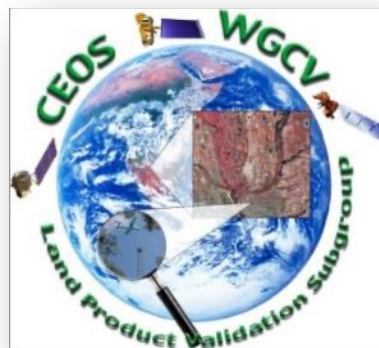


Land Product Validation (LPV) Sub-group Meeting



Fernando Camacho – (EOLab/U. Valencia) – Chair

Michael Cosh – (USDA) – Vice Chair

Subgroup meeting

21 Sep 2021

NEXT LPV TELECON 09 Nov 2021

Attendance

Participants

Fernando Camacho
Michael Cosh
Jaime Nickeson
Zhuosen Wang
Gareth Roberts
John Bolten
Carsten Montzka
Tomoaki Miura
Hongliang Fang
Louis Giglio
Sylvain Leblanc
Frank Göttsche

Sophie Bontemps
Mat Disney
John Armston
Sasha Tyukavina
Laura Duncanson
Dominique Carrer
Glynn Hulley

Not attending

Else Swinnen
Marie Weiss
Victor Rodríguez-Galiano
Chris Crawford
Joshua Gray

Proposed agenda items

- Welcome
- CEOS WGCV 49th meeting
- SRIX4VEG & ESA cal/val Supersite optical missions
- CCVS Project
- Seeking LPV Vice Chair nominations
- 2021 Newsletter
- Focus Area web status
- Focus Area Reporting

CEOS WGCV 49th meeting

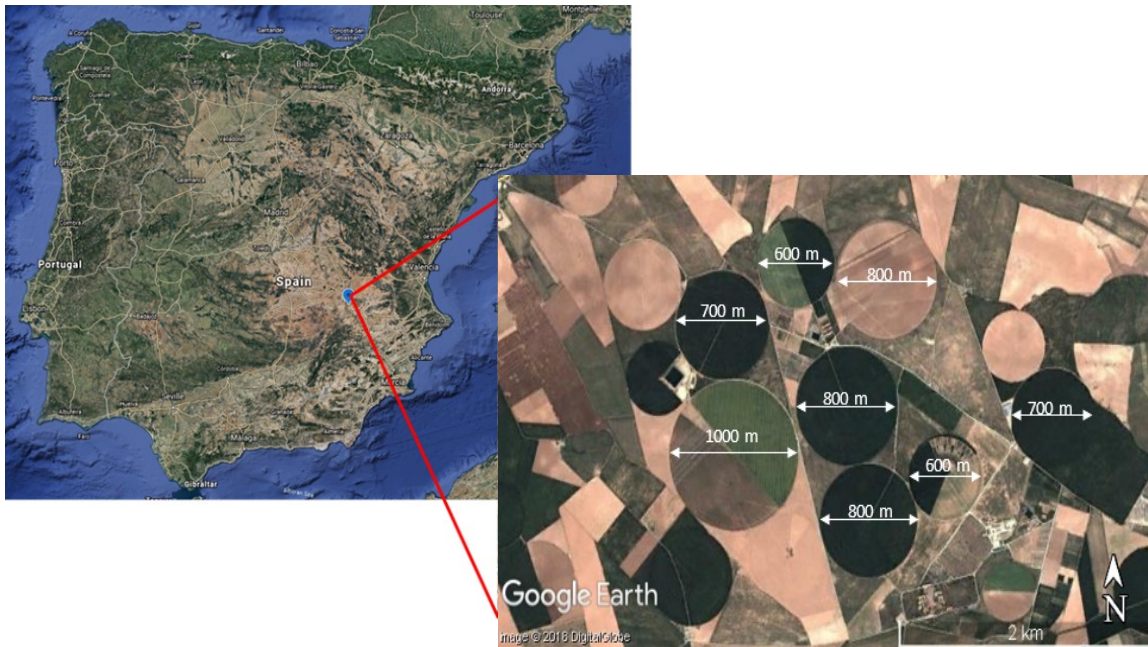
June 29th - July 2nd, 2021, virtual

Items relevant for LPV

- **ACIX-II Land webpage** developed in the Cal/Val portal <http://calvalportal.ceos.org/acix-ii-land>, results and documents will be published in Q3/2021. **Main outcomes:**
 - No clear superiority of AC processors. More in-situ data needed.
 - CMIX results vary depending on validation dataset. No clear superiority. Semi-transparent clouds and cloud boundaries are an issue for most algorithms. How to define a transparent cloud?
- **ACIX-III & CMIX-II** to intercompare atm. correction (AC) and cloud masking (CM) processors for Hyperspectral imagery (PRISMA) and multispectral (Sentinel-2 & Landsat-8). 1st workshop to define methodologies expected for Autumn 21
- **Terms & Definitions:** An initiative started to agreed on a common online glossary of terms (harmonization required between ISO, CEOS, INSPIRE, NASA, OCG EO terms and definitions)
- **ISO 19124-1 Geographic information — Calibration and validation of remote sensing data and derived products — Part 1: Fundamentals** reviewed by WGCV (Part 2: Optical sensors; Part 3: Hyperspectral sensors; Part 4: Lidar; Part 5: SAR/InSAR; Part 6: Microwave; Part 7: Thematic Data; Part 8: Cal/Val site)
- Others: WGCV support to CEOS Strategy on GST UNFFCCC, new solar reference spectrum (TSIS-1 HSRS)
- Agenda and presentation are available at <https://ceos.org/meetings/wgcv-49/>

SRIX4VEG & ESA cal/val Supersite optical missions

- Barrax site has been selected for the surface reflectance intercomparison exercise to be conducted in July 2022. 1st workshop in Autumn 2021. Registrations are open <https://frm4veg.org/srix4veg/>
- Barrax has been selected to be the first ESA cal/val supersites for optical missions
 - Hypernets system to be deployed for surface reflectance validation + UAV systems & hand-held radiometers
 - Automated DHPs and field campaigns for LAI, fapar, CCC
 - FLEX team to install FLOX box, Cable/Piccolo
 - Atmosphere characterization (CIMEL, Piccolo Sun tracker)



DJI Matrice 600 Pro UAV +
Headwall VNIR-SWIR Co-Aligned +
GPS/IMU + LiDAR



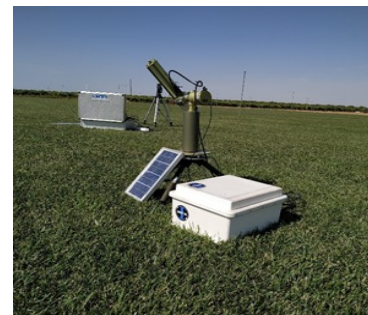
ASD FieldSpec 4 Hi-Res



Piccolo System



CIMEL, AERONET protocol



LICOR LAI2200

DHP



SPAD-502



CCVS workshop 2021 - Going Virtual



Objectives:

The CCVS workshop will be a multi-disciplinary forum addressing the main components of the Copernicus program: atmospheric composition, optical observations, altimetry and radar imaging. It will:

- Present an overview of existing calibration and validation sources for the cal/val of sentinel missions;
- Identify gaps and limitations;
- Propose improvements, synergies and innovations for the future.

Audience:

The workshop is open to international experts on calibration and validation, in-situ measurement, as well as users of Sentinel products interested in quality aspects.

Seeking LPV Vice Chair nominations

LPV Vice Chair

March of 2022 is the end of the term for Fernando and in April Mike will take over for him as the new LPV Chair.

This means we are seeking nominations for a new vice chair **now**. If any of you are interested, please let us know. If you have any good candidates in mind, please pass them on. We will be seeking a candidate that is not from North America.

LPV 2021 Newsletter

- We have a draft of the newsletter that will be distributed internally first.
- Let us know if you have input of wide interest that isn't covered here.
- Send listserv updates asap!

Newsletter Content

1. [Two New Protocols Completed and Endorsed](#)
2. [Biomass Protocol Uptake](#)
3. [SRIX4VEG](#)
4. [New Focus Area Leads](#)
5. [Seeking New LPV Vice Chair](#)
6. [Meetings](#)
7. [Special Issues](#)

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!

Good news is that most 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	May 2021	Oct 2019	
Biophysical LAI/Fpar	Sept 2020	Dec 2020	Sept 2020	Sept 2020	Oct 2019	Sept 2019
Surface Rad/Albedo	Mar 2021	Feb 2020	Mar 2021	Dec 2019	Dec 2019	May 2020
LST/Emissivity	Mar 2021	April 2019	Mar 2021	April 2019	April 2019	
Fire/Burn Area	May 2021	Dec 2020	Mar 2020		Mar 2020	
Soil Moisture	Mar 2021	Feb 2019	Mar 2021	Mar 2021	Sept 2019	Dec 2020
Phenology	Apr 2021	July 2020	Apr 2021	April 2020		
Snow Cover	April 2019	Jan 2021			Oct 2019	
Vegetation Index	May 2021	Feb 2021	May 2021	May 2021	May 2019	
Biomass	Apr 2021	Apr 2021	Apr 2021	Apr 2021	Oct 2019	Sept 2020

Focus Area Reports

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

Land Cover

- Special session @IGARSS 2021 (July 2021)
 - « CEOS Land Product Validation: Sampling-based estimation of area and accuracy for Land Cover products »
 - P. Olofsson as keynote speaker - Good practices
 - 4 speakers with LC validation experience (Global LC map, National LC map, LUCAS dataset)
 - Quite interactive, with a lot of questions
- EU Copernicus LC:
 - Climate Change Service: working on the update of LC validation DB (adding 2020 samples)
 - Land Cover Service: publication of the procedure and results of the global 100m land cover map validation



ELSEVIER

Contents lists available at [ScienceDirect](#)

Remote Sensing of Environment

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



Towards operational validation of annual global land cover maps

Tsendbazar N.^{a,*}, M. Herold^a, L. Li^a, A. Tarko^a, S. de Bruin^a, D. Masiliunas^a, M. Lesiv^b, S. Fritz^b, M. Buchhorn^c, B. Smets^c, R. Van De Kerchove^c, M. Duerauer^b



Biophysical

- Conferences
 - IGARSS 2021 special session “UAV and Low-cost Sensor Networks for Land Monitoring and Cal/Val”, video available on the IGARSS site, slides contact Benjamin Brede (benjamin.brede@wur.nl)
 - ESA Living Planet Symposium 2022 (23-27th May 2022, Bonn), session proposal closed (Sep 10), abstract due Nov 18, 2021 (<https://lps22.esa.int>)
- Field campaigns
 - FRM4VEG (LAI, FAPAR, CCC) in cropland (Barrax, Sp) and forest (Wytham Woods, UK), July 2021
 - Vertical LAI measurement (DNF, 42.41°N, 117.31 ° E, China), Apr, Jun, & Sep, 2021
- References that can be added to website
 - Brown, L.A., Camacho, F., García-Santos, V., Origo, N., Fuster, B., Morris, H., Pastor-Guzman, J., Sánchez-Zapero, J., Morrone, R., Ryder, J., Nightingale, J., Boccia, V., & Dash, J. (2021). Fiducial Reference Measurements for Vegetation Bio-Geophysical Variables: An End-to-End Uncertainty Evaluation Framework. *Remote Sensing*, 13, 3194. <https://www.mdpi.com/2072-4292/13/16/3194>
 - Kang, Y., Ozdogan, M., Gao, F., Anderson, M.C., White, W.A., Yang, Y., Yang, Y., & Erickson, T.A. (2021). A data-driven approach to estimate leaf area index for Landsat images over the contiguous US. *Remote Sensing of Environment*, 258, 112383. <https://doi.org/10.1016/j.rse.2021.112383>
 - Zhang Y., Fang, H., Wang, Y., and Li S., 2021. Variation of intra-daily instantaneous FAPAR estimated from the geostationary Himawari-8 AHI data. *Agricultural and Forest Meteorology*, 307, 108535. <https://doi.org/10.1016/j.agrformet.2021.108535>
 - Brown, L.A., Meier, C., Morris, H., Pastor-Guzman, J., Bai, G., Lerebourg, C., Gobron, N., Lanconelli, C., Clerici, M., & Dash, J. (2020). Evaluation of global leaf area index and fraction of absorbed photosynthetically active radiation products over North America using Copernicus Ground Based Observations for Validation data. *Remote Sensing of Environment*, 247, 111935. <https://doi.org/10.1016/j.rse.2020.111935>

Fire Disturbance (1/2)

Focus area website

Largely up to date, listserv still needs to be updated

Burned Area product updates

- Copernicus Global Land Service (<https://land.copernicus.eu/global/products/ba>)
 - Sentinel-3 OLCI burned area product (version 3; released 2021/06/27)
 - July 2020 - present
 - 300m spatial resolution; monthly composites
 - Quality assessment ongoing

Copernicus Climate Change Initiative (CCI)

- FireCCILT11 AVHRR burned area (released December 2020)
 - 5-km native resolution + 0.25° gridded; monthly temporal resolution
 - 1982 - 2018
 - Otón et al. (2021) IJAEOG
 - Instrumental artifacts remain (Giglio and Roy, submitted)

Fire Disturbance (2/2)

Recent Publications

- Xu, W., Wooster, M.J., Polehampton, E., Yemelyanova, R. and Zhang, T., 2021. Sentinel-3 active fire detection and FRP product performance-Impact of scan angle and SLSTR middle infrared channel selection. *Remote Sensing of Environment*, 261, p. 112460.
- Campagnolo, M.L., Libonati, R., Rodrigues, J.A. and Pereira, J.M.C., 2021. A comprehensive characterization of MODIS daily burned area mapping accuracy across fire sizes in tropical savannas. *Remote Sensing of Environment*, 252, p. 112115.
- Hall, J.V., Argueta, F. and Giglio, L., 2021. Validation of MCD64A1 and FireCCI51 cropland burned area mapping in Ukraine. *International Journal of Applied Earth Observation and Geoinformation*, 102, p. 102443.
- Vetruta, Y., Cochrane, M.A., Priyatna, M., Sukowati, K.A. and Khomarudin, M.R., 2021. Evaluating accuracy of four MODIS-derived burned area products for tropical peatland and non-peatland fires. *Environmental Research Letters*, 16(3), p. 035015.
- Xu, W., Wooster, M.J., He, J. and Zhang, T., 2021. Improvements in high-temporal resolution active fire detection and FRP retrieval over the Americas using GOES-16 ABI with the geostationary Fire Thermal Anomaly (FTA) algorithm. *Science of Remote Sensing*, 3, p. 100016.
- Forghani, A., Thankappan, M., & Cechet, B., 2021. Validation of MODIS and AVHRR Fire Detections in Australia. *International Journal of Geoinformatics*, 17(3).
- “An important outcome of this study is the production of a database of fire locations derived from high-resolution imagery, which can serve as a resource for future validation efforts as detection algorithms evolve and sensors change.”

LST & Emissivity (1/4)

COVID-19 and conferences

- EUMETSAT Conference 2021, this week: **Sep 20-24, virtual**
- 6th Recent Advances on Quantitative Remote Sensing (RAQRS) Conference, postponed further: **Sep 19-23, 2022, Valencia (Torrent), Spain**
- Surface Biology and Geology (SBG) 6th Community Webinar: Oct 12 at 11am ET (4pm UTC/8am PT), Project office activities and from international partners (sbg.jpl.nasa.gov)

Project news

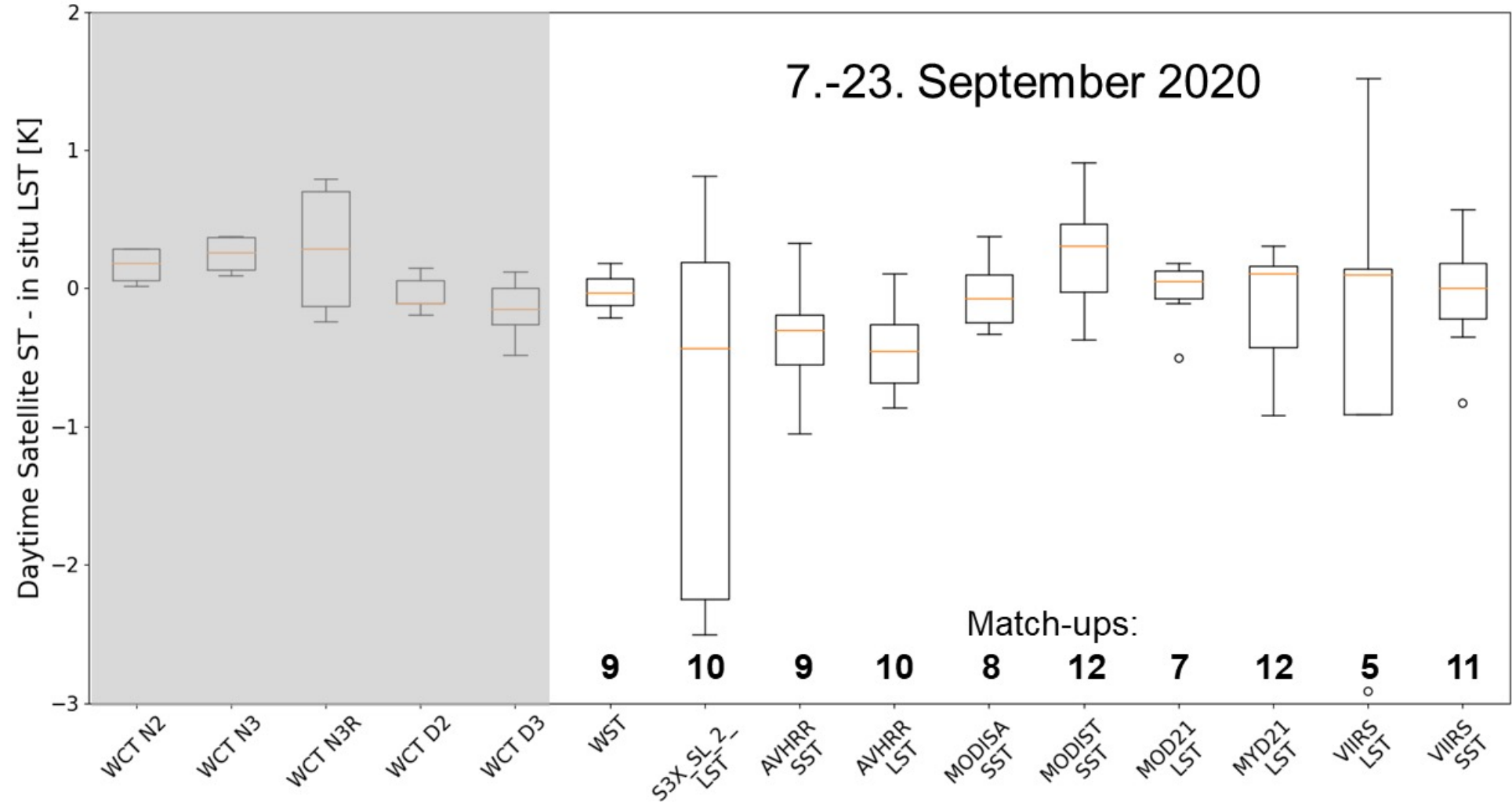
- EUMETSAT 'Lake Constance project': final report submitted, presentation at EUMETSAT Conference 2021 (no 272).
- Copernicus LAW: set up LST validation station at Hyytiälä, Finland.
- Landsat 9 TIR checkout and validation activities scheduled for Oct-Nov 2021
- ECOSTRESS collection 2 (build 7) improved LST&E products in early 2022.

LST & Emissivity (2/4)

EUMETSAT 'Lake Constance project'

**Thermal IR
Product
Intercomparison**

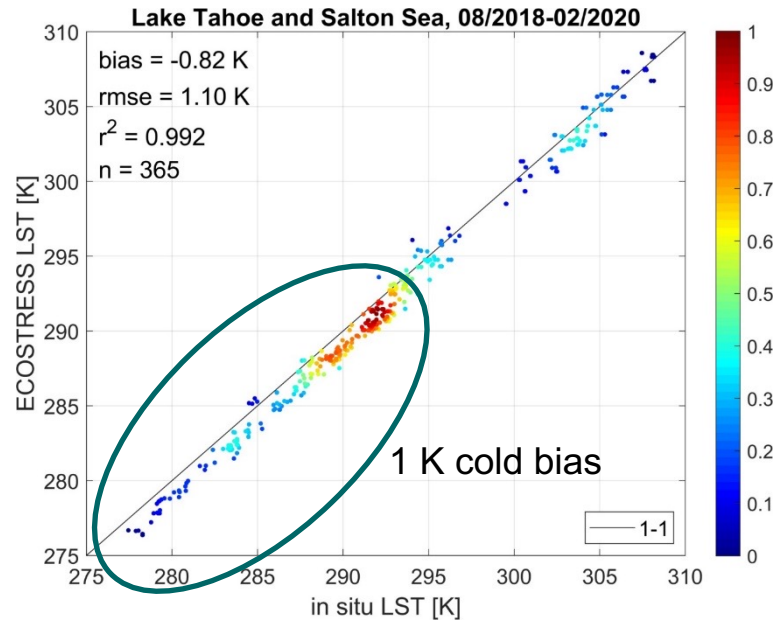
F Göttsche, W.
Wimmer, M.
Martin, and L.
Perez-Planels



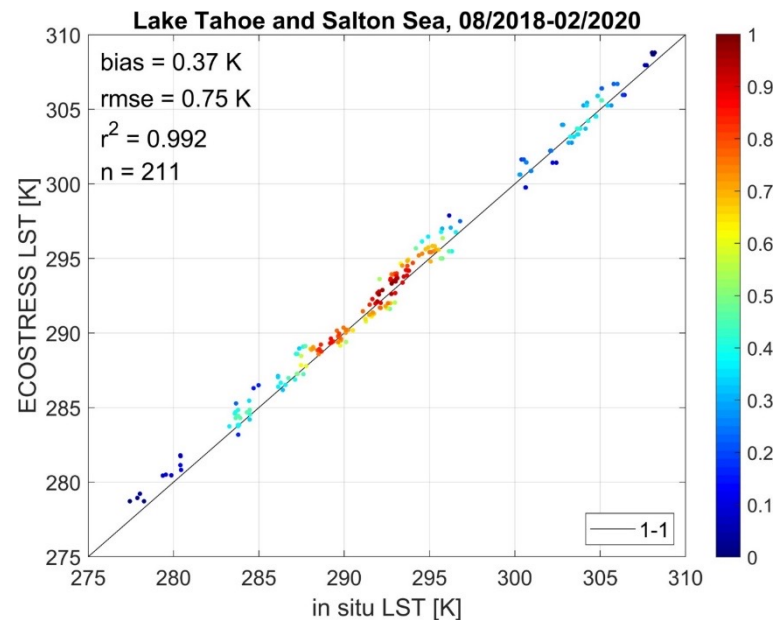
LST & Emissivity (3/4)

ECOSTRESS calibration improvements

Old Calibration LST validation



New Calibration LST validation



Expected calibration change to be made in ECOSTRESS collection 2 (build 7)

Only temperatures below 295 K affected due to cold blackbody calibration and inadequate ISS cooling.

LST (4/4) Recent LST&E publications

- 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.
- 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.
- 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. Reiners et al. (2021), Validation of AVHRR Land Surface Temperature with MODIS and In Situ LST - A TIMELINE Thematic Processor, Remote Sensing, doi: 10.3390/rs13173473.
- L. Pérez-Planells et al. (2021), Validation of Sentinel-3 SLSTR Land Surface Temperature Retrieved by the Operational Product and Comparison with Explicitly Emissivity-Dependent Algorithms, Remote Sensing, doi: 10.3390/rs13112228.
- Chen et al. (2021), Land Surface Temperature from GOES-East and GOES-West, Journal of Atmospheric and Oceanic Technology, DOI: 10.1175/JTECH-D-20-0086.1

Surface Radiation

Baseline Surface Radiation Network (BSRN) albedo WG

- Wang serves as chair of albedo WG supporting albedo products validation

Meeting

- EUMETSAT Conference – 20-24 Septembre 2021 (<https://www.eumetsat.int/eumetsat-meteorological-satellite-conference-2021>)
- Series of invited speakers for the International Earth Surface Working Group (IESWG) – next one 'Snow ice and cryosphere-atmosphere interaction (23Sep2021)' (<http://cimss.ssec.wisc.edu/iswg/meetings/2022/>)

Code

- Development of Quality Monitoring Tool for COPERNICUS/C3S Albedo products [1981-now] – detection of trends and breaks. Online web interface in dev (<https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-albedo?tab=overview>).

Articles

- Carrer, D.; Meurey, C.; Hagolle, O.; Bigeard, G.; Paci, A.; Donier, J.-M.; Bergametti, G.; Bergot, T.; Calvet, J.-C.; Goloub, P.; Victori, S.; Wang, Z. Casual Rerouting of AERONET Sun/Sky Photometers: Toward a New Network of Ground Measurements Dedicated to the Monitoring of Surface Properties? Remote Sens. 2021, 13, 3072. <https://doi.org/10.3390/rs13163072>

Land Surface Phenology

- We have been working on the protocol and planning a review meeting in-line with either EGU, LPS, or the recently announced Phenology conference in France.
- There are some emerging geostationary phenology data that we are validating with flux data with Xiaoyang Zhang (South Dakota State University).
- We are producing higher and higher resolution LSP products, and working with collaborators at Lund (Eklundh et al) and BU (Friedl), to validate the data using our emerging best practices. Both Josh's NCSU group and Friedl's BU group, have made 5 m LSP maps from PlanetScope, and we're planning to produce those across the NEON sites to leverage their existing phenology transects.

Soil Moisture

News:

- The International Soil Moisture Monitoring Network (ISMN) will transfer operations from TU Vienna to the German Federal Institute of Hydrology (BfG) and to the connected International Center for Water Resources and Global Change (ICWRGC). The transfer is planned to be finished by end of 2022. This provides a long-term perspective for our main reference data base.
- NASA SMAP, CYGNSS and NISAR missions will jointly launch a “Soil Moisture School” activity, targeting young professionals and graduate students. This includes also networks and validation activities, contact Simon Yueh
- Paper led by Andreas Colliander (NASA-JPL) about “Validation of Soil Moisture Data Products from the NASA SMAP Mission” under review
 - ⇒The DCA algorithm of the radiometer-based enhanced product (PE) exhibits the best performance
 - ⇒All algorithms show a relative degradation of the performance over croplands
- Paper by Edward Ayres, Andreas Colliander, Michael Cosh, Joshua A. Roberti, Sam Simkin, Melissa A. Genazzio, ‘Validation of SMAP Soil Moisture at Terrestrial National Ecological Observatory Network (NEON) Sites Show Potential for Soil Moisture Retrieval in Forested Areas’, IEEE.

Workshops:

- 6th Satellite Soil Moisture Validation and Application Workshop, postponed to 7-9th June 2022, Perugia, Italy
- 7th Satellite Soil Moisture Validation and Application Workshop, Fall 2024?, New Orleans, USA?

Vegetation Indices

VI Focus Area Updates:

- Edited an outline of the validation protocol document (revised a few times), wishing to finalize the expanded outline.
- Began working on long-term stability analysis of NOAA JPSS VI products, which should feed to finalizing the expanded outline.

Snow

-

Above Ground Biomass (1/5)

CEOS Biomass Protocol Supporting New Activities



Committee on Earth Observation Satellites

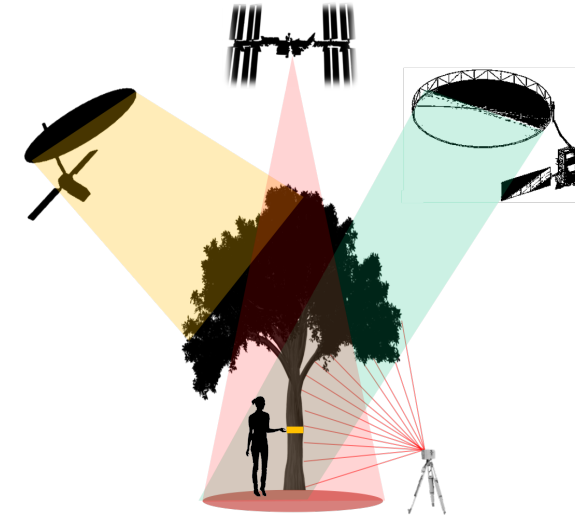
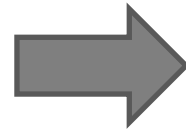
CEOS Working Group on Calibration and Validation
Land Product Validation Subgroup

Aboveground Woody Biomass Product Validation

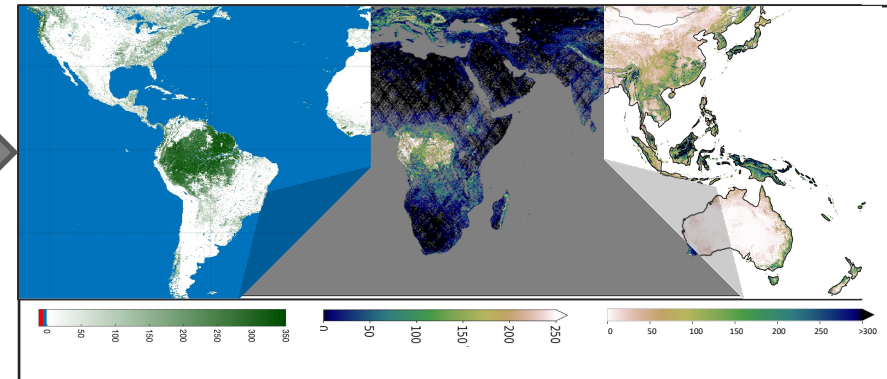
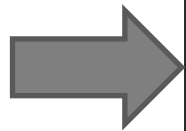
Good Practices Protocol

Version 1.0 – 2021

Editors: Laura Duncanson, Mat Disney, John Armston, David Minor, Fernando Camacho, Jaime Nickeson

Linked,
complementar
y activities



Above Ground Biomass (2/5)

GEO-TREES Status

1. Activity accepted in March 2021 for the 2021-2022 GEO work programme

2. People behind GEO-TREES:

- Jerome Chave (Laboratoire Evolution et Diversité Biologique, France)
- Stuart Davies (Smithsonian Tropical Research Institute, USA)
- Mat Disney (University College London, UK)
- Laura Duncanson (University of Maryland, USA)
- Martin Herold (Wageningen University, NL)
- Nicolas Labrière (Laboratoire Evolution et Diversité Biologique, France)
- Oliver Phillips (University of Leeds, UK)
- Shaun Quegan (University of Sheffield, UK)
- Sassan Saatchi (Jet Propulsion Laboratory, USA)
- Plinio Sist (CIRAD, FR)
- Dmitry Schepaschenko (International Institute of Applied System Analysis, Austria)
- Klaus Scipal (European Space Agency, Italy)

3. First Achievements

- CNES committed to fund a project office for two years
- ESA ForestScan activity kicked off to set up three reference sites (French Guiana, Gabon, Malaysia).
- NASA acquired 2021 airborne lidar (LVIS) over French Guiana.
- Discussions under way with ISRO, World Bank (Mozambique pilot), others.

Above Ground Biomass (3/5)

Biomass Harmonization: Membership and Status

ESA (+EU/UK Researchers):

- Clement Albinet
- Martin Herold
- Heather Kay
- Richard Lucas
- Joana Melo
- Erik Næsset
- Kostas Papathanassiou
- Klaus Scipal
- Frank-Martin Seifert
- Pedro Rodriguez Veiga

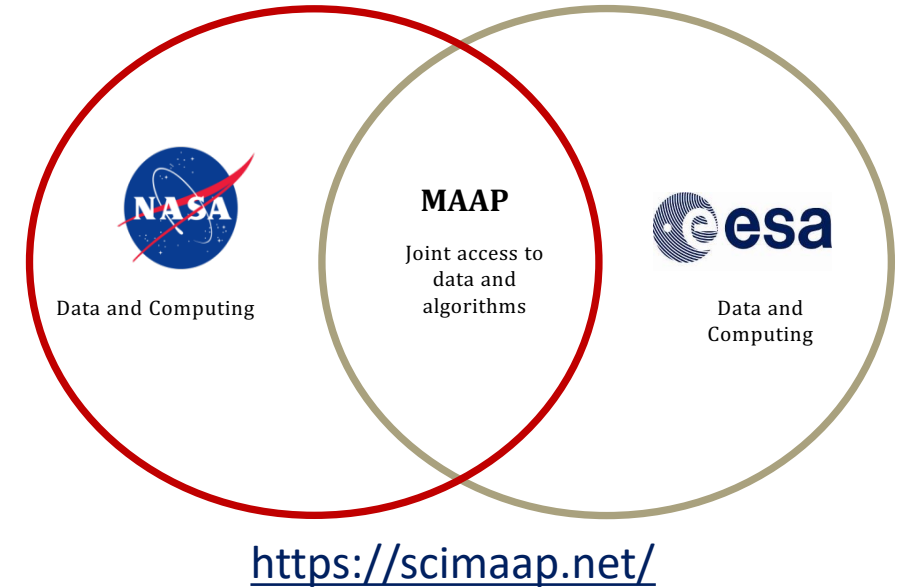
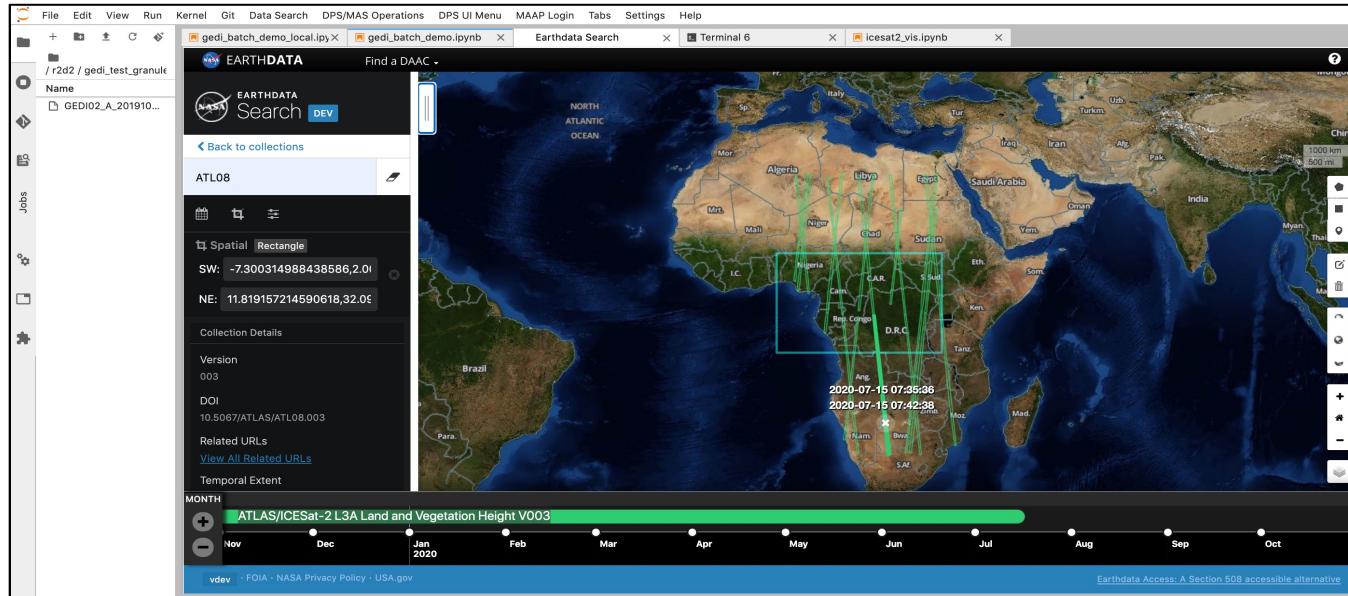
NASA (+US Researchers):

- John Armston
- Ralph Dubayah
- Laura Duncanson
- David Minor
- Sean Healey
- Ron McRoberts
- Sassan Saatchi
- Sylvia Wilson

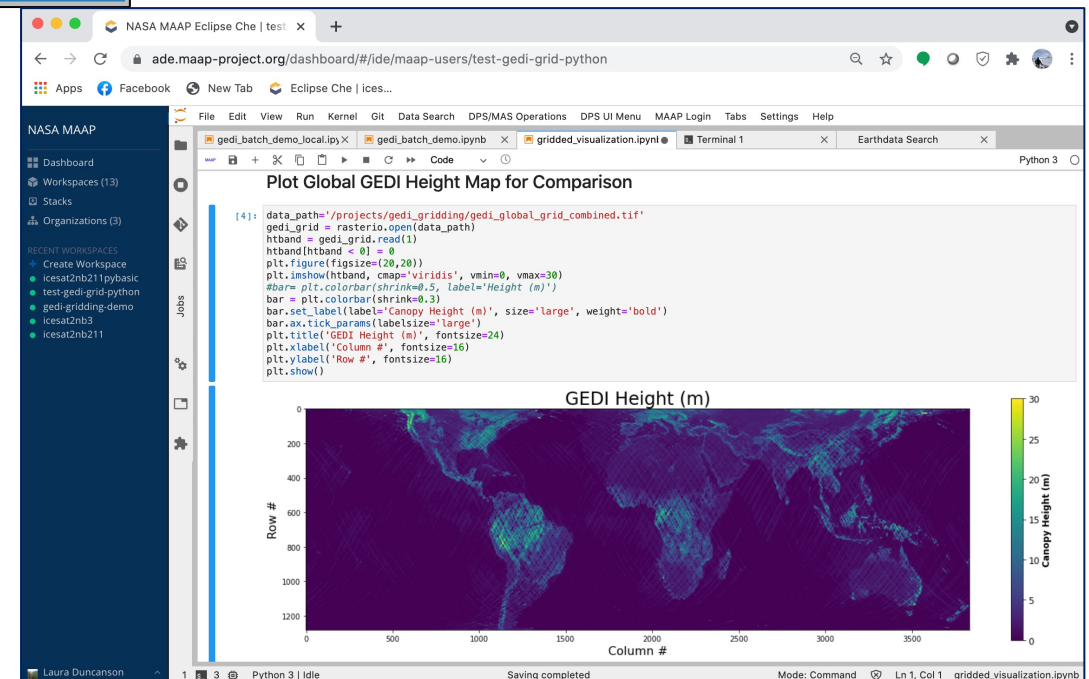
JAXA:

- Osamu Ochiai
- Ake Rosenqvist
- Takeo Tadono
- Masato Hayashi

Above Ground Biomass (4/5)



- Bilateral platform between ESA and NASA
- Designed for collaborative **open science**, algorithm and product development
- Processing in the cloud (AWS)
- Hosts open satellite, **airborne and field data**
- Hosting biomass harmonization activity



Above Ground Biomass (5/5)

The screenshot displays the NASA Earthdata MAAP Dashboard. The top navigation bar includes 'Welcome', 'Explore', 'About', and 'Feedback'. The left sidebar shows 'EXPLORE' with 'Areas' set to 'Boreal'. Below this, there are four data layers: 'Canopy Height (m)' (0-25), 'Max Normalized ...' (0-1), 'Topographic Sola...' (0-1), and 'Taiga-Tundra Eco...' (SPARSE & UNIFORM, NON-FOREST EDGE (...)). The main map area shows a 3D visualization of the boreal region with colored dots representing biomass data. The right sidebar contains 'BIOMASS PRODUCT SHARING' with a paragraph of text and a section for 'Inputs'.

EARTHDATA
MAAP Dashboard **BETA**

Welcome Explore About Feedback

EXPLORE

Areas

Global

Boreal

Taiga Ecotone

Canopy Height (m) 0 25

Max Normalized ... 0 1

Topographic Sola... 0 1

Taiga-Tundra Eco... SPARSE & UNIFORM NON-FOREST EDGE (...)

BIOMASS PRODUCT SHARING

MAAP User Working Group (UWG) members are developing a biomass product using covariates from Landsat 8, ICESat-2 Canopy Heights, and Copernicus DEM for the boreal region. This region is 50 - 75 degrees North, encompassing parts of North America and Eurasia. The MAAP makes it possible for UWG members to collaborate virtually and scale their science using the MAAP Algorithm Development Environment (ADE) and Data Processing System (DPS).

Inputs: Pictured are the inputs to the final biomass product as well as the final product itself. Landsat8 Covariates are a UWG-generated product. ICESat-2 ATL08 is included as a dependent variable in the model and is shown here with color categories based on canopy height.

The MAAP will enable international scientific collaboration on biomass mapping. Later this year, MAAP scientists will use the platform to share and request other groups' biomass products to enable harmonization of those different products.

ATL08 information Canopy height measurements taken with ICESat2 sensor are used determine tree heights across the region of interest.

Landsat Covariates 14 different variables derived from

In collaboration with Development Seed and the MAAP team, the biomass harmonization activity is working on a **web-based dashboard to allow exploration of the new biomass products**, and associated **story telling** by product teams and data users (e.g. *Paraguay, Peru, Wales, Japan*). **The dashboard is planned for release in advance of COP26,**