



## PROBAV Collection 2: What is new?

Else Swinner<sup>1</sup>, Stefan Adriaensen<sup>1</sup>, Dennis Clarijs<sup>1</sup>, Luis Gómez Chova<sup>2</sup>, Dominique Jolive<sup>3</sup>, Fabrizio Nir<sup>4</sup>, Didier Ramon<sup>1</sup>, Kerstin Stelzer<sup>5</sup>, Sindy Sterckx<sup>1</sup>, Carolien Tot<sup>1</sup>

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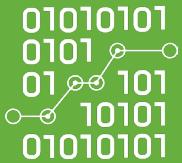
<sup>3</sup> HYGEOS, France<sup>4</sup> ESA/ESRIN, Frascati<sup>5</sup> Italy, <sup>5</sup> Brockmann Consult



# PROBA-V

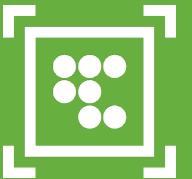
- Daily global EO data
- Spatial resolution 1 km – 333 m – 100 m
- 21/10/2013 – 30/06/2020
- <https://proba-v.vgt.vito.be>

GOING BEYOND  
EXPECTATIONS FOR  
GLOBAL VEGETATION  
MONITORING



## Proba-V Collection 2

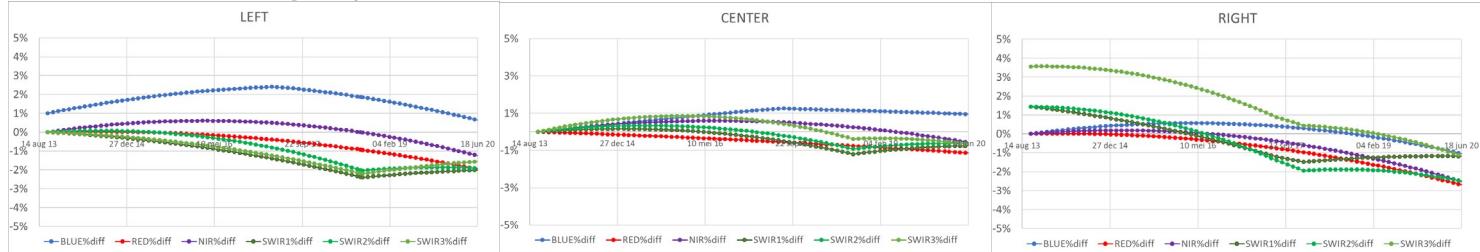
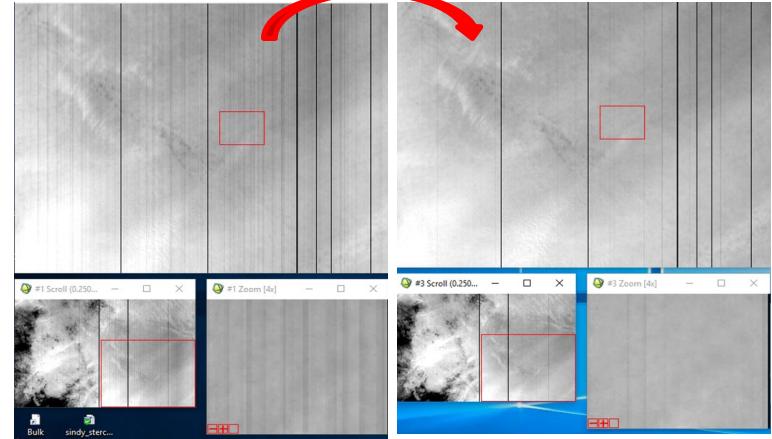
- 1) updated radiometric calibration
- 2) a new and better cloud detection method and improved cloud shadow detections
- 3) an improved atmospheric correction
- 4) harmonisation of the compositing among the resolutions
- 5) update of the product format
- 6) a new catalogue to distribute the data



# Radiometric calibration: changes

- 2nd degree polynomial model for observed radiometric change (both increase & decrease of responsivity )
- Correction for small negative bias in LEFT BLUE and SWIR RIGHT
- Updates to SWIR equalization/multiangular calibration coefficients based on yaw maneuver data (pixel depended changes)

Sindy Sterckx, Stefan Adriaensen (VITO)



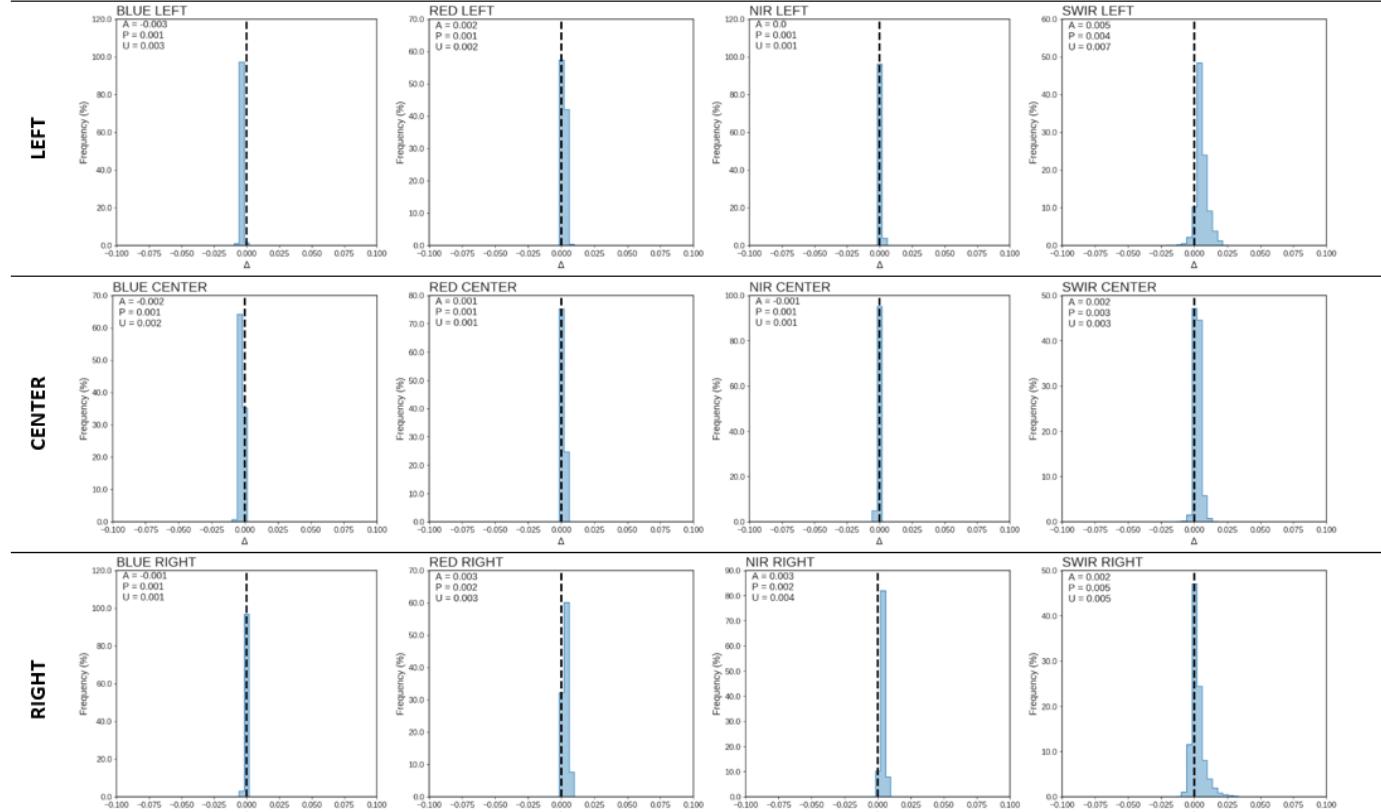
See poster: Benhadj et al., PROBA-V overview of calibration and trending analysis (B1.02 Monday 17:30-19:00)  
See presentation: Adriaensen et al. Lunar Irradiance Model of ESA (LIME) and its application for PROBA-V radiometric calibration (B1.02.1 Monday 14:10)

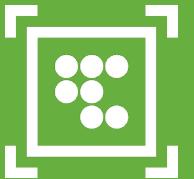


# Radiometric calibration: impact

1 year TOA data  
(07/2018 - 06/2019)

Bias C1 - C2





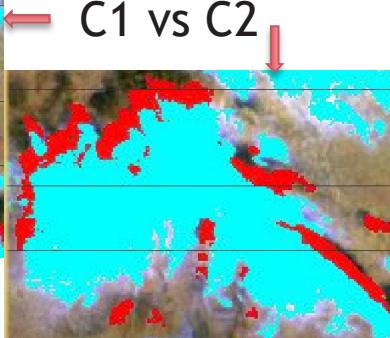
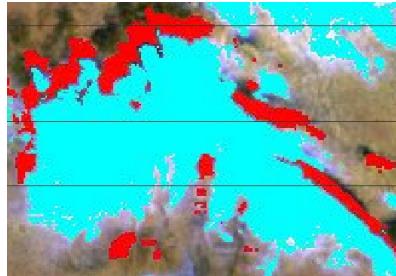
# Cloud detection: changes

VNIVERSITAT  
D VALÈNCIA

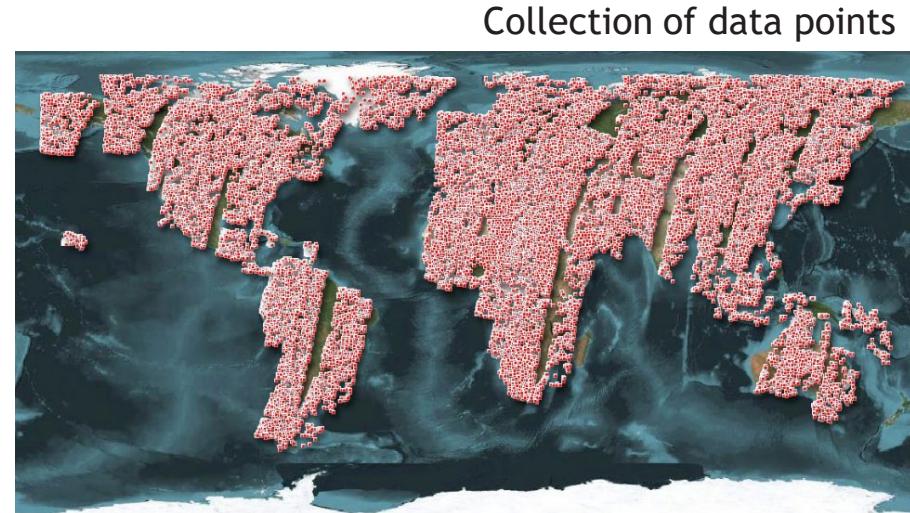
BROCKMANN  
CONSULT GMBH

Luis Gómez Chova (UV), Kerstin Stelzer (BC)

- Multi-Layer Perceptron (MLP) neural network algorithm
- Training and validation data on large data set
- No dependency on auxiliary data input
- Performance of cloud detection greatly improved
- Adaptation of the cloud shadow detection



vito  
remote sensing



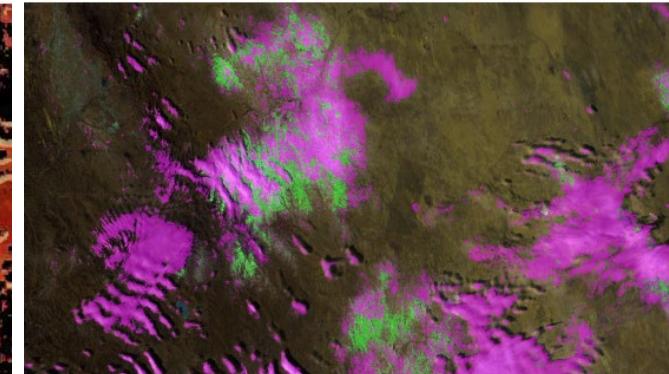
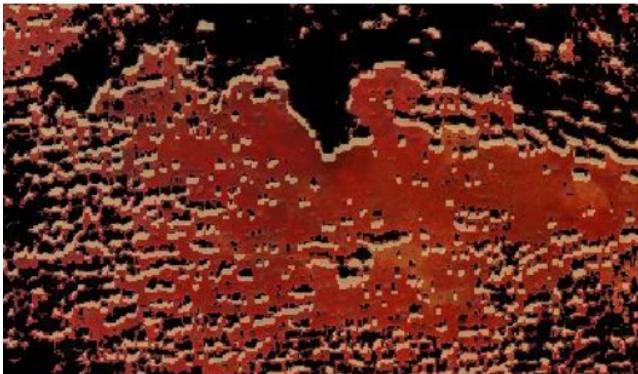
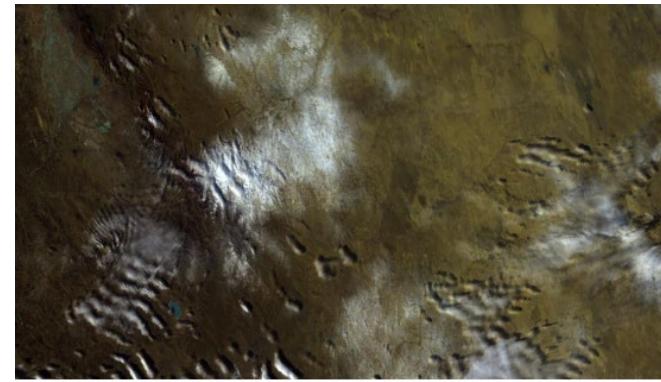
Collection of data points



# Cloud detection: impact

Kerstin Stelzer (BC)

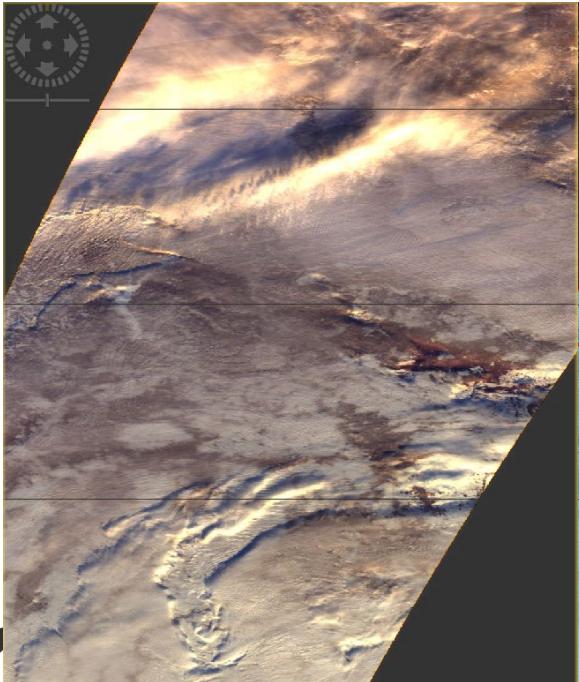
- **Very good performance!**
  - Under-detection in winter in C1 solved (dependence on auxiliary data)
  - Over-detection in C1 is solved
  - Good separation between cloud and snow/ice
- **Trade-offs**
  - Some overestimation on salt lakes and urban areas
  - Thin semi-transparent clouds: 50% detected
  - Sparse snow or melting ice often not detected
- **Cloud shadow masking of medium quality**



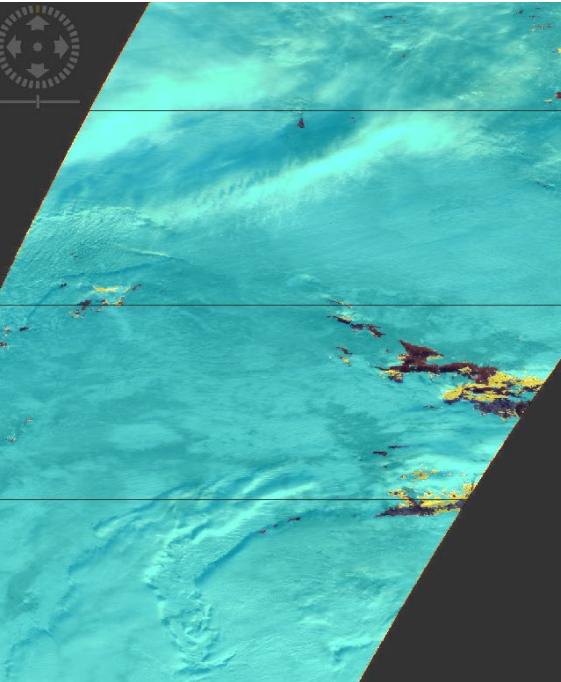


# Cloud detection: impact

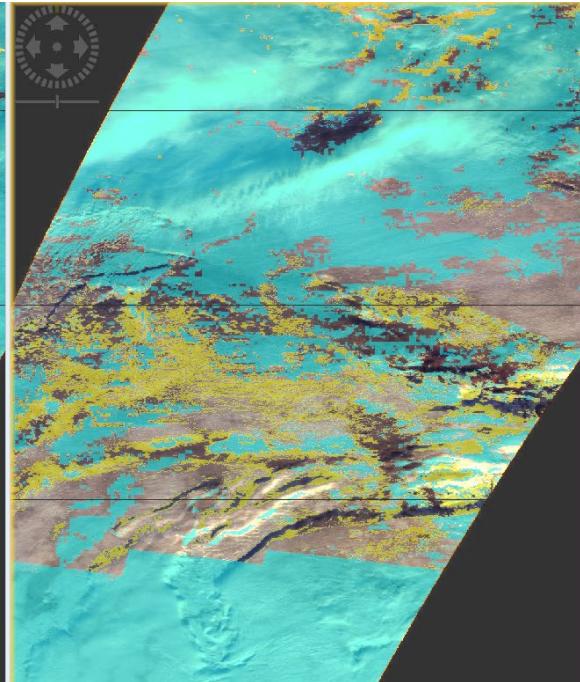
RGB



C2



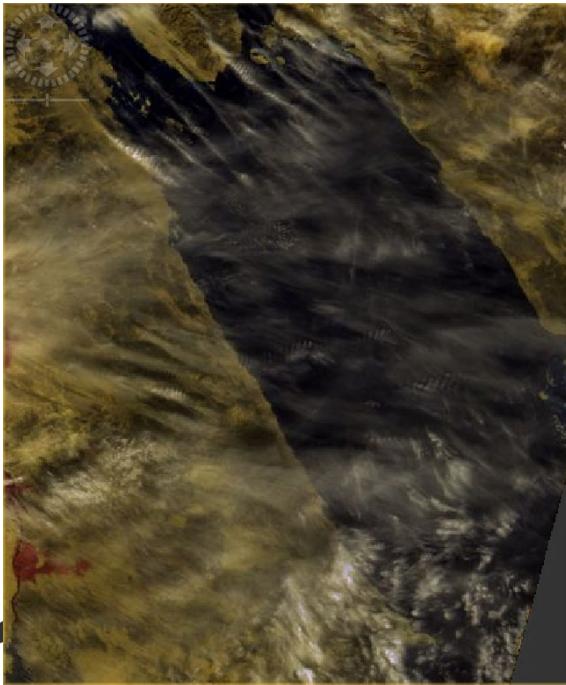
C1



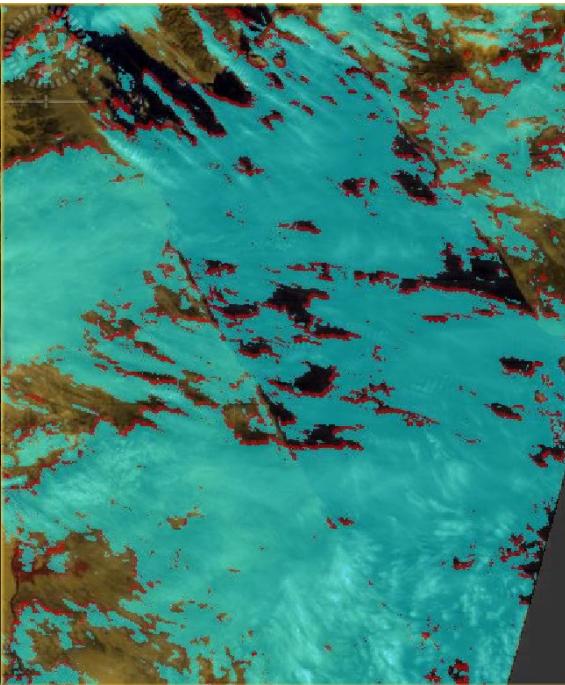


# Cloud detection: impact

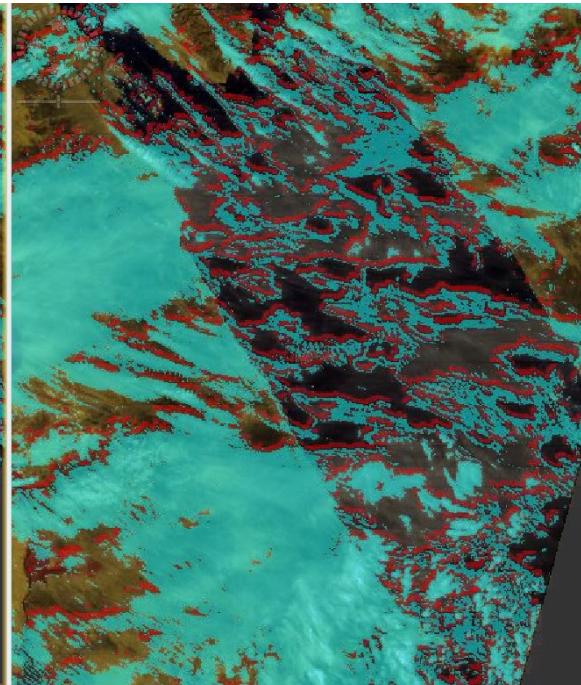
RGB



C2



C1



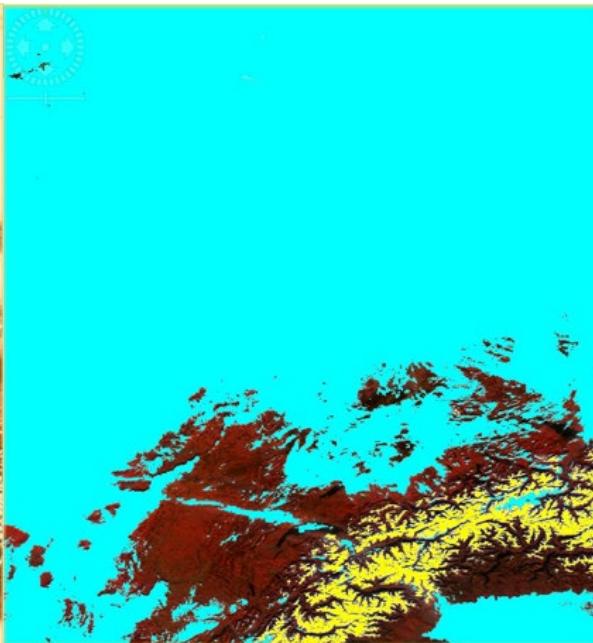


# Cloud detection: impact

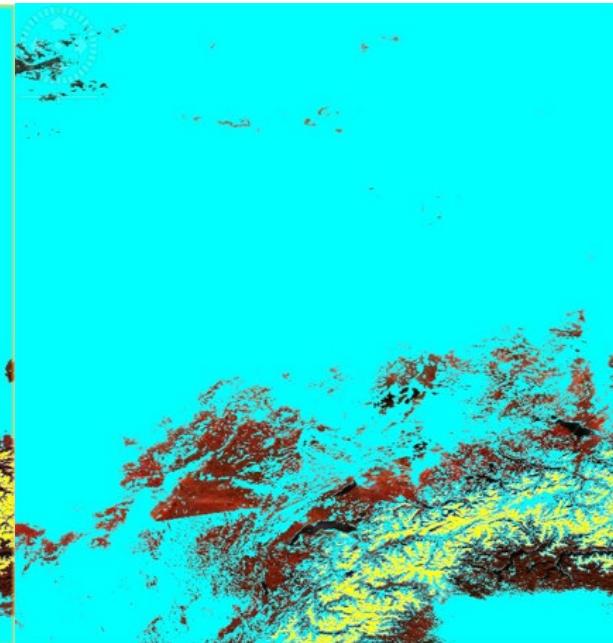
RGB



C2

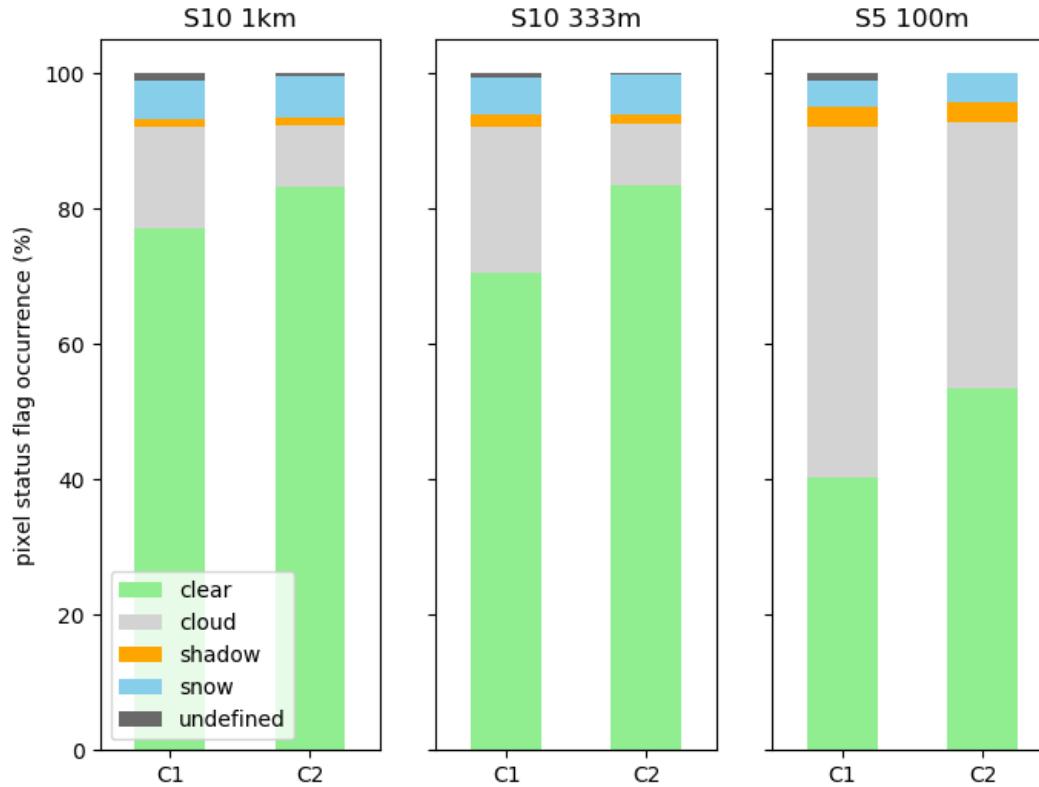


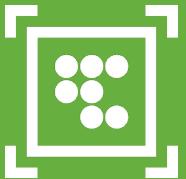
C1





# Cloud detection: impact





# Atmospheric correction: changes



Didier Ramon, Dominique Jolivet (HYGEOS)

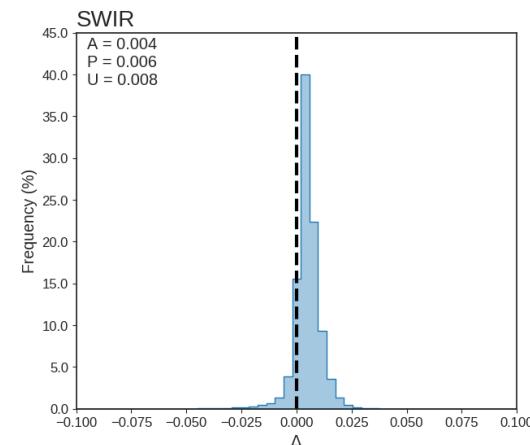
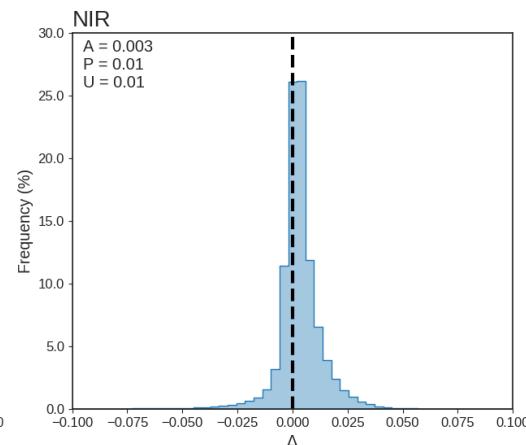
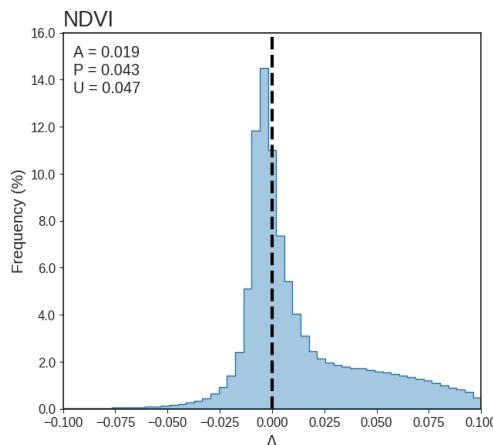
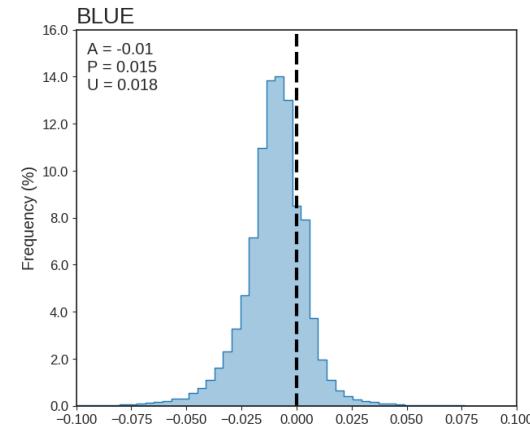
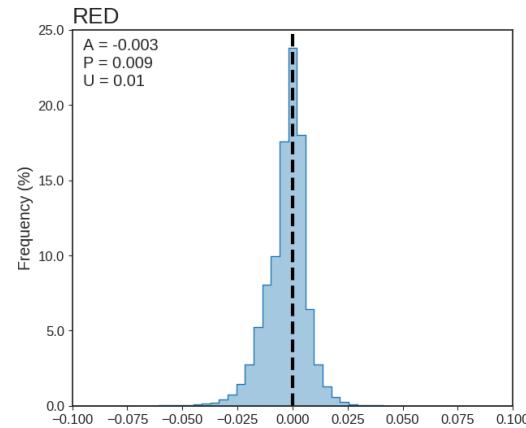
- Simplified Model for Atmospheric Correction (SMAC)
- MERRA2 (Modern-Era Retrospective analysis for Research and Applications, version 2) for the inputs of the atmospheric correction
- Validation: based on the Atmospheric Correction InterComparison Exercise (ACIX) approach
- Results:
  - Top-Of-Canopy (TOC)reflectances are better characterized
  - Artefacts due to the image-based Aerosol Optical Thickness (AOT) retrieval are removed



# Atmospheric correction: impact

S10 TOC 1km

07/2018 - 06/2019





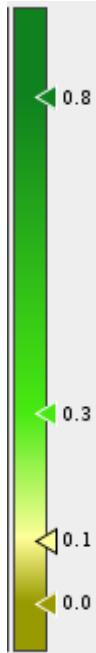
# Atmospheric correction: impact

S1-TOC 1km

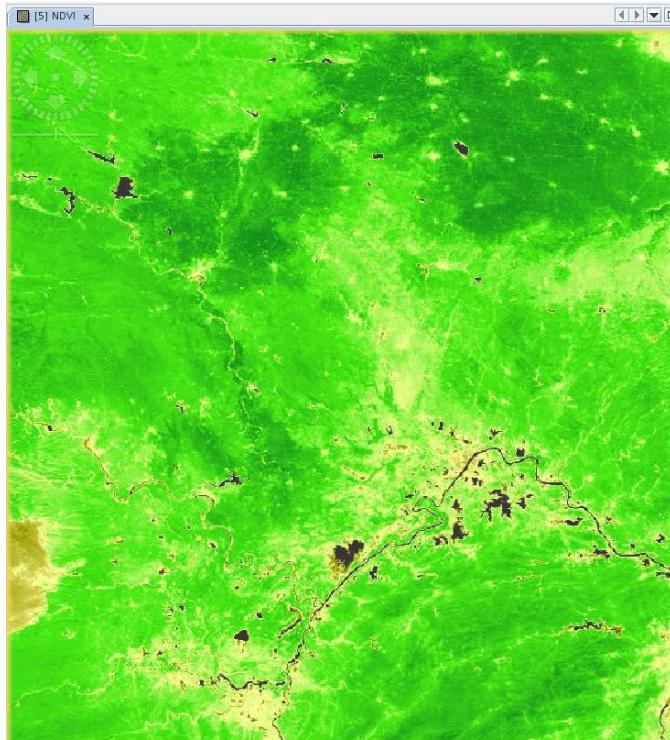
20141221

X29Y04

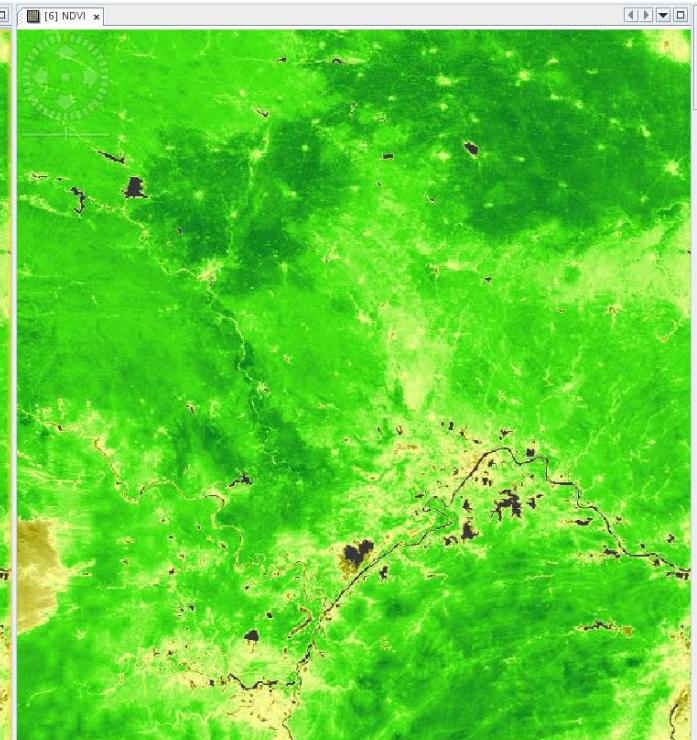
BLUE (B0)

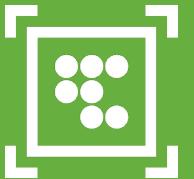


PROBA-V C2



PROBA-V C1





# Harmonization of compositing: changes

- C1: Different compositing rule for 1 km & 300/100 m
  - 1 km: rad qual BLUE RED – NIR
  - 300/100 m: rad qual BLUE – RED – NIR – SWIR
- In 10 day period:
  - only 1 CLEAR observation, but with SWIR = bad  
→ cloud observation enters composite, stripe is visible in S10
- C2: all resolutions: rad qual BLUE – RED - NIR





# Harmonization of compositing: impact

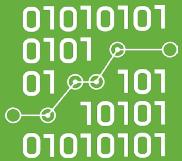
C2 with change in compositing rule:  
SM reflects bad quality SWIR

C1: good quality SWIR in composite,  
but cloudy observations are selected

The screenshot displays a software interface for remote sensing data analysis, specifically focusing on soil moisture (SM) flags and composite imagery.

- Product Explorer:** A table showing various pixel types and their descriptions. The "GOOD..." entries are checked, indicating they are used in the compositing rule.
- Mask Manager:** A panel showing a legend for different pixel types: CLEAR (green), UNDEFI... (yellow), CLOUD (cyan), SNOWICE (orange), CLOUD\_... (light yellow), LAND (magenta), GOOD.... (blue), GOOD.... (purple), GOOD.... (orange), and GOOD.... (green).
- f(x) [x] RGB:** A composite image showing a landscape with green vegetation and a large, dark, textured area representing clouds or bad quality SWIR data.
- [1] SM\_FLAGS:** A blue-toned image showing the SM\_FLAGS layer. It features several vertical black lines and a circular registration mark in the center.
- [2] SM\_FLAGS:** A blue-toned image showing the SM\_FLAGS layer. It is mostly solid blue, indicating no flagged pixels.
- [2] RGB:** A composite image showing the same landscape as the first panel, but with the cloudy area appearing darker and more uniform in tone, reflecting the good quality SWIR data selected by the harmonized compositing rule.

At the bottom of the interface, there are navigation buttons and a status bar showing coordinates (395.13 : 1), a compass rose (0°), and other metadata.

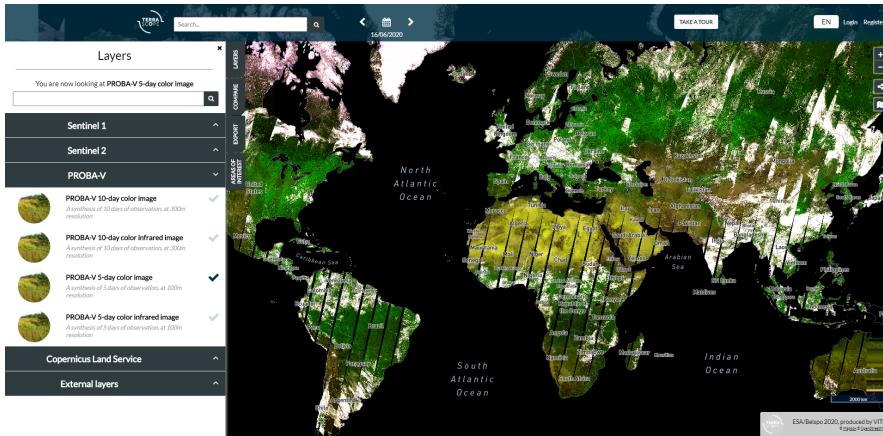


# Product format: changes

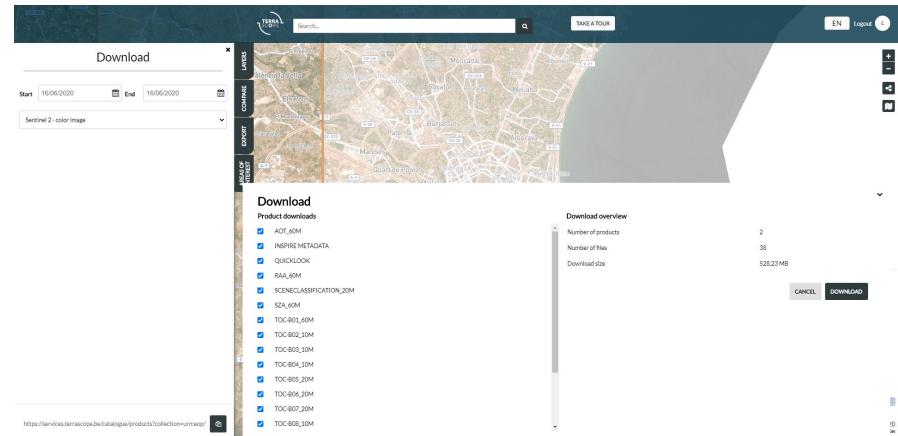
- C1
  - HDF5 and GeoTIFF
- C2
  - HDF5 and Cloud Optimized GeoTIFF  
(<https://www.cogeo.org/>)
  - Update of metadata to allow for threshold compliancy with the CEOS Analysis Ready Data for Land (CARD4L)

01010101  
0101  
01 01 101  
10101  
01010101

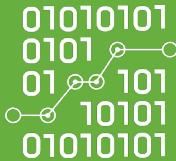
# New catalogue



New user interface  
Integrated time series  
Comparison features



New catalogue: OSCARS  
Authentication update  
(Edugain, Google, Facebook, EOSC)



# Current status

- Status of production
  - ✓ 2013 – 2018 – 2019 – 2020: processed
    - 2014: processing ongoing
    - 2015 – 2015 – 2016 – 2017: ready by Q1/2023
- Validation
  - ✓ Phase I: Verification
  - ✓ Phase II: Analysis of 1 year of data & comparison with external data
    - Report: [Product Evaluation Collection 2 | PROBAV \(vito.be\)](#)
    - Poster: Toté et al. (B3.03 PROBAV and PV-CC)
  - Phase III: Validation of full data set (Q1/2023)