



European Union



**4th SENTINEL-2**

**VALIDATION TEAM MEETING**

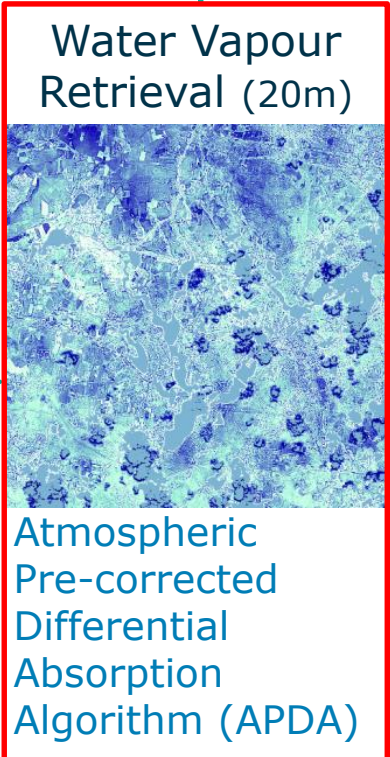
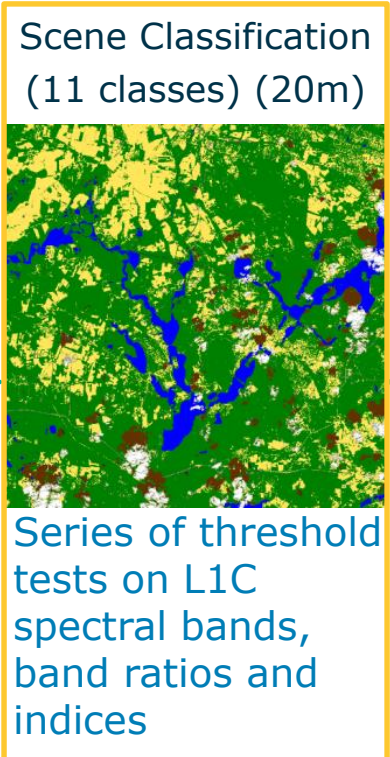
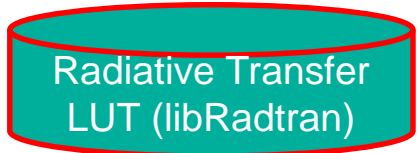
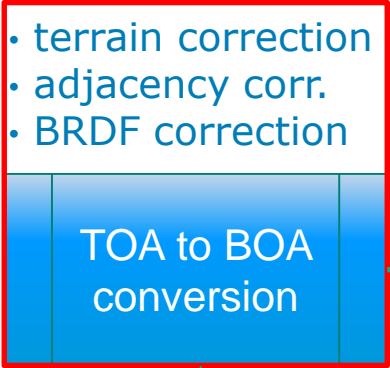
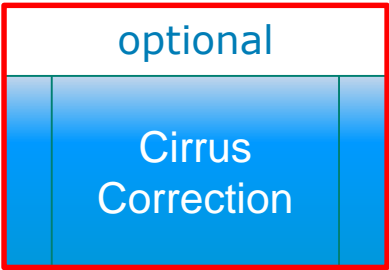
15–17 March 2021 | Virtual Event

**Sentinel-2 Level-2 processing: Sen2Cor status and outlook for 2021**



1. Sen2Cor processor overview
2. Sen2Cor versions (TOOLBOX) – L2A processing baselines (PDGS)
3. L2A product quality references
4. Future evolutions in 2021
5. Recommendations / Discussion

# Sen2Cor processor overview



- 10m:
- 4 bands
  - AOT, WV maps
- 20m (60m):
- 9 (11) bands
  - SCL, AOT, WV
  - cloud probability
  - snow probability

# Sen2Cor versions



## General User's versions:

Version 2.5 released on March 19, 2018 (publicly available)

Version 2.8 released on May 10, 2019 (publicly available)

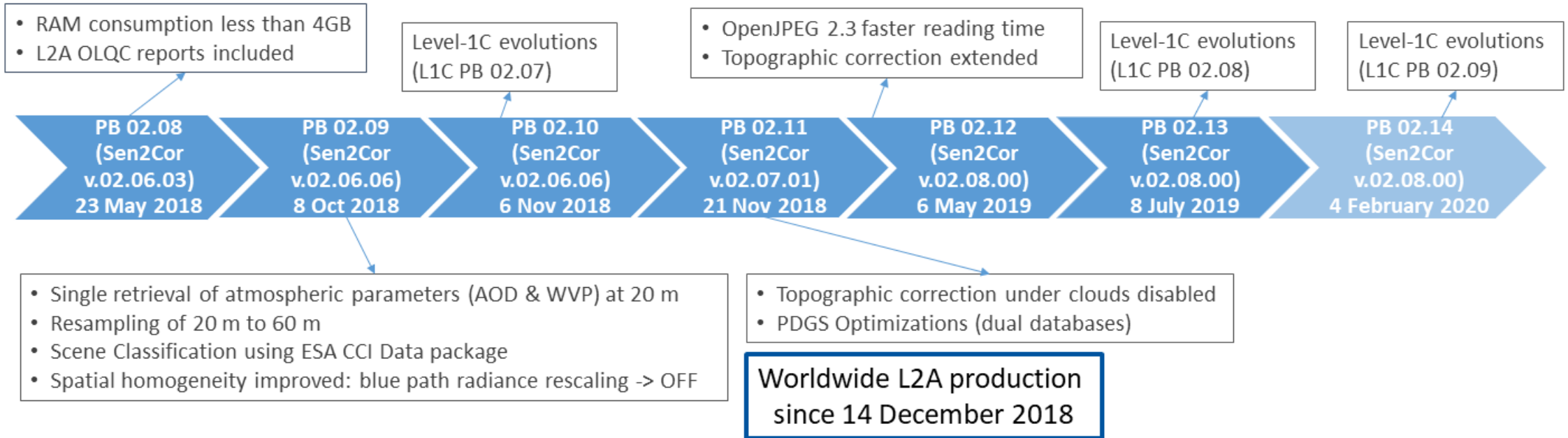
Version 2.9 to be soon released

## S2 PDGS versions:

Version 2.8 in operations since May 2019  $\geq$  L2A PB 02.12

Version 2.9 to be soon transferred to operations: L2A PB 02.15  
(supports L1C refined products)

# Level-2A processing baselines



**L2A data quality consistent since PB 02.12**

# L2A product quality references



L2A Product Performance reported in the monthly L2A Data Quality Reports:

<https://sentinels.copernicus.eu/web/sentinel/data-product-quality-reports>

Next presentation:

Comparison of the Copernicus Sentinel-2 L2A Core Product distributed by ESA and the Sen2Cor Toolbox 'user-generated' product

# Future evolutions



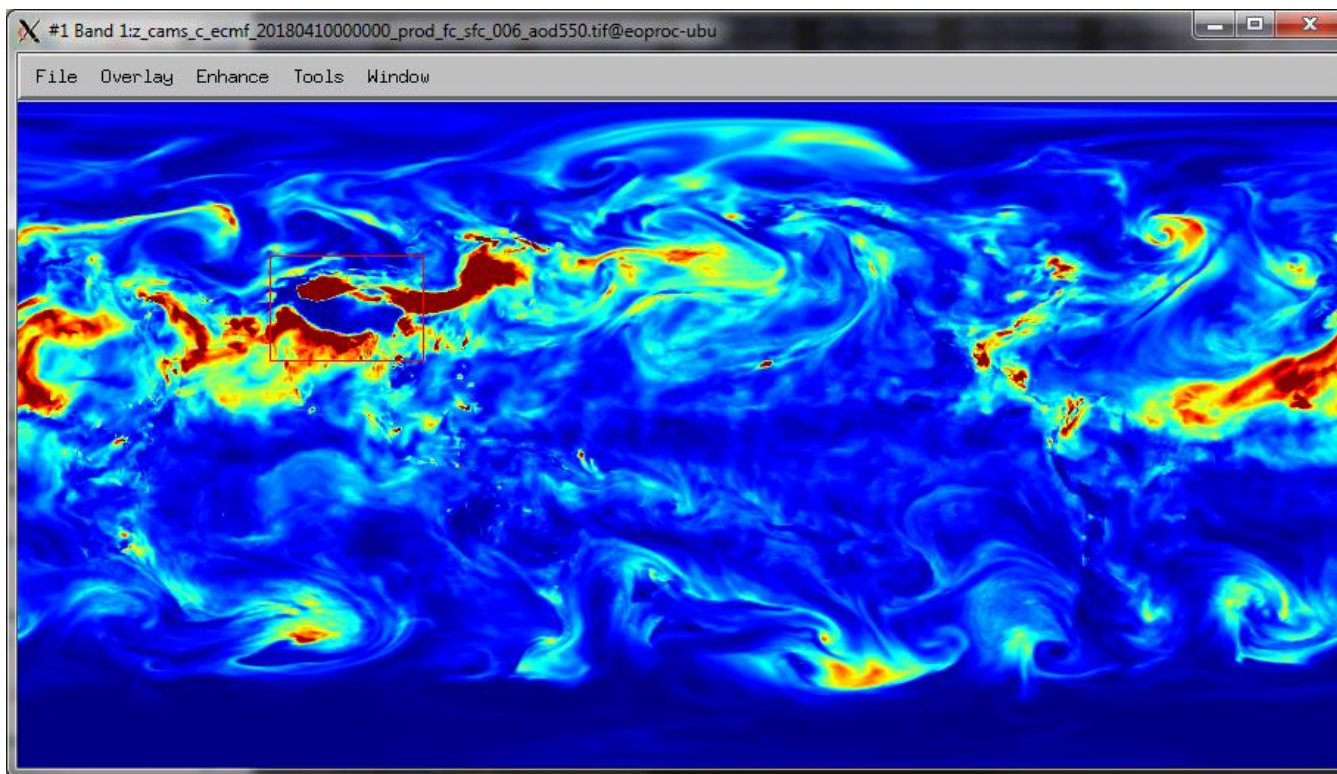
1. Compatibility with the Copernicus DEM @90m (PDGS format)
2. Support of PSD 14.6 (PSD updated for L1C refined products)
3. Sen2Cor supporting CAMS atmospheric data
4. Sen2Cor Scene Classification Evolution
5. Addition of L2A Quality Indicators
6. Provision of band B01 also at 20m resolution
7. Addition of a DOI (Digital Object Identifier)
8. Support of Landsat-8 and Python 3 (dedicated presentation)

2.9

2.10

3.0

# Future evolution: Sen2Cor CAMS



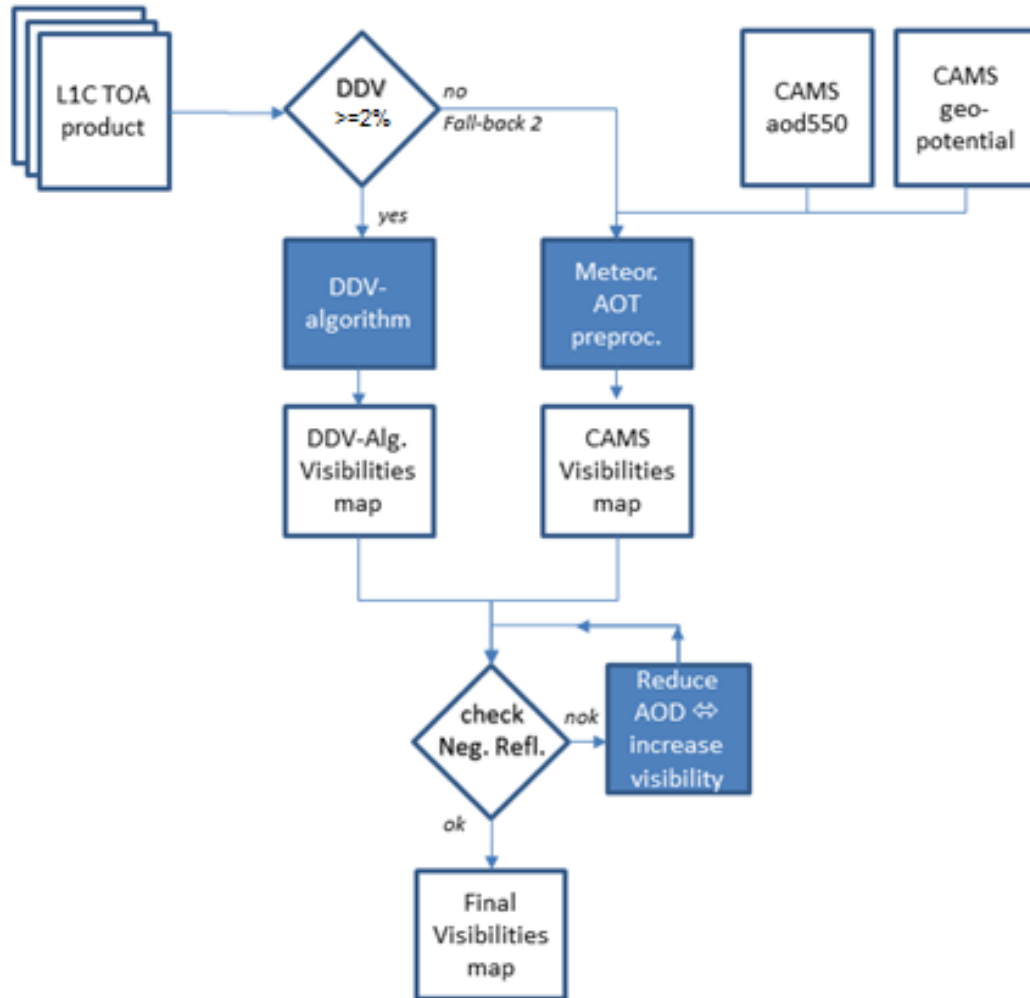
L2A improvements expected on non vegetated areas:

- Bare areas like deserts
- Ice/snow covered areas
- Coastal areas, seas
- Winter products

Example of CAMS aod550 product 0.4 x 0.4 deg lat-lon grid  
source: Copernicus Atmosphere Monitoring Service (CAMS)



# Future evolution: Sen2Cor CAMS



- Fall back solution when DDV pixels are missing in the image.
- ECMWF-CAMS Total AOD at 550 nm short term forecast (< 24 hours)
- Sen2Cor CAMS developed by TPZ F
- Validation performed by DLR

# Future evolution: Scene Classification



- Improved casted shadow algorithm supporting Copernicus DEM 30 m
- Limit false cloud detection on bright pixels
- Limit false snow detection in clouds
- Improved cloud shadow detection
- Dilation of cloud (80m) / cloud shadow (40m) / snow (20m)

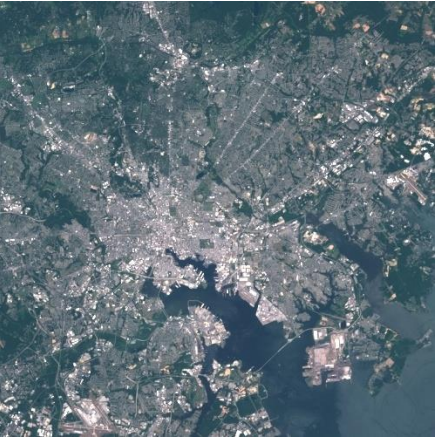
*Cloud top height estimation derived from S2 MSI instrumental parallax properties used to improved the quality of cloud shadow and cloud / snow mask detection.*

# Future evolution: Scene Classification

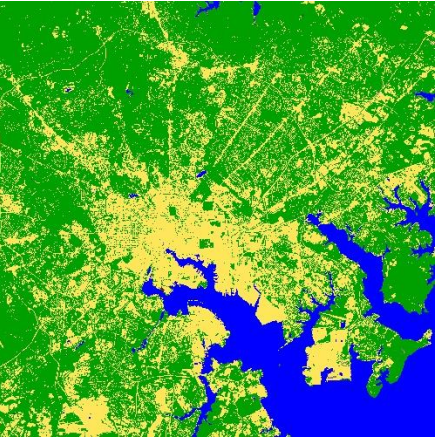
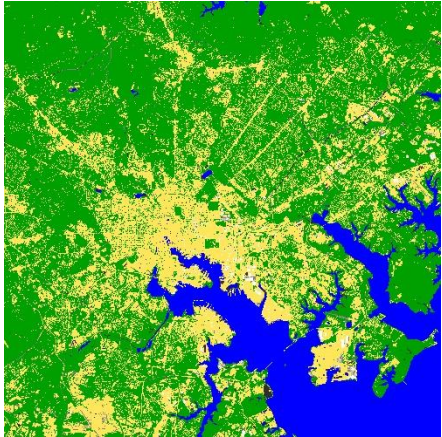


Location: Baltimore, USA

Date: 10/07/2018



L1C



Prototype

v. 2.8

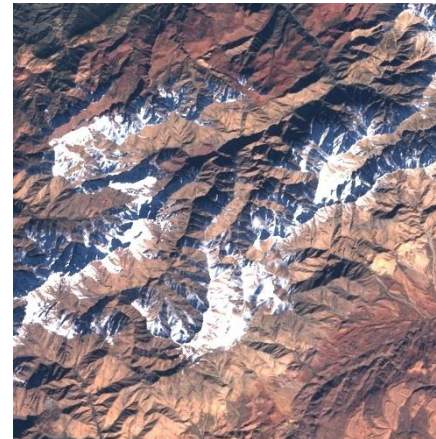
Artificial bright targets

# Future evolution: Scene Classification

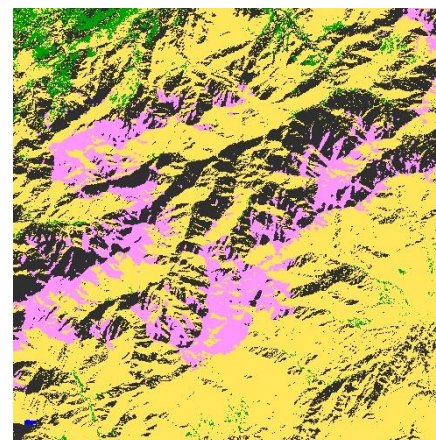
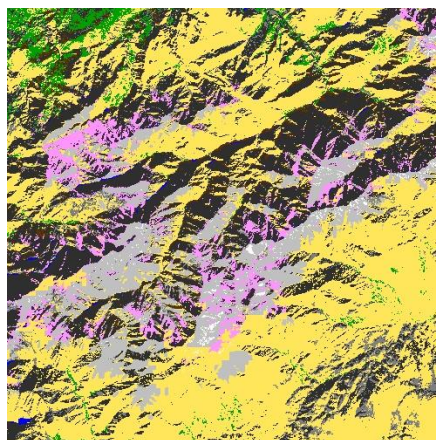


Location: Atlas, Morocco

Date: 18/12/2017



L1C



Prototype

v. 2.8

Natural bright targets: slopes facing sun

# Future evolution: Scene Classification



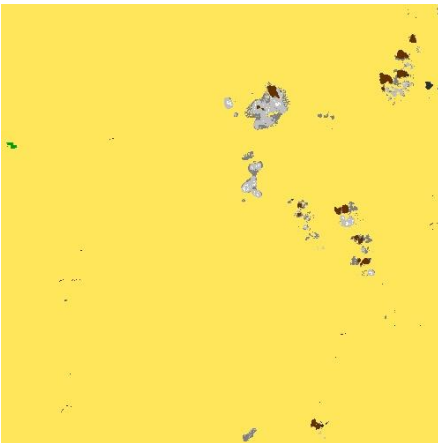
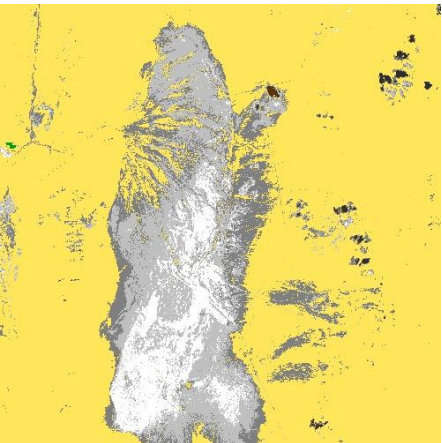
Location: Arizona, USA

Date: 01/05/2017



L1C

v. 2.8



Prototype

Natural bright targets: bright sand/salt desert

# Recommendations / Discussion



- With Toolbox version:
  - Use of a Digital Elevation Model (DEM) in Sen2Cor to improve scene classification
  - Download and install ESA CCI auxiliary data package
  - Use the default configuration shipped with Sen2Cor v.02.08.00
- General comment:
  - Careful with L2A products acquired with Sun Zenith Angle (SZA) higher than  $70^\circ$
  - More details in monthly data quality reports

# External links and references



- L2A products available on OpenHub

<https://scihub.copernicus.eu/dhus/>

- Sen2Cor version 2.9 for SNAP Toolbox (soon) available at:

<http://step.esa.int/main/third-party-plugins-2/sen2cor/>



# Thank you for attention !



## Sentinel-2 Level-2 processing: Sen2Cor status and outlook for 2021



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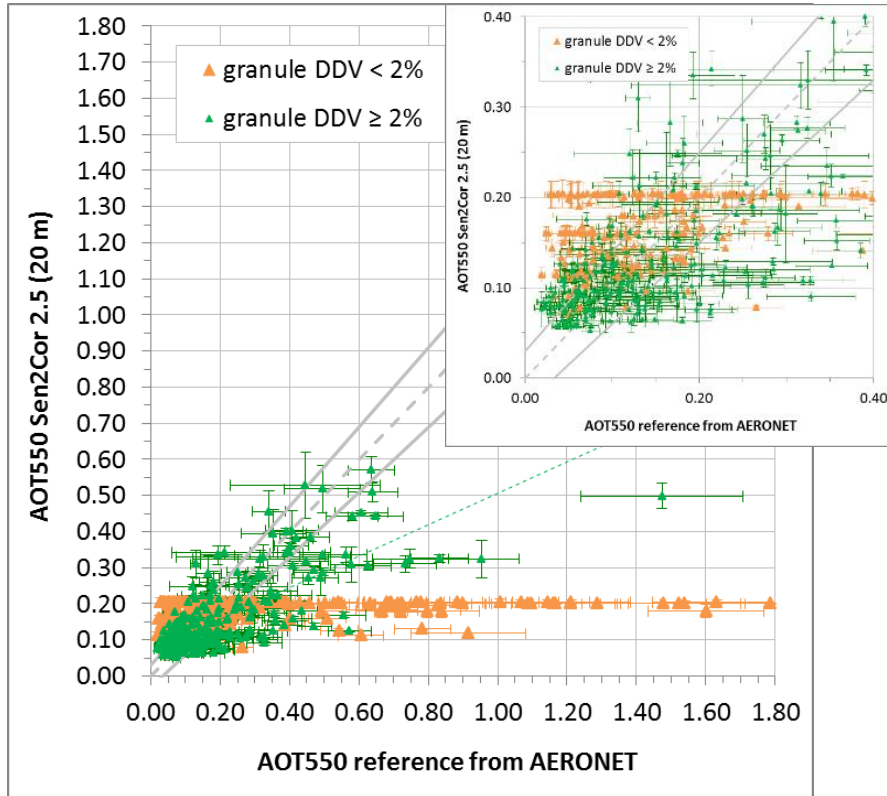




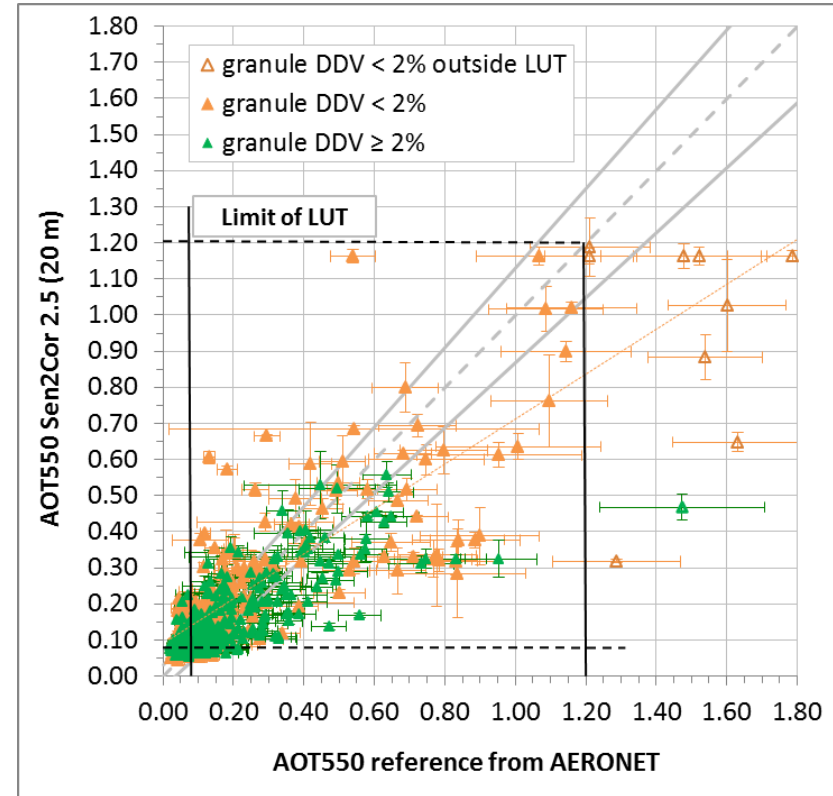
# Future evolution: Sen2Cor CAMS



## Sen2Cor 2.5 public version

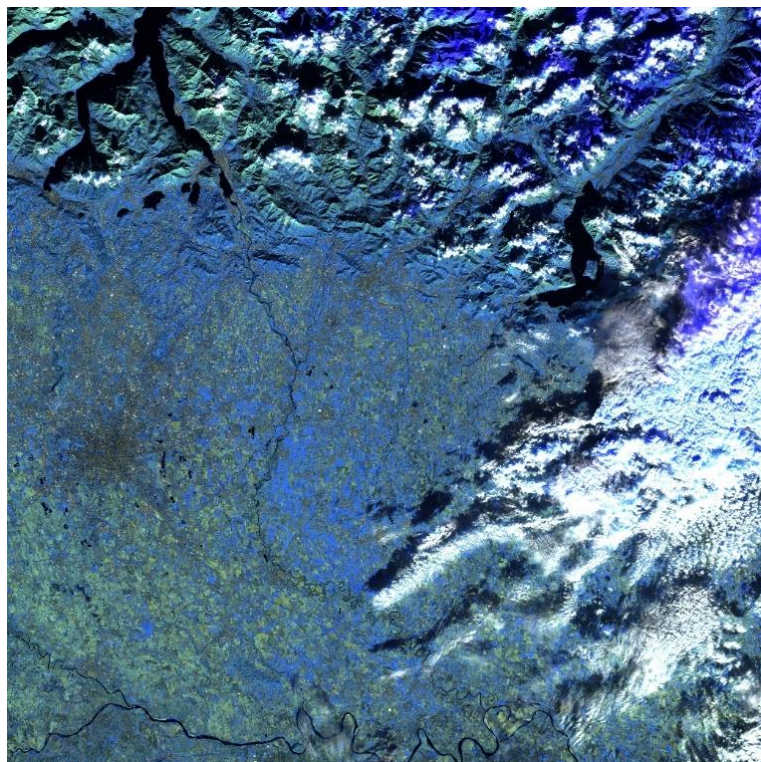


## Sen2Cor 2.5 CAMS prototype

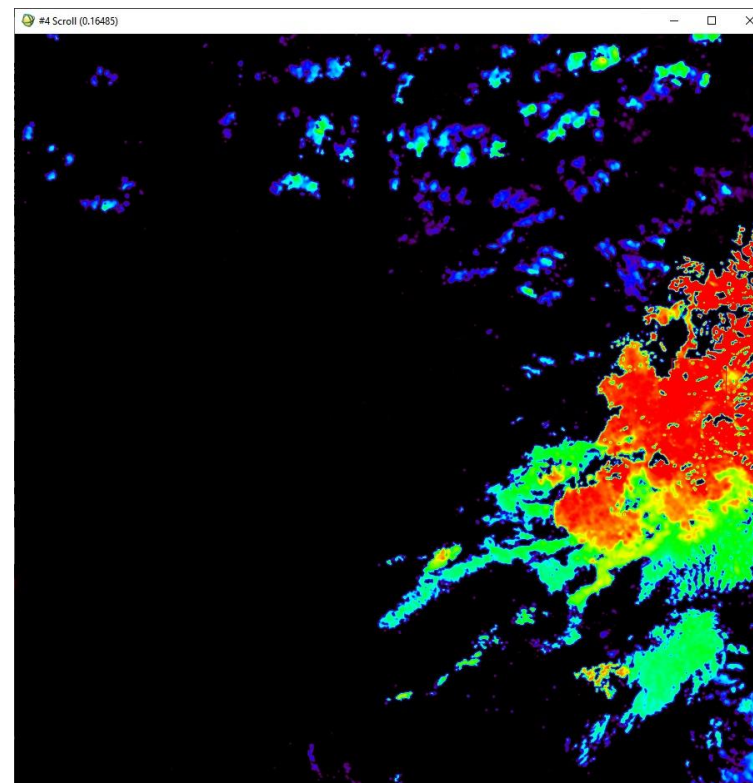


Correlation plot of Sen2Cor  $AOT_{550}$  retrieval at 20 m resolution versus  $AOT_{550}$  reference from AERONET (25 AERONET sites)

# Future evolution: Scene classification

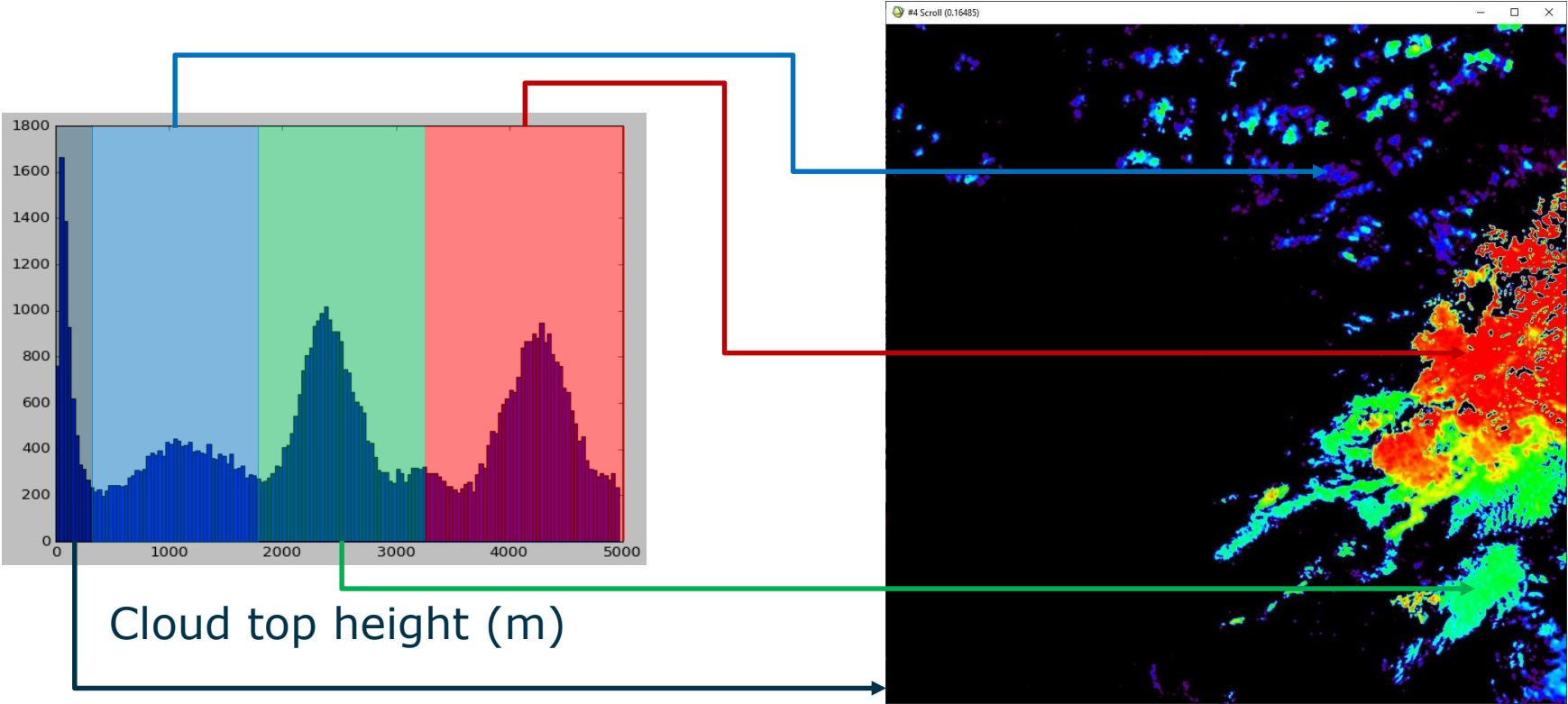


RGB: (B12, B11, B8A)



Cloud top height estimation

# Future evolution: Scene classification



Cloud top height (m)

Cloud top height estimation