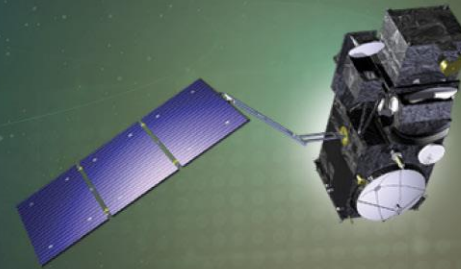




PROGRAMME OF THE
EUROPEAN UNION



co-funded with



7th Sentinel-3 Validation Team Meeting 2022

18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy

The “Copernicus Space Component Validation for Land Surface Temperature, Aerosol Optical Depth and Water Vapor Sentinel-3 Products (LAW)” Project : Overview and Main achievements regarding S3 validation

C. Henocq¹, M. Denisselle¹, Y. Drocourt¹, L. Sogacheva², P. North³, N. Kalakoski², V. Sofieva², R. Preusker⁴, D. Ghent⁵, F. Goettsche⁶, J. Anand⁵, L. Pérez-Planells⁶, J-M. RIVET¹, L. Kleverman¹, S. Scifoni⁷, S. Dransfeld⁸

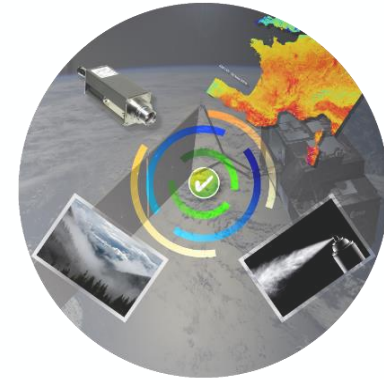
(1) ACRI-ST, (2) Finnish Meteorological Institute (FMI), (3) Swansea University, (4) Spectral Earth, (5) University of Leicester, (6) KIT - Karlsruher Institut für Technologie, (7) SERCO c/o ESA-ESRIN, (8) ESA/ESRIN

ESA UNCLASSIFIED – For ESA Official Use Only



Overview of the LAW project

- 2-years ESA/Copernicus project started in January 2020 – extended in 2022 to cope with COVID travel restrictions
- European consortium gathering Validation, Instrumentation and Expert teams
- **MAIN OBJECTIVE** = Having a **more extensive and systematic validation** of three Sentinel 3 parameters against ground-based measurements
 1. Increasing the level of confidence the users will have in these products
 2. Better identify areas where product are limited and need to be improved



Disclaimer

The work performed in the frame of this contract is funded by the European Union.

The views expressed herein can in no way be taken to reflect the official opinion of the European Space Agency or the European Union.

Objectives of the LAW project : Validation of S3 products using comparison with ground-based measurements:

1. Collect, control and qualify the selected in-situ measurements
2. Create S3 products /ground-based measurements **matchups**
3. Analysis of theses matchups regarding S3 quality assessment, S3 parameters uncertainties and possible Algorithm evolutions
4. **Distribution of these matchups through a dedicated web portal**



OL_2_LFR____

Providing **Integrated Water Vapour (IWV)** column on 300m resolution – Over Land and Ocean

SL_2_LST____

Providing **Land Surface Temperature (LST)** on 1 km resolution

SY_2_AOD____

Providing **Aerosol Optical Depth (AOD)** on 4,5 km resolution – Over Land and Ocean

Objectives of the LAW project : Validation of S3 products using comparison with ground-based measurements:

1. Enlarge the LST-dedicated networks as current deficiency in term of biome coverage :
 - Perform a LST gap analysis to select 5 relevant locations + deploy and maintain these new 5 LST stations
2. Create S3 products /ground-based measurements **matchups**
3. Analysis of theses matchups regarding S3 quality assessment, S3 parameters uncertainties and possible Algorithm evolutions
4. **Distribution of these matchups + + LST raw data** through a dedicated web portal



OL_2_LFR____

Providing **Integrated Water Vapour (IWV)** column on 300m resolution – Over Land and Ocean

SL_2_LST____

Providing **Land Surface Temperature (LST)** on 1 km resolution

SY_2_AOD____

Providing **Aerosol Optical Depth (AOD)** on 4,5 km resolution – Over Land and Ocean



Main achievements of the LAW project :

- **Validation over 2-years** of the OLCI IWV dataset and the SYN AOD dataset :
 - Data quality assessment and analysis of the associated uncertainties (dedicated papers published in AMT)
 - Definition of the products limitations and specification of required algorithm evolutions
- On-going Validation of the SLSTR LST datasets (Final result end of 2022)
- **Deployment of 5 new LST stations** in Europe and Australia since October 2021 (except KIT forest -August 2020). Nominal acquisition and data transmission
- Creation of a **matchup database** fully open to anyone (after subscription) via a web portal <https://law.acri-st.fr/home> providing :
 - All information about the project
 - On-demand matchup request (from January 2020) + Provision of In-situ data from selected networks
 - Validation report and results





Main achievements of the LAW project :

➤ **Validation over 2-years** of the OLCI IWV dataset and the SYN AOD dataset :

- Data quality assessment and analysis of the associated uncertainties (dedicated papers published in AMT)
- Definition of the products limitations and specification of required algorithm evolutions

R. Preusker – 19/10/2022 – Atmosphere Session 9:00 AM

L. Sogacheva – 19/10/2022 – Aerosols, Cloud and Surface Session 10:00 AM

➤ On-going Validation of the SLSTR LST datasets (Final result end of 2022)

➤ **Deployment of 5 new LST stations** in Europe and Australia since October 2021 (except KIT forest -August 2020). Nominal acquisition and data transmission

J. Anand – 19/10/2022 – Landcover & Temperature Session 09:00 AM

➤ Creation of a **matchup database** fully open to anyone (after subscription) via a web portal <https://law.acri-st.fr/home> providing :

- All information about the project
- On-demand matchup request (from January 2020) + Provision of In-situ data from selected networks
- Validation report and results

Creation of a Matchup Database

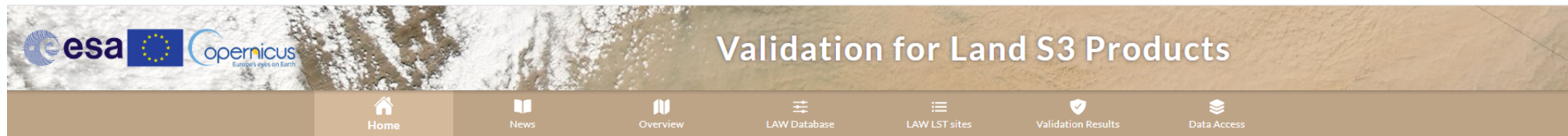
- IWV Matchup Datasets = [Jan. 2020 – Dec. 2021]
- AOD Matchup Datasets = [Jan. 2020 – Today]
- LST Matchup Datasets = [Oct. 21 – Today] except for KIT Forest site deployed in August 2020

1. S3A and S3B satellite extraction provided with similar format than operational products
2. All operational anomalies (RFI, decontamination, Lunar Calibration, ...) filtered out
3. One NetCDF file per station gathering all selected matchups

IWV Dataset	AOD dataset	LST dataset
 	 	<p>The 5 LAW LST Stations :</p> <ul style="list-style-type: none"> ▪ Puéchabon, France ▪ KIT Forest, Germany ▪ Svartberget, Sweden ▪ Hyttiala, Finland ▪ Robson Creek, Australia
<ul style="list-style-type: none"> • 31 * 31 OLCI pixels extraction = ~ 10 km² around each station at each overpass • All ground-based data acquired +/- 3 hours 	<ul style="list-style-type: none"> • 11 * 11 SYN AOD super-pixels extraction = ~ 50 km² around each station at each overpass • All ground-based data acquired +/- 30 minutes 	<ul style="list-style-type: none"> • 51 * 51 super – pixels extraction = ~ 50 km² around each station at each overpass • Day and night passes • All ground-based data acquired +/- 1 hour

Accessibility of the Matchup Database on dedicated web portal

- Free access (upon subscription) on <https://law.acri-st.fr/home>



The “Copernicus Space Component Validation for Land Surface Temperature, Aerosol Optical Depth and Water Vapor Sentinel-3 Products Project”

(A)

Started in January 2020 for a 2-year period, the “Copernicus Space Component Validation for Land Surface Temperature, Aerosol Optical Depth and Water Vapor Sentinel-3 Products” (referenced in the following by “LAW”) is a project managed by ESA/ESRIN.

This project aims to perform a more extensive and systematic validation against ground-based measurements of three Sentinel 3 datasets: the Integrated Water Vapor included in OL_2_LFR products, Aerosol Optical Depth included in SY_2_AOD products and Land Surface Temperature provided by SL_2_LST products. This validation is followed by an analysis phase to better identify areas where products are limited algorithm evolutions and improvements increasing the quality of these products.

A preliminary analysis of the available ground-based measurements showed a gap in the LST networks, in particular regarding the biome distribution. To foster the validation of LST against a wider variety of stations, five new LST stations have been deployed in the frame of the LAW project.

Matchups between these new LST ground-based measurements and S3 products, but also matchups between existing AOD and IWV in-situ measurements and S3 products have been computed all along the project and are accessible to public via this website (see data access panel). Project documentation and Validation reports are available on this web portal.

The AOD and IWV activities, including validation and analysis phase, have been ended in December 2021 with the publication of the consolidated validation reports. All matchups created during these two years are still available on the data access page. The creation of matchups will also be pursued in 2022.

Due to the COVID-19 pandemic, the deployment of LST stations have been delayed and, as consequences, the LST validation phase only started in January 2022. Preliminary results and associated matchups will be displayed on this website all along 2022.

The LAW consortium is composed of ACRI-ST, also acting as the prime contractor, the Finnish Meteorological Institute (FMI), the SWANSEA University, the University of Leicester, the Karlsruhe Institute of Technology (KIT) and Spectral Earth.

DISCLAIMER

The work performed in the frame of this contract is funded by the European Union.
The views expressed herein can in no way be taken to reflect the official opinion of the European Space Agency or the European Union.



7th Sentinel 3 Validation Team Meeting

18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy



Navigation menu with icons for Home, News, Overview (circled in red), LAW Database, LAW LST sites, and Validation Results.

The objective of the LAW project, consists in strengthening the validation of three important L2 products:

L	LST	Land Surface Temperature	▼
A	AOD	Aerosol Optical Depth	▼
W	IWV	Integrated Water Vapor	▼

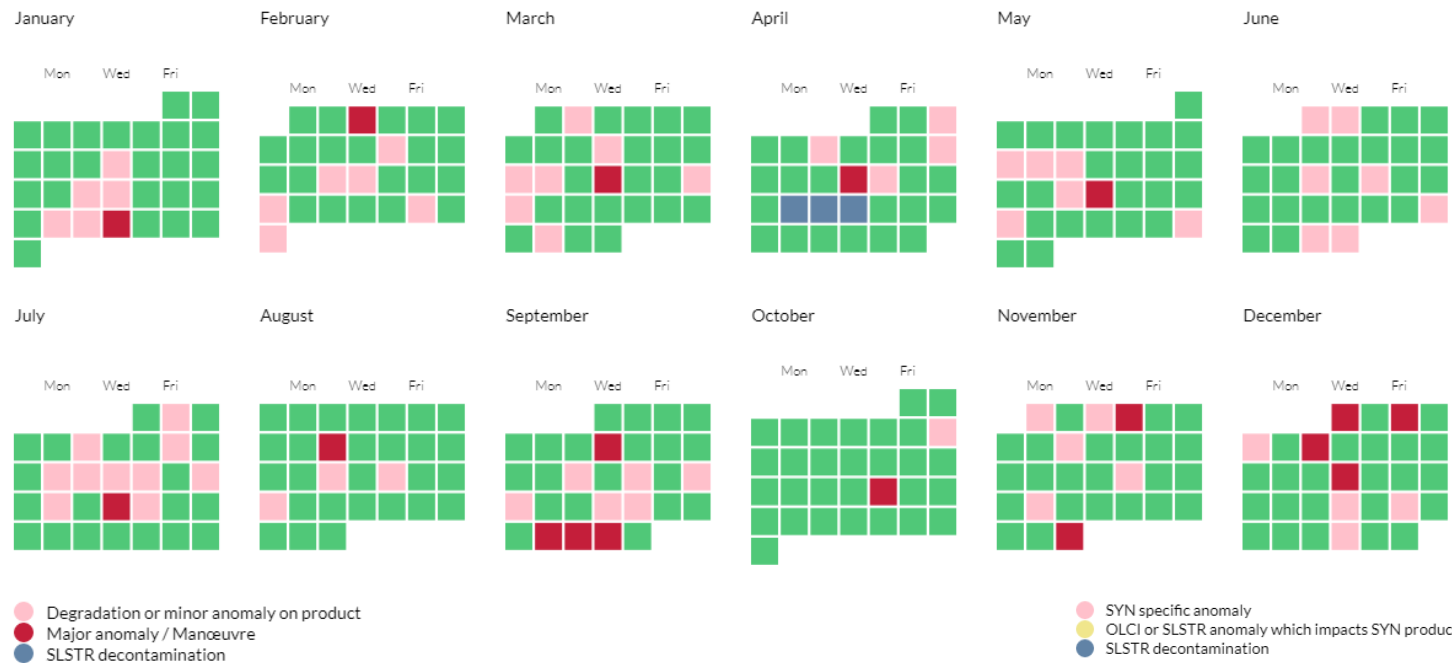
Satellite products are provided with their own quality flags (i.e. clouds/snow and or ice, surface class instrument /calibration /pointing errors, sun glint, ...). However, some elements like RFI affection or specific operational issues like SLSTR decontamination are not transcribed through flags inside S3 products.

S3 products affected by such operational issues have then been filtered out from the LAW database.

2020 Calendars ▼

2021 Calendars ▼

2022 Calendars ▼



Each date is « clickable » and provides information about anomaly and the extent of affectation

Anomaly Details : 21/10/2021

S3A & S3B : Pointing errors due to planned manoeuvre. Products from sensing period from 12:37:09 to 13:18:08 are affected by the issue

CLOSE

Legend:

- Degradation or minor anomaly on product
- Major anomaly



7th Sentinel 3 Validation Team Meeting 2022

18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy



PROGRAMME OF THE EUROPEAN UNION



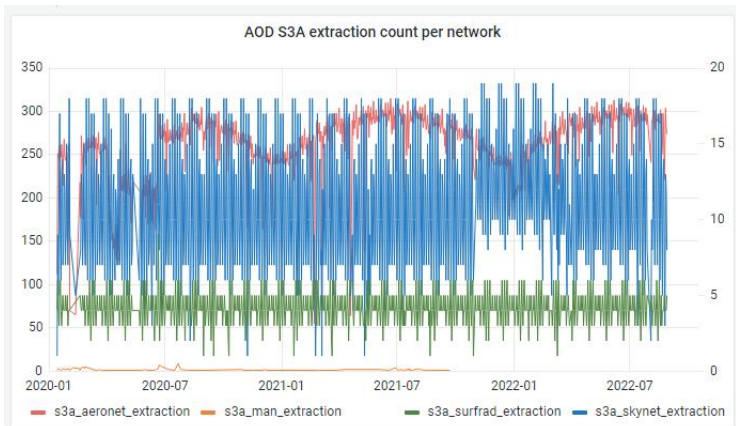
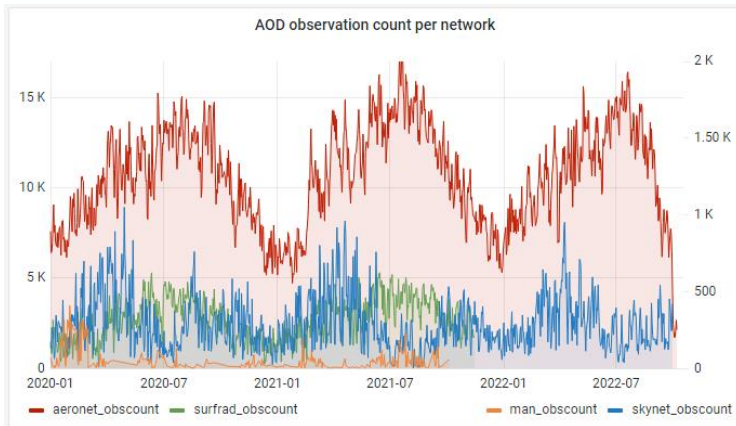
co-funded with



Data availability for AOD and IWV ground-based measurements and satellite extraction

Description of LAW LST stations in dedicated tab

Final Validation Reports for AOD and IWV datasets + Current LST Validation report (Monthly Updated)



The following list includes selected networks for each dataset. The suitability of these networks with the purpose of the LAW project has been evaluated by our validation experts and are currently the basis of the LAW validation comparative strategy.

As all ground-based measurements are coming from high-qualified networks, the data filtering methodologies are the one already applied by original networks. The data availability is also the same than the one provided by original networks.

For further details, please refer to the following [dataset description](#).

Concerning LST matchups, 1 or 2 matchups are available per day for each satellite since the confirmation of a correct deployment of the station and, once a month, new data are made available on this website. The date of the first valid matchup associated with each station is :

- 31/07/2020 for KIT forest
- 01/10/2021 for Hyttiälä
- 26/10/2021 for Svartberget
- 05/10/2021 for Puéchabon
- 15/10/2021 for Robson Creek

First valid matchup for all LST stations

Description of the Matchup database (specific readme included in each request)



7th Sentinel 3 Validation Team Meeting 2022

18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy



PROGRAMME OF THE EUROPEAN UNION



co-funded with



1

Validation for Land S3 Products

Home News Overview LAW Database LAW LST sites Validation Results Data Access

Dataset

- AOD
- IWV
- LST

NEXT >

Data access upon subscription

➤ Selection criteria =

- 1 Dataset
- 1 Time window + 1 or 2 Satellites +1 or several networks
- 1 or several Regions of Interest

➔ One zipped file including several NetCDF files, one per station

➔ Email with direct link

➔ [Order list with status and download link](#)

2

Validation for Land S3 Products

Home News Overview LAW Database LAW LST sites Validation Results Data Access

Selection

Start date Jan 1, 2020

End date Oct 17, 2022

AERONET

MAN

SKYNET

MATCHUP INsitu

S3A

S3B

< PREVIOUS NEXT >

3

Validation for Land S3 Products

Home News Overview LAW Database LAW LST sites Validation Results Data Access

Stations

Please specify one or multiple sets of coordinates for the stations you wish to select for your order.

You can do this by either drawing the zone using the panel on the right or by entering the values and clicking on Add

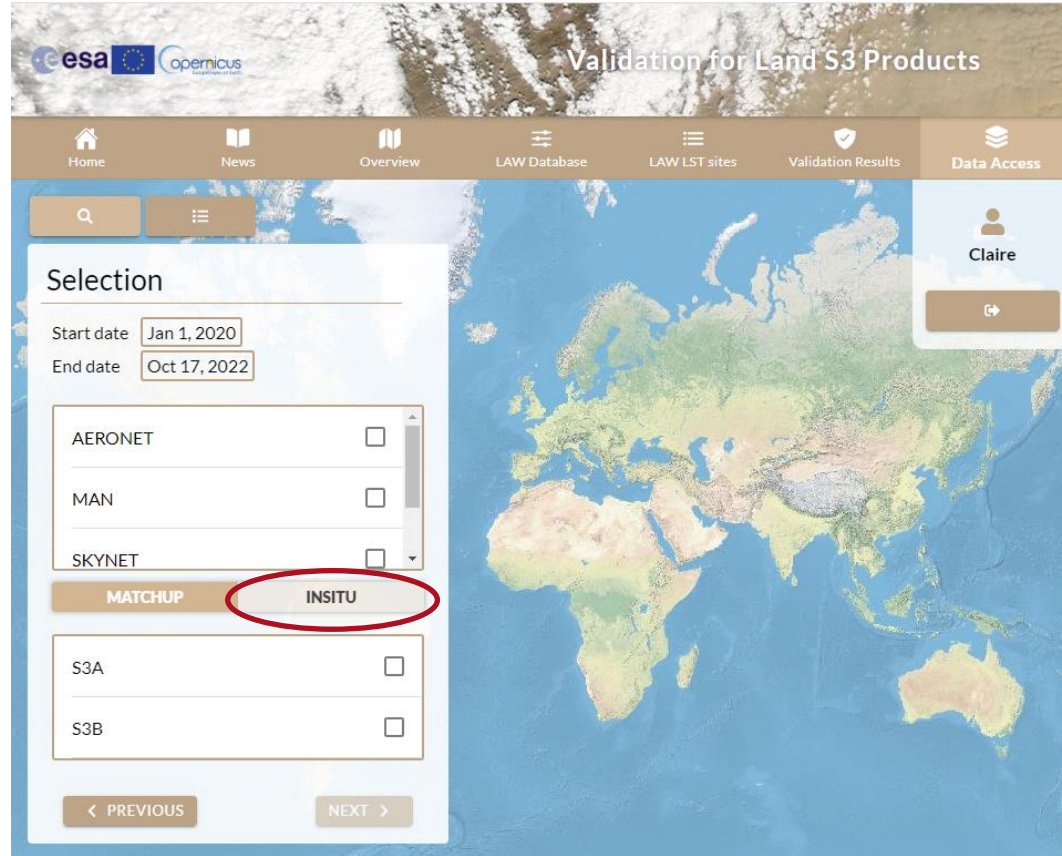
Min Lat Max Lat Min Lon Max Lon

Coordinates

Accept terms of use and [Data Policy](#)

< PREVIOUS NEXT >





NEW Selection criteria – only ground-based measurements

Option required for LST, extended to AOD and IWV ground based measurements

1. 1 Dataset
2. 1 Time window + 1 or several networks
3. 1 or several Regions of Interest

7th Sentinel 3 Validation Team Meeting 2022

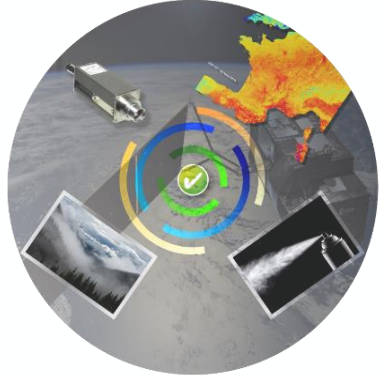
18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy



PROGRAMME OF THE
EUROPEAN UNION



co-funded with



THANK YOU FOR YOUR ATTENTION

<https://law.acri-st.fr/app/home>

contact-law@acri-st.fr

