Welcome to the 1st webinar

The webinar will last around 1h

The slides will be available on the Sen4CAP website in the coming 48 hrs (http://esa-sen4cap.org/)

Presenters:

Sophie Bontemps & Philippe Malcorps from *UCLouvain*

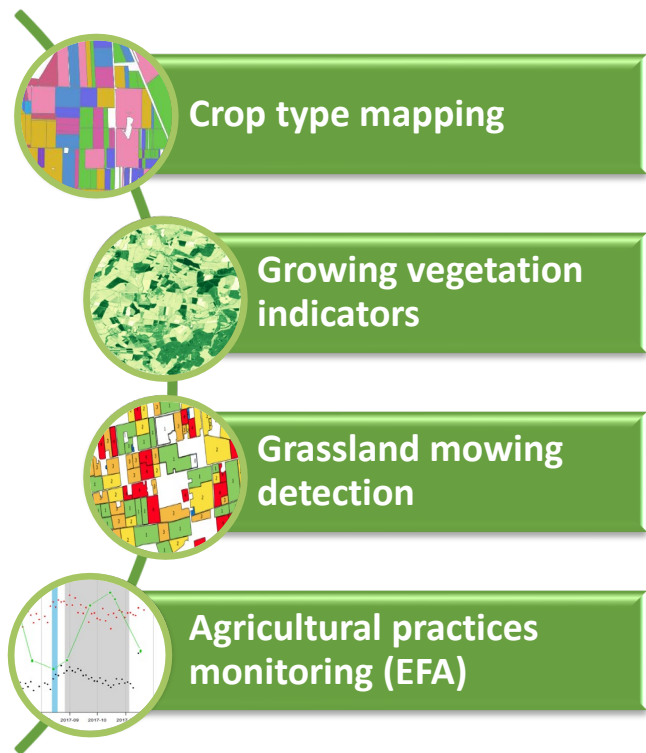**Members of the consortium available to answer your questions:**

Laura de Vendictis from *e-GEOS*; Lucie Savelkova, Lubos Kucera from *GISAT*; Katja Bajec from *Sinergise*; Cosmin Cara, Cosmin Udroiu, Laurentiu Nicola and Florin Tutunaru from *CS Romania*

Webinar outline

- Sen4CAP overview

- What's new since November 2019?

    o System download and test Virtual Machines

    o Capacity building & User support

    o One-year extension

- System evolution – what is planned?

- User perspective – sharing experience

- Next events

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- **Sen4CAP overview**

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Use Cases: Sentinels to support payment decisions

Crop type mapping

Growing vegetation indicators

Grassland mowing detection

Agricultural practices monitoring (EFA)

Use Cases
w/ Paying Agencies

Use case
Crop diversification
Permanent grassland identification
EFA-Land lying fallow
EFA-Catch crops
EFA-Nitrogen-fixing crops
Interactive visualization
Land abandonment
LPIS update
Claimless system

European Space Agency

From prototyping to NRT national demonstrations

Design and prototyping
2017 agri season – local sites

Demonstration and validation
2018 & 2019 agri seasons – national NRT
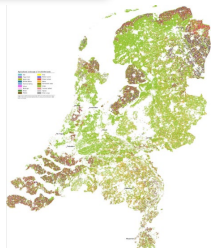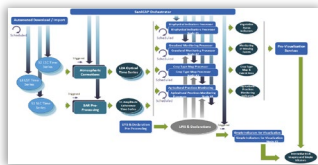
Use cases selection

Crop type mapping

Vegetation growing indicators

Grassland mowing detection

Agricultural practices monitoring

Products Specifications

Benchmarked Methods

Algo & System design

Prototype products

Validation
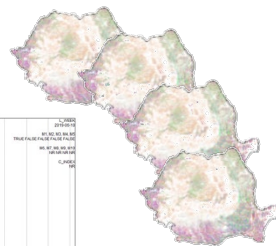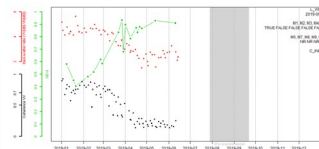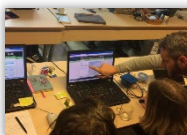
Use cases demonstration

National scale

Continuous monitoring

Validation & Fitness-to-use assessment

Capacity building and training

System qualification

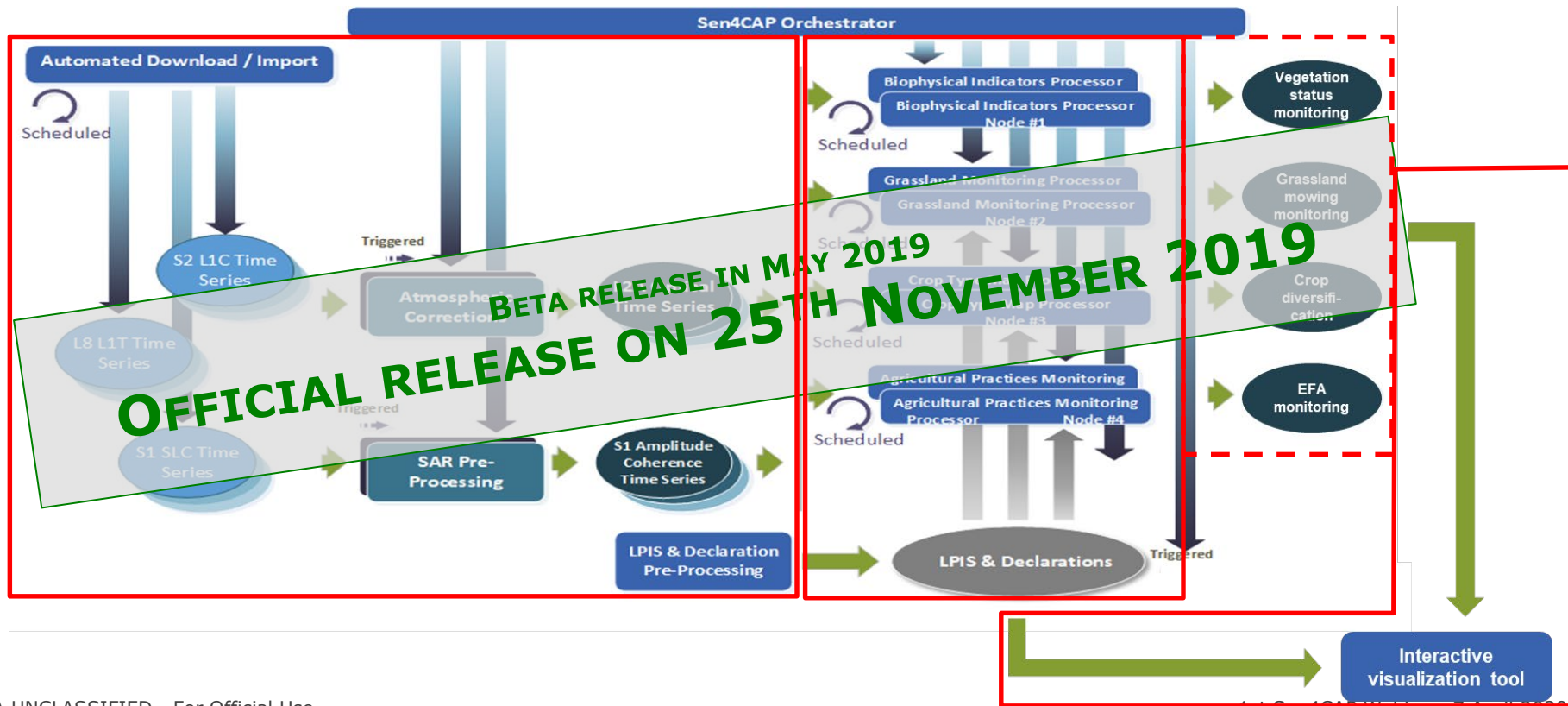Netherlands
Lithuania
France
Spain
Czech Republic
Romania
Italy

1st Sen4CAP Webinar, 7 April 2020

European Space Agency

Sen4CAP system (v1.0)

Input EO time series

Majority of Europe >2 day revisit

115

73

59
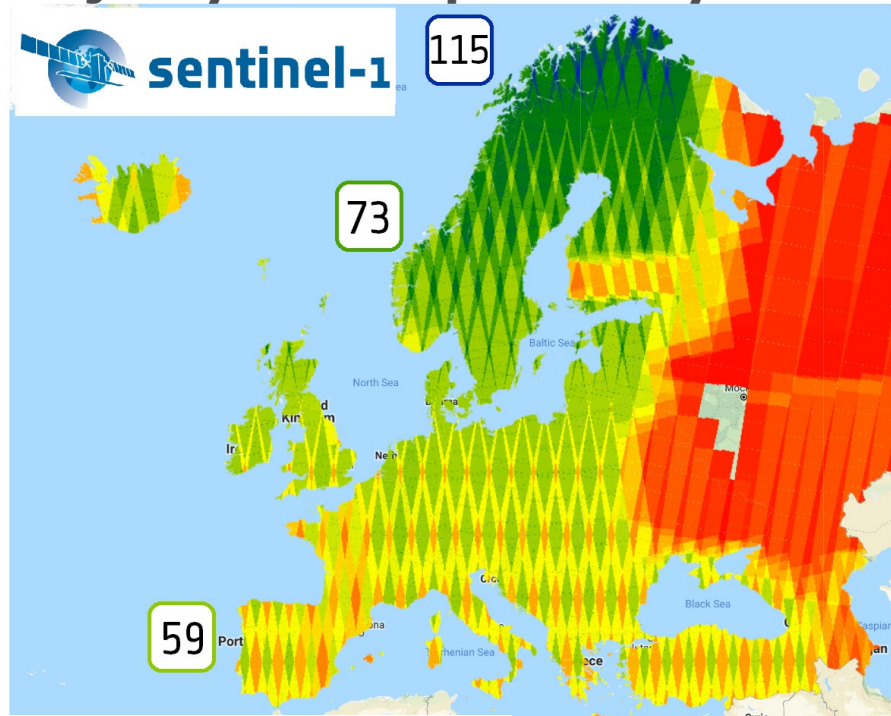
S-1A & -1B (July-Sept 2018)

Majority of Europe >3 day revisit

72

37

18
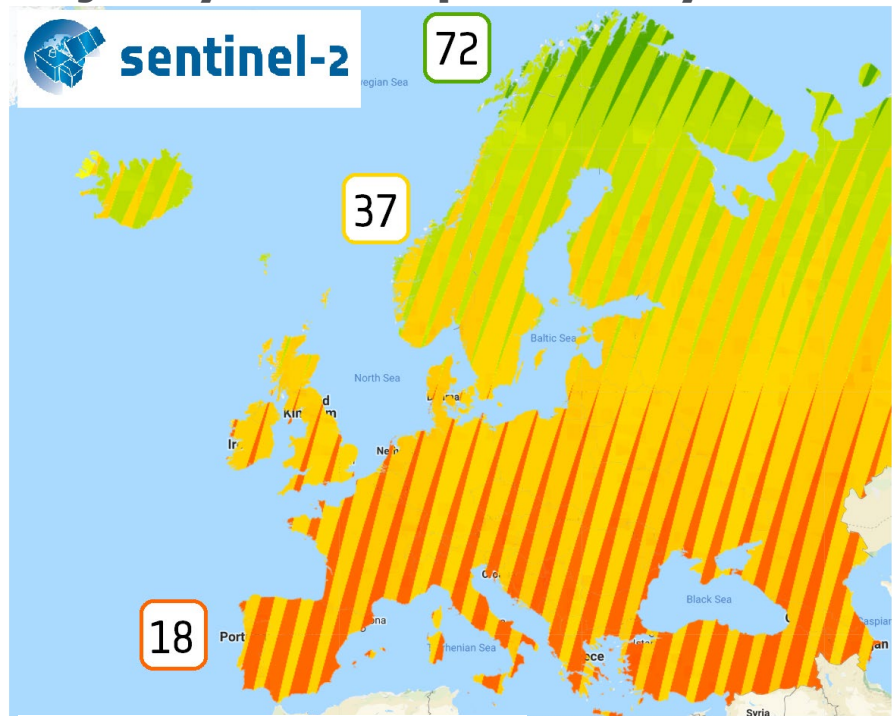
S-2A & -2B (July-Sept 2018)

1st Sen4CAP Webinar, 7 April 2020

European Space Agency

Sen4CAP system to process in near-real time full time series locally or on the cloud
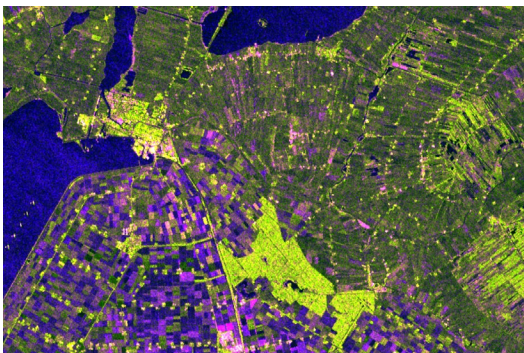
Metrics / markers stored for each LPIS/GSAA parcel

Crop type mapping

Growing vegetation indicators

Grassland mowing detection

Agricultural practices monitoring
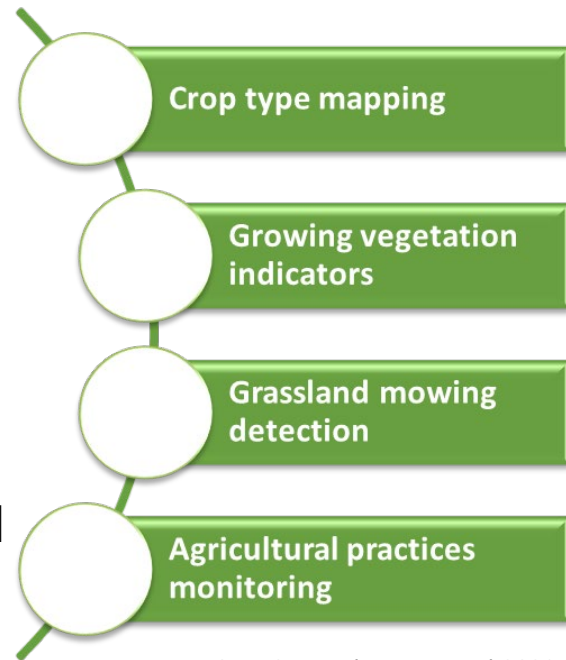
Sen4CAP system : simple parametrization and subsidy application upload

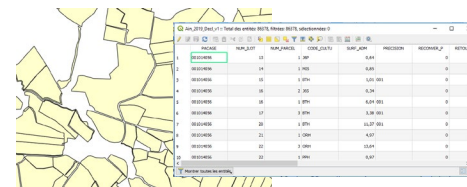| Before the monitoring period	Monitoring period

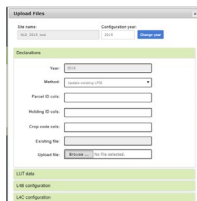**System initialization**

Start of the season

End of the season...

Subsidy application

Tables and config files

Upload data

Sen4CAP system : main parameters settings

Area of Interest	Shapefile to be uploaded
Monitoring period	Start and end dates to be defined
S1+S2 / S1+S2+L8	L8 to be selected

Sen4CAP system : data from PA

Subsidy application (shp)	Subsidy application layer (shapefile)
Tables and config files (csv)	L4A crop code LUT L4B config file L4C config file + agri practices tables
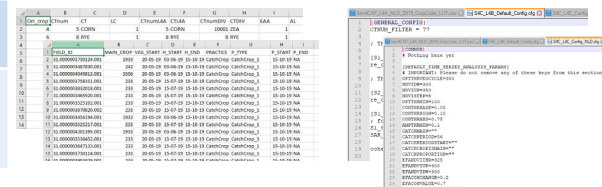
Sen4CAP is free and open source
Based on open source existing software

Under GNU-GPL License

Based on **Orfeo ToolBox** framework

Cluster-ready architecture for distributed processing

Integration of **SNAP** tools and processing chains

Operational system required : **CentOS7** (GNU/LINUX)

PostgreSQL and **PostGIS** implementation

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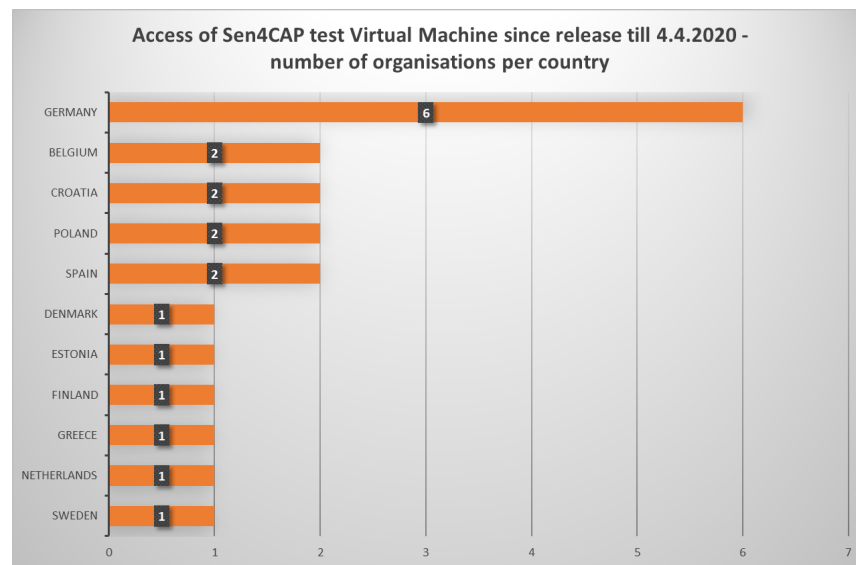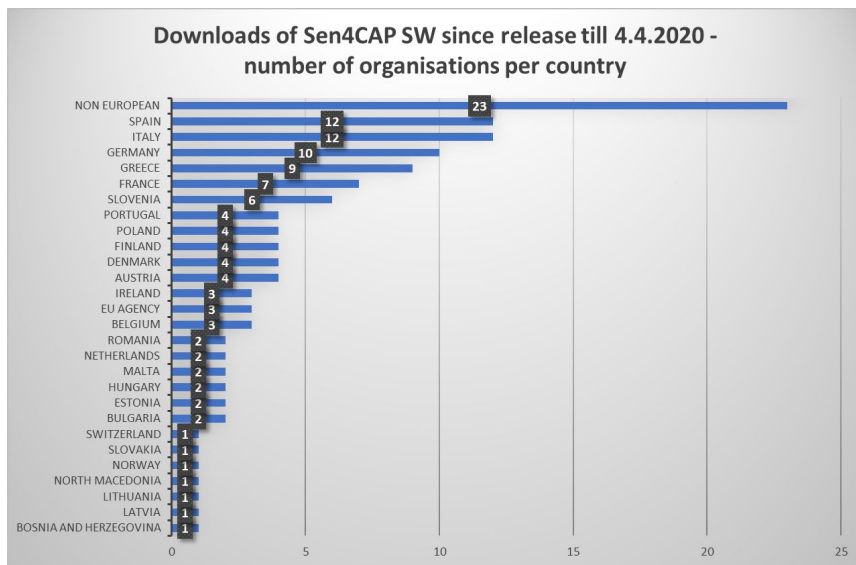
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System download & Test Virtual Machine

1.0 release candidate of the open-source Sen4CAP EO processing system

➢ **Installation package on our website or GitHub repository**

➢ **Access to a test virtual machine** (system already installed), for mandated PAs

Downloads of Sen4CAP SW since release till 4.4.2020 - number of organisations per country

Access of Sen4CAP test Virtual Machine since release till 4.4.2020 - number of organisations per country

1st Hands-On training in Belgium
20-21 January 2020

All material online
http://esa-sen4cap.org/

14h00-14h20	○	Welcome and introduction (P. Defourny, UCLouvain)
14h20-14h35	○	Sen4CAP system and visualization tool: objective, overview, architecture, data flow (S. Bontemps, UCLouvain; K. Bajec, Sinergise)
14h35-14h50	○	Subsidy application preparation (S. Bontemps, UCLouvain)
14h50-15h30	○	Crop type mapping from Sentinel-1 and Sentinel-2: concepts and methods, crop diversification use case (S. Bontemps & P. Malcorps, UCLouvain)
15h30-15h45	○	Biophysical indicators derived from Sentinel-2: concept and methods (P. Defourny, UCLouvain)
15h45-16h10	○	Break
16h10-16h50	○	Grassland mowing detection from Sentinel-1 and Sentinel-2: concepts and methods, permanent grassland monitoring use case (L. de Vendictis, e-GEOS)
16h50-17h30	○	Agricultural practices monitoring from Sentinel-1 and Sentinel-2: concepts and methods; EFA use case (L. Kucera, GISAT)
17h30-18h00	○	Questions and discussions

9h00-10h30	○	Hands-on training using Unix Virtual Machines on CREODIAS (P. Malcorps & S. Bontemps, UCLouvain; L. Nicola CS RO)
		▪ First steps with the Sen4CAP system for an automated usage
		▪ LPIS / GSAA data preparation and upload
10h30-11h00	○	Break
11h00-12h30	○	Hands-on training using Unix Virtual Machines on CREODIAS (continued)
		▪ Manual usage of the Sen4CAP processors
		▪ System installation and ICT requirements
12h30-14h00	○	Lunch
14h00-15h30	○	Hands-on training using the Sen4CAP products
		▪ Products download from the system (P. Malcorps & S. Bontemps, UCLouvain; L. Nicola CS RO)
		▪ Sen4CAP visualization tool (K. Bajec, Sinergise)
		▪ Products exploration in visualization (or QGIS) (P. Malcorps, UCLouvain; L. de Vendictis, e-GEOS; L. Kucera, GISAT)
15h30-16h00	○	Break
16h00-17h00	○	Hands-on training using the Sen4CAP products
		▪ Products exploration in visualization (or QGIS) (P. Malcorps, UCLouvain; L. de Vendictis, e-GEOS; L. Kucera, GISAT)
17h00-17h30	○	Questions and discussions

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Forum, documentation and online training

One-year extension

1. R&D: new processor for tillage indicator

2. System development

   ➢ General maintenance and bugs fixing – YOUR INPUTS NEEDED

   ➢ Interfacing the markers database

   ➢ Integrating a feedback mechanism

   ➢ Implement interfaces to all 4 DIAS platforms + Docker container

3. 2020 demonstration for our 7 pilot countries aiming at system uptake

4. Collaboration with NIVA project

   ➢ Development of specific APIs

   ➢ Specific IT and non-IT support and training

5. More capacity building and support to the whole users community

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System evolution – what are we currently working on?

- **Improved User Interface: statistics tab**

- **Markers database**

- **New DEM integration for Northern countries**

- **Processors improvements: example with the L4A crop type**

- Corrections in the Sen4CAP services for downloading, S1 preprocessing and also for importing user data (subsidy applications layer, configuration files, etc.)

- Corrections in the processors (L4A, L4B and L4C) especially for the automated mode and for specific users demands

- Testing production using ESA Sen2Cor products

- System components dockerization

Improved User Interface: statistics tab

- <u>Objective</u>: give **more information regarding raw data acquisition and preprocessing status**

- <u>2 sections</u>:
    - o Orbit Acquisition Reports
    - o Monthly Preprocessing Reports
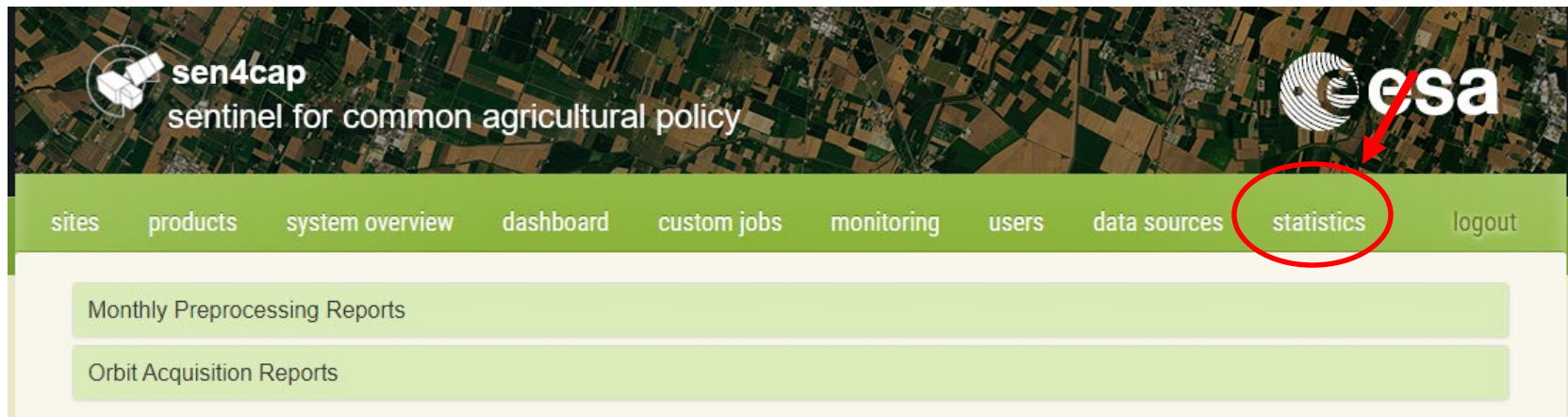
- <u>Orbit Acquisition Reports</u>

-> number and date of data acquisitions

April 2020
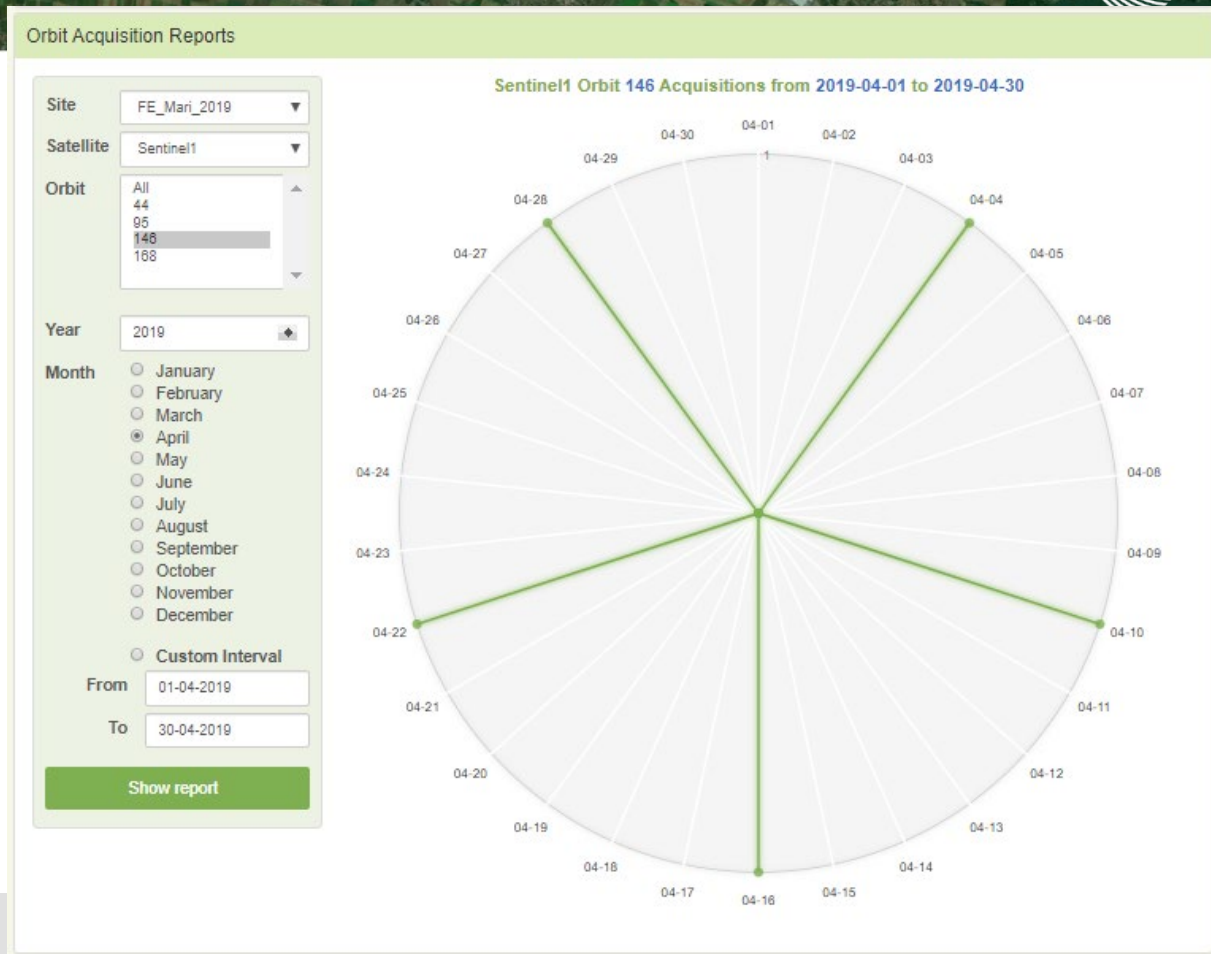
Improved User Interface: statistics tab

- <u>Monthly Preprocessing Reports</u>

-> preprocessing status
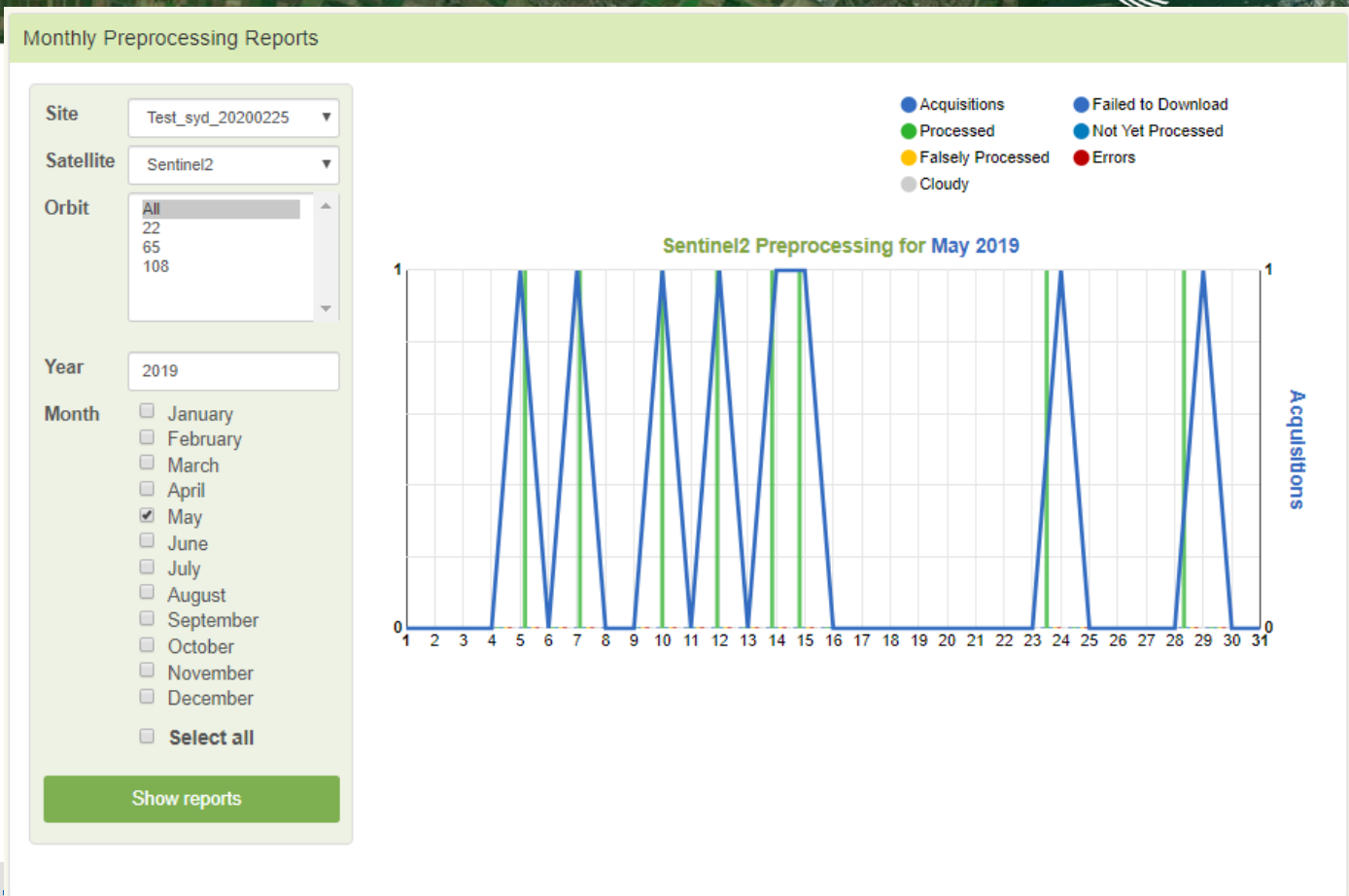
Markers database

- <u>Markers</u> = **S1/S2/L8 derived information averaged at parcel-level** (e.g. S1 coherence/amplitude, S2 reflectance values, NDVI, LAI, etc.)

- <u>2 types of services</u>:

  o Markers **stored in the markers database as tables**

    → Direct access to the tables containing the markers (SQL language)

    → REST API for accessing the markers via HTTP requests

  o Markers that can directly be derived from raster data served with REST API already available on DIASes, **on-the-fly extraction/calculation** (Sentinel Hub UI/BYOC API approach)

- <u>Current status</u>: **design** of the markers DB

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New DEM integration for Northern countries

- <u>Problem</u>: **SRTM** used in MAJA (S2 preprocessing) and SNAP (S1 preprocessing) **defined only to 60° N/S of latitude**!

- <u>Solution</u>: to use the **EU-DEM v1.1** from Copernicus services

https://land.copernicus.eu/imagery-in-situ/eu-dem/eu-dem-v1.1

European Space Agency
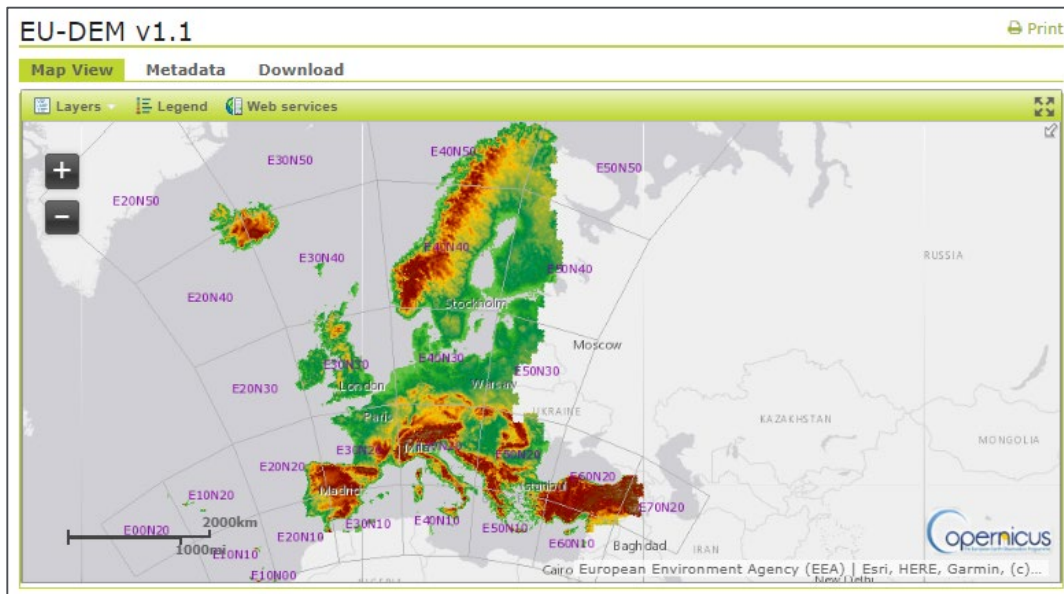
New DEM integration for Northern countries

- Current status: problem with the long **reading step** of the EU-DEM rasters in **SNAP**

  o Will be fixed in the **next version of SNAP** (version 8.0) that should be released in April

  o **Other solution**: to reproject and split the EU-DEM rasters to get a similar format than the SRTM

- Opportunity: to test the adaptability of the system to handle **any local (national) DEM**

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Processors improvements: example with the L4A crop type

- <u>For now</u>: L4A crop type outputs
    - Parcels shp and csv, with the **results of the classification**
    - Different csv and rds files containing
        -> the **calibration and validation « markers » that are used for the classification**: it does not contain id of the parcels
        -> the **results of the validation**: it needs further commands (in R) to proper extract the results
- <u>Objective</u>: final outputs generated by the processor, directly usable and interpretable by the user

Processors improvements: example with the L4A crop type

- <u>Objective</u>: final outputs generated by the processor, directly usable and interpretable by the user

Accuracy_metrics_0402_1250
Accuracy_metrics_plot_0402_1250
Confusion_matrix_0402_1250
Confusion_producer_0402_1250
Confusion_user_0402_1250

Validation results

Data_calibration_final_after_smote_0402_1249
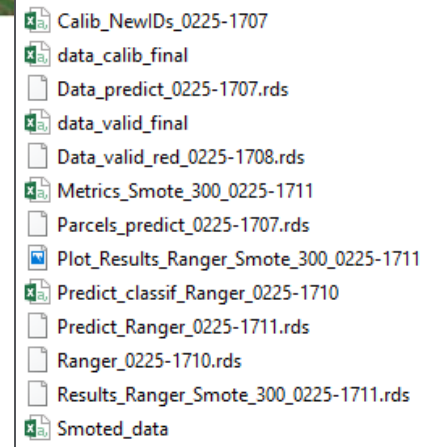Data_calibration_final_before_smote_0402_1249
Data_validation_final_0402_1249
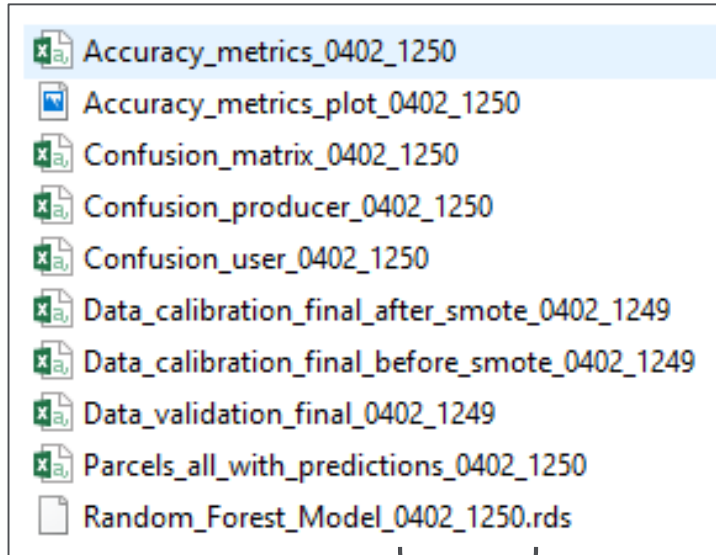
Markers used for the classification
+ integration in the markers DB

Parcels_all_with_predictions_0402_1250

Parcels with classification results

Random_Forest_Model_0402_1250.rds

Random Forest model

Date and hour

Calib_NewIDs_0225-1707
data_calib_final
Data_predict_0225-1707.rds
data_valid_final
Data_valid_red_0225-1708.rds
Metrics_Smote_300_0225-1711
Parcels_predict_0225-1707.rds
Plot_Results_Ranger_Smote_300_0225-1711
Predict_classif_Ranger_0225-1710
Predict_Ranger_0225-1711.rds
Ranger_0225-1710.rds
Results_Ranger_Smote_300_0225-1711.rds
Smoted_data

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Go to:

http://etc.ch/jiBY

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Next events

- Webinars going on …
  - May 5th
  - June 2nd

- Online training on April 21 – general presentation and system operation

- New version will be released during April

- **Your request ???**

Thank you for your attention
and your contribution

sen4cap
common agricultural policy