Norwegian Meteorological Institute

MET Norway Metadata Format Specification

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Version 4.0

Abstract

MET Norway Metadata Format (MMD) is an XML metadata format for storing information about scientific datasets. MMD is made to document datasets in order to make them findable. In this it supports information elements of Findable, Accessible, and Reusable from the FAIR guiding principles. Through the web services identified in MMD and the encoding of datasets according to the preferred format NetCDF-CF, it also supports the Interoperable aspect. The specification is strongly linked to discovery metadata standards like ISO19115 and GCMD DIF, but it also extends these as it contains configuration metadata specific for the handling of the datasets at the host data centre.

Revision history

Version	Date	Comment	Responsible
4.0	2025-12-15	Major revision: adding ISO 639-1 language code reference, adding personnel type and uri, better description of geographic_extent, improved guidance for platform/instrument and links to external vocabularies. Addition of GCMDPLT and GCMDINST keywords vocabularies. Controlled vocabularies are autogenerated from internal thesauri. The element metadata_source is added.	Lara Ferrighi, Øystein Godøy
3.1	2020-??-??	Minor corrections of typos and cleaning of fields that should have been cleaned earlier.	Lara Ferrighi, Øystein Godøy, ??
3.0	2020-04-30	General cleaning of document related to converting it to ASCIIDOC, a number of typos and inconsistencies have been fixed, controlled vocabularies updated, alternate_identifier added and major rewrite of platform and instrument, data_citation and reference and use_constraints elements.	Øystein Godøy, Lara Ferrighi, Trygve Halsne

Version	Date	Comment	Responsible
2.1	2018-12-13	Modifications of controlled vocabularies related to satellite data and data collections, minor edit on related_dataset, major edit on reference.	Øystein Godøy
2.0	2017-10-17	Added controlled vocabularies and elements for instrument children like mode, polarisation and product_type.	Trygve Halsne, Øystein Godøy
1.9	2017-05-29	Added ODATA to data_access to support NBS.	Øystein Godøy, Egil Støren, Bard Saadatnejad, Trygve Halsne
1.8	2017-03-13	Adaptations to support NBS (in particular Sentinel-2). Depreciation of system_specific elements used for Halo and BarentsWatch (covered by other elements).	Øystein Godøy, Sarfraz Alam, Trygve Halsne, Bard Saadatnejad
1.7	2016-11-04	Consolidation of document, addition of collection keyword and preparation for NBS usage.	Øystein Godøy, Sarfraz Alam
1.6	2016-05-10	Minor formatting changes. Addition of configuration metadata elements (from XMD and others). Addition of vocabulary suggestions.	Øystein Godøy, Bard Saadatnejad, Sarfraz Alam
1.5	2013-07-15		Øystein Torget
1.4	2013-06-20		Øystein Torget
1.3	2013-03-13		Øystein Torget

Version	Date	Comment	Responsible
1.2	2013-03-06	Added Obsolete as a dataset status. Re-formatted document and added some more formalism to the intro sections.	Øystein Godøy, Øystein Torget
1.1	2013-02-12	Added mapping between MMD and ISO dataset status codes. Move vocabulary from sub element of keywords to attribute.	Øystein Torget
1.0	2013-01-18	First version.	Øystein Torget

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Chapter 1. Introduction

MET Norway Metadata Format (MMD) is an XML metadata format for storing information about scientific datasets. It is meant for consumption by internal systems and to be a corner stone in our data management. The main focus of MMD is to ensure that all relevant datasets managed by MET Norway are findable. As such the specification is strongly linked to discovery metadata standards like ISO19115 and GCMD DIF, but it also extends these as it contains configuration metadata specific for the handling of the datasets at the host data centre.

1.1. Applicable documents

1. ISO19115 [https://geo-ide.noaa.gov/wiki/index.php?title=Category:ISO_19115]

2. ISO19115 North American Profile [http://www.fgdc.gov/standards/projects/incits-l1-standards-projects/NAP-Metadata]

3. Environmental Climate Data Sweden ISO19115 Profile [https://ecds.se/pages/profile]

4. INSPIRE Metadata [http://inspire.ec.europa.eu/index.cfm/pageid/101]

5. WMO Core Profile (ISO19115) [http://www.wmo.int/pages/prog/www/WIS/metadata_en.html]

6. Global Change Master Directory Interchange Format [http://gcmd.gsfc.nasa.gov/add/difguide/index.html]

7. Climate and Forecast Convention [http://cfconventions.org/]…

8. Attribute Convention for Dataset Discovery [http://wiki.esipfed.org/index.php?title=Category:Attribute_Conventions_Dataset_Discovery]

9. ISO8601…

10. GCMD Science Keywords [https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/?format=csv]

11. Climate and Forecast Standard Names [https://vocab.nerc.ac.uk/standard_name/]

12. SeaDataNet [https://vocab.seadatanet.org/search]

13. OPeNDAP [http://docs.opendap.org/index.php/Documentation]

1.2. Scope

The intended audience of this document is MET Norway employees responsible for

- implementing and maintaining software for metadata management in support of internal and external services
- managing datasets
- contributing to external distributed data management services

The following national and international data management activities have been or are supported using the MMD specification and related software components:

- BarentsWatch [https://www.barentswatch.no]

- Halo

- [Norge digitalt](https://www.geonorge.no/Geodataarbeid/Norge-digitalt/) [https://www.geonorge.no/Geodataarbeid/Norge-digitalt/]

- MET Norway Scientific Information System (METSIS)

  - [Arctic Data Centre](https://arc.met.no) [https://arc.met.no]

  - [WMO Global Cryosphere Watch](https://gcw.met.no) [https://gcw.met.no]

  - [WMO Year of Polar Prediction](https://yopp.met.no) [https://yopp.met.no]

  - [Svalbard Integrated Arctic Earth Observing System](https://sios-svalbard.org) [https://sios-svalbard.org]

  - [Norwegian Scientific Data Network](https://www.nordatanet.no) [https://www.nordatanet.no]

  - [Norwegian Marine Data Centre](https://nmdc.no) [https://nmdc.no]

  - [ESA Cryosphere Virtual laboratory](https://cvl.eo.esa.int) [https://cvl.eo.esa.int]

  - [ESA/NOSA CryoClim](http://cryoclim.net) [http://cryoclim.net]

  - [EUMETSAT Ocean and Sea Ice SAF](https://osisaf.met.no) [https://osisaf.met.no]

  - [EU H2020 project INTERACT](https://eu-interact.org) [https://eu-interact.org]

  - [EU H2020 project APPLICATE](https://applicate.eu) [https://applicate.eu]

  - [EU FP7 project ACCESS](http://www.access-eu.org) [http://www.access-eu.org]

  - [EU FP 6 project DAMOCLES](http://www.damocles-eu.org) [http://www.damocles-eu.org]

  - [International Polar Year](https://public.wmo.int/en/bulletin/international-polar-year-2007-2008) [https://public.wmo.int/en/bulletin/international-polar-year-2007-2008]

The purpose is to document datasets, not web services. Information in on the web services for a datasets is provided through the data_access element and accompanied by e.g. GetCapabilities documents.

Development of the specification have been supported through research grants from the Research Council of Norway, Norwegian Space Agency, European Space Agency, EUMETSAT, EU and ministries (BarentsWatch and S-ENDA).

1.3. Objectives

1. To document data and products managed by MET Norway.

2. To facilitate metadata re-use between different projects and services at MET Norway.

3. To be compatible with the GCMD DIF and ISO19115/ISO19139 metadata standards as imposed by WMO and Norge Digitalt/INSPIRE.

4. To provide as lossless conversion between the different formats as possible.

Chapter 2. Metadata elements

2.1. metadata_identifier

Element	/mmd/metadata_identifier
Required	Yes
Repetition allowed	No
Description	Unique identifier for the dataset described by the metadata document. This identifier is used to identify a dataset across different systems. The MMD format does not make hard requirements on the format of the ids, but to be compatible with DIF the following characters are not allowed: • Backward Slash '\' • Forward Slash '/' • Colon ':' • Whitespaces ' ' The identifier used currently is UUID.

Example XML	<pre><metadata_identifier>
	    9663fc67-5687-4bf2-a274-f3826e41fdc8
	</metadata_identifier></pre>

DIF equivalent	/DIF/Entry_ID
ISO equivalent	/gmd:MD_Metadata/gmd:fileIdentifier/gco:CharacterString

2.2. alternate_identifier

Element	/mmd/alternate_identifier
Attributes	**type** identification of the type of identifier used. Currently no controlled vocabulary is defined, this should be added once better knowledge of domains are known. Initially at least WMO Information System (WIS) type identifiers should be supported. This field should **not** be used for DOIs. these should go into Section 2.29.
Required	No
Repetition allowed	Yes
Description	Alternative identifier for the dataset described by the metadata document. This identifier is when datasets may have multiple identifiers, i.e. identifiers depending on the framework data are shared through.

| Example XML | <pre><alternate_identifier type="WIS">
    urn:x-wmo:md:int.wmo.wis::ca.gc.ec.msc-1.1.9.3
</alternate_identifier></pre> |
|---|---|
| DIF equivalent | NA |
| ISO equivalent | NA |

2.3. last_metadata_update

Element	**/mmd/last_metadata_update**
Attributes	None
Required	Yes
Repetition Allowed	No
Description	The last update of the metadata record including the creation of the metadata record. This is not intended as full provenance records, but and indication of what has happened to the information. Each update require sub elements datetime, in iso8601 format, and type, note is optional. Type is regulated by the following keywords: Created, Minor modification, Major modification.
Example XML:	<pre><last_metadata_update>
<update>
<datetime>2012-10-31T12:00:00Z</datetime>
<type>Created</type>
<note></note>
</update>
<update>
<datetime>2020-03-31T10:23:00Z</datetime>
<type>Major modification</type>
<note>Changed structure of the metadata element.</note>
</update>
</last_metadata_update></pre>
DIF equivalent	/DIF/Last_DIF_Revision_Date
ISO equivalent	/gmd:MD_Metadata/gmd:dateStamp This mapping is somewhat uncertain since the element is described as: "date that metadata was created." But GeoNetwork automatically updates on Save, so we take this to mean that it is last updated time for the metadata.

2.4. metadata_status

Element	**/mmd/metadata_status**
Attributes	None

Element	/mmd/metadata_status
Required	Yes
Repetition allowed	No
Description	Status for the metadata record. This is configuration metadata and should not be misinterpreted as Section 2.11. The only purpose of this tag is to determine whether the dataset should be indexed or not.
Example XML	`<metadata_status>Active</metadata_status>`
DIF equivalent	NA
ISO equivalent	NA

2.5. collection

Element	/mmd/collection
Attributes	None
Required	Yes
Repetition allowed	Yes
Description	The purpose of this tag is the same as for the ownertag in XMD files. It is used to identify which collection a dataset belong to. This is used to identify sets when serving metadata through e.g. OAI-PMH or to identify which data to present in e.g. a project specific portal when all metadata records are in the same repository. The keyword used to identify the collection should be short (e.g. NMDC, NMAP, SIOS, …). See Section 4.12 for details.
Example XML	`<collection>NMDC</collection>`
DIF equivalent	NA
ISO equivalent	NA

2.6. title

Element	/mmd/title
Attributes	• xml:lang. The ISO 639-1 two letter language code for the language that the title is in.
Required	Yes
Repetition allowed	Yes, but each repetition should have a different language.

Element	/mmd/title
Description	The title of the dataset. The language in the title is specificed in the xml:lang attribute. To be compatible with DIF the title cannot be longer than 220 characters.
Example XML	`<title xml:lang="en">OSISAF Northern Hemisphere Ice edge</title>`
DIF equivalent	/Entry_Title
ISO equivalent	/gmd:MD_Metadata/ gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:title/gco:CharacterString

2.7. abstract

Element	/mmd/abstract
Attributes	• xml:lang. The ISO 639-1 two letter language code for the language that the abstract is in.
Required	Yes
Repetition allowed	Yes, but each repetition should have a different language.

Element	/mmd/abstract
Description	The abstract should summarize and described the dataset. The following guidelines for a good abstract follows (from DIF): • Capitalization should follow standard constructs. For readability, all capital letters or all lower case letters should not be used. Use the appropriate case where applicable. • Acronyms should be expanded to provide understanding. • Where applicable, the abstract should also include brief statements on the following information: • Data processing information (gridded, binned, swath, raw, algorithms used, necessary ancillary data sets). • Date available. • Data set organization (description of how data are organized within and by file). • Scientific methodology or analytical tools. • Time gaps in data set coverage. • Units and unit resolution. • Similarities and differences of these data to other closely-related data sets. • Other pertinent information. • Capitalization should follow standard constructs. For readability, all capital letters or all lower case letters should not be used. Use the appropriate case where applicable. • Acronyms should be expanded to provide understanding. • Where applicable, the abstract should also include brief statements on the following information: • Data processing information (gridded, binned, swath, raw, algorithms used, necessary ancillary data sets). • Date available. • Data set organization (description of how data are organized within and by file). • Scientific methodology or analytical tools. • Time gaps in data set coverage. • Units and unit resolution. • Similarities and differences of these data to other closely-related data sets. • Other pertinent information.

Element	/mmd/abstract
Example XML:	``` <abstract xml:lang="en"> The daily analysis of sea ice concentration are obtained from operation satellite images of the polar regions. It is based on atmospherically corrected signal and an optimal sea ice concentration algorithm. This product is available for free from the EUMETSAT Ocean and Sea Ice Satellite Application Facility (OSI SAF). </abstract> ```
DIF equivalent	/Summary/Abstract
ISO equivalent	/gmd:MD_Metadata/ gmd:identificationInfo/gmd:MD_DataIdentification/gmd:abstract/gco:CharacterString

2.8. temporal_extent
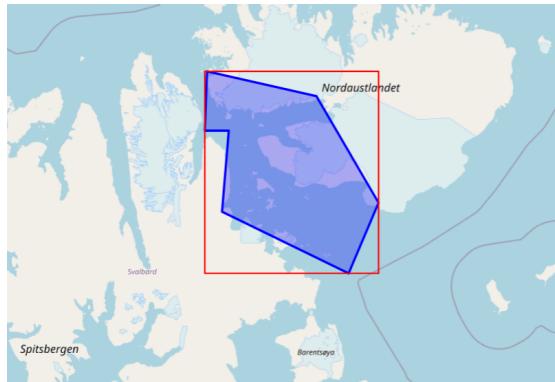
Element	/mmd/temporal_extent
Attributes	None
Required	Yes
Repetition allowed	Yes. Repetition is used when there are gaps in the dataset.
Description	Defines the temporal extent or coverage of the dataset. The extent is defined used two sub elements: • start_date: The start date and time, in iso8601 format, for data collection or model coverage. • end_date: The end date and time, in iso8601 format, for data collection or model coverage. • If the dataset is not complete, the end_date element can be left empty.
Example XML:	``` <temporal_extent> <start_date>2012-01-01T12:00:00Z</start_date> <end_date>2012-02-01T13:00:00Z</end_date> </temporal_extent> ```
DIF equivalent	/DIF/Temporal_Coverage
ISO equivalent	/gmd:MD_Metadata/ gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:temporalElement/gmd:EX_TemporalExtent/gmd:extent

2.9. geographic_extent/rectangle

Element	/mmd/geographic_extent/rectangle
Attributes	srsName
Required	Yes
Repetition allowed	No
Description	The geographic extend of the datasets defined a rectangle in lat/lon projection. The extent is defined using the following child elements: • north: The northernmost point covered by the dataset. • south: The southernmost point covered by the dataset. • west: The westernmost point covered by the dataset. • east: The easternmost point covered by the dataset. The allowed values of east and west (i.e. the longitude values) must be within -180:180, while the allowed values for north and south (i.e. the latitude values), must be within -90:90. Generally the upper right longitude will be greater than the lower left longitude (i.e. east > west). However when the area crosses the (+/-)180° antimeridian (dateline crossing), the value of the lower left longitude will be greater than the value of the upper right longitude (east < west). It is recommended to provide at least 2 decimals for the values. The default value of the srsName is "EPSG:4326". To provide, in addition, more detailed information about the geographic extent see Section 2.10.
Example XML:	``` <geographic_extent> <rectangle srsName="EPSG:4326"> <north>79.95893</north> <south>78.874289</south> <east>23.203125</east> <west>18.105469</west> </rectangle> </geographic_extent> ```
DIF equivalent	/DIF/Spatial_Coverage
ISO equivalent	/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:geographicElement/gmd:EX_GeographicBoundingBox

2.10. geographic_extent/polygon

Element	/mmd/geographic_extent/polygon
Attributes	None
Required	No

Element	/mmd/geographic_extent/polygon
Repetition allowed	No
Description	Geographic extent of the dataset described as a GML polygon.
	The projection of the coordinates can be specified in compliance with GML, but for maximum compatibility with internal systems all coordinates should be given in EPSG:4326.
	If a polygon is provided it should be inclued in the same geographic_extent section as the rectangle of Section 2.9 (which is always mandatory).
	The relation between the rectangle and the polygon is that the rectangle is the smallest box containing all corners of the polygon, as in the figure below:
Example XML:	

```
<geographic_extent>
 <rectangle srsName="EPSG:4326">
  <north>79.95893</north>
  <south>78.874289</south>
  <east>23.203125</east>
  <west>18.105469</west>
 </rectangle>
 <polygon>
  <gml:Polygon id="polygon" srsName="EPSG:4326">
   <gml:exterior>
    <gml:LinearRing>
     <gml:pos>78.874289 22.324219</gml:pos>
     <gml:pos>79.26587 23.203125<gml:pos>
     <gml:pos>79.831716 21.379395<gml:pos>
     <gml:pos>79.95893 18.171387<gml:pos>
     <gml:pos>79.651722 18.105469<gml:pos>
     <gml:pos>79.651722 18.808594<gml:pos>
     <gml:pos>79.216649 18.61084<gml:pos>
     <gml:pos>78.874289 22.324219<gml:pos>
    </gml:LinearRing>
   </gml:exterior>
  </gml:Polygon>
 </polygon>
</geographic_extent>
```

Element	/mmd/geographic_extent/polygon
DIF equivalent	NA
ISO equivalent	/gmd:MD_Metadata/ gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent/gmd:EX_Extent/gmd:geographicElement/gmd:EX_BoundingPolygon/gmd:polygon/

2.11. dataset_production_status

Element	/mmd/dataset_production_status
Attributes	None
Required	Yes
Repetition allowed	No
Description	Production status for the dataset using a controlled vocabulary. The valid keywords are listed in Section 4.5. If set as "In Work", remember that end_date in Section 2.8 can (should) be empty.
Example XML	`<dataset_production_status>In Work</dataset_production_status>`
DIF equivalent	/DIF/Data_Set_Progress The defined statuses are the same as in DIF so no mapping is required.
ISO equivalent	/gmd:MD_Metadata/gmd:status

2.12. dataset_language

Element	/mmd/dataset_language
Attributes	None
Required	No
Repetition allowed	No
Description	The ISO 639-1 two letter language code of the language used in production, storage etc. of the dataset. The default for all datasets is English (en).
Example XML:	`<dataset_language>en</dataset_language>`
DIF equivalent	/DIF/Data_Set_Language
ISO equivalent	/gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:language/gmd:LanguageCode

2.13. operational_status

Element	/mmd/operational_status
Attributes	None
Required	No
Repetition allowed	No
Description	The current operational status of the product. Valid keywords are listed in Section 4.11.
Example XML:	`<operational_status>Pre-Operational</operational_status>`
DIF equivalent	NA
ISO equivalent	NA

2.14. access_constraint

Element	/mmd/access_constraint
Attributes	None
Required	No
Repetition allowed	No
Description	Limitations on the access to the dataset. See Section 4.10 for a list of valid values.
Example XML:	`<access_constraint>Open</access_constraint>`
DIF equivalent	/DIF/Access_Constraints
ISO equivalent	/gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd :MD_LegalConstraints/gmd:accessConstraints/gmd:MD_RestrictionCode = 'otherConstraints' and /gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd :MD_LegalConstraints/gmd:otherConstraints/gco:CharacterString

2.15. use_constraint

Element	/mmd/use_constraint
Attributes	None

Element	/mmd/use_constraint
Required	No
Repetition allowed	No
Description	Restrictions on the use of the dataset. The use_constraint has the following sub elements: • identifier: referring to the spdx licenseId. • resource: the url to the referred license. OR • license_text: free text field for datasets that are not using a formal license. If used identifier and resource should be left empty. See Section 4.3 for a list of valid values for identifiers and resources.

Example XML:	<pre><use_constraint>
	    <identifier>CC-BY-4.0</identifier>
	    <resource>http://spdx.org/licenses/CC-BY-4.0</resource>
	</use_constraint></pre>
	
	or
	
	<pre><use_constraint>
	    <license_text>CMIP6 model data produced by EC-Earth-Consortium is
	licensed under a Creative Commons Attribution-ShareAlike 4.0
	International License (https://creativecommons.org/licenses). Consult
	https://pcmdi.llnl.gov/CMIP6/TermsOfUse for terms of use governing
	CMIP6 output, including citation requirements and proper
	acknowledgment. Further information about this data, including some
	limitations, can be found via the further_info_url (recorded as a
	global attribute in this file) . The data producers and data providers
	make no warranty, either express or implied, including, but not limited
	to, warranties of merchantability and fitness for a particular purpose.
	All liabilities arising from the supply of the information (including
	any liability arising in negligence) are excluded to the fullest extent
	permitted by law.</license_text>
	</use_constraint></pre>

DIF equivalent	/DIF/Use_Constraints
ISO equivalent	/gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:resourceConstraints/gmd: MD_LegalConstraints/gmd:useLimitation/gco:CharacterString

2.16. personnel

Element	/mmd/personnel
Attributes	None
Required	Yes (see details on roles below)
Repetition allowed	Yes
Description	Relevant contact persons for the dataset. All datasets must have at least one entry of personnel specifying the Principal Investigator (role Investigator). The contact has the following sub elements • role: The role the person/organisation has related to this dataset. The value must * come from Contact roles. • type: The type of personnel entry. This entry can only have the value Person or Organisation, following the Contact types controlled vocabulary. • name: The full name of the contact. The name field has an optional attribute "uri" to provide persistent identifiers for a person or an organisation. The currently supported schemas are orcid.org and ror.org. • email: The email address to the contact. • phone: The phone number to the contact. The number should include land codes. • organisation: The name of the organisation where the person is employed. The organisation field has an optional attribute "uri" to provide persistent identifiers for an organisation. The currently supported schema for organisation is ror.org. • contact_address contain the address information of the person. It consists of: • address is the organization name, department, mail stop, street address, etc. of the person. • city: is the city or town of the person. • province_or_state: is the province, region or state. • postal_code: is the postal code of the person. • country: is the country of the person. Role, name, organisation and email are mandatory fields.

Element	/mmd/personnel
| Example XML: | ```
<personnel>
    <role>Technical contact</role>
    <type>Person</type>
    <name uri="https://orcid.org/0000-1111-2222-3333">Ole Dole</name>
    <email>ole.dole@example.com</email>
    <phone>004711111111</phone>
    <organisation uri="https://ror.org/001n36p86">Norwegian
Meteorological Institute</organisation>
    <contact_address>
    <address>Meteorologisk institutt, Henrik Mohnsplass 1</address>
    <city>Oslo</city>
    <province_or_state>Oslo</province_or_state>
    <postal_code>0000</postal_code>
    <country>Norway</country>
    </contact_address>
<personnel>
``` |
| DIF equivalent | /Personnel

There is a slight mismatch with DIF since DIF has first name, middle name and last name as separate elements. In export to DIF the name element is exported to <Last_Name> since this element is required. |
| ISO equivalent | For the personell with the role "Metadata author" we place it in

/gmd:MD_Metadata/gmd:contact/gmd:CI_ResponsibleParty

since the ISO standard states that the this element should be "party responsible for the metadata information"

For the other contacts we place them in

/gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:pointOfContact |

2.17. data_center

Element	/mmd/data_center
Attributes	None
Required	No
Repetition allowed	No

Element	/mmd/data_center
Description	Description about the datacenter responsible for the distribution of the dataset. The element has the following child elements: • data_center_name: The name of the data center. This field is split into two child elements: ◦ short_name: the short name or acronym of the data center. ◦ long_name: the long name (or full name) of the data center. • data_center_url: URL to the data center's main website. Information on the data centre contact person for a data centre is conveyed through the element Section 2.16. See Section 2.16 for more information. The role of a data center contact must be "Data center contact". If an id is assigned to the dataset by the data center, it can be included as Section 2.2.

Example XML	```xml
	<data_center>
	    <data_center_name>
	        <short_name>MET Norway</short_name>
	        <long_name>Norwegian Meteorological Institute</long_name>
	    </data_center_name>
	    <data_center_url>http://met.no</data_center_url>
	</data_center>
	``

DIF equivalent	/DIF/Data_Center
ISO equivalent	/gmd:MD_Metadata /gmd:distributionInfo/gmd:MD_Distribution/gmd:distributor/gmd:MD_Distributor/ gmd:distributorContact/gmd:CI_ResponsibleParty

2.18. data_access

Element	/mmd/data_access
Attributes	None
Required	No
Repetition allowed	Yes

Element	/mmd/data_access
Description	Description of how to access the data in the dataset. This element has the following child elements: • type: Description of the type of data access. This is a controlled vocabulary, see Data Access Types. • description: A short description of the data access type and purpose (if necessary). • resource: The URL used to access the data. E.g. for WMS this should point at the GetCapabilities document. • wms_layers: WMS servers behave very different. Some servers has huge GetCapabilities documents with several thousand entries. The purpose of this element is to predefine a number of WMS layers. If the user requests visualisation, the first WMS layer in the list will be presented first.

Example XML:	<pre><code><data_access>
	    <type>OGC WMS</type>
	    <resource>http://...</resource>
	    <description>...</description>
	    <wms_layers>
	    <wms_layer>sea_ice_concentration</wms_layer>
	    </wms_layers>
	</data_access></code></pre>

DIF equivalent	/Related_UrlRL
ISO equivalent	/gmd:MD_Metadata/ gmd:distributionInfo/gmd:MD_Distribution/gmd:transferOptions/gmd:MD_DigitalTransferOptions/gmd:onLine/gmd:CI_OnlineResource

2.19. related_dataset

Element	/mmd/related_dataset
Attributes	relation_type. Valid content is shown below: • parent: This dataset is a child dataset of the referenced dataset. i.e. the other dataset is its parent. • auxiliary: This dataset is auxiliary data for the referenced dataset.
Required	No
Repetition allowed	Yes.
Description	Specifies the relation between this dataset and another dataset. The type of relationship is determined by the relation_type attribute. The content of the element is a valid identifier as identified in the Section 2.1 element.

Element	/mmd/related_dataset
Example XML	``` <related_dataset relation_type="parent"> 9663fc67-5687-4bf2-a274-f3826e41fdc8 </related_dataset> ```
DIF equivalent	NA
ISO equivalent	If the relation_type = "parent". In other cases there are is no mapping. /gmd:MD_Metadata/gmd:parentIdentifier

2.20. storage_information

Element	/mmd/storage_information
Attributes	
Required	No
Repetition allowed	No
Description	Information about the underlying data storage when this is available. File format specifications must follow a controlled vocabulary, as must checksums. Allowed file formats are available in skos [https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/GranuleDataFormat/?format=rdf]. Checksums can be md5sum, shasum (sha256sum, sha384sum, sha512sum) and other higher order approaches. Sub elements include: • file_name: File name for the file in question. • file_location: Location of the file in the local file storage. • file_format: Identification of the file format • file_size: Size of file according to the units expressed as attribute unit. Valid units are MB, GB and TB. • checksum: A checksum for the file. This element require attribute type to be present. • storage_expiry_date: The date when the dataset reaches the end of its life cycle management. After this date the dataset can be deleted. When this information is not present, it is implied that the dataset does not have a storage expiration date, that it is in active life cycle management, and that it can not be deleted. Virtual datasets that are established through aggregation of individual files on e.g. an OPeNDAP server are not described with this element. For harvested data usually only file format is available, if any.

Element	/mmd/storage_information

Example XML:	```xml
	<storage_information>
	  <file_name>
	    osisaf_radiative_flux_24h_hl_polstere-050_multi_202003051200.nc
	  </file_name>
	  <file_location>/home/steingod/Desktop</file_location>
	  <file_format>NetCDF-CF</file_format>
	  <file_size unit="GB">0.12</file_size>
	  <checksum type="sha512sum">
	ad33563f9ab3a6f2ba74ebd72cb1f45fda00d55121a29a29230147e3472ef267c50882b
	0e0b21ef9ee5ed5cc25e454167cd19a1818f1e13bc044b6fc3ef8f285
	  </checksum>
	  <storage_expiry_date>2027-10-24</storage_expiry_date>
	</storage_information>
	``

DIF equivalent	Not directly represented, but partly through Multimedia Sample.
ISO equivalent	NA

2.21. related_information

Element	/mmd/related_information
Attributes	None
Required	No
Repetition allowed	Yes
Description	Description of related information and how to access it. This element has the following child elements: • type: Description of the type of information. A controlled vocabulary is required. See Related Information Types. • resource: The URL used. • description: Textual description on the resource. This element should be used for e.g. THREDDS landing pages. i.e. that is the pages providing the overview of services (HTTP, OPeNDAP, WMS, …) for a dataset. The specific web services for data access are to be added using Section 2.18. This element should also be used to provide links to related publications, e.g. data papers, scientific publications or relevant documentations. The resource should point to the landing page of the publications.

Element	/mmd/related_information
| Example XML: | ```xml
<related_information>
    <type>Project home page</type>
    <description>Project home page</description>
    <resource>URI</resource>
</related_information>

<related_information>
    <type>Dataset landing page</type>
    <description>Dataset landing page</description>
    <resource>URI</resource>
</related_information>

<related_information>
    <type>Scientific publication</type>
    <description>Author, Title (YYYY), Publisher, doi</description>
    <resource>URI</resource>
</related_information>

<related_information>
    <type>Other documentation</type>
    <description>Conference poster</description>
    <resource>URI</resource>
</related_information>

<related_information>
  <type>Observation facility</type>
  <description>WIGOS Station: KVITOYA (0-20000-0-01011)</description>

<resource>https://oscar.wmo.int/surface/#/search/station/stationReportD
etails/0-20000-0-01011</resource>
</related_information>
``` |
| DIF equivalent | /Related_Url

View Related Information |
| ISO equivalent | /gmd:MD_Metadata/ gmd:distributionInfo/gmd:MD_Distribution/gmd:transferOptions/gmd:MD_DigitalTransferOptions/gmd:onLine/gmd:CI_OnlineResource |

2.22. iso_topic_category

Element	/mmd/iso_topic_category
Attributes	none
Required	Yes
Repetition allowed	Yes

Element	/mmd/iso_topic_category
Description	ISO topic category fetched from a controlled vocabulary. Valid keywords are listed in Section 4.7. This field is required for compatibility with DIF and ISO
Example XML:	`<iso_topic_category>ocean</iso_topic_category>`
DIF equivalent	/DIF/ISO_TOPIC_Category
ISO equivalent	/gmd:MD_Metadata/gmd:identificationInfo/ gmd:MD_DataIdentification/gmd:topicCategory/gmd:MD_TopicCategoryCode

2.23. keywords

Element	/mmd/keywords
Attributes	• vocabulary: The vocabulary where the keyword is fetched from. The vocabulary "None" is used if the keyword is not from a vocabulary. The recommended vocabularies to use are listed in Section 4.1, see also Section 3.3 for further details. Search services are currently based on GCMD Science keywords (GCMDSK).
Required	Yes
Repetition allowed	Yes. It is expected that different keyword elements have different vocabulary child elements.
Description	A set of keywords describing the dataset. The keywords should be fetched from a pre-defined vocabulary, but this is not a requirement. This element has two child elements: • resource: URI to machine readable form of the vocabulary used. • keyword: A single keyword describing the dataset. This can be hierarchically like GCMD using a separator. • separator: the character used as separator. This could be e.g. the GCMD '>', but in XML this is encoded as '>'. Other valid separators are: | / -. The primary usage for this element is to describe variables in the dataset, but it could also be used to describe other features.

Element	/mmd/keywords
| Example XML: | ```
<keywords vocabulary="GCMDSK">
    <keyword>Earth Science &gt; Climate Indicators &gt; Teleconnections &gt; North Atlantic Oscillation</keyword>

    <resource>https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords</resource>
    <separator>&gt;</separator>
</keywords>
``` |
| DIF equivalent | /DIF/Parameters |
| ISO equivalent | /gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString |

2.24. project

Element	/mmd/project
Attributes	None
Required	No
Repetition allowed	Yes
Description	Project where the dataset was generated or collected. The element is described using two child element: • short_name: is the abbreviated name of the project from which the data were collected. • long_name: is the full name of the project from which the data were collected. These names must be maintained in a controlled vocabulary.
| Example XML: | ```
<project>
    <short_name>ICE</short_name>
    <long_name>Ice Coverage Everywhere</long_name>
</project>
``` |
| DIF equivalent | /DIF/Project |
| ISO equivalent | NA |

2.25. platform

Element	/mmd/platform
Attributes	None

Element	/mmd/platform
Required	No
Repetition allowed	Yes

Element	/mmd/platform
Description	The platform used to collect the data. Many of the child elements of this group are specifically covering remote sensing information. For a more detailed description of this element and suggested vocabularies see Section 3.4. The element is described using the following child elements: **short_name** is the abbreviated name of the platform (see Section 3.4) used to acquire the data (from a controlled vocabulary). **long_name** is the full name of the platform (see Section 3.4) used to acquire the data (from a controlled vocabulary). **resource** the link to the controlled vocabulary term describing the platform provided above (see Section 3.4). **orbit_relative** is the relative orbit number for a polar orbiting satellite. **orbit_absolute** is the absolute orbit number for a polar orbiting satellite. **orbit_direction** it defines the orbit direction of polar orbiting satellites. The value can be either "ascending" or "descending". **instrument** this part is providing a specification of the instrument. The instrument information can be filled even if the platform information is not provided or not applicable. For more details about this, see Section 3.4. • short_name: this is an acronym for the instrument/sensor (from a controlled vocabulary, see Section 3.4). • long_name: this is the full name for the instrument/sensor (from a controlled vocabulary, see Section 3.4). • resource: this is a link to the controlled vocabulary term describing the instrument (Section 3.4). • mode: this is specific for SAR (can be for other instruments in the future), see Section 4.13. • polarisation: is also for SAR, see Section 4.14 • product_type: is for the Sentinel satellites, see Section 4.15 for more information.

	ancillary is used for information that does not fit in any of the other elements. It includes: • cloud_coverage in percentage which indicates how much of the available data that are covered by clouds. This is used for optical satellite data. • scene_coverage in percentage which indicates how much of map projected satellite product that actually is covered by the satellite. This is useful for e.g. Sentinel-2 data and old AVHRR data at MET. • timeliness indicates whether the data are delayed, i.e. Non-Time Critical (NTC), or Near Real Time (NRT) data. To provide a reference to specific observation facilities, use Section 2.21 (with type "Observation facility").

Example XML:	```xml
	<platform>
	    <short_name>Sentinel-1A</short_name>
	    <long_name>Sentinel-1A</long_name>
	    <resource>
	    https://space.oscar.wmo.int/satellites/view/sentinel_1a
	    </resource>
	    <orbit_relative>121</orbit_relative>
	    <orbit_absolute>62391</orbit_absolute>
	    <orbit_direction>ascending</orbit_direction>
	    <instrument>
	        <short_name>SAR-C</short_name>
	        <long_name>Synthetic Aperture Radar (C-band)</long_name>
	        <resource>
	        https://space.oscar.wmo.int/instruments/view/sar_c_sentinel_1
	        </resource>
	        <mode>IW</mode>
	        <polarisation>VV+VH</polarisation>
	    </instrument>
	    <ancillary>
	        <cloud_coverage>23.4</cloud_coverage>
	        <scene_coverage>77</scene_coverage>
	        <timeliness>NRT</timeliness>
	    </ancillary>
	</platform>
	``

DIF equivalent	/DIF/Platform
ISO equivalent	For ISO we translate platforms to keywords from a specific vocabulary. /gmd:MD_Metadata /gmd:identificationInfo/gmd:MD_DataIdentification/gmd:descriptiveKeywords/gmd:MD_Keywords/gmd:keyword/gco:CharacterString

2.26. spatial_representation

Element	/mmd/spatial_representation
Attributes	None
Required	No
Repetition allowed	No.
Description	The method used to spatially represent geographic information. Valid entries are: vector, grid, point and trajectory (see Section 4.2).
Example XML:	`<spatial_representation>grid</spatial_representation>`
DIF equivalent	NA
ISO equivalent	/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:spatialRepresentationType

2.27. metadata_source

Element	**/mmd/metadata_source**
Attributes	None
Required	No
Repetition allowed	No
Description	The type of metadata source. This element refers to the flow of metadata information, whether it is from internal assets (data produced and/or maintained internally within MET Norway/Arctic Data Centre) or from external data centres through metadata harvesting. It follows a controlled vocabulary from Section 4.4.
Example XML	`<metadata_source>Internal</metadata_source>`
DIF equivalent	NA
ISO equivalent	NA

2.28. activity_type

Element	/mmd/activity_type
Attributes	None
Required	No
Repetition allowed	Yes.

Description	The activity used to collect the data.
	Valid keywords are listed in Section 4.6.
Example XML:	`<activity_type>Space Borne Instrument</activity_type>`
DIF equivalent	NA
ISO equivalent	NA

2.29. dataset_citation

Element	/mmd/dataset_citation
Attributes	None
Required	No (see below for details)
Repetition allowed	Yes

Element	/mmd/dataset_citation
Description	A description of how the dataset should be properly cited. If this information is not available, a citation string will be generated from the metadata available. MMD elements will be translated to Datacite metadata standard when DOI minting is required. This element has the following child elements: • author: The name of the organization(s) or individual(s) with primary intellectual responsibility for the data set's development. This is a mandatory element and is a comma separated list. This field is required for DOI minting for the dataset. • publication_date: The publication/reference date for the (cited) resource. This field is required for DOI minting for the dataset, in the form YYYY-MM-DD • title: The title of the data set, this may be the same as Entry Title or the title of a report or paper. • series: journal, report series or similar for documents. • edition: The version of a cited resource. • volume: The order or sequence of a resource in a series or set. • issue: The issue number of a resource (usually within a volume). • publication_place: The name of the city (and state or province and country if needed) where the resource was made available. • publisher: The name of the individual(s) or organization(s) that made the resource available. This field is required for DOI minting for the dataset. • pages: The range of pages or total number of pages of a cited resource. • isbn: International Standard Book Number (if available). • doi: Digital Object Identifier (if available). • url: The URL of the online resource containing the cited resource (not necessary if DOI is provided). • other: Additional free-text reference information.

Element	/mmd/dataset_citation
| Example XML: | ```
<dataset_citation>
    <author>
Cristian Lussana, Ole Einar Tveito, Andreas Dobler, and Ketil Tunheim
    </author>
    <title>
seNorge_2018, daily precipitation, and temperature datasets over Norway
    </title>
    <series>Earth System Science Data</series>
    <volume>11</volume>
    <issue>4</issue>
    <edition></edition>
    <publication_date>2019-10-01</publication_date>
    <publisher>Copernicus Publications</publisher>
    <pages></pages>
    <isbn></isbn>
    <doi>https://doi.org/10.5194/essd-11-1531-2019</doi>
    <url></url>
    <other></other>
</dataset_citation>
``` |
| DIF equivalent | /DIF/Data_Set_Citation |
| ISO equivalent | There are no direct equivalent in ISO for this element as a whole, but parts can be put into citation information.

dataset_release_date can be translated to

/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:date/gco:DateTime

where gmd:CI_DateTypeCode has attribute codeListValue="publication"

other_citation_details can be translated to

gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:citation/gmd:CI_Citation/gmd:otherCitationDetails |

2.30. quality_control

Element	/mmd/quality_control
Attributes	None
Required	No
Repetition allowed	No

Element	/mmd/quality_control
Description	The level of quality control performed on the dataset/product. Valid keywords are listed in Section 4.18. Additional information about data quality control can be provided through the related_information element providing a URL to the quality control documentation.
Example XML:	``` <quality_control>Basic quality control</quality_control> ```
DIF equivalent	Quality
ISO equivalent	To be defined

Chapter 3. Explanations

3.1. Interpretation of child and parent relationship

If a dataset has a <related_dataset relation_type="parent"> element it means that the referred dataset is this datasets parent. This relationship does not impose any specific characteristics on either the parent or the child dataset. For instance it is not required that the parents dataset is a dataset series and that the child dataset is a dataset within the series. The relationship only causes the child dataset to inherit elements from the parent dataset. Exact semantics for inheritance is to be decided.

3.2. DOI minting request

When requesting a DOI for a dataset following the MMD specifications, the required metadata elements (see Datacite schema 4.3 [https://schema.datacite.org/meta/kernel-4.3/doc/DataCite-MetadataKernel_v4.3.pdf]) to be sent to Datacite will be extracted from the MMD records. The following mapping is in place:

Datacite	Obl.	MMD
Creator	M	/mmd/dataset_citation/author
Title	M	/mmd/title
Publisher	M	/mmd/dataset_citation/publisher
Publication Year	M	/mmd/dataset_citation/publication_date
Resource Type	M	Dataset or Collection depending on the presence of /mmd/temporal_extent/end_date
Language	O	/mmd/dataset_language
AlternateIdentifier	O	/mmd/metadata_identifier (with attribute "METNO UUID")
Rights	O	/mmd/use_constraint/identifier (with attribute rightsURI (resource), rightsIdentifier (identifier), schemeURI (https://spdx.org/licenses/), rightsIdentifierScheme (SPDX))
Description	R	/mmd/abstract (with attribute descriptionType "Abstract")
GeoLocation	R	/mmd/geographic_extent/rectangle

3.3. Variable/parameter descriptions

MMD currently relies on the GCMD Science Keywords for parameter descriptions. The GCMD Science Keywords are available in multiple forms, i.e.,

1. comma separated file [https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/?format=csv]

2. JSON file [https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/?format=json]

3. RDF file [https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/?format=rdf]

4. API reference [https://gcmd.earthdata.nasa.gov/kms/capabilities?format=html]

5. interactive Viewer [https://gcmd.earthdata.nasa.gov/KeywordViewer/scheme/Earth%20Science?gtm_scheme=Earth%20Science]

However, many datasets are encoded using the Climate and Forecast convention [http://cfconventions.org], where CF Standard Names are used. These are available through http://cfconventions.org/Data/cf-standard-names/current/build/cf-standard-name-table.html, and can be converted to GCMD Science Keywords using http://dap.onc.uvic.ca/erddap/convert/keywords.html (further information to be provided).

For observational data WMO Integrated Global Observing System (WIGOS) observed parameter descriptions can be used. These are available at https://codes.wmo.int/wmdr/. Use information from the sections on observed variable.

3.4. Platform and Instrument vocabularies

The platform and instrument used to aquire data are relevant information to describe a dataset. The MMD specification uses a complex field platform (see Section 2.25) to store this.

In order to cover a large variety of use cases, granularity and different vocabularies, some flexibility is added to the field. This includes the acceptance of incomplete vocabularies, e.g., with gaps, and information that cannot be covered using a single source vocabulary.

Depending on the type of data, some information might not be available. An overview of the supported vocabularies, and recommendations on how to fill the platform/instrument fields are provided below.

Remote Sensing

For remote sensing data, the WMO Space-based Capabilities (OSCAR/Space) [https://space.oscar.wmo.int/spacecapabilities] controlled vocabulary is recommended for platform and instrument information.

List of resources:

- Platforms: use the List of Satellites [https://space.oscar.wmo.int/satellites] as reference
- Instruments: use the List of Instruments [https://space.oscar.wmo.int/instruments] as reference

For platform information:

- short_name: use the Acronym from the specific satellite details table (e.g. "Aqua" from https://space.oscar.wmo.int/satellites/view/aqua)
- long_name: use the Full name from the specific satellite details table (e.g. "Earth Observation System - Aqua" from https://space.oscar.wmo.int/satellites/view/aqua)
- resource: use the URL of the specific satellite (e.g. https://space.oscar.wmo.int/satellites/view/aqua)

On the specific satellite page, a list of instruments onboard the satellite is provided.

For instrument information:

- short_name: use the Acronym from the specific instrument details table (e.g. "MODIS" from https://space.oscar.wmo.int/instruments/view/modis)

- long_name: use the Full name from the specific instrument details table (e.g. "Moderate-resolution Imaging Spectro-radiometer" from https://space.oscar.wmo.int/instruments/view/modis)

- resource: use the URL of the specific instrument (e.g. https://space.oscar.wmo.int/instruments/view/modis)

If different instruments from the same platform are used within the dataset, then the whole platform field should be repeated, where the platform information is the same and the instrument information is reporting the different instruments used. Similarly, if the data is referring to the same instuments, but onboard different platforms, the whole field should be repeated.

Other types of platforms and instruments

Instrument reference can be given also in absence of platform details. For specific sensors, instruments and other types of devices the following vocabularies are recommended:

- the SeaDataNet device categories [https://vocab.nerc.ac.uk/collection/L05/current/]

- the SeaVoX Device Catalogue [https://vocab.nerc.ac.uk/collection/L22/current/]

For example, for CTD data the following could be used:

```
<platform>
    <short_name/>
    <long_name/>
    <instrument>
        <short_name>CTD</short_name>
        <long_name>Conductivity, temperature and depth package</long_name>
        <resource>http://vocab.nerc.ac.uk/collection/L22/current/TOOL0001/</resource>
    </instrument>
</platform>
```

For other platforms that do not refer to remote sensing satellites, as for example ships and vessels, the following vocabulary is recommended:

- the ICES Platform Codes [https://vocab.nerc.ac.uk/collection/C17/current/]

For example, for CTD data onboard the Oceania research vessel:

```
<platform>
    <short_name/>
    <long_name>Oceania</long_name>
    <resource>http://vocab.nerc.ac.uk/collection/C17/current/67CE/</resource>
    <instrument>
        <short_name>SBE 911+ CTD</short_name>
        <long_name>Sea-Bird SBE 911plus CTD</long_name>
        <resource>http://vocab.nerc.ac.uk/collection/L22/current/TOOL0058/</resource>
    </instrument>
</platform>
```

Using GCMD keywords

Providing platforms/instruments using the GCMD Platforms and GCMD Instruments keywords is still possible, but it is recommended to use instead the full keyword string and add that to the keywords field using "GCMDPLT" and "GCMDINST" vocabulary attributes.

For example, referring to the "OCEAN WEATHER STATIONS" GCMD Platform keywords, this is preferred:

```
<keywords vocabulary="GCMDPLT">
 <keyword>Platforms > Water-based Platforms > Fixed Platforms > Surface > OCEAN WEATHER
STATIONS</keyword>
 <resource>https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/platforms</resource>
</keywords>
```

For an instrument, as the "MAGNAPROBE" from the GCMD Instrument keywords, these two approaches can be used:

```
<keywords vocabulary="GCMDINST">
 <keyword>Instruments > In Situ/Laboratory Instruments > Probes > MAGNAPROBE</keyword>
 <resource>https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/instruments</resourc
e>
</keywords>
```

and/or

```
<platform>
    <short_name/>
    <long_name/>
    <instrument>
        <short_name>MAGNAPROBE</short_name>
        <long_name>MagnaProbe</long_name>
        <resource>https://gcmd.earthdata.nasa.gov/kms/concept/99b75b86-1e64-4d48-a01f-
aa0cc855a4ae</resource>
    </instrument>
</platform>
```

The long and short names are given for all platforms/instruments (if available) are given at the orginal source:

- Platforms [https://gcmd.earthdata.nasa.gov/KeywordViewer/scheme/platforms?gtm_scheme=platforms]

- Instruments [https://gcmd.earthdata.nasa.gov/KeywordViewer/scheme/instruments?gtm_scheme=instruments]

and can also be found in different formats (see https://gcmd.earthdata.nasa.gov/static/kms/)

Section 2.25

Chapter 4. Controlled vocabularies

4.1. Keywords Vocabulary

The vocabulary where the keyword is fetched from.

code	resource	definition
GCMDSK	https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords	This vocabulary should be used to provide keywords from The Global Change Master Directory (GCMD) Earth Science Keywords list.
GCMDPLT	https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/platforms	This vocabulary should be used to provide keywords from The Global Change Master Directory (GCMD) Platform Keywords list.
GCMDINST	https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/instruments	This vocabulary should be used to provide keywords from The Global Change Master Directory (GCMD) Instrument Keywords list.
GCMDLOC	https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/locations	This vocabulary should be used to provide keywords from The Global Change Master Directory (GCMD) Location Keywords list.
GCMDPROV	https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/providers	This vocabulary should be used to provide keywords from The Global Change Master Directory (GCMD) Data Center/Service Provider Keywords list.
CFSTDN	https://vocab.nerc.ac.uk/standard_name/	This vocabulary should be used to provide keywords from The Climate and Forecast (CF) Standard Names tables.
GEMET	http://inspire.ec.europa.eu/theme	This vocabulary should be used to provide keywords from The GEMET - INSPIRE theme register.
NORTHEMES	https://register.geonorge.no/metadata-kodelister/nasjonal-temainndeling	This vocabulary should be used to provide keywords from The GeoNorge National topic category list.
None	-	This tag should be used to provide keywords that do not belong to a controlled vocabulary.

[keywords_vocabulary]

4.2. Spatial Representation

The method used to spatially represent geographic information.

code	definition
vector	Vector data is used to represent geographic data.
grid	Grid data is used to represent geographic data.
point	A single data point (having no implied coordinate relationship to other points)
trajectory	A series of data points along a path through space with monotonically increasing times

Section 2.26

4.3. Use Constraint

A controlled vocabulary to be used to describe constraints on the usage of metadata and/or data. Ideally, as little constraints as needed should be used to allow maximal reuse of the data. The definitions below relate to Creative Commons.

code identifier	code resource	definition
CC0-1.0	http://spdx.org/licenses/CC0-1.0	The person who associated a work with this deed has dedicated the work to the public domain by waiving all of his or her rights to the work worldwide under copyright law, including all related and neighboring rights, to the extent allowed by law.
CC-BY-3.0	http://spdx.org/licenses/CC-BY-3.0	This is an old version of the CC-BY-4.0 license. It is strongly recommend the use of the CC-BY-4.0 license instead.
CC-BY-4.0	http://spdx.org/licenses/CC-BY-4.0	This license lets others distribute, remix, adapt, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered. Recommended for maximum dissemination and use of licensed materials.
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code identifier	code resource	definition
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CC-BY-ND-4.0	http://spdx.org/licenses/CC-BY-ND-4.0	This license lets others reuse the work for any purpose, including commercially; however, it cannot be shared with others in adapted form, and credit must be provided to you.
CC-BY-NC-ND-4.0	http://spdx.org/licenses/CC-BY-NC-ND-4.0	This license is the most restrictive of our six main licenses, only allowing others to download your works and share them with others as long as they credit you, but they can't change them in any way or use them commercially.

Section 2.15

4.4. Metadata Source

The type of metadata source. This element refers to the flow of metadata information.

code	definition
Internal	Metadata are generated through internal procedures within MET Norway/Arctic Data Centre. This apply to datasets that are produced and/or maintained by MET Norway/Arctic Data Centre.
External-Harvest	Metadata are generated through harvesting procedure of external data centers. This applies to datasets that are produced and/or maintained by contributing data centers.

Section 2.27

4.5. Dataset Production Status

Production status for the dataset.

code	definition
Planned	Refers to data sets to be collected in the future and are thus unavailable at the present time. For Example: The Hydro spacecraft has not been launched, but information on planned data sets may be available.
In Work	Refers to data sets currently undergoing production or data that is continuously being collected or updated. For Example: data from the AIRS instrument on Aqua is being collected continuously.
Complete	Refers to data sets in which no updates or further data collection will be made. For Example: Nimbus-7 SMMR data collection has been completed.
Obsolete	A new version of the dataset has been generated. The new version should be used, this is kept for back tracing.
Not available	The production status of the dataset is not available or not provided.

Section 2.11

4.6. Activity Type

Controlled vocabulary to be used to describe activity types. Rather than using the term observation type or platform which possibly could describe the nature of observed datasets, activity type is used to filter between both observations and simulations that possibly are describing the same phenomena. Activity types are used to identify the origin of the dataset documented through the MMD specifications. This is not an identification of the observation platform, e.g. specific vessel, synoptic (SYNOP) station or satellite, but more the nature of the generation process (e.g. simulation, in situ observation, remote sensing etc). It is useful in the context of filtering data when searching for relevant datasets.

code	definition
Aircraft	Observations made during a flight trajectory. The observations can include remote sensing instruments, dropsondes or in situ measurements. Both manned and unmanned vehicles are covered by this term. The output is typically a trajectory, but could also be profiles or points.
Space Borne Instrument	Observations or analysed products based upon data from a space borne instrument (typically onboard a satellite). The nature of the output is typically gridded, i.e. images or profiles.
Numerical Simulation	Data are generated by the use of a numerical simulation of the atmosphere, the ocean, the climate or similar. Statistical analysis is not covered by this.
Climate Indicator	This indicates a dataset that has been generated by analysis of some data with the emphasis on being representative in a climate context (e.g. consistent in time). Furthermore, a climate indicator is "compact" representation of the feature studied (e.g. the temporal evolution of area covered by sea ice in the Arctic). Climate Indicators are frequently linked to GCOS requirements.
In Situ Land-based station	This is used to tag datasets generated from a site located on land. This can be a permanent, e.g. a synoptic (SYNOP) or radiosondes (TEMP) station or a temporary site, e.g. a field experiment.

code	definition
In Situ Ship-based station	This is used to identify datasets generated during cruises. Typically it describes a full dataset generated in a context, possibly describing both ocean and atmospheric conditions.
In Situ Ocean fixed station	This is used to describe ocean stations that are fixed in space. Typically this is moorings, anchored buoys, oil rigs etc.
In Situ Ocean moving station	This is used to describe ocean stations that are moving around. Typically this is gliders and drifting buoys.
In Situ Ice-based station	This is used to tag datasets generated from a site located on drifting sea ice or some other ice sheet (possibly on land but moving). It typically describes a temporary site (e.g. a field experiment). It would also be used to describe ships frozen in ice and drifting e.g. across the Arctic as well as Ice Thethered Platforms (ITP) and Ice Mass Balance Buoys (IMBB).
Interview/Question naire	This is not much used within environmental science, but comes in useful sometimes. It is used to cover the results of interviews and questionnaires especially in interdisciplinary science.
Maps/Charts/Photog raphs	This is used to tag datasets containing imagery or PDF documents. This could e.g. be a time lapse photographic session of a specific site illustrating e.g. snow cover or cloud cover. It can also be used to tag documents or maps describing the nature of a field station. It would then require datasets to be linked (which currently is not supported).
Not available	This is used when information on the activity type is not available or not provided.

Section 2.28

4.7. ISO Topic Category

Terms defined by ISO describing data themes.

code	definition
inlandWaters	Inland water features, drainage systems and characteristics, for example rivers and glaciers, salt lakes, water utilization plans, dams, currents, floods and flood hazards, water quality, hydrographic charts, watersheds, wetlands, hydrography
intelligenceMilitary	Military bases, structures, activities, for example barracks, training grounds, military transportation, information collection
climatologyMeteor ologyAtmosphere	Processes and phenomena of the atmosphere, for example cloud cover, weather, climate, atmospheric conditions, climate change, precipitation
utilitiesCommunica tions	Energy, water and waste systems and communications infrastructure and services, for example hydroelectricity, geothermal, solar and nuclear sources of energy, water purification and distribution, sewage collection and disposal, electricity and gas distribution, data communication, telecommunication, radio, communication networks

code	definition
farming	Rearing of animals or cultivation of plants, for example agriculture, irrigation, aquaculture, plantations, herding, pests and diseases affecting crops and livestock
imageryBaseMapsEarthCover	Base maps, for example land/earth cover, topographic maps, imagery, unclassified images, annotations, digital ortho imagery
structure	Man-made construction, for example buildings, museums, churches, factories, housing, monuments, shops, towers, building footprints, architectural and structural plans
health	Health, health services, human ecology, and safety, for example disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services, health care providers, public health
elevation	Height above or below sea level, for example altitude, bathymetry, digital elevation models, slope, derived products, DEMs, TINs
society	Characteristics of society and culture, for example settlements, housing, anthropology, archaeology, education, traditional beliefs, manners and customs, demographic data, tourism, recreational areas and activities, parks, recreational trails, historical sites, cultural resources, social impact assessments, crime and justice, law enforcement, census information, immigration, ethnicity
environment	Environmental resources, protection and conservation, for example environmental pollution, waste storage and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape, water quality, air quality, environmental modeling
extraTerrestrial	
biota	Flora or fauna in natural environment, for example wildlife, vegetation, biological sciences, ecology, wilderness, sea life, wetlands, habitat, biological resources
disaster	
transportation	Means and aids for conveying persons or goods, for example roads, airports/airstrips, shipping routes, tunnels nautical charts, vehicle or vessel location, aeronautical charts, railways
geoscientificInformation	Information pertaining to earth sciences, for example geophysical features and processes, geology, minerals, sciences dealing with the composition, structure and origin of the earth's rocks, risks of earthquakes, volcanic activity, landslides, gravity information, soils, permafrost, hydrogeology, groundwater, erosion
oceans	Features and characteristics of salt water bodies (excluding inland waters), for example tides, tidal waves, coastal information, reefs, maritime, outer continental shelf submerged lands, shoreline
economy	Economic activities, conditions, and employment, for example production, labor, revenue, business, commerce, industry, tourism and ecotourism, forestry, fisheries, commercial or subsistence hunting, exploration and exploitation of resources such as minerals, oil and gas

code	definition
planningCadastre	Information used for appropriate actions for future use of the land, for example land use maps, zoning maps, cadastral surveys, land ownership, parcels, easements, tax maps, federal land ownership status, public land conveyance records
location	Positional information and services, for example addresses, geodetic networks, geodetic control points, postal zones and services, place names, geographic names
boundaries	Legal land descriptions, for example political and administrative boundaries, governmental units, marine boundaries, voting districts, school districts, international boundaries
Not available	The iso topic category is not available or not provided.

Section 2.22

4.8. Related Information Types

Description of the type of related information provided.

code	definition
Project home page	URI to the project home page generating the data.
Users guide	URI to a users guide or product manual for the dataset.
Dataset landing page	A dataset landing page.
Scientific publication	A scientific publication.
Data paper	A factual and objective publication with a focused intent to identify and describe specific data, sets of data, or data collections to facilitate discoverability.
Data management plan	The data management plan (DMP) associated to the data.
Software	A computer program in source code (text) or compiled form.
Other documentation	A resource consisting primarily of words for reading, e.g. grey literature, lab notes, accompanying materials, conference poster.
Observation facility	For observational data (in situ or remote) an information page containing more detailed information on the observation facility following OGC Observations and Measurements or WMO Integrated Global Observing System approach.
Extended metadata	Additional unspecified metadata on the data.
Data server landing page	The URL to access an application server (e.g. THREDDS, Hyrax and ERDDAP) landing page or catalog.

[related_information_types]

4.9. Data Access Types

Description of the type of data access provided.

code	definition
HTTP	Direct access to the full data file. May require authentication, but should point directly to the data file.
OPeNDAP	Open-source Project for a Network Data Access Protocol
OGC WMS	OGC Web Mapping Service, URI to GetCapabilities Document.
OGC WFS	OGC Web Feature Service, URI to GetCapabilities Document.
OGC WCS	OGC Web Coverage Service, URI to GetCapabilities Document.
FTP	File Transfer Protocol.
ODATA	Open Data Protocol.

[data_access_types]

4.10. Access Constraint

A controlled vocabulary to be used to describe the constraints on accessing specific metadata and/or data. This is used to determine the exposure of metadata and data internally and externally. Ideally all datasets (metadata and data) are freely available, but it is acknowledged that some metadata and data may have restrictions that limits their visibility to specific communities only.

code	definition
Open	These data are freely available to everyone and can be made available without any restrictions.
Registered users only (automated approval)	These data are available for users as long as they register with name, affiliation, and a valid email address. The verification process can be automated.
Registered users only (manual approval required)	These data are available for users as long as they register with name, affiliation, and a valid email address. The verification process must be manual.
Restricted to a community	These data are available for users within a restricted community. This community determines the authorization mechansim to utilise whether this being IP-address, community specific users names or other.
Restricted access to metadata	Information on these data MUST NOT be exposed externally. This implies that neither metadata can be exposed externally.

Section 2.14

4.11. Operational Status

Controlled vocabulary to be used to describe operational status of datasets handled. This is used in filtering of the information. Typically scientific datasets are generated without a temporal perspective and review process. The review process of scientific products is publications in refereed journals or in data citation papers. Experimental, Pre-Operational and Operational are concepts supported by institutions with a commitment for a specific delivery over time.

code	definition
Operational	This is used to tag datasets that are continuously being evaluated and validated. The production of the data is under the responsibility of an authority and follows a review and documentation process. Operational data are generated on a continuous basis with a temporal perspective.
Pre-Operational	This is used to describe data that are under review for becoming the next operational delivery. It is usually produced continuously, but not necessarily distributed to users not specifically. It covers the intermediate step between Experimental and Operational.
Experimental	This is used to describe data that belongs to a development and production chain that provides operational data. It is the first step in the process of becoming operational.
Scientific	This is used to describe purely scientific products, i.e. products generated through scientific projects and usually with a limited temporal perspective.
Not available	This is used when information on the operational status is not available or not provided.

Section 2.13

4.12. Collection Keywords

The purpose of this vocabulary is to identify which collection a dataset belongs to. This is used to identify sets when serving metadata through e.g. OAI-PMH or to identify which data to present in e.g. a project specific portal when all metadata records are in the same repository.

code	definition
CC	Datasets related to the Cryosphere in the context of the CryoClim project.
NMAP	Remote sensing datasets or higher order products based on remote sensing datasets generated in the context of the Norwegian Satellite Earth Observation Database for Marine and Polar Research (NORMAP).
ADC	Datasets related to the Arctic Data Centre. This is the fall back collection, but it might be that some datasets are not officially part of the ADC collection and thus should only be searchable, but not exported using OAI-PMH.
GCW	Datasets relevant for WMO Global Cryosphere Watch.

code	definition
NMDC	Datasets relevant for the Norwegian Marine Data Centre. This is basically datasets of a marine origin, regardless of whether they are of operational or scientific origin.
SIOS	Datasets relevant for the Svalbard Integrated Arctic Earth Observing System.
NSDN	Datasets shown in the context of the Norwegian Scientific Data Network (NorDataNet).
DOKI	Datasets provided by projects funded by the Research Council of Norway during the International Polar Year 2007/2008.
DAM	Datasets provided through the EU FP6 project DAMOCLES.
ACCESS	Datasets provided in the context of the EU FP7 project ACCESS.
NBS	Copernicus Sentinel datasets provided in the context of the National Ground Segment for Satellite Data.
APPL	Datasets provided in the context of EU H2020 project APPLICATE.
YOPP	Datasets provided in the context of WMO Year Of Polar Prediction.
METNCS	Datasets provided through core services at MET Norway.
SESS2018	Datasets provided in relation to the report State of Environmental Science in Svalbard (SESS) report in 2018.
SESS2019	Datasets provided in relation to the report State of Environmental Science in Svalbard (SESS) report in 2019.
SESS2020	Datasets provided in relation to the report State of Environmental Science in Svalbard (SESS) report in 2020.
SESS2022	Datasets provided in relation to the report State of Environmental Science in Svalbard (SESS) report in 2022.
SIOSCD	Datasets that are SIOS Core Data.
SIOSAP	Datasets from the SIOS Access Programme.
SIOSIN	Datasets from the SIOS InfraNor project funded by the Research Council of Norway.
CVL	Datasets from the ESA Cryosphere Virtual Lab.
AeN	Datasets provided through the Arven etter Nansen project (Nansen Legacy) funded by the Research Council of Norway.
TONE	Datasets from the Troll Observing Network in Antarctica.
NySMAC	Datasets from Ny-Ålesund in the context of NySMAC (Ny-Ålesund Science Managers Committee).
KSS	Datasets from the Norwegian Centre for Climate Services (Norsk KlimaServiceSenter).
GEONOR	Datasets that shall be discoverable through Geonorge.
POLARIN	Datasets that are relevant for the EU Horizon Europe project POLARIN.

4.13. Instrument Modes

Instrument Modes for Sentinel-1 (SAR-C)

code	definition
SM	StripMap. Relates to Sentinel-1
IW	ScanSAR - Interferometric Wide Swath. Relates to Sentinel-1
EW	ScanSAR - Extra-Wide Swath. Relates to Sentinel-1
WV	Wave Mode. Relates to Sentinel-1

[instrument_modes]

4.14. Polarisation Modes

Polarisation Modes

code	definition
HH	Single polarisation mode: Horisontally transmitted and Horisontally received
VV	Single polarisation mode: Vertically transmitted and Vertically received
HH+HV	Dual polarisation mode:
VV+VH	Dual polarisation mode:

[polarisation_modes]

4.15. Product Types

code	definition
SLC	Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
GRD	Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84.
OCN	Ocean (OCN) products for wind, wave and currents applications derived from the SAR data.
S2MSI1C	Ortho-rectified and UTM geo-coded Top-of-Atmosphere Reflectance with sub-pixel multispectral and multi-date registration.

code	definition
S2MSI2A	Ortho-rectified and UTM geo-coded Bottom-of-Atmosphere multi-spectral reflectance. Additional outputs are Aerosol Optical Thickness (AOT) map, Water Vapour (WV) map, Scene Classification map together with Quality Indicators data.
SAR-WV-L1-SLC	Wave (WV) Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-WV-L2-OCN	Wave (WV) Level-2 Ocean (OCN) products for wind, wave and currents applications derived from the SAR data.
SAR-SM1-L1-GRDH	Stripmap (SM) Beam 1 Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-SM1-L1-SLC	Stripmap (SM) Beam 1 Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-SM1-L0-RAW	Stripmap (SM) Beam 1 Level-0 (RAW) products, the basis from which all other high level products are produced.
SAR-SM2-L1-GRDH	Stripmap (SM) Beam 2 Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-SM2-L1-SLC	Stripmap (SM) Beam 2 Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-SM2-L0-RAW	Stripmap (SM) Beam 2 Level-0 (RAW) products, the basis from which all other high level products are produced.
SAR-SM3-L1-GRDH	Stripmap (SM) Beam 3 Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-SM3-L1-SLC	Stripmap (SM) Beam 3 Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-SM3-L0-RAW	Stripmap (SM) Beam 3 Level-0 (RAW) products, the basis from which all other high level products are produced.
SAR-SM4-L1-GRDH	Stripmap (SM) Beam 4 Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-SM4-L1-SLC	Stripmap (SM) Beam 4 Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-SM4-L0-RAW	Stripmap (SM) Beam 4 Level-0 (RAW) products, the basis from which all other high level products are produced.

code	definition
SAR-SM5-L1-GRDH	Stripmap (SM) Beam 5 Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-SM5-L1-SLC	Stripmap (SM) Beam 5 Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-SM5-L0-RAW	Stripmap (SM) Beam 5 Level-0 (RAW) products, the basis from which all other high level products are produced.
SAR-SM6-L1-GRDH	Stripmap (SM) Beam 6 Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-SM6-L1-SLC	Stripmap (SM) Beam 6 Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-SM6-L0-RAW	Stripmap (SM) Beam 6 Level-0 (RAW) products, the basis from which all other high level products are produced.
SAR-EW-L1-GRDM	Extra Wide Swath (EW) Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. Medium resolution.
SAR-EW-L1-GRDH	Extra Wide Swath (EW) Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-EW-L1-SLC	Extra Wide Swath (EW) Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-EW-L2-OCN	Extra Wide Swath (EW) Level-2 Ocean (OCN) products for wind, wave and currents applications derived from the SAR data.
SAR-EW-L0-RAW	Extra Wide Swath (EW) Level-0 (RAW) products, the basis from which all other high level products are produced.
SAR-IW-L1-GRDM	Interferometric Wide Swath (IW) Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. Medium resolution.
SAR-IW-L1-GRDH	Interferometric Wide Swath (IW) Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using an Earth ellipsoid model such as WGS84. High resolution.
SAR-IW-L1-SLC	Interferometric Wide Swath (IW) Level-1 Single Look Complex (SLC) products consist of focused SAR data, geo-referenced using orbit and attitude data from the satellite, and provided in slant-range geometry.
SAR-IW-L2-OCN	Interferometric Wide Swath (IW) Level-2 Ocean (OCN) products for wind, wave and currents applications derived from the SAR data.

code	definition
SAR-IW-L0-RAW	Interferometric Wide Swath (IW) Level-0 (RAW) products, the basis from which all other high level products are produced.
MSI-L1C	Level-1C ortho-rectified and UTM geo-coded Top-of-Atmosphere Reflectance from the Sentinel 2 Multi-Spectral Imager with sub-pixel multispectral and multi-date registration.
MSI-L2A	Level-2A ortho-rectified and UTM geo-coded Bottom-of-Atmosphere multi-spectral reflectance from the Sentinel 2 Multi-Spectral Imager. Additional outputs are Aerosol Optical Thickness (AOT) map, Water Vapour (WV) map, Scene Classification map together with Quality Indicators data.
OL-L1-EFR	Level-1 top of atmosphere reflectance from the Ocean and Land Colour Instrument (OLCI) push-broom imaging spectrometer that measures solar radiation reflected by the Earth at a ground spatial resolution of around 300m, over all surfaces, in 21 spectral bands. Full resolution (EFR).
OL-L1-ERR	Level-1 top of atmosphere reflectance from the Ocean and Land Colour Instrument (OLCI) push-broom imaging spectrometer that measures solar radiation reflected by the Earth at a ground spatial resolution of around 300m, over all surfaces, in 21 spectral bands. Reduced resolution (ERR).
SL-L1-RBT	Level-1 radiances and brightness temperatures from Sea and Land Surface Temperature Radiometer (SLSTR) observations
SR-L1A-SRA	Level 1A altimetry data from the Synthetic Aperture Radar Altimeter (SRAL) aboard the European Space Agency (ESA) Sentinel 3 satellites. These products are geo-located bursts of echoes with all calibrations applied.
SR-L1B-SRA	Level 1B altimetry data from the Synthetic Aperture Radar Altimeter (SRAL) aboard the European Space Agency (ESA) Sentinel 3 satellites. These products are geo-located and fully calibrated multi-looked High Resolution power echoes.
SR-L1B-SRA-S	Level 1B-S altimetry data from the Synthetic Aperture Radar Altimeter (SRAL) aboard the European Space Agency (ESA) Sentinel 3 satellites. The data are fully SAR-processed and calibrated High Resolution complex echoes arranged in stacks after slant range correction and prior to echo multi-look (multi-look processing reduces noise by averaging of adjacent pixels, and thereby reduces the standard deviation of the noise level).
OL-L2-WFR	Level-2 OLCI (Ocean and Land Colour Instrument) reduced resolution water and atmosphere geophysical products.
OL-L2-WRR	Level-2 OLCI (Ocean and Land Colour Instrument) reduced resolution water and atmosphere geophysical products.
OL-L2-LFR	Level-2 OLCI (Ocean and Land Colour Instrument) Full Resolution Land and atmosphere geophysical products.
OL-L2-LRR	Level-2 OLCI (Ocean and Land Colour Instrument) Reduced Resolution Land and atmosphere geophysical products.
SR-L2-WAT	Level-2 Sentinel-3 SRAL Level-2 marine altimetry data

code	definition
SR-L2-LAN	Level-2 Sentinel-3 SRAL Level-2 land altimetry data
SR-L2-LAN-HY	Level-2 Sentinel-3 STM Hydrology Thematic Products contain surface topography estimations of lakes and rivers.
SR-L2-LAN-SI	Level-2 Sentinel-3 STM Sea Ice Thematic Products contain estimations of the radar freeboard over the Arctic and Antarctic sea ice.
SR-L2-LAN-LI	Level-2 Sentinel-3 STM Land Ice Thematic Products contain surface topography estimations of the Greenland and Antarctic ice sheets.
SL-L2-WST	Level-2 sea surface temperature derived from Sea and Land Surface Temperature Radiometer (SLSTR) observations
SL-L2-FRP	Level-2 fire radiative power derived from Sea and Land Surface Temperature Radiometer (SLSTR) observations
SL-L2-AOD	Level-2 aerosol optical depth derived from Sea and Land Surface Temperature Radiometer (SLSTR) observations
SL-L2-LST	Level-2 land surface temperature derived from Sea and Land Surface Temperature Radiometer (SLSTR) observations
SY-L2-SYN	The SYN branch of Sentinel-3 processing is a synergy of OLCI and SLSTR products. Level-2 surface reflectance and aerosol parameters over Land.
SY-L2-VGP	The SYN branch of Sentinel-3 processing is a synergy of OLCI and SLSTR products. Level-2 1 km VEGETATION-Like product (~VGT-P) - TOA Reflectance.
SY-L2-AOD	Level-2 aerosol optical depth derived from Sea and Land Surface Temperature Radiometer (SLSTR) observations
SY-L2-VG10	The SYN branch of Sentinel-3 processing is a synergy of OLCI and SLSTR products. Level-2. 1 km VEGETATION-Like product (~VGT-S10) 10 day synthesis surface reflectance and NDVI (normalised difference vegetation index).
SY-L2-VG1	The SYN branch of Sentinel-3 processing is a synergy of OLCI and SLSTR products. Level-2 1 km VEGETATION-Like product (~VGT-S1) 1 day synthesis surface reflectance and NDVI (normalised difference vegetation index).
TR-L1B-IR-SIR	Level 1B irradiance products from the TROPOMI instrument onboard Sentinel-5 Precursor, containing solar irradiance spectra. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. There are four different spectrometers, each with its own optics and detector: mediumwave ultraviolet (UV), longwave ultraviolet combined with visible (UVIS), near infrared (NIR), and shortwave infrared (SWIR). The spectrometers for UV, UVIS and NIR are jointly referred to as UVN. Radiation for the SWIR spectrometer is transferred by an optical relay part in the UVN system from the telescope to an interface position (the pupil stop) for the SWIR spectrometer. This is done because of the more stringent thermal requirements on the SWIR part of the instrument. L1B_IR_SIR products contain the solar irradiance spectra for the SWIR bands (band 7 and band 8). This covers the spectral range of 2305-2385 nm.

code	definition
TR-L1B-IR-UVN	Level 1B irradiance products from the TROPOMI instrument onboard Sentinel-5 Precursor, containing solar irradiance spectra. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. The spectrometers for ultraviolet (UV), longwave ultraviolet combined with visible (UVIS) and near infrared (NIR) are jointly referred to as UVN. L1B_IR_UVN products contain the solar irradiance spectra for the UVN bands (band 1 through band 6). This covers the spectral range of 270-775 nm.
TR-L1B-RA-BD1	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 1 spans a spectral range of 270-300 nm.
TR-L1B-RA-BD2	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 2 spans a spectral range of 300-320 nm.
TR-L1B-RA-BD3	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 3 spans a spectral range of 320-405 nm.
TR-L1B-RA-BD4	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 4 spans a spectral range of 405-500 nm.
TR-L1B-RA-BD5	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 5 spans a spectral range of 675-725 nm.

code	definition
TR-L1B-RA-BD6	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 6 spans a spectral range of 725-775 nm.
TR-L1B-RA-BD7	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 7 spans a spectral range of 2305-2355 nm.
TR-L1B-RA-BD8	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. Band 8 spans a spectral range of 2345-2385 nm.
TR-L2-AER-AI	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. TROPOMI aerosol index is referred to as the Ultraviolet Aerosol Index (UVAI). The relatively simple calculation of the Aerosol Index is based on wavelength dependent changes in Rayleigh scattering in the UV spectral range where ozone absorption is very small. UVAI can also be calculated in the presence of clouds so that daily, global coverage is possible. This is ideal for tracking the evolution of episodic aerosol plumes from dust outbreaks, volcanic ash, and biomass burning.
TR-L2-AER-LH	The TROPOMI Aerosol Layer Height product focuses on retrieval of vertically localised aerosol layers in the free troposphere, such as desert dust, biomass burning aerosol, or volcanic ash plumes. The height of such layers is retrieved for cloud-free conditions.
TR-L2-CLOUD	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from the earth. The TROPOMI instrument, single payload onboard Sentinel-5 Precursor, retrieves operationally the most important quantities for cloud correction of satellite trace gas retrievals: cloud fraction, cloud optical thickness (albedo), and cloud-top pressure (height). Cloud parameters from TROPOMI are not only used for enhancing the accuracy of trace gas retrievals, but also to extend the satellite data record of cloud information derived from oxygen A-band measurements initiated with GOME.

code	definition
TR-L2-CO	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. The TROPOMI instrument, single payload onboard Sentinel-5 Precursor, retrieves the CO global abundance exploiting clear-sky and cloudy-sky Earth radiance measurements in the 2.3 ⬜m spectral range of the shortwave infrared (SWIR) part of the solar spectrum. TROPOMI clear sky observations provide CO total columns with sensitivity to the tropospheric boundary layer. For cloudy atmospheres, the column sensitivity changes according to the light path. The TROPOMI CO retrieval uses the same method employed by SCIAMACHY.
TR-L2-NO2	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from Earth. The TROPOMI instrument, single payload onboard Sentinel-5 Precursor, retrieves operationally tropospheric and stratospheric NO_2 column products. The TROPOMI NO_2 data products pose an improvement over previous NO_2 data sets, particularly in their unprecedented spatial resolution, but also in the separation of the stratospheric and tropospheric contributions of the retrieved slant columns, and in the calculation of the air-mass factors used to convert slant to total columns.
TR-L2-SO2	Total column Sulphur Dioxide (SO2) data from the TROPOspheric Monitoring Instrument (TROPOMI) aboard the Sentinel 5P satellite.
TR-L2-CH4	Level 2 (geolocated) total column Methane (CH4) data from the TROPOspheric Monitoring Instrument (TROPOMI) aboard the Sentinel 5P satellite.
TR-L2-HCHO	Total column Formaldehyde (HCHO) data from the TROPOspheric Monitoring Instrument (TROPOMI) aboard the Sentinel 5P satellite.
TR-L2-O3	The TROPOMI instrument onboard Sentinel-5 Precursor is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from the earth. Ozone (O3) is of crucial importance for the equilibrium of the Earth's atmosphere. In the stratosphere, the ozone layer shields the biosphere from dangerous solar ultraviolet radiation. In the troposphere, it acts as an efficient cleansing agent, but at high concentration it also becomes harmful to the health of humans, animals, and vegetation. Ozone is also an important greenhouse-gas contributor to ongoing climate change.

code	definition
TR-L2-O3-TCL	The TROPOspheric Monitoring Instrument (TROPOMI) tropospheric ozone product is a level-2c product that represents three days of averaged tropospheric ozone columns on a 0.5° by 1° latitude-longitude grid for the tropical region between 20°N and 20°S. The TROPOMI tropospheric ozone column product uses the TROPOMI Level-2 total OZONE and CLOUD products as input.
TR-L2-O3-PR	Sentinel 5P total column ozone products contain total ozone, ozone temperature, and error information including averaging kernels. These data products are provided in a 7km x 3.5km resolution.
TR-L2-NP-BD3	The TROPOMI instrument onboard Sentinel-5 Precursor (S5P) is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from the earth. The S5P level 2 methane product is dependent on having information on cloud occurrence at spatial resolution finer than that achievable from TROPOMI itself. This information is also useful for other purposes, including assessing the influence of cloud on other L2 products and issues related to spatial co-registration. A level 2 auxiliary product was therefore developed to describe cloud in the TROPOMI field of view (FOV), using co-located observations of VIIRS (Visible Infra-red Imaging Radiometer Suite) on the U.S. S-NPP (Suomi - National Polar-orbiting Partnership). S5P flies in a so-called loose formation with the S-NPP with a temporal separation between them of less than 5 minutes. The main information contained in the S5P-NPP product is: A statistical summary for each S5P FOV of the NPP-VIIRS L2 Cloud Mask (VCM). The mean and standard deviation of the sun-normalised radiance in a number of VIIRS moderate resolution bands. This information is provided for three S5P spectral bands (to account for differences in spatial sampling).
TR-L2-NP-BD6	The TROPOMI instrument onboard Sentinel-5 Precursor (S5P) is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from the earth. The S5P level 2 methane product is dependent on having information on cloud occurrence at spatial resolution finer than that achievable from TROPOMI itself. This information is also useful for other purposes, including assessing the influence of cloud on other L2 products and issues related to spatial co-registration. A level 2 auxiliary product was therefore developed to describe cloud in the TROPOMI field of view (FOV), using co-located observations of VIIRS (Visible Infra-red Imaging Radiometer Suite) on the U.S. S-NPP (Suomi - National Polar-orbiting Partnership). S5P flies in a so-called loose formation with the S-NPP with a temporal separation between them of less than 5 minutes. The main information contained in the S5P-NPP product is: A statistical summary for each S5P FOV of the NPP-VIIRS L2 Cloud Mask (VCM). The mean and standard deviation of the sun-normalised radiance in a number of VIIRS moderate resolution bands. This information is provided for three S5P spectral bands (to account for differences in spatial sampling).

code	definition
TR-L2-NP-BD7	The TROPOMI instrument onboard Sentinel-5 Precursor (S5P) is a nadir-viewing, imaging spectrometer covering wavelength bands between the ultraviolet and the shortwave infrared. The instrument uses passive remote sensing techniques to attain its objective by measuring, at the Top Of Atmosphere (TOA), the solar radiation reflected by and radiated from the earth. The S5P level 2 methane product is dependent on having information on cloud occurrence at spatial resolution finer than that achievable from TROPOMI itself. This information is also useful for other purposes, including assessing the influence of cloud on other L2 products and issues related to spatial co-registration. A level 2 auxiliary product was therefore developed to describe cloud in the TROPOMI field of view (FOV), using co-located observations of VIIRS (Visible Infra-red Imaging Radiometer Suite) on the U.S. S-NPP (Suomi - National Polar-orbiting Partnership). S5P flies in a so-called loose formation with the S-NPP with a temporal separation between them of less than 5 minutes. The main information contained in the S5P-NPP product is: A statistical summary for each S5P FOV of the NPP-VIIRS L2 Cloud Mask (VCM). The mean and standard deviation of the sun-normalised radiance in a number of VIIRS moderate resolution bands. This information is provided for three S5P spectral bands (to account for differences in spatial sampling).

[product_types]

4.16. Contact Roles

code	definition
Investigator	The person who headed the investigation or experiment that resulted in the acquisition of the data described (i.e., Principal Investigator, Experiment Team Leader) and knows the details on data collection and processing.
Technical contact	The person who is knowledgeable about the technical content of the data (quality, processing methods, units, available software for further processing).
Metadata author	The main responsible person for the generation of the metadata for this dataset. Other people could have been involved, but this is the main contact with regard to the metadata.
Data center contact	An individual affiliated with a data center.

[contact_roles]

4.17. Contact Types

The type of personnel associated with the dataset.

code	definition
Person	A person.

code	definition
Organisation	An organisation, institution or any other entity that is not referred to as an individual.

[contact_types]

4.18. Quality Control

A controlled vocabulary for the level of quality control performed on the dataset/product.

code	definition
No quality control	No quality control has been performed on the dataset.
Basic quality control	A basic quality control has been performed on the dataset. The result of the quality control follows the data as flags.
Extended quality control	The dataset has undergone basic real time quality control and more advanced quality control. The advanced quality control may include controls on the temporal and spacial scale. The result follows the data as flags.
Comprehensive quality control	The dataset has undergone extensive quality control, including but not limited to basic and advanced automatic controls and regular manual control. The result of the quality control follows the data as flags.

Section 2.30