



# DOCUMENT

**Copernicus Space Component** 

**ESA-NASA** Technical Operating Arrangements



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### **1 INTRODUCTION**

#### 1.1 Background

Copernicus is a European programme, providing Earth Observation information for environmental monitoring and civil security. The dedicated Sentinels missions are being developed to meet the operational needs of the programme.

According to Article 9 of the Regulation establishing the Copernicus programme, the European Commission shall manage, on behalf of the European Union (EU) and in its field of competence, relationships with third countries and international organisations.

In line with this Regulation, the European Commission has concluded Agreements with the European Space Agency (ESA) and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) on the implementation of the space component of Copernicus.

These Agreements foresee that ESA and EUMETSAT shall provide support to the EU for the matters concerning the international technical cooperation of the Copernicus Programme. In particular, ESA and EUMETSAT shall assess the impact of international technical cooperation requests and shall implement and be responsible for technical actions with international partners subject to the prior approval of the European Commission and prerequisite funding provided by the European Union.

On this basis, the European Commission requests ESA and EUMETSAT to establish relevant technical operating arrangements with international partners, primarily focusing on the Sentinels operated by ESA and EUMETSAT and addressing issues such as liability and technical data interface specifications.

ESA and EUMETSAT will be responsible for the implementation of the technical operating arrangements, in coordination and subject to the prior agreement by the European Commission.

The implementation of the technical operating arrangements will be facilitated by a joint 'Copernicus Cooperation group', involving the European Commission, ESA, EUMETSAT and the international partners, whose members meet whenever necessary, to oversee and stimulate cooperative activities (e.g. exchange of best practices, comparison of products, exchange of personnel).



#### **1.2 Purpose and objectives**

The European Union, represented by the European Commission, and the United States of America, represented by the US State Department, have signed a Cooperation Arrangement to ensure the access to Sentinel data for the United States of America. Specifically, the European Union and United States recognize full and free access to each other's environmental satellite data is of mutual benefit and should follow the GEOSS Data Sharing Principles. U.S. agencies, including the U.S. National Oceanic and Atmospheric Administration (NOAA), the U.S. National Aeronautics and Space Administration (NASA), and the U.S. Geological Survey (USGS) will continue to provide a wide range of observations and the European Commission will provide high bandwidth connections to U.S. agencies to access Sentinel data. In addition to data sharing, collaborations are being encouraged in areas of calibration/validation, development of societal applications and coordination on spectrum issues.

Based on this Cooperation Agreement, ESA and NASA will coordinate the technical implementation covering the Sentinel data access to NASA by developing a technical operating agreement signed by NASA and ESA.

Based on this Cooperation Agreement, ESA and NASA cooperate on a voluntary basis for enabling Sentinel data access to NASA, without any exchange of funds. In the event that either ESA or NASA is unable to continue one or several of the activities described in these Technical Operating Arrangements, each may have the option of terminating the participation in the activity, after consultation with the other and after giving reasonable advance notice.

The purpose of this technical operating arrangement is to define ESA's and NASA's respective roles and responsibilities as well as the terms and conditions under which they will cooperate to implement the exchange of satellite data foreseen in the Cooperation Arrangement between the European Commission and the International partner on Cooperation on Earth observation data related to the Copernicus programme.

In this arrangement both sides recognise that the European Union and United States of America are pursuing Earth Observation activities in a number of areas of common interest and that sharing each other's satellite data on the basis of reciprocity should provide mutual benefits. Both sides are committed to the principle for full, free and open access to European Sentinel and NASA Earth Observation satellite data and information, subject to applicable security restrictions.



#### 1.3 Scope

This non-binding document describes the technical arrangements (e.g. cooperative initiatives description, operational interfaces, ESA required support) between both Agencies.

In case other entities (e.g. Universities, Institutes) are involved in the arrangement on NASA's side, NASA acts as an interface and contact point between ESA and the other entity.

#### 1.4 References

An overview of the overall Copernicus dedicated Sentinel missions is available in the Sentinel Online portal at <u>sentinels.copernicus.eu</u>. In particular the portal contains up to date information on:

- Mission description, including space and ground segment aspects, and operational news
- Products definition, including contents and format specifications
- Detailed mission user handbook
- Link to data access hubs, including registration, user manuals, operational news

The following documents are referenced in this Technical Arrangement and provide further detailed information.

- CSC Operations Concept document, GMES-GSEG-EOPG-PD-12-0056, Issue 1.1
- "Legal notice on the use of Copernicus Sentinel Data and Service Information", https://sentinel.esa.int/documents/247904/690755/Sentinel\_Data\_Terms\_ and\_Conditions

#### 2 EUROPEAN ACCESS TO NASA MISSION AND CALIBRATION DATA

In adherence to its free-and-open data policy (http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/), NASA will continue to



provide Earth observation data products to European users from the NASA Distributed Active Archive Centers (DAACs). DAACs are custodians of mission data and ensure data are easily accessible to users. Acting in concert, the DAACs provide reliable, robust services to users whose needs may cross the traditional boundaries of specific science disciplines, while continuing to support the particular needs of users within the discipline communities. Data from all DAAC holdings can be searched from <a href="https://search.earthdata.nasa.gov/">https://search.earthdata.nasa.gov/</a>.

Program Website: https://earthdata.nasa.gov/ Alaska Satellite Facility: https://www.asf.alaska.edu/ Atmospheric Science Data Center: https://eosweb.larc.nasa.gov/ Crustal Dynamics Data Information System: http://cddis.gsfc.nasa.gov/ Global Hydrology Resource Center: https://ghrc.nsstc.nasa.gov/home/ Goddard Earth Sciences Data and Information: http://disc.sci.gsfc.nasa.gov/ Land Processes: https://lpdaac.usgs.gov/ L1 and Atmosphere Archive and Distribution System: https://ladsweb.nascom.nasa.gov/ National Snow and Ice Data Center: http://nsidc.org/daac Oak Ridge National Laboratory: http://daac.ornl.gov/ Ocean Biology: http://oceancolor.gsfc.nasa.gov/cms/ Physical Oceanography: http://podaac.jpl.nasa.gov/ Socioeonomic Data and Applications Data Center: http://sedac.ciesin.columbia.edu/

This includes, but is not limited to data from (full list available from https://earthdata.nasa.gov/user-resources/remote-sensors):

- Soil Moisture Active Passive (SMAP)
- Orbiting Carbon Observatory-2 (OCO-2)
- Moderate Resolution Imaging Spectroradiometer (MODIS)
- Clouds and Earth's Radiant Energy System (CERES)
- Visible and Infrared Scanner (VIRS)
- Atmospheric Infrared Sounder (AIRS)
- Global Precipitation Monitoring (GPM) instruments

NASA will share data access information with ESA. Links may allow ESA to retrieve datasets or may be posted on ESA and EU Copernicus data access portals to inform European users.



#### **3** ARRANGEMENT TECHNICAL INTERFACES

In the frame of Copernicus, technical arrangements aim, among others, at providing:

- a supplementary access to Sentinel Mission data, i.e. through specific data acquisition services (data hub to data hub), specific data products, mirror sites, etc, thus further valorising the Sentinel missions exploitation.
- access to relevant NASA Mission data, i.e. through specific data acquisition services (data hub to data hub), specific data products, mirror sites, etc, thus further valorising the relevant missions exploitation.

#### **3.1** Technical Arrangement Types

The technical operating arrangement provides a frame for specialised solutions in five main areas:

- 1. Data acquisition and Quasi Real Time production (International Local Stations currently not foreseen)
- 2. Complementary collaborative data products and algorithms definition
- 3. Core data product dissemination and access (e.g. international mirror sites)
- 4. Development of innovative tools and applications
- 5. Complementary external validation support activities

Note that the above technical arrangement types address on one side the Sentinel missions, and on the other side relevant NASA missions.

The following sections define the technical arrangements for the specific area of cooperation.

In the frame of this technical arrangement:

- additional areas of technical cooperation may be included in the future if relevant and prior endorsed by the European Commission and NASA.
- regular technical meetings are intended to be held between the NASA and ESA, e.g. within the Copernicus Cooperation Group, this latter lead by the European Commission. The European Commission shall be invited as observer to all such meetings and all meeting documentation shall be forwarded to the European Commission for information.



#### 4 INTERNATIONAL ARCHIVING AND DISSEMINATION CENTRES, MIRROR SITE

#### 4.1 Involved Entities

NASA will directly connect to the ESA interface (i.e. International Data Hub).

### 4.2 NASA Activity

NASA will implement a Sentinel data mirror archive in the U.S. for re-use and redissemination of all Sentinel 1, 3, and 5P products. NASA will make the Sentinel collections available to users who register for Earth Observing System (EOS) Data and Information System (EOSDIS) user profiles (i.e. Earthdata Login) and who have agreed to the terms and conditions set by NASA and the European Space Agency (ESA) to access Sentinel data. Sentinel data archived by NASA will be provided to all science data users without further access conditions or restrictions.

# 4.3 ESA Support

#### 4.3.1 Access to the Sentinel International Data Hub

ESA grants NASA access to the International Data Hub (IntDH), a rolling archive, providing bulk dissemination capabilities for Sentinel data products. The IntDH will continuously store Sentinel data acquired during the previous month(s) at the processing levels agreed as part of the Sentinel core data product list and the associated timeliness as defined in the CSC Operations Concept Document, it enables searching, browsing, previewing and downloading the Sentinel data. The time interval covered by the IntDH rolling archive will be scalable and include at least the previous 30 days of data.

Access to the Sentinel archived data is provided via a separated data access infrastructure not subject of this Technical Arrangement. If required in the future, a specific campaign could be put in place as a one-off activity to be coordinated with other international partners to transfer reprocessed or missing data. Such a campaign, including selected archived data publishing in the IntDH, may also apply in the future to make re-processed Sentinel data available



Access to the IntDH is allowed via a web authentication module. ESA will provide NASA with a username and password to access the IntDH. This username and password may be used only by NASA (including its representatives, employees and contractors involved in the initiative) for the purpose of the initiative and will not be shared with other natural or legal persons.

NASA will use the IntDH access only for the purpose of its activity in the initiative described above. Through registration at the IntDH, accessing and\or downloading available content, NASA will not misuse or interfere with the service of the IntDH portal. In particular, NASA aims at building a mirror archive of Sentinel data and hence will not repeat the download of identical datasets from the IntDH, but store downloaded Sentinel data for re-use and re-dissemination. In the event of file corruption, NASA may request ESA support retransmission of files.

All functionalities and contents offered by the IntDH are provided by ESA on a best efforts-basis. The transmission of content from the IntDH may be interrupted or delayed by ESA in the event of technical constraints, such as the internet bandwidth. In such case, the download requested by NASA will be enabled later taking into account other users' requests.

#### 4.3.2 Data Transfer

ESA will provide appropriate interfaces, to transfer Sentinel data to NASA via internet. If required, ESA supports network performance tuning to fully utilize available bandwidth.

# 4.4 Time Schedule

The IntDH will be available from the sentinels.copernicus.eu portal. ESA will provide Sentinel data sets as they become available in accordance with ESA data provision plan (e.g. after launch, commensurate with the ramp-up plan for data provision).

NASA will be ready to accept data transfers after the on-orbit commissioning phase of each Sentinel.

# 4.5 Reporting

NASA will keep the European Commission and ESA informed about the course and success of the activity.



The regular reports regarding the Sentinel data mirror site shall have at least annual frequency, and shall as a minimum contain information regarding:

- Sentinel data use and applications;
- Onward-dissemination of Sentinel data, including user statistics of the mirrored Sentinel data;
- Any changes to the pre-agreed set up of activities that may have an impact on ESA's support to the partner's activities.

More specifically, as concerns Sentinel data Mirror Site usage statistics, the following minimum categories of information shall be provided to the European Commission and ESA as part of the annual reports.

User account statistics, including:

- Utilisation domain (i.e. research, commercial, education, other)
- Usage field (i.e. atmosphere, emergency, marine, land, security, climate, other)
- Country of the account user

Note: the above fields should be requested as part of the user account registration

#### Data dissemination statistics, including:

- Data delivered per utilisation domain and usage field
- Data volume per utilisation domain and usage field
- Total number of distinct users
- Total volume of data distributed
- Total volume of data distributed by product
- Statistics on the core product delivered

#### 4.6 Sentinel Data Governance

Sentinel data made available via the IntDH are governed by the "Legal notice on the use of Copernicus Sentinel Data and Service Information".

In the event that in the future specific Sentinel data are assessed by the EU designates Sentinel data as "sensitive", the access to such Sentinel data through the IntDH and its use and distribution may be subject to different licensing conditions.



This also applies for Sentinel data already received by NASA, or a partner as indicated under 2.1 above through the IntDH, in the event Sentinel data are assessed to be "sensitive" after the time of data download.

#### 5 INTERNATIONAL COMPLEMENTARY EXTERNAL VALIDATION SUPPORT

#### 5.1 NASA Activity

NASA may conduct complementary Sentinel data Calibration and/ or Validation activities in support of the Copernicus programme.

Sentinel data required for those projects may be supplied directly from ESA's open data access hub (SciHub) to the project, or from the NASA mirror site, described in chapter 4 above. In the latter case, reporting and data governance are handled as per chapter 4 above.

NASA may conduct these Calibration/Validation projects together with partner entities. In such case, NASA acts as an interface and contact point between ESA and the other entity.

Details of on-going and planned Calibration/Validation projects are described in separate technical documents, describing the involved entities, the scope of the Calibration/Validation project, applied methodology, expected results and related use/licence conditions, geographic area of interest, way of Sentinel data supply, time schedule and reporting.

Annex A contains a list of the currently on-going and planned projects. Annex A will be updated as and when necessary.

# 5.2 ESA support

# 5.2.1 ESA technical support to complementary validation activity

ESA will provide sample data sets of the Sentinel 1, 3 and 5p core products (e.g. L0, L1, L2) as they become available to support joint validation and calibration activities.



# 5.3 Reporting

Reporting regarding the complementary external validation activities will be defined in the related separate technical documentation. In case, the NASA Sentinel data mirror site facilitates Sentinel data supply to the validation project, reporting on data dissemination to the projects is handled as per section 4.5 above.

# 5.4 Sentinel Data Governance

Sentinel data used by the complementary validation activity are governed by the "Legal notice on the use of Copernicus Sentinel Data and Service Information."



# Annex A. Complementary external validation support projects

The following contains a list of the currently on-going and planned projects aimed at complementary Sentinel data Calibration and/ or Validation activities in collaboration between NASA and ESA with the aim of improving the quality of both core Sentinel core products and of derived higher-level products.

• None at the moment of issuing the first version of this TOA.