Copernicus Sentinel-2 Global Mosaic

Copernicus Global Land User Conference

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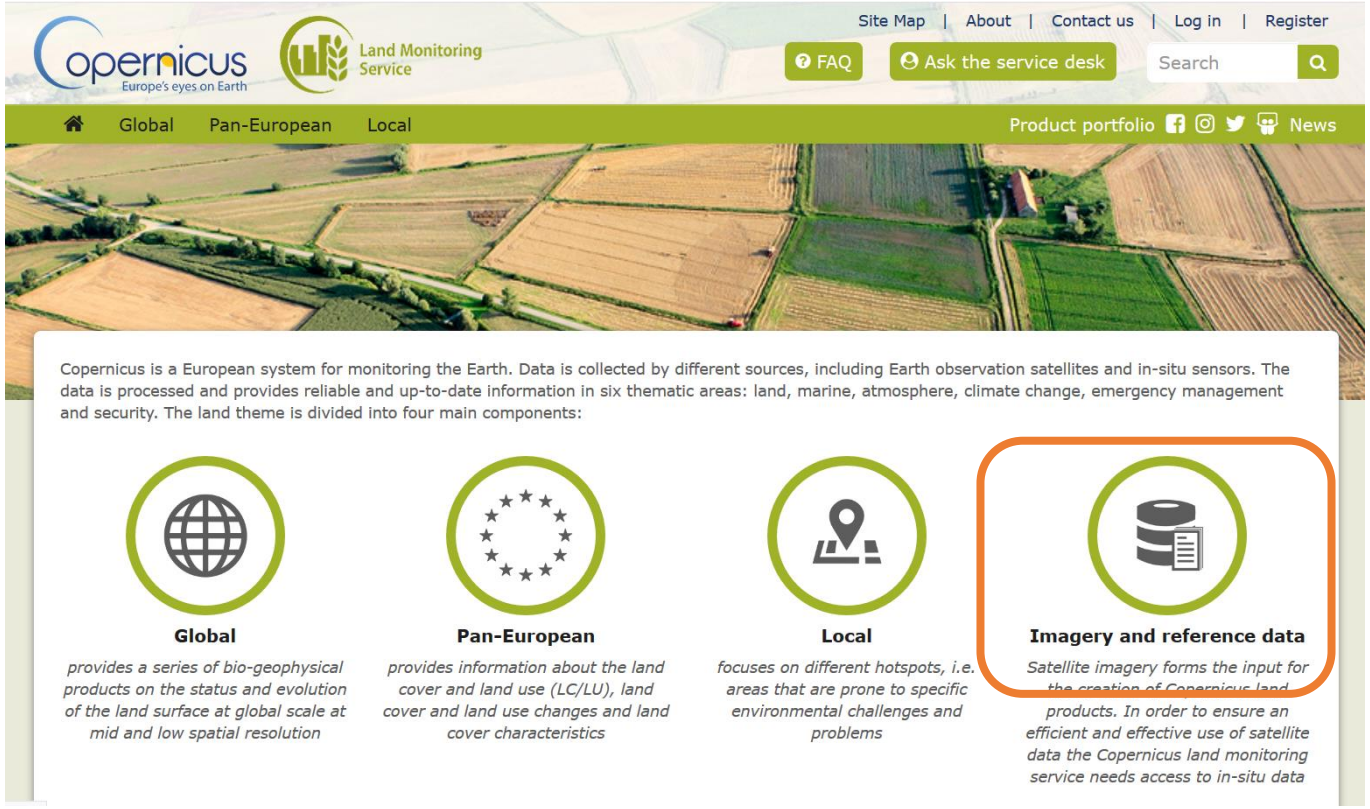
Gunnar Brandt, Brockmann Consult, Project Manager S2GM

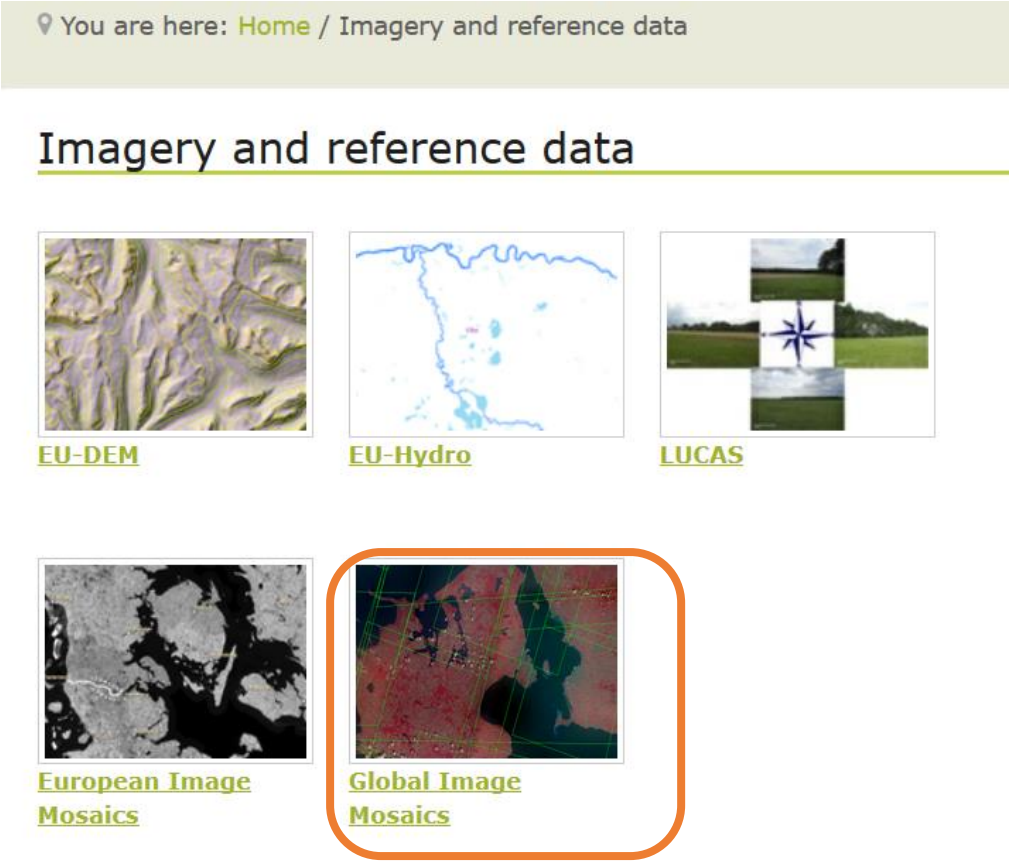
GeoVille SINERGISE Brockmann Consult GmbH Copernicus Europe's eyes on Earth European Commission

Objective and scope

- Generating composites of Sentinel-2 L2A surface reflectance data on global scale
- Analysis-ready data for direct and convenient usage
- Use cases include but are not limited to REDD+ activities, i.e. monitoring land use and deforestation
- Expert support
- State-of-the art service provision

Positioning within CLMS





https://land.copernicus.eu/imagery-in-situ/global-image-mosaics

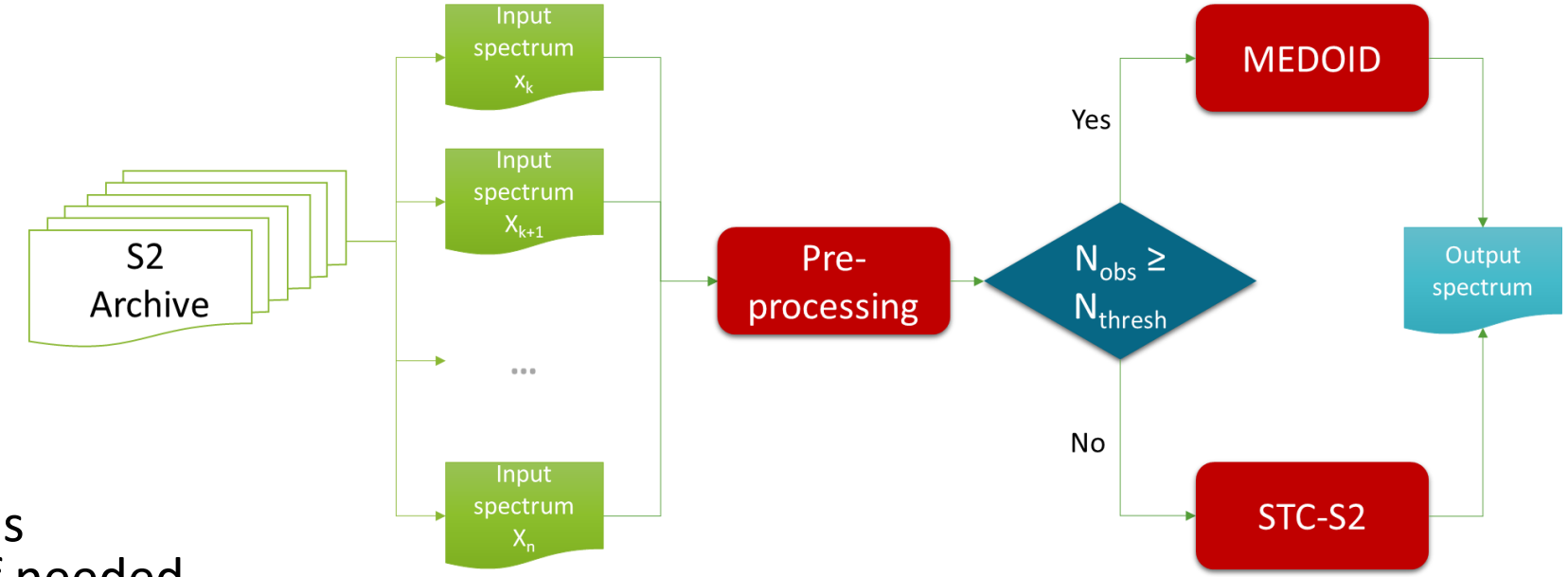
www.s2gm.eu Copernicus Sentinel-2 Global Mosaic

Offer in a nutshell

- **User-tailored mosaics and composites** of Sentinel-2 L2A, best representative pixel
- **European coverage**, global coverage expected in the coming months, conditional to availability of Sentinel-2 L2A
- Temporal coverage, currently **since April 2017**
- **Different compositing periods** comprising 1-day, 10-day, month, quarter, year
- 3 Sentinel-2 **native spatial resolutions** 10, 20, and 60m, resampling applied if required
- **Near real-time** product availability, typically few days after observation

Two Compositing Algorithms

- **Short-term composite < 4 valid observations:**
  Decision-tree approach evaluating scene classification, similar to Landsat WELD
- **MEDOID >= 4 observations:**
  Multidimensional median on the entire spectrum, statistical approach
- **Rigid pre-processing**
  to eliminate invalid observations
- Generating mosaics pixel by pixel from **original observations, no spectrum averaging or other image blending** is applied
- **Spatial resampling** of bands to non-native resolutions if needed



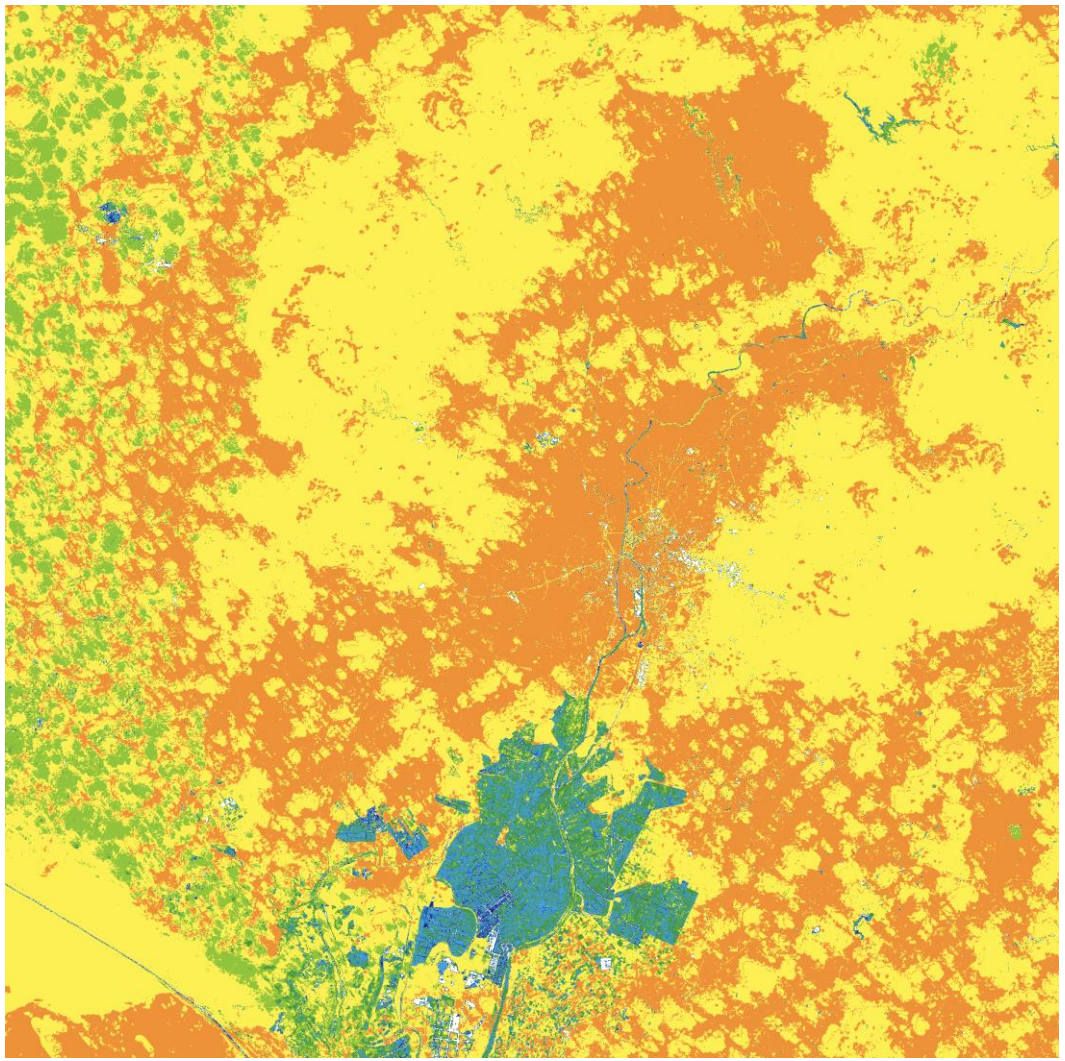

60m, Annual mosaic 2017

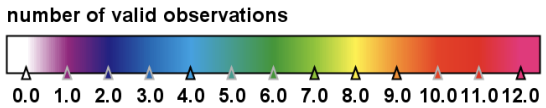
Composite Algorithm - Sevilla

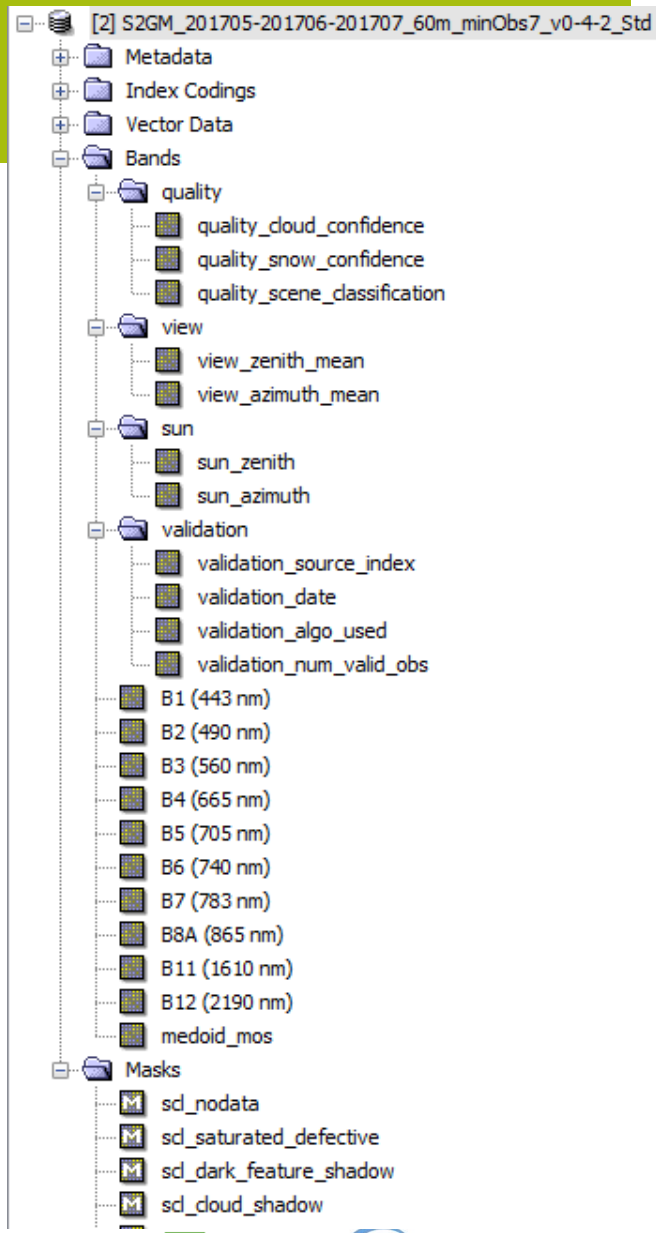
1) Sevilla
3-monthly composite
May/ June/ July 2017
60m spatial resolution

2) Mask – Medoid Algorithm

3) Number of valid observations





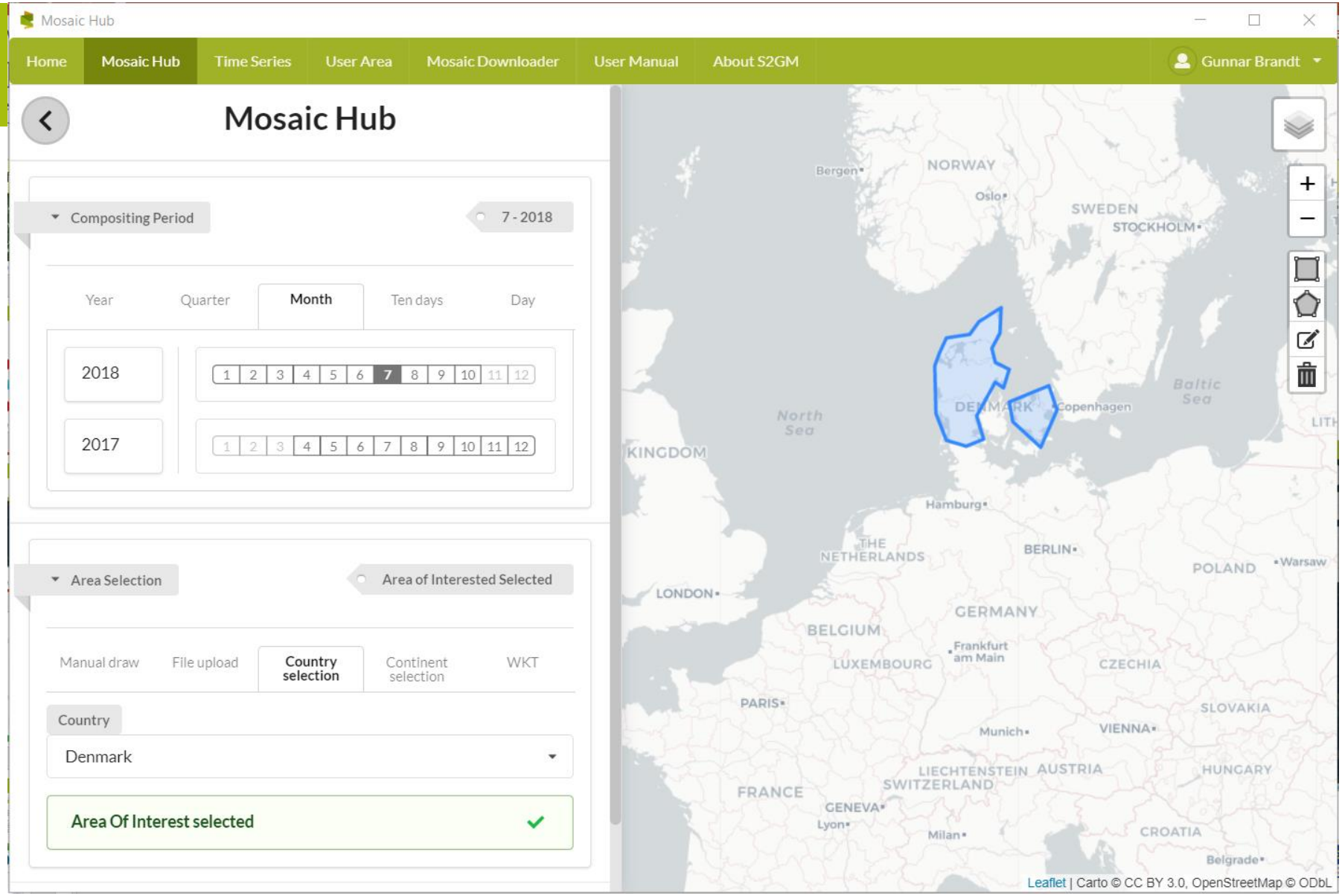


Mosaic generation and distribution approach

- Sentinel-2 Global Mosaic allows users to **tailor products** with respect to
  - Compositing period (day, 10-day, month, quarter, year)
  - Area of interest
  - File format (GeoTIFF, JP2, NetCDF)
  - Spatial resolution (10, 20, 60m)
  - Coordinate system (WGS84, UTM)
  - Bands to be included
  - Auxiliary information (AOT, geometry, scene classification, etc.)
- Sentinel-2 data volumes and permutations of options make **traditional approach** of full-archive processing, storage, and distribution **prohibitive**

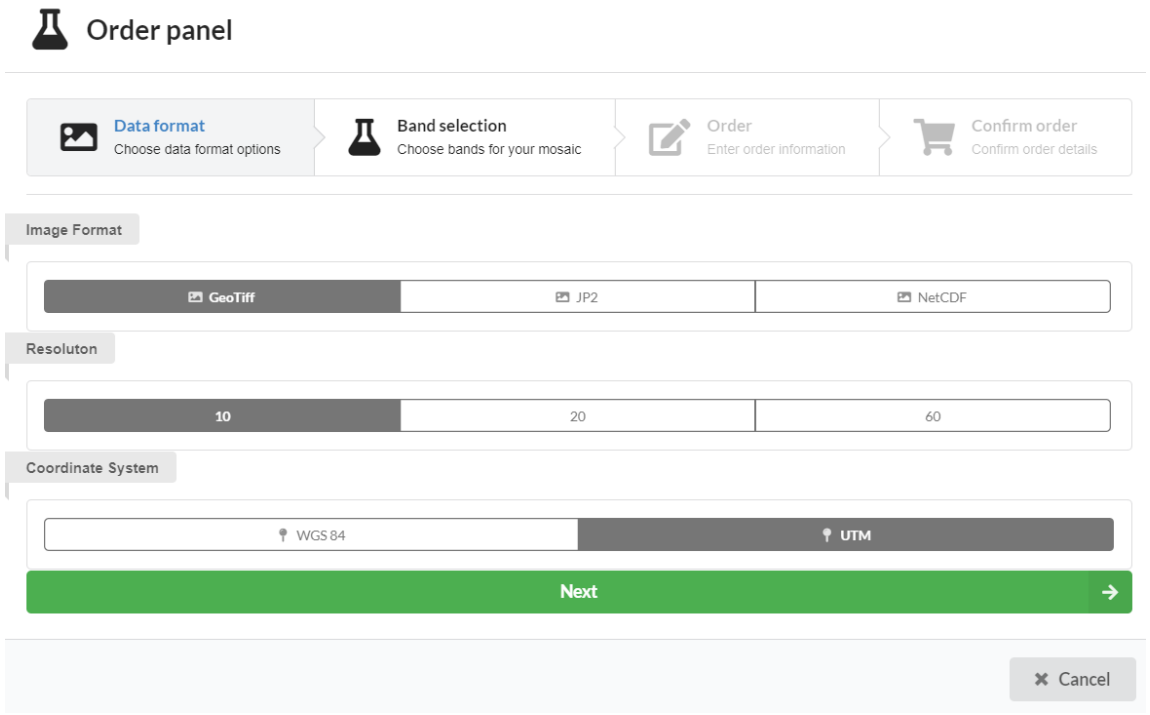
Mosaic Hub

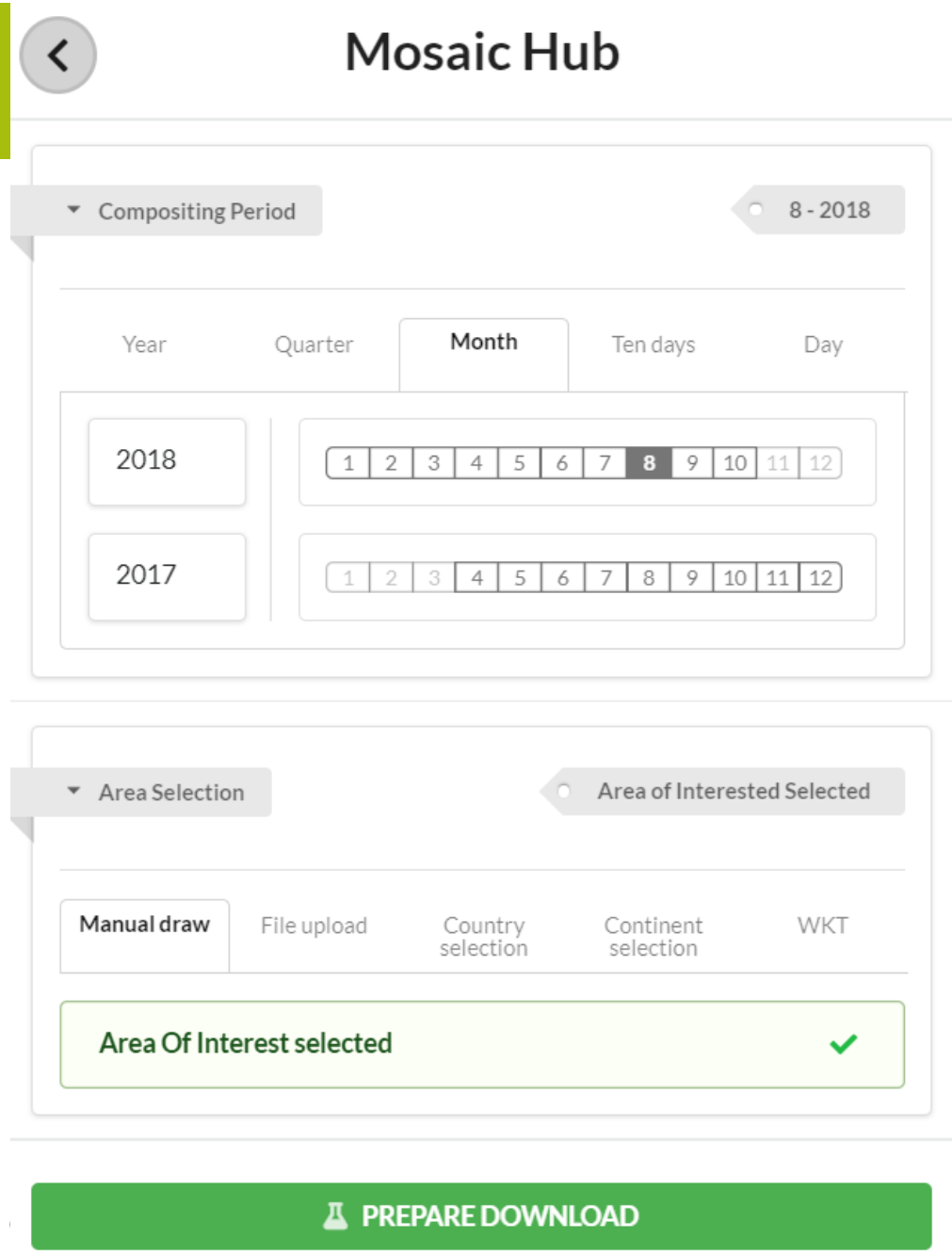
- **On-request** generation of tailored mosaics leveraging on cloud resources and free availability of S-2 L2A
- **Time-series** feature
- Mosaic Hub as **interactive user interface**
- Website and desktop application with convenient **download manager**



Tailoring & Requesting

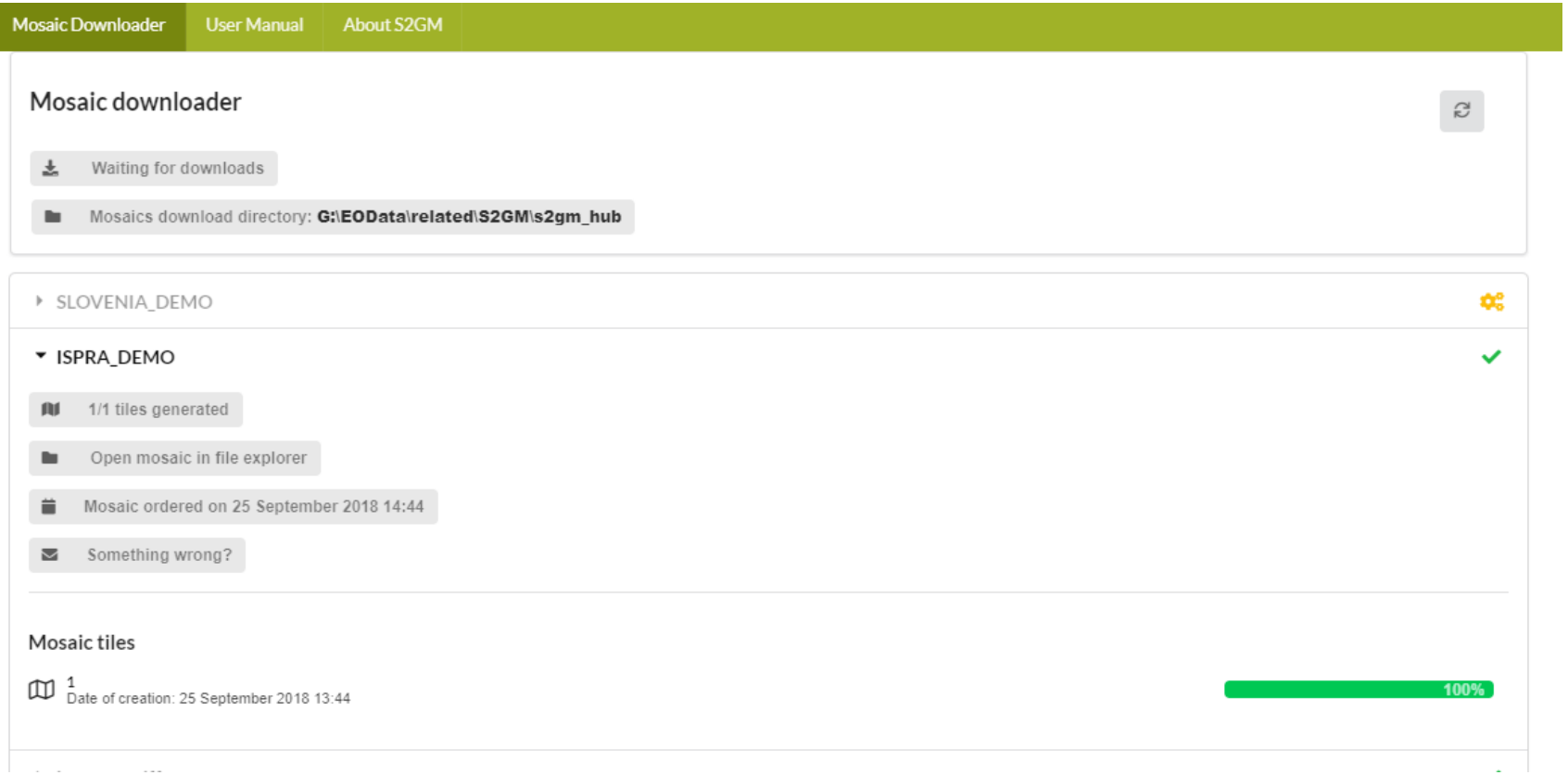
- Mosaic specification is dialogue-based

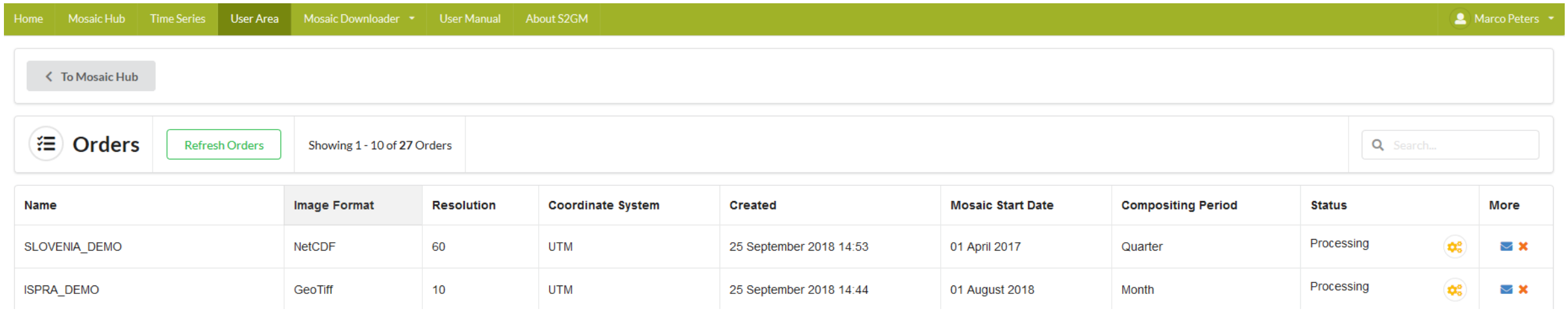




Download

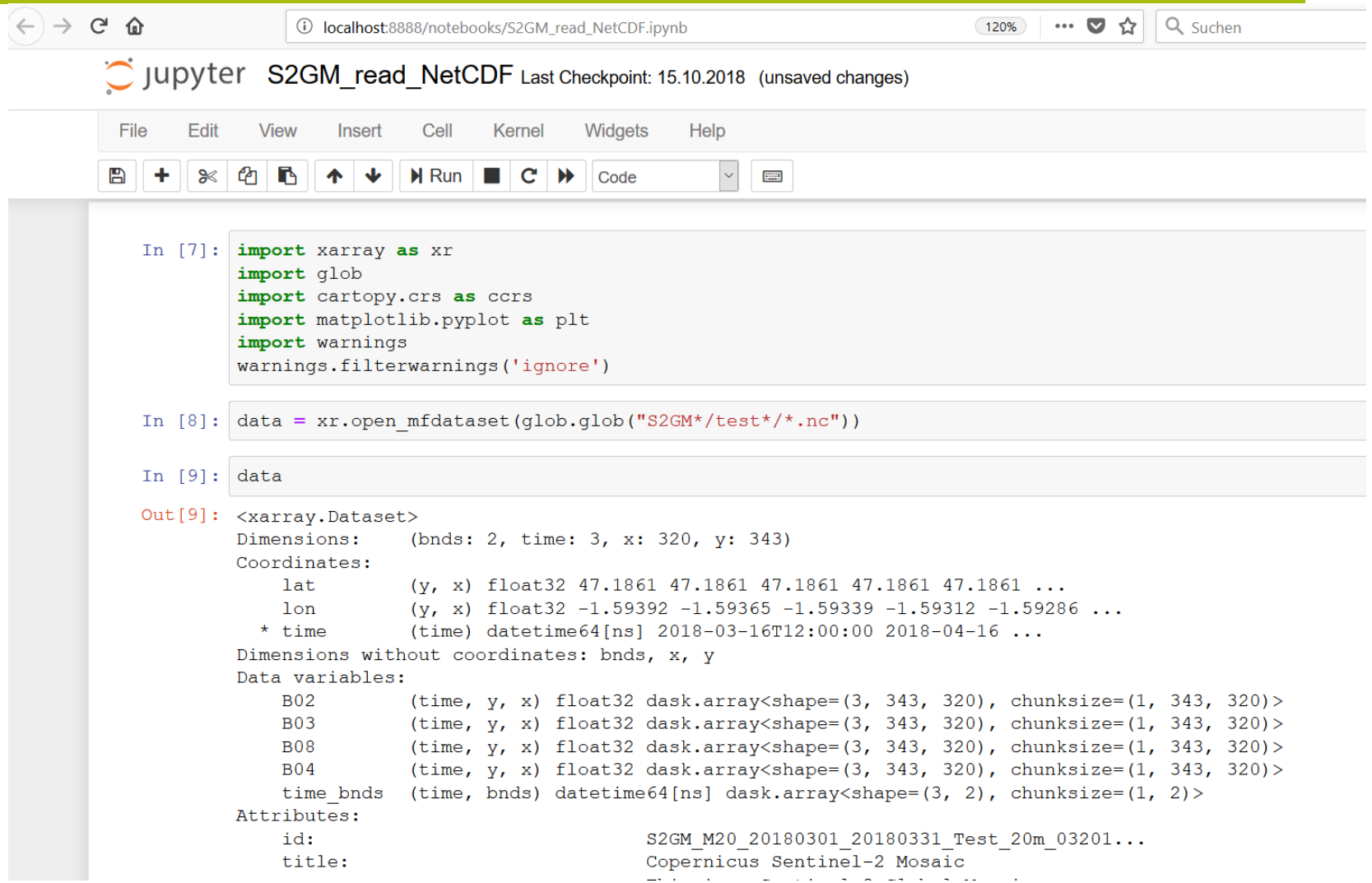
- User area lists all requests
- Download manager ensures convenient and robust distribution





Analysis Ready products

- **Three file formats**: jp2, GeoTIFF, NetCDF
- **INSPIRE-compliant**
- Accompanied by extensive **metadata** (xml, json, NetCDF Metadata)
- **SNAP reader** about to be released
- **Example**:
  Exploit stack of S2GM products with Python's xarray



Analysis Ready products

- Readily exploit image time-series of monthly composites

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In [16]: std = data.B08.std(dim="time").plot(figsize=(12,8),vmax = 0.15)
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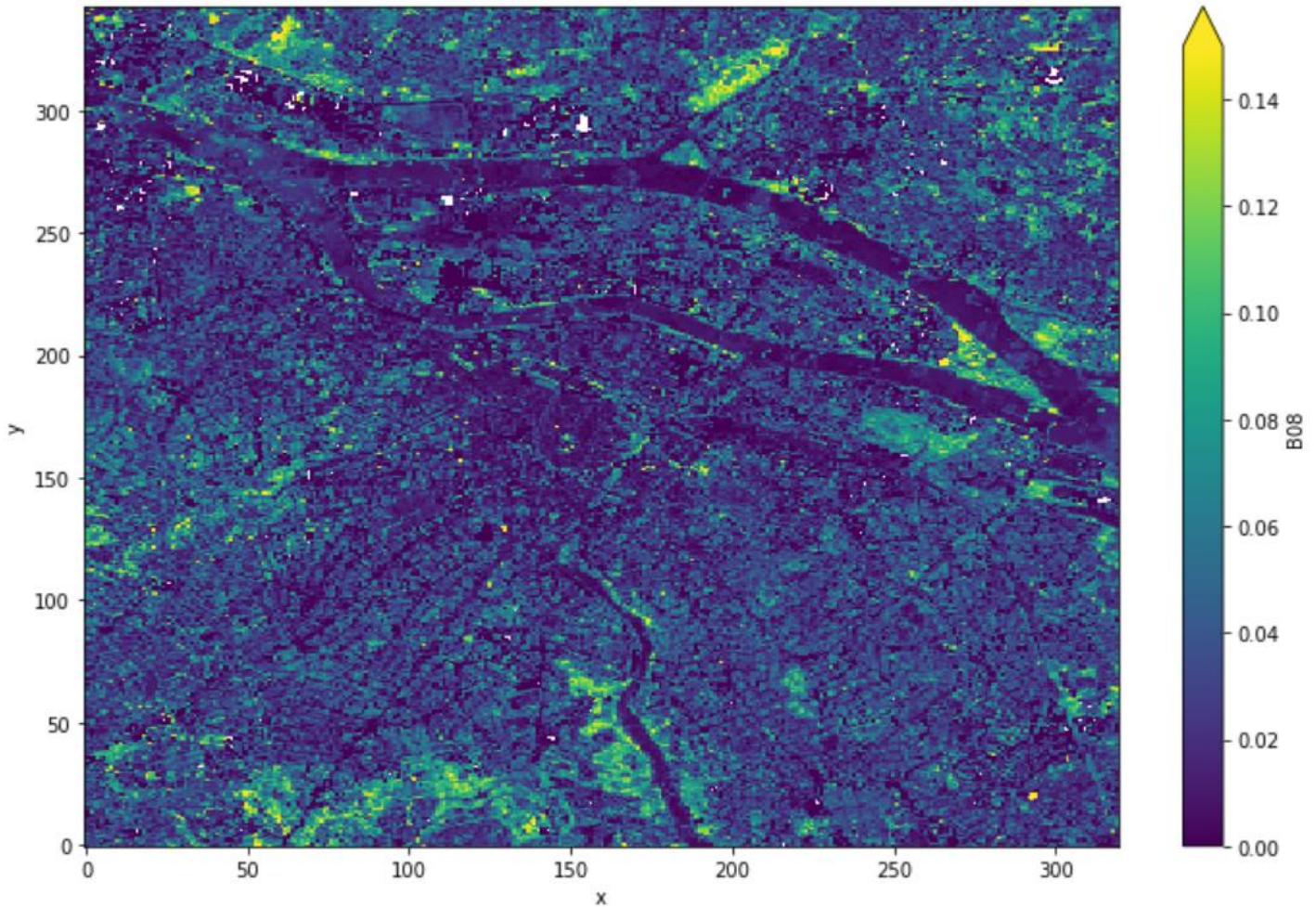

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The surface reflectance in band B02 [1]

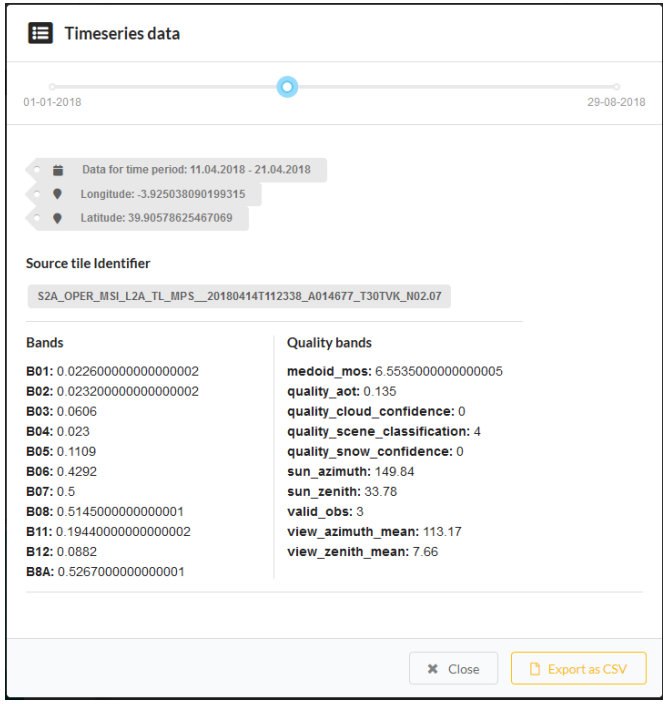
Brockmann Consult GmbH

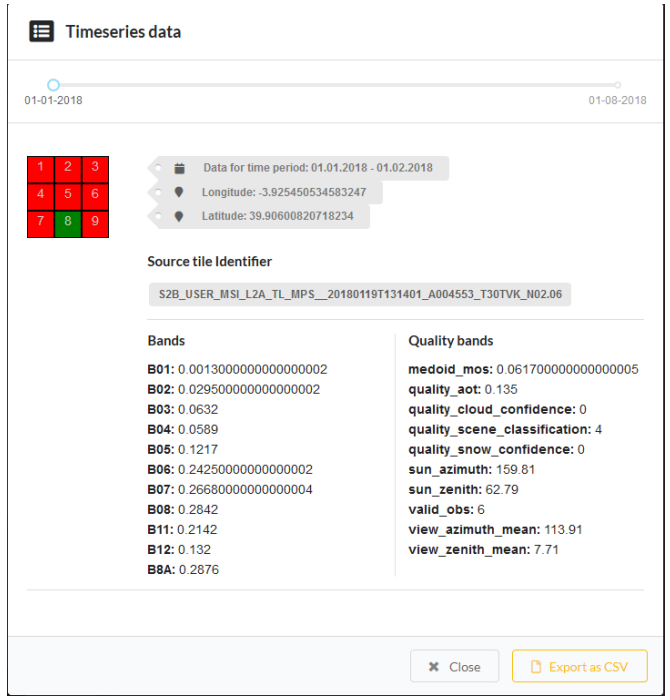
Copernicus Europe's eyes on Earth

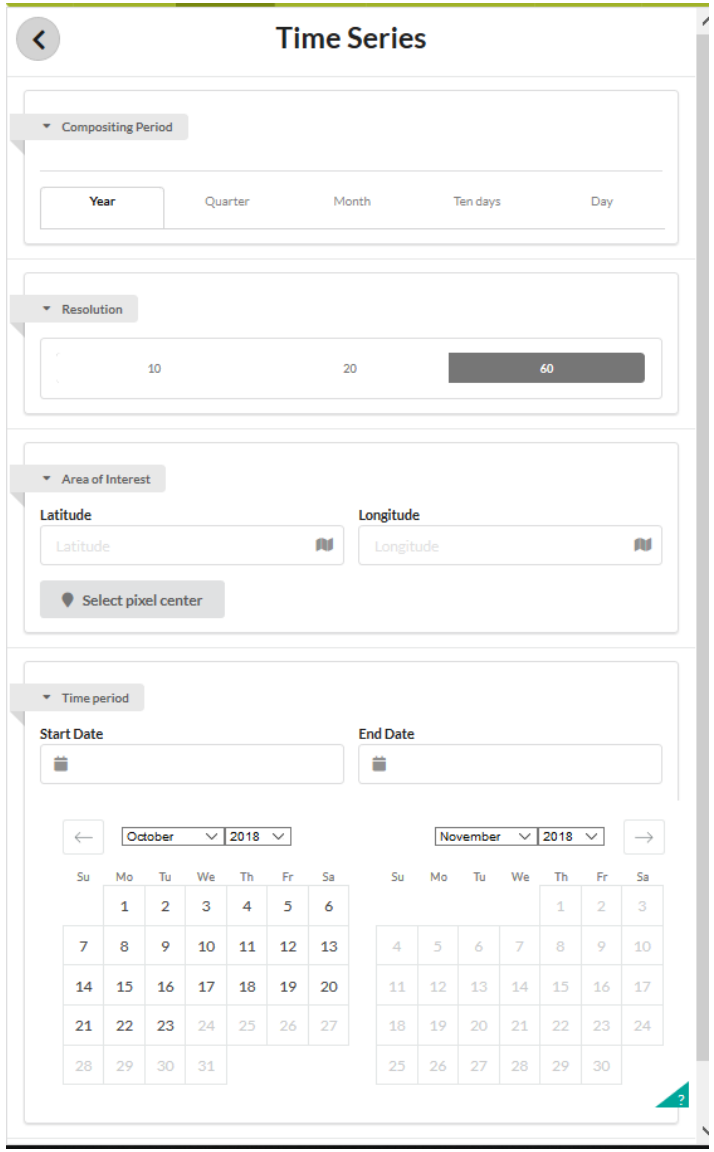
European Commission

Time-series tool

- Generation of time-series at arbitrary locations
- Single pixels or 3x3
- Direct inspection of data in the Mosaic Hub
- Download as csv for further analysis

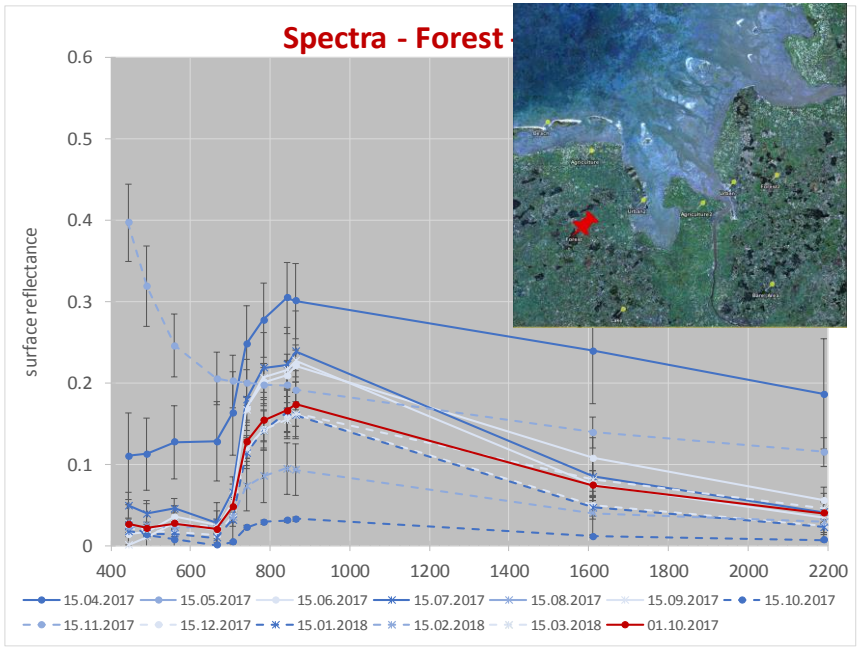






Quality control and validation

- Internal QC in production process to
  - Eliminate corrupt input files
  - Ensure integrity of output files
- Expert validation independent of production process
- Independent reference implementation



- External validation by independently contracted expert team
- Scientific validation of products and service provision
- Consortium led by IGN FI

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S2GM website

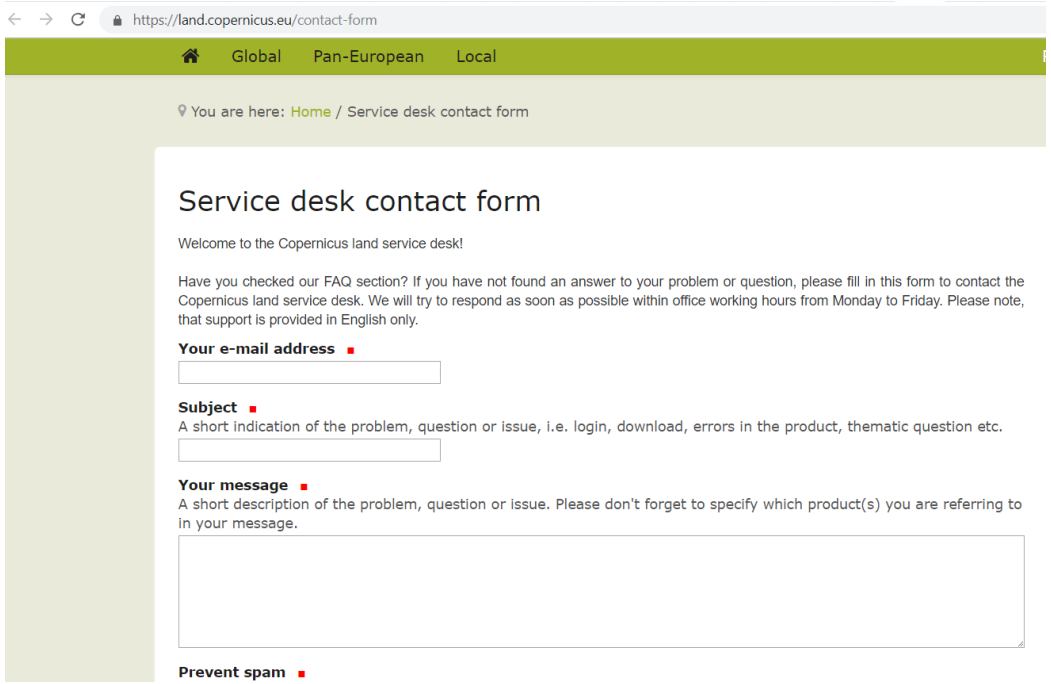
- Central entry point to all service components:
  - Mosaic Hub
  - Documentation
  - User support
  - News

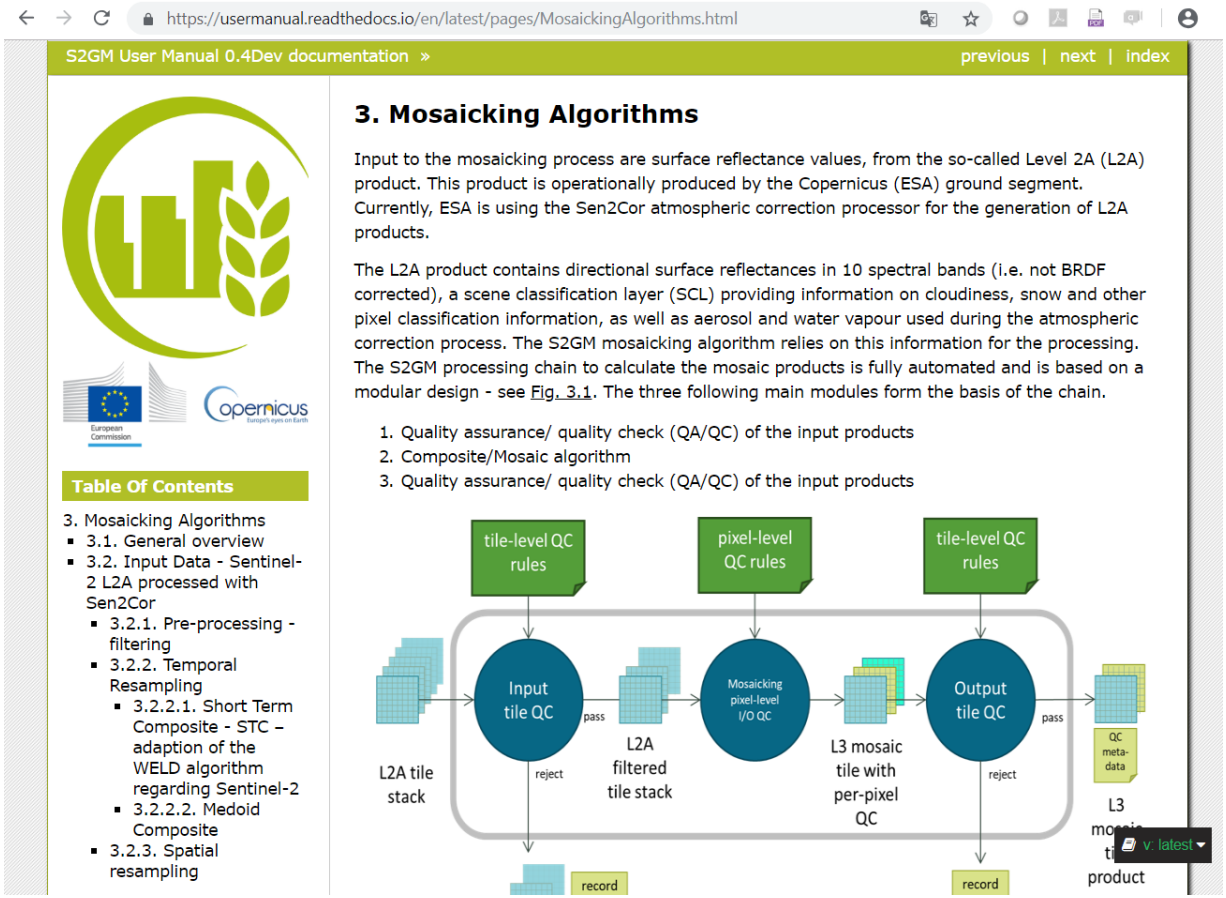
https://land.copernicus.eu/imagery-in-situ/global-image-mosaics/

www.s2gm.eu

Documentation and support

- Algorithm Theoretical Basis Document (ATBD)
- Online User Manual
- Expert support via CLMS service desk





Consortium

- Three European SMEs with complementary expertise in Earth Observation since many years.
- Clearly defined roles in S2GM service

SINERGISE

- Maintaining S2 L2A archive
- Mosaic Hub technology
- Distribution of products

BROCKMANN CONSULT GMBH

- Managing contract and consortium
- Mosaicking algorithms
- Sentinel-2 (pre-) processing expertise

GeoVille

- Internal quality control
- Thematic expertise land

Summary

Copernicus Sentinel-2 Global Mosaic service

- provides scientifically sound mosaics of Sentinel- 2 surface reflectance data on a global scale
- is fit for various applications
- is free to use by everyone
- is accessible via www.s2gm.eu and via CLMS
- is operated by a team of dedicated experts ready to support users

Contact info@s2gm.eu
Or the Service desk of CLMS at
https://land.copernicus.eu/contact-form for more information!