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ESA'S EARTH OBSERVATION THIRD PARTY MISSIONS

Data Access Guide
Current and Heritage
Missions

July 2024

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TABLE OF CONTENTS

1. INTRODUCTION

1.1 Purpose

In addition to providing users with data from its own Earth observing (EO) satellites, the European Space Agency (ESA) has long provided users with access to a number of non-ESA EO missions – so called Third Party Missions (TPM).

The purpose of this document is to help users identify the various types of data that are available from these missions, the kinds of applications that the data may be used for, and, importantly, the practical procedures required for access, including registration, search, selection and retrieval of the data of interest.

1.2 Scope

ESA's TPM scheme has operated for more than 40 years, in the frame of the 'Earthnet' programme, providing EO data to users in Europe and around the world, and currently includes over 60 instruments on more than 50 missions. This reflects the needs of the majority of users who rely on a combination of EO data, both to increase sustainability of their services and to complement the range of observation parameters. ESA TPMs include missions still in operation as well as historical datasets (e.g., only archived data are available). TPM datasets are transferred to the Heritage Space Programme five years after the end of a mission or the agreement with the owner.
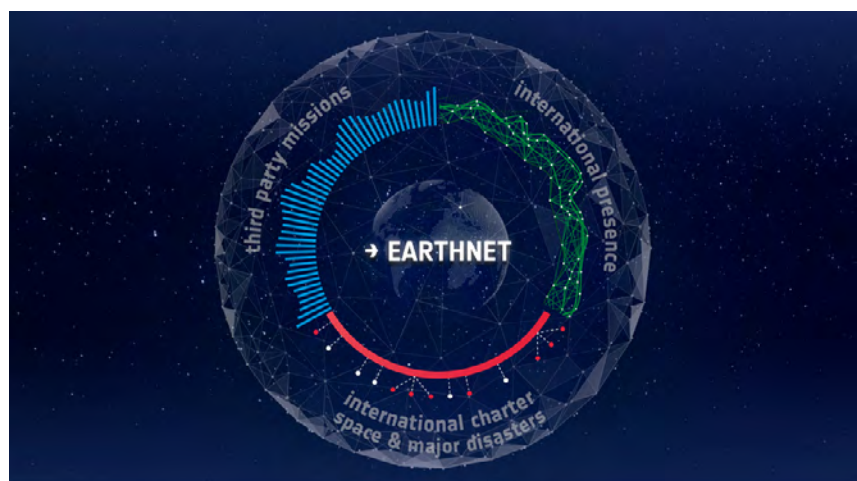
A TPM is a mission that is operated by any legal body, governmental or non-governmental, other than ESA, for which:

- ESA assumes some formal responsibility towards the mission operator or to which ESA contributes financially, usually through sharing of ground segment facilities or operations;
- ESA assumes a data distribution responsibility to a European or worldwide user community; or,
- ESA otherwise procures the right to sub-license data to users under the TPM scheme.

The benefits of individual TPMs are reviewed as part of the EO data portfolio on an annual basis. The review includes identification of missions – proposed either by ESA, ESA Member States or through user projects as potential ESA TPM candidates. A technical and scientific evaluation is performed, including review by the Earth Science Advisory Committee (ESAC), taking into consideration the mission characteristics, the type of data to be provided by the mission, as well as complementarity to both ESA missions and other TPMs. Emphasis is given to the potential for use in scientific contexts and pre-operational applications.

In the past, the TPM scheme was focused on serving European users with regional acquisitions. However, in recent years, evolving user requirements and a growing user community have broadened the geographic extent covered. Today, the TPM scheme also covers regions outside Europe, in some cases with worldwide coverage, and serves many non-European users. Furthermore, improvements in technology and the internet have led to an evolution in access mechanisms, with data no longer only directly receivable via transmission to European ground stations.

As an increasing number of EO applications evolve and reach maturity, the users of the TPM scheme have expanded beyond pure research to include application development and pre-operational use, including those funded by ESA's programmes and TPM Under Assessment.

The reader should note that operational Copernicus data access is outside the scope of this document. More information on Copernicus can be found here: *www.esa.int/Our_Activities/Observing_the_Earth/Copernicus*

1.3 Contents and How to Use this Document

Section 2 contains commonly used acronyms, including agency acronyms.

Section 3 explains ESA's overall data policy and the process to order and obtain TPM data.

Section 4 helps users understand and select data from the various types available. Available data are categorised to aid selection and a summary of available coverage – both spatial and temporal – is given.

Section 5 explains the various methods available for accessing data and contains information on the EOHelp team and on how to get assistance with accessing and using TPM products.

Section 6 provides an in-depth explanation of the data product characteristics for each TPM mission / instrument, along with any special conditions regarding coverage or availability.

Section 7 presents a summary of the Featured Datasets that are generally freely available online via Immediate Access or Fast Approval. **Featured Datasets** are specific subsets of the collections represented in Section 6 and provide access to data over a restricted area and/or within a limited period.

Section 8 highlights some future/potential additions to the ESA TPM portfolio.

This guide is available online at:
https://earth.esa.int/eogateway/documents/20142/37627/Third-Party-Mission-Data-Access-Guide.pdf

2. ACRONYMS

2.1 Organisation Acronyms

Airbus DS	Airbus Defence and Space
ASI	Agenzia Spaziale Italiana
Azercosmos	Space Agency of the Rebulic of Azerbaijan
BLMIT	Beijing Landview Mapping Information Technology
CDTI	Centre for the Development of Industrial Technology (Spain)
CEOS	Committee on Earth Observation Satellites
CNES	Centre National d'Études Spatiales (France)
CNTS	Centre National des Techniques Spatiales (Algeria)
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
CSA	Canadian Space Agency
DLR	Deutsches Zentrum für Luft- und Raumfahrt
DMCii	Disaster Monitoring Constellation Imaging International
ESA	European Space Agency
ESAC	Earth Science Advisory Committee
ESRIN	European Space Research Institute
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUSI	European Space Imaging
FMI	Finnish Meteorological Institute
GFZ	German Research Centre for Geosciences
Hisdesat	Hisdesat Servicios Estratégicos S.A.
ISRO	Indian Space Research Organisation
JAXA	Japanese Aerospace Exploration Agency
JPL	NASA Jet Propulsion Laboratory
JRC	Joint Research Centre of the European Commission
KARI	Korea Aerospace Research Institute
Maxar	Maxar Technologies Inc.
MDA	MacDonald, Dettwiler and Associates Ltd.
MoD	Italian Ministry of Defense
MOE (Japan)	Ministry of the Environment (Japan)
MUR	Italian Ministry of Research

NASA	National Aeronautics and Space Administration (USA)
NASDA	National Space Development Agency (Japan, now JAXA)
NARSDA	National Space Research and Development Agency (Nigeria)
NIES	National Institute for Environmental Studies (Japan)
NIVR	Netherlands Agency for Aerospace Programmes
NOAA	National Oceanic and Atmospheric Administration (USA)
NRSCC	National Remote Sensing Center of China
NSERC	Natural Sciences and Engineering Research Council of Canada
NSMC	National Satellite Meteorological Centre (China)
NSO	Netherlands Space Office
SNSA	Swedish National Space Agency
SSC	Swedish Space Corporation
SSTL	Surrey Satellite Technology Ltd.
TEKES	National Technology Agency of Finland
TUBITAK	Scientific and Technological Research Countil of Turkey
UKSA	United Kingdom Space Agency
USGS	United States Geological Survey
UTCSR	University of Texas Center for Space Research

2.2 Technical Acronyms

ADEN	ALOS Data European Node
AIS	Automatic Identification System before BSQ
BSQ	Band Sequential
CCD	Charge-Coupled Device
CZCS	Coastal Zone Colour Scanner before DEM
DEM	Digital Elevation Model
DSM	Digital Surface Model
EDAP	Earthnet Data Assessment Pilot
EOC	Electro-Optical Camera before EDAP
EO	Earth Observation
FBD	Fine Beam Double (Polarisation)
FBS	Fine Beam Single (Polarisation)
FTP (Server)	File Transfer Protocol (Server)
GCP	Ground Control Point
GIS	Geographic Information System
GPS	Global Positioning System
HDF	Hierarchical Data Format
IR	Infrared
LTAN	Local Time of Ascending Node
MS	Multi-Spectral
NDVI	Normalized Difference Vegetation Index
NIR	Near-Infrared
NRT	Near Real Time

OSA	Optical Sensor Assembly
PAN	Panchromatic
PI	Principal Investigator
QA	Quality Assessment
PPP	Public-Private Partnership
RBV	Return Beam Vidicon before RT
RT	Real Time
R&D	Research & Development
SAR	Synthetic Aperture Radar
SeaWiFS	Sea-viewing Wide Field-of-view Sensor before SMR
SMR	Sub-Millimetre Radiometer
SR	Surface Reflectance
ST	Surface Temperature
SW	Short Wavelength
SWIR	Shortwave Infrared
TIR	Thermal Infrared
TPM	Third Party Mission
TPMO	TPM Owner/Operator
VIS	Visible
VNIR	Visible Near Infrared

3. ESA'S EARTH OBSERVATION DATA POLICY

3.1 Data Policy

ESA's updated Earth Observation Data Policy was approved by ESA Member States with the objective of maximising the beneficial use of ESA EO mission data and to stimulate balanced development of scientific, public utility, and commercial applications, consistent with the given mission's objectives. The same principles apply for TPM data, which are disseminated by ESA in accordance with the mission owners' applicable data policies.

TPM data are offered in support of research and application development, including research on long-term issues of Earth system science, research, development in preparation for future operational use, and ESA internal use.

Eligible Principal Investigators (PI) worldwide can apply for TPM data for these purposes, including any research and development (R&D) entity (e.g., universities, research institutions), as well as R&D and innovation teams of commercial European companies exclusively for non-commercial and non-operational activities. Restrictions may apply to users from certain countries, depending on license conditions and national security legislation in the data provider's country.

3.2 Legal

The full details of the TPM applicable Terms and Conditions (rights and obligations of the Project's PI and of ESA) are provided to the science user for acceptance and signature.

There are some general abiding principles that apply:

– The PI acknowledges the full title and ownership, including all derived rights, by the TPM Owner/Operator (TPMO) of all TPM data;

– The PI assumes full responsibility for the TPM data utilisation, including utilisation with co-investigators. If applicable, the PI shall provide ESA with a detailed list of all co-investigators;

– The PI undertakes that the data supplied shall not be copied, transferred, or otherwise be made available to third parties without the written consent of the TPMO through ESA;

– The PI shall publish the results achieved using TPM data in peer-reviewed journals and/or present results at dedicated workshops, preferably organised by ESA;

– The PI acknowledges and takes account of scheduling and processing constraints both at satellite and ground segment level;

– The PI is authorised to undertake duplication of data as necessary for the performance of the Project, without any charges to ESA or to the TPMO.

Full details can be found online at:
https://earth.esa.int/eogateway/documents/20142/1560778/ESA-Third-Party-Missions-Terms-and-Conditions.pdf

4. UNDERSTANDING AND SELECTING FROM THE DATA AVAILABLE

4.1 The Different Data Types Available from ESA TPMs

Most instruments whose data are available through the ESA TPM scheme can be divided into three broad categories.

Radar Imagery

These instruments transmit at frequencies of around 1–10 GHz and measure the backscattered signals to generate microwave images of the Earth's surface. Both Synthetic Aperture Radars (SARs) and real aperture side-looking imaging radar systems fall into this category. The images produced have resolutions comparable to those of high to medium resolution optical imagers, but radars have the capability to 'see' through clouds, providing data on an all-weather, day/night basis.

Applications include the detection of ocean surface waves, fronts, eddies and oil slicks, detection and tracking of ships from their wakes, operational sea ice forecasting and, on land, the identification of vegetation type and cover as well as forestry and agriculture applications. The ability of SARs to penetrate cloud cover makes them particularly valuable in rainforest studies and resource monitoring applications.

Optical/Multispectral (MS) Radiometry

Visible/infrared imaging MS radiometers are used to image the Earth's atmosphere and surface across a number of spectral bands. The highest resolutions start at the sub-1 m level up to medium and low resolution in the kilometre range. Swath widths can range from tens to hundreds of kilometres.

Low-resolution MS data can be used to gather large-scale/broad environmental information, such as land cover and ocean colour/temperature. Medium-resolution data are typically used to reveal features such as towns or large roads; high resolution offers views of small roads or even the differentiation of individual cars and houses, for example.

Atmospheric Data

Atmospheric data are derived from several types of instruments that use various techniques and different parts of the electromagnetic spectrum to undertake measurements of the atmosphere's composition. Each atmospheric gas is characterised by its 'absorption' and 'emission' spectra, which describe how the molecules respond to different frequencies of radiation. Remote-sensing instruments exploit these 'signatures' to provide information on atmospheric composition, using measurements over a range of wavelengths between ultraviolet and microwave.

Applications include: pollution monitoring; climatology, including studies of the carbon cycle; volcanic eruption monitoring; and operational meteorology.

Other Data

Other data covers additional instruments that are not covered by radar imagery, optical/multispectral radiometry or atmospheric instruments.

4.2 Levels of Data Processing

The data observed by an instrument are typically transformed, by the application of an appropriate algorithm, into data relevant to the phenomenon of interest. For example, wind vectors over the ocean can be derived from the response given by a radiometric signal after reflection from the surface of the ocean. In most cases, several algorithms are applied in series to arrive at the desired final product. While each data provider, mission and instrument may have their own conventions, the following processing levels are based on the CEOS convention and are representative of the levels of data processing that are generally available:

· **Raw Data**: Data in their original packets, as received from a satellite.

· **Level 0:** Reconstructed unprocessed instrument data at full space-time resolution with all available supplemental information to be used in subsequent processing appended (e.g., ephemeris, health, and safety).

· **Level 1:** Unpacked, reformatted Level 0 data, with all supplemental information to be used in subsequent processing appended. Optional radiometric and geometric correction (i.e., orthorectification) applied to produce parameters in physical units. Data are generally presented in full space/time resolution. A wide variety of sub-level products are possible.

· **Level 2:** Retrieved environmental variables (e.g., ocean wave height, soil moisture, ice concentration) at the same resolution and location as the Level 1 source data.

· **Level 3:** Data or retrieved environmental variables that have been spatially and/or temporally resampled (i.e., derived from Level 1 or 2 products). Such resampling may include averaging and compositing.

Each Level represents a step in the process of transforming physical information (raw, Level 0, Level 1) into relevant geophysical information (Level 2, Level 3).

4.3 Summary of Heritage, Current and Potential Third Party Missions and Instruments

Missions and instruments under the TPM scheme are divided into three categories: Current, Potential and Heritage.

Current missions are those missions and instrument that are still operational and active. Heritage missions are the missions that are no longer operational.

Potential missions may become available in the future via the ESA TPM scheme. These missions have either been launched recently, are planned for launch soon, are existing/ past missions for which a data agreement with ESA is under discussion and thus not yet in place, or for which agreements are in place, but technical implementation is not yet finalised. See Earth Online (*https://earth.esa.int*) for the most recent updates.

CURRENT		
	Mission	**Instrument**
Optical (Very High Resolution)	GeoEye-1	GIS
	GEOSAT-2	HiRAIS
	PlanetScope	Imager
	Pleiades 1A/1B	HiRI
	Pleiades NEO	PNEO
	SkySat	Cassegrain
	SPOT 6	NAOMI
	Vision 1	S1-4 Imager
	WorldView-1 / 2 / 3	WV-110
Optical (Med/High Resolution)	GEOSAT-1	SLIM
	Landsat-8	OLI
	PROBA-1	HRC
	ResourceSat-2 (IRS-R2)	LISS-III/IV / AWiFS
Optical (Low/Med Resolution)	Landsat-8	TIRS
Radar (Very High Resolution)	COSMO-SkyMed	SAR 2000
	COSMO-SkyMed Second Generation	SAR 2000
	ICEYE	X-band SAR
	PAZ	X-band SAR
	RADARSAT-2	C-band SAR
	SAOCOM	L-band SAR
	TerraSAR-X / TanDEM-X	X-band SAR
Radar (Med/High Resolution)	NovaSAR-1	SAR S-band
Atmospheric Data	Aura	OMI
	GHGSAT	WAF-P Imaging Spectrometer
	GOSAT	TANSO-CAI
	GOSAT-2	TANSO-FTS
	Odin	OSIRIS / SMR
	SciSat-1	ACE-FTS / MAESTRO
Other	Spire	STRATOS / SENSE / AIRSAFE

CURRENT

HERITAGE		
Optical (Very High Resolution)	CartoSat-1 (IRS-P5)	PAN
	Ikonos-2	OSA (PAN and MS)
	KOMPSAT-2	MSC
	SPOT 7	NAOMI
	QuickBird	BGIS2000
	WorldView-4	WV-110
Optical (Med/High Resolution)	ALOS-1	AVNIR-2 / PRISM
	DMC	SLIM-6
	FSSCat	HyperScout-2
	IRS-1C/D	LISS-III / PAN / WiFS
	JERS-1	OPS
	KOMPSAT-1	EOC
	Landsat-1 / 2 / 3 / 4 / 5	MSS
	Landsat-3	RBV
	Landsat-4 / 5	TM
	Landsat-7	ETM+
	MOS-1A/1B	MESSR / VTIR
	PROBA-1	CHRIS
	RapidEye	REIS
	ResourceSat-1 (IRS-P6)	LISS-III/IV / AWiFS
	SPOT 1 / 2 / 3	HRV
	SPOT 4	HRVIR
	SPOT 5	HRG/HRS
Optical (Low/Med Resolution)	OceanSat-2	OCM-2
Radar (Very High Resolution)	RADARSAT-1	C-band SAR
Radar (Med/High Resolution)	ALOS-1	PALSAR
	JERS-1	L-band SAR
	SeaSat	L-band SAR
Atmospheric	POES and Metop	AVHRR
	Tansat	ACGS / CAPI
Other	GRACE	Grace Instrument

POTENTIAL		
Optical (Low/Med Resolution)	BRO	RF / SIGINT
	IRS-P3	MOS
	Nimbus-7	CZCS
Other	RISAT	SAR C-band

4.4 Timeline of TPM Missions

The following timeline shows the instrument type and launch and end-of-life year of current, heritage and potential TPM missions.

ESA THIRD PARTY MISSIONS 2024

■ Operational
■ Past
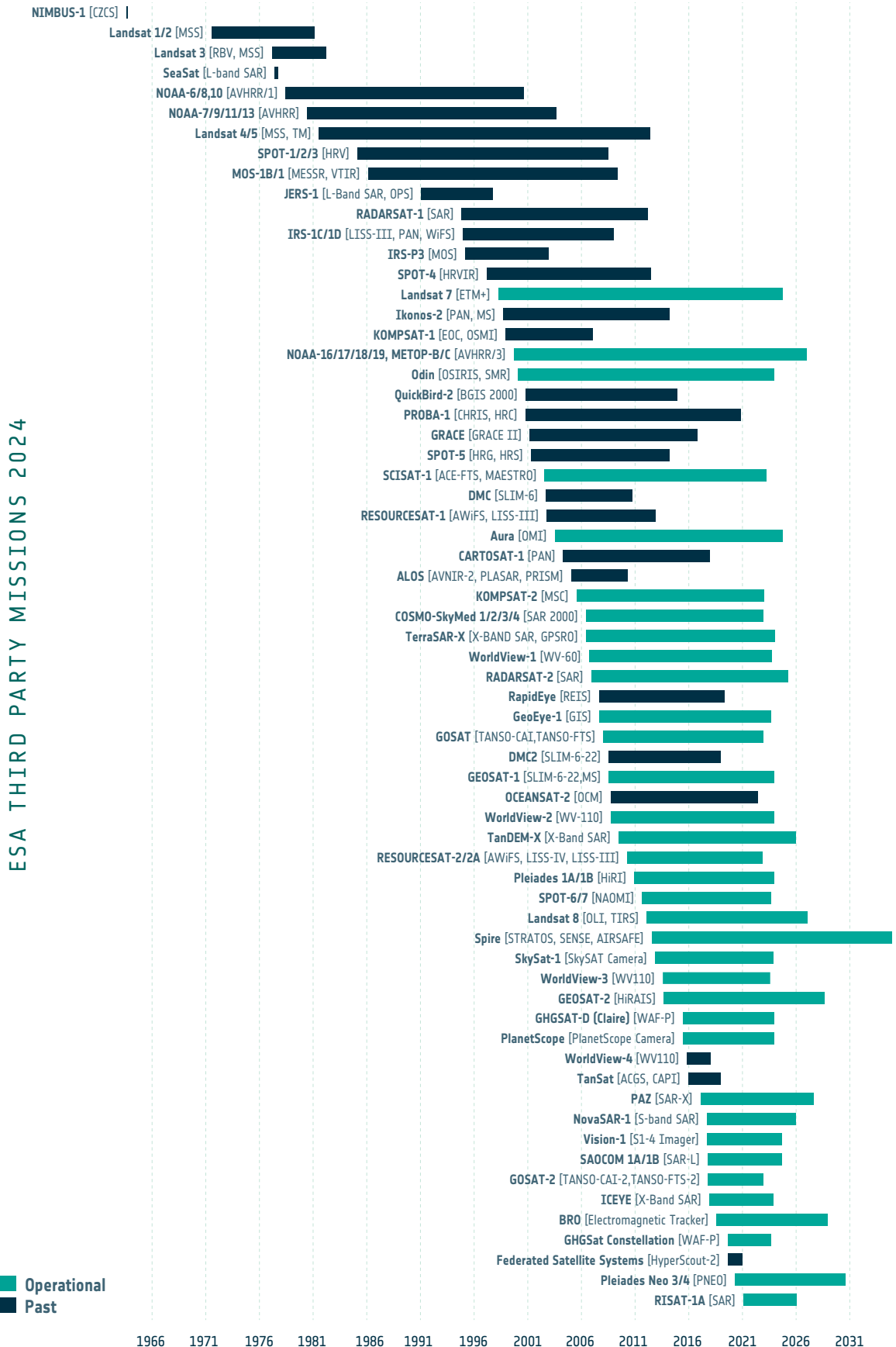
4.5 Types of TPM Data Collections

There are different mechanisms by which ESA TPM data is made available to users. Users can either request new data acquisitions, request access to both ESA or third party archives, or access 'Featured Datasets'. ESA archives include ESA-hosted copies of specific data previously requested by other TPM users.

On Request Collections

Also known as On Demand Data, these collections are not owned or hosted by ESA, but ESA provides the opportunity for the user community to access data from suppliers free of charge following the submission of a Project Proposal.

Through the Project Proposal, the Principal Investigator (PI) provides detailed information about the project to be executed (executive summary, team composition, schedule, summary of data requirements), and then the project is assessed to evaluate the scientific merits and innovation in relation to the technical feasibility. If accepted, the PI is entitled to submit an order to the data provider for the approved quota.

This distribution method is open for research and application development and prototype / test projects. The programme's purpose is to support as many high-quality and innovative projects as possible within the quota limit available, therefore only a limited number of products are allowed for each project.

ESA Copy Collections

These collections are composed of ESA-maintained copies of data previously requested via Project Proposal. When the size of the archive for a specific dataset is large enough, an ESA Copy Collection is made available to users. For these collections, no closed temporal and spatial coverage is obtained, rather the products are scattered and dispersed worldwide and in different time windows depending on the original requests of the Project Proposals. These collections grow as ESA collects new products.

Full Archive Collections

These collections consist of the full dataset of mission data over a certain area and with a specific temporal coverage. Collections could be composed of data acquired by ESA ground stations or obtained after agreement with the data owner.

Featured Datasets

These are subsets of entire collections (hosted by ESA or the data owner), over a specific area, and/or with a limited time period. Featured Datasets can also be composed of data from different missions. ESA offers a number of Featured Datasets for easy access to thematic, systematically processed data.

A catalogue of Featured Datasets is available in Chapter 7 and more information can be found on ESA's Earth Online website at:
https://tpm-ds.eo.esa.int/collections

4.6 Understanding User Information Needs Versus Data Capabilities

Earth Online

There are a number of resources available on ESA's Earth Online (*https://earth.esa.int*) to help match end-user needs with available data, including technical details such as instrument and product specifications. Earth Online also includes pages dedicated to ESA TPMs, accessible here: *https://earth.esa.int/eogateway/missions/third-party-missions*

The Earth Online PI Community pages (*https://earth.esa.int/eogateway/activities/pi-community*) offer more information for researchers on applying for data, as well as scientific results and related news.

CEOS Missions, Instruments and Measurements Database (CEOS MIM Database)

On behalf of the Committee on Earth Observation Satellites (CEOS), ESA maintains the CEOS Database of Missions, Instruments and Measurements (CEOS MIM Database), which is updated annually based on a survey of CEOS member space agencies. The CEOS MIM Database contains information on the capabilities and plans of space agencies' EO programmes.

http://database.eohandbook.com

A CEOS MIM Database page has been developed specifically in support of ESA TPM users, here: *https://database.eohandbook.com/esatpm*

CEOS Earth Observation Handbook

ESA also publishes the CEOS Earth Observation Handbook in both print and online editions. Past publications can be found at *www.eohandbook.com*

4.7 Earthnet Data Assessment Pilot

The Earthnet Data Assessment Pilot (EDAP) is responsible for assessing the quality and suitability of existing or candidate missions for the Earthnet Third Party Missions (TPM).

For over 40 years, ESA's Earthnet Programme has played a significant role as part of ESA's mandatory activities, providing the framework for integrating non-ESA missions, i.e., Third Party Missions, into the overall ESA Earth Observation (EO) strategy. Complementary to ESA-owned EO missions, the programme allows European users access to a large portfolio of TPMs and is particularly important for promoting the international use of EO data.

In line with Earthnet objectives, ESA aims to foster cooperation and collaboration with not only other national space agencies, but also commercial mission providers. In recent years, the availability of low-cost small satellites and the innovation of constellations has resulted in an increasing number of commercial companies who have established business models to provide information services fed by their own satellite systems.

These new providers are playing an important role in the international EO landscape. Some of these missions are potential candidates for Earthnet TPMs, leading ESA to establish the EDAP project to assess them. In addition to assessing quality and suitability of the missions, the EDAP project also establishes dialogues with the various mission providers to improve the overall coherence of the EO system.

This early data assessment is intended to provide some indication of the potential of each existing mission to remain as a TPM and for new and future missions to become TPMs within ESA's Earthnet programme. Furthermore, EDAP places an emphasis on multi-mission studies that may span several instrument domains. Such studies contribute to interoperability across existing and future missions and help foster synergies between these missions.

The EDAP website provides more information, visit
https://earth.esa.int/eogateway/activities/edap to learn more.

4.8 Heritage Space Programme

ESA holds one of the largest, continuously growing, scientific space data archives in the world. ESA heritage space data and records represent a unique, valuable, independent, and strategic resource owned by all ESA Member States. They provide the capability to look back in time and understand changes affecting our planet.

The Heritage Space Programme responds to the mandate of preserving, making accessible, and valorising the heritage space data acquired through past ESA programmes and agreements.

In Earth observation, the Heritage Space Programme (see *https://earth. esa.int/eogateway/missions/heritage-missions*) covers 150+ ESA and TPM heritage missions and campaign data starting from the mid 1970's (including ERS, Envisat, GOCE, Landsat series, ALOS) which is no longer covered by mission post-operations phase budgets.

In the case of payloads and instruments from TPMs available to ESA through specific agreements (e.g., Earth observation TPM agreements, ESA third party joint missions or experiments, ESA payloads on-board third party space platforms), data are covered by the Heritage Space Programme five years after the end of satellite operations / agreement.
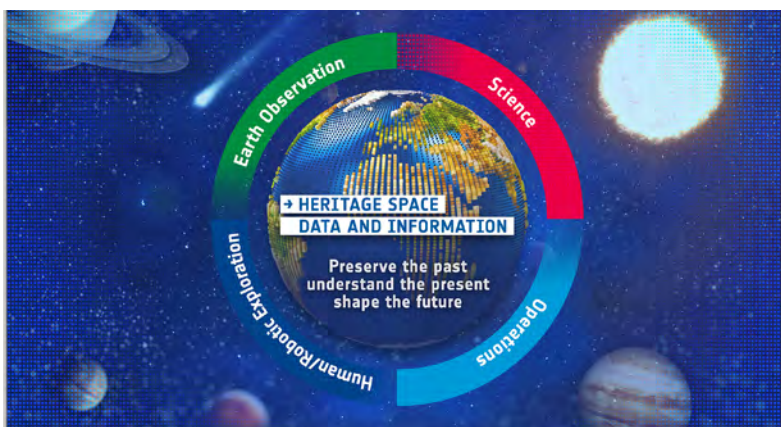
5. HOW TO DISCOVER AND ACCESS THIRD PARTY MISSION DATA

5.1 ESA Earth Online

The first point of entry for TPM data discovery is ESA Earth Online: http://earth.esa.int

Here users can find information on all EO data that is accessible through ESA, including TPM data. Users can also find:

· mission and instrument news and descriptions;
· collection descriptions;
· product technical descriptions;
· data access links; and,
· information on selected Earth/environmental topics and the applications of satellite data.

5.2 How to Access TPM Data Distributed by ESA

A pre-requisite to accessing TPM data collections is the creation of a personal EO Sign in account. Users will then be able to access the data collections according to the instructions provided in the "How to access this data" section of each data collection description page on Earth Online (Figure 1). The access types are:

Immediate Access: Only requires an Earth Online account to gain immediate access to the data collection. See Figure 2 for more details.

Fast Approval: Users can request access to the collection. The requests are reviewed by ESA and, if approved, access is granted within two working days.

Project Proposal: Data are available for on-demand ordering. The proposal, containing details about the project to be executed, undergoes an evaluation process by ESA and the data owner, and a notification is sent to the user after about four-six weeks. If the evaluation is successful, the proposal is accepted, and a quota of products is allocated to the project. See Figure 3 for more details. The amount of data that can be requested via a TPM Project Proposal is limited and varies between missions and instruments. Current limits are defined on the FAQ page at: https://earth.esa.int/eogateway/faq/how-much-data-may-i-request-in-a-project-proposal

Third Party Access: Users are directed to a third party website, often that of the data provider. The data is freely available through the third party, however users will typically have to register to gain access.

TPM Sample Datasets: Users can access and download sample products from various ESA Third Party Missions. These products are freely available on the respective mission pages of the ESA Earth Online website. For more information, see Section 5.4.

Figure 1: The above image shows the dataset description page for the Pleiades ESA Archive. Note that this website is regularly updated, visit https://earth.esa.int/eogateway/catalog/pleiades-esa-archive for the current version.

Researchers can quickly obtain datasets from ESA's Third Party Missions and Heritage Missions on a free basis by using the Fast Registration mechanism

The mechanism includes Fast Registration with Immediate Access (Open) for unrestrained datasets and Fast Registration with Approval (Restrained) for data subject to geographical restrictions or verification of user identity

Open datasets can be obtained following submission of a simple form and restrained datasets can normally be obtained within two days, following evaluation of a data access request by ESA

1 BROWSE AND SELECT

Begin by browsing datasets covered by Fast Registration with Immediate Access or Fast Registration with Approval, to find a collection that meets your requirements

2 SIGN IN

After choosing your collection, a Data Access form must be completed to obtain the data. To access the form, you should log into or register for an ESA EO Sign In account

3 PREPARE AND SUBMIT

OPEN DATASETS

The form retrieves your account details and no further information is required before submission to ESA

RESTRAINED DATASETS

The form retrieves your account details but you must also fill in information related to the project's domain.
After submission, the request will be reviewed by ESA within two working days, after which you will be notified of the outcome by email

4 DOWNLOAD

After submission of the Data Access form for open data or approval of the request for restrained data, you will receive two emails with details of how to download your dataset

5 PROMOTE

After completion of the project, users are encouraged to contact the Earth Online editorial team to discuss the possibility of preparing a Success Story about the research. The editors can be reached at:
contentmatters4earthonline@ejr-quartz.com

Read the full guide on how to complete the Fast Registration process:
https://earth.esa.int/eogateway/news/how-to-access-earth-observation-data-distributed-by-esa-fast-registration

Figure 2: Applicable to both Immediate access and Fast Approval Data Authorisation Processes

HOW TO COMPLETE A PROJECT PROPOSAL

Through its Third Party Missions (TPM) programme, ESA distributes high-quality Earth observation data from international missions on a free basis to support research and development activities

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

A comprehensive, step-by-step guide on how to complete a Project Proposal can be found here:
https://earth.esa.int/eogateway/news/how-to-guide-for-submitting-project-proposals

Figure 3: Project Proposal Data Authorisation Processes

5.3 ESA Online Data Access Interfaces

Following the granting of access rights as mentioned in section 5.2, users can discover and download data from ESA online collections using either of the following interfaces:

– ESA TPM Online Dissemination Services
– EO-Catalogue and Download Tool

5.3.1 ESA TPM Online Dissemination Service

The full list of TPM Data Collections available from the ESA TPM Online Dissemination Service for browsing and download is shown at *https://tpm-ds.eo.esa.int/collections*. Four different main services are available:

- https://alos-palsar-ds.eo.esa.int/oads/access/ for ALOS PALSAR collections
- https://alos-ds.eo.esa.int/oads/access/ for ALOS optical collections
- https://landsat-diss.eo.esa.int/oads/access/ for Landsat collections
- https://tpm-ds.eo.esa.int/oads/access/ for all the other TPM collections

EO data collections can be searched by applying different filters and, if relevant, providing geographical search parameters.
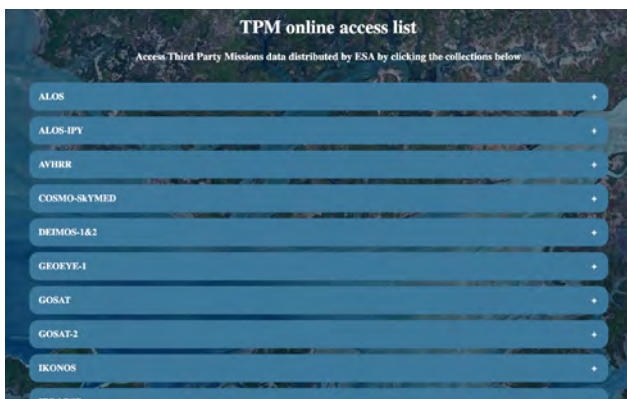
Figure 4: ESA Third Party Missions Online Access List
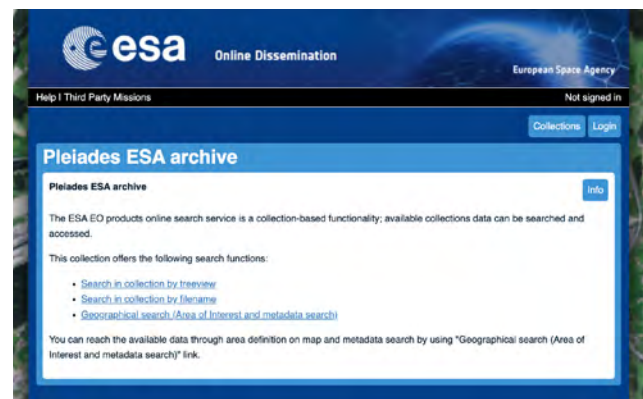
Figure 5: The Online Dissemination Service for the Pleiades ESA Archive

Products are organised by collection and can be discovered without registration. Data browsing can be performed by predefined tree view (by date, by track and frame, by country/city, etc.) or via searches based on the filename. Alternatively, geographical searches can be performed on a static map or on a catalogue that allows execution of dynamic geographical searches, as well as the inclusion of filter criteria based on product metadata. These different mechanisms can be seen in Figure 6.

The data are immediately available for download or are generated on-demand after processing of the corresponding low-level products. Data download is an option for registered users.
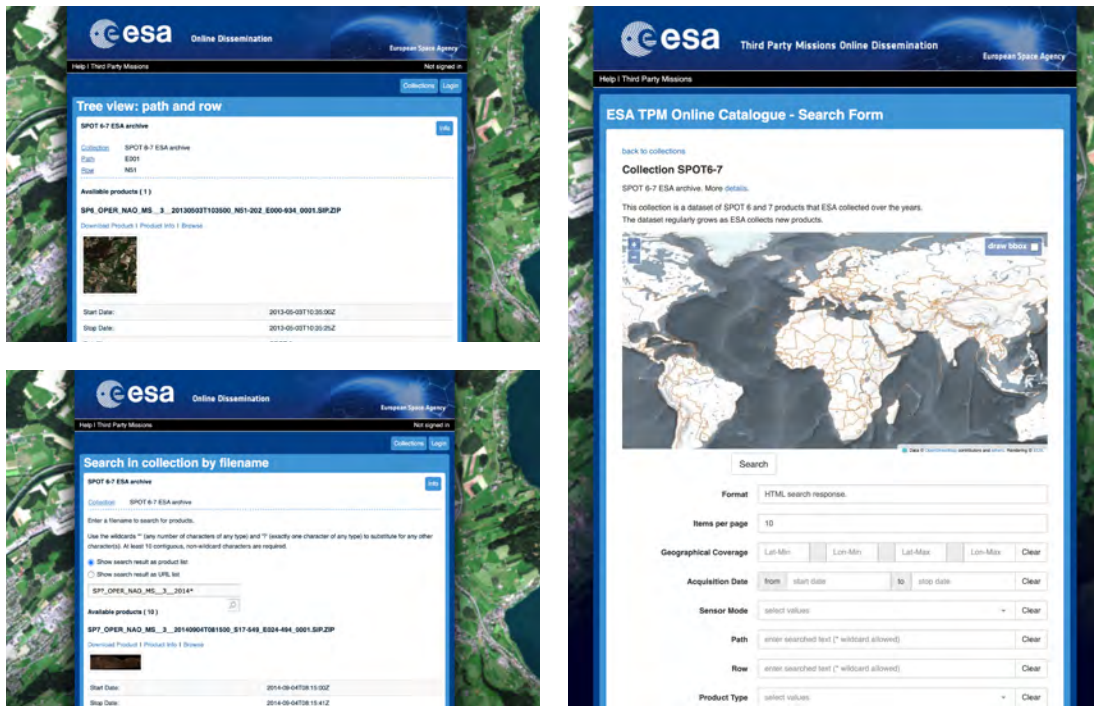
Figure 6: The different mechanisms through which users can discover data on the Online Dissemination Service

5.3.2 EO-Cat Catalogue and Download Tool

Alternatively, users can discover and access data available through different collections via the EO-Cat application (*https://eocat.esa.int*).

Using the EO-Cat catalogue, users can search and discover TPM products from different collections at the same time by applying geographical parameters and metadata search criteria. Once identified, products can be downloaded by registered and authorised users.

The EO data collections can be searched by applying different filters related to the mission, the instrument or the application, over a certain time period and area of interest. More advanced filtering criteria are available depending on the collection (e.g., orbit, cloud coverage, polarisation, etc.). The footprint and, if applicable, example images of the retrieved products can be visualised before deciding to download.

Figure 7: EO-Cat catalogue and download tool

5.4 ESA TPM Sample Datasets

Given the extensive and growing offering of TPMs, it can be a challenge for users to determine which missions or datasets best meet their specific requirements. To facilitate preview and comparison of these data collections, sample products from various ESA Third Party Missions are available for download. These sample datasets provide a glimpse into the offerings of these TPMs without the need for a formal registration or submission of a project proposal.

The freely accessible samples, which are available for direct download from their respective mission pages on ESA Earth Online, cover both optical and radar instruments and are organised according to the product structure defined by the data providers, closely mirroring the offering of the full TPM collection. Available datasets are catalogued here:
https://earth.esa.int/eogateway/news/sample-data-products-from-esas-third-party-missions

Products distributed through ESA dissemination services—typically those found in the ESA archive collections—are released in EO-SIP format. This format is a package that includes the metadata file, browse images, and the original data in its native format.

For the optical samples, all images were acquired over ESA's test site at La Crau in France. Similarly, all SAR samples were captured over a test site at Neustrelitz in Germany. These consistent acquisitions enable users to compare how different satellites view the same area. This facilitates decision-making regarding which missions, with their respective resolutions, product types, bands, acquisition modes, polarisation, etc. best align with users' specific requirements.

Missions for which sample data is available are identified using the following icon in the Chapter 6 tables. Further sample datasets are planned and they will be released as they become available.

5.5 ESA EO Analysis Tools

ESA has made available a wide range of open-source tools to facilitate the handling and use of EO data. These tools include experimental data processing algorithms and increasingly provide specific support for TPM data. A complete list can be found here: *https://earth.esa.int/eogateway/tools.*

Sentinel Toolboxes

ESA is developing free open-source toolboxes for the scientific exploitation of the Sentinel missions. However, these can also be used for a range of other national and Third Party Missions. The toolboxes inherit functionality from historical tools developed over the last 10 years.

The toolboxes have been designed to have flexible, evolving functionality and to operate on cloud computing infrastructure. There are a number of toolboxes currently available, and more information can be found here: *http://step.esa.int/main/toolboxes*

Brockmann Consult, SkyWatch and C-S are also jointly developing a common architecture for all Sentinel Toolboxes called the Sentinel Application Platform (SNAP).

The SNAP architecture is ideal for Earth observation processing and analysis due to its adherence to the following technological innovations: Extensibility, Portability, Modular Rich Client Platform, Generic EO Data Abstraction, Tiled Memory Management, and a Graph Processing Framework.

SNAP can be downloaded here: *http://step.esa.int/main/download/snap-download*

5.6 How to Get Help

ESA's EO User Services strive to provide a user-friendly interface between the satellite systems and data users. EOHelp is the unique contact point for ESA EO and TPM, including on-request orders, complaints handling and requests for information. Contact EOHelp at:

EOHelp | ESA – ESRIN

Largo Galileo Galilei, 1

I-00044 Frascati, Italy

Email: eohelp@esa.int

https://esatellus.service-now.com/csp

T +39 06 941 80777

6. A CLOSER LOOK AT THE DATA AVAILABLE

6.1 TPM Data Availability

Section 4 of this guide provides a summary of measurement categories, spatial and temporal coverage, and type of products available through the ESA TPM scheme.

This section presents additional details on the missions and instruments and the products they offer. Note that in this section, processing levels (i.e., Level 1B, etc.) reflect the language used by the data providers and may not necessarily conform to the CEOS standard provided for illustration in Section 4.

Each instrument and product are categorised per the adjacent legend.

Mission / Sensor	Resolution class Spatial coverage	Mission launch & end-of-life years
Instrument & agency (& any partners)	Full instrument name	Operating agency, country / any partner agencies (see acronym list for details)	
Type	Describes the type of sensor, relates to the data type icon above	
Measurements & applications	Describes the types of measurements the sensor takes, and typical applications of these measurments	Example data image shown here
Technical characteristics	**Wavebands:** The wavebands the sensor operates on **Spatial resolution:** A measure of the smallest object that can be resolved by the sensor **Swath width:** The size of the strip of Earth's surface from which data are collected	
Products		
Processing level / Product type	Descriptions of available levels, modes, band combinations, etc.	
ESA TPM collection and access options		
Collection Name	Short collection summary Access method Dissemination systems & links Online collection description page link	
Weblinks Mission Name: URL for online mission description page		QR CODE

| Mission / Sensor | ⬤ Resolution class | Spatial coverage 🌍 | Mission launch & end-of-life years 🏛 | ☁⬇ |

Data type icon:

Icon	Type	
☀	Optical	LOW-MED (≥100 m) MED-HIGH (1.5–100 m) VERY HIGH (≤1.5 m)
◎	Radar	MED-HIGH (>5 m) VERY HIGH (≤5 m)
☁	Atmospheric	
📊	Other	

Describes over what geographic regions the data is avaiable

Gives the launch year (and end-of-life year for heritage missions)

Heritage mission icon (if applicable)

Sample Datasets (if applicable)

Collection type icon:

Icon	
📦	ESA Copy
🗂	Full Archive
👤	On Request
✦	Featured Dataset

Access methods icon:

Icon	
🔓	Immediate Access
👥	Third Party
✓	Fast Approval
📊	Project Proposal

6.2 ALOS

ALOS was developed by JAXA and carried two optical instruments and an L-band active microwave sensor payload. Applications include cartography, regional observation, disaster observation and resources surveying.
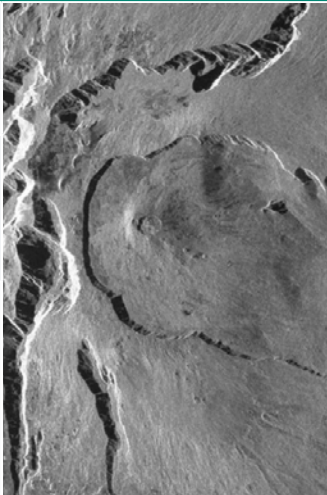
ESA built and operated the European/African ground segment for ALOS, known as the ALOS Data European Node (ADEN). In exchange, ESA receives full data rights over the ADEN zone (Europe, Africa, Middle East) for distribution to all users residing in the zone.

Unless already held in the ESA archive, project data outside of the ADEN zone is no longer available via the TPM scheme.

Data outside the ADEN zone is available at:
https://www.gportal.jaxa.jp/gp/top.html

ADEN ground station coverage

ALOS / AVNIR-2	MED-HIGH	EUROPE, N. AFRICA, MIDDLE EAST, ESA COPY		LAUNCH-EOL 2006-2011	
Instrument & agency (& any partners)	Advanced Visible and Near Infra-red Radiometer Type 2 | JAXA, Japan				
Type	High-resolution optical imager				
Measurements & applications	High-resolution multispectral imager for land applications, which includes environmental monitoring, agriculture and forestry, and disaster monitoring.				
Technical characteristics	**Wavebands:** VIS: 0.42 - 0.50 µm, 0.52 - 0.60 µm, 0.61 - 0.69 µm; NIR: 0.76 - 0.89 µm **Spatial resolution:** 10 m **Swath width:** 70 km				

Products	
Level 1C	Radiometrically and geometrically corrected data (ortho-corrected). The products follow the standard CEOS format convention.

ESA TPM collection and access options		
ALOS African Coverage ESA archive		See Section 7.1 for more details.
TropForest - ALOS, GEOSAT-1 & KOMPSAT-2 optical coverages over tropical forests		See Section 7.17 for more details.
ALOS AVNIR-2 L1C		Full archive acquired in ADEN zone plus few worldwide products Fast approval is required to access AVNIR-2 data. Data can be downloaded from the Online Dissemination Service *https://alos-ds.eo.esa.int/oads/access/collection/ALOS_AVNIR-2_OBS_L1C* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/alos-avnir-2-l1c*

Weblinks
ALOS: https://earth.esa.int/eogateway/missions/alos

ALOS / PALSAR	MED-HIGH	EUROPE, N. AFRICA, MIDDLE EAST, ESA COPY		LAUNCH-EOL 2006-2011	
Instrument & agency (& any partners)	Phased Array type L-band Synthetic Aperture Radar | JAXA, Japan				
Type	Imaging microwave radar.				
Measurements & applications	High-resolution microwave imaging of land and ice for use in environmental monitoring, agriculture and forestry, disaster monitoring, Earth resource management and interferometry.				
Technical characteristics	**Wavebands:** Microwave - L-Band 1270 MHz **Spatial resolution:** High-res (F): 10 m, ScanSAR (W): 30 m, Polarimetry (P): 100 m **Swath width:** High-res (F): 40 - 70 km, Scan SAR (W) mode: 250 - 360 km, Polarimetry (P): 30 km				

Products	
Level 1.0	Raw data generated by every downlink segment and every band. Divided into an equivalent size to one scene.
Level 1.1	Processing includes range compression and one look azimuth compression (SLC).
Level 1.5	Radiometric and geometric corrections are performed on top of the L1.1 processing, provided in ground range geometry, multi-look in range and azimuth (GDH and GEC).

All PALSAR products are in CEOS format (BSQ: Band Sequential), and the following modes are available:
- Fine Mode Single Polarisation (FBS); single polarisation (HH or VV)
- Fine Beam Double Polarisation (FBD); double polarisation (HH/HV or VV/VH)
- ScanSAR Burst mode 1 (WB1); single polarisation. The same data rate as that of the high-resolution mode or half this rate. The data in this mode is not divided into individual scans. Not available for Level 1.1 (SLC)
- Polarimetry (PLR); Observation with four polarisations simultaneously.

ESA TPM collection and access options		
ALOS PALSAR International Polar Year Antarctica		See Section 7.4 for more details.
ALOS PALSAR		Full archive acquired in ADEN zone plus few worldwide products Fast approval is required to access PALSAR data. Data can be downloaded from EO-Cat *(https://eocat.esa.int)* and from the Online Dissemination Service *https://alos-palsar-ds.eo.esa.int/oads/access/collection* More information on the collection can be found here: *https://earth.esa.int/eogateway/catalog/alos-palsar-products*

Weblinks
ALOS: https://earth.esa.int/eogateway/missions/ALOS
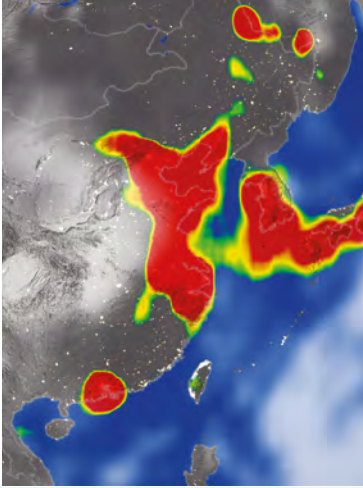
ALOS / PRISM	MED-HIGH	EUROPE, N. AFRICA, MIDDLE EAST, ESA COPY	LAUNCH-EOL 2006-2011	

Instrument & agency (& any partners)	Panchromatic Remote-sensing Instrument for Stereo Mapping | JAXA, Japan
Type	High resolution panchromatic stereo imager
Measurements & applications	High resolution panchromatic stereo imager for land applications, which include cartography, digital terrain models, civil planning, agriculture and forestry.
Technical characteristics	**Wavebands**: VIS-NIR: 0.52 - 0.77 μm (panchromatic) **Spatial resolution:** 2.5 m **Swath width:** 35 km (triplet stereo observations), 70 km (nadir observations+35 km backward)

Products

Level 1B - OB1 Panchromatic	Composed of up to three views; Nadir, Forward and Backward at 35 km swath
Level 1B – OB2 Panchromatic	Composed of up to two views; Nadir view at 70 km width and Backward view at 35 km width

Radiometrically and geometrically corrected data.
The products follow the standard CEOS format convention.

ESA TPM collection and access options

ALOS African Coverage Cloud Free		See Section 7.2 for more details.
ALOS PRISM L1C European Coverage Cloud Free		See Section 7.3 for more details.
ALOS PRISM L1B		Full archive acquired in the ADEN zone plus a few worldwide products. Fast approval is required to access PRISM data. Each user is entitled to download a maximum of 50 PRISM products per year. Data can be downloaded from the Online Dissemination Service: *https://alos-ds.eo.esa.int/oads/access/collection/ALOS_PRISM_L1B.* More information about the collection can be found here: *https://earth.esa.int/eogateway/catalog/alos-prism-l1b*
ALOS PRISM L1C		Full archive acquired in ADEN zone plus a few worldwide products. Fast approval is required to access PRISM data. Each user is entitled to download a maximum of 50 PRISM products per year. Data can be downloaded from the Online Dissemination Service: *https://alos-ds.eo.esa.int/oads/access/collection/ALOS_PRISM_OBS_L1C* More information about the collection can be found here: *https://earth.esa.int/eogateway/catalog/alos-prism-l1c*

Weblinks
ALOS: https://earth.esa.int/eogateway/missions/alos

6.3 Aura

Aura (formerly EOS/Chem-1) is the chemistry mission of NASA with the overall objective to study the chemistry and dynamics of Earth's atmosphere from the ground through the mesosphere.
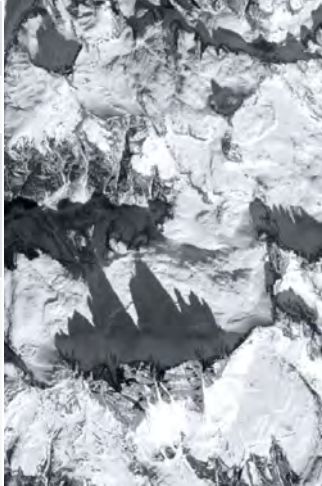
The Ozone Monitoring Instrument (OMI) is a nadir-viewing UV/VIS imaging spectrograph that measures the solar radiation backscattered by the Earth's atmosphere and surface over the entire wavelength range from 270 to 500 nm, with a spectral resolution of about 0.5 nm. The design is of GOME heritage, flown on ERS-2, as well as of SCIAMACHY and GOMOS heritage, flown on Envisat.

The overall objective is to monitor ozone and other trace gases and to monitor tropospheric pollutants worldwide. The OMI instrument is a contribution of the Netherlands Agency for Aerospace Programmes (NIVR) in collaboration with the Finnish Meteorological Institute (FMI) to the EOS Aura mission.

AURA / OMI	ATMOSPHERIC GLOBAL LAUNCH 2004
Instrument & agency (& any partners)	Ozone Monitoring Instrument | NASA, USA / FMI, Finland / NIVR, Netherlands
Type	Pushbroom imaging grating spectrometer
Measurements & applications	Mapping of ozone columns, key air quality components (NO_2, SO_2, BrO, OClO and aerosols), measurements of cloud pressure and coverage, global distribution, and trends in UV-B radiation.
Technical characteristics	**Wavebands:** UV1: 270 - 314 nm | UV2: 306 - 380 nm | VIS: 350 - 500 nm **Spatial resolution:** 2600 km **Swath width:** 13 × 24 km or 36 × 48 km depending on the product. Also has zoom modes (13 × 13 km), for example for urban pollution detection.

Products	
Radiometrically and Geo-located Radiance Products (Level 1B)	The GDPS algorithm takes the raw sensor measurements (Level 0 data), calibration, and spacecraft attitude and ephemeris information to produce radiometrically calibrated and geo-located radiances.
Orbital Atmospheric Products (Level 2)	The OMI Level 2 (orbital swaths) products contain the geophysical parameters (at ground-pixel resolution) derived from radiometrically calibrated and geo-located radiances (Level 1B product).
Global Binned Atmospheric Products (Level 2G)	Level 2G (L2G) datasets contain one day's worth of Level 2 data (typically 14 orbits) ordered by ground position rather than by time.
Global Gridded Atmospheric Products (Level 3)	OMI Level 3 daily global products are produced by using best pixel data over small equal angle grids covering the whole globe.

ESA TPM collection and access options	
Complete NASA dataset	Data are available through the Aura OMI website: *https://disc.sci.gsfc.nasa.gov/Aura/data- holdings/OMI.* More information can be found here: *https://earth.esa.int/eogateway/catalog/aura-omi-complete-nasa-dataset*

Weblinks
AURA OMI: https://earth.esa.int/eogateway/missions/aura

6.4 Cartosat-1 (IRS-P5)

Cartosat-1 (also known as IRS-P5) was an Indian Earth-imaging satellite, operated by the Indian Space Research Organisation (ISRO) and its applications focused on mapping India.

Cartosat-1 / PAN	VERY HIGH	GLOBAL	LAUNCH-EOL 2005-2019
Instrument & agency (& any partners)	PAN-Fore and PAN-Aft	ISRO, India		
Type	High resolution optical imagers		
Measurements & applications	DTM (Digital Terrain Model) / DEM (Digital Elevation Model) generation, mapping urban and rural development.		
Technical characteristics	**Wavebands:** 500 - 850 nm **Spatial resolution:** 2.5 m **Swath width:** 27 km		

Products	
PAN-Aft (backward), PAN-Fore (forward), Stereo (PAN-Aft+PAN-fore)	System or radiometrically corrected and ortho corrected data. Available at Level 1 and Level 2.
Euro-Maps 3D Digital Surface Model	A homogeneous, 5m spaced digital surface model (DSM) semi-automatically derived from 2.5m in-flight stereo data provided by IRS-P5 CartoSat-1 and developed in cooperation with the German Aerospace Centre, DLR. Available at Level A and A+.

ESA TPM collection and access options		
Cartosat-1 European Cities Coverage		See Section 7.5 for more details.
CartoSat-1 archive and Euro-Maps 3D Digital Surface Model		ESA offers access to Cartosat-1 data (both archive and DSM) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/cartosat-1-archive-and-euro-maps-3d-digital-surface-model*

Weblinks
Cartosat-1: https://earth.esa.int/eogateway/missions/IRS-P5

6.5 COSMO-SkyMed

COSMO-SkyMed is a four-spacecraft constellation, conceived by Agenzia Spaziale Italiana (ASI) and funded by the Italian Ministry of Research (MUR) and the Italian Ministry of Defense (MoD).

Each of the four satellites is equipped with a SAR instrument and is capable of operating in all visibility conditions at high resolution and in real time. The overall objective of this program is global EO and the relevant data exploitation for the needs of the military community as well as for the civil (institutional, commercial) community.

COSMO-SkyMed's archive and tasking data are now available to the scientific user community for research and application development.

COSMO-SkyMed /SAR 2000	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2007	
Instrument & agency (& any partners)	Synthetic Aperture Radar – 2000	ASI / MoD, Italy			
Type	Imaging Microwave Radar			
Measurements & applications	All-weather images of ocean, land, and ice for monitoring of land surface processes, ice, environmental monitoring, risk management, environmental resources, maritime management and topographic Earth mapping.			
Technical characteristics	**Wavebands:** X-band Microwave, 9.6 GHz, in single and dual polarisation modes **Spatial resolution:** Stripmap HIMAGE: 3 m, Stripmap PING PONG: 15 m, ScanSAR Wide: 30 m, ScanSAR Huge: 100 m. **Swath width:** Stripmap HIMAGE: 40 km, Stripmap PING PONG: 30 km, ScanSAR Wide: 100 km, ScanSAR Huge: 200 km.			

COSMO-SkyMed /SAR 2000

Products

Single-look Complex (Level 1A (1A_SCSB and 1A_SCSU))	RAW data focused on slant range-azimuth projection, which is the sensor's natural acquisition projection. The product contains In-Phase and Quadrature of the focused data, weighted and radiometrically equalised. The processing of the 1A_SCSU product differs from that of the 1A_SCSB product in the following ways: a non-weighted processing is performed, which means that windowing is not applied on the processed bandwidth; and radiometric equalisation (in terms of compensation of the range antenna pattern and incidence angle) is not performed; hence only compensation of the antenna transmitter gain and receiver attenuation and range spreading loss is applied.
Detected Ground Multi-look (Level 1B (1B_DGM))	Obtained by detecting, multi-looking and projecting the COSMO-SkyMed products SAR Standard SAR Higher Level Auxiliary Products Single-look Complex Slant data onto a grid regular in ground.
Geocoded products - GEC (Level 1C) and GTC (Level 1D)	Obtained by projecting the 1A product onto a regular grid in a chosen cartographic reference system. In the case of Level 1C, the surface is the Earth ellipsoid, while for the Level 1D a Digital Elevation Model is used to approximate the real Earth surface. Level 1D data are constituted by the Backscattering coefficient of the observed scene, multi-looked, including the annexed Incidence Angles Mask.

All COSMO-SkyMed products are available in the following modes:
· CSK ScanSAR Huge/Wide: a low-resolution mode that creates extra-wide swaths by collecting short segments at different ranges and then mosaicking them together.
· CSK StripMap PING PONG: a medium-resolution mode collected over long, continuous swaths in which the beam is pointed broadside to the satellite track. Two radar polarisations selectable among HH, HV, VH and VV.
· CSK StripMap HIMAGE: a medium-resolution mode collected over long, continuous swaths in which the beam is pointed broadside to the satellite track.

ESA TPM collection and access options

COSMO-SkyMed ESA archive		The collection is composed of the copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products over the years. Data service request is required to access Cosmo SkyMed data. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/CosmoSkyMed* More information on the collection can be found here: *https://earth.esa.int/eogateway/catalog/cosmo-skymed-esa-archive*
COSMO-SkyMed full archive and tasking		ESA offers access to worldwide COSMO-SkyMed data (both archived and new acquisitions) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/cosmo-skymed-full-archive-and-tasking*

Weblinks
COSMO-SkyMed series:https://earth.esa.int/eogateway/missions/cosmo-skymed-series
COSMO-SkyMed: https://earth.esa.int/eogateway/missions/cosmo-skymed
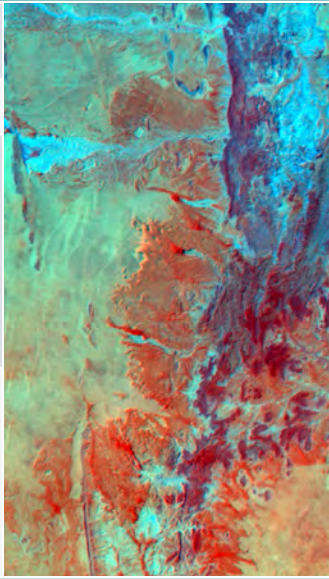
6.5.1 COSMO-SkyMed Second Generation

COSMO-SkyMed Second Generation (CSG), composed of two SAR satellites, is at the forefront of radar technology, and will ensure improvements and guarantee continuity with the First Generation COSMO-SkyMed (CSK) satellites, preserving the high quality and the highest precision features, both required for the interferometric activities. The programme is funded by Agenzia Spaziale Italiana (ASI), the Italian Ministry of Defence (MoD) and the Italian Ministry of Education, Universities and Scientific Research.

COSMO-SkyMed Second Generation / SAR 2000	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2019	
Instrument & agency (& any partners)	Synthetic Aperture Radar – 2000 | ASI / MoD, Italy			
Type	Imaging Microwave Radar			
Measurements & applications	All-weather images of ocean, land, and ice for monitoring of land surface processes, ice, environmental monitoring, risk management, environmental resources, maritime management and topographic Earth mapping.			
Technical characteristics	**Wavebands:** X-band Microwave, 9.6 GHz, in single, dual and quad polarisation mode **Spatial resolution:** Stripmap: 3 x 3 m, PING PONG: 12 x 5 m, ScanSAR 1: 20 x 4 m, ScanSAR 2: 40 x 6 m. Quad Polarisation: 3 x 3 m **Swath width:** Stripmap: 40 km, PING PONG: 30 km, ScanSAR 1: 100 km, ScanSAR 2: 200 km. Quad Polarisation: 40 x 15 km			
Products				
SCS (Level 1A, Single-look Complex Slant)	Data in complex format, in slant range projection (the sensor's natural acquisition projection) and zero doppler projection, weighted and radiometrically equalised. The coverage corresponds to the full resolution area illuminated by the SAR instrument.			
DGM (Level 1B, Detected Ground Multi-look)	Product obtained by detecting, multi-looking and projecting the Single-look Complex Slant data onto a grid regular in ground. It contains focused data, amplitude detected, optionally despeckled by multi-looking approach, radiometrically equalised and represented in ground/azimuth projection.			
GEC (Level 1C, Geocoded Ellipsoid Corrected)	Focused data, amplitude detected, optionally despeckled by multi-looking approach, geolocated on the reference ellipsoid and represented in a uniform preselected cartographic presentation. Any geometric correction derived by usage of terrain model isn't applied to this product by default.			
GTC (Level 1D, Geocoded Terrain Corrected)	Focused data, fully calibrated with the usage of terrain model, amplitude detected, optionally despeckled by multi-looking approach, geolocated on a DEM and represented in a uniform preselected cartographic presentation. The image scene is located and accurately rectified onto a map projection, through the use of Ground Control Points (GCPs) and Digital Elevation Model (DEM). It differs from GEC for the use of the DEM (instead of reference ellipsoid) for the accurate conversion from slant to ground range and to approximate the real earth surface.			
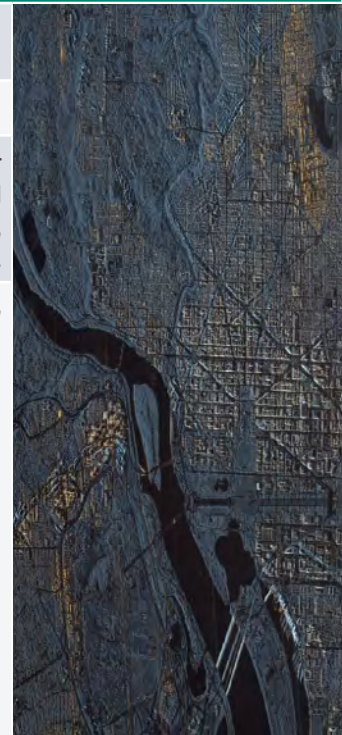
COSMO-SkyMed Second Generation / SAR 2000

Products

All COSMO-SkyMed Second Generation products are available in the following modes:

· CSG ScanSAR 1 and ScanSAR 2: Provides huge image size at the expense of resolution. The SAR antenna beam is scanned in the elevation plane to cover a wider swath in the cross-track direction. As the scanning cycle shall be completed within the maximum integration time allowed by the synthetic aperture, the swath width is achieved at the expense of the azimuth resolution SCANSAR operates in Single and Dual polarisation.

· CSG StripMap and PING PONG: Provides uninterrupted coverage with medium geometric resolution and medium image size. The antenna is configured to generate a beam with fixed azimuth and elevation pointing. Coverage in along track is inherently achieved by the spacecraft orbital movement. According to the desired swath position within the access range, appropriate beam forming is applied for range ambiguity suppression. StripMap operates in Single and dual polarisation; PING PONG operates in Alternate polarisation.

· CSG Quad-Polarization: CSG features a polarization Stripmap mode using an "interleaved" technique. This technique involves halving the Pulse Repetition Interval (PRI) and alternately transmitting in H and vertical V polarizations. The SAR collects echoes from the same target in both polarizations. The timing of these echoes differs by half of a standard PRI, and the satellite's position during the two transmissions also differs due to its movement. The SAR antenna can receive both H and V polarizations simultaneously, allowing it to capture quad-pol components of the scattered echoes.

ESA TPM collection and access options

COSMO-SkyMed full archive and tasking		ESA offers access to worldwide COSMO-SkyMed Second Generation data (both archived and new acquisitions) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/cosmo-skymed-full-archive-and-tasking*

Weblinks
COSMO-SkyMed series:
https://earth.esa.int/eogateway/missions/cosmo-skymed-series
COSMO-SkyMed Second Generation:
https://earth.esa.int/eogateway/missions/cosmo-skymed-second-generation

6.6 DMC First Generation

The DMC is a constellation of microsatellites formerly coordinated by DMCii. It is a network of Low Earth Orbit microsatellites with an objective to provide frequent observations of Earth for monitoring disasters. The DMC satellites all carry SLIM-6 MSC multispectral cameras and are placed into Sun-synchronous low earth orbit. ESA offers access to DMC data over Europe as part of the IMAGE2007 Featured Dataset.

DMC / SLIM-6	MED-HIGH	EUROPE	LAUNCH-EOL 2003-2011
Instrument & agency (& any partners)	Surrey Linear Imager – 6 Channel | DMCii (SSTL, United Kingdom / TUBITAK, Turkey / UKSA, United Kingdom / NASRDA, Nigeria / BLMIT, China / CNTS, Algeria)		
Type	Medium-resolution Optical Imager		
Measurements & applications	The Disaster Management Constellation uses visible and NIR imagery in support of disaster management.		
Technical characteristics	**Wavebands:** VIS: 0.63 - 0.69 μm, 0.52 - 0.60 μm and NIR: 0.77 - 0.90 μm **Spatial resolution:** 32 m **Swath width:** Two imaging banks each with a 340 km swath. The two swaths overlap by 16 km, providing a total swath up to 648 km		

ESA TPM collection and access options		
IMAGE 2007 European Coverage		See Section 7.9 for details.

Weblinks
DMC: https://earth.esa.int/eogateway/missions/dmc

6.7 FSSCat

The FSSCat mission comprises two federated 6U CubeSats that support Copernicus Land and Marine Environment services. Serving as a precursor to a future Earth Observation satellite constellation, FSSCat was equipped with a multi-spectral optical payload and a dual microwave payload, including a GNSS-Reflectometer and an L-band radiometer with interference detection/mitigation capabilities. Its capabilities encompass measuring soil moisture, ice extent, ice thickness, and detecting melting ponds on ice.

FSSCat / HyperScout-2	MED GLOBAL	LAUNCH-EOL 2020 - 2021
Instrument & agency (& any partners)	HyperScout-2 | ESA, Italy	
Type	Medium Resolution Hyperspectral Optical Imager	
Measurements & applications	A compact hyperspectral VNIR (Visible and Near Infrared) imager and multispectral (MS) Thermal Infrared (TIR) imager with a wide swath. An artificial intelligence (AI) chip carried by the satellite allowed AI processing algorithms to be directly applied to acquired data while onboard, enabling the production of Level-1C hyperspectral data in-orbit.	
Technical characteristics	**Wavebands:** VIS-NIR: 450 - 950 nm (50 spectral bands with a spectral resolution of 18 nm) **Spatial resolution:** 75 m **Swath width:** 300 km (across track)	

Products	
Level 1C	Radiometrically and geometrically corrected data (ortho-corrected). The products follow the standard CEOS format convention.

ESA TPM collection and access options	
FSSCat HyperScout-2 Level 1C	The collection is composed of the full FSSCat HyperScout-2 archive. Users can immediately access the collection via FTP download from *ftp://tpm-if.eo.esa.int/* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/fsscat-products*

EDAP Quality Assessment:
https://earth.esa.int/documents/d/earth-online/technical-note-on-quality-assessment-for-fsscat-hyperscout-2

Weblinks
FSSCat: https://earth.esa.int/eogateway/missions/fsscat

6.8 GeoEye-1

GeoEye-1 is an Earth-imaging satellite that previously belonged to the DigitalGlobe constellations and was distributed by European Space Imaging (EUSI). It was designed to be the world's highest-resolution commercial Earth-imaging satellite. It is now operated by Maxar Technologies of United States.

GeoEye-1 / GIS	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2008
Instrument & agency (& any partners)	GeoEye Imaging System (GIS) | Maxar, USA / EUSI, Europe		
Type	Very High-resolution Optical Imager. Pushbroom imager		
Measurements & applications	High-resolution land observation.		
Technical characteristics	**Wavebands:** Panchromatic (Pan): 450 - 900 nm, Multispectral (MS) 4-bands; Blue: 450 - 510 nm Green: 520 - 580 nm Red: 655 - 690 nm Near-IR: 780 - 920 nm **Spatial resolution:** 0.41 m PAN, 1.64 m MS (at nadir) **Swath width:** 15.2 km (multiple adjoining paths can be imaged in a target area in a single orbit pass due to S/C agility)		

Products	
Level 2 Standard	Normalised for topographic relief.
Level 2 View Ready Standard	Ready for orthorectification (RPB files embedded).
Level 3 View Ready Stereo	Collected in-track for stereo viewing and manipulation (not available for SWIR).
Level 3 Map Ready (Ortho)	Scale 1:12,000, orthorectified. Additional processing unnecessary.

ESA TPM collection and access options		
GeoEye-1 ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access GeoEye-1 data Data can be downloaded from the Online Dissemination Service at *https://tpm-ds.eo.esa.int/oads/access/collection/GeoEye-1* More information can be found here: *https://earth.esa.int/eogateway/catalog/geoeye-1-esa-archive*
GeoEye-1 full archive and tasking		ESA offers access to worldwide GeoEye-1 data (both archived and new acquisitions) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/geoeye-1-full-archive-and-tasking*

Weblinks
GeoEye-1: https://earth.esa.int/eogateway/missions/GeoEye-1

6.9 GEOSAT-1 (DEIMOS-1)

GEOSAT-1 (formerly Deimos-1) is an Earth-imaging microsatellite built for Elecnor Deimos of Spain. It is now owned and operated by GEOSAT Satelites. It is part of a group of satellites collectively known as the Disaster Monitoring Constellation (DMC) and was the first private European Earth observation satellite launched.

The objective of GEOSAT-1 is to provide a global imaging capability at medium resolution (22 m) in three spectral bands. Applications include rapid-response disaster monitoring and mitigation. The DMC satellites carry a multispectral camera (SLIM-6) in a Sun-synchronous orbit.

GEOSAT-1 / SLIM-6	MED-HIGH	GLOBAL ESA COPY	LAUNCH 2009	
Instrument & agency (& any partners)	Surrey Linear Imager - 6 Channel | GEOSAT Satellites, Europe			
Type	High-resolution Optical Imager.			
Measurements & applications	The satellite provides imagery for commercial applications in maritime, forestry, agriculture, environment and forestry within the Iberian Peninsula region and Europe.			
Technical characteristics	**Wavebands:** Green: 0.52 - 0.60 μm, Red: 0.63 - 0.69 μm, NIR: 0.77 - 0.90 μm. **Spatial resolution:** 650 km **Swath width:** 22 m at nadir			
Products				
Level 1R	All 3 spectral channels combined into a band-registered image using LOR data. Geopositioned product based on rigorous sensor model. Coefficients derived from internal and external satellite orientation parameters coming from telemetry and appended to metadata			
Level 1T	Data orthorectified to sub-pixel accuracy (10 meters RMS error approximately) with respect to Landsat ETM+ reference data and hole-filled seamless SRTM DEM data V3, 2006 (90 m). The use of the GCPs, it is not automatic, as it is done manually, which gives greater precision. (GCPs by human operators).			
ESA TPM collection and access options				
TropForest - ALOS, GEOSAT-1 & KOMPSAT-2 optical coverages over tropical forests		See Section 7.17 for more details.		

GEOSAT-1 / SLIM-6

ESA TPM collection and access options

GEOSAT-1 and 2 ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access GEOSAT-1 data. Data can be downloaded from EO-Cat and the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/Deimos* More information about the collections can be found at: *https://earth.esa.int/eogateway/catalog/geosat-1-and-2-esa-archive*
GEOSAT-1 full archive and tasking		ESA offers access to worldwide GEOSAT-1 data (both archived and new acquisitions) via project proposal. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/geosat-1-full-archive-and-tasking*

Weblinks
GEOSAT series: https://earth.esa.int/eogateway/missions/geosat
GEOSAT-1: https://earth.esa.int/eogateway/missions/geosat-1

6.9.1 GEOSAT-2 (DEIMOS-2)

GEOSAT-2 (formerly Deimos-2) is the second satellite of the GEOSAT Earth Observation system, following GEOSAT-1. A high-resolution satellite, it became the first European fully-private satellite capable of providing sub-metric multispectral imagery with a two day average revisit time worldwide.

GEOSAT-2 / HiRAIS	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2014
Instrument & agency (& any partners)	High Resolution Advanced Imaging System (HiRAIS) | GEOSAT Satelites, Europe		
Type	Very High-resolution Optical Imager		
Measurements & applications	Agriculture, forestry, disaster monitoring, land use, surveillance, civil protection, intelligence and border control information.		
Technical characteristics	Wavebands: Panchromatic: 560 - 900 nm, Multispectral: Blue: 466 - 525 nm Green: 532 - 599 nm Red: 640 - 697 nm NIR: 770 - 892 nm Spatial resolution: 0.75 m PAN, 4 m MS Swath width: 12 km		

Products	
Level 1B	A calibrated and radiometrically corrected product, but not resampled. The product includes the Rational Polynomial Coefficients (RPC), the metadata with gain and bias values for each band needed to convert the digital numbers into radiances at pixel level, and information about geographic projection (EPGS), corners geolocation, etc.
Level 1C	A calibrated and radiometrically corrected product, manually orthorectified and resampled to a map grid. The geometric information is contained in the GeoTIFF tags.

GEOSAT-2 products are available in the following variations:

· **Pan-sharpened**: Resulting from a merging of the high-resolution panchromatic and lower resolution multispectral imagery. The fusion does not preserve all spectral features of the multispectral bands, so it should not be used for radiometric purposes. The resolution varies depending on the processing level: 1 m for L1B, 0.75 m for L1C, or 0.40 m for L1D. Available bands include all bands, RGB, or Ni-R-G.
· **Panchromatic**: A single-band image coming from the panchromatic sensor. It has a resolution of 1 m for L1B or 0.75 m for L1C.
· **Multispectral**: A four-band image coming for the multispectral sensor, with band co-registration. It has a resolution of 4 m for L1B or 3 m for L1C.
· **Bundle**: A five-band image containing the panchromatic and multispectral products packaged together, with band co-registration. It has a resolution of 1/4 m (PAN/MS) for L1B, 0.75/3 m for L1C, or 0.40/1.6 m for L1D.
· **Stereo Pair**: Image products obtained from two acquisitions of the same target performed from different viewpoints in the same pass by using the agility feature of the platform. These products can be provided as a pair of pan-sharpened or panchromatic images.

GEOSAT-2 / HiRAIS

ESA TPM collection and access options

GEOSAT-2 Portugal Coverage		See Section 7.6 for details
GEOSAT-2 Spain Coverage		See Section 7.7 for details.
GEOSAT-1 and 2 ESA archive		The collection is composed of the copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access GEOSAT-2 data. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/Deimos* More information can be found here: *https://earth.esa.int/eogateway/catalog/geosat-1-and-2-esa-archive*
GEOSAT-2 full archive and tasking		ESA offers access to GEOSAT-2 data (both archived and new acquisitions) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/geosat-2-full-archive-and-tasking*

Weblinks
GEOSAT series: https://earth.esa.int/eogateway/missions/geosat
GEOSAT-2: https://earth.esa.int/eogateway/missions/geosat-2

6.10 GHGSat

The GHGSat constellation is specifically designed for detecting and quantifying Greenhouse Gas (GHG) emissions from point sources as small as individual oil and gas wells. GHGSat is concerned with the remote sensing, identification, and facility attribution of GHG emissions from global sources. Each satellite is equipped with a wide-angle Fabry-Perot (WAF-P) imaging spectrometer, designed to measure the vertical column abundances of GHGs.

GHGSat / WAF-P	ATMOSPHERIC GLOBAL	LAUNCH 2020
Instrument & agency (& any partners)	Wide-Angle Fabry-Perot (WAF-P) Imaging Spectrometer | GHGSat Inc., Canada	
Type	Optical Imaging Spectrometer	
Measurements & applications	Detection of facility-level emissions of greenhouse gases, site-specific methane measurements	
Technical characteristics	**Wavebands:** SWIR 1635 - 1675 nm **Spatial resolution:** GHGSat-D: <50 m, GHGSat-CX: 25 m **Swath width:** GHGSat-D: <15 km, GHGSat-CX: 20 km	

Products	
Abundance Dataset (Level 2)	Set of per-pixel abundances in excess of the local background (in parts per billion (ppb)) for a single species, and per-pixel measurement error expressed as a standard deviation for a single site on a single satellite pass. The data format is 16-bit GeoTIFF.
Concentration Maps (Level 2)	High readability pseudo-colour map combining surface reflectance and column density expressed in parts per billion (ppb) for a single species in PNG format. The relevant abundance dataset is provided as well.
Emission Rates (Level 4)	Instantaneous rate for a detected emission from a targeted source estimated using abundance datasets from a single satellite pass and applying dispersion modelling techniques. The delivered product includes the emission rate estimate with uncertainty and key dispersion parameters (in CSV format) as well as the abundance dataset used for the emission estimate. This product is only delivered in the emissions package if an emission is detected within the abundance dataset. The Level 2 products will be delivered regardless of whether or not an emission is detected.

ESA TPM collection and access options	
GHGSat archive and tasking	ESA offers access to worldwide GHGSat data (both catalogue and new collect) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/ghgsat-archive-and-tasking*

Weblinks
GHGSAT: https://earth.esa.int/eogateway/missions/ghgsat

6.11 GOSAT

GOSAT is a Japanese climate change EO mission, developed by JAXA. The mission carries two thermal and near infrared sensors for carbon observation – a Fourier Transform Spectrometer (TANSO-FTS) and a Cloud and Aerosol Imager (TANSO-CAI). The objective of the mission is to provide monitoring of the sources and sinks of CO_2 on a sub-continental scale in support of the Kyoto protocol.

GOSAT / TANSO-CAI	ATMOSPHERIC GLOBAL	LAUNCH 2009
Instrument & agency (& any partners)	Thermal and Near Infrared Sensor for Carbon Observation – Cloud and Aerosol Imager (TANSO-CAI) | JAXA (MOE / NIES), Japan	
Type	Imaging multispectral radiometer (VIS/IR).	
Measurements & applications	Measurement of cloud and aerosol for calibration of TANSO-FTS.	
Technical characteristics	**Wavebands:** 0.380µm, 0.674 µm, 0.870 µm, 1.60 µm UV (~0.01 µm - ~0.40 µm) VIS (~0.40 µm - ~0.75 µm) NIR (~0.75 µm - ~1.3 µm) SWIR (~1.3 µm - ~3.0 µm) **Spatial resolution:** 0.5 km (UV, VIS, NIR bands), 1.5 km (SWIR band) **Swath width:** 1000 km (UV, VIS, NIR bands), 750 km (SWIR band)	

Products	
TANSO-CAI Level 1B/L1B+	L1B data product is a radiance product obtained by dividing the CAI L1A data product into frames, applying band-to-band registration without interpolation based on Band 3 of TANSO-CAI sensor. Map projection is not applied. L1B+ data product is a map-projected radiance product obtained by dividing the CAI L1A data product into frames and applying data interpolation and band-to-band registration.
TANSO-CAI L3 Global Normalized Difference Vegetation Index (NDVI)	The Level 3 NDVI product is calculated by using the reflectance generated every 3 days from the CAI L1B data for the 30 days (10 recurrent cycles) radiance data. The globe is divided in 36 rectangles and each product represents one rectangle.
TANSO-CAI L3 Global Radiance Distribution (all pixels)	L3 Global Radiance Distribution product is generated each day from the TANSO-CAI L1B+ product acquired during the three preceding consecutive observation days and shifted day by day.
TANSO-CAI L3 Global Reflectance Distribution (clear sky)	The Level 3 CAI Global Reflectance Distribution data product is processed by collecting the image data with minimum reflectance from the Cloud and Aerosol Imager (TANSO-CAI)'s Level 1B data for 30 days. The product shows the surface of the globe clear of clouds in most areas. This product is generated every 3 days by using the image data for 30 days and shifted three days.

GOSAT / TANSO-CAI

ESA TPM collection and access options

GOSAT TANSO FTS and CAI full archive and new products		The collection is composed of a full GOSAT archive as produced by JAXA. Fast approval is required to access GOSAT data. Data is available for online FTP download from *ftp://gosat-ds.eo.esa.int*
		More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/gosat-tanso-fts-and-cai-full-archive-and-new-products*

Weblinks
GOSAT series: https://earth.esa.int/eogateway/missions/gos-1
GOSAT-1: https://earth.esa.int/eogateway/missions/gosat

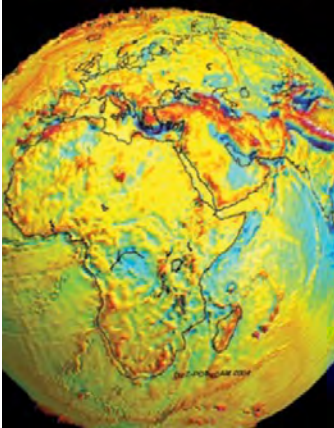| GOSAT / TANSO-FTS	ATMOSPHERIC	GLOBAL	LAUNCH 2009
Instrument & agency (& any partners)	Thermal and Near Infrared Sensor for Carbon Observation - Fourier Transform Spectrometer (TANSO-FTS)	JAXA (MOE / NIES), Japan		
Type	Atmospheric temperature and humidity sounder and atmospheric chemistry instrument.		
Measurements & applications	Global CO_2, O3, H2O and CH4 distribution.		
Technical characteristics	**Wavebands:** 0.758 - 0.775 μm, 1.56 - 1.72 μm, 1.92 - 2.08 μm, 5.56 - 14.3 μm **Spatial resolution:** 10.5 km **Swath width:** 1000 km		
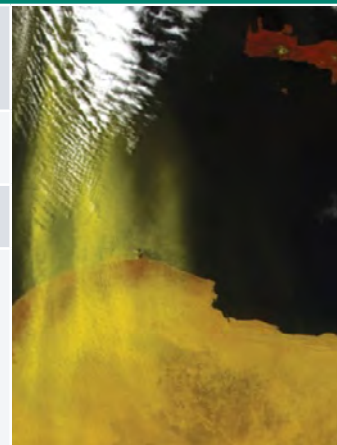
Products

GOSAT TANSO-FTS Level 1B (Observation and Special Observation Modes, Day and Night)	Non-liner correction, phase correction, and complex Fourier transformation are applied to raw IGM to produce spectra and spectral radiance after calibration. Four different product types are available: · Observation mode day side, · Observation mode night side, · Special Observation mode (target) day side · Special Observation (target) mode night side. Each product contains one scene, defined as 1/60 of one pass. Near Real Time products are available.
GOSAT TANSO-FTS L2 CH4 Column Amount	Methane (CH4) column abundances obtained by the TANSO-FTS in the shortwave infrared (SWIR) bands. Each product stores the column amount for one day.
GOSAT TANSO-FTS L2 CO2 Column Amount	Carbon Dioxide (CO_2) column abundances obtained by the TANSO-FTS in the SWIR bands. Each product stores the column amount for one day.
GOSAT TANSO-FTS L2 H2O Column Abundance	Water vapour (H2O) column abundances obtained by the TANSO-FTS in the SWIR bands. Each product stores the column amount for one day.
GOSAT TANSO-FTS L2 CO2 Profile	Carbon Dioxide (CO_2) vertical profile retrieved from the thermal infrared (TIR) spectrum. Each product stores the results for one day.
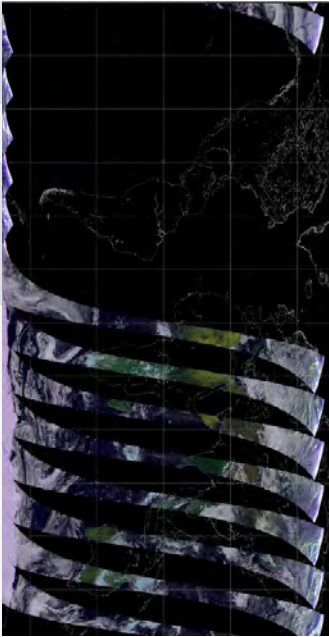
GOSAT / TANSO-FTS

Products

GOSAT TANSO-FTS L2 CH4 Profile	Methane (CH4) vertical profile retrieved form the thermal infrared (TIR) spectrum. Each product stores the results for one day.
GOSAT TANSO-FTS L3 CH4 Global Distribution	Monthly average of the CH4 column abundances of every 2.5-degree lattice across the globe, which is retrieved by interpolating with the monthly total of L2 CH4 column abundances (SWIR). Each file contains data for one month.
GOSAT TANSO-FTS L3 CO2 Global Distribution	Monthly average of the CO^2 column abundances of every 2.5-degree lattice across the globe, which is retrieved by interpolating with the monthly total of L2 CO^2 column abundances (SWIR). Each file contains data for one month.
GOSAT TANSO-FTS L4A Global CO2 Flux	The L4A data products, available in both text and netCDF formats, store monthly fluxes of CO^2 estimated for sub-continental regions. It is issued once per year
GOSAT TANSO-FTS L4A Global CH4 Flux	The L4A data products, available in both text and netCDF formats, store monthly fluxes of CH4 estimated for sub-continental regions. It is issued once per year
GOSAT TANSO-FTS L4B Global CO2 Distribution	The L4B data products store six-hourly global distributions of CO^2, derived from L4A via model simulation that depicts changes in gas concentrations affected by surface fluxes and atmospheric transport
GOSAT TANSO-FTS L4B Global CH4 Distribution	The L4B data products store six-hourly global distributions of CH4, derived from L4A via model simulation that depicts changes in gas concentrations affected by surface fluxes and atmospheric transport

ESA TPM collection and access options

GOSAT TANSO FTS and CAI full archive and new products ESA		The collection is composed of a full GOSAT archive as produced by JAXA Fast approval is required to access GOSAT data. Data is available for online FTP download from *ftp://gosat-ds.eo.esa.int* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/gosat-tanso-fts-and-cai-full-archive-and-new-products*

Weblinks
GOSAT series: https://earth.esa.int/eogateway/missions/gos-1
GOSAT-1: https://earth.esa.int/eogateway/missions/gosat

6.12 GOSAT-2

GOSAT-2 (Greenhouse gases Observing Satellite-2), which is also known as "IBUKI-2", is a JAXA satellite dedicated to the observation of greenhouse gases. The satellite expands upon the capabilities of its predecessor and carries enhanced versions of the two mission instruments aboard the GOSAT satellite: it is able to observe levels of carbon dioxide, methane, ozone, water vapour in the atmosphere and also carbon monoxide and nitrogen dioxide levels.

GOSAT-2 / TANSO-CAI-2	ATMOPSHERIC	GLOBAL	LAUNCH 2018
Instrument & agency (& any partners)	Thermal and Near infrared Sensor for Carbon Observation - Cloud and Aerosol Imager-2 (TANSO-CAI-2) | JAXA (MOE / NIES), Japan		
Type	Imaging multispectral radiometer (VIS/IR).		
Measurements & applications	Detection and correction of cloud and aerosol for TANSO-FTS-2, aerosol characteristics		
Technical characteristics	**Wavebands:** Forward Viewing (+20°): 0.343 µm, 0.443 µm, 0.674 µm, 0.869 µm, 1.63 µm Backward Viewing (-20°): 0.380 µm, 0.550 µm, 0.674 µm, 0.869 µm, 1.63 µm **Spatial resolution:** 0.5 km (0.343, 0.443, 0.674, 0.869, 0.380, 0.550, 0.674, 0.869 µm bands), 1.0 km (1.63 µm band) **Swath width:** 1000 km		
Products			
CAI-2 Level 1A	Uncorrected image data of TANSO-CAI-2, stored as digital number together with telemetry of geometric information at observation point, orbit and altitude data, temperature, etc. One scene is defined as a satellite revolution, with data starting from one ascending node to the next ascending node. · Common data products contain common information for both Forward looking and Backward looking; · FWD products contain information for Forward looking bands, from 1 to 5; · BWD products contain information for Backward looking bands, from 6 to 10.		
CAI-2 Level 1B	Contains spectral radiance data per pixel. Band-to-band registration of each forward- and backward-viewing band is applied to this product. In addition, ortho-correction is performed to observation location data based on an earth ellipsoid model, using digital elevation model data to put information of observation location with regard to elevation to all pixels. Forward and backward viewing bands are stored in the same file.		
CAI-2 Level 2 Cloud Discrimination	Stores clear-sky confidence levels per pixel, which are calculated by combining the results of threshold tests for multiple features such as reflectance ratio and Normalized Difference Vegetation Index (NDVI), obtained from spectral radiance data in GOSAT-2 TANSO-CAI-2 L1B Product. Forward and backward viewing bands are stored in the same file.		

GOSAT-2 / TANSO-CAI-2

ESA TPM collection and access options

GOSAT-2 TANSO FTS-2 and CAI-2 full archive and new products

Collection is composed of the full GOSAT archive as produced by JAXA
Fast approval is required to access GOSAT-2 TANSO CAI-2 data.
Data is available for online FTP download from: *ftp://gosat-ds.eo.esa.int*
More information about the collection can be found at:
https://earth.esa.int/eogateway/catalog/gosat-2-tanso-fts-2-and-cai-2-full-archive-and-new-products

Weblinks
GOSAT series: https://earth.esa.int/eogateway/missions/gos-1
GOSAT-2: https://earth.esa.int/eogateway/missions/gosat-2

GOSAT-2 / TANSO-FTS-2   ATMOSPHERIC   GLOBAL   LAUNCH 2018

Instrument & agency (& any partners)	Thermal and Near infrared Sensor for Carbon Observation - Fourier Transform Spectrometer-2 (TANSO-FTS-2)	JAXA (MOE / NIES), Japan
Type	Atmospheric temperature and humidity sounder and atmospheric chemistry instrument.
Measurements & applications	Global CO^2, CH4, O3, H2O, CO distribution.
Technical characteristics	**Wavebands:** 0.754 - 0.772 µm, 1.56 - 1.69 µm, 1.92 - 2.38 µm, 5.55 - 8.41 µm, 8.41 - 14.30 µm **Spatial resolution:** 9.7 km **Swath width:** 160 km

Products

FTS-2 Level 1A Products	Interferogram data observed by FTS-2, together with geometric information of observation points and various telemetry sampled as equal distance. In addition, data from an optical camera (CAM) near the observation time are also stored. Following product types are available, for day and night observations: · Common data products contain common information for SWIR/TIR including CAM data; · SWIR data contain information from SWIR band (only day observations); · TIR data contain information from TIR band; The data are first processed with predicted orbit file and made immediately available to generate Near Real Time products.
FTS-2 level 1B Products	Level 1B products are complex spectrum data generated by interferogram data sampled at equal distance and applied radiometric correction, phase correction, Fourier transformation, etc. Spectrum data generated by Fourier transformation, radiometric, phase and other corrections to raw interferogram data in L1A. The sampled CAM data near the observation time are also stored. Three different product types, each for day and night observations. · Common data products contain common information for SWIR/TIR including CAM data; · SWIR products for SWIR spectrum data before and after sensitivity correction (only day observations); · TIR products for TIR spectrum data after sensitivity correction using blackbody and deep space calibration data and after correction of finite field of view. The data are first processed with predicted orbit file and made immediately available to generate Near Real Time products

GOSAT-2 / TANSO-FTS-2

Products

FTS-2 Level 2 Column-averaged Dry-air Mole Fraction	Stores column-averaged dry-air mole fraction of atmospheric gases; TANSO-FTS-2 SWIR data acquired under the condition where no cloud or only optically thin cirrus clouds are present.
FTS-2 Level 2 Chlorophyll Fluorescence and Proxy Method	Stores solar-induced chlorophyll fluorescence data and column-averaged dry-air mole fraction of atmospheric gases; result obtained under the assumption of clear-sky condition from radiance spectrum.

ESA TPM collection and access options

GOSAT-2 TANSO FTS-2 and CAI-2 full archive and new products		The collection is composed of a full GOSAT archive as produced by JAXA. Fast approval is required to access GOSAT-2 TANSO FTS-2 data. Data is available for online FTP download from *ftp://gosat-ds.eo.esa.int* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/gosat-2-tanso-fts-2-and-cai-2-full-archive-and-new-products*

Weblinks
GOSAT series: https://earth.esa.int/eogateway/missions/gos-1
GOSAT-2: https://earth.esa.int/eogateway/missions/gosat-2

6.13 GRACE

The Gravity Recovery and Climate Experiment (GRACE) mission was a joint project between NASA and DLR. The twin satellites were built by Astrium and launched together using a ROCKOT in 2002. The mission was operated by the German Satellite Operations Centre until its end in October 2017.

The primary science objective of GRACE was to measure the Earth's gravity field and time variability with unprecedented accuracy. The secondary science objective was to obtain approximately 150 very precise globally distributed vertical temperature and humidity profiles of the atmosphere per day using the GPS radio occultation technique.

GRACE / GRACE Instrument	OTHER	GLOBAL	LAUNCH-EOL 2002-2017
Instrument & agency (& any partners)	GRACE Instrument | NASA, USA / DLR, Germany / ESA, Europe / GFZ, Germany		
Type	Gravity instruments		
Measurements & applications	Global models of the mean and time variable Earth gravity field. Gravity, magnetic and geodynamic measurements; soil moisture; ocean topography/currents.		
Technical characteristics	**Wavebands:** K-Band (0.83 - 2.8 cm) **Spatial resolution:** Very Low Resolution (>1200 m) **Swath width:** 400 km		

Products		
	Level-1B data products are the result of a possibly irreversible processing applied to both the Level-1A and Level-0 data at NASA/JPL. The data are correctly time-tagged and data sample rate is reduced from the higher rates of the previous levels. Collectively, the processing from Level-0 to Level-1B is called the Level-1 Processing. This level also includes the ancillary data products generated during this processing and the additional data needed for further processing.	
Level 1B	Satellite clock solution	Offset of the satellite receiver clock relative to GPS time, obtained by linear fit to raw on-board clock offset estimates.
	GPS flight data	Preprocessed and calibrated GPS code and phase tracking data edited and decimated from instrument high-rate (10s (code) or 1s (phase)) to low-rate (10s) samples for science use (1 file per day, level-1 format).
	Accelerometer Housekeeping data	Accelerometer proof-mass bias voltages, capacitive sensor outputs, instrument control unit (ICU) and sensor unit (SU) temperatures, reference voltages, primary and secondary power supply voltages (1 file per day, level-1 format).
	Accelerometer data	Preprocessed and calibrated Level-1B accelerometer data edited and decimated from instrument high-rate (0.1s) to low-rate (1s) samples for science use (1 file per day, level-1 format).
	Intermediate clock solution	Derived with GIPSY POD software (300s sample rate) (1 file per day, GIPSY format).
	Instrument processing unit	Edited and decimated from high-rate (TBD s) to low-rate (TBD s) samples for science use (1 file per day, level-1 format).

GRACE / GRACE Instrument

Level 1B	Spacecraft Mass Housekeeping data	Level 1B Data as a function of time
	GPS navigation solution data	Edited and decimated from instrument high-rate (60 s) to low-rate (30 s) samples for science use (1 file per day, level-1 format)
	OBDH time mapping to GPS time Housekeeping data	Preprocessed and calibrated star camera quaternion data edited and decimated from instrument high-rate (1 s) to low-rate (5 s) samples for science use (1 file per day, level-1 format)
	Star camera data	Pre-processed and calibrated star camera quaternion data edited and decimated from instrument high-rate (1 s) to low-rate (5 s) samples for science use (1 file per day, level-1 format)
	Thruster activation Housekeeping data	GN2 thruster data used for attitude (10 mN) and orbit (40 mN) control
	GN2 tank temperature and pressure Housekeeping data	GN2 tank temperature and pressure data
	Oscillator frequency data	Derived from POD product GRACE-A and GRACE-B Combined Level-1B Data Product
	Preprocessed and calibrated k-band ranging data	Range, range-rate and range-acceleration data edited and decimated from instrument high-rate (0.1 s) to low-rate (5 s) samples for science use (1 file per day, level-1 format)
	Atmosphere and Ocean De-aliasing Product	GRACE Atmosphere and Ocean De-aliasing Product
Level 2		Level-2 data products include the static and time-variable (monthly) gravity field and related data products derived from the application of Level-2 processing at GFZ, UTCSR and JPL to the previous level data products. This level also includes the ancillary data products such as GFZ's Level-1B short-term atmosphere and ocean de-aliasing product (AOD1B) generated during this processing. All level-2 products have 1 file per time span, and are in the level-2 format.
	GAC	Combination of non-tidal atmosphere and ocean spherical harmonic coefficients provided as average over certain time span (same as corresponding GSM product) based on level-1 AOD1B product.
	GCM	Spherical harmonic coefficients and standard deviations of the long-term static gravity field estimated by combination of GRACE satellite instrument data and other information for a dedicated time span (multiple years) and spatial resolution.
	GAB	Non-tidal ocean spherical harmonic coefficients provided as average over certain time span (same as corresponding GSM product) based on level-1 AOD1B product.
	GAD	Bottom pressure product - combination of surface pressure and ocean (over the oceans, and zero over land). Spherical harmonic coefficients provided as average over certain time span (same as corresponding GSM product) based on level-1 AOD1B product.
	GSM	Spherical harmonic coefficients and standard deviations of the static gravity field estimated from GRACE satellite instrument data only for a dedicated time span (e.g. weekly, monthly, multiple years) and spatial resolution.

ESA TPM collection and access options

GRACE-A and GRACE-B Level 1B, Level 1B combined and Level 2 Data Products		Users can access all GRACE Level-1B/-2 products via the GFZ/ISDC archive (local registration required): *https://isdc.gfz-potsdam.de/grace-isdc* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/grace-a-and-grace-b-level-1b-level-1b-combined-and-level-2-data-products*

Weblinks
GRACE: https://earth.esa.int/eogateway/missions/grace

6.14 ICEYE

The ICEYE constellation consists of 27 X-band Synthetic Aperture Radar (SAR) satellites as of June 2023. Over the coming years, it is expected to grow to provide persistent monitoring capabilities with high rate of revisits and high resolution view of the Earth's surface. Each orbit plane is phased around the Earth with a different local time of ascending node (LTAN) and descending node (LTDN) in order to have the ability to observe a location at different times of the day.

ICEYE / X-Band SAR	VERY HIGH	GLOBAL	LAUNCH 2018
Instrument & agency (& any partners)	X-Band SAR | ICEYE, Finland		
Type	Synthetic Aperture Radar in X-band		
Measurements & applications	Agricultural monitoring, marine oil spill monitoring, monitoring sea ice movements, prevention of illegal fishing locations, urban monitoring, vessel tracking (ship detection).		
Technical characteristics	**Wavebands**: X-band (9.65 GHz) **Spatial resolutions**: Spot: 25cm , Strip: 3m, Scan: 15m. **Swath wid**th: 5 km Spot, 30 km Strip, 100 km Scan		
Products			
Single Look Complex (SLC) (Level 1A)	Single Look Complex (SLC) Level 1A products consist of focused SAR data geo-referenced using orbit and altitude data from the satellite and the scenes are stored in the satellite's native image acquisition geometry which is the slant-range-by-azimuth imaging plane and with zero-Doppler SAR coordinates. The pixels are spaced equidistant in azimuth and in slant range. The products include a single look in each dimension using the full transmit signal bandwidth and consist of complex magnitude value samples preserving both amplitude and phase information. No radiometric artefacts induced by spatial resampling or geocoding. The product is provided in Hierarchical Data Format (HDF5) plus a xml file with selected metadata.		
Ground Range Detected (GRD) (Level 1B)	Ground Range Detected (GRD) Level 1B products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model. The image coordinates are oriented along the flight direction and along the ground range. Pixel values represent detected magnitude, however the phase information is lost. The resulting product has approximately square spatial resolution pixels and square pixel spacing with reduced speckle due to the multi-look processing at the cost of worse spatial resolution. No image rotation to a map coordinate system has been performed and interpolation artefacts are thus avoided. The product is provided in GeoTiff plus a xml file with selected metadata.		

ICEYE / X-Band SAR

Products

All ICEYE products are available in the following modes:

- **Strip Instrument Mode**: The ground swath is illuminated with a continuous sequence of pulses while the antenna beam is fixed in its orientation. This results in a long image strip parallel to the flight direction, with the transmitted pulse bandwidth is adjusted to always achieve a ground range resolution of 3 m.

- **Spot Instrument Mode**: The radar beam is steered to illuminate a fixed point to increase the illumination time, resulting in an extended Synthetic aperture length, which improves the azimuth resolution. Spot mode uses a 300 MHz pulse bandwidth and provides a slant plane image with a resolution of 0.5 m (range) by 0.25 m (azimuth); when translated into the ground, the products have 1m resolution covering an area of 5 km x 5 km. Due to multi-looking, speckle noise is significantly reduced.

- **Scan Instrument Mode**: The phased array antenna is used to create multiple beams in the elevation direction which allows to acquire a large area (100 km x 100 km) with resolution better than 15 m. To achieve the finest image quality of its Scan image, ICEYE employs a TOPSAR technique, which brings major benefits over the quality of the images obtained with conventional SCANSAR imaging. With the 2-dimensional electronic beam steering, TOPSAR ensures the maximum radar power distribution in the scene, providing uniform image quality.

- **Dwell Mode:** With this acquisition mode the satellite stares at the same location for up to 25 seconds. This yields a very fine azimuth resolution and highly reduced speckle noise. The 25 second collection time also allows the acquired image stack to be reconstructed as a video, providing insight into the movement of objects.

ESA TPM collection and access options

ICEYE ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products over the years. A data service request is required to access ICEYE data. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/smcat/ICEYE/* More information on the collection can be found here: *https://earth.esa.int/eogateway/catalog/iceye-esa-archive*
ICEYE full archive and tasking		ESA offers access to worldwide ICEYE data (both archive and new tasking) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/iceye-full-archive-and-tasking*

EDAP Quality Assessment:
https://earth.esa.int/eogateway/documents/20142/37627/Technical+Note+on+Quality+Assessment+for+ICEYE+X2.pdf/15222d39-d01e-102e-ea34-edea82ff76dc

Weblinks
ICEYE: https://earth.esa.int/eogateway/missions/ICEYE

6.15 Ikonos-2

Ikonos-2 was a high-resolution commercial imaging satellite operated by Maxar. Ikonos-2 carried MS and PAN instruments, known as the Optical Sensor Assembly (OSA). The outputs of these instruments were combined in post-processing into a synthesised product known as the Geo Ortho Kit.

Ikonos-2 / OSA	VERY HIGH	ESA COPY	LAUNCH-EOL 1999-2015	
Instrument & agency (& any partners)	Optical Sensor Assembly Maxar, USA / EUSI, Europe			
Type	Very High-resolution Optical Imager			
Measurements & applications	Land, landscape topography, natural disasters, floods, landslides			
Technical characteristics	**Wavebands**: Band 1 (Blue) 0.45 - 0.53 µm Band 2 (Green) 0.52 - 0.61 µm Band 3 (Red) 0.64 - 0.72 µm Band 4 (NIR) 0.767 - 0.868 µm **Spatial resolutions:** 0.82 m (PAN), 3.2 m (MS) at nadir **Swath width**: 11.3 km			

Products

Geo Ortho Kit	The Geo Ortho kit consists of Black-and-White images with radiometric and geometric corrections (1-metre pixels, CE90=15 metres) bundled with multispectral images with absolute radiometry (4-metre pixels, CE90=50 metres). The Geo Ortho Kit is tailored for sophisticated users such as photogrammetrists who want to control the orthorectification process. Geo Ortho Kit images include the camera geometry obtained at the time of image collection. Applying Geo Ortho Kit imagery, customers can produce their own highly accurate orthorectified products by using commercial off the shelf software, digital elevation models (DEMs) and optional ground control.

ESA TPM collection and access options

Ikonos-2 ESA archive	The collection is composed of the copy of products requested by ESA supported projects over their areas of interest in Europe, North Africa and the Middle East from 2000 to 2008. Fast approval is required to access Ikonos-2 data. Data can be downloaded from EO-Cat *(https://eocat.esa.int)* and the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/IKONOS2* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/ikonos-esa-archive*

Weblinks
Ikonos-2: https://earth.esa.int/eogateway/missions/ikonos-2

6.16 IRS-1C/1D
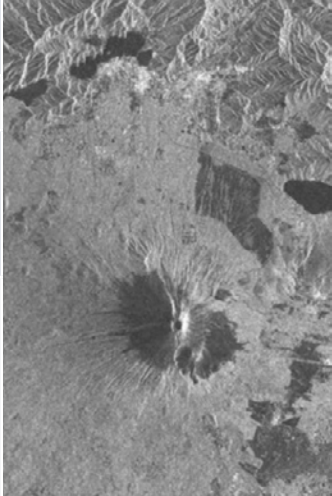
IRS-1C and IRS-1D were two identical satellites from the Indian Space Research Organisation (ISRO). IRS-1C was launched in December 1995 and ceased operations in 2007; IRS-1D was launched in September 1997 and ceased operations in 2010. As part of Indian Remote Sensing Satellite (IRS) programme, they contributed to support the national economy in the areas of agriculture, water resources, forestry and ecology, geology, water sheds, marine fisheries, coastal management, weather forecast and natural disaster management.

IRS-1C/1D / PAN / LISS-III / WiFS	MED-HIGH	GLOBAL	LAUNCH-EOL 1995-2010
Instrument & agency (& any partners)	Panchromatic Camera (PAN) Linear Imaging Self-Scanning Sensor-III (LISS-III) Wide Field Sensor (WiFS) | ISRO, India / GAF, Germany		
Type	Optical Imagers		
Measurements & applications	Land and water resources management, vegetation index mapping, geological and geomorphological mapping, urban fringe monitoring, disaster management		
Technical characteristics	**Wavebands**: PAN: 0.5 - 0.75 μm LISS-III: Green: 0.52 - 0.59 μm | Red: 0.62 - 0.68 μm Near-IR: 0.77 - 0.86 μm | SWIR: 1.55 - 1.75 μm WiFS: Red: 0.62 - 0.68 μm | Near-IR: 0.77 - 0.86 μm **Spatial resolutions**: PAN: 5.6 m at nadir | LISS-III: 23.5m (VNIR), 70.5 m(SWIR) | AWiFS: 188 m **Swath width**: PAN: 70km at nadir | LISS-III: 142 km (VNIR), 148 km (SWIR) | AWiFS: 810 km		

Products	
PAN	Panchromatic Level 1, resolution 5 m, Coverage 70 km x 70 km
LISS-III	Multi-spectral Level 1, resolution 25 m, Coverage 140 km x 140 km
WiFS	Multi-spectral Level 1, resolution 180 m, Coverage 800 km x 800 km

Available products:
· System or radiometrically corrected
· Ortho corrected (DN)

ESA TPM collection and access options		
IRS-1C/1D European Coverage		See Section 7.10 for more details.
IRS-1C/1D Full archive		ESA offers access to IRS-1C/1D archive data via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/irs-1c-1d-full-archive*

Weblinks
IRS series: https://earth.esa.int/eogateway/missions/irs-1c-1d
IRS-1C: https://earth.esa.int/eogateway/missions/IRS-1C
IRS-1D: https://earth.esa.int/eogateway/missions/IRS-1D

6.17 JERS-1

JERS-1 was launched in February 1992, reaching its end of life in October 1998. It was a radar/optical mission led by NASDA (now JAXA). The overall objectives were the generation of global data sets with SAR and OPS sensors aimed at surveying resources, establishing an integrated EO system, and verifying instrument/system performances.

The mission applications focused on survey of geological phenomena, land usage, observation of coastal regions, geologic maps, environment and disaster monitoring and demonstration of two-pass SAR interferometry for change detection.

JERS-1 / L-band SAR	MED-HIGH	EUROPE, NORTH AFRICA	LAUNCH-EOL 1992-1998
Instrument & agency (& any partners)	L-band Synthetic Aperture Radar | JAXA / NASDA, Japan		
Type	Optical Imaging Microwave Radar		
Measurements & applications	Applications include ocean observations such as waves or ice sheets, selected land features such as mountainous terrain or agricultural fields, and geological data.		
Technical characteristics	**Waveband**: 1275 MHz (L-Band) MW (~0.1 cm - ~100 cm), **Spatial resolution**: 18 m (range) × 18 m (azimuth at three looks) **Swath width**: 75 km		

Products	
JERS-1 SAR Level 1 Precision Image	The SAR PRI product is a multi-look (speckle-reduced), ground range, system corrected image. It is the appropriate product for most users interested in remote-sensing applications. The product is calibrated and corrected for the SAR antenna pattern and range-spreading loss: radar backscatter can be derived from the product for geophysical modelling, but no correction is applied for terrain-induced radiometric effects. The image is not geo coded and terrain distortion (foreshortening and layover) has not been removed.
JERS-1 SAR Level 1 Single Look Complex Image	The SLC product is a slant-range projected complex image in zero-Doppler SAR coordinates. The data is sampled in natural units of time in range and along track, with the range pixel spacing corresponding to the reciprocal of the platform ADC rate and the along track spacing to the reciprocal of the PRF. Data is processed to an unweighted Doppler bandwidth of 1000 Hz, without sidelobe reduction. The product is suitable for interferometric, calibration and quality analysis applications.

JERS-1 / L-band SAR

ESA TPM Collection and Access Options

JERS-1 SAR Level 1 Precision Image	🔓 📁	The collection is composed of the data acquired by Fucino and Kiruna ESA ground stations. Users can immediately access the collection. Data can be downloaded from EO-Cat *(https://eocat.esa.int)* and from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/JERS1-PRI* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/jers-1-sar-level-1-precision-image*
JERS-1 SAR Level 1 Single Look Complex Image	🔓 📁	The collection is composed of the data acquired by Fucino and Kiruna ESA ground stations. Users can immediately access the collection. Data can be downloaded from EO-Cat *(https://eocat.esa.int)* and from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/JERS1-SLC* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/jers-1-sar-level-1-single-look-complex-image*

Weblinks
JERS-1: https://earth.esa.int/eogateway/missions/jers-1

JERS-1 / OPS	MED-HIGH		EUROPE, NORTH AFRICA		LAUNCH-EOL 1992-1998	

Instrument & agency (& any partners)	Optical Sensor | JAXA / NASDA, Japan
Type	Medium-resolution Optical Imager
Measurements & applications	Medium-resolution multispectral imager for land applications which include environmental monitoring, agriculture and forestry, disaster monitoring.
Technical characteristics	**Wavebands**: Green: 0.52 - 0.60 µm | Red: 0.63 - 0.69 µm NIR: 0.76 - 0.86 µm **Spatial resolution**: 18.3 m (range) × 24.2 m (azimuth) **Swath width**: 75 km

Products

OPS (Optical Sensor) Very Near Infrared Radiometer (VNIR) System Corrected Products Level 1	Only the VNIR products are available as ESA TPM data. All four bands are corrected with vertical and horizontal de-striping and the radiometry values are expanded from the range [0,63] to [0,255]. No geometrical correction is applied. Radiometric correction is applied. The JERS-1 OPS digital products are recorded in a format that conforms to the CEOS Standard Family Format conventions.

ESA TPM collection and access options

JERS-1 OPS (Optical Sensor) Very Near Infrared Radiometer (VNIR) System Corrected Products level 1	🔓 📁	The collection is composed of data acquired by Fucino and Kiruna ESA ground stations. Users can immediately access the collection. Data can be downloaded from EO-Cat *(https://eocat.esa.int)* and from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/JERS1-SYC* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/jers-1-ops-optical-sensor-very-near-infrared-radiometer-vnir-system-corrected-products-level-1*

Weblinks
JERS-1: https://earth.esa.int/eogateway/missions/JERS-1

6.18 KOMPSAT-1

KOMPSAT-1 (Korean Multi-Purpose Satellite), also known as Arirang-1, was a South Korean Earth observation satellite launched on 21 December 1999. It successfully operated for eight years until its communication link was lost on 30 December 2007, leading to the discontinuation of satellite operations in January 2008.

The main objective of KOMPSAT-1 was to capture imagery of the Earth's surface to monitor environmental changes, support land management activities, and aid in disaster response. KOMPSAT-1 carried an Electro-Optical Camera (EOC).

KOMPSAT-1 / EOC	HIGH	EUROPE	LAUNCH-EOL 1999-2008
Instrument & agency (& any partners)	Electro-Optical Camera (EOC) | KARI, Korea		
Type	High-resolution optical imager (camera)		
Measurements & applications	Captures panchromatic imagery of the Earth's surface to monitor environmental changes, support land management activities, and aid in disaster response.		
Technical characteristics	**Wavebands:** PAN: 510 - 730 nm **Spatial resolution:** 6.6 m **Swath width:** 17 km		

Products	
EOC_PAN_1P	Available as a single coverage collection of data over 50 European Cities acquired by KOMPSAT-1's Electro-Optical Camera (EOC) geolocated and orthorectified. The dataset is composed of PAN imagery at 6.6 m GSD, in GeoTIFF format and corresponds to Level 1B processing.

ESA TPM collection and access options	
KOMPSAT-1 Coverage of 50 European Cities - Featured Dataset	Available as a sample collection of data acquired by KOMPSAT-1's Electro-Optical Camera (EOC) with no orthorectification or radiometric calibration. See Section for 7.11 more details. Users can immediately access the collection. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/Kompsat1* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/kompsat-1-coverage-of-50-european-cities*

Weblinks
KOMPSAT-1: https://earth.esa.int/eogateway/missions/kompsat-1

6.18.1 KOMPSAT-2

KOMPSAT-2, also referred to as Arirang-2, was developed by KARI to provide continuity from the KOMPSAT-1 mission.

The main mission objectives of KOMPSAT-2 were to provide surveillance of large-scale disasters and support disaster response, acquire independent high-resolution images for Geographic Information Systems (GIS), assist the composition of printed maps and digitised maps for domestic and overseas territories, inform decisions around the balanced development of Korean territories, and to survey natural resources. KOMPSAT-2 carried the MSC (Multi-Spectral Camera) instrument.

KOMPSAT-2 / MSC	VERY HIGH		EUROPE, ESA COPY		LAUNCH-EOL 2006-2023	
Instrument & agency (& any partners)	Multi-Spectral Camera	KARI (ELOP), South Korea				
Type	Very High-resolution Optical Imager					
Measurements & applications	Surveillance and response to large-scale disasters, acquisition of independent high- resolution images for GIS, composition of printed and digitised maps for domestic and overseas territories, balanced development of Korean territories, survey of natural resources, and continuation of satellite EO after KOMPSAT-1.					
Technical characteristics	**Wavebands:** **P**anchromatic: 0.50 - 0.90 µm VIS: 0.45 - 0.52 µm, 0.52 - 0.60 µm, 0.63 - 0.69 µm NIR: 0.76 - 0.90 µm **Spatial resolutions:** 1 m (PAN), 4 m (MS) **Swath width:** 15 km					

Products

PAN	Locate, identify and measure surface features and objects primarily by their physical appearance (500 - 900 nm)
MS band 1	Mapping shallow water, differentiating soil from vegetation (450 - 520 nm - blue)
MS band 2	Differentiating vegetation by health (520 - 600 nm - green)
MS band 3	Differentiating vegetation by species (630 - 690 nm - red)
MS band 4	Mapping vegetation, mapping vegetation vigor/health, differentiating vegetation by species (760 - 900 nm NIR)

ESA TPM collection and access options

TropForest 2010 – Featured Dataset		KOMPSAT-2 contributed to the TropForest 2010 project. See Section 7.17 for more details.
KOMPSAT-2 ESA archive		The collection contains products from selected areas worldwide, mainly in Europe, acquired between 2007 and 2014 and ESA copies. Users can immediately access the collection. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/Kompsat2* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/kompsat-2-esa-archive*

Weblinks
KOMPSAT-2: https://earth.esa.int/eogateway/missions/kompsat-2

6.19 Landsat

In the mid-1960's, NASA embarked on an initiative to develop and launch the first Earth-monitoring satellite to meet the needs of resource managers and earth scientists.

NASA was responsible for operating the program through the early 1980's. In January 1983, operation of the Landsat system was transferred to NOAA. In October 1985, the Landsat system was commercialized and EOSAT assumed responsibility for its operation under contract to NOAA. Following the Remote Sensing Policy Act of 1992, USGS EROS Data Center (EDC) retained primary responsibility from the Government to archive Landsat data, and operations passed to USGS before the launch of Landsat 7 in 1999. Landsat's Global Survey Mission is to establish and execute a data acquisition strategy that ensures repetitive acquisition of observations over the Earth's land mass, coastal boundaries, and coral reefs.

The full dataset acquired by European ground stations (more than 1 million scenes) is now available online via direct download.

6.19.1 Landsat 1-5

The Multi Spectral Scanner (MSS) instrument was carried aboard the Landsat 1 to 5 missions between 1972 and 2013. Global MSS acquisitions ended in 1999, even though Landsat 4 and 5 were still active. The Multi Spectral Scanner (MSS) on the Landsat-1 to 5 missions was an opto-mechanical scanning instrument (whiskbroom technique, unidirectional operation) consisting of a double reflector-type telescope, scanning mirror, filters, detectors, and associated electronics. The Thematic Mapper (TM) instrument was carried aboard Landsat 4 & 5, where it measured surface radiance and emittance, lands cover state and change.

Landsat 1-5 /MSS	MEDIUM	EUROPE, NORTH AFRICA, MIDDLE EAST	LAUNCH-EOL 1972-2013

Instrument & agency (& any partners)	Multi Spectral Scanner (MSS)	USGS / NASA, USA
Type	Imaging multi-spectral radiometers
Measurements & applications	Measurement of Surface radiance mainly for land applications
Technical characteristics	**Wavebands**: Green: 0.5 - 0.6 μm, Red: 0.6 - 0.7 μm NIR-1: 0.7 - 0.8 μm, NIR-2: 0.8 - 1.1 μm TIR: 10.40 - 12.60 μm (Landsat-3 only) **Spatial resolutions:** Cross-track: 68 m, Along-track: 83 m (resampled to 60 m) **Swath width:** 185 km

Products

This dataset contains all the Landsat 1 to Landsat 5 Multi Spectral Scanner (MSS) high-quality ortho-rectified Level 1 GEO and GTC dataset acquired by ESA from 1974 to 1993 over the Fucino, Kiruna (active from April to September only) and Maspalomas (on campaign basis) visibility masks. Two different product levels are available.

Geometrically and terrain corrected GTC Products (Level 1T)	The most accurate level of processing as they incorporate Ground Control Points (GCPs) and a Digital Elevation Model (DEM) to provide systematic geometric and topographic accuracy; with geodetic accuracy dependent on the number, spatial distribution and accuracy of the GCPs over the scene extent, and the resolution of the DEM used.
Geometrically corrected GEO Product (Level 1G)	Normally generated where there is a lack of GCPs, and are derived purely from data collected by the sensor and spacecraft e.g. ephemeris data.

ESA TPM Collection and Access Options

Landsat MSS ESA Archive	The collection is composed of the products acquired at ESA receiving stations (Fucino, Masplomas, Matera and Kiruna visibility masks) Users can immediately access the collection. Data can be downloaded from the Online Dissemination Service at: *https://landsat-diss.eo.esa.int/oads/access/collection/LandsatMSS* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/landsat-mss-esa-archive*

Weblinks
Landsat Series: https://earth.esa.int/eogateway/missions/landsat
Landsat 1-3: https://earth.esa.int/eogateway/missions/landsat-1-to-landsat-3
Landsat 4-5: https://earth.esa.int/eogateway/missions/landsat-4-and-landsat-5

6.19.2 Landsat 3

The Return Beam Vidicon (RBV) instrument was employed on Landsat 1 to 3 from 1972 to 1983, offering an 80-meter spatial resolution. It consisted of three separate, co-aligned television cameras, each dedicated to a specific spectral band (band 1: blue-green, band 2: yellow-red, band 3: NIR).

For Landsat 3 (1978-1983), the RBV system underwent a redesign, employing two cameras operating within a single broad spectral band (ranging from green to near-infrared, 0.505–0.750 μm). These cameras were placed side by side, providing panchromatic spectral response and a higher spatial resolution compared to Landsat 1 and Landsat 2. Each camera covered a swath of approximately 90 km, resulting in a total swath width of 180 km, with a spatial resolution of 40 m.

Landsat 3 / RBV	MEDIUM	GLOBAL	LAUNCH-EOL 1978-1983
Instrument & agency (& any partners)	Return Beam Vidicon (RBV) | NOAA / NASA, USA		
Type	Optical imager (camera)		
Measurements & applications	The data was considered useful for engineering evaluation purposes rather than scientific analysis. The data is a historical collection that comes from the digitisation of old films.		
Technical characteristics	**Wavebands:** VIS: 505 - 750 nm **Spatial resolution:** 40 m **Swath width:** 180 km		

Products	
Geometrically and Terrain Corrected (GTC) Products (Level 1T)	This dataset contains Landsat 3 Return Beam Vidicon (RBV) products, acquired by ESA by the Fucino ground station over its visibility mask. The data (673 scenes) are the result of the digitisation of the original 70 millimetre (mm) black and white film rolls.

ESA TPM Collection and Access Options	
Landsat RBV PAN 1P	Users can immediately access the collection. Data can be downloaded from the Online Dissemination Service at: *https://landsat-diss.eo.esa.int/smcat/LandsatRBV/* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/landsat-rbv*

Weblinks
Landsat Series: https://earth.esa.int/eogateway/missions/landsat
Landsat 1-3: https://earth.esa.int/eogateway/missions/landsat-1-to-landsat-3

6.19.3 Landsat 5

The acquired Landsat Thematic Mapper (TM) scene covers approximately 183 x 172.8 km. A standard full scene is nominally centred on the intersection between a path and row (the actual image centre can vary by up to 100 m). A full image is composed of 6920 pixels x 5760 lines and each band requires 40 MB of storage space (uncompressed) at 30 m spatial resolution in the VIS, NIR and SWIR as well as 120 m in the TIR spectral range.

Landsat 5 / TM	MEDIUM	EUROPE, NORTH AFRICA, ASIA	LAUNCH-EOL 1984-2013
Instrument & agency (& any partners)	Thematic Mapper (TM) | USGS / NASA, USA		
Type	Imaging multi-spectral radiometers		
Measurements & applications	Measures surface radiance and emittance, lands cover state and change (e.g. vegetation type). Used as multipurpose imagery for land applications.		
Technical characteristics	**Wavebands**: Blue: 0.45-0.52 µm, Green: 0.52-0.60 µm, Red: 0.63 - 0.69 µm, NIR: 0.76 - 0.90 µm SWIR-1: 1.55 - 1.75 µm, SWIR-2: 2.08 - 2.35 µm TIR: 10.40 - 12.50 µm **Spatial resolutions:** PAN: 15 m, VIS/NIR/SWIR: 30 m, TIR: 120 m **Swath width:** 185 km		

Products

This dataset contains all the Landsat 5 Thematic Mapper high-quality ortho-rectified L1T dataset acquired by ESA from 1984 to 2011 over the Fucino, Matera, Kiruna and Maspalomas visibility masks, as well as campaign data over Malindi, Bishkek, Chetumal, and Libreville. A standard full scene is nominally centred on the intersection between a path and row (the actual image centre can vary by up to 100 m). Two different product levels are available.

Geometrically and terrain corrected GTC Products (Level 1T)	The most accurate level of processing as they incorporate Ground Control Points (GCPs) and a Digital Elevation Model (DEM) to provide systematic geometric and topographic accuracy; with geodetic accuracy dependent on the number, spatial distribution and accuracy of the GCPs over the scene extent, and the resolution of the DEM used.
Geometrically corrected GEO Product (Level 1G)	Normally generated where there is a lack of GCPs, and are derived purely from data collected by the sensor and spacecraft e.g. ephemeris data.

ESA TPM collection and access options

Landsat 5 Thematic Mapper European and Mediterranean Countries Cloud Free		See Section 7.12 for more details.
Landsat 5 Thematic Mapper ESA Archive		The collection is composed of the products acquired at ESA receiving stations (Fucino, Masplomas, Matera and Kiruna visibility masks) plus data from the campaign at Chetumal (Mexico) and Bishkek (Kyrgyzstan), Libreville (Gabon) and Malindi (Kenya). Users can immediately access the collection. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and from the Online Dissemination Service at: *https://landsat-diss.eo.esa.int/oads/access/collection/LandsatTM* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/landsat-tm-esa-archive*

Weblinks
Landsat Series: https://earth.esa.int/eogateway/missions/landsat
Landsat 5: https://earth.esa.int/eogateway/missions/landsat-4-and-landsat-5

6.19.4 Landsat-7

The Landsat Enhanced Thematic Mapper Plus (ETM+) instrument was introduced with Landsat-7. ETM+ data cover the visible, near-infrared, shortwave, and thermal infrared spectral bands of the electromagnetic spectrum. Data had been acquired constantly by Matera, Kiruna, Maspalomas and Neustrelitz ground stations, until 2003, when the instruments has a major anomaly in the scanning mirror compensation.

Landsat-7 / ETM+	MED-HIGH	EUROPE, NORTH AFRICA, MIDDLE EAST	LAUNCH-EOL 1999-2022
Instrument & agency (& any partners)	Enhanced Thematic Mapper Plus | USGS / NASA, USA		
Type	Imaging Multispectral Radiometer (VIS/IR)		
Measurements & applications	Measures surface radiance and emittance, land cover state and change (e.g., vegetation type). Used as multipurpose imagery for land applications.		
Technical characteristics	**Wavebands:** PAN: 0.52 - 0.90 μm Blue: 0.45 - 0.52 μm Green: 0.53 - 0.61 μm Red: 0.63 - 0.69 μm NIR: 0.77 - 0.90 μm SWIR-1: 1.55 - 1.75 μm SWIR-2: 2.08 - 2.35 μm TIR: 10.40 - 12.50 μm **Swath width:** 185 km **Spatial resolutions:** PAN: 15 m, VNIR/SWIR: 30 m, TIR: 60 m		

Products	
Geometrically and terrain corrected GTC Products (Level 1T)	The ESA Archive dataset contains all the Landsat 7 Enhanced Thematic Mapper high-quality ortho-rectified L1T dataset (or L1Gt where not enough GCPs are available) over Kiruna, Maspalomas, Matera and Neustrelitz visibility masks acquired from 1999 to 2003. A standard full scene is 185 x 170 km, nominally centred on the intersection between a Path and Row (the actual image centre can vary by up to 100 m).

ESA TPM collection and access options		
Landsat 7 ETM+ (Enhanced Thematic Mapper Plus) ESA Archive		The collection is composed of the products acquired at ESA receiving stations (Fucino, Masplomas, Matera and Kiruna visibility masks) Users can immediately access the collection. Data can be downloaded from EOCAT (*https://eocat.esa.int*) and from the Online Dissemination Service at: *https://landsat-diss.eo.esa.int/oads/access/collection/LandsatETM* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/landsat-etm-esa-archive*
Landsat 7 ETM+ European and Mediterranean Countries Cloud Free		See Section 7.13 for more details.

Weblinks	
Landsat Series: https://earth.esa.int/eogateway/missions/landsat Landsat-7: https://earth.esa.int/eogateway/missions/landsat-7	

6.19.5 Landsat-8

The Operational Land Imager (OLI) and the Thermal Infrared Scanner (TIRS) are the two instruments carried on board Landsat-8.

These two sensors provide seasonal coverage of the global landmass at a spatial resolution of 30 m (visible, NIR, SWIR), 100 m (thermal) and 15 m (panchromatic). The spectral coverage and radiometric performance (accuracy, dynamic range and precision) are designed to detect and characterise multi-decadal land cover change in concert with historic Landsat data.

The OLI provides two new spectral bands in respect to the Landsat-7 ETM+ instrument, one tailored especially for detecting cirrus clouds and the other for coastal zone observations, and the TIRS collects data for two more narrow thermal bands. The nominal schedules expect the collection of at least 740 OLI and TIRS scenes per day, where each scene is a digital image covering a 185 × 180 km surface area.

Landsat-8 / OLI/TIRS	MED-HIGH (OLI) LOW-MED (TIRS)	EUROPE, NORTH AFRICA, MIDDLE EAST	LAUNCH 2013
Instrument & agency (& any partners)	Operational Land Imager & Thermal Infrared Sensor | USGS / NASA, USA		
Type	Imaging Multispectral Radiometer (VIS/IR)		
Measurements & applications	Measures surface radiance and emittance, land cover state and change. Used as multipurpose imagery for land applications including Earth resource and environmental monitoring, agriculture and forestry, disaster monitoring and assessment, and ice & snow cover mapping.		
Technical characteristics	**OLI** **Wavebands:** VIS-SWIR: 9 bands: 0.43 - 2.3 µm **Spatial Resolutions:** PAN: 15 m, VIS-SWIR: 30 m **Swath width:** 185 km **TIRS** **Wavebands:** TIR: 10.5 µm and 12 µm **Resolution:** 100 m **Swath width:** 185 km		
Products			
Daily collection 2 data	Data acquired daily from USGS.		
Level 1 Precision Terrain (Corrected) products (L1TP)	Radiometrically calibrated and orthorectified image data derived from L0 data scaled to at-aperture spectral radiance or reflectance and resampled for relief displacement and registration to a cartographic projection using ground control points (GCPs) and digital elevation model (DEM).		
Level 1 Systematic Terrain (Corrected) products (L1GT)	Systematic radiometric, geometric and terrain corrections applied and resampled for registration to a cartographic projection, referenced to the WGS84, G873, or current version. This level is produced in case of insufficient GCP, caused by extensive snow/cloud cover, which makes the orthorectification impossible.		
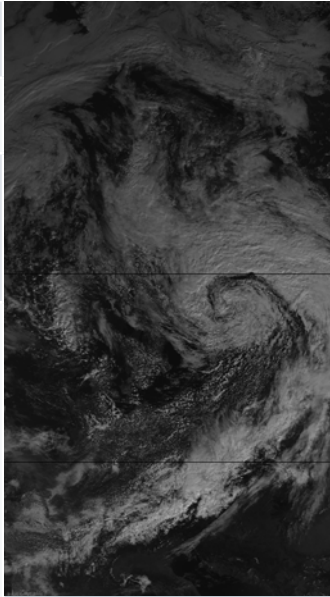
Landsat-8 / OLI/TIRS

Products	
L2SP - Level 2 Science Products (L2SP) products	Includes Surface Reflectance (SR), Surface Temperature (ST), ST intermediate bands, an angle coefficients file, and Quality Assessment (QA) Bands
L2SR - Level 2 Surface Reflectance (L2SR) products	Includes Surface Reflectance (SR), an angle coefficients file, and Quality Assessment (QA) Bands; it is generated if ST could not be generated

Landsat-8 Level 1 products combine data from the two Landsat instruments; OLI and TIRS.

Three classes of products are available:

- Real Time (RT): Newly acquired Landsat-8 OLI/TIRS data are processed upon downlink but use an initial TIRS line-of-sight model parameters; the data is made available in less than 12 hours (4-6 hours typically). Once the data have been reprocessed with the refined TIRS parameters, the products are transitioned to either Tier 1 or Tier 2 and removed from the Real-Time tier (in 14-16 days).

- Tier 1 (T1): Landsat scenes with the highest available data quality are placed into Tier 1 and are considered suitable for time-series analysis. Tier 1 includes Level-1 Precision and Terrain (L1TP) corrected data that have well-characterised radiometry and are inter-calibrated across the different Landsat instruments.

- Tier 2 (T2): Landsat scenes not meeting Tier 1 criteria during processing are assigned to Tier 2. Tier 2 scenes adhere to the same radiometric standard as Tier 1 scenes, but do not meet the Tier 1 geometry specification due to less accurate orbital information (specific to older Landsat sensors), significant cloud cover, insufficient ground control, or other factors. This includes Systematic Terrain (L1GT) and Systematic (L1GS) processed data.

ESA TPM collection and access options

Landsat-8 Collection 2 European Coverage		The collection is composed of Level 1 and Level 2 products from Collection 2. Users can immediately access the collection. Data can be downloaded from the the Online Dissemination Service at: *https://landsat-diss.eo.esa.int/oads/access/collection/LANDSAT-8_L1* *https://landsat-diss.eo.esa.int/oads/access/collection/LANDSAT-8_L2* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/landsat-8-collection-2-european-coverage*

EDAP Quality Assessment:
https://earth.esa.int/eogateway/documents/20142/37627/
Technical+Note+on+Quality+Assessment+for+FarEarth+Landsat+8+OLI+RT+Products.pdf/f087e11e-b01e-9187-4d5b-4b08a06cb15c

Weblinks
Landsat Series: https://earth.esa.int/eogateway/missions/landsat
Landsat-8: https://earth.esa.int/eogateway/missions/landsat-8

6.20 MOS-1A/1B

The Marine Observation Satellite (MOS) Constellation, made up of MOS-1A and 1B, were Japan's first marine observation satellites, owned and operated by the National Space Development Agency of Japan (NASDA), now JAXA. The satellites were designed to monitor ocean currents, sea surface temperature, atmospheric water vapour, ocean chlorophyll levels, and precipitation, as well as land vegetation. The spacecraft also acted as relays for data from remote in situ sensor platforms.

MOS-1A/1B / MESSR	MED-HIGH	GLOBAL COVERAGE	LAUNCH - EOL MOS-1A: 1987-1995 MOS-1B: 1990-1996
Instrument & agency (& any partners)	Multi-spectral Electronic Self-Scanning Radiometer (MESSR)| JAXA		
Type	Four-band pushbroom radiometer (VIS/NIR)		
Measurements & applications	Information on coastal zone dynamics, water resources, vegetation dynamics, and geological applications.		
Technical characteristics	**Wavebands:** VIS: 0.51 - 0.69 µm, 0.61 - 0.69 µm; NIR: 0.72 - 0.80 µm, 0.80 - 1.10 µm **Spatial resolutions:** 50 m **Swath width:** 100 km		

Products

ESA System Corrected Map-oriented (Level 1) Products (MES_GEC_1P)	The collection includes MOS-1A/1B MESSR products which were generated during the MOS Bulk Processing Campaign using the MOS Processor v3.02. These products are available in GeoTIFF format and distributed in EO-SIP packaging. Specifically, the collection features Geocoded Ellipsoid System Corrected Level 1 products (MES_GEC_1P).

ESA TPM collection and access options

MOS-1A/1B ESA Orthorectified Map-oriented MESSR Products	Users can immediately access the collection. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/socat/ESA_Orthorectified_Map_oriented_Level1_products* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/esa-orthorectified-map-oriented-level-1-products*
MOS-1A/1B ESA System Corrected Map-oriented MESSR Products	Users can immediately access the collection. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/socat/ESA_System_corrected_map_oriented_Level_1_products* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/esa-system-corrected-map-oriented-level-1-products*

Weblinks
MOS-1A/1B: https://earth.esa.int/eogateway/missions/mos-1-1b
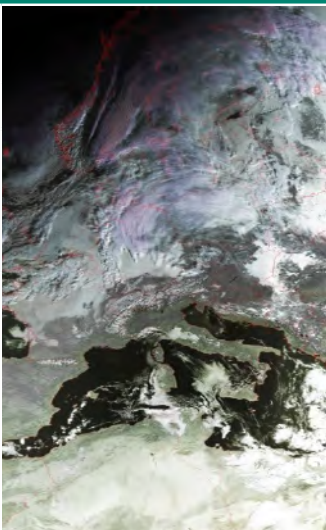
MOS-1A/1B / VTIR	MED-HIGH	GLOBAL COVERAGE	LAUNCH - EOL MOS-1A: 1987-1995 MOS-1B: 1990-1996
Instrument & agency (& any partners)	Visible and Thermal Infrared Radiometer (VTIR) | JAXA		
Type	Mechanical-scanning radiometer (VIS/TIR)		
Measurements & applications	Snowpack mapping, water vapour distribution, cloud cover mapping, ocean currents, sea surface temperature, and sea ice dynamics.		
Technical characteristics	**Wavebands:** VIS: 0.40 - 0.75 µm; TIR: 6.0 - 7.0 µm, 10.5 - 11.5 µm, 11.5 - 12.5 µm **Spatial resolutions:** VIS: 0.9 km; TIR: 2.7 km **Swath width:** 1500 km		

Products

ESA System Corrected (Level 1) VTI_SYC_1P)	The ESA System Corrected (Level 1) MOS-1A/1B VTIR product collection comprises data products generated during the MOS Bulk Processing Campaign using the MOS Processor v3.02. These products are available in GeoTIFF format and are disseminated in EO-SIP packaging.

ESA TPM collection and access options

MOS-1A/1B ESA System Corrected VTIR Products	Users can immediately access the collection. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/socat/ESA_System_corrected_Level_1_MOS_1_1B_VTIR_ product* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/esa-system-corrected-level-1-mos-1-1b-vtir-products*

Weblinks
https://earth.esa.int/eogateway/missions/mos-1-1b

6.21 NOAA POES and Metop Local Area Coverage Imagery
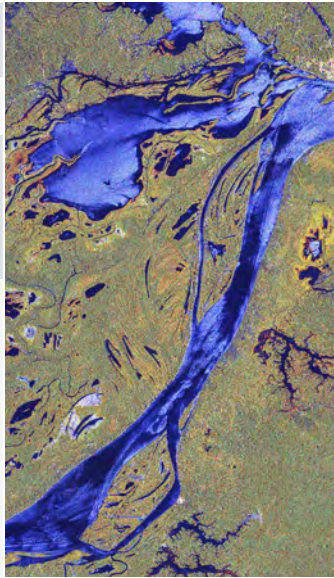
This collection is composed of AVHRR Level 1B products (1.1 km) reprocessed from the NOAA POES and Metop AVHRR sensors data acquired at the University of Dundee and University of Bern ground stations and from the ESA and University of Bern data historical archive.

Two data collections cover Europe and neighbouring regions for the period 1 January 1981 to 31 December 2020.

POES and Metop / AVHRR	ATMOSPHERIC	EUROPE	LAUNCH 1981
Instrument & agency (& any partners)	Advanced Very High Resolution Radiometer | NOAA, USA / EUMETSAT, Europe		
Type	Multi spectral radiometer		
Measurements & applications	Measurements of land and sea surface temperature, cloud cover, snow and ice cover, soil moisture and vegetation indices.		
Technical characteristics	**Wavebands:** VIS: 0.40 - 0.75 µm NIR: 0.75 - 1.30 µm SWIR: 1.3 - 3.0 µm MWIR: 3.0 - 6.0 µm TIR: 6.0 - 15.0 µm **Spatial resolutions:** 1100 m **Swath width:** 3000 km		

Products	
Level 1B	The product format is the NOAA AVHRR Level 1B that combines the AVHRR data from the HRPT stream with ancillary information like Earth location and calibration data which can be applied by the user. Other appended parameters are time codes, quality indicators, solar and satellite angles and telemetry.

ESA TPM collection and access options

There are two collections available for AVHRR L1B.

AVHRR L1B 1981-2020 European Collection		This collection is composed of AVHRR L1B (1.1 km) products acquired over Europe and neighbouring regions by the AVHRR instruments on-board the NOAA-6 to NOAA-19 and Metop series of satellites. Users can immediately access the collection via the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/NOAA_AVHRR_L1B_LAC*
AVHRR 1989-1997 1km Global (excluding Europe) Land Collection		AVHRR dataset1 KM-project out-of-Europe: This collection is composed of AVHRR HRPT L1B Local Area Coverage (LAC) products acquired outside Europe by the AVHRR instruments on-board the NOAA-6 to NOAA-19 satellites. Users can immediately access the collection via the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/NOAA_AVHRR_L1B_LAC_out-of-Europe*

More information can be found here:
https://earth.esa.int/eogateway/catalog/avhrr-level-1b-local-area-coverage-imagery

Weblinks
NOAA: https://earth.esa.int/eogateway/missions/noaa
Metop: https://earth.esa.int/eogateway/missions/metop

6.22 NovaSAR-1
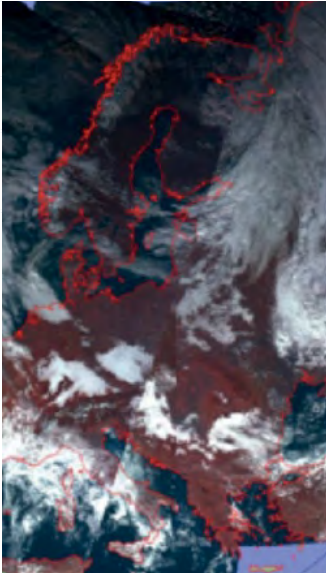
NovaSAR-1, a minisatellite launched in September 2018, its a technology demonstration mission intended to validate the performance of S-band Synthetic Aperture Radar (SAR), featuring a designed operational lifespan of seven years, and developed through a collaborative effort between Surrey Satellite Technology Ltd. (SSTL) and Airbus Defence & Space Ltd., supported by funding from entities in the UK, India, Australia, and the Philippines. The S-band SAR provides medium-resolution imagery ranging from 6 to 30 meters, making it well-suited for applications such as flood monitoring, agricultural crop assessment, forest monitoring (including temperate and rain forests), land use mapping, disaster management, and maritime applications.

NovaSAR-1 / S-SAR	MED-HIGH	GLOBAL	LAUNCH 2018
Instrument & agency (& any partners)	S-SAR | SSTL, UK / Airbus DS, UK		
Type	Imaging Microwave Radar		
Measurements & applications	Flood monitoring, agricultural crop assessment, forest monitoring (including temperate and rain forests), land use mapping, disaster management, and maritime applications.		
Technical characteristics	**Wavebands:** S-band Microwave, 3.1 – 3.3 GHz, in single-, dual-, and tri-polarisation mode. **Spatial resolutions:** Stripmap: 6 m ScanSAR: 20 m ScanSAR Wide: 30 m **Swath width:** Stripmap: 13 – 20 km ScanSAR: 50 – 100 km ScanSAR Wide: 55 – 140 km		
Products			
Level 1	Reconstructed, unprocessed instrument data at full resolution.		
GEC (Level 2, Geocoded Ellipsoid Corrected)	Processed product with applied radiometric and geometric corrections. Maritime and ocean applications.		
GTC (Level 2, Geocoded Terrain Corrected)	Processed product with applied radiometric and geometric corrections. Land applications and change detection.		
ESA TPM collection and access options			
NovaSAR-1 new tasking		ESA offers access to worldwide NovaSAR-1 new tasking data via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/novasar-1-new-tasking*	

Weblinks
NovaSAR-1: https://earth.esa.int/eogateway/missions/novasar-1

6.23 OceanSat-2

OceanSat-2 (a follow-on of IRS-P4/Oceansat-1) was an Indian Space Research Organisation (ISRO) mission focused on oceanography and sea-ice monitoring, surface winds and ocean surface strata, ocean colour, suspended sediments, atmospheric aerosols, chlorophyll concentrations, phytoplankton blooms, the identification of potential fishing zones and assessment of primary productivity, among other applications. The mission carried the Ocean Colour Monitor 2 (OCM-2), the Radio Occultation Sounder for the Atmosphere (ROSA) and a scatterometer.
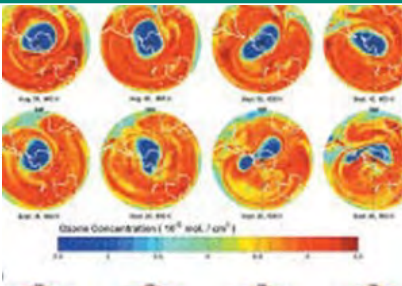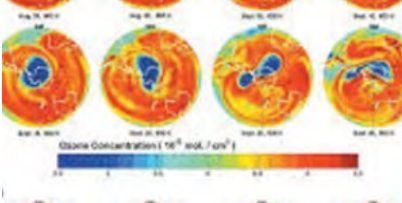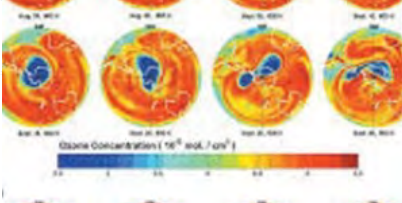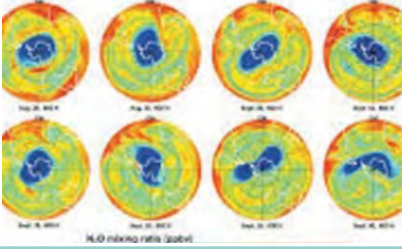
ESA began operational acquisition of OCM-2 data at the Neustrelitz ground station in Germany in January 2016, covering the North Sea, northern Mediterranean Sea, and part of the Atlantic Ocean. Data acquisition ceased in 2022.
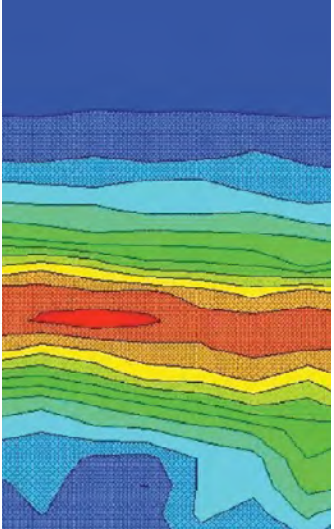
OceanSat-2 / OCM-2	LOW-MED ⛭ EUROPE 🌍	LAUNCH-EOL 2009 -2023 🏛
Instrument & agency (& any partners)	Ocean Colour Monitor 2	ISRO, India / GAF, Germany	
Type	Medium-resolution spectro-radiometer	
Measurements & applications	Spectro-radiometer providing observations in eight VIS-NIR spectral bands for various marine applications.	
Technical characteristics	**Wavebands**: 404 - 424 nm (for yellow substance absorption) ; 431 - 451 nm (for chlorophyll absorption) ; 476 - 496 nm (for chlorophyll and other pigments) ; 500 - 520 nm (for turbidity and suspended sediments) ; 546 - 566 nm (for chlorophyll reference) ; 610 - 630 nm (for total suspended matter estimation) ; 725 - 755 nm (for atmospheric correction) ; 845 - 885 nm (for atmospheric correction/aerosol optical thickness) **Spatial resolutions**: 236 m (azimuth) × 360 m (range) **Swath width**: 1420 km	

Products	
Level 1B	Geophysical Data containing Radiance Data for all 8 Bands of OCM-2. Available for users in NRT (<3 hours).
Level 2B	Geophysical Data L2B for given Geophysical parameter. The avaliable geophysical parameters are: Chlorophyll, Aerosol Depth, Different Attenuation, Total Suspended Sediments. Available for users in NRT (<3 hours).
Level 2C	Georeferenced Radiance Data for given geo physical parameter. Geo physical parameters: Chlorophyll, Aerosol Depth, Different Attenuation, Total Suspended Sediments. Available for users in NRT (<3 hours).

ESA TPM collection and access options		
OceanSat-2 Data	🔓 📁	Users can immediately access the collection via the dissemination service and will be required to log in (new users shall register) to ESA EO Sign In to download the products. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/OceanSat2*

Weblinks
OceanSat-2: https://earth.esa.int/eogateway/missions/oceansat-2

6.24 Odin

Odin is an international aeronomy and astronomy minisatellite mission led by Sweden, with Canada, France and Finland as partners. The project is carried out and funded jointly by the space agencies of Sweden (SNSA), Canada (CSA and NSERC), Finland (TEKES), and France (CNES). The Swedish Space Corporation (SSC) is responsible for spacecraft system design and development, with a spacecraft operations centre located at Esrange at a latitude of 68ºN. Odin carries the Optical Spectrograph and Infrared Imaging System (OSIRIS) and Sub-Millimetre Radiometer (SMR) instruments, both of which are well suited for atmospheric gas detection.

The Odin mission objectives are mainly astronomy and aeronomy applications, including atmospheric research: observation of stratospheric ozone chemistry, mesospheric ozone science, summer mesospheric science and coupling of atmospheric regions.

Odin / SMR	ATMOSPHERIC　GLOBAL	LAUNCH 2001
Instrument & agency (& any partners)	Sub-millimetre Radiometer | SNSA, Sweden / CSA, Canada / CNES, France / TEKES, Finland	
Type	Atmospheric Temperature & Humidity Sounder and Atmospheric Chemistry Instrument	
Measurements & applications	Measures global distributions of ozone and species of importance for ozone chemistry: ClO, HNO3, H2O, N2O, (HO2, H2O2). Measures temperature in the height range 15 - 100 km.	
Technical characteristics	**Wavebands**: Microwave: 118.7 GHz + 4 bands in the region 480 - 580 GHz: Tuneable measures 2-3 × 1GHz regions at a time. **Spatial resolutions**: Vertical resolution 1.5 - 3 km, along track 600 km **Swath width**: N/A, but measures in the altitude range 5 - 100 km	
Products		
SMR Level 1B	The entirely reconsolidated, complete Odin-SMR data archive was reprocessed applying a revised calibration scheme and upgraded algorithms.	
SMR Level 2	Regenerated for the main mesospheric and stratospheric frequency modes (i.e., FM 01, 02, 08, 13, 14, 19, 21, 22, 24).	
ESA TPM collection and access options		
Odin SMR data products	Data is available from external TPM site on the Odin-SMR Project Portal: · Odin-SMR Level 1 in JSON format · Odin-SMR Level 2 as NetCDF files · Odin-SMR monthly Level 2 as NetCDF files derived from L2 v3.0 data More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/odin-smr-data-products*	

Weblinks
ODIN: https://earth.esa.int/eogateway/missions/odin

Odin / OSIRIS	ATMOSPHERIC	GLOBAL	LAUNCH 2001
Instrument & agency (& any partners)	Optical Spectrograph and Infra-Red Imaging System | SNSA, Sweden / CSA, Canada / CNES, France / TEKES, Finland		
Type	Atmospheric Chemistry (Limb-scanning SW Spectrometer)		
Measurements & applications	Detects aerosol layers and abundance of species such as O_3, NO_2, OClO, BrO and NO. Consists of spectrograph and IR imager.		
Technical characteristics	**Wavebands**: Spectrograph: UV-VIS: 0.28 - 0.80 µm; IR Imager: NIR: 1.26 µm, 1.27 µm, 1.52 µm **Spatial resolution**: Spectrograph: 1 km at limb, Imager: 1 km in vertical **Swath width**: N/A, but measures in the altitude range 5 - 100 km		

Products

OSIRIS vertical profiles	The data products are regularly processed and provide Ozone density vertical profiles (both Level 2 and Level 3), vertical profiles of stratospheric Aerosol (both Level 2 and Level 3), slant column densities of NO2 profiles (Level 2), stratospheric BrO profiles (Level 2).

ESA TPM collection and access options

Odin OSIRIS data products	On the basis of an agreement with the University of Saskatchewan, data are available on external TPM FTP server as described by the University of Saskatchewan. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/odin-osiris-data-products*

Weblinks
ODIN: https://earth.esa.int/eogateway/missions/odin

6.25 PAZ

The PAZ (Spanish for "peace") satellite, launched on 22 February 2018, is owned and operated by Hisdesat, and is based on the use of a high-resolution X-band Synthetic Aperture Radar (SAR). The satellite operates in the same orbit as its twin satellites TerraSAR-X and TanDEM-X, and the three satellites work together as a constellation. The objective of the PAZ mission is to provide imagery for both civilian and security and defence requirements.

PAZ / SAR	VERY HIGH	GLOBAL	LAUNCH 2018
Instrument & agency (& any partners)	X-band Synthetic Aperture Radar | Hisdesat / CDTI, Spain		
Type	Imaging Microwave Radar		
Measurements & applications	High resolution X-band radar for security, land use, urban management, environmental monitoring, risk management.		
Technical characteristics	**Wavebands**: 9.65 GHz, 300 MHz bandwidth, all four polarisation modes **Spatial resolutions**: Staring Spotlight: 0.25 m High Resolution Spotlight: 1 m Spotlight: 2 m Stripmap: 3 m ScanSAR: 18 m ScanSAR Wide: 40 m **Swath width**: Staring Spotlight: 4 x 4 m High Resolution Spotlight: 5-10 x 5 km Spotlight: 10 x 10 km Stripmap: 15-30 x 50 km ScanSAR: 100 x 150 km Wide ScanSAR: 270 x 200 km		

Products	
Modes	· StripMap mode (SM), in single and dual polarisation: the ground swath is illuminated with a continuous train of pulses while the antenna beam is pointed to a fixed angle, both in elevation and in azimuth. · ScanSAR mode (SC), in single polarisation: the swath width is increased in respect to the StripMap mode, it is composed of four different sub-swaths, which are obtained by antenna steering in elevation direction · Wide ScanSAR mode (WS), in single polarisation: the usage of six sub-swaths allows to obtain a higher swath coverage product · Spotlight modes, in single and dual polarisation: spotlight modes take advantage of the beam steering capability in the azimuth plane to illuminate for a longer time the area of interest; a sensible improvement of the azimuth resolution is achieved at the expense of a shorter scene size. Spotlight mode (SL) is designed to maximise the azimuth scene extension at the expense of the spatial resolution, and High Resolution Spotlight mode (HS) is designed to maximize the spatial resolutions at the expense of the scene extension. · Staring Spotlight mode (ST), in single and dual polarisation: the virtual rotation point coincides with the centre of the beam: the image length in the flight direction is constrained by the projection on- ground of the azimuth beamwidth and it leads to a target azimuth illumination time increment and to achieve the best azimuth resolution.

PAZ / SAR

Products

Geometric projections	· Single Look Slant Range Complex (SSC): single look product of the focused radar signal: the pixels are spaced equidistant in azimuth and in slant range. No geocoding is available, no radiometric artifacts included. Product delivered in the DLR-defined binary COSAR format. The SSC product is intended for applications that require the full bandwidth and phase information, e.g. for SAR interferometry and polarimetry. · Multi Look Ground Range Detected (MGD): detected multi look product in GeoTiff format with reduced speckle and approximately square resolution cells on ground. The image coordinates are oriented along flight direction and along ground range; the pixel spacing is equidistant in azimuth and in ground range. A simple polynomial slant to ground projection is performed in range using a WGS84 ellipsoid and an average, constant terrain height parameter. No image rotation to a map coordinate system is performed and interpolation artifacts are thus avoided. · Geocoded Ellipsoid Corrected (GEC): multi look detected product in GeoTiff format. It is projected and re-sampled to the WGS84 reference ellipsoid assuming one average terrain height. No terrain correction performed. UTM is the standard projection, for polar regions UPS is applied. · Enhanced Ellipsoid Corrected (EEC): multi look detected product in GeoTiff format. It is projected and re-sampled to the WGS84 reference ellipsoid. The image distortions caused by varying terrain height are corrected using an external DEM; therefore the pixel localisation in these products is highly accurate. UTM is the standard projection, for polar regions UPS is applied.
Classes	· Spatially Enhanced products (SE): designed with the target of maximising the spatial resolution in pixels with squared size, so the larger resolution value of azimuth or ground range determines the square pixel size, and the smaller resolution value is adjusted to this size and the corresponding reduction of the bandwidth is used for speckle reduction. · Radiometrically Enhanced products (RE): designed with the target of maximising the radiometry, so the range and azimuth resolutions are intentionally decreased to significantly reduce speckle by averaging several looks.

ESA TPM collection and access options

PAZ ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access PAZ data. Data can be downloaded from the Online Dissemination Service: *https://tpm-ds.eo.esa.int/smcat/PAZ/* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/paz-esa-archive.*
PAZ full archive and tasking		ESA offers worldwide access to PAZ data (both archive and new tasking) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/paz-full-archive-and-new-tasking*

Weblinks
PAZ: https://earth.esa.int/eogateway/missions/paz

6.26 PlanetScope

The PlanetScope constellation consists of multiple groups of small cubesats (Doves and SuperDoves) which are used to image nearly all of Earth's surface every day.
The constellation is composed of more than 430 Dove and SuperDove satellites at the time of writing.

The PlanetScope Camera on each Dove captures data in red, green, blue, and near-infrared bands. The cameras on the SuperDoves extend this capability by adding new red-edge, green I (513-549nm), coastal blue, and yellow channels.

PlanetScope	VERY-HIGH	GLOBAL	LAUNCH 2016	
Instrument & agency (& any partners)	PlanetScope Camera | Planet Labs, USA			
Type	Multispectral Optical Imager			
Measurements & applications	Frequent imaging of the Earth's surface			
Technical characteristics	**Wavebands**: **Coastal Blue*:** 431 - 452 nm **Blue:** 465 - 515 nm **Green I*:** 513 - 549 nm **Green II:** 547 - 583 nm **Yellow*:** 600 - 620 nm **Red:** 650 - 680 nm **Red-Edge*:** 697 - 713 nm **NIR:** 845 - 885 nm * bands unique to SuperDove	**Frame Size:** 24 km x 8 km (approximate) for Dove-C 24 km x 16 km (approximate) for Dove-R 32.5 km x 19.6 km (approximate) for SuperDove **Ground Sample Distance (nadir):** Dove: 3.0 - 4.1 m SuperDove: 3.7 - 4.2 m		

Products	
Basic Scene Level 1B	System or radiometrically corrected and ortho corrected data. Available at Level 1 and Level 2.
Ortho Scene Level 3B	Radiometrically, sensor and geometrically corrected and projected to a cartographic map projection. The geometric correction uses fine Digital Elevation Models (DEMs) with a post spacing of between 30 and 90 metres.
Visual Ortho Scene Level 3B	Orthorectified and colour-corrected (using a colour curve) 3-band RGB Imagery. This correction attempts to optimise colours as seen by the human eye providing images as they would look if viewed from the perspective of the satellite

ESA TPM collection and access options		
PlanetScope ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access PlanetScope data. Data can be downloaded from the Online Dissemination Service: *https://tpm-ds.eo.esa.int/socat/PlanetScope* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/planetscope-esa-archive*
PlanetScope full archive		ESA offers worldwide access to PlanetScope products (both archive and monitoring data) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/planetscope-full-archive*

EDAP Quality Assessment:
https://earth.esa.int/eogateway/documents/20142/1305226/EDAP-REP-007-TN-on-Quality-Assessment-for-PlanetScope-DOVE-v1.2.pdf

Weblinks
PlanetScope: https://earth.esa.int/eogateway/missions/planetscope

6.27 Pleiades 1A/1B

Pleiades is a two-spacecraft constellation of CNES, introducing advanced technologies in EO. Starting with the first launch in 2011, the Pleiades programme follows the SPOT satellite series services.

The identical twin satellites deliver very-high optical resolution imagery (0.5 m) and offer a daily revisit capability to any point on the globe.

Pleiades 1A/1B / HiRI	VERY HIGH GLOBAL ESA COPY LAUNCH 2011
Instrument & agency (& any partners)	High-Resolution Imager | CNES, France / Airbus DS, Germany
Type	Very High-resolution Optical Imager
Measurements & applications	Very High-resolution optical imagery for cartography, land use, risk management, agriculture and forestry, civil planning and mapping, digital terrain models, and defence.
Technical characteristics	**Wavebands**: 4 bands + PAN: Pan: 480 - 820 nm Near IR: 775 - 915 nm, Red: 620 - 700 nm, Green: 510 - 590 nm, Blue: 450 - 530 nm. **Swath width**: 20 km swath at nadir. Agile platform giving ±50 degrees off-track. **Resolutions**: Panchromatic: 0.5 m, Multispectral: 2 m

Products	
Primary Product (Level 1A)	Processing level closest to the natural image acquired by the sensor. This product restores perfect collection conditions: the sensor is placed in rectilinear geometry, and the image is clear of all radiometric distortion.
Standard Orthorectified (Level 3)	Georeferenced images in Earth geometry, corrected from acquisition and terrain off-nadir effects.
Tailored Orthorectified (Level 3)	Custom orthorectification using a more precise 3D model provided by the client or acquired for the purpose.

The products are available in the following modes:
· Panchromatic image at 0.5 m resolution
· Pansharpened colour image at 0.5 m resolution
· Multispectral image in 4 spectral bands at 2 m resolution
· Bundle (0.5 m panchromatic image + 2 m multispectral image)
To complement the traditional offer, the 'Full archive and tasking' includes the subscription for accessing to OneAtlas Living Library where the entire OneAtlas optical archive is made available in streaming mode

Pleiades 1A/1B / HiRI

ESA TPM collection and access options

Pleiades ESA archive		The collection is composed of the copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access Pleiades data. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/Pleiades* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/pleiades-esa-archive*
Pleiades full archive and tasking		ESA offers access to worldwide Pleiades data (both archived and new acquisitions) and to OneAtlas Living Library via project proposal submission. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Pleiades-full-archive-and-tasking*

Weblinks
Pleiades: https://earth.esa.int/eogateway/missions/pleiades

6.28 Pleiades Neo

Pleiades Neo, initially also known as VHR-2020, is a four-satellite very high resolution Earth observation satellite constellation by Airbus Defence & Space designed as a follow on to the Pleiades-HR satellites.

When fully deployed, Airbus' Pleiades Neo constellation will comprise four identical satellites to provide commercial and institutional customers with high-resolution imaging. Phased at 90° and operated in the same orbit, these satellites are to be capable of visiting any point on the globe at least twice daily.

Pleiades Neo / Optical Imager	VERY HIGH	GLOBAL	LAUNCH 2021
Instrument & agency (& any partners)	Optical Imager | Airbus DS, Germany		
Type	Very High-resolution Optical Imager.		
Measurements & applications	Mapping, urban applications, maritime, defence. Substantial contribution to disasters monitoring.		
Technical characteristics	**Spectral bands:** **Panchromatic:** 450 - 800 nm **Deep Blue:** 400 - 450 nm **Blue:** 450 - 520 nm **Green:** 530 − 590 nm **Red:** 620 − 690 nm **Red Edge:** 700 - 750 nm **Near-infrared:** 770 − 880 nm **Swath width:** 14 km at nadir **Spatial resolution:** Panchromatic 0.3 m, Multispectral 1.2 m		

Products	
Primary Product (Level 1A)	The Primary product is the processing level closest to the natural image acquired by the sensor. This product restores perfect collection conditions: the sensor is placed in rectilinear geometry, and the image is clear of all radiometric distortion.
Projected (Level 2A)	The product is mapped onto the Earth cartographic system using a standard reference datum and projection system at a constant terrestrial altitude, relative to the reference ellipsoid.
Orthorectified (Level 3)	The Ortho product is a georeferenced image in Earth geometry, corrected from acquisition and terrain off-nadir effects.

The products are available in the following modes:
· Panchromatic image at 0.3 m resolution
· Pansharpened colour image at 0.3 m resolution
· Multispectral image in all spectral bands at 1.2 m resolution
· Bundle (0.3m panchromatic image + 1.2 m multispectral image)

ESA TPM collection and access options		
Pleiades Neo full archive and tasking		ESA offers access to worldwide Pleiades data (both archived and new acquisitions) via project proposal submission. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Pleiades-neo-full-archive-and-tasking*
		To complement the traditional offer, the 'Full archive and tasking' includes the subscription for accessing to OneAtlas Living Library where the entire OneAtlas optical archive is made available in streaming and download mode.

Weblinks
Pleiades Neo: https://earth.esa.int/eogateway/missions/pleiades-neo
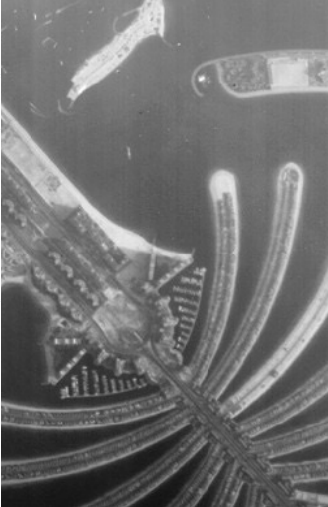
6.29 PROBA-1

The PROBA-1 mission was originally an ESA technology demonstration mission, started in mid-1998 and funded within the frame of ESA's General Support Technology Programme.

PROBA-1's main instrument was the Compact High Resolution Spectrometer (CHRIS), which had applications in the atmospheric, land, agriculture, oceans and coastal domains. It also carried the High Resolution Camera (HRC), which had a primary function of education and public outreach.

PROBA-1 / CHRIS	MED-HIGH	GLOBAL	LAUNCH-EOL 2001-2021
Instrument & agency (& any partners)	Compact High-Resolution Imaging Spectrometer | ESA, Europe / UKSA, United Kingdom / SSTL, United Kingdom / DMCii, Various		
Type	Imaging Multispectral Radiometer (VIS/IR)		
Measurements & applications	Supported a range of land, ocean, and atmospheric applications, including agricultural science, forestry, environmental science, atmospheric science and oceanography.		
Technical characteristics	**Wavebands**: VIS-NIR: 400 - 1050 nm (63 contiguous spectral bands at a spatial resolution of 36 m; or 18 bands at full spatial resolution of 18 m) **Spatial Resolutions**: 36 m or 18 m depending on wavebands selected **Swath width**: 14 km		
Products			
Level 1A	Images acquired in one of the following 5 modes, and delivered in HDF data files: Mode 1 (aerosols) Mode 2 (water bands) Mode 3 (land channels) Mode 4 (chlorophyl band set) Model 5 (land channels – half swath width)		
ESA TPM collection and access options			
PROBA-1 CHRIS Level 1A	The full PROBA-1 CHRIS archive is available. Users can immediately access the collection. Data are available for immediate download from EO-Cat (*https://eocat.esa.int*) and from the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/Proba1-CHRIS* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Proba-CHRIS-level-1a*		

Weblinks
PROBA-1: https://earth.esa.int/eogateway/missions/proba-1

PROBA-1 / HRC	MED-HIGH	GLOBAL	LAUNCH 2001

Instrument & agency (& any partners)	High-Resolution Camera	ESA, Europe
Type	High-resolution Optical Imager
Measurements & applications	Primarily intended for technology development, education and general public information purposes. Applications include agriculture, forestry, land cover mapping, vegetation, ocean and coastal information (coastal geomorphology), and water monitoring (water management).
Technical characteristics	**Waveband**: Panchromatic images VIS (~0.40 μm - ~0.75 μm) **Spatial resolution**s: 5 m ground resolution at 600 km. **Swath width:** 5 km

Products

Level 1A	The data are greyscale images containing 1024 × 1024 pixels and covers an area of 25 km^2. HRC data are supplied in BMP format.

ESA TPM collection and access options

PROBA -1 HRC	The full PROBA-1 HRC archive is available. Users can immediately access the collection. Data are available for immediate download from EO-Cat (*https://eocat.esa.int*) from the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/Proba1-HRC* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Proba-HRC*

Weblinks
PROBA-1: https://earth.esa.int/eogateway/missions/proba-1

6.30 QuickBird-2

QuickBird-2 was an Earth-imaging satellite of Maxar, with data distributed by European Space Imaging (EUSI). It was designed to be the world's highest-resolution commercial Earth-imaging satellite. Initially, at the fairly low orbital altitude of 450 km to obtain higher resolution but at the expense of swath width, in mid-April 2011, the orbit was raised to 482 km to extend the mission duration.

QuickBird-2 / BGIS-2000	VERY HIGH	GLOBAL ESA COPY	LAUNCH-EOL 2001-2015	
Instrument & agency (& any partners)	Ball Global Imaging System 2000 (BGI2000) | Maxar, USA / EUSI, Europe			
Type	Very High-resolution Multispectral Optical Imager			
Measurements & applications	Map creation, change detection, and image analysis in land, agricultural, forest and climate areas			
Technical characteristics	**Wavebands:** Panchromatic: 450 - 900 nm, Multispectral 4-bands; Blue: 450 - 520 nm, Green: 520 - 600 nm Red: 630 - 690 nm, Near-IR: 760 - 900 nm **Spatial resolutions**: 0.61 m PAN, 2.4 m MS (at nadir) **Swath width**: 16.5 km			

Products

Level 2 Standard	Normalised for topographic relief.
Level 2 View Ready Standard	Ready for orthorectification (RGB files embedded).
Level 3 View Ready Stereo	Collected in-track for stereo viewing and manipulation.
Level 3 Map-Ready (Ortho)	Scale 1:12,000, orthorectified. Additional processing unnecessary.

Band composition options:
· Panchromatic
· 4-Band Multispectral (BLUE, GREEN, RED, NIR1) · 4-Band Pan-sharpened (BLUE, GREEN, RED, NIR1)
· 4-Band Bundle (PAN, BLUE, GREEN, RED, NIR1) · 3-Bands Natural Colour (pan-sharpened BLUE, GREEN, RED)
· 3-Band Coloured Infrared (pan-sharpened GREEN, RED, NIR1) · Natural Colour / Coloured Infrared (3-Band pan-sharpened)

ESA TPM collection and access options

QuickBird-2 ESA archive	The collection is composed of the copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access QuickBird-2 data. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/QuickBird-2* More information can be found here: *https://earth.esa.int/eogateway/catalog/quickbird-2-esa-archive*
QuickBird full archive	ESA offers access to worldwide QuickBird-2 archived data via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/quickbird-full-archive*

Weblinks
QuickBird-2: https://earth.esa.int/eogateway/missions/QuickBird-2

6.31 RADARSAT-1/2

The RADARSAT programme consists of a pair of Canadian remote-sensing satellites.
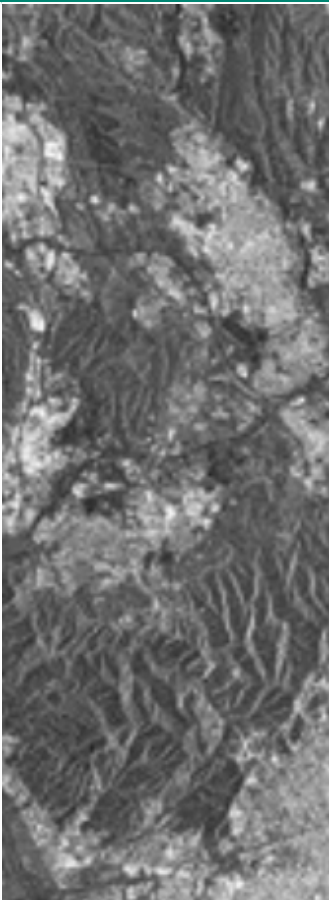
RADARSAT-1 was Canada's first commercial EO satellite and was developed to monitor the planet's natural resources and environmental changes. It was equipped with a SAR instrument that could be steered to collect data over a 1,175 km wide area using seven beam modes.

RADARSAT-2 is a jointly funded satellite mission of CSA and MDA, representing a Canadian government/ industry partnership in a commercial venture. RADARSAT-2 provides continuity from RADARSAT-1 and has the objectives of developing an EO satellite business through a private sector-led arrangement with the federal government and offering data for new applications tailored to market needs.

RADARSAT-1 / C-band SAR	VERY HIGH GLOBAL LAUNCH-EOL 1995-2013
Instrument & agency (& any partners)	C-band Synthetic Aperture Radar | CSA / MDA, Canada
Type	Imaging Microwave Radar
Measurements & applications	All-weather images of ocean, ice and land surfaces. Used for monitoring of coastal zones, polar ice, sea ice, sea state, geological features, vegetation and land surface processes.
Technical characteristics	**Waveband**: Microwave C-band 5.3 GHz, HH polarisation **Spatial resolutions**: ScanSAR Wide: 100 m ScanSAR Narrow: 60 m Wide, Standard, Extended low/high: 24 m Fine: 8 m **Swath widths**: ScarSAR wide: 500 km ScarSAR narrow: 300 km Wide: 150 km Standard: 100 km Extended low: 170 km Extended high: 75 km Fine: 50 km
Products	
Single Look Complex (SLC)	Amplitude and phase information is preserved. Data is in slant range. Georeferenced and aligned with the satellite track.
Path Image (SGF)	Data is converted to ground range and may be multi-look processed. Scene is oriented in direction of orbit path. Georeferenced and aligned with the satellite track.
Path Image Plus (SGX)	Same as SGF except processed with refined pixel spacing as needed to fully encompass the image data bandwidths. Georeferenced and aligned with the satellite track.

RADARSAT-1 / C-band SAR

Products	
Map Image (SSG)	Image is geocorrected to a map projection.
Precision Map Image (SPG)	Image is geocorrected to a map projection. Ground control points (GCP) are used to improve positional accuracy.
ScanSAR Narrow/Wide (SCN/W)	ScanSAR Narrow/Wide beam mode product with original processing options and metadata fields (for backwards compatibility only). Georeferenced and aligned with the satellite track.
ScanSAR Fine (SCF)	ScanSAR product equivalent to SGF with additional processing options and metadata fields. Georeferenced and aligned with the satellite track.
ScanSAR Sampled (SCS)	Same as SCF except with finer sampling. Georeferenced and aligned with the satellite track.

RADARSAT-1 products are available in the following modes:
· Standard beam mode
· Wide beam modes
· Fine beam mode
· Extended High beam mode
· Extended Low beam mode
· ScanSAR mode

ESA TPM collection and access options		
RADARSAT-1 full archive and tasking		ESA offers access to worldwide RADARSAT-1 archived data via project proposal. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/radarsat-1-2-full-archive-and-tasking*

Weblinks
RADARSAT-1: https://earth.esa.int/eogateway/missions/radarsat

RADARSAT-2 / C-band SAR	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2007

Instrument & agency (& any partners)	C-band Synthetic Aperture Radar	CSA / MDA, Canada
Type	Imaging Microwave Radar
Measurements & applications	All-weather images of ocean, ice and land surfaces. Used for monitoring of coastal zones, polar ice, sea ice, sea state, geological features, vegetation and land surface processes.
Technical characteristics	**Waveband:** Microwave: C band 5.405 GHz HH, VV, HV, VH polarisation – includes Quad polarisation imaging modes. **Spatial resolutions:** Spotlight: <1 m, Ultra-fine, Wide Ultra-fine: 3 m Extra-fine: 5 m (Wide) Multi-look fine, (Wide) Fine, (Wide) Fine Quad-pol: 8 m Standard, Extended high/low, (Wide) Standard Quad-pol: 25 m ScanSAR narrow: 50 m, ScanSAR wide: 100 m S**wath widths** (range x azimuth): Spotlight: 18 x 8 km, Ultra-fine: 20 x 20 km Fine, Wide Ultra-fine, Multi-look fine: 50 x 50 km Wide Multi-look fine: 90 x 50 km Extra-fine: 125 x 125 km, Wide Fine, Wide: 150 x 150 km Standard: 100 x 100 km, Extended high: 75 x 75 km Extended low: 170 x 170 km Fine/Standard Quad-pol: 25 x 25 km Wide Fine/Standard Quad-pol: 50 x 25 km ScanSAR narrow: 300 x 300 km, ScanSAR wide: 500 x 500 km

Products	
Single Look Complex (SLC)	Amplitude and phase information is preserved. Data is in slant range. Georeferenced and aligned with the satellite track.
Path Image (SGF)	Data is converted to ground range and may be multi-look processed. Scene is oriented in direction of orbit path. Georeferenced and aligned with the satellite track.
Path Image Plus (SGX)	Same as SGF except processed with refined pixel spacing as needed to fully encompass the image data bandwidths. Georeferenced and aligned with the satellite track.
Map Image (SSG)	Image is geocorrected to a map projection.
Precision Map Image (SPG)	Image is geocorrected to a map projection. Ground control points (GCP) are used to improve positional accuracy.
ScanSAR Narrow/Wide (SCN/W)	ScanSAR Narrow/Wide beam mode product with original processing options and metadata fields (for backwards compatibility only). Georeferenced and aligned with the satellite track.
ScanSAR Fine (SCF)	ScanSAR product equivalent to SGF with additional processing options and metadata fields. Georeferenced and aligned with the satellite track.
ScanSAR Sampled (SCS)	Same as SCF except with finer sampling. Georeferenced and aligned with the satellite track.

RADARSAT-2 / C-band SAR

For RADARSAT-2, the products are available in the following modes:

- Standard beam mode
- Wide Swath beam mode
- Fine Resolution beam mode
- Extended Low Incidence beam mode
- Extended High Incidence beam mode
- ScanSAR Narrow beam mode
- ScanSAR Wide beam mode
- Standard Quad Polarisation beam mode
- Wide Standard Quad Polarisation beam mode
- Fine Quad Polarisation beam mode
- Wide Fine Quad Polarisation beam mode
- Multi-look Fine Resolution beam mode
- Wide Multi-look Fine Resolution beam mode
- Ultra-fine Resolution beam mode
- Wide Ultra-fine Resolution beam mode
- Wide Fine Resolution beam mode
- Extra-fine Resolution beam mode
- Spotlight beam mode

ESA TPM collection and access options

RADARSAT-2 ESA archive		The collection is composed of the copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access RADARSAT-2 data. Data can be downloaded from the Online Dissemination Service at *https://tpm-ds.eo.esa.int/oads/access/collection/RadarSat-2* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/RadarSat-2-ESA-archive*
RADARSAT- 2 full archive and tasking		ESA offers access to worldwide RADARSAT-1 & 2 data (both archived and new acquisitions) via project proposal. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/radarsat-1-2-full-archive-and-tasking*

Weblinks
RADARSAT-2: https://earth.esa.int/eogateway/missions/radarsat

6.32 RapidEye

RapidEye was a commercial EO mission, operated by Planet Labs at the time of mission end, and was a constellation of five minisatellites. The mission provided high-resolution (5 m) MS imagery and applications include agriculture, forestry, energy & infrastructure, environment, and security & emergency management.

RapidEye / REIS	MED-HIGH GLOBAL	LAUNCH-EOL 2008-2020
Instrument & agency (& any partners)	RapidEye Earth Imaging System | Planet Labs, USA	
Type	High-resolution Optical Imager	
Measurements & applications	High-resolution images with short observing cycle for commercial and scientific applications including cartography, land surface, digital terrain models, disaster management, and environmental monitoring.	
Technical characteristics	**Wavebands:** Blue: 440 - 510 nm Green: 520 - 590 nm Red: 630 - 685 nm Red Edge: 690 - 730 nm Near IR: 760 - 850 nm **Spatial resolution**: 6.5 m (resampled on the ortho product to 5 m) **Swath width**: 77 km	
Products		
Basic Level 1B	Radiometric and sensor corrected. It is the least processed of the RapidEye image products. This product is designed for customers who wish to do their own geometric correction and is accompanied by all the needed information for processing the data into a geo-corrected form.	
Ortho Tile Level 3A	Radiometric, sensor and geometrically corrected (by using DEMs with a post spacing of between 30 and 90 metres) and aligned to a cartographic map projection. Ground Control Points (GCPs) are used in the creation of every image and the accuracy of the product will vary from region to region based on available GCPs. The product is composed of a GeoTIFF file that contains image data and geolocation information, an XML format metadata file, and an Unusable Data Mask (UDM) file in GeoTIFF format.	

RapidEye / REIS

ESA TPM collection and access options

RapidEye South America – Featured Dataset		See Section 7.14 for details.
RapidEye Time Series for Sentinel-2 – Featured Dataset		See Section 7.15 for details.
RapidEye ESA archive		The collection is composed of the copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access Rapideye data. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/Rapideye* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Rapideye-ESA-archive*
RapidEye Full archive		ESA offers access to worldwide Rapideye archived data via project proposal submission. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/rapideye-full-archive-and-tasking*

Weblinks
RapidEye: https://earth.esa.int/eogateway/missions/rapideye

6.33 ResourceSat-1 (IRS-P6)

ResourceSat-1, also known as IRS-P6, was an EO mission in the Indian Remote Sensing Satellite (IRS) series of Indian Space Research Organisation (ISRO). ResourceSat-1 was the continuation of the IRS-1C/1D missions with considerably enhanced capabilities. The overall objective of the mission was to provide continued remote-sensing data services on an operational basis for integrated land and water resources management.

ResourceSat-1 (IRS-P6) / LISS-III/IV / AWiFS	MED-HIGH	GLOBAL	LAUNCH-EOL 2003-2013
Instrument & agency (& any partners)	Linear Imaging Self Scanner III (LISS III), Linear Imaging Self Scanner IV (LISS IV) & Advanced Wide Field Sensor (AWiFS) | ISRO, India / GAF, Germany		
Type	Optical Imagers		
Measurements & applications	Data is used for vegetation type assessment, resource assessment, crop stress detection, crop production forecasting, forestry, land use and land cover change		
Technical characteristics	**Wavebands**: VIS: 0.52 - 0.59 µm, 0.62 - 0.68 µm, NIR: 0.77 - 0.86 µm, SWIR: 1.55 - 1.75 µm **Spatial resolution**: LISS-III:23.5 m, LISS-IV: 5.8 m, AWiFS: 56 m. **Swath width:** LISS-III: 141 km, LISS-IV: 70 - 23.9 km, AWiFS: 740 km.		

Products	
LISS-IV	Mono-chromatic with selectable band, however in practice the red is used.
LISS-III	Multi-spectral.
AWiFS	Multi-spectral.

Available products:
· System or radiometrically corrected
· Ortho corrected (DN)

ESA TPM collection and access options	
IMAGE2006 European Coverage – Featured Dataset	ResourceSat-1 (LISS-III) contributed to IMAGE2006/European Coverage. See Section 7.8 for more details.
ResourceSat-1/IRS-P6 full archive	ESA offers access to worldwide archived ResouceSat-1 data via project proposal submission More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/resourcesat-1-irs-p6-full-archive*

Weblinks
ResourceSat-1 (IRS-P6): https://earth.esa.int/eogateway/missions/irs-p6-resourcesat-1

6.34 ResourceSat-2 (IRS-R2)

ResourceSat-2, also known as IRS-R2, in an environmental satellite from the Indian Space Research Organisation (ISRO) intended to continue the remote sensing data services to global users provided by ResourceSat-1. The satellite also provides data with enhanced multispectral and spatial coverage.

ResourceSat-2A is a Remote Sensing satellite intended for resource monitoring and carries three payloads which are similar to those of ResourceSat-2. The ResourceSat-2 TPM refers to the constellation, ResourceSat-2 and ResourceSat-2A. The data provided is a composition of the data aquired by both satellites.

ResourceSat-2 / LISS-III/ LISS-IV / AWiFS	MED-HIGH	GLOBAL	LAUNCH 2011
Instrument & agency (& any partners)	Linear Imaging Self-Scanning Sensor-III (LISS-III), Linear Imaging Self-Scanning Sensor-IV (LISS-IV) & Advanced Wide Field Sensor (AWiFS)	ISRO, India / GAF, Germany		
Type	Optical Imagers		
Measurements & applications	Data is used for agricultural crop discrimination and monitoring, crop acreage/yield estimation, precision farming, water resources, forest mapping, rural infrastructure development, disaster management		
Technical characteristics	**Wavebands**: LISS-III: Green: 0.52 - 0.59 µm, Red: 0.62 - 0.68 µm Near-IR: 0.77 - 0.86 µm, SWIR: 1.55 - 1.70 µm LISS-IV: Green: 0.52 - 0.59 µm, Red: 0.62 - 0.68 µm Near-IR: 0.77 - 0.86 µm AWiFS: Green: 0.52 - 0.59 µm, Red: 0.62 - 0.68 µm Near-IR: 0.77 - 0.86 µm, SWIR: 1.55 - 1.70 µm **Spatial resolutions**: LISS-III: 23.5 m, LISS-IV: 5.8 m, AWiFS: 56 m **Swath width:** LISS-III: 141 km, LISS-IV: 70 - 23.9 km AWiFS: 740 km		

Products	
LISS-IV	Mono-Chromatic with selectable band, however in practice the red is used.
LISS-III	Multi-spectral.
AWiFS	Multi-spectral.

Available products: · System or radiometrically corrected · Ortho corrected (DN) · Ortho corrected (TOA reflectance)

ESA TPM collection and access options	
ResourceSat-2 full archive and tasking	ESA offers access to Resourcesat-2 archived and new tasking data via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/resourcesat-2-full-archive-and-tasking*

Weblinks
ResourceSat-2: https://earth.esa.int/eogateway/missions/resourcesat-2

6.35 SAOCOM

The SAOCOM (Satélite Argentino de Observación Con Microondas) satellite series represents Argentina's polarimetric L-band SAR constellation of two spacecraft (SAOCOM-1A and SAOCOM-1B), a program defined, managed and operated by CONAE (Comisión Nacional de Actividades Espaciales), Argentina's Space Agency in Buenos Aires. The overall objective of SAOCOM is to provide effective Earth observation and disaster monitoring capability.

SAOCOM / L-Band SAR	MED-HIGH	GLOBAL	LAUNCH 2018
Instrument & agency & any partners)	SAOCOM L-Band SAR | CONAE, Argentina / ASI, Italy		
Type	SAR		
Measurements & applications	Measurement of land, ocean, emergencies, soil moisture, interferometry.		
Technical characteristics	**Waveband**: L-band **Spatial Resolution**: STRIPMAP: 10 m, TopSAR narrow: 30/50 m, TopSAR wide: 50/100 m **Swath Width**: STRIPMAP: 20/40 km, TopSAR narrow: 100/150 km, TopSAR wide: 220/350 km		

Products	
Level 1A - SLC	Complex data in slant range, radiometrically calibrated with no geometric corrections.
Level 1B - DI	Data projected to ground range, radiometrically calibrated and georeferenced.
Level 1C - GEC	Radiometrically calibrated, geocoded and georeferenced exploiting ellipsoid.
Level 1D - GTC	Radiometrically calibrated, geocoded and georeferenced exploiting topography.

SAOCOM products are available in the following modes:
· STRIPMAP mode: Data acquired at fixed azimuth steering (beam from S1 up to S10). Single (HH or VV), Double (HHHV, VHVV) and quad polarisation available.
· TOPSAR (Narrow and Wide) mode: Data acquired in ScanSAR like mode (Mode A, Mode B or Wide). Double (HHHV, VHVV) and quad polarisation available.

ESA TPM collection and access options	
SAOCOM data products	Data acquired in the ASI zone of exclusivity is available from an external Third Party Mission site. On the basis of an agreement with the Agenzia Spaziale Italiana (ASI), data are available through the ASI SAOCOM Data Hub upon user membership request and registration: *http://saocom.asi.it:8081* More information can be found here: *https://earth.esa.int/eogateway/catalog/saocom-data-products*
PUMAS initiative	The ESA/CONAE Promotion of Utilization and Mission Applications and Science (PUMAS) initiative under Earthnet's Third Party Missions Programme offers an opportunity for users located in the territory of ESA Member States including Canada as an ESA Cooperating State, and associated members to access SAOCOM archived and new tasking data via project proposal submission. The collection offers products acquired outside of the ASI zone of exclusivity. More information can be found here: *https://earth.esa.int/eogateway/announcement-of-opportunity/saocom*

EDAP Quality Assessment: https://earth.esa.int/eogateway/documents/20142/37627/ Technical+Note+on+Quality+Assessment+for+SAOCOM.pdf/fb4628a8-ee31-2b31-4f59-ebb8a3f0e8b8

Weblinks
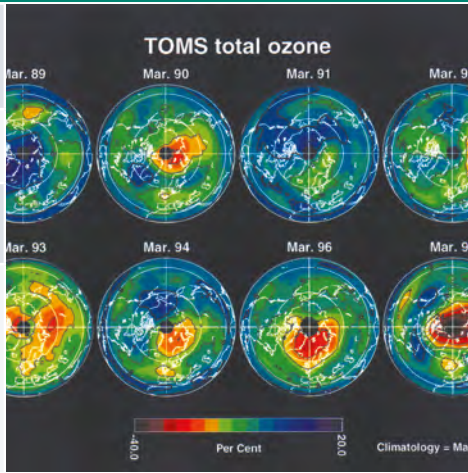SAOCOM: https://earth.esa.int/eogateway/missions/saocom

6.36 SciSat-1: ACE-FTS and MAESTRO

SciSat-1 is a CSA atmospheric science mission carrying the Atmospheric Chemistry Experiment-Fourier Transform Spectrometer (ACE-FTS) instrument. The instrument measures the vertical distribution of trace gases, in particular the regional polar ozone budget, as well as pressure and temperature (derived from carbon dioxide lines).

SciSat-1 also carries the Measurement of Aerosol Extinction in the Stratosphere and Troposphere Retrieved by Occultation (MAESTRO) instrument, a dual-channel optical spectrometer in the shortwave to thermal infrared range. The instrument can be used to generate column measurements for ozone, nitrogen dioxide and aerosol/cloud extinction.

SciSat-1 / ACE-FTS	ATMOSPHERIC GLOBAL LAUNCH 2003
Instrument & agency (& any partners)	Atmospheric Chemistry Experiment - Fourier Transform Spectrometer | CSA, Canada
Type	Atmospheric Chemistry - Limb -scanning IR Spectrometer
Measurements & applications	Measure and understand the chemical processes that control the distribution of ozone in the Earth's atmosphere, especially at high altitudes.
Technical characteristics	**Wavebands**: SWIR-TIR: 2 - 5.5 μm, 5.5 - 13 μm (0.02-1 cm^{-1} resolution) **Spatial resolution**: 2 - 6 km **Swath width**: 4 - 150 km
Products	
Level 2	Temperature, Pressure and Volume Mixing Ratio (VMR) vertical profiles as a function of altitude for many atmospherically relevant molecules, in particular of the regional polar O3 budget. For historical reasons, the retrieved results are interpolated onto a 1 km "grid" using a piecewise quadratic method.
ESA TPM collection and access options	
SciSat-1: ACE-FTS and MAESTRO	Dataset available from external TPM site: access upon user registration to SciSat-1/ACE database: *https://database.scisat.ca/level2* More information can be found here: *https://earth.esa.int/eogateway/catalog/scisat-1-ace-fts-and-maestro*

Weblinks
SciSat-1: https://earth.esa.int/eogateway/missions/scisat-1

SciSat-1 / MAESTRO	ATMOSPHERIC GLOBAL LAUNCH 2003
Instrument & agency (& any partners)	Measurements of Aerosol Extinction in the Stratosphere and Troposphere Retrieved by Occultation | CSA, Canada
Type	Atmospheric Chemistry - Limb - scanning SW Spectrometer
Measurements & applications	Chemical processes involved in the depletion of the ozone layer.
Technical characteristics	**Wavebands**: UV-NIR: 0.285 - 1.03 μm (1 - 2 nm spectral resolution) **Spatial resolution**: Approximately 1 - 2 km vertical **Swath width**: FOV 1.25 mrad

TOMS total ozone

Products

Level 2	Measurement of ozone, nitrogen dioxide and aerosol/cloud extinction (solar occultation measurements of atmospheric attenuation during satellite sunrise and sunset with the primary objective of assessing the stratospheric ozone budget). Products are available for O3 VMR profile data, aerosol extinction profile data, total optical depth spectra (UV/VIS) and aerosol OD spectra (VIS)

ESA TPM collection and access options

SciSat-1: ACE-FTS and MAESTRO	Dataset available from external TPM site: access upon user registration to SciSat-1/ACE database: *https://databace.scisat.ca/level2* More information can be found here: *https://earth.esa.int/eogateway/catalog/scisat-1-ace-fts-and-maestro*

Weblinks
SciSat-1: https://earth.esa.int/eogateway/missions/scisat-1

6.37 SeaSat

SeaSat was a NASA/JPL experimental EO mission launched in 1978. It carried the first space borne SAR. During its brief 106-day lifetime, SeaSat collected more information about the oceans than had been acquired in the previous 100 years of shipboard research. The SAR instrument provided a wealth of information on diverse ocean phenomena such as sea-surface winds and temperatures, surface and internal waves, currents, sea ice, wind, and rainfall, thus giving the first global view of ocean circulation. It pioneered satellite oceanography and proved the viability of imaging radar for studying our planet. SeaSat's SAR instrument also provided spectacular images of Earth's land surfaces, thus demonstrating the immense potential of the SAR observation technology and generating great interest in satellite active microwave remote sensing.

SeaSat / L-band SAR	MED-HIGH	EUROPE AND SOME GLOBAL	LAUNCH-EOL 1978-1978
Instrument & agency (& any partners)	L-band Synthetic Aperture Radar | NASA JPL, USA		
Type	Imaging Microwave Radar		
Measurements & applications	Measurement of sea-surface winds and temperatures, wave heights, atmospheric liquid water content, sea ice features and ocean topography.		
Technical characteristics	**Waveband**: 1.275 GHz (L-band) **Spatial resolution**: 25 m (azimuth) × 25 m (range) **Swath width**: 100 km		

Products	
Level 1 - SAR Single Look Complex Image Product	Comparable to the ESA SLC/IMS images generated for ASAR and ERS platforms. Data are processed to an unweighted Doppler bandwidth of 1200 Hz, without sidelobe reduction. The product is suitable for interferometric, calibration and quality analysis applications.
Level1 - SAR Precision Image	Based on the general definition of the SAR CEOS format. Sidelobe reduction is applied to achieve a nominal PSLR of less than −21 dB. The image is not geocoded and terrain distortion has not been removed.
Level 1 - SAR Ellipsoid Geocoded Precision Image	Generated by geocoding of data processed to the SEA_PRI_1P product specification. Products are generated in UTM map coordinates, with output pixel spacing at 12.5m. Geocoding is undertaken on the approximation that all image points lie on the surface of the WGS84 ellipsoid adjusted for a local representative vertical datum. It should be noted that mapping distortions will occur as a consequence of terrain relief.

ESA TPM collection and access options		
SeaSat ESA archive		It is the complete SEASAT dataset acquired by ESA. Users can immediately access the collection via the dissemination service. Data are available for immediate download from EO-Cat (*https://eocat.esa.int*) and from the Online Dissemination Service *https://tpm-ds.eo.esa.int/oads/access/collection/SeaSat* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Seasat-ESA-archive*

Weblinks
SeaSat: https://earth.esa.int/eogateway/missions/seasat

6.38 SkySat

SkySat is a constellation of 21 high-resolution Earth imaging satellites owned and operated by the commercial company Planet. SkySat-1 was launched in 2013 and a launch programme has followed.

The first two SkySat satellites (SkySat-1 and SkySat-2) are A and B Generations, the other 19 satellites are modernised C Generation satellites. Six of the C Generation SkySat satellites (from SkySat-16 to SkySat-21) were launched into non-sun-synchronous orbits to increase the image cadence between 52 degrees northern and southern latitude up to 6-7 times per day on worldwide average, with a maximum of 12.
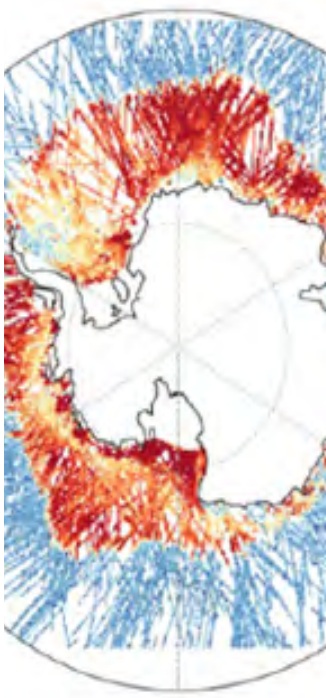
SkySat / SkySat Camera	VERY HIGH	GLOBAL	LAUNCH 2013	
Instrument & agency (& any partners)	SkySat Camera | Planet Labs, USA			
Type	Panchromatic & Multispectral Optical			
Measurements & applications	Mapping, urban applications, maritime, environmental monitoring, general application imagery.			
Technical characteristics	**Wavebands:** Blue 450 - 515 nm Green 515 - 595 nm Red 605 - 695 nm NIR 740 - 900 nm PAN 450 - 900 nm **Spatial resolution:** PAN: 0.86 m (SkySat-1 to -2), 0.65 - 0.72 m (SkySat-3 to -15), 0.57 m (SkySat-16 to -21) MS: 1 m (SkySat-1 to -2), 0.81 - 1 m (SkySat-3 to -15), 0.75 m (SkySat-16 to -21) **Swath width:** 8 km at nadir (SkySat-1 to -2) 5.9 km at nadir (SkySat-3 to -15) 5.5 km at nadir (SkySat-16 to -21)			

Products

Basic Scene	Includes Analytic and Panchromatic imagery that is uncalibrated and in a raw digital number format. The Basic Scene Product is not radiometrically corrected for atmosphere or for any geometric distortions inherent in the imaging process. It is provided with RPC values for geo positioning.
Visual Ortho Scene	Orthorectified, pansharpened, and colour-corrected (using a colour curve) 3-band RGB Imagery.
Pansharpened Multispectral Ortho Scene	Orthorectified, pansharpened, and colour-corrected (using a colour curve) 4-band BGRN Imagery.
Analytic DN Ortho Scene	Orthorectified, multispectral data from the SkySat constellation. The Analytic DN product is an uncalibrated, digital number imagery product. This product is designed for a wide variety of applications that require imagery with an accurate geolocation and cartographic projection. The product has been processed to remove distortions caused by terrain. It eliminates the perspective effect on the ground (not on buildings), restoring the geometry of a vertical shot. In addition to orthorectification, the imagery has radiometric corrections applied to correct for any sensor artifacts. The initial availability does not include transformation to at-sensor radiance.

SkySat / SkySat Camera

Products

Panchromatic DN Ortho Scene	Orthorectified, panchromatic data from the SkySat constellation. The Panchromatic DN product is an uncalibrated, digital number imagery product. The Panchromatic product has a finer GSD than the Analytic Product due to NOAA license restrictions and is useful for visual interpretation as well as pan-sharpening of coarser resolution Multispectral data. The initial availability does not include transformation to at-sensor radiance.
Analytic Ortho Scene	Analytic products are calibrated multispectral imagery products that have been processed to allow analysts to derive information products for data science and analytics. The imagery has radiometric corrections applied to correct for any sensor artifacts and transformation to top-of-atmosphere radiance. (product is not available for images acquired before October 2017)
Ortho Collect Product	Created by composing SkySat Ortho Scenes along an imaging strip into segments typically unifying ~60 SkySat Ortho Scenes. The product may contain artifacts resulting from the composing process, particular offsets in areas of stitched source scenes. In a next version, artifacts caused by scene misalignment will be hidden by cutlines. This is particularly important for the appearance of objects in built-up areas and their accurate extraction.

ESA TPM collection and access options

SkySat ESA Archive		The collection is composed of a copy of optical products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access SkySat data. Data can be downloaded from the Online Dissemination Service: *https://tpm-ds.eo.esa.int/smcat/SkySat/* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/skysat-esa-archive*
SkySat Full Archive and New Tasking		ESA offers worldwide access to Skysat data (both archive and new tasking) via project proposal submission. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/skysat-full-archive-and-new-tasking*

EDAP Quality assessment:
https://earth.esa.int/eogateway/documents/20142/37627/EDAP.REP.015+TN+on+Quality+Assessment+for+SkySat_v1.0.pdf/59a2a91d-eecd-20f1-4a13-e670dad8eed3

Weblinks
SkySat: https://earth.esa.int/eogateway/missions/SkySat

6.39 Spire

Spire constellation is composed of more than 160 LEMUR nanosatellites. Each satellite is multi-payload, equipped with different sensors to collect global radio frequency data in near-real-time.

Spire / STRATOS / SENSE / AIRSAFE	OTHER 📊 GLOBAL 🌐 LAUNCH 2015
Instruments & agency (& any partners)	STRATOS: Advanced, science-grade Global Navigation Satellite System Earth Observation (GNSS-EO); SENSE: Receiver for AIS (Automatic Identification System) signal reception from ships at sea; AIRSAFE: ADS-B (Automatic Dependent Surveillance - Broadcast) receiver for tracking of aircraft | Spire Global, USA
Type	GNSS Radio Occultation and Reflectometry
Measurements & applications	AIS service used for tracking sea vessels (illegal fishing, trade monitoring, maritime domain awareness, insurance, asset tracking, search and rescue, and prevention of piracy) GNSS-RO to measure temperature, pressure and humidity profiles of the atmosphere for meteorology, weather forecast and models ADS-B sensors for tracking of aircraft on a global scale.
Technical characteristics	GPS radio occultation measurements are used from multiple GNSS constellations (GPS, Galileo, GLONASS, and QZSS) to determine temperature, pressure and humidity profiles of Earth's atmosphere. The receiver tracks, on average, five-six dual frequency GNSS signals for precision orbit determination (POD) at 1 Hz, as well as multiple simultaneous GNSS satellites at 50 Hz (rising or setting) for the GNSS-RO measurements.

Spire / STRATOS / SENSE / AIRSAFE

Products

GNSS Polarimetric Radio Occultation	Novel Polarimetric Radio Occultation (PRO) measurements collected by three Spire satellites are available over the period 15 May 2023 to 30 November 2023. Unlike regular RO measurements, which only capture Right-Handed Circularly Polarised (RHCP) signals, PRO measurements include both H and V polarisations. The differential phase shift between H and V polarisations correlates with the presence of hydrometeors such as ice crystals, rain, and snow. By combining the H and V data, PRO provides the same information on atmospheric thermodynamic properties as RO, including temperature, humidity, and pressure, based on the signal's bending angle. Various levels of these products are provided.
GNSS Reflectometry	GNSS Reflectometry (GNSS-R) uses reflections of GNSS signals to measure Earth's surface properties. Spire collects two types of GNSS-R data: Near-Nadir incidence Left-Handed Circularly Polarised (LHCP) reflections for ocean wind, wave conditions, and soil moisture, and Grazing-Angle Right-Handed Circularly Polarised (RHCP) reflections for altimetry and smooth surface characterisation (like ice and inland water). Near-Nadir data have been available since December 2020, and Grazing-Angle data since May 2019. Various levels of derived products and raw data are provided. Derived Level 1 and Level 2 products are available, as well as some special Level 0 raw Intermediate Frequency (IF) data.
ADS-B Data Stream	A monthly subscription to global ADS-B satellite data is available from December 2018.
AIS Messages	AIS messages observed from Spire satellites (S-AIS) and terrestrial partner sensor stations (T-AIS) are available through a monthly subscription, starting from June 2016.

ESA TPM collection and access options

Spire live and historical data		ESA offers access to worldwide Spire data (both historical and live products) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/spire-live-and-historical-data*
Announcement of Opportunity		An Announcement of Opportunity was launched for the international scientific community to access Spire mission data for science and application development. This includes PRO datasets from 15 May 2023 to 30 November 2023, Near-Nadir GNSS-R datasets from 25 January 2024 to 24 July 2024, and Grazing-Angle GNSS-R datasets from 25 January 2024 to 24 July 2024. The opportunity is open to users in ESA Member States (including Canada) and European Commission Member States, with a proposal submission deadline of 31 March 2025.

EDAP Quality Assessment:
https://earth.esa.int/eogateway/documents/20142/37627/
SPIRE+STRATOS+%28GNSS+RO%29+Quality+Assessment+Summary_1.2.pdf/cf350d81-da28-9dc2-7d01-7953d34fe2bc

Weblinks
Spire: https://earth.esa.int/eogateway/missions/Spire

6.40 SPOT

The SPOT EO system is designed by CNES and operated by Spot Image/Airbus Defence and Space. It has been in operation since February 1986 offering exceptional temporal coverage. Archived and new data satellites are available through an agreement between ESA and Airbus Defence and Space/Spot Image.

6.40.1 SPOT 1 to SPOT 3

The SPOT EO system designed by CNES began operations on the 22nd of February 1986 with the launch of SPOT 1, which carried two High-Resolution Visible (HRV) imagers. SPOT 1 generated more than 2.7 million Earth images in its 17 years of operation. On the 22nd of January 1990, SPOT 2 joined its predecessor in orbit, carrying the same imaging instruments, and generating a further 6.5 million Earth images in its almost 20-year lifespan.

The final first generation SPOT satellite was launched on the 26th of September 1993, again carrying HRV imagers.

SPOT 1–3 / HRV	MED-HIGH	ESA COPY	LAUNCH-EOL 1986-2009
Instrument & agency (& any partners)	High-Resolution Visible Imager | CNES, France / Airbus DS, Germany		
Type	Medium/High-resolution Optical Imagers		
Measurements & applications	Cartography, land surface, agriculture and forestry, civil planning and mapping, digital terrain models, environmental monitoring, coastal applications.		
Technical characteristics	**Wavebands**: VIS: Green: 0.5 - 0.59 µm; Red: 0.61 - 0.68 µm; NIR: 0.79 - 0.89 µm; Panchromatic (VIS): 0.51 - 0.73 µm **Spatial resolutions**: 20 m Multispectral, 10 m Panchromatic **Swath width**: 117 km (i.e., 60 km + 60 km with 3 km overlap), steerable up to ±27 degrees off-track.		
Products			
Level 1A	Radiometric correction of distortions due to differences in sensitivity of the elementary detectors of the viewing instrument. Intended for users who wish to do their own geometric image processing.		
Level 1B	Radiometric correction identical to that of Level 1A. Geometric correction of systematic effects (panoramic effect, Earth curvature and rotation). Internal distortions of the image are corrected for measuring distances, angles and surface areas. Specially designed product for photo-interpreting and thematic studies.		
Level 2B	Radiometric correction identical to that of Level 1A. Geometrical correction done in a standard cartographic projection (UTM WGS84 by default) not tied to ground control points. Allowing for possible differences in location, this product is used to combine the image with geographical information of various types (vectors, raster maps and other satellite images).		

SPOT 1–3 / HRV

ESA TPM collection and access options

SPOT 1-5 ESA archive

Fast approval is required to access SPOT-1-3 data. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/SPOT1-5_ESA*

More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Spot1-5-ESA-archive*

Weblinks
SPOT Series: https://earth.esa.int/eogateway/missions/spot

6.40.2 SPOT 4

In March 1998, SPOT 4 joined the SPOT family, bringing with it new capabilities, including the VEGETATION instrument and upgraded HRV imagers (HRVIR). To ensure continuity of service, HRVIR had the same geometric imaging characteristics (a swath of 60 km per instrument and oblique viewing capability of 27° on each side of the local vertical), but its performance had been increased by adding a new shortwave infrared spectral band (SWIR).

SPOT 4 / HRVIR	MED-HIGH ESA COPY	LAUNCH-EOL 1998-2013
Instrument & agency (& any partners)	High-Resolution Visible and Infrared Imager | CNES, France / Airbus DS, Germany	
Type	Medium/High-resolution Optical Imager	
Measurements & applications	Cartography, land surface, agriculture and forestry, civil planning and mapping, digital terrain models, environmental monitoring, coastal applications.	
Technical characteristics	**Wavebands**: VIS: Green 0.5 - 0.59 μm; Red: 0.61 - 0.68 μm; NIR: 0.79 - 0.89 μm; SWIR: 1.58 - 1.75 μm; Panchromatic(VIS): 0.61 - 0.68 μm **Spatial resolutions**: Multispectral and SWIR 20 m; panchromatic 10 m **Swath width**: 117 km (i.e., 60 km + 60 km with 3 km overlap), steerable up to ±27 degrees off-track	
Products		
Level 1A	Radiometric correction of distortions due to differences in sensitivity of the elementary detectors of the viewing instrument; no geometric correction applied. Intended for users who wish to do their own geometric image processing. SpotScene format.	
Level 1B	Radiometric correction identical to that of Level 1A. Geometric correction of systematic effects (panoramic effect, Earth curvature and rotation). Internal distortions of the image are corrected for measuring distances, angles and surface areas. No map projection applied. Specially designed product for photo-interpreting and thematic studies. SpotScene format.	

SPOT 4 / HRVIR

Products

Level 2A	Radiometric correction identical to that of Level 1A. Geometrical correction done in a standard cartographic projection (UTM WGS84 by default) not tied to ground control points, terrain distortion not corrected. Allowing for possible differences in location, this product is used to combine the image with geographical information of various types (vectors, raster maps and other satellite images). SpotScene and SpotView format.
Level 3 (Ortho)	Map projection based on ground control points and a DEM based on Reference3D data to eliminate distortions due to relief. SpotView format.

Data available as:
- Monospectral
- Multispectral
- Multispectral with SWIR

ESA TPM collection and access options

IMAGE2006/European Coverage – Featured Dataset		SPOT 4 contributed to IMAGE2006/European Coverage. See Section 7.8 for more details.
SPOT 4/5 Take 5 – Featured Dataset		See Section 7.16 for more details.
SPOT 1-5 ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world (mainly Europe and Africa). Fast approval is required to access SPOT-4 data. Data can be downloaded from EO-Cat (*https://eocat.esa.in*t) and the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/SPOT1-5_ESA* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Spot1-5-ESA-archive*

Weblinks
SPOT Series: https://earth.esa.int/eogateway/missions/spot
SPOT 4: https://earth.esa.int/eogateway/missions/spot-4

6.40.3 SPOT 5

In May 2002, SPOT 5 was added to the SPOT family. Compared to its predecessors, SPOT 5 offered greatly enhanced capabilities due to its improved resolution and provided an ideal balance between high-resolution and wide-area coverage with its twin High-Resolution Geometric (HRG) instruments.
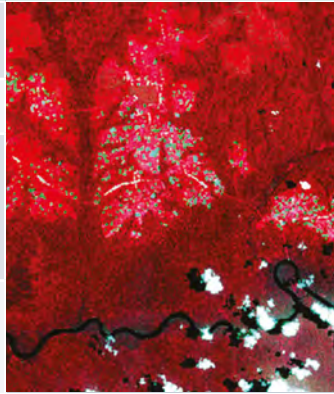
Another key feature was the unprecedented acquisition capability of the High-Resolution Stereoscopic (HRS) imaging instrument, which had the ability to take stereo pair images quasi-simultaneously. Stereo pair imagery is vital for applications that require 3D terrain modelling.

The satellite operated nominally until March 2015, after which the SPOT 5 Take 5 Programme commenced (see Section 7.16).

SPOT 5 / HRG	MED-HIGH	GLOBAL ESA COPY	LAUNCH-EOL 2002-2015
Instrument & agency (& any partners)	High-Resolution Geometric	CNES, France / Airbus DS, Germany		
Type	High-resolution Optical Imagers		
Measurements & applications	Twin HRG instruments provided high-resolution multispectral images that can be processed to produce simulated imagery of 2.5 m resolution. These measurements are well suited to cartography, land surface, agriculture and forestry, civil planning and mapping, digital terrain models, and environmental monitoring applications.		
Technical characteristics	**Wavebands:** VIS: Green: 0.50 - 0.59 µm; Red: 0.61 - 0.68 µm; NIR: 0.79 - 0.89 µm; SWIR: 1.50 - 1.75 µm; Panchromatic: 0.49 - 0.69 µm **Spatial resolutions:** Panchromatic : 2.5 m (super mode simulated) or 5 m (at nadir)	Multispectral: 10 m (at nadir), SWIR: 20 m **Swath widths**: 60 km (one instrument), 117 km (two instruments).		

SPOT 5 / HRS	MED-HIGH	GLOBAL ESA COPY	LAUNCH-EOL 2002-2015
Instrument & agency (& any partners)	High-Resolution Stereoscopic	CNES, France / Airbus DS / Spot Image, Germany		
Type	High-resolution Optical Imager		
Measurements & applications	High-resolution stereo instrument for various applications, such as map making and in the generation of DEMs. HRS uses the same CCD line detector design as for the HRG instrument.		
Technical characteristics	**Wavebands**: Panchromatic: 0.49-0.69 µm **Spatial resolutions**: 10 m cross-track, 5 m along-track **Swath width**: 120 km		

SPOT 5 / HRG + HRS

Products

Level 1A	Radiometric correction of distortions due to differences in sensitivity of the elementary detectors of the viewing instrument; no geometric correction applied. Intended for users who wish to do their own geometric image processing. SpotScene format.
Level 1B	Radiometric correction identical to that of Level 1A. Geometric correction of systematic effects (panoramic effect, Earth curvature and rotation). Internal distortions of the image are corrected for measuring distances, angles and surface areas. No map projection applied. Specially designed product for photo-interpreting and thematic studies. SpotScene format.
Level 2A	Radiometric correction identical to that of Level 1A. Geometrical correction done in a standard cartographic projection (UTM WGS84 by default) not tied to ground control points, terrain distortion not corrected. Allowing for possible differences in location, this product is used to combine the image with geographical information of various types (vectors, raster maps and other satellite images). SpotScene and SpotView format.
Level 3 (Ortho)	Map projection based on ground control points and a DEM based on Reference3D data to eliminate distortions due to relief. SpotView format.
SPOTMaps 2.5 (Level 2A Ortho)	Provides nationwide or regional seamless coverage, radio corrected and orthorectified, derived from colour imagery. It is available for more than 110 countries, representing a total of more than 95 million km^2. The dataset has a resolution of 2.5 m.

Data available as:

- Panchromatic - PanSharpened - Multispectral - Multispectral with SWIR

ESA TPM collection and access options

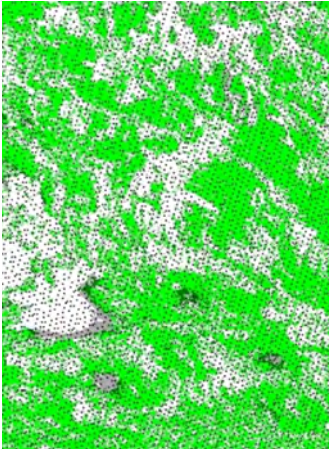|		
IMAGE2006/European Coverage Featured Dataset		SPOT 5 contributed to the IMAGE2006/European Coverage. See Section 7.8 for more details.
SPOT 4-5 Take 5 ESA archive – Featured Dataset		See Section 7.16 for more details.
SPOT1-5 ESA archive		The collection is composed of a copy of products (but SPOTMaps 2.5 dataset) requested by ESA supported projects over their areas of interest around the world (mainly Europe and Africa). Fast approval is required to access SPOT-5. Data can be downloaded from EO-Cat (*https://eocat.esa.int*) and the Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/Spot1-5_ESA* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/ Spot1-5-ESA-archive*
SPOT-6 to 7 full archive and tasking and SPOTMaps 2.5 dataset		The SPOTMaps 2.5 global dataset is accessible after Project Proposal acceptance. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/spot-6-to-7-full-archive-and-tasking-and-spotmaps-2-5-dataset*

Weblinks
SPOT Series: https://earth.esa.int/eogateway/missions/spot
SPOT 5: https://earth.esa.int/eogateway/missions/spot-5

6.40.4 SPOT 6/7

SPOT 6 (Satellite pour l'Observation de la Terre) is a commercial Earth-imaging satellite owned and operated by Airbus Defence and Space. It was launched on 9 September 2012 and remains operational. SPOT 7 was launched on 1 June 2014 and ceased operations on 17 March 2023.

SPOT 6 and 7 were identical satellites and aimed at providing high-resolution, wide-area optical imagery.

SPOT 6/7 / NAOMI	VERY HIGH	GLOBAL ESA COPY	LAUNCH: 2012 (SPOT-6) LAUNCH-EOL: 2014-2023 (SPOT-7)
Instrument & agency (& any partners)	New AstroSat Optical Modular Instrument / High-Resolution Optical Imager	Airbus DS, Germany / Azercosmos (SPOT 7), Azerbaijan		
Type	High-resolution optical imagers		
Measurements & applications	Multi-purpose high-resolution optical imagery, ensuring service continuity of SPOT 4 and 5.		
Technical characteristics	**Wavebands:** 4 bands + PAN: Near IR (0.760 - 0.890 µm) Red (0.625 - 0.695 µm) Green (0.530 - 0.590 µm) Blue (0.450 - 0.520 µm) PAN (0.450 - 0.745 µm) **Spatial resolutions**: Panchromatic: 1.5 m. Multispectral: 6 m **Swath width**: 117 km (i.e., 60 km + 60 km with 3 km overlap).		

Products	
Primary (Level 1A)	Processing level closest to the natural image acquired by the sensor. This product restores perfect collection conditions: the sensor is placed in rectilinear geometry, and the image is clear of all radiometric distortion.
Standard Orthorectified (Level 3)	The orthorectified product is a georeferenced image in Earth geometry, corrected from acquisition and terrain off-nadir effects.
Tailored Orthorectified (Level 3)	Custom orthorectification using a more precise 3D model provided by the client or acquired for the purpose.

The products are available in the following modes:
· Panchromatic image at 1.5 m resolution
· Pansharpened colour image at 1.5 m resolution
· Multispectral image in 4 spectral bands at 6 m resolution
· Bundle (1.5 m panchromatic image + 6 m multispectral image)

SPOT 6/7 / NAOMI

ESA TPM collection and access options

SPOT 6 and 7 ESA archive		The collection is composed of a copy of products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products over the years. Fast approval is required to access SPOT 6-7 data. Data can be downloaded from EO-Cat and the Online Dissemination Service *https://tpm-ds.eo.esa.int/oads/access/collection/SPOT6-7.* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Spot-6-and-7-ESA-archive*
SPOT-6 to 7 full archive and tasking and SPOTMaps 2.5 dataset		ESA offers access to worldwide SPOT 6-7 data (both archived and and new acquisitions for SPOT 6 and archived for SPOT 7) and to OneAtlas Living Library via project proposal submission. More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/spot-6-to-7-full-archive-and-tasking-and-spotmaps-2-5-dataset* To complement the traditional offer, the 'Full archive and tasking' includes the subscription for accessing the OneAtlas Living Library where the entire OneAtlas optical archive is made available in streaming and download mode.

Weblinks
SPOT Series: https://earth.esa.int/eogateway/missions/spot
SPOT 6: https://earth.esa.int/eogateway/missions/spot-6
SPOT 7: https://earth.esa.int/eogateway/missions/spot-7
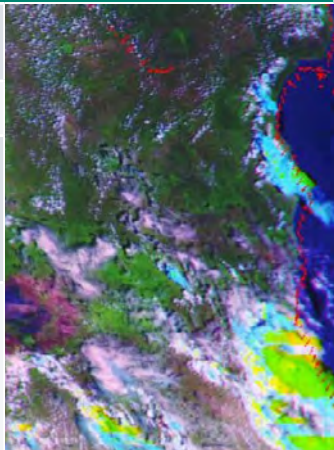
6.41 TanSat

The TanSat mission detected and monitored carbon dioxide (CO_2) in the atmosphere. The satellite carried two instruments: the Atmospheric Carbon-dioxide Grating Spectrometer (ACGS) for near-infrared CO_2 absorption measurements and the Cloud Aerosol Polarization Imager (CAPI) for high-resolution cloud and aerosol studies, which helped correct CO_2 measurement errors.

TanSat/ACGS	ATMOSPHERIC ⬛ GLOBAL 🌍	LAUNCH-EOL 2016-2020 🏛
Instrument & agency (& any partners)	Atmospheric Carbon-dioxide Grating Spectrometer | NSMC/NRSCC, China	
Type	Pushbroom spectrometer (NIR/SWIR)	
Measurements & applications	Measurement of near-infrared absorption by CO_2.	
Technical characteristics	**Wavebands**: 758 - 776 nm, 1594 - 1624 nm, 2041 - 2081 nm **Spatial resolution**: 3 km (along-track), 2 km (cross-track) **Swath width**: 20 km	

Products	
L1A DS	Dark calibration sample product
L1A GL	Glint sample products
L1A LS	Lamp calibration sample product
L1A ND	Principal-Plane nadir sample product
L1A ZS	Z-Axis solar calibration sample
L1B CAL DS	Dark calibration sample product
L1B CAL LS	Lamp calibration sample product
L1B CAL ZS	Z-Axis solar calibration sample product
L1B SCI GL	Glint science sample product
L1B SCI ND	Principal-Plane nadir science product

ESA TPM collection and access options	
TanSat ACGS Full archive	The collection is composed of the full ACGS archive. Fast approval is required to access TanSat data. Data is available for download from *ftp://tpm-if.eo.esa.int/* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/tansat-agcs-and-capi-products*

Weblinks TanSat: https://earth.esa.int/eogateway/missions/tansat	

TanSat/CAPI	ATMOSPHERIC	GLOBAL	LAUNCH-EOL 2016-2020

Instrument & agency (& any partners)	Cloud Aerosol Polarization Imager	NSMC/NRSCC, China
Type	Pushbroom radiometer (VIS, NIR and SWIR)
Measurements & applications	Observation of aerosol and cloud optical properties.
Technical characteristics	**Wavebands**: 380 nm, 670 nm, 870 nm, 1375 nm, 1640 nm **Spatial resolution**: 250 m (at 380, 670, 870 nm), 1000 m (at 1375, 1640 nm) **Swath width**: 375 km

Products

L1A ND	Principal-plane nadir product
L1B ND 1000M	Principal-plane nadir products at 1000 m resolution (1375 nm, 1640 nm)
L1B ND 250M	Principal-plane nadir products at 250 m resolution (380 nm, 670 nm, 870 nm)
L1B ND GEOQK	Principal-plane nadir georeferenced at 250 m resolution
L1B ND GEO1K	Principal-plane nadir georeferenced at 1000 m resolution
L1B ND OBC	Principal-plane nadir on-board calibrator product
L2 ND CLM	Principal-plane nadir cloud flag product

ESA TPM collection and access options

TanSat CAPI Full archive	The collection is composed of the full CAPI archive. Fast approval is required to access TanSat data. Data is available for download from *ftp://tpm-if.eo.esa.int/* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/tansat-agcs-and-capi-products*

Weblinks
TanSat: https://earth.esa.int/eogateway/missions/tansat

6.42 TerraSAR-X/TanDEM-X

TerraSAR-X and TanDEM-X are twin German SAR satellites created and operated in a Public-Private Partnership (PPP) between the German Aerospace Centre DLR and Airbus Defence and Space.

The scientific objective of the missions is to make multi-mode and high-resolution X-band radar data available for a wide spectrum of applications in fields such as hydrology, geology, climatology, oceanography, and disaster monitoring.

TerraSAR-X and TanDEM-X are fully operational and in close formation flight. The two spacecraft provide a single-pass interferometric configuration for cartography (DEM generation) - making use of interferometry and stereometry.

TerraSAR-X/TanDEM-X / SAR	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2007 (TerraSAR-X) / LAUNCH 2010 (TanDEM-X)
Instrument & agency (& any partners)	X-band Synthetic Aperture Radar | DLR / Airbus DS, Germany		
Type	Imaging Microwave Radar		
Measurements & applications	High-resolution images for monitoring of land surface and coastal processes and for agricultural, geological and hydrological applications. TerraSAR-X and TanDEM-X operate in formation flight to facilitate DEM generation, especially at high altitudes.		
Technical characteristics	**Wavebands**: 9.65 GHz, 300 MHz bandwidth, all four polarisation modes **Spatial resolutions**: Staring Spotlight: 0.25 m High Resolution Spotlight: 1 m Spotlight: 2 m Stripmap: 3 m ScanSAR: 18 m ScanSAR Wide: 40 m **Swath widths**: Staring Spotlight: 4 km x 3.7 km High Resolution Spotlight: 10 km x 5 km Spotlight: 10 km × 10 km Stripmap: 30 km x 50 km ScanSAR: 100 km x 150 km ScanSAR Wide: 270 km x 200 km		

TerraSAR-X/TanDEM-X / SAR

Products

Single Look Slant Range Complex (SCC)	Azimuth - slant range (time domain).
Multi Look Ground Range Detected (MGD)	Azimuth - ground range (without terrain correction).
Geocoded Ellipsoid Corrected (GEC)	Map geometry with ellipsoidal corrections only (no terrain correction performed).
Enhanced Ellipsoid Corrected (EEC)	Map geometry with terrain correction, using a DEM.
WorldDEMcore	WorldDEMcore is the output of interferometric processing of StripMap data pairs without any post-processing.
WorldDEM™	WorldDEM™ is produced based on WorldDEMcore, representing the surface of the Earth (including buildings, infrastructure and vegetation). Hydrological consistency is ensured.
WorldDEM DTM	In additional editing steps, WorldDEM™ is transformed into a Digital Terrain Model (DTM) representing bare Earth elevation.
World DEM Bundle	Includes WorldDEM™, WorldDEM DTM, and Quality Layers.

Optical products (SSC, MGD, GEC and EEC) can be acquired in six image modes and are provided in different packages:
· Staring SpotLight (basic, Interferometric pack, and Maritime pack)
· High Resolution SpotLight (basic, Interferometric pack, and Maritime pack)
· SpotLight (basic, Interferometric pack, and Maritime pack)
· StripMap (basic, Interferometric pack, and Maritime pack)
· ScanSAR (basic and Maritime pack)
· Wide ScanSAR (basic and Maritime pack)

ESA TPM collection and access options

TerraSAR-X ESA archive		The collection is composed of the copy of optical products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products. Fast approval is required to access TerraSAR-X/Tandem-X data. Data can be downloaded from the Online Dissemination Service *https://tpm-ds.eo.esa.int/oads/access/collection/TerraSAR-X* More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/TerraSAR-X-ESA-archive*
TerraSAR-X/TanDEM-X full archive and tasking		ESA offers access to worldwide TerraSAR-X/Tandem-X data (both archived and new acquisitions) and WorldDEM products via project proposal submission More information about the collection can be found at: *https://earth.esa.int/eogateway/catalog/Terrasar-x-tandem-x-full-archive-and-tasking*

Weblinks
TerraSAR-X / TanDEM-X: https://earth.esa.int/eogateway/missions/terrasar-x-and-tandem-x

6.43 Vision-1

Vision-1 is a high-resolution optical satellite, which provides 0.9m resolution imagery in the panchromatic band and 3.5m in the multispectral bands (NIR, RGB), with a 20.8km swath width. The data is particularly suited for defence, security, maritime and agriculture applications.

Vision-1 / S1-4 Imager	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2018	
Instrument & acengy (& any partners)	SSTL-300 S1 Imager | Airbus DS, Germany / SSTL, United Kingdom			
Type	High-Resolution Imagery			
Measurements & applications	Particularly suited for defence, security and agriculture applications. Facilitates near real-time imaging.			
Technical characteristics	**Swath width**: 20.8 km at Nadir **Resolution**: 0.9 m **Spectral bands**: Pan: 450 - 650 nm; Near Infrared: 760 - 910 nm; Red: 600 - 670 nm; Green: 510 - 590 nm; Blue: 440 - 510 nm			

Products	
Projected (Level 2)	The product is mapped onto the Earth cartographic system using a standard reference datum and projection system at a constant terrestrial altitude, relative to the reference ellipsoid. By default, the map projection system is WGS84/UTM. The image is georeferenced without the application of a Digital Elevation Model (DEM) and supplied with the RPC model file. Pansharpened is not available as projected product
Standard Ortho (Level 3)	Georeferenced image in Earth geometry, including the application of an Airbus World DEM for Ortho and GCPs (using Airbus Intelligence One Atlas BaseMap as reference). The orthorectification procedure eliminates the perspective effect on the ground (excluding buildings) to restore the geometry of a vertical shot.

All Vision-1 products are available in the following spectral band combinations:
- Panchromatic (PAN): includes data contained within a single high resolution black and white band, with a product pixel size of 0.87 m
- Multispectral (MS4): includes four multispectral (colour) bands: Blue, Green, Red and Near Infrared. The product pixel size is 3.48 m.
- Bundle (BUN): provides both the 4-band multispectral, and the panchromatic data from the same acquisition in a single, non-merged product. Data is provided as 16-bit GeoTiffs with pixel sizes of 3.48 m and 0.87 m for MS and PAN data respectively
- Pansharpened (PSH): single higher resolution 0.87 colour product obtained by the combination of the visual coloured information of the multispectral data with the details provided in the panchromatic data

ESA TPM collection and access options	
Full archive	ESA offers access to worldwide Vision-1 data (both archive and new tasking) via project proposal submission. More information can be found here: *https://earth.esa.int/eogateway/catalog/vision-1-full-archive-and-tasking*

Weblinks
Vision-1: https://earth.esa.int/eogateway/missions/vision-1

6.44 WorldView

The WorldView series consists of 4 high resolution commercial Earth imaging satellites owned by Maxar and distributed by European Space Imaging (EUSI). The overall objective is to meet the growing commercial demand for high-resolution satellite imagery.

WorldView-1 / WV-60	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2007
Instrument & agency (& any partners)	WorldView-60 Camera | Maxar, USA / EUSI, Europe		
Type	Very High-resolution Optical Imager		
Measurements & applications	Multi-purpose high-resolution optical imagery: the sub 1m resolution products allow a wide range of applications such as map creation, change detection and in-depth image analysis.		
Technical characteristics	**Wavebands**: Panchromatic: 450 - 900 nm, **Spatial resolutions:** 0.50 m PAN (at nadir) **Swath width:** 17.6 km		

WorldView-2 / WV-110	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2009
Instrument & agency (& any partners)	WorldView-110 Camera | Maxar, USA / EUSI, Europe		
Type	Very High-resolution Optical Imager		
Measurements & applications	High-resolution panchromatic and 8-band multispectral imagery for precise map creation, monitoring applications, change detection, mapping of vegetation		
Technical characteristics	**Wavebands:** Panchromatic: 450 - 800 nm, Multispectral 8-bands; Coastal Blue: 400 - 450 nm Blue: 450 - 510 nm Green: 510 - 580 nm Yellow: 585 - 625 nm Red: 630 - 690 nm Red edge: 705 - 745 nm Near-IR1: 770 - 895 nm Near-IR2: 860 - 1040 nm **Spatial resolutions:** 0.46 m PAN, 1.85 m MS (at nadir) **Swath width:** 16.4 km		

WorldView-3 / WV-110	VERY HIGH	GLOBAL ESA COPY	LAUNCH 2014
Instrument & agency (& any partners)	WorldView-110 Camera | Maxar, USA / EUSI, Europe		
Type	Very High-resolution Optical Imager		
Measurements & applications	Precise map creation, monitoring applications, change detection, mapping of vegetation; forestry, wildlife, geology, mining, agriculture applications		
Technical characteristics	**Wavebands:** Panchromatic: 450 - 800 nm, Multispectral 8-bands in VNIR; Coastal Blue: 400 - 450 nm Blue: 450 - 510 nm Green: 510 - 580 nm Yellow: 585 - 625 nm Red: 630 - 690 nm Red edge: 705 - 745 nm Near-IR1: 770 - 895 nm Near-IR2: 860 - 1040 nm Multispectral 8-bands in SWIR; SWIR-1: 1195 - 1225 nm SWIR-2: 1550 - 1590 nm SWIR-3: 1640 - 1680 nm SWIR-4: 1710 - 1750 nm SWIR-5: 2145 - 2185 nm SWIR-6: 2185 - 2225 nm SWIR-7: 2235 - 2285 nm SWIR-8: 2295 - 2365 nm **Spatial resolutions**: 0.31 m PAN, 1.24 m MS, 3.70 m SWIR (at nadir), **Swath width:** 13.1 km		

WorldView-4 / WV-110	VERY HIGH	GLOBAL ESA COPY	LAUNCH-EOL 2016-2019	
Instrument & agency (& any partners)	WorldView-110 Camera | Maxar, USA / EUSI, Europe			
Type	Very High-resolution Optical Imager			
Measurements & applications	High-resolution imagery for precise map creation, monitoring applications, change detection, mapping of vegetation, street markings			
Technical characteristics	**Wavebands:** Panchromatic(PAN): 450 - 800 nm, Multispectral (MS) 8-bands; Blue: 450 - 510 nm Green: 510 - 580 nm Red: 655 - 690 nm Near-IR: 780 - 920 nm **Spatial resolutions:** PAN: 0.31m, MS:1.24 m (at nadir) **Swath width:** 13.1 km			

WorldView

Products

Level 2 Standard	Normalised for topographic relief.
Level 2 View Ready Standard	Ready for orthorectification (RBP files embedded).
Level 3 View Ready Stereo	Collected in-track for stereo viewing and manipulation (not available for SWIR).
Level 3 Map-Ready (Ortho)	Orthorectified with scale 1:12000. Additional processing unnecessary.

Band combinations:
· Panchromatic
· 4-bands Multispectral (not WV-1)
· 4-bands Pan-sharpened (not WV-1)
· 4-bands Bundle (not WV-1)
· 3-bands Natural colour (not WV-1)
· 3-bands Coloured Infrared (not WV-1)
· 8-bands Multispectral (WV-2 & VW-3 only)
· 8-bands Bundle (WV-2 & WV-3 only)
· SWIR (WV-3 only)

Worldview-1/2/3/4

ESA TPM collection and access options

WorldView ESA archive		The collection is composed of a copy of optical products requested by ESA supported projects over their areas of interest around the world. The dataset regularly grows as ESA collects new products over the years. Fast approval is required to access WorldView data. Data can be downloaded from the Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/WorldView* More information can be found here: *https://earth.esa.int/eogateway/catalog/worldview-esa-archive*
WorldView full archive and tasking		ESA offers access to worldwide WorldView-1/2/3 data (both archived and new acquisitions) via project proposal submission. ESA also offers access to WorldView-4 full archive data via project proposal submission. More information can be found here: · *https://earth.esa.int/eogateway/catalog/worldview-1-full-archive-and-tasking* · *https://earth.esa.int/eogateway/catalog/worldview-2-full-archive-and-tasking* · *https://earth.esa.int/eogateway/catalog/worldview-3-full-archive-and-tasking* · *https://earth.esa.int/eogateway/catalog/worldview-4-full-archive*
WorldView-2 European Cities – Featured Dataset		See Section 7.18 for more details.

Weblinks
WorldView series: https://earth.esa.int/eogateway/missions/worldview
WorldView-1: https://earth.esa.int/eogateway/missions/worldview-1
WorldView-2: https://earth.esa.int/eogateway/missions/worldview-2
WorldView-3: https://earth.esa.int/eogateway/missions/worldview-3
WorldView-4: https://earth.esa.int/eogateway/missions/worldview-4

7. FEATURED DATASETS

The following Featured Datasets are currently available, and represent a specific subset of the entire collection described in Section 6. These datasets provide data over a restricted area and/or with a limited time period.

For further technical details of each dataset's mission/ instrument, please refer to the appropriate section in Section 6 – referenced at the bottom of each Featured Dataset table.

7.1 ALOS African Cloud Free Coverage (AVNIR-2)

This dataset is a collection of the best available (cloud minimal) African coverage acquired by the AVNIR-2 instrument, composed of Level 1B products (radiometrically corrected with absolute calibration coefficient included).

ALOS African Cloud Free Coverage (AVNIR-2)	MED-HIGH AFRICA DATASET COVERAGE 2006-2009
ALOS (AVNIR-2)	
Spatial and Temporal Coverage	Africa July 9th 2006 to May 12th 2009.
Access Information	Data are available for immediate download via the TPM Online Dissemination Service at: *https://alos-ds.eo.esa.int/oads/access/collection/ALOS_Africa_AVNIR2*
Mission/Instrument Information	For more details, please see Section 6.2
Weblinks	More information: https://earth.esa.int/eogateway/catalog/alos-african-coverage-esa-archive

Figure 8: ALOS AVNIR-2 African Coverage

7.2 ALOS African Cloud Free Coverage (PRISM)

This dataset is a collection of the best available (cloud minimal, below 10%)
African coverage acquired by PRISM in OB1 mode.

ALOS African Cloud Free Coverage (PRISM)	MED-HIGH	AFRICA	DATASET COVERAGE 2006-2009
ALOS (PRISM)			
Spatial and Temporal Coverage	Africa July 9th 2006 to May 12th 2009.		
Access Information	Data are available for download via the TPM Online Dissemination Service at: *https://alos-ds.eo.esa.int/oads/access/collection/ALOS_Africa_PRISM* Data download requires fast approval.		
Mission/Instrument Information	For more details, please see Section 6.2		
Weblinks	More information: https://earth.esa.int/eogateway/catalog/alos-african-coverage-esa-archive		

Figure 9: ALOS Cloud Free African Coverage (PRISM)

7.3 ALOS L1C European Coverage Cloud Free (PRISM)

This collection is composed of a subset of ALOS-1 PRISM OB1 L1C products which have been chosen so as to provide a cloud-free coverage over Europe.

ALOS L1C European Coverage Cloud Free ESA Archive (PRISM)	MED-HIGH EUROPE	DATASET COVERAGE 2007-2011
ALOS (PRISM)		
Spatial and Temporal Coverage	Europe March 26th 2007 to March 31st 2011.	
Access Information	Data are available for download via the TPM Online Dissemination Service at: *http://alos-ds.eo.esa.int/smcat/ALOSPRISML1CCloudFreeEuropeanCoverage10/* Data download requires fast approval.	
Mission/Instrument Information	For more details, please see Section 6.2	
Weblinks	More information: https://earth.esa.int/eogateway/catalog/alos-prism-l1c-european-coverage-cloud-free	

Figure 10: ALOS Cloud Free European Coverage

7.4 ALOS International Polar Year Antarctica (PALSAR)

Initiated under the International Polar Year (IPY), ESA provides full resolution ScanSAR products from ALOS PALSAR over Antarctica. ALOS PALSAR ScanSAR (WB1) processed products in 100 m spatial resolution (L1.5) are available for Research and Application development.

| ALOS International Polar Year (IPY) (PALSAR)	MED-HIGH	ANTARCTICA	DATASET COVERAGE 2008-2010	
ALOS (PALSAR)				
Spatial and Temporal Coverage	Antarctica Two different periods, July-Dec 2008 (cycle 21-24) and May 2009 - March 2010 (cycle 27 - 31)			
Access Information	Data are available for immediate download via the TPM Online Dissemination Service at *https://tpm-ds.eo.esa.int/oads/access/collection/ALOSIPY*			
Mission/Instrument Information	For more details, please see Section 6.2			
Weblinks	More information: https://earth.esa.int/eogateway/catalog/alos-palsar-international-polar-year-antarctica			

Figure 11: ALOS International Polar Year Antartica (PALSAR)

7

7.5 Cartosat-1 Euro-Maps 3D European Cities Coverage

This dataset covers a large number of European cities. For each city, there are one or more Cartosat-1 ortho image products and one or more Euro-Maps 3D DSM tiles clipped to the extent of the ortho coverage.

Cartosat-1 European Cities Coverage	VERY HIGH	EUROPE	DATASET COVERAGE 2019-2022
Cartosat-1 Euro-Maps 3D			
Spatial and Temporal Coverage	Europe November 12th 2019 to November 8th 2022		
Access Information	Data are available for download via the TPM Online Dissemination Service at *https://tpm-ds.eo.esa.int/smcat/Cartosat/* Data download requires fast approval.		
Mission/Instrument Information	For more details, please see Section 6.4		
Weblinks	More information: https://earth.esa.int/eogateway/catalog/european-cities-cartosat-1-euro-maps-3d		
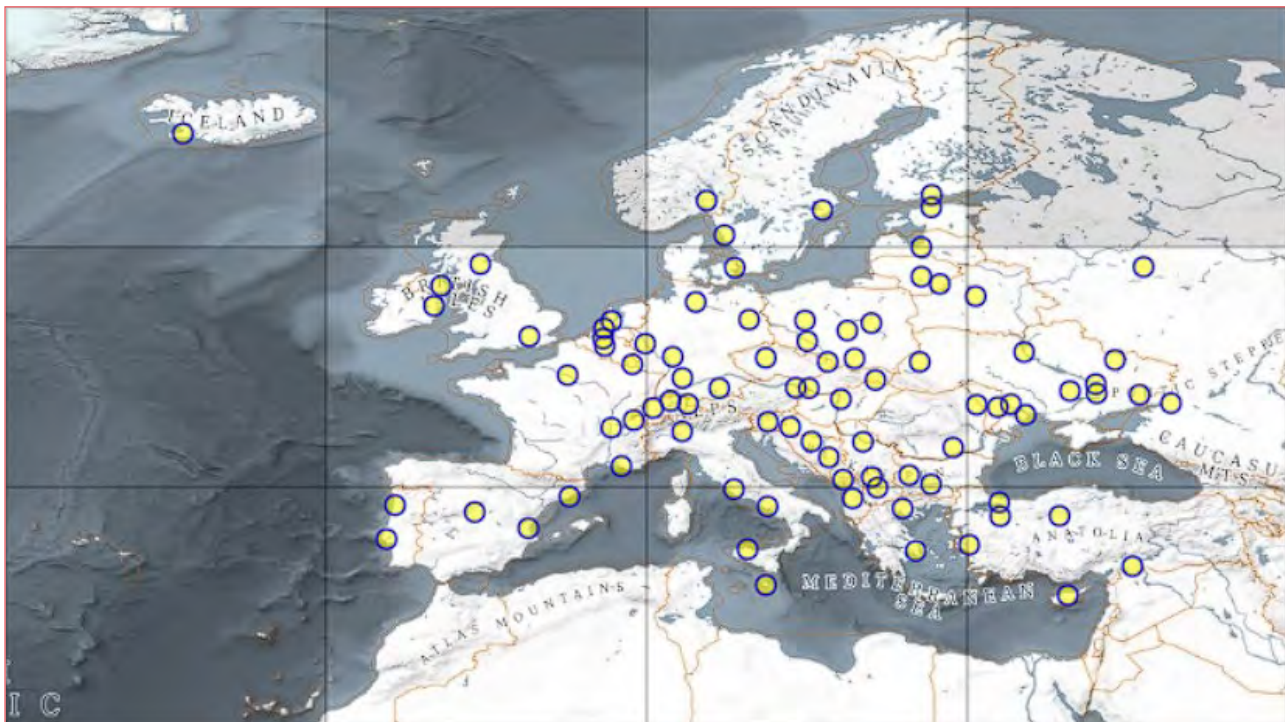
Figure 12: Cartosat-1 Euro-Maps 3D European Cities Coverage

7.6 GEOSAT-2 Portugal Coverage

Full coverage of Portugal, including the Azores and Madeira islands, acquired by GEOSAT-2 from January 2021 to December 2021 with more than 90% cloud-free coverage. The collection is composed of both Bundle and Pan-sharpened L1C Orthorectified products.

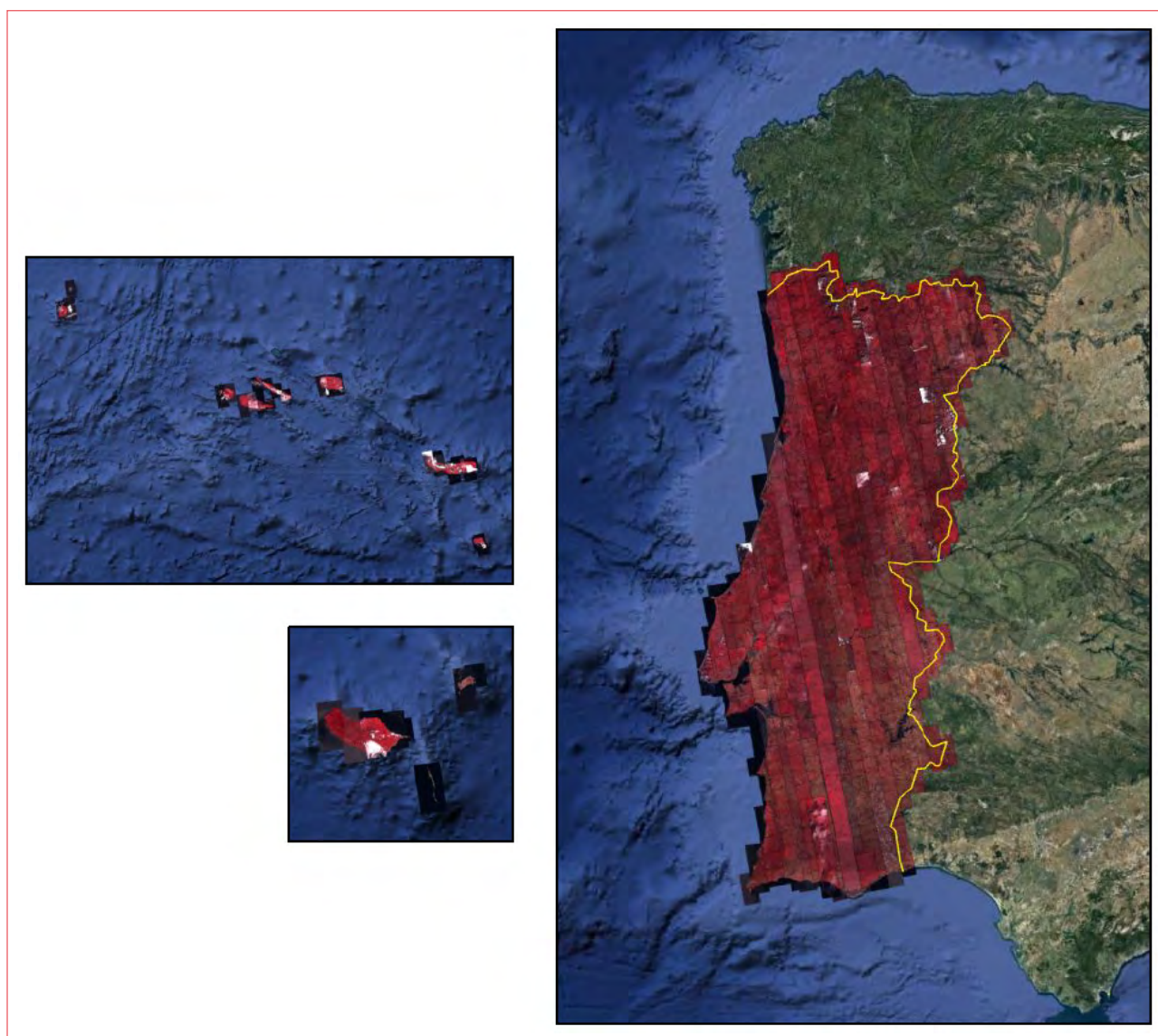| GEOSAT-2 Portugal Coverage	VERY HIGH PORTUGAL DATASET COVERAGE 2021
GEOSAT-2	
Spatial and Temporal Coverage	Portugal January 8th 2021 to December 11th 2021
Access Information	Data are available for download via the TPM Online Dissemination service at: *https://tpm-ds.eo.esa.int/smcat/G2_Portugal_2021/* Data download requires fast approval.
Mission/Instrument Information	For more details, please see Section 6.9.1
Weblinks	More information: https://earth.esa.int/eogateway/catalog/geosat-2-portugal-coverage

Figure 13: GEOSAT-2 2021 Portugal Coverage

7.7 GEOSAT-2 Spain Coverage

The collection consists of two separate coverages of Spain with more than 90% cloud-free coverage, including the Balearic and Canary Islands, acquired between March and November of 2021 and 2022. The collection is composed of both Bundle and Pan-sharpened L1C orthorectified products.

GEOSAT-2 Spain Coverage	VERY HIGH	SPAIN	DATASET COVERAGE 2021
GEOSAT-2			
Spatial and Temporal Coverage		Spain March 1st 2021 to November 15th 2021 March 1st 2022 to November 15th 2022	
Access Information		Data are available for download via the TPM Online Dissemination service at *https://tpm-ds.eo.esa.int/oads/access/collection/G2_Spain_2021* Data download requires fast approval.	
Mission/Instrument Information		For more details, please see Section 6.9.1	
Weblinks		More information: https://earth.esa.int/eogateway/catalog/geosat-2-spain-coverage	

Figure 14: GEOSAT-2 2022 Spain Coverage

7.8 IMAGE2006 European Coverage

Two cloud-free coverages of Europe are available, resampled to 20 m spatial resolution in national projection and 25 m in European projection for orthorectified data. Data have been sourced from SPOT-4 HRVIR (20 m original spatial resolution), SPOT-5 HRG (10 m original spatial resolution) and Resourcesat-1 (IRS-P6) LISS III (with 23 m original spatial resolution), each with four spectral bands. The swath width is about 60 km for the SPOT satellites and 140 km for the IRS-P6 satellite.

More information on these datasets can be obtained from the EOHelp team or the IMAGE2006 European Coverage – Methodology and Results document:
https://earth.esa.int/eogateway/documents/20142/37627/Image-2006-European-Coverage.pdf

IMAGE2006 European Coverage	MED-HIGH EUROPE DATASET COVERAGE 2006
SPOT 4, SPOT 5, Resourcesat-1 (IRS-P6)	
Spatial and Temporal Coverage	Europe (38 countries). 2006, with data from 2005 and 2007 used to fill any gap
Access Information	Data are available for immediate download via the TPM Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/Image2006* or via the EO-Cat catalogue.
Mission/Instrument Information	For more details, please see Sections 6.32, 6.39.2 and 6.39.3
Weblinks	More information: https://earth.esa.int/eogateway/catalog/image-2006-european-coverage

Figure 15: IMAGE2006 European Coverage

7.9 IMAGE2007 European Coverage

Coverage captured by the DMC constellation (UK-DMC, Beijing-1 and NigeriaSat-1). Images are derived from 32 m resolution optical images from the SLIM-6 instrument. The following products, with European coverage, are available:

· L1R: Band registered product derived from the L0R product.
· L1T: Orthorectified product derived from the L1R product using manually collected GCPs from IMAGE2000 and SRTM DEM V3.1 data.

More information on these products can be found in the DMC Data Product Manual for the DMC Europe 2007 Coverage, which can be obtained from ESA Earth Online here:
https://earth.esa.int/eogateway/documents/20142/37627/DMC-Product-Manual-for-the-DMC-Europe-2007-Coverage

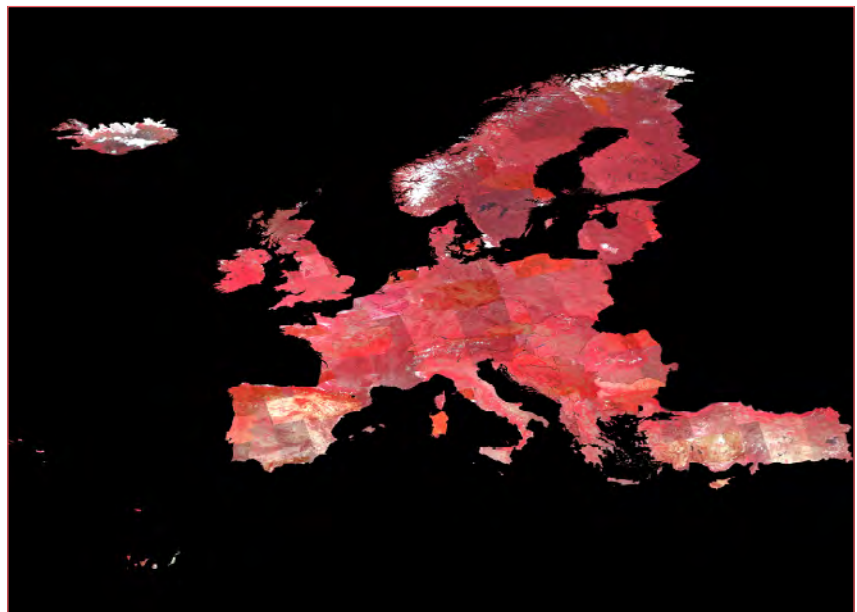| IMAGE2007 European Coverage	MED-HIGH EUROPE	DATASET COVERAGE 2007
UK-DMC, Beijing-1 and NigeriaSat-1		
Spatial and Temporal Coverage	Europe. April 7th 2007 to October 9th 2007	
Access Information	Data are available for immediate download via the TPM Online Dissemination Service at: *https://tpm-ds.eo.esa.int/oads/access/collection/Image2007*	
Mission/Instrument Information	For more details, please see Section 6.6	
Weblinks	More information: https://earth.esa.int/eogateway/catalog/image-2007-european-coverage	

Figure 16: IMAGE2007 European Coverage

7.10 IRS-1C/1D European Coverage

Three cloud-free coverages of Europe are available.

IRS 1C/1D European Coverage	MED-HIGH ⚬ EUROPE 🌍 DATASET COVERAGE 1996-2004 🏛
IRS-1C/1D	
Spatial and Temporal Coverage	Europe. 3 coverages available – data from 1996 to 2004.
Access Information 🔓	Data is available for immediate download via the TPM Online Access List (*https://tpm-ds.eo.esa.int/oads/access/collection/IRS1*) or via the EO-Cat catalogue.
Mission/Instrument Information	For more details, please see Section 6.16
Weblinks	More information: https://earth.esa.int/eogateway/catalog/irs-1c-1d-esa-archive

Figure 17: IRS COVERAGE 1999-2001

Figure 18: IRS COVERAGE 1996-1998

Figure 19: IRS COVERAGE 2002-2004

7.11 KOMPSAT-1 Coverage of 50 European Cities

Available as a sample collection of data acquired by KOMPSAT-1's Electro-Optical Camera (EOC) with no orthorectification or radiometric calibration. The dataset includes PAN imagery at 6.6 m GSD, with a swath of 17 km. Data are available in TIFF format and correspond to Level 1B processing.

KOMPSAT-1 Coverage of 50 European Cities	HIGH	EUROPE	DATASET COVERAGE 2000-2004	
KOMPSAT-1				
Spatial and Temporal Coverage	Europe March 6th 2000 to August 6th 2004			
Access Information	Data are available for immediate download via the TPM Online Dissemination Service https://tpm-ds.eo.esa.int/oads/access/collection/Kompsat1			
Mission/Instrument Information	For more details, please see Section 6.18			
Weblinks	More information: https://earth.esa.int/eogateway/catalog/kompsat-1-coverage-of-50-european-cities			

Figure 20: KOMPSAT-1 European Coverage

7.12 Landsat 5 Thematic Mapper European and Mediterranean Countries Cloud Free

The dataset contains the cloud-free products from the Landsat 5 Thematic Mapper collection acquired over Europe, North Africa and the Middle East. For each scene only one product is selected, with the minimal cloud coverage.

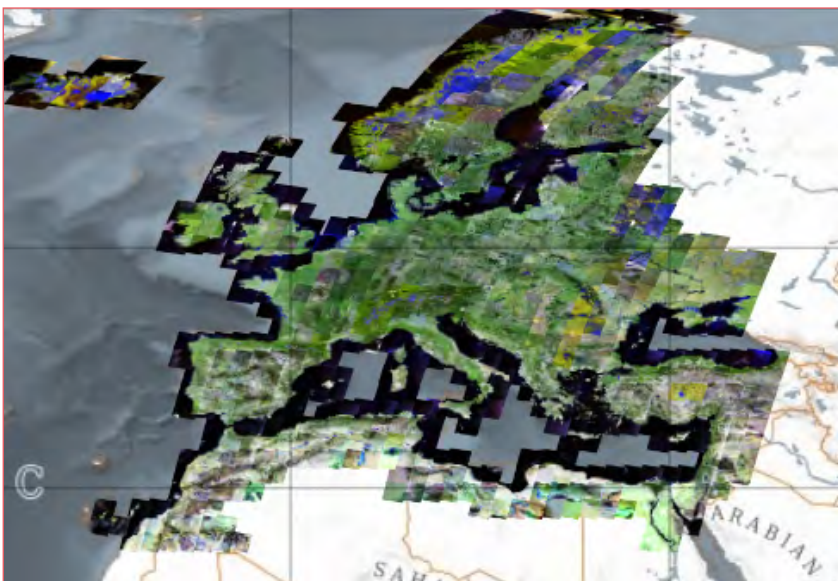| Landsat 5 European and Mediterranean Countries Cloud Free	MED EUROPE, NORTH AFRICA and MIDDLE EAST	DATASET COVERAGE 1986-1995
Landsat 5 TM		
Spatial and Temporal Coverage	Europe, North Africa and Middle East September 18th 1986 to September 9th 1995	
Access Information	Data are available for immediate download via the TPM Online Dissemination Service at: *https://landsat-diss.eo.esa.int/smcat/LandsatTMCloudFree*	
Mission/Instrument Information	For more details, please see Section 6.19.3	
Weblinks	More information: https://earth.esa.int/eogateway/catalog/landsat-5-tm-european-and-mediterranean-countries-cloud-free-collection	

Figure 21: Landsat 5 TM Coverage

7.13 Landsat 7 ETM+ European and Mediterranean Countries Cloud Free

The dataset is a collection of the cloud-free products from the Landsat 7 Enhanced Thematic Mapper acquired over Europe, North Africa and the Middle East. For each scene only one product is selected, with the minimal cloud coverage.

Landsat 7 European and Mediterranean Countries Coverage	MED-HIGH	EUROPE, NORTH AFRICA and MIDDLE EAST	DATASET COVERAGE 1999 - 2003
Landsat 7 ETM+			
Spatial and Temporal Coverage		Europe, North Africa and the Middle East July 10th 1999 to May 23rd 2003	
Access Information		Data are available for immediate download via the TPM Online Dissemination Service at *https://landsat-diss.eo.esa.int/smcat/LandsatETMCloudFree*	
Mission/Instrument Information		For more details, please see Section 6.19.4	
Weblinks		More information: https://earth.esa.int/eogateway/catalog/landsat-7-etm-european-and-mediterranean-countries-cloud-free-collection	

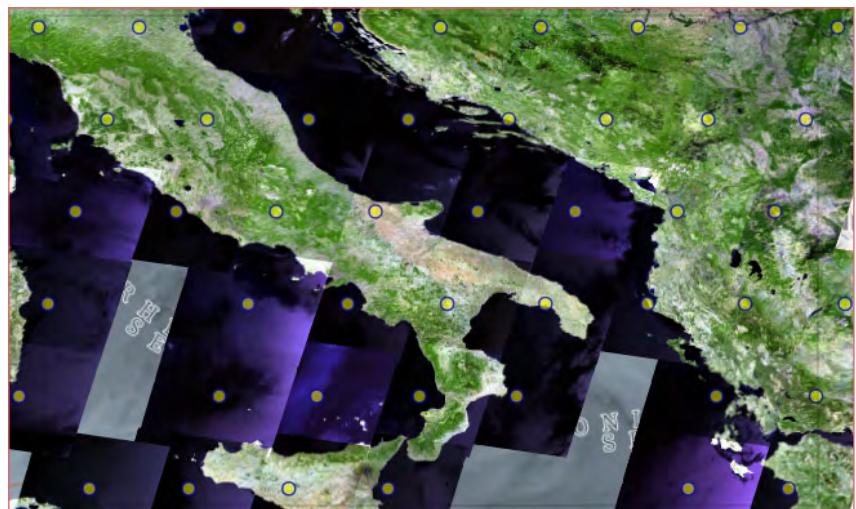*Figure 22: Landsat 7 ETM+ Coverage*

7.14 RapidEye South America

In collaboration with Planet Labs, ESA has made this collection of low cloud cover Level 3A tiles freely available via the TPM programme. The RapidEye Earth Imaging System (REIS) provides data at 5 metre spatial resolution (multispectral, orthorectified).

RapidEye South America	MED-HIGH	SOUTH AMERICA	DATASET COVERAGE 2012-2015
RapidEye (REIS)			
Spatial and Temporal Coverage		This dataset covers more than 6 million km² of South American countries (Argentina, Bolivia, Chile, Ecuador, Paraguay, Peru and Uruguay). Images were acquired from 2012 to 2015 (mostly 2015).	
Access Information		Data are available for immediate download via the TPM Online Dissemination Service: *https://tpm-ds.eo.esa.int/oads/access/collection/RapidEye_SouthAmerica* or via the EO-Cat catalogue.	
Mission/Instrument Information		For details please see Section 6.32	
Weblinks		More information: https://earth.esa.int/eogateway/catalog/rapideye-south-america	

Figure 23: RapidEye - South America

7.15 RapidEye Time Series for Sentinel-2 (RapidEye Take 5)

Carried out by ESA in collaboration with Planet Labs in order to produce 5-day revisit time-series datasets (for this reason it is also called RapidEye Take-5) over selected sites – similar to that produced by the Sentinel-2 mission.

The RapidEye Earth Imaging System (REIS) provides data at 5 m spatial resolution (multispectral L3A orthorectified). The products are radiometrically and sensor corrected similar to the Sentinel-2 Level 1B basic product, but have geometric corrections applied during orthorectification using Digital Elevation Models (DEMs) and GCPs.

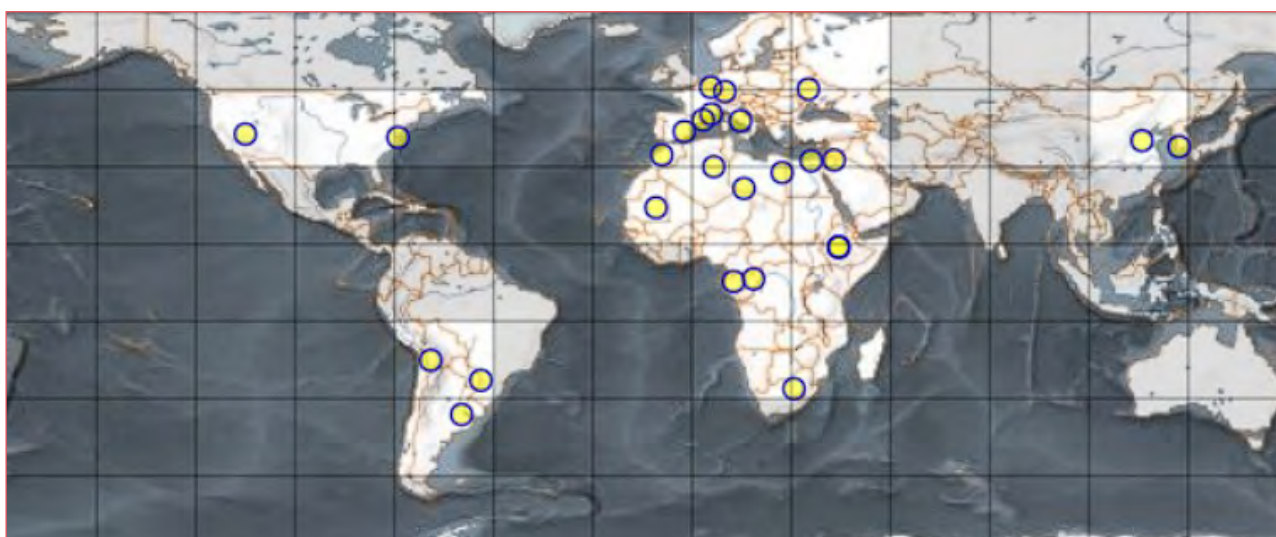| RapidEye Time Series for Sentinel-2	MED-HIGH	VARIOUS SELECTED AREAS	DATASET COVERAGE 2013-2015
RapidEye (REIS)			
Spatial and Temporal Coverage	Two high-resolution time series were collected for the following periods: - February to June 2013 over sites in Argentina, Belgium, Chesapeake Bay, China, Congo, Egypt, Ethiopia, Gabon, Jordan, Korea, Morocco, Paraguay, South Africa and Ukraine. - April to September 2015 for a further ten sites: Limburgerhof, Railroad Valley, Libya, Algeria, Figueres, Mauritania, Barrax, ESRIN, Uyuni Salt Lake.		
Access Information	Data are available for immediate download via the TPM Online Dissemination Service *https://tpm-ds.eo.esa.int/oads/access/collection/RapidEye_Take5* or via the EO-Cat catalogue.		
Mission/Instrument Information	For details please see Section 6.32		
Weblinks	More information: https://earth.esa.int/eogateway/catalog/rapideye-time-series-for-sentinel-2		

Figure 24: RapidEye Take 5

7.16 SPOT 4-5 Take 5 ESA Archive (SPOT 4/5 Time Series for Sentinel-2)

At the end of their operational lives SPOT 4 and 5 were placed into orbits that resulted in 5-day revisit times – consistent with the operation of Sentinel-2. SPOT 4/5 Take 5 data collected over a selection of international sites allowed users to prepare for Sentinel-2 by testing their methods and applications, as well as to showcase the utility of the derived products.

| SPOT 4-5 Take 5 ESA Archive	MED-HIGH	VARIOUS SELECTED AREAS	DATASET COVERAGE 2013-2015
SPOT 4/5			
Spatial and Temporal Coverage	SPOT 4 Take 5 (January 31st – June 9th, 2013) over 45 selected sites SPOT 5 Take 5 (April 8th – September 15th, 2015) over 145 selected sites		
Access Information	Level 1A (only for SPOT 5), 1C and 2A time series are available for immediate download via the TPM Online Dissemination Service *https://tpm-ds.eo.esa.int/oads/access/collection/SPOT4-5Take5_ESA*		
Mission/Instrument Information	For more details, please see Sections 6.40.2 and 6.40.3		
Weblinks	More information: https://earth.esa.int/eogateway/catalog/spot-4-5-take5-esa-archive		
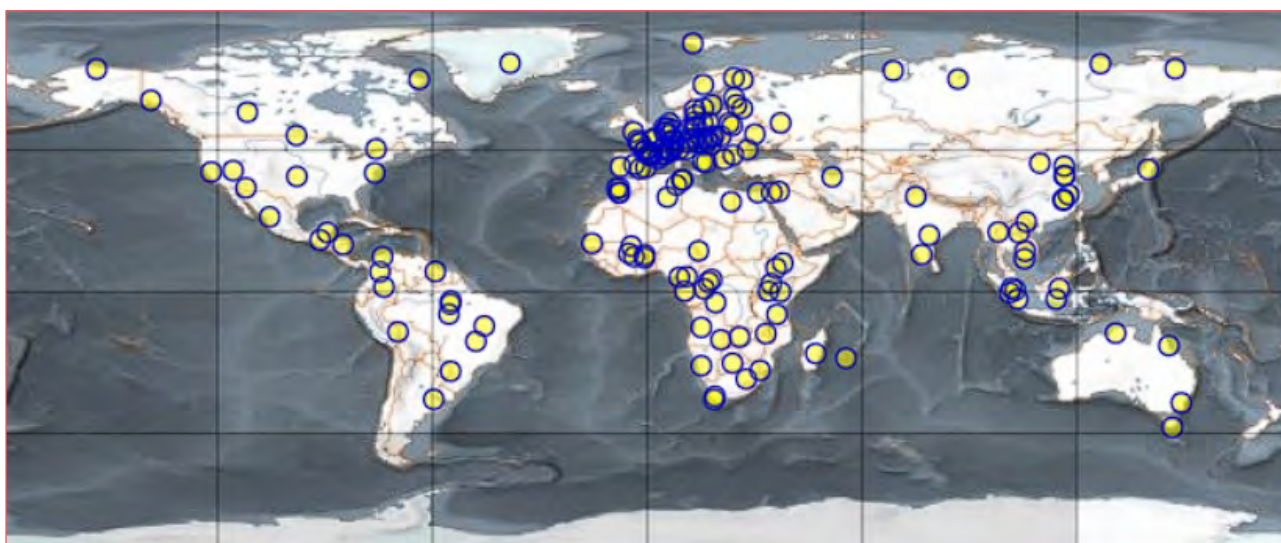
Figure 25 : SPOT 4-5 Take 5 ESA Archive

7.17 TropForest 2010 - Optical Coverages Over Tropical Forests

Covers tropical forest areas in South East Asia and South America. The data were acquired by the ALOS, GEOSAT-1 and KOMPSAT-2 satellites with the goal of creating a harmonised geo-database of ready-to-use satellite imagery to support 2010 global forest assessments performed by the Joint Research Centre (JRC) of the European Commission and the FAO.

TropForest 2010 - Optical Coverages Over Tropical Forests	MED-HIGH TROPICAL FORESTS DATASET COVERAGE 2009-2011
ALOS, GEOSAT-1 (DEIMOS-1) and KOMPSAT-2	
Spatial and Temporal Coverage	January 2009 to August 2011 The products are located in the tropical forests in Latin America (excluding Mexico) and Tropical South and Southeast Asia (excluding China)
Access Information	Data are available for immediate download via the TPM Online Dissemination Service *https://tpm-ds.eo.esa.int/oads/access/collection/Tropforest* or via the EO-Cat catalogue
Mission/Instrument Information	For more details, please see Section 6.2, 6.9, 6.18.1
Weblinks	More information: https://earth.esa.int/eogateway/catalog/tropforest-alos-deimos-1-kompsat-2-optical-coverages-over-tropical-forests

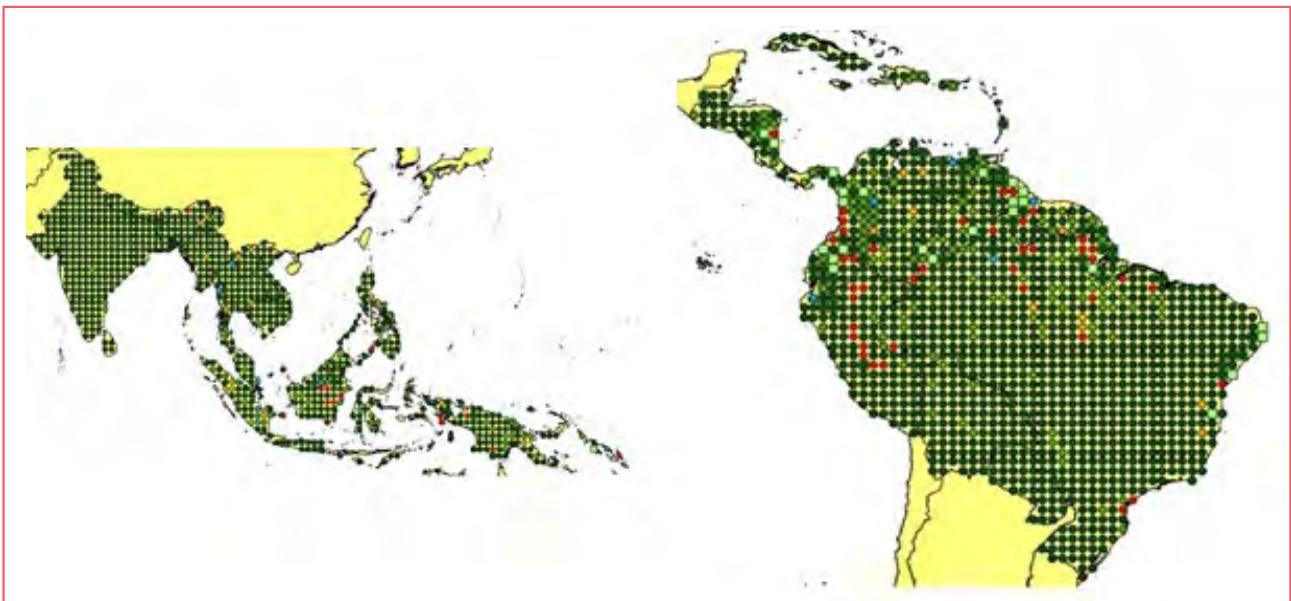*Figure 26: TropForest 2010 coverage*

7.18 WorldView-2 European Cities

Coverage has been provided by European Space Imaging. Very High Resolution satellite imagery collected by WorldView-2 was delivered to complete ESA's Urban Atlas, which provides coverage of European Urban Areas with more than 100,000 inhabitants at 40 cm resolution: 290 of the 305 2010 Urban Atlas Zones are covered, as well as 5 Urban Atlas Zones in Croatia − totalling 537,502 km². An 8-Band MS + PAN bundle of archive data is available.

WorldView-2 European Cities	VERY HIGH EUROPE DATASET COVERAGE 2010-2015
WorldView-2	
Spatial and Temporal Coverage	European Urban Areas with more than 100,000 inhabitants, acquired from July 2010 to July 2015.
Access Information	Data are available for download via the TPM Online Dissemination Service (*https://tpm-ds.eo.esa.int/oads/access/collection/WorldView-2*) or via the EO-Cat catalogue. Data download requires fast approval.
Mission/Instrument Information	For more details, please see Section 6.44
Weblinks	More information: https://earth.esa.int/eogateway/catalog/worldview-2-european-cities

Figure 27: WorldView-2 European Cities Product Coverage

8. FUTURE/POTENTIAL ESA THIRD PARTY MISSIONS

8.1 BRO Satellite Constellation

BRO (Breizh Reconnaissance Orbiter) comprises a fleet of nano satellites operated by a French company named Unseenlabs. The main objective is to detect radio frequency emissions, thereby facilitating maritime surveillance of vessels operating without Automatic Identification System (AIS) transponders or cooperative beacons as they engage in unlawful activities, seeking to evade official oversight.

8.2 Nimbus-7/CZCS

CZCS data acquired and archived at ESA are being recovered through a dedicated project as part of the Heritage Space Programme.

The craft was placed in a Sun-synchronous orbit and transmission of data from all of the experiments was completed as scheduled. For the first time, NASA and ESA were able to receive data on the global atmosphere in real time.

8.3 IRS-P3

The Indian Remote Sensing Satellite-P3 (IRS-P3) was part of India's expansive Earth observation series managed by ISRO. IRS-P3 supported remote sensing in fields such as agriculture, forestry, geology, and hydrology. Compared to its predecessors, IRS-P3 was equipped with more diverse payloads to enhance its utility. One such payload, the Modular Optoelectronic Scanner (MOS) instrument, was developed by DLR and gathered data over Europe in the late 1990s. MOS was an experimental imaging spectrometer designed to observe the visible and near-infrared (VNIR) to short-wave infrared (SWIR) range. Its purpose was to monitor various aspects of the Earth's surface, including interactions between the surface and atmosphere; ocean colour; phytoplankton distribution; and the regional and global presence of man-made aerosols and their relationship with gaseous substances. These datasets are currently being recovered through a dedicated ESA project in collaboration with DLR and will be made available to users upon the project's completion.

8.4 RiSat-1A

Radar Imaging Satellite-1A (RiSat-1A) is a mission built by ISRO with the aim of providing all weather surveillance using Synthetic Aperture Radar (SAR). Its mission objective encompasses diverse applications such as agriculture, forestry, soil moisture assessment, geology, sea ice monitoring, coastal surveillance, object identification, and flood monitoring, as well as military surveillance.