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

**S3-A SLSTR Cyclic Performance Report** 

Cycle No. 032

Start date: 31/05/2018

End date: 27/06/2018



Ref.: S3MPC.RAL.PR.02-032 Issue: 1.0 Date: 04/07/2018 Contract: 4000111836/14/I-LG

Customer:	ESA	Document Ref.:	S3MPC.RAL.PR.02-032
Contract No.:	4000111836/14/I-LG	Date:	04/07/2018
		Issue:	1.0

Project:	PREPARATION AND OPERATION		PERFORMANCE CENTRE (MPC)									
Title:	S3-A SLSTR Cyclic Performance	S3-A SLSTR Cyclic Performance Report										
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Distribution:	ESA, EUMETSAT, S3MPC conso	rtium										
Accepted by ESA	S. Dransfeld, MPC Deputy TO for OPT P. Féménias, MPC TO											
Filename	S3MPC.RAL.PR.02-032 - i1r0 - 5	SLSTR Cyclic Report 0	32.docx									

#### Disclaimer

The work performed in the frame of this contract is carried out with funding by the European Union. The views expressed herein can in no way be taken to reflect the official opinion of either the European Union or the European Space Agency.









# **Changes Log**

Version	Date	Changes
1.0	04/06/2018	First Version

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# **1** Processing Baseline Version

IPF	IPF / Processing Baseline version	Date of deployment
SL1	06.14 / 2.17	CGS: 05/07/2017 13:15 UTC (NRT) PAC: 05/07/2017 12:34 UTC (NTC)
SL1	06.15 / 2.29	CGS: 04/04/2018 10:09 UTC PAC: 04/04/2018 10:09 UTC
SL2	06.12 / 2.17	CGS: 05/07/2017 13:16 UTC (NRT) PAC: 05/07/2017 12:42 UTC (NTC)



# 2 Instrument monitoring

#### 2.1 Instrument temperatures

As a thermal infrared instrument, thermal stability and uniformity of the optical mechanical enclosure (OME) is critical to the radiometric calibration. Figure 1 and Figure 2 show the orbital average temperature of the OME and instrument baffles during Cycle 32. The temperatures were stable (on top of a daily variation cycle), except for a small increase on  $6^{th}$  and  $7^{th}$  June during the blackbody crossover test. During this test the temperatures of the two internal blackbody sources are adjusted (see Section 2.4) causing some heating of the instrument and inner baffles.

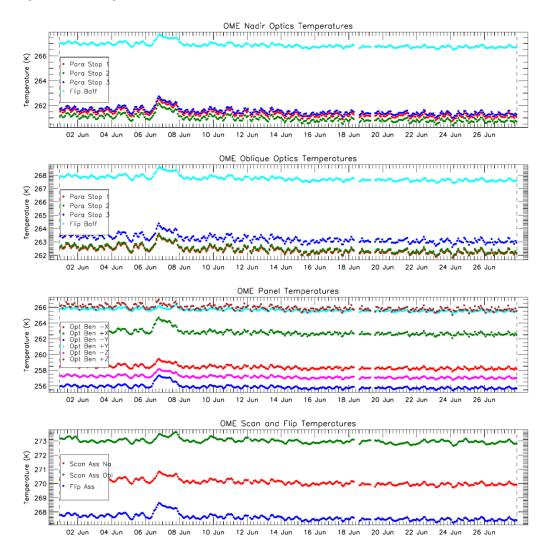
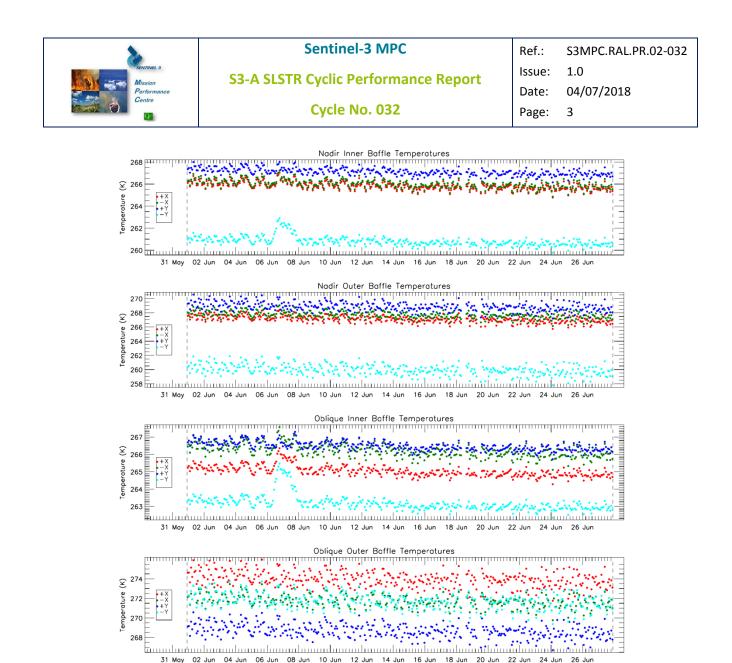


Figure 1: OME temperature trends for Cycle 32 showing the paraboloid stops and flip baffle (top two plots) and optical bench and scanner and flip assembly (lower two plots). The vertical dashed lines indicate the start and end of the cycle. Each dot represents the average temperature in one orbit.



*Figure 2: Baffle temperature trends for Cycle 32. The vertical dashed lines indicate the start and end of the cycle. Each dot represents the average temperature in one orbit.* 



#### **2.2** Detector temperatures

The detector temperatures in Cycle 32 were stable at their expected values following the instrument decontamination that was performed during Cycle 28 between 15<sup>th</sup> and 21<sup>st</sup> February. The decontamination involved warming up the focal plane array in order to remove water ice contamination from the cold surfaces. Figure 3 shows the detector temperatures for the past year and the decontamination is clearly visible as a rise in detector temperature (the previous decontamination was performed in Cycle 20). A few orbits in Cycle 32 show slightly lower average detector temperatures and these are due to the tests performed on 4-7<sup>th</sup> June and 18-19<sup>th</sup> June (see Section 6).

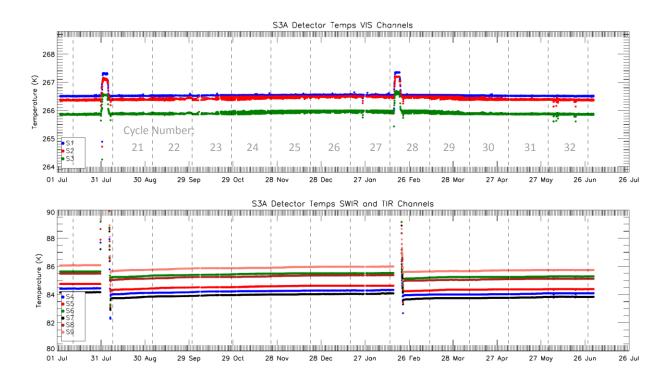


Figure 3: Detector temperatures for each channel for the last year of operations. Discontinuities occur for the infrared channels where the FPA was heated for decontamination. The vertical dashed lines indicate the start and end of each cycle. Each dot represents the average temperature in one orbit. The different colours indicate different detectors.



## 2.3 Scanner performance

Scanner performance in Cycle 32 has been consistent with previous operations and within required limits.

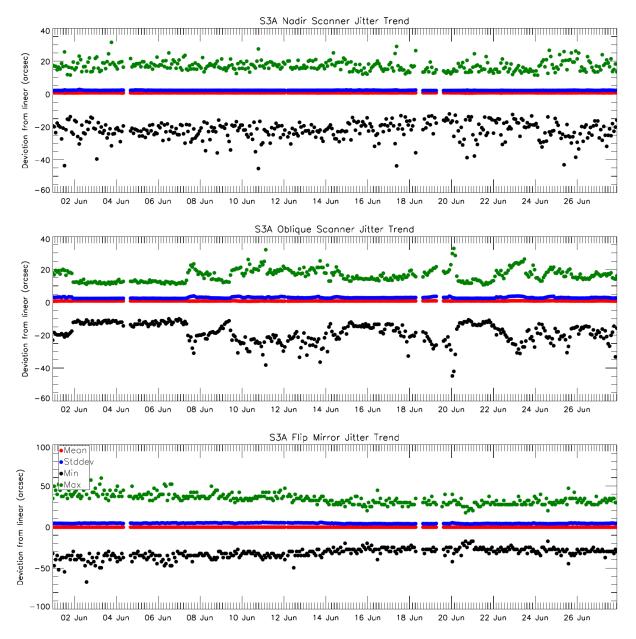


Figure 4: Scanner and flip jitter for Cycle 32, showing mean, stddev and max/min difference from expected position per orbit for the nadir view (red, blue, green and black respectively).



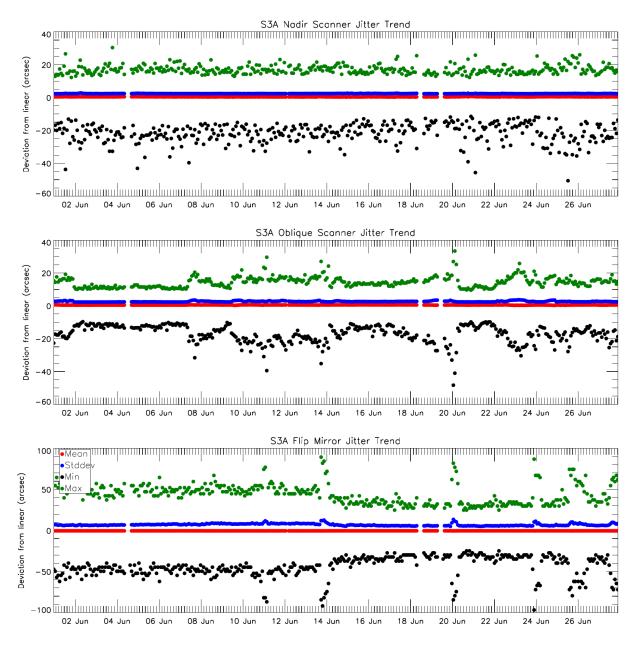


Figure 5: Scanner and flip jitter for Cycle 32, showing mean, stddev and max/min difference from expected position per orbit for the oblique view (red, blue, green and black respectively).



#### 2.4 Black-Bodies

Figure 6 shows the orbital average blackbody temperatures during Cycle 32. The temperatures were stable (on top of a daily variation cycle). Longer term analysis also shows a yearly variation, with temperatures rising as the Earth approaches perihelion at the beginning of January. Cycle 32 falls after this yearly peak with +YBB temperatures around 302.8 K (see Figure 7 and Table 3). Figure 6 shows that gradients across the blackbody baseplate are stable and within their expected range ( $\pm 20$ mK). On 6<sup>th</sup> June a blackbody crossover test was performed, and this involves swapping the temperatures of the two blackbodies – i.e. cooling the +YBB and heating the -YBB. Figure 6 clearly shows this change of temperature on 6-7<sup>th</sup> June and the associated change in temperature gradient across the baseplate when the blackbody temperatures were swapped over.

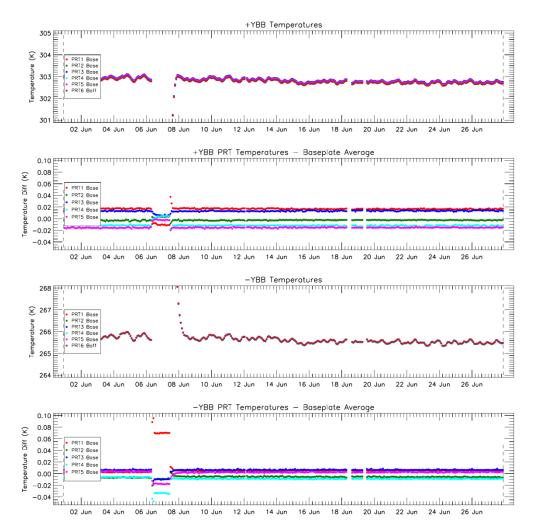


Figure 6: Blackbody temperature and baseplate gradient trends during Cycle 32. The vertical dashed lines indicate the start and end of the cycle. Each dot represents the average temperature in one orbit.

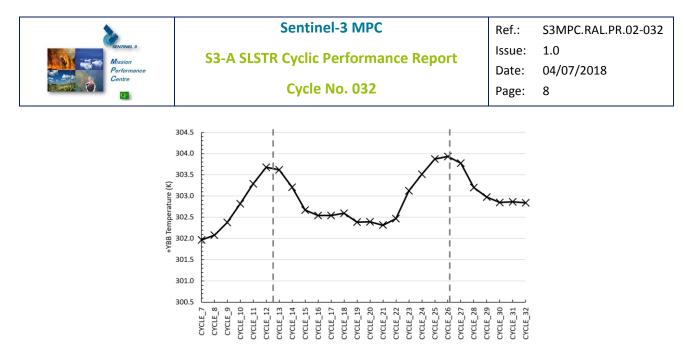


Figure 7: Long term trends in average +YBB temperature in each cycle, showing yearly variation. The vertical dashed lines indicate the 1<sup>st</sup> January 2017 and 2018.



### **2.5** Detector noise levels

#### 2.5.1 VIS and SWIR channel signal-to-noise

The VIS and SWIR channel noise in Cycle 32 was stable and consistent with previous operations - the signal-to-noise ratio of the measured VISCAL signal over the mission so far is plotted in Figure 8. Table 1 and Table 2 give the average signal-to-noise in each cycle (excluding the anomaly/decontamination period in cycles 20 and 28). Note that this averages over the significant detector-detector dispersion for the SWIR channels that is shown in Figure 8.

# Table 1: Average reflectance factor, and signal-to-noise ratio of the measured VISCAL signal for cycles 021-032, averaged over all detectors for the nadir view.

	Average		Nadir Signal-to-noise ratio											
	Reflectance Factor	Cycle 021	Cycle 022	Cycle 023	Cycle 024	Cycle 025	Cycle 026	Cycle 027	Cycle 028	Cycle 029	Cycle 030	Cycle 031	Cycle 032	
<b>S1</b>	0.187	230	232	234	235	234	228	226	223	228	232	234	226	
S2	0.194	235	235	239	236	237	233	232	229	232	237	233	231	
<b>S3</b>	0.190	231	229	234	232	234	227	227	223	229	228	228	221	
<b>S4</b>	0.191	135	136	139	140	142	141	138	138	138	140	139	139	
S5	0.193	232	229	236	236	235	238	235	236	232	233	235	236	
<b>S6</b>	0.175	138	139	142	146	145	146	143	143	143	142	143	143	

 Table 2: Average reflectance factor, and signal-to-noise ratio of the measured VISCAL signal for cycles 021-032,

 averaged over all detectors for the oblique view.

	Average	Oblique Signal-to-noise ratio											
	Reflectance Factor	Cycle 021	Cycle 022	Cycle 023	Cycle 024	Cycle 025	Cycle 026	Cycle 027	Cycle 028	Cycle 029	Cycle 030	Cycle 031	Cycle 032
<b>S1</b>	0.166	240	241	243	246	246	239	236	235	237	242	249	239
S2	0.170	245	246	253	249	251	243	239	238	243	249	249	247
<b>S3</b>	0.168	238	238	247	239	244	234	227	229	235	234	239	234
<b>S4</b>	0.166	108	108	110	111	111	110	107	107	109	109	110	108
S5	0.166	168	168	172	173	173	172	170	171	170	170	169	172
S6	0.155	108	107	111	110	113	109	107	107	109	109	110	110



#### Sentinel-3 MPC

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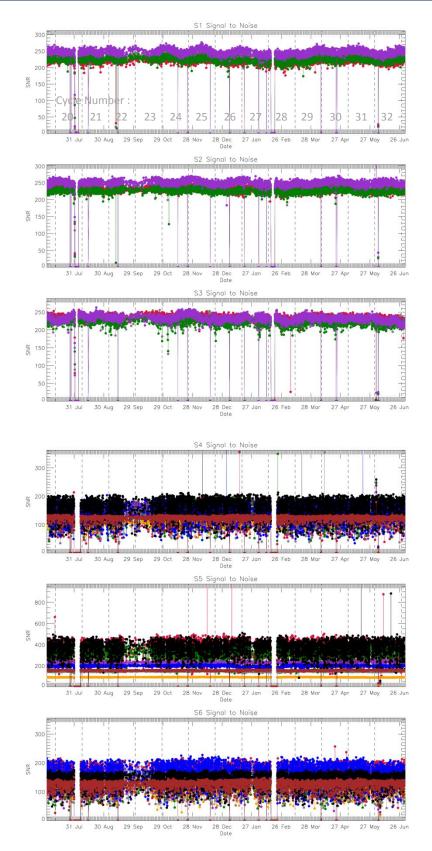


Figure 8: VIS and SWIR channel signal-to-noise of the measured VISCAL signal in each orbit for the last year of operations. Different colours indicate different detectors. The vertical dashed lines indicate the start and end of each cycle.



#### 2.5.2 TIR channel NEDT

The thermal channel NEDT values in Cycle 32 are consistent with previous operations and within the requirements. NEDT trends calculated from the hot and cold blackbody signals are shown in Figure 9. The blackbody crossover test where the hot and cold blackbody temperatures were swapped is clearly visible on 6-7<sup>th</sup> June. NEDT values for each cycle, averaged over all detectors and both Earth views, are shown in Table 3 and Table 4.

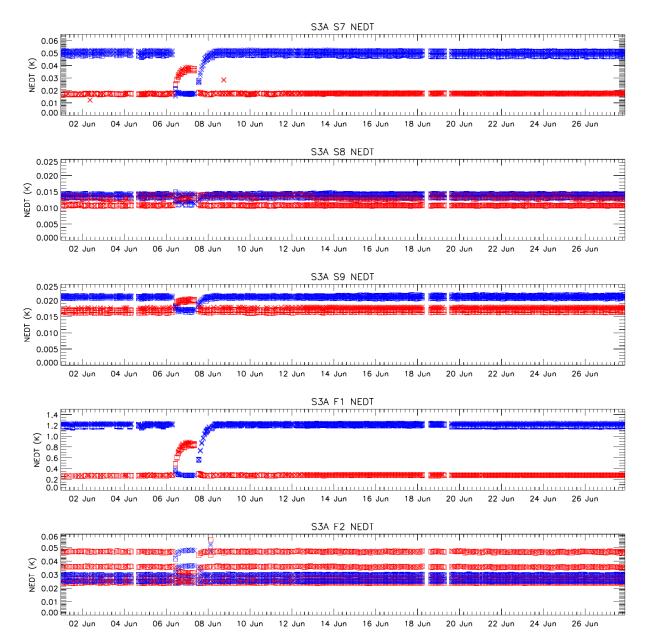


Figure 9: NEDT trend for the thermal channels in Cycle 32. Blue points were calculated from the cold blackbody signal and red points from the hot blackbody. The square symbols show results calculated from the nadir view and crosses show results from the oblique view. Results are plotted for all detectors and integrators, which is why there are several different levels within the same colour points (particularly for S8 and F2).



# Table 3: NEDT for cycles 021-032 averaged over all detectors for both Earth views towards the +YBB (hot). The blackbody crossover test on 6-7th June was excluded from the average.

		Cycle 021	Cycle 022	Cycle 023	Cycle 024	Cycle 025	Cycle 026	Cycle 027	Cycle 028	Cycle 029	Cycle 030	Cycle 031	Cycle 032
+YBB to (K)	•	302.316	302.466	303.125	303.515	303.871	303.931	303.776	303.203	302.977	302.850	302.868	302.841
	S7	17.5	17.6	17.3	17.2	17.1	17	17.1	17.1	17.2	17.5	17.4	18.1
NEDT	<b>S8</b>	11.3	11.4	11.8	12	12	12.1	12.2	11.7	11.6	11.8	12.0	12.1
NEDT (mK)	<b>S9</b>	17	17.2	17.3	17.4	17.4	17.5	17.7	16.9	16.8	16.9	17.0	17.3
(	F1	276	277	270	269	266	265	268	265	268	273	274	295
	F2	31.4	31.6	31.8	32	33.7	33.4	34.5	34	33.7	33.7	33.8	33.6

Table 4: NEDT for cycles 021-032 averaged over all detectors for both Earth views towards the –YBB (cold). The blackbody crossover test on 6-7th June was excluded from the average.

		Cycle 021	Cycle 022	Cycle 023	Cycle 024	Cycle 025	Cycle 026	Cycle 027	Cycle 028	Cycle 029	Cycle 030	Cycle 031	Cycle 032
-YBB te (K)	-	264.900	265.012	265.790	266.251	266.754	266.760	266.479	265.683	265.460	265.439	265.600	265.621
	S7	51.2	50.8	49.4	48.7	48.0	48.0	48.2	49.3	49.8	49.9	49.9	48.8
NEDT	<b>S8</b>	13.7	13.7	13.7	13.7	13.7	13.7	13.9	13.8	13.8	13.8	13.9	13.9
NEDT (mK)	S9	20.9	21.1	21.2	21.2	21.3	21.5	21.5	20.8	20.8	20.9	21.1	21.0
(	F1	1233	1223	1183	1161	1145	1144	1150	1179	1201	1207	1206	1195
	F2	26.7	26.8	26.8	26.8	26.8	26.8	27.4	27.3	27.3	27.3	27.5	27.8



## 2.6 Calibration factors

#### 2.6.1 VIS and SWIR VISCAL signal response

Signals from the VISCAL source for the VIS channels show oscillations due to the build up of ice on the optical path within the FPA. Decontamination must be carried out periodically in order to warm up the FPA and remove the ice. The latest decontamination cycle was successfully performed at the beginning of Cycle 28, and the previous one was performed in Cycle 20. The VISCAL signal has behaved as expected following the decontamination.

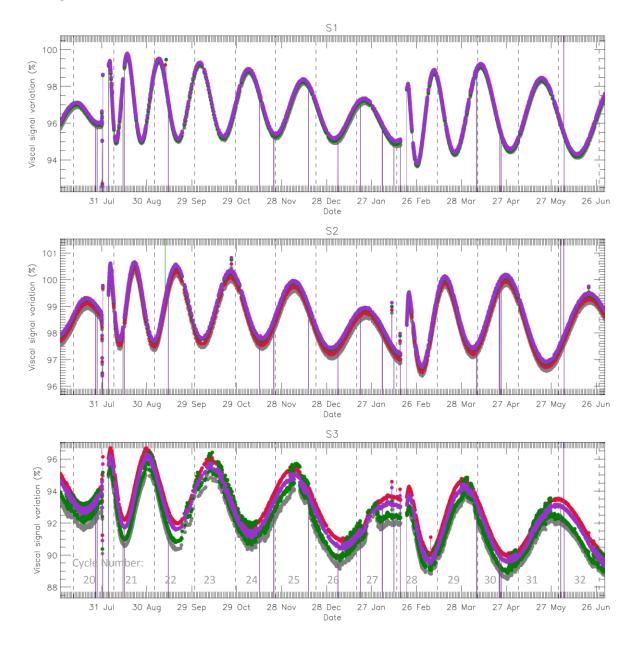


Figure 10: VISCAL signal trend for VIS channels for the last year of operations (nadir view). Different colours represent different detectors. The vertical dashed lines indicate the start and end of each cycle.

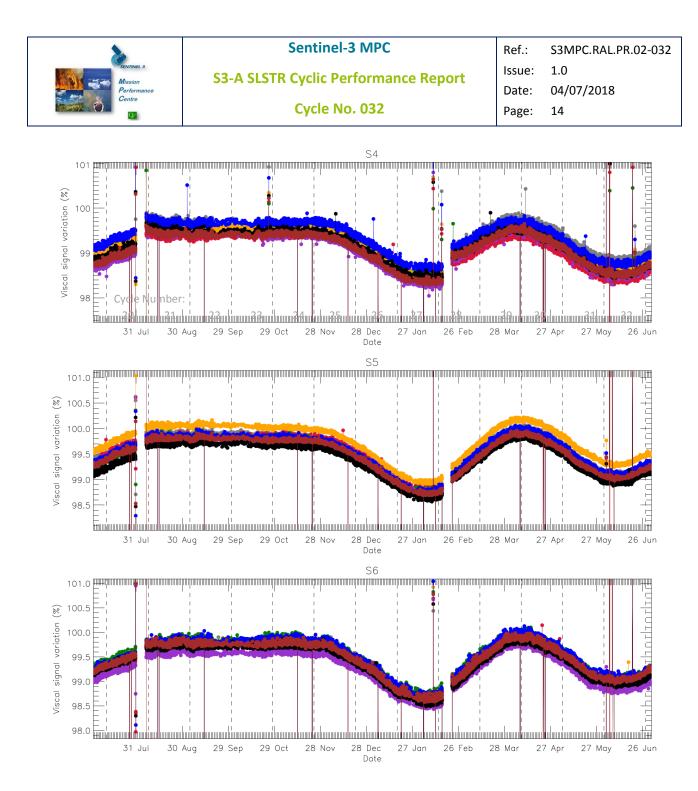


Figure 11: VISCAL signal trend for SWIR channels for the last year of operations (nadir view). Different colours represent different detectors. The vertical dashed lines indicate the start and end of each cycle.



# 3 Level-1 product validation

### **3.1** Geometric calibration/validation

Regular monitoring using the GeoCal Tool implemented at the MPC is being carried out. This monitors the geolocation performance in Level-1 images by correlation with ground control point (GCP) imagettes. Each Level-1 granule typically contains several hundred GCPs, which are filtered based on signal-to-noise to obtain a daily average in the across and along track directions. The results are plotted in Figure 12 for Cycle 32, giving the average positional offsets in kilometres for Nadir and Oblique views.

Figure 13 shows the global positional offset distribution during the Cycle 32. In Nadir view, the maps show larger positional offsets at latitudes >60 degrees. In Oblique view, the offsets are larger than in the Nadir view across the whole globe, especially in the along-track direction.

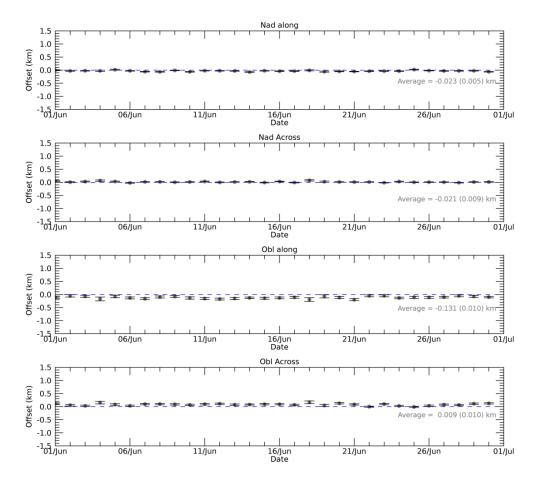
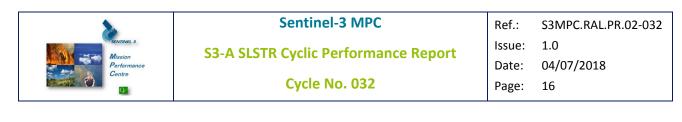


Figure 12: Daily offset results in km from the GeoCal Tool analysis for Nadir along- and across-track (top two plots) and Oblique along- and across-track (bottom two plots). The error bars show the standard deviation. The x-axis shows the date (day/month).



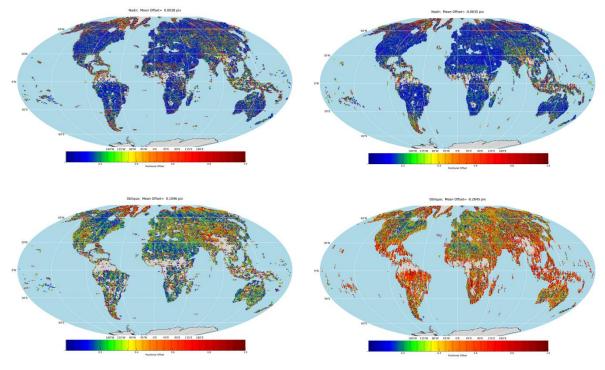


Figure 13: Worldwide positional offset distribution in across- (left) and in along-track (right) directions for Nadir (top) and Oblique (bottom) views during Cycle-32. Different colours represent the size of the offset.

#### 3.2 Radiometric validation

The radiometric calibration of the visible and SWIR channels is monitored using the S3ETRAC service. The S3ETRAC service extracts OLCI and SLSTR Level-1 data and computes associated statistics over 49 sites corresponding to different surface types (desert, snow, ocean maximising Rayleigh signal, and ocean maximising sunglint scattering). These S3ETRAC products are used for the assessment and monitoring of the VIS and SWIR radiometry by the ESL.

Details of the S3ETRAC/SLSTR statistics are provided on the S3ETRAC website <u>http://s3etrac.acri.fr/index.php?action=generalstatistics#pageSLSTR</u>

- Number of SLSTR products processed by the S3ETRAC service
- Statistics per type of target (DESERT, SNOW, RAYLEIGH, SUNGLINT)
- Statistics per site
- Statistics on the number of records

The results of the inter-comparison analysis of SLSTR with OLCI and AATSR over desert sites processed in Cycle 32 show that SLSTR agrees with OLCI and AATSR for the visible channels, but channel S5 differs from AATSR by 12%.

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Oblique view comparisons using desert sites are not available due to geometric differences between the different sensors. A full analysis for visible and SWIR channels in Nadir and Oblique views was made using radiative transfer modelling of sun-glints. Results can be found in the presentation, "WED-0900-SL-Etxaluze WEB.pdf" in the Joint SLSTR session of the fourth S3VT meeting:

https://www.eumetsat.int/website/home/News/ConferencesandEvents/DAT\_3645214.html

As described in the latest Product Notice for processing baseline v2.29, the recommendation for users is to adjust the S5 and S6 radiometric calibration as shown in Table 5.

 Table 5: Recommended correction factors for channel S5 and S6 radiances as given in the Product Notice for

 processing baseline v2.29.

	Nadir view	Oblique view
S5 correction	1.12	1.15
S6 correction	1.20	1.26

# 3.3 Image quality

The Level-1 image quality is assessed when data are available at the MPC. For example by combining all granules over one day into a single combined image. Figure 14 shows an example combined image for the visible channels from 14<sup>th</sup> June 2018 (daytime only).

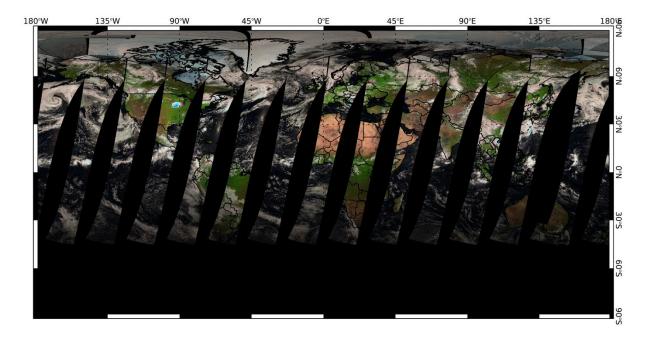


Figure 14: Daytime combined Level-1 image for visible channels on 14th June 2018.



# 4 Level 2 SST validation

SLSTR A level 2 WST SSTs have been validated for Cycle 32 by binning to level 3 across the entire cycle and compared to the Met Office OSTIA L4 analysis.

SLSTR A level 2 WCT SSTs have been validated using CMEMS *in situ* data for Cycle 32. Match-ups between SLSTRA and *in situ* data are provided by the EUMESAT OSI-SAF.

## 4.1 Level 3

Level 3 spatially averaged SST maps for daytime and nighttime are shown in Figure 15. The figures are produced by spatial and temporal binning of quality\_level = 5 1-km pixels from all available SL\_2\_WST granules within the cycle. Also shown in Figure 15 are the number of 1-km pixels contributing to each average and the mean difference to OSTIA (dt\_analysis).

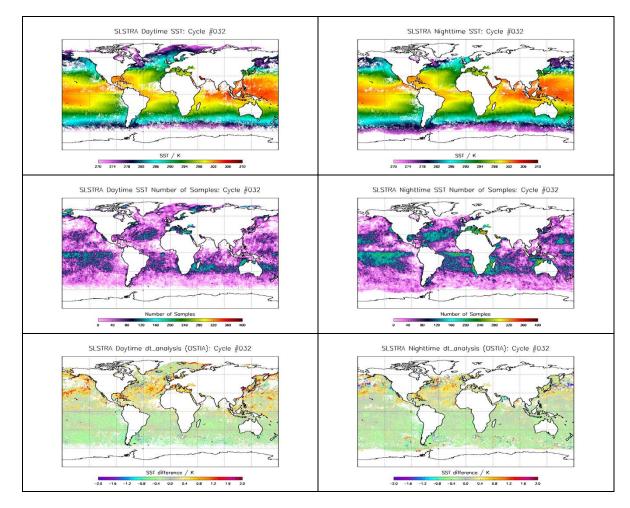


Figure 15: (Top) Level 3 spatially average SST for Cycle 32 at a resolution of 0.05 degrees. Maps are shown for daytime (left) and nighttime (right). Also shown are (middle) number of 1-km samples in each average and (bottom) mean difference to OSTIA L4 SST analysis.



### 4.2 Dependence on latitude, TCWV, Satellite ZA and date

The dependence of the difference between SLSTRA SST<sub>skin</sub> and drifting buoy SST<sub>depth</sub> for Cycle 32 is shown in Figure 16. No adjustments have been made for difference in depth or time between the satellite and in situ measurements. SLSTRA SSTs are extracted from the SL\_2\_WCT files. Daytime 2-channel (S8 and S9) results are shown in red, night time 2-channel results are shown in blue and night time 3-channel results are shown in green. Solid lines indicate dual-view retrievals, dashed lines indicate nadir-only retrievals. Bold lines indicate statistically significant (95% confidence) results.

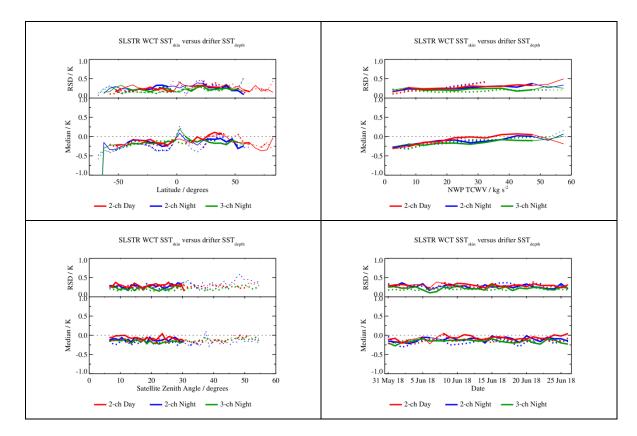


Figure 16: Dependence of median and robust standard deviation of match-ups between SLSTRA SST<sub>skin</sub> and drifting buoy  $SST_{depth}$  for Cycle 32 as a function of latitude, total column water vapour (TCWV), satellite zenith angle and date. Any data gaps are due to delays in match-up processing.



# 4.3 Spatial distribution of match-ups

The spatial distribution of SLSTRA/drifter match-ups for Cycle 32 is shown in Figure 17. No adjustments have been made for difference in depth or time between the satellite and in situ measurements.

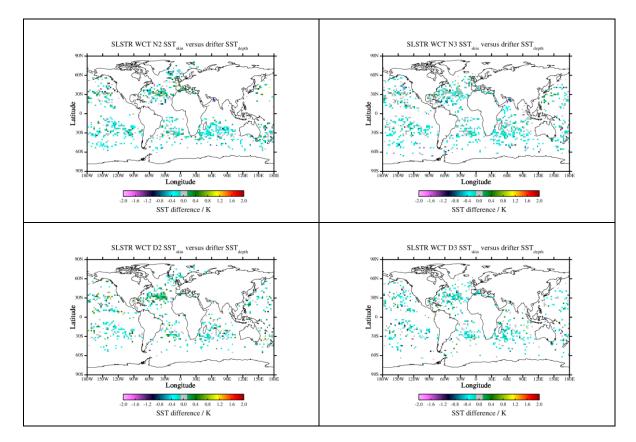


Figure 17: Spatial distribution of match-ups between SLSTR-A SST<sub>skin</sub> and drifting buoy SST<sub>depth</sub> for Cycle 32.



## 4.4 Match-ups statistics

Match-ups statistics (median and robust standard deviation, RSD) of SLSTR-A/drifter match-ups for Cycle 32 are shown in **Table 6**. No adjustments have been made for difference in depth or time between the satellite and *in situ* measurements and so at night time (in the absence of diurnal warming) an offset of around -0.17 K is expected. The RSD values indicate SLSTR-A is providing SSTs mostly within its target accuracy (0.3 K).

Retrieval	Number	Modian (K)	RSD (K)
Retrieval	Number	Median (K)	KSD (K)
N2 day	2948	-0.13	0.28
NZ Udy	2340	-0.13	0.20
D2 day	1937	-0.06	0.31
N2 night	2810	-0.18	0.30
N3 night	3681	-0.13	0.19
D2 night	1855	-0.11	0.27
D3 night	1855	-0.16	0.22

Table 6: SLSTR drifter match-up statistics for Cycle 32.



# 5 Level 2 LST validation

Level 2 Land Surface Temperature products have been validated against in situ observations (Category-A validation) from ten "Gold Standard" Stations, and intercompared (Category-C validation) with respect to an independent operational reference product (SEVIRI from LSA SAF). In all cases it is the NTC products that are validated, and the Probabilistic cloud masking implementation is used for all cloud masking. Level-3C products for the full Cycle are evaluated for identifying any gross problems.

## 5.1 Category-A validation

Category-A validation uses a comparison of satellite-retrieved LST with *in situ* measurements collected from radiometers sited at a number of stations spread across the Earth, for which the highest-quality validation can be achieved. Here we concentrate on ten "Gold Standard" stations which are installed with well-calibrated instrumentation. The results can be summarised as follows (see Figure 18):

- Average absolute accuracy (vs. Gold Standard):
  - Daytime: 1.2K
  - Night-time: 1.0K

The day-time accuracy is only just outside the mission requirement, but is impacted by the very small number of matchups for some stations in the cycle due to cloud, and slightly larger bias at the most heterogeneous stations. The night-time accuracy is just within the mission requirement of < 1K. Note, in this cycle no cloud free matchups were obtained from the Des Moines, Iowa site.

As with the past two cycles cloud has reduced the number of matchups per station during to single figures for most stations during day or night, with some missing statistics entirely. It is therefore challenging to determine robust statistics. Nonetheless, it can be seen that overall the matchups are in general close to the 1:1 line with very few outliers. No systematic bias is evident from these matchups. It is deemed more informative for future cycles to monitor the cumulative statistics which will give an indication of whether these are deviating from the mission requirements as cycles are passed.

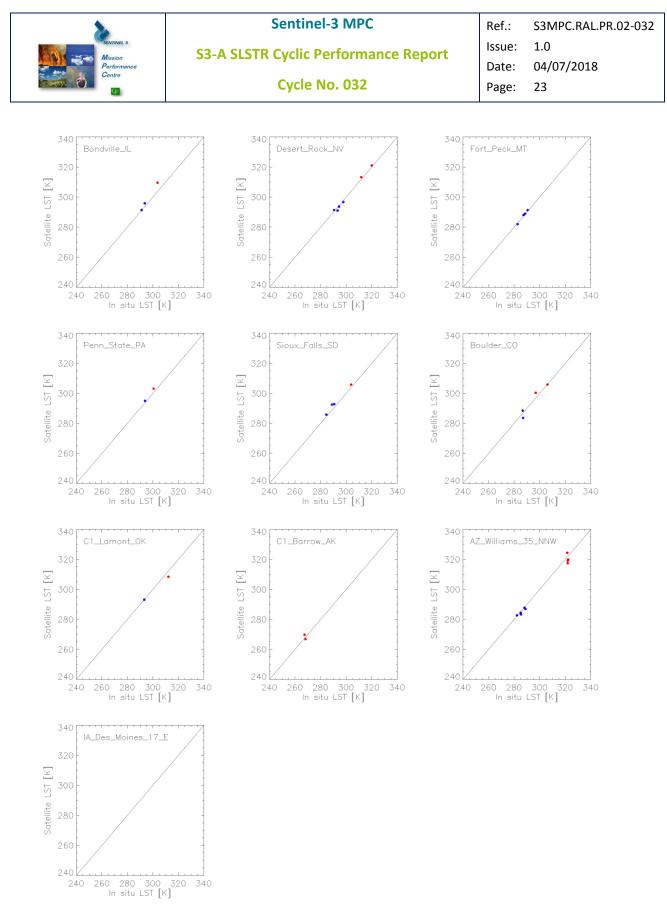


Figure 18: Validation of the SL\_2\_LST product over Cycle 32 at six Gold Standard in situ stations of the SURFRAD network plus two Gold Standard station from the ARM network, and two Gold Standard station from the USCRN network: Bondville, Illinois (1<sup>st</sup> row, left); Desert Rock, Nevada (1<sup>st</sup> row, centre); Fort Peck, Montana (1<sup>st</sup> row, right); Penn State University, Pennsylvania (2<sup>nd</sup> row, left); Sioux Fall, South Dakota (2<sup>nd</sup> row, centre); Table Mountain, Colorado (2<sup>nd</sup> row, right); Southern Great Plains, Oklahoma (3<sup>rd</sup> row, left); Barrow, Alaska (3<sup>rd</sup> row, centre); Williams, Arizona (3<sup>rd</sup> row, right); Des Moines, Iowa (4<sup>th</sup> row, left).



# 5.2 Category-C validation

Category-C validation uses inter-comparisons with similar LST products from other sources such as other satellite sensors, which give important quality information with respect to spatial patterns in LST deviations. Here we compare the SL\_2\_LST product with the operational SEVIRI L2 product available from the LSA SAF. The results can be summarised in Table 7.

 Table 7: Median differences from the intercomparison of the SL\_2\_LST product with respect to the operational

 LSA SAF SEVIRI LST product for the period of Cycle 32.

Continent	Median Difference (K)		
	Day	Night	
Africa	2.0	2.1	
Europe	2.9	2.1	

For Africa, the differences across the continent are relatively small, with just slightly larger differences in the East Africa Rift during the day. For Europe the differences increase towards the east into European Russia. These eastern matchups are towards the edge of the SEVIRI disk and therefore represent large viewing angles. At these extreme viewing angles it is expected that SLSTR LST would be increasingly higher than SEVIRI LST. There are some large differences in southern Africa at night which are influenced from orbits on two days. These are being investigated.

Other analysis can be summarised as follows:

- Differences with respect to biomes tend to be larger during the day for surfaces with more heterogeneity and/or higher solar insolation
- Differences increase for both day and night towards the edge of the SEVIRI disk as the SEVIRI zenith angles become larger

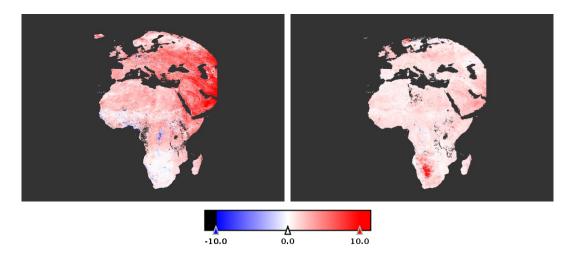


Figure 19: Intercomparison of the SL\_2\_LST product with respect to the operational LSA SAF SEVIRI LST product for the period of Cycle 32: daytime composite differences (left), night-time composite differences (right).



While some of these differences are > 1 K they are all within the corresponding uncertainty of SEVIRI at the pixel-scale (> 2K), and so the **two products can be assessed as being consistent**. It should also be noted that there are no significant differences between the two products in terms of biome-dependency - the differences are consistent across biomes. Some residual cloud contamination is evident from the large differences at the edge of cloud cleared features. While the cloud contamination is seen for both SLSTR (strong negative differences) and SEVIRI (strong positive differences), compared with cycles where the basic cloud mask was used the contamination for SLSTR is lower indicating improved masking with the Probabilistic Cloud Mask. However, less matchups are evident which suggests the cloud masking could be slightly over conservative in some biomes. This will be monitored over the following Cycles to identify whether an optimisation to the cloud coefficients should be considered for some biomes.



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## 5.3 Level-3C Assessment

To better understand the global product and identify any gross issues Level-3 evaluation is also performed. Here we generate monthly daytime and night-time 0.05° composites (Figure 20 – top) of the LST field and corresponding sampling ratios (Figure 20 - bottom). The sampling ratios are derived as clear\_pixels / (clear\_pixels + cloudy\_pixels).

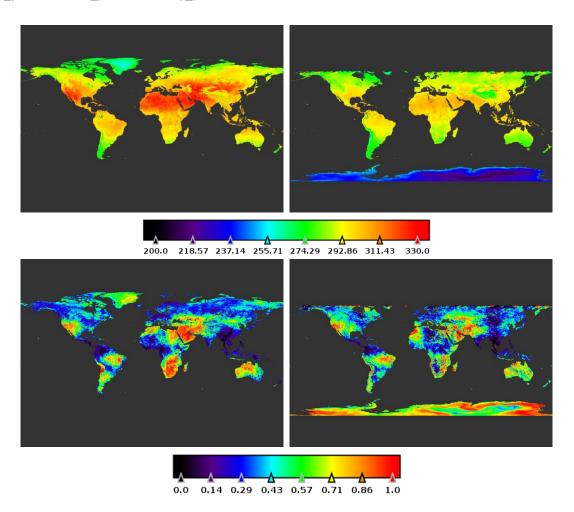


Figure 20: Monthly composites at 0.05° of LST (top) and sampling ratio (bottom) for the period of Cycle 32: daytime composites (left), night-time composites (right).

The LST fields indicate the SL\_2\_LST product is producing values in line with expectations. There are few distinct issues or non-physical values evident. The only exception are a few high values at night from a couple of days. The source of these are being investigated. Cloud contamination appears to be at a minimum, although there appears to be some excessive cloud clearing in some regions particularly at night. This is supported by the sampling ratio which is lower than would be expected over parts of the Sahara and Central Asia. It is possible that the lack of temporal interpolation of the ECMWF Skin Temperature could be a root cause, but this requires further investigation.



# 6 Events

SLSTR was switched on and operating nominally during the cycle, with SUE scanning and autonomous switching between day and night modes, except for the following events.

- On 2<sup>nd</sup> June there was a gap in data between 08:19 and 09:45.
- On 3<sup>rd</sup> June a sequence error at Svalbard led to missing data between 13:20 and 13:21.
- On 4<sup>th</sup> June a seasonal stray light test was performed. This involved putting the instrument into a non-standard configuration and so no Level-1 and Level-2 products could be generated between 08:48 and 13:57.
- On 6<sup>th</sup>/7<sup>th</sup> June a blackbody crossover test was performed. This involved swapping over the temperatures of the two blackbody calibration sources, and therefore affects the calibration of the thermal channels. The test started at 08:02 on 6<sup>th</sup> June and the instrument returned to normal configuration with stable blackbody temperatures at the beginning of the day on 8<sup>th</sup> June. Note that this test only affects the thermal infrared and fire channel data. The data were affected as follows:
  - Gap for SWIR and thermal channels 6<sup>th</sup> June 08:02-08:03 whilst initial commands were sent to the instrument
  - Gap for thermal channels only 6<sup>th</sup> June 09:12-10:34 whist blackbody temperatures were within 10K of each other (i.e. not possible to calibrate)
  - Gap for thermal channels only 7<sup>th</sup> June 10:53-12:28 whist blackbody temperatures were within 10K of each other (i.e. not possible to calibrate)

Although the thermal channel data are only missing in the Level-1 products for a short period around the crossover of the blackbody temperatures, the thermal calibration was affected for the whole duration of the test whist the blackbody temperatures were changing.

- On 18<sup>th</sup>/19<sup>th</sup> June a crosstalk test was performed. This involved putting the instrument into a non-standard configuration and so no Level-1 and Level-2 products could be generated on 18<sup>th</sup> June 07:45-12:51, and on 19<sup>th</sup> June 07:19-12:26.
- On the 21<sup>st</sup> of June radio frequency interference at Svalbard led to missing data between 00:22-00:23.



# 7 Appendix A

Other reports related to the Optical mission are:

S3-A OLCI Cyclic Performance Report, Cycle No. 032 (ref. S3MPC.ACR.PR.01-032)

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

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