

# Land Product Validation (LPV) Sub-group Meeting



Fernando Camacho – (EOLab/U. Valencia) – Chair  
Vice Chair – Vacant  
Subgroup meeting  
10 Mar 2020

**NEXT LPV TELECON 05 May 2020**

# Attendance

## Participants

Fernando Camacho  
Jaime Nickeson  
Zhuosen Wang  
Michael Cosh  
Pontus Olofsson  
Frank Götttsche  
Marie Weiss  
Andrew Edwards  
Glynn Hulley  
Sophie Bontemps  
Laura Duncanson  
Gareth Roberts  
John Armston  
Joshua Gray

Mat Disney

## Excused

Victor Rodríguez-Galiano  
Dominique Carrer  
Carsten Montzka  
Tomoaki Miura  
Else Swinnen  
Thomas Nagler  
Hongliang Fang  
Jadu Dash  
Luigi Boschetti

## Absent

Andrew Edwards  
Sylvain Leblanc

# Proposed agenda items

- Welcome
- LPV Vice-Chair and status updates
- CEOS Supersite and BElse Swinnen
- iomass Val Meeting
- NordSpect network
- New products from JAXA
- Focus Area review and update status
- Focus Area Reporting

# New VC and Status of Working Group

Finally some progress to report!

Very happy to have Michael Cosh (USDA) volunteer to take on the vice-chair role for LPV.

His candidature was voted by the LPV members by email.

Results:

- Participation 20 members ( 83%, excluding Michael) > quorum (75%)
- **YES : 19 votes (95%)**
- BLANK: 1 vote (5%)

**Congratulations to Dr. Michael Cosh, new LPV vice-chair !**

We are confident in Mike's leadership skills and that he will continue to steer us in the right directions. To be reported to the WGCV by email. Next WGCV-46 meeting postponed (coronavirus)

Other good news is that we have a verbal commitments from two others that we are working to get the last of our holes filled. A representative to work with Thomas on Snow, and Mike has kindly helped us identify a candidate to fill the spot he is vacating.

# CEOS WGCV LPV Supersites and Biomass Validation Workshop



**Canberra, Australia**  
**March 2nd-6<sup>th</sup>**  
**Hosted by CSIRO**

Australian CEOS SIT Chair team has nominated 'carbon and biomass' as one of the thematic priorities for its 2020-21 term. The aim of this meeting was to ensure support for the CEOS LPV Biomass Protocol to ensure appropriate application and interpretation of the new AGB datasets.

- Representative of ecosystem networks (TERN, NEON, ICOS, eLTER) and validation networks (GBOV, FRM4veg), space agencies (JAXA, ISRO, NASA, ESA) and the biomass validation protocol team (overview, sampling, uncertainties, requirements).
- Main outcomes include collaboration with ecosystem networks (TERN, eLTER), adaptation of protocols (TERN), provision of validation requirements (TERN, eLTER), and identification of new reference sites (JAXA, ISRO).
- Presentation posted at [ceos.org](http://ceos.org)

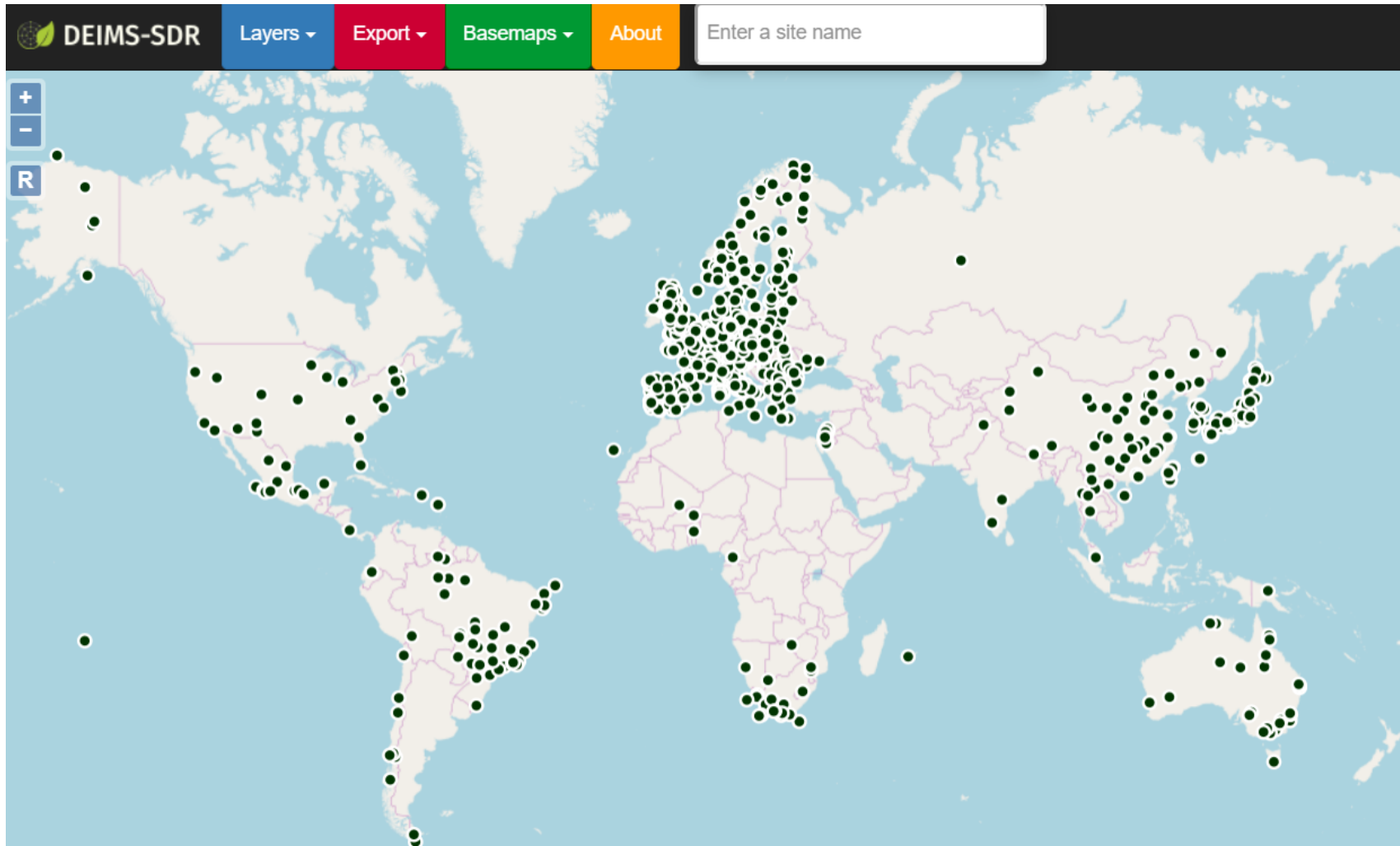
# CEOS LPV Supersites and Biomass Validation Workshop

Supersite session:

- Collaborative actions between GBOV and TERN. GBOV is instrumenting some TERN ecosystem sites (PAR sensors, LST sensors, automated DHP cameras)
- TERN, ICOS, eLTER willing to adapt their protocol for validation purposes
  - Fernando to provide TERN (and then ICOS, others) with minimum requirements to make LAI, fAPAR measurements compliance with validation requirements.
  - Luke (FRM4veg, GBOV) to collaborate in TERN training activities
- eLTER to identify a first subsets of candidate supersites (biomass, LAI, FAPAR...) over Europe and tropics (ILTER), and to establish mechanism to translate to eLTER sites our requirements. LPV to provide feedback on the first selection of sites and discuss the way forward
- JAXA supersites to expand our supersite network in Asia
- Supersite definition to be consistent across WGCV (serve to multiple variables).
  - Biomass supersites → Biomass reference site.
  - Refine the current supersite definition (Joanne, Fernando) to endorse by WGCV.

# CEOS LPV Supersites and Biomass Validation Workshop

Refer to <https://deims.org> to access information on the 150 sites of ILTER



# NordSpec network

## NordSpec: a network of multispectral measurement sites



Collaborators:

- **ICOS Sweden + Finland**
- **SITES** (Swedish Infrastructure for Ecosystem Science)

For satellite data validation and improved process knowledge

<http://nordspec.nateko.lu.se>

Eklundh et al. 2011,  
*Sensors*, 11, 7678-7709.



Long term support

- Long term support
- Open data policy
- SR, NDVI, FAPAR, phenology + ICOS (LAI, ABG)

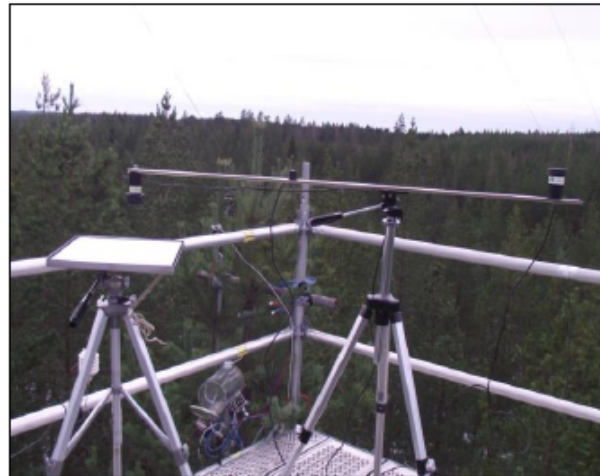
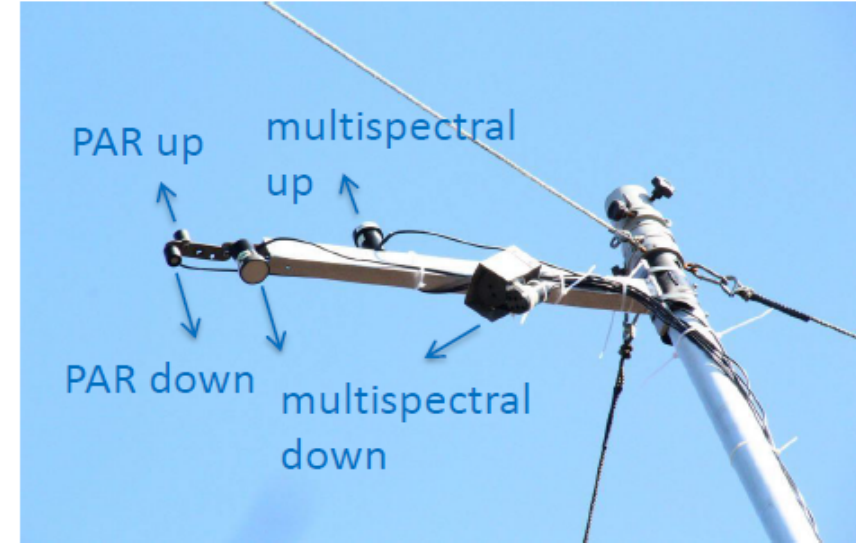
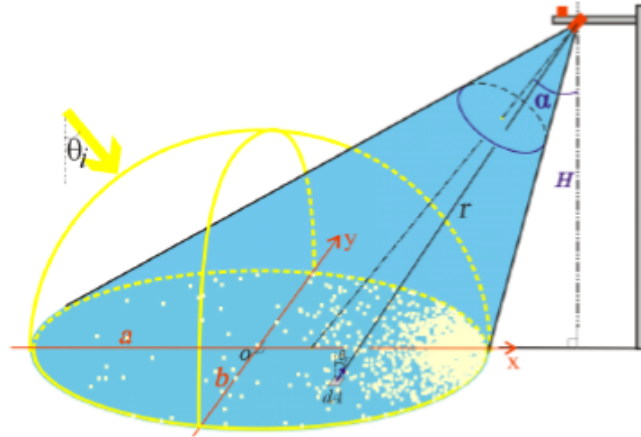
Contact:

- Lars Eklund, University of Lund



# NordSpec network

## Continuous Multispectral Measurements



Outdoor reflectance calibration  
(Jin and Eklundh, 2015, 2018)



Decagon sensors



SKYE sensors  
red, reledge,  
NIR, SWIR



# NordSpec network



## Hyltemossa forest

- Lat 56°N
- Temperate coniferous forest
- Homogenous area ca 25 ha
- Multispectral sensor at 100 m, footprint ca 3000 m<sup>2</sup>
- 150 m ICOS mast



## Svartberget forest

- Lat 64°N
- Boreal coniferous forest
- Multispectral sensor at 80 m, footprint ca 1700 m<sup>2</sup>
- Homogenous area ca 40 ha
- 150 m ICOS mast



## Norunda forest

- Lat 60°N
- Hemi-boreal coniferous forest
- Will be clearcut 2021
- Multispectral sensor at 68 m, footprint ca 700 m<sup>2</sup>
- Homogenous area ca 100 ha
- 150 m ICOS mast

## FRM4Veg Phase -2

- KO meeting , 11-12 February - join FLEX MAG meeting session
- FRM and validation protocols for SR, fAPAR and CCC (LAI x Ch). Interactions with CEOS LPV expected for SR and fAPAR.
- CEOS Surface Reflectance Round Robin (S3R) exercise in 2021 ( to be confirmed for LAI and fAPAR)
- First workshop in March 2021, a whole week in Frascati with S2VT, S3VT and Surface Reflectance RR intercomparison
- Next campaign in Hanich (deciduous forest) in July 2020. ICOS – GBOV sites.
- Next FLEX campaign in Spain in June –July 2021

# New Products from JAXA/SGLI sensor

Received a notice last week of the release of products from JAXA from **SGLI sensor**

Including, among others:

- LSR
- LST
- NDVI, EVI, LAI, fAPAR
- Snow
- Biomass

From GCOM\_C (Global Change Observatory Mission - Climate) (250m, 1 km):

[https://suzaku.eorc.jaxa.jp/GCOM\\_C/data/product\\_std.html](https://suzaku.eorc.jaxa.jp/GCOM_C/data/product_std.html)

From JASMES (JAXA Satellite Monitoring for Environmental Studies) global at 5 km (NDVI, LST, LAI) :

[https://www.eorc.jaxa.jp/JASMES/SGLI\\_STD/daily.html](https://www.eorc.jaxa.jp/JASMES/SGLI_STD/daily.html)

Please review your product lists and the links here to see if these should be added !

# Annual Web Site and Listserv Review

- At this rate our annual update is going to run into the next one, the original status lists for updates were sent last April!
- Please recall that **new content is not required**, but please review current content.
- Before sending newsletter to your community, please make sure your listserv information is current. If you know a colleague has moved institutions, make sure we have the updated address. Please add colleagues (post docs or other collaborators) not currently on your list who may not be aware of LPV yet.

# 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!

Action needed!!

Focus Area	Letter sent to leads	Home Page Review / Update	Products Reviewed/ Updated	Collaboration Review/ Update	References Updated	Listserv review/ update	Letters to community
<b>Landcover</b>	Apr 2019					Oct 2019	
<b>Biophysical LAI/Fapar</b>	Apr 2019	July 2019	July 2019	July 2019	July 2019	Oct 2019	Sep 2019
<b>Surface Rad/Albedo</b>	Apr 2019	Dec 2019	Oct 2019	Dec 2019	Dec 2019	Dec 2019	
<b>LST/Emissivity</b>	Apr 2019	Apr 2019	Apr 2019	Apr 2019	Apr 2019	Apr 2019	
<b>Fire/Burn</b>	Apr 2019		Mar 2020		Mar 2020		
<b>Soil Moisture</b>	Apr 2019		Feb 2019		Sep 2019	Sep 2019	
<b>Phenology</b>	Apr 2019						
<b>Snow Cover</b>	Apr 2019					Oct 2019	
<b>Vegetation Index</b>	Apr 2019	Sep 2019	May 2019	Sep 2019	May 2019	May 2019	
<b>Biomass</b>	Apr 2019	Apr 2019	Mar 2020	Apr 2019	Apr 2019	Oct 2019	

# Focus Area Reports

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

# Fire/Burned Area

## Fire Disturbance

Updated LPV Fire focus area web pages:

- Burned area and active fire validation & product publications
- Updated product availability
  - New geostationary (GOES E & W, Himawari) FRP products available from LSA-SAF
    - Currently 15-day NRT data are available via ftp
    - Long-term record available on request

Sentinel-3 FRP validation activities planned (KCL/ESA) :

- South Africa in August (2020)
- Airborne campaign planned in Canada (2021)



# Phenology

## Land Surface Phenology

- Advanced Phenological Information Services Meeting
  - Excellent new tools for obtaining integrated phenology data: rNPN, Phenosynth, Dacqre, AppEEARs
  - Synthesis paper in progress
- Bolton et al. RSE paper on HLS Pheno
  - Data available to public in ~1 month
- New submission of a review paper:
  - Rodriguez-Galiano, V. & Dash J. Land surface phenology as indicator of global terrestrial ecosystem dynamics: a systematic review. Submitted to “Methods in Ecology and Evolution”
- MCD12Q2 C6.1
  - 2015 FluxNet analysis
  - C6.1 code delivered to NASA



Remote Sensing of Environment

Volume 240, April 2020, 111685



## Continental-scale land surface phenology from harmonized Landsat 8 and Sentinel-2 imagery

Douglas K. Bolton <sup>a</sup>, Josh M. Gray <sup>b</sup>, Eli K. Melaas <sup>c</sup>, Minkyu Moon <sup>a</sup>, Lars Eklundh <sup>d</sup>, Mark A. Friedl <sup>a</sup>



APIS  
Tucson, AZ  
Oct, 2019

# Surface Radiation

## Focus Area action items

- The products list has been updated with latest link to access the products.
- Newsletter is in progress

## Upcoming meetings

- 16th Baseline Surface Radiation Network (BSRN) Scientific Review and Workshop – June 29-July3, 2020, Bologna, Italy --Pending due to the coronavirus
- IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2020 - July 18-24, 2020
- Annual F2F COPERNICUS/C3S meeting in Toulouse (France) for the generation of C3S Albedo Climate Data Record V2 (1981-today).

## New Article

- Lellouch, Carrer et al., *Evaluation of two Global Land Surface Albedo Datasets Distributed by the Copernicus Climate Change Service and the EUMETSAT LSA-SAF - RS / Special issue F. Camacho (in revision)*. MODIS and EPS albedos compare well with 5% of difference (lower performance for VGT).

# LST & Emissivity (1/4)

## News and Meetings

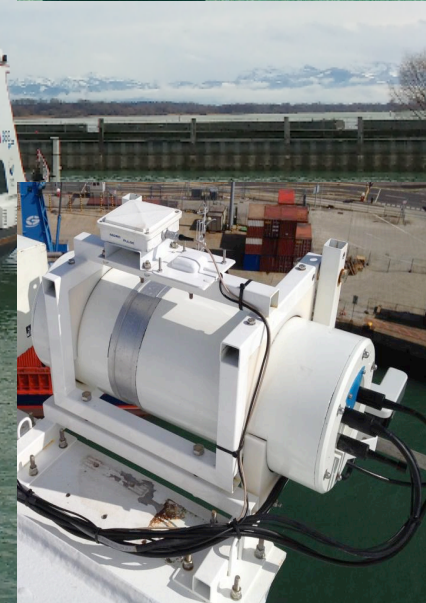
(all meetings and participation are TBD per restrictions due to COVID-19)

- EGU General Assembly 3-8 May 2020, Vienna, Austria
- LST CCI User Workshop (24-26 Jun 2020) at Met Office, UK
- Recent Advances in Quantitative Remote Sensing (RAQRS) Symposium, University of Valencia, Spain. 21-25 Sep 2020
- EUMETSAT Conference, Würzburg, Germany. 28 Sep - 2 Oct 2020
- **Five standardized instrument packages** for LST validation to be built within 'Copernicus LAW project for Sentinel-3 products'; deployment on sites maximizing usefulness (gap analysis)

# LST & Emissivity (2/4)

## LST & SST validation on Lake Constance

- Thermal Infra-red Product Inter-comparison and Validation with FRM Radiometers
- Project funded by EUMETSAT  
KIT  
University of Southampton  
kick-off 2020-02-10)

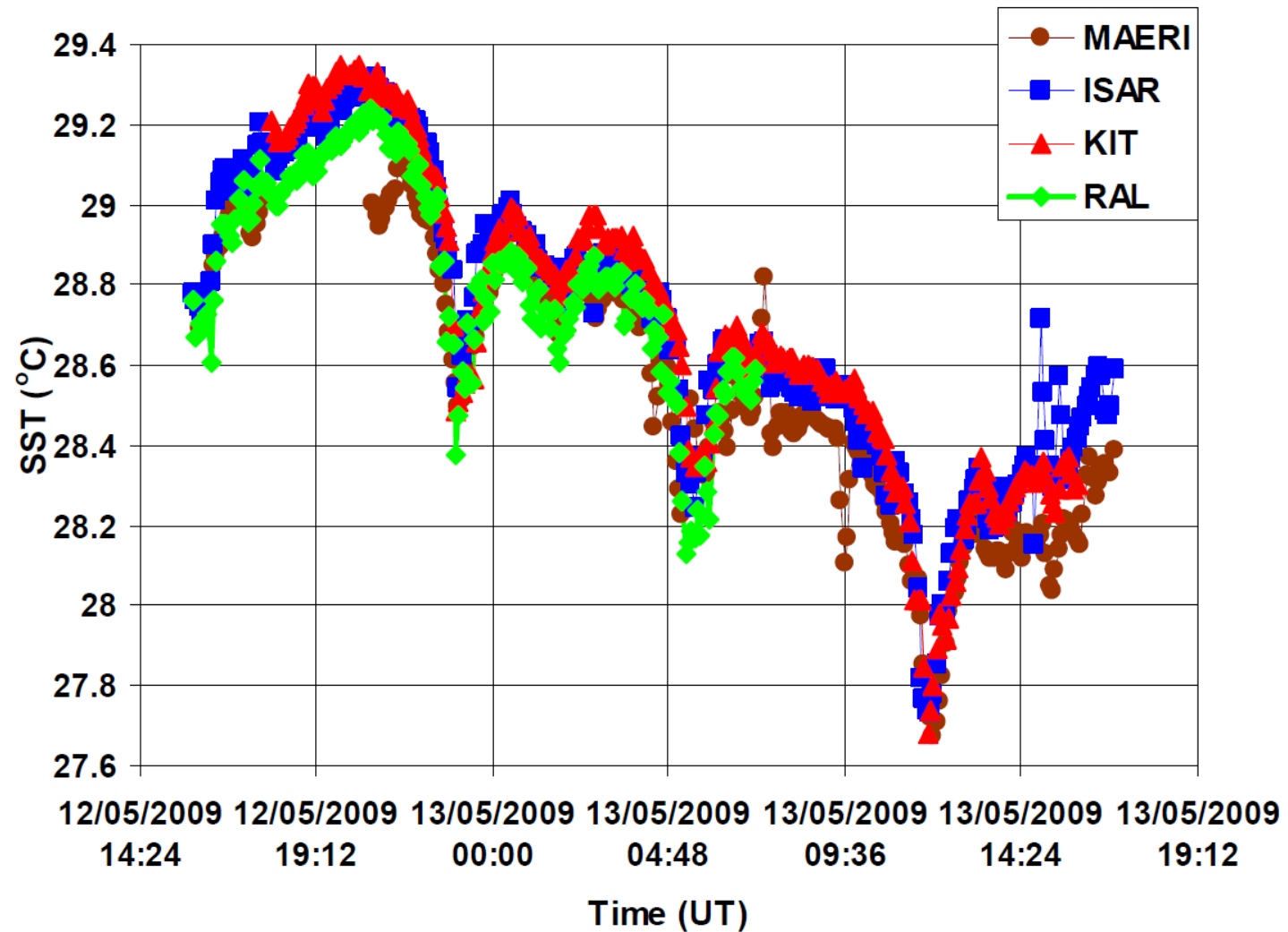


ISAR (UoS)

# LST & Emissivity (3/4)

## Lake Constance Site Objectives

- Acquire an LWST data set from two FRM radiometers operating in parallel
- Inter-compare in-situ LWST data and uncertainties of the radiometers
- Compare infra-red satellite ST products (Sentinel-3) with in-situ LWST

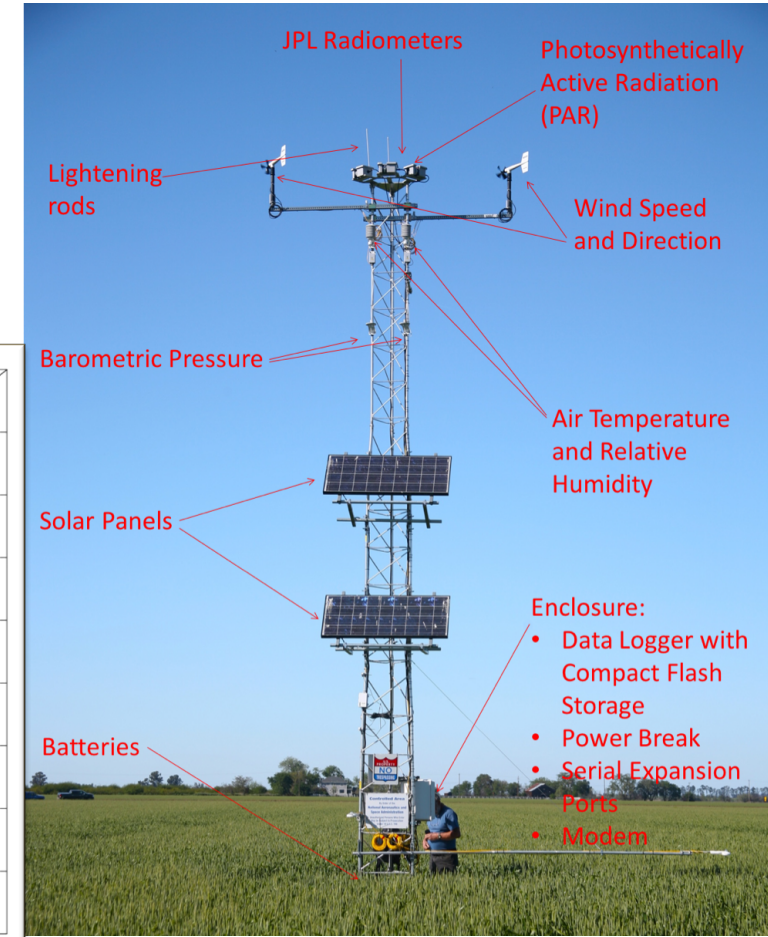
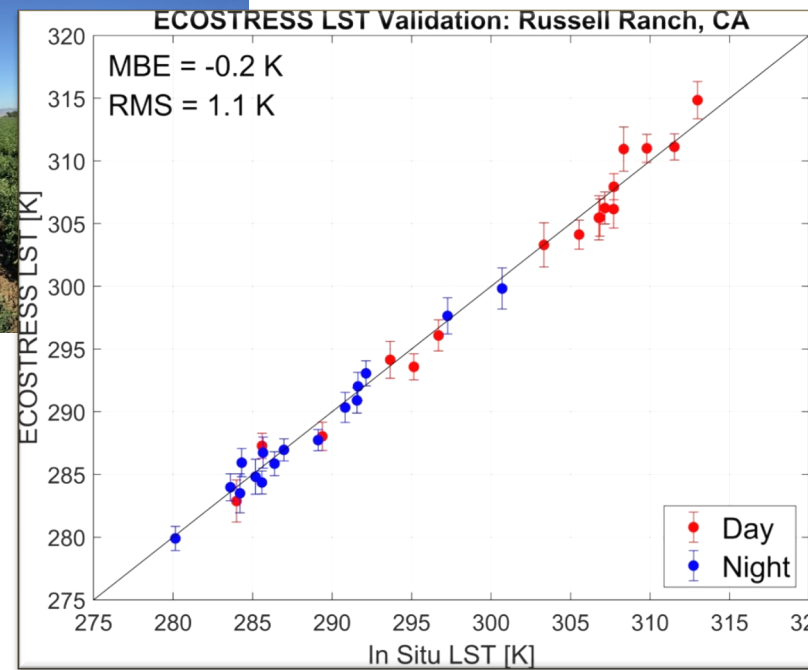


Plot data from NPL REPORT OP3, E. Theocharous, E. Usadi and N. P. Fox, ISSN: 1754-2944, National Physical Laboratory, Hampton Road, Teddington, UK

# LST & Emissivity (4/4)

LST validation at Russell Ranch, CA <https://russellranch.jpl.nasa.gov/>

- Dedicated site measuring surface temperature and net radiation at agricultural facility near UC Davis, CA
- Established in 2013 for validation of ECOSTRESS and other high resolution LST products



# Soil Moisture (1/2)

## NISAR

- The NASA-ISRO Synthetic Aperture Radar mission (~mid-2022) will monitor in L-band via radar at a high resolution (~100m) nominally every 12 days (2 overpasses/12 days).
- Science Team Selections, 3 with soil Moisture focus (~\$1 million in 2020 for development of SM algorithms)
- L+S ASAR flights Summer 2020

## CYGNSS

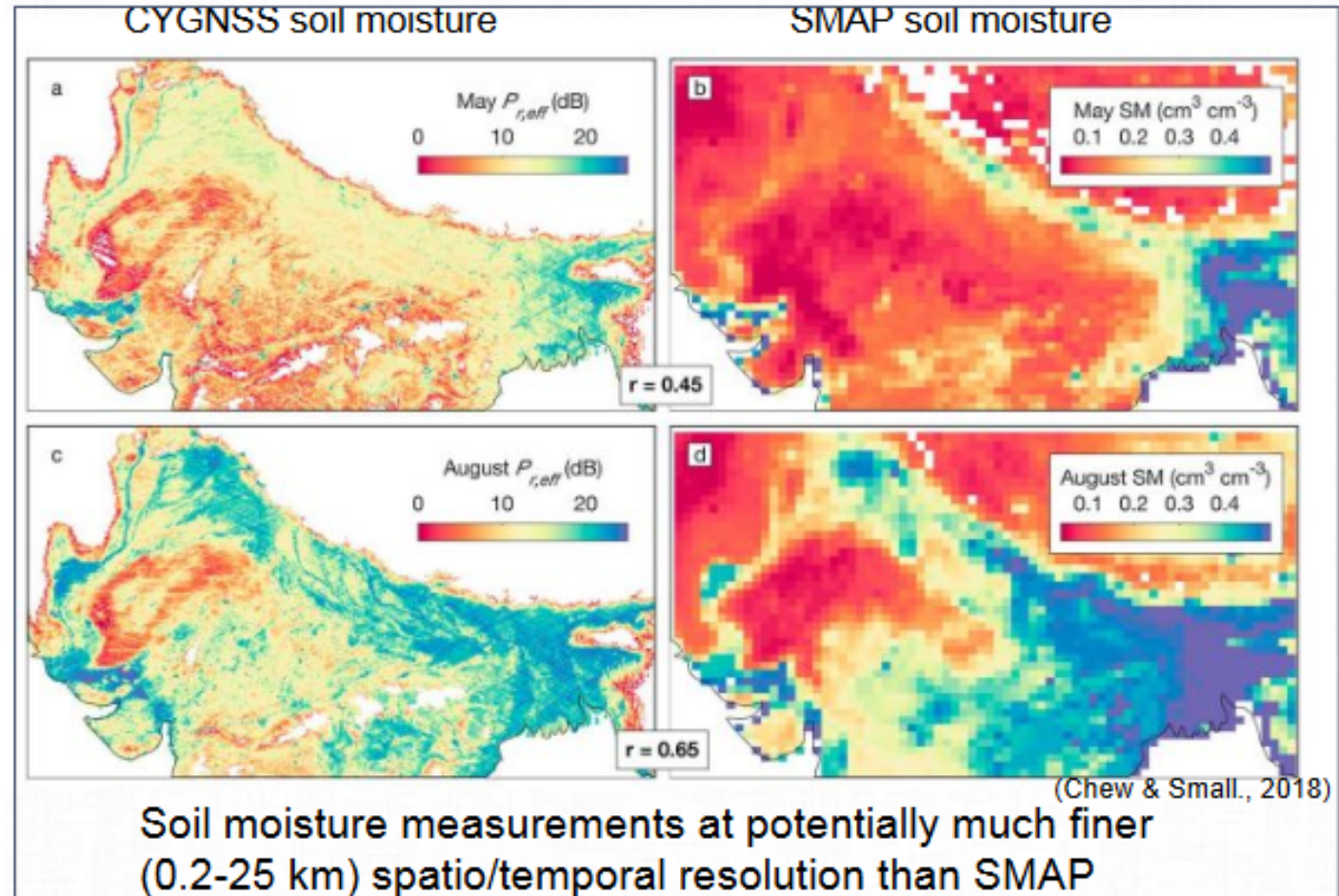
- Product coming soon, ~daily 25km, as good as 4km possible

## SMAP ongoing...

## SMOS ongoing...

## AMSR3

- Set for launch in 2022



# Soil Moisture (2/2)

## Other

- Field campaign summer 2019 completed: SARSense C- and L-band SAR in support for the ESA mission candidate ROSE-L
- U.S. National Soil Moisture Network Strategy completed, at ExComm,
- Good Practices Protocol: Closed for contributions, filling gaps, homogenizing content

## Workshops:

CoronaVirus impacting meetings?

- National Soil Moisture Workshop (U.S.) August 12-13, 2020, Beltsville, MD.
- 6<sup>th</sup> Satellite Soil Moisture Validation and Application Workshop, Sept 15-17, 2020, Perugia, Italy  
<http://www.irpi.cnr.it/en/conference/the-6th-satellite-soil-moisture-validation-and-application-workshop/>
- 7<sup>th</sup> Satellite Soil Moisture Validation and Application Workshop, Fall 2022, New Orleans, USA



# Vegetation Indices

No progress to report at this time.

# Snow (1/2)

## Snow Products

- ESA SNOW-CCI (released by Nov 2019)
  - Daily Global Snow Extent products released (Prototype product): 1982-2018: AVHRR (ca 5km); 2000-2018: MODIS (ca 1km); Version 1 planned for Oct 2020
  - Global SWE products 1978-2018, PMW (25 km); Version 1 Validation of products based on SNOWPEX protocols, some adaptations
  - Reprocessing to SE V1 and SWE V2 is ongoing,
- EEA High Resolution Snow Extent Product from Sentinel-2 (20m, near real time; Europe; planned for April 2020)
- Prototype Snow cover and Melt extent Product from Sentinel-3 SLSTR and Sentinel-1 SAR for PanEuropean domain: Validation of Melt extent is challenging as quality and representativeness of reference data are limited; used reference data
  - Insitu snow / meteo data
  - Landsat / S2 snow extent products together with numerical meteo data
  - Output of snow layers from distributed hydro model

# Snow (2/2)

## Workshops relevant for Snow

- International Conf. on Snow Hydrology, 28-31 Jan 2020, Bolzano  
<https://snowhydro.eurac.edu/>
- EARSEL Special Interest Group of Land Ice and Snow, 3-5 Feb 2020, Bern  
<http://www.earsel.org/SIG/Snow-Ice/workshop/programme.php>

## Upcoming Workshop

- EC ESA EO for Polar Science Workshop, 17-19 June 2020, Copenhagen  
<http://eo4polar.esa.int/>

# Above Ground Biomass (1/2)

**CEOS LPV  
Supersites and Biomass  
Validation Workshop  
Canberra, Australia  
March 2nd-6th**

Outcomes of the  
biomass meeting:



- JAXA to provide ALOS2 data over biomass reference sites for hopeful participation in BRIX2 next year
- JAXA to work toward public reference data provision in Japan and in SE Asia
- ISRO added a few potential biomass reference sites and will work toward protocol implementation; no airborne lidar possible, but drone lidar will be explored

# Above Ground Biomass (2/2)

- TERN Australia is working with biomass focus area to draft CEOS letters of support for new data collection
- TERN looking to expand current plans to better fit biomass protocol recommendations
- biomass focus area working toward an executive summary of protocol (for provision to agencies / funders) and a series of appendices to facilitate streamlines reference data collection
- eLTER and iLTER sites to add biomass relevant meta data requirements to system (currently possible as they area currently open to changes); this will facilitate tracking where other reference data are available

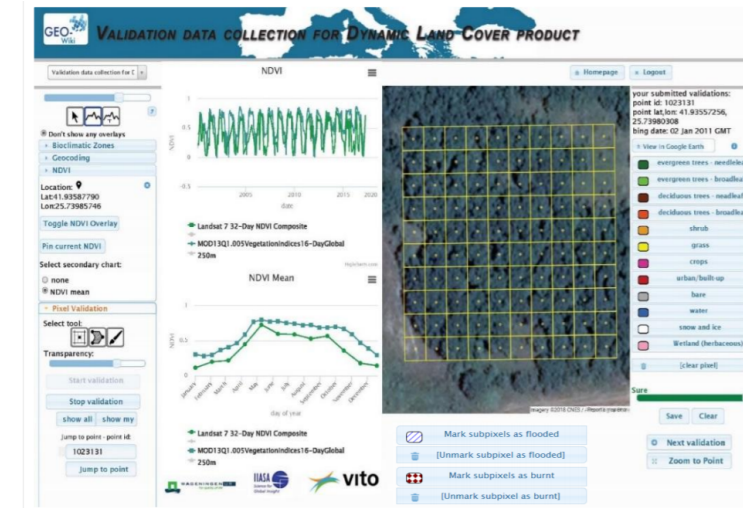
## Protocol Work

- Working on finishing the protocol itself and hope to have our final document circulated for internal review by the end of the month.

# Land Cover (1/3)

## Global LC products validation activities

- Copernicus Global 100m Land Cover map: ongoing validation - 74.3% +/-1.8% (confidence intervals at 95% confidence level) for the discrete map (using GeoWiki)
- CCI LC High Resolution: LC map over 3 sub-continental areas (Siberia, Amazonia, Sahel), validation of LC and LC change from 1990s
- CCI LC 300m: new validation protocols to better target LC change (more samples in hot-spot LC change areas). Methodology in 2020; results in 2021
- C3S Land Cover: validation of global LC maps until 2018 (2019 generated in May 2020, validated in September 2020)
- GlobeLand30 validations (global scale + different validation datasets by continent)



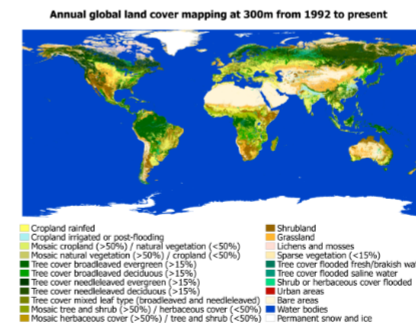
[Overview](#) [Download data](#) [Documentation](#)

This dataset provides global maps describing the land surface into 22 classes, which have been defined using the United Nations Food and Agriculture Organization's (UN FAO) Land Cover Classification System (LCCS). In addition to the land cover (LC) maps, four quality flags are produced to document the reliability of the classification and change detection.

In order to ensure continuity, these land cover maps are consistent with the series of global annual LC maps from the 1990s to 2015 produced by the European Space Agency (ESA) Climate Change Initiative (CCI), which are also available on the ESA CCI LC viewer.

To produce this dataset, the entire Medium Resolution Imaging Spectrometer (MERIS) Full and Reduced Resolution archive from 2003 to 2012 was first classified into a unique 10-year baseline LC map. This is then back- and up-dated using change detected from (i) Advanced Very-High-Resolution Radiometer (AVHRR) time series from 1992 to 1999, (ii) SPOT-Vegetation (SPOT-VGT) time series from 1998 to 2012 and (iii) PROBA-Vegetation (PROBA-V) and Sentinel-3 OLCI (S3 OLCI) time series from 2013 to 2019.

Beyond the climate-modelling communities, this dataset's long-term consistency, yearly updates, and high thematic detail on a global scale have made it attractive for a multitude of applications such as land accounting, forest monitoring and desertification, in addition to scientific research.



# Land Cover (2/3)

- Update of the Land Cover validation protocol
  - ToC drafted + broad review of literature
  - TbD: contact key people from the community to contribute
- Link with GEOGLAM Essential Agriculture Variables (EAV's)
  - Dedicated workshop on 23-24 Oct 19 (Belgium)



- Target: EAV's definition by June 2020 (GEOGLAM / JECAM meeting in Canada)

EAV	Definition
Fallow mask	Binary determination of currently uncultivated lands usually or recently used for agriculture
Utilized agricultural areas mask	Binary determination of currently cultivated lands
Annual Crop Mask	Binary determination of all lands with active agricultural development
Irrigated Areas Mask	Binary determination of currently cultivated agricultural lands that have utilized irrigation this season
Crop group map	Discrete determination of currently growing species types
Crop type map	Determination of locations currently growing crop types, expressed as a map
Crop type area estimate	Determination of areal extent of currently growing crop types, expressed as a unit of area
Rangeland Mask	
Crop Yield estimation	Harvestable weight* of commodity per unit area* (*definitions must be declared)
Crop yield forecast	Within season, pre-harvest forecast of harvestable weight* of commodity per unit area* (*definitions must be declared)
Crop condition assessment	Measure (quantitative? qualitative?) of crop status relative to short-term reference* (*definition must be declared)
Rangeland Condition	
Water Productivity	Crop production per unit of water consumed through ET expressed through kg per cubic meter

# Land Cover (3/3)

## Methods and Guidelines Document (MGD) v. 3

- The third version of GFOI's Methods and Guidance Documentation (MGD) is currently under external review
- Additional guidance added to estimation sections
- Better connections between National Forest Inventory (NFI)- and remote sensing-assisted estimation



# Biophysical (1/2)

- Website update
  - EPS LAI/FAPAR product added to Product List
  - SEVIRI LAI/FAPAR information corrected
  - OLCI FAPAR contact directed to ESA Helpdesk
- Publications
  - Kimm et al., 2020. Deriving high-spatiotemporal-resolution leaf area index for agroecosystems in the U.S. Corn Belt using Planet Labs CubeSat and STAIR fusion data. *Remote Sensing of Environment*, 239, 111615.
  - Zhang et al., 2020. The potential of satellite FPAR product for GPP estimation: An indirect evaluation using solar-induced chlorophyll fluorescence. *Remote Sensing of Environment*, 240, 111686.
- Abstracts submitted (H. Fang)
  - IGARSS'20 Waikoloa, Hawaii, USA. Jul 19-24, 2020.
  - RAQRS'20 Univ. of Valencia, Spain. Sep 21-25, 2020. (+ M. Weiss)
- *Remote Sensing* special issue
  - “Remote Sensing of Biophysical Parameters” (deadline: Nov 27, 2020)  
 Editors: J. GarcíaHaro (U. Valencia), H. Fang (CAS), and M. Campos-Taberner (U. Valencia)  
[http://www.mdpi.com/journal/remotesensing/special\\_issues/Biophysical\\_Parameters](http://www.mdpi.com/journal/remotesensing/special_issues/Biophysical_Parameters)

# Biophysical (2/2)

- ESA EO for agriculture under pressure (Frascati, Italy, 25-29 May 2020)
  - Crop parameters (health, nutrients, maturity) estimation and monitoring
  - Monitoring of soil parameters and land-degradation processes
  - Rangeland and pasture-land monitoring
  - Drones, IoT, commercial satellite constellations (CubeSats++), meteo data, GNSS, Sentinels: Selecting and combining different data types
- ISPRS(nice) – 14-20 June 2020  
 (<http://www.nice-acropolis.com/%C3%A9v%C3%A8nement/isprs-2020/>)
  - Detailed program not available yet but many potential interesting topics.
- RAQRS (Valencia, Spain, September 2020), deadline for abstract submission - extended to 15<sup>th</sup> March  
 (<https://ipl.uv.es/raqrs/?q=content/home>)
  - Session 5: Advances in consolidated datasets of Essential Climate Variables and their impact arising from the Climate Change Initiative