



# DOCUMENT

## DRAGON 6 COOPERATION ANNOUNCEMENT OF OPPORTUNITY INFORMATION & CONDITIONS

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## 1 INTRODUCTION

### 1.1 Purpose and structure of the document

ESA, together with the National Remote Sensing Center of China (NRSCC), an entity under the Ministry of Science and Technology (MOST) of the P.R. China, have cooperated in the field of Earth observation application development for the last 29 years. This cooperation has been successively strengthened by the creation of dedicated joint Earth Observation cooperation called the Dragon Cooperation. There have been the following 4 years programmes to date:

- Dragon 1 (2004 – 2008);
- Dragon 2 (2008 – 2012);
- Dragon 3 (2012 – 2016);
- Dragon 4 (2016 – 2020);
- Dragon 5 (2020 – 2024).

A strong interest has been expressed by all parties to continue and further strengthen the successful cooperation between Europe and China under the framework of Dragon. Therefore, a call for follow-on cooperation between ESA and MOST called Dragon 6 is proposed in this document.

Chapter 1 outlines the purpose of this document and provides lists of relevant documents and abbreviations;  
 Chapter 2 provides background to the Dragon cooperation;  
 Chapter 3 illustrates the opportunity, including the conditions and the science objectives;  
 Chapter 4 provides the proposals' review and evaluation criteria;  
 Chapter 5 provides an overview of the call schedule.

### 1.2 Applicable documents

- [A1] Terms and conditions for the use and distribution of Copernicus Sentinels data  
<https://dataspace.copernicus.eu/terms-and-conditions>
- [A2] Legal notice on the use of Copernicus Sentinel Data and Service Information  
[https://sentinels.copernicus.eu/documents/247904/690755/Sentinel\\_Data\\_Legal\\_Notice](https://sentinels.copernicus.eu/documents/247904/690755/Sentinel_Data_Legal_Notice)
- [A3] ESA data policy for ERS, Envisat and Earth Explorer missions  
[https://sentinels.copernicus.eu/documents/247904/690755/Sentinel\\_Data\\_Legal\\_Notice](https://sentinels.copernicus.eu/documents/247904/690755/Sentinel_Data_Legal_Notice)
- [A4] Terms and Conditions for the Utilisation of ESA's Earth Observation Data  
<https://earth.esa.int/eogateway/documents/20142/1564626/Terms-and-Conditions-for-the-use-of-ESA-Data.pdf>
- [A5] List of free ESA EO data sets  
<https://earth.esa.int/web/guest/data-access/browse-data-products> <https://eocat.esa.int/sec/#data-services-area>
- [A6] Terms and Conditions for the Utilisation of Data under ESA's Third Party Missions scheme  
<https://earth.esa.int/eogateway/documents/20142/1560778/ESA-Third-Party-Missions-Terms-and-Conditions.pdf>



### 1.3 Reference documents & websites

- [R1] The Dragon 5 Programme website (<https://dragon5.esa.int/>)
- [R2] 2017 Dragon 4 Programme [e-brochure](#)
- [R3] Dragon 5 mid-term Symposium (<https://dragon-symp2022.esa.int/>)
- [R4] Dragon 5 2023 Symposium (<https://dragon-symp2023.esa.int/>)
- [R5] Dragon 6 AO Web site (<https://earth.esa.int/eogateway/announcement-of-opportunity/dragon-6>)
- [R6] ESA, ESA TPM and Copernicus EO missions in Dragon portfolio  
[https://eo4society.esa.int/dragon\\_files/D6\\_Table\\_MissionsESA\\_ESATPM\\_Copernicus.pdf](https://eo4society.esa.int/dragon_files/D6_Table_MissionsESA_ESATPM_Copernicus.pdf)
- [R7] Chinese EO missions in Dragon portfolio  
[https://eo4society.esa.int/dragon\\_files/D6\\_Table\\_MissionsChina.pdf](https://eo4society.esa.int/dragon_files/D6_Table_MissionsChina.pdf)

### 1.4 List of Acronyms

Acronym	Definition
AATSR	Advanced Along Track Scanning Radiometer
ATSR	Along Track Scanning Radiometer
ADEN	ALOS Data European Node
ADM Aeolus	ESA Earth Explorer Atmospheric Dynamics Mission (ADM-Aeolus) will provide global observations of wind profiles from space
ACGS	Atmospheric Carbon-dioxide Grating Spectrometer
ALOS	Advanced Land Observing Satellite operated by JAXA
AO	Announcement of Opportunity
AOI	Area(s) of Interest – a geographical region or area located by geo-coordinates
ASAR	Advanced Synthetic Aperture Radar on board Envisat
ASCAT	Advanced SCATterometer on the Metop-1 polar orbiting satellite
AVNIR-2	ALOS Advanced Visible and Near Infrared Radiometer type 2
BIOMASS	ESA Earth Explorer due for launch 2022, carrying P-band SAR for measuring global forest biomass
CAPI	Cloud Aerosol Polarization Imager
CBERS 4	CBERS-4 is an Earth Resources Satellite jointly developed by China and Brazil. It was launched successfully on 7th Dec., 2014
CFOSAT	CFOSAT is a Sino-French collaboration satellite ocean wave and wind measurement, the satellite was launched in October 2018
CNES	Centre National d'études Spatiales or National Centre for Space Studies
Copernicus programme	Previously known as GMES (Global Monitoring for Environment and Security), is the European Programme for the establishment of a European capacity for Earth Observation employing Sentinel satellites
COSMO-SkyMed	<b>C</b> onstellation of small <b>S</b> atellites for the <b>M</b> editerranean basin <b>O</b> bservation. Series of 4 X-band SAR satellites flying in constellation and operated by Agenzia Spaziale Italiana
CRYOSAT-2	ESA Explorer satellite - CryoSat-2 carries a sophisticated radar altimeter to measure ice thickness and variations
CSES	China Seismo-Electromagnetic Satellite
DORIS	Doppler Orbitography and Radio-positioning Integrated by Satellite instrument is a microwave tracking system that can be utilized to determine the precise location of satellites
EarthCARE	ESA Explorer satellite EarthCARE is a joint European-Japanese mission addressing the need for a better understanding of the interactions between cloud, radiative transfer and aerosol processes
ENVISAT	ENVIronment SATellite



ELP	ESA's Living Planet Programme, which comprises a science and research element, which includes the Earth Explorer missions. The operational element is Earth Watch.
EO	Earth Observation
ERS	European Remote Sensing Satellite of which there were 2
ESA	European Space Agency
FLEX	ESA FLuorescence EXplorer (FLEX) mission carrying a high-resolution imaging spectrometer FLORIS (FLuOREscence Imaging Spectrometer)
FY	Polar orbiting and geo-stationary meteorological satellites of China
GeoEye	Satellites acquiring VHR (0.41m pan-sharpened) multispectral optical imagery
GEOSAT	Satellite acquiring VHR (75cm pan-sharpened) multispectral optical imagery
GF- 1 to 7	High-resolution earth observing system of China, their payloads include optical and SAR sensors for NRT applications
GMES	Global Monitoring for Environment and Security
GOCE	Gravity field and steady-state Ocean Circulation Explorer
GOME	Global Ozone Monitoring Experiment
GOMOS	Global Ozone Monitoring by Occultation of Stars
HJ	Chinese optical and SAR satellite constellation for environment and disaster monitoring.
HY	Chinese Ocean Satellites, including HY-1 and HY-2
ICEYE	X-band constellation of SAR satellites acquiring imagery in VV polarisation
JAXA	Japan Aerospace Exploration Agency
Jilin-1	A Chinese self-developed remote sensing satellite for commercial use, it was launched in October 2015
MERIS	MEDium Resolution Imaging Spectrometer Instrument
MIPAS	Michelson Interferometer for Passive Atmospheric Sounding
MIRAS	Microwave Imaging Radiometer using Aperture Synthesis
MOST China	Ministry of Science and Technology, China
MSI	Multi Spectral Imager - optical instrument on board Sentinel 2
MSS-1	Macau science Satellite-1
MWR	MicroWave Radiometer
NRSCC	National Remote Sensing Center of China
NRT	Near Real Time
OceanSat-2	Satellite with an Ocean Colour Monitor instrument operated by the Indian Space Research Organization
OLCI	Ocean Land Colour Instrument on board Sentinel 3 A & B
PI	Principal Investigator
PALSAR	ALOS Phased Array L-band SAR
PAZ SAR	X-band frequency SAR, the satellite is positioned in the same orbit as TerraSAR-X and TanDEM-X resulting in a three SAR satellite constellation
PLEIADES	Pleiades is a two-spacecraft constellation of CNES, providing VHR optical imagery
PLEIADES-NEO	Pléiades Neo is a VHR constellation of CNES of two identical satellites phased at 180° from each other.
PlanetScope	Satellite constellation consisting of groups of VHR individual satellites (Doves)
PRISM	ALOS Panchromatic Remote sensing Instrument for Stereo Mapping
PROBA-1	Small satellite carrying the Compact High Resolution Imaging Spectrometer (CHRIS) and High Resolution Camera (HRC)
PROBA-V	Project for On-Board Autonomy – Vegetation (improved smaller version of the large VGT (Vegetation) optical instrument of SPOT-4 and SPOT-5 missions)
QuickBird	Archive mission, satellites acquiring VHR (<0.61m pan-sharpened) multispectral optical imagery
RA	Radar Altimeter



Radarsat-1	Archive C-band single polarimetric (HH) SAR with several different imaging modes
Radarsat-2	C-band fully polarimetric SAR with several different imaging modes
RapidEye	A constellation of five mini satellites that can acquire and process up to 5 million km <sup>2</sup> of imagery daily to generate unique land information products
SAR	Synthetic Aperture Radar
S1-A/B	Sentinel 1 A & B satellites with a C-band SAR sensor
S2-A/B	Sentinel 2 A & B satellites with an optical imager
S3-A/B	Sentinel 3 A & B satellites with optical and thermal radiometers, a SAR altimeter and a MWR
SDGSAT-1	The Sustainable Development Science Satellite 1 (SDGSAT-1)
SCIAMACHY	SCanning Imaging Absorption SpectroMeter for Atmospheric CHartographY
SKYSAT	Is the VHR constellation component of Planets satellite imaging portfolio
SLSTR	Sea Land Surface Temperature Radiometer on board Sentinel 3 A & B
SMOS	ESA Earth Explorer satellite – Soil Moisture Ocean Salinity
SPOT	Satellite Pour l'Observation de la Terre, commercial high resolution optical imaging satellite
SRAL	SAR Radar Altimeter on Sentinel 3 A & B
SSO	ESA Single Sign on Account to access the proposal submission template
ScanSAR	The antenna is scanned in range several times during the synthetic aperture
SpotLight	Mechanical antenna steering in the azimuth direction is used to increase the illumination time, resulting in an increased synthetic aperture
StripMap	The antenna beam has a fixed pointing direction with respect to the platform
SWARM	ESA Earth Explorer Satellites - The Swarm mission will provide measurements of the Earth's geomagnetic field simultaneously over different regions of the globe
TanSat	A China's satellite to measure methane and carbon dioxide levels in the atmosphere
TerraSAR-X	TerraSAR-X1 (also referred to as TSX or TSX-1) is a German SAR satellite mission for scientific and commercial applications
TPM	Third Party Mission
VHR	Very High Resolution
Vision-1	Satellite acquiring VHR (<1m pan-sharpened) multispectral optical imagery
WorldView	Satellites acquiring VHR (<0.5m pan-sharpened) multispectral optical imagery
WS	Wind Scatterometer
WFV	Wide Field of View



## 2 BACKGROUND TO THE DRAGON COOPERATION

The Dragon Programme – a joint undertaking between ESA, the Ministry of Science and Technology (MOST) and the National Remote Sensing Centre of China (NRSCC) – is a wide-ranging research initiative designed to encourage increased exploitation of ESA Earth observation (EO) satellite data within China. After 19 years of cooperation, this pioneering programme has become a model for scientific and technological cooperation between China and Europe, raising the research level in Earth observation to help meet new global challenges. In the current phase – Dragon 5 – some 734 scientists from 213 European and Chinese research institutes have been working together for four years to produce new science and results. By stimulating and supporting novel research, collaborative projects and training, Dragon 5 is showing a wealth of scientific output, thus ensuring that this unique initiative continues to deliver outstanding results.

Since 2004, this dedicated science and exploitation programme has brought together the European and Chinese EO scientific community, to work on a broad range of projects designed to encourage increased exploitation of ESA and Chinese Earth observation satellite data. Dragon has also promoted collaborative research at ESA, through participation of young Chinese scientists as international research fellows. Building on the success of the past years, Dragon 5 teams up scientists to work on 55 projects across 10 thematic areas.

Dragon provides a unique platform for the joint exploitation of EO data from optical, infrared, thermal and microwave sensors for science and application development.

- The Dragon 1 programme (2004 to 2008) focused on the exploitation of ESA ERS and Envisat data for science and application development in China.
- Dragon 2 and 3 presented new opportunities for the exploitation of satellite data for scientific research with the launch of new satellite missions including the ESA Explorer missions and the Chinese Huanjing constellation. In addition, the provision of archive data allowed for change detection and time series analysis.
- Dragon 4 used data from several new missions such as the Chinese FY, GF and TanSat missions, as well as European Sentinel and Earth Explorer satellites to address the following priority themes: Atmosphere, Climate & Carbon Cycle, Oceans and Coastal Zones, Ecosystems including Forest and Grasslands, Urbanization & Smart Cities, Hydrology & Cryosphere, Solid Earth & Associated Disaster Risk Reduction, Agriculture Food & Water, Calibration/Validation.
- Dragon 5 uses an increase portfolio of satellite missions (54) to address a wider range of thematic areas compared to Dragon 4 to include climate change and data analysis.

As well as EO exploitation for science and applications, the Dragon cooperation from the start has fostered the training of Chinese and European young scientists who are engaged on the projects to undertake research. The young scientists report their findings at annual symposia in the poster sessions and have published papers in the dragon Symposium proceedings at the mid stages and in the final results for each programme. Under this mechanism and since 2004, a total of more than 800 post graduate young scientists have been awarded higher degrees by research M.Sc. and Ph.D. level or have done post doctorate research. ESA and NRSCC organise with host institutions in China annual advanced training courses in ocean and coastal zones, land, atmosphere and hydrology applications. To date 1181 Chinese young scientists have received training in EO data exploitation by attending these courses. These courses are taught by the Dragon senior scientists. ESA and MOST- China have also promoted and resumed after COVID an exchange of visiting fellows hosted by institutes both in China and Europe, with planned Chinese fellows visiting institutes in Europe to be from 3 to 12 months and European fellows visiting institutes in China for 3 to 6 months.



### 3 DESCRIPTION OF THE CALL

#### 3.1 Objectives of the call

The main objectives of the Dragon 6 Announcement of Opportunity (AO) are:

- **Promote the exploitation of Copernicus Sentinels, ESA, ESA TPM and Chinese EO data**
  - *for science and application development*
- **Stimulate scientific exchange**
  - *by the formation of joint Sino-European teams*
  - *academic exchanges particularly Young Scientists*
- **Publish co-authored results**
  - *in ESA and NRSCC joint results publication (2026) & (2028)*
  - *in leading scientific journals*
- **Provide training to young European and Chinese scientists.**

#### 3.2 General conditions of the call

The European Space Agency (ESA) jointly with The National Remote Sensing Center of China (NRSCC) under the Ministry of Science and Technology (MOST), announce the opportunity to conduct research and application development projects using ESA, Copernicus Sentinels, ESA Third Party Missions and Chinese EO data.

Proposals shall be submitted via the dedicated web site at:

<https://earth.esa.int/eogateway/announcement-of-opportunity/dragon-6>

ESA/NRSCC may decide to select only a portion of the proposer's investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance.

#### 3.3 Conditions for selected Dragon Projects

##### 3.3.1 Sino-European Teams

Proposals should carefully consider the formation of joint Sino-European teams and it is expected that institutions in both Europe and China will be actively engaged in awarded projects.

Proposals based on the continuity of Dragon 5 projects and the thematic areas specified in Table 1 are welcome, inviting research continuity and exploitation of new ESA, Copernicus Sentinels, ESA Third Party Mission and Chinese EO missions' data. For an overview of Dragon 5 projects and achievements, please refer to [R1].

##### 3.3.2 Young Scientists nomination

Each project is required to nominate and train young post graduate scientists during the Dragon 6 cooperation phase. The project team list shall indicate the names of the proposed young scientists and the level of post graduate training that will be provided by the institute (i.e. Masters, doctorate degrees or post doctorate research) either:

- at the moment of AO submission (if already available);
- within 6 months of Kick off (for a successfully awarded project).

ESA and NRSCC will provide a Young Scientist Training Proposal Template to all PIs of successfully awarded projects. The PIs shall ensure the template is compiled and submitted to either ESA or NRSCC (respectively for European and Chinese Young Scientists) for their approval.



### **3.3.3 Participation to Annual Dragon Symposia**

Annual Dragon Symposia are planned to take place in either Europe or China with the kick off of the Dragon 6 cooperation taking place in Europe with the location and date to be announced on the [Dragon 5 website](#) [R1] and the [Dragon 6 AO website](#) [R5] within November 2023.

Principal Investigators (or in exceptional cases a nominated Senior Scientist from their side of the Project group) shall physically attend the annual symposia and co-present the project results (with their corresponding European or Chinese PI). The Principal Investigator (or nominated Senior Scientist) shall also participate during the Symposia to the round table discussions and adjudicate poster sessions if requested.

The Principal Investigators shall ensure nominated Young Scientist within their group shall participate and present their results physically in a dedicated poster session at the annual symposium (with the exception of the KO Symposium).

The progress and accomplishments of the selected projects will be monitored by ESA/NRSCC.

### **3.3.4 Submission of research results to nominated Journals**

For all awarded projects the Principal Investigators (PIs) from both European and China will be required to submit a single co-authored paper for publication in English in journals nominated by ESA and NRSCC at the mid-term and final results phase of the Dragon 6 cooperation period (currently planned for Summer 2026 and 2028 respectively).

### **3.3.5 Access to EO data**

Access to the ESA and Copernicus Sentinels EO data sets necessary to execute the projects will be provided to the selected Principal Investigators free of charge. For the requested ESA Third Party Missions and Chinese Missions data, access to EO datasets will be granted subject to data access agreements and data availability.

The call will provide opportunities for scientists from Europe and China to cooperate for the exploitation of Copernicus Sentinels. Chinese, ESA and ESA TPM EO data in P.R. China, and at other regional and global scales. It is expected that the projects will be managed through bilateral cooperation agreements between the Chinese and the European Partners. Proposals which cover the exploitation of products for research and development of applications for EO data analysis, EO data shall include some or all of the following sources:

- ESA EO missions' data both archive and operational i.e. ERS, Envisat, Earth Explorers, Earthwatch-ProbaV, (see annexes 1, 2, and 3);
- Copernicus Sentinels missions' data via the Sentinels Scientific/Open access Data Hub (see annex 4)
- Third Party Missions' data, provided by ESA (see annex 5);
- Chinese EO missions' data (see annex 6).

The Principal Investigators (PIs) are expected to jointly evaluate their data requirements thoroughly, in terms of both quantities and types. Apart from the Sentinels' missions with no quota restriction, the provision of other EO data could be subjected to priorities for scheduling and operating the sensors and to the capacities and constraints of the ground segment.

### **3.3.6 Specific conditions applicable to Chinese Young Scientists**

Any proposed Chinese Young Scientist shall be of MSc or Ph.D level, of Chinese Nationality, shall attend a Chinese Institution for their studies (with the exception of exchanges within the Dragon cooperation to be hosted at a European Institution) and be under 35 years of age at the moment of Young Scientist training proposal submission (see section 3.3.2).



### 3.3.7 *Specific conditions applicable to European Young Scientists*

Any proposed European Young Scientist shall be of MSc or Ph.D level, of ESA Member state Nationality, shall attend a European Institution for their studies (with the exception of exchanges within the Dragon cooperation to be hosted at a Chinese Institution) and be under 35 years of age at the moment of Young Scientist training proposal submission (See section 3.3.2).

## 3.4 Organisation of a project's proposal

For a specific topic in table 1, each proposal shall be led by two Principal Investigators (PIs), one from Europe and one from China.

### 3.4.1 *Principal Investigator(s) tasks for proposal submission*

The proposal shall be completed by either the Principal Investigator (PI) from Europe or China. All information pertinent to a proposal shall be included by submitting the proposal. One of the two PIs (European/Chinese) entitled to submit the proposal shall create or have created an ESA EOAIM (Earth Observation Identity and Access Management System) sign in account, called ESA EO Sign in account to be able to access the on-line submission forms but also the other PI of the Dragon proposal (European / Chinese the one that will not submit the proposal) must have completed the registration and have an active EO Sign in account to be appointed/added by his/her colleague as the other Dragon PI in the proposal:

<https://eoiam-idp.eo.esa.int/> (Register to create a new ESA EO Sign in account)

<https://earth.esa.int/eogateway/announcement-of-opportunity/dragon-6> (with an ESA EO Sign in account)

## Submit a project proposal for Dragon 6

The following information shall be provided:

1. Completion of the Project information
  - Title (insert the project's title);
  - Dragon 6 topic and sub-topic (select from pull down list, from table 1 in the information from scientists);
  - Identify the study area (select from pull down list);
  - Provide the Executive summary (insert the summary).
2. Insert the 2 PIs contact and affiliation details.
3. Provide the list of all team members including co-investigators and young scientists (download, complete and up-load the relevant 'Dragon Team composition' xls table).
4. Team Composition, Experience, Innovation and Contribution to Dragon 6
  - Fill in the text boxes with information on team composition and experience.
5. Dragon 6 project proposal objectives and description  
Fill in the text boxes taking note of the information to be inserted;
  - Detailed description;
  - Schedule (providing and overall plan, detailing the schedule of the research, the deliverables at each stage and reporting at annual Dragon Symposia in 2025, 2026, 2027 and 2028);
  - Expected results (informing on the expected outputs of the research and if they are products and descriptions, algorithms, model runs etc.);
  - Young scientists' contribution (outline the contribution to the projects objectives and results reporting at annual Symposia, either as poster presentations or papers submitted to Symposia proceedings). On the European side, each project may expect to receive an ESA award for Young Scientists support subject to ESA standard contract conditions).



6. Inform on EO data to be utilised - download, complete and upload the relevant '*Dragon EO data requirements*' xls file including:
  - ESA and ESA TPM data needed (sheet1)
  - Copernicus Sentinels data (sheet2))
  - Chinese EO data (sheet3)).
7. Upload vector descriptor files reporting Areas of Interest of the project (.kmz or .shp)
8. Acceptance of the Dragon 6 Call conditions.



### 3.5 Research and development on Dragon 6 topics

Proposals from Sino-European teams will be invited to address the following Dragon 6 themes identified by MOST China and ESA as shown in table 2. As for the Dragon 5 cooperation programme, the proposed themes have been aligned in order to reflect key societal issues and their relation of the science component to other initiatives, e.g. UN sustainable development goals, GEO societal benefit areas and the ESA EO science for society strategy. Continuity of Dragon 5 projects will be considered.

Topic	Sub-topic
1. Solid Earth	1.1 Seismic deformation monitoring 1.2 Monitoring of surface deformation of large landslides 1.3 Infrastructure health diagnosis and safety monitoring 1.4 Subsurface target detection
2. Oceans & Coastal zones	2.1 Algae and phytoplankton blooms 2.2 Marine dynamic environment 2.3 Sea surface characteristics 2.4 Marine disasters 2.5 Sea level rise and coastal zones management
3. Atmosphere	3.1 Greenhouse gases and carbon emissions 3.2 Air quality 3.3 Atmospheric-terrestrial-marine carbon cycle
4. Climate Change	4.1 Climate change modelling 4.2 Climate change adaptation and mitigation 4.3 Climate change resilience 4.4 Disaster prevention and monitoring
5. Sustainable Agriculture and Water Resources	5.1 Food security 5.2 Crop growth and yield monitoring 5.3 Water resources and its utilization 5.4 Drought and flood disaster
6. Ecosystems	6.1 Detection of forest cover change 6.2 Collaborative estimation of forest quality parameters 6.3 Grassland and its degradation monitoring 6.4 Forest and grassland disaster monitoring 6.5 <b>Wetlands and ecology</b> 6.6 <b>Biomass – AGB estimation techniques</b>
7. Urbanization and Environment	7.1 Urban expansion 7.2 Urban land use structure and its change 7.3 Urban environment 7.4 Smart cities
8. Cryosphere and Hydrology	8.1 Inversion of key elements of the cryosphere in Pan Third Pole Region 8.2 Validation of key elements of cryosphere in Pan Third Pole Region 8.3 Integration of eco-hydro models and multi-source data simulation 8.4 Wetlands and ecology
9. Calibration and Validation	9.1 Satellite calibration field network and cross calibration 9.2 Cross radiation calibration and normalization processing 9.3 Validation network and technology 9.4 Common product production and verification services 9.5 <b>Biomass L1, L2 &amp; L3 product verification</b>
10. Data Analysis	10.1 Big Data Analytics 10.2 Artificial Intelligence and Machine Learning 10.3 Cloud Platforms 10.4 <b>Advanced Processing Techniques</b>

Table 1. Dragon 6 ESA-MOST Joint Proposal Topics [new Dragon 6 items in bold]



### **3.6 Requests for information concerning the Announcement of Opportunity.**

Further information regarding this call may be found on the dedicated website:

(<https://earth.esa.int/eogateway/announcement-of-opportunity/dragon-6>)

Email assistance can be received by contacting the ESA and NRSCC Dragon Offices as follows:

- ESA Dragon Office: [dragon@esa.int](mailto:dragon@esa.int)
- NRSCC Dragon Office: [dragon@ifrit.ac.in](mailto:dragon@ifrit.ac.in)



## 4 SUBMISSION & EVALUATION OF PROPOSALS

### 4.1 Proposal submission

**[IMPORTANT]** Please follow the guidelines for submission available at:  
<https://earth.esa.int/eogateway/announcement-of-opportunity/dragon-6>

Each proposal shall be led by a European and a Chinese Principal Investigator. All investigators shall have read and accepted the Terms and Conditions for the utilisation of ESA Earth Observation data, ESA Third Party Missions data and Copernicus Sentinels data, as applicable. Please refer to section 1.2 of this document for the terms and conditions. The Principal Investigators shall have read and accepted the Terms and Conditions for the utilisation of each Chinese EO data, and access to some Chinese EO data are need to submitting data request to dragon office in Chinese side. All proposals must be written in English.

### 4.2 Review Panel and procedures

Proposals that are submitted in the framework of the Dragon 6 cooperation will be reviewed by a scientific committee with representatives appointed by ESA and MOST/NRSCC:

- With expertise that encompass scientific research, technology, applications development, national and international research programmes and EO satellite missions;
- With a broad understanding of the uses of Earth observation data, including uses in operational systems.

The purpose of the review is:

- To assess whether the specific projects are in accordance with ESA, ESA TPM, Copernicus Sentinels & Chinese EO data policy and with the specific objectives of the Dragon 6 cooperation;
- To evaluate the scientific, application and technical merits of the proposed projects in relation to their technical feasibility.

The final decisions concerning the acceptance of proposals for projects will be made upon recommendation of the scientific review committee. Final approval will be granted according to the ESA and MOST-NRSCC acceptance procedures.

### 4.3 Evaluation criteria

Within the overall context of the ESA Earth Observation mission objectives, the evaluation process is expected to identify opportunities to exploit the potential of the ESA Earth Observation mission. The following criteria will be used in the evaluation process:

- Suitability of the proposal to the conditions for scientific use of EO and other data;
- Continuity of the ESA-MOST Dragon 5 projects and themes and / or new scientific exploitation of EO and other data;
- Relevance of the proposed project to the objectives of the ESA Earth Observation and Chinese EO missions and the specific call objectives;
- The merit of the project from a scientific, technological, economic and operational viewpoint and the degree of innovation of the proposal;
- The technical feasibility of completing the project and achieving positive results within a period of typically four years, with special emphasis on the adequacy and practicability of the schedule presented in the proposal;
- The competence and relevant experience of the Principal Investigators as an indication of their ability to complete the project successfully;
- Involvement of young scientists and in particular assignment of research packages lasting 1 to 4 years and reporting;
- Proposed teaming on both European and Chinese side, including the identification of Principal Investigators and joint teams to undertake research packages within each project;
- The Principal Investigators shall in particular be responsible for the management and coordination of the research



project and coordination of results reporting at annual Symposia including publication of papers in Symposia proceedings and journal publications.

## 4.4 Follow-on actions and activities

An analysis of data requirements will be done by ESA and NRSCC to define a product/programming quota of the restrained dataset based on the amount of data requested in the proposal. The results of the evaluation (acceptance/rejection or request for modifications) will be transmitted to the Principal Investigators (PIs) who shall inform their teams accordingly.

At the start-up of an accepted project the PIs will be granted:

- Access to all ESA EO data systematically available online requested in the frame of the proposal, a detailed list of systematically available on-line products is available at the address:  
<https://earth.esa.int/web/guest/data-access/browse-data-products>  
<https://eocat.esa.int/sec/#data-services-area>
- A product/programming quota of the restrained ESA and ESA TPM EO dataset for the project.
- A product/programming quota for some restrained Chinese EO data for the project.

Following notification, the selected Principal Investigators will have to:

- Confirm their intention to proceed with the project;
- Confirm the funding of the project (including a written confirmation from the funding entity) <sup>Note 1</sup>
- Agree to the allocated data quantities and the delivery conditions;

In some cases, the principal investigators will be required to amend their proposal to meet the acceptance criteria and in accordance with the remarks expressed by the evaluators.

## 5 SCHEDULE

Milestone	Date / Comment
Opening of the call	30 October 2023
Deadline for submission of proposals	12:00 (CET) / 19:00 (CST) 11 December 2023
ESA/MOST-NRSCC review meeting	Early February 2024
Notification of evaluation to proposers	Following both ESA and MOST China approval March 2024
Symposium for Kick Off Dragon 6 cooperation projects	Location and date to be announced via a news item on the <a href="#">Dragon 5 website</a> [R1] and on the <a href="#">Dragon 6 AO website</a> [R5] within November 2023.
Start of ESA and Chinese EO data order/delivery	July 2024
Projects completion, final results publication and reporting	June 2028 (4 years)

Table 2 The schedule of the Dragon 6 AO and Cooperation Duration

Note 1 ESA will fund mission support for European Dragon PI participation to the Annual Symposia and / or Dragon 6 Training Courses. Subject to selection via the ESA Open Call for Dragon Young Scientists ESA will also fund young European scientists engaged in the selected Dragon 6 projects, covering 4 years periods of the Dragon 6 co-operation. Similar to the Dragon 5 programme it is assumed that for the selected European part of the projects the remainder of the costs will be funded by sources outside of ESA.



## ANNEX 1 - ARCHIVE ESA EO MISSIONS

The following Annex details general information on the portfolio of Dragon 6 Cooperation ESA EO missions.

**Specific details regarding data availability and access information is found online in the table of [ESA, ESA TPM and Copernicus EO Missions of the Dragon Cooperation \[R6\]](#).**

### ERS

Archive products derived from the following instruments on-board the ERS-1 (launched in 1991 and ended on 10 March 2000) and ERS-2 (launched in 1995 and retired on 5 September 2011) satellites can be made available to this opportunity:

- **Active Microwave Instrument (AMI).** It operates in C-band (5.3 GHz) and combines the functions of a *Synthetic Aperture Radar (SAR)* and a *Wind Scatterometer (WS)*. Through its set of four antennae (three for the Scatterometer and one for the SAR), the Earth's surface is illuminated, and the backscattered energy is received to produce data on wind fields and wave spectra, and to prepare high-resolution images. Three modes of operation are possible: the image mode (SAR), the wave mode (SAR) and the wind mode (WS).
- **Along Track Scanning Radiometer (ATSR).** It consists of two instruments, an Infra-Red Radiometer (IRR) and a Microwave Sounder (MWS). On board ERS-1 the IRR is a four-channel infrared radiometer used for measuring sea-surface temperatures (SST) and cloud-top temperatures, whereas on board ERS-2 the IRR is equipped with additional visible channels for vegetation monitoring. The MWS is a two channel passive radiometer.
- **Radar Altimeter (RA).** It is a Ku-band (13.8 GHz) nadir-pointing active microwave sensor designed to measure the time return echoes from ocean and ice surfaces. Functioning in one of two operational modes (ocean or ice) the Radar Altimeter provides information on significant wave height; surface wind speed; sea surface elevation, which relates to ocean currents, the surface geoid and tides; and various parameters over sea ice and ice sheets.
- **Global Ozone Monitoring Experiment (GOME).** It is a nadir-scanning ultraviolet and visible spectrometer for global monitoring of atmospheric Ozone on-board ERS-2. A key feature of GOME is its ability to detect other chemically active atmospheric trace-gases as well as aerosol distribution.

A detailed description of available ERS data products is provided at:

<https://earth.esa.int/eogateway/missions/ers> .  
<https://earth.esa.int/eogateway/missions/ers/data>

### ENVISAT

Archive products derived from the following instruments on board the ENVISAT satellite mission (launched in 2002 and ended in 2012) can be made available under this call:

- **MEDium Resolution Imaging Specrometer Instrument (MERIS).** It measures the solar radiation reflected by the Earth, at a ground spatial resolution of 300m and 1200m, in 15 spectral bands, programmable in width and position, in the visible and near infra-red. It allows global coverage of the Earth in 3 days.
- **Advanced Synthetic Aperture Radar (ASAR)** It operates at C-band and ensures continuity with the image mode (SAR) and the wave mode of the ERS-1/2 AMI. It features enhanced capability in terms of coverage, range of incidence angles, polarisation, and modes of operation. This enhanced capability is provided by significant differences in the instrument design: a full active array antenna equipped with distributed transmit/receive modules which provides distinct transmit and receive beams, a digital waveform generation for pulse "chirp" generation, a block adaptive quantisation scheme, and a ScanSAR mode of operation by beam scanning in elevation.
- **Advanced Along Track Scanning Radiometer (AATSR).** Its main goal is to establish continuity of the ATSR-1 and ATSR-2 data sets of precise sea surface temperature (SST), thereby ensuring the production of a unique 10 year near-continuous data set at the levels of accuracy required (0.3 K or better) for climate research and for the community of operational as well as scientific users who will have been developed through the ERS-1 and ERS-2 missions.
- **Radar Altimeter 2 (RA-2).** It is an instrument for determining the two-way delay of the radar echo from the Earth's surface to a very high precision: less than a nanosecond. It also measures the power and the shape of the



reflected radar pulses. Its measurements are used to determine the ocean topography, to map and monitor sea ice, polar ice sheets, and most land surfaces. Measurement of the radar echo power and shape enables the determination of wind speed and significant wave height at sea, thus supporting weather and sea state forecasting.

- **Michelson Interferometer for Passive Atmospheric Sounding (MIPAS).** It is a Fourier transform spectrometer for the measurement of high-resolution gaseous emission spectra at the Earth's limb. It operates in the near to mid infrared where many of the atmospheric trace-gases playing a major role in atmospheric chemistry have important emission features.
- **Global Ozone Monitoring by Occultation of Stars (GOMOS).** It is the newest ESA instrument aiming at ozone monitoring. It is a tool to provide altitude-resolved global ozone mapping and trend monitoring with very high accuracy, as needed for the understanding of ozone chemistry and for model validation.
- **SCanning Imaging Absorption Spectrometer for Atmospheric CHartography (SCIAMACHY).** Its primary mission objective is to perform global measurements of trace gases in the troposphere and in the stratosphere

**For Envisat ASAR and ERS SAR data** access is available through the ESA (A)SAR Online Dissemination server <https://esar-ds.eo.esa.int/oads/access/collection> (only an active ESA EO Sign in account needed). In addition for ASAR and SAR level zero products a quota of 100 products per year per product can be assigned by ESA on request through the submission of a Data Service request (<https://earth.esa.int/eogateway/news/how-to-request-level-zero-radar-data-from-ers-and-envisat>). Dragon PIs can simply require ENVISAT and ERS (A)SAR level zero products in the Dragon project proposal. A detailed description of available ENVISAT data products is provided at the address: <https://earth.esa.int/eogateway/missions/envisat/data>

## GOCE

The Gravity Field and Steady-State Ocean Circulation Explorer (GOCE) was launched on 17 March 2009 and ceased operation on 11 November 2014. GOCE was dedicated to measuring the Earth's gravity field and modelling the Earth's geoid with extremely high accuracy and spatial resolution.

- The GOCE **Gradiometer** measured gravity gradients in all spatial directions. The measured signal is the difference in gravitational acceleration at the test-mass location inside the spacecraft caused by gravity anomalies from attracting masses of the Earth.

More information about the GOCE mission and available resources is available at:

<https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/goce>

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

[https://www.esa.int/Applications/Observing\\_the\\_Earth/FutureEO/goce](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/goce)



## ANNEX 2 - OPERATIONAL EARTH EXPLORERS MISSIONS

The following Annex details general information on the portfolio of Dragon 6 Cooperation ESA EO Earth Explorers missions.

**Specific details regarding data availability and access information is found online in the table of [ESA, ESA TPM and Copernicus EO Missions of the Dragon Cooperation](#) [R6].**

### SMOS

The Soil Moisture and Ocean Salinity (SMOS) mission has been designed to observe soil moisture over the Earth's landmasses and sea surface salinity over the oceans. The satellite was launched on 2 November 2009.

- The main instrument is the **Microwave Imaging Radiometer using Aperture Synthesis (MIRAS)**, which is an interferometric radiometer, operating between 1400-1427 MHz (L-band).

More information about the SMOS mission is available at:

<https://earth.esa.int/eogateway/missions/smos/data>

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

[http://www.esa.int/Applications/Observing\\_the\\_Earth/SMOS](http://www.esa.int/Applications/Observing_the_Earth/SMOS)

### CRYOSAT-2

ESA's Earth Explorer CryoSat-2 mission, launched on 8 April 2010, is dedicated to precise monitoring of the changes in the thickness of marine ice floating in the polar oceans and variations in the thickness of the vast ice sheets that overlie Greenland and Antarctica.

- CryoSat-2's primary payload is the **SAR/Interferometric Radar Altimeter (SIRAL)**, which has extended capabilities to meet the measurement requirements for ice-sheet elevation and sea-ice freeboard.

More information about the CRYOSAT-2 mission is available at: \_

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

[https://www.esa.int/Applications/Observing\\_the\\_Earth/FutureEO/CryoSat](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/CryoSat)

### SWARM

The Swarm mission is a constellation of three satellites carrying a new generation of magnetometers enabling measurements to be taken over different regions of the Earth simultaneously. Swarm also provides monitoring of the time-variability aspects of the geomagnetic field, this is a great improvement on the current method of extrapolation based on statistics and ground observations. The geomagnetic field models resulting from the Swarm mission will further our understanding of atmospheric processes related to climate and weather and will also have practical applications in many different areas, such as space weather and radiation hazards. The satellites were launched on 22 November 2013.

- Each satellite is carrying a science payload consisting of the following instruments: **Absolute Scalar Magnetometer (ASM); Vector Field Magnetometer (VFM); Electrical Field Instrument (EFI); Accelerometer (ACC); Laser Retro Reflector (LRR)**

More information about the SWARM ([ESA - Swarm](#)) mission is available at: \_

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

<https://earth.esa.int/eogateway/missions/swarm/data>



## ADM-Aeolus

ESA's Explorer Atmospheric Dynamics Mission-Aeolus satellite, creates a series of consistent global wind profiles for the first time (about 100 per hour), giving meteorologists better information with which to predict the weather. The unique location of the satellite, in orbit around the Earth, means that ADM-Aeolus will be able to provide wind profiles for the entire planet, including remote areas lacking any ground-based weather station.

- The core space element of ADM-Aeolus is **ALADIN (Atmospheric Laser Doppler Instrument)**, a direct detection LIDAR incorporating a fringe-imaging receiver (analysing aerosol and cloud backscatter) and a double-edge receiver (analysing molecular backscatter).

More information about ADM-Aeolus mission and products are available at:

<https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/aeolus>

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

<https://earth.esa.int/eogateway/missions/aeolus/data>

[https://www.esa.int/Applications/Observing\\_the\\_Earth/FutureEO/Aeolus](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/Aeolus)



## ANNEX 3 - FUTURE EARTH EXPLORERS MISSIONS

The following Annex details general information on the portfolio of Dragon 6 Cooperation ESA EO Future Earth Explorers missions. Specific details regarding data availability and access information will be available online after Mission Commissioning phase in the [table of ESA, ESA TPM and Copernicus EO Missions of the Dragon Cooperation \[R6\]](#)

### EarthCARE

The EarthCARE mission aims to improve the representation and understanding of the Earth's radiative balance in climate and numerical weather forecast models by acquiring vertical profiles of clouds and aerosols, as well as the radiances at the top of the atmosphere. The satellite will be launched in 2024 (Access to data will be confirmed following successful launch and operation of the satellite):

- The satellite will carry the following instruments: Backscatter Lidar (ATLID) - ESA High-spectral resolution and depolarisation; Cloud Profiling Radar (CPR) - JAXA/NICT -36 dBZ sensitivity, 500 m vertical range, Doppler; Multi-Spectral Imager (MSI) - ESA 7 channels, 150 km swath, 500 m pixel; Broadband Radiometer (BBR) - ESA 2 channels, 3 views (nadir, fore and aft).

More information about the EarthCARE mission is available at:

[https://www.esa.int/Applications/Observing\\_the\\_Earth/FutureEO/EarthCARE](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/EarthCARE)  
<https://earth.esa.int/eogateway/missions/earthcare>

### BIOMASS

Forest type and forest cover worldwide are two characteristics that can be detected by today's satellites, but Biomass will take the information to the next level. Due for launch in 2024, the satellite will carry the first P-band synthetic aperture radar, able to deliver accurate maps of tropical, temperate and boreal forest biomass. The global mass of trees is not obtainable by ground measurement techniques. The five-year mission will witness at least eight growth cycles in the world's forests. Observations from this new mission will also lead to better insight into rates of habitat loss and, therefore, the effect this may have on biodiversity in the forest environment.

- The instrument will be **P-band Synthetic Aperture Radar (SAR)**

Access to data will be confirmed following successful launch and operation of the satellite and provided at that time in [R6].

More information about the BIOMASS mission is available at:

[https://www.esa.int/Applications/Observing\\_the\\_Earth/FutureEO/Biomass](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/Biomass)  
<https://earth.esa.int/eogateway/missions/biomass>

### FLEX

The FLuorescence EXplorer (FLEX) mission will yield information about the health of the world's plants by measuring a faint florescence glow they give off as they photosynthesise. Importantly, the signal, which is invisible to the naked eye, varies according to environmental conditions and the health of the plant – and, therefore, if measured, it can be used to assess plant health and stress. The launch is scheduled for 2025 (Access to data will be confirmed following successful launch and operation of the satellite.)

- The main instrument is FLORIS (FLuOREscence Imaging Spectrometer) which is a high-resolution imaging spectrometer acquiring data in the 500–780 nm spectral range, with a sampling of 0.1 nm in the oxygen bands (759–769 nm and 686–697 nm) and 0.5–2.0 nm in the red edge, chlorophyll absorption and PRI (Photochemical Reflectance Index) bands.

More information about the FLEX mission is available at:

[https://www.esa.int/Applications/Observing\\_the\\_Earth/FutureEO/FLEX](https://www.esa.int/Applications/Observing_the_Earth/FutureEO/FLEX)  
<https://earth.esa.int/eogateway/missions/flex>



## ANNEX 4 - COPERNICUS SENTINELS MISSIONS

Sentinels products will be made available to the Dragon 6 teams in agreement with the Legal notice on the use of Copernicus Sentinel Data and Service Information. The following Annex details general information on the portfolio of Dragon 6 Cooperation Copernicus EO missions.

**Specific details regarding data availability and access information is found online in the table of [ESA, ESA TPM and Copernicus EO Missions of the Dragon Cooperation \[R6\]](#).**

Data dissemination will be provided online via the standard scientific/open access data hub mechanism, via user self-registration. Further information about Sentinel missions, products and on-line access to data can be found at: <https://sentinel.esa.int/web/sentinel/home>

### Sentinel 1 A/B

The Sentinel-1 mission comprises a constellation of two polar-orbiting satellites, operating day and night performing C-band synthetic aperture radar imaging, enabling them to acquire imagery regardless of the weather and sunlight conditions. While Sentinel-1A remains fully operational the Sentinel-1B end of mission has been announced by ESA on August 2022. Sentinel-1 will work in a pre-programmed operation mode to avoid conflicts and to produce a consistent long-term data archive built for applications based on long time series. The Sentinel-1 observation scenario available at: <https://sentinel.esa.int/web/sentinel/missions/sentinel-1/observation-scenario>

Access to data is via the Copernicus Data Space Ecosystem by user registration. <https://dataspace.copernicus.eu/>

More information about Sentinel-1 data and products available at: <https://sentinel.esa.int/web/sentinel/user-guides/sentinel-1-sar>

### Sentinel 2 A/B

The Copernicus Sentinel-2 mission comprises a constellation of two polar-orbiting satellites placed in the same sun-synchronous orbit, phased at 180° to each other. It aims at monitoring variability in land surface conditions, and its wide swath width (290 km) and high revisit time (10 days at the equator with 1 satellite, and 5 days with 2 satellites under cloud-free conditions, which results in 2-3 days at mid-latitudes) will support monitoring of Earth's surface changes. The coverage limits are from between latitudes 56° south and 84° north

- The high-resolution optical imaging Sentinel-2 mission carries a **Multi-spectral Imager (MSI)** for land and coastal monitoring.

Access to data is via the Copernicus Data Space Ecosystem by user registration. <https://dataspace.copernicus.eu/>

More information about Sentinel-2 data and products available at: <https://sentinel.esa.int/web/sentinel/user-guides/sentinel-2-msi>

### Sentinel 3 A/B

The Sentinel-3 satellites carry Envisat continuity instruments that provide medium resolution optical and thermal infrared data for land and ocean monitoring. The instrument payload includes: **SAR Radar Altimeter (SRAL)**; **Ocean and Land Colour Instrument (OLCI)** -continuity from Envisat MERIS; **Sea Land Surface Thermal infrared radiometer (SLSTR)** – continuity from AATSR.

The latest products include vegetation synergy products by combining OLCI and SLSTR data. Next generation vegetation



products will combine FLEX, OLCI and SLSTR data for vegetation condition assessment.

Access to data is via the Copernicus Data Space Ecosystem by user registration

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

For SRAL and OLCI over water

<https://data.eumetsat.int/>

More information about Sentinel-3 data and products is available at :

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-olci>

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-slstr>

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-altimetry>

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-synergy>

## Sentinel 4

Sentinel-4 will be a geostationary satellite for atmospheric composition monitoring. The main objective of the Sentinel-4 mission is to monitor key air quality trace gases and aerosols over Europe in support of the Copernicus Atmosphere Monitoring Service (CAMS) at high spatial resolution and with a fast revisit time. The target species of the Sentinel-4 mission include the key air quality parameters NO<sub>2</sub> (nitrogen dioxide), O<sub>3</sub> (ozone), SO<sub>2</sub> (sulfur dioxide), HCHO (formaldehyde), CHOCHO (glyoxal), and aerosols. Complementarily, the Low Earth Orbiting (LEO) missions S5 and S5p will deliver the S4 target species and additionally CO (carbon monoxide), CH<sub>4</sub> (methane), and stratospheric O<sub>3</sub> (ozone) with global daily coverage for climate, air quality, and ozone/surface UV applications.

- The satellite will carry an **Ultraviolet-Visible-Near-Infrared (UVN)** light imaging spectrometer instrument embarked on the Meteosat Third Generation Sounder (MTG-S) satellite.

Access to data will be confirmed following successful launch and operation of the satellite and provided at that time in [R6].

More information about Sentinel-4 mission and products are available at:

<https://sentinel.esa.int/web/sentinel/missions/sentinel-4>

## Sentinel 5

Sentinel-5 is focused on air quality and composition-climate interaction with the main data products being O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, HCHO, CHOCHO and aerosols. Additionally SENTINEL-5 will also deliver quality parameters for CO, CH<sub>4</sub>, and stratospheric O<sub>3</sub> with daily global coverage for climate, air quality, and ozone/surface UV applications.

- The Sentinel-5 mission consists of high resolution spectrometer system operating in the ultraviolet to shortwave infrared range with 7 different spectral bands: UV-1 (270-300nm), UV-2 (300-370nm), VIS (370-500nm), NIR-1 (685-710nm), NIR-2 (745-773nm), SWIR-1 (1590-1675nm) and SWIR-3 (2305-2385nm). The instrument will be carried on the MetOp-SG A satellite.

Access to data will be confirmed following successful launch and operation of the satellite and provided at that time in [R6].

More information about Sentinel-5 missions and products are available at:

<https://sentinel.esa.int/web/sentinel/missions/sentinel-5>

## Sentinel 5-P

The main objective of the Copernicus Sentinel-5P mission is to perform atmospheric measurements with high spatio-temporal resolution, to be used for air quality, ozone & UV radiation, and climate monitoring & forecasting. The satellite's



local time of ascending node crossing of 13.30 h has been chosen to facilitate the so-called loose formation operation with NASA's Suomi-NPP spacecraft. This concept will allow the utilization of co-located, high resolution cloud mask data provided by the VIIRS (Visible Infrared Imaging Radiometer Suite) instrument on-board Suomi-NPP during routine processing of the TROPOMI methane product).

- The mission consists of one satellite carrying the TROPOspheric Monitoring Instrument (TROPOMI) instrument. The TROPOMI instrument combines the strengths of SCIAMACHY, OMI and state-of-the-art technology to provide observations.

More information about Sentinel 5-P missions and products are available at:

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-5p-tropomi/introduction>

## Sentinel 6

Sentinel-6 carries a radar altimeter to provide high-precision and timely observations of the topography of the global ocean. This information is essential for the continued monitoring of changes in sea level, a key indicator of climate change. It is also essential for operational oceanography. Mapping up to 95% of Earth's ice-free ocean every 10 days, it offers vital information on ocean currents, wind speed and wave height for maritime safety. The data are also important for protecting and managing the increasingly busy coastal zones. Sentinel-6 builds on heritage from the Jason series of ocean topography satellites and from ESA's CryoSat mission. Importantly, this new mission is designed to complement ocean information from Sentinel-3. More information about the Sentinel-6 mission is available at:

[https://www.esa.int/Applications/Observing\\_the\\_Earth/Copernicus/Sentinel-6](https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-6)



## ANNEX 5 - ESA THIRD PARTY MISSIONS

ESA Third Party Mission (TPM) data, either archived or newly available at the time, will contribute to Dragon 6. Those contributions will respect related Data Access Agreements and associated partial limitations (e.g. geographical, user nationality or other) as given by the data policy of the respective mission. The following TPM products will be available to the selected Dragon 6 teams with an associated quota of products. PIs are requested to take note of these quotas when preparing their proposals and inform on their TPM data requirements. For all TPM missions, Dragon 6 project PIs will be requested to accept on-line the ESA Terms and Conditions for data use prior to data delivery. The following Annex details general information on the portfolio of Dragon 6 Cooperation ESA TPM EO missions divided into optical and SAR missions' sensors.

**Specific details regarding data availability and access information is found online in the table of [ESA, ESA TPM and Copernicus EO Missions of the Dragon Cooperation \[R6\]](#)**

### PROBA-1

Proba-1 is a technology demonstrator turned operational Earth observation mission - ESA's smallest, less than a cubic metre in volume. Proba-1's main instrument is the Compact High Resolution Imaging Spectrometer (CHRIS), acquiring 13 square km scenes at 17 m spatial resolution in 18 user-selected visible and near-infrared wavelengths. This agile satellite can also deliver up to five different viewing angles.

ESA is offering a free online access to PROBA-1 CHRIS and HRC archived data. Archive data can be access immediately to all users after fast registration.

<https://earth.esa.int/eogateway/catalog/proba-chris-level-1a>

<https://earth.esa.int/eogateway/catalog/proba-hrc>

### PROBA-V

All 1Km, 333m and 100m products are available to project investigators.

More information about PROBA-V Mission, products and data access is available at:

<https://www.vito-eodata.be/PDF/portal/Application.html#Home>

<https://earth.esa.int/eogateway/catalog/proba-v-1km-333m-and-100m-products>

### Planet

For the Planet products, there is a limited quota on the number of products per year that can be requested. Satellite data available includes the following:

- RAPIDEYE archive;
- PLANETSCOPE archive and new;
- SKYSAT archive and new.

The RapidEye constellation of five Earth Observation satellites has been in operation since February of 2009. The system images a 77 kilometre wide swath. RapidEye's sensors produce imagery in five spectral bands (Red, Green, Blue, Red Edge and Near Infrared). Over 70% of RapidEye's imagery has a view angle of less than 10°, as the view angle of RapidEye imagery is always less than 20°. The constellation also has the capability for daily revisit to any point on earth. Each of the five satellites are identically calibrated so that images between satellites are indistinguishable from each other.

PlanetScope satellite constellation consists of multiple launches of groups of individual satellites (Doves). Therefore, on-orbit capacity is constantly improving in capability or quantity, with technology improvements deployed at a rapid pace. Each Dove satellite is a CubeSat 3U form factor (10 cm by 10 cm by 30 cm). The complete PlanetScope constellation of more than 120 active satellites in orbit can image the entire land surface of the Earth every day (equating to a daily collection



capacity of 265 million km<sup>2</sup>/day). The constellation is constantly "on" and does not require ordering or acquisition planning.

The SkySat constellation is the VHR component of Planets satellite image portfolio. Skysat-A and B generation satellites were launched in 2013/14. The SkySat-C generation satellite (60 x 60 x 95 cm) is a high-resolution Earth imaging satellite, first launched in 2016, all collecting thousands of square kilometres of imagery. Each satellite is 3-axis stabilized and agile enough to slew between different targets of interest. Each satellite has four thrusters for orbital control, along with four reaction wheels and three magnetic torquers for attitude control. All SkySats contain Cassegrain telescopes with a focal length of 3.6m, with three 5.5 megapixel CMOS imaging detectors making up the focal plane. Imagery are captured in a continuous strip of single frame images known as "scenes", which are all acquired in the blue, green, red, NIR-infrared, and panchromatic bands.

More information about Planet ESA TPMs and products are available at:

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

<https://earth.esa.int/eogateway/missions/rapideye#data-section>

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

<https://earth.esa.int/eogateway/missions/planetscope#data-section>

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

<https://earth.esa.int/eogateway/missions/skysat#data-section>

## Pleiades/Pleiades-Neo/SPOT

There is a limited quota for archive and new acquisitions as follows:

- SPOT 6m Color or 1.5m Black&White MONO archive and new;
- SPOT 1.5m Color or bundle MONO archive and new;
- PLEIADES 2m Color or 0.5m Black&White MONO archive and new;
- PLEIADES 0.5m Color or bundle MONO archive and new;
- PLEIADES-NEO 0.3m Panchromatic one band Black & White image at 0.3 m resolution;
- PLEIADES-NEO Pansharpened colour image at 0.3 m resolution;
- PLEIADES-NEO Multispectral colour image in 4 bands (RGB+NIR) or 6 bands (also Deep blue and Red Edge) at 1.2 m resolution;
- PLEIADES-NEO Bundle 0.3 m panchromatic image and 1.2 m multispectral image (4 or 6 bands) simultaneously acquired;
- For STEREO products, the sqkm consumption is double;
- For TRISTEREO products, the sqkm consumption is three times.

Pleiades is a two-spacecraft constellation of CNES, introducing advanced technologies in Earth observation. Starting with the first launch in 2011, the Pleiades programme follows the SPOT programme satellite series services. The identical twin satellites deliver very-high optical resolution (0.5m resolution) and offer a daily revisit capability to any point on the globe. Pléiades Neo is a very high resolution optical constellation of two identical satellites phased at 180° from each other. The constellation provides continuity for the Pléiades mission, with enhanced performance in terms of accuracy, reactivity and frequency. Fast tasking, high agility and a huge volume of data are the main advantages of the mission. The constellation is manufactured, owned and operated by Airbus Defence and Space.

Pléiades Neo 3, the first satellite in the constellation, was launched on 28 April 2021, followed by Pléiades Neo 4 on 16 August 2021. The constellation remains operational.

Very High Resolution optical Pléiades Neo data at 30 cm PAN resolution (1.2 m 6- bands Multispectral) are available as part of the Airbus provision with twice daily revisit capability over the entire globe. The swath width is 14 km (footprint at nadir).

The SPOT (from French "Satellite pour l'Observation de la Terre") constellation has been supplying high-resolution, wide-area optical imagery since 1986. The last satellites, SPOT 6 and SPOT 7, will assure data continuity through to 2024. All of the SPOT satellites provide imagery in Panchromatic and Multispectral bands with a swath of 60km. The HRV (IR) sensor on board SPOT 1-4 provides data at 10 m spatial resolution Panchromatic mode and 20 m (Multispectral mode). The HRG



sensor on board SPOT-5 provides spatial resolution from 2.5 m in the panchromatic band to 10 m in the multispectral mode. The SWIR band imagery remains at 20 m. The NAOMI sensor on board of SPOT 6 & 7 provides data up to 1.5 m spatial resolution Panchromatic and Multispectral.

More information about SPOT/Pleiades/Pleiades-Neo ESA TPMs are available at:

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

<https://earth.esa.int/eogateway/missions/spot#data-section>

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

<https://earth.esa.int/eogateway/missions/pleiades#data-section>

<https://earth.esa.int/eogateway/missions/pleiades-neo>

<https://earth.esa.int/eogateway/missions/pleiades-neo#data-section>

## GEOSAT-1/2

GEOSAT-1 full archive and new tasking products are available at 22 m resolution in two processing levels.

- L1R (Basic Geopositioned): All 3 spectral channels combined into a band-registered image. Geopositioned product based on sensor model. Coefficients derived from satellite orientation parameters coming from telemetry and appended to metadata.
- L1T (L1R orthorectified): Orthorectified to sub-pixel accuracy (10 metres RMS error approximately) with respect to Landsat ETM+ reference data and hole-filled seamless SRTM DEM data V3, 2006 (90 m).

GEOSAT-1 products are provided in DIMAP format. The image products are delivered in the TIFF and GeoTIFF image formats by default. All products can be provided in False Colours (R,G,NIR) or Natural Colours (R, G, Synthetic Blue).

There is a limited quota for archive and new acquisitions as follows:

- L1 pan sharpened or bundle: archive or new,
- L1 stereo pair: archive or new.

Geosat-2 is a very-high resolution (75cm pan-sharpened) multispectral optical satellite and is the second satellite of the Deimos Earth Observation system, following Deimos-1, which was launched in 2009. The satellite provides mid-resolution, very-wide-swath imagery. Geosat-2 launched on 19 June 2014, with a mission lifetime of at least seven years. It operates from a Sun-synchronous orbit at a mean altitude of 620 km, with a local time of ascending node (LTAN) of 10h30, which allows an average revisit time of two days worldwide (one day at mid-latitudes). The spacecraft design is based on an agile platform for fast and precise off-nadir imaging (up to 30° over nominal scenarios and up to 45° in emergency cases), and it carries a push-broom very-high resolution camera with 5 spectral channels (1 panchromatic with 1m resolution, 4 multispectral bands with 4m resolution).

More information about Geosat-1 and 2 ESA TPMs and products are available at:

<https://earth.esa.int/eogateway/missions/geosat-1>

<https://earth.esa.int/eogateway/missions/geosat-1-data-section>

<https://earth.esa.int/eogateway/missions/geosat-2>

<https://earth.esa.int/eogateway/missions/geosat-2#data-section>



## WorldView 2&3/GeoEye-1/QuickBird

There is a limited quota for archive and new acquisitions from DigitalGlobe Inc. satellites as follows:

- Panchromatic (30, 40, 50/60, 60cm) or 4-band (30, 40, 50/60, 60cm) or 8-Bands (30, 40, 50/60cm) or SWIR (7,5cm): STANDARD / ORTHO READY STANDARD
- For ORTHO READY STEREO and MAP SCALE ORTHO1:12000 products, the sqkm consumption is double.

WorldView-2, launched in October 2009, is an imaging satellite of DigitalGlobe Inc. of Longmont, CO, USA (follow-on spacecraft to WorldView-1). WorldView-2 collects images at 0.41m panchromatic and 1.64m 8-bands multi-spectral data. Along with the Pan (450-800 nm) and the four typical multispectral bands (blue, green, red, NIR), WorldView-2 has four additional bands for enhanced multispectral analysis (coastal blue, yellow, red edge, NIR2). Together they are designed to improve segmentation and classification of land and aquatic features beyond any other space-based remote sensing platform. The additional spectral bands also enable WorldView-2 to more accurately present the world as the human eye can perceive it, creating a more realistic "true colour" view of the world.

With the launch of WorldView-3 on 13 August 2014, the DigitalGlobe constellation was able to set a new technological bar for commercial satellite imagery, offering customers the highest available resolution, revisit rate, capacity and spectral diversity. WorldView-3 is operating in a sun-synchronous orbit at an altitude of 617 km, which results in an average revisit time of < 1 day. WorldView-3 collects images at 0.31m panchromatic, 1.24m 8 VNIR bands, 3.7m in the 8 SWIR bands and a 30m resolution in the CAVIS (Clouds, Aerosols, Vapors, Ice and Snow).

GeoEye-1, launched in September 2008, is an imaging satellite of DigitalGlobe Inc. of Longmont, Colorado, United States. The spacecraft is in a sun-synchronous orbit with an operating altitude of 681km. GeoEye-1 collects images at 0.41m panchromatic and 1.65m 4-bands multi-spectral data. The sensor is optimised for large projects, as it can collect over 350,000 square kilometres of VHR satellite imagery every day. GeoEye-1 can revisit any point on Earth once every three days, or even sooner depending on latitude and elevation angle.

QuickBird was a satellite in a sun-synchronous orbit with an operating altitude of 450 km. It completed one revolution every 93.4 minutes and absolved more than 15 revolutions per day. QuickBird simultaneously collected up to 0.61m panchromatic and 2.88 m 4 band multi-spectral data. The large swath width of 16.5 km combined with 128 Gigabit on-board storage enabled QuickBird to collect with high geolocational accuracy 210,000 km<sup>2</sup> of high-resolution imagery per day, or more than 75 million km<sup>2</sup> of imagery data annually (over three times the size of North America). Along with the Pan (450-900 nm, stretching from the Blue to the Near Infrared) QuickBird provided four typical multispectral bands in the visible to near-infrared range: Blue (450-520 nm), Green (520-600 nm), Red (630-690 nm) and Near Infrared (760-900 nm).

More information about ESA TPM WorldView series are available at:

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

More information about Quickbird ESA TPM are available at:

<https://earth.esa.int/eogateway/missions/quickbird-2>

More information about Geoeeye ESA TPM are available at:

<https://earth.esa.int/eogateway/missions/geoeeye-1>

## Vision-1

There is a limited quota for archive and new acquisitions from Vision-1 satellites with spectral band combination options: as follows:

- Panchromatic (PAN): includes data contained within a single high resolution black and white band, with product pixel size of 0.87m
- Multispectral (MS4): includes four multispectral (colour) bands: Blue, Green, Red and Near Infrared. The product pixel size is 3.48m
- 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 3.48m and 0.87m 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.

Two different geometric processing levels are:

- 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 are not available as projected product

- Standard Ortho (level 3): georeferenced image in Earth geometry, including the application of a 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.

Only the basic radiometric processing is available providing the radiance value.

Launched on 16 September 2018, Vision-1 offers orthorectified products with resolution up to 87 cm in panchromatic mode and 3.48 in multispectral mode as standard

More information about Vision-1 ESA TPM are available at:

<https://earth.esa.int/eogateway/missions/vision-1>

<https://earth.esa.int/eogateway/missions/vision-1#data-section>

## ALOS-1 PALSAR & optical sensors

ALOS-1 was a satellite carrying an optical and L-band SAR payload. All products are archive since the satellite is no longer operational. Products that can be requested include:

- PRISM;
- AVNIR-2;
- PALSAR.

For the PRISM products, there is a limited quota on the number of products per year that can be requested. For AVNIR-2 and PALSAR products, an unlimited number of products per project per year per product type can be requested. Available products are the ones available in the ESA archive which mostly covers the ADEN zone, and some OOOZ data. The PI of the project requesting the ALOS-1 data has to be European. The co-PI can be Chinese.

More information about ALOS Mission and products distributed by ESA under this ESA TPM agreement available at:

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

<https://earth.esa.int/aos/alos>

Alos Palsar

<https://alos-palsar-ds.eo.esa.int/oads/access/collection>

Alos Prism

<http://alos-ds.eo.esa.int/smcat/ALOSPRISML1CCLoudFreeEuropeanCoverage10/>

Also Avnir

[https://alos-ds.eo.esa.int/socat/ALOS\\_AVNIR-2\\_OBS\\_L1C](https://alos-ds.eo.esa.int/socat/ALOS_AVNIR-2_OBS_L1C)



## COSMO-SkyMed

COSMO-SkyMed (CSK) is an Italian Earth-imaging constellation consisting of four identical satellites which launched between 2007 and 2010. CSK-1, CSK-2 and CSK-4 remain operational.

COSMO-SkyMed stands for 'Constellation of small Satellites for the Mediterranean basin Observation'. The mission is owned and operated by ASI (Agenzia Spaziale Italiana) and is funded by the Italian Ministry of Research and the Italian Ministry of Defense.

COSMO-SkyMed Second Generation (CSG) is the follow-on mission to COSMO-SkyMed (CSK) assuring continuity and improvement of the supply of SAR services through data and products, to preserve and enhance the ability of customers and operational users to fulfil their mandates.

A limited quota of archive products and new acquisitions can be requested for each project. The following modes can be requested: ScanSAR (Wide and Huge) and StripMap (PingPong and Himage).

More information about the COSMO-SkyMed first and second generation Mission and products distributed by ESA under this ESA TPM agreement are available at:

<https://earth.esa.int/eogateway/missions/cosmo-skymed>

<https://earth.esa.int/eogateway/missions/cosmo-skymed-second-generation>

<https://earth.esa.int/eogateway/missions/cosmo-skymed#data-section>

## RadarSat-1 & 2

Now an archive mission, Radarsat-1 is a single polarisation imaging SAR operating at C-band frequency (5.3 GHz). Radarsat-2 is operational and is a fully polarimetric imaging SAR operating at C-band frequency (5.405 GHz).

A limited quota of archive products or new acquisitions can be requested for each project. For both Radarsat 1 and 2, the following modes can be requested:

- ScanSAR Wide & Narrow;
- Wide, Standard, Extended Low;
- Extended High, Fine;
- Standard, Fine.

For more information on these modes, swath width, resolution and polarisations available refer to:

<https://directory.eoportal.org/web/eoportal/satellite-missions/r/radarsat-1>

<https://directory.eoportal.org/web/eoportal/satellite-missions/r/radarsat-2>

More information about RadarSat-1/2 ESA TPMs are available at:

<https://earth.esa.int/eogateway/missions/radarsat-1>

<https://earth.esa.int/eogateway/missions/radarsat-1#data-section>

<https://earth.esa.int/eogateway/missions/radarsat-2>

<https://earth.esa.int/eogateway/missions/radarsat-2#data-section>

## Iceye

A limited quota of archive products or new acquisitions can be requested for each project. The following modes can be requested:

- Stripmap;
- StripMap high;
- SpotLight;
- ScanSAR.



ICEYE's is an X-band constellation of SAR satellites acquiring imagery in VV polarisation. The overall mission is to enable better decision making for everyone by providing timely and reliable Earth observation data. To achieve that goal, the company is developing its own synthetic-aperture radar (SAR) sensor technologies suitable for satellites under 100kg in weight. ICEYE is building a constellation of 18 SAR satellites by the end of 2020, which will enable a 3 hour on average revisit rate around the globe. For more information on the products available refer to:

<https://www.iceye.com/hubfs/Downloadables/ICEYE-SAR-Product-Guide-2019.pdf>

For SLC and GRD demonstration products see:

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

More information about ICEYE ESA TPM are available at:

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

<https://earth.esa.int/eogateway/missions/iceye#data-section>

## PAZ

A limited quota of archive products or new acquisitions can be requested for each project. The following modes can be requested:

- High Resolution SpotLight (HS);
- SpotLight (SL);
- StripMap (SMScanSAR (SC).

PAZ SAR is operating at X-band frequency and the satellite is positioned in the same orbit as TerraSAR-X and TanDEM-X and features exactly identical ground swaths and acquisition modes, the three form a high-resolution SAR satellite constellation. More information about PAZ ESA TPM are available at:

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

<https://earth.esa.int/eogateway/missions/paz#data-section>

## TerraSAR-x and TanDEM-x

A limited quota of archive products or new acquisitions can be requested for each project. The following modes can be requested:

- High Resolution SpotLight (HS);
- SpotLight (SL);
- StripMap (SM);

TerraSAR-X and TanDEM-X are German radar satellites from DLR (the German Aerospace Center). TerraSAR-X launched in 2007 and was joined by TanDEM-X in 2010. Both satellites remain operational. The twin satellites feature a unique geometric accuracy that is unmatched by any other spaceborne sensor.

Flying in close formation, the objective of the TerraSAR-X and TanDEM-X satellites is to simultaneously image Earth's terrain from different angles with unprecedented accuracy for research and development purposes as well as scientific and commercial applications. The primary payload on the TerraSAR-X and TanDEM-X satellites is an X-band radar sensor. This instrument allows the satellites to acquire images with different swath widths, resolutions and polarisations.

The TerraSAR-X and TanDEM-X SAR instrument is an active phased array X-band antenna system with operational modes of 'stripmap', 'spotlight' and 'scanSAR' permitting the acquisition of high-resolution imagery as well as of wide-swath imagery. More information about TerraSAR-X and TanDEM-X ESA TPMs are available at:

<https://earth.esa.int/eogateway/missions/terrasar-x-and-tandem-x>

<https://earth.esa.int/eogateway/missions/terrasar-x-and-tandem-x#data-section>



## ANNEX 6 - CHINESE EO DATA

The following Annex details general information on the portfolio of Dragon 6 Cooperation Chinese missions.

Specific details regarding data availability and access information is found online in table of [Chinese Missions of the Dragon Cooperation](#) [R7].

### Archived data

A series of archived Chinese EO data and products are available for Dragon 6 use, including FY-3, CBERS, HJ -1A/B, GF-1, TanSat and global covered GLASS-ABB/BBD/FAPAR/GPP/LAI/LST data and more different thematic data.

### HY-1 & 2

There are three satellites in the HY-1 Series, 1A, 1B and 1C. HY-1A was launched in 2002, HY-1B in 2007, HY-1C in 2018 and HY-1D in 2020. They carry sensors designed to monitor and measure Ocean Colour and SST. The two main sensors are: COCTS - Chinese Ocean Colour and Temperature Scanner (developed by SITP) & CZI - Coastal Zone Imager (CCD Camera) (developed by CAST).

The HY-2 satellite is a marine remote sensing satellite developed by China and launched in 2011. Two HY-2 satellites, HY-2A and Hy-2B, have been successfully launched in 2011 and 2018, HY-2C in 2020 and HY-2D in 2021. The objective of HY-2 is monitoring the dynamic ocean environment and includes following payloads:

- The radar altimeter is used to detect the height of the sea surface, significant wave heights, the wind speed and marine basic parameters;
- The microwave scatterometer is used to global sea surface wind field monitoring;
- The scanning microwave radiometer is used to obtain the global sea surface temperature, sea surface wind field, the water vapour content, cloud water content, sea ice, rainfall etc.;
- The calibration microwave radiometer is used to provide water vapour content calibration service to the altimeter.

More information about the HY -1 & 2 missions is available at: <http://www.nsoas.org.cn/eng/column/145.html> and <http://www.nsoas.org.cn/eng/column/146.html>

### FY Series

There are two types of Chinese Meteorological Satellites (FY Series): Polar System (FY 1, FY-3) and Geostationary System (FY-2, FY-4). Polar-orbit satellites operational system can provide both local and global environment data; geostationary satellites system can provide observation of East-Asia hemisphere hourly. Products derived from FY-1D, FY-2E/F/G/H, FY-3A/B/C/D and FY-4A, FY-4B can be made available to this opportunity. FY-3G launched in August 2023 is in orbit testing phase while FY4C launch is foreseen form 2024 and both will be also made available to this opportunity.

FY-1 series are China's first-generation sun-synchronous orbiting meteorological satellites. Observing instruments aboard FY-1D are as follows:

- Multi-channel Visible and Infrared Scan Radiometer (MVISR);
- Space Environment Monitor (SEM) for observing energetic particles in solar winds.

China's first geostationary meteorological satellites were named FY-2 satellites. Observing instruments aboard FY-2 includes following:

- Stretched Visible and Infrared Spin Scan Radiometer (S-VISSR);
- Space Environment Monitor (SEM).



FY-3 satellites are China's second generation polar-orbiting meteorological satellites, with substantively enhanced functionalities and technical capabilities. FY-3 Products derived from the following instruments can be made available under this call:

- Visible and Infrared Radiometer (VIRR);
- Medium Resolution Spectral Imager (MERSI);
- Infrared Atmospheric Sounder (IRAS);
- Micro-Wave Temperature Sounder (MWTS);
- Micro-Wave Humidity Sounder (MWHS);
- Micro-Wave Radiation Imager (MWRI);
- Backscatter Ultraviolet Sounder (SBUS);
- Total Ozone Unit (TOU);
- Earth Radiation Measurement (ERM);
- Solar Irradiance Monitor (SIM);
- Space Environment Monitoring (SEM);
- Space Environment Suite (SES).

FY-4 is China's second generation geostationary meteorological satellite. FY-4 Products derived from the following instruments can be made available under this call:

- Advanced Geostationary Radiation Imager (AGRI);
- Geostationary Interferometric Infrared Sounder (GIIRS);
- Lightning Mapping Imager (LMI);
- Space Environment Package (SEP).

More information on the missions can be found at following websites:

<http://www.nsmc.org.cn/en/NSMC/Channels/outline.html> (Chinese and English versions)

<https://www.eoportal.org/satellite-missions/fy-4#fy-4-fengyun-4-geostationary-meteorological-satellite-series>

<https://www.eoportal.org/satellite-missions/fy-3>

## CBERS-04

The China-Brazil Earth Resources Satellite (CBERS) was jointly developed by China and Brazil since 1988. CBERS-04 was launched successfully on 7 December 2014. The payloads of CBERS-04 are as follows:

- Panchromatic & CCD Camera (PAN). The PAN Camera has three spectral bands in the visible and near infrared range and one panchromatic band. It has a nadir spatial resolution of 5 meters for panchromatic bands and spatial resolution of 10 meters for multispectral bands;
- Multispectral Camera (MUX). The MUX Camera has a nadir spatial resolution of 20 meters and a swath width of 120 km. It has four spectral bands in the visible and near infrared range;
- Infrared Multispectral Scanner (IRS). The IRS instrument has a spatial resolution of 40 meters (for three visible to short-wave infrared spectral bands) and 80 meters (for one thermal infrared band). Its swath width is 120 km;
- Wide Field Imager (WFI). The WFI camera has a nadir spatial resolution of 73 meters in four visible to near-infrared spectral bands. It has a swath width of 866 km.

## Jilin-1

The Jilin-1 satellite, the China's self-developed remote sensing satellite for commercial use, was launched in October 2015. Jilin-1 consists of four satellites, one for high-resolution images (<1 m), one for testing new space technology and another two for video. It is operated by Chang Guang Satellite Technology Co., Ltd under the Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences. The satellites will focus on providing photographs to commercial clients, while helping with harvest assessment, geological disaster prevention and resource surveys. Satellite constellation (multi-spectral data can be requested), environment monitoring ChinaGEOSS Data Sharing Network Open partial permissions. Jilin-1 data (JL1-GPO1 and JL1-GPO2) will be available for use of Dragon 6 projects.

More information about Jilian constellation available at <https://www.eoportal.org/satellite-missions/jilin-con>



## CFOSAT

A Sino-French collaboration mission CFOSAT was launched in 2018, the satellite has two wave and wind measuring instruments, surface wave investigation and monitoring (SWIM) and wind scatterometer (SCAT). CFOSAT is designed to study ocean surface wind and wave conditions to improve forecasts for marine meteorology and knowledge of climate variations.

More information on the missions can be found at following website: <http://www.nsoas.org.cn/eng/column/147.html>

## TanSat

The TanSat is a satellite to measure methane and carbon dioxide levels in the atmosphere and was launched in 2016. It is sponsored by MOST China. The TanSat satellite carries two instruments: ACGS (Atmospheric Carbon-dioxide Grating Spectrometer), and CAPI (Cloud Aerosol Polarization Imager), both dedicated to global CO<sub>2</sub> detection and monitoring. The instruments can observe in three acquisition modes, with the same data sampling rate: nadir, ocean glint and surface target.

TanSat data are also included in ESA TPMs see more information and data access page below:

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

<https://earth.esa.int/eogateway/catalog/tansat-agcs-and-capi-products>

## GF-1

The GF-1 satellite was launched on 26 April 2013, as part of High-resolution Earth observing system of China. It has three payloads including a high-resolution pan sensor, a high-resolution multispectral CCD camera (PMS) and a mid-resolution multispectral camera with 800 km swath (WFV). The GF-1 WFV data (16 m resolution) will be available for Dragon 6 use.

More information about the GF-1 missions is available at:

<http://www.chinageoss.cn/en/index.html/-/detailIndex?secondIndex=0&id=2&code=5>

## GF-6

The GF-6 satellite was launched on 2 June 2018, is an optical remote sensing satellite with red-edge band. It is on 645 km sun synchronous orbit, and its local time of descending is 10:30 a.m. GF-6 is configured with one 2/8m Panchromatic & Multispectral Scanners (PMS) and one 16m WFV Multispectral Cameras, which have the ability of high resolution and wide swath imaging on the same satellite. The GF-6 WFV data (16 m resolution) will be available for Dragon 6 use.

More information about the GF-6 missions is available at:

<http://www.chinageoss.cn/en/index.html/#/detailIndex?secondIndex=1&id=7&code=5>

## CSES-1(01)

The CSES-1(01) (Seismo-Electromagnetic Satellite, CSES) is the first platform of China's earthquake observation system in space and was launched successfully in 2018. The satellite carries 8 instruments, including search-coil magnetometer (SCM), electric field detector (EFD), high precision magnetometer (HPM), GNSS occultation receiver (GOR), plasma analyzer package (PAP), langmuir probe (LAP), high energetic particle package (HEPP) and detector (HEPD), and tri-band beacon (TBB). It is flying in a sun synchronous orbit with an altitude of 507 km and descending node time of 14:00 LT., which will have a lot of application prospects in the study of seismology, geophysics, space sciences, and so on. Zhangheng-1 data will be available for use of Dragon 6 projects. The CSES-1 data policy is regulated by Center for Space Information Research, National Institute of Natural Hazards, MEM. More information about CSES-1 available at <https://cses.web.roma2.infn.it/>

## Luoja-1

Luoja-1 (LJ1-01) satellite is the first dedicated night-time light remote sensing satellite in the world and was successfully launched in 2018. Its spatial resolution is 130 m. As its range spans 250 × 250 km, global night-time light image acquisition can be completed within 15 days under ideal conditions, representing a significant technological advance in Chinese remote sensing capabilities from surface monitoring to social and economic development monitoring. The Lujia-01 satellite provides



thematic products, such as the GDP index, carbon emission index, urban housing vacancy rate index, and so on. It dynamically monitors macroeconomic operation in the world and provides an objective basis for government decision-making. Access to

More information on the Mission can be found at [https://www.mdpi.com/journal/sensors/special\\_issues/RS\\_Luojia\\_01](https://www.mdpi.com/journal/sensors/special_issues/RS_Luojia_01)

## SDGSAT-1

SDG Satellite SDG-1, known as SDGSAT-1, is the first satellite developed specifically for the implementation of UN 2030 Agenda for Sustainable Development (SDG), and the first Earth science satellite among the satellites developed by the Chinese Academy of Sciences (CAS), which is launched successfully into orbit On November 5, 2021.

Tailored to the needs of monitoring and evaluating indicators related to global SDGs, SDGSAT-1 is equipped with three kinds of payloads including thermal infrared, low-light-level and multi-spectral imagers, orbiting the Earth at an altitude of 505 km and an inclination angle of 97.5.

The three payloads, combined with their 300 km-wide swaths, can provide all-time, all-weather, multi-load cooperative observations, achieving global coverage in 11 days.

SDGSAT-1 aims to achieve the fine depiction of "traces of human activities" and therefore to provide exclusive data support for the SDG indicators which reflect the interaction between human activities and nature. The interaction of human activities with the Earth's surface environment monitoring.

China will develop and operate follow-on satellites to and provide more indicator-tailored data sources to facilitate global SDG implementation. Policy regulated by International Research Center of Big Data for Sustainable Development Goals (CBAS). More information on the SDGSAT-1 mission can be found at:

<https://www.sdgsat.ac.cn/>

<https://sdg.casearth.cn/en/mobile/datas/SDGSAT>

## MSS-1

Satellite A (noted as SAT\_A) for the Macau Scientific Satellite 1 mission is the first satellite with high-precision geomagnetic field measurements in China, which jointly accomplishes monitoring the space environment over the South Atlantic Anomaly Region with Satellite B. SAT\_A mainly comprises subsystems of structure and mechanism, thermal controlling, attitude and orbit controlling, house-keeping, TT&C, power supply, overall circuit, digital data transmission, scientific payload, etc. It is equipped with high-precision magnetometers and high-energy particle detectors. SAT\_A is designed to be operated in circular orbits with an inclination of 41°. Its altitude is ~450km. The mass is around 550kg, and the lifetime is designed longer than 5 years. Earth's low latitude magnetic field and space environment changes monitoring, policy regulated by Macau Institute of Space Technology and Application. The following instruments are on board of MSS-1 SAT\_A:

- COUPLED DARK STATE MAGNETOMETER (CDSM)
- FLUX GATE MAGNETOMETER (FGM)
- ENERGETIC ELECTRON SPECTROMETER (EES)
- VECTOR FIELD MAGNETOMETER (VFM)
- MICRO ADVANCED STELLAR COMPASS (MASC)
- GNSS RECEIVER SUBSYSTEM (GNSS)
- SATELLITE LASER RANGING (SLR).

More information about the MSS-1 missions is available at: <https://mss.must.edu.mo/>

## ZY-1-02D

ZY 1 Number 2 Optical Mission of China (ZY-1-02D) for natural resource monitoring has been successfully launched on September 2019. China Centre for Resources Satellite Data and Application Open partial permissions to access data.

Products derived from the following instruments can be made available under this call:

- CCD (ZY Series) - CCD and multispectral imager
- PAN (ZY Series) - Panchromatic and multispectral imager

More information about the ZY missions is available at: <https://www.cresda.com/zgzywxyyzeng/index.html>



## Chinese EO Missions (In orbit-testing) HJ-2E, HJ-2F and FY-3F, FY-3G

HJ-2E (Huanjing Jianzai 2E) Synthetic Aperture Radar (SAR) satellite is a 5-metre resolution S-band radar satellite to be used for “Environmental and Disaster Monitoring and Forecasting” was launched in Oct-2022 and is under commissioning/testing phase. HJ-2E data could be made available to the Dragon opportunity through the China Centre for Resources Satellite Data and Application-CRESDA (<https://www.cresda.com/> and <https://data.cresda.cn/#/home>), policy regulated by the Satellite Application Center for Ecology and Environment, MEE.

HJ-2F (Huanjing Jianzai 2F) Synthetic Aperture Radar (SAR) satellite is a 5-metre resolution S-band radar satellite to be used for “Environmental and Disaster Monitoring and Forecasting” was launched in August 2023 and is under commissioning/testing phase. HJ-2E data could be made available to the Dragon opportunity through the China Centre For Resources Satellite Data and Application-CRESDA (<https://www.cresda.com/> and <https://data.cresda.cn/#/home>), policy regulated by the Satellite Application Center for Ecology and Environment, MEE.

FY-3F (Chinese Meteorological Satellites (FY Series): Polar System FY-3F launched in August 2023 is in orbit-testing phase. The new satellite is equipped with an advanced microwave thermometer, a microwave hygrometer, and an infrared hyperspectral atmospheric detector. Compared with FY-3C, the number of atmospheric vertical detection channels provided by FY-3F is up by over 40 times, which means that the new satellite will have a more accurate understanding of atmospheric temperature and humidity stratification. In addition, FY-3F has an upgraded ultraviolet detection capability, and is equipped with two newly developed ultraviolet hyperspectral remote sensing detectors.

FY-3G (Chinese Meteorological Satellites (FY Series): Polar System FY-3G launched in April 2023 is in orbit-testing phase. FY-3G is part of China's second generation polar-orbiting meteorological satellites.

More information about FY-3 series available at <http://www.nsmc.org.cn/nsmc/cn/home/index.html> and at <https://www.eoportal.org/satellite-missions/fy-3>

## Next Chinese EO Missions

The following EO Chinese Missions will be launched presumably during 2024 /2025 and will be made available to Dragon opportunity.

### CSES-1(02)

The CSES-1(02) will be launched in 2024 is a Seismo-Electromagnetic Satellite for natural disaster, meteorology, natural resources monitoring policy regulated by Center for Space Information Research, National Institute of Natural Hazards, MEM, data will be made available to Dargon 6 accepted projects. More information available at [https://cses.web.roma2.infn.it/?page\\_id=198](https://cses.web.roma2.infn.it/?page_id=198)

### FY-4C

Geostationary satellite FY -4C, the launch is foreseen form 2024 and will be also made available to this opportunity.