



Land Monitoring

CLMS Sentinel-3 OLCI and SLSTR surface reflectance as common basis for derived land products

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Sentinel-3 Validation Team Meeting – 30.03.2026-01.04.2026



CLMS Bio-geophysical Portfolio

Vegetation



- Burnt Area
- Leaf Area Index
- Fraction of Absorbed Photosynthetically Active Radiation
- Fraction of vegetation cover
- Normalized Difference Vegetation Index
- Dry Matter Productivity
- Net Primary Production
- Land Surface Phenology

Water Bodies



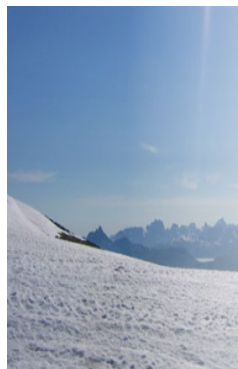
- Water Bodies
- Lake Ice Extent
- River and Lake Water Level
- Lake Water Quality

Temperature & reflectance



- Surface Reflectance
- Land Surface Temperature
- Lake Water Surface Temperature

Snow



- Snow Cover Extent
- Snow State
- Snow Water Equivalent

Soil moisture



- Surface Soil Moisture
- Soil Water Index

Evapotranspiration



- Evapotranspiration
- Heat flux

Free and Open Access

<https://land.copernicus.eu>

<https://dataspace.copernicus.eu/>



CLMS Sentinel-3 Biophysical NRT Products – Current status

Variable	Temporal coverage	Temporal resolution	Spatial coverage	Spatial resolution	Sensor
Surface Reflectance V2.3	June 2018 - present	1 day	Global	300m	S3/OLCI & SLSTR
LAI – FAPAR – FCOVER V2	2014 - present	10 days	Global	300m	PROBA-V + S3/OLCI
NDVI V3	2014 - present	10 days	Global	300m	PROBA-V + S3/OLCI
DMP – NPP V2	2014 - present	10 days	Global	300m	PROBA-V + S3/OLCI
Land Surface Phenology V2	2014 - present	1 year	Global	300m	PROBA-V + S3/OLCI
Burnt Areas V4	July 2018 – present Jan 2025 - present	1 month 1 day	Global	300m	S3/OLCI & SLSTR
Evapotranspiration V1	Nov 2025 – present	10 days	Global	300m	S3/OLCI & SLSTR
Heat flux V1	Nov 2025 – present	1 day	Global	300m	S3/OLCI & SLSTR
Lake Water Quality V2	Sept 2024 – present	10 days	Global	300m	S3/OLCI
River and Lake Water Level V2	1992 – present 2002 – present	-	Lakes Rivers	-	Altimeters
Lake Ice Extent V2	July 2025 – present	1 day	Global	500m	S3/SLSTR
Lake Water Surface Temperature V1	Nov 2016 – present	10 days	Global	1km	S3/SLSTR

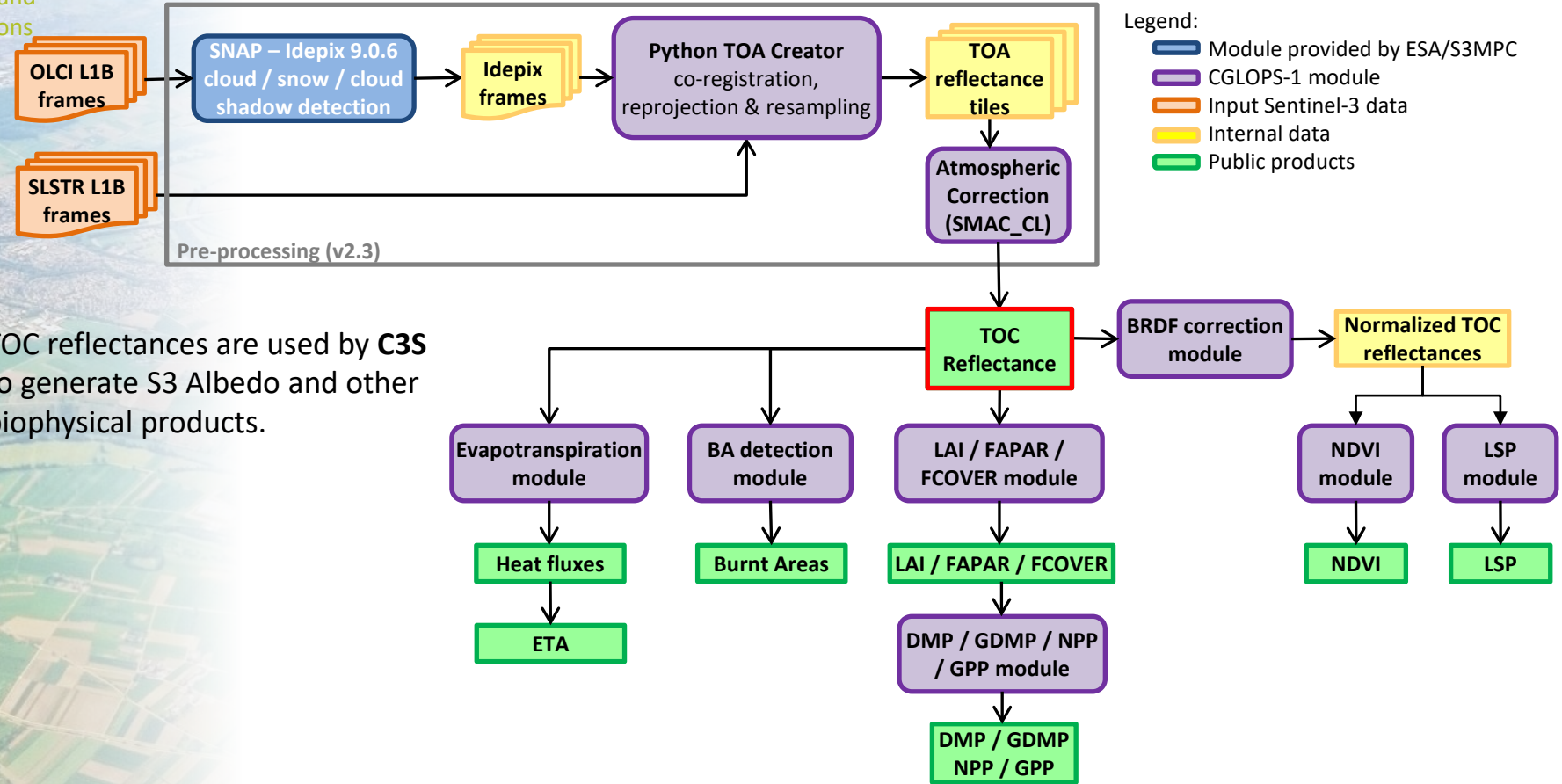
CGLOPS-1

CGLOPS-2



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CLMS Sentinel-3 "Vegetation" Biophysical Products – Workflow of NRT chain



TOC reflectances are used by **C3S** to generate S3 Albedo and other biophysical products.



Sentinel-3 Surface Reflectance – Processing chain

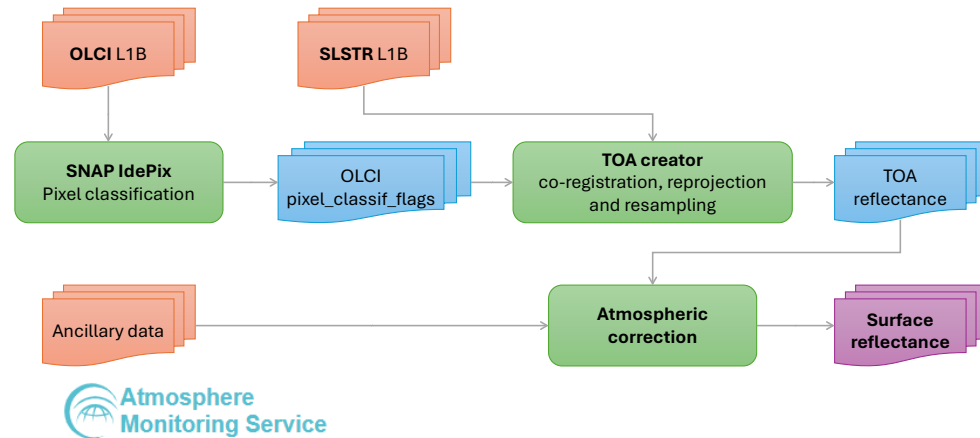
Input

- Baseline Collection 004 OLCI and SLSTR Level1B
- ancillary data from CAMS and MERRA-2 for atmospheric correction

Processing chain

- pixel classification
- co-registration between OLCI and SLSTR
- reprojection and resampling to a regular 1°/336 (~300m) grid
- calibration adjustment factors applied on OLCI-A and on SLSTR
- atmospheric correction (SMAC)
- propagation of per-pixel uncertainties

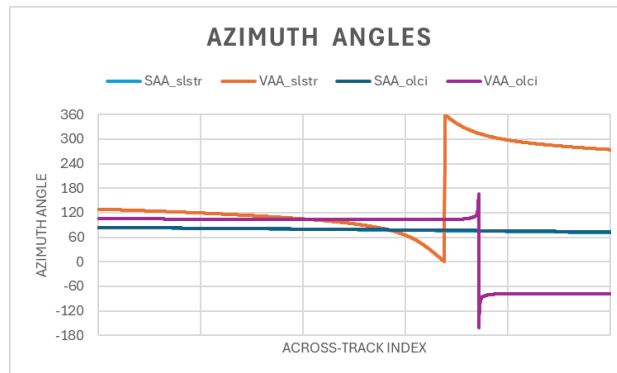
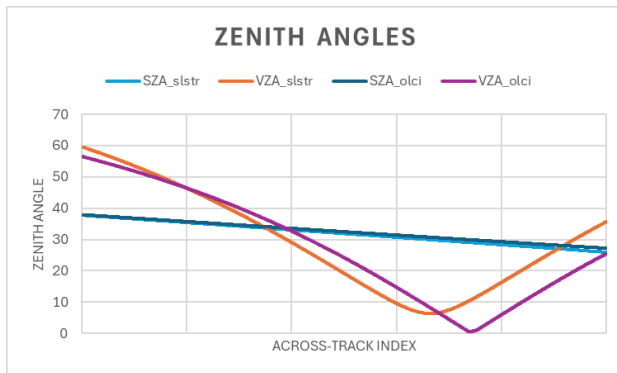
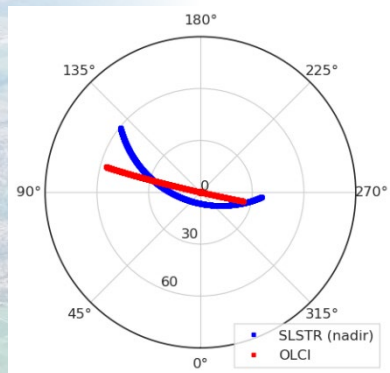
Output products at 300m resolution: Surface Reflectance V2.3 (2018 – NRT)



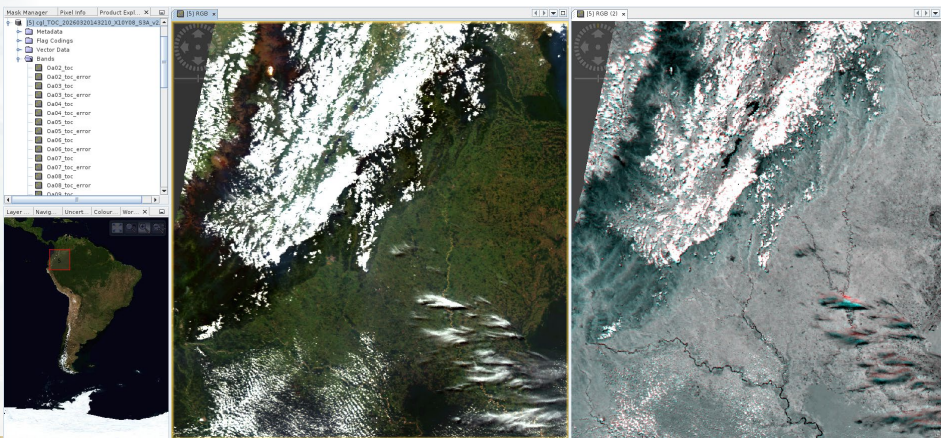


Sentinel-3 Surface Reflectance – Challenges

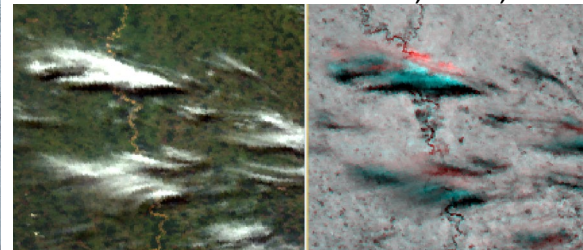
❑ OLCI and SLSTR: two different scanning systems



❑ Parallax effects



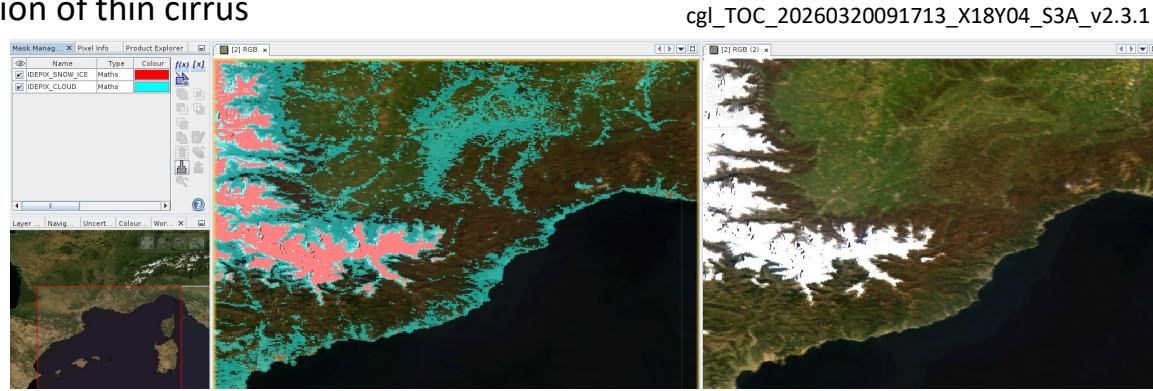
OLCI True color RGB RGB S3, Oa17, Oa17





Sentinel-3 Surface Reflectance – Challenges

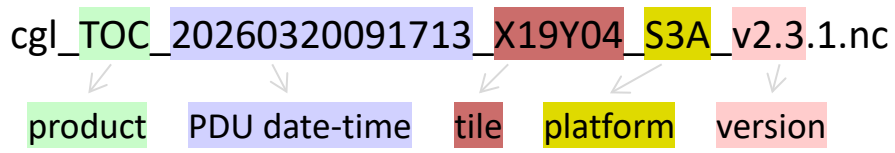
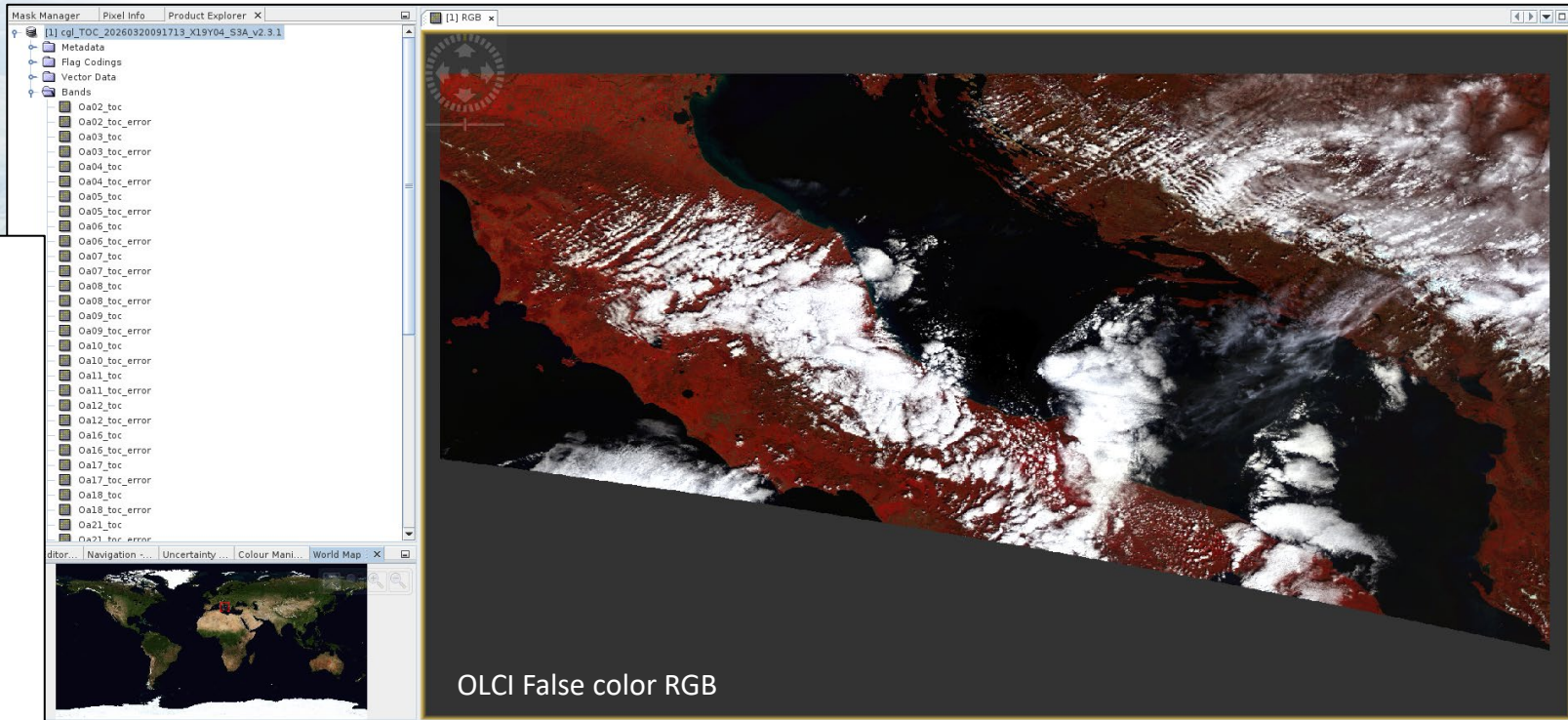
- ❑ Surface reflectance product is only generated in case of matching OLCI/SLSTR products pair
- ❑ OLCI and SLSTR: not identical instrument footprint
- ❑ Radiometric calibration adjustments are applied
 - On OLCI-A based on tandem study results (Lamquin et al., 2020)
 - On SLSTR (VNIR-SWIR) bands based on [vicarious calibration adjustment factors](#) (S3MPC, 2021)
- ❑ Pixel classification
 - No combined OLCI+SLSTR cloud/shadow/snow pixel identification
 - OLCI Idepix: some omission of semi-transparent clouds, over-detection over bright surfaces, misidentification of snow as clouds
 - SLSTR cloud flag: over-detection of thin cirrus





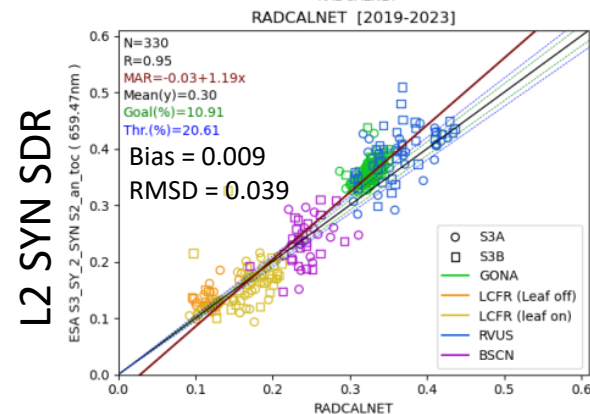
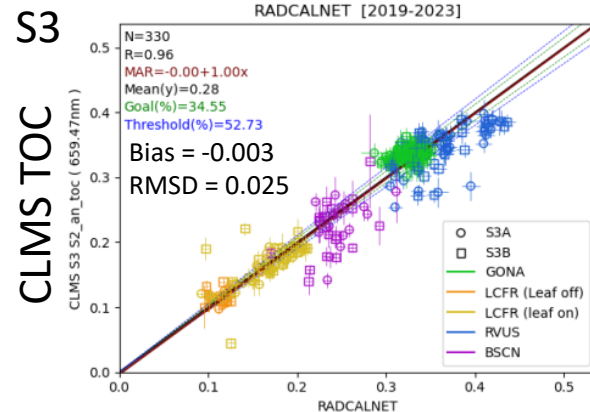
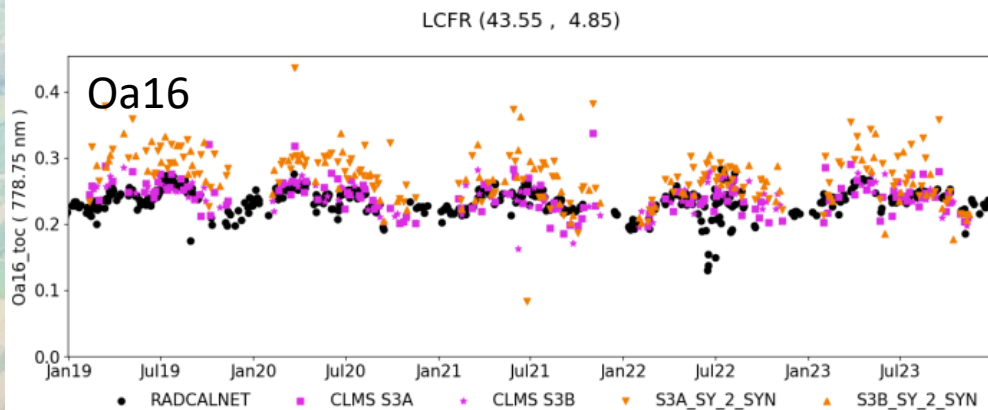
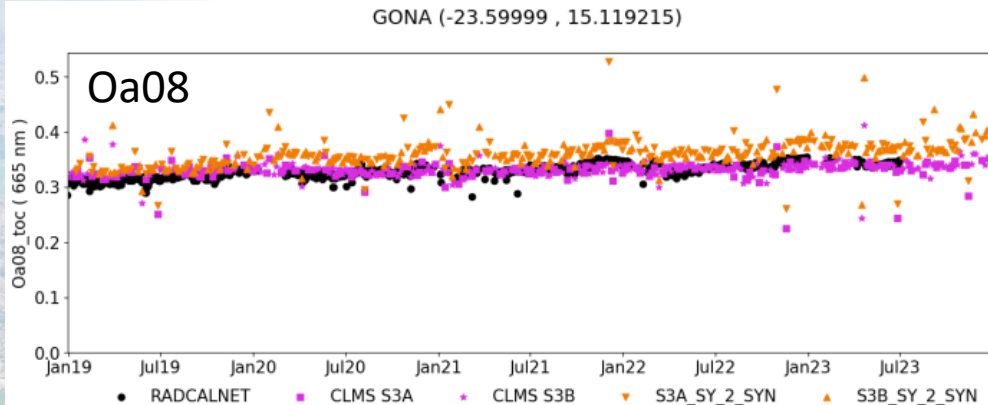
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Sentinel-3 Surface Reflectance – Example product





Sentinel-3 Surface Reflectance – Validation



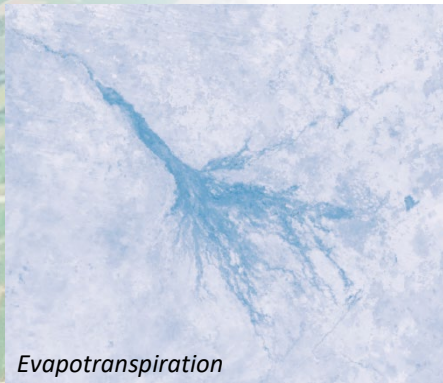
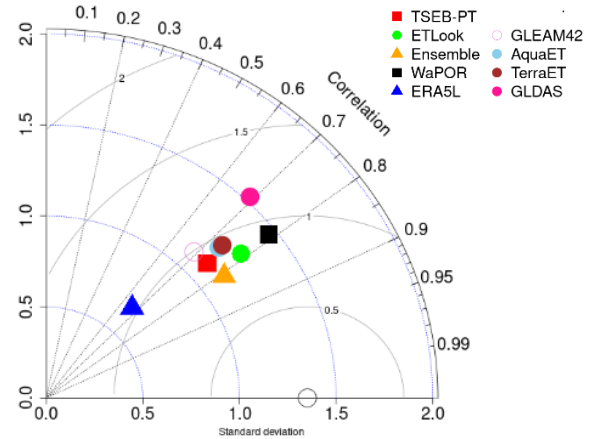
ATBD, PUM and Validation report at:

<https://land.copernicus.eu/en/products/temperature-and-reflectance/surface-reflectance-2018-present-raster-300m-global-daily-version-2.3>

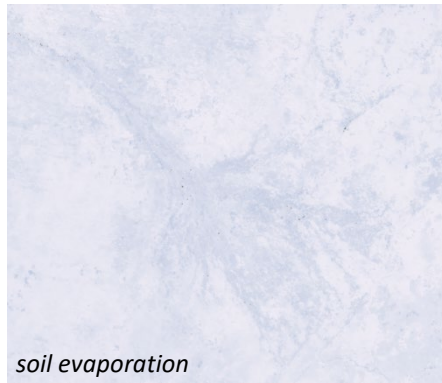


CLMS Evapotranspiration and Heat Flux

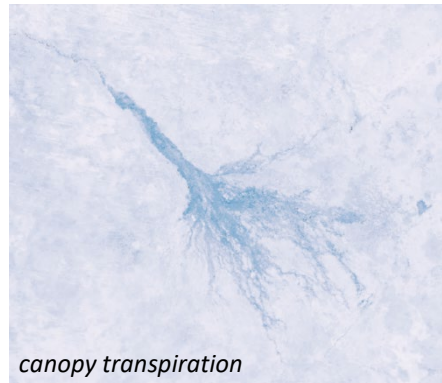
- ❑ CLMS OLCI Surface Reflectance and ESA SLSTR LST as input
- ❑ Two evapotranspiration modelling frameworks (TSEB-PT, ETLook) and an Ensemble model
- ❑ 10-daily actual evapotranspiration (ET), soil Evaporation, canopy Transpiration + QFLAG
- ❑ Daily Sensible and Latent heat fluxes from TSEB-PT + QFLAG
- ❑ In comparison with in-situ data on +200 Eddy covariance sites, Ensemble ET performs best



Evapotranspiration



soil evaporation



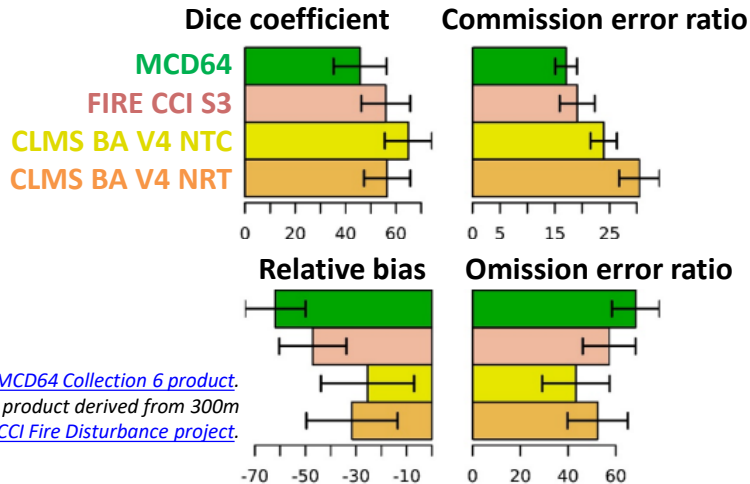
canopy transpiration





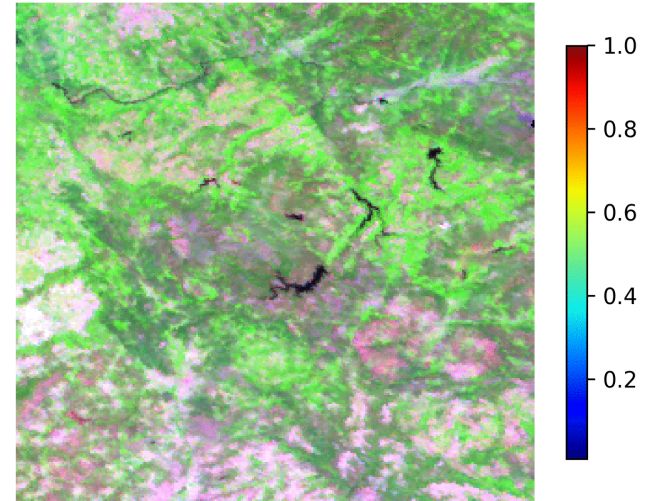
CLMS Burnt Areas V4.0

- ❑ Daily NRT (Jan 2025 onwards) and Monthly NTC products (July 2018 onwards) (Padilla et al., 2025)
- ❑ Day of burn and associated probability, Burnt fraction of pixel and associated probability, QFlag
- ❑ Compared with 2020 reference dataset provided by C3S
 - Monthly NTC BA V4 is the most accurate
 - Daily NRT BA V4 is as accurate as best non-CLMS NTC products



MCD64: Non-Time-Critical [MODIS-MCD64 Collection 6 product](#).
FIRE CCI S3: Non-Time-Critical product derived from 300m Sentinel-3 SLSTR in the [ESA CCI Fire Disturbance project](#).

01-08-2025

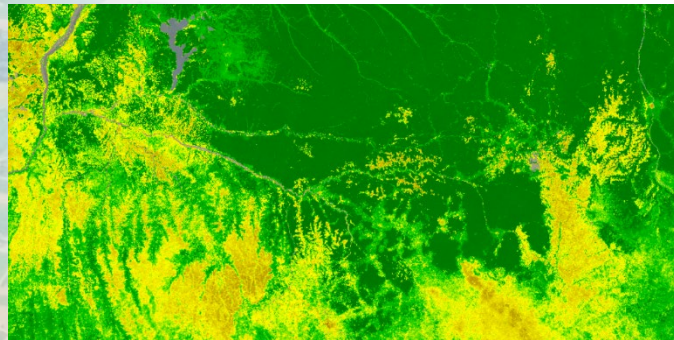
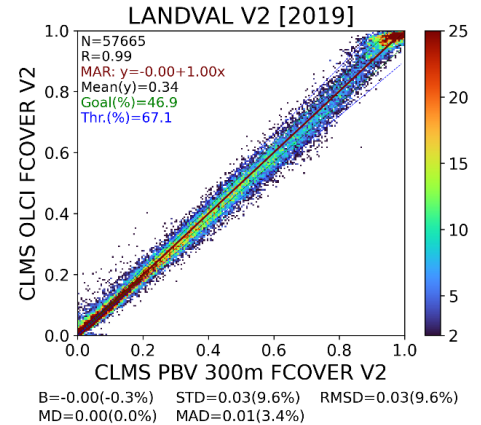


Daily fractional burned area over northwestern Spain. Each reflectance image is viewed in two snapshots: the first without the BA detections of the day and the following one with the detections of the day.

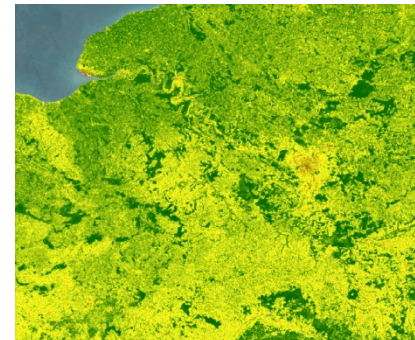


CLMS LAI, FAPAR, FCOVER V2

- ❑ Neural networks (EBF/non EBF) to get instantaneous estimates + filtering and gap filling (EBF only)
- ❑ Compositing for dekadal estimates in near-real time (RT0) and consolidated after 1 (RT1), 2 (RT2) and 6 (RT6) dekads.
- ❑ 10-daily LAI, FAPAR and FCOVER with associated uncertainties, quality indicators +Qflag
- ❑ Validation is in progress
 - very good consistency between PROBA-V and OLCI estimates



LAI, February 2025, Congo



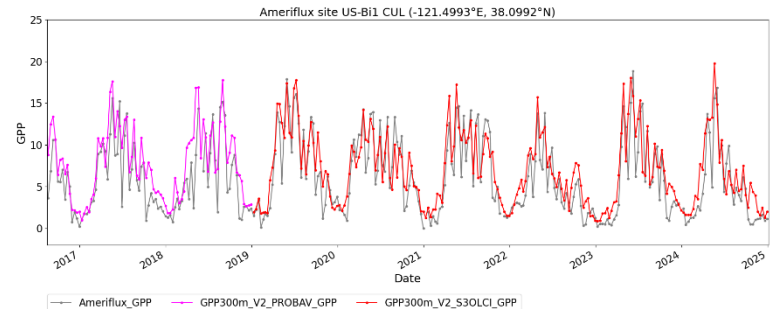
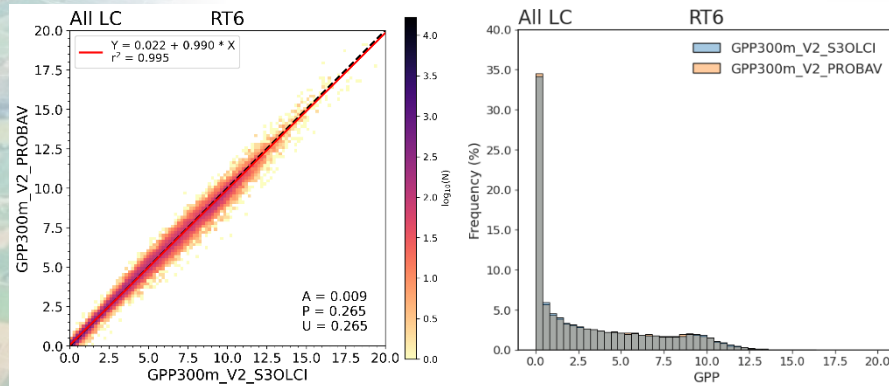
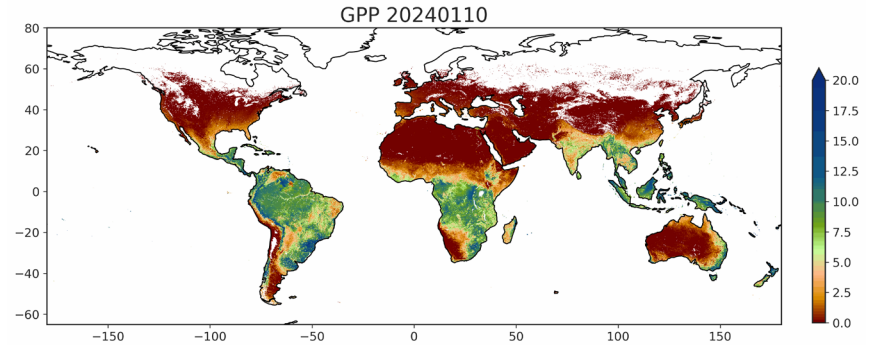
Fcover June 2025, France

ATBD, PUM and Validation report at: <https://land.copernicus.eu/en/products/vegetation/leaf-area-index-v2-0-300m>
<https://land.copernicus.eu/en/products/vegetation/fraction-of-absorbed-photosynthetically-active-radiation-v2-0-300m>
<https://land.copernicus.eu/en/products/vegetation/fraction-of-green-vegetation-cover-v2-0-300m>



CLMS (G)DMP, NPP, GPP V2

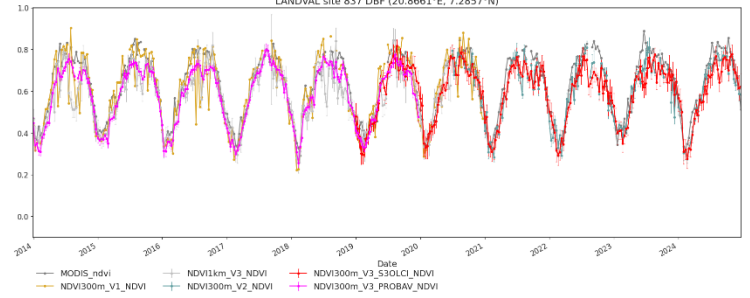
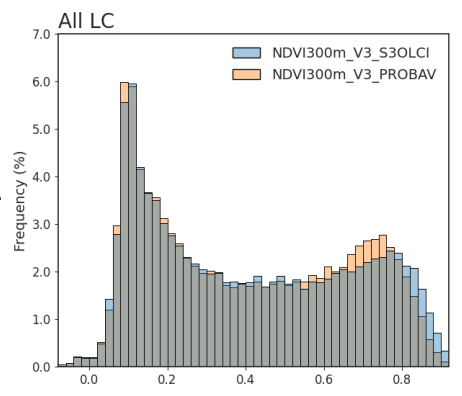
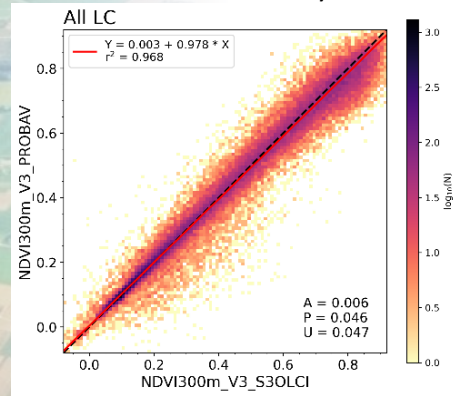
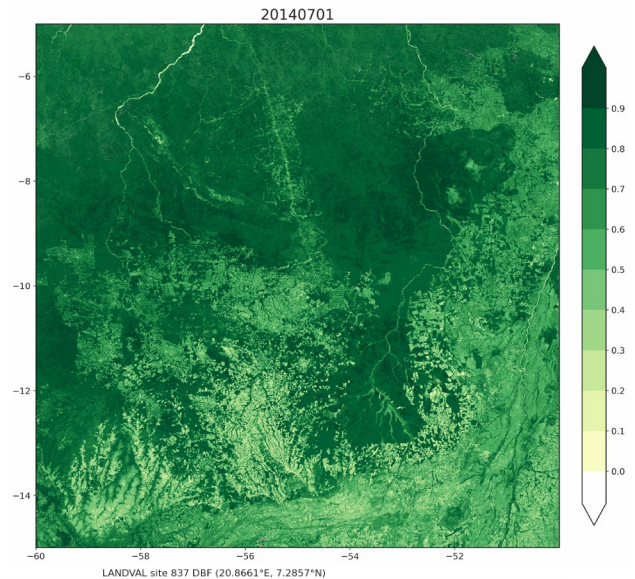
- ❑ Derived from FAPAR V2 and meteorological data (ECMWF)
- ❑ Compositing for dekadal estimates in near-real time and consolidated after 1, 2 and 6 dekads
- ❑ 10-daily DMP, GDMP, NPP and GPP, quality indicators +Qflag
- ❑ Quality Assessment Report will be released soon





CLMS NDVI V3

- ❑ BRDF-correction applied on PROBA-V Collection 2 and CLMS OLCI Surface Reflectances
- ❑ 10-daily NDVI and associated uncertainty, quality indicators + QFlag
- ❑ Good spatial and statistical consistency between PROBA-V and OLCI NDVI
- ❑ Large spatial and statistical consistency with NDVI 1km V3, suitable to extend the time series to the past (+25 years from 1999 onwards)



ATBD, PUM and Validation report at:

<https://land.copernicus.eu/en/products/vegetation/normalised-difference-vegetation-index-v3-0-300m>

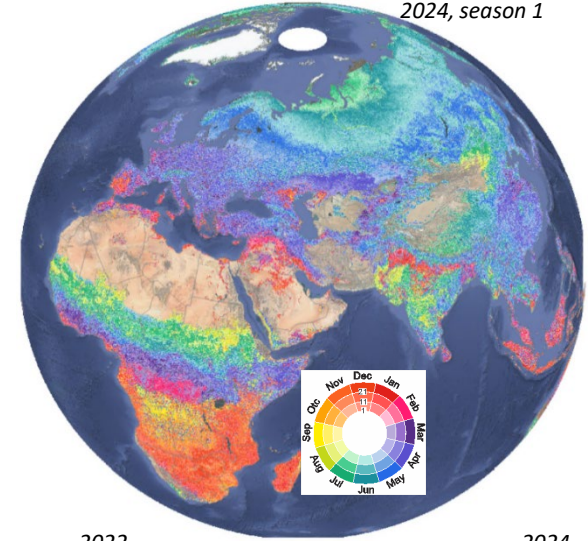


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CLMS Land Surface Phenology V2

- ❑ PROBA-V and OLCI BRDF-corrected TOC reflectances used as input
- ❑ 11 years of 13 phenology and productivity parameters for up to 2 growing seasons + QFlag
- ❑ Start and End of Season dates reliably captured against in-situ data from 4 networks
- ❑ Robust and consistent product with high spatial coherence and realistic latitudinal and biome-specific variability

Date of Maximum of Season
2024, season 1



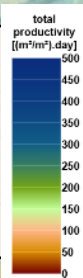
Egypt
Total Productivity – Season 1
2014

2018

2020

2022

2024



ATBD, PUM and Validation report at:

<https://land.copernicus.eu/en/products/vegetation/land-surface-phenology-2014-present-raster-300m-global-yearly-version-2>



Wrap-up

- ❑ Sentinel-3 OLCI+SLSTR based CLMS products
 - Surface reflectance: archive from 2018 + NRT production
 - Derived bio-geophysical variables
- ❑ Free and open access

Product documentation PUM, ATBD, QAR	https://land.copernicus.eu
Product exploration	https://land.copernicus.eu/en/map-viewer https://browser.dataspace.copernicus.eu/
Product download	https://dataspace.copernicus.eu/
Service desk	https://land.copernicus.eu/en/contact-service-helpdesk



Land Monitoring

Thank you for your
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