

ESA Agency Report

WGISS#55 Meeting
18-20 April 2023, Cordoba (Argentina)
Mirko Albani, ESA/ESRIN

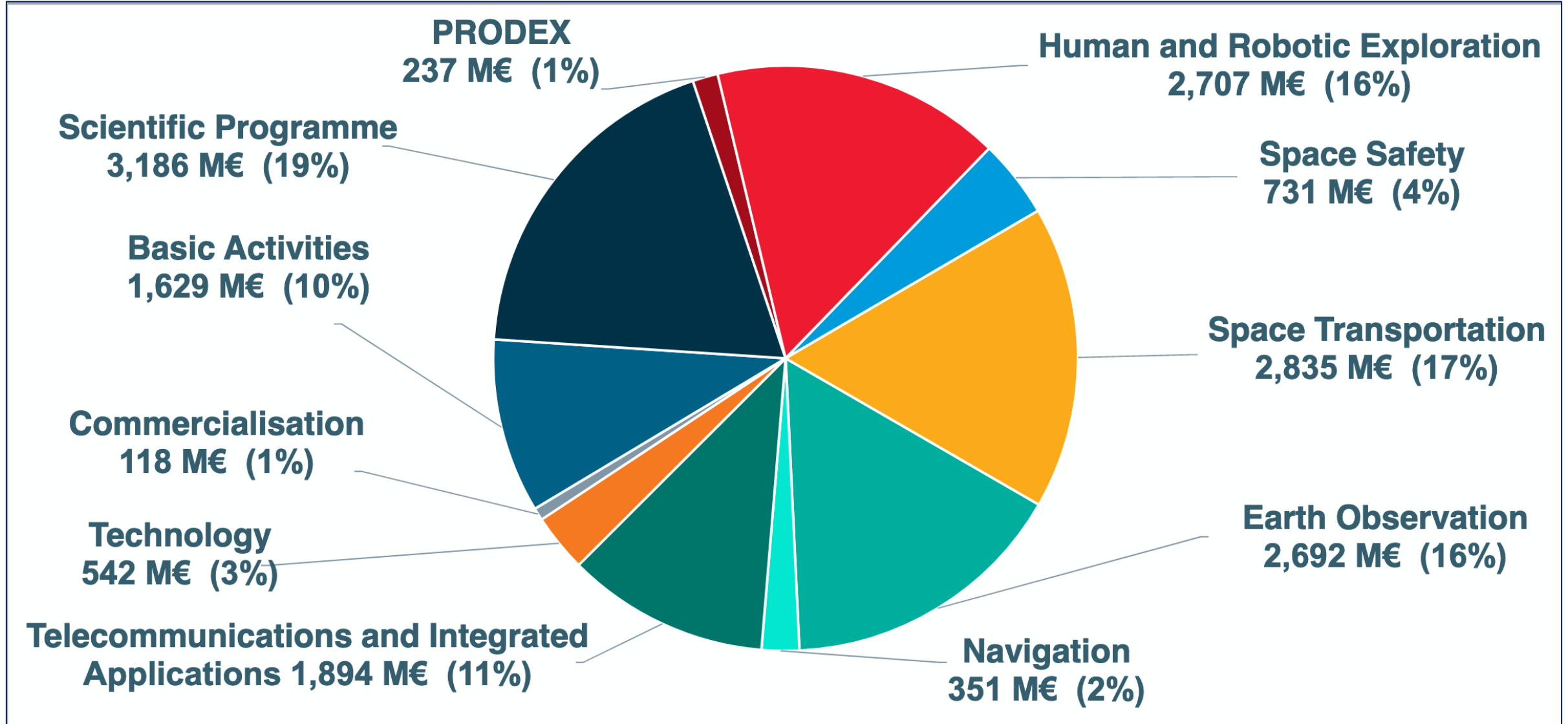
ESA 2022 Council at Ministerial Level

The ESA Council Ministerial Meeting 2022 (CM22) took place on 22-23 November in Paris (France).
Decision to increase ESA's budget by 17% compared to the last Ministerial meeting in 2019.

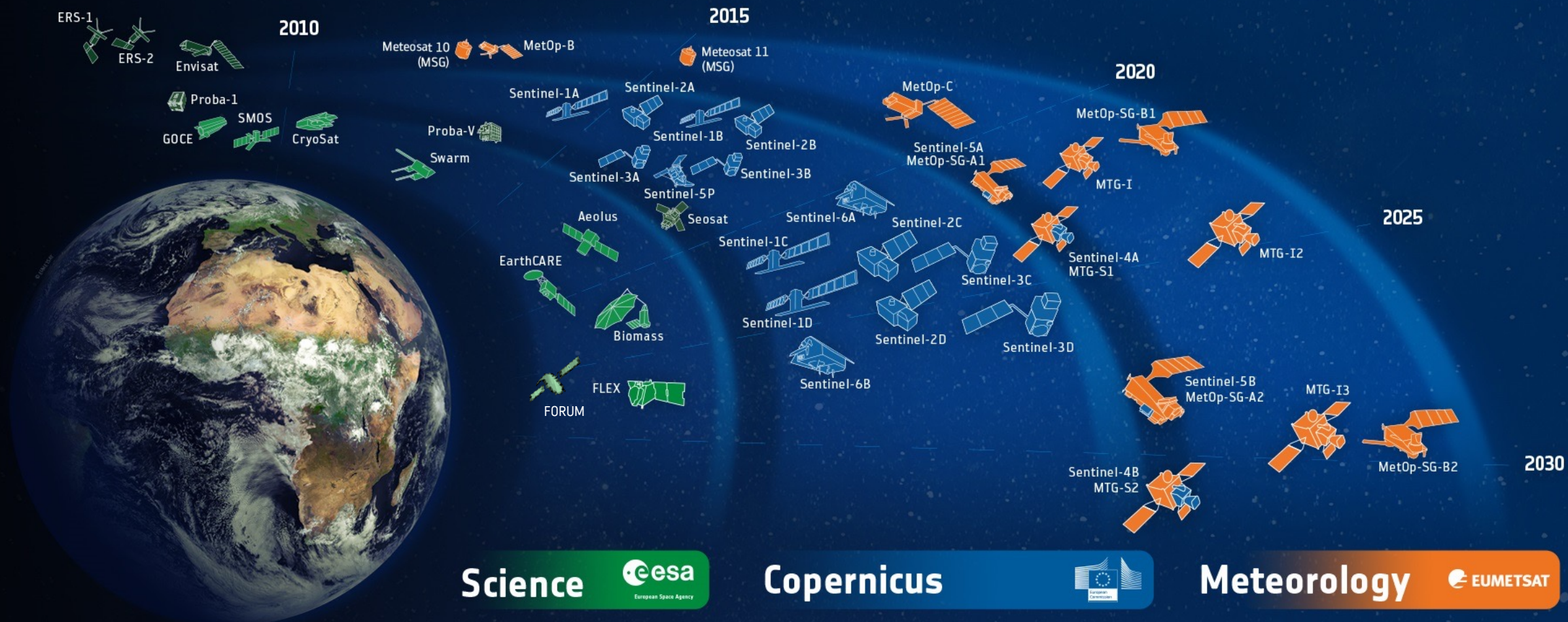


Total Subscriptions 16.9 B€

Mandatory Activities and CSG for 5 years



ESA-Developed Earth Observation Missions





Copernicus is the largest producer of EO data in the world

All global
landmass is
observed
every 5 days
at 10m
resolution

**25 TB of Daily Data
Production by
Sentinels**

**300 TB of Daily Sentinel
Products Disseminated for
Services to Society**

Copernicus
2+ PB/week

> 650.000
Registered
Users



Sentinel missions are operated in full operations capacity

- Sentinel-1A → nominal operations
- Sentinel-2A and Sentinel-2B → nominal operations
- Sentinel-3A and Sentinel-3B → nominal operations
- Sentinel-5P → nominal operations
- Copernicus Contributing Missions
→ with established and emerging data suppliers



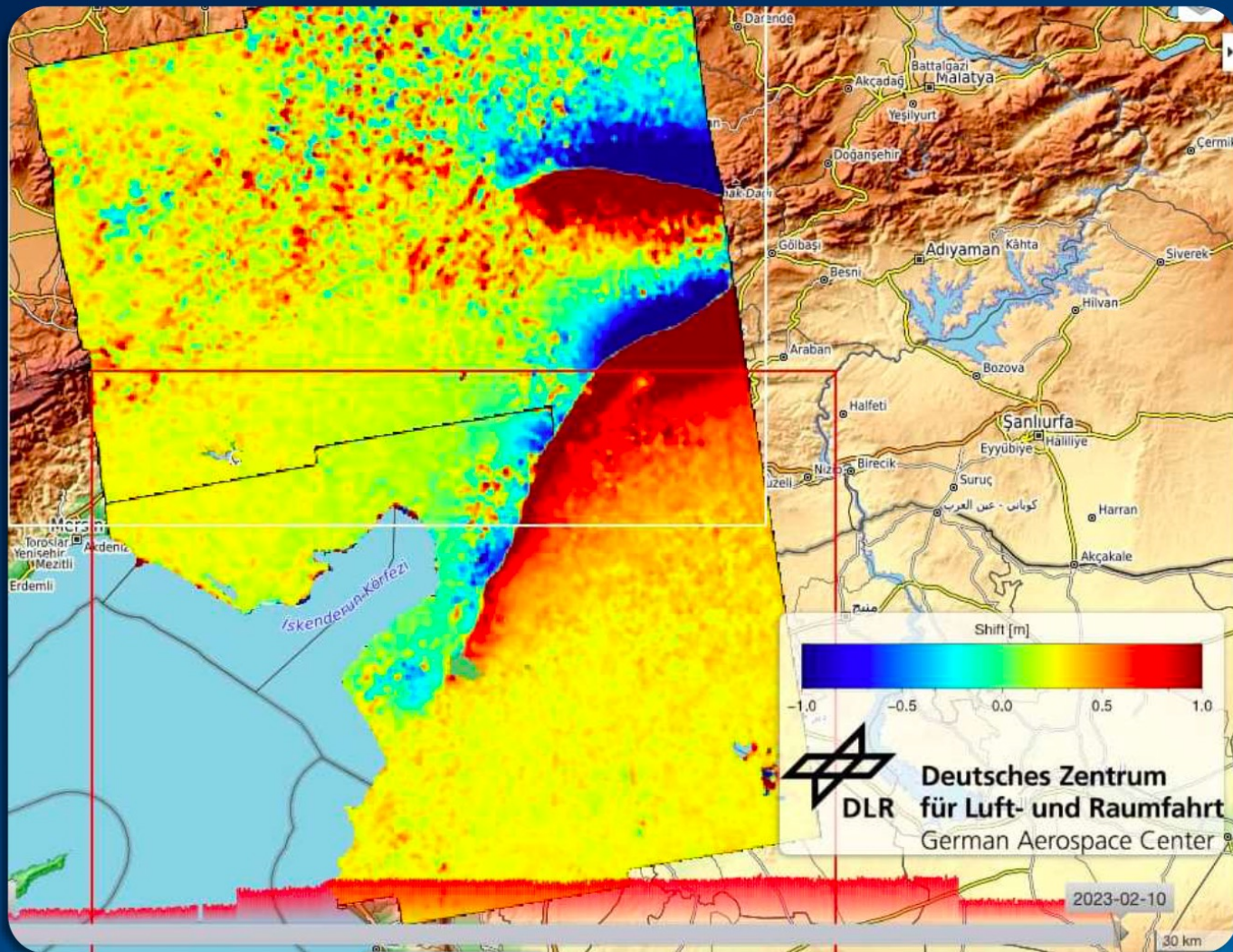
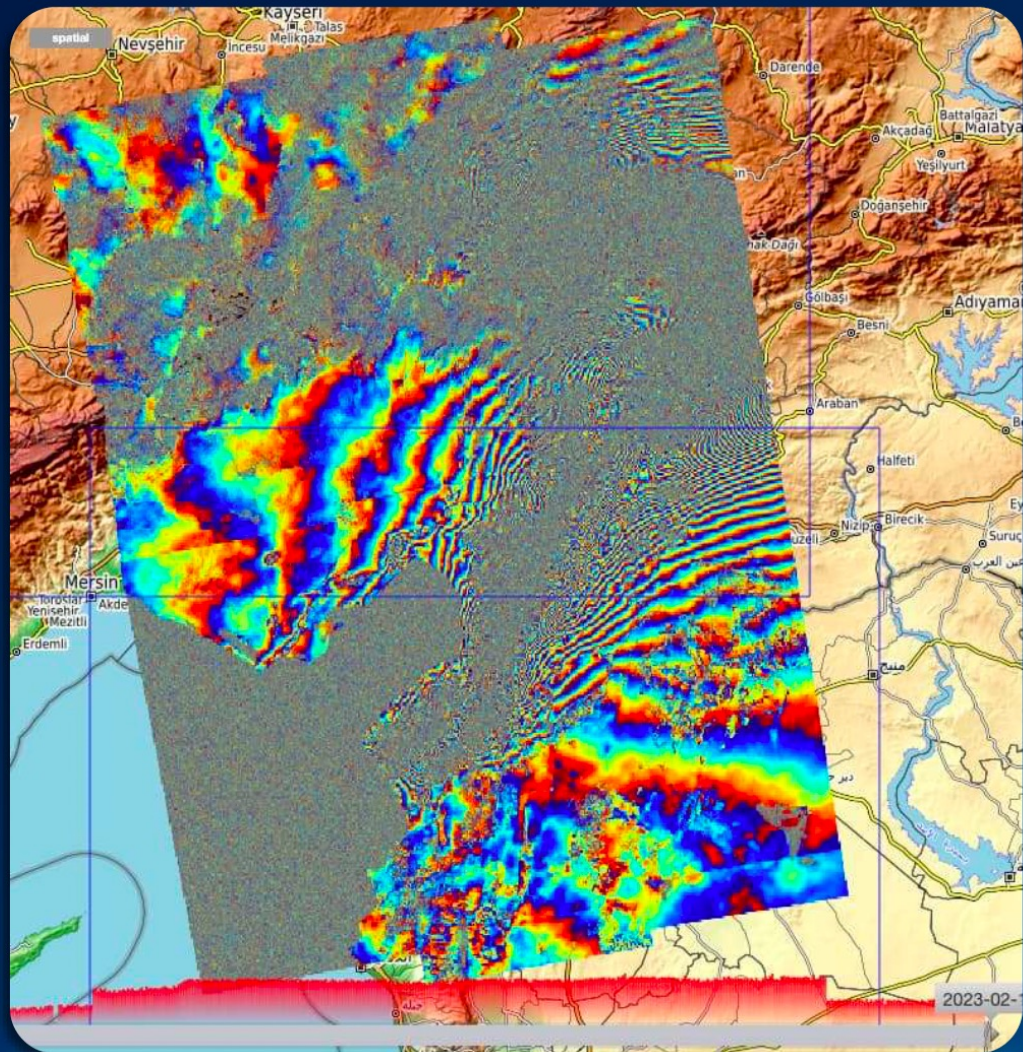
Turkey Earthquake, Multiple Products from Same S-1 Data



Radar Interferometry by the DIAPASON
InSAR processing service (CNES developed)

Deformation map by Radar Signal Shift Products Service
(DLR developed)

S-1 data from 9 February and 28 January

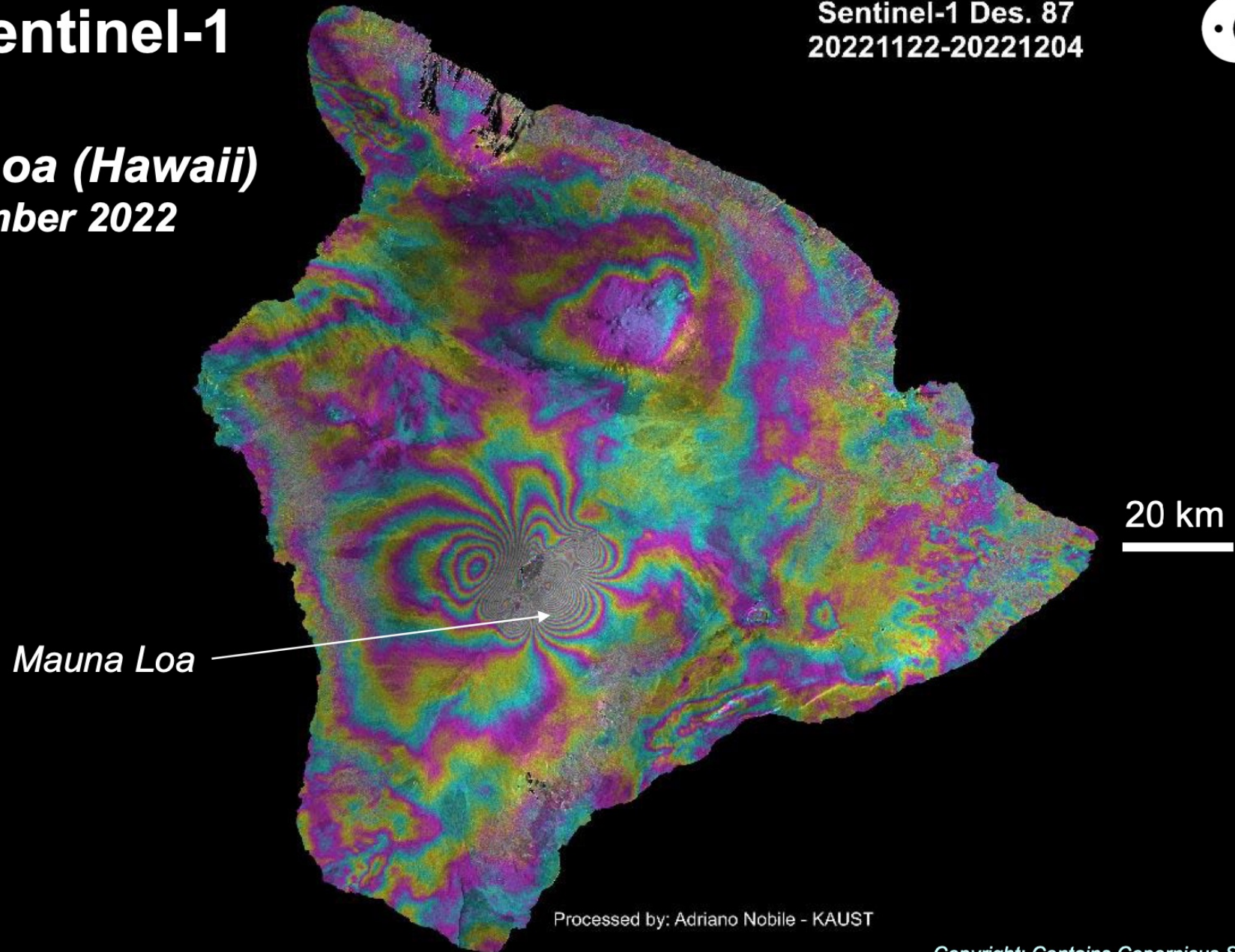


Applications: Sentinel-1

Sentinel-1 Des. 87
20221122-20221204



Eruption of Mauna Loa (Hawaii)
started on 28 November 2022



SAR interferogram

Processed by: Adriano Nobile - KAUST

Copyright: Contains Copernicus Sentinel data (2022)



→ THE EUROPEAN SPACE AGENCY

Applications: Sentinel-2 & 3

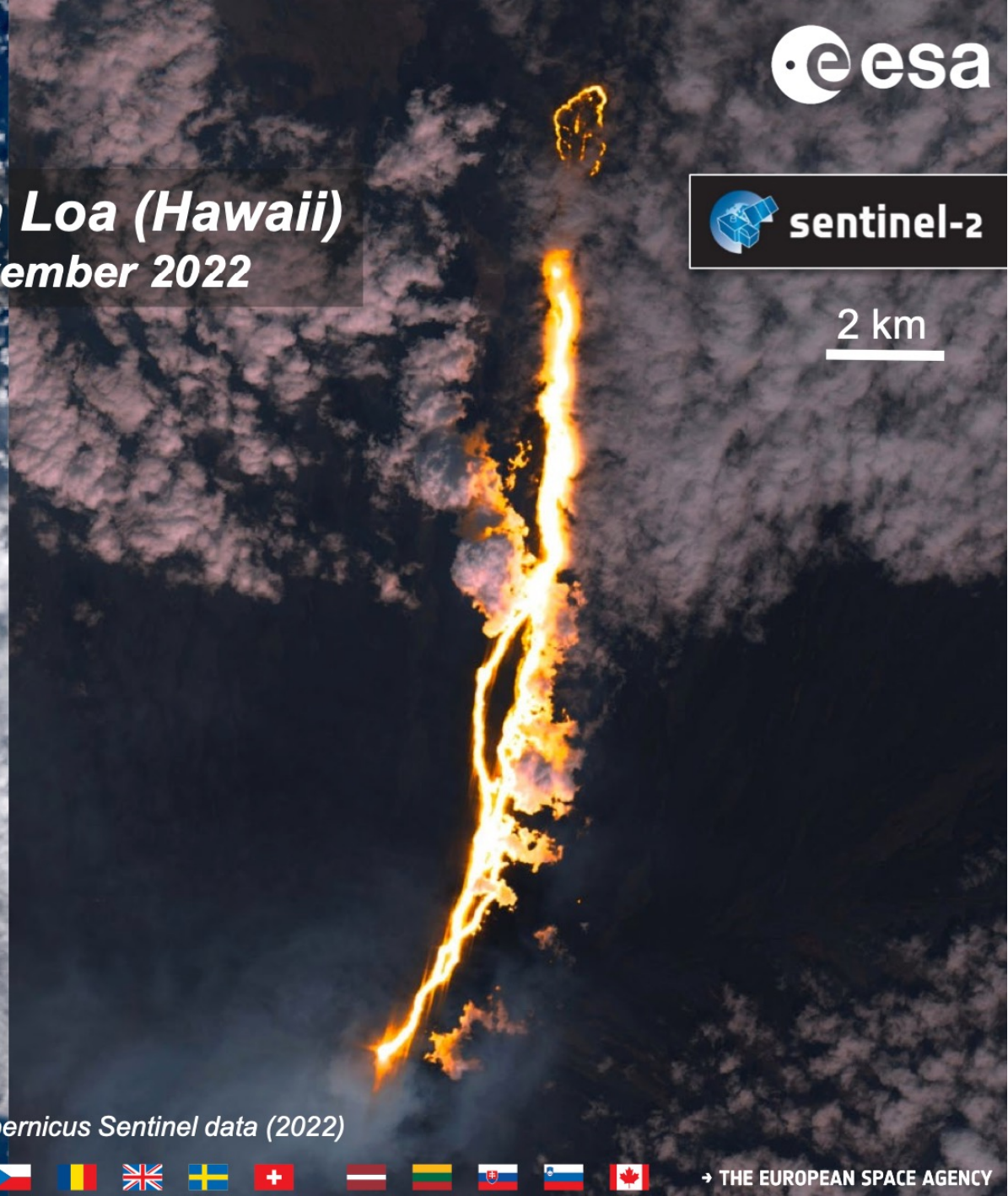
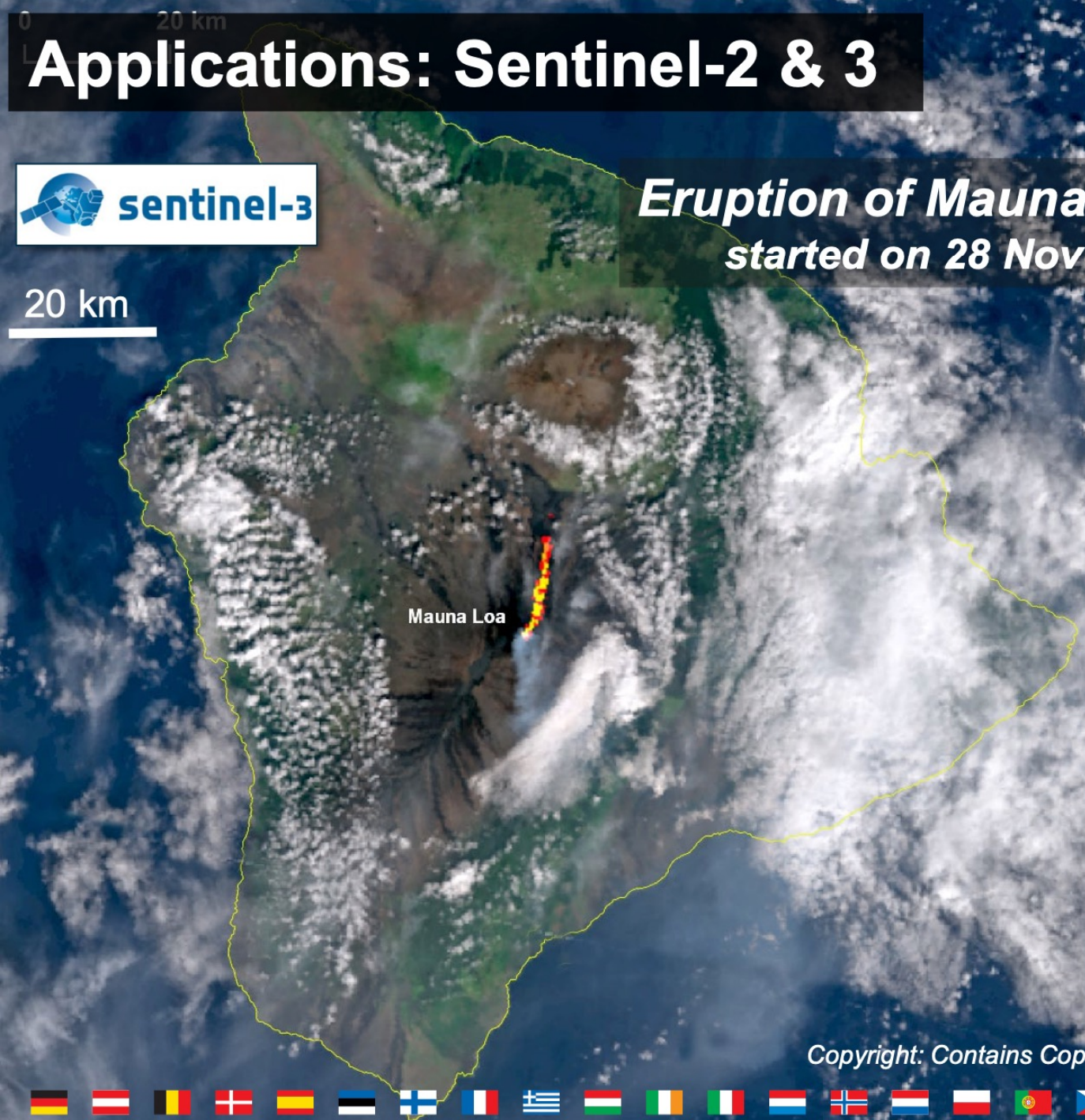


Eruption of Mauna Loa (Hawaii)
started on 28 November 2022



20 km

2 km



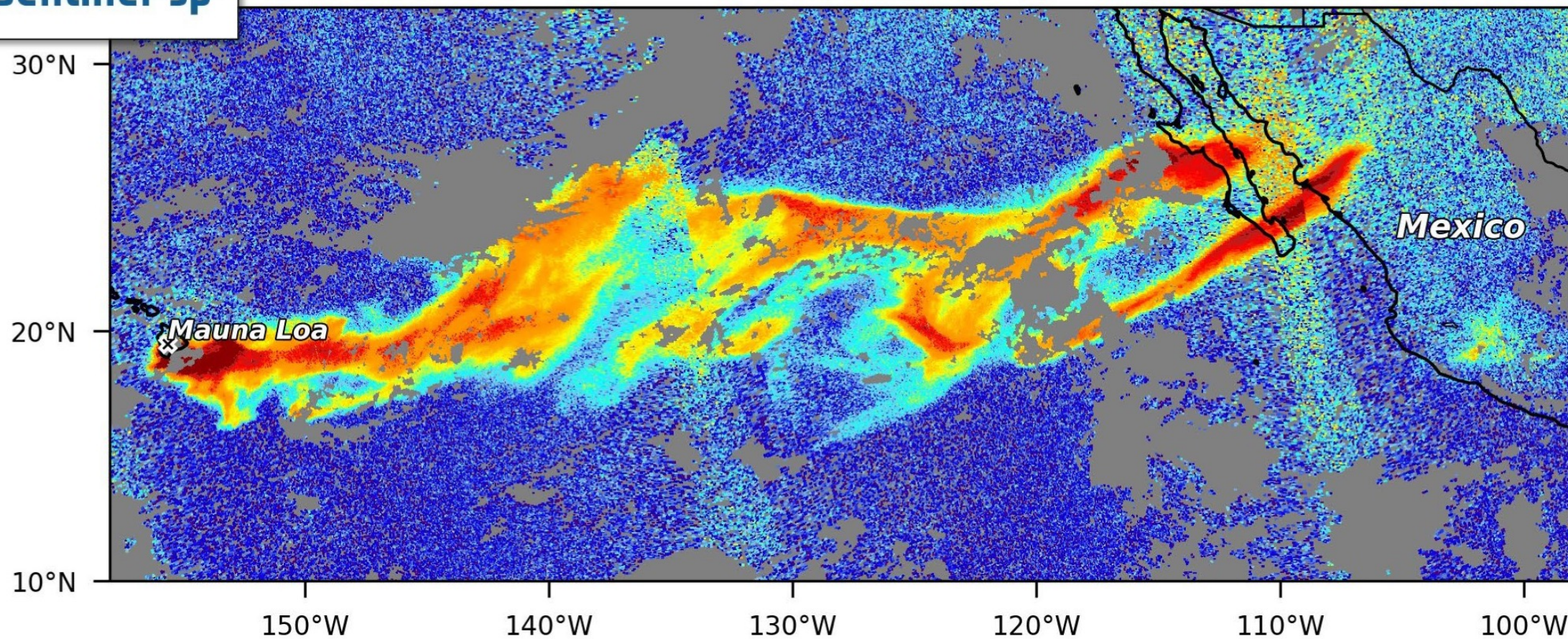
Copyright: Contains Copernicus Sentinel data (2022)



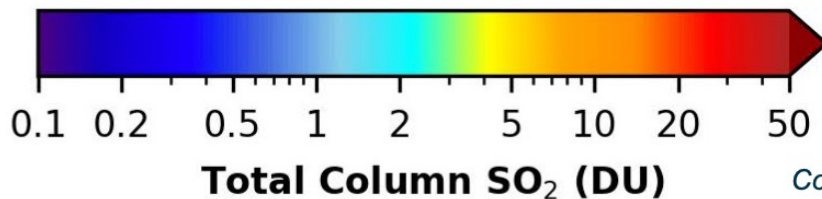
Applications: Sentinel-5p



S5P/TROPOMI Total Column Sulfur Dioxide 30 Nov 2022



**Eruption of Mauna Loa
(Hawaii) started on 28
November 2022**



Copyright: Contains Copernicus Sentinel data (2022)



PROGRAMME OF THE EUROPEAN UNION

Copernicus Space Component – Evolution



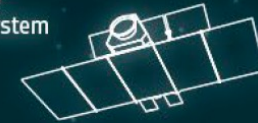
co-funded with



CHIME
Copernicus Hyperspectral Imaging Mission for the Environment

ROSE-L

L-band Radar Observing System



soil properties

geohazards



LSTM
Land Surface Temperature Monitoring



sustainable agriculture



Sentinel-1 NG



Sentinel-2 NG



CIMR
Copernicus Imaging Microwave Radiometer



sea-ice concentration



CO2M
Copernicus Anthropogenic Carbon Dioxide Monitoring



carbon dioxide and methane from human activity

+ Next Generation Sentinels for data continuation and enhanced observations



Sentinel-3 TOPO/OPT NG



CRISTAL
Copernicus Polar Ice and Snow Topography Altimeter



ice sheets and glaciers
sea-ice thickness
snow



→ THE EUROPEAN SPACE AGENCY

The new Copernicus Data Space Ecosystem Service



The Copernicus Data Space Ecosystem is the next step in the evolution of Earth observation data access.

- ⇒ Immediate cloud access to large amounts of open & free EO data from the Sentinel satellites, for both new and historical Sentinel images, as well as Copernicus Contributing Missions.
- ⇒ Supporting users in accessing, viewing, using, downloading, and analysing data.



Science: Earth Explorers



Status of ESA Earth Explorers Operational Missions



CryoSat / SMOS Sea Ice Thickness

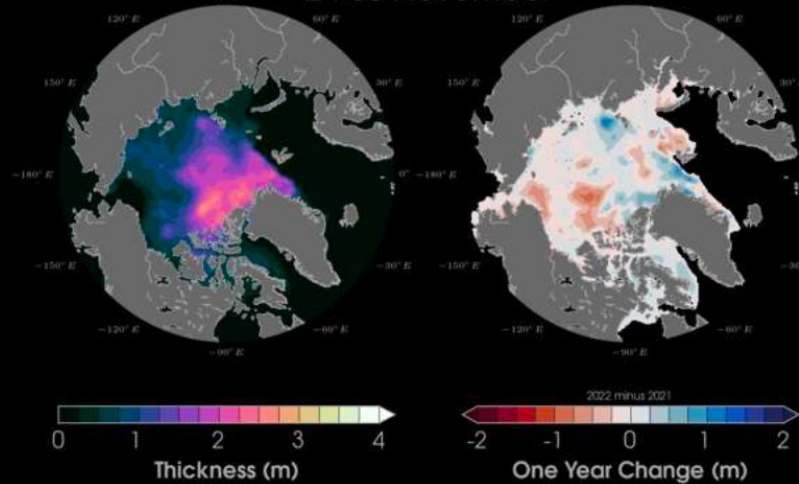
24-30 November

Weekly averaged product of Arctic Sea Ice thickness

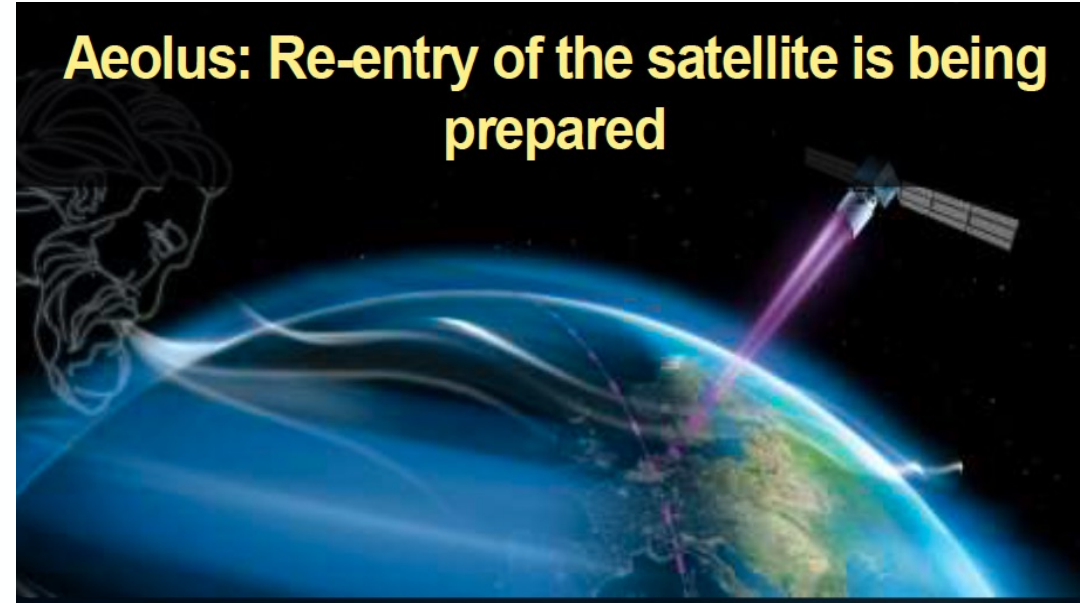
CryoSat / SMOS Sea Ice thickness product released weekly

Right: Difference compared to the previous week

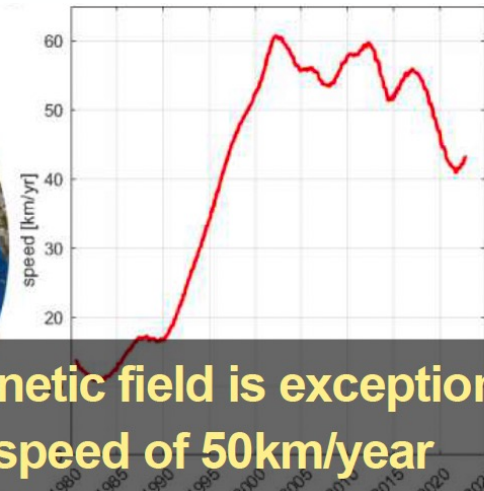
Visualisation by Zachary Labe



Aeolus: Re-entry of the satellite is being prepared



2022.9



SWARM reveals Earth's magnetic field is exceptionally dynamic, moving at a speed of 50km/year



New Earth Explorers Development



earthcare

ESA'S CLOUD, AEROSOL AND RADIATION MISSION

Aim The largest and most complex Earth Explorer to date, EarthCARE will advance:

- our understanding of the role that clouds and aerosols play in reflecting incident solar radiation back into space
- trapping infrared radiation emitted from Earth's surface

Innovation EarthCARE is a joint venture between ESA and JAXA (Japan Aerospace Exploration Agency), and it will employ high-performance lidar and radar technology, which has never been flown in space before

Curiosity The largest Earth Explorer to date, at 19 m long with the solar panel deployed



biomass

ESA'S FOREST MISSION

Aim To provide crucial information about the state of our forests and how they are changing

Innovation Its data will be used to further our knowledge of the role forests play in the carbon cycle. Observations from this mission will also lead to:

- better insight into rates of habitat loss, thus the impact this may be having on biodiversity in the forest environment;
- the opportunity to map subsurface geology in deserts and map the topography of forest floors

Curiosity Biomass will also provide essential support to UN treaties on the reduction of emissions from deforestation and forest degradation

flex

ESA'S PHOTOSYNTHESIS MISSION

Aim To provide global maps of vegetation fluorescence that can reflect photosynthetic activity and plant health and stress

Benefits Important for a better understanding of the global carbon cycle, but also for agricultural management and food security

Innovation Currently not possible to measure photosynthetic activity from space, but FLEX's novel instrument will be capable of achieving this

Curiosity FLEX will fly in tandem with the Copernicus Sentinel-3 mission, in particular working in combination with the OLCI and SLSTR instruments Sentinel-3 carries

forum

ESA'S THERMAL RADIATION MISSION

Aim To measure the radiation emitted by Earth into space, providing insight into the planet's radiation budget and how it is controlled

Benefits Will allow to better understand the energy balance of our planet, bringing great benefits to climate science

Innovation FORUM will measure across the entire far-infrared part of the electromagnetic spectrum, which has previously never been measured. It will allow more accurate tracking of key atmospheric components such as:

- anthropogenic greenhouse gases;
- water vapour and optically thin ice clouds; thus improving the accuracy of climate models



Earth Observation Heritage Missions at ESA

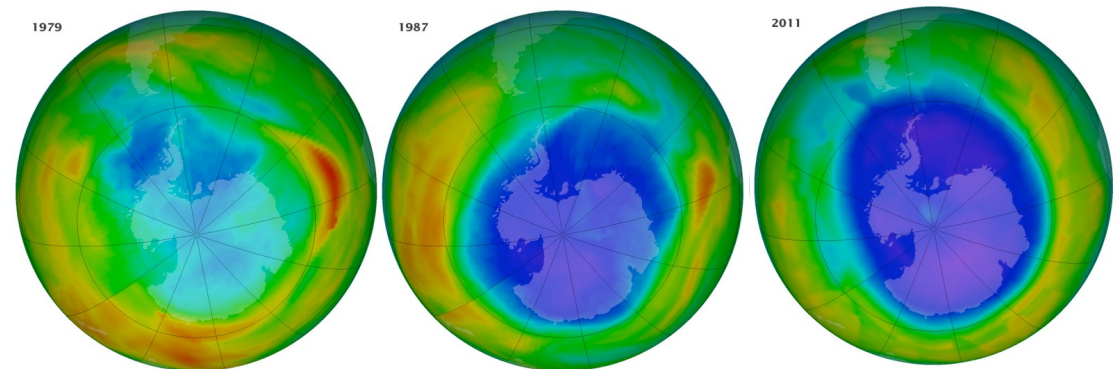
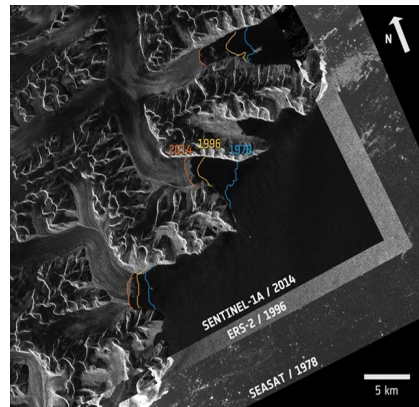
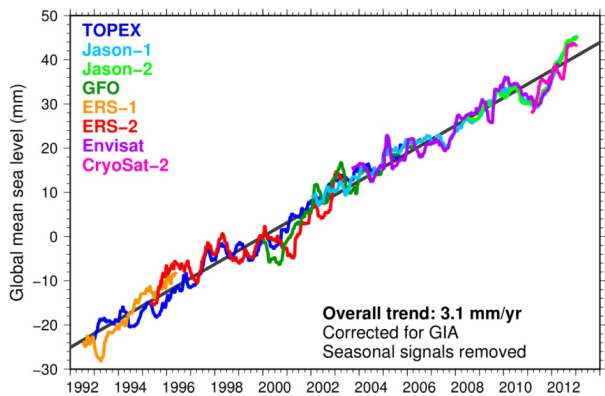


ESA Heritage Missions

EO Campaigns

ESA Heritage Third Party Missions

Thematic Collections



Heritage Missions → continuous improvement → climate standard quality

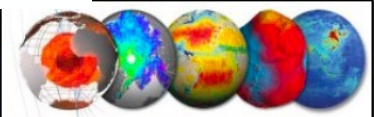
→ **Fundamental Data Record (FDR)**

→ **Analysis Ready Data (ARD)**

NEW paradigm for the valorisation of the ESA heritage missions

Generation of **FDR for Heritage Missions** missions

- generation of a harmonised, unified and coherent multi-instrument long-term time series with enhanced performance
- provide a thorough uncertainty characterization
- Explore the generation of **Analysis Ready Data** or **Thematic Data Products (TDP)** targeting new or specific user “niche”



Copernicus missions

Sentinel missions

- sentinel-1a
- sentinel-1b
- sentinel-2a
- sentinel-2b
- sentinel-3a
- sentinel-3b
- sentinel-5p

Copernicus Contributing Missions

ESA missions

Earth Explorer missions

- aeolus
- swarm
- cryosat
- smos

Heritage missions

- goce
- envisat
- ers-1
- ers-2

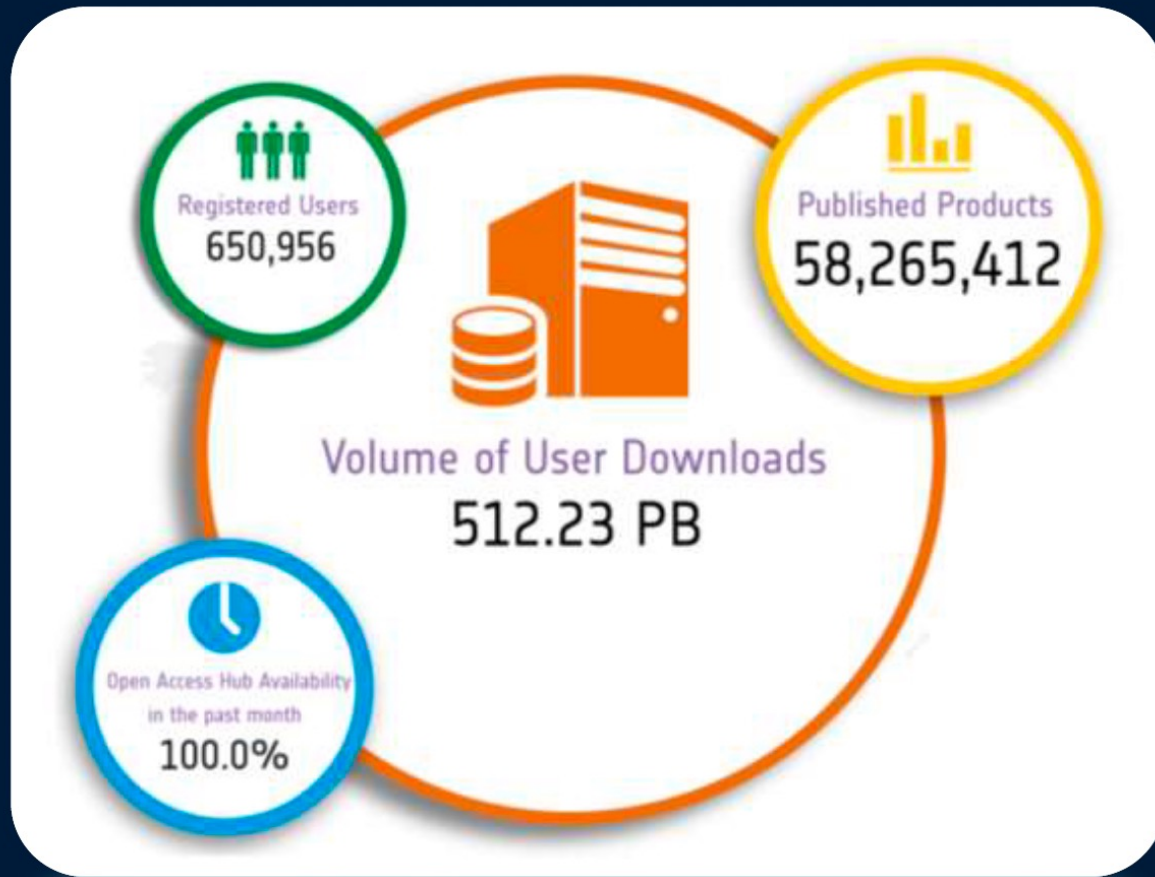
Proba missions

- proba-v
- proba-1

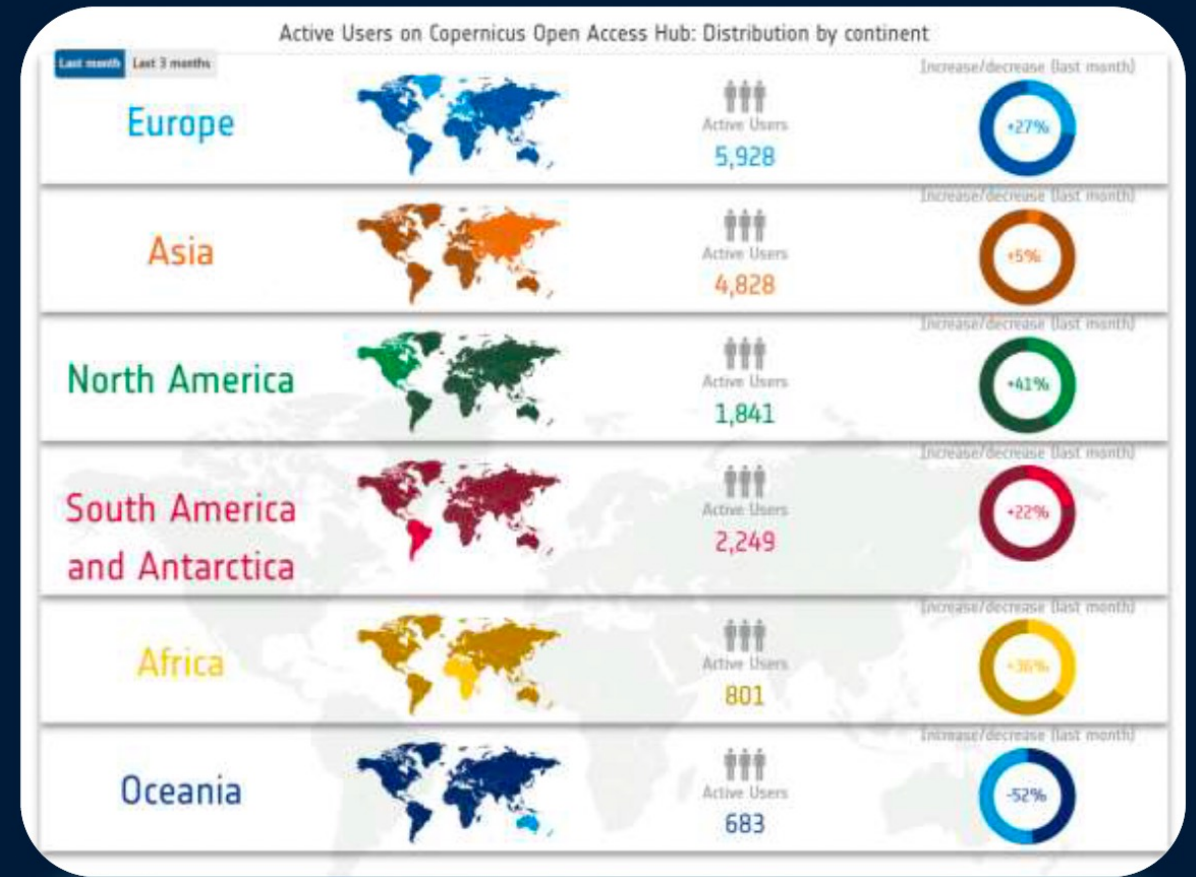
ESA Third Party missions

e.g. Iceye, Pleiades, Landsat, ...

+ ESA EO campaigns data



Registered Users, total data download and published products since start of operations



Active Users on Copernicus Open Access Hub for the past month: Distribution by continent

Where to get more statistics on Copernicus Sentinel missions data use ?

Sentinel Online

Missions | User Guides | Technical Guides | Thematic Areas | Data Access | Toolboxes

Sentinel User Guides

Success Stories

- Improved Copernicus Sentinel-2 snow cover product to help in environmental assessments
- How can Copernicus Sentinel-2 aid in water mapping using artificial intelligence?
- Copernicus Sentinel-3 helps track Canada's tragic heatwave fires

New Sentinboard Announcements

- Paper on quantifying river ice movement
- Copernicus Sentinel-1 Infographic
- Sentinel-2 exceeds expectations
- Sentinella monitor Earth's various eruptions
- Sentinel Success Stories
- 99 Copernicus User Stories
- Earth Starts Beating

Access to Sentinel data via download

Access to Sentinel data via cloud

Sentinel News

- Temporary unavailability of Copernicus Sentinel 2 production on 22 and 23 August 2021
- Copernicus Sentinel 1B unavailability
- Temporary unavailability of Copernicus Sentinel 2 production between 19 and 20 August 2021
- Copernicus Sentinel 1B unavailability
- Worldwide extension of the Geometric Refinement processing on Sentinel 2 products on 23 August 2021
- Temporary unavailability of Copernicus Sentinel 2 production between 9 and 10 August 2021
- Copernicus Sentinel 1A unavailability

Events

- 2021 Living Planet Symposium

Browse to other sites

Data access annual reports within Sentinel Online:
<https://sentinels.copernicus.eu>

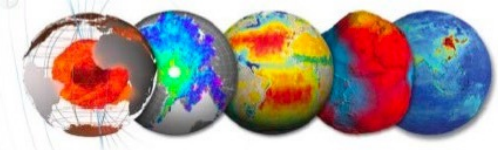


Sentinel Data Dashboard

- Registered Users: 427,178
- Published Products: 41,845,577
- Volume of User Downloads: 377.88 PB
- Open Access Hub Availability in the past month: 99.1%

Developed by SERCO | Version: 1.5.1 | User Guide

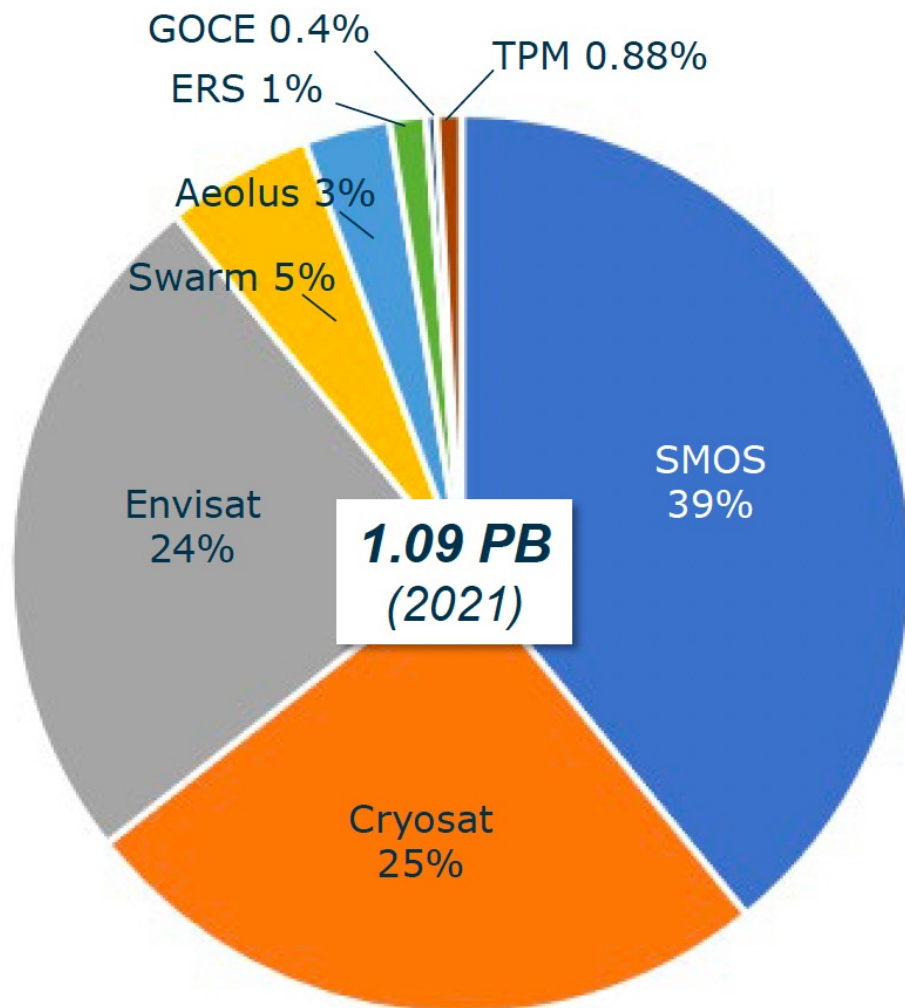
Sentinel dashboard:
<https://dashboard.copernicus.eu>



Downloaded data volume for ESA missions



Downloaded data volume by missions (in 2021)



Downloaded data volume by location of download (in 2021)

