JECAM
Joint Experiment for Crop Assessment and Monitoring

GEOGLAM
GLOBAL AGRICULTURAL MONITORING

JECAM 2020 Annual Science Meeting

Virtual meeting and interactive sessions

10:00 UTC – 11:45 UTC Eastern Session (Chair: Miao Zhang, JECAM co-lead)
12:00-13:45 CEST / 06:00-07:45 EDT / 20:00-21:45 AEST

12:15 UTC – 14:30 UTC Central Session (Chair: Pierre Defourny, JECAM co-lead)
14:15-16:30 CEST / 08:15-10:30 EDT / 22:15-00:30 AEST

15:00 UTC – 16:45 UTC Western Session (Chair: Andrew Davidson, JECAM co-lead)
17:00-18:45 CEST / 11:00-12:45 EDT / 01:00-02:45 AEST

23 June 2020

Australian Eastern Standard Time (AEST) : UTC +10
Central European Summer Time (CEST) : UTC +2
Eastern Daylight Time (EDT) : UCT-4

JECAM
Joint Experiment for Crop Assessment and Monitoring

JECAM 2020 Annual Science Meeting

12:15 UTC – 14:30 UTC Central Session (Chair: Pierre Defourny, JECAM co-lead)
14:15-16:30 CEST / 08:15-10:30 EDT / 22:15-00:30 AEST

- Welcome
- Achievements of the JECAM SAR cross-site intercomparison
  Talk (25 min) + Q&A

JECAM Co-lead Pierre Defourny, UCLouvain (Belgium)
JECAM Experiment leads Heather Mc Nairm, Laura Dingle Robertson, Mehdi Hosseini AAFC (Canada)

- JECAM guidelines for validation – call for update in AI era
  Is my cross-validation representative of my site ? *+ Q&A*

JECAM Co-lead Pierre Defourny, UCLouvain (Be)
JECAM partner François Waldner (Australia)

- JECAM guidelines and Essential Agriculture Var. & exchanges
  Interactive session on padlet

All JECAM partners Pierre Defourny, UCLouvain (Be)

- Update on the Mission opportunities *+ Q&A*
  Venus Mission Data Exploitation (CNES)
  NISAR Mission Call for opportunity (NASA-ISRO)

JECAM partners
Eric Ceschia, Gerard Dedieu (CESBIO)
Heather Mc Nairn (AAFC)

- JECAM site interests for future experiments: earlier discussion synthesis and continuation: priority topics and opportunities
  Interactive session on padlet

JECAM Co-lead Miao Zhang, AIRCAS (China)

- Survey for the next JECAM 2021 Annual Science Meeting
  Live survey

All JECAM partners Andrew Davidson, AAFC (Canada)

14:30– 15:00 Breakfast/Coffee break/Lunch/Dinner

Next session: 15:00 UTC – 16:45 UTC Western Session (Chair: Andrew Davidson, JECAM co-lead)
17:00-18:45 CEST / 11:00-12:45 EDT / 01:00-02:45 AEST

JECAM annual science meetings

Joint Experiment for Crop Assessment and Monitoring

JEACAM Annual science meetings – presentation available on line

- 2011 Calgary - Training workshop hosted by AAFC
- 2014 Ottawa (Canada) hosted by AAFC (AAFC support)
- 2015 Brussels (Belgium) hosted by UCLouvain (ESA Sen2-Agri support)
- 2016 Kiev (Ukraine) hosted by SRI (FP7-SIGMA support)
- 2017 Rome (Italy) hosted by FAO (FP7-SIGMA support)
- 2018 Taichung City (Taiwan) hosted by Taiwan Ag. Res. Inst. (TARI support)
- *2019 JECAM dinner at the ESA Living Planet Symposium (Milan, Italy)*

…2020 Ottawa (Canada) planned by AAFC (AAFC support) to into 2020 Virtual Meeting


Brussels 2015


Rome, 2017


2019 - Milano - JECAM network dinner

2020 JECAM Annual Meeting - 23 June 2020

JECAM
Joint Experiment for Crop Assessment and Monitoring

The JECAM-SAR Experiment

- 3-year research project (2017-2020)

Objectives

1. develop best practices for use of SAR for crop type mapping
   - C-band single-frequency SAR ✓
   - SAR-optical comparisons ✓
   - CP assessment
   - multi-frequency-SAR comparison
2. strengthen the parameterization of the Water Cloud Model to estimate Leaf Area Index and biomass from SAR, and to expand the WCM to other economically important crops

Global network of over 25 voluntary JECAM sites

· 25km x 25km
· long term research

- Principal Investigators (Heather McNairn; Andrew Davidson)
- Science leads (Mehdi Hosseini (LAI/biomass) and Laura Dingle Robertson (classification))
- Funding for Laura and Mehdi's salary: CSA

Progress and Next Steps

- Thousands of SAR images were collected over multiple years and multiple sites
- Demonstrated a clear understanding of how C-Band SAR behaves over diverse agro-ecosystems; delivered very promising results
- Delivered inter-comparisons of methods for crop classification and LAI/biomass retrievals
- Documented in a number of journal publications
- Funding to AAFC for JECAM-SAR research has ended; have other project funding for SAR research focused on Canadian sites (SAR-VI; phenology; early season classification)
- AAFC research team will complete analysis of CP for crop classification to meet internal needs and will pursue (unfunded) analysis of multi-frequency SAR over select sites under bilateral collaboration
- Need to determine a new model to continue broader collaborative work

JECAM Project - Crop Type Identification & Mapping

Activity 1 - Applying Agriculture and Agri-Food Canada (AAFC) Earth Observation Crop Inventory Method to other JECAM Sites

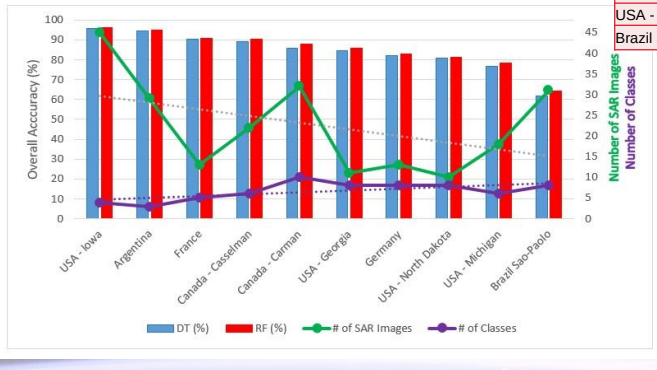
- The overall objective of this research was to test how AAFC's existing operational DT crop classification system compared to a soon-to-be implemented RF system.

- The secondary objective of this research was to determine if SAR-only C-band data stacks could be utilized as a surrogate to optimized optical and SAR imagery combinations for operational crop inventory and mapping.

Results

- Many images, few classes - highest overall accuracies
- Fewer images with more classes - decline in accuracy
- Anomalies included:
  - Brazil – high number of images, 8 classes but lower accuracy

Site	DT (%)	RF (%)	# of SAR Images	# of Classes
USA - Iowa	95.6	96.2	45	4
Argentina	94.4	94.8	29	3
France	90.3	91	13	5
Canada - Casselman	89.0	90.5	22	6
Canada - Carman	85.8	87.9	32	10
USA - Georgia	84.8	85.8	11	8
Germany	82.3	83.1	13	8
USA - North Dakota	80.7	81.2	10	8
USA - Michigan	76.8	78.2	18	6
Brazil Sao-Paolo	61.9	64.3	31	8



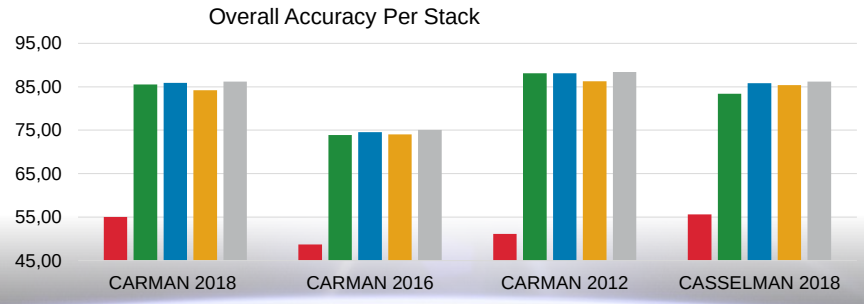
L. Dingle Robertson, A.M. Davidson, H. McNairn, M. Hosseini, S. Mitchell, D. de Abelleyra, S. Veron and M.H. Cosh. Synthetic Aperture Radar (SAR) Image Processing for Operational Space-Based Agriculture Mapping. 2020 – IJRS – *in press*
L. Dingle Robertson, A.M. Davidson, H. McNairn, M. Hosseini et al. 2020. C-band SAR imagery for classification of diverse, worldwide agricultural systems; 2020 IJRS – Accepted minor revisions; in final review

Activity 2 - Compact Polarimetry SAR – Canadian Sites

Activity 2 – Compact Polarimetry SAR for Agriculture Classification

The overall objective of this research was to assess compact polarimetry parameters for crop classification

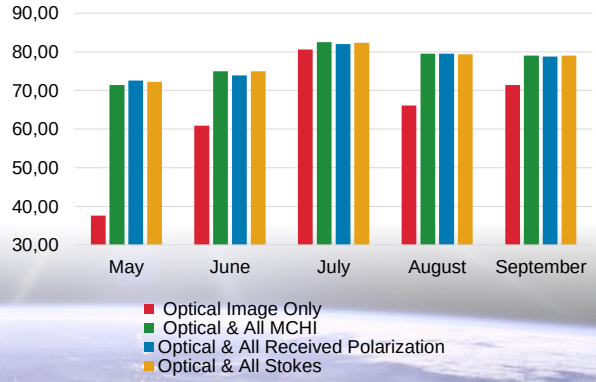
	CARMAN 2018	CARMAN 2016	CARMAN 2012	CASSELMAN 2018
	Overall Accuracy	Overall Accuracy	Overall Accuracy	Overall Accuracy
Degree Linear Polarization	55.04	48.73	51.15	55.61
M-Chi Decomposition	85.51	73.91	88.10	83.37
Received Polarization	85.93	74.57	88.11	85.79
Stokes Vectors	84.17	74.06	86.23	85.39
Mchi-Rec'dPol-Stokes	86.22	75.07	88.40	86.20



Changes Through the Growing Season

- When only one optical image (cloud free, full AOI) is available, CP images improve overall classification accuracies from 1.5% up to 34% depending on the month

	Optical Image Only	Optical & All MCHI	Optical & All Received Polarization	Optical & All Stokes
May	37.59	71.40	72.54	72.25
June	60.84	74.92	73.90	74.99
July	80.59	82.51	82.02	82.35
August	66.07	79.56	79.51	79.31
September	71.38	79.05	78.77	79.05

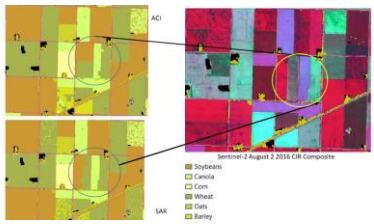


Multi-frequency SAR Classification
Next wave of Satellite Classification Excellence

Activity 3 – Multi-Frequency SAR for Agriculture Classification

The overall objective of this research was to assess multi-frequency SAR for crop classification

Visual comparison of subset of SAR to optical only (ACI) 2016



2016 Classifications

2016 Carman Data	Optical Only	Multi-Frequency SAR Combination Scenarios					
	AAFC Crop Inventory	All Season	Early Season	Late Season	Top 10 Bands	C & X Only	C & L Only	L & X Only
6 Class	97.6	95.9	93.0	82.4	91.3	92.1	92.9	92.1
14 Class	96.2	92.9	89.4	75.3	86.0	87.3	89.8	86.2

Multi-frequency SAR Classification
Next wave of Satellite Classification Excellence

2018 Classifications

Carman, Manitoba, Canada
2018 C- & L-band SAR
RandomForest Classification

	2018 ACI Results		All Season		Early Season (April to **July 17**)		Very Early Season (April to **June 23**)	
	UA	PA	UA	PA	UA	PA	UA	PA
Barley	100	100	100	92.0	99.9	69.0	88.0	47.5
Oats	98.8	92.5	96.2	83.0	89.8	71.6	31.0	16.2
Wheat	96.2	99.1	91.5	98.4	84.2	93.0	61.4	74.5
Corn	97.2	95.5	98.0	96.2	94.2	93.2	75.0	80.3
Canola	100	99.9	99.7	98.0	98.4	97.5	83.7	81.1
Soybeans	97.4	99.9	95.3	98.5	90.8	95.8	81.8	90.4
Sunflower	100	96.5	94.3	82.4	0.2	0.2	0.2	0.1
Beans	98.8	100	99.9	88.1	95.8	43.2	38.7	6.9
Potatoes	100	52.9	98.6	99.2	54.2	98.0	10.3	8.2
Overall Accuracy	97.8		95.7		89.9		71.0	

Highlights From the JECAM SAR Inter-Comparison Project - Classification

SUMMARY TO-DATE:

- Encouraging results for wider application of crop mapping with C-band SAR only.
- Best practices for C-band SAR image preprocessing for crop type mapping now available.
- Best practices for compact polarimetry disseminated to AAFC Operational Team
- Working with multiple space agencies to obtain multi-site multi-frequency imagery focusing on Central and South America

@SistersofSAR

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JECAM Project: LAI & Biomass

- Test AAFC methods at other JECAM sites
- Make the models stronger using available data over Canadian and international JECAM sites.
- Test JECAM member sites' methodologies at multiple sites
- Extend the model to other interested crop types such as rice.
- Adapt the model to multi-frequency and Compact-Pol SAR.

SAR and Ground Data

- Ground data

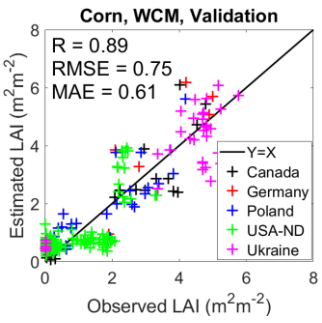
JECAM Sites	Crops	Parameters
Argentina	Soybean	LAI
Canada	Corn, Wheat, Soybeans, Canola	LAI, Biomass, Soil Moisture
Germany	Wheat, Corn	LAI, Biomass, Soil Moisture
India	Rice	LAI
Poland	Corn, Wheat	LAI, Biomass, Soil Moisture
Ukraine	Corn, Wheat, Soybeans	LAI
USA-North Dakota	Corn	LAI, Biomass, Soil Moisture

- SAR imagery
  - RADARSAT-2 & Sentinel-1
    - Radiometric Conversion
    - Speckle Filtering (GAMMA 5 by 5)
    - Range Doppler Terrain Correction

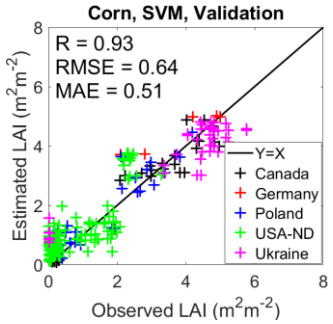
LAI Estimation Results - Corn

- Sentinel-1 & Radarsat-2 (VV-VH)
- 65 Calibration points and 237 validation points

WCM



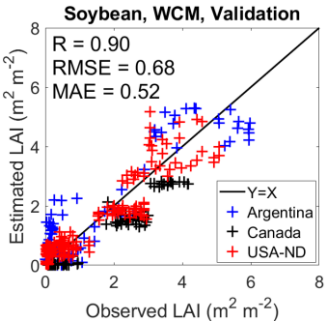
SVM



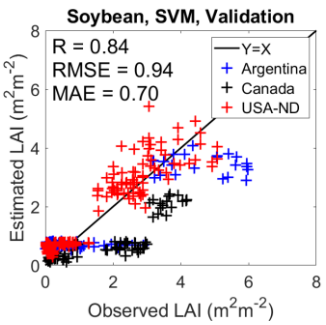
LAI Estimation Results - Soybean

- Sentinel-1 & Radarsat-2 (VV-VH)
- 100 Calibration points and 345 validation points

WCM



SVM



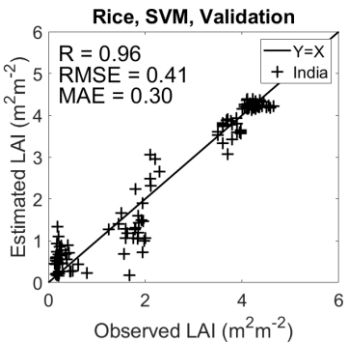
LAI Estimation Results - Rice

- Sentinel-1 & Radarsat-2 (VV-VH)
- 119 Calibration points and 120 validation points

WCM

No soil moisture measurement was available!

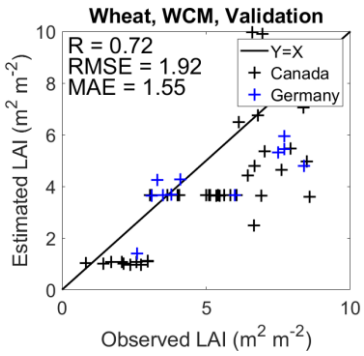
SVM



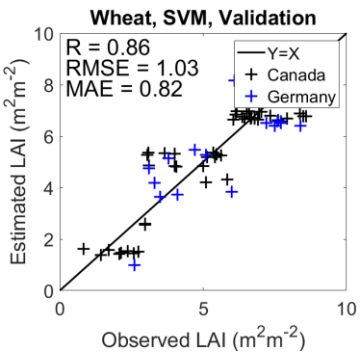
LAI Estimation Results - Wheat

- Sentinel-1 & Radarsat-2 (VV-VH)
- 60 Calibration points and 59 validation points

WCM



SVM



Conclusions

- The C-band SAR sensors have high potential for monitoring crop LAI.
- The SVM model is very promising if high amount of training data that covers the whole LAI range is available.
- The WCM is less sensitive to the number of calibration points. It provides promising results with limited number of calibration points.

Lessons Learned From the JECAM LAI/Biomass Analysis

- For crops such as soybean, corn and rice, SAR sensors is a primarily source of data for crop LAI/Biomass/Yield monitoring. Integration of SAR and optical data would help to improve the accuracies.
- Crop biophysical modeling would usually be more accurate if we have crop type and crop phenology information.
- Processing of S1 data specifically the SLC products is very slow. Need to develop a memory friendly software or provide ARD data.
- Given the importance of the ground data for the modeling specifically for training the machine learning algorithms, it would be very helpful that the data from all the JECAM sites stored in a shared database.
- It would be helpful to develop a guideline for preprocessing the satellite data and each JECAM partner process the time-series of SAR and optical data over their sites and store the extracted satellite parameters in the shared database.

Acknowledgements

This study was funded in part by the Canadian Space Agency Government Related Initiatives Program (GRIP) (Project: *An international comparison of Synthetic Aperture Radar (SAR) based methods for crop type and crop condition monitoring: Developing an operational monitoring capability for Canada, and beyond*; McNairn and Davidson Principal Investigators).

ALOS-2 data were provided by JAXA. TerraSAR-X data were provided by DLR. RADARSAT-2 data were provided by CSA.

Appreciation and Thanks to all the agencies for providing field and satellite data including AAFC, CSA, ESA, JAXA, DLR, USDA and other agencies and universities as shown, without which this research and results found would be not possible.

JECAM 2020 Annual Science Meeting

Joint Experiment for Crop Assessment and Monitoring

12:15 UTC – 14:30 UTC Central Session (Chair: Pierre Defourny, JECAM co-lead)

14:15-16:30 CEST / 08:15-10:30 EDT / 22:15-00:30 AEST

- Welcome — **JECAM Co-lead** Pierre Defourny, UCLouvain (Belgium)
- Achievements of the JECAM SAR cross-site intercomparison — **JECAM Experiment leads** Heather Mc Nairm, Laura Dingle Robertson, Mehdi Hosseini AAFC (Canada)
  Talk (25 min) + Q&A
- JECAM guidelines for validation – call for update in AI era — **JECAM Co-lead** Pierre Defourny, UCLouvain (Be)
  Is my cross-validation representative of my site ? *+ Q&A* — **JECAM partner** François Waldner (Australia)
- JECAM guidelines and Essential Agriculture Var. & exchanges — **All JECAM partners** Pierre Defourny, UCLouvain (Be)
  Interactive session on padlet
- Update on the Mission opportunities *+ Q&A* — **JECAM partners**
  Venus Mission Data Exploitation (CNES) — Eric Ceschia, Gerard Dedieu (CESBIO)
  NISAR Mission Call for opportunity (NASA-ISRO) — Heather Mc Nairn (AAFC)
- JECAM site interests for future experiments: earlier discussion synthesis and continuation: priority topics and opportunities — **JECAM Co-lead** Miao Zhang, AIRCAS (China)
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17:00-18:45 CEST / 11:00-12:45 EDT / 01:00-02:45 AEST

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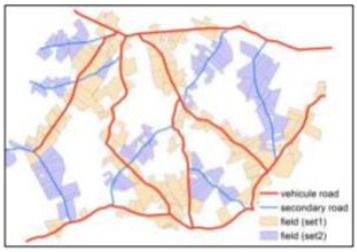
JECAM guidelines for validation – call for an update in AI era

Annex II: The CEOS WGCV Land Product Validation Hierarchy

Stage 1 Validation	Product accuracy is assessed from a small (typically < 30) set of locations and time periods by comparison with in situ or other suitable reference data.
Stage 2 Validation	Product accuracy is estimated over a significant set of locations and time periods by comparison with reference in situ or other suitable reference data. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.
Stage 3 Validation	Uncertainties in the product and its associated structure are well quantified from comparison with reference in situ or other suitable reference data. Uncertainties are characterised in a statistically robust way over multiple locations and time periods representing global conditions. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and periods. Results are published in the peer-reviewed literature.
Stage 4 Validation	Validation results for stage 3 are systematically updated when new product versions are released and as the time-series expands.



The proposed sampling strategy consists in "windshield survey" along the roads from motorized vehicle. This approach allows a data collector to easily and rapidly capture the entire crop diversity from all visible fields.

UCLouvain

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Terminology to clarify ?

- **« Model or method verification »** can be based calibration dataset only

  to evaluate the performance of a classification model or an inversion algorithm

  => to support model parametrization, model calibration, etc. or as quality control procedure

- **« Model, method or product benchmarking »** based on reference data targeting disagreement areas to compare the performances of different processing methods/products

  => to support the selection of a model or of a method

- **« EO product or map accuracy assessment (validation) »** based on validation dataset to quantify the accuracy of the information based on a statistically-sound strategy

  => to support the decision to be made from this EO product

1. « Model or method verification » can be based calibration dataset only

to evaluate the performance of a classification model or an inversion algorithm

=> to support model parametrization, model improvement, etc. or as quality control procedure

Example: **calibration assessment of Random Forest model for crop type mapping**

- All available training samples are used to train the RF model
- Confusion matrix using the training samples to assess the model performance and/or the training dataset performances (i.e. 100 % in situ for calibration)

  => evaluation of the features set used as input,

  => evaluation of the model parametrization,

  => identification of poor representativity of training data for some classes,

  => assessment of the classification of marginal or less frequent classes

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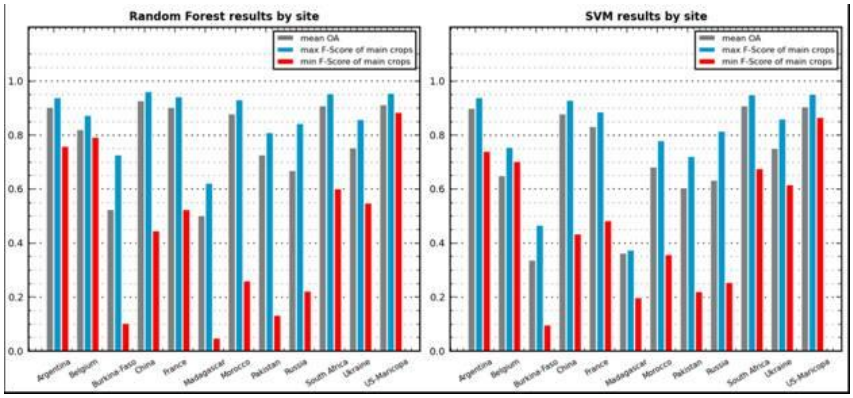
1. « Model or method verification »

Results of the RF verification and benchmarking exercise between Random Forest and SVM over 12 sites



The RF classifier yields better results for most of the sites. SVM produces good results comparable to RF when the number of classes is small, as shown by the results of Argentina and China, and specially in South-Africa where results are much better.

However, as the SVM is very sensitive to a balanced share of samples between the classes, it has to be parameterized in such a way tha all classes are equally represented. This means that majority classes will be under-sampled. For this reason and for these classes, lower results are obtained if they are compared with the RF results, whilst for minority classes results may be better.

2020 JECAM Annual Meeting - 23 June 2020

sentinel-2 + AGRICULTURE

UCLouvain

2. « Model, method or product benchmarking » targeting disagreement areas

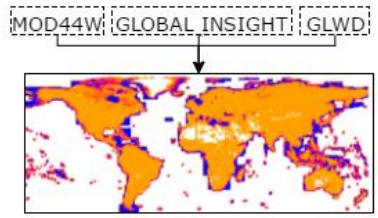
- to compare the performances of different processing methods/products

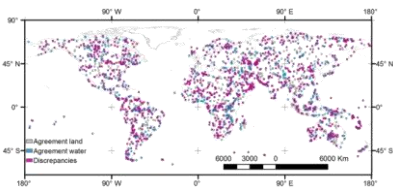
Example: comparison of four global waterbodies maps

Stratification according to the disagreement between products:

- Stratum 1: high confidence in correctly mapping the land class
  => 25 % of reference points selected by random sampling
- Stratum 2 : high confidence in correctly mapping the water class
  => 25 % of reference points selected by random sampling
- Stratum 3 : error-prone areas
  => 50 % of reference points selected by random sampling in the error-prone stratum

=> Total number of reference points : 2110 samples





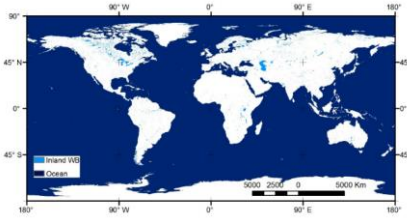
(Lamarche et al., 2016)

2. « Model, method or product benchmarking » targeting disagreement areas

Example: comparison of three four global waterbodies maps

- Overall Accuracy with all samples (2110 points) => no difference !

	Extent		Non-Water			Water		
	(LAT)	OA (%)	PA (%)	UA (%)	F-Score (%)	PA (%)	UA (%)	F-Score (%)
SAR-WBI*	84°N - 60° S	98	99	99	99	62	84	71
GIW v1.0*	90° N - 60° S	98	99	99	99	78	77	77
GFC-datamask*	80° N - 57° S	99	100	99	100	79	97	87
CCI global map	90° N - 90° S	99	99	100	100	92	86	89



CCI global map of open water bodies

- Overall accuracy ~~using samples of the error-prone stratum (1030 points)~~ => very discriminant !

	Non-Water				Water		
	OA	PA	UA	F-Score	PA	UA	F-Score
SAR-WBI	74	90	79	84	23	43	30
GIW v1.0	86	92	90	91	67	72	70
GFC-datamask	89	98	89	93	61	89	73
CCI global map	89	93	92	93	75	78	77

(Lamarche et al., 2016)

JECAM 3. Thematic accuracy – case of categorical variables

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Remote Sensing of Environment

Key issues in rigorous accuracy assessment of land cover products

Stephen V. Stehman, Giles M. Foody

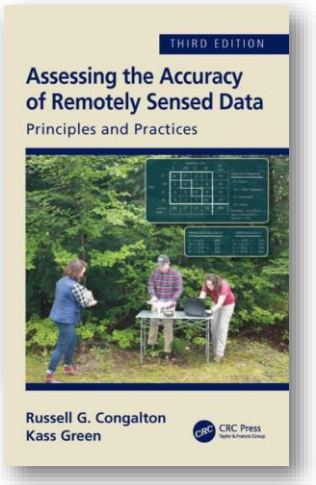

Handbook on remote sensing for agricultural statistics


Remote Sensing of Environment

Review

Good practices for estimating area and assessing accuracy of land change

Pontus Olofsson, Giles M. Foody, Martin Herold, Stephen V. Stehman, Curtis E. Woodcock, Michael A. Wulder


THIRD EDITION

Assessing the Accuracy of Remotely Sensed Data

Principles and Practices

Russell G. Congalton

Kass Green

CRC Press

2020 JECAM Annual Meeting - 23 June 2020

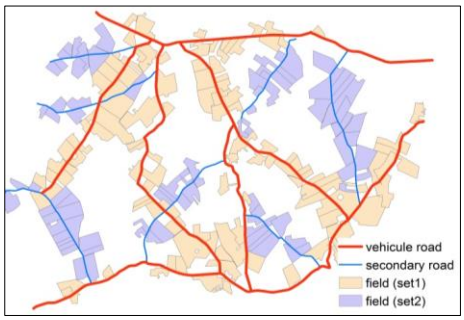
UCLouvain

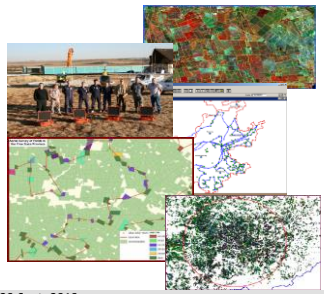
3.1 Sampling design – sample clustering

Reference sample clusters to save cost and time

JECAM Guidelines – "windshield survey"

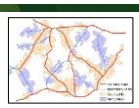
by motorized vehicles (car, motorbike) selecting a set of appropriate roads (set 1) and complemented by regular additional transect (set 2) using secondary roads and tracks to try to reduce the spatial bias brought about by roadside sampling.





3.1 Sampling design – JECAM guidelines assessed !

Reference sample clusters "windshield survey" validated by JECAM for cropland mapping by comparing results in 4 countries



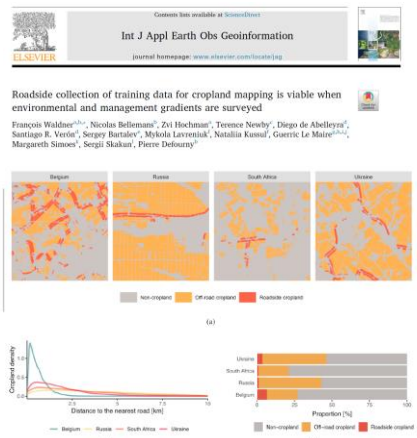


Fig. 2. Characteristics of the four study sites. (a) Subsets of 12 km × 12 km highlighting the specific landscape patterns of the four study sites. Grey depicts areas that are not cropped whereas orange and red correspond to off-road and roadside cropland areas, respectively. (b) Proximity of cropland pixels to roads. (c) Proportion of roadside and off-road cropland in each landscape. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

=> road planning should capture most variability

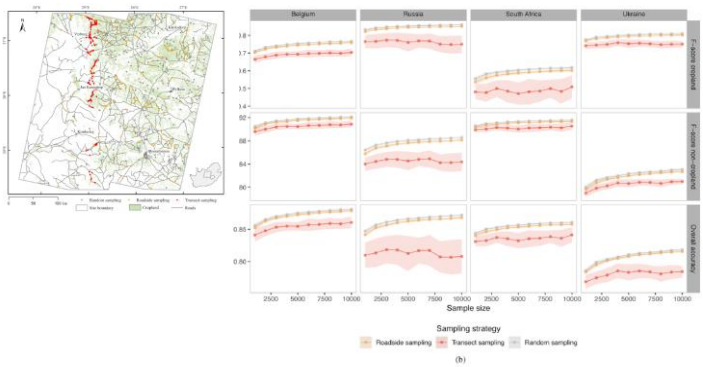


Fig. 5. Relationships between (a) sample size and representativeness and, (b) sample size and accuracy for the three sampling strategies and the four study sites. The envelopes indicate the standard deviations observed across simulations. Note that, for the sake of readability, accuracy values obtained for Random sampling were systematically slightly shifted upwards.

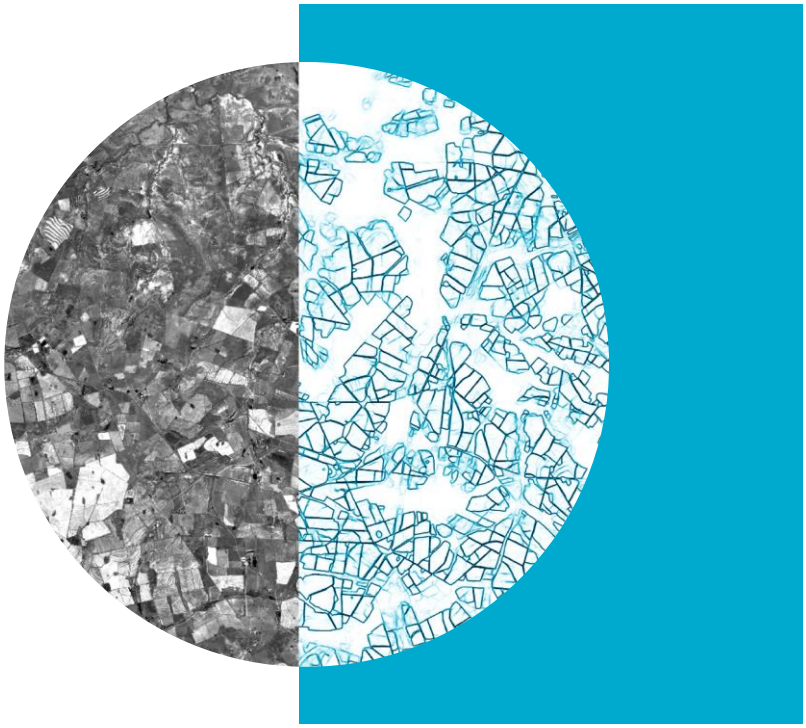
JECAM 3. Thematic accuracy – case of categorical variables

Joint Experiment for Crop Assessment and Monitoring

- Key components of any quantitative accuracy assessment
  - The sampling design (see above)
  - **The response design**
    - ground survey from motorbike, car or in the field using apps like GeoODK
    - drones (CIMMYt, BMGF STARS, WFP)
    - very light aircrafts (South Africa)
    - on screen interpretation DANGER due to correlation between cal. data errors and validation data errors (typically for cropland) !!!
  - The analysis and reporting (UA, PA,F-Score, …?)

UCLouvain

The *T* index: Can I trust my cross-validation?



Franz Waldner

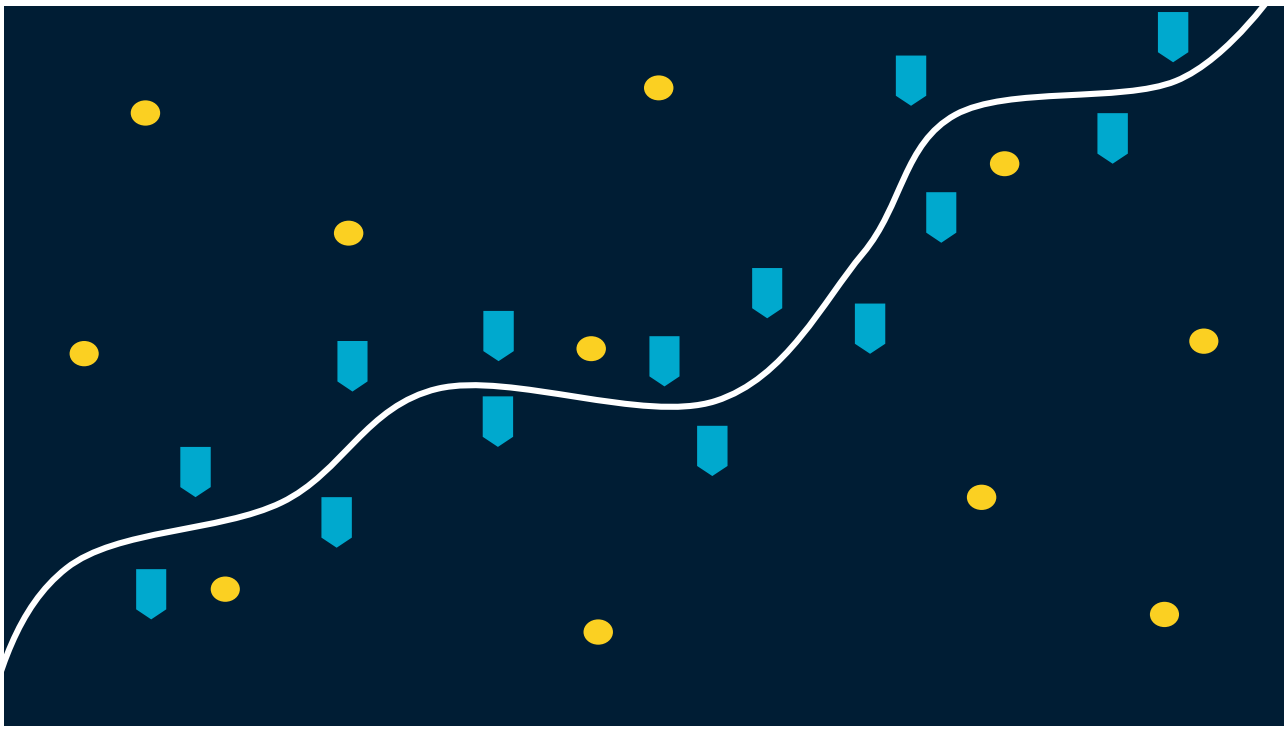
JECAM Meeting| 19 June 2020

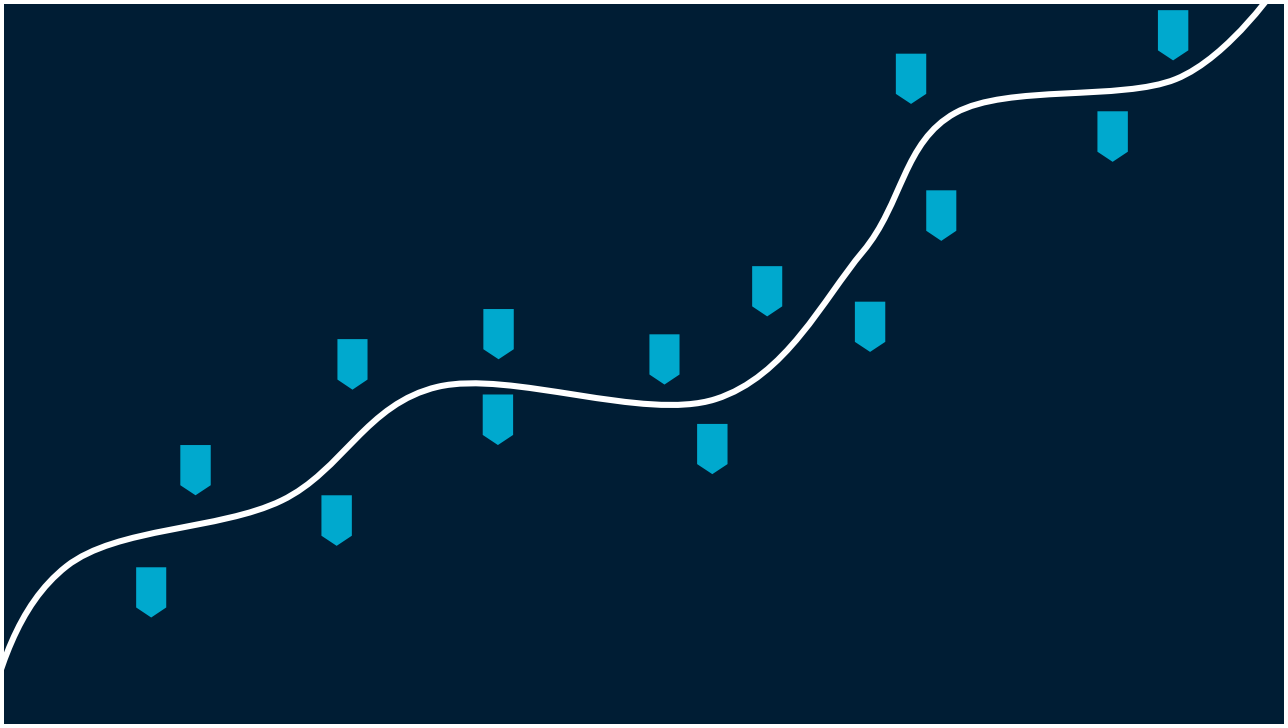
Australia's National Science Agency

What do we mean by accuracy?

Accuracy is the degree of correctness of a *map.*


Remote Sensing of Environment
Good practices for estimating area and assessing accuracy of land
Pontus Olofsson
Curtis E. Woodcock
Michael A. Wulder
Stephen V. Stehman
Status of land cover classification accuracy assessment
Giles M. Foody*
Basic probability sampling designs for thematic map accuracy
assessment
STEPHEN V. STEHMAN
Sampling designs for accuracy assessment of land cover
STEPHEN V. STEHMAN*
Key issues in rigorous accuracy assessment of land cover products
Stephen V. Stehman
Giles M. Foody





Cross-validation is common when an independent probability sample is not available

Cross-validation estimates accuracy on hold-out samples.

Cross-validation is common when an independent probability sample is not available

Cross-validation estimates accuracy on hold-out samples.

Cross-validation at the rescue

The reference set **is not** a probability sample of the map population.

Even though the test set **is** a probability sample of the reference set, it **is not** a probability sample of the map population.

→ Cross-validated accuracy estimates may be biased.

HOLD-OUT CROSS-VALIDATION

Simple cross-validation would be representative of the population if the reference data was a **random sample**.

Can we identify how far/close we are from an ideal random hold-out sample?

The *T* index indicates the probability of a sample to be random.

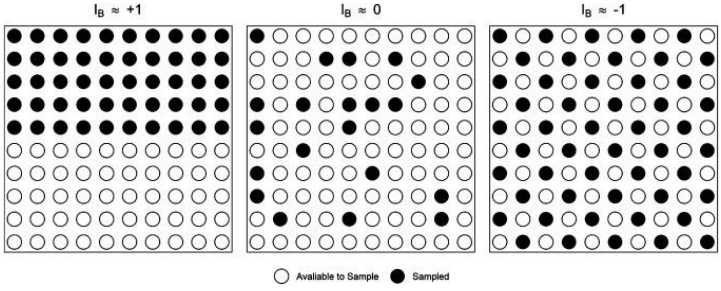
The rationale is that:

1. Remote sensing images the whole map population.
2. We can characterise the spread of data using the normalised Moran's I index.

The normalised Moran's *I*

Moran's *I* is a well-known measure of spatial auto-correlation.

The normalised Moran's I (IB) is bounded between -1 and 1.
IB can characterise the spread of data in the feature space. IB = 0 for random samples and correlates with classification accuracy.



Tillé et al. "Measuring the spatial balance of a sample: A new measure based on Moran's I index." *Spatial Statistics* 23 (2018): 182-192.
Fowler, Waldner and Hochman. "All pixels are useful, but some are more useful: Efficient in situ data collection for crop-type mapping using sequential exploration methods." *JAG*. 91 (2020): 102114.

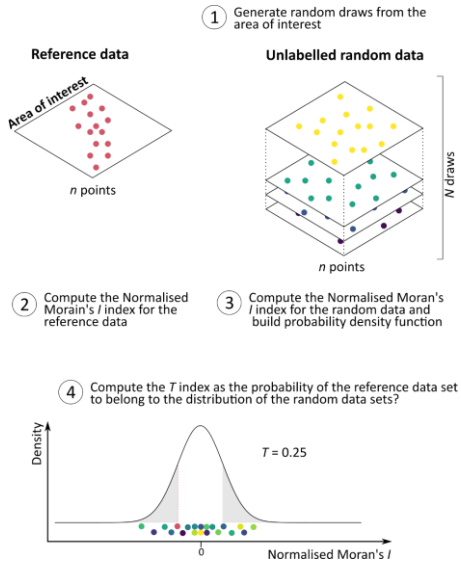
Introducing the *T* index

The *T* index

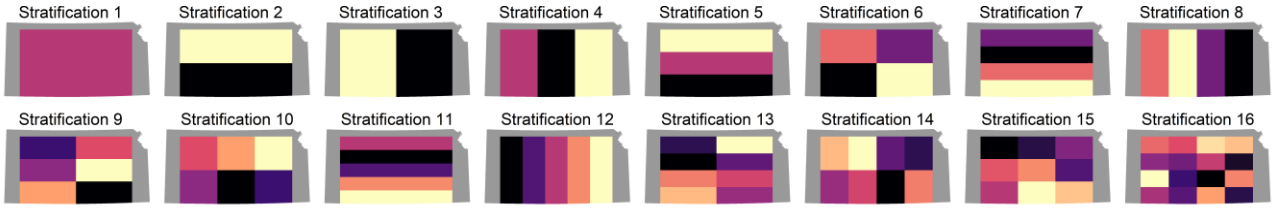
It is built using reference data and random unlabelled data.

Consistent interpretation is proposed through the empirical rule.

T index	Representative?	Interpretation
0-0.05	No	Biased
0.05-0.32	Fair	Likely biased
0.32-1	Substantial	Can be trusted



Case study on crop identification



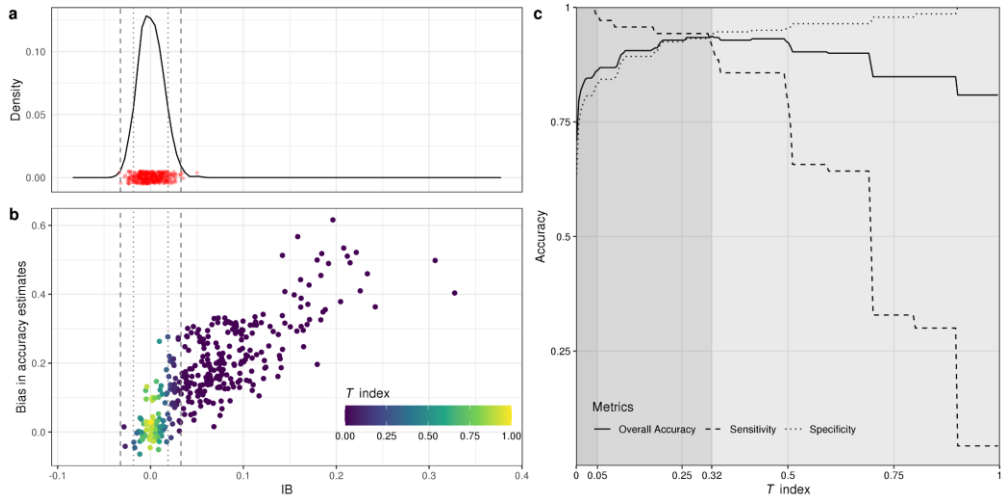
Reference data
6 classes from the Cropland Data Layer
5 reference sets per stratification layer
1000 data points per reference set (25% validation)
125 random samples (250 pixels)

Classifier
Random forest

Satellite data
Harmonised Landsat Sentinel

Accuracy metric
Overall accuracy

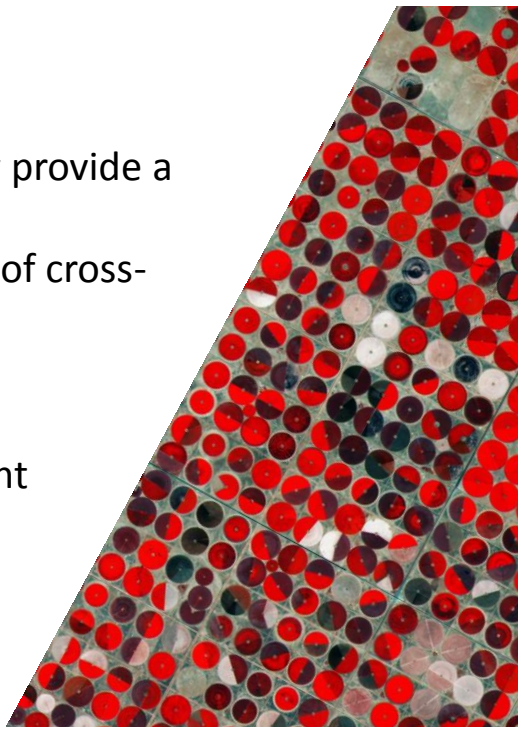
The case study validates the rationale



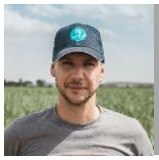
Conclusions

- Cross-validation does not necessarily provide a measure of map accuracy.
- The *T* index indicates the probability of cross-validated accuracy estimates to be representative.

- Report *T* index in accuracy assessment



Thank you



Franz Waldner
Agriculture & Food

+61 291 234 567
franz.waldner@csiro.au

Australia's National Science Agency

JECAM 2020 Annual Science Meeting

JECAM Joint Experiment for Crop Assessment and Monitoring

12:15 UTC – 14:30 UTC Central Session (Chair: Pierre Defourny, JECAM co-lead)

14:15-16:30 CEST / 08:15-10:30 EDT / 22:15-00:30 AEST

- Welcome — **JECAM Co-lead** Pierre Defourny, UCLouvain (Belgium)
- Achievements of the JECAM SAR cross-site intercomparison — **JECAM Experiment leads** Heather Mc Nairm, Laura Dingle Robertson, Mehdi Hosseini AAFC (Canada)
  Talk (25 min) + Q&A
- JECAM guidelines for validation – call for update in AI era — **JECAM Co-lead** Pierre Defourny, UCLouvain (Be)
  Is my cross-validation representative of my site ? *+ Q&A* — **JECAM partner** François Waldner (Australia)
- JECAM proposition for Essential Agriculture Variables & exchanges — **All JECAM partners** Pierre Defourny, UCLouvain (Be)
  Interactive session on padlet
- Update on the Mission opportunities *+ Q&A* — **JECAM partners**
  Venus Mission Data Exploitation (CNES) — Eric Ceschia, Gerard Dedieu (CESBIO)
  NISAR Mission Call for opportunity (NASA-ISRO) — Heather Mc Nairn (AAFC)
- JECAM site interests for future experiments: earlier discussion synthesis and continuation: priority topics and opportunities — **JECAM Co-lead** Miao Zhang, AIRCAS (China)
  Interactive session on padlet
- Survey for the next JECAM 2021 Annual Science Meeting — **All JECAM partners** Andrew Davidson, AAFC (Canada)
  Live survey

14:30– 15:00 Breakfast/Coffee break/Lunch/Dinner

Next session: 15:00 UTC – 16:45 UTC Western Session (Chair: Andrew Davidson, JECAM co-lead)

17:00-18:45 CEST / 11:00-12:45 EDT / 01:00-02:45 AEST

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JECAM proposition for Essential Agriculture Variables & exchanges

3 JECAM guidelines available at jecam.org/documents/
endorsed by the network since 2014

- *JECAM Guidelines: Definition of the Minimum Earth Observation Dataset Requirements*

- *JECAM Guidelines for cropland and crop type definition and field data collection*

- *FAO Classification of crops*

⇒ ***GREAT SUCCESS*** *IN TERMS OF USE AND REFERENCE IN THE LITTERATURE*

⇒ *"Annual Cropland" definition used as an* ***international standard*** *with reference to JECAM*

⇒ *NEED FOR UPDATE AS EO HAS CHANGED COMPLETELY:*
EO TIME SERIES ON CONTINUOUS BASIS (Sentinels, Planet, ….)
MACHINE LEARNING CLOUD COMPUTING EXPANDS OPERATIONAL CAPACITY TO LARGE SCALE

UCLouvain

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Development of requirements for a set of GEOGLAM "**Essential Agriculture Variables (EAVs)"** to leverage and complement other community efforts to define their thematic "essential variables."

On-going process at GEOGLAM level with some working sessions planned this week

More info
http://earthobservations.org/geoglam.php?t=eo_data_coordination&s1=eodc_eav_wg

	Core EAVs	Supporting EAVs	Cross-Community EVs for GEOGLAM
Definition	Remotely-sensed, policy-relevant indicators of state and change of agricultural land use and productivity from national to global scales.	Remote sensing-derived "building blocks" that can be combined with other information or data to provide Core EAVs.	Supporting EAVs that explicitly leverage work already done by other EV communities

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Essential Agric. Variables

	Core EAVs	Definition	Agricultural Land Type Covered	Application or Policy Supported
JECAM	Utilized agricultural areas mask	Binary determination of currently cultivated lands	all annual and perennial, including permanent (>5 years grass), nonpermanent, and managed grassland	Land cover/use state & change; Broad brush monitoring, especially in early months, to narrow analysis, mask products for general assessment
JECAM	Annual Crop Mask	Binary determination of all lands with active agricultural development	all annual crops (JECAM definition)	Land cover/use state & change; Broad brush monitoring to narrow analysis, mask products for general assessment
JECAM	Crop type map	Determination of locations currently growing crop types, expressed as a map	Each nationally relevant crop, accounting for ~80% of total area under production	
JECAM	Crop type area estimate	Determination of areal extent of currently growing crop types, expressed as a unit of area		Production; interannual land cover/use change
JECAM	Crop Yield estimation	Harvestable weight* of commodity per unit area* (*definitions must be declared)	Each nationally relevant crop type, accounting for ~80% of total area under production	Productivity, markets & trade, insurance, humanitarian
JECAM	Crop yield forecast	Within season, pre-harvest forecast of harvestable weight* of commoity per unit area* (*definitions must be declared)	Each nationally relevant crop group or crop type, as appropriate, accounting for ~80% of total area under production	Productivity, markets & trade, insurance, humanitarian
JECAM	Crop condition assessment	Measure (quantitative? qualitative?) of crop status relative to short-term reference* (*definition must be declared)	For crop group or crop type, as each season progresses	Productivity, markets & trade, insurance, humanitarian, pest and disease detection
JECAM	Cover crop	Determination of cultivation of a crop between main cropping seasons, not for the purpose of harvesting		
	Crop rotation	The sequence of crop groups or crop type cultivated for the purpose of harvesting, within or between years		

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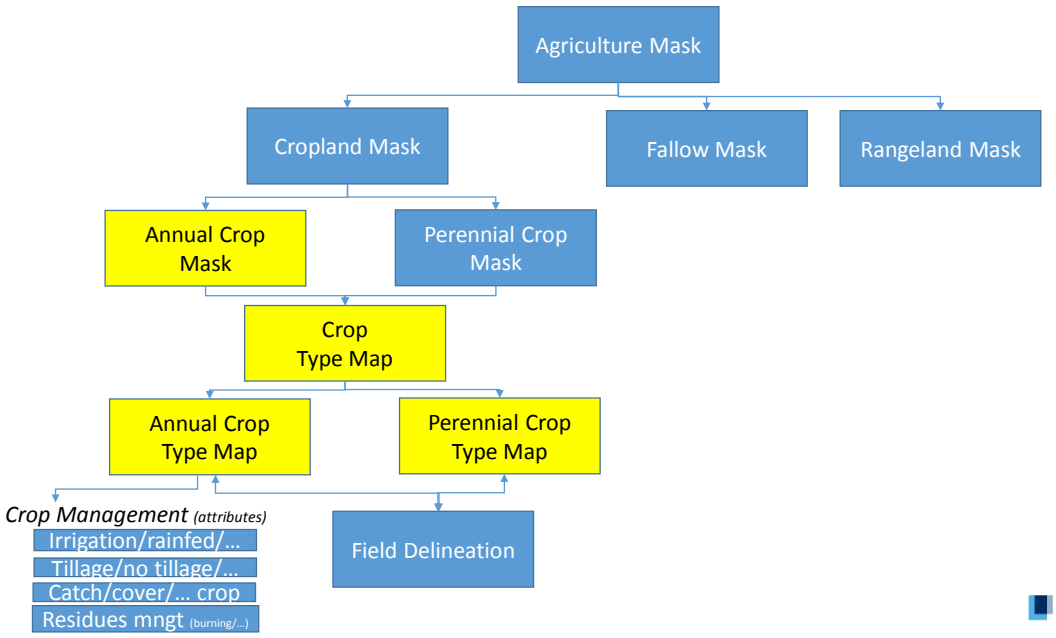
JECAM for Essential Agric. Variables



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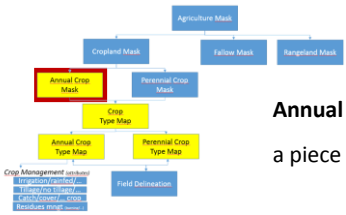
JECAM for Essential Agric. Variables



Annual Crop Mask corresponds partly to the JECAM Annual Cropland :

a piece of arable land that is sowed or planted at least once within a 12 months period.

JECAM Guidelines for cropland and crop type definition and field data collection (2014)

The **annual cropland** from a remote sensing perspective is a piece of land of minimum 0.25 ha (min. width of 30 m) that is sowed/planted and harvestable at least once within the 12 months after the sowing/planting date. The annual cropland produces an herbaceous cover and is sometimes combined with some tree or woody vegetation.* **

*the herbaceous vegetation expressed as fcover (fraction of soil background covered by the living vegetation) is expected to reach at least 30 % while the tree or woody (height >2m) cover should typically not exceed a fcover of 15%.

**There are 3 known exceptions to this definition. The first concerns the sugarcane plantation and cassava crop which are included in the cropland class although they have a longer vegetation cycle and are not yearly planted. Second, taken individually, small plots such as legumes do not meet the minimum size criteria of the cropland definition. However, when considered as a continuous heterogeneous field, they should be included in the cropland. The third case is the greenhouse crops that cannot be monitored by remote sensing and are thus excluded from the definition

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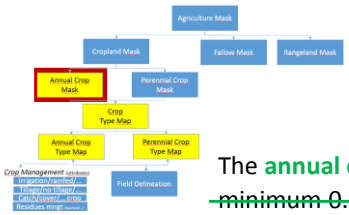
JECAM for Essential Agric. Variables



Towards an *Updated JECAM Guidelines for cropland and crop type definition*
submitted for interactive discussion and possible JECAM endorsement (June 2020 ?)

The **annual crop mask** from a remote sensing perspective is defined by all pieces of land ~~of minimum 0.25 ha (min. width of 30 m)~~ where at least one crop is sowed/planted and harvestable once within the 12 months after the sowing/planting date. The annual crop~~land~~ produces an herbaceous cover and is sometimes combined with some tree or woody vegetation.* **

Update 1 – **Wording change**
***Proposition to* change ~~Annual Cropland~~ for Annual Crop Mask :**
the crops are annual while the annual cropland could be ambiguous these days.

Update 2 - **Spatial Scale**
***Proposition to* remove the minimum from the definition but add this info:**
The minimum mapping unit of the annual crop mask varies from 25 m² (0,0025 ha) for VHR imagery (1-2m resolution) to 100-900 m² (0,01 to 0,09 ha) for HR imagery (3 to 10m resolution).

*the ~~herbaceous~~ crop vegetation expressed as fcover (fraction of soil background covered by the living vegetation) is expected to reach at least 30 % while the tree or woody (height >2m) cover should typically not exceed a fcover of 15%.

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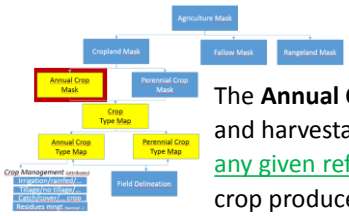
JECAM for Essential Agric. Variables



The **Annual Crop Mask** is defined by all pieces of land where at least one crop is sowed/planted and harvestable within the 12 months after the sowing/planting date, and refers to a season or any given reference period corresponding the growing cycle of the targeted crops. The annual crop produce an herbaceous cover and is sometimes combined with tree, woody vegetation or perennial crops.

Update 3 – **Temporal Scale**
Proposition: add a temporal reference as the intense use of time series, mask of annual crop could refer to different periods as a field cultivated for a given period can be turned into fallows for the following season
"refers to a season or any given reference period corresponding the growing cycle of the targeted crops. ."
ex. Annual Crop Mask for the so called Summer Grain Season in Western Cape (SAF)
Annual Mask of Annual Crops for 2018-2019 spanning from August 2018 to November 2019

The **Agricultural Year Mask of Annual Crops** is the cumulated areas of all the possible Annual Crop Masks over an agricultural year corresponding to 12 months or more.

Add-on concept – **Agricultural Year**
Proposition to refer to the official wording of the so called 'Agricultural Year' used by national statistics offices to clarify what was intuitively often referred to as the *former* JECAM annual cropland

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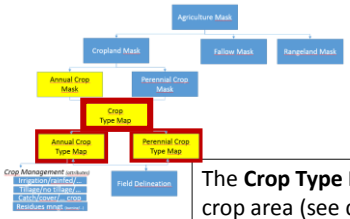
JECAM for Essential Agric. Variables



Towards an *Updated JECAM Guidelines for cropland and crop type definition*
submitted for interactive discussion and possible JECAM endorsement (June 2020 ?)

The **Crop Type Map** corresponds to the piece of land identified either as annual crop area or as perennial crop area (see definition below) and shall refer to a time period ranging from any given period of time to maximum an agricultural year. In case of multiple cycle over an agricultural year, either only the primary crop or the sequence of crops is reported; in case of intercropping and mixed crops in the same field, the species association is reported as long as the least developed crop contributes to at least a quarter of the overall agricultural vegetation fCover.

Annual crop types are sowed/planted at least once a year, produces an herbaceous cover reaching at least a fCover (fraction of soil background covered by the living vegetation) of 30 % and is harvestable within the 12 months after the sowing/planting date; it is sometimes combined with some tree or woody vegetation and while the tree or woody (height >2m) cover should typically not exceed a fCover of 15%.

Perennial crop types are multi-annual plant (crops, forages, shrubs and trees) able to regrow without being replanted for several years (at least two years) and continue to produce grains, seeds, fruits, and biomass after a single harvest for up to 10 years for crops and much longer for forages, shrubs and trees. The first harvest usually take place after one year or later.

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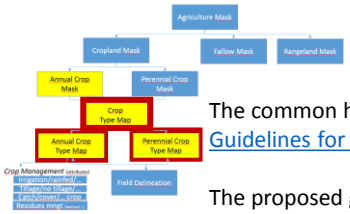
JECAM for Essential Agric. Variables



The common hierarchical typology with common aggregation levels, as proposed by JECAM (JECAM 2014. Guidelines for field data collection) and adopted by several international initiatives, should be updated.

The proposed general legend gathers the global diversity of crop types and follows a hierarchical grouping of crops to share common aggregation levels (level 1 = land cover; level 2= crop group; level 3= crop class; level 4 = sub-class). Here below, an example for levels 1 and 2, including the proposed perennial types:

Annual crops
- Cereals
- Vegetables and melons
- Oilseed crops
- Root / tuber crops with high starch or inulin content
- Beverage and spice crops
- Leguminous crops
- Sugar crops
- Other crops

Perennial crops
- Fruits and berries (all excluding strawberries which are not perennial)
- Nuts
- Oil-bearing crops (permanent only)
- Spices, condiments and aromatic herbs
- Other perennial crops (coffee, cocoa, tea, natural rubber, hops, sisal, agave, hemp, asparagus, miscanthus, others)

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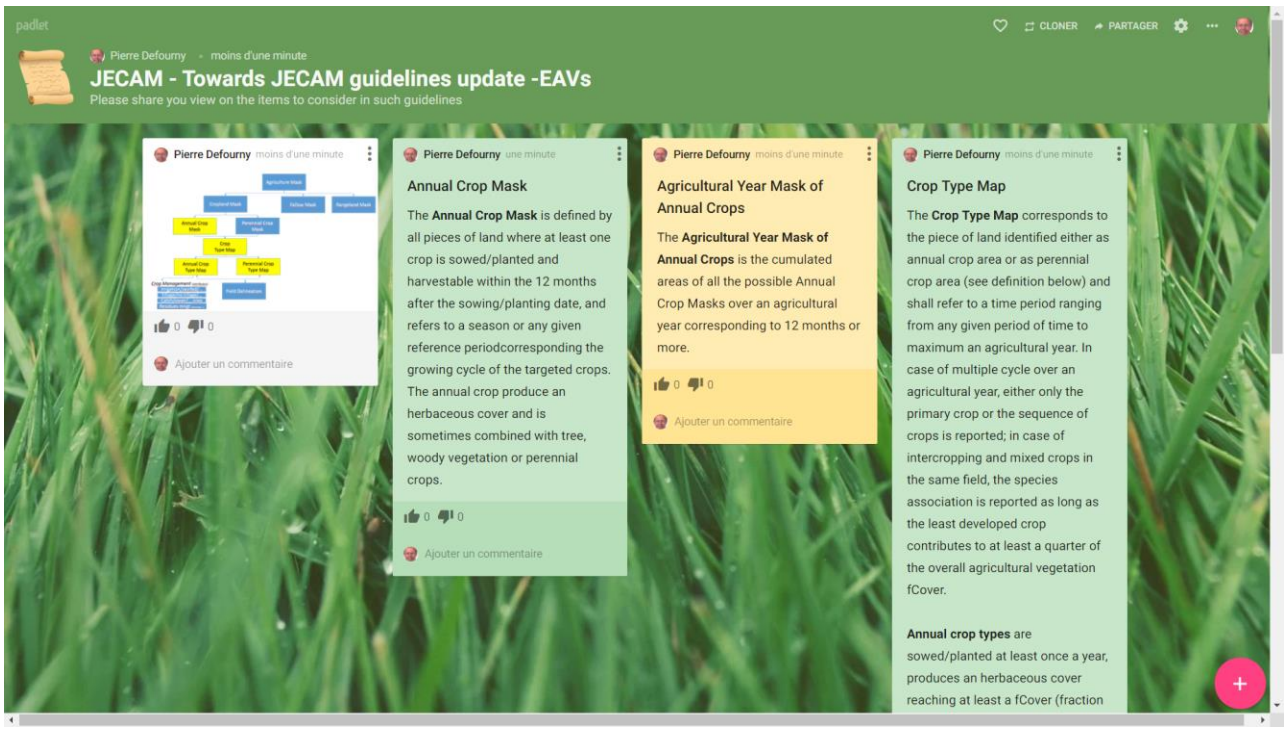

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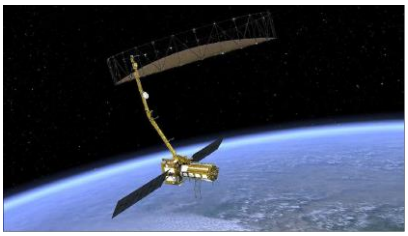
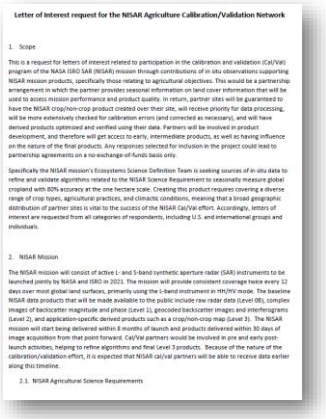
NISAR Mission opportunity for JECAM



contact person for agriculture application : Paul Siqueira (NASA/U.Mass.)
JECAM contact: Heather McNairn (AAFC)

- Active L- and S-band synthetic aperture radar (SAR) instruments
- To be launched jointly by NASA and ISRO in 2022.
- Consistent coverage twice every 12 days over most global land surfaces, primarily using the L-band instrument in HH/HV mode.
- Cal/Val partners would be involved in pre and early postlaunch activities, helping to refine algorithms and final Level 3 products.
- NISAR cal/val partners will be able to receive data earlier



Letter of Interest request for the NISAR Agriculture Calibration/Validation Network

1. Scope

This is a request for letters of interest related to participation in the calibration and validation (Cal/Val) program of the NASA ISRO SAR (NISAR) mission through contributions of in situ observations supporting NISAR mission products, specifically those relating to agricultural objectives. This would be a partnership arrangement in which the partner provides seasonal information on land cover information that will be used to assess mission performance and product quality. In return, partner sites will be guaranteed to have the NISAR crop/non-crop product created over their site, will receive priority for data processing, will be more extensively checked for calibration errors (and corrected as necessary), and will have derived products optimized and verified using their data. Partners will be involved in product development, and therefore will get access to early, intermediate products, as well as having influence on the nature of the final products. Any responses selected for inclusion in the project could lead to partnership agreements on a no-exchange-of-funds basis only.

Specifically the NISAR mission's Ecosystems Science Definition Team is seeking sources of in situ data to refine and validate algorithms related to the NISAR Science Requirement to seasonally measure global cropland with 80% accuracy at the one hectare scale. Creating this product requires covering a diverse range of crop types, agricultural practices, and climactic conditions, meaning that a broad geographic distribution of partner sites is vital to the success of the NISAR Cal/Val effort. Accordingly, letters of interest are requested from all categories of respondents, including U.S. and international groups and individuals.

2. NISAR Mission

The NISAR mission will consist of active L- and S-band synthetic aperture radar (SAR) instruments to be launched jointly by NASA and ISRO in 2021. The mission will provide consistent coverage twice every 12 days over most global land surfaces, primarily using the L-band instrument in HH/HV mode. The baseline NISAR data products that will be made available to the public include raw radar data (Level 0B), complex images of backscatter magnitude and phase (Level 1), geocoded backscatter images and interferograms (Level 2), and application-specific derived products such as a crop/non-crop map (Level 3). The NISAR mission will start being delivered within 8 months of launch and products delivered within 30 days of image acquisition from that point forward. Cal/Val partners would be involved in pre and early post-launch activities, helping to refine algorithms and final Level 3 products. Because of the nature of the calibration/validation effort, it is expected that NISAR cal/val partners will be able to receive data earlier along this timeline.

2.1. NISAR Agricultural Science Requirements

JECAM
CESBIO
ISRO
CNES CENTRE NATIONAL D'ÉTUDES SPATIALES
ISA Israel Space Agency Ministry of Science & Technology

The VENµS mission: a tool for the scientists, a contribution to prepare the next generation of Sentinel 2

- **G. Dedieu[1,3], A. Karnieli[2], O. Hagolle[1,3], E.Ceschia[3]**

- [1] *CESBIO, Unité mixte CNES-CNRS-IRD-UPS, Toulouse University, France*
- [2] *The Remote Sensing Laboratory, Jacob Blaustein Institute for Desert Research, Ben Gurion University of the Negev, Israel*
- [3] *Centre National d'Etudes Spatiales, Toulouse, France*

Venμs Uniqueness

- **Temporal resolution**
  - 2 days revisit time for monitoring rapid changes
- **Spectral resolution**
  - Super spectral sensor – 12 spectral bands VIS-NIR for land applications (Blue to NIR)
- **Spatial resolution**
  - Pixel size : 5 m Registration requirement: 3 m rmse
- **Swath: 27.56 km**
- **View angle**
  - Constant view angle, at constant local solar time (10h30)
- **Stereo pairs with a small angle difference at 620nm**
  - Cloud screening based on altitude, DEM generation
- **Tilting capability**
  - 30 deg across and along track

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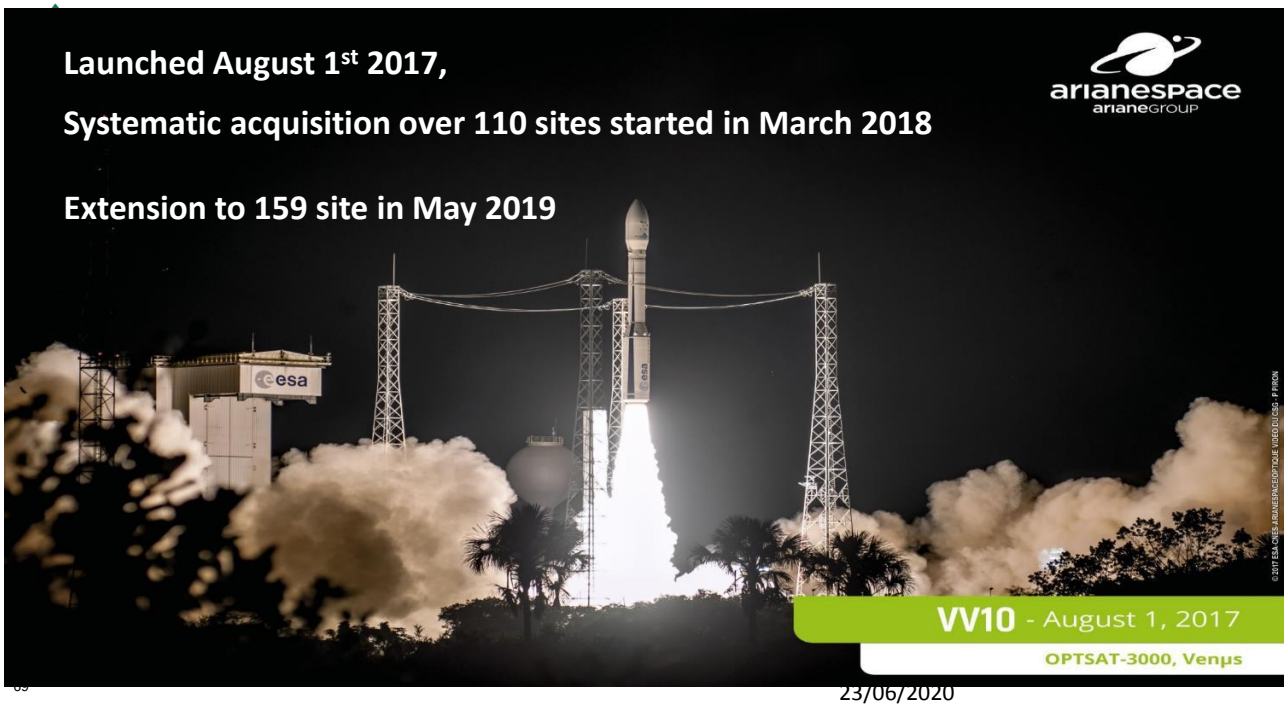

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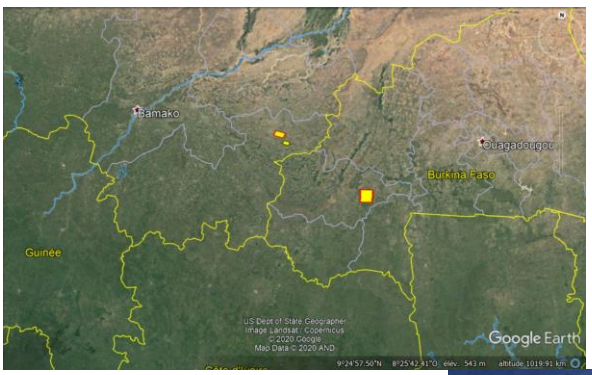
23/06/2020

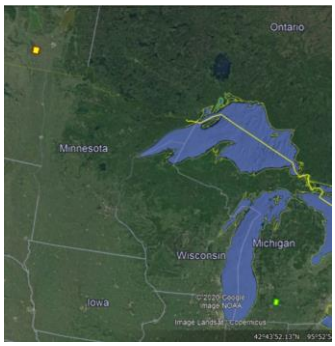
Venµs sites

- **123 acquisitions**
  - **159 sites,**
  - **27 over Israel**
  - **9 over France**
  - **And 123 over the rest of the world**
  - **And also 28 more for calibration but not available to users**

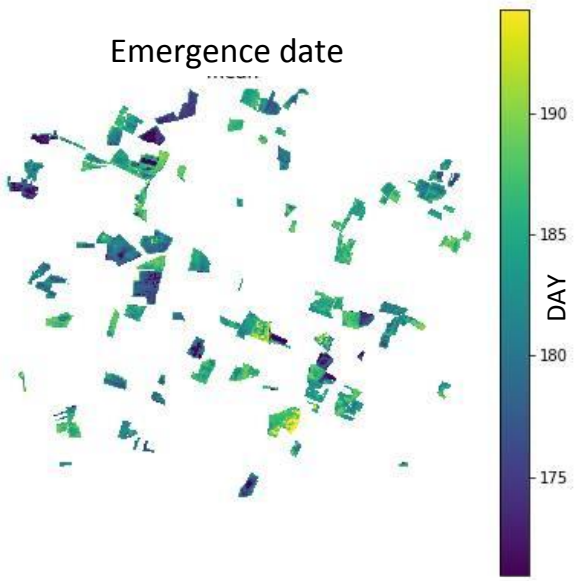
Joint Venµs/JECAM sites

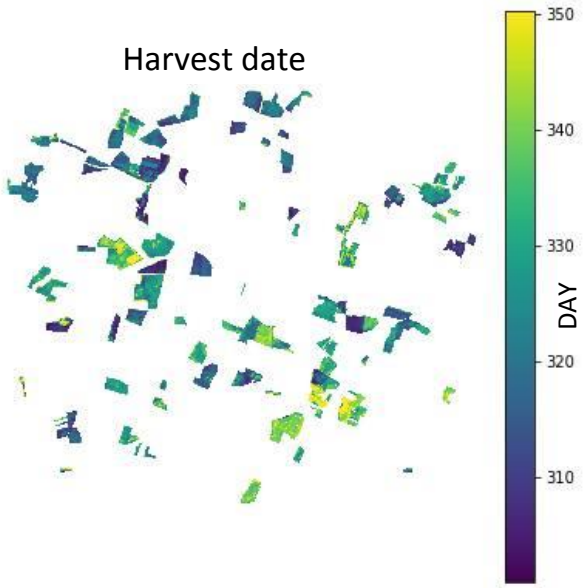


Joint Venµs/JECAM sites



Crop calendar: Winter wheat (2018) 8 x 8 km window

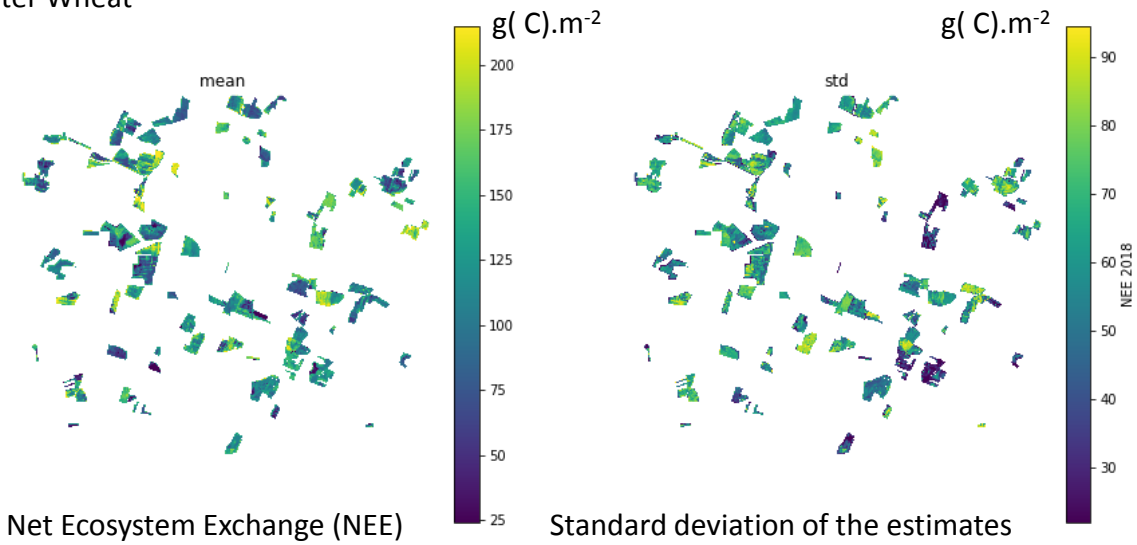




RESULTS : Assimilation of VENµS and Sentinel 2

Winter Wheat

Modeling approach: SAFY-C02

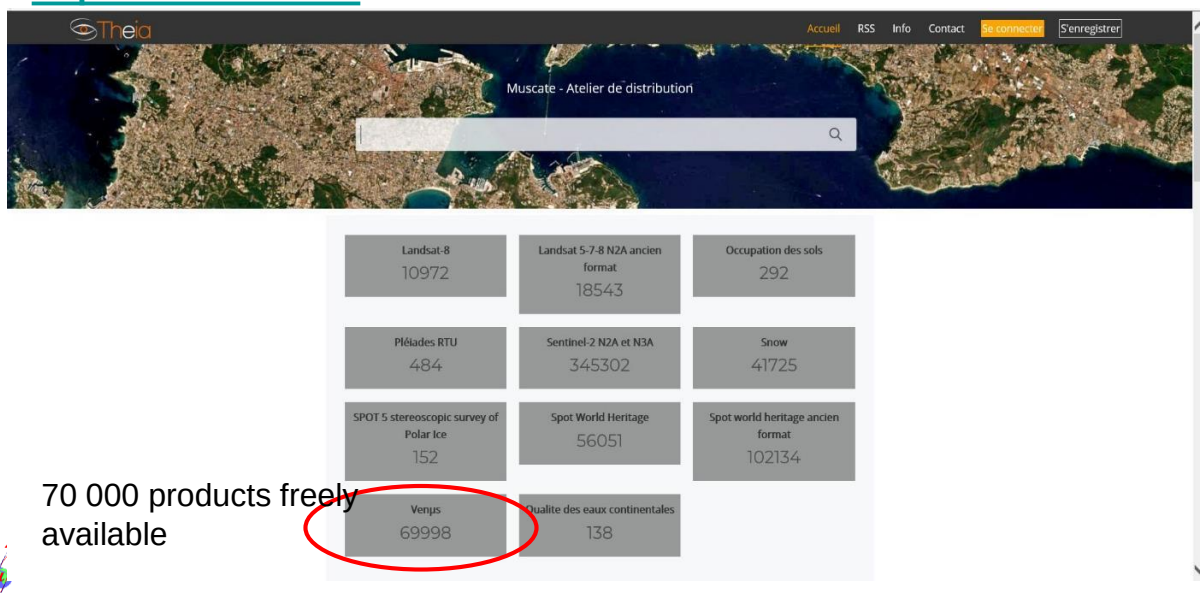


Net Ecosystem Exchange (NEE)

Standard deviation of the estimates

Product portal

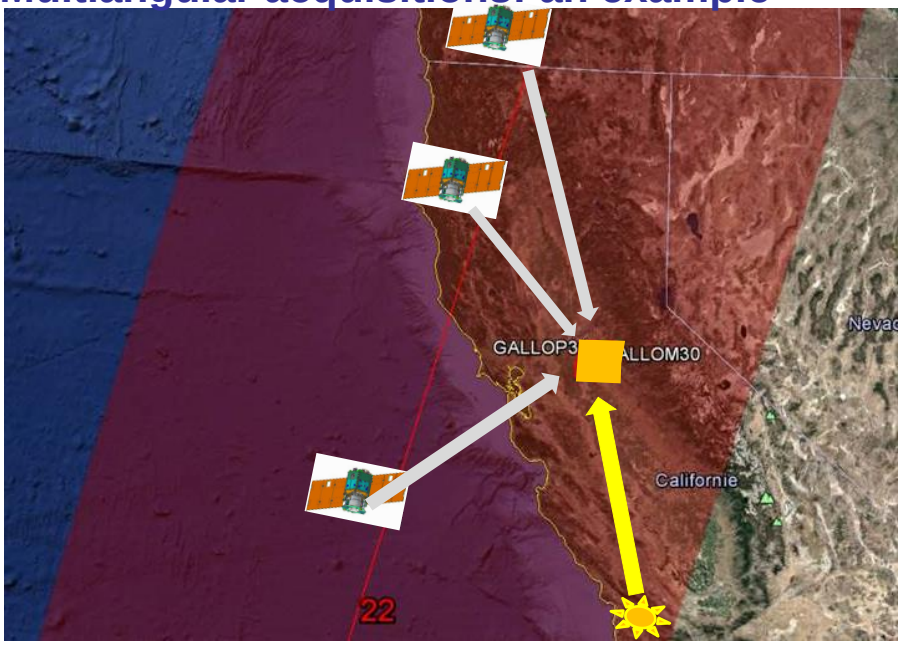
- https://theia.cnes.fr



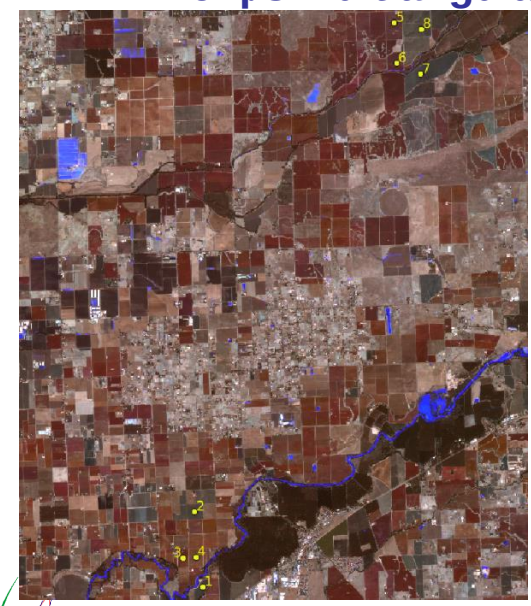
70 000 products freely available

Venμs Multiangular acquisitions: an example

For now, only one site is acquired under 3 different angles from the same overpass (Gallo, California)



Venμs Multiangular acquisitions: an example



RGB composite of the same “green” spectral band under 3 directions

Blue : forward direction (close to sunglint) hence the blue color for water),
Green for Nadir
Red for backward.

Vineyards with E-W ranks appear in Bordeaux while vineyards with N-S ranks appear in gray/green.

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Venμs plan until 2022

- Current acquisitions (2 days revisit, 720 km altitude) will continue until late **October 2020**
- From **November 2020 to October 2021**, the satellite will go down to 410 km, stay there for several months and then will go up to 560 km. No image acquisition for scientists during this period
- From **November 2021** and for at least one year, the satellite will stay at 560 km and it will acquire image every day, with constant view angles and about 4m resolution => image acquisitions for scientists
- For this period starting Nov. 2021, a new call for proposal of sites will be issued within a couple of months
- We expect to perform multiangular acquisitions over more sites, so you will be able to request such acquisitions in your proposal

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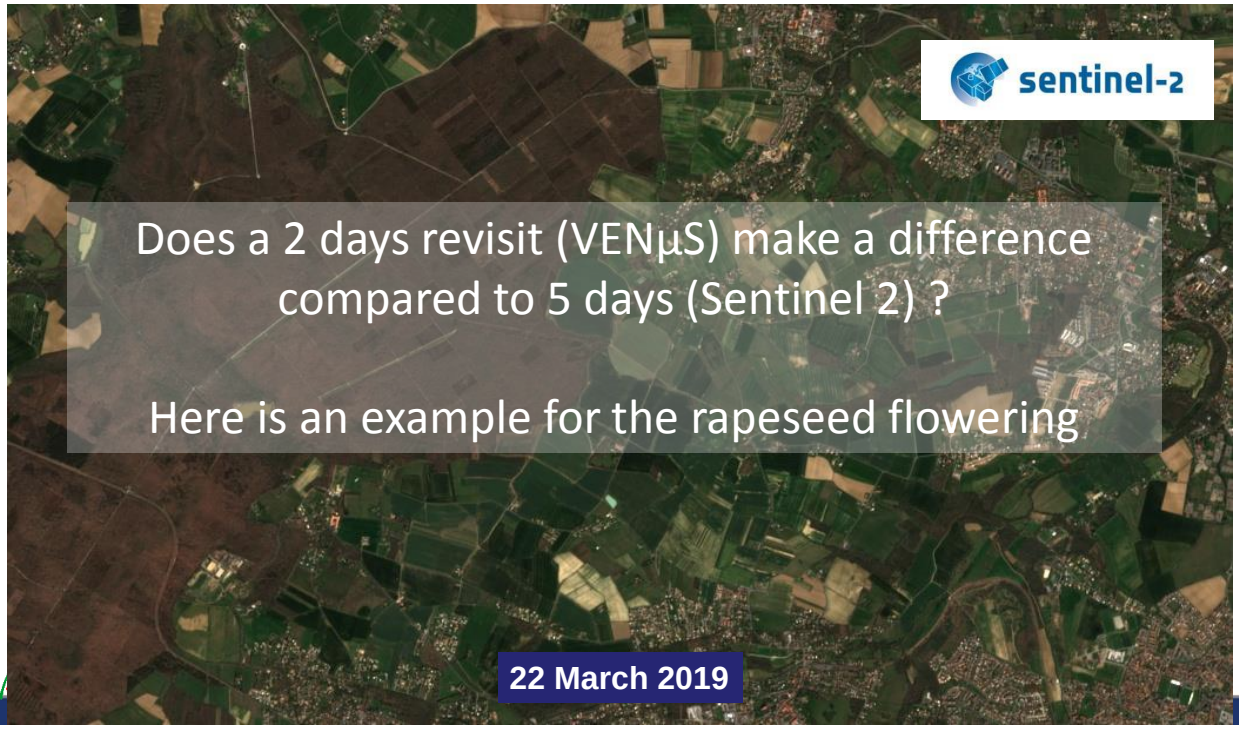
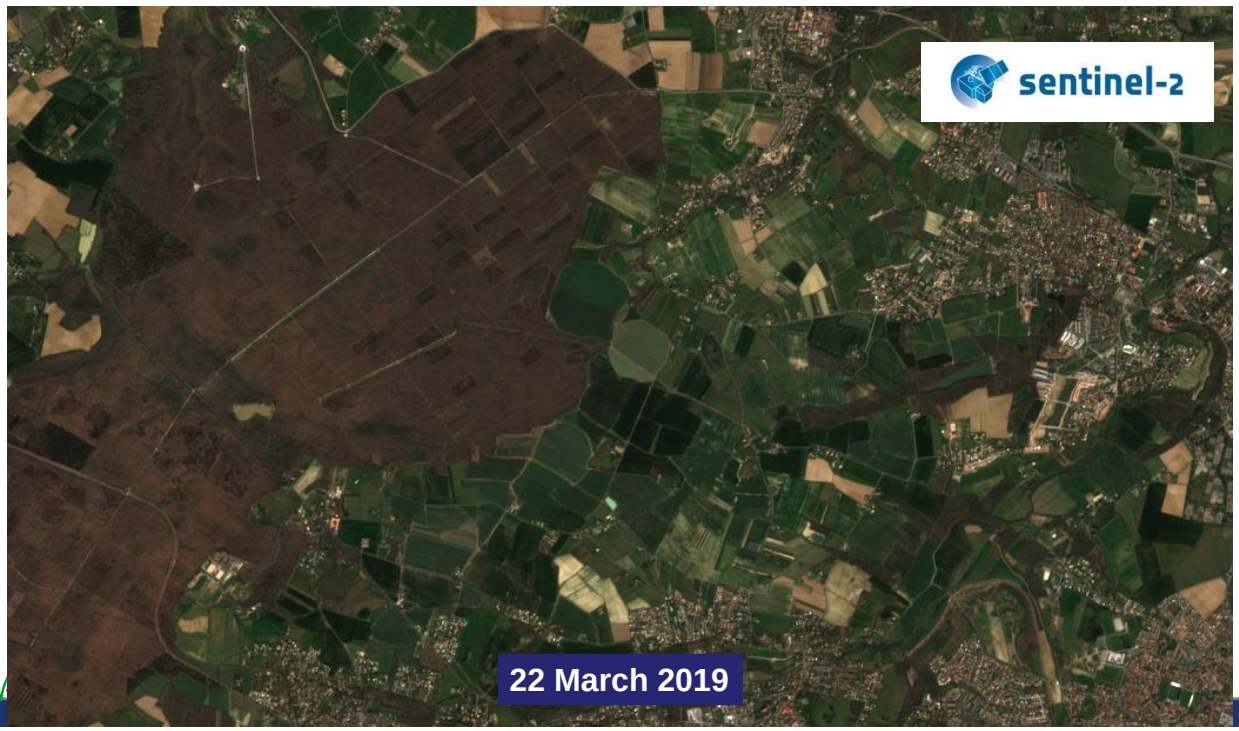
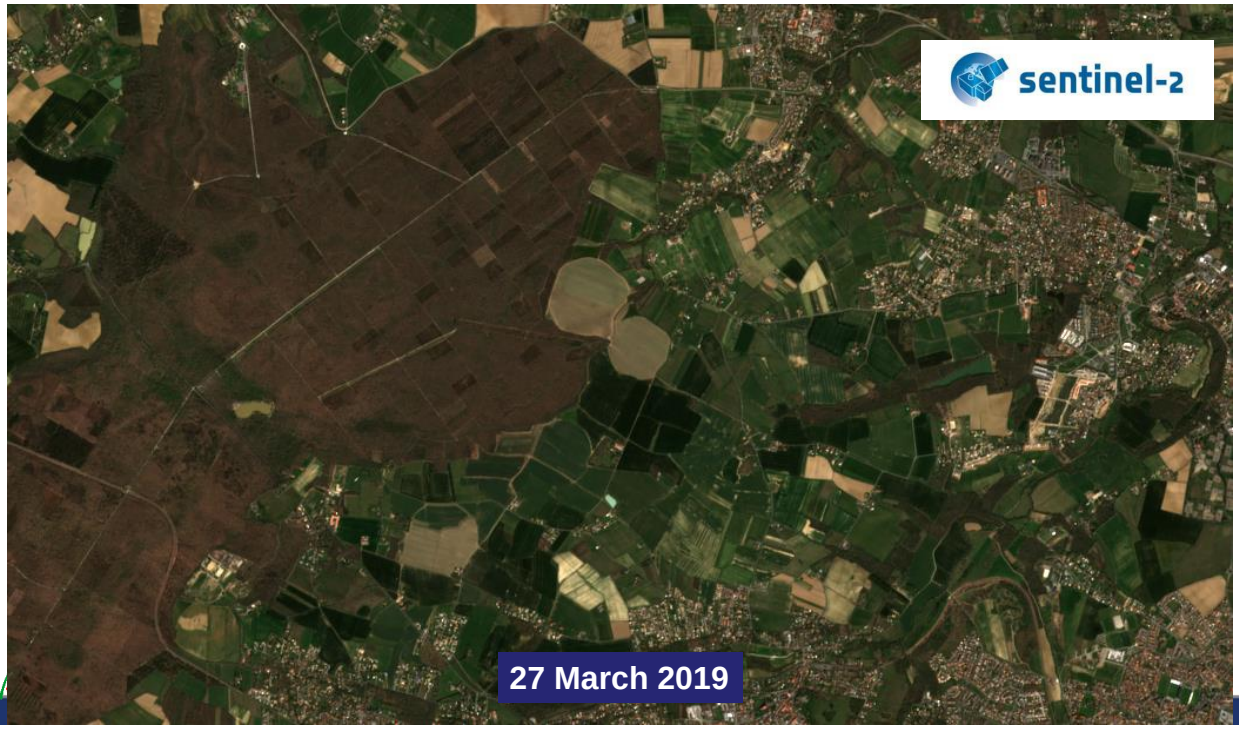
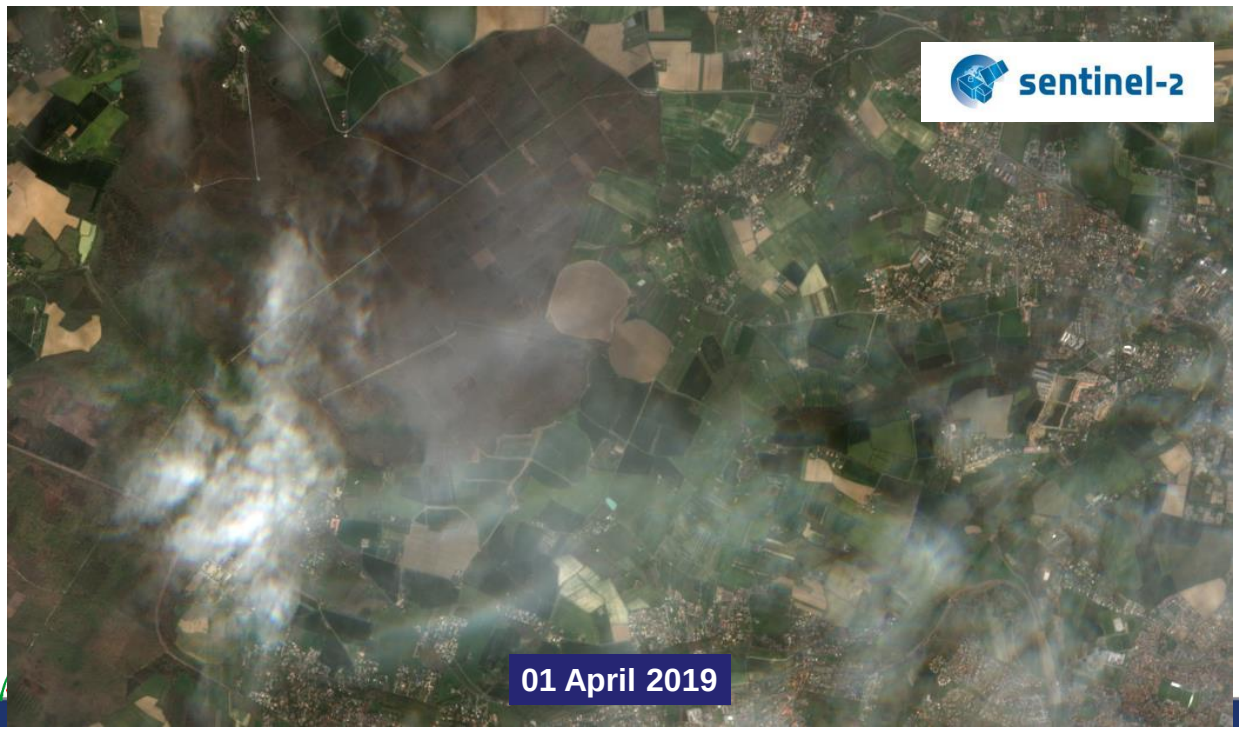
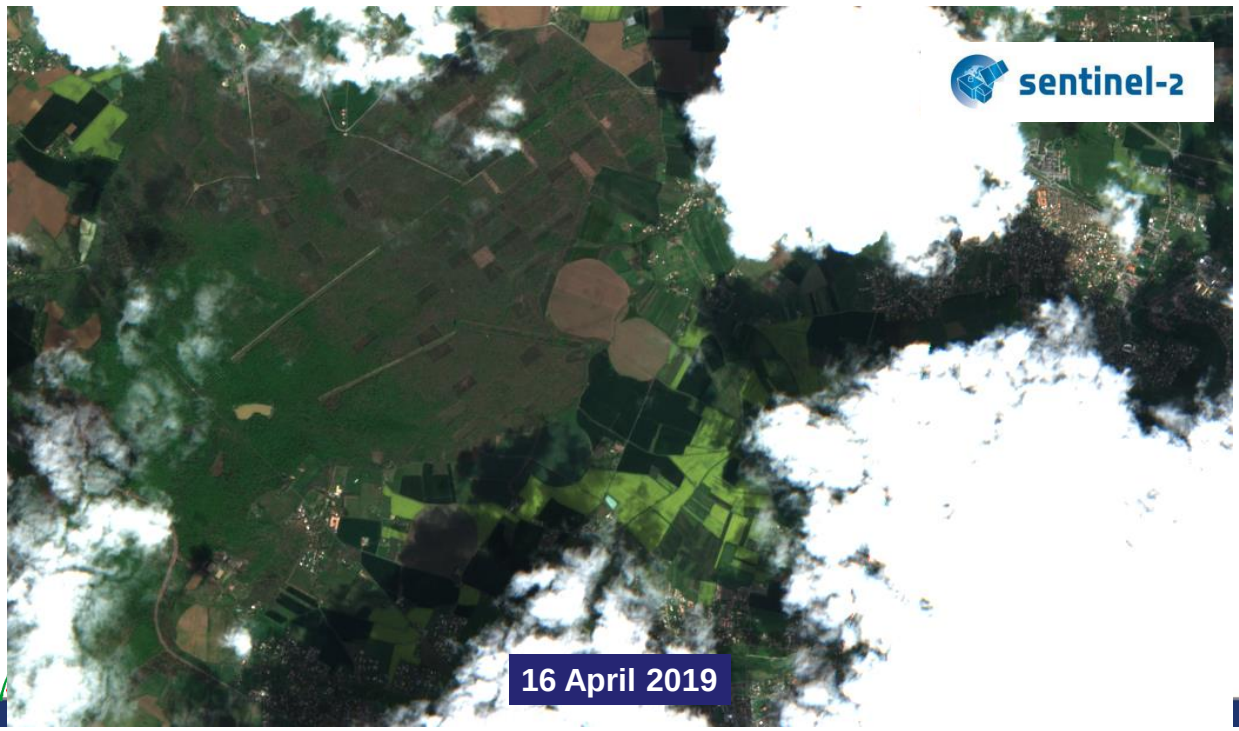

sentinel-2
Does a 2 days revisit (VENµS) make a difference compared to 5 days (Sentinel 2) ?
Here is an example for the rapeseed flowering
22 March 2019

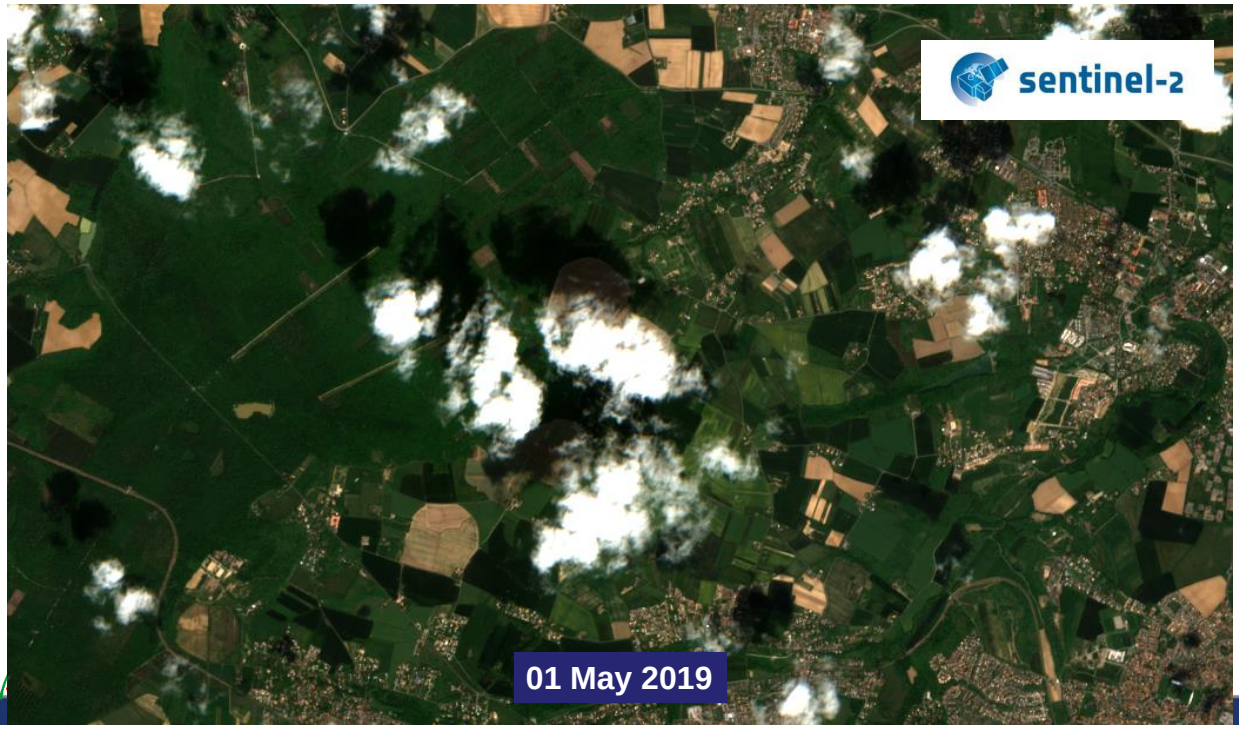

sentinel-2
22 March 2019

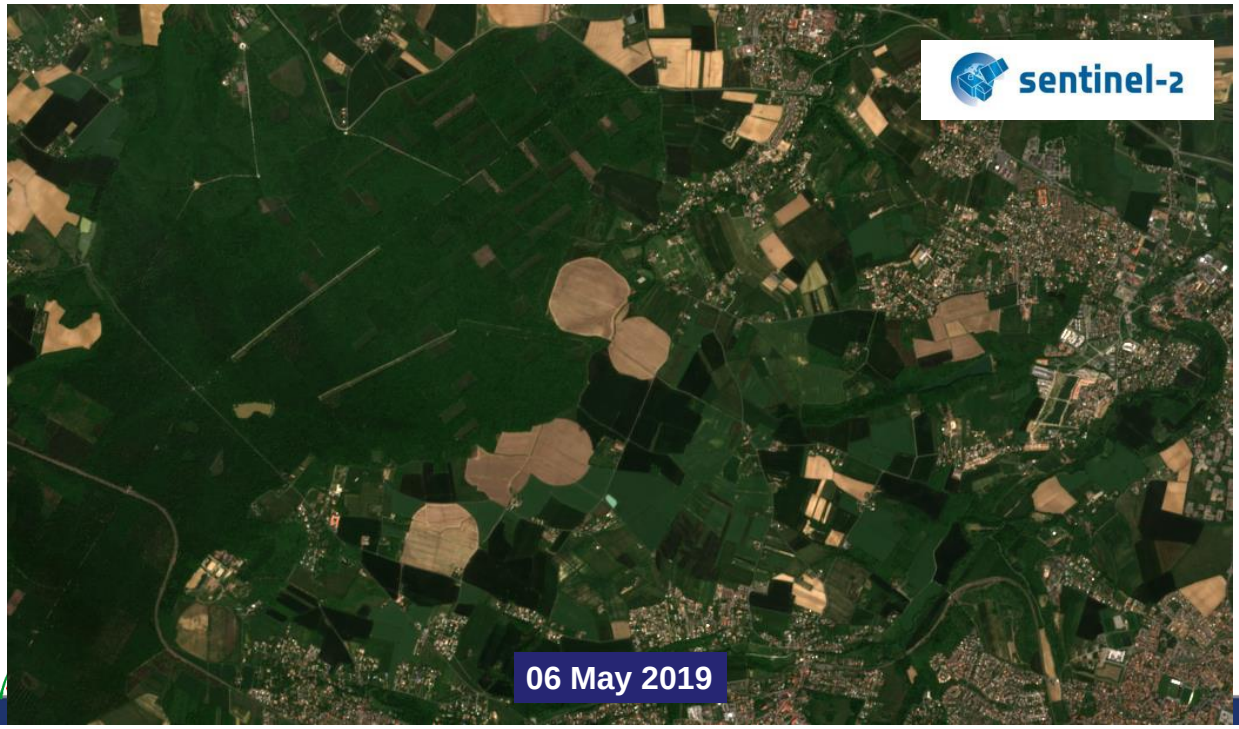

sentinel-2
27 March 2019

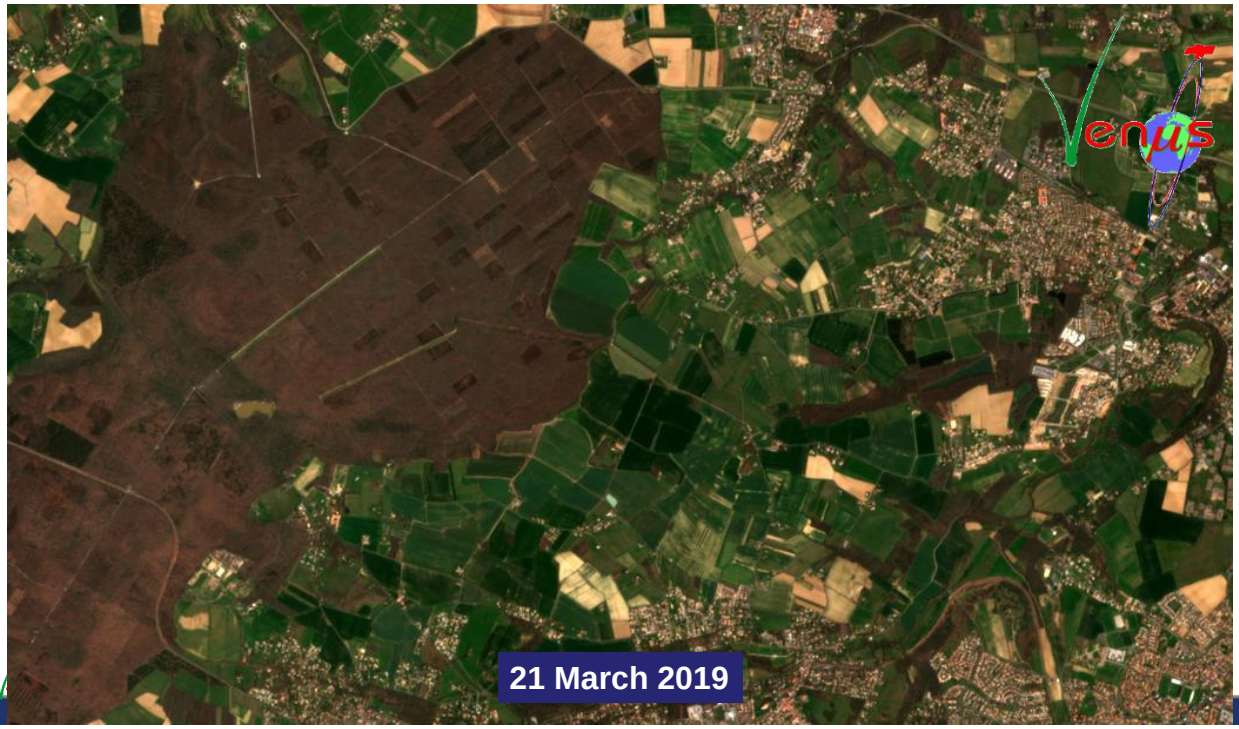

sentinel-2
01 April 2019


sentinel-2
11 April 2019


sentinel-2
16 April 2019


sentinel-2
01 May 2019


sentinel-2
06 May 2019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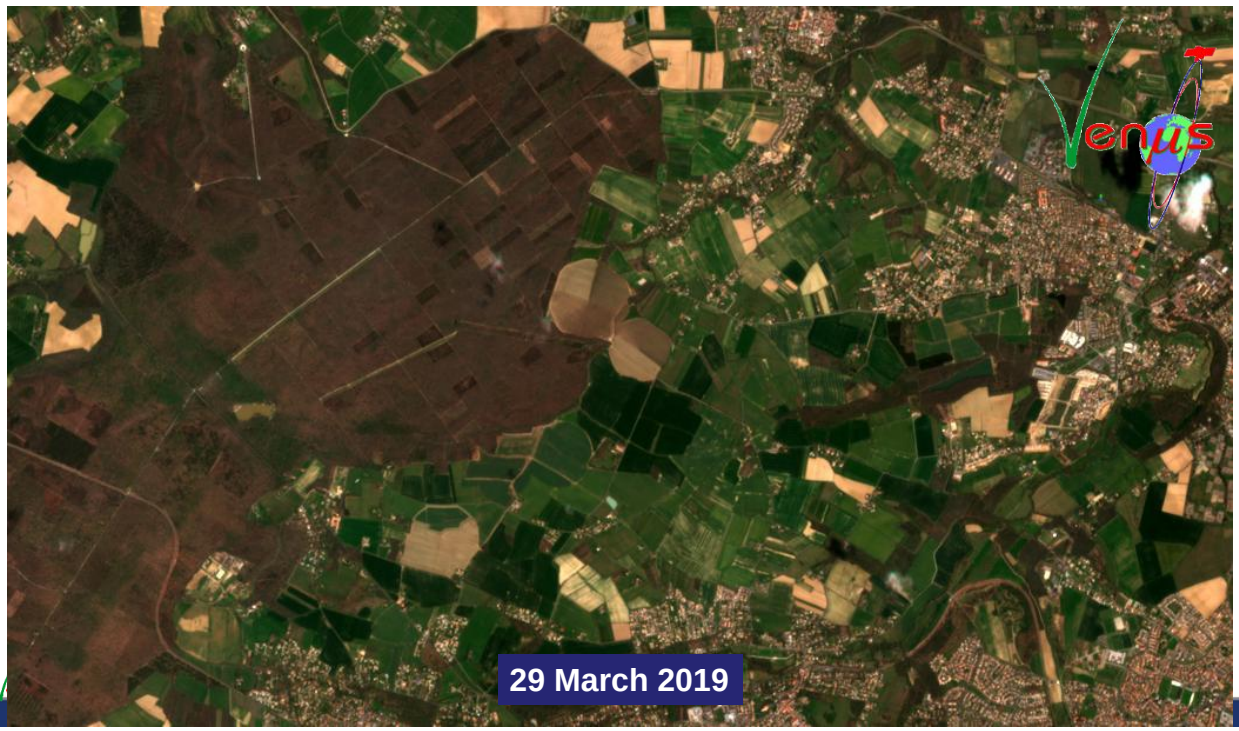
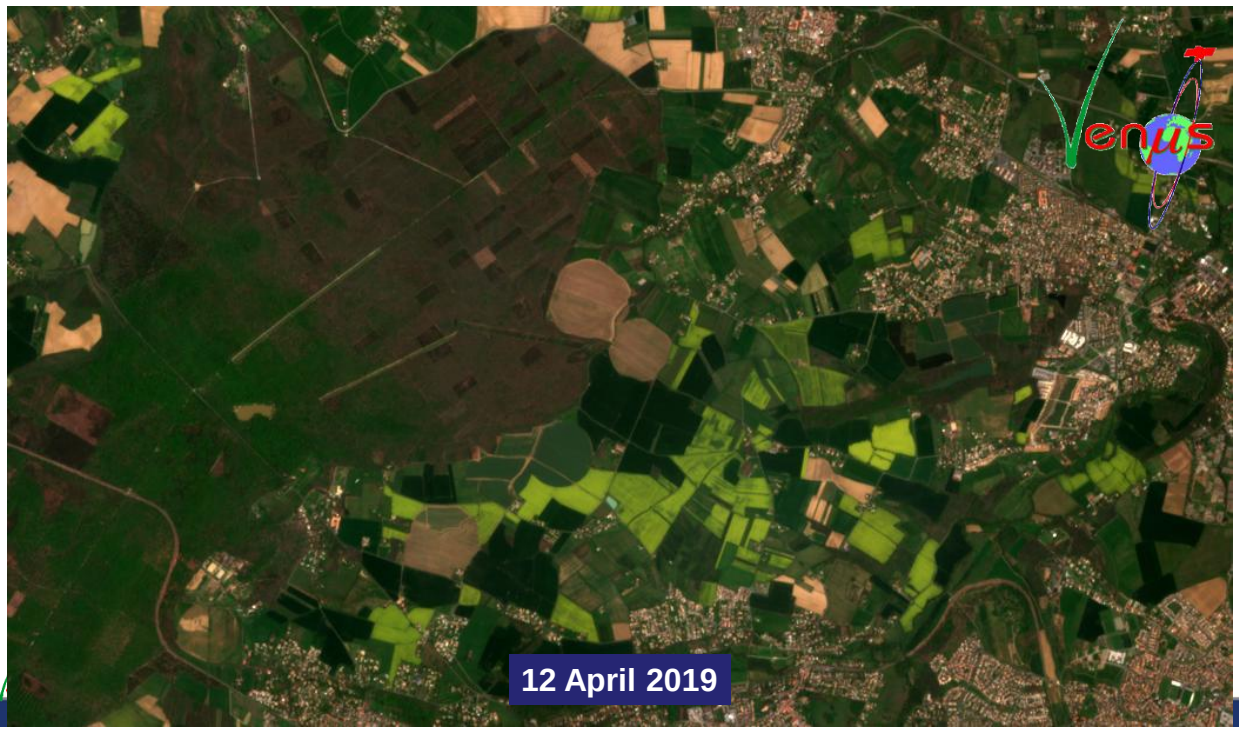
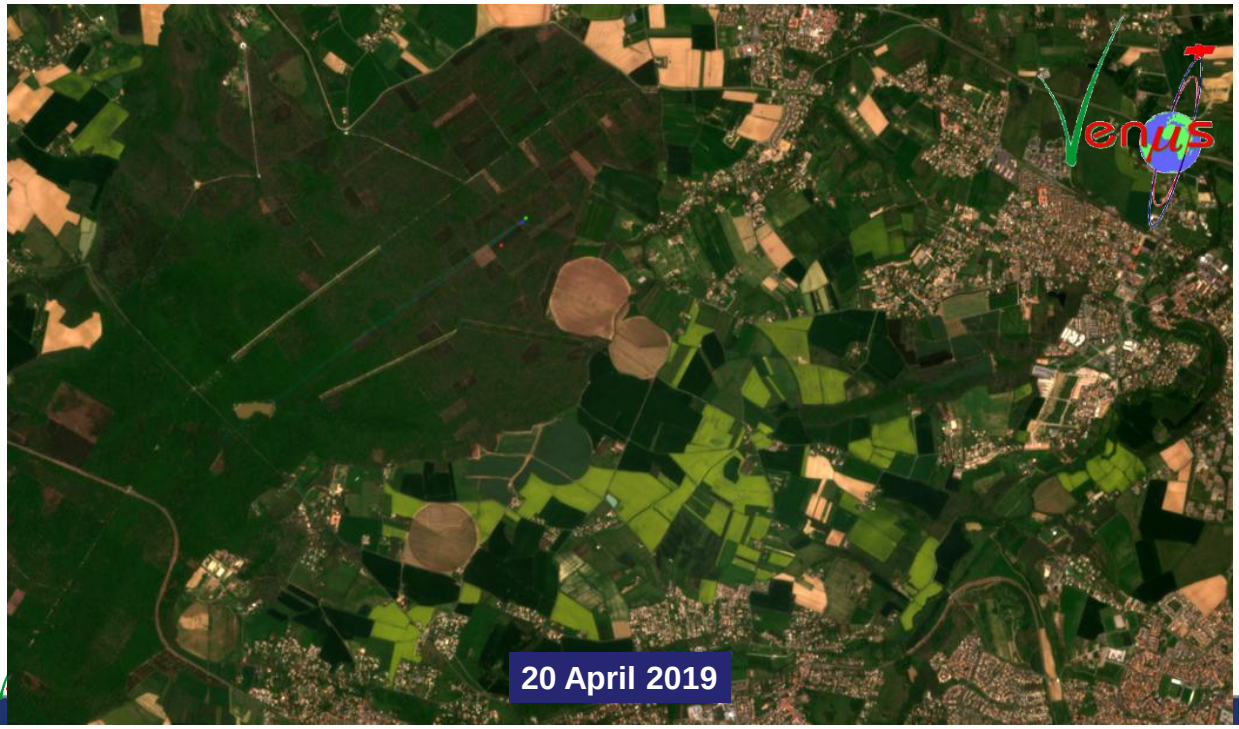
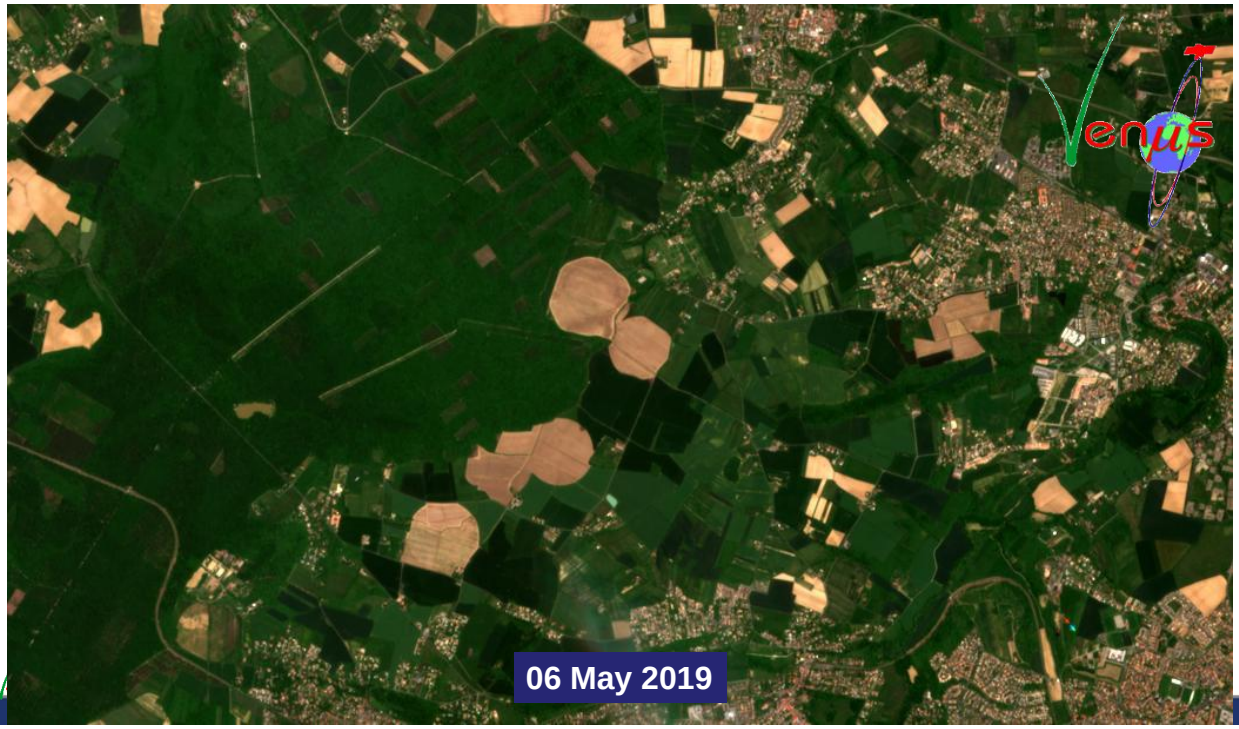

29 March 2019


31 March 2019


12 April 2019


20 April 2019


30 April 2019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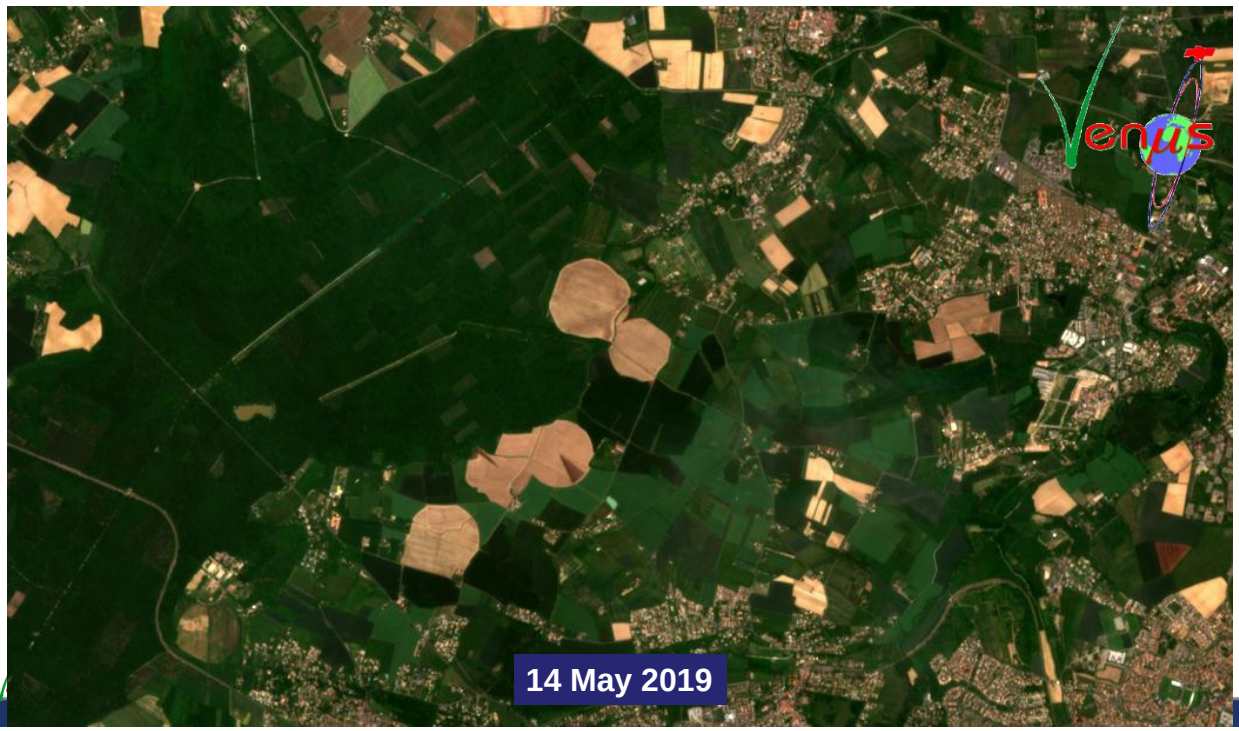
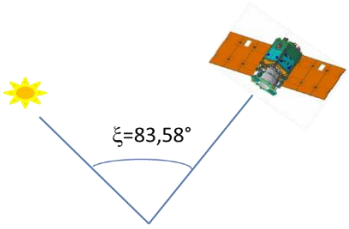

14 May 2019

October 15, 2019

Solar zenith angle	47.39
Solar azimut angle	168.48
View zenith angle	36.21
View azimut angle	346.17

Forward

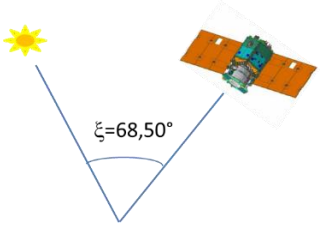


Phase angle

October 15, 2019

Solar zenith angle	47.56
Solar azimut angle	168.60
View zenith angle	23.12
View azimut angle	319.88

‘’~Nadir’’

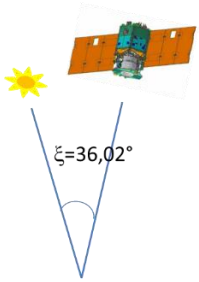


Phase angle

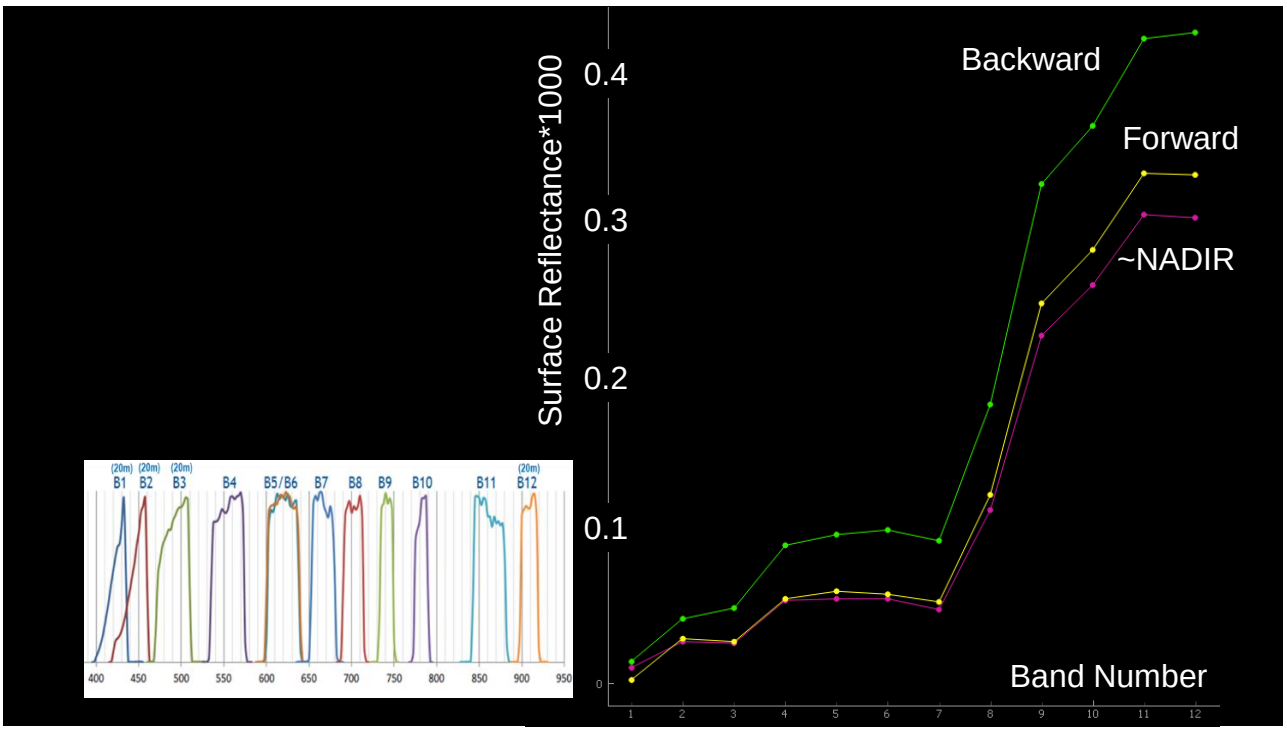
October 15, 2019

Solar zenith angle	47.31
Solar azimut angle	169.14
View zenith angle	38.76
View azimut angle	221.64

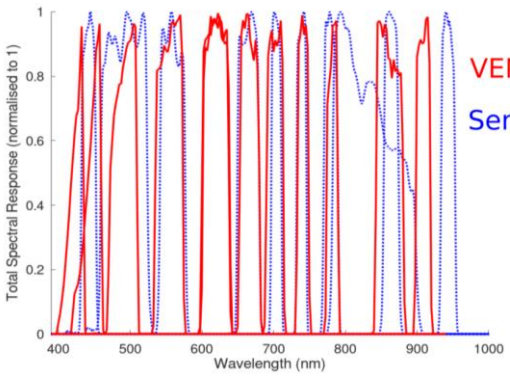
Backward

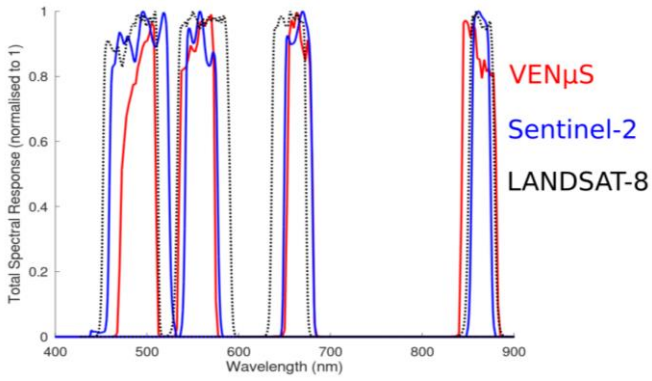


Phase angle



VENµS, Sentinel 2, Landsat 8 spectral bands





	VENµS	Sentinel-2	Landsat 8
Color Infrared (NIR, Red, Green)	11, 7,4	8a, 4, 3	5,4,3
Natural Color (Red, Green, Blue)	7,4,3	4,3,2	4,3,2
NDVI (Red, NIR)	7, 11	4, 8a	4, 5

JECAM **ESA Advanced Training on Land RS – Agriculture** (16-20 Sept. 2019), Louvain-la-Neuve (Be)

GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

GEO Knowledge Hub

Single place to discover, access and reuse the knowledge and results developed by the GEO Work Programme.

Text search **Mediation** **Linkage** **Open access**

Mediation: is the process of joint work by the GEO Secretariat and the Knowledge Hub contributors to ensure inclusion of trusted information

GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

GEO Knowledge Hub: Knowledge Building

Knowledge Building

- Semi Automatic Ingestion
- Knowledge Resources mediation
- Curation of the existing GEOSS Platform EO Resources if available
- Enrichment of GEOSS Platform with identified EO Resources and Respective Data Provider *if not yet available*

Screening the Scientific Publication to collect and mediate Knowledge around it, identifying all related essential resources, to create the related Knowledge Package.

GEOSS API

GEO SYMPOSIUM *De Salvo et al. (GEO)* #EO4IMPACT19

GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

GEO Knowledge Hub: resources identification

GEO Work Programme Community

↓

Knowledge Resources Identification and Collection

→

Resource types	Sources
Publications	Post-prints with DOI stored
Code, models, software & tools	Open source in Github with DOI. Backups.
Operational Environment	Virtual machine access (AWS for GEO)
Remote sensing data	GEOSS Platform and/or Cloud descriptions (e.g., STAC)
In situ data	GEOSS Platform, Data Repository, and/or KH database
Results and products	GEOSS Platform, Data Repository, and/or KH database
Videos, Other	Directly stored in the Knowledge Hub (preferably).

GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

The first pilot case presented at GEO symposium 2020: the Sen2-Agri system developed thanks to JECAM

GEOGLAM

Software

Github link - to Sent2Agri software code
https://github.com/Sen2Agri/Sen2Agri-System

Technical documents

http://www.esa-sen2agri.org/resources/technical-documents/

Training material

http://www.esa-sen2agri.org/training-beginners/
http://www.esa-sen2agri.org/training-1/

GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

The first pilot case presented at GEO symposium 2020: the Sen2-Agri system developed thanks to JECAM

GEOGLAM

Scientific Publications

Building a Data Set over 12 Globally Distributed Sites to Support the Development of Agriculture Monitoring Applications with Sentinel-2
http://www.esa-sen2agri.org/wp-content/uploads/Bontemps-et-al.-2015-Building-a-Data-Set-over-12-Globally-Distributed-S.pdf (DOI: 10.3390/rs71215815)

Tools/Methods/Software

http://www.esa-sen2agri.org/

Input Remote sensing data:

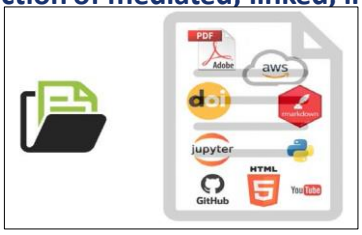
Sentinel 2,https://scihub.copernicus.eu/dhus/#/home
Access to Sentinel 2 from GEOSS Plattform
DIAS, AWS, Google
Landsat 8: http://landsat.usgs.gov/
Access to Landsat 8 GEOSS Platform
DIAS, AWS, Google

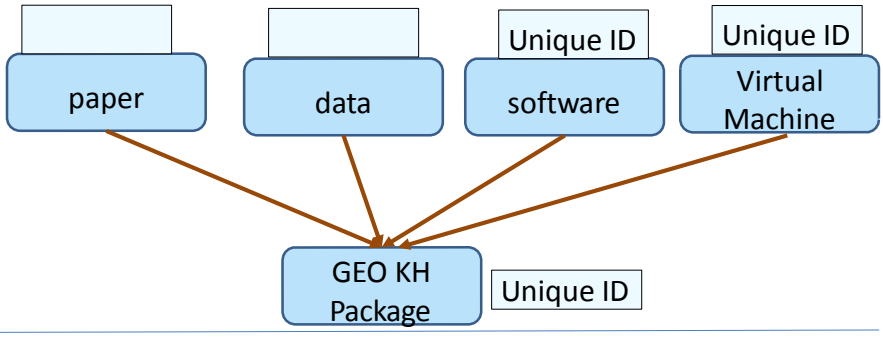
In situ Data: Not yet publically available

GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

Knowledge hub: collection of mediated, linked, indexed documents





JECAM
Joint Experiment for Crop Assessment and Monitoring

Survey for the next JECAM 2021 Annual Science Meeting

All JECAM partners Andrew Davidson, AAFC (Canada)

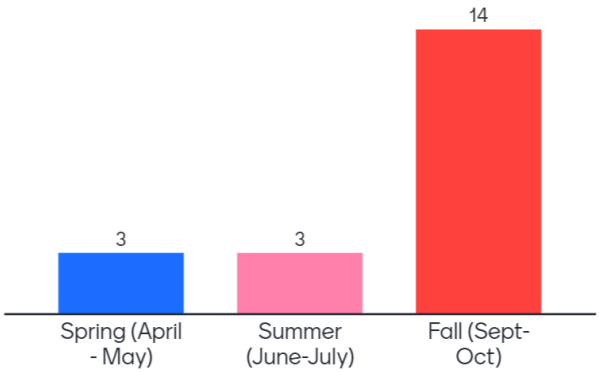
What is your preferred timing for the 2021 JECAM Meeting ?

Mentimeter

Go to **www.menti.com** and use the code **28 11 23**

What is your preferred timing for the 2021 JECAM Meeting ?

Mentimeter



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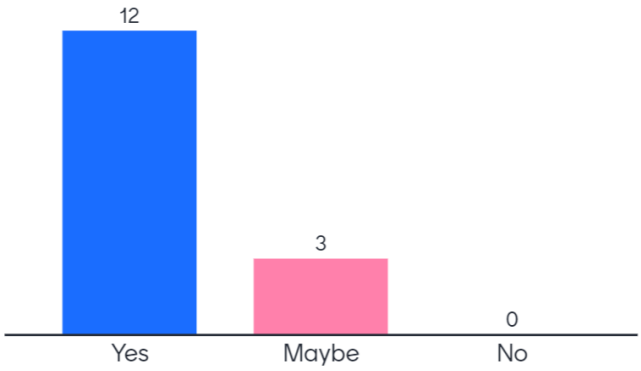
Go to www.menti.com and use the code 28 11 23

Do you have interest in attending a SAR for agriculture training (2 - 3 days) after the JECAM annual meeting ?

Mentimeter



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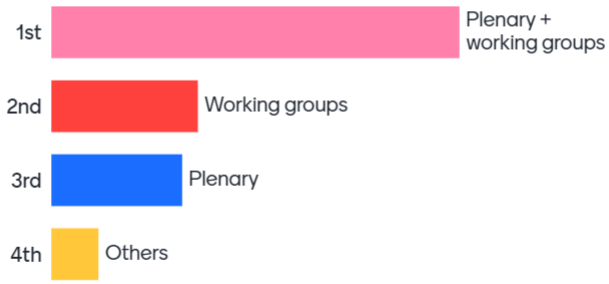
JECAM
Joint E

Go to www.menti.com and use the code 93 67 77

Do you have a preferred format for the 2021 meeting?

Mentimeter



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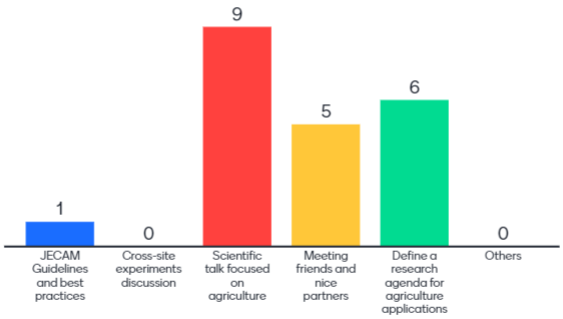
JECAM
Joint E:

Go to www.menti.com and use the code 93 67 77

What particular interests do you have that you may want to see discussed?

Mentimeter



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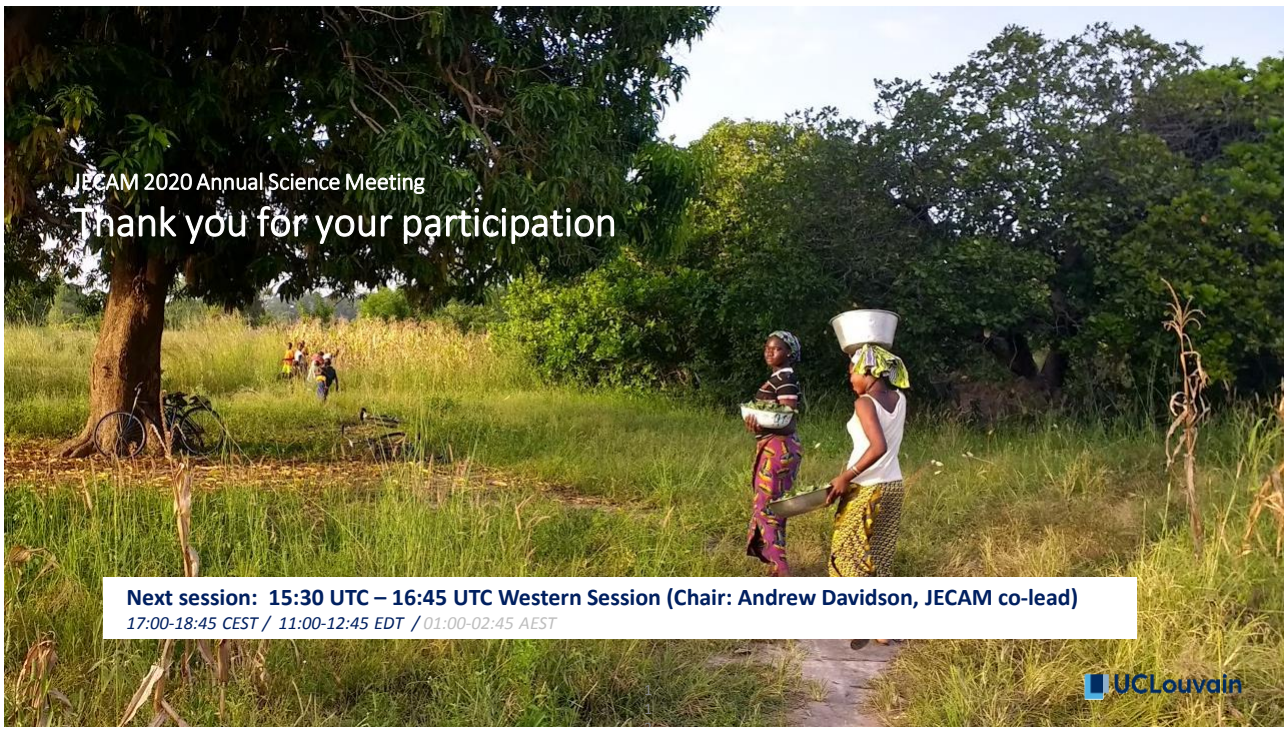


JECAM Joint Experiment for Crop Assessment and Monitoring

JECAM 2020 Annual Science Meeting

15:30 UTC – 16:45 UTC Western Session (Chair: Andrew Davidson, JECAM co-lead)
17:00-18:45 CEST / 11:00-12:45 EDT / 01:00-02:45 AEST

- Introduction of the new sites — **JECAM Co-lead** Andrew Davidson, AAFC (Canada)
- Review of the existing JECAM achievements — **JECAM Co-lead** Pierre Defourny for the lead authors
- JECAM site interests for future experiments - interactive session — **All JECAM partners**
  turning priority topics and opportunities into actions
  Interactive session on padlet
- Review of the website update status for each JECAM site — **JECAM Co-lead** Andrew Davidson, AAFC (Canada)
- Concluding remarks — **JECAM Co-lead** Pierre Defourny, UCLouvain (Belgium)

2020 JECAM Annual Meeting - 23 June 2020

JECAM Joint Experiment for Crop Assessment and Monitoring

GEOGLAM GLOBAL AGRICULTURAL MONITORING

Review of the existing JECAM achievements

Miao Zhang, Pierre Defourny, Andrew Davidson
JECAM co-leads
with inputs from co-authors of the existing experiments
23 June 2020

2020 online JECAM Annual Meeting

JECAM
Joint Experiment for Crop Assessment and Monitoring

Achievements and activities of joint experiments

Achieved experiments

→ Large field cropland mapping experiment
→ Crop type mapping experiment
→ Crowd/expert sourcing experiment for cropland validation
→ Calibration dataset experiment
→ SAR experiments

Ongoing experiments and activities

→ Experiment on the comparison of different training data sources for cropland mapping
→ Smallholder cropping system experiment
→ Crop type and biomass mapping based optical and SAR synergy

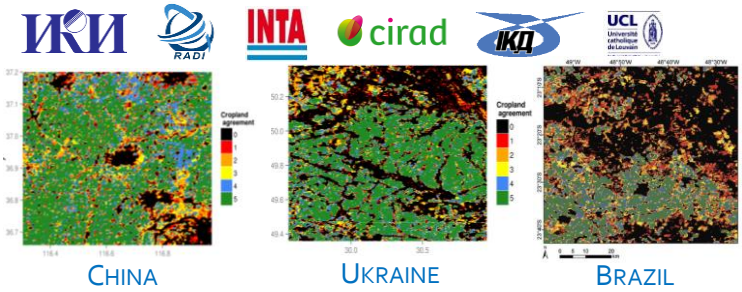
JECAM
Joint Experiment for Crop Assessment and Monitoring

SIGMA
Stimulating Innovation for Global Monitoring of Agriculture

Large field experiment

JECAM benchmarking of 5 cropland methods over 5 sites

5 partners testing 5 different methods to map cropland over 5 sites using the same 250 m MODIS time series and same in situ cal/val datasets



CHINA UKRAINE BRAZIL

Towards a set of agrosystem-specific cropland mapping methods to address the global cropland diversity

→ MODIS 250m imagery is capable to identify fields down to 20 ha
→ The site effect was found to persistently dominate the method effect
→ A subset of 20% of the training data would reach similar accuracy

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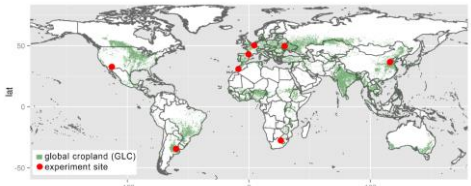
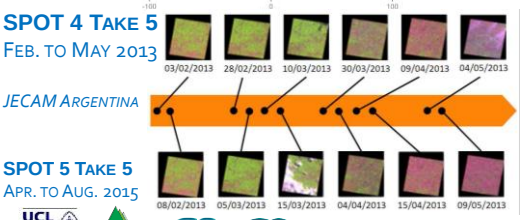
Crop type experiment

sentinel-2
→ AGRICULTURE

JECAM – cropland and crop types methods benchmarking

SPOT4(TAKE5) experiment uses SPOT4 at its end of life as a simulator to give us a hint of the time series that Sentinel-2 mission will provide





+ 12 site managers

over 12 sites in 2013; over 6 sites in 2015

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Crowd/expert sourcing experiment

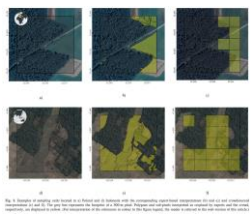
JECAM – SIGMA global cropland validation data collection

Integration of expert interpreted and crowdsourced data for cropland validation


Remote Sensing of Environment 221 (2019) 235–246
Contents lists available at ScienceDirect
Remote Sensing of Environment
journal homepage: www.elsevier.com/locate/rse

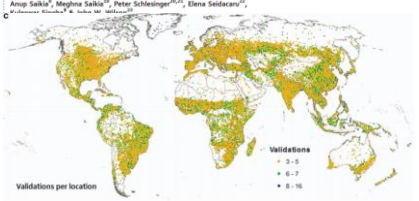
Conflation of expert and crowd reference data to validate global binary thematic maps

François Waldner[a,b,*], Anne Schucknecht[c,d], Myroslava Lesiv[e], Javier Gallego[c], Linda See[e], Ana Pérez-Hoyos[c], Raphaël d'Andrimont[a,c], Thomas de Maet[a], Juan Carlos Laso Bayas[e], Steffen Fritz[e], Olivier Leo[c], Hervé Kerdiles[c], Mónica Díez[f], Kristof Van Tricht[g], Sven Gilliams[g], Andrii Shelestov[h], Mykola Lavreniuk[h], Margareth Simões[i,j], Rodrigo Ferraz[i], Beatriz Bellón[i], Agnès Bégué[i,k], Gerard Hazeu[k], Vaclav Stonacek[l], Jan Kolomaznik[l], Jan Misurec[l], Santiago R. Verón[m,n], Diego de Abelleyra[m], Dmitry Plotnikov[o], Li Mingyong[p], Mrinal Singha[p], Prashant Patil[p], Miao Zhang[p], Pierre Defourny[a]




www.nature.com/scientificdata
SCIENTIFIC DATA
OPEN
Data Descriptor: A global reference database of crowdsourced cropland data collected using the Geo-Wiki platform

Juan Carlos Laso Bayas[1], Myroslava Lesiv[1], François Waldner[2], Anne Schucknecht[3,4], Martina Duerauer[1], Linda See[1], Steffen Fritz[1], Dilek Fraisl[1], Inian Moorthy[1], Ian McCallum[1], Christoph Perger[1], Olha Danylo[1], Pierre Defourny[2], Javier Gallego[3], Sven Gilliams[5], Ibrar ul Hassan Akhtar[6,7], Swarup Jyoti Baishya[8], Mrinal Baruah[8], Khangsembou Bungnamei[8], Alfredo Campos[9,10], Trishna Changkakati[8], Anna Cipriani[11,12], Krishna Das[8], Kasmee Das[8], Imarnani Das[8], Ryan Frankel Davis[13,14], Purabi Hazarika[8], Brian Alan Johnson[15], Ziga Malek[16], Monia Elisa Molinari[17], Kripal Panging[8], Chandra Kant Pawe[8], Ana Pérez-Hoyos[3], Parag Kumar Sahariah[18], Dhrubajyoti Sahariah[8], Anup Saikia[8], Meghna Saikia[18], Peter Schlesinger[19,20], Elena Seidacarov[21]



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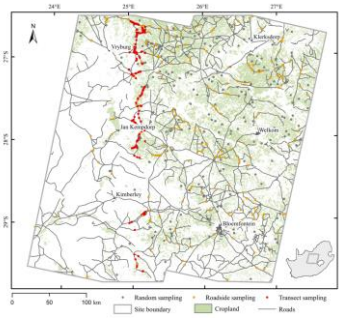
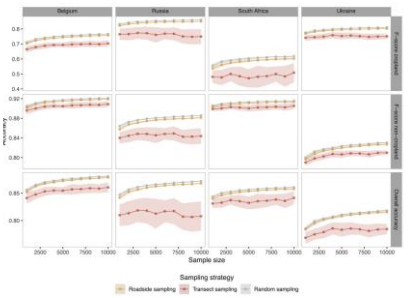
Calibration dataset experiments

Assess roadside sampling (windshield survey) for cropland mapping

The potential biases of roadside, random, and transect sampling was analyzed

→ Roadside sampling were significantly less representative than random sampling
→ The resulting maps using roadside samples were only 2% less accurate
→ Roadside sampling can be a viable source of training data for cropland mapping if the range of environmental and management gradients is surveyed





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SAR Cross-Sites Inter-comparison

Crop type and biomass mapping based optical and SAR synergy (ongoing)

19 sites sharing in situ data for a large experiment led by AAFC

Synthetic aperture radar and optical satellite data for estimating the biomass of corn

An investigation of inversion methodologies to retrieve the leaf area index of corn from C-band SAR data

Dipankar Mandal[a,*], Mehdi Hosseini[b], Heather McNairn[c], Vineet Kumar[a], Avik Bhattacharya[a], Y.S. Rao[a], Scott Mitchell[b], Laura Dingle Robertson[c], Andrew Davidson[c], Katarzyna Dabrowska-Zielinska[d]

[a] Microwave Remote Sensing Lab, Centre of Studies in Resources Engineering, Indian Institute of Technology Bombay, Mumbai, India
[b] Geomatics and Landscape Ecology Laboratory, Carleton University, Canada
[c] Agriculture and Agri-Food Canada, Ottawa, Canada
[d] Institute of Geodesy and Cartography, Warsaw, Poland

Quad and compact multitemporal C-band PolSAR observations for crop characterization and monitoring

Led by Heather McNairn, Andrew Davidson, Dingle-Robertson Laura and Mehdi Hosseini (AAFC)

JECAM Joint Experiment for Cr

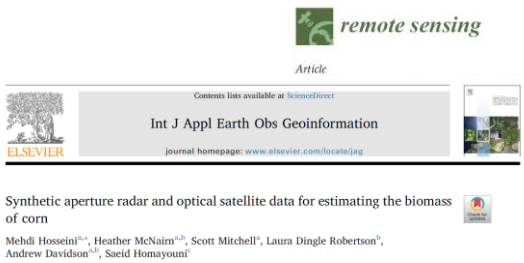
JECAM SAR experiments

Joint Experiment for Crop Assessment and Monitoring

GEO GROUP ON EARTH OBSERVATIONS

JECAM SAR Cross-Sites Intercomparison – Crop type and biomass mapping based optical and SAR synergy (ongoing)

19 ! sites sharing in situ data for a large experiment led by AAFC


remote sensing

Article

Contents lists available at ScienceDirect

Int J Appl Earth Obs Geoinformation

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Synthetic aperture radar and optical satellite data for estimating the biomass of corn

Mehdi Hosseini[a,*], Heather McNairn[a,b], Scott Mitchell[a], Laura Dingle Robertson[b], Andrew Davidson[a,b], Saeid Homayouni[c]


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Quad and compact multitemporal C-band PolSAR observations for crop characterization and monitoring

S. Homayouni[a,*], H. McNairn[b], M. Hosseini[c], X. Jiao[b], J. Powers[d]

ation in Preparation for the ssion (RCM)

anesh [1], Heather McNairn [2], am Salehi [4] and Saeid Homayouni [5,*]

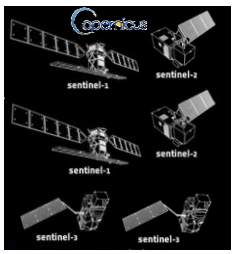
Canada

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Led by Heather McNairn, Andrew Davidson, Dingle-Robertson Laura and Mehdi Hosseini (AAFC)

2020 JECAM Annual Meeting - 23 June 2020

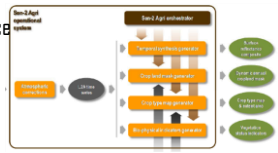
EO and IT (r)evolutions have changed the game in many cropping syst.



Free, open and long term data policy (US, EU,...)

ALOS-2
IRS AwiFS
HJ-1A/1B
...

Open source processing tools using ML algo.



CEOS

Coordination for EO systems redundancy & harmonization

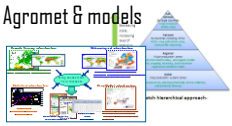
JECAM Joint Experiment for Crop Assessment and Monitoring

GEOGLAM

Global network with cross site experim.

Improved Meteo Data (e.g. GPM, ERAS,...)

Agromet & models

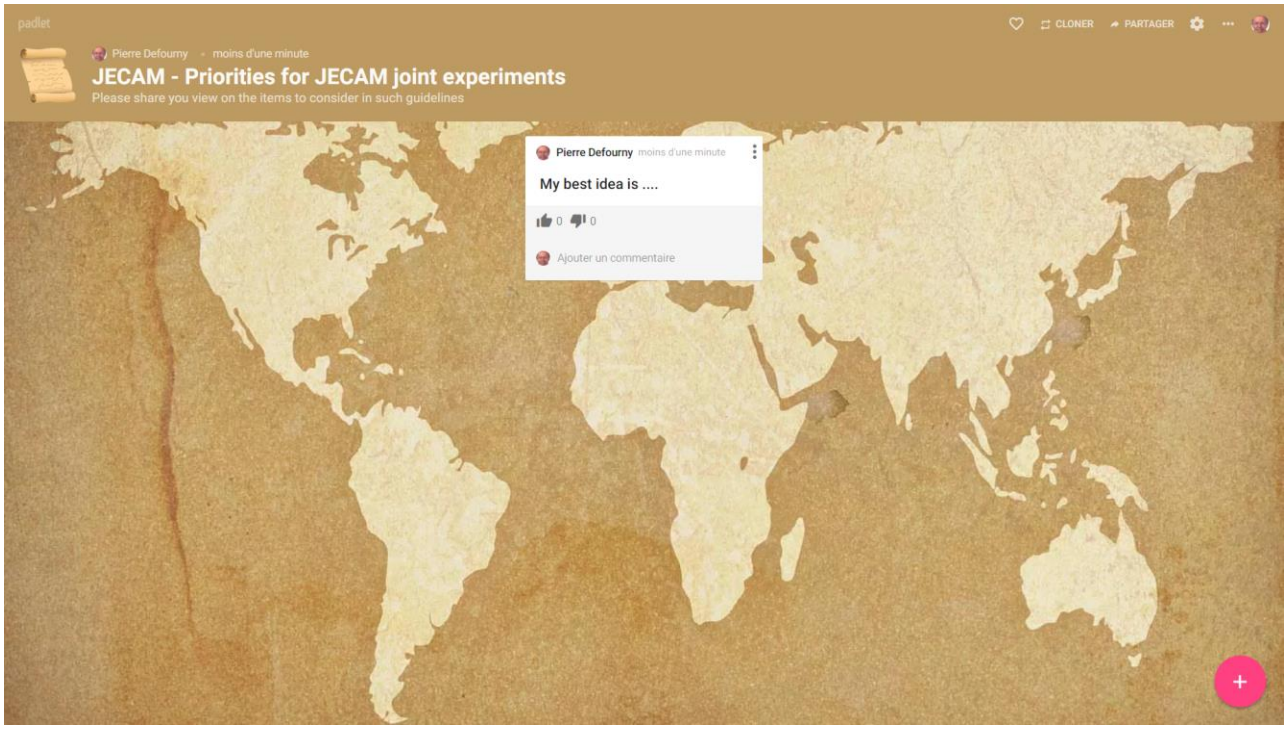


EO ag. basic products => field level

1. Cropland mapping
2. Crop type mapping
3. Biophys. var. (fCover, LAI,fAPAR)
4. Crop condition monitoring
5. Ag. practices monitoring
6. Crop advice/field zoning

Meteo-EO-stat model => regional

7. Nat./reg. production estimate


padlet
CLONER
PARTAGER
Pierre Defourny - moins d'une minute
JECAM - Priorities for JECAM joint experiments
Please share you view on the items to consider in such guidelines
Pierre Defourny moins d'une minute
My best idea is ....
0
0
Ajouter un commentaire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Jean Bouchat (UCLouvain)
Santiago Veron
Franz Waldner
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Diego de Abelleyra
BKB
Bimal Kumar Bhattacharya
YSC
Y.S. Cheng
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Shalini Saxena
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