

ORIGINAL N° 2

Copernicus Space Component

Technical Operating Arrangement

ESA - Brazilian Space Agency and INPE



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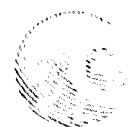
Copernicus Space Component Technical Operating Arrangement (TOA)

between the European Space Agency on one side,

and

the Brazilian Space Agency and the National Institute for Space Research of Brazil as the authority responsible for implementing this TOA and as the authority in charge of interacting directly with ESA for the purpose of its implementation, on the other side,

executing the Cooperation Arrangement concluded between the European Commission and the Ministry for Science, Technology, Innovation and Communication of the Federative Republic of Brazil on their Cooperation in the area of data access and use of Sentinel data of the Copernicus programme.



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 will 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 will provide support to the EU for the matters concerning the international technical cooperation of the Copernicus Programme. In particular, ESA and EUMETSAT will assess the impact of international technical cooperation requests and will 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 actions, in coordination and subject to prior consultation with 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 as mentioned in the respective Cooperation Arrangement signed by the European Union and the international partner.

1.2 Purpose and objectives

The European Union, represented by the European Commission, and the Ministry for Science, Technology, Innovation and Communication of the Federative Republic of Brazil ("the Ministry") have signed on 8 March 2018 a Cooperation Arrangement ("the Arrangement") to ensure the mutual access to the Sentinel series of satellite data and to



Brazilian earth observation satellite data. The European Union and the Ministry recognize that full and free access to each other's environmental satellite data is of mutual benefit. Furthermore, the European Commission would like to emphasise the importance of in-situ data from Brazilian networks for the Copernicus programme.

In addition to satellite data sharing, a collaboration is also envisaged in areas of calibration/validation, development of societal applications and coordination on spectrum issues.

As stipulated in the Arrangement, ESA on one side and the Brazilian Space Agency (AEB) and the National Institute for Space Research in Brazil (INPE) as the Brazilian institution designated by AEB for the technical implementation of this TOA on the other side, will coordinate the technical implementation covering the free, full and open Sentinel data access to INPE using high bandwidth connections from data hub to data hub with a view to foster the exchange of Earth observation data between Europe and Brazil.

While AEB is responsible for Brazil's space program, INPE works in close cooperation with AEB and has been formally delegated by AEB to implement the present TOA.

Furthermore, ESA and INPE will coordinate the technical implementation for the provision of free, full and open access to all Brazilian Earth observation satellite data, and certain other satellite data acquired by INPE, including historical data sets, to the Copernicus programme and its participating states.

The coordination will be ensured based on the present Copernicus Space Component Technical Operating Arrangement (TOA).

The purpose of the TOA is to define ESA's and INPE's respective roles and responsibilities as well as the terms and conditions under which they will cooperate to implement the mutual exchange of satellite and other data foreseen in the Arrangement.

In the present TOA both ESA and INPE recognise that the European Union and the Ministry are pursuing Earth Observation activities in a number of areas of common interest and that sharing each other's satellite data based on reciprocity should provide mutual benefits. Both sides are committed to the principle for full, free and open access to European Sentinel and Brazilian earth observation satellites data and information, subject to applicable security restrictions. Both sides acknowledge that access to in-situ data provided by INPE and its partners will bring added value to the Copernicus programme.

The TOA will be implemented based on voluntary, non-legally-binding cooperation without exchange of funds. In the event that either ESA or INPE is unable to continue one or several of the activities described in this TOA, each Signatory may discontinue participation in such activities. In such cases, the Signatories will endeavour to consult each other and provide each other with reasonable notice of their intentions.

The TOA will take effect on the date of the last signature by the three Signatories to this TOA.

1.3 Scope

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

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

It is intended that satellite data and the in-situ data be made available for distribution on the European "Copernicus Data and Information Access Services" (DIAS). Therefore, the provision of the in-situ data from Brazil to the Copernicus Ecosystem needs to be addressed by the present TOA.

Regarding in-situ data of relevance and utilisation for the Copernicus Services, the European Environment Agency (EEA- Delegated entity for the cross-cutting coordination of the Copernicus in-situ component) will act as the interface and contact point. The detailed arrangements covering this specific cooperation are outside the scope of this document.

1.4 References

An overview of the overall Copernicus dedicated Sentinel missions is available in the Sentinel Online portal at sentinels.copernicus.eu. 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 TOA 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](https://sentinel.esa.int/documents/247904/690755/Sentinel_Data_Terms_and_Conditions)



2 EUROPEAN ACCESS TO BRAZILIAN EO MISSIONS AND CALIBRATION DATA AND PARTNER IN-SITU DATA

2.1 INPE will provide the Copernicus programme and its participating states with full, free and open access to all Brazilian satellite data and all other satellite data (e.g. Resourcesat-2, DMC-II) acquired by INPE and available for free distribution on INPE's catalogue.

2.2 These data will be made available for distribution on the European "Copernicus Data Access and Information Systems" (DIAS).

2.3 The relevant Brazilian satellites missions comprise certain land, ocean and atmosphere series of civilian satellites. These are, at the time of the signature of this TOA:

- CBERS
- AMAZONIA -1

This list will be updated as new satellites will become available.

2.4 INPE and its partners operate networks of geophysical, meteorological and other in situ and Earth observation data that can support the calibration and validation of satellite Earth observations and derived products, as well provide input to the Copernicus services. A number of these facilities have been specifically established to support satellite Earth observation calibration and validation.

Data from these networks, and other data and information of value to calibration/validation activities and the Copernicus services, will be made available to the Copernicus programme in accordance with national, state/territory and organisation-level policies.

These data are made available on a free and open basis, generally under 'Creative Commons' licenses.

2.5 Other means of access, including near-real time protocol access and file transfer services, may also be available to the Copernicus programme and INPE will facilitate discussions on these matters where requested by ESA, the European Commission and/or EEA.

As in the case of Brazilian satellites, INPE will keep ESA also informed about the availability of Brazilian in-situ data, including the corresponding access methods.

Where ESA identifies a desire to access data to support calibration/validation activities, INPE will act as a coordinating point to facilitate such discussions. Where the European Commission and /or the EEA identifies a desire to access partner in-situ data to support the Copernicus services, INPE will act as coordinating point to facilitate such discussions.

2.6 Once available and fully operational, ESA and INPE may make also use of the EllaLink submarine cable Lisbon- Fortaleza for sending data in both directions.

3 ARRANGEMENT OF TECHNICAL INTERFACES

In the frame of Copernicus, the present TOA aims, 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 Brazilian EO Mission data, i.e. through specific data acquisition services (e.g. data hub to data hub), specific data (higher level) products, mirror sites, etc, thus further valorising the relevant missions' exploitation.
- access to other relevant data, i.e. through specific data acquisition services (e.g. data hub to data hub), specific data (higher-level) products, mirror sites, etc., thus further valorising the relevant networks of geophysical, meteorological, in situ and other Earth observation data.
- access to relevant data on ESA and the Brazilian side via the EllaLink Lisbon-Fortaleza submarine cable, once the latter will offer the necessary services.

ESA will serve as facilitator for data transmission to the DIAS.

3.1 Technical Arrangement Types

The TOA 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

The above technical arrangement types address on one side the Sentinel missions and on the other side the relevant INPE missions.

As specified in Section 1.3, the technical and utilisation aspects of in-situ data are responsibility of EEA and as such are out of scope for this document.



In the context of this TOA:

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

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

4 INTERNATIONAL ARCHIVING AND DISSEMINATION CENTRES, MIRROR SITE

4.1 Involved Entities

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

Other partners on INPE side may be engaged as required, following prior consultation with ESA and the European Commission.

4.2 INPE Activity

INPE intends to establish a Regional Copernicus Data Access/Analysis Mirror Site (“INPE Data Mirror Site”) to improve access to, and exploitation of, Sentinel data in Brazil.

In the context of the present TOA, this INPE Data Mirror Site is intended to retrieve data from ESA-operated Sentinel missions from ESA-operated data systems, and then to store and make available such data to government, industry, research and general public users for download and online analysis. The INPE Data Mirror Site is intended to access all data products produced by all ESA-operated Sentinel missions for a geographical area of interest, i.e. Latin America.

The specific data products to be retrieved, and the scope of the geographic region for which data will be retrieved/stored/re-distributed, may change from time to time. INPE will discuss such changes with ESA prior to implementing them in the INPE Data Mirror Site. The INPE Data Mirror Site is intended to be a distributed system:



- The primary point of facilitating access for re-distribution/analysis, being established at www.dgi.inpe.br
- Long-term archives, not intended for day-to-day use for re-distribution or analysis, being hosted by www.dgi.inpe.br.

INPE intends to utilise Academic Research Networks on the Brazilian side peering to GEANT on the European side (potentially via INTERNET2), as the backhaul connection from ESA-operated systems to the INPE Data Mirror Site. Such networks are scaled for data of the scale of Copernicus, and are a cost-effective way of moving large amounts of scientific data. INPE understands that ESA intends to directly connect ESA-operated data systems with the European GEANT network using high-bandwidth connections.

The types and levels of service provided by the INPE Data Mirror Site (such as web service access, direct file download, etc.) will be determined from time to time by INPE in consultation with its partners and ESA.

Access will always be in a manner consistent with the overarching terms documented in the Arrangement.

4.3 ESA Support

4.3.1 Access to the Sentinel International Data Hub

ESA will grant INPE 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 TOA. 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 INPE with a username and password to access the IntDH. This username and password may be used only by INPE (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.



INPE 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, INPE will not misuse or interfere with the service of the IntDH portal. In particular, INPE 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, INPE 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 INPE 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 INPE via internet. If required, ESA supports network performance tuning to fully utilize available bandwidth.

In the same vein, ESA will provide appropriate interfaces to INPE regarding transfer data to INPE (and vice-versa) via the EllaLink submarine cable, once the latter will be available and suitable for these operations.

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).

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

4.5 Reporting

INPE 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 will have at least annual frequency, and will 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;
- INPE will provide feedback to ESA on the Copernicus data access mechanism.

INPE intends to allow the INPE Data Mirror Site to collect statistical information on Sentinel data re-distribution and analysis, and intends to cooperate with ESA on technical means for ensuring such data is formatted/structured to ensure it is of maximum value.

INPE intends to collect INPE Data Mirror Site user and use information, and report this information to ESA and the European Commission, consistent with the terms documented in the Arrangement.

In order to support the distribution of Sentinel data in Brazil and to share aggregated information with ESA and the European Commission, a simple and un-bureaucratic user registration process will be implemented.

As concerns the INPE Data Mirror Site usage statistics, the following minimum categories of information will 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

The above fields will 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
- Proportions of data delivered per utilisation domain and usage field.



The statistics will be provided for the reporting period and cumulatively.

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 the EU, in the future, designates Sentinel data as “sensitive”¹, 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 INPE, or a partner as indicated under Section 1.3 above, through the IntDH, in the event Sentinel data are assessed to be “sensitive” after the time of data download.

Where Sentinel data are identified as “sensitive”, INPE will endeavor to remove such data from the INPE Data Mirror Site noting that it will be unable to retract data already re-distributed.

5 INTERNATIONAL COMPLEMENTARY EXTERNAL VALIDATION SUPPORT

5.1 INPE Activity

INPE 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 the Copernicus Open Access Hub (<http://scihub.copernicus.eu>) to the project, or from the INPE Data Mirror site, described in Section 4.2 above. In the latter case, reporting and data governance are handled as per Section 4.5 .

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

¹ As defined in Art. 13 of the COMMISSION DELEGATED REGULATION (EU) No 1159/2013 of 12 July 2013 supplementing Regulation (EU) No 911/2010 of the European Parliament and of the Council on the European Earth monitoring programme (GMES) by establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES dedicated data and GMES service information



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/license 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 1,2, 3 and 5P core products (L1 and L2. LO only in special cases) as they become available to support joint validation and calibration activities.

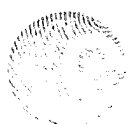
5.3 Reporting

Reporting regarding the complementary external validation activities will be defined in the related separate technical documentation.

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

6 DISCLAIMER

6.1 Access to data from the Sentinel missions is on an “as is” basis. ESA disclaims all conditions, representations and warranties of any kind, whether express, implied statutory or otherwise including, but not limited to what concerns the functionalities of the Data Hub and the data transferred. This disclaimer includes the warranties regarding availability, continuity, accuracy, integrity, reliability, fitness for or compatibility with a particular purpose or meeting the users' requirements, satisfactory results or non-infringement of third party rights.



6.2 ESA will not be held liable for any damage that may result from the support activities provided under this TOA, including in particular the functionalities of the Data Hub, the data transfer, and advice and communication by ESA personnel.

6.3 ESA may at any time review, modify, suspend or terminate the support activities under this TOA, including but not limited to on the occurrence of the following events:

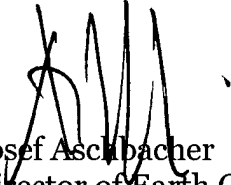
- (i) lack of sufficient funding for sustaining Sentinel missions, and associated facilities and activities,
- (ii) satellite or ground system failure,
- (iii) suspension or cancellation of planned activities of related Sentinel systems and facilities, in order for ESA or the EU to carry out activities considered of a higher priority.

6.4 ESA may modify the Sentinels' operations plans at any time, if it considers such corrective action necessary for ensuring the safety and success of the missions.

Done and signed in three originals, one for each Signatory to the TOA,

For the European Space Agency,

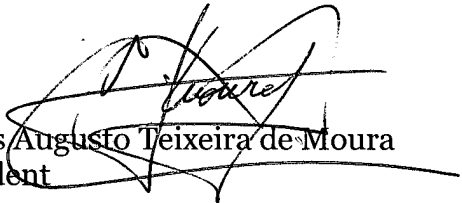
on this day, 25 February 2019



Josef Aschbacher
Director of Earth Observation Programmes

For the Brazilian Space Agency,

on this day, 14 March 2019



Carlos Augusto Teixeira de Moura
President

For the National Institute for Space Research,

on this day, 11th March 2019



Ricardo M. O. Galvão
Director



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 INPE 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 signing this TOA.

