

Sentinel-2 Mission Status

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5th GEOGLAM RAPP WORKSHOP, ESRIN, 16-17 May 2017

Copernicus Sentinel-2 Mission Constellation



**Two satellites on the same orbit
180° apart from each other**

**Global geometric revisit
of 5 days at equator with 2 satellites**

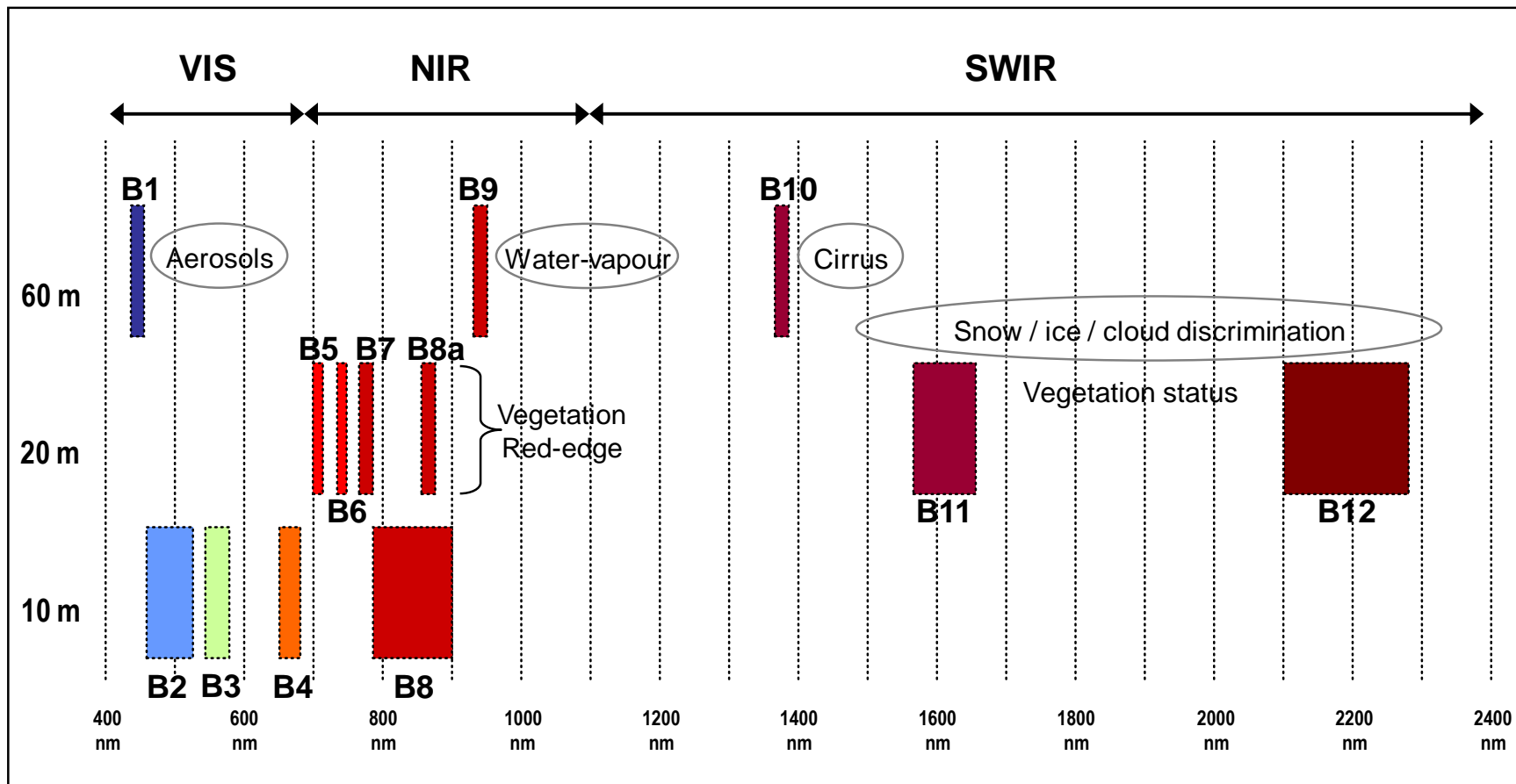


Swath of 290 Km

**Sun Synchronous Orbit,
786 km mean altitude**

**0 days 00 hours 00 minutes
Sentinel 2 constellation:
summer solstice**

Sentinel-2 MSI spectral bands



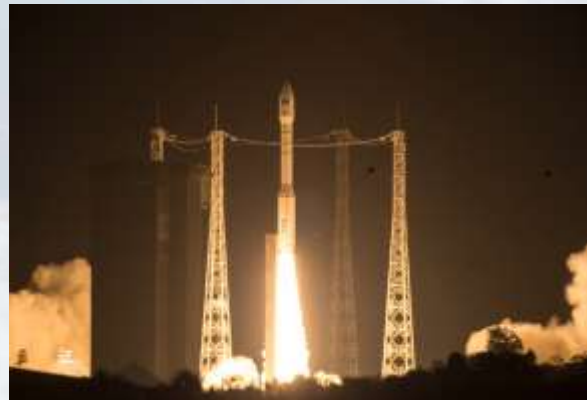
➤ Sentinel-2A nominal routine operations continue

- Systematic coverage **of Europe, Greenland and Africa every 10 days** (at equator). Rest of the World (due to reduced illumination at Northern latitudes): 20-day revisit till additional station (Inuvik) and/or EDRS is introduced (~summer 2017)
- First Sentinel-2 Validation Team (S2VT) and 2nd Sentinel-2 Quality Working Group meeting held in November 2016 confirming excellent performance of S2A. Product evolution recommendations being analysed.
- Improved mission planning check procedures have been introduced, based on in-orbit experience, to minimise outages.
- Pre-operational Level-2A 'Europe' released on 2 May 2017 via Open Access Hub (see below)
- **Sentinel-2B launch 6 March 2017, IOC phase proceeding nominally**

Sentinel-2: we have twins!



#Sentinel2Go:
15,000 messages on Twitter, Facebook, Instagram, etc. were posted in 48 hrs and ~ **100 million people** were reached all over the world



Sentinel-2B first image

sentinel-2

15 Mach 2017

Colour vision

- Introducing Sentinel-2

[ESA > Our Activities > Observing](#)

Applications

- Plant health
- Changing lands
- Water bodies
- Disaster mapping

A 'TOAST' TO COPERNICUS

About the mission

- Facts and figures
- Satellite constellation
- Instrument
- About the launch

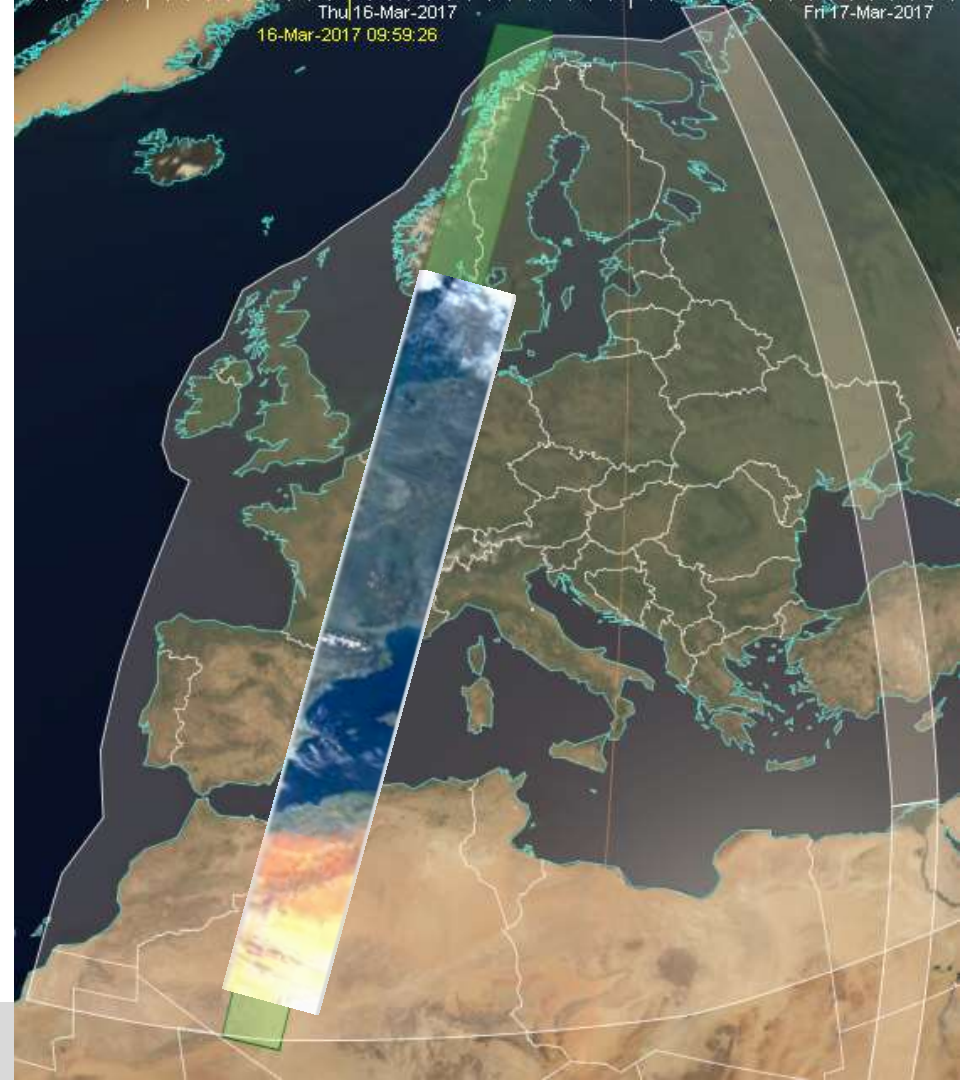


Brindisi, Italy



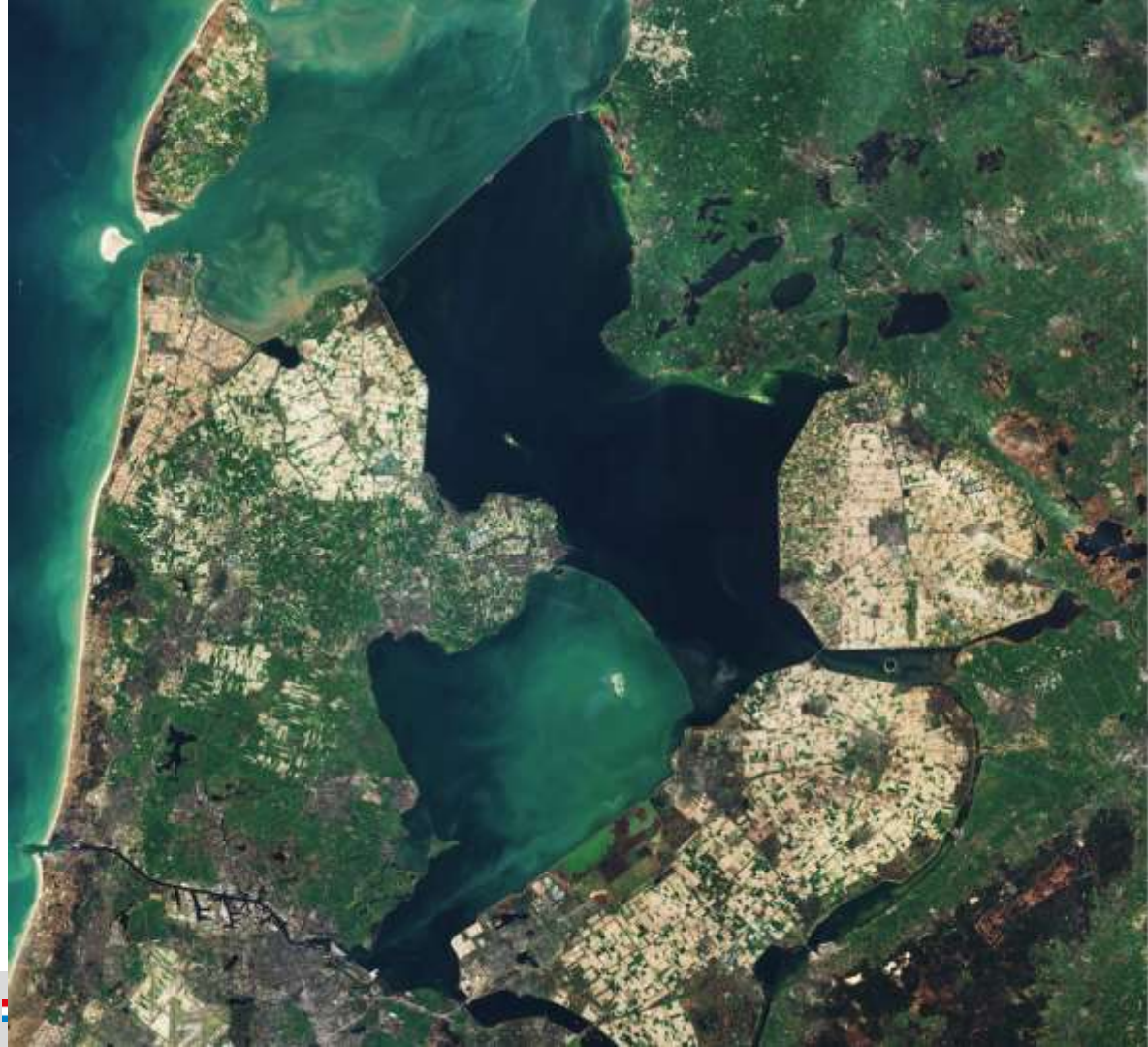
Sentinel-2B – 16 Mar 2017

One week after the launch!



Sentinel-2B

Netherlands
16 Mar 2017



S2B

Antwerp
Harbour
16 Mar 2017



S2B

Brussels
16 Mar 2017



Sentinel-2B status



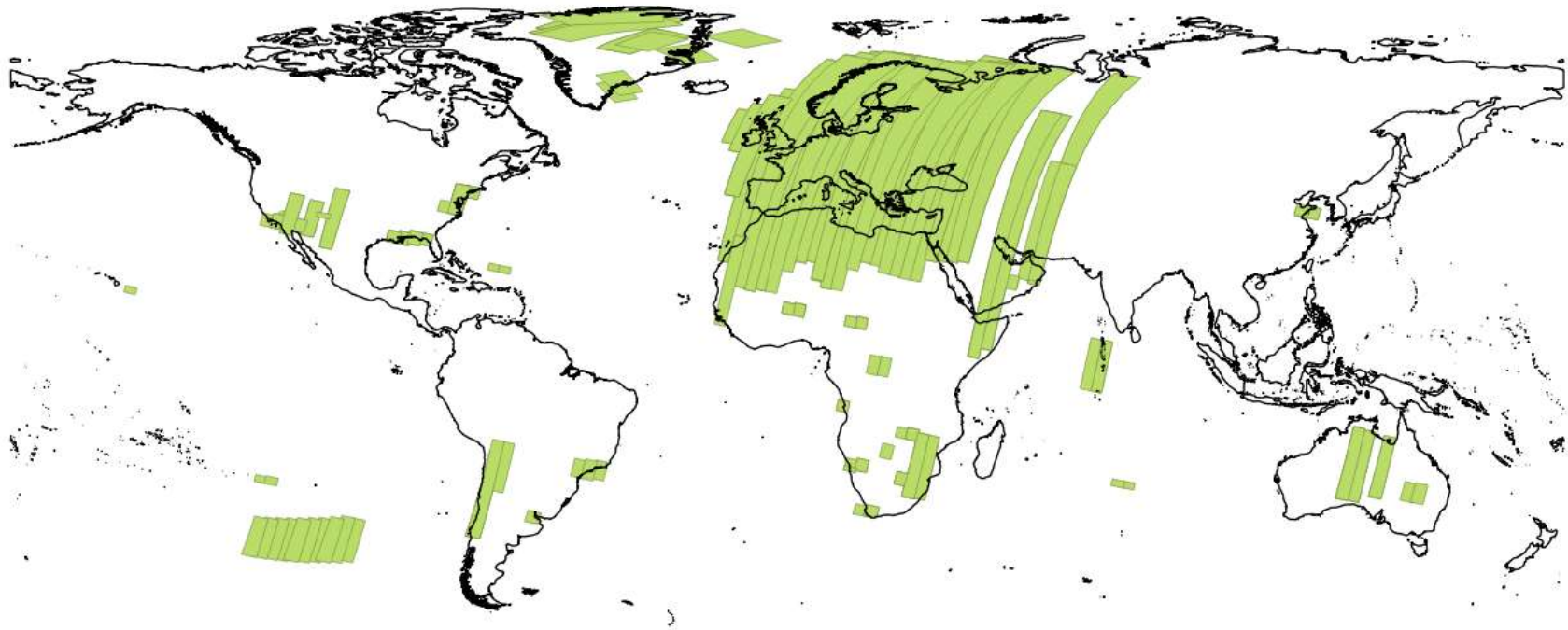
- All satellite functions are performing nominally.
- Several absolute calibration acquisitions were carried out with different integration times for the MSI SNR evaluation.
- About 6 hours of MSI image acquisitions were performed last week covering systematically Europe and vicarious sites for performance refinement.
- MSI decontamination took place 2-3 May

Upcoming

- Finalise IOC Phase activities, IOCR (mid-June 2017)
- OCP Inter-Satellite Link to show the functional capability of transmitting data to ground via a GEO counter-terminal
- Reselection of defective detector element, update of GIPP/NUC
- Sample products release to QWG for assessment prior to IOCR



Sentinel-2B acquisition areas during phase E1 esa



Sentinels Data Access – Current Configuration



 Copernicus Open Access Hub

 LATEST NEWS

 78,112 Self registered Users

 16,299,049 Products Downloaded
14.09 PB Volume Downloaded

 No Rolling Policy

 Sentinel-1 NTC
Sentinel-2 L1C
Sentinel-3 (preops)

 Max 2 concurrent Downloads

 Collaborative Hub

 LATEST NEWS

 13 Collaborative GS
7 Data Hub Relays

 6,864,273 Products Downloaded
6.88 PB Volume Downloaded

 Node1: 30 days
Node2: 9 days

 Sentinel-1 NRT & NTC
Sentinel-2 L1C

 Node1: Max 10 downloads
Node2: No Limits

 International Hub

 LATEST NEWS

 4 International Agreements

 2,303,826 Products Downloaded
2.08 PB Volume Downloaded

 30 days

 Sentinel-1 NTC
Sentinel-2 L1C

 Max 10 concurrent downloads

 Copernicus Services Hub

 LATEST NEWS

 185 Registered Users

 939,802 Products Downloaded
710.71 TB Volume Downloaded

 No Rolling Policy

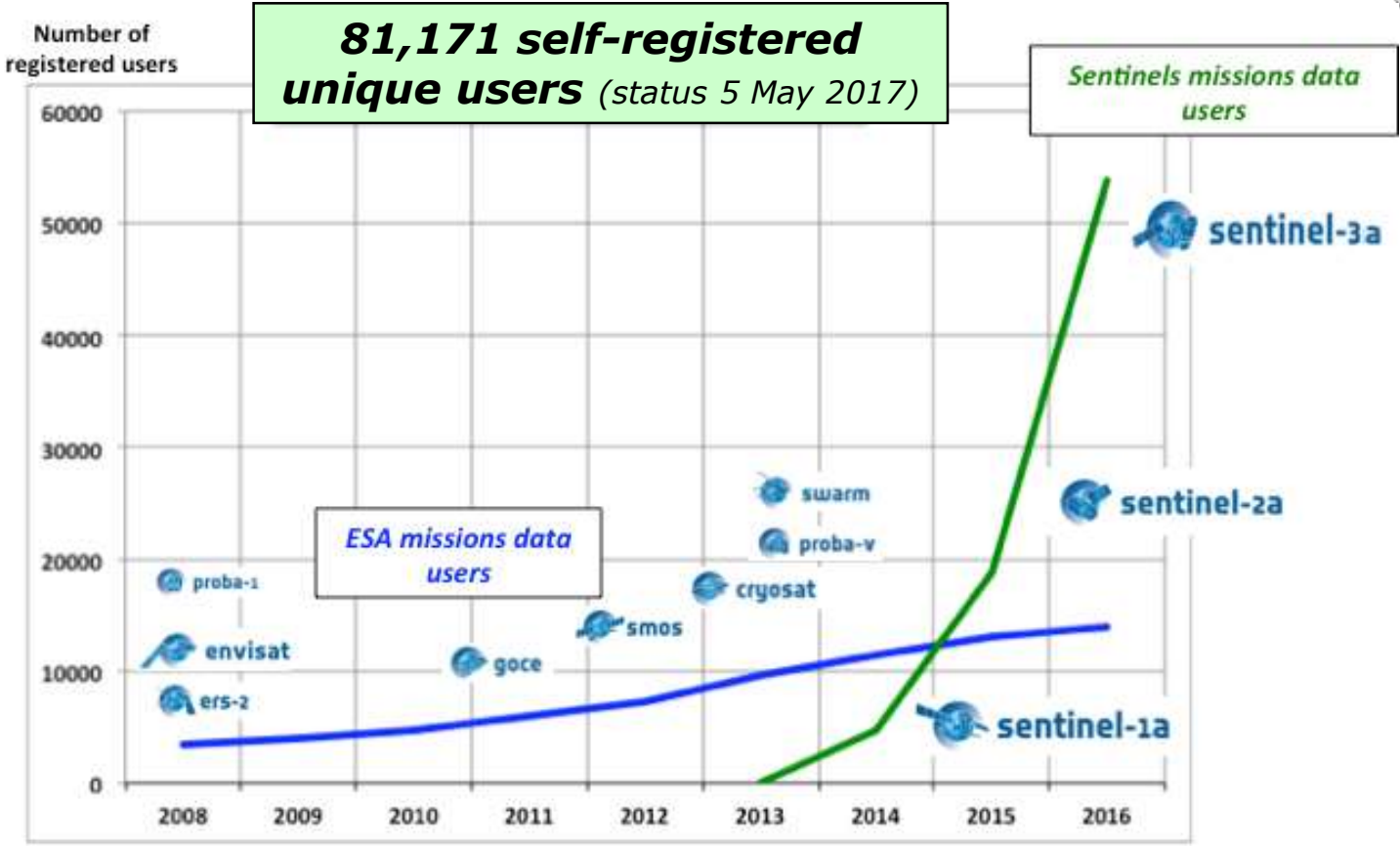
 Sentinel-1 NTC
Sentinel-2 L1C

 Max 10 concurrent downloads

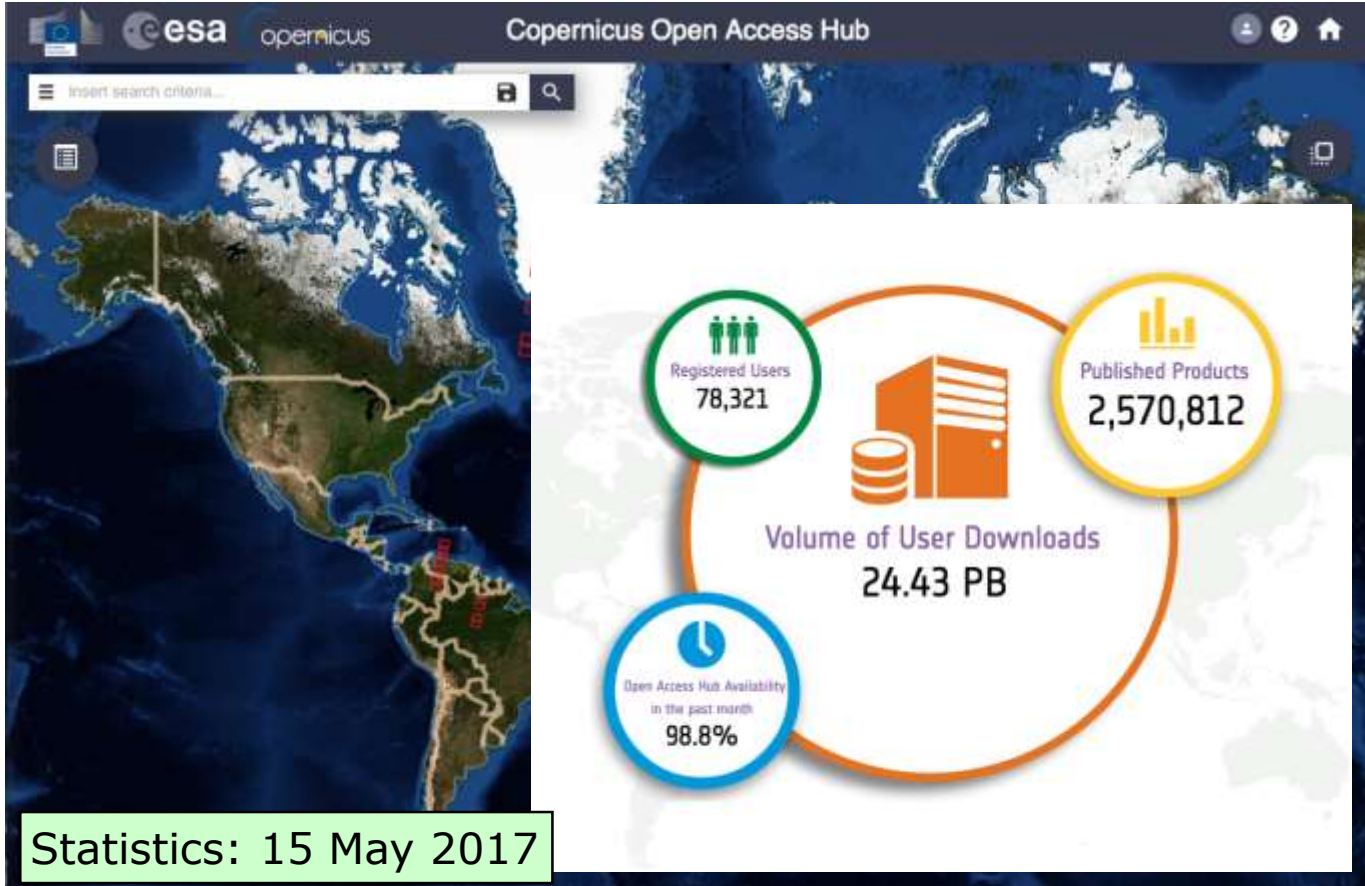
Statistics: 16 May 2017



Sentinels Data Access – User Registration



Sentinels Data Distribution – Overall Statistics

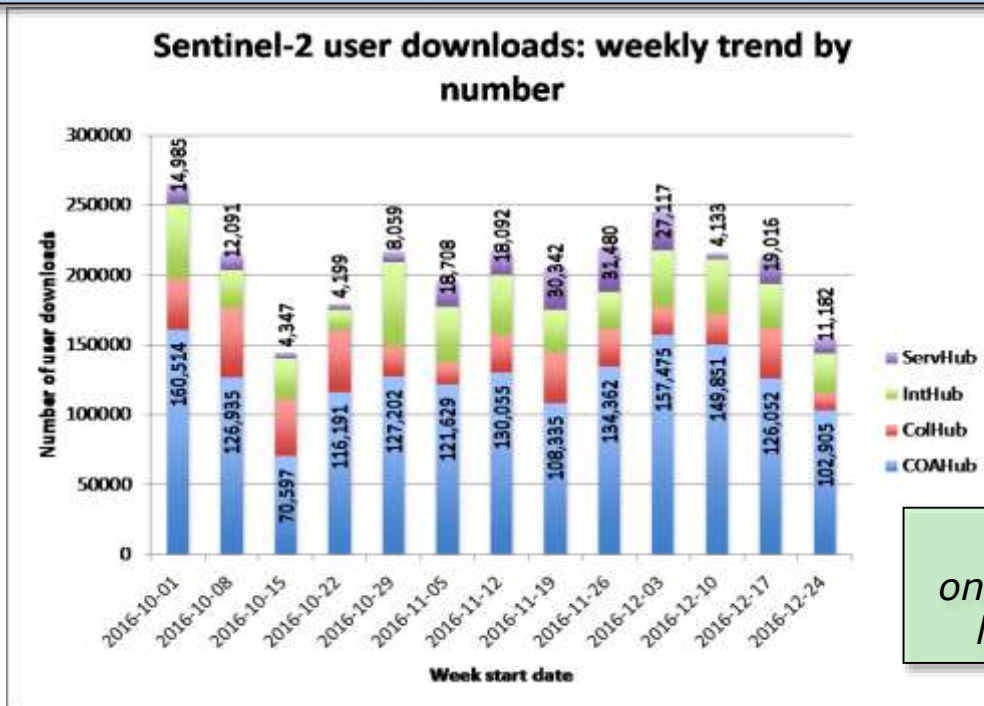


Statistics: 15 May 2017



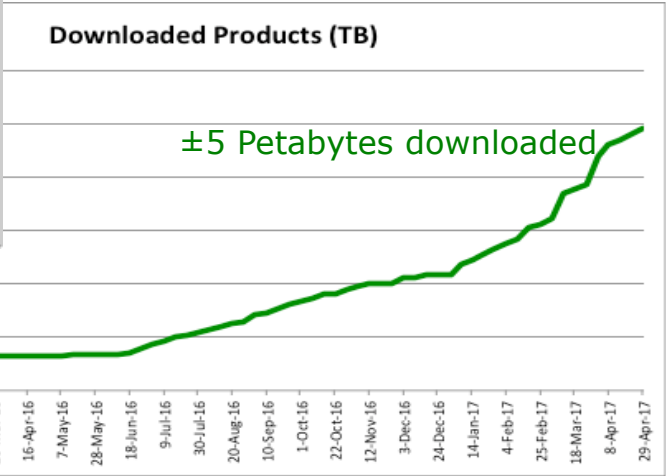
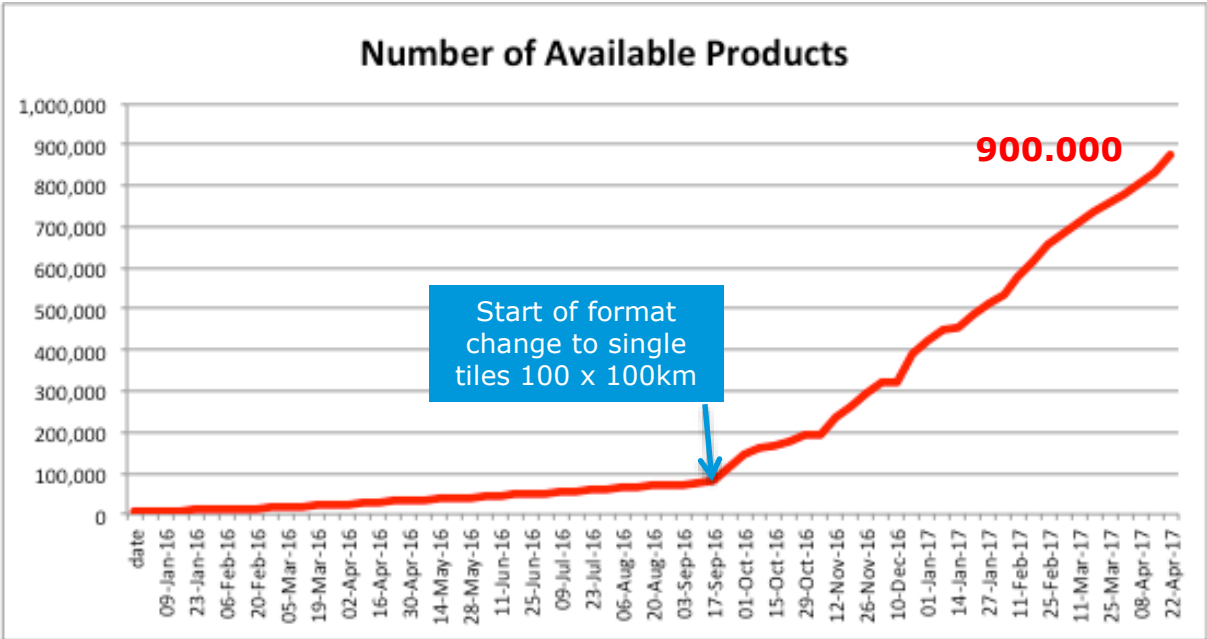
Sentinel-2: Data Distribution Statistics

Approx. 2,7 million products were downloaded during Q4-2016 (1,75PB of data)



Exploitation ratio - 1:10
on average each product published has been downloaded 10 times

Sentinel-2 Data Access (since Dec 2015)



More than 7.000.000 Sentinel-2 products downloaded in 16 months!



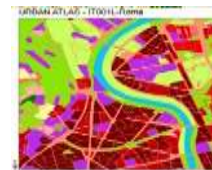
Ever increasing range of S2 Applications



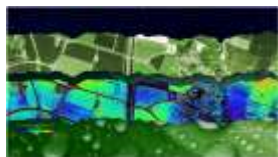
Forests & Carbon, Vegetation monitoring



European Land cover, human impact, high resolution layers



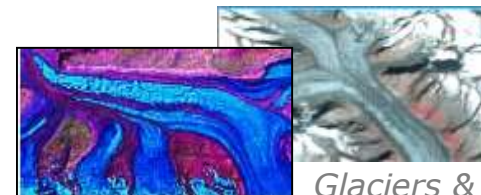
Regional to Urban Applications



Agriculture, Fluorescence & biophysical parameters



Global Land use & land cover

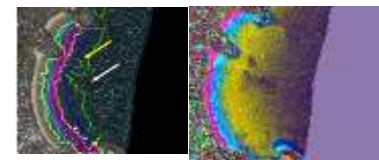
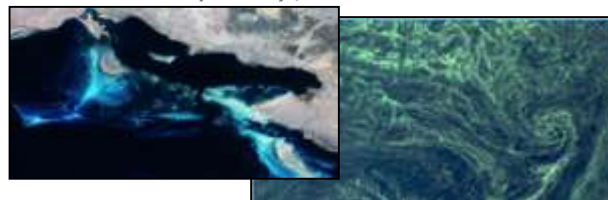


Glaciers & Ice



Emergency management

Water quality, Wetlands



Coastal zones/bathymetry



Geology & Geomorphology
European Space Agency

Sentinel-2 Products:



Name	High-level Description	Production	Preservation Strategy	Volume
Level-1C	Top-of-atmosphere reflectances in cartographic geometry	Systematic	Long-term	~500 MB (each 100x100km ²)
Level-2A	Bottom-of-atmosphere reflectances in cartographic geometry	On user side* (using Sen2Cor on Sentinel-2 Toolbox**)	N/A	~800 MB (each 100x100km ²)

*: European Pilot production just published, systematic global production of L2A planned.



→ Level-1C product status:

- › Fist products released on December 2015 (baseline 02.00)
 - Consolidation of processing chain => Baseline 02.04
- › Corrected some minor errors
 - Tile naming, detector footprint equators, physical gains metadata, clipping of reflectances at 1...
- › **Improvements performed**
 - Increased quantization depth, added meteorology auxiliary files
 - Improvement of geometric and radiometric calibration
 - Processing chain consolidation (robustness and processing time optimization)
- › Single tile products and short file names

→ Level 1 C product outlook

- › Short term: baseline 02.05 since beginning of May
 - correction of errors affecting auxiliary files and metadata
- › Medium term (~2018)
 - Geometric refinement: 3 m multi-temporal geolocation accuracy
 - Improved DEM: better geolocation for mountainous areas
 - Masks in raster format
 - Under study: offset on reflectances

Mission Performances

➔ Absolute geolocation

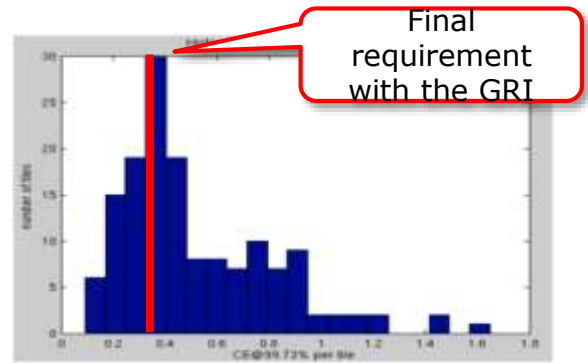
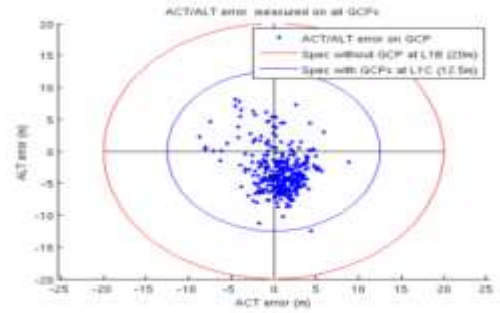
- › **CE 9.2 m at 95%**, well below the mission specification without the GRI (20 m)
- › NB: the quality of the Digital Elevation Model can impact performance locally in mountainous areas

➔ Multi-temporal registration

- › The multi-temporal is the only mission requirement which is not yet met (as expected):
 - **CE 1.12 pixels at 95%**, vs. 0.3 pixel specified
- › The full performance will be reached after activation of the GRI
 - This has been verified on a few sample products during commissioning

➔ Multi-spectral registration

- › Performance **below 0.3 pixels at 99% for all bands**
- › This contributes to the quality of image composites (RGB)
- › Co-registration performance also depends on the quality of the DEM (dependent on the altitude of imaged objects)



Sentinel 2 products

→ Level 2A product

Characteristics	Current status
Definition	Bottom-of-Atmosphere reflectances
Projection	Same as L1C
Dissemination unit	Same as L1C
Production	User-side production with publicly available software Sen2cor
Preservation	N/A
Volume	~ 800 MB
Images format	JPEG 2000 15 bits integer with quantization value = 10000
Metadata	Same as L1C + Radiometric classification (cloud, cloud shadows, water, snow...)
Auxiliary data	Same as L1C + Retrieved aerosol optical thickness and water vapour

L2A Production over Europe, open on SciHub since 2 May 2017



- The **Sen2Cor** processor (version 2.3.1) is generating bottom-of-atmosphere (BOA) reflectance products.
- It generates daily up to **300GB** of **L2A** products (~600 Tiles per Day).
- L2A products are made available as from 02 May 2017 through <http://scihub.esa.int>
- Products granularity of **L2A** is the same as **L1C** available on SciHub.
- **Could the GEOGLAM-RAPP community assess the suitability of such L2A?**



Next steps for S2 mission...

- Continue EDRS 'User Commissioning' for S2A (started)
- Jun 2017: start **Reprocessing** of data acquired during Sentinel-2A commissioning phase and entire Sentinel-2 archive into new tile format
- 14 Jun 2017: **Sentinel-2B 'First images' event** with celebration '60 years Rome Treaty'
- Sentinel-2B IOC finalisation - **IOCR** on 15 June 2017, mission **handover** followed by **ramp-up** (IOCR+ 4 m), data release to be authorised @IOCR
- Jul 2017: Results of **Level-2A** feasibility study, objective to decide roadmap for systematic global L2A production
- Autumn: Sentinel-2B 'User Commissioning' EDRS
- 2018: Start of GRI-based production for S2A and S2B.
- 2018: Towards operational L2A processor for global production, tbc
- 2018: Usage of better DEM, tbc
- 2018: Start major reprocessing exercise of all S2A/S2B archived data with GRI and operational L2A processor (archive size ~5PB!).

Thank you very much for your attention!
<http://sentinels.copernicus.eu>

