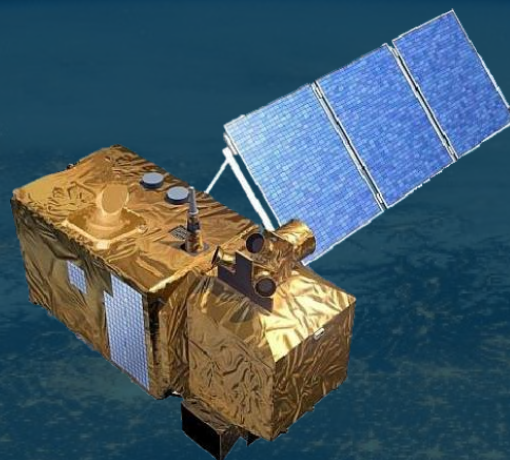




PROGRAMME OF THE
EUROPEAN UNION



co-funded with

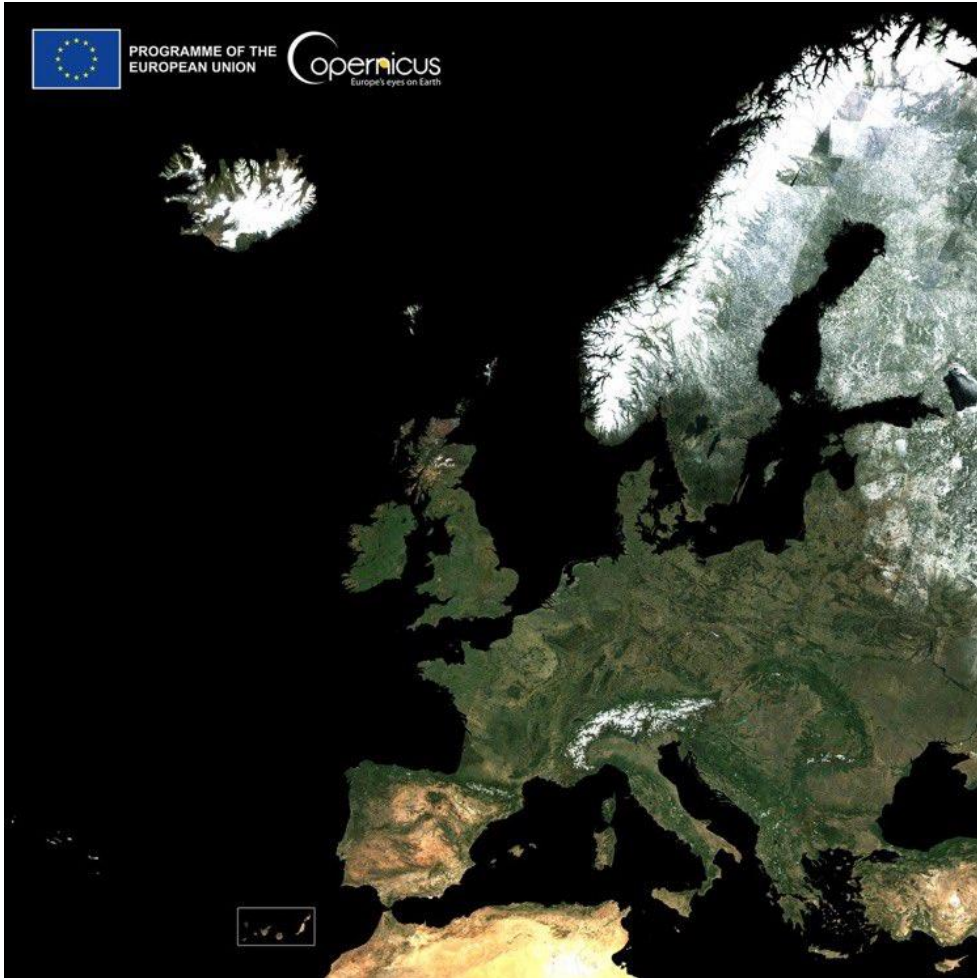


Copernicus Sentinel-2 Mission Status

Ferran Gascon
Sentinel-2 Mission Manager

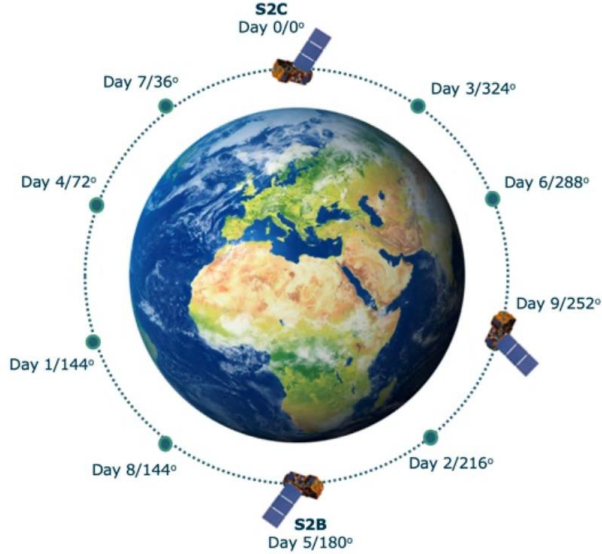
12 September 2023





- ✓ Nominal mission operations and good health status for both Sentinel-2A and Sentinel-2B satellites.
- ✓ Mission being upgraded e.g. with:
 - Extended observation scenario.
 - Collection-1 provision.
- ✓ Further upgrades in progress e.g.:
 - New pilot products.
 - Aquatic reflectances.
- ✓ Large range of applications in land, marine, emergency, security, atmosphere and climate domains.

Schedule Overview

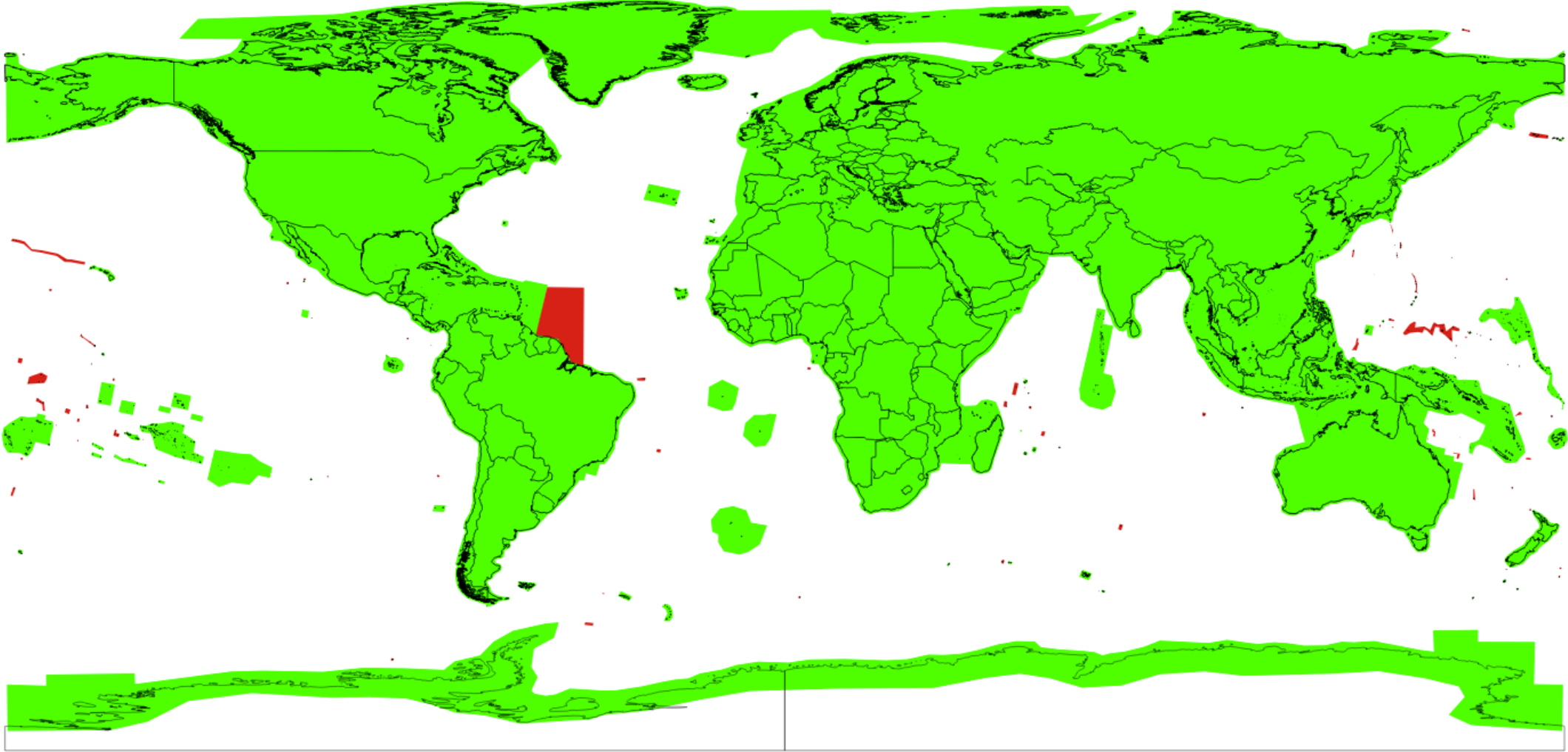


Type	Code	Description	Users	Coverage
User Products	Level-1B	Top-of-atmosphere radiances in sensor geometry	Expert users	Global
	Level-1C	Top-of-atmosphere reflectances in cartographic geometry	All users	Global
	Level-2A	Surface reflectances in cartographic geometry		
Pilot Products	Level-2H	Harmonised Sentinel-2 + Landsat-8/9 surface reflectances in cartographic geometry	On-demand	On-demand pilot productions
	Level-2F	Fused Sentinel-2 + Landsat-8/9 surface reflectances in cartographic geometry		

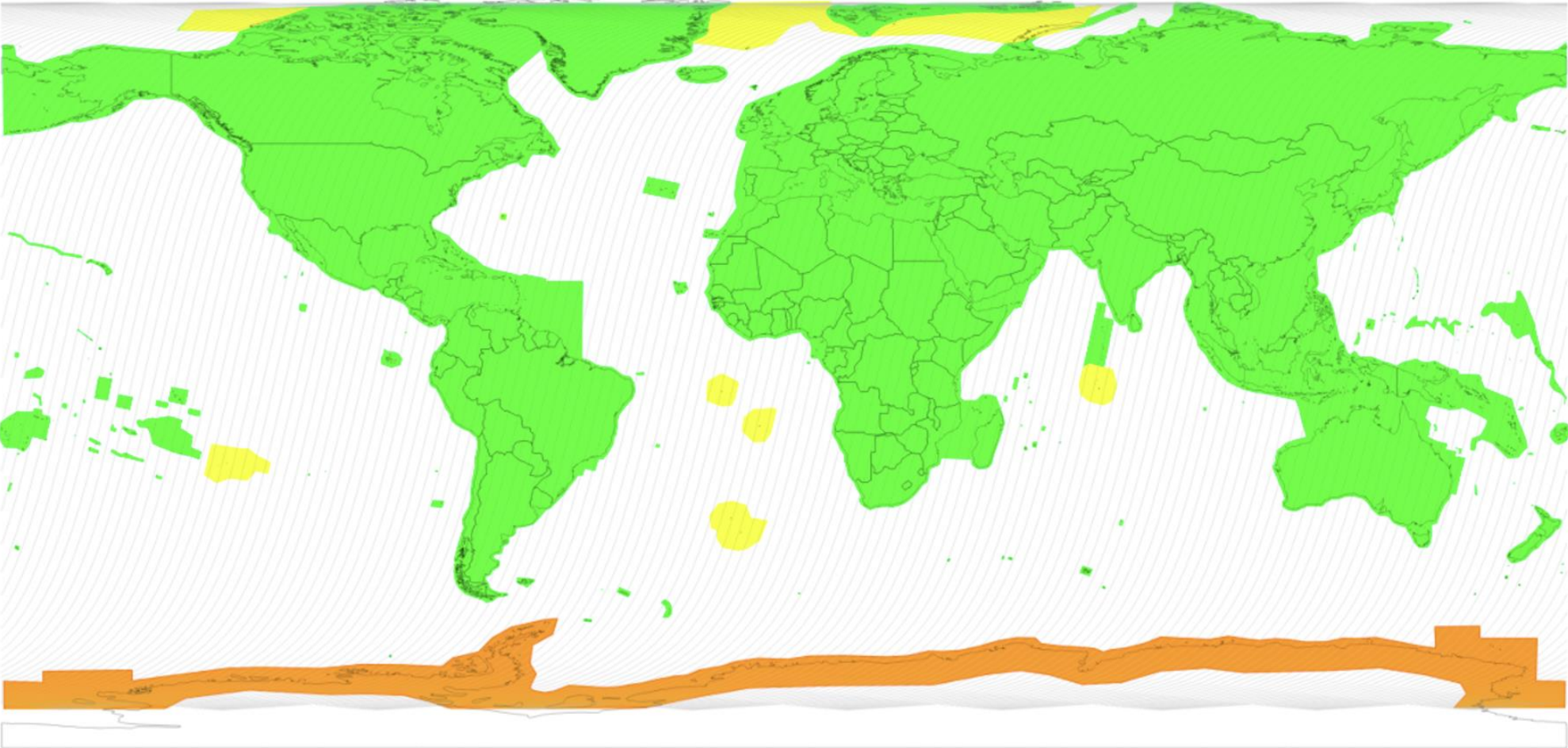
Main Achievements Since Last Review

- ✓ **2022 June:** Start of operations with new observation scenario.
- ✓ **2022 June 22:** Release of updated Sentinel-2A and -2B spectral response functions.
- ✓ **2022 December:** Level-2A processor (Sen2Cor) version 2.11.
- ✓ **2022 December 06:** Release of new Processing Baseline (05.09).
- ✓ **2023 January 24:** Opening of the “Copernicus Data Space Ecosystem”.
- ✓ **2023 January 24:** Publication of first Collection-1 products.
- ✓ **2023 April 20:** Opening of a new Sentinel operations dashboard.
- ✓ **2023 July 12:** Distribution of Sentinel-2 GRI (Global Reference Image) as a free & open product.

New Observation Scenario (since June 2022)



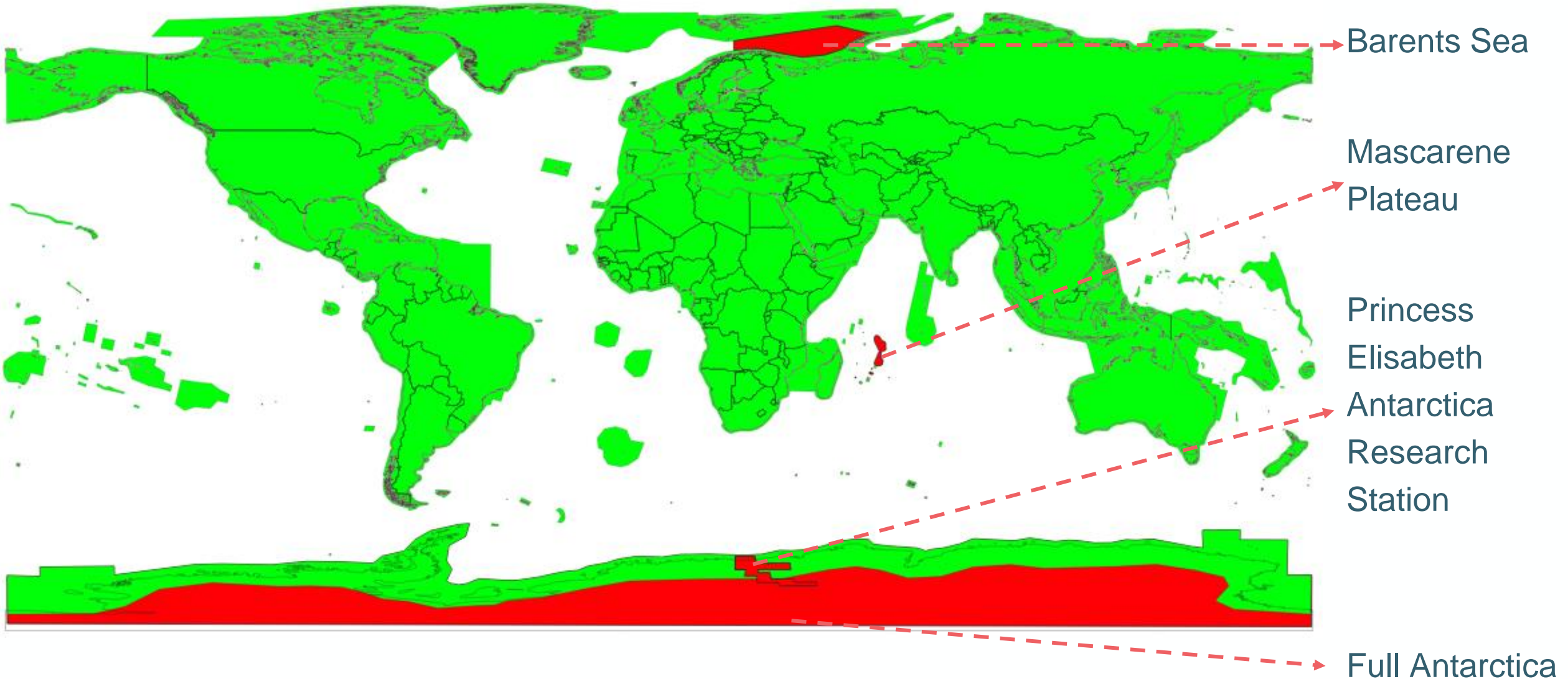
Sentinel-2 / Observation Scenario



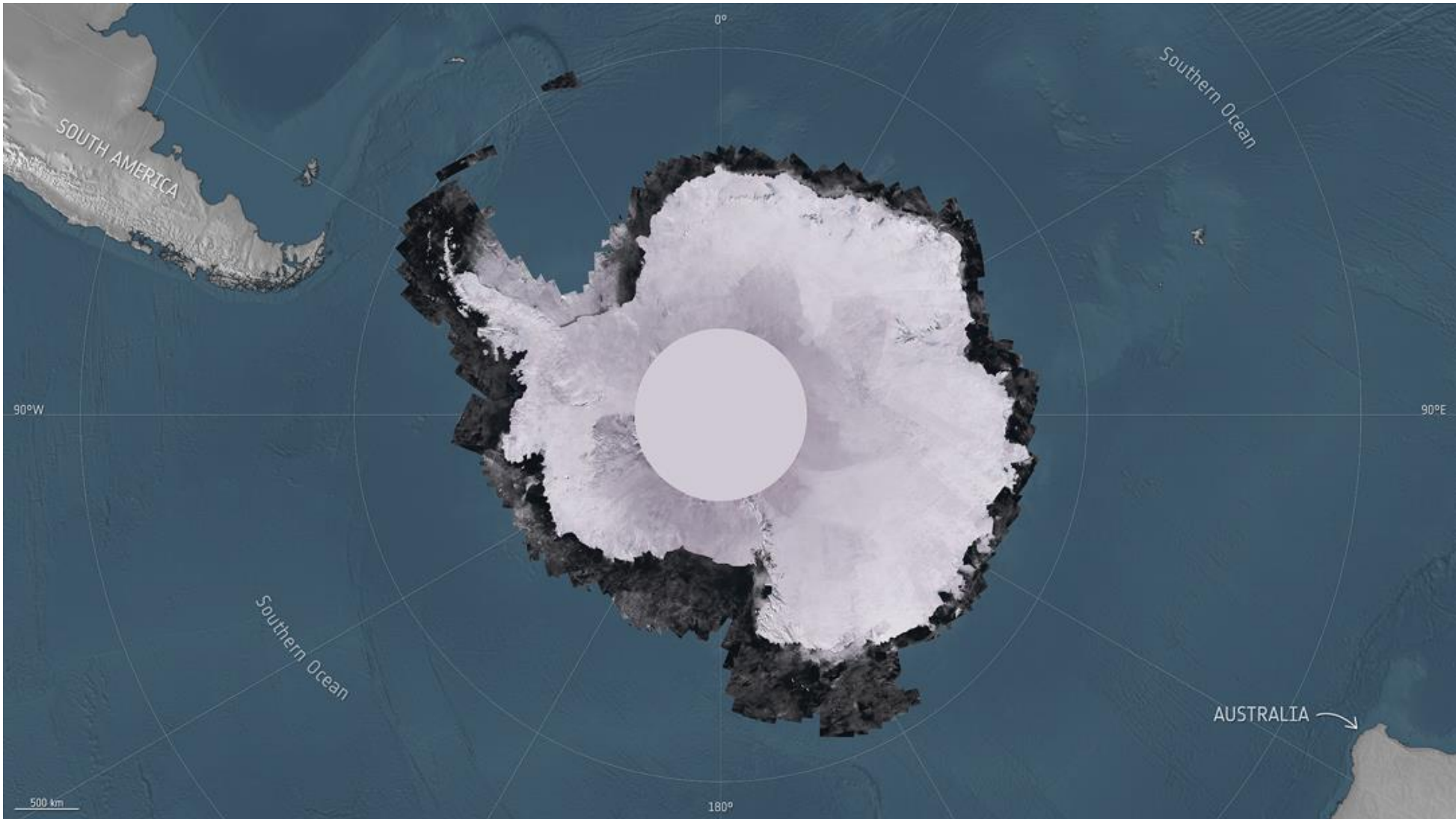
- 5 days
- 10 days
- 10 days access from alternated tracks



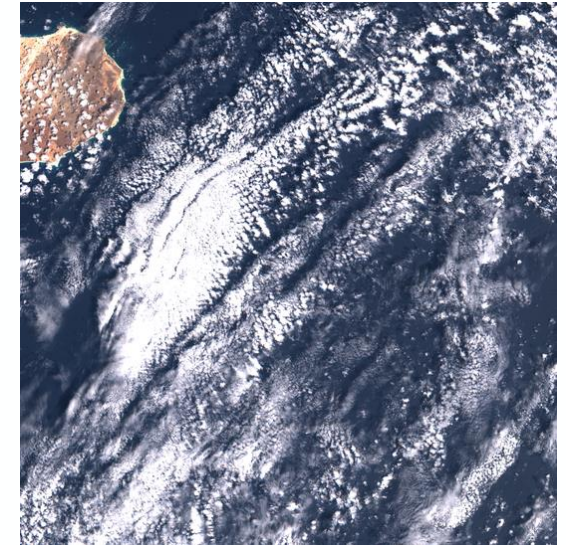
Ad-hoc Acquisition Campaigns



Mosaic of acquisitions over Antarctica in 2023



- Collection 1 being generated by reprocessing full S2 archive for all user products (Level-1B, Level-1C and Level-2A).
- Products will use the latest Processing Baseline (05.xx) which includes Copernicus DEM 30m, geometric refinement with S2 GRI, etc.
- Reprocessing campaign on-going, first products published on 24 January 2023 on DIAS platforms (CREODIAS, MUNDI and ONDA) and the Copernicus Data Space Ecosystem.
- Planned production completion within Q4 2023 and planned distribution completion within first half 2024.
- More information at:
<https://sentinels.copernicus.eu/ca/web/sentinel/technical-guides/sentinel-2-msi/copernicus-sentinel-2-collection-1-availability-status>

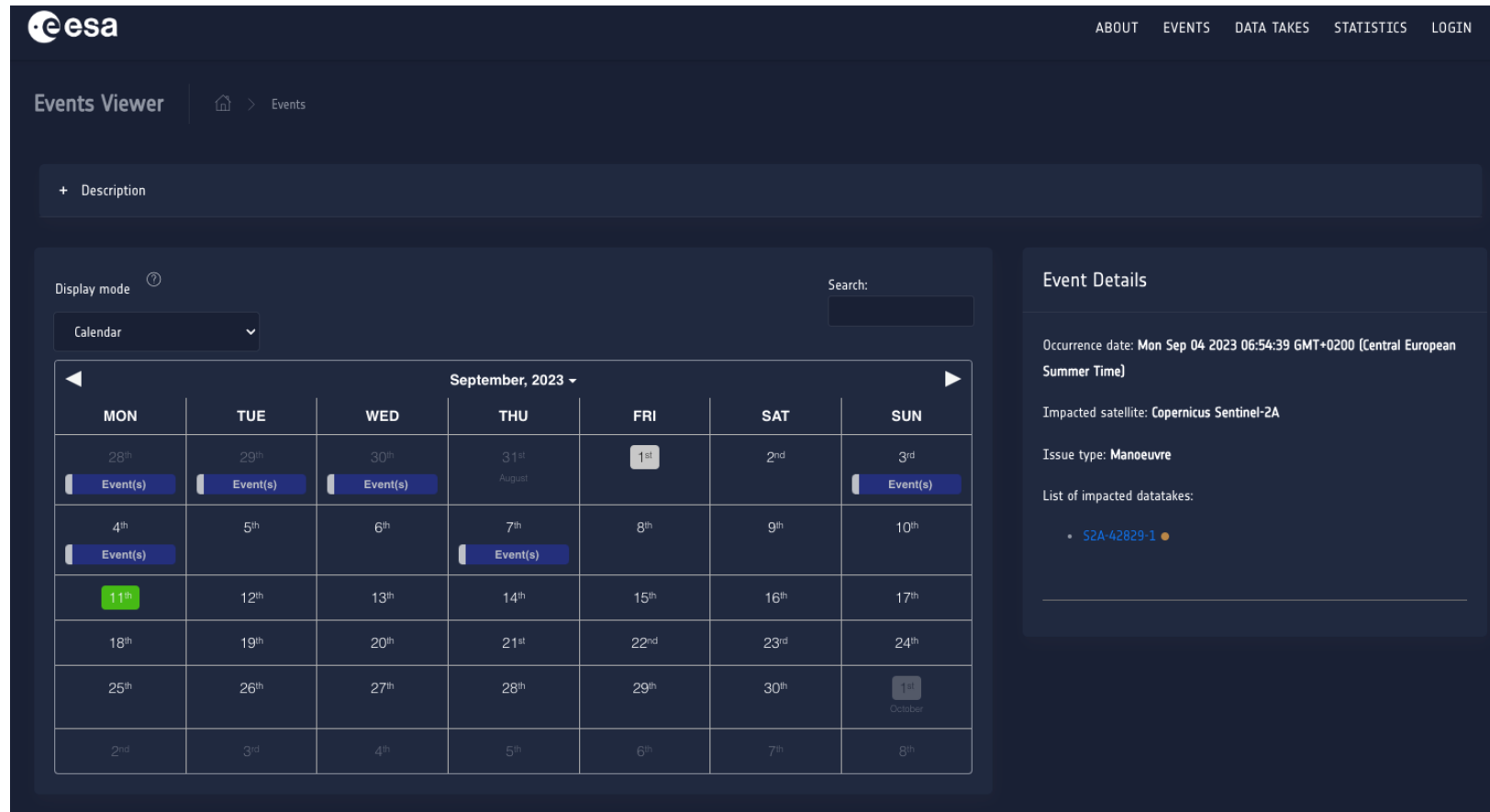


Cabo Verde 04 April 2019



- A new public dashboard on the Sentinels operations status is available in beta version providing timely operational information to users.

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



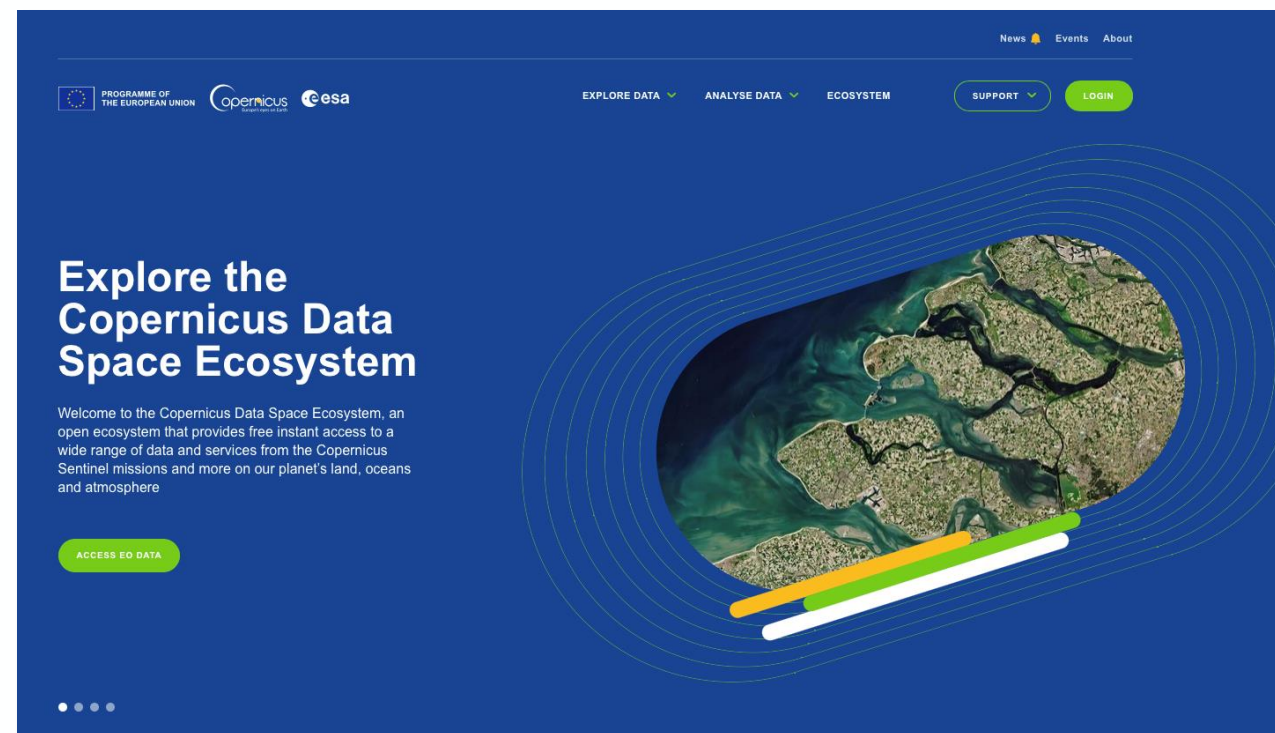
The screenshot shows the 'Events Viewer' interface on the Copernicus Sentinel-2 Operations Dashboard. The top navigation bar includes 'ABOUT', 'EVENTS', 'DATA TAKES', 'STATISTICS', and 'LOGIN'. The main content area features a 'Description' section, a 'Display mode' dropdown set to 'Calendar', and a search bar. The calendar view displays events for September 2023, with event bars indicating occurrences on various dates. A right-hand panel titled 'Event Details' provides specific information for a selected event, including the occurrence date (Mon Sep 04 2023 06:54:39 GMT+0200 [Central European Summer Time]), the impacted satellite (Copernicus Sentinel-2A), the issue type (Manoeuvre), and a list of impacted datatakes (S2A-42829-1).

- ✓ The **Copernicus Data Space Ecosystem** Service offer has been significantly upgraded in July 2023 as per public service roadmap.

<https://documentation.dataspace.copernicus.eu/Roadmap.html>

- ✓ Additional services and data offer are planned before end 2023.
- ✓ The ramp-down of the Copernicus Data Hub Services is on-going to support final users in smoothly migrating to the new service.

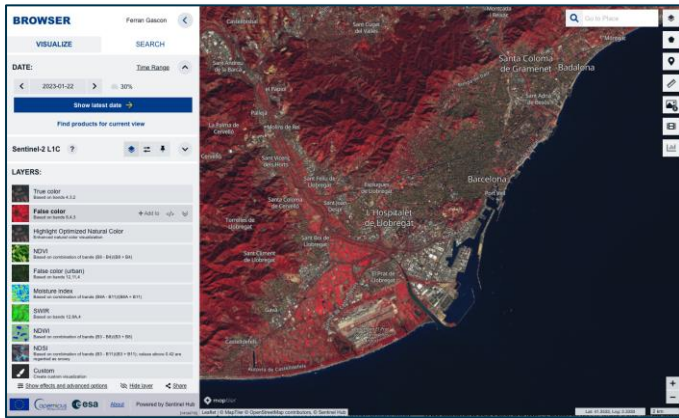
<https://dataspace.copernicus.eu>



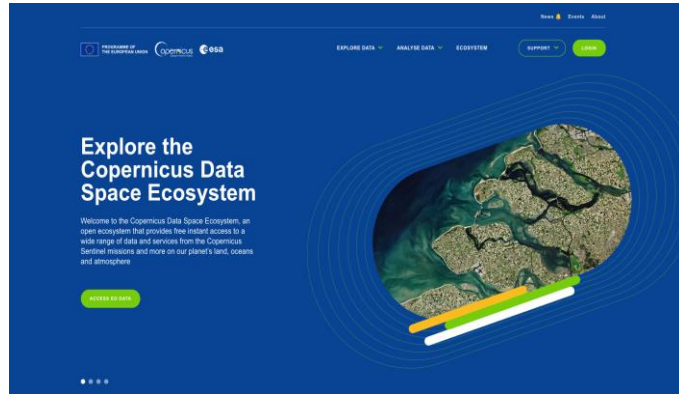


- ✓ The **Copernicus Data Space Ecosystem Service** offer has been significantly upgraded in July 2023 as per public service roadmap (including new data, APIs and Apps): <https://documentation.dataspace.copernicus.eu/Roadmap.html>

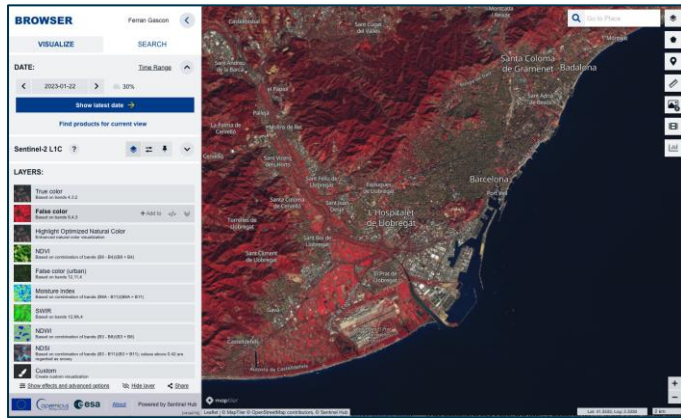
<https://dataspace.copernicus.eu/>



- ✓ Additional services and data offer are planned before end 2023.
- ✓ The ramp-down of the Copernicus Data Hub Services is ongoing (up to end-of-September 2023) to support final users in smoothly migrating to the new service.



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



Available from July 2023

Product Type	File Description	Data Access Type	Spatial Extent	Temporal Extent	More Information	Available from
L1C	packed or unpacked	IAD (Immediately available data)	World	Jul-15 - Present	Details	Jan-23
L2A	packed or unpacked (original ESA product)	IAD	World	Jul-15 - Present	Details	Jul-23
L2A	packed (original ESA products)	DAD (Deferred available data)	World	Jul-15 - Present	Details	Jul-23
L0(*)	packed	DAD	World	Jul-15 - Present	Details	Jul-23

(*) Access restrictions may apply.

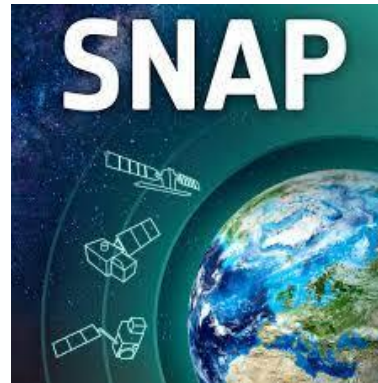
Additionally available from October 2023

Product Type	File Description	Data Access Type	Spatial Extent	Temporal Extent	More Information	Available from
L1B(*)	EUP	IAD	World	Last 2 weeks	Details	Oct-23
L1B(*)	EUP	DAD	World	Full archive	Details	Oct-23

(*) Access restrictions may apply.

Core Modules

- S2 L1C/L2A reader.
- S2 level 2H/F reader.
- S2 Resampling Processor.
- Multi-size mosaic (mosaic at native resolution).
- Reflectance to radiance module.
- Biophysical Variables Retrieval (S2 L2B).
- Radiometric Indices Processor (vegetation, soil and water).
- Forest Cover Change Processor.
- C2RCC Processor (Case 2 Regional Coastal Colour).
- S2 MCI Processor (Maximum Chlorophyll Index).
- The Rayleigh Correction Processor.

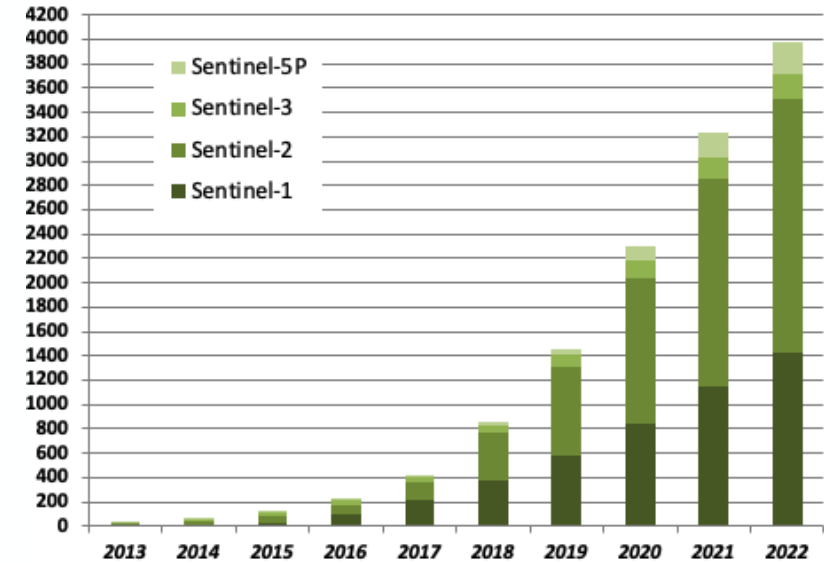
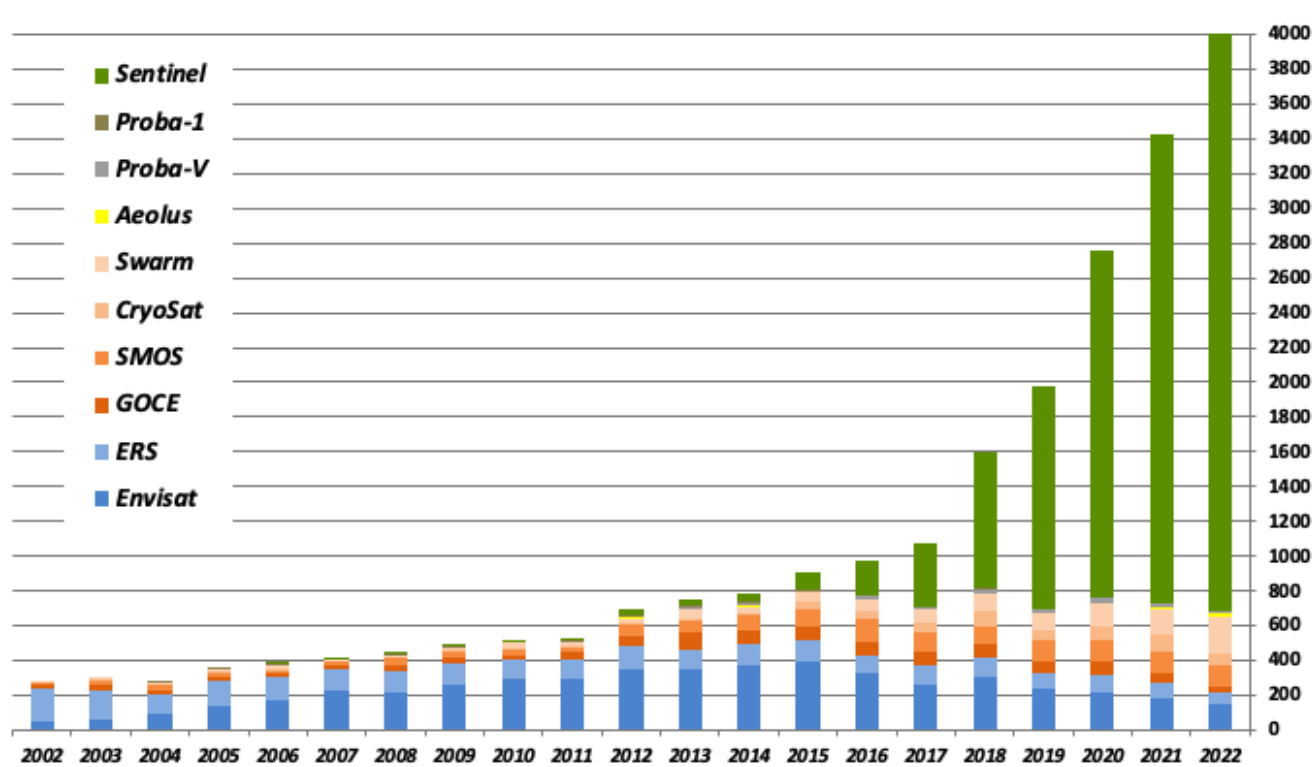


Plug-ins

- **Sen2Cor** – Atmospheric Correction and Cloud screening.
- **Sen2Res** - To enhance the spatial resolution of Sentinel-2 products (SuperResolution).
- **Sen2Three** – Spatio-temporal synthesis L3.
- **Sen2Coral** – Module for Coral Reef monitoring.
- **Sen-ET** – Module for evapotranspiration (ET) estimation using S2 data.
- **iCor** – Atmospheric Correction for land and aquatic areas.
- **IdePix** – Scene Classification including Cloud screening.
- **S2 Toolbox OTB adapters** – Module including Orfeo Toolbox.

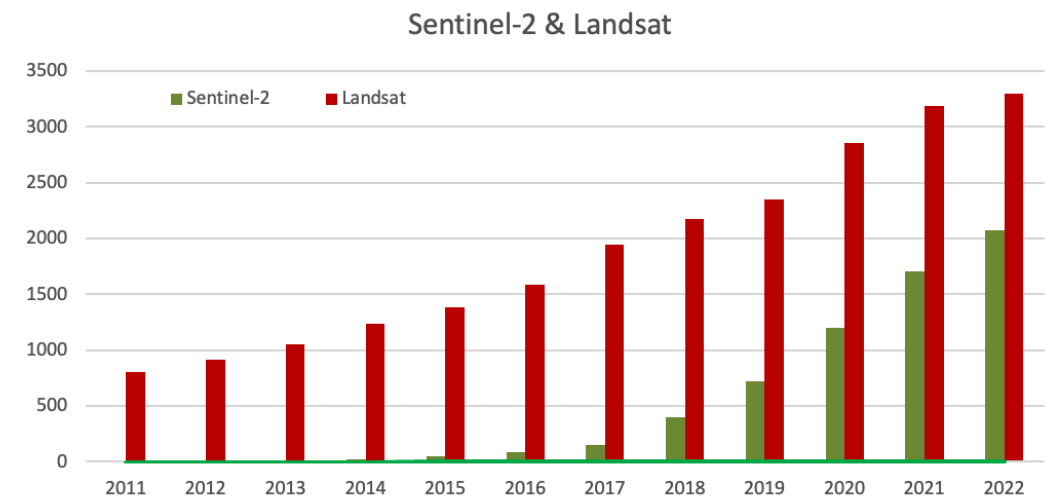
- Distribution of Level-1B products worldwide via the CDSE (October 2023).
- Copernicus DEM 30m used in the real-time flow production (Q4 2023).
- Pilot on-demand service for S2-Landsat harmonised (L2H) and fused (L2F) products (Q4 2023).
- Completion of Sentinel-2 archive reprocessing Collection-1 distribution (Q2 2024).
- Ad-hoc acquisition campaign over the full Antarctica within mission reach (each austral summer).
- Provision of L2A surface reflectance uncertainties with an offline tool (Q4 2023).
- Replacement of S2A operational satellite unit (Q3 2024).
- Provision of a new Aquatic Reflectance layer within Level-2A product.
- New products format (including e.g. COG/zarr, metadata in JSON format, STAC).

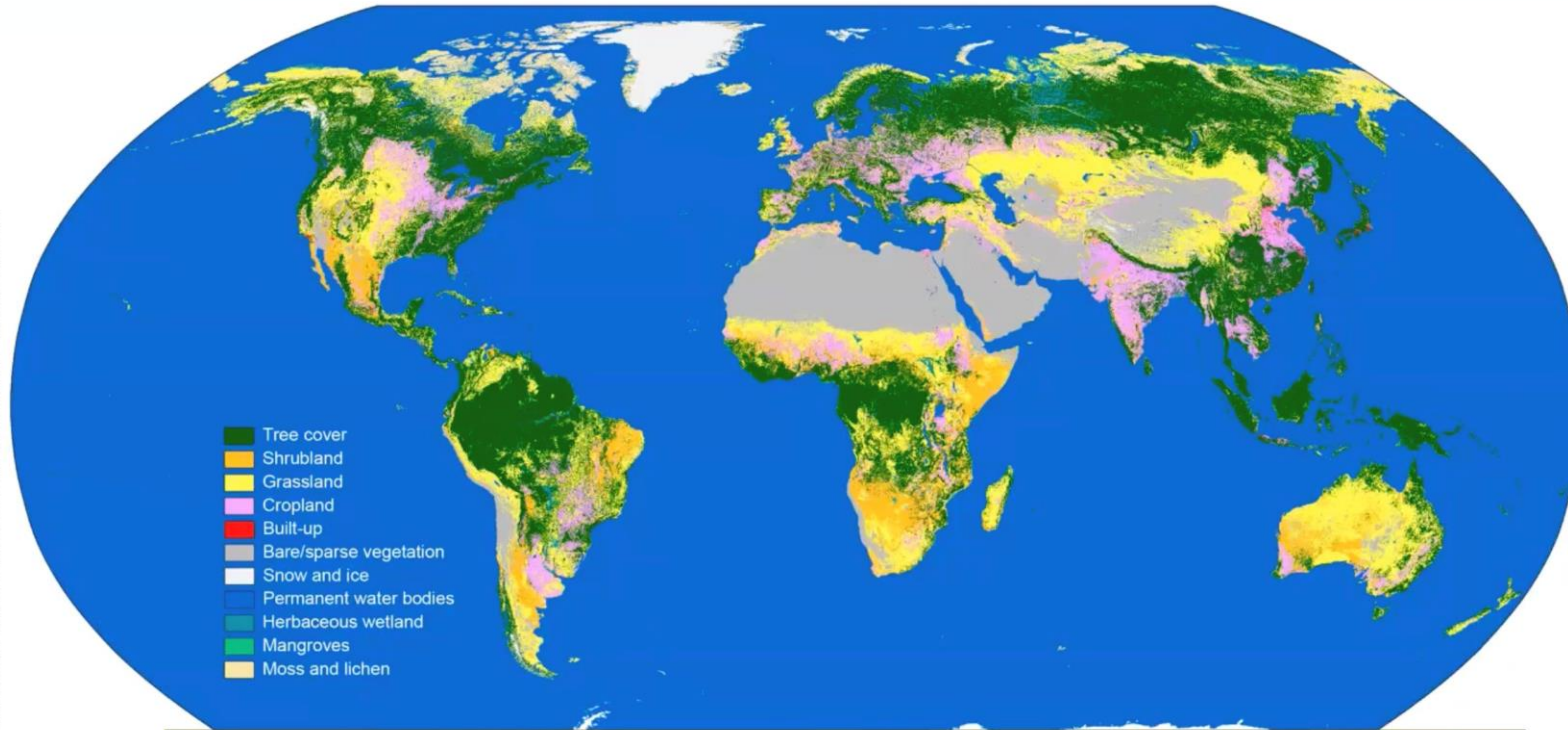
Peer-Reviewed Publications



2073 publications in 2022

Method: Based on Elsevier SCOPUS database, exact number of peer reviewed publications searching for mission/instrument name within papers title, abstract and keywords, and excluding conference papers.





© ESA WorldCover: project 2021
© Contains modified Copernicus Sentinel data (2021), processed by ESA WorldCover consortium

<https://worldcover2021.esa.int>

- ✓ Fast generation and validation of a world land cover based on S2 and S1.
 - ✓ 10m resolution
 - ✓ 11 land cover classes
 - ✓ Delivered 10 months from last data take
 - ✓ 77% overall accuracy, validated independently
-
- Product will be made operational by the CLMS (Copernicus Land Monitoring Service) in 2023.



- Emperor penguin colonies experienced unprecedented breeding failure in a region of Antarctica where there was total sea ice loss in 2022.
- The discovery supports predictions that over 90% of emperor penguin colonies will be quasi-extinct by the end of the century, based on current global warming trends.

communications

earth & environment

ARTICLE

Check for updates

<https://doi.org/10.1038/s43247-023-00927-x>

OPEN

Record low 2022 Antarctic sea ice led to catastrophic breeding failure of emperor penguins

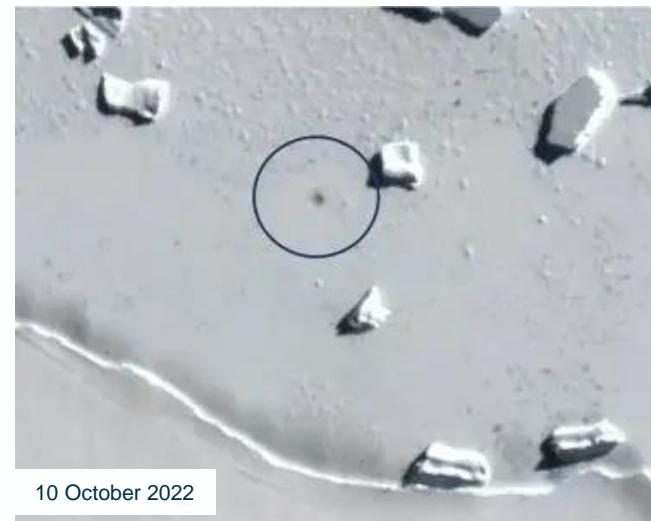
Peter T. Fretwell¹, Aude Boutet² & Norman Ratcliffe¹

www.nature.com/commsenv

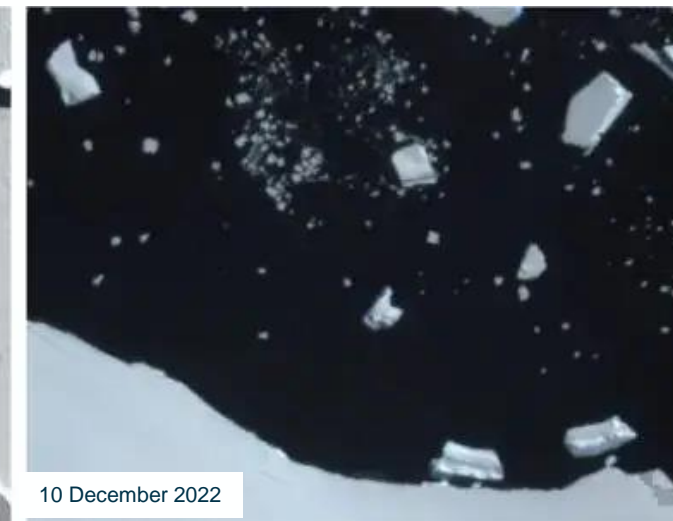


Emperor penguins (*Aptenodytes Forsteri*) breed on sea ice during the Antarctic winter

Credit: Doug Allan, British Antarctic Survey (BAS).



10 October 2022

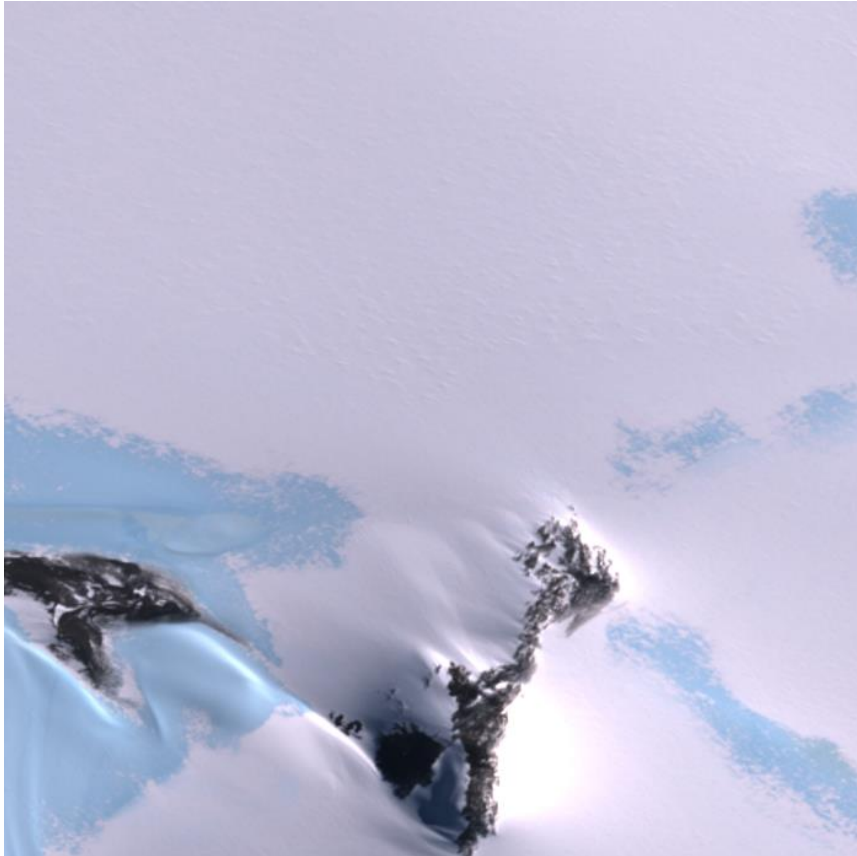


10 December 2022

Comparisons show a colony on sea ice at Smyley Island between 10 October 2022 and 10 December 2022.

Copyright: Contains modified Copernicus Sentinel data (2022), processed by BAS.

Unearthing a rare meteorite in Antarctica



Blue icefields in Antarctica.
Credit: contains modified Copernicus Sentinel data (2023), processed by ESA



- ✓ Antarctica is one of the best places in the world to search for space rocks.
- ✓ A team from the Belgian Princess Elisabeth Antarctica (PEA) used data from a Sentinel-2 ad-hoc acquisition campaign to plan an expedition that recovered one of the biggest meteorites (7.6 kg) ever found in Earth's southernmost continent.
- ✓ Advanced analysis of the meteorites found is expected to help scientists investigate the Solar System and the processes within it.

<https://sentinel.esa.int/web/sentinel/-/copernicus-sentinel-2-helps-explorers-unearth-rare-7.6-kg-meteorite-in-antarctica>



1998

Pivot irrigated fields in Egypt by
Landsat & Sentinel-2 data