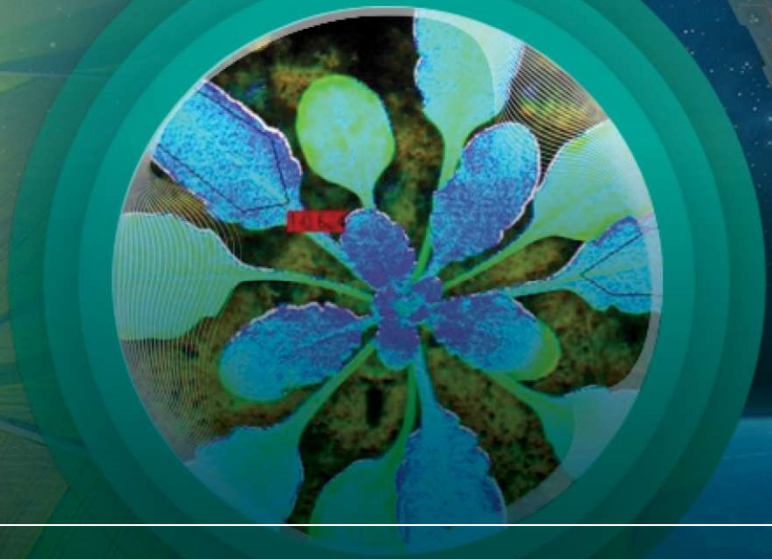
FLEX-Fluorescence 2026 Workshop

03 – 06 March | Bonn University, Germany



INSIF, International Network of Sun-Induced Chlorophyll Fluorescence

CONRIBUTORS

Tommaso Julitta, Mitchell Kennedy, Andreas Burkart, Paul Naethe, Agnieszka Bialek, Pieter De Vis, Astrid Zimmermann, Ashley Ramsay, Thomas Storm, Laura Mihai, Javier Pacheco-Labrador, Dirk Schuettemeyer, Marin Tudoroiu, Marco Celesti

JB Hyperspectral Devices, Düsseldorf Germany

National Physics Laboratory. Teddington, United Kingdom

Brockmann Consult. Hamburg, Germany

INFLPR. Magurele, Romania

Environmental Remote Sensing and Spectroscopy Laboratory (SpecLab),

Spanish National Research Council (CSIC)

ESA. European Space Agency

THANKS ! ! ! !

esa

European Space Agency

UNIVERSITA' DEGLI STUDI DI MILANO BICOCCA

JÜLICH FORSCHUNGSZENTRUM

Consiglio Nazionale delle Ricerche

MPI-BGC Jena

VNIVERSITAT DE VALÈNCIA

Universität Zürich[UZH]

ITC UNIVERSITY OF TWENTE.

BROCKMANN CONSULT

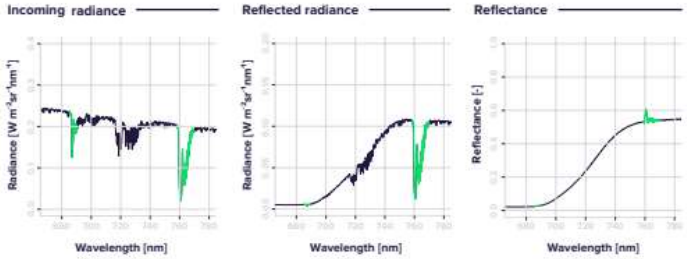
INFLPR

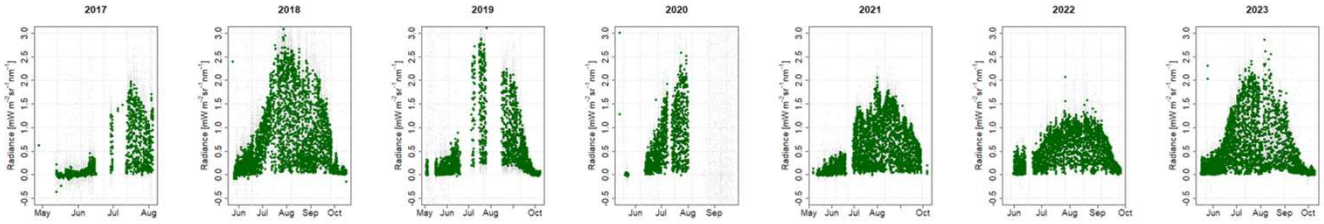
NPL National Physical Laboratory

CSIC CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

FloX: The Fluorescence boX

OPTIC	Spec1	Spec2
Wavelength range	~ 650–800 nm;	~ 400–950 mn
Spectral Sampling Interval (SSI)	~ 0.17 nm	~ 0.65 nm
Spectral resolution (FWHM)	~ 0.3 nm	~ 1.5 nm
Signal to Noise Ratio (SNR)	~ 1000	~ 250
Field Of View (FOV)	Dual FOV. Upwelling radiance ~25°. Downwelling radiance 180°	



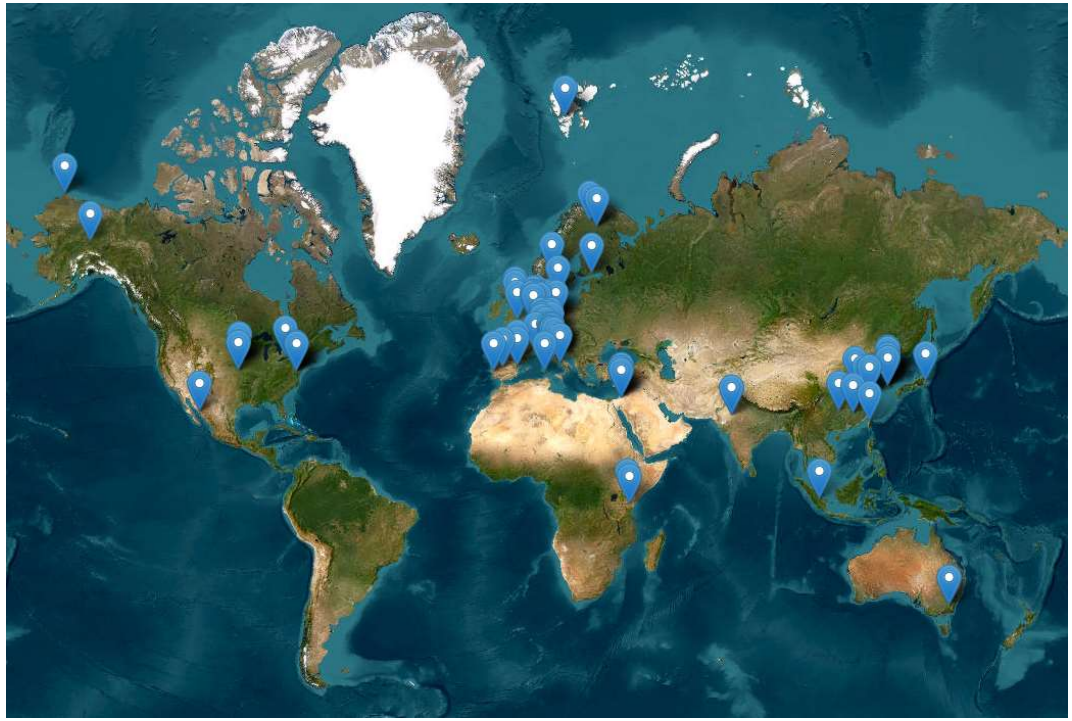


Courtesy: John Gamon

INSIF

Two years ESA funded project to implement a network. Main focus FLEX validation.

- **Automatic processing & Uncertainty propagation**
- **Database implementation & Online portal**
- **Data policy definition**
- **Longer terms plans(in situ Calibration)**



NPL National Physical Laboratory

CSIC Consejo Superior de Investigaciones Científicas

INFLPR

Brockmann Consult

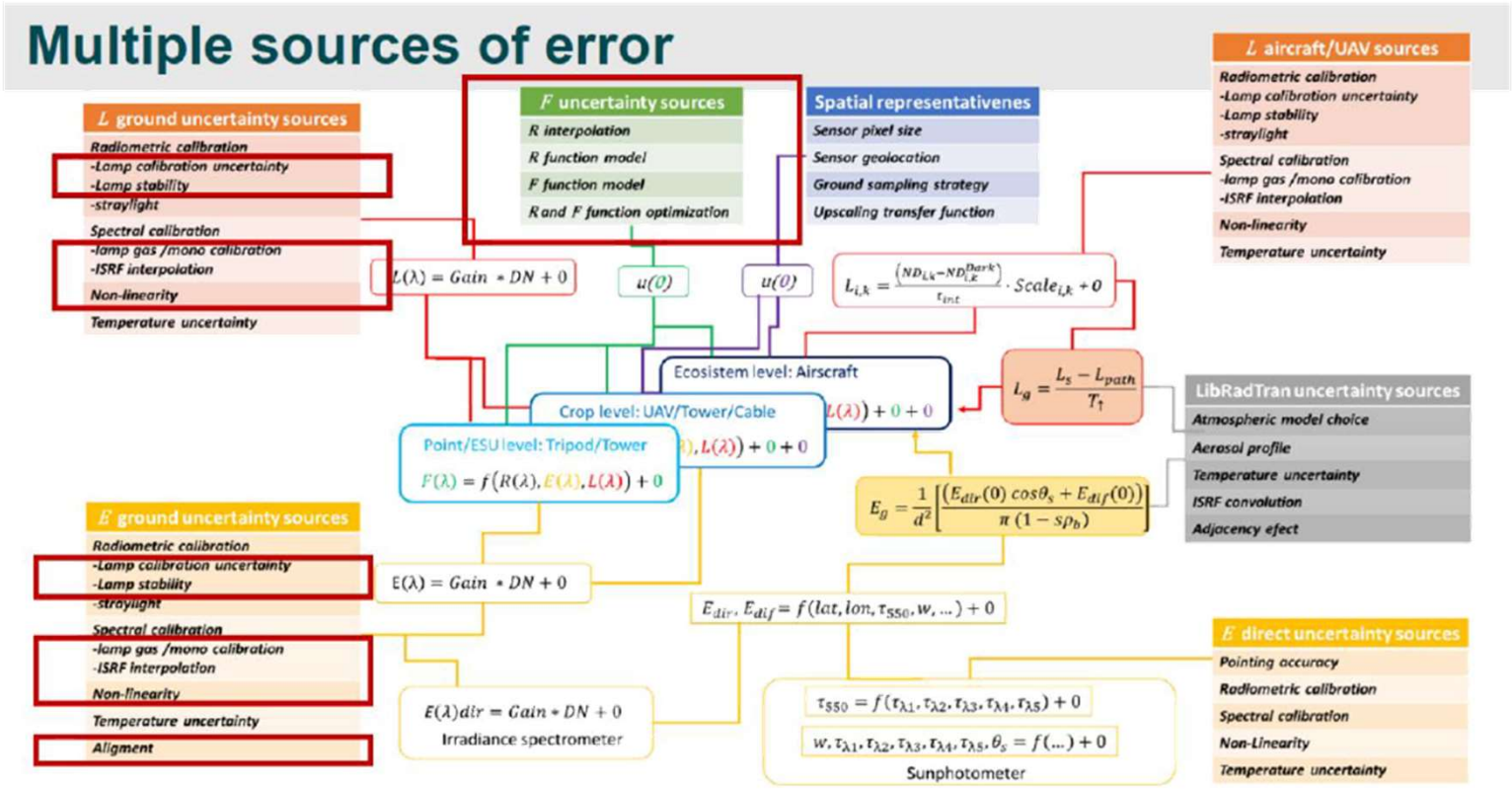
UNCERTAINTY PROPAGATION

HYPERSPECTRAL DEVICES

NPL National Physical Laboratory

CSIC Consejo Superior de Investigaciones Científicas

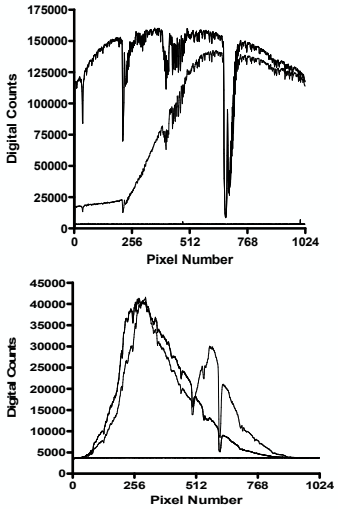
INFLPR



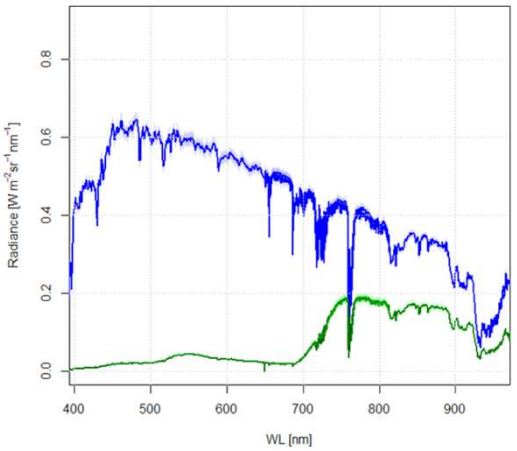
CREDIT: Cendrero et al., 2022

DATA PROCESSING

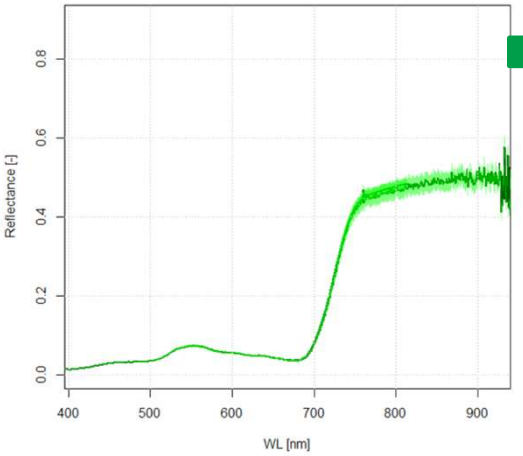
Level 0. RAW



Level 1. RADIANCE

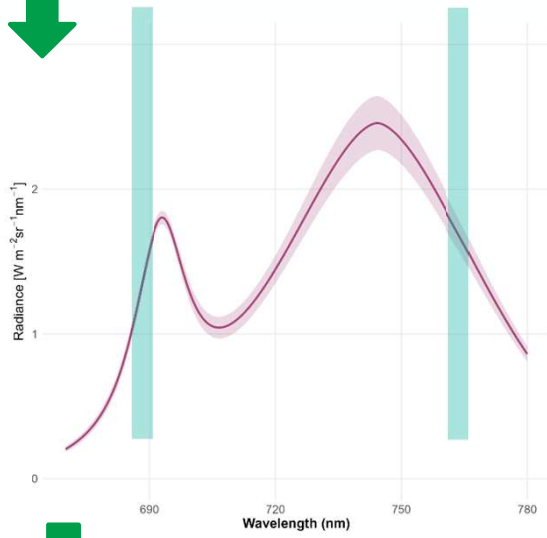


Level 2A. REFLECTANCE



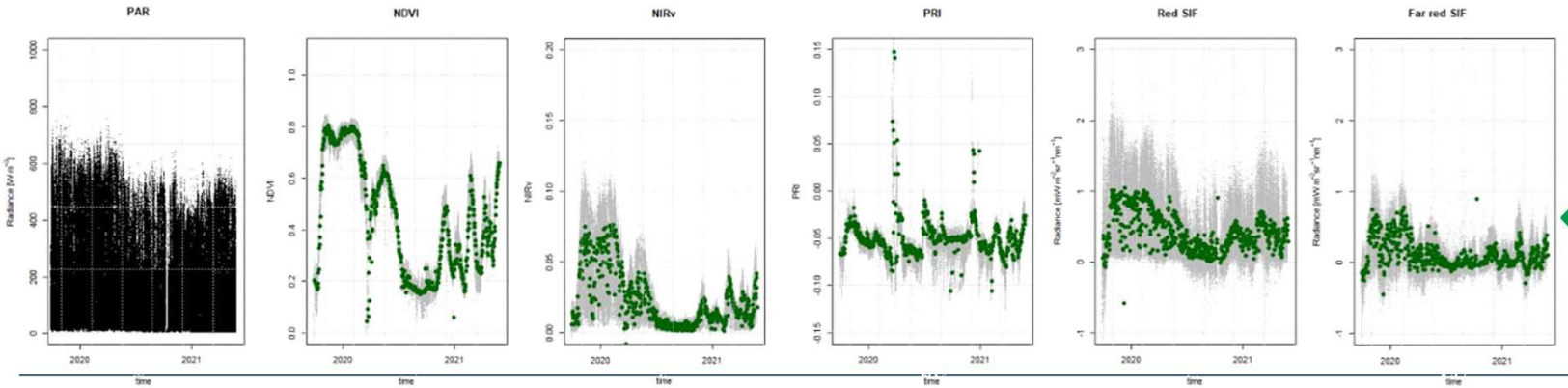
Level 2B. SIF

Oxygen B Oxygen A



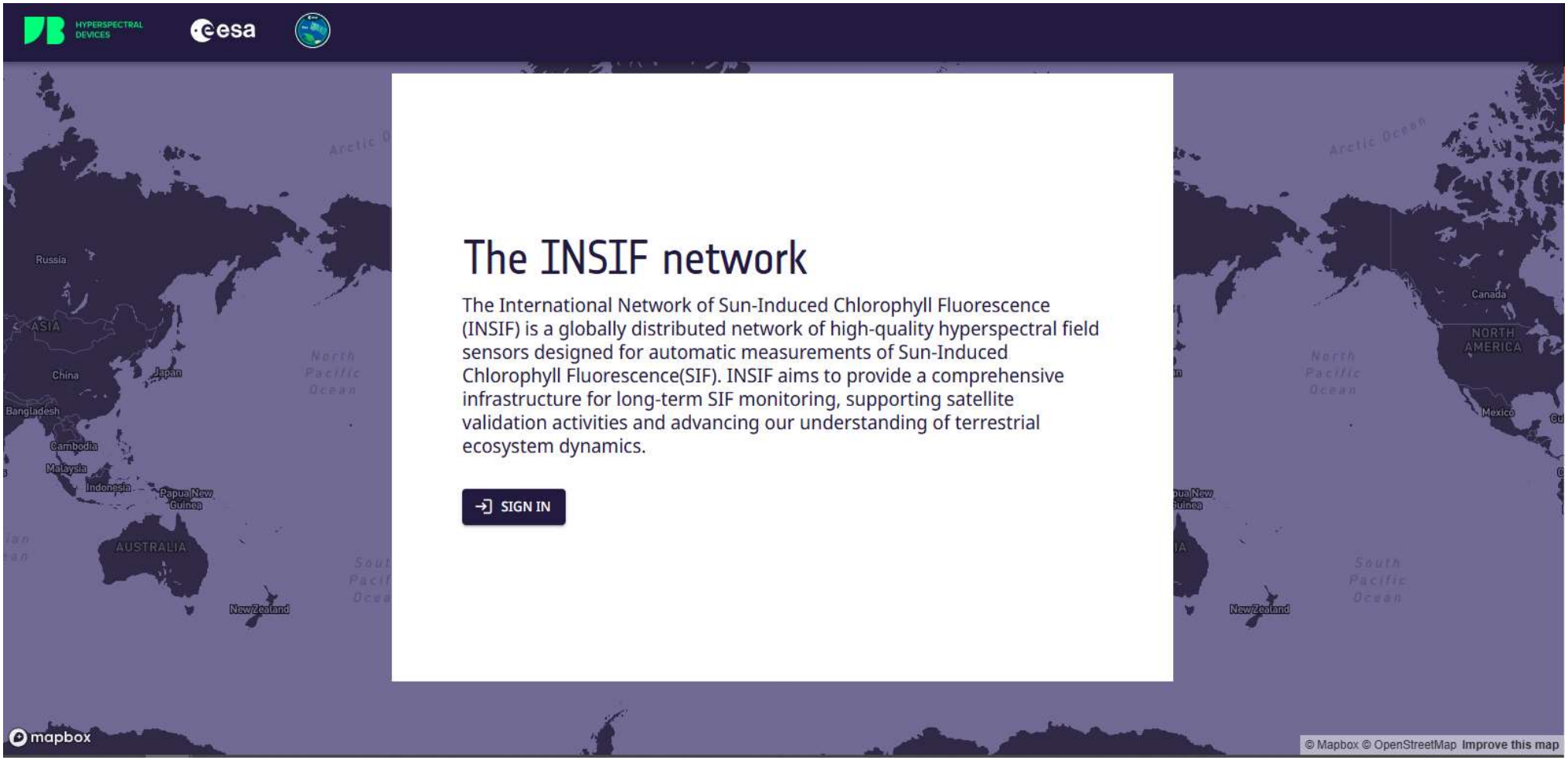
Level 2C. VIs

+

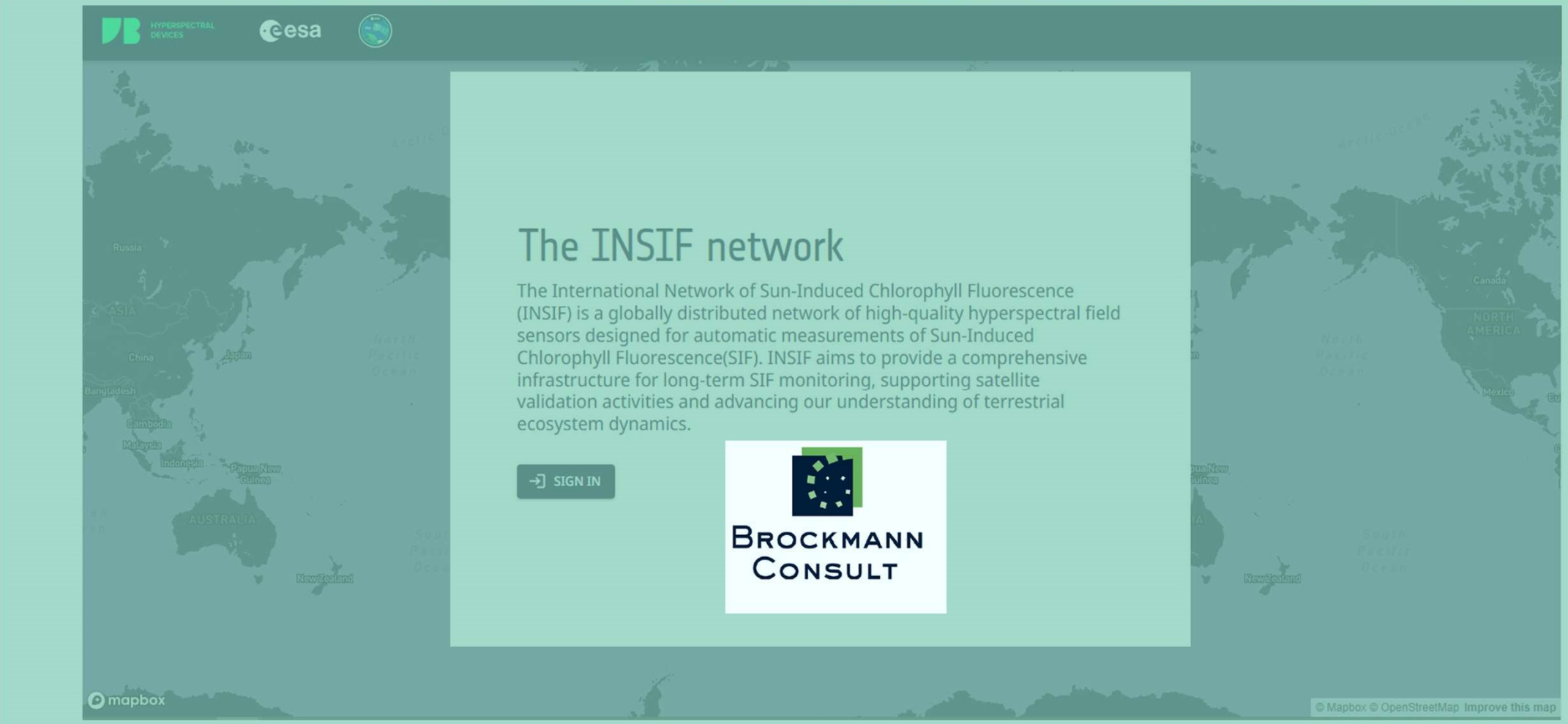


Quality Flag Criteria

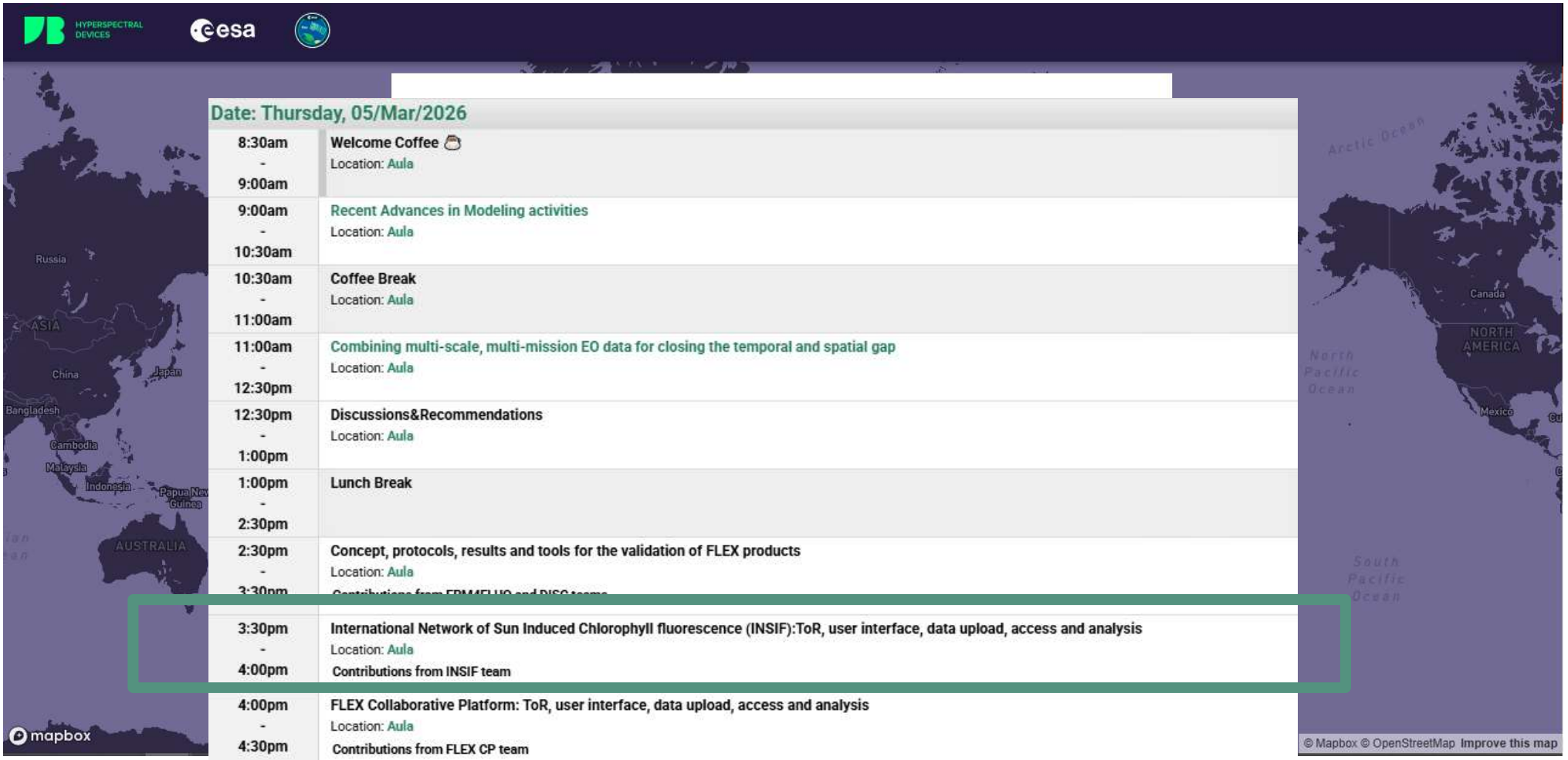
OUTLOOK


HYPERSPECTRAL DEVICES
esa
The INSIF network
The International Network of Sun-Induced Chlorophyll Fluorescence (INSIF) is a globally distributed network of high-quality hyperspectral field sensors designed for automatic measurements of Sun-Induced Chlorophyll Fluorescence(SIF). INSIF aims to provide a comprehensive infrastructure for long-term SIF monitoring, supporting satellite validation activities and advancing our understanding of terrestrial ecosystem dynamics.
SIGN IN
Russia
ASIA
China
Japan
Bangladesh
Cambodia
Malaysia
Indonesia
Papua New Guinea
AUSTRALIA
New Zealand
North Pacific Ocean
South Pacific Ocean
Arctic Ocean
Canada
NORTH AMERICA
Mexico
mapbox
© Mapbox © OpenStreetMap Improve this map

OUTLOOK


HYPERSPECTRAL DEVICES
esa
The INSIF network
The International Network of Sun-Induced Chlorophyll Fluorescence (INSIF) is a globally distributed network of high-quality hyperspectral field sensors designed for automatic measurements of Sun-Induced Chlorophyll Fluorescence(SIF). INSIF aims to provide a comprehensive infrastructure for long-term SIF monitoring, supporting satellite validation activities and advancing our understanding of terrestrial ecosystem dynamics.
SIGN IN
BROCKMANN CONSULT
Russia
ASIA
China
Japan
Bangladesh
Cambodia
Malaysia
Indonesia
Papua New Guinea
AUSTRALIA
New Zealand
Canada
NORTH AMERICA
Mexico
mapbox
© Mapbox © OpenStreetMap Improve this map

OUTLOOK



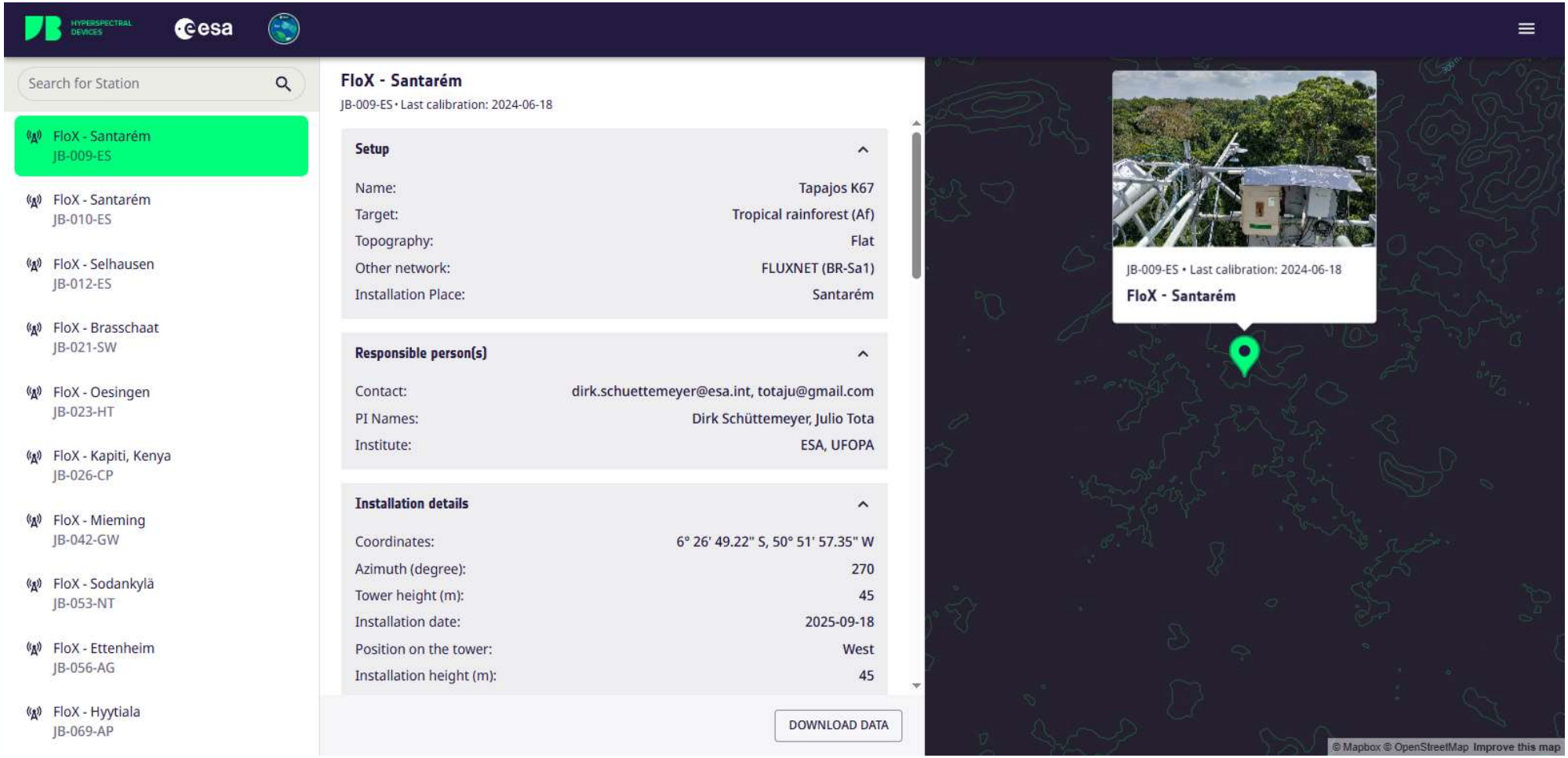
Date: Thursday, 05/Mar/2026

8:30am - 9:00am	**Welcome Coffee** Location: Aula
9:00am - 10:30am	**Recent Advances in Modeling activities** Location: Aula
10:30am - 11:00am	**Coffee Break** Location: Aula
11:00am - 12:30pm	**Combining multi-scale, multi-mission EO data for closing the temporal and spatial gap** Location: Aula
12:30pm - 1:00pm	**Discussions&Recommendations** Location: Aula
1:00pm - 2:30pm	**Lunch Break**
2:30pm - 3:30pm	**Concept, protocols, results and tools for the validation of FLEX products** Location: Aula Contributions from FRM4FLUO and RISC teams
3:30pm - 4:00pm	**International Network of Sun Induced Chlorophyll fluorescence (INSIF):ToR, user interface, data upload, access and analysis** Location: Aula Contributions from INSIF team
4:00pm - 4:30pm	**FLEX Collaborative Platform: ToR, user interface, data upload, access and analysis** Location: Aula Contributions from FLEX CP team

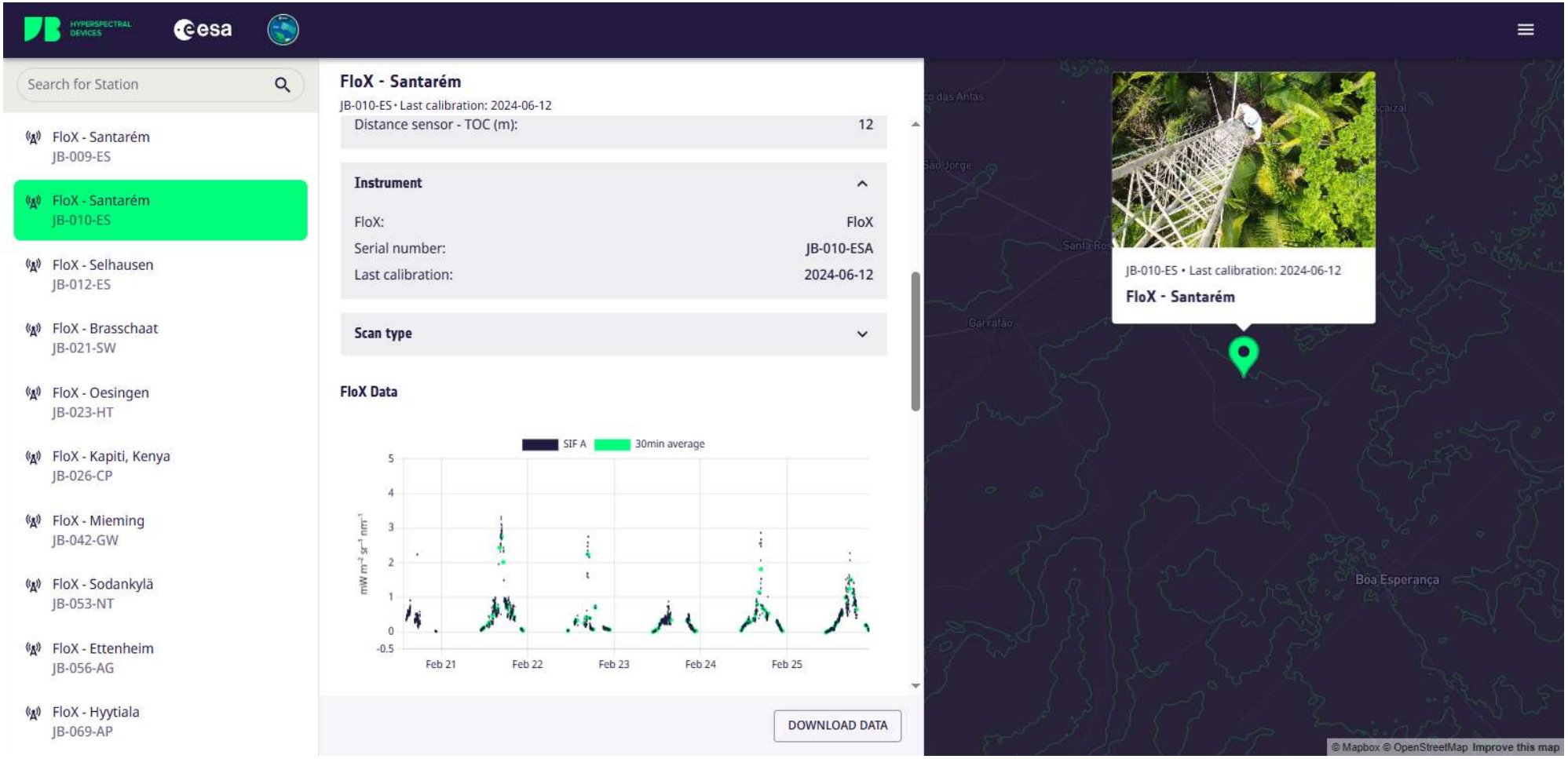
OUTLOOK


HYPERSPECTRAL DEVICES
esa
Search for Station
FloX - Santarém
JB-009-ES
FloX - Santarém
JB-010-ES
FloX - Selhausen
JB-012-ES
FloX - Brasschaat
JB-021-SW
FloX - Oesingen
JB-023-HT
FloX - Kapiti, Kenya
JB-026-CP
FloX - Mieming
JB-042-GW
FloX - Sodankylä
JB-053-NT
FloX - Ettenheim
JB-056-AG
FloX - Hyytiala
JB-069-AP
Svalbard
Greenland
Iceland
Sweden
Norway
Russia
Canada
United Kingdom
Belarus
EUROPE
Kazakhstan
ASIA
NORTH AMERICA
Spain
Italy
Greece
Turkmenistan
China
Japan
Morocco
Tunisia
Iraq
Iran
Pakistan
Bangladesh
Mexico
Cuba
Libya
Egypt
Mauritania
Niger
Sudan
Yemen
Oman
Nigeria
AFRICA
Somalia
Cambodia
Malaysia
Maldives
Indonesia
Papua New Guinea
Colombia
Peru
Tanzania
SOUTH AMERICA
Angola
Madagascar
Namibia
South Africa
Chile
Uruguay
AUSTRALIA
New Zealand
ANTARCTICA
Arctic Ocean
North Pacific Ocean
North Atlantic Ocean
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
mapbox
© Mapbox © OpenStreetMap Improve this map

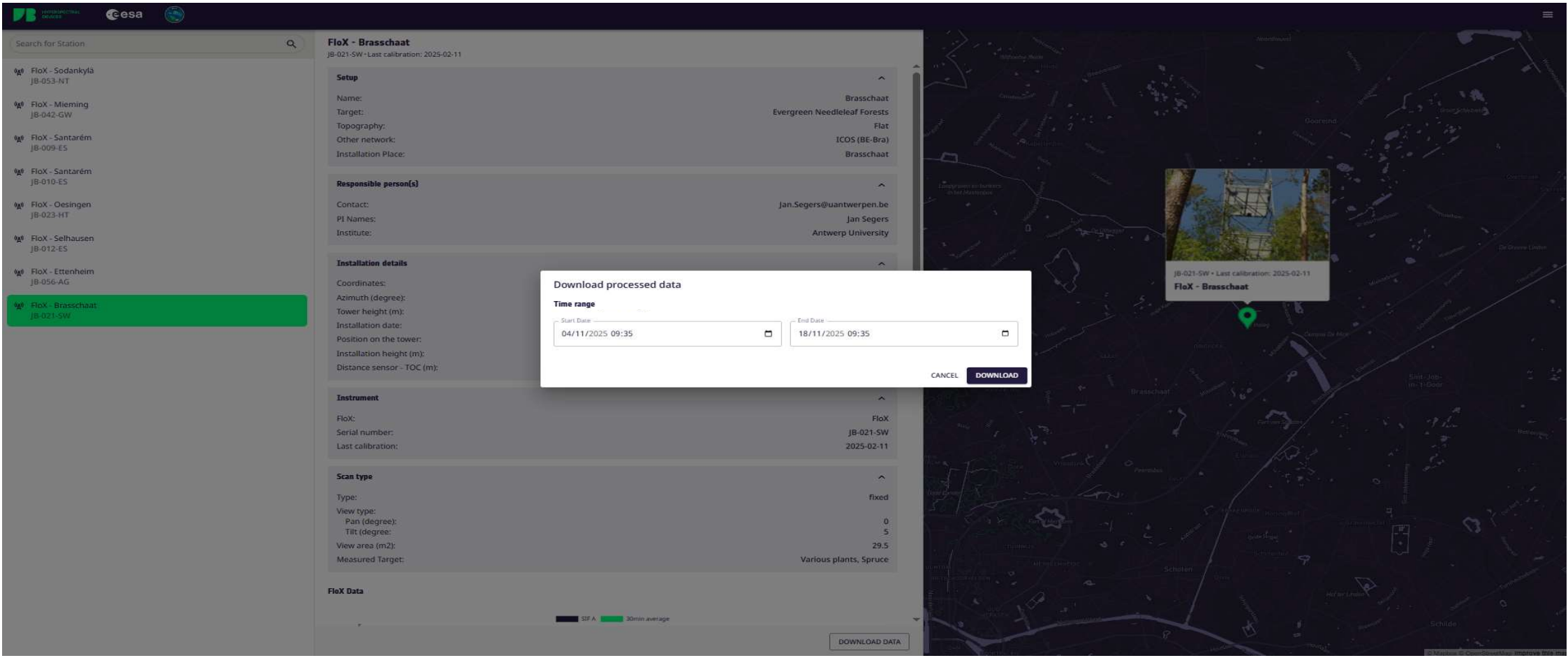
OUTLOOK


HYPERSPECTRAL DEVICES
esa
Search for Station
FloX - Santarém
JB-009-ES
FloX - Santarém
JB-010-ES
FloX - Selhausen
JB-012-ES
FloX - Brasschaat
JB-021-SW
FloX - Oesingen
JB-023-HT
FloX - Kapiti, Kenya
JB-026-CP
FloX - Mieming
JB-042-GW
FloX - Sodankylä
JB-053-NT
FloX - Ettenheim
JB-056-AG
FloX - Hyytiala
JB-069-AP
FloX - Santarém
JB-009-ES • Last calibration: 2024-06-18
Setup
Name: Tapajos K67
Target: Tropical rainforest (Af)
Topography: Flat
Other network: FLUXNET (BR-Sa1)
Installation Place: Santarém
Responsible person(s)
Contact: dirk.schuettemeyer@esa.int, totaju@gmail.com
PI Names: Dirk Schüttemeyer, Julio Tota
Institute: ESA, UFOPA
Installation details
Coordinates: 6° 26' 49.22" S, 50° 51' 57.35" W
Azimuth (degree): 270
Tower height (m): 45
Installation date: 2025-09-18
Position on the tower: West
Installation height (m): 45
DOWNLOAD DATA
JB-009-ES • Last calibration: 2024-06-18
FloX - Santarém
© Mapbox © OpenStreetMap Improve this map

OUTLOOK


HYPERSPECTRAL DEVICES
esa
Search for Station
FloX - Santarém
JB-009-ES
FloX - Santarém
JB-010-ES
FloX - Selhausen
JB-012-ES
FloX - Brasschaat
JB-021-SW
FloX - Oesingen
JB-023-HT
FloX - Kapiti, Kenya
JB-026-CP
FloX - Mieming
JB-042-GW
FloX - Sodankylä
JB-053-NT
FloX - Ettenheim
JB-056-AG
FloX - Hyytiala
JB-069-AP
FloX - Santarém
JB-010-ES • Last calibration: 2024-06-12
Distance sensor - TOC (m): 12
Instrument
FloX: FloX
Serial number: JB-010-ESA
Last calibration: 2024-06-12
Scan type
FloX Data
SIF A
30min average
mW m⁻² sr⁻¹ nm⁻¹
5
4
3
2
1
0
-0.5
Feb 21
Feb 22
Feb 23
Feb 24
Feb 25
DOWNLOAD DATA
JB-010-ES • Last calibration: 2024-06-12
FloX - Santarém
Boa Esperança
© Mapbox © OpenStreetMap Improve this map

OUTLOOK


Search for Station
FloX - Sodankylä
JB-053-NT
FloX - Mieming
JB-042-GW
FloX - Santarém
JB-009-ES
FloX - Santarém
JB-010-ES
FloX - Oesingen
JB-023-HT
FloX - Selhausen
JB-012-ES
FloX - Ettenheim
JB-056-AG
FloX - Brasschaat
JB-021-SW
FloX - Brasschaat
JB-021-SW • Last calibration: 2025-02-11
Setup
Name: Brasschaat
Target: Evergreen Needleleaf Forests
Topography: Flat
Other network: ICOS (BE-Bra)
Installation Place: Brasschaat
Responsible person(s)
Contact: Jan.Segers@uantwerpen.be
PI Names: Jan Segers
Institute: Antwerp University
Installation details
Coordinates:
Azimuth (degree):
Tower height (m):
Installation date:
Position on the tower:
Installation height (m):
Distance sensor - TOC (m):
Instrument
FloX: FloX
Serial number: JB-021-SW
Last calibration: 2025-02-11
Scan type
Type: fixed
View type:
Pan (degree): 0
Tilt (degree): 5
View area (m2): 29.5
Measured Target: Various plants, Spruce
FloX Data
SIF A
30min average
DOWNLOAD DATA
Download processed data
Time range
Start Date
04/11/2025 09:35
End Date
18/11/2025 09:35
CANCEL
DOWNLOAD
JB-021-SW • Last calibration: 2025-02-11
FloX - Brasschaat

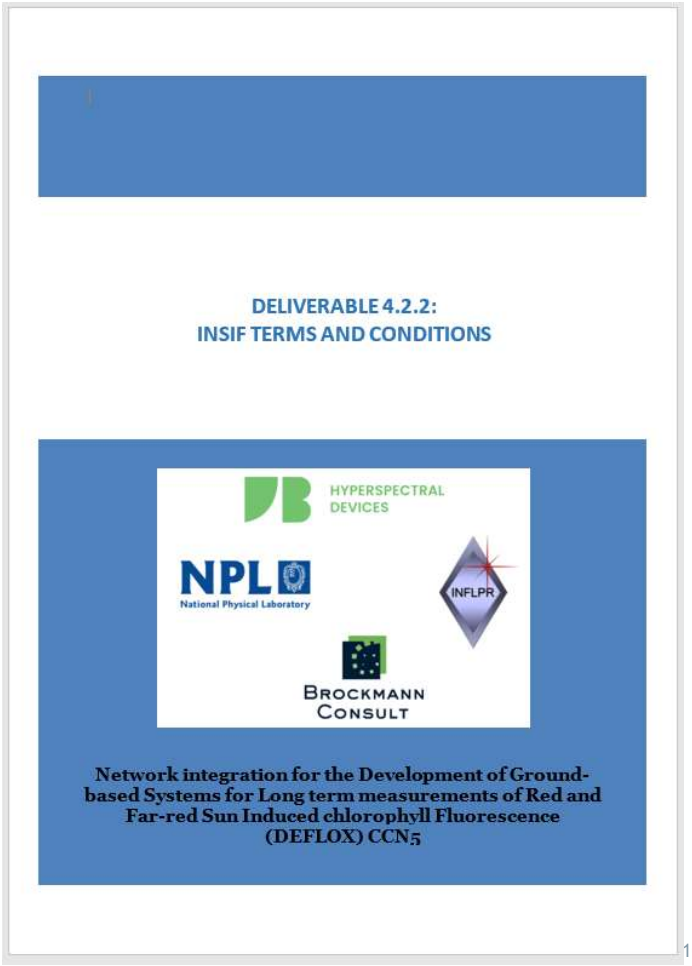
INSIF building up

TESTING PHASE - OCT 2025										
number	FLOX SN	country	PI	town	target	comments	Cal file	metadata	INSIF credentials	Processing
1	JB-012-ES	Germany	ESA	Selhasuen	crop		yes	yes	ok	active
2	JB-009-ES	Brazil	ESA	Santarem	primary forest	internet to improve	yes	yes	ok	active
3	JB-010-ES	Brazil	ESA	Santarem	secondary forest	calibration	yes	yes	ok	active
4	JB-069-AP	Finland	Jon Atherton	Hyytiala	evergreen needleleaf	no winter	yes	yes	ok	
5	JB-023-HT	Switzerland	Alex Damm	Oesingen	crop		yes	yes	ok	
6	JB-021-SW	Belgium	Jan Segers	braschaat	evergreen needleleaf		yes	yes	ok	
7	JB-053-NT	Finland	Neus sabater	sodankyyla	evergreen needleleaf	no winter	yes	yes	ok	active
8	JB-56-AG	Germany	Anna Goeritz	Ettenheim	mixed forest		yes	yes	ok	
9	JB-042-GW	Austria	Georg Wolfhart	Mieming	evergreen needleleaf	no transfer	yes	yes	ok	
10	JB-050-AD	Switzerland	Alex Damm	Zurich	urban	no internet	yes		ok	
11	JB-015-AD	Switzerland	Alex Damm	Laegren	mixed forest	no transfer	yes		ok	
12	JB-038-AD	Switzerland	Alex Damm	Davos	evergreen needleleaf		yes		ok	

INSIF TERMS AND CONDITIONS

Community survey launched at PLS 2025

About 80 replies



INSIF TERMS AND CONDITIONS

Table of Contents

INSIF TERMS AN

APPENDIX B. GUIDELINES FOR INSIF DATA CITATION

All data downloaded from the INSIF platform must be properly cited in any publication, presentation, report, or other form of dissemination. The citation requirements are as follows:

Mandatory Citation Elements

When using INSIF data in publications, users must:

1. **Acknowledge the INSIF platform** – Clearly state that the data were obtained from the INSIF (International Network of Sun-Induced chlorophyll Fluorescence) platform.
2. **Cite the Principal Investigator (PI)** – Include the name of the PI responsible for the FloX instrument from which the data originated. This information is provided on the instrument's landing page within the platform.
3. **Acknowledge funding sources** – If funding acknowledgments are specified on the instrument's landing page, these must be included in the acknowledgment section of the publication.

Collaboration with Principal Investigators

Users are strongly encouraged to contact the PI of the instrument(s) whose data they are using to discuss the research and explore potential collaboration opportunities. Depending on the extent and nature of data use, it may be appropriate to invite the PI as a co-author of the publication. This practice promotes scientific collaboration and ensures proper recognition of the efforts involved in data collection and quality control.

Recommended Citation Format

The following format is recommended for citing INSIF data:

Data citation: [PI Name(s)], [Year]. [Dataset title or description]. Downloaded from the INSIF platform (https://[platform URL]), [access date].

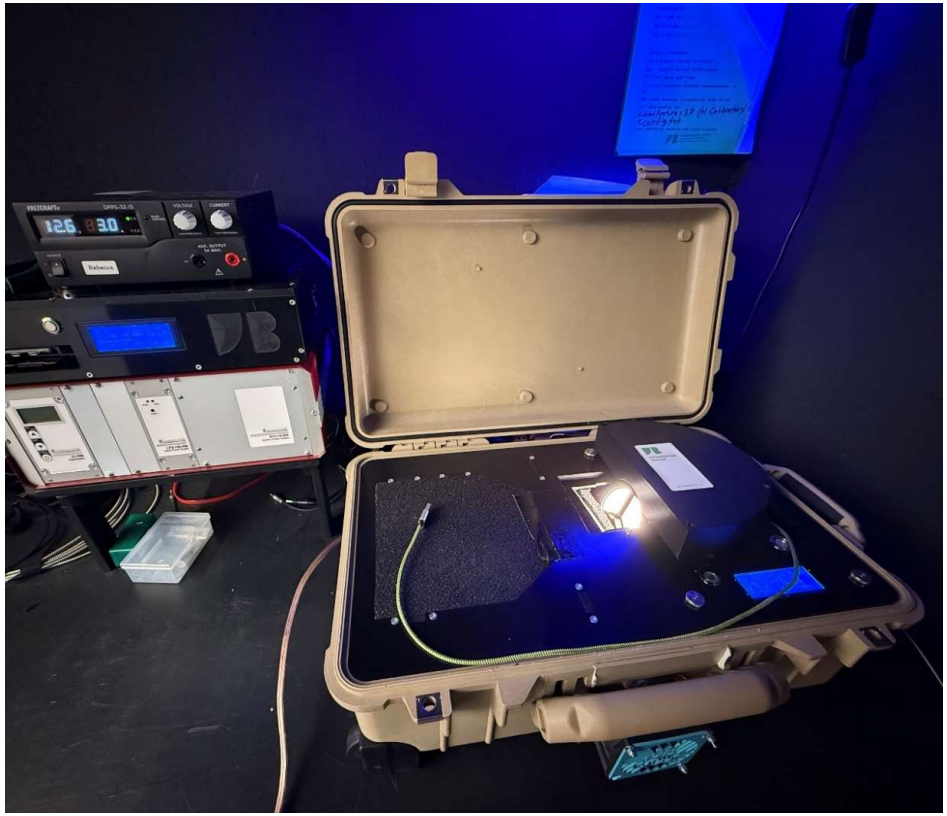
Acknowledgment section: "Data used in this study were obtained from the INSIF (International Network of Sun-Induced chlorophyll Fluorescence) platform. We acknowledge [PI Name] for providing the [instrument name/location] measurements. [Include specific funding acknowledgment text as provided on the instrument landing page]."

Compliance

Failure to properly cite and acknowledge INSIF data according to these requirements may result in temporarily blocked or restricted access to the platform or future data downloads from the platform or in the termination of the platform use agreement by the platform provider subject to the terms and conditions of the INSIF platform.

LONGER TERMS

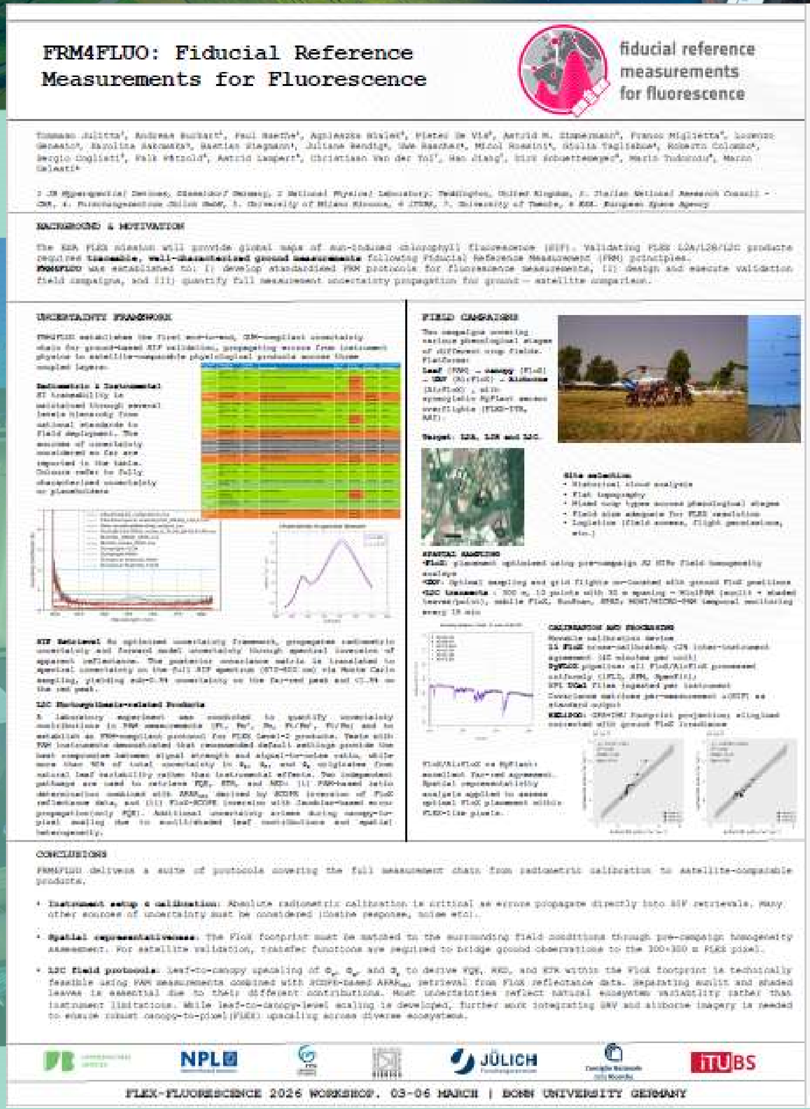
MOVABLE CALIBRATION DEVICE BOX (MOX)



fiducial reference measurements for fluorescence

LONGER TERMS

MOVABLE CALIBRATION DEVICE



fiducial reference measurements for fluorescence

CONCLUSIONS

- **INSIF** is getting ready. Beta version is now under test on 10 systems (number can increase in spring 2026)
- **Standard processing pipeline** at different levels (L1, L2), including uncertainty is implmeneted.
- **Terms and conditions (e.g. Data policy)** ready(shaped from the survey feedback)
- **Longer term** plan under discussion. Goal of covering at least the FLEX mission duration
- Benefit for the scientific community to explore the data for better ecological **process understanding.**
- More update after **August 2026!**

HANK YOU FOR LISTENING

www.jb-hyperspectral.com

info@jb-hyperspectral.com