PREPARATION AND OPERATIONS OF THE MISSION PERFORMANCE CENTRE (MPC) FOR THE COPERNICUS SENTINEL-3 MISSION

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## **Changes Log**

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# List of Changes

Version	Section	Answers to RID	Changes



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# **1** Processing Baseline Version

### 1.1 Sentinel3-A

IPF	IPF / Processing Baseline version	Date of deployment
OL1	06.08 / 2.48	NRT: 11/04/2019 13 :01 UTC NTC: 11/04/2019 13 :01 UTC
OL2	06.12 / 2.38	NRT: 29/08/2018 09:24 UTC NTC: 29/08/2018 09:33 UTC
SY2	06.17 / 2.51	NTC: 30/05/2019 11:00 UTC
SY2_VGS	06.07 / 2.44	NTC: 21/01/2019 10:06 UTC

### 1.2 Sentinel3-B

IPF	IPF / Processing Baseline version	Date of deployment
OL1	06.08 / 1.20	NRT: 11/04/2019 13 :01 UTC NTC: 11/04/2019 13 :01 UTC
OL2	06.12 / 1.09	NRT: 29/08/2018 09:24 UTC NTC: 29/08/2018 09:33 UTC
SY2	06.17 / 1.23	NTC: 30/05/2019 11:00 UTC
SY2_VGS	06.07 / 1.16	NTC: 21/01/2019 10:06 UTC



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# 2 Instrument monitoring

### 2.1 CCD temperatures

### 2.1.1 OLCI-A

The monitoring of the CCD temperatures is based on MPMF data extractions not yet operational. In the meantime, we monitor the CCD temperatures on the long-term using Radiometric Calibration Annotations (see Figure 1). Variations are very small (0.09 C peak-to-peak) and no trend can be identified. Data from current cycle (rightmost data points) do not show any specificity.

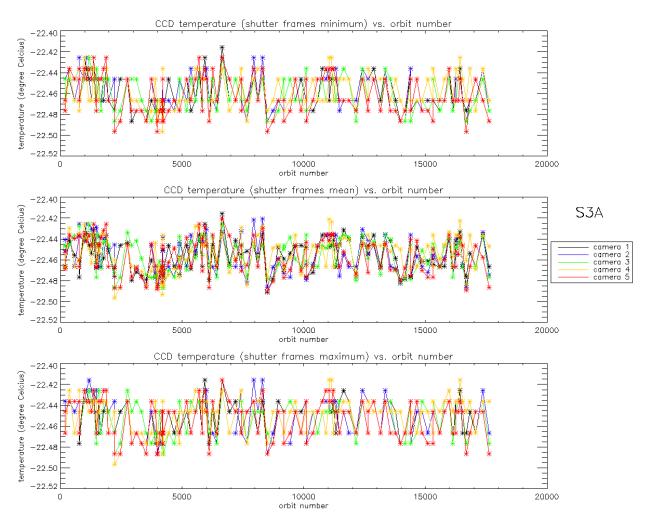


Figure 1: long term monitoring of OLCI-A CCD temperatures using minimum value (top), time averaged values (middle), and maximum value (bottom) provided in the annotations of the Radiometric Calibration Level 1 products, for the Shutter frames, all radiometric calibrations so far except the first one (absolute orbit 183) for which the instrument was not yet thermally stable.



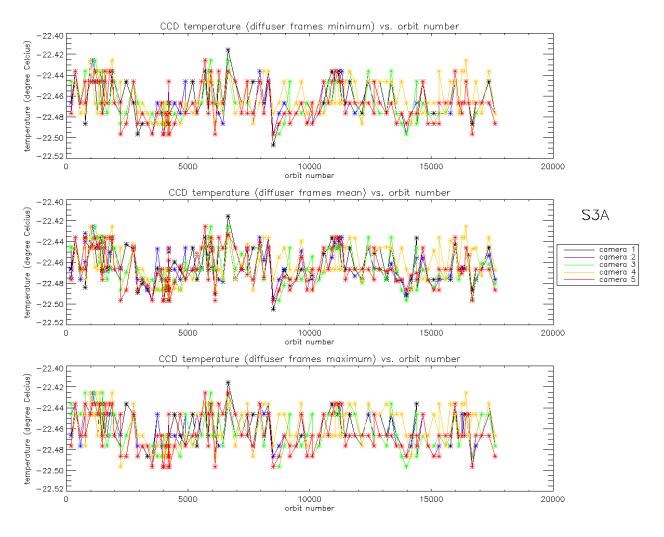


Figure 2: Same as Figure 1 for diffuser frames.



#### 2.1.2 OLCI-B

As for OLCI-A, the variations of CCD temperature are very small (0.08 C peak-to-peak) and no trend can be identified. Data from current cycle (rightmost data points) do not show any specificity.

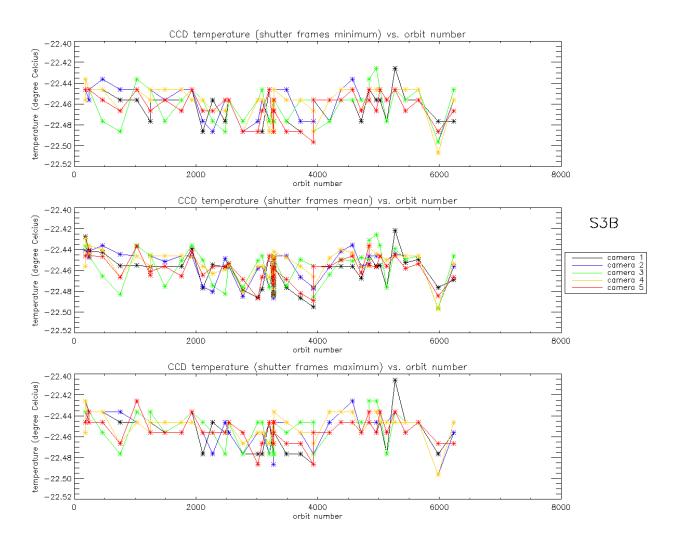


Figure 3: long term monitoring of OLCI-B CCD temperatures using minimum value (top), time averaged values (middle), and maximum value (bottom) provided in the annotations of the Radiometric Calibration Level 1 products, for the Shutter frames, all radiometric calibrations so far except the first one (absolute orbit 167) for which the instrument was not yet thermally stable.



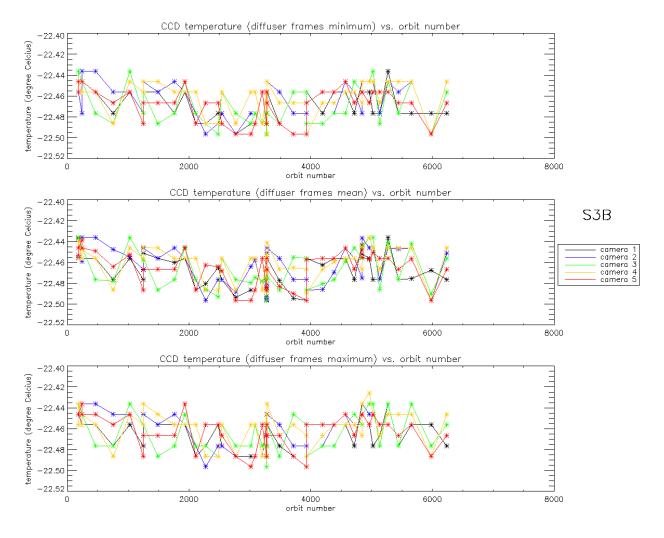


Figure 4: same as Figure 3 for diffuser frames.



### 2.2 Radiometric Calibration

For OLCI-A, two Radiometric Calibration Sequences have been acquired during Cycle 046:

- So1 sequence (diffuser 1) on 18/06/2019 12:26 to 12:28 (absolute orbit 17364)
- So1 sequence (diffuser 1) on 06/07/2019 23:06 to 23:08 (absolute orbit 17627)

For OLCI-B, one Radiometric Calibration Sequences have been acquired during Cycle 027:

S01 sequence (diffuser 1) on 07/07/2019 08:32 to 08:32 (absolute orbit 6239)

The acquired Sun azimuth angles are presented on Figure 5 for OLCI-A and Figure 6 for OLCI-B, on top of the nominal values without Yaw Manoeuvre (i.e. with nominal Yaw Steering control of the satellite).

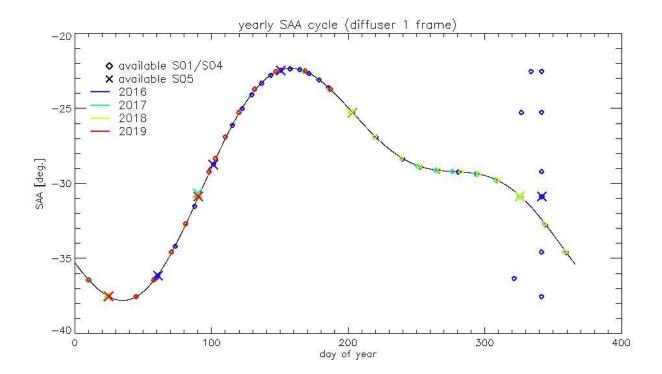


Figure 5: Sun azimuth angles during acquired OLCI-A Radiometric Calibrations (diffuser frame) on top of nominal yearly cycle (black curve). Diffuser 1 with diamonds, diffuser 2 with crosses, 2016 acquisitions in blue, 2017 in green, 2018 in yellow and 2019 in red.



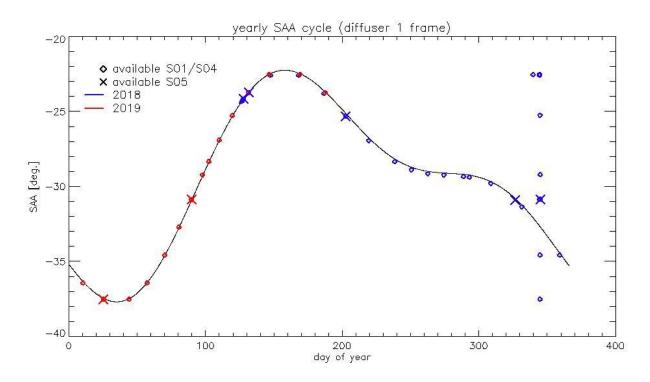


Figure 6: same as Figure 5 for OLCI-B (2018 in blue, 2019 in red).

Sun Azimuth Angles as a function of solar zenith Angles are presented in Figure 7 for OLCI-A and Figure 8 for OLCI-B.

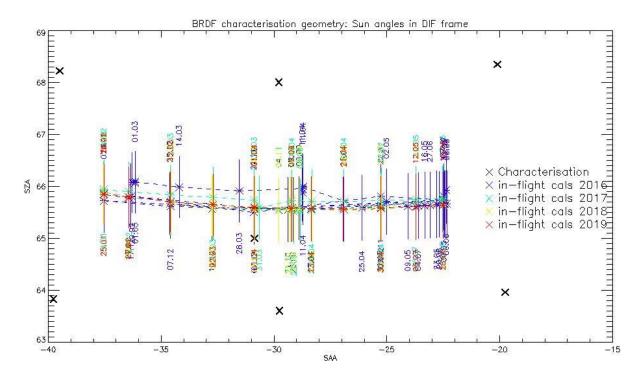


Figure 7: OLCI-A Sun geometry during radiometric Calibrations on top of characterization ones (diffuser frame)



#### Sentinel-3 MPC

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× Characterisation × in-flight cals 2018 × in-flight cals 2019 BRDF characterisation geometry: Sun angles in DIF frame 69 × × 68 08.05 P£.03 28.05 26.01 27.021.01 — 05.11 亜1226.89 22.07 .027.08 67 28.11 1.05 22.03 £0 ₹ 8 66 96.95 12.05 12.05 11.1239-81 10860422 1181.016 22.07 08.082.18 08.09 20.0408.08 65 11.131.08% 112.226. 64 × X 63Ē -35 -20 -15 -25 -40 -30 SAA

Figure 8: same as Figure 7 for OLCI-B



#### 2.2.1 Dark Offsets [OLCI-L1B-CV-230]

#### Note about the High Energy Particles:

The filtering of High Energy Particle (HEP) events from radiometric calibration data has been implemented (for shutter frames only) in a post processor, allowing generating Dark Offset and Dark Current tables computed on filtered data. The post-processor starts from IPF intermediate data (corrected counts), applies the HEP detection and filtering and finally computes the Dark Offset and Dark Current tables the same way as IPF. An example of the impact of HEP filtering is given in Figure 9.

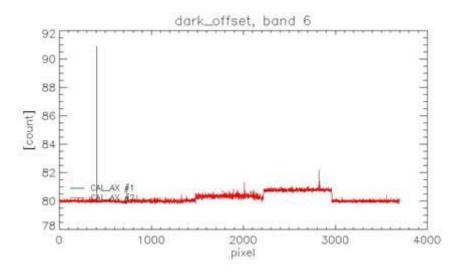


Figure 9: Dark Offset table for band Oa06 with (red) and without (black) HEP filtering (Radiometric Calibration of 22 July 2017). The strong HEP event near pixel 400 has been detected and removed by the HEP filtering.

All results presented below in this section have been obtained using the HEP filtered Dark Offset and Dark Current tables.



#### 2.2.1.1 OLCI-A

#### Dark offsets

Dark offsets are continuously affected by the global offset induced by the Periodic Noise on the OCL convergence. Current Cycle calibrations are affected the same way as others. The amplitude of the shift varies with band and camera from virtually nothing (e.g. camera 2, band 0a1) to up to 5 counts (Oa21, camera 3). The Periodic Noise itself comes on top of the global shift with its known signature: high frequency oscillations with a rapid damp. This effect remains more or less stable with time in terms of amplitude, frequency and decay length, but its phase varies with time, introducing the global offset mentioned above.

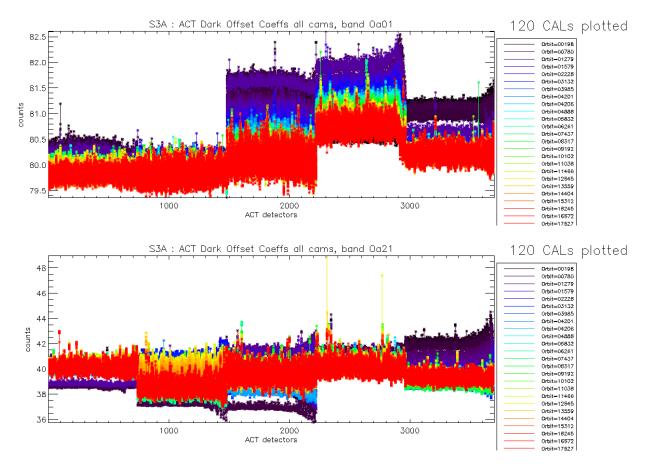


Figure 10: OLCI-A Dark Offset for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 183) for which the instrument was not thermally stable yet.

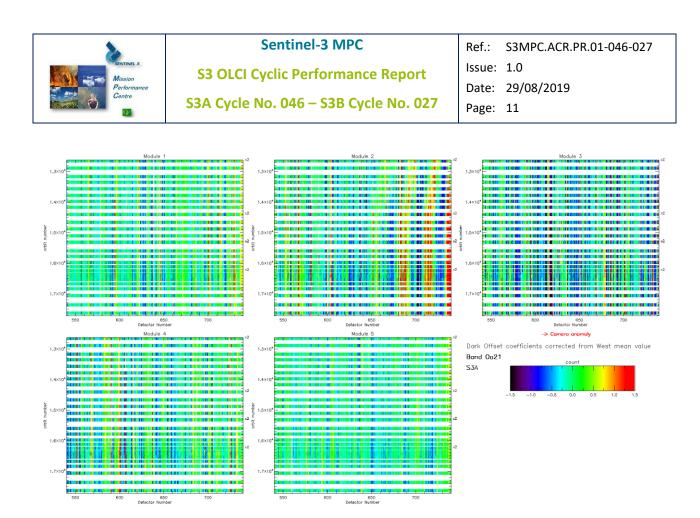


Figure 11: map of OLCI-A periodic noise for the 5 cameras, for band Oa21. X-axis is detector number (East part, from 540 to 740, where the periodic noise occurs), Y-axis is the orbit number. Y-axis range is focused on the most recent 5000 orbits. The counts have been corrected from the West detectors mean value (not affected by periodic noise) in order to remove mean level gaps and consequently to have a better visualisation of the long term evolution of the periodic noise structure. At the beginning of the mission the periodic noise for band Oa21 had strong amplitude in camera 2, 3 and 5 compared to camera 1 and 4. However PN evolved through the mission and these discrepancies between cameras have been reduced. At the time of this Cyclic Report Camera 2 still shows a slightly higher PN than other cameras.

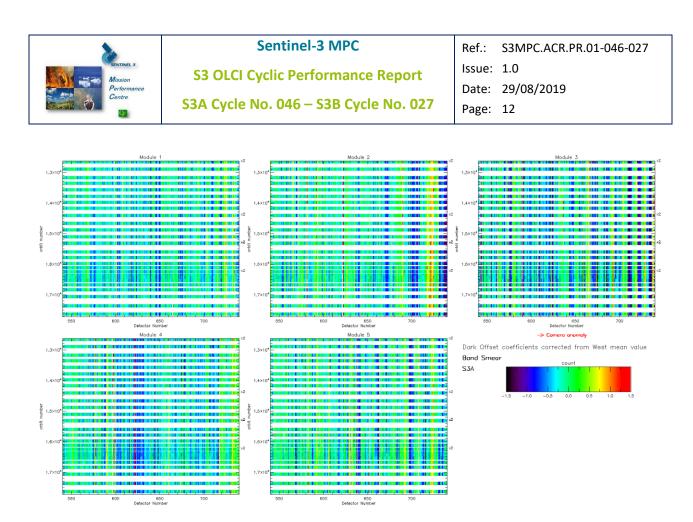


Figure 12: same as Figure 11 for smear band.

Figure 11 and Figure 12 show the so-called 'map of periodic noise' in the 5 cameras, for respectively band 21 and smear band. These maps have been computed from the dark offsets after removal of the mean level of the WEST detectors (not impacted by PN) in order to remove mean level gaps from one CAL to the other and consequently to highlight the shape of the PN. Maps are focused on the last 200 EAST detectors where PN occurs and on a time range covering only the last 5000 orbits in order to better visualize the current cycle's CALs.

As there was no camera anomaly during the current cycle, there is no sudden change of periodic noise to report during the current cycle. For camera 2 band Oa21 a slight PN phase drift occurred between orbit 13500 and 14500 but is now stabilized.

#### **Dark Currents**

Dark Currents (Figure 13) are not affected by the global offset of the Dark Offsets, thanks to the clamping to the average blind pixels value. However, the oscillations of Periodic Noise remain visible. There is no significant evolution of this parameter during the current cycle except the small regular increase (almost linear), for all detectors, since the beginning of the mission (see Figure 14).



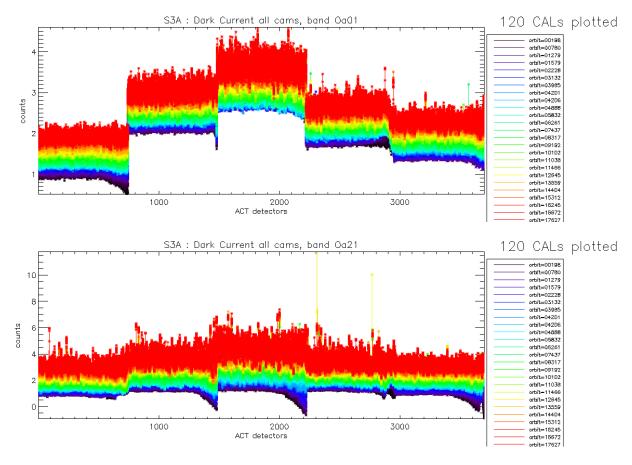


Figure 13: OLCI-A Dark Current for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 183) for which the instrument was not thermally stable yet.

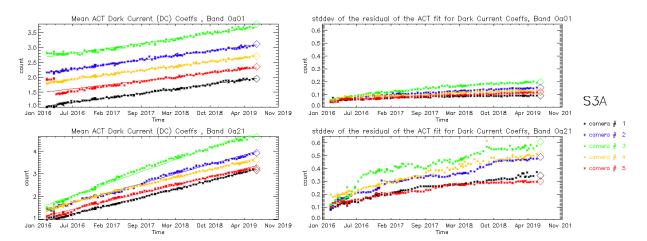


Figure 14: left column: ACT mean on 400 first detectors of OLCI-A Dark Current coefficients for spectral band Oa01 (top) and Oa21 (bottom). Right column: same as left column but for Standard deviation instead of mean. We see an increase of the DC level as a function of time especially for band Oa21.

A possible explanation of the regular increase of DC could be the increase of the number of hot pixels which is more important in Oa21 because this band is made of more CCD lines than band Oa01 and thus



receives more cosmic rays impacts. It is known that cosmic rays degrade the structure of the CCD, generating more and more hot pixels at long term scales. Indeed, when computing the time slopes of the spatially averaged Dark Current as a function of band, i.e. the slopes of curves in left plots of Figure 14, one can see that Oa21 is by far the most affected, followed by the smear band (Figure 15, left); when plotting these slopes against total band width (in CCD rows, regardless of the number of micro-bands), the correlation between the slope values and the width becomes clear (Figure 15, right).

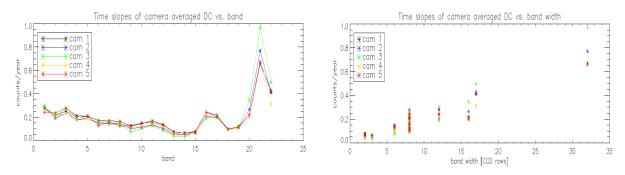


Figure 15: OLCI-A Dark current increase rates with time (in counts per year) vs. band (left) and vs. band width (right)

#### 2.2.1.2 OLCI-B

#### **Dark Offsets**

Dark offsets for OLCI-B show a similar behaviour than for OLCI-A: mean level gaps between different orbits, induced by the presence of a pseudo periodic noise on the east edge of the cameras with a drifting phase.

Evolution of OLCI-B Dark Offset coefficients for band Oa01 and Oa21 are represented in Figure 16.

The periodic noise maps are shown for band Oa21 and smear band respectively in Figure 17 and Figure 18. As it happened for OLCI-A after a few thousands of orbits, the strong periodic noise phase and amplitude drift, present at the very beginning of the mission shows a beginning of stabilization.

An instrument anomaly occurred on OLCI-B on 29 May 2019 (reported in document "S3MPC.ACR.MEM.061") followed by a reset of the instrument on 31 May 2019. This reset is probably responsible of the slight change of PN shape visible in camera 3 band Oa21 (see Figure 17) and of the slight change of PN phase in camera 3 smear band (see Figure 18).



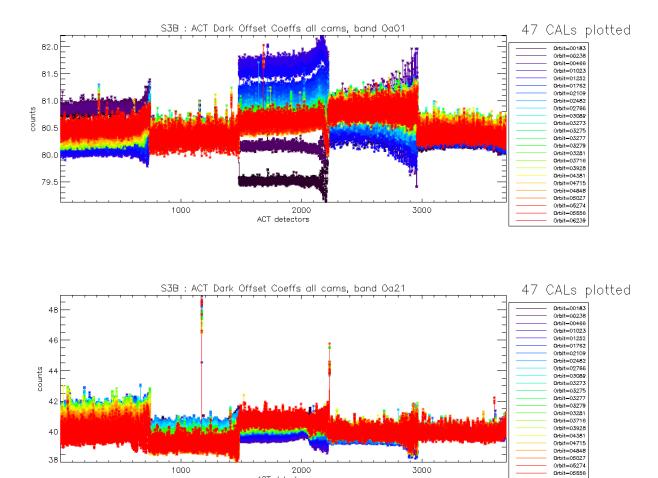


Figure 16: OLCI-B Dark Offset for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 167) for which the instrument was not thermally stable yet.

3000

Orbit=06239

2000 ACT detectors

1000

38

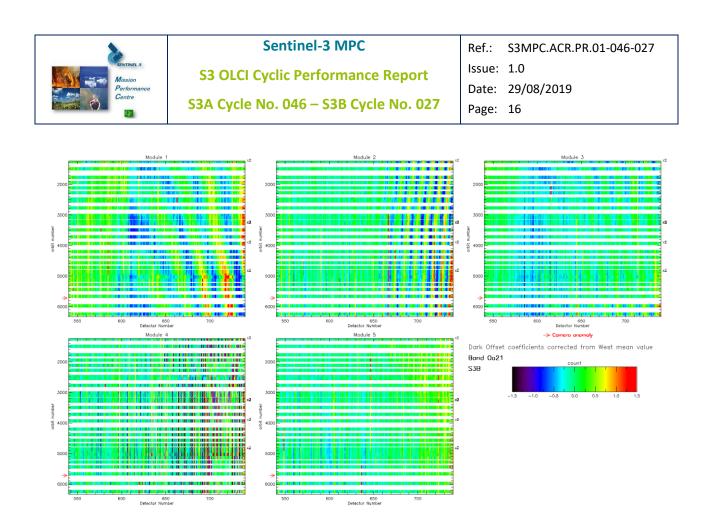


Figure 17: OLCI-B map of periodic noise for the 5 cameras, for band Oa21. X-axis is detector number (East part, from 540 to 740, where the periodic noise occurs), Y-axis is the orbit number. The counts have been corrected from the West detectors mean value (not affected by periodic noise) in order to remove mean level gaps and consequently to have a better visualisation of the long term evolution of the periodic noise structure.

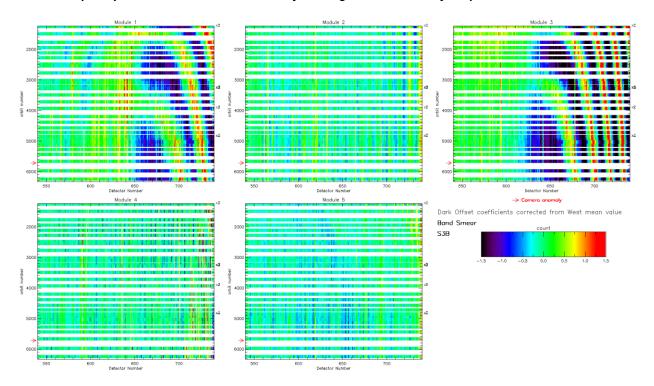


Figure 18: same as Figure 17 for smear band.



As for OLCI-A there is no significant evolution of the Dark Current coefficients (Figure 19) during the current cycle except the small regular increase (almost linear), for all detectors, since the beginning of the mission (see Figure 20) probably due to an increase of hot pixels (see Figure 21).

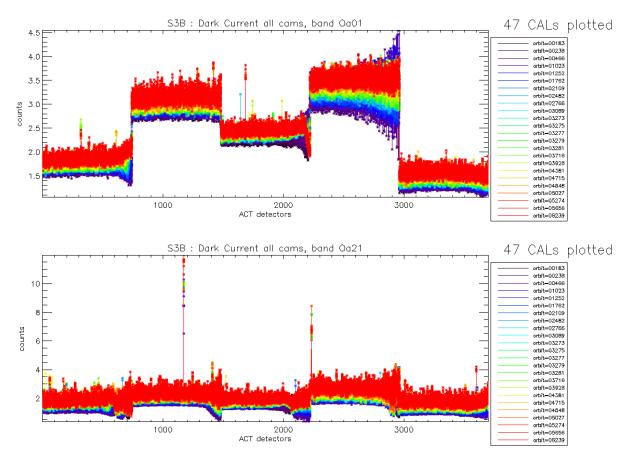


Figure 19: OLCI-B Dark Current for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 167) for which the instrument was not thermally stable yet.

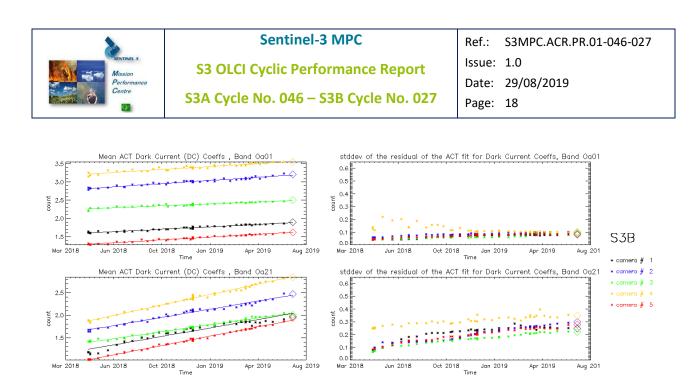


Figure 20: left column: ACT mean on 400 first detectors of OLCI-B Dark Current coefficients for spectral band Oa01 (top) and Oa21 (bottom). Right column: same as left column but for Standard deviation instead of mean. We see an increase of the DC level as a function of time especially for band Oa21.

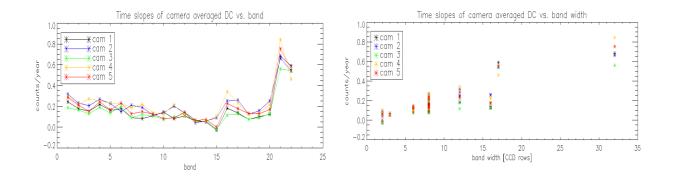


Figure 21: OLCI-B Dark Current increase rates with time (in counts per year) vs. band (left) and vs. band width (right)



#### 2.2.2 Instrument response and degradation modelling [OLCI-L1B-CV-250]

#### 2.2.2.1 Instrument response monitoring

#### 2.2.2.1.1 OLCI-A

Figure 22 shows the gain coefficients of every pixel for two OLCI-A channels, Oa1 (400 nm) and Oa21 (1020 nm), highlighting the significant evolution of the instrument response since early mission.

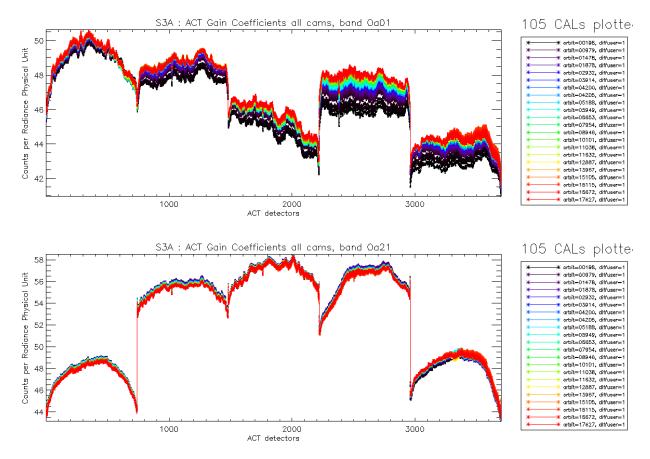


Figure 22: OLCI-A Gain Coefficients for band Oa1 (top) and Oa21 (bottom), all diffuser 1 radiometric calibrations so far except the first one (orbit 183) for which the instrument was not thermally stable yet.

The gains plotted in Figure 22, however are derived using the ground BRDF model – as the only one available in the operational processing software so far – which is known to suffer from illumination geometry dependent residual errors (see previous Cyclic Reports for more details). Consequently they are post-processed to replace the ground BRDF model by the in-flight version, based on Yaw Manoeuvres data, prior to determine the radiometric evolution.

Figure 23 displays a summary of the time evolution derived from post-processed gains: the cross-track average of the BRDF corrected gains (taking into account the diffuser ageing) is plotted as a function of time, for each module, relative to a given reference calibration (the 07/12/2016). It shows that, if a



significant evolution occurred during the early mission, the trends tend to stabilize, with the exception of band 1 of camera 1 and 4.

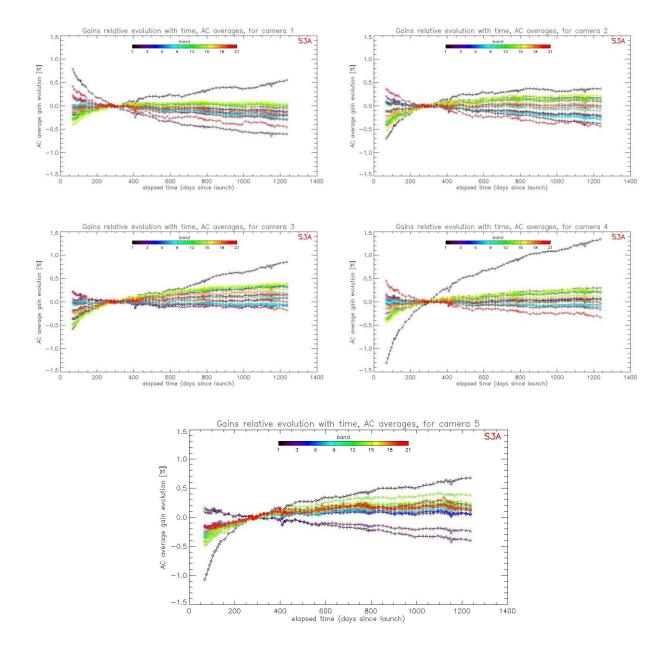


Figure 23: camera averaged gain relative evolution with respect to "best geometry" calibration (07/12/2016), as a function of elapsed time since the change in OLCI channels settings (25/04/16); one curve for each band (see colour code on plots), one plot for each module. The diffuser ageing has been taken into account.



#### 2.2.2.1.2 OLCI-B

Figure 24 shows the gain coefficients of every pixel for two OLCI-B channels, Oa1 (400 nm) and Oa21 (1020 nm), highlighting the significant evolution of the instrument response since early mission.

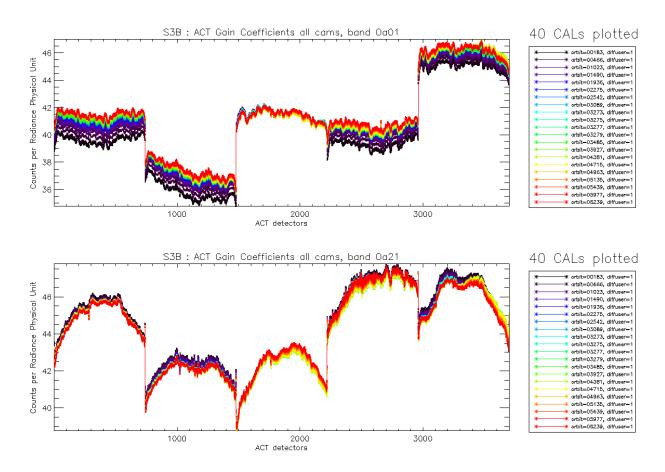
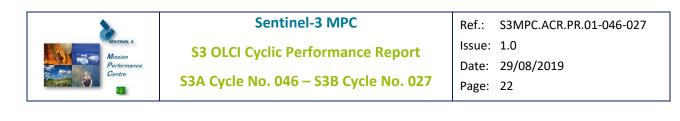


Figure 24: OLCI-B Gain Coefficients for band Oa1 (top) and Oa21 (bottom), all diffuser 1 radiometric calibrations so far except the first one (orbit 167) for which the instrument was not thermally stable yet.

Figure 25 displays a summary of the time evolution derived from post-processed gains: the cross-track average of the BRDF corrected gains is plotted as a function of time, for each module, relative to a given reference calibration (first calibration after channel programming change: 18/06/2018). It shows that, if a significant evolution occurred during the early mission, the trends tend to stabilize. The large amount of points near elapsed time = 220 days is due to the yaw manoeuvre campaign.



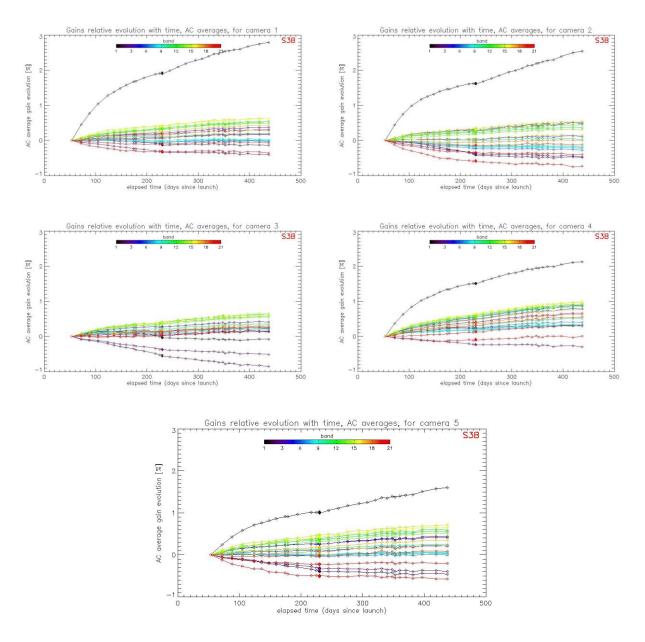


Figure 25: OLCI-B camera averaged gain relative evolution with respect to first calibration after channel programming change (18/06/2018), as a function of elapsed time since the beginning of the mission; one curve for each band (see colour code on plots), one plot for each module. The diffuser ageing is not taken into account (too early to model it yet).



#### 2.2.2.2 Instrument evolution modelling

#### 2.2.2.2.1 OLCI-A

The OLCI-A Radiometric Model has been refreshed and put in operations the 11/04/2019 (Processing Baseline 2.48). The model has been derived on the basis of an extended Radiometric Calibration dataset (from 25/04/2016 to 25/01/2019). It includes the correction of the diffuser ageing for the five bluest bands (Oa1 to Oa5) for which it is clearly measurable. The model performance over the complete dataset (including the 13 calibrations in extrapolation over about 6 months) remains better than 0.1% (at the exception of band Oa01) when averaged over the whole field of view (Figure 26) while the previous model, trained on a Radiometric Dataset limited to 27/08/2017, shows a strong drift of the model with respect to most recent data (Figure 27). Comparison of the two figures shows the improvement brought by the updated Model over almost all the mission: only Oa01 show a lower performance for the very first calibration with the new model.

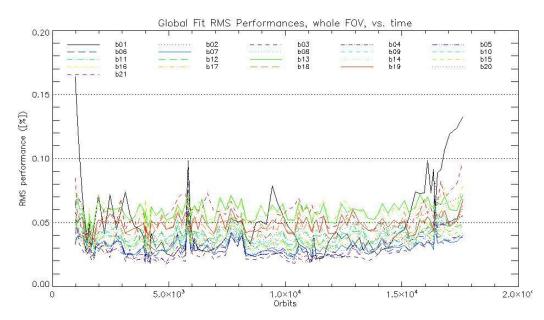
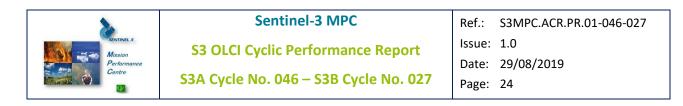


Figure 26: RMS performance of the OLCI-A Gain Model of the current processing baseline as a function of orbit.



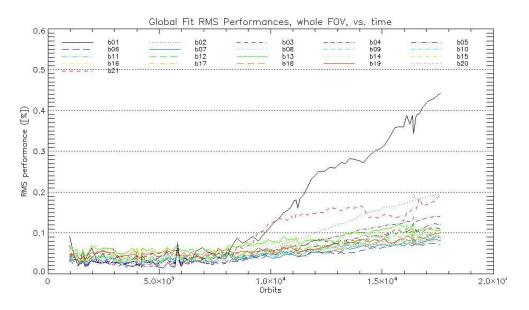


Figure 27: RMS performance of the OLCI-A Gain Model of the previous Processing Baseline as a function of orbit.

The overall instrument evolution since channel programming change (25/04/2016) is shown on Figure 28.

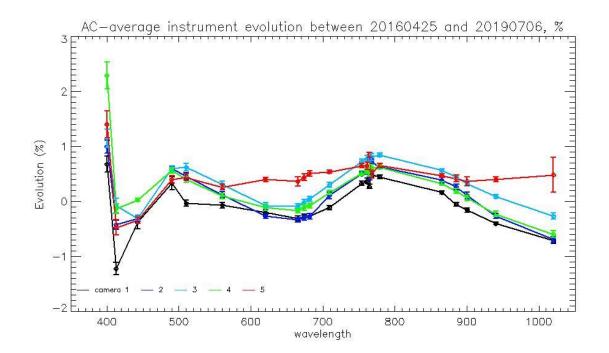


Figure 28: OLCI-A Camera-averaged instrument evolution since channel programming change (25/04/2016) and up to most recent calibration (06/07/2019) versus wavelength.



The overall per camera performance, as a function of wavelength, and at each orbit is shown on Figure 29 as the average and standard deviation of the model over data ratio.

Finally, Figure 30 to Figure 32 show the detail of the model performance, with across-track plots of the model over data ratios at each orbit, one plot for each channel.

Comparisons of Figure 30 to Figure 32 with their counterparts in Report of Cycle 42 clearly demonstrate the improvement brought by the new model whatever the level of detail.

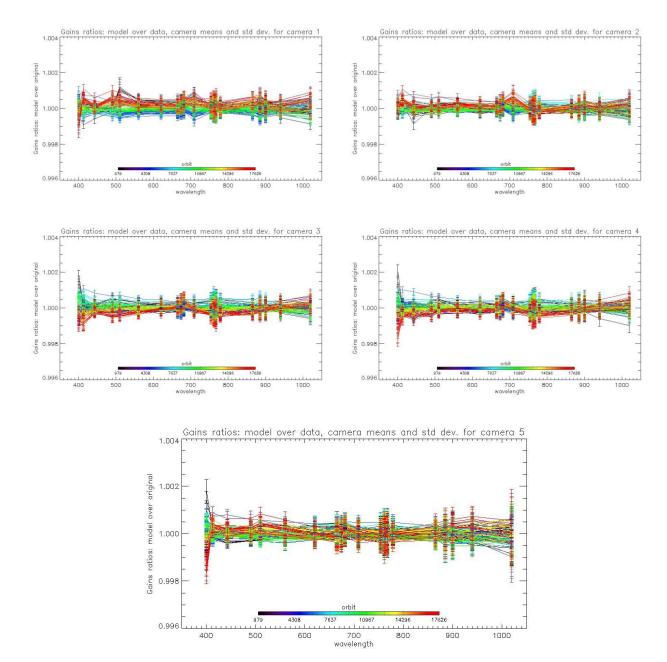


Figure 29: For the 5 cameras: OLCI-A Evolution model performance, as camera-average and standard deviation of ratio of Model over Data vs. wavelength, for each orbit of the test dataset, including 13 calibrations in extrapolation, with a colour code for each calibration from blue (oldest) to red (most recent).



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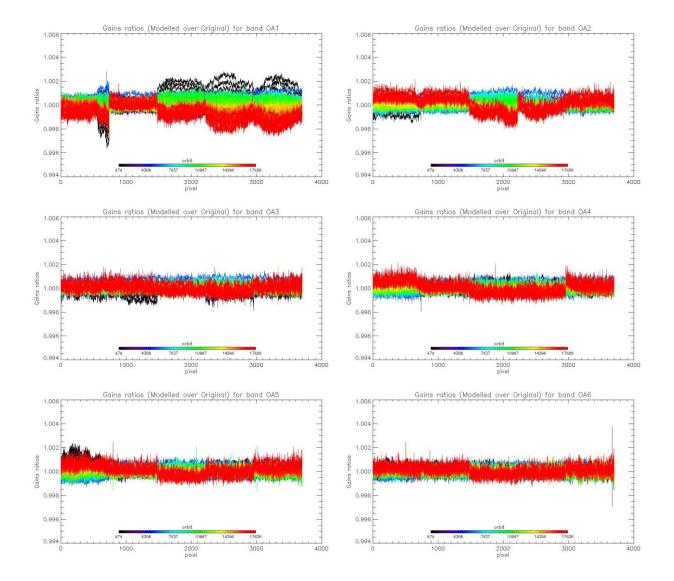


Figure 30: Evolution model performance, as ratio of Model over Data vs. pixels, all cameras side by side, over the whole current calibration dataset (since instrument programing update), including 13 calibrations in extrapolation, channels Oa1 to Oa6.



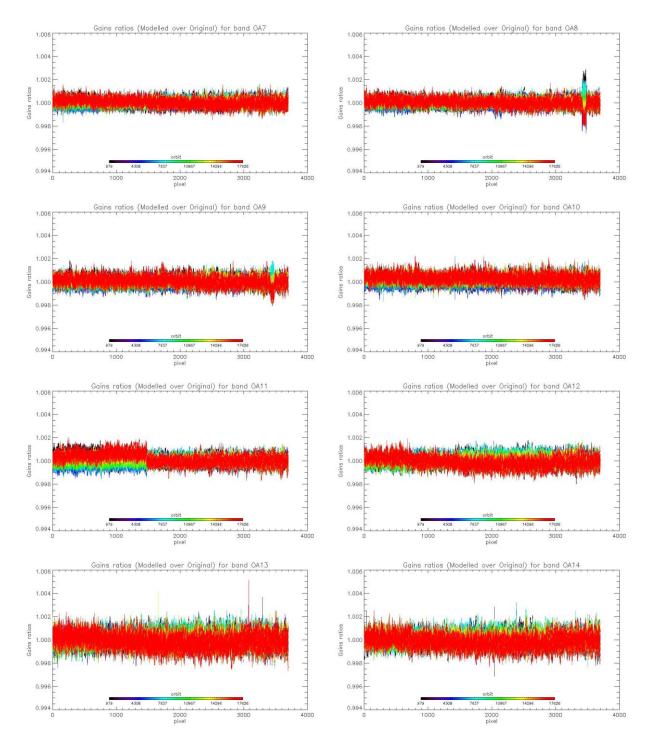


Figure 31: same as Figure 14 for channels Oa7 to Oa14.



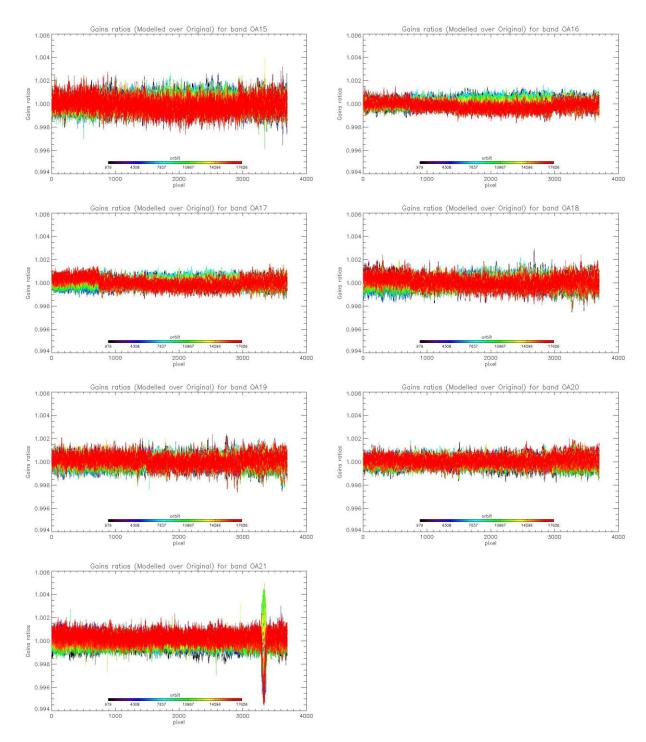


Figure 32: same as Figure 30 for channels Oa15 to Oa21.



#### 2.2.2.2.2 OLCI-B

Instrument response and degradation modelling for OLCI-B, including the use of the in-flight BRDF model (based on 11<sup>th</sup> December 2018 Yaw Manoeuvres), has been deployed at PDGS on 11<sup>th</sup> April 2019 (Processing Baseline 1.20). The model performance over the complete dataset (including the 11 calibrations in extrapolation over about 5 months) is illustrated in Figure 33. It remains better than 0.13% when averaged over the whole field of view except for Oa01 which already shows a strong drift (0.42%).

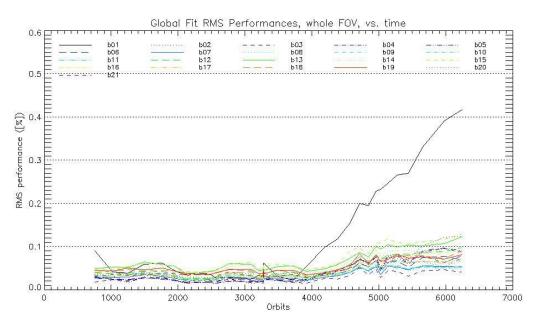


Figure 33: RMS performance of the OLCI-B Gain Model of the current processing baseline as a function of orbit

The overall instrument evolution since channel programming change (18/06/2018) is shown on Figure 28.



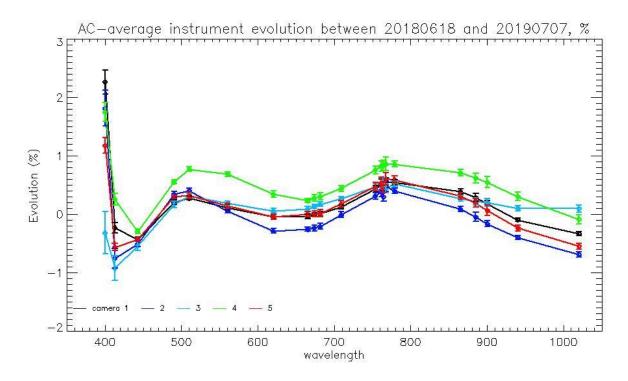


Figure 34: OLCI-B Camera-averaged instrument evolution since channel programming change (18/06/2018) and up to most recent calibration (07/07/2019) versus wavelength.

The overall per camera performance, as a function of wavelength, and at each orbit is shown on Figure 35 as the average and standard deviation of the model over data ratio.

Finally, Figure 36 to Figure 38 show the detail of the model performance, with across-track plots of the model over data ratios at each orbit, one plot for each channel.



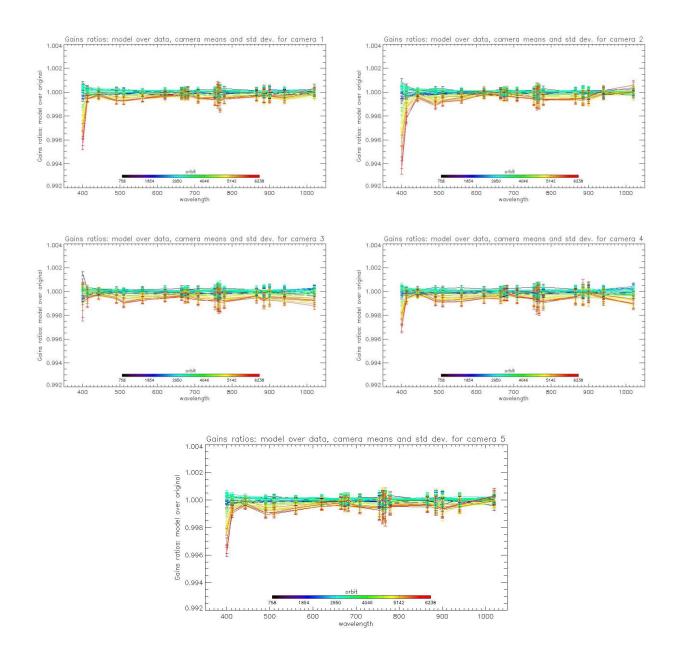


Figure 35: For the 5 cameras: OLCI-B Evolution model performance, as camera-average and standard deviation of ratio of Model over Data vs. wavelength, for each orbit of the test dataset, including 11 calibrations in extrapolation, with a colour code for each calibration from blue (oldest) to red (most recent).



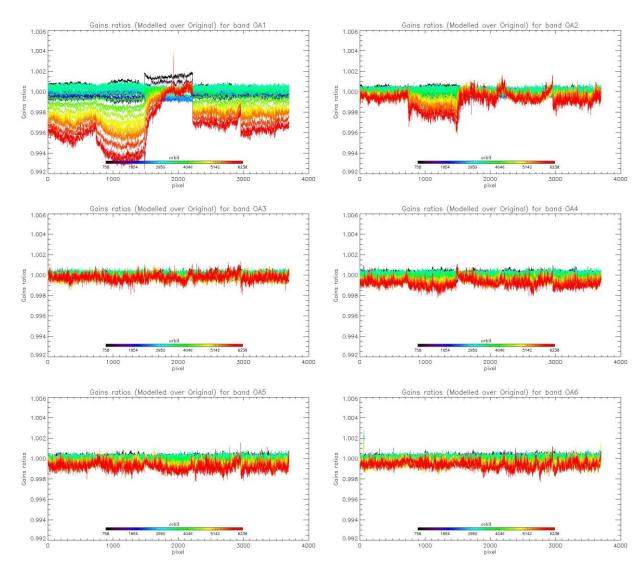


Figure 36: Evolution model performance, as ratio of Model over Data vs. pixels, all cameras side by side, over the whole current calibration dataset (since instrument programming update), including 11 calibrations in extrapolation, channels Oa1 to Oa6.



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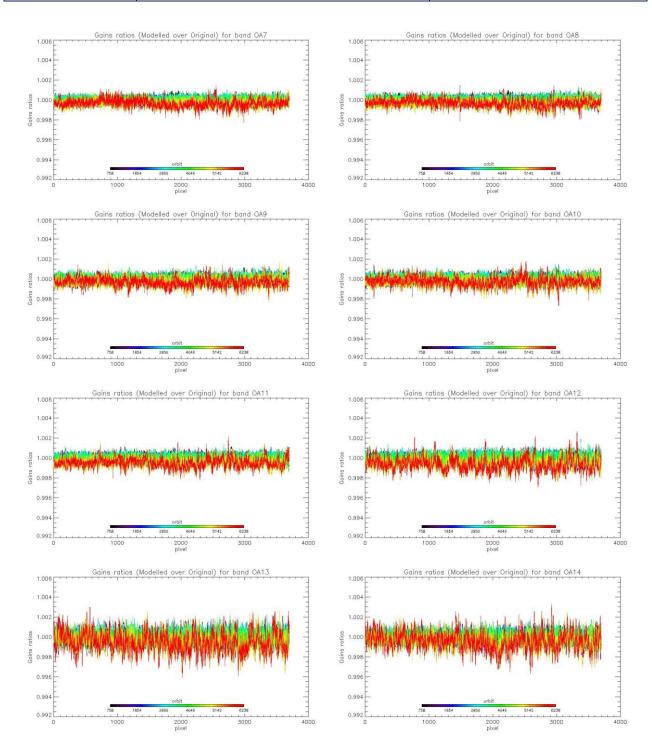


Figure 37: same as Figure 14 for channels Oa7 to Oa14.



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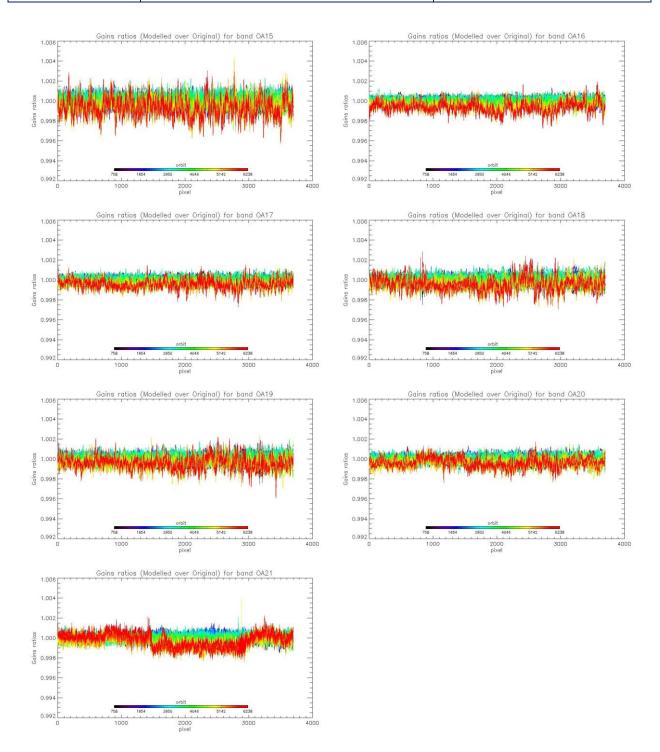


Figure 38: same as Figure 30 for channels Oa15 to Oa21.



#### 2.2.3 Ageing of nominal diffuser [OLCI-L1B-CV-240]

#### 2.2.3.1 OLCI-A

There has been no calibration sequence S05 (reference diffuser) for OLCI-A during acquisition cycle 046.

Consequently, the last results presented in Cycle Report #43/#24 (S3A/S3B) stay valid.

#### 2.2.3.2 OLCI-B

There has been no calibration sequence S05 (reference diffuser) for OLCI-B during acquisition cycle 027.

Consequently, the last results presented in Cycle Report #42/#23 (S3A/S3B) stay valid.

#### 2.2.4 Updating of calibration ADF [OLCI-L1B-CV-260]

#### 2.2.4.1.1 OLCI-A

The following CAL\_AX ADF has been generated and distributed to PDGS during the reported period for OLCI-A:

S3A\_OL\_1\_CAL\_AX\_20190706T230619\_20991231T235959\_20190711T120000\_\_\_\_\_\_MPC\_O\_AL\_021.SEN3

It includes an update of the Dark Correction LUTs (from the radiometric calibration acquired on 06/07/2019) and of the Geometric Calibration Models (see section 2.5.1).

#### 2.2.4.1.2 OLCI-B

The following CAL\_AX ADF has been generated and distributed to PDGS during the reported period for OLCI-B:

S3A\_OL\_1\_CAL\_AX\_20190706T230619\_20991231T235959\_20190711T120000\_\_\_\_\_\_MPC\_O\_AL\_021.SEN3

It includes an updated of the Dark Correction LUTs (from the radiometric calibration acquired on 09/07/2019) and of the Geometric Calibration Models (see section 2.5.2).

# 2.2.5 Radiometric Calibrations for sun azimuth angle dependency and Yaw Manoeuvres for Solar Diffuser on-orbit re-characterization [OLCI-L1B-CV-270 and OLCI-L1B-CV-280]

#### 2.2.5.1.1 OLCI-A

This activity has not evolved during cycle 046 and results presented in Cycle 15 report are still valid.

#### 2.2.5.1.2 OLCI-B

Activity has started for S3B-OLCI. The SAA domain explored is now increased by the acquisitions from the Yaw Manoeuvres and analysis becomes meaningful. Analysis is on-going.



## 2.3 Spectral Calibration [OLCI-L1B-CV-400]

#### 2.3.1 OLCI-A

There has been one Spectral Calibration (S02 + S03) acquisition for OLCI-A during the reporting period:

- S02 sequence (diffuser 1) on 21/06/2019 11:08 to 11:09 (absolute orbit 17406)
- S03 sequence (Erbium doped diffuser) on 21/06/2019 12:49 to 12:50 (absolute orbit 17407)

and one Spectral calibration S09:

\$09 sequence on 21/06/2019 09:04:46 to 09:04:52 (absolute orbit 17405)

The S02/S03 data have been processed and analysed to assess OLCI-A spectral long-term evolution. The absolute results are presented in Figure 39 while its long term evolution is presented on Figure 40. Evolution obtained with alternate method (O2 absorption), using calibration sequences S09, is presented in Figure 41.



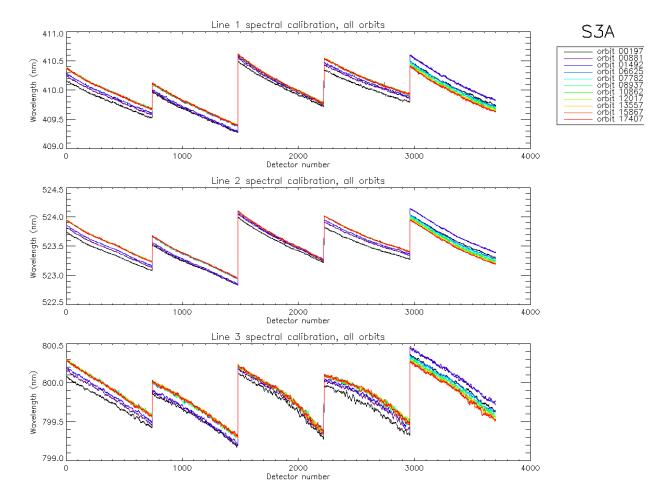


Figure 39: OLCI-A across track spectral calibration from all S02/S03 sequences since the beginning of the mission. Top plot is spectral line 1, middle plot is spectral line 2 and bottom plot spectral line 3.



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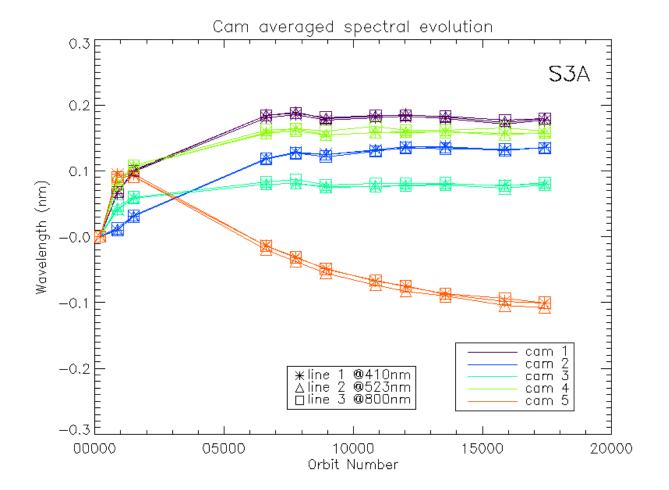
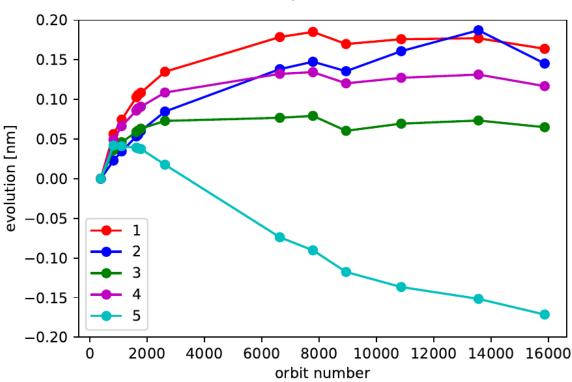


Figure 40: OLCI-A camera averaged spectral calibration evolution as a function of time since launch (all spectral S02/S03 calibrations since the beginning of the mission are included). The data are normalized with the first Spectral Calibration.





**OLCI-A S09 Spectral Calibration Drift** 

Figure 41: OLCI-A line-averaged spectral calibration relative to the one at orbit 380 (march 2016), as a function of time derived from all S09 sequences. The last calibration for S09 is from 05 March 2019. For each camera, the spectral evolution corresponding derived from spectral lines at 485 nm, 656 nm, 770 nm and 854 nm have been averaged.

We see that the long term evolution of the spectral calibration obtained with sequence S09 (Figure 41) is in rather good agreement with the one obtained with sequence S02/S03 (Figure 40). Indeed, for camera 1, 2, 3 and 4, we observe for the two methods a positive trend of the spectral calibration at the beginning of the mission which is now rather stabilized, and for camera 5, an obvious negative trend since almost the beginning of the mission with maybe a beginning of stabilization during recent CALs. We observe however minor discrepancies between the methods like for example a hat shape during the last 4 calibrations in camera 2 visible only for S09 method, or the very last point of camera 5 which for S09 tends to decrease again rather than stabilizing. In all cases, the spectral calibration drift is smaller than 0.2 nm and the change with respect to the values included in the Auxiliary Data files is less than 0.1 nm. However, camera 5, and to a lesser extend cameras 2, do further evolve thus and an evolution of the Auxiliary Parameters impacted by the instrument spectral model, reflecting the current state of the instrument, may have to be considered in the future.



#### 2.3.2 OLCI-B

There has been one Spectral Calibration (S02 + S03) acquisition for OLCI-B during the reporting period:

- S02 sequence (diffuser 1) on 01/07/2019 11:09 to 11:11 (absolute orbit 6155)
- S03 sequence (Erbium doped diffuser) on 01/07/2019 12:50 to 12:52 (absolute orbit 6156)

and one Spectral calibration S09:

S09 sequence on 01/07/2019 09:06:18 to 09:06:24 (absolute orbit 6154)

The S02/S03 data have been processed and analysed to assess OLCI-B spectral long-term evolution. The absolute results are presented in Figure 42 while its long term evolution is presented on Figure 43. Evolution obtained with alternate method (O2 absorption), using calibration sequences S09, is presented in Figure 44.

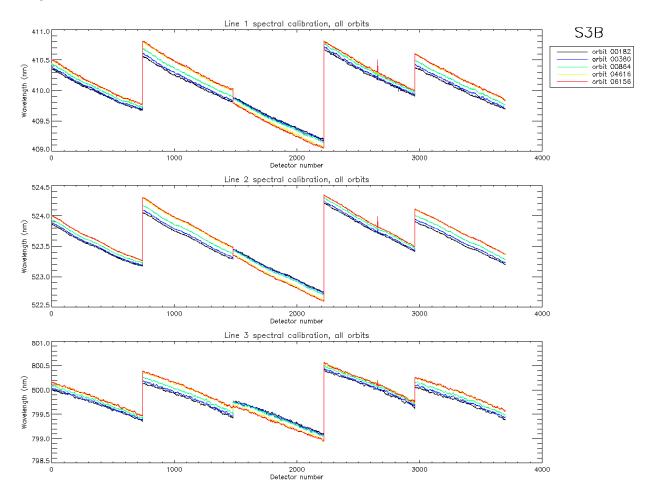


Figure 42: OLCI-B across track spectral calibration from all S02/S03 sequences since the beginning of the mission. Top plot is spectral line 1, middle plot is spectral line 2 and bottom plot spectral line 3.



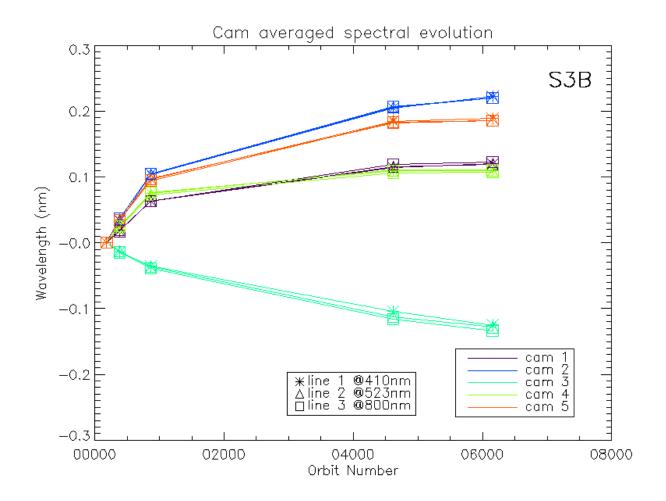
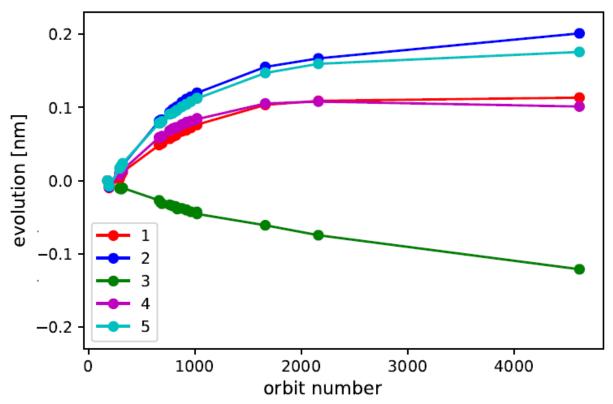


Figure 43: OLCI-B camera averaged spectral calibration evolution as a function of time since launch (all spectral S02/S03 calibrations since the beginning of the mission are included). The data are normalized with the first Spectral Calibration.





### OLCI-B S09 Spectral Calibration Drift

Figure 44: OLCI-B line-averaged spectral calibration relative to the one at orbit orbit 179 (May 2018), as a function of time derived from all S09 sequences. The last calibration for S09 is from 15 March 2019. For each camera, the spectral evolution corresponding derived from spectral lines at 485 nm, 656 nm, 770 nm and 854 nm have been averaged.

Figure 42 to Figure 44 show that:

- As for OLCI-A camera 5, the wavelength calibration drift of OLCI-B camera 3 goes in the opposite direction than for the other cameras.
- It seems than the quick drift of the early mission tends to stabilize
- The drift obtained with the S02/S03 method and the one obtained with the S09 method are very similar.

the spectral calibration drift is smaller than  $\approx$ 0.20 nm for all cases.



## 2.4 Signal to Noise assessment [OLCI-L1B-CV-620]

#### 2.4.1 SNR from Radiometric calibration data

#### 2.4.1.1 OLCI-A

SNR computed for all calibration data (S01, S04 and S05 sequences) as a function of band number is presented in Figure 45.

SNR computed for all calibration data as a function of orbit number for band Oa01 (the less stable band) is presented in Figure 46.

There is no significant evolution of this parameter during the current cycle and the ESA requirement is fulfilled for all bands.

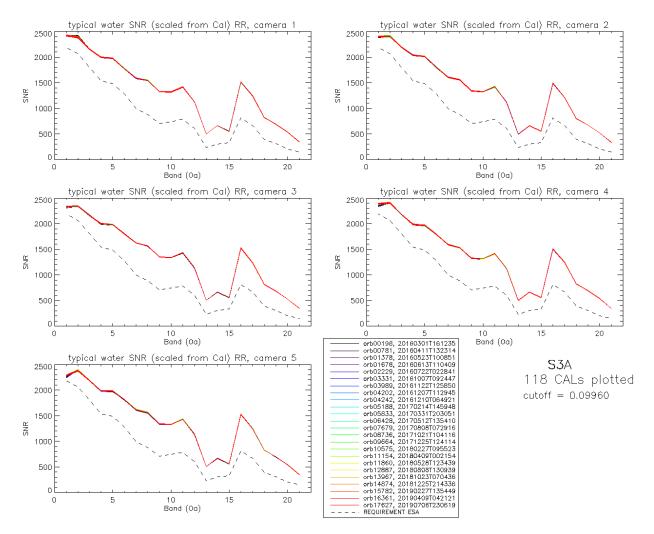


Figure 45: OLCI-A Signal to Noise ratio as a function of the spectral band for the 5 cameras. These results have been computed from radiometric calibration data. All calibrations except first one (orbit 183) are presents with the colours corresponding to the orbit number (see legend). The SNR is very stable with time: the curves for all orbits are almost superimposed. The dashed curve is the ESA requirement.



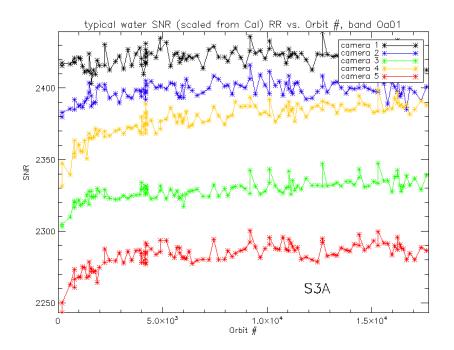


Figure 46: long-term stability of the SNR estimates from Calibration data, example of channel Oa1.

The mission averaged SNR figures are provided in Table 1 below, together with their radiance reference level. According to the OLCI SNR requirements, these figures are valid at these radiance levels and at Reduced Resolution (RR, 1.2 km). They can be scaled to other radiance levels assuming shot noise (CCD sensor noise) is the dominating term, i.e. radiometric noise can be considered Gaussian with its standard

deviation varying as the square root of the signal; in other words:  $SNR(L) = SNR(L_{ref}) \cdot \int_{L_{ref}}^{L} dt$ 

Following the same assumption, values at Full Resolution (300m) can be derived from RR ones as 4 times smaller.



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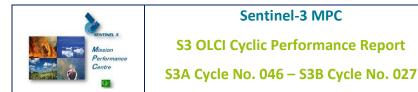
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S3A Cycle No. 046 – S3B Cycle No. 027

# Table 1: OLCI-A SNR figures as derived from Radiometric Calibration data. Figures are given for each camera (time average and standard deviation), and for the whole instrument. The requirement and its reference radiance level are recalled (in mW.sr<sup>1</sup>.m<sup>-2</sup>.nm<sup>-1</sup>).

	$L_{ref}$	SNR	C1		c2		C		C	-	C	5	A	II
nm	LU	RQT	avg	std	avg	std	avg	std	avg	std	avg	std	avg	std
400.000	63.0	2188	2421	6.0	2398	6.6	2328	7.1	2378	11.7	2283	9.1	2361	6.9
412.000	74.1	2061	2392	8.6	2407	5.8	2339	4.8	2401	5.0	2383	8.0	2384	4.8
442.000	65.6	1811	2160	5.1	2198	5.8	2165	4.8	2185	4.1	2196	5.2	2181	3.5
490.000	51.2	1541	2001	4.8	2036	5.1	1997	4.0	1983	4.4	1988	4.8	2001	3.5
510.000	44.4	1488	1979	5.3	2014	4.9	1984	4.6	1966	4.6	1985	4.6	1986	3.7
560.000	31.5	1280	1776	4.6	1802	4.2	1802	4.9	1794	3.9	1818	3.4	1798	3.1
620.000	21.1	997	1591	4.1	1609	4.2	1624	3.3	1593	3.2	1615	3.6	1607	2.7
665.000	16.4	883	1546	4.2	1558	4.4	1566	3.9	1533	3.7	1561	4.0	1553	3.2
674.000	15.7	707	1329	3.5	1338	3.8	1350	2.8	1323	3.3	1342	3.6	1336	2.6
681.000	15.1	745	1319	3.7	1326	3.2	1337	2.7	1314	2.4	1333	3.6	1326	2.2
709.000	12.7	785	1420	4.5	1420	4.2	1435	3.4	1414	3.6	1430	3.1	1424	3.0
754.000	10.3	605	1127	3.2	1120	3.0	1135	3.5	1124	2.5	1139	3.0	1129	2.5
761.000	6.1	232	502	1.2	498	1.2	505	1.2	500	1.1	507	1.5	503	0.9
764.000	7.1	305	663	1.6	658	1.5	667	2.1	661	1.6	670	2.2	664	1.4
768.000	7.6	330	558	1.6	554	1.3	562	1.3	556	1.5	564	1.4	559	1.1
779.000	9.2	812	1515	5.1	1498	5.0	1525	5.3	1511	5.2	1526	5.2	1515	4.5
865.000	6.2	666	1244	3.6	1213	3.8	1238	4.1	1246	3.7	1250	2.9	1238	3.1
885.000	6.0	395	823	1.7	801	1.7	814	2.0	824	1.5	831	1.8	819	1.2
900.000	4.7	308	691	1.7	673	1.3	683	1.7	693	1.4	698	1.6	687	1.0
940.000	2.4	203	534	1.1	522	1.1	525	1.0	539	1.1	542	1.4	532	0.8
1020.000	3.9	152	345	0.8	337	0.9	348	0.7	345	0.9	351	0.8	345	0.5



#### 2.4.1.2 OLCI-B

SNR computed for all OLCI-B calibration data (S01, S04 (but not the dark-only S04) and S05 sequences) as a function of band number is presented in Figure 47.

SNR computed for all OLCI-B calibration data as a function of orbit number for band Oa01 (the less stable band) is presented in Figure 48.

As for OLCI-A the SNR is very stable in time. There is no significant evolution of this parameter during the current cycle and the ESA requirement is fulfilled for all bands.

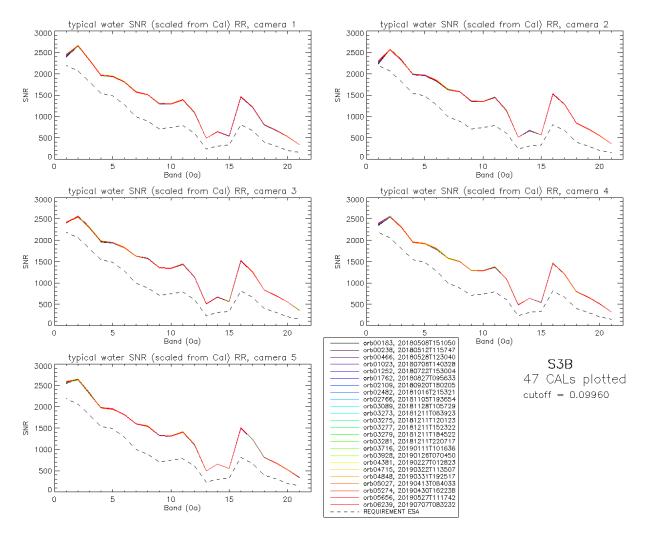


Figure 47: OLCI-B Signal to Noise ratio as a function of the spectral band for the 5 cameras. These results have been computed from radiometric calibration data. All calibrations except first one (orbit 167) are presents with the colours corresponding to the orbit number (see legend). The SNR is very stable with time: the curves for all orbits are almost superimposed. The dashed curve is the ESA requirement.



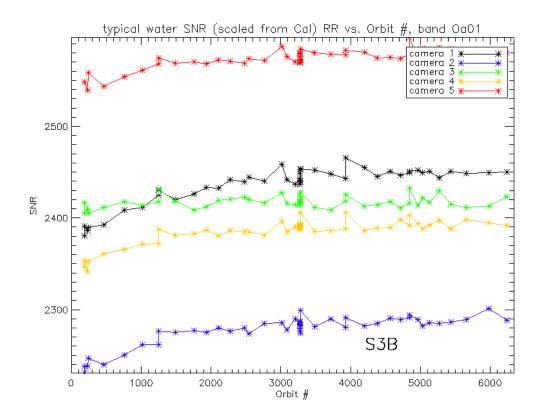


Figure 48: long-term stability of the OLCI-B SNR estimates from Calibration data, example of channel Oa1.



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# Table 2: OLCI-B SNR figures as derived from Radiometric Calibration data. Figures are given for each camera (time average and standard deviation), and for the whole instrument. The requirement and its reference radiance level are recalled (in mW.sr<sup>-1</sup>.m<sup>-2</sup>.nm<sup>-1</sup>).

	$L_{ref}$	SNR	C		C		C		<i>m</i> ni C4	-	C	5	A	II
nm	LU	RQT	avg	std	avg	std	avg	std	avg	std	avg	std	avg	std
400.000	63.0	2188	2436	20.5	2277	16.5	2417	6.4	2384	14.4	2572	11.3	2417	12.8
412.000	74.1	2061	2655	6.4	2570	6.1	2550	7.9	2549	5.9	2641	7.1	2593	4.8
442.000	65.6	1811	2327	6.4	2318	6.5	2304	6.4	2308	6.4	2312	6.1	2314	5.5
490.000	51.2	1541	1965	4.8	1986	6.1	1971	5.3	1950	5.0	1978	5.1	1970	4.1
510.000	44.4	1488	1936	5.6	1964	5.1	1942	5.2	1921	4.5	1950	4.6	1943	4.0
560.000	31.5	1280	1812	5.2	1846	5.7	1828	4.8	1802	5.3	1816	4.9	1821	4.3
620.000	21.1	997	1572	4.6	1627	4.7	1625	3.7	1576	4.4	1601	3.4	1600	3.2
665.000	16.4	883	1513	4.1	1579	4.1	1573	4.3	1501	3.3	1546	4.1	1542	3.1
674.000	15.7	707	1301	4.0	1358	4.4	1353	3.6	1292	3.1	1328	3.2	1326	2.8
681.000	15.1	745	1292	3.4	1347	3.1	1343	3.0	1285	2.8	1316	3.0	1317	2.2
709.000	12.7	785	1389	4.3	1446	4.3	1442	4.8	1372	3.3	1412	4.2	1412	3.4
754.000	10.3	605	1094	4.4	1140	3.9	1140	4.1	1088	3.0	1114	4.1	1115	3.5
761.000	6.1	232	487	1.3	508	1.2	508	1.5	485	1.2	497	1.4	497	1.1
764.000	7.1	305	642	1.7	671	2.2	671	2.1	640	1.8	656	2.1	656	1.7
768.000	7.6	330	540	1.5	567	1.3	564	1.5	540	1.4	554	1.7	553	1.1
779.000	9.2	812	1464	4.6	1533	5.2	1524	6.4	1464	4.1	1504	5.1	1498	4.4
865.000	6.2	666	1220	4.1	1285	4.2	1257	4.4	1203	3.5	1237	3.4	1240	3.3
885.000	6.0	395	807	2.6	847	1.8	833	2.1	798	1.9	814	2.1	820	1.7
900.000	4.7	308	679	1.4	714	2.1	704	1.7	669	1.5	682	1.5	690	1.2
940.000	2.4	203	527	1.4	550	1.6	550	1.4	509	1.2	522	1.5	532	1.0
1020.000	3.9	152	336	0.8	359	1.2	358	0.9	318	0.8	339	1.2	342	0.8



#### 2.4.2 SNR from EO data

#### 2.4.2.1 OLCI-A

There has been no update on SNR assessment from EO data during the cycle. Last figures (cycle 9) are considered valid.

#### 2.4.2.2 OLCI-B

The SNR assessment from EO data has not been applied to OLCI-B considering a) that SNR estimates from RC data have been proved more reliable for OLCI-A and b) that it requires a significant amount of human and machine resources that can be more efficiently used for other tasks.

### 2.5 Geometric Calibration/Validation

#### 2.5.1 OLCI-A

#### 2.5.1.1 Global performance

The good performance of OLCI-A georeferencing since the introduction of the upgraded Geometric Calibration on 14/03/2018 is confirmed. The following figures show time series of the overall RMS performance (requirement criterion) and of the across-track and along-track biases for each camera. The performance improvement on the 14/03/2018 is obvious on each figure, the most dramatic improvements affecting along-track bias of Camera 3 (Figure 52) and across-track biases of Cameras 4 and 5 (Figure 53 & Figure 54, respectively). Compliance is comfortably met since then (Figure 49): RMS values remain around 0.3 pixel and all biases below 0.2 pixel from 14/03 on, except for the along-track bias of camera 3 for which a small drift can be noticed, implying a performance slightly below -0.2 pixel since a few weeks (Figure 52, right).

It can be seen that the peak RMS value on 14/08/2018 is associated to a very low number of GCPs: only 345 (out of scale on Figure 49) and can be considered as an outlier. The same remark applies to the AC and AL biases displayed in Figure 50 to Figure 54.

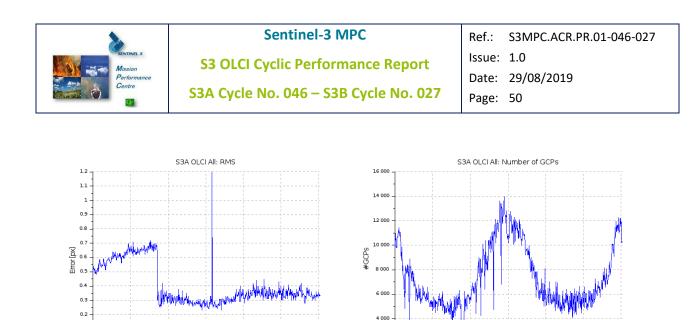


Figure 49: overall OLCI-A georeferencing RMS performance time series (left) and number of validated control points corresponding to the performance time series (right) over the whole monitoring period

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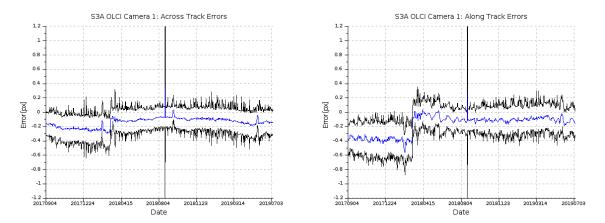


Figure 50: across-track (left) and along-track (right) georeferencing biases time series for Camera 1.

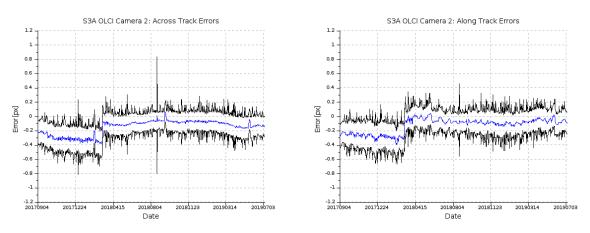
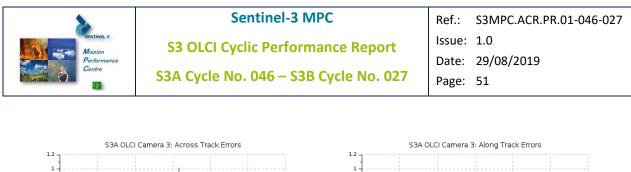
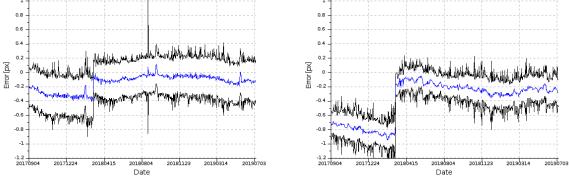
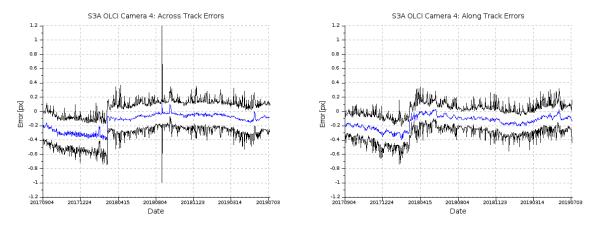


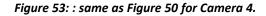
Figure 51: same as Figure 50 for Camera 2.











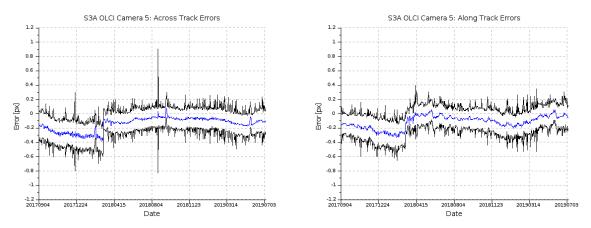


Figure 54: : same as Figure 50 for Camera 5.



#### 2.5.1.2 Cross-FOV analysis

An update of the geometric monitoring tools and procedures now allows to analyse the performance at a more detailed level and in particular with respect to the across-track position (in instrument grid).

This allowed to identify optical distortion implying a variation of the georeferencing performance across the field-of view. An example is provided below for the 5<sup>th</sup> of May 2019 (Figure 55). It shows that the performance remains generally correct for all pixels, except at the edge of camera 2 where it exceeds 0.5 pixel in absolute value. It also shows that the variations of the biases are in the same direction for all cameras, implying a maximum misregistration at the cameras interface.

Re-calibration of the instrument pixels pointing vectors (IPPVM) to correct this issue has been done and shall be put in production soon.

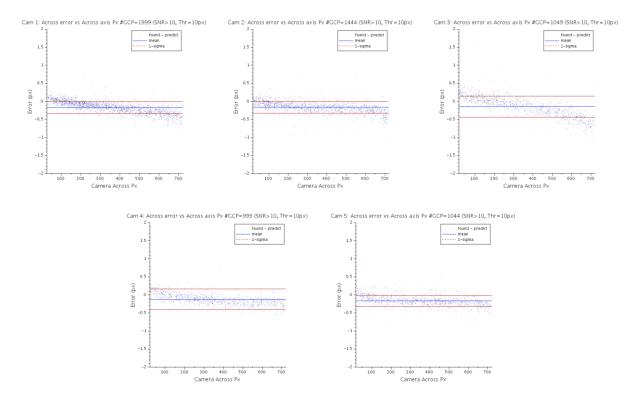


Figure 55: OLCI-A across-track georeferencing error (pixels) as a function of instrument spatial pixel for each camera (1 to 5 from left to right and top to bottom), example of 5/5/2019.

A long-term monitoring has been put in place and, considering the behaviour highlighted above, puts emphasis, on the one hand on the differences at the camera interfaces, and on the other hand on the maximum misregistration within each camera. Values are roughly stable with time.

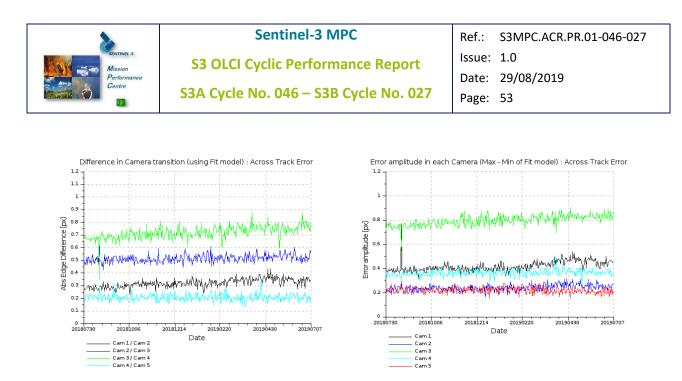


Figure 56: OLCI-A spatial across-track misregistration at each camera transition (left) and maximum amplitude of the across-track error within each camera (left).

#### 2.5.2 OLCI-B

#### 2.5.2.1 Global performance

The performance of OLCI-B georeferencing is within requirements since the introduction of the 3<sup>rd</sup> Geometric Calibration on 12/12/2018. The following figures show time series of the overall RMS performance (requirement criterion) and of the across-track and along-track biases for each camera. The performance of across-track pointing is excellent over the whole mission. The along-track performance, showing significant drifts for all cameras is well corrected with the latest Calibration. It seems fairly stable for cameras 3, 4 and 5, but a small drift still seems present for cameras 1 and 2. Drifts are closely monitored, and re-calibration applied as necessary to ensure compliance to the requirement.

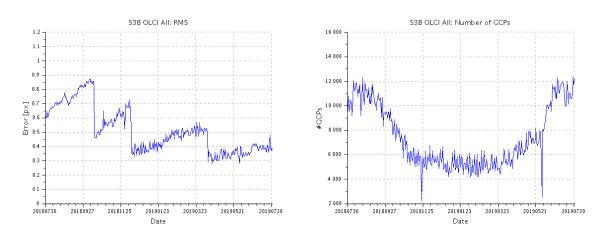
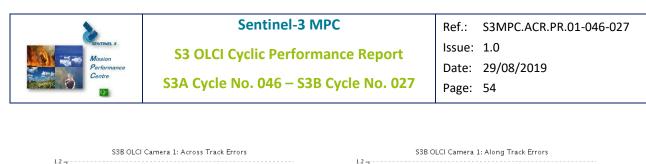


Figure 57: overall OLCI-B georeferencing RMS performance time series (left) and number of validated control points corresponding to the performance time series (right) over the whole monitoring period



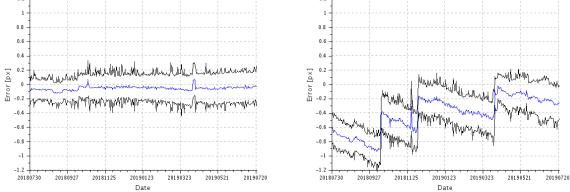


Figure 58: across-track (left) and along-track (right) georeferencing biases time series for Camera 1.

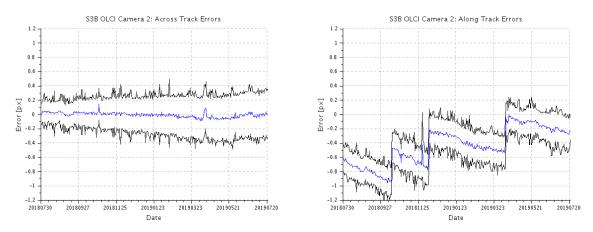


Figure 59: same as Figure 58 for Camera 2.

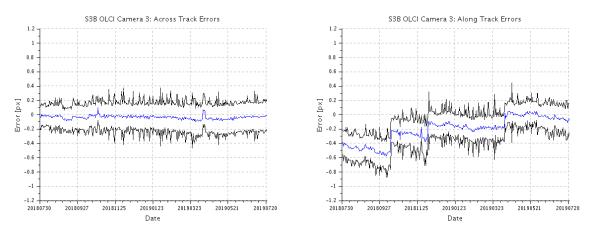


Figure 60: same as Figure 58 for Camera 3.

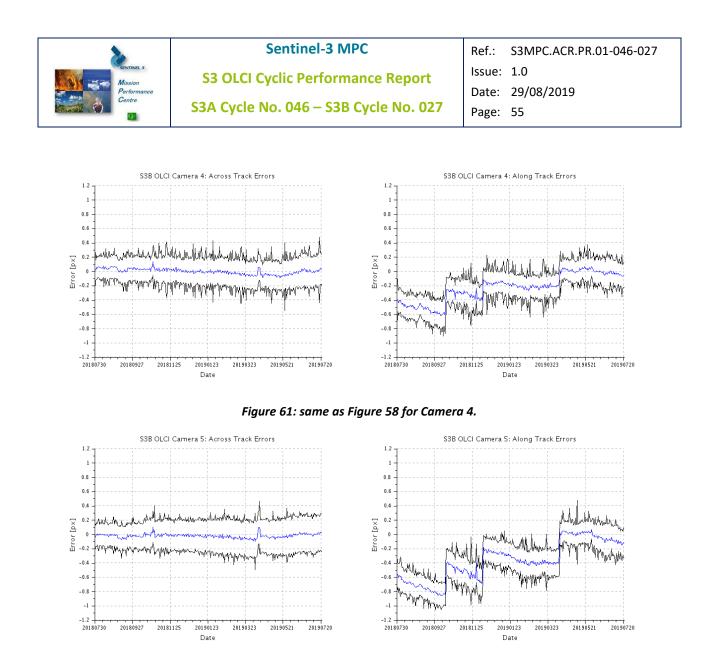


Figure 62: same as Figure 58 for Camera 5.

#### 2.5.2.2 Cross-FOV analysis

The same cross-FOV performance analysis as described for OLCI-A has been applied to OLCI-B. It highlighted even larger optical distortion implying a variation of the georeferencing performance across the field-of view. The same example (5<sup>th</sup> of May 2019) is shown on Figure 63. It shows higher variations that for OLCI-A, with biases exceed 0.5 pixel at edges of cameras 1 2 and 3, and a significantly non-linear cross-FOV variation inside camera 1. As for OLCI-A the general trends of the biases variations are in the same direction for all cameras, implying a maximum misregistration at the cameras interface.

Re-calibration of the instrument pixels pointing vectors (IPPVM) to correct this issue has been done and shall be put in production soon.

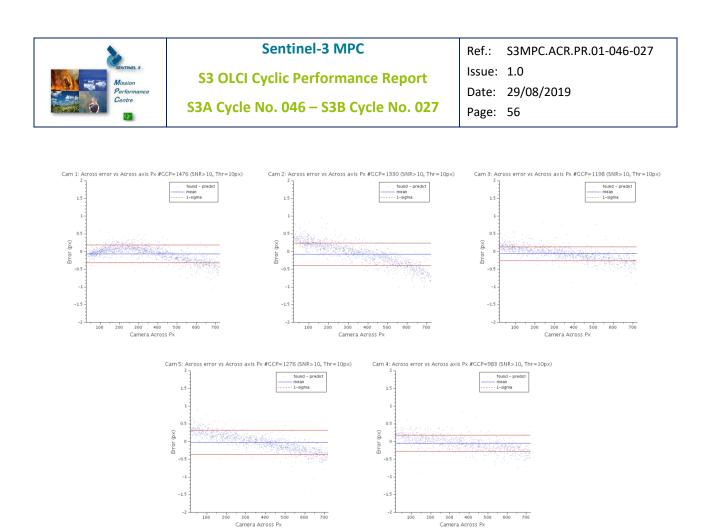


Figure 63: OLCI-B across-track georeferencing error (pixels) as a function of instrument spatial pixel for each camera (1 to 5 from left to right and top to bottom), example of 5/5/2019.

The same long-term monitoring has been put in place and, considering the behaviour highlighted above, puts emphasis, on the one hand on the differences at the camera interfaces, and on the other hand on the maximum misregistration within each camera (Figure 64). Misregistration can reach up to 1 pixel, both at transitions and within a given camera. In this case the values are not stable in time, even if this improves after last re-calibration (mid-April): the analysis is not independent of the platform to instrument alignment correction that this last re-calibration focussed on.

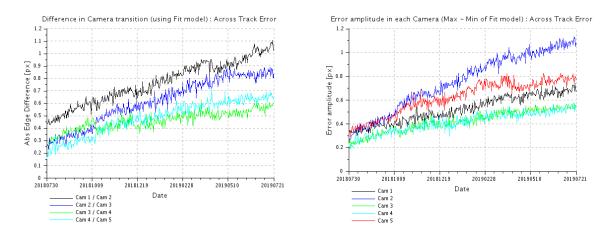


Figure 64: OLCI-B spatial across-track misregistration at each camera transition (left) and maximum amplitude of the across-track error within each camera (left).



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# **3 OLCI Level 1 Product validation**

## 3.1 [OLCI-L1B-CV-300], [OLCI-L1B-CV-310] – Radiometric Validation

#### 3.1.1 S3ETRAC Service

#### Activities done

The S3ETRAC service extracts OLCI L1 RR and SLSTR L1 RBT data and computes associated statistics over 49 sites corresponding to different surface types (desert, snow, ocean maximizing Rayleigh signal, ocean maximizing sunglint scattering and deep convective clouds). The S3ETRAC products are used for the assessment and monitoring of the L1 radiometry (optical channels) by the ESLs.

All details about the S3ETRAC/OLCI and S3ETRAC/SLSTR statistics are provided on the S3ETRAC website <u>http://s3etrac.acri.fr/index.php?action=generalstatistics</u>

- Number of OLCI products processed by the S3ETRAC service
- Statistics per type of target (DESERT, SNOW, RAYLEIGH, SUNGLINT and DCC)
- Statistics per sites
- Statistics on the number of records

For illustration, we provide below statistics on the number of S3ETRAC/OLCI records generated per type of targets (DESERT, SNOW, RAYLEIGH, SUNGLINT and DCC) for both OLCI-A (Figure 65) and OLCI-B (Figure 66).



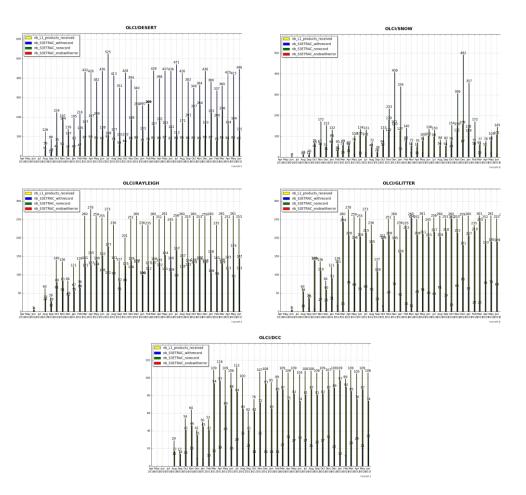


Figure 65: summary of S3ETRAC products generation for OLCI-A

(number of OLCI-A L1 products Ingested, yellow – number of S3ETRAC extracted products generated, blue – number of S3ETRAC runs without generation of output product (data not meeting selection requirements), green – number of runs ending in error, red, one plot per site type).



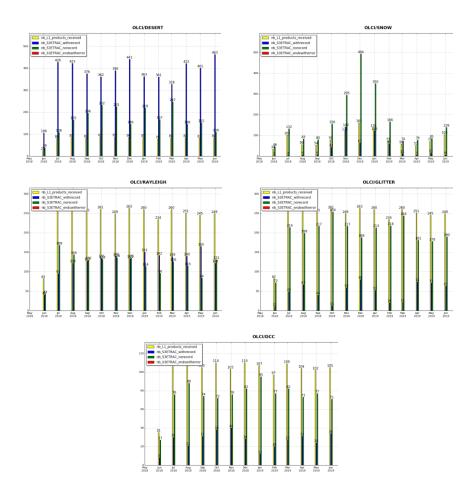


Figure 66: summary of S3ETRAC products generation for OLCI-B

(number of OLCI-B L1 products Ingested, yellow – number of S3ETRAC extracted products generated, blue – number of S3ETRAC runs without generation of output product (data not meeting selection requirements), green – number of runs ending in error, red, one plot per site type).



#### 3.1.2 Radiometric validation with DIMITRI

There has been no new result during the cycle. Last figures (cycles 045/026) are considered valid.

#### 3.1.3 Radiometric validation with OSCAR

The OSCAR Rayleigh have been applied to the S3A and S3B S3ETRAC data from the 6 oceanic calibration sites listed in **Error! Reference source not found.**.

		, ,			
Site Name	Ocean	North Latitude	South Latitude	East Longitude	West Longitude
PacSE	South-East of Pacific	-20.7	-44.9	-89	-130.2
PacNW	North-West of Pacific	22.7	10	165.6	139.5
PacN	North of Pacific	23.5	15	200.6	179.4
AtlN	North of Atlantic	27	17	-44.2	-62.5
AtlS	South of Atlantic	-9.9	-19.9	-11	-32.3
IndS	South of Indian	-21.2	-29.9	100.1	89.5

Table 3. S3ETRAC Rayleigh Calibration sites

The weighted average OSCAR S3A and S3B Rayleigh results for June 2019 and the standard deviation calibration are shown below (Table 4Figure 67**Error! Reference source not found.** and **Error! Reference source not found.**). In the spectral bands for which the Rayleigh calibration method is applicable (i.e. from Oa1 till Oa12). S3A seems to be significantly brighter than S3B, by about 0.6 % to 2.3%, with largest differences observed in Blue bands.



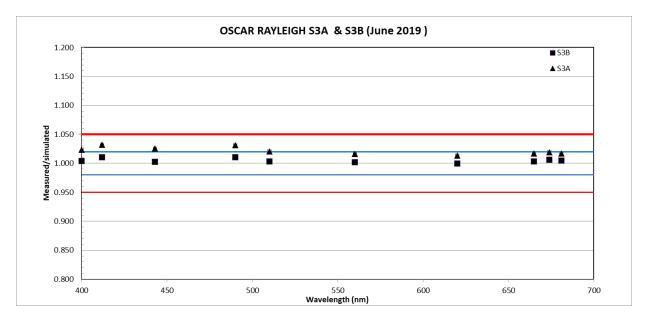


Figure 67: OSCAR Rayleigh S3A and S3B Calibration results: weighted average from June 2019.



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#### Table 4. OSCAR Rayleigh S3A and S3B results for June 2019.

OLCI band	Wavelength	Oscar Rayleigh S3A	June 2019	Oscar Rayleigh S3B June 2019			
	(nm)	Weight. Average	stdev	Weight. Average	stdev		
Oa01	400	1.023	0.031	1.004	0.028		
Oa02	412	1.032	0.030	1.011	0.027		
Oa03	443	1.025	0.026	1.002	0.024		
Oa04	490	1.031	0.018	1.010	0.018		
Oa05	510	1.021	0.014	1.003	0.013		
Oa06	560	1.016	0.015	1.002	0.014		
Oa07	620	1.013	0.015	0.999	0.016		
Oa08	665	1.017	0.013	1.003	0.015		
Oa09	674	1.019	0.014	1.006	0.015		
Oa10	681	1.017	0.013	1.005	0.015		
Oa11	709	1.000	0.012	0.990	0.016		
Oa12	754	1.010	0.006	1.004	0.013		
Oa13	761.25	NA	NA	NA	NA		
Oa14	764.375	NA	NA	NA	NA		
Oa15	767.5	NA	NA	NA	NA		
Oa16	778.75	NA	NA	NA	NA		
Oa17	865	NA	NA	NA	NA		
Oa18	885	NA	NA	NA	NA		
Oa19	900	NA	NA	NA	NA		
Oa20	940	NA	NA	NA	NA		
Oa21	1020	NA	NA	NA	NA		

\*OSCAR Rayleigh results for band Oa01 have to be considered with care due to larger uncertainty in the radiative transfer calculation

## 3.2 [OLCI-L1B-CV-320] – Radiometric Validation with Level 3 products

#### 3.2.1 OLCI-A

There has been no new result during the cycle. Last figures (cycle 20) are considered valid.

#### 3.2.2 OLCI-B

This activity has not started for OLCI-B.



# 4 Level 2 Land products validation

### 4.1 [OLCI-L2LRF-CV-300]

#### 4.1.1 Routine extractions

There has been no new result during the cycle. Last figures (cycles 045/026) are considered valid.

#### 4.1.2 Comparisons with MERIS MGVI and MTCI climatology

There has been no new result during the cycle. Last figures (cycles 045/026) are considered valid.

## 4.2 [OLCI-L2LRF-CV-410 & OLCI-L2LRF-CV-420] – Cloud Masking & Surface Classification for Land Products

There has been no new result during the cycle. Last figures (cycle 27) are considered valid.



S3A Cycle No. 046 – S3B Cycle No. 027

# 5 Level 2 Water products validation

# 5.1 [OLCI-L2-CV-210, OLCI-L2-CV-220] – Vicarious calibration of the NIR and VIS bands

#### 5.1.1 OLCI-A

There has been no update of the SVC (System Vicarious Calibration) during Cycle 046. Last figures (cycle 17) are considered valid.

#### 5.1.2 OLCI-B

There has been no update of the SVC (System Vicarious Calibration) during Cycle 027. Last figures (cycle 023) are considered state of the art.

## 5.2 [OLCI-L2WLR-CV-300, OLCI-L2WLR-CV-310, OLCI-L2WLR-CV-32, OLCI-L2WLR-CV-330, OLCI-L2WLR-CV-340, OLCI-L2WLR-CV-350, OLCI-L2WLR-CV-360 and OLCI-L2WLR-CV-370] – Level 2 Water-leaving Reflectance product validation.

#### 5.2.1 Acknowledgements

S3-MPC acknowledges all PIs mentioned below and their respective institutions for their valuable contribution to the validation of OLCI L2 water products with a special emphasis on AERONET-OC PIs for their unique contribution to NRT data validation and a special mention to Giuseppe Zibordi maintaining and providing data over 5 ground stations. AERONET-OC is indeed from far the largest contributor of Fiducial Reference Measurements for routine quantitative data validation.

- AERONET-OC
  - AAOT, Galata, Gloria, GDT, HLH: Giuseppe Zibordi, Joint Research Centre of the European Commission
  - **leodo**: Young-Je Park & Hak-Yeol You, Korean Institute of Ocean Science and Technology & Korea Hydrographic and Oceanographic Administration
  - LISCO: Sam Ahmed, Alex Gilerson, City College of New York
  - **MVCO**: Hui Feng and Heidi Sosik, Ocean Process Analysis Laboratory (OPAL), Woods Hole Oceanographic Institution
  - Thornton: Dimitry Van der Zande, RBINS/OD Nature
  - Lucinda: Thomas Schroeder, Integrated Marine Observing System, IMOS
  - **WaveCIS**: Alan Weidemann, Bill Gibson, Robert Arnone, University of Southern MS, Coastal Studies Inst LSU, Naval Research Laboratory



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- BOUSSOLE
  - David Antoine, Enzo Vellucci (Curtin University, Perth & Laboratoire d'Oceanographie de Villefranche, CNRS)
- MOBY
  - Kenneth Voss & Carol Johnson (University of Miami & NIST)
- SLGO
  - Simon Belanger, Thomas Jaegler & Peter Galbraith (Arctus, Inc & Department of fisheries and Ocean Canada)
- AWI
  - Astrid Bracher (Alfred-Wegener-Institut)
- IMOS
  - Thomas Schroeder (Integrated Marine Observing System, IMOS)
- BSH
  - Holger Klein (Bundesamt für Seeschifffahrt und Hydrographie, BSH)
- Proval
  - Edouard Leymarie (Laboratoire d'Oceanographie de Villefranche, CNRS)

#### 5.2.2 OLCI-A

There has been no new result during the cycle. Last figures (cycles 045/026) are considered valid.

#### 5.2.3 OLCI-B

There has been no new result during the cycle. Last figures (cycles 045/026) are considered valid.

# 5.3 [OLCI-L2WLR-CV-430] – Algorithm performance over spatial and temporal domains

There has been no new result during the cycle. Last figures (cycle 27) are considered valid.

## 5.4 [OLCI-L2WLR-CV-510 & 520] – Cloud Masking & Surface Classification for Water Products

There has been no new result during the cycle. Last figures (cycle 27) are considered valid.



### 5.5 [OLCI-L2WLR-CV530] Validation of Aerosol Product

### 5.6 Validation of Aerosol Product

There has been no new result during the cycle. Last figures (cycles 42/23) are considered valid.

# 5.7 [OLCI-L2WLR-CV-380] Development of calibration, product and science algorithms

There has been no new development on calibration, product and science algorithms during the cycle.



# 6 Validation of Integrated Water Vapour over Land & Water

There has been no new result during the cycle. Last figures (cycle 40/21) are considered valid.



# 7 Level 2 SYN products validation

There has been no new result during the cycle. Last figures (cycle 43/24) are considered valid.



## 8 Events

For OLCI-A, two Radiometric Calibration Sequences have been acquired during Cycle 046:

- So1 sequence (diffuser 1) on 18/06/2019 12:26 to 12:28 (absolute orbit 17364)
- S01 sequence (diffuser 1) on 06/07/2019 23:06 to 23:08 (absolute orbit 17627)

and one Spectral Calibration (S02 + S03):

- S02 sequence (diffuser 1) on 21/06/2019 11:08 to 11:09 (absolute orbit 17406)
- S03 sequence (Erbium doped diffuser) on 21/06/2019 12:49 to 12:50 (absolute orbit 17407)

and one Spectral calibration S09:

S09 sequence on 21/06/2019 09:04:46 to 09:04:52 (absolute orbit 17405)

For OLCI-B, one Radiometric Calibration Sequences have been acquired during Cycle 027:

S01 sequence (diffuser 1) on 07/07/2019 08:32 to 08:32 (absolute orbit 6239)

and one Spectral Calibration (S02 + S03):

- S02 sequence (diffuser 1) on 01/07/2019 11:09 to 11:11 (absolute orbit 6155)
- S03 sequence (Erbium doped diffuser) on 01/07/2019 12:50 to 12:52 (absolute orbit 6156)

and one Spectral calibration S09:

S09 sequence on 01/07/2019 09:06:18 to 09:06:24 (absolute orbit 6154)



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# 9 Appendix A

Other reports related to the Optical mission are:

 S3 SLSTR Cyclic Performance Report, S3A Cycle No. 046, S3B Cycle No. 027 (ref. S3MPC.RAL.PR.02-046-027)

All Cyclic Performance Reports are available on MPC pages in Sentinel Online website, at: <a href="https://sentinel.esa.int">https://sentinel.esa.int</a>

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