

Land Product Validation (LPV) Sub-group Meeting



Michael Cosh – (USDA) –Chair

Fabrizio Niro – (ESA/ESRIN) – Vice Chair

Subgroup meeting

04 Apr 2023

NEXT LPV TELECON TBD, 2023

Attendance

Participants

Michael Cosh
Fabrizio Niro
Jaime Nickeson
Zhuosen Wang
Tomoaki Miura
Sylvain Leblanc
Joshua Gray
Louis Giglio
Angela Erb
Bernardo Mota
Victor Rodríguez-Galiano
Carsten Montzka
Sasha Tyukavina
Neha Humke

Kim Calders

Unavailable

Marie Weiss
Laura Duncanson
Carrie Vuyovich
Else Swinnen
Glynn Hulley
Frank Göttsche
Joshua Gray
John Bolten
Jorge Sanchez-Zapero
Luke Brown
Sophie Bontemps

New FA Leads

We are happy to announce that we have two more new members of the LPV Working Group, following the **5** that were added in February!

Shortly following our last call, invites were extended to **Kim Calders** from Ghent University and **Neha Hunka** from the University of Maryland to lead our Biomass focus area.

I don't know that there is more Biomass news beyond this, so we will have them introduce themselves during the Biomass focus area report. Laura will stay on in an ex-officio role to help during the transition (once she returns from maternity leave).

Protocols Status – Updates or Still on Track?

Focus Area	Protocol
Biophysical	LAI(2014)
Fire/Burn Area	Targeting summer 2023
Phenology	Targeting summer 2023
Vegetation Index	Targeting summer 2023
Land Cover	Targeting spring 2023
Snow Cover	
Surface Radiation	Albedo(2019)
Soil Moisture	SM(2020)
LST and Emissivity	LST (2019)
Aboveground Biomass	AGWB(2021)

2023 Focus Area Leads

	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 (1 st term)
	Sophie	Bontemps	Université Catholique de Louvain	Belgium	Oct 2023 (2 nd term)
Biophysical	Marie	Weiss	INRA	France	Sep 2023 (2 nd term)
	Sylvain	Leblanc	Natural Resources Canada	Canada	Sep 2023 (2 nd term)
	Luke	Brown	University of Salford	UK	Jan 2026 (1 st term)
Fire/Burn Area	Louis	Giglio	University of Maryland	USA	Sep 2023 (1 st term)
	Bernardo	Mota	National Physical Lab	UK	Jan 2026 (1 st term)
Surface Rad	Zhuosen	Wang	UMass Boston	USA	ex-officio
	Angela	Erb	UMass Boston	USA	Jan 2026 (1 st term)
	Jorge	Sanchez-Zapero	EOLab	Spain	Jan 2026 (1 st term)
Soil Moisture	John	Bolten	NASA GSFC	USA	Apr 2023 (1 st term)
	Carsten	Montzka	Jülich Research Centre	Germany	Sept 2023 (2 nd term)
LST	Glynn	Hulley	NASA/JPL	USA	July 2024 (2 nd term)
	Frank	Goettsche	Karlsruhe Institute of Technology	Germany	Dec 2022 (2 nd term)
Phenology	Joshua	Gray	North Carolina State University	USA	Jan 2025 (2 nd term)
	Victor	Rodríguez-Galiano	University of Seville	Spain	Aug 2025 (2 nd term)
Snow Cover	Carrie	Vuyovich	NASA GSFC	USA	Jan 2026 (1 st term)
	VACANCY				
Veg Index	Tomoaki	Miura	University of Hawai'i	USA	Dec 2022 (2 nd term)
	Else	Swinnen	VITO	Belgium	Apr 2023 (2 nd term)
Biomass	Laura	Duncanson	UMD/GSFC	USA	ex-officio
	Kim	Calders	Ghent University	Belgium	Feb 2026 (1 st term)
	Neha	Hunke	UMD	USA	Feb 2026 (1 st term)

WCGV and LPV Plenary, June 2023

Upcoming WGCV Plenary

- *WGCV 5-9 June 2023 ESRIN, Frascati, Italy*

LPVE Meeting – Frascati, June – Proposed LPV Plenary following

- Land Product Validation and Evolution, June 12-14, 2023 ESRIN, Frascati, Italy
- Land Production Validation Plenary, June 15, 2023 ESRIN, Frascati, Italy

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 LPVE, Frascati, Italy (Submitted Poster, will send copy of last version from 2018 as a sample and will be requesting input, perhaps combined with Mike's input for WGCV?)
- **Submit an abstract for an LPV Session at AGU in December?? Last done in 2014!**

Topics for Plenary – Invites??

List from last month, items to address at June Plenary – other suggestions?

- Where does Solar Induced Fluorescence fall within LPV hierarchy?
- Where does Evapotranspiration fall within LPV hierarchy?
- Interaction with ICOS for updating of protocols for supersites and LPV products.
 - Perhaps invite ICOS rep to discuss?
- Discussion with IVOS on TOA calibration of LST
 - TIR/LST Cal/Val network discussion?
- What does Stage 4 validation look like for LPV products?

FA Web Status

Things are getting more colorful!

The Home and Collaboration page updates/reviews are very easy so lets clear those columns by next call.

Can everyone read the GD folder link I sent??

Questions from the new leads about any of this??

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

Focus Area Reports

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

Snow

If you recall from Carrie Vuyovich's (GSFC) introduction last time as our new Snow focus area lead, she mentioned she had some field campaigns for SnowEX coming up.

She is returning from Alaska today and won't be able to join us.

Aboveground Biomass

Introductions from Kim Calders and Neha Hunika.

Welcome to LPV Kim and Neha!

Land Surface Phenology (1/4)

- Special issues in **Remote Sensing:**

- Advances in Detecting and Understanding Land Surface Phenology

- **Special Issue Editors:**

- a) **Dr. Jianmin Wang**

- Guest Editor* (Geospatial Sciences Center of Excellence, South Dakota State University, Brookings, SD 57007, USA)

- b) **Dr. Xiaoyang Zhang**

- Guest Editor* (Geospatial Sciences Center of Excellence, South Dakota State University, Brookings, SD 57007, USA)

Deadline for manuscript submissions: **31 August 2023**

- Remote Sensing for Vegetation Phenology in a Changing Environment

- **Special Issue Editors:**

- a) **Dr. Dr. Mei Yu**

- Guest Editor* (Department of Environmental Sciences, University of Puerto Rico, Rio Piedras, San Juan, PR 00926, USA)

- b) **Dr. Yuyu Zhou**

- Guest Editor* (Department of Geological & Atmospheric Sciences, Iowa State University, 3019 Agronomy Hall, Ames, IA 50011, USA)

Deadline for manuscript submissions: **30 June 2023**

Land Surface Phenology (2/4)

International Journal of Applied Earth Observations and Geoinformation 116 (2023) 103148

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

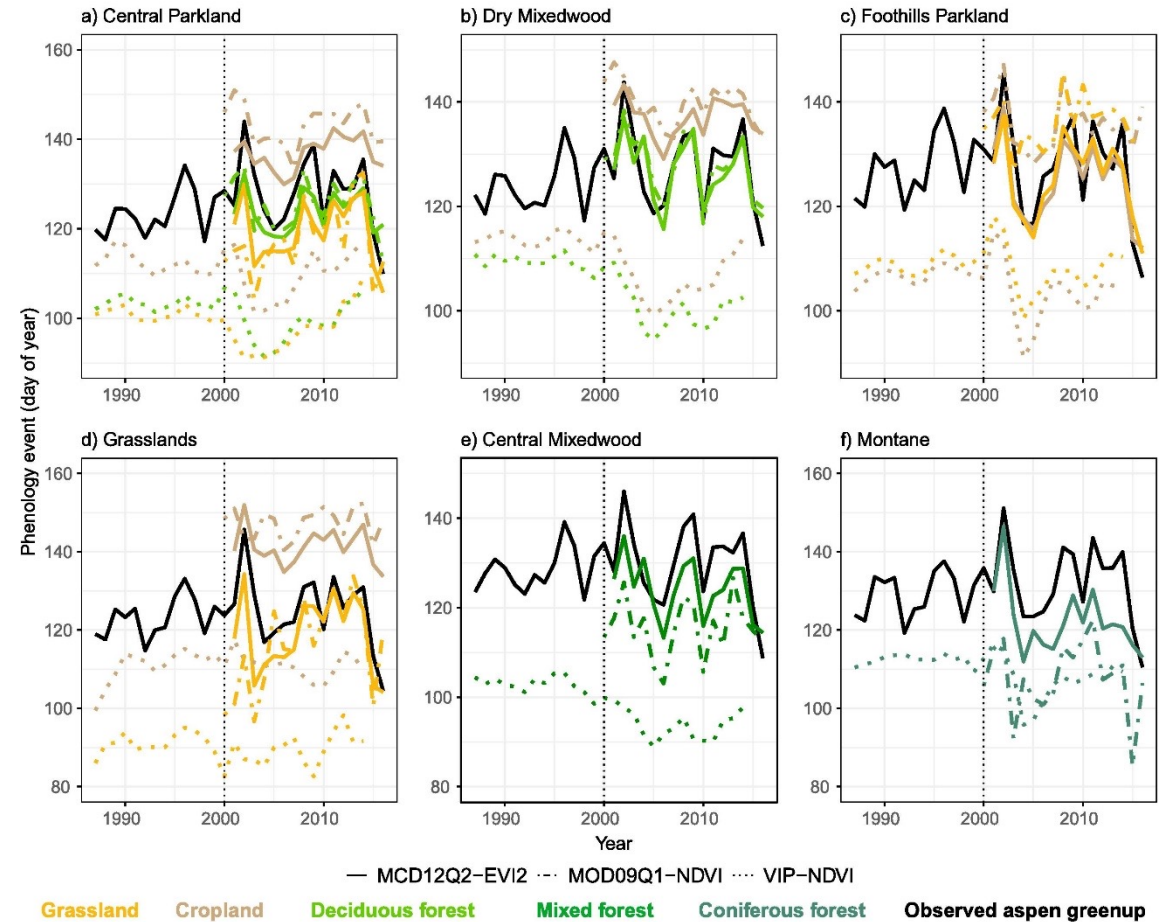
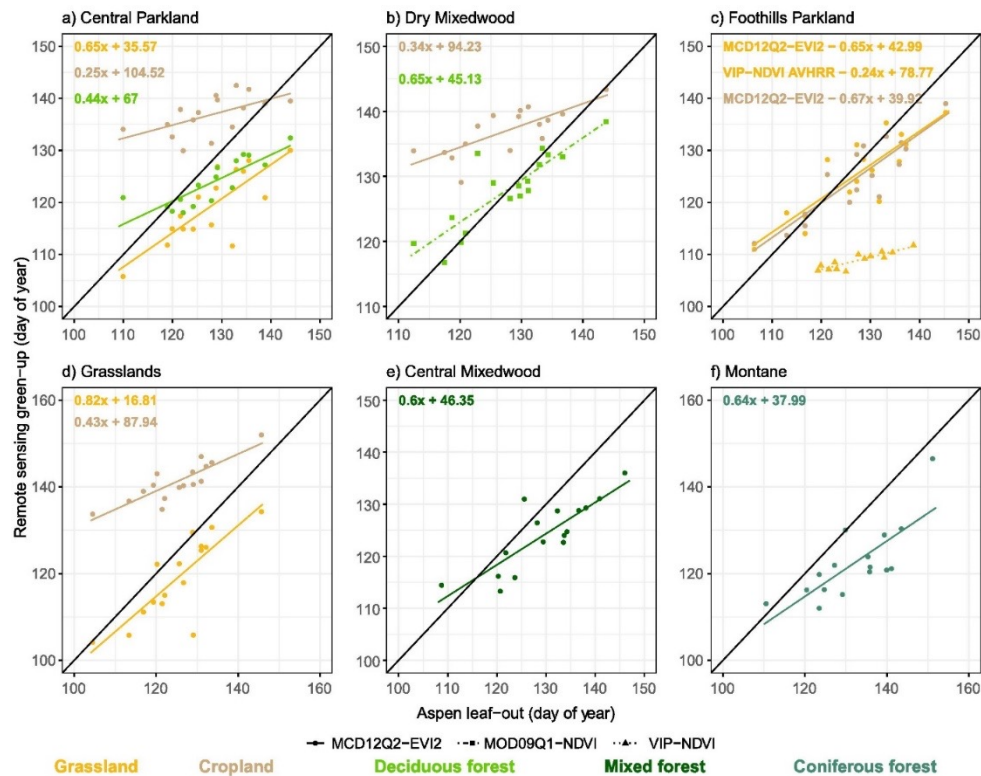
International Journal of Applied Earth Observations and Geoinformation

journal homepage: www.elsevier.com/locate/jag

Validating remotely sensed land surface phenology with leaf out records from a citizen science network

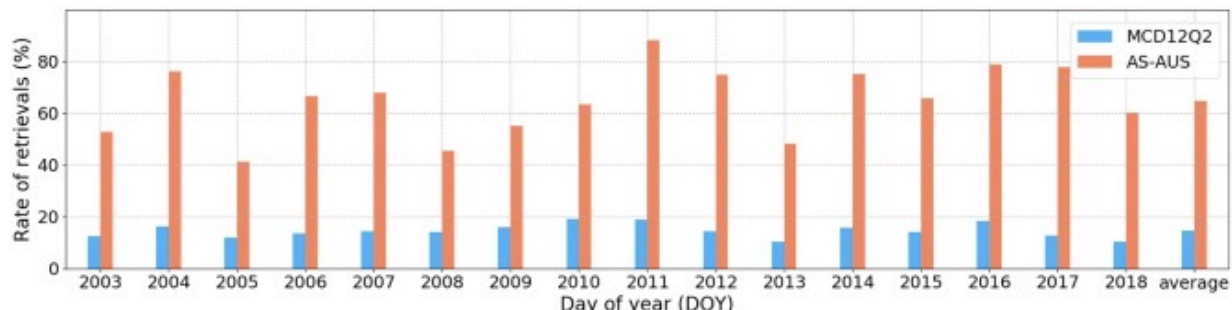
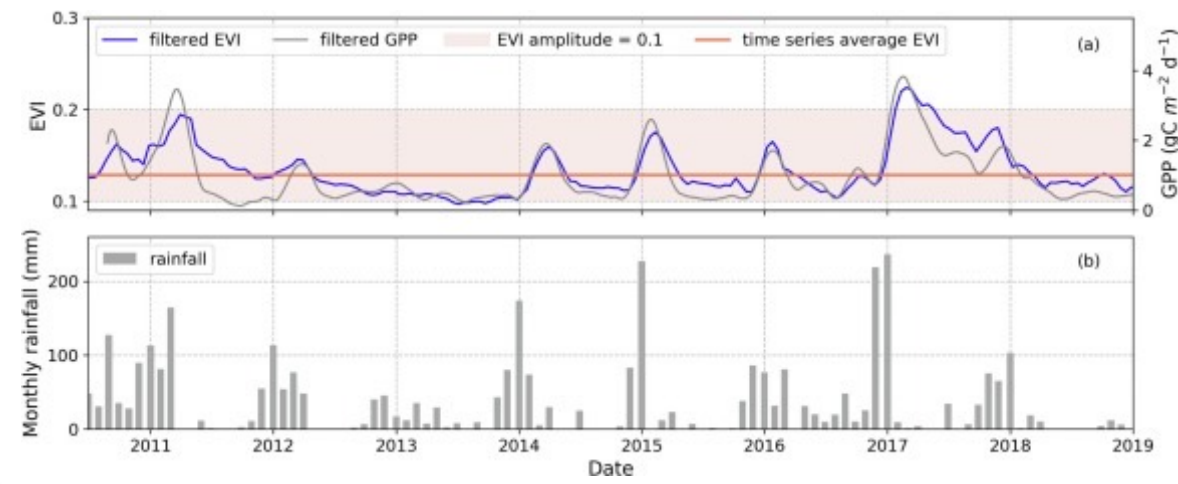
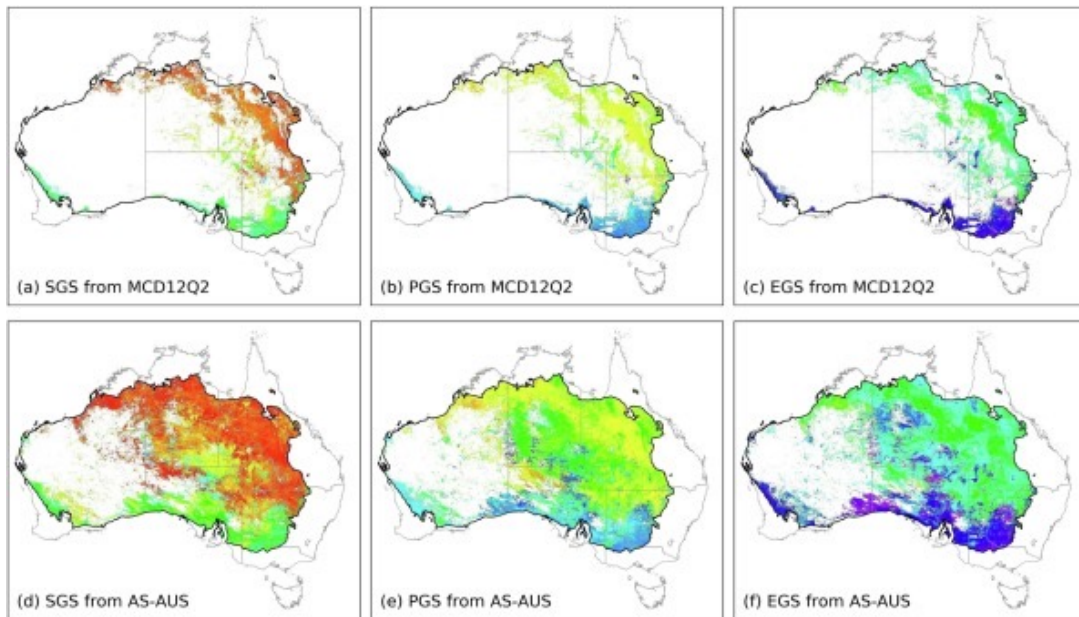
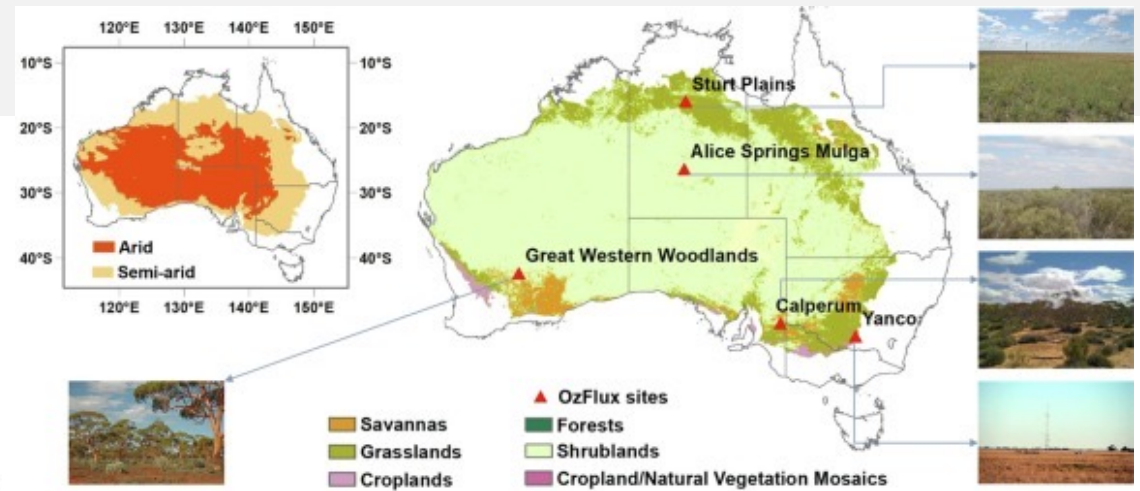
Logan M. Purdy^{*}, Zihaoan Sang, Elisabeth Beaubien, Andreas Hamann

Department of Renewable Resources, University of Alberta, 751, General Services Building, Edmonton, AB T6G 2H1, Canada



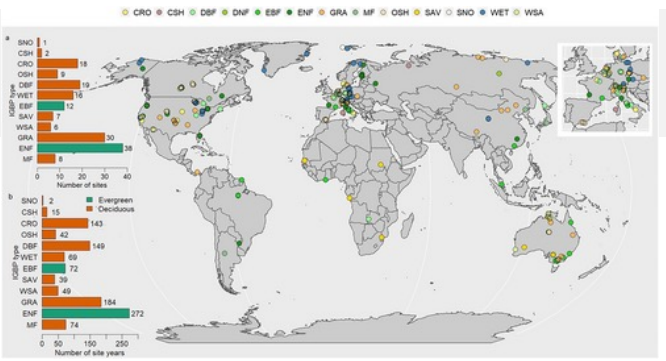
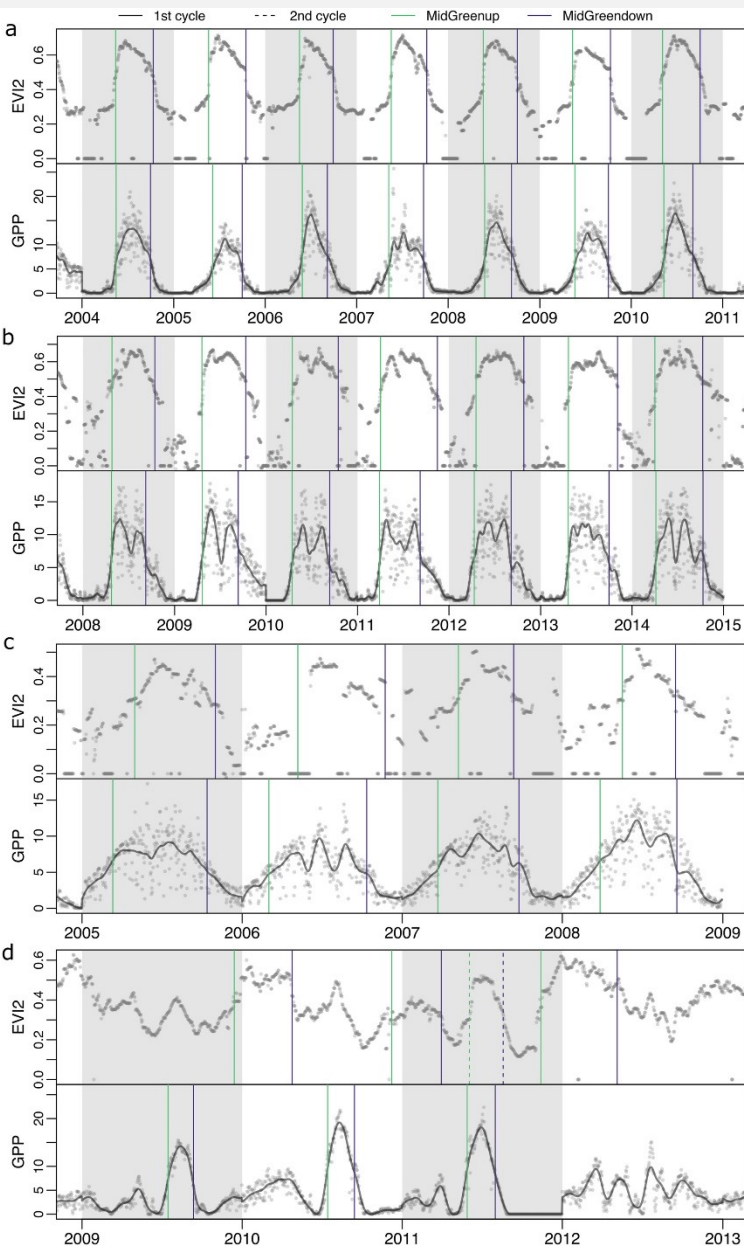
Land surface phenology retrievals for arid and semi-arid ecosystems

Qiaoyun Xie^a, Jamie Cleverly^{a,b}, Caitlin E. Moore^{c,d}, Yanling Ding^{a,e}, Christopher C. Hall^a, Xuanlong Ma^f, Luke A. Brown^g, Cong Wang^h, Jason Beringer^c, Suzanne M. Proberⁱ, Craig Macfarlane^j, Wayne S. Meyer^j, Gaofei Yin^k, Alfredo Huete^a



MODIS LSP Product (MCD12Q2) evaluated in precip-driven savanna-grassland dominant systems.

AS-AUS & Q2 consistent where both estimates are present, but Q2 omits considerable low-amp phenology



Global Biogeochemical Cycles

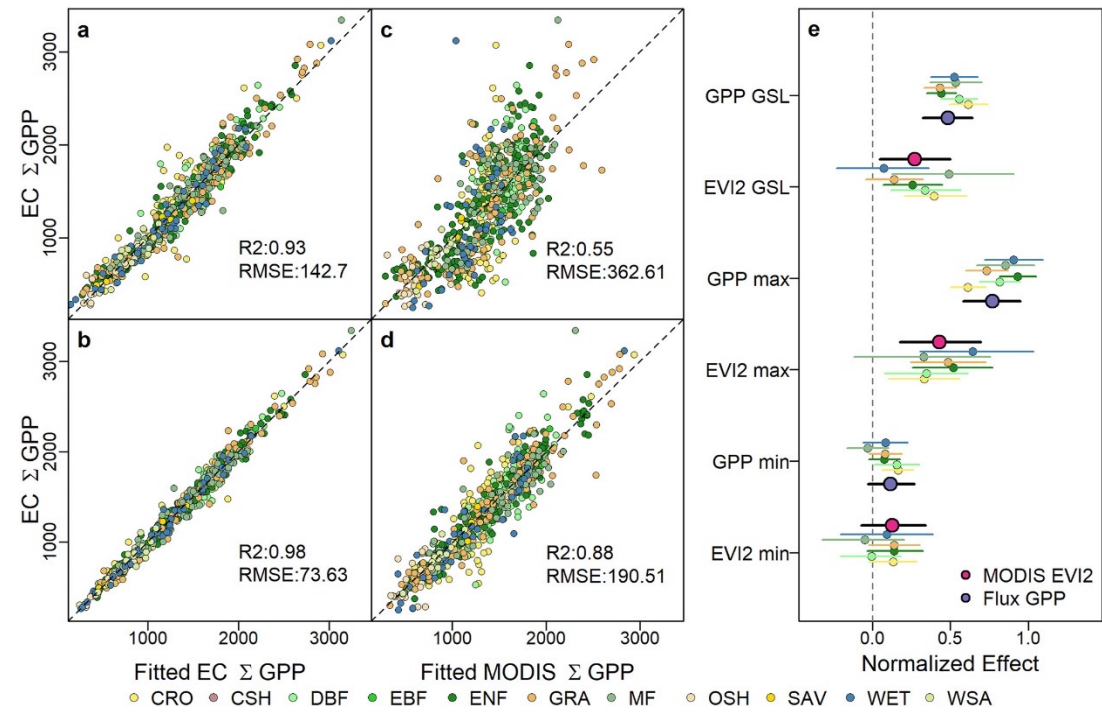
Research Article | Open Access | CC BY

Observations of Satellite Land Surface Phenology Indicate That Maximum Leaf Greenness Is More Associated With Global Vegetation Productivity Than Growing Season Length

Xiaojie Gao, Ian R. McGregor, Josh M. Gray, Mark A. Friedl, Minkyu Moon

First published: 24 February 2023 | <https://doi.org/10.1029/2022GB007462>

↶ ↷
Q2 & FLUXNET2015 phenometric compared across diverse biomes
 Hierarchical $\Sigma GPP \sim f(Isp/flux)$: LSP explains most of large-scale var, much more w/ site-effects. $EVI2_{max}$ has a much stronger effect on ΣGPP compared to GSL



Fitted EC Σ GPP Fitted MODIS Σ GPP Normalized Effect
 ● CRO ● CSH ● DBF ● EBF ● ENF ● GRA ● MF ● OSH ● SAV ● WET ● WSA

Soil Moisture

News:

- QA4SM v2.2.1 released, since v2.2.0 also user data upload possible, see <https://qa4sm.eu/ui/home>

Workshops:

- 7th Satellite Soil Moisture Validation and Application Workshop, Fall 2024?, New Orleans, USA?
- SMAPVEX Workshop 2023 at Mt. Ida Campus of UMass Amherst in Boston, MA, on April 18-20, 2023
- National Soil Moisture Workshop, August 14-17, 2023, <https://www.drought.gov/events/2023-national-soil-moisture-workshop-2023-08-14>
 - Aug 14: Soil Moisture Field School: A hands-on session on soil moisture installation & operation conducted at the nearby USDA ARS field site.
 - Aug 15-16: National Soil Moisture Workshop: The workshop will include a roundtable discussion to gain feedback on the draft Data Quality Guidance White Paper.
 - Aug 17: Forest Soil Moisture Monitoring Special Session

Vegetation Indices

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)
- Held a kick-off meeting with the expert group (December 15, 2022)
 - Group members charged to review the outline and provide feedback
- Held a 2nd meeting to review comments/suggestions from the expert group (January 31, 2023)
 - Co-leads charged to revise the outline and incorporate the comments
- Revised the outline, following comments/suggestions from the expert group and shared the revised outline with them (March 15, 2023)
- Writing up the first complete draft (current)

Co-lead Recruitment

- Plan to ask several people for interest

Land Cover (1/2)

Protocol update:

- First draft ~60% ready
- Need to reach out to individual contributors to get remaining first drafts
- Next steps: editing the entire document for consistency, community review and approval

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

Tentative outline:

Executive summary (Sophie Bontemps, Sasha Tyukavina)

1. Introduction (co-leads/contributors: Sophie Bontemps, Sasha Tyukavina)
 - 1.1. Scope of the guidelines
 - 1.2. CEOS Validation stages (contributor: Nandika Tsendbazar (stage 4 specifics))
 - 1.3. Current state of global and continental-scale land cover and change mapping and validation (contributor: Martin Herold, Sasha Tyukavina, Amy Pickens, Peter Potapov)
 - 1.4. Diversity of quality assessment purposes (benchmarking, uncertainty flag, product assessment=validation) (contributor: Pierre Defourny)
2. Definitions and general principles (co-leads: Sophie Bontemps, + TBD)
 - 2.1. Land cover, land cover change, land use (contributors: IIASA, Pierre Defourny, Bryant Serre, Gerbrand Koren)
 - 2.2. Categorical maps vs. continuous fields (e.g. % tree cover) (contributor: Pierre Defourny, Bryant Serre, Gerbrand Koren)
 - 2.3. Land cover change maps (contributors: IIASA, Nandika Tsendbazar, Bryant Serre, Gerbrand Koren)
 - 2.4. Confidence-building, accuracy assessment and inter-comparison with existing products (contributor: Sophie Bontemps)
 - 2.5. Map accuracy assessment vs. classification uncertainty (contributors: Gerardo Lopez Saldana, Sophie Bontemps)
 - 2.6. Accuracy metrics and area estimates (contributors: Giles Foody, Martin Herold)
3. Sampling design (co-leads/contributors: Sasha Tyukavina, Pontus Olofsson)
 - 3.1. Sampling unit
 - 3.2. Sampling frame
 - 3.3. Common probability sampling designs
 - 3.4. Stratification
 - 3.5. Sample size planning and allocation to strata
4. Response design (co-leads: Julien Radoux, Giles Foody?)
 - 4.1. Sample labeling protocol (contributors: IIASA, Julien Radoux, Peter Potapov)
 - 4.2. Quality of reference data (contributors: IIASA, Giles Foody, Pierre Defourny)
 - 4.3. Accounting for reference data uncertainty (contributors: Nandika Tsendbazar, Sasha Tyukavina, Julien Radoux)
5. Analysis (co-leads/contributors: Sasha Tyukavina, Pontus Olofsson)
 - 5.1. Estimating map accuracy
 - 5.2. Estimating target class area
 - 5.3. Model-assisted estimators of area
6. Sources of reference data (co-leads: Linda See, + TBD)
 - 6.1. Time-series of medium resolution optical data (contributor: Gerardo Lopez Saldana)
 - 6.2. High resolution optical data (contributors: IIASA, Nandika Tsendbazar, Flavie Pelletier)
 - 6.3. Spaceborn and airborne lidar data (contributor: Flavie Pelletier)
 - 6.4. Data from UAV (contributor: Gerbrand Koren)
 - 6.5. Ground surveys (contributor: Xiangming Xiao, Raphaël d'Andrimont)
 - 6.6. Existing land cover maps (contributor: Bryant Serre, Flavie Pelletier)
 - 6.7. Expert-based methods vs. crowdsourcing (contributors: IIASA, Sasha Tyukavina)
7. Examples of global and continental-scale validation efforts (co-lead: Sophie Bontemps)
 - 7.1. Copernicus 100m land cover map validation (contributors: IIASA, Nandika Tsendbazar, Martin Herold)
 - 7.2. ESA Climate Change Initiative global land cover time series (contributor: Céline Lamarche)
 - 7.3. ESA Climate Change Initiative High Resolution Land Cover product (contributor: Céline Lamarche)
 - 7.4. UMD GLAD validation of single- and multi-class land cover and change maps (contributor: Sasha Tyukavina, Peter Potapov)
 - 7.5. ESA Climate Change Initiative Water Bodies product (contributor: Céline Lamarche)
 - 7.6. EU Copernicus HRL, EU crop map (contributor: Raphaël d'Andrimont)
 - 7.7. OSFAC (contributor: Landing Mane - to be confirmed)
 - 7.8. Validation strategy for land cover and land cover change in support of GLANCE (contributor: BU)
 - 7.9. Validation strategy for landscape metrics (contributor: Bryant Serre)
8. Challenges and future directions (co-lead: Pierre Defourny)
 - 8.1. Operational validation updates (contributor: Nandika Tsendbazar, Martin Herold)

Land Cover (2/2)

Joint workshop between CEOS LPV and GEOGLAM to produce community validation guidelines for cropland and crop type maps

Dates finalized: 12 – 14 September, 2023

Location: National Agricultural Library, Beltsville, MD

Workshop co-leads: Sasha Tyukavina (UMD/CEOS LPV), Sophie Bontemps (UCLouvain/CEOS LPV), Chris Justice (NASA Harvest), Alyssa Whitcraft (NASA Harvest), Jaime Nickeson (NASA/CEOS LPV)

Draft agenda and invitations to participants coming soon...



Biophysical (1/3)

- Workshops
 - ESA LPVE Workshop (June 2023)
 - IGARSS2023, Special session led by R. Fernandes

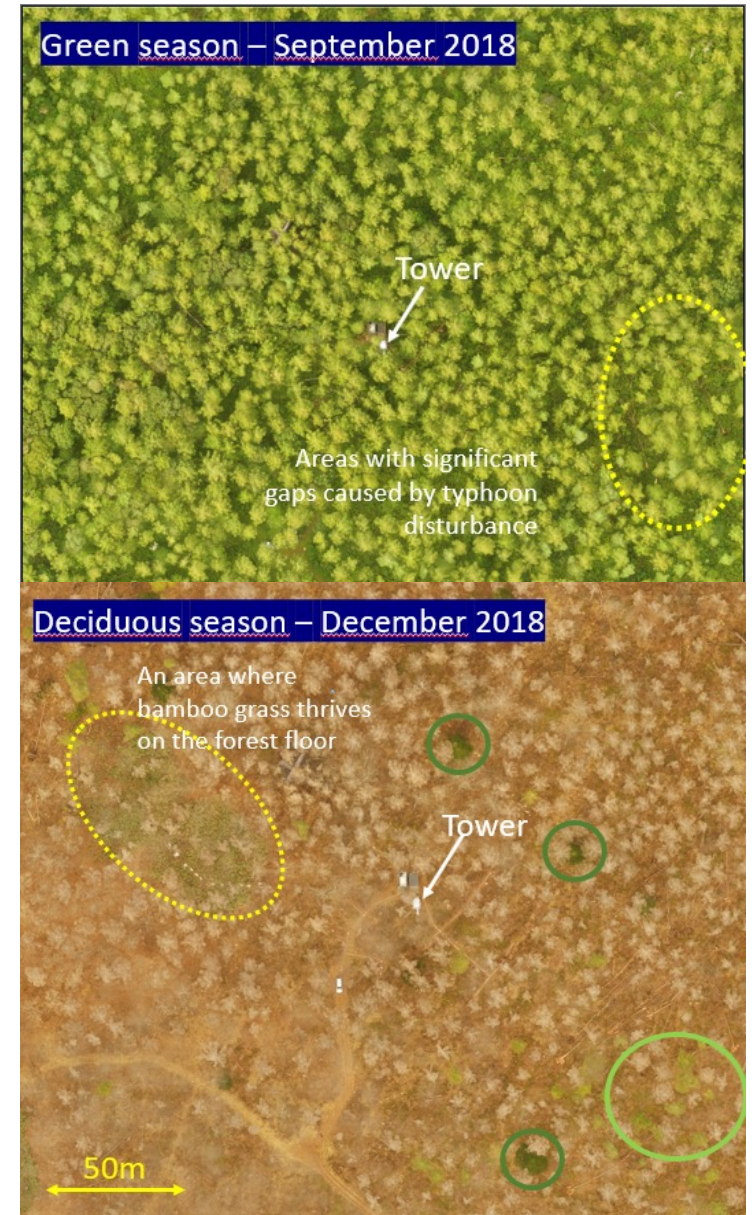
CCS.54: From Need to Product: Recent Advances in Mapping and Validation of Vegetation Biophysical Parameters at Regional to Global Extents

 - Workshop on Remote Sensing Observation and Research Station Network (Chongqing, China, Apr 7-10, 2023)
 - =>collection of remote sensing observation professionals
(mostly land)

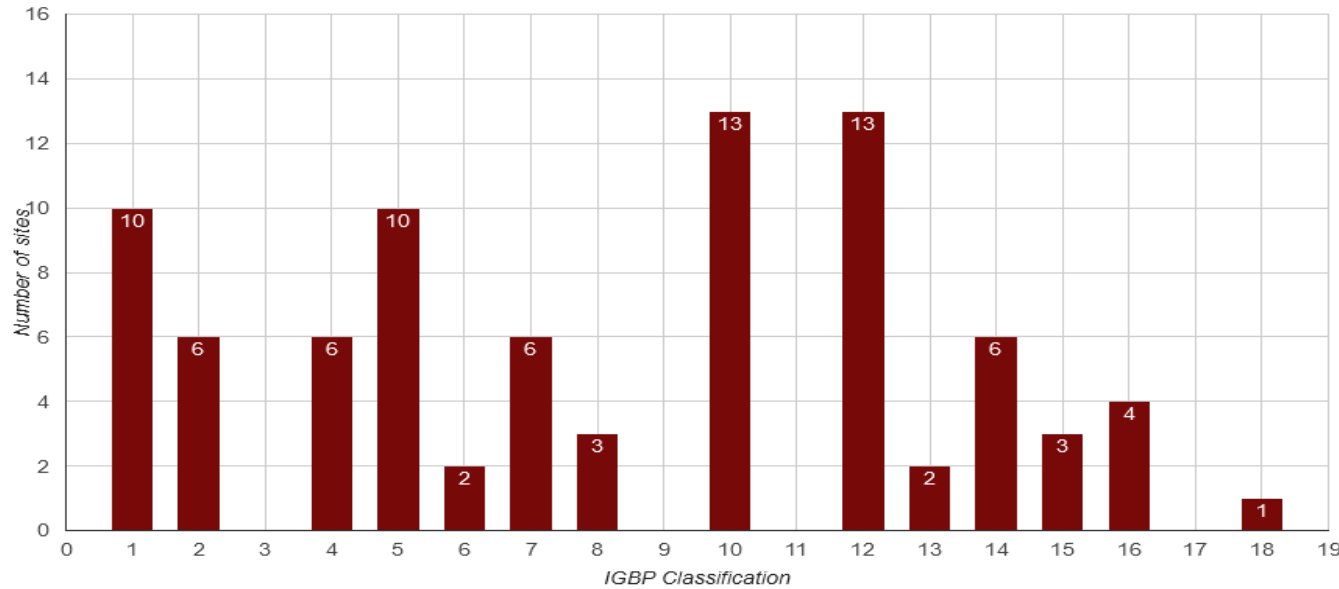
- TBD next month
 - Newsletter

Biophysical (2/3)

- New site equipped : Fuji Hokuroku – JAPAN
 - Larch Forest (IGBP #3) → not yet represented in GBOV
- Deployment of:
 - 4 fluxes PAR network
 - Up/down automated DHP



Biophysical (3/3)



GBOV is opened to equip new sites to increase the Representativeness

- Deciduous broadleaf
- Closed shrublands
- Savannas
- Permanent wetlands

- Possible equipment: automatic DHP, PAR budget, LST
- A team must be on site to collaborate with GBOV
- GBOV buy and install the instrument in agreement with the team
- GBOV ensures 1 year of maintenance
- After one year, the local team is offered to keep the instruments if they can maintain them at their own expense, otherwise GBOV will remove them
- Data are open, publicly available

Fire Disturbance (1/5)

Validation Protocol Status/Plans

- Update of 2010 draft burned area validation protocol ongoing
- Circulate full draft prior to next GOFC Fire IT meeting in Nov. 2023
- Active Fire protocol to follow

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 – March 2023

Editors: *

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

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

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Table of Contents

List of Acronyms and Nomenclature

I Introduction and background

1.1 CEOS validation stages

2 Production and standardization of reference data for validation purposes

2.1 Validation reference data

2.2 Temporal and spatial criteria for the selection of validation reference data

2.3 Thematic content of the reference data

2.4 Format of the reference data

2.5 Quality assessment of the reference data

2.6 Special considerations for burned area reference data

2.6.1 Agriculture

2.6.2 Peatlands

2.6.3 Understorey burning

2.6.4 Other?

2.7 Established burned area reference data sets

3 General strategy for validation of global burned area products

3.1 Sampling design

3.2 Special cases of burned area validation

3.3 Burned area product accuracy intercomparisons

3.4 Coarse resolution gridded burned area products

4 Burned area product accuracy reporting

4.1 Validation metrics

4.2 Reporting validation results

5 References

Fire Disturbance (2/5)

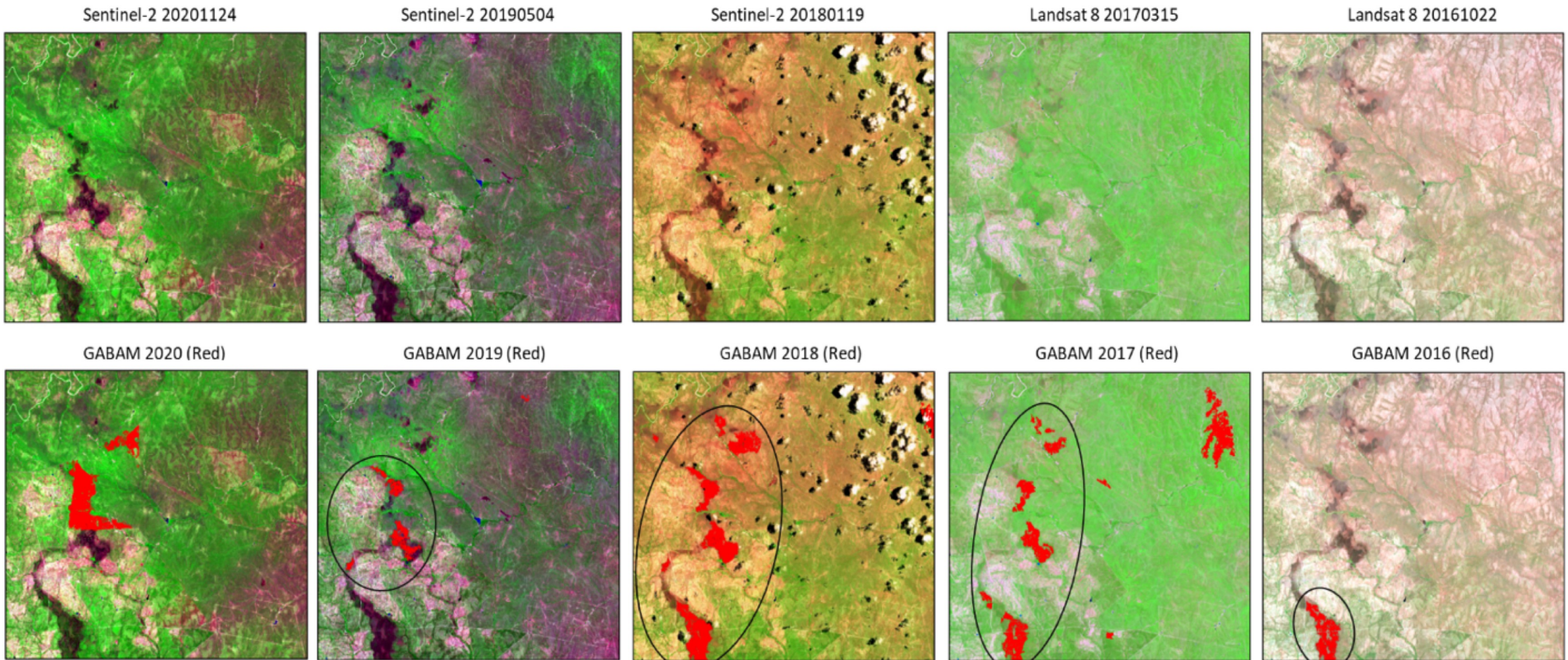
“Product quality assessment is necessary for global products given the large number of factors that can adversely affect their quality... and because over large areas product quality issues, such as stripes at input image granule boundaries, or anomalous temporal and spatial burning patterns... may remain undetected by validation activities that necessarily rely on a limited sample of independent reference data.”

Boschetti, L., et al., 2019, Global validation of the collection 6 MODIS burned area product. *Remote Sensing of Environment*, 235:11490.

Fire Disturbance (3/5)

Long, T., et al., 2019, 30 m Resolution Global Annual Burned Area Mapping Based on Landsat Images and Google Earth Engine. *Remote Sensing*, 11.

Changes in vegetation/soil moisture repeatedly misclassified as burned (GABAM tile S02E030):



○ Commission errors

Fire Disturbance (4/5)

Recent Publications – Active Fire

- da Rocha Miranda, J., Juvanhol, R. S., & da Silva, R. G., 2023, Use of maximum entropy to improve validation and prediction of active fires in a Brazilian savanna region. *Ecological Modelling*, 475, 110219.
- Coskuner, K. A., 2022, Assessing the performance of MODIS and VIIRS active fire products in the monitoring of wildfires: a case study in Turkey. *iForest-Biogeosciences and Forestry*, 15, 85.

Fire Disturbance (5/5)

Recent Publications – Burned Area

- Hosseini, M., & Lim, S., 2023, Burned area detection using Sentinel-1 SAR data: A case study of Kangaroo Island, South Australia. *Applied Geography*, 151, 102854.
- Franquesa et al., 2022, Assessment and characterization of sources of error impacting the accuracy of global burned area products. *Remote Sensing of Environment*, 280, 113214.
- Stroppiana et al., 2022, Sentinel-2 sampling design and reference fire perimeters to assess accuracy of Burned Area products over Sub-Saharan Africa for the year 2019. *ISPRS Journal of Photogrammetry and Remote Sensing*, 191, 223-234.
- Jiao et al., 2022, Evaluation of Four Satellite Derived Fire Products in the Fire-prone, Cloudy and Mountainous Area over Subtropical China. *IEEE Geoscience and Remote Sensing Letters*.
- Arjasakusuma et al., 2022, Monthly Burned-Area Mapping using Multi-Sensor Integration of Sentinel-1 and Sentinel-2 and machine learning: Case Study of 2019's fire events in South Sumatra Province, Indonesia. *Remote Sensing Applications: Society and Environment*, 100790.
- Deshpande et al., 2022, Detecting and quantifying residue burning in smallholder systems: An integrated approach using Sentinel-2 data. *Int. J. of Applied Earth Observation and Geoinformation*, 108, 102761.
- Smith et al., 2022, Evaluation of low-resolution remotely sensed datasets for burned area assessment within the wildland-urban interface. *Remote Sensing Applications: Society and Environment*, 100752.

LST & Emissivity

- No input

Surface Radiation

- **Global Downward Radiation Product Validation Best Practices Protocol**
 - Completed the first draft of chapters 1, 2, 4 and 5.

- **LPVE 2023 Abstracts submitted**
 - 1) Algorithm and preliminary validation of Sentinel-3 based surface albedo product for the continuity of Copernicus Climate Change Service.
J. Sánchez-Zapero, F. Camacho, E. Martínez-Sánchez

 - 2) Surface ALbedo VALidation (SALVAL) Platform: Towards CEOS LPV Validation Stage 4
Jorge Sánchez-Zapero, Enrique Martínez-Sánchez, Fernando Camacho, Zhuosen Wang, Dominique Carrer, Crystal Schaaf, Jaime Nickeson and Michael Cosh

 - 3) Validation of satellite albedo products across resolutions.
Angela Erb, Crystal Schaaf, Zhuosen Wang, Yun Yang, Ian Paynter, Shuai Zhang