

Data Collection Services Handbook

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The present revision of the Data Collection Services Handbook has been coordinated by EUMETSAT, JMA and NOAA on behalf of the Coordination Group for Meteorological Satellites (**CGMS**). Some of the information presented in this Handbook has been collated from publically available material, including published manuals and webpages. In particular, the **Satellite Data Communication Handbook**, as well as **CGMS**, **EUMETSAT**, **NOAA**, **JMA** and **WMO** websites, were used extensively and sections from these sources have been reproduced. All used sources are listed in the Useful Links section of this Handbook.

A link to the electronic version of this Handbook is also provided in the Useful Links section.

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Introduction and Overview

Data Collection Services (DCS) are services, offered by meteorological Satellite Operators, that enable the relay of environmental data from Data Collection Platforms (DCPs) to end users, through the use of a Certified DCP Transmitter installed on the DCP.

Several meteorological Satellite Operators, namely the European Organisation for the Exploitation of Meteorological Satellites (**EUMETSAT**), the Japan Meteorological Agency (**JMA**) and the National Oceanic and Atmospheric Administration (**NOAA**), coordinate their Data Collection Service (DCS) activities through the Coordination Group for Meteorological Satellites (**CGMS**). This international coordination ensures global DCS coverage, apart from the Polar Regions.

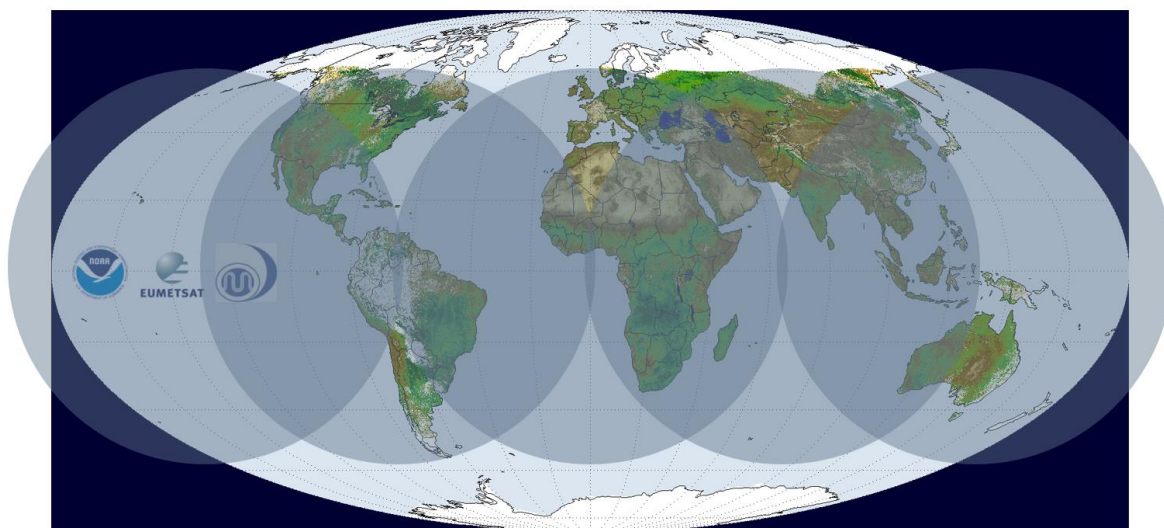


Figure 1 Data Collection Services - Coverage (EUMETSAT, JMA, NOAA)

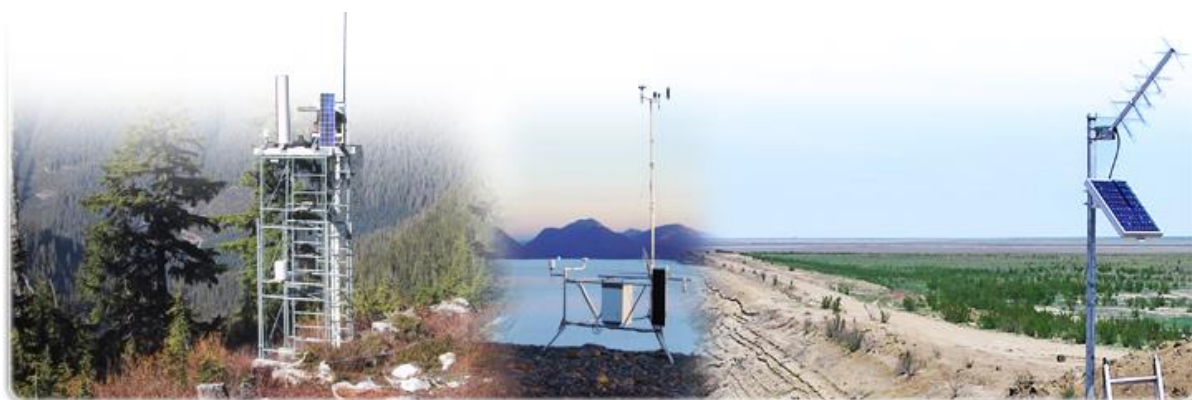


Figure 2 Data Collection Platforms with Certified DCP Transmitters (Credit: NOAA)

The Indian Space Research Organisation (**ISRO**), the China Meteorological Administration (**CMA**) and the Russian Federal Service for Hydrometeorology and Environmental Monitoring (**Roshydromet**) also operate proprietary Data Collection Services, but these are currently not covered in this Handbook.

Although Data Collection Services are supported by both geostationary and low earth orbiting satellites, their characteristics and applications are different. This Handbook focuses on the services provided from geostationary orbit. Information about services provided by low earth orbiting meteorological satellites can be found in the Useful Links section, under **Argos DCS**.

This is the first published edition of the **DCS Handbook**, created by CGMS with the aim of providing a short introduction to Data Collection Services and their purpose, as well as an overview of further sources for more in-depth DCS information. The Handbook is intended for potential Operators of Data Collection Platforms, who are interested in automated data collection from remote instrumentation located either on land or at sea, as well as DCS Data Users, and Certified DCP Transmitter Manufacturers. The Handbook is tailored to readers with no previous knowledge of DCS, to help them assess whether DCS could fulfil some or all of their remote data collection requirements and/or how to make use of the available Data Collection Services. It outlines key DCS information and directs readers to other available resources, which provide detailed specifications and guidelines.

The Handbook considers Data Collection Services and technologies in operation at the time of writing. Note, however, that the Handbook does not attempt to provide full details of the services provided by each individual satellite operator on a regional basis. Such details should be obtained directly from the Satellite Operators. Note also that the DCS Handbook does not replace the existing **International Data Collection System (IDCS) Users' Guide**.

1. WHAT IS A DATA COLLECTION SERVICE (DCS)

Data Collection Services (DCS) are services, offered by meteorological Satellite Operators, which enable the relay of environmental data from Data Collection Platforms (DCPs) to end users, through the use of a Certified DCP Transmitter installed on the DCP.

Data Collection Services are an important function of meteorological satellites (other functions include Earth imaging). Satellite Operators certify DCP Transmitters for use with their system. The Satellite Operator makes DCS possible through operating the meteorological satellite data relay, allowing DCP Transmitters to send data to a central ground station via the satellite for subsequent processing and distribution of the data to the end users. The distribution to end users is often achieved via the data networks of the World Meteorological Organization, but also via other terrestrial and satellite-based dissemination systems. The DCS is free to use if users adhere to the policies of the Satellite Operator. Generally, these policies dictate that collected data are made available to the world meteorological community, so that everyone can benefit from them.

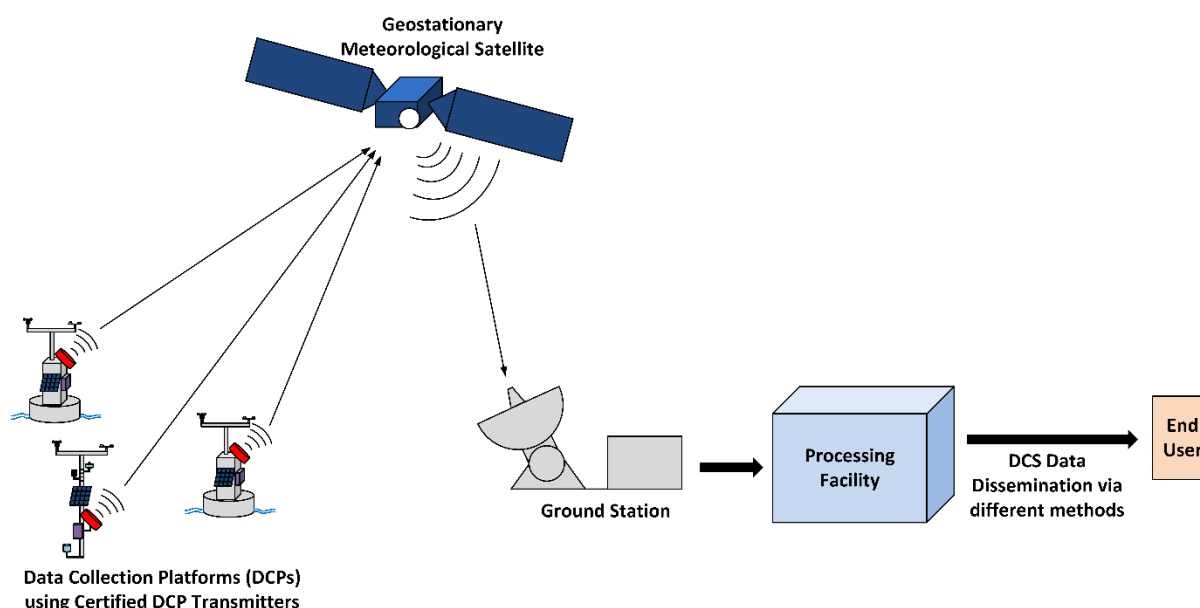


Figure 3 Data Collection Service (DCS)

1.1. WHAT IS A CERTIFIED DCP TRANSMITTER

The Certified DCP Transmitter is an integral part of the Data Collection Service (DCS). It is mounted on the Data Collection Platform and designed to transmit the data collected by the DCP to a meteorological satellite within its field of view, where the data are relayed back to Earth for processing and dissemination to the various end users. Certified DCP Transmitters can be purchased from specific DCP Transmitter Manufacturers, who have obtained certification for their DCP Transmitters from the

Satellite Operators. Links to lists of manufacturers who offer Certified DCP Transmitters can be found in the Useful Links section, under **Lists of Certified DCP Transmitter Manufacturers**.

A Data Collection Platform (**DCP**) can be any measurement facility, such as an automatic weather station or an ocean buoy, which collects environmental data through instruments/sensors. The instruments/sensors can measure different environmental parameters, such as wind speed, direction, rainfall, water level, temperature, seismic activity, fire index parameters, etc.

The DCP Transmitter allows for the automatic retrieval of data from the DCP, which can be particularly advantageous for data collection in remote locations. Certified DCP Transmitters can be installed on a DCP that is either static or mobile.

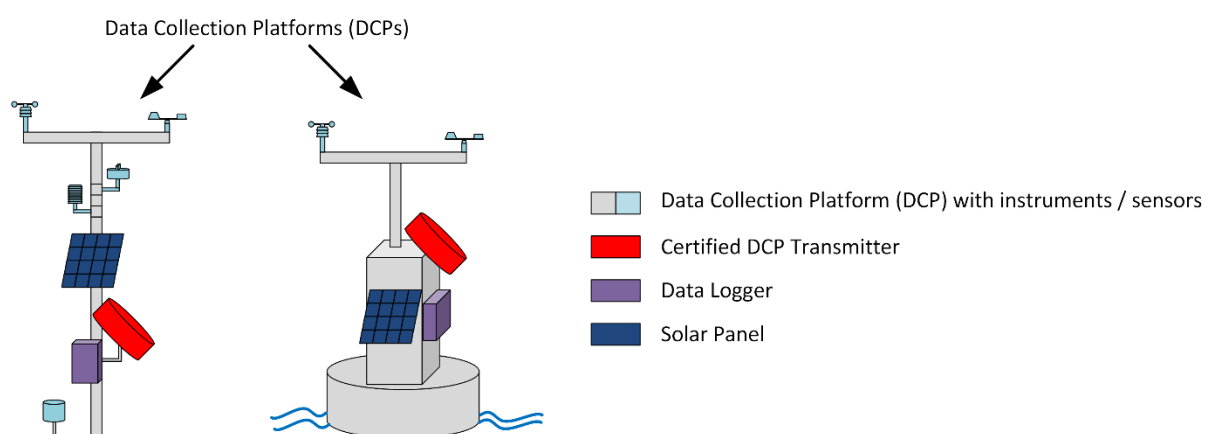


Figure 4 Data Collection Platform using a Certified DCP transmitter

1.2. WHAT ARE THE APPLICATIONS OF A CERTIFIED DCP TRANSMITTER

The Certified DCP Transmitter can have a variety of applications, depending on its type. The different types of Certified DCP Transmitters are described in detail in Section 6 Which DCP Transmission Types Exist.

Most commonly, a DCP Transmitter is set up to transmit data on a repeating pattern via a scheduled timeslot, e.g. it reports every hour or at regular intervals throughout the day. It is also possible to set up the DCP Transmitter to send an 'alert' message when a certain threshold is exceeded.

Some possible applications include:

- **Meteorological data collection from remote land sites at regular intervals**

The availability of meteorological observations from sparsely inhabited land areas is often poor. In such areas, the use of a Certified DCP Transmitter for automatic transmission at regular intervals can provide information that is essential for accurate weather prediction. Many such systems have been deployed across Africa under the sponsorship of the World Meteorological Organization (WMO).

- **Water resources management**

The management of water resources can be facilitated by making use of a Certified DCP Transmitter operating in Alert Mode. For example, a special message might be transmitted once a particular parameter threshold has been exceeded, i.e. to trigger actions in case of water quality issues or warn of an impending flood danger resulting from the high-water level of a river.

- **Tsunami warning system**

Tide-level data can be acquired from Certified DCP Transmitters situated on moored buoys, comprising a Tsunami Warning network. The DCP Transmitter messages can be used to confirm the absence or presence of a tsunami, following a seismic event. If a tsunami is detected, and when certain other criteria are met, warning messages can be distributed to the affected national authorities to activate emergency measures. UNESCO's Intergovernmental Oceanographic Commission (**IOC**) globally coordinates and fosters the establishment of regional tsunami warning and mitigation systems in the Pacific and Indian Oceans, in the North East Atlantic, Mediterranean and Caribbean seas.

- **Forest fire monitoring**

Certified DCP Transmitters can facilitate forest fire protection through regular transmission of fire index parameters, allowing for continuous real-time automated fire weather data. As an example, this type of functionality is used by organizations responsible for monitoring earth resources where observations are needed frequently and quickly, such as the U.S. Forest Service forest fire operations.

2. HOW CAN I USE THE DCS

2.1. ALL DCS ROLES AT A GLANCE

There are several ways to have a role in and/or benefit from the Data Collection Services, provided by the Satellite Operators (see Section 3 for more details on the role of the Satellite Operator):

- As a DCP Operator;
- As a DCS Data User;
- As a Manufacturer of Certified DCP Transmitters.

The following table and diagram can help you gain a basic understanding of which of the above three roles may apply to you, as a person/entity that can benefit from the DCS. Further details on each of these three roles can then be found in the following sub-sections.

*Table 1 All DCS uses/roles at a glance***

	DCP Operator*	DCS Data User*	Certified DCP Transmitter Manufacturer
Role Definition			
The technical manager of the Data Collection Platform, responsible for the DCP Transmitter setup, operations and ongoing maintenance.	✓	✗	✗
The end user of the data relayed and distributed through the Data Collection Services.	✗	✓	✗
The designer of the DCP Transmitter, who produces it, applies for its certification with the Satellite Operator and makes it available on the market for DCP Operators to purchase	✗	✗	✓
Benefits			
Benefits from automatic retrieval of data from the DCP, with cost reduction, security and ease of use. Benefits from reliable and robust satellite communication provided by geostationary satellites.	✓	✗	✗
Can access environmental data from DCPs that are placed in remote locations, such as sparsely inhabited land areas or buoys, where availability of meteorological observations is often poor.	✗	✓	✗
Can advertise the transmitters as compatible for use with the DCS offered by meteorological Satellite Operators	✗	✗	✓

* The DCP Operator and the DCS Data User are often the same person/entity.

** Note: Data Collection Services are provided by meteorological Satellite Operators, whose role is to ensure a reliable and continuous Data Collection Service (see Section 3 for more details on the role of the Satellite Operators).

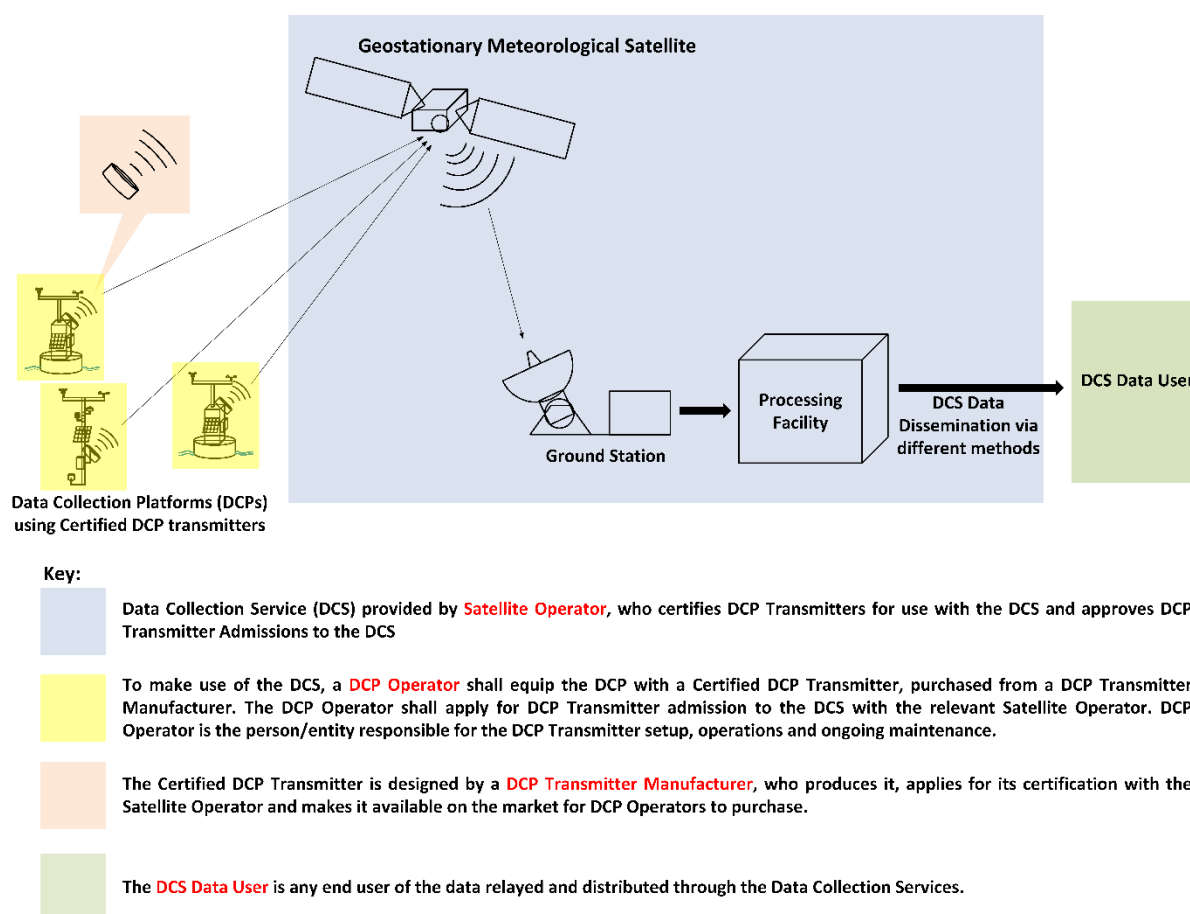


Figure 5 All DCS roles/uses at a glance

2.2. WHO IS THE DCP OPERATOR

• What is the role of a DCP Operator using the DCS

A DCP Operator is the technical manager of the Data Collection Platform. To make use of the DCS, the DCP Operator shall equip the DCP with a Certified DCP Transmitter, purchased from a DCP Transmitter Manufacturer. In the context of DCS, the DCP Operator is the person/entity responsible for the DCP Transmitter setup, operations and ongoing maintenance. The DCP Operator interfaces with the Satellite Operator throughout the lifetime of the DCP Transmitter. Technical parameters required for the transmission of data are the responsibility of the DCP Operator, who should be familiar with the equipment operation policies of the relevant Satellite Operator. A DCP Operator is not necessarily the owner of the DCP, nor the area on which it is situated. The DCP Operator is often the user of their own DCP Data.

• What are the benefits of using the DCS as a DCP Operator

Through equipping their DCP with a Certified DCP Transmitter and using the DCS, a DCP Operator can receive information from their remote DCP and benefit from:

- **Reliability and robustness**

Data Collection Services are provided by geostationary satellites and therefore benefit from reliable and robust satellite communication. As DCS do not use terrestrial communication networks, they are less likely to be affected by environmental challenges (such as storms, earthquakes, etc.). Due to their reliability and robustness, Data Collection Services are sometimes used in addition to using terrestrial communication networks. In those cases, installing a Certified DCP Transmitter on the DCP can provide redundancy and increase reliability of data transmission.

- **Reduction in site visits**

DCP Transmitters are highly autonomous and reliable. Therefore, after initial installation only periodic maintenance visits are usually the extent of operator involvement. This can be particularly beneficial for data collection from sites that may not be accessible to humans during parts of the year.

- **Global coverage**

DCS provide global coverage, with the exception of the Polar Regions, which allows for the transmission of data from DCPs located in remote areas and enables more geographically complete environmental monitoring.

- **Low data latency**

Data Collection Services are provided by geostationary satellites, which remain 'fixed' over one point on the Earth's surface and are therefore always visible from the DCP Transmitter. This results in low data latency.

- **Ease of use**

Once the DCP Transmitter is operational, there is minimal maintenance related to the use of the Data Collection Service itself. The maintenance is primarily related to the upkeep of the DCP.

- **Cost**

Data Collection Services are free to use, with the primary cost being the initial capital outlay when purchasing the Certified DCP Transmitter. In contrast to using manual data collection methods, DCP Transmitters remove the need for manual retrieval through a visit to the DCP site and reduce commitments to travel expenses and resources.

- **Security**

Data Collection Services replace the need for research individuals to visit remote, inhospitable or dangerous sites in order to retrieve environmental data.

- **Satellite Operator commitment**

The meteorological Satellite Operators are committed to the long-term provision of DCS, as evidenced by the investment in DCS related hardware, embarking of DCS in future meteorological satellite programs and improvements to the speed and accuracy of data communication.

- **What should a DCP Operator consider when deciding to use the DCS**

In addition to assessing all the potential benefits, to establish whether the DCS can fulfil their data retrieval needs, a DCP Operator should take into consideration the:

- Geographical coverage of the DCS. Refer to Section **3.4** What is the DCS Coverage.
- Type of DCP Transmitters available. Refer to Section **6** Which DCP Transmission Types Exist.
- Data Policies of the Satellite Operator for use of DCS. These policies usually dictate that collected data are made available to the world meteorological community, so that everyone can benefit from them. Generally, DCS shall only be used for the collection of environmental data by governmental and/or non-profit users. In some cases non-governmental environmental use of DCS may be authorized where there is a government interest in the collection and/or receipt of the data. For the exact Data Policy of each Satellite Operator, refer to Useful links section, under **Satellite Operators – Data Policies for DCS Use**.

Taking these considerations into account will help the DCP Operator determine whether the use of DCS is appropriate for their use case.

- **What are the responsibilities of a DCP Operator using the DCS**

The success of the DCS is dependent upon all DCP Operators managing their Certified DCP Transmitters in accordance with the procedures of the respective Satellite Operator. It is therefore important that DCP Operators rectify any problems with their DCP Transmitters as quickly as possible to minimize any impact on other users of the DCS.

DCP Operators are responsible for performing regular checks on their DCP Transmitters to ensure that they are transmitting in accordance with the agreed transmission schedule.

They are also responsible for immediately responding to communications from the Satellite Operator, such as notifications of out-of-slot transmissions or bad transmission characteristics. Normally the DCP Operator is expected to be able to correct any invalid transmissions and any malfunction interfering with normal DCP Transmitter operations within 72 hours.

DCP Operators also inform the Satellite Operator of any change in the status of their DCP Transmitters that might result in them not transmitting for an extended period of time (e.g. greater than three months).

DCP Operators are also expected to immediately inform the Satellite Operator if the transmission timeslots are no longer required or if they no longer intend to operate their DCP Transmitter. The timeslots can then be de-allocated and assigned to another DCP Operator.

- **How can a DCP Operator start using the DCS**

To make use of the DCS, a DCP Operator shall equip the DCP with a Certified DCP Transmitter, purchased from a DCP Transmitter Manufacturer. Links to lists of manufacturers who offer Certified DCP Transmitters can be found in the Useful Links section, under **Lists of Certified DCP Transmitter Manufacturers**.

In addition, to start using the DCS, the DCP Operator shall apply for DCP Transmitter admission to the DCS with the relevant Satellite Operator. The applicant should be the person/entity who is actually going to operate the DCP, as opposed to just own it.

The exact DCP Transmitter admission process can vary depending on the Satellite Operator, but it usually requires that the DCP Operator complete an Admission Form, detailing the DCP Operator contact information, DCP location and application, type of DCP Transmitter, and other technical information. Specific information on the admission processes of example Satellite Operators can be found in the Useful Links section, under **DCP Operator – DCP Transmitter Admission to the DCS**.

The Satellite Operator assesses the admission application, after review of the Admission Form and further coordination with the other Satellite Operators and with WMO. Upon successful admission of the DCP Transmitter to the DCS, the Satellite Operator shall notify the DCP Operator of the allocated timeslot, frequency and address.

2.3. WHO IS THE DCS DATA USER

• What is the role of a DCS Data User

A **DCS Data User** is any end user of the data relayed and distributed through the Data Collection Services. There are generally two types of DCS Data Users:

- The DCS Data User whose requirements for specific type(s) of data from a specific location have resulted in the installation of a DCP using a Certified DCP Transmitter. The DCP has been set up to cater for their requirements. When the DCP is equipped with a Certified DCP Transmitter, this person/entity can then retrieve their required data through the dissemination mechanisms offered by the DCS. This is the most common type of DCS Data User. An example of this type of DCS Data User would be a federal agency wanting to assess water levels across chosen remote sites. DCS could even be used for such diverse applications as an amateur beekeeper wanting to monitor temperature levels in their local hives. A variety of users can make use of DCS data despite the difference in scale of application. The DCP Operator and the DCS Data User are often the same person/entity.
- A DCS Data User can also be a member of the wider meteorological community that makes use of existing data made available through the DCS data dissemination mechanisms. The Satellite Operator policies generally dictate that data relayed and distributed by the DCS are made available to the wider world meteorological community, so that everyone can benefit from them. As an example, Tsunami warning centers can use DCS data from several networks of ocean buoys.

• What are the benefits of using the DCS as a DCS Data User

As a DCS Data User, one can access environmental data from DCPs that are placed in remote locations, such as sparsely inhabited land areas or buoys, where availability of meteorological observations is often poor. The DCS provides access to a broader suite of parameters than can be currently observed

using satellite radiometers. DCS data can also be utilized for calibration of satellite instruments and as empirical data ingested directly into Numerical Weather Prediction Models.

- **How can a DCS Data User start using the DCS**

The data relayed by the DCS are distributed to end users via various different methods. Most Satellite Operators make DCS data globally available on the Global Telecommunication System (GTS), a data network of the World Meteorological Organization (WMO), which allows interested users to request access to the DCS data through their local National Weather Service. Satellite Operators may also make DCS data available via other proprietary methods, through terrestrial (e.g. Internet) and near real-time (e.g. satellite-based) dissemination systems. It should be noted that no software is provided for the accessing or decoding of DCS data, this responsibility lies with the DCS Data User.

The different methods for retrieving DCS data are described in more detail in Section 4 How do I retrieve DCS Data.

2.4. WHO IS THE MANUFACTURER OF CERTIFIED DCP TRANSMITTERS

- **What is the role of the Manufacturer of Certified DCP Transmitters**

The Manufacturer of Certified DCP Transmitters is the designer of the DCP Transmitter, who produces it, applies for its certification with the Satellite Operator and makes it available on the market for DCP Operators to purchase. Whenever a new or modified DCP Transmitter is brought onto the market, it must be certified by the Satellite Operators for use with the Data Collection Services. A Certified DCP Transmitter, which is to operate with any of the geostationary meteorological satellites, needs to be carefully designed by the Certified DCP Transmitter Manufacturers to provide reliable and stable operations, which should never disturb the integrity of the overall Data Collection Service.

- **What are the benefits of being a Manufacturer of Certified DCP Transmitters**

A Manufacturer of Certified DCP Transmitters can advertise the transmitters as compatible for use with the DCS offered by meteorological Satellite Operators. Once a DCP Transmitter has achieved type certification, it may be marketed without the need for further certification, provided the design is not altered in any way and that the DCP Transmitter meets the specified performance standards.

- **What are the responsibilities of a Manufacturer of Certified DCP Transmitters**

It may be necessary for the DCP Transmitter to undergo a series of tests to ensure that it is both technically and operationally compatible with current systems. In the event that any modifications or design changes are made which might affect the performance of the equipment, the Satellite Operator may require that a prototype, with full documentation of changes and modifications, be submitted for testing and re-certification.

- **How can a Manufacturer certify a DCP Transmitter for use with the DCS**

DCP Transmitter Manufacturers can certify their DCP Transmitter for use with the DCS through applying for certification with the relevant Satellite Operator.

The exact DCP Transmitter certification process can vary depending on the Satellite Operator, but it usually requires that the DCP Transmitter Manufacturer complete a DCP Transmitter Certification Form, detailing the DCP Transmitter Manufacturer contact information, DCP Transmitter model and serial number, type of DCP Transmitter, and other technical information (e.g. weight, size, power output, uplink frequency, etc.). This is usually followed by a requirement that the DCP Transmitter Manufacturer prepare a test plan and detailed test procedures for the Satellite Operator's review and agreement. Following successful laboratory testing, the DCP Transmitter Manufacturer should usually perform a test (e.g. 24 hours) using one of the satellites of the Satellite Operator. In that case, the Satellite Operator would assign the satellite and a test frequency in order to collect and analyse the messages transmitted during this "live" test.

The DCP Transmitter Certification is a "type certification" wherein a representative production unit is tested and found to fulfil all the requirements of the Satellite Operator. The testing of further production units with the same model number is therefore not required. However, where major design changes have been made, either to hardware or software, then either full or partial re-testing will be required. The extent of any re-testing shall be agreed with the Satellite Operator.

The Manufacturer shall receive a certificate once their DCP Transmitter has successfully passed all certification tests.

Specific information on the certification processes of example Satellite Operators can be found in the Useful Links section, under **DCP Transmitter Certification for use with the DCS**.

3. WHO PROVIDES THE DCS

3.1. WHAT IS THE ROLE OF THE SATELLITE OPERATORS

Data Collection Services are provided by meteorological Satellite Operators, whose role is to ensure a reliable and continuous Data Collection Service. The Satellite Operator makes the DCS possible through operating the meteorological satellite used for data relay from the Certified DCP Transmitters to a central ground station, and subsequently processing and distributing the data to the end users. Satellite Operators certify DCP Transmitters designed by manufacturers for use with their system. Satellite Operators assess and approve DCP Operator applications for admission to the DCS. They coordinate new DCP Operator admissions with the other Satellite Operators offering DCS and with WMO. Upon successful admission to the DCS, the Satellite Operator shall notify the DCP Operator of the allocated timeslot, frequency and address.

3.2. WHO ARE THE SATELLITE OPERATORS

EUMETSAT, JMA and NOAA are meteorological Satellite Operators offering Data Collection Services.

Table 2 Satellite Operators offering Data Collection Services

Agency	Satellite	Geographical coverage
EUMETSAT	Meteosat 0° and IODC satellites	Atlantic Ocean, Europe, Africa and the Indian Ocean
JMA	Himawari-8 satellite	East Asia and the western Pacific Ocean
NOAA	GOES-E and GOES-W satellites	North and South America, Pacific Islands, the Caribbean islands

ISRO, Roshydromet and CMA also operate Data Collection Services, but these are not covered in this Handbook.

More information specific to each of the Data Collection Services offered by EUMETSAT, JMA and NOAA can be found in the following sections of this Handbook.

3.3. WHAT ARE THE RESPONSIBILITIES OF THE SATELLITE OPERATORS

Satellite Operators are responsible for maintaining a continuous and reliable Data Collection Service, through ensuring nominal operations of the meteorological satellites relaying the DCS data, as well as the ground segment equipment used for processing and further distribution of the data to the end user.

The Satellite Operators are responsible for assigning DCP Transmitter addresses and managing the transmission schedules used by DCP operators. They monitor DCP transmissions to ensure they are

continuing to operate and occur in accordance with the agreed timeslots and characteristics. In cases of deviation from nominal operations, the Satellite Operator shall notify the DCP Operator.

Example DCP Transmitter performance and quality parameters monitored by the Satellite Operator are: start time, frequency offset, modulation index, carrier level, message length and number of detected bit errors. These parameters are included in the transmitted DCP messages.

Satellite Operators also monitor the performance of the whole DCS for external interference. If necessary, affected DCP Transmitters shall be re-allocated to another channel in coordination with the DCP Operator.

3.4. WHAT IS THE DCS COVERAGE

In order to transmit data to a satellite, the DCP Transmitter needs to be located under its footprint, and thus have a direct line of sight to the satellite. The Data Collection Services described in this Handbook are provided by meteorological satellites in geostationary orbit. Geostationary satellites are placed at an altitude of approximately 36,000 kilometers directly over the equator and remain ‘fixed’ over one point on the Earth’s surface, providing a relatively stable connection to terrestrial platforms. Some geostationary satellite networks may work at up to 75 degrees latitude with careful antenna siting, and with appropriate (and expensive) equipment, they can function at latitudes as high as 80 degrees (as has been achieved at Eureka Weather Station in the Canadian Arctic with two very large antennas, Skull Point and Upper Paradise). However, as a general rule, beyond 80 degrees the curvature of the Earth prevents the transmitter signal from reaching the satellite.

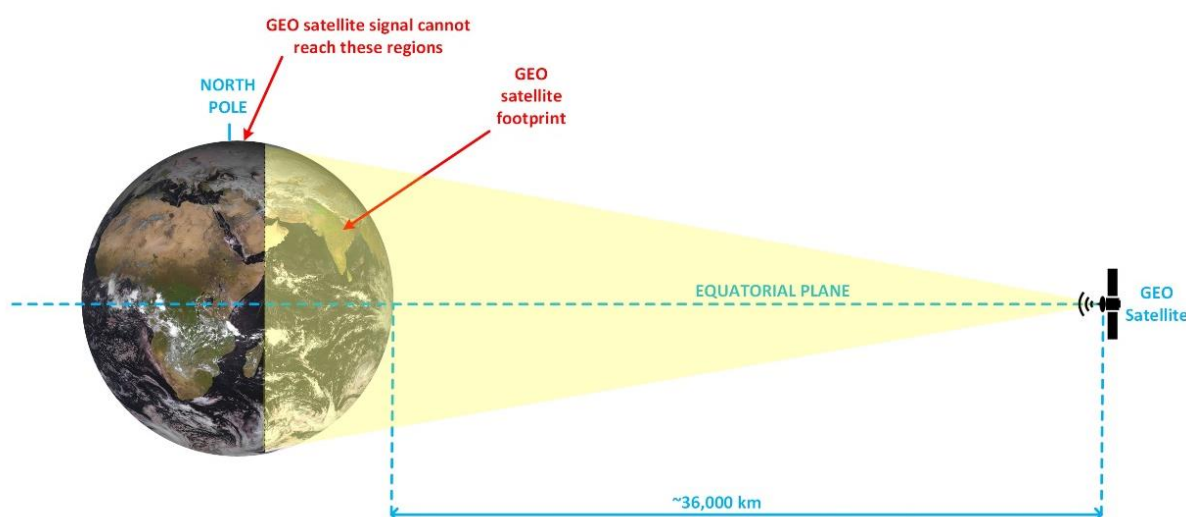


Figure 6 Signal coverage of a geostationary satellite (not to scale)

EUMETSAT, JMA and NOAA all operate their own geostationary meteorological satellites, which offer Data Collection Services. Together, their satellites distributed at different positions over the equator, achieve a truly global Data Collection Service, which provides almost complete network coverage, with the exception of the Polar Regions, where the curvature of the Earth interrupts the required line of sight between the platform transmitter and the satellite. The Polar Regions aside, the scale of coverage allows for the transmission of data from DCPs equipped with Certified DCP Transmitters located in remote and inhospitable areas, where regular physical access may not be feasible.

The following coverage map illustrates the global DCS coverage provided by EUMETSAT, JMA and NOAA. Although such published coverage maps are helpful to gain a basic understanding of the DCS coverage, it is advisable that the DCP Operator check directly with the Satellite Operator to verify that there are no coverage issues in the locations where their DCPs equipped with Certified DCP Transmitters are to be deployed.

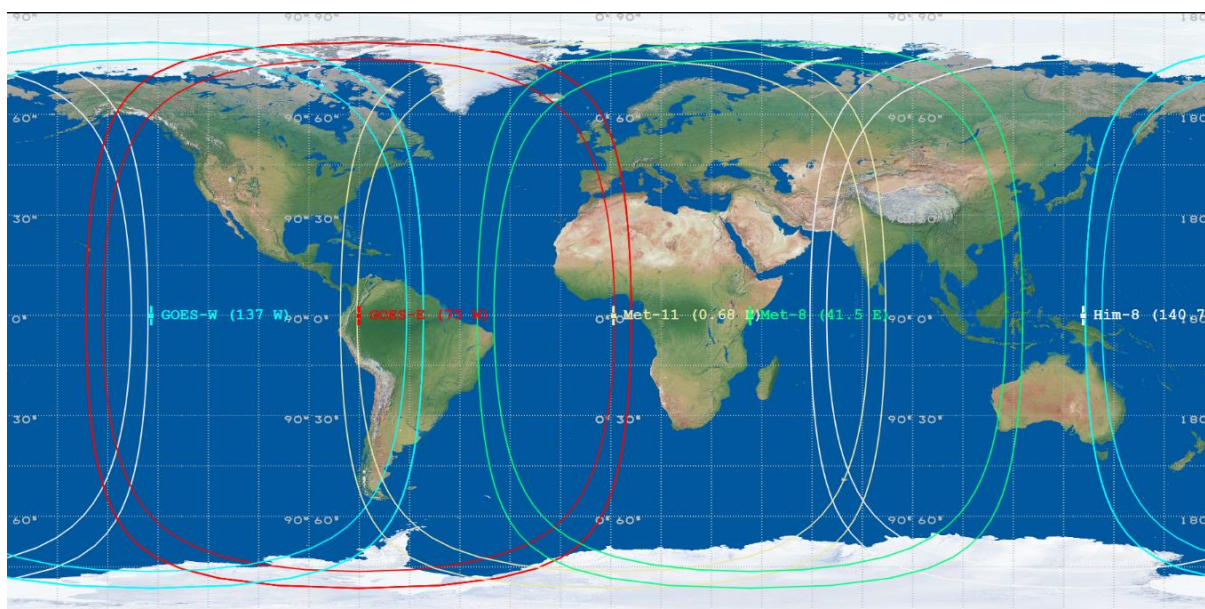


Figure 7 Global DCS Coverage of EUMETSAT, JMA and NOAA Geostationary Meteorological Satellites

3.5. HOW ARE DCS COORDINATED

The Coordination Group for Meteorological Satellites (CGMS) is the group responsible for global coordination of meteorological satellite systems. CGMS coordinates the Data Collection Services activities of EUMETSAT, JMA and NOAA. The frequency allocation for DCS data is coordinated by CGMS to ensure that the systems do not interfere.

CGMS promotes standards and interoperability/operational procedures to the CGMS agencies for the benefit of the user community of the DCS Regional (and International) systems.

CGMS has made a significant contribution to Data Collection Services and DCP Transmitters, including the development of a common standard for the International Data Collection Service (IDCS). Some of the DCS bandwidth on board all CGMS-coordinated meteorological satellites is reserved for the International Data Collection Service, which enables truly global DCS Coverage and allows DCP Operators to receive DCP messages from mobile DCP Transmitters moving between the footprints of the different satellites (e.g. DCP Transmitters on ships or aircraft travelling around the world).

CGMS continues its work in the development of future standards and best practices for DCS.

Further details on CGMS can be found in the Useful links section, under **CGMS**.

4. HOW DO I RETRIEVE DCS DATA

End users can retrieve the DCS data distributed by EUMETSAT, JMA and NOAA through a variety of methods. The general concepts of each of these methods are summarized below. Specific details of the proprietary DCS Data distribution methods of each Satellite Operator can be found in Section 5 Example DCS and their proprietary DCS Data Distribution methods.

4.1. DCS DATA RETRIEVAL VIA THE GTS

EUMETSAT, JMA and NOAA all make DCS data globally available on the Global Telecommunication System (GTS), a global data network of the World Meteorological Organization (WMO). The GTS network is at the heart of the WMO Information System (WIS), which links all 192 WMO Member States and territories with a dedicated, secure network and is used to transmit environmental data to meteorological services throughout the world.

DCS data retrieval via the GTS can be requested through the user's local National Weather Service. Through GTS, the DCS data relayed, processed and distributed by EUMETSAT, JMA and NOAA can be retrieved from anywhere within the WIS and are available for request through the National Weather Service in the respective country where the user is located.

The DCS Data distributed via the GTS is disseminated in the form of so-called DCP bulletins. The Satellite Operator processes the DCS data into DCP bulletins containing DCP messages. The Satellite Operator then forwards the DCP bulletins to their respective Regional Telecommunication Hub (RTHs), the entry point to the rest of the GTS network, thus allowing DCS data to be discovered and retrieved from anywhere within the WIS. To enable the routing of DCS data via the GTS, the DCP messages must adhere to the formats, structures and procedures as defined by the WMO. As a general rule, messages that are specified for immediate distribution are processed into bulletins and forwarded within a few minutes of reception.

The availability of GTS is the responsibility of the WMO. The Satellite Operators are only responsible for ensuring that the DCP bulletins reach the RTH within the specified timeliness. Further information on the GTS, WMO and WIS is provided in the Useful links section, under **Data Retrieval - GTS**.

4.2. NEAR REAL-TIME DCS DATA RETRIEVAL

Near Real-time retrieval of DCS data is also available depending on the Satellite Operator. Near real-time DCS data is made available to the user as soon as possible after collection and processing. Each Satellite Operator has a proprietary method for distribution of near real-time data, which can include satellite or terrestrial-based solutions.

4.3. INTERNET BASED DCS DATA RETRIEVAL

Internet based retrieval of DCS data is also available depending on the Satellite Operator. For instance, DCS data may be made available via e-mail or can be retrieved by the user through a dedicated website. DCS data on the web may not be available in near real-time. Each Satellite Operator has a proprietary method for internet based DCS data retrieval.

5. EXAMPLE DCS AND THEIR PROPRIETARY DCS DATA DISTRIBUTION METHODS

This section provides more information on the individual Data Collection Services offered by EUMETSAT, JMA and NOAA, as well as their proprietary DCS Data distribution methods.

5.1. METEOSAT DCS BY EUMETSAT

EUMETSAT is an intergovernmental organization dedicated to supplying weather and climate-related satellite data, images and products to the National Meteorological Services of its Member States in Europe, and other users worldwide.

The Meteosat DCS is one of the core services operated by EUMETSAT in support of meteorology and weather prediction. The service enables DCP Operators to use the Meteosat system to retrieve environmental data collected from DCP platforms. The Meteosat DCS, initially established with the first generation of Meteosat satellites, has continued and expanded with Meteosat Second Generation (MSG), and will also be incorporated on the future Meteosat Third Generation (MTG).

The Meteosat geostationary operational satellites are located at a longitude of 0° and over the Indian Ocean (IODC); hence the DCS can be used by all DCPs equipped with Certified DCP Transmitters situated within their telecommunications field of view. A realistic limit of this view is about 75° great circle arc of the sub-satellite point and corresponding to a ground antenna elevation of 5°. This field of view can extend to approximately 80° great circle arc, depending upon local topographical features.

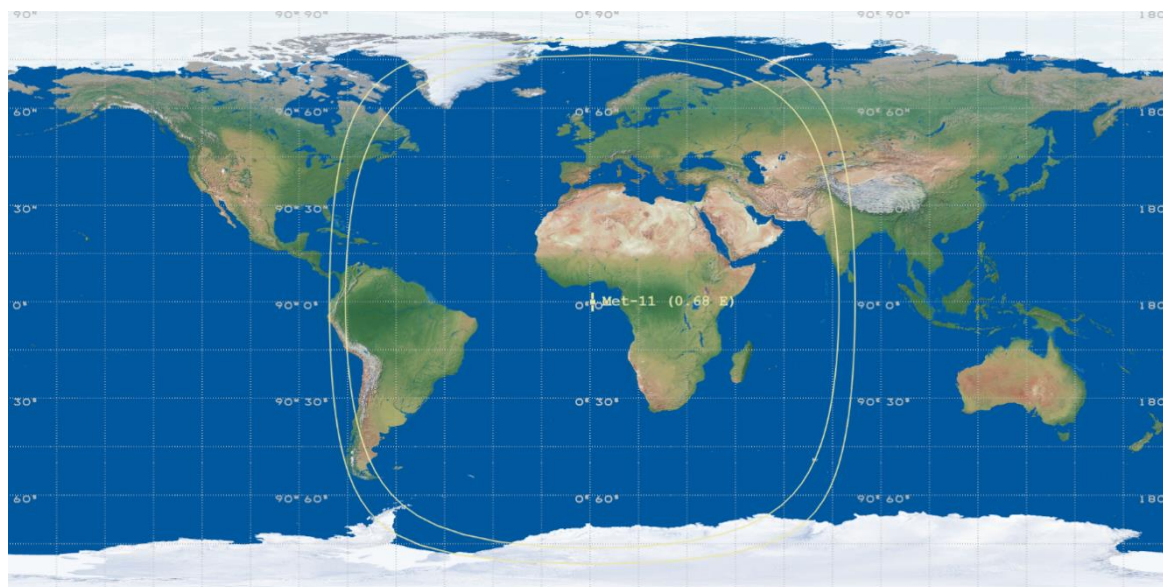


Figure 8 Meteosat 0° DCS Coverage Area

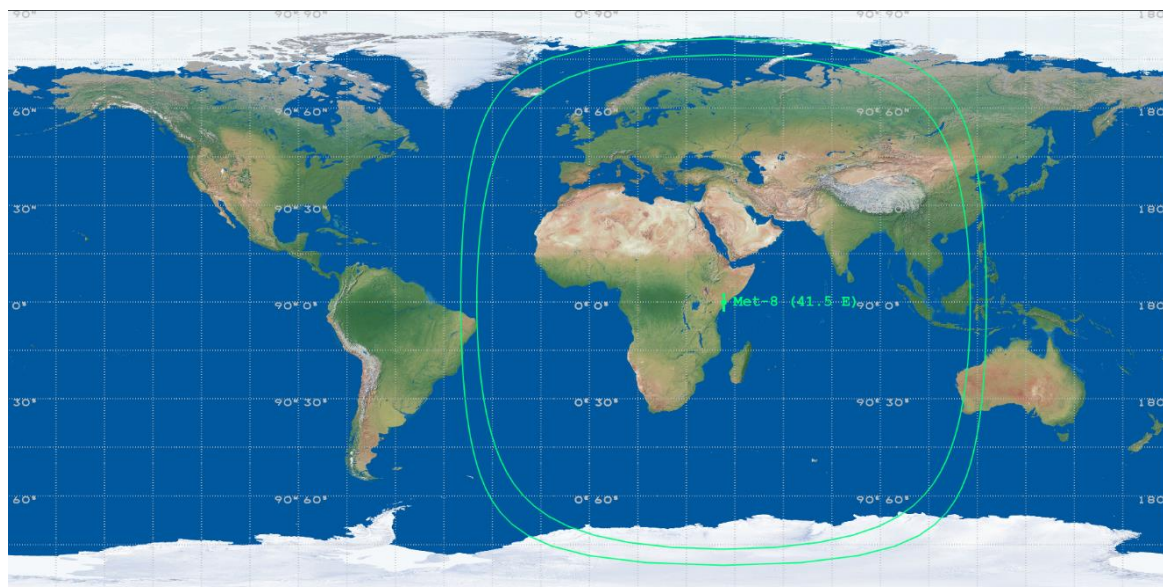


Figure 9 Meteosat IODC DCS Coverage Area

The following figure illustrates the Meteosat DCS operated by EUMETSAT. DCP messages from Certified DCP Transmitters within the Meteosat satellites fields of view, are relayed to the ground station and then routed immediately to the DCP Processing Facility (DCPF) at the Main Control Centre (MCC) in Darmstadt, Germany. The DCP messages are compared with the master list of expected DCP transmissions, processed and distributed to the end user through three different mechanisms.

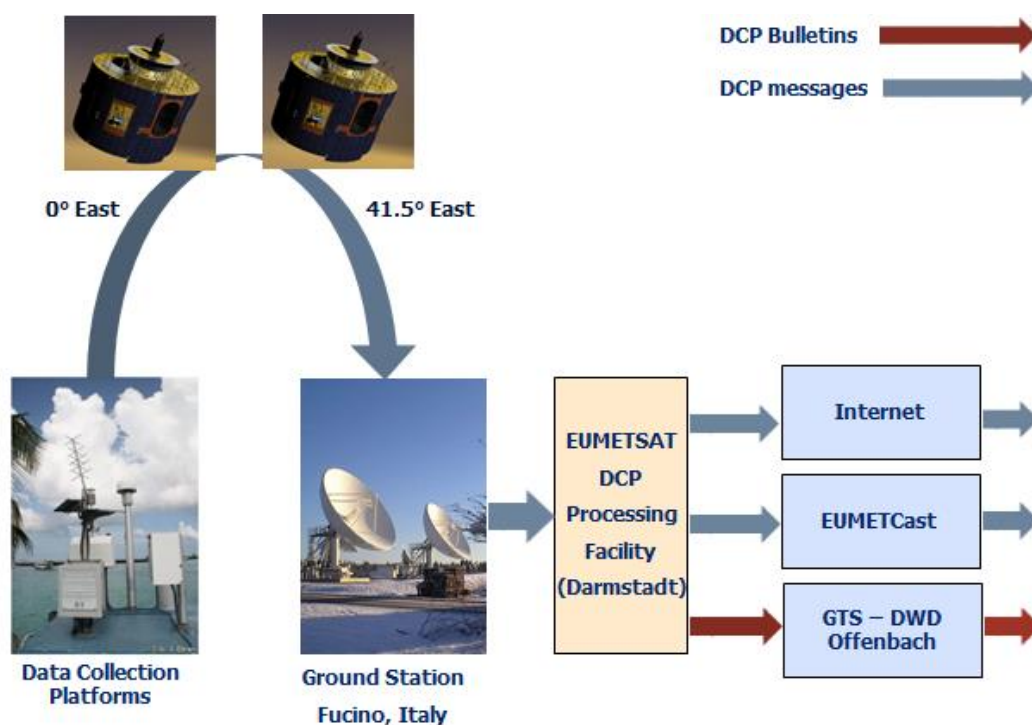


Figure 10 Meteosat Data Collection Service

The Meteosat DCS has approximately 120 DCP Operators located in 66 countries (Europe, Africa and Asia). There are over 1200 DCPs allocated with 60% transmitting at any time. Due to the remote locations and the seasonal use, many DCP Transmitters are inactive for several months during the year.

- **EUMETSAT DCS Data Retrieval**

EUMETSAT distributes DCS data to the end user through three different mechanisms: EUMETCast (EUMETSAT's data dissemination system), Internet and the GTS (refer also to Section 4.1).

EUMETSAT DCS Data retrieval through one of these three mechanisms is detailed in the EUMETSAT Product Navigator (EUMETSAT's Product Catalogue), which can be found in the Useful links section, under **EUMETSAT DCS Data Retrieval – Product Navigator**.

Further information on the Meteosat DCS can be found in the Useful links section, under **Meteosat DCS by EUMETSAT**.

5.2. GOES DCS BY NOAA

NOAA is an American scientific agency within the United States Department of Commerce that focuses on the conditions of the oceans, major waterways, and the atmosphere.

GEOS DCS is a “national critical” meteorological service operated by NOAA in support of environmental events monitoring. NOAA operates meteorological satellites at 75°W (GOES-East) and at 135°W (GOES-West).

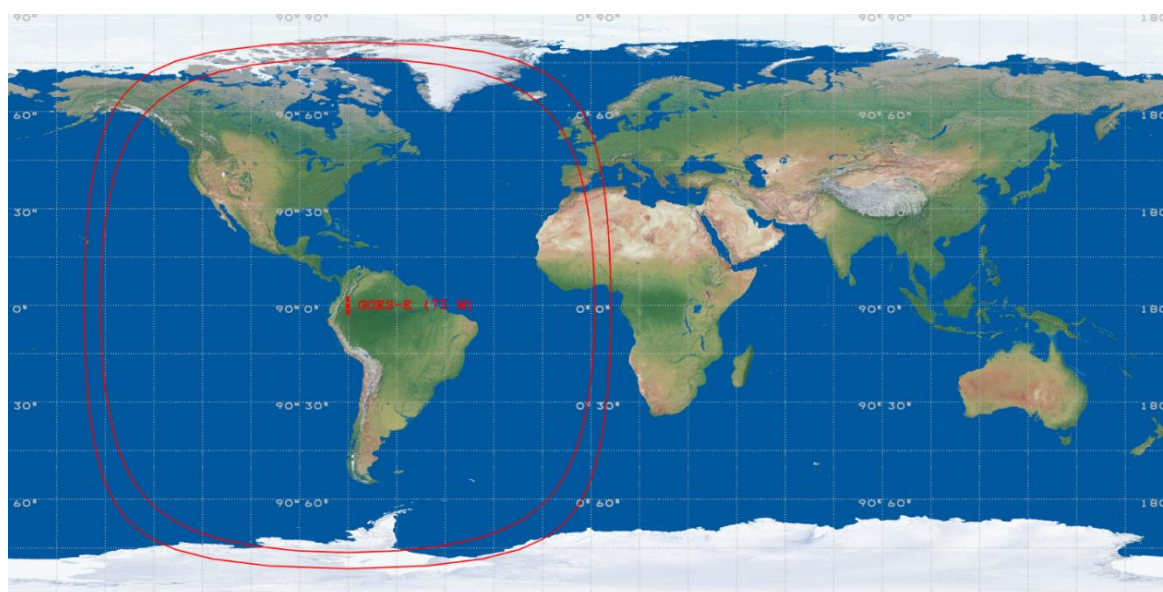


Figure 11 GOES-East DCS Coverage Area



Figure 12 GOES-West DCS Coverage Area

The following figure illustrates the GOES DCS operated by NOAA. DCP messages from Certified DCP Transmitters within the GOES satellites fields of view, are relayed to the ground stations at NOAA NSOF in Suitland, MD and NOAA WCDA in Wallops Island, VA, and then integrated automatically into NOAA's National Weather Service, through existing networks, to create better meteorological forecasts for the American public.

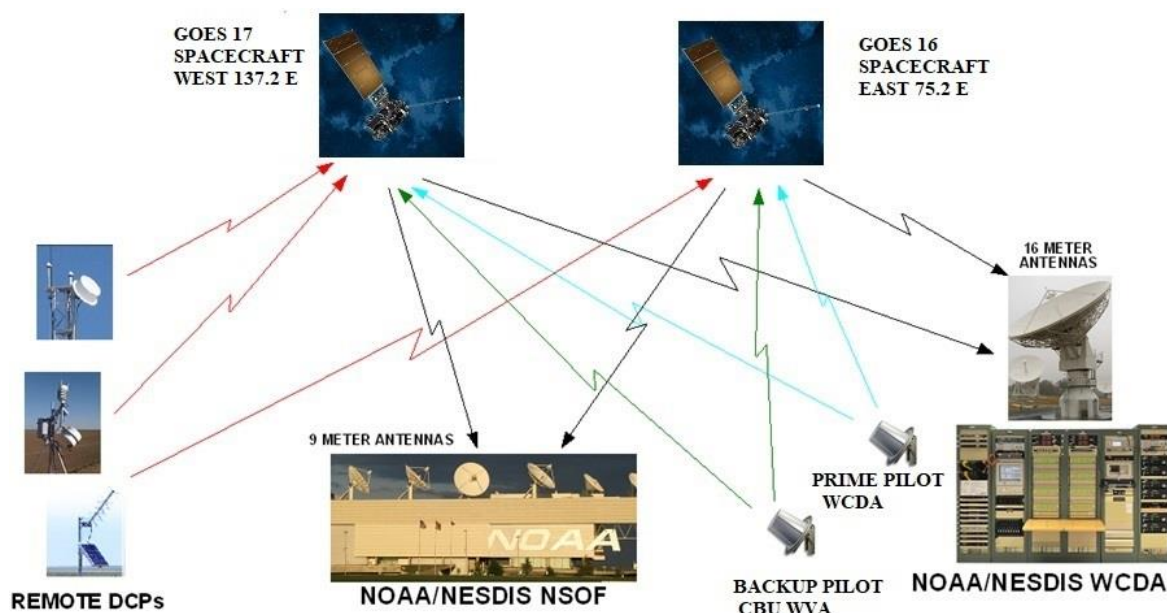


Figure 13 GOES Data Collection Service

The GOES geostationary meteorological satellites relay approximately 860,000 transmissions from 42,000 DCP Transmitters per day, containing an estimated 7.5 million observations. Events monitored through use of GOES DCS include floods, wildfires, tsunamis, earthquakes, hurricanes, tornadoes and droughts among others. GOES DCS provides the primary (and sometimes only) communications for sending and receiving this information. GOES DCS facilitates public safety and greatly benefits the U.S. economy, with return on investment in the billions.

Incorporating recent and planned improvements to their systems, the NOAA GOES DCS will be able to support triple or more of its present data capacity. In 2019 NOAA also improved the metadata appended to each DCP message resulting in higher data measurement quality control while reducing the older design's overhead by 25 per cent.

- **NOAA DCS Data Retrieval**

NOAA distributes DCS data to the end user through four different mechanisms: Domestic Satellite, Internet, e-mail and the GTS (refer also to Section 4.1). Several large users receive the messages directly from the satellite using the L-Band downlink.

More information on NOAA DCS Data retrieval through one of these mechanisms can be found in the Useful links section, under **NOAA DCS Data Delivery**.

Further information on the NOAA DCS can be found in the Useful links section, under **GOES DCS by NOAA**.

5.3. HIMARAWI-DCS BY JMA

As part of Japan's government, JMA implements its services with the ultimate goals of prevention and mitigation of natural disasters, safety of transportation, development and prosperity of industry and improvement of public welfare.

The Himawari-8 satellite is located at 140.7°E. The name MTSAT-DCS was changed to Himawari-DCS with the operational satellite switchover in July 2015.

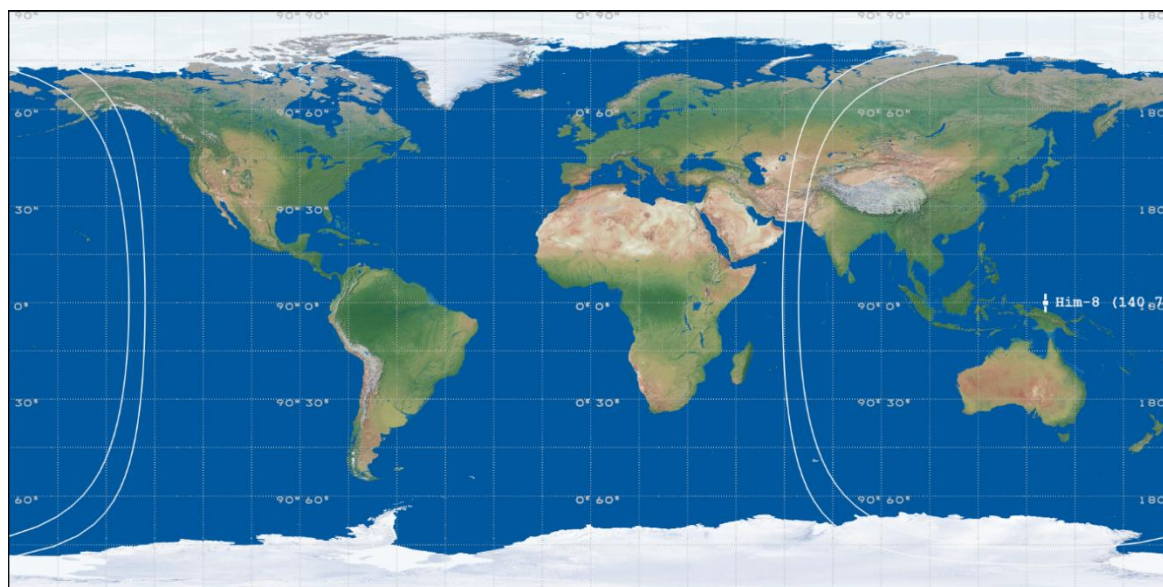


Figure 14 Himawari-8 140.7°E DCS Coverage Area

The following figure illustrates the Himawari-DCS operated by NOAA. DCP messages from Certified DCP Transmitters within the Himawari satellite field of view are relayed to the ground stations operated by the Himawari Operation Enterprise Corporation (HOPE), and then routed immediately to the Meteorological Satellite Center (MSC) and JMA Headquarters for processing and distribution to the end user through different mechanisms.

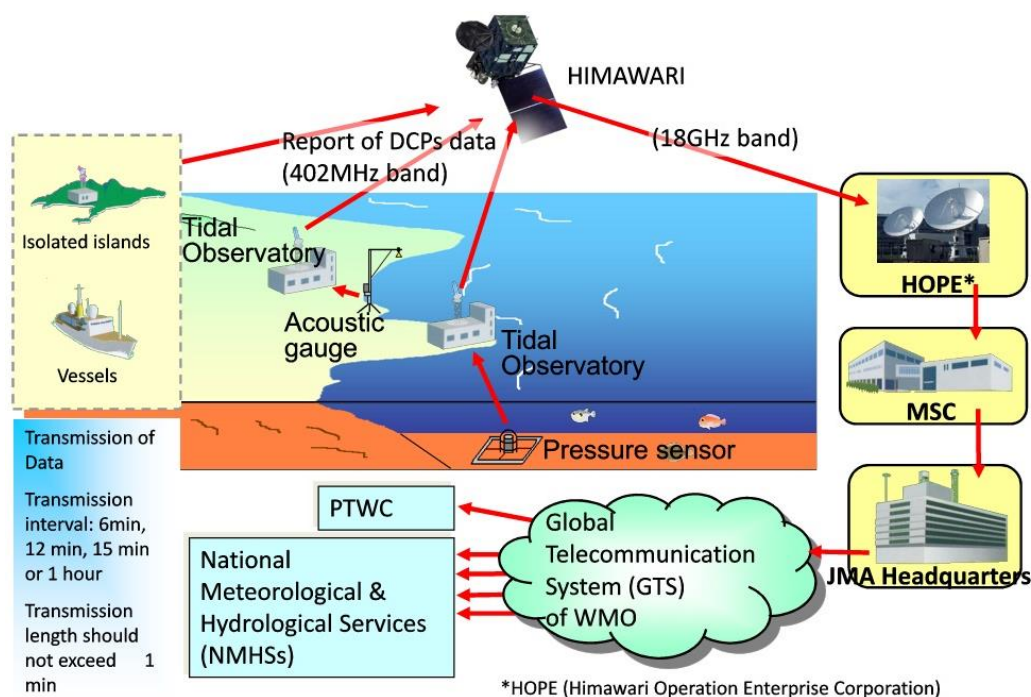


Figure 15 Himawari-DCS

- **Himawari-DCS Data Retrieval**

JMA distributes DCS data to the end user through three different mechanisms: e-mail, MSC website and the GTS (refer also to Section **4.1**).

For DCP Operators without a GTS network connection, JMA reports the collected DCP data by e-mail, and/or posts them on the MSC website, in addition to delivery via the GTS. The website is available only to DCP Operators with an account and a password issued by JMA.

More information on JMA DCS Data retrieval through one of these mechanisms can be found in the Useful links section, under **JMA DCS Data Delivery**.

Further information on the JMA DCS can be found in the Useful links section, under **Himawari-DCS by JMA**.

6. WHICH DCP TRANSMISSION TYPES EXIST

The basic DCS transmission process is common across all Satellite Operators. The transmissions are assigned to the different DCP Operators based on an allocated timeslot and frequency channel. The length of the slot depends on the bit rate of the transmission, which depends on both the DCP Transmitter and the satellite used.

DCP Transmission can be classified into different types based on several main characteristics.

6.1. BASED ON DCP TRANSMITTER MODE OF OPERATION

A DCP Transmitter can be configured to transmit data in different modes of operation (transmission schedules).

- **Self-timed**

Most commonly, a DCP Transmitter is configured to transmit data on a repeating pattern (controlled by an internal clock) via a scheduled timeslot. The schedule is jointly agreed by the DCP Operator and the Satellite Operator. The standard transmission intervals are hourly or three-hourly, but depending on the program and channel availability this repetition rate could be increased.

DCP transmitters are unidirectional and rely on an accurate clock to remain within their allocated timeslot. There is typically a 15-second guard period before and after each timeslot to allow for clocks that are too fast or too slow, making the total timeslot 30 seconds longer than the maximum time permitted per transmission.

- **Alert (also known as Random)**

It is also possible to configure the DCP Transmitter to send short 'alert' messages, usually not exceeding 10 seconds in duration, when the value of one or more measured parameters exceeds a pre-set threshold. The DCP Transmitter will usually also repeat the message two or three times every 10 to 15 minutes in order to reduce the risk of possible interference by other alert DCP messages on the same dedicated channel.

- **Hybrid**

The DCP Transmitter can also be configured into hybrid mode of operation, combining the self-timed and alert modes of operation. In that case, the Satellite Operator will usually assign the DCP Transmitter to two different channels (one for the self-timed messages and one for the alert messages).

As an example, a self-timed DCP Transmitter on a DCP located on a riverbank could be programmed to transmit a message every 5 minutes to communicate the water temperature. Alternatively, the DCP could monitor the water temperature, with the DCP transmitter sending a one-off 'alert' message when the water exceeds a certain temperature threshold.

6.2. BASED ON DCP TRANSMITTER LOCATION AND FREQUENCY ALLOCATION

Each DCP Transmitter is identified by its unique address and transmits at a specific radio frequency channel, assigned by the Satellite Operator within a set frequency band.

Certified DCP Transmitters can be installed on a DCP that is either static or mobile. As a result, the DCP Transmitters are allocated to one of two DCS bandwidth subsets: international and regional.

- **Static DCP – DCP Transmitter allocated to Regional DCS Bandwidth**

If the DCP is always under the footprint (area of coverage) of a single geostationary satellite, the DCP Transmitter is allocated to a transmission channel within the DCS bandwidth reserved for regional transmissions. Regional DCPs are generally in a fixed position.

- **Mobile DCP – DCP Transmitter allocated International DCS Bandwidth**

Some of the DCS bandwidth on board of the meteorological spacecraft is reserved for the International Data Collection Service (IDCS). If the platform is mobile, for example on a ship or an aircraft, and travels across the footprint of several satellites, it is allocated to an international channel via the IDCS. The IDCS is designed to support mobile DCPs, i.e. those DCP Transmitters on ships, ocean buoys, aircraft or balloons, which move from the field of view of one geostationary satellite to another. The IDCS frequency allocation for DCS data is coordinated by CGMS to ensure that the different systems do not interfere. Further information on IDCS is available in the Useful links section, under **International Data Collection System (IDCS) Users' Guide**.

Further information on DCS Bandwidth can be found in Annex A – DCS Bandwidth.

6.3. BASED ON DCP TRANSMISSION RATE CAPABILITY

DCP Transmitters can be split into two types based on their transmission rate capabilities:

- **Standard Rate DCP (SRDCP) Transmitters**

Standard Rate DCP (SRDCP) Transmitters are capable of transmitting at 100 bps. They are limited to transmitting up to 649 bytes of platform data in 60 seconds (including 5 seconds unmodulated carrier, preamble, sync code and address) with a timing accuracy within +/- 15 seconds.

SRDCP Transmitters at 100 bps are an old standard of messages, which are no longer supported by some Satellite Operators. They are based on the original DCS protocol, which is now considered to be very old and slow, with the DCP Transmitters also being considerably power-hungry.

EUMETSAT and JMA still are still supporting SRDCP Transmitters at 100 bps. However, EUMETSAT for instance shall only consider new allocations for high rate (HRDCP) Transmitters. NOAA's support for SRDCP Transmitters at 100 bps is being discontinued in January 2020.

Newer satellites have allowed the Satellite Operators to offer higher data rates (through HRDCP Transmitters). Currently there is no international standard for higher-rate services.

NOAA and JMA also support DCP Transmission at 300 bps.

- **High Rate DCP (HRDCP) Transmitters**

High Rate DCP (HRDCP) Transmitters are higher rate than the original SRDCP Transmitters. It is capable of transmitting the same amount of data in the same time or larger amount of data faster. EUMETSAT and NOAA support HRDCP Transmission at 1200 bps.

The design of HRDCP transmitters has a much higher noise immunity due to the type of forward error correction used, and provides a very reliable indication of message quality. For those reasons, Satellite Operators usually recommend using HRDCP Transmission.

USEFUL LINKS

Overview	Useful Links	Contact details
Satellite Operators offering DCS and other relevant Organizations		
CGMS The Coordination Group for Meteorological Satellites (CGMS) is the group for global coordination of meteorological satellite systems. The coordination is pursued from an end-to-end perspective between meteorological satellite operators and user communities such as WMO and IOC-UNESCO.	Go to CGMS Website: https://www.cgms-info.org	CGMS Secretariat c/o EUMETSAT Eumetsat-Allee 1 64295 Darmstadt Germany Tel.: +49 6151 807 4190 Fax: +49 6151 807 6150 cgmssec@eumetsat.int
EUMETSAT EUMETSAT is an intergovernmental organization and was founded in 1986. Our purpose is to supply weather and climate-related satellite data, images and products – 24 hours a day, 365 days a year – to the National Meteorological Services of our Member and Cooperating States in Europe, and other users worldwide. EUMETSAT is the permanent secretariat of CGMS.	Go to EUMETSAT Website: https://www.eumetsat.int	EUMETSAT Eumetsat-Allee 1 64295 Darmstadt Germany +49 6151 807 3660/3

Overview	Useful Links	Contact details
JMA JMA, is an agency of the Ministry of Land, Infrastructure, Transport and Tourism. It is charged with gathering and providing results for the public in Japan, that are obtained from data based on daily scientific observation and research into natural phenomena in the fields of meteorology, hydrology, seismology and volcanology, among other related scientific fields.	Go to JMA Website: https://www.jma.go.jp/jma/indexe.html	Japan Meteorological Agency Satellite Program Division 1-3-4 Otemachi Chiyoda-ku Tokyo 100-8122 Japan +81-(0)3-3201-8677 metsat@met.kishou.go.jp
NOAA The National Oceanic and Atmospheric Administration (NOAA) is an American scientific agency within the United States Department of Commerce that focuses on the conditions of the oceans, major waterways, and the atmosphere.	Go to NOAA Website: https://www.noaa.gov/	National Oceanic and Atmospheric Administration 1401 Constitution Avenue NW Room 5128 Washington, DC 20230 United States of America 24/7 Technical Support: +1 (757) 824-7450 dcs@noaa.gov
WMO As a specialized agency of the United Nations, the World Meteorological Organization (WMO) is dedicated to international cooperation and coordination on the state and behaviour of the Earth's atmosphere, its interaction with the land and oceans, the weather and climate it produces, and the resulting distribution of water resources.	Go to WMO Website: https://www.wmo.int	7bis, Avenue de la Paix Case Postale 2300 CH-1211 Geneva 2 Switzerland +41 (0) 22 730 81 11 wmo@wmo.int

Overview	Useful Links	Contact details
ISRO Starting with IRS-1A in 1988, the Indian Space Research Organisation (ISRO) has launched many operational remote sensing satellites. Today, India has one of the largest constellations of remote sensing satellites in operation, with 11 operational satellites in orbit.	Go to ISRO Website: https://www.isro.gov.in/	
CMA The China Meteorological Administration (CMA) has established an integrated meteorological observing system incorporating space-based, airborne and ground based observations, which has steadily improved the accuracy of weather forecasts and climate predictions.	Go to CMA Website: http://www.cma.gov.cn/	

Overview	Useful Links	Contact details
Roshydromet Roshydromet is a federal executive body that performs the functions state services in the field of hydrometeorology and related areas, environmental monitoring, its pollution, state supervision over the work impact on meteorological and other geophysical processes. The provision of state services in the field of hydrometeorology and related areas, environmental monitoring and pollution is carried out by Roshydromet in the manner established by the Government of the Russian Federation.	Go to Roshydromet Website: http://www.meteorf.ru Go to Roshydromet Website > Satellites: http://www.meteorf.ru/product/radars/ Go to Website of Scientific Research Center of Space Hydrometeorology "Planeta" (SRC Planeta): http://planet.iitp.ru/ Go to Website of Scientific Research Center of Space Hydrometeorology "Planeta" (SRC Planeta) > Сбор данных > Космическая система сбора и передачи данных Росгидромета (Roshydromet DCS): http://planet.iitp.ru/Sist_sb/Sist_sb.html	Roshydromet Novovagankovsky Lane 12 Moscow GSP-3 125993 Russia +7 (499) 252-55-04 +7 (499) 252-14-86 garkina@mcc.mecom.ru Scientific Research Center of Space Hydrometeorology "Planeta" (SRC Planeta) Bolshoy Predtechensky st. 7 Moscow 123242 Russia asmus@planet.iitp.ru
Geostationary Data Collection Services		
Meteosat DCS by EUMETSAT	Go to EUMETSAT Homepage > Data > Meteosat Data Collection Services: https://www.eumetsat.int/website/home/Data/MeteosatDataCollectionServices/index.html	
GOES DCS by NOAA	Go to NOAA DCS Website > System Information: https://dcs1.noaa.gov/ Go to NOAAASIS Website > GOES > GOES DCS: https://noaasis.noaa.gov/GOES/GOES_DCS/goes_dcs.html	
Himawari-DCS by JMA	Go to JMA Website > Services > Observations > Meteorological Satellites > NMHSs > Himawari DCS: http://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcs89.html	

Overview	Useful Links	Contact details
Low Earth Orbit Data Collection Services		
Argos DCS	<p>Go to Argos System Website: http://www.argos-system.org/</p> <p>Go to UMETSAT Argos DCS Page: EUETSAT Homepage > Satellites > Current Satellites > Metop > Metop Design > A-DCS https://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Metop/MetopDesign/ADCS/index.html</p> <p>Go to NOAA Argos DCS Page: NOAASIS Website> Polar > Argos DCS https://www.noaasis.noaa.gov/POLAR/ARGOS/argos.html</p>	
DCP Operator – DCP Transmitter Admission to the DCS		
EUMETSAT DCP Operator – DCP Transmitter Admission Form	<p>Go to EUMETSAT Homepage > Data > Meteosat Data Collection Services > DCP Operators: https://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&dDocName=PDF_REG_04_DCP&RevisionSelectionMethod=LatestReleased&Renderition=Web</p>	
JMA DCP Operator – DCP Transmitter Admission Process	<p>Go to JMA Website > Services > Observations > Meteorological Satellites > NMHSs > Arrangements for Operating a new DCP > Annex 1: Arrangements for Operating a New Regional Data Collection Platform http://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcs89/annex1.pdf</p>	
JMA DCP Operator – DCP Transmitter Admission Form	<p>Go to JMA Website > Services > Observations > Meteorological Satellites > NMHSs > Arrangements for Operating a new DCP > Annex 2 : Application Form for a New Regional Data Collection Platform for Himawari-DCS https://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcs89/annex2.xls</p>	

Overview	Useful Links	Contact details
NOAA DCP Operator – DCP Transmitter Admission Form	<p>Go to NOAA SIS Website > GOES > GOES DCS > How to become a User: https://noaasis.noaa.gov/GOES/GOES_DCS/howto.html</p> <p>Go to NOAA DCS Website > Submit an Application for a GOES DCS SUA https://dcs1.noaa.gov/</p>	
Satellite Operators – Data Policies for DCS Use		
EUMETSAT Data Policy – Access to Meteosat DCP Channels	<p>Go to EUMETSAT website > About us > Who we are > Legal Framework > Data Policy > Access to Meteosat DCP Channels: https://www.eumetsat.int/website/home/AboutUs/WhoWeAre/LegalFramework/DataPolicy/index.html</p>	
JMA Data Policy – Terms and conditions for the use of the Himawari-DCS	<p>Go to JMA Website > Services > Observations > Meteorological Satellites > NMHSs > Arrangements for Operating a new DCP > Terms and conditions for the use of the Himawari-DCS are available in Annex 2: Application Form for a New Regional Data Collection Platform for Himawari-DCS: https://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcs89/annex2.xls</p>	
NOAA Data Policy – DCS Regulations	<p>Go to NOAA SIS Website > GOES > GOES DCS > DCS Rules > Read information on Use of the NOAA Data Collection Systems: https://www.noaasis.noaa.gov/GOES/GOES_DCS/dcsrule.html</p>	
Lists of Certified DCP Transmitter Manufacturers		
GOES DCS Certified DCP Transmitter Manufacturers list	<p>Go to EUMETSAT Website > Data > Data Delivery > Equipment Manufacturers: https://www.eumetsat.int/website/home/Data/DataDelivery/EquipmentManufacturers/index.html</p>	
Meteosat DCS Certified DCP Transmitter Manufacturers list on NOAA website	<p>Go to NOAA DCS Website > System Information > Certification Information: https://dcs1.noaa.gov/documents/GOES%20DCS%20Certified%20Vendors.pdf</p>	

Overview	Useful Links	Contact details
DCP Transmitter Certification for use with the DCS		
EUMETSAT DCP Transmitter Certification Form	Go to EUMETSAT Homepage > Data > Meteorological Data Collection Services > Certification > GOES DCS Certified Manufacturers List: https://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&DocName=PDF_REG_06_DCP-CERT&RevisionSelectionMethod=LatestReleased&Rendition=Web	
JMA DCP Operator – DCP Transmitter Technical Requirements	Go to JMA Website > Services > Observations > Meteorological Satellites > NMHSs > Arrangements for Operating a new DCP > Annex 3: Technical Requirements on Regional Data Collection Platform for using the Data Collection System of the Himawari series of satellites https://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcs89/Annex3_TechnicalRequirements_REV.C.pdf	
NOAA DCP Transmitter Certification Policy	Go to NOAA DCS Website > System Information > Certification Information > NOAA Policy on Use of Certified Transmitters: https://dcs1.noaa.gov/documents/NOAA%20Policy%20on%20Use%20of%20Certified%20Transmitters.pdf	
DCS Data Retrieval - EUMETSAT, JMA and NOAA		
EUMETSAT DCS Data Retrieval – Product Navigator	Go to EUMETSAT Website > Data > Product Navigator < Search “DCP”: https://navigator.eumetsat.int/product/EO:EUM:DAT:OBS:DCP	
EUMETSAT Data Delivery (all mechanisms)	Go to EUMETSAT Website > Data > Data Delivery https://www.eumetsat.int/website/home/Data/DataDelivery/index.html	
JMA DCS Data Delivery	Go to JMA Website > Services > Observations > Meteorological Satellites > NMHSs > DPS > Himawari DCS > Data flow in Himawari-DCS https://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcp89.html	

Overview	Useful Links	Contact details
NOAA DCS Data Delivery	Go to NOAA SIS Website > GOES > GOES DCS > Data delivery detailed in GOES DCS Description: https://www.noaasis.noaa.gov/GOES/GOES_DCS/goes_dcs.html	
Data Retrieval - GTS		
WMO Global Telecommunication System (GTS)	Go to WMO Community Platform > Activity Areas > Global Telecommunication System (GTS) https://community.wmo.int/activity-areas/global-telecommunication-system-gts	
Manual on the Global Telecommunication System – WMO 386 - DCP Bulletins Data Designators in abbreviated headings	Go to WMO Community Platform > Activity Areas > WMO Information System (WIS) > Related Publications > WMO 386 > See Attachment II-5 Data designators (T1T2A1A2ii) in abbreviated headings https://community.wmo.int/activity-areas/wmo-information-system-wis Go to WMO Community Platform > Activity Areas > Operational Information Service (OIS) > Meteorological Bulletins TTAAII CCCC > Volume C1 - Catalogue of Meteorological Bulletins > Description of Abbreviated Headings T1T2A1A2ii CCCC https://community.wmo.int/activity-areas/operational-information-service/volume-c1 Alternatively, the WMO 386 manual can also be found directly through the search field of the WMO Library: https://library.wmo.int/	
WMO Information System (WIS)	Go to WMO Community Platform > Activity Areas > WMO Information System (WIS) https://community.wmo.int/activity-areas/wmo-information-system-wis	

Overview	Useful Links	Contact details
Handbooks and Guides		
DCS Handbook Electronic Version	<p>You can navigate to the DCS Handbook link from the DCS page on CGMS Website:</p> <p>CGMS Website > Home > Satellites > Data Collection Services: https://www.cgms-info.org/index.php/cgms/page?cat=SAATELLITES&page=Data+Collection+Systems+%28DCS%29</p>	
Satellite Data Communication Handbook	<p>Satcom Handbook: https://library.wmo.int/index.php?lvl=notice_display&id=20662%20-%20XFhrl1VKiUl#.XFjhSIVKjIU</p> <p>WMO Website > CBS-WIS > ET-CTS > SATCOM > "Satellite Data Telecommunication Handbook" [WMO No 1223] https://wiswiki.wmo.int</p>	
EUMETSAT DCS Guide TD 16 Meteosat Data Collection and Distribution Service	<p>EUMETSAT Homepage > Data > Meteosat Data Collection Services > DCS Overview: https://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&dDocName=PDF_TD16_METEOSAT_DATA_COLLECTION_AND_DISTRIBUTION_SERVICE&RevisionSelectionMethod=LatestReleased&Rendition=Web</p>	
JMA DCS Guide Guide to the Use of the Data Collection Service of the Himawari series of satellites (Himawari-DCS)	<p>JMA Website > Services > Observations > Meteorological Satellites > NMHSs > DPS): http://www.jma.go.jp/jma/jma-eng/satellite/nmhs/dcs89/guide.pdf</p>	
NOAA GOES DCS Guide GOES DCS System Characterization Report	<p>Go to NOAA DCS Website > System Information > General Information > GOES DCS System Characterization Report: https://dcs1.noaa.gov/documents/System%20Char%20Report.pdf</p>	

Overview	Useful Links	Contact details
International Data Collection System (IDCS) Users' Guide	<p>CGMS Website > Publications > Technical Specifications and Guides:</p> <p>https://www.cgms-info.org/index.php/cgms/page?cat=PUBLICATIONS&page=Technical+specifications+%26+guides</p> <p>http://www.cgms-info.org/documents/international-data-collection-system-users-guide-2009.pdf</p>	

GLOSSARY

Alert	A type of message transmitted by a DCP when a measurement exceeds a predetermined threshold
Argos	The Argos Data Collection and location Service (DCS) is a data collection and relay program that provides global coverage and platform location
AWS	Automatic Weather Station, a type of Data Collection Platform (DCP)
Certified DCP Transmitter	A device mounted on the Data Collection Platform and designed to transmit the data collected by the DCP to a meteorological satellite, where the data are relayed back to Earth for processing and dissemination to the various end users. Certified DCP Transmitters can be purchased from a DCP Transmitter Manufacturers.
CGMS	Coordination Group for Meteorological Satellites
CMA	China Meteorological Administration
CNES	Centre National d'Etudes Spatiales
DCS	Data Collection Services - services offered by meteorological satellite operators, that enable the relay of environmental data from Data Collection Platforms (DCPs) to end users, through the use of a Certified DCP Transmitter installed on the DCP.
DCP	Data Collection Platform - any measurement facility, such as an automatic weather station or a seismic monitor, which collects environmental data through instruments/sensors.
DCP Operator	The technical manager of the Data Collection Platform. To make use of the DCS, the DCP Operator shall equip the DCP with a Certified DCP Transmitter, purchased from a DCP Transmitter Manufacturer. In the context of DCS, The person/entity responsible for the DCP Transmitter setup, operations and ongoing maintenance
DCPF	Data Collection Processing Facility
EUMETCast	EUMETSAT's Broadcast System for Environmental Data
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FTP	File Transfer Protocol
Geostationary orbit	Satellites in geostationary orbits are placed at an altitude of approximately 36,000 kilometers directly over the equator and remain 'fixed' over one point on the Earth's surface.
GOES	Geostationary Orbit Satellite System, a meteorological satellite system operated by NOAA
GOES-E and GOES-W	Names give to the different locations used by operational GOES satellites, corresponding the regions which they cover. GOES-17 became GOES-West in February 2019.
GTS	Global Telecommunication System of the WMO
Himawari-8	Himawari-8 is a Japanese meteorological satellite, the 8th of the Himawari geostationary meteorological satellite operated by the Japan Meteorological Agency
HRDCP	High Rate Data Collection Platform
Hybrid	A type of message transmitted by a DCP that can contain a combination of self-timed and alert messages
IDCS	International Data Collection Service
ISRO	Indian Space Research Organisation
JMA	Japan Meteorological Agency
Meteosat-8 and Meteosat-11	Operational EUMETSAT satellites, part of MSG (Meteosat Second Generation). Both satellites include DCS and web imagery in their services. Meteosat-8 is positioned at 41.5° longitude (over the Indian Ocean) and Meteosat-11 is positioned at 0° longitude.

MSG	Meteosat Second Generation
MTG	Meteosat Third Generation
NOAA	National Oceanic and Atmospheric Administration
ROSHYDROMET	Russian Federal Service for Hydrometeorology and Environmental Monitoring
RTH	Regional Telecommunications Hub
Self-timed	A type of message transmitted by a DCP at regular intervals, following a predetermined schedule
SRDCP	Standard Rate Data Collection Platform
TD	Technical Document
WMO	World Meteorological Organization

ANNEX A – DCS BANDWIDTH

The DCS uplink bandwidth is divided into a number of channels, and each DCP Transmitter is allocated to one of them, depending on its role. The following shows the bandwidth partitioning for the GEO (and LEO) Data Collection Services. Satellites on the opposite sides of the earth use the same frequencies, as they do not interfere.

Basic general partitioning of the band 401 – 403 MHz for future long-term coordinated use of DCS systems on geostationary and non-geostationary MetSat and EESS systems

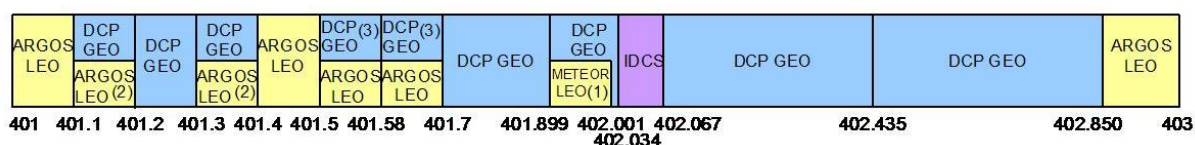


Figure 16 Bandwidth partitioning for the GEO (and LEO) Data Collection Services

The DCS bandwidth is also grouped into two subsets: international and regional.

• International

Some of the DCS bandwidth on board of the meteorological spacecraft is reserved for the International Data Collection Service (IDCS). If the platform is mobile, for example on a ship or an aircraft, and travels across the footprint of several satellites, the DCP Transmitter is allocated to an international channel via the IDCS (International Data Collection Service). The IDCS frequency allocation for DCS data is coordinated by CGMS to ensure that the different systems do not interfere.

Use of the IDCS allows coordinated DCP Transmitter design and message formats, thus permitting the uninterrupted collection of messages from mobile DCP Transmitters to be received and processed by any of the Coordination Group for Meteorological Satellites (CGMS) geostationary meteorological Satellite Operators. This provides almost continuous telecommunication coverage in most regions of the globe, with the exception of the poles.

Only self-timed DCP Transmitters can use the IDCS channels. Although the normal time slots on IDCS channels are of 90 seconds, DCP transmissions must not exceed 60 seconds. The additional time within the slot is used as a “guard-band” to protect neighboring time slots in case of drift in the clock controlling transmissions from the DCP.

There are 11 IDCS channels (with center frequencies spaced 3 kHz apart), from 402.0355 - 402.0685 MHz regardless of the spacecraft. The IDCS operates in the Meteorological Satellite Service in compliance with ITU Radio Regulations.

In special circumstances and on a temporary basis, normally not exceeding one year, fixed DCP Transmitters can use the IDCS with the approval of all CGMS members. Such requests should be channeled through the CGMS Secretariat.

Further information on IDCS is available in the Useful links section, under **International Data Collection System (IDCS) Users' Guide**.

- **Regional**

If the DCP is always under the footprint (area of coverage) of a single geostationary satellite, the DCP Transmitter is allocated to a transmission channel within the DCS bandwidth reserved for regional transmissions. Regional DCPs are generally in a fixed position.

- **EUMETSAT**

In the EUMETSAT system, older Meteosat First Generation compatible DCP Transmitters (SRDCP) are allocated with 3 kHz channel spacing assignments and are confined to the frequency range 402.0685 – 402.200 MHz. The MSG satellites have an additional capacity of 135 regional channels when assigned to 1.5 kHz channel spacing within the frequency range 402.2005 – 402.4345 MHz.

High Rate DCP Transmitters use a separate area of the bandwidth within the 402.2005 – 402.4345 MHz range to avoid interference with Standard Rate DCPs. Use of the bandwidth for HRDCP reduces the number of SRDCP channels without affecting established DCP Transmitters.

The following figure shows the Meteosat DCS Bandwidth Allocations. There are 245 regional channel slots (at 1.5 kHz spacing) available (this excludes the IDCS channels). Of these channel slots, 88 are allocated to 'older' DCPs, which are assigned 3 kHz spacing, therefore 157 channel slots are available for 1.5 kHz DCPs. HRDCPs also have 3 kHz spacing.

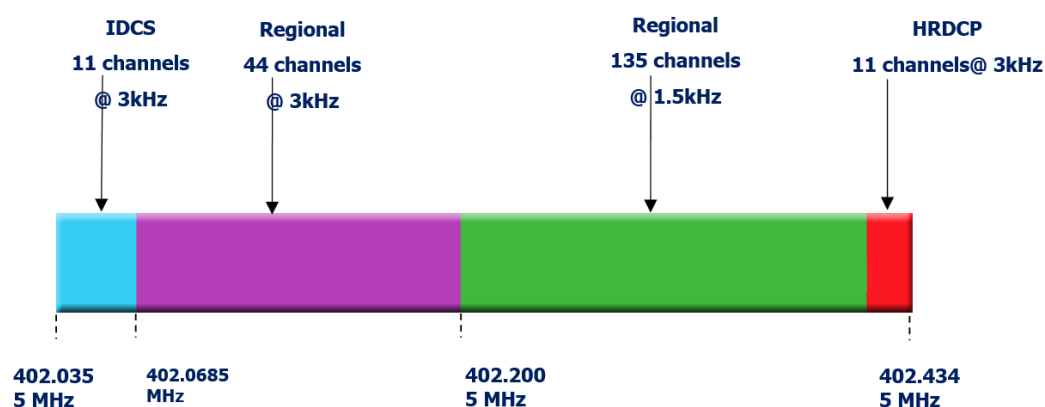


Figure 17 Meteosat DCS Bandwidth Allocations

- **JMA**

In the Himawari-DCS, data should be transmitted at a radio frequency channel, assigned by JMA, within the frequency band from 402.0685 to 402.4000 MHz (100 bps) and 402.1 to 402.4 MHz (300 bps). In addition, radio signal bandwidth should be within 1.8 kHz for 100 bps and 300 bps.

- **NOAA**

The following figure illustrates the GOES DCS frequency band. Regional DCP transmitters are assigned by NOAA within the frequency band from 401.7 MHz to 402.0 MHz.

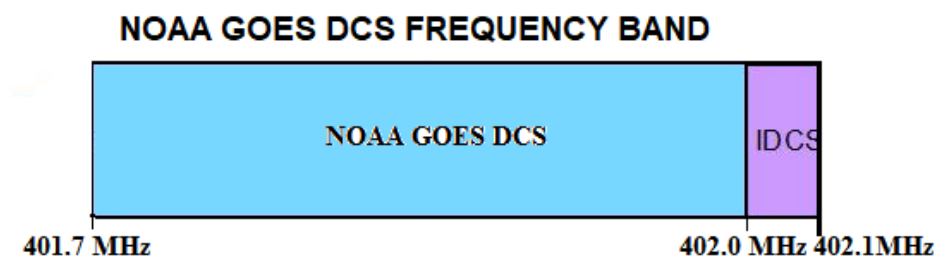


Figure 18 GOES DCS Bandwidth Allocations

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