



What does the Sentinel 2 offer (not only) to agriculture?



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Copernicus...securing long term continuity of systematic observations from Space



2011

2015

2020

2030

Access to Contributing Missions

S-1 A/B/C/D

S-1 A/B 2nd Generation

S-2 A/B/C/D

S-2 A/B 2nd Generation

S-3 A/B/C/D

S-3 A/B 2nd Generation

S-4 A/B (on MTG)

S-5 Precursor

S-5 A/B/C (on MetOp-SG)

S-6 A/B

SECOND LAUNCH
25.04.2016
FIRST LAUNCH
3.04.2014

SECOND LAUNCH
2017
FIRST LAUNCH
23.06.2015

FIRST LAUNCH
16.02.2016

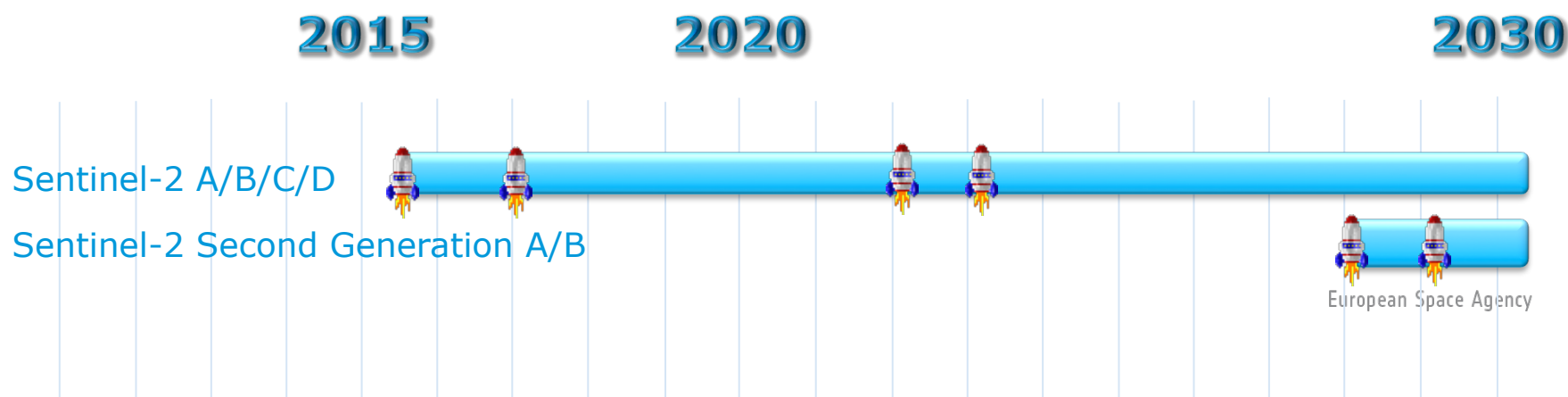
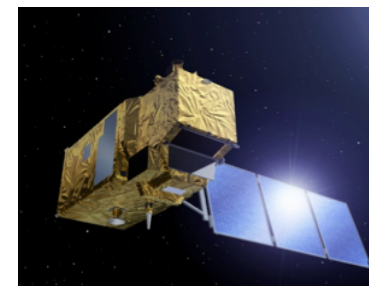
FIRST LAUNCH
2016



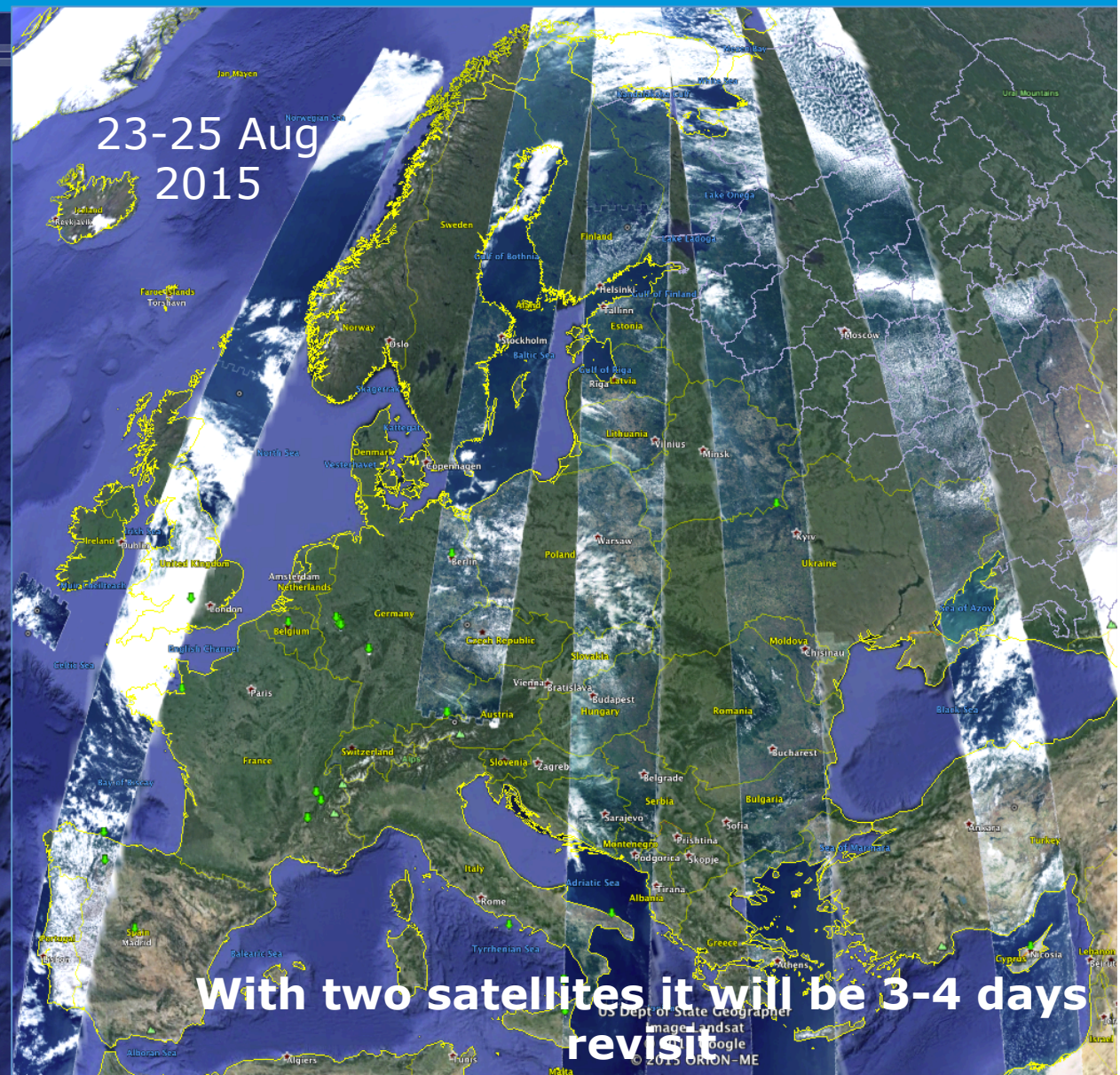
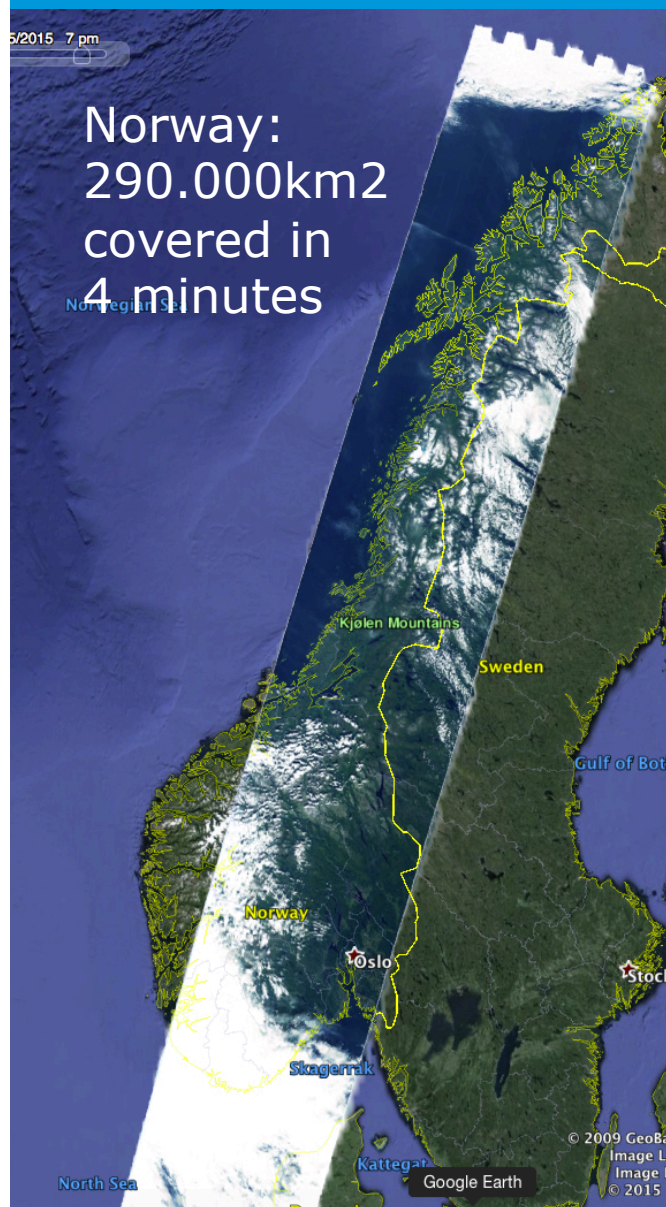
Sentinel-2 Mission Overview



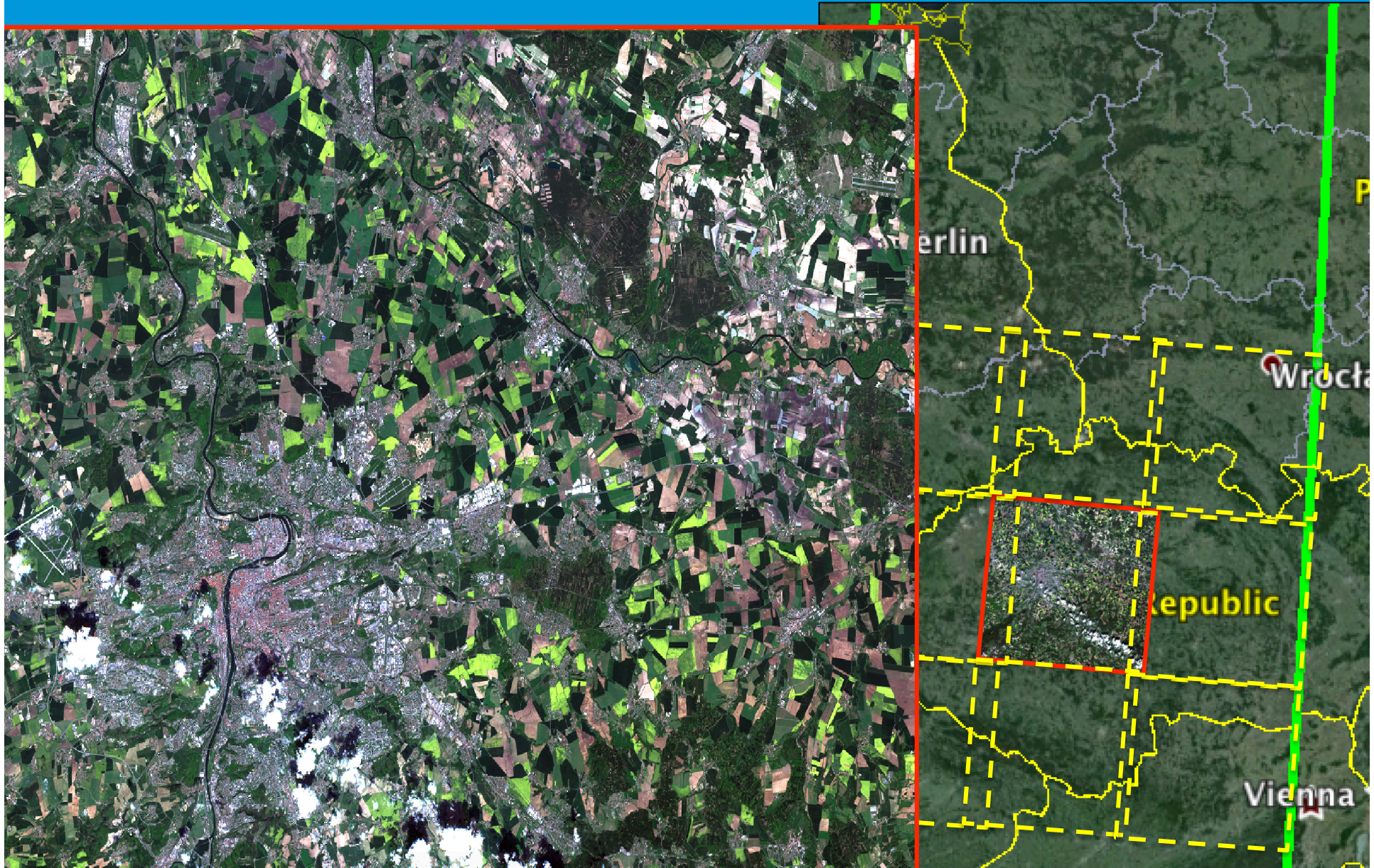
- **Spacecrafts**: 2 operating in twin configuration
- **Orbit**: Sun-synchronous at 786 km (14+3/10 revs per day), with LTDN 10:30 AM
- **MultiSpectral Instrument (MSI)**: operating in pushbroom principle, filter based optical system
- **Spectral bands**: 13 (VIS–NIR–SWIR spectral domains)
- **Spatial resolution**: 10m / 20m / 60m
- **Swath**: 290 km



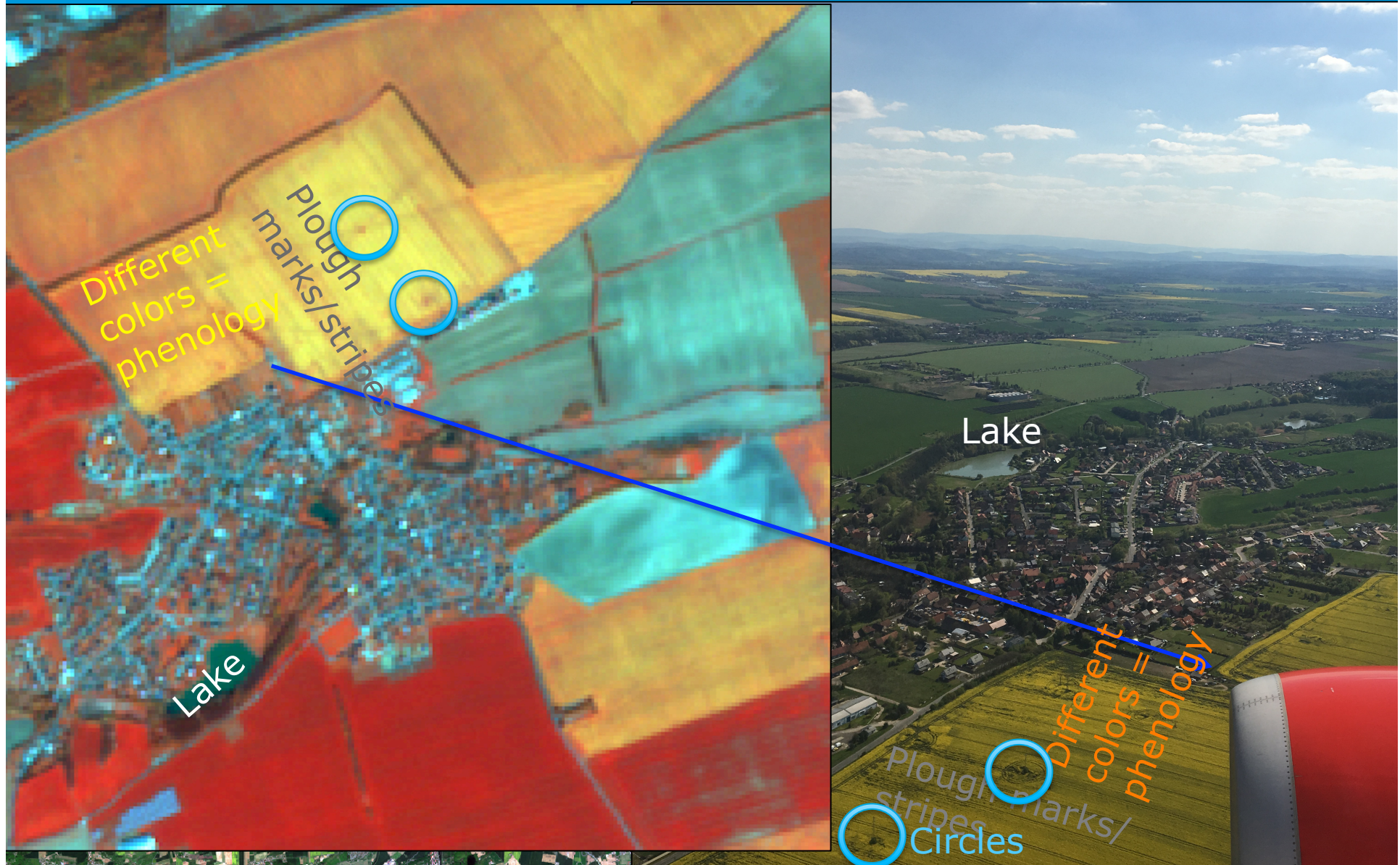
Europe in few minutes: Large swath of 290 km, 7-8 days revisit in the Czech Republic



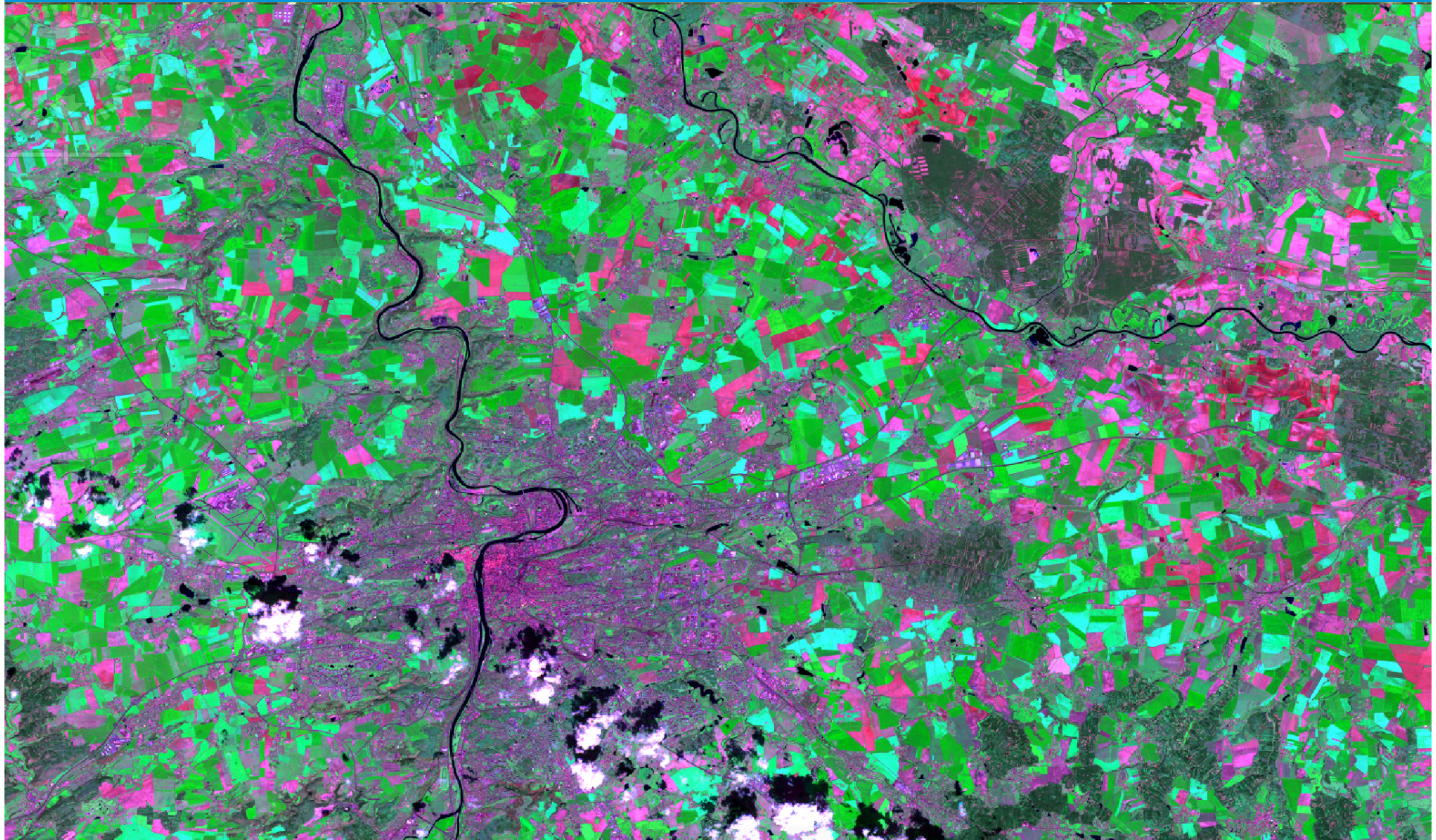
Pragha, 6 May seen by Sentinel-2 Large Swath!



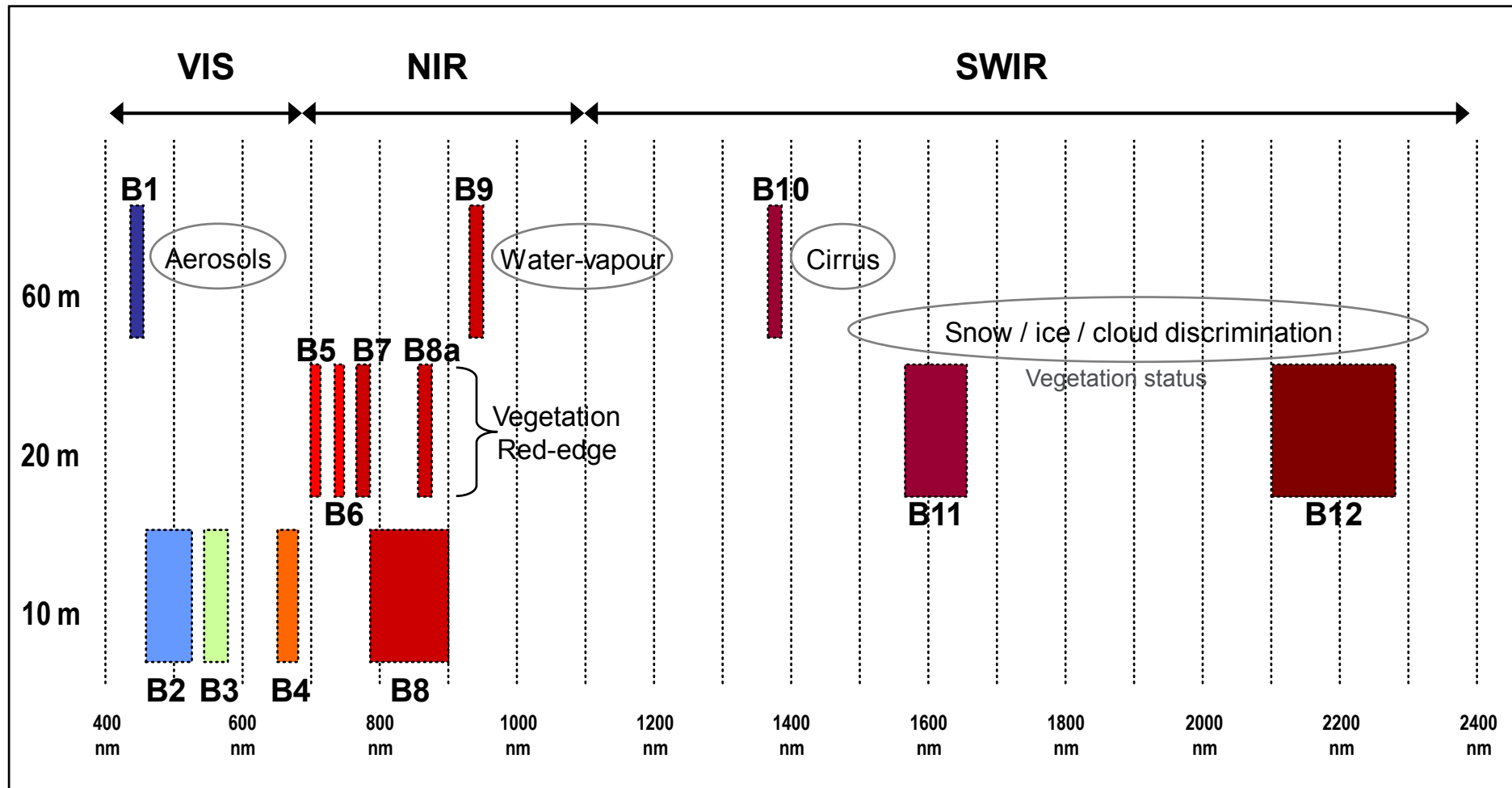
Agricultural fields, 6 May by Sentinel-2: Sharp details on sub-field level!



Praha, 6 May seen by Sentinel-2 MULTISPECTRAL



Spectral Bands & Spatial Resolution



Collaboration with JRC and the Czech State Agriculture Intervention Fund (SZFI)



→ CZECH AGRICULTURE FROM SPACE



**CZECH CROP TYPE
MAP 2015**

- winter rapeseed
- winter cereals
- spring cereals
- sugarbeet
- maize
- potatoes
- fodder crops
- other annual crops

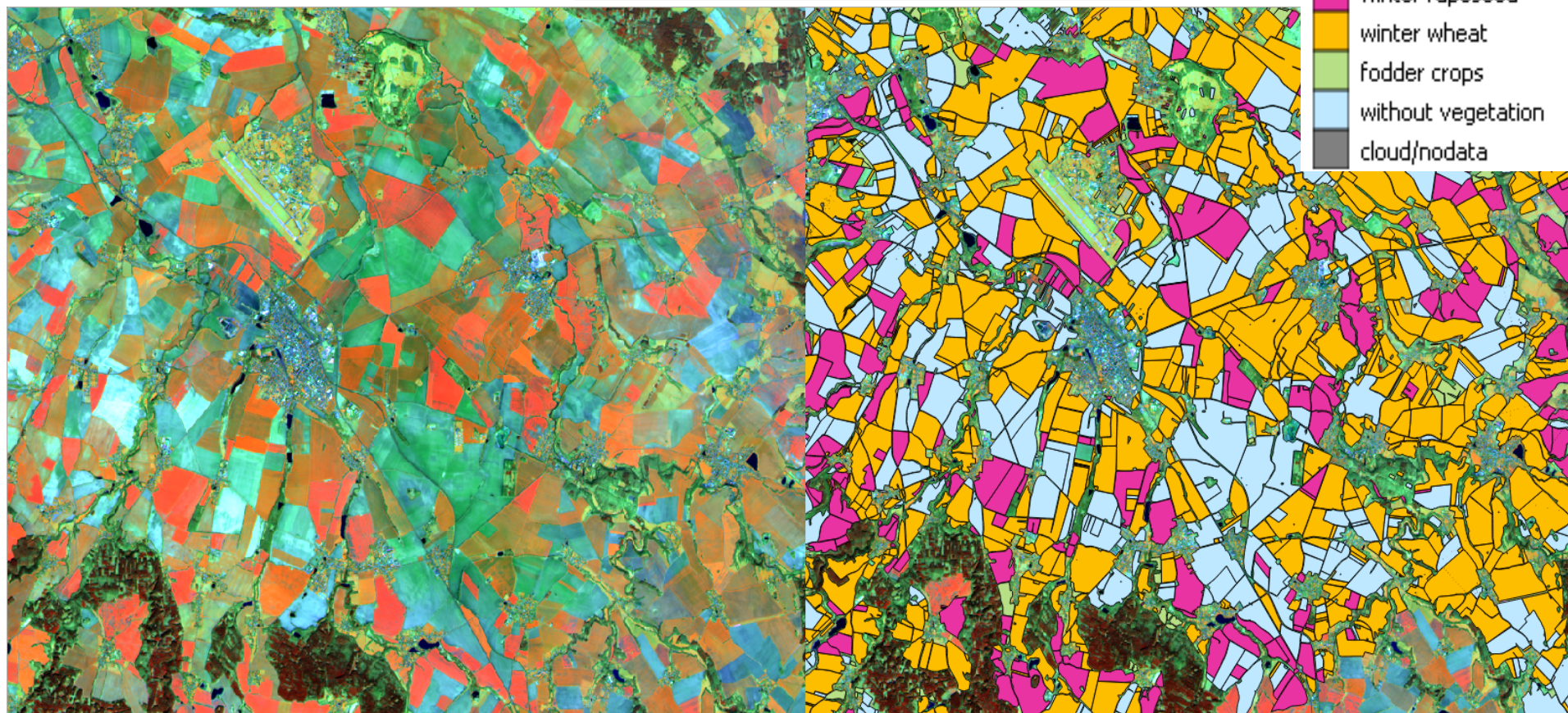
Data sources:
Sentinel-1, Sentinel-2,
Landsat-8, Czech LPIS



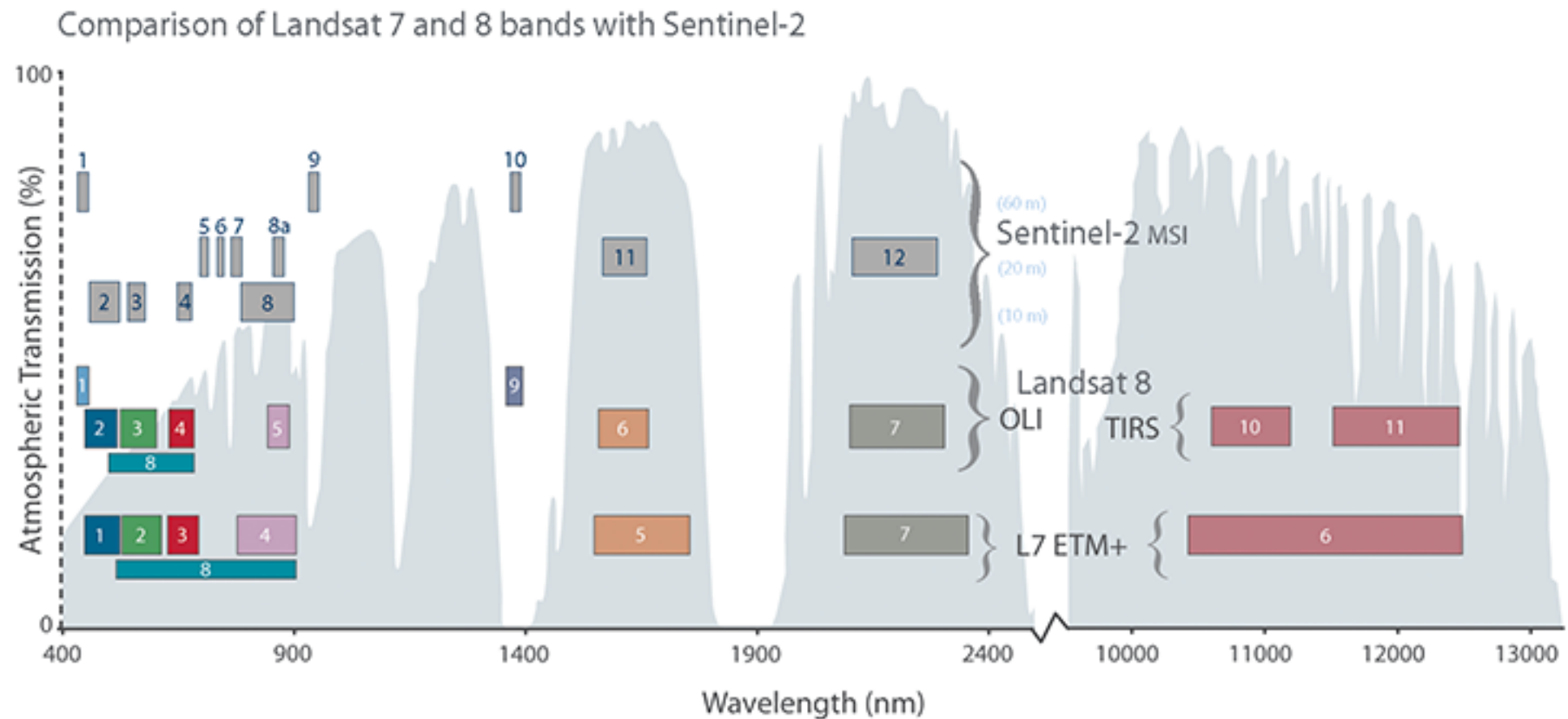
Crop Type Mapping 2016

Czech Republic, Central Bohemia

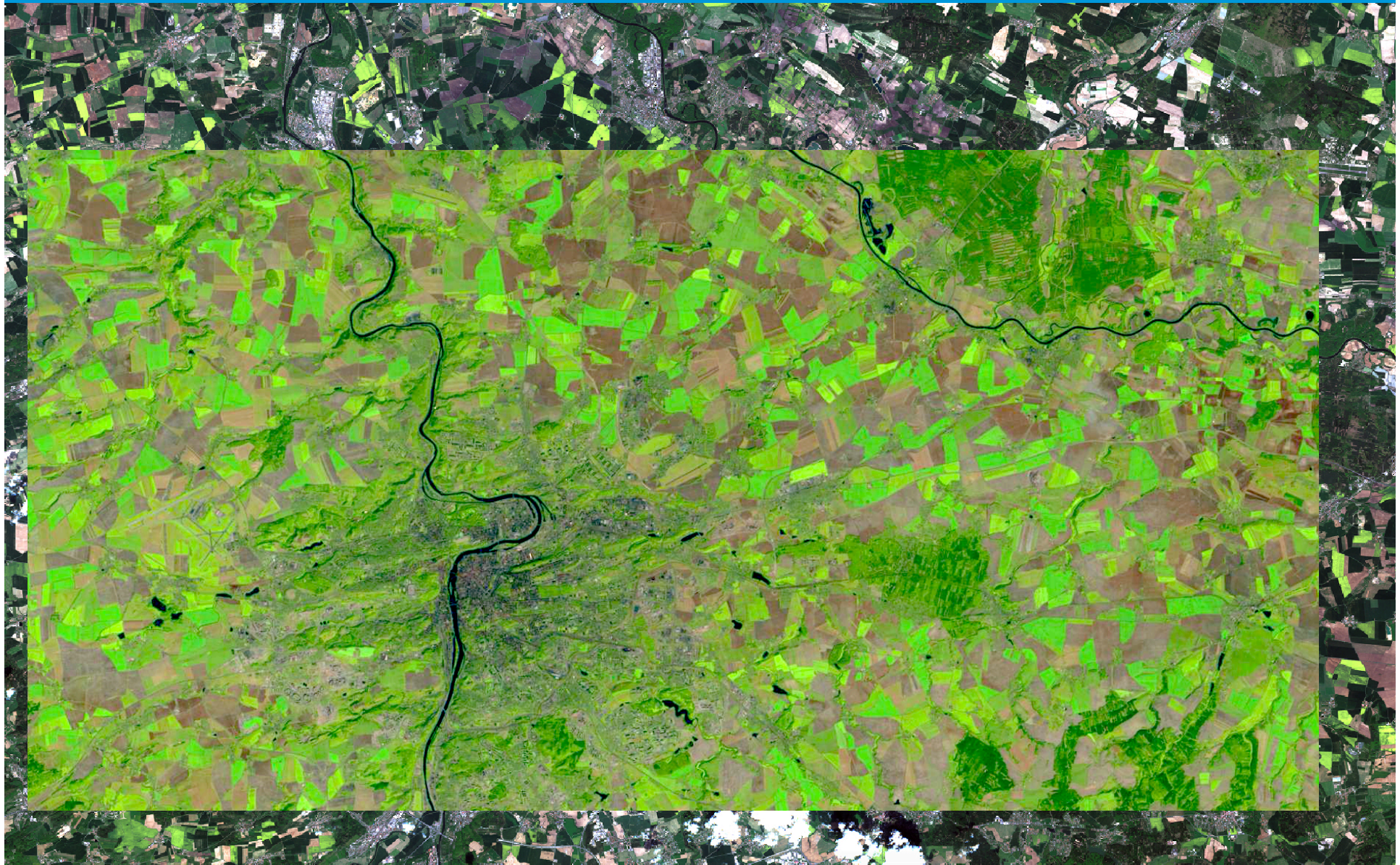
Winter crops - March 2016



Contains modified Copernicus Sentinel data
[2016]



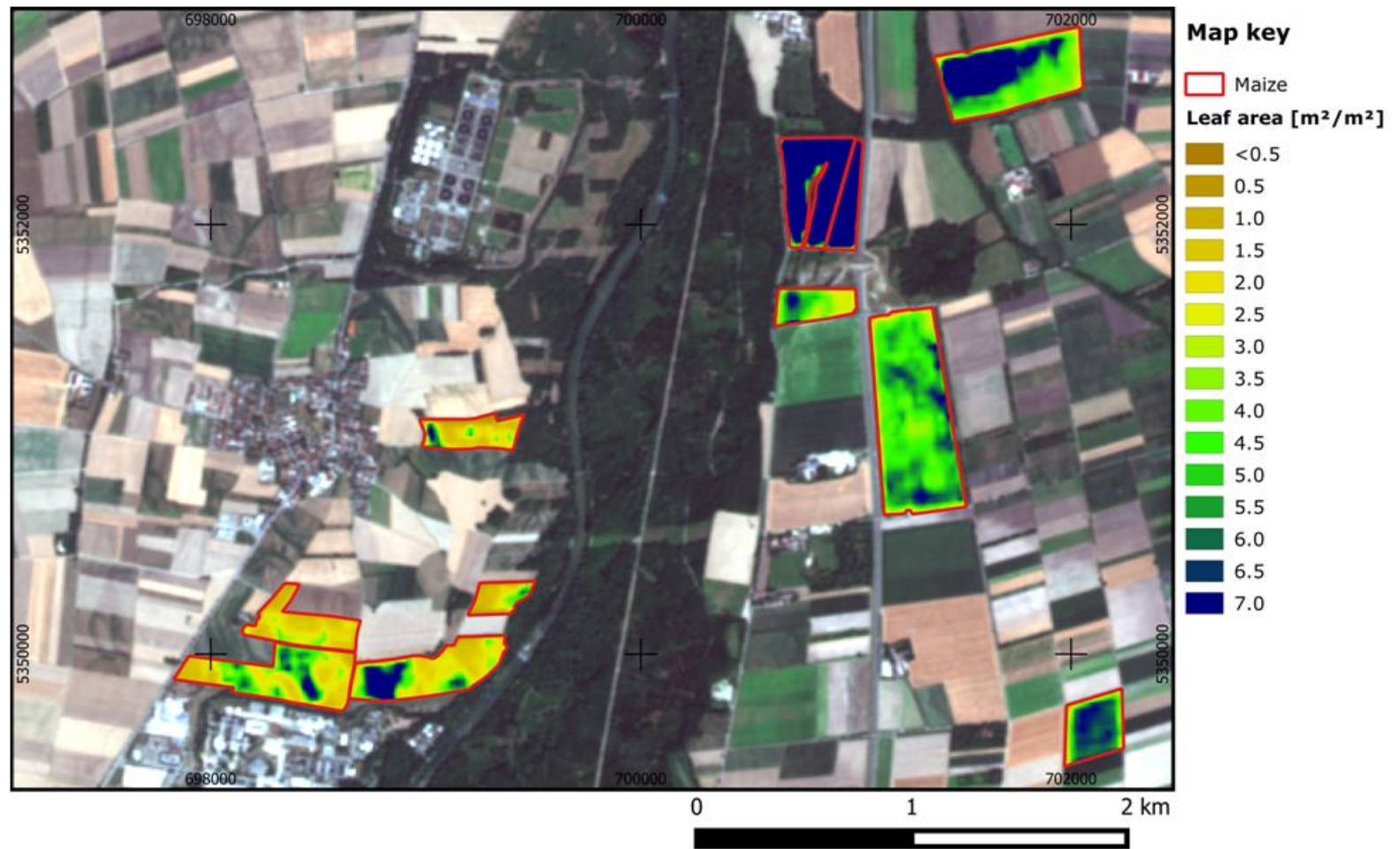
Going back in time: Praha 6 May 2016 versus 27 April 1989



Higher revisit frequency through multi-mission: Crop Parameter Retrieval over time



Landsat 8
Jul 24, 2015
Leaf Area



Source: Heike Bach Topic: Agriculture
VISTA www.vista-geo.de

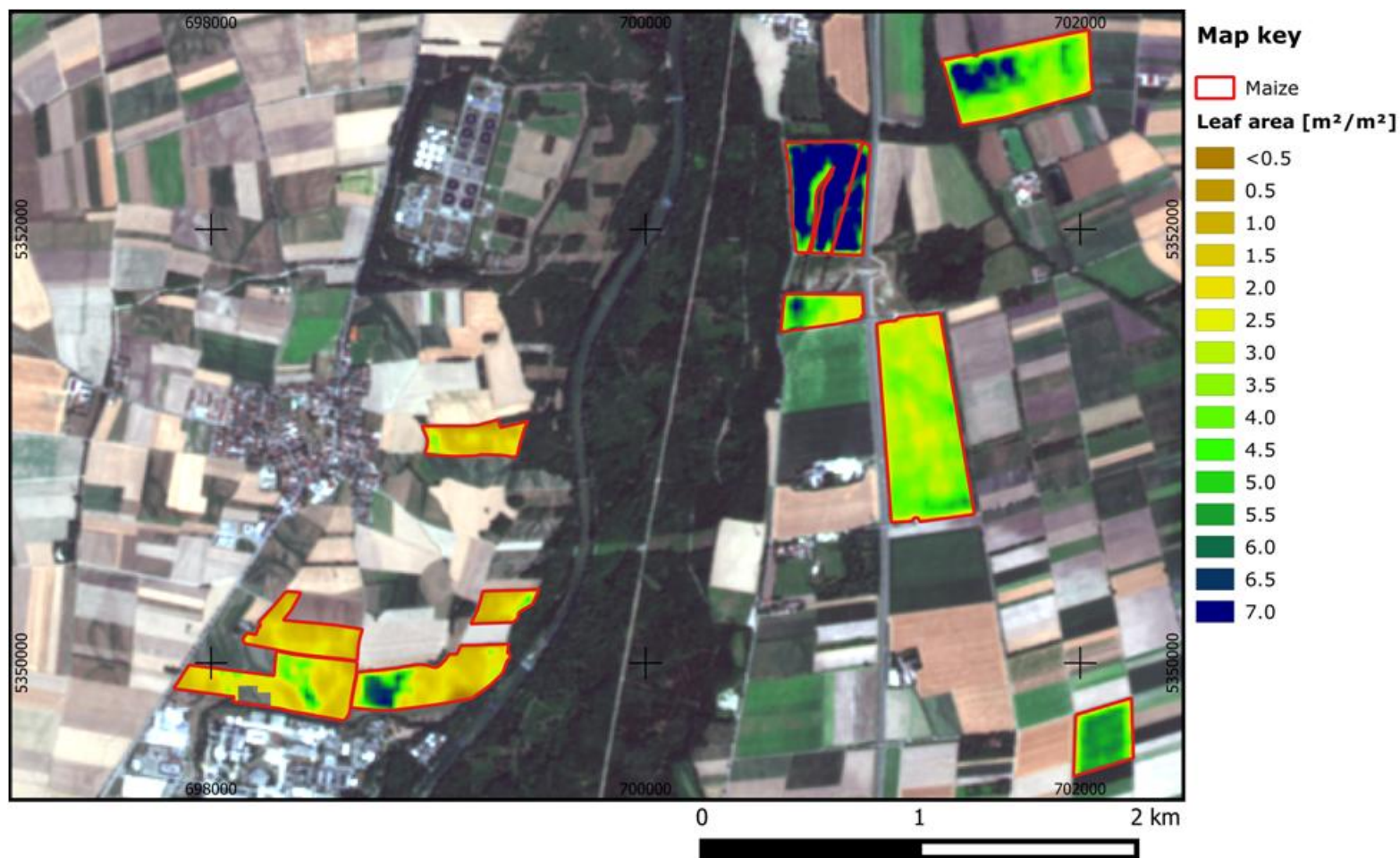


European Space Agency

Crop Parameter Retrieval over time



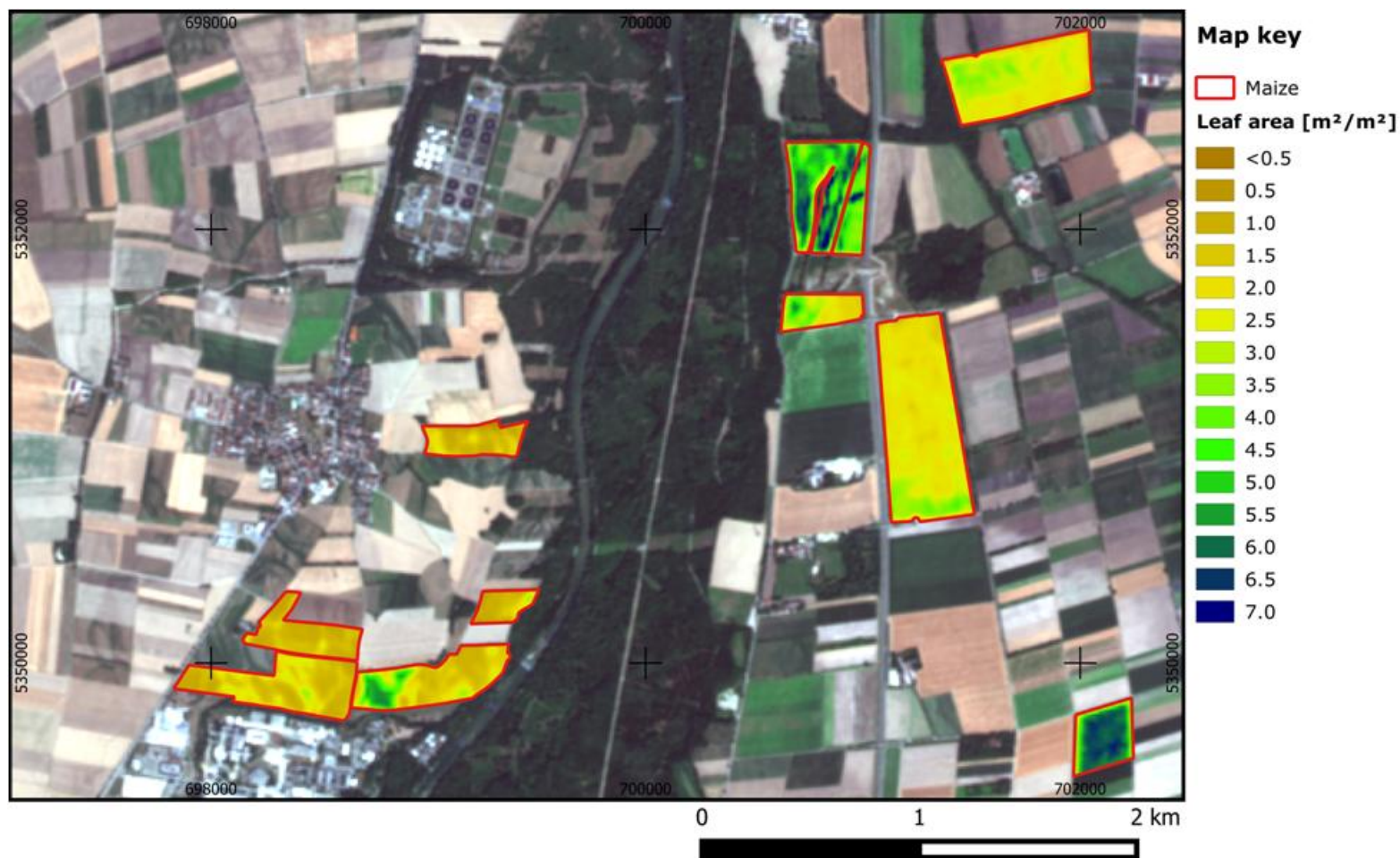
Landsat 8
Jul 31, 2015
Leaf Area



Crop Parameter Retrieval over time



Sentinel-2A
Aug 06, 2015
Leaf Area



Crop Parameter Retrieval over time



Sentinel-2A
Aug 13, 2015
Leaf Area



Crop Parameter Retrieval over time



Landsat 8
Sep 01, 2015
Leaf Area



Crop Parameter Retrieval over time



Landsat 8
Sep 17, 2015
Leaf Area

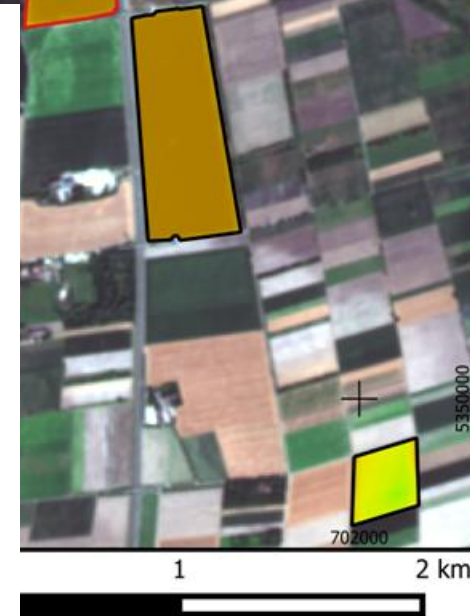
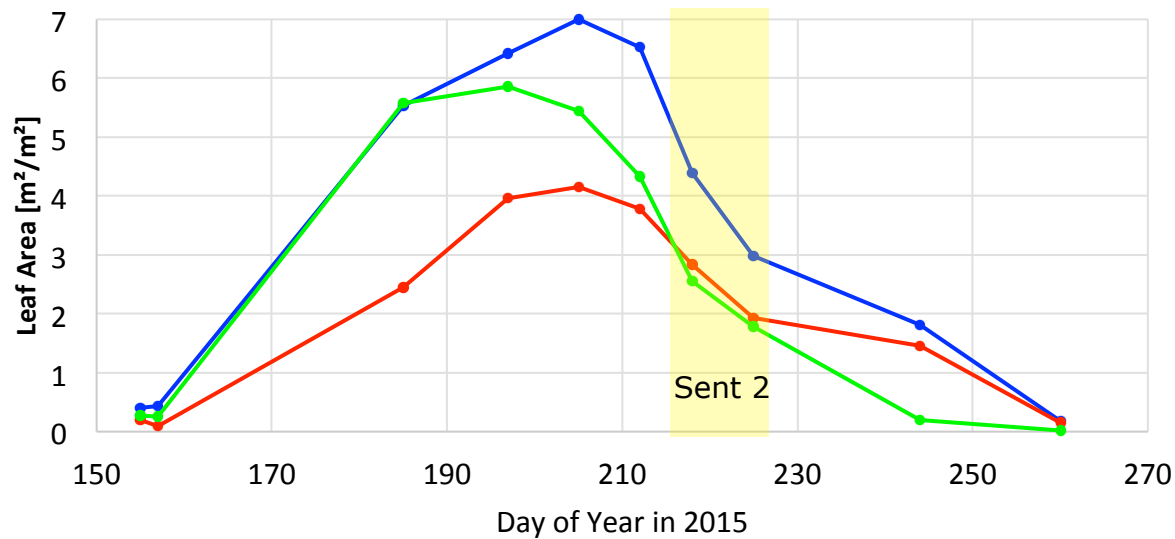


Map key

Leaf area [m^2/m^2]



Leaf Area development for selected maize fields



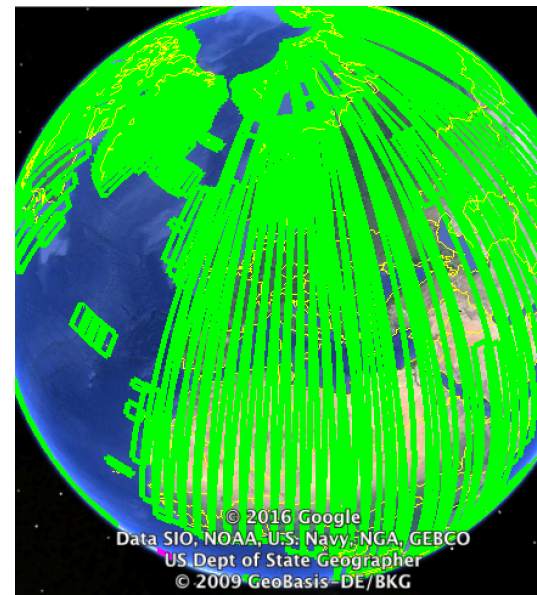
European Space Agency

Heike Bach Topic: Agriculture
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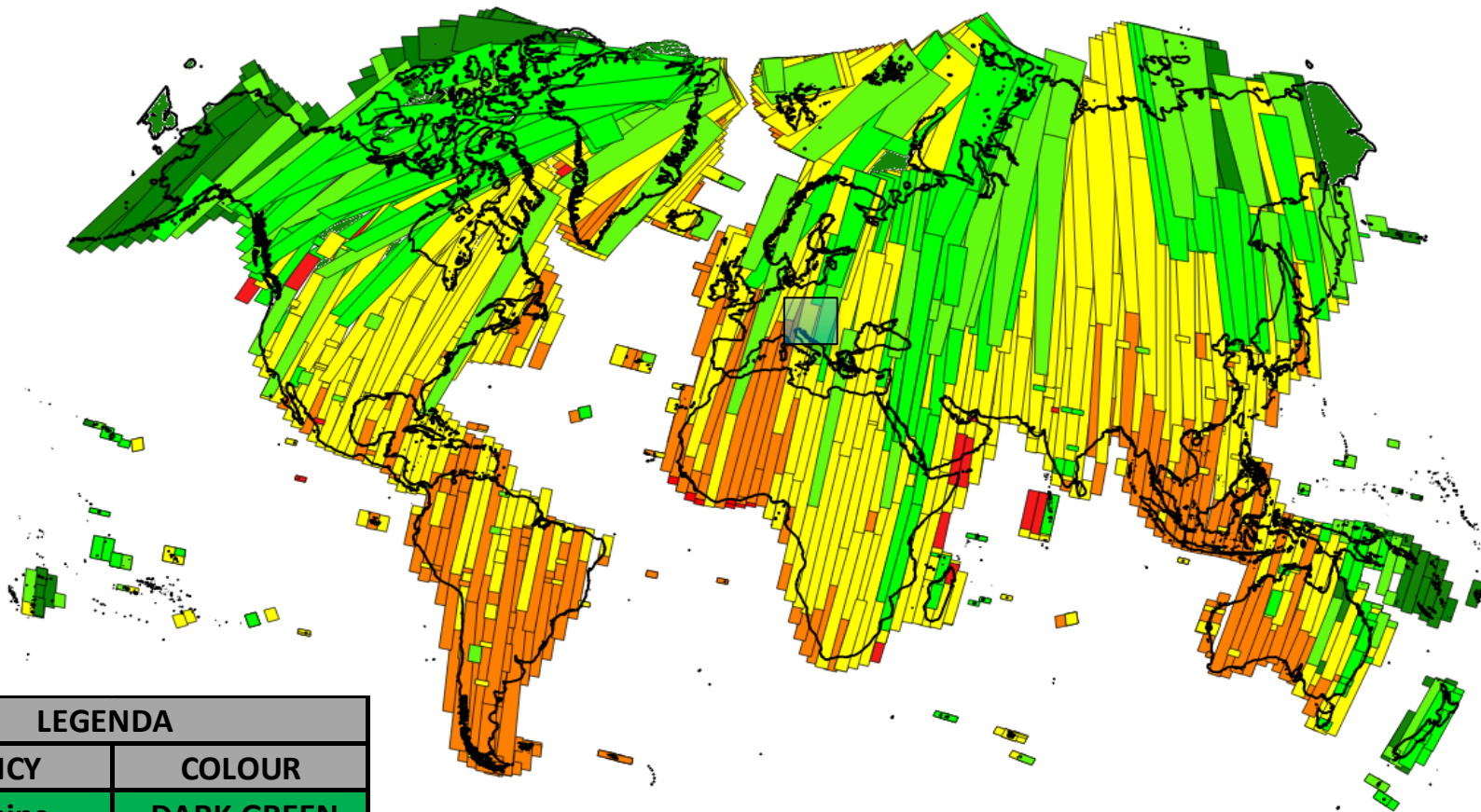
Sentinel-2 Observation scenario, acquisition plans online



1. Currently observation of **average ~14 min/orbit** (i.e. **>80%** of average observation time in full operations)
 - Systematically Europe & Africa on every orbit = 10 days (at equator)
 - The Rest of the World (RoW) within a cell
- **New: revisit frequency increased to 20 days Rest of World!**
- Observation plan is published ahead of every repeat cycle as kml at <https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-2/acquisition-plans>



**Sentinel-2A Data latency:
very fast data availability! ~ 3-4 hours
over Czech Republic**



LEGENDA	
LATENCY	COLOUR
0-100 mins.	DARK GREEN
100-200 mins.	GREEN
200-300 mins.	YELLOW
300-400 mins	ORANGE
400-500 mins.	RED

Sentinel-2 Products



Name	High-level Description	Production	Preservation Strategy	Volume
Level-1B	Top-of-atmosphere radiances in sensor geometry	Systematic	Long-term	~27 MB (each 25x23km ²)
Level-1C	Top-of-atmosphere reflectance in cartographic geometry			~27 MB (each 25x23km ²)
Level-2A	Bottom-of-atmosphere reflectances in cartographic geometry (prototype product)	Using Sentinel-2 Toolbox**)		~600 MB (each 100x100km ²)

**Geometric accuracy
<12m without
Ground control
points!
Excellent
radiometry**

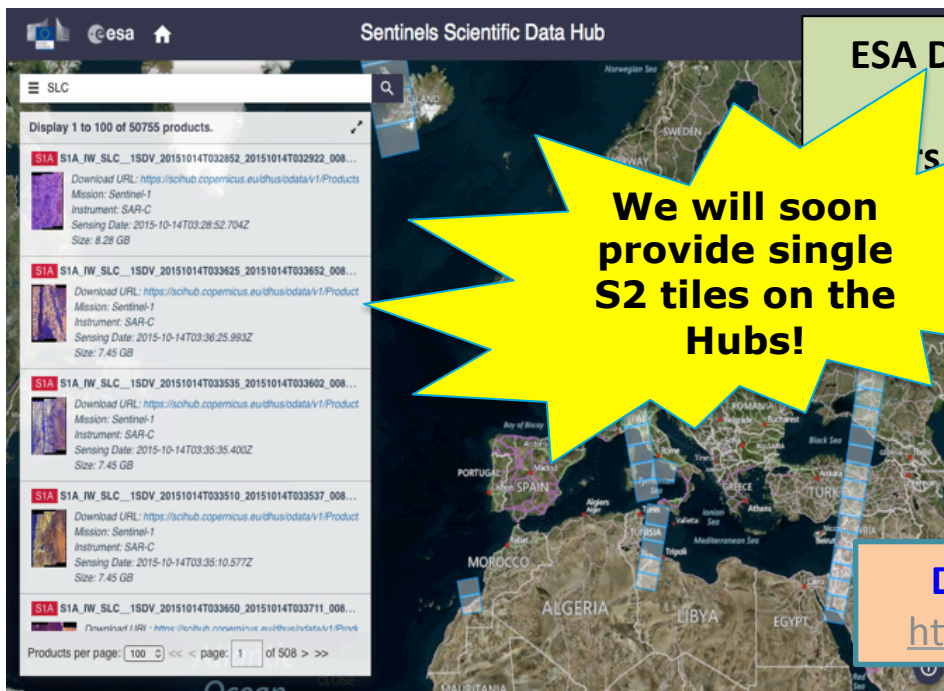
***: Systematic global production of L2A is currently being prepared**

** : <https://sentinels.copernicus.eu/web/sentinel/toolboxes/sentinel-2> European Space Agency

Data Access Overview



- ESA CSC data access is ensuring that **all Sentinels core products** are accessible **to all users online**
 - Any user can **self-register** at sentinels.copernicus.eu
- ESA delivers all Sentinel data on 24/7 basis **as Near Real Time** products (3 hours from sensing) as well as Non Time Critical products (24 hours from sensing)



ESA Data Hub provides an OPEN SOURCE Web interface

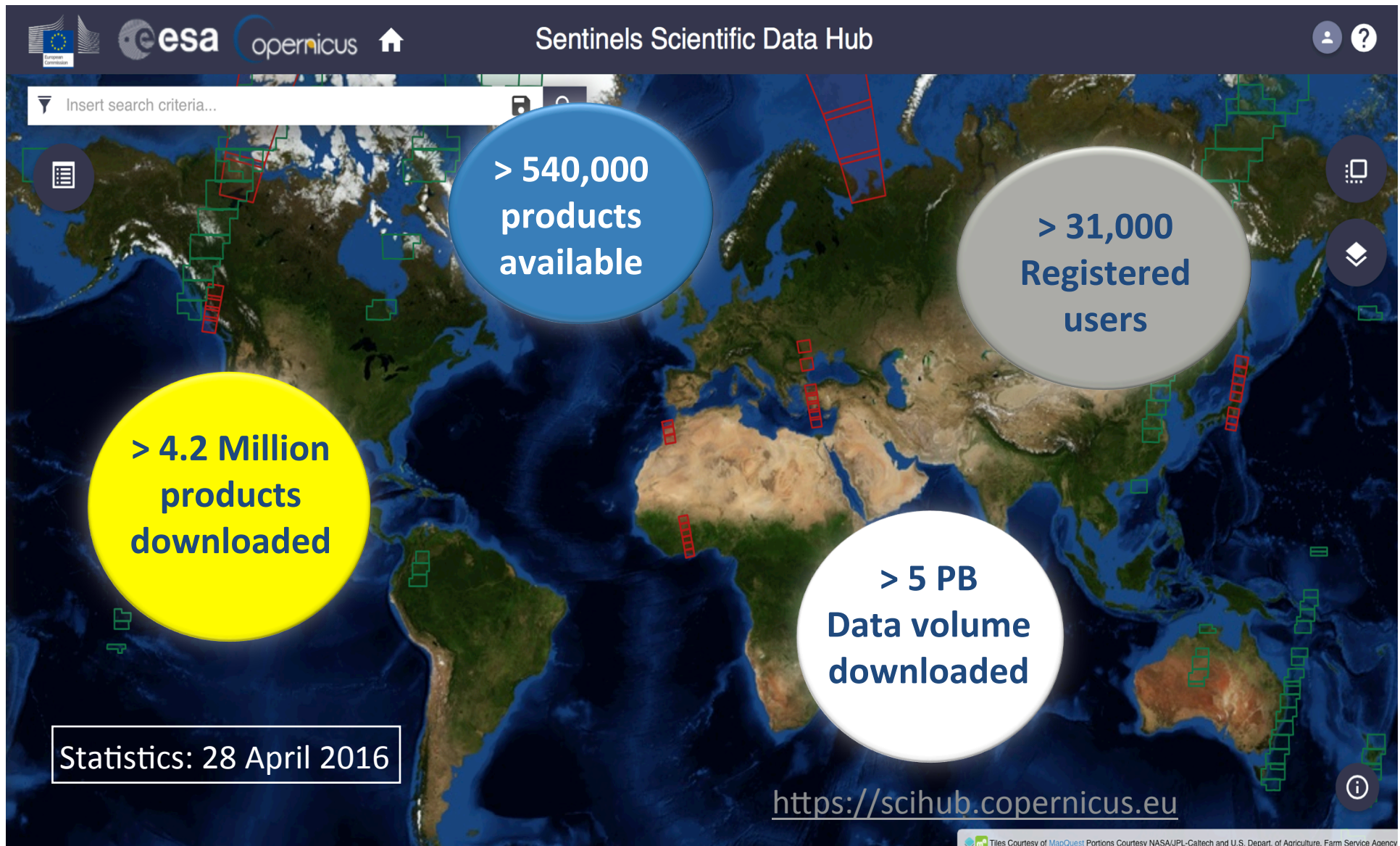
Users can set own scripts to automatically retrieve, filter and download products

We will soon provide single S2 tiles on the Hubs!

Sentinel Toolbox available as open source software <https://github.com/senbox-org>

Data Hub Server available as open source software <https://github.com/SentinelDataHub/DataHubSystem>

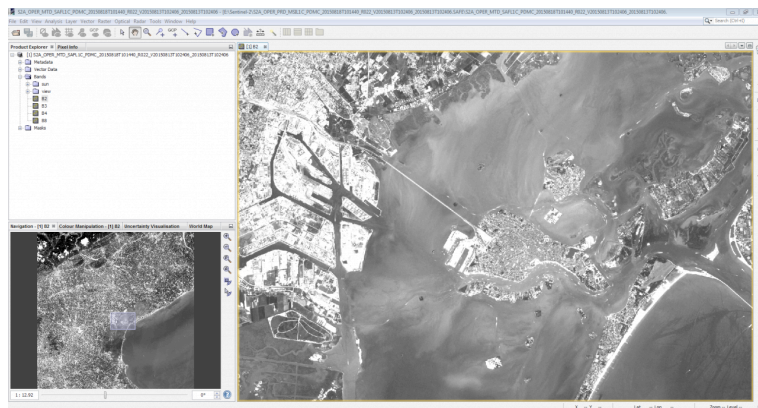
Sentinels Data Access - Statistics Open Hub



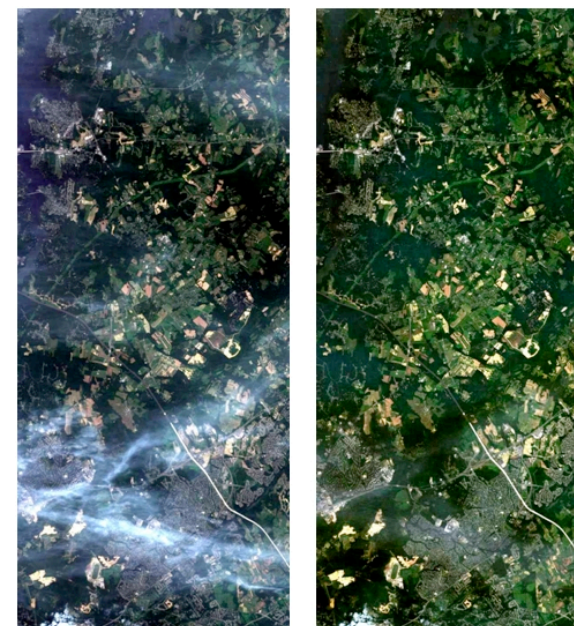
User tools are also available



- ✓ The Sentinel-2 toolbox (SNAP) includes a rich set of visualisation, analysis and processing tools



- ✓ It also integrates the ESA Level-2A atmospheric processor Sen2Cor (TOA → BOA + classification options)



TOA Level-1C image data (left)
associated BOA image data (right)

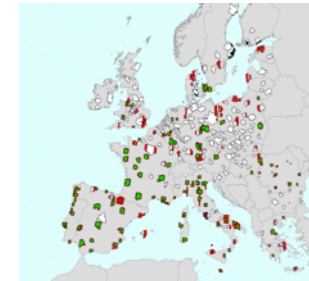
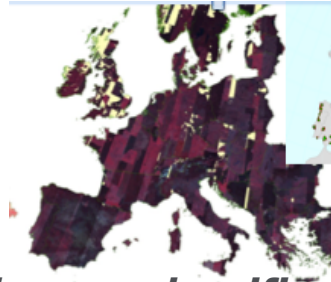
Ever increasing range of applications



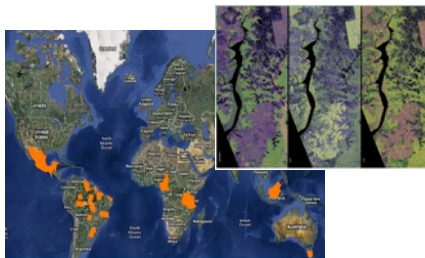
Forests & Carbon, Vegetation monitoring



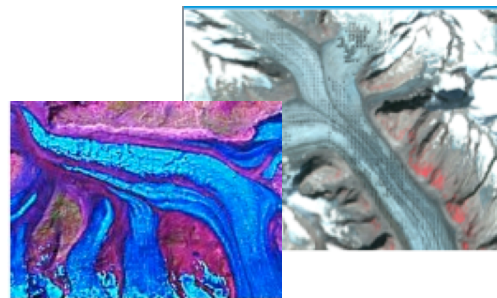
**Land cover classification/
CORINE, IMAGE2006,
IMAGE2009 etc.**



Regional to Urban Applications



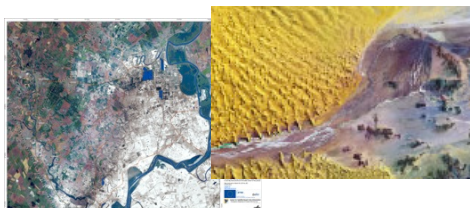
Emergency management



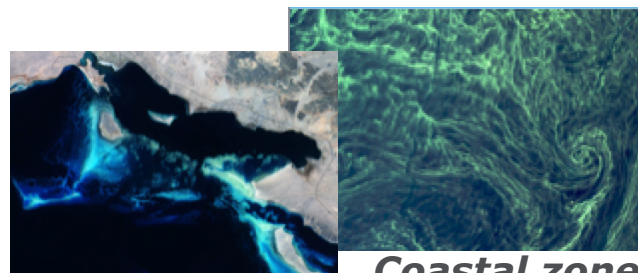
Glaciers & Ice



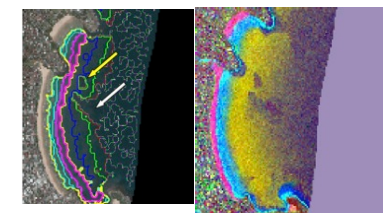
**Global Land use,
agriculture
& change**



Geology



**Coastal zones/
Water quality**



**Coastal zones/
bathymetry**

European Space Agency

Benefits of systematic acquisitions: Example from 3 days ago



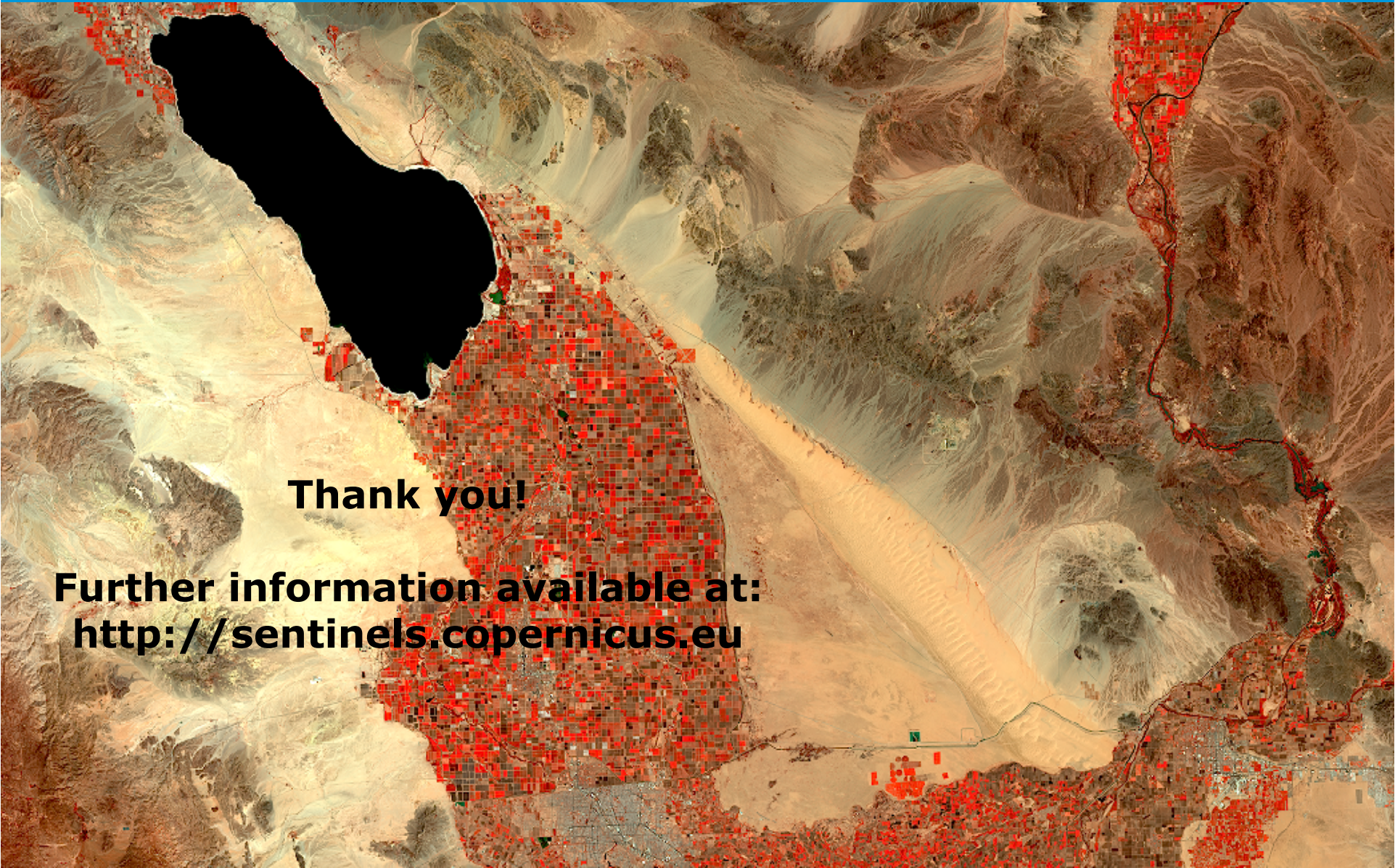
1. Quick on site,
without special
planning: Canada
fires



Sentinel-2 Mission outlook



1. Continued **increase of data acquisition: 10 days revisit on all land masses is the goal** before year end, using EDRS-A & 4th X-band station
2. Ease data access: **MOVE TO TILES** concept (and other measures); possibility to download only a **True Colour Image** (RGB) ~summer 2016
3. **Reprocessing** of Commissioning Phase data ~ Q3/2016
3. *Start of pre-operational **surface reflectance (L2A)** processing ~summer 2016*
4. **Seek to keep our user community happy**, by providing easy, free and fast access to the highest quality products: LISTEN & INVOLVE e.g. **S2 Validation team** meeting ~Q3-Q4/2016
5. **Complete the constellation:...Sentinel-2B launch upcoming**

A satellite map of a desert region, likely the Negev Desert, showing a large black silhouette of a lake or reservoir in the upper left. The terrain is characterized by sandy dunes, rocky outcrops, and sparse vegetation. A prominent red line, possibly a road or boundary, runs diagonally across the right side. The map is overlaid with a grid of red and black squares, indicating specific data points or areas of interest.

Thank you!

**Further information available at:
<http://sentinels.copernicus.eu>**