

# VEN $\mu$ S Mission Evolutions and Radiometric Performances during VM5 in-orbit test phase

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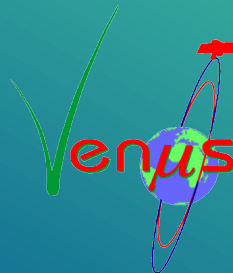
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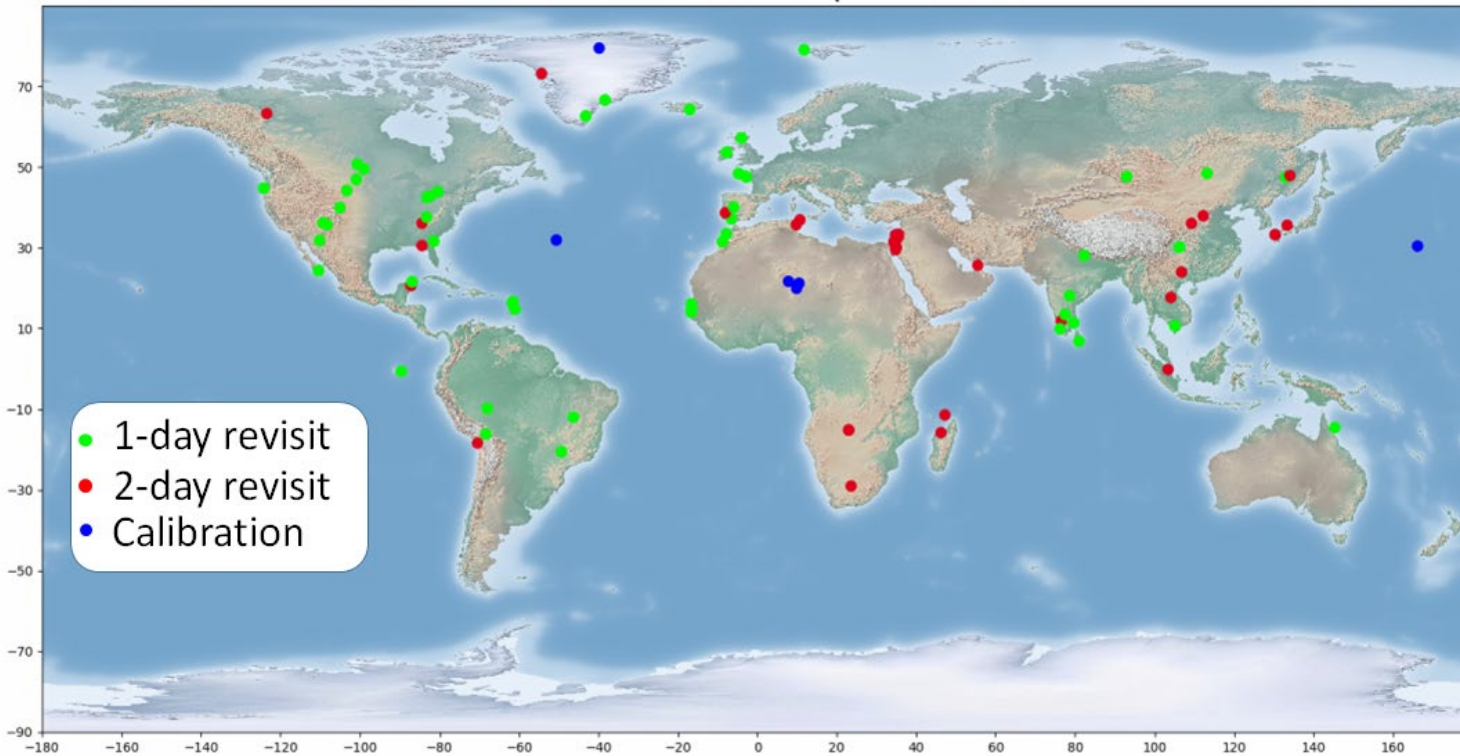
# Outline



- ❖ VEN $\mu$ S Mission Overview and Phases
- ❖ VEN $\mu$ S Instrument
- ❖ VEN $\mu$ S Products
- ❖ Radiometric Calibration
- ❖ Conclusions



# VEN $\mu$ S Mission Overview

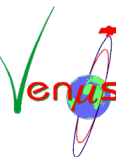
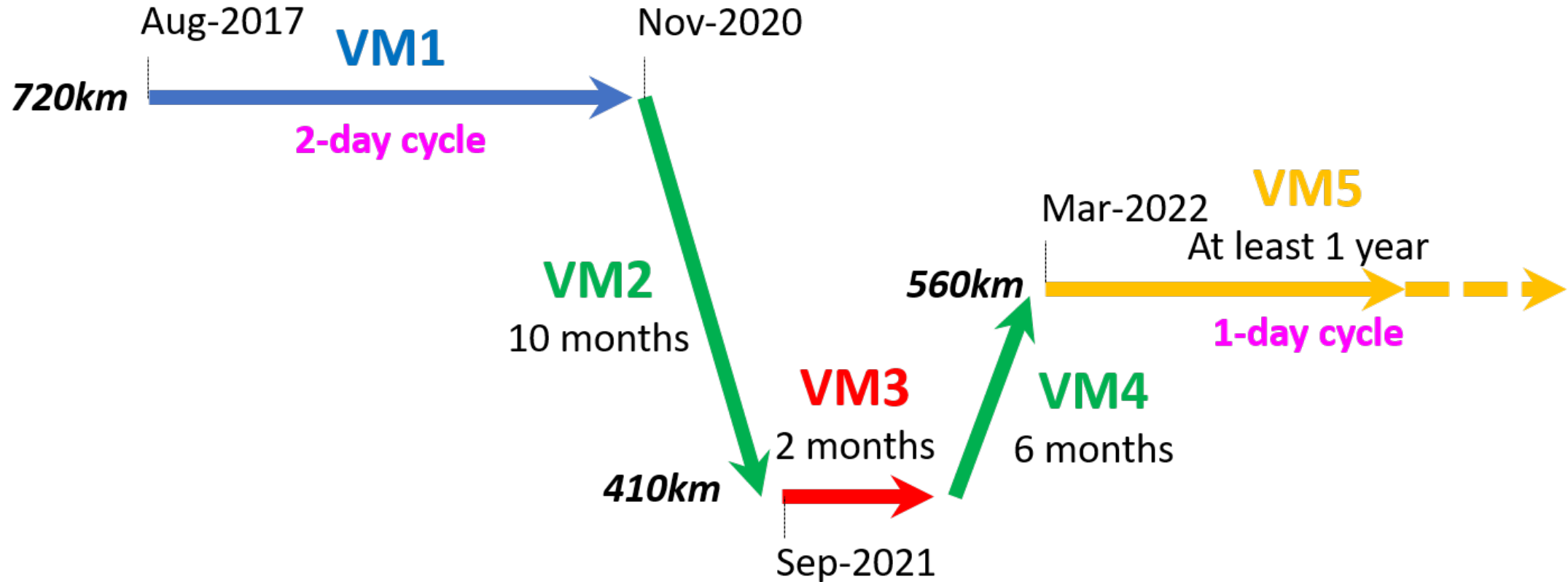


Location of the 88 sites selected following an international call for proposals

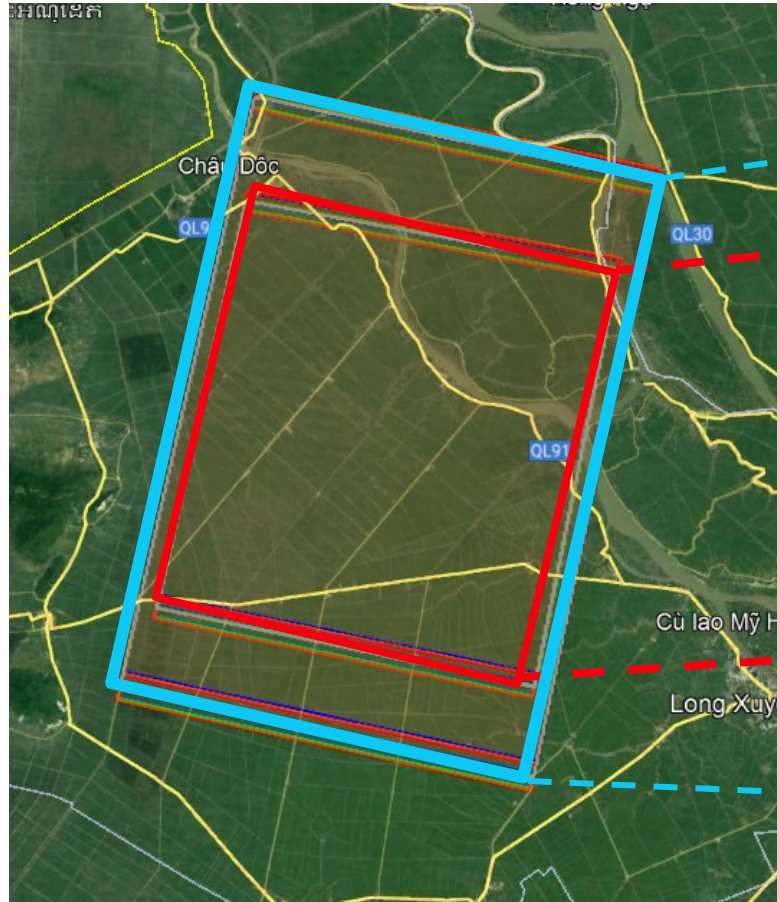
- ❖ French – Israeli mission
- ❖ Study of vegetation, 4 years mission
- ❖ 88 selected scientific sites
- ❖ 12 spectral bands in VNIR
- ❖ 1 or 2 day revisit, GSD 4.1m
- ❖ Tilting capability: +/- 30 deg
- ❖ Swath 21 km
  
- ❖ Successfully launched Aug. 1, 2017
- ❖ Products on [www.theia-land.fr](http://www.theia-land.fr)



## VEN $\mu$ S Mission Phases



# VEN $\mu$ S VM1 product vs VM5 product



VM1 vs VM5 footprints of a scientific site over Vietnam



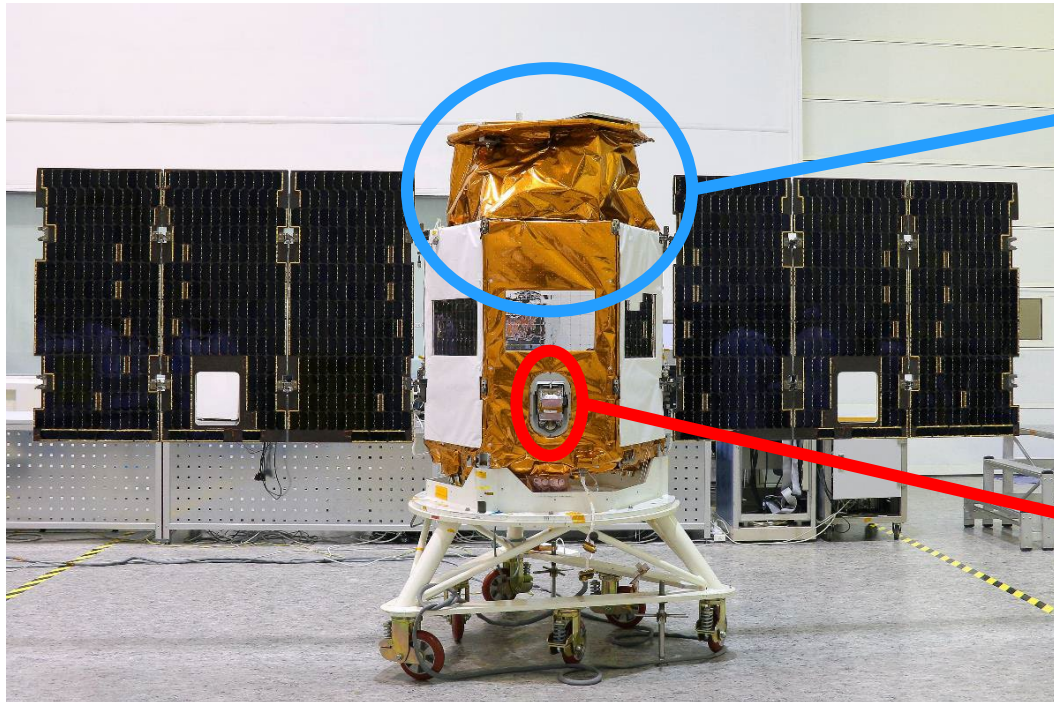
B7 image during VM5  
Altitude = 560 km  
Resolution = 4,1 m  
Swath = 21,3 km



B7 image during VM1  
Altitude = 720 km  
Resolution = 5,3 m  
Swath = 27,6 km

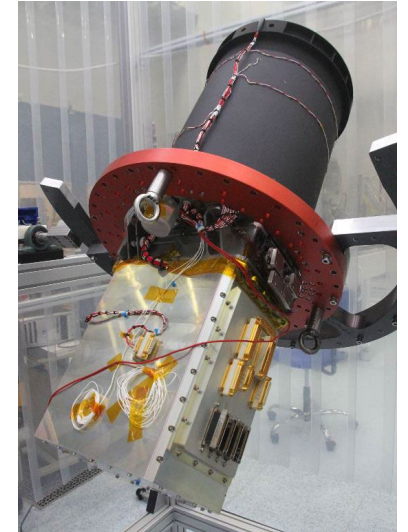


## VEN $\mu$ S Payloads



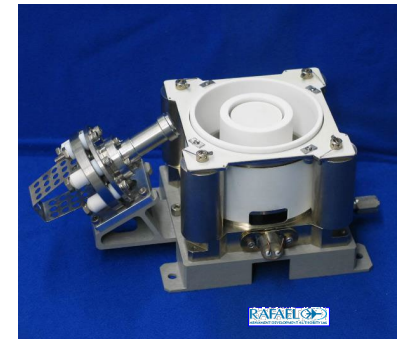
### *Scientific mission*

Radiometer  
12 spectral bands in VNIR

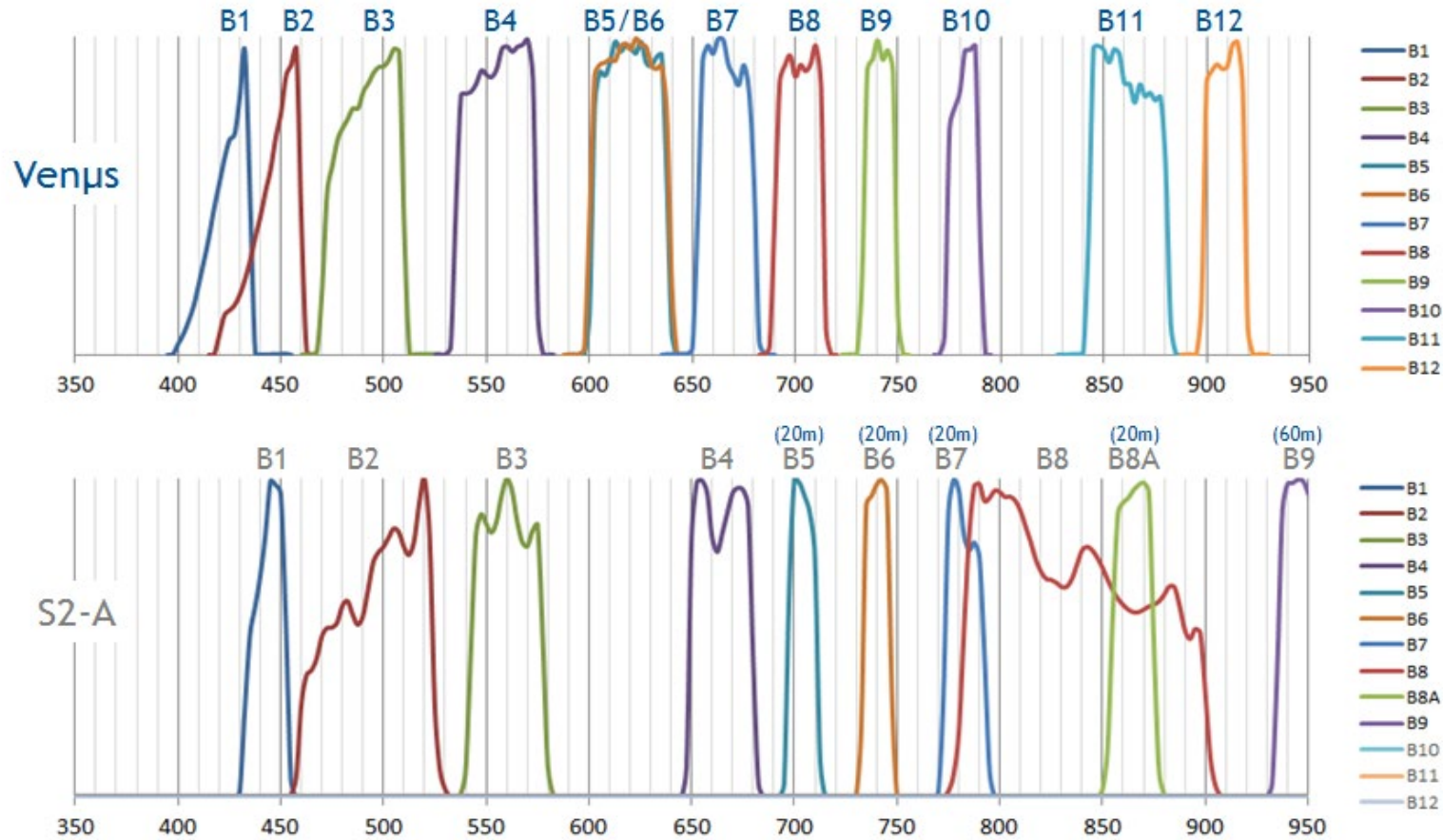


### *Technological mission*

IHET  
Israeli Hall Effect Thruster



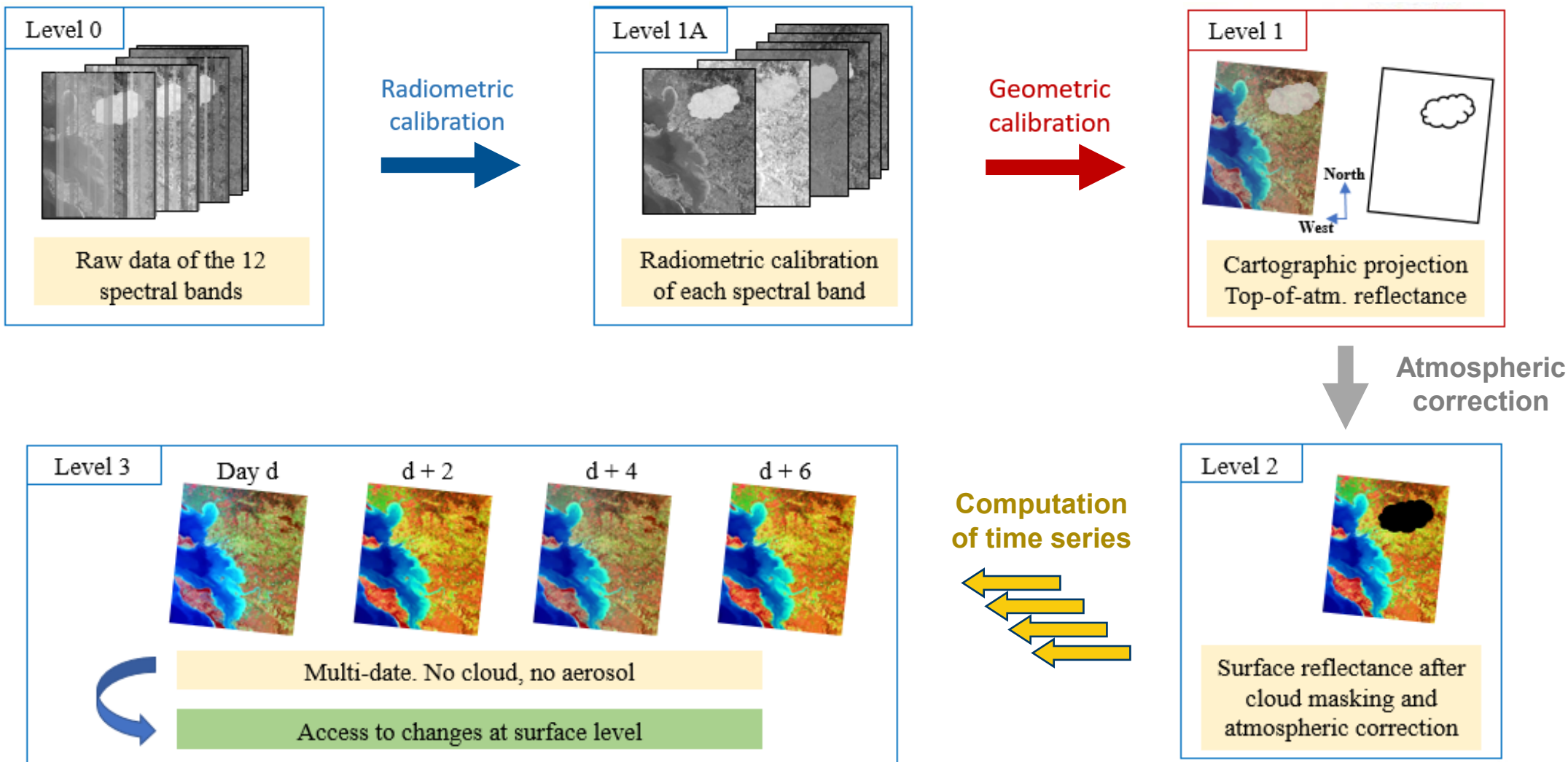
# VEN $\mu$ S Instrument



- ❖ 12 spectral bands in VNIR
- ❖ Stereoscopic bands B5 & B6 for clouds detection
- ❖ No cirrus detection band (no SWIR bands)



# VEN $\mu$ S Products



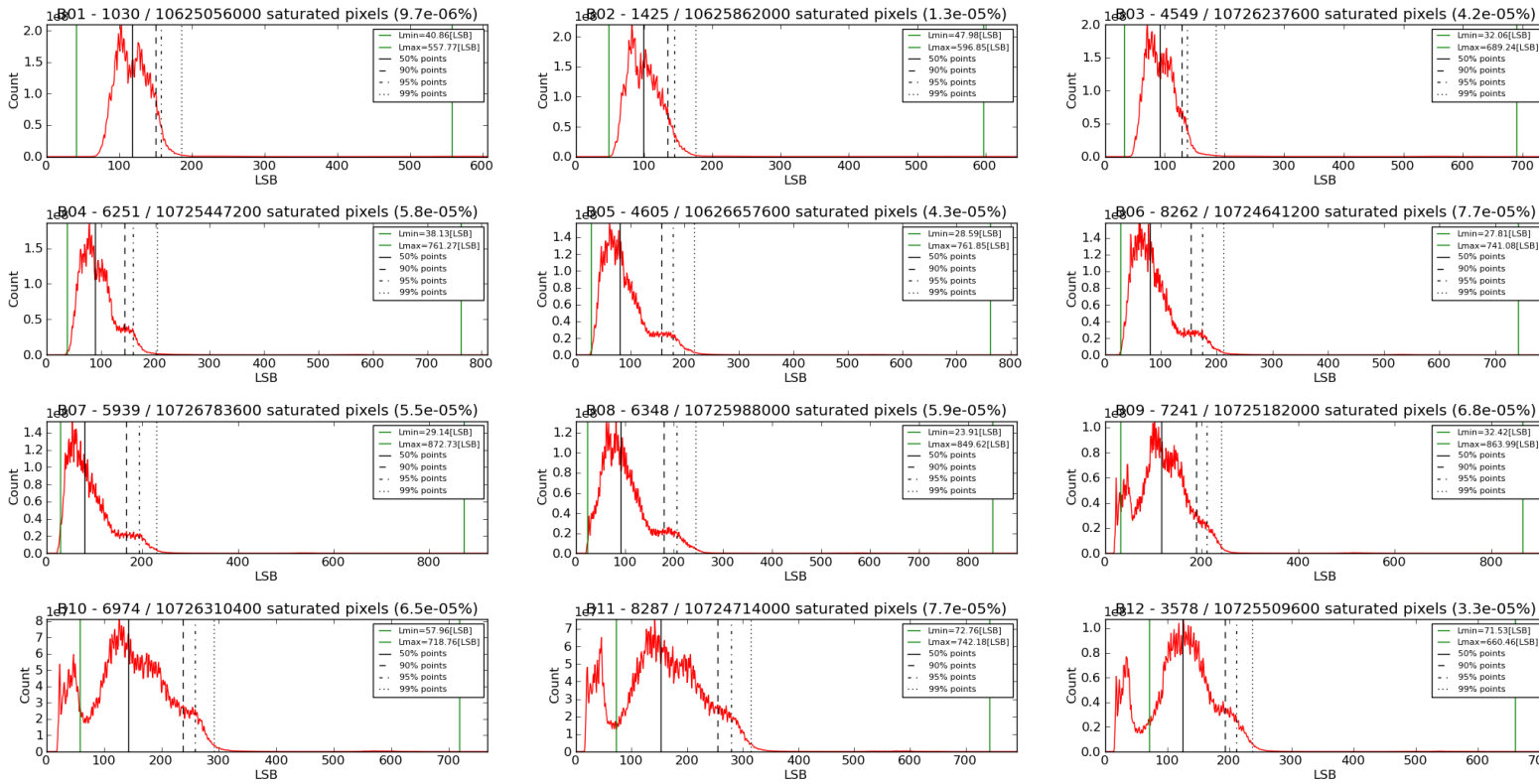


# Radiometric Calibration – Dynamics

❖ Integration time changed between VM1 and VM5 due to orbit variation

❖ From 794 ms to 588 ms → reduced dynamics

Histograms of 293 L0 products



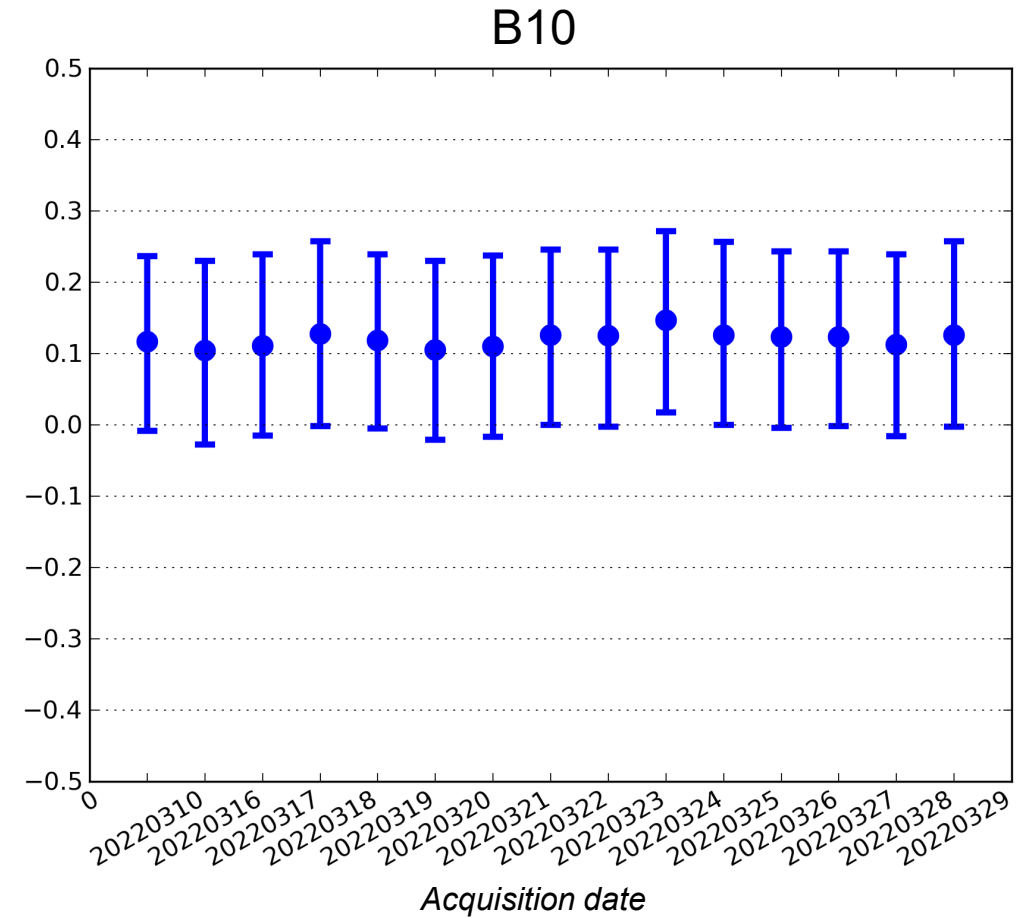
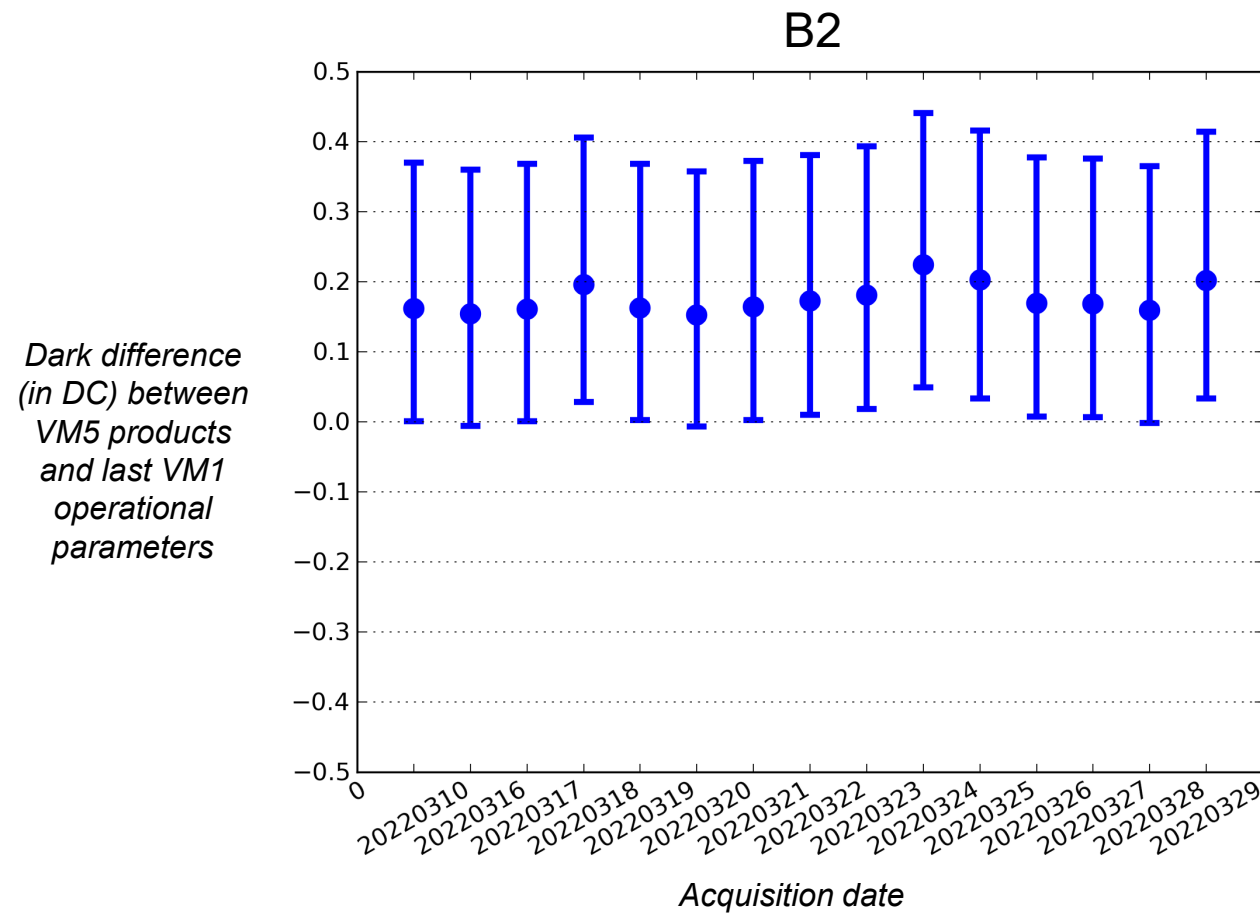
Band	VM1 gain	VM5 gain
B1	6.95	10.37
B2	1.87	2.80
B3	1.30	1.94
B4	1.33	1.98
B5	1.20	1.79
B6	1.09	1.63
B7	1.16	1.74
B8	1.45	2.16
B9	1	1.49
B10	1.58	2.35
B11	1.58	2.35
B12	1.78	2.65

❖ Camera gains were increased by a factor of ~1.5 for all spectral bands the 6<sup>th</sup> of August 2022



# Radiometric Calibration – Dark Signal

## ❖ Dark coefficient variation estimation between VM1 and VM5



## ❖ Similar trend for all spectral band → Dark coefficients have been updated for VM5

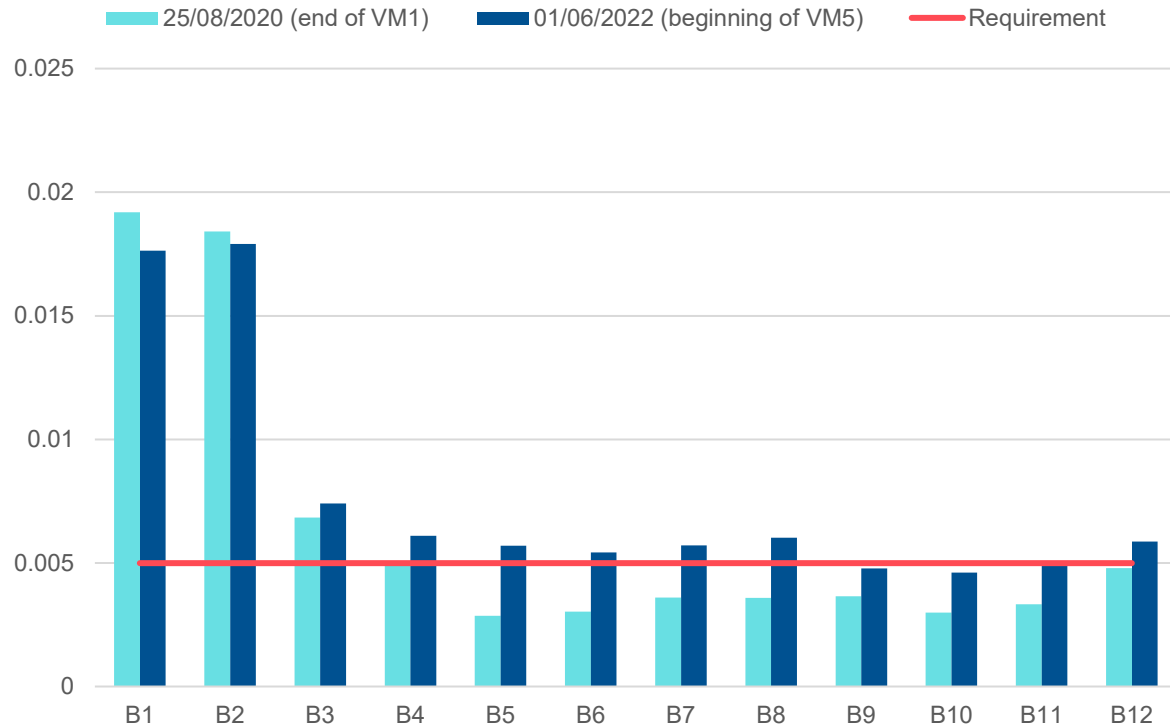
- ❖ Increase between 0.1 and 0.2 DC for all spectral band except 0.6 DC for B1 (noisiest band)



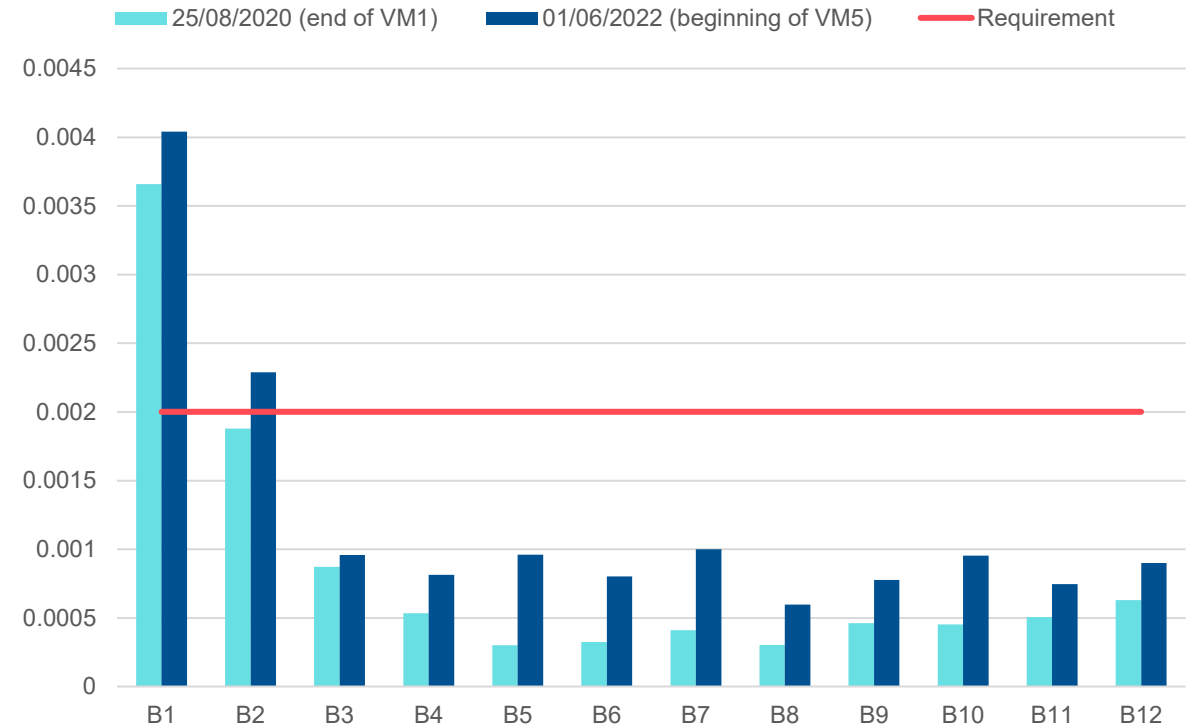
# Radiometric Calibration – Equalization

## ❖ Fixed Pattern Noise (FPN) computation comparison between end of VM1 and beginning of VM5

FPN by band (%) - Low Frequency



FPN by band (%) - High Frequency



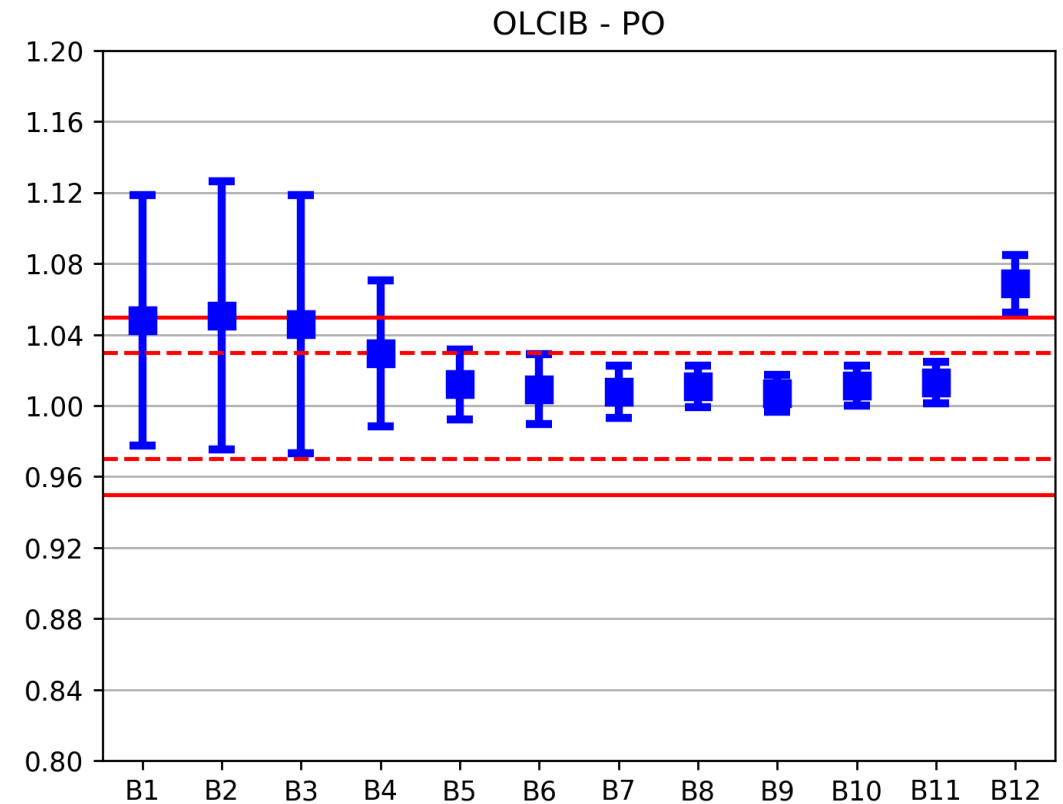
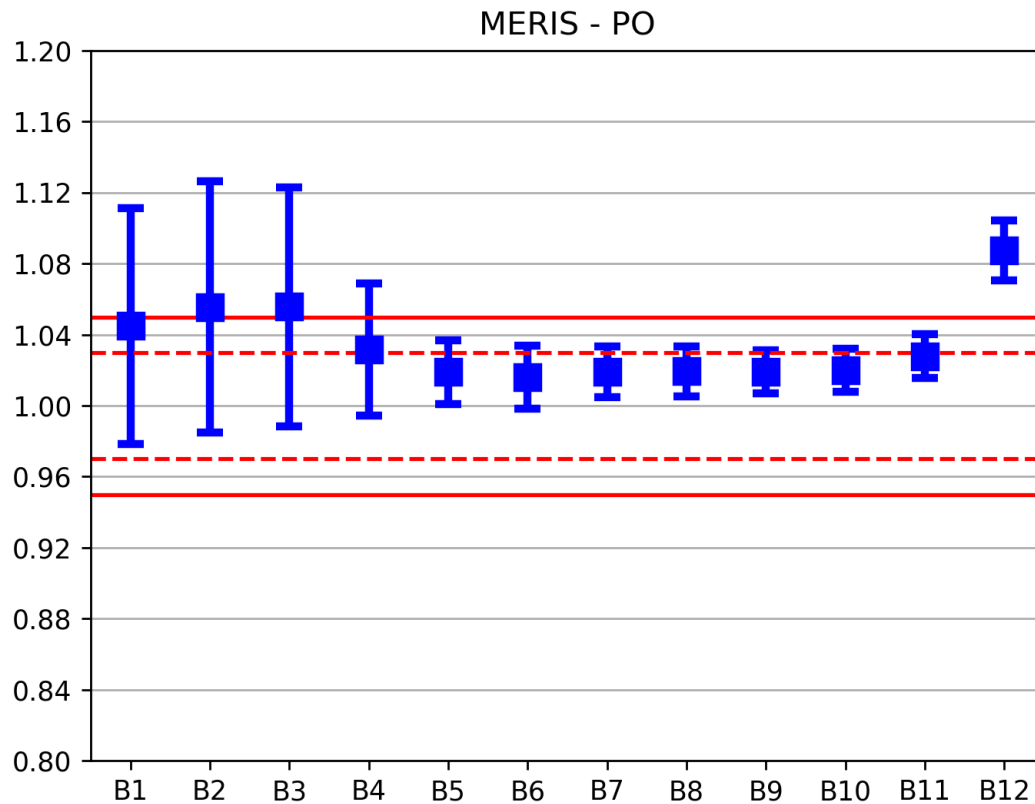
## ❖ A slight increase of equalization noise especially for low frequency noise as expected

❖ Estimation of new equalization coefficients is in progress



## Radiometric Calibration – Absolute Calibration

❖ Absolute calibration results for desert method (PICS) with respect to end of VM1 operational coefficients

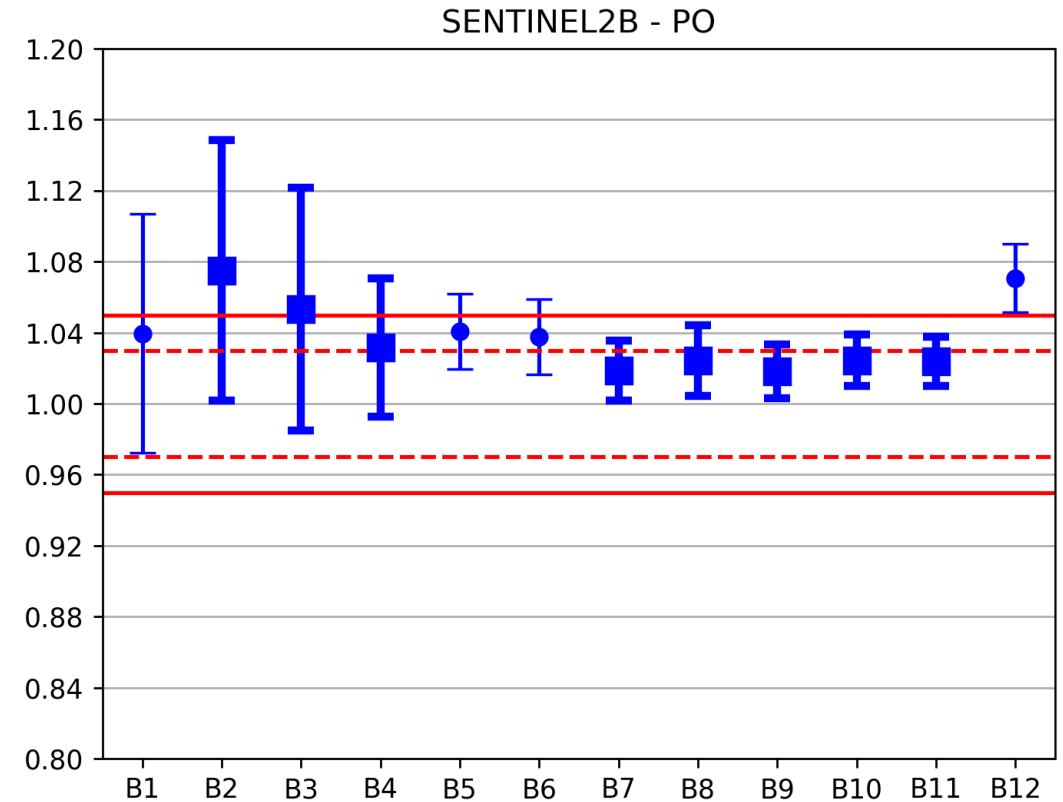
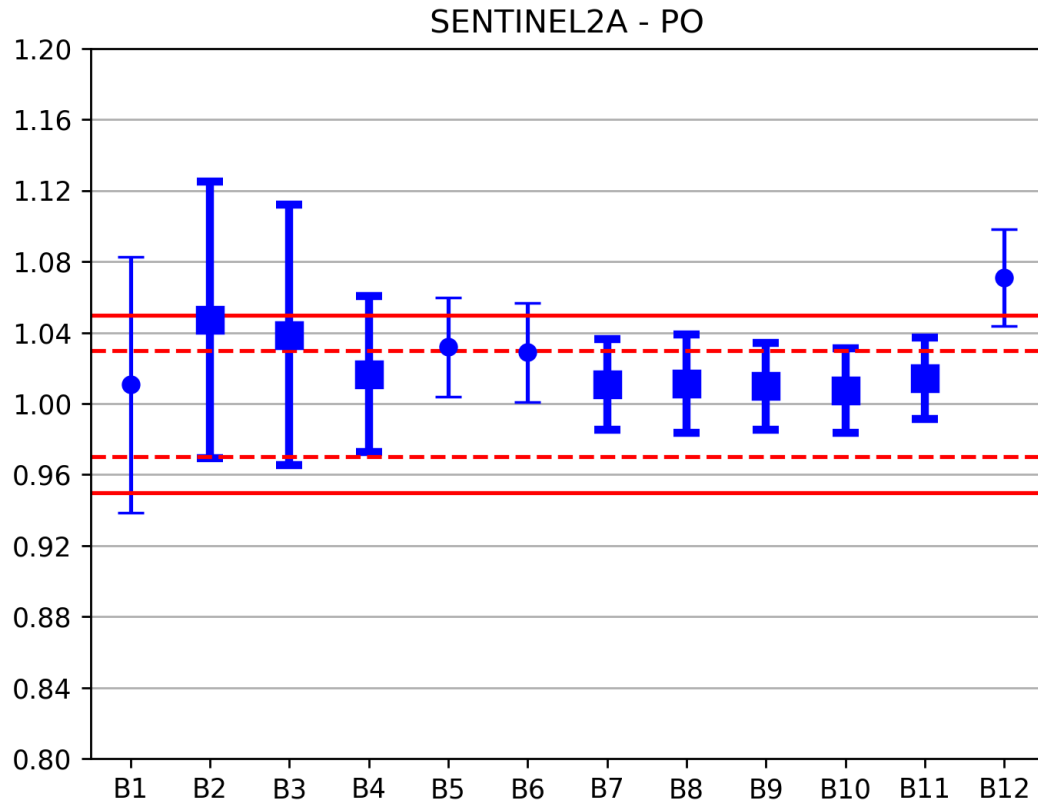


- ❖ Slight increase of VM5 absolute calibration coefficients with respect to operational ones during VM1
- ❖ Good results consistency between each reference sensor



# Radiometric Calibration – Absolute Calibration

❖ Absolute calibration results for desert method (PICS) with respect to end of VM1 operational coefficients



- ❖ Results will be confirmed with the Moon method and simultaneous nadir observations (SNO) with Sentinel-2
- ❖ Absolute coefficients update is coming soon



## Conclusions

### ❖ Product performances

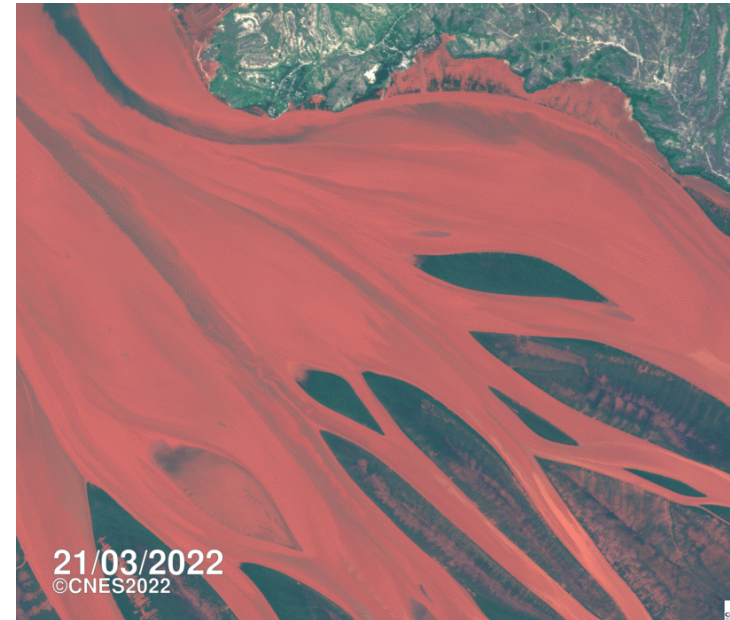
- VM5 products radiometric quality is under assessment
- Radiometric quality is well monitored (accuracy of absolute calibration is under 3% for most of the bands)
- Updates of some parameters (equalization and absolute calibration coefficients) will be performed soon to improve products performances

### ❖ Reprocessing in progress

- All VM1 archive is currently reprocessed with an updated tuned configuration of all processing parameters (including geometric and radiometric calibration and cloud detection)

### ❖ 1-day revisit and 4 m resolution provide crucial information in specific cases

- VM5 products will be available shortly



*Time series over BOMBETO site (Madagascar)*



*Time series over SIRGAS site (Brazil)*



Products freely available : [www.theia-land.fr](http://www.theia-land.fr)



Thank you for your attention !

