



# Sentinel-3 Marine Centre Status

Bruno Lucas,  
Carolina Nogueira Loddo,  
Remko Scharroo,  
Estelle Obligis

[s3.stm@eumetsat.int](mailto:s3.stm@eumetsat.int)



# Presentation outline

## Marine Centre:

- **Current Status**
  - Overall Status & Activities
  - Data Production and Orbit Usage
- **Last Reprocessing**
  - Product Quality
- **Future PBs**
- **EUM S3 Altimetry Webpage** ([sral.eumetsat.int](https://sral.eumetsat.int))
- **Product Portfolio**

# Space segment operational status

## Satellite

- All Sentinel-3A & B platform operations are performed nominally, including manoeuvres (In-plane and Out-of-Plane), security key changes and regular and annual calibration activities.
  - Support to Sigma0 transponder testing
  - OLTC updates (S3A: 27/07/2020, S3B: 22/06/2020)
- **Sentinel-3A&B topography instruments are all performing nominally.**

## Anomalies

- S3B calibration issue after OLTC update (UNS 6018)
- No other relevant anomalies to report, several missing/late dumps (CGS issues) resulting in lower KPIs

# S3 Production and Dissemination Status

## ■ Sentinel-3A

- Production **Completeness** (NRT/STC/NTC)
  - In nominal conditions Completeness is above 98.5%
- Production **Timeliness** (NRT/STC/NTC)
  - In nominal conditions Timeliness is above 98.5%

## ■ Sentinel-3B

- Production **Completeness** (NRT/STC/NTC)
  - In nominal conditions Completeness is above 98.5%
- Production **Timeliness** (NRT/STC/NTC)
  - In nominal conditions Timeliness is above 98.5%

There are no systematic issues affection the production of the data in time.

When values drop below KPIs, due to maintenance activities or contingencies and on a very exceptional matter.

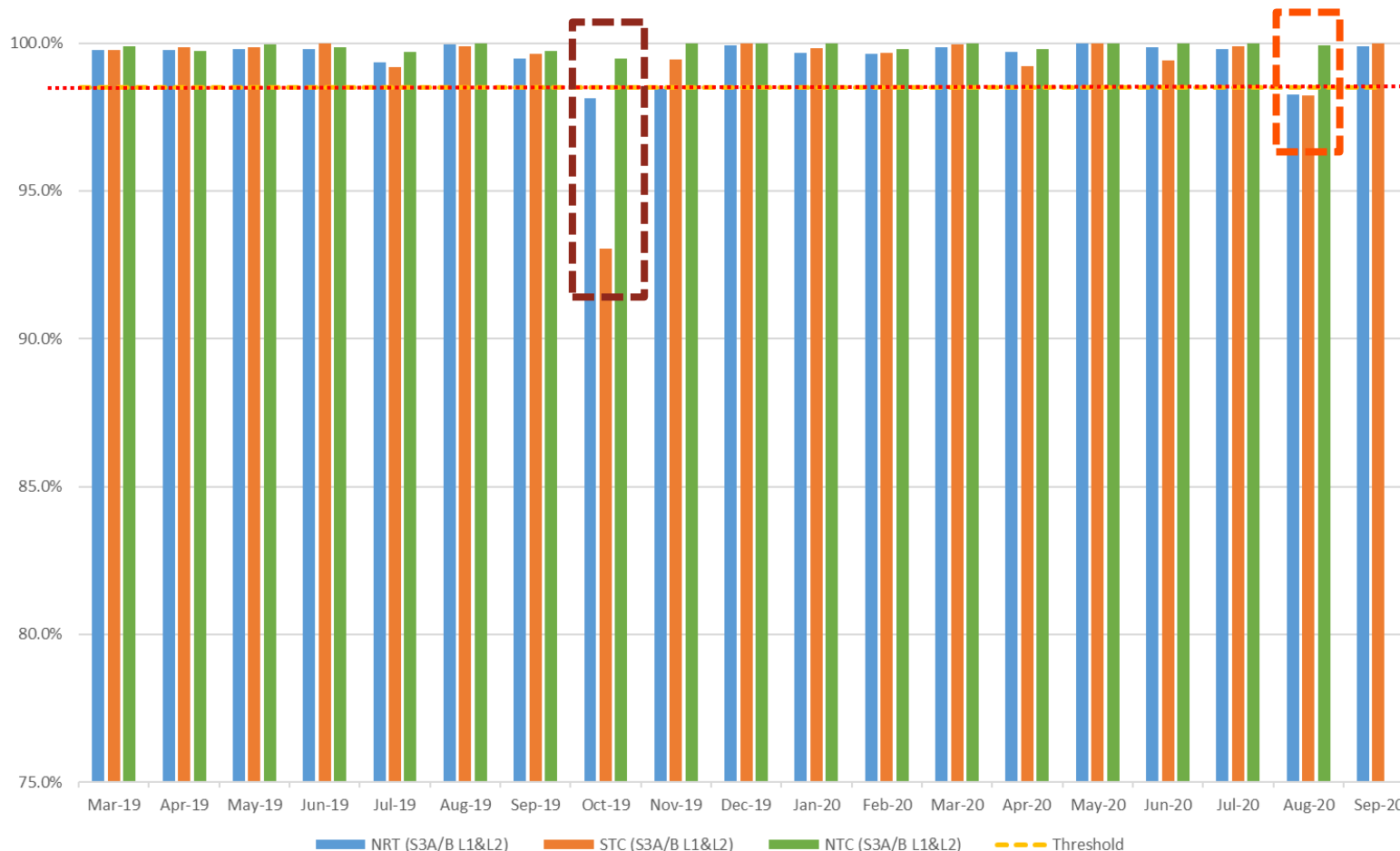
- Most relevant issue to report happened last Oct/Nov (UNS 5300).

On-going work for preparation of Marine PDGS to S3C

# Marine Center Status – Data production

Timeliness	Completeness	Threshold
NRT	98.5%	< 3 hours
STC	98.5%	< 48 hours
NTC	98.5%	< 30 days

S3A/B L1&L2 Completeness AND Timeliness @ ODA



~NRT: 99.53%  
~STC: 99.31%  
~NTC: 99.88%

**Major issue in the Marine Ground Segment (UNS 5300)**

**Critical impact in internal DB, a lot of manual intervention.**

**Timeliness & Completeness lost at NRT/STC but kept at NTC**

**Data access issue, data produced, but CODA/ODA users could not access it for couple days. EUMETCast not affected. (UNS 6149)**

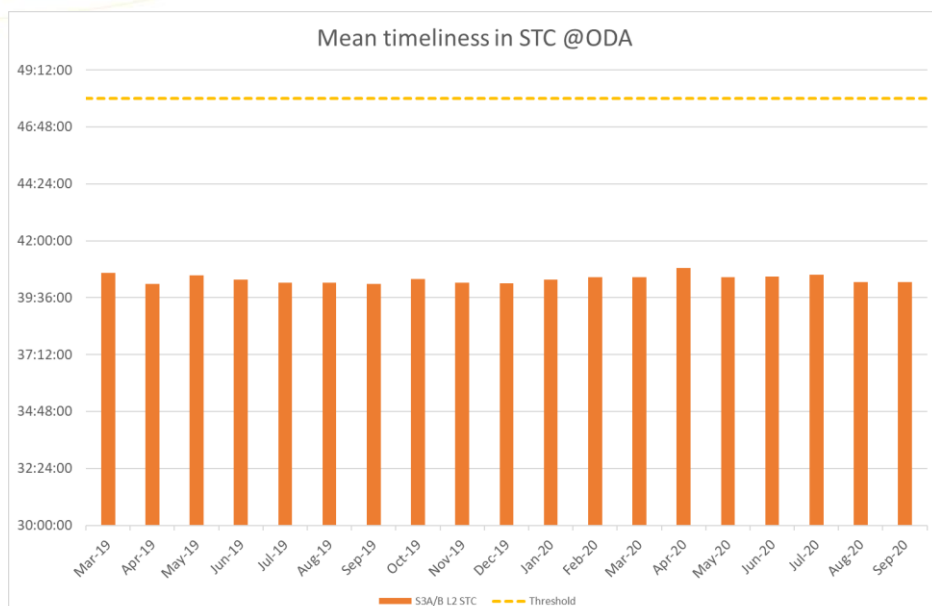
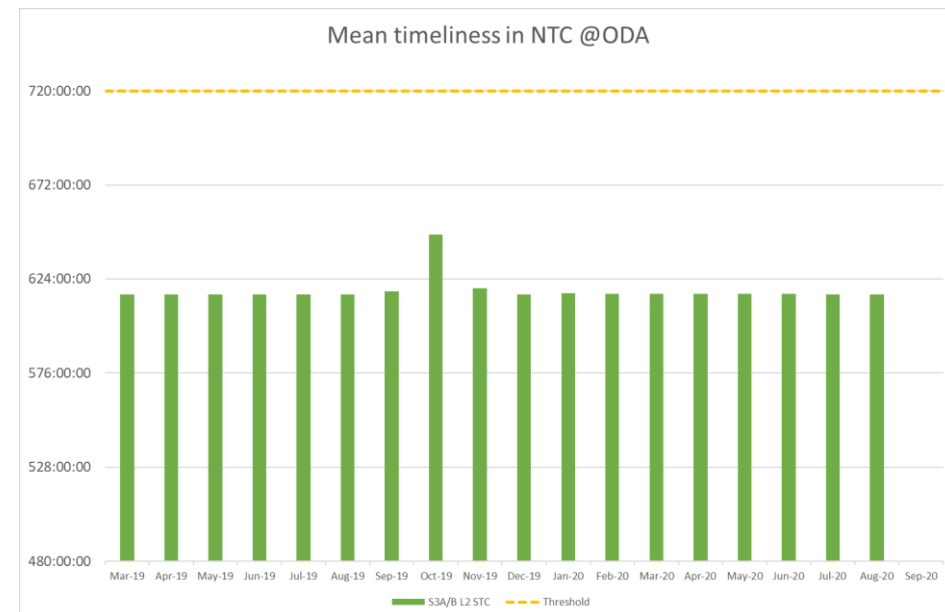
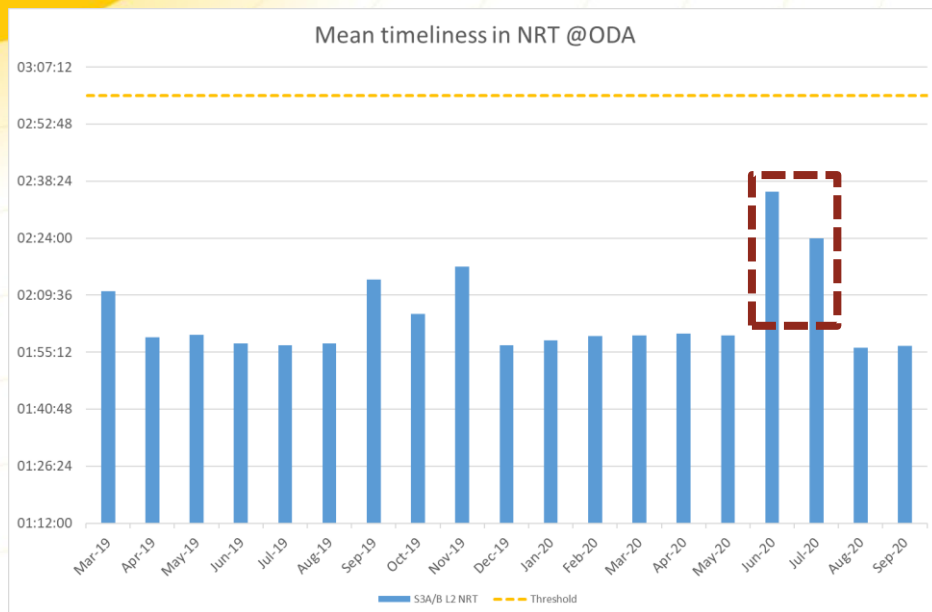
S3A and S3B Altimetry L1 and L2 products @ ODA

Minor underperformances in case of:

- Delayed/Lost delivery from Ground Station
- Ground segment maintenance
- Delayed mandatory ADFs

# Marine Center Status – Mean Timeliness

Timeliness	Completeness	Threshold
NRT	98.5%	< 3 hours
STC	98.5%	< 48 hours
NTC	98.5%	< 30 days



S3A and S3B  
SR\_2\_WAT\_\_\_\_  
(Level 2)

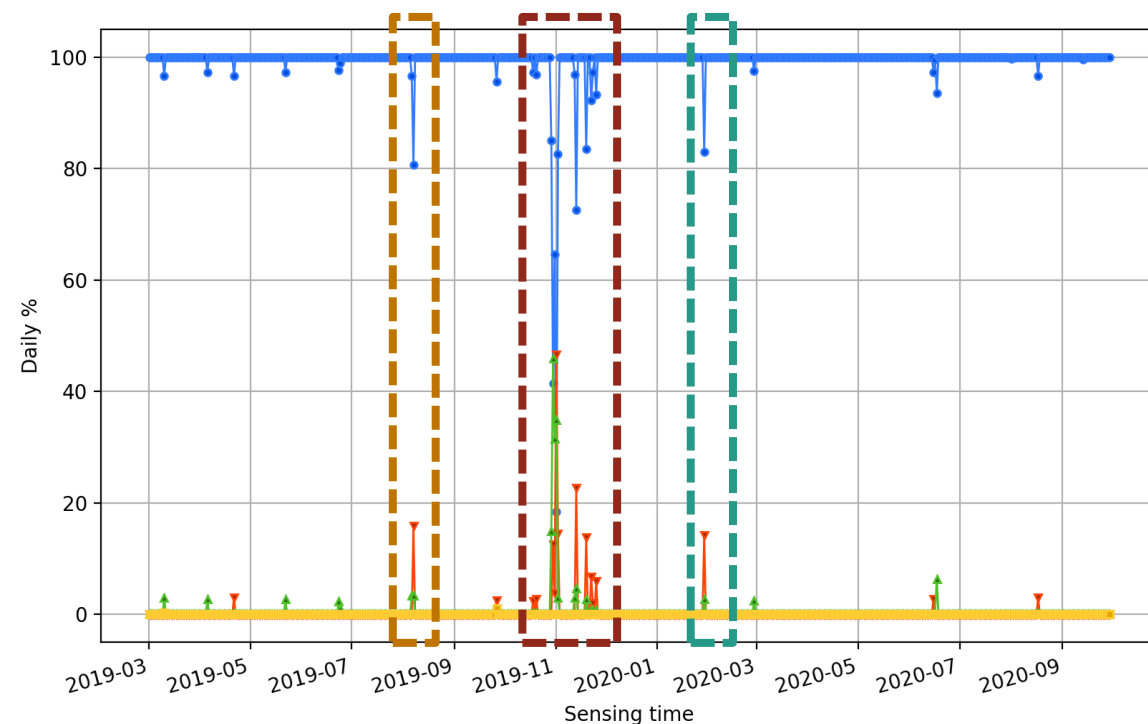
~NRT: 02:04 (H)  
~STC: 40:23 (H)  
~NTC: 25.27 (D)

Minor underperformance in case of:

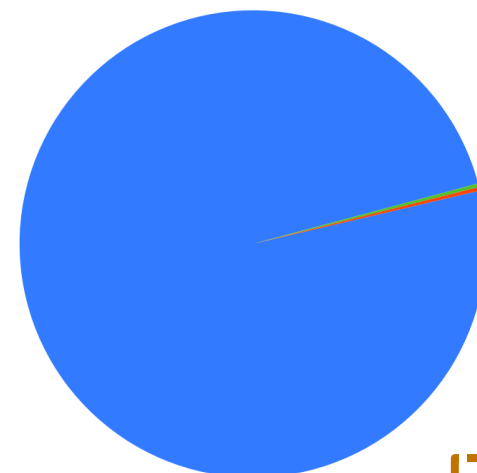
- Delayed/Lost delivery from Ground Station
- Ground segment maintenance
- Delayed mandatory ADFs

# S3A&B Level 2 NRT Orbit usage (last ~18 months)

Orbit usage in S3A-B/SR\_2\_WAT\_\_\_/NR in OPE



**Major issue in the Marine Ground Segment (UNS 5300)**



**Planned Maintenance (UNS 5562)**

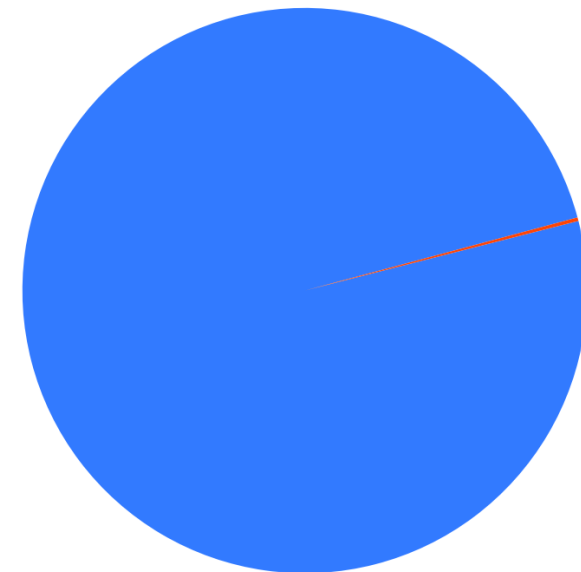
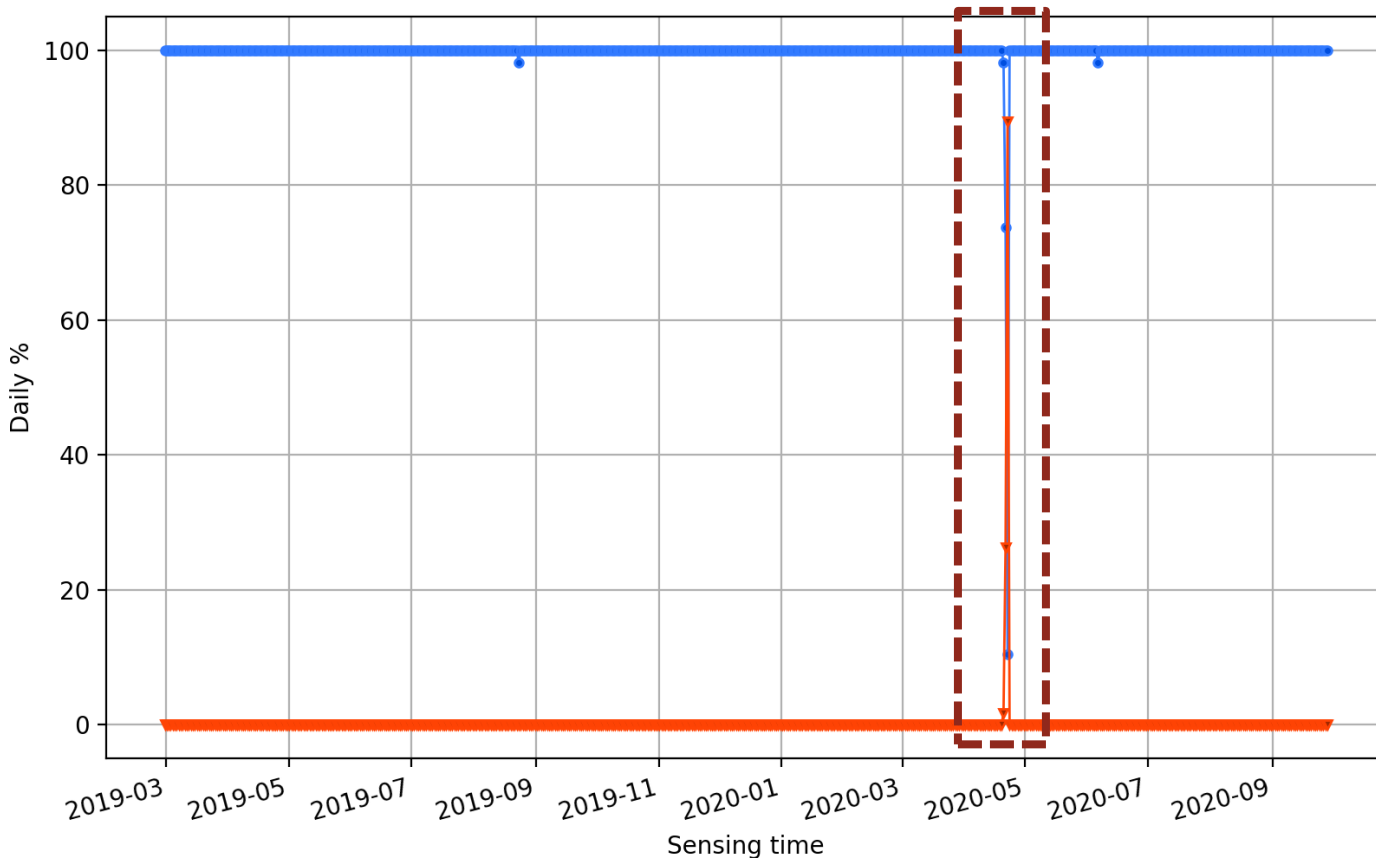
**Internal Database issue**

roe 99.498%  
dor 0.256%  
nat 0.242%  
fpo 0.000%  
osf 0.002%

For both satellites above 99.5% the 1<sup>st</sup> option GNSS-ROE or DORIS (best options) used > 99.8% of the time

# S3A&B Level 2 STC Orbit Usage (last ~18 months)

Orbit usage in S3A-B/SR\_2\_WAT\_\_\_/ST in OPE



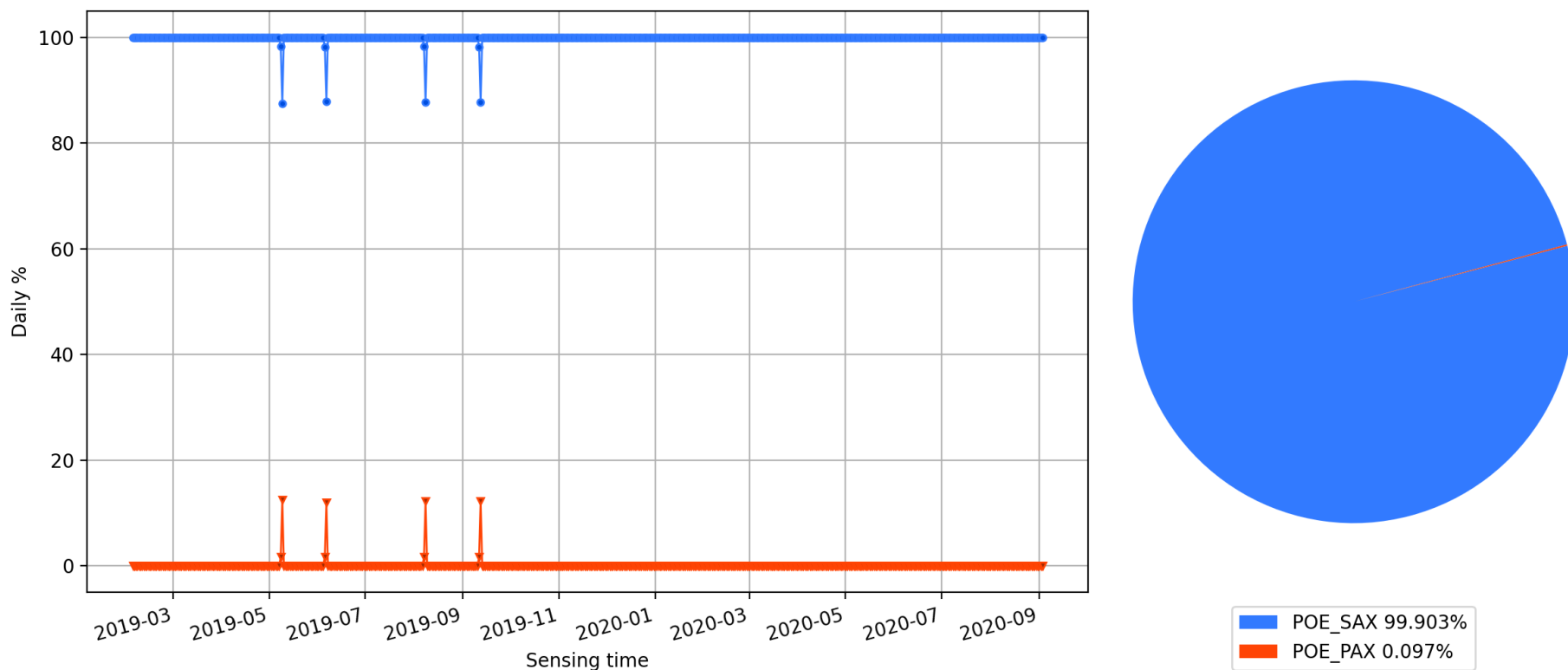
MDO\_SAX 99.791%  
MGN\_PAX 0.203%

For both satellites above 99.8% the 1<sup>st</sup> option.

Unavailability of SALP MOE orbits (UNS 5828)

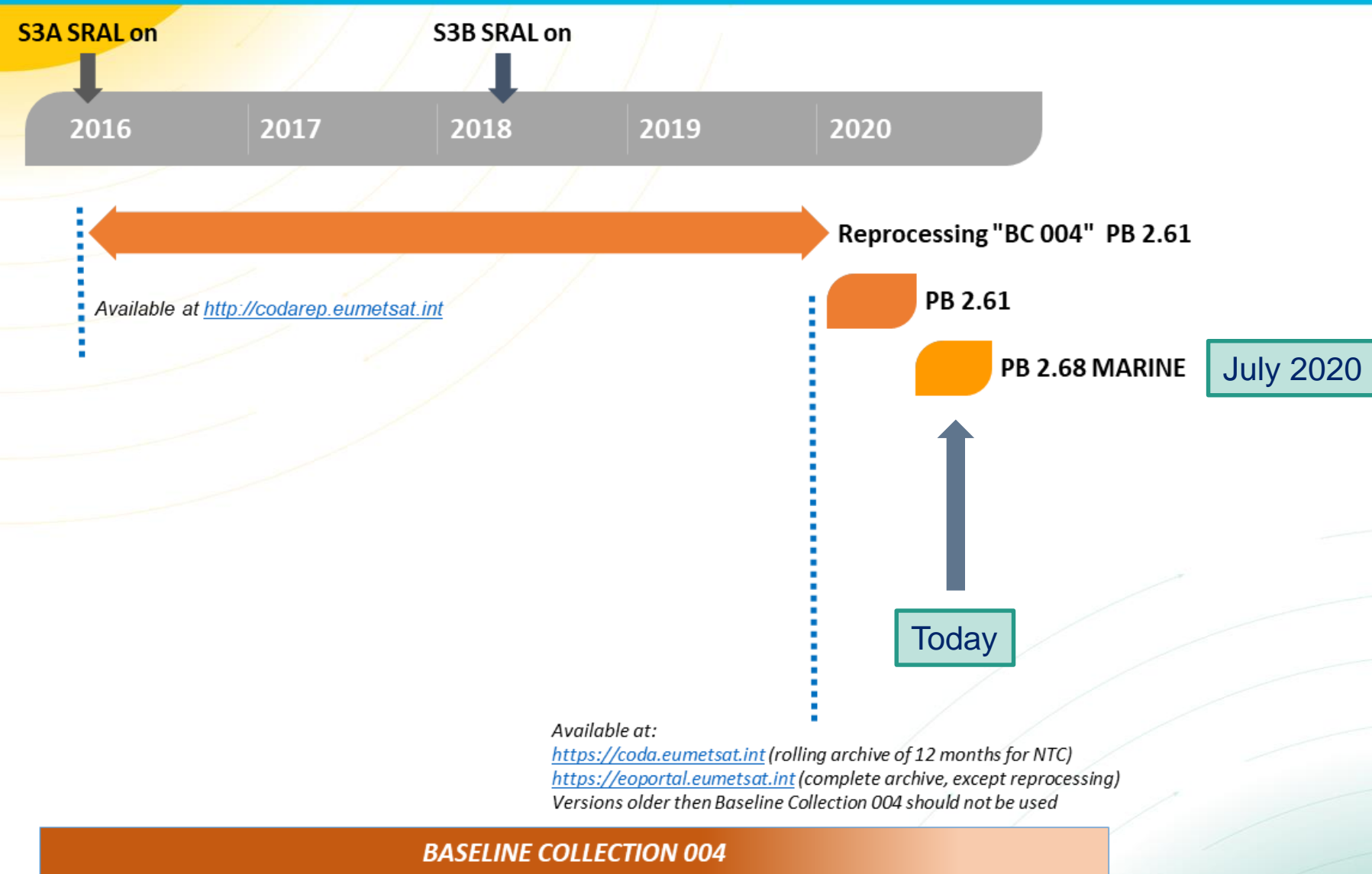
# S3A&B Level 2 NTC Orbit Usage (last ~18 months)

Orbit usage in S3A-B/SR\_2\_WAT\_\_\_/NT in OPE



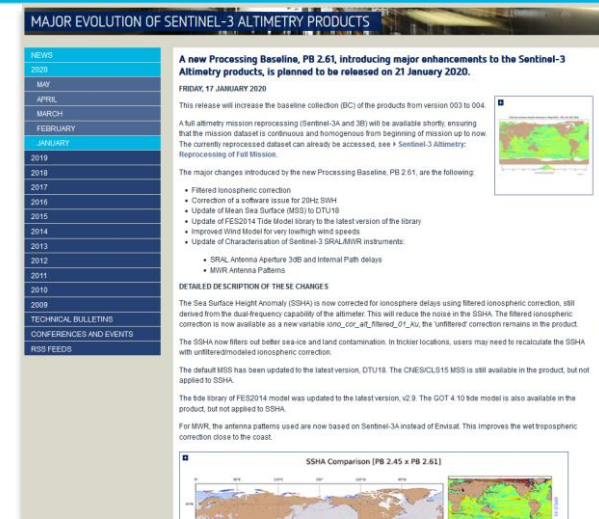
For both satellites above 99.9% the 1<sup>st</sup> option....  
SALP & EUMETSAT teams have improved NTC orbits delivery mechanisms since 2019/12 (no more missing POESAX orbits)

# Marine Processing Baselines (Today)



# Reprocessing

- Full mission reprocessing for S3A and S3B
  - More details here:  
[https://www.eumetsat.int/website/home/News/DAT\\_4852830.html](https://www.eumetsat.int/website/home/News/DAT_4852830.html)
- “Latest and greatest” PB used (PB 2.61)  
*[installed in 2020/01/21]*
  - Filtered Ionospheric correction
  - Correction of a software issue for 20Hz SWH
  - Update of Mean Sea Surface (MSS) to DTU18
  - Update of FES2014 Tide Model library to the latest version of the library
  - Improved Wind Model for very low/high wind speeds
  - Update of Characterisation of Sentinel-3 SRAL/MWR instruments:
    - SRAL Antenna Aperture 3dB and Internal Path delays
    - MWR Antenna Patterns
  - More details here:  
[https://www.eumetsat.int/website/home/News/DAT\\_4762430.html](https://www.eumetsat.int/website/home/News/DAT_4762430.html)
- Plus (reprocessing only):
  - Updated POD platform/attitude ADFs
  - Updated POE-F standard orbits used (S3A/B)

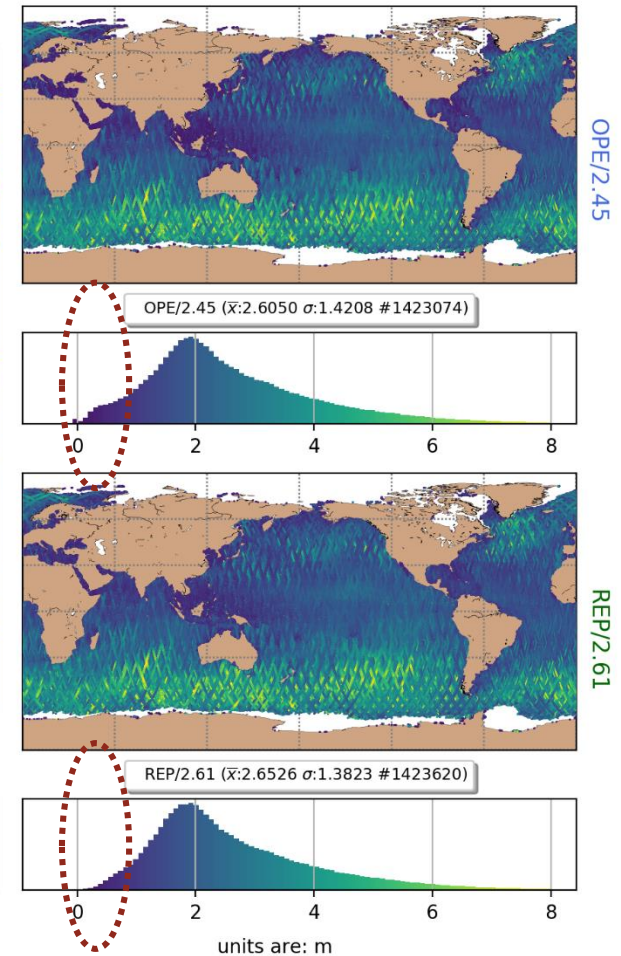
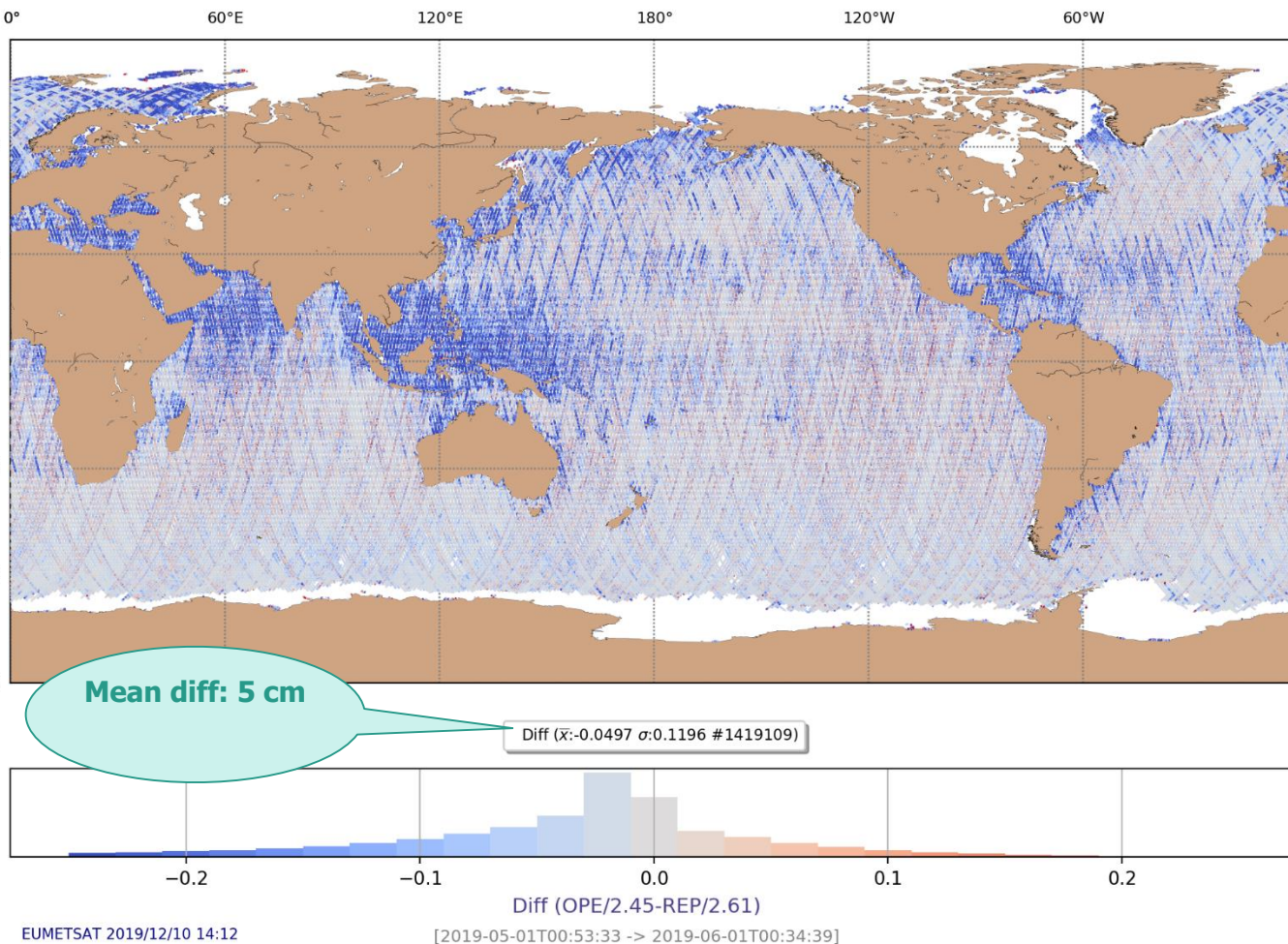


Starting from L0 and redoing calibrations and science processing for both MWR and SRAL

- Baseline Collection increased to 004
  - Can be seen in the filename  
S3A\_SR\_2\_WAT(...)MR1\_R\_NT\_004.SEN3
- L2 made available to the users (S3VT and upon request) by 2020/01/28
- L1 (L1A, B-S, B) and L2 available in **CODAREP** by 2020/06/05

# SWH differences BC 004 (new) x BC 003 (old)

SWH Comparison [PB 2.45 x PB 2.61]



Data has been filtered for open-ocean, excluded any sea-ice contamination, and limited to the -0.5 meters to 8 meters of SWH

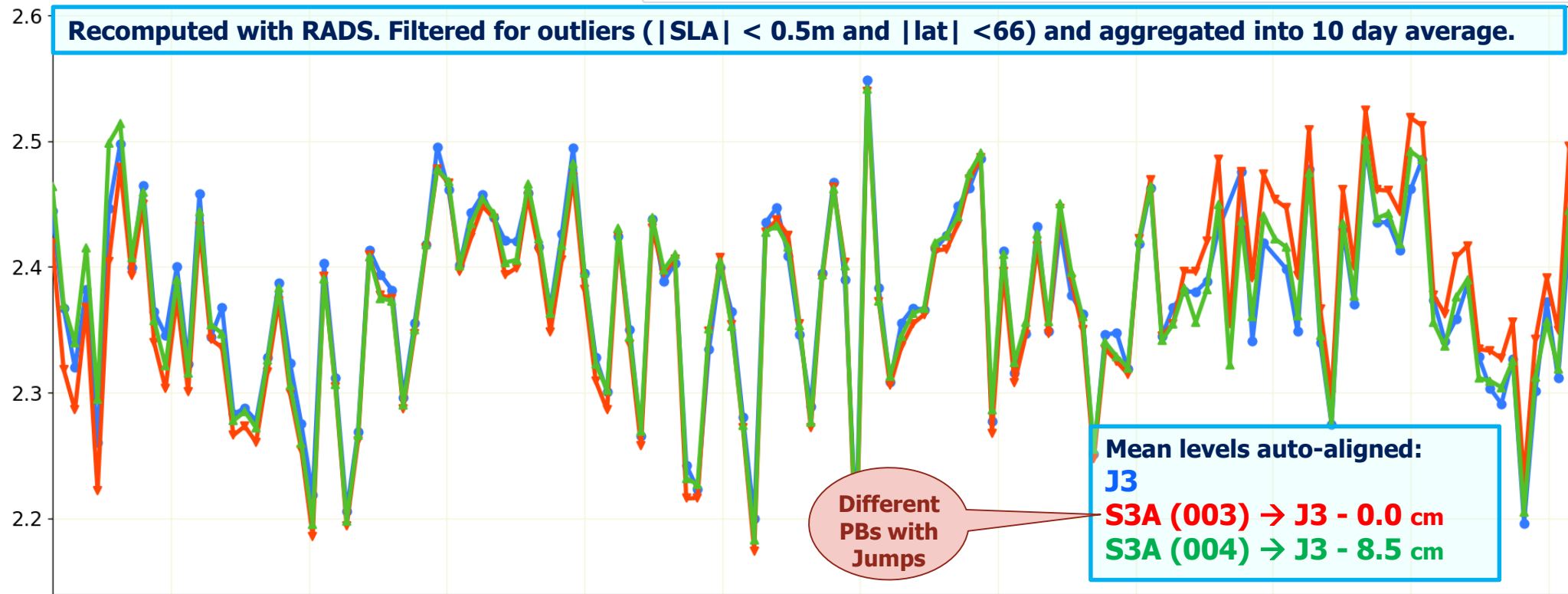
# Product Performance Overview – SWH

**S3A (003) → old data**  
**S3A (004) → new data**

SWH

J3 ( $\bar{x}$ :2.3733) S3A SAR/BC003 ( $\bar{x}$ :2.3733) +[-0.0001 offset] S3A SAR/BC004 ( $\bar{x}$ :2.3733) +[-0.0853 offset]

Recomputed with RADS. Filtered for outliers ( $|SLA| < 0.5\text{m}$  and  $|lat| < 66$ ) and aggregated into 10 day average.



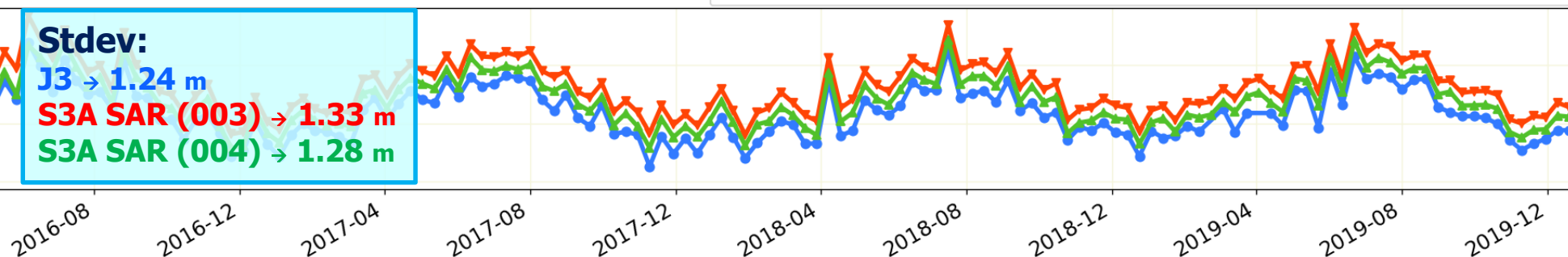
J3 STDEV ( $\bar{x}$ :1.2372) S3A SAR/BC003 STDEV ( $\bar{x}$ :1.3264) S3A SAR/BC004 STDEV ( $\bar{x}$ :1.2797)

**Stdev:**

J3 → 1.24 m

S3A SAR (003) → 1.33 m

S3A SAR (004) → 1.28 m



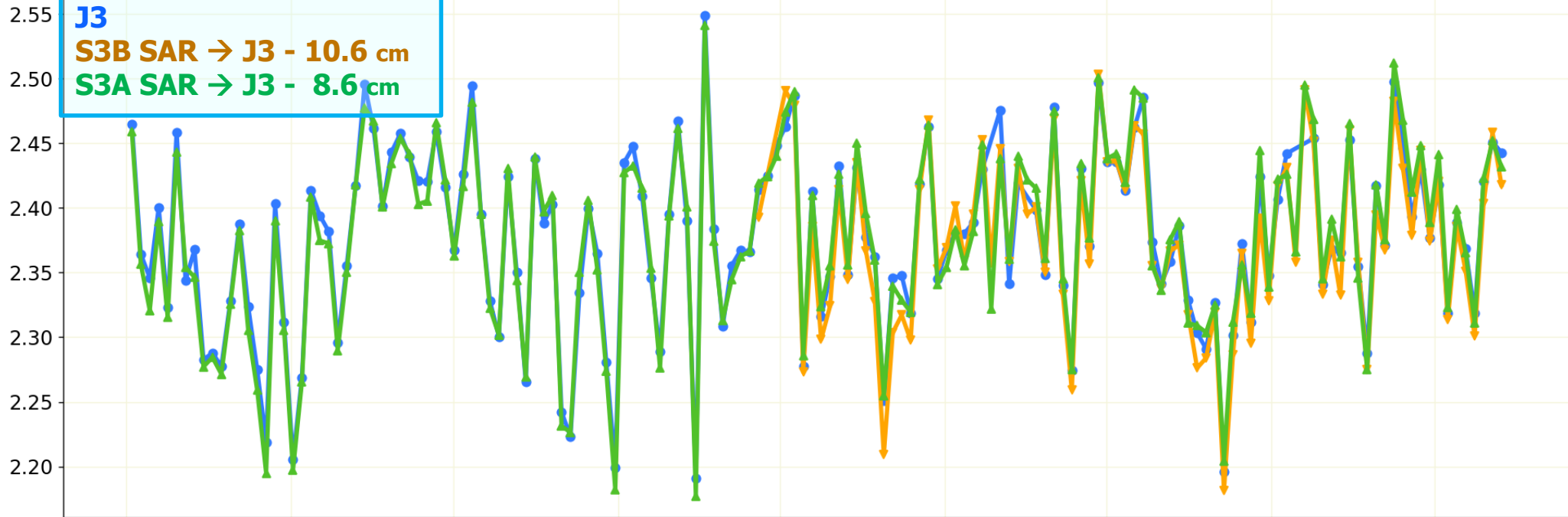
# Product Performance Overview – SWH (2)

SWH

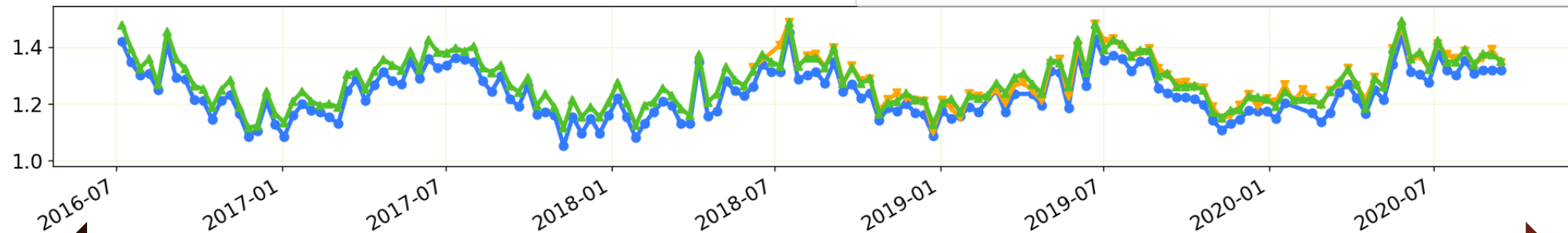
J3 ( $\bar{x}$ :2.3761) S3B SAR ( $\bar{x}$ :2.3761) +[-0.1056 offset] S3A SAR ( $\bar{x}$ :2.3761) +[-0.0858 offset]

Mean levels auto-aligned:

**J3**  
**S3B SAR → J3 - 10.6 cm**  
**S3A SAR → J3 - 8.6 cm**



J3 STDEV ( $\bar{x}$ :1.2374) S3B SAR STDEV ( $\bar{x}$ :1.2909) S3A SAR STDEV ( $\bar{x}$ :1.2810)

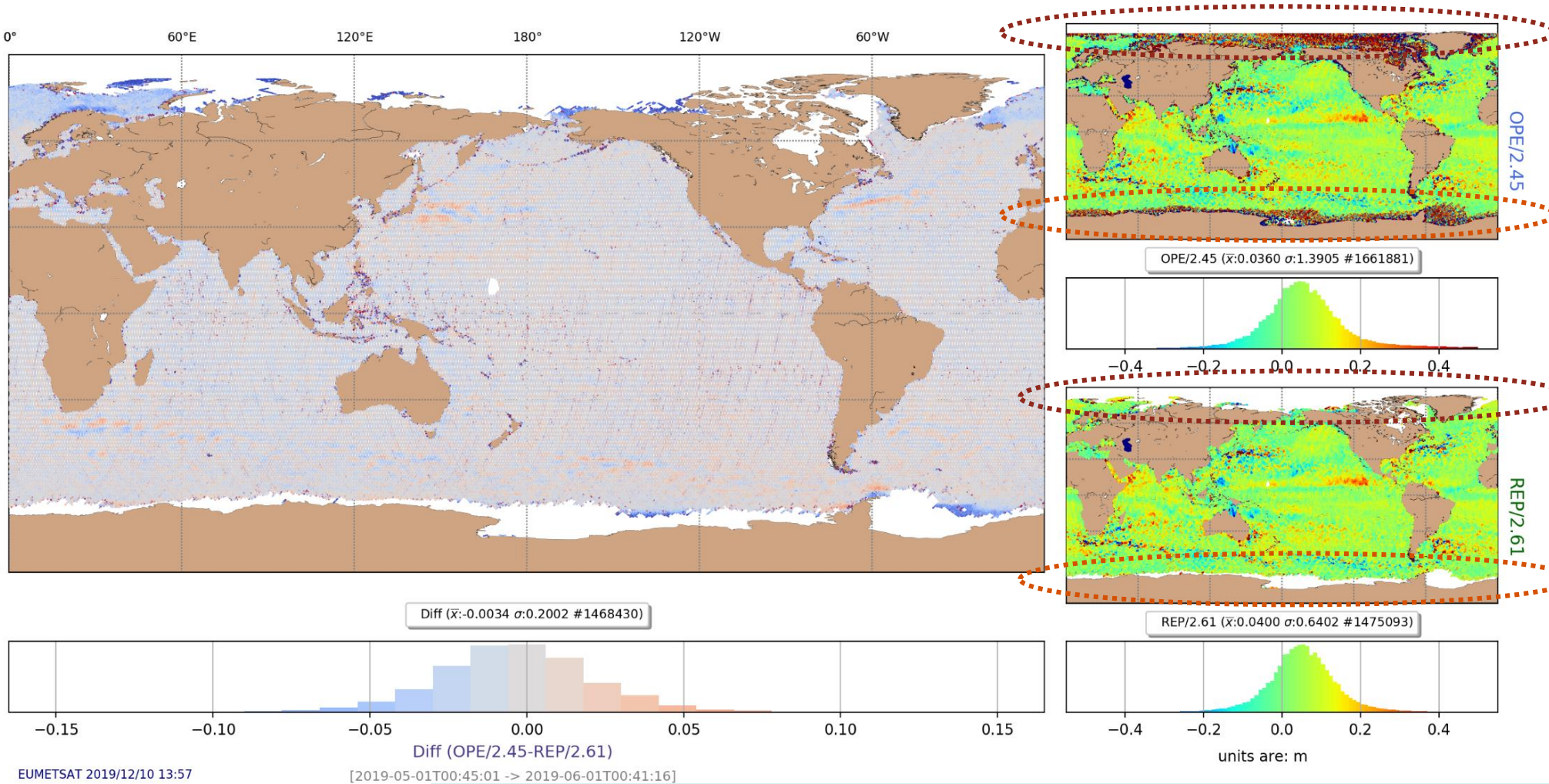


S3 Reprocessing BC004

S3 'live data'

# SSHA differences BC 004 (new) x BC 003 (old)

SSHA Comparison [PB 2.45 x PB 2.61]



**No filtering has been applied to the data, just removed SSHA values larger than |0.5| m**

# Product Performance Overview – SLA

**S3A (003) → old data**  
**S3A (004) → new data**

Sea Level Anomaly (recomputed)

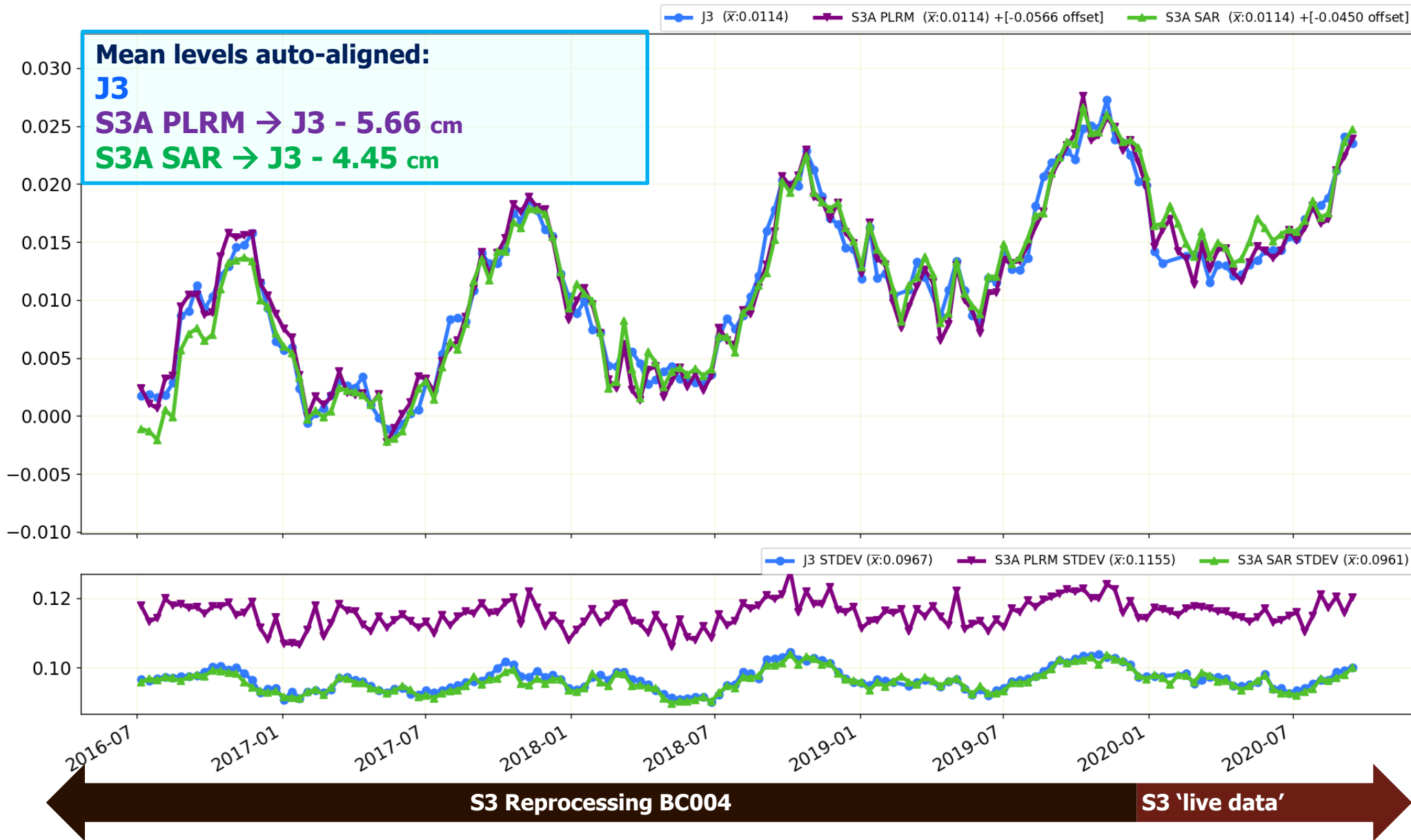
J3 D:0.0045/y    S3A SAR/BC003 D:0.0059/y    S3A SAR/BC004 D:0.0052/y  
J3 ( $\bar{x}$ :0.0100)    S3A SAR/BC003 ( $\bar{x}$ :0.0100) +[-0.0443 offset]    S3A SAR/BC004 ( $\bar{x}$ :0.0100) +[-0.0445 offset]

Recomputed with RADS. Filtered for outliers ( $|SLA| < 0.5\text{m}$  and  $|lat| < 66$ ) and aggregated into 10 day average.  
Same MSS/Tides/etc. used for S3A and J3.



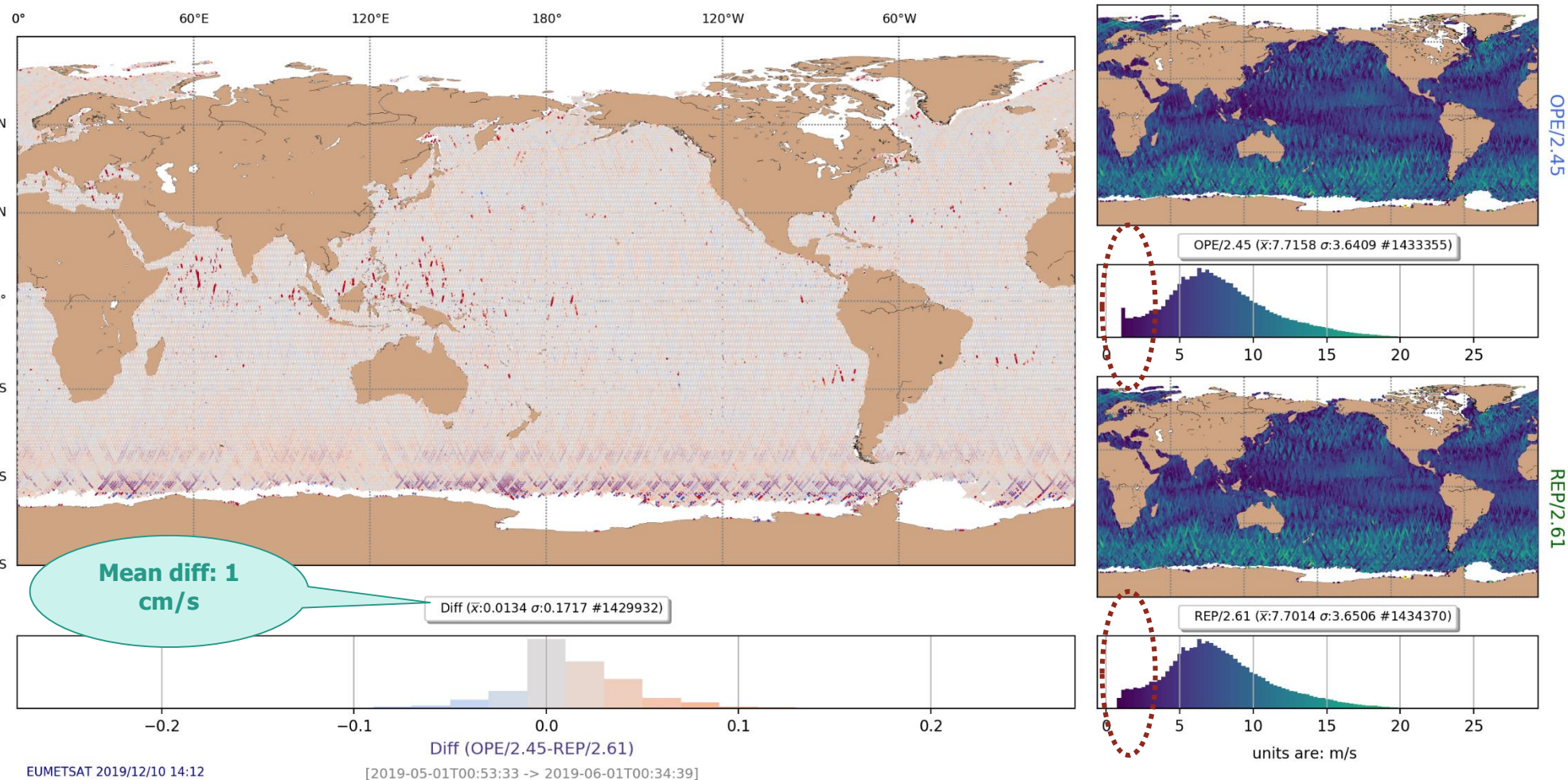
# Product Performance Overview – SLA (2)

Sea Level Anomaly (recomputed)



# Wind Speed differences BC 004 (new) x BC 003 (old)

Wind Speed Comparison [PB 2.45 x PB 2.61]



Data has been filtered for open-ocean, excluded any sea-ice contamination, and limited to the 0 to 30 m/s

# Alt Wind Speed x Model

**S3A (003) → old data**  
**S3A (004) → new data**

Wind Speed x ECMWF model

J3 ( $\bar{x}$ :0.4003) S3A SAR/BC003 ( $\bar{x}$ :0.1310) S3A SAR/BC004 ( $\bar{x}$ :0.1248)

Recomputed with RADS. Filtered for outliers ( $|SLA| < 1$  and  $|lat| < 66$ ) and aggregated into 10 day average.

**Mean:**

**J3** → **0.400 m/s**

**S3A SAR (003)** → **0.131 m/s**

**S3A SAR (004)** → **0.125 m/s**

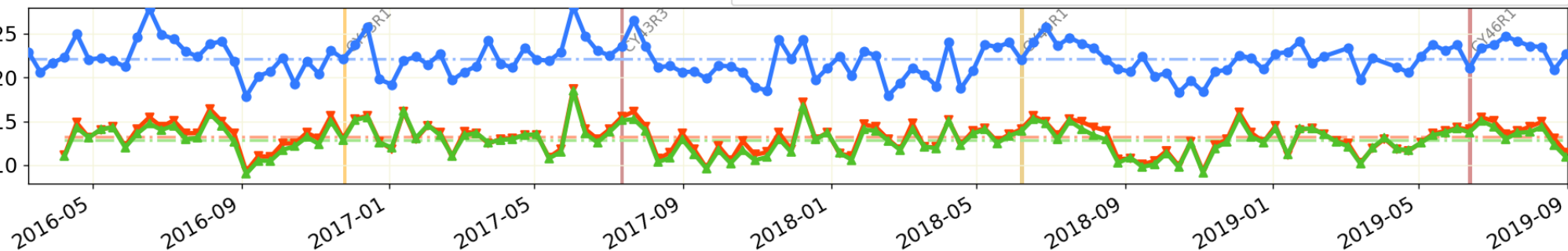
**Stdev:**

**J3** → **1.221 m/s**

**S3A (003)** → **1.132 m/s**

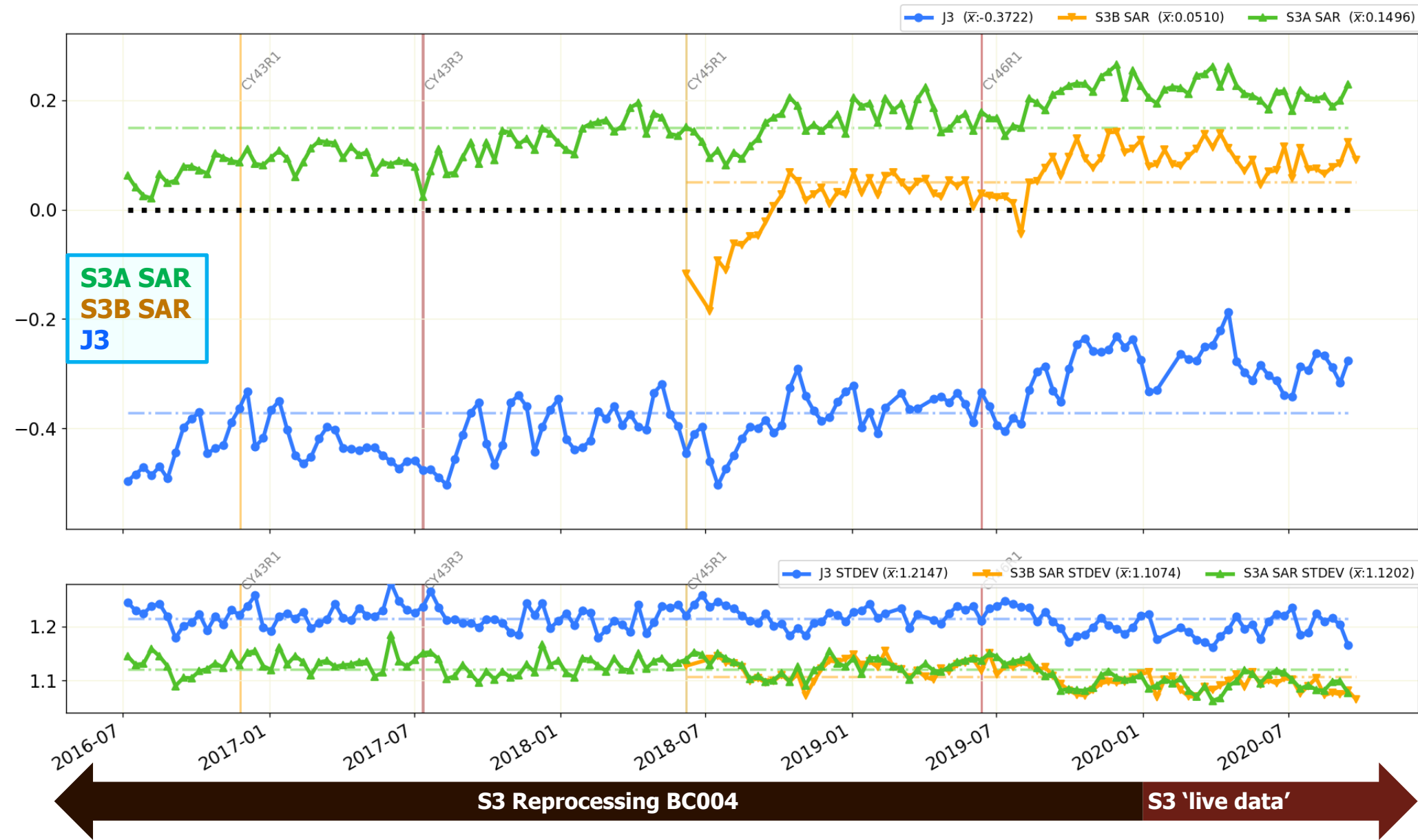
**S3A (004)** → **1.129 m/s**

J3 STDEV ( $\bar{x}$ :1.2212) S3A SAR/BC003 STDEV ( $\bar{x}$ :1.1319) S3A SAR/BC004 STDEV ( $\bar{x}$ :1.1289)



# Product Performance Overview – Wind Speed (2)

Wind Speed x ECMWF model



# Marine Processing Baselines (Today)

S3A SRAL on

S3B SRAL on

2016

2017

2018

2019

2020

Reprocessing "BC 004" PB 2.61

Available at <http://codarep.eumetsat.int>

PB 2.61

PB 2.68 MARINE

July 2020

Next minor PB  
2.7x MARINE

Dec 2020

Today

Available at:  
<https://coda.eumetsat.int> (rolling archive of 12 months for NTC)  
<https://eoportal.eumetsat.int> (complete archive, except reprocessing)  
Versions older than Baseline Collection 004 should not be used

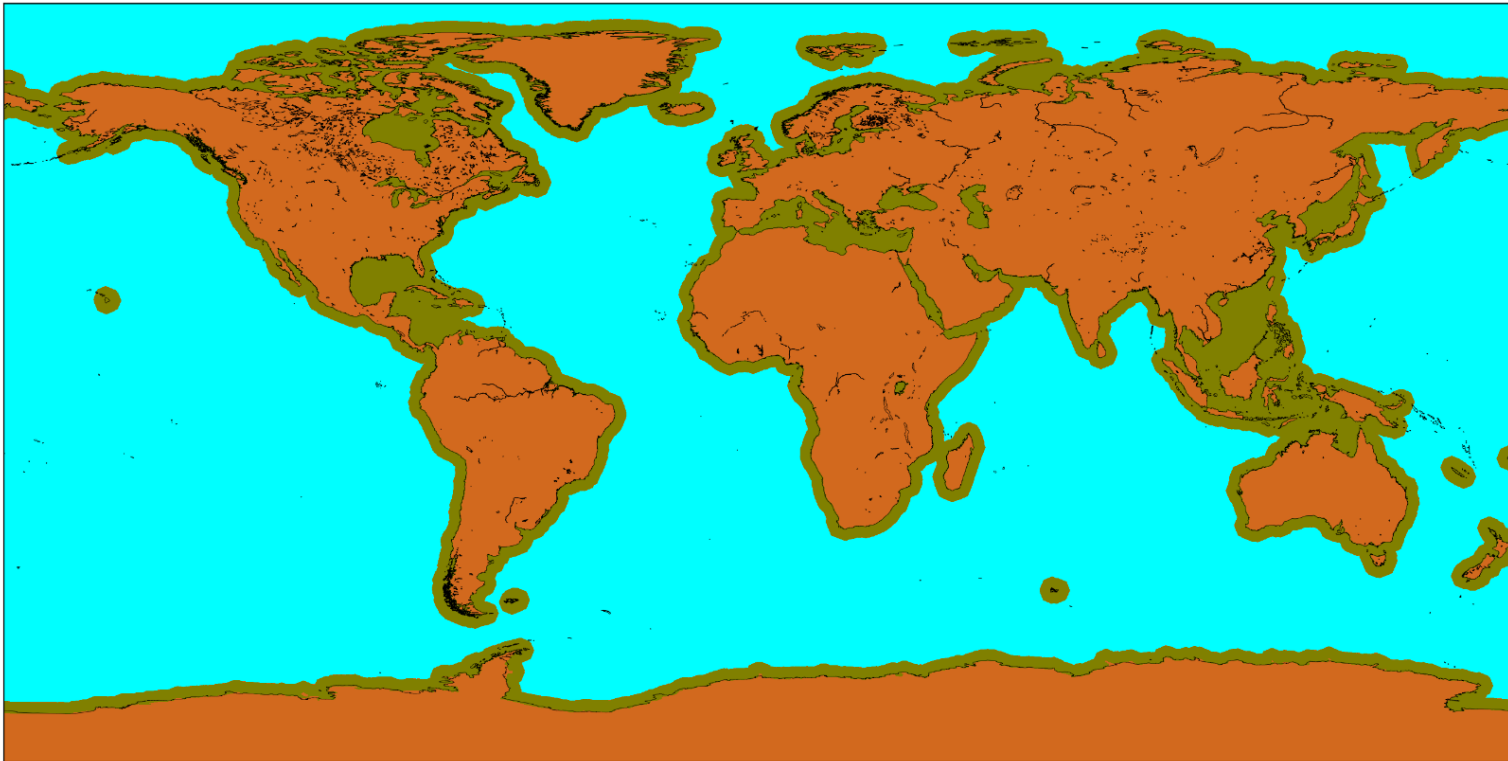
**BASLINE COLLECTION 004**

# Starting with PB 2.68 MARINE (July 2020)

- **Differences on common Ocean/Sea Ice between SR\_2\_WAT and SR\_2\_LAN**
- Different evolutions MRN and LND side
  - L2 Marine IPF under full EUM responsibility, including evolution and maintenance
- **Updated L2 Land/Sea mask**
  - Same mask both centres
  - Different responsibilities (gradually):
    - Open Ocean & Coastal Zone & Leads:
      - Full EUM responsibility
    - Land, Inland Waters and Ice (including sea-ice freeboard):
      - Full ESA responsibility
- **L1 still the same** (for the time being, split schedule to be agreed between agencies)
  - Updated L1A format (avoiding repeated calibrations)
    - Note anomaly SIIIMPC-4568 – only 1 Cal2 available in L1A, to be fixed in next PB
  - Faster reading of data
  - Autocal update (low impact, sigma0/wind)
  - Other fixes bugs *under the hood*

# Previous Marine Centre Mask (< PB 2.68-MARINE)

S3\_SR\_2\_MLM\_AX\_20000101T000000\_20991231T235959\_20171111T111111\_\_\_\_\_EUM\_O\_AL\_002.SEN3



Common

**Original MLM +  
Major in-land  
water bodies  
common: Great  
Lakes, Caspian,  
Lake Victoria**

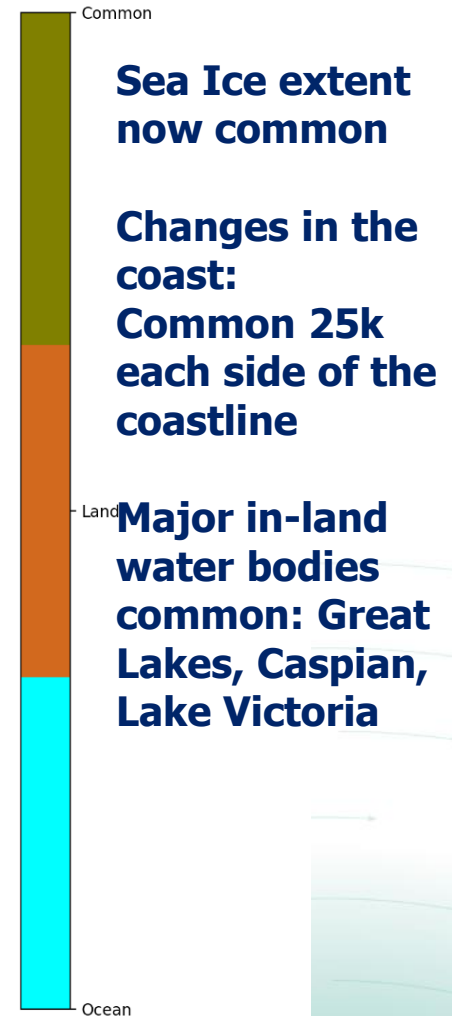
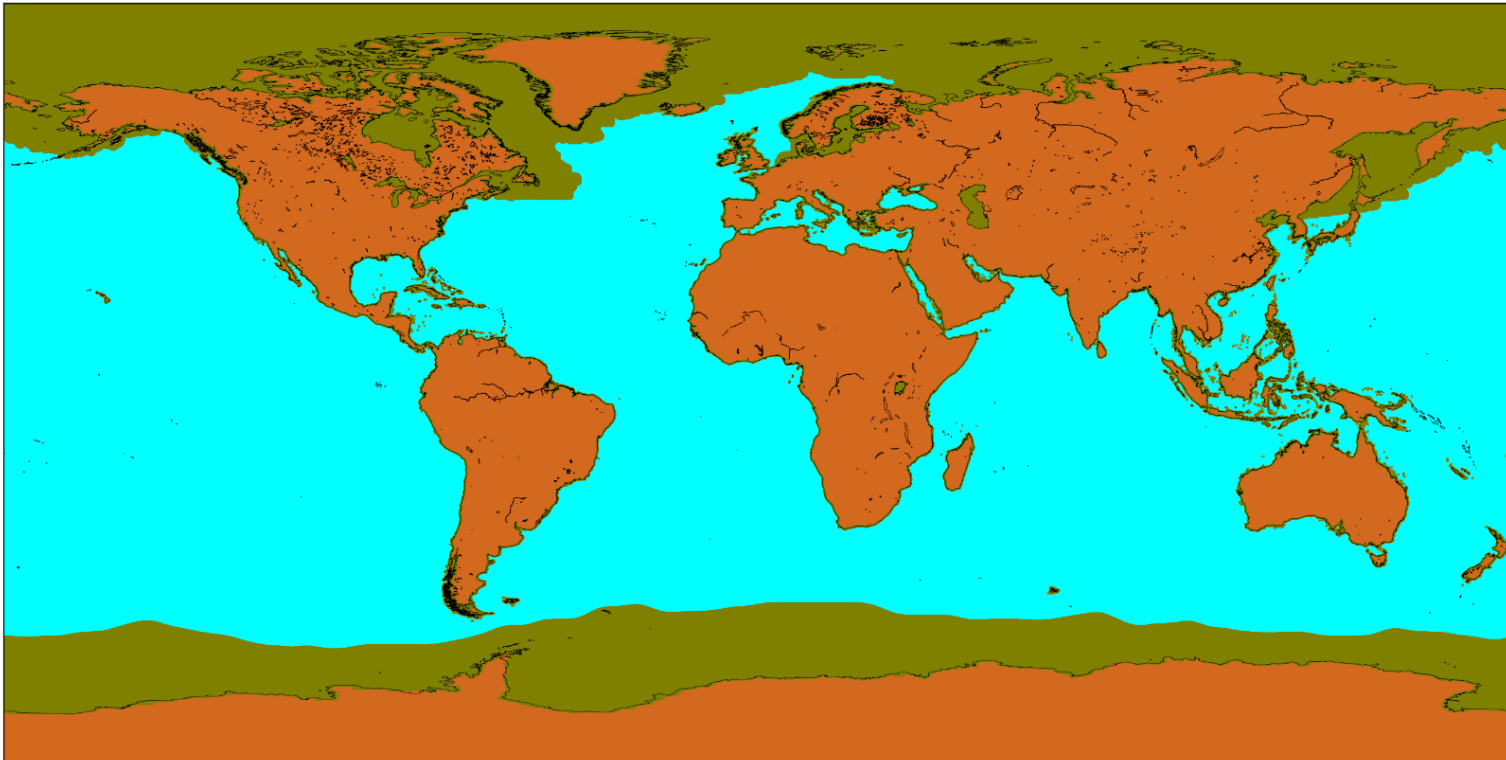
Land

Ocean

Marine Centre produces data in the blue and green areas

# Current Mask Land/Marine

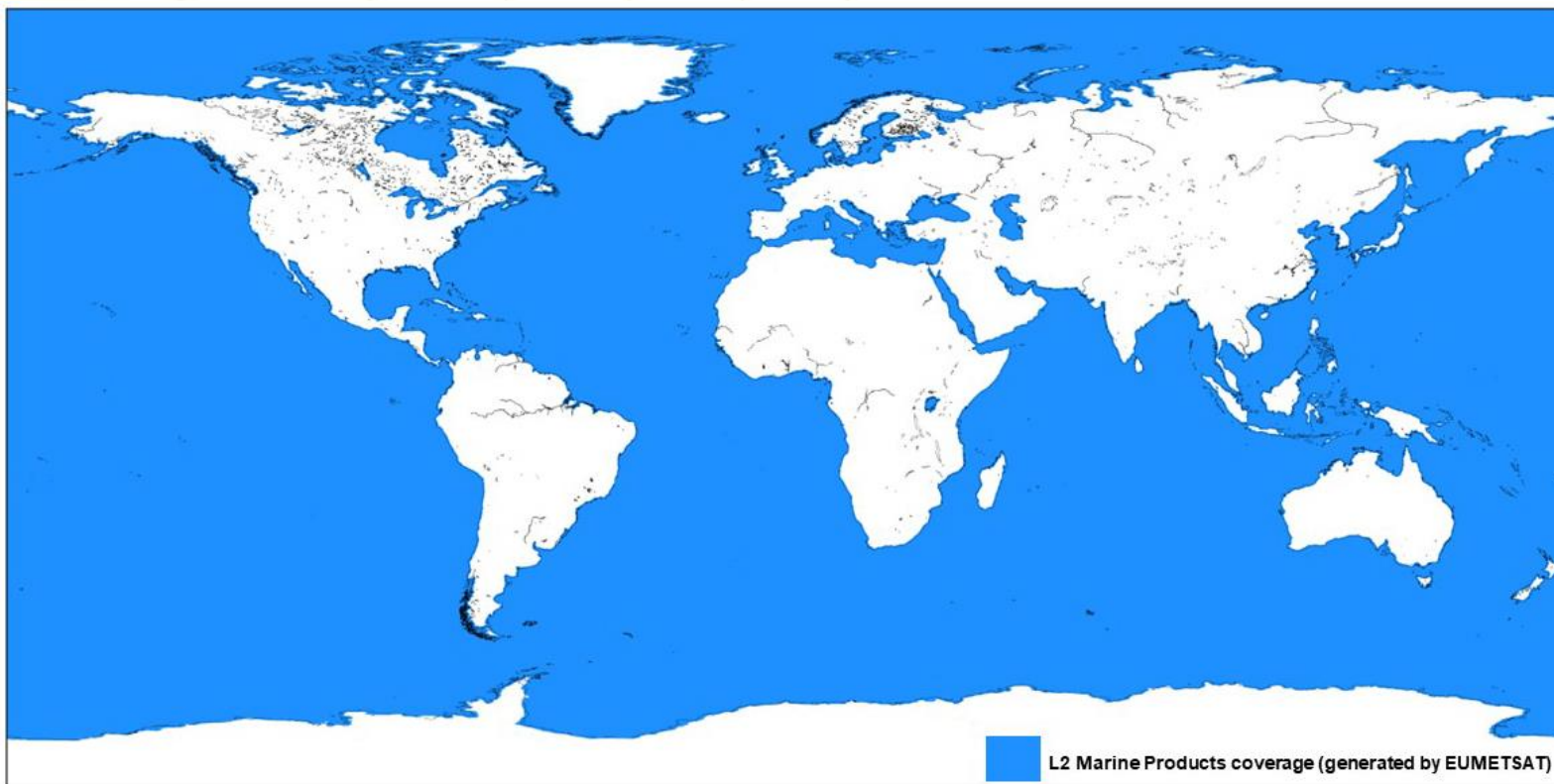
S3\_SR\_2\_MLM\_AX\_20160216T000000\_20991231T235959\_20191209T120000 MPC\_O\_AL\_003.SEN3



Marine Centre produces data in the blue and green areas

# Current Mask Land/Marine

Marine Centre produces data in the **blue** areas



**Sea Ice extent  
now common**

**Changes in the  
coast:  
Common 25k  
each side of the  
coastline**

**Major in-land  
water bodies  
common: Great  
Lakes, Caspian,  
Lake Victoria**

@ <https://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Sentinel3/AltimetryServices/AltimetryMarineProducts/index.html>

# Marine Processing Baselines (Future)

S3A SRAL on

S3B SRAL on

2016

2017

2018

2019

2020

2021

Reprocessing "BC 004" PB 2.61

Available at <http://codarep.eumetsat.int>

PB 2.61

PB 2.68 MARINE

Next minor PB 2.7x  
MARINE

July 2020

Dec 2020

Today

Available at:

<https://codarep.eumetsat.int> (rolling archive of 12 months for NTC)

<https://eoportal.eumetsat.int> (complete archive, except reprocessing)

Versions older than Baseline Collection 004 should not be used

**BASELINE COLLECTION 004**

Minor PBs the  
rest of the year  
2020  
No change in the  
mission science  
timeline

# Highlights for Future evolutions (2020-2021-2022)

## Dec 2020 (TBC):

- Internal tides, angle of approach, MDT CNES/CLS 18, etc.
- No change to the science timeline

## Spring 2021:

- PLRM updates (L1+L2)
- MRN/LND mask at L1 (TBC)

## Fall 2021:

- Drift fix:
  - Calibration Processing update
  - Range Walk
- Zero-Masking
- Updated Pole Tide (TBC)
- MSSs: DTU20, CNES-CLS 20 (TBC)

## 2021/2022:

- GPD+ wet tropo correction in the products
- SAR SSB
- MOG2D in NRT
- Sea ice concentration from OSI SAF

## SATELLITES

### CURRENT SATELLITES

METEOSAT

METOP

SENTINEL-3

### ALTIMETRY SERVICES

CURRENT PROCESSING  
BASELINES

ALTIMETRY MARINE  
PRODUCTS

OCEAN COLOUR SERVICES

SEA SURFACE TEMPERATURE  
SERVICES

ATMOSPHERIC COMPOSITION

SENTINEL-3 DESIGN

SENTINEL-3 DATA FORMATS

SENTINEL-3 TOOLS & TRAINING

JASON-3

FUTURE SATELLITES

PAST SATELLITES

LAUNCHES AND ORBITS

GROUND SEGMENT

SCIENCE ACTIVITIES

TECHNICAL DOCUMENTS

GLOSSARY

The dual-frequency Synthetic Aperture Radar Altimeter (SRAL) on Sentinel-3 provides sea surface topography measurements in SAR mode, with a spatial resolution as narrow as 300 m.

SRAL is supported by a microwave radiometer for atmospheric correction and by a DORIS receiver, Global Navigation Satellite System, and laser retroreflector to determine its position in space with pinpoint accuracy.

Altimetry data can be used to determine sea and lake surface height, significant wave height, surface wind speed, and sea ice height and thickness.

The products will be available in:

- Near-Real-Time (NRT): products shall be available to the users within three hours after sensing.
- Short Time Critical (STC): products available to the users within 48 hours after sensing.
- Non-Time-Critical (NTC): products available to the users within one month after sensing.

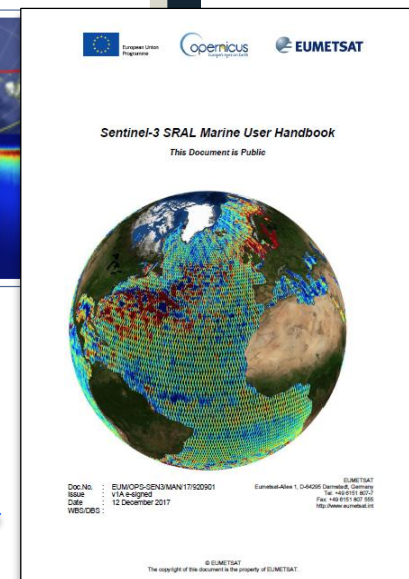
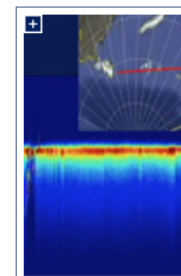
The second table below lists the current operational altimetry products.

A full list of our ocean products can be found on our [Ocean Products page](#).

### ► Sentinel-3 SRAL Marine User Handbook

### ► Timeline and Overview of the SRAL/MWR Processing Baselines

PROCESSING BASELINE DEPLOYMENT DATE	PROCESSING BASELINE VERSION	SRAL L1 PRODUCT NOTICE	SRAL L2 PRODUCT NOTICE
21 Jan 2020	2.61	► Copernicus S3 Product Notice — Altimetry	► Sentinel-3 Product Notice — STM L2 Marine
14 Feb 2019	2.45	► Copernicus S3 Product Notice — Altimetry	► Sentinel-3 Product Notice — STM L2 Marine
06 Dec 2018	2.33 (S3A)/1.13 (S3B)	► Copernicus S3 Product Notice — Altimetry	► Sentinel-3 Product Notice — STM L2 Marine



**Product Notices with detailed information Level 1 and Marine Level 2**

# S3 ALT page @ EUM: [sral.eumetsat.int](http://sral.eumetsat.int)

SATELLITES

CURRENT SATELLITES

METEOSAT

METOP

SENTINEL-3

ALTIMETRY SERVICES

CURRENT PRODUCTS

ALTIMETRY PRODUCTS

OCEAN COLOUR

SEA SURFACE SERVICES

ATMOSPHERIC

SENTINEL-3 DATA

SENTINEL-3 DATA

SENTINEL-3 DATA

JASON-3

FUTURE SATELLITES

PAST SATELLITES

LAUNCHES AND

GROUND SEGMENTS

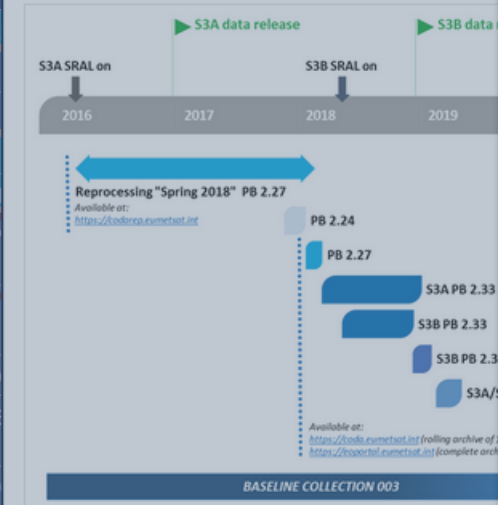
SCIENCE ACTIVITIES

TECHNICAL DOCUMENTS

GLOSSARY

## Timeline and overview of previous Sentinel-3 SRAL/MWR Processing

### OBSOLETE BASELINE COLLECTION 003



### SRAL/MWR Processing Baselines of Sentinel-3 - Obsolete Baseline Collection 003

BASELINE COLLECTION 003	PB 2.27	PB 2.33/1.13*	PB 2.4
IPF versions	SRAL L1 (SR-1): 06.13 MWR L1 (MW-1): 06.04 SRAL/MWR L2 (SM-2): 06.12	SRAL L1 (SR-1): 06.14 MWR L1 (MW-1): 06.07 SRAL/MWR L2 (SM-2): 06.14 * PB1.13: same IPF versions, it only includes some static Auxiliary Data Files (ADFs) which are specific to S3B	SRAL L1 (SR-1): 06.14 MWR L1 (MW-1): 06.07 SRAL/MWR L2 (SM-2): 06.14
Product Notice	> L1 PN (2.27) > L2 PN (2.27)	> L1 PN (2.33) > L2 PN (2.33) > L1 PN (2.33/1.13) > L2 PN (2.33/1.13)	> L1 PN (2.4) > L2 PN (2.4)
PB Deployment date (NRT)	14/02/2018	04/04/2018 (S3A, PB2.33) 06/12/2018 (S3B, PB 1.13)	14/02/2018
Dataset (NTC) (sensing time & server)	Reprocessed "Spring 2018": From: 01/03/2016 To: 12/02/2018 > CODArep Operational NTC From: 13/01/2018 To: 09/03/2018 > EOP	Operational NTC From: 09/03/2018 To: 20/01/2019 > CODA > EOP	Operational NTC From: 09/03/2018 To: 20/01/2019 > CODA > EOP
Manifest file		ANX information is more accurately computed.	Corrected reports applied
Calibration			
Retrackers			
MSS			
Tide Models			
Backscatter coefficient			

## Timeline and Overview of the SRAL/MWR Processing Baselines of Sentinel-3.

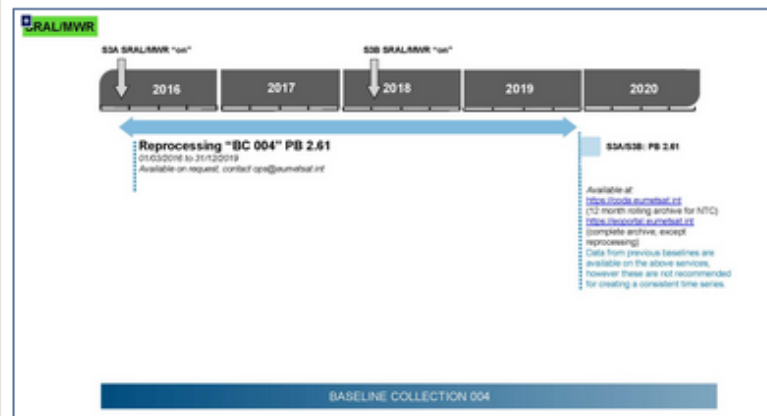
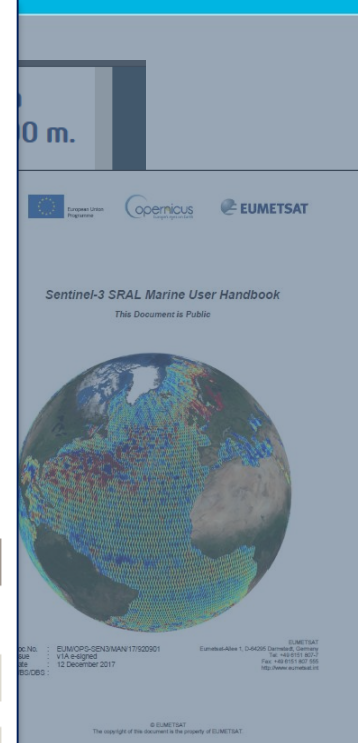


Figure 1: Timeline of the of the SRAL/MWR Processing Baselines of Sentinel-3

### SRAL/MWR Processing Baselines of Sentinel-3 - Baseline Collection 004

BASELINE COLLECTION 004	PB 2.61
IPF versions	SRAL L1 (SR-1): 06.17 MWR L1 (MW-1): 06.11 SRAL/MWR L2 (SM-2): 06.18
Product Notice	> L1 PN > L2 PN
User Announcement	> Major evolution of Sentinel-3 Altimetry products
PB Deployment date (NRT)	21/01/2020
Dataset (NTC) (sensing time & server)	Operational NTC From: 27/12/2019 To: Current > CODA > EOP
Manifest file	Pass number anomalies were corrected, the the Pass number of the products is correct and limited to 770.
Calibration	
Retrackers	Update of fitting routine, to correct SWH issue (see below), small impact on retracked parameters
SSHA	SSHA is now computed using the filtered Ionospheric correction, both in SAR and PLRM. The SSHA PLRM is now computed using PLRM SSB (bug fix)
MSS	Update of Mean Sea Surface (MSS) to DTU18
Tide Models	Update of FES2014 Tide Model library to the latest version of the library
Wet tropo	Update of radiometer derived Wet Tropo mostly due to updated MWR Antenna Patterns, larger effect getting closer to the coast
Dry tropo	
Wind	Improved Wind Model for very low/high wind speeds
Speed/Backscatter coefficient	
SVWH	Correction of a software issue for 20-Hz SWH
Sea ice	



Product Notices with detailed information Level 1 and Marine Level 2

# EUMETSAT's User Notification Service (UNS)

## How to get the User Announcements

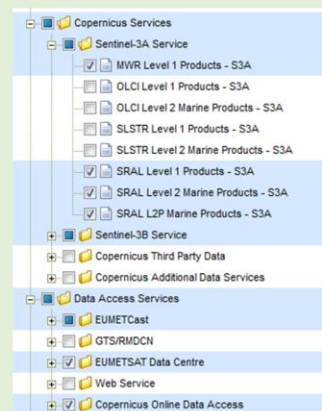
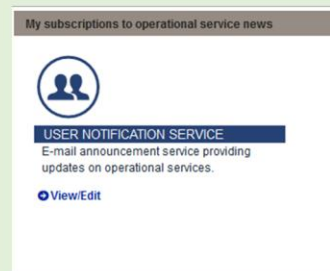
You can receive the notifications of any issue occurring in the Sentinel-3 ground segment or spacecraft via an email notification. This is also applicable also to any other EUMETSAT mission (even is just for data distribution)

You need to have an account in the EUMETSAT EOPortal (the same portal used to access to CODA or Data Centre).

If you don't have an account you need to go the EOPortal (<https://eoportal.eumetsat.int>) and select "New User – Create New Account" and follow the email instructions.

If you already have an account just go to the URL: <https://eoportal.eumetsat.int> and select "User Notification Service" (top image of this box), then you can select what elements are relevant (examples on the image on the bottom right side of this box).

At any time the user announcements can be seen at <https://uns.eumetsat.int/>



Type:	Service Alert
Ann Nr:	5300
Rev:	6
Start Time:	2019/10/29 19:10
End Time:	2019/11/06 08:00
Satellites:	Sentinel-3A, Sentinel-3B
Subsystem:	
Component:	
Subject:	ground-segment-anomaly
Impact:	data-delayed
Detail:	Investigation is ongoing. NRT SRAL L2 WAT products in BUFR format affected. [Rev 2] All NRT SRAL L2 WAT products impacted. [Rev 3] Services impacted updated. Users will also experience delays in the updates to the Data Centre Archive catalogue. [Rev 4] Timeliness issues with CODA may be expected. [Rev 5] The data outage is expected to last few more days. Delayed data will be provided to users at the earliest opportunity. [Rev 6] Service has been resumed. Delayed data will be provided to users at the earliest opportunity.
Url:	
Orbits:	
Status:	recovered
Issue Time:	2019/11/08 09:18

# Sentinel-3 Altimetry Marine Products Portfolio

Main “S3 Altimetry” Page @ EUM  
[sral.eumetsat.int](http://sral.eumetsat.int)

Starting point to download of Marine products (S3,J3,etc.): [eoportal.eumetsat.int](http://eoportal.eumetsat.int)

Status	Product	EUMETCast (NRT/STC)	ODA CODA	Data Centre	AVISO+	CMEMS	Timeliness
<b>S3A: operational</b>  <b>S3B: operational (since December 2018)</b>	SRAL L1A		✓	✓			STC, NTC
	SRAL L1B	✓	✓	✓			NRT, STC, NTC
	SRAL L1BS		✓	✓			STC, NTC
	SRAL L2 WAT	✓	✓	✓			NRT, STC, NTC
	SRAL L2P SLA (produced by CNES/CLS)	✓			✓		NRT, STC, NTC
	SRAL L3 SLA (produced by CNES/CLS)					✓	NRT/STC, NTC
<b>New Products (Operational since Mid-2019)</b>	SRAL L2P WAVE (produced by CNES/CLS)	✓			✓		NRT
	SRAL L3 WAVE (produced by CNES/CLS)					✓	NRT
	SRAL L2 BUFR (NRT only)	✓					NRT

Will also include WIND (starting July 2020)

Copernicus [Altimetry] Land Products for Africa:  
 SR\_2\_LAN (STC/NTC) distributed via EUMETCast Africa