

CEOP/IGWCO Joint Meeting, Feb.28 – March 4, University of Tokyo, Japan

Standardization framework for CEOP metadata development and application

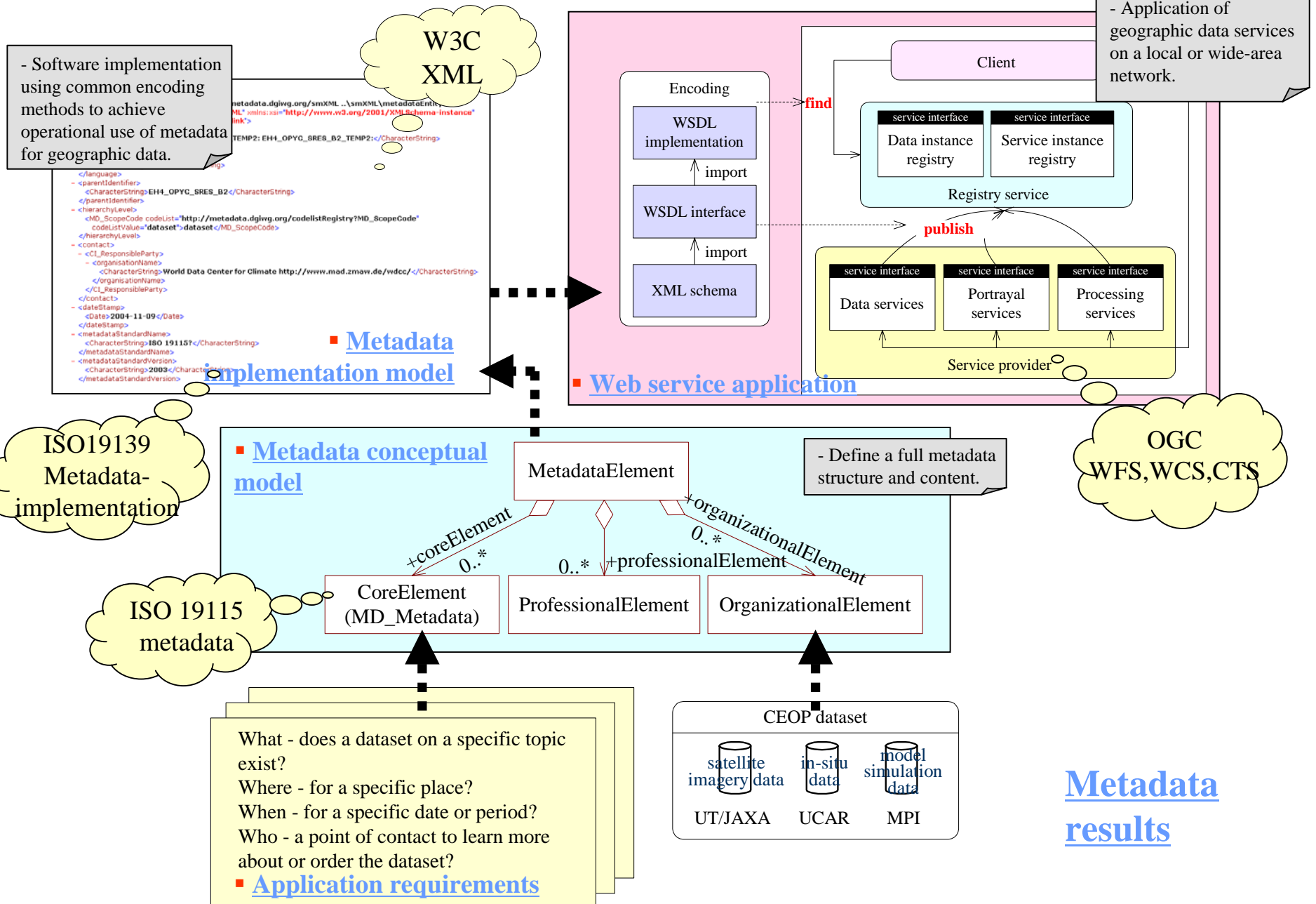
Rong Xie, Prof. Ryosuke Shibasaki
{xierong, shiba}@skl.iis.u-tokyo.ac.jp



Background

- CEOP (<http://ceop.net/>) is establishing an integrated global observing system for water cycle for both scientific and social needs.
- To integrate various CEOP data, like satellite imagery data, reference site data and model simulation results (GRIB, MOLTS), metadata development and application becomes an important basic research.
- Standardization metadata provides data producers with the format and content for properly describing their data, effectively and efficiently data management and data maintenance. Also, it supports data users to find and obtain more useful data they need effectively and efficiently.

Metadata standard development framework



Application requirements

To know the user requirements, it is firstly required to answer the questions:

- **What** - does a dataset on a specific topic exist?
- **Where** - for a specific place?
- **When** - for a specific date or period?
- **Who** - a point of contact to learn more about or order the dataset?

Header Information of Each data file (Ver.02)

Revision date of this table(Ver.02): Aug. 11, 2003

First version of this table(Ver.01): Nov. 18, 2002

for “Satellite imagery data”

No.	Description	Type	Size	
1	Filename	Character	64	
2	Sensor	Character	64	
3	Product	Character	64	
4	Observation Date and Time	Character	64	
5	Image Size	Character	64	データサイズ
6	Data Type	Character	64	
7	Data Unit	Character	64	
8	Scale Factor	Character	64	ピクセル値
9	Observation Channel	Character	256	
10	Reference Site	Character	64	
11	LAT./LON. in center of Lower Left Pixel	Character	64	
12	Grid Size	Character	64	地上でのグリッド間隔 (緯度・経度単位)
13	Missing Value	Character	64	9999
14	Observation area ratio (Observed Pixel/All Pixel)	Character	64	サイトのうちの何%をその衛星画像がカバーしているか?
15	Subset software version	Character	64	
16	Processing Date	Character	64	
17	Processing Center	Character	64	
18	Input Original Filename	Character	64	
19	Original File Processing Center	Character	64	
20	HDF library version	Character	64	
21	Blank	Character	576	

Total Size:

2048 Byte

for “Reference site
data”

CEOP Reference Site Data Set Metadata Procedures

The documentation (i.e. the "Readme" file) that accompanies each CEOP Reference Site Data Set is as important as the data itself. This information permits collaborators and other analysts to become aware of the data and to understand any limitations or special characteristics of data that may impact its use elsewhere. The data set documentation should accompany all data set submissions and contain the information listed in the outline below. The following outline (and content) should be adhered to as closely as possible to make the documentation consistent across all data sets. A documentation file submission must accompany each submitted data set.

TITLE: This should match the data set name

CONTACT(S):

Name(s) of Reference Site Contact(s)
 Complete mailing address, telephone/facsimile Nos.,
 E-mail address and WWW address (if applicable)
 Similar contact information for data questions (if different than above)

1.0 DATA SET OVERVIEW:

Introduction or abstract
 Time period covered by the data
 Physical location (including lat/lon/elev) of the measurement or platform, **landscape, and soil characteristics**
 Data source if applicable (e.g. for operational data include agency)
 Any World Wide Web address references (i.e. additional documentation such as Project WWW site)

2.0 INSTRUMENTATION DESCRIPTION:



a directory of Earth science data and services



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- Agriculture
- Atmosphere
- Biosphere
- Climate Indicators
- Cryosphere
- Human Dimensions
- Hydrosphere
- Land Surface
- Oceans
- Paleoclimate
- Solid Earth
- Spectral/Engineering
- Sun-Earth Interactions

Global Modeling and Assimilation Office (GMAO) Model Output Data to Support the Coordinated Enhanced Observing Period (CEOP)

[Update this record](#)

Summary

2004-06-22

These data are from the GEOS3 operational data assimilation system for the period 1 July 2001 to 30 September 2001 corresponding to the Coordinated Enhanced Observing Period (CEOP) Enhanced Observing Period-1 (EOP-1).

The GMAO will provide operational analyses for CEOP. The data for the first CEOP EOP-1 are available as are the Model Output Time Series (MOLTS) for the CEOP reference sites.

See: http://gmao.gsfc.nasa.gov/sci_research/CEOP/README1st.php for further documentation and details.

for "MOLTS"

Data Set Citation

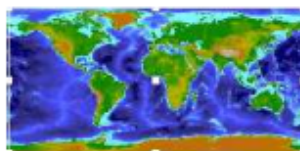
Dataset_Creator: NASA GSFC Global Modeling and Assimilation Office
Dataset_Title: GEOS3 CEOP EOP-1
Dataset_Release_Date: 2003
Dataset_Release_Place: Greenbelt, MD
Dataset_Publisher: NASA/GSFC
Online_Resource: http://gmao.gsfc.nasa.gov/sci_research/CEOP/README1st.php

Temporal Coverage

Start Date: 2001-07-01
Stop Date: 2004-09-30

Spatial Coverage

Southernmost Latitude: -90.0
Westernmost Longitude: -180.0
Northernmost Latitude: 90.0
Easternmost Longitude: 180.0



Location Keywords

GLOBAL

Data Resolution

Latitude Resolution: 1 degree
Longitude Resolution: 1 degree

Parameters

HYDROSPHERE > SNOWICE > SNOW DEPTH **i**
CRYOSPHERE > SEA ICE > SNOW DEPTH **i**

ISO Topic Category

CLIMATOLOGY/METEOROLOGY/ATMOSPHERE
BIOTA
OCEANS
INLAND WATERS
GEOSCIENTIFIC INFORMATION
ELEVATION

Platform

GCM > General Circulation Model
MODELS

Project

CEOP > Coordinated Enhanced Observing Period
GEWEX > Global Energy and Water Cycle Experiment

Entry ID

CEOP_DAO

Keywords

Model Output Location Time Series
Goddard Earth Observing System
.....

Data Set Progress

IN WORK

Originating Center

NASA/DAO

Data Center

Data Center Name: NASA/GSFC/GMAO > Global Modeling and Assimilation, ...
Data Center URL: <http://gmao.gsfc.nasa.gov/>
Name: MICHELE, DR. RIENECKER
Email: mrienecker@gmao.gsfc.nasa.gov
Address: Head, Global Modeling and Assimilation Office, ...
City: Greenbelt
Province or State: MD
Postal Code: 20771

Distribution

Distribution_Media: ftp
Fees: none

Personnel

Name: MICHAEL BOSILOVICH
Role: TECHNICAL CONTACT
Email: Michael.Bosilovich@nasa.gov
Address: NASA/Goddard Space Flight Center Data Assimilation Office
City: Greenbelt
Province or State: MD
Postal Code: 20771
Country: USA

Related URL

Content Type: RELATED DATA SET DESCRIPTION
URL: http://gmao.gsfc.nasa.gov/sci_research/CEOP/index.php
Description: Access to additional documentation

Reference

Chou, M.D., 1984: Broadband water vapor transmission functions for atmospheric IR flux computations. J. Atmos. Sci., 41, 1775-1778

ISO Metadata Information

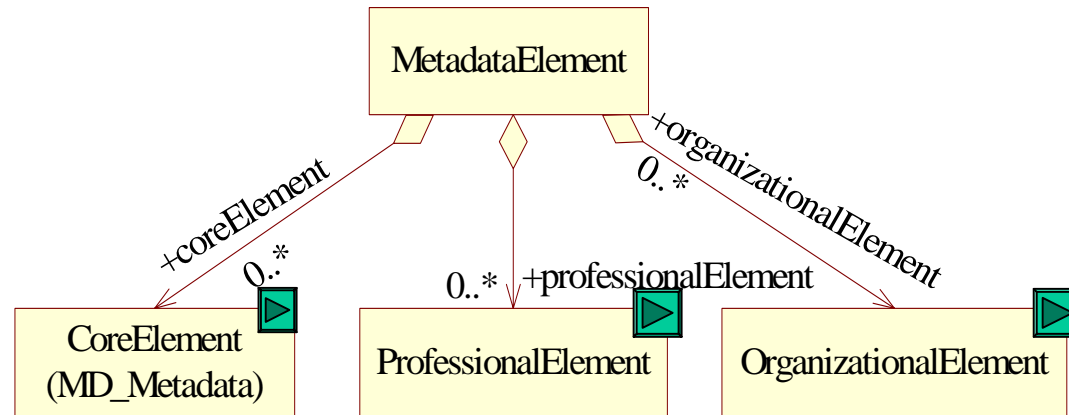
Metadata Name: CEOS IDN DIF
Metadata Version: VERSION 9.0

Metadata conceptual model

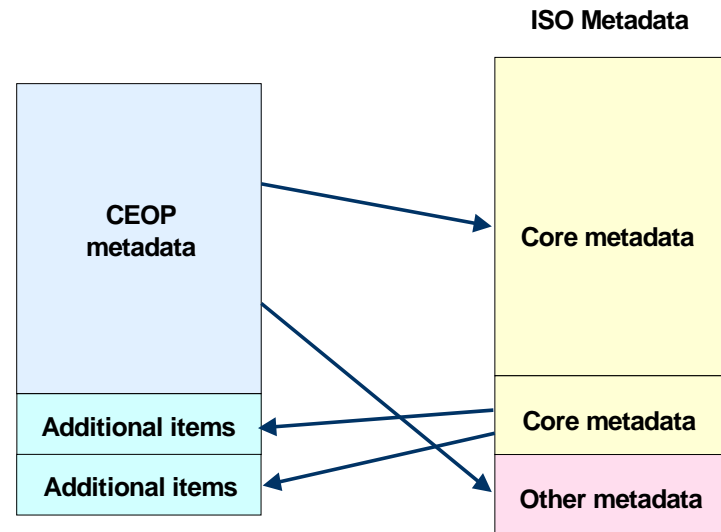
- We take advantage of integrating or making conformant of CEOP metadata following ISO metadata standard.
- ISO 19115 metadata was approved by the international community in April 2003 as a tool to define metadata in the field of geographic information.
- This standard defines the schema required for describing geographic information and services and provides information about identification, extent, quality, spatial and temporal schema, spatial reference, and distribution of digital geographic data.

Metadata conceptual model

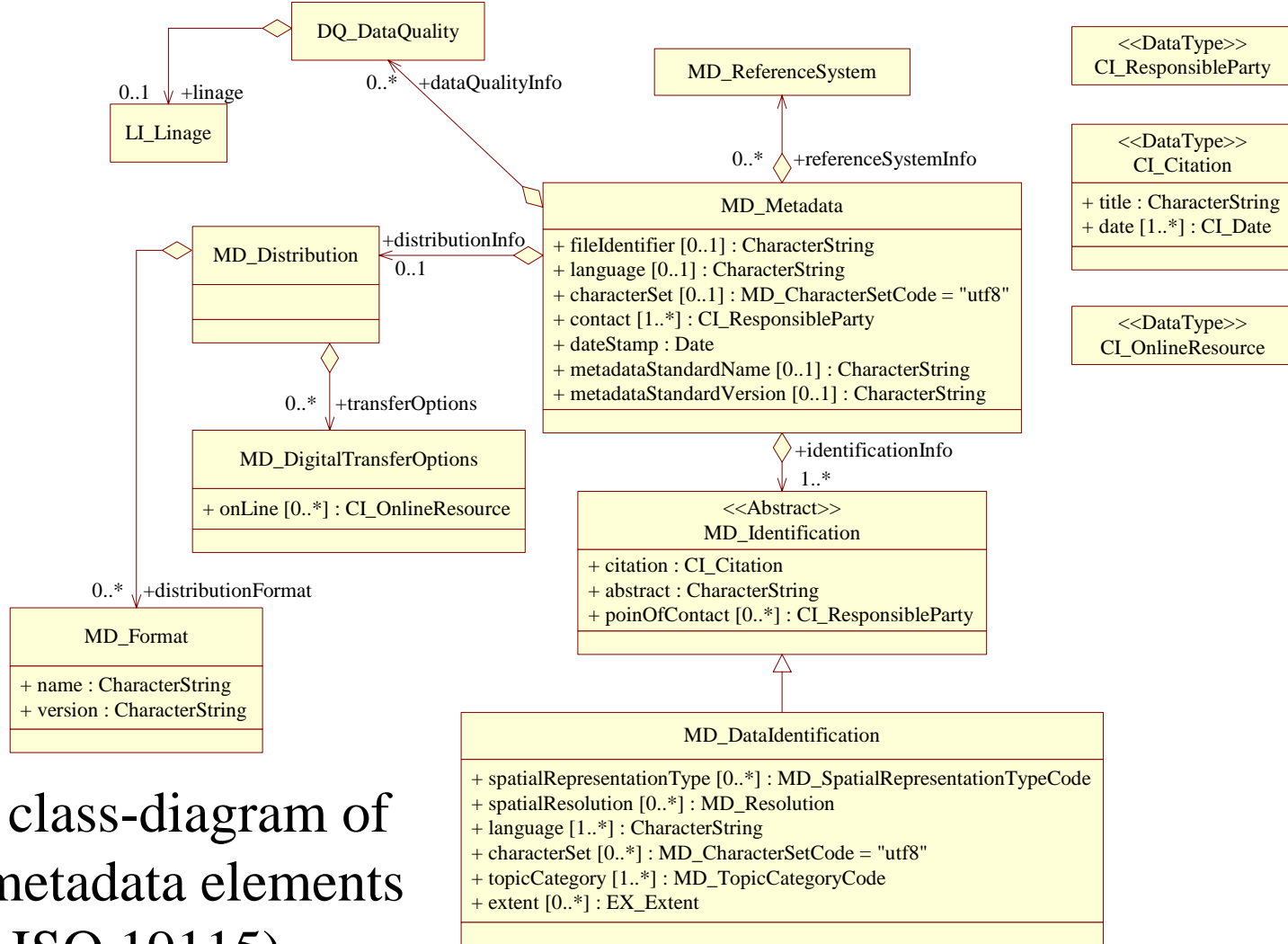
- A full metadata set should include *core elements*, *professional elements* and *organizational elements*.
- Core metadata defines a basic minimum number of metadata elements based on ISO 19115..
- Any additions for the specific professional needs.
- Any additions for the specific need of different research communities.



(a) Metadata content and structure



(b) CEOP/ISO metadata standard harmonization



UML class-diagram of core metadata elements (from ISO 19115)



Mapping Header information of Satellite data and ISO metadata (1)

Index	CEOP Header Data Item Description	ISO_Metadata package	ISO_Metadata Class	ISO_Metadata attribute	Data type	Explanations
1	Filename	Identification Information	MD_Identification	citation	CI_Citation	Filename can be title (an attribute of CI_Citation class). See 19115_No.360
2	Sensor		MD_Sensor			If MD_Sensor class suggested in 19115-2 is not applied, this will be handled as "title".
3	Product		MD_DataIdentification	topicCategory	Class	High-level geographic data thematic classification to assist in the grouping and search of available geographic data sets. Can be used to group keywords as well. Listed examples are not exhaustive. "imageryBaseMapsEarthCover" seems to be the most appropriated among the examples given. But, "CEOP_Satellite_Imagery" is suggested as a better term.
			or MD_Keywords	keywords	CharacterString	Keywords can be used.
4	Observation Date and Time	Extent information	EX_TemporalExtent	Class	TM_Primitive	Date and time for the content of the dataset
5	Image Size	Spatial representation information	MD_GridSpatialRepresentation			Spatio grid dimension
				numberOfDimensions	Integer	
				axisDimensionProperties	Sequence<MD_Dimension>	Row, column, vertical etc. see B.5.14 MD_DimensionNameTypeCode <<CodeList>> Resolution of Grid is also represented here
				cellGeometry	class (MD_CellGeometryCode)	Point or area
		Content information	MD_RangeDimension	sequenceIdentifier	MemberName	Number of spectral/frequency bands
6	Data Type	Content information	MD_Band	cellValueType		e.g. 2 byte Integer Proposed in 19115-2: mandatory (if applicable) bit representation of data value in raster cell
7	Data Unit	Content information	MD_CoverageDescription	attributeDescription	record type (see. 19103)	Unit of physical measurement Def. Record type (see. 19103): "A Record is used as an implementation representation for features, by keeping a list of (name, value) pairs in a dictionary. This represents a generic storage structure for features."

Mapping Header information of Satellite data and ISO metadata (2)

Index	CEOP Header Data Item Description	ISO_Metadata package	ISO_Metadata Class	ISO_Metadata attribute	Data type	Explanations
8	Scale Factor	Content information	MD_Band	scaleFactor	Real	19115_No.266
9	Observation Channel	Content information	MD_RangeDimension	descriptor	CharacterString	
new	FOV (new)		MD_Band	bandResolution		Proposed by 19115-2: smallest distance between which separate points can be distinguished, as specified in instrument design.
10	Reference Site	Citation and responsible party	CI_Citation	title	CharacterString	19115_No.360 (to be included in "title" of file).
		Identification	MD_DataIdentification	geographicDescription	EX_geographicDescription --> MD_Identifier	Reference sites to be registered as a namespace.
11	LAT./LON. In center of Lower Left Pixel	Identification --> Spatial representation information	MD_DataIdentification --> EX_GeographicBoundingBox	westBoundLongitude, eastBoundLongitude, southBoundLatitude, northBoundLatitude		19115_No.343.
new	LAT./LON. And Height of the Satellite in scanning the Scene Center (new)	MD_Sensor?	SD_PointPosition	origin	GM_Point	Definition: position of satellite when scanned the center of a scene (Lat. Lon. Height (km)) 19130 "sensor model" allows to describe the position of a satellite at any arbitrary time with SD_PointPosition. But it is not included by 19115-2. Need to extend 19115-2 according to 19130.
12 (modified)	Grid Size	Spatial representation information	MD_GridSpatialRepresentation			<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">MD_GridSpatialRepresentation</p> <ul style="list-style-type: none"> + numberOfDimensions : Integer + axisDimensionProperties : Sequence<MD_Dimension> + cellGeometry : MD_CellGeometryCode + transformationParameterAvailability : Boolean </div>
13	Missing Value	Content information	MD_Band	new attribute should be added "value_for_missing_data"	CharacterString	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">MD_Band</p> <ul style="list-style-type: none"> + maxValue [0..1] : Real + minValue [0..1] : Real + units [0..1] : UomLength + peakResponse [0..1] : Real + bitsPerValue [0..1] : Integer + toneGradation [0..1] : Integer + scaleFactor [0..1] : Real + offset [0..1] : Real </div> <p>Missing data: data are not captured though a grid-cell is in the observation area.</p>

Mapping Header information of Satellite data and ISO metadata (3)

Index	CEOP Header Data Item Description	ISO_Metadata package	ISO_Metadata Class	ISO_Metadata attribute	Data type	Explanations
		Content information	MD_Band	new attribute should be added "out_of_observation"	boolean	Out of observation: a grid-cell is out of the observation area.
14	Observation area ratio (Observed Pixel/All Pixel)	Content information	MD_ImageDescription	new attribute should be added.	Real	Need to Add.
15	Subset software version	Data quality information (Lineage info.)	LI_ProcessStep	description	CharacterString	
new	Reference for Processing Algorithm for Physical data product	Data quality information (Lineage info.)	LI_ProcessStep	description	CharacterString	Citation information of documents describing algorithms of computing physical parameter values from satellite imagery to be described here.
16	Processing Date	Data quality information (Lineage info.)	LI_ProcessStep	dateTime	DateTime	
17	Processing Center	or. Data quality information (Lineage info.)	LI_ProcessStep	processor	class: CI_ResponsibleParty	
18	Input Original Filename	Data quality information (Lineage info.)	LI_Source	description	CharacterString	
	Original File version	Data quality information (Lineage info.)	LI_Source	description	CharacterString	
19	Original File Processing Center	Data quality information (Lineage info.)	CI_ResponsibleParty and/or CI_Contact		CharacterString	
20	HDF library version → no longer relevant	Distribution information	MD_Format	name and version	CharacterString	This data item will be removed.
21	Blank					

Mapping CEOP Reference site metadata and ISO metadata (1)

CEOP content	Item	ISO package	Class	Attribute	Description
Contact(s)	Name(s) of reference site Contact(s)	Citation and responsible party information	CI_ResponsibleParty	organisationName	Name of the responsible organization
	Complete mailing address, telephone/facsimile Nos.	Citation and responsible party information	CI_Contact	address	Physical and email address at which the organization or individual may be contacted.
				phone	Telephone numbers at which the organization or individual may be contacted.
	E-mail address and WWW address (if applicable)	Citation and responsible party information	CI_Contact	onlineResource	On-line information that can be used to contact the individual or organization.
Similar contact information for data questions (if different than above)	Citation and responsible party information	CI_Contact	contactInstructions	Supplemental instructions on how or when to contact the individual or organization	
Data set overview	Introduction or abstract	Identification Information	MD_Identification	abstract	Brief narrative summary of the content of the resource(s)
	Time period covered by the data	Identification information	MD_Usage	useageDateTime	Date and time of the first use or range of uses of the resource and/or resource series
	Physical location (including lat/lon/elev) of the measurement or platform, landscape, and soil characteristics	Identification	MD_DataIdentification	geographicBox	Minimum bounding rectangle within which data is available
				geographicDescription	Description of the geographic area within which data is available
				environmentDescription	Description of the dataset in the producer's processing environment, including items such as the software, the computer operating system, file name, and the dataset size
	Data source if applicable (e.g. for operational data include agency)	Lineage information	LI_Source	LI_Lineage	source
description				Information about the source data used in creating the data specified by the scope	
sourceCitation				Recommended reference to be used for the source data	
			sourceExtent	Information about the spatial, vertical and temporal extent of the source data	

Mapping CEOP Reference site metadata and ISO metadata (2)

CEOP content	Item	ISO package	Class	Attribute	Description
	Any World Wide Web address references (i.e. additional documentation such as project WWW site)	Metadata extent information	MD_MetadataExtensionInformation	extensionOnLineResource	Information about on-line sources containing the community profile name and the extended metadata elements. Information for all new metadata elements
Instrumentation description	Description of instrumentation (e.g. make, model, height, and relationship to the canopy.)	Lineage information	LI_ProcessStep	description	CharacterString √ +processStep <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">LI_ProcessStep</p> <p>+ description : CharacterString</p> <p>+ rationale [0..1] : CharacterString</p> <p>+ dateTime [0..1] : DateTime</p> <p>+ processor [0..*] : CI_ResponsibleParty</p> </div>
	Figures (or links), if applicable	Identification information	MD_Identification	graphicOverview	Provides a graphic that illustrates the resource(s) (should include a legend for the graphic)
	Instrumentation specifications (e.g. accuracy, precision, frequency, resolution, etc.)	Data quality information	DQ_Element	+NameofMeaure +measureDescription +results (DQ_QuantitativeResult)	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;"><<Abstract>> DQ_Element</p> <p>+ nameOfMeasure [0..*] : CharacterString</p> <p>+ measureIdentification [0..1] : MD_Identifier</p> <p>+ measureDescription [0..1] : CharacterString</p> <p>+ evaluationMethodType [0..1] : DQ_EvaluationMethodTypeCode</p> <p>+ evaluationMethodDescription [0..1] : CharacterString</p> <p>+ evaluationProcedure [0..1] : CI_Citation</p> <p>+ dateTime [0..*] : DateTime</p> <p>+ result [1..2] : DQ_Result</p> </div>
Data collection and processing	Description of data collection	Lineage information	LI_Lineage	statement	General explanation of the data producer's knowledge about the lineage of a dataset
	Description of derived parameters and processing techniques used	Lineage information	LI_ProcessStep	description	CharacterString Original Def.: description of the event, including related parameters or tolerances
				rationale	CharacterString Original Def: requirement or purpose for the process step

Mapping CEOP Reference site metadata and ISO metadata (3)

CEOP content	Item	ISO package	Class	Attribute	Description
Quality control procedures	Description of quality control procedures including an exact description of data flagging methodology (e.g., range limits, physically based checks, etc.)	Data quality information	LI_ProcessStep	description	CharacterString Original Def.: description of the event, including related parameters or tolerances
Gap filling procedures	Description of gap filling procedures	Lineage information	LI_ProcessStep	description	CharacterString Original Def.: description of the event, including related parameters or tolerance
Data remarks	PI's assessment of the data (i.e. disclaimers, instrument problems, quality issues, etc.)	Data quality element information	DQ_Element	evaluationMethodDescription	Free text Original def.: description of the evaluation method
				evaluationProcedure	CI_Citation Def: reference to the procedure information
				result	DQ_Result Def: value (or set of values) obtained from applying a data quality measure or the out come of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level
	Missing data periods	Data quality element information	DQ_CompletenessOmission		Data absent from the dataset, as described by the scope
	Data intercomparisons, if applicable	Data quality element	LI_ProcessStep	description	CharacterString Original Def.: description of the event, including related parameters or tolerance
Reference requirements	Specify how you require your data to be referenced	Constraint information	MD_Constraints	useLimitation	CharacterString Original Def.: limitation affecting the fitness for use of theresource or metadata. Example, "not to be used for navigation"
References	List of documents cited in this data set description	Distribution information	MD_Medium	name	Name of the medium on which the resource can be received

MOLTS variables to ISO mapping (1)

GMAO record	Record content/example	ISO Class	Attribute	Description
Data set citation	Dataset Creator	MD_Identification	citation	Citation data for the resource(s)
	Dataset Title	MD_Identification	abstract	brief narrative summary of the content of the resource(s)
	Dataset Release Date			
	Dataset Release Place			
	Dataset Publisher	MD_Identification	pointOfContact	identification of, and means of communication with, person(s) and organization(s) associated with the resource(s)
	Online Resource	MD_Identification	resourceFormat	provides a description of the format of the resource(s)
Temporal coverage	Start Date Stop Date	EX_TemporalExtent	extent	Date and time for the content of the dataset
Geographic coverage	Southernmost Latitude	EX_GeographicBoundingBox	southBoundLatitude	Southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north)
	Westernmost Longitude	EX_GeographicBoundingBox	westBoundLongitude	Western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east)
	Northernmost Latitude	EX_GeographicBoundingBox	northBoundLatitude	Northern-most, coordinate of the limit of the dataset extent expressed in latitude in decimal degrees (positive north)
	Easternmost Longitude	EX_GeographicBoundingBox	eastBoundLongitude	Eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east)
Location keywords	GLOBAL	EX_GeographicDescription	geographicIdentifier	Identifier used to represent a geographic area
Data resolution	Latitude Resolution Longitude Resolution	MD_DataIdentification	spatialResolution	Factor which provides a general understanding of the density of spatial data in the dataset
Parameters	HYDROSPHERE > SNOW/ICE > SNOW DEPTH CRYOSPHERE > SEA ICE > SNOW DEPTH	MD_DataIdentification	topicCategory	Main theme(s) of the dataset
ISO topic category	CLIMATOLOGY/METEOR OLOGY/ATMOSPHERE BIOTA OCEANS INLAND WATERS GEOSCIENTIFIC INFORMATION ELEVATION	MD_TopicCategoryCode <<Enumeration>>	ClimatologyMeteorology Atmosphere, inlandWaters, oceans etc.	High-level geographic data thematic classification to assist in the grouping and search of available geographic data sets. Can be used to group keywords as well. Listed examples are not exhaustive.
Platform	GCM > General Circulation Model MODELS	MD_CoverageDescription	attributeDescription	Description of the attribute described by the measurement value

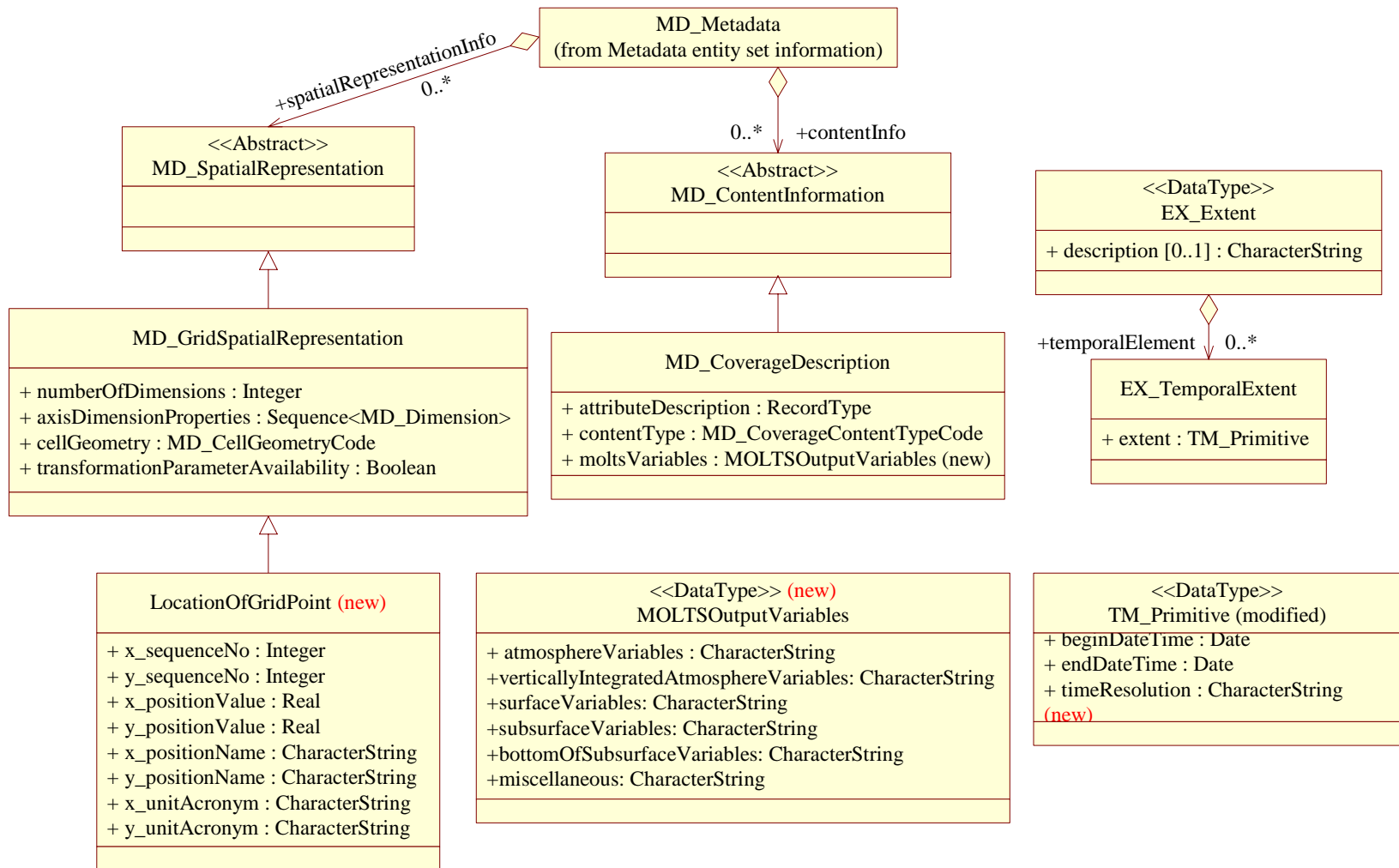
MOLTS variables to ISO mapping (2)

GMAO record	Record content/example	ISO Class	Attribute	Description
Project	CEOP ≥ Coordinated Enhanced Observing Period GEWEX ≥ Global Energy and Water Cycle Experiment	LI_Lineage	source	Information about the source data used in creating the data specified by the scope
Entry ID	CEOP_DAO	MD_Identifier	authority	Person or party responsible for maintenance of the namespace
Keywords	MOLTS Model Output Location Time Series Goddard Earth Observing System GEOS-3 CEOP model data output TEMS GTOS G3OS	MD_Keywords	keyword	Commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject
Dataset progress	IN WORK	MD_DataIdentification	supplementalInformation	Any other descriptive information about the dataset
Originating center	NASA/DAO	MD_Distributor	distributorContact	party from whom the resource may be obtained. This list need not be exhaustive
Data center	Data Center Name	MD_Distribution	distributor	provides information about the distributor
	Data Center URL	MD_DigitalTransferOptions	onLine	information about online sources from which the resource can be obtained
Distribution	Distribution Media	MD_Medium	name	Name of the medium on which the resource can be received
	Fees	MD_StandardOrderProcess	fees	Fees and terms for retrieving the resource. Include monetary units
Personnel	Name	CI_ResponsibleParty	individualName	Name of the responsible person- surname, given name, title separated by a delimiter
	Role	CI_ResponsibleParty	role	Function performed by the responsible party
	Email	CI_Address	electronicMailAddress	Address of the electronic mailbox of the responsible organization or individual
	Contact Address	CI_Address	address	Physical and email address at which the organization or individual may be contacted
	City	CI_Address	city	City of the location
	Province or State	CI_Address	administrativeArea	State, province of the location
	Postal Code	CI_Address	postalCode	ZIP or other postal code
	Country	CI_Address	country	Country of the physical address

MOLTS variables to ISO mapping (3)

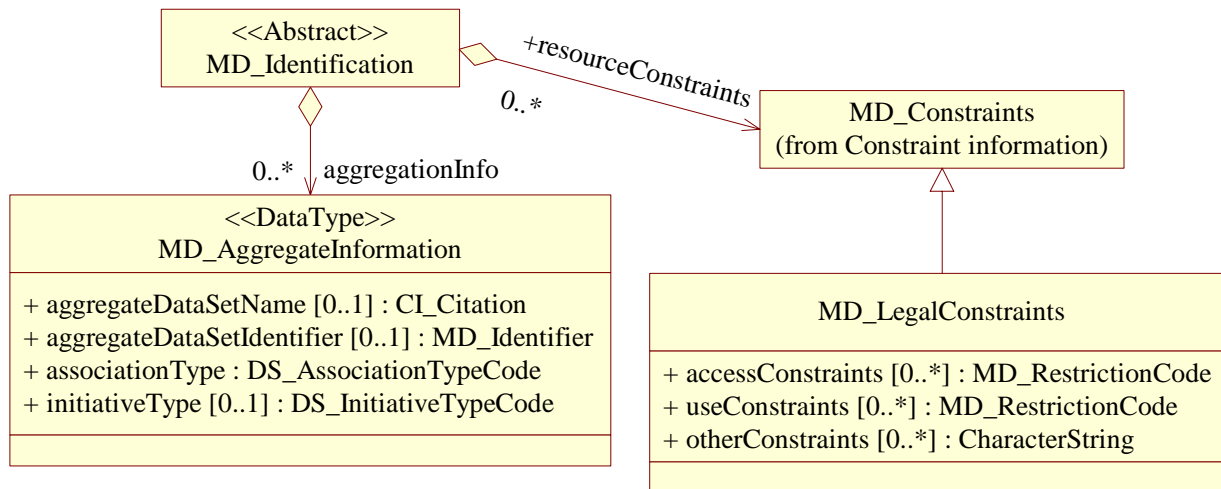
GMAO record	Record content/example	ISO Class	Attribute	Description
Related URL	Content Type	CI_OnlineResource	name	Name of the online resource
	URL	CI_OnlineResource	linkage	Location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme such as http://www.statkart.no/isotc211
	Description: Access to additional documentation	CI_OnlineResource	description	Detailed text description of what the online resource is/does
Reference	Chou, M. D., 1984: Broadband water vapor transmission functions for atmospheric IR flux computations. J. Atmos. Sci., 41, 1775-1778	MD_FeatureCatalogueDescription	featureCatalogueCitation	Complete bibliographic reference to one or more external feature catalogues
Metadata name and version	Metadata Name	MD_Metadata	metadataStandardVersion	Name of the metadata standard (including profile name) used
	Metadata Version	MD_Metadata	metadataStandardVersion	Version (profile) of the metadata standard used
Creation and review dates	DIF Creation Date	CI_Citation	editionDate	Date of the edition
Identifiers (new)	Location ID	EX_GeographicDescription	geographicIdentifier	Identifier used to represent a geographic area
Time (new)	Valid Date/Time	EX_TemporalExtent	extent	Date and time for the content of the dataset
	Time resolution			Note: need to add
Location of grid point (new)	Point location of model simulation	Ex_BoundingPolygon	Polygon[1..x]: GM_Object	Center point of a grid originally used for model simulation
MOLTS variables (new)	Atmosphere Variables, Vertically Integrated Atmos. Variables, Surface Variables, Subsurface Variables, Bottom of Subsurface Variables, Miscellaneous	MD_CoverageDescription	attributeDescription	Description of the attribute described by the measurement value
		MD_CoverageDescription	contentType	Type of information represented by the cell value





UML class-diagram of professional metadata elements
(An example – MOLTS metadata)





UML class-diagram of organizational metadata elements

(An example – for MOLTS metadata design in MPI)



Example of CEOP satellite imagery metadata

Satellite imagery metadata list (1)

+metadataEntitySetInformation

MD_Metadata:

fileIdentifier: (unique identifier for this metadata file)

language: (language used for documenting metadata)

characterSet: (full name of the character coding standard used for the metadata set)

contact:

CI_ResponsibleParty:

individualName: (name of the responsible person- surname, given name, title separated by a delimiter)

organisationName: (name of the responsible organization)

positionName: (role or position of the responsible person)

contactInfo:

CI_Contact:

phone:

CI_Telephone:

voice: (telephone number by which individuals can speak to the responsible organization or individual)

facsimile: (telephone number of a facsimile machine for the responsible organization or individual)

address:

CI_Address:

deliveryPoint: (address line for the location)

city: (city of the location)

administrativeArea: (state, province of the location)

postalCode: (ZIP or other postal code)

country: (country of the physical address)

electronicMailAddress: (address of the electronic mailbox of the responsible organization or individual)

onlineResource: (on-line information that can be used to contact the individual or organization)

role: (function performed by the responsible party)

dateStamp: (date that the metadata was created)

metadataStandardName: (name of the metadata standard (including profile name) used)

metadataStandardVersion: (version (profile) of the metadata standard used)

+identificationInformation

MD_Identification:

abstract: (brief narrative summary of the content of the resource(s))

pointOfContact:

CI_ResponsibleParty:

individualName: (name of the responsible person- surname, given name, title separated by a delimiter)

organisationName: (name of the responsible organization)

positionName: (role or position of the responsible person)

contactInfo:

CI_Contact:

phone:

CI_Telephone:

voice: (telephone number by which individuals can speak to the responsible organization or individual)

facsimile: (telephone number of a facsimile machine for the responsible organization or individual)

address:

CI_Address:

deliveryPoint: (address line for the location)

city: (city of the location)

administrativeArea: (state, province of the location)

postalCode: (ZIP or other postal code)

country: (country of the physical address)

electronicMailAddress: (address of the electronic mailbox of the responsible organization or individual)

onlineResource: (on-line information that can be used to contact the individual or organization)

Satellite imagery metadata list (2)

MD_DataIdentification:

spatialRepresentationType: (method used to spatially represent geographic information)

language: (language(s) used within the dataset)

characterSet: (full name of the character coding standard used for the dataset)

topicCategory: (main theme(s) of the dataset)

extent:

EX_Extent:

description: (spatial and temporal extent for the referring object)

geographicElement:

EX_GeographicBoundingBox:

westBoundLongitude: (western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east))

eastBoundLongitude: (eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east))

southBoundLatitude: (southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north))

northBoundLatitude: (northern-most, coordinate of the limit of the dataset extent expressed in latitude in decimal degrees (positive north))

EX_GeographicDescription:

geographicIdentifier: (identifier used to represent a geographic area)

temporalElement:

EX_TemporalExtent:

extent:

TM_Primitive:

beginDateTime: (the temporal position at which the ordinal era began)

endDateTime: (the temporal position at which the ordinal era ended)

dataFrequency: (frequency with which data are made)

verticalElement:

EX_VerticalExtent:

minimumValue: (lowest vertical extent contained in the dataset)

maximumValue: (highest vertical extent contained in the dataset)

unitOfMeasure: (vertical units used for vertical extent information Examples: metres, feet, millimetres, hectopascals)

MD_Keywords:

keywords: (commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject)

MD_Resolution:

equivalentScale:

MD_RepresentativeFraction:

Satellite imagery metadata list (3)

denominator: (the number below the line in a vulgar fraction)

distance: (ground sample distance)

+dataQualityInformation

DQ_DataQuality:

lineage:

LI_Lineage:

statement: (general explanation of the data producer's knowledge about the lineage of a dataset)

processStep:

LI_ProcessStep:

description: (description of the event, including related parameters or tolerances)

dateTime: (date and time or range of date and time on or over which the process step occurred)

processor:

CI_ResponsibleParty:

individualName: (name of the responsible person- surname, given name, title separated by a delimiter)

source:

LI_Source:

description: (detailed description of the level of the source data)

+referenceSystemInformation

MD_ReferenceSystem:

referenceSystemIdentifier: (name of reference system)

+spatialRepresentationInformation

MD_GridSpatialRepresentation:

numberOfDimensions: (number of independent spatial-temporal axes)

axisDimensionProperties:

MD_Dimension:

dimensionName: (name of the axis)

dimensionSize: (number of elements along the axis)

resolution: (degree of detail in the grid dataset)

cellGeometry:

MD_CellGeometryCode:

point: (each cell represents a point)

area: (each cell represents an area)

transformationParameterAvailability: transformation between image coordinates and geographic or map coordinates exist (are available)

+contentInformation

MD_CoverageDescription:

attributeDescription: (description of the attribute described by the measurement value)

MD_ImageDescription:

illuminationElevationAngle: illumination elevation measured in degrees clockwise from the target plane at intersection of the optical line of sight with the Earth's surface

illuminationAzimuthAngle: illumination azimuth measured in degrees clockwise from true north at the time the image is taken. For images from a scanning device, refer to the centre pixel of the image

imagingCondition: conditions affected the image

imageQualityCode: specifies the image quality

Satellite imagery metadata list (4)

cloudCoverPercentage: area of the dataset obscured by clouds, expressed as a percentage of the spatial extent

processingLevelCode: image distributor's code that identifies the level of radiometric and geometric processing that has been applied

compressionGenerationQuantity: count of the number of lossy compression cycles performed on the image

triangulationIndicator: indication of whether or not triangulation has been performed upon the image

radiometricCalibrationDataAvailability: indication of whether or not the radiometric calibration information for generating the radiometrically calibrated standard data product is available

cameraCalibrationInformationAvailability: indication of whether or not constants are available which allow for camera calibration corrections

filmDistortionInformationAvailability: indication of whether or not Calibration Reseau information is available

lensDistortionInformationAvailability: indication of whether or not lens aberration correction information is available

MD_RangeDimension:

sequenceIdentifier: (number that uniquely identifies instances of bands of wavelengths on which a sensor operates)

descriptor: (description of the range of a cell measurement value)

MD_Band:

maxValue: (longest wavelength that the sensor is capable of collecting within a designated band)

minValue: (shortest wavelength that the sensor is capable of collecting within a designated band)

units: (units in which sensor wavelengths are expressed)

peakResponse: (wavelength at which the response is the highest)

bitsPerValue: (maximum number of significant bits in the uncompressed representation for the value in each band of each pixel)

toneGradation: (number of discrete numerical values in the grid data)

scaleFactor: (scale factor which has been applied to the cell value)

offset: (the physical value corresponding to a cell value of zero)

bandResolution: (smallest distance between which separate points can be distinguished, as specified in instrument design) (new)

cellValueType: (bit representation of data value in raster cell) (new)

outOfObservation: (a grid-cell is out of the observation area) (new)

+distributionInformation

MD_DigitalTransferOptions:

online: (information about online sources from which the resource can be obtained)

CI_OnlineResource:

linkage: (location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme such as <http://www.statkart.no/isotc211>)

name: (name of the online resource)

description: detailed text description of what the online resource is/does

MD_Format:

name: (name of the data transfer format)

version: (version of the format (date, number, etc))

+additionalInformation (new)

MD_Sensor

SD_PointPosition

origin:

GM_Point: (position of satellite when scanned the center of a scene (Lat. Lon. Height (km))) (new)

Example of CEOP reference site metadata

Reference site metadata list (1)

+metadataEntitySetInformation

MD_Metadata:

fileIdentifier: (unique identifier for this metadata file)

language: (language used for documenting metadata)

characterSet: (full name of the character coding standard used for the metadata set)

contact:

CI_ResponsibleParty:

individualName: (name of the responsible person- surname, given name, title separated by a delimiter)

organisationName: (name of the responsible organization)

positionName: (role or position of the responsible person)

contactInfo:

CI_Contact:

phone:

CI_Telephone:

voice: (telephone number by which individuals can speak to the responsible organization or individual)

facsimile: (telephone number of a facsimile machine for the responsible organization or individual)

address:

CI_Address:

deliveryPoint: (address line for the location)

city: (city of the location)

administrativeArea: (state, province of the location)

postalCode: (ZIP or other postal code)

country: (country of the physical address)

electronicMailAddress: (address of the electronic mailbox of the responsible organization or individual)

onlineResource: (on-line information that can be used to contact the individual or organization)

role: (function performed by the responsible party)

dateStamp: (date that the metadata was created)

metadataStandardName: (name of the metadata standard (including profile name) used)

metadataStandardVersion: (version (profile) of the metadata standard used)

+identificationInformation

MD_Identification:

abstract: (brief narrative summary of the content of the resource(s))

pointOfContact:

CI_ResponsibleParty:

individualName: (name of the responsible person- surname, given name, title separated by a delimiter)

organisationName: (name of the responsible organization)

positionName: (role or position of the responsible person)

contactInfo:

CI_Contact:

Reference site metadata list (2)

phone:

CI_Telephone:

voice: (telephone number by which individuals can speak to the responsible organization or individual)

facsimile: (telephone number of a facsimile machine for the responsible organization or individual)

address:

CI_Address:

deliveryPoint: (address line for the location)

city: (city of the location)

administrativeArea: (state, province of the location)

postalCode: (ZIP or other postal code)

country: (country of the physical address)

electronicMailAddress: (address of the electronic mailbox of the responsible organization or individual)

onlineResource: (on-line information that can be used to contact the individual or organization)

graphicOverview: (provides a graphic that illustrates the resource(s) (should include a legend for the graphic))

MD_BrowseGraphic:

filename: (name of the file that contains a graphic that provides an illustration of the dataset)

fileDescription: (text description of the illustration)

fileType: (format in which the illustration is encoded Examples: CGM, EPS, GIF, JPEG, PBM, PS, TIFF, XWD)

MD_DataIdentification:

spatialRepresentationType: (method used to spatially represent geographic information)

language: (language(s) used within the dataset)

characterSet: (full name of the character coding standard used for the dataset)

topicCategory: (main theme(s) of the dataset)

extent:

EX_Extent:

description: (spatial and temporal extent for the referring object)

geographicElement:

EX_GeographicBoundingBox:

westBoundLongitude: (western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east))

eastBoundLongitude: (eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east))

southBoundLatitude: (southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north))

northBoundLatitude: (northern-most coordinate of the limit of the dataset extent expressed in latitude in decimal degrees (positive north))

temporalElement:

EX_TemporalExtent:

extent:

TM_Primitive:

beginDateTime: (the temporal position at which the ordinal era began)

endDateTime: (the temporal position at which the ordinal era ended)

dataFrequency: (frequency with which data are made)

verticalElement:

EX_VerticalExtent:

minimumValue: (lowest vertical extent contained in the dataset)

Reference site metadata list (3)

maximumValue: (highest vertical extent contained in the dataset)
unitOfMeasure: (vertical units used for vertical extent information Examples: metres, feet, millimetres, hectopascals)

supplementalInformation: (any other descriptive information about the dataset)

MD_Resolution:

equivalentScale:

MD_RepresentativeFraction:

denominator: (the number below the line in a vulgar fraction)

distance: (ground sample distance)

+constraintsInformation

MD_LegalConstraints:

accessConstraints: (access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource or metadata)

useConstraints: (constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the resource or metadata)

+dataQualityInformation

DQ_DataQuality:

report:

DQ_Element:

nameOfMeasure: (name of the test applied to the data)

measureDescription: (code identifying a registered standard procedure)

evaluationMethodDescription: (description of the measure)

DQ_Completeness:

value: (quantitative value or values, content determined by the evaluation procedure used)

lineage:

LI_Lineage:

statement: (general explanation of the data producer's knowledge about the lineage of a dataset)

processStep:

LI_ProcessStep

description: (description of the event, including related parameters or tolerances)

source:

LI_Source:

description: (detailed description of the level of the source data)

+referenceSystem

MD_ReferenceSystem:

referenceSystemIdentifier: (name of reference system)

RS_Identifier:

codeSpace: (name or identifier of the person or organization responsible for namespace)

Reference site metadata list (4)

version: (version identifier for the namespace)

+portrayalCatalogueInformation

MD_PortrayalCatalogueReference:

portrayalCatalogueCitation:

CI_Citation:

title: (name by which the cited resource is known)

alternateTitle: (short name or other language name by which the cited information is known)

date:

CI_Date:

date: (reference date for the cited resource)

edition: (version of the cited resource)

editionDate: (date of the edition)

identifier: (value uniquely identifying an object within a namespace)

citedResponsibleParty: (name and position information for an individual or organization that is responsible for the resource)

CI_ResponsibleParty:

individualName: (name of the responsible person- surname, given name, title separated by a delimiter)

presentationForm: (mode in which the resource is represented)

series:

CI_Series:

name: (name of the series, or aggregate dataset, of which the dataset is a part)

issueIdentification: (information identifying the issue of the series)

page: (details on which pages of the publication the article was published)

otherCitationDetails: (other information required to complete the citation that is not recorded elsewhere)

collectiveTitle: (common title with holdings note)

ISBN: (international Standard Book Number)

ISSN: (international Standard Serial Number)

+distributionInformation

MD_DigitalTransferOption:

online:

CI_OnlineResource:

linkage: (location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme)

name: (name of the online resource)

description: (detailed text description of what the online resource is/does)

MD_Format:

name: (name of the data transfer format)

version: (version of the format (date, number, etc))

Example of reference site metadata – taking BALTEX Lindenberg reference site as an example

+metadataEntitySetInformation

MD_Metadata:

fileIdentifier: BALTEX_LINDENBERG_20021001_20030930

language: en

characterSet: utf8

contact:

CI_ResponsibleParty:

individualName: Dr. Frank Beyrich

organisationName: Meteorologisches Observatorium Lindenberg

positionName: Deutscher Wetterdienst (DWD)

contactInfo:

CI_Contact:

phone:

CI_Telephone:

voice: +49 33677 60228

facsimile: +49 33677 60280

address:

CI_Address:

deliveryPoint: Am Observatorium 12

city: OT Lindenberg

administrativeArea: Tauche

postalCode: D – 15848

country: Germany

electronicMailAddress: frank.beyrich@dwd.de

onlineResource: <http://www.dwd.de/en/Funde/Observator/MOL>

role: CEOP Reference Site Manager

dateStamp: 2004-11-12

metadataStandardName: CEOP reference site data set metadata

metadataStandardVersion: 1.0

Example of CEOP MOLTS metadata

+metadataEntitySetInformation

MD_Metadata:

fileIdentifier: (name of the entry)
 language: (language used for documenting metadata)
 characterSet: (full name of the character coding standard used for the metadata set)
 parentIdentifier: (file identifier of the metadata to which this metadata is a subset (child))
 hierarchyLevel: (scope to which the metadata applies)
 contact:
 CI_ResponsibleParty: (responsible for the metadata)
 organisationName: (name of the responsible organization)
 role: (function performed by the responsible party)
 dateStamp: (date that the metadata was created)
 metadataStandardName: (name of the metadata standard (including profile name) used)
 metadataStandardVersion: (version (profile) of the metadata standard used)

+identificationInfo

MD_Identification:

citation: (citation data for the resource(s))
 CI_Citation:
 title: (name by which the cited resource is known)
 alternateTitle: (short name or other language name by which the cited information is known)
 date:
 CI_Date:
 date: (reference date for the cited resource)
 dateType: (event used for reference date)
 edition: (version of the cited resource)
 editionDate: (date of the edition)
 identifier: (value uniquely identifying an object within a namespace)
 citedResponsibleParty: (name and position information for an individual or organization that is responsible for the resource)
 CI_ResponsibleParty:
 individualName: (name of the responsible person- surname, given name, title separated by a delimiter)
 role: (function performed by the responsible party)
 presentationForm: (mode in which the resource is represented)
 abstract: (brief narrative summary of the content of the resource(s))
 status: (status of the resource(s))
 pointOfContact:
 CI_ResponsibleParty:
 individualName: (name of the responsible person- surname, given name, title separated by a delimiter)
 organisationName: (name of the responsible organization)
 positionName: (role or position of the responsible person)
 contactInfo:
 CI_Contact:
 phone:
 CI_Telephone:
 voice: (telephone number by which individuals can speak to the responsible organization or individual)
 facsimile: (telephone number of a facsimile machine for the responsible organization or individual)
 address:

MOLTS metadata list (2)

CI_Address:

deliveryPoint: (address line for the location)

city: (city of the location)

administrativeArea: (state, province of the location)

postalCode: (ZIP or other postal code)

country: (country of the physical address)

electronicMailAddress: (address of the electronic mailbox of the responsible organization or individual)

onlineResource: (on-line information that can be used to contact the individual or organization)

CI_OnlineResource:

linkage: (location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme)

description: (detailed text description of what the online resource is/does)

role: (function performed by the responsible party)

resourceFormat: (provides a description of the format of the resource(s))

MD_Format:

name: (name of the data transfer format(s))

specification: (name of a subset, profile, or product specification of the format)

descriptiveKeywords: (provides category keywords, their type, and reference source)

MD_Keywords:

keyword: (commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject)

MD_DataIdentification:

spatialRepresentationType: (method used to spatially represent geographic information)

MD_SpatialRepresentationTypeCode: (method used to represent geographic information in the dataset)

spatialResolution:

MD_Resolution:

equivalentScale: (level of detail expressed as the scale of a comparable hardcopy map or chart)

MD_RepresentativeFraction:

denominator: (the number below the line in a vulgar fraction)

distance: (ground sample distance)

language: (language(s) used within the dataset)

characterSet: (full name of the character coding standard used for the dataset)

topicCategory:

MD_TopicCategoryCode: (high-level geographic data thematic classification to assist in the grouping and search of available geographic data sets)

extent:

EX_Extent:

description: (spatial and temporal extent for the referring object)

verticalElement:

EX_VerticalExtent:

minimumValue: (lowest vertical extent contained in the dataset)

unitOfMeasure: (vertical units used for vertical extent information)

verticalElement:

EX_VerticalExtent:

maximumValue: (highest vertical extent contained in the dataset)

unitOfMeasure: (vertical units used for vertical extent information)

temporalElement:

EX_TemporalExtent:

extent:

TM_Primitive:

beginDateTime: (the temporal position at which the ordinal era began)

endDateTime: (the temporal position at which the ordinal era ended)

MOLTS metadata list (3)

timeResolution: (new)

geographicElement:

EX_GeographicBoundingBox:

westBoundLongitude: (western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east))

eastBoundLongitude: (eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east))

southBoundLatitude: (southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north))

northBoundLatitude: (northern-most, coordinate of the limit of the dataset extent expressed in latitude in decimal degrees (positive north))

EX_GeographicDescription:

geographicIdentifier: (identifier used to represent a geographic area)

supplementalInformation: (any other descriptive information about the dataset)

MD_AggregateInformation:

aggregateDataSetName:

CI_Citation:

title: (name by which the cited resource is known)

alternateTitle: (short name or other language name by which the cited information is known)

otherCitationDetails: (other information required to complete the citation that is not recorded elsewhere)

initiativeType:

DS_InitiativeTypeCode: (type of aggregation activity in which datasets are related)

+contentInfo

MD_Constraints: (restrictions on the access and use of a resource or metadata)

MD_LegalConstraints:

accessConstraints: (access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource or metadata)

MD_RestrictionCode: (limitation(s) placed upon the access or use of the data)

useConstraints: (constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the resource or metadata)

MD_RestrictionCode: (limitation(s) placed upon the access or use of the data)

+dataQualityInfo

DQ_DataQuality:

scope: (the specific data to which the data quality information applies)

DQ_Scope:

level: (hierarchical level of the data specified by the scope)

report: (quantitative quality information for the data specified by the scope)

DQ_Element:

nameOfMeasure: (name of the test applied to the data)

measureDescription: (description of the measure)

DQ_Completeness: (presence and absence of features, their attributes and their relationships)

DQ_CompletenessCommission: (excess data present in the dataset, as described by the scope)

result: (value obtained from applying a data quality measure or outcome of evaluating the obtained value against a specified acceptable conformance quality level)

DQ_ThematicAccuracy: (accuracy of quantitative attributes and the correctness of non-quantitative attributes and of the classifications of features and their relationships)

DQ_QuantitativeAttributeAccuracy: (accuracy of quantitative attributes)

result: (the same as above)

DQ_LogicalConsistency: (degree of adherence to logical rules of data structure, attribution and relationships (data structure can be conceptual, logical or physical))

DQ_ConceptualConsistency: (adherence to rules of the conceptual schema)

result: (the same as above)

DQ_PositionalAccuracy: (accuracy of the position of features)

DQ_GridDEDDataPositionalAccuracy: (closeness of gridded data position values to values accepted as or being true)

result: (the same as above)

MOLTS metadata list (4)

linkage: (non-quantitative quality information about the lineage of the data specified by the scope)

LI_Lineage:

statement: (general explanation of the data producer's knowledge about the lineage of the dataset)

source: (information about the source data used in creating the data specified by the scope)

LI_Source:

description: (detailed description of the level of the source data)

+referenceSystemInfo

MD_ReferenceSystem:

referenceSystemIdentifier: (name of reference system)

RS_Identifier

codeSpace: (name or identifier of the person or organization responsible for namespace)

version: (version identifier for the namespace)

+contentInfo

MD_ContentInformation: (description of the content of a dataset)

MD_CoverageDescription:

attributeDescription: (description of the attribute described by the measurement value)

contentType: (type of information represented by the cell value)

MD_CoverageContentTypeCode: (specific type of information represented in the cell)

X_Position: (???)

Y_Position: (???)

+distributionInfo

MD_Distribution:

DistributionFormat (provides a description of the format of the data to be distributed)

MD_Format:

name: (name of the data transfer format)

version: (version of the format (date, number, etc))

distributor: (provides information about the distributor)

MD_Distributor:

distributorContact: (party from whom the resource may be obtained. This list need not be exhaustive)

CI_ResponsibleParty:

organisationName: (name of the responsible organization)

role: (function performed by the responsible party)

distributionOrderProcess: (provides information about how the resource may be obtained, and related instructions and fee information)

MD_StandardOrderProcess:

fees: (fees and terms for retrieving the resource)

distributorTransferOptions

MD_DigitalTransferOptions:

unitsOfDistribution: (tiles, layers, geographic areas, etc., in which data is available)

transferSize: (estimated size of a unit in the specified transfer format, expressed in megabytes. The transfer size is > 0.0)

online: (information about online sources from which the resource can be obtained)

CI_OnlineResource:

linkage: (location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme)

description: detailed text description of what the online resource is/does

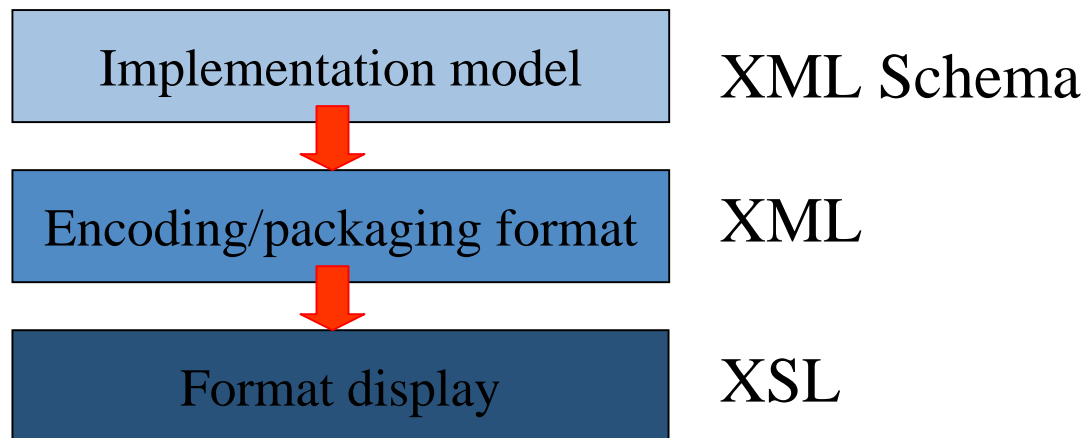
offline: (information about offline media on which the resource can be obtained)

MD_Medium:

name: (name of the medium on which the resource can be received)

Metadata implementation model

- Defines the specific content organization that could be carried in a preferred transfer format
- Need to express how the information will be structured in a given encoding/packaging format
- XML provides the context and structure to support encoding of many types of information.
- XML style language (XSL) is used for format of XML document for display.

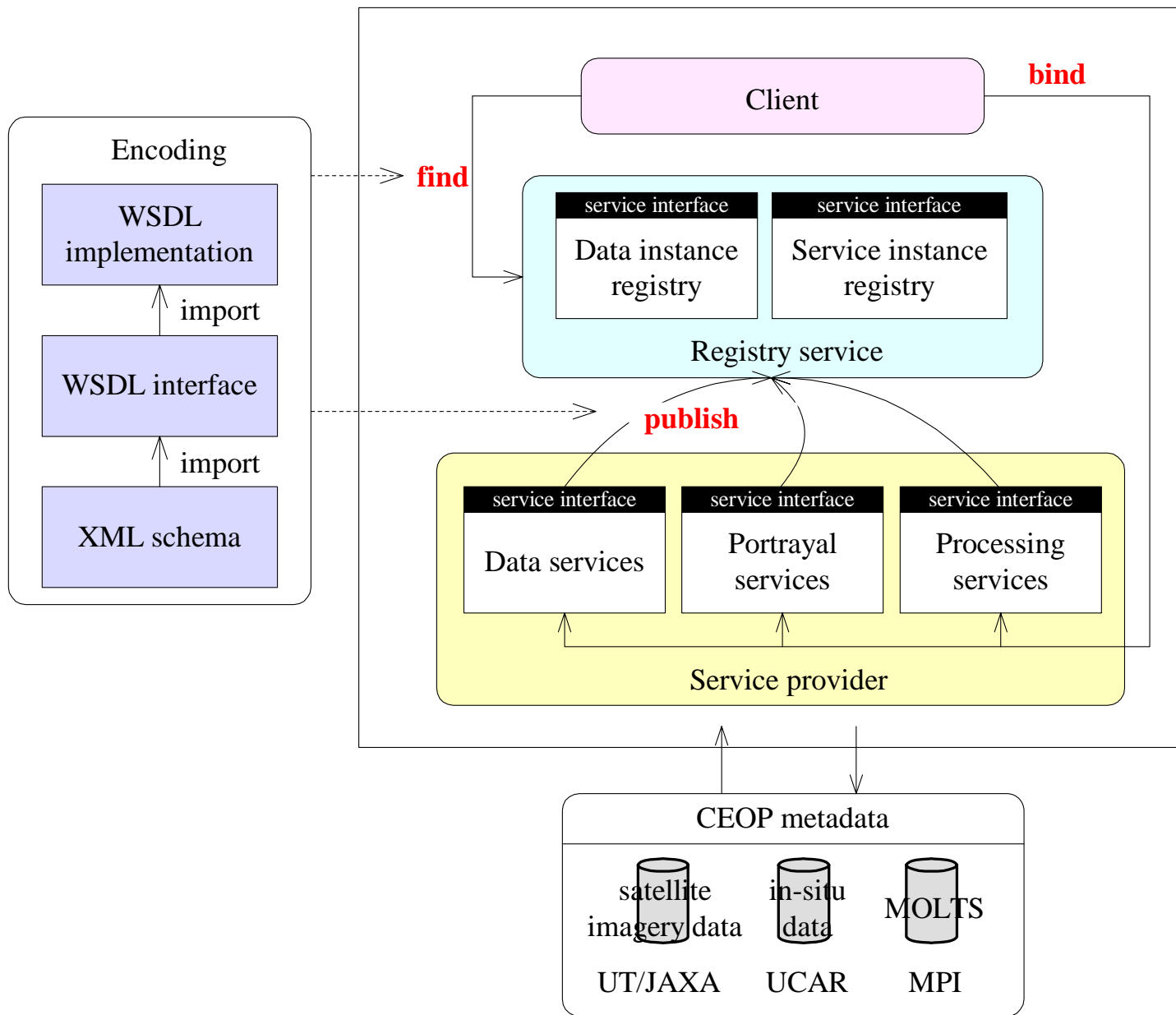


```
<?xml version="1.0" ?>
- <MD_Metadata xsi:schemaLocation="http://metadata.dgiwg.org/smXML ..\smXML\metadataEntity.xsd"
  xmlns="http://metadata.dgiwg.org/smXML" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xlink="http://www.w3.org/1999/xlink">
- <fileIdentifier>
  <CharacterString>EH4_OPYC_SRES_B2_TEMP2: EH4_OPYC_SRES_B2_TEMP2:</CharacterString>
</fileIdentifier>
- <language>
  <CharacterString>en</CharacterString>
</language>
- <parentIdentifier>
  <CharacterString>EH4_OPYC_SRES_B2</CharacterString>
</parentIdentifier>
- <hierarchyLevel>
  <MD_ScopeCode codeList="http://metadata.dgiwg.org/codelistRegistry?MD_ScopeCode"
    codeListValue="dataset">dataset</MD_ScopeCode>
</hierarchyLevel>
- <contact>
  - <CI_ResponsibleParty>
    - <organisationName>
      <CharacterString>World Data Center for Climate http://www.mad.zmaw.de/wdcc/</CharacterString>
    </organisationName>
    </CI_ResponsibleParty>
  </contact>
- <dateStamp>
  <Date>2004-11-09</Date>
</dateStamp>
- <metadataStandardName>
  <CharacterString>ISO 19115?</CharacterString>
</metadataStandardName>
- <metadataStandardVersion>
  <CharacterString>2003</CharacterString>
</metadataStandardVersion>
- <identificationInfo>
  - <MD_Identification>
    - <citation>
      - <CI_Citation>
        - <title>
```

MOLTS metadata in XML

Web service applications

- Provide access to metadata about the description of services, their location on the Internet, and the means of accessing and using these services.
- Discover what services can be used to access specific data holdings.
- Develop a common model for publishing, binding Web service



Metadata application architecture (from OGC)

Specifically, ...

- **Publish/Find/Bind** paradigm
- Need to design **Service Interface** based on Web Coverage Service (WCS), Coordinate Transfer Service (CTS), Web Feature Service (WFS) in addition to OPeNDAP/DODS.
- Need to develop or reinforce **Registry** of global observation data dictionary and models.

Conclusions

- We propose a standardization framework for CEOP metadata development and application.
- We develop satellite imagery metadata list, reference site metadata list, MOLTS metadata list based on ISO 19115.
- The proposed standardization framework can be a basic research for the integration of various CEOP data, like satellite imagery data, reference site data and model simulation results (GRIB, MOLTS).

Thank you for your attention !