



QUARTERLY IMAGE QUALITY REPORT

IQR#032

Reporting period from 01/01/2022 to 18/03/2022

Reference: *PROBA-V_D9_QIR-032_2022-Q1_v1.0*

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1. Maintenance acquisitions

1.1. Introduction

For the next phase in its lifetime, PROBA-V will acquire only a limited amount of segments, for accommodating instrument sanity, while it is in a hibernate condition. The instrument is kept in stand-by for reasons the thermal stability.

A limit number of calibration images will be acquired to monitor both radiometric and geometric sanity of the instrument. The acquisitions will serve both methods 'at once' as much as possible.

1.2. Calibration Plan - 'hibernate'

For radiometry it is decided that lunar measurements over the full cycle will be continued every month. As an addition to this, few dark current (DC) acquisitions will be done to allow for the automated monitoring of the dark signal and bad pixel detection. The DC will be acquired for all 3 cameras. The amount of calibrations in a month will be 19 lunar and 2 DC resulting in < 1GByte in data.

2 extra acquisitions for Railroad Valley are programmed every month.

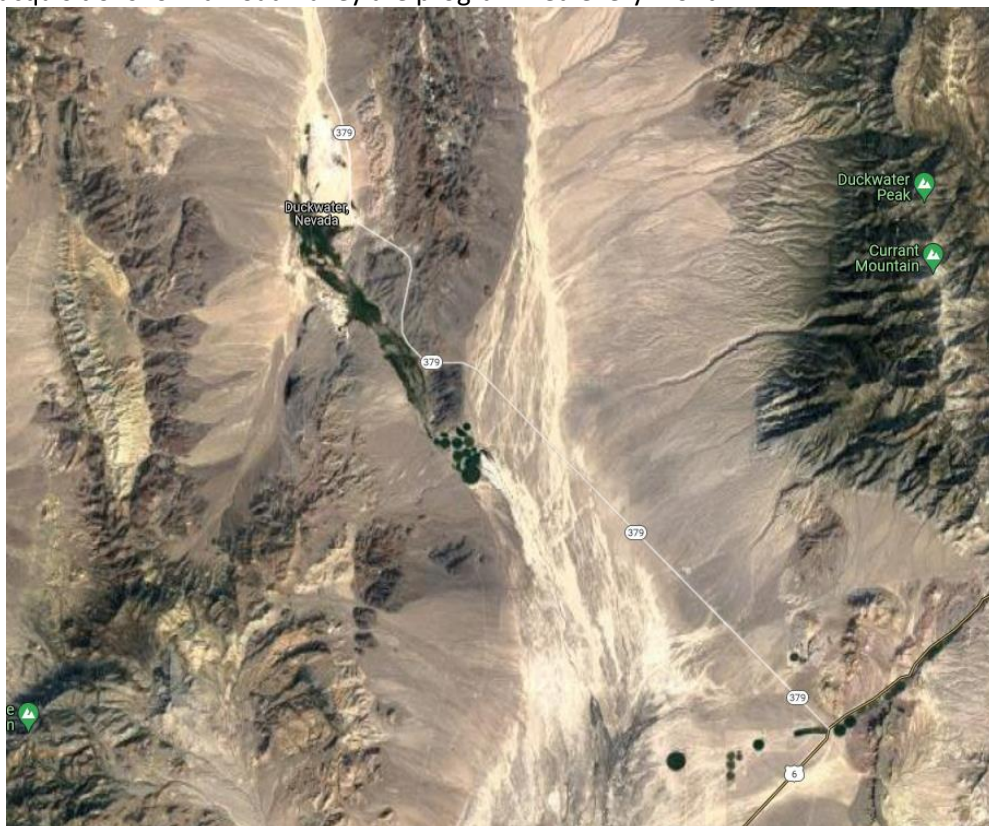


Figure 1: Railroad Valley area

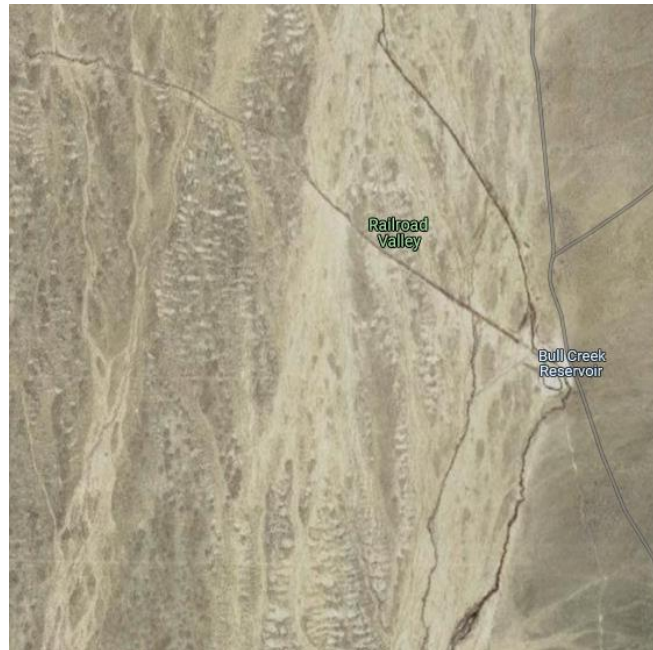


Figure 2: Close-up of the site

1.3. Planned Calibration Request

Currently the following planning (Table 1) has been executed or waiting to be executed on board. In the IQC database, 30 calibration products of this campaign have been stored out of 57 planned requests. Only 2 of these failures are rejected on board, the others failed somewhere in the data chain, at TFF or at L1A level.

Once a month, around start of a new moon cycle, the full planning is programmed : moon, DARKCURRENT and Railroad Valley are inserted into the IPC and uploaded to the platform.



Table 1 : List of planned and executed calibration acquisitions

Timestamp	Type	Status
08/01/2022 03:48	DARK_CURRENT	EXECUTED
09/01/2022 08:37	MOON	EXECUTED
10/01/2022 04:52	MOON	EXECUTED
11/01/2022 02:49	MOON	EXECUTED
11/01/2022 02:49	MOON	EXECUTED
12/01/2022 22:41	MOON	EXECUTED
12/01/2022 22:41	MOON	EXECUTED
15/01/2022 14:49	MOON	EXECUTED
16/01/2022 12:45	MOON	EXECUTED
17/01/2022 14:04	MOON	EXECUTED
18/01/2022 15:23	MOON	EXECUTED
19/01/2022 03:11	MOON	EXECUTED
19/01/2022 23:26	MOON	EXECUTED
20/01/2022 21:23	MOON	EXECUTED
21/01/2022 07:30	MOON	EXECUTED
20/01/2022 21:23	MOON	EXECUTED
21/01/2022 07:30	MOON	EXECUTED
21/01/2022 21:00	MOON	EXECUTED
22/01/2022 17:15	MOON	EXECUTED
23/01/2022 21:56	MOON	EXECUTED
24/01/2022 04:41	MOON	EXECUTED
25/01/2022 04:11	DARK_CURRENT	EXECUTED
08/02/2022 14:15	MOON	REJECTED
09/02/2022 03:37	DARK_CURRENT	REJECTED
09/02/2022 10:30	MOON	EXECUTED
10/02/2022 08:27	MOON	EXECUTED
10/02/2022 15:51	MISCELLANEOUS	EXECUTED
11/02/2022 06:23	MOON	EXECUTED
13/02/2022 02:16	MOON	EXECUTED
14/02/2022 00:12	MOON	EXECUTED
14/02/2022 00:12	MOON	EXECUTED
14/02/2022 03:26	DARK_CURRENT	EXECUTED
14/02/2022 22:08	MOON	EXECUTED
15/02/2022 21:46	MOON	EXECUTED
16/02/2022 21:23	MOON	EXECUTED
17/02/2022 07:31	MOON	EXECUTED
18/02/2022 05:27	MOON	EXECUTED
19/02/2022 01:42	MOON	EXECUTED
19/02/2022 18:34	MOON	EXECUTED
20/02/2022 15:29	MISCELLANEOUS	EXECUTED
09/03/2022 23:38	MOON	EXECUTED
10/03/2022 15:29	MISCELLANEOUS	EXECUTED
10/03/2022 21:35	MOON	EXECUTED
11/03/2022 04:12	DARK_CURRENT	EXECUTED
12/03/2022 05:38	MOON	EXECUTED
13/03/2022 13:42	MOON	EXECUTED
14/03/2022 09:57	MOON	EXECUTED
15/03/2022 07:53	MOON	EXECUTED
16/03/2022 04:08	MOON	EXECUTED
17/03/2022 00:24	MOON	EXECUTED
18/03/2022 08:27	MOON	EXECUTED
19/03/2022 08:05	MOON	UPLINKED
19/03/2022 15:29	MISCELLANEOUS	UPLINKED
20/03/2022 00:57	MOON	UPLINKED
20/03/2022 16:09	MOON	UPLINKED
21/03/2022 03:49	DARK_CURRENT	UPLINKED

1.4. Current issues : update required

Due to limitation of the S-band download capacity, 3 types of calibration are performed :

- MOON
- DARK CURRENT
- Railroad valley

Only 2 DARK CURRENT and 2 Railroad Valley. In the last lunar calibration campaign, we notice that, due to the lack of updating the calibration, the current parameters are no longer valid. In practice, this means that a majority of the pixels are becoming invalid due to negative radiance, after application of the sensormodel. Therefore an update of the Dark Current and Absolute Calibration parameters for both VNIR and SWIR is now inevitable.

1.4.1. Moon acquisitions

Due to the lack of updates to the Radiometric calibration, images of the moon are no longer automatically processed to the final calibration results. This requires a manual intervention and also blocks some results from being processed. The entire database with lunar acquisitions will be processed using the most recent calibration parameters for the appropriate period.

1.4.2. Dark Current

The update of the dark current requires enough acquisitions to have statistical relevant update. Therefore an assessment is done if the dark section of the lunar acquisitions can be used to do this update. Based upon the DN values you can see values for the SWIR2 (Figure 4) both cases of normal DC and Moon DARK are already quite close, but for the BLUE (VNIR) the DN values are 5x larger. This is related to the Integretion Time of the instrument, but it also might mean that we can not update the VNIR with these acquisitions.

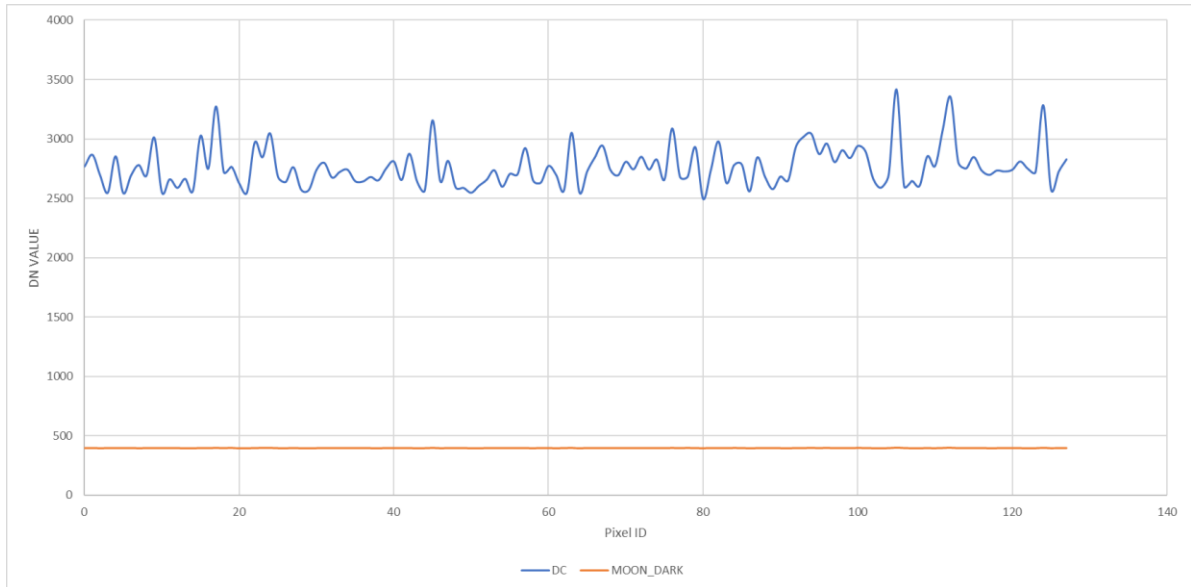


Figure 3: BLUE DC and MOON DARK DN values

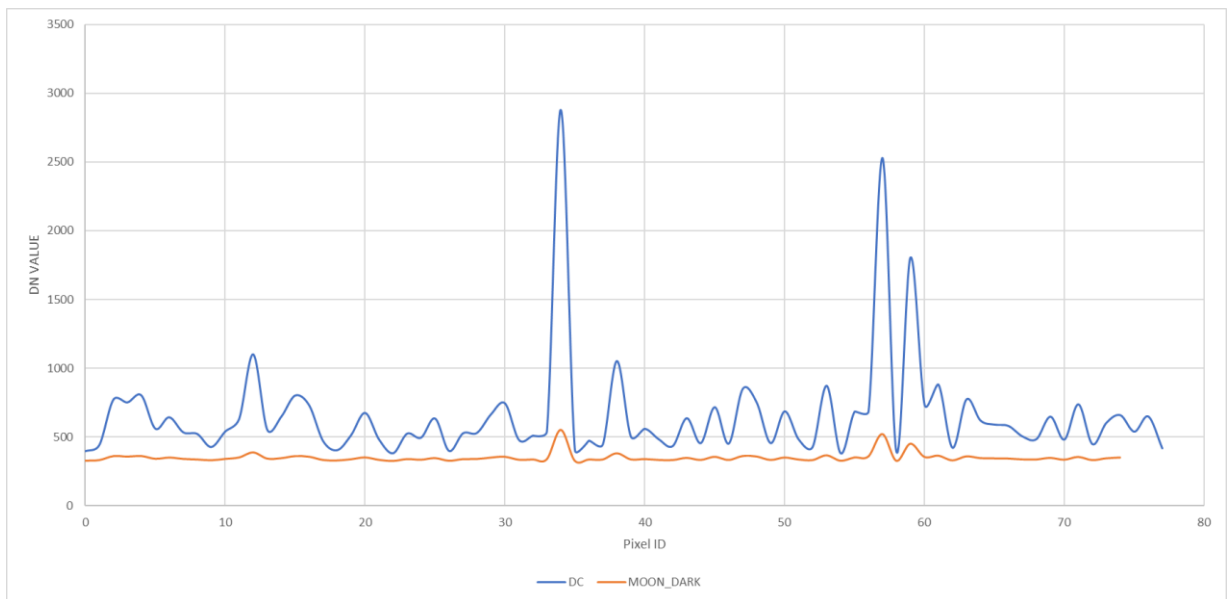


Figure 4: SWIR2 DC and MOON DARK DN values

1.4.3. Railroad Valley

From the current only one image of railroad valley was processed upto L1B format. Acquisition taken at 10/02/2022 – 16.30 UTC. Figure 5 shows the unprojected quicklook of the BLUE band.

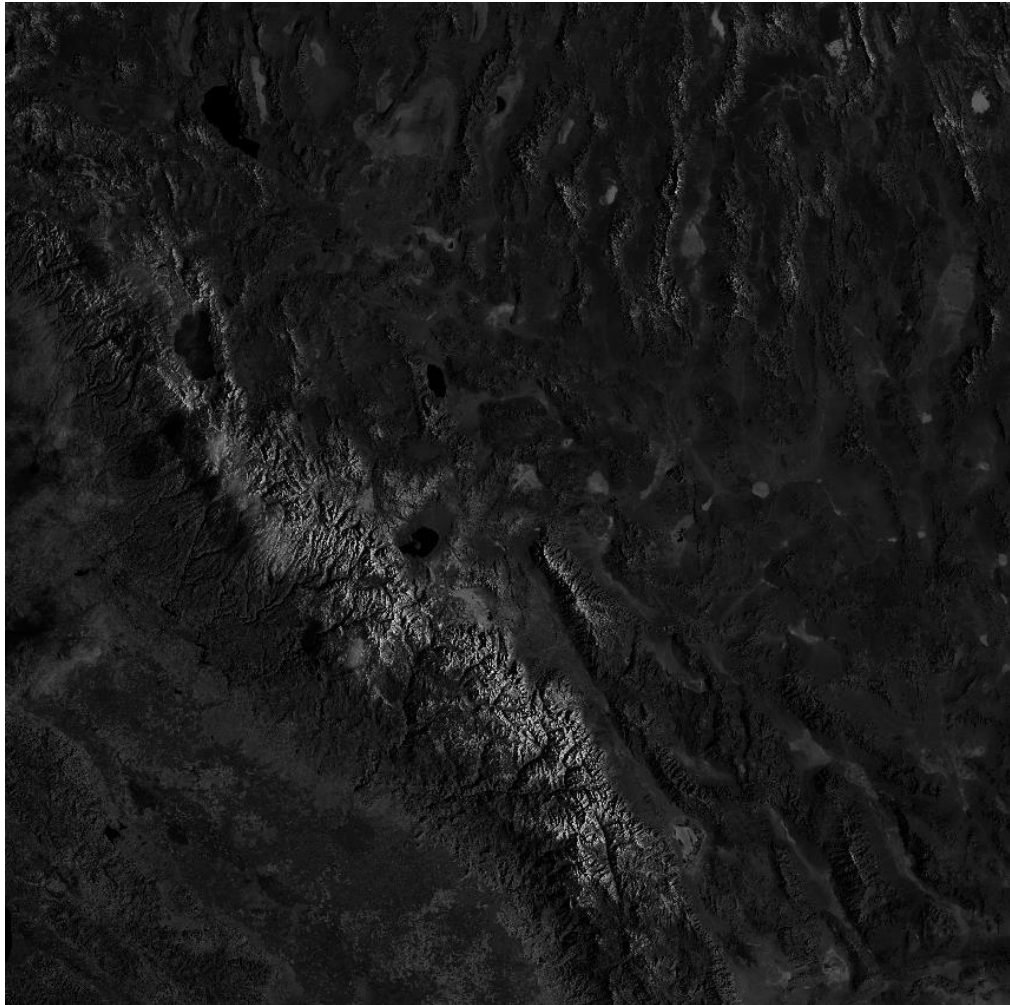


Figure 5: PROBA-V BLUE Railroad Valley acquisition 10/02/2022

When inspecting the retrieved data, the DN values appear to be extremely low. Two main reasons have been identified :

- Instrument Integration Time settings.

Since there is are longer nominal data acquisitions, the data is recorded with IPC. When creating the the new calibration plan for Railroad Valley, instrument settings were recovered from another calibration opportunity with IT=1.2ms. With nominal acqsuistions (i.e. for Libya4) the IT = 3ms

- Local Time Solar Zenith angle.

At the time of the image, the solar elevation angle approx.. 25 degrees, which is quite low.

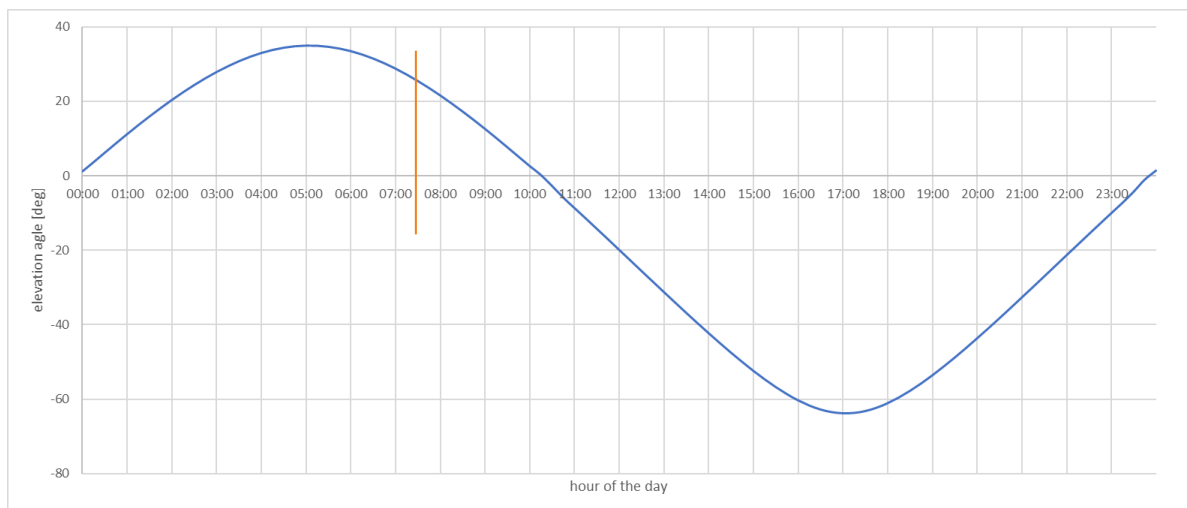


Figure 6: Solar Elevation angle at Railroad valley for 10/02/2022

In Figure 7 the TOA reflectance level, provided through RADCALNET, is plotted for the timestamp closest to the PROBA-V overpass. These numbers are based on direct reflectance and atmospheric measurements which are fed into a Radiative Transfer Model to calculate the TOA reflectance. The TOA reflectance levels are comparable to desert reflectances.

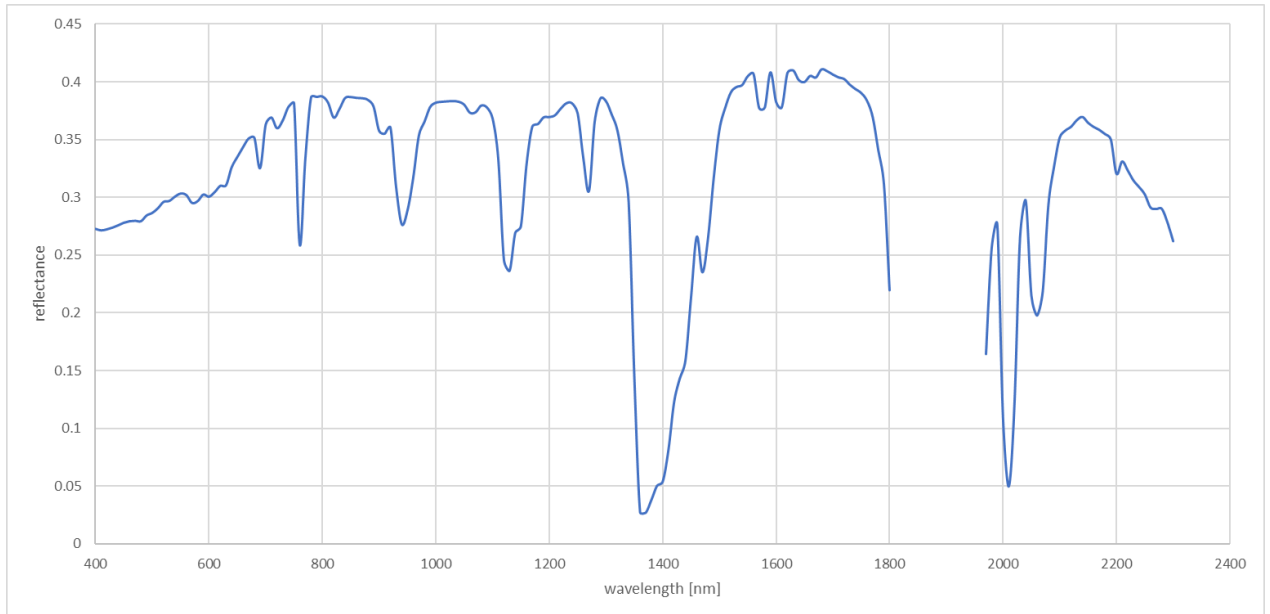


Figure 7: Railroad Valley TOA Relectance for the closest measurement timestamp (17.00h UTC)

Conclusion for Railroad Valley acquisitions is that in the next period Railroad will be re-imaged with new instrument settings and with higher elevation angels.

2. 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. Fournie, 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 2: Reference Documents