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OGC Coverage Implementation Schema –
GRIB2 Coverage Encoding Profile

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Abstract

This Interface Standard is a profile of the OGC GML Application Schema - Coverages version 1.0 [OC 09-146r2], since version 1.1 renamed to "OGC Coverage Implementation Schema" for clarification. This document specifies the usage of the GRIB2 data format for the encoding of OGC coverages. This encoding is maintained by the World Meteorological Organisation (WMO) and is the standard encoding for the exchange and storage of general regularly distributed information expressed in binary form.

Keywords

The following are keywords to be used by search engines and document catalogues.

ogcdoc, OGC document, wcs, grib, wmo

Preface

Coverages represent digital geospatial information representing space/time-varying phenomena. OGC Abstract Topic 6 [OGC 07-011] - which is identical to ISO 19123 - defines an abstract model of coverages; due to its generality, this model is not yet interoperable as it allows different incompatible implementations. The OGC Coverage Implementation Schema establishes a concise, interoperable coverage model based on ISO 19123. Coverage instances represented according to the Coverage Implementation Schema (CIS) version 1.1 [OGC 09-146r3] may be encoded in GML (based on the Geography Markup Language (GML) version 3.2 [OGC 07-036]) or other suitable ASCII or binary formats.

This Application Schema of CIS specifies the usage of the GRIB2 data format for the encoding of OGC coverages. It is based on the authoritative format specification available in the WMO Manual on Codes.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

*Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.*

Submitting organizations

The following organizations submitted this Document to the Open Geospatial Consortium (OGC):

Deutscher Wetterdienst
Météo-France
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# Scope

This OGC GML Application Schema - Coverages - GRIB2 Coverage Encoding Profile - henceforth abbreviated as "CIS for GRIB2" specifies an encoding of coverages in the GRIB2 data exchange format.

#  Conformance

This standard defines the following requirements and conformance class:

* grib-coverage, of URI http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage, with a single pertaining conformance class, grib-coverage, of URI http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/conf/grib2-coverage.

Requirements for 1 standardization target type is considered:

* concrete coverage instance documents, as generated by some service and/or consumed by some client.

Conformance with this standard shall be checked using all the relevant tests specified in Annex A (normative) of this document. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing web site[[1]](#footnote-1).

All requirements-classes and conformance-classes described in this document are owned by the standard(s) identified.

# References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

OGC 09-146r2, OGC GML Application Schema - Coverages, version 1.0

Conformance classes used:

* + - gml-coverage
		- multipart
		- special-format

OGC 07-036, OpenGIS Geography Markup Language (GML) Encoding Standard, version 3.2

WMO 306, Manual on Codes, International Codes, Volume I.2, Part B - Binary Codes, FM 92-XIV GRIB edition 2

#  Terms and Definitions

This document uses the terms defined in Sub-clause 5.3 of [OGC 06-121r8], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

For the purposes of this document, the following additional terms and definitions apply.

**raster or image space**

Space used to reference the grid point values (cf. GRIB2 format specification [GRIB2]).

model space

Space used to reference points on the earth (cf. GRIB2 format specification [GRIB2]).

# Conventions

This sections provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

## Identifiers

The normative provisions in this specification are denoted by the URI

<http://www.opengis.net/spec/wcs/grib2/1.0>

All requirements and conformance tests that appear in this document are denoted by partial URIs which are relative to this base.

# Clauses not Containing Normative Material

The GRIB edition 2 (GRIB2) format specification [GRIB2] is designed for the exchange and storage of general regularly distributed information in binary form. It is primarily used to represent the outputs of numerical weather prediction models, but is in no way restricted to this domain. GRIB2 was preceded by two other format specifications, GRIB edition 0 and GRIB edition 1. The difference between both of these formats, however, are of such structural magnitude that they can be seen as different formats. For this reason, GRIB editions 0 and 1 are outside the scope of this CIS for GRIB2 specification.

A GRIB2 file is composed of one or more GRIB2 messages, which are composed of several sections providing metadata and one or more 2D arrays of values, which can be mapped from image space to corresponding points in model space. The array can have a rectangular spatial shape, but other, non-regular coordinate systems can be used. Additionally, grid points are not necessarily representative of rectangular areas - some coordinate systems used in GRIB2 represent their data using triangular grid cells (cf. GRIB2 format specification [GRIB2]).

The only coverage types supported by this specification are cis:GridCoverage, cis:RectifiedGridCoverage, cis:ReferenceableGridCoverage, and any coverage type derived thereof.

Following the notation of the abstract coverage definition in the CIS [OGC 09-146r2] the rangeType is limited according to the GRIB specification.

##  Namespace prefix conventions

 The following namespaces are used in this document. The prefix abbreviations used constitute conventions used here, but are not normative. The namespaces to which the prefixes refer are normative, however.

| Prefix | Namespace URI | Description |
| --- | --- | --- |
| xsd | http://www.w3.org/2001/XMLSchema | XML Schema namespace |
| gml | http://www.opengis.net/gml/3.2 | GML 3.2.1 |
| cis | http://www.opengis.net/cis/1.0 | GML Application Schema - Coverages 1.0 |
| grib | http://www.opengis.net/wcs/grib2/1.0 | CIS-GRIB Encoding Profile 1.0 |
| wcs | http://www.opengis.net/wcs/2.0 | WCS 2.0 |

Table 1: Namespace mappings

 Clauses not containing normative material sub-clause 2

# Clause containing normative material

Requirements class grib2-coverage establishes how coverages are represented in the GRIB2 encoding format. It further specifies how coverages can be requested e.g. from a WCS by defining the parameter for GRIB features compression. Its identifying URL is given by http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage.

##  grib2-coverage

### General

The GRIB2 format allows not only the use of internationally coordinated variables which are published by the WMO, but also variables defined only locally. The following admonition of from the WMO's Manual on Codes should be reiterated at this juncture:

... the use of Local tables in messages intended for non-local or international exchange is strongly discouraged.

In this sense, it is possible to encode GRIB2 messages using locally defined variables, but the likelihood that users will be able to interpret these messages is much lower than when the tables published by the WMO are used. If locally defined variables are used to exchange data, however, the tables required for reading the data should be supplied to users in an appropriate fashion.

|  |
| --- |
| **Requirements Class** |
| **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage** |
| Target type | Token |
| Dependency  | **http://www.w3.org/2001/XMLSchema** |
| Dependency  | **http://www.opengis.net/gml/3.2** |
| Dependency | **http://www.opengis.net/CIS/1.1** |
| Dependency | **http://www.opengis.net/wcs/2.0** |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/grib-specification**A GRIB2 encoded coverage shall follow the GRIB2 specification [GRIB2]. |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/type**A GRIB2 encoded coverage **shall** be of type cis:GridCoverage, cis:RectifiedGridCoverage, or cis:ReferenceableGridCoverage, or a subtype thereof. |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/uri**If the usage of URIs is possible, GRIB2 encoding of a coverage **shall** be indicated by the following URI: [http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/conf/grib2-coverage](http://www.opengis.net/spec/GMLCOV_grib2-coverages/1.0/conf/grib2-coverage). |

## Domain

|  |
| --- |
| **Requirements Class** |
| **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage** |
| Target type | Token |
| Dependency  | **http://www.w3.org/2001/XMLSchema** |
| Dependency  | **http://www.opengis.net/gml/3.2** |
| Dependency | **http://www.opengis.net/CIS/1.1** |
| Dependency | **http://www.opengis.net/wcs/2.0** |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/crs**The coordinate reference system identified by the value of the srsName attribute of the gml:Envelope element of the gml:domainSet element of a GRIB2 encoded coverage **shall** be the same as the coordinate reference system used in the GRIB2 part.Note: The value of the srsName attribute of the Envelope element shall be inherited by all directly expressed geometries (see GML 3.2 [OGC 07-036] clause 9.10), i.e. for all range set values encoded in GRIB2. |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/pixel-is-area**The domain of a GRIB2 encoded coverage shall respect the coverage's raster space as defined in the GRIB2 specification [GRIB2], i.e. the grid point position described in code table 3.8 of the GRIB2's grid definition section.**Note:** The definition of grids in GML 3.2 [OGC 07-036] clause 19.2.2 which CIS is based on reads as: "When a grid point is used to represent a sample space (e.g. image pixel), the grid point represents the center of the sample space (see ISO 19123:2005, 8.2.2).".Note: This requirement specifies that the gml:domainSet element shall respect the raster type i.e. it shall include the half pixel border in case of PixelIsArea (see also Figure 1) but not in case of PixelIsPoint. In other words, in case of PixelIsArea the gml:domainSet element is decreased by the half of both gml:offsetVector elements in the gml:lowerCorner coordinate compared to the case of PixelIsPoint. The gml:origin element stays the same independently of the raster space. |

### Examples

The following XML fragments show the domainSet and the domainSet elements describing the domain of sample coverages respecting the axis ordering of the used CRS:

* Default axis order (easting, northing) using PixelIsArea:

<gml:boundedBy>

 <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSG/0/4326"

 srsDimension="2">

 <gml:lowerCorner>62.4375 29.4375</gml:lowerCorner>

 <gml:upperCorner>336.5625 70.5625</gml:upperCorner>

 </gml:Envelope>

</gml:boundedBy>

<gml:domainSet>

 <gml:RectifiedGrid dimension="2" gml:id="grid\_p">

 <gml:limits>

 <gml:GridEnvelope>

 <gml:low>0 0</gml:low>

 <gml:high>657 1377</gml:high>

 </gml:GridEnvelope>

 </gml:limits>

 <gml:origin>

 <gml:Point gml:id="grid\_origin\_p"

 srsName="http://www.opengis.net/def/crs/EPSG/0/3857">

 <gml:pos>0 0</gml:pos>

 </gml:Point>

 </gml:origin>

 <gml:offsetVector srsName="http://www.opengis.net/def/crs/EPSG/0/3857">

 0.0625 0.0625

 </gml:offsetVector>

 </gml:RectifiedGrid>

</gml:domainSet>

* Default axis order (easting, northing) using PixelIsPoint:

<gml:boundedBy>

 <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSG/0/4326"

 srsDimension="2">

 <gml:lowerCorner>62.5 29.5</gml:lowerCorner>

 <gml:upperCorner>336.5 70.5</gml:upperCorner>

 </gml:Envelope>

</gml:boundedBy>

<gml:domainSet>

 ... (same as above)

</gml:domainSet>

The simple figure below provides an explanation of the relation between raster or image space and model space in the case of PixelIsArea using the values from the examples above.

 100 110 490
 | 0 | |
 | | | |
350 -- +---+---+---+ ... +---+
 0 - | \* | \* | \* | ... | \* |
340 -- +---+---+---+ ... +---+
 | \* | \* | \* | ... | \* |
 +---+---+---+ ... +---+
 ...
 +---+---+---+ ... +---+ -- 60
 | \* | \* | \* | ... | \* | - 29
 +---+---+---+ ... +---+ -- 50
 | |
 39

Figure 1: Relation between raster or pixel and model space in case of PixelIsArea. Coordinates connected to the grid with two lines represent model space, whereas coordinates connected with one line represent raster space.

## GRIB2 parameters

### Request

The following GRIB parameters are defined for requesting GRIB encoded coverages, for example via WCS GetCoverage requests.

Note: It is always possible for a given coverage instance to determine its current parameter values, i.e., the parameter values used at creation. Thus a GRIB encoded coverage is self-describing.

|  |
| --- |
| **Requirements Class** |
| **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage** |
| Target type | Token |
| Dependency  | **http://www.w3.org/2001/XMLSchema** |
| Dependency  | **http://www.opengis.net/gml/3.2** |
| Dependency | **http://www.opengis.net/CIS/1.1** |
| Dependency | **http://www.opengis.net/wcs/2.0** |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/parameters-xml**The structure of an XML request requesting a GRIB encoded coverage instance shall be extended as defined in Table 2 and the respective XML Schema being part of this standard. |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/parameters-kvp**The structure of a KVP request requesting a GRIB encoded coverage instance shall be extended as defined in Table 2 where the parameter names shall be prefixed with grib2, for example grib2:compression.Note: This prefix is used as namespace replacement in order to minimize the risk of reusing already defined KVP parameters. |

| **Names** | **Definition** | **Data type and values** | **Multiplicity and use** |
| --- | --- | --- | --- |
| grib2:compression | Compression type according to GRIB2 code table 5.0 "Data representation template number | Integer between 0 and 65535 | Zero or one (optional)  |

Table 2: Parameters for requesting GRIB2 encoded coverage

### Response

|  |
| --- |
| **Requirements Class** |
| **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage** |
| Target type | Token |
| Dependency  | **http://www.w3.org/2001/XMLSchema** |
| Dependency  | **http://www.opengis.net/gml/3.2** |
| Dependency | **http://www.opengis.net/CIS/1.1** |
| Dependency | **http://www.opengis.net/wcs/2.0** |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/compression**The response to a successful request for a GRIB2 encoded coverage containing a compression GRIB parameter shall consist of a GRIB2 encoded coverage using the specified compression.**Note:** A server or service not implementing the requested feature is always free to respond with an exception. |

### Exceptions

|  |
| --- |
| **Requirements Class** |
| **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage** |
| Target type | Token |
| Dependency  | **http://www.w3.org/2001/XMLSchema** |
| Dependency  | **http://www.opengis.net/gml/3.2** |
| Dependency | **http://www.opengis.net/CIS/1.1** |
| Dependency | **http://www.opengis.net/wcs/2.0** |
| **Requirement** | **http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage/exceptions**When a server or service encounters an error described in column "meaning of exception code" in Table 3, it shall return the corresponding exception report message with the contents of the locator parameter value as specified in the right column of Table 3. |

| exceptionCode value | HTTP code | Meaning of code | locator value |
| --- | --- | --- | --- |
| CompressionNotSupported | 404 | Server does not support the requested compression | Value of compression parameter |
| CompressionInvalid | 404 | Invalid compression requested | Value of compression parameter |

Table 3: Exception codes for GRIB2 parameters

# Media Types for any data encoding(s)

GRIB2 encoding of a coverage shall be indicated by the following MIME type identifier:

application/wmo-grib

**Note:** this MIME type is new and will be registered with IANA.

Annex A: Conformance Class Abstract Test Suite (Normative)

* 1. Conformance class: grib-coverage

The OGC URI identifier of this conformance class is: http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/conf/grib2-coverage.

* + 1. Prerequisites

Make sure that at least one GRIB2 encoded coverage instance is available. Repeat the tests for each GRIB2 encoded coverage instance available.

* + 1. Follow GRIB2 specification

Test id: /conf/grib-coverage/grib-specification

Test purpose:

A GRIB2 encoded coverage shall follow the GRIB2 specification [GRIB2].

Dependency: http://www.wmo.int/pages/prog/www/WMOCodes/WMO306\_vI2/VolumeI.2.html

Test method:

Validate the coverage instance under test against the GRIB2 specification. Test passes if coverage instance is valid according to the GRIB2 specification.

* + 1. Correct coverage type

Test id: /conf/grib-coverage/type

Test purpose:

A GRIB2 encoded coverage shall be of type cis:GridCoverage, cis:RectifiedGridCoverage, or cis:ReferenceableGridCoverage, or a subtype thereof. Dependency: http://www.opengis.net/spec/CIS/1.0/conf/gml-coverage

Test method:

If the coverage instance under test is encoded in a multipart message check that its first part consists of a GML document of type cis:GridCoverage, cis:RectifiedGridCoverage, or cisIS:ReferenceableGridCoverage, or a subtype thereof.

Test passes if constraint evaluates to true.

* + 1. Correct URI

Test id: /conf/grib-coverage/uri

Test purpose:

If the usage of URIs is possible, GRIB2 encoding of a coverage shall be indicated by the following URI: http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage

Test method:

If the coverage instance under test is encoded in a multipart message, check that the xlink:role attribute of the gml:rangeParameters element of the gml:File element of the gml:rangeSet element of its first part has the value http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/req/grib2-coverage

Test passes if constraint evaluates to true.

* + 1. Correct MIME type

Test id: /conf/grib-coverage/mime-type-identifier

Test purpose:

GRIB2 encoding of a coverage shall be indicated by the following MIME type identifier:

application/wmo-grib

if the type has already been registered at IANA. Until this time the following MIME type identifier is allowed provisionally:

application/x-grib

Test method:

If the coverage instance under test is encoded in a multipart message, check that the gml:mimeType element of the gml:File element of the gml:rangeSet element of its first part, as well as the Content-Type header of its second part have the value application/x-grib.

Test passes if constraints evaluate to true.

* + 1. Correct CRS

Test id: /conf/grib\_coverages/crs

Test purpose:

The coordinate reference system identified by the value of the srsName attribute of the gml:Envelope element of the gml:domainSet element of a GRIB2 encoded coverage shall be the same as the coordinate reference system used in the GRIB2 part.

Test method:

If the coverage instance under test is encoded in a multipart message, check that the srsName attribute of the gml:Envelope element of the gml:domainSet element in the first part defines the same coordinate reference system as the one used in the second part, which in case of cis:ReferenceableGridCoverage is the coordinate reference system used for the tiepoints and in the case of cis:GridCoverage is not present.

Test passes if constraint evalutes to true.

* + 1. Correct raster space

Test id: /conf/grib-coverages/pixel-is-area

Test purpose:

The domain of a GRIB2 encoded coverage shall respect the coverage's raster space as defined in the GRIB2 specification [GRIB2], i.e. the grid point position described in code table 3.8 of the GRIB2's grid definition section.

Test method:

If the coverage instance under test is encoded in a multipart message, check that the values used in the gml:lowerCorner and gml:upperCorner elements of the gml:Envelope element of the gml:domainSet element of its first part respect the raster space settings used in the second part.

In case of PixelIsArea, type CIS:RectifiedGridCoverage, and grid axis parallel to the CRS axis, the difference between the values used in the gml:lowerCorner and gml:Envelope elements shall be the same as the number of pixels defined in the gml:domainSet element multiplied with the respective value of the respective gml:offsetVector element, taking into account the right axis ordering.

In case of PixelIsPoint, type CIS:RectifiedGridCoverage, and grid axis parallel to the CRS axis, the difference between the values used in the gml:lowerCorner and gml:Envelope elements shall be the same as the number of pixels defined in the gml:domainSet element minus 1 multiplied with the respective value of the respective gml:offsetVector element, taking into account the right axis ordering.

Test passes if constraint evalues to true.

* + 1. Parameters XML

Test id: /conf/grib-coverage/parameters-xml

Test purpose:

The structure of an XML request requesting a GRIB encoded coverage instance shall be extended as defined in Table 2 and the respective XML Schema being part of this standard.

Test method:

Validate the GRIB2 parameters present in the request if an XML request was used to obtain the coverage instance under test.

Test passes if an XML request was used to obtain the coverage instance under test and the GRIB2 parameters are valid according to the XML schema and the coverage instance is encoded as requested.

* + 1. Parameters KVP

Test id: /conf/grib-coverage/parameters-kvp

Test purpose:

The structure of a KVP request requesting a GRIB encoded coverage instance shall be extended as defined in Table 2 where the parameter names shall be prefixed with grib2, for example grib2:compression.

Test method:

Validate the GRIB2 parameters present in the request if a KVP request was used to obtain the coverage instance under test.

Test passes if a KVP request was used to obtain the coverage instance under test and the GRIB2 parameters are valid according to Table 2 and the coverage instance is encoded as requested.

* + 1. Compression

Test id: /conf/grib-coverage/compression

Test purpose:

The response to a successful request for a GRIB2 encoded coverage containing a compression GRIB parameter shall consist of a GRIB2 encoded coverage using the specified compression.

Test method:

Check the GRIB2 parameters present in the request used to obtain the coverage instance under test for the presence of the compression parameter. If found and the parameter is valid, verify that the coverage instance is encoded using the requested compression.

Test passes if the compression parameter is present and the coverage instance is encoded as requested or if a HTTP 404 error code with the exceptionCode value CompressionNotSupported is returned.

* + 1. Exceptions

Test id: /conf/grib-coverage/exceptions

Test purpose:

When a server or service encounters an error described in column "meaning of exception code" in Table 3, it shall return the corresponding exception report message with the contents of the locator parameter value as specified in the right column of Table 3.

Test method:

Validate possible exception responses obtained instead of coverage instances when requesting GRIB2 encoded coverages using unsupported and invalid compression parameters.

Test passes if exceptions are using the relevant exceptionCode.

* 1. Links

WMO Manual on Codes, Volume I.2: http://www.wmo.int/pages/prog/www/WMOCodes/WMO306\_vI2/VolumeI.2.html

Current WMO tables used for interpretation of GRIB: http://www.wmo.int/pages/prog/www/WMOCodes/WMO306\_vI2/LatestVERSION/LatestVERSION.html

GRIB API: https://software.ecmwf.int/wiki/display/GRIB/Home

wgrib2: http://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/

* 1. Examples

This clause holds a valid example of a GRIB2 encoded coverage, but omits the GRIB2 content itself, as well as a WCS GetCoverage request including GRIB2 parameters. Additionally, the GRIB2 keys of the coverage are provided. These keys can easily be mapped to the GML part. The complete examples, including the GRIB2 content, are available online at the same place as the accompanying XML schemas.

The following sketches a valid coverage (contents of second part omitted):

Content-Type: Multipart/Related; boundary=wcs;

 start="GML-Part"

 type="application/x-grib

--wcs

Content-Type: text/xml

<?xml version="1.0" encoding="UTF-8"?>

<cis:RectifiedGridCoverage

 xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance

 xmlns:xlink=http://www.w3.org/1999/xlink

 xmlns:gml=http://www.opengis.net/gml/3.2

 xmlns:cis=http://www.opengis.net/CIS/1.0

 xmlns:swe=http://www.opengis.net/swe/2.0

 xsi:schemaLocation=http://www.opengis.net/CIS/1.0

 http://schemas.opengis.net/CIS/1.0/CISAll.xsd

 gml:id="p">

 <gml:boundedBy>

 <gml:Envelope srsName="http://www.opengis.net/def/crs/EPSG/0/4326"

 srsDimension="2">

 <gml:lowerCorner>29.4375 62.4375</gml:lowerCorner>

 <gml:upperCorner>70.5625 336.5625</gml:upperCorner>

 </gml:Envelope>

 </gml:boundedBy>

 <gml:domainSet>

 <gml:RectifiedGrid dimension="2" gml:id="grid\_p">

 <gml:limits>

 <gml:GridEnvelope>

 <gml:low>0 0</gml:low>

 <gml:high>657 1377</gml:high>

 </gml:GridEnvelope>

 </gml:limits>

 <gml:origin>

 <gml:Point gml:id="grid\_origin\_p"

 srsName="http://www.opengis.net/def/crs/EPSG/0/3857">

 <gml:pos>0 0</gml:pos>

 </gml:Point>

 </gml:origin>

 <gml:offsetVector srsName="http://www.opengis.net/def/crs/EPSG/0/3857">

 0.0625 0.0625

 </gml:offsetVector>

 </gml:RectifiedGrid>

 </gml:domainSet>

 <gml:File>

 <gml:rangeParameters xlink:href="cid:p.grb"

 xlink:role="http://www.opengis.net/spec/CIS\_grib2-coverages/1.0/conf/grib2-coverage"

 xlink:arcole="fileReference"/>

 <gml:fileReference>cid:p.grb</gml:fileReference>

 <gml:fileStructure/>

 <gml:mimeType>application/x-grib</gml:mimeType>

 </gml:File>

 <cis:rangeType>

 <swe:DataRecord>

 <swe:field name="p">

 <swe:Quantity

 definition="http://mmisw.org/ont/cf/parameter/air\_pressure">

 <swe:description>Air pressure</swe:description>

 <swe:nilValues/>

 <swe:uom code="Pa"/>

 </swe:Quantity>

 </swe:DataRecord>

 </cis:rangeType>

</cis:RectifiedGridCoverage>

--wcs

Content-Type: application/x-grib

Content-Description: coverage data

Content-Transfer-Encoding: binary

Content-ID: p.grb

Content-Disposition: inline

II

...

--wcs--

Below the complete GRIB2 information obtained via the grib\_ls command provided by the GRIB API is shown:

p.grb

edition centre date dataType gridType stepRange

typeOfLevel level shortName packingType

2 edzw 20151109 fc regular\_ll 0

generalVerticalLayer 1 P grid\_simple

1 of 1 grib messages in p.grb

1 of 1 total grib messages in 1 files

Analog to this summary, the summary provided by wgrib2 is as follows:

1:0:d=2015110900:PRES:reserved – reserved:anl:

The complete output produced by using grib\_dump, also a part of the GRIB API, is:

\*\*\*\*\* FILE: p.grb

#============== MESSAGE 1 ( length=2714297 ) ==============

GRIB {

 # Meteorological products (grib2/tables/11/0.0.table)

 discipline = 0;

 editionNumber = 2;

 # Offenbach (RSMC) (grib1/0.table)

 centre = 78;

 subCentre = 255;

 # Start of forecast (grib2/tables/11/1.2.table)

 significanceOfReferenceTime = 1;

 dataDate = 20151109;

 dataTime = 0;

 dateTime = 201511090000;

 # Operational products (grib2/tables/11/1.3.table)

 productionStatusOfProcessedData = 0;

 # Forecast products (grib2/tables/11/1.4.table , grib2/tables/local/edzw/1/1.4.table)

 typeOfProcessedData = 1;

 # Deterministic system (grib2/grib2LocalSectionNumber.78.table)

 localDefinitionNumber = 254;

 localHostIdentifier = 0;

 localCreationDateYear = 2015;

 localCreationDateMonth = 11;

 localCreationDateDay = 9;

 localCreationDateHour = 11;

 localCreationDateMinute = 30;

 localCreationDateSecond = 55;

 localValidityDateYear = 0;

 localValidityDateMonth = 0;

 localValidityDateDay = 0;

 localValidityDateHour = 0;

 localValidityDateMinute = 0;

 localValidityDateSecond = 0;

 localInformationNumber = 0;

 localVersionNumber = 0;

 localNumberOfExperiment = 1;

 localDecodeDate = 20151109113055;

 localValidityDate = 0;

 numberOfDataPoints = 904689;

 # There is no appended list (grib2/tables/11/3.11.table)

 interpretationOfNumberOfPoints = 0;

 # Latitude/longitude (Also called equidistant cylindrical, or Plate Carree) (grib2/tables/11/3.1.table)

 gridDefinitionTemplateNumber = 0;

 # Earth assumed spherical with radius of 6 371 229.0 m (grib2/tables/11/3.2.table)

 shapeOfTheEarth = 6;

 Ni = 1377;

 Nj = 657;

 iScansNegatively = 0;

 jScansPositively = 1;

 jPointsAreConsecutive = 0;

 alternativeRowScanning = 0;

 latitudeOfFirstGridPointInDegrees = 29.5;

 longitudeOfFirstGridPointInDegrees = 336.5;

 latitudeOfLastGridPointInDegrees = 70.5;

 longitudeOfLastGridPointInDegrees = 62.5;

 iDirectionIncrementInDegrees = 0.0625;

 jDirectionIncrementInDegrees = 0.0625;

 gridType = regular\_ll;

 NV = 6;

 # Analysis or forecast at a horizontal level or in a horizontal layer at a point in time (grib2/tables/11/4.0.table , grib2/tables/local/edzw/1/4.0.table)

 productDefinitionTemplateNumber = 0;

 # Mass (grib2/tables/11/4.1.0.table , grib2/tables/local/edzw/1/4.1.0.table)

 parameterCategory = 3;

 # Pressure (Pa) (grib2/tables/11/4.2.0.3.table , grib2/tables/local/edzw/1/4.2.0.3.table)

 parameterNumber = 0;

 #-READ ONLY- parameterUnits = Pa;

 #-READ ONLY- parameterName = Pressure ;

 # Forecast (grib2/tables/11/4.3.table , grib2/tables/local/edzw/1/4.3.table)

 typeOfGeneratingProcess = 2;

 # assimilation (grib2/tables/local/edzw/1/backgroundProcess.table)

 backgroundProcess = 2;

 # icXeu (ICON europe,icoeu or icreu or icieu) (grib2/tables/local/edzw/1/generatingProcessIdentifier.table)

 generatingProcessIdentifier = 2;

 # Minute (grib2/tables/11/4.4.table)

 indicatorOfUnitOfTimeRange = 0;

 # Hour (stepUnits.table)

 stepUnits = 1;

 forecastTime = 0;

 stepRange = 0;

 # Generalized vertical height coordinate (grib2/tables/11/4.5.table , grib2/tables/local/edzw/1/4.5.table)

 typeOfFirstFixedSurface = 150;

 #-READ ONLY- unitsOfFirstFixedSurface = unknown;

 #-READ ONLY- nameOfFirstFixedSurface = Generalized vertical height coordinate;

 scaleFactorOfFirstFixedSurface = 0;

 scaledValueOfFirstFixedSurface = 1;

 # Generalized vertical height coordinate (grib2/tables/11/4.5.table , grib2/tables/local/edzw/1/4.5.table)

 typeOfSecondFixedSurface = 150;

 #-READ ONLY- unitsOfSecondFixedSurface = unknown;

 #-READ ONLY- nameOfSecondFixedSurface = Generalized vertical height coordinate;

 scaleFactorOfSecondFixedSurface = 0;

 scaledValueOfSecondFixedSurface = 2;

 topLevel = 1;

 bottomLevel = 2;

 shortNameECMF = P;

 shortName = P;

 nameECMF = Pressure;

 name = Pressure;

 cfNameECMF = unknown;

 cfName = unknown;

 cfVarNameECMF = pres;

 cfVarName = pres;

 nlev = 61;

 numberOfVGridUsed = 4;

 uuidOfVGrid = 00000000000000000000000000000000;

 numberOfValues = 904689;

 packingType = grid\_simple;

 # A bit map does not apply to this product (grib2/tables/11/6.0.table)

 bitMapIndicator = 255;

 bitmapPresent = 0;

 values(904689) = {

 4.0296103516e+03, 4.0295793457e+03, 4.0295856934e+03, 4.0293276367e+03, 4.0291567383e+03,

 4.0290236816e+03, 4.0290268555e+03, 4.0289992676e+03, 4.0288918457e+03, 4.0288435059e+03,

 4.0287202148e+03, 4.0287612305e+03, 4.0286115723e+03, 4.0285578613e+03, 4.0283735352e+03,

 4.0282292480e+03, 4.0282800293e+03, 4.0280874023e+03, 4.0280820312e+03, 4.0279626465e+03,

 4.0278747559e+03, 4.0278110352e+03, 4.0276682129e+03, 4.0275056152e+03, 4.0274033203e+03,

 4.0272768555e+03, 4.0269133301e+03, 4.0269714355e+03, 4.0267290039e+03, 4.0266113281e+03,

 4.0265122070e+03, 4.0263759766e+03, 4.0262399902e+03, 4.0262873535e+03, 4.0260175781e+03,

 4.0258459473e+03, 4.0257407227e+03, 4.0255769043e+03, 4.0254768066e+03, 4.0253500977e+03,

 4.0252744141e+03, 4.0250563965e+03, 4.0249213867e+03, 4.0248891602e+03, 4.0247363281e+03,

 4.0245847168e+03, 4.0244169922e+03, 4.0242705078e+03, 4.0241401367e+03, 4.0241174316e+03,

 4.0240124512e+03, 4.0238601074e+03, 4.0236977539e+03, 4.0235612793e+03, 4.0234533691e+03,

 4.0232766113e+03, 4.0230588379e+03, 4.0230261230e+03, 4.0228981934e+03, 4.0226079102e+03,

 4.0225544434e+03, 4.0224792480e+03, 4.0222468262e+03, 4.0220876465e+03, 4.0219382324e+03,

 4.0217687988e+03, 4.0216384277e+03, 4.0213740234e+03, 4.0210839844e+03, 4.0211223145e+03,

 4.0209431152e+03, 4.0208195801e+03, 4.0206520996e+03, 4.0204931641e+03, 4.0203020020e+03,

 4.0200712891e+03, 4.0199011230e+03, 4.0197346191e+03, 4.0195900879e+03, 4.0193945312e+03,

 4.0192893066e+03, 4.0191364746e+03, 4.0190158691e+03, 4.0188352051e+03, 4.0187365723e+03,

 4.0185864258e+03, 4.0183671875e+03, 4.0182714844e+03, 4.0181098633e+03, 4.0179628906e+03,

 4.0176005859e+03, 4.0173286133e+03, 4.0172502441e+03, 4.0174060059e+03, 4.0173139648e+03,

 4.0174094238e+03, 4.0173093262e+03, 4.0172126465e+03, 4.0170007324e+03, 4.0169138184e+03

 ... 904589 more values

 }

 #-READ ONLY- maximum = 4033.24;

 #-READ ONLY- minimum = 3394.93;

 #-READ ONLY- average = 3854.02;

 #-READ ONLY- numberOfMissing = 0;

 #-READ ONLY- standardDeviation = 132.994;

 #-READ ONLY- skewness = -0.899912;

 #-READ ONLY- kurtosis = 0.211889;

 #-READ ONLY- isConstant = 0;

 #-READ ONLY- getNumberOfValues = 904689;

}

The following is a valid WCS 2.0 GetCoverage request including some GRIB2 parameters:

<?xml version="1.0" encoding="UTF-8"?>

<wcs:GetCoverage

 xmlns:wcs="http://www.opengis.net/wcs/2.0"

 xmlns:grib2="http://www.opengis.net/CIS/grib2/1.0"

 xmlns:gml="http://www.opengis.net/gml/3.2"

 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

 xsi:schemaLocation="http://www.opengis.net/wcs/2.0

 http://schemas.opengis.net/wcs/2.0/wcsAll.xsd

 http://www.opengis.net/CIS/grib2/1.0

 http://schemas.opengis.net/CIS/grib2/1.0/CISGRIB2.xsd"

 service="WCS"

 version="2.0.1">

 <wcs:Extension>

 <grib2:parameters>

 <grib2:compression>0</grib2:compression>

 </grib2:parameters>

 </wcs:Extension>

 <wcs:CoverageId>p</wcs:CoverageId>

 <wcs:format>application/x-grib</wcs:format>

 <wcs:mediaType>multipart/related</wcs:mediaType>

</wcs:GetCoverage> Annex C: Revision history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Release | Author | Paragraph modified | Description |
| 2015-10-15 | 0.0.1 | Daniel Lee | All | First draft based on discussions in DWG MetOcean |
| 2015-10-28 | 0.0.2 | Peter Baumann | Abstract, Overview, Domain  | Minor corrections |
| 2015-10-29 | 0.0.3 | Daniel Lee | Overview, identification, range | Draft incorporating suggestions gathered in telephone conference with DWG MetOcean |
| 2016-01-20 | 0.1.0 | Daniel Lee | Submitters, submitting organizations | Include new authors of document, reformat for submission to SWG |
| 2016-02-16 | 0.1.1 | Daniel Lee | All | Change references to GMLCOV to proposed CIS |

1. [www.opengeospatial.org/cite](http://www.opengeospatial.org/cite) [↑](#footnote-ref-1)