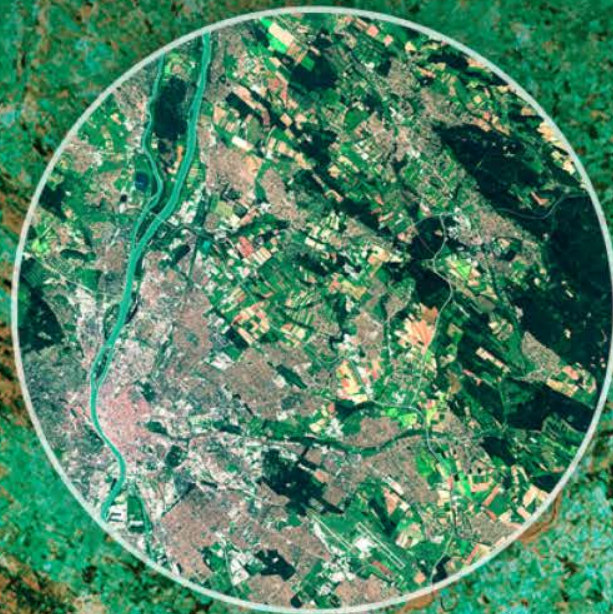


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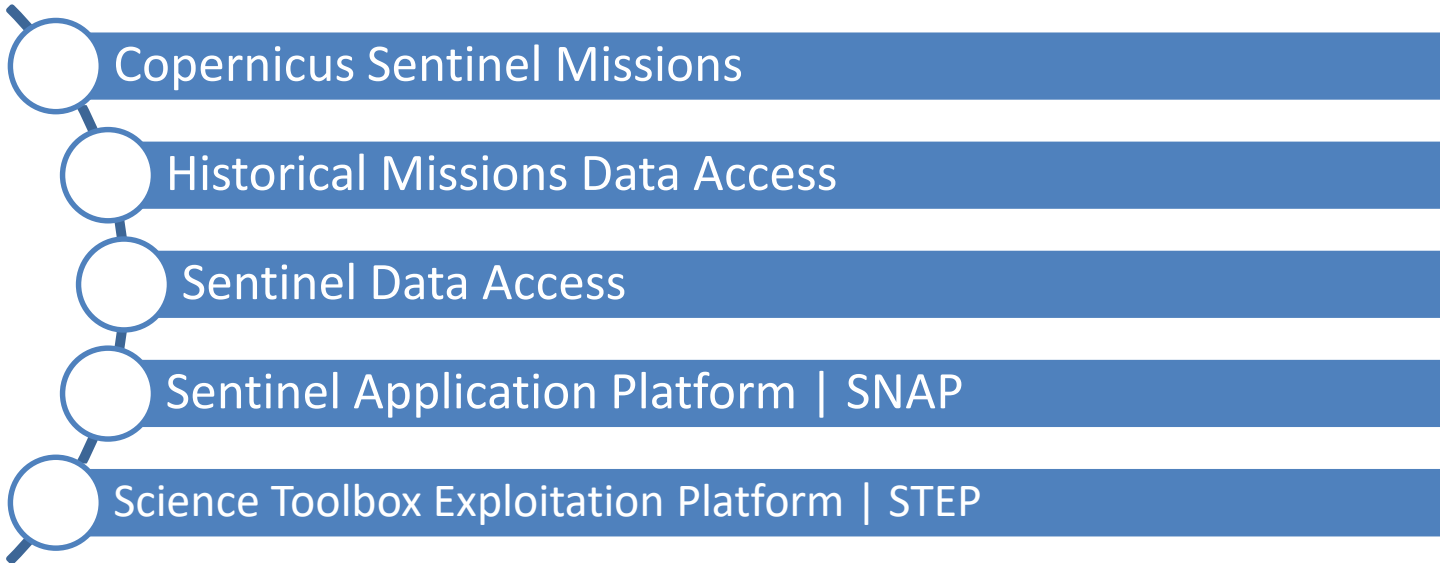
SENTINEL DATA ACCESS & PROCESSING TOOLS

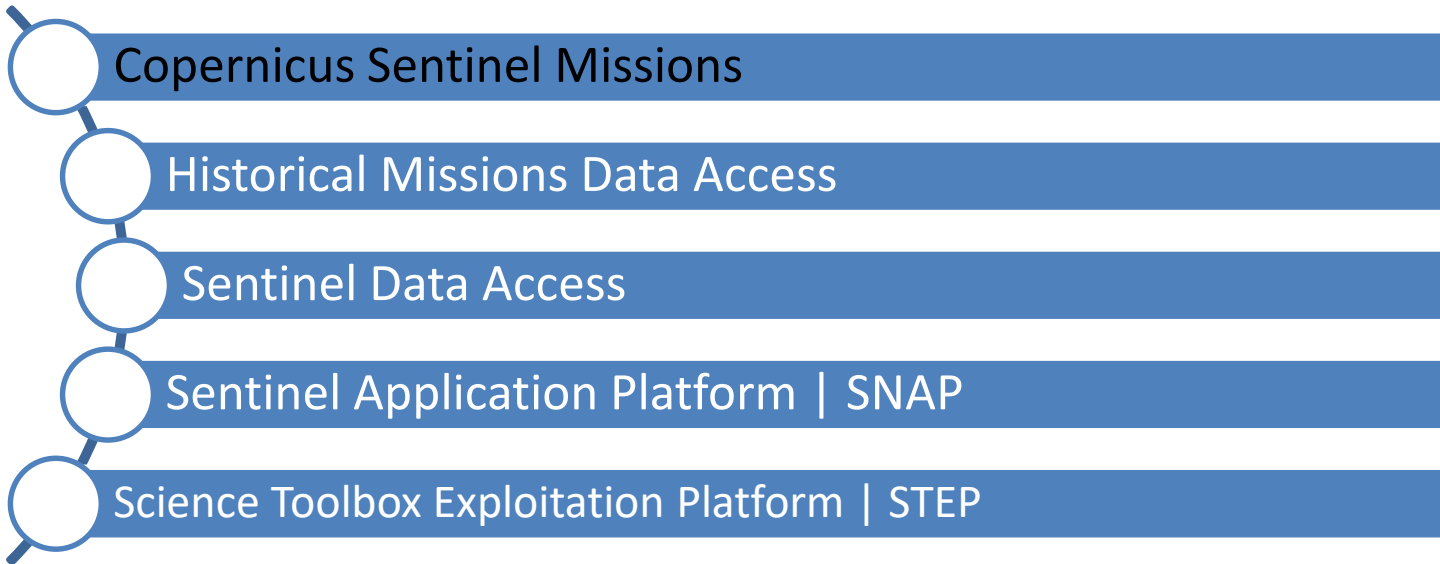
Michael Foumelis

French Geological Survey (BRGM), France

with contribution from **ESA-ESRIN**

Presentation Overview






The Copernicus Programme

A Space Flagship Programme run by EU and ESA

Dedicated satellites (“Sentinels”):

- **S1: Radar Mission**  S1A: April-2014
S1B: April-2016
- **S2: High Resolution Optical Mission**  S2A: June-2015
- **S3: Medium Resolution Imaging and Altimetry Mission**  S3A: Feb-2016
- S4: GEO Atmospheric Chemistry Mission
- S5P/S5: LEO Atmospheric Chemistry Missions
- S6/Jason-CS: Altimetry Mission



Sentinel Online | The Official Sentinel Website

<https://sentinel.esa.int/web/sentinel/home>

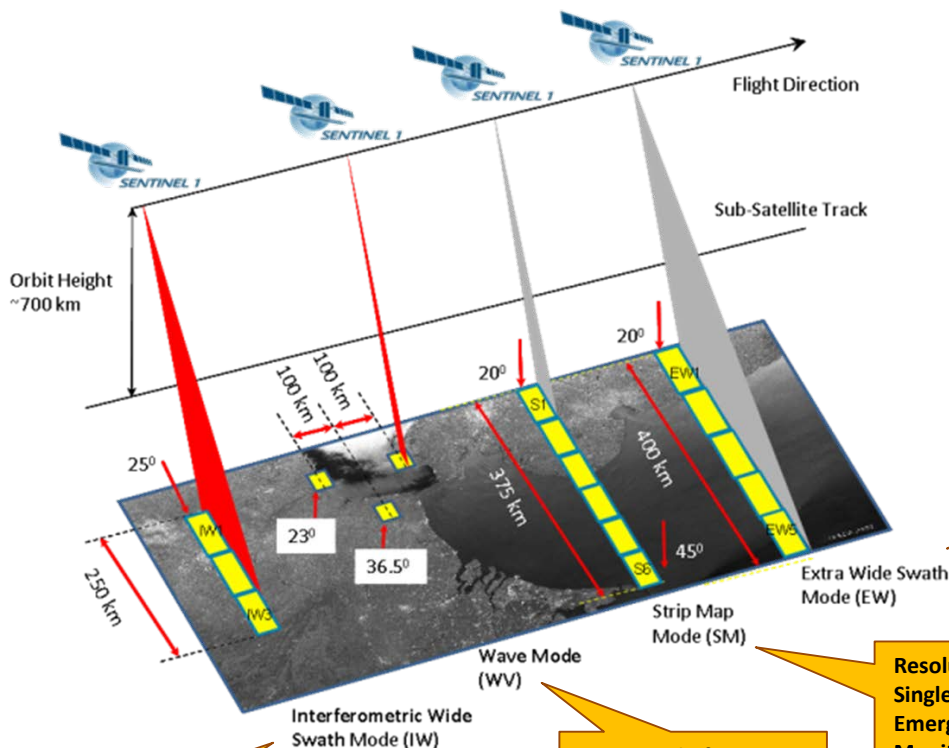


Sentinel online website provides technical guidelines for all sentinels, news and events related ,data access info and policy, last scientific results and more...

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Sentinel-1 Mission Profile



S-1 SAR can be operated in 4 exclusive imaging modes with different resolution and coverages.

Resolution: 20 x 40m
Single and dual Polarisation
Polar areas, and ocean relevant areas
Can be used for interferometry

Resolution: 5m x 5m
Single and dual Polarisation
Emergency Services-Disaster
Monitoring

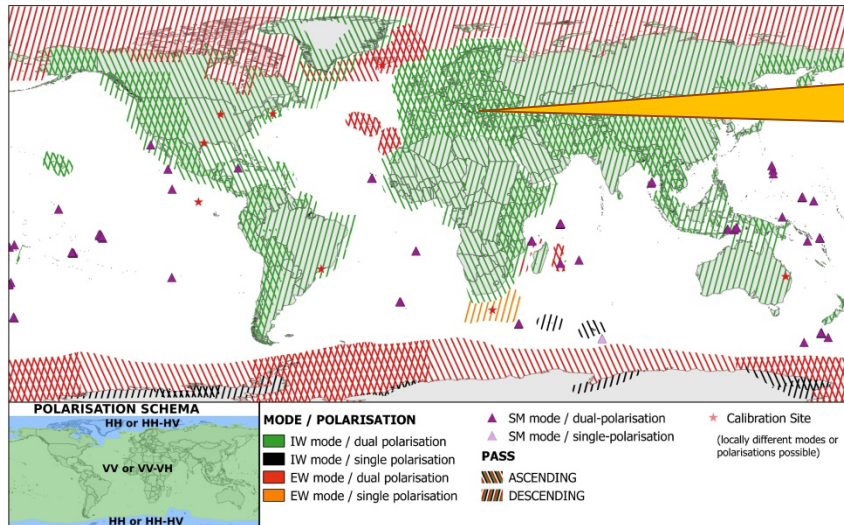
Resolution: 5m x 20m
Single and dual Polarisation
Pre-defined mode over Land

Composed of
Stripmap imagettes
Single polarisation
Pre-defined mode
over open oceans

Sentinel-1 Observation scenario

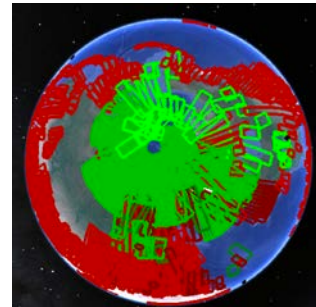
Sentinels are operated via a pre-defined background observation plan published ahead of every repeat cycle as KML format at: <https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-1/observation-scenario>

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



Europe covered systematically every cycle, ascending and descending passes, IW mode, Dual polarisation

- HH-HV or HH polarization for the monitoring of polar environments, sea-ice zones
- VV-VH or VV polarization for all other observation zones



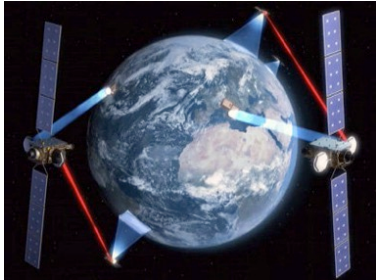
Operational use of European Data Relay System (EDRS)

The European Data Relay System service provides complementary acquisition of Sentinel-1 mission data addressing in particular:

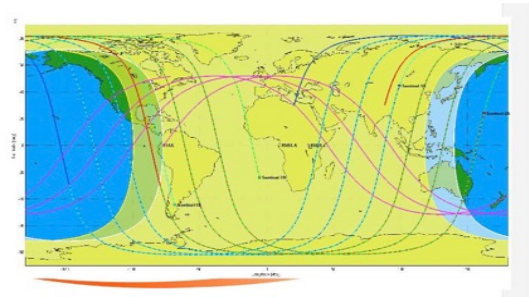
- **increased coverage**
- **enhanced timeliness, including quasi-real time (QRT)** observation capabilities, in particular outside Europe

The main functions provided by the service are:

- Sentinels mission **data transmission via Optical (Laser) link** to the GEO satellites
- Mission **data relay** between the GEO satellites and the Ka-band ground receiving terminals
- Mission **data reception, decommutation and provision** to the service interface point (Copernicus WAN circulation network)



EUTELSAT 9B hosting EDRS-A



EDRS-Sentinels geometrical visibility map

Sentinel-1/EDRS-A Operations

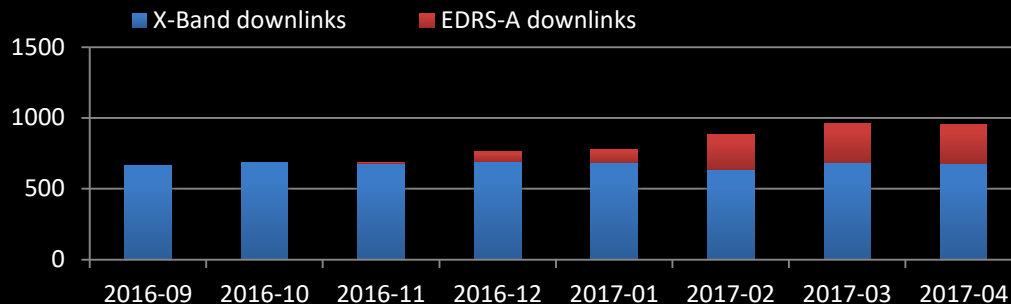
EDRS-A is operated as an additional downlink resource supporting Sentinel-1A and Sentinel-1B operations and brings a significant enhancement to the S1 operations, in particular:



More than 1000 EDRS-A/S1A operational downlinks performed to date

- ✓ Significant **increase in production volume** thanks to the additional downlink capabilities. Sentinel-1 products are being made available through the standard on-line data access mechanisms
- ✓ **Increased observations** (e.g. revisit) and SAR dual polarisation acquisitions
- ✓ significant **increase of Sentinel-1 pass-through acquisitions in X-Band over Europe**

S1A: X-Band and EDRS Downlinks per month



Sentinel-1 Systematic GLOBAL processing for IW SLC

- Backwards processing of IW SLC over areas not included in the SLC processing scenario since 2014.10.06 has started in summer 2016

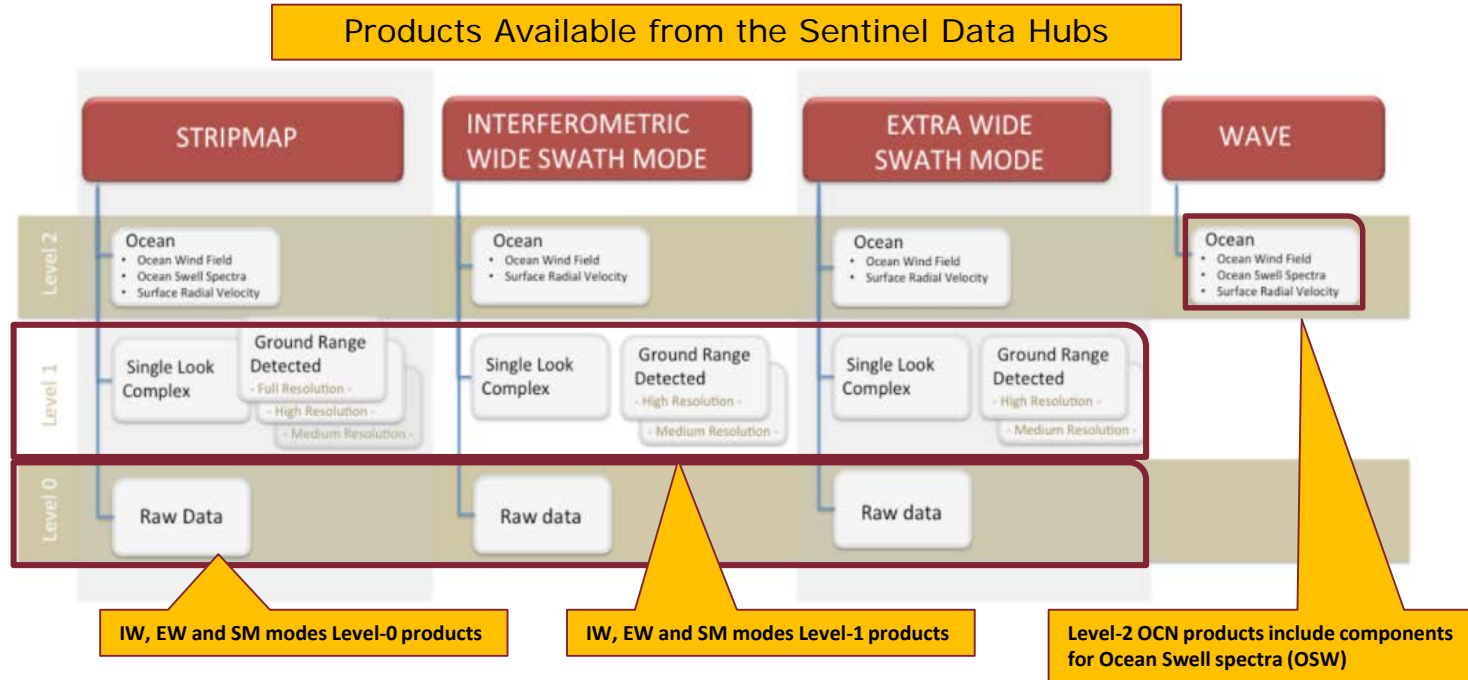


- Missing IW SLC for all areas in the past have being gradually made available on-line during 2016
- On-line availability of IW SLC products for all S1A data acquired since Oct. 2014 over land and ice masses has been completed in November 2016.

All Sentinel-1 data acquired in IW over Land and Ice masses since the Sentinel-1A data access opening is now available on-line to all users.

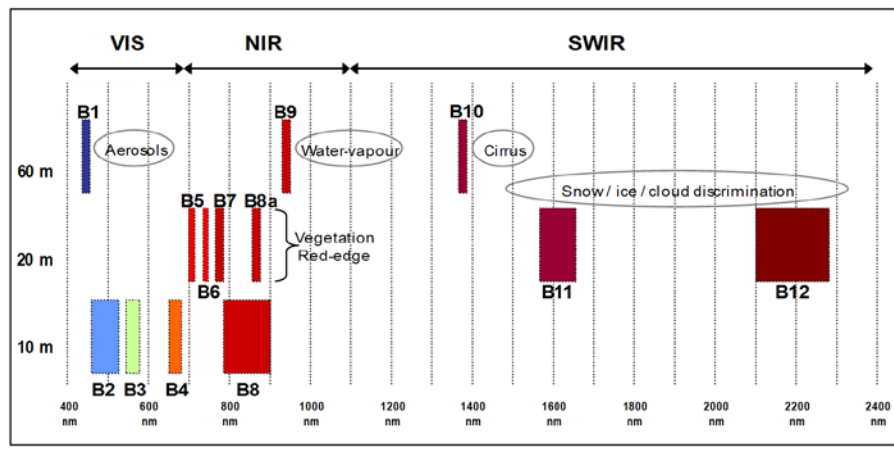
Sentinel-1 Production Scenario

All Sentinels acquired data is systematically downlinked and processed to generate a predefined list of core products within specific timeliness

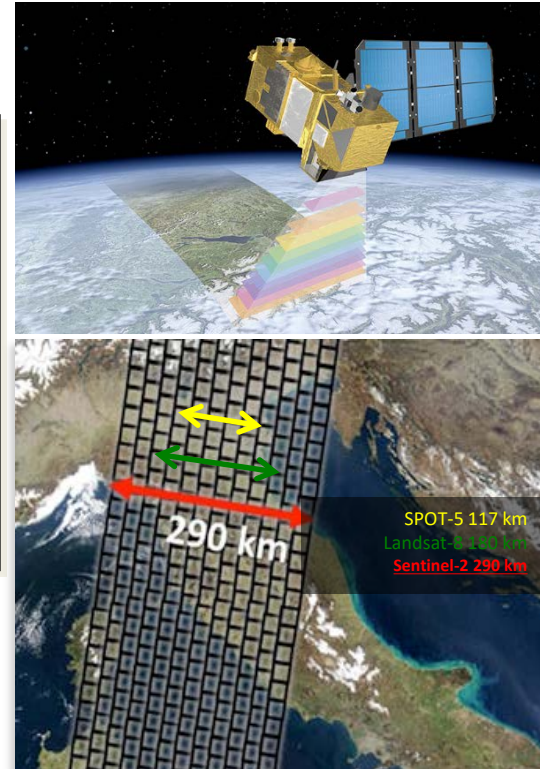


Sentinel-2 Mission Profile

High Resolution Optical Mission - Multispectral Imager (MSI) Instrument



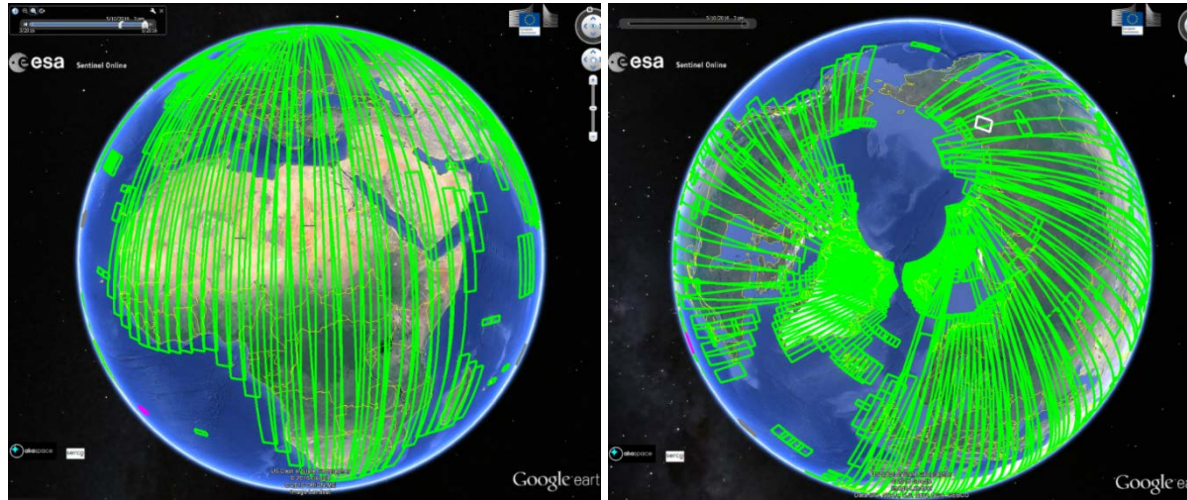
- 13 spectral bands in the Visible (VIS), Near Infrared (NIR), Short Wave Infrared (SWIR)
- Ground pixel resolution of 10m, 20m, 60m (for atmospheric correction) across a 290 km swath



Sentinel-2 Observation scenario

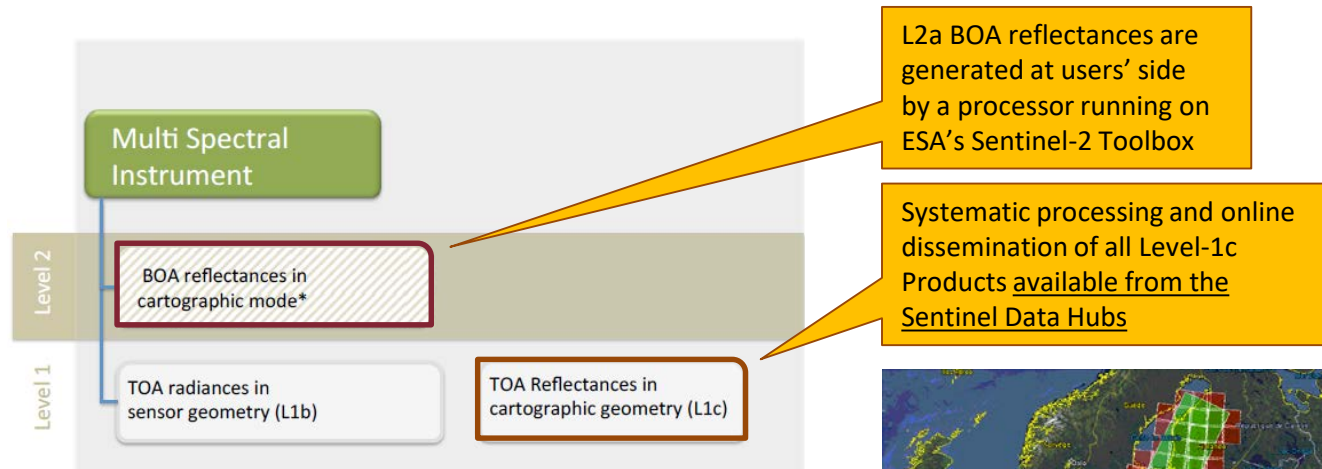
Regularly published online in KML format at:

<https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-2/acquisition-plans>



- High Revisit (10 days) at the equator with one satellite - 5 days with 2 satellites (2-3 days at mid-latitudes)
- Sentinel-2 systematically covers all land surfaces (56° South latitude - 84° North latitude)
- Europe & Africa systematically covered on every orbit
- The rest of the world within a certain time interval: currently 30 days, will be progressively reduced over the coming months to reach 10 days.

Sentinel-2 Production Scenario



Sentinel 2 Toolbox – L2b Biophysical Products

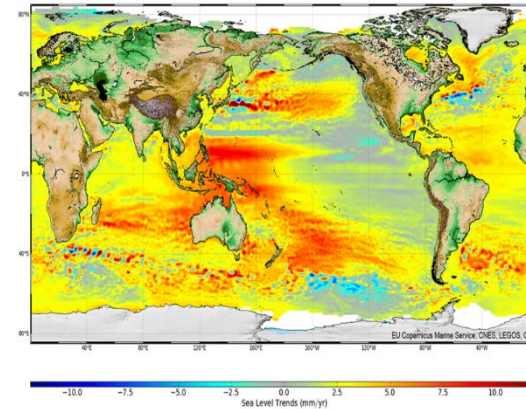
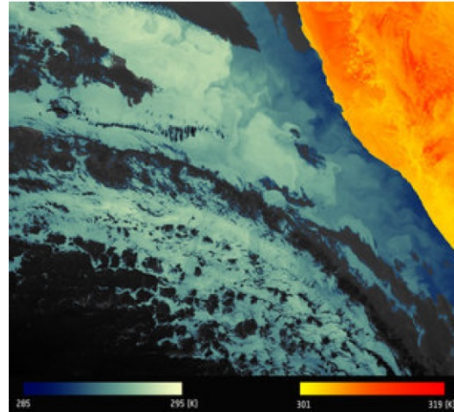
- **LAI:** Leaf Area index
- **FAPAR:** Fraction of Photosynthetically Active Radiation
- **CCC:** Canopy Chlorophyll Content
- **CWC:** Canopy Water Content



L1c Product Tile Composition

Sentinel-3 Mission Profile

Operational Oceanography & Global Land Application



Optical Payload

OLCI (Ocean and Land Color Instrument)

SLSTR (Sea and Land Surface Temperature Radiometer)

Data continuity of the Vegetation instrument (on SPOT4/5),
Enhanced fire monitoring capabilities

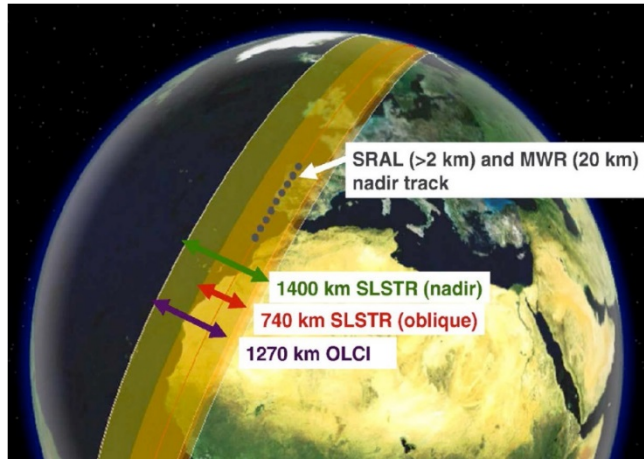
Topography Payload

SRAL (Synthetic Radar Altimeter)
Sea surface topography data

MWR (Micro Wave Radiometer)

POD
Precise Orbit Determination

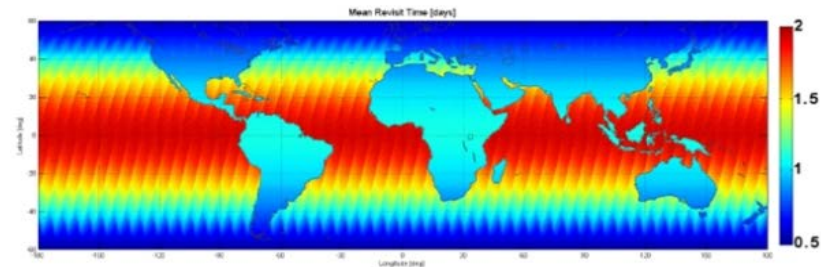
Sentinel-3 Observation scenario



- Sentinel 3 Systematic Processing and dissemination in NRT
- The OLCI instrument acquires data over daylight part of the orbit
- SLSTR, SRAL and MWR acquired data over the whole orbit

Revisit at Equator

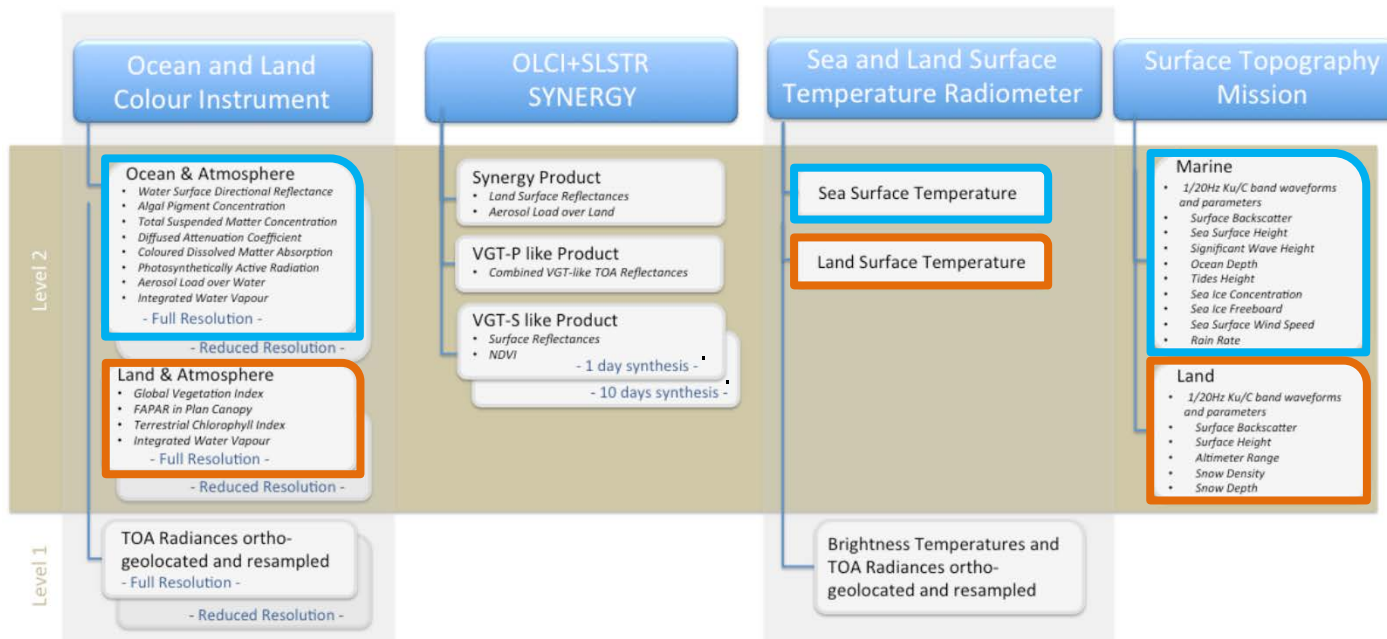
Ocean Colour	< 1.9 days
Land Colour	< 1.1 day
SLST	< 0.9 day



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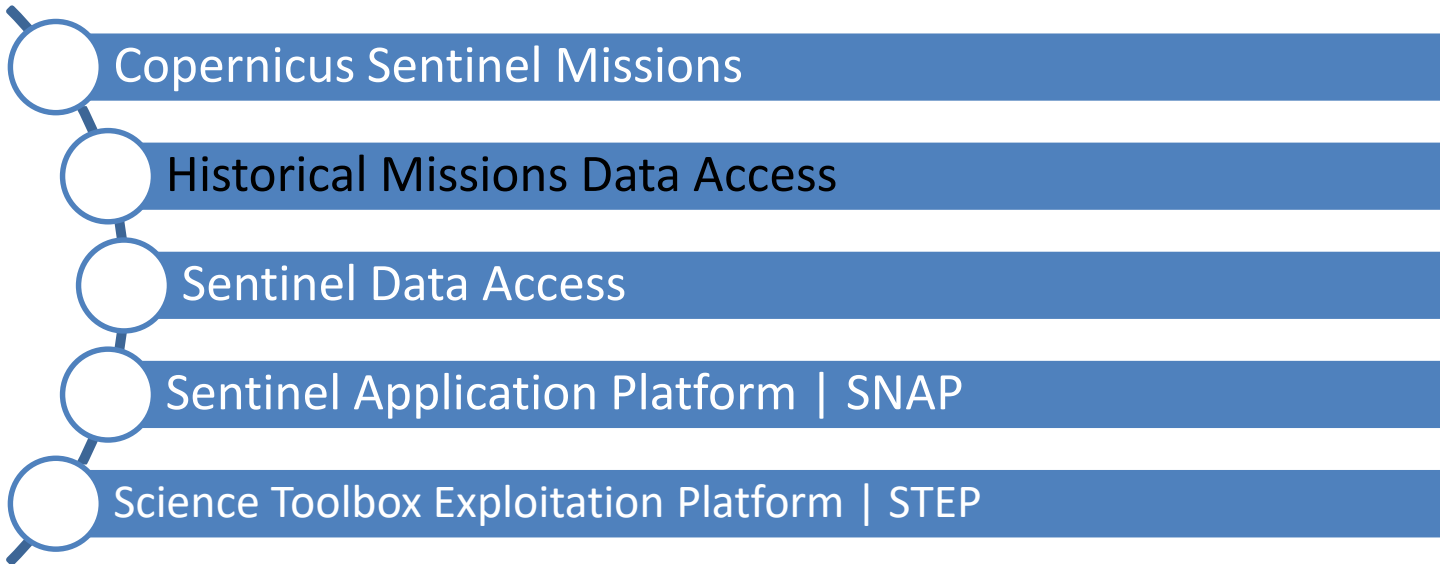
Sentinel-3 Production Scenario



ESA disseminates the S-3
L1 & L2 Land Products



Eumetsat disseminates the S-3
L1 & L2 Marine Products



Facilitating Access to EO data

A constant ESA objective:

→ *Ease access to Earth Observation data*

1. ESA EO data policy:
 - free of charge, open (and of high quality)
2. Constant upgrade of ground segment for easier access to EO data including Near Real Time (NRT) and reprocessing
3. Need to address “heritage” data for future use

→ *Need to anticipate the way users will use EO data in future
(e.g. exploitation platform, data/algorithm toolboxes)*

ESA Earth Observation Data Policy | **PAST**

To stimulate a balanced development of Science, Public Utility and Commercial Applications, consistent with the mission objectives

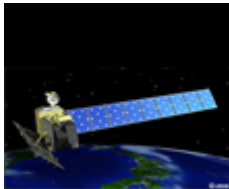
To maximize the beneficial use of data from ESA EO satellites



ERS and Envisat



Earth Explorers



ESA Third Party Missions

ESA Data Policy

Free datasets

Open access and free of charge. User registration and acceptance of ESA Terms & Conditions are required

Restrained datasets

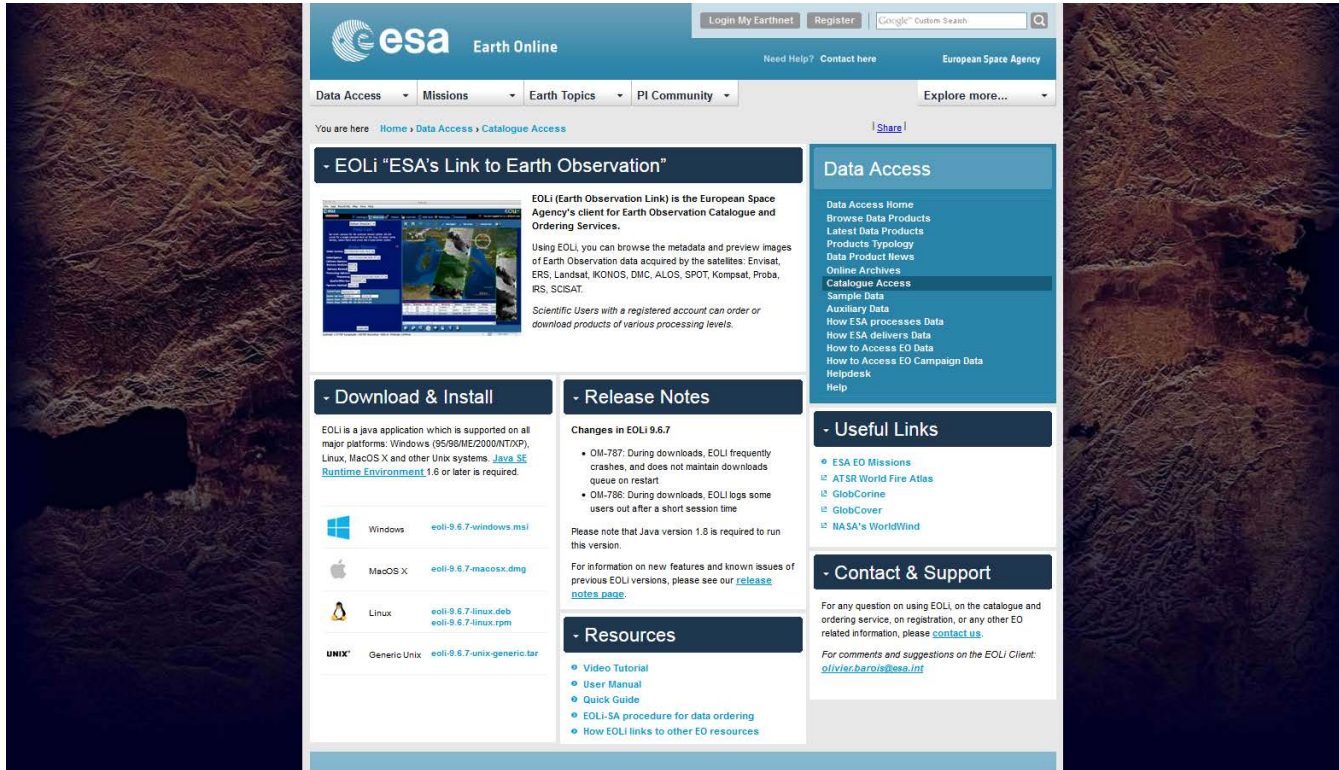
Free of charge. The submission of a Project (Full) Proposal and acceptance of the ESA Terms & Conditions are required, after its evaluation a quota will be assigned

Data Policy of individual data providers

In some case a reproduction cost (e.g. ALOS) or Specific Restrictions (limitations of quota, geographical restrictions, etc.) to the use of data may be applied for TPM

Historical Missions Data Access

ESA Link to Earth Observation | EOLI



The screenshot displays the ESA Earth Online (EOLI) website. The header includes the ESA logo, 'Earth Online' text, and navigation links like 'Login My Earthnet', 'Register', and 'Need Help? Contact here'. The main navigation bar features 'Data Access', 'Missions', 'Earth Topics', and 'PI Community'. The 'Data Access' section is highlighted, showing a sidebar with links to 'Data Access Home', 'Browse Data Products', 'Latest Data Products', 'Products Typology', 'Data Product News', 'Online Archives', 'Catalogue Access', 'Sample Data', 'Auxiliary Data', 'How ESA processes Data', 'How ESA delivers Data', 'How to Access EO Data', 'How to Access EO Campaign Data', 'Helpdesk', and 'Help'. The main content area is titled '- EOLI "ESA's Link to Earth Observation"' and describes EOLI as the European Space Agency's client for Earth Observation Catalogue and Ordering Services. It mentions that EOLI can be used to browse metadata and preview images of Earth Observation data acquired by satellites like Envisat, ERS, Landsat, KONOS, DMC, ALOS, SPOT, Kompsat, Proba, RS, and SCISAT. Below this, there are sections for '- Download & Install' and '- Release Notes'. The '- Download & Install' section lists download links for Windows, MacOS X, Linux, and Generic Unix. The '- Release Notes' section lists changes in EOLI 9.6.7, including fixes for crashes and logging issues. The '- Useful Links' section lists links to ESA EO Missions, ATSR World Fire Atlas, GlobCorine, GlobCover, and NASA's WorldWind. The '- Contact & Support' section provides information on how to get help, including a link to the EOLI Client support page and a contact email address.

- EOLI "ESA's Link to Earth Observation"

EOLI (Earth Observation Link) is the European Space Agency's client for Earth Observation Catalogue and Ordering Services.

Using EOLI you can browse the metadata and preview images of Earth Observation data acquired by the satellites: Envisat, ERS, Landsat, KONOS, DMC, ALOS, SPOT, Kompsat, Proba, RS, SCISAT.

Scientific Users with a registered account can order or download products of various processing levels.

- Download & Install

EOLI is a java application which is supported on all major platforms: Windows (95/98/ME/2000/NTXP), Linux, MacOS X and other Unix systems. [Java SE Runtime Environment 1.6](#) or later is required.

Windows [eoli-9.6.7-windows.msi](#)

MacOS X [eoli-9.6.7-macosx.dmg](#)

Linux [eoli-9.6.7-linux.deb](#)
[eoli-9.6.7-linux.rpm](#)

UNIX* Generic Unix [eoli-9.6.7-unix-generic.tar](#)

- Release Notes

Changes in EOLI 9.6.7

- OM-787: During downloads, EOLI frequently crashes, and does not maintain downloads queue on restart
- OM-786: During downloads, EOLI logs some users out after a short session time

Please note that Java version 1.6 is required to run this version.

For information on new features and known issues of previous EOLI versions, please see our [release notes page](#).

- Useful Links

- [ESA EO Missions](#)
- [ATSR World Fire Atlas](#)
- [GlobCorine](#)
- [GlobCover](#)
- [NASA's WorldWind](#)

- Contact & Support

For any question on using EOLI, on the catalogue and ordering service, on registration, or any other EO related information, please [contact us](#).

For comments and suggestions on the EOLI Client: olivier.barois@esa.int

- Resources

- [Video Tutorial](#)
- [User Manual](#)
- [Quick Guide](#)
- [EOLI-SA procedure for data ordering](#)
- [How EOLI links to other EO resources](#)

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ERS/ENVISAT (A)SAR - How to Obtain (A)SAR OTF Data

(A)SAR **On The Fly** data products are freely available to ESA registered users via the [EOLI-SA client](#).

Users can search and browse all products openly, but a registration on the ESA EO Data Portal is order required to download.

In order to register and to be granted access to the available products, users are required to follow the steps below:

- Create an EO-SSO account following the [instructions](#) (for users who have not registered already).
- Apply for (A)SAR OTF Data
 - **Level 1** ([ASAR IMS](#) - [ASAR IMP](#) - [ASAR APS](#) - [ASAR APP](#))
Users can access (A)SAR OTF Standard Service (Level 1 data products) by submitting a [Fast Registration](#). Access will be automatically enabled at registration submission. Users will receive an email containing access details.
 - **Level 0** ([ASAR IM](#) - [ASAR APC](#) - [ASAR APH](#) - [ASAR APV](#))
Users can access (A)SAR OTF Level 0 data products by submitting a [Data Service Request](#) justifying and describing the data needs. **Please note that access** to Level 0 Data is not part of the standard OTF Service and it will be granted in exceptional cases. Requests will be evaluated and feedback will be provided usually within 2 weeks.

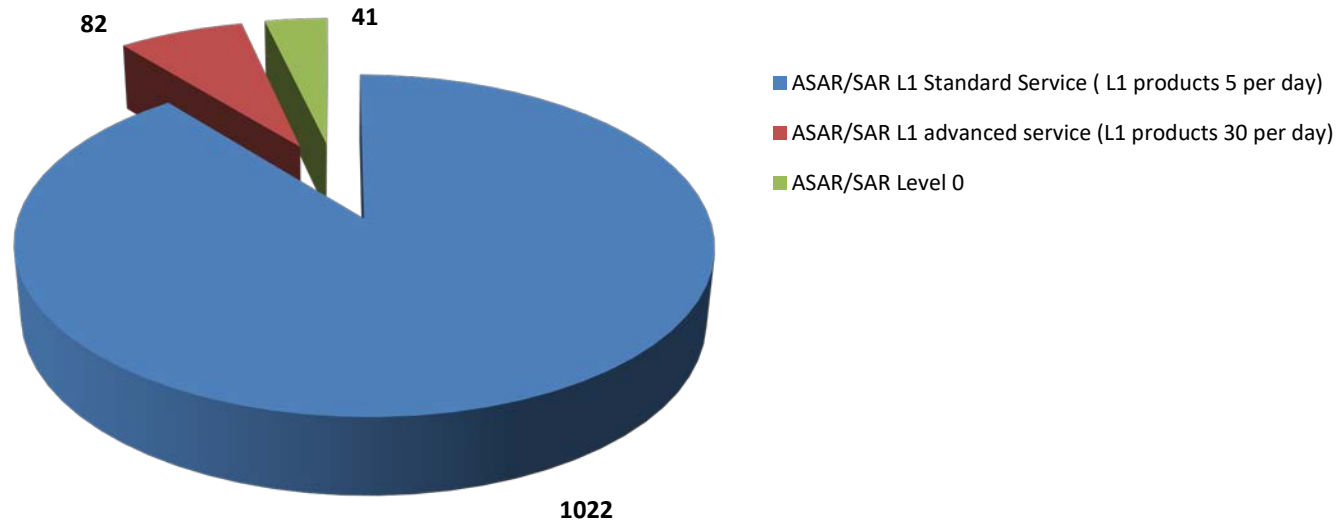
The service is being rolled out gradually (*ASAR WS from December 2016, and ERS IM from Q1 2017*).

Quality of Service : In order to allow a fair share of resources the dissemination system allows data download with the following rules:

- Users can download only a fixed number of products per day (from 00:00 to 23:59 UTC) – *Standard service up to 5 products per day*
- Users can perform only a limited number of requests or download in parallel

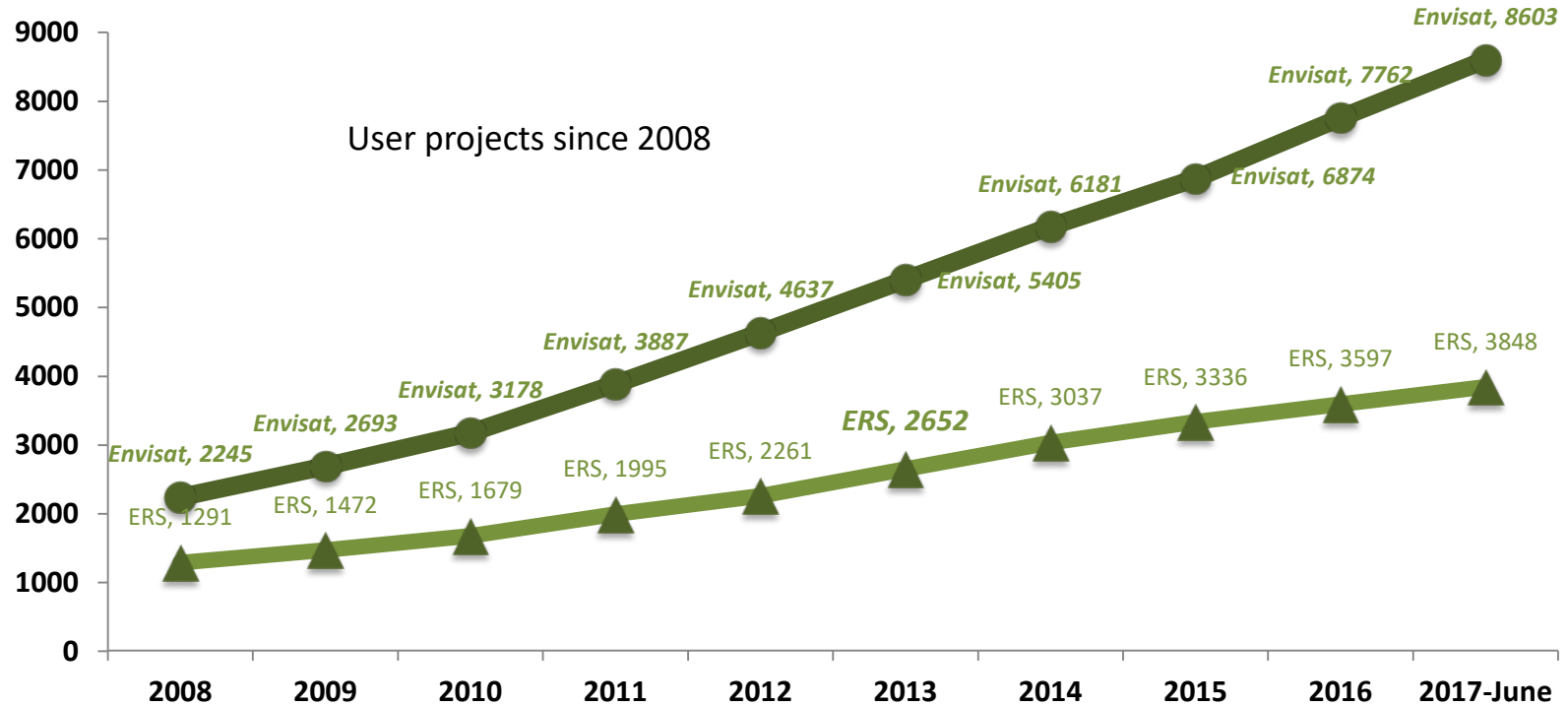
Because not all online disseminated data is immediately available for download, as there might be products that need to be processed, the consumption of daily quota occurs already when the product is requested and not when the download begins. However, even if daily quota is over, users are allowed to download the products already requested or not yet available at request time.

(A) SAR On The Fly system new users (opened in July 2016)

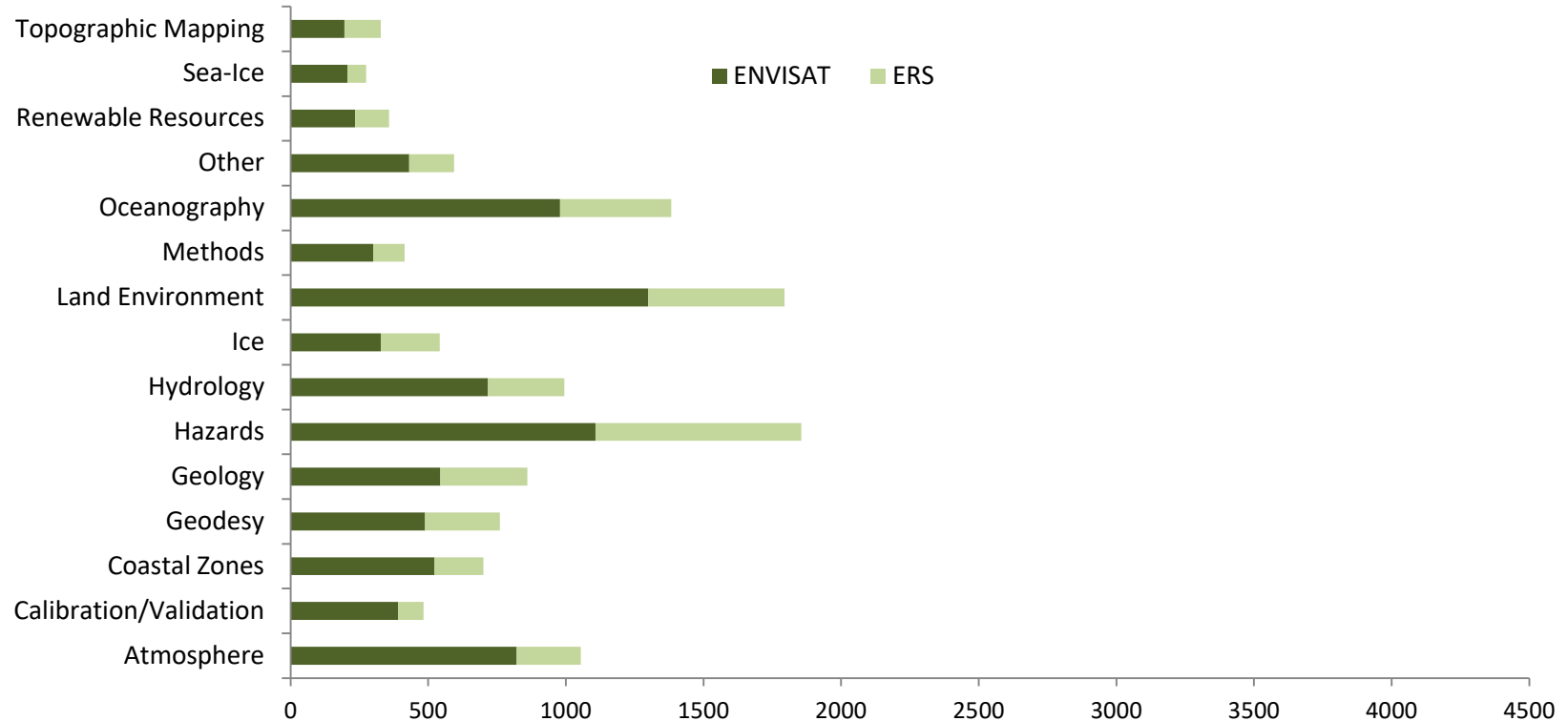


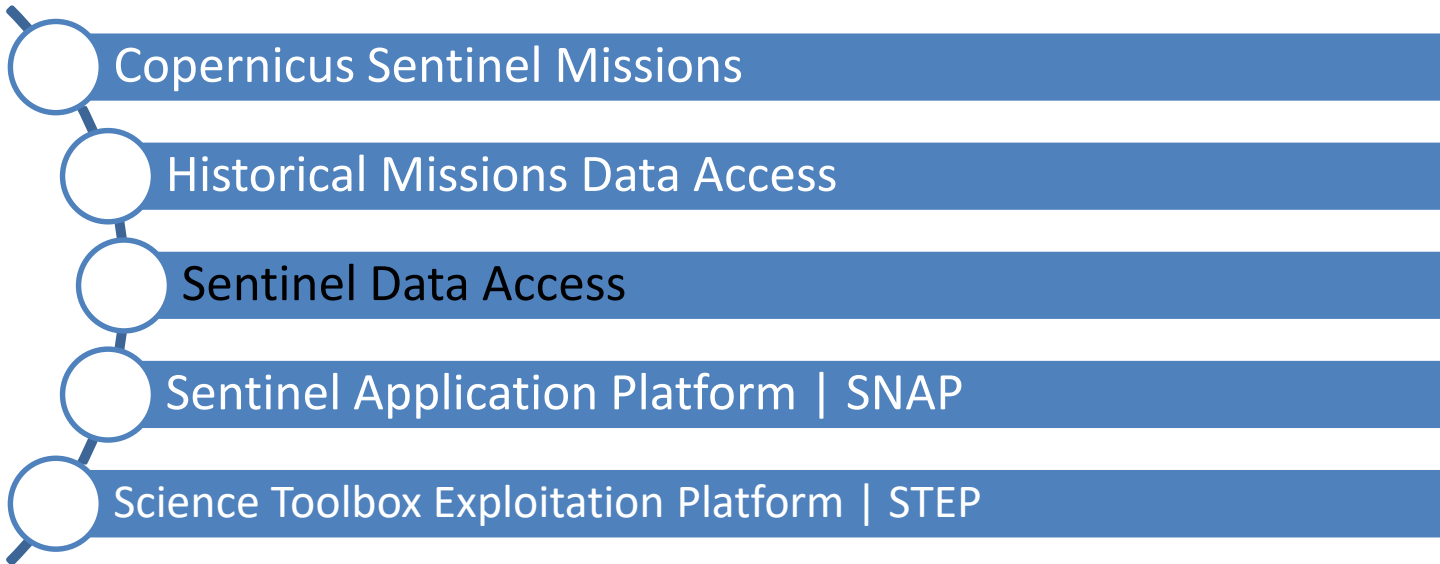
Note: Please consider that Old/already existing PIs have been migrated to the new (OTF) system with corresponding download rights for ASAR and SAR Level 1 and Level 0 products

Evolution of ERS and ENVISAT user project



Distribution of ENVISAT and ERS user projects by Application Domain



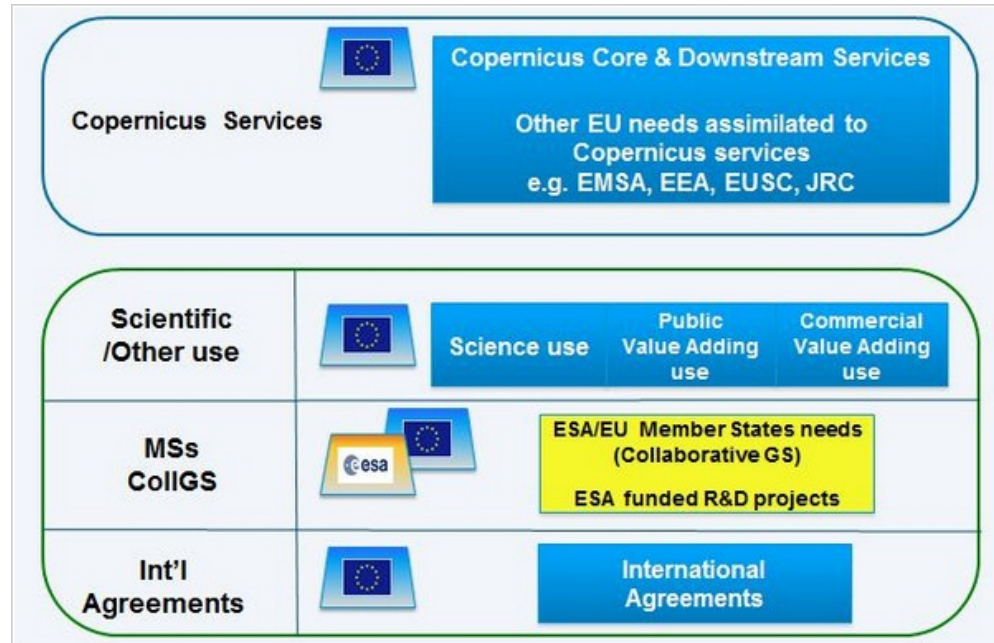


The Copernicus Space Component



Sentinel data access | Use typologies and the corresponding services/data access (overview)

Typologies are defined for Sentinel data access



Register for use by Copernicus services via CSCDA → <https://spacedata.copernicus.eu>

Register for Other/Scientific use via Sentinel-1 Scientific Data hub → <https://scihub.copernicus.eu>

Copernicus Sentinel Data Policy

Copernicus Data Policy for Sentinels Missions

- ❑ The Copernicus data policy is adopted via a Delegated Regulation
- ❑ This policy promotes the access, use and sharing of Copernicus information and data on a full, free and open basis
- ❑ One of the main objectives is to support downstream segment and research, technology and innovation communities
- ❑ The European research institutes will be able to make the best use of these data to create innovative applications and services

**Sentinel Data Policy = full and open access
to Sentinel data to all users**

In practical terms

- Anybody can (has the right to) access acquired Sentinel data
- Licenses for the Sentinel data are free of charge
- Online access with users registration including acceptance of T&C*

* *TERMS AND CONDITIONS FOR THE USE AND DISTRIBUTION OF SENTINEL DATA*
available online on the Sentinel website
(https://sentinel.esa.int/documents/247904/690755/Sentinel_Data_Legal_Notice)

Copernicus Data Access & Redistribution

Private companies are re-distributing Sentinel products/images via free and pay-per-use schemes

The open access Data Hub, for anyone (82,000 users)

Collaborative mirror sites directly serve 900+ users (status end 2016)

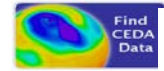
Scientific Data Hub

Collaborative Data Hub

International Access Hub

Copernicus Services Data Hub

Google Earth Engine



As of spring 2016, international partners mirror sites have started disseminating towards own national communities

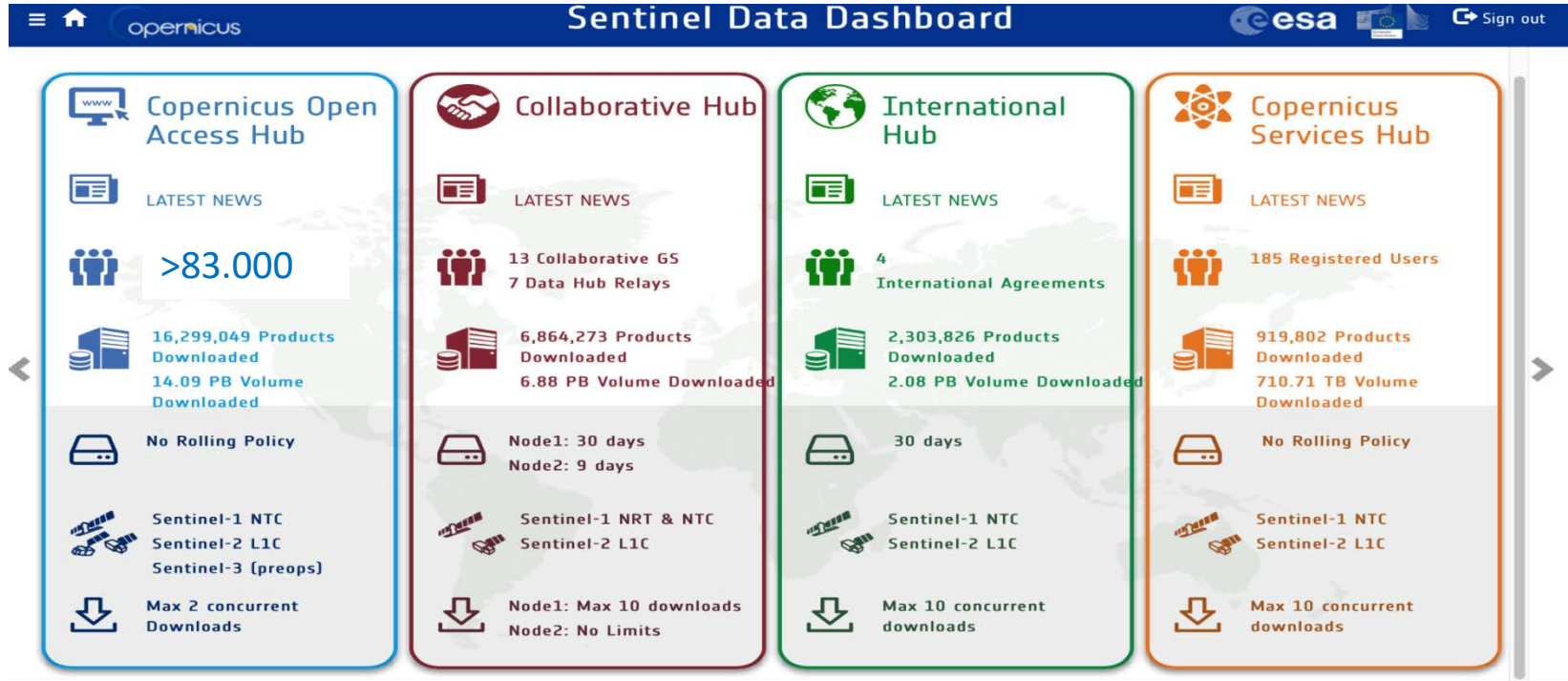
Copernicus services are providing their higher level products to ~10,000 users (status Q1 2016)

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Sentinel Data Hubs – Configuration

Sentinel Data Hubs operated by ESA



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Sentinel Data Access for Scientific Users | Open Access Hub

The free, full and open data policy adopted for the Copernicus programme foresees access available to all users for the Sentinel data products, via a simple registration.

Users can register and download Sentinel-1 data from the online Sentinel Data Hub (<https://scihub.copernicus.eu/>).

Anyone can register online via self-registration. The self-registration process is automatic and immediate. Registration grants access rights for searching and downloading Sentinels products. Sentinel-1 and Sentinel-2 (coming soon Sentinel-3) products are available at no cost for anybody. The data available through the Data Hub is governed by the Terms and Conditions of the use and distribution of Sentinel data, which the User is deemed to have accepted by using the Sentinel data.

More technical <https://scihub.copernicus.eu/userguide/>

Copernicus (Sentinel) Open Access Hub (1/5)

S1/S2 and S3 data are available to all users via Sentinel Open Access Hub

“Access point”
click on “Open HUB”

Welcome to the Copernicus Open Access Hub

The Copernicus Open Access Hub (previously known as Sentinel's 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-2B PreOps Hub** **S-3 PreOps Hub**

User Guide **Open Source Portal** **Reports & Stats**

Access Points

Open Access Hub : access point for all Sentinel missions with access to the interactive graphical user interface.
API Hub : access point for API users with no graphical interface. All API users regularly downloading the latest data are encouraged to use this access point for a better performance.
Sentinel-2B Pre-operational Hub : pre-operational access point for all users to Sentinel-2B data. Login credentials are `s2bguest:s2bguest`.
Sentinel-3A Pre-operational Hub : pre-operational access point for all users to Sentinel-3 L1 and L2 Land data. Login credentials are `s3guest:s3guest`.

For more details or request of help support please send an e-mail to eo-support@copernicus.esa.int

User Guide

Overview

The Open Access Hub provides complete, free and open access to Sentinel-1, Sentinel-2 and Sentinel-3 user products.

Sentinel-1 Data Offer

The Sentinel-1 data offer for the Open Access Hub consists of:

- Level-0 and Level-1 user products for the following acquisition modes:
 - Strip Map (SM)
 - Interferometric Wide Swath (IW)
 - Extra Wide Swath (EW)
- Level-2 user products for the following acquisition modes:
 - Wave (WV)
 - Interferometric Wide Swath (IW)
 - Extra Wide Swath (EW)

The Sentinel-1 acquisitions zones with the related mode and polarisation are defined on a cyclic (32 days) basis in the observation scenarios.
The Sentinel-1 ground segment production baseline is described in the production scenarios.

Sentinel-2 Data Offer

The Sentinel-2 data offer for the Open Access Hub will consist of Level-1C user products.

Sentinel-3 Data Offer

The Sentinel-3 data offer for the Open Access Hub will consist of Level-1 and Level-2 (Land) user products for the OLCI, SLSTR and SRAL instruments.

The Data Hub Archive

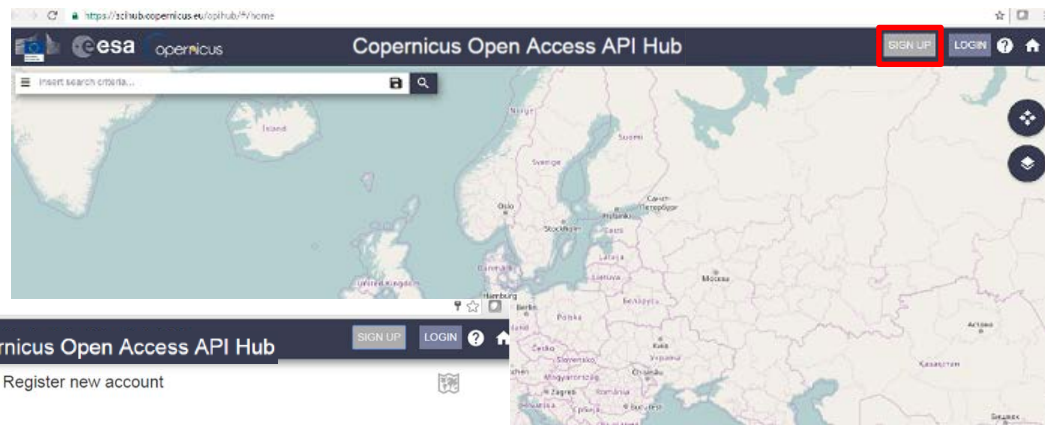
The Open Access Hub maintains an archive of all the products for download via HTTP.

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Copernicus (Sentinel) Open Access Hub (2/5)

If you are already registered log in to start using the Sentinel Hub geographic interface to browse and download Sentinel data, if you are a new user click on the **circled red** link “SIGN UP” to complete registration



Register new account

Sentinel data access is free and open to all.

On completion of the registration form below you will receive an e-mail with a link to validate your e-mail address. Following this you can start to download the data. Username field accepts only alphanumeric characters plus ".", "-", "_" and "+".

Firstname	Lastname
Username	
Password	Confirm Password
E-mail	Confirm E-mail
Select Domain	
Select Usage	
Select Country	

By registering in this website you are deemed to have accepted the T&C for Sentinel data use.



Fill this form to start registration procedure (username and e-mail address should be provided in lower case only) then you will receive a mail with a link to validate your mail address. Finally an administrator will be able to let you access to the Sentinel Data Hub.
Please note that by registering in this website you are deemed to have accepted the T&C for Sentinel data use.

https://sentinel.esa.int/documents/247904/690755/Sentinel_Data_Terms_and_Conditions

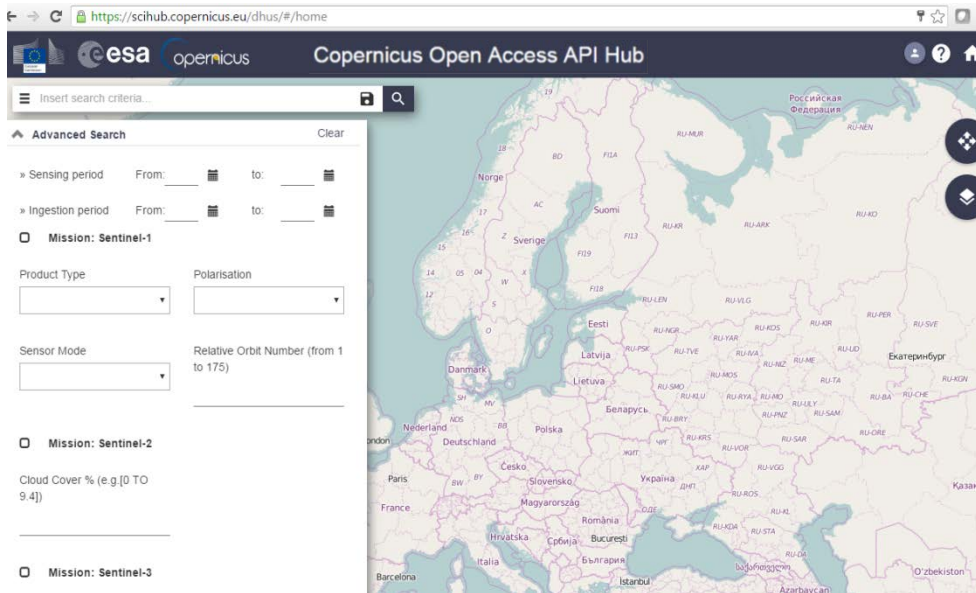
REGISTER

Copernicus (Sentinel) Open Access Hub (3/5)

Once completed registration you can log in and use the “Advanced search” criteria, start use Sentinel hub interface to search and download sentinels data .

Search criteria available:

- Draw region of interest
- Full text search
- Advanced search (product, type, acq.dates, etc.)



Sentinels Scientific Data Hub

The Sentinels Scientific Data Hub is a web based system designed to provide EO data users with distributed mirror archives and bulk dissemination capabilities for the Sentinels products.

Terms of Sentinels Scientific Data Hub portal and Data supply conditions

Full details on **Sentinel Online** at:
<https://sentinel.esa.int/>

Copernicus (Sentinel) Open Access Hub (4/5)

Copernicus Open Access API Hub

Display 1 to 25 of 1821 products.

S1A SAR-C S1A_IW_SLC__1SDV_20160629T050314_20160629T050341_011921_0125CC_5BF3

Download URL: [https://scihub.copernicus.eu/dhus/bdata/v1/Products/16786fb-94d8-413a-8304-084a1f0cde62/\\$v](https://scihub.copernicus.eu/dhus/bdata/v1/Products/16786fb-94d8-413a-8304-084a1f0cde62/$v)

Mission: Sentinel-1; Instrument: SAR-C; Sensing Date: 2016-06-29T05:03:14.111Z; Size: 7.63 GB

Icons:

Sentinels data are distributed using a SENTINEL-specific variation of the **Standard Archive Format for Europe (SAFE)** format

Select product of your interest and use the icons to (the **circled red** icons): Zoom in the map, view product details, move it in the 'Cart' or "Download product"



Click and download, shopping cart, batch download. A maximum of 2 concurrent downloads per user is allowed in order to ensure a download capacity for all users.

Copernicus (Sentinel) Open Access Hub (5/5)

The screenshot displays the Copernicus Open Access Hub interface for a specific Sentinel-1 product. The URL in the address bar is [https://scihub.copernicus.eu/dhus/odata/v1/Products\('c5b296f-fb85-4945-b77b-5f724985316b'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('c5b296f-fb85-4945-b77b-5f724985316b')/$value). The interface is divided into several sections:

- Footprint:** A map showing the geographic area covered by the product, outlined in red.
- Quicklook:** A small thumbnail image of the product data.
- Attributes:** A section containing product metadata:
 - Summary:**
 - Date: 2016-06-29T05:03:38.922Z
 - Filename: S1A_IW_SLC__1SDV_20160629T050338_20160629T050406_011921_0125CC_B765.SAFE
 - Identifier: S1A_IW_SLC__1SDV_20160629T050338_20160629T050406_011921_0125CC_B765
 - Instrument: SAR-C
 - Mode: IW
 - Satellite: Sentinel-1
 - Size: 7.93 GB
 - Product:** A section for product-specific details.
 - Platform:** A section for platform-related information.
- Inspector:** A section showing the product's file structure:
 - S1A_IW_SLC__1SDV_20160629T050338_20160629T050406_011921_0125CC_B765.SAFE
 - annotation
 - measurement
 - preview
 - support
 - S1A_IW_SLC__1SDV_20160629T050338_20160629T050406_011921_0125CC_B765.SAFE-report-20160629T072914.pdf
 - manifest.safe

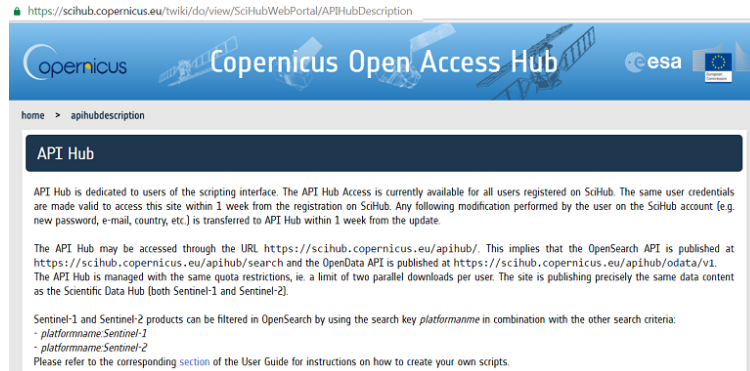
At the bottom of the interface, there are navigation controls including back, forward, and search buttons.

View product details is an online inspection of the searched products by browsing and pre-viewing the product metadata and measurements without downloading it. A preview panel displays information on the product contents and structure.

API Hub

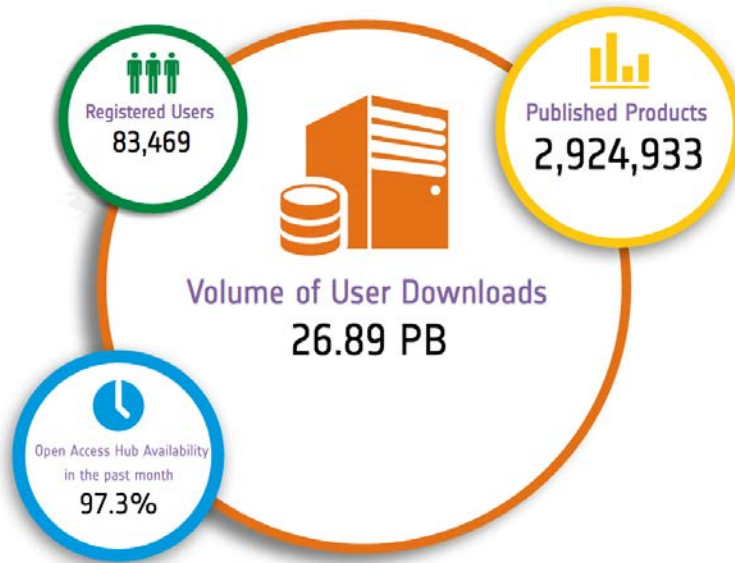
APIs And Batch ScriptingRev. The Data Hub exposes two dedicated Application Program Interfaces (API) for browsing and accessing the EO data stored in the rolling archive. The APIs are: [Open Data Protocol \(OData\)](#) & [Open Search \(Solr\)](#). The OData interface is a data access protocol built on core protocols like HTTP and commonly accepted methodologies like REST that can be handled by a large set of client tools as simple as common web browsers, download-managers or computer programs such as [cURL](#) or [Wget](#).

OpenSearch is a set of technologies that allow publishing of search results in a standard and accessible format. OpenSearch is RESTful technology and complementary to the OData. In fact, OpenSearch can be used to complementary serve as the query aspect of OData, which provides a way to access identified or located results and download them.

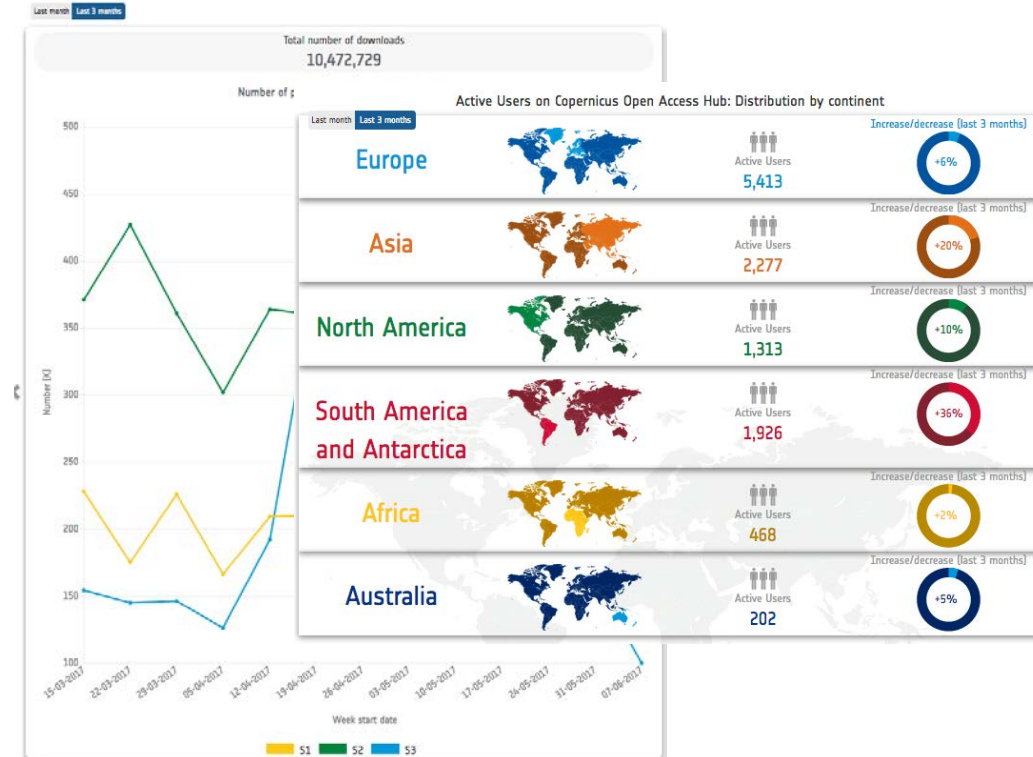


API Hub : access point for API users with no graphical interface. All API users regularly downloading the latest data are encouraged to use this access point for a better performance.

Sentinel Open Access Data Hub



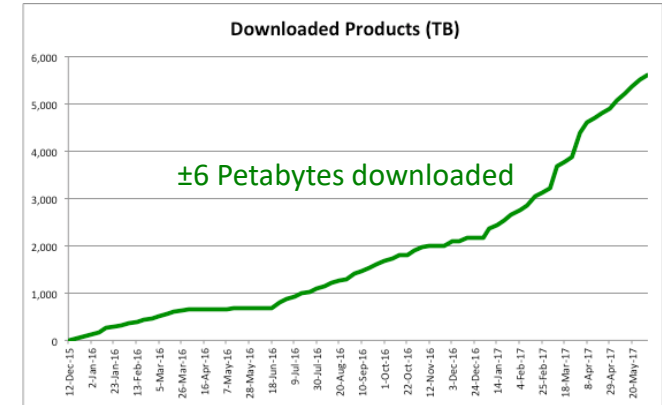
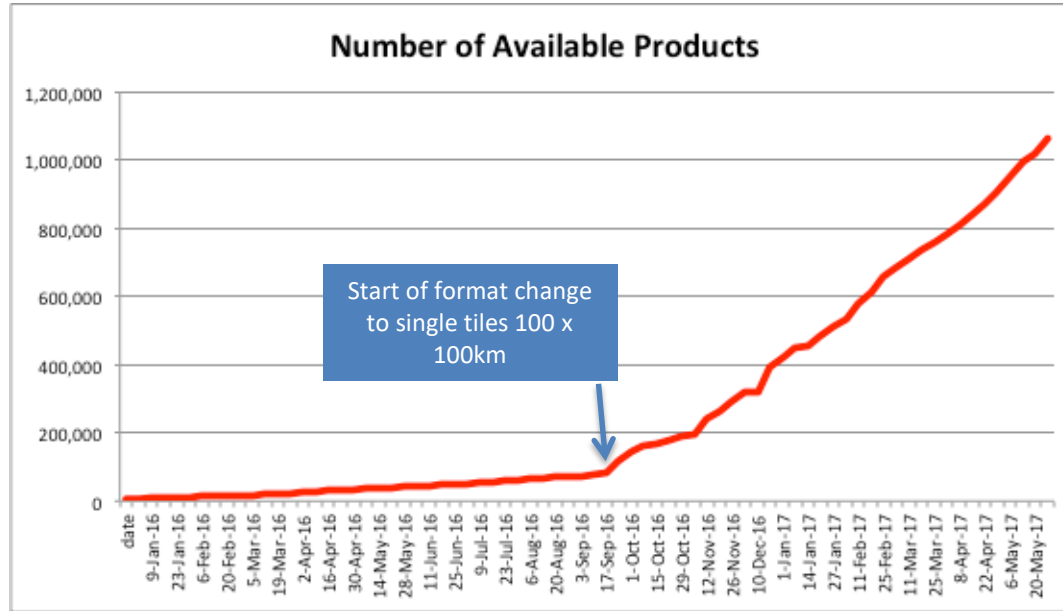
Stats on June 2017



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Sentinel-2 Data Access (since Dec 2015)




More than 6.000.000 Sentinel-2 products downloaded by the time of S2B launch!

Annual Data Access Report online



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Copernicus Sentinel Data | Alternative Dissimination Sources



ALASKA SATELLITE FACILITY
Making remote-sensing data accessible since 1991

Home | Get Started | Get Data | Datasets | Data Tools | Tutorials | About ASF

Home

Sentinel-1 Data

Get Started | Find Data | Tutorials - Data Recipes

Find Data

Search - Filter - Download

Vertex

Useful Links

- Get Started
- Datasets Overview
- Tutorials - Data Recipes

ALOS PALSAR

- Sentinel-1
- Bulk Download Instructions

Data Formats

- Cite Data

About Us

The Alaska Satellite Facility downloads, processes, archives and distributes remote-sensing data to scientific users around the world. ASF's mission is to make remote-sensing data accessible.

Contact Info

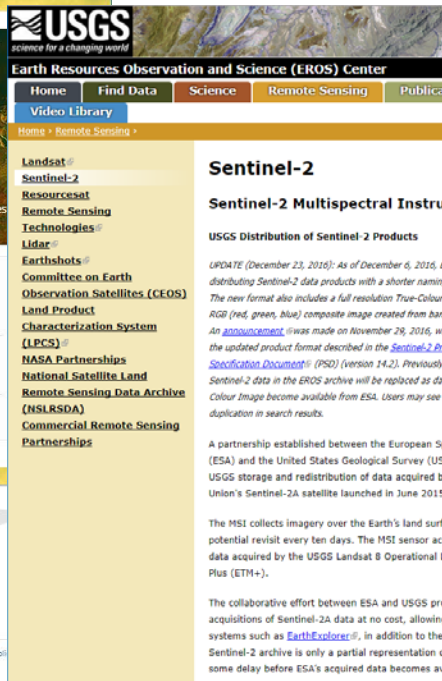
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Fairbanks, AK 99775
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science for a changing world

Earth Resources Observation and Science (EROS) Center

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Video Library

Home > Remote Sensing >

Landsat

- Sentinel-2
- Resources
- Remote Sensing
- Technologies
- Lidar
- Earthshots
- Committee on Earth Observation Satellites (CEOS)
- Land Product Characterization System (LPCS)
- NASA Partnerships
- National Satellite Land Remote Sensing Data Archive (NSLRSDA)
- Commercial Remote Sensing Partnerships

Sentinel-2

Sentinel-2 Multispectral Instru

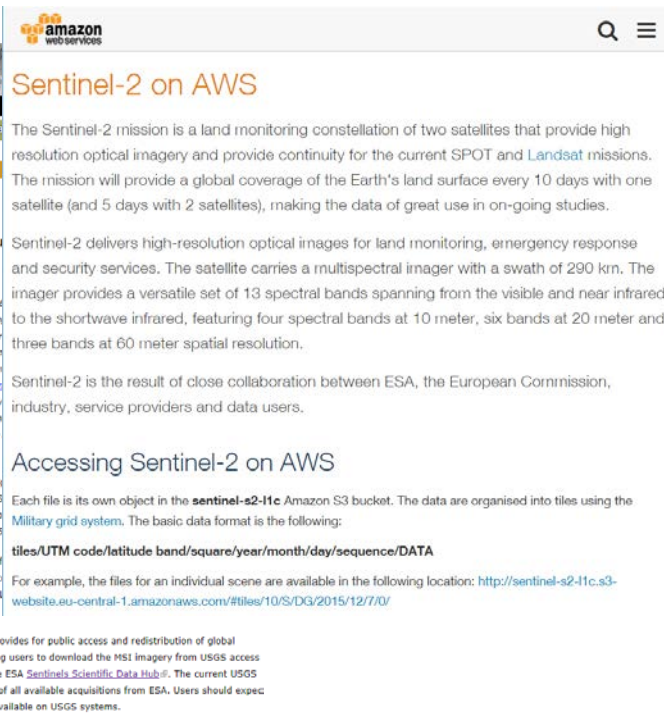
USGS Distribution of Sentinel-2 Products

UPDATE (December 23, 2016): As of December 6, 2016, distributing Sentinel-2 data products with a shorter naming. The new format also includes a full resolution True-Colour RGB (red, green, blue) composite image created from band 2 (red), band 3 (green), and band 4 (blue). An announcement was made on November 29, 2016, in the updated product format described in the [Sentinel-2 Product Specification Document](#) (PSD) (version 14.2). Previously Sentinel-2 data in the EROS archive will be replaced as the Colour Image become available from ESA. Users may see duplication in search results.

A partnership established between the European Space Agency (ESA) and the United States Geological Survey (USGS) storage and redistribution of data acquired by the Sentinel-2A satellite launched in June 2015.

The MSI collects imagery over the Earth's land surface and revisits every ten days. The MSI sensor acquires data acquired by the USGS Landsat 8 Operational Land Imager (OLI).

The collaborative effort between ESA and USGS provides for public access and redistribution of global acquisitions of Sentinel-2A data at no cost, allowing users to download the MSI imagery from USGS access systems such as [EarthExplorer](#), in addition to the ESA [Sentinels Scientific Data Hub](#). The current USGS Sentinel-2 archive is only a partial representation of all available acquisitions from ESA. Users should expect some delay before ESA's acquired data becomes available on USGS systems.



amazon
web services

Sentinel-2 on AWS

The Sentinel-2 mission is a land monitoring constellation of two satellites that provide high resolution optical imagery and provide continuity for the current SPOT and Landsat missions. The mission will provide a global coverage of the Earth's land surface every 10 days with one satellite (and 5 days with 2 satellites), making the data of great use in on-going studies.

Sentinel-2 delivers high-resolution optical images for land monitoring, emergency response and security services. The satellite carries a multispectral imager with a swath of 290 km. The imager provides a versatile set of 13 spectral bands spanning from the visible and near infrared to the shortwave infrared, featuring four spectral bands at 10 meter, six bands at 20 meter and three bands at 60 meter spatial resolution.

Sentinel-2 is the result of close collaboration between ESA, the European Commission, industry, service providers and data users.

Accessing Sentinel-2 on AWS

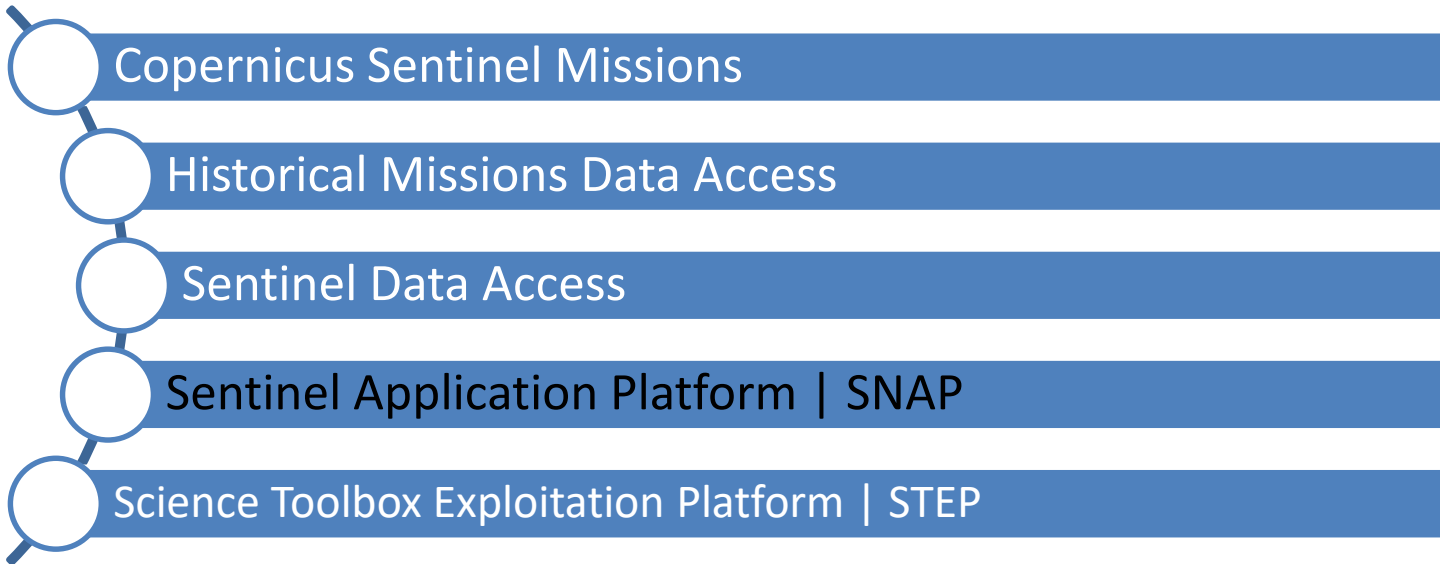
Each file is its own object in the **sentinel-s2-11c** Amazon S3 bucket. The data are organised into tiles using the **Military grid system**. The basic data format is the following:

tiles/UTM code/latitude band/square/year/month/day/sequence/DATA

For example, the files for an individual scene are available in the following location: <http://sentinel-s2-11c.s3-us-west-2.amazonaws.com/#/tiles/10/S/DG/2015/12/7/0/>

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SNAP

- The common architecture for all **Sentinel Toolboxes** and **SMOS Toolbox** is called Sentinel Application Platform (SNAP).
- SNAP architecture is ideal for Earth Observation processing and analysis due the following technological innovations: Extensibility, Portability, Modular Rich Client Platform, Generic EO Data Abstraction, Tiled Memory Management and a Graph Processing Framework.

Activity initially funded through SEOM element of ESA's EOEP-4 (www.seom.esa.int)



SNAP Development History



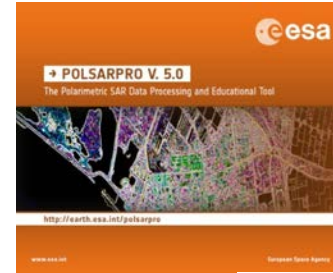
Built on previous
development

next esa s

BE



ESA Polarimetric SAR Data Processing and
Educational Tool



UNIVERSITÉ DE
RENNES I

User Developed Plugins



Multi-Mission Scientific Platform

Development Consortia



BROCKMANN
CONSULT GMBH



TELESPAZIO VEGA
DEUTSCHLAND

A Finmeccanica / Thales Company



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Sentinel Application Platform | SNAP

❑ **SAR Toolbox (S1TBX)**

- Scientific toolbox for the handling and post-processing of data products from Sentinel-1 SAR mission

❑ **High Resolution Optical Toolbox (S2TBX)**

- Toolbox for the visualisation, analysis and post-processing of data products from Sentinel-2 multi-spectral optical data

❑ **Medium Resolution Optical Toolbox (S3TBX)**

- Toolbox for the processing and analysis of Sentinel 3 OLCI and SLSTR

❑ **Developer forum**

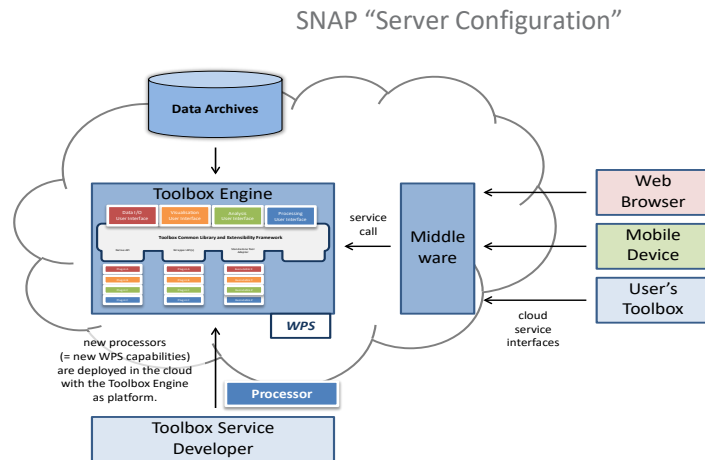
- Requirements addressing a common platform issues
- Define the platform roadmap
- Coordinate horizontal activities across the three toolboxes

SNAP Cardinal Requirements

- ☐ CR 1 Openness
- ☐ CR 2 Multi-mission support
- ☐ CR 3 Extendibility & Modularity
- ☐ CR 4 Portability
- ☐ CR 5 Easy operability
- ☐ CR 6 Building on heritage
- ☐ CR 7 Performance

Benefits of SNAP

- Developed as open source software
- Common Java core framework
- Joint development plan for Sentinel toolboxes
- Interchangeable Java/Python plugins
- Portable engine to Cloud infrastructure
- Single installer



NetBeans



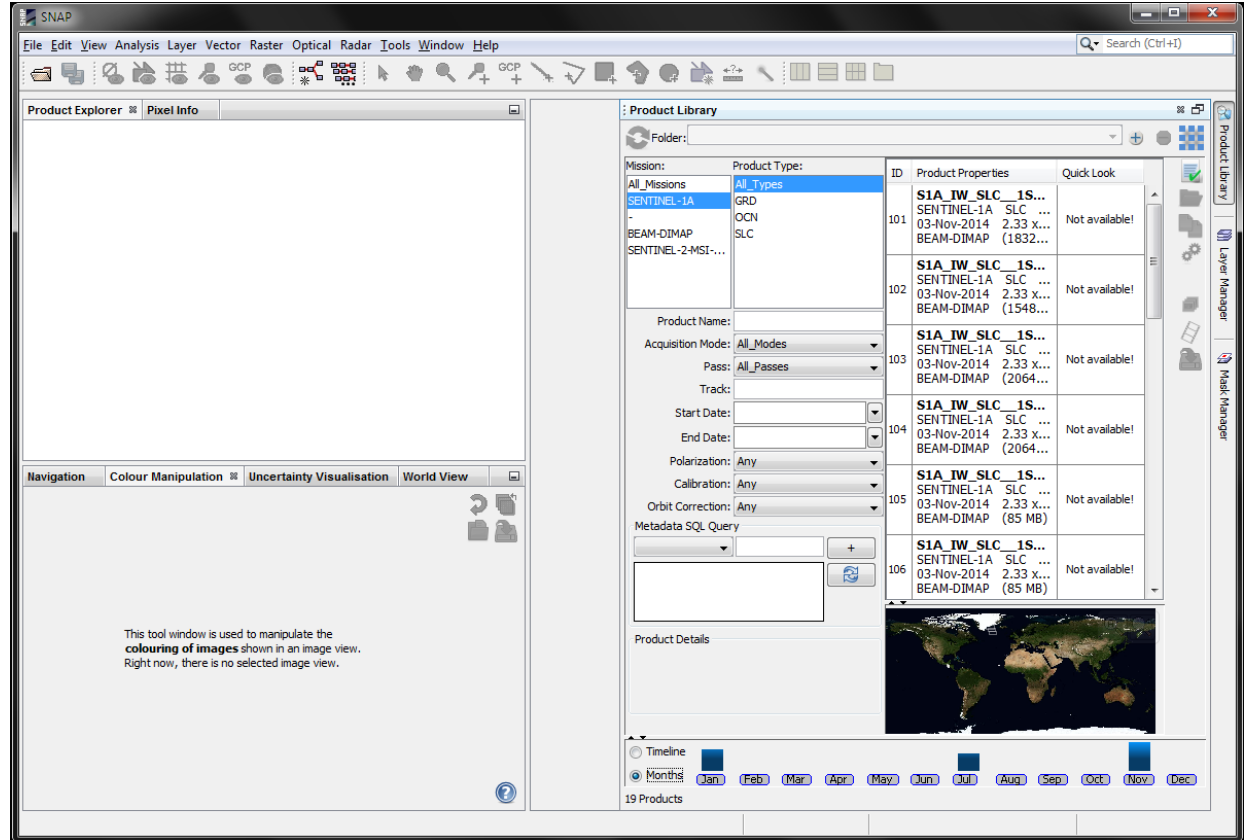
github
SOCIAL CODING





SNAP

All-in-One Environment



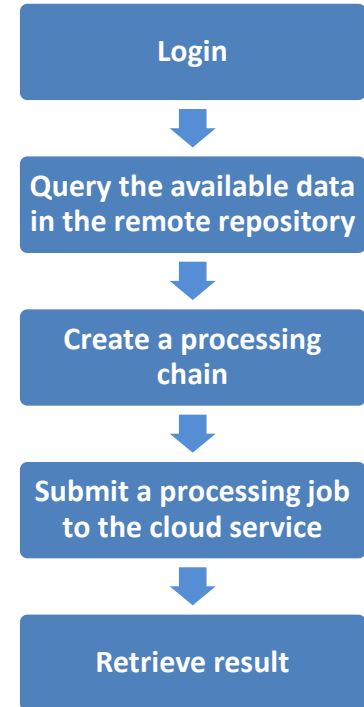
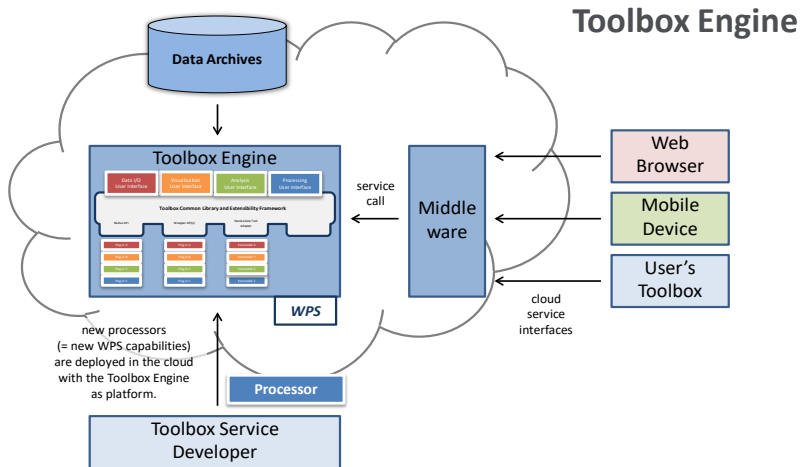
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Cloud Exploitation Platform (CEP)

Smoothly utilize a **Cloud Computing Platform** where data repositories and high performance processing capabilities are available

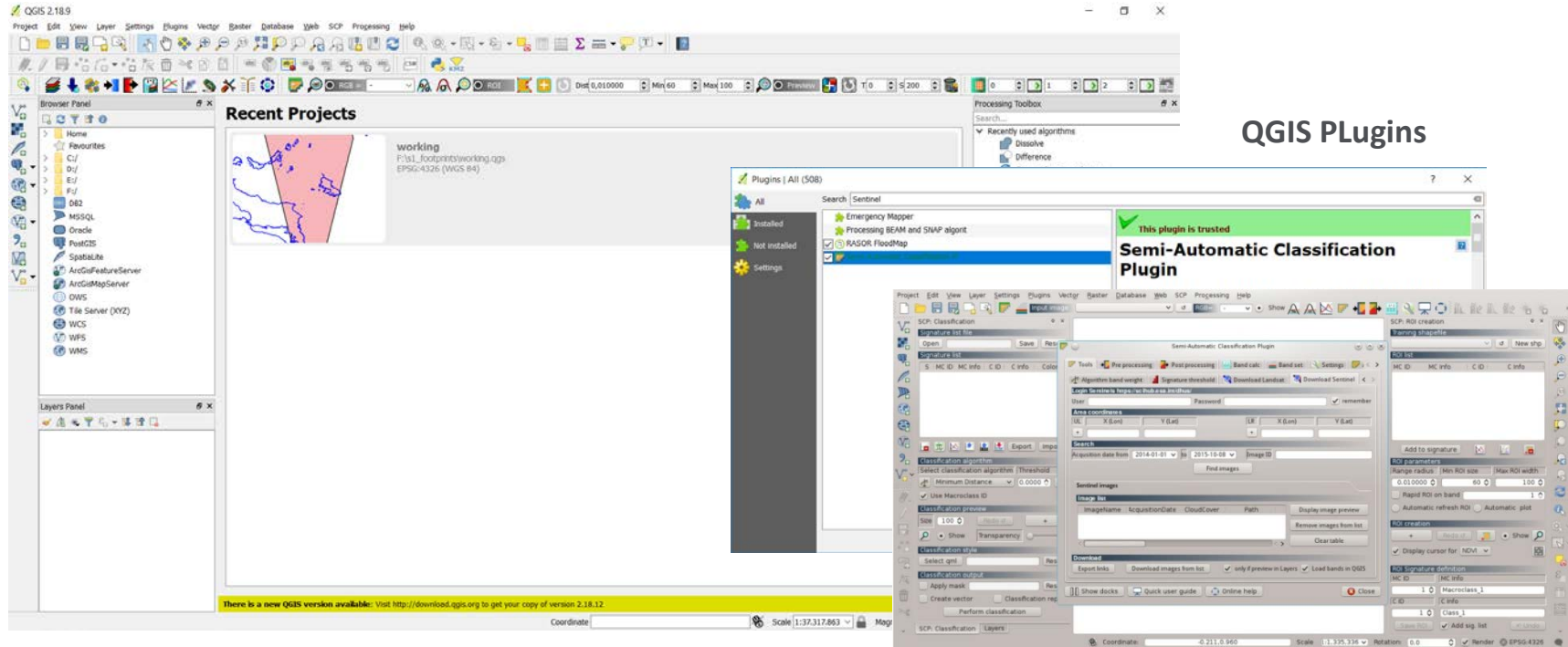
Facilitate entry into **Cloud Processing Services** through the familiar and user friendly graphical interface of the Toolboxes



How to Measure Success

- ❑ The success of the Toolboxes can only be measured in terms of **user acceptance**.
- ❑ User acceptance is gained
 - if we provide the **tools that users need**;
 - if users **enjoy working with tools** we provide;
 - if we ensure that **these tools grow, improve and evolve** while they are being used;
 - if we **support and train the users** in using the tools;
 - if we **maintain the tools** and retain the efforts users already invested in understanding and applying the tools;
 - if we **let users participate** in a sustainable Toolbox development.

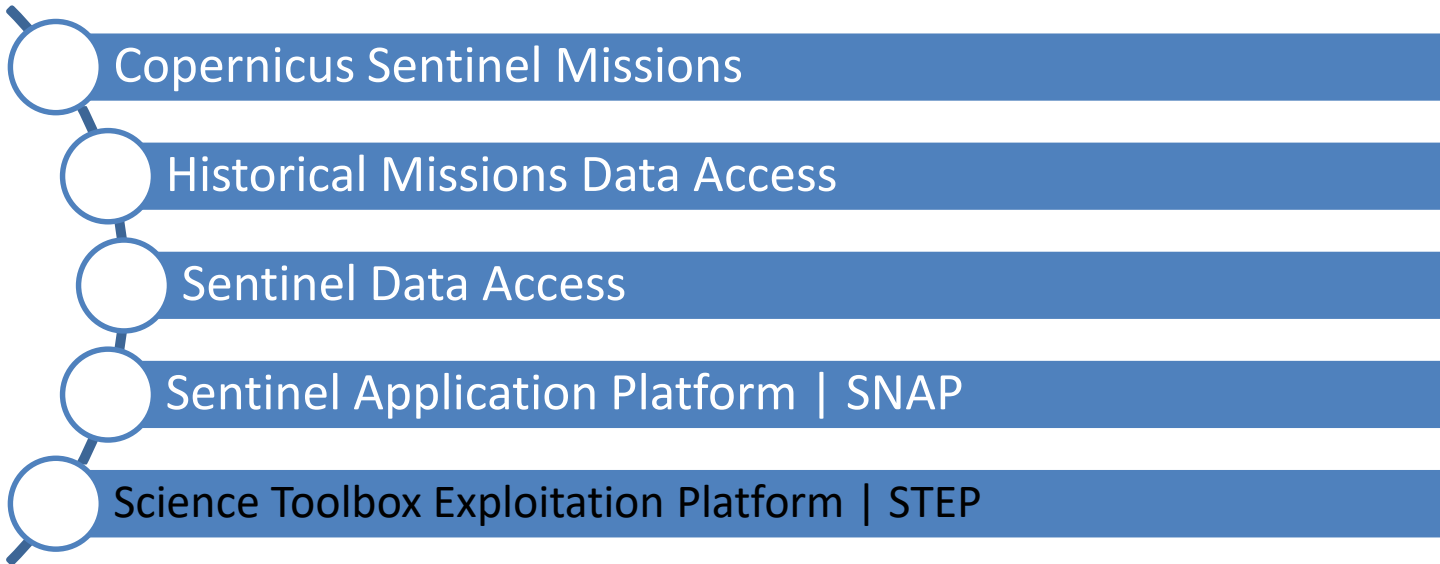
Third Party Sentinel Processing Tools | QGIS



QGIS PLUGINS

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step
science toolbox exploitation platform

ESA STEP **TOOLBOXES** **DOWNLOAD** GALLERY DOCUMENTATION COMMUNITY

Home > Scientific Toolbox Exploitation Platform

multimission scientific toolboxes

ESA is developing free open source toolboxes for the scientific exploitation of Earth Observation missions under the the Scientific Exploitation of Operational Missions (SEOM) programme element. STEP is the ESA community platform for accessing the software and its documentation, communicating with the developers, dialoguing within the science community, promoting results and achievements as well as providing tutorials and material for training scientists using the Toolboxes.

The ESA toolboxes support the scientific exploitation for the ERS-ENVISAT missions, the Sentinels 1/2/3 missions and a range of National and Third Party missions. The three toolboxes are called respectively Sentinel 1, 2 and 3 Toolbox and share a common architecture called SNAP. They contain some functionalities of historical toolboxes such as BEAM, NEST and Orfeo Toolbox that were developed over the last years.

SNAP Features
 Download
 Tutorials
 Community
 Documentation
 Developers
 Gallery
 Blog

The following results have been obtained thanks to the Sentinel Toolboxes :

S1A Country Mosaic of Romania

A dual polarization colour composite of entire Romania using fifteen Sentinel-1A acquired products between October and November 2014.

[View More](#)

SNAP Download page Information on Sentinel Toolboxes' Access to Beta versions for testing development including Frequently Asked Questions (FAQs)

step
science toolbox exploitation platform

ESA STEP TOOLBOXES **DOWNLOAD** GALLERY DOCUMENTATION COMMUNITY

Home > Download

Download

Here you can download the latest installers for SNAP and the Sentinel Toolboxes.

Data provision is available to all users via the [Sentinel Data Hub](#).

Previous Versions

Former releases can be downloaded from the [Previous Versions](#) page. But we highly encourage you to test the beta version for the next release !

Installers

The next release of **SNAP** is currently in beta stage, with a target date for the final release in mid July. The current version is **2.0 beta-04** (13.07.2015 18:00).

Access to the current installers for the most common platforms (Windows, MacOS, Linux) are provided on-demand to interested beta-testers.

During the installation process you can select to download and install the **Sentinel-1**, **Sentinel-2**, or **Sentinel-3** Toolbox or even all of them.

In return, we ask beta testers to **give feedback** on the software (installation procedure, functionalities, encountered issues, ...) **before the final release in July 2015** on the [Espace](#).

If you are interested in participating to the beta testing phase of the new release of **SNAP** and the Sentinel Toolboxes, please fill up the contact form below and we will get in touch with you.

Your Name (required):

Your Email (required):

[Send](#)

Sources

All software is published under the [GFDL](#) license and its sources are available on [Gitea](#).

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The screenshot shows the 'step' science toolbox exploitation platform interface. The navigation bar includes links for ESA, STEP, TOOLBOXES, DOWNLOAD, GALLERY, DOCUMENTATION (highlighted with a red box), and COMMUNITY. The main content area is titled 'multimission scientific toolboxes' and describes the development of free open source toolboxes for the scientific exploitation of Earth Observation missions. It mentions the Scientific Exploitation of Operational Missions (SEOM) programme element and the STEP community platform. Below the text, there are icons for SNAP Features, Download, Tutorials, Community, Documentation, Developers, Gallery, and Blog.

The following results have been obtained thanks to the Sentinel Toolboxes :

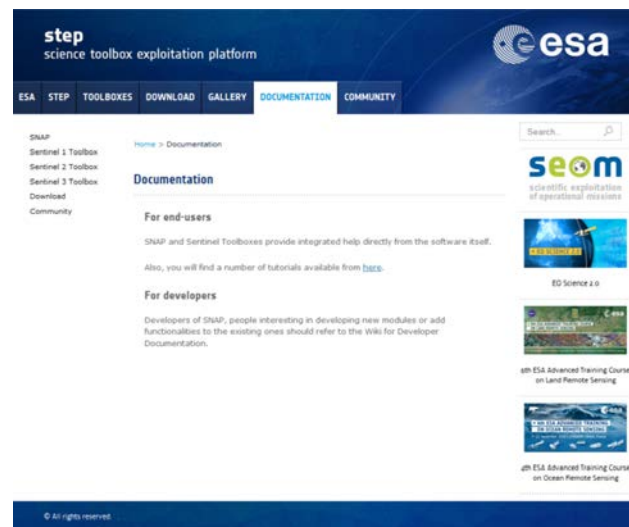


S1A Country Mosaic of Romania

A dual polarization colour composite of entire Romania using fifteen Sentinel-1A GDRH products acquired between October and November 2014.

[View More](#)

Technical documentation for both end-users and developers



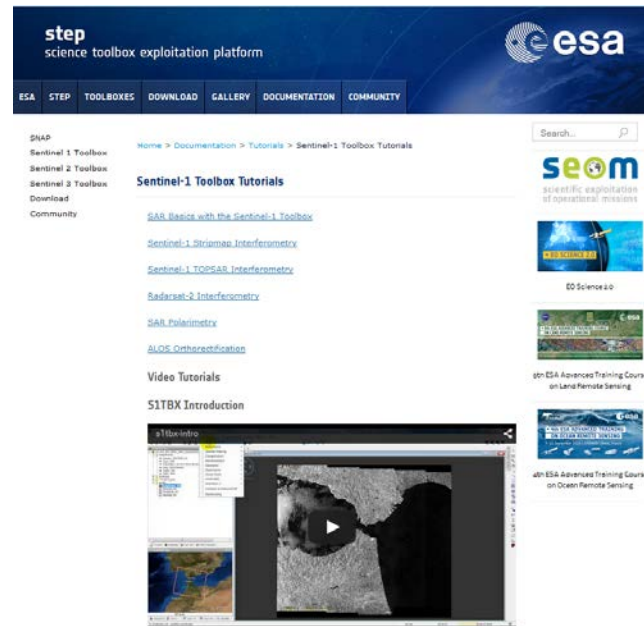
The screenshot shows the 'step' science toolbox exploitation platform interface with the 'DOCUMENTATION' tab highlighted. The main content area is titled 'Documentation' and is divided into two sections: 'For end-users' and 'For developers'. The 'For end-users' section mentions that SNAP and Sentinel Toolboxes provide integrated help directly from the software itself and that users will find a number of tutorials available from links. The 'For developers' section mentions that developers of SNAP, people interested in developing new modules or add functionalities to the existing ones should refer to the Wiki for Developer Documentation. On the right side, there are icons for EO Science 2.0, 6th ESA Advanced Training Course on Land Remote Sensing, and 4th ESA Advanced Training Course on Ocean Remote Sensing.



The following results have been obtained thanks to the Sentinel Toolboxes :



Step-by-step tutorials including YouTube videos



step.esa.int

Science Toolbox Exploitation Platform



- SNAP
- Sentinel 1 Toolbox
- Sentinel 2 Toolbox
- Sentinel 3 Toolbox
- Download
- Community

Home > Scientific Toolbox Exploitation Platform

Search

seom
scientific exploitation
of operational missions



EO Science 2.0



6th ESA Advanced Training Course
on Land Remote Sensing



6th ESA Advanced Training Course
on Ocean Remote Sensing

multimission scientific toolboxes

ESA is developing **free open source toolboxes** for the scientific exploitation of Earth Observation missions under the the Scientific Exploitation of Operational Missions (SEOM) programme element. **STEP** is the ESA community platform for accessing the software and its documentation, communicating with the developers, dialoguing within the science community, promoting results and achievements as well as providing tutorials and material for training scientists using the Toolboxes.

The ESA toolboxes support the **scientific exploitation** for the ERS-ENVISAT missions, the **Sentinels 1/2/3** missions and a range of **National and Third Party** missions. The three toolboxes are called respectively **Sentinel 1**, **2** and **3** Toolboxes and share a common architecture called **SNAP**. They contain some functionalities of historical toolboxes such as BEAM, NEST and Orfeo Toolbox that were developed over the last years.



SNAP Features



Download



Tutorials



Community



Documentation



Developers

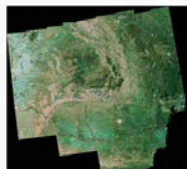


Gallery



Blog

The following results have been obtained thanks to the Sentinel Toolboxes :

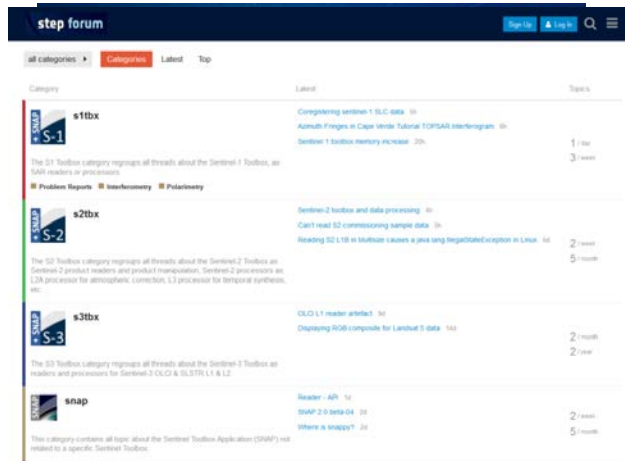


SIA Country Mosaic of Romania

A dual polarization colour composite of the entire Romania using fifteen Sentinel-1A GRDH products acquired between October and November 2014.

[View More](#)

Technical forum, gathering user feedback and communicating results



As an open source software, the maintainers of SNAP and the Sentinel Toolboxes welcome code contribution and bug fixes !

The entry point for developers is [here](#).

Issue tracker

You just found a bug ? Or maybe you want to report about this excellent idea you just had for a future release ? We welcome reports for issues and feature requests !

Issue tracking is provided by Jira and is hosted [here](#).

Thank you