

## Sentinel-3 Product Notice – SYnergy-Aerosol Optical Depth

<b>Mission</b>	S3A & S3B
<b>Sensor</b>	SYNERGY AOD products
<b>Product</b>	<ul style="list-style-type: none"> <li>• SY_2_AOD</li> </ul>
<b>Product Notice ID</b>	S3.PN-SYN-AOD.01
<b>Issue/Rev Date</b>	08/04/2021
<b>Version</b>	1.0
<b>Preparation</b>	This Product Notice was prepared by the Sentinel 3 (S3) Mission Performance Centre and by ESA experts
<b>Approval</b>	ESA Mission Management

### Summary

This is a product notice for the release of operational Sentinel-3 SYNERGY Aerosol Optical Depth Level 2 products to user's community. The notice gives a clear indication of the current status of the latest processing baseline delivered for SYN-AOD products and known limitations. The products are currently available via the Copernicus Open Access Hub.

The users are informed that the date of 08/04/2021 corresponds to the public release of the SYN AOD products. However, the production has started on the 19/02/2020 and all products since that date are available in the data hub.



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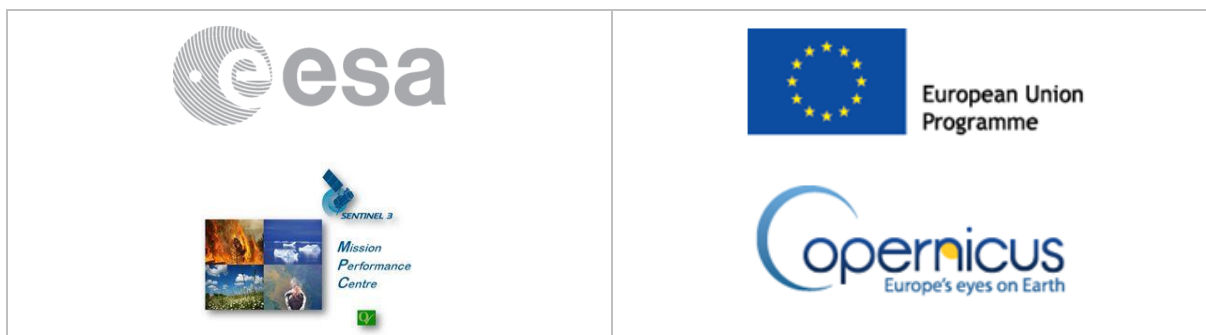


### Processing Baseline

	S3A	S3B
<b>Processing Baseline</b>	<ul style="list-style-type: none"> <li>IPF Processing Baseline: 2.66</li> </ul>	<ul style="list-style-type: none"> <li>IPF Processing Baseline: 1.40</li> </ul>
<b>IPFs version</b>	<ul style="list-style-type: none"> <li>SY_2_AOD IPF version: 01.04</li> </ul>	<ul style="list-style-type: none"> <li>SY_2_AOD IPF version: 01.04</li> </ul>
	<ul style="list-style-type: none"> <li>OL_1 IPF version: 06.09</li> </ul>	<ul style="list-style-type: none"> <li>OL_1 IPF version: 06.09</li> </ul>
	<ul style="list-style-type: none"> <li>SL_1 IPF version: 06.17</li> </ul>	<ul style="list-style-type: none"> <li>SL_1 IPF version: 06.17</li> </ul>

### Current Operational Processing Baseline

IPF	IPF Version	In operations since (creation date)
<b>S3A</b>		
OL_1	06.09	10/12/2020 11:22 UTC
SL_1	06.17	12/11/2020 11:54 UTC
SY_2_AOD	01.04	23/06/2020 10:50 UTC
<b>S3B</b>		
OL1	06.09	10/12/2020 11:22 UTC
SL1	06.17	12/11/2020 11:54 UTC
SY_2_AOD	01.04	23/06/2020 10:50 UTC



## Description of the Processing Baseline

### S3A

The key points of the IPF processing baseline 2.XX for the SYNERGY AOD level 2 products are:

- This processing is taking benefit of the spectral and angular capabilities of the co-registration of OLCI and SLSTR L1b radiances over the same grid. All relevant L1b datasets are then averaged on a **super-pixel resolution defined at 4.5 km<sup>2</sup>**. Note that only radiometry associated with clear-sky pixels are considered in this averaging.
- This processing is a global one, meaning that aerosol characteristics are provided for Land and Sea pixels. Over land, it uses as inputs to the aerosol retrieval module both SLSTR views (nadir and oblique) and all channels (except S4, i.e., 1.37µm, dedicated to cloud detection) + one OLCI channel: Oa3, 442.5 nm.

Over Ocean, the aerosol retrieval module is only considering SLSTR channels.

Aerosol characteristics are then provided on a 4.5 km resolution, over the whole common OLCI swath.

- The processing of super-pixels to estimate aerosol properties is based on optimization by iterative numerical inversion, with propagation of uncertainties. Two free parameters describing the atmosphere are aerosol optical depth, parameterized at 550nm, and the ratio of aerosol fine to coarse mode. Parameterised surface models are used to describe the land and ocean surface reflectance. Over land these models include further free parameters retrieved during the inversion, while over ocean the reflectance is specified using a priori wind speed and pigment concentrations. Further aerosol properties (for example spectral variation of AOD) are calculated from the AOD at 550nm and fine/coarse ratio, constrained by a priori climatology giving local values of the components, for example SSA of coarse mode. The full algorithm is described in the product ATBD, S3-L2-AOD-SYN-ATBD, v1.12.
- SYN AOD products are providing – on a 4.5 km resolution – all derived and retrieved aerosol parameters plus contextual parameters such as time, quality flags, solar and satellite angles (related to the center of a given super-pixel) and geographical position (related to the center and the corner of a given super-pixel). The aerosol parameters are:
  - Aerosol Optical thickness and their Uncertainties at 440, 550, 670, 985, 1600 and 2250 nm,
  - Single Scattering Albedo at 440, 550, 670, 985, 1600 and 2250 nm,
  - Fine-mode aerosol optical depth at 550nm,
  - Aerosol Angstrom parameter between 550 and 865nm,
  - Dust aerosol optical depth at 550nm,
  - Aerosol absorption optical depth at 550nm.



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- Note that no cosmetic filling is performed in SYN AOD processing and an AOD value is only provided if the aerosol retrieval has been successful. To understand why there may be no AOD associated with some pixels, several quality flags are defined in the product:
  - Land/Ocean: The super-pixel is defined as Land/Ocean (i.e. more than 50% of included 300m pixels are defined as Land/Ocean)
  - oblq\_missing/dual\_view: only SLSTR radiometric measurements from nadir view have been taken into account in this retrieval/SLSTR radiometric measurements from both views have been taken into account.
  - cloudy\_n/cloud\_o: Nadir/oblique retrieval was rejected due to cloud cover (cloud fraction of majority surface type exceeds 50%).
  - glint\_n/glint\_o: glint has been detected in nadir/oblique measurements.
  - sdr\_neg: at least one surface reflectance (SDR) value was found to be negative during the aerosol retrieval process.
  - aod\_zero: the aerosol retrieval process failed due to AOD zero ( $<5e3$ ).
  - fm\_clim: the fine mode retrieval failed and the FM value was taken from climatology.
  - unc\_failed: the uncertainty estimate failed.
  - Invalid: the Aerosol retrieval failed over this super-pixel.
  - Outlier: the AOD value associated with this super-pixel has been discarded by the AOD local variance threshold test.
  - Low\_ndvi: this super-pixel is defined as a non dark-vegetation pixel (i.e.  $NDVI < 0.7$ ).
  - Clean\_air\_est: this super-pixel is associated with clear atmosphere, especially over dark surfaces, for which negative AOD can occur in the aerosol retrieval module.

### S3B

The IPF processing baseline 1.XX for the SYNERGY level 2 products is similar to the S3A processing baseline.



## Known product quality limitations

### Common to S3A and S3B

The following limitations have been identified:

- The `oblq_missing` and `dual_view` SYN AOD flags are only defined when the aerosol retrieval is possible over the super-pixel (i.e. when more than 50% of the included 300m pixels are valid and clear-sky pixels).
- The SYN AOD product includes some derived OLCI and SLSTR L1b flags based on the following rule: if more than 50% of included 300m pixels are flagged, then this derived flag will be raised for the whole super-pixel.
- A cloud fraction is provided for each super-pixel and independently for each SLSTR view. However, the parameter associated with the oblique view is wrongly set to 0 (meaning clear-sky pixel) in the nadir-only area. This issue will be soon corrected by setting this parameter to `_FillValue` inside the nadir-only area.
- Some visible transitions can be observed at the nadir-only/dual-view interface resulting from the different retrieval principles over the dual & single-view areas.
- Bright areas, over desert surfaces, are considered less reliable
- High latitude areas may suffer from contamination by undetected snow/ice, and retrievals with sun angles less than 70 degrees only should be used.
- Transition seen from single view to dual views due to different algorithms in the retrieval
- It is possible there is some contamination by undetected cloud due to use of instrument cloud masks

### Specific to S3A

- Nothing specific to S3A

### Specific to S3B

- Nothing specific to S3B



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### Products Availability

- Copernicus Open Access Hub (<https://scihub.copernicus.eu/>)
- S3 Expert Users Data Hub
- Other



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### Any other useful information

- None

### User Support

- Questions about SYN products can be asked to the Sentinel-3 User Support desk at:
  - [eosupport@copernicus.esa.int](mailto:eosupport@copernicus.esa.int)

### References

- OLCI L1 Product Notice
  - S3.PN.OLCI-L1.07, v1.0 dated on 29/10/2019
- SLSTR L1 Product Notice
  - S3.PN.SLSTR-L1.07, v1.1 dated on 09/06/2020
- Product Data Format Specification – SYNERGY Level 2 Global Aerosol Products, Ref: S3MPC.ACR.AOD.003 - 02, Issue: 1.2, Date: 30/09/2019
- SYN Land User Handbook, ref. S3MPC.HBK.003, Issue 1.0, Date: 15/02/2021

<https://sentinel.esa.int/documents/247904/4598110/Sentinel-3-Synergy-Land-Handbook.pdf>



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## Static ADFs

### S3A

- S3A\_SL\_1\_MCHDAX\_20160216T000000\_20991231T235959\_20170120T120000\_\_\_\_\_MPC\_O\_AL\_003.SEN3
- S3A\_SY\_1\_GCPBAX\_20160216T000000\_20991231T235959\_20170120T120000\_\_\_\_\_MPC\_O\_AL\_003.SEN3
- S3\_SY\_1\_CDIBAX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3A\_SY\_1\_PCP\_AX\_20160216T000000\_20991231T235959\_20170120T120000\_\_\_\_\_MPC\_O\_AL\_005.SEN3
- S3A\_OL\_1\_MCHDAX\_20160216T000000\_20991231T235959\_20170120T120000\_\_\_\_\_MPC\_O\_AL\_003.SEN3
- S3A\_SY\_2\_PCPAAX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_ACLMAX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_ART\_AX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_LSR\_AX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_OSR\_AX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3

### S3B

- S3B\_SL\_1\_MCHDAX\_20180425T000000\_20991231T235959\_20180409T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3B\_SY\_1\_GCPBAX\_20180425T000000\_20991231T235959\_20180409T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3\_SY\_1\_CDIBAX\_20000101T000000\_20991231T235959\_20151214T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3B\_SY\_1\_PCP\_AX\_20180425T000000\_20991231T235959\_20180409T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3B\_OL\_1\_MCHDAX\_20180425T000000\_20991231T235959\_20180409T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3B\_SY\_2\_PCPAAX\_20180425T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_001.SEN3
- S3\_SY\_2\_ACLMAX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_ART\_AX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_LSR\_AX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3
- S3\_SY\_2\_OSR\_AX\_20160216T000000\_20991231T235959\_20190930T120000\_\_\_\_\_MPC\_O\_AL\_002.SEN3

**End of the Product Notice**