








# Mission Status: Sentinel-1, -2 and -3

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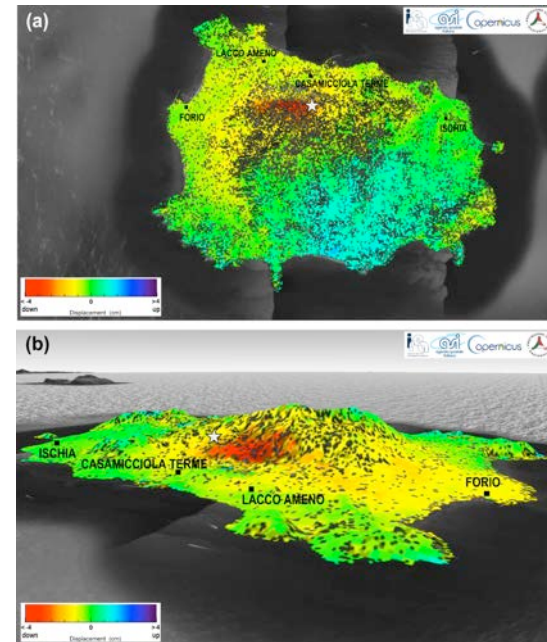
Earth Observation Directorate  
ESA-ESRIN, Frascati

## Key Features

<b>GFOI Core</b> →		<b>SENTINEL-1:</b> 4-40m resolution, 6 day revisit at equator	2 Sats in orbit	▶	Polar-orbiting, all-weather, day-and-night radar imaging
<b>GFOI Core</b> →		<b>SENTINEL-2:</b> 10-60m resolution, 5 days revisit time	2 Sats in Orbit	▶	Polar-orbiting, multispectral optical, high-res imaging
		<b>SENTINEL-3:</b> 300-1200m resolution, 2 days revisit	1 Sat in Orbit	▶	Optical and altimeter mission monitoring sea and land parameters
		<b>SENTINEL-4:</b> 8km resolution, 60 min revisit time	1 <sup>st</sup> Launch in 2020	▶	Payload for atmosphere chemistry monitoring on MTG-S
		<b>SENTINEL-5p:</b> 7-68km resolution, 1 day revisit	Launched Oct 2017	▶	Mission to reduce data gaps between Envisat, and S-5
		<b>SENTINEL-5:</b> 7.5-50km resolution, 1 day revisit	1 <sup>st</sup> Launch in 2021	▶	Payload for atmosphere chemistry monitoring on MetOp 2 <sup>nd</sup> Gen
		<b>SENTINEL-6:</b> 10 day revisit time	1 <sup>st</sup> Launch in 2020	▶	Radar altimeter to measure sea-surface height globally

**FULL, FREE AND OPEN**

- **Sentinel-1 nominal routine operations on-going**
  - Sentinel-1A and -1B data routinely provided to Copernicus Services and users worldwide
  - On-going support to various activations from the Copernicus Emergency Management Service and International Charter Space and Major Disasters
- **Sentinel-1 constellation generates now nearly 12 TB of products daily** (against a formal specification of 3 TB)
- **Sentinel-1 is operated close to its full mission capacity** (i.e. difficulty to accommodate additional observations)
- **Upcoming activities**
  - Identify and implement mission evolution to support new user needs, assess an increased system capacity enabling further mission exploitation, etc.

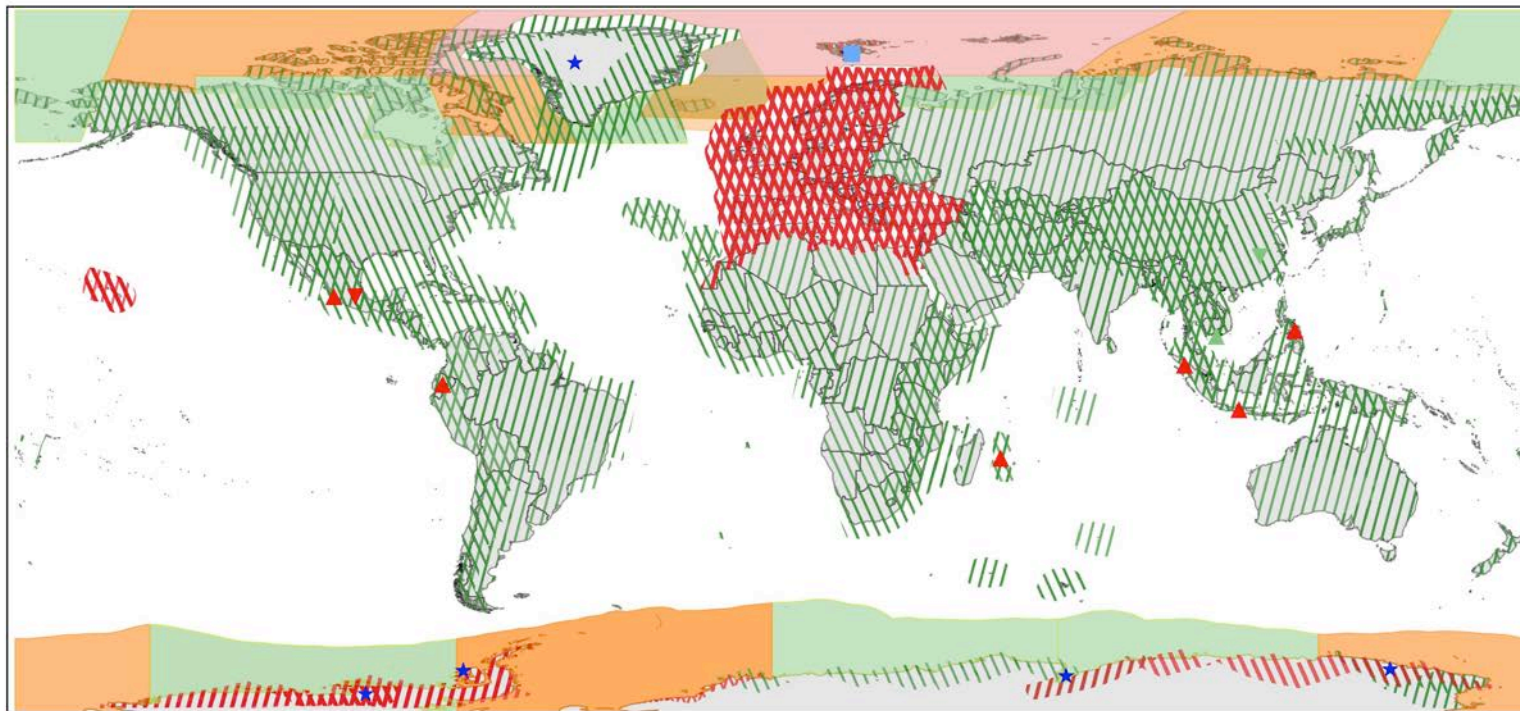


Md 4.0 Earthquake in Ischia, Italy, 21/08/2017.  
 Ground deformation measured by Sentinel-1  
 © Contains Copernicus Sentinel Data (2017) / CNR-IREA

# Sentinel-1 Constellation Observation Scenario: Revisit & Coverage Frequency



validity start: 02/2018



Updated  
Map

Baseline  
starting  
Feb 2018

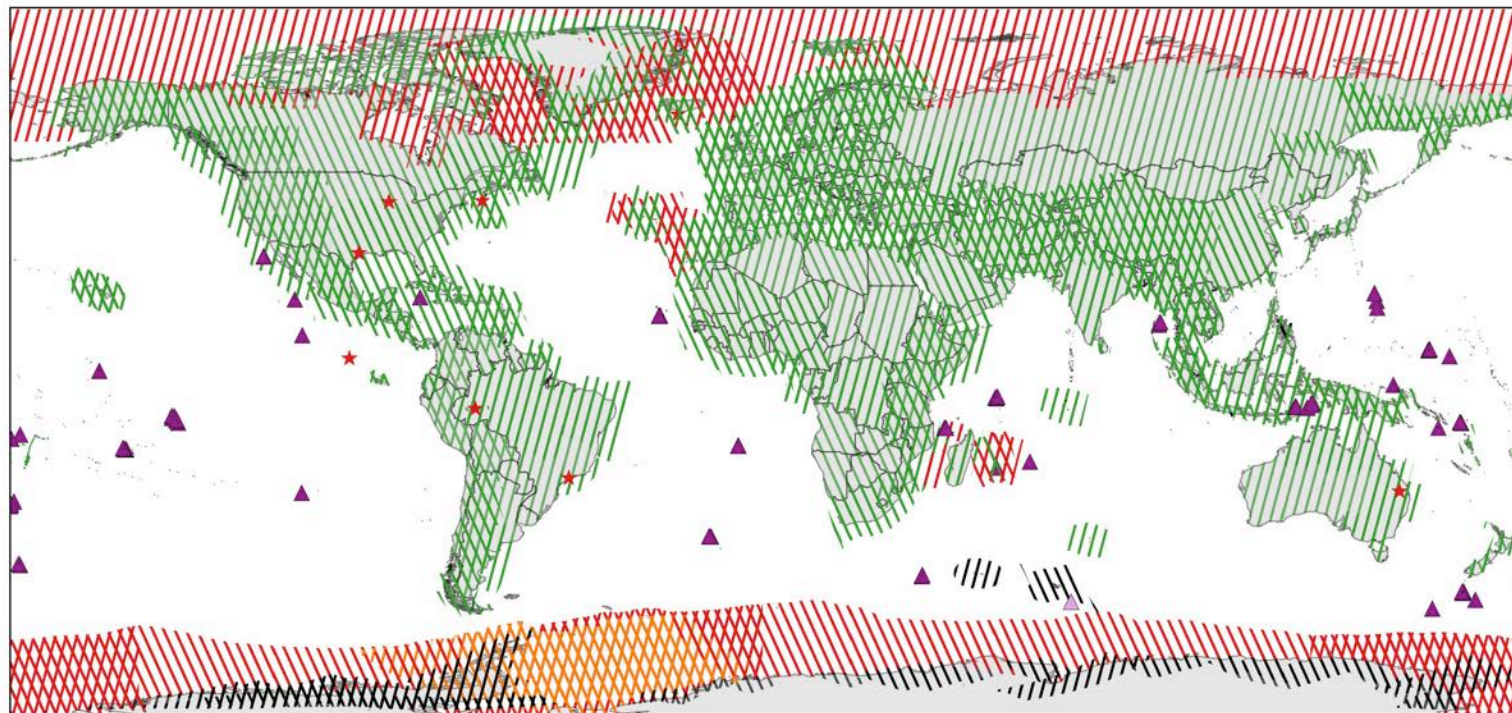
PASS	REVISIT	FREQUENCY *	COVERAGE	FREQUENCY **	REFERENCE DATA SITES (6d repeat)
<ul style="list-style-type: none"> <li> ASCENDING</li> <li> DESCENDING</li> </ul>	<ul style="list-style-type: none"> <li> 6 days</li> <li></li> <li></li> </ul>	<ul style="list-style-type: none"> <li> 12 days</li> <li></li> <li></li> </ul>	<ul style="list-style-type: none"> <li> 1 days</li> <li> 1-3 days</li> <li> 2-4 days</li> </ul>		<ul style="list-style-type: none"> <li> Highly active volcanism</li> <li> Fast subsidence</li> <li> Short growth cycle, intensive agriculture</li> <li> Fast changing wetlands</li> <li> Fast moving outlet glaciers</li> <li> Permafrost &amp; glaciers</li> </ul>

\* coverage ensured from same, repetitive relative orbits  
 \*\* coverage not considering repetitiveness of relative orbits

# Sentinel-1 Constellation Observation Scenario: Mode - Polarisation - Observation Geometry



validity start: 02/2018



Updated  
Map

Baseline  
starting  
Feb 2018

## POLARISATION SCHEMA



## MODE / POLARISATION

- IW mode / dual polarisation
- IW mode / single polarisation
- EW mode / dual polarisation
- EW mode / single polarisation

## PASS

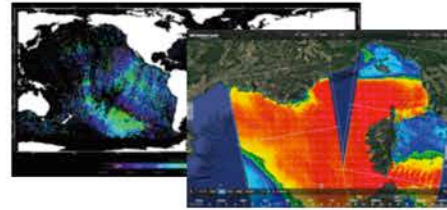
- ASCENDING
- DESCENDING

- SM mode / dual-polarisation
- SM mode / single-polarisation

- Calibration Site  
(locally different modes or polarisations possible)

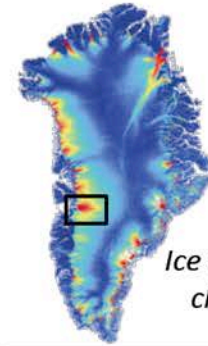
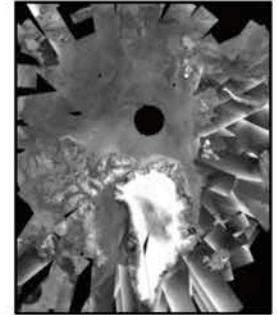


*Maritime surveillance: oil spill monitoring, ship detection, illegal fisheries, etc.*

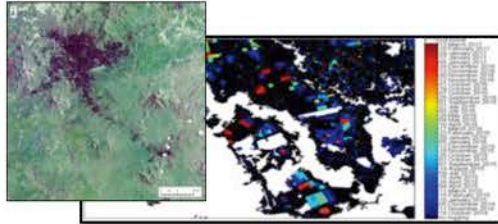


*Sea state: wind, wave*

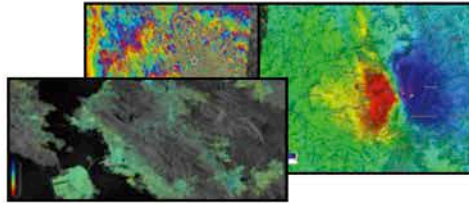
*Sea ice and iceberg monitoring*



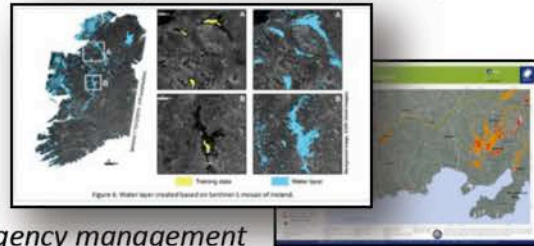
*Ice sheets, glaciers, climate change*



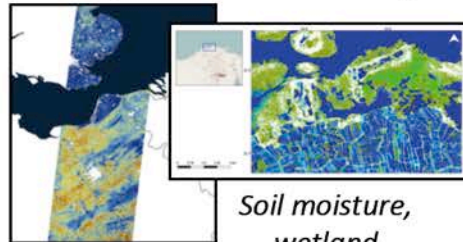
*Land use, agriculture, forestry, logging, land classification, urban planning*



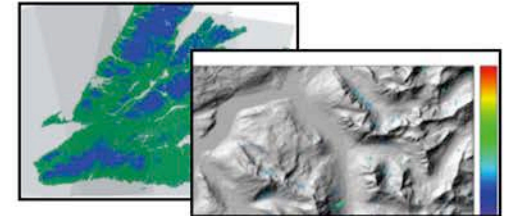
*Ground deformation: subsidence, landslides, earthquakes, volcanoes, infrastructure monitoring*



*Emergency management*



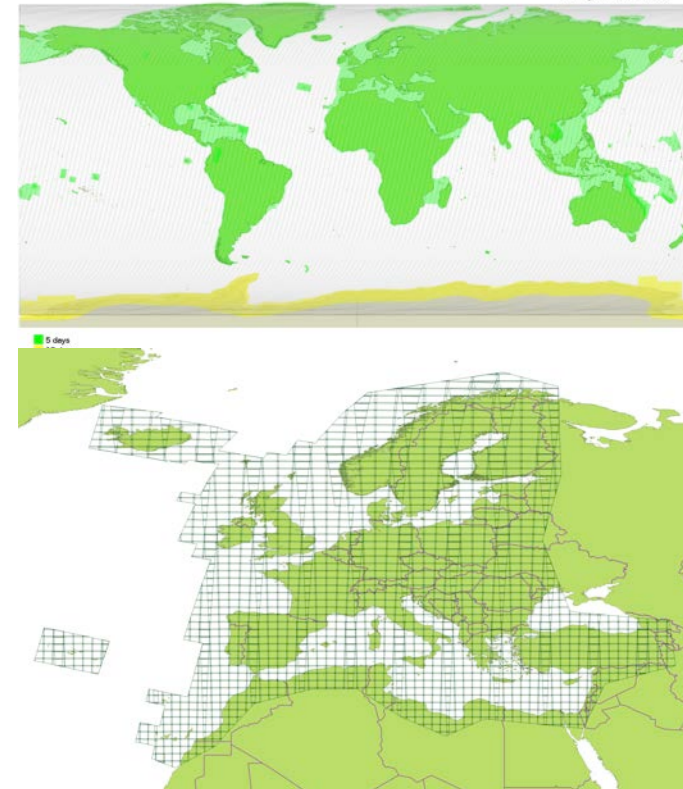
*Soil moisture, wetland*



*Snow, permafrost, avalanches, ...*

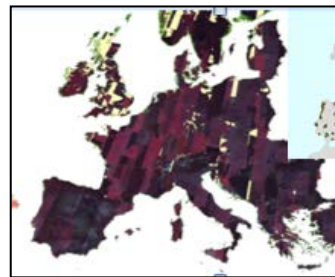
- Both Sentinel-2A and -2B operational.
- Systematic global coverage every 5 days.
- Surface reflectance product (Level-2A) distributed over Europe since May 2017 for Sentinel-2A, and since December 2017 for Sentinel-2B → July 2018 start of global Level-2A production.
- Completed reprocessing of Sentinel-2A commissioning phase products

Sentinel-2 Constellation Observation Scenario:  
Revisit Frequency

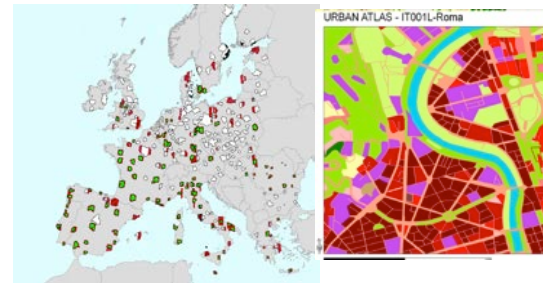




*Agriculture, Forests & Carbon, Vegetation monitoring*



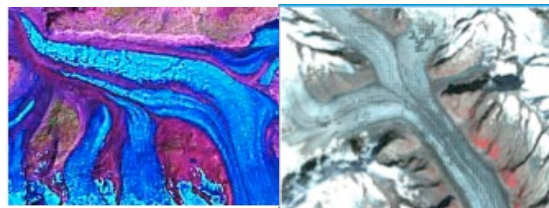
*European Land cover classification, high resolution layers & change.*



*Regional to Urban Applications*



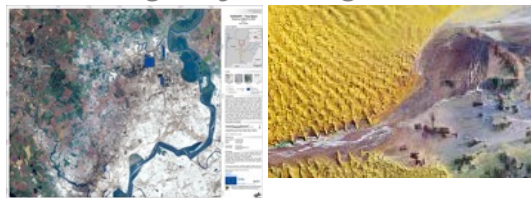
*Emergency management*



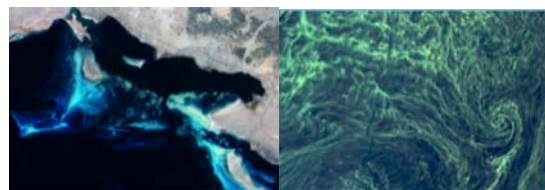
*Glaciers & Ice*



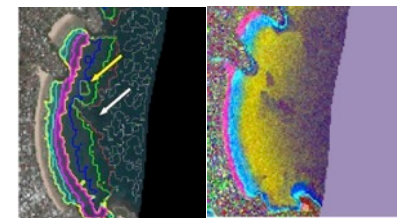
*Global Land use & change*



*Geology*



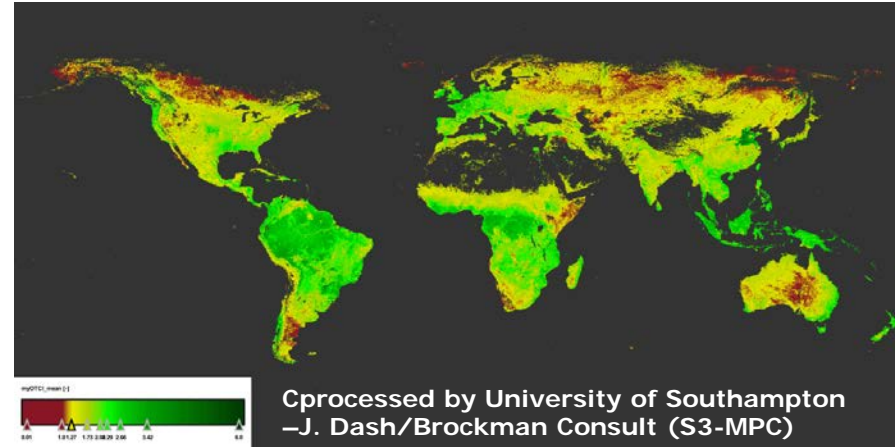
*Water quality*



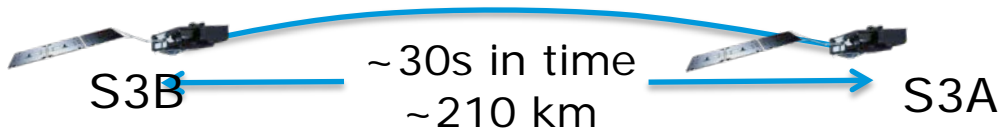
*Coastal zones/bathymetry*



- **Sentinel-3A** is now in **routine operations phase** and has reached full operational capacity: ESA-EUMETSAT Joint Routine Operations Readiness Review was successfully completed in October 2017
- Status of Sentinel-3A is **nominal**, with space and ground subsystems and instruments (OLCI, SLSTR, SRAL, MWR) performing nominally
- All Level 1 and Level 2 Land and Marine core data product have been **released**
- Definition and implementation of two new core (**Aerosol Optical Depth** and **Fire Radiative Product**) data products are on-going; sample products expected in Q2 2018



- **Reprocessing campaigns**, including data from commissioning phase, are ongoing for optical and altimetry data
- Intense on ground **validation activities** are on-going to ensure the best possible user acceptance of the Sentinel-3A products
- **Next milestone:** Preparation for **Sentinel-3B launch** (planned for 25 April 2018) is on-going



<https://scihub.copernicus.eu/>

## Welcome to the Copernicus Open Access Hub

The Copernicus Open Access Hub (previously known as Sentinels Scientific Data Hub) provides complete, free and open access to [Sentinel-1](#), [Sentinel-2](#) and [Sentinel-3](#) user products, starting from the In-Orbit Commissioning Review (IOCR).



Open Hub



API Hub



S-3 PreOps Hub



GNSS Hub

# Sentinel Open Hub: Free and Open Access to Sentinel data (previously called "Scientific" Hub)

<https://scihub.copernicus.eu/>



- Access through self-registration
- Automated download scripting capability and dedicated API-Hub
- Restriction on concurrent downloads

More than 130,000 users registered  
2.3 Million Sentinel-1 products are available on-line for download, representing about 3.5 PB of data.  
More than 14 PB of data downloaded by users.

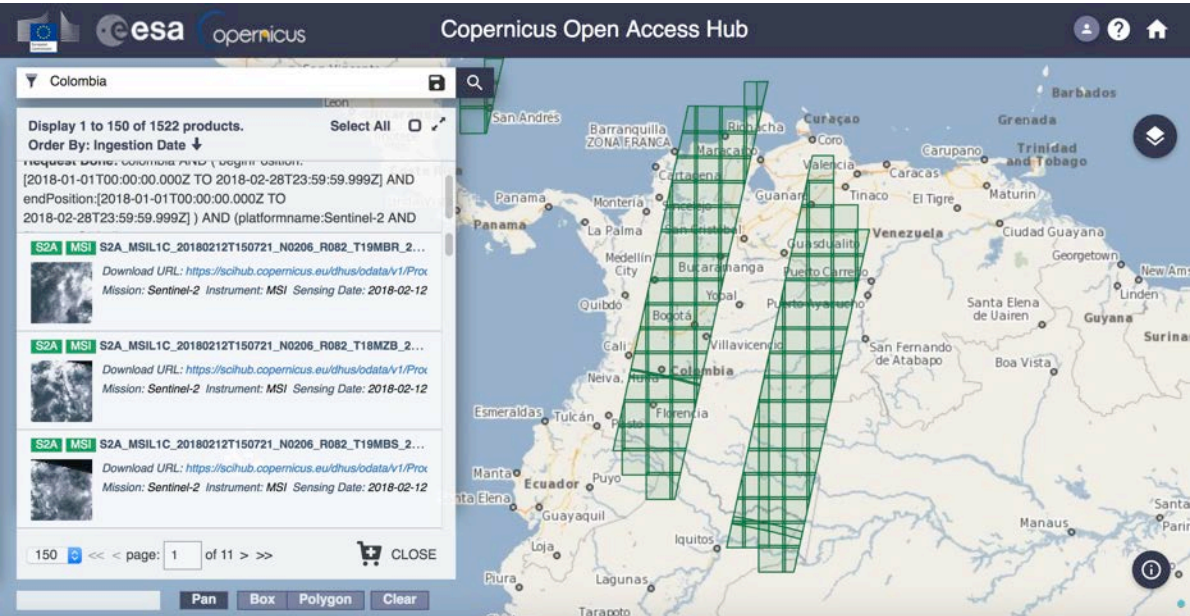
ESA UNCLASSIFIED -

2018 | Slide 11



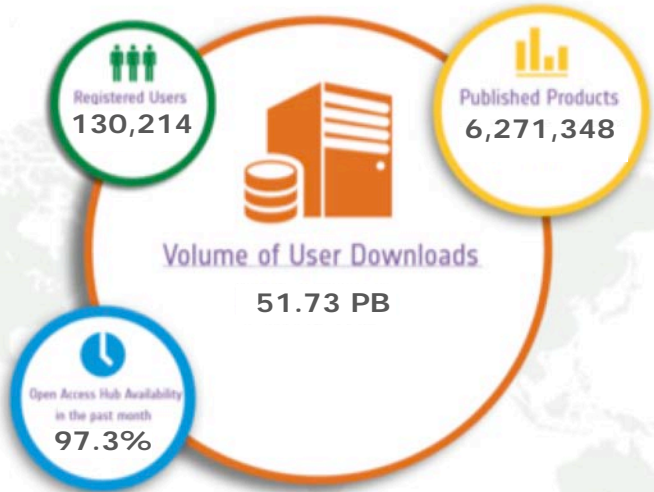
# Sentinel Open Hub: Free and Open Access to Sentinel data (previously called "Scientific" Hub)

<https://scihub.copernicus.eu/> 



Sentinel-2 over Colombia in Jan/Feb 2018  
(150 out of 1532 scenes)

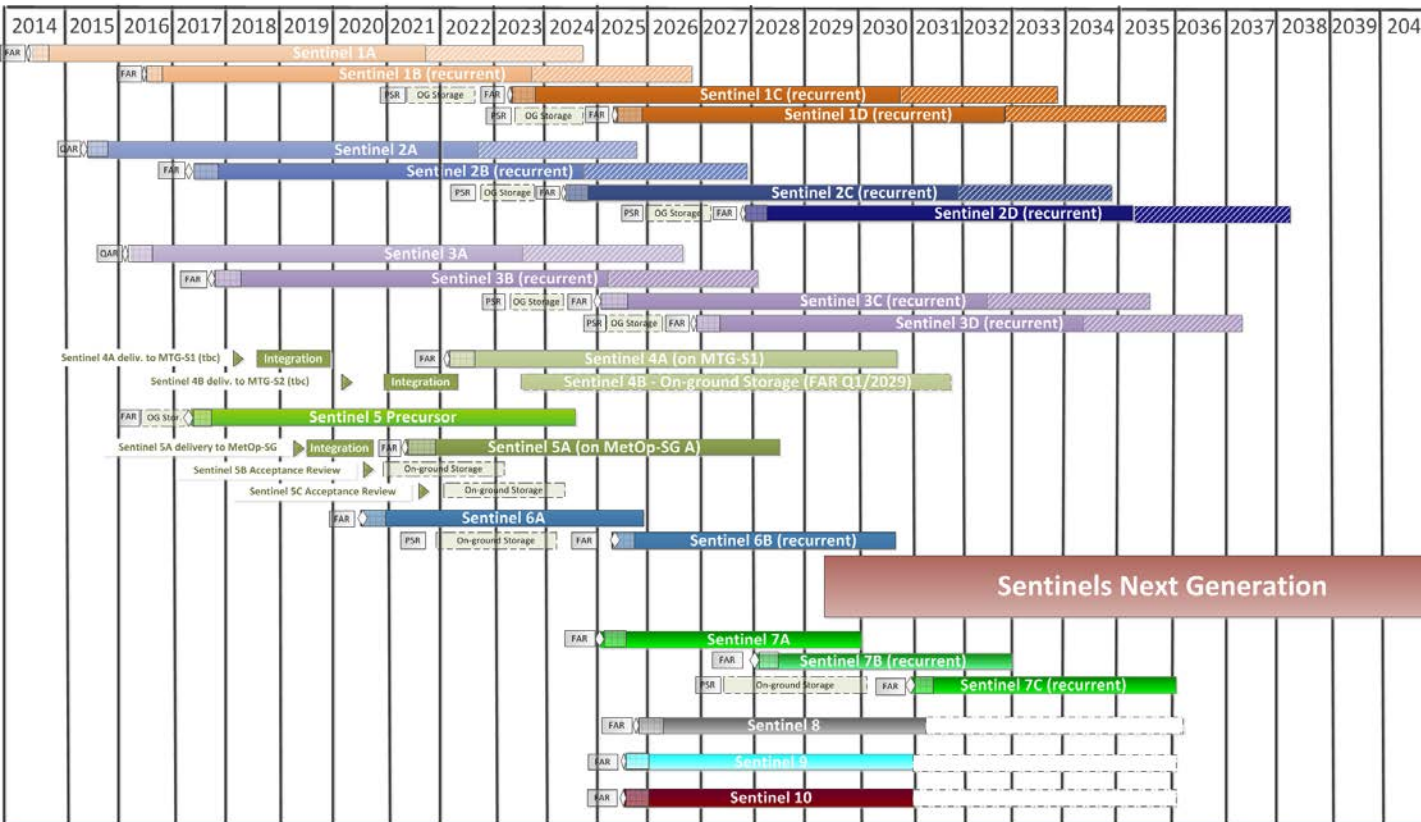
Overall Statistic of Open Hub  
(Status 28/02/2018)



ESA UNCLASSIFIED - For Official Use



European Space Agency



← Potential for CSC Evolution

**Legend:**

- Qualification Acceptance Review (QAR)
- Flight Acceptance Review (FAR) or PreStorage Review (PSR)
- On-ground (OG) Storage
- Tentative launch date
- In-orbit Commissioning
- 3 years Extended lifetime

Status: 21 Nov 2016



It is assumed that the following Sentinels are confirmed as a result of the user consultation process and following a gap analysis :

Candidates to be verified through requirements process!

- Sentinel-7: a anthropogenic CO<sub>2</sub> monitoring mission
- Sentinel-8: a Thermal Infrared Imager (companion to Sentinel-2 C/D)
- Sentinel-9: components:
  - S-9 ICE: Enhanced Ice and Snow Continuity mission
  - S-9 HEO: Polar Weather Payload on a Highly Elliptical Orbit
- Sentinel-10: a Hyper-spectral mission
- Sentinel-11: L-band SAR mission

# Summary



- The European Copernicus Programme will secure **continuity of observations and data availability** for the next 20+ years;
- Copernicus Data policy: **free and open access** for everybody  
→ <https://scihub.copernicus.eu/>
- Sentinel-1 and -2 are **core mission for GFOI**
- Additional potential use of Sentinel-3 in **GFOI Early Warning**
- Growing user community on **Open Hub** and other distribution channels and platforms
- On-going discussion on **extension of the Sentinel** family

