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

S3-A SLSTR Cyclic Performance Report

Cycle No. 035

Start date: 20/08/2018

End date: 16/09/2018



Mission
Performance
Centre

SENTINEL 3



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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.









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Changes Log

| Version | Date | Changes |
|---------|------------|---------------|
| 1.0 | 24/09/2018 | First Version |
| | | |
| | | |
| | | |

List of Changes

| Version | Section | Answers to RID | Changes |
|---------|---------|----------------|---------|
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1 Processing Baseline Version

| IPF | IPF / Processing Baseline version | Date of deployment |
|-----|-----------------------------------|---------------------------------|
| SL1 | 06.16 / 2.37 | CGS: 02/08/2018 09:22 UTC |
| | | PAC: 02/08/2018 09:32 UTC |
| SL2 | 06.14 / 2.37 | CGS: 02/08/2018 09:19 UTC (NRT) |
| | | PAC: 02/08/2018 09:36 UTC (NTC) |



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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 035. The temperatures were stable (on top of a daily variation cycle).

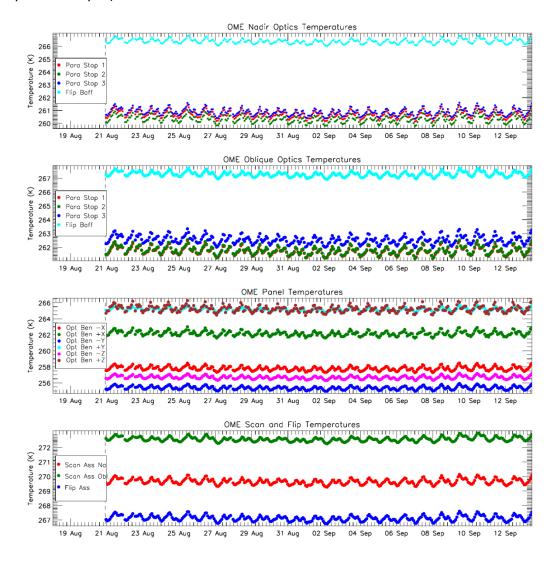


Figure 1: OME temperature trends for Cycle 035 showing the paraboloid stops and flip baffle (top two plots) and optical bench and scanner and flip assembly (lower two plots). The vertical dashed lines indicate the start and end of the cycle. Each dot represents the average temperature in one orbit. Note that the gaps are due to problems in data distribution to the MPC rather than real missing data.

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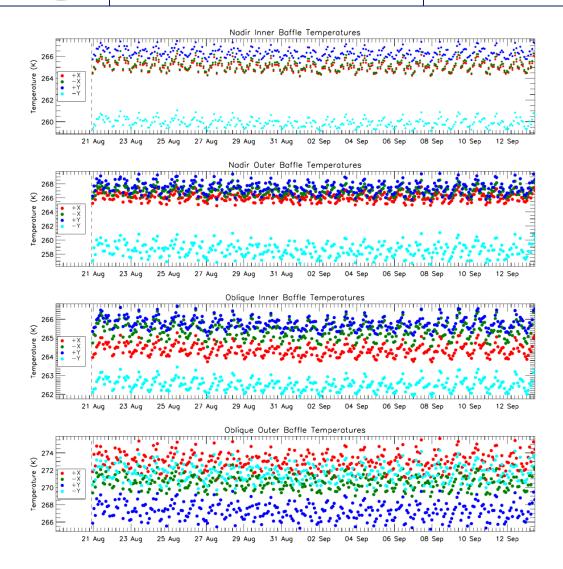


Figure 2: Baffle temperature trends for Cycle 035. The vertical dashed lines indicate the start and end of the cycle. Each dot represents the average temperature in one orbit. Note that the gaps are due to problems in data distribution to the MPC rather than real missing data.



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2.2 Detector temperatures

The detector temperatures in Cycle 035 were stable at their expected values following the increase in the cooler cold tip temperature on 18th July. The latest instrument decontamination cycle was performed at the end of the cycle, starting on the 13th September (see Section 6). The decontamination involves 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. The previous decontamination carried out in February is clearly visible as a rise in detector temperature. A few orbits in Cycle 32 and Cycle 35 show slightly lower average detector temperatures and these were due to instrument tests that were performed connected to the commissioning of S3B.

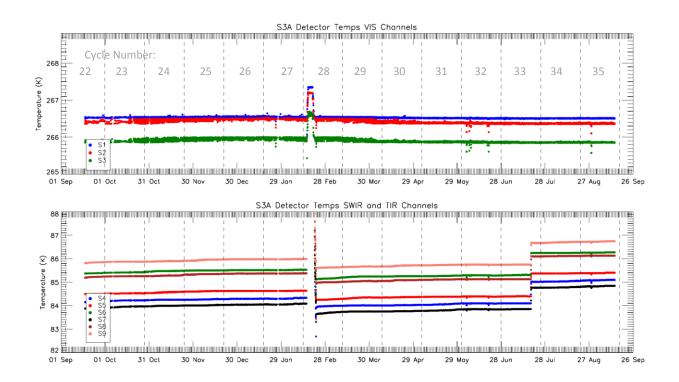


Figure 3: Detector temperatures for each channel for the last year of operations. Discontinuities occur for the infrared channels where the FPA was heated for decontamination. The vertical dashed lines indicate the start and end of each cycle. Each dot represents the average temperature in one orbit.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

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2.3 Scanner performance

Scanner performance in Cycle 035 has been consistent with previous operations and within required limits.

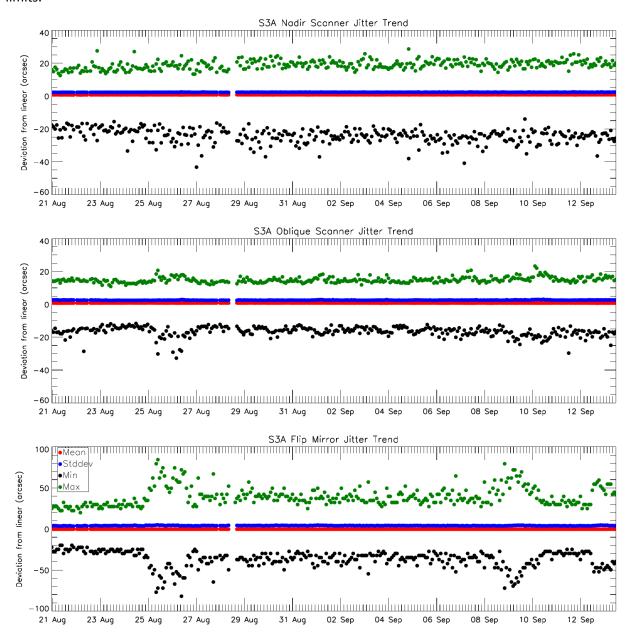


Figure 4: Scanner and flip jitter for Cycle 035, showing mean, stddev and max/min difference from expected position per orbit for the nadir view (red, blue, green and black respectively).

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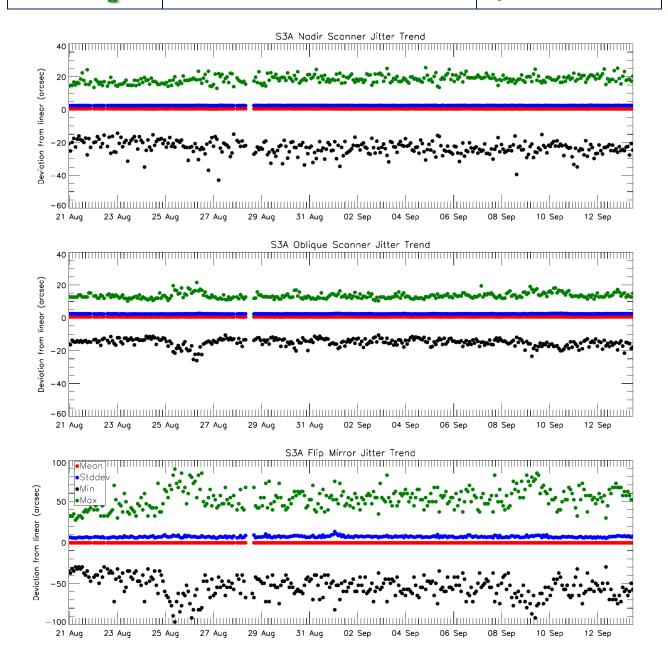


Figure 5: Scanner and flip jitter for Cycle 035, showing mean, stddev and max/min difference from expected position per orbit for the oblique view (red, blue, green and black respectively).



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2.4 Black-Bodies

Figure 6 shows the orbital average blackbody temperatures during Cycle 035. 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 035 falls after this yearly peak with +YBB temperatures around 302.6 K (see Figure 7 and Table 3). Figure 6 shows that gradients across the blackbody baseplate are stable and within their expected range (±20mK).

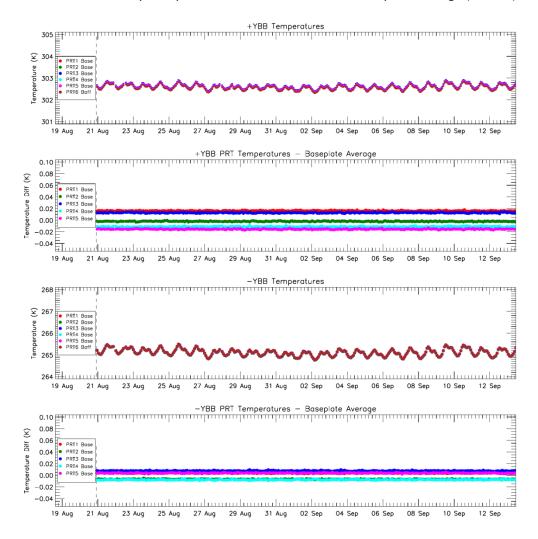


Figure 6: Blackbody temperature and baseplate gradient trends during Cycle 035. The vertical dashed lines indicate the start and end of the cycle. Each dot represents the average temperature in one orbit.



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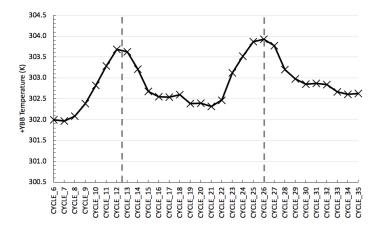


Figure 7: Long term trends in average +YBB temperature in each cycle, showing yearly variation. The vertical dashed lines indicate the 1st January 2017 and 2018.



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2.5 Detector noise levels

2.5.1 VIS and SWIR channel signal-to-noise

The VIS and SWIR channel noise in Cycle 035 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 instrument decontaminations). 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 024-035, averaged over all detectors for the nadir view.

| | Average | | Nadir Signal-to-noise ratio | | | | | | | | | | |
|-----------|-----------------------|--------------|-----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|
| | Reflectance Factor | Cycle 024 | Cycle 025 | Cycle 026 | Cycle 027 | Cycle 028 | Cycle 029 | Cycle 030 | Cycle 031 | Cycle 032 | Cycle 033 | Cycle 34 | Cycle 035 |
| S1 | 0.187 | 235 | 234 | 228 | 226 | 223 | 228 | 232 | 234 | 226 | 233 | 231 | 234 |
| S2 | 0.194 | 236 | 237 | 233 | 232 | 229 | 232 | 237 | 233 | 231 | 232 | 236 | 235 |
| S3 | 0.190 | 232 | 234 | 227 | 227 | 223 | 229 | 228 | 228 | 221 | 223 | 229 | 226 |
| S4 | 0.191 | 140 | 142 | 141 | 138 | 138 | 138 | 140 | 139 | 139 | 137 | 139 | 138 |
| S5 | 0.193 | 236 | 235 | 238 | 235 | 236 | 232 | 233 | 235 | 236 | 232 | 231 | 230 |
| S6 | 0.175 | 146 | 145 | 146 | 143 | 143 | 143 | 142 | 143 | 143 | 142 | 141 | 141 |

Table 2: Average reflectance factor, and signal-to-noise ratio of the measured VISCAL signal for cycles 024-035, averaged over all detectors for the oblique view.

| | Average | | Oblique Signal-to-noise ratio | | | | | | | | | | |
|-----------|-----------------------|--------------|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|
| | Reflectance Factor | Cycle 024 | Cycle 025 | Cycle 026 | Cycle 027 | Cycle 028 | Cycle 029 | Cycle 030 | Cycle 031 | Cycle 032 | Cycle 033 | Cycle 34 | Cycle 035 |
| S1 | 0.166 | 246 | 246 | 239 | 236 | 235 | 237 | 242 | 249 | 239 | 245 | 236 | 241 |
| S2 | 0.170 | 249 | 251 | 243 | 239 | 238 | 243 | 249 | 249 | 247 | 246 | 245 | 246 |
| S3 | 0.168 | 239 | 244 | 234 | 227 | 229 | 235 | 234 | 239 | 234 | 232 | 232 | 237 |
| S4 | 0.166 | 111 | 111 | 110 | 107 | 107 | 109 | 109 | 110 | 108 | 109 | 111 | 109 |
| S5 | 0.166 | 173 | 173 | 172 | 170 | 171 | 170 | 170 | 169 | 172 | 168 | 169 | 170 |
| S6 | 0.155 | 110 | 113 | 109 | 107 | 107 | 109 | 109 | 110 | 110 | 108 | 109 | 109 |

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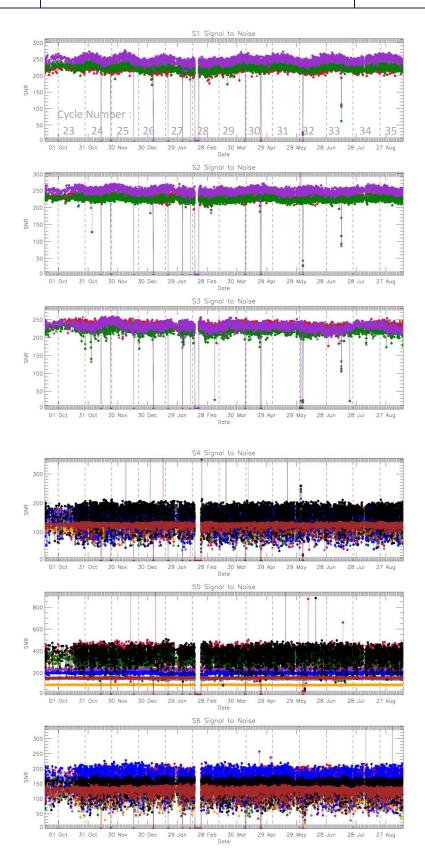


Figure 8: VIS and SWIR channel signal-to-noise of the measured VISCAL signal in each orbit for the last year of operations. Different colours indicate different detectors. The vertical dashed lines indicate the start and end of each cycle.



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2.5.2 TIR channel NEDT

The thermal channel NEDT values in Cycle 035 are consistent with previous operations and within the requirements. NEDT trends calculated from the hot and cold blackbody signals are shown in Figure 9. NEDT values for each cycle, averaged over all detectors and both Earth views, are shown in Table 3 and Table 4.

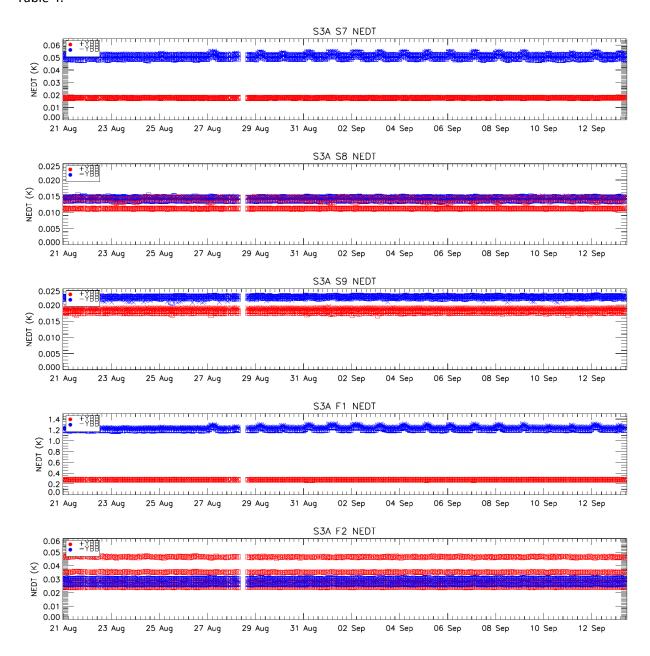


Figure 9: NEDT trend for the thermal channels in Cycle 035. Blue points were calculated from the cold blackbody signal and red points from the hot blackbody. The square symbols show results calculated from the nadir view and crosses show results from the oblique view. Results are plotted for all detectors and integrators, which is why there are several different levels within the same colour points (particularly for S8 and F2).



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Table 3: NEDT for cycles 024-035 averaged over all detectors for both Earth views towards the +YBB (hot).

| | | Cycle 024 | Cycle 025 | Cycle 026 | Cycle 027 | Cycle 028 | Cycle 029 | Cycle 030 | Cycle 031 | Cycle 032 | Cycle 033 | Cycle 034 | Cycle 035 |
|--------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| +YBB to | • | 303.515 | 303.871 | 303.931 | 303.776 | 303.203 | 302.977 | 302.850 | 302.868 | 302.841 | 302.669 | 302.622 | 302.624 |
| | S7 | 17.2 | 17.1 | 17 | 17.1 | 17.1 | 17.2 | 17.5 | 17.4 | 18.1 | 17.6 | 17.7 | 17.7 |
| NEDT | S8 | 12 | 12 | 12.1 | 12.2 | 11.7 | 11.6 | 11.8 | 12.0 | 12.1 | 12.3 | 12.4 | 12.6 |
| NEDT (mK) | S9 | 17.4 | 17.4 | 17.5 | 17.7 | 16.9 | 16.8 | 16.9 | 17.0 | 17.3 | 17.6 | 18.3 | 18.3 |
| () | F1 | 269 | 266 | 265 | 268 | 265 | 268 | 273 | 274 | 295 | 279 | 279 | 279 |
| | F2 | 32 | 33.7 | 33.4 | 34.5 | 34 | 33.7 | 33.7 | 33.8 | 33.6 | 33.6 | 33.7 | 33.6 |

Table 4: NEDT for cycles 024-035 averaged over all detectors for both Earth views towards the -YBB (cold).

| | | Cycle 024 | Cycle 025 | Cycle 026 | Cycle 027 | Cycle 028 | Cycle 029 | Cycle 030 | Cycle 031 | Cycle 032 | Cycle 033 | Cycle 034 | Cycle 035 |
|--------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| -YBB te | - | 266.251 | 266.754 | 266.760 | 266.479 | 265.683 | 265.460 | 265.439 | 265.600 | 265.621 | 265.337 | 265.203 | 265.110 |
| | S7 | 48.7 | 48.0 | 48.0 | 48.2 | 49.3 | 49.8 | 49.9 | 49.9 | 48.8 | 50.0 | 50.6 | 51.0 |
| | S8 | 13.7 | 13.7 | 13.7 | 13.9 | 13.8 | 13.8 | 13.8 | 13.9 | 13.9 | 14.0 | 14.4 | 14.4 |
| NEDT (mK) | S9 | 21.2 | 21.3 | 21.5 | 21.5 | 20.8 | 20.8 | 20.9 | 21.1 | 21.0 | 21.5 | 22.3 | 22.5 |
| () | F1 | 1161 | 1145 | 1144 | 1150 | 1179 | 1201 | 1207 | 1206 | 1195 | 1207 | 1209 | 1224 |
| | F2 | 26.8 | 26.8 | 26.8 | 27.4 | 27.3 | 27.3 | 27.3 | 27.5 | 27.8 | 27.6 | 28.2 | 28.3 |



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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 started at the end of Cycle 35, and the previous one was performed in Cycle 28.

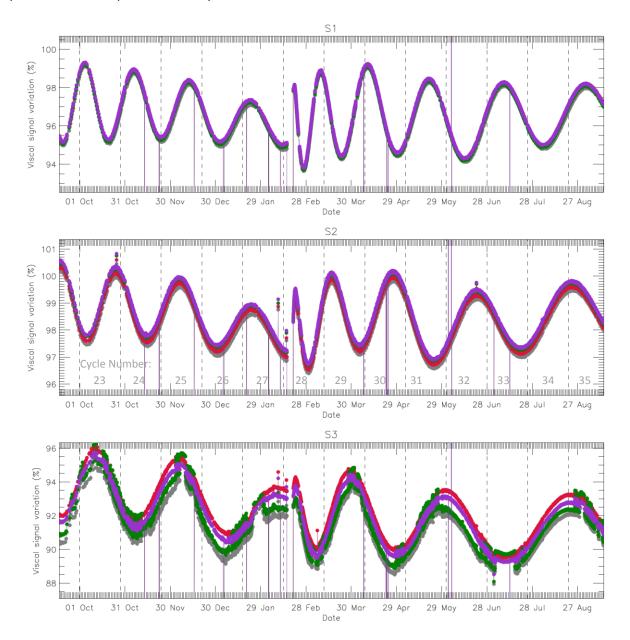


Figure 10: VISCAL signal trend for VIS channels for the last year of operations (nadir view). Different colours represent different detectors. The vertical dashed lines indicate the start and end of each cycle.

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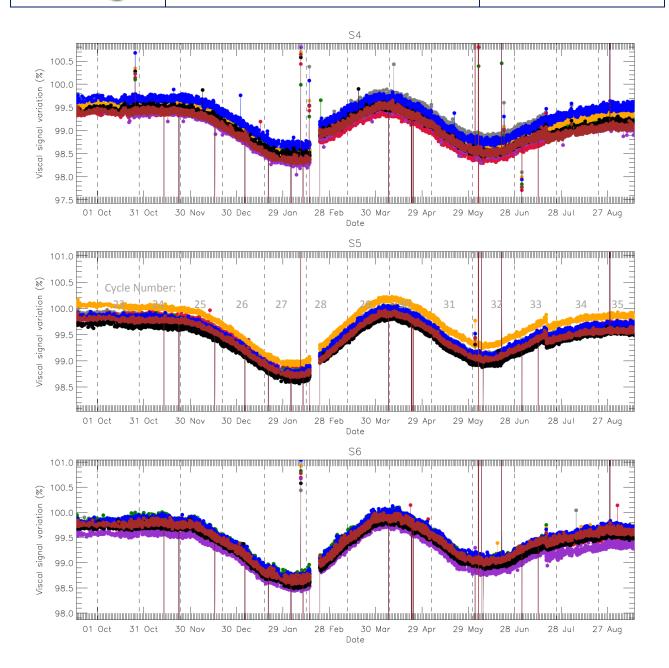


Figure 11: VISCAL signal trend for SWIR channels for the last year of operations (nadir view). Different colours represent different detectors. The vertical dashed lines indicate the start and end of each cycle.



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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 035, giving the average positional offsets in kilometres for Nadir and Oblique views.

Figure 13 shows the global positional offset distribution during the Cycle 035. 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.

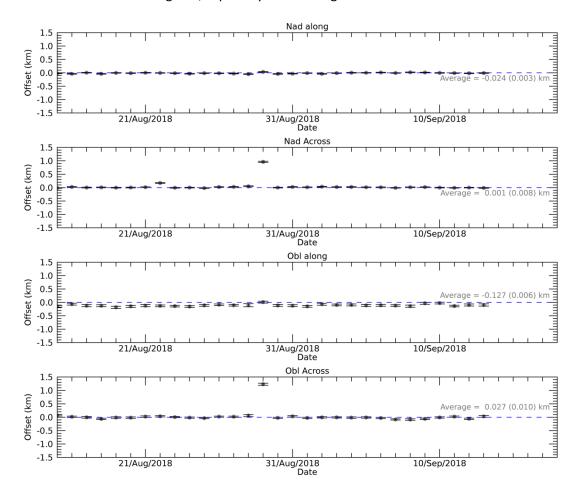


Figure 12: Daily offset results in km from the GeoCal Tool analysis for Nadir along- and across-track (top two plots) and Oblique along- and across-track (bottom two plots). The error bars show the standard deviation. The x-axis shows the date (day/month).



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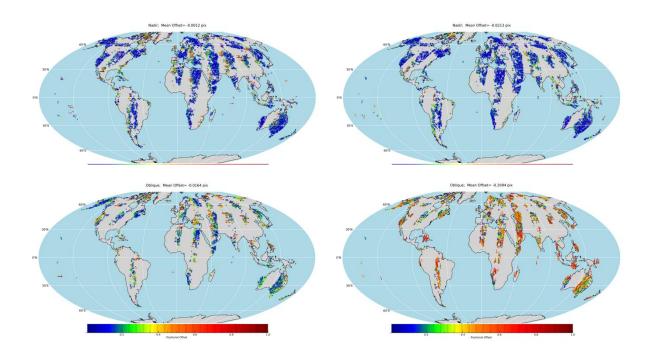


Figure 13: Worldwide positional offset distribution in across- (left) and in along-track (right) directions for Nadir (top) and Oblique (bottom) views for 10th September. Different colours represent the size of the offset.

On 29th August, an out-of-plane manoeuvre was executed (see Section 6) increasing the positional offsets in the across-track direction for the Nadir and Oblique views. The manoeuvre affected the processing of the subsequent orbits, as shown in Figure 14.



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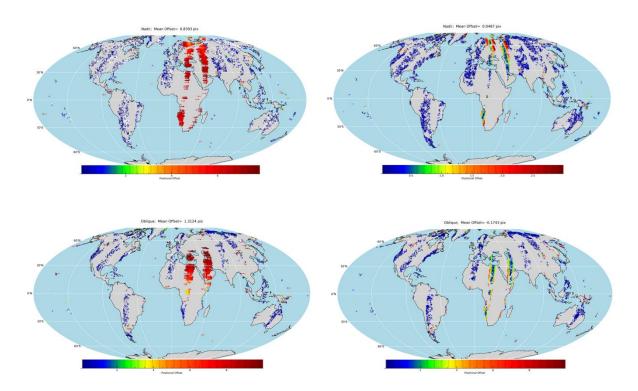


Figure 14: Worldwide positional offset distribution in across- (left) and in along-track (right) directions for Nadir (top) and Oblique (bottom) views on the 29th of August. Offsets increased along two orbits during the manoeuvre.



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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 http://s3etrac.acri.fr/index.php?action=generalstatistics#pageSLSTR

- 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

Inter-comparison analysis of SLSTR nadir view with AATSR over desert sites shows that SLSTR agrees with AATSR for the visible channels, but channel S5 differs from AATSR by 12%. 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 modeling 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 |



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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 15 shows an example combined image for the visible channels from 23rd August 2018 (daytime only).

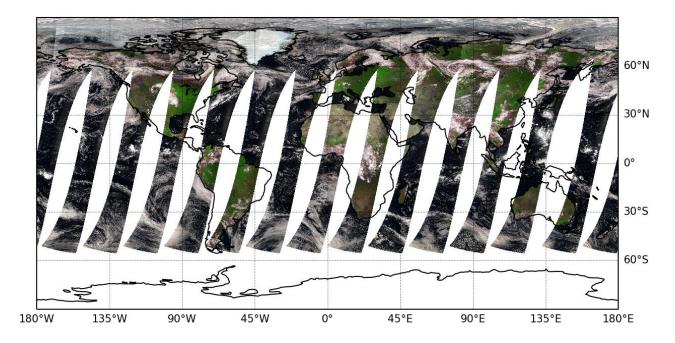


Figure 15: Daytime combined Level-1 image for visible channels on 23rd August 2018.



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4 Level 2 SST validation

SLSTR A level 2 WST SSTs have been validated for Cycle 035 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 035. 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 16. 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 16 are the number of 1-km pixels contributing to each average and the mean difference to OSTIA (dt_analysis).

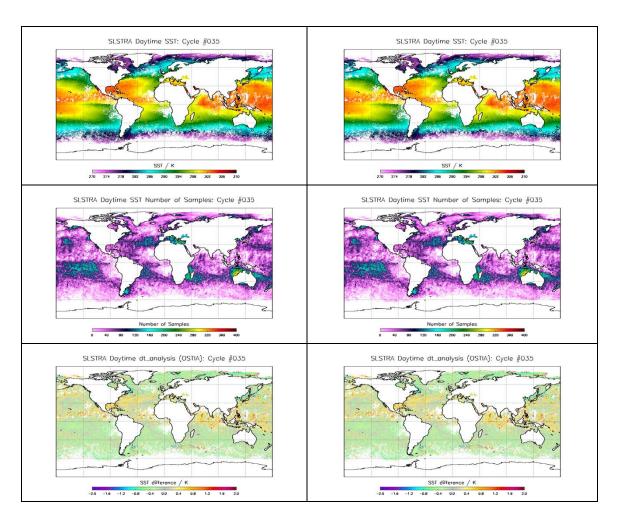


Figure 16: (Top) Level 3 spatially average SST for Cycle 035 at a resolution of 0.05 degrees. Maps are shown for daytime (left) and nighttime (right). Also shown are (middle) number of 1-km samples in each average and (bottom) mean difference to OSTIA L4 SST analysis.



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4.2 Dependence on latitude, TCWV, Satellite ZA and date

The dependence of the difference between SLSTRA SST_{skin} and drifting buoy SST_{depth} for Cycle 035 is shown in Figure 17. 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.

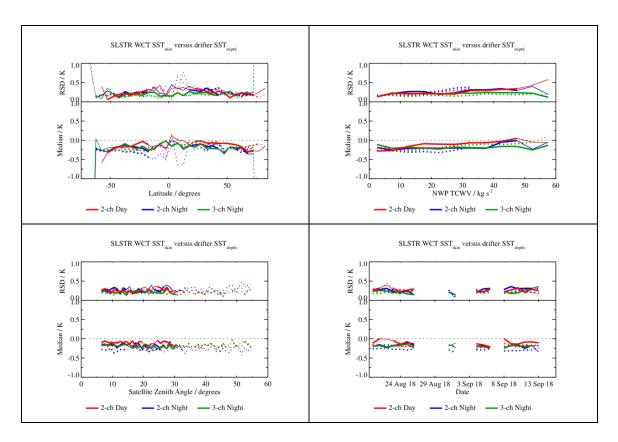


Figure 17: Dependence of median and robust standard deviation of match-ups between SLSTRA SST_{skin} and drifting buoy SST_{depth} for Cycle 035 as a function of latitude, total column water vapour (TCWV), satellite zenith angle and date. Any data gaps are due to delays in match-up processing at the time this report was generated.



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4.3 Spatial distribution of match-ups

The spatial distribution of SLSTR-A/drifter match-ups for Cycle 035 is shown in Figure 18. No adjustments have been made for difference in depth or time between the satellite and in situ measurements.

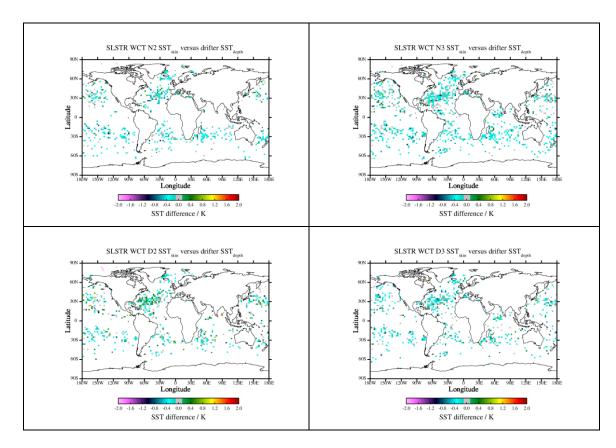


Figure 18: Spatial distribution of match-ups between SLSTR-A SST_{skin} and drifting buoy SST_{depth} for Cycle 035.



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4.4 Match-ups statistics

Match-ups statistics (median and robust standard deviation, RSD) of SLSTR-A/drifter match-ups for Cycle 035 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).

Table 6: SLSTR drifter match-up statistics for Cycle 035.

| Table of old in anyton material up attended for eyers occi- | | | | | |
|---|--------|------------|---------|--|--|
| Retrieval | Number | Median (K) | RSD (K) | | |
| N2 day | 1306 | -0.18 | 0.25 | | |
| D2 day | 1377 | -0.10 | 0.27 | | |
| N2 night | 1668 | -0.28 | 0.27 | | |
| N3 night | 2502 | -0.17 | 0.19 | | |
| D2 night | 1266 | -0.18 | 0.28 | | |
| D3 night | 1266 | -0.19 | 0.22 | | |



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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 eleven "Gold Standard" stations which are installed with well-calibrated instrumentation. The results can be summarised as follows (see Figure 19):

Average absolute accuracy (vs. Gold Standard):

Daytime: 1.1KNight-time: 1.0K

The day-time accuracies are slightly outside the mission requirement of < 1K, but is impacted to some extent by very small number of matchups for some stations in the cycle due to cloud, and slightly larger bias at the most heterogeneous stations. Note, in this cycle no cloud free matchups were obtained from the Barrow, North Slopes Alaska or Des Moines, Iowa sites. Also, it is pertinent to the number of matchups that the instrument has been in decontamination phase for the last days of the cycle (from the 12.00 on the 13th September 2018).

As with the past two cycles cloud has reduced the number of matchups per station 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.



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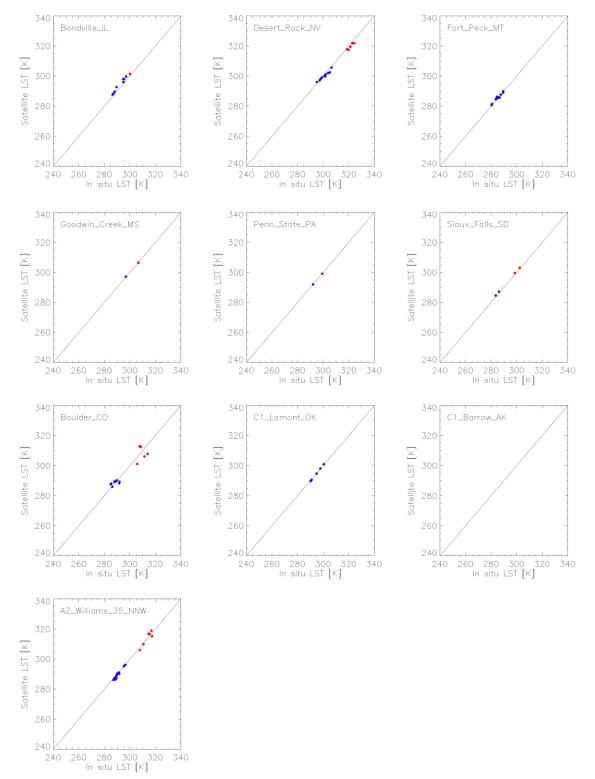


Figure 19: Validation of the SL_2_LST product over Cycle 35 at seven Gold Standard in situ stations of the SURFRAD network plus two Gold Standard station from the ARM network, and two Gold Standard station from the USCRN network: Bondville, Illinois (1st row, left); Desert Rock, Nevada (1st row, centre); Fort Peck, Montana (1st row, right); Goodwin Creek, Mississippi (2nd row, left); Penn State University, Pennsylvania (2nd row, centre); Sioux Fall, South Dakota (2nd row, right); Table Mountain, Colorado (3rd row, left); Southern Great Plains,



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Oklahoma (3rd row, centre); Barrow, Alaska (3rd row, right); Williams, Arizona (4th row, left); Des Moines, Iowa (4th row, centre).

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 35.

| Continent | Median Difference (K) | | | |
|-----------|-----------------------|-------|--|--|
| Continent | Day | Night | | |
| Africa | 1.7 | 1.6 | | |
| Europe | 2.0 | 1.0 | | |

For Africa, the differences across the continent are relatively small, with just slightly larger differences over the Sahara and 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. For night-time the differences are < 2K over both continents. Compared with the previous cycle the differences are slightly reduced.

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

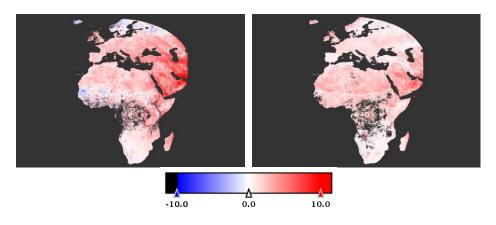


Figure 20: Intercomparison of the SL_2_LST product with respect to the operational LSA SAF SEVIRI LST product for the period of Cycle 35: daytime composite differences (left), night-time composite differences (right).



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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 21 - top) of the LST field and corresponding sampling ratios (Figure 21 - bottom). The sampling ratios are derived as clear_pixels / (clear_pixels + cloudy_pixels).

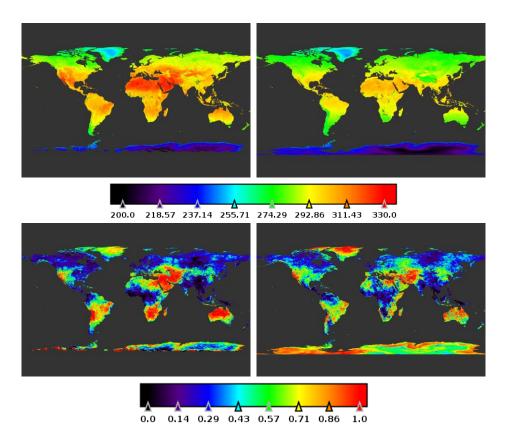


Figure 21: Monthly composites at 0.05° of LST (top) and sampling ratio (bottom) for the period of Cycle 35: daytime composites (left), night-time composites (right).

The LST fields indicate the SL_2_LST product is producing values in line with expectations. There are no distinct issues or non-physical values evident. 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. Comparing this effect from the previous cycles indicates the same regions are subject to excessive cloud clearing. This will continue to be monitored, but is providing growing evidence that the lack of temporal interpolation of the ECMWF Skin Temperature could be a root cause.



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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 22nd August, an antenna problem caused a gap in data between 11:23 and 13:04. This gap also affected the geometric calibration in the following orbit.
- On 28th August a seasonal stray light test was performed, and this meant that normal observational products were not generated between 08:40 and 13:52.
- On 29th August an out of plane manoeuvre was performed between approximately 07:35 and 08:15. This affected the pointing of the satellite, and the geometric calibration in subsequent orbits (NRT data affected between 07:32 and 09:43, and NTC data affected between 06:39 and 10:03).
- On 13th September, a period of decontamination was started. This involves heating up the focal plane assembly to evaporate water ice. Data are unavailable from around 12:00 on 13th September. Visible channels were switched on again from 11:55 on 17th September, and infrared channels returned to normal from 21:51 on 19th September.



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7 Appendix A

Other reports related to the Optical mission are:

S3-A OLCI Cyclic Performance Report, Cycle No. 035 (ref. S3MPC.ACR.PR.01-035)

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

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