Land Product Validation (LPV) Sub-group Meeting

Michael Cosh – (USDA) –Chair
Fabrizio Niro – (ESA/ESRIN) – Vice Chair

Subgroup meeting
02 Apr 2024

NEXT LPV TELECON JUNE 4, 2024 (discuss)

	First Name	Last Name	Institution	Institution	End of Term	
Admin	Michael	Cosh	USDA	USA	Apr 2025	
	Fabrizio	Niro	ESA	Italy	Apr 2025 (promotion to Chair)	
	Jaime	Nickeson	GSFC	USA		
Land Cover	Alexandra	Tyukavina	University of Maryland	USA	March 2024 (1st term)	New invited
	Nandika	Tsendbazar	Wageningen University	Netherlands	April 2027(1st term)	New accepted
	Sophie	Bontemps	Université Catholique de Louvain	Belgium	Ex-officio	Term ended
Biophysical	Richard	Fernandes	Natural Resources Canada	Canada	Apr 2027 (last term)	Term near ending
	Hao	Tang	University of Maryland	USA	April 2027 (1st term)	
	Luke	Brown	University of Salford	UK	Jan 2026 (1st term)	
Fire/Burn Area	Louis	Giglio	University of Maryland	USA	Sep 2026 (2nd term)	
	Bernardo	Mota	National Physical Lab	UK	Jan 2026 (1st term)	
Surface Rad	Zhuosen	Wang	UMass Boston	USA	ex-officio	
	Angela	Erb	UMass Boston	USA	Jan 2026 (1st term)	
	Jorge	Sanchez-Zapero	EOLab	Spain	Jan 2026 (1st term)	
Soil Moisture	John	Bolten	NASA GSFC	USA	Apr 2026 (2nd term)	
	Alex	Gruber	TU Wien	Austria	Sept 2026 (1st term)	
LST	Glynn	Hulley	NASA/JPL	USA	July 2024 (2nd term)	
	Lluis	Perez Planells	Karlsruhe Institute of Technology	Germany	Sept 2026 (1st term)	
Phenology	Joshua	Gray	North Carolina State University	USA	Jan 2025 (2nd term)	
	Victor	Rodríguez-Galiano	University of Seville	Spain	Aug 2025 (2nd term)	
Snow Cover	Carrie	Vuyovich	NASA GSFC	USA	Jan 2026 (1st term)	
	Juha	Lemmetyinen	FMI	Finland	Sept 2026 (1st term)	
Veg Index	Simon	Kraatz	USDA	USA	Apr 2027 1st term	
	Tomoaki	Miura	University of Hawai'i	USA	Ex-officio	
	Else	Swinnen	VITO	Belgium	Apr 2023 (2nd term)	
Biomass	Laura	Duncanson	UMD/GSFC	USA	ex-officio	
	Kim	Calders	Ghent University	Belgium	Feb 2026 (1st term)	
	Neha	Hunka	UMD	USA	Feb 2026 (1st term)	
ET	Yun	Yang	Mississippi State	USA	Jan 2027 (1st term)	
	Carmelo	Cammalleri	Politecnico di Milano	Italy	Jan 2027 (1st term)	
GPP/NPP	TBD					
	TBD					

WCGV and LPV Plenary

Recent and Upcoming WGCV Plenaries

- *WGCV-53, March 5-8, 2024* *CONAE, Cordoba, Argentina*
- *WGCV-54, Late 2024* *USGS, Sioux Falls, South Dakota*

Past LPV Plenary Meetings

- May 2016, ESA LPS, Prague, Czech Republic
- March 2018, ESA LPVE, Frascati, Italy
- April 2019, ESA LPS, Milan Italy
- May 2021, Virtual
- Sep 2022 Virtual
- June 2023, ESA Frascati
- Propose AGU 2024 (December), Washington, D.C. ???

Validation Stages

Biomass updated to Stage 2 Validation

	Validation Stage - Definition and Current State	Variable
0	No validation. Product accuracy has not been assessed. Product considered beta.	
1	Product accuracy is assessed from a small (typically < 30) set of locations and time periods by comparison with in-situ or other suitable reference data.	**Snow** **Fire Radiative Power**
2	Product accuracy is estimated over a significant (typically > 30) set of locations and time periods by comparison with reference in situ or other suitable reference data. Spatial and temporal consistency of the product, and its consistency with similar products, has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.	**fAPAR** **Phenology** **LAI** **Biomass**
3	Uncertainties in the product and its associated structure are well quantified over a significant (typically > 30) set of locations and time periods representing global conditions by comparison with reference in situ or other suitable reference data. Validation procedures follow community-agreed-upon good practices. Spatial and temporal consistency of the product, and its consistency with similar products, has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.	**Vegetation Indicies** **LST & Emissivity** **Active Fire** **Burned Area**
4	Validation results for stage 3 are systematically updated when new product versions are released or as the interannual time series expands. When appropriate for the product, uncertainties in the product are quantified using fiducial reference measurements over a global network of sites and time periods (if available).	**Land Cover** **Albedo** **Soil Moisture**

Protocols Status – Updates or Still on Track?

Focus Area	Protocol
Biophysical	LAI (2014), Update with Fapar (??)
Fire/Burn Area	Burned Area Targeting 2023 Active Fire next
Phenology	Targeting 2023
Vegetation Index	Targeting 2023 (60%)
Land Cover	Targeting 2023 (95%)
Snow Cover	
Surface Radiation	Albedo(2019) Global Downward Radiation Product Validation Best Practices (80%)
Soil Moisture	SM (2020)
LST and Emissivity	LST (2019)
Aboveground Biomass	AGWB (2021)
Evapotranspiration	

WGCV-53

Day 1 (3/5/24, Cordoba Argentina) Hosted by CONAE

SAOCOM 1A & 1B – (https://www.argentina.gob.ar/ciencia/conae/saocom-1-acquisition-plans-downloads-0)
SAOCOM 2A in 2029
Steven Ramage (CEOS Executive Officer) – Priorities of CEOS include GEO Work Programme integration and Biodiversity
WGCV Vice Chair Nomination: Medhavy Thankappan (Geoscience Australia)
SI-Traceable Satellite (SITSat) Task Team Report, CLARREO Pathfinder (nasa.gov)
CEOS New Space Task Team (NSTT) white paper

Day 2 LPV Comments

- Philippe Goryl (WGCV Chair, ESA) noted the need for further coordination between MSSG and LPV on snow, and also other groups. A better mechanism is needed for collaboration.
- Nigel (UKSA) noted that in the context of LST, under the IVOS banner, relevant individuals from LPV subgroups participated in the LST workshop. While formal outreach may be lacking, there is awareness and participation from LPV members in relevant activities.
- LPV is hoping to organise workshops that bring together instrument scientists and end users, facilitating improved communication and understanding between these groups. The goal is to enhance connections between those working at the sensor level and end users, ultimately improving the usability of data.

TIRCalNet
Infrared and Visible Optical Sensors (IVOS)
Fiducial Reference Measurement (FRM) Assessment Framework Pilots Review
Space Agency Reports

WGCV-53

Day 3 SRIX4Veg protocols

Decision 03	LPV and IVOS Chairs will coordinate a review of the SRIX4Veg Good Practice Protocol with feedback to be returned by June. Feedback will be used to update the document by September, ahead of the next IVOS meeting, where final changes will be reviewed ahead of submission of the document for endorsement at WGCV-54 in October.

WGCV-53-ACT-22	Valentina Boccia to distribute the draft SRIX4Veg Good Practice Protocol for LPV and IVOS review.	**End of April 2024**
WGCV-53-ACT-23	LPV and IVOS Chairs to coordinate a review of the SRIX4Veg Good Practice Protocol with their subgroups and provide feedback to Valentina Boccia so an update can be prepared for the September IVOS meeting and then a subsequent final version for endorsement at WGCV-54 (October).	**June 2024**

Greenhouse Gas Cal/Val Networks, Resources Catalogue and IMEO WG
WGCV Support to 2024 CEOS Chair Priority on Biodiversity
Essential Biodiversity Variables (EBVs)

Lastly, WGCV Deliverables for LPV from WGCV 53

Good Practices Protocol on Land Cover	Q3 2024	A community developed document detailing standards and methods for validating land cover classification from a variety of satellite platforms
Good Practices Protocol on Vegetation Indices	Q3 2024	A community developed document detailing review of practices for vegetation index validation and intercomparison.

FA Web Status

The Home and Collaboration pages have been placed in your GoogleDoc folders for markup updates/reviews

Since last call, 5 boxes have changed, only 2 of them were shaded. Still WAY too much color here!

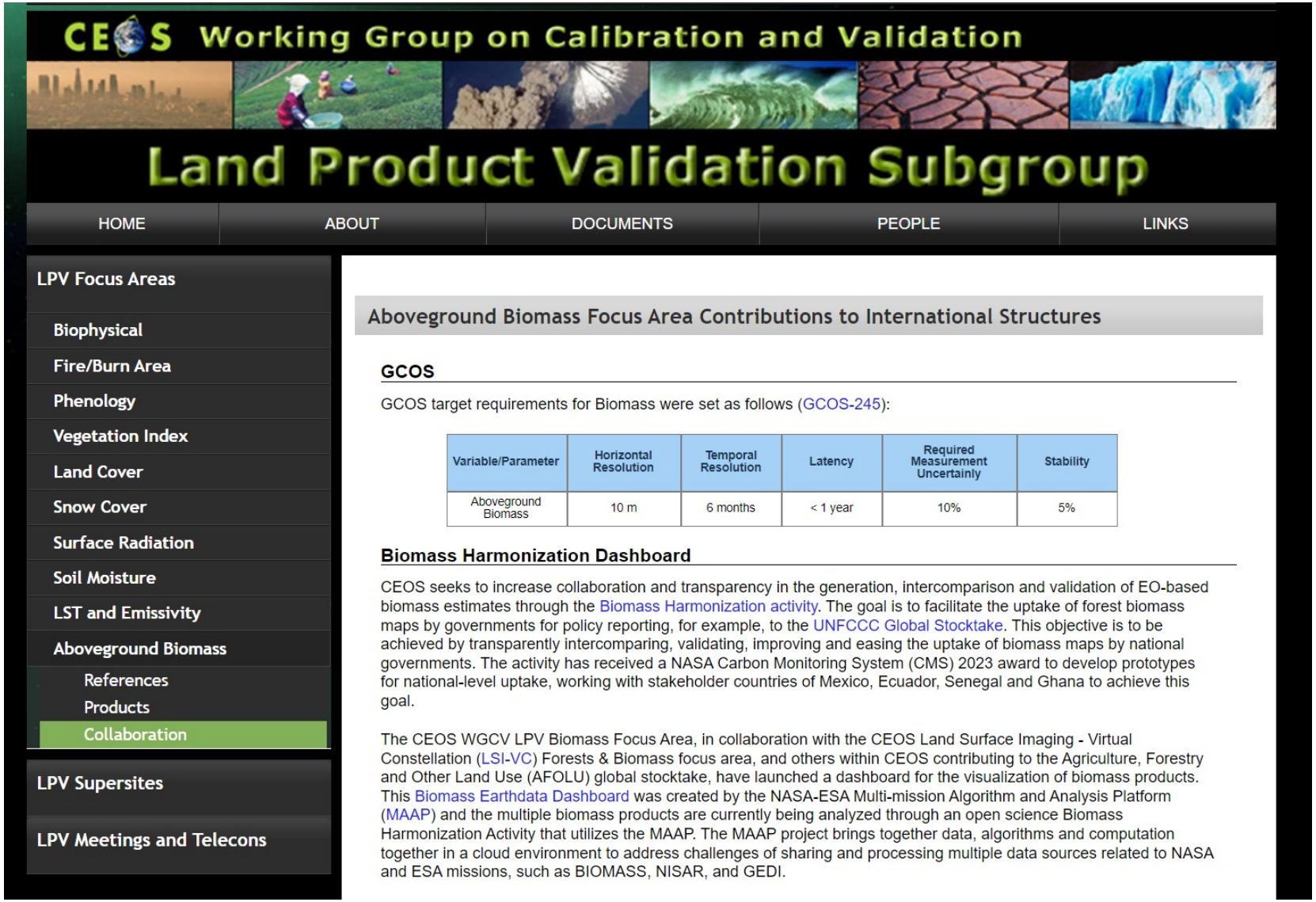
Focus Area	Home Page	Product table	Collaboration Page	References	Listserv	Letters to Community
Land Cover	May 2021	Dec 2023	May 2021	Sep 2021	Dec 2023	Oct 2022
Biophysical LAI/Fpar	Nov 2021	Nov 2021	Nov 2021	Aug 2022	Oct 2019	Sept 2019
Surface Rad/Albedo	Jan 2024	Jan 2023	Mar 2021	Oct 2022	Dec 2023	Draft Jan 2024
LST/Emissivity	Jan 2024	Mar 2024	Mar 2024	Jan 2024	Dec 2023	
Fire/Burn Area	May 2021	Feb 2024	Mar 2020	Aug 2022	Dec 2023	
Soil Moisture	Jan 2024	Feb 2019	Mar 2021	Sep 2022	Dec 2020	Dec 2020
Phenology	Apr 2021	July 2020	Apr 2021	Oct 2022	Dec 2023	
Snow Cover	Oct 2021	Jan 2021	Oct 2021	Oct 2021	Oct 2019	
Vegetation Index	May 2021	Nov 2021	May 2021	May 2021	May 2019	
Biomass	Mar 2024	Oct 2021	Mar 2024	Dec 2023	Dec 2023	Sept 2020

Focus Area Reports

- Biomass
- Soil Moisture
- Vegetation Indices
- Land Cover
- Fire/Disturbance
- LST&E
- Surface Radiation
- Land Surface Phenology
- Biophysical (LAI/FAPAR)
- Snow
- Evapotranspiration

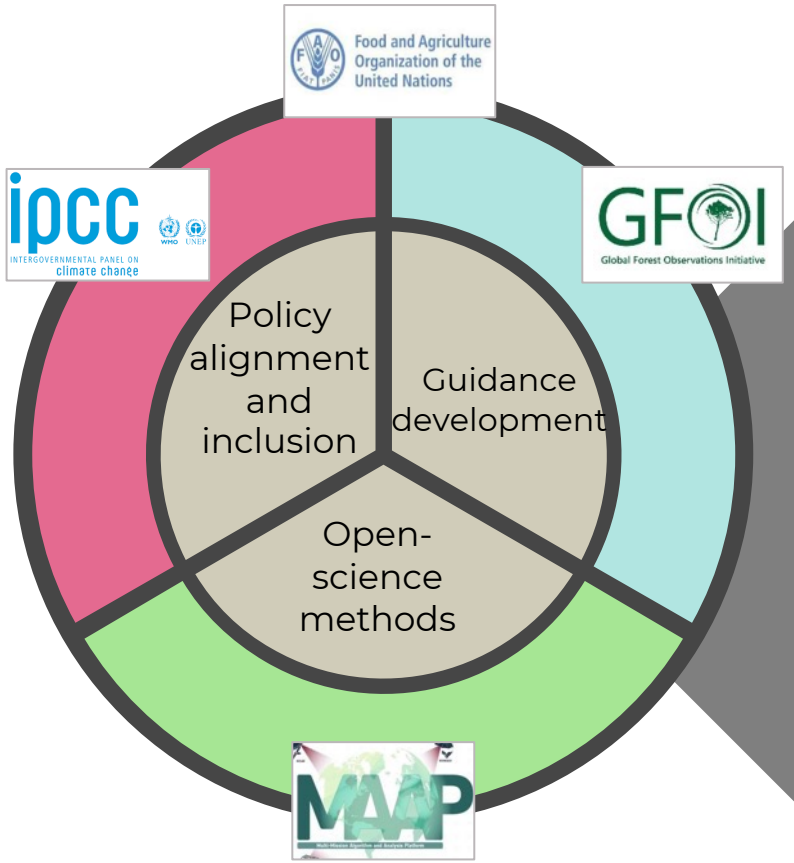
Biomass (1/3)

CEOS LPV Aboveground Biomass web pages update



Biomass (2/3)

Biomass Harmonization: Ongoing activities



NASA Carbon Monitoring Systems 2022

In-review, Feb 2024

IPCC Tier 1 AGBD estimates from EO data

- Delivers AGBD estimates, in the format of Intergovernmental Panel on Climate Change (IPCC) Tier 1 values for natural forests.
- Sourced from NASA GEDI mission and ESA CCI Biomass initiative

Direct use:

- **IPCC Emissions Factors Database**

20-22 March, 2024

Biomass to Policy workshop

- How to communicate policy requirements to map makers, and product integration with (ground)NFI data to map users
- Toward new guidance documentation for using EO biomass products

Use Cases:

- **Mexico:**
- **Mozambique**
- **West Africa**

Updated daily

Public source codes for AGB map and NFI integration

- The ESA-NASA Joint Multi-Mission Algorithm and Analysis Platform (MAAP) is a collaborative cloud-computing environment.
- The open-source Biomass Harmonization public Gitlab repository is regularly updated and maintained.

Use case:

- **Country summaries of AGB density and stock with EO maps**

Hunka et al., in review (preprint available)

Biomass (2/3)

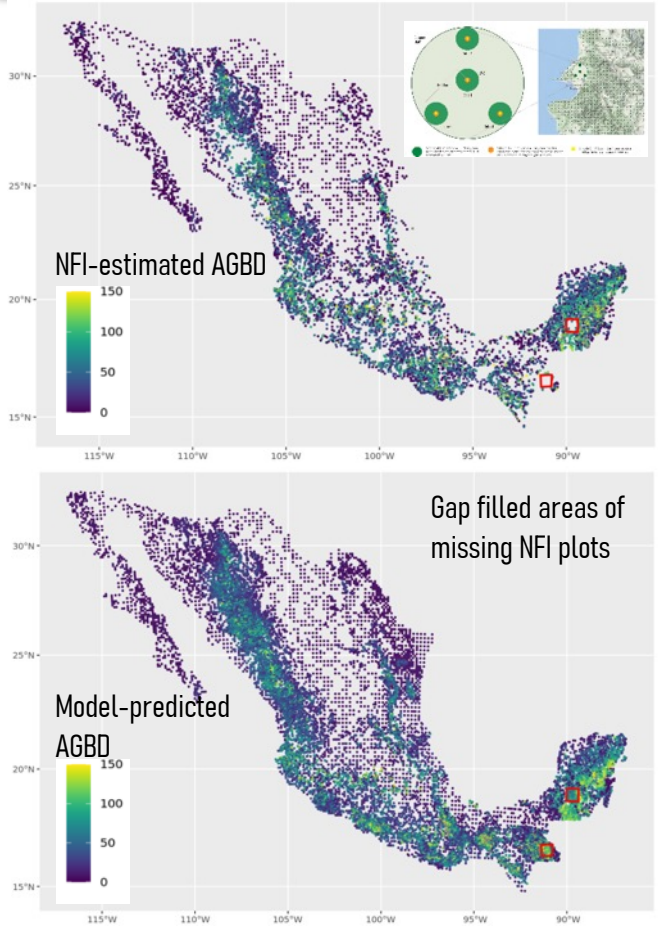
Harmonization: Ongoing Activities

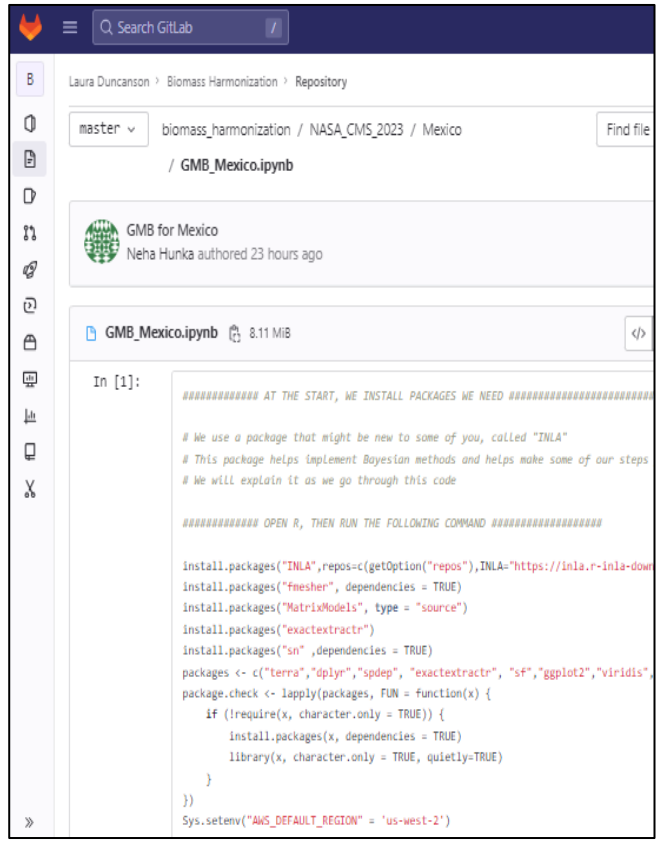
University of Maryland, the USGS SilvaCarbon program, and the GFOI R&D Component

20-22 March 2024, USGS, Reston, VA

Summary:

- Received an update from map developers on **current methods and approaches to estimating biomass** and associated uncertainty, as well as clarify what the current requirements for reporting on the policy side are.
- **Collaboratively developed example codes and drafted outline of guidance** to assist countries in improving biomass stock estimates by integrating EO data. Data from two countries (Mexico and Mozambique) were used this exercise, with the aim of creating tangible codes/modules on the NASA MAAP Platform.
- **Showcase how EO-based estimates can be used to fill gaps in current guidance in the policy domain**.





Available at public [Biomass Harmonization Gitlab repository]

Soil Moisture (1/2)

7th Satellite Soil Moisture Validation and Application Workshop

June 4-6, 2024
Kellogg Hotel and Conference Center
219 S Harrison Rd., East Lansing, MI 48824

Soil Moisture (1/2)

Share Post

Hosted by Michigan State University

The purpose of the 7th Satellite Soil Moisture Validation and Application Workshop is to discuss and reconcile recent methodological advances in the development, validation and application of global satellite soil moisture observations. The workshop series is unique as it brings together satellite soil moisture users and developers with the aim of deriving and exploiting soil moisture from passive and active microwave satellite missions\sensors (SMAP, SMOS, ASCAT, AMRS-2, Sentinel-1, NISAR, and other legacy missions) as well as optical instruments (e.g., MODIS, Sentinel-2, and others).

Important Dates:

May 01, 2024 --- Abstract submission closes
May 05, 2024 --- Author notification
May 15, 2024 --- Registration closes
May 20, 2016 --- Final schedule posted
June 4-6, 2024 -- Workshop

https://events.anr.msu.edu/soilmoisture/

Soil Moisture (2/2)

Upcoming workshops:

- BIPM-WMO Metrology for Climate Action Workshop 2024
  - 16-18 September @ BIPM headquarters, Sevres, France (hybrid)
  - Call for papers - https://bipm-cenv2024.org/. The deadline for submissions is 31 May 2024
  - 2022 workshop report: https://www.bipm.org/en/doi/10.59161/Rapport202303

Relevant projects:

- FRM4SM - Fiducial Reference Measurements for Soil Moisture project likely to get another 2 year extension (2025-2026). Goals for this extension period are
  - to establish validation good practice guidelines for high resolution sm products, and
  - to have an updated version of the CEOS soil moisture validation good practice protocol including all the progress of FRM4SM and whatever else has been going on on the community.

Vegetation Indices (1/2)

Protocol Development

- Formed a small group of VI experts to review the outline (November 2022)
  - Carolien Toté (VITO, Belgium)
  - Kamel Didan (University of Arizona, USA)
  - Molly Brown (University of Maryland, USA)
  - ~~Michele Meroni (JRC, Italy)~~
  - Kazuhito Ichii (Chiba University, Japan)
- Kick-off meeting with the expert group (Dec 2022), 2nd meeting review comments (Jan 2023)
- Revised the outline and shared the revised outline with group (March 2023)
- First draft completed (December 2023)
- Final review by expert group (December 2023 - January 2024)
- Reviewed the VI listserv (March - April 2024)
- Plan to send the draft protocol document for the community (April 2024)

Co-lead Recruitment

- Plan to recruit another replacement lead after the first protocol draft is ready for community-wide feedback

Contents

Land Cover (1/3)

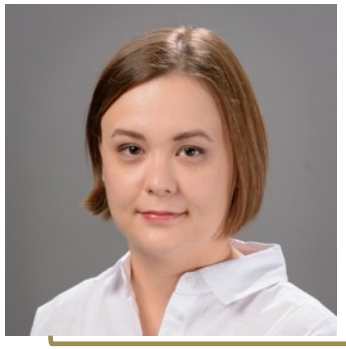
Protocol update: in the editing process

Status: finalizing the edits of the version 0.1 of the updated guidelines, expected to be sent out to community review in Spring 2024 (version 1.0 – after review)

Working group: 34 people from 17 institutions from 9 countries

Editors:

Alexandra (Sasha) Tyukavina
U. Maryland, USA



Sophie Bontemps
UC Louvain, Belgium

Giles Foody
U. of Nottingham, UK

Stephen Stehman
SUNY ESF, USA

CEOS LPV Land Cover Focus Area Co-leads


Committee on Earth Observation Satellites
Working Group on Calibration and Validation
Land Product Validation Subgroup
Land Cover Focus Area

Land Cover and Change Map Accuracy Assessment and Area Estimation Good Practices Protocol

Version 0.1 - 2024

Editors: Alexandra Tyukavina, Sophie Bontemps, Giles Foody, Stephen V. Stehman

Chapter leads: Alexandra Tyukavina (Chapters 1, 2, 3, 5), Sophie Bontemps (Chapters 1, 2, 7), Pontus Olofsson (Chapters 3, 5), Giles Foody and Julien Radoux (Chapter 4), Linda See and Bryant Serre (Chapter 6), Xiao-Peng Song (Chapter 8).

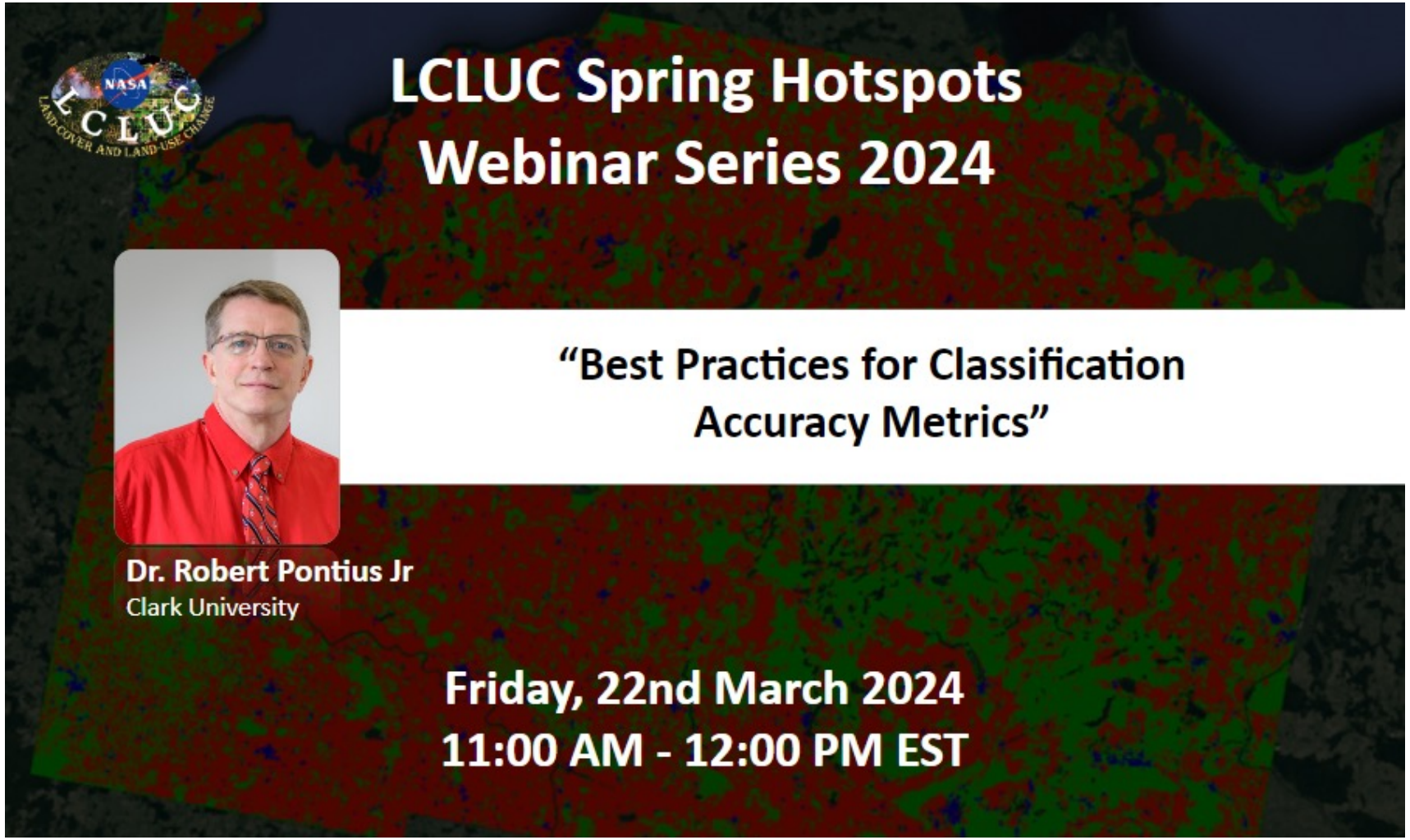
Land Cover (2/3)

Additional LC Updates

- ✓ **Product list update:** finalized (Product list was updated to include only those products providing validation information)
- ✓ **New co-lead:** New co-lead has been added to the LPV LC leadership.
- ✓ **Presentations:** Sasha Tyukavina will be presenting an overview of LPV LC activities (guidelines work + cropland validation workshop) at the NASA LCLUC meeting on Wednesday, April 3rd (tomorrow), in-person in Gaithersburg, MD

Land Cover (3/3)

LC related events/resources



Webinar recording available at the LCLUC website: https://lcluc.umd.edu/sites/default/files/Pontius-Webinar.mp4

Biophysical (1/4)

New Biophysical Products – LAI and fAPAR

ESA Vegetation Parameters Climate Change LAI and fAPAR, Version 1.0 (via ceda.ac.uk)

- Validated vegetation parameters of LAI and fAPAR (with uncertainty quantification), 2000-2020, for a North-South transect over Europe and Africa (SPOT/VGT – PROBAV)
- Additional experimental (unvalidated) products, notably fPAR_chlorophyll, leaf chlorophyll content, and albedo in the VIS and NIR.
- Direct Numerical Inversion of RTM – 5 day revisit (10 day compositing window)

HiQ-LAI: a high-quality reprocessed MODIS leaf area index dataset with better spatiotemporal consistency from 2000 to 2022 (via Zenodo & Google Earth Engine)

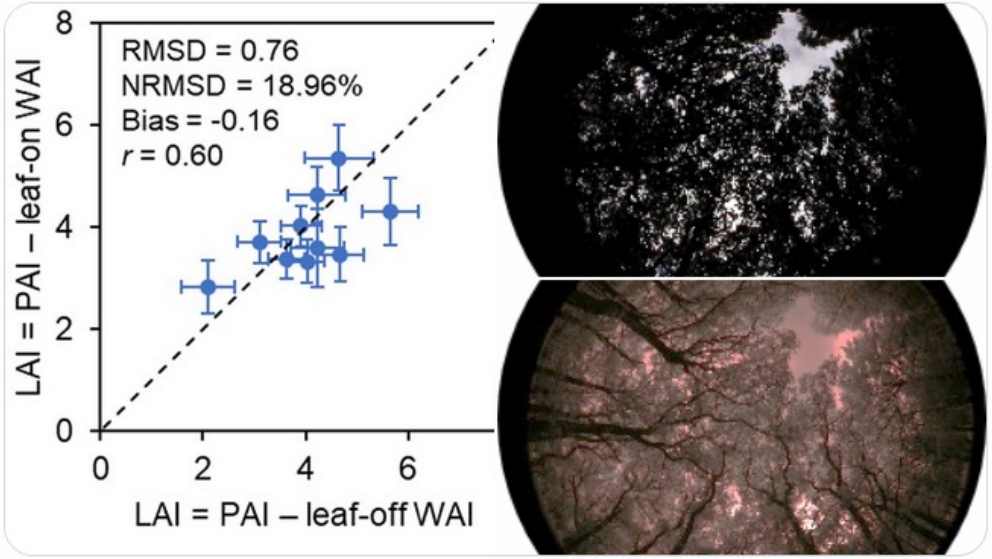
- Spatio-temporal information compositing algorithm (STICA) including pixel quality information, spatiotemporal correlation, and the original retrieval.
- Better performance than the original MODIS product with a RMSE (bias) decrease from 0.87 (−0.17) to 0.78 (−0.06)
- Descriptor manuscript published in Earth System Science Data: https://doi.org/10.5194/essd-16-1601-2024

Biophysical (2/4)

Recent/upcoming field campaigns

- Wood area index (WAI) measurement in a deciduous needleleaf forest with snow background (Saihanba, China), Mar 6-8, 2024 (H. Fang)
- Terrestrial laser scanning & near-infrared DHP campaign at Wytham Woods, UK (LPV SuperSite), leaf-off: Apr 1-8, 2024, leaf-on to follow in Jun/Jul (L. Brown)

- **Near-infrared digital hemispherical photography evaluated as measurement technique for discriminating between leaves and wood under leaf-on conditions**
  - Benchmarked using leaf-off & leaf-on (FRM4VEG) data at Wytham Woods, UK (LPV SuperSite)
  - Enables plant area index (PAI) to be decomposed into leaf/wood area index (LAI & WAI)
  - Published in Ecological Informatics: https://doi.org/10.1016/j.ecoinf.2023.102441



Biophysical (3/4)

Upcoming workshops

- **Annual Meeting of the Federation of Remote Sensing Field Networks**, Huai'lai, Hebei Province, China, Apr 20-21, 2024
- **EARSeL Symposium**, Manchester, UK – Jun 17-20, 2024
- **2nd Forum on Remote Sensing Field Experiments and Validation**, Zhangye, Gansu Province, China, Jul 5-6, 2024
- **IGARSS 2024**, Athens, Greece, Jul 7-12, 2024
  - No special session about vegetation products or their validation…
- **RAQRS**, Valencia, Spain, Sep 23-27, 2024 (abstracts May 1)
- **National Earth Observation Conference**, York, UK, Sep 10-12, 2024

Biophysical (4/4)

Recent/upcoming publications

Manuscripts

- Fang, H., et al., Canopy vertical structural profiles measured at two temperate forest sites in northern China: Intercomparison of tower, mast, crane, and UAV measurements (to be submitted)
- Li, W., Weiss, M., Jay, S., Wei, S., Zhao, N., Comar, A., Lopez-Lozano, R., De Solan, B., Yu, Q., Wu, W., & Baret, F. (2024). Daily monitoring of Effective Green Area Index and Vegetation Chlorophyll Content from continuous acquisitions of a multi-band spectrometer over winter wheat. Remote Sens. Environ., 300, 113883
- Yan, K., Wang, J., Peng, R., Yang, K., Chen, X., Yin, G., Dong, J., Weiss, M., Pu, J., & Myneni, R.B. (2024). HiQ-LAI: a high-quality reprocessed MODIS leaf area index dataset with better spatiotemporal consistency from 2000 to 2022. Earth Syst. Sci. Data, 16, 1601-1622
- Fernandes, R., Djamai, N., Harvey, K., Hong, G., MacDougall, C., Shah, H., & Sun, L. (2024). Evidence of a bias-variance trade off when correcting for bias in Sentinel 2 forest LAI retrievals using radiative transfer models. Remote Sens. Environ., 305, 114060

Elsevier EO book chapters

- Fang, H. et al., Remote Sensing of FAPAR, Leaf Area Index and Clumping Index. Comprehensive Remote Sensing. S. Liang (ed.) (under 1st round review)
- Wang, Y. et al., Retrieval of canopy leaf area index, canopy cover, and clumping index using the LiDAR technology. Carbon fluxes and biophysical variables estimation from Earth observation. M. Campos-Taberner (ed.) (first draft on Jun 1, 2024)

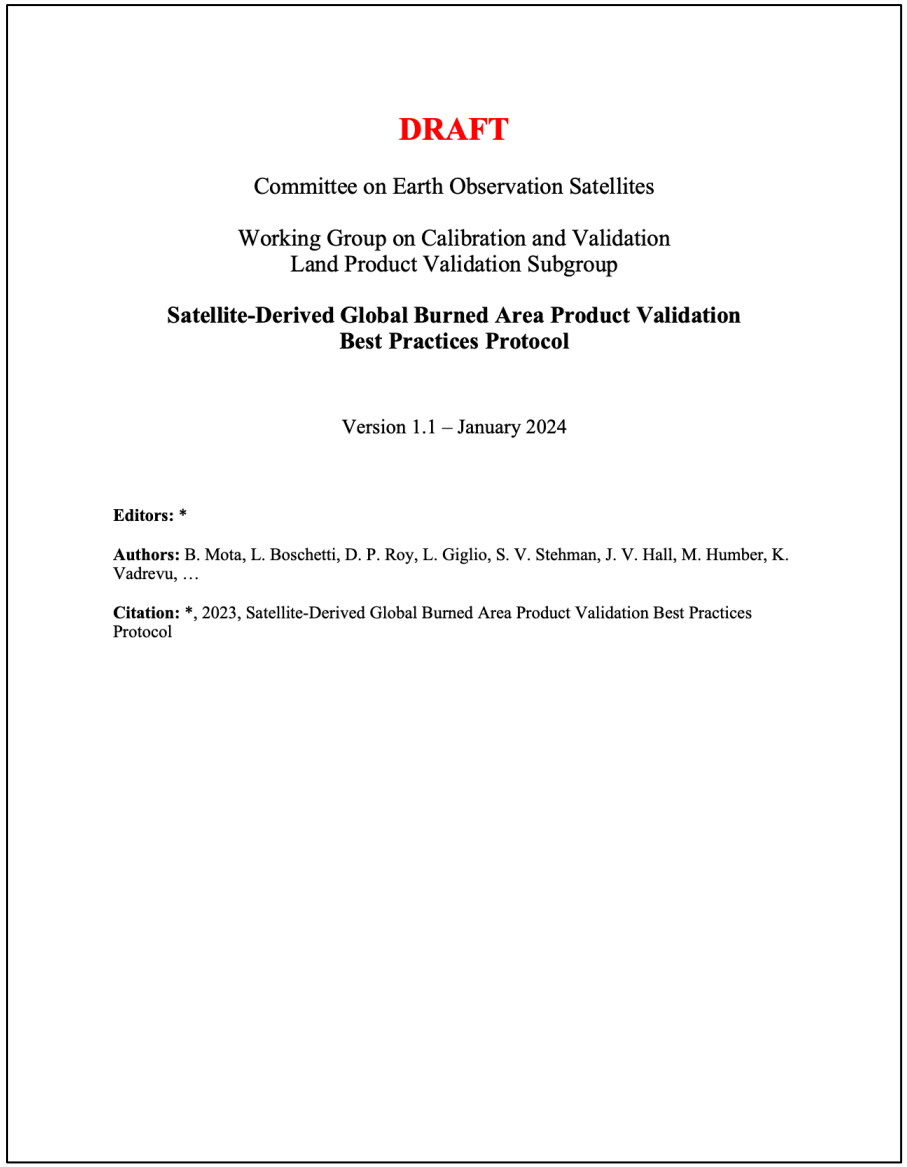
Fire Disturbance

Burned Area Validation Protocol Status

- Update of draft burned area validation protocol continues
- Now includes contributions from the Fire CCI group

VIIRS Burned Area Product

- NASA's Collection 2 VIIRS burned area product has finally been reprocessed and Stage-3 validated.
- Public release will follow shortly.



DRAFT

Committee on Earth Observation Satellites

Working Group on Calibration and Validation
Land Product Validation Subgroup

Satellite-Derived Global Burned Area Product Validation Best Practices Protocol

Version 1.1 – January 2024

Editors: *

Authors: B. Mota, L. Boschetti, D. P. Roy, L. Giglio, S. V. Stehman, J. V. Hall, M. Humber, K. Vadrevu, …

Citation: *, 2023, Satellite-Derived Global Burned Area Product Validation Best Practices Protocol

LST & E (1/3)

Upcoming Conferences

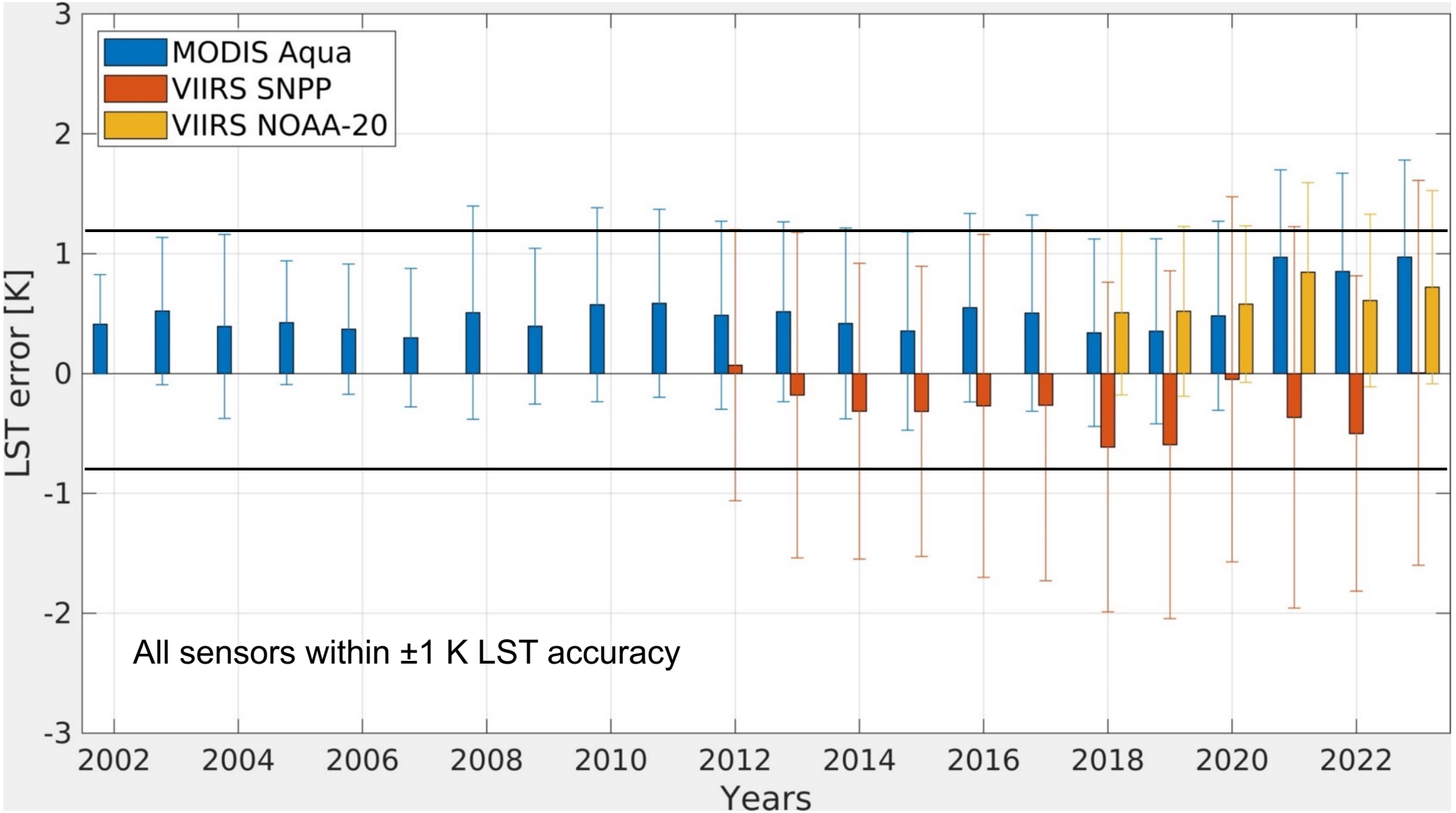
- Surface Biology and Geology (SBG) annual workshop, June 4-6, 2024
- EGU General Assembly, 14–19 April, 2024
- EARSeL Symposium, Manchester, June 17-20
- IGARSS, Athens, 7-12 July 2024 special session on TIR:
  - Innovative EO applications based on high spatial and temporal resolution thermal data
- 7th International Symposium on Recent Advances in Quantitative Remote Sensing (RAQRS'VII), Valencia, Sep 23-27

Project news

- TIRCALNet preparation study, coordination meeting in April 2024
- ECOSTRESS forward processing and reprocessing for Collection 2 higher level products (ET, ESI, WUE) has begun
- SBG-TIR Key Decision Point (KDP)-B expected in March 2024
- International science workshop on High resolution Thermal remote sensing expected in India during November 2024

LST & E (2/3)

Time-series of MODIS and VIIRS LST validation over Lake Tahoe from 2002-2023



LST & E (3/3)

Recent publications

2022 CEOS International Thermal Infrared Radiometer Comparison. Part I: Laboratory Comparison of Radiometers and Blackbodies

YOSHIRO YAMADA,[a] SUBRENA HARRIS,[a] MICHAEL HAYES,[a] ROB SIMPSON,[a] WERENFRID WIMMER,[b] RAYMOND HOLMES,[b] TIM NIGHTINGALE,[c] ARROW LEE,[c] NIS JEPSEN,[d] NICOLE MORGAN,[c] FRANK-M. GÖTTSCHE,[f] RAQUEL NICLÒS,[g] MARTÍN PERELLÓ,[g] CRAIG DONLON,[h] AND NIGEL FOX[a]

[a] *National Physical Laboratory, Teddington, United Kingdom*
[b] *University of Southampton, Southampton, United Kingdom*
[c] *Rutherford Appleton Laboratory, Science and Technology Facilities Council, Oxon, United Kingdom*
[d] *Danish Meteorological Institute, Copenhagen, Denmark*
[e] *CSIRO/Australian Bureau of Meteorology, Battery Point, Tasmania, Australia*
[f] *Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany*
[g] *University of Valencia, Valencia, Spain*
[h] *European Space Agency, Noordwijk, Netherlands*

(Manuscript received 3 May 2023, in final form 3 November 2023, accepted 7 February 2024)

ABSTRACT: An international comparison of field deployed radiometers for sea surface skin temperature (SST_{skin}) retrieval was conducted in June 2022. The campaign comprised a laboratory comparison and a field comparison. In the laboratory part, the radiometers were compared with reference standard blackbodies, while the same was done with the blackbodies used for the calibration of the radiometers against a transfer standard radiometer. Reference values were provided by the National Physical Laboratory (NPL), traceable to the primary standard on the International Temperature Scale of 1990. This was followed by the field comparison at a seaside pier on the south coast of England, where the radiometers were compared against each other while viewing the closely adjacent surface of the sea. This paper reports the results of the laboratory comparison of radiometers and blackbodies. For the blackbody comparison, the brightness temperature of the blackbody reported by the participants agreed with the reference value measured by the NPL transfer standard radiometer within the uncertainties for all temperatures and for all blackbodies. For the radiometer comparison, the temperature range of most interest from the SST_{skin} retrieval point of view is 10°–30°C, and in this temperature range, and up to the maximum comparison temperature of 50°C, all participants' reported results were in agreement with the reference. On the other hand, below 0°C the reported values showed divergence from the reference and the differences exceeded the uncertainties. The divergence shows there is room for improvement in uncertainty estimation at lower temperatures, although it will have limited implication in the SST_{skin} retrieval.

KEYWORDS: Ocean; Sea surface temperature; Infrared radiation; Instrumentation/sensors; Remote sensing; Measurements

1. Introduction

The temperature of Earth's surface is a fundamental and integral parameter within the larger system of the global cli-

are fully anchored to the International System of Units (SI) and that there is a direct regular correlation with "true" surface/in situ–based measurements.

The most accurate of these surface-based measurements

2022 CEOS International Thermal Infrared Radiometer Comparison. Part II: Field Comparison of Radiometers

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[d] *Danish Meteorological Institute, Copenhagen, Denmark*
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[f] *Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany*
[g] *University of Valencia, Valencia, Spain*
[h] *European Space Agency, Noordwijk, Netherlands*

(Manuscript received 3 May 2023, in final form 8 January 2024, accepted 19 January 2024)

ABSTRACT: An international comparison of field-deployed radiometers for sea surface skin temperature (SST_{skin}) retrieval was conducted during two weeks in June 2022. The comparison comprised a laboratory comparison and a field comparison. The field comparison of the radiometers took place on the second week at a seaside pier on the south coast of England. Six thermal infrared radiometers were compared with each other while continuously viewing the closely adjacent surface of the sea from the end of the pier. This paper reports the results of this field comparison. All participants' radiometers agreed with the reference value, evaluated as the simple mean of the participant-reported values, within the claimed uncertainties. The SST_{skin} variation during the 5-day period was within 3°C around 18.3°C, which is 2 times as large in range as in the previous comparison in 2016, while the mean of the difference from the reference value over the period evaluated for each participant was found to be within 0.07°C, which is a 2-times improvement on the previous results. During the comparison an insignificant but noticeable abrupt shift in measured value occurred in one of the radiometers, which could not have been detected without comparison with other instruments. This demonstrated the effectiveness of having long-term stable internal reference sources in the instrument, a feature this particular radiometer did not have. The combined results from the laboratory comparison and the field comparison contribute to improve confidence in the retrieved SST_{skin}.

KEYWORDS: Ocean; Sea surface temperature; Infrared radiation; Instrumentation/sensors; Remote sensing; Measurements

1. Introduction

Sea surface temperature (SST), identified as one of the essential climate variables (Bojinski et al. 2014) that critically contributes to the characterization of Earth's climate by the World Meteorological Organization Global Climate Observing System (GCOS) (WMO 2022), is monitored globally from

The calibration and validation community within the Committee on Earth Observation Satellites (CEOS) has previously held comparison exercises to verify the accuracy of these radiometers (Rice et al. 2004; Barton et al. 2004; Theocharous et al. 2010, 2017, 2019; Theocharous and Fox 2010; Barker-Snook et al. 2017a,b). However, 6 years had passed since the last

Suface Radiation (1/3)

Surface radiation: Angela Erb, Jorge Sánchez-Zapero, Zhuosen Wang

- **FA Web Status: Expected completion 5/1/2024**

Focus Area	Home Page	Product table	Collaboration Page	References	Listserv	Letters to Community
Surface Rad/Albedo	Jan 2024	In progress	In progress	In progress	Dec 2023	draft

Community Meetings

- **International Radiation Symposium 2024,** Hangzhou, China -- 17-21 June 2024
  http://www.irs2024.org

- **18th BSRN Scientific Review and Workshop,** Japan Meteorological Agency Headquarters, Tokyo, Japan-- 1-5 July 2024.
  https://bsrn.awi.de/meetings/2024/

- **7th International Symposium on Recent Advances in Quantitative Remote Sensing,** Torrent (Valencia)-Spain-- 23-27th September 2024.
  https://ipl.uv.es/raqrs

Suface Radiation (2/3)

Updated Albedo Datasets

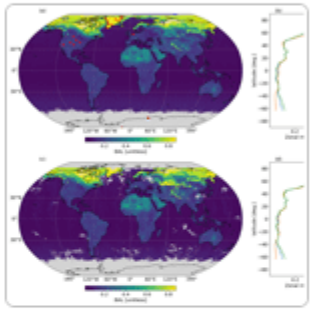
Articles / Volume 16, issue 2 / ESSD, 16, 1007–1028, 2024

Search

https://doi.org/10.5194/essd-16-1007-2024

Article | Assets | Peer review | Metrics | Related articles

Data description paper | 22 Feb 2024



Four decades of global surface albedo estimates in the third edition of the CM SAF cLoud, Albedo and surface Radiation (CLARA) climate data record

Aku Riihelä, Emmihenna Jääskeläinen, and Viivi Kallio-Myers

Abstract

We present the surface albedo data in the third edition of the CM SAF cLoud, Albedo and surface Radiation (CLARA) data record family. The temporal coverage of this edition is extended from 1979 until the near-present day. The core algorithms and data format remain unchanged from previous editions, but now white- and blue-sky albedo estimates are also available for the first time in CLARA data. We present an overview of the retrieval, followed by an assessment of the accuracy and stability of the data record, based on collocated comparisons with reference surface albedo measurements and intercomparisons with preceding satellite-based albedo data records. Specific attention is paid to addressing the spatial representativeness problem inherent in the

Suface Radiation (3/3)

Updated Albedo Datasets

Research Article

Upgrade and extension of LSA-SAF land surface albedo archive from EPS Metop/AVHRR: description and quality assessment

Anthéa Delmotte, Daniel Juncu, Xavier Ceamanos, Isabel F. Trigo & Sandra Gomes

Article: 2300043 | Received 03 Dec 2022, Accepted 22 Dec 2023, Published online: 21 Jan 2024

Cite this article https://doi.org/10.1080/22797254.2023.2300043 Check for updates

ABSTRACT

Formulae display: MathJax

ETAL is the operational EPS Ten-Day Albedo product, produced by the EUMETSAT Satellite Application Facility for Land Surface Analysis (LSA SAF). By back-processing the full catalogue of EPS-Metop radiance data from September 2007 to June 2021, we are able to 1) extend the temporal coverage (previously the archive only went back to 2015) and 2) improve the product archive that was based on near-real time (NRT) processing; the second point is achieved by using reanalyses instead of forecasts of atmospheric conditions and by not being exposed to missing data in the NRT radiance inputs. We present this reprocessed part of the ETAL data set, called ETAL-R, and assess its quality and consistency with respect to the original archive of NRT ETAL data (for the overlapping period 2015–2021), as well as its accuracy compared to albedo from MODIS and ground stations. ETAL-R exhibits reliable long-term stability and increased homogeneity compared to the NRT archive, and the comparison against the additional reference data shows satisfactory accuracy. Overall, ETAL-R is shown to be very consistent with the ETAL NRT archive while – under certain

Land Surface Phenology (1/5)

ESRIN (ESA) “super site” design: implementing phenology protocol and phenocam(s) for crop progress observations

- Adapting NEON pheno protocols

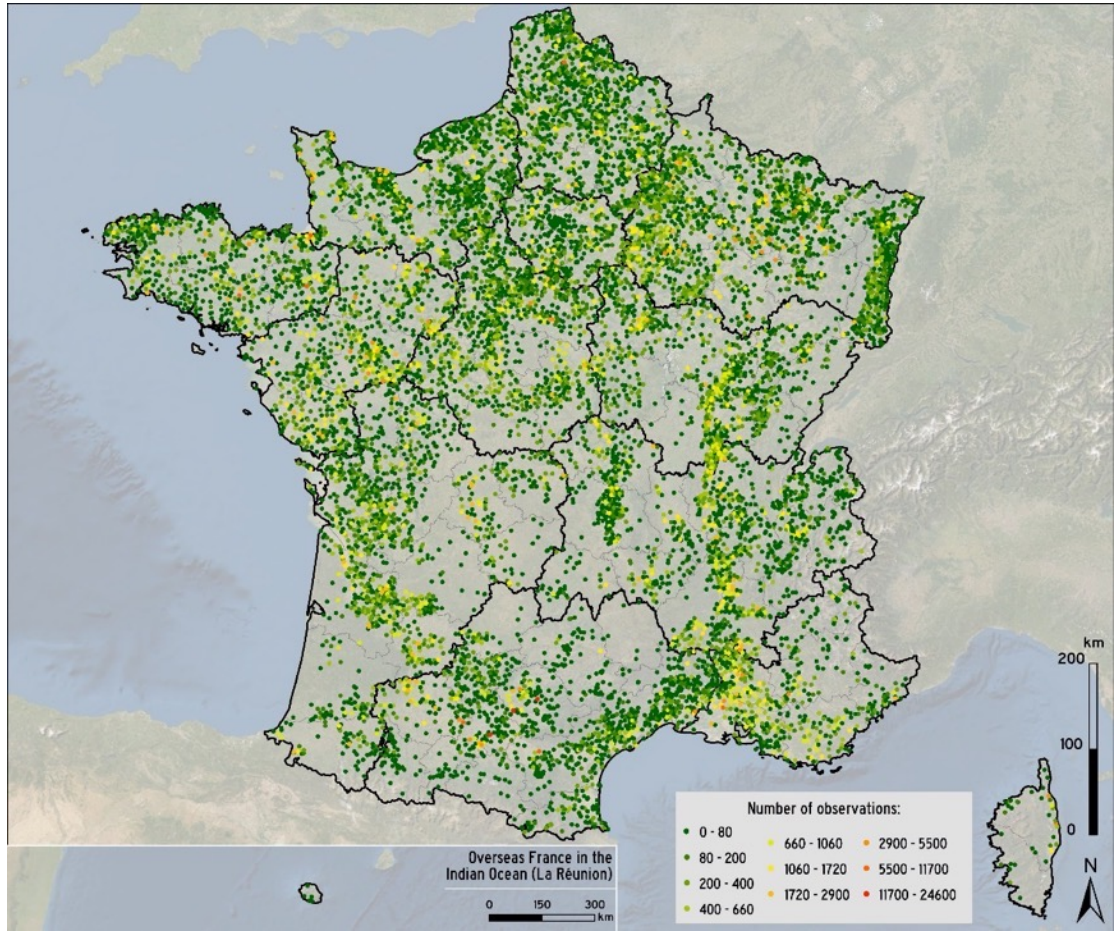
Upcoming EGU General Assembly 2024 talks:

- How precipitation controls end of season, especially in grasslands. **Overall:** EOS sensitivity to P anomalies exerts a secondary control on GSL and NEP and can be estimated as $NDVI_t \sim P_t$
- Gray: *Drought Changes Growing Season Length and Vegetation Productivity*
- Choi & Gray: *Understanding the role of vegetation responses to drought in regulating autumn senescence*
- *Caparros-Santiago & Rodriguez-Galiano: Land surface phenology across major natural vegetation land cover types in the Iberian Peninsula*
- *García-Pérez & Rodriguez-Galiano: Comparing crop calendars: phenology derived from sentinel 2 data vs official data.*

Protocol chapter about UAV LSP in second round of revisions.

Land Surface Phenology (2/5)

Preliminary results on the validation of HR-VPP with the phenological network of France (TEMPO)



TEMPO: "New" observational network in France managed by INRAE

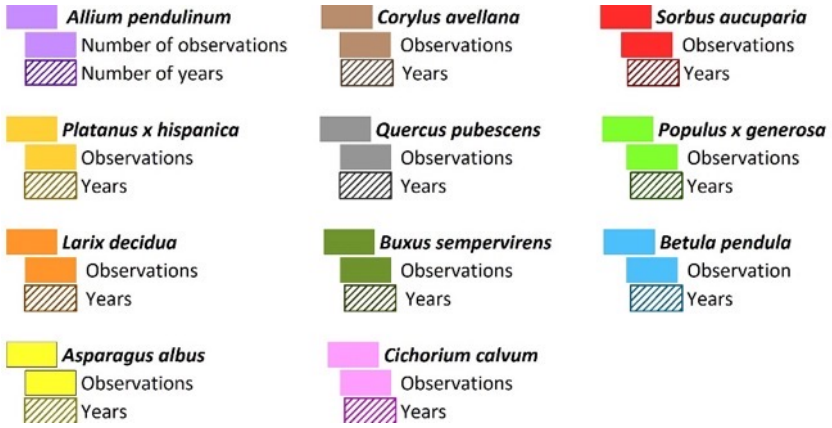
- 2,310,850 observations
- 10,945 sites
- 1,150 species and varieties
- Temporal coverage: jan. 1954-aug. 2022

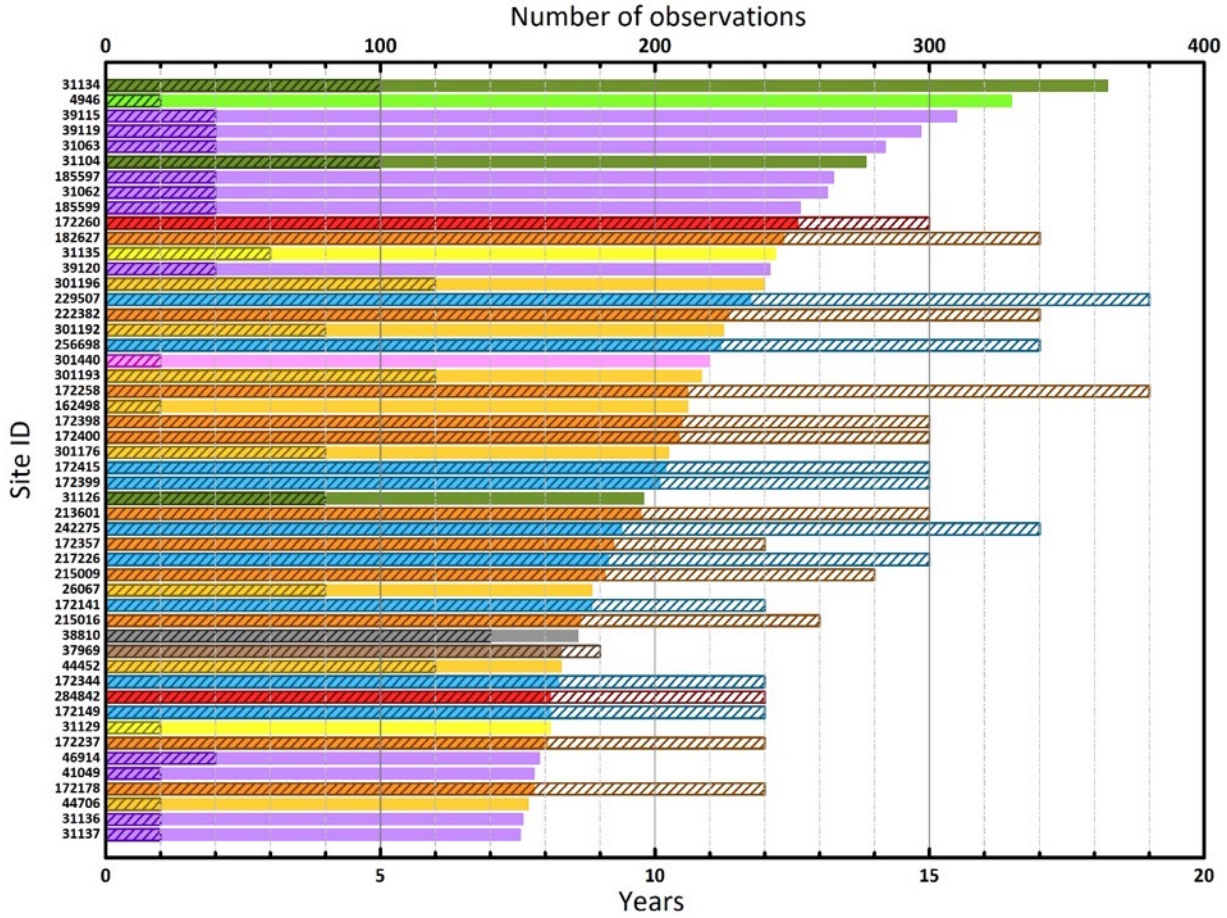
Rodriguez-Galiano et al. 2023 (In Prep.)

Land Surface Phenology (3/5)

Preliminary results on the validation of HR-VPP with the phenological network of France (TEMPO)

Vegetation group	Genera	CORINE Land Cover Map (cover description and code)
Deciduous broad-leaved trees and shrubs	***Betula* (144/17)**, *Corylus (84/26)*, ***Fagus* (39/10)**, *Forsythia* (23/8), ***Fraxinus* (72/19)**, *Platanus (11/2)*, ***Robinia* (3/2)**, ***Sorbus* (78/6)**, ***Syringa* (36/9)**	Broad-leaved forest (311), mixed forest (313), transitional woodland-shrub (324), green urban areas (141)
Evergreen coniferous trees	*Abies* (3/1), ***Picea* (25/5)**, ***Pinus* (6/1)**	Coniferous forest (312)
Deciduous coniferous trees	*Larix (24/2)*	Coniferous forest (312), mixed forest (313)



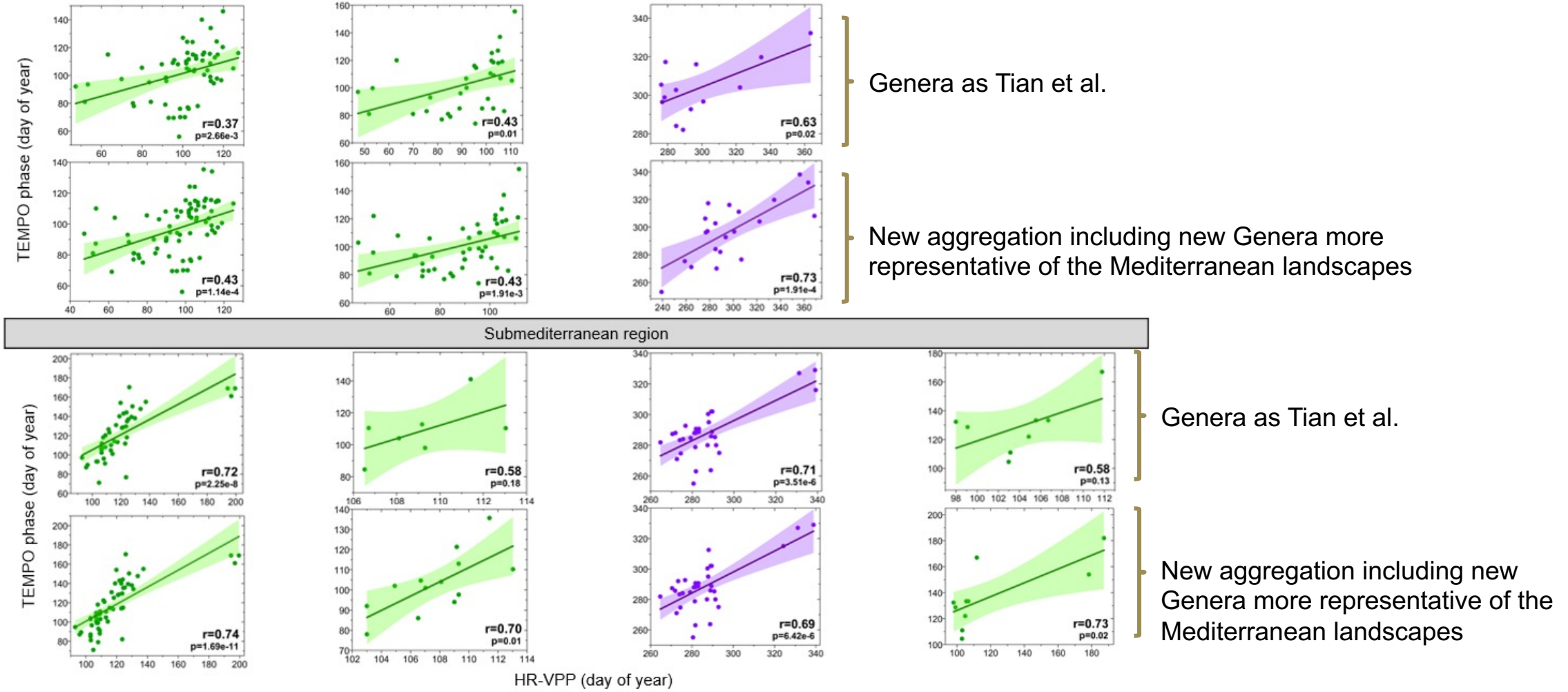


CEOS WORKING GROUP ON CALIBRATION & VALIDATION

Land Surface Phenology (4/5)

Preliminary results on the validation of HR-VPP with the phenological network of France (TEMPO)

Deciduous broad-leaved			Evergreen coniferous
Leaves unfolded (10%)	Leaves undolded (50%)	Automnal coloration/leaf fall 50%	Leaves unfolded (10%)
Mediterranean region			
Submediterranean region			



Genera as Tian et al.

New aggregation including new Genera more representative of the Mediterranean landscapes

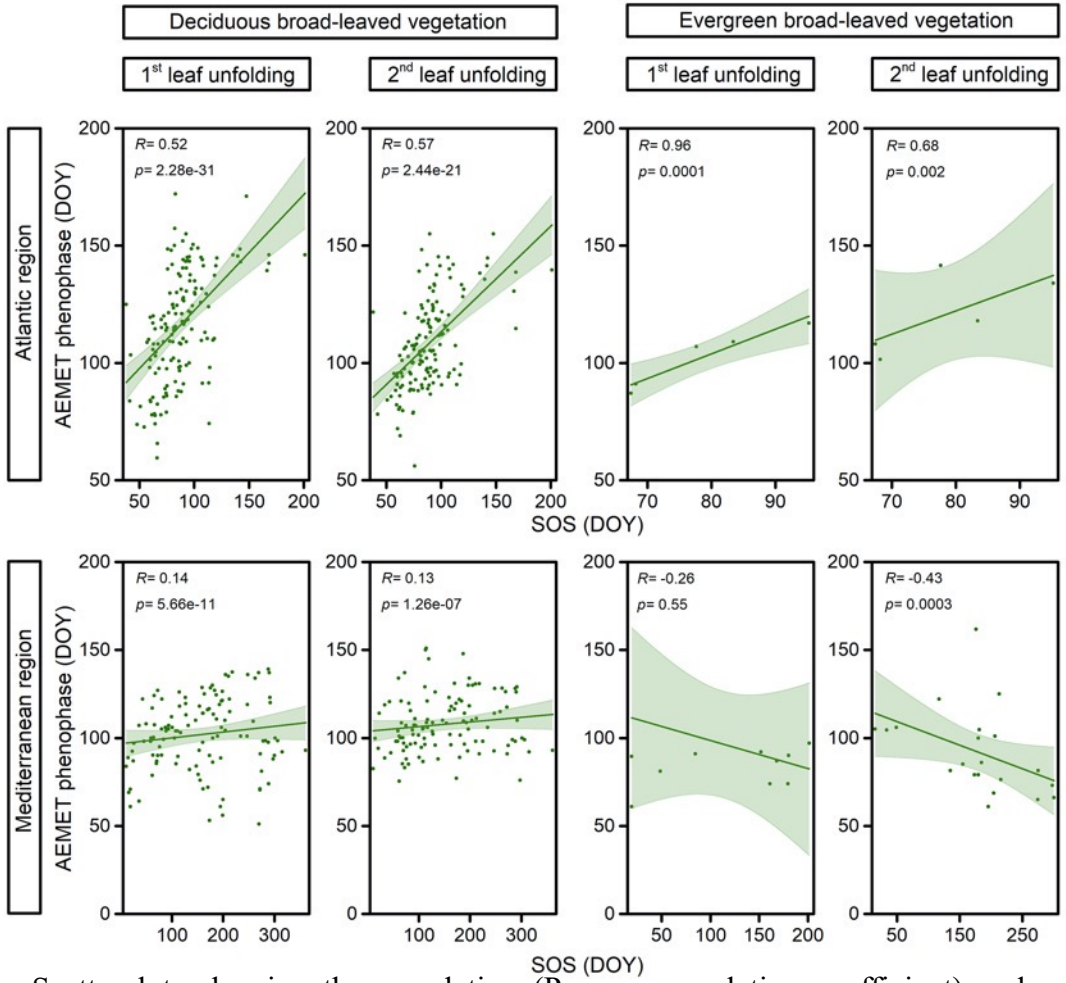
Genera as Tian et al.

New aggregation including new Genera more representative of the Mediterranean landscapes

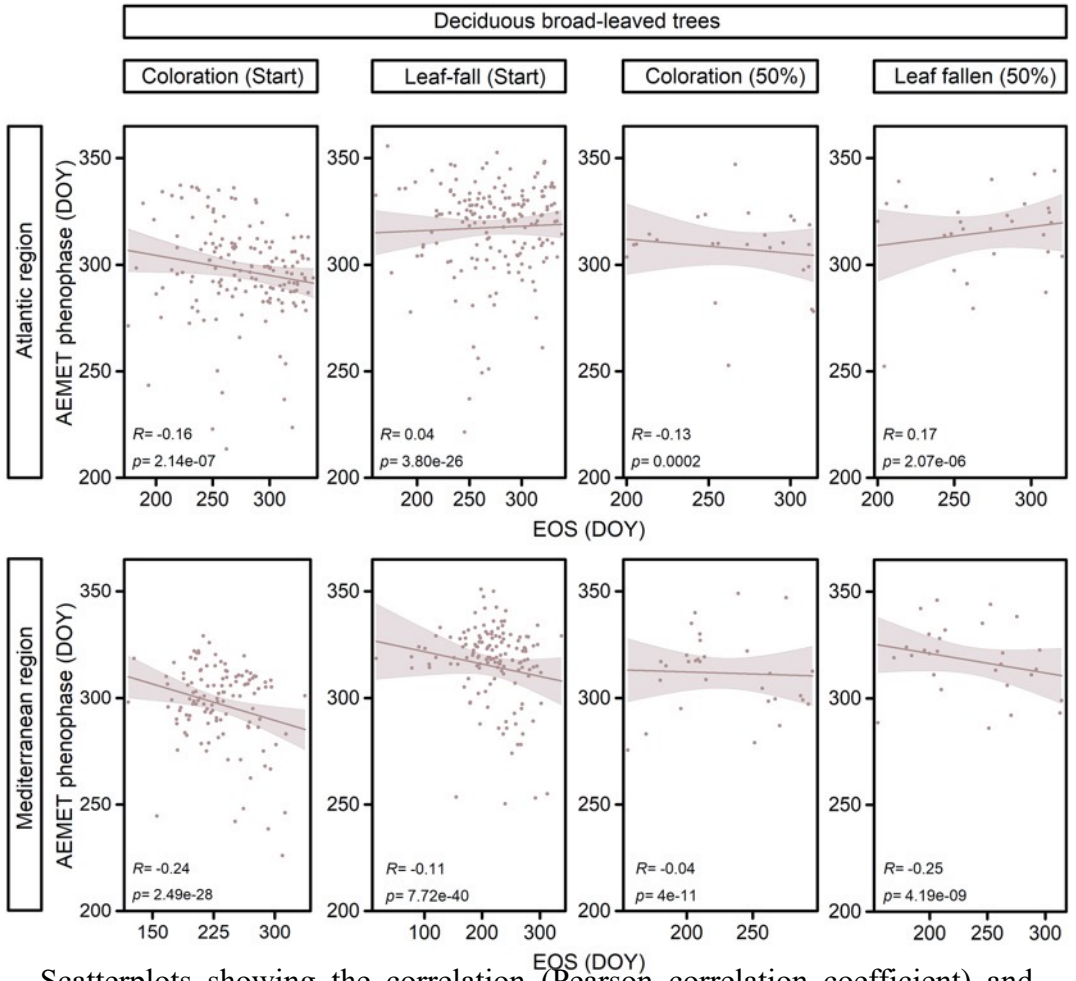
CEOS WORKING GROUP ON CALIBRATION & VALIDATION

Land Surface Phenology (5/5)

Analysing long-term spatiotemporal patterns of land surface phenology over the Iberian Peninsula using MODIS data (in prep)



Scatterplots showing the correlation (Pearson correlation coefficient) and significance level (p-value) between paired AEMET autumn phenophases and SOS for deciduous and evergreen broad-leaved vegetation in the Atlantic and Mediterranean biogeographic regions.



Scatterplots showing the correlation (Pearson correlation coefficient) and significance level (p-value) between paired AEMET autumn phenophases and EOS for deciduous broad-leaved vegetation in the Atlantic and Mediterranean biogeographic regions.

Snow (1/3)

Recent Publications

Compared two different SWE validation datasets over North America:

1. Manual snow courses
   - NRCS
   - CanSWE
   - Regional snow courses
2. NOAA Gamma Airborne Survey

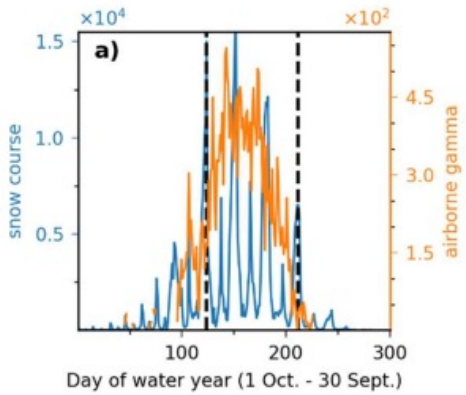
Used validation data to evaluate 14 gridded global SWE products

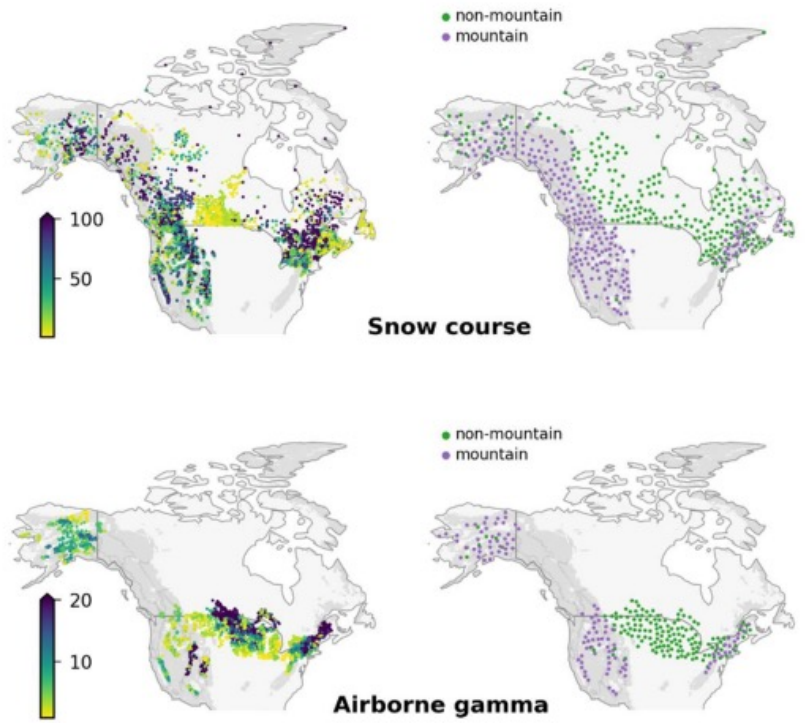
https://doi.org/10.5194/egusphere-2023-3013
Preprint. Discussion started: 10 January 2024

Use of multiple reference data sources to cross validate gridded snow water equivalent products over North America

Colleen Mortimer[1], Lawrence Mudryk[1], Eunsang Cho[2], Chris Derksen[1], Mike Brady[1], Carrie Vuyvich[3]

[1]Climate Research Division, Environment and Climate Change Canada, Toronto, Canada
[2] Ingram School of Engineering, Texas State University, San Marcos, TX, USA
[3] Hydrological Sciences Laboratory, NASA Goddard Space Flight Center, Greenbelt, MD, USA





Mortimer, C., Mudryk, L., Cho, E., Derksen, C., Brady, M., and Vuyovich, C.: Use of multiple reference data sources to cross validate gridded snow water equivalent products over North America, EGUsphere [preprint], https://doi.org/10.5194/egusphere-2023-3013, 2024.

Snow (2/3)

Related Effort

Global Climate Observing System program (GCOS)

Assesses the status of global climate observations and provides guidance for improvement of global observations to understand the implications of climate change.

2022 GCOS Implementation Plan:
https://gcos.wmo.int/en/publications/gcos-implementation-plan2022

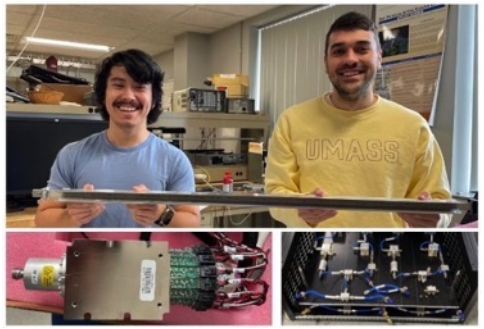
2022 GCOS ECV Requirements:
https://library.wmo.int/records/item/58111-the-2022-gcos-ecvs-requirements-gcos-245

- Current Essential Climate Variable (ECV) guidance for snow is being reviewed over the next 6 months
- The consensus updated requirements and ECV products will then be taken back to GCOS
- An additional outcome of this exercise could be publication outlining the snow community's needs as they relate to Snow ECV products and requirements.

Snow (3/3)

Campaigns:

- **NASA IIP instrument, SNOWWI - C, Ku-band (low and high) – was flown over Grand Mesa, CO in Mar 2024**



Snow Water-equivalent Wide Swath Interferometer and Scatterometer (SNOWWI)

	Band	Freq (GHz)	Pol
Active	C	5.35	VV,VH
Active	Ku-Lo	13.60	VV,VH
Active	Ku-Hi	17.25	VV,VH

UAV-based SAR for SWE retrieval

	Band	Freq (GHz)	Pol
Active	C	5-6	VV, HH, HV, VH
Active	Ku	14-15	VV, HH, HV, VH

Evapotranspiration

Our new focus area leads, **Yun Yang and Carmelo Cammalleri** are now on board.

They have begun to compile content and information to populate some of their new web pages and to also been pulling together a community list that will become their listserv.