Land Product Validation (LPV) Sub-group Meeting

Fernando Camacho – (EOLab/U. Valencia) – Chair
Michael Cosh – (USDA) – Vice Chair

Subgroup meeting
01 Feb 2022

NEXT LPV TELECON 05 Apr 2022

Attendance

Participants

Fernando Camacho
Michael Cosh
Jaime Nickeson
Zhuosen Wang
Gareth Roberts
John Bolten
Carsten Montzka
Louis Giglio
Sylvain Leblanc
Frank Göttsche
Sasha Tyukavina
Else Swinnen
Victor Rodríguez-Galiano
Glynn Hulley
Laura Duncanson
John Armston
Mat Disney
Chris Crawford
Joshua Gray
Sophie Bontemps

Not attending

Dominique Carrer
Hongliang Fang
Tomoaki Miura
Marie Weiss
Simon Gascoin

Proposed agenda items

- Welcome
- LPV Chair Transition
- LPV Work Plan
- LPV Bonn???
- Focus Area Web Status
- Focus Area Reporting

CEOS LPV Chair transition

- Last telecon of Fernando Camacho as LPV Chair. Thank you to all of you to make a success this three-year term, with two new Good Practices validation protocols endorsed, an online validation tool (SALVAL) developed, new reference data and several validation exercises of new sensors and datasets conducted by LPV.

- Since March, 1ST Mike Cosh will be the new CEOS LPV Chair. All the best to Mike and the LPV to continue doing a good contribution to CEOS and the satellite validation community.

- Searching for a new Vice Chair. Candidates send applications to Mike and Jaime.

- ESA is willing to propose a candidate to Vice-Chair, probably Fabrizio Niro, to be confirmed in the coming days.

- Voting the vice-chair candidates by March (before next WGCV meeting).

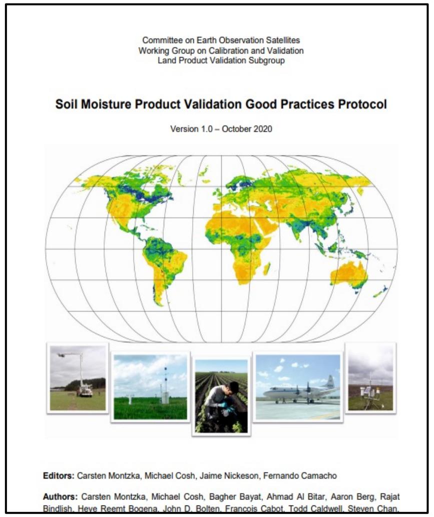
LPV Work Plan 2019 – 2022 Wrap Up

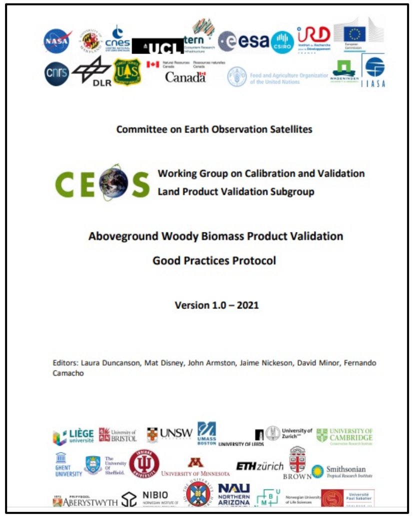
CEOS WORKING GROUP ON CALIBRATION & VALIDATION

Closed Work Plan Items

CEOS LPV Work Plan 2019-2021

Biomass	L.Duncanson	CARB-16	Cal/val and production of biomass products from CEOS missions	2017	Q4/2019	closed	Development of a coordinated cal/val strategy across NASA and ESA biomass missions that protocols, data sharing, and the establishment of round-based carbon super-sites.
Biomass	L.Duncanson	CARB-16-2018-2	Biomass validation paper	2018	Q2/2019	closed	Background paper for the ISSI special issue on the need for biomass product validation and CEOS WGCV Biomass Protocol.
Biomass	L.Duncanson	CARB-16-2018-3	CEOS WGCV biomass protocol	2018	Q3/2019	closed	CEOS WGCV biomass validation protocol
Biomass	L.Duncanson	CARB-16-2018-5	Establishment of ground-based carbon super-sites	2018	Q4/2019	closed	Establishment of ground-based carbon super-sites
Biophysical	H. Fang	19-LPV-13	Biophysical Workshop at IGARSS	2019	Q3/2019	closed	A workshop to be conducted in IGARSS-19 Japan
Biophysical	M. Weiss	19-LPV-14	Datasharing platform under FAIR principles for ground references	2019	Q2/2020	closed	Support ESA platform
Chair	F.Camacho	19-LPV-01	Revise hierarchy table including FRM concept	2019	Q3/2019	closed	Revise the LPV table to better describe the fiducial reference concept
Chair	F.Camacho	19-LPV-03	Investigate suitability of ICOS delivered data for validation	2019	Q1/2020	closed	Assess the quality of data delivery by ICOS and usefulness for validation of satellite products
Chair	F.Camacho	AGRI-13	Stablish mechanism to collaborate with GEOGLAM related to Essential	2019	Q4/2019	closed	Producion of EAV from GEOGLAM will require long-term coordination effort between GEO(
Chair	F.Camacho	19-LPV-04	Promote a new WGCV SR task (LPV-IVOS) in the context of FRM4VEG	2019	Q3/2019	closed	FRM4Veg project is developing protocols for fiducial SR collection and validation of SR. Pha:
Chair/ Biop	F.Camacho/ Fang	20-LPV-01	Update DIRECT 2.0 to 2.1	2021	Q4/2021	closed	Include new datasets (eg Fang et al), update in the cal/val portal
Land Cover	FA leads	19-LPV-12	Workshop on LC product validation	2020	Q3/2021	closed	Organize a workshop on LC product validation (to relate this with the protocol writing)
LST	FA leads	19-LPV-20	Ecostress stage 1 validation	2019	Q4/2020	closed	Validation of ECOSTRESS Lst
Soil Moisture	FA leads	19-LPV-18	Soil Moisture Validation Protocol	2019	Q2/2021	closed	Develop the Soil Moisture global validation protocol.
VI	Miura	19-LPV-25	paper on vi VIIRS validation	2019	Q2/2020	closed	Publish VIIRS validation study





LPV Work Plan 2019 – 2022 Wrap Up

Started / On-going Work Plan Items

CEOS LPV Work Plan 2019-2021							
Albedo	Zhousen	19-LPV-09	Developing protocols for surface downwelling radiation product validation	2019	Q4/2020	started	Expand the Surface Radiation group developing the validation protocols for satellite-bases radiation.
Albedo	F.Camacho / FA lea	19-LPV-10	Paper on albedo validation and intercomparison (SALVAL tool)	2019	Q4/2021	on going	SALVAL tool in line, need for C6 MODIS
Biomass	L.Duncanson	CV-20-02	BRIX-II	2019	Q1/2022	on going	Carry out the Biomass Intercomparison exercise. Seek particpiation from the global comm
Chair	F.Camacho	19-LPV-02	Update LPV supersites list	2019	Q4/2021	on going	Update LPV Supersites in Europe according to ESA FRM4Veg & FLEX, and GBOV instrument
Chair /Radiation	F.Camacho	CV-20-01	SRIX4Veg	2021	Q4/2022	on going	SR intercomparison exercise and SR validation protocol (FRM4Veg project)
Land Cover	Sophie Bontemps	19-LPV-11	Land Cover product validation protocol	2019	Q4/2021	on going	Develop good practices for Land Cover product validation. One-class (cropland) is first prop generalized to general LC products.
Phenology	FA leads	19-LPV-21	Phenology Validation Protocol	2019	Q2/2022	started	Develop the Phenology validation protocol.
VI	FA leads	19-LPV-22	VI validation protocol	2019	Q2/2022	started	first draft q1/2021 , final version after the third workshop

- Protocols for Surface downwelling radiation started by I. Grant. Not sure about someone is planning to work on it.
- SALVAL tool developed (www.salval.eolab.es). Need for MODIS C6.1 → Zhousen task.

- CEOS BRIX-II – Laura Duncanson
- CEOS SRIX4Veg – 1st Workshop 28 March, Field campaign July 2022 in Barrax.

- Protocols for Land Cover (Cropland) in preparation/discussion with GEOGLAM EAV.
- Protocols for Phenology - Josh (update needed)
- Protocols for VI – Tomoaki and Else (update needed)
- Protocols for Burned Area – Louis and Gareth

LPV Work Plan 2019 – 2022 Wrap Up

Pending

CEOS LPV Work Plan 2019-2021							
Active Fire /BA	FA leads	19-LPV-17	Develop validation protocol for Active Fire / FRP	2019	Q2/2021	pending	Develop the AC/FRP good practices validation protocol. First draft for 2
Active Fire /BA	FA leads	19-LPV-16	BA protocol	2019	Q4/2022	pending	To complete the BA validation protocol
Chair / Bioph	F.Camacho / FA lea	21-LPV-01	Provide feedback to ICOS on protocols	2021	Q4/2021	pending	transfer to LAI team
Biophysical	M. Weiss / FA leads	19-LPV-15	Update the LAI protocol, complement it with Fapar	2019	Q4/2021	pending	LAI protocol to be updated including the new technologies and high res should be also written or merge with LAI protocol (most parts are com
VI	FA leads	19-LPV-23	3rd Workshop VI	2019	Q2/2022	pending	Hold a workshop or special session on VI

- Protocols for Active Fire and Burned Area validation. Not sure about the plan.

- Update LAI protocol with FAPAR. Identified key scientist to contribute, but no progress since then.

- Provide feedback to ICOS on LAI/FAPAR protocols – action for the Biophysical team

- Promote special sessions AGU, EGU – Improve promotion and communication of LPV

Recommendation: Redefine LPV action plan for the next three years, with all of ongoing and pending actions in mind.

Thank you, Fernando!!

Thanks for your leadership these past 3 years, and your dedication to LPV throughout your involvement with us.

Much progress has been made under your tenure, with protocol published and planned and validation exercises executed and planned.

We expect our paths will continue to cross and look forward to that continued interaction.

All the best to you!!!

LPV Bonn???

- We had discussions about a potential LPV Plenary in Bonn this year at LPS 2022.
- Not sure we have sufficient attendance, no much response on that question, and much less sure about travel w COVID still very much in the picture, many meeting still planned for virtual or hybrid.
- Virtual is possible… thoughts?

Focus Area Review/Update Status

Status of updates by focus area.

Some only need a review, changes are not required, just assure all is current!

Product lists are now up to date.

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

WORKING GROUP ON CALIBRATION & VALIDATION

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Focus Area Reports

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

Biophysical (1/2)

- We did some LAI vertical profile measurement at a deciduous needleleaf forest site in China. The data were used to compare with terrestrial, airborne and GEDI LAI profile data.

- Hongliang wrote a Chinese article to introduce and promote the FRM concept in China. Similar concepts maybe adopted in Chinese networks.

- We examined the temporal variation of GEOV2 and MODIS LAI uncertainty based on the product QA information.

- New journal launched by Chinese Academy of Sciences, JORS.

Biophysical (2/2)

Publications

- Wang et al., 2022. Retrieval and validation of vertical LAI profile derived from terrestrial, airborne, and spaceborne LiDAR data at a deciduous needleleaf forest site. *Agricultural and Forest Meteorology* (submitted) (**validation of the vertical LAI profile**).
- Fang et al., 2021. On the construction of China's fiducial reference measurement (FRM) network for land surface remote sensing product validation (In Chinese), *Advances in Earth Science*, **36**(12): 1215-1223. https://doi.org/10.11867/j.issn.1001-8166.2022.003 (**promote the FRM concept in China**)
- Fang et al., 2021. Long-term variation of global GEOV2 and MODIS leaf area index (LAI) and their uncertainties: An insight into the product stabilities. *Journal of Remote Sensing*, 2021, 9842830. https://doi.org/10.34133/2021/9842830 (**examine the temporal variation of product uncertainty**)

Fire Disturbance (1/3)

Product Update

- VIIRS NightFire Product (Elvidge et al., 2013)
    - Sub-pixel thermal anomalies detected using NIR, SWIR and MIR channels
    - Information on time of detection source size (m^2), radiant heat intensity
    - Version 3.0 available from Dec 2017 – present; daily resolution
        - https://eogdata.mines.edu/products/vnf/

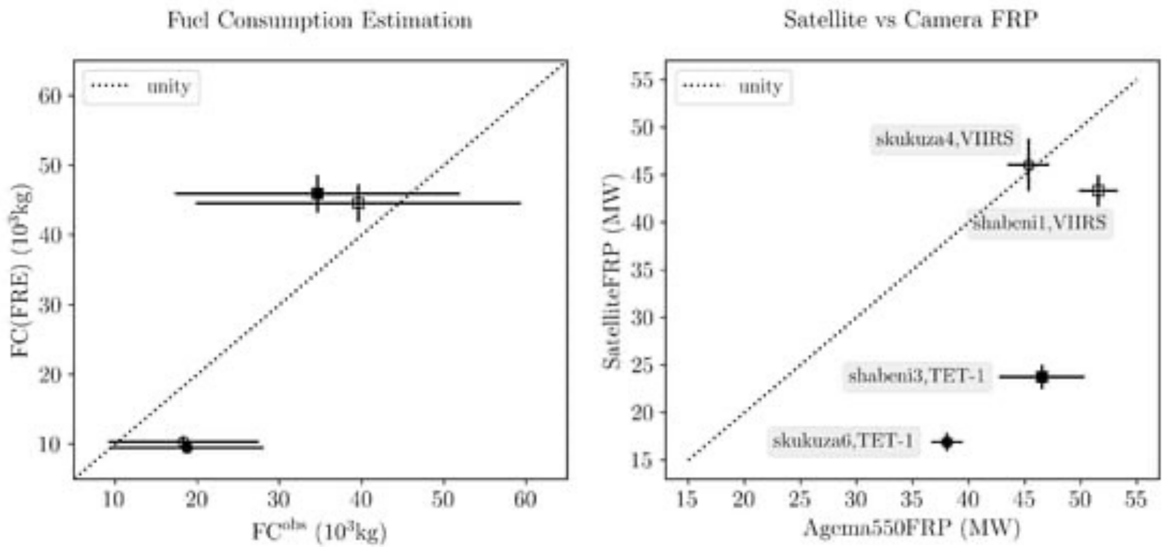
- ESA Fire CCI
    - Sentinel-2 burned area product for Africa (FireCCISFD20)
    - 20m and 0.25° spatial resolution
    - 2019 (2016 exists)

Webpage

- Products page updated
- Collaboration page up to date
- References up to date

Fire Disturbance (2/3)

Recent Publications



- Chen, J., Li, R., Tao, M., Wang, L., Lin, C., Wang, J., Wang, L., Wang, Y. and Chen, L., 2022. Overview of the performance of satellite fire products in China: Uncertainties and challenges. *Atmospheric Environment*, *268*, p.118838.

- Franquesa, M., Lizundia-Loiola, J., Stehman, S.V. and Chuvieco, E., 2022. Using long temporal reference units to assess the spatial accuracy of global satellite-derived burned area products. *Remote Sensing of Environment*, *269*, p.112823.
  - Stage 3 validation of FireCCI51, C3SBA10 and MCD64A1 c6 burned area products using proposed “alternative approach to estimate spatial accuracy by disentangling the spatial from the temporal component of BA detection errors”

- Paugam, R., Wooster, M.J., Mell, W.E., Rochoux, M.C., Filippi, J.B., Rücker, G., Frauenberger, O., Lorenz, E., Schroeder, W., Main, B. and Govender, N., 2021. Orthorectification of Helicopter-Borne High Resolution Experimental Burn Observation from Infra Red Handheld Imagers. *Remote Sensing*, *13*(23), p.4913.

Fire Disturbance (3/3)

Recent Publications

- Arruda, Vera LS, et al. 2021. An alternative approach for mapping burn scars using landsat imagery, Google Earth Engine, and deep learning in the Brazilian Savanna. *Remote Sensing Applications: Society and Environment,* 22: 100472.
    - Validated Landsat and MODIS burned area maps using subset of Landsat-based training data

LST & Emissivity (1/4)

Conferences

- Thermal infraRed Imaging Satellite for High-resolution Natural resource Assessment (TRISHNA) Days Workshop: **March 22-24, 2022, Toulouse, France**
- International Earth Surface Working Group (IESWG) Workshop: **Apr 05-07, 2022, fully virtual, hosted by Finnish Meteorological Institute (FMI)**
- ESA Living Planet Symposium (LPS): **May 23-27, 2022, Bonn, Germany**
- Int. Radiation Symposium (IRS) 2022: **Jul 4-8, 2022, Thessaloniki, Greece**
- EUMETSAT Meteorological Satellite Conf.: **Sep 19-23, Brussels, Belgium**
- 6th Recent Advances on Quantitative Remote Sensing (RAQRS) Conf.: **Sep 19-23, 2022, Valencia (Torrent), Spain**

LST & Emissivity (2/4)

Project News

- LSA SAF (EUMETSAT): LST validation station at Gobabeb, Namibia operates nominally; however, still irregular data transmission (internet issues)
- ESA LST_cci Phase 1 has been completed; **Phase 2** started on 1st of Jan 2022 and has "a key objective to improve the current suite of LST ECV Products, and produce new LST ECV Products, in order to meet as a minimum, the threshold requirements for LST set by the Global Climate Observing System (GCOS), and where possible the target requirements".
- Copernicus LAW: five new LST validation stations are now operational. LST Validation Protocol and Radiometer Calibration Report have been updated. While the AOD & WV parts ended in Dec 2021, ESA extended the LST part to Dec 2022 (allows for Covid-19 related delays of the stations deployment).
- ECOSTRESS collection 2 (build 7) improved LST&E and cloud mask products about to start reprocessing. Gobabeb and Lake Tahoe in situ validation data used for cold calibration adjustment.
- Landsat 9 surface temperature validation and assessment underway at core US stage- validation sites (JPL, RIT).

LST & Emissivity (3/4)

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

Validation for Land S3 Products

LST validation stations

- KIT forest (Germany)
- Svartberget (Sweden)
- Hyytiälä (Finland)
- Robson Creek (Australia)
- Puéchabon (France)

Robson Creek (Australia)

Located at 16,11°S ; 145,38°E

This site is another site known under the TERN network as the Robson Creek Rainforest SuperSite which includes three sub-sites: FNQ Rainforest, Robson Creek and Daintree/Cape Tribulation.

The biome is 5 in the ALB2 classification; i.e. closed to open (more than 15 %) broadleaved evergreen and/or semi-deciduous forest.

Image from https://supersites.tern.org.au/supersites/fnqr-robson

Tower at Robson Creek

View from the tower

https://law.acri-st.fr/home

LST & Emissivity (4/4)

- J. Ma et al. (2021), Continuous evaluation of the spatial representativeness of land surface temperature validation sites, Remote Sensing of Environment, vol. 265, doi: 10.1016/j.rse.2021.112669.
- P. Sismanidis et al. (2021), Satellite-derived quantification of the diurnal and annual dynamics of land surface temperature. Remote Sensing of Environment, vol. 265, doi: 10.1016/j.rse.2021.112642
- F. Hong et al. (2021), A simple yet robust framework to estimate accurate daily mean land surface temperature from thermal observations of tandem polar orbiters, Remote Sensing of Environment, vol. 264, doi: 10.1016/j.rse.2021.112612
- Hulley et al. (2021), Validation and quality assessment of the ECOSTRESS level-2 land surface temperature and emissivity product, IEEE Transactions on Geoscience and Remote Sensing, doi: 10.1109/TGRS.2021.3079879.
- I.F. Trigo et al. (2021), Validation and consistency assessment of land surface temperature from geostationary and polar orbit platforms: SEVIRI/MSG and AVHRR/Metop, ISPRS J. Photo. Rem. Sens., doi: 10.1016/j.isprsjprs.2021.03.013
- P. Wu et al. (2021), Spatially Continuous and High-Resolution Land Surface Temperature Product Generation: A review of reconstruction and spatiotemporal fusion techniques, IEEE Geoscience and Remote Sensing Magazine, vol. 9(3), doi: 10.1109/MGRS.2021.3050782

Surface Radiation

- Updated list of radiation products on LPV website

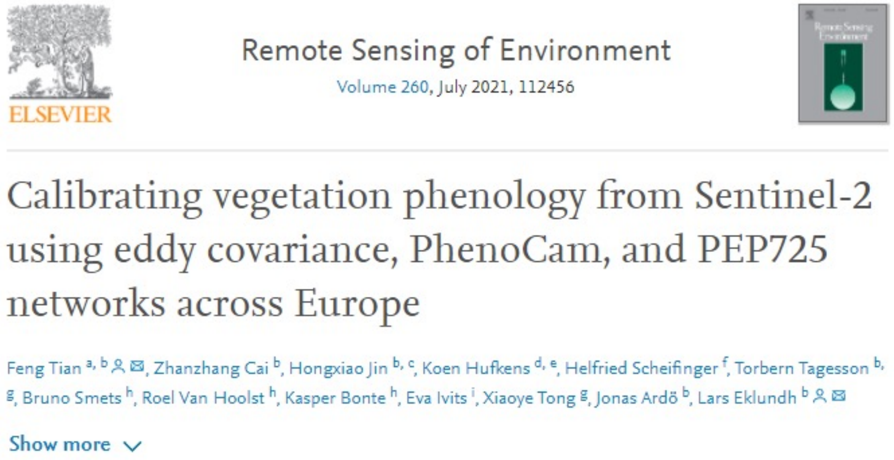
- *In-situ* albedo measurements
  National Tibetan Plateau Data Center (https://data.tpdc.ac.cn/en/)   --- Several sites in China

- SALVAL
  Fernando is leading a paper on albedo products validation with SALVAL.
  Preparing C6.1 MCD43 albedo over the validation sites.

- Published papers
  Shao et al., 2021, Cross-Comparison of Global Surface Albedo Operational Products-MODIS, GLASS, and CGLS, *Remote Sensing*, 13(23), 4869; https://doi.org/10.3390/rs13234869

Land Surface Phenology (1/4)

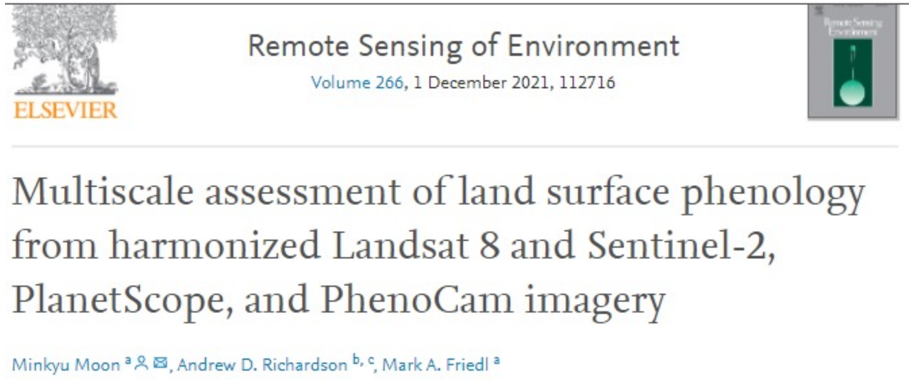
- New paper published on the calibration of “High Resolution Vegetation Phenology and Productivity” product
  - Tian et al., 2021. Calibrating vegetation phenology from Sentinel-2 using eddy covariance, PhenoCam, and PEP725 networks across Europe. RSE, 260, 112456
- New paper published in RSE
  - Moon et al., 2021. Multiscale assessment of land surface phenology from harmonized Landsat 8 and Sentinel-2, PlanetScope, and PhenoCam imagery. RSE, 266, 112716
- New LSP conference: PHENOLOGY 2022 - Phenology at the crossroads
  - 20-24 June in Avignon, France
  - Submissions open from 10 January 2022 to 1 March 2022
- New special issue in Science of Remote Sensing: Identifying the climate and human impacts on vegetation dynamics and their sustainability using Earth observation data
- New paper under review from Gray’s group: assessing LSP with FLUXNET2015 data


ELSEVIER
Remote Sensing of Environment
Volume 260, July 2021, 112456

Calibrating vegetation phenology from Sentinel-2 using eddy covariance, PhenoCam, and PEP725 networks across Europe

Feng Tian [a, b], Zhanzhang Cai [b], Hongxiao Jin [b, c], Koen Hufkens [d, e], Helfried Scheifinger [f], Torbern Tagesson [b, g], Bruno Smets [h], Roel Van Hoolst [h], Kasper Bonte [h], Eva Ivits [i], Xiaoye Tong [g], Jonas Ardö [b], Lars Eklundh [b]

Show more


ELSEVIER
Remote Sensing of Environment
Volume 266, 1 December 2021, 112716

Multiscale assessment of land surface phenology from harmonized Landsat 8 and Sentinel-2, PlanetScope, and PhenoCam imagery

Minkyu Moon [a], Andrew D. Richardson [b, c], Mark A. Friedl [a]

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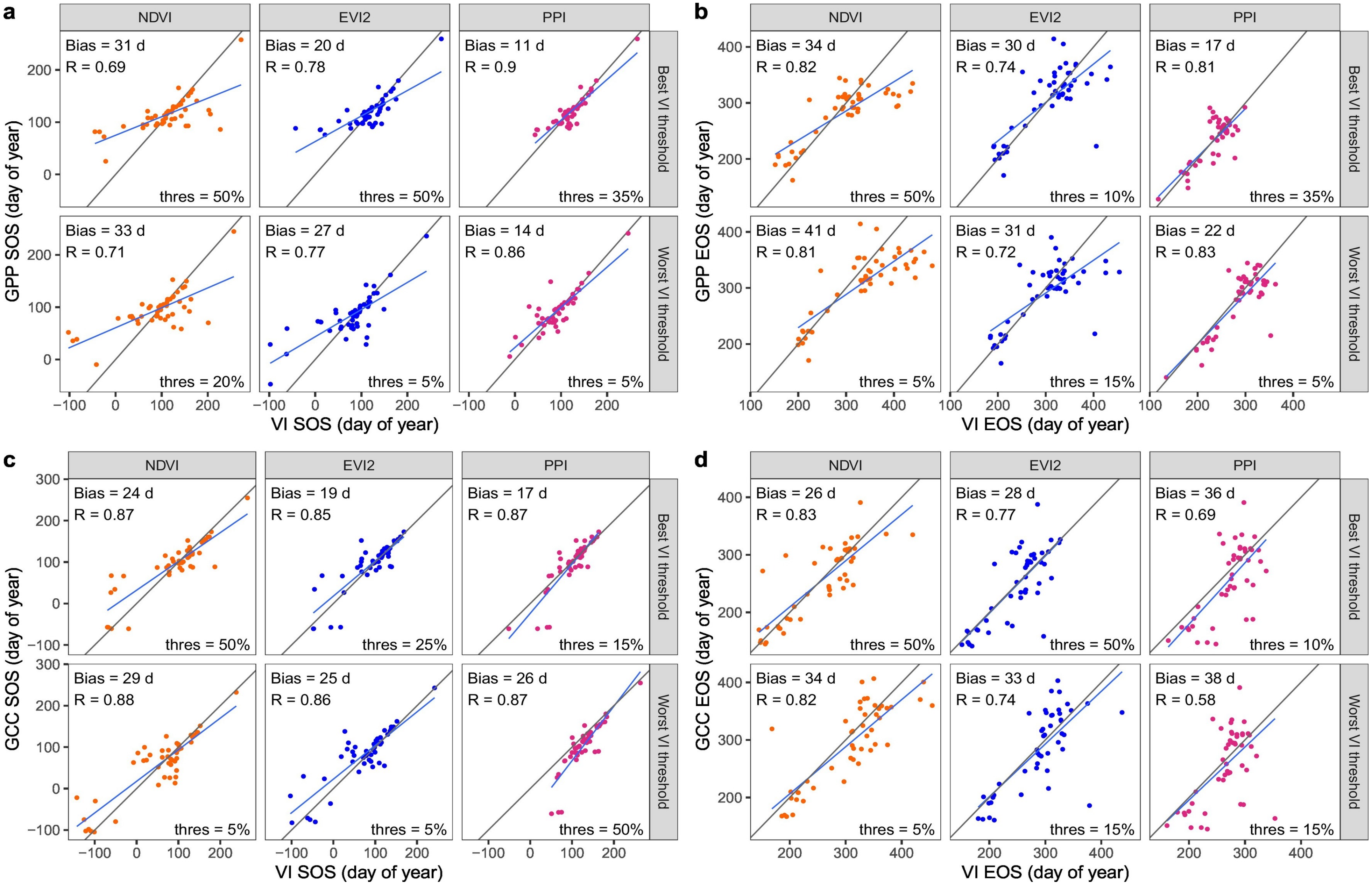
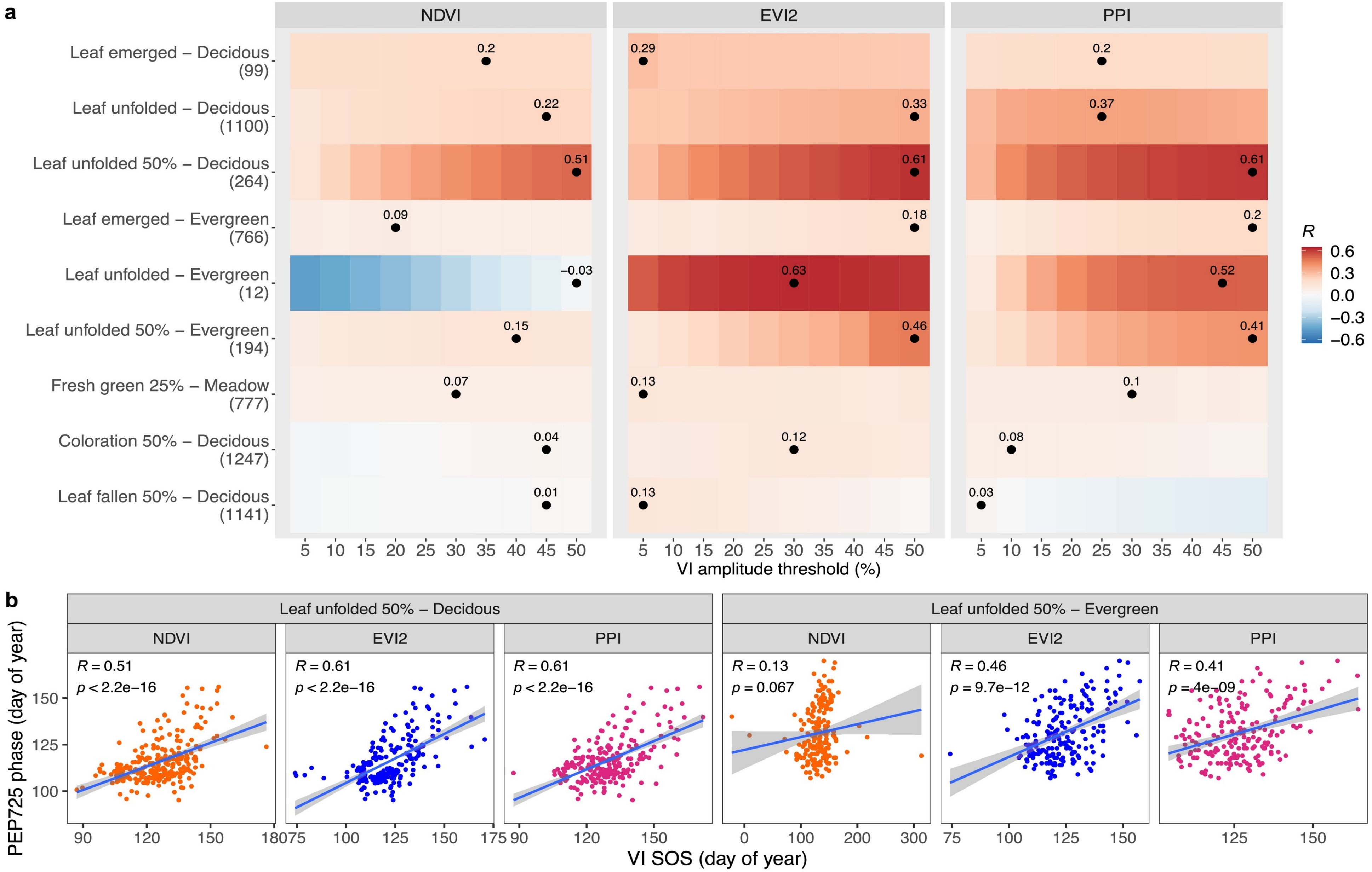
Land Surface Phenology (2/4)

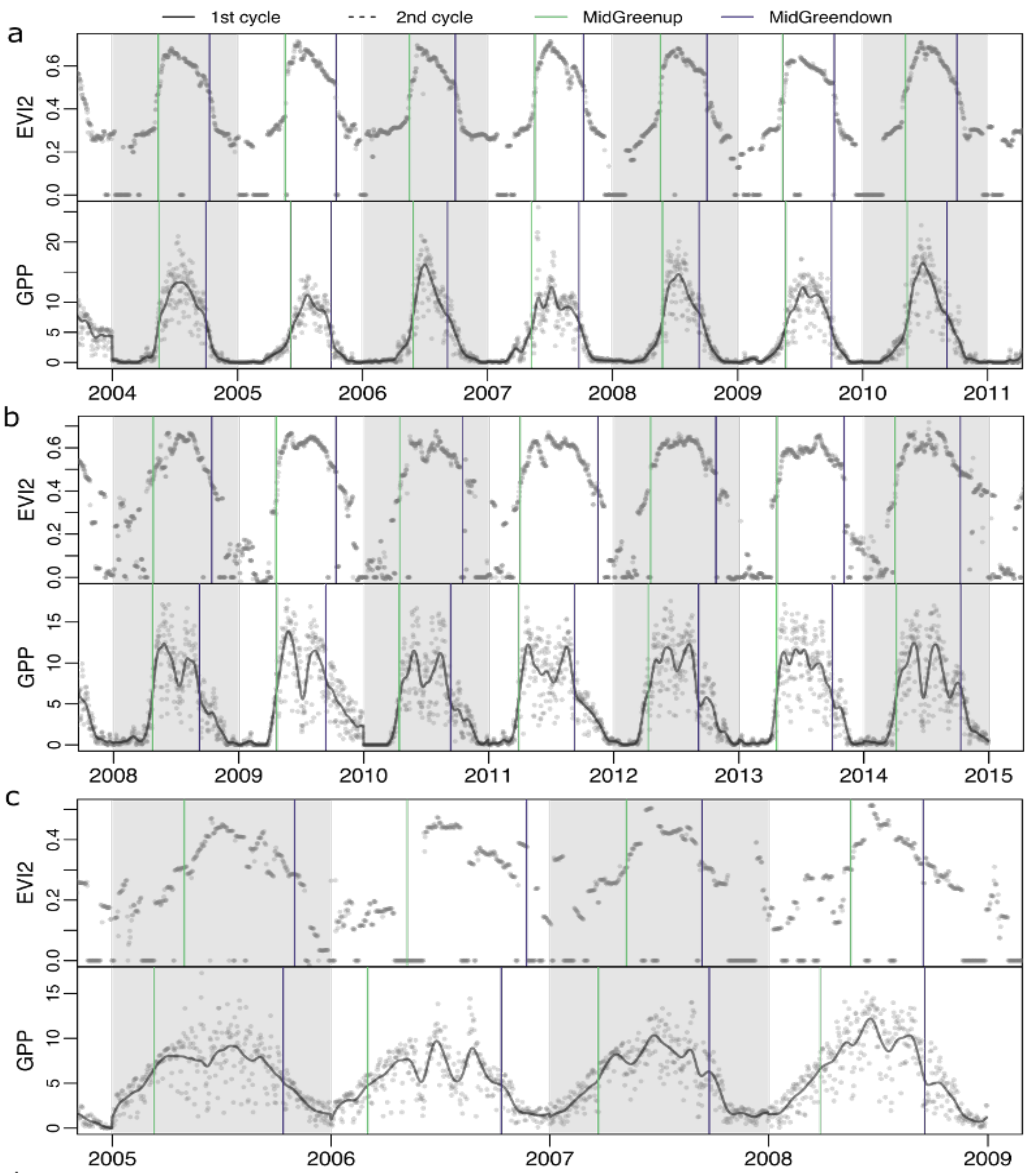


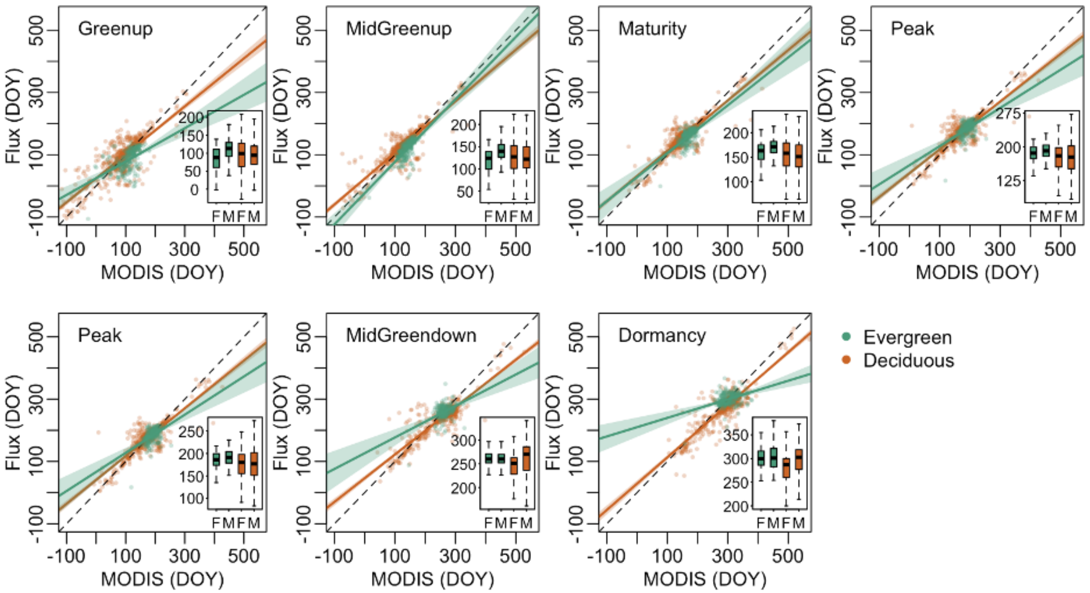
Land Surface Phenology (3/4)

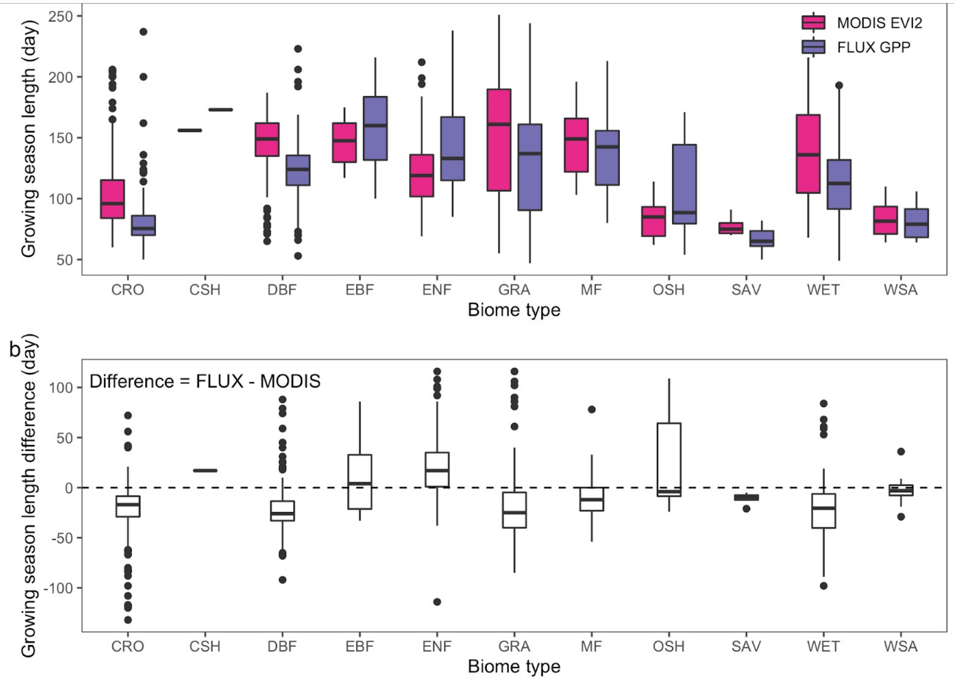


Tian et al., 2021. RSE, 260, 112456

Land Surface Phenology (4/4)







Soil Moisture

News:

- QA4SM: Sentinel-1 radar high resolution data now available for validation
- SMAP Validation paper published:

  Colliander, A., R.H. Reichle, W.T. Crow, M.H. Cosh, F. Chen, S. Chan, N. Das, R. Bindlish, J. Chaubell, S.B. Kim, Q. Liu, P. O'Neill, R.S. Dunbar, L. Dang, J. Kimball, T.J. Jackson, H.K. al Jassar, J. Asanuma, B. K. Bhattacharya, A. Berg, D.D. Bosch, L. Bourgeau-Chavez, T. Caldwell, J.-C. Calvet, C. Holifield Collins, K.H. Jensen, S. Livingston, E. Lopez-Baeza, J. Martínez-Fernández, H. McNairn, M. Moghaddam, C. Montzka, C. Notarnicola, T. Pellarin, I. Pfeil, J. Pulliainen, J. Ramos, M. Seyfried, P. Starks, Z. Su, R. van der Velde, Y. Zeng, M. Thibeault, M. Vreugdenhil, J.P. Walker, M. Zribi, D. Entekhabi, and S. Yueh (2022): Validation of Soil Moisture Data Products from the NASA SMAP Mission. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing 15, 364-392. DOI:10.1109/JSTARS.2021.3124743

Workshops:

- 6th Satellite Soil Moisture Validation and Application Workshop, postponed to 7-9th June 2022, Perugia, Italy
- World Congress on Soil Science, 31 July - 5 August 2022, Glasgow (https://22wcss.org)
- 7th Satellite Soil Moisture Validation and Application Workshop, Fall 2024?, New Orleans, USA?

Vegetation Indices (1/2)

Protocol

- Section on inter-comparison is being prepared.

Validation

- Continuing with an inter-comparison exercise between VIIRS and GOES-R VIs using in situ data from AmeriFlux as a reference

Special Session

- Convening a conference session at AOGS 2022 VIRTUAL, IG16 "Earth Monitoring from Operational Geostationary Satellite", co-conveners, Weile Wang, Kazuhito Ichii, & Tomoaki Miura, 01-05 August 2022 (**Abstract Submission Due: 23 February 2022**)

Vegetation Indices (2/2)

Operational Production

PROBA-V C2

- Evaluation of 1-year TDS of TOC refl and NDVI
- Comparison against PV C1 and MOD13A3 C6
- Abstract sent to LPS2022

CGLS

- NDVI 300 m V2 (S3)
  - External review of CGLS NDVI 300 m V2 was successful
  - Product upgraded to pre-operational status
  - Publication in preparation
- Preparation of NDVI 300 m V2 started (PROBA-V)

LSA-SAF

- Preparation of METImage NDVI consistent with MetOp-A/B/C-AVHRR ENDVI

S3-MPC

- Evaluation of SYN_VGT products (incl. NDVI) based on last PB (IPF/PB for S3A is 06.09/2.77, for S3B 06.09/1.55, 14 June 2021)

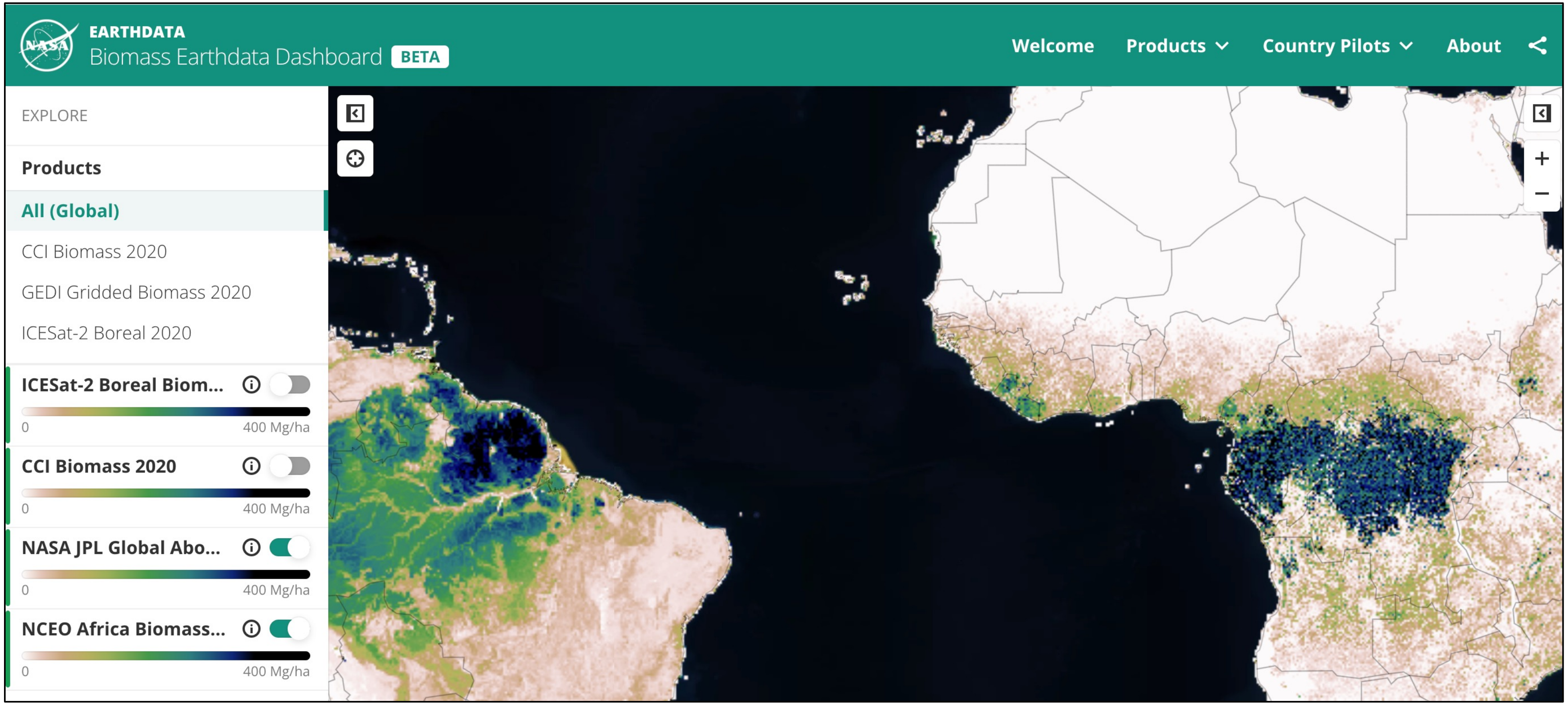
Snow

- USGS Collection 2 Landsat Analysis Ready Data fractional snow cover area (fSCA) products for the CONUS and Alaska will be released in February

- NASA’s Terrestrial Hydrology Program is currently supporting a NASA Snow Albedo team to conduct hydrological testbed scoping studies in 2022

Above Ground Biomass (1/2)

- Biomass Reference Network - GEO-TREES
- Biomass Harmonization Activity for the UNFCCC GST
- Web platform presented at COP26



https://earthdata.nasa.gov/maap-biomass

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Above Ground Biomass (2/2)

Next Steps for Biomass Harmonization Team

- **Update dashboard**
  - Add GEDI L4B and GEO-TREES page
  - More visibility for input agencies / institutions
  - Add Mangroves?

- **Early 2022 focus on validation**
  - Using NFI data (jurisdictional-level validation in partner countries)
  - Using airborne lidar biomass maps (biome-level)
  - Explore optical record (e.g. Planet) for monitoring reference sites

- **Validation results will guide harmonization concepts**
  - Current plan - harmonization of estimates at a sub-national jurisdictional level, Draft paper

- **Expand work on country engagement to more Silvacarbon and SERVIR countries**
  - Currently 5 countries, but conversations to start with many more (20+)
  - Planned Silvacarbon meeting in Feb 2022

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Land Cover (1/3)

General updates:

- Started the outline of updated Land Cover and Change validation guidelines;
- Planning of the joint workshop between CEOS LPV and GEOGLAM on the validation of agricultural land cover products/essential agricultural variables.

Proposed in-person workshop date: second half of 2022

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

Funding: NASA ROSES 21 under the F2.Topical Workshop call
Deadline to apply for funding: May 13, 2022
Approval to submit a proposal received from NASA Program Managers
Brad Doorn (Applied Sciences) and Garik Gutman (LCLUC)

GEOGLAM Global Agricultural Monitoring

HARVEST EARTH DATA FOR INFORMED AGRICULTURAL DECISIONS

Land Cover (2/3)

New datasets: Global cropland extent and change, 2000-2019 (UMD GLAD)

Table 3 Regional and global map accuracy metrics

From: Global maps of cropland extent and change show accelerated cropland expansion in the twenty-first century

	Cropland 2000–2003 (%)	Cropland 2016–2019 (%)	Stable cropland (%)	Cropland gain (%)	Cropland loss (%)
Africa					
OA	96.9 (0.7)	96.5 (0.8)	97.2 (0.6)	97.9 (0.6)	99.4 (0.3)
UA	71.3 (4.1)	77.3 (3.2)	71.9 (4.6)	57 (5)	48 (5)
PA	65.8 (8.3)	70.6 (7.9)	64.6 (8.2)	49.4 (12)	39.9 (21.5)
South-west Asia					
OA	96.2 (0.7)	96.2 (0.7)	95.7 (0.8)	98.6 (0.2)	98.9 (0.3)
UA	90.1 (2.7)	87.5 (2.8)	86 (3.5)	59 (4.9)	66 (4.8)
PA	85 (3.2)	89.2 (3.2)	82.5 (3.5)	85.9 (8.6)	52.1 (10
Australia and New Zealand					
OA	99.1 (0.2)	98.9 (0.2)	99.2 (0.2)	99.6 (0.1)	99.9 (0)
UA	86 (3.2)	84.6 (3)	88.5 (3.3)	57 (5)	54 (5)
PA	98.7 (0.4)	96.8 (2.5)	95.8 (1.6)	73.8 (19.1)	100 (0)
South-east Asia					
OA	97.3 (0.6)	96.6 (0.7)	96.7 (0.7)	99.3 (0.1)	99.2 (0.
UA	92.8 (2.3)	86.5 (2.8)	87 (3.4)	69 (4.6)	78 (4.2)
PA	83.8 (4.2)	84.1 (4.2)	80.1 (4.6)	92.4 (6.3)	60.6 (9.
Europe and North Asia					
OA	96.8 (0.7)	96.8 (0.7)	96.1 (0.7)	99.2 (0.2)	99.6 (0.
UA	93.1 (2.2)	93.6 (2)	92.7 (2.7)	71 (4.6)	79 (4.1)
PA	86.4 (3.3)	86.1 (3.3)	79.3 (3.9)	83.1 (9.3)	98.8 (1.
North and Central America					
OA	98.5 (0.5)	97.8 (0.5)	98.6 (0.4)	99 (0.3)	99.4 (0.
UA	93.6 (2.2)	90.8 (2.3)	93 (2.6)	67 (4.7)	82 (3.9)
PA	96.2 (2.2)	94.7 (2.6)	97 (1.7)	69.7 (14.9)	72.2 (14
South America					
OA	99.5 (0.2)	99.1 (0.3)	99.4 (0.2)	99.3 (0.3)	99.8 (0)
UA	94.1 (2)	94.5 (1.6)	93.9 (2.4)	88 (3.3)	76 (4.3)
PA	94.3 (3.5)	92 (3.9)	90.7 (4)	83.7 (7.9)	89.2 (9.6)
World					
OA	97.5 (0.2)	97.2 (0.3)	97.3 (0.2)	98.9 (0.1)	99.4 (0.1)
UA	90 (1.1)	88.5 (1)	88.3 (1.3)	67.4 (1.9)	73.3 (1.9)
PA	86 (1.8)	86.4 (1.9)	82.9 (1.9)	73.3 (5.8)	70.3 (6.4)

OA, overall accuracy; UA, user's accuracy; PA, producer's accuracy. The s.e.m. of accuracy metrics is shown in parenthesis.

https://glad.umd.edu/dataset/croplands/

nature food ARTICLES
https://doi.org/10.1038/s43016-021-00429-z
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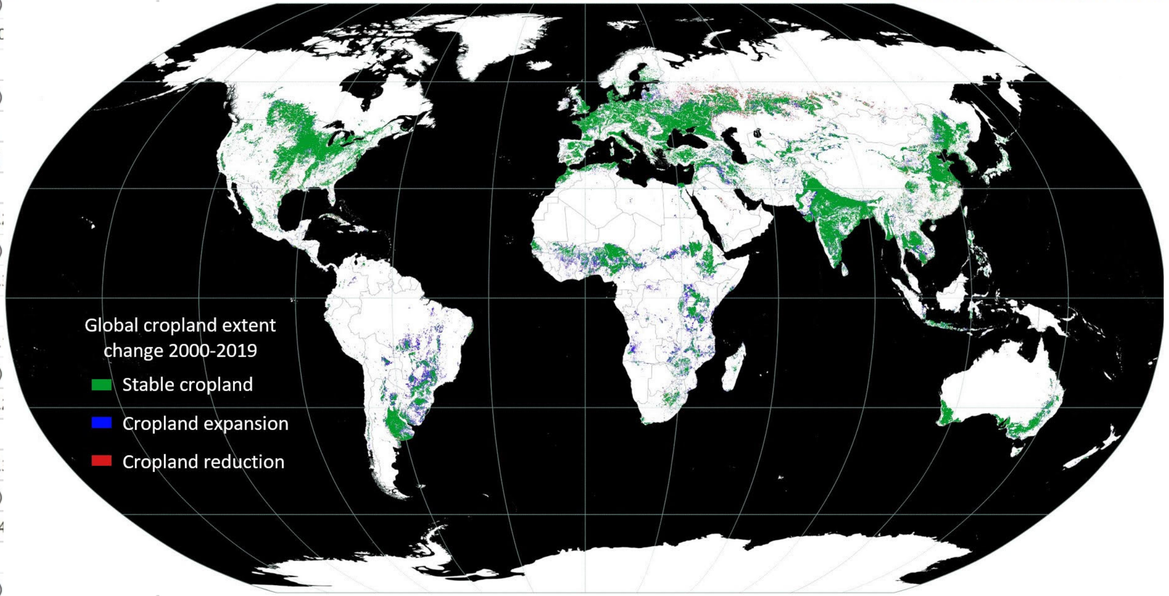
Global maps of cropland extent and change show accelerated cropland expansion in the twenty-first century

Peter Potapov[1✉], Svetlana Turubanova[1], Matthew C. Hansen[1], Alexandra Tyukavina[1], Viviana Zalles[1], Ahmad Khan[1], Xiao-Peng Song[2], Amy Pickens[1], Quan Shen[1] and Jocelyn Cortez[3]



Global UA and PA
of cropland extent 86-90%
of stable cropland 83-88%
of cropland change 67-73%

Global sample size: 3500 pixels

Land Cover (3/3)

ENVIRONMENTAL RESEARCH LETTERS

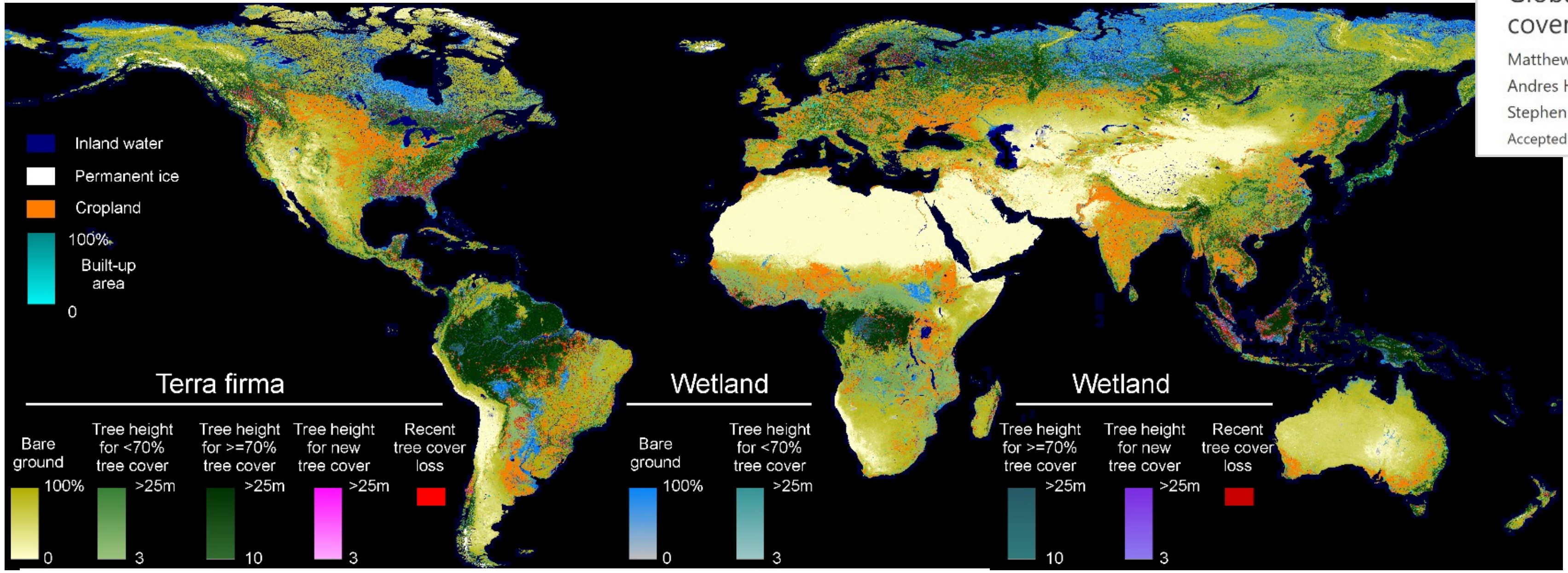
ACCEPTED MANUSCRIPT • OPEN ACCESS

Global land use extent and dispersion within natural land cover using Landsat data

Matthew C Hansen[1], Peter V Potapov[2], Amy Pickens[3], Alexandra Tyukavina[4], Andres Hernandez Serna[5], Viviana Zalles[6], Svetlana Turubanova[7], Indrani Kommareddy[5], Stephen V Stehman[8], Xiaopeng Song[9] + Show full author list

Accepted Manuscript online 29 December 2021 •

New datasets: Global land cover and land use, 2019 (UMD GLAD)



land cover / land use		Users	Producers	SE(Users)	SE(Prod)	Reference area (km^2)	SE (km^2)	Map area (km^2)
bare ground	1	92.00%	91.84%	3.87%	3.53%	19528277	131113	19494042
semi-arid vegetation	2	66.00%	81.62%	6.77%	5.91%	15576710	167169	19262935
dense short vegetation	3	64.00%	70.45%	6.86%	4.29%	25162743	366470	27699561
open or short tree cover	4	70.00%	58.90%	6.55%	5.88%	17974564	218966	15124483
dense and tall tree cover	5	78.00%	87.36%	5.92%	3.45%	17376763	146034	19462705
wetland	6	52.40%	59.58%	4.54%	8.52%	8814559	72570	10022241
permanent surface water	7	98.09%	99.45%	0.62%	0.40%	29636753	41491	30044442
permanent ice	8	94.00%	80.19%	3.39%	14.56%	395948	182	337764
built-up land	9	84.00%	42.80%	5.24%	10.64%	3878108	23521	1975958
cropland	10	92.00%	70.11%	3.87%	6.49%	15218599	140985	11596957
treed land use	11	76.73%	57.82%	4.59%	9.89%	4372688	20866	3294899
other land use	12	0.00%	0.00%	0.00%	0.00%	379325	371	0
						Overall Accuracy	78.35	SE=1.86

Land cover / land use class UA and PA vary:

permanent surface water 98-99%
permanent ice 80-94%
bare ground 92%
cropland 70-92%
…
wetland 52-60%
built-up land 43-84%

Global sample size: 950 points

https://glad.umd.edu/dataset/global-land-cover-land-use-v1