

Commercial EO data and services for Cultural Heritage

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15/10/2024

Central component – Earthnet TPMs



About THIRD PARTY MISSIONS PROGRAMME

What are TPMs?

Third Party Missions are earth observation missions that are not owned or operated by ESA. The agency has an agreement with these third parties to distribute data products from their missions to scientific users

History?

ESA's TPM arrangement has been operating for over

45 YEARS

providing EO data to users in **Europe** and **worldwide** for research and pre-operational applications development

How many?

TPMs currently include over 60 instruments on more than 50 missions

<60

INSTRUMENTS

50+

MISSIONS

- Atmospheric
- Optical
- Reflected Global Navigation Satellite System (GNSS-R) and Radio Occultation
- Gravity Field
- SAR



More than 17700 research projects used TPM data since 2008 with over 3000 newly registered TPM users in the last 12 months

Benefits?

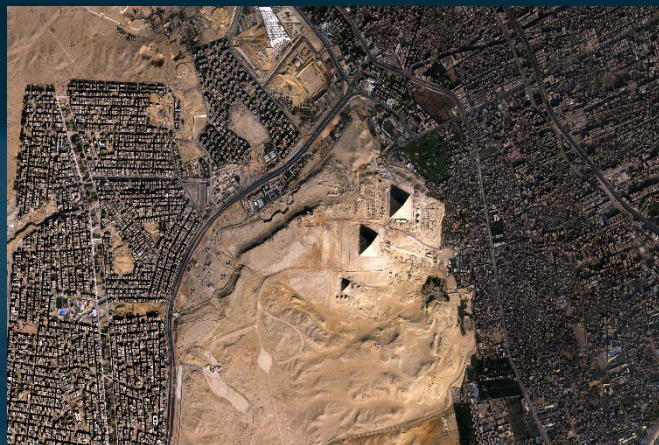
Data is offered from a large number of international missions through a single programme. One of the criteria for selecting new missions is that they utilise instruments that offer similar data to those acquired by ESA missions, contributing to a wide range of data that may be used together. Other criteria include degree of innovation, opportunity for new international collaboration and experience to be gained for future missions

TPMs data combined with the data from ESA missions, can exploit the synergy between all sources of data to meet the needs of user communities, from different sectors, for a growing range of applications

Data Access?

<https://earth.esa.int/eogateway/missions/third-party-missions>

Commercial EO data for cultural heritage



Pyramids of Giza (Egypt)
Vision-1 © Airbus Defence and Space Limited (2020)



Angkor Wat (Cambodia)
Planet Labs © SkySat (2021)

Commercial data providers under agreement with ESA deliver very high resolution (VHR) optical, SAR, atmospheric composition and thermal data that help to identify, monitor and analyse areas of interest all around the world. These data are a vital tool to support research on **historical sites stability and integrity, SAR-cheology urban sprawl monitoring around historical sites, risk assessment and impact of climate change to cultural heritage**, among others.

- Vision 1
- WorldView
- ICEYE
- PlanetScope
- SkySat
- Pleiades/PNEO
- PAZ
- GEOSAT-1/2
- Cosmo Sky-Med
- Cartosat-1
- TerraSAR-X/TanDEM-X
- SatVu

➔ Since 2022, more than 30 projects in the cultural heritage domain have been supported by the TPM Programme.

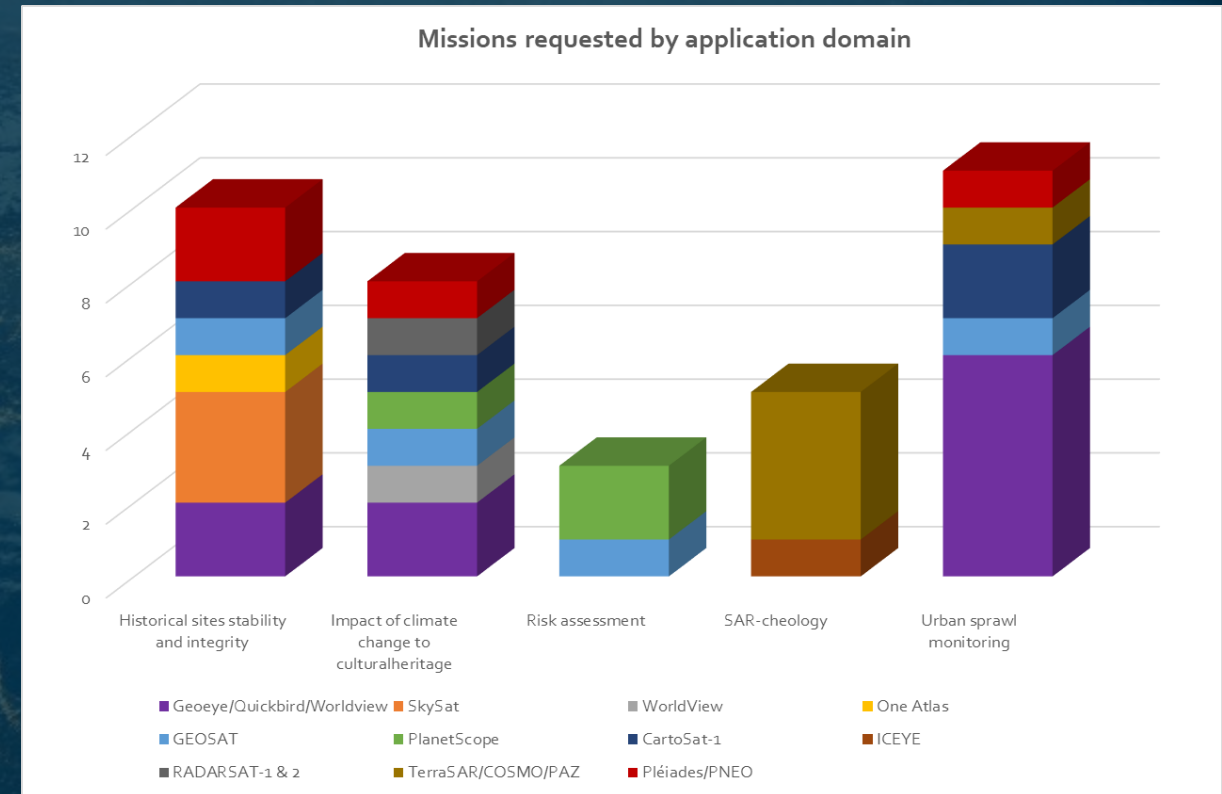
LEARN & DISCOVER - DATA APPLICATION

HOW TO USE SPACE DATA TO PROBE HUMANKIND'S ANCIENT PAST

TPM) programme are enabling archaeological investigations that could help to unravel the mysteries of past...

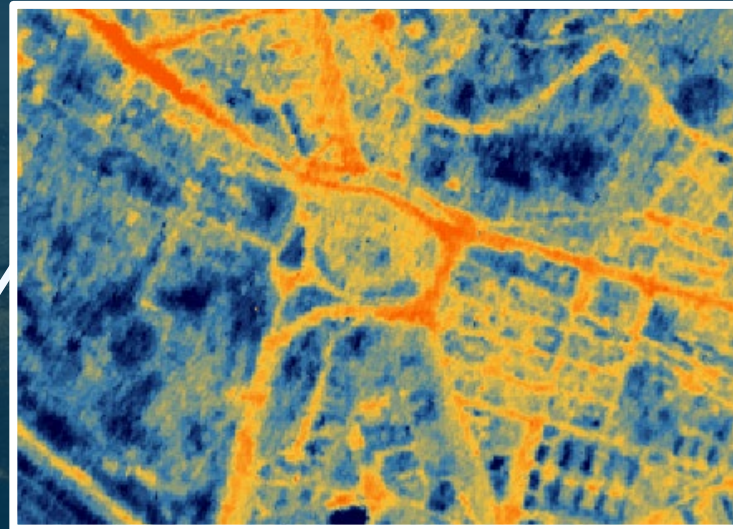
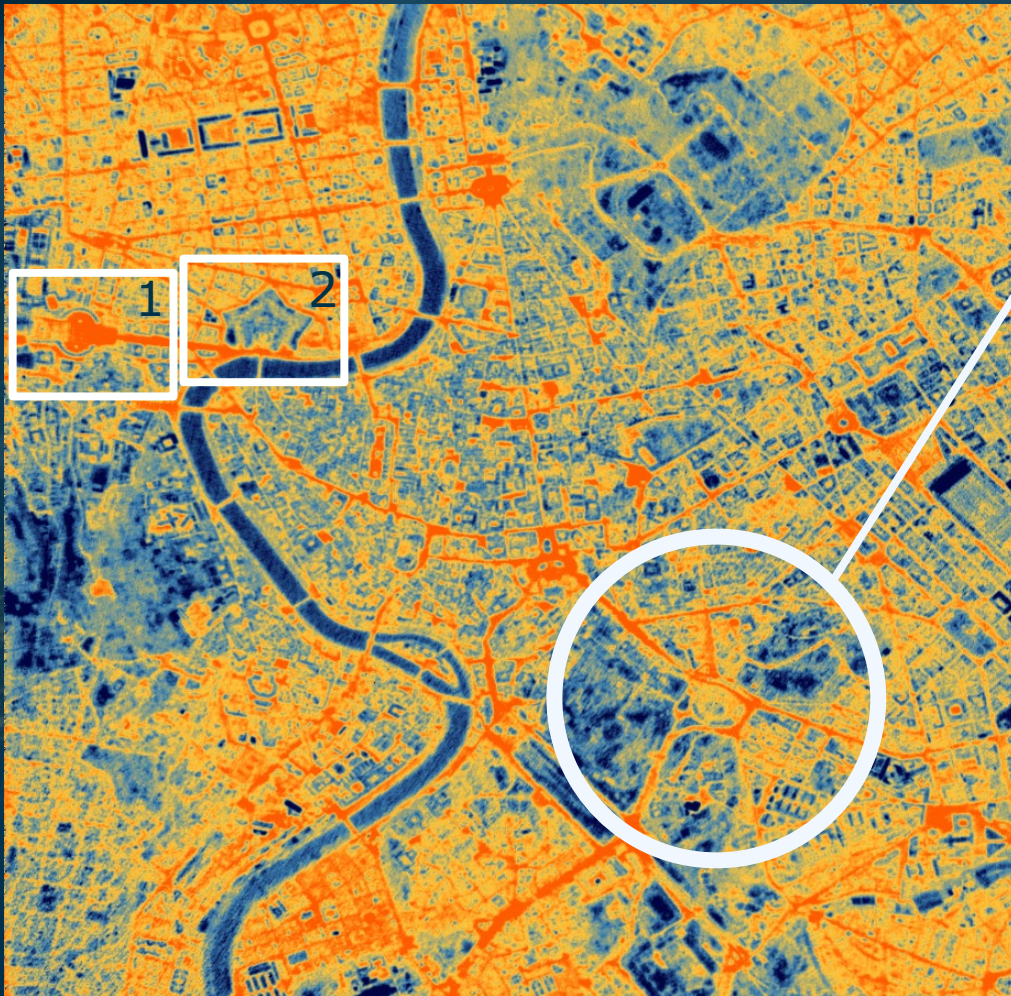
Discover more at:
<https://earth.esa.int/eogateway>

- ❑ **Historical sites stability and integrity** (monitoring and measuring shifts or sinking of the ground on which historical sites are built)
- ❑ **SAR-cheology** (identification of buried archaeological features in dry, desert areas)
- ❑ **Urban sprawl monitoring** (to track evolution of cities and suburbs, which can impact and potentially threaten nearby historical sites)
- ❑ **Risk assessment** (illegal looting, identification and monitoring of damage over historical sites, in particular in conflict or post conflict affected countries)
- ❑ **Impact of climate change to cultural heritage after natural disasters**



Urban Heritage Sites: Heat Risk by SatVu

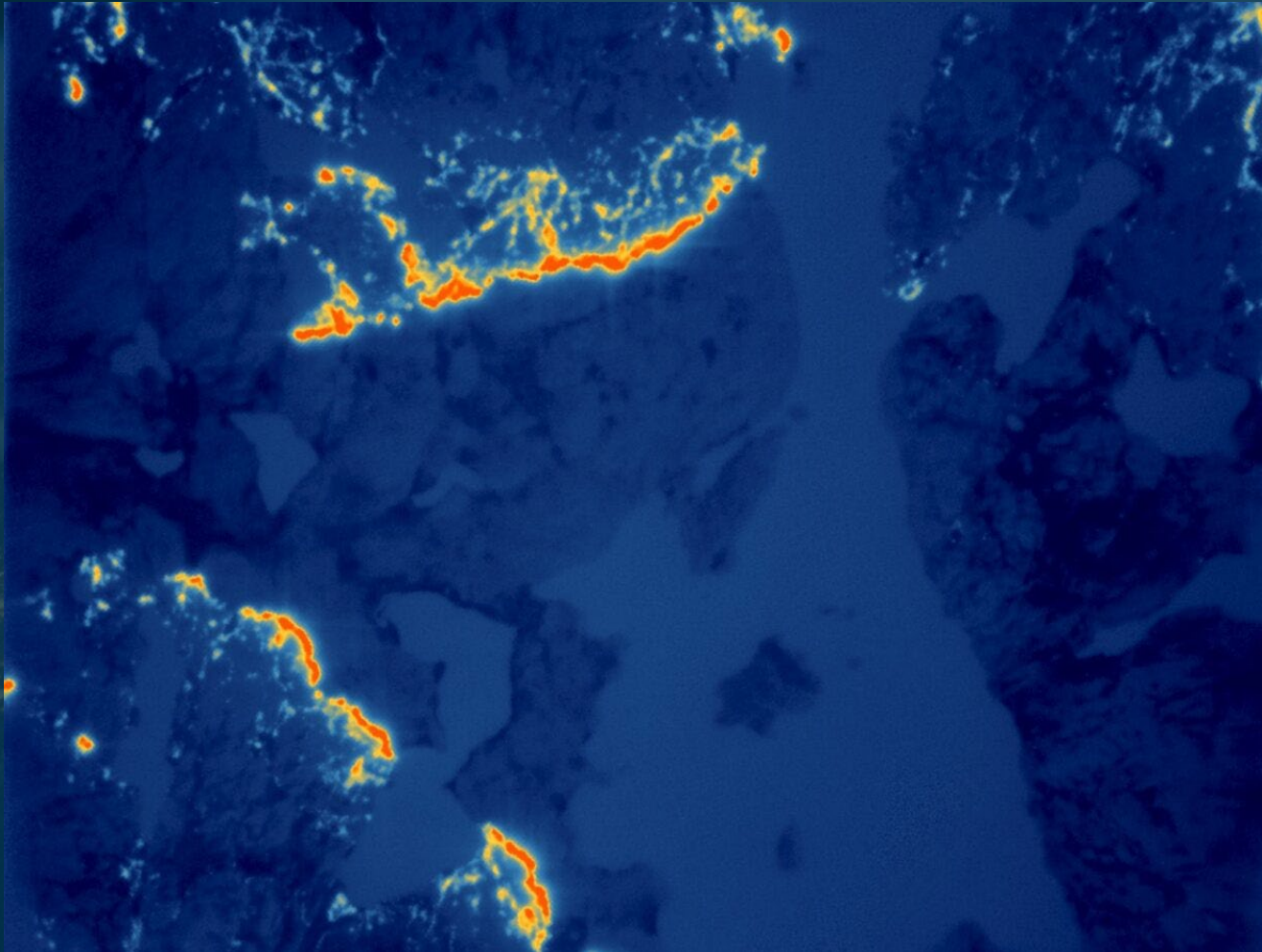
Rome, Italy, 23rd June 2023, 01:00 local time



Evidence of the urban heat island effect are clearly noticeable in this **nighttime image of Rome**. The comparison between the Vatican (1) and tree-lined Castel Sant'Angelo (2) highlights this difference.

- High res thermal also allows us to monitor the impact of the urban heat island effect and extreme heat events on heritage sites.
- You can see the roads around the Colosseum retain heat, increasing the heat risk in the area and potentially affecting historic structures.

Northwest Territories, Canada



27 July 2023

Wildfire fronts are visible

Many archaeological sites are at risk of wildfires.

High resolution thermal data can see through smoke to monitor fire location & movement at night and day.

The improved resolution is particularly useful to locate the fire front, direction of travel and proximity to remote sites.

TPM Announcement of opportunity will be opened in near future for TPM users to request access to Hotsat-1 6-months archive

TPM Data Sample products gallery

Explore Sample Data Products from Third Party Missions



The table below lists examples of sample data products from a range of ESA Third Party Mission (TPM) datasets.

Click on the provided link to preview what these TPMs provide and download samples

 <p>+</p>  <p>GEOSAT-1</p>	 <p>+</p>  <p>GEOSAT-2</p>	 <p>+</p>  <p>IRS-P5 [Cartosat-1]</p>	 <p>+</p>  <p>IRS-P6 [ResourceSat-1]</p>
 <p>+</p>  <p>IRS-P6 [ResourceSat-2]</p>	 <p>+</p>  <p>PAZ</p>	 <p>+</p>  <p>PlanetScope</p>	 <p>+</p>  <p>RapidEye</p>
 <p>+</p>  <p>SkySat</p>	 <p>+</p>  <p>Vision-1</p>	 <p>+</p>  <p>WorldView-3</p>	

● Optical - acquired over ESA's test site at La Crau, France

● SAR - synthetic aperture radar data acquired over a test site at Neustrelitz, Germany

What are TPMs?

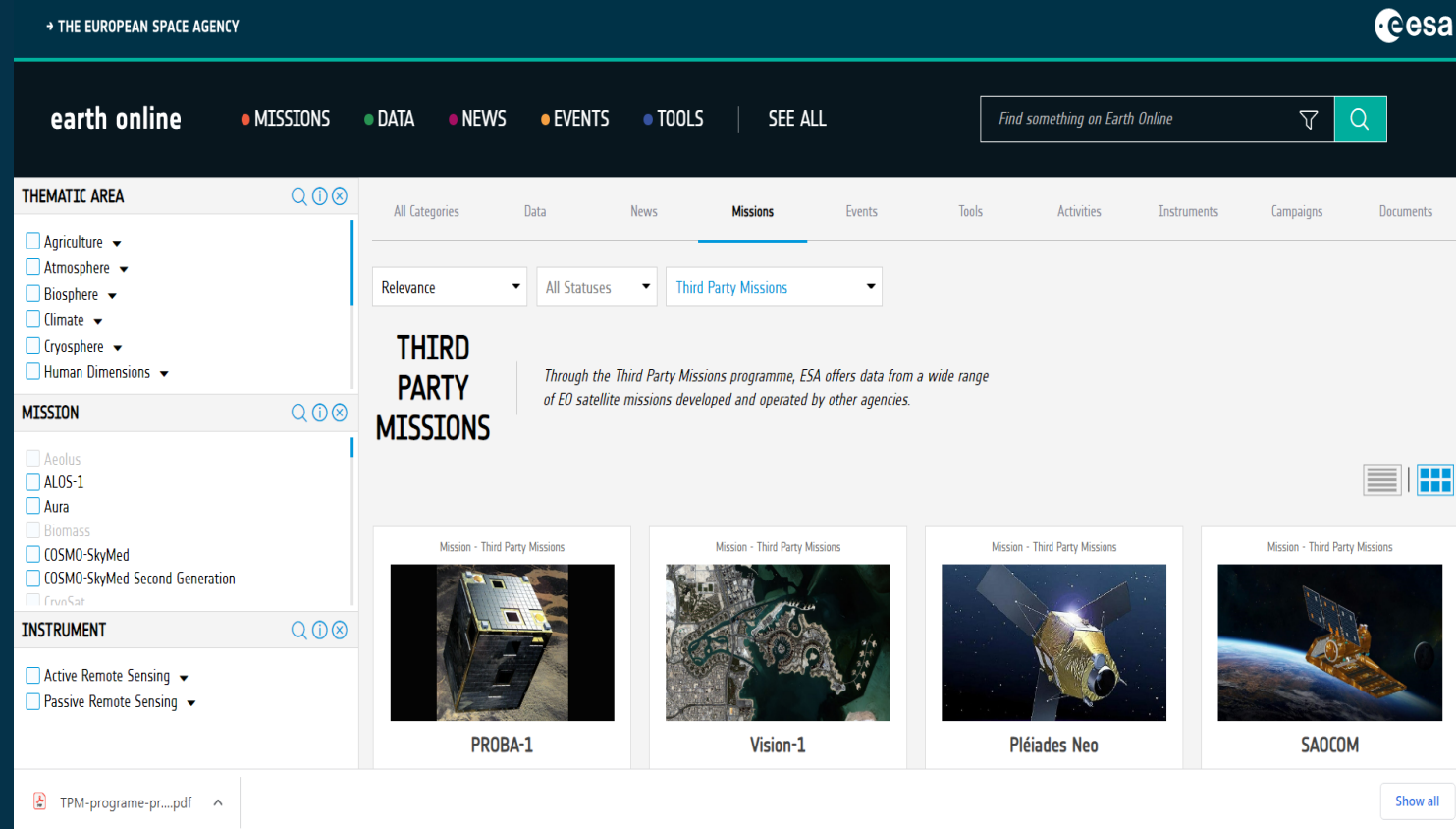
ESA's TPM programme consists of over 50 non-ESA Earth observation satellite missions. ESA provides free access to the wide and growing range of TPM datasets for research and pre-operational applications development

<https://earth.esa.int/eogateway/news/explore-sample-data-products-from-third-party-missions>

How to Access commercial TPM Data – Project Proposal

From the Earth Online mission description page:

<https://earth.esa.int/eogateway/missions/third-party-missions>



1 SELECT
You can search for data products for use in your projects by [browsing the available collections](#)

2 REGISTER
Once you have selected your mission and data collection, a Project Proposal must be completed. To complete the proposal, **you must log in or register an ESA EO Sign-In account**

3 PREPARE
Create and fill-out the proposal, which includes outlining the objectives, methods and deliverables of the project, the composition of the team of researchers and the region of interest. You may optionally add further data collections from different missions to the proposal

4 SUBMIT
Once the proposal is complete, submit it to ESA for evaluation. This process may take up to six weeks, after which the user is notified as to the outcome of the assessment and, if approved, provided with instructions on how to order the products from the data provider

5 PROMOTE
When the project closes, a final report should be submitted. Users are then encouraged to **contact the Earth Online editorial team so a success story about the project can be prepared for the website**. The editors can be reached at: contentmatters4earthonline@ejr-quartz.com

Where to find all this information?

ESA TPM DATA ACCESS GUIDE

<https://earth.esa.int/eogateway>

[TPM Terms & conditions](#)

Go-to guide to Third Party Mission data offering

27 Feb 2024

ESA's latest Third Party Missions Data Access Guide has been published, providing technical details and information on available data collections for all current or past Third Party Missions.

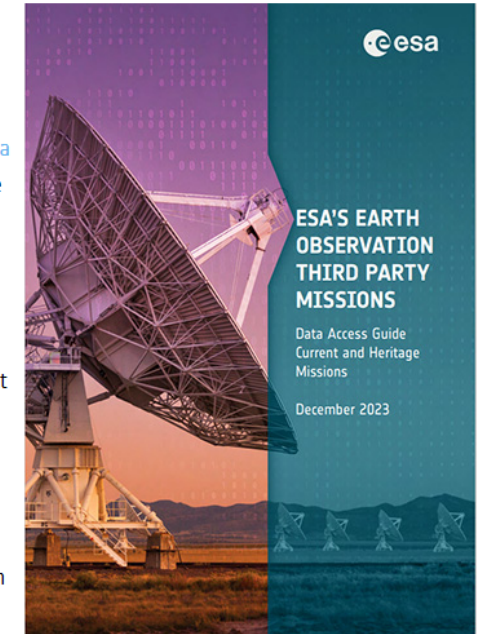
The December 2023 version of [ESA's Third Party Missions \(TPM\) Data Access Guide](#) is now available for download. This is your go-to guide to the offering of TPM data (from current or Heritage missions), including the collection descriptions and how to access them.

The 2023 version of this guide has been revised with respect to the 2022 version, to include recently available data collections provided by new missions in the TPM portfolio – FSSCat, KOMPSAT-1, Landsat RBV, NovaSAR-1 and TanSat.

Featured Datasets - specific subsets of data collections that are freely available online via Immediate Access or Fast Approval - are the topic of one section in the guide. These open datasets provide data over a restricted area and/or with a limited time period and can be obtained following submission of a simple form.

The new featured collections are ALOS PRISM Level-1c European coverage cloud free, GEOSAT-2 Portugal coverage, GEOSAT-2 Spain coverage 2021 consisting of 1 m PAN and 4 m multispectral imagery, Landsat 5 TM European and Mediterranean countries cloud free collection, Landsat 7 ETM+ European and Mediterranean countries cloud free collection and finally, KOMPSAT-1 coverage of 50 European cities.

Other notable new collections, that are not included in the featured section, include Cartosat-1 Euro-Maps 3D, and ESA archives for ICEYE, PAZ, PlanetScope and SkySat.



ESA's Earth Observation Third Party Missions data access guide

TPM data success stories


As part of Earthnet's outreach activities, articles about the use of ESA's Third Party Missions data within the scientific community are regularly published

<https://earth.esa.int/eogateway/missions/third-party-missions>

If you have interesting results to share, please contact the **ESA editorial team** to turn your experience of using ESA Third Party Mission data into a success story.

Please email the team at:
contentmatters4earthonline@ejr-quartz.com

News - Success Stories




2 Nov 2022

Satellites investigate Earth's terrestrial hydrosphere

ESA's Earth observation satellites are playing a leading role in furthering our understanding of how Earth's water cycle is being influence...

News - Success Stories



4 Oct 2022

Remote sensing scientists raise alarm for African savannah

Researchers have used high resolution WorldView-3 imagery to map vegetation cover in the Greater Maasai Mara savannah, ...

News - Success Stories

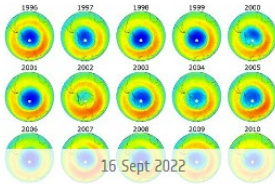


29 Sept 2022

How satellite data help to shape society

Data from ESA's Earth observation archives are improving understanding of the interactions between human activities and t...

News - Success Stories




16 Sept 2022

Satellites track the health of the ozone layer

ESA's Earth observation activities are contributing to international efforts to monitor and preserve the layer of stratospheric ozone...

News - Success Stories

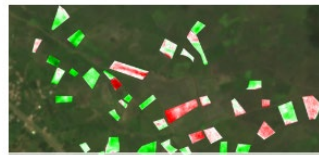


21 July 2022

Space helps monitor Earth's changing biosphere

Earth's biosphere is continually changing. Through its pioneering Earth observation missions, ESA is making critical contributions...

News - Success Stories



5 May 2022

Predicting crop yield using Planet data

The world's population continues to grow, while the climate crisis is raising Earth's temperatures and increasing the likelihood o...

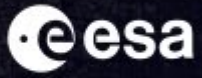
Introduction to CCM Activity



PROGRAMME OF THE
EUROPEAN UNION



co-funded with



ESA procures commercial EO data on behalf of European Commission for Copernicus program
→ *Copernicus Contributing Missions (CCMs)*



Copernicus Contributing Missions

EO data (and associated delivery services)
for operational needs

Data procurement:

- from European established data suppliers
- from **European emerging data suppliers**
- from non-European established suppliers



Copernicus Contributing Missions

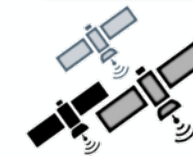
CCM Activity Framework



**Contractual set-up for
VHR Commercial
missions**



**Cooperation agreements
for Institutional missions**
(e.g. Radarsat
Constellation Mission,
Landsat satellites)



Full, free & open missions
for which no agreement is
necessary (e.g. CryoSat, MetOp)

What are the Copernicus Contributing Missions (CCMs)?

- **CCMs support Copernicus by providing commercial data that complement observations from the Sentinel family (current Sentinels and Sentinel Next generation)**
- Functioning mostly in the very high resolution (VHR) OPT/SAR domain, new commercial domains have been introduced (hyperspectral, thermal infrared, atmospheric composition)

ESA's role in the procurement of CCMs? ESA entrusted entity for CCM Activity

- ESA implements an ongoing CCM procurement process on behalf of the European Commission. The procurement aims to leverage commercial advances in remote sensing to satisfy the current and future needs of the Copernicus services
- **The agency launched in October 2022 a new procurement module – called the Dynamic Purchasing System (DPS) for CCM – through which companies can apply to become CCMs**
- 3 procurement categories; two stages: Stage 1 on-boarding; Stage 2 restricted competition amongst qualified companies

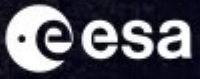
CCMs and Copernicus Services



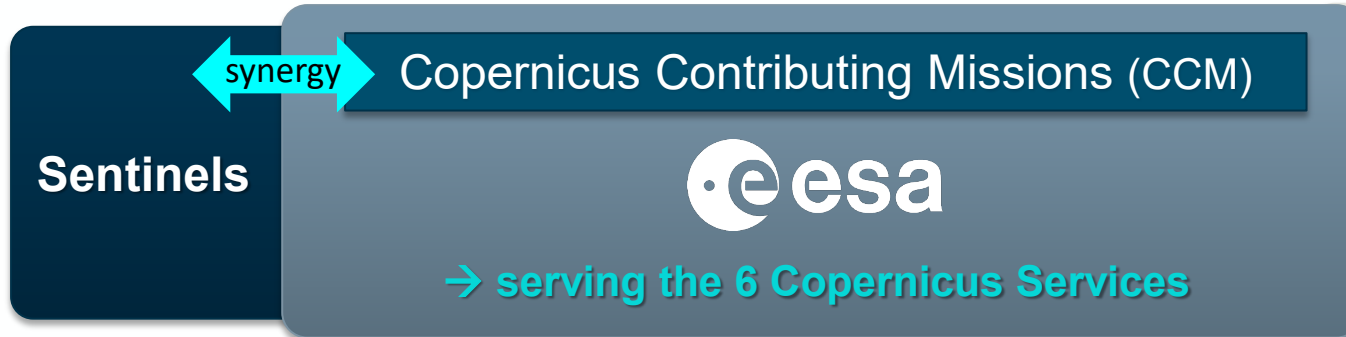
PROGRAMME OF THE
EUROPEAN UNION



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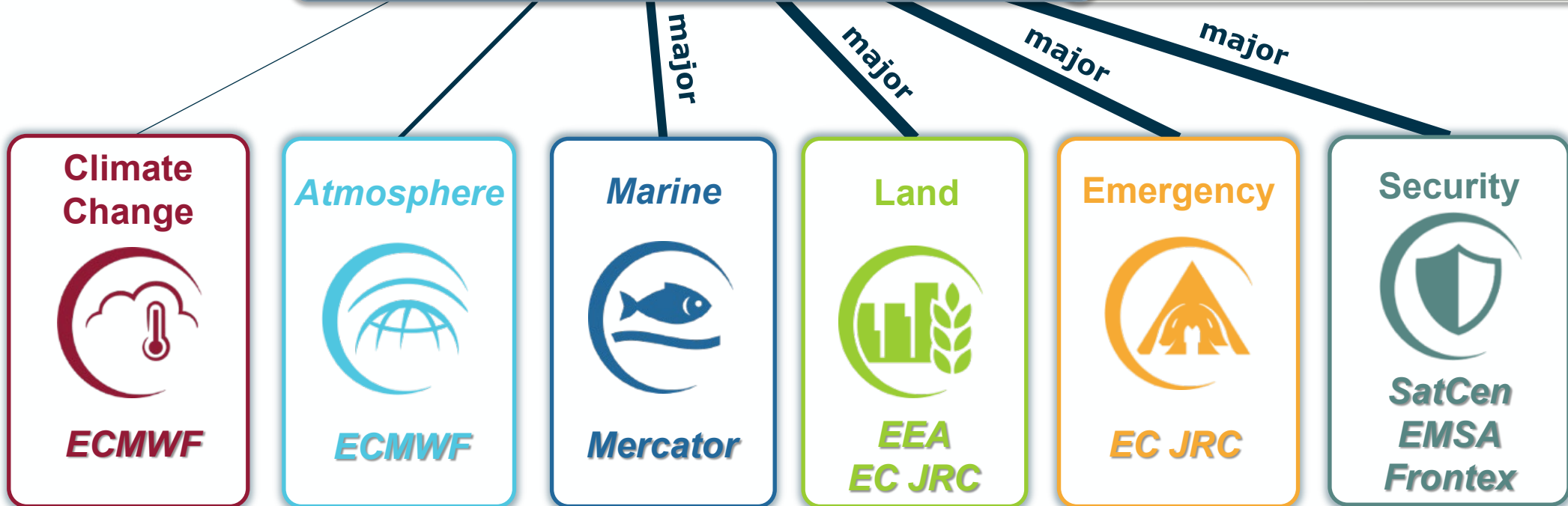


Copernicus
Space
Component



CCM follows an industrial policy:

- EU preference for data buy
- Gradual inclusion of data from European space start-ups
- Importance given to data quality



Copernicus
Service
Component



Current Copernicus Contributing Missions (established and emerging)

- Sensor type
- Synthetic aperture radar
 - Atmospheric composition
 - Multispectral
 - Hyperspectral
 - Thermal
- Optical

- European Emerging CCMs
- Completed mission



Emerging CCMs



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THE EUROPEAN EMERGING COPERNICUS CONTRIBUTING MISSIONS

What are the Emerging CCMs?



Coming from the European New Space ecosystem, the European Emerging Copernicus Contributing Missions (CCMs) are commercial satellite missions aiming to provide Earth Observation data to the Copernicus Programme in complement to Sentinel observations and established Data Providers contribution to fulfil the data needs of the Copernicus Services.



Innovations?

The European Emerging Copernicus Contributing Missions cover different commercial data domains:

- Hyperspectral
- Thermal infrared
- Atmospheric composition
- Multispectral

It is also to be noted that Hyperspectral, Thermal infrared and Atmospheric composition are emerging commercial data domains so far not used in the Copernicus Contributing Missions Programme.



Benefits?

By harnessing the vast and growing array of CCM data, the six thematic Copernicus Services provide high-quality information on **climate change, air quality, land use, and marine ecosystems**. By addressing critical environmental and societal challenges, the Copernicus Programme plays a significant role in fostering sustainable development, enhancing disaster resilience, and supporting evidence-based decision-making at local, regional, and global levels.

How many?

9
x 5 YEARS
MISSIONS

There are currently 9 European Emerging Copernicus Contributing Missions under contract with ESA with a duration of up to 5 years.



For more information visit:

https://www.esa.int/Applications/Observing_the_Earth/Copernicus/New_Space_companies_join_Copernicus

SATLANTIS

GEI-SAT Precursor



GESat

KUVA SPACE

Hyperfield 1



HIVE



FOREST-2



Hydra-2



SPIP



BALKAN-1



ProtoMéthée-1



Example of Macellum site in Pozzuoli (Naples)

Multitemporal data



©ArcheoFlegrei.it

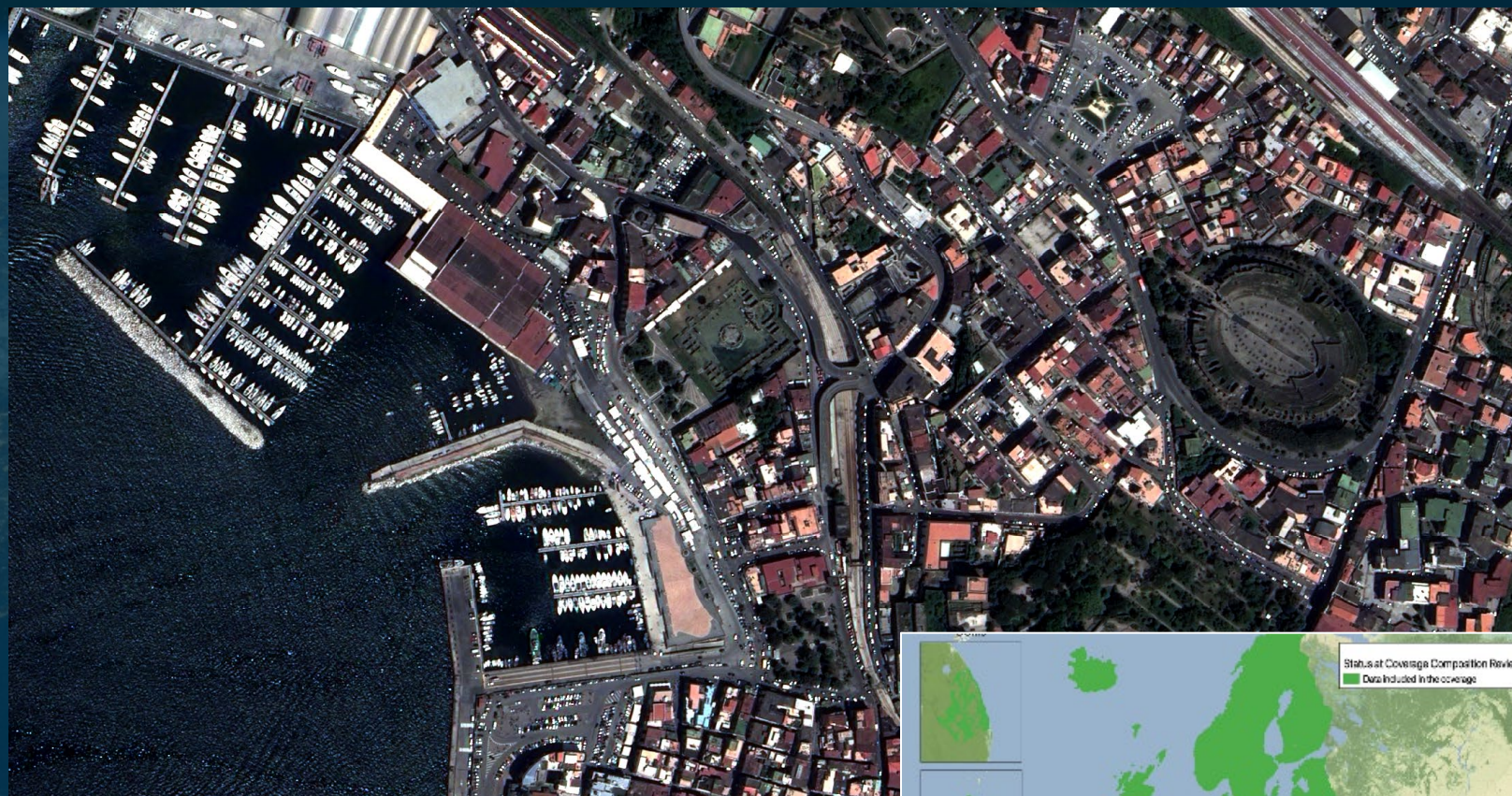
Pansharpend Pleiades at 0.5 m

2014 NCC

PAN available in VHR_IMAGE_2015

©Pleiades CNES 2014, distributed by Airbus DS provided under COPERNICUS by the European Union and ESA, all rights reserved.

[Click here for further info on the systematic collections](#)



Large coverage datasets

Description	Acquisition window	Resolution
One coverage of 38-39 European states and the French Overseas Departments. Such coverages are generated every 3 years	Vegetation season in reference years 2012, 2015, 2018, 2021 and 2024 (under acquisition)	1-4 m



Example of Macellum site in Pozzuoli (Naples)

Multitemporal data



© pafleg.cultura.gov.it

VHR_IMAGE_2015



PLEIADES 1A – 09/05/2014 at 10.12
VNIR 2 m

VHR IMAGE 2021



PLEIADES 1B – 15/06/2021 at 10.08
VNIR 2 m

False Colour Composite 432

- Dark blue water
- Red vegetation/tree
- White ground/limestone



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© visitnaples.eu

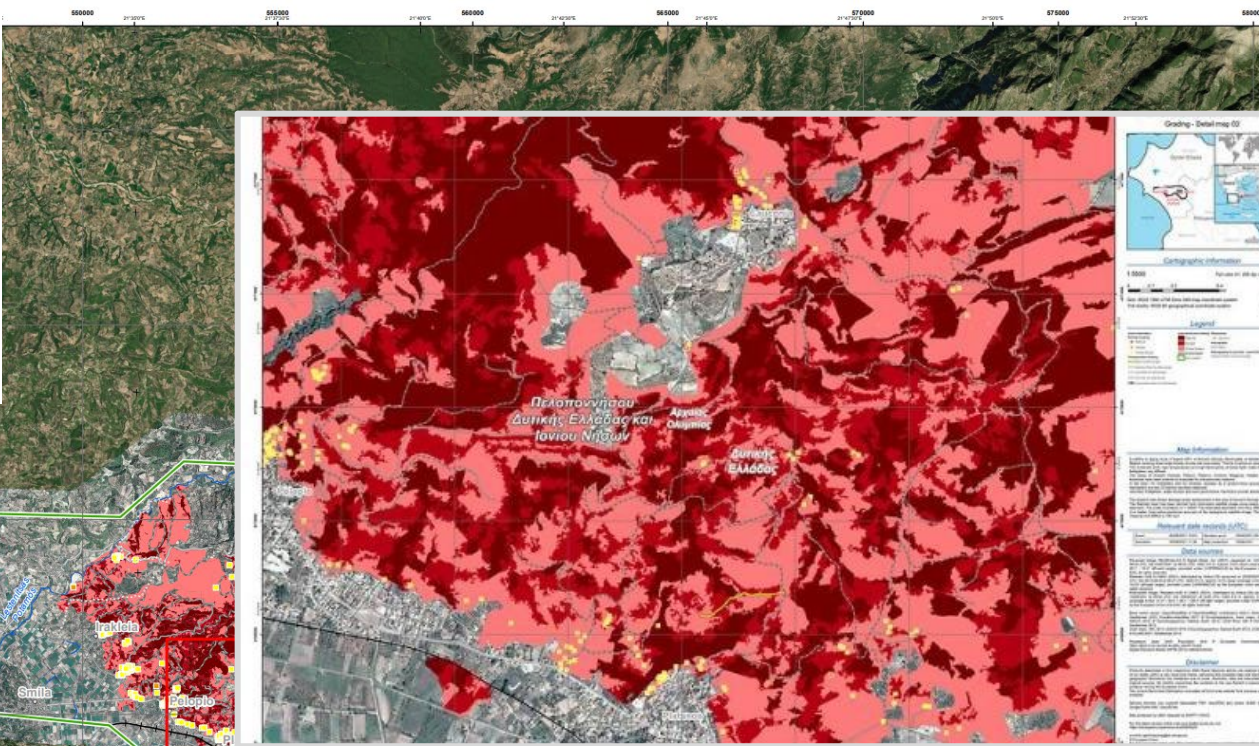
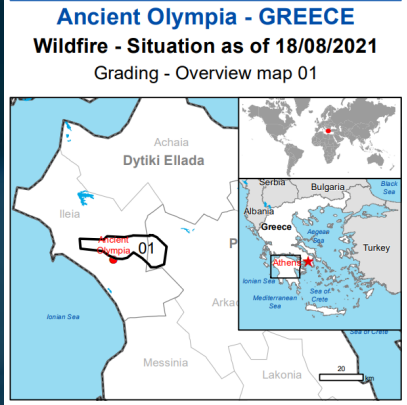
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→ THE EUROPEAN SPACE AGENCY

EMSR 528 – Wildfire affecting Ancient Olympia

GLIDE number: N/A Activation ID: EMSR528
Int. Charter Act. ID: N/A Product N.: 01ANCIENTOLYMPIA_v1



A wildfire occurred in 4 July 2021 in Ancient Olympia Municipality at Western Greece Region, burning down large forests of pine and rural areas.

Pre-event image:

World View - 2/3, (acquired on 14/07/2021 at 09:44 UTC, the 03/07/2021 at 09:22 UTC, GSD 0.5m). © Digital Globe 2021, Inc. provided under COPERNICUS by the European Union and ESA, all rights reserved.

Pléiades - 1A/B (acquired on 25/05/2021 at 09:31 UTC, the 26/10/2018 at 09:27 UTC, GSD 0.5m), ©CNES 2021, distributed by Airbus DS provided under COPERNICUS by the European Union and ESA, all rights reserved.

Post-event image:

Pléiades - 1A/B (acquired on 15/08/2021 at 09:50 UTC, the 18/08/2021 at 9:28 UTC, GSD 0.5 m), ©CNES 2021, distributed by Airbus DS provided under COPERNICUS by the European Union and ESA, all rights reserved.

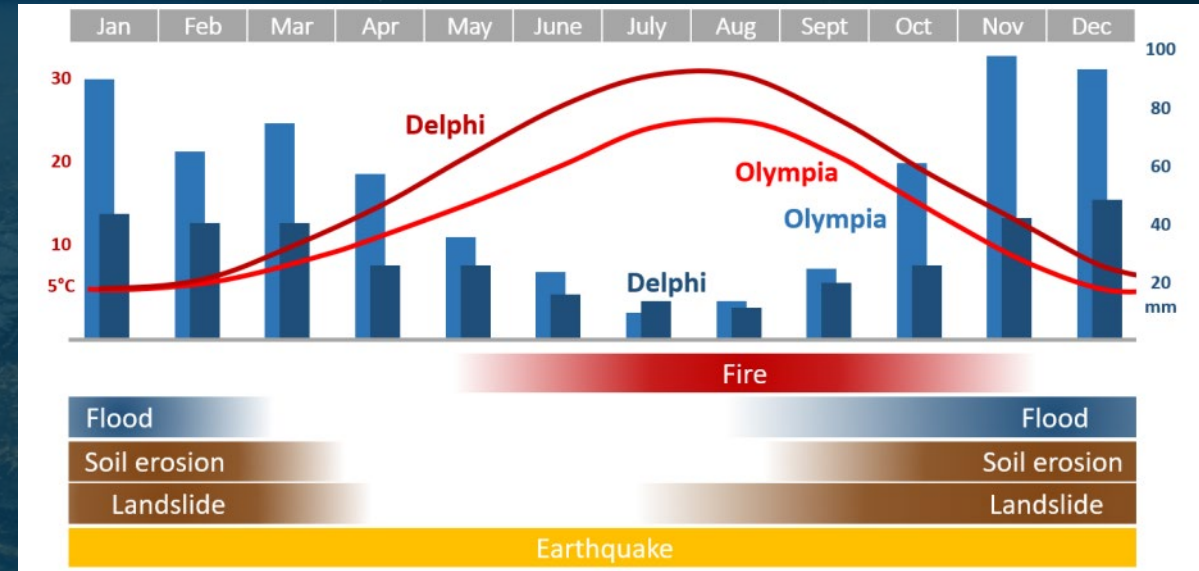
Legend

Crisis Information	Transportation Grading	Land Use-Cover Grading	Placenames
Built Up Grading	Road, Possibly damaged	Destroyed	Placename
Destroyed	Primary Road, No visible damage	Damaged	Hydrography
Damaged	Secondary Road, No visible damage	Possibly damaged	River
Possibly damaged	Local Road, No visible damage	General Information	Stream
	Cart Track, No visible damage	Area of Interest	Lake
	Long-distance railway, No visible damage	Detail map	Physiography & Land Use - Land Cover
		Not Analysed	Features available in the vector package
		Administrative boundaries	
		Province	
		Municipality	

CEMS Multi-risk analysis supported by CCM



The Risk & Recovery Mapping component of the Copernicus Emergency Management Service has been activated by Greece in May 2022 to develop multi-risk analyses for the Delphi and Ancient Olympia archaeological sites in Greece. This activation produced hazard, exposure, vulnerability, and risk geo-data and maps for forest fires, flash floods, plain floods, earthquakes, landslides, soil erosion.



<https://emergency.copernicus.eu/mapping/list-of-components/EMSN128>

Data set/ source	Description/ Quality parameters
Pléiades Source: Copernicus Space Component Data Access system (CSCDA) mechanism/ website	Date/Time: 2021-08-11 09:31:43 UTC, 2021-05-19 09:27:14 UTC, 2021-05-19 09:27:56 UTC, 2021-05-25 09:30:46 UTC Spatial resolution (GSD): 0.5m Cloud coverage: 0% Incident angle: 13.9°,11.1°,14.3°,9.4° Number of scenes: 4
WorldView-2, WorldView-3 Source: Copernicus Space Component Data Access system (CSCDA) mechanism/ website	Date/Time: 2021-06-20 09:28:10 UTC, 2021-07-03 09:22:28 UTC Spatial resolution (GSD): 0.5m Cloud coverage: 0% Incident angle: 5.4°,11.3° Number of scenes: 2

source EMS INFORMATION BULLETIN Nr 161



Man-made destruction of CH



Man-made destruction of Cultural Heritage is a growing concern worldwide (e.g. Palmyra destruction in Syria, etc.). Many countries have at-risk Cultural Heritage sites and hence have interest to collaborate with the EU in this field.

Pleiades 1B –
08/08/2014 at 08.16
– 2m VNIR

WorldView1 –
30/03/2021 at 08.10
– PAN 0.5 m

Activation from CEMS Risk and Recovery

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©Photo reportage from [Corriere.it](https://www.corriere.it)

User categories and access rights to established CCM data



Who can access Copernicus Contributing Missions data ?	Viewing data (no download)	Downloading data	Tasking satellites
Copernicus services	✓	✓	✓
EU institutions & bodies	✓	✓	
Research projects funded by EU	✓	✓	*
Public Authorities (national, regional, local)	✓	✓ *	
International organisations & NGOs	✓	*	
General public	✓		

*Simplified table. Full details in the Annex 2 of [Data Access Portfolio](#) and at: <https://spacedata.copernicus.eu/web/guest/collections>





<https://earth.esa.int/eogateway/events/vh-roda>



VH-RODA 2024

02-06 December 2024 | ESA-ESRIN



Pyramids of Giza (Egypt)
Vision-1 © Airbus Defence and Space Limited (2020)



Angkor Wat (Cambodia)
Planet Labs © SkySat (2021)



Burned areas in Tunisia
WorldView-3 © (2023) Maxar

Thank you
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