QUARTERLY IMAGE QUALITY REPORT

IQR#014

Reporting period from 16/03/2017 to 15/06/2017

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Author(s): Sindy Sterckx, Stefan Adriaensen, Iskander Benhadj, Erwin Wolters
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Signatures

Author(s) Sindy Sterckx, Stefan Adriaensen, Erwin Wolters, Iskander Benhadj

Reviewer(s) Dennis Clarijs

Approver(s) Dennis Clarijs

Issuing authority VITO N.V.

Change record

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1.0	20/06/2017	All	Initial version	

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1. Radiometric Image Quality

1.1. Summary

It should be noted that the figures in this report are generated on the basis of the **collection 1 ICP** files.

Since May 1 2017 a degradation model has been implemented to correct for the slight degradation observed in the DCC interband, Libya-4 and Moon calibration results for LEFT and CENTER BLUE.

For the RIGHT SWIR strips we start to see a slight overcorrection of the degradation due to the application of the degradation model in collection 1. It should be noticed that the coefficients of the degradation model has been determined about one year ago. A reevaluation of the coefficients of the SWIR degradation model is currently on-going.

During Q2 of 2017 one new bad pixel was identified.

1.2. Assessment of the radiometric accuracy

1.2.1. Absolute radiometric accuracy

The absolute radiometric calibration requirement for PROBA-V specifies a 5 % absolute accuracy. This requirement is assessed through vicarious calibration over Libya-4 desert site and Rayleigh calibration zones.

1.2.1.1. Libya-4 desert calibration

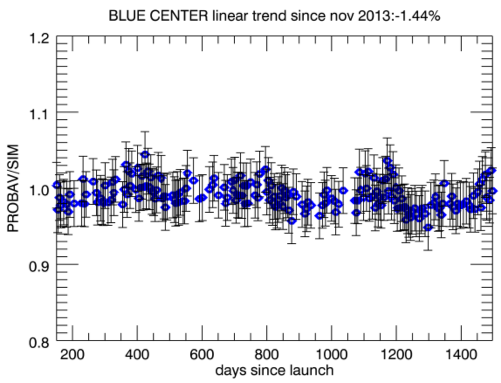
Methodology

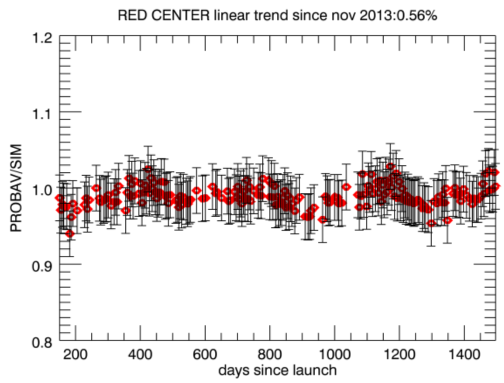
The nominal approach for assessing the absolute radiometric accuracy relies on the comparison between cloud-free TOA reflectance as measured over the Libya-4 desert site by PROBA-V and the modelled TOA reflectance values, following the approach described in [LIT1]. Validation of the approach using various satellite data (i.e. AQUA-MODIS, MERIS, AATSR, PARASOL, SPOT-VGT) has shown that absolute calibration over the Libya-4 desert is achievable with this approach with an accuracy of 3% [LIT1, LIT2].

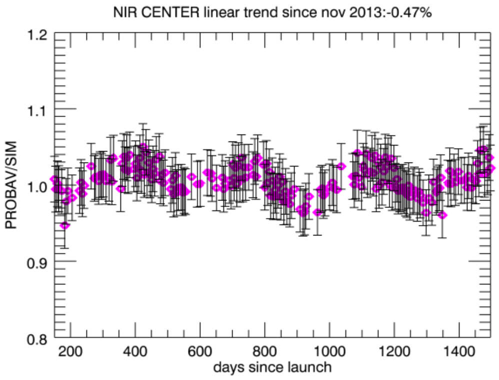
Results

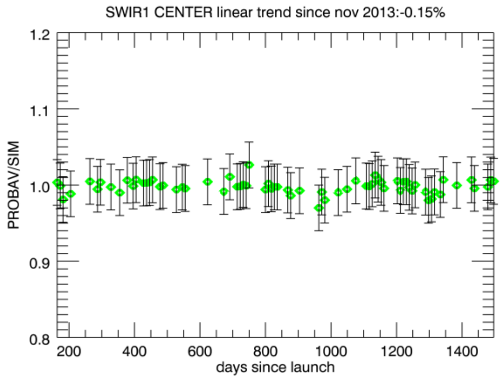
In Figure 1, Figure 3 and Figure 5 the monthly averaged results ($avg(\rho_{TOA}^{k,ProbaV(Acom)}/\rho_{TOA}^{k,model})$) and its standard deviation are given for respectively LEFT, CENTER and RIGHT camera.

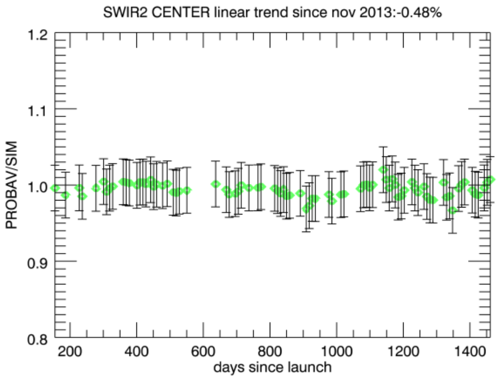
The individual area-averaged results are given in Figure 2,











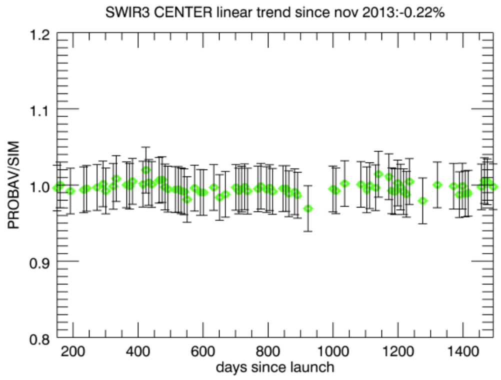


Figure 4, Figure 6 with a 3 % error bar (as expected uncertainty for an individual result) for respectively VNIR and SWIR strips.

Results are obtained based on the **Collection 1** ICP files.

As reporting in previous report a degradation model has to be implemented to correct for the observed degradation in the calibration results for the LEFT BLUE and CENTER BLUE strips. In order to define the best coefficients for the degradation model various desert sites have been reprocessed with the ”collection 1” ICP files (see section 1.2.3). Based on the results a degradation model has been implemented, since 1 May 2017, to correct for the observed degradation in the calibration results for the LEFT BLUE and CENTER BLUE strips.

For the RIGHT SWIR strips we start to see a slight overcorrection of the degradation due to the application of the degradation model. It should be noticed that the coefficients of the degradation model has been determined about one year ago. A reevaluation of the coefficients of the SWIR degradation model is ongoing.

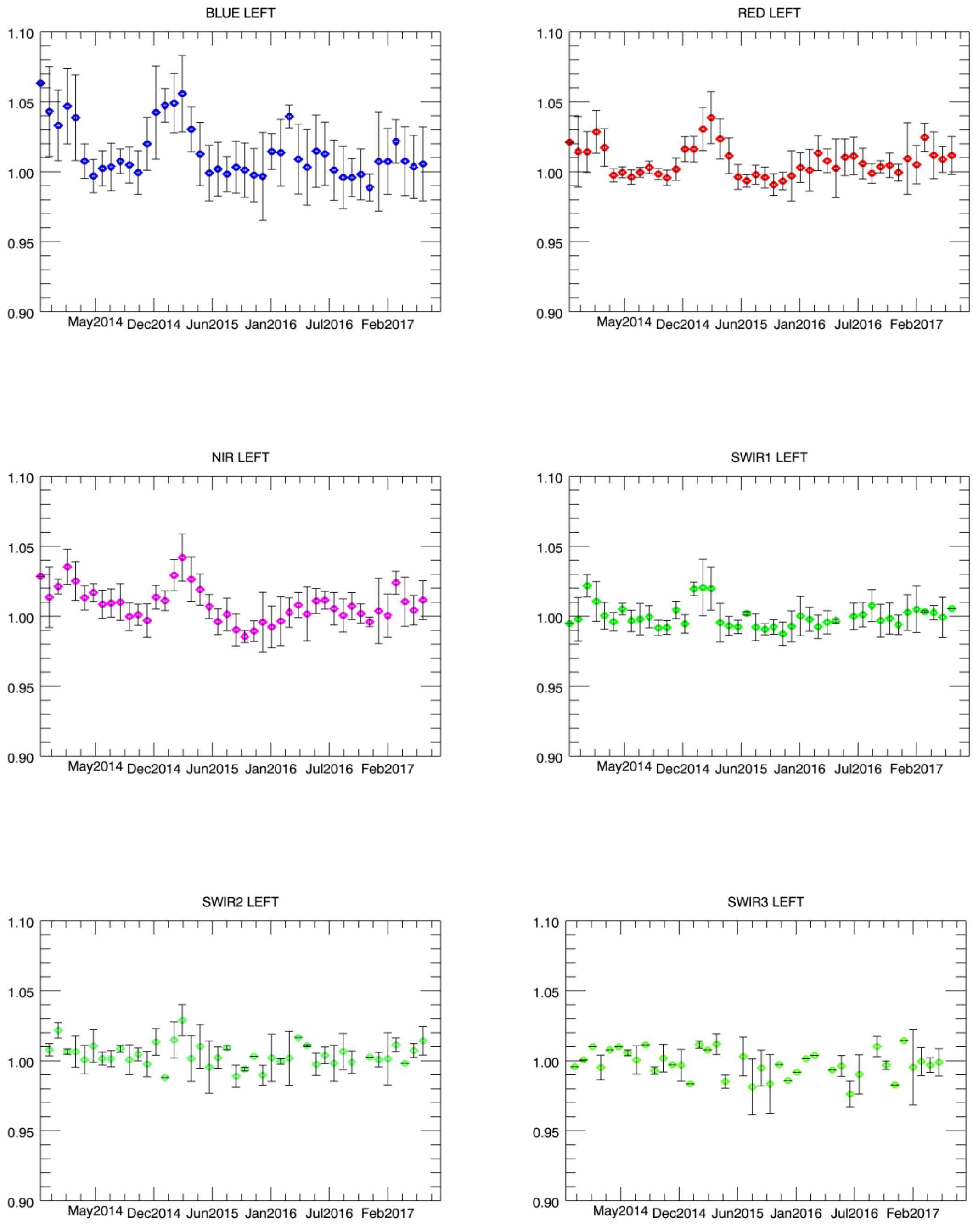


Figure 1. Libya-4 desert calibration results: LEFT monthly averaged results (Collection 1)

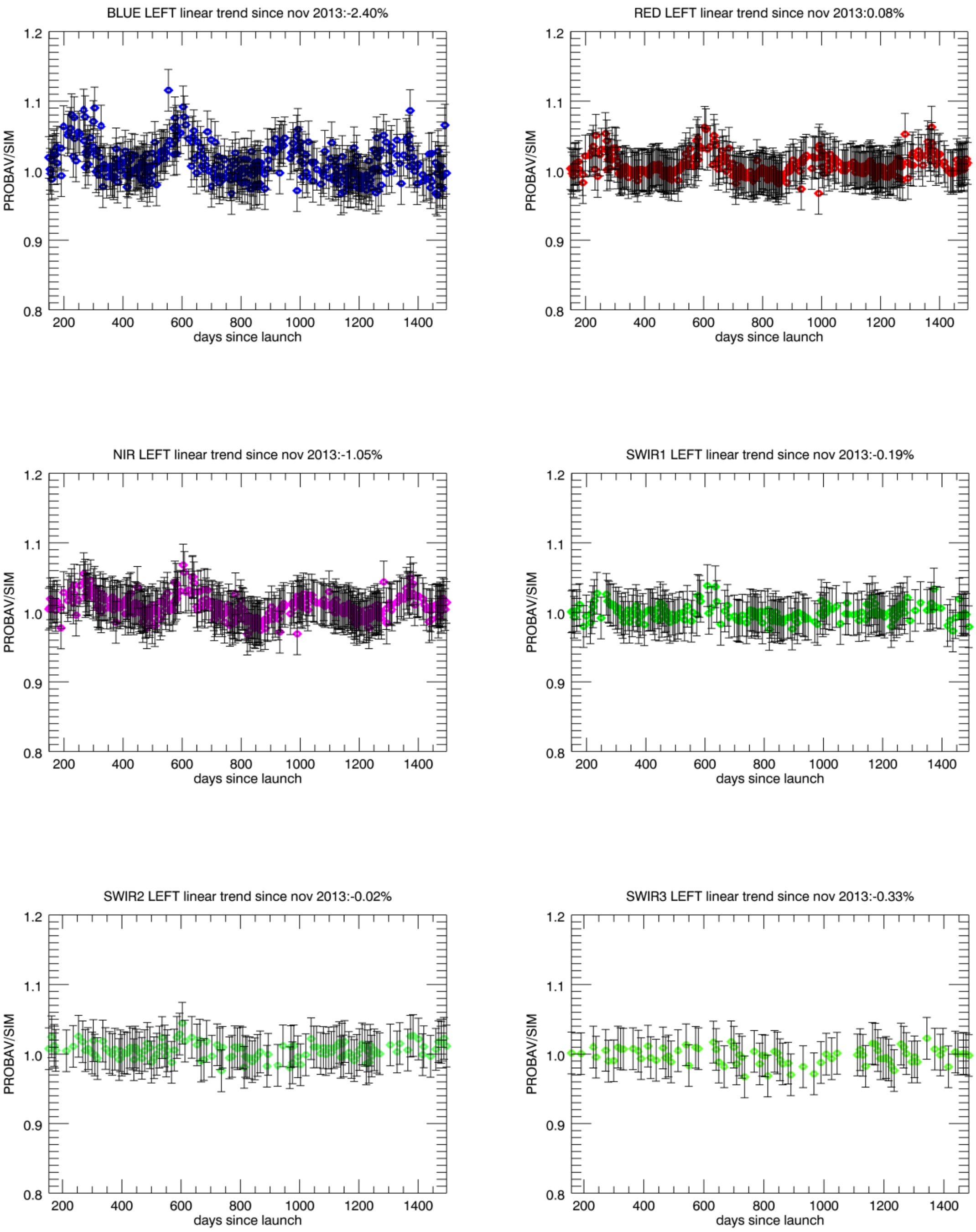


Figure 2. Libya-4 desert calibration results: LEFT individual results (Collection 1)

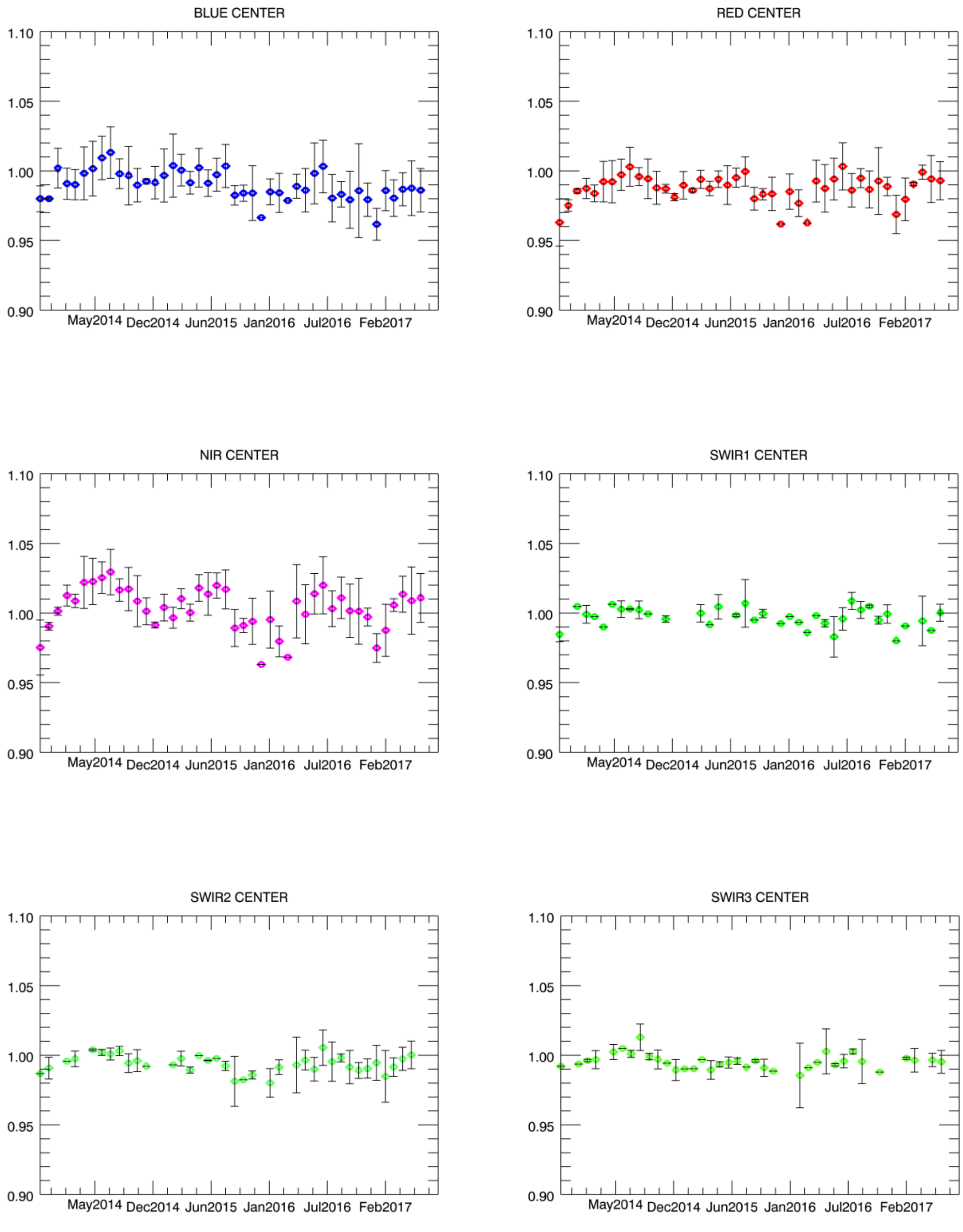


Figure 3. Libya-4 desert calibration results: CENTER monthly averaged results (Collection 1)

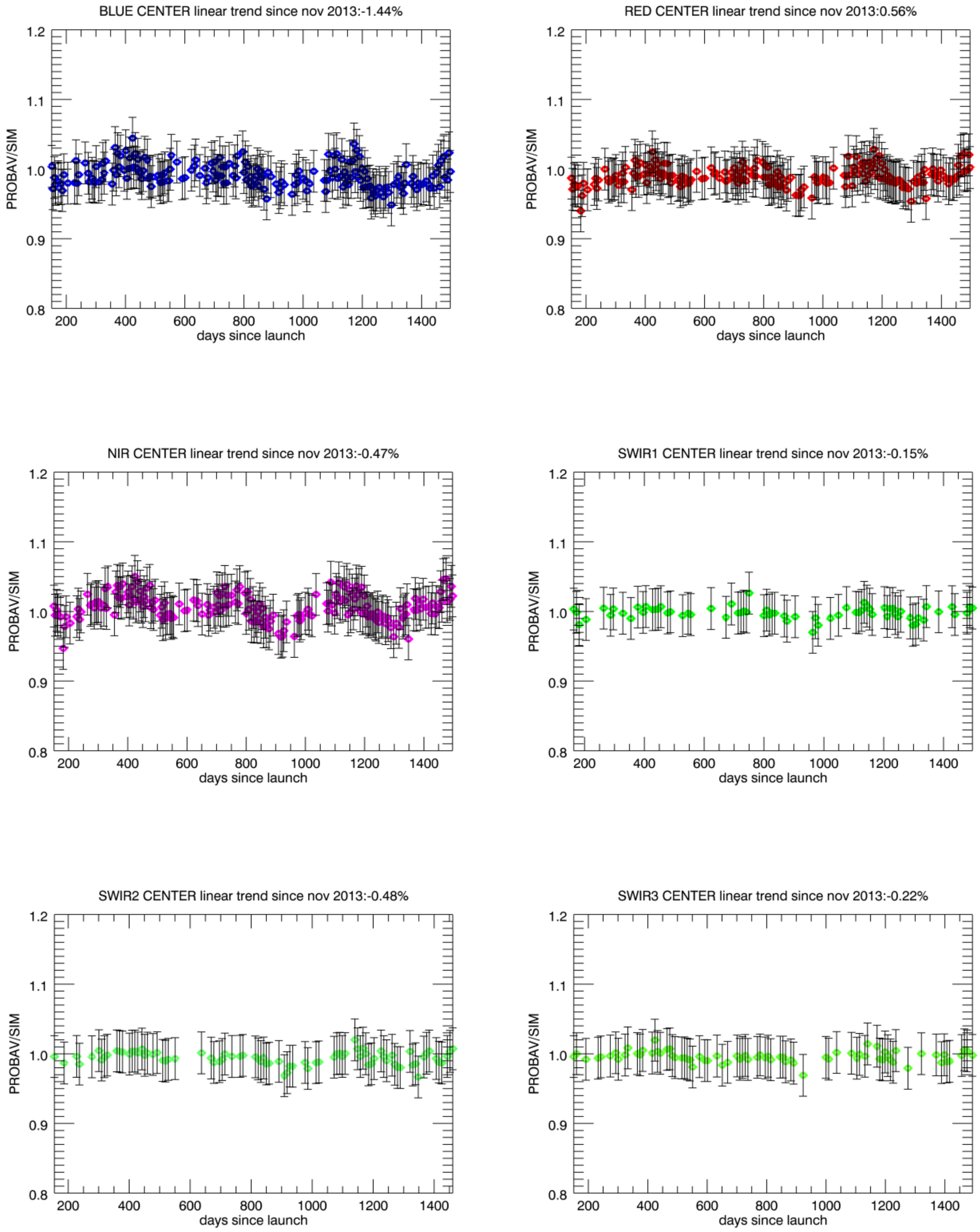


Figure 4. Libya-4 desert calibration results: CENTER individual results (Collection 1)

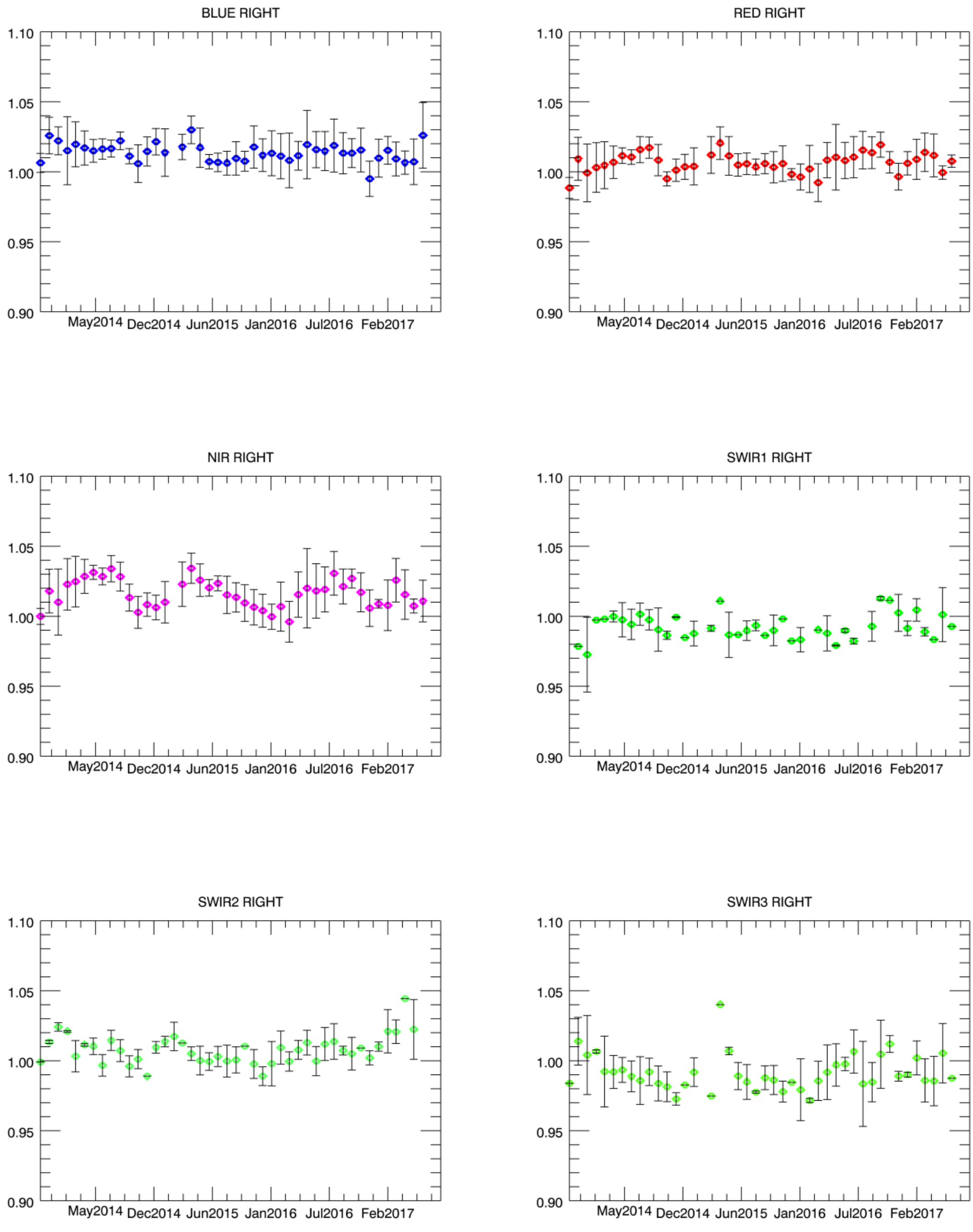


Figure 5. Libya-4 desert calibration results: RIGHT monthly averaged results (Collection 1)

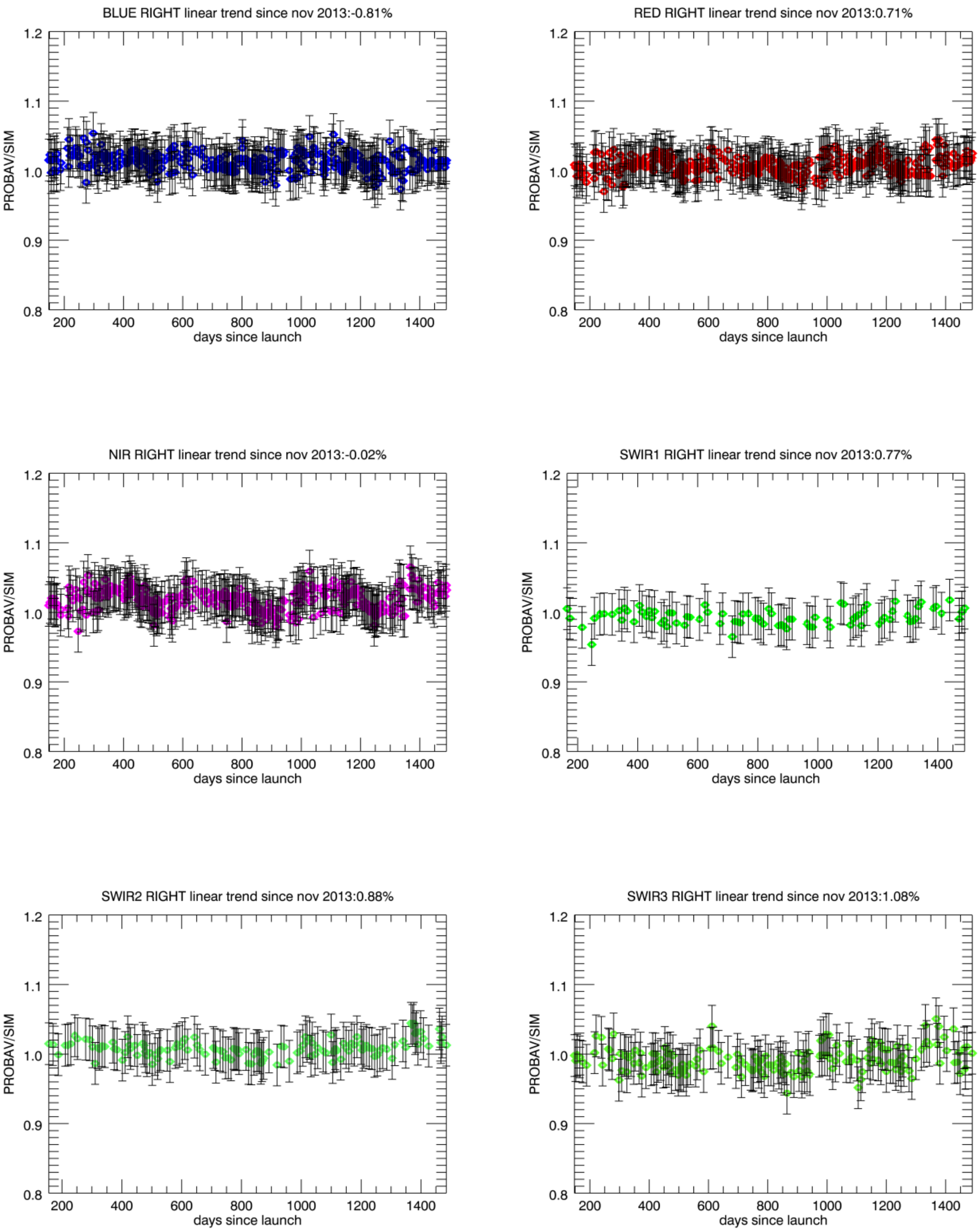


Figure 6. Libya-4 desert calibration results: RIGHT individual results (Collection 1)

1.2.1.2. Rayleigh calibration

Methodology

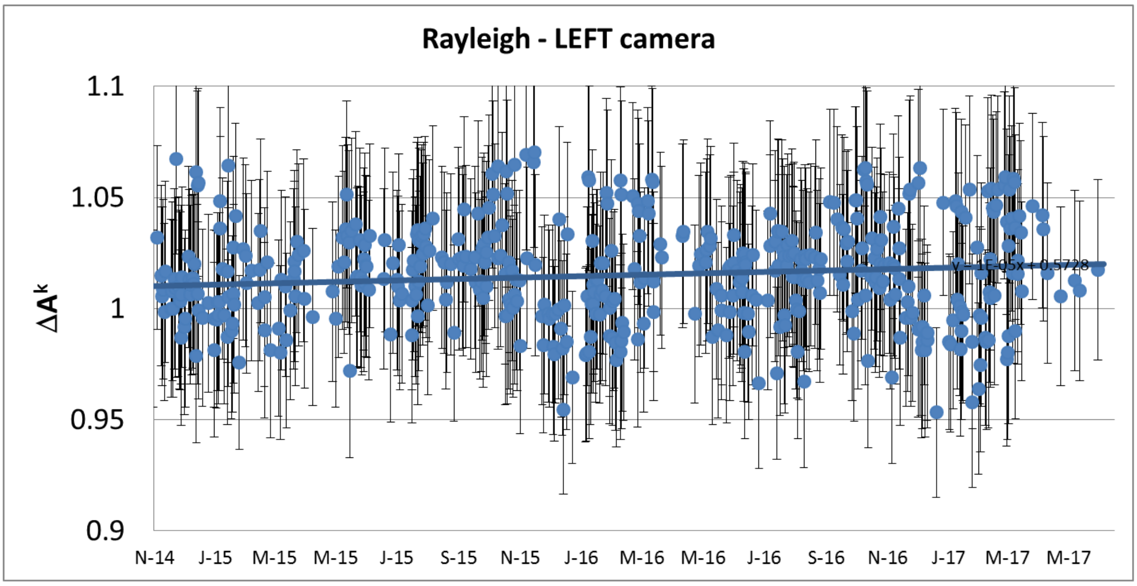
The Rayleigh calibration approach is an absolute calibration method for BLUE and RED bands. The primary assumption of the approach is that the ocean does not contribute to the Top-Of-Atmosphere (TOA) signal in the NIR. The contribution of aerosol scattering is derived from the ***NIR reference band*** where molecular scattering is negligible. The aerosol content estimated from the NIR band is then transferred to the BLUE and RED band to model the TOA radiance with a radiative transfer code. The simulated radiance values are then compared with the measured values.

Results

The scene averaged Rayleigh results ($(\rho_{TOA}^{k,ProbaV(Acom)}/\rho_{TOA}^{k,model})$) (with a 4 % error bar as rough indication of uncertainty of one individual result) obtained since January 2014 for LEFT, CENTER and RIGHT camera are given in respectively Figure 7, Figure 8 and Figure 9.

Results are obtained using the **Collection 1 ICP** files.

No significant trend is visible in the Rayleigh calibration results. For the CENTER camera no valid Rayleigh observations were obtained during the reporting period. This is largely due to the presence of sun glint in the acquired images.



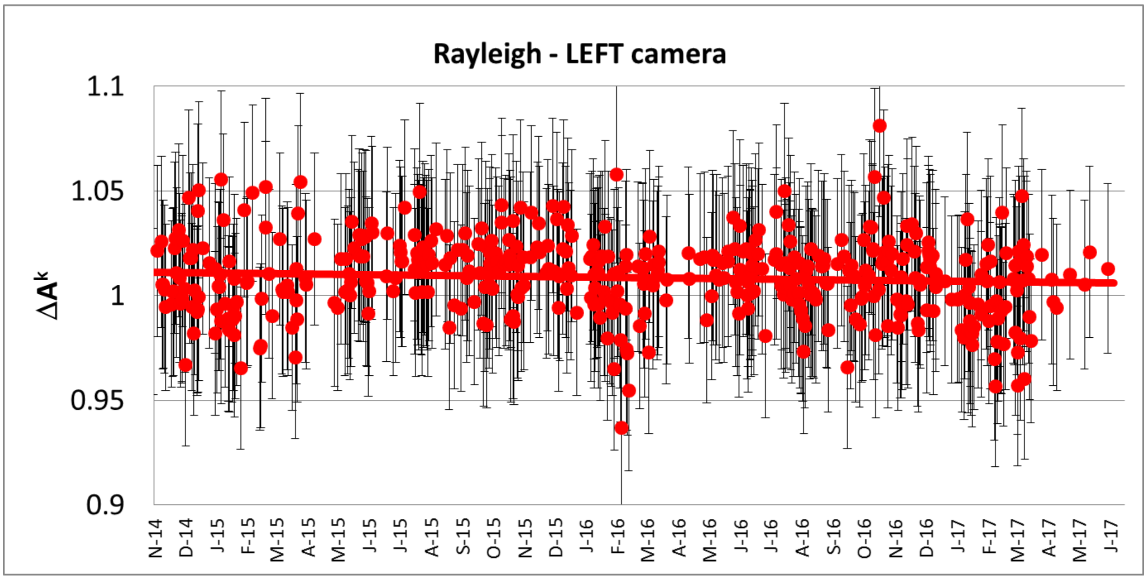
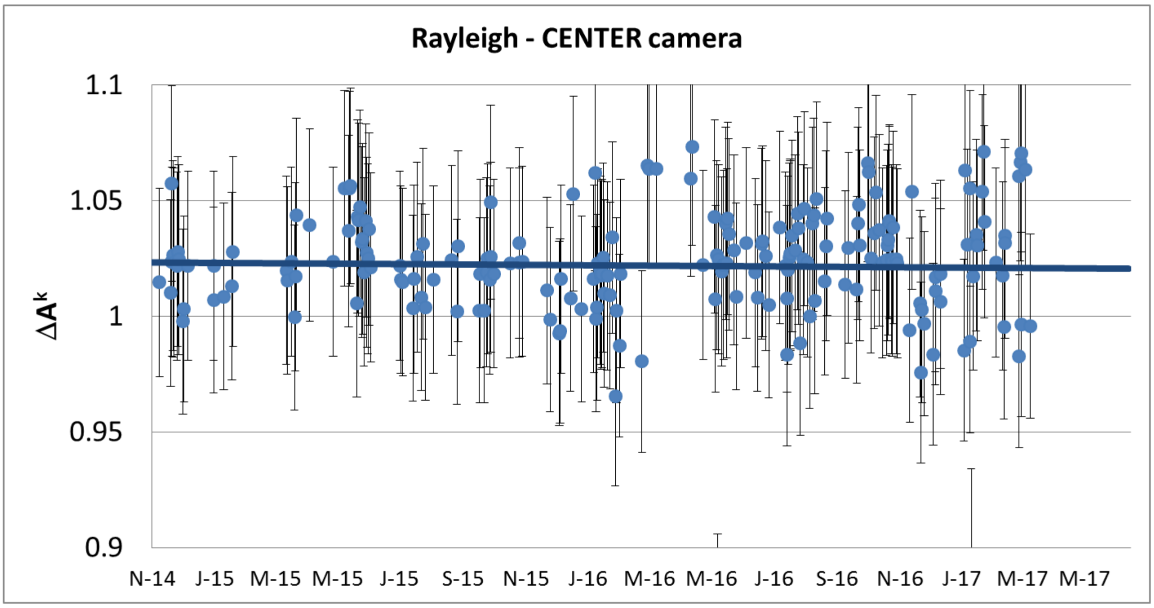


Figure 7. Rayleigh absolute calibration results: LEFT camera (Collection 0)



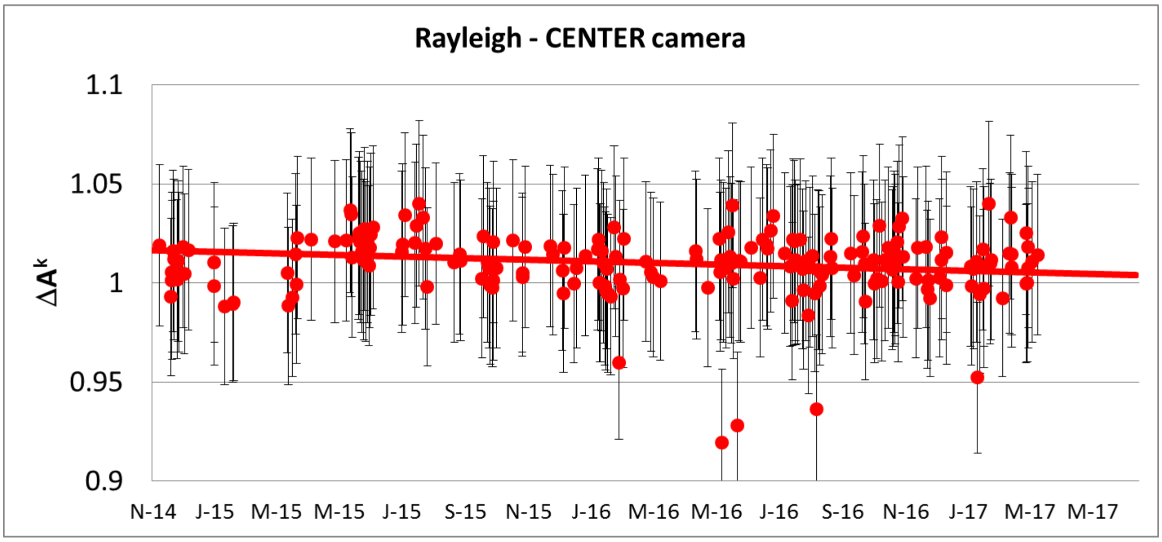
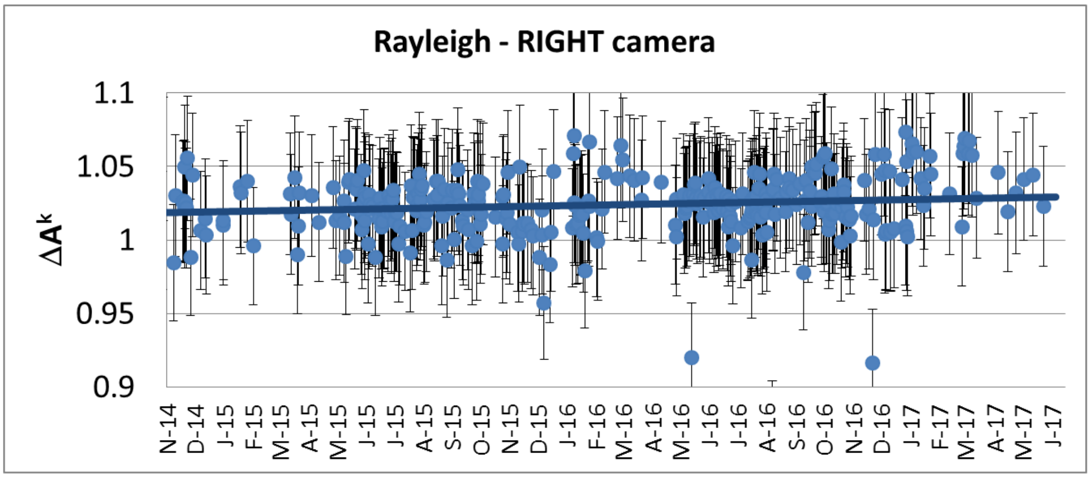


Figure 8. Rayleigh absolute calibration results: CENTER camera (Collection 1)



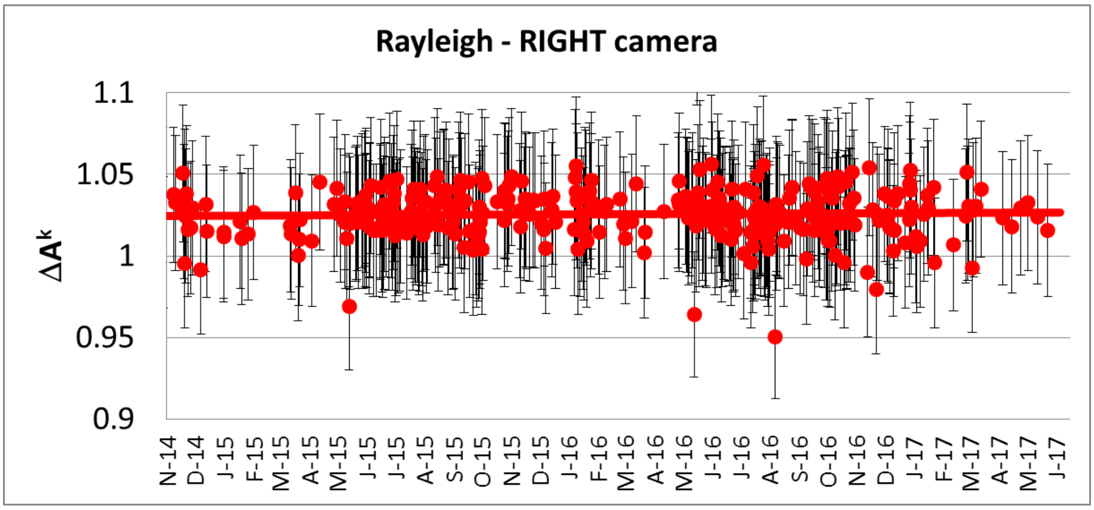


Figure 9. Rayleigh absolute calibration results: RIGHT camera (Collection 1)

1.2.2. Inter-band radiometric accuracy

The inter-band radiometric calibration requirement for PROBA-V specifies a 3 % inter-band accuracy. This requirement is assessed through vicarious calibration over deep convective clouds.

1.2.2.1. Calibration over deep convective clouds (DCC)

Methodology

The DCC approach is an inter-band calibration method. It makes use of bright, thick, high altitude, convective clouds over oceanic sites. Their reflective properties are spectrally flat in visible and near-infrared and the only contributions to the observed signal are from the cloud reflectance, molecular scattering and ozone absorption which can be modelled with a radiative transfer code.
The cloud reflectance in the non-absorbing VNIR bands is mainly sensitive to the cloud optical thickness. The DCC method uses the TOA reflectance in the 'reference' RED band to estimate cloud optical thickness assuming a fixed ice particle model. The derived cloud optical thickness is then used to model using a radiative transfer code the TOA reflectance for the BLUE and NIR band.

The method is not suited for the SWIR band as clouds are no longer spectrally uniform in this spectral region.

Results

The DCC inter-band calibration is defined by reference to the used RED reference band. The average DCC inter-band calibration result per month (from March 2015 to June 2017) is given in Figure 10 for all cameras using the **collection 1 ICP files**..

Similarly as in the Libya-4 desert results, a slight decreasing trend is observed in the DCC BLUE CENTER and LEFT results is observed. This again argues for the application of a degradation model for the BLUE strips of the CENTER and LEFT camera.

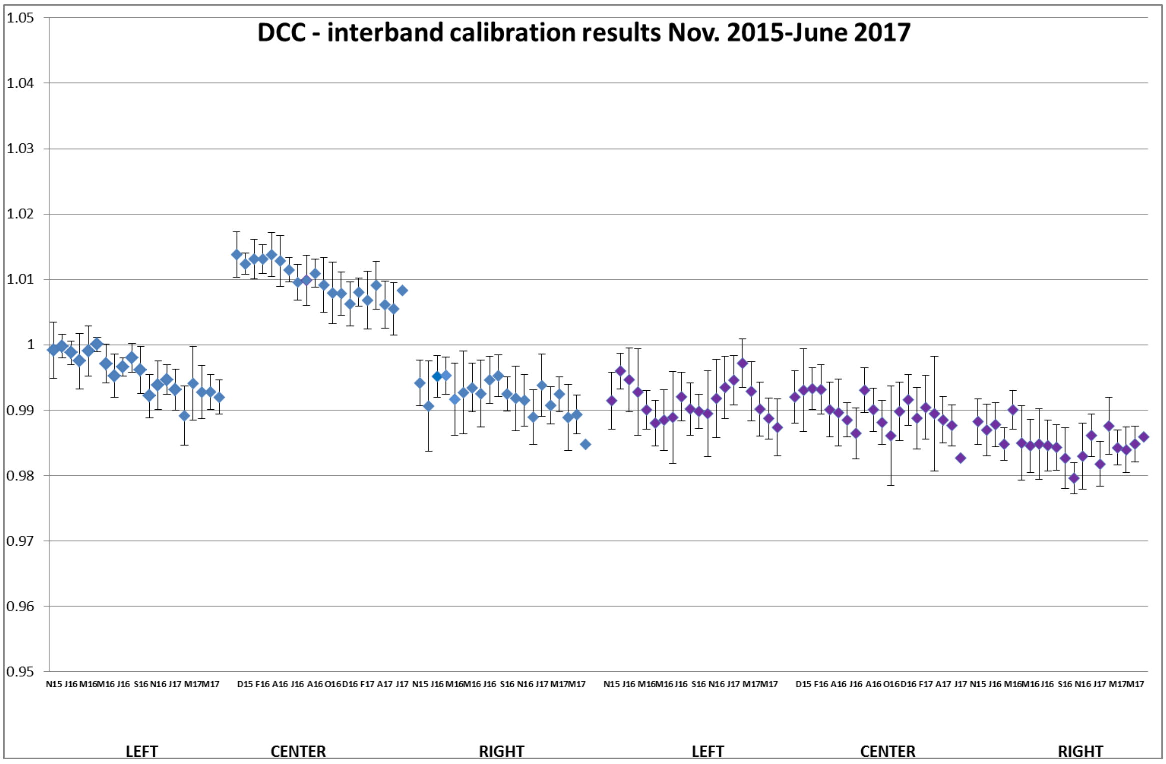


Figure 10. DCC inter-band calibration results: LEFT, CENTER and RIGHT camera

1.2.3. PROBA-V Multi-temporal radiometric accuracy

1.2.3.1. Desert calibration

A degradation model is used to update the absolute calibration coefficients of the different SWIR strips. In Table 1 the applied correction is given. This linear degration model is being applied for collection 1 since start of the operational phase (i.e. October 2014). A re-evaluation of the coefficients of the SWIR degradation model , mainly for RIGHT strips, is still under investigation.

Table 1. SWIR degradation model: applied linear trend/month

STRIP	linear trend/month (%)
SWIR1 LEFT	-0.087
SWIR2 LEFT	-0.104
SWIR3 LEFT	-0.097
SWIR 1 CENTER	-0.093
SWIR2 CENTER	-0.092
SWIR3 CENTER	-0.086
SWIR 1 RIGHT	-0.106
SWIR 2 RIGHT	-0.143
SWIR 3 RIGHT	-0.122

As reporting in previous sections a degradation is observed degradation in the calibration results for the LEFT BLUE and CENTER BLUE strips. To correct for this decrease in responsivity a degradation model should be applied. In order to define the best coefficients for the degradation model various desert sites are being reprocessed with the ”collection 1” ICP files and the trend in the calibration results is determined as illustrated in Figure 11.

The coefficients of the degradation model which has been implemented since 1 May 2017 to correct for the observed degradation in the calibration results for the LEFT BLUE and CENTER BLUE strips is given in Table 2 .

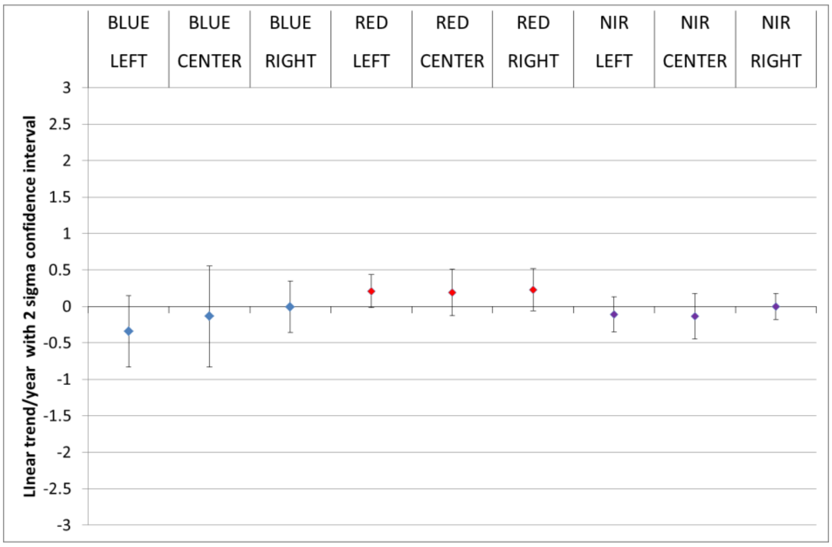


Figure 11. Observed linear trend per year (average and standard deviation over 7 desert sites)

Table 2. LEFT and CENTER BLUE degradation model: applied linear trend/month (since May 2017)

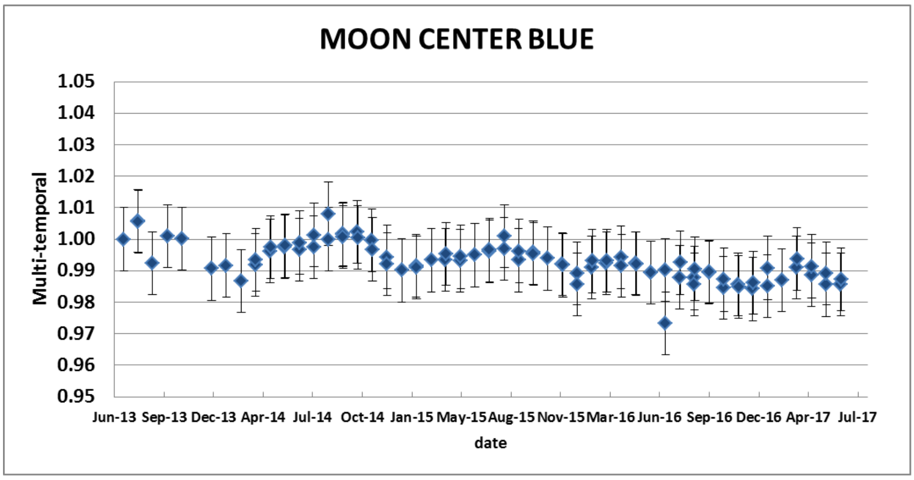
STRIP	Linear trend/month (%)
LEFT BLUE	-0.028
CENTER BLUE	-0.011

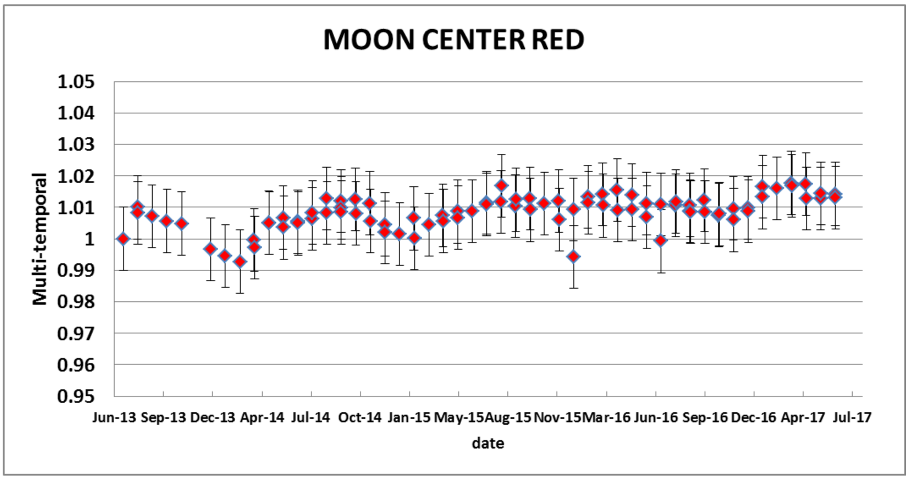
1.2.3.2. Lunar calibration

The Lunar calibration results for the VNIR CENTER camera bands, normalised to June 2013, are given in Figure 12. The results are given based on the **collection 1 ICP** files. For the SWIR center 2 strip a bug in the offset/bias correction in the processing of the lunar acquisition was detected. This issue is current under investigation. Therefore no results are given for the CENTER SWIR2 strip.

For the BLUE band a slight degradation is visible similar as observed in the Libya-4 and the DCC results. It is expected that through the application of the degradation model (being applied since May 2017) the trend will reduced for subsequent acquisitions.

Similarly as in the Libya-4 CENTER RED results an increase in responsivity is observed in the lunar CENTER RED results.





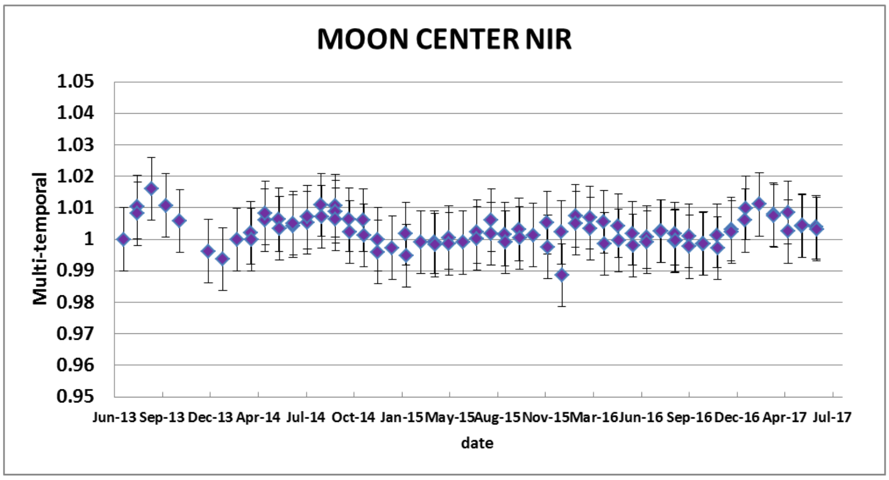


Figure 12. Lunar Calibration results CENTER camera normalised to June 2013 (collection 1 ICP files)

1.3. Dark current

1.3.1. Methodology

- Monthly difference plots :
  - All dark current results obtained during a period of one month for observations performed with a long integration time are averaged per pixel. This gives for each pixel the monthly averaged dark current, expressed **in LSB/s**, and its standard deviation.
  - The dark current results and its standard deviation expressed in LSB/s are converted to **LSB** using a maximum Integration Time for nominal acquisitions. For VNIR strips **0.006s** is used. For SWIR strips **0.02s.**
  - The differences between months (i.e. Month3-Month2, Month2-Month1) are calculated. This is done for both the dark current and the stdev. Differences are visualized in plots in blue the dark current difference in LSB is plotted, in red the standard deviation difference. This latter is an indicator of changes in the dark current noise between months.

As mentioned in the previous quarterly report (IQR#005) the integration time used for the SWIR dark current acquisitions has been decreased from 3s to 0.2 s since 2015.

1.3.2. VNIR results

Monthly difference plots for VNIR dark currents are given in Figure 13, Figure 14 and Figure 15 for respectively LEFT, CENTER and RIGHT camera.

Dark current differences for the VNIR bands are well below 1 DN, except for one pixel in the RIGHT RED strip.

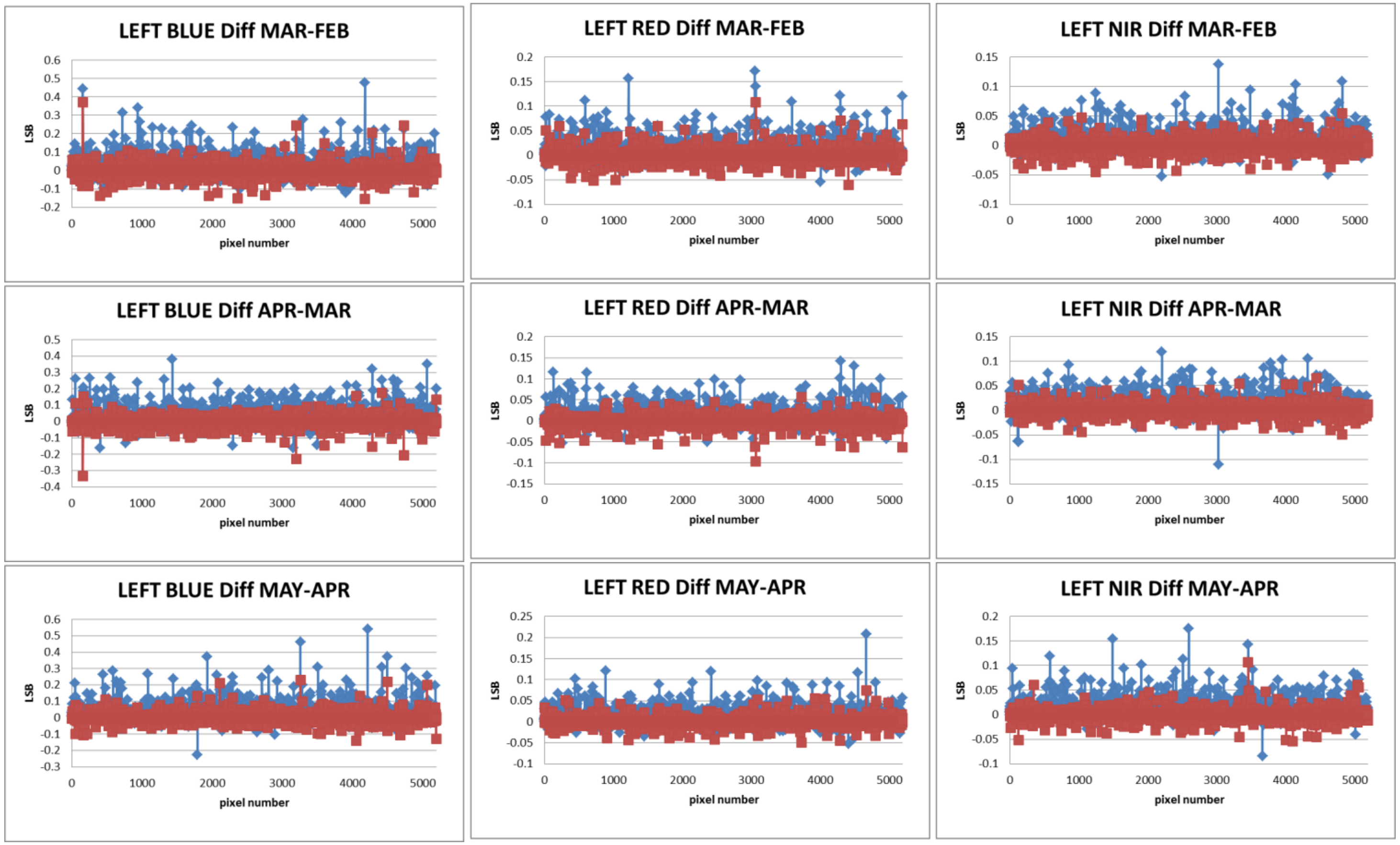


Figure 13. LEFT camera VNIR: Monthly difference (Feb to May 2017) in dark current (Blue) and standard deviation (Red) of the monthly averaged results.

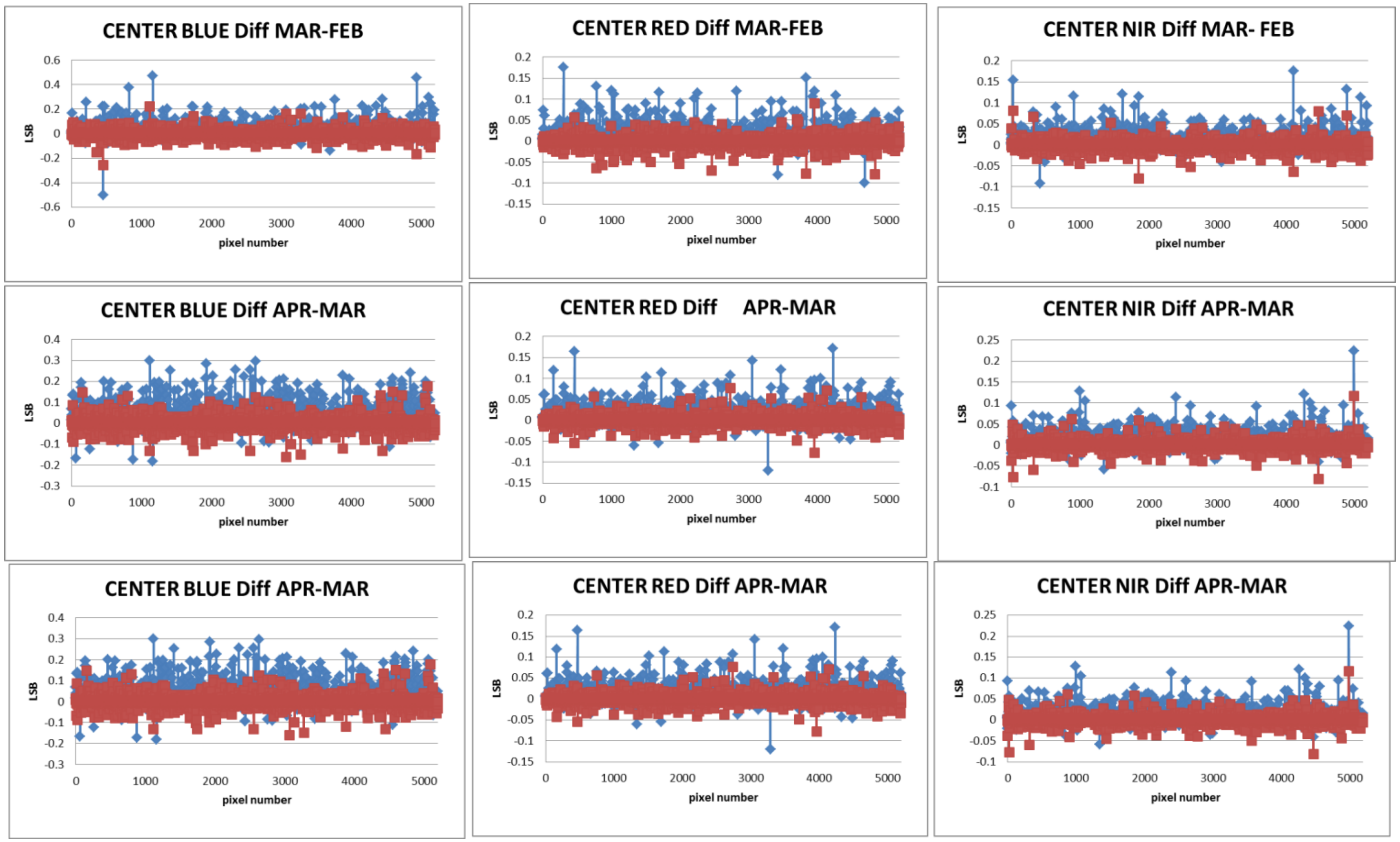


Figure 14. CENTER camera VNIR: Monthly difference (Feb to May 2017) in dark current (Blue) and standard deviation (Red) of the monthly averaged results.

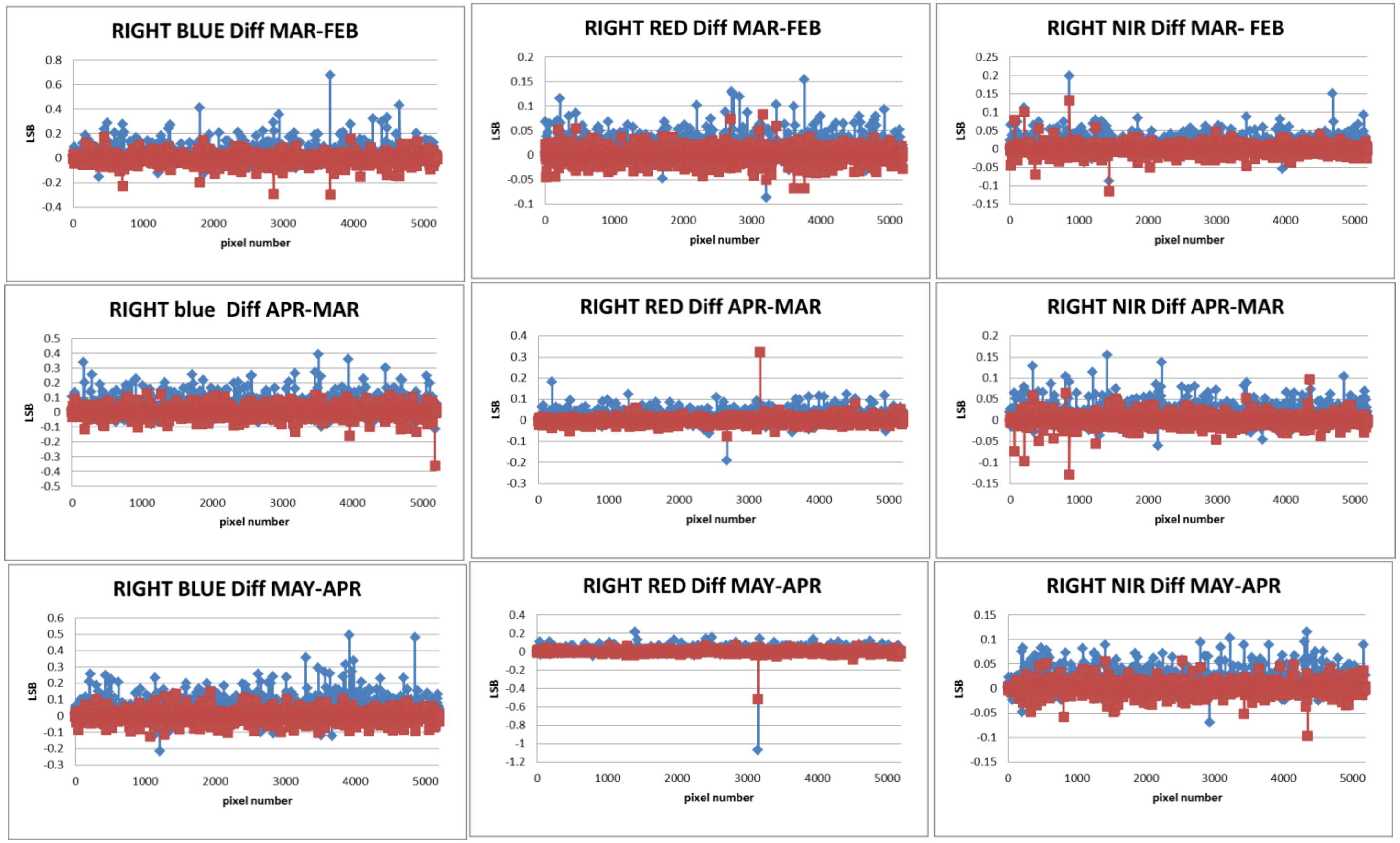


Figure 15. RIGHT camera VNIR: Monthly difference (Feb to May 2017) in dark current (Blue) and standard deviation (Red) of the monthly averaged results.

1.3.3. SWIR results

Monthly difference plots for SWIR dark currents are given in Figure 16 ,Figure 17 and Figure 18 for respectively LEFT, CENTER and RIGHT camera.

A dark current outlier analysis is performed for pixels having for at least one month a dark current expressed in LSB larger than the DC THRESHOLD. This DC THRESHOLD is set to 4 LSB. For those pixels the following dark current pixel statuses are given :

- Both monthly differences > 4 LSB ? **Quality is "H DC BAD"**
- One monthly difference > 4 LSB ? **Quality is "H DC NOK"**.
- Both monthly differences < 4 LSB ? **Quality is "H DC OK"**

In Table 3,Table 4 and Table 5 the resulting SWIR dark current status during the last 3 months is reported for respectively LEFT, CENTER and RIGHT camera.

Similarly as in previous reporting periods jumps in the dark current values of a few SWIR pixels is observed, requiring regular updates of ICP dark current values.

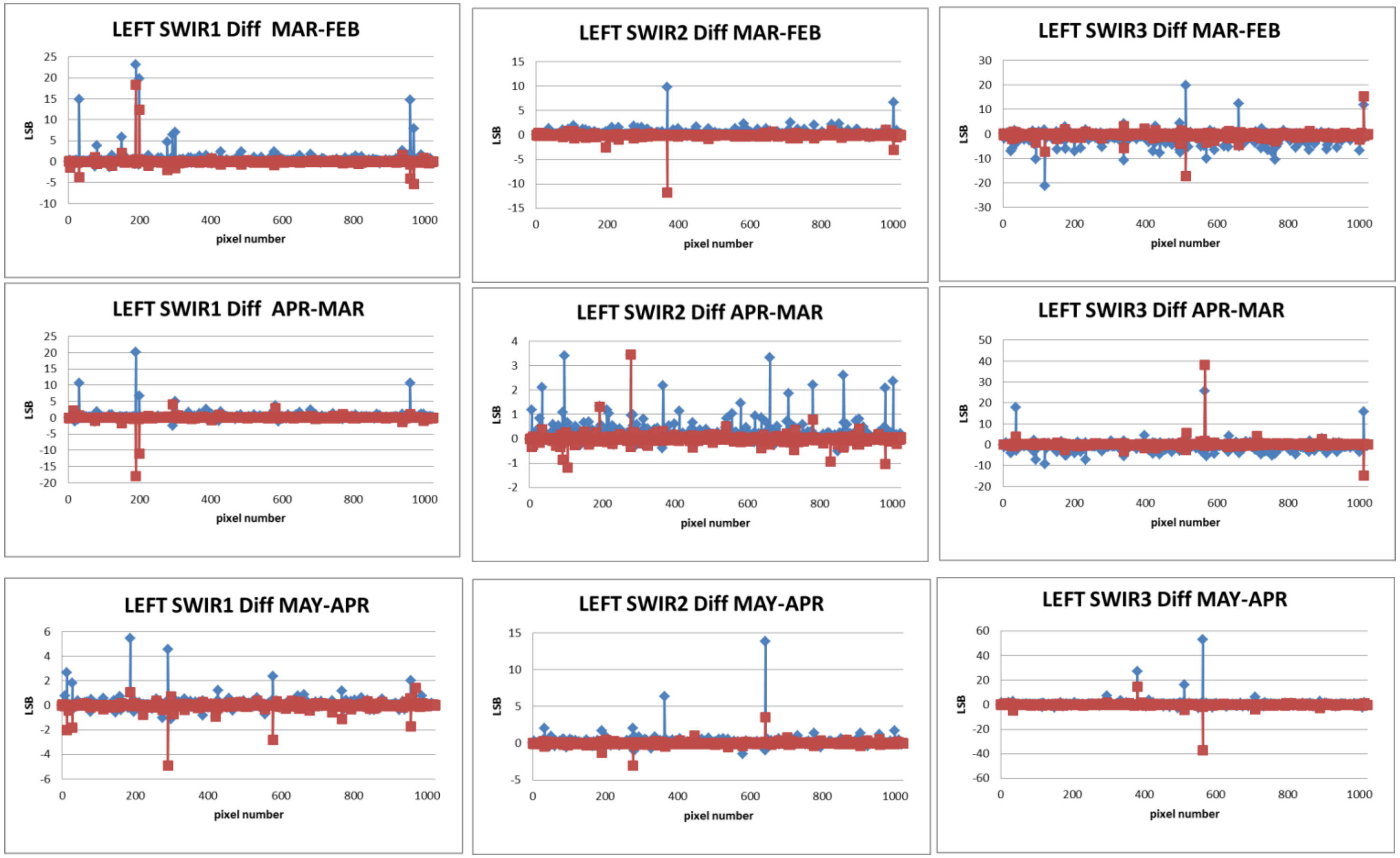


Figure 16. LEFT camera SWIR: Monthly difference (Feb to May 2017) in dark current (Blue) and standard deviation (Red) of the monthly averaged results.

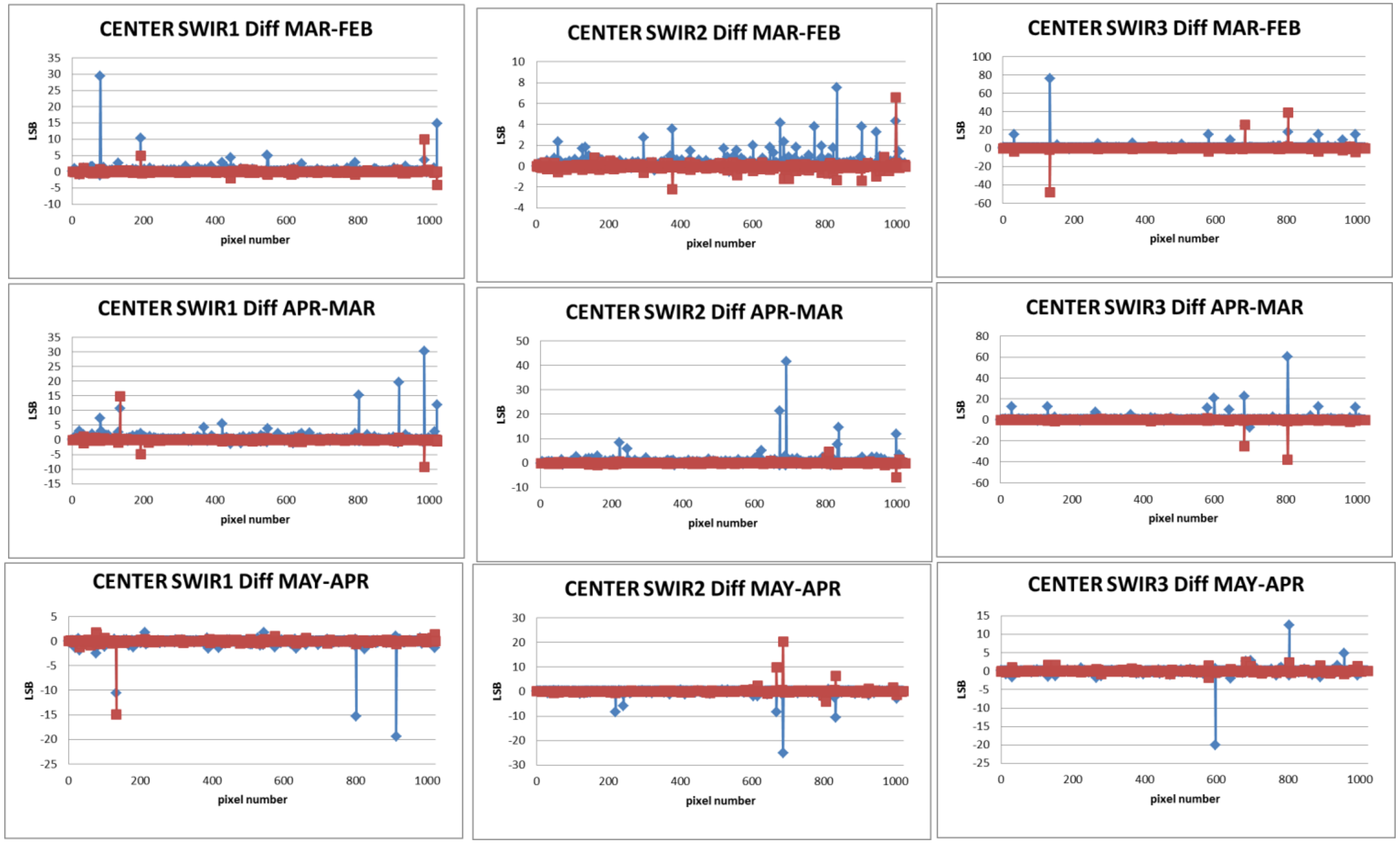


Figure 17. CENTER camera SWIR: Monthly difference (Feb to May 2017) in dark current (Blue) and standard deviation (Red) of the monthly averaged results.

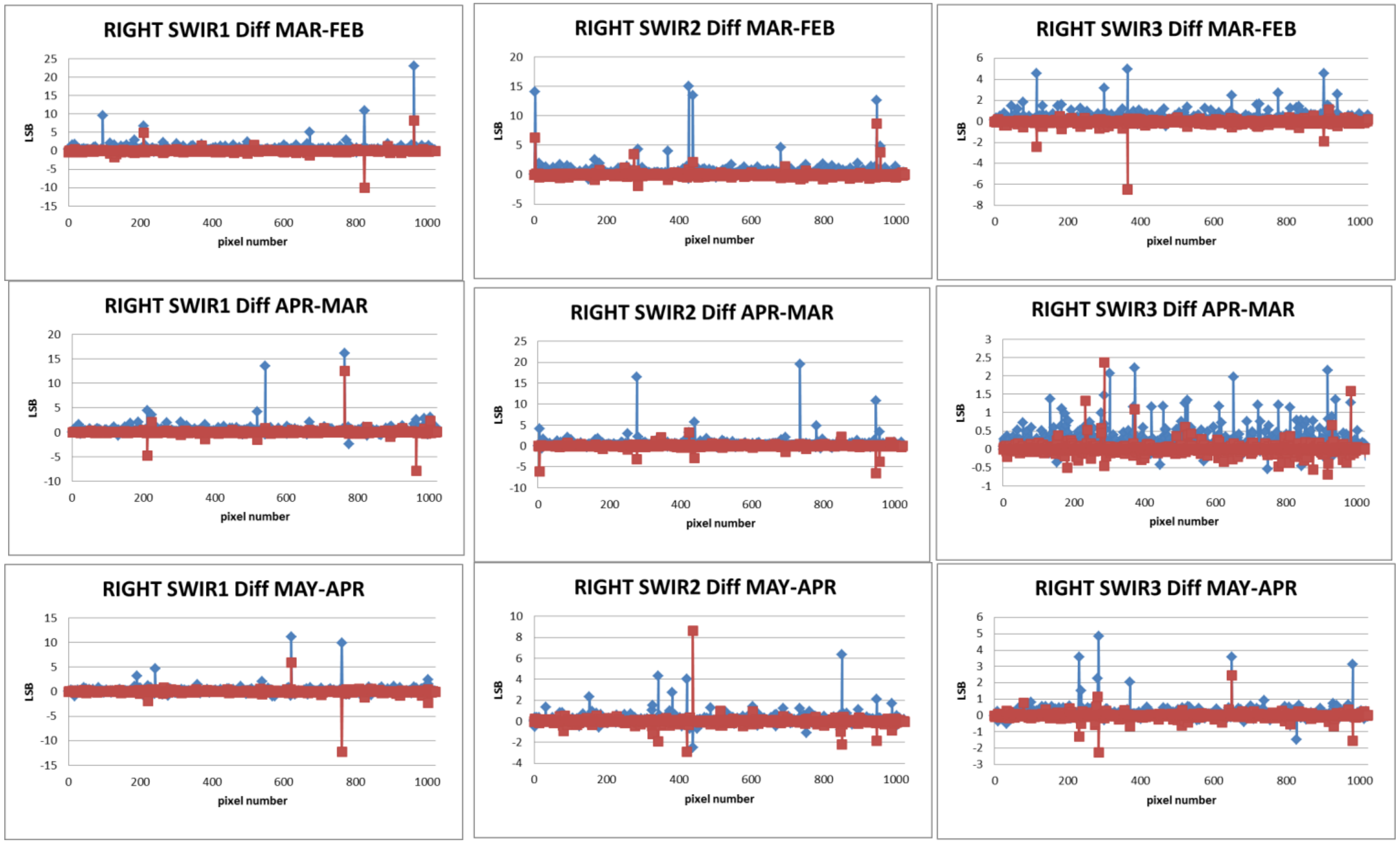


Figure 18. RIGHT camera SWIR: Monthly difference (Feb to May 2017) in dark current (Blue) and standard deviation (Red) of the monthly averaged results.

LEFT																	
Jan-Feb-Mar						Feb-Mar-Apr						Mar-Apr-Jun					
SWIR1		SWIR2		SWIR3		SWIR1		SWIR2		SWIR3		SWIR1		SWIR2		SWIR3	
28	H DC BAD	366	H DC NOK	115	H DC BAD	28	H DC BAD	366	H DC NOK	20	H DC BAD	187	H DC BAD	364	H DC NOK	564	H DC BAD
956	H DC BAD	194	H DC NOK	493	H DC BAD	187	H DC BAD	1000	H DC NOK	90	H DC BAD	28	H DC NOK	643	H DC NOK	20	H DC NOK
966	H DC BAD	1000	H DC NOK	510	H DC BAD	197	H DC BAD	211pixels	H DC OK	115	H DC BAD	197	H DC NOK	217pixels	H DC OK	34	H DC NOK
3	H DC NOK	196pixels	H DC OK	761	H DC BAD	298	H DC BAD			173	H DC BAD	290	H DC NOK			90	H DC NOK
147	H DC NOK			20	H DC NOK	956	H DC BAD			198	H DC BAD	298	H DC NOK			115	H DC NOK
158	H DC NOK			23	H DC NOK	147	H DC NOK			336	H DC BAD	956	H DC NOK			173	H DC NOK
187	H DC NOK			85	H DC NOK	275	H DC NOK			419	H DC BAD	146pixels	H DC OK			177	H DC NOK
197	H DC NOK			90	H DC NOK	290	H DC NOK			438	H DC BAD					198	H DC NOK
222	H DC NOK			150	H DC NOK	966	H DC NOK			568	H DC BAD					230	H DC NOK
275	H DC NOK			164	H DC NOK	137pixels	H DC OK			591	H DC BAD					297	H DC NOK
290	H DC NOK			173	H DC NOK					660	H DC BAD					336	H DC NOK
298	H DC NOK			188	H DC NOK					721	H DC BAD					381	H DC NOK
637	H DC NOK			198	H DC NOK					753	H DC BAD					395	H DC NOK
803	H DC NOK			216	H DC NOK					761	H DC BAD					419	H DC NOK
126pixels	H DC OK			250	H DC NOK					818	H DC BAD					438	H DC NOK
				276	H DC NOK					906	H DC BAD					512	H DC NOK
				312	H DC NOK					1009	H DC BAD					568	H DC NOK
				336	H DC NOK					23	H DC NOK					591	H DC NOK
				337	H DC NOK					34	H DC NOK					660	H DC NOK
				419	H DC NOK					85	H DC NOK					710	H DC NOK
				438	H DC NOK					150	H DC NOK					721	H DC NOK
				471	H DC NOK					177	H DC NOK					753	H DC NOK
				475	H DC NOK					216	H DC NOK					761	H DC NOK
				494	H DC NOK					230	H DC NOK					818	H DC NOK
				495	H DC NOK					276	H DC NOK					906	H DC NOK
				518	H DC NOK					337	H DC NOK					1009	H DC NOK
				552	H DC NOK					395	H DC NOK					642pixels	H DC OK
				553	H DC NOK					471	H DC NOK						
				554	H DC NOK					475	H DC NOK						
				561	H DC NOK					493	H DC NOK						
				568	H DC NOK					494	H DC NOK						
				591	H DC NOK					495	H DC NOK						
				617	H DC NOK					510	H DC NOK						
				630	H DC NOK					518	H DC NOK						
				645	H DC NOK					553	H DC NOK						
				658	H DC NOK					561	H DC NOK						
				660	H DC NOK					564	H DC NOK						
				721	H DC NOK					617	H DC NOK						
				734	H DC NOK					630	H DC NOK						
				740	H DC NOK					658	H DC NOK						
				753	H DC NOK					734	H DC NOK						
				764	H DC NOK					740	H DC NOK						
				769	H DC NOK					764	H DC NOK						
				818	H DC NOK					769	H DC NOK						
				856	H DC NOK					856	H DC NOK						
				871	H DC NOK					871	H DC NOK						
				906	H DC NOK					907	H DC NOK						
				907	H DC NOK					935	H DC NOK						
				935	H DC NOK					998	H DC NOK						
				972	H DC NOK					670pixels	H DC OK						
				998	H DC NOK												
				1009	H DC NOK												
				689pixels	H DC OK												

Table 3. LEFT SWIR dark current pixel outliers (ID L1A).

CENTER																	
JAN-FEB-MAR						FEB-MAR-APR						MAR-APR-MAY					
SWIR1		SWIR2		SWIR3		SWIR1		SWIR2		SWIR3		SWIR1		SWIR2		SWIR3	
1021	H DC BAD	831	H DC BAD	30	H DC BAD	77	H DC BAD	831	H DC BAD	30	H DC BAD	133	H DC BAD	220	H DC BAD	598	H DC BAD
77	H DC NOK	674	H DC NOK	131	H DC BAD	1021	H DC BAD	995	H DC BAD	131	H DC BAD	802	H DC BAD	242	H DC BAD	804	H DC BAD
190	H DC NOK	812	H DC NOK	579	H DC BAD	190	H DC NOK	669	H DC NOK	266	H DC BAD	914	H DC BAD	669	H DC BAD	30	H DC NOK
419	H DC NOK	995	H DC NOK	890	H DC BAD	367	H DC NOK	674	H DC NOK	364	H DC BAD	77	H DC NOK	687	H DC BAD	131	H DC NOK
443	H DC NOK	175pixels	H DC OK	994	H DC BAD	419	H DC NOK	687	H DC NOK	579	H DC BAD	367	H DC NOK	834	H DC BAD	266	H DC NOK
545	H DC NOK			364	H DC NOK	443	H DC NOK	182pixels	H DC OK	640	H DC BAD	419	H DC NOK	617	H DC OK	364	H DC NOK
547	H DC NOK			503	H DC NOK	545	H DC NOK			682	H DC BAD	985	H DC NOK	831	H DC OK	579	H DC NOK
686	H DC NOK			640	H DC NOK	547	H DC NOK			804	H DC BAD	1021	H DC NOK	995	H DC OK	640	H DC NOK
144pixels	H DC OK			682	H DC NOK	985	H DC NOK			890	H DC BAD	158pixels	H DC OK	186pixels	H DC OK	682	H DC NOK
				804	H DC NOK	150pixels	H DC OK			957	H DC BAD					697	H DC NOK
				868	H DC NOK					994	H DC BAD					890	H DC NOK
				957	H DC NOK					503	H DC NOK					957	H DC NOK
				97pixels	H DC OK					697	H DC NOK					994	H DC NOK
										868	H DC NOK					102pixels	H DC OK
										99pixels	H DC OK						

Table 4. CENTER SWIR dark current pixel outliers (ID L1A)

RIGHT																	
JAN-FEB-MAR						FEB-MAR-APR						MAR-APR-MAY					
825	H DC BAD	438	H DC BAD	364	H DC BAD	209	H DC BAD	3	H DC BAD	115	H DC BAD	762	H DC BAD	3	H DC NOK	285	H DC NOK
95	H DC NOK	3	H DC NOK	115	H DC NOK	95	H DC NOK	438	H DC BAD	364	H DC NOK	209	H DC NOK	276	H DC NOK	218 pixels	H DC OK
209	H DC NOK	287	H DC NOK	418	H DC NOK	517	H DC NOK	946	H DC BAD	902	H DC NOK	241	H DC NOK	343	H DC NOK		
601	H DC NOK	369	H DC NOK	514	H DC NOK	540	H DC NOK	276	H DC NOK	207 pixels	H DC OK	517	H DC NOK	422	H DC NOK		
673	H DC NOK	427	H DC NOK	902	H DC NOK	673	H DC NOK	287	H DC NOK			540	H DC NOK	438	H DC NOK		
963	H DC NOK	681	H DC NOK	940	H DC NOK	762	H DC NOK	369	H DC NOK			621	H DC NOK	733	H DC NOK		
238 pixels	H DC OK	946	H DC NOK	192 pixels	H DC OK	825	H DC NOK	427	H DC NOK			271pixels	H DC OK	779	H DC NOK		
		956	H DC NOK			963	H DC NOK	681	H DC NOK					850	H DC NOK		
		167 pixels	H DC OK			257pixels	H DC OK	733	H DC NOK					946	H DC NOK		
								779	H DC NOK					166 pixels	H DC OK		
								956	H DC NOK								
								164 pixels	H DC OK								

Table 5. RIGHT SWIR dark current pixel outliers (ID L1A)

1.4. Bad pixels

1 new bad pixel is found in this reporting period.

Reporting period Mid-March - Mid-June 2017														
CAMERA	STRIP	pixel numbers (ID L1 A)												
		NEW BAD	BAD (from previous periods)											
left	swir1		28	298	352	644	956							
left	swir2		711	863										
left	swir3		90	172	250	419	438	568	759	761				
center	swir1		1021											
center	swir2		57	295	769	831	900							
center	swir3	804	29	30	131	476	579	640	763	889	890	917	938	994
right	swir1													
right	swir2		14	438	470									
right	swir3													

Table 6: Overview Bad pixels

1.5. Radiometric ICP file

The updates to the radiometric ICP file used within the user segment for the processing of the nominal PROBA-V data by PF are listed in the Table 7 and Table 8 for respectively collection 0 and collection 1.

ICP filename	Description
PROBAV_X_R_000_20140116_01.xml	Update of offset and NL values provided by OIP at end of the commissioning phase
PROBAV_X_R_000_20140215_01.xml	Update of VNIR and SWIR dark currents
PROBAV_X_R_000_20140219_01.xml	Update of SWIR equalizations
PROBAV_X_R_000_20140322_01.xml	Update of VNIR and SWIR dark currents , SWIR status map update : one bad pixel added
PROBAV_X_R_000_20140419_01.xml	Update of VNIR and SWIR dark currents , SWIR status map update : five bad pixel added
PROBAV_X_R_000_20140529_01.xml	Update of VNIR and SWIR dark currents , Update of SWIR equalizations
PROBAV_X_R_000_20140626_01.xml	Update of VNIR and SWIR dark currents ,update of absolute blue **CENTER and RIGHT**
PROBAV_X_R_000_20140718_01.xml	Update of VNIR and SWIR dark currents , Update of SWIR equalizations
PROBAV_X_R_000_20140826_01.xml	Update of VNIR and SWIR dark currents , Update of SWIR equalizations, SWIR status map update : two bad pixels added
PROBAV_X_R_000_20140923_01.xml	Update of absolute calibration coefficient **BLUE LEFT, NIR LEFT, RED CENTER**, Update of VNIR and SWIR dark currents, Update of SWIR equalizations, SWIR status map updated: one bad pixel added.
PROBAV_X_R_000_20141025_01.xml	Update of absolute calibration coefficient **NIR RIGHT.** Update of VNIR and SWIR dark currents , Update of SWIR equalizations, SWIR status map updated : one bad pixel added.
PROBAV_X_R_000_20141108_01.xml	Update of SWIR equalizations, SWIR status map updated : three bad pixels added.
PROBAV_X_R_000_20141129_01.xml	Update of VNIR and SWIR dark currents , Update of SWIR equalizations.

PROBAV_X_R_000_20141220_01.xml	Update of VNIR and SWIR dark currents (using for SWIR DC acquisitions with IT of 3 s) , Update of SWIR equalizations.
PROBAV_X_R_000_20141220_02.xml*	Update of SWIR dark currents (using DC acquisitions with IT **of 0.6s**). Update SWIR equalization coefficients.
PROBAV_X_R_000_20141220_03.xml**	Update of SWIR dark currents (using DC acquisitions with IT **of 0.2s**). Update of absolute calibration coefficient of **RIGHT SWIR3**. SWIR status map updated : four bad pixels added. Update SWIR equalization coefficients.
PROBAV_X_R_000_20150311_01.xml	Update of SWIR dark currents (using DC acquisitions with IT of 0.2s)
PROBAV_X_R_000_20150409_01.xml	Update of SWIR dark currents (using DC acquisitions with IT of 0.2s)
PROBAV_X_R_000_20150422_01.xml	Update of SWIR dark currents (using DC acquisitions with IT of 0.2s)
PROBAV_X_R_000_20150527_01.xml	Update of SWIR dark currents (using DC acquisitions with IT of 0.2s)
PROBAV_X_R_000_20150630_01.xml	Update of VNIR and SWIR dark currents
PROBAV_X_R_000_20150724_01.xml	Update of SWIR dark currents
PROBAV_X_R_000_20150826_01.xml	Update of SWIR dark currents. Update of absolute calibration parameter of **RIGHT SWIR2** strip.
PROBAV_X_R_000_20150926_01.xml	Update of SWIR dark currents, **and absolute calibration coefficients SWIR strips** (except Right SWIR3)

PROBAV_X_R_000_20151031_01.xml	Update of SWIR dark currents
PROBAV_X_R_000_20151119_01.xml	Update of SWIR dark currents SWIR status map updated : 1 bad pixel added.
PROBAV_X_R_000_20151218_01.xml	Update of SWIR dark currents SWIR status map updated : 1 bad pixel added.
PROBAV_X_R_000_20160122_01.xml	Update of SWIR dark currents
PROBAV_X_R_000_20160206_01.xml	Update of SWIR dark currents Update of absolute calibration coefficient of **SWIR:** • LEFT SWIR1 : increase radiance with 0.84 % • LEFT SWIR2 : increase radiance with 1.04 % • LEFT SWIR3 : increase radiance with 1.83 % • CENTER SWIR1: increase radiance with 1.19% • CENTER SWIR2: increase radiance with 1.29% • CENTER SWIR3: increase radiance with 1.16% • RIGHT SWIR1 : increase radiance with 1.28 % • RIGHT SWIR2: increase radiance with 0.78 % • RIGHT SWIR3: increase radiance with 0.90 %
PROBAV_X_R_000_20160225_01.xml	Update dark currents
PROBAV_X_R_000_20160319_01.xml	Update dark currents SWIR status map updated : 1 bad pixel added
PROBAV_X_R_000_20160423_01.xml	Update dark currents SWIR status map updated : 2 bad pixels added

PROBAV_X_R_000_20160521_01.xml	Update dark currents Update of SWIR absolute following linear degradation model *** Correction for 0-based versus 1-based pixel numbering error in previous status map update: Left SWIR3 pixel 568 and Center SWIR2 pixel 831 correctly added
PROBAV_X_R_000_20160622_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20160719_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20160823_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20160927_01.xml	Update dark currents Update of SWIR absolute following linear degradation model*** One bad pixel added
PROBAV_X_R_000_20161201_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***

* created on January 23 with a validity date in the past, ** created on February 13 with a validity date in the past, *** Applied Linear trend (in%)/month : SWIR1 LEFT: -0.087;SWIR2 LEFT:-0.104;SWIR3 LEFT:-0.097;SWIR1 CENTER:-0.093;SWIR2 CENTER:-0.092;SWIR3 CENTER:-0.086;SWIR1 RIGHT:-0.106;SWIR2 RIGHT:-0.143;SWIR3 RIGHT:-0.122.

Table 7: Radiometric ICP-file updates Collection 0

PROBAV_X_R_000_YEARMN01_**101**.xml*	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20161201_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20161201_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20161201_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20161201_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20170101_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20170120_01.xml	SWIR status map updated : 1 bad pixel added
PROBAV_X_R_000_20170201_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***
PROBAV_X_R_000_20170220_01.xml	SWIR status map updated : 1 bad pixel added
PROBAV_X_R_000_20170301_01.xml	Update dark currents Update of SWIR absolute following linear degradation model***

PROBAV_X_R_000_20170401_01.xml	Update dark currents Update of SWIR absolute following linear degradation model*** SWIR status map updated : 1 bad pixel added
PROBAV_X_R_000_2017051_01.xml	Update dark currents Update of SWIR absolute following linear degradation model*** Update of LEFT BLUE and CENTER BLUE absolute calibration coefficients following linear degradation model****
PROBAV_X_R_000_20170601_01.xml	Update dark currents Update of SWIR absolute following linear degradation model*** Update of LEFT BLUE and CENTER BLUE absolute calibration coefficients following linear degradation model****

* YEAR :2013-2016; MN:01-12; *** Applied Linear trend (in%)/month : SWIR1 LEFT: -0.087;SWIR2 LEFT:-0.104;SWIR3 LEFT:-0.097;SWIR1 CENTER:-0.093;SWIR2 CENTER:-0.092;SWIR3 CENTER:-0.086;SWIR1 RIGHT:-0.106;SWIR2 RIGHT:-0.143;SWIR3 RIGHT:-0.122. ***** Applied linear trend (in%)/month: BLUE LEFT: -0.028, BLUE CENTER: -0.011

Table 8: Radiometric ICP-file updates Collection 1

2. Geometric Image Quality

2.1. Summary

The quarterly average location error over the period 16/03/2017 – 15/06/2017 was 69 m (1σ = 82 m) for all spectral bands (combined cameras). Compared to previous reporting period this is a 11% decrease of the ALE. This decrease was uniformly observed over all spectral bands.

The total number of chips per day and per spectral band used for the geometric accuracy analysis increased by 29% on average compared to the previous reporting period.

The daily average location error compliance (ALE < 300m) was at the level of 99.17%, which is slightly better (by <0.1%) than in the previous reporting period.

The geometric ICP file generated on 8/9/2016, valid from 1/9/2016 is still valid.

2.2. Assessment of the geometric accuracy on L1C data

The absolute location error (ALE) and accompanying standard deviation of the Level1C data is presented in the table below for each camera, spectral band/strip and reporting month.

CAMERA 1 Mean ALE (m)			
Strip\Period	16/12/2016 - 15/01/2017	16/01/2017 - 15/02/2017	16/02/2017 - 15/03/2017
BLUE	66.64, std = 39.33	76.08, std = 45.34	87.31, std = 43.01
RED	67.28, std = 39.77	77.77, std = 46.98	87.92, std = 44.07
NIR	68.26, std = 42.55	77.68, std = 49.12	86.08, std = 47.75
SWIR1	89.75, std = 54.63	99.80, std = 60.70	102.69, std = 59.60
SWIR2	68.93, std = 38.90	74.66, std = 43.35	78.35, std = 40.32
SWIR3	65.57, std = 38.22	72.61, std = 42.89	78.09, std = 39.24

Table 9: Mean absolute location error for camera 1.

CAMERA 2 Mean ALE (m)			
Strip\Period	16/12/2016 - 15/01/2017	16/01/2017 - 15/02/2017	16/02/2017 - 15/03/2017
BLUE	60.90, std = 36.10	72.66, std = 44.17	83.12, std = 39.65
RED	59.18, std = 35.08	71.88, std = 43.16	79.30, std = 38.16
NIR	59.72, std = 36.99	70.26, std = 45.74	77.03, std = 42.72
SWIR1	63.43, std = 38.85	71.54, std = 45.17	71.13, std = 41.66
SWIR2	64.89, std = 41.20	76.11, std = 49.11	78.60, std = 43.66
SWIR3	68.30, std = 42.98	81.43, std = 52.88	85.03, std = 45.84

Table 10: Mean absolute location error for camera 2.

CAMERA 3 Mean ALE (m)			
Strip\Period	16/12/2016 - 15/01/2017	16/01/2017 - 15/02/2017	16/02/2017 - 15/03/2017
BLUE	78.55, std = 42.71	75.55, std = 42.80	57.61, std = 33.66
RED	83.61, std = 45.09	79.06, std = 44.31	58.40, std = 34.14
NIR	81.24, std = 44.28	81.74, std = 46.44	62.59, std = 37.98
SWIR1	77.23, std = 43.76	78.45, std = 45.01	60.87, std = 36.84
SWIR2	84.05, std = 46.03	84.98, std = 48.30	66.91, std = 40.51
SWIR3	105.73, std = 58.77	109.06, std = 63.20	86.43, std = 54.59

Table 11: Mean absolute location error for camera 3.

2.3. Assessment of the geometric accuracy on L2 data

2.3.1. Absolute geometric accuracy

The daily summary of the L2 data absolute location error for all spectral bands is presented in the tables and figures below for the three reporting months:

- from 16/03/2017 to 15/04/2017
- from 16/04/2017 to 15/05/2017
- from 16/05/2017 to 15/06/2017

The tables list:

- The day of the measurement in format dd-mm-yy
- The daily achieved compliance (%B) for the BLUE band (% of GCP where ALE<=300m)
- The daily achieved compliance (%R) for the RED band (% of GCP where ALE<=300m)
- The daily achieved compliance (%N) for the NIR band (% of GCP where ALE<=300m)
- The daily achieved compliance (%S) for the SWIR band (% of GCP where ALE<=450m)

- The number of GCP per day (NB-B) used to derive the absolute location error ALE for the BLUE band
- The daily average ALE (in m) for the BLUE band (MU-B)
- The daily ALE standard deviation (in m) for the BLUE band (STD-B)

- The number of GCP per day (NB-R) used to derive the absolute location error ALE for the RED band
- The daily average ALE (in m) for the RED band (MU-R)
- The daily ALE standard deviation (in m) for the RED band (STD-R)

- The number of GCP per day (NB-N) used to derive the absolute location error ALE for the NIR band
- The daily average ALE (in m) for the NIR band (MU-N)
- The daily ALE standard deviation (in m) for the NIR band (STD-N)

- The number of GCP per day (NB-S) used to derive the absolute location error ALE for the SWIR band
- The daily average ALE (in m) for the SWIR band (MU-S)
- The daily ALE standard deviation (in m) for the SWIR band (STD-S)

Day	%B	%R	%N	%S	NB-B	MU-B	STD-B	NB-R	MU-R	STD-R	NB-N	MU-N	STD-N	NB-S	MU-S	STD-S
16-03-17	99.03	99.48	99.46	99.73	32197	64.77	85.02	37569	59.18	70.44	30732	58.65	64.44	31318	61.22	70.95
17-03-17	98.9	99.24	99.23	99.72	27182	65.13	94.22	31332	59.74	77.09	27385	61.3	74.39	27969	61.8	75.76
18-03-17	98.74	99.32	99.3	99.67	26558	70.1	105.53	29256	61.6	73.15	28558	60.45	70.25	28773	62.62	82.64
19-03-17	99.02	99.44	99.41	99.74	27346	65.85	90.31	31397	59.03	69.16	28581	60.01	79.22	28383	62.52	74.66
20-03-17	98.97	99.26	99.31	99.69	21695	65.22	81.7	25301	60.43	80.03	21512	59.25	80.82	21300	65.04	83.55
21-03-17	98.72	99.33	99.13	99.68	24640	71.87	82.63	29265	66.46	71.88	24023	68.17	82.8	24406	70.51	84.84
22-03-17	98.36	98.92	98.85	99.69	25510	82.52	88.99	28181	78.49	75.37	26022	77.08	82.54	25955	78.14	87.52
23-03-17	98.63	98.98	99.12	99.68	30282	81.18	101.77	32098	76.2	76.51	30670	73.05	79.82	29743	77.25	82.08
24-03-17	98.18	98.22	98.39	99.69	25919	97.95	104	28176	96.45	93.32	26885	91.9	84.46	26370	89.97	88.39
25-03-17	98.87	99.14	99.11	99.71	27237	77.81	96.23	31132	73.22	73.51	27098	73.84	84.21	26301	75.19	84.24
26-03-17	98.46	98.86	98.55	99.57	15763	82.77	103.21	18319	77.41	90.61	15440	78.2	96.24	15231	80.59	96.43
27-03-17	98.83	99.14	99.16	99.72	28257	70.48	88.73	30990	66.66	75.77	30089	66.41	83.41	29968	68.15	78.6
28-03-17	98.99	99.32	99.39	99.78	34573	67.22	83.75	39134	62.12	77.66	37461	60.95	69.09	38089	64.16	70.12
29-03-17	99.07	99.32	99.37	99.79	35113	66.56	92.5	39448	62.19	76.27	37758	61.38	70.42	37709	62.34	75.71
30-03-17	98.92	99.38	99.41	99.7	34299	67.4	90.41	39787	62.71	71.27	36845	63.78	74.02	36110	66.78	79.46
31-03-17	98.67	99.31	99.28	99.68	35226	67.84	96.28	40282	61.91	79	39955	61.84	79.36	39688	65.39	85.86
01-04-17	98.68	99.16	99.14	99.67	42477	77.16	93.92	46445	73.37	79.36	40934	70.29	75.08	40546	73.02	86.57
02-04-17	98.52	98.65	98.74	99.76	37319	90.58	90.69	39740	89.23	85.43	38804	84.66	82.84	38805	82.29	78.53
03-04-17	98.69	98.87	98.79	99.64	37693	95.66	89.89	41097	93.24	81.41	39729	90.21	85.74	40781	87.95	91.33
04-04-17	98.36	98.67	98.74	99.66	34501	94.2	97.6	38236	92.42	88.35	38218	86.82	88.37	38110	86.27	86.2
05-04-17	98.49	98.74	98.69	99.61	43778	90.14	98.4	39533	89.53	86.88	37652	85.75	88.63	37076	85.18	88.33
06-04-17	98.74	98.99	98.98	99.73	32336	78.23	90.85	36390	75.12	87.6	34225	72.9	83.5	33505	73.79	75.69
07-04-17	99.03	99.4	99.38	99.75	30370	66.07	89.58	35065	58.97	67.48	34161	58	73.75	33372	61.24	72.77
08-04-17	99.13	99.4	99.35	99.73	31966	59.77	84.98	38473	55.42	71.78	34897	56.89	79.92	36370	60.64	79.78
09-04-17	98.75	99.39	99.36	99.7	32006	65.07	98.4	37383	58.13	76.31	36098	60.27	80.04	37494	63.21	78.87
10-04-17	98.97	99.44	99.36	99.69	37142	62.77	90.93	41900	56.77	69.81	38118	58.45	73.68	40736	61.87	81.79
11-04-17	98.84	99.22	99.33	99.72	38861	63.4	94.71	45149	56.78	77.27	40236	56.74	77.15	42442	58.98	74.22
12-04-17	99.1	99.37	99.32	99.74	30957	60.34	86.08	35782	55.69	72.82	34425	54.53	70.48	36768	56.86	74.82
13-04-17	98.68	99.18	99.14	99.66	35230	66.16	96.94	40949	61.22	83.01	39688	59.42	78.5	40176	62.39	78.02
14-04-17	98.58	99.12	99.14	99.64	35787	67.96	87.44	37995	63.57	84.48	38035	61.06	83.15	36403	63.65	84.15
15-04-17	98.63	98.85	99.02	99.66	37499	69.98	94.64	39960	67.24	86.45	37584	64.81	79.91	37046	66.61	85.23
Averages	**98.76**	**99.13**	**99.13**	**99.70**	**31926**	**73.30**	**92.59**	**35770**	**68.73**	**78.37**	**33284**	**67.65**	**79.23**	**33450**	**69.54**	**81.20**

Table 12: Daily achieved compliance and the daily average location error (in m) for all spectral bands in the period 16/03/2017 to 15/04/2017.

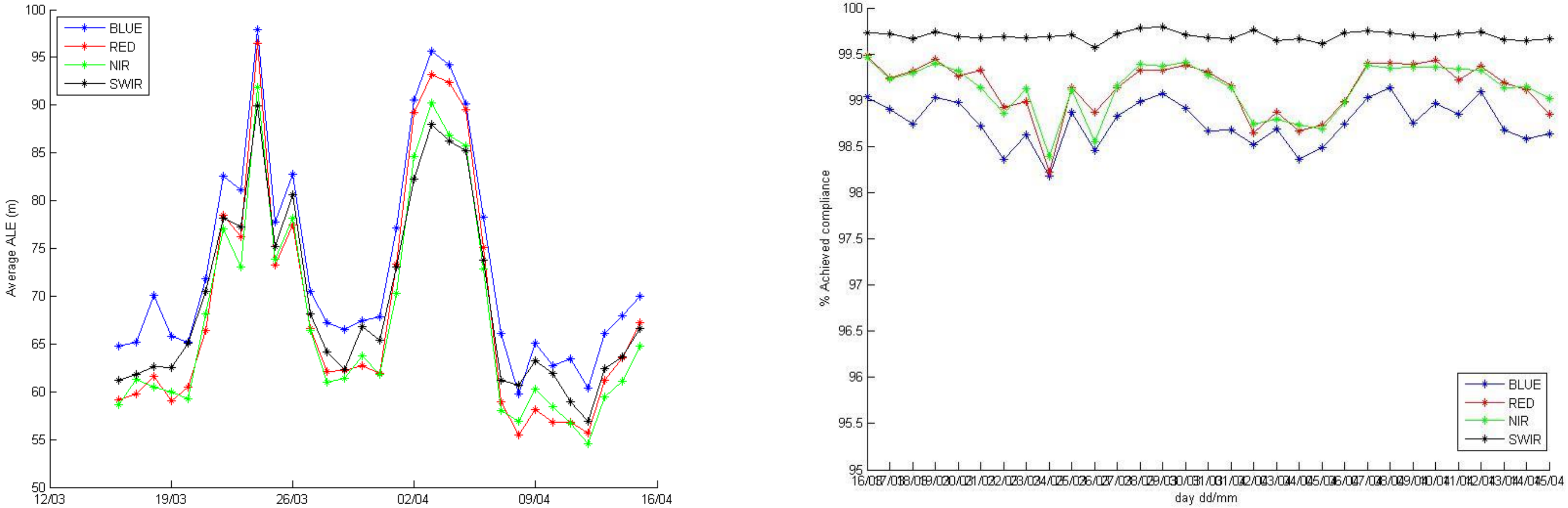


Figure 19: Daily average location error in the period from 16/03/2017 – 15/04/2017 (left) and the average daily compliance of the spectral bands (right).

Day	%B	%R	%N	%S	NB-B	MU-B	STD-B	NB-R	MU-R	STD-R	NB-N	MU-N	STD-N	NB-S	MU-S	STD-S
16-04-17	98.9	98.89	98.94	99.66	32544	68.65	91.14	37734	67.46	83.53	36679	65	76.91	35706	66.35	85.01
17-04-17	98.86	99.01	99.07	99.68	31334	71.08	93.73	35986	69.15	85.39	35137	66.82	85.46	35429	69.24	83.27
18-04-17	98.68	98.79	98.64	99.62	37541	79.21	91.07	38038	80.37	84.76	37399	78.01	86.59	36352	77.13	87.55
19-04-17	97.95	97.85	97.83	99.58	37558	93.54	99.39	39055	93.6	91.83	38216	90.26	92.27	35325	88.41	94.93
20-04-17	98.62	98.62	98.42	99.66	39333	87.28	92.88	41399	87.11	85.44	39442	83.75	89.41	39430	82.72	84.54
21-04-17	98.71	98.88	98.75	99.69	43916	84.06	92.01	47980	81.59	77.54	44175	81.3	81.47	44773	80.52	79.98
22-04-17	98.88	99.12	99.08	99.69	45659	73.41	95.42	48107	71.02	85.49	40395	69.41	81.64	40381	72.1	83.15
23-04-17	98.47	98.9	99	99.6	33359	77.84	100.95	35368	75.47	90.41	35239	73.08	93.03	34368	73.37	90.45
24-04-17	98.81	99.16	99.27	99.64	33921	70.41	92.32	38659	66.96	87.16	37712	64.38	80.91	37276	68.03	88.87
25-04-17	98.78	99.09	99.21	99.68	34397	70.49	91.99	40714	66.2	78.14	38049	63.81	83.29	38357	65.72	82.86
26-04-17	98.67	99.03	99.06	99.69	35833	74.48	94.01	41789	69.17	81.33	39620	67.93	81.38	41596	68.57	89.22
27-04-17	98.51	99.1	99.08	99.71	35063	72.55	100.36	41440	65.55	80.87	39311	65.55	80.93	41918	64.82	82.01
28-04-17	98.75	99.29	99.3	99.68	38753	70.57	94.01	45065	63.93	85.95	38449	63.84	78.65	39854	65.75	79.33
29-04-17	98.98	99.36	99.32	99.78	32534	64.84	90.9	38159	57.79	66.4	33734	58.64	65.86	37045	60.95	72.36
30-04-17	98.98	99.35	99.32	99.74	31650	67.58	88.04	38091	61	72.5	34615	60.29	76.9	38745	61.54	76.85
01-05-17	98.86	99.28	99.22	99.71	32492	69.54	97.13	38057	64.83	76.34	36929	63.29	79.04	37997	66.97	81.06
02-05-17	98.55	98.92	99.02	99.62	28733	76.27	102.69	34236	71.22	86.69	32589	70.75	90.22	33052	72.66	91.52
03-05-17	98.89	99.34	99.26	99.69	38638	73.49	86.77	45668	68.46	80.15	41901	68.79	82.64	45587	69.24	78.19
04-05-17	98.9	99.11	99.08	99.75	39058	76.42	94.77	43955	70.95	76.41	41706	68.61	79.6	45260	67.72	75
05-05-17	98.79	99.03	99.1	99.76	38823	83.16	84	45129	80.89	82.71	44045	76.88	80.06	47398	74.43	76.96
06-05-17	98.38	98.66	98.71	99.67	34346	83.97	96.47	40188	82.02	88.13	40118	77.58	84.75	40788	75.62	83.71
07-05-17	98.9	99.15	99.2	99.68	49436	81.52	95.75	52890	75.84	90.58	44410	72.05	82.75	46239	71.89	83.52
08-05-17	98.65	99.11	99.13	99.73	37145	73.67	95.48	43806	67.97	77.53	40731	65.64	73.27	43466	67.32	73.56
09-05-17	99	99.33	99.22	99.69	37718	66.31	85.14	43688	61.47	70.03	40652	61.2	79.47	42352	64.64	79.54
10-05-17	98.98	99.34	99.29	99.7	36490	64.74	90.29	41941	59.72	80.97	37110	60.36	82.92	37842	62.63	81
11-05-17	98.89	99.23	99.11	99.63	46471	67.45	92.61	49867	61.81	85.36	42052	62.68	81.57	44499	65.56	84.77
12-05-17	98.93	99.31	99.21	99.68	40199	66.67	85.3	47717	61.27	77.37	42376	63.17	80.36	45872	65.47	83.09
13-05-17	99.08	99.41	99.37	99.78	40732	62.74	86.2	46284	57.35	78.78	41641	58.18	80.02	45339	61.28	72.86
14-05-17	99.1	99.51	99.41	99.75	51265	64.43	93.73	50200	59.47	72.56	43675	60.88	75.72	46853	64.88	74.38
15-05-17	99.15	99.49	99.39	99.74	54091	63.34	80.21	58967	57.88	76.1	44795	60.51	75.15	43587	62.93	75.4
Averages	**98.79**	**99.09**	**99.07**	**99.69**	**38301**	**73.33**	**92.50**	**43005.9**	**69.25**	**81.22**	**39430**	**68.09**	**81.41**	**40756**	**69.28**	**81.83**

Table 13: Daily achieved compliance and the daily average location error (in m) for all spectral bands in the period 16/04/2017 – 15/05/2017.

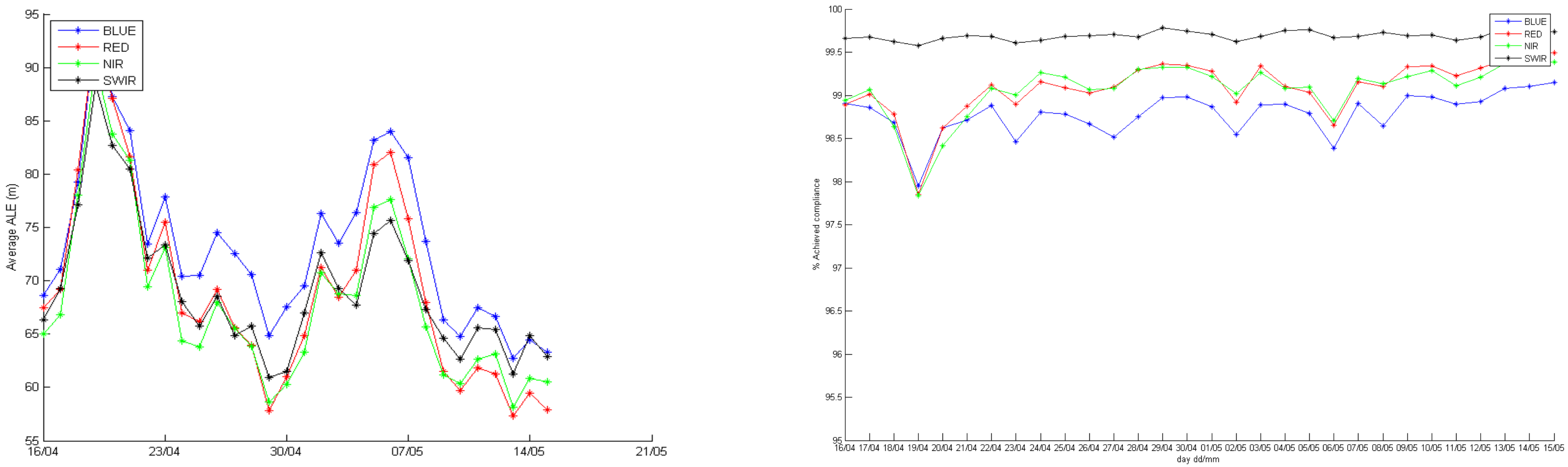
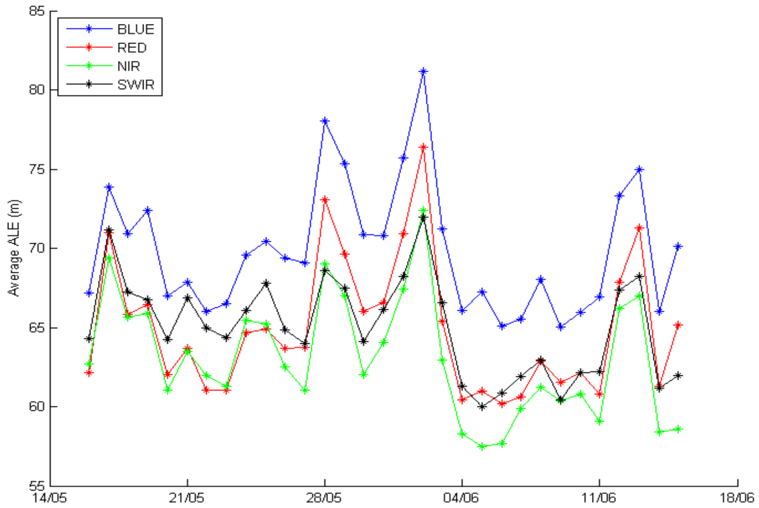


Figure 20: Daily average location error in the period from 16/04/2017 – 15/05/2017 (left) and the average daily compliance of all spectral bands (right).

Day	%B	%R	%N	%S	NB-B	MU-B	STD-B	NB-R	MU-R	STD-R	NB-N	MU-N	STD-N	NB-S	MU-S	STD-S
16-05-17	98.99	99.29	99.26	99.66	40106	67.18	88.31	46865	62.17	75.49	45174	62.72	76.59	46521	64.3	75.31
17-05-17	98.71	98.93	99.04	99.73	37536	73.86	89.59	45046	70.99	80.29	44350	69.38	80.15	46700	71.18	78.1
18-05-17	98.9	99.15	99.14	99.66	39384	70.91	96.75	47157	65.81	73.69	47957	65.66	79.48	49228	67.25	81.89
19-05-17	98.97	99.42	99.21	99.69	42038	72.37	92.16	48912	66.44	72.27	46862	65.88	81.4	45134	66.77	80.47
20-05-17	98.91	99.31	99.37	99.69	39025	67.02	83.06	45265	62.01	81.71	44794	61.07	75.36	45532	64.25	80.14
21-05-17	98.94	99.24	99.19	99.68	41421	67.82	90.42	48774	63.69	82.21	45554	63.5	87.96	47037	66.9	86.93
22-05-17	99.03	99.28	99.27	99.72	43033	66.04	88.87	50845	61.04	76.72	48339	61.94	81.77	52223	64.95	77.79
23-05-17	99.05	99.38	99.41	99.76	41742	66.51	84.34	49685	61.04	75.63	47299	61.28	71.6	51223	64.33	74.55
24-05-17	99.03	99.37	99.36	99.79	40594	69.56	91.55	49039	64.69	76.83	47696	65.44	78.07	51219	66.09	69.74
25-05-17	98.83	99.35	99.31	99.74	47146	70.43	90.77	55504	64.91	72.81	52716	65.2	78.52	55259	67.78	74.22
26-05-17	98.91	99.29	99.27	99.77	47770	69.4	89.14	55407	63.67	73.32	54612	62.52	68.45	55934	64.86	71.3
27-05-17	99.05	99.28	99.35	99.75	48558	69.11	88.06	56821	63.75	72.87	55390	61.04	74.17	57289	63.99	76.36
28-05-17	98.8	99.05	99.11	99.79	42483	78.04	91.76	49418	73.09	78.59	50130	69.03	76.72	52742	68.59	69.86
29-05-17	98.69	99.09	99.23	99.75	40660	75.33	91.33	47617	69.63	72.7	48673	67.01	72.74	49570	67.5	75.09
30-05-17	98.8	99.14	99.34	99.71	42316	70.88	89.88	50872	66.03	78.61	50241	62.01	71.25	51703	64.12	79.67
31-05-17	98.85	99.3	99.27	99.74	39581	70.78	87.53	48833	66.58	76.63	46886	64.08	73.83	50487	66.16	78.44
01-06-17	98.85	99.14	99.25	99.73	41039	75.72	87.15	49732	70.91	79.91	49674	67.44	75.58	53157	68.2	78.5
02-06-17	98.6	98.91	99	99.73	42256	81.15	94.86	51020	76.41	86.36	51010	72.42	79.21	50270	71.93	79.39
03-06-17	98.82	99.18	99.3	99.76	43465	71.25	92.78	52328	65.38	78.16	50383	62.96	74.27	52562	66.57	75.61
04-06-17	98.97	99.29	99.33	99.76	45363	66.08	89.04	55953	60.45	75.81	53255	58.31	76.42	56530	61.31	74.18
05-06-17	98.96	99.29	99.33	99.75	43533	67.21	85.67	55365	60.99	76.55	55884	57.48	81.66	58508	59.99	77.81
06-06-17	98.98	99.26	99.37	99.78	45444	65.08	85.97	56705	60.2	73.52	60120	57.65	68.97	58855	60.83	71.42
07-06-17	99.15	99.42	99.49	99.81	35155	65.55	84.13	43049	60.64	75.05	45673	59.89	80.09	47605	61.92	66.17
08-06-17	98.9	99.25	99.33	99.72	45129	68.04	93.57	55874	62.87	79.91	57323	61.24	73.98	58554	62.96	75.11
09-06-17	99.09	99.27	99.3	99.77	48686	65	84.23	58293	61.52	74.66	57060	60.4	71.49	60115	60.45	73.4
10-06-17	99.14	99.41	99.4	99.76	45464	65.96	89.88	55219	62.13	73.22	55128	60.78	72.92	56430	62.12	76.7
11-06-17	99.05	99.44	99.4	99.75	46389	66.95	90.31	55224	60.82	70.75	55029	59.1	69.67	57882	62.23	69.42
12-06-17	98.99	99.28	99.31	99.74	45603	73.33	84.35	54350	67.84	76.87	53539	66.21	79.93	56044	67.38	74.69
13-06-17	98.82	99.14	99.33	99.81	48375	74.95	87.69	58501	71.28	78.09	58898	67.01	65.44	60292	68.2	70.89
14-06-17	99.25	99.34	99.4	99.77	47174	65.99	86.09	57055	61.29	70.76	57996	58.38	68.28	61280	61.2	75.47
15-06-17	99.16	99.4	99.5	99.78	43615	70.14	81.4	54111	65.17	71.83	56175	58.57	66.91	58925	61.96	73.05
Averages	**98.94**	**99.25**	**99.30**	**99.74**	**43228**	**69.92**	**88.73**	**51898**	**64.95**	**76.19**	**51414**	**63.08**	**75.25**	**53381**	**65.04**	**75.54**

Table 14: Daily achieved compliance and the daily average location error (in m) for all spectral bands in the period 16/05/2017 – 15/06/2017.



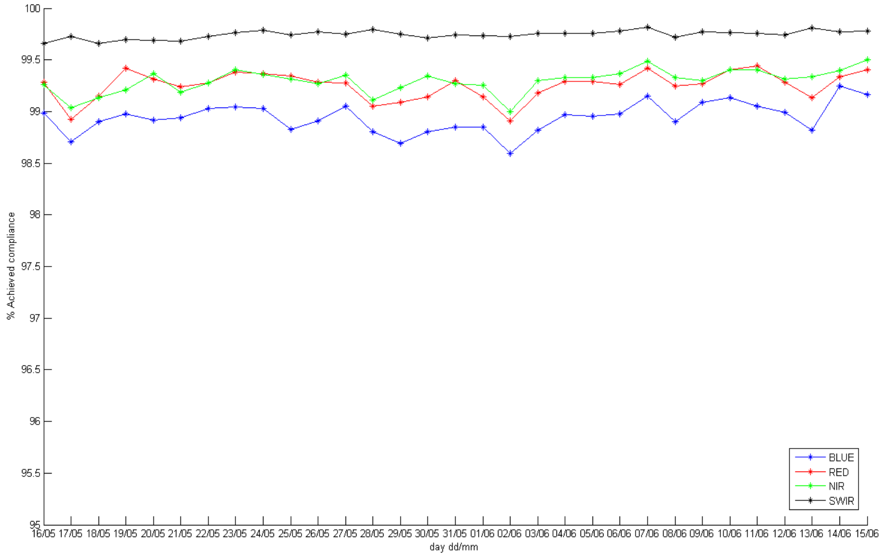


Figure 21: Daily average location error (left) for all spectral bands in the period from 16/05/2017 – 15/06/2017 and the average daily compliance (right).

The total number of chips per day and per spectral band used for the geometric accuracy analysis increased by 50% on average compared to the previous reporting period.

The daily average location error compliance (ALE < 300m) was at the level of 99.1%, which is slightly lower (by 0.1%) than in the previous reporting period.

The quarterly average location error was 77 m (1σ < 84 m) for all spectral bands (combined cameras). Compared to the previous reporting period, this is a slight increase (+3 m). The SWIR and NIR channels had the largest increase, with values of +5.4% and +5.1%, respectively.

2.3.2. Inter-band geometric accuracy

The monthly average inter-band geolocation error for all combinations of spectral bands was as follows:

Band pair	Inter-band error [m]
BLUE-RED	35.28, std=10.24
BLUE-NIR	52.13, std=18.97
BLUE-SWIR	53.89, std=16.38
RED-NIR	35.22, std=15.81
RED-SWIR	42.18, std=10.04
NIR-SWIR	42.33, std=8.71

Table 15: Inter-band geolocation accuracy for period 16/03/2017 to 15/04/2017 stated for combined cameras, at 95% confidence level.

Band pair	Inter-band error [m]
BLUE-RED	35.79, std=11.50
BLUE-NIR	52.28, std=18.14
BLUE-SWIR	53.55, std=15.40
RED-NIR	35.36, std=14.45
RED-SWIR	41.99, std=10.21
NIR-SWIR	40.61, std=7.78

Table 16: Inter-band geolocation accuracy for period 16/04/2017 to 15/05/2017 stated for combined cameras, at 95% confidence level

Band pair	Inter-band error [m]
BLUE-RED	32.84, std=9.83
BLUE-NIR	48.54, std=15.22
BLUE-SWIR	49.71, std=12.12
RED-NIR	33.79, std=12.03
RED-SWIR	41.13, std=8.79
NIR-SWIR	40.17, std=7.34

Table 17: Inter-band geolocation accuracy for period 16/05/2017 to 15/06/2017 stated for combined cameras, at 95% confidence level.

For the combined cameras, the inter-band geometric accuracy ranged from 32 m to 53 m (standard deviation 7 – 18 m), which is 0.09 – 0.16 of a pixel (333 m). This result is about comparable to the previous reporting period. Throughout the period, the largest decrease in the geometric inter-band accuracy is observed between the blue band and both SWIR and NIR bands.

The inter-band RED-NIR registration accuracy is at the level of 35 m (similar to the previous reporting period).

2.3.3. Multi-temporal geometric accuracy

During this reporting period the multi-temporal compliance of the geometric accuracy was at the level of:

- 83.08% for the VNIR sensor (191131GCPs used),
- 95.30 % for the VNIR/SWIR combined (215369GCPs used).

The multi-temporal VNIR sensor compliance has increased by 8.6% and 2.28% for the VNIR and combined VNIR/SWIR, respectively, compared to the previous reporting period (values were 74.48% and 93.02%, respectively).

For the VNIR the multi-temporal geometric accuracy is below the requirements. A map of regions with decreased multi-temporal geometric accuracy is presented in Figure 22.

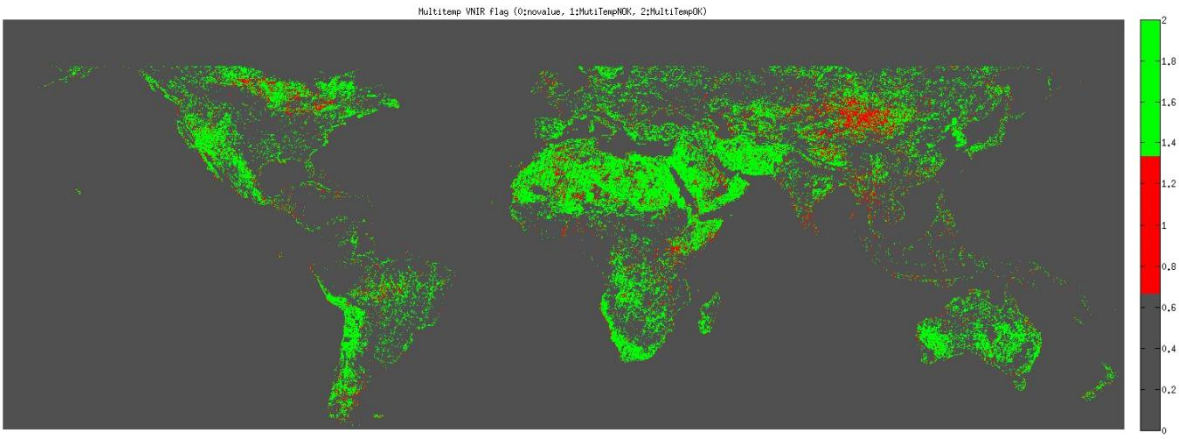


Figure 22: Multi-temporal geometric accuracy for the VNIR sensor. Compliant areas are marked in green; areas with accuracy below 95% are marked in red. Grey areas represent no data.

For the VNIR/SWIR combined the multi-temporal geometric accuracy is compliant with the requirements. A map of regions with decreased multi-temporal geometric accuracy is presented in Figure 23.

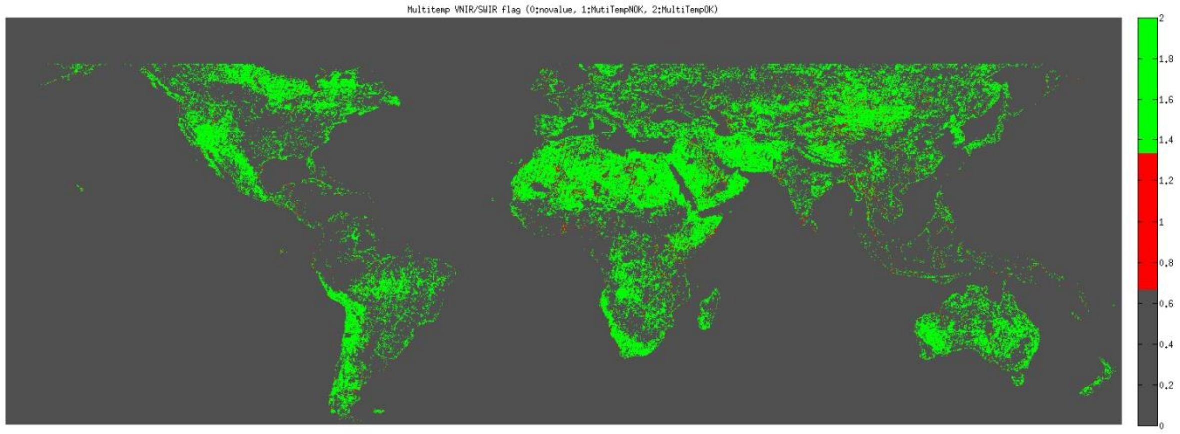


Figure 23: Multi-temporal geometric accuracy for the VNIR/SWIR combined. Compliant areas are marked in green; areas with accuracy below 95% are marked in red. Grey areas represent no data.

2.4. Geometric ICP file

On 08.09.2016 a new file with validity date set to 01.09.2016 was created.

ICP filename	Description
PROBAV_ICP_GEOMETRIC#LEFT_20160901_V01 PROBAV_ICP_GEOMETRIC#CENTER_20160901_V01 PROBAV_ICP_GEOMETRIC#RIGHT_20160901_V01	Correction for the gradual degradation observed in the last week of August and first week of September 2016.

Table 18: Geometric ICP-file updates.

3. Reference documents

RD-1	PROBA-V Commissioning Report Annex 1-Radiometric Calibration Results [N77D7-PV02-US-20-CRPT-Annex1-RadiometricCalibartion-v1_3]
RD-2	PROBA-V Commissioning Report Annex 2-Geometric Calibration Results [N77D7-PV02-US-20-CRPT-Annex2-GeometricCalibartion-v1_3]
LIT1	Govaerts, Y., Sterckx S. and Adriaensen S. (2013) "Use of simulated reflectances over bright desert target as an absolute calibration reference" Remote Sensing Letters, Vol. 4, Iss. 6, 2013.
LIT2	S. Adriaensen,K. Barker,L. Bourg ,M. Bouvet,B. Fougnie,Y. Govaerts,P. Henry, C. Kent,D. Smith ,S. Sterckx. "CEOS IVOS Working Group 4: Intercomparison of vicarious calibration methodologies and radiometric comparison methodologies over pseudo-invariant calibration sites A Report to the CEOS/IVOS Working Group", 2012
LIT3	Sterckx S., Adriaensen S., Livens, L., "Rayleigh, Deep Convective Clouds and Cross Sensor Desert vicarious calibration validation for the PROBA-V mission." IEEE Transactions on Geoscience and Remote Sensing. Inter-Calibration of Satellite Instruments Special Issue. Vol.51:3, 1437 – 1452.

Table 18: Reference Documents