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## Sentinel-3A Product Notice – STM L2 Marine

<b>Mission</b>		S3-A
<b>Sensor</b>		SRAL/MWR
<b>Product</b>		L2 NRT, STC and NTC (Marine Products)
<b>Product Notice ID</b>		EUM/OPS-SEN3/DOC/16/893228
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<b>Version</b>		v1D e-signed
<b>Preparation</b>		This Product Notice was prepared by EUMETSAT with the support of the ESA and the S3 Mission Performance Centre experts
<b>Approval</b>		EUMETSAT Mission Management

### Summary

This document is the Product Notice for the public release of Sentinel-3 Surface Topography Mission (STM) Level-2 Near Real Time (NRT), Short Time Critical (STC) and Non-Time Critical (NTC) products generated at the Marine Centre, EUMETSAT.

The Notice describes the STM current status, processing baseline, product quality and limitations, and product availability status.



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## Processing Information

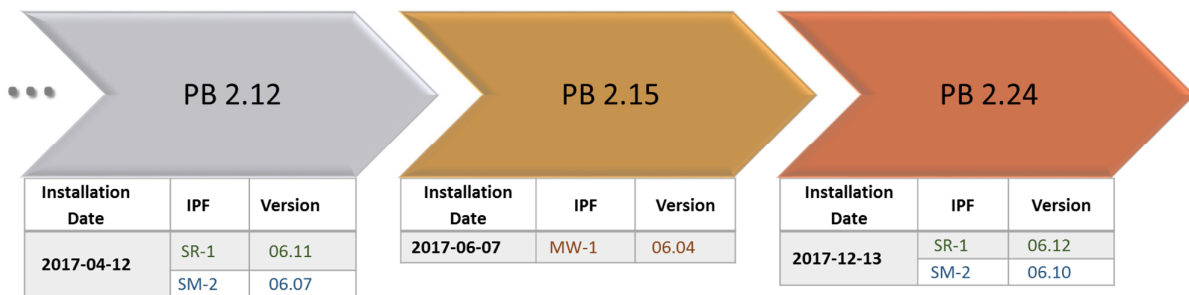
### Processing Baseline

- Processing Baseline (PB) **2.24**
  - SRAL L1 IPF (SR-1): version **06.12**
  - MWR L1 IPF (MW-1): version **06.04**
  - SRAL/MWR L2 IPF (SM-2): version **06.10**
  - The list of Static Auxiliary Data Files that are part of the Processing Baseline can be found at the end of the document.

## Description

### Status of the Processing Baselines

The installation date of **PB 2.24** is **2017-12-13**. Installation dates and contents of the previous PBs are detailed in the figure below.



Processing Baseline 2.15 was used for the “Spring” Reprocessing campaign. The Reprocessed dataset spans from 2016-06-15 to 2017-04-15.

Details on how and where to obtain the data can be found in the section Product Availability.

### New in this PB

A major evolution of the Sentinel-3 Altimetry products has been performed, such that the baseline collection of the products has been increased from version 002 to 003 (It can be noticed in the end of the SEN3 filename).

These evolutions comprise, among others, the updated version of the SAMOSA retracking algorithm (now following DPM 2.5), updated Mean Sea Surfaces (DTU 15 [default] and CNES/CLS 15), updated tide model (FES 2014 [default] and GOT 4.10).

The evolutions are expected to improve the consistency of SAR and PLRM retrievals for sea surface height and to be even more in line with the ECMWF models for winds and waves.

There are also newer additions to the L2 product, these should make it easier to use by the users. There is now a flag (*orbit\_type\_01*), at measurement level, describing the type of orbits used in the processing, this is particularly relevant for NRT data.

New indexing scheme is available to allow easy matching between 1Hz and 20Hz data, the same approach used by EnviSat. The following variables were added (*index\_1hz\_meas\_20\_[ku|c]*, *index\_first\_20hz\_meas\_01\_[ku|c]*, *num\_20hz\_meas\_01\_[ku|c]*).



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There are improvements on the wet tropospheric correction, especially near the coast, as the 5-parameter algorithm was improved, and the backscatter coefficient is now corrected for attenuation, bringing Sentinel-3 in line with other altimeter product formats.

Improvements on sea ice detection are also part of the updates of this Processing Baseline.

Level 2 products now include internal netCDF compression (transparent to the user), reducing the file size by about 50%.

In addition, the Sentinel-3 Marine Data Centre at EUMETSAT will now also produce data over the North-American Great Lakes, Lake Victoria, and the Caspian Sea.

### **L2 Marine Products Quality:**

The quality of L2 WAT product is within the mission requirements for the 3 SRAL parameters (Range, SWH, and Wind Speed).

There are some known limitations that are described in the following sections.

The data is within requirements also in terms of completeness and timeliness.

The sea ice processing is not yet optimised. Improvements to the sea-ice ground processing are foreseen in the near future.

### **Known product quality limitations**

The Sentinel-3A STM L2 products have some known processing limitations which are reported in the next pages as «Anomalies» or «Notices». Anomalies are related to issues on the processing baseline (e.g. *bugs*) whilst Notices are limitations which are planned to be improved in the medium-long term (e.g. *algorithm evolution, calibration campaigns, etc.*).

## **Notices on the products**

- **Notice #1 – MWR calibration is not completed**

MWR calibration is not completed, so the radiometer measurement values and derived quantities do not have an optimised performance.

The MWR L1 brightness temperatures exhibit a difference of up to 1 K between ascending and descending tracks for the 23.8 GHz channel. Work is ongoing to understand the source of this difference.

In the L2 products the radiometer wet tropospheric correction deduced from 5 parameters has not been calibrated yet and should not be used (`rad_wet_tropo_cor_sst_gam_01_ku` and `rad_wet_tropo_cor_sst_gam_01_plrm_ku`).

The composite wet tropospheric correction has not been calibrated yet and should not be used (`comp_wet_tropo_cor_01_ku` and `comp_wet_tropo_cor_01_plrm_ku`).

- **Notice #2 - MWR parameters not computed due to MWR calibration over open ocean**

During MWR calibrations over open ocean, the brightness temperatures for both channels are not computed and set to default values in the product.

As a consequence, 1 Hz parameters derived from the MWR are set to default values, except for the atmospheric attenuation. This affects the wet tropospheric correction, water vapour content and cloud liquid water content.

A revision of the MWR calibration sequence is under investigation. This would reduce the number of occasions where the MWR values are set to Default. A fix is expected in early 2018.



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- **Notice #3 - Mean values of Ku band and C band sigma0**

The Ku band sigma0 in all modes (LRM, PLRM and SAR) has been biased to be aligned with the mean value for Envisat (10.8 dB without the atmospheric attenuation). A system bias of -25.95 dB was applied to SARM Ku band and of -2 dB to the LRM and PLRM Ku band. Note that up to processing baseline 2.9 (including) this value was set to -25.65 dB.

Note also that the sigma0 derived from ice sheet retracers exhibits a mean value close to 42 dB.

The C-band sigma0 in all modes (LRM and PLRM) has not been biased and exhibit a mean value around 11 dB which is lower by 4 dB compared to Jason-2.

Since PB 2.24 the sigma0 is corrected for attenuation. Data processed with older versions were **not** corrected for attenuation. This was done only before injection into algorithms like for the retrieval of wind speed.

- **Notice #4 - Noise on the dual frequency ionospheric correction**

The higher noise of the C band range inherent to the PLRM processing contributes to a high noise in the dual frequency ionospheric correction.

- **Notice #5 – Sea State Bias (SSB) is still not optimize for S3**

The SSB correction has not been tuned for Sentinel-3A and contains Jason-2 SSB solution.

- **Notice #6 – Some geophysical flags have not been tuned for Sentinel-3A**

Some geophysical flags were derived from Envisat mission and have not been tuned for Sentinel-3A.

The rain flag is presently based on Envisat flag and it has not been tuned for Sentinel-3A mission.

The ocean/sea ice flag is presently based on Envisat flag and it has not been tuned for Sentinel-3A mission.

- **Notice #7 - Numerical Overflow for the Waveform Peakiness Parameters (“EUM/Sen3/NCR/3569”)**

The SAR Ku Waveform Peakiness field (peakiness\_2\_20\_ku) is affected by numerical overflow (i.e. padded to Fill Value) when it takes values above 32.767. Same limitation is present in PLRM mode and C Band. This will be tackled as part of a future evolution of the product.

- **Notice #8 - Numerical Overflow for the Waveform MQE Parameter (“EUM/Sen3/NCR/3570”)**

The SAR Waveform MQE field (mqe\_ocean\_20\_ku) is affected by numerical overflow (i.e. padded to Fill Value) when it takes values above 3.2767. Same limitation is present in PLRM mode and C Band. This will be tackled as part of a future evolution of the product.

- **Notice #9 – Platform angles invalid during manoeuvres (“EUM/Sen3/NCR/2720”)**

The satellite platform angles were not large enough to accommodate the angles during a manoeuvre. This has been corrected as part of PB 2.24. Previous data processed may exhibit default values for the angles, depending on the manoeuvre.

- **Notice #10 – CNES/CLS 15 MSS is set to default values in certain zones (“EUM/Sen3/NCR/3484”)**

The MSS CNES/CLS 15 is set to default value over inland waters, the Beaufort Sea, certain Antarctica regions, and over land. This means it cannot be used to provide a global SSA. In case the user wants to use this MSS instead of the default DTU15, he/she should be aware of this.



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## **Anomalies on the products**

### **Open Anomalies**

The following anomalies are still open and will be resolved as soon as possible.

- **Anomaly “EUM/Sen3/NCR/3403” – Issue in range positioning the SAR waveform at Greenwich Meridian**

A few 20-Hz geophysical measurements (range, wave height and sigma nought) are systematically padded to FillValue at Greenwich meridian cross in SAR and PLRM mode. This issue is related to an issue in the OLTC on board of S3A. This affects some 20Hz measurements crossing the meridian, but it is not enough to invalidate the 1-Hz data. It affects about 21 seconds of data per cycle.

**Affects:** L2 SRAL NRT/STC/NTC

- **Anomaly “EUM/Sen3/NCR/3448” - GIM Iono Correction set to Fill Value on occasions**

The ionospheric GIM correction (fieldname is `iono_cor_gim_01_ku`) can be set to Fill Value on certain products that cross the midnight. The post-midnight period of the product, will not have GIM iono correction.

**Affects:** L2 SRAL NRT/STC/NTC

- **Anomaly “EUM/Sen3/NCR/3635” – 1Hz data without associated 20Hz measurements**

On some occasions, related to the application of the land-sea mask, there may be 1-Hz time dimension data without associated 20-Hz data. On the newly indexes added to the product with PB 2.24, it will be possible to see index values with Fill Value. Until the issue is resolved, the user needs to ensure that index read is valid integer.

**Affects:** L2 SRAL NRT/STC/NTC from PB 2.24 onwards

### **Limited product degradation**

The following anomalies are product degradations clearly delimited in time, it will be solved (if possible) in the next reprocessing.

- **Anomaly “EUM/Sen3/NCR/2893” – Degradation of model dry and wet tropospheric correction during the day 2017-02-08**

Due to unavailability of a meteorological correction file (`AX__MA2_AX`) during the day 2017-02-08, the model dry (`mod_dry_tropo_cor`) and wet tropospheric correction (`mod_wet_tropo_cor`) are degraded in that day. Since the dry tropospheric correction is directly used to compute sea level anomaly, the measurement of the sea level anomaly (`ssha`) is slightly degraded on 2017-02-08. It affected the STC and NTC data with the sensing of 2017-02-08, including reprocessed data.



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## **Anomalies closed in PB 2.24**

The following anomalies were closed by the latest processing baselines but are still present in part of the mission dataset available to the users.

- **Anomaly “EUM/Sen3/AR/2273” - Duplicated measurements at granule transition**

Duplicated measurements at 10 minutes granule transition in L2 NRT products.

There are duplicates of 1 Hz measurements (same 1 Hz time tag) between consecutive granules. At granules transition, the last 1 Hz measurement and the first 1 Hz measurement of the following granule may have the same datation. In some cases, the 1 Hz range values (on either or both granules) might be set to default values because there are not enough 20 Hz observations within the granule to compute the 1 Hz range.

This generates about 100 seconds of potentially duplicated data per day (in NRT).

Note that the 20 Hz parameters (range, SWH and Sigma0) are not affected.

Corrected in PB 2.24. Affects L2 NRT data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/2587” - Overflow of the Ku band atmospheric attenuation**

In the L2 products the atmospheric attenuation in Ku band is set to default values in the products when value exceeds 1.27 dB. Note that for these measurements the wind speed is well calculated.

Corrected in PB 2.24. Affects data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/2996” – Mismatch between manifest and global attributes.**

The information reported in the SRAL manifest is different from the one reported in the netcdf global attributes. The majority of the auxiliary data files (ADFs) reported in the manifest are not reported in the global attributes

Corrected in PB 2.24. Affects data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/3217” - Atmospheric attenuation issue during MWR calibration**

The atmospheric attenuation on Ku band and C band is set to default values for sporadic points located in the fringe of the MWR calibration sequences. These isolated 1 Hz values can be found over open ocean.

As a consequence, wind speed, sea state bias, dual frequency ionospheric correction and ssha parameters are set to default value.

Corrected in PB 2.24. Affects data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/3216” - Bias in Inverse Barometer correction**

There is a bias of 1 cm over open ocean on the inverse barometer correction when comparing to the ECMWF model.

The source of the bias is the calculation of the mean pressure that has to be refined for the handling of the ocean and land grid points.

Corrected in PB 2.24. Affects data processed with previous versions.

- **Anomaly “EUM/Sen3/AR/3219” - Sea Ice discrimination identifying too many floes**

A comparison of Arctic sea ice discrimination statistics during October 2016 between Sentinel-3A and CryoSat shows that S3 processing is identifying four times more floes to leads than CryoSat’s discriminator than would be expected during this period. Sentinel-3A discrimination requires further tuning.

Corrected in PB 2.24. Affects data processed with previous versions.



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- **Anomaly “EUM/Sen3/NCR/3220” - Residual error on SAR sigma0 for strong radial velocities**

The SAR Ku band SWH from SAMOSA retracker shows an error correlated to SWH, as expected on SAMOSA 2.3 retracker. The maximum magnitude of the error is estimated to 30 cm for the stronger waves.

The SAR range values show a discrepancy of 0.5% SWH compared to PLRM and Jason-2 observations. This will be corrected in the future by the inclusion of the SAMOSA 2.5 retracker.

Corrected in PB 2.24. Affects data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/3240” - Iono Gim Correction always set to FillValue in STC Products**

The ionospheric GIM correction (fieldname is *iono\_cor\_gim\_01\_ku*) is always set to the Fill value on the L2 STC Products and in the global attributes the attribute *xref\_iono\_data* (input GIM File) is empty.

Corrected in PB 2.24. Affects L2 NRT data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/3571” – 20 Hz Iono Dual Range Correction frequently set to FillValue over open ocean**

The 20 Hz ionospheric dual range corrections in SAR and PLRM mode (*iono\_corr\_alt\_20\_ku* and *iono\_corr\_alt\_20\_plrm\_ku*) are frequently set to Fill value over open ocean. As consequence of this, the 20 Hz *ssha* in SAR and PLRM mode will be set to Fill value as well.

Corrected in PB 2.24. Affects data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/3636” – Issue with Quality Flag for Sigma0 (PLRM and SAR)**

The output of the sigma0 quality flag was not correctly set for PLRM, reporting erroneously the SAR value.

Corrected in PB 2.24. Affects L2 data processed with previous versions.

- **Anomaly “EUM/Sen3/NCR/3706” – Wrong value for sea ice range**

In some cases, the sea ice range would be wrong by kilometers due to the application of corrections with FillValue, which should have been discarded from the processing.

Corrected in PB 2.24. Affects L2 data processed with previous versions.

### Processing Baseline (PB 2.24) – Static ADFs

The following list is the complete list of static ADF used by the processors. Any change from the previous processing baseline is highlighted in red. A brief description of the role of each ADF in processing is in the product manifest.

MWR L1

S3A\_MW\_1\_SLC\_AX\_20000101T000000\_20991231T235959\_20160603T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3  
S3A\_MW\_1\_STD\_AX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3  
S3A\_MW\_1\_CHDNAX\_20160216T000000\_20991231T235959\_20161014T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3  
S3A\_MW\_1\_CHDRAX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3

SRAL L1

S3\_AX\_1\_CST\_AX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3  
S3A\_SR\_1\_CONCAX\_20000101T000000\_20991231T235959\_20160603T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3  
S3\_SR\_1\_CONMAX\_20160216T000000\_20991231T235959\_20170713T120000\_\_\_\_\_MPC\_O\_AL\_005.SEN3  
S3\_SR\_1\_LSM\_AX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3  
S3A\_SR\_1\_CHDNAX\_20000101T000000\_20991231T235959\_20160603T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3  
S3A\_SR\_1\_CHDRAX\_20000101T000000\_20991231T235959\_20160603T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3

SRAL/MWR L2

S3\_SR\_2\_CON\_AX\_20160216T000000\_20991231T235959\_20170322T120000\_\_\_\_\_MPC\_O\_AL\_009.SEN3  
S3A\_SR\_2\_CCT\_AX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3







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### Products Availability

- Copernicus Online Data Access (<https://codarep.eumetsat.int>) , SRAL L2 NTC Reprocessed Dataset
- Copernicus Online Data Access (<https://coda.eumetsat.int>), NRT, STC and NTC (see details below)
- EUMETCast (<https://eoportal.eumetsat.int>), NRT, STC (see details below)
- EUMETSAT Data Centre (<https://eoportal.eumetsat.int>) , NRT, STC and NTC (see details below)
- EUMETSAT Online Data Access (<ftp://oda.eumetsat.int>), NRT, STC and NTC (see details below)

Product	EUMETCast	ODA*	CODA**	CODAREP**	EUMETSAT Data Centre
<b>L2 Marine Products</b> (SR_2_WAT)	NRT STC	NRT STC NTC	NRT STC NTC	NTC Reprocessed data	NRT STC NTC

\* **ODA** is available only for Copernicus Services and S3VT users

\*\* **CODA** and **CODAREP** are available to all users

*Please note that data processed with older versions of the Processing Baseline are still available in CODA/Data Centre – It is not recommended to use them.*

### Any other useful information

- Note that the SRAL NRT products are 10 minutes length, instead of being dump based as originally specified – this is part of the Product Definition.

### References

Sentinel-3 Mission Requirements Traceability Document (MRTD), C. Donlon, EOP-SM/2184/CD-cd, 2011.

<https://sentinel.esa.int/documents/247904/1848151/Sentinel-3-Mission-Requirements-Traceability>

Product Data Format Specification - SRAL/MWR Level 1 & 2 Instrument Products, Ref: S3IPF.PDS.003, Issue: 2.9, Date: 15/11/2017

Available in the EUMETSAT site under "Data" / "Technical Documents" / "Operational Services" / "Copernicus" / "Sentinel-3" / "Altimetry"

**End of the Product Notice**