



MONTHLY OPERATIONS REPORT

MOR#095

Reporting period from 16-Oct-2021 to 31-Oct-2021

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1. Summary

Since July 1st, 2020, PROBA-V operates as an experimental mission due to the declining overpass time only acquiring the European and African continent. On 31st of October 2021, this experimental phase was stopped as well. The vegetation instrument was switched to standby mode on October 31 23:59:59.

In the first half of the reporting period, all of the synthesis products were nearly complete. No missing transfer frame files were missing, and no automatic recoveries were recorded with impact on the products. The amount of decompression errors and geometric errors remained at a low acceptable level. The timeliness of the products is now on average 17h instead of 9h as there are no quality operators available throughout the weekends and public holidays.

No major anomalies were recorded in the radiometric and geometric quality assessment.

Phase 2 of the reprocessing is ongoing. This phase, consisting out of processing of the period July 2018 – June 2019 is projected to be finished at the end of week 47/2021 after which a full validation will follow. A first initial validation exercise of the first 6 months does not show any issues with the data and confirm the improvements of cloud detection and atmospheric correction modules.

2. System Infrastructure

Category	% Up Time	% Down Time
Switches	100.0	0.0
Database Servers	100.0	0.0
Mid Term File Servers	100.0	0.0
Short Term File Servers	100.0	0.0
Master Servers	100.0	0.0
Worker Nodes	100.0	0.0
PDF	100.0	0.0

Table 1: System Infrastructure availability for this reporting period

3. Image Processing Services

3.1. Ingested and archived products

Product Type	Total	Received	Missing data, ingested by VITO	Archived
METEO	120	120	0	117
TFF	45	45	0	45

Table 2: Ingested and archived products for this reporting period

3.2. Generated and archived products

Product Type	Total	Processed	Error	Archived
PROBAV_L1A - Calibration	144	135	9 ^(*)	144
PROBAV_L1A - Nominal	318	318	0	318
PROBAV_L1C	318	318	0	318
PROBAV_L2A_100M	115	115	0	115
PROBAV_L2A_300M	318	318	0	318
PROBAV_L2A_1KM	318	318	0	318
PROBAV_L3_S1_TOA_100M	15	15	0	15
PROBAV_L3_S1_TOC_100M	15	15	0	15
PROBAV_L3_S1_TOC_NDVI_100M	15	15	0	15
PROBAV_L3_S5_TOA_100M	2	2	0	2
PROBAV_L3_S5_TOC_100M	2	2	0	2
PROBAV_L3_S5_TOC_NDVI_100M	2	2	0	2
PROBAV_L3_S1_TOA_300M	15	15	0	15
PROBAV_L3_S1_TOC_300M	15	15	0	15
PROBAV_L3_S10_TOC_300M	1	1	0	1
PROBAV_L3_S10_TOC_NDVI_300M	1	1	0	1
PROBAV_L3_S1_TOA_1KM	15	15	0	15
PROBAV_L3_S1_TOC_1KM	15	15	0	15
PROBAV_L3_S10_TOC_1KM	1	1	0	1
PROBAV_L3_S10_TOC_NDVI_1KM	1	1	0	1

Table 3: Generated and archived products for this reporting period

(*) L1A error due geometric processing

3.3. Backup and archiving service

Product type	Total Files	Total File Size (GB)
TFF	48	143.94
L1A	489	255.54
Database transaction logs	672	23.8
Database incremental back-up	38	7.65
Database full back-up	7	455.08

Table 4: Back-up data volumes for this reporting period

Product type	Total Files	Total File Size (GB)
PROBAV_TRANSFERFRAMES	48	154.55
PROBAV_L1A	489	274.39
PROBAV_L1C	342	476.10
PROBAV_L2A_100M	248	225.65
PROBAV_L2A_300M	684	121.76
PROBAV_L2A_1KM	684	15.91
PROBAV_L3_S1_TOA_100M	28	210.27
PROBAV_L3_S1_TOC_100M	28	199.01
PROBAV_L3_S1_TOC_NDVI_100M	28	23.17
PROBAV_L3_S5_TOA_100M	6	174.67
PROBAV_L3_S5_TOC_100M	6	174.54
PROBAV_L3_S5_TOC_NDVI_100M	6	19.94
PROBAV_L3_S1_TOA_300M	28	101.47
PROBAV_L3_S1_TOC_300M	28	95.00
PROBAV_L3_S10_TOC_300M	2	11.68
PROBAV_L3_S10_TOC_NDVI_300M	2	1.05
PROBAV_L3_S1_TOA_1KM	28	13.44
PROBAV_L3_S1_TOC_1KM	28	12.60
PROBAV_L3_S10_TOC_1KM	2	1.56
PROBAV_L3_S10_TOC_NDVI_1KM	2	0.13
ICP_GEOMETRIC_CENTRE	0	0
ICP_GEOMETRIC_LEFT	0	0
ICP_GEOMETRIC_RIGHT	0	0
ICP_RADIOMETRIC_CENTRE	0	0
ICP_RADIOMETRIC_LEFT	0	0
ICP_RADIOMETRIC_RIGHT	0	0
METEO_ECMWF	123	0.15
METEO_METEOSERVICES	122	0.65
POLARMOTION	0	0

Table 5: Archived data volumes for this reporting period

3.4. Dissemination service

Product type	Added to catalogue	Ordered	Delivered
PROBAV_L1C	314	68	68
PROBAV_L2A_100M	114	0	0
PROBAV_L2A_300M	314	6	6
PROBAV_L2A_1KM	314	0	0
PROBAV_L3_S1_TOA_100M	14	69	70
PROBAV_L3_S1_TOC_100M	14	700	1539
PROBAV_L3_S1_TOC_NDVI_100M	14	0	0
PROBAV_L3_S5_TOA_100M	3	0	0
PROBAV_L3_S5_TOC_100M	3	194	202
PROBAV_L3_S5_TOC_NDVI_100M	3	6	8
PROBAV_L3_S1_TOA_300M	14	113	113
PROBAV_L3_S1_TOC_300M	14	17	48
PROBAV_L3_S10_TOC_300M	1	2	2
PROBAV_L3_S10_TOC_NDVI_300M	1	22	886
PROBAV_L3_S1_TOA_1KM	14	15	16
PROBAV_L3_S1_TOC_1KM	14	15	47
PROBAV_L3_S10_TOC_1KM	1	3	2
PROBAV_L3_S10_TOC_NDVI_1KM	1	339	357

Table 6: Ordered and delivered products for this reporting period

3.5. End-user activity

6 new user(s) were registered in this reporting period.

The total number of users registered for PROBA-V data and that have ordered data is **1990** with **124** different nationalities representing **1444** different companies/universities.

Product type	Africa	Asia	Europe	N-America	Oceania	S-America
PROBAV_L1C	0	0	188.77	0	0	0
PROBAV_L2A_100M	0	0	0	0	0	0
PROBAV_L2A_300M	0	0.40	0.53	0	0	0
PROBAV_L2A_1KM	0	0	0	0	0	0
PROBAV_L3_S1_TOA_100M	0	173.81	788.41	0	0	0
PROBAV_L3_S1_TOC_100M	0	0	1364.93	100.20	0	0
PROBAV_L3_S1_TOC_NDVI_100M	0	0	0	0	0	0
PROBAV_L3_S5_TOA_100M	0	0	0	0	0	0
PROBAV_L3_S5_TOC_100M	0	16.92	317.99	0	0	0
PROBAV_L3_S5_TOC_NDVI_100M	0.55	0	0.12	0	0	0
PROBAV_L3_S1_TOA_300M	0	0	46.49	0	0	1012.62
PROBAV_L3_S1_TOC_300M	0	0	77.58	48.12	0	0
PROBAV_L3_S10_TOC_300M	0.03	0	5.81	0	0	0
PROBAV_L3_S10_TOC_NDVI_300M	0	0.09	64.45	0	0	0
PROBAV_L3_S1_TOA_1KM	0	0.00	6.42	0	0	0
PROBAV_L3_S1_TOC_1KM	0	0	11.28	0	0	0
PROBAV_L3_S10_TOC_1KM	0.19	0	0.80	0	0	0
PROBAV_L3_S10_TOC_NDVI_1KM	0.06	51.77	0.01	0	0	0.00

Table 7: Data download (GB) in total per Origin of the User for the reporting period

Product Type	Global
L1C	188.77
PROBAV_L2A_100M	0
PROBAV_L2A_300M	0.93
PROBAV_L2A_1KM	0
PROBAV_L3_S1_TOA_100M	962.22
PROBAV_L3_S1_TOC_100M	1465.13
PROBAV_L3_S1_TOC_NDVI_100M	0
PROBAV_L3_S5_TOA_100M	0
PROBAV_L3_S5_TOC_100M	334.91
PROBAV_L3_S5_TOC_NDVI_100M	0.66
PROBAV_L3_S1_TOA_300M	1059.10
PROBAV_L3_S1_TOC_300M	125.70
PROBAV_L3_S10_TOC_300M	5.84
PROBAV_L3_S10_TOC_NDVI_300M	64.54
PROBAV_L3_S1_TOA_1KM	6.43
PROBAV_L3_S1_TOC_1KM	11.28
PROBAV_L3_S10_TOC_1KM	1.00
PROBAV_L3_S10_TOC_NDVI_1KM	51.84

Table 8: Data download (GB) in total for the reporting period

Company	# Downloads
VISIOTERRA	1347
JOINT RESEARCH CENTRE	868
CESBIO	843
ARID LAND RESEARCH CENTER	260
ICMBIO	98
DESCARTES UNDERWRITING	82
HOCHSCHULE KARLSRUHE TECHNIK UND WIRTSCHAFT	74
VITO	70
UCLOUVAIN	65
CHINA INSTITUTE OF WATER RESOURCES AND HYDROPOWER	37

Table 9: Top 10 user companies for the reporting period

Country	# Users
CHINA	217
BELGIUM	167
INDIA	99
FRANCE	92
BRAZIL	84
UNITED STATES	83
ITALY	80
NETHERLANDS	70
UNITED KINGDOM	65
GERMANY	63

Table 10: Top 10 countries with most registered users

List of issues raised by users:

- about the fallow land data

4. Image Calibration services

4.1. Radiometric Calibration

Calibration request type	Total	Processed	Not received	Error
CLOUDS	17	15	2	0
DARK CURRENT	10	7	1	2
MOON	9	9	0	0
RAYLEIGH	24	21	3	0
SNOW	0	0	0	0
SUN_GLINT	0	0	0	0

Table 11: Calibration Image requests for this reporting period

Calibration image type	Total	Valid	Invalid
PROBA_V_L1A_CALIBRATION	9	0	9
PROBA-V_L1B_CALIBRATION	126	83	43
PROBA-V_L1B_INTERSECTION	343	170	160
PROBA-V_L1B_OVERLAPREGION	0	0	0

Table 12: Processed calibration images for this reporting period

This update only includes an update with the last calibration results recorded by PROBA-V. Compared to the previous report, only 2 weeks of extra calibration results have been captured.

The 1st November 2021, PROBA-V stopped its normal calibration campaign. Therefore this is the final monthly update.

Long-term monthly Libya-4 mean plots for different cameras are given in Figure 1 and Figure 2 and Figure 3. Deep convective clouds interband calibration results are given in Figure 4.

The orbital drift makes it difficult to interpret correctly the observed trends. Very strong seasonal variations are observed in the Libya-4 results for the RIGHT camera, while for Center camera results are stable. In the DCC results a strong decreasing trend is observed during the last year for mainly the blue strips. The foreseen updates in the calibration coefficients for Collection 2 might reduce these effects.

No bad pixel has been identified.

In total 7 lunar cycles between -90° and 90° phase have been captured, apart from the routine moon calibration acquisitions. Constant phase angle acquisitions are very useful to characterize the temporal behaviour of a EO-sensor (i.e. PROBA-V), but they hide a large part of the applied irradiance model.

PROBA-V is continuing with moon calibrations after the experimental phase, supporting the further development of such models (i.e. LIME).

Radiometric ICP file

The BLUE LEFT/CENTER absolute calibration coefficients will be updated following a linear degradation model and the dark currents will be updated.

The final ICP files are

- PROBAV_ICP_RADIOMETRIC#LEFT_20211103_V01
- PROBAV_ICP_RADIOMETRIC#CENTER_20211103_V01
- PROBAV_ICP_RADIOMETRIC#RIGHT_20211103_V01

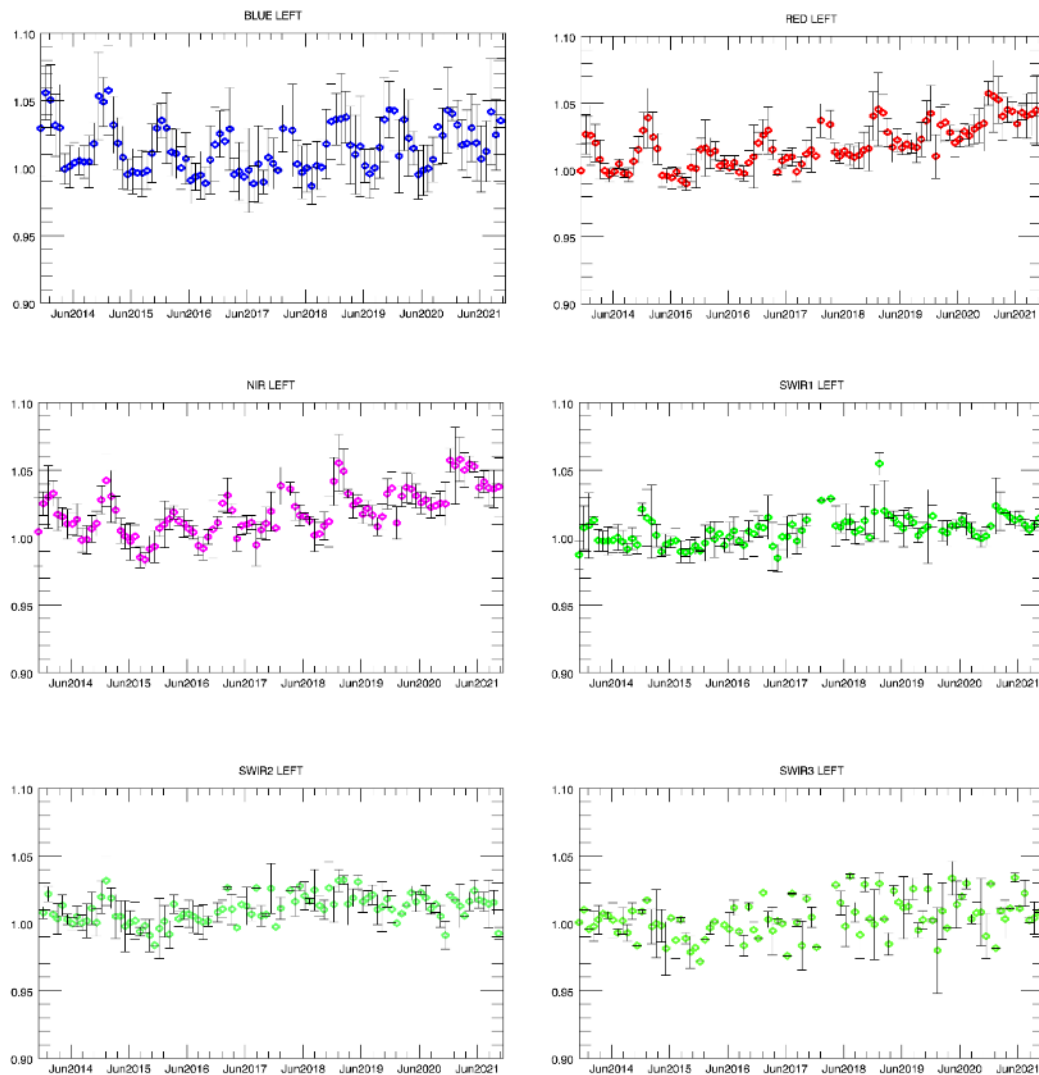


Figure 1. Libya-4 desert calibration results: LEFT monthly averaged results (collection 1)

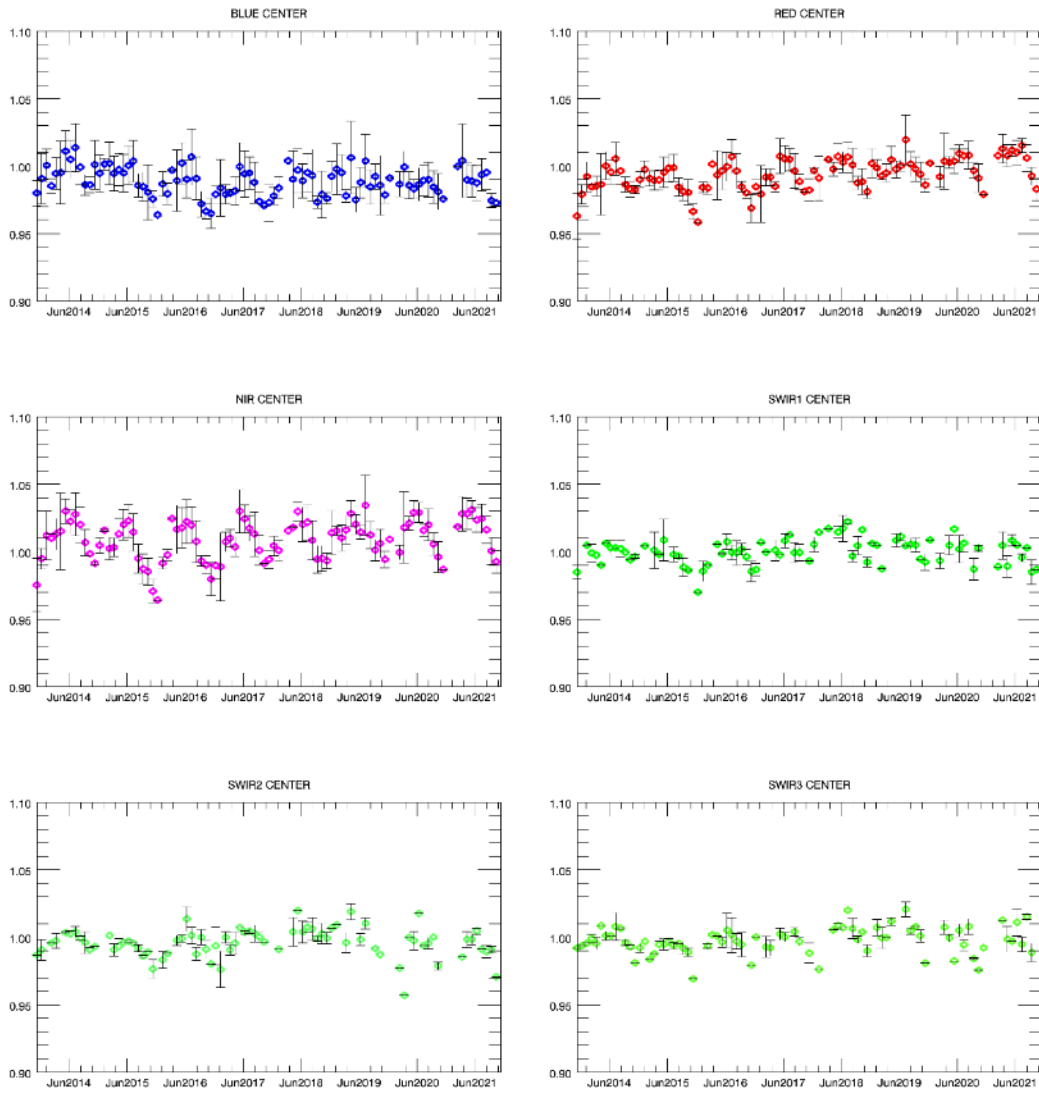


Figure 2. Libya-4 desert calibration results: CENTER monthly averaged results (collection 1)

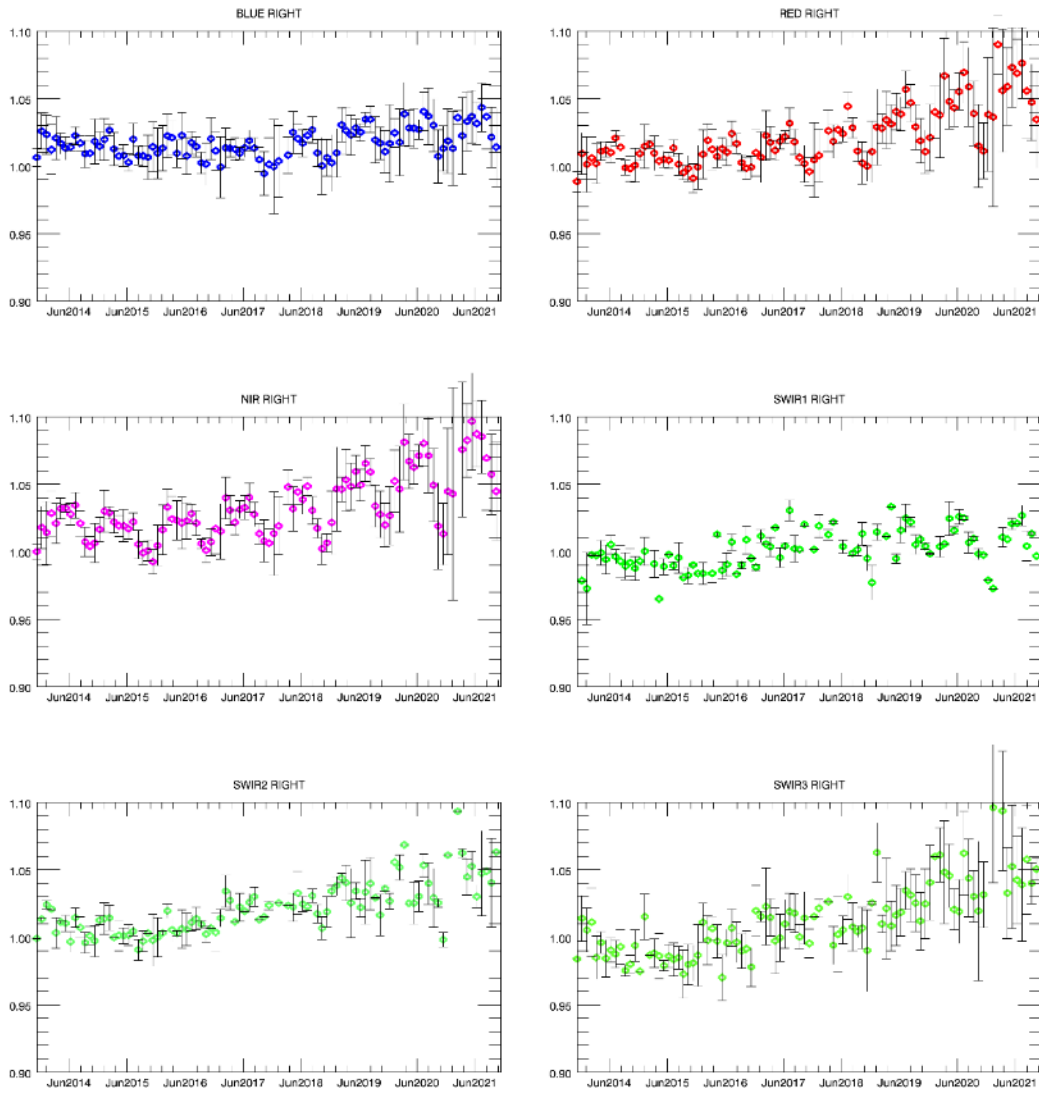


Figure 3. Libya-4 desert calibration results: RIGHT monthly averaged results (collection 1)

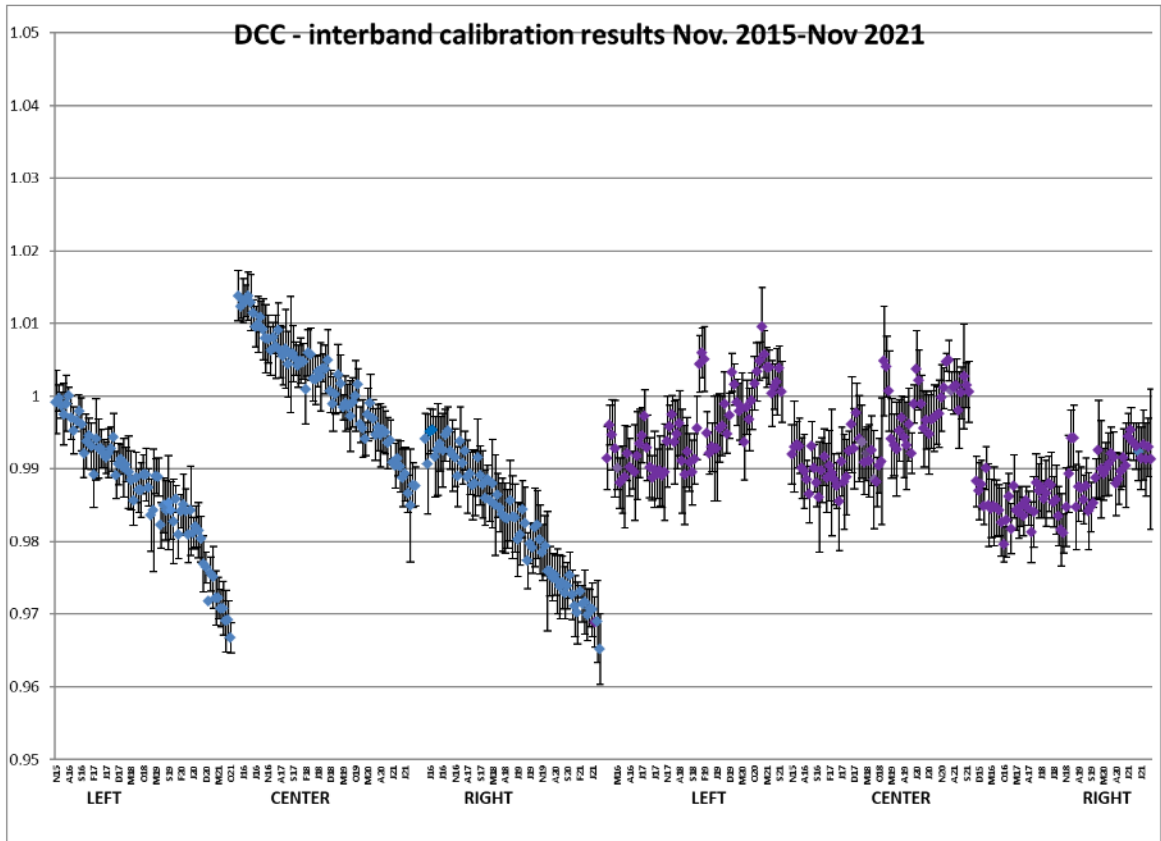


Figure 4. DCC inter-band calibration results: LEFT, CENTER and RIGHT camera (collection 1)

4.2. Geometric Calibration

Calibration image type	Total	Processed	Error
PROBA-V_L1C_INTERSECTION	2053	2053	0

Table13: Processed calibration images for this reporting period

During the reporting period 16/9 – 31/10/2021, the average ALE was < 71 m ($\sigma < 95$ m). The daily ALE evolution (Figure 5) shows that in general the ALE was 50 – 80 m, but there were two maxima: on 5/10 values peaked at ~95 m, while on 24/10 values peaked at 120 – 126 m.

The average daily compliance was 99.10% (98.66% – 99.67% for BLUE – SWIR), with minimum values being 90.68, 89.60, 90.00, and 99.01% for BLUE, RED, NIR, and SWIR, respectively, on 24/10.

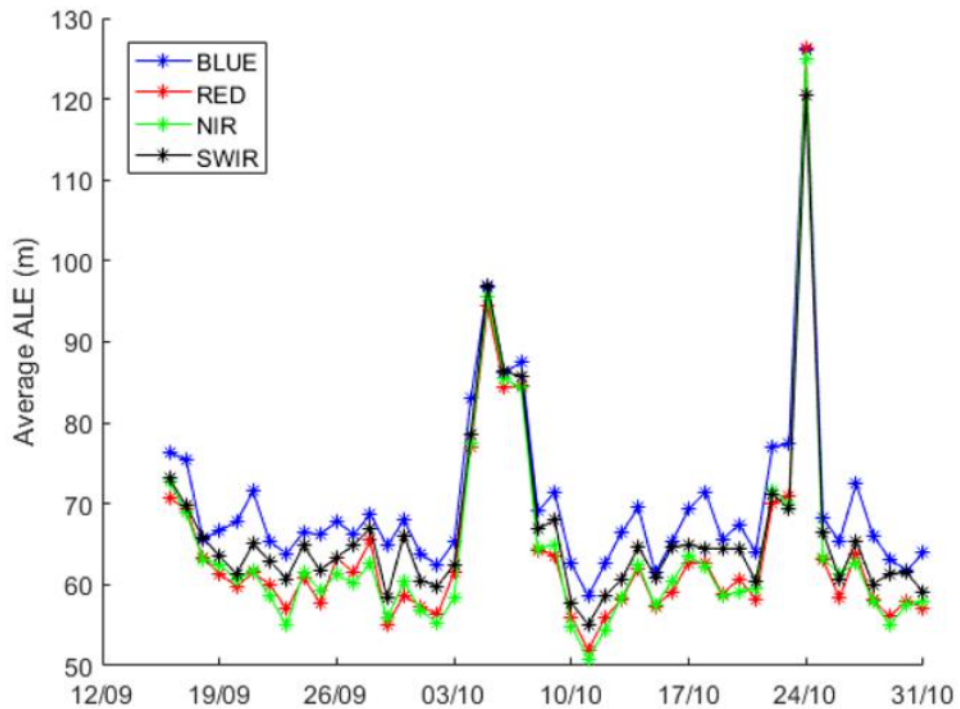


Figure 5: Daily ALE evolution for 16/9 – 31/10/2021.

5. Anomalies

5.1. Image processing issues

A detailed description of each issue is available in the Weekly Report and the image processing tracking system <https://juniper.vgt.vito.be/ciptools>

The below table gives an overview of the S1's of this reporting period:

	# S1	Dates
Major Gaps (> 21600 km ² (missing TFF))	0	
Large Gaps (< 21600 km ²)	0	
Medium Gaps (< 10000 km ²)	0	
Minor Gaps (< 3600 km ²)	0	
Negligible Gaps (< 1000 km ²)	15	17/10, 22/10, 27/10, 16/10, 21/10, 31/10, 30/10, 25/10, 20/10, 24/10, 29/10, 19/10, 28/10, 23/10, 18/10
Complete synthesis (no gaps)	1	26/10

Table14: Overview of S1 for this reporting period

Synthesis	Missing	Decom. Error	Geom. Error	Missing TFF	Autom. Recovery	VC4 Missing	Create Contours	Other
20211016	65.16%	2	4					
20211017	66.49%	6						
20211018	66.52%	3						
20211019	67.01%	10	3					
20211020	66.68%	3						
20211021	64.30%	8	6					
20211022	64.66%	3	1				2	
20211023	64.91%	4	11				1	
20211024	66.05%	3	7				1	
20211025	64.54%	3	12					
20211026	65.29%	1						
20211027	65.42%	7					3	
20211028	66.02%	4	5				3	
20211029	66.04%	7	3					
20211030	65.37%	5	1					
20211031	65.78%	2	3					

Table 15: List of synthesis with an error overview of the missing percentages and errors for this reporting period

6. Scheduled activities for the next period(s)

- Software upgrades:
No software upgrades planned
- Hardware:
Movement of nominal production setup to reprocessing stack.
- Development:
No new developments planned
- No other activities scheduled.

7. Operational remarks

All PROBA-V workflows were switched off on November 1st, 2021. The used hardware will be moved to the reprocessing environment to improve the processing speed of phase 3 of the reprocessing (entire archive). Only a small setup will be held to be able to cope with possible future calibration (dark current and lunar) segments to be able to evaluate instrument deterioration.