Land Product Validation (LPV) Sub-group Meeting

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

Subgroup meeting
2 Mar 2021

NEXT LPV TELECON 13 Jul 2021

Attendance

Participants

Fernando Camacho
Michael Cosh
Jaime Nickeson
Zhuosen Wang
Gareth Roberts
John Bolten
Carsten Montzka
Tomoaki Miura
Hongliang Fang
Louis Giglio
Joshua Gray
Sylvain Leblanc
Frank Göttsche
Simon Gascoin
Else Swinnen
Sophie Bontemps
Glynn Hulley
Chris Crawford
Dominique Carrer
Mat Disney
John Armston
Pontus Olofsson
Marie Weiss
Thomas Nagler

Not attending

Victor Rodríguez-Galiano
Laura Duncanson

Proposed agenda items

- Welcome
- CEOS LPV Plenary
- ICOS 2020/21 - Level 2 Ecosystem data
- FRM4VEG-2
- New Land Cover focus area lead
- Focus Area review and update status
- Focus Area Reporting

CEOS LPV Plenary

26 May – 27 May 2021, Virtual

- 15h UTC – 18h UTC

- **First day for invited speakers** : CEOS agencies (WGCV, ESA, NASA), EO Services (MODIS/VIIRS, Copernicus Global Land, EUMETSAT SAF-land), ground networks (ICOS, NEON, GBOV)
- **Second day to review the action plan** for each LPV focus area, define goals, identify gaps and provide recommendations to CEOS agencies (WGCV).

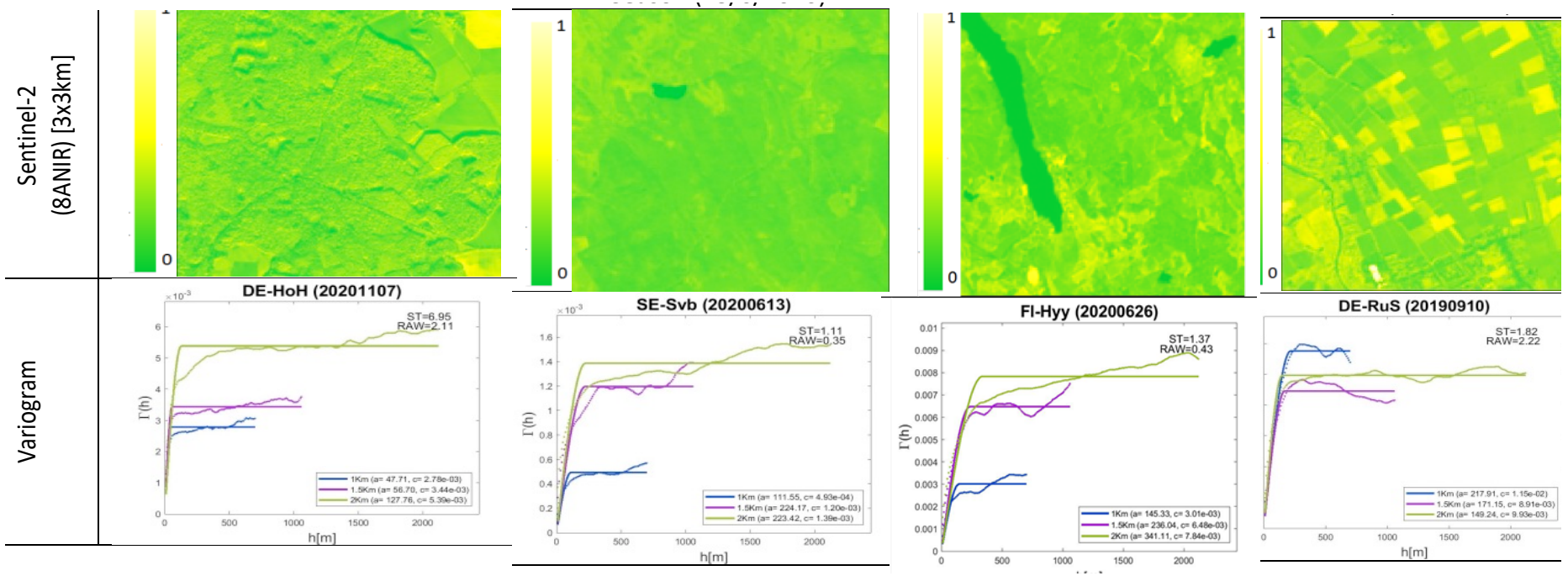
- Please revise your plans and define your next actions, with focus on protocols, validation and intercomparison exercises, ground/ fiducial references and communication.

- **Time limited to 12 minutes** per focus area. Please be concise.
- 50 minutes are reserved for Q&A and discussion.

ICOS 2020-1 Level2 Ecosystem data

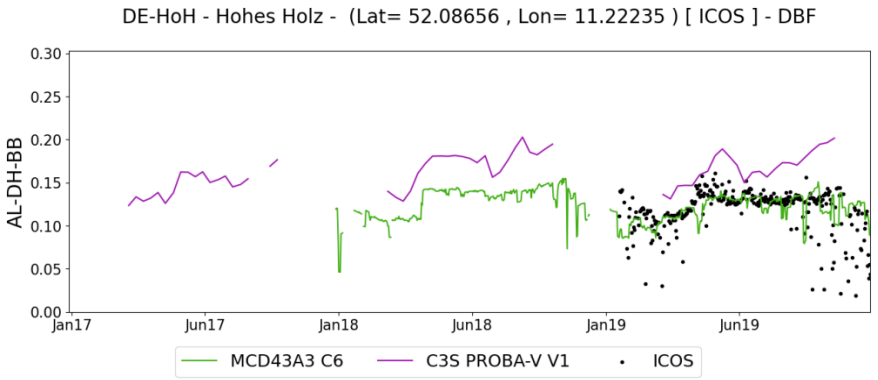
LPV Work Plan 19-LPV-03 ; Investigate ICOS data

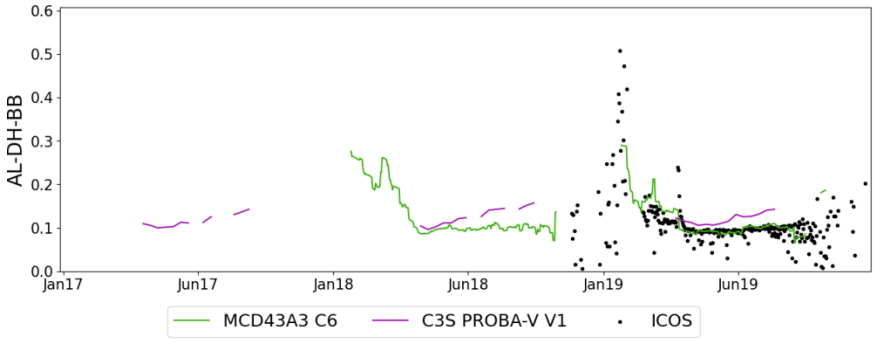
- **ICOS release 2020-1 of Level 2 Ecosystem data** https://www.icos-cp.eu/data-products/icos-release-2020-1-level-2-ecosystem-data
- Final quality data product for eddy covariance fluxes, ancillary and meteorological observations **at sixteen labelled ICOS stations** in the ecosystem domain. Period 2017-2019.
- Albedo, GAI/PAI, FAPAR, AGB, GPP… among measured variables
- 4 CEOS LPV supersites (De-HoH, SE-Svb, FI-Hyy, De-RuS)

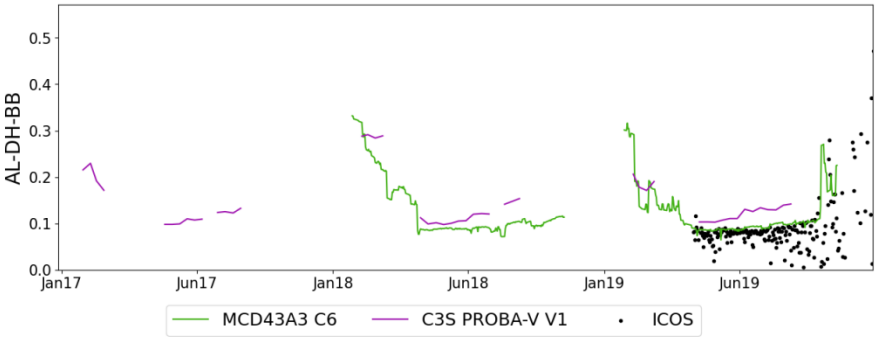


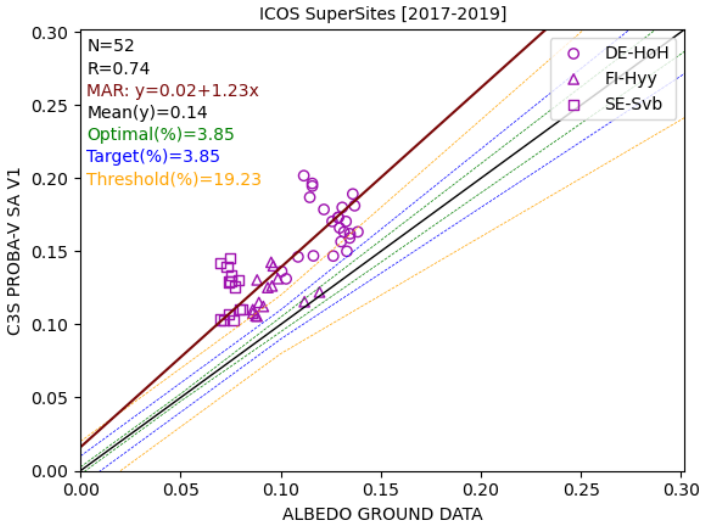
ICOS 2020-1 Level2 Ecosystem data

Albedo ICOS data

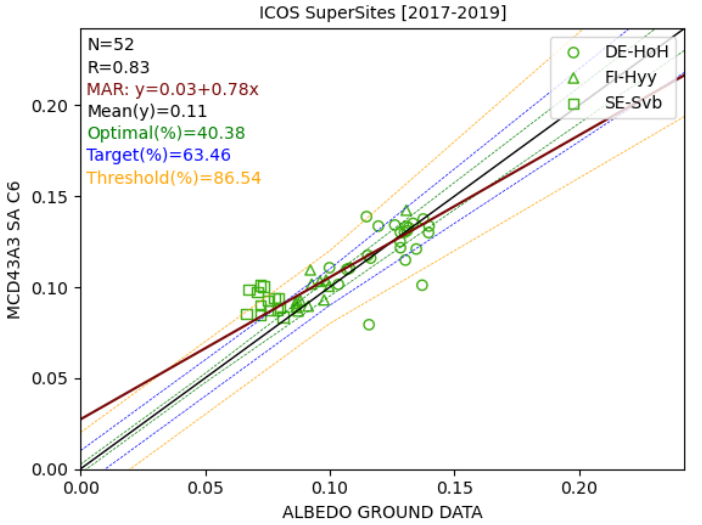








B=0.040(32.30%) STD=0.019(15.42%) RMSD=0.044(35.79%)
MD=0.035(28.23%) MAD=0.035(28.23%)



B=0.005(4.52%) STD=0.013(12.42%) RMSD=0.014(13.22%)
MD=0.003(2.68%) MAD=0.007(6.55%)

C3S PROBA-V SA V1 MCD43A3 SA C6

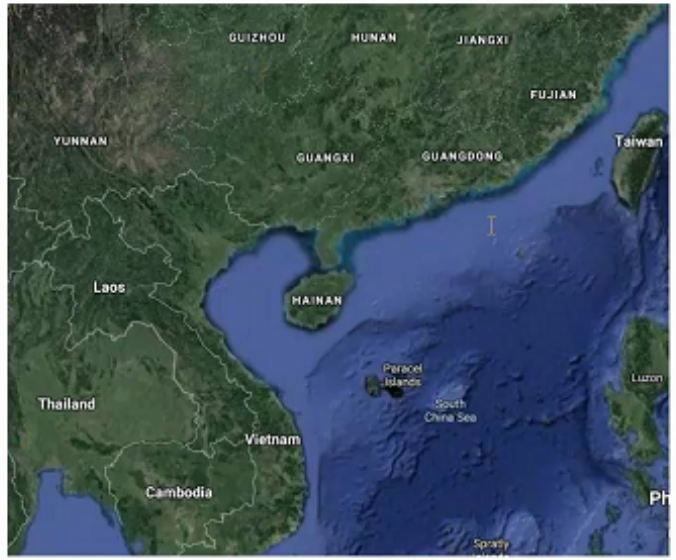
FRM4VEG-2

Effort restarted on 15 February.

- **Next campaign with drones in Wytham – summer 21**
- **SRIX4Veg preparation for summer 22, focused on UAV.** Announcement in Spring 21.

ESA – Chinese Academy of Science (CAS) collaboration

- **CAS** to set up a site in China, Hainan province, following FRM4Veg protocols for surface reflectance and biophysical variables. CAS goal is to have their site as CEOS LPV supersite.



Land Cover FA Leads

- We have invited a new Land Cover focus area lead to join us, and she just yesterday accepted. We will start the on-boarding process and will introduce her to the group at the Plenary in May.

- We want to give a special **THANK YOU** to Pontus for his 10 years (!) of service to the LPV Subgroup. It's been a pleasure working with him. It's one of the longest LPV tenures, but both he and Luigi were around much beyond their tenures and we appreciate them sticking around and the contributions they made and will continue to make to the focus areas they led.

- Pontus & Co have compiled an impressive collection of Tutorials and a GEE application for area estimation and accuracy assessment that will serve well as a protocol outline. Pontus will give a informal presentation on this today.
  See this work at https://area2.readthedocs.io/en/latest/overview.html

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!

Most focus area pages are in need of review/update.

Good news is that most Product lists are now up to date.

Focus Area	Home Page	Product table	Collaboration Page	References	Listserv names	Letters to Community
Land Cover		Jan 2021			Oct 2019	
Biophysical LAI/Fpar	Sept 2020	Dec 2020	Sept 2020	Sept 2020	Oct 2019	Sept 2019
Surface Rad/Albedo	Dec 2019	Feb 2020	Dec 2019	Dec 2019	Dec 2019	May 2020
LST/Emissivity	April 2019	April 2019	April 2019	April 2019	April 2019	
Fire/Burn Area	April 2019	Dec 2020	Mar 2020		Mar 2020	
Soil Moisture	April 2019	working on it	Feb 2019	Sept 2019	Sept 2019	Dec 2020
Phenology	April 2019	July 2020		April 2020		
Snow Cover	April 2019	Jan 2021			Oct 2019	
Vegetation Index	Sept 2019	Feb 2021	Sept 2019	May 2019	May 2019	
Biomass	April 2019	Mar 2020	April 2019	April 2019	Oct 2019	Sept 2020

CEOS WORKING GROUP ON CALIBRATION & VALIDATION

Focus Area Reports

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

Snow

- SnowPEx+ Virtual Information Meeting (VIM) 03 Feb 2021, WEBEX conference. The aim of the meeting was to
  - Provide an overview of the current SnowPEx+ products.
  - Begin compilation of SnowPEx+ reference data sets
    - QC'ed in situ snow from multiple sources
    - snow maps from hi-res optical using different algorithms
    - gridded snow models
  - Organize the 3rd International Satellite Snow Products Intercomparison and Validation Workshop (ISSPI-3)

  https://snowpex.enveo.at/doc/20210203_SnowPExPlus_VIM/20210203.SnowPEx+_VIM_01_Overview_Nagler.pdf

- Updates were made to the Snow Products list

Above Ground Biomass

- The Aboveground Woody Biomass protocol is done and ready for endorsement (yay!!)
- The Biomass Reference Network will become a GEO activity:
  - GEO TREES - Terrestrial Reference Network for Earth Observation of Ecosystem Structure ;)
- We continue to participate in the CEOS Agriculture, Forest and Other Land Use (AFOLU) discussions wrt the biomass product inputs to the UNFCCC's Global Stock Take.
- GEDI biomass products are forthcoming!!

Land Cover

- A new co-lead has been identified to replace Pontus

- Preparation of the Special session @IGARSS 2021 (Brussels, July 2021)

  CEOS Land Product Validation: Sampling-based estimation of area and accuracy for Land Cover products

  – P. Olofsson (Boston Univ.): 'Good practices for estimating area and assessing accuracy of land cover and land cover change products'

  – R. d'Andrimont (JRC): 'LUCAS Copernicus 2018: Earth Observation relevant in-situ data on land cover throughout the European Union'

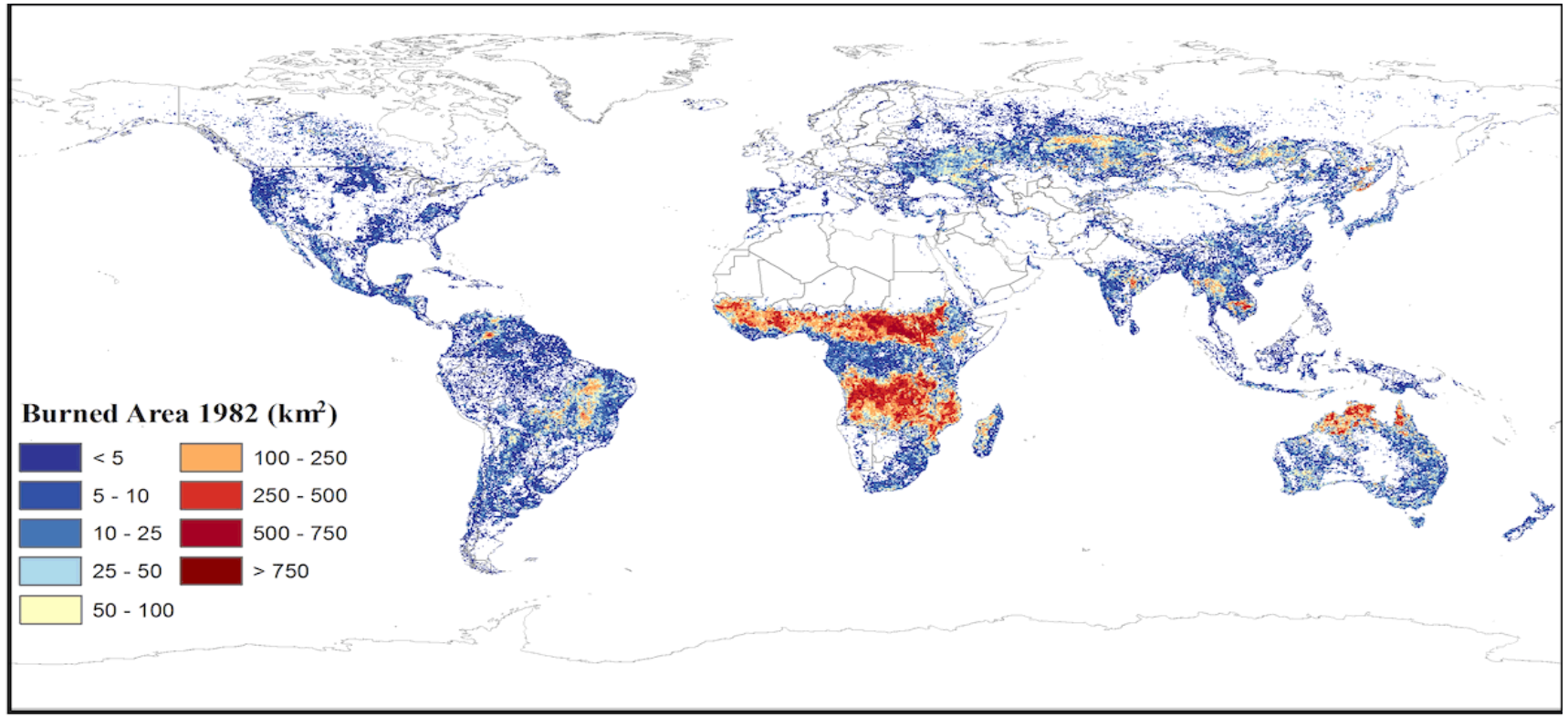
  – C. Lamarche (UCLouvain): 'Protocol design for classification algorithms benchmarking and validation for global land cover maps in the Copernicus Climate Change Service and ESA CCI Land Cover High and Medium Resolution '

- Next: website update & newsletter, protocol building on recent work achieved in various frameworks

Fire Disturbance (1/2)

Burned area product : Copernicus Climate Change Initiative (CCI)

- FireCCILT11 AVHRR burned area (released December 2020)
  - 5-km native resolution + 0.25° gridded
  - Monthly temporal resolution
  - 1982 - 2018
  - Validation and comparison results forthcoming



Chuvieco, E.; Pettinari, M.L.; Otón, G. (2020): ESA Fire Climate Change Initiative (Fire_cci): AVHRR-LTDR Burned Area Grid product, version 1.1. Centre for Environmental Data Analysis, 21 December 2020. doi:10.5285/62866635ab074e07b93f17fbf87a2c1a

Fire Disturbance (2/2)

Recent Publications

Active Fire

Libonati, R., Pereira, J. M. C, Da Camara, C. C., et al., 2021, Twenty-first century droughts have not increasingly exacerbated fire season severity in the Brazilian Amazon. *Nature Scientific Reports*, 11:4400.

> *"…assessment of the hypothesis relied on an incorrect active fire dataset, which led to an underestimation of the decreasing trend in fire activity and to an inflated rank for year 2015…"*

Burned Area

Ramo, R., Roteta, E., Bistinas, I., van Wees, D., Bastarrika, A., Chuvieco, E., and van der Werf, G. R., 2021, African burned area and fire carbon emissions are strongly impacted by small fires undetected by coarse resolution satellite data. *PNAS*, 118 (9), e2011160118.

Liu, T., and Crowley, M. A., 2021, Detection and impacts of tiling artifacts in MODIS burned area classification. *IOP SciNotes*, 2, 014003.

> *"…we find severe tiling artifacts in FireCCI, version 5.1 (FireCCI51) in northwest India and Pakistan, where the classified burned area is disjointed at the latitudinal boundary of two tiles that largely separates the Indian states of Punjab and Haryana. In contrast, this tiling effect is less noticeable in MCD64A1…"*

Biophysical

- Biophysical focus area protocol
  - Had a telecon to discuss the protocol (M. Weiss, F. Camacho and H. Fang)
  - Agreed to merge the LAI protocol into a biophysical protocol
  - A small group will start to work on the skeleton first
  - Plan to submit as a journal paper

- Global PAI and vertical profile data distributed from GEDI/ISS
  - in 25 m footprint size since 2019 (https://gedi.umd.edu/data/products/)
  - Dubayah, R., et al. (2020). The Global Ecosystem Dynamics Investigation: High-resolution laser ranging of the Earth's forests and topography. *Science of Remote Sensing, 1*, 100002. https://doi.org/10.1016/j.srs.2020.100002

- UAV4VAL - Dragon-5 project (EU-China collaboration).
  - Exploiting UAV for validation of Sentinel-2 and GAOFEN-6 reflectance and biophysical products.
  - UAV measurements will be conducted over several sites of China and Europe.
  - Partners: U.Southampton, NPL, Wuhan University. http://dragon5.esa.int/projects/

- Reference added to website
  - Amin, E., Verrelst, J., Rivera-Caicedo, J.P., Pipia, L., Ruiz-Verdú, A., & Moreno, J. (2020). Prototyping Sentinel-2 green LAI and brown LAI products for cropland monitoring. *Remote Sensing of Environment*, 112168, https://doi.org/10.1016/j.rse.2020.112168

LST&E (1/3)

COVID-19 and conferences

- IGARSS Conference 2021: **Jul 11 - 16, Brussels, Belgium**
- EUMETSAT Conference 2021: **Sep 20-24, Bucharest, Romania**
- 6th Recent Advances on Quantitative Remote Sensing (RAQRS) Conference: **Sep 20-24, 2021, Valencia (Torrent), Spain**

LST&E (2/3)

Landsat LST validation activities

- Conduct a validation ‘round-robin’ at JPL:
  - Thermal radiometers from JPL, ASU, RIT
  - JPL blackbodies, chambers, and water baths
- Conduct additional measurements during Landsat under-flights at field sites:
  - March-May 2021
  - Railroad valley, Algodones dunes
  - Lake Tahoe, Salton sea, Tonzi ranch, Russell Ranch
- Establish protocols for Landsat 9 checkout and validation

LST&E (3/3)

Recent LST&E publications

- Hulley et al. (2020), Validation and quality assessment of the ECOSTRESS level-2 land surface temperature and emissivity product, Rem. Sens. Environ, in review.

- Loveless et al. (2021), The Combined ASTER MODIS Emissivity Over Land (CAMEL) Version 2 Climatology, Remote Sens., 13, 111, doi: 10.3390/rs13010111.

- 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, doi: 10.1109/MGRS.2021.3050782.

Surface Radiation

Protocol

- Still working on development of the Downward Radiation validation best practices protocol

Meetings

- International Radiation Symposium 2020 is further postponed to 4 – 8 July 2022.

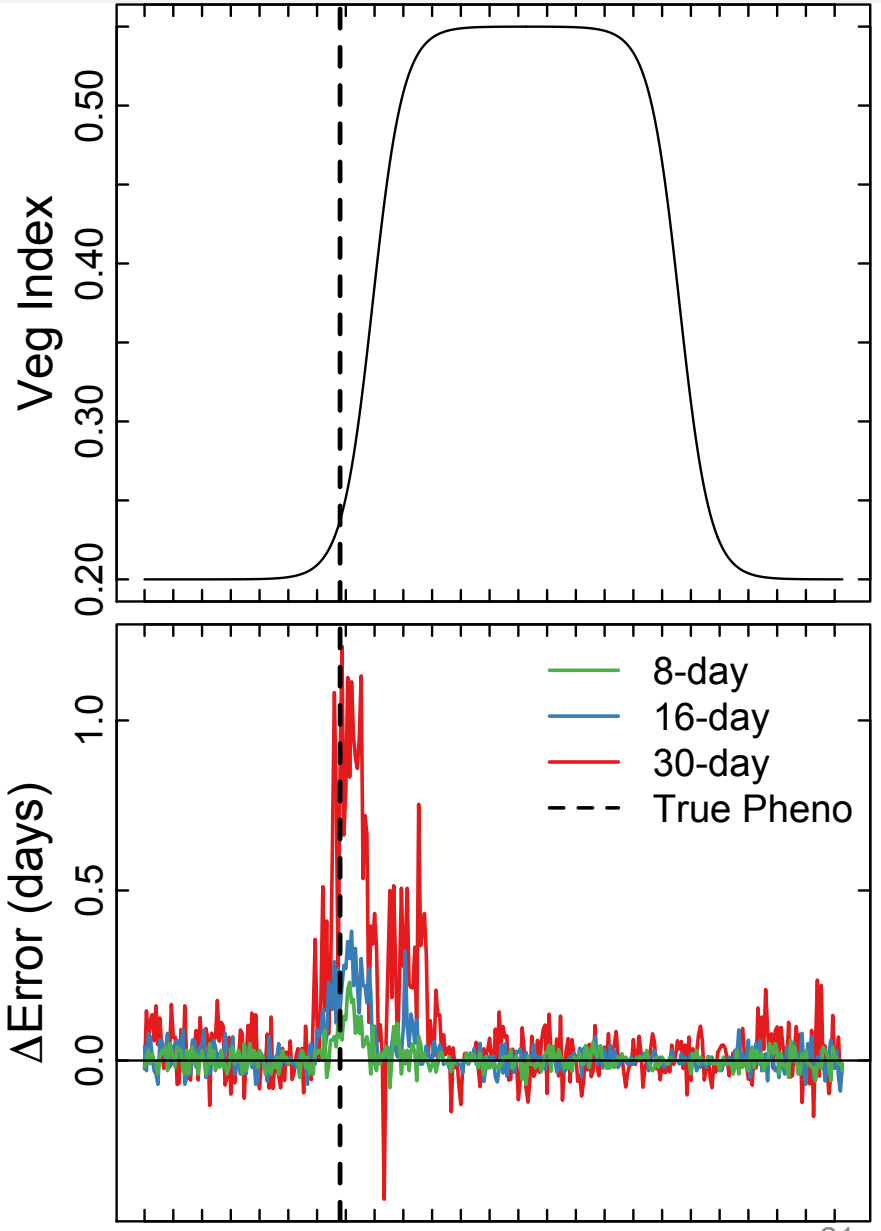
- IGARSS 2021 will be held physically at the Square-Brussels, with an option to participate virtually through an on-line platform, from Monday, 12th - 16th of July 2021.

Special issue

"Multi-Angular Remote Sensing“ special issue, journal “Remote Sensing”
Deadline for manuscript submissions: 30 June 2021.

Land Surface Phenology

- Victor and Josh working on LSP error budget
  - Victor: smoothing, gap-filling, function fitting
  - Josh: temporal patterns of missing data, spatial variability, ground sampling schemes
- Best practices for assessment/validation of phenometrics
  - Simulation supported strategies for spatial sampling design
  - Statistical models for public science data (USNPN, PEP725)
  - EC Flux assessment: paper close to submission relating MCD12Q2 and FLUXNET2015
- Methodologies
  - Bayesian LSP paper under review
- Other protocol activities
  - Drafting of protocol
  - Review of new literature and summarization of existing knowledge base



CEOS WORKING GROUP ON CALIBRATION & VALIDATION

Soil Moisture (1/2)

News:

- QA4SM v1.4.0 released, now also ESA CCI (Active, Passive, Combined) and C3S datasets can be used as a reference for cross-validation
- H2020 Project: Copernicus Cal/Val Solution (https://cordis.europa.eu/project/id/101004242), the goal is to develop a comprehensive and uniform solution for Cal/Val activities of all current and future Sentinels (i.e. all variables). Anyone involved here?
- NASA-USDA FAS SMAP Enhanced Global Soil Moisture Product update - The NASA-USDA Enhanced SMAP Global soil moisture product now provides soil moisture information across the globe at 10-km spatial resolution. This data set includes surface and subsurface soil moisture (mm), soil moisture profile (%), surface and subsurface soil moisture anomalies (-). https://gimms.gsfc.nasa.gov/SMOS/SMAP/L03/

Soil Moisture (2/2)

Workshops:

- Exploring a Dynamic Soil Information System – National Academies of Sciences, Engineering, and Medicine
  - 3 Day Virtual Workshop
  - March 2 at 11am – 4pm EST ; March 3 and 4 at 11am – 2:30 PM EST
  - https://www.eventbrite.com/e/exploring-a-dynamic-soil-information-system-a-workshop-tickets-139548113163?aff=odeimcmailchimp&mc_cid=a3d55fe576&mc_eid=d5604f7137
- 6th Satellite Soil Moisture Validation and Application Workshop, postponed to autumn 2021 or Spring 2022, Perugia, Italy (now planned to be in person and virtual). Details TBD.
- 7th Satellite Soil Moisture Validation and Application Workshop, Fall 2022, New Orleans, USA
- Soil Moisture Fire Workshop planned for Spring, 2021. Matt Levi (UGA), Tyson Ochsner (OSU). Virtual.
- The National Coordinated Soil Moisture Monitoring Network (NCSMMN) is pleased to announce a Soil Moisture Network Operator's Workshop (SMNOW) on March 8 and 10th, 2021. - *This virtual workshop is designed to provide a forum for peer-to-peer sharing for those involved in the collection and generation of soil moisture data from in situ resources.*
  - *Registration link - https://docs.google.com/forms/d/e/1FAIpQLSdaAZQpIZ9RzQpLCZIUohvNyZxC9KgZF4wgpjNcCXtEJEMUFg/viewform*

Vegetation Indices

- Product list for Vegetation Indices were updated on the web site

- Protocol development being worked
  Draft outline due at the end of March 31

- Completion and publication of a new validation paper in Remote Sensing of Environment

  Validation and analysis of Terra and Aqua MODIS, and SNPP VIIRS vegetation indices under zero vegetation conditions: A case study using Railroad Valley Playa
  Miura, T., Smith, C. Z., and Yoshioka, H. (2021)
  https://doi.org/10.1016/j.rse.2021.112344