

Copernicus Space Component

Technical Operating Arrangement

Between

***The European Organisation for the Exploitation of
Meteorological Satellites***


And

The University of Chile

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1 INTRODUCTION

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

According to Article 9 of the Regulation establishing the Copernicus Programme [AD-1], 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 Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Space Agency (ESA) on the implementation of the space component of Copernicus ('Copernicus Delegation Agreements').

These Agreements foresee that EUMETSAT and ESA shall provide support to the EU in matters concerning the international technical cooperation of the Copernicus Programme. In particular, EUMETSAT and ESA 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 EU.

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

EUMETSAT and ESA are responsible for the implementation of the TOAs, in coordination and subject to the prior agreement by the European Commission.

The implementation of the TOAs is facilitated by a joint 'Copernicus Cooperation Group', involving the European Commission, EUMETSAT, ESA, the European Environmental Agency (EEA) and international partners. The Copernicus Cooperation Group meets whenever necessary to oversee and stimulate cooperative activities (e.g. exchange of best practices, comparison of products, exchange of personnel).

2 BACKGROUND

EUMETSAT concluded in November 2014 a Copernicus Agreement with the European Union on the implementation of the Copernicus programme (hereinafter "Copernicus Agreement"). In accordance with Article 8 of the Copernicus Agreement, EUMETSAT shall implement and be responsible for subsequent technical actions with international partners on behalf of the European Commission.

The European Commission concluded in March 2018 a Cooperation Arrangement with the Republic of Chile on Cooperation on Earth Observation data related to the Copernicus programme, which may be complemented by separate TOAs", as necessary, between implementation agencies on both sides, including EUMETSAT and University of Chile, institution that was appointed as operator of the agreement by the Government of Chile.

3 PURPOSE AND SCOPE

The purpose of this TOA is to define the respective roles and responsibilities of EUMETSAT and the University of Chile to facilitate the mutual access to the Sentinel series of satellite data and the *in situ* data recorded by public Chilean institutions and to establish the terms and conditions under which they will cooperate to implement the exchange of data foreseen in the EU-Chile Cooperation Arrangement referred to in section 2 above.

EUMETSAT and University of Chile recognise that the European Union and the Republic of Chile are pursuing Earth observation activities in a number of areas of common interest and that sharing each other's satellite and/or *in situ* data on the basis of reciprocity should provide mutual benefits. Both sides acknowledge that access to data provided by University of Chile and its partners will bring added value to the Copernicus programme. EUMETSAT and University of Chile are committed to the principle of full, free and open access to European Sentinel data and products and to University of Chile *in situ* data and information, subject to applicable security restrictions.

The TOA is a non-binding document and describes technical operating arrangements (e.g. cooperative initiatives description, operational interfaces, required support) between University of Chile and EUMETSAT necessary to give effect to relevant aspects of the Cooperation Arrangement referred to in section 2 above.

Where other entities (e.g. Universities, Institutes) are involved in the arrangement on University of Chile or EUMETSAT side, University of Chile and EUMETSAT will act as the sole interface and contact point with such entities.

In the framework of this TOA:

- additional areas of technical cooperation related to delivery of Sentinel data and products and *in situ* data, agreed by EUMETSAT and University of Chile, may be included in the future, if relevant and with prior endorsement by the European Commission.
- regular technical meetings related to the delivery of Sentinel data products and the *in situ* data provided by University of Chile are intended to be held between EUMETSAT and the University of Chile (and other key holders as required). The European Commission may be invited as observer to such meetings and all relevant meeting documentation shall be forwarded to the European Commission for information.

This TOA will operate on the basis of voluntary non legally-binding cooperation without any exchange of funds and may be amended by written agreement of EUMETSAT and University of Chile. In the event that either EUMETSAT or University of Chile is unable to continue one or several of the activities described in this TOA, each party may discontinue participation in such activities after consultation with the other and after giving reasonable advance notice.

4 REFERENCES

An overview of the overall Copernicus dedicated Sentinel missions is available in the Sentinel Online portal at <https://sentinels.copernicus.eu/web/sentinel/home>. 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:

- Regulation (EU) No 377/2014 of the European Parliament and the Council of 3 April 2014 establishing the Copernicus Programme and repealing Regulation (EU) No 911/2010 (hereinafter "Copernicus Regulation")
- 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.
- Cooperation Arrangement between the European Commission and Under Secretary of Telecommunications of Chile on behalf of the Council of Ministers for Space Development of the Republic of Chile on Cooperation in the area of data access and use of Sentinel data of the Copernicus Programme, signed on 8 March 2018.
- Cooperation Agreement between the Under Secretary of Telecommunications of Chile and the University of Chile on the operation of the Agreement between the European Commission and the Republic of Chile referred to in the preceding paragraph, signed on 9 March 2018.
- Legal notice on the use of Copernicus Sentinel Data and Service Information from the European Commission
(https://sentinels.copernicus.eu/documents/247904/690755/Sentinel_Data_Legal_Notice).
- Copernicus Space Component Product and Data List (COPE-GSEG-EOPG-PD-14-0017 -
<https://sentinels.copernicus.eu/documents/247904/685154/Sentinel+Products+List-Issue1-Rev1.pdf>)
- TD 15 - EUMETCast - EUMETSAT's Broadcast System for Environmental Data (EUM/OPS/DOC/06/0118)

5 SENTINEL MISSIONS EXPLOITED BY EUMETSAT ON BEHALF OF THE EU

5.1 Overview

EUMETSAT is the operator of the Sentinel-3 satellites, in cooperation with ESA, and delivers the Sentinel-3 marine mission, while ESA delivers the land mission.

EUMETSAT will also operate and exploit the Sentinel-4 and Sentinel-5 atmospheric missions implemented as part of its Meteosat Third Generation and EPS-Second Generation satellite systems.

EUMETSAT will also operate and exploit the Jason-CS/Sentinel-6 cooperative mission in cooperation with NOAA/NASA.

5.2 Sentinel-3 mission

The Sentinel-3 mission will provide high-accuracy optical, radar and altimetry data for marine and land services. It will measure variables such as sea-surface topography, sea- and land-surface temperature, ocean colour and land colour with high-end accuracy and reliability.

The full Sentinel-3 mission will consist of up to three satellites simultaneously in orbit. Sentinel-3 is a low Earth orbit, sun-synchronous satellite, with an inclination of 98.65° and a repeat cycle of 27 days. The full coverage and revisit time will be achieved with both Sentinel-3 A and -3 B being in orbit. The nominal mission life time is foreseen to be 7.5 years. The optical mission payload consists of the Ocean and Land Colour Instrument (OLCI) and the Sea and Land Surface Temperature Radiometer (SLSTR). The topography mission payload comprises the Ku-/C-band Synthetic Aperture Radar Altimeter (SRAL) and the Microwave Radiometer (MWR). These are complemented by three instruments for Precise Orbit Determination (POD): DORIS, a Doppler Orbit Radio positioning system, GNSS, a GPS receiver, providing precise orbit determination and tracking multiple satellites simultaneously, and LRR to accurately locate the satellite in orbit using a Laser Retro-Reflector system.

The EU has approved four models of Sentinel-3 (Sentinel-3A, -3B, -3C and -3D). The first model, Sentinel-3A, was launched on 16 February 2016. Sentinel-3B was launched on 25 April 2018. The launch dates for Sentinel-3C and -3D are yet to be confirmed, in consultation with ESA and the EC.

The specific data sets EUMETSAT will provide to University of Chile are described in Appendix A to this TOA.

6 EUROPEAN ACCESS TO UNIVERSITY OF CHILE DATA

In adherence to its data policy, University of Chile will provide to European users access to *in situ* data collected by Chilean institutions that agree to provide access to their Earth observation instruments. University of Chile intends to provide access to the Copernicus services to national observatory networks, including geophysical and meteorological networks, as agreements with the different Chile's agencies progress, to support the enhancement of the Copernicus data architecture and the development of global products. The preliminary list is contained in the "Roadmap for the Identification of Calibration/Validation Activities" in Appendix C to this TOA.

Where EUMETSAT, the European Commission and/or the EEA identify a desire to access *in situ* partner data to support calibration activities for Copernicus, or wishes to discuss complementary calibration/validation activities such as the Copernicus data access mechanisms, including the Copernicus Data Information Access Services (DIAS), University of Chile will act as a coordination point to facilitate such discussions. Where other entities are involved, University of Chile will act as the sole interface and contact point with such entities.

The specific data sets University of Chile will provide access to are described in Appendix A to this TOA.

7 TECHNICAL ARRANGEMENT INTERFACES

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

- a supplementary access to Sentinel Mission data, i.e. through specific data acquisition services (data hub to data hub), specific data (higher-level) products, mirror sites, etc, thus further valorising the Sentinel missions exploitation; and
- access to relevant partner data, i.e. through specific data acquisition services (data hub to data hub), specific data (higher-level) products, mirror sites, etc, thus further valorising the relevant networks of geophysical, meteorological, *in situ*, radiation and other Earth observation data.

This TOA provides a framework for specialised solutions addressing the Sentinel missions and the relevant instruments of the University of Chile and its partner institutions in the following main areas of cooperation:

1. Support to big Earth Observation data management;
2. Multi-sensor data integration;
3. Analysis ready data development;
4. Data discovery and data dissemination tools;
5. Technical support (calibration/validation)
6. Applications of Earth observation data in different research domains.

The above technical arrangement types address on the one side the Sentinel missions and on the other side relevant partner and associated institutions' data. Where access to partner in situ data is requested by the Copernicus programme, technical arrangements will be discussed and agreed between University of Chile and the European Commission and/or the EEA.

Technical arrangements are described in Appendix B to this TOA.

8 INTERNATIONAL ARCHIVING AND DISSEMINATION CENTRES

8.1 Involved entities

University of Chile intends to be the sole entity to establish a direct operational interface to EUMETSAT under this TOA. Other partners may be engaged as required, following prior consultation with EUMETSAT and the European Commission.

8.2 Activities

The primary activities will be to use Sentinel data for scientific study, to aid in the development of operational products and new applications from these data, and the production of operational products. Operational use includes both near real time use and delayed-mode science data in support of both research and applications.

8.3 EUMETSAT support

EUMETSAT grants University of Chile access to the EUMETSAT mechanisms providing NRT Sentinel-3 marine data products.

Access to the Sentinel-3 marine archived data and products are provided via a separated data access infrastructure not subject of this TOA. If required in the future, EUMETSAT and University of Chile may discuss specific campaigns, to be coordinated with other international partners, to transfer missing data. Such campaigns may also apply in the future to make reprocessed Sentinel data available.

All functionalities and contents offered by the EUMETSAT mechanisms are provided by EUMETSAT on a best efforts-basis. The transmission of content from the EUMETSAT mechanisms may be interrupted or delayed by EUMETSAT or a third party, in the event of technical constraints, such as the internet bandwidth.

8.4 University of Chile support

University of Chile will use the EUMETSAT mechanisms access only for the purpose of its activity in the initiative described above or agreed via separate arrangements. Through accessing and/or downloading available content, University of Chile will not misuse or interfere with the service of the EUMETSAT mechanisms.

9 INTERNATIONAL COMPLEMENTARY EXTERNAL VALIDATION SUPPORT

9.1 Activities

University of Chile intends to support, through a partner institution yet to be determined, complementary Sentinel-3 marine data and products calibration and assessment activities in collaboration with EUMETSAT with the aim of improving the quality of Sentinel-3 marine products, and optimising Sentinel-3 marine data and products to meet global, regional and local needs.

9.2 EUMETSAT support

EUMETSAT will provide to University of Chile sample data sets and satellite and sensor characterisation data for the sole use of supporting joint calibration and assessment activities. Description of such data, where needed, shall be provided in Appendix A to this TOA.

9.3 University of Chile support

Details of any calibration and assessment shall be described in separate documents, describing the involved entities, the scope of the calibration and assessment project, applied methodology, expected results and related use/licence conditions, geographic area of interest, mechanism for supply of Sentinel-3 marine data and products, time schedule and reporting

University of Chile may conduct these calibration and assessment projects together with partner entities. In such case, University of Chile will be the sole entity that will establish a direct operational interface to EUMETSAT under this TOA.

10 REPORTING

University of Chile will provide EUMETSAT all the necessary details requested to ensure compliance with the reporting requirements agreed between EUMETSAT and the EC.

In this regard, University of Chile shall keep EUMETSAT informed about the implementation of this TOA. Reporting shall be done at least annually, and shall as a minimum contain information regarding:

- Copernicus user registrations and use;
- Onward-dissemination of Sentinel-3 marine data and products, including user statistics of the Sentinel-3 marine data and products provided by University of Chile data hub; and
- Any changes to the agreed mechanisms that may have an impact on EUMETSAT's support to University of Chile activities.

Regarding usage, statistics related to University of Chile and all relevant third parties, the following minimum categories of information shall be provided to EUMETSAT as part of the annual reporting:

User account statistics, including:

- Utilisation domain (i.e. National Institutions-such as IMD, Researchers, Commercial-SME, education, other -please specify);
- Usage field (i.e. atmosphere, emergency, marine, land, security, climate, other - please specify);
- Estimated downstream users benefitting from the data downloaded: 0-10, 11-100, 101-1000, over 1000;
- Country of the account user.

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

Data dissemination statistics, including:

- Volume of data provided to users in near real time;
- Volume of data provided to users on delayed time;
- Total volume of data distributed;
- Data delivered per utilisation domain and usage field
- Total number of users registered.

11 GOVERNANCE

Sentinel data made available via EUMETCast, EUMETSAT CODA and the EUMETSAT EO Portal are governed by the legal notice on the use of Copernicus Sentinel Data and Service Information from the European Commission. University of Chile accepts these conditions implicitly by using or distributing the Sentinel data.

In the event that in the future specific Sentinel data are assessed by the EU to be “sensitive”, the access to such Sentinel data through the EUMETCast, EUMETSAT CODA and the EUMETSAT EO Portal and its use and distribution may be subject to different licensing conditions. This also applies for Sentinel data already received by University of Chile in the event Sentinel data are assessed to be “sensitive” after the time of data download.

APPENDIX A RECIPROCITY ON DATA EXCHANGE

1 UNIVERSITY OF CHILE ACCESS TO SENTINEL SATELLITE DATA, CALIBRATION DATA AND IN SITU DATA

EUMETSAT will provide to University of Chile Sentinel-3, level 1 and level 2, marine data and products and other Sentinel data distributed by EUMETSAT on behalf of the EU as described in the Copernicus Space Component Product and Data List.

This includes, but is not limited to the following:

Sea surface temperature (SST) from the Sea and Land Surface Temperature Radiometer (SLSTR) in netCDF format
Ocean colour (OC) from the Ocean and Land Colour Instrument (OLCI) in netCDF format, at full and reduced resolutions
Ocean Altimetry Products from the Synthetic Aperture Radar Altimeter (SRAL) instrument in netCDF format
Aerosol Optical Depth (AOD) and Fire Radiative Power (FRP) when available in netCDF format (when operationally available)

Further information on the list of products distributed by EUMETSAT and their formats is available from the EUMETSAT Product Navigator: <http://navigator.eumetsat.int/>

EUMETSAT will provide to University of Chile, for distribution to members of the Sentinel-3 Validation Team, sample data sets of the Sentinel-3 core products (e.g. L0, L1, L2) as per the Copernicus Space Component Product and Data List and satellite and sensor characterisation data as they become available for the sole use of supporting joint validation and calibration activities.

2 EUROPEAN ACCESS TO UNIVERSITY OF CHILE, CALIBRATION DATA AND IN SITU DATA

EUMETSAT and its European users will be provided access to data from networks of geophysical, meteorological and other *in situ* and Earth Observation data operated by University of Chile and its partners that can support the calibration and assessment of satellite Earth Observations and derived products, as well as derived input to the Copernicus services networks and other data and information of value to calibration activities and to the Copernicus services, may be made available to the Copernicus programme in accordance with national, estate/territory and organisation-level policies. A detailed roadmap for the availability of the data is described in Appendix C “Roadmap for the Identification of Calibration/Validation Activities”.

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

APPENDIX B TECHNICAL OVERVIEW**1 EUMETSAT MECHANISMS TO PROVIDE ACCESS TO DATA****1.1 DESCRIPTION OF MECHANISMS**

There are three EUMETSAT mechanisms to provide access to Sentinel-3 marine data and products to users, as described in Figure 1 below:

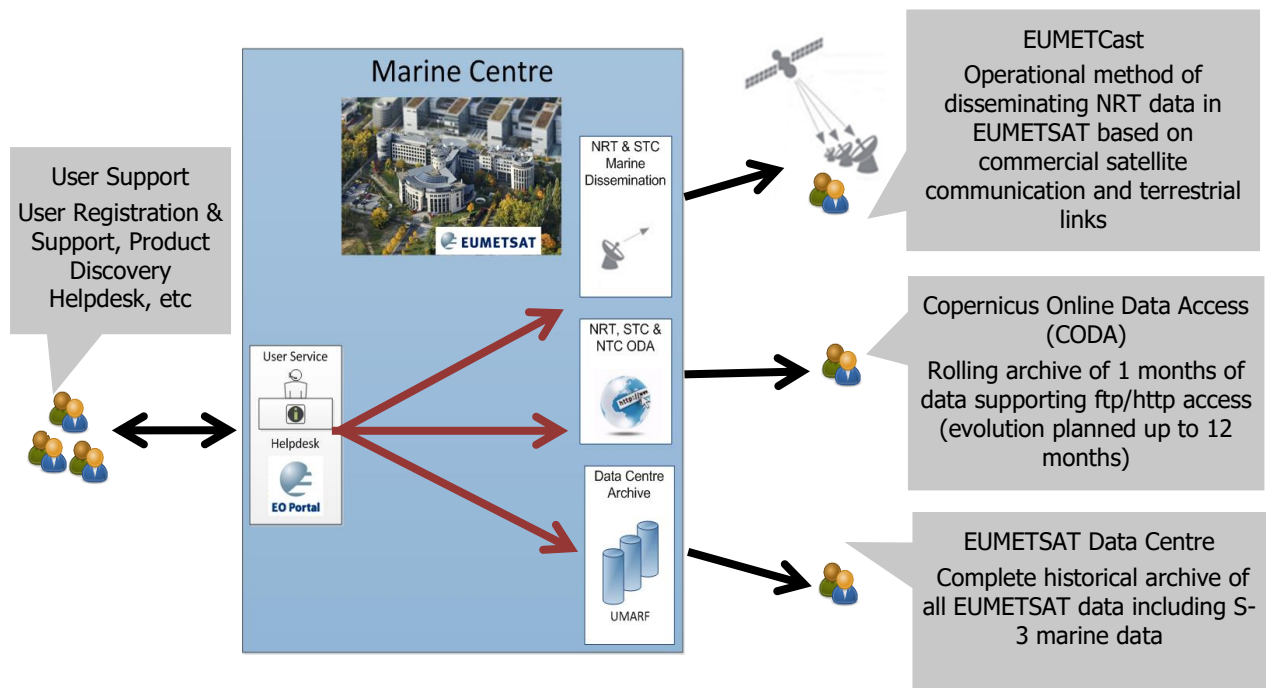


Figure 1: Access to Sentinel-3 marine data and products

The baseline mechanism for the transfer of Sentinel-3 marine data and products and other Sentinel data distributed by EUMETSAT on behalf of the EU is EUMETCast as per the TD 15 - EUMETCast - EUMETSAT's Broadcast System for Environmental Data.

The architecture of the EUMETCast system is presented in Figure 2 below.

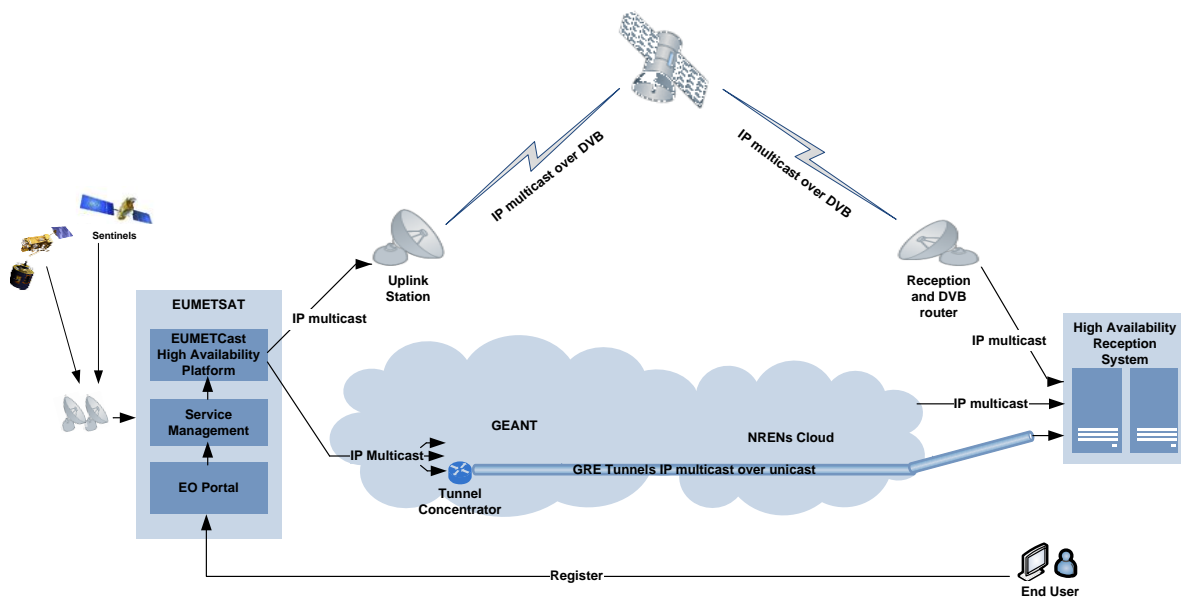


Figure 2: EUMETCast System Architecture

1.2 DATA TRANSFER

The baseline mechanism for the data transfer to University of Chile is EUMETCast-Terrestrial, using the mechanisms and terrestrial links. The data delivery is based on a Push model using Internet Protocol (IP) multicast allowing the users to receive the data at the end station as soon as it is available. Additionally, multicast has a one-to-many concept and is highly scalable on the number of users with a single transmission from the server.

The service is part of EUMETSAT operations and managed at EUMETSAT headquarters with the multicast server application hosted on a dedicated EUMETCast Platform, consisting of high-availability load sharing servers. The data is organized in multicast channels and the management of the bandwidth is achieved per channel and by the use of a priority scheme.

The files are disseminated using Digital Video Broadcasting - Satellite - Second Generation (DVB-S2) encapsulation on commercial telecommunication satellite networks and native multicast on terrestrial IP networks. The terrestrial network service has an extensive worldwide connectivity based on Source Specific Multicast (SSM). Unicast tunnels can encapsulate multicast IP packets and in this way bridge non-multicast enabled network parts, based on Generic Routing Encapsulation.

1.3 SYSTEM AVAILABILITY

The EUMETCast Terrestrial reception system is a high-availability system allowing the use of off-the-shelf, commercial and inexpensive equipment. The subscription to the entitled channels and the data storage can be customized and the data reception monitored on a web interface.

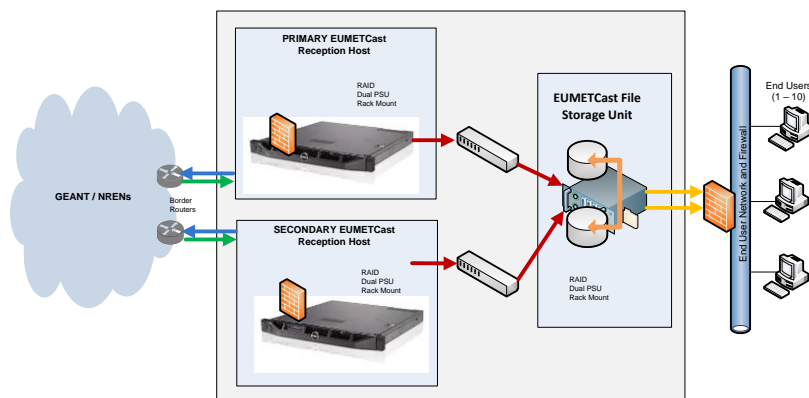


Figure 3: EUMETCast Terrestrial operational reception system

1.4 TIME SCHEDULE

EUMETSAT will provide Sentinel data sets as they become available in accordance with EUMETSAT data provision plan (e.g. after launch, commensurate with the ramp-up plan for data provision).

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

University of Chile plans to acquire Sentinel data from the EUMETSAT mechanisms as soon as it is available. At first, University of Chile plans to validate these data for scientific and operational purposes. As appropriate, these data is intended to be used to help generate operational environmental products.

2 UNIVERSITY OF CHILE MECHANISMS TO PROVIDE ACCESS TO DATA

2.1 DESCRIPTION OF MECHANISMS

The base mechanism to transfer the in situ data to be provided, both by the University of Chile, and by its partners that operate land and maritime data acquisition networks, will be the transfer of the files, be they from the individual measuring stations or from historical files, from the servers of the Center for Mathematical Modelling, operator of the National Laboratory of High Performance Computing (NLHPC). The www.datoscopernicus.cl server will maintain, to the extent that this is authorized by the different partner entities that produce

the data, an on line copy of above mentioned data to be obtained directly by European users. If this is not possible, URLs that directly point to the requested data will be kept on that server, so that the European user will not have to access a separate service, but will obtain the data directly in a single point of service perception.

2.2 DATA TRANSFER

The data will be transferred to EUMETSAT through the connection CMM-REUNA (Chilean NREN) -RedCLARA-GÉANT, through the use of wget commands, resulting in direct transfer from CMM servers (for most cases), or by redirecting the demand to the servers of the institutions that generate the data. The latter case will be sought to be avoided by developing agreements with the partner institutions that allow the University of Chile to distribute the data directly with due recognition to the institutions that generate them.

2.3 SYSTEM AVAILABILITY

The Server hosting the Web Service is part of the National High Performance Computing Laboratory (NLHPC), a system committed to high availability with continuous 7x24 operation, 365 days a year. The storage system is periodically backed up and has service restoring policies in a maximum of 4 hours for complex failures. The data is further supported at the sites of the partner institutions that are primarily responsible for the collection and distribution of the data.

2.4 TIME SCHEDULE

The commissioning of the different data sets will follow the schedule established in Appendix C "Roadmap for the Identification of Calibration/Validation Activities". Schedule that is already in development, so the first on-site data sets will be available immediately after the signing of this TOA has been completed.

APPENDIX C**ROADMAP FOR THE IDENTIFICATION OF
CALIBRATION/VALIDATION ACTIVITIES**

Copernicus Data Hub Chile

Roadmap for the Identification of Calibration/Validation activities

April 2019

1. Introduction

The University of Chile is Chile's oldest and most prestigious university. It is a state owned university and as such it has traditionally carried out several tasks of national interest. The University of Chile was the institution leading the first satellite tracking station from 1959 on and it has been leading Chile's development in Astronomy that has lead to its current position of being the house of a large part of the Astronomical instruments of the World. This is also the case of the National Seismology Service (www.csn.uchile.cl) providing seismic information and managing the national network of seismic stations and several other initiatives such as the Center for Science of Climate and Resilience (CR2, www.cr2.cl) and several other initiatives. The University of Chile is currently the house of Chile's National High Performance Computing hosted and operated by the Center for Mathematical Modelling (CMM, www.cmm.uchile.cl), where the Copernicus Repository is being deployed.

This preamble is important, since although the University of Chile is not the owner of the in situ data that Copernicus is interested in, this institution plays in Chile a central role in the development of initiatives of national interest and is recognized as such by all public bodies.

In order to organize the in situ data, CMM as the University of Chile department in charge of the task is currently working in establishing a series of agreements with Ministries and Government bodies that will allow it to make that data available to the Copernicus users and the world in general.



University of Chile's Rector Ennio Vivaldi and Minister Felipe Ward show the agreement signed on March 19, 2019

In particular, the University of Chile has recently signed an agreement with the Ministry of National Assets (Ministerio de Bienes Nacionales), organization that coordinates Chile's Spatial Data Infrastructure, IDE Chile (<http://www.ide.cl/>).

Through this agreement a large amount of Chile's public spatial data will be made available in the near future. To do this, technical and specific agreements will be needed, but the basis for the construction of such agreements is already in place.

2. Preliminary list of Agencies Managing In Situ Data

As indicated in the introduction, a large amount of Chile's spatial data is already available through IDE Chile (<http://www.ide.cl/>) but all information is in Spanish and there are several organizations that do not publish all their information through the IDE Portal. To mediate these facts, the plan we are putting in place consists of reaching agreements with the institutions and convince them to provide access to all their data through the Copernicus Repository. In the following paragraphs we describe the first data sets that we plan to make available within this year.

2.1. National Seismology Service of the University of Chile

The National Seismology Center (Centro Sismológico Nacional, CSN) of the College of Physical and Mathematical Sciences of the University of Chile is the national technical organization monitoring the seismic activity along Chile's national territory. CSN's mission is to deliver data and seismic information with high quality standards and in a timely manner to the Chilean Office of Emergency management of the Ministry of the Interior and Public Safety of Chile (ONEMI), to the Hydrographic and Oceanographic Service of the Navy (SHOA), to public authorities, the scientific world, experts in disaster prevention, management and seismic risk reduction, as well as the community at large.

The Service provides information registered by a network of seismographs, accelerometers and GPS stations along the Chilean territory. See below the maps showing the locations of GPS stations and seismometers. For further information (in Spanish) see: <http://www.csn.uchile.cl/red-sismologica-nacional/introduccion/>



GPS Stations managed by CSN



Seismometers managed by CSN

The data is currently available from CSN's website, we plan to integrate its data and make available through webservices at the Copernicus Repository Website (www.datos-copernicus.cl) 4 months after the Repository becomes fully operational.

2. 2. National Air Quality Monitoring System of the Ministry of the Environment

National Air Quality Monitoring System (SINCA) is in charge of providing Air Quality information for public use along all of Chile. SINCA provides access to its on line measurement stations (hourly non validated and daily validated) as well as time series with validated meteorological and air quality data. The location of the measurement stations is shown in the map below:



The measurement stations deliver periodic measurements of the following air quality parameters:

PM 2,5 PM 10 O₃ SO₂ NO₂ CO

The following meteorological parameters are also measured by some of the stations:

Temperature	Pressure	Wind direction	Wind speed
Relative humidity	Rain	Global Radiation	HR
Solar Radiation			

The data is currently available in the SINCA website at <https://sinca.mma.gob.cl/index.php/redes>.

Our goal in the Copernicus Repository website is to reorganize the data to make it easier to access to it through webservices for direct use by GIS systems and introduce a uniform interface that in English to make the data available worldwide.

2. 3. Chilean Meteorological Directorate (DMC) of the General Directorate of Civil Aeronautics (DGAC)

The Chilean Meteorological Directorate (DMC) is an organization depending upon the General Directorate of Civil Aeronautics (DGAC) of the Chilean Air Force (FACH) is in charge of providing the basic and processed meteorological information as requested by Aeronautics and to provide meteorological and climate services the different socio-economic activities developed in the country. The DMC operates meteorological stations located along Chile as seen in the on line website: <http://www.meteochile.gob.cl/PortalDMC-web/index.xhtml> where for each one of Chile's regions a map such as the one below is deployed showing the locations of the measuring stations.



In the current version of the software a click on the station allows the user to deploy the status of the station at that time as show below



The parameters shown are: temperature, humidity, wind speed and direction, air pressure and daily rain. The Lat/Long position of the station is also displayed.

Historical data as well as daily data can be obtained from the DMC website
<https://climatologia.meteochile.gob.cl/application/diario/recienteEma/330121>

DMC operates also a national network of UV radiation measurement stations. The data from these stations can be obtained from <http://www.meteochile.gob.cl/PortalDMC-web/index.xhtml>

Recently, the University of Chile has signed an agreement with the Air Force (See photo below) to develop a series of initiatives in space technology, including Earth Observation Satellites and EO data that will allow the University to access this information for distribution through the Copernicus Repository website.



University of Chile's Rector and Air Force Commander in Chief sign collaboration agreement:

<http://www.uchile.cl/noticias/152016/u-de-chile-y-fach-desarrollaran-programa-espacial-nacional>

Our plan consists of integrating the data in English in our portal to access the data through webservices. Currently this can be done from their Geoportal, but the information is only available in Spanish.

2. 4. Organizations with Agreements in Progress

CMM is actively seeking agreements with institutions managing spatial data in Chile. The following institutions have already been contacted in order to access and publish their data. In some cases this will simply imply to integrate them in a common interface and get their data through already established web services, but in other cases more complex data curation and organization processes will have to be established. The following is the list of institutions that we are currently working with in order to establish agreements

- **National Service of Geology and Mining, SERNAGEOMIN.** (<https://www.sernageomin.cl/>) Is Chile's technical organization responsible for

generating, maintaining and disseminate basic geological and geological resources information, as well as geological hazards in Chile's national territory. SERNAGEOMIN is also responsible to monitor the observance of mining regulations, in particular with respect to security issues and potential hazards.

Among key information managed by SERNAGEOMIN is the activity of Volcanoes through the National Volcanic Surveillance Network which manages a network of accelerometers, seismometers and GPS stations installed at key volcanoes along the Chilean territory.

Preliminary conversations with SERNAGEOMIN have opened the door to a detailed work to be carried out in the coming months to reach an agreement on methodology to access and publish the data they collect everyday.

- **National Corporation for Forestry, CONAF** (www.conaf.cl). Is Chile's organization in charge of forestry resources in Chile. Its goals are:
 - The promotion, renovation and handling of the forests
 - The increase of the urban wooded areas
 - The mitigation and adaptation to the climate change
 - The monitoring of the observance of forestry and environmental regulations
 - The protection of vegetation resources and the management of National Parks and State protected areas.

Key information managed by CONAF is the forest registry of all Chile's territory and the surveillance of forest fires and related data.

As in the case of SERNAGEOMIN, preliminary conversations have been started to analyse the data they collect and study how it can be published in the Copernicus Repository Portal.

3. Preliminary Chronogram

The following is the basic Chronogram that we are committed to follow:

Service	Type of Data	M1	M2	M3	M4	M5	M6	M7	M8
CSN	Seismic and GPS Data								
SINCA	Atmospheric and Environmental								
DMC	Metheorological								
IDE	Several types of Spatial Data								