

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

S3 OLCI Cyclic Performance Report

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Cycle No. 077

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End date: 25/10/2021

S3-B

Cycle No. 058

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Sentinel-3 MPC

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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	06.11 / 2.76	NRT: 28/04/2021 07:15 UTC NTC: 28/04/2021 07:15 UTC
OL2 LAND	06.14 / 2.66	NRT: 23/06/2020 08:00 UTC NTC: 23/06/2020 08:00 UTC
OL2 MAR	07.00 / 2.72M	NRT: 16/02/2021 08:35 UTC NTC: 15/02/2021 05:46 UTC
SY2	06.21 / 2.77	NTC: 14/06/2021 08:21 UTC
SY2_VGS	06.09 / 2.77	NTC: 14/06/2021 08:21 UTC

1.2 Sentinel3-B

IPF	IPF / Processing Baseline version	Date of deployment
OL1	06.11 / 1.57	NRT: 29/07/2021 08:30 UTC NTC: 29/07/2021 08:30 UTC
OL2 LAND	06.14 / 1.40	NRT: 23/06/2020 08:00 UTC NTC: 23/06/2020 08:00 UTC
OL2 MAR	07.00 / 2.72M	NRT: 16/02/2021 07:56 UTC NTC: 15/02/2021 06:47 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.

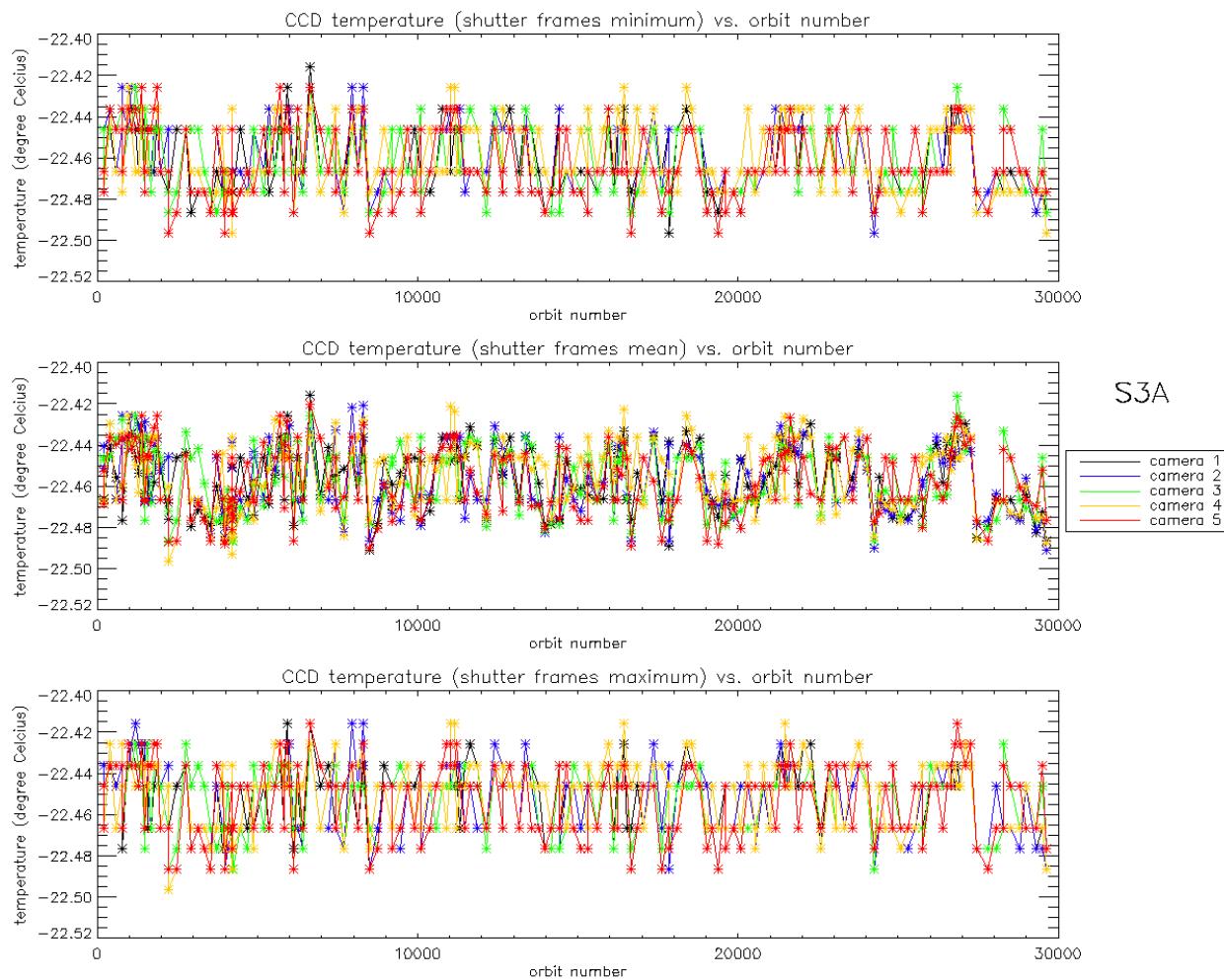


Figure 1: long term monitoring of OLCI-A CCD temperatures using minimum value (top), time averaged values (middle), and maximum value (bottom) provided in the annotations of the Radiometric Calibration Level 1 products, for the shutter frames, all radiometric calibrations so far except the first one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



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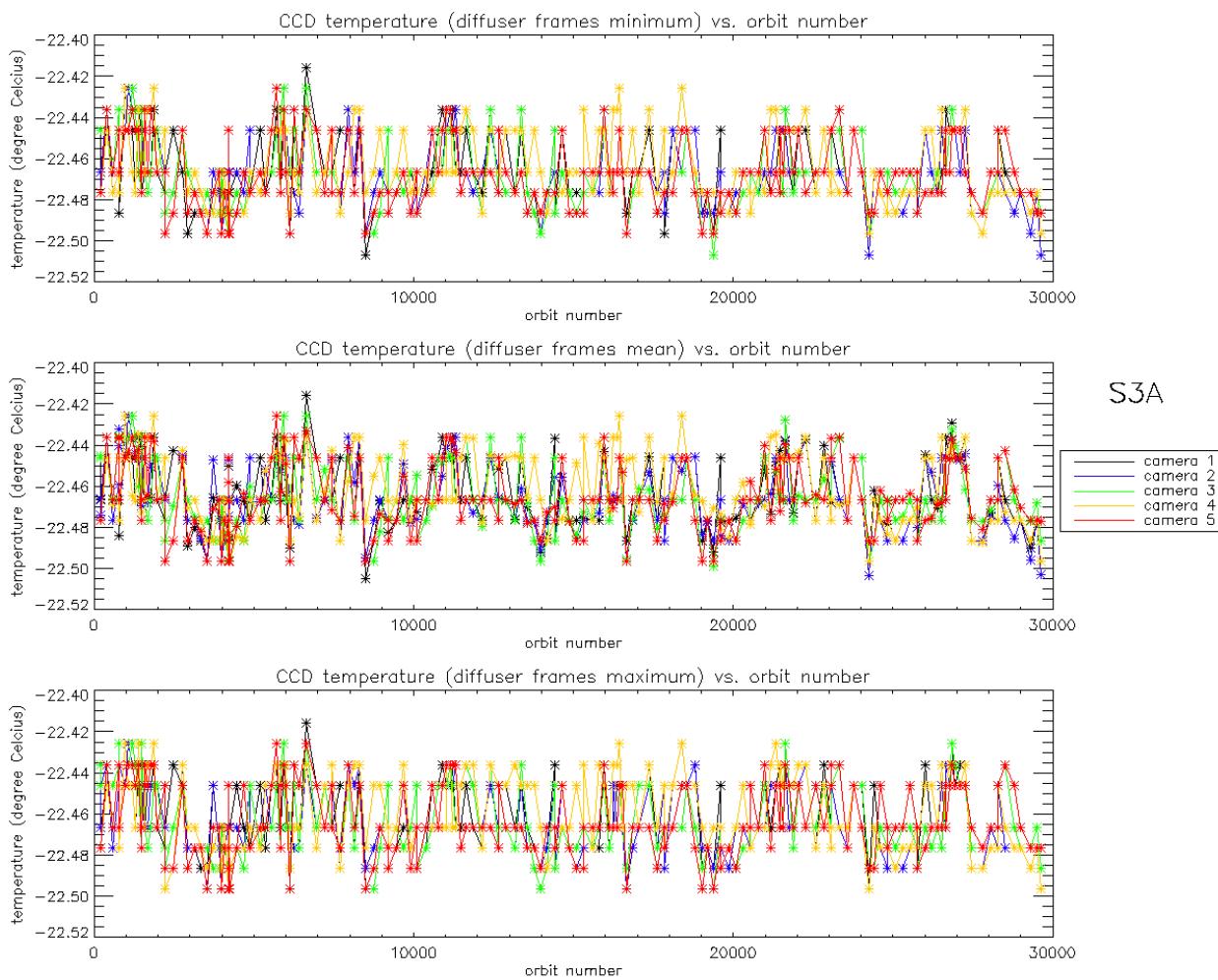


Figure 2: Same as Figure 1 for diffuser frames.



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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.

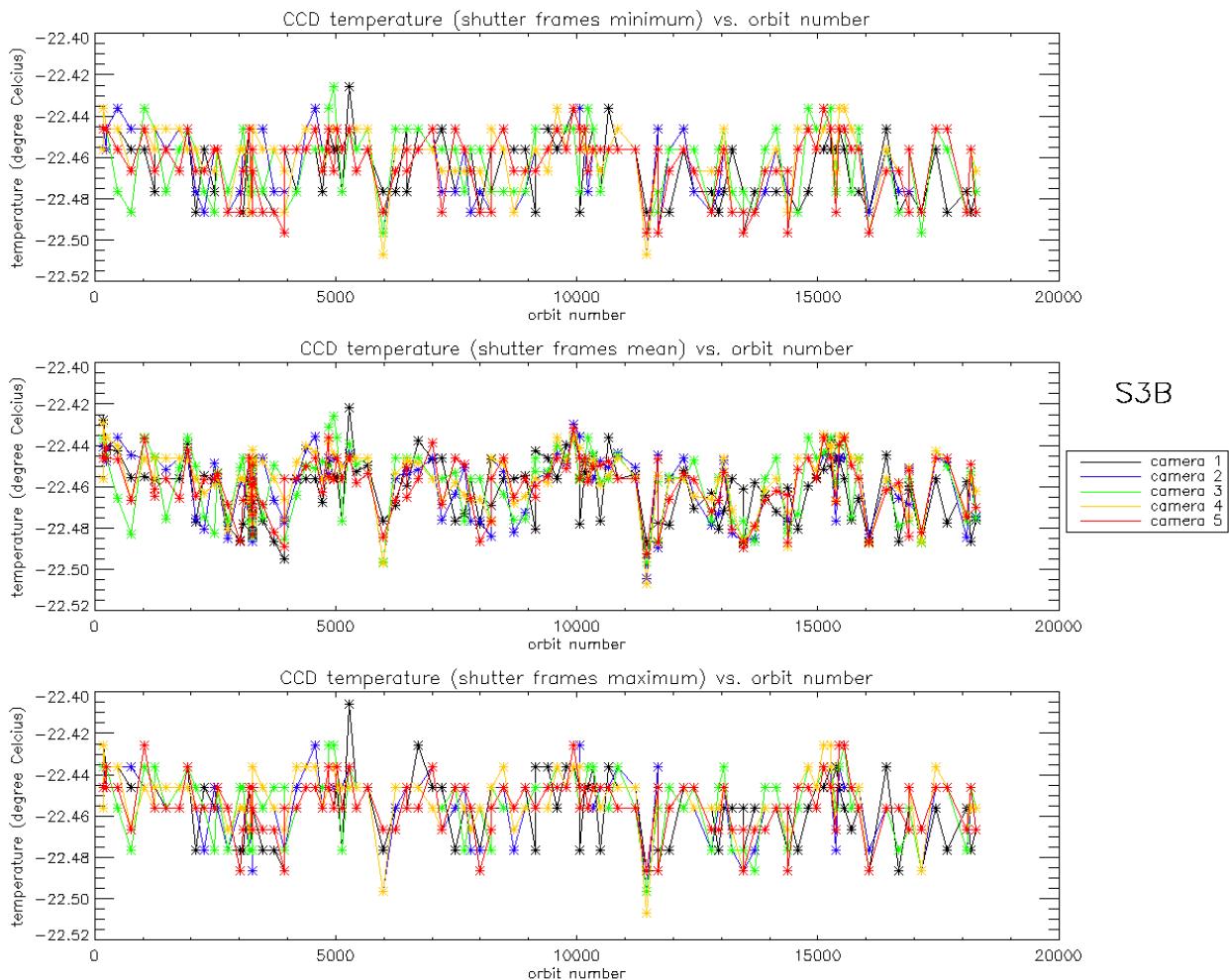


Figure 3: long term monitoring of OLCI-B CCD temperatures using minimum value (top), time averaged values (middle), and maximum value (bottom) provided in the annotations of the Radiometric Calibration Level 1 products, for the Shutter frames, all radiometric calibrations so far except the first one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



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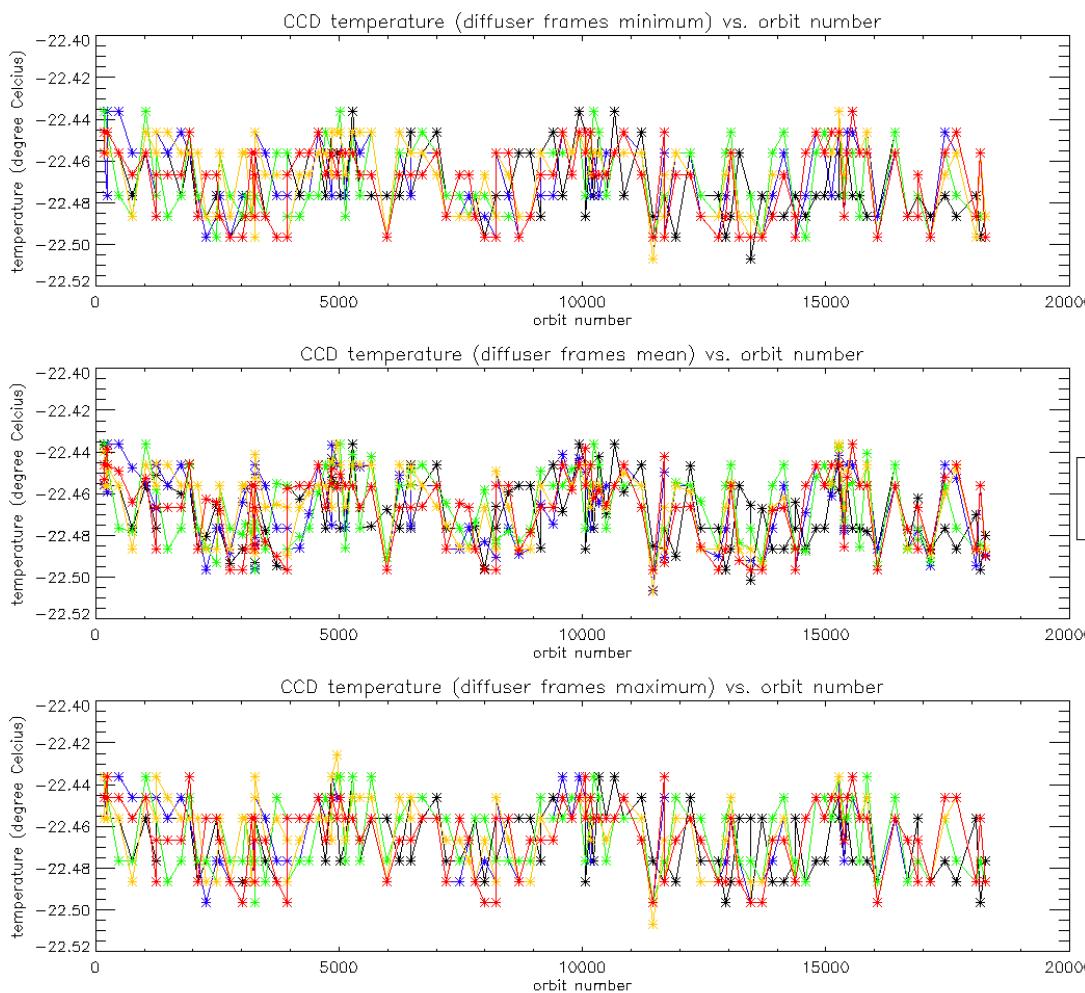


Figure 4: same as Figure 3 for diffuser frames.

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2.2 Radiometric Calibration

For OLCI-A, three Radiometric Calibration sequences have been acquired during Cycle 077:

- ❖ S01 sequence (diffuser 1) on 03/10/2021 08:47 to 08:49 (absolute orbit 29311)
- ❖ S01 sequence (diffuser 1) on 16/10/2021 11:33 to 11:35 (absolute orbit 29498)
- ❖ S01 sequence (diffuser 1) on 25/10/2021 09:19 to 09:21 (absolute orbit 29625)

For OLCI-B, three Radiometric Calibration sequences have been acquired during Cycle 058:

- ❖ S01 sequence (diffuser 1) on 14/10/2021 16:48 to 16:50 (absolute orbit 18079)
- ❖ S01 sequence (diffuser 1) on 21/10/2021 12:05 to 12:07 (absolute orbit 18176)
- ❖ S01 sequence (diffuser 1) on 28/10/2021 12:24 to 12:26 (absolute orbit 18276)

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).

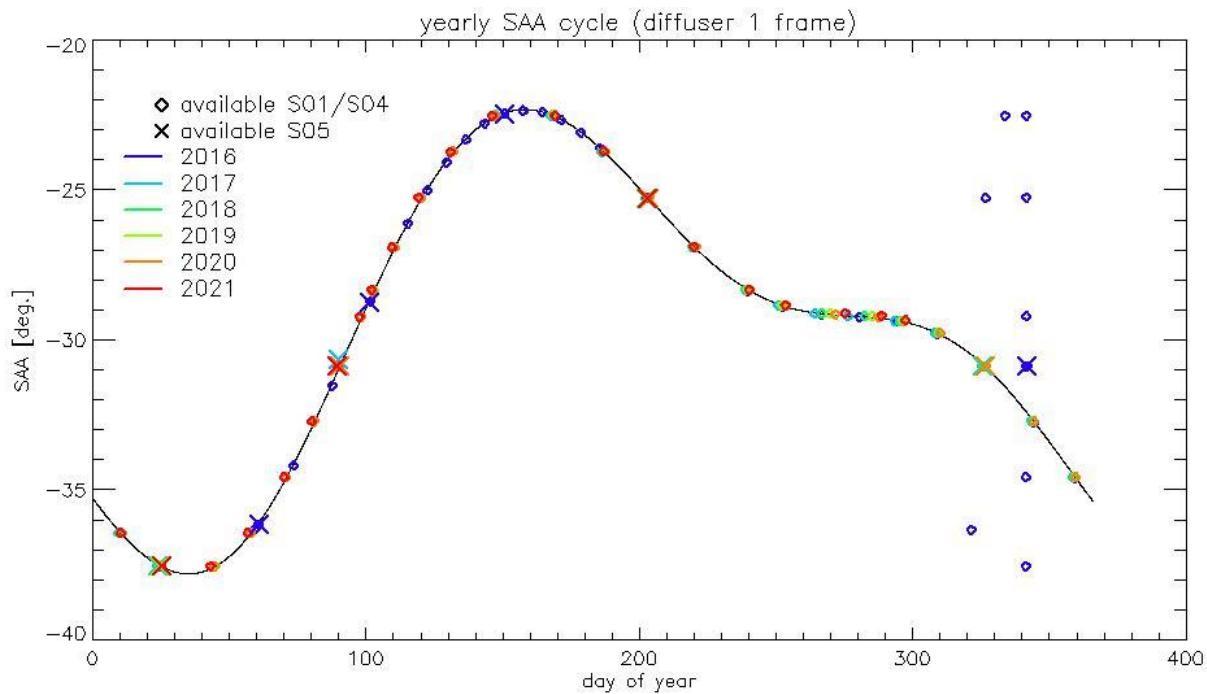


Figure 5: Sun azimuth angles during acquired OLCI-A Radiometric Calibrations (diffuser frame) on top of nominal yearly cycle (black curve). Diffuser 1 with diamonds, diffuser 2 with crosses, 2016 acquisitions in dark blue, 2017 in clear blue, 2018 in green, 2019 in light green, 2020 in orange and 2021 in red.

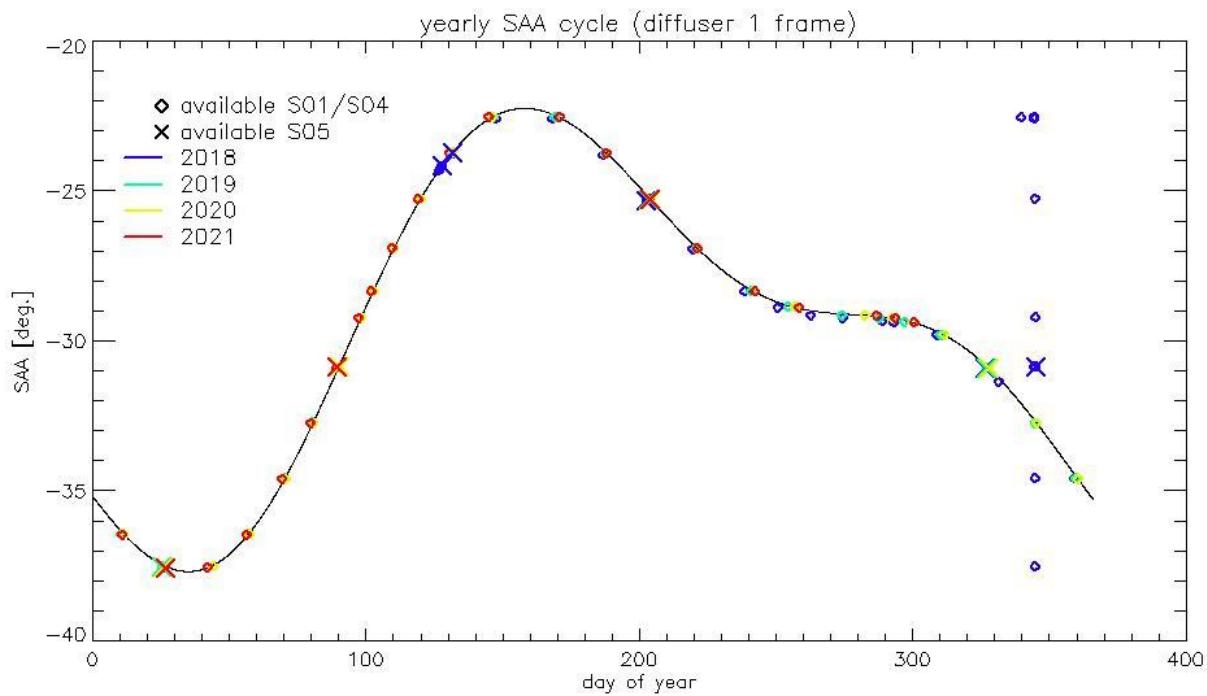


Figure 6: same as Figure 5 for OLCI-B (2018 in blue, 2019 in green, 2020 in yellow and 2021 in red).



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

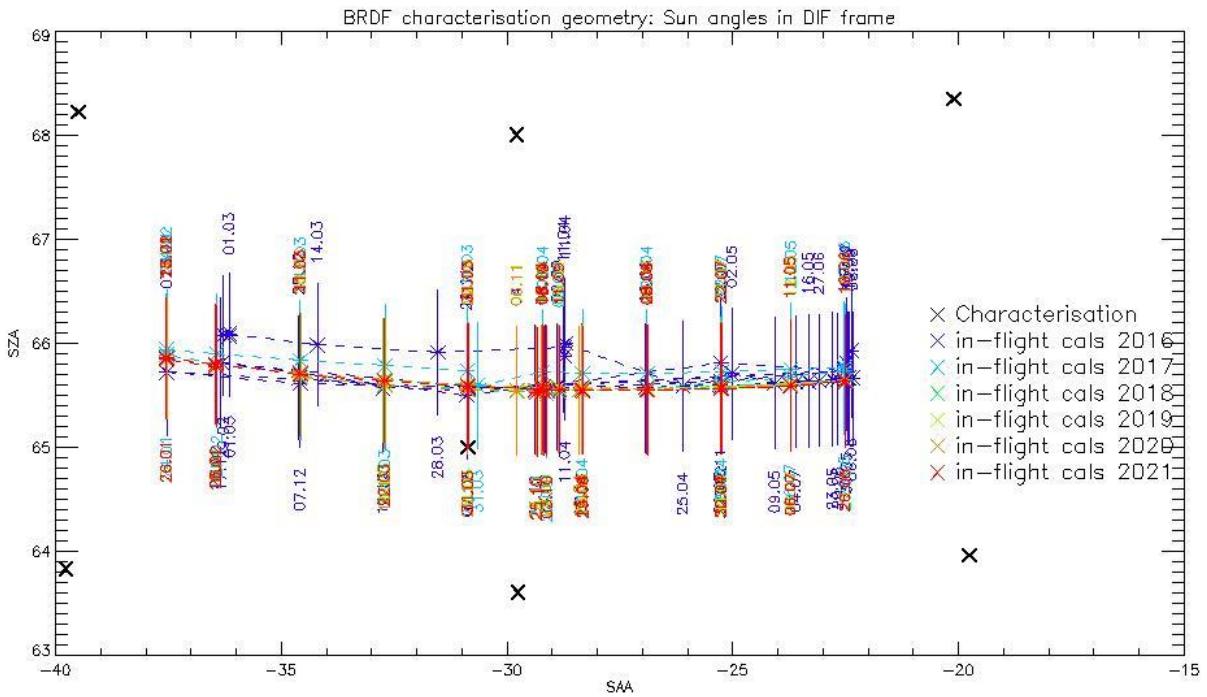


Figure 7: OLCI-A Sun geometry during radiometric Calibrations on top of characterization ones (diffuser frame)

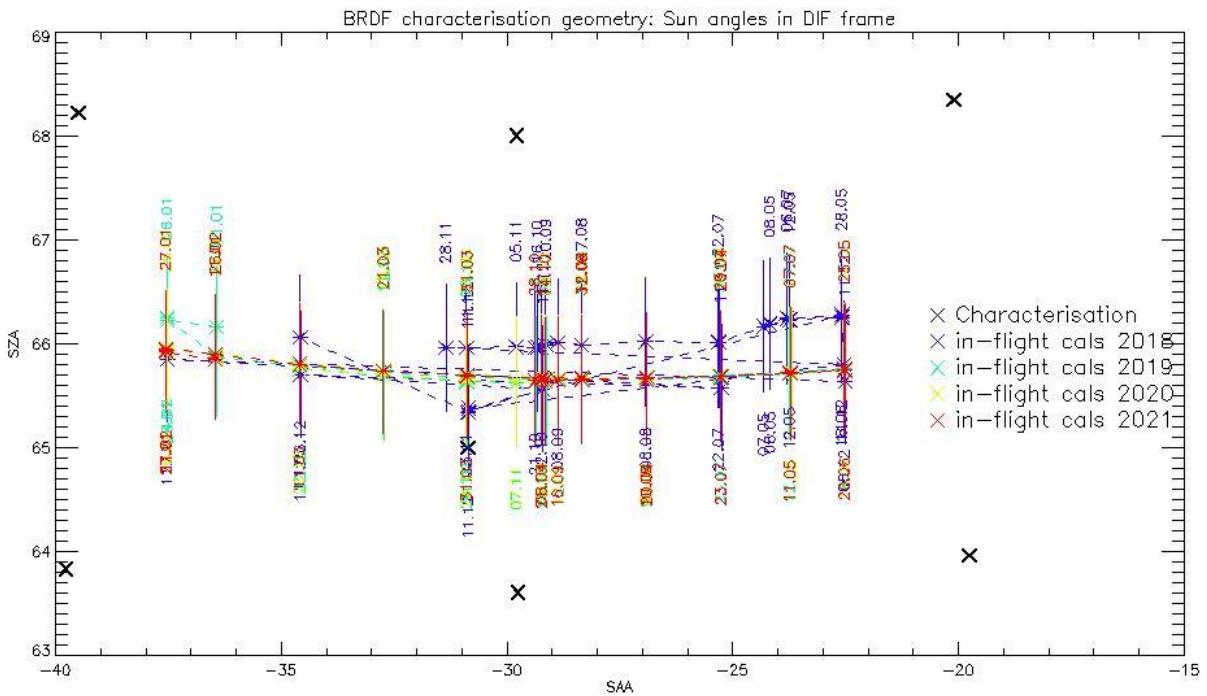


Figure 8: same as Figure 7 for OLCI-B

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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.

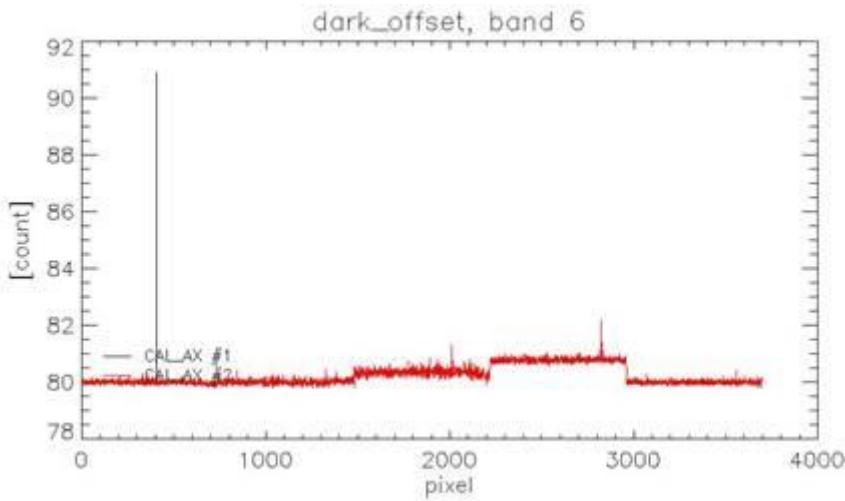


Figure 9: Dark Offset table for band Oa06 with (red) and without (black) HEP filtering (Radiometric Calibration of 22 July 2017). The strong HEP event near pixel 400 has been detected and removed by the HEP filtering.

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

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2.2.1.2 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 Oa01) 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.

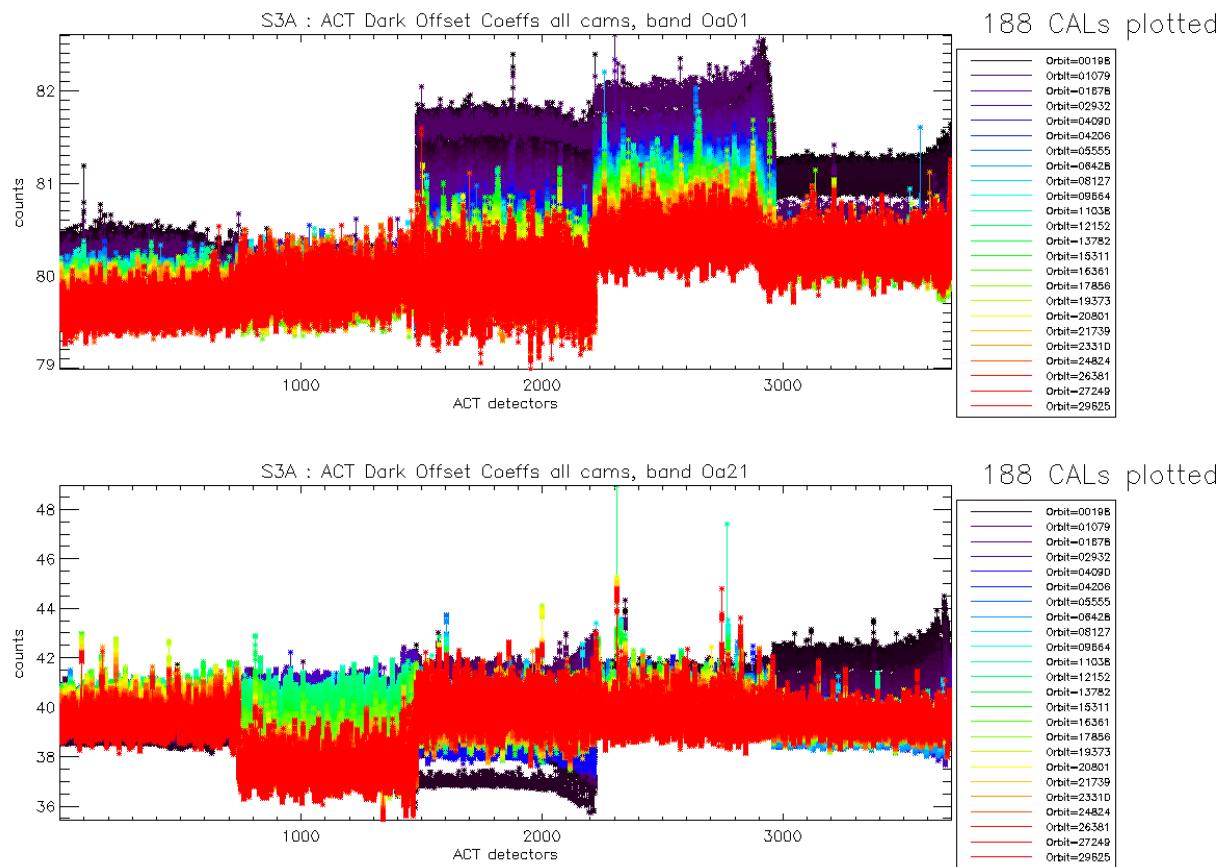


Figure 10: OLCI-A Dark Offset for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 183) for which the instrument was not thermally stable yet.



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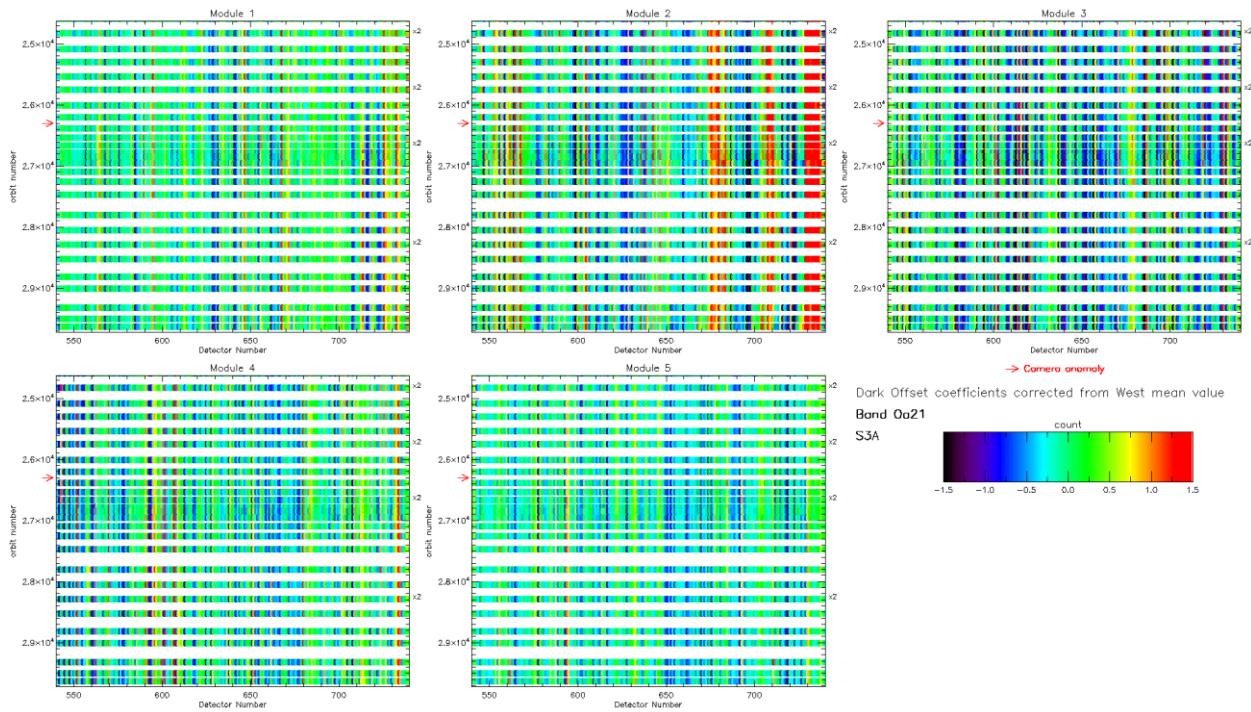


Figure 11: map of OLCI-A periodic noise for the 5 cameras, for band Oa21. X-axis is detector number (East part, from 540 to 740, where the periodic noise occurs), Y-axis is the orbit number. Y-axis range is focused on the most recent 5000 orbits. The counts have been corrected from the West detectors 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

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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.

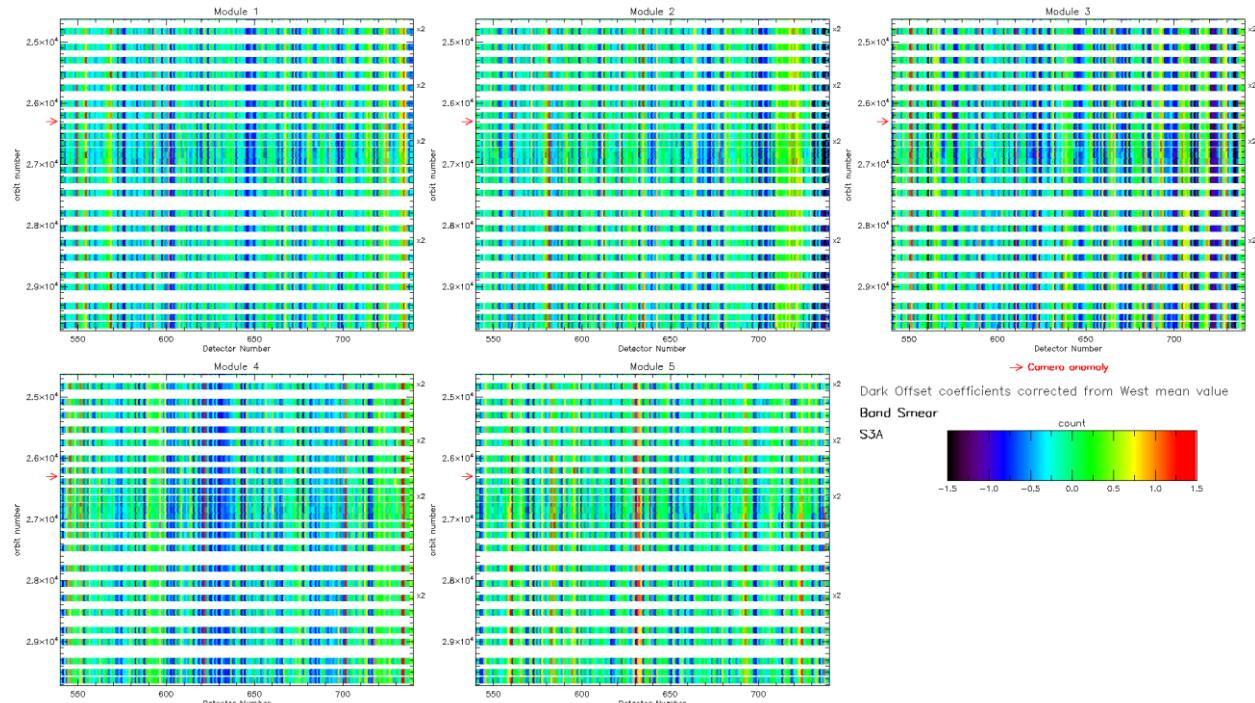


Figure 12: same as Figure 11 for smear band.

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 CALs of the current cycle.

Figure 11 and Figure 12 show that at this stage of the mission the PN is very stable in all cameras. There is no special behaviour noticed during the reporting period.

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).

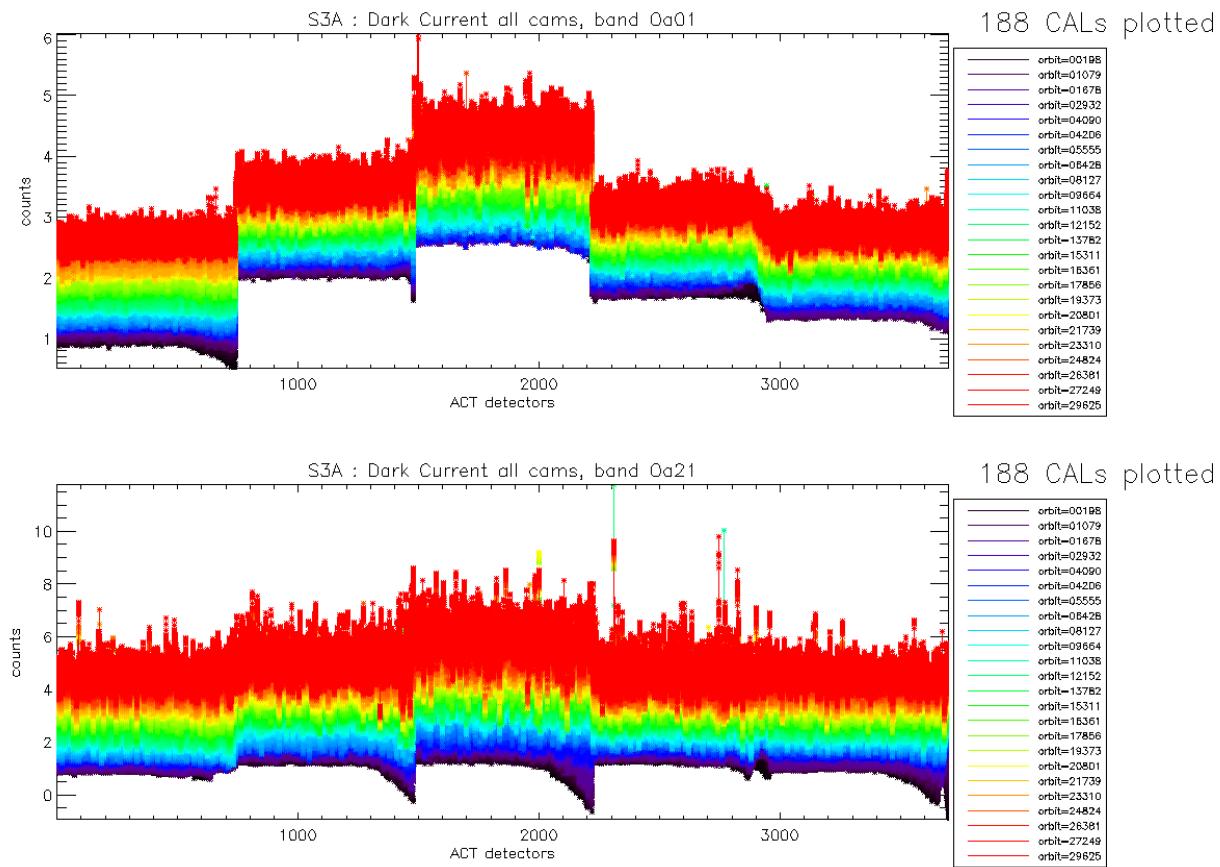


Figure 13: OLCI-A Dark Current for band Oa01 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 183) for which the instrument was not thermally stable yet.

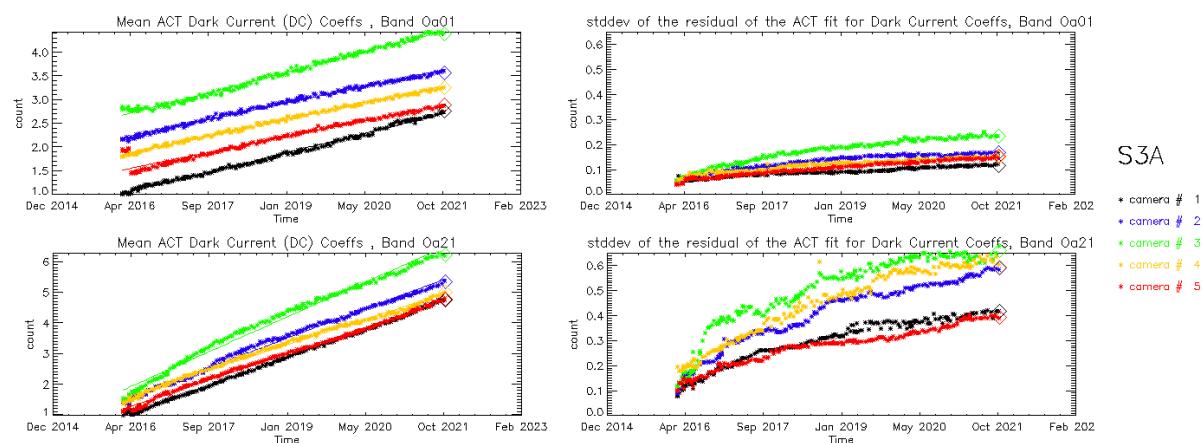


Figure 14: left column: ACT mean on 400 first detectors of OLCI-A Dark Current coefficients for spectral band Oa01 (top) and Oa21 (bottom). Right column: same as left column but for Standard deviation instead of mean. We see an increase of the DC level as a function of time especially for band Oa21.

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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).

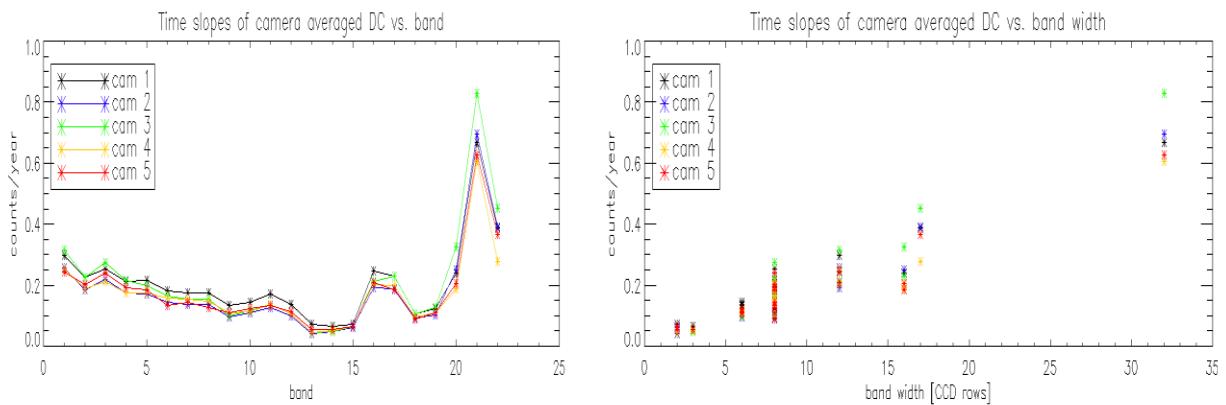


Figure 15: OLCI-A Dark current increase rates with time (in counts per year) vs. band (left) and vs. band width (right)

2.2.1.3 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 is now showing a clear stabilization.

Despite this overall stabilization, small evolutions are still noticeable in some bands/camera, like for example camera 1 in band Oa21 (upper left map in Figure 17) or in camera 1 band smear (upper left map in Figure 18).

Globally, OLCI-B PN is slightly less stabilized than OLCI-A PN.

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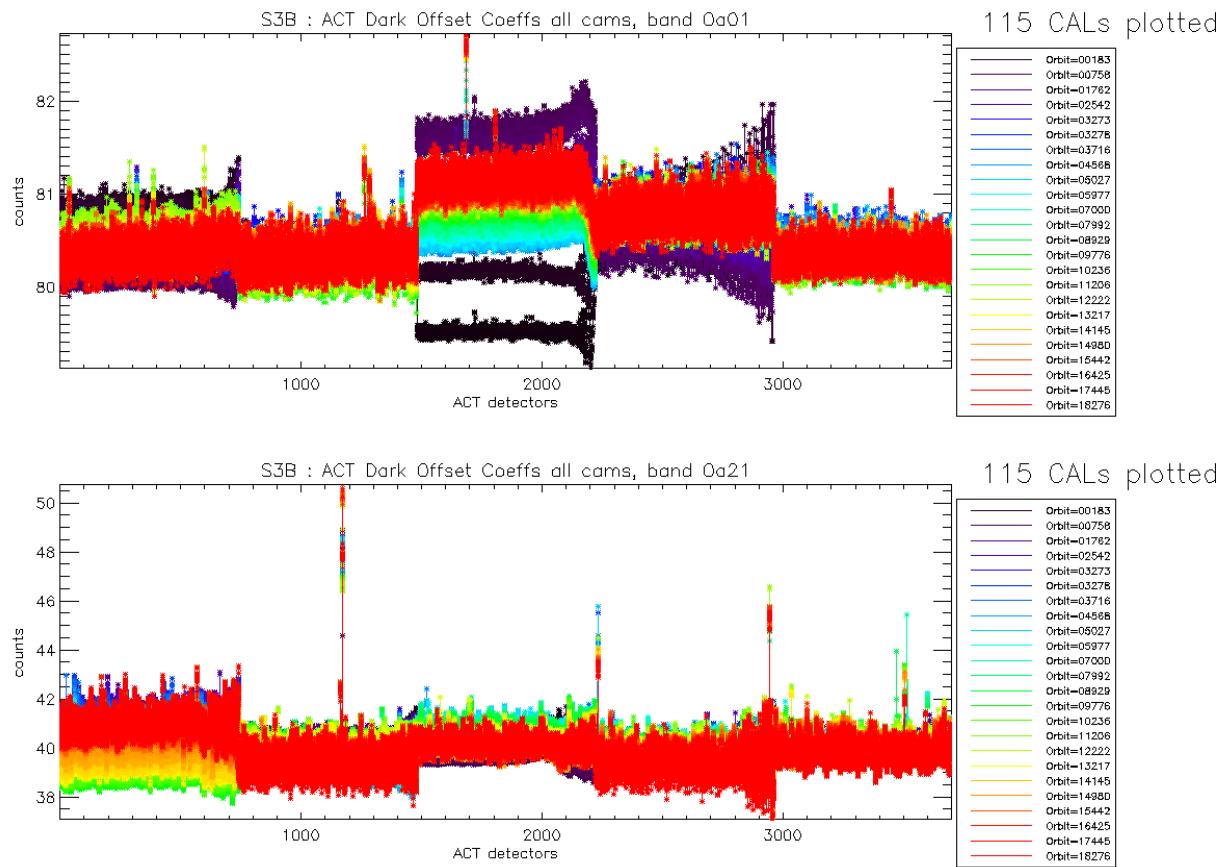


Figure 16: OLCI-B Dark Offset for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 167) for which the instrument was not thermally stable yet.



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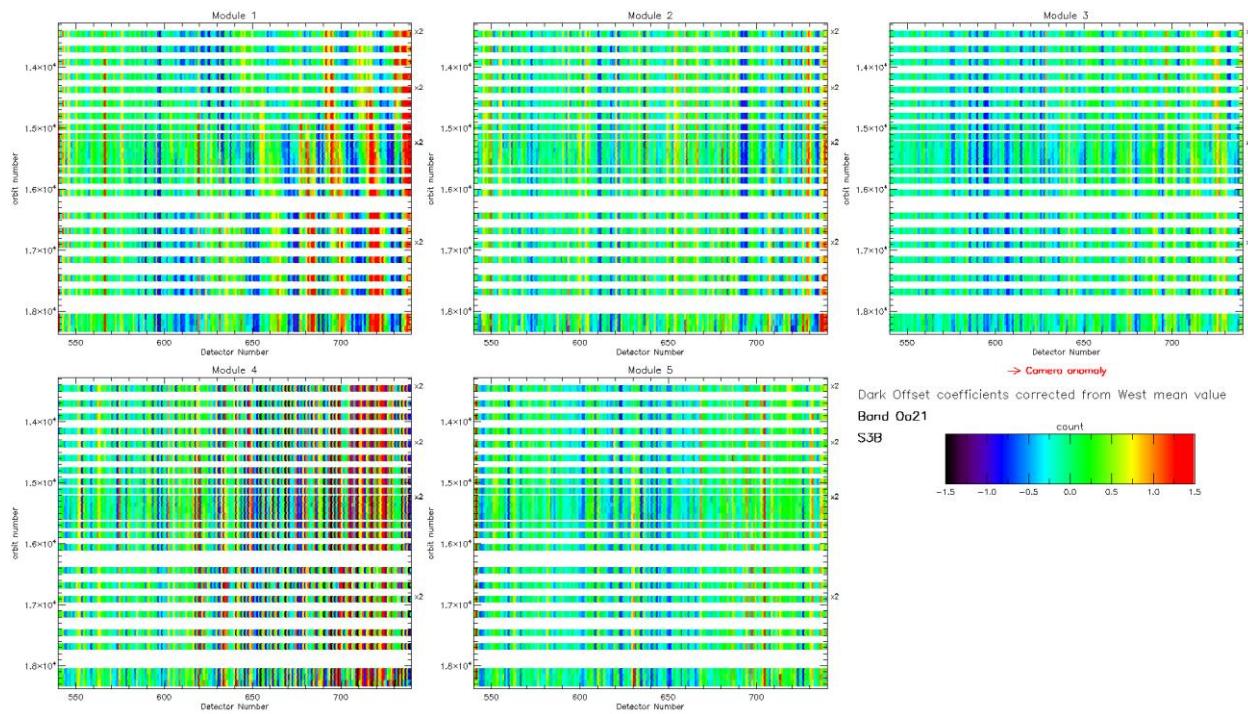


Figure 17: OLCI-B map of periodic noise for the 5 cameras, for band Oa21. X-axis is detector number (East part, from 540 to 740, where the periodic noise occurs), Y-axis is the orbit number. The counts have been corrected from the West detectors mean value (not affected by periodic noise) in order to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

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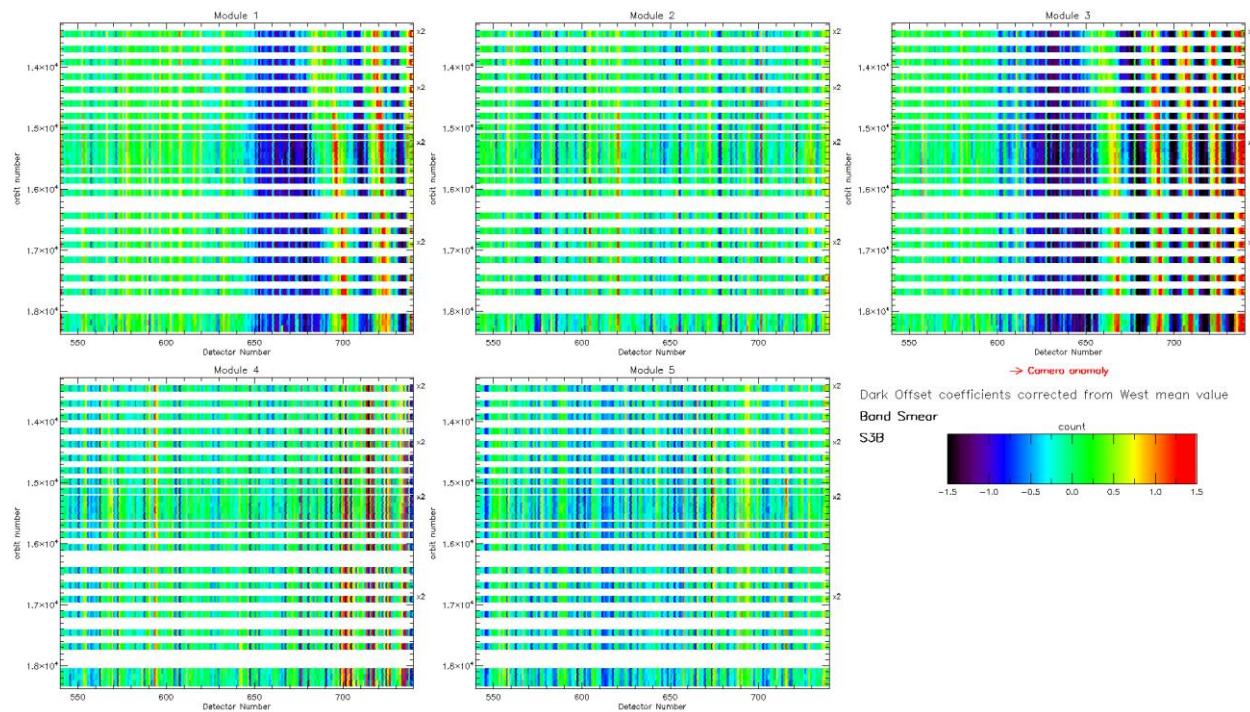


Figure 18: same as Figure 17 for smear band.

Dark Currents

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).

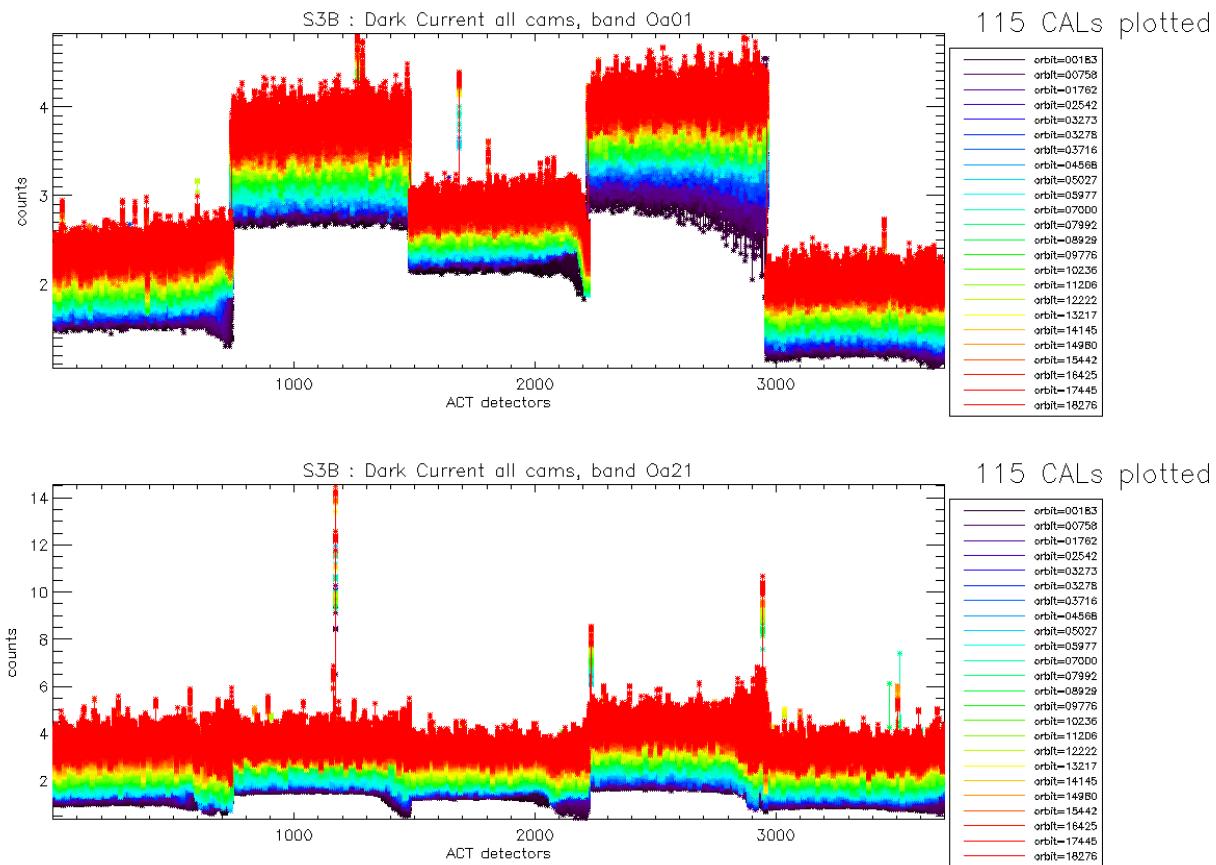
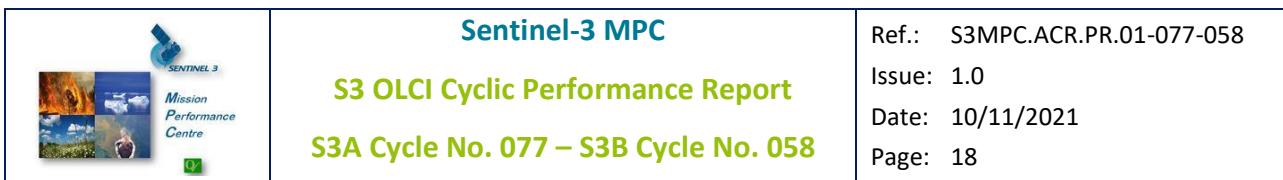


Figure 19: OLCI-B Dark Current for band Oa1 (top) and Oa21 (bottom), all radiometric calibrations so far except the first one (orbit 167) for which the instrument was not thermally stable yet.

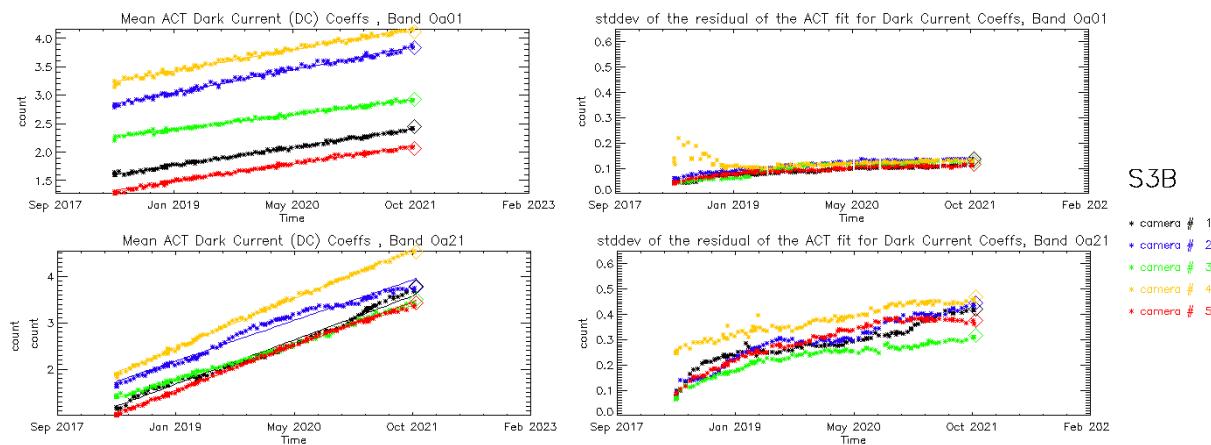


Figure 20: left column: ACT mean on 400 first detectors of OLCI-B Dark Current coefficients for spectral band Oa01 (top) and Oa21 (bottom). Right column: same as left column but for Standard deviation instead of mean. We see an increase of the DC level as a function of time especially for band Oa21.

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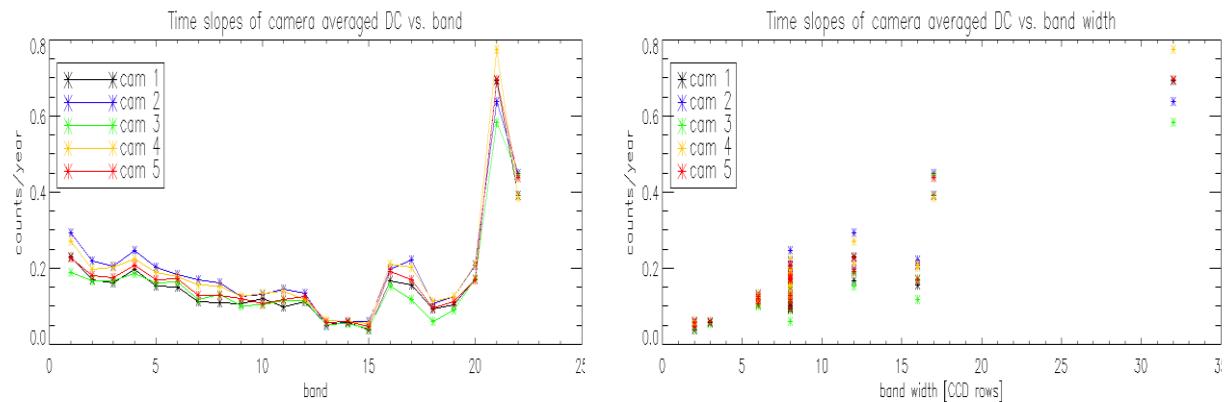


Figure 21: OLCI-B Dark Current increase rates with time (in counts per year) vs. band (left) and vs. band width (right)

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.

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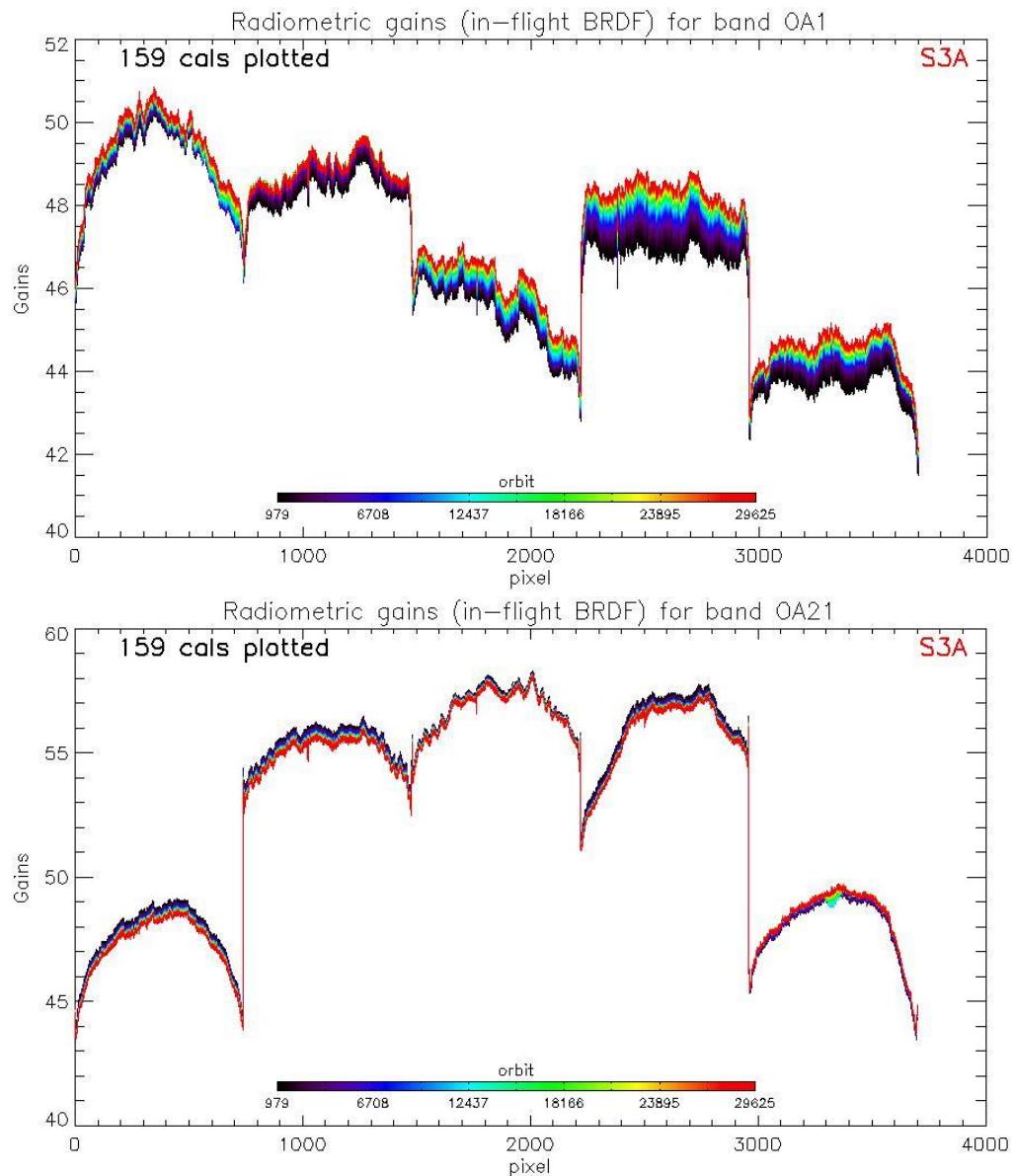


Figure 22: OLCI-A Gain Coefficients for band Oa1 (top) and Oa21 (bottom), derived using the in-flight BRDF model. The dataset is made of all diffuser 1 radiometric calibrations since orbit 979.

Figure 23 displays a summary of the time evolution of the cross-track average of the gains (in-flight BRDF, taking into account the diffuser ageing), for each module, relative to a given reference calibration (the 25/04/2016, change of OLCI channel settings). It shows that, if a significant evolution occurred during the early mission, the trends tend in general to stabilize, with some exceptions (e.g. band 1 of camera 1 and 4, bands 2 & 3 of camera 5).



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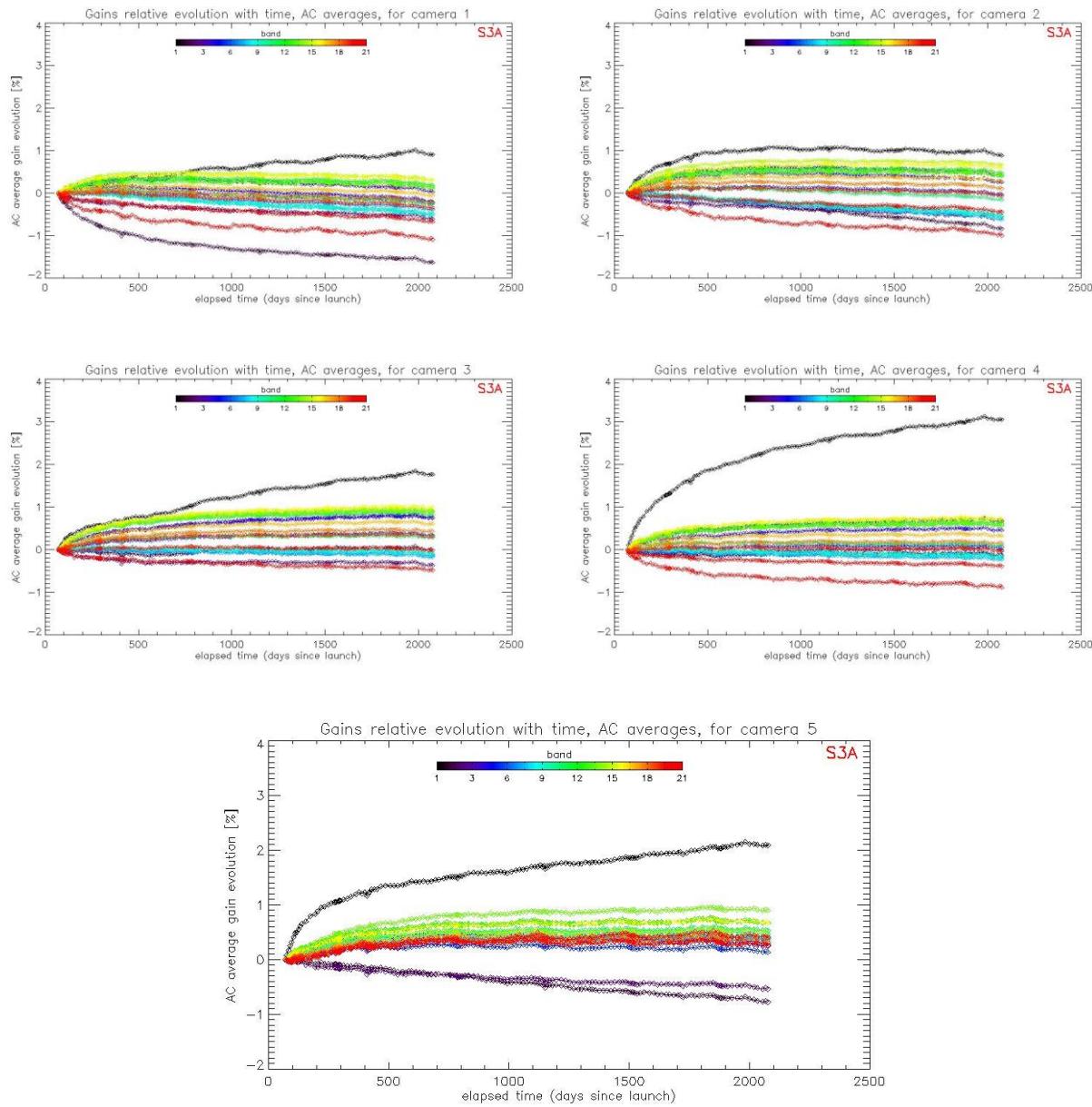


Figure 23: camera averaged gain relative evolution with respect to calibration of 25/04/2016 (change of OLCI channel settings), as a function of elapsed time since the beginning of the mission; one curve for each band (see colour code on plots), one plot for each module. The diffuser ageing has been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

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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.

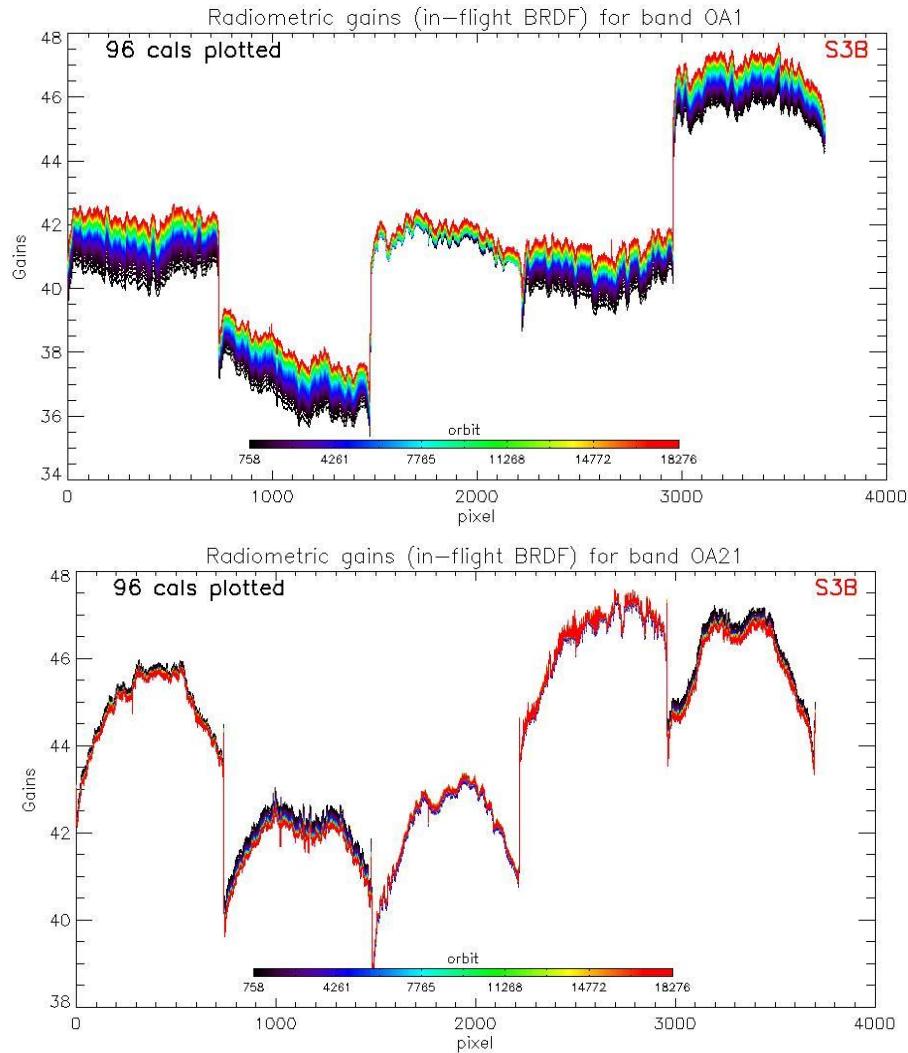


Figure 24: OLCI-B Gain Coefficients for band Oa1 (top) and Oa21 (bottom), derived using the in-flight BRDF model. The dataset is made of all diffuser 1 radiometric calibrations since orbit 758.

Figure 25 displays a summary of the time evolution of the cross-track average of the gains (in-flight BRDF, taking into account diffuser ageing), 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.



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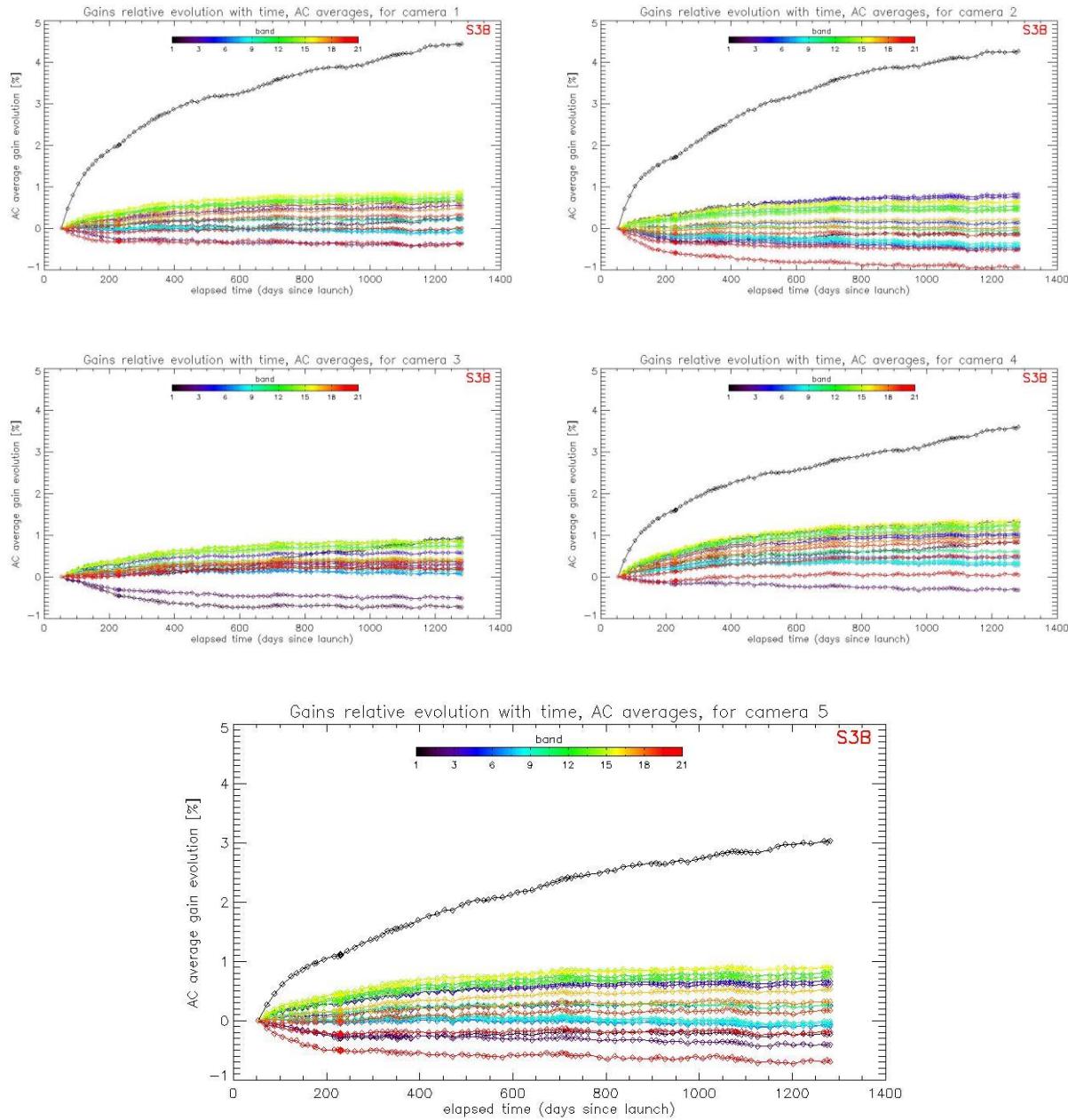


Figure 25: OLCI-B camera averaged gain relative evolution with respect to first calibration after channel programming change (18/06/2018), as a function of elapsed time since the beginning of the mission; one curve for each band (see colour code on plots), one plot for each module. The diffuser ageing has been taken into account.

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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 at PDGS the 15/10/2020 (Processing Baseline 2.71). The model has been derived on the basis of an extended Radiometric Calibration dataset (from 08/08/2016 to 08/08/2020). It includes the correction of the diffuser ageing for the six bluest bands (Oa1 to Oa6) for which it is clearly measurable. The model performance over the complete dataset (including the 31 calibrations in extrapolation over about 16 months) remains better than 0.13% for all bands except Oa01 (<0.15%) when averaged over the whole field of view (Figure 26) even though a drift is now visible for all bands with respect to the most recent data. The previous model, trained on a Radiometric Dataset limited to 28/08/2019, shows clearly a more pronounced 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. Performance shown on Figure 26 adopts, as for OLCI-B, the multiple model approach, i.e. different models (two for OLCI-A, three for OLCI-B since PB 1.57) are used to cover the whole mission (red dashed line on Figure 26), each model being fitted on a partial dataset (green dashed line on Figure 26) whose coverage is optimised to provide best performance.

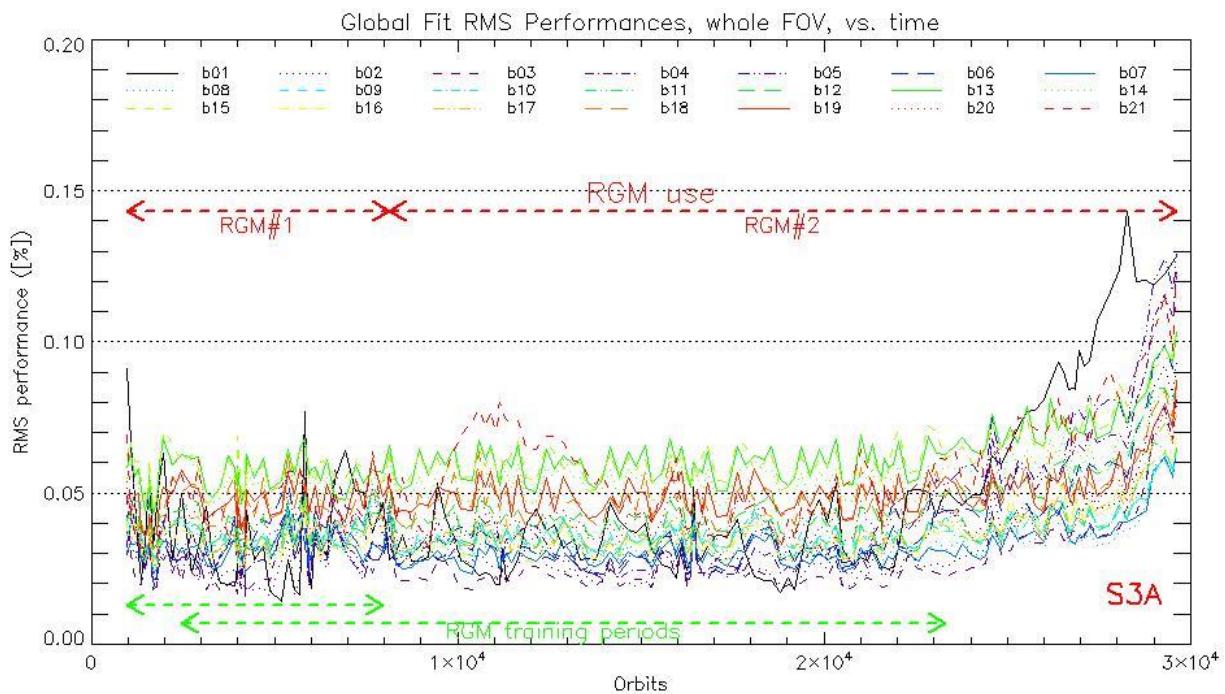


Figure 26: RMS performance of the OLCI-A Gain Model of the current processing baseline as a function of orbit.



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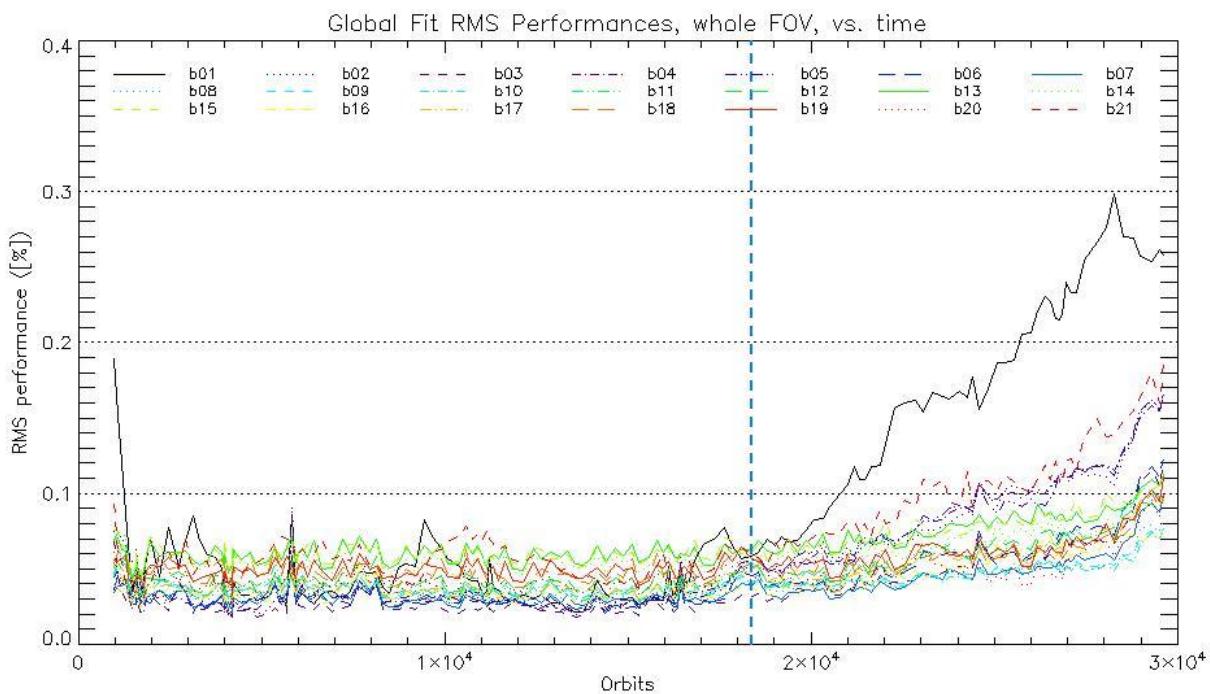


Figure 27: RMS performance of the OLCI-A Gain Model of the previous Processing Baseline as a function of orbit.
The blue vertical dotted line defines the limit from which the gain model starts to be extrapolated (i.e. it corresponds to the most recent CAL of the dataset used to build the model).

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



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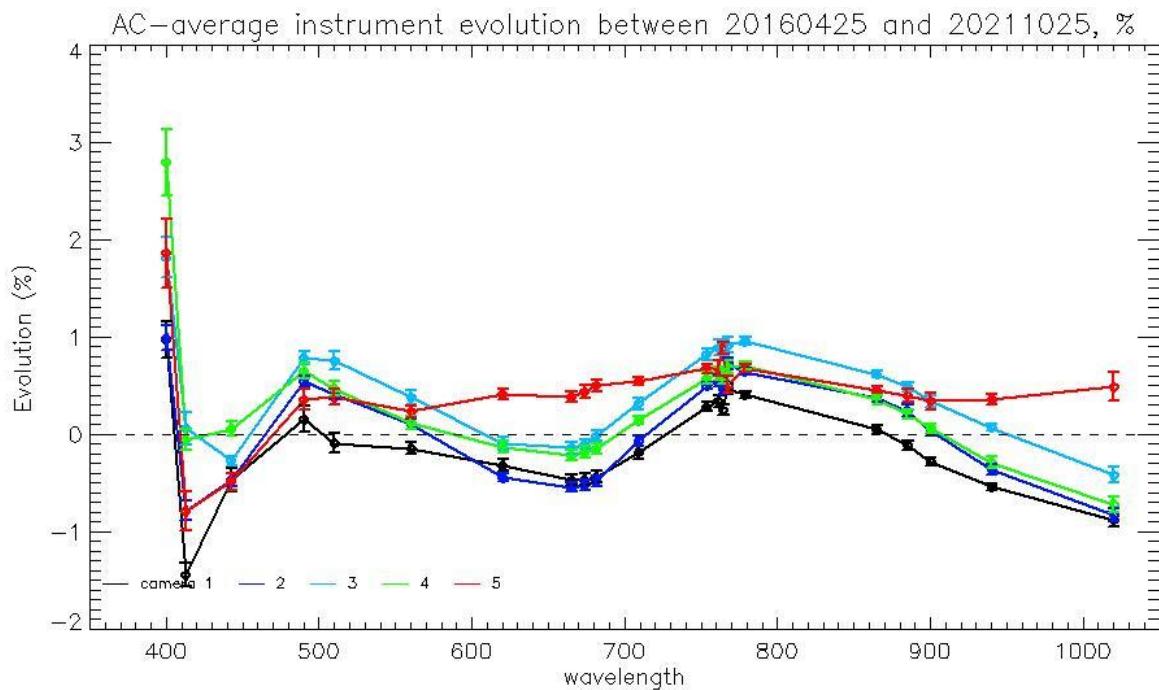


Figure 28: OLCI-A Camera-averaged instrument evolution since channel programming change (25/04/2016) and up to the most recent calibration (25/10/2021) versus wavelength.

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 62 clearly demonstrate the improvement brought by the new model whatever the level of detail.



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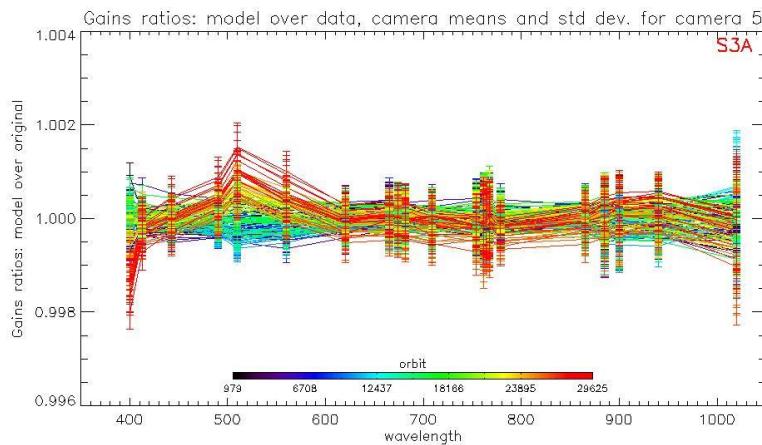
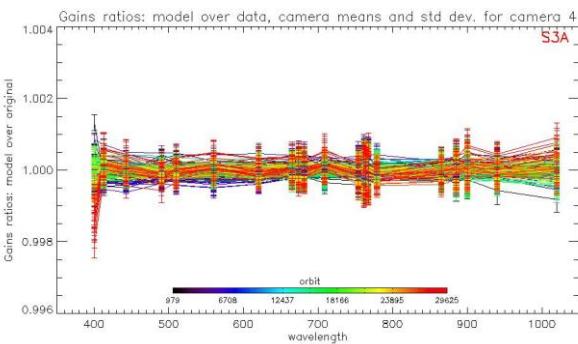
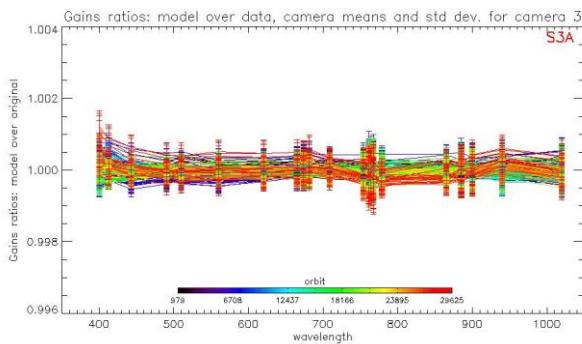
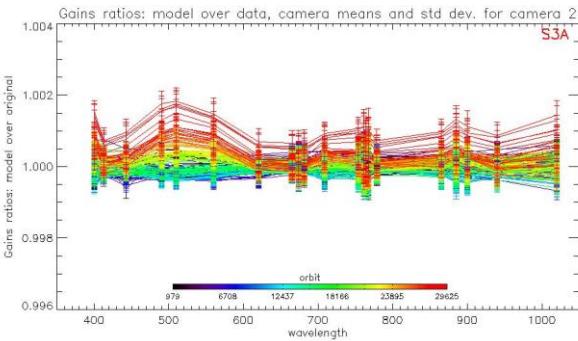
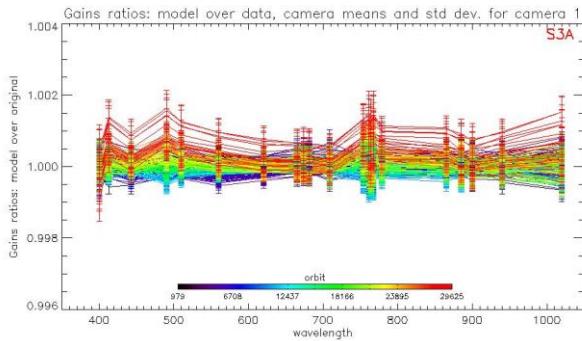


Figure 29: For the 5 cameras: OLCI-A Evolution model performance, as camera-average and standard deviation of ratio of Model over Data vs. wavelength, for each orbit of the test dataset, including 31 calibrations in extrapolation, with a colour code for each calibration from blue (oldest) to red (most recent).



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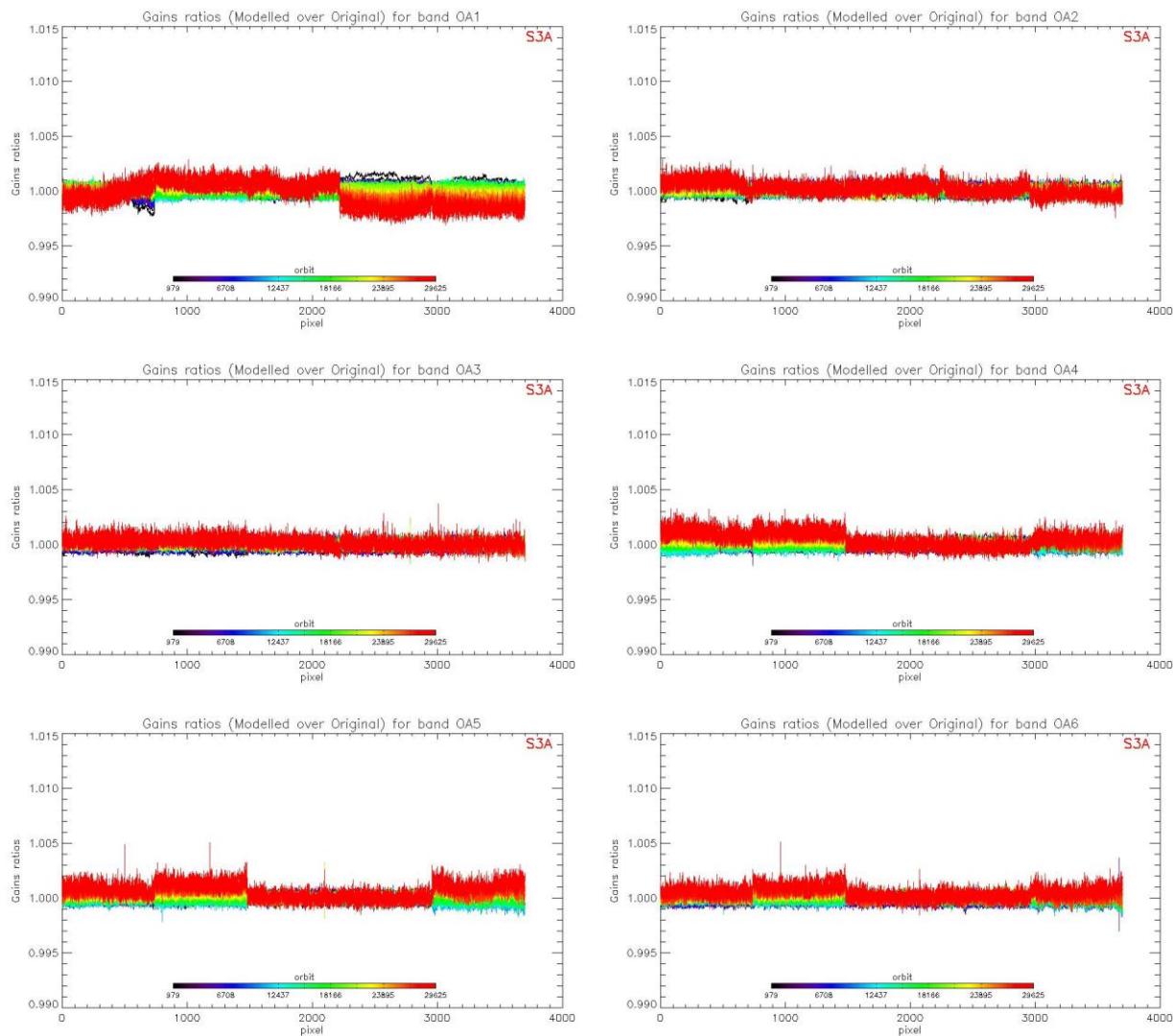


Figure 30: OLCI-A evolution model performance, as ratio of Model over Data vs. pixels, all cameras side by side, over the whole current calibration dataset (since instrument programing update), including 31 calibrations in extrapolation, channels Oa1 to Oa6.



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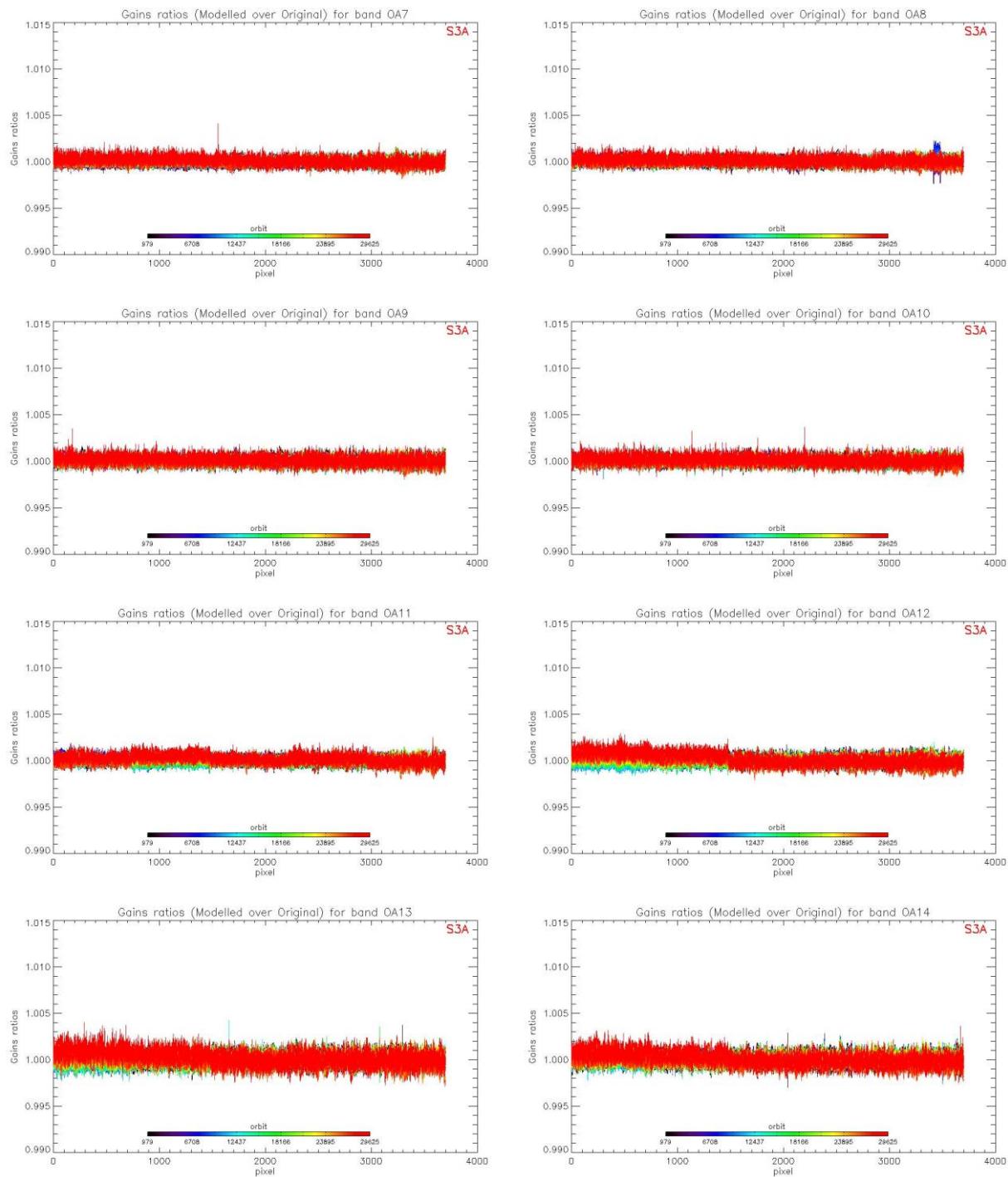


Figure 31: same as Figure 30 for channels Oa7 to Oa14.



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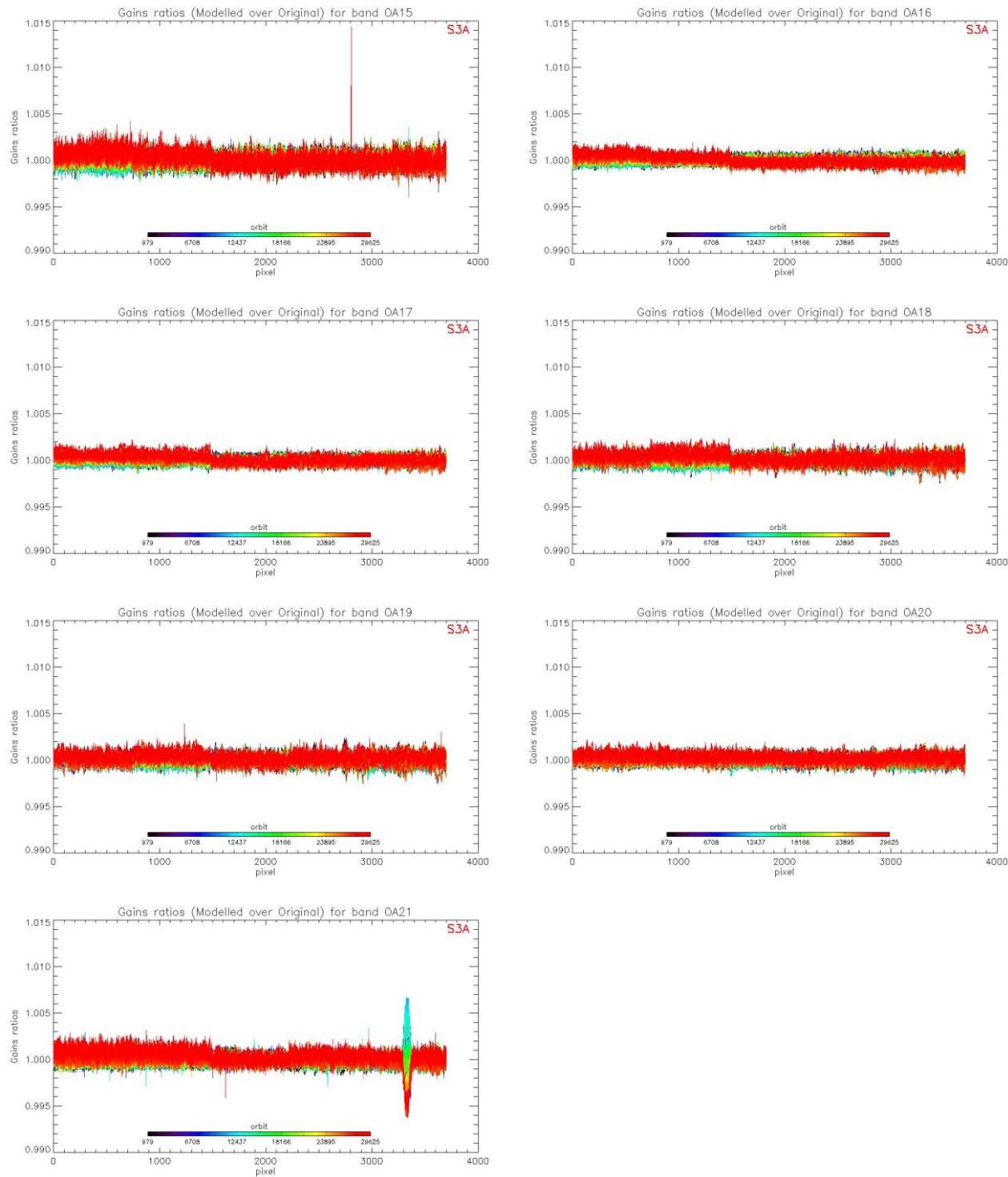


Figure 32: same as Figure 30 for channels Oa15 to Oa21.

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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 11th December 2018 Yaw Manoeuvres), has been refreshed and deployed at PDGS on 29th July 2021 (Processing Baseline 1.57). The model has been derived on the basis of a more recent Radiometric Calibration dataset (from 18/06/2019 to 20/06/2021). 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 8 calibrations in extrapolation over about 5 months) is illustrated in Figure 33. It remains better than 0.07% when averaged over the whole field of view for all band except Oa01 (< 0.09%). The previous model, trained on a Radiometric Dataset limited to 09/08/2020, shows a strong drift of the model with respect to most recent data, especially for band Oa01 (Figure 34). Comparison of the two figures shows the improvement brought by the updated Model over all the mission.

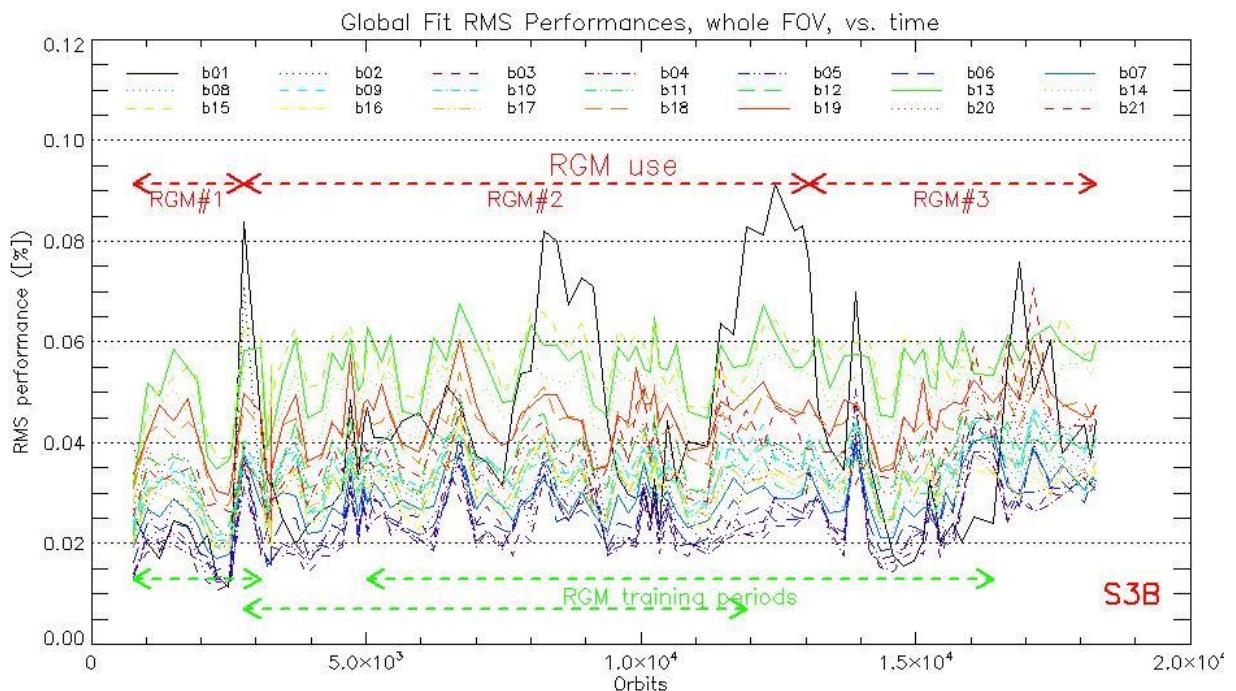


Figure 33: RMS performance of the OLCI-B Gain Model of the current processing baseline as a function of orbit.



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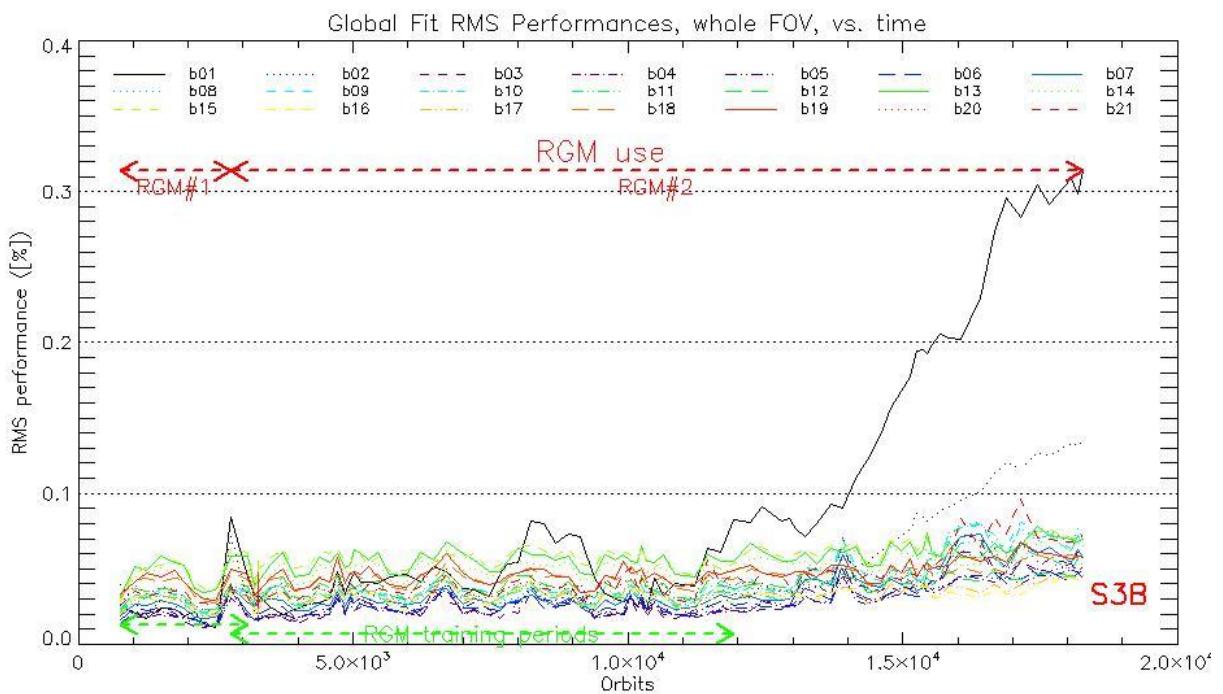


Figure 34: RMS performance of the OLCI-B Gain Model of the previous processing baseline as a function of orbit (please note the different vertical scale with respect to Figure 33).

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The overall instrument evolution since channel programming change (18/06/2018) is shown on Figure 35.

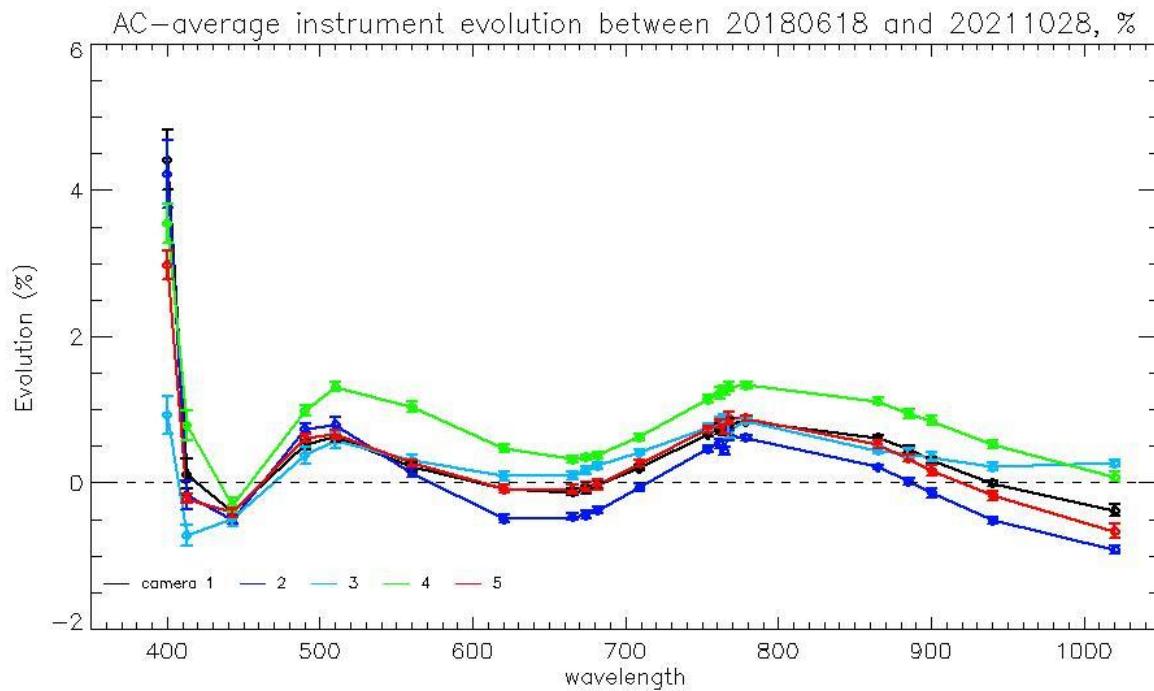


Figure 35: OLCI-B Camera-averaged instrument evolution since channel programming change (18/06/2018) and up to most recent calibration (28/10/2021) versus wavelength.

The overall per camera performance, as a function of wavelength, and at each orbit is shown on Figure 36 as the average and standard deviation of the model over data ratio.

Finally, Figure 37 to Figure 39 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.



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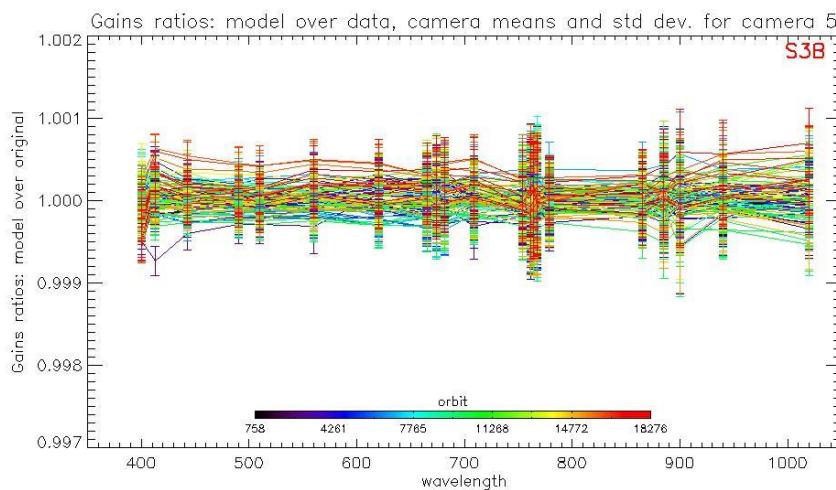
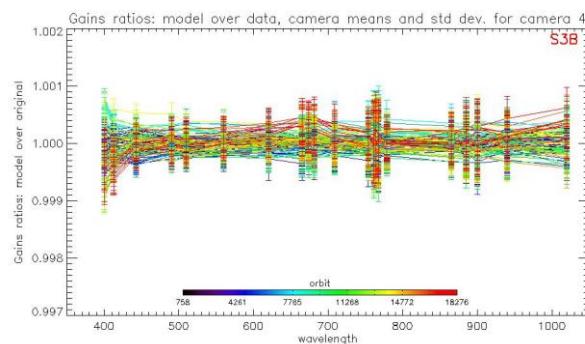
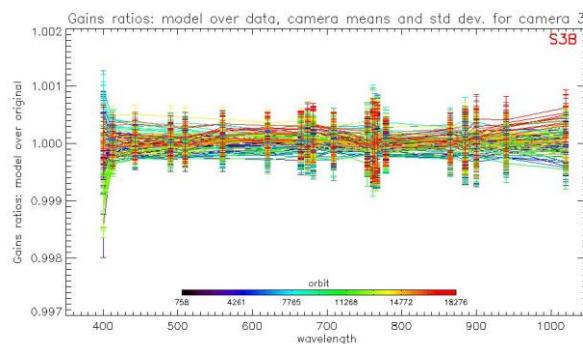
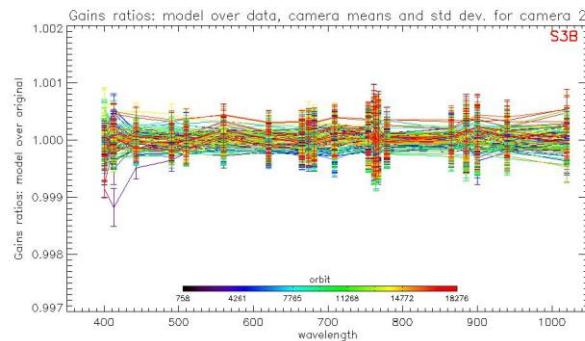
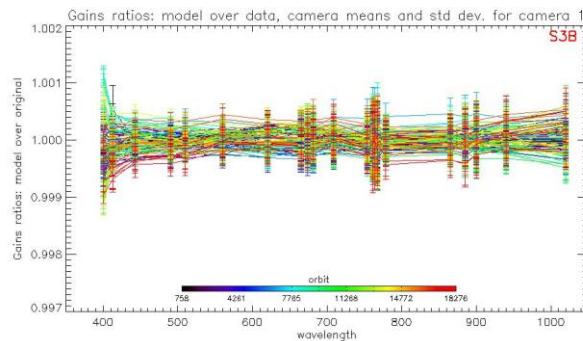


Figure 36: For the 5 cameras: OLCI-B Evolution model performance, as camera-average and standard deviation of ratio of Model over Data vs. wavelength, for each orbit of the test dataset, including 8 calibrations in extrapolation, with a colour code for each calibration from blue (oldest) to red (most recent).



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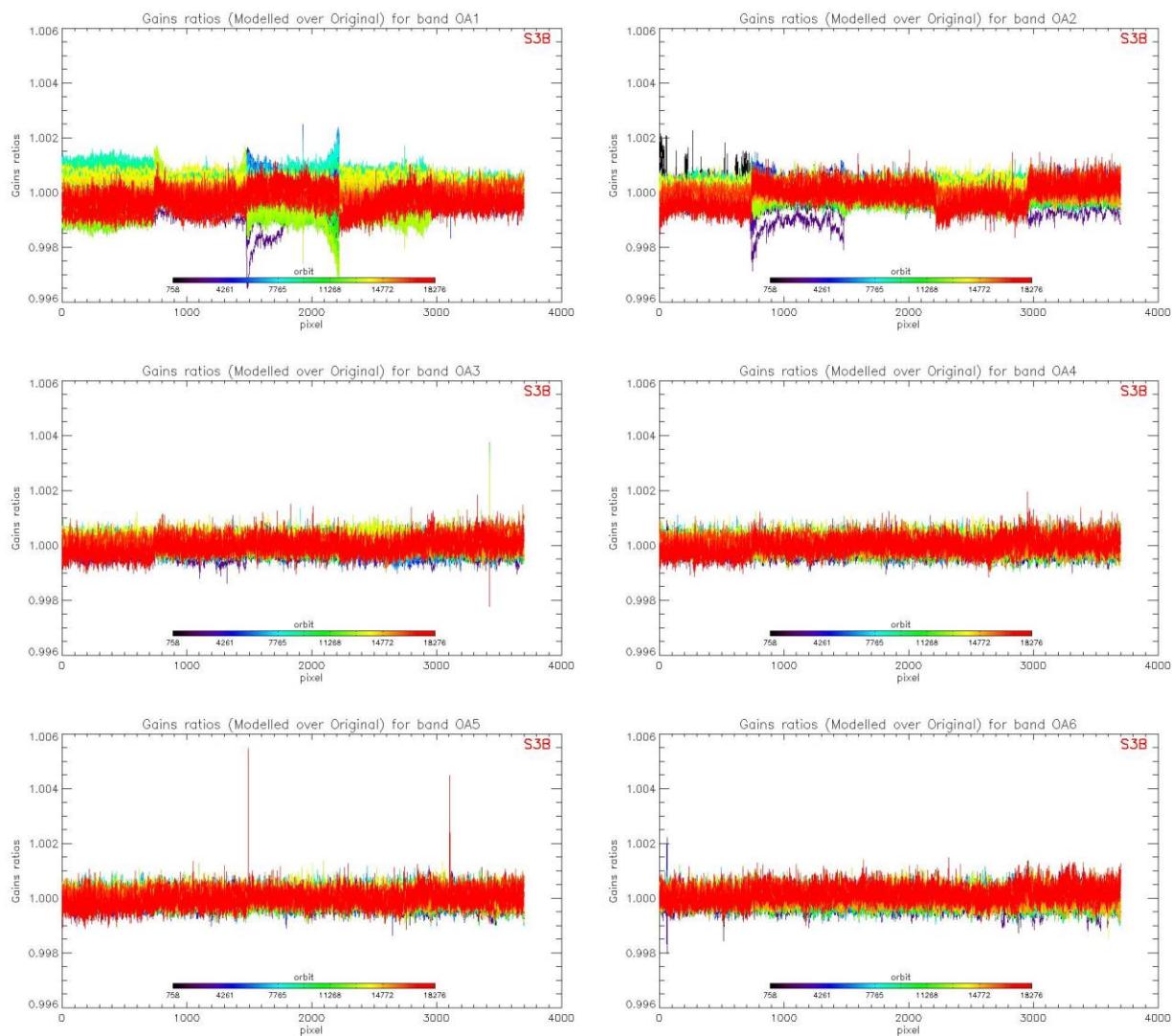


Figure 37: OLCI-B evolution model performance, as ratio of Model over Data vs. pixels, all cameras side by side, over the whole current calibration dataset (since instrument programming update), including 8 calibrations in extrapolation, channels Oa1 to Oa6.



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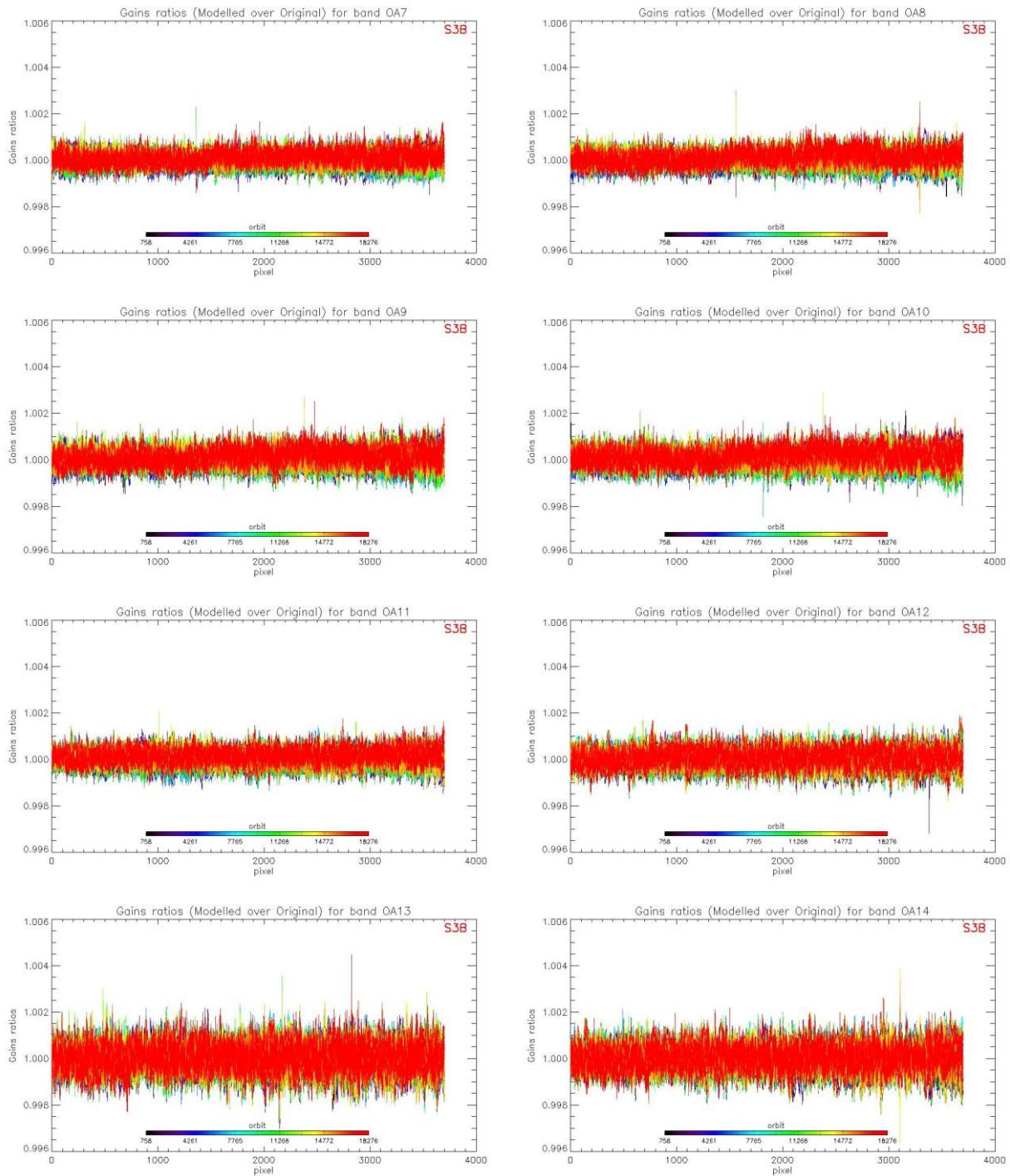


Figure 38: same as Figure 37 for channels Oa7 to Oa14.



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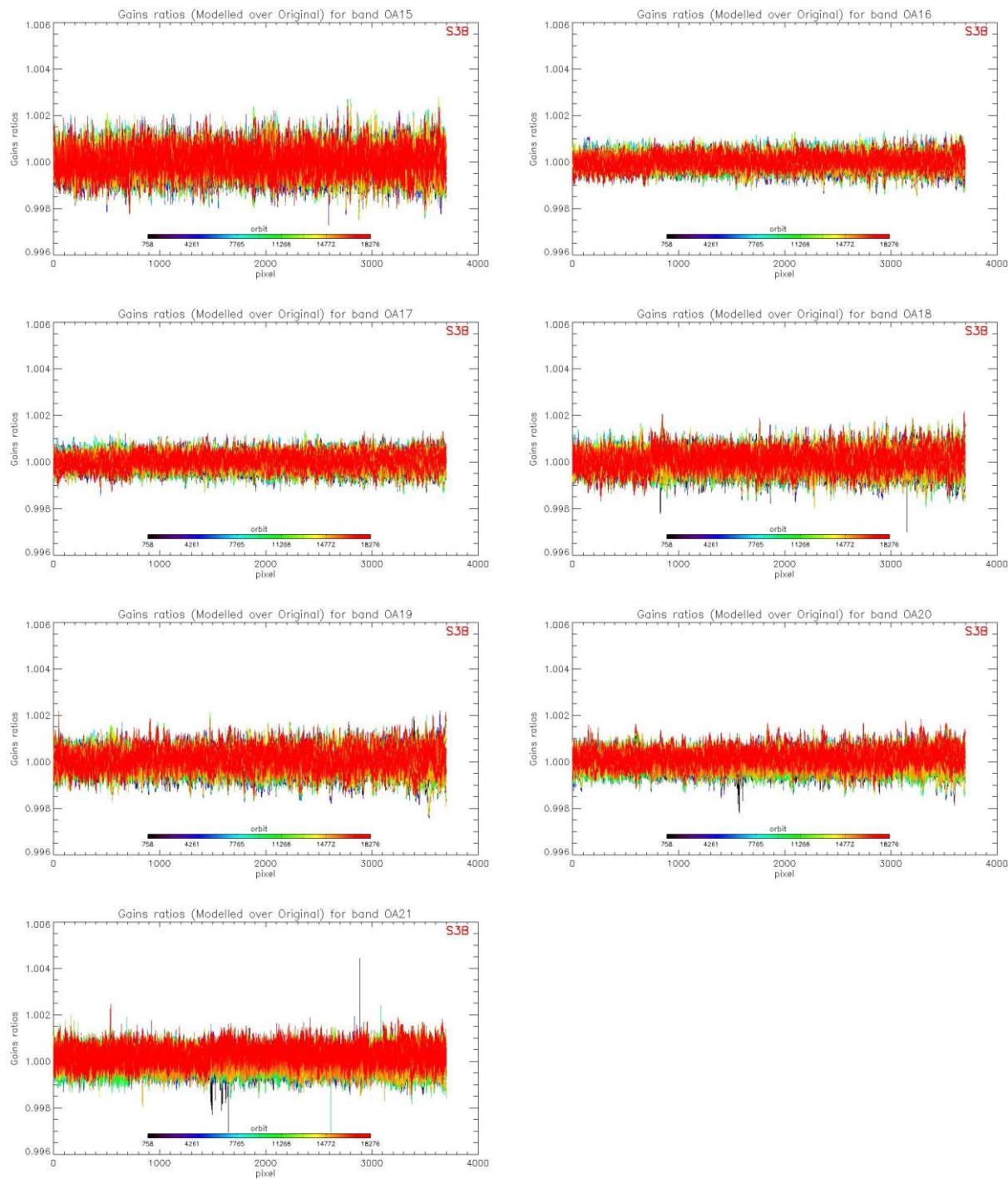


Figure 39: same as Figure 37 for channels Oa15 to Oa21.

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

2.2.3.1 OLCI-A

There has been no sequence S05 (reference diffuser) for OLCI-A during acquisition cycle 077.

Consequently, the last ageing results, presented in CPR #74/#55 (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 058.

Consequently, the last ageing results, presented in CPR #74/#55 (S3A/S3B), stay valid.

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

2.2.4.1.1 OLCI-A

A new CAL_AX ADF has been delivered to PDGS during the report period for OLCI-A: it contains an updated Radiometric Gain Model, fitted on an extended radiometric calibration data set:

S3A_OL_1_CAL_AX_20211027T000000_20991231T235959_20211029T120000_____MPC_O_AL_025.SEN3

2.2.4.1.2 OLCI-B

A new CAL_AX ADF has been delivered to PDGS during the report period for OLCI-B: it contains an updated Radiometric Gain Model, fitted on an extended radiometric calibration data set processed using a revised Ageing model.

S3B_OL_1_CAL_AX_20211027T000000_20991231T235959_20211029T120000_____MPC_O_AL_015.SEN3

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 077 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.

	<p style="text-align: center;">Sentinel-3 MPC S3 OLCI Cyclic Performance Report S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 39
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2.3 Spectral Calibration [OLCI-L1B-CV-400]

2.3.1 OLCI-A

There has been no S02+S03 nor S09 Spectral Calibration for OLCI-A in the reporting period.

Consequently, the last spectral calibration results, presented in CPR #74/#55 (S3A/S3B), stay valid.

2.3.2 OLCI-B

There has been no S02+S03 nor S09 Spectral Calibration for OLCI-B in the reporting period.

Consequently, the last spectral calibration results, presented in CPR #74/#55 (S3A/S3B), stay valid.

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 40.

SNR computed for all calibration data as a function of orbit number for band Oa01 (the less stable band) is presented in Figure 41.

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

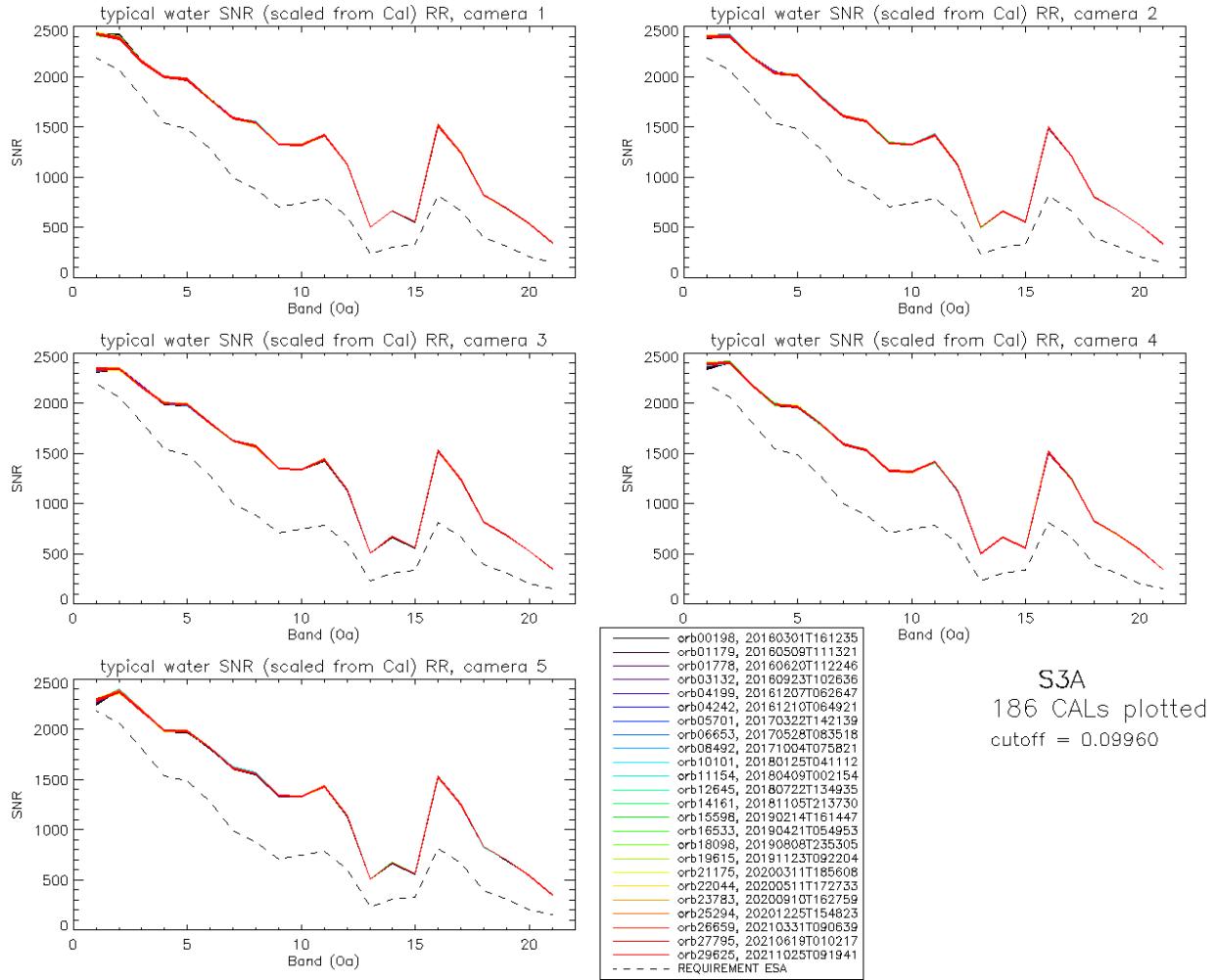


Figure 40: OLCI-A Signal to Noise ratio as a function of the spectral band for the 5 cameras. These results have been computed from radiometric calibration data. All calibrations except first one (orbit 183) are presents with the colours corresponding to the orbit number (see legend). The SNR is very stable with time: the curves for all orbits are almost superimposed. The dashed curve is the ESA requirement.

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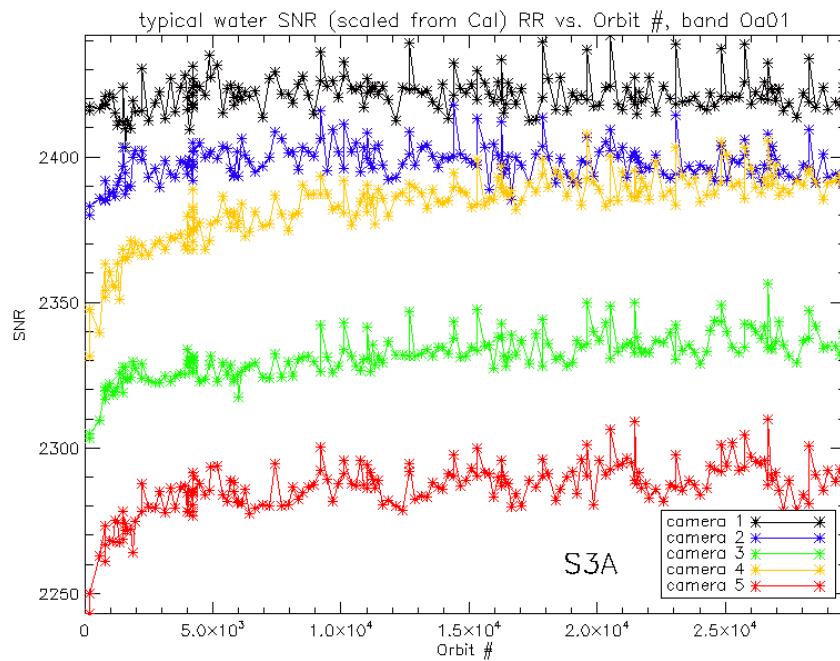


Figure 41: long-term stability of the SNR estimates from Calibration data, example of channel Oa1.

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: $SNR(L) = SNR(L_{ref}) \cdot \sqrt{\frac{L}{L_{ref}}}$. Following the same assumption, values at Full Resolution (300m) can be derived from RR ones as 4 times smaller.

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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 $mW.sr^{-1}.m^{-2}.nm^{-1}$).

nm	L _{ref}	SNR	C1		C2		C3		C4		C5		All	
			LU	RQT	avg	std	avg	std	avg	std	avg	std	avg	std
400.000	63.0	2188	2421	6.2	2398	6.2	2331	7.7	2383	11.9	2286	9.1	2364	6.9
412.000	74.1	2061	2388	9.3	2404	6.7	2339	4.9	2401	4.9	2380	9.1	2382	5.5
442.000	65.6	1811	2158	5.8	2196	6.0	2164	4.9	2185	4.1	2194	5.7	2179	4.0
490.000	51.2	1541	2000	4.6	2036	4.9	1998	4.1	1984	4.4	1988	4.6	2001	3.2
510.000	44.4	1488	1979	5.4	2014	5.0	1985	4.5	1967	4.4	1985	4.3	1986	3.5
560.000	31.5	1280	1775	4.5	1802	4.2	1803	4.6	1794	3.9	1818	3.4	1799	3.0
620.000	21.1	997	1591	4.1	1609	4.3	1624	3.2	1593	3.2	1615	3.5	1606	2.6
665.000	16.4	883	1546	4.2	1557	4.4	1566	4.0	1533	3.6	1561	3.7	1553	3.0
674.000	15.7	707	1328	3.4	1337	3.7	1350	2.8	1323	3.2	1342	3.5	1336	2.5
681.000	15.1	745	1319	3.6	1326	3.2	1338	2.7	1314	2.5	1333	3.4	1326	2.2
709.000	12.7	785	1420	4.2	1420	4.1	1435	3.3	1414	3.5	1431	3.1	1424	2.7
754.000	10.3	605	1127	3.1	1121	2.8	1136	3.2	1125	2.5	1139	2.7	1130	2.2
761.000	6.1	232	502	1.1	498	1.1	505	1.2	501	1.1	508	1.4	503	0.8
764.000	7.1	305	663	1.6	658	1.6	668	2.0	661	1.5	670	2.1	664	1.3
768.000	7.6	330	558	1.4	554	1.3	562	1.3	557	1.3	564	1.3	559	1.0
779.000	9.2	812	1516	4.7	1498	4.6	1526	5.2	1512	4.9	1526	5.0	1516	4.1
865.000	6.2	666	1244	3.6	1213	3.5	1239	3.8	1246	3.5	1250	2.8	1238	2.8
885.000	6.0	395	823	1.7	801	1.6	814	1.9	824	1.5	831	1.6	819	1.1
900.000	4.7	308	691	1.6	673	1.3	683	1.6	693	1.5	698	1.5	688	1.0
940.000	2.4	203	534	1.2	522	1.2	525	0.9	539	1.1	542	1.3	532	0.7
1020.000	3.9	152	345	0.9	337	0.8	348	0.7	345	0.8	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 42.

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 43.

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.

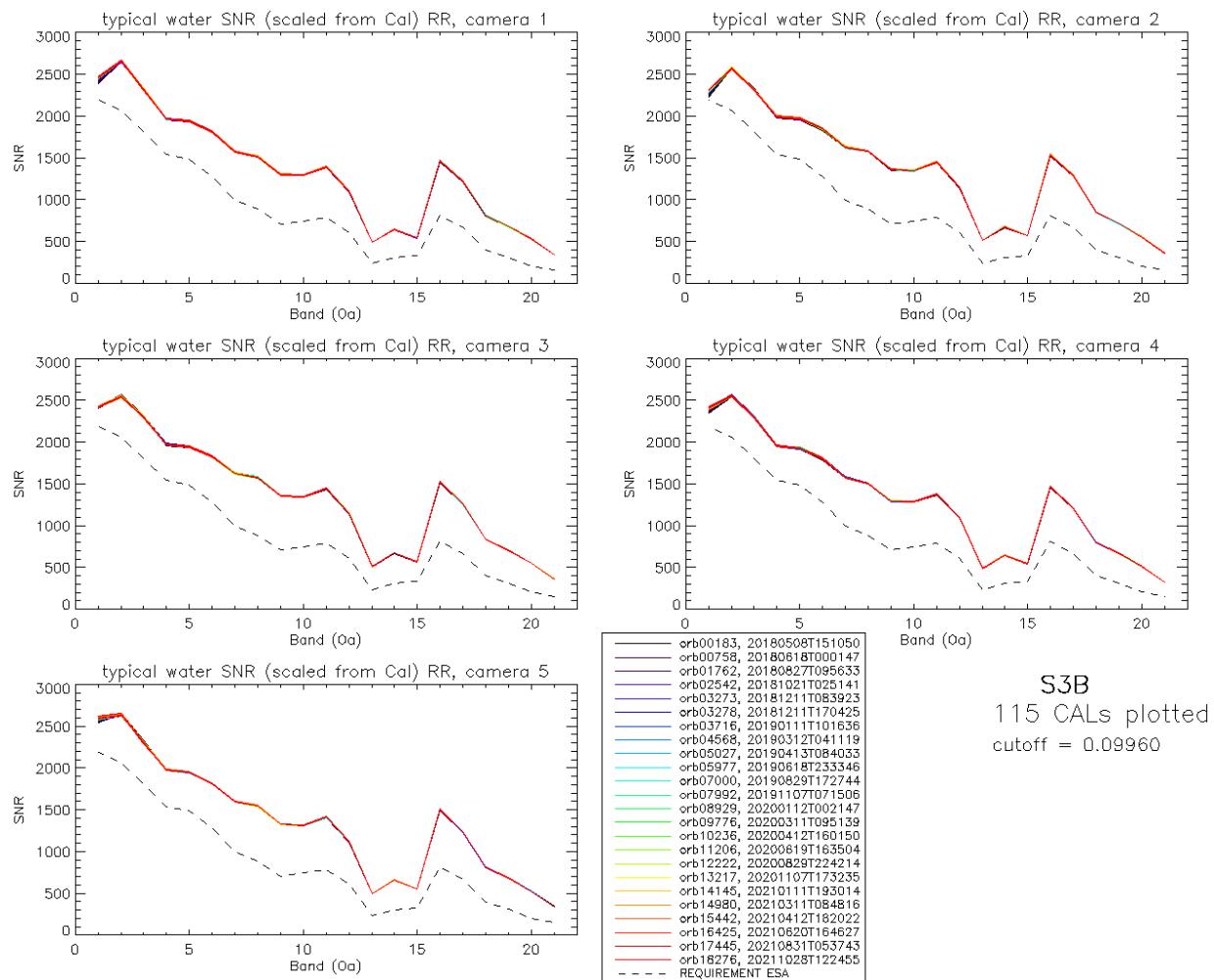


Figure 42: OLCI-B Signal to Noise ratio as a function of the spectral band for the 5 cameras. These results have been computed from radiometric calibration data. All calibrations except first one (orbit 167) are presents with the colours corresponding to the orbit number (see legend). The SNR is very stable with time: the curves for all orbits are almost superimposed. The dashed curve is the ESA requirement.



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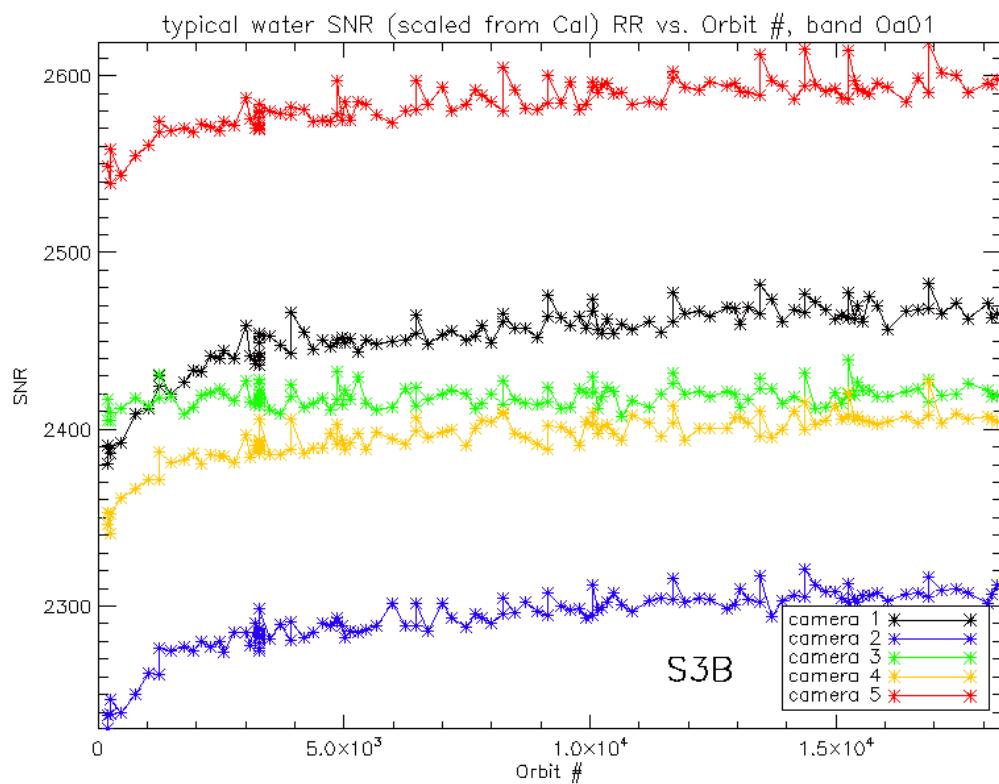


Figure 43: long-term stability of the OLCI-B SNR estimates from Calibration data, example of channel Oa1.

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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 $\text{mW} \cdot \text{sr}^{-1} \cdot \text{m}^{-2} \cdot \text{nm}^{-1}$).

nm	L _{ref}	SNR	C1		C2		C3		C4		C5		All	
			avg	std	avg	std	avg	std	avg	std	avg	std	avg	std
400.000	63.0	2188	2452	19.5	2292	17.0	2418	6.0	2395	13.8	2584	13.8	2428	13.0
412.000	74.1	2061	2655	6.6	2569	5.9	2545	8.3	2550	5.9	2638	7.2	2591	5.0
442.000	65.6	1811	2324	6.3	2317	5.9	2300	6.3	2303	6.8	2309	6.4	2311	5.3
490.000	51.2	1541	1966	4.6	1989	5.5	1971	4.9	1952	4.6	1979	4.5	1972	3.7
510.000	44.4	1488	1938	4.8	1967	5.5	1943	4.9	1924	5.0	1951	4.8	1945	3.9
560.000	31.5	1280	1813	4.9	1848	5.2	1829	4.5	1804	5.0	1817	4.1	1822	3.7
620.000	21.1	997	1572	4.2	1626	4.6	1625	3.6	1576	3.6	1601	3.2	1600	2.8
665.000	16.4	883	1513	4.2	1579	3.8	1573	3.8	1501	3.1	1546	3.9	1543	2.8
674.000	15.7	707	1301	3.9	1358	3.5	1353	3.3	1292	2.6	1328	2.9	1326	2.3
681.000	15.1	745	1293	3.6	1347	3.2	1343	2.9	1285	2.8	1316	2.9	1317	2.1
709.000	12.7	785	1390	4.1	1447	4.2	1443	4.1	1373	2.9	1412	3.8	1413	3.0
754.000	10.3	605	1096	3.8	1143	3.7	1142	3.6	1089	2.8	1116	3.3	1117	2.9
761.000	6.1	232	487	1.2	509	1.2	508	1.3	485	1.2	497	1.4	498	1.0
764.000	7.1	305	643	1.6	672	1.9	672	1.9	641	1.7	657	1.8	657	1.5
768.000	7.6	330	541	1.5	568	1.5	564	1.4	541	1.4	554	1.6	554	1.1
779.000	9.2	812	1467	4.2	1535	4.7	1527	5.5	1467	4.1	1506	4.5	1500	3.9
865.000	6.2	666	1221	3.5	1287	3.7	1258	3.6	1205	3.6	1238	2.9	1242	2.8
885.000	6.0	395	808	2.3	847	1.9	834	2.0	799	1.7	814	2.1	820	1.5
900.000	4.7	308	679	1.5	714	2.0	704	1.7	670	1.5	683	1.5	690	1.2
940.000	2.4	203	527	1.3	549	1.5	551	1.3	510	1.1	522	1.3	532	0.9
1020.000	3.9	152	336	0.8	358	1.3	358	0.8	318	0.8	338	1.0	342	0.6

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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

OLCI-A georeferencing performance is compliant since the introduction of MPC Geometric Calibration, put in production on the 14th of March 2018. It has however significantly improved after its last full revision of GCMs (Geometric Calibration Models, or platform to instrument alignment quaternions) and IPPVMs (Instrument Pixels Pointing Vectors) both derived using the GeoCal Tool and put in production on 30/07/2019.

The following figures (Figure 44 to Figure 49) show time series of the overall RMS performance (requirement criterion) and of the across-track and along-track biases for each camera. New plots (Figure 50 and Figure 51) introduce monitoring of the performance homogeneity within the field of view: georeferencing errors in each direction at camera transitions (difference between last pixel of camera N and first pixel of camera N+1) and within a given camera (maximum bias minus minimum inside each camera). The performance improvement since the 30/07/2019 is significant on most figures: the global RMS value decreases from around 0.35 to about 0.2 (Figure 44), the across-track biases decrease significantly for all cameras (Figure 45 to Figure 49), the along-track bias reduces for at least camera 3 (Figure 47) and the field of view homogeneity improves drastically (Figure 50 and Figure 51, but also reduction of the dispersion – distance between the ± 1 sigma lines – in Figure 45 to Figure 49).

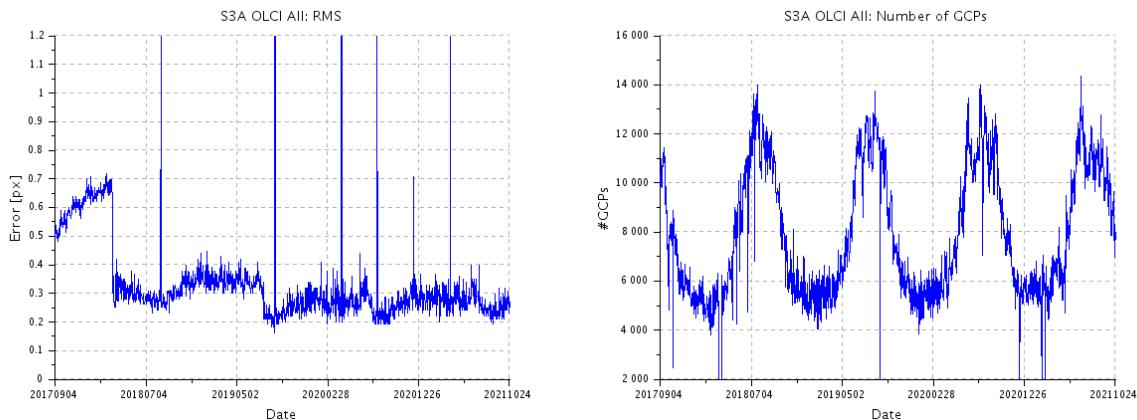


Figure 44: overall OLCI-A georeferencing RMS performance time series (left) and number of validated control points corresponding to the performance time series (right) over the whole monitoring period

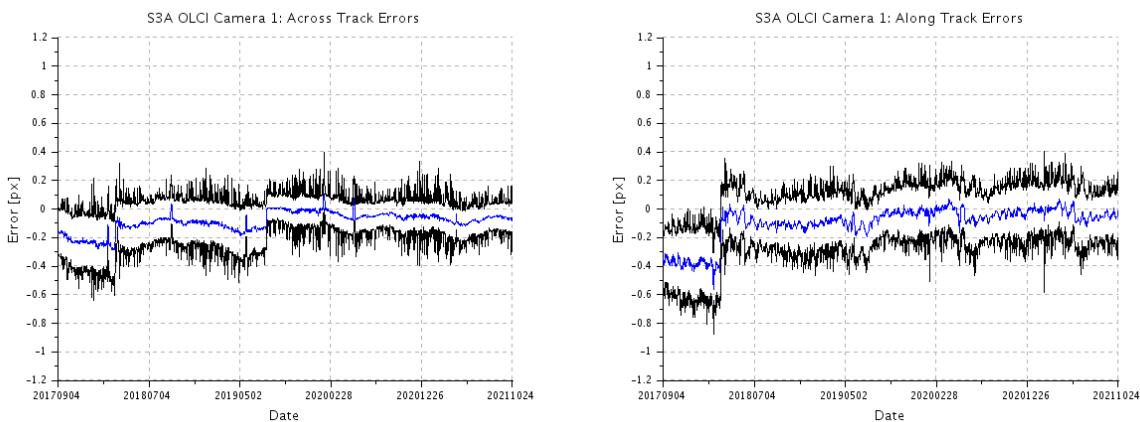


Figure 45: across-track (left) and along-track (right) OLCI-A georeferencing biases time series for Camera 1. Blue line is the average, black lines are average plus and minus 1 sigma.

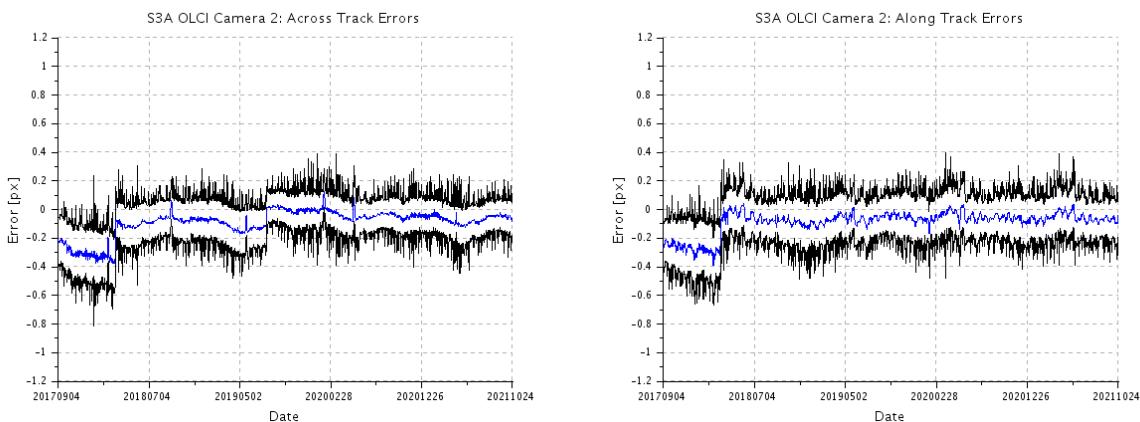


Figure 46: same as Figure 45 for Camera 2.

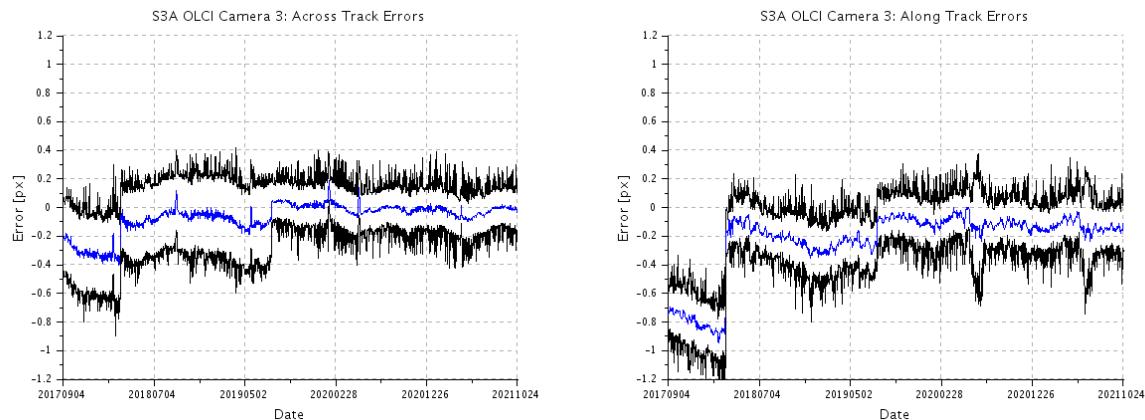


Figure 47: same as Figure 45 for Camera 3.

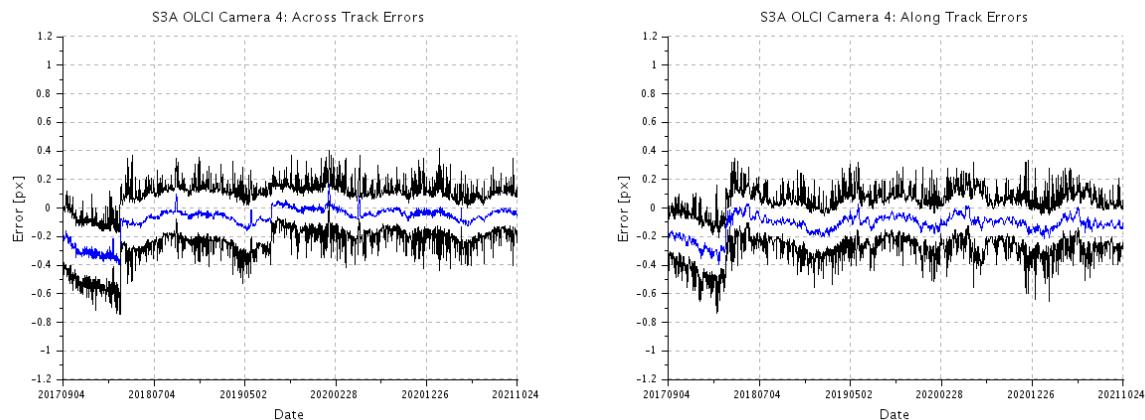


Figure 48: same as Figure 45 for Camera 4.

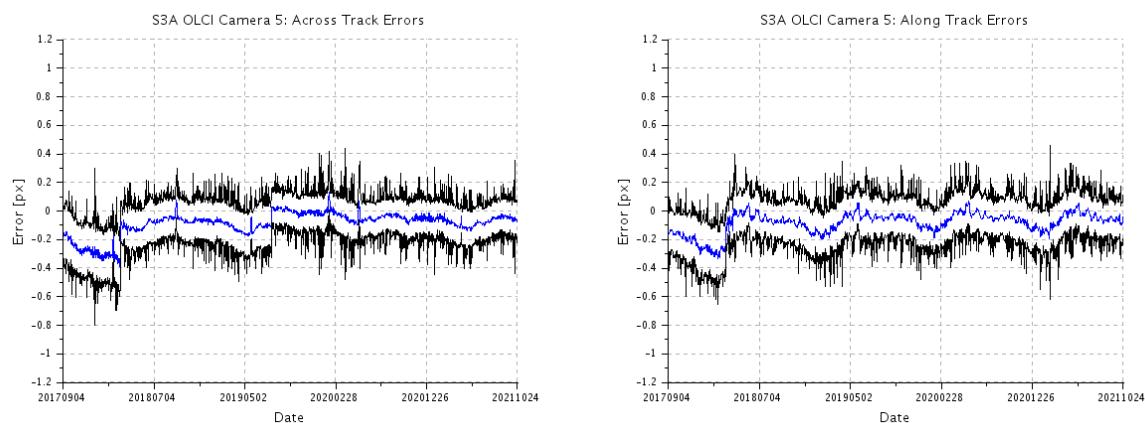


Figure 49: same as Figure 45 for Camera 5.

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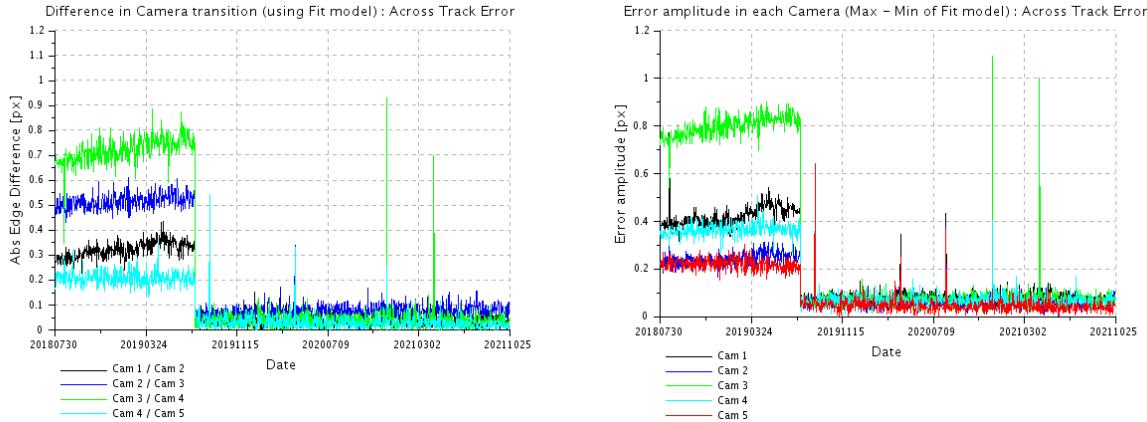


Figure 50: OLCI-A spatial across-track misregistration at each camera transition (left) and maximum amplitude of the across-track error within each camera (left).

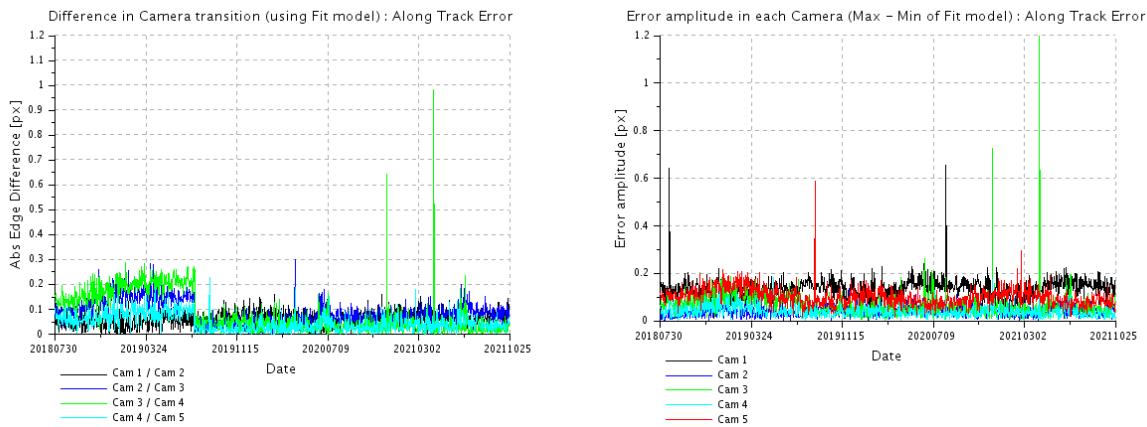


Figure 51: OLCI-A spatial along-track misregistration at each camera transition (left) and maximum amplitude of the along-track error within each camera (left).

2.5.2 OLCI-B

Georeferencing performance of OLCI-B improved significantly with the fourth geometric calibration introduced the 30/07/2019. However, the instrument pointing is still evolving, in particular for camera 2 (Figure 58) and a new geometric calibration has been done and introduced in the processing chain on the 16th of April 2020. Its impact is significant on the along-track biases of all cameras (Figure 53 to Figure 57), but also on the continuity at camera interfaces (Figure 58, left) and on intra-camera homogeneity (Figure 58, right). Since then, further adjustments to the geometric calibration have been introduced, mainly to correct the along-track drifts. The most recent was put in production on 10/12/2020 and its effect can be seen e.g. on left graphs of Figure 53 and Figure 54 (along-track biases of cameras 1 & 2).

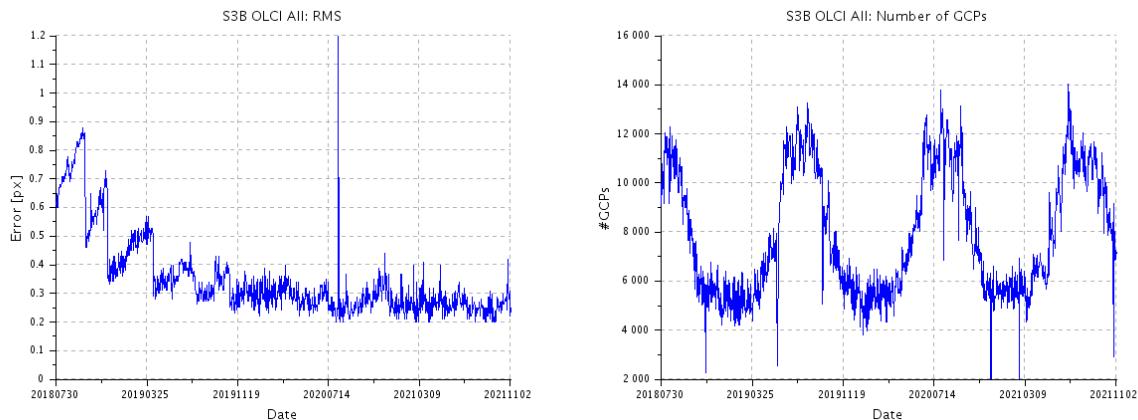


Figure 52: overall OLCI-B georeferencing RMS performance time series over the whole monitoring period (left) and corresponding number of validated control points (right)

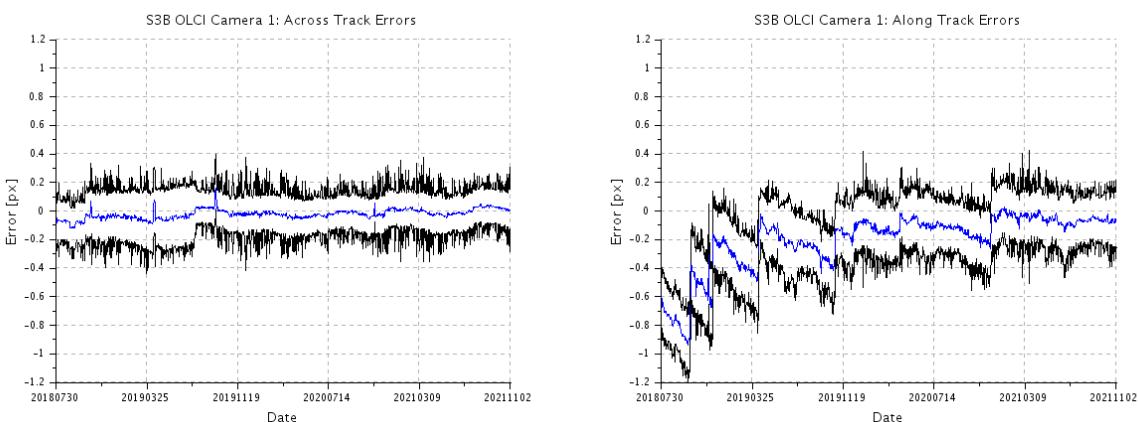


Figure 53: across-track (left) and along-track (right) OLCI-B georeferencing biases time series for Camera 1.

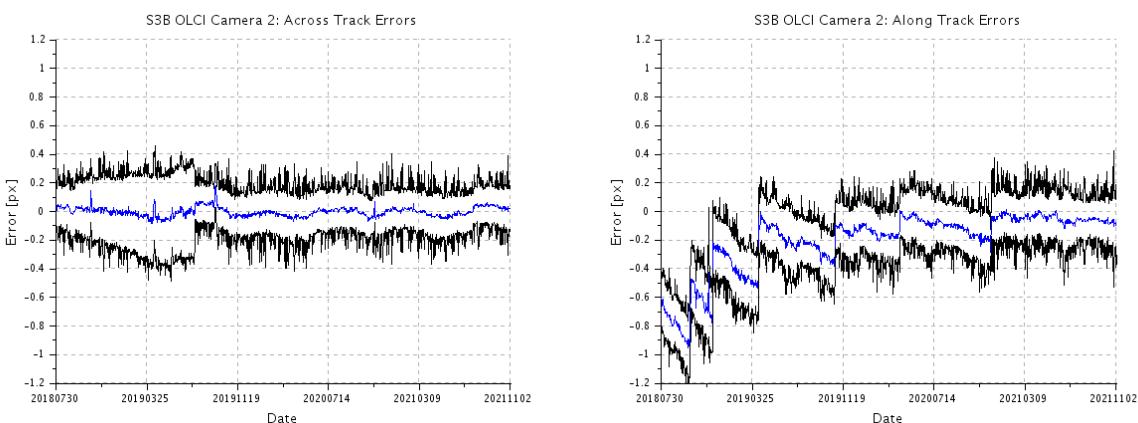


Figure 54: same as Figure 53 for Camera 2.



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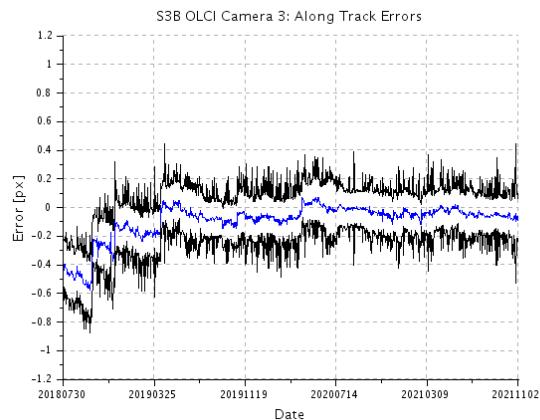
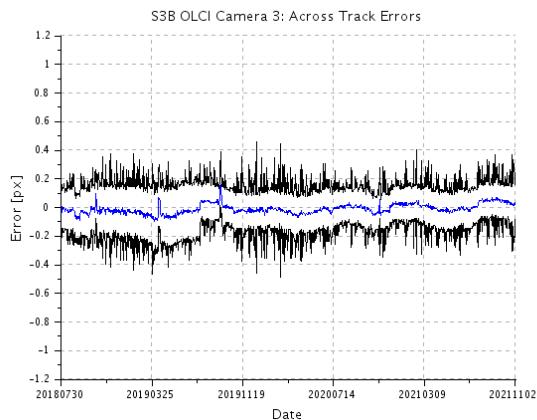


Figure 55: same as Figure 53 for Camera 3.

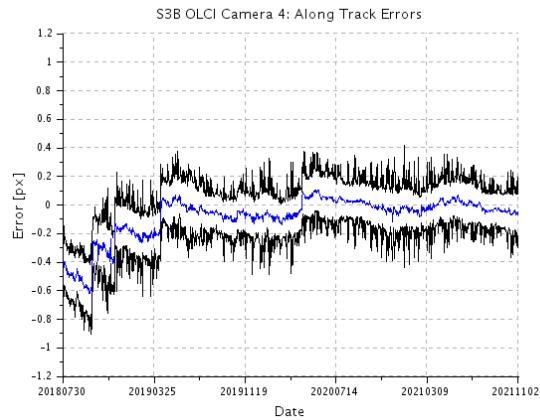
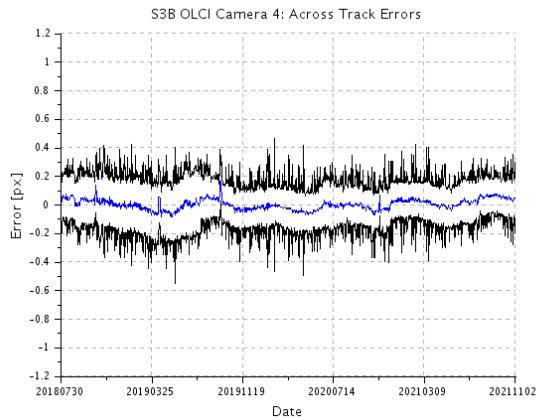


Figure 56: same as Figure 53 for Camera 4.

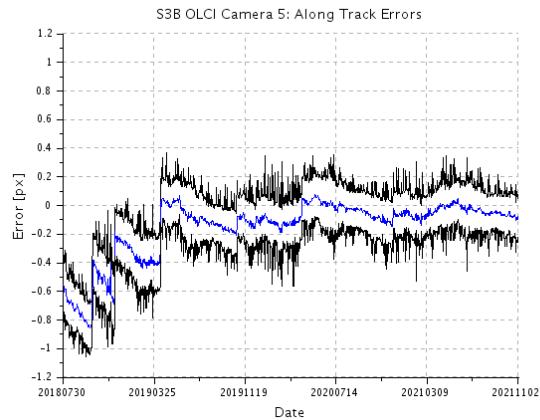
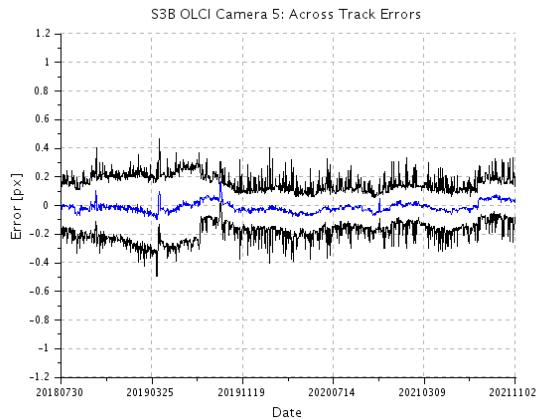


Figure 57: same as Figure 53 for Camera 5.



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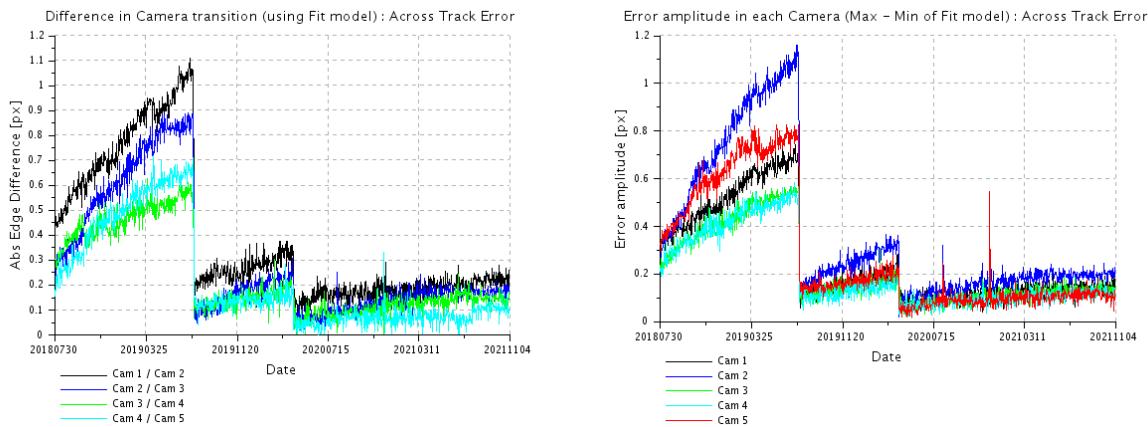


Figure 58: OLCI-B spatial across-track misregistration at each camera transition (left) and maximum amplitude of the across-track error within each camera (left).

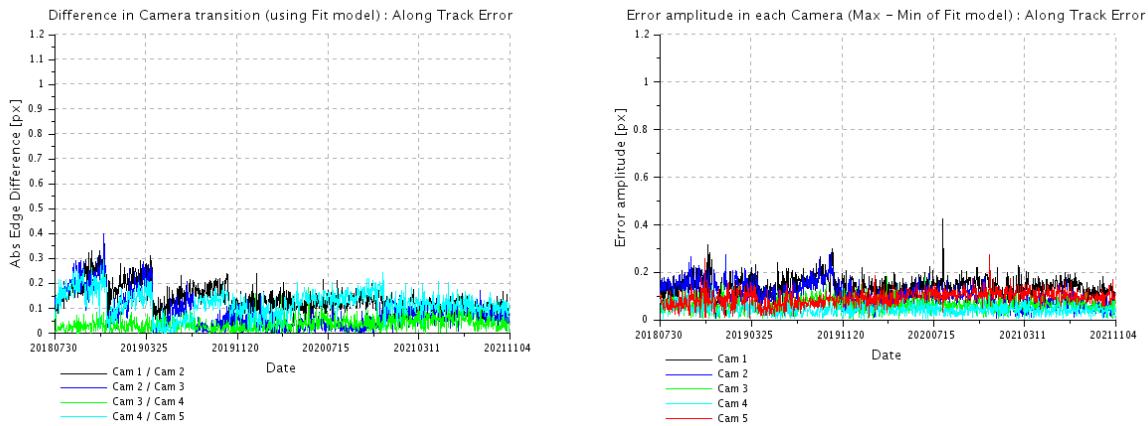


Figure 59: OLCI-B spatial along-track misregistration at each camera transition (left) and maximum amplitude of the along-track error within each camera (left).

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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 <http://s3etrap.acri.fr/index.php?action=generalstatistics>.

- ❖ 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 60) and OLCI-B (Figure 61).



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Figure 60: summary of S3ETRAC products generation for OLCI-A
(number of OLCI-A L1 products Ingested, blue – number of S3ETRAC extracted products generated, green – number of S3ETRAC runs without generation of output product (data not meeting selection requirements), yellow – number of runs ending in error, red, one plot per site type).



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Figure 61: 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).

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3.1.2 Radiometric validation with DIMITRI

Highlights

OLCI-A and OLCI-B L1B radiometry verification as follow:

- ❖ The verification is performed over Desert and Ocean-sites **until the 5th of November 2021**.
- ❖ All results from OLCI-A and OLCI-B over Rayleigh, Glint and PICS are consistent with the previous cycle over the used CalVal sites.
- ❖ Good stability of both sensors OLCI-A and OLCI-B could be observed, nevertheless the time-series average shows higher reflectance from OLCI-A.
- ❖ Bands with high gaseous absorption are excluded.

Verification and Validation over PICS

1. The ingestion of all the available L1B-LN1-NT products from OLCI-A and OLCI-B over the 6 desert CalVal-sites (Algeria3 & 5, Libya 1 & 4 and Mauritania 1 & 2) has been performed **until the 5th of November 2021**.
2. The results are consistent over all the six used PICS sites (Figure 62 and Figure 63). Both sensors show a good stability over the analysed period.
3. The temporal average over the period **January 2021 - Present** of the elementary ratios (observed reflectance to the simulated one) for **OLCI-A** shows gain values between 2-4% over all the VNIR bands (Figure 64). Unlikely, the temporal average over the same period of the elementary ratios for **OLCI-B** shows gain values within 2% (mission requirements) over the VNIR spectral range (Figure 64). The spectral bands with significant absorption from water vapor and O₂ (Oa11, Oa13, Oa14, Oa15 and Oa20) are excluded.



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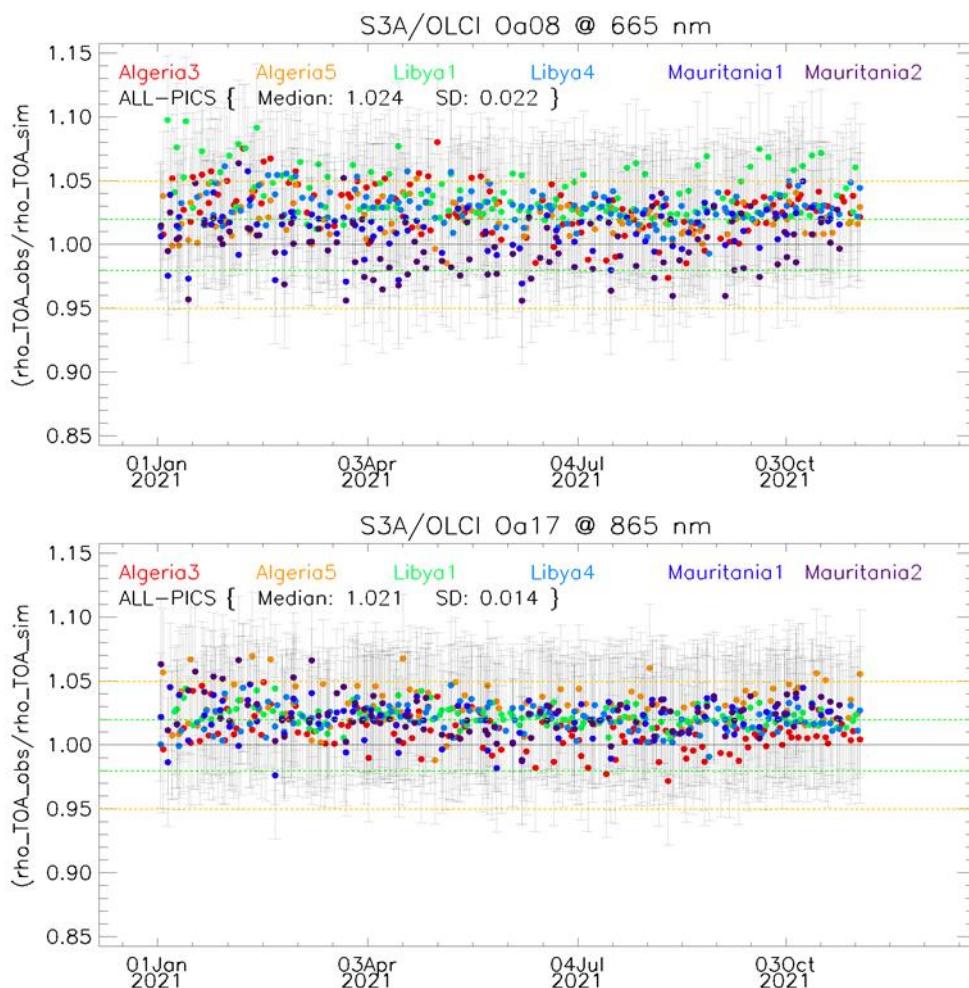


Figure 62: Time-series of the elementary ratios (observed/simulated) signal from OLCI-A for (top to bottom) bands Oa08 and Oa17 respectively over January 2021-Present from the six PICS Cal/Val sites. Dashed-green and orange lines indicate the 2% and 5% respectively. Error bars indicate the desert methodology uncertainty.



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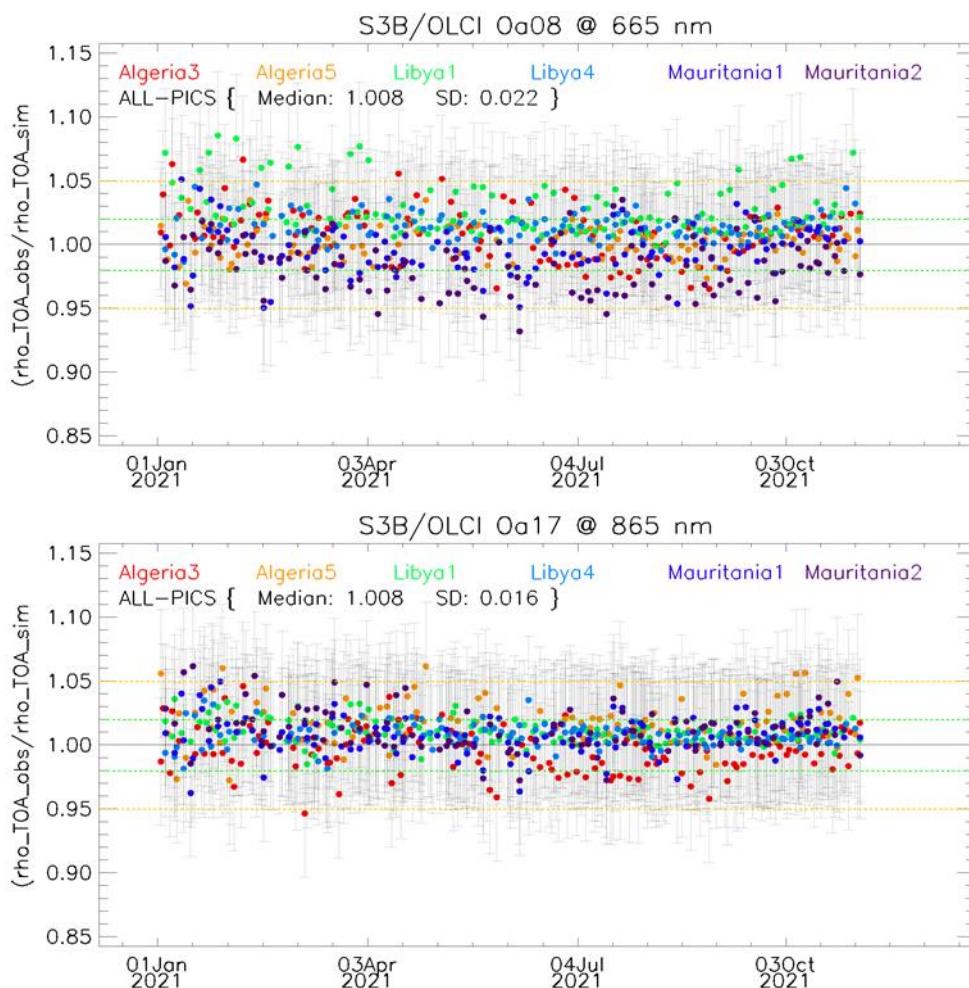


Figure 63: Time-series of the elementary ratios (observed/simulated) signal from OLCI-B for (top to bottom) bands Oa08 and Oa17 respectively over January 2021-Present from the six PICS Cal/Val sites. Dashed-green and orange lines indicate the 2% and 5% respectively. Error bars indicate the desert methodology uncertainty.

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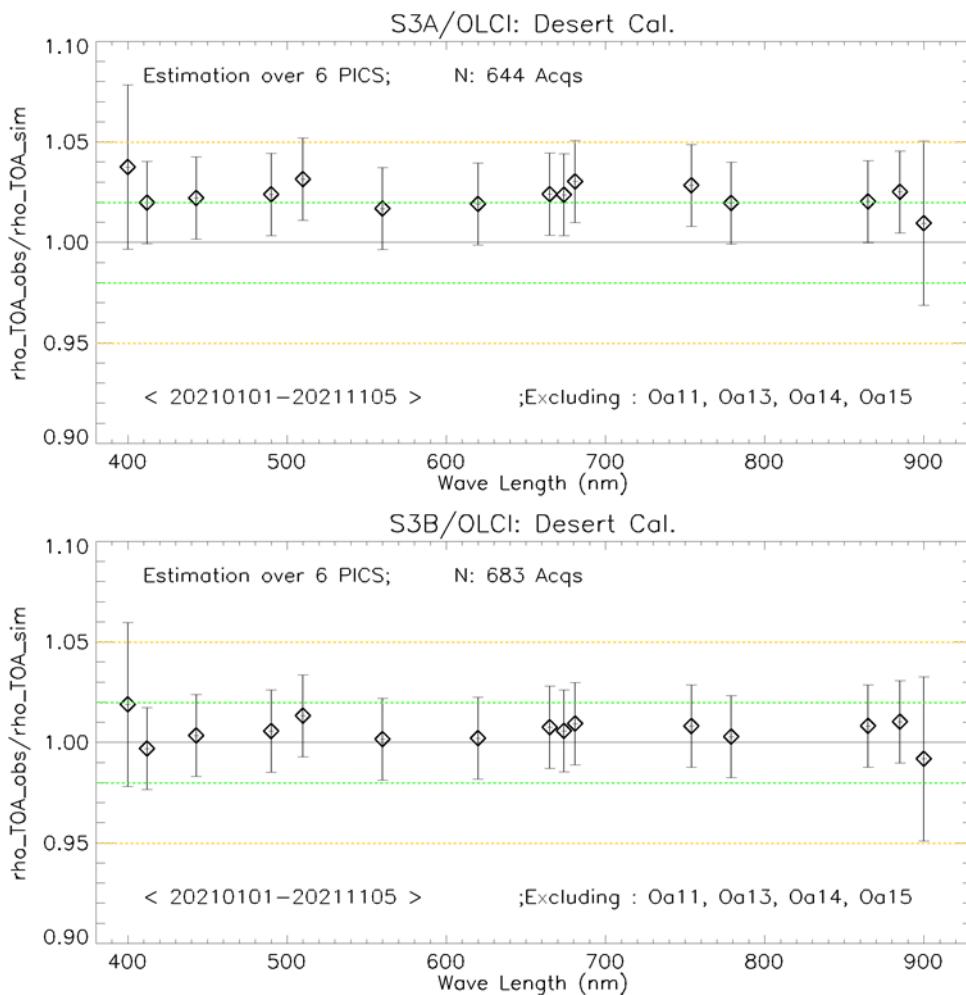


Figure 64: The estimated gain values for OLCI-A and OLCI-B over the 6 PICs sites identified by CEOS over the period January 2021-Present as a function of wavelength. Dashed-green and orange lines indicate the 2% and 5% respectively. Error bars indicate the desert methodology uncertainty.

Cross-mission Intercomparison over PICs:

X-mission Intercomparison with MODIS-A MSI-A and MSI-B has been performed until June and August 2021 respectively. Figure 65 shows time-series of the elementary ratios from S2A/MSI, Aqua/MODIS, S3A/OLCI and S3B/OLCI over the LYBIA4 site for several periods over April 2016 until August 2021.

We observe a clear stability of the three sensors, associated with higher reflectance from OLCI-A wrt to MSI-A and MODISA. MODISA shows higher fluctuation wrt to MSI-A and OLCI-A/B ones.

Figure 66 shows the estimated gain over different time-series for different sensors (MSI-A, OLCI-A, OLCI-B and MODIS-A) over PICs. The spectral bands with significant absorption from water vapour and O2 are excluded. OLCI-A seems to have higher gain wrt the other sensors, which means that OLCI-A has brighter reflectance than its simulated one by PICs method.

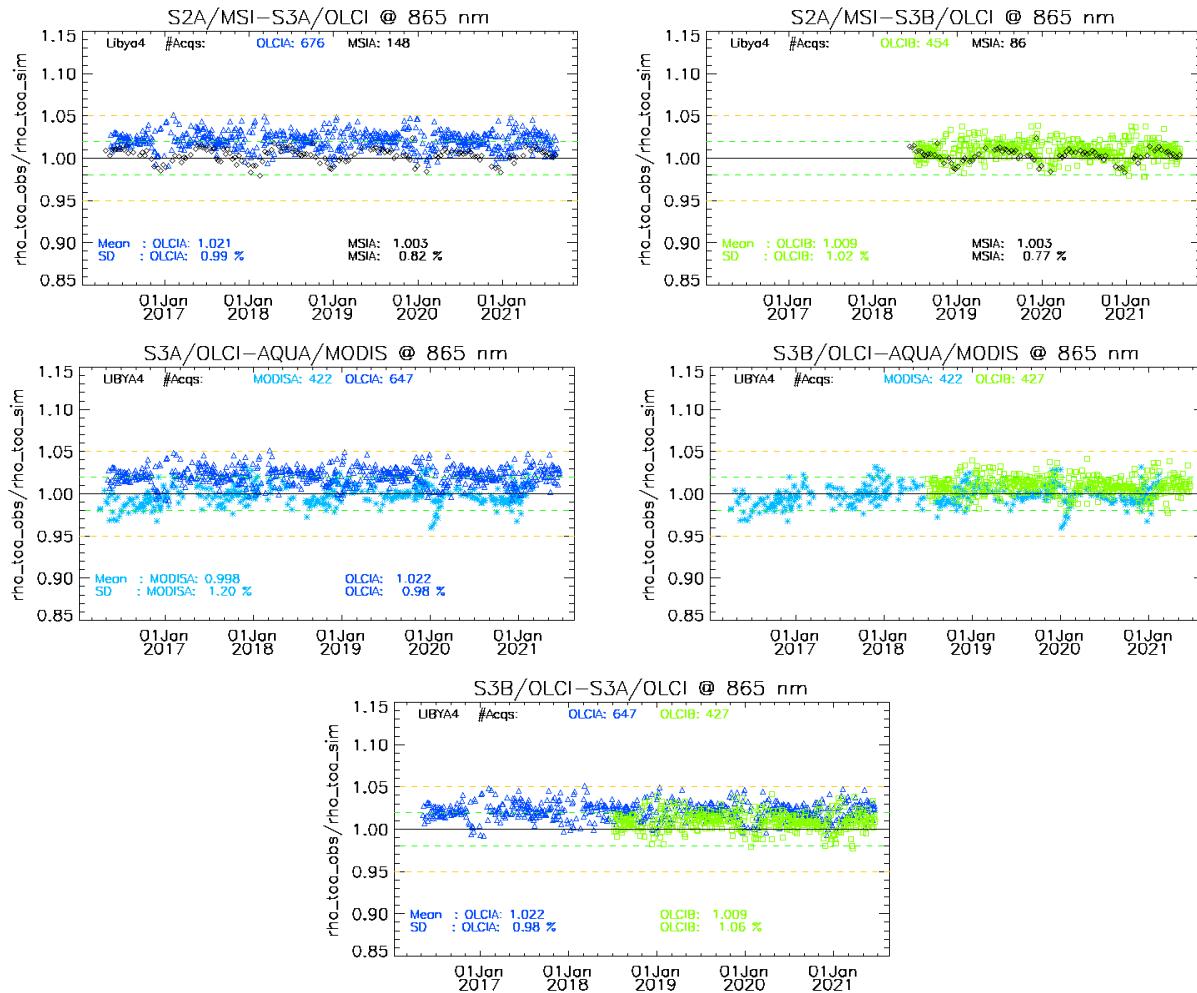


Figure 65: Time-series of the elementary ratios (observed/simulated) signal from (black) S2A/MSI, (blue) S3A/OLCI, (green) S3B/OLCI and (Cyan) Aqua/MODIS for NIR band 865nm over LIBYA4 site. Dashed-green and orange lines indicate the 2% and 5% respectively. The systematic and total uncertainties of the desert methodology are 1% and 5% respectively.

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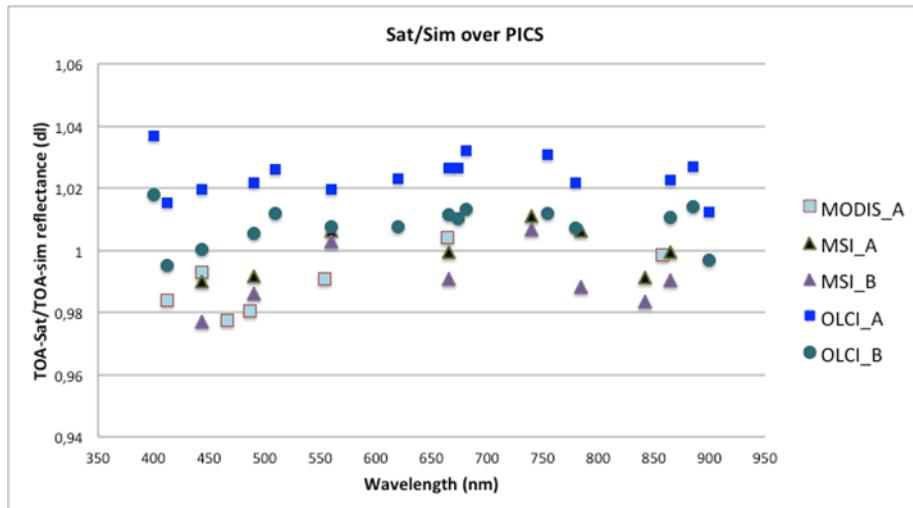


Figure 66: Ratio of observed TOA reflectance to simulated one for (green-yellow) S2A/MSI, (red) Aqua/MODIS, (blue) S3A/OLCI and (green) S3B/OLCI averaged over the six PICS test sites as a function of wavelength.

Validation over Rayleigh

Rayleigh method has been performed from the available mini-files over the **last 12 months** for OLCI-A and OLCI-B. The results were produced with the configuration (ROI-AVERAGE). The gain coefficients of OLCI-A are consistent with the previous results. Bands Oa01-Oa05 display biases values between 3%-5% while bands Oa06-Oa09 exhibit biases between about 2%, just within the mission requirement (Figure 67). The gain coefficients of OLCI-B are lower than OLCI-A ones, where bands Oa01-Oa05 display biases values about 2-5%, when bands Oa6-Oa9 exhibit biases around the 2% mission requirement (Figure 67).

Validation over Glint and synthesis

Glint calibration method with the configuration (ROI-PIXEL) has been performed over the **last 12 months** for OLCI-A and OLCI-B. The outcome of this analysis shows a good consistency with the desert and Rayleigh outputs over the NIR spectral range Oa06-Oa09 for both sensors. Glint results from OLCI-A show that the NIR bands are within the 2% (mission requirements), except Oa21 which shows higher biases more than ~5% for both sensors (see Figure 67). Again, the glint gain from OLCI-B looks slightly lower than OLCI-A one.

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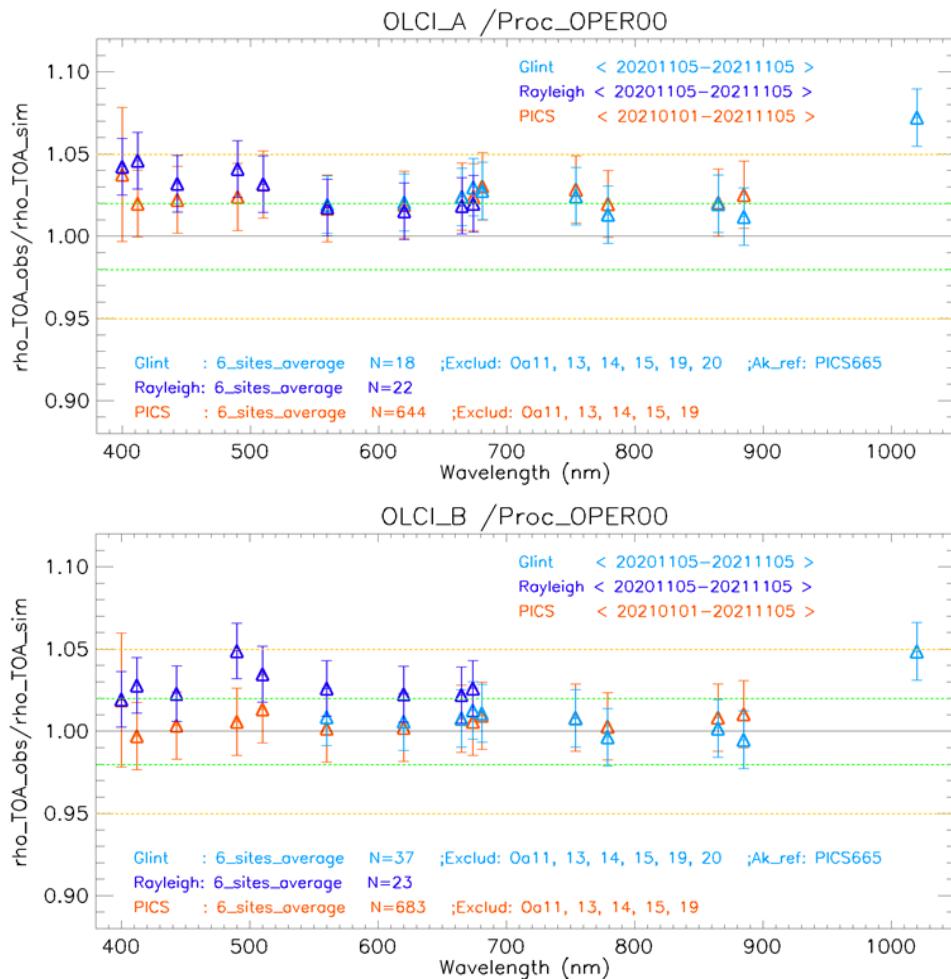


Figure 67: The estimated gain values for OLCI-A and OLCI-B from Glint, Rayleigh and PICS methods over the past twelve months as a function of wavelength. We use the gain value of Oa8 from PICS-Desert method as reference gain for Glint method. Dashed-green and orange lines indicate the 2% and 5% respectively. Error bars indicate the method uncertainties.

3.1.3 Radiometric validation with OSCAR

OSCAR Rayleigh results

The OSCAR Rayleigh have been applied to the S3A and S3B S3ETRAC data from the 6 oceanic calibration sites (Table 3) using a new chlorophyll climatology which has been derived from the CMEMS OLCI monthly CHL products from considering the years 2017, 2018 and 2019.

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Table 3: S3ETRAC Rayleigh Calibration sites

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

In Figure 68 the average OSCAR OLCI-A and OLCI-B Rayleigh results are given for October 2021 (only partially processed). In Figure 69 and Table 4 the average of all scenes currently (re)processed with this new climatology is given. The (re)processing was done on the S3ETRAC scenes from all months of 2019 and 2020, and Jan – Oct. 2021.

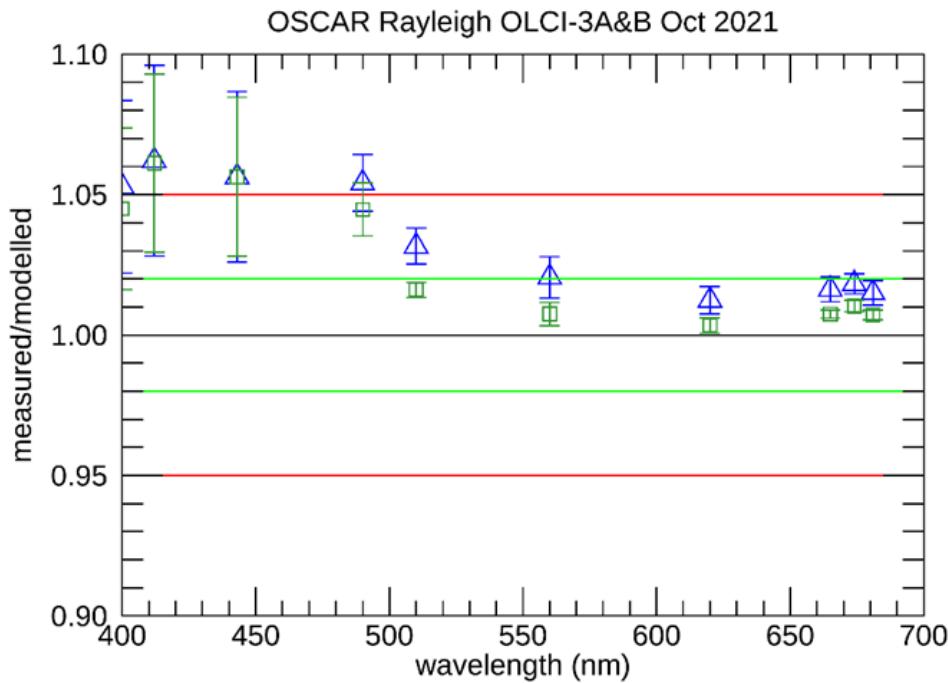


Figure 68: OSCAR Rayleigh S3A and S3B Calibration results as a function of wavelength for September 2021. The results are obtained with a new climatology derived from CMEMS OLCI monthly CHL products.



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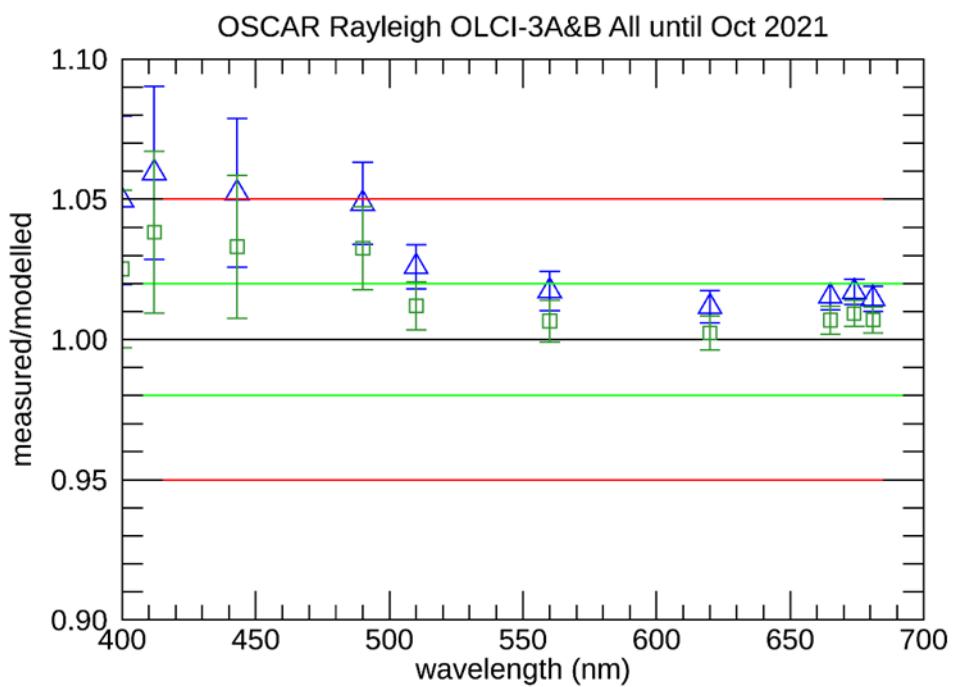


Figure 69. OSCAR Rayleigh S3A and S3B Calibration results as a function of wavelength for Jan – September 2021. Average and standard deviation over all scenes currently (re)processed with the new climatology.

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Table 4. OSCAR Rayleigh calibration results for S3A and S3B (average and standard deviation over all acquisitions) over all scenes currently (re)processed with the new climatology and observed difference (in %) between OLCIA and OLCIB

OLCI band	Wavelength (nm)	Oscar Rayleigh OLCIA		Oscar Rayleigh OLCIB		% difference OLCIA and OLCIB
		avg	stdev	avg	stdev	
Oa01	400	1.050	0.030	1.025	0.028	2.32%
Oa02	412	1.059	0.031	1.038	0.029	2.00%
Oa03	443	1.052	0.027	1.033	0.025	1.83%
Oa04	490	1.049	0.015	1.033	0.015	1.53%
Oa05	510	1.026	0.008	1.012	0.009	1.36%
Oa06	560	1.017	0.007	1.007	0.007	1.06%
Oa07	620	1.012	0.006	1.002	0.006	0.92%
Oa08	665	1.015	0.005	1.007	0.005	0.83%
Oa09	674	1.017	0.004	1.009	0.005	0.76%
Oa10	681	1.015	0.004	1.007	0.005	0.75%
Oa11	709	0.998	0.008	0.993	0.008	0.45%
Oa12	754	1.009	0.001	1.008	0.002	0.13%

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.

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4 Level 2 Land products validation

4.1 [OLCI-L2LRF-CV-300]

4.1.1 Routine extractions

- ❖ The focus for this time period has been on the rolling archive Non Time Critical (NT) data until the 5th of November 2021. More data available for statistical analysis as a concatenation procedure for all available data in the MERMAID processing has been implemented.
- ❖ Concatenated time series of OLCI Global Vegetation Index and OLCI Terrestrial Chlorophyll Index have been regenerated on the current rolling archive availability including previous extractions since June 2016 and April 2018 for S3A and S3B respectively.

4.1.1.1 OLCI-A

Figure 70 to Figure 79 below present the Core Land Sites OLCI-A time series over the current period.

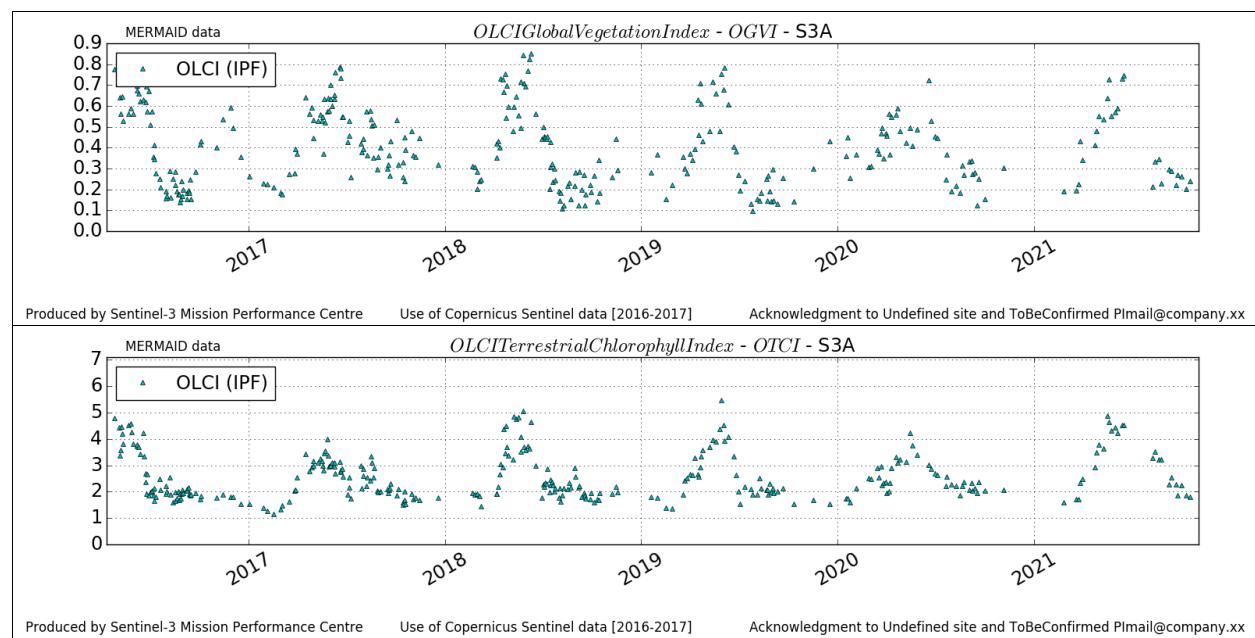


Figure 70: DeGeb time series over current report period

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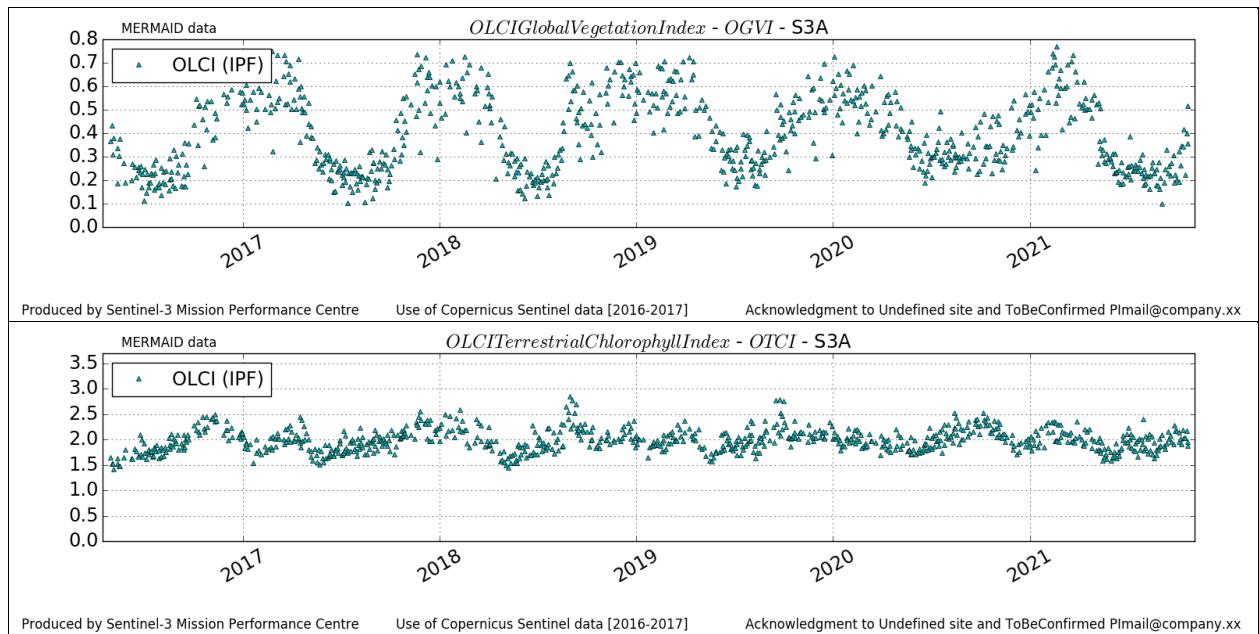


Figure 71: ITCat time series over current report period

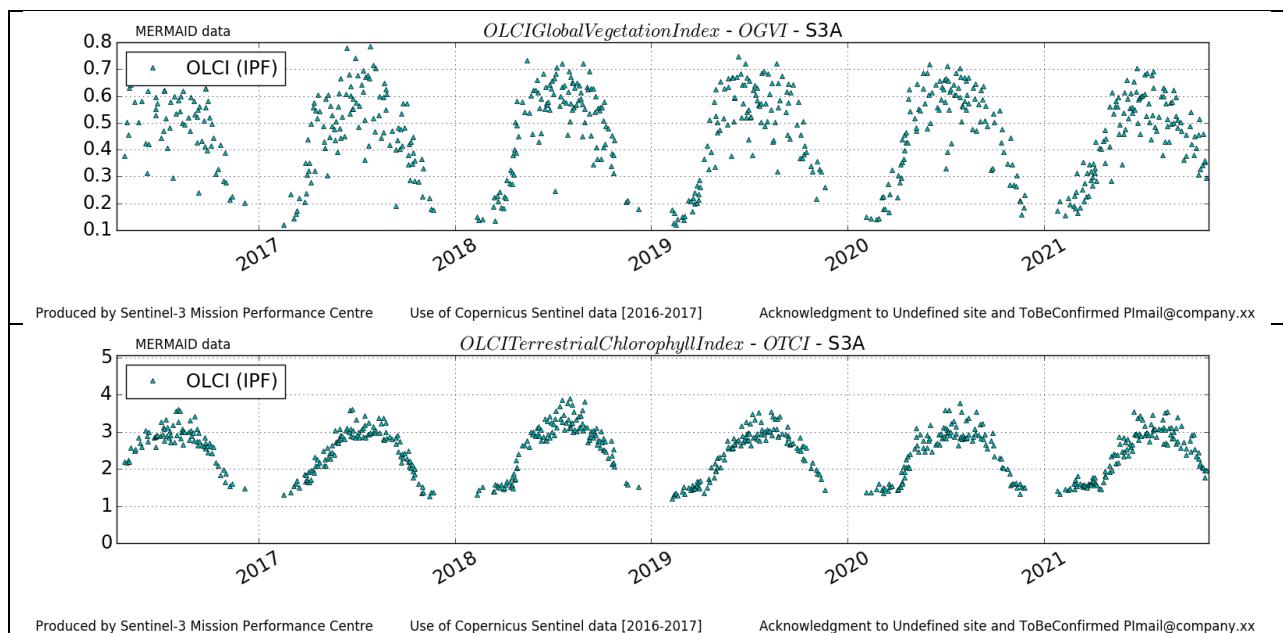


Figure 72: ITisp time series over current report period

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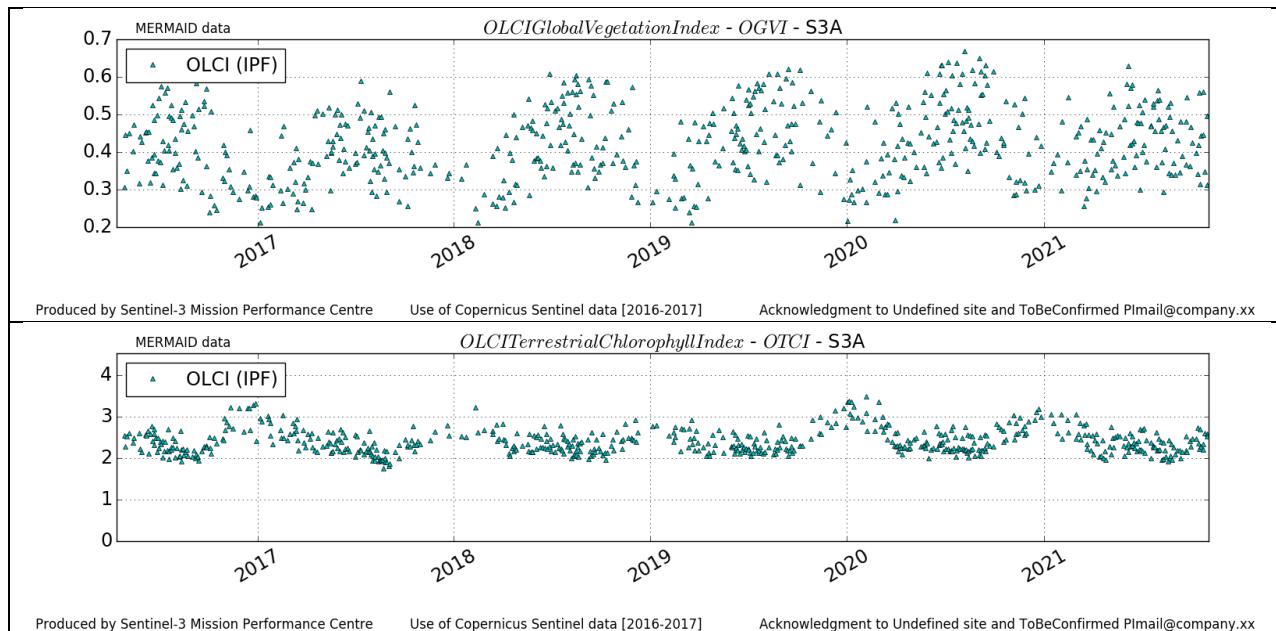


Figure 73: ITSro time series over current report period

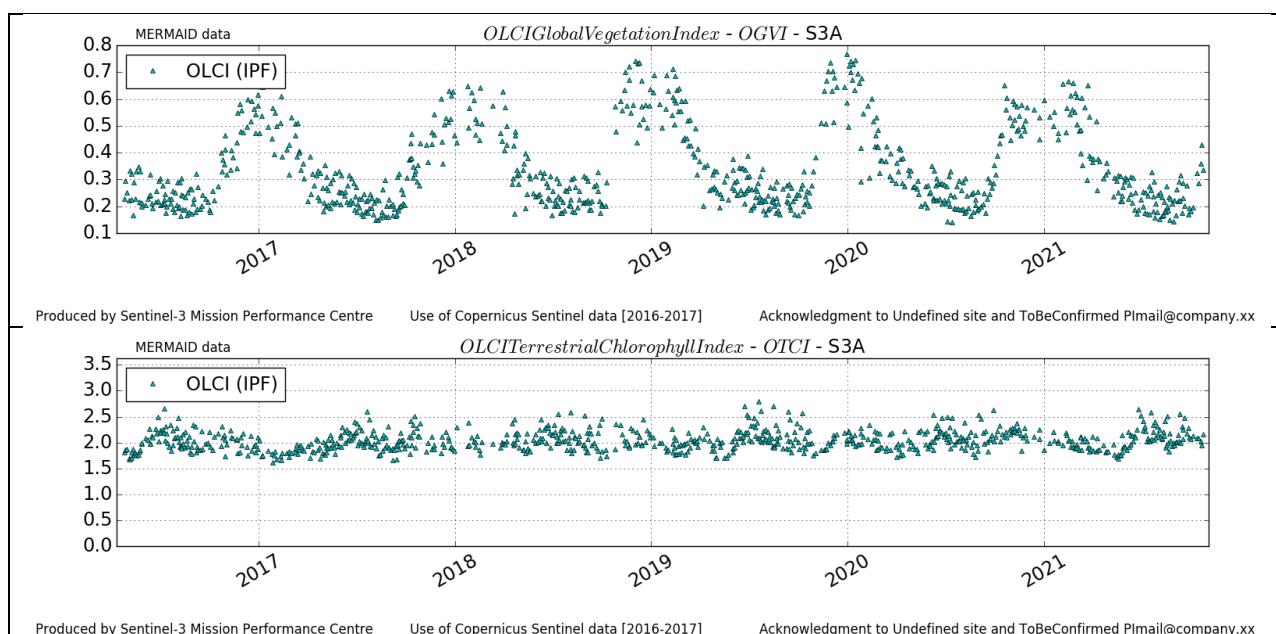


Figure 74: ITTra time series over current report period

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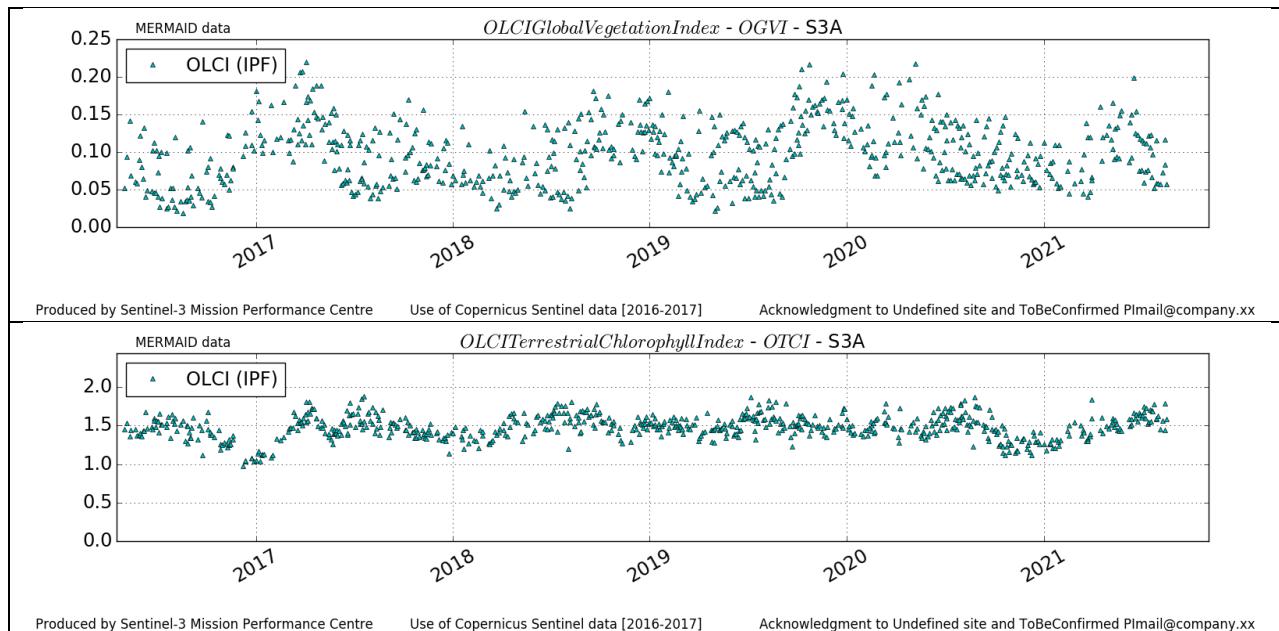


Figure 75: SPAli time series over current report period

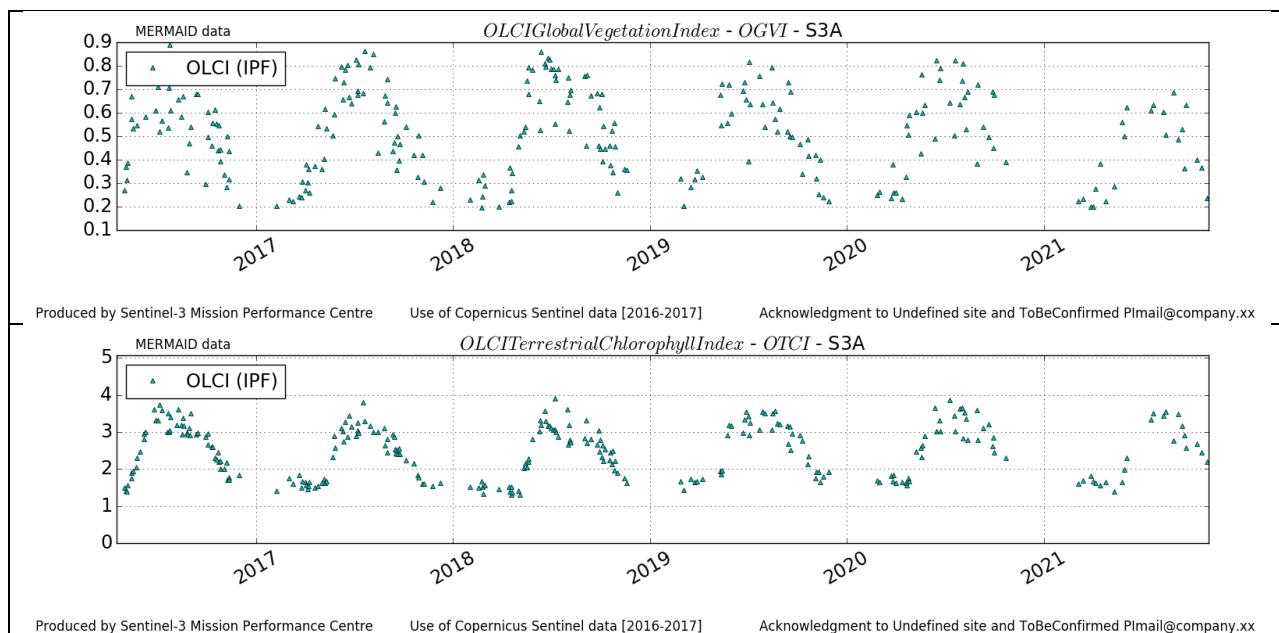


Figure 76: UKNfo time series over current report period

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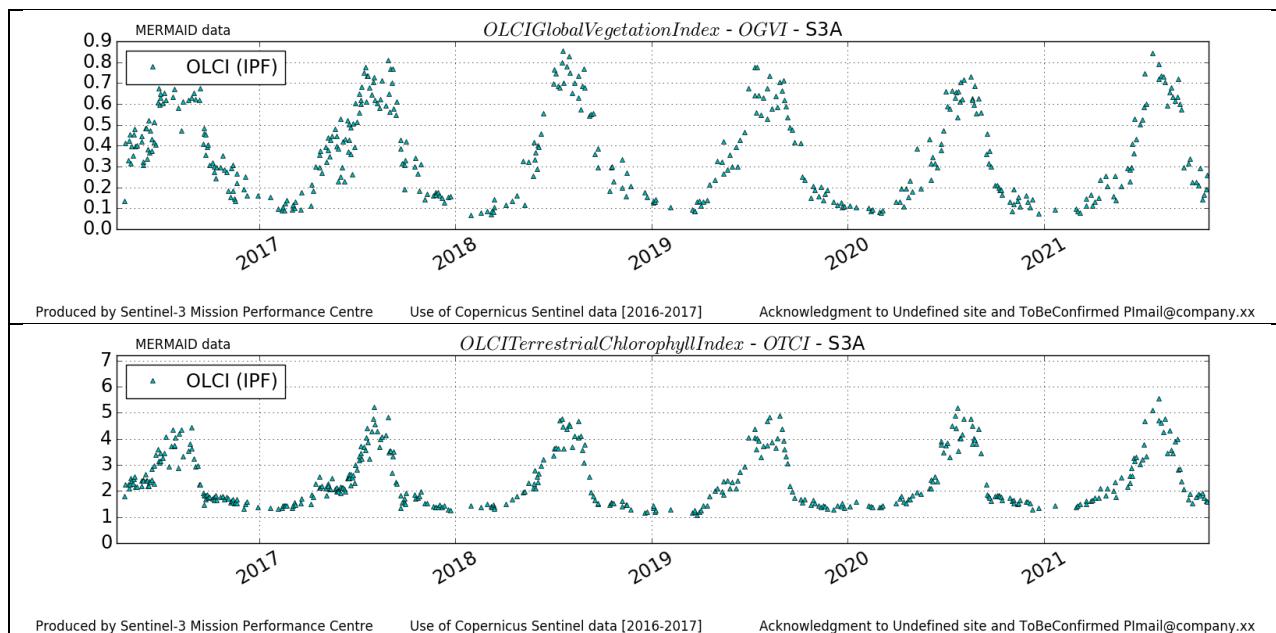


Figure 77: USNe1 time series over current report period

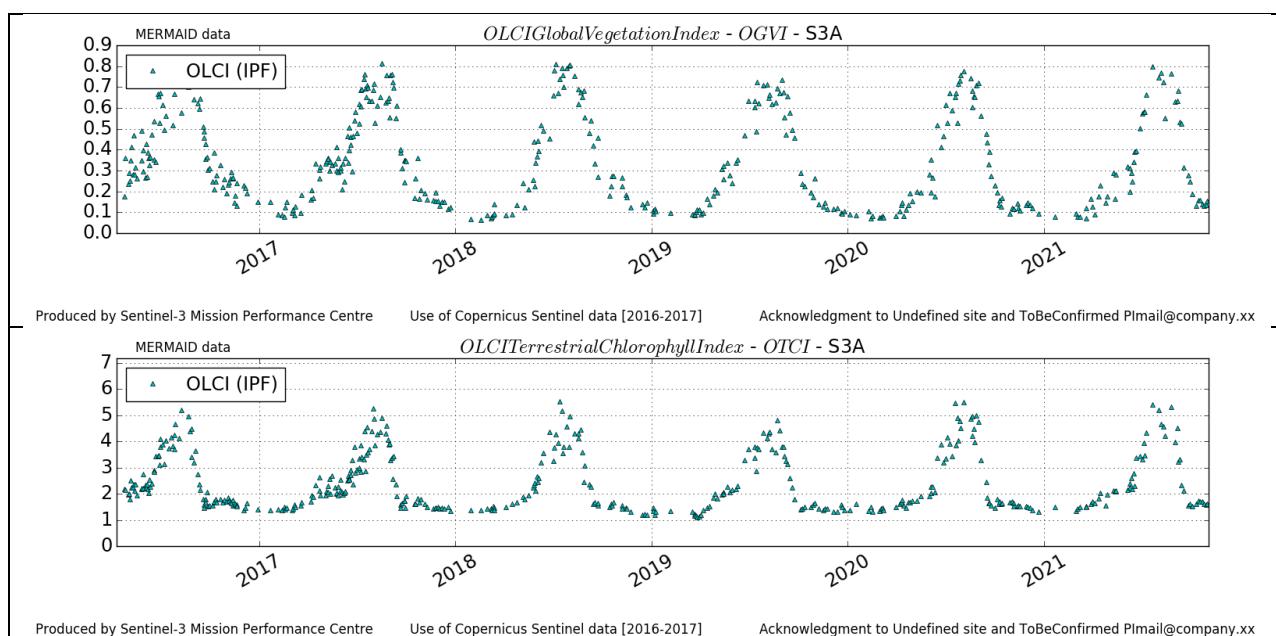


Figure 78: USNe2 time series over current report period

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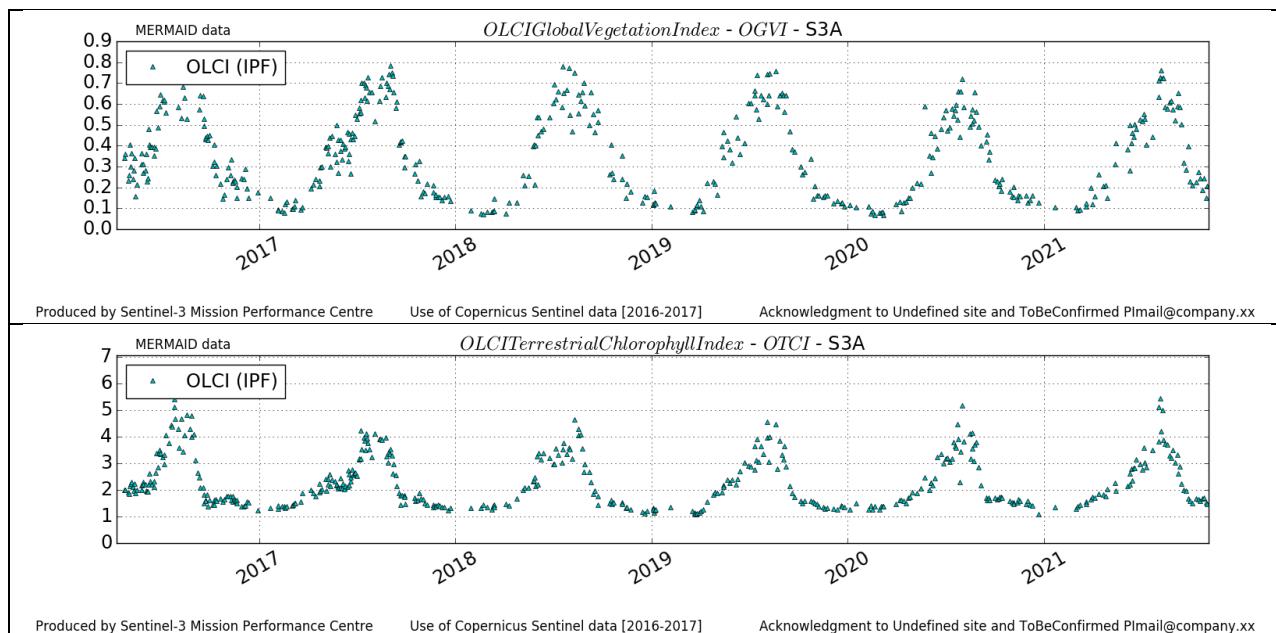


Figure 79: USNe3 time series over current report period

4.1.1.2 OLCI-B

Figure 80 to Figure 89 below present the Core Land Sites OLCI-B time series over the current period.

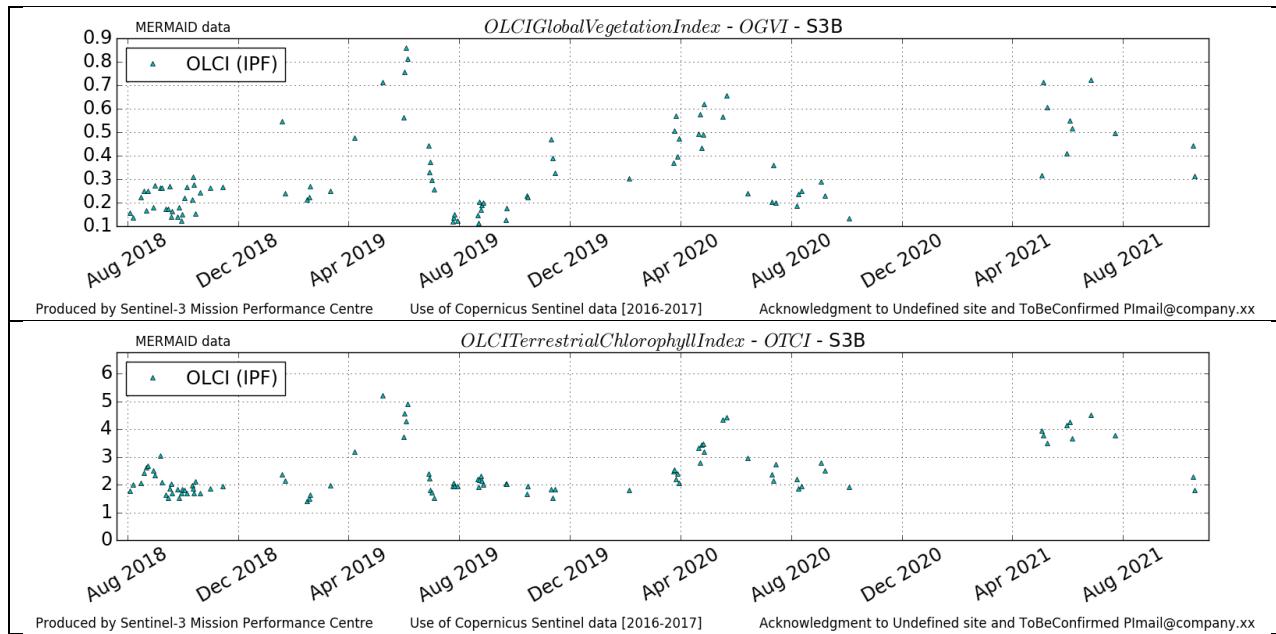


Figure 80: DeGeb time series over current report period

 <p>Sentinel-3 MPC</p> <p>S3 OLCI Cyclic Performance Report</p> <p>S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 72
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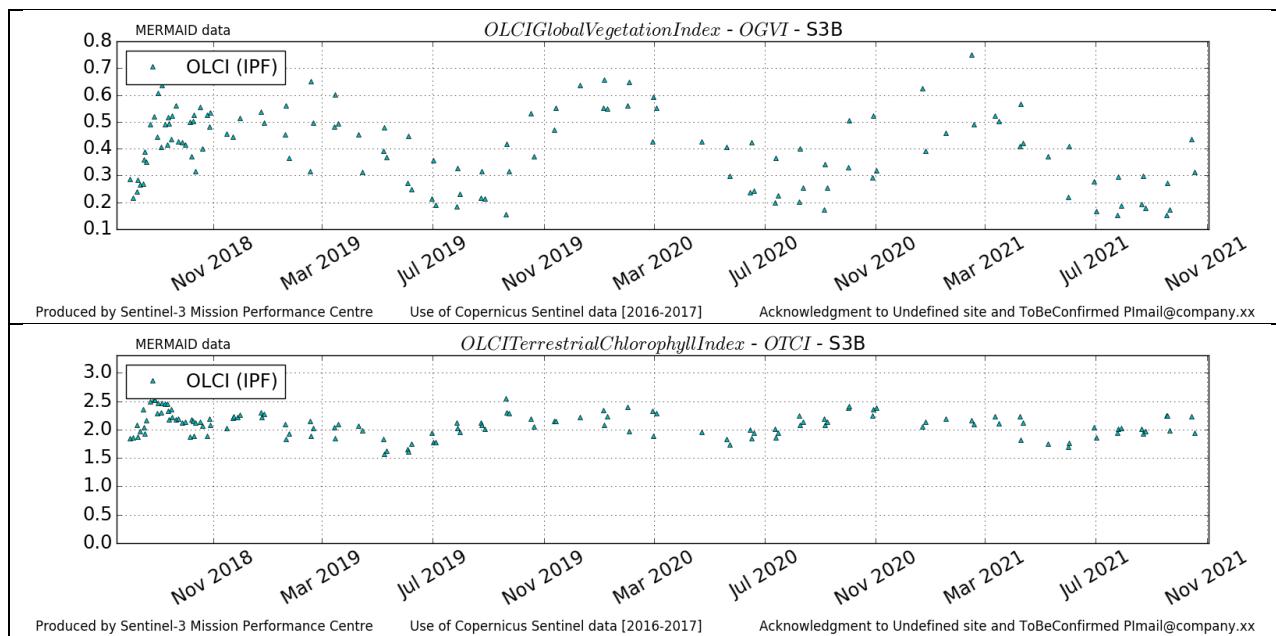


Figure 81: ITCat time series over current report period

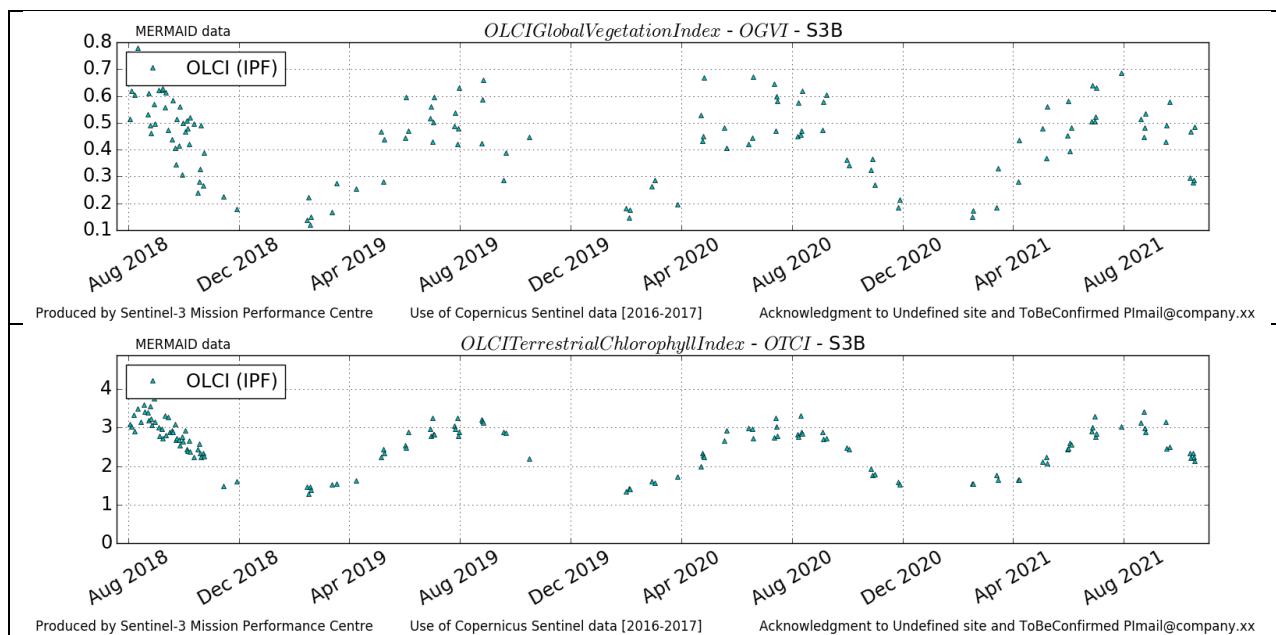


Figure 82: ITisp time series over current report period

 <p>Sentinel-3 MPC</p> <p>S3 OLCI Cyclic Performance Report</p> <p>S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 73
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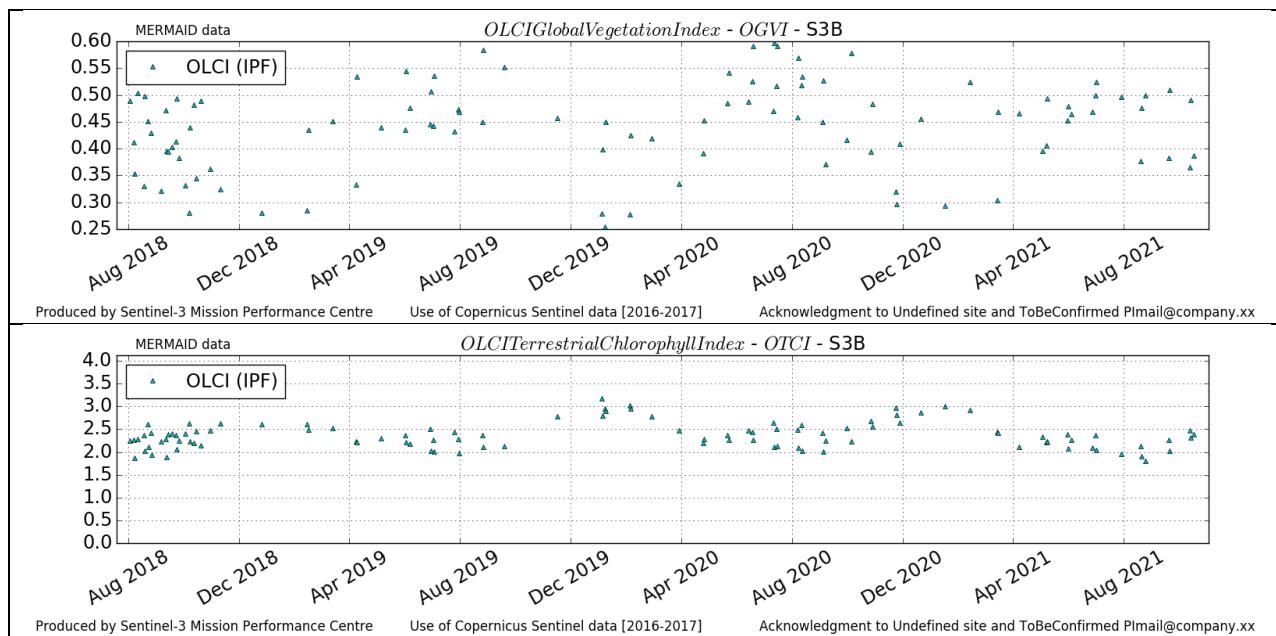


Figure 83: ITSro time series over current report period

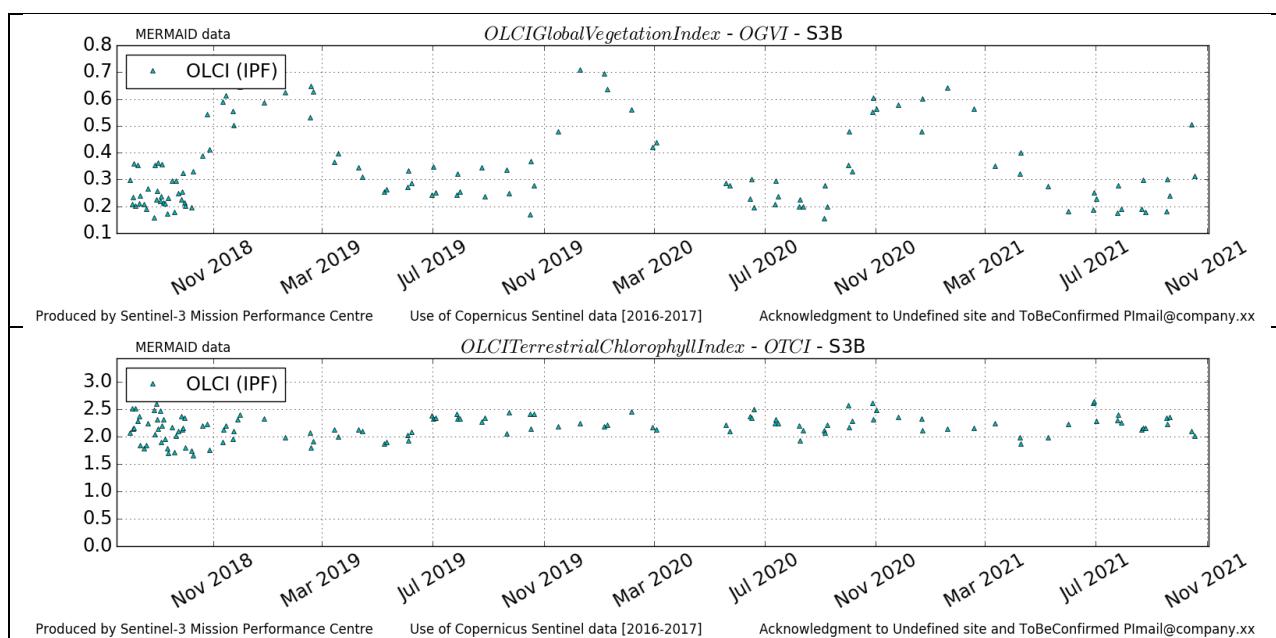


Figure 84: ITTra time series over current report period

 <p>Sentinel-3 MPC</p> <p>S3 OLCI Cyclic Performance Report</p> <p>S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 74
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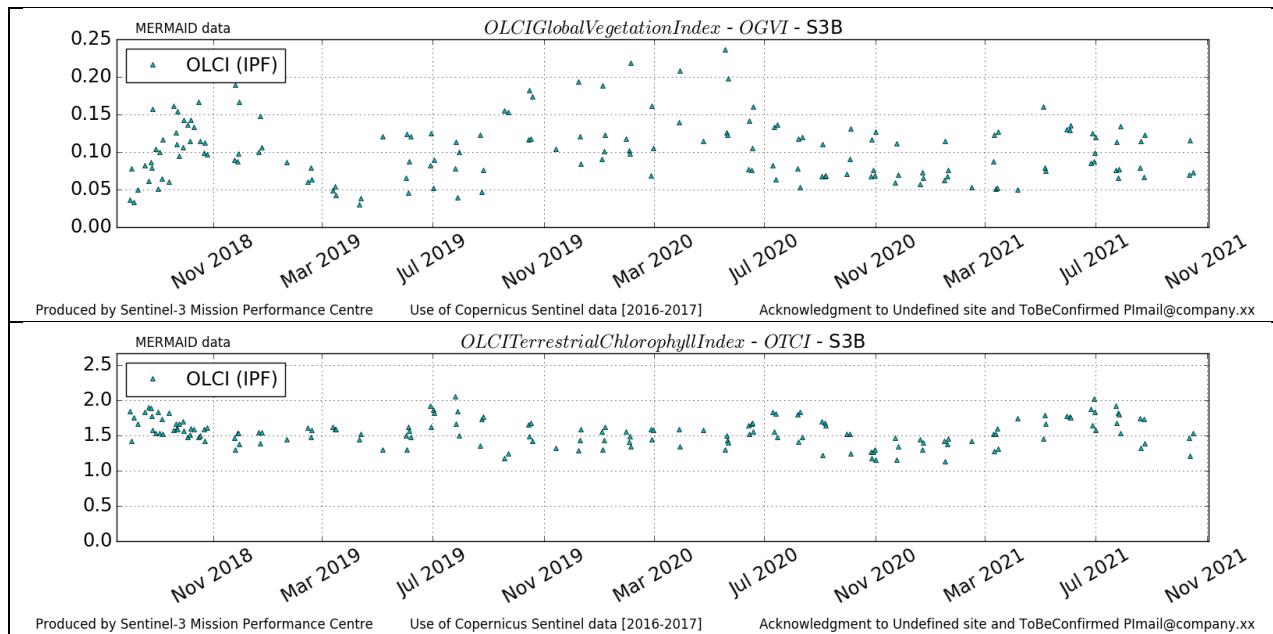


Figure 85: SPALi time series over current report period

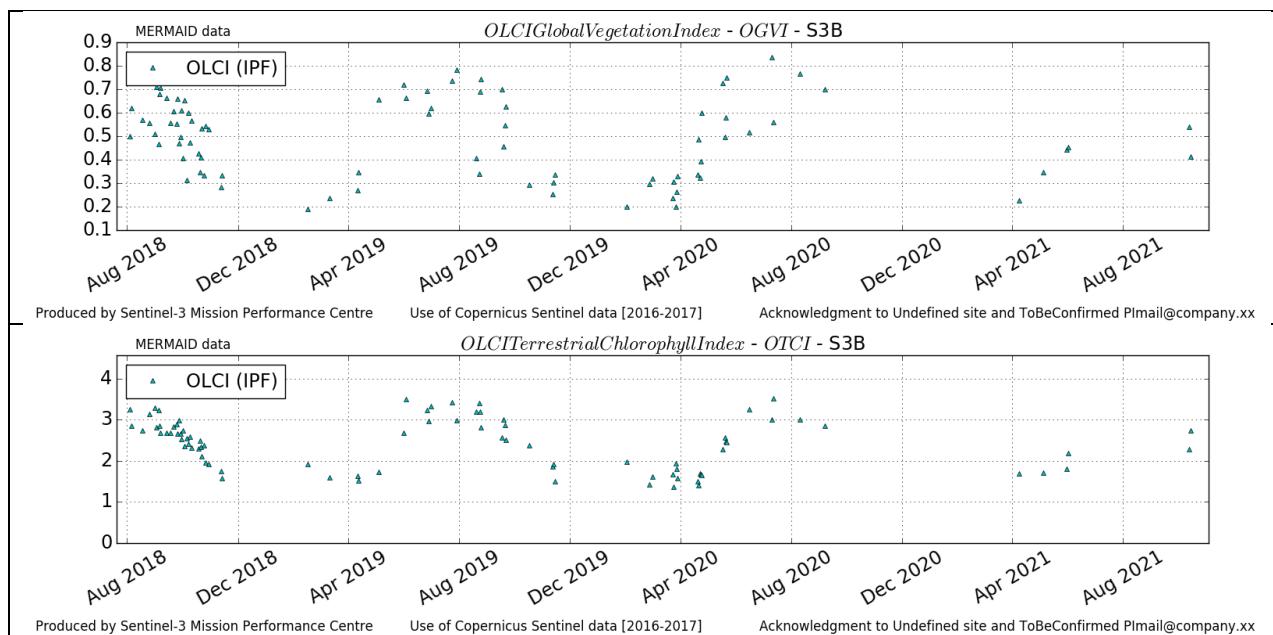


Figure 86: UKNfo time series over current report period

 <p>Sentinel-3 MPC</p> <p>S3 OLCI Cyclic Performance Report</p> <p>S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 75
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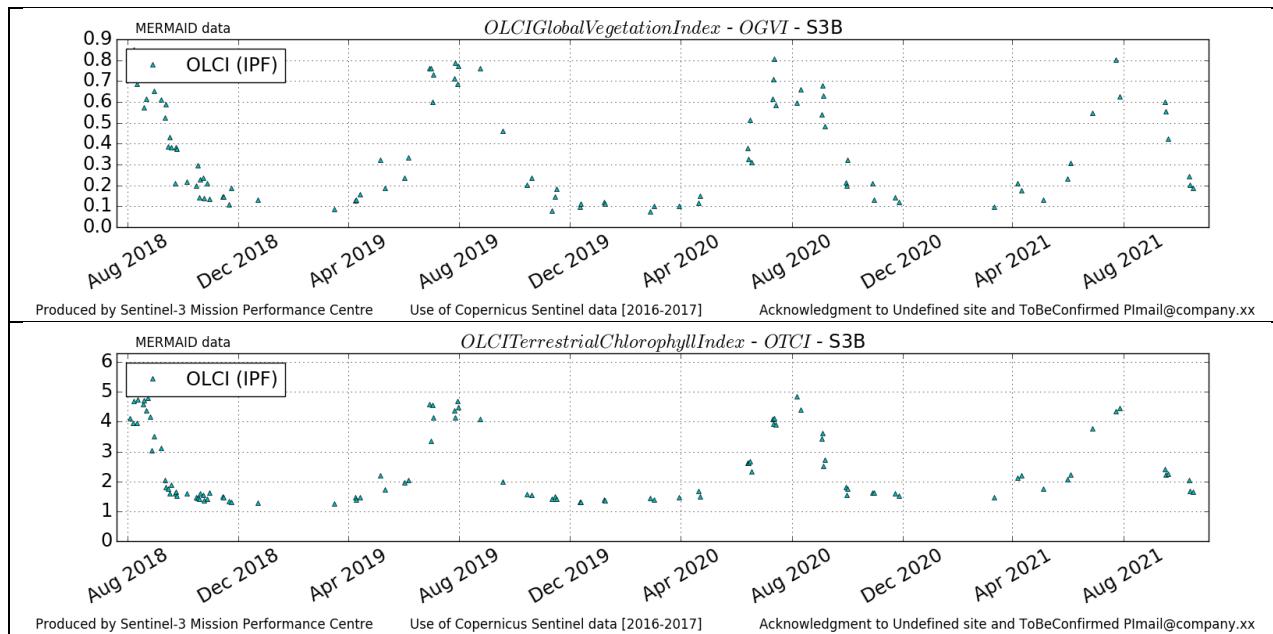


Figure 87: USNe1 time series over current report period

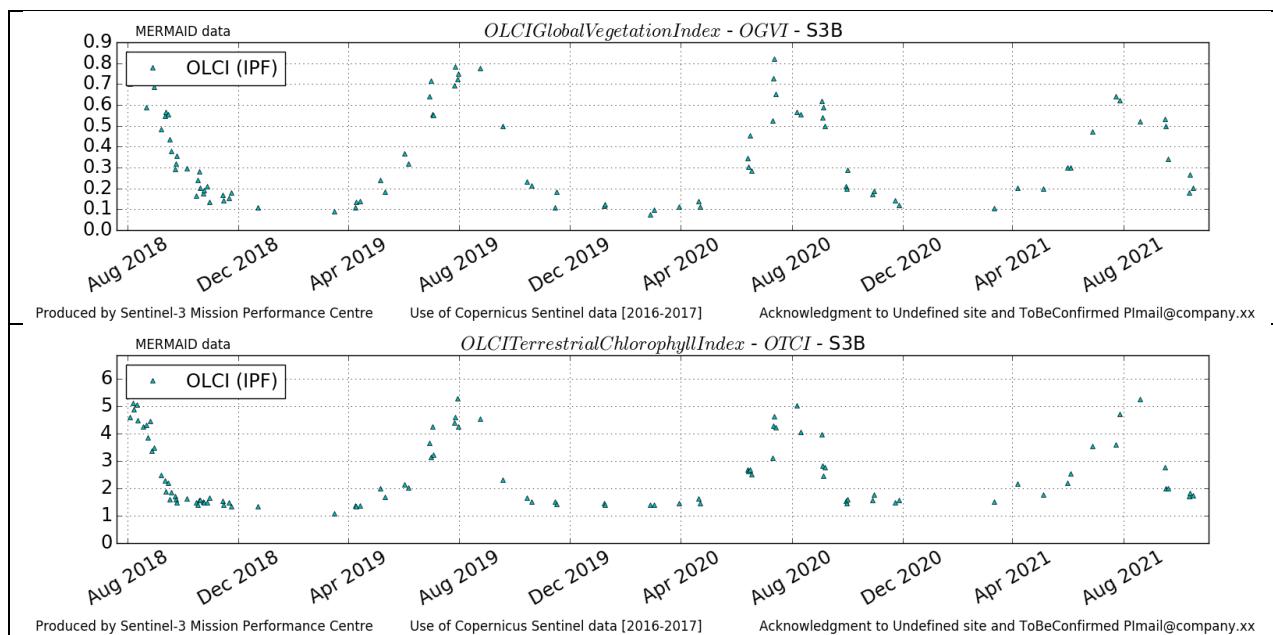


Figure 88: USNe2 time series over current report period

 <p>Sentinel-3 MPC</p> <p>S3 OLCI Cyclic Performance Report</p> <p>S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 76
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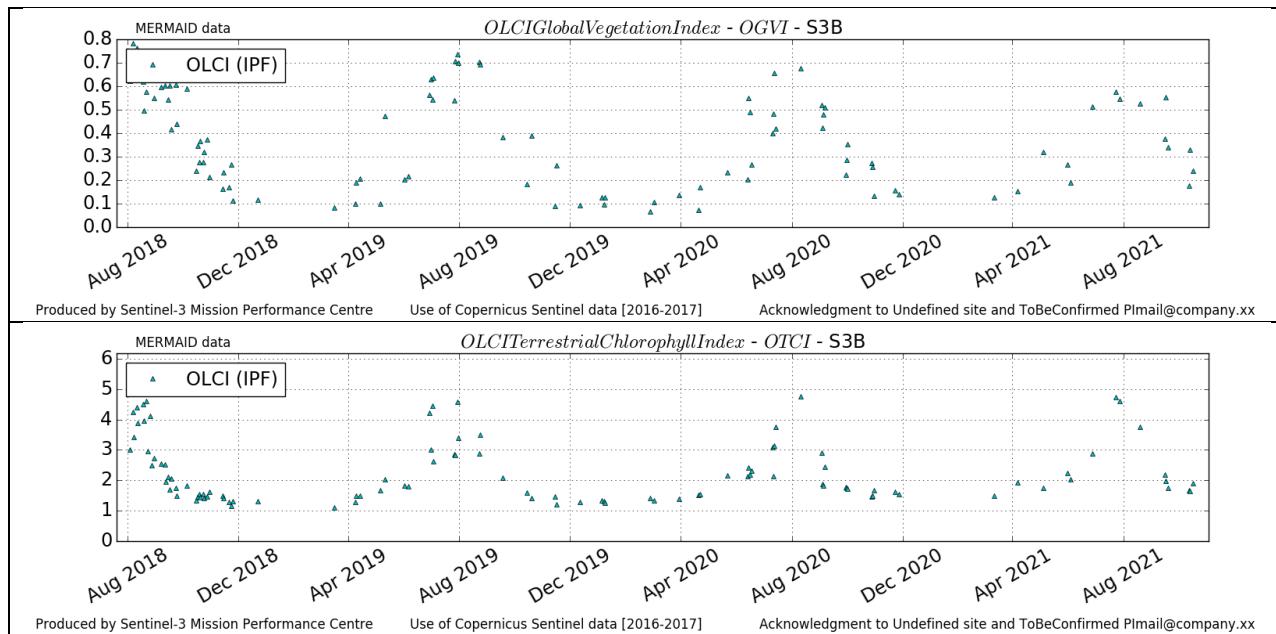


Figure 89: USNe3 time series over current report period

4.1.2 Comparisons with MERIS MGVI and MTCI climatology

This report presents the comparison between MERIS and OLCI land products between the 12th of October 2021 and the 5th of November 2021. The comparison is conducted using 3x3 pixel extractions over 42 established validation sites. The sites are distributed across a range of latitudes and include representative land cover types (Table 5). Statistical measures of the comparison between MERIS and OLCI products are presented in Table 6. In general, there is good agreement between the land products with strong R^2 values and biases around 0. There are similar seasonal trajectories and timings shown in the extractions from both products at the following sites reviewed in this monthly report: BE-Brasschaat, DE-Haininch and FR-EstreesMons (Figure 90 to Figure 92). The monthly mean extractions from all sites is shown in Figure 93. OTCI from S3A shows a strong agreement with the MERIS archive, $R^2 = 0.93$, NRMSD < 0.08 with a low bias, -0.02. OGVI similarly shows a strong agreement with the MERIS archive, $R^2 = 0.93$, NRMSD < 0.15 with a slightly higher bias of 0.06.

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Table 5: Validation sites analysed in report S3A 70/S3B 51. Land cover data from GLC2000 grouped according to the International Geosphere-Biosphere Programme (IGBP) designations.

Acronym	Country	Network	Lat	Lon	Land cover
AU-Cape-Tribulation	Australia	TERN-SuperSites, OzFlux	-16.106	145.378 EBF	
AU-Cumberland	Australia	TERN-SuperSites, AusCover/OzFlux	-33.615	150.723 EBF	
AU-Great-Western	Australia	TERN-SuperSites, AusCover/OzFlux	-30.192	120.654 DBF	
AU-Litchfield	Australia	TERN-SuperSites, AusCover/OzFlux	-13.18	130.79 EBF	
AU-Robson-Creek	Australia	TERN-SuperSites, AusCover/OzFlux	-17.117	145.63 EBF	
AU-Rushworth	Australia	TERN-AusCover	-36.753	144.966 DBF	
AU-Tumbarumba	Australia	TERN-SuperSites, AusCover/OzFlux	-35.657	148.152 EBF	
AU-Warra-Tall	Australia	TERN-SuperSites, AusCover/OzFlux	-43.095	146.654 EBF	
AU-Watts-Creek	Australia	TERN-AusCover	-37.689	145.685 EBF	
AU-Wombat	Australia	TERN-SuperSites, AusCover/OzFlux	-37.422	144.094 EBF	
BE-Brasschaat	Belgium	ICOS	51.308	4.52 ENF	
BE-Vielsalm	Belgium	ICOS	50.305	5.998 ENF	
BR-Mata-Seca	Brazil	ENVIRONET	-14.88	-43.973 non-forest	
CA-Mer-Bleue	Canada	National Capitol Comission	45.4	-75.493 non-forest	
CR-Santa-Rosa	Costa Rica	ENVIRONET	10.842	-85.616 EBF	
CZ-Bili-Kriz	Czechia	ICOS	49.502	18.537 ENF	
DE-Haininch	Deutschland	ICOS Associated	51.079	10.453 DBF	
DE-Hones-Holz	Deutschland	ICOS	52.085	11.222 DBF	
DE-Selhausen	Deutschland	ICOS	50.866	6.447 cultivated	
DE-Tharandt	Deutschland	ICOS	50.964	13.567 ENF	
FR-Aurade	France	ICOS	43.55	1.106 cultivated	
FR-Estrees-Mons	France	ICOS Associated	49.872	3.021 cultivated	
FR-Guayaflux	France	ICOS Associated	5.279	-52.925 EBF	
FR-Hesse	France	ICOS	48.674	7.065 DBF	
FR-Montiers	France	ICOS	48.538	5.312 DBF	
FR-Puechabon	France	ICOS	43.741	3.596 ENF	
IT-Casterporziano2	Italy	ICOS	41.704267	12.357293 DBF	
IT-Collelongo	Italy	EFDC	41.849	13.588 DBF	
IT-Lison	Italy	ICOS	45.74	12.75 cultivated	
NE-Loobos	Netherlands	ICOS Associated	52.166	5.744 ENF	
SE-Dahra	Senegal	KIT / UC	15.4	-15.43 cultivated	
UK-Wytham-Woods	United Kingdom	ForestGeo - NPL	51.774	-1.338 DBF	
US-Bartlett	United States	NEON, AERONET	44.064	-71.287 DBF	
US-Central-Plains	United States	NEON, AERONET	40.816	-104.746 non-forest	
US-Harvard	United States	NEON, AERONET	42.537	-72.173 DBF	
US-Moab-Site	United States	NEON, AERONET	38.248	-109.388 non-forest	
US-Mountain-Lake	United States	NEON, AERONET	37.378	-80.525 DBF	
US-Oak-Rige	United States	NEON, AERONET	35.964	-84.283 DBF	
US-Ordway-Swisher	United States	NEON, AERONET	29.689	-81.993 ENF	
US-Smithsonian	United States	NEON, AERONET	38.893	-78.14 DBF	
US-Steigerwaldt	United States	NEON	45.509	-89.586 DBF	
US-Talladega	United States	NEON, AERONET	32.95	-87.393 ENF	

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Table 6: Comparison statistics between monthly S3A/B OLCI land products and MERIS archive data.

Site Acronym	S3A								S3B							
	OTCI vs MTCI				OGVI vs MGVI				OTCI vs MTCI				OGVI vs MGVI			
	n	R2	NRMSD	Bias	n	R2	NRMSD	Bias	n	R2	NRMSD	Bias	n	R2	NRMSD	Bias
AU-Calperum	12	0.45	0.04	0.09	12	0.9	0.08	-0.01	12	0.19	0.04	0.03	12	0.72	0.16	0
AU-Cape-Tribulation	12	0.82	0.04	-0.1	12	0.37	0.04	0.16	12	0.76	0.04	-0.18	12	0.04	0.13	0.17
AU-Cumberland	12	0.57	0.04	-0.06	12	0.58	0.07	0.07	12	0.45	0.04	0.02	12	0.55	0.1	0.09
AU-Great-Western	12	0.96	0.02	0.12	12	0.94	0	0.04	12	0.94	0.02	0.12	12	0.72	0.1	0.02
AU-Robson-Creek	12	0.91	0.03	-0.05	12	0.91	0.04	0.11	12	0.87	0.04	-0.17	12	0.74	0.09	0.12
AU-Rushworth	12	0.8	0.04	0.14	12	0.25	0.08	0.1	12	0.76	0.04	-0.01	12	0.43	0.08	0.06
AU-Tumbarumba	12	0.85	0.05	0.3	12	0.54	0.06	0.09	12	0.68	0.06	0.15	12	0.23	0.13	0.02
AU-Warra-Tall	12	0.64	0.06	-0.1	12	0.38	0.17	0.04	9	0.66	0.06	-0.31	9	0.21	0.31	0.01
AU-Watts-Creek	12	0.66	0.05	0.03	12	0.48	0.08	0.09	12	0.71	0.05	-0.02	12	0.23	0.11	0.08
AU-Wombat	12	0.9	0.03	0.12	12	0.38	0.05	0.08	12	0.91	0.03	-0.05	12	0.04	0.14	0.05
BE-Brasschaat	11	0.99	0.03	-0.05	11	0.97	0.05	0.06	10	0.98	0.03	-0.09	10	0.95	0.08	0.02
BE-Vielsalm	11	0.89	0.05	0.05	11	0.98	0.06	0.1	10	0.75	0.06	0.03	10	0.85	0.17	0.1
CA-Mer-Bleue	10	0.96	0.05	0	10	0.98	0.06	0.03	10	0.94	0.05	-0.02	10	0.97	0.08	0.01
CZ-Bili-Kriz	11	0.57	0.08	0.11	11	0.96	0.07	0.06	8	0.92	0.04	-0.1	8	0.94	0.07	0.06
DE-Haininch	10	0.99	0.06	-0.06	10	0.98	0.08	0.06	9	0.97	0.09	-0.04	9	0.97	0.1	0.1
DE-Hones-Holz	10	0.99	0.04	0.06	10	0.99	0.05	0.04	10	0.97	0.08	-0.11	10	0.94	0.12	0.01
DE-Selhausen	12	0.89	0.08	-0.02	12	0.5	0.21	0.06	12	0.78	0.11	-0.14	12	0.27	0.27	0.01
DE-Tharandt	10	0.98	0.03	0	10	0.97	0.09	0.1	10	0.98	0.03	-0.2	10	0.97	0.09	0.1
FR-Aurade	12	0.8	0.11	0.06	12	0.8	0.19	0.13	11	0.88	0.08	0.03	11	0.86	0.16	0.08
FR-Estrees-Mons	12	0.95	0.07	0.06	12	0.9	0.11	0.06	12	0.9	0.1	0.14	12	0.93	0.07	0.04
FR-Guayaflux	12	0.73	0.03	-0.15	12	0.19	0.07	0.17	11	0.62	0.04	-0.23	11	0.01	0.25	0.2
FR-Hesse	12	0.99	0.03	0.05	12	0.99	0.04	0.07	11	0.96	0.07	0.03	11	0.87	0.15	0.07
FR-Montiers	12	1	0.03	-0.14	12	0.98	0.06	0.04	12	0.96	0.08	-0.14	12	0.94	0.13	0.07
FR-Puechabon	12	0.84	0.03	-0.05	12	0.94	0.03	0.09	12	0.91	0.04	0.05	12	0.88	0.09	0.06
IT-Casterporziano2	12	0.96	0.02	-0.12	12	0.86	0.05	0.06	12	0.92	0.04	-0.04	12	0.59	0.08	0.03
IT-Collelongo	12	0.99	0.05	0	12	0.99	0.05	0.02	12	0.94	0.12	0.05	12	0.93	0.16	0.03
IT-Lison	12	0.98	0.03	-0.05	12	0.97	0.07	0.09	12	0.92	0.06	-0.05	12	0.92	0.1	0.08
NE-Loobos	12	0.73	0.07	0.08	12	0.91	0.1	0.05	12	0.61	0.07	0.05	12	0.88	0.1	0.03
UK-Wytham-Woods	12	0.97	0.05	0.07	12	0.97	0.07	0.11	11	0.92	0.08	-0.05	11	0.89	0.14	0.07
US-Bartlett	12	0.98	0.03	-0.02	12	0.98	0.1	0.06	12	0.89	0.08	-0.05	12	0.95	0.12	0.04
US-Central-Plains	12	0.68	0.04	-0.01	12	0.92	0.1	0.01	11	0.67	0.04	-0.03	11	0.79	0.21	0
US-Harvard	12	0.99	0.03	-0.17	12	0.97	0.09	0.05	12	0.97	0.05	-0.21	12	0.93	0.14	0.01
US-Jornada	10	0.69	0.06	0.04	10	0.75	0.2	0.01	8	0.87	0.03	0.09	8	0.02	0.2	0
US-Moab-Site	12	0.75	0.02	0.05	12	0.14	0.22	0.01	11	0.88	0.02	0.02	11	0.04	0.43	0.04
US-Mountain-Lake	12	0.99	0.03	-0.22	12	0.99	0.05	0.03	11	0.96	0.07	-0.41	11	1	0.05	0
US-Oak-Rige	12	1	0.02	-0.06	12	0.98	0.07	0.05	12	0.98	0.05	-0.07	12	0.99	0.05	0.05
US-Smithsonian	11	0.99	0.05	-0.2	11	0.99	0.05	0.04	9	0.99	0.06	-0.22	9	0.97	0.09	0.01
US-Steigerwaldt	11	0.99	0.03	0.04	11	0.99	0.05	0	9	0.94	0.07	-0.05	9	0.99	0.05	0.01
US-Talladega	12	0.98	0.02	-0.13	12	0.98	0.05	0.07	12	0.91	0.05	-0.19	12	0.93	0.1	0.07



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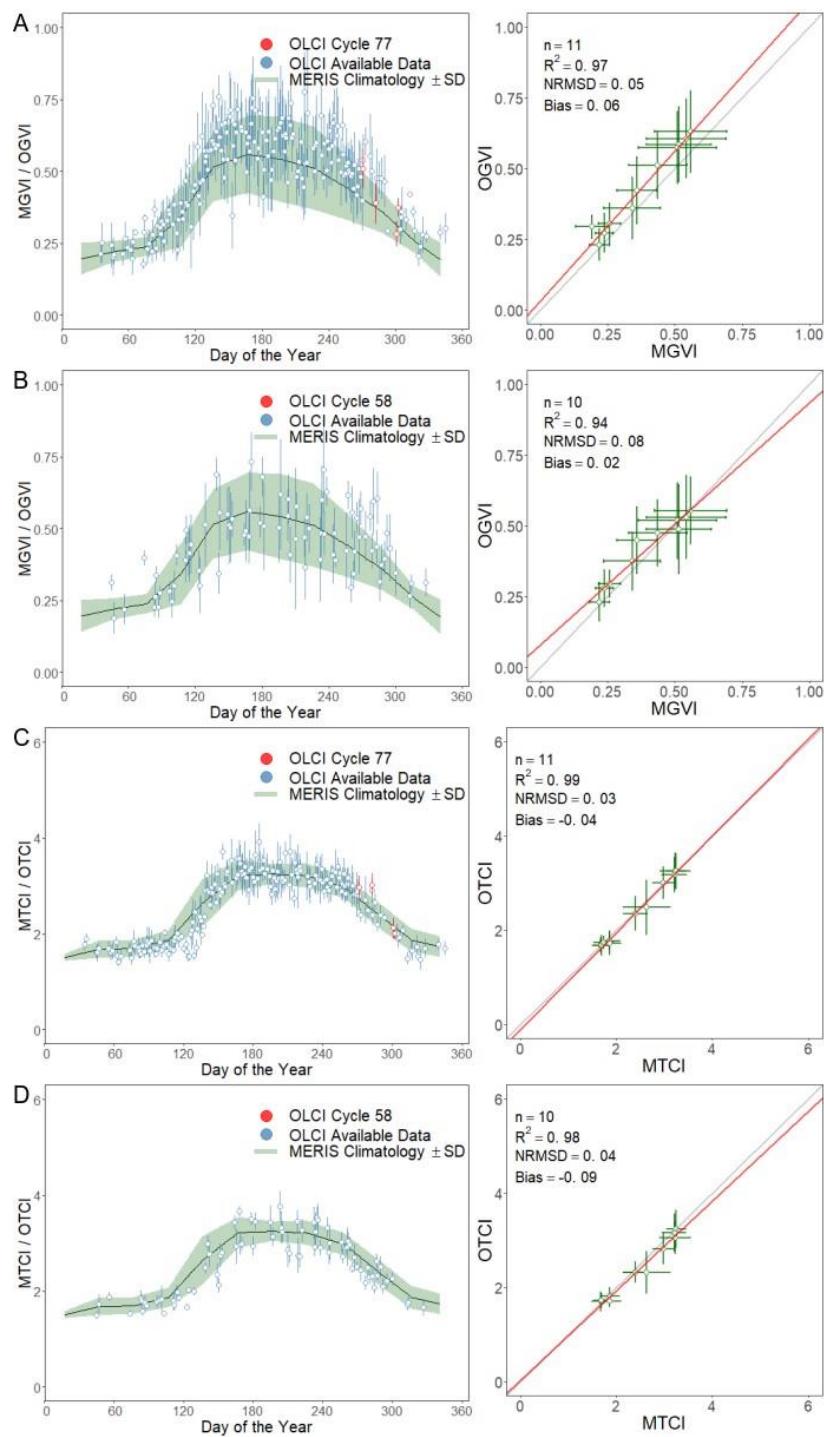


Figure 90: Time-series OGVI and OTCI and corresponding scatterplot of monthly mean for site BE-Brasschaat, Belgium, land cover Needle-leaved, evergreen. A and C represent S3A; B and D represent S3B.



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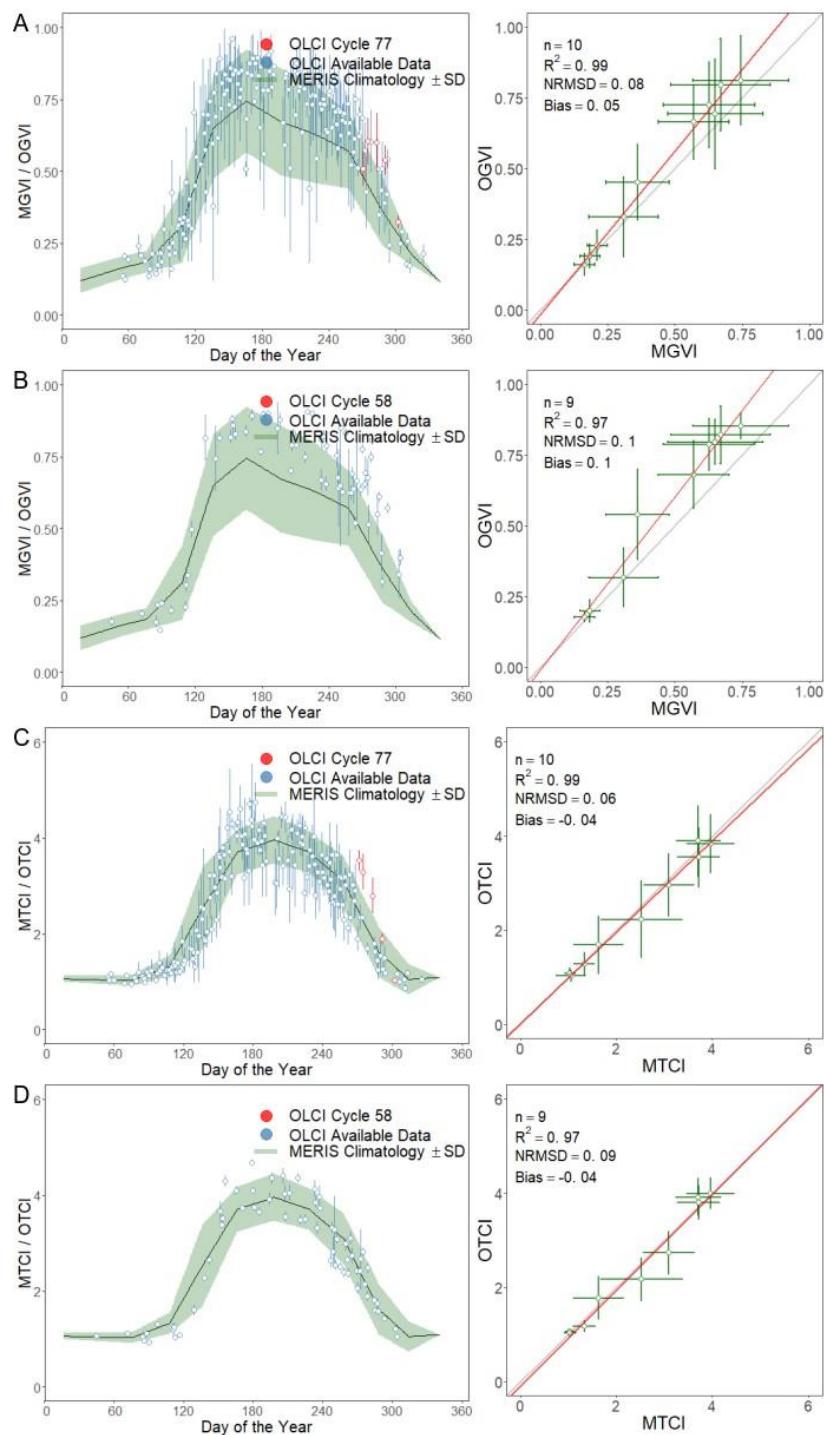


Figure 91: Time-series OGVI and OTCI and corresponding scatterplot of monthly mean for site DE-Haininch, Deutschland, land cover Broadleaved, deciduous, closed. A and C represent S3A; B and D represent S3B.



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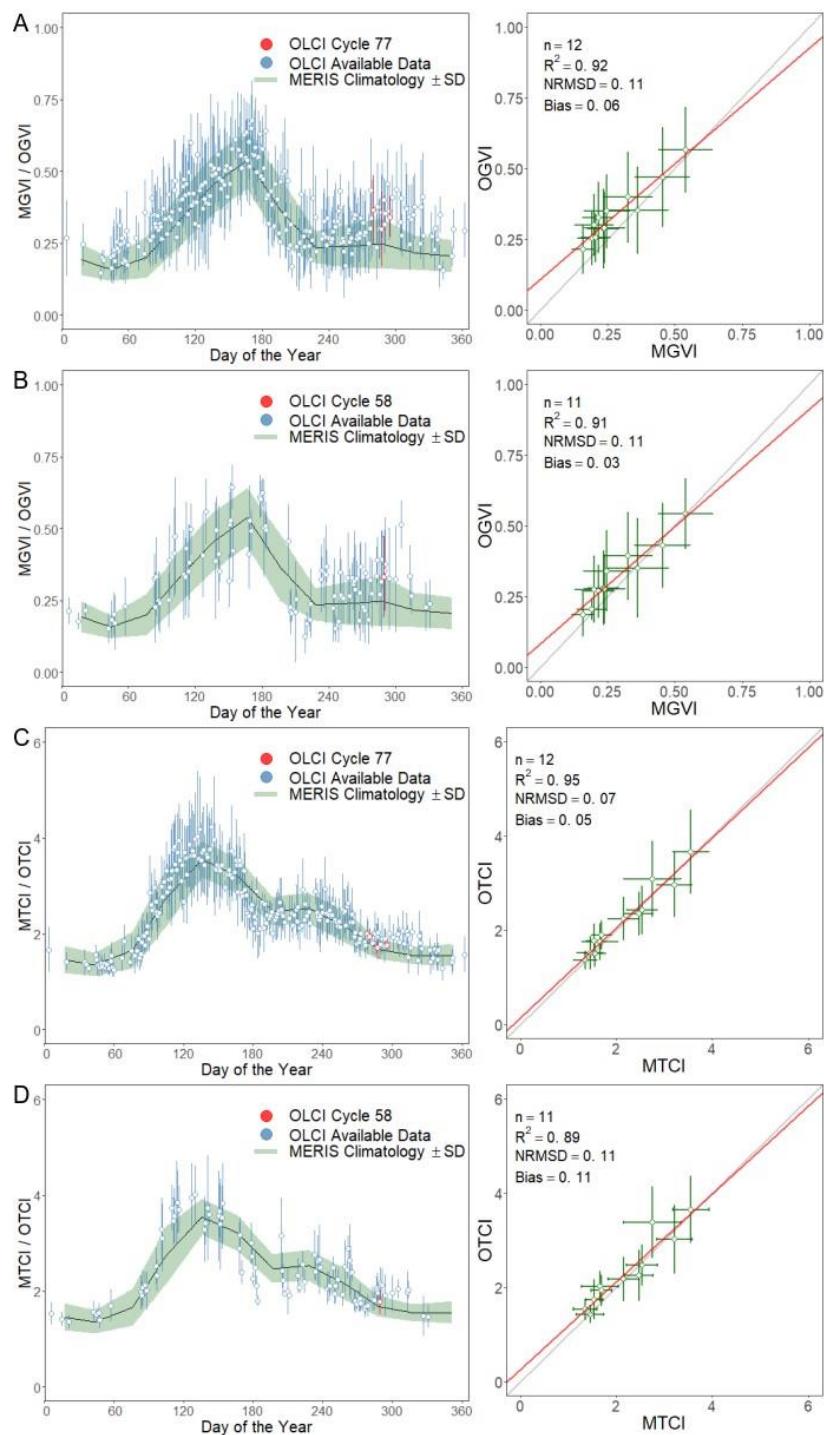


Figure 92: Time-series OGVI and OTCI and corresponding scatterplot of monthly mean for site FR-EstreessMons, France, land cover Cultivated and managed areas. A and C represent S3A; B and D represent S3B.

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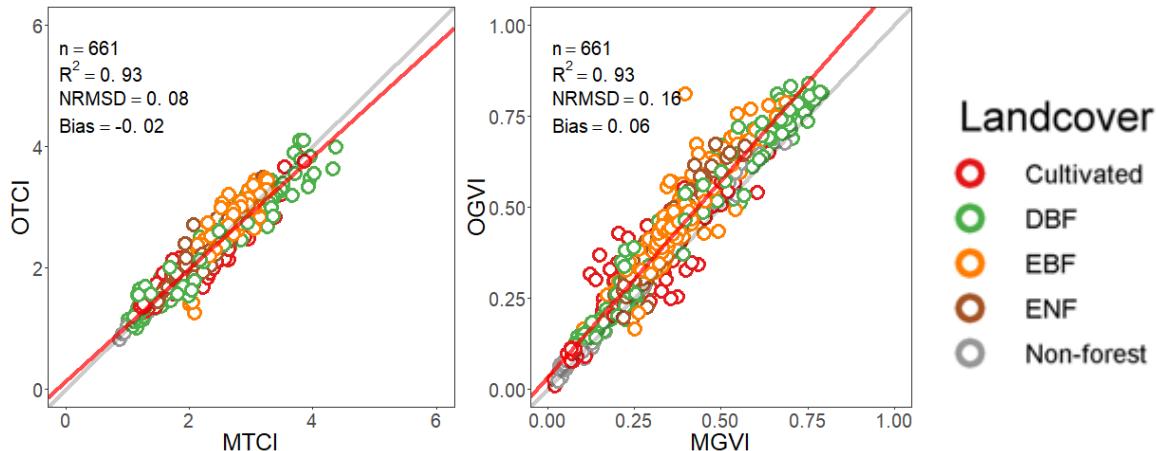


Figure 93: Comparison of OTCI-MTCI (a) and OGVI-MGVI (b). Points in the scatterplot represent the monthly mean of all available S3A and MERIS archive over 42 validation sites. Red and grey lines represent the modelled and 1:1 lines respectively. The scatterplots are updated to include extractions from current S3A cycle.

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 075-A/055-B) are considered valid.

Routine monitoring activities have been continued.

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5 Level 2 Water products validation

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

Results are not further discussed here as SVC is now implemented directly by EUMETSAT.

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, Irbe Lighthouse:** Giuseppe Zibordi, Joint Research Centre of the European Commission
- **Ieodo, Socheongcho:** 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
- **USC_SEAPRISM:** Burton Jones and Curtiss Davis, University Southern California | USC, Oregon State University
- **WaveCIS:** Alan Weidemann, Bill Gibson, Robert Arnone, University of Southern MS, Coastal Studies Inst – LSU, Naval Research Laboratory
- **Ariake tower:** Joji Ishizaka, Kohei Arai, Nagoya University & Saga University
- **Blyth NOAH:** Rodney Forster, University of Hull, UK
- **Casablanca platform:** Giuseppe Zibordi, Marco Malone, Joint Research Centre of the European Commission

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- Grizzly bay, Lake Okeechobee, South Greenbay: NimaPahlevan, NASA
- **Lake Erie:** Tim Moore, Steve Ruberg, Menghua Wang, University of New Hampshire & NOAA
- ❖ 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

Activities done

- ❖ The focus for this time period has been on the rolling archive Non Time Critical (NT) data until the 8th of November 2021.
- ❖ Since **16 February 2021**, EUMETSAT has released a new L2 Ocean Colour processor in Sentinel-3 OLCI operations. L2 operational Ocean Colour data now belong to **Collection 3**, OL_L2M.003.00. Collection-3 introduces major changes in Level-2 Ocean Colour processing. The goal of the changes is to achieve accuracy and consistency between OLCI-A and -B and to introduce several algorithm improvements:
 - System Vicarious Calibration gains are updated in OLCI-A and OLCI-B.
 - Revised Bright Pixel Correction, new Chlorophyll Index algorithm, and updated whitecap correction are introduced in the open water processing chain.
 - New Neural Network v.2 (NNv.2) is introduced in the complex water processing chain.

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- New and updated flags are available, together with a new flag recommendation for users.
- ❖ The full Collection 002 time series period is here after compared to the new processing baseline PB3.00 covering 16 February 2021 to present.
- ❖ All extractions and statistics have been regenerated on the current rolling archive availability including all the extraction since July 2017. The available matchups therefore represent over almost three years of operation.
 - ❖ At best 891 and 895 matchups at 490 and 560nm respectively are useful for Collection 002 time period. OLCI's performances remain nominal.
 - ❖ At best 181 and 256 matchups at 490 and 560nm respectively are useful for Collection 003 time period. OLCI's performances remain nominal.

Overall Water-leaving Reflectance performance

Scatter plots and Performance Statistics

Figure 94 and Figure 95 below present the scatterplots and statistics of OLCI FR versus in situ reflectance. Two time periods are considered:

- ❖ The Collection 002 period from launch of the Sentinel 3 A in April 2016 to the 15th of February 2021
- ❖ Collection 003 introduced 16/02/2021.

Table 7 below summarises the statistics over the overall Collection 002 dataset (July 2017-16 February 2021) and Table 8 for data processed with Collection 003 only (16/02/2021 on). The whole time series statistics are almost within the requirements (5% accuracy in the blue/green bands) – as demonstrated by the RPD values within ±5%, with the noticeable exception of 400 and 412 nm over 10%, very similar to those of the Reprocessing period that was used to derive SVC gains. Performances over the Collection 003 period appear significantly lower but still require consolidation.



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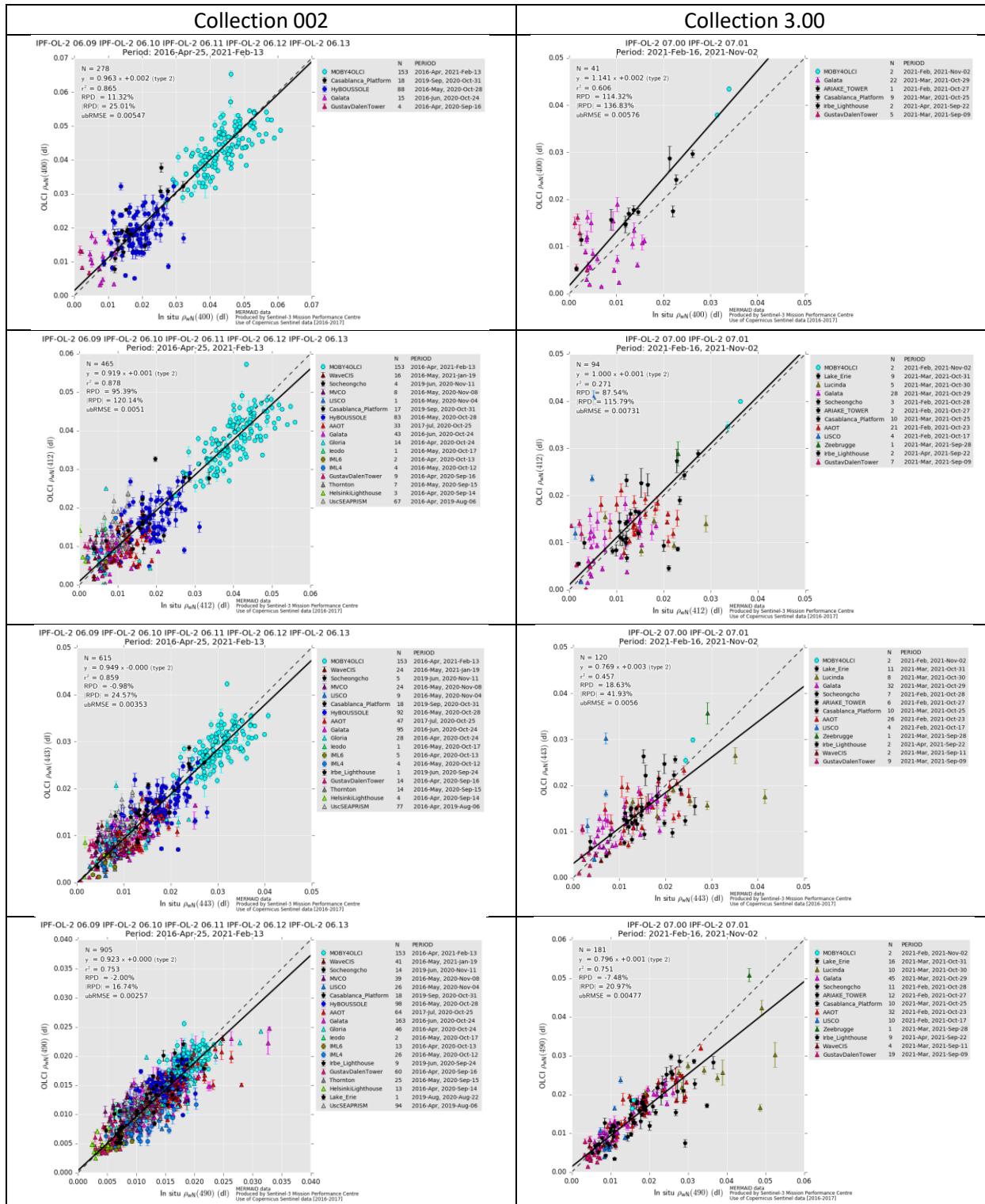


Figure 94: Scatter plots of OLCI-A versus in situ radiometry (FR data). Processing Baseline prior to 3.00 (left), Collection 003 (right), Oa1 to Oa4 (400 to 490 nm)



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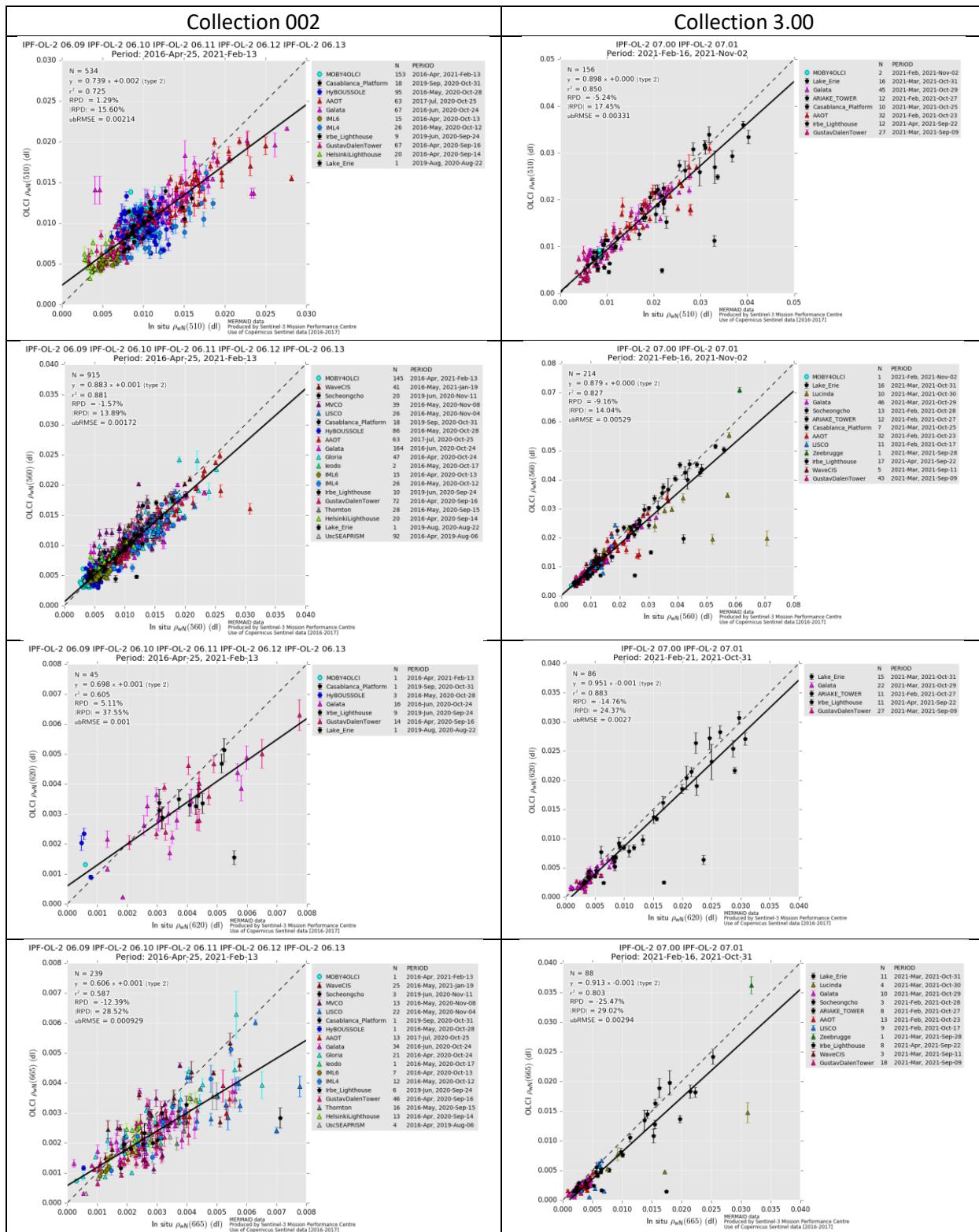


Figure 95: Scatter plots of OLCI-A versus in situ radiometry (FR data). Processing Baseline prior to 3.00 (left), Collection 003 (right), Oa5 Oa6 Oa7 and Oa8 (510, 560, 620 and 665 nm).

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Table 7: OLCI-A FR statistics over December 2017-15/02/2021.

lambda	N	RPD	RPD	MAD	RMSE	slope	intercept	r2
400	278	11.32%	25.01%	0.0004	0.0055	0.9634	0.0015	0.87
412	461	95.36%	120.33%	-0.0009	0.0052	0.9218	0.0008	0.88
443	610	-1.43%	24.23%	-0.0010	0.0036	0.9517	-0.0002	0.86
490	891	-2.34%	16.61%	-0.0006	0.0026	0.9251	0.0003	0.75
510	534	1.29%	15.60%	-0.0004	0.0022	0.7391	0.0024	0.72
560	895	-1.72%	13.78%	-0.0005	0.0018	0.8805	0.0006	0.89
620	45	5.11%	37.55%	-0.0005	0.0011	0.6977	0.0006	0.60
665	236	-12.10%	28.43%	-0.0006	0.0011	0.6201	0.0005	0.60

Table 8: OLCI-A FR statistics over mid-February 2021-present (Collection 003).

lambda	N	RPD	RPD	MAD	RMSE	slope	intercept	r2
400	41	114.32%	136.83%	0.0031	0.0066	1.1411	0.0017	0.61
412	94	87.54%	115.79%	0.0010	0.0074	1.0003	0.0010	0.27
443	120	18.63%	41.93%	-0.0001	0.0056	0.7686	0.0031	0.46
490	181	-7.48%	20.97%	-0.0020	0.0052	0.7963	0.0014	0.75
510	156	-5.24%	17.45%	-0.0012	0.0035	0.8978	0.0004	0.85
560	214	-9.16%	14.04%	-0.0019	0.0056	0.8794	0.0002	0.83
620	86	-14.76%	24.37%	-0.0013	0.0030	0.9507	-0.0009	0.88
665	88	-25.47%	29.02%	-0.0016	0.0033	0.9131	-0.0010	0.80

Time series

Figure 96 and Figure 97 below present AAOT and Galata in situ and OLCI time series over the June 2017-present period, including Collection 003 introduced 16/02/2021.



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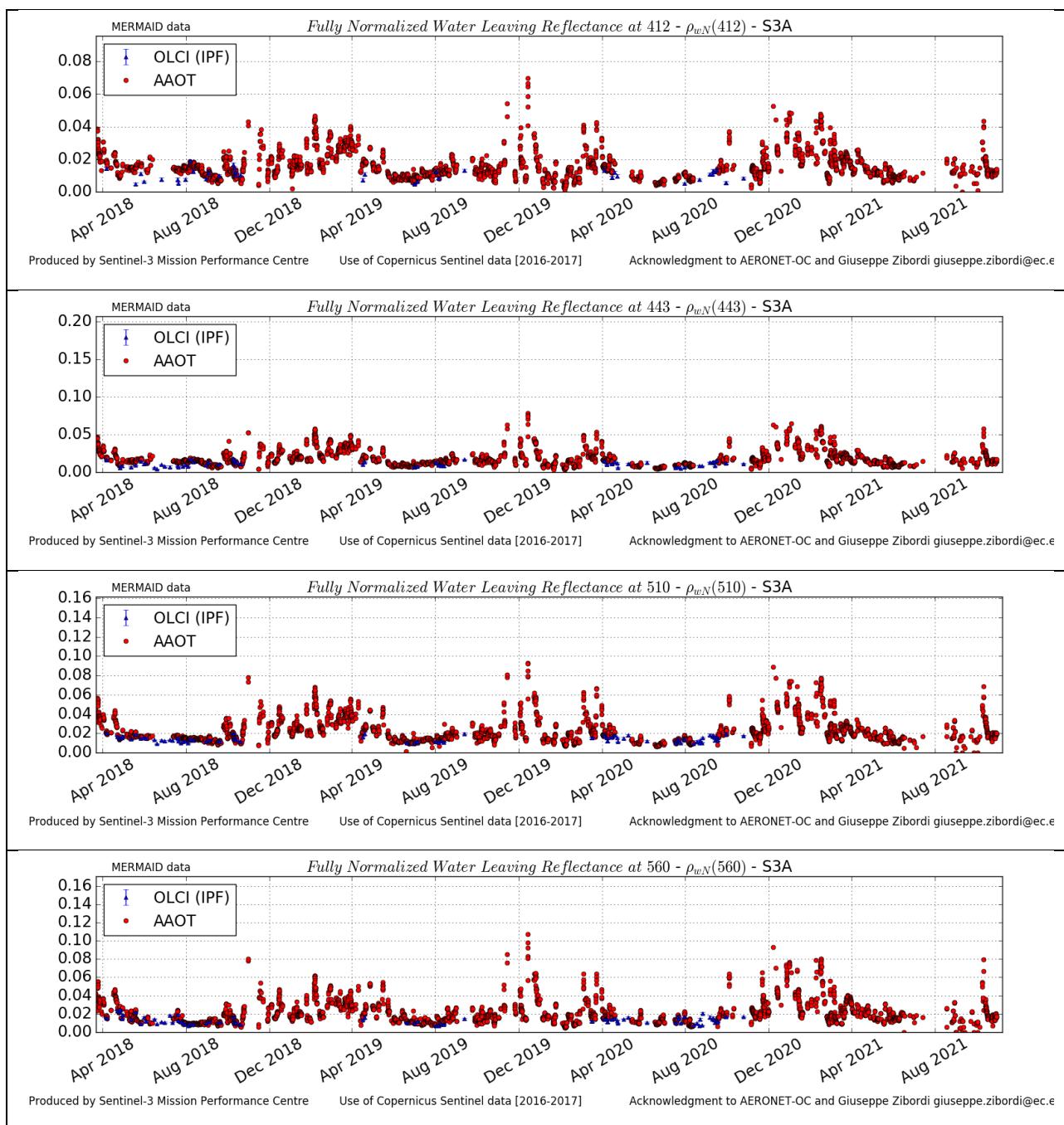


Figure 96: AAOT time series over current report period



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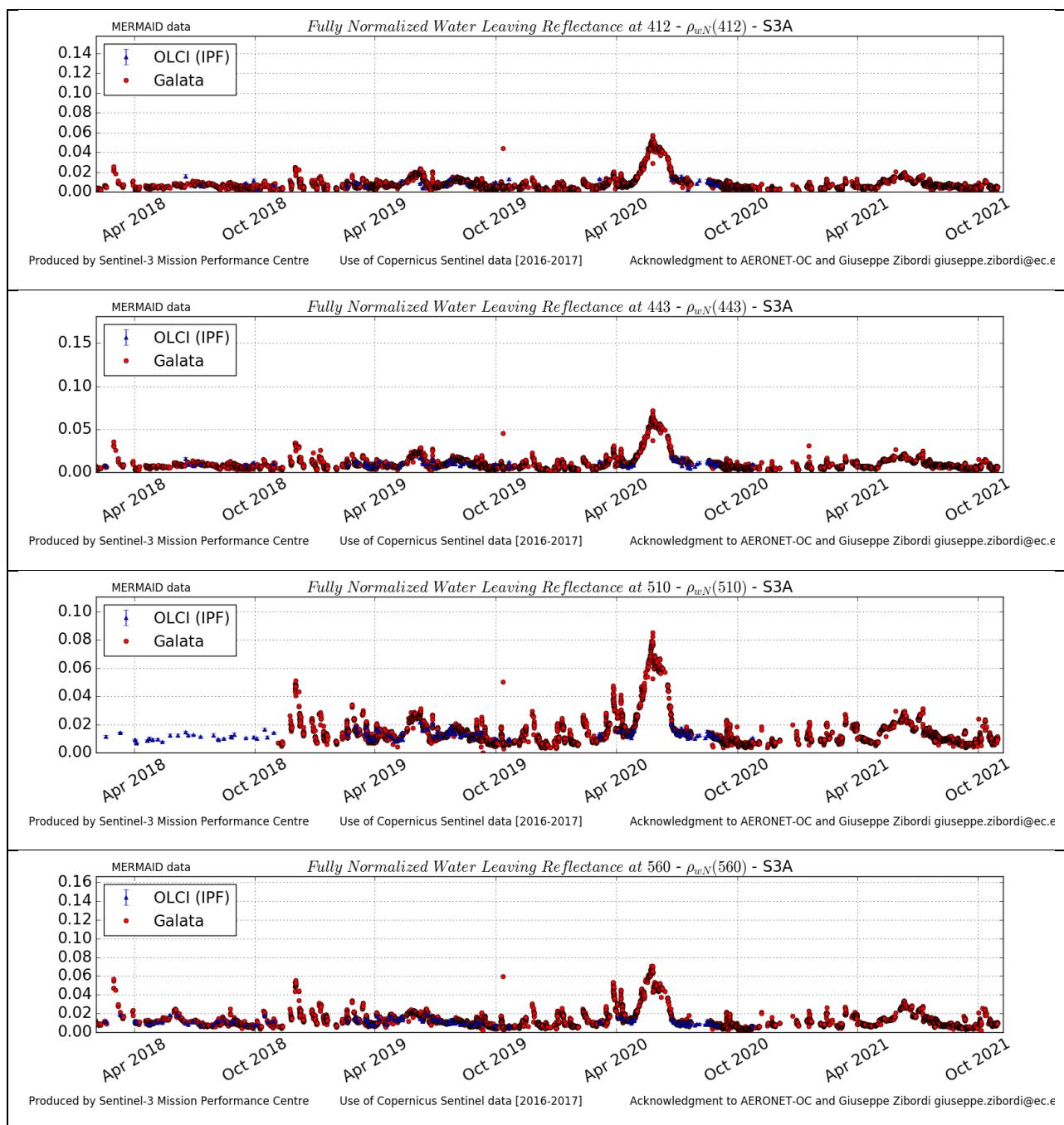


Figure 97: Galata time series over current report period

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5.2.3 OLCI-B

Activities done

- ❖ The focus for this time period has been on the rolling archive Non Time Critical (NT) data until the 8th of November 2021.
- ❖ Since **16 February 2021**, EUMETSAT has released a new L2 Ocean Colour processor in Sentinel-3 OLCI operations. L2 operational Ocean Colour data now belong to **Collection 3**, OL_L2M.003.00. Collection-3 introduces major changes in Level-2 Ocean Colour processing. The goal of the changes is to achieve accuracy and consistency between OLCI-A and -B and to introduce several algorithm improvements:
 - System Vicarious Calibration gains are updated in OLCI-A and OLCI-B.
 - Revised Bright Pixel Correction, new Chlorophyll Index algorithm, and updated whitecap correction are introduced in the open water processing chain.
 - New Neural Network v.2 (NNv.2) is introduced in the complex water processing chain.
 - New and updated flags are available, together with a new flag recommendation for users.
- ❖ All extractions and statistics have been regenerated on the current rolling archive availability including all the extraction since February 2019.
 - ❖ At best 237 and 261 matchups at 490 and 560nm respectively are useful for Collection 002.
 - ❖ At best 175 and 210 matchups at 490 and 560 nm respectively are useful for Collection 003.
- ❖

It must be noted that OLCI-B has SVC adjustment only since 16/02/2021.

Overall Water-leaving Reflectance performance

Scatter plots and Performance Statistics

Figure 98 and Figure 99 below presents the scatterplots and statistics of OLCI-B FR versus in situ reflectance.

Two time periods are considered:

- ❖ The Collection 002 period from beginning of the mission to the 15th of February 2021,
- ❖ Collection 003, introduced 16/02/2021.

Table 9 below summarises the statistics over the whole reporting period while Table 10 present the same figures restricted to Collection 003.



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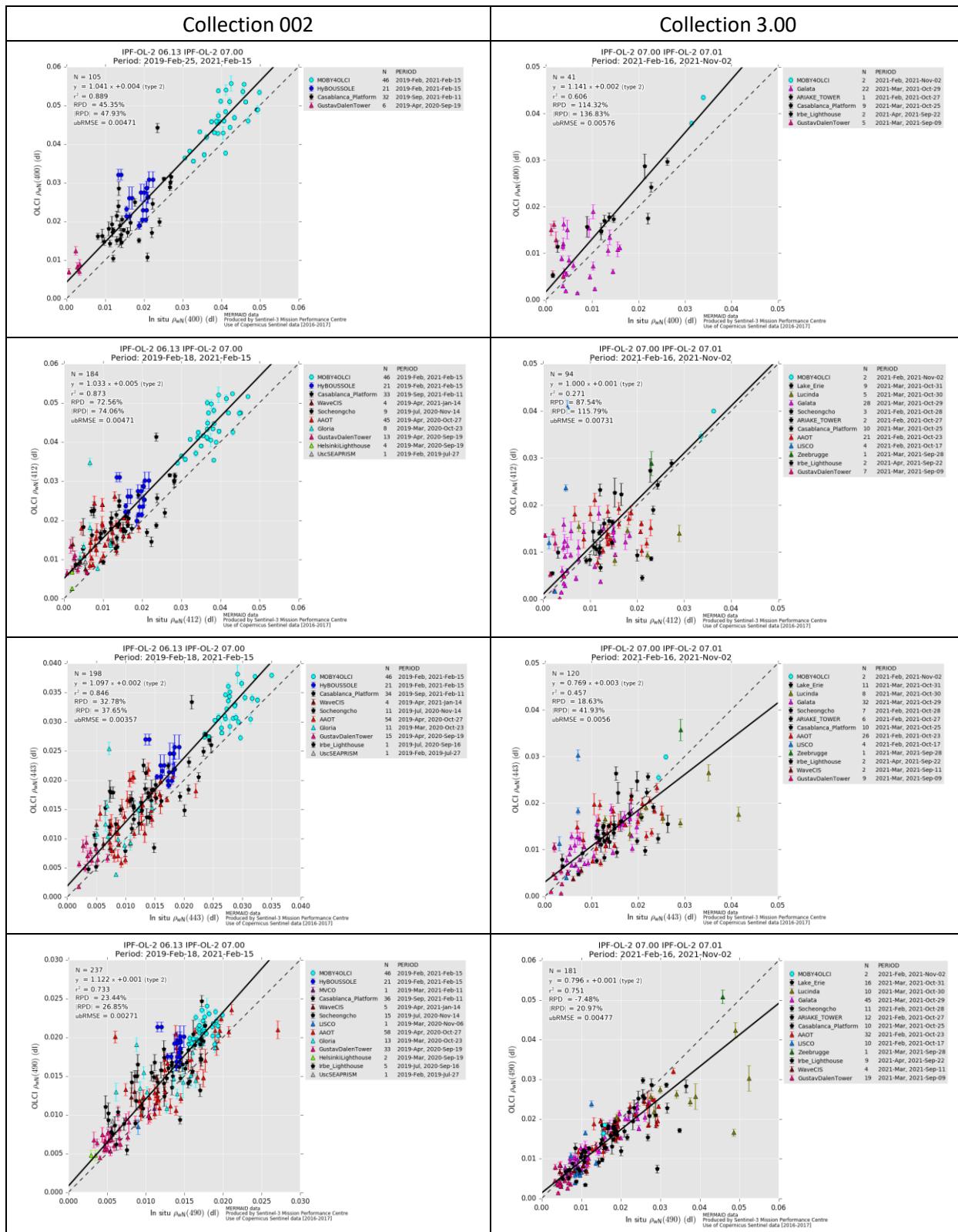


Figure 98: Scatter plots of OLCI-B versus in situ radiometry (FR data). Processing Baseline prior to Collection 3.00 (left), Collection 003 (right), Oa1 to Oa4 (400 to 490 nm)



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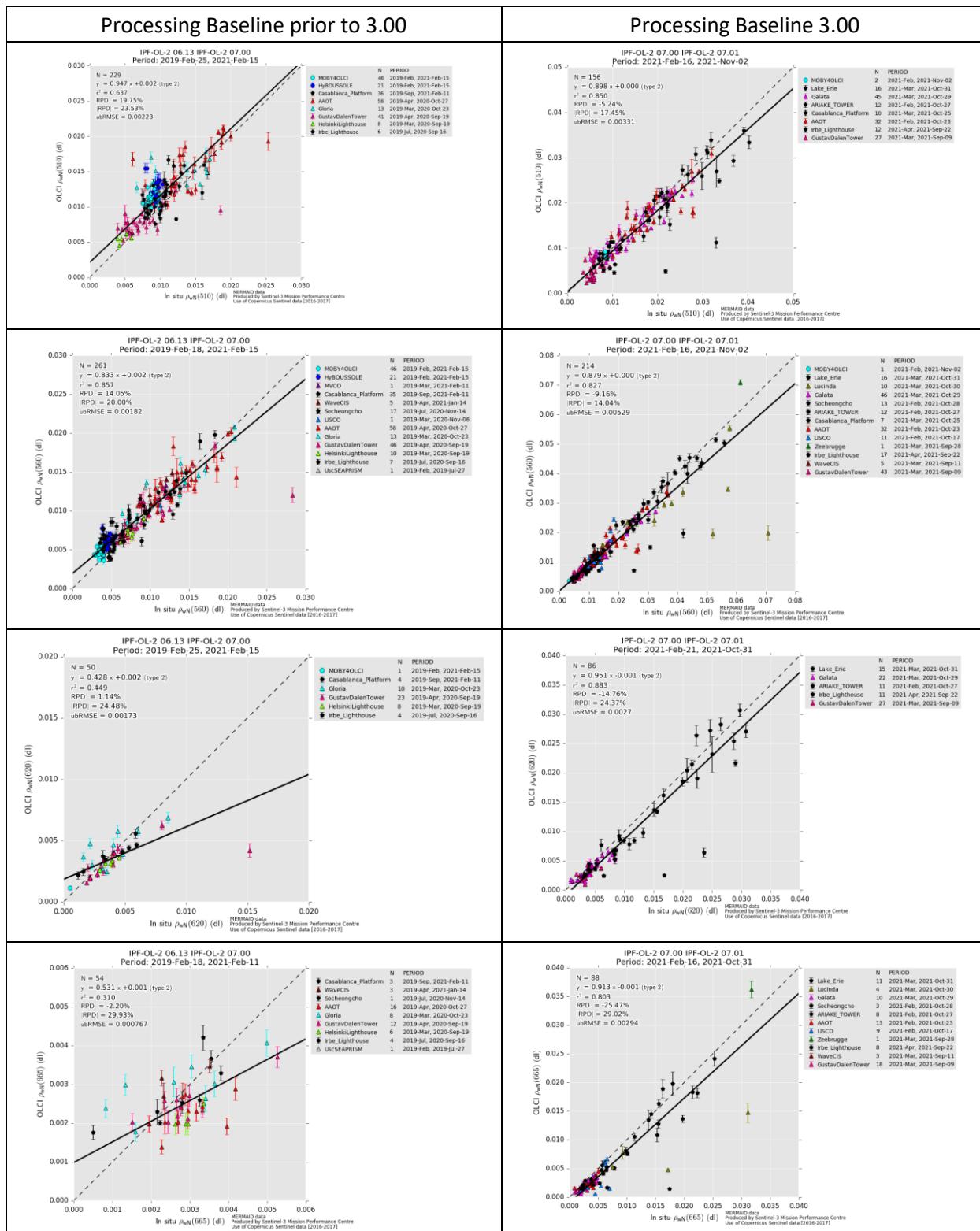


Figure 99: Scatter plots of OLCI-B versus in situ radiometry (FR data). Processing Baseline prior to Collection 3.00 (left), Collection 003 (right), Oa5 to Oa8 (510 to 665 nm)

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Table 9: OLCI-B FR statistics over the July 2017-16 February 2021 period.

lambda	N	RPD	RPD	MAD	RMSE	slope	intercept	r2
400	105	45.35%	47.93%	0.0053	0.0071	1.0409	0.0042	0.89
412	184	72.56%	74.06%	0.0057	0.0074	1.0327	0.0052	0.87
443	198	32.78%	37.65%	0.0034	0.0049	1.0969	0.0019	0.85
490	237	23.44%	26.85%	0.0024	0.0036	1.1217	0.0008	0.73
510	229	19.75%	23.53%	0.0016	0.0027	0.9471	0.0021	0.64
560	261	14.05%	20.00%	0.0005	0.0019	0.8334	0.0019	0.86
620	50	1.14%	24.48%	-0.0004	0.0018	0.4277	0.0018	0.45
665	54	-2.20%	29.93%	-0.0004	0.0009	0.5313	0.0010	0.31

It is recalled that that OLCI-B had no SVC adjustment over this period.

Table 10: OLCI-B FR statistics over mid-February 2021-present (Collection 003).

lambda	N	RPD	RPD	MAD	RMSE	slope	intercept	r2
400	33	101.56%	114.92%	0.0040	0.0074	1.3039	0.0003	0.71
412	69	74.34%	93.75%	0.0015	0.0060	1.0551	0.0007	0.60
443	103	18.86%	41.43%	-0.0001	0.0049	0.9906	0.0001	0.66
490	168	-2.98%	21.89%	-0.0014	0.0044	0.9197	0.0000	0.82
510	153	-0.88%	18.35%	-0.0008	0.0035	0.9238	0.0004	0.86
560	209	-3.25%	14.80%	-0.0009	0.0034	0.9879	-0.0007	0.93
620	76	-10.61%	23.36%	-0.0014	0.0050	0.7844	0.0007	0.74
665	86	-15.24%	31.79%	-0.0015	0.0042	0.8565	-0.0004	0.77

Time series

Figure 100 and Figure 101 below present AAOT and Casablanca Platform in situ and OLCI-B time series over the current period.



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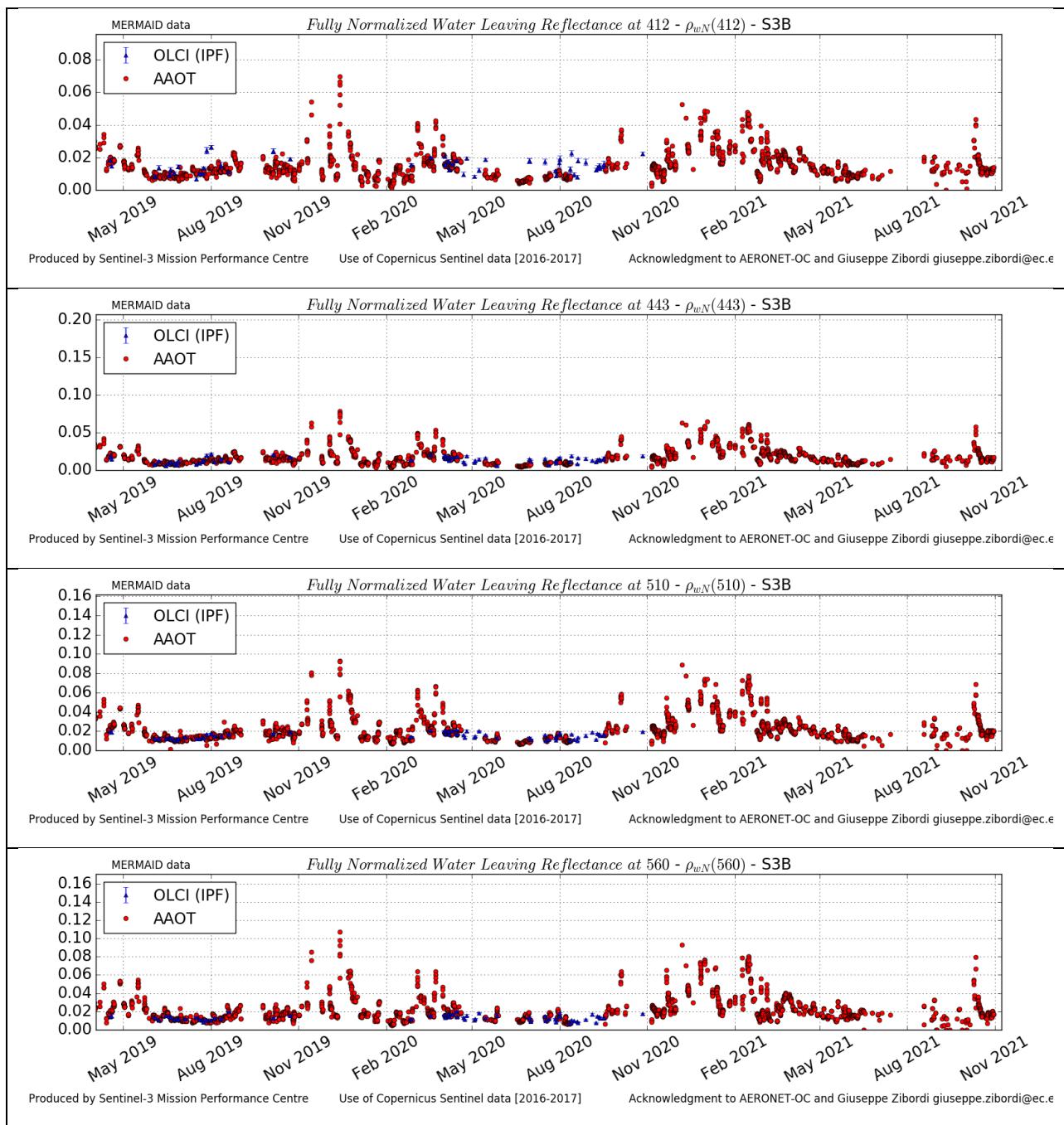


Figure 100: AAOT time series over current report period



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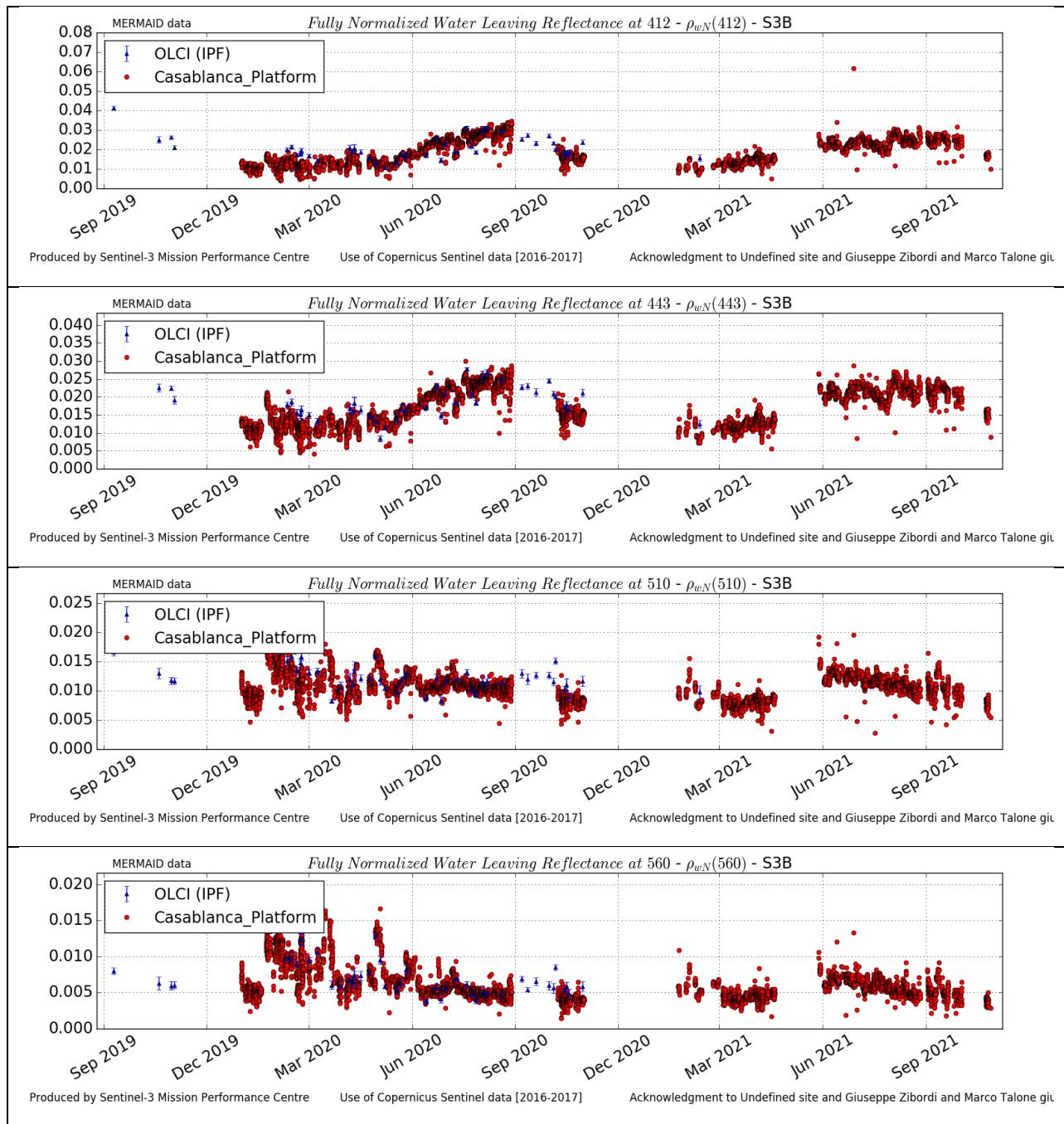


Figure 101: Casablanca Platform time series over current report period

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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 075-A/055-B) are considered valid.

Routine monitoring activities have been continued.

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

There has been no new result during the cycle. Last figures (cycle 075-A/055-B) are considered valid.

Routine monitoring activities have been continued.

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

Improvement of alternative atmospheric correction

There has been no new result during the cycle. Last figures (cycle 075-A/055-B) are considered valid.

Routine monitoring activities have been continued.

 <p>SENTINEL-3 Mission Performance Centre</p>	<p>Sentinel-3 MPC S3 OLCI Cyclic Performance Report S3A Cycle No. 077 – S3B Cycle No. 058</p>	<p>Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 98</p>
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6 Validation of Integrated Water Vapour over Land & Water

There has been no new result during the cycle. Last figures (cycle 075-A/055-B) are considered valid.

Routine monitoring activities have been continued.

 <p>SENTINEL-3 Mission Performance Centre</p>	<p>Sentinel-3 MPC</p> <p>S3 OLCI Cyclic Performance Report</p> <p>S3A Cycle No. 077 – S3B Cycle No. 058</p>	<p>Ref.: S3MPC.ACR.PR.01-077-058</p> <p>Issue: 1.0</p> <p>Date: 10/11/2021</p> <p>Page: 99</p>
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7 Level 2 SYN products validation

There has been no new result during the cycle. Most recent performance figures can be found in the S3MPC OPT Annual Performance Report - Year 2020 (S3MPC.ACR.APR.007, issue 1.0, 26/02/2021), available on-line at:

<https://sentinels.copernicus.eu/web/sentinel/user-guides/sentinel-3-olci/document-library>.

	<p style="text-align: center;">Sentinel-3 MPC S3 OLCI Cyclic Performance Report S3A Cycle No. 077 – S3B Cycle No. 058</p>	Ref.: S3MPC.ACR.PR.01-077-058 Issue: 1.0 Date: 10/11/2021 Page: 100
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8 Events

For OLCI-A, three Radiometric Calibration sequence have been acquired during Cycle 077:

- ❖ S01 sequence (diffuser 1) on 03/10/2021 08:47 to 08:49 (absolute orbit 29311)
- ❖ S01 sequence (diffuser 1) on 16/10/2021 11:33 to 11:35 (absolute orbit 29498)
- ❖ S01 sequence (diffuser 1) on 25/10/2021 09:19 to 09:21 (absolute orbit 29625)

For OLCI-B, one Radiometric Calibration sequence has been acquired during Cycle 058:

- ❖ S01 sequence (diffuser 1) on 14/10/2021 16:48 to 16:50 (absolute orbit 18079)
- ❖ S01 sequence (diffuser 1) on 21/10/2021 12:05 to 12:07 (absolute orbit 18176)
- ❖ S01 sequence (diffuser 1) on 28/10/2021 12:24 to 12:26 (absolute orbit 18276)

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9 Appendix A

Other reports related to the Optical mission are:

- ❖ S3 SLSTR Cyclic Performance Report, S3A Cycle No. 077, S3B Cycle No. 058
(ref. S3MPC.RAL.PR.02-077-058)

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

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