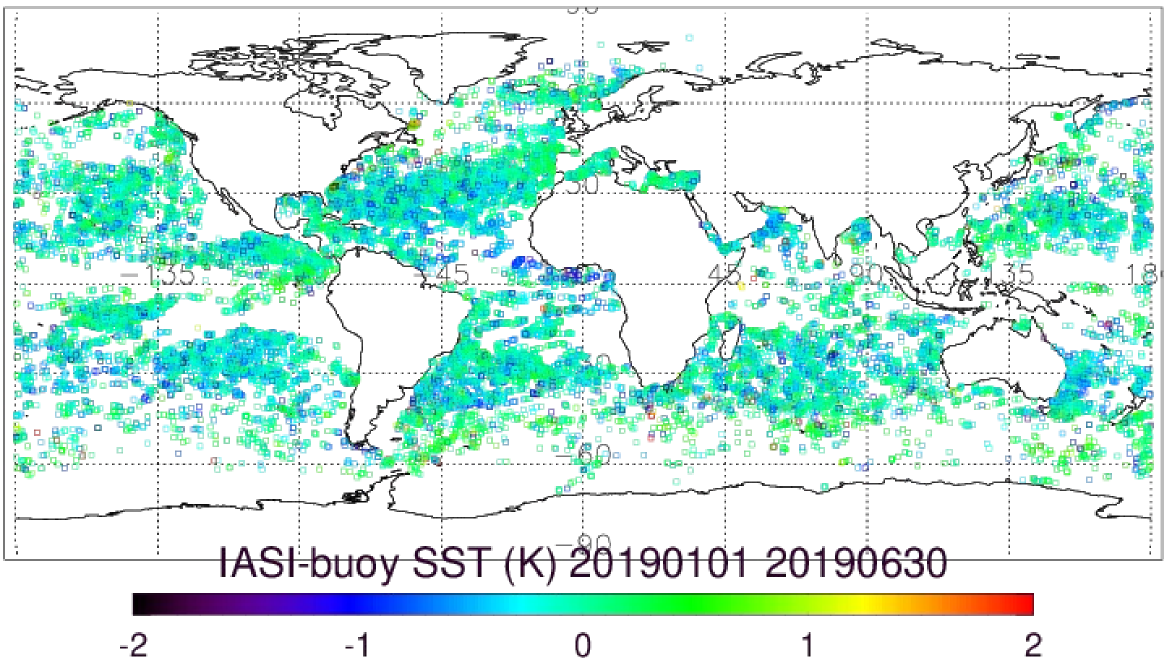


Figure 19: Mean Metop-B IASI night-time SST minus drifting buoy SST analyses for Quality Levels 3, 4 and 5, JUL. 2018 to JUN. 2019

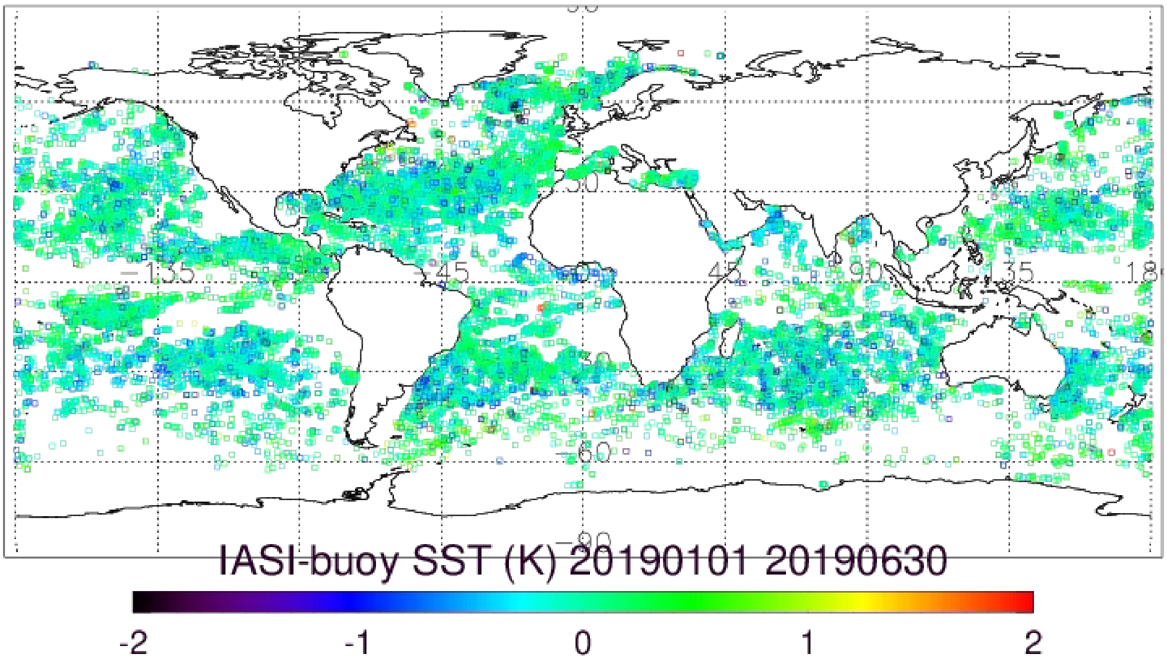


Figure 20: Mean Metop-B IASI day-time SST minus drifting buoy SST analyses for Quality Levels 3, 4 and 5, JUL. 2018 to JUN. 2019

Comments:
All statistics are performing well and within the requirements. For the period 1st January to 30th June 2019, the global mean difference night-time IASI minus drifting buoy is -0.13K with standard deviation of 0.50K (n=23178), and for day-time the mean difference is -0.07K with standard deviation of 0.49K (n=24468).

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.

Geostationary Meteosat & GOES-East DLI quality results over July 2018 to June 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 %
JUL. 2018	6673	377.11	-0.71	-0.19	96.23	16.49	4.37	56.27
AUG. 2018	6640	371.48	-1.44	-0.39	92.25	16.50	4.44	55.58
SEP. 2018	6456	357.30	-2.53	-0.71	85.84	14.59	4.08	59.17
OCT. 2018	6684	329.21	-2.95	-0.90	82.08	13.89	4.22	57.81
NOV. 2018	6292	306.69	-5.78	-1.88	62.31	15.82	5.16	48.42
DEC. 2018	6642	298.85	-7.20	-2.41	51.82	18.99	6.35	36.46
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	5084	336.96	-1.68	-0.50	90.03	15.60	4.63	53.70
JUN. 2019	4291	365.40	-3.75	-1.03	79.47	20.99	5.74	42.56
(*) 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: Geostationary DLI quality results over 1st 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 July 2018 to June 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 %
JUL. 2018	2231	369.12	2.40	0.65	87.00	10.97	2.97	70.28
AUG. 2018	2178	360.98	2.65	0.73	85.32	12.82	3.55	64.49
SEP. 2018	2096	335.69	2.82	0.84	83.20	14.73	4.39	56.12
OCT. 2018	2232	322.09	-1.03	-0.32	93.60	17.12	5.32	46.85
NOV. 2018	2160	313.92	-6.67	-2.12	57.51	18.13	5.78	42.25
DEC. 2018	2183	297.56	-15.12	-5.08	-1.63	21.50	7.23	27.75
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	1408	315.43	4.13	1.31	73.81	14.07	4.46	55.39
JUN. 2019	720	350.26	7.51	2.14	57.12	13.79	3.94	60.63
(*) 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: Meteosat Indian Ocean DLI quality results over 1st half 2019.

Comments:
The negative DLI mean difference observed in January and February 2019 is typical of winter conditions. The formation of inversion layers during clear nights reduced the air temperature at 2 m compared to the atmospheric upper layer temperatures. The DLI algorithm only uses the 2 m temperature, leading to an underestimation in such conditions. The DLI mean difference in January 2019 is slightly out of the requirement, the other statistics are 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 at http://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 from July 2018 to June 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 %
JUL. 2018	297	345.02	8.89	6.67	-33.4	12.65	3.65	63.5
AUG. 2018	286	338.66	8.84	5.59	-11.8	11.65	3.44	65.6
SEP. 2018	298	319.98	7.38	4.59	8.2	13.68	4.28	57.2
OCT. 2018	310	299.53	2.24	2.18	56.4	15.54	5.22	47.8
NOV. 2018	297	296.36	-6.20	2.37	52.6	13.77	4.69	53.1
DEC. 2018	295	288.62	-8.21	2.88	42.4	13.60	4.76	52.4
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
(*) 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: AHL DLI quality results over JUL. 2018 to JUN. 2019.

Comments:
Requirements are met for all months except for mean difference in June. The reason for this is validation results at the Hamburg-Fühlsbüttel station. These observations are collected through WMO GTS and investigations have been initiated to check for changes in encoding of missing values.

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 from July 2018 to June 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 %
JUL. 2018	9297	484.33	-1.54	-0.32	96.82	72.08	14.88	50.39
AUG. 2018	8761	461.90	5.89	1.28	87.25	79.75	17.27	42.45
SEP. 2018	5965	427.57	-2.80	-0.65	93.45	63.01	14.74	50.88
OCT. 2018	7241	385.78	7.98	2.07	79.31	69.21	17.94	40.20
NOV. 2018	6002	338.60	5.43	1.60	83.96	71.55	21.13	29.56
DEC. 2018	5692	345.32	5.37	1.56	84.45	74.72	21.64	27.87
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	7847	432.87	1.92	0.44	95.56	76.13	17.59	41.38
MAY 2019	8216	444.79	-11.42	-2.57	74.32	73.28	16.48	45.08
JUN. 2019	7187	466.66	-0.68	-0.15	98.54	72.23	15.48	48.41
(*) 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: Geostationary SSI quality results over 1st 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 from July 2018 to June 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 %
JUL. 2018	5316	501.11	-2.47	-0.49	95.07	65.70	13.11	56.30
AUG. 2018	4986	462.56	-3.86	-0.83	91.66	70.82	15.31	48.97
SEP. 2018	3659	462.42	-0.47	-0.10	98.98	61.80	13.36	55.45
OCT. 2018	4001	371.54	8.45	2.27	77.26	59.43	16.00	46.68
NOV. 2018	3265	334.76	13.63	4.07	59.28	65.01	19.42	35.27
DEC. 2018	2990	339.37	13.73	4.05	59.54	69.89	20.59	31.35
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	4642	449.76	-11.30	-2.51	74.88	71.41	15.88	47.08
JUN. 2019	3903	470.04	4.13	0.88	91.21	60.14	12.79	57.35
(*) 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: Meteosat Indian Ocean SSI quality results over 1st 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 24: 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 24. 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 from July 2018 to June 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 %
JUL. 2018	305	209.09	-37.04	17.08	-70.8	24.79	12.92	56.9
AUG. 2018	281	119.50	-22.92	19.74	-97.4	25.36	22.06	26.5
SEP. 2018	295	73.96	-15.67	20.46	-104.6	19.54	27.15	9.5
OCT. 2018	305	33.64	-8.41	24.42	-144.2	16.07	43.02	-43.4
NOV. 2018	295	8.27	-3.31	18.80	-88.0	10.42	74.59	-148.6
DEC. 2018	300	3.23	-	-		-	-	-
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
(*) 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 25: AHL SSI quality results over JUL. 2018 to JUN. 2019

Comments:
The requirement on mean difference is not met at any point, and the requirement on standard deviation is not met during the winter months. The reason why mean difference is not met is due to an overestimation on most stations. This overestimation is currently being tuned in the next version of the software to deploy. Adding to this, some of the stations are located in shadows of mountains. This is the situation for several of the stations along the Norwegian coast as well as the station at Hopen. The standard deviation tells us that correcting this mean difference will solve the issue for the period of the year where the solar elevation is high. During winter time, this product is difficult due to the small signal to noise ratio.

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 26: 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.

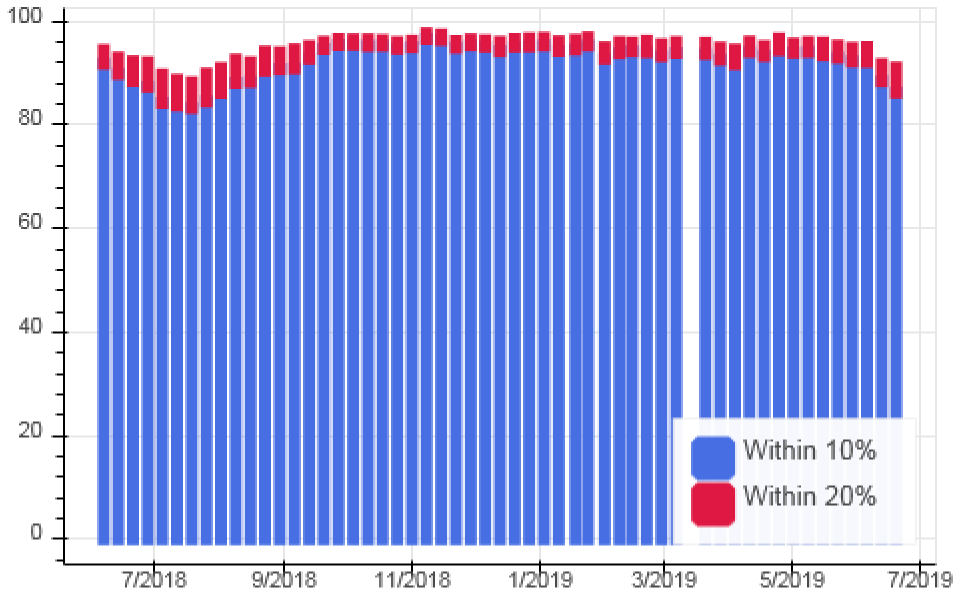


Figure 21: Comparison of ice concentrations from the Greenland overview charts made by DMI and the OSI SAF concentration product. Northern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%.

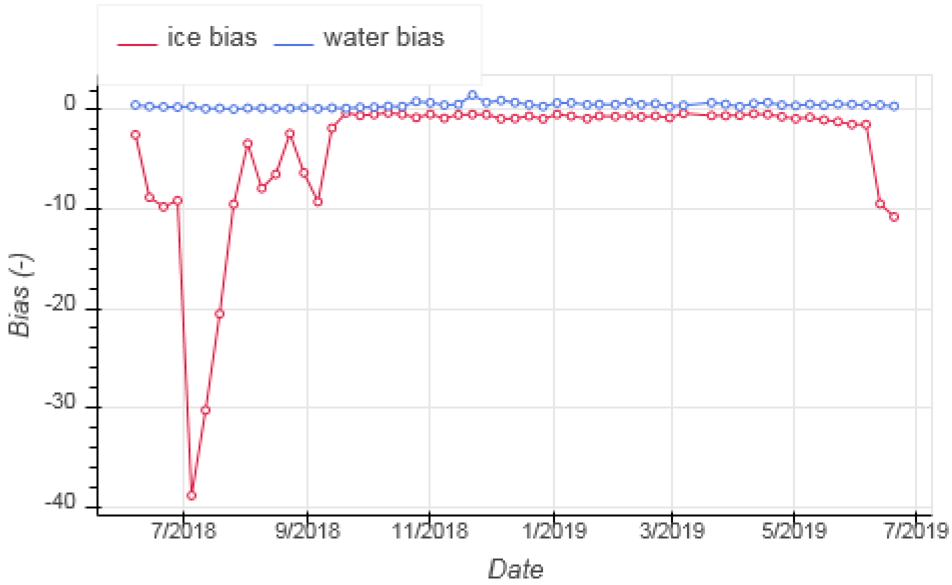


Figure 22: Difference between ice concentrations from the Greenland overview charts made by DMI and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Northern hemisphere.

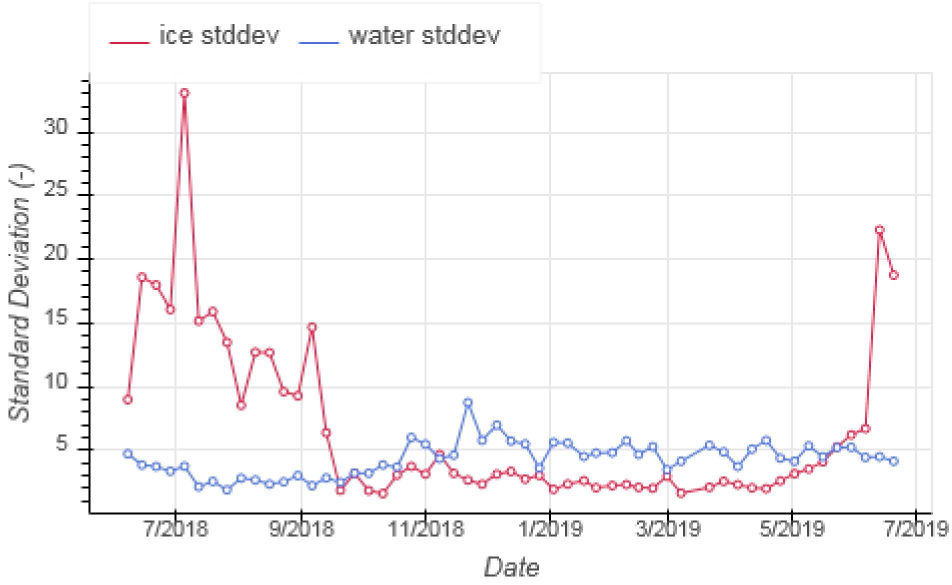


Figure 23: Standard deviation of the difference in ice concentrations from the Greenland overview charts made by DMI and OSI SAF concentration product for two categories: water and ice. Northern hemisphere.

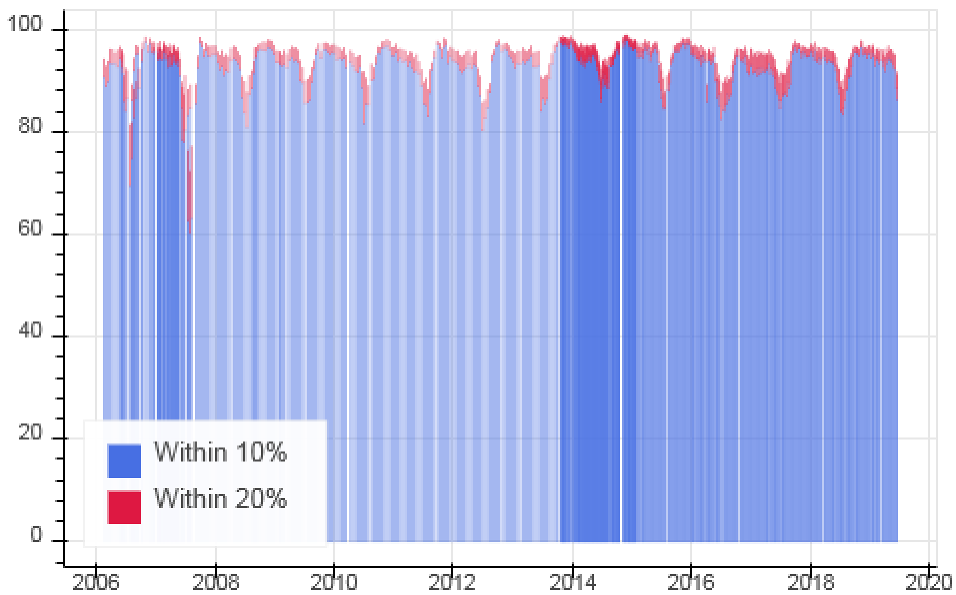


Figure 24: Multiyear variability. Comparison between ice concentrations from the Greenland overview charts made by DMI and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%. Northern hemisphere.

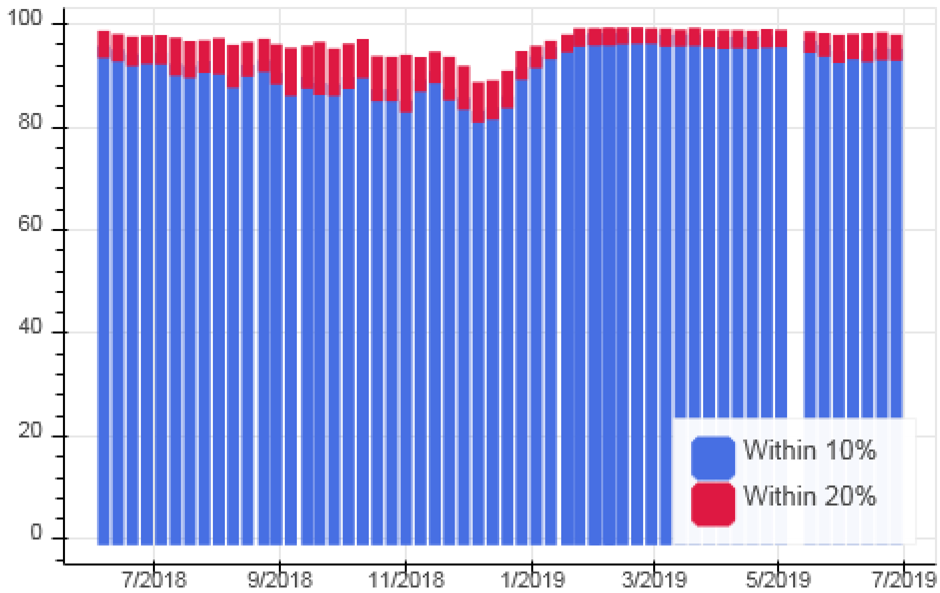


Figure 25: Comparison between ice concentrations from the NIC ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/-10%, and likewise for +/-20%. Southern hemisphere.

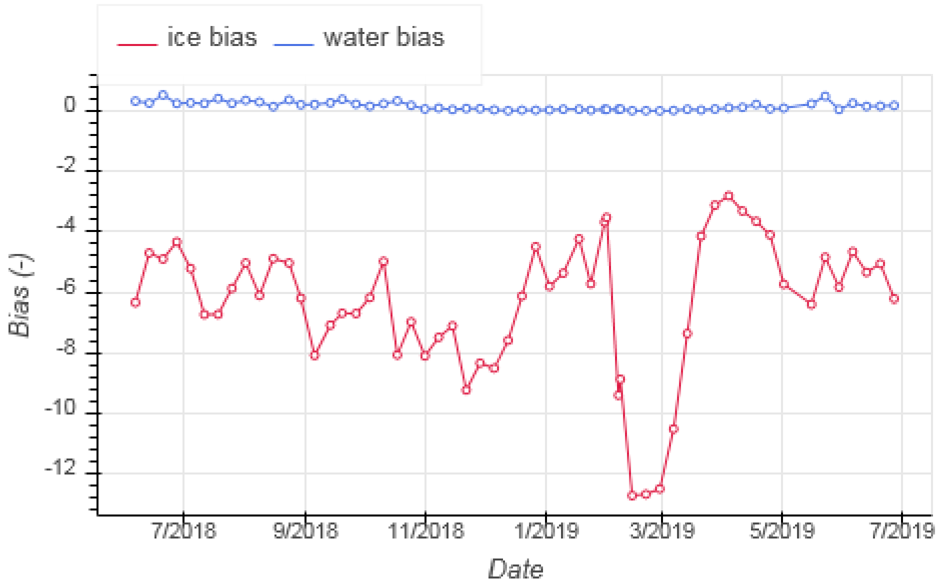


Figure 26: Difference between the ice concentrations from the NIC ice analysis and OSI SAF concentration product for two categories: water and ice. When the difference is below zero, the OSI SAF sea ice concentration has a lower estimate than the ice analysis. Southern hemisphere.

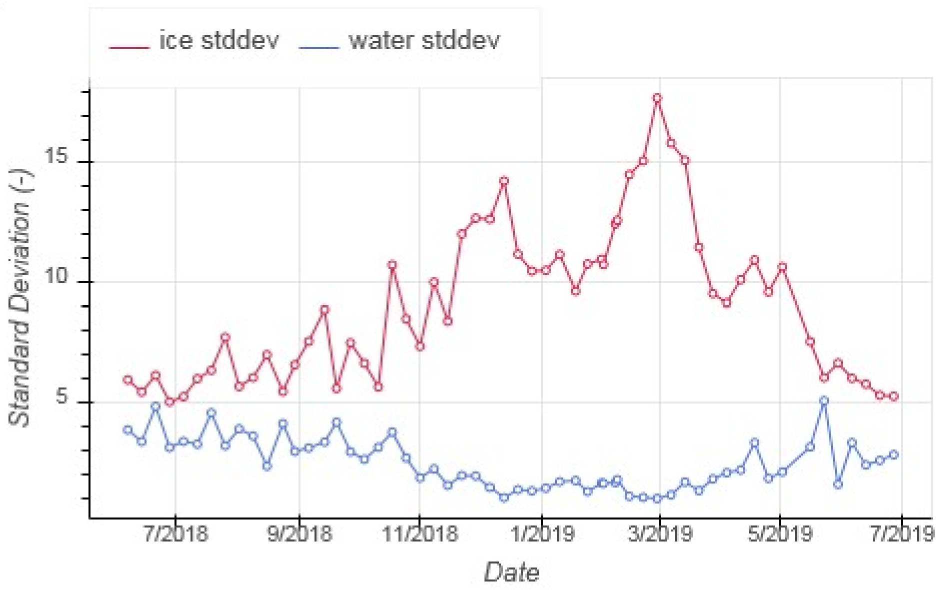


Figure 27: Standard deviation of the difference in ice concentrations from the NIC ice analysis and OSI SAF concentration product for two categories: water and ice. Southern hemisphere.

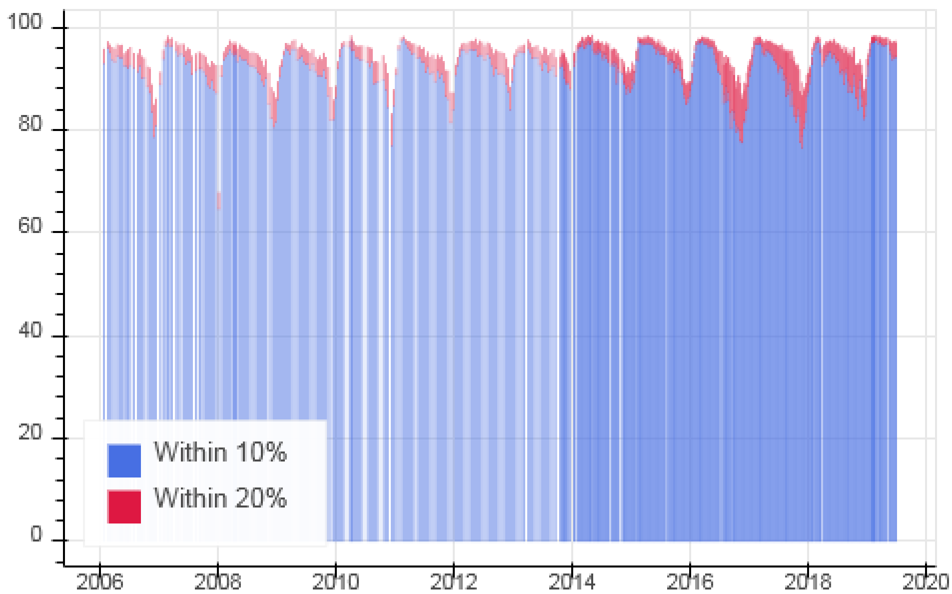


Figure 28: Multiyear variability. Comparison between ice concentrations from the NIC ice analysis and the OSI SAF concentration product. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range of +/- 10%, and likewise for +/-20%. Southern hemisphere.

Concentration product					
Month	+/- 10% [%]	+/- 20% [%]	Mean difference [%]	SD [%]	Number of obs.
JUL. 2018	92.2	93.2	-3.3	11.1	530629
AUG. 2018	96.3	97.0	-1.3	6.4	591009
SEP. 2018	98.1	98.6	-0.7	4.5	495207
OCT. 2018	99.0	99.3	-0.4	2.8	582221
NOV. 2018	98,2	98.8	-0.6	3.6	484838
DEC. 2018	97.3	98.1	-1.0	4.6	342949
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

Table 27: Monthly quality assessment results from comparing the OSI SAF sea ice concentration product to MET Norway ice service analysis for the Svalbard area. From JUL. 2018 to JUN. 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
JAN. 2019	78.16	21.84	0.00	0.00	0.00	0.00
FEB. 2019	77.95	22.05	0.00	0.00	0.00	0.00
MAR. 2019	79.54	20.46	0.00	0.00	0.00	0.00
APR. 2019	81.01	18.99	0.00	0.00	0.00	0.00
MAY 2019	79.89	20.11	0.00	0.00	0.00	0.00
JUN. 2019	77.45	22.55	0.00	0.00	0.00	0.00

Table 28: Statistics for sea ice concentration confidence levels, Code 0-5, Northern Hemisphere.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JAN. 2019	90.90	9.10	0.00	0.00	0.00	0.00
FEB. 2019	93.06	6.94	0.00	0.00	0.00	0.00
MAR. 2019	92.18	7.82	0.00	0.00	0.00	0.00
APR. 2019	87.79	12.21	0.00	0.00	0.00	0.00
MAY 2019	82.32	17.68	0.00	0.00	0.00	0.00
JUN. 2019	77.91	22.09	0.00	0.00	0.00	0.00

Table 29: 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 concentration product accuracy, showing the std. dev. of the difference in ice concentration between the OSI SAF product and the DMI ice analysis for NH and the NIC ice analysis for SH, respectively. Tables of statistics for confidence levels show that both the NH and SH product quality is good and rather stable.
Average yearly SD for the period Jul. 2018 – Jun. 2019 can be seen in table just below. The average yearly SD is below 10% and 15% for the NH and SH hemisphere products, respectively, and thus fulfill the service specifications.

Average yearly standard deviation		
	Avg. SD ice	Avg. SD water
Northern hemisphere	6.15	4.28
Southern hemisphere	9.41	2.49

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.

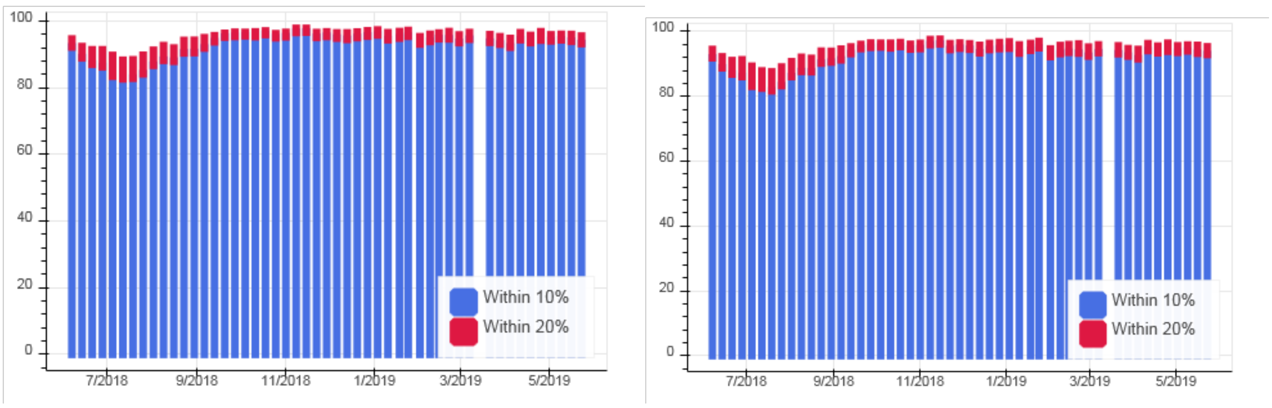


Figure 29: Comparison of ice concentrations from the Greenland overview charts made by DMI and the OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right. Northern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations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

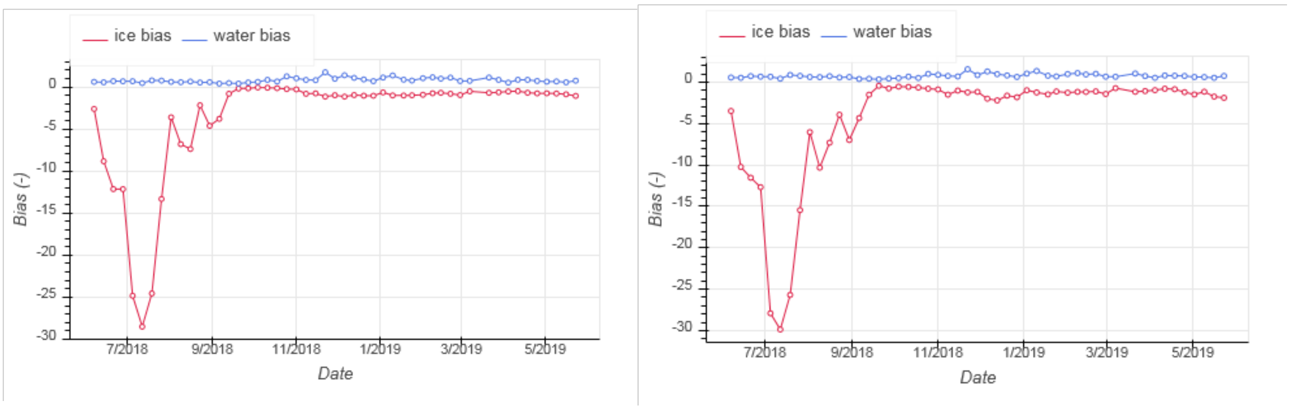


Figure 30: Difference between ice concentrations from the Greenland overview charts made by DMI and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Northern Hemisphere

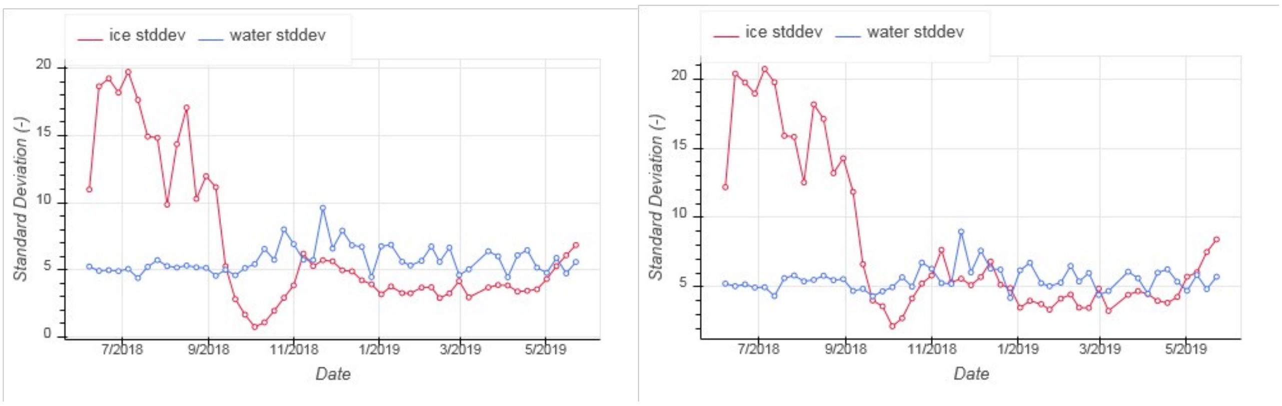


Figure 31: Standard deviation of the difference in ice concentrations from the Greenland overview charts made by DMI and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Northern hemisphere.

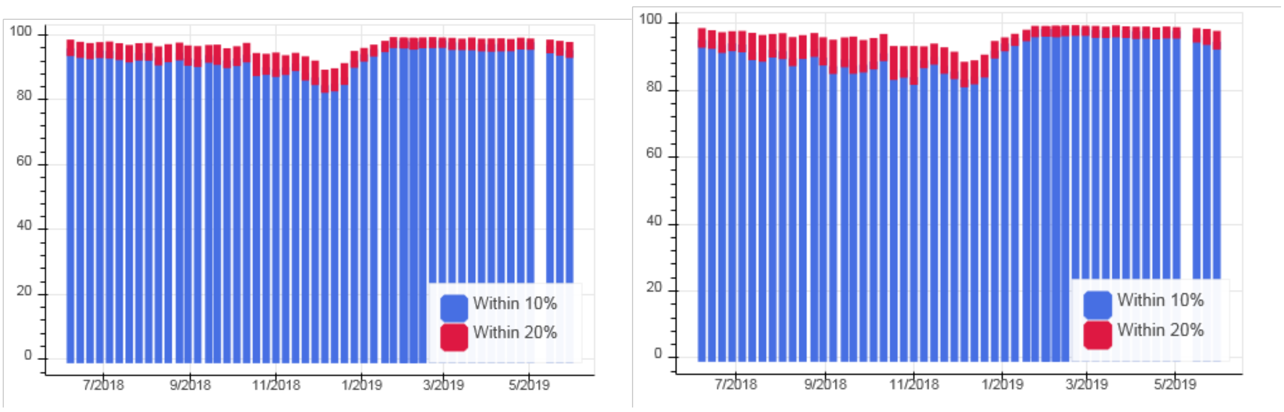


Figure 32: Comparison of ice concentrations from the NIC ice analysis and the OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right. Southern hemisphere. 'Match +/- 10%' corresponds to those grid points where concentrations are within the range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

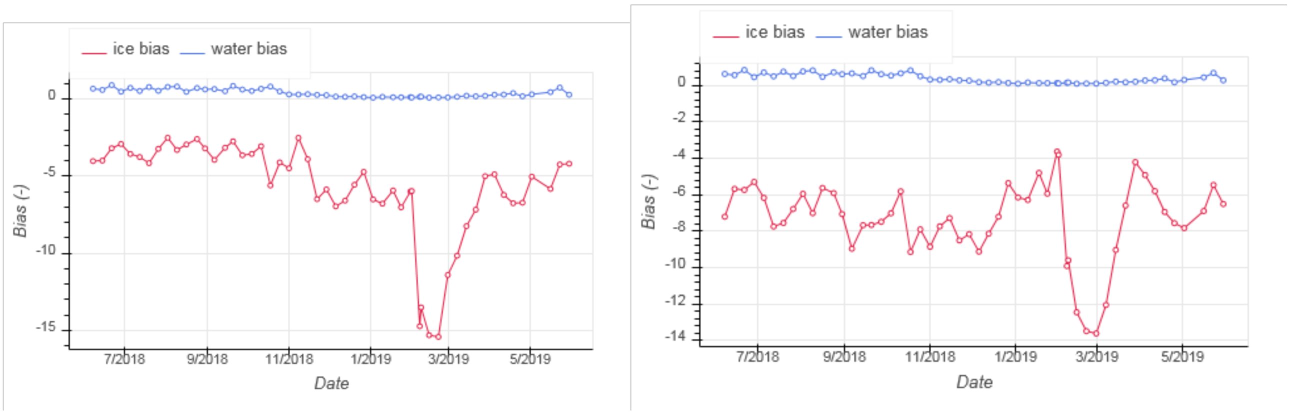


Figure 33: Difference between ice concentrations from the NIC ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and ice. Southern Hemisphere

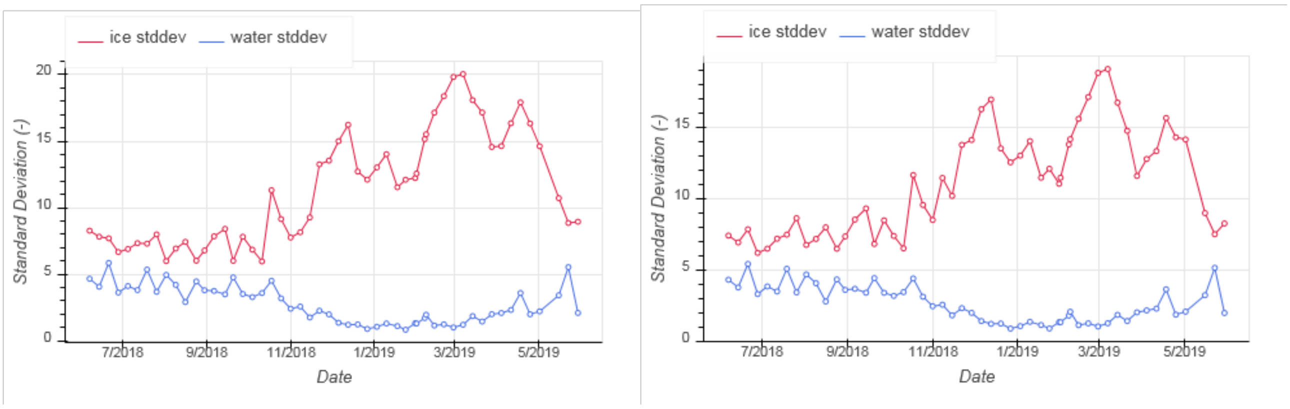


Figure 34: Standard deviation of the difference in ice concentrations from the NIC ice analysis and OSI SAF AMSR-2 concentration product based on OSHD algorithm to the left and based on TUD algorithm to the right for two categories: water and, ice. Southern hemisphere.

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 difference 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 table just below. On average the standard deviation is within target accuracy of 10 % and 15 % for the NH and SH hemisphere products, respectively.

Average yearly standard deviation		
	Average SD Ice	Average SD Water
OSHD algorithm NH	8.06	5,54
TUD algorithm NH	6.96	5.72
OSHD algorithm SH	11.11	2.65
TUD algorithm SH	11.40	2.74

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.

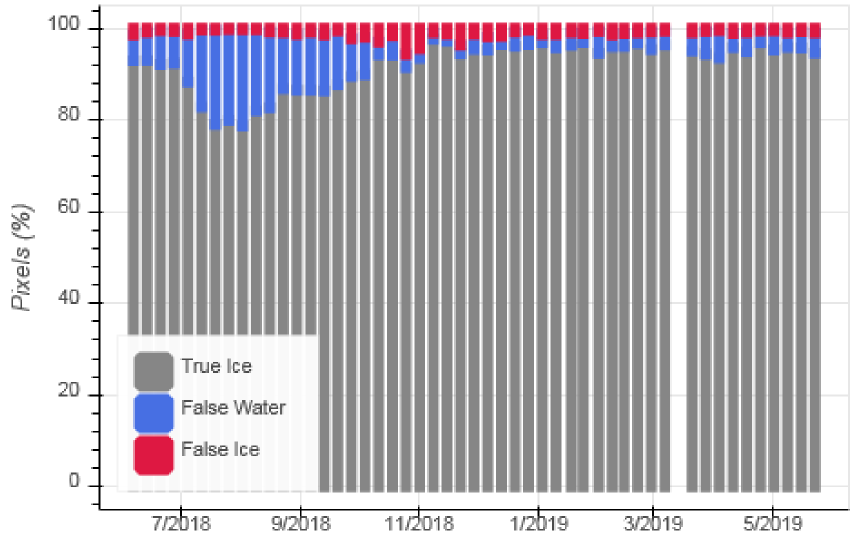


Figure 35: Comparison between the Greenland overview charts made by DMI and the OSI SAF sea ice edge product. Northern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the DMI ice analysis indicated ice and vice versa for the 'False Ice' category.

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.

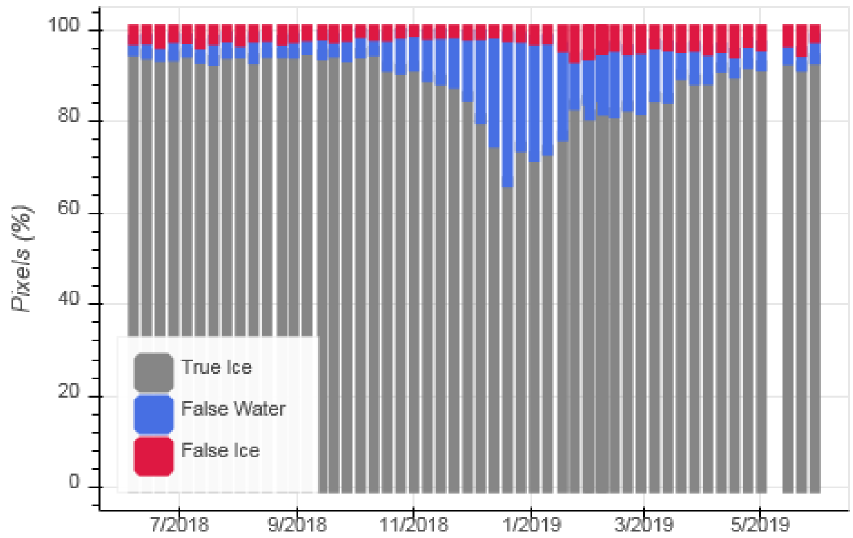


Figure 37: Comparison between the NIC ice analysis and the OSI SAF sea ice edge product. Southern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the NIC ice analysis indicated ice and vice versa for the 'False Ice' category.

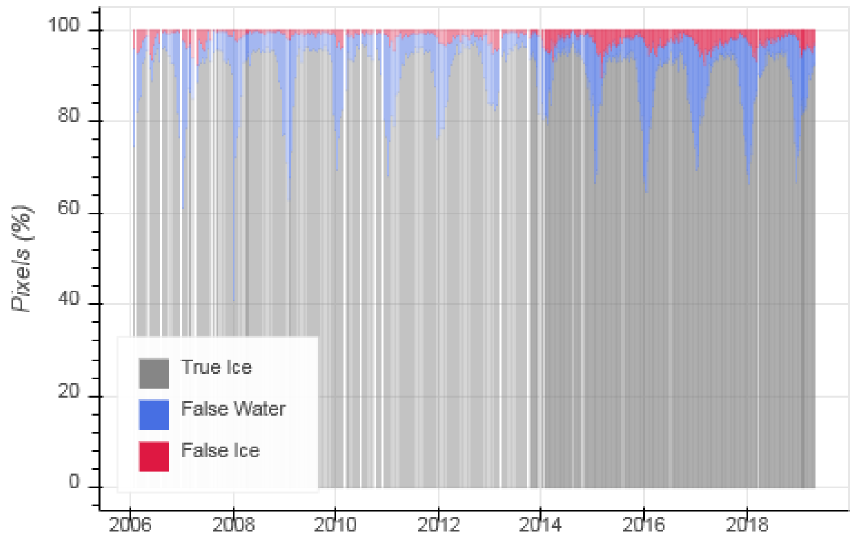


Figure 38: Multiyear variability. Comparison between the NIC ice analysis and the OSI SAF sea ice edge product. Southern hemisphere. 'False Water' means grid points where the OSI SAF product indicated water and the NIC ice analysis indicated ice and vice versa for the 'False Ice' category.

Month	Correct [%]	SAF lower [%]	SAF higher [%]	Mean edge diff [km]	Number of obs.
JUL. 2018	94.85	4.96	0.19	33.00	704245
AUG. 2018	98.32	1.24	0.44	27.93	717898
SEP. 2018	99.19	0.33	0.48	20.69	600476
OCT. 2018	99.29	0.17	0.54	9.86	739303
NOV. 2018	98.73	0.69	0.58	12.48	650385
DEC. 2018	98.19	0.77	1.04	12.94	554406
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

Table 30: Monthly quality assessment results from comparing OSI SAF sea ice products to MET Norway ice service analysis for the Svalbard area, from JUL. 2018 to JUN. 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.
JUL. 2018	-	-	-	-	-
AUG. 2018	-	-	-	-	-
SEP. 2018	98.83	0.46	0.71	15.94	92043
OCT. 2018	98.48	1.28	0.24	28.32	460215
NOV. 2018	97.88	1.85	0.27	32.40	368172
DEC. 2018	90.76	9.96	0.28	69.30	368248
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	-	-	-	-	-

Table 31: Monthly quality assessment results from comparing OSI SAF sea ice products to MET Norway ice service analysis for the Weddell Sea area, from JUL. 2018 to JUN. 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
JAN. 2019	76.48	3.67	15.53	3.63	0.70	53.84
FEB. 2019	73.59	5.65	15.56	4.34	0.86	53.86
MAR. 2019	73.82	5.49	15.13	4.64	0.92	53.83
APR. 2019	78.23	8.76	8.88	3.31	0.83	53.59
MAY 2019	78.37	5.69	11.25	3.83	0.86	53.06
JUN. 2019	80.17	3.42	9.82	5.74	1.39	52.01

Table 32: Statistics for sea ice edge confidence levels, Code 0-5, Northern Hemisphere.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JAN. 2019	94.41	1.23	1.61	1.77	0.99	22.38
FEB. 2019	96.26	0.75	1.13	1.23	0.64	22.37
MAR. 2019	96.00	0.61	1.41	1.44	0.53	22.36
APR. 2019	91.39	1.85	3.56	2.65	0.55	22.38
MAY 2019	85.72	4.31	5.99	3.34	0.63	22.40
JUN. 2019	79.49	4.79	9.90	5.01	0.81	22.41

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

Comments:
In Table 30, 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 is 17.8 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 to September, when melting of snow and ice makes the product quality worse.

In Table 31, the Southern Hemisphere OSI SAF ice edge product is compared with weekly navigational ice charts from the Weddell Sea region (MET Norway ice service). The past yearly averaged edge difference for the 8 months containing ice charts is 39.9 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 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]
JUL. 2018	-	-
AUG. 2018	-	-
SEP. 2018	-	-
OCT. 2018	73744	2632062
NOV. 2018	34490	2311415
DEC. 2018	42689	1995398
JAN. 2019	27756	1599028
FEB. 2019	39994	1319614
MAR. 2019	37488	1164778
APR. 2019	42094	1018201
MAY 2019	80717	1170443
JUN. 2019	-	-

Table 34: 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
JAN. 2019	91,47	0,75	7,05	0,60	0,12	53,84
FEB. 2019	89,16	0,90	9,15	0,67	0,13	53,86
MAR. 2019	89,15	0,89	9,13	0,68	0,15	53,83
APR. 2019	91,54	1,01	6,53	0,77	0,15	53,59
MAY 2019	83,57	0,77	2,85	12,65	0,16	53,06
JUN. 2019	78,71	0,38	0,43	20,22	0,26	52,01

Table 35: Statistics for sea ice type confidence levels, Northern Hemisphere.

Month	Code=5	code=4	code=3	code=2	code=1	Unprocessed
JAN. 2019	93,38	0,24	0,26	5,94	0,17	22,38
FEB. 2019	95,39	0,16	0,21	4,10	0,14	22,37
MAR. 2019	94,61	0,13	0,18	4,98	0,10	22,36
APR. 2019	89,96	0,13	0,19	9,62	0,10	22,38
MAY 2019	83,78	0,15	0,22	15,74	0,11	22,40
JUN. 2019	76,85	0,18	0,27	22,59	0,11	22,41

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

Comments:
In Table 34, 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.

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 39 is the difference between the hemispheric OSI SAF product and the validation product. The OSI SAF operational emissivity is lower than the validation product on both the northern and southern hemispheres giving a negative bias. The mean annual difference on the northern hemisphere is -0.05 and on the southern hemisphere it is -0.05. There is no clear seasonal cycle neither on the northern nor southern hemisphere.

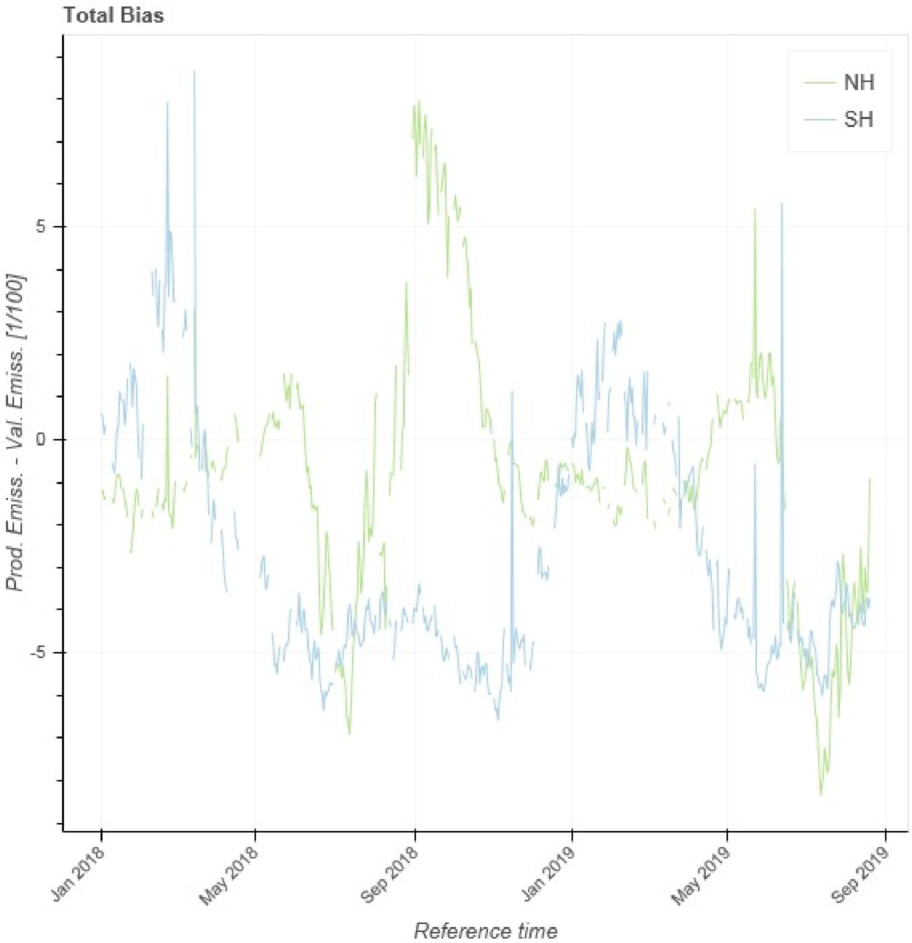


Figure 39: The mean hemispheric difference between the OSI SAF operational product and the validation product derived from NWP and SSMIS data. The y-axis unit is in hundreds (1/100)

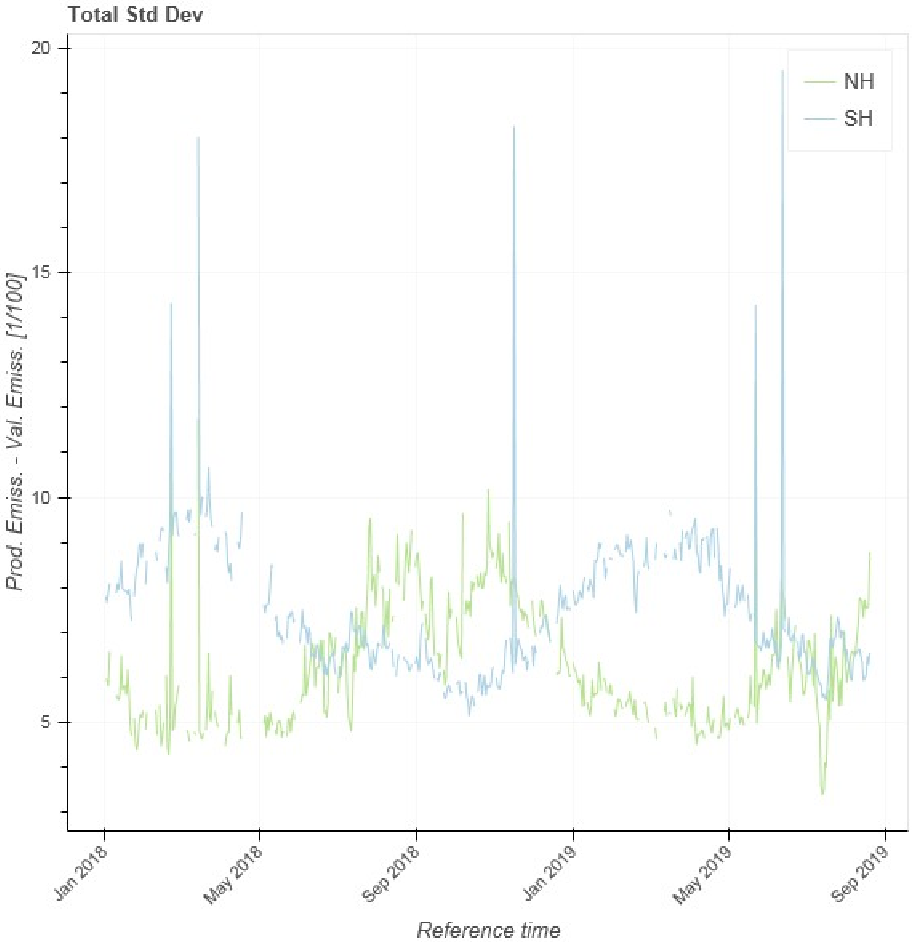


Figure 40: The standard deviation of the difference between the OSI SAF operational product and the validation product for the northern and southern hemispheres. The y-axis unit is in hundreds (1/100)

Comments:
The emissivity mean difference and the emissivity STD are summarized in the table just below and compared to target and threshold accuracies. The emissivity product is well within the threshold accuracy.

	Mean difference	SD	Target accuracy	Threshold accuracy
NH	-0.05	0.06	0.05	0.15
SH	-0.05	0.06	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 ice-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 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.

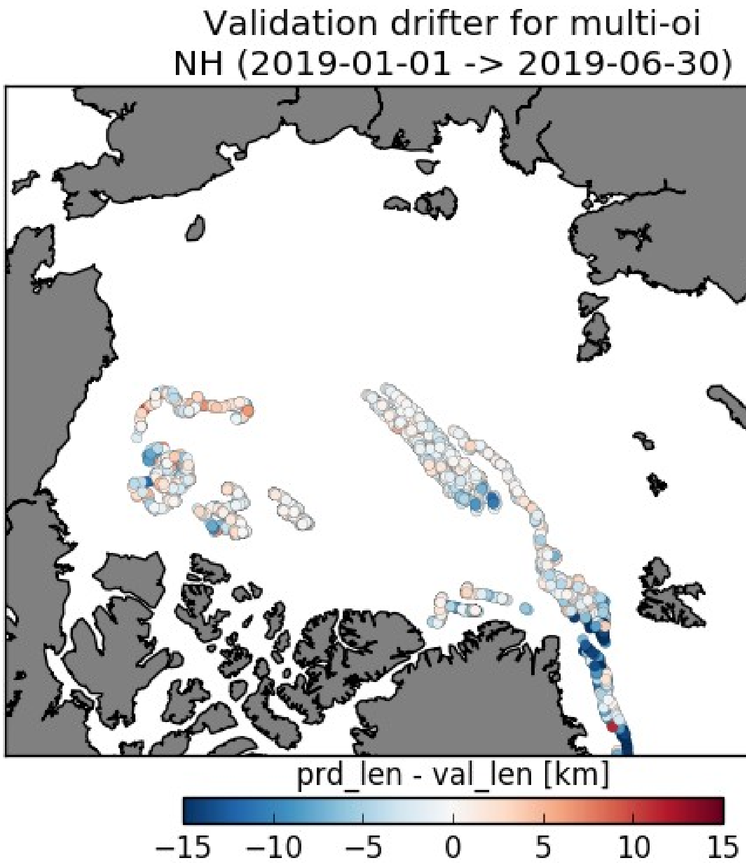


Figure 41: Location of GPS drifters for the quality assessment period (JAN. 2019 to JUN. 2019). The shade of each symbol represents the mean difference (prod-ref) in drift length (km over 2 days) for the multi-oi product.

Month	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
JUL. 2018	0,02	0,4	5,46	6,29	0,87	0,52	0,88	208
AUG. 2018	0,96	0,13	5,17	5,68	0,84	0,47	0,91	272
SEP. 2018	0,16	-0,29	5,43	4,78	0,87	0,42	0,91	432
OCT. 2018	-0,32	-0,5	3,84	3,18	0,92	-0,04	0,95	735
NOV. 2018	-0,18	-0,05	2,5	2,5	0,93	0,14	0,97	714
DEC. 2018	-0,54	-0,25	2,52	4,01	0,92	-0,01	0,97	664
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
Last 12 months	-0.108	-0.382	3.406	3.815	0.89	0.198	0.95	5920

Table 37: Quality assessment results for the LRSID (multi-oi) product (NH) for JUL. 2018 to JUN. 2019.

Month	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
JUL. 2018	--	--	--	--	--	--	--	0
AUG. 2018	--	--	--	--	--	--	--	0
SEP. 2018	--	--	--	--	--	--	--	0
OCT. 2018	-0,31	-0,76	5,74	5,7	0,93	-0,25	0,86	516
NOV. 2018	0,08	0,01	3,74	3,66	0,94	0,23	0,94	659
DEC. 2018	-0,34	-0,05	3,2	3,82	0,95	-0,12	0,96	333
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
Last 12 months	-0.109	-0.328	3.914	4.206	0.93	0.036	0.92	3204

Table 38: Quality assessment results for the LRSID (SSMIS-F18) product (NH) for JUL. 2018 to JUN. 2019.

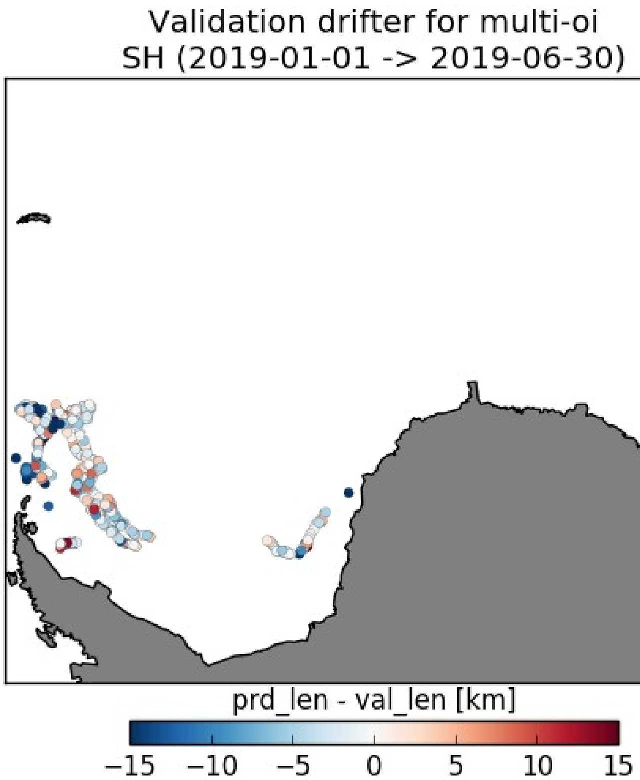


Figure 42: Location of GPS drifters for the quality assessment period (JAN. 2019 to JUN. 2019). The shade of each symbol represents the mean difference (prod-ref) in drift length (km over 2 days) for the multi-oi product.

Products	b(X) [km]	b(Y) [km]	σ(X) [km]	σ(Y) [km]	α	β[km]	ρ	N
multi-oi	-0.599	+0.478	6.016	5.945	0.84	-1.105	0.92	614
ssmis-f18	+0.020	+0.202	6.703	5.949	0.91	-0.538	0.92	326
amsr2-gw1	-0.579	+0.309	5.362	4.721	0.91	-0.801	0.95	363

Table 39: Quality assessment results for selected OSI-405-c products (SH) for the last 12 months (JUL. 2018 to JUN. 2019).

Comments:
Northern Hemisphere: The validation results for OSI-405-c are nominal and within target requirements for the period. Note that seven GPS buoys were blacklisted for this validation, all from Central Arctic Ocean and accessed on meereisportal.de (2018P66, P67, P70, P71, P72, and P73). These seven buoys show dubious drift trajectories, and report very high air temperatures. We are in contact with the data portal team to check if these trajectory files should be reprocessed. Since these seven buoys extend back into the previous HYR period (July to December 2018), the statistics reported above for year 2018 and for “last 12 months” differ from those featured in the previous HYR. The updated 2018 statistics are believed to be more reliable.

Southern Hemisphere: There are too few ice-drifting buoys available to robustly conclude on the accuracy of OSI-405-c wrt target requirements during the time period. Reported statistics will vary heavily from year to year, depending on the number and location of validation buoys (e.g. buoys close to the sea-ice edge will be more difficult to track than those further towards the continent).

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-neighbour 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

The table below shows 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.

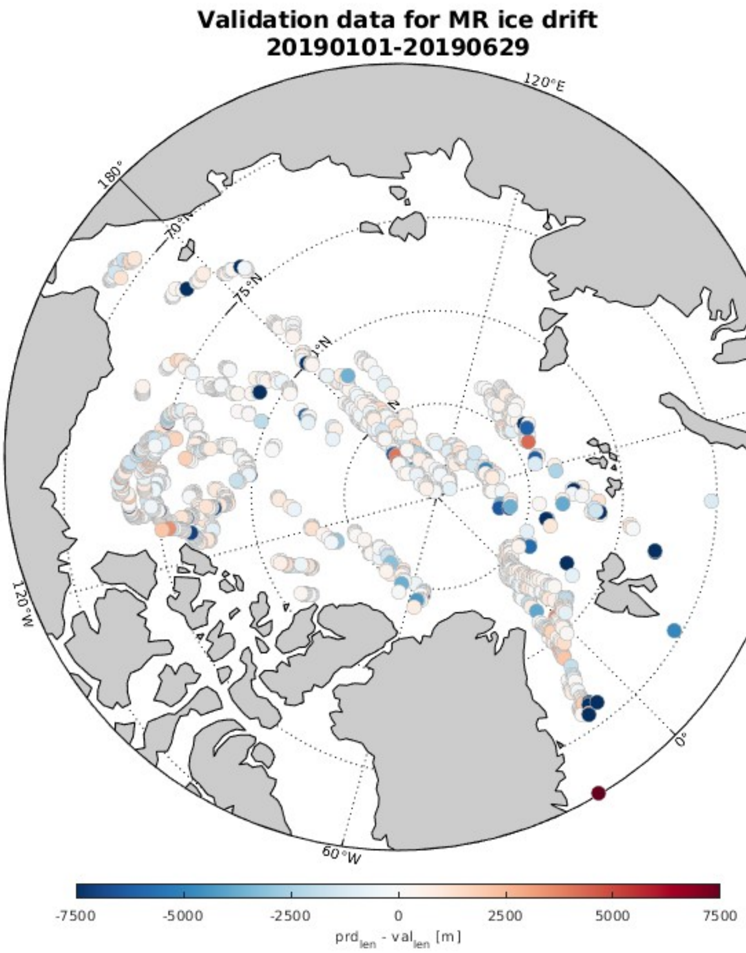


Figure 43: Location of GPS drifters for the quality assessment period (JAN. 2019 to JUN. 2019). The shade of each symbol represents the difference (prod-def) in drift length in meters

Month	b(X) [m]	b(Y) [m]	σ(X) [m]	σ(Y) [m]	α	β [m]	ρ	N
JUL. 2018	-208	229	777	757	0.94	-95.9	0.978	158
AUG. 2018	-27	-29	481	1082	0.95	34.5	0.960	252
SEP. 2018	-402	663	1156	3453	0.55	462	0.527	112
OCT. 2018	-12	351	2301	1631	1.00	-170	0.893	328
NOV. 2018	237	-52	919	1120	0.97	-73.7	0.983	4268
DEC. 2018	-428	525	1501	1504	0.99	-28.0	0.959	14528
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
Last 12 months	-87	152	1207	1290	0.97	-11.6	0.969	49114

Table 40: MR sea ice drift product (OSI-407) performance, JUL. 2018 to JUN. 2019

Comments:

The product requirement target accuracy of 2 km on yearly 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 first half year of 2019.
Match-ups were found with 171 individual buoys during this period, after carrying out the automated nearest-neighbour approach.
After further quality control 119 buoys were disqualified, and the remaining 52 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):
2101513, 2601625, 4101596, 4101608, 4101610, 4101622, 4101623, 4101624, 4101626, 4101627, 4101664, 4101666, 4101765, 4401549, 4401553, 4401558, 4401565, 4401605, 4401750, 4401751, 4401753, 4401768, 4401778, 4401779, 4401786, 4601550, 4601596, 4601605, 4601609, 4601624, 4700552, 4701658, 4701659, 4701660, 4701716, 4800632, 4800633, 4800642, 4800726, 4800769, 4800770, 4801632, 4801633, 4801636, 4801655, 4801656, 4802504, 4802539, 5301764, 5301765, 5401508, 6202679, 6203523, 6203525, 6203527, 6203549, 6203550, 6203551, 6203552, 6203553, 6203554, 6203555, 6203556, 6203557, 6203558, 6203559, 6203561, 6203562, 6203563, 6203564, 6203565, 6203566, 6203568, 6203569, 6203570, 6203571, 6203572, 6203574, 6203575, 6203576, 6203577, 6203578, 6203579, 6203580, 6203581, 6203603, 6203710, 6203711, 6203715, 6301558, 6301560, 6301562, 6301563, 6301564, 6400528, 6400562, 6401501, 6401502, 6401503, 6401506, 6401531, 6401539, 6401550, 6401555, 6401556, 6401561, 6401562, 6401565, 6401566, 6401568, 6401569, 6401570, 6401571, 6401572, 6401687, 6401781, 6401782, 6501555, 6501556
Another buoy that should be mentioned is: 4101625, which has not been excluded from the dataset, but might have left sea ice area in later observations travelling far south of Greenland.

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 July 2017 to June 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/.

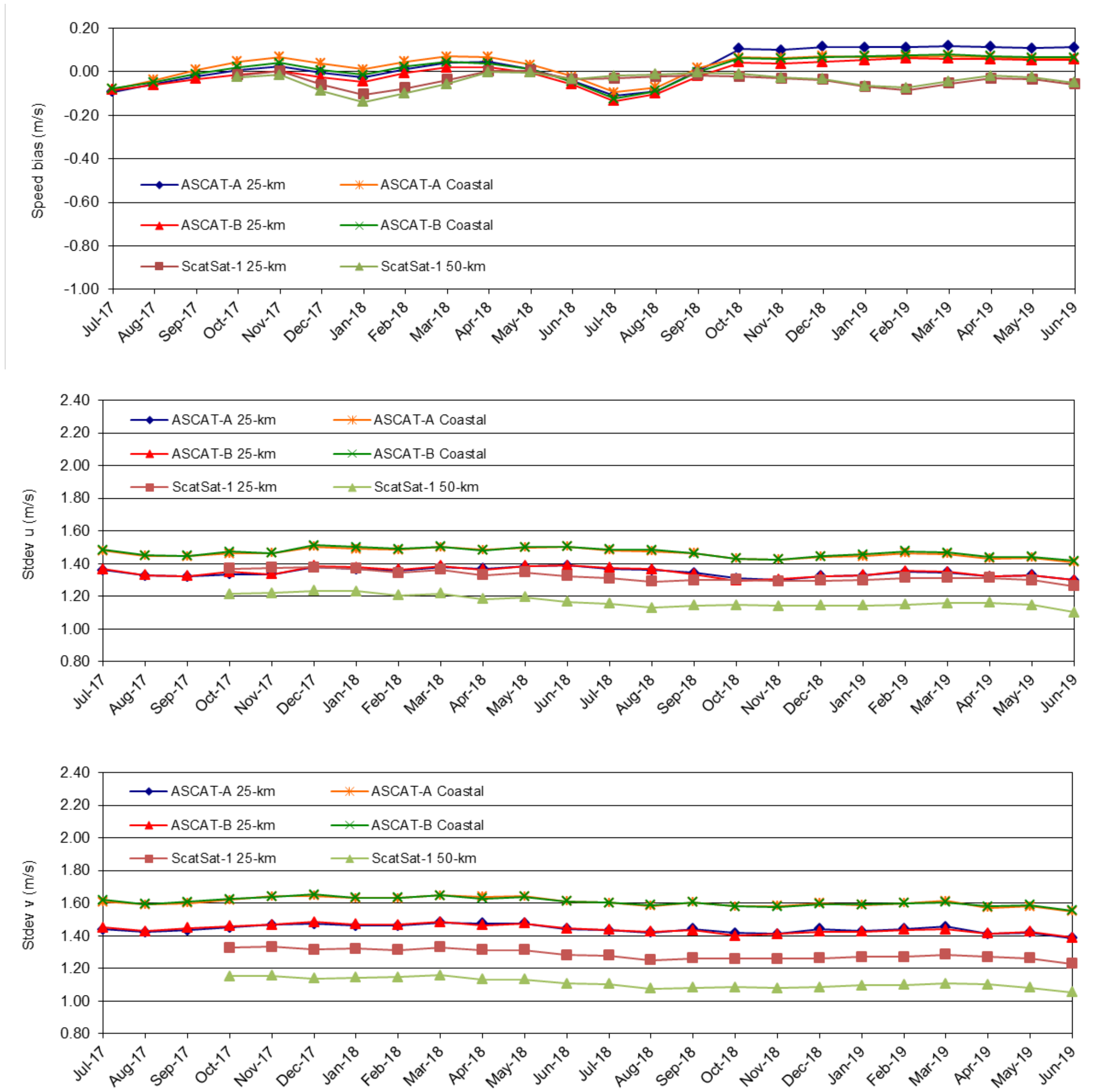


Figure 44: Comparison of scatterometer winds against ECMWF NWP forecast winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus ECMWF, top), wind u component standard deviation (middle) and wind v component standard deviation (bottom) are shown.

5.4.2. Comparison with buoys

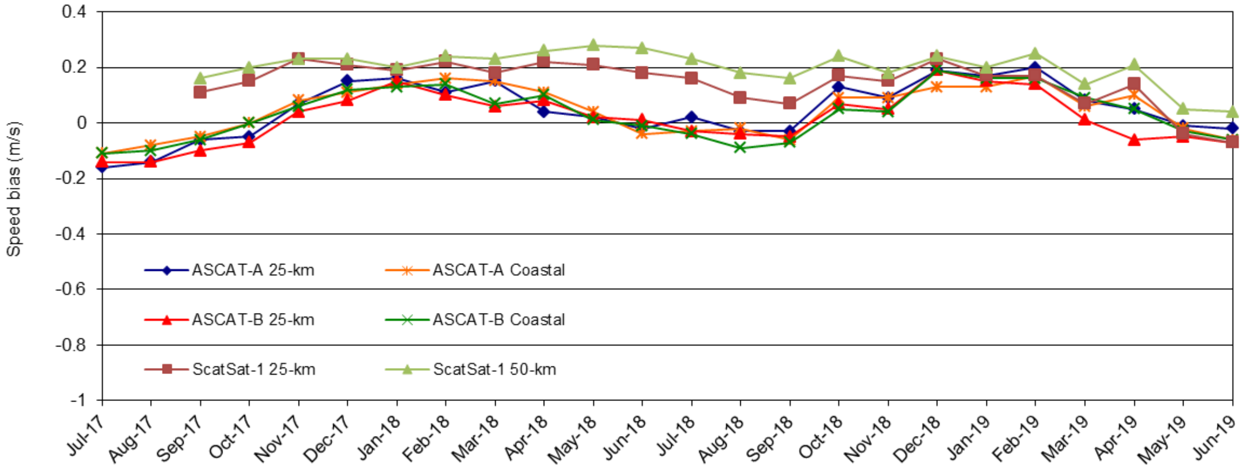
We compare the scatterometer winds with wind data from moored buoys on a monthly basis. The buoy data of approximately 150 buoys spread over the oceans (most of them in the tropical oceans and near Europe and North America) are retrieved from the ECMWF MARS archive and collocated with scatterometer winds. 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*

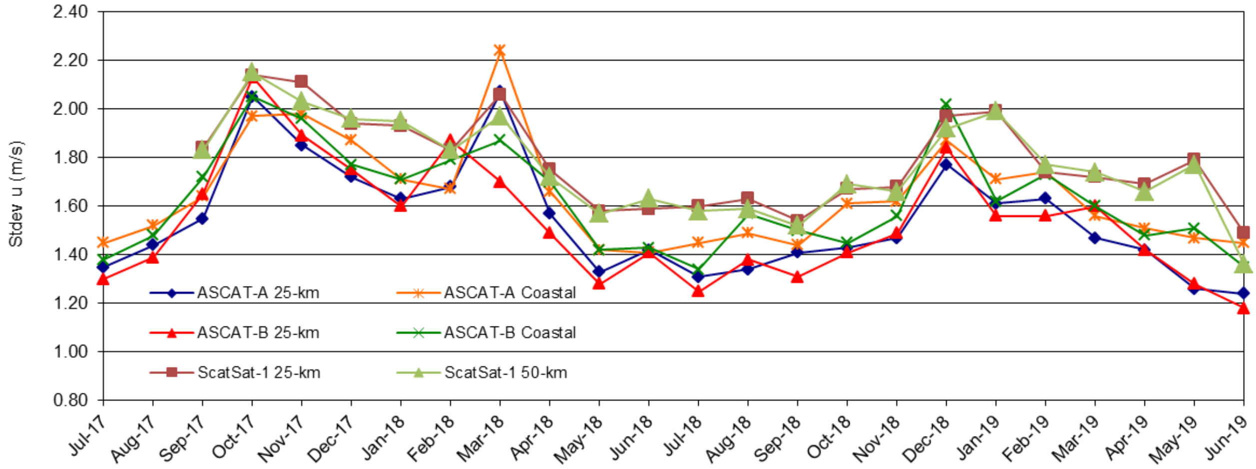
exchanges of heat and water vapor including the molecular constraints in the interface, J. Atmos. Sci., vol. 36, 1979.

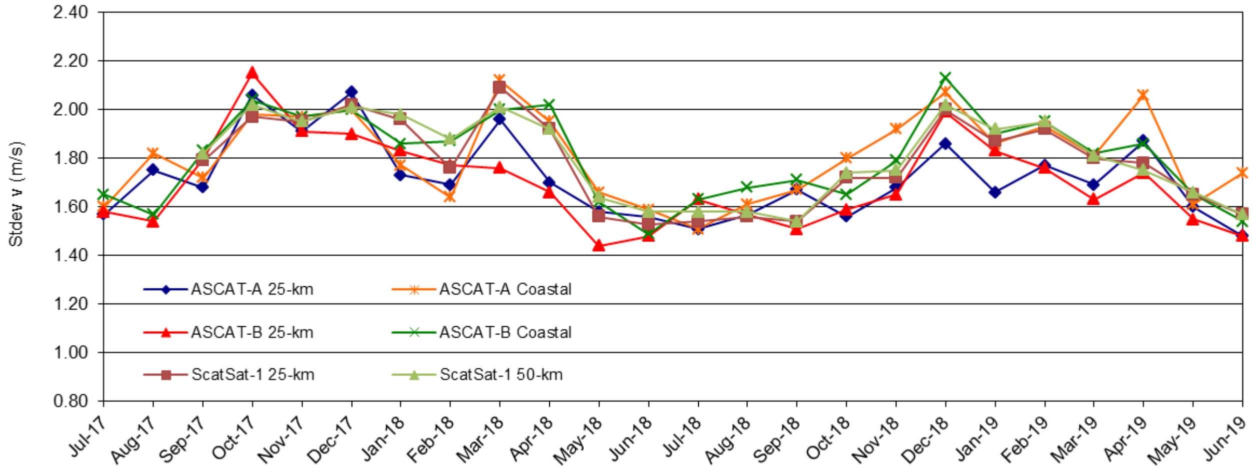
The figure below shows the monthly results of July 2017 to June 2019.

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.


Speed bias (m/s)
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
ASCAT-A 25-km
ASCAT-A Coastal
ASCAT-B 25-km
ASCAT-B Coastal
ScatSat-1 25-km
ScatSat-1 50-km
Jul-17 Aug-17 Sep-17 Oct-17 Nov-17 Dec-17 Jan-18 Feb-18 Mar-18 Apr-18 May-18 Jun-18 Jul-18 Aug-18 Sep-18 Oct-18 Nov-18 Dec-18 Jan-19 Feb-19 Mar-19 Apr-19 May-19 Jun-19


Stdev u (m/s)
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
ASCAT-A 25-km
ASCAT-A Coastal
ASCAT-B 25-km
ASCAT-B Coastal
ScatSat-1 25-km
ScatSat-1 50-km
Jul-17 Aug-17 Sep-17 Oct-17 Nov-17 Dec-17 Jan-18 Feb-18 Mar-18 Apr-18 May-18 Jun-18 Jul-18 Aug-18 Sep-18 Oct-18 Nov-18 Dec-18 Jan-19 Feb-19 Mar-19 Apr-19 May-19 Jun-19


Stdev v (m/s)
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
ASCAT-A 25-km
ASCAT-A Coastal
ASCAT-B 25-km
ASCAT-B Coastal
ScatSat-1 25-km
ScatSat-1 50-km
Jul-17 Aug-17 Sep-17 Oct-17 Nov-17 Dec-17 Jan-18 Feb-18 Mar-18 Apr-18 May-18 Jun-18 Jul-18 Aug-18 Sep-18 Oct-18 Nov-18 Dec-18 Jan-19 Feb-19 Mar-19 Apr-19 May-19 Jun-19

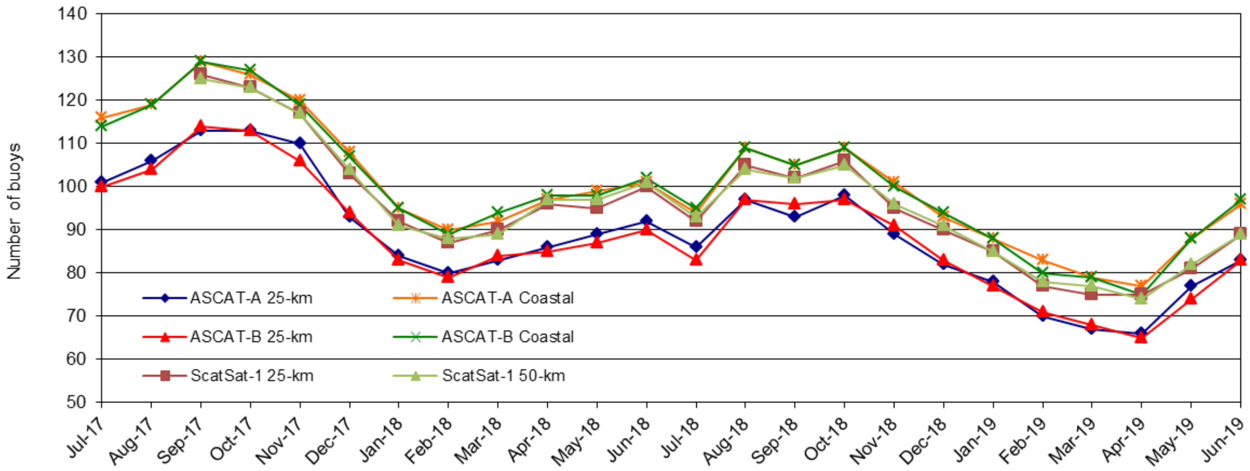


Figure 45: Comparison of scatterometer winds against buoy winds (monthly averages). For each product, the wind speed mean difference (scatterometer minus buoy, top), wind u component standard deviation (2nd plot) and wind v component standard deviation (3rd plot) are shown. Also the number of buoys available 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
JAN. 2019	1465	1412
FEB. 2019	1485	1533
MAR. 2019	1509	1355
APR. 2019	1535	1629
MAY 2019	1561	1532
JUN. 2019	1573	1345

Table 41: Statistics on central OSI SAF web site use over 1st half 2019.

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

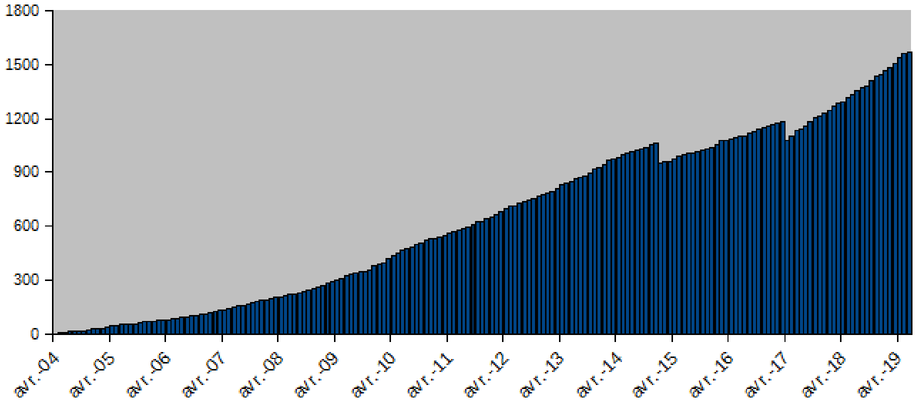


Figure 46: Evolution of external registered users on the central Web Site from April 2004 to JUN. 2019.

The following table lists the institutions or companies the new registered users (over 1st half 2019) are from.

Country	Institution, establishment or company	Acronym
Australia	Curtin University	CU
Bermuda	Bermuda Weather Service	BWS
Brasil	Universidade Federal de Viçosa	UFV
Canada	Universite Laval	ULaval
China	South China Sea Marine Survey and Technoloy Center	SCMSTC
China	China University of Petroleum	CUP
China	National Marine Data and Information Service	NMDIS
Finland	Äijälän Rusti	AR
France	Ecole Nationale Supérieur Maritime	ENSM
France	Observatoire de Paris	OBSPM
Germany	Institut für Statistik und Wirtschaftsmathematik	RWTH
India	Indian Institute of Sciences, Bangalore	IISC
India	Anna University, Chennai	AU
India	Indian Institute of Technology, Bombay	IITB
Iran	Zanjan University	ZNU
Ireland	Irish Meteorological Service, Met Éireann	Met Éireann
Italy	Regional Environmental Protection Agency of Calabria	ARPA
Kenya	Coastal Oceans Research and Development – Indian Ocean	CORDIO-EA
Peru	Universidad Nacional Agraria La Molina	UNALM
Philippines	Rizal Technological University	RTU
Portugal	Instituto Superior Técnico	IST
Portugal	Oceanic Observatory of Madeira	OOM
Portugal	Faculty of Sciences of the University of Lisbon	FCUL
Portugal	Oceanic Observatory of Madeira	OOM
Russia	Institute of Natural and Technical Systems	INTS
Russia	SIBINTEK	SIBINTEK
Senegal	Université Gaston Berger	UGB
United Kingdom	Durham University	DUR.AC
United Kingdom	Green Energy Options	GEO
United Kingdom	Newcastle University	NCL.AC
United State	University of Delaware	UD
United State	University of California, Riverside	UCR
United State	New York University	NYU

Table 42: List of institutes of the new registered users over 1st half 2019 on the central Web Site

Moreover 32 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 1st half 2019 (pages views)						
Countries	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUN. 2019
China (2480)	501	413	461	406	377	322
United States (2337)	428	362	385	400	391	371
France (806)	171	157	176	109	94	99
United-kingdom (523)	111	79	104	65	79	85
Senegal (325)	31	34	37	87	73	63
Russia (213)	31	37	34	37	45	29
Japan (178)	35	27	20	45	28	23
Germany (172)	37	29	35	21	35	15
Spain (152)	26	36	32	22	15	21
South Korea (150)	38	17	30	25	16	24
Others/Commercial (411)	82	55	93	66	59	56

Table 43: Usage of the OSI SAF central Web Site by country (top 10) over 1st 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 12. All requests were acknowledged or answered within three working days. 4 were categorized as ‘info’, 0 as ‘archive’, 7 as ‘unavailable’ and 1 as ‘anomaly’.

The total number of OSI SAF helpdesk inquiries at the HL subsystem in this half year was 14. All requests were acknowledged or answered within three working days. 13 were categorized as ‘info’, 1 as ‘archive’, 0 as ‘unavailable’ and 0 as ‘anomaly’.

The total number of OSI SAF helpdesk inquiries at scat@knmi in this half year was 52. All requests were acknowledged or answered within three working days. 42 were categorized as ‘info’, 2 as ‘archive’ and 8 as ‘unavailable’, in the latter category all requests were referring to ScatSat-1 products.

The total number of OSI SAF helpdesk inquiries about the web site (usually about the personal account) was 5. All requests were acknowledged or answered within three working days.

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/).

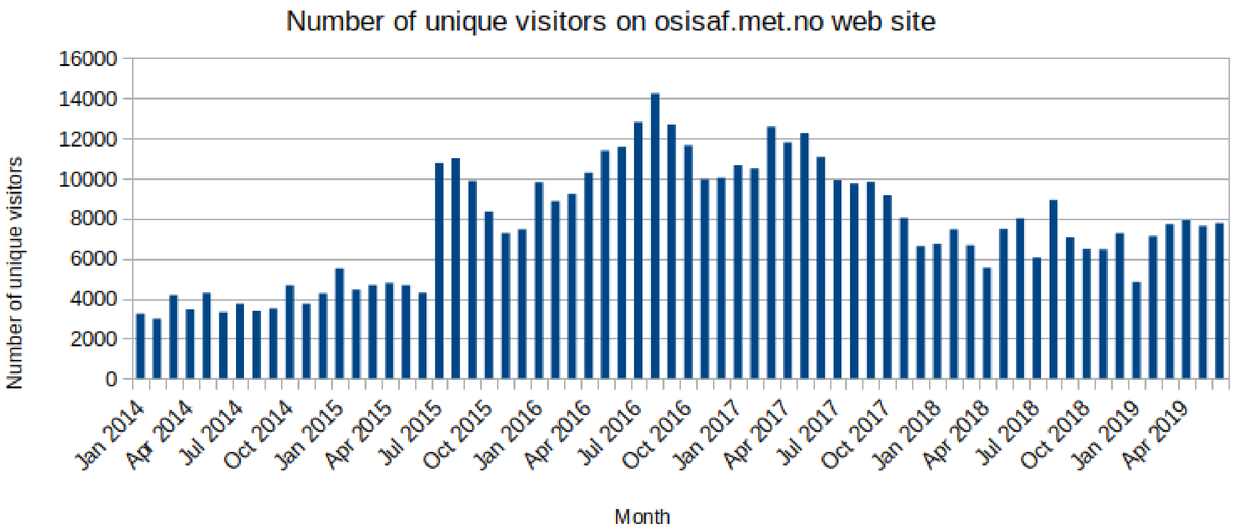


Figure 47: Evolution of unique visitors on the HL OSI SAF Sea Ice portal from January 2014 to JUN. 2019 (http://osisaf.met.no)

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 June 2019. Only external sessions (from outside KNMI) are counted.

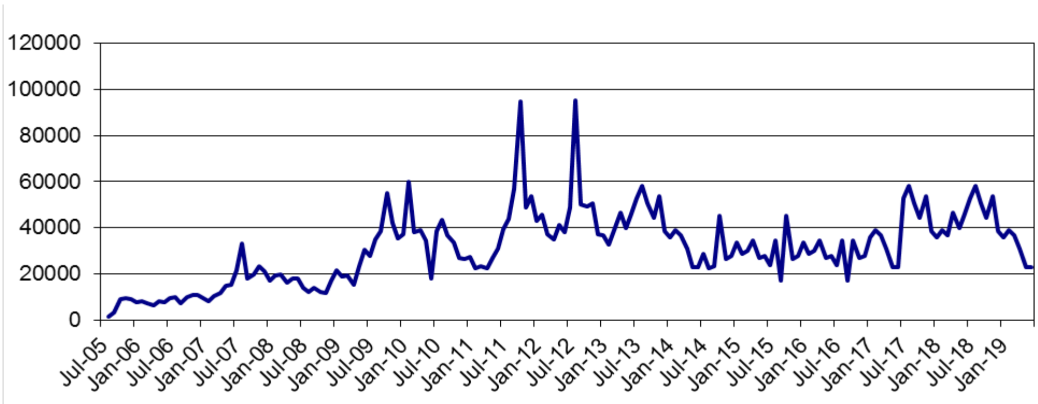


Figure 48: Number of page views on KNMI scatterometer website per month

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

Entity	Shortened name	Country
Met Éireann		Ireland
Turkish State Meteorological Service		Turkey
Institute of Remote Sensing and Digital Earth		China
State Key Laboratory of Remote Sensing Science		China
Wuhan University		China
China University of Petroleum		China
Observatório Oceânico da Madeira		Portugal
Private user		Portugal
Private user		China

Table 44: 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.

		JAN. 2019		FEB. 2019		MAR. 2019		APR. 2019		MAY 2019		JUN. 2019	
		Ifremer FTP	PO.DAAC	Ifremer FTP	PO.DAAC	Ifremer FTP	PO.DAAC	Ifremer FTP	PO.DAAC	Ifremer FTP	PO.DAAC	Ifremer FTP	PO.DAAC
SST MAP +LML		0	x	0	x	1	x	4	x	5998	x	1064	x
SSI MAP +LML		2920	x	5503	x	10332	x	6861	x	6816	x	5416	x
DLI MAP +LML		0	x	0	x	0	x	3195	x	973	x	216	x
OSI-201 series	GBL SST	0	1639	0	176	0	282	0	8866	0	1876	1	369
OSI-202 series	NAR SST	505	393	431	297	522	1632	480	499	500	270	3630	413
OSI-204 series	MGR SST	97570	194402	202971	13015	313436	20864	70113	38867	68217	17996	55080	50060
OSI-206 series	Meteosat SST	0	1142	0	755	0	1053	3125	19251	392	39099	0	2274
OSI-207 series	GOES-East SST	321	5407	750	4	1059	6	1017	1	2078	13	296	2274
OSI-IO-SST	Meteosat-8 SST	0	1486	0	6	0	0	0	937	0	94	2	1476
OSI-208 series	IASI SST	0	170575	9858	172967	10846	4639	10393	18034	37629	1798	18111	15990
OSI-250	Meteosat SST Data record	0	x	0	x	0	x	0	x	0	x	0	x
OSI-303 series	Meteosat DLI	184	x	1524	x	2466	x	2244	x	585	x	191	x
OSI-304 series	Meteosat SSI	309928	x	308095	x	246005	x	218057	x	221813	x	262026	x
OSI-305 series	GOES-East DLI	1	x	0	x	0	x	1	x	5	x	36	x
OSI-306 series	GOES-East SSI	30088	x	65644	x	150692	x	227514	x	126958	x	105954	x
OSI-IO-DLI	Meteosat-8 DLI	1973	x	1165	x	24853	x	9719	x	4878	x	2581	x
OSI-IO-SSI	Meteosat-8 SSI	1973	x	1165	x	24853	x	9719	x	4878	x	2581	x

Table 45: Number of OSI SAF products downloaded from Ifremer FTP server and PO.DAAC server over 1st 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. For the CMEMS statistics 1 download = 1 user/dataset/day. For HL FTP 1 download = 1 downloaded product file.

		JAN. 2019		FEB. 2019		MAR. 2019		APR. 2019		MAY 2019		JUN. 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)	27420	NA	25216	50231	69431	61380	151674	65594	105082	38183	121537	37670
OSI-402 series	Global Sea Ice Edge	2337	NA	6146	47869	9193	59425	6336	65121	6237	36864	51713	35741
OSI-403 series	Global Sea Ice Type	11351	NA	13593	48682	14142	61021	56414	64249	26810	36740	63131	35068
OSI-404 series	Global Sea Ice Emissivity	1	x	859	x	2	x	63	x	61	x	3776	x
OSI-405 series	Low resolution Sea Ice Drift	9811	NA	10649	47553	11157	57827	24250	63976	14676	38073	27856	33717
OSI-407 series	Medium resolution Sea Ice Drift	0	x	13311	x	212	x	3747	x	132	x	4209	x
OSI-408 series	Global Sea Ice Concentration (AMSR-2)	594	x	3110	x	5548	x	1791	x	1734	x	5118	x
OSI-409	Ice Concentration Data Record v1.2	3	NA	85959	0	48807	1	64656	0	58750	894	482	0
OSI-430	Ice Concentration ICDR v1.2	92	NA	5575	51972	12843	72918	17097	66708	6400	44827	1066	35789
OSI-430-b	Ice Concentration ICDR v2.0	-	x	-	x	-	x	-	x	10169	x	10453	x
OSI-450	Ice Concentration Data Record v2.0	712	x	65841	x	40215	x	137971	x	161583	x	83611	x
Downloaded SST, DLI and SSI over the OSI SAF High Latitude FTP server													
OSI-203 series	AHL SST	1313	x	5681	x	684	x	571	x	3656	x	426	x
OSI-205 series	L2 SST/IST	41445	x	8613	x	201720	x	88322	x	6938	x	242925	x
OSI-301 series	AHL DLI	0	x	0	x	0	x	1	x	0	x	8078	x
OSI-302 series	AHL SSI	0	x	0	x	0	x	0	x	0	x	8083	x

Table 46: Number of OSI SAF products downloaded from OSI SAF Sea Ice FTP server over 1st 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 user and archived OSCAT data to 0 user during the reporting period.

		JAN. 2019		FEB. 2019		MAR. 2019		APR. 2019		MAY 2019		JUN. 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	20 per file (BUFR), 21 per file (NetCDF)	181794	20 per file (BUFR), 21 per file (NetCDF)	42523	20 per file (BUFR), 21 per file (NetCDF)	66538	20 per file (BUFR), 21 per file (NetCDF)	87691	20 per file (BUFR), 21 per file (NetCDF)	223286	20 per file (BUFR), 21 per file (NetCDF)	87524
OSI-102-b	ASCAT-B 25km	20 per file (BUFR), 17 per file (NetCDF)	85474	20 per file (BUFR), 17 per file (NetCDF)	17487	20 per file (BUFR), 17 per file (NetCDF)	64346	20 per file (BUFR), 17 per file (NetCDF)	38716	20 per file (BUFR), 17 per file (NetCDF)	90947	20 per file (BUFR), 17 per file (NetCDF)	35549
OSI-103	ASCAT-A 12.5km												
OSI-104	ASCAT-A Coastal	30 per file (BUFR), 34 per file (NetCDF)	70890	30 per file (BUFR), 34 per file (NetCDF)	54524	30 per file (BUFR), 34 per file (NetCDF)	42566	30 per file (BUFR), 34 per file (NetCDF)	46895	30 per file (BUFR), 34 per file (NetCDF)	33888	30 per file (BUFR), 34 per file (NetCDF)	37102
OSI-104-b	ASCAT-B Coastal	30 per file (BUFR), 35 per file (NetCDF)	109003	30 per file (BUFR), 35 per file (NetCDF)	47267	30 per file (BUFR), 35 per file (NetCDF)	12705	30 per file (BUFR), 35 per file (NetCDF)	51526	30 per file (BUFR), 35 per file (NetCDF)	40628	30 per file (BUFR), 35 per file (NetCDF)	30342
OSI-112-a	ScatSat-1 25 km wind vectors	6 per file (BUFR), 12 per file (NetCDF)	N/A	6 per file (BUFR), 12 per file (NetCDF)	N/A	6 per file (BUFR), 12 per file (NetCDF)	N/A	6 per file (BUFR), 12 per file (NetCDF)	N/A	6 per file (BUFR), 12 per file (NetCDF)	N/A	6 per file (BUFR), 12 per file (NetCDF)	N/A
OSI-112-b	ScatSat-1 50 km wind vectors	6 per file (BUFR), 8 per file (NetCDF)	N/A	6 per file (BUFR), 8 per file (NetCDF)	N/A	6 per file (BUFR), 8 per file (NetCDF)	N/A	6 per file (BUFR), 8 per file (NetCDF)	N/A	6 per file (BUFR), 8 per file (NetCDF)	N/A	6 per file (BUFR), 8 per file (NetCDF)	N/A

Table 47: Number of OSI SAF products downloaded from KNMI FTP server and PO.DAAC server over 1st 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 48: 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 1st 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 **1st half 2019**.

	Item	Volume in MB	Number of files
OSI-152	ERS2_OR1ERW025_OPE	19892	51056
OSI-409/OSI-409-a	F-08_OR1SICOGB_OPE	5688	1136
OSI-401 series	F-15_OSICOGB_OPE	2344	4800
OSI-450	F-17_OR2SICOGB_OPE	353	68
OSI-401 series	F-17_OSICOGB_OPE	2298	4584
OSI-401 series	F-18_OSICOGB_OPE	2298	168
OSI-404 series	F-18_OSIEMGB_OPE	103	4
OSI-305 / OSI-306	GOES-13_OSIDSSI_OPE	5054	441
OSI-305 / OSI-306	GOES-13_OSIHSSI_OPE	10298	1488
OSI-206	GOES-13_OSIHSST_OPE	997	278
OSI-305-a / OSI-306-a	GOES-16_ODDLISSI_OPE	15975	1343
OSI-305-a / OSI-306-a	GOES-16_OHDLISSI_OPE	14142	1627
OSI-206-a	GOES-16_OSIHSSTN_OPE	95656	8611
OSI-408	GW-1_OSICOAMSRGB_OPE	37	2
OSI-103 (with soil moisture)	M01_OAS025_OPE	31775	18698
OSI-104-b	M01_OASWC12_OPE	46906	4295
OSI-201-b	M01_OSSTGLBN_OPE	32045	858
OSI-205-a	M01_OSSTIST2_OPE	1003	95
OSI-203-a	M01_OSSTIST3A_OPE	28	2
OSI-202-b	M01_OSSTNARN_OPE	23	1
OSI-103 (with soil moisture)	M02_OAS012_OPE	7391	2378
OSI-103 (with soil moisture)	M02_OAS025_OPE	31781	18712
OSI-103	M02_OASW012_OPE	22935	8531
OSI-102	M02_OASW025_OPE	2225	6281
OSI-104	M02_OASWC12_OPE	49638	5418
OSI-407	M02_OMRSIDRN_OPE	3717	547
OSI-150-a	M02_OR1ASW025_OPE	43337	54441
OSI-150-b	M02_OR1ASWC12_OPE	39721	12682
OSI-201	M02_OSSTGLB_OPE	2384	113
OSI-202	M02_OSSTNAR_OPE	854	112
OSI-301	MML_ODLIAHL_OPE	1	1
OSI-409/OSI-409-a	MML_OR1SICOGB_OPE	21	4
OSI-450	MML_OR2017SICOGB_OPE	72	58
OSI-401 series	MML_OSICOGB_OPE	8810	3312
OSI-401 series (NetCDF)	MML_OSICOGBN_OPE	6089	308
OSI-405 series	MML_OSIDRGB_OPE	3696	5077
OSI-402 series	MML_OSIEDGB_OPE	1	6
OSI-402 series (NetCDF)	MML_OSIEDGBN_OPE	999	122
OSI-403 series	MML_OSITYGB_OPE	24	300
OSI-403 series (NetCDF)	MML_OSITYGBN_OPE	7296	878
OSI-302	MML_OSSIAHL_OPE	8	21
OSI-203	MML_OSSTAHL_OPE	45	64
OSI-250	MSG1_OR1HSST_OPE	697309	53002

	Item	Volume in MB	Number of files
OSI-304	MSG1_OSIDSSI_OPE	4131	8
OSI-250	MSG2_OR1HSST_OPE	509418	50362
OSI-304	MSG2_OSIDSSI_OPE	5062	441
OSI-206 (NetCDF)	MSG2_OSIHSSTN_OPE	49435	25
OSI-303/OSI-304	MSG3_OHDLISSI_OPE	325706	14801
OSI-304	MSG3_OSIDSSI_OPE	4131	357
OSI-304	MSG3_OSIHSSI_OPE	10304	1488
OSI-206	MSG3_OSIHSST_OPE	1418	278
OSI-206 (NetCDF)	MSG3_OSIHSSTN_OPE	49435	1207
OSI-303-a/OSI-304-a	MSG4_ODDLISSI_OPE	989	83
OSI-303-a/OSI-304-a	MSG4_OHDLISSI_OPE	650176	72616
OSI-206-a (NetCDF)	MSG4_OSIHSSTN_OPE	109369	8119
Old NAR SST	N17_OSSTACOR_OPE	2550	4073
Old NAR SST	N17_OSSTCANA_OPE	1492	4785
Old NAR SST	N18_OSSTACOR_OPE	2550	2986
Old NAR SST	N18_OSSTCANA_OPE	1492	2987
OSI-409/OSI-409-a	NIMBUS7_OR1SICOGB_OPE	74498	14974
OSI-151-a	QUIKSCAT_OR1SWW025_OPE	277808	35723
OSI-151-b	QUIKSCAT_OR1SWW050_OPE	18	14
OSI-112-a	SCATSAT1_OSSW025_OPE	187	32

Table 49: Volume of data downloaded (in MB) by products from EDC over 1st half 2019

Ingestion Summary over the 1st 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	JAN. 2019	FEB. 2019	MAR. 2019	APR. 2019	MAY 2019	JUN. 2019
OSI-404	Global Sea Ice Emissivity (DMSP-F18)	100	100	75.8	86.7	87.1	100
OSI-305-a	Daily Downward Longwave Irradiance (GOES-16)	100	100	64.5	100	83.9	100
OSI-306-a	Daily Surface Solar Irradiance (GOES-16)						
OSI-305-a	Hourly Downward Longwave Irradiance (GOES-16)	100	100	67.3	100	86.3	99.9
OSI-306-a	Hourly Surface Solar Irradiance (GOES-16)						
OSI-207-a	Hourly Sea Surface Temperature (GOES-16)	100	100	66.6	99.4	85.6	100
OSI-408	Sea Ice Concentration (AMSR-2)	100	100	67.7	95.0	87.1	100
OSI-102-b	ASCAT 25km Wind (Metop-B)	99.7	100	68.7	81.6	83.1	100
OSI-104-b	ASCAT 12.5km Coastal Wind (Metop-B)	99.7	100	68.2	82.6	88.6	100
OSI-102	ASCAT 25km Wind (Metop-A)	99.7	100	70.3	84.0	83.6	100
OSI-104	ASCAT 12.5km Coastal Wind (Metop-A)	99.7	100	70.7	84.0	87.4	100
OSI-201-b	Global Sea Surface Temperature (Metop-B)	100	100	64.5	100	80.7	100
OSI-202-b	NAR Sea Surface Temperature (Metop-B)	100	100	67.7	100	80.7	100
OSI-407-a	Global Sea Ice Drift (Multi Mission)	99.1	98.2	66.1	87.5	87.9	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	100
OSI-203-a	SST/IST L3 (Metop-B)	-	-	100	100	100	100
OSI-203-b	SST/IST L3 (NPP)	-	-	100	100	100	100
OSI-301	AHL Downward Longwave Irradiance (Multi Mission)	100	100	74.1	100	87.1	100
OSI-401-b	Global Sea Ice Concentration (Multi Mission)	100	100	66.1	90	80.6	100
OSI-405-c	Global Low Resolution Sea Ice Drift	100	100	64.5	96.7	87.1	100
OSI-402-c	Global Sea Ice Edge (Multi Mission)	98.4	100	62.9	100	82.2	100
OSI-403-c	Global Sea Ice Type (Multi Mission)	98.4	98.2	67.7	100	83.9	100
OSI-302	AHL Surface Solar Irradiance (Multi Mission)	100	100	80.6	100	80.6	96.7
OSI-203	AHL Sea Surface Temperature (Multi Mission)	100	100	74.2	100	87.1	100
OSI-303-a	Daily Downward Longwave Irradiance (MSG)	100	89.3	67.7	100	80.6	100
OSI-304-a	Daily Surface Solar Irradiance (MSG)						
OSI-303-a	Hourly Downward Longwave Irradiance (MSG)	100	88.1	65.6	100	86.3	99.9
OSI-304-a	Hourly Surface Solar Irradiance (MSG)						
OSI-206-a	Hourly Sea Surface Temperature (MSG)	100	87.9	66.9	99.9	85.3	100
OSI-202-b	NAR Sea Surface Temperature (NPP)	100	98.2	61.3	100	85.4	98.3
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 50: Percentage of received OSI SAF products in EDC in 1st half 2019

7. Training

EUMeTrain is conducting the very popular 4th edition of the Marine Course interactively online and in asynchronous mode. A Moodle platform is used. The course is primarily designed for marine forecasters, but other meteorologists are invited to participate. Ad Stoffelen provided a webcast lecture. The 4th EUMeTrain Marine Course is supported by experts from KNMI, ECMWF, NOAA and EUMETSAT (https://training.eumetsat.int/course/view.php?id=301).

8. Recent publications

Vogelzang and Stoffelen, Improvements in Ku-band scatterometer wind ambiguity removal using ASCAT-derived empirical background error correlations
Quart. J. Royal Meteor. Soc., 144, 2018, 716, 2245-2259, doi:10.1002/qj.3349.

Belmonte Rivas, M., I. Otosaka, A.C.M. Stoffelen and A.H. Verhoef, A scatterometer record of sea ice extents and backscatter: 1992–2016
The Cryosphere, 12, 2018, 2941-2953, doi:10.5194/tc-12-2941-2018.

Wang, Z., A.C.M. Stoffelen, B. Zhang, Y. He, W. Lin and X. Li, Inconsistencies in scatterometer wind products based on ASCAT and OSCAT-2 collocations
Remote Sens. Environ., 2019, 225, 207-216, doi:10.1016/j.rse.2019.03.005.

Li, Z., A.C.M. Stoffelen and A.H. Verhoef, A generalized simulation capability for rotating- beam scatterometers
Atmospheric Measurement Techniques, 12, 2019, 3573-3594, doi:10.5194/amt-12-3573-2019.