



**ÚSTAV GEOGRAFIE**  
Prírodovedecká fakulta UPJŠ v Košiciach



# Radar Earth Observation – ESA EO Data Access and resources, applications, Copernicus OA Hub

ESA UNCLASSIFIED



# Activities

- ESA is one of the few space agencies in the world to combine responsibility in nearly all areas of space activity.



**space science**



**human spaceflight**



**exploration**



**earth observation**



**launchers**



**navigation**



**operations**



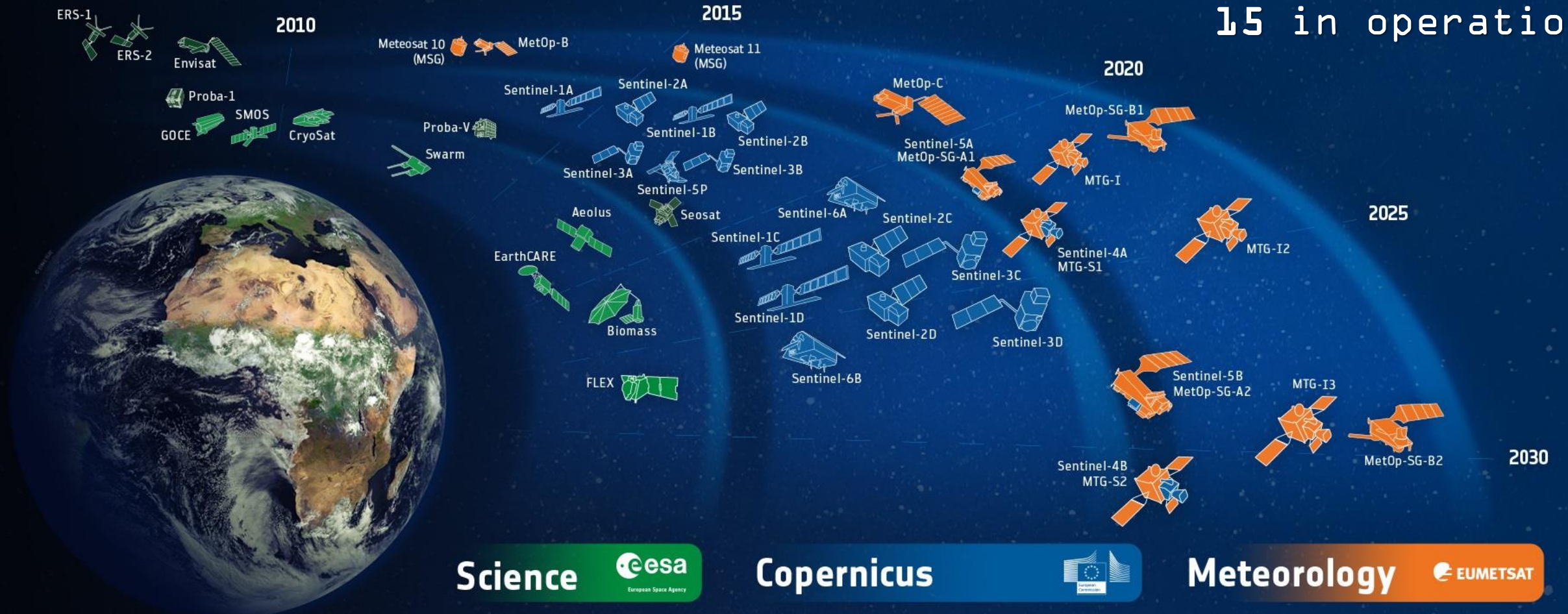
**technology**



**telecommunications**

# ESA-Developed Earth Observation Missions

Satellites  
25 under  
development  
15 in operation



# Science: Earth Explorers



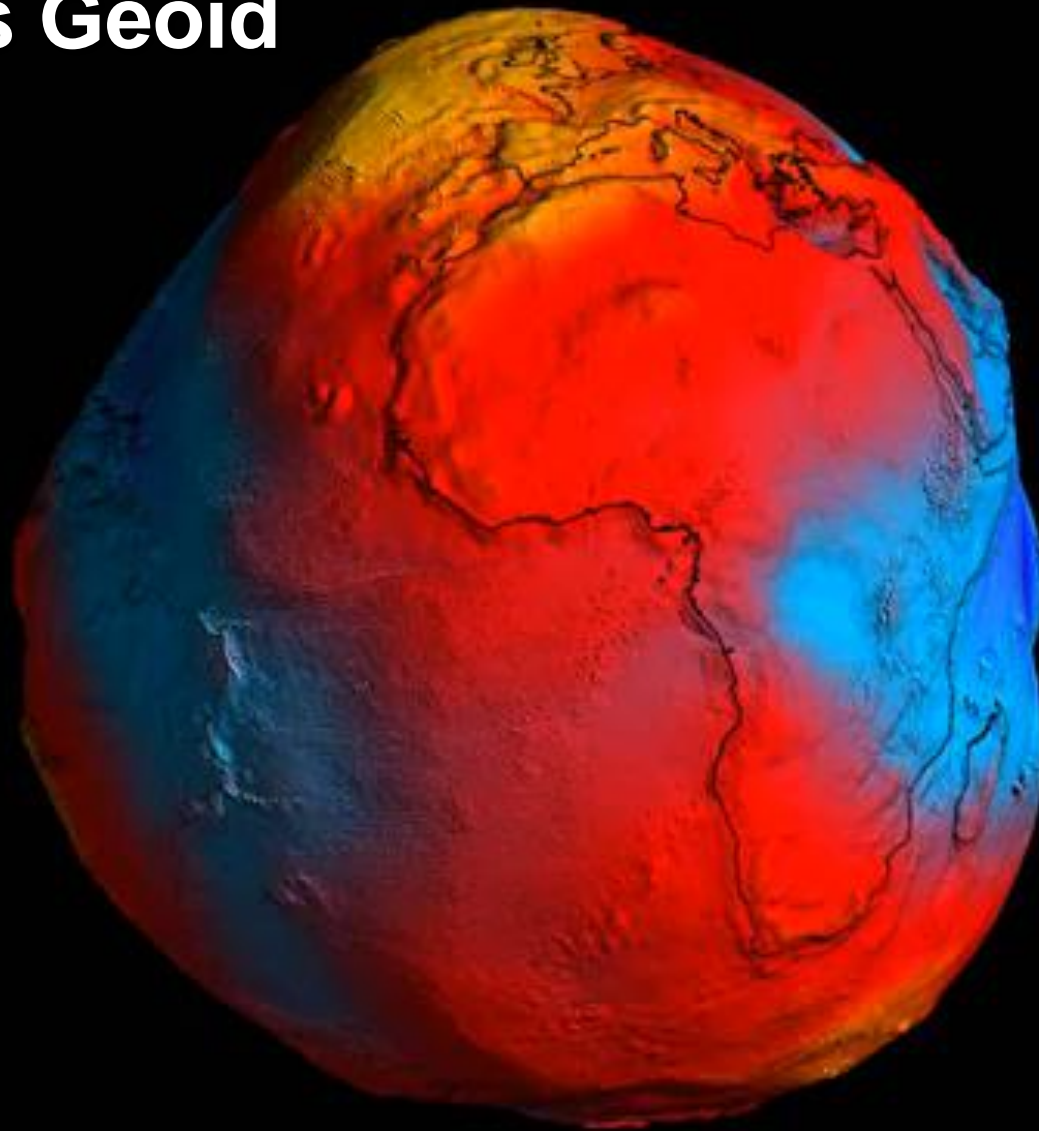
## Ice Volume

30 thousand cubic km





# GOCE: Earth's Geoid



- model of the 'geoid' with unprecedented accuracy and spatial resolution
- crucial reference for measuring ocean circulation and sea-level change

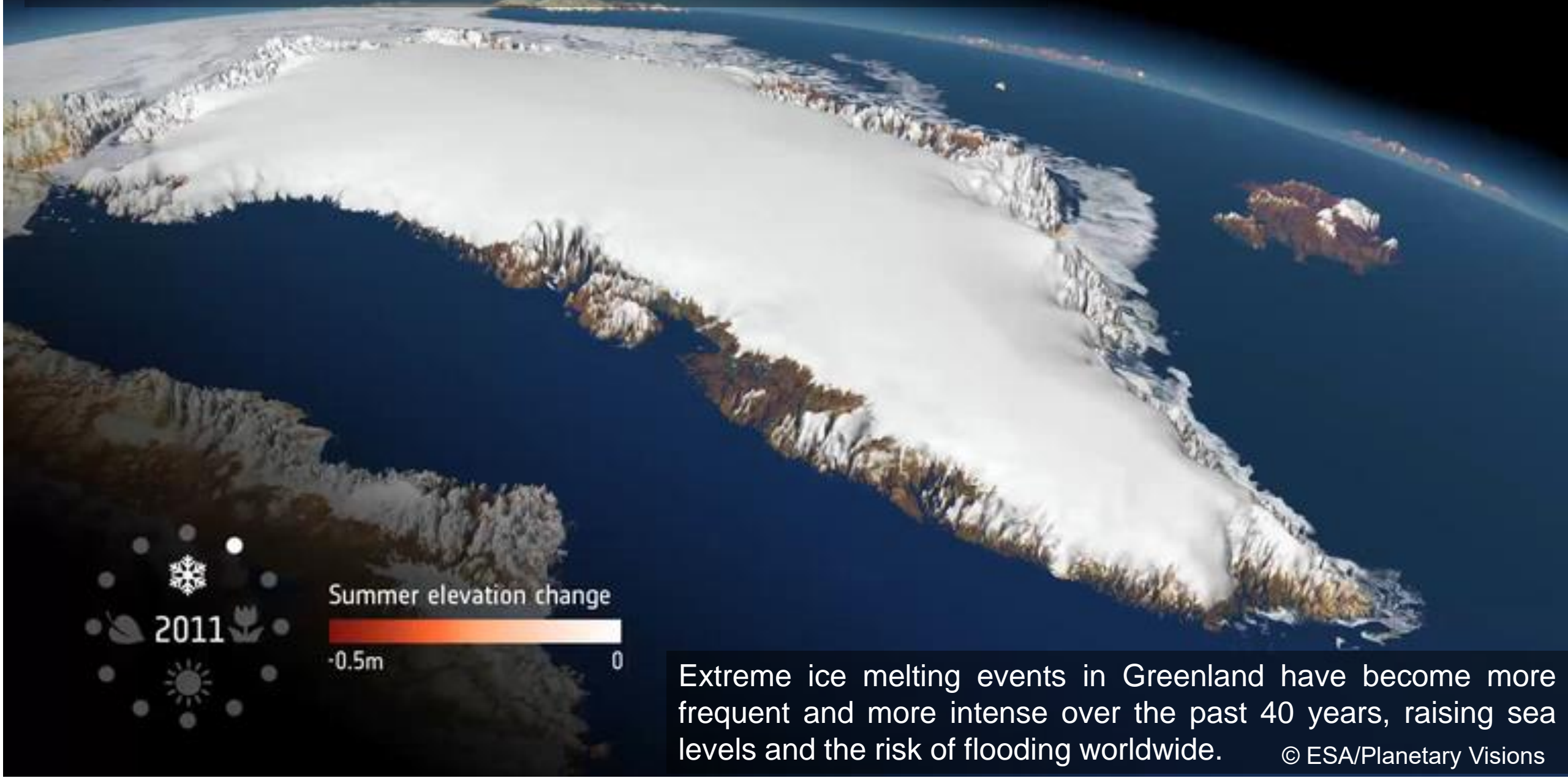
<https://visioterra.net/VtGsep/>

© ESA/HPF/DLR



European Space Agency

# Cryosat: Greenland meltwater runoff

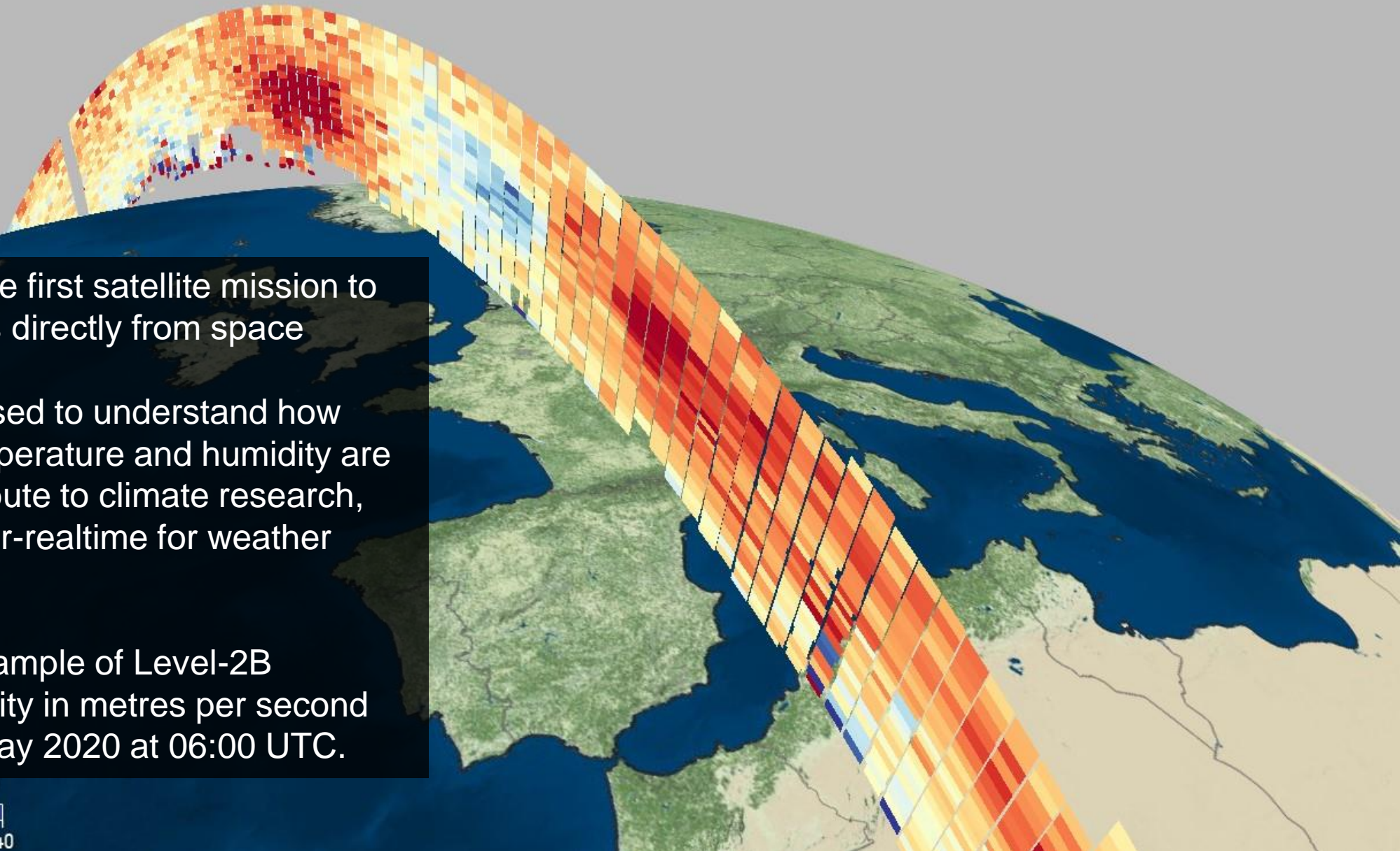


Extreme ice melting events in Greenland have become more frequent and more intense over the past 40 years, raising sea levels and the risk of flooding worldwide. © ESA/Planetary Visions

# Aeolus: Wind profile from Aeolus 6 May 2020

- Aeolus satellite is the first satellite mission to profile Earth's winds directly from space
- Its data are being used to understand how wind, pressure, temperature and humidity are interlinked to contribute to climate research, and also now in near-realtime for weather forecasting
- This image is an example of Level-2B Rayleigh wind velocity in metres per second over Europe on 6 May 2020 at 06:00 UTC.

Aeolus rayleigh wind velocity (m/s)







# Future Earth Explorers

# Upcoming Earth Explorers



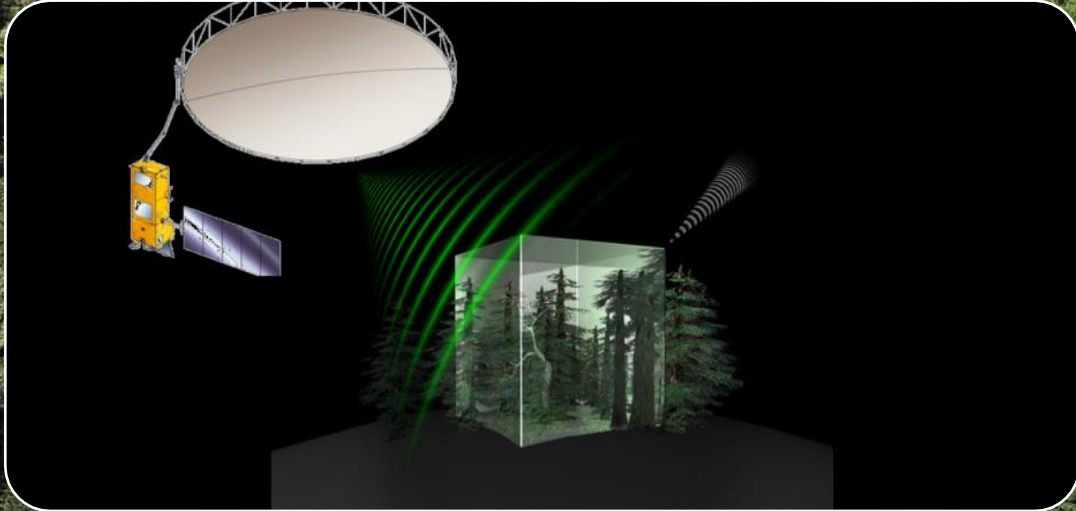
6

## EarthCARE

- Clouds, aerosols & radiation
- High performance lidar tech.
- Partnership JAXA
- Launch planned 2021



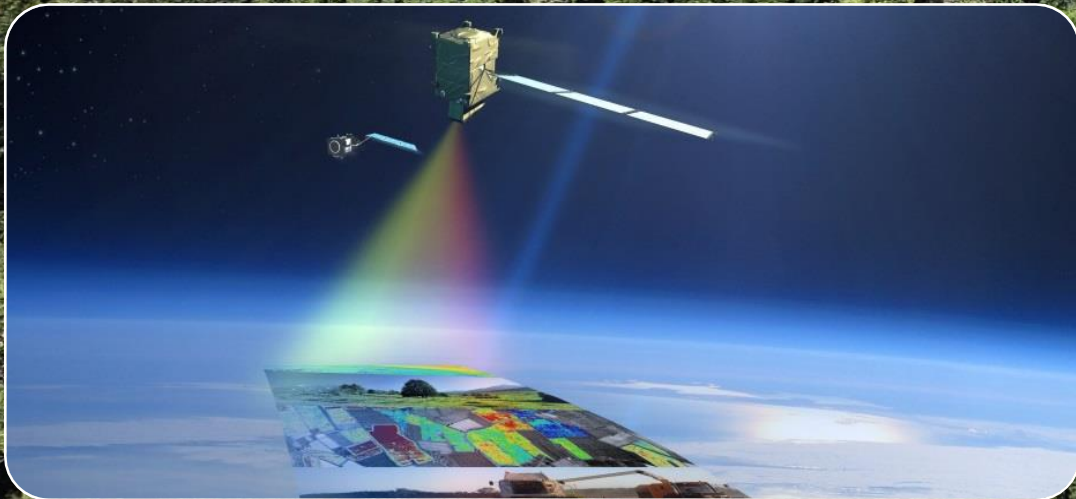
# Further Earth Explorers



7

## Biomass

- Biomass estimates
- First P-band SAR in space
- Launch planned 2022



8

## FLEX

- Vegetation fluorescence, indicator of photosynthesis
- Launch planned 2022



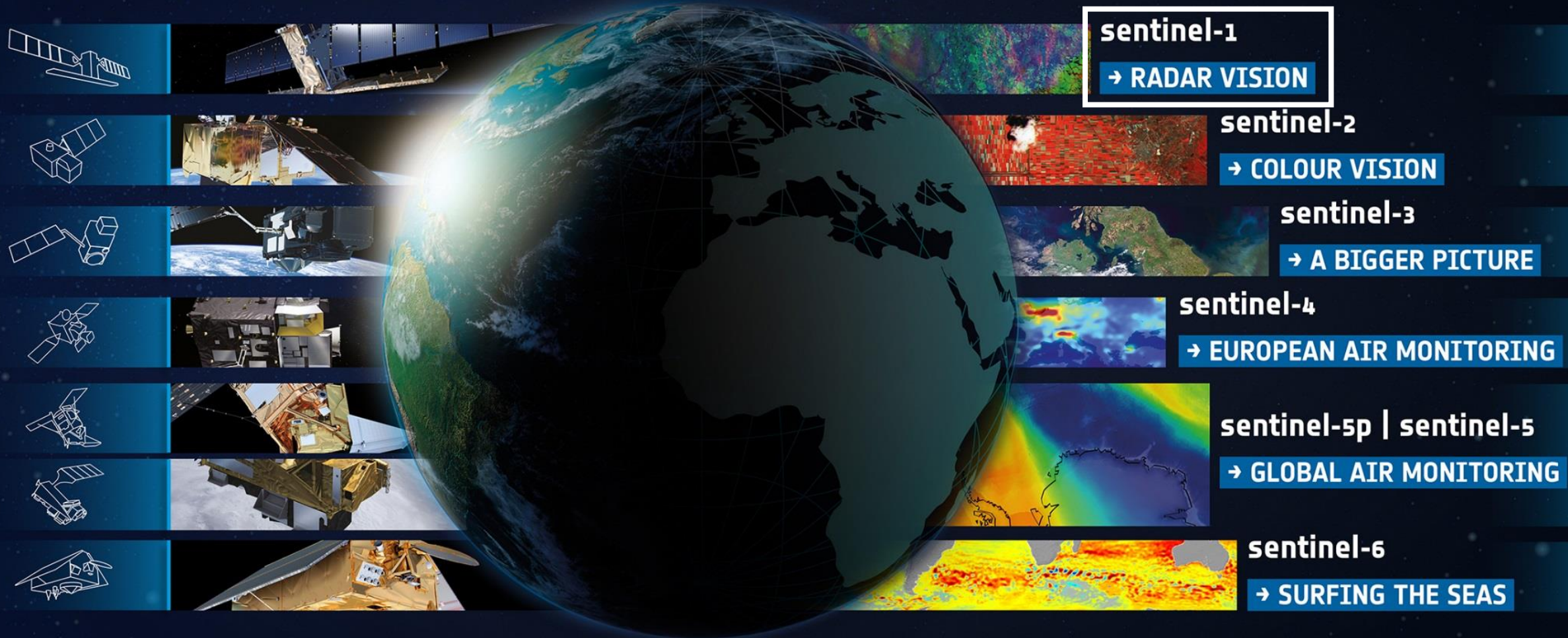
## 12

### Earth Explorer 12

- A Call for Ideas was issued on 20 February 2023. The deadline to submit a full proposal is 29 September 2023

# Environmental Monitoring - Copernicus

# Environmental Monitoring: Copernicus Sentinels



- sentinel-1**  
→ RADAR VISION
- sentinel-2**  
→ COLOUR VISION
- sentinel-3**  
→ A BIGGER PICTURE
- sentinel-4**  
→ EUROPEAN AIR MONITORING
- sentinel-5p | sentinel-5**  
→ GLOBAL AIR MONITORING
- sentinel-6**  
→ SURFING THE SEAS

# The Big Data Revolution

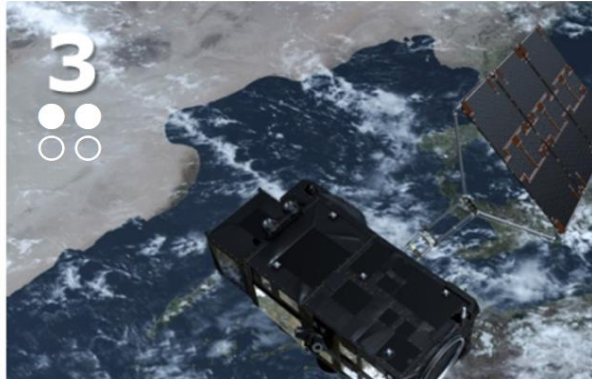
Copernicus is the largest producer of EO data in the world

1  
●●  
○○



**Sentinel-1 (A/B)** – SAR imaging  
All weather, day/night applications,  
interferometry

3  
●●  
○○



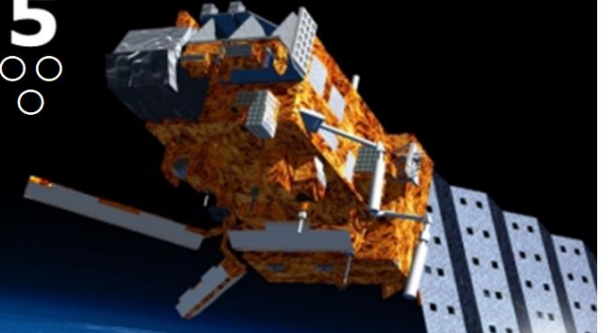
**Sentinel-3 (A/B)** – Ocean and  
global land monitoring

5P  
●

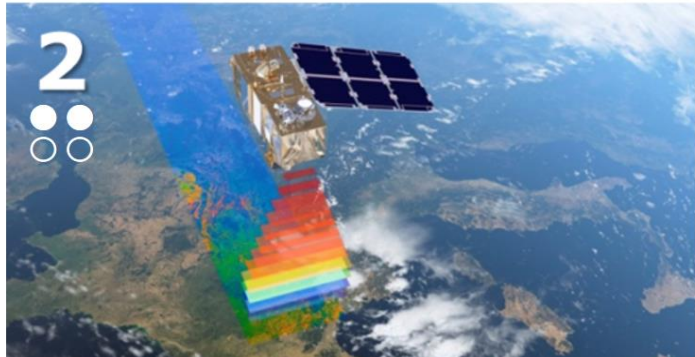


**Sentinel-5 precursor/ Sentinel-5 (A/B)** – Low Earth-orbit  
Atmospheric composition monitoring

5  
○○  
○



2  
●●  
○○



**Sentinel-2 (A/B)** – Multi-spectral  
imaging, Land applications: urban,  
forest, agriculture,...

4  
○○



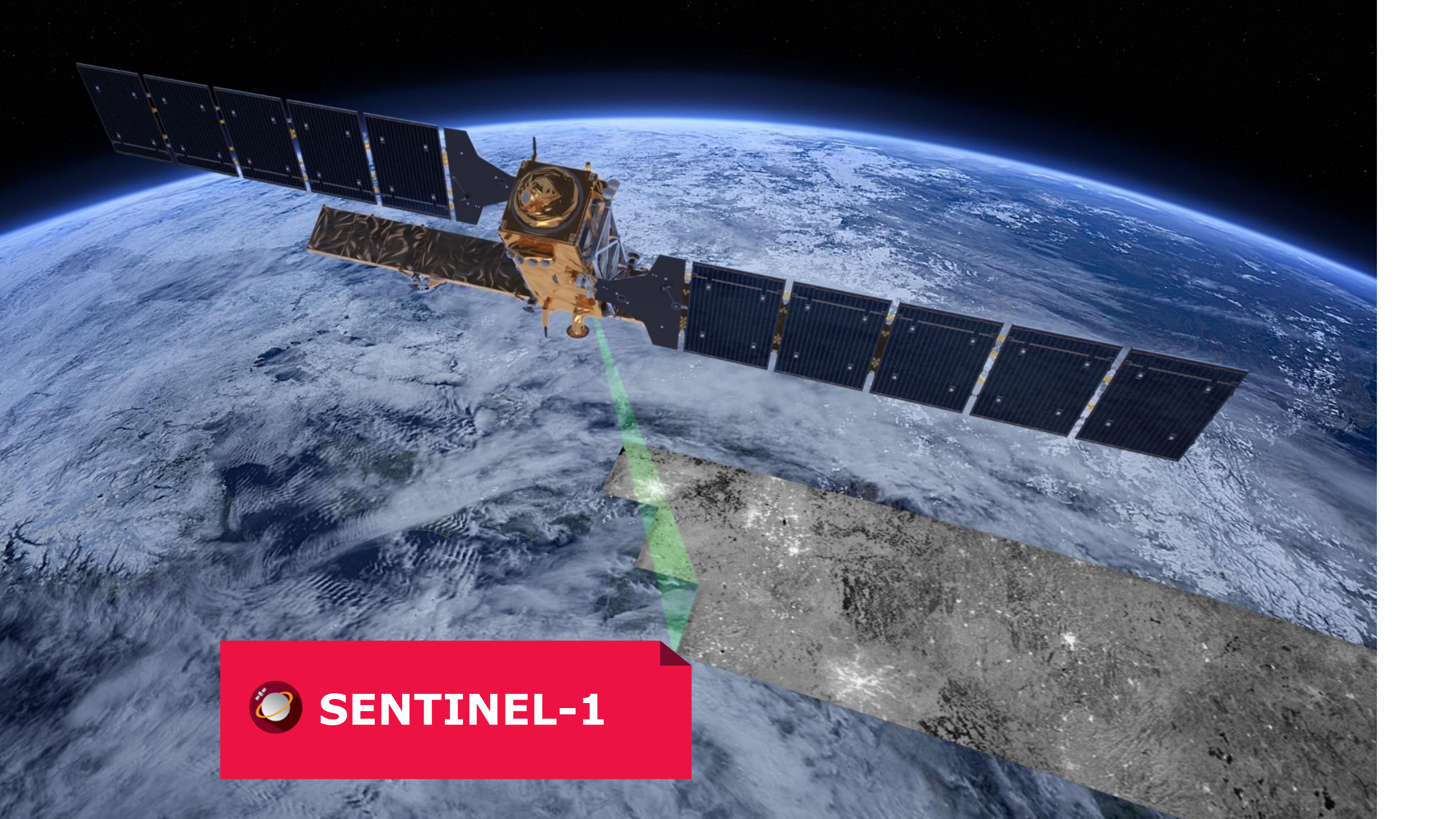
**Sentinel-4 (A/B)** – Geostationary  
atmospheric

6  
○○



**Sentinel 6 - Jason-CS (A/B)** – Low inclination Altimetry  
Sea-level, wave height and marine wind speed






 **SENTINEL-1**



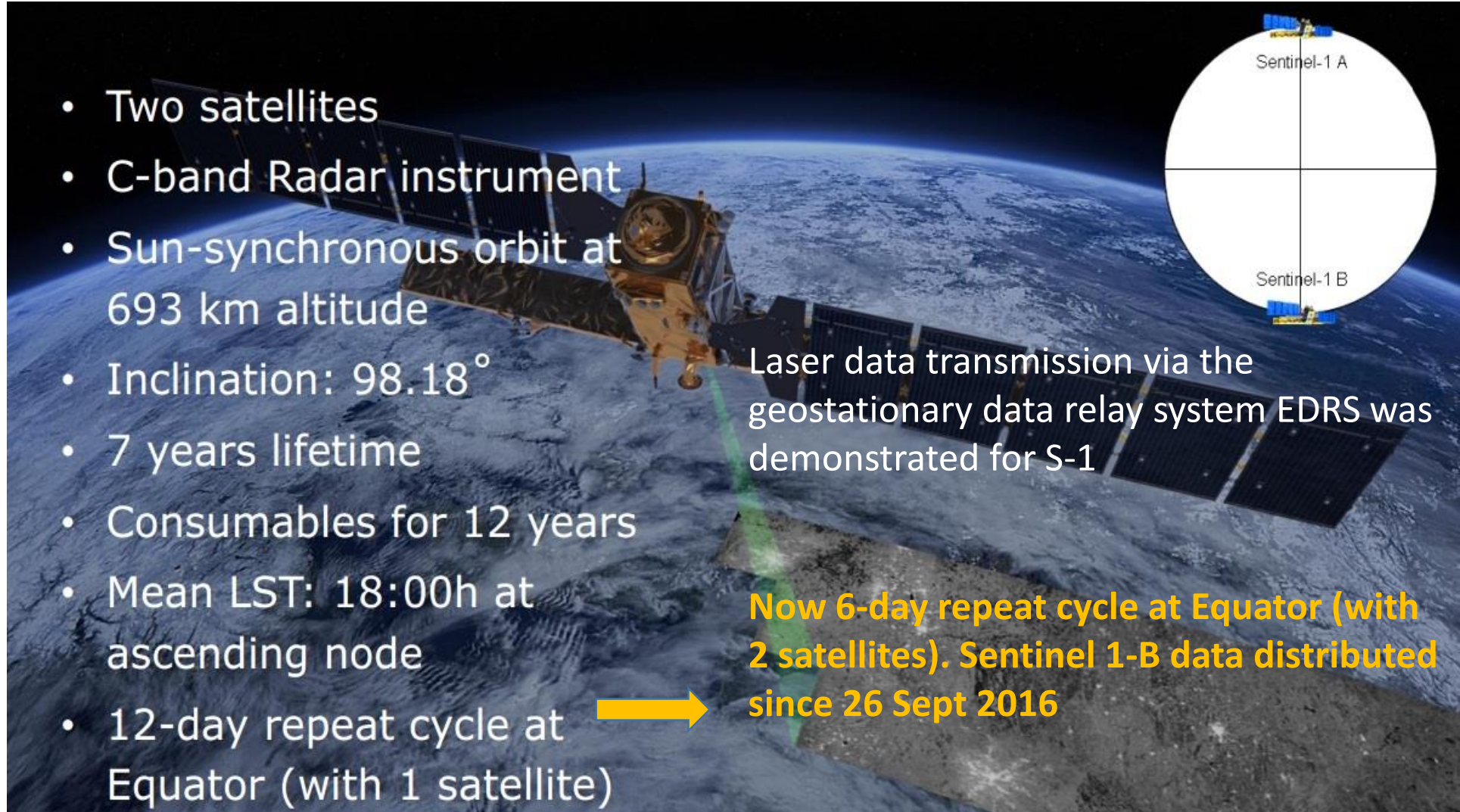
# Sentinel-1

## Mission Overview

- Two satellites
- C-band Radar instrument
- Sun-synchronous orbit at 693 km altitude
- Inclination:  $98.18^\circ$
- 7 years lifetime
- Consumables for 12 years
- Mean LST: 18:00h at ascending node
- 12-day repeat cycle at Equator (with 1 satellite) 

Laser data transmission via the geostationary data relay system EDRS was demonstrated for S-1

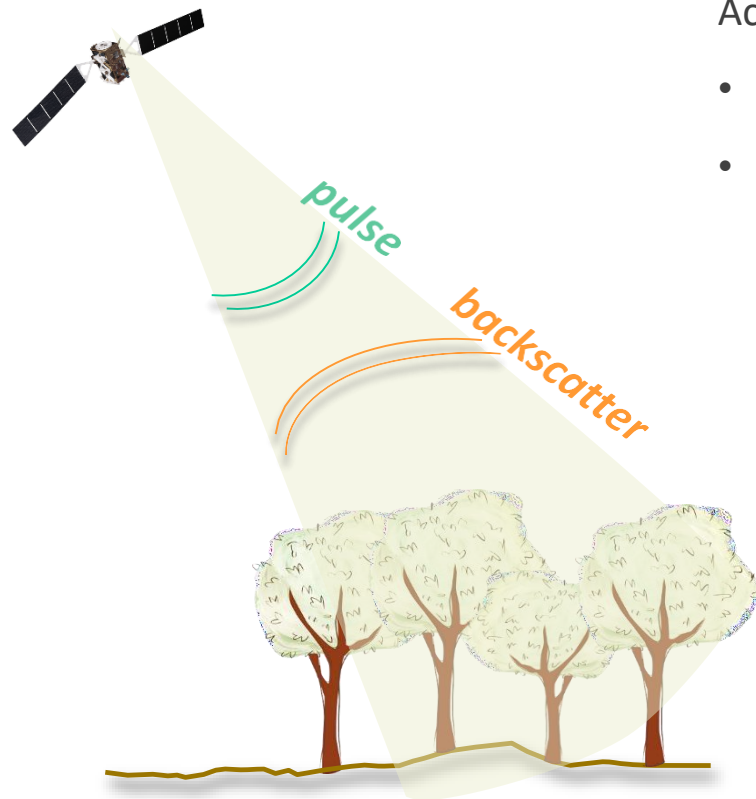
**Now 6-day repeat cycle at Equator (with 2 satellites). Sentinel 1-B data distributed since 26 Sept 2016**



# Active Radar Remote Sensing

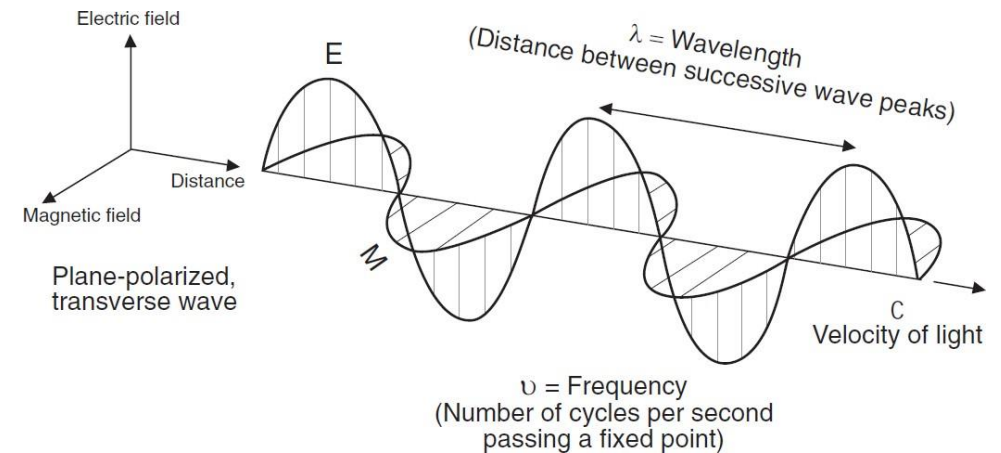
*Basic characteristics of radar systems/SAR sensors*

- active ⇒ independent of sun illumination



Active remote sensing sensors generate EM-waves

- no sunlight required night time acquisitions possible
- no problems due to bad illumination

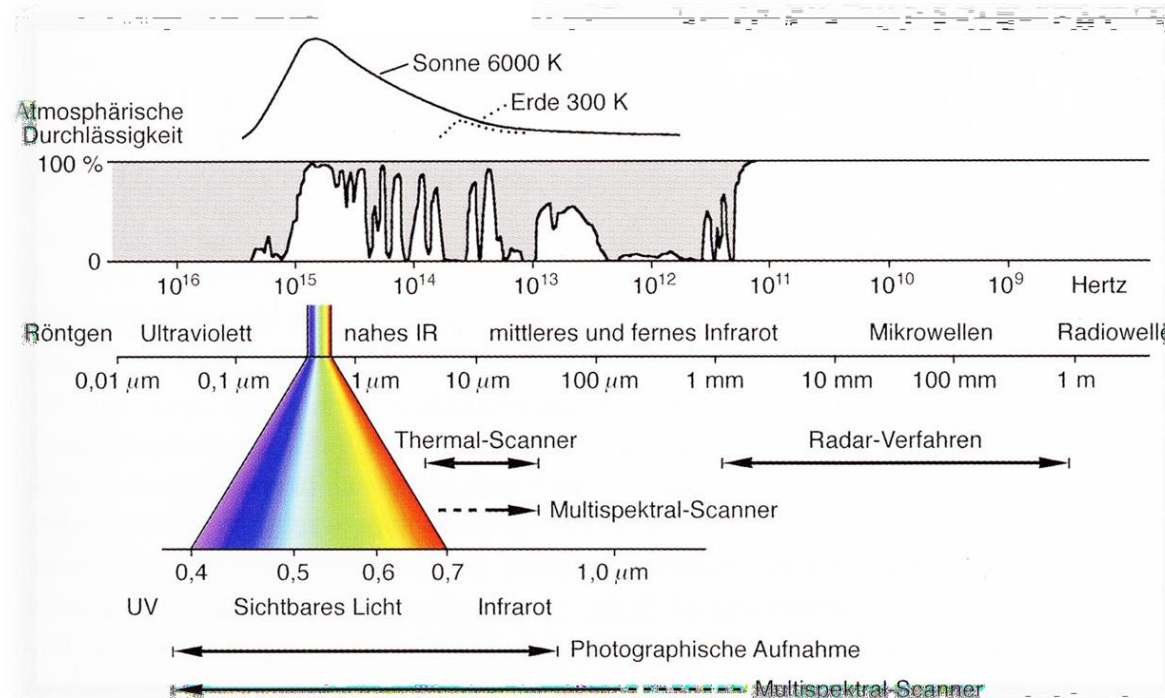


# Active Radar Remote Sensing

## *Basic characteristics of radar systems/SAR sensors*

- **active**                   ⇒ **independent of sun illumination**

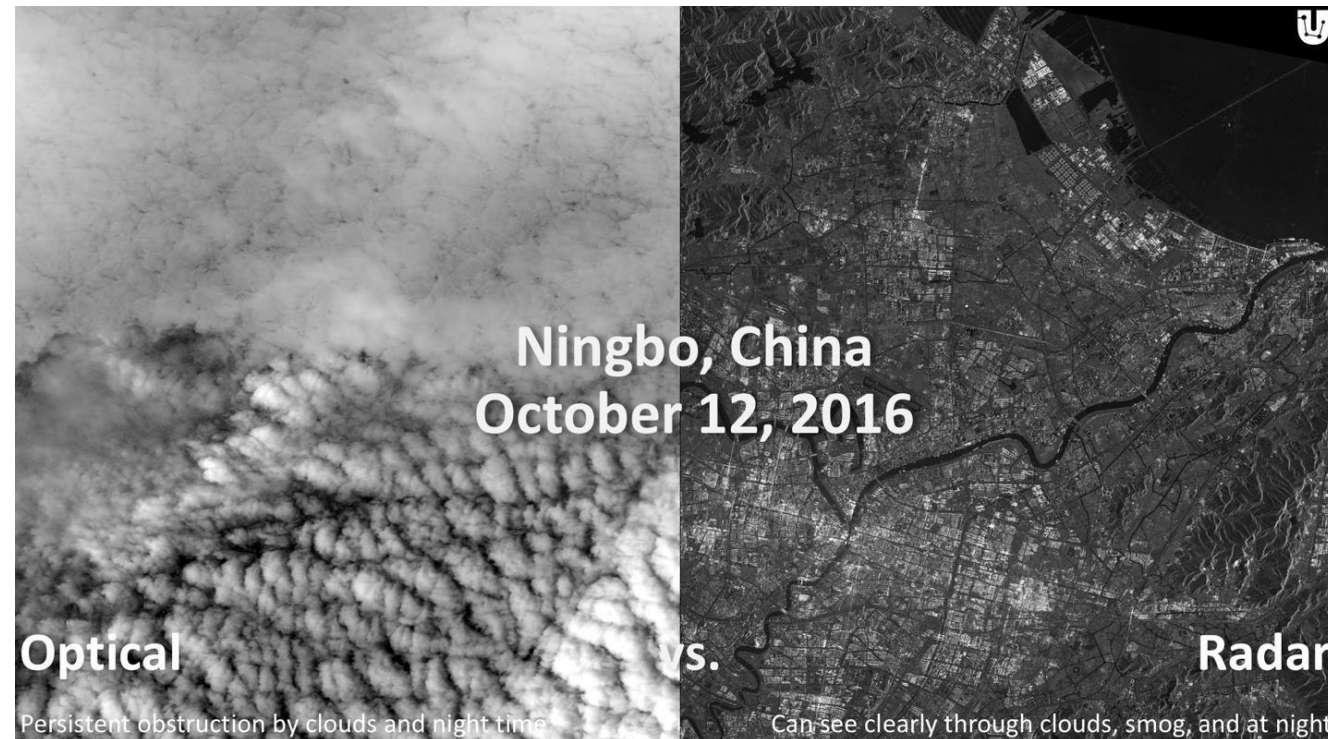
*electromagnetic spectrum*



# Active Radar Remote Sensing

## *Basic characteristics of radar systems/SAR sensors*

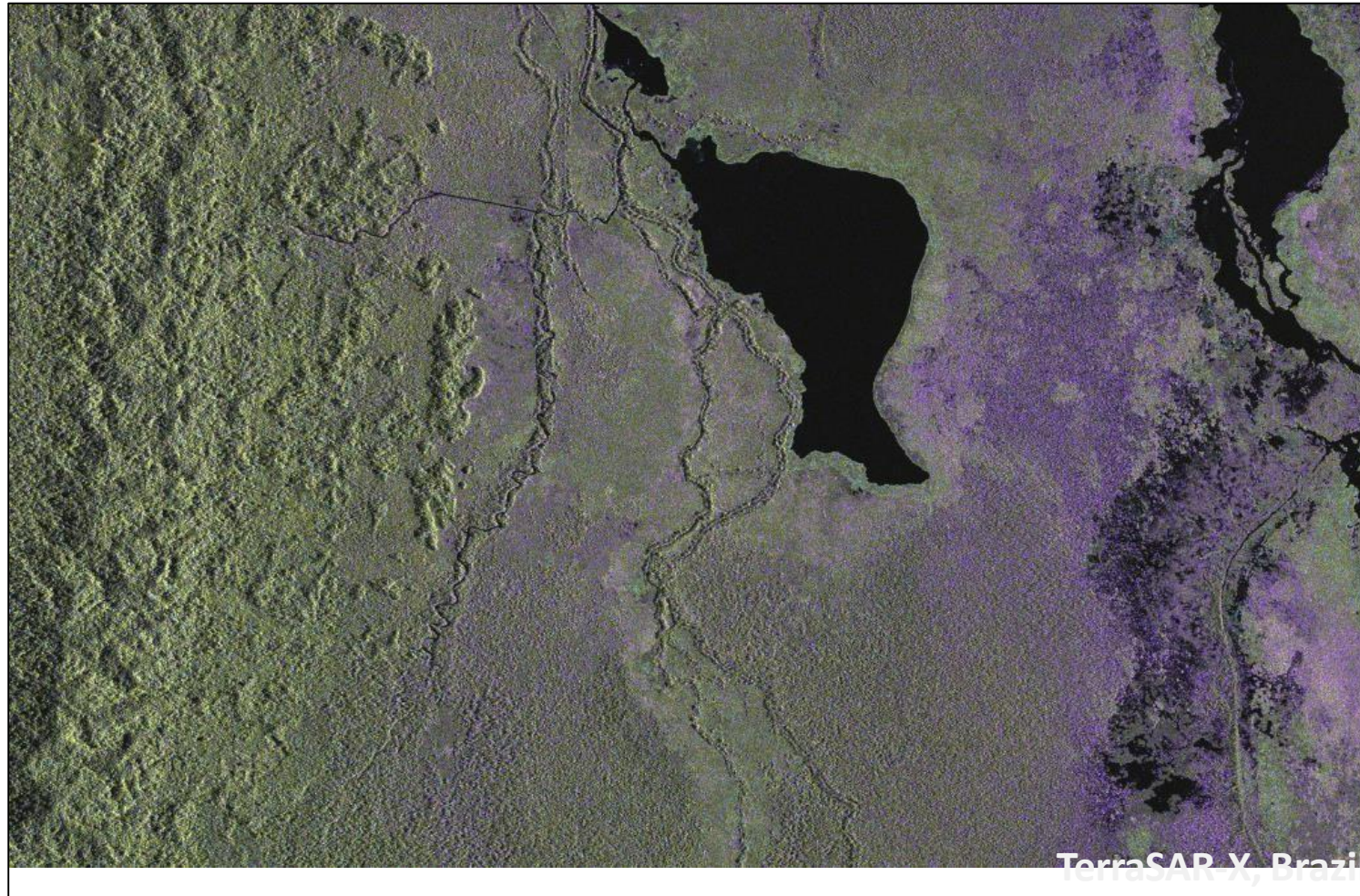
- active ⇒ independent of sun illumination
- **microwave** ⇒ **penetrates into/through objects**  
clouds and (partially) canopy, soil, snow  
(almost) no problems with clouds, dust, fog. Sensing of „hidden“ objects



# Active Radar Remote Sensing

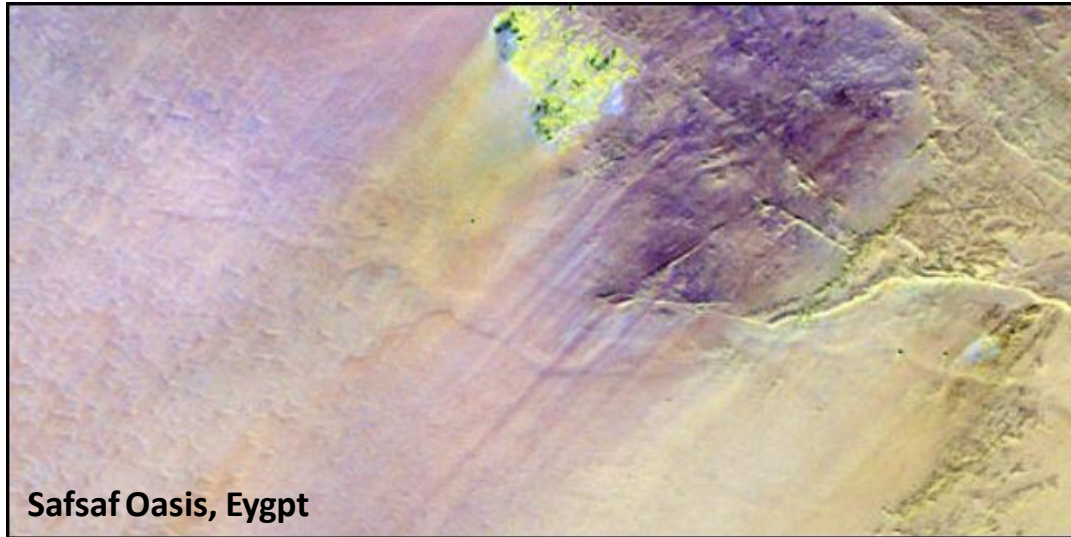
*Characteristics / Example all weather*

Cloud cover is a big problem in remote sensing of moist tropics



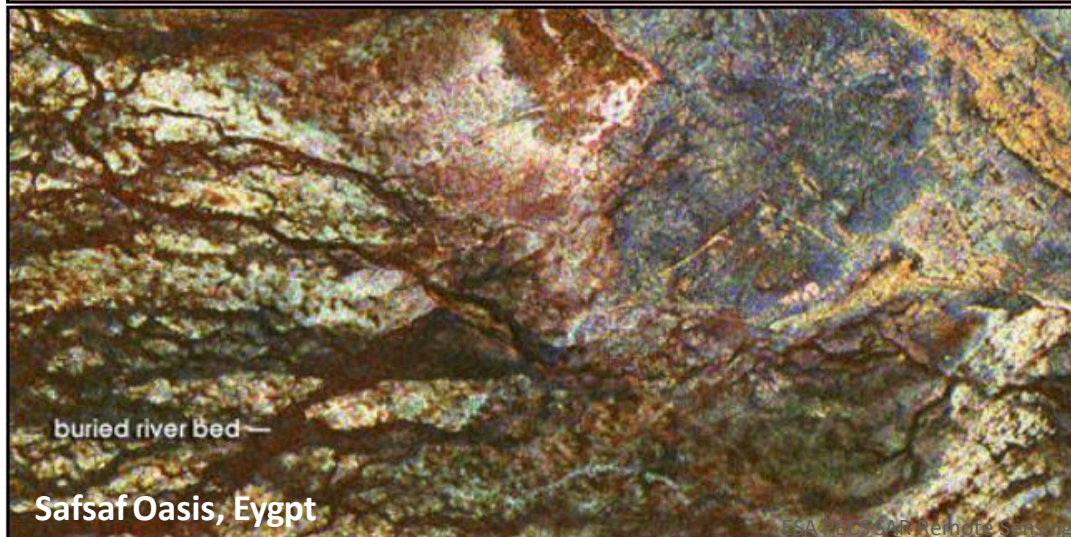
# Active Radar Remote Sensing

## *Characteristics / penetration through sand*



Safsaf Oasis, Egypt

Landsat Thematic Mapper  
shows the desert's surface



buried river bed —

Safsaf Oasis, Egypt

SIR-C/X-SAR  
shows what the landscape might look  
like if stripped bare of sand

# Sentinel-1

## SAR Operational Modes

Operational Modes	Resolution	Swath Width	Polarisation
	20 x 40 m <sup>2</sup>	> 400 km	HH+HV or VV+VH
	5 x 20 m <sup>2</sup>	> 250 km	HH+HV or VV+VH
	5 x 5 m <sup>2</sup>	> 80 km	HH+HV or VV+VH
	5 x 5 m <sup>2</sup>	20 x 20 km <sup>2</sup> at 100 km spacing	HH or VV

➤ **Daily coverage of high priority areas, e.g. Europe, Canada, shipping routes**

**Main modes of operations:**

- **IW over land and coastal waters (normally VV or VV-VH polarization)**
- **EW over extended sea (VV or VV-VH) and sea-ice (HH or HH-HV) areas**
- **WV over open oceans**

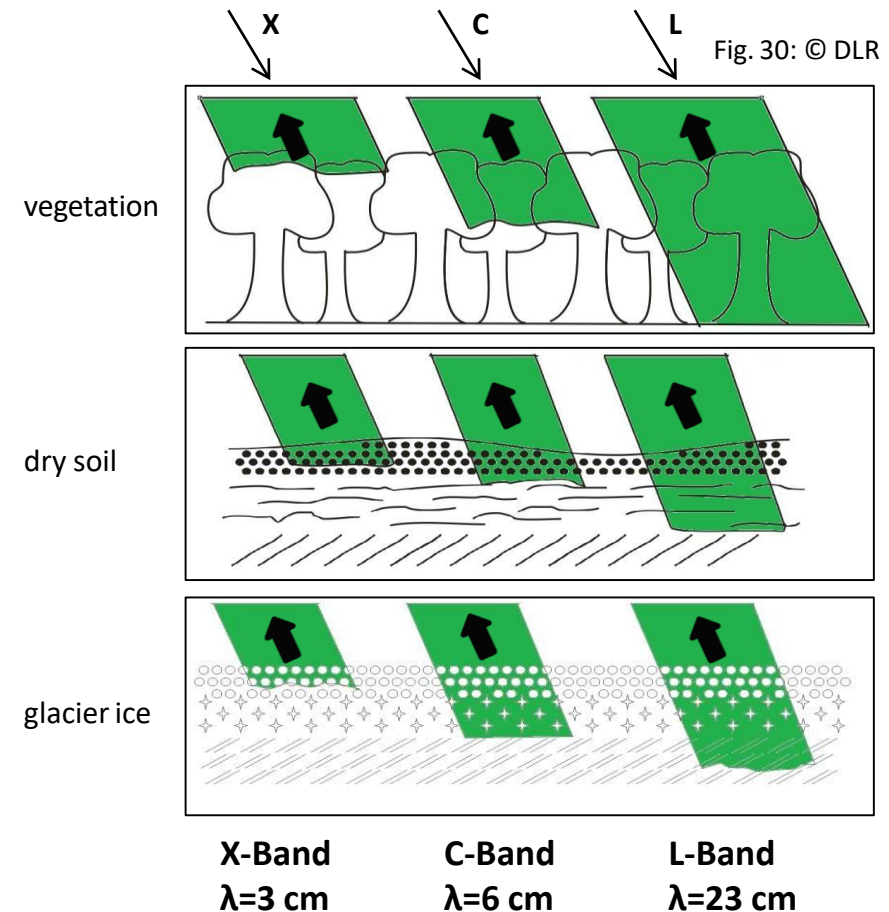
# Active Radar Remote Sensing

*Advantages / Example all weather*

- active  $\Rightarrow$  independent of sun illumination
- **microwave**  $\Rightarrow$  **penetrates into/through objects**

The penetration depth is depending on **wavelength** and **dielectric characteristics** of objects

wavelengths:      **X-band: 3 cm**  
                          **C-band: 6 cm**  
                          **L-band: 23 cm**



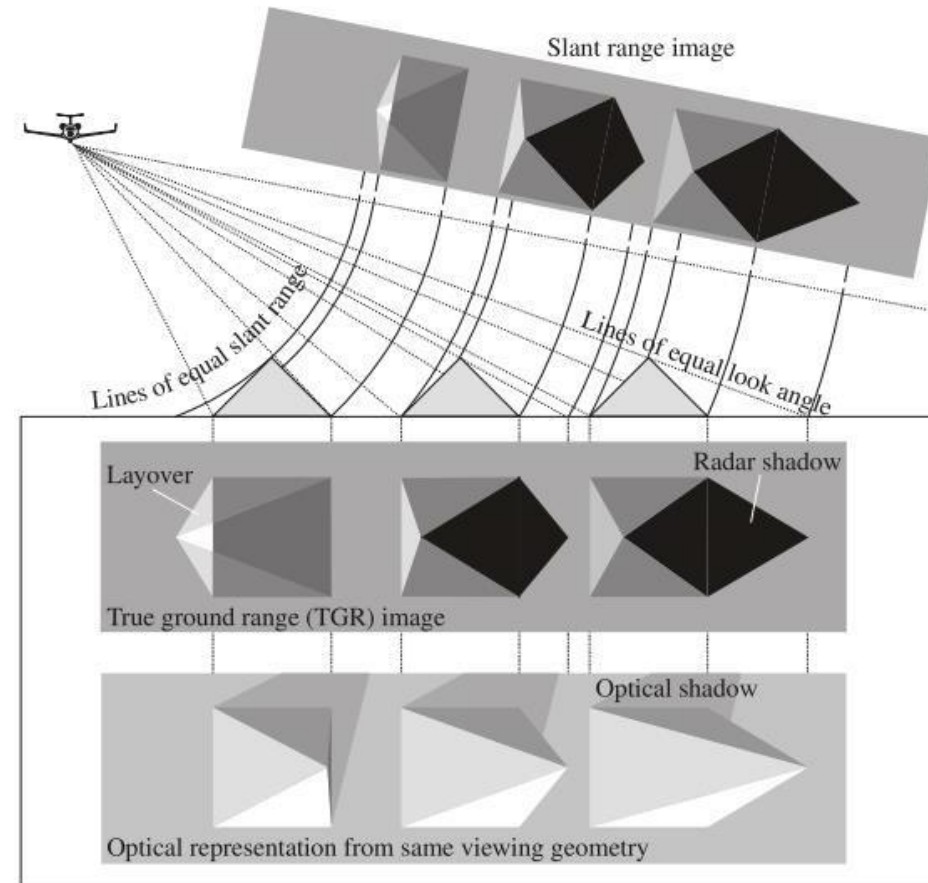


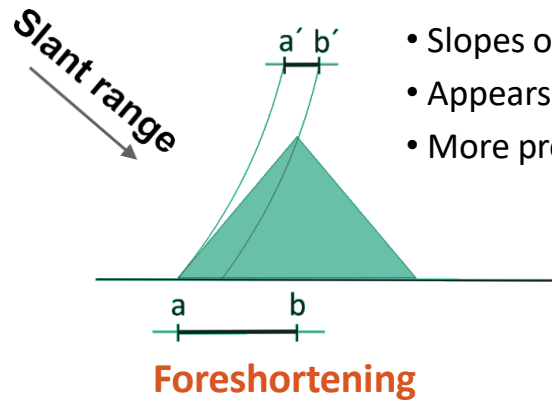
# Geometric Effects in SAR images

## Effects of side-looking geometry

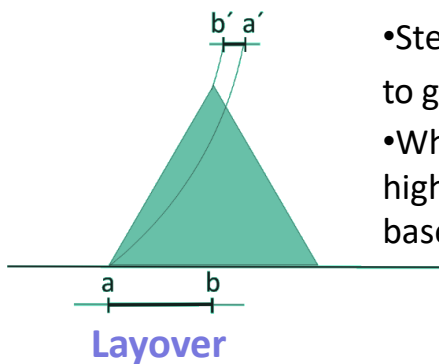
- The mapping of a radar image is contrary to the intuitive mapping of an optical image
- Side looking geometry of SAR systems cause some typical geometric effects

- Controlled by:
  - ❖ Incidence angle
  - ❖ Topography
- The effects are:
  - ❖ Foreshortening
  - ❖ Layover
  - ❖ Radar shadow

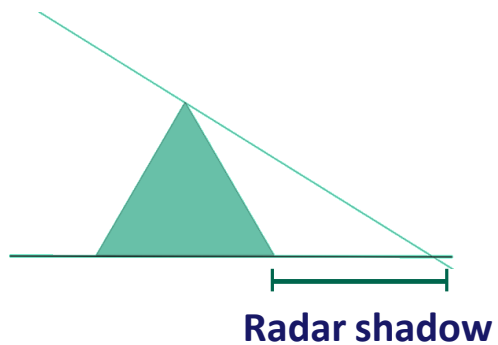




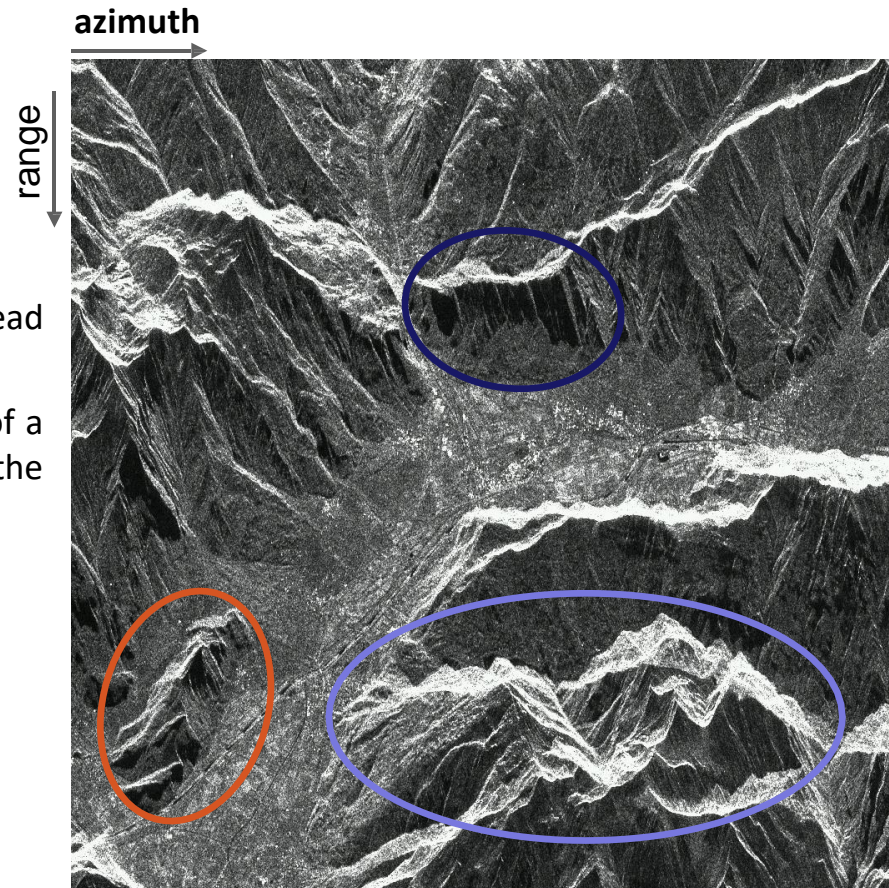
- Slopes oriented to the SAR appear compressed (Distance between a and b is shortened)
- Appears as very bright area
- More pronounced in near range (small incidence angle) than in far range (high incidence angles)



- Steep slopes oriented to the SAR lead to ghost images
- When radar beam reaches the top of a high feature (b) before it reaches the base (a)

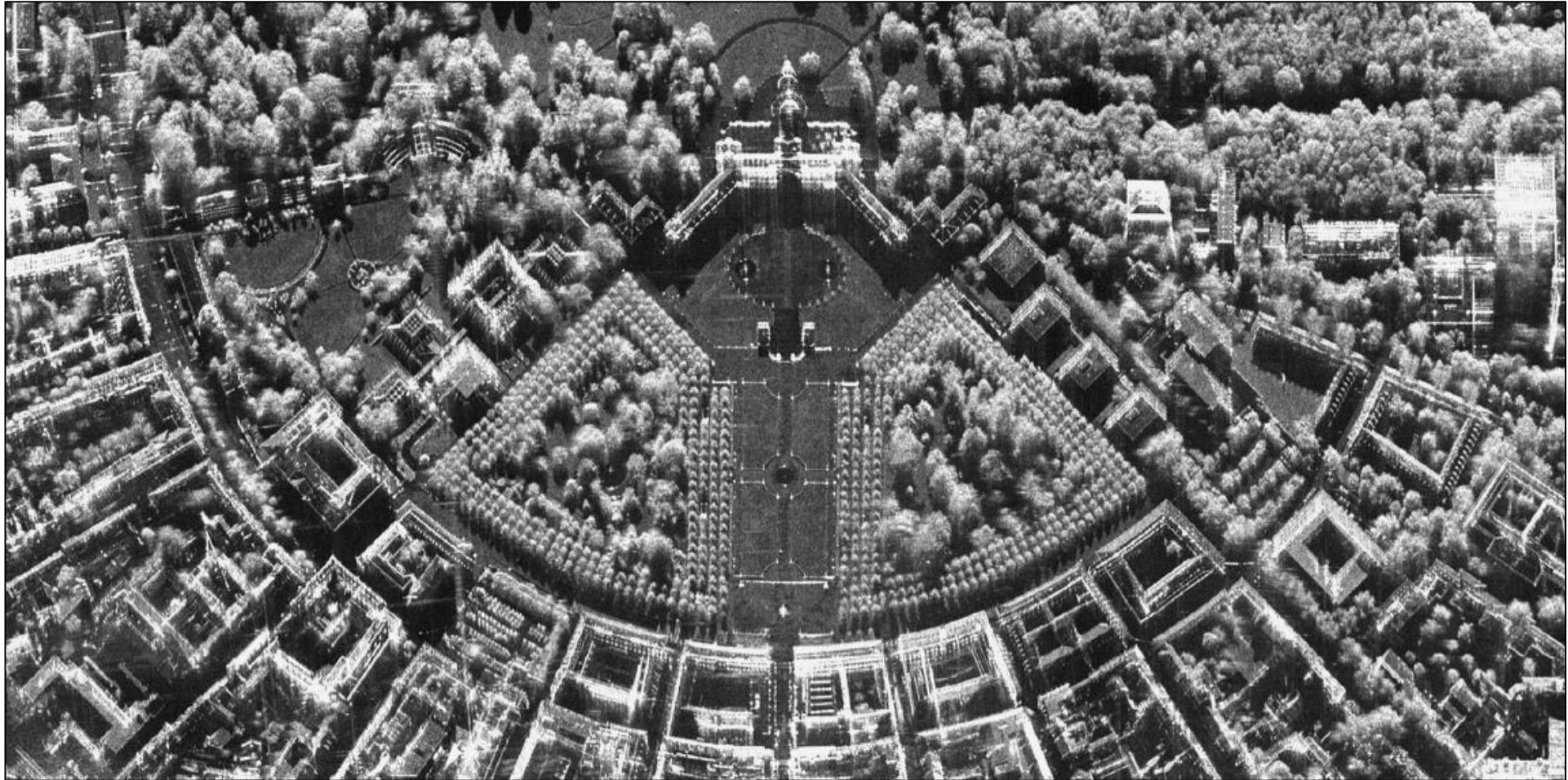


- Steep slopes oriented away from the SAR return no signal
- No signals can be transmitted to this area (as it is blocked by the slope)
- Thus no signals can be scattered back from these areas
- Appears as black area in the image



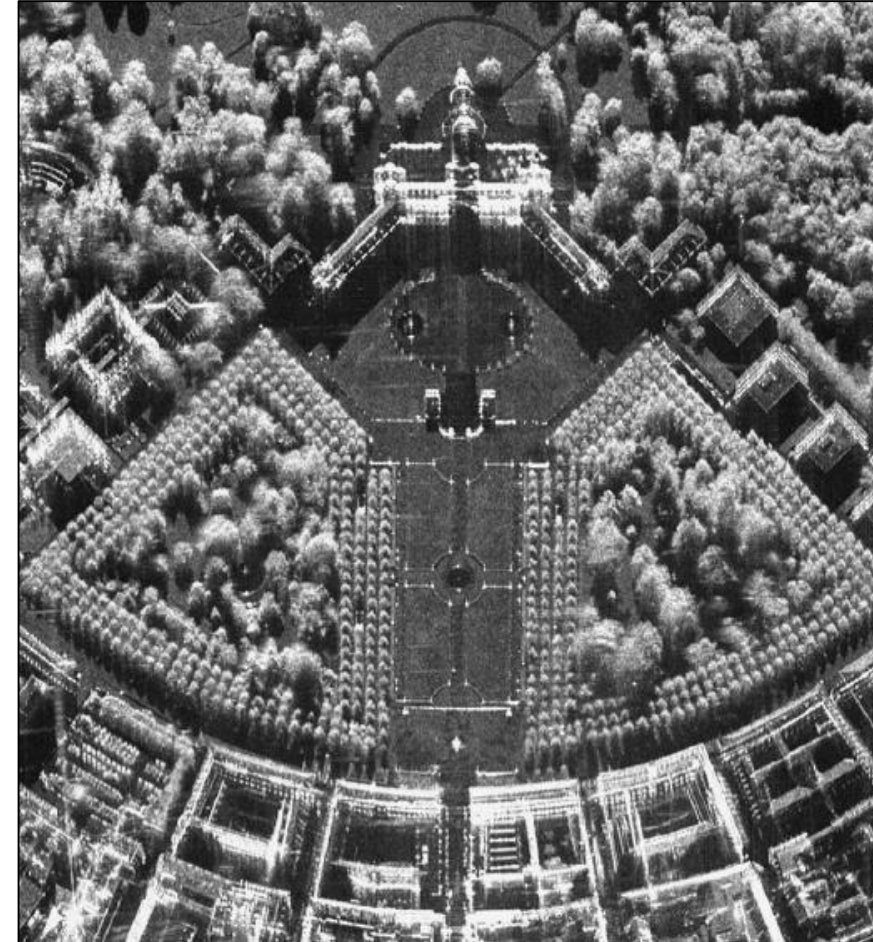
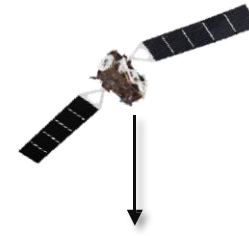
# SAR Data Example

Effects of side-looking geometry



Andreas R. Brenner and Ludwig Roessing, Radar Imaging of Urban Areas by Means of Very High-Resolution SAR and Interferometric SAR, IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 46, NO. 10, OCTOBER 2008 (X-band)

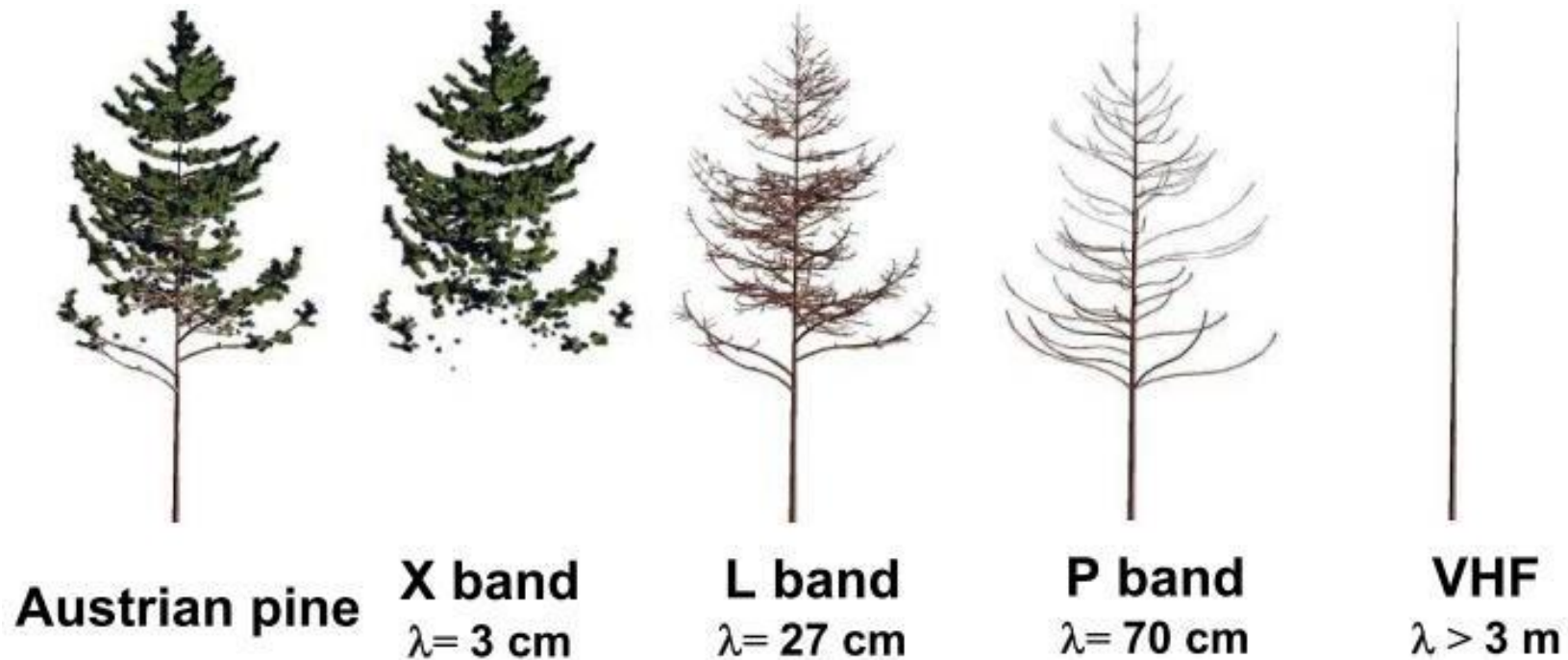
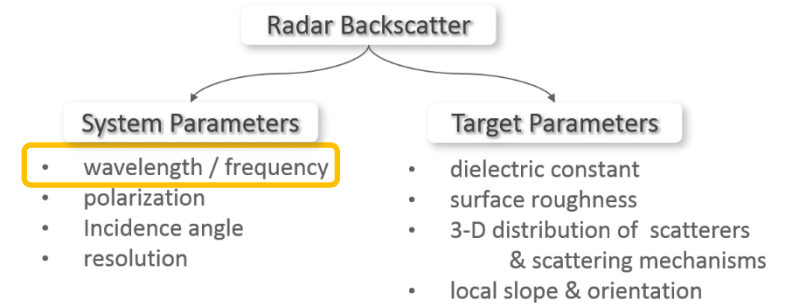
# SAR Data Examples



GoogleMaps

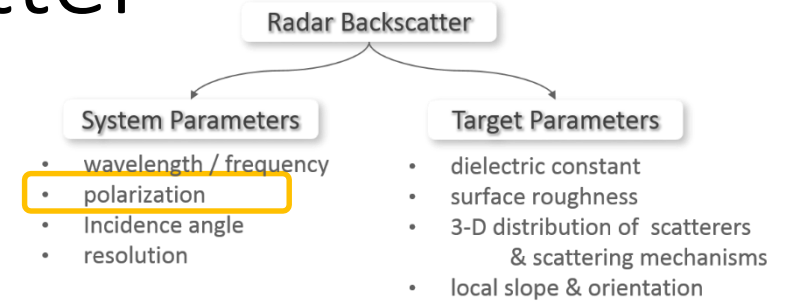
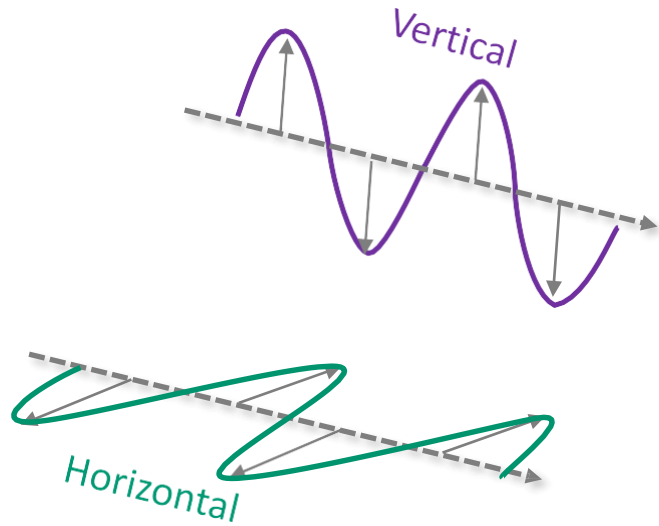
# Influences on radar backscatter

System parameters : Wavelength/Frequency



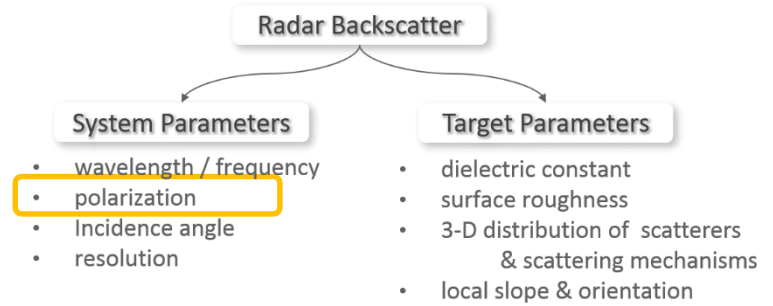
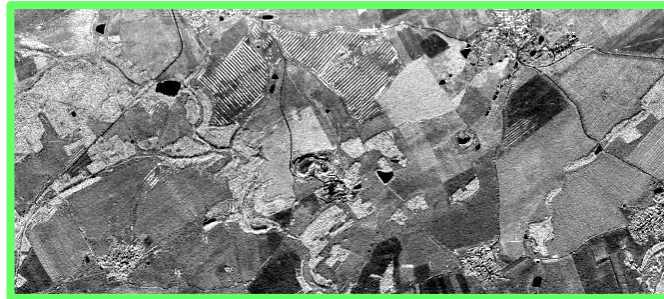
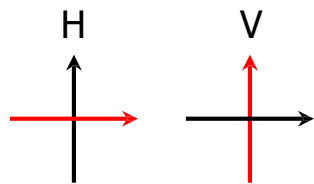
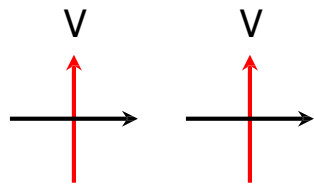
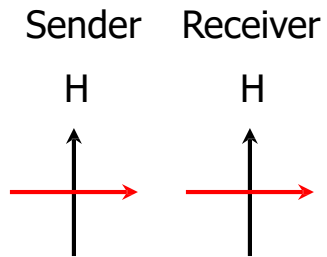
# Influences on radar backscatter

System parameters : Polarization



# Influences on radar backscatter

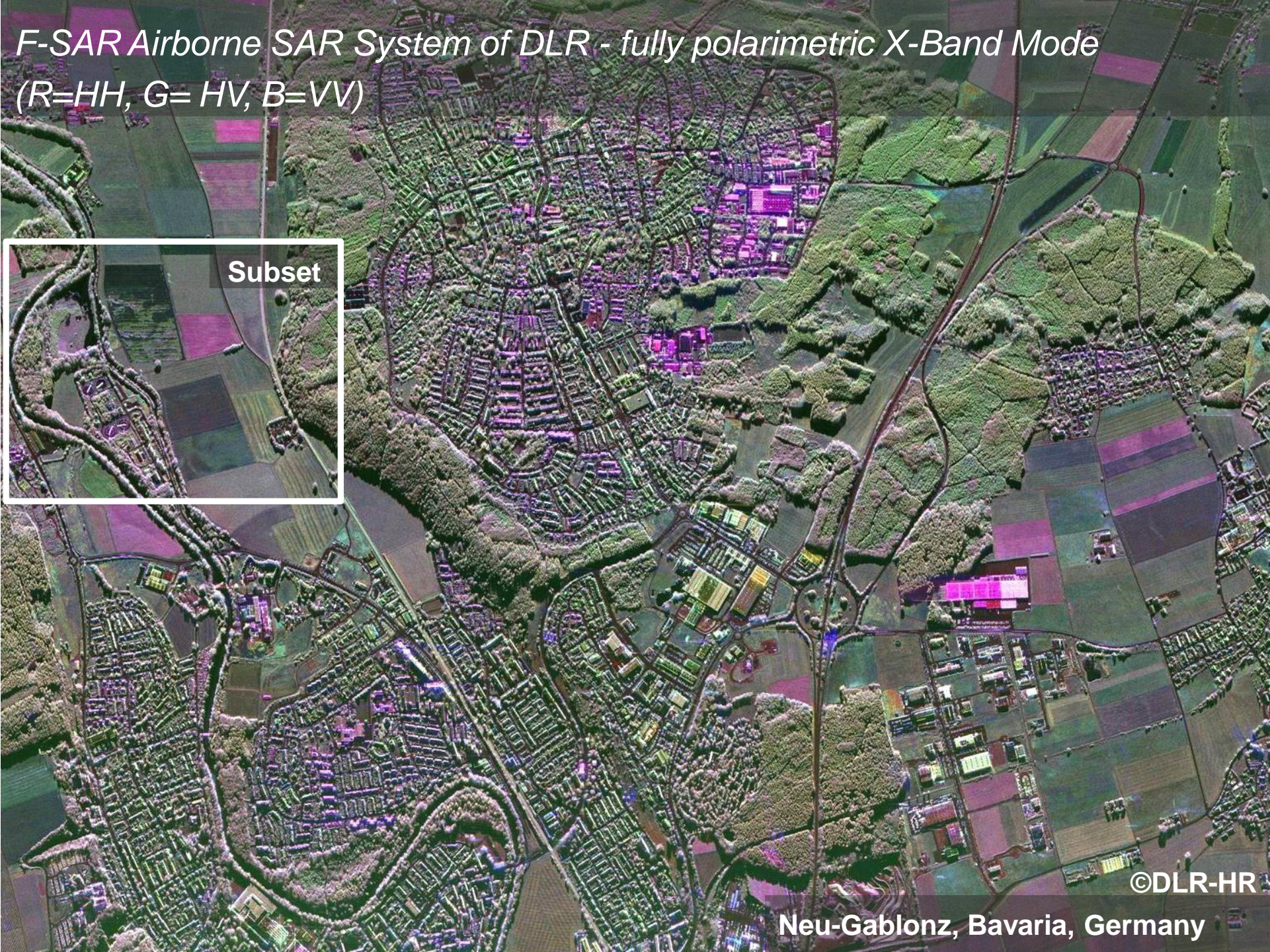
## System parameters : Polarization



RGB-Composite



*F-SAR Airborne SAR System of DLR - fully polarimetric X-Band Mode  
(R=HH, G=HV, B=VV)*

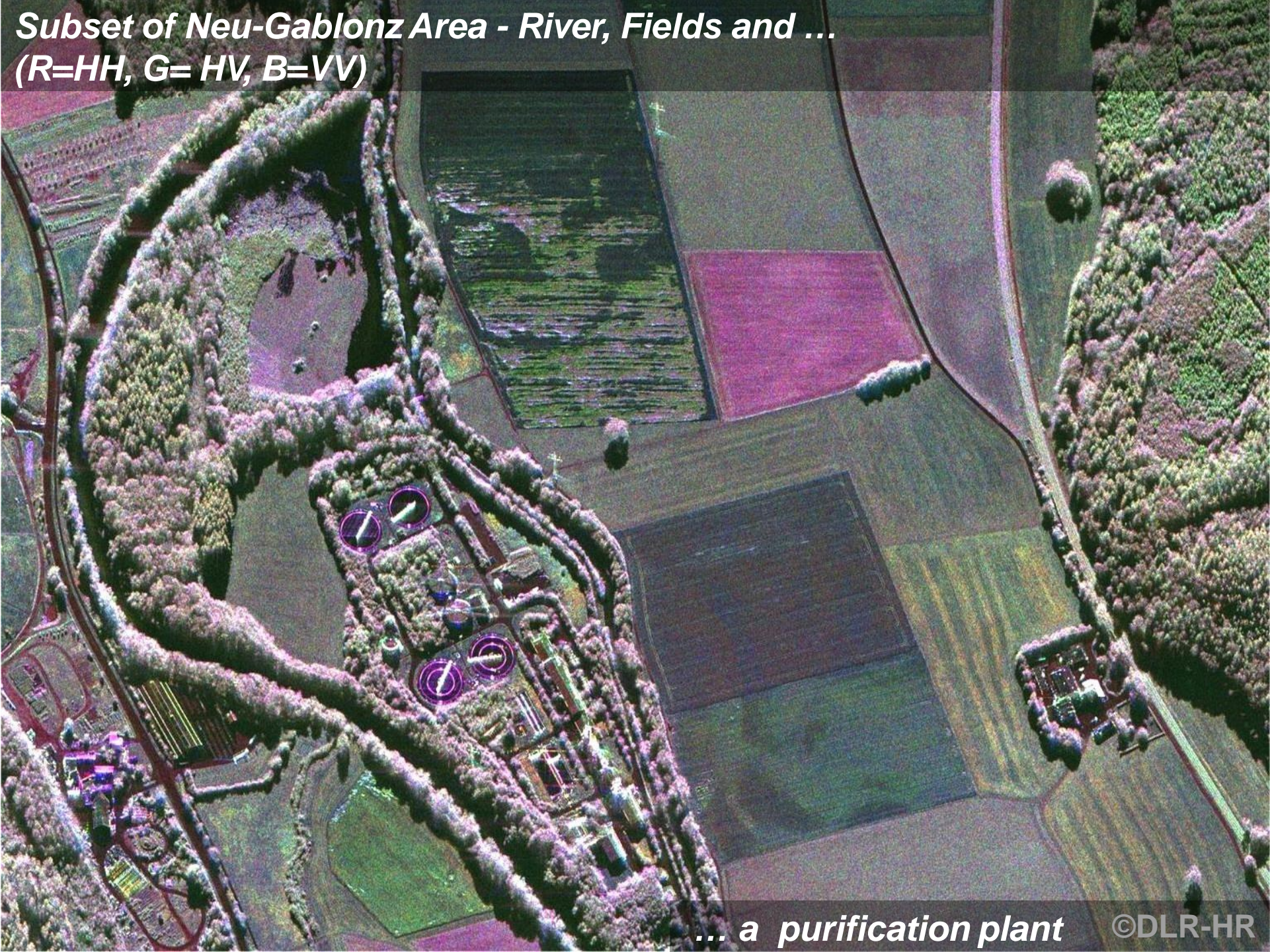


©DLR-HR

Neu-Gablonz, Bavaria, Germany



*Subset of Neu-Gablonz Area - River, Fields and ...  
(R=HH, G=HV, B=VV)*

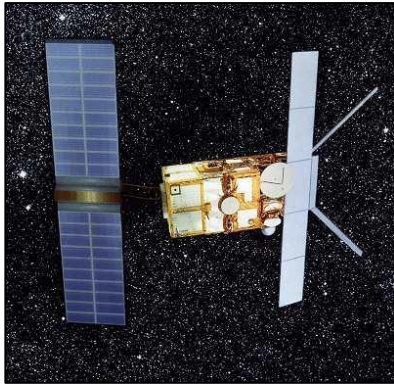


*... a purification plant*

©DLR-HR

# Active Radar Remote Sensing

*Examples of satellite based radar sensors*



ERS-1, 2



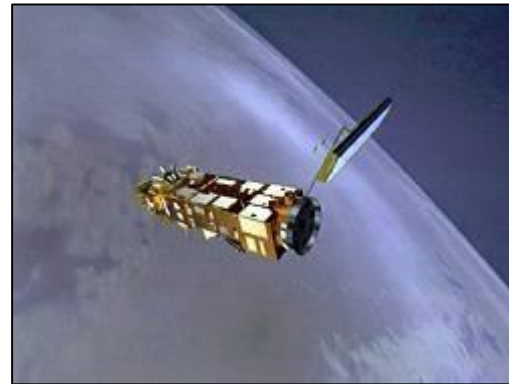
JERS-1



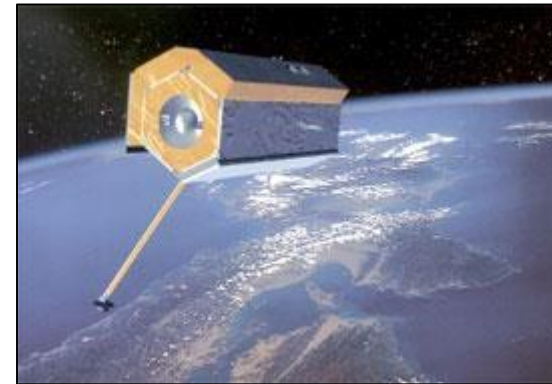
Radarsat 1, 2



ALOS (PALSAR)

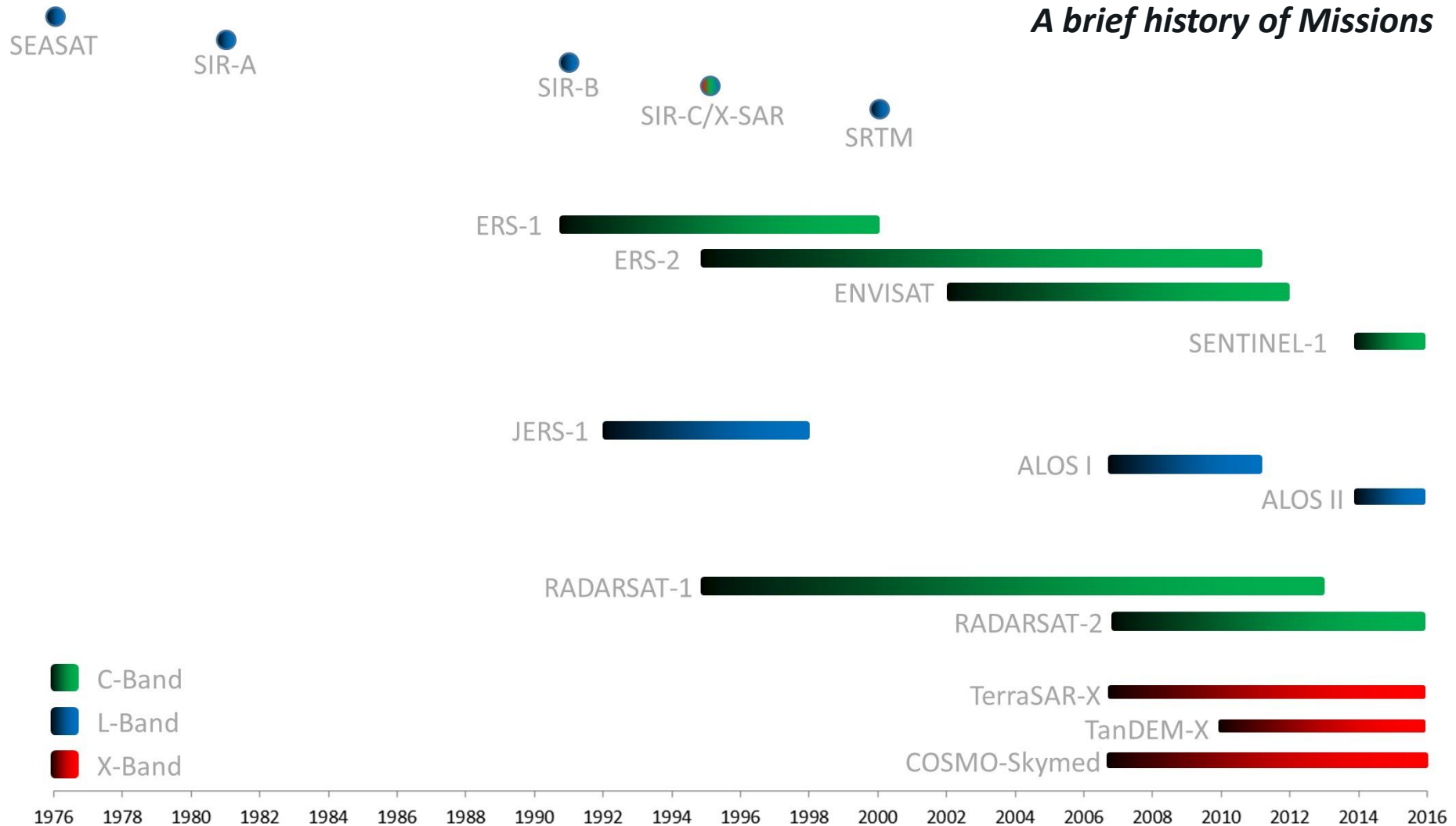


Envisat (ASAR)

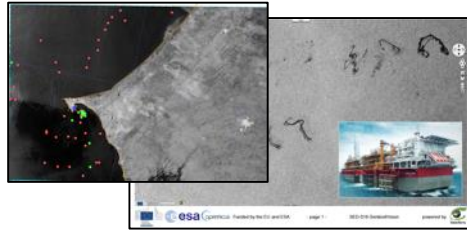


TerraSAR-X

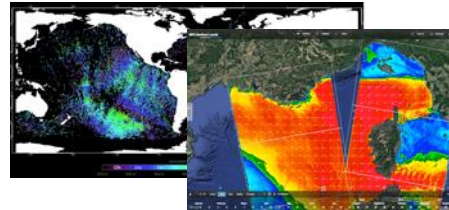
# Active Radar Remote Sensing



# Sentinel-1 applications → ever increasing

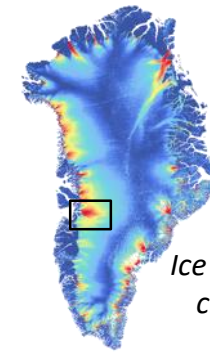
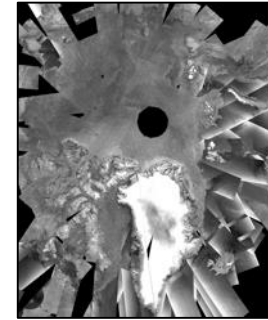


*Maritime surveillance: oil spill monitoring, ship detection, illegal fisheries, etc.*

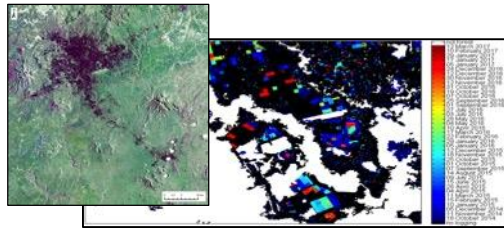


*Sea state: wind, wave*

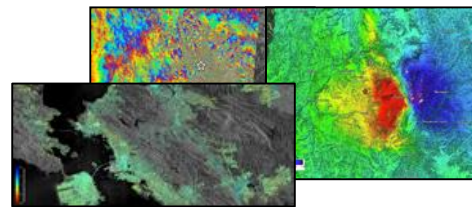
*Sea ice and iceberg monitoring*



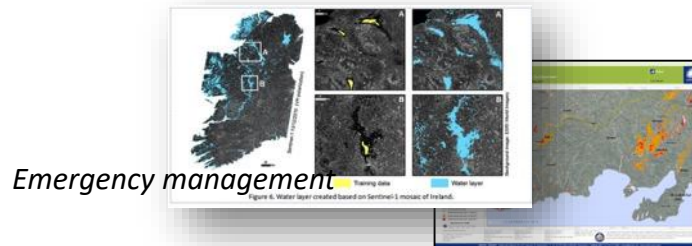
*Ice sheets, glaciers, climate change*



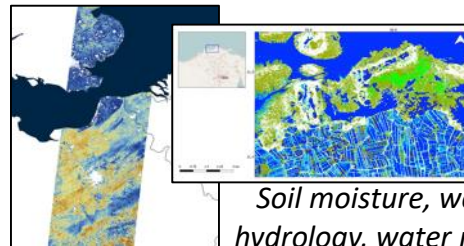
*Land use, agriculture, forestry, logging, land classification, urban planning*



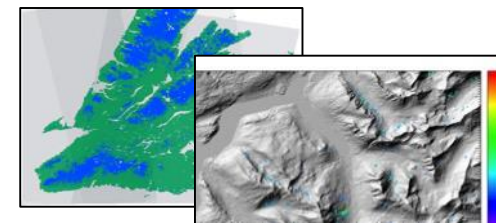
*Ground deformation: subsidence, landslides, earthquakes, volcanoes, infrastructure monitoring*



*Emergency management*



*Soil moisture, wetland, hydrology, water mapping*



*Snow, permafrost, avalanches,...*

# Example of UK map of crop classification

Example of  
Land Cover  
application

Crop Map of England (CROME)



  
Rural Payments  
Agency

Zalzan @Zalzan\_Salleh · 27 feb

Highly accurate Crop Map of #England (#CROME) from #sentinel1 and #sentinel2 data  
now available as #OpenData environment.data.gov.uk/convey.pro//AyoPEma by  
#CopernicusEU via @c0nvey

0 50 100 km

# ESA Data Policy

# → ESA Earth Observation Data Policy

- To stimulate a balanced development of Science, Public Utility and Commercial Applications, consistent with the mission’s objectives
- To maximize the beneficial use of data from ESA EO satellites



**ERS and Envisat**



**Earth Explorers**



**ESA Third Party Missions**

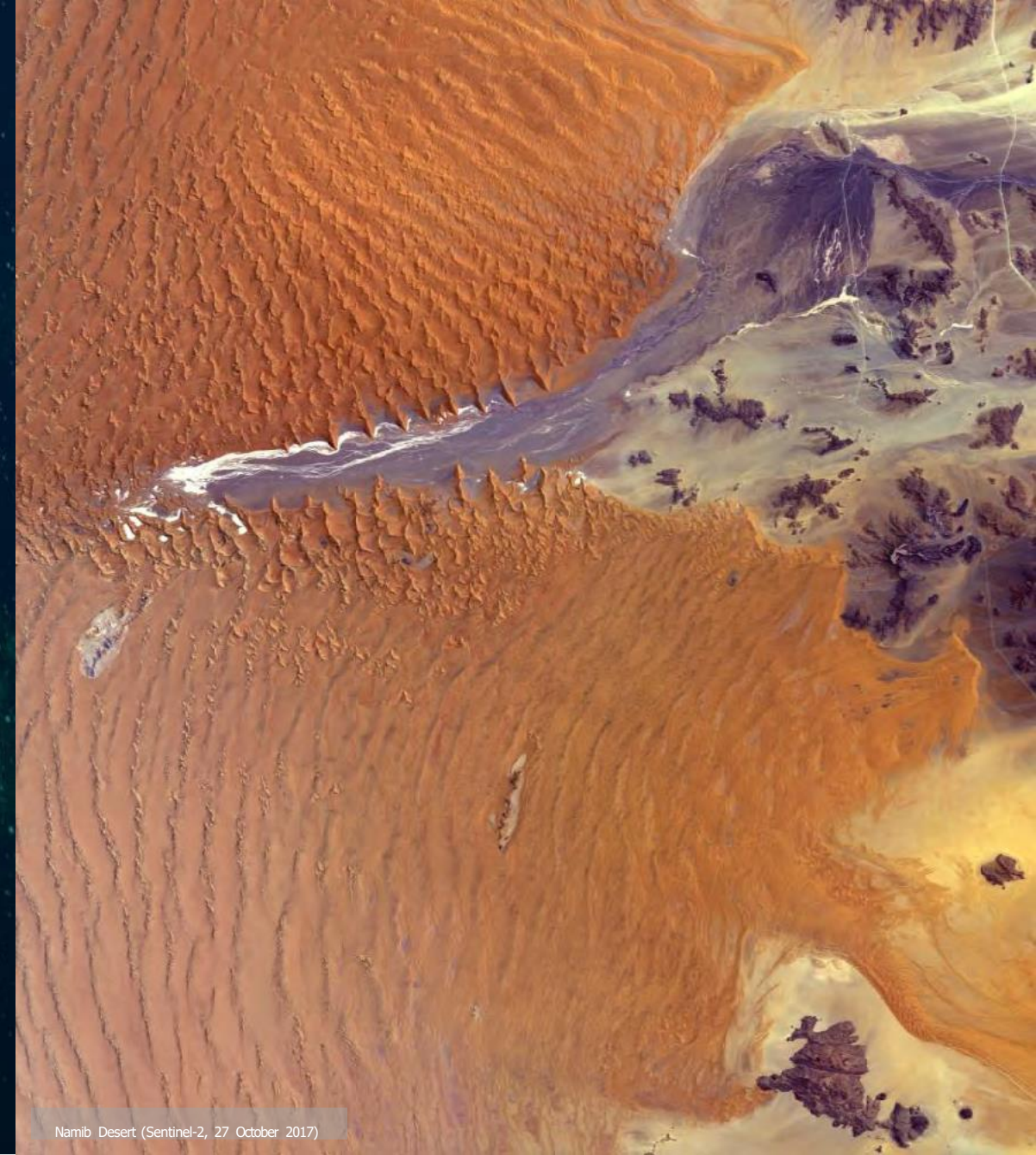
## ESA Data Policy

- Free datasets  
(Free of charge; User registration and acceptance of ESA Terms & Conditions are required → Open access)
- Restrained datasets  
(Free of charge; User registration, 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

→ Where to access EO data

## Free open source platforms

- **Copernicus Open Access Hub**
- Earth System Lab
- ESA Thematic Exploitation Platforms
- Alaska Satellite Facility
- Copernicus Global Land Service
- **Copernicus Data Space Ecosystem**
- **Sentinel Data Access Service**
- USGS Earth Explorer
- Sentinel Application Platform software
- Open Data Cube



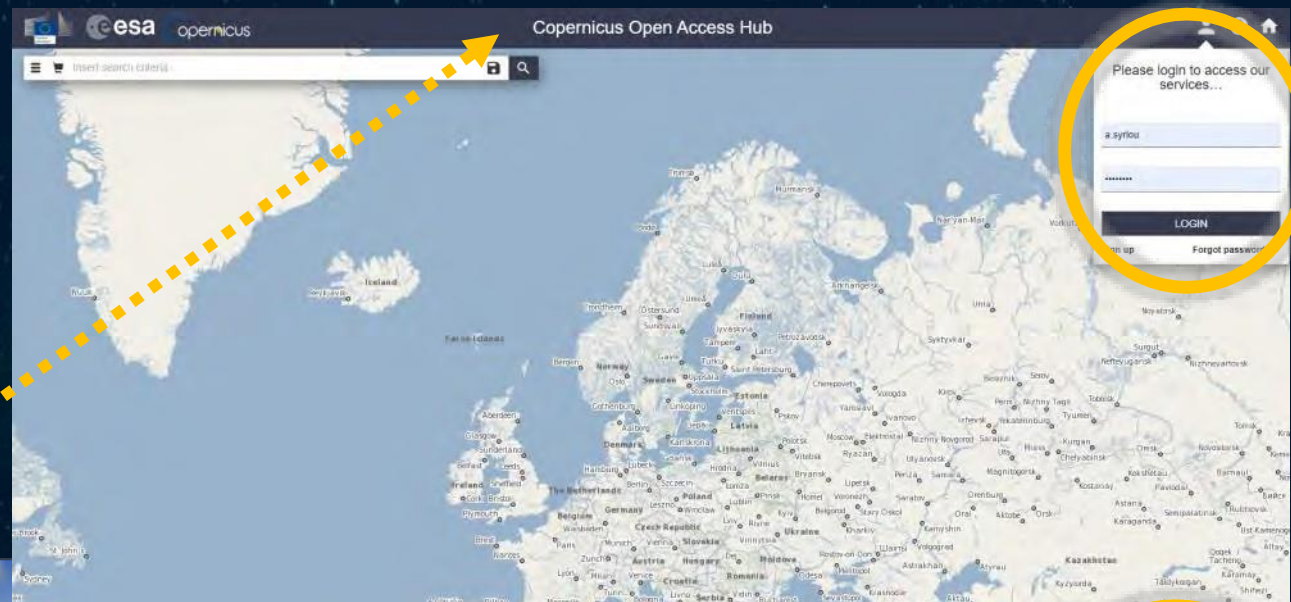
Namib Desert (Sentinel-2, 27 October 2017)





# → Copernicus Open Access Hub

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



The Copernicus Open Access Hub (previously known as Sentinels Scientific Data Hub) provides complete, free and open access to Sentinel-1, Sentinel-2, Sentinel-3 and Sentinel-5P user products



# → Copernicus Open Access Hub

The screenshot displays the Copernicus Open Access Hub interface. On the left, the 'Advanced Search' panel is visible, featuring several filter sections: 'Sort By' (Ingestion Date), 'Order By' (Descending), 'Sensing period' (2019/02/01 to 2019/09/27), 'Ingestion period', 'Mission' (with checkboxes for Sentinel-1, Sentinel-2, and Sentinel-3), 'Satellite Platform', 'Product Type', 'Polarisation', 'Sensor Mode', 'Relative Orbit Number', 'Collection', 'Cloud Cover %', 'Timeliness', 'Instrument', and 'Product Level'. Yellow arrows point to the search criteria input field, the sensing period date range, and the Sentinel-1, Sentinel-2, and Sentinel-3 mission checkboxes. The main area shows a map of the Balkans region with several red and yellow polygons overlaid, representing search areas. An inset window on the right shows a list of search results, including product IDs, download URLs, and mission details. A text box at the bottom of the inset reads: 'The Copernicus Open Access Hub access to all Sentinel missions'.

# → Alaska Satellite Facility (ASF)

<https://www.asf.alaska.edu/>  
<https://www.asf.alaska.edu/asf-tutorials/data-recipes/>

The screenshot shows the Alaska Satellite Facility (ASF) website. The header includes the EarthData logo and a search bar. The main navigation menu has links for Home, Get Started, Get Data, Datasets, Data Tools, Tutorials, and About ASF. A sidebar on the left lists various satellite datasets, with Sentinel-1 highlighted. The main content area features a large satellite image with the text 'Welcome To ASF' and a 'Data Tools' dropdown menu. The footer contains contact information for the Alaska Satellite Facility, social media links, and a copyright notice for 2019.

The ASF facility is part of the Geophysical Institute of the University of Alaska Fairbanks.

ASF downlinks, processes, archives, and distributes remote-sensing data to scientific users around the world

# → Copernicus Data Space Ecosystem

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



Data catalogue:

- Copernicus Sentinels Missions
- Copernicus Contributing Missions
- Federated data sets

ESA UNCLASSIFIED



European Space Agency

# → USGS Earth Explorer

<https://earthexplorer.usgs.gov/>



U.S. Geological Survey - search catalogue of satellite and aerial imagery

**USGS**  
science for a changing world

EarthExplorer - Home

Home 1 New System Message

Search Criteria Data Sets Additional Criteria Results

Search Criteria Summary (Show)

1. Enter Search Criteria

To narrow your search area, type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

Geocoder KML/Shapefile Upload

Select a Geocoding Method

Address/Place

Address/Place

Show Clear

Polygon Predefined Area

Degree/Minute/Second Decimal

No coordinates selected.

Use Map Add Coordinate Clear Coordinates

Date Range Result Options

Search from: mm/dd/yyyy to: mm/dd/yyyy

Search months: (All)

Data Sets Additional Criteria Results

2. Select Your Data Set(s)

Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the *Additional Criteria* or *Results* buttons below. Click the plus sign next to the category name to show a list of data sets.

Use Data Set Prefilter ([What's This?](#))

Data Set Search:

- Aerial Imagery
- AVHRR
- CEOS Legacy
- Commercial Satellites
- Declassified Data
- Digital Elevation
- Digital Line Graphs
- Digital Maps
- EO-1
- Global Fiducials
- HCMM
- ISERV
- Land Cover
- Landsat
- NASA LPDAAC Collections
- Radar
- Sentinel
- UAS
- Vegetation Monitoring
- ISRO Resourcesat

Clear All Selected Additional Criteria Results

DOI Privacy Policy | Legal | Accessibility | Site Map | Contact USGS

U.S. Department of the Interior | DOI Inspector General | White House | E-gov | No Fear Act | FOIA

EarthExplorer - Home

Home 1 New System Message

Search Criteria Data Sets Additional Criteria Results

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Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the *Additional Criteria* or *Results* buttons below. Click the plus sign next to the category name to show a list of data sets.

Use Data Set Prefilter ([What's This?](#))

Data Set Search:

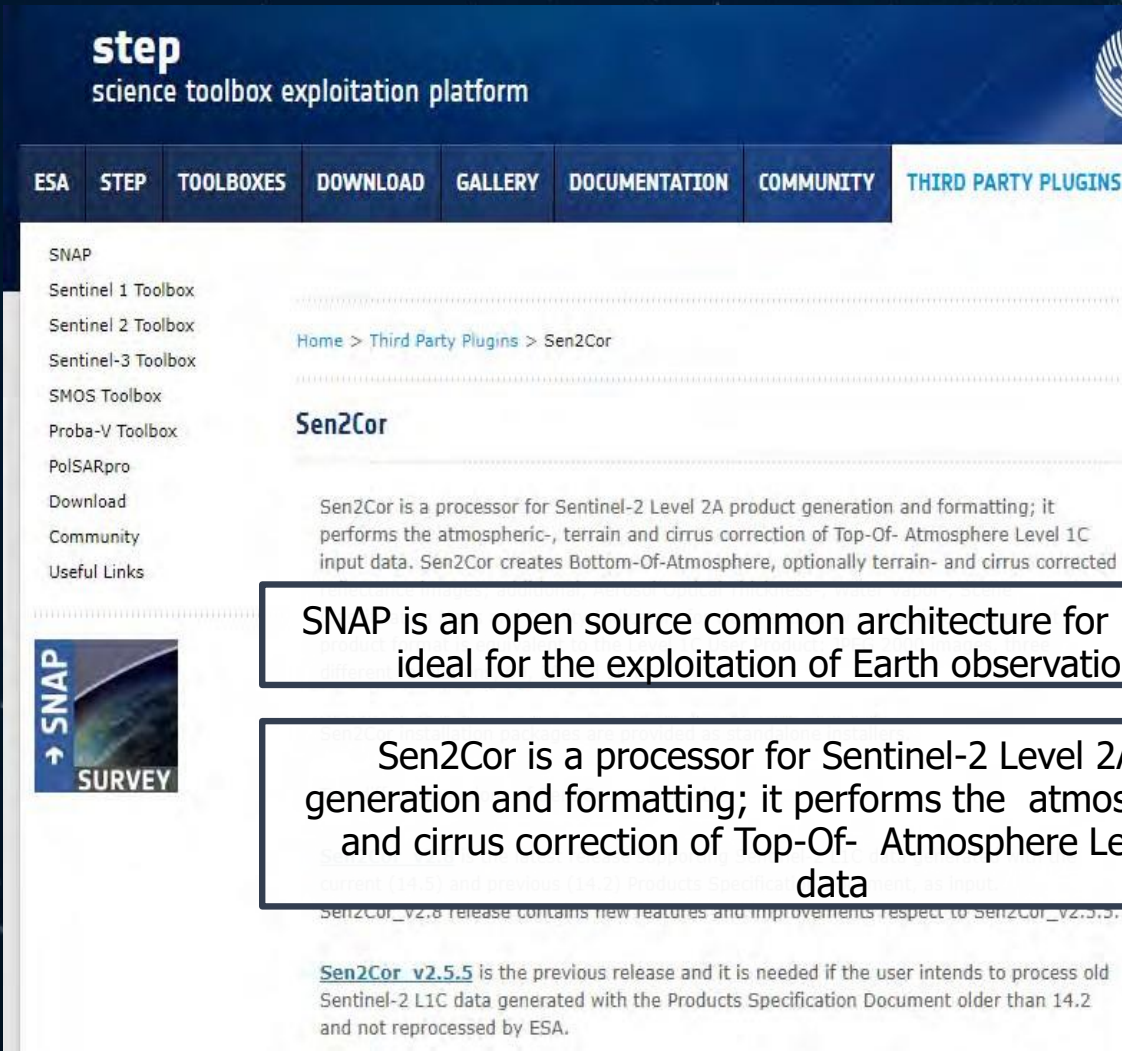
- Aerial Imagery
- AVHRR
- CEOS Legacy
- Commercial Satellites
- Declassified Data
- Digital Elevation
- Digital Line Graphs
- Digital Maps
- EO-1
- Global Fiducials
- HCMM
- ISERV
- Land Cover
- Landsat
- NASA LPDAAC Collections
- Radar
- Sentinel
- UAS
- Vegetation Monitoring
- ISRO Resourcesat

Clear All Selected Additional Criteria Results



# → SNAP (Sentinel Application Platform) software

<http://step.esa.int/main/download/snap-download/>



The screenshot shows the 'Sen2Cor' download page on the STEP website. The page title is 'Sen2Cor'. The breadcrumb trail is 'Home > Third Party Plugins > Sen2Cor'. The main heading is 'Sen2Cor'. The text describes Sen2Cor as a processor for Sentinel-2 Level 2A product generation and formatting, performing atmospheric, terrain, and cirrus correction of Top-Of-Atmosphere Level 1C input data. It also mentions that the Sen2Cor v2.5.5 release contains new features and improvements, and that the previous release (v2.5.5) is needed for processing old Sentinel-2 L1C data.

SNAP is an open source common architecture for ESA toolboxes ideal for the exploitation of Earth observation data

Sen2Cor is a processor for Sentinel-2 Level 2A product generation and formatting; it performs the atmospheric, terrain and cirrus correction of Top-Of-Atmosphere Level 1C input data



The screenshot shows the 'SNAP Download' page on the STEP website. The page title is 'SNAP Download'. The breadcrumb trail is 'Home > Download > SNAP Download'. The main heading is 'SNAP Download'. The text describes the current version (7.0.0) and provides information about the installers. It offers three different installers for Windows 64-bit, Windows 32-bit, Mac OS X, and Unix 64-bit. The page also includes a table of download links for various toolboxes and a section for feedback.

	Windows 64-bit	Windows 32-bit	Mac OS X	Unix 64-bit
Sentinel Toolboxes	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>
SMOS Toolbox	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>
All Toolboxes	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>	<a href="#">Download</a>

## → Where to access EO data

### Partially open-source EO platforms

- **EO Browser Sentinel Hub**
- DIAS - Copernicus Data & Information Access Services
- Google Earth Engine
- Earth on AWS



Athens, Greece (Digital Globe WW-3, 4 January 2013)

# → EO Browser - SENTINEL Hub

<https://apps.sentinel-hub.com/eo-browser/>

EO Browser

Search Results Visualization Pins

Data sources:

- Sentinel-1
- Sentinel-2
- L1C
- L2A
- Max. cloud coverage: 100 %
- Sentinel-3
- Sentinel-5P
- Landsat
- Envisat Meris
- MODIS
- Proba-V
- GBS

Time range:

2019-08-27 2019-09-27

Theme: [icon]

Search

Free sign up for all features

Powered by Sentinel with contributions from the European Space Agency v2.19.14

EO Browser

Go to Place

Search Results Visualization Pins

Database: SENTINEL-2 L2A SHOW L1C

Date: 2019-09-25

- Custom: Create custom rendering
- True color: Based on bands 4,1,2
- Scene classification map: Classification of Sentinel2 data as result of ESA's Scene classification algorithm
- False color: Based on bands 8,4,3
- False color (urban): Based on bands 12,11,4
- NDVI: Based on combination of bands (B3 - B4)/(B3 + B4)
- Moisture index: Based on combination of bands (B8A - B11)/(B8A + B11)
- SWIR: Based on bands 12,8A,4
- NDWI: Based on combination of bands (B3 - B6)/(B3 + B6)
- NDSI: Based on combination of bands (B3 - B11)/(B3 + B11)

Free sign up for all features

Powered by Sentinel with contributions from the European Space Agency v2.19.14

EO Browser

Go to Place

Search Results Visualization Pins

Database: SENTINEL-2 L2A SHOW L1C

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- SWIR: Based on bands 12,8A,4
- NDWI: Based on combination of bands (B3 - B6)/(B3 + B6)
- NDSI: Based on combination of bands (B3 - B11)/(B3 + B11)

Free sign up for all features

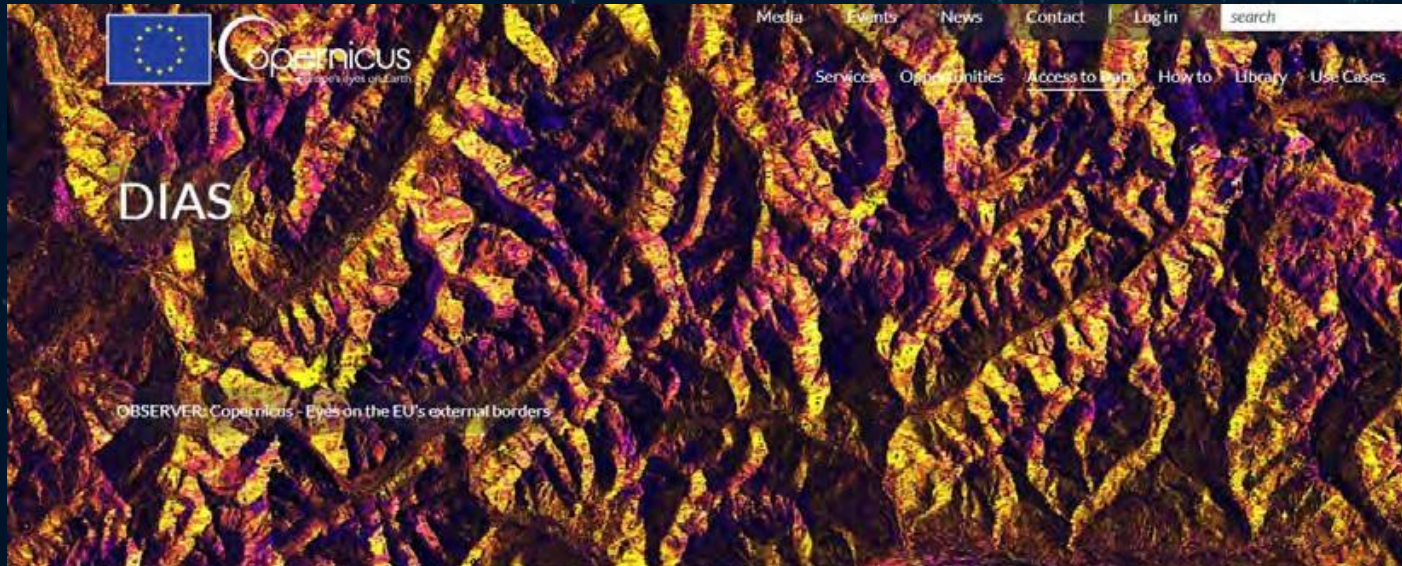
Powered by Sentinel with contributions from the European Space Agency v2.19.14





# → DIAS - Copernicus Data & Information Access Services

<https://www.copernicus.eu/en/access-data/dias>



Home > Access to Data > DIAS

DIAS

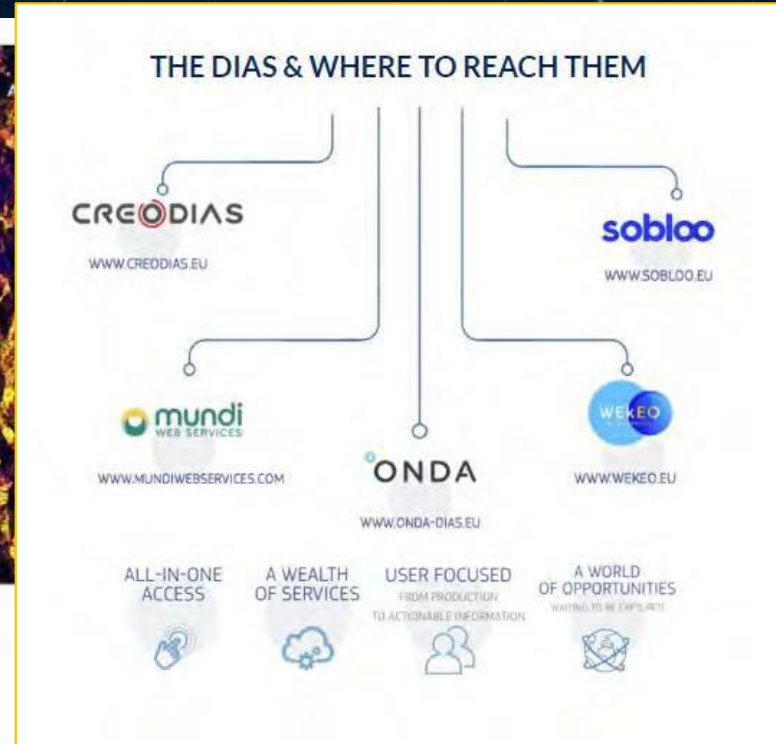
Conventional Data Access Hubs

## DIAS

To facilitate and standardise access to data, the European Commission provides centralised access to Copernicus data and information, as well as Information Access Services.

The five DIAS online platforms allow users to discover, manipulate, process and download Copernicus Sentinel data, as well as to the Information Access Services cloud-based tools (open source and/or on a pay-per-use basis).

Each of the five competitive platforms also provides access to additional services in terms of support or priority. Thanks to a single access point for the data, users can discover and host their own applications in the cloud, while removing the need to download bulky files from several access points and process them locally.



DIAS online platforms allow users to discover, manipulate, process and download Copernicus Sentinel data and information products from Copernicus' six operational services, together with cloud-based tools (open source and/or on a pay-per-use basis)

[https://www.copernicus.eu/sites/default/files/Copernicus\\_DIAS\\_Factsheet\\_eet\\_June2018.pdf](https://www.copernicus.eu/sites/default/files/Copernicus_DIAS_Factsheet_eet_June2018.pdf)

# → Google Earth Engine

<https://earthengine.google.com/platform/>

The screenshot shows the Google Earth Engine web interface. At the top, there's a search bar and navigation tabs for 'Scripts', 'Docs', and 'Assets'. The 'Scripts' tab is active, showing a list of scripts on the left and a script editor in the center. The script editor contains JavaScript code for processing satellite imagery, including comments and function definitions. Below the script editor is a map of a region in Chile, with a zoomed-in view of a forested area. On the right side, there's a 'Console' tab showing the output of the script, including a transition matrix and confusion matrix.

The landing page features a large satellite image of a forested area. The main heading reads "A planetary-scale platform for Earth science data & analysis". Below this, it says "Powered by Google's cloud infrastructure" and includes a "Watch Video" button. A section titled "Meet Earth Engine" explains that the platform combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities. At the bottom, a diagram shows a satellite icon, a plus sign, a flowchart icon, another plus sign, and a globe icon, representing the combination of "Satellite Imagery", "Your Algorithms", and "Real World Applications".

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European Space Agency

→ Where to access EO data

## Commercial EO platforms

- DigitalGlobe / Maxar
- OneAtlas
- Planet platform
- e-Geos
- Decartes Labs



→ OneAtlas

<https://www.intelligence-airbusds.com/oneatlas/>

**AIRBUS** DEFENCE AND SPACE

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Home > Products / Services > OneAtlas

40.437°N  
23.642°W

# OneAtlas

Connecting Imagery from Space to Decisions on Earth

40.427°N  
23.642°W

Documents Contact us

OneAtlas is a unique collaborative environment to easily access premium imagery, perform large-scale image processing, extract industry specific insights and benefit from Airbus assets to develop your solutions.

The OneAtlas Services include:

- Living Library
- WorldDEM Streaming
- Verde
- Mobile
- Change Detection
- Starling
- Basemap
- Earth Monitor
- Ocean Finder
- Refinery Scanner

Access to optical and radar satellite imagery, and associated services and solutions



# → Planet Platform

<https://www.planet.com/products/platform/>

**planet**

**PLATFORM**  
Automated, scalable, API-first

[GET AN API ACCOUNT](#)

**INTEGRATED AND BUILT FOR SCALE**

Planet's fully-automated, cloud-based imagery platform downloads, processes, and manages terabytes of data every day. Built for speed and affordability, our platform enables customers to ingest data, and run analytics at scale.

**Fully-automated imagery processing**

Planet's imagery pipeline corrects for a variety of factors and delivers analysis-ready data, without costly post-processing or manual intervention.

- ✓ Orthorectification removes collection geometry, pointing error, and terrain variability distortions
- ✓ Radiometric corrections correct for sensor artifacts and transformation to at-sensor radiance
- ✓ Top- and bottom-of-atmosphere corrections reduce spectral inconsistency across time and location

Planet's cloud-based imagery platform gives access to PlanetScope, RapidEye and SkySAT data



→ e-geos

<https://www.e-geos.it/>

e-geos offer a wide selection of platforms for services, analytics and reports, together with an online EO data catalogue

The screenshot displays the e-geos website interface. At the top, there is a navigation bar with links for Home, Offering, Technology, Markets, News, Info, and Private Area. Below the navigation bar, there are several sections:

- PLATFORMS:** Access to industry-related platforms for services, analytics and reports. Listed platforms include SEonSe - Maritime surveillance, AWARE - Asset management, AgriGeo - Agriculture Management, Braint - Defense and Intelligence, and Cleos - Cloud computing.
- DATA CATALOGUE:** Single request of one or more satellite data imagery. Options include Buy satellite data, Online Catalogue, and Price list. A "READ MORE" button is present.
- MISSIONI ALI:** A section with a "READ MORE" button.

The main content area features a "New Query" form with the following fields:

- Areas of Interest:** No Aoi, use the "+" button to add a new Aoi.
- Period of interest:** Start: Oct 07, 2019 at 13:11:10 UTC; Stop: Oct 14, 2019 at 13:11:10 UTC. Note: Time frame includes catalog imagery only.
- Sensors of Interest:** A list of sensors with checkboxes: GeoEye-1, IKONOS-2, QUICKBIRD-2, Worldview-1, Worldview-2, Worldview-3, and COSMO-SkyMed. The number of satellites selected is 1.
- Filters:** No filter specified, click on the "+" button to add a filter.

Below the form is a "MISSIONS" grid showing various satellite imagery options, each with a "Go to satellite" button:

- COSMO-SKYMED
- BLACK SKY
- DIGITALGLOBE
- DEIMOS IMAGING
- KOMPSAT
- ALOS
- IRS
- RADARSAT





# → Descartes Labs

<https://www.descarteslabs.com/>



Platform ▾

Solutions

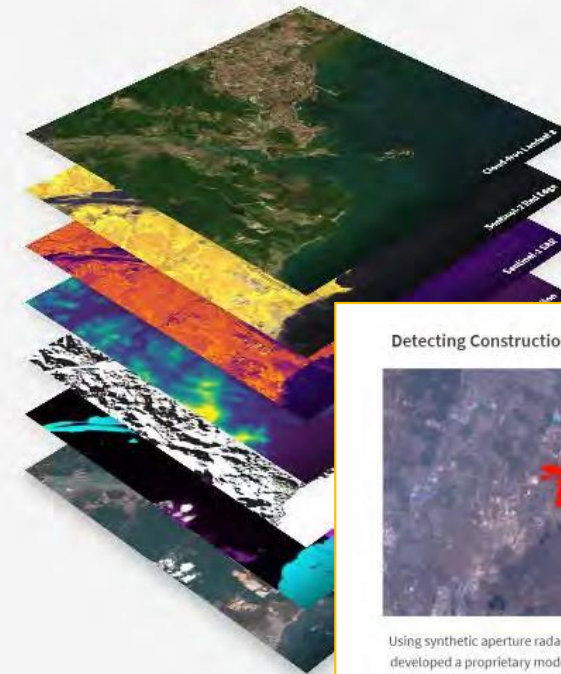
Demos ▾

Company ▾

Contact Sales

## A data refinery, built to understand our planet

Instant access to science-ready imagery and intelligence from multiple data sources.



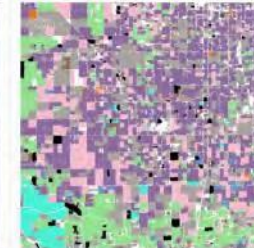
Descartes Labs Platform collects data daily from public and commercial sources, cleans it, calibrates it, and stores it in an easy-to-access catalogue, ready for scientific analysis

### Detecting Construction Starts



Using synthetic aperture radar (SAR), we developed a proprietary model that can identify new construction starts on the ground on a monthly basis, regardless of weather conditions. This model enables a real-time look at changes and trends impacting infrastructure growth.

### Crop Classification in California



Leveraging our database of industry leading high-resolution imagery, we built a model that first identifies field boundaries and then classifies which crops are growing within each field. With this optimized approach, field teams spend less time surveying ground data and more time focusing on business growth opportunities.

### Wind Turbine Detection



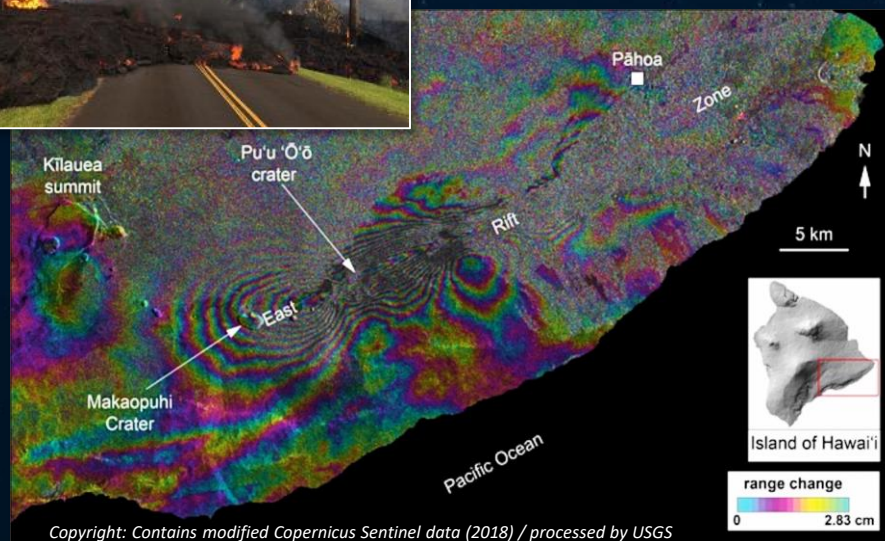
Using high-resolution Airbus imagery, we built a computer vision model that can quickly identify all physical wind turbine assets worldwide in just a few hours. This solution automates analysis that would take a fleet of human analysts several months to complete.



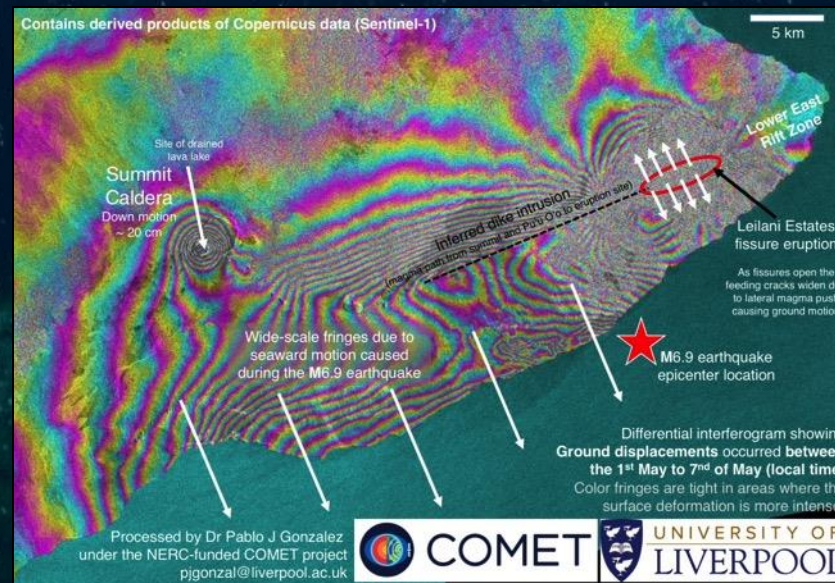
# Sentinel-1: a major tool for geophysicists



**Eruption and earthquake near Kilauea volcano, Hawaii (3 May 2018)**



**Sentinel-1 interferogram (19 April – 1 May 2018)**



**Sentinel-1 interferogram (1 May – 7 May 2018)**

Deformation due to magmatic intrusion → magma withdrawn from middle East Rift Zone and intruded beneath lower East Rift Zone.



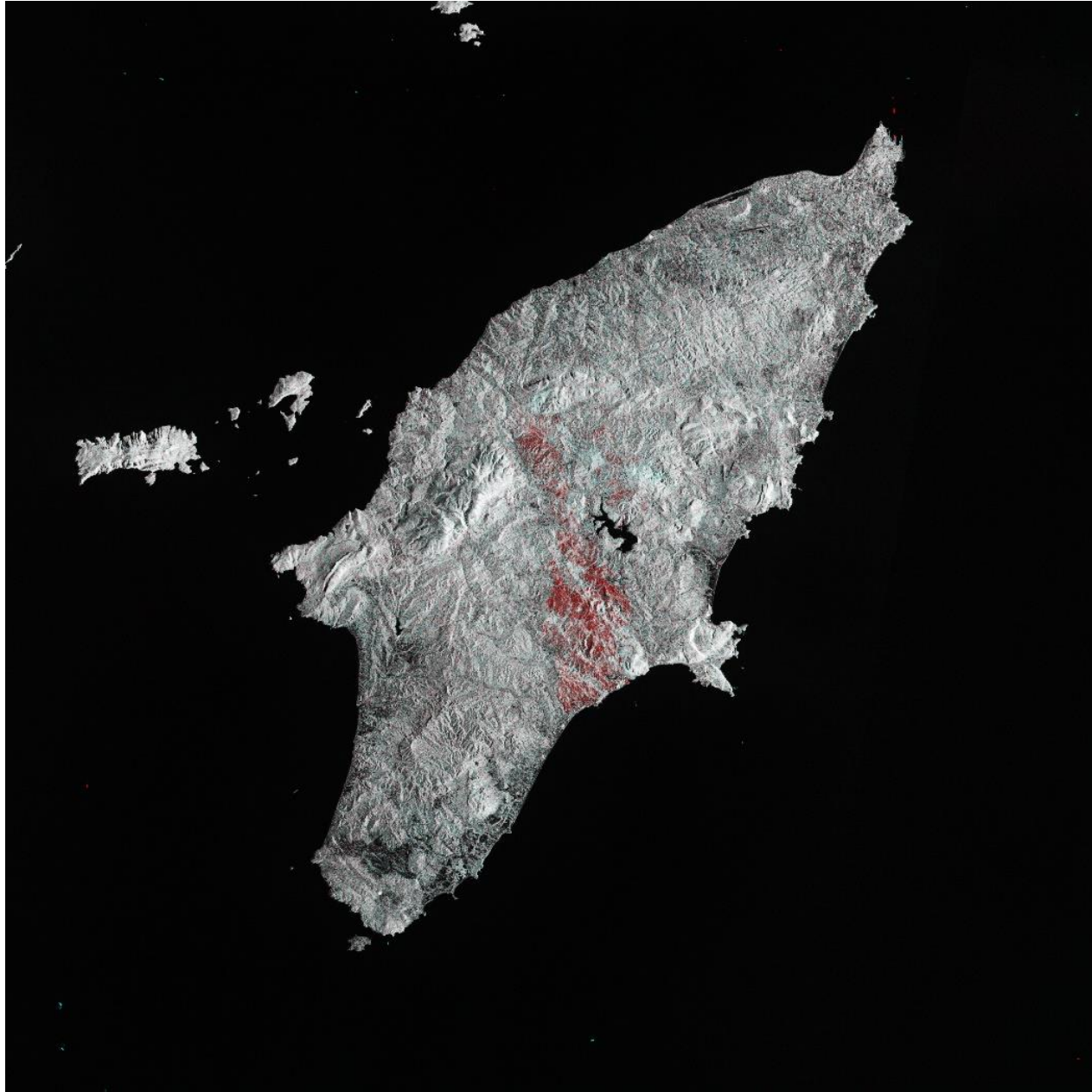


EO Browser

**PRACTICAL 1**

**SENTINEL-1 FOR MAPPING WILDFIRES**

RHODES, GREECE (12 - 24 July)



Between 18 and 28 July 2023, wildfires [broke out on Rhodes](#). Fierce blazes ravaged almost 18,000 hectares of land, destroyed buildings, trapped animals and led to a mass evacuation of thousands of tourists.



**EO Browser**

**PRACTICAL 2**

**SENTINEL-1 FOR MAPPING WATER SURFACE ROUGHNESS**

ROME, ITALY (14 September 2023)

The screenshot shows the EO Browser interface with a map of the Rome region. The map displays a grayscale visualization of water surface roughness. The interface includes a search bar with 'ROME' entered, a dataset selection menu showing 'Sentinel-1 AWS-IW-VVH', and a date selector set to '2023-09-14'. A custom script editor is open, showing the following code:

```
1 // script Water surface roughness
2 val = Math.log(0.05/(0.018+VV*1.5));
3 return [val];
```

The map labels include Rome, Frosinone, Campobasso, Latina, Benevento, Caserta, Avellino, Naples, Salerno, and Giugliano in Campania. The interface also features a 'Refresh Evalsript' button and a 'Free sign up' link for all features.

```
// script Water surface roughness
val = Math.log(0.05/(0.018+VV*1.5));
return [val];
```



**EO Browser**

**PRACTICAL 3**

**SENTINEL-1 FOR MAPPING OIL SPILL**

Pointe d'Esny (29.7.2020 - 10.8.2020)

```

//Oil slicks and Red tide monitoring
//By TIZNEGAR Startup Co, www.tiznegar.com
//Dataset:Sentinel-1 AWS-IW-VVH

var ORM = Math.log(0.01/(0.01+VV*2));

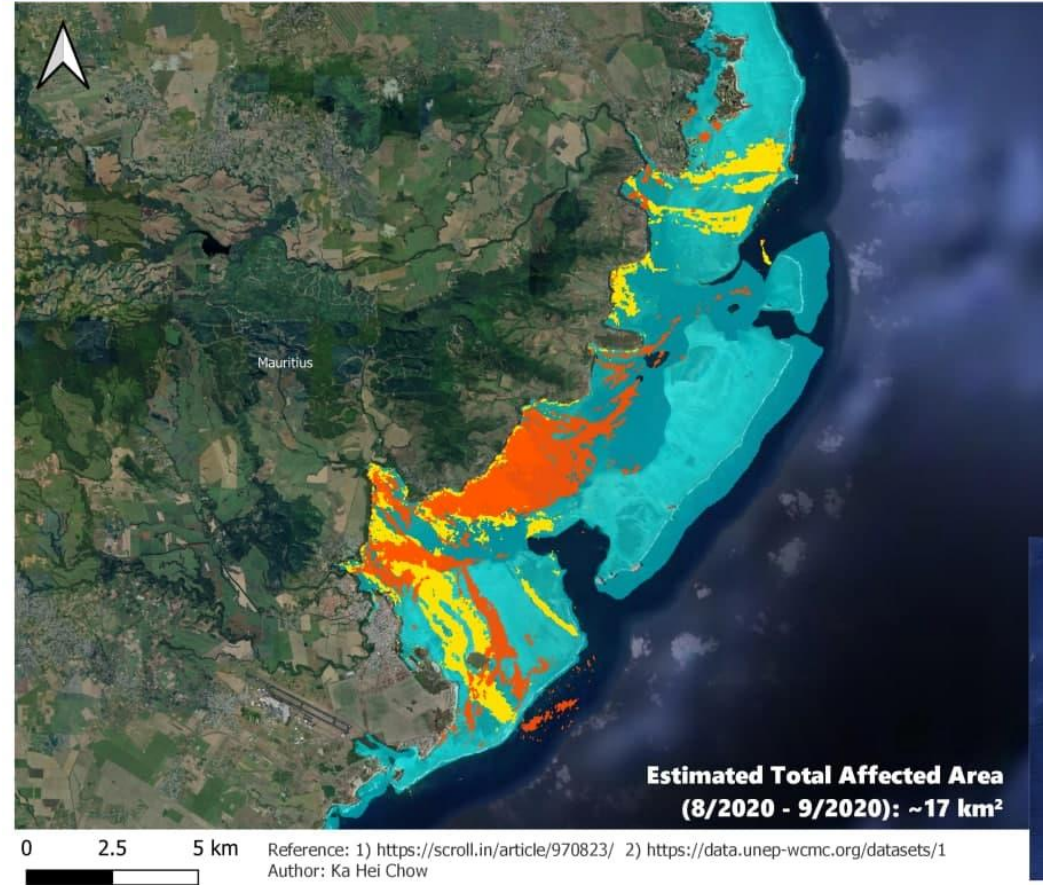
if (ORM < [ 0 ] && VV< [ 0.01]&& VH< [ 0.1]) {

return colorBlend
(ORM,
  [-1.6, -1.2, -.8, -.4, -.2, 0],
  [
    [0,0,.1 ],
    [0,0,.8],
    [1,0,0],
    [1,.5,.2],
    [1,.8,.2],
    [1,1,.4],
    [.5,.8,.3],

  ]);
}
else {
return [2.5*VV,2.5*VV,2.5*VV]
}

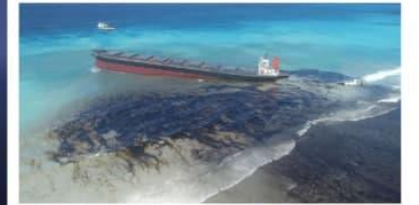
```

## The Disastrous Impact of MV Wakashio Oil Spill on Coral Reef Reserve



- September 2020  
 August 2020
- Affected Area
  - Affected Area
  - Coral Reef Area (2018)

*MV Wakashio oil spill occurred offshore of Pointe d'Esny on 25 July 2020.*



Thank you for the attention