JECAM
Joint Experiment for Crop Assessment and Monitoring

GROUP ON EARTH OBSERVATIONS

JECAM - Joint Experiment for Crop Assessment and Monitoring

Recent progress with SAR/Optical Inter-Comparison Projects

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Science and Technology Branch, Agriculture and Agri-Food Canada

GEOGLAM
Global Agricultural Monitoring

JECAM.ORG

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JECAM Origins

The GEO Agricultural Community of Practice established JECAM in 2009 to enhance international Collaboration

The JECAM research platform is now the foundation of GEOGLAM R&D

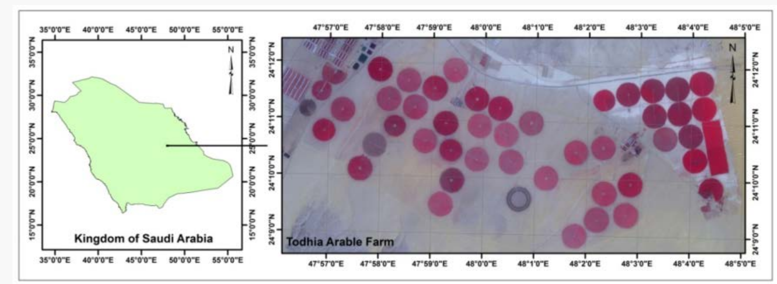
Currently supporting/supported by Sen2Agri (ESA) and SIGMA (EC) projects

Research towards operations focus

Website: JECAM.org

JECAM Principles

- **Collect and share** time-series datasets from a variety of Earth observing satellites and in-situ crop and meteorological measurements for each site.



- Develop **common standards** in definition, reporting methods and field protocols.

- The Committee on Earth Observing Satellites (CEOS) and member agencies support with the **acquisition and timely provision of data.**

- **Catalyze R&D activities across JECAM sites** to move from scientific state of the art to operational monitoring

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Global network of over 30 voluntary JECAM sites

Inter-Comparison Projects

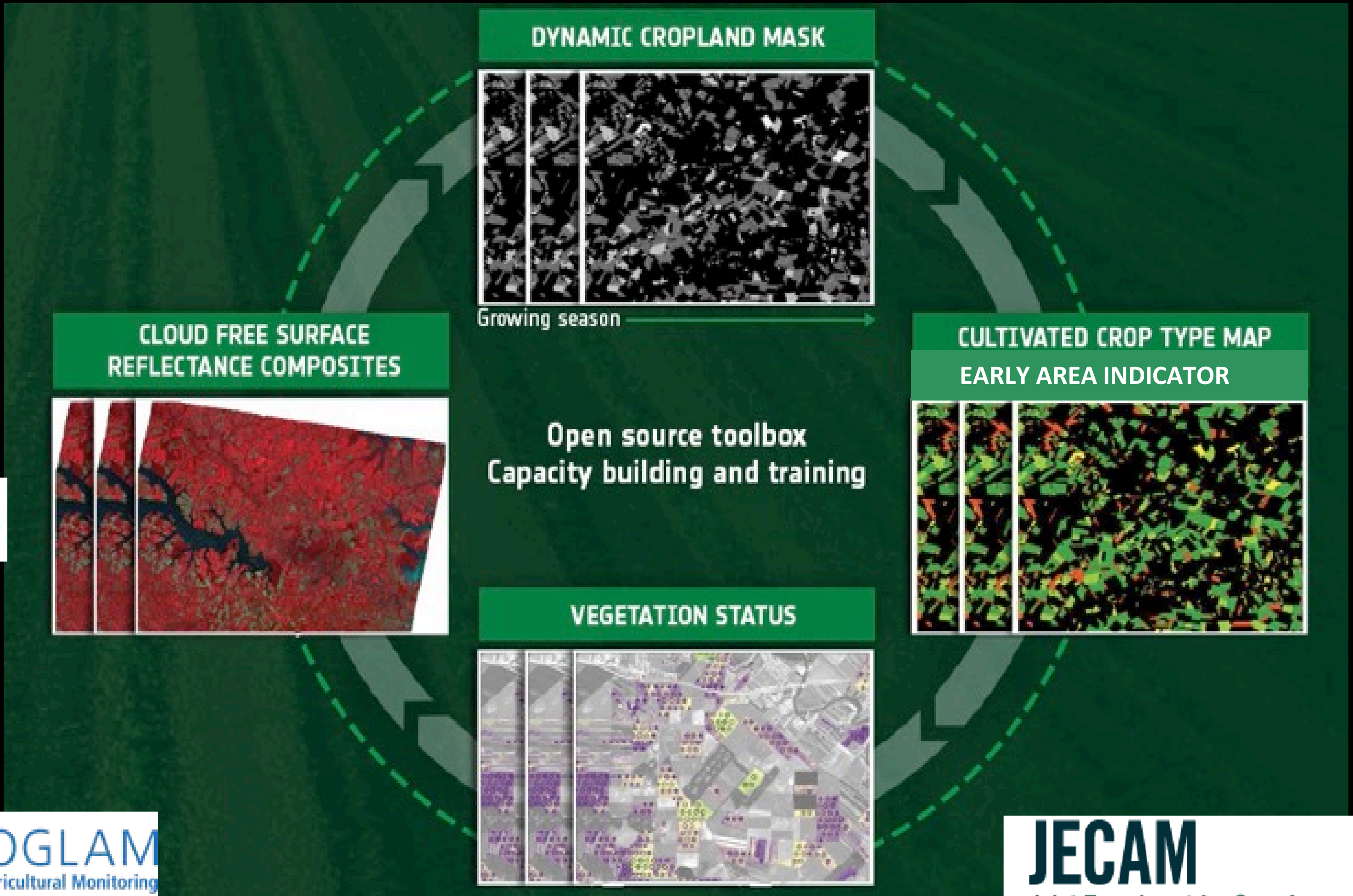
Sen2-Agri ESA Project- Focus on Action Ready Products
Crop condition, type, & area

sentinel-2

→ AGRICULTURE

ESA Sentinel-2 data for local to global agricultural monitoring - contribution to GEOGLAM

Project

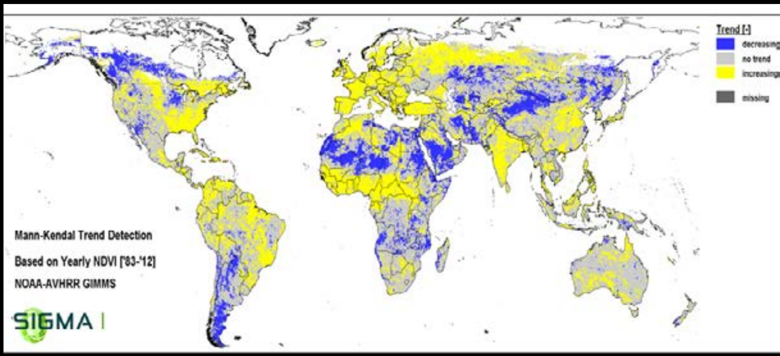


Key Users

Joint Experiment for Crop Assessment and Monitoring

SIGMA: Stimulating Innovation for Global Monitoring of Agriculture and its Impact on the Environment

- EC FP-7 Project
- Consortium lead by VITO (Belgium)
  - Partners in EC, Ukraine, Russia, China, Ethiopia, Kenya, Niger, Argentina, USA



- Contributing to Developing Standards and Best practices
  - Cross site experiments
    - Land cover mapping
    - Yield estimations
    - Agricultural Trend Analysis
- Capacity Needs Assessment-> selection of Priority countries
- Environmental Impact Assessment of Agricultural land use change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http://www.jecam.org/

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

This document is the first version of the JECAM Guidelines for field data collection. It has been prepared based on 24 JECAM site reports for 2013, and the discussions from several working sessions in the framework of different international on-going efforts, including the ESA Sen2Agri and FP7-SIGMA projects which supports this work. The JECAM partners also provided feedback and suggestions during the JECAM science meeting (21-23 July 2014, Ottawa). This is a living document and will be revised and updated as required.

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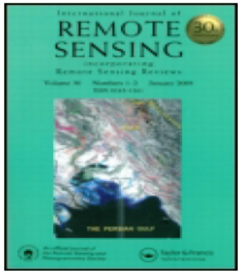
Cross-Comparison Case Study – SIGMA Optical Cropland

- Accurate cropland information is the foundation of for global crop monitoring
- An optical inter-comparison of cropland mapping methods using the JECAM network was conducted as part of the SIGMA Project (EC funded)



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

François Waldner, Diego De Abelleyra, Santiago R. Verón, Miao Zhang, Bingfang Wu, Dmitry Plotnikov, Sergey Bartalev, Mykola Lavreniuk, Sergii Skakun, Nataliia Kussul, Guerric Le Maire, Stéphane Dupuy, Ian Jarvis & Pierre Defourny

SIGMA

Stimulating Innovation for Global Monitoring of Agriculture

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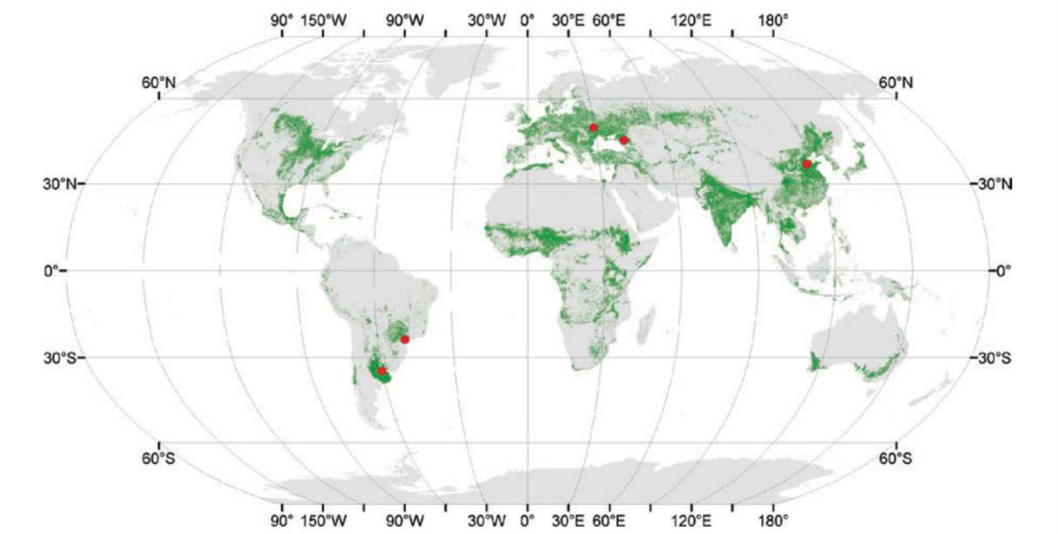
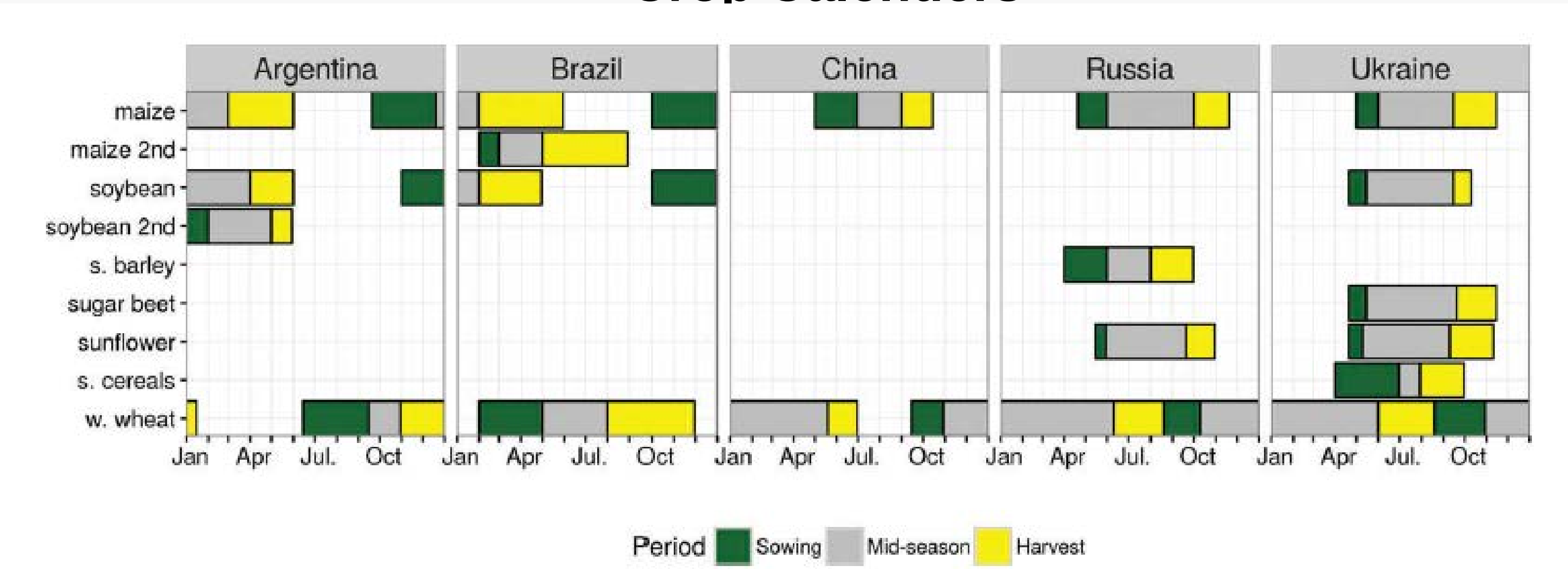
Cross-Comparison Case Study – SIGMA Optical Cropland

- This study compares five existing cropland mapping methodologies in five contrasting agro-ecosystems.
- Each of the methods were tested using 7-day 250 m MODIS mean composites, input satellite data as well as calibration and validation data were identical.

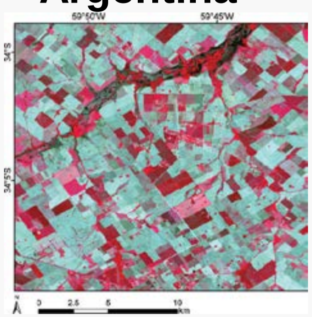


Crop Calenders

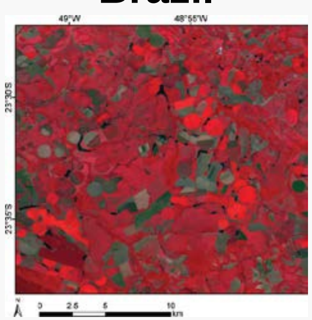


Landscape Pattern/Fragmentation

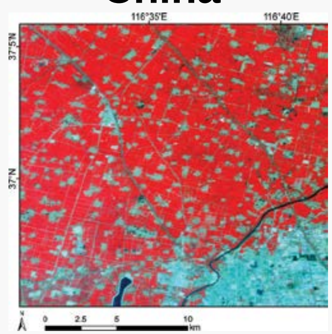
Argentina



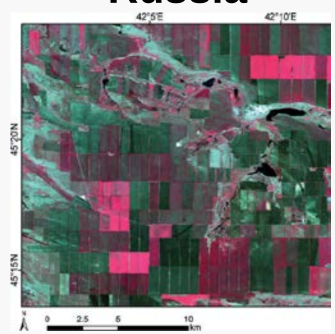
Brazil



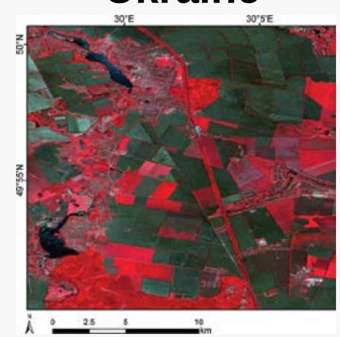
China



Russia



Ukraine



Cross-Comparison Case Study – SIGMA Optical Cropland

- Five supervised classification methods were trained and applied:
  - Maximum Likelihood, Support Vector Machines, Random Forest, LOGIT regression, and Neural Networks.

- The differences observed for the five methods in terms of spatial discrepancies and accuracy figures are good grounds for considering that two determinant factors for cropland identification are:
  - (1) the landscape fragmentation; and,
  - (2) the specificity of the agro-ecosystems in terms of land cover/crop type diversity and proportions rather than the algorithm itself

- the impact of satellite data quality (number of available composites, number of images per composites, residual aerosol effect, omitted cloud, shadow, or snow pixels) could also partly explain the differential performance across sites

Cross-Comparison Case Study – SIGMA Optical Cropland

Conclusions

- Overall accuracies ranged from 85% to 95% and displayed statistically significant difference in error rates
- Study confirmed that accurate cropland mapping is achievable with MODIS over fields of 20 ha or larger
- Results suggest a best practice is combine multiple classification approaches in a regionally specific way (i.e. one approach does not fit all)
- Factors affecting selected approaches include: Regional cloudiness; field size; landscape fragmentation; crop diversity,
- While this study provides insight into these affects for these sites, further study required to isolate the effect of landscape variables to provide prescriptive guidance on best approaches.

Radar (SAR) Cross-Sites Experiments Proposal (2016)

Crop Type Identification

The general objectives of this work package are to: (a) better understand how the addition of SAR imagery add value to existing crop mapping efforts, and (b) to develop a strategy for optimizing its broader implementation.

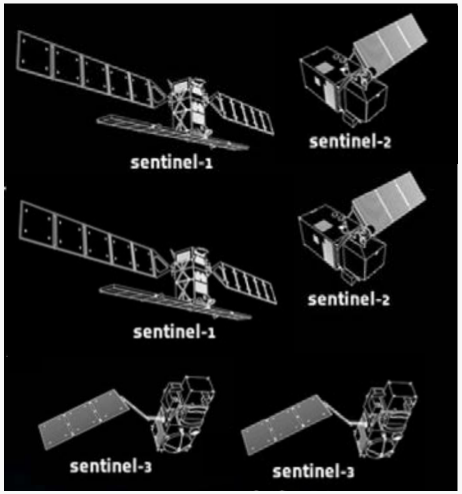
Particularly, we propose to:

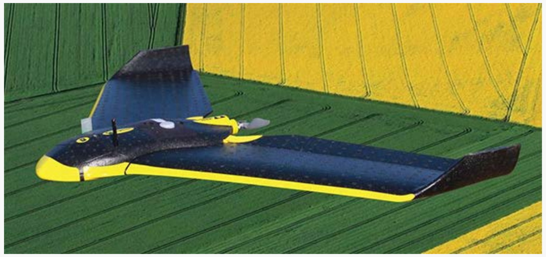
1. Evaluate how (i.e. when, where and by how much) the addition of C-Band SAR improves ability of current mapping efforts (usually optical-driven) to map crops with high accuracy over simple to unusual and complex agricultural systems.
2. Assess incremental benefits of using multi-frequency SAR (C-, L-, and X-band) for crop mapping using SAR-optical or SAR-only approaches.
3. Develop a capacity-building strategy to transfer knowledge so that partners (JECAM, Asia-RICE, others?) are prepared to strategically target and incorporate SAR data within operational crop mapping activities.
4. **Establish a critical mass of rice monitoring sites (an invitation)**

EO and IT (R)evolution Changing the Game

Monitor-Forecast-Response!

Copernicus





Free, open and long term data policy (EU)

Change much needed for agriculture and food supply chain for :

- Farm income stability
- Market stability
- Food supply security
- Improved use of land, soil and water
- Reduction of environmental impacts
- Climate change adaptation
- Pest and disease monitoring and forecasting…

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Global network with shared protocols

About Becoming a JECAM Member

- Simple process:
  - We just ask that members document the site
  - Complete and annual report describing their research
  - Be willing to share their science and data with other sites in the network
- The value sites get from JECAM in proportional to their engagement
- JECAM is a research platform, not a funder, however the coordinated nature of JECAM provides a compelling opportunity to attract research funding. (10M Euros plus from Europe and many millions in national funding support)
- You can contact JECAM through the JECAM website (JECAM.org) or directly to Ian Jarvis (ian.jarvis@agr.gc.ca)

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Thank You !