

EOVOC

Recommended Schema.org Encoding for EO Resources

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Public Engineering Report

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Chapter 1. Scope

This Engineering Report proposes a Schema.org based JSON-LD [\[JSON-LD\]](#) encoding for Earth Observation (EO) resource metadata. Resources that can be described include collections, services and applications and datasets (i.e., products or granules). The report provides JSON-LD document models for the exchange of information describing EO resources, both within and between different organisations. The encoding aims to facilitate the creation of Knowledge Graphs or Linked Data representations for EO resources and their discovery through mass-market search engines.

Chapter 2. References

2.1. Normative references

[DCAT]

Data Catalog Vocabulary (DCAT) - Version 2, W3C Recommendation 04 February 2020,
<https://www.w3.org/TR/vocab-dcat-2/>

[JSON]

RFC 7159, The JavaScript Object Notation (JSON) Data Interchange Format, March 2014,
<http://www.ietf.org/rfc/rfc7159.txt>

[GeoJSON]

RFC 7946, The GeoJSON Format, <https://www.w3.org/TR/json-ld11/>

[JSON-LD]

JSON-LD 1.1, A JSON-based Serialization for Linked Data, W3C Recommendation 16 July 2020,
<https://www.w3.org/TR/json-ld11/>

[LDP]

Linked Data Platform 1.0, W3C Recommendation 26 February 2015, <https://www.w3.org/TR/ldp/>

[OGC14-055r2]

OGC14-055r2, OGC OWS Context GeoJSON Encoding Standard, Version 1.0,
<https://docs.opengeospatial.org/is/14-055r2/14-055r2.html>.

[OGC17-003r2]

OGC17-003r2, OGC EO Dataset Metadata GeoJSON(-LD) Encoding Standard, Version 1.0,
<https://docs.opengeospatial.org/is/17-003r2/17-003r2.html>.

[OGC17-084r1]

OGC17-084r1, EO Collection GeoJSON(-LD) Encoding, Version 1.0, <https://docs.ogc.org/bp/17-084r1/17-084r1.html>.

[SHACL]

Shapes Constraint Language (SHACL), W3C Recommendation, 20 July 2017, <https://www.w3.org/TR/shacl/>

[SKOS]

SKOS Simple Knowledge Organization System, Reference, W3C Recommendation 18 August 2009,
<https://www.w3.org/TR/skos-reference/>

[SPARQL]

SPARQL 1.1 Overview, W3C Recommendation 21 March 2013, <https://www.w3.org/TR/sparql11-overview/>

2.2. Other references

[CEOS-OS-BP]

CEOS OpenSearch Best Practice Document, Version 1.3, https://ceos.org/document_management/Working_Groups/WGISS/Documents/WGISS%20Best%20Practices/CEOS%20OpenSearch%20Best%20Practice.pdf

[JSONPath]

JSONPath, <http://goessner.net/articles/JsonPath/index.html>

[SHACL-UC]

SHACL Use Cases and Requirements, W3C Working Group Note, 20 July 2017, <https://www.w3.org/TR/shacl-ucr/>

[ESIPFed]

"Schema.org Publishing Guidelines for the Geosciences", V1.1.0, <https://doi.org/10.5281/zenodo.3736235>, <https://github.com/ESIPFed/science-on-schema.org/releases/tag/1.1.0>

[DCAT-AP-SDO]

DCAT-AP to Schema.org Mapping, Unofficial Draft 30 April 2021, <https://ec-jrc.github.io/dcat-ap-to-schema-org/>

[OGC19-020r1]

OGC19-020r1, OGC Testbed-15: Catalogue and Discovery Engineering Report, <https://docs.ogc.org/per/19-020r1.html>.

[STAC-ITEM]

STAC Item Specification, v1.0.0-beta-2, <https://github.com/radiantearth/stac-spec/blob/v1.0.0-beta.2/item-spec/item-spec.md>.

[WEBAPI]

Machine Readable Web APIs with Schema.org Action Annotations, Procedia Computer Science Volume 137, 2018, Pages 255-261, <https://doi.org/10.1016/j.procs.2018.09.025>.

[SHAPEUML]

ShapeUML: RDF Constraints Visualization based on UML, <https://lov.ilabt.imec.be/unshackled/spec/shape-uml>.

Chapter 3. Conventions

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

3.1. Glossary

- **collection**

A collection is an aggregation of granules sharing the same product specification. A collection typically corresponds to the series of products derived from data acquired by a sensor on board a satellite and having the same mode of operation. Different agencies use different terms for "collection": collection (CNES, NASA), dataset (JAXA), dataset series (ESA), product (JAXA).

- **context**

A set of rules for interpreting a JSON-LD document as specified in the section "The Context" of the JSON-LD specification.

- **granule**

A granule is the finest granularity of data that can be independently managed. A granule usually matches the individual file of EO satellite data. Different agencies use different terms for "collection": dataset (ESA), granule (NASA), product (ESA, CNES), scene (JAXA).

- **JSON**

A lightweight, text-based, language-independent data interchange format, based on the Javascript programming language.

- **product**

Same meaning as "granule".

- **structured data**

Structured data is a standardized format for providing information about a [Web] page and classifying the page content. Source: Google.

3.2. Abbreviated terms

- API Application Programming Interface
- CEOS Committee on Earth Observation Satellites
- EO Earth Observation
- HATEOAS Hypermedia As The Engine Of Application State
- HTTP HyperText Transfer Protocol
- IRI Internationalised Resource Identifier
- ISO International Organisation for Standardisation
- JSON JavaScript Object Notation

- JSON-LD JavaScript Object Notation for Linked Data
- OGC Open Geospatial Consortium
- ORCID Open Researcher and Contributor IDentifier
- RDF Resource Description Framework
- REST Representational State Transfer
- ROR Research Organization Registry
- SHACL Shapes Constraint Language
- SPARQL SPARQL Protocol and RDF Query Language
- URI Uniform Resource Identifier
- URL Uniform Resource Locator
- URN Uniform Resource Name
- W3C World Wide Web Consortium
- WGISS Working Group on Information Systems and Services
- WKT Well-Known Text
- XML eXtensible Markup Language
- XSD XML Schema Definition Language

3.3. Symbols

Conventions 4 (graphical notation) and 6 (namespace) of <https://github.com/ESIPFed/science-on-schema.org/blob/master/CONVENTIONS.md> are applied.

The graphical notation is borrowed from [ESIPFed], with the exception of named literals for which a different shape is used. The diagrams are prepared with PlantUML.

The <https://schema.org/> namespace for schema.org is used.

Chapter 4. EO Collections Encoding

This section defines the encoding of Earth Observation collection metadata. We use a presentation similar to the GeoJSON Encoding Specifications in [OGC17-003r2], [OGC19-020r1] and [OGC17-084r1].

4.1. Metadata Information

Metadata Information applies to EO Collections ([Dataset](#)), EO Granules ([Dataset](#)) and EO Services and Applications ([CreativeWork](#)).

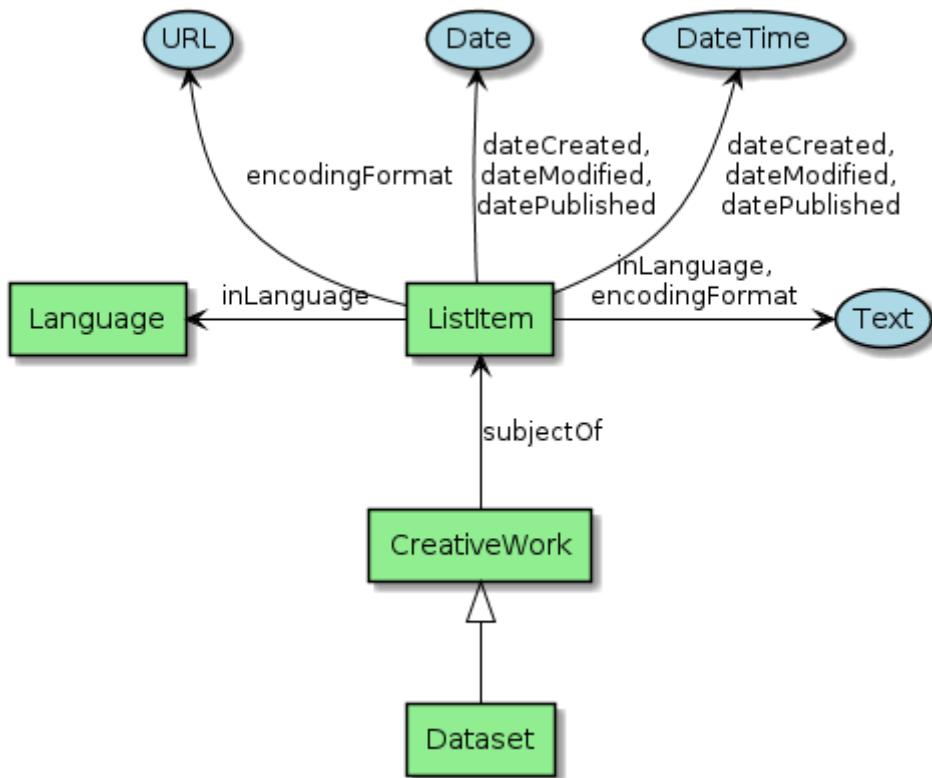


Figure 1. Metadata Information Schema

The complete list of metadata information properties is given in [Table 1](#). The properties are grouped in a [Listitem](#) as proposed by [\[DCAT-AP-SDO\]](#). [\[ESIPFed\]](#) proposes an alternative presentation using a [DataDownload](#).

Table 1. *Listitem* object properties

JSON Property	Definition	Data type and values	Multiplicity and use
<code>@type</code> <code>\$.@type</code>	Type of the object. This property has the fixed value "Listitem".	Range: String Fixed value: "Listitem"	One (mandatory)
<code>dateCreated</code> <code>\$.dateCreated</code>	Date of creation of the metadata document.	Domain: CreativeWork Range: Date or DateTime	Zero or one (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
dateModified \$.dateModified	Date of last update of the metadata document.	Domain: CreativeWork Range: Date or DateTime	One (Mandatory)
datePublished \$.datePublished	Date of first availability of the metadata document.	Domain: CreativeWork Range: Date or DateTime	Zero or one (optional)
encodingFormat \$.encodingFormat	An established standard to which the metadata conforms. Encoded with encodingFormat (e.g. media type such as "application/vnd.iso.19139-2+xml") as proposed by [ESIPFed] .	Domain: CreativeWork or MediaObject Range: Text or URL	Zero or one (optional)
inLanguage \$.inLanguage	Resource language code, not empty, e.g. "en" (English).	Domain: CreativeWork Range: Language or Text	Zero or one (optional)

List Item Shape

```
eoshacl:ListItemShape
  a sh:NodeShape ;
  sh:targetClass schema:ListItem ;  # applies to all schema:ListItem
  sh:closed false ;
  sh:property [
    sh:path schema:encodingFormat ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
      [ sh:nodeKind sh:IRI ]
      [ sh:datatype xsd:string ]
    )
  ] ;
  # optional schema:inLanguage
sh:property [
  sh:path schema:dateCreated ;
  sh:minCount 0 ;
  sh:maxCount 1
] ;
sh:property [
  sh:path schema:dateModified ;
  sh:minCount 1 ;
  sh:maxCount 1
] ;
sh:property [
  sh:path schema:datePublished ;
  sh:minCount 0 ;
  sh:maxCount 1
] .

```

```
eoshacl:DateRangeShape # shape for all date ranges.
  a sh:NodeShape ;
  sh:targetObjectsOf schema:dateModified ;
  sh:targetObjectsOf schema:datePublished ;
  sh:targetObjectsOf schema:dateCreated ;

  # sh:resultMessage "Value does not correspond to expected range." ;
  sh:closed false ;
  sh:minLength 10 ; # format: 2021-12-08
  sh:maxLength 24 ; # format: 2020-09-29T11:07:54.000Z
  sh:or (
    [ sh:datatype xsd:dateTime ]
    [ sh:datatype xsd:date ]
    [ sh:datatype schema:Date ]
    [ sh:datatype schema:DateTime ]
  ) .

```

ListItem encoding example

```
{  
  "@context": "https://schema.org",  
  "@type": "Dataset",  
  "name": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain  
Corrected Systematic processing (LANDSAT.ETM.GTC)",  
  "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper  
high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility  
masks.",  
  "subjectOf": {  
    "@type": "ListItem",  
    "temporal": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",  
    "dateCreated": "1999-07-01T00:00:00Z",  
    "datePublished": "1999-07-01T00:00:00Z",  
    "dateModified": "2019-07-17T00:00:00Z",  
    "inLanguage": "en",  
    "encodingFormat": "application/vnd.iso.19139-2+xml"  
  }  
}
```

4.2. Data Identification

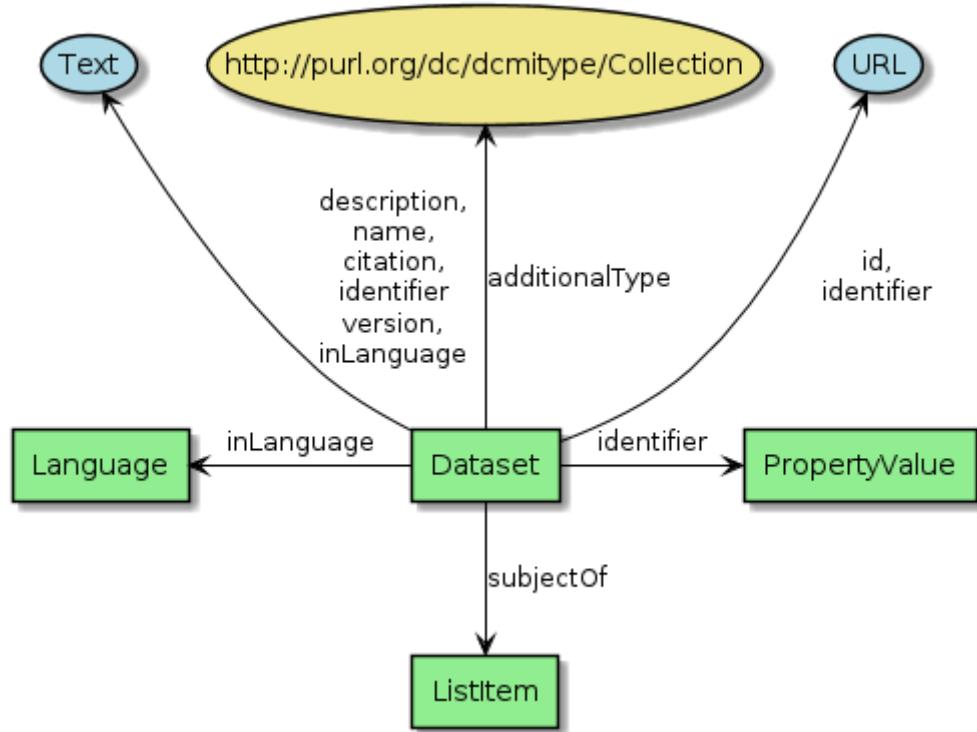


Figure 2. Data Identification Schema

The complete list of Data identification properties is given in [Table 2](#).

Table 2. Data Identification properties

JSON Property	Definition	Data type and values	Multiplicity and use
@context \$.@context	Optional context property.	Range: String Fixed value: "https://schema.org"	Zero or one (optional)
@type \$.@type	Type of the object. This property has the fixed value "Dataset".	Range: String Fixed value: "Dataset"	One (mandatory)
description \$.description	A description of the collection.	Domain: Thing Range: Text	One (mandatory)
name \$.name	The name of the collection.	Domain: Thing Range: Text	One (mandatory)
identifier \$.identifier	Identifier given to the collection. Text is used for simple identifiers such as 'TropForest'. PropertyValue can be used to include DOI information.	Domain: Thing Range: Text Url PropertyValue See also Table 4 .	One or more (mandatory)
additionalType \$.additionaltypes	Unique identifiers (URI) for the type of the resource. Is equivalent to the dct:type property used by DCAT for classifying dataset types [https://www.w3.org/TR/vocab-dcat-2/#classifying-dataset-types]. E.g. http://purl.org/dc/dcmitype/Collection , https://inspire.ec.europa.eu/metadata-codelist/ResourceType/series	Domain: Thing Range: URL	Zero or more (optional)
@id \$.@id	Unique identifier for the collection (IRI).	Range: URL	Zero or one (optional)
alternateName \$.alternateName	Alternate name of the collection. Maybe used to refer to the CEOS IDN [https://idn.ceos.org/] shortname of the collection: e.g. C1532648157-ESA is the IDN shortname used for the collection with identifier TropForest .	Domain: Thing Range: Text	Zero or more (optional)
citation \$.citation	A bibliographic reference for the resource.	Domain: CreativeWork Range: Text	Zero or one (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
inLanguage \$.inLanguage	Resource language code, not empty, e.g. "en" (English)..	Domain: CreativeWork Range: Language Text	Zero or one (optional)
subjectOf \$.subjectOf	Refers to metadata information about the collection.	Domain: Thing Range: ListItem (Table 1)	Zero or more (optional)
publishingPrinciples \$.publishingPrinciples	An established standard to which the resource conforms.	Domain: CreativeWork Range: URL CreativeWork	Zero or more (optional)
version \$.version	Version number or other version designation of the resource.	Domain: CreativeWork Range: Number Text	Zero or one (optional)

Data Identification encoding example

```
{
  "@context": {
    "@vocab": "https://schema.org/"
  },
  "@type": "Dataset",
  "additionalType": [
    "http://purl.org/dc/dcmitype/Collection",
    "https://inspire.ec.europa.eu/metadata-codelist/ResourceType/series"
  ],
  "@id": "https://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC",
  "name": "Landsat 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain Corrected Systematic processing",
  "alternateName": "LANDSAT.ETM.GTC",
  "includedInDataCatalog": {
    "@type": "DataCatalog",
    "name": "FedEO Clearinghouse"
  },
  "url": [
    "https://earth.esa.int/eogateway/catalog/landsat-7-etm-enhanced-thematic-mapper-plus-geolocated-terrain-corrected-systematic-processing",
    "https://search.earthdata.nasa.gov/portal/idn/search?q=C1532648148-ESA"
  ],
  "identifier": [
    "LANDSAT.ETM.GTC",
    "C1532648148-ESA"
  ]
}
```

```

    },
    "@type": "PropertyValue",
    "propertyID": "https://idn.ceos.org/",
    "value": "C1532648148-ESA",
    "url": "https://search.earthdata.nasa.gov/portal/idn/search?q=C1532648148-ESA"
  ],
  "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility masks.",
  "temporalCoverage": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",
  "inLanguage": {
    "@type": "Language",
    "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
    "name": "en"
  },
  "subjectOf": [
    {
      "@type": "ListItem",
      "dateCreated": "1999-07-01T00:00:00Z",
      "datePublished": "1999-07-01T00:00:00Z",
      "dateModified": "2019-07-17T00:00:00Z",
      "inLanguage": {
        "@type": "Language",
        "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
        "name": "en"
      },
      "encodingFormat": "application/vnd.iso.19139-2+xml"
    },
    {
      "@type": "MediaObject",
      "contentUrl":
"https://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/dif10%2Bxml",
      "encodingFormat": "application/dif10+xml",
      "name": "DIF-10 metadata",
      "additionalType": "http://www.iana.org/assignments/relation/alternate"
    }
  ]
}

```

4.2.1. Resource Dates

Resource dates apply to EO Collections ([Dataset](#)), EO Granules ([Dataset](#)) and EO Services and Applications ([CreativeWork](#)).

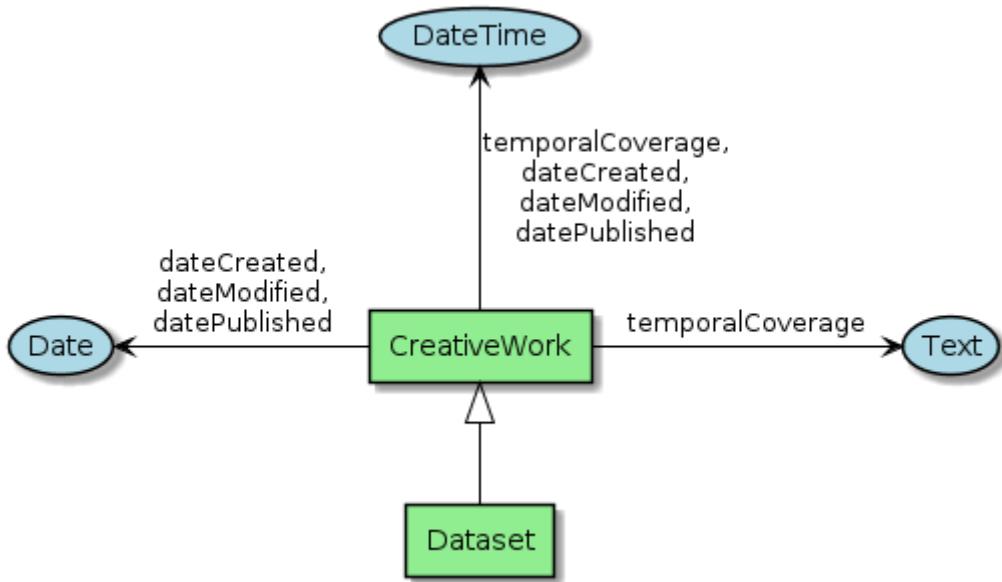


Figure 3. ResourceDates Schema

The complete overview of date related properties for resources is given in Table 3.

Table 3. Dates object properties

JSON Property	Definition	Data type and values	Multiplicity and use
temporalCoverage \$.temporalCoverage	Date or range of dates relevant for the resource. For example: "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z"	Domain: Dataset Range: DateTime or Text	One (Mandatory)
dateCreated \$.dateCreated	Date of creation of the resource.	Domain: CreativeWork Range: Date or DateTime	Zero or one (optional)
dateModified \$.dateModified	Date of last update of the resource.	Domain: CreativeWork Range: Date or DateTime	One (Mandatory)
datePublished \$.datePublished	Date of publication of the resource.	Domain: CreativeWork Range: Date or DateTime	Zero or one (optional)

ResourceDates encoding example

```
{  
  "@context": "https://schema.org",  
  "@type": "Dataset",  
  "name": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain  
Corrected Systematic processing (LANDSAT.ETM.GTC)",  
  "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper  
high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility  
masks. The Landsat 7 ETM+ scenes typically covers 185 x 170 km. A standard full scene  
is nominally centred on the intersection between a Path and Row (the actual image  
centre can vary by up to 100m). Each band requires 50MB (uncompressed), and Band 8  
requires 200MB (panchromatic band with resolution of 15m opposed to 30m).",  
  "temporalCoverage": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",  
  "dateCreated": "1999-07-01T23:59:00Z",  
  "datePublished": "1999-07-02T08:00:00Z",  
  "dateModified": "2004-01-01T08:00:00Z"  
}
```

4.2.2. PropertyValue

PropertyValue can be used to identify all kinds of resources including EO Collections ([Dataset](#)), EO Granules ([Dataset](#)), EO Services and Applications ([CreativeWork](#)) and Persons ([Person](#)).

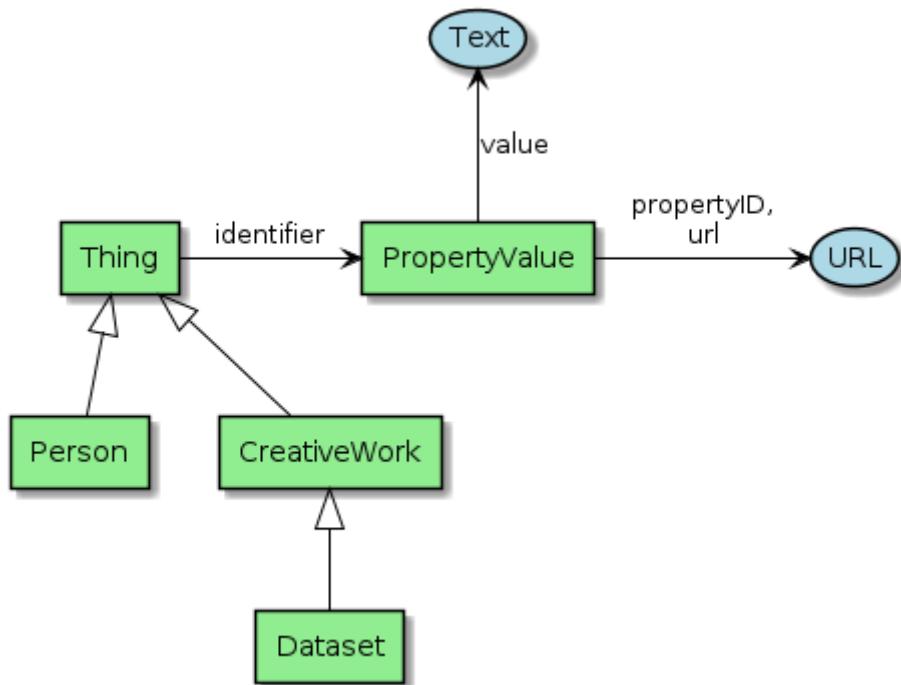


Figure 4. PropertyValue Schema

The complete description of PropertyValue is given in [Table 4](#). The encoding of [identifier](#) with a [PropertyValue](#) corresponds to the encoding proposed by [\[ESIPFed\]](#). The [propertyID](#) should use an URL from the registry at <https://registry.identifiers.org/registry>.

Table 4. PropertyValue object properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$identifier[*].@type	Type of the object. This property has the fixed value "PropertyValue".	Range: String Fixed value: "PropertyValue"	Zero or one (optional)
@id \$identifier[*].@id	ID of the identifier. E.g. https://doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA .	Range: URL	Zero or one (optional)
value \$identifier[*].value	Value of the identifier, including the prefix (e.g. doi:) identifying the type of identifier. E.g. doi:10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA. The prefix is included as recommended by [ESIPFed].	Range: Text	One (mandatory)
propertyID \$identifier[*].propertyID	A commonly used identifier for the characteristic represented by the property. [ESIPFed] recommends using the registry.identifiers.org URI for the identifier scheme, e.g. https://registry.identifiers.org/registry/doi .	Range: URL	One (mandatory)
url \$identifier[*].url	Resolvable URL of the item where the resource being identified can be found. E.g. https://doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA .	Range: URL	Zero or one (optional)

PropertyValue Shape

```
eoshacl:PropertyValueShape
  a sh:NodeShape ;
  sh:targetClass schema:PropertyValue ; # applies to all schema:PropertyValue
  # Be stricter than schema.org
  sh:closed true ;
  sh:ignoredProperties ( rdf:type ) ;
  sh:property [
    sh:path schema:value ;
    sh:minLength 1 ;
    sh:minCount 0 ; # Optional when used with "variableMeasured"
    # sh:maxCount 1 ; # Multiple values can be used for
  "schema:additionalProperty"
    sh:or (
      [ sh:datatype xsd:string ]
      [ sh:datatype xsd:double ]
      [ sh:datatype xsd:integer ]
    )
  ] ;
  sh:property [
    sh:path schema:url ;
    sh:nodeKind sh:IRI ;
    sh:minCount 0 ;
    sh:maxCount 1
  ] ;
  sh:property [
    sh:path schema:description ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
    sh:maxCount 1
  ] ;
  sh:property [
    sh:path schema:unitText ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
    sh:maxCount 1
  ] ;
  sh:property [
    sh:path schema:name ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
    sh:maxCount 1
  ] ;
  sh:property [
    sh:path schema:propertyID ;
    sh:datatype xsd:string ; # According to schema.org, should be
  schema:URL or schema:Text.
    sh:minCount 1 ;
    sh:maxCount 1
  ] .
```

In the example below, PropertyValue is used to associate a DOI [https://doi.org] identifier to a Dataset.

PropertyValue encoding example (Collection DOI)

```
{  
  "@context": {  
    "@vocab": "https://schema.org/"  
  },  
  "@type": "Dataset",  
  "name": "ESA Sea Surface Temperature Climate Change Initiative (ESA SST CCI):  
GHRSST Multi-Product ensemble (GMPE)",  
  "identifier": {  
    "@id": "https://doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA",  
    "@type": "PropertyValue",  
    "propertyID": "https://registry.identifiers.org/registry/doi",  
    "value": "doi:10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA",  
    "url": "https://doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA"  
  }  
}
```

NOTE

CEOS IDN [https://idn.ceos.org/] collection identifiers are currently not registered at <https://registry.identifiers.org>.

PropertyValue encoding example (IDN)

```
{  
  "@context": "https://schema.org/",  
  "@type": "Dataset",  
  "name": "Landsat 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain  
Corrected Systematic processing",  
  "url": "https://earth.esa.int/eogateway/catalog/landsat-7-etm-enhanced-thematic-  
mapper-plus-geolocated-terrain-corrected-systematic-processing",  
  "identifier": {  
    "@type": "PropertyValue",  
    "propertyID": "https://idn.ceos.org/",  
    "value": "C1532648148-ESA",  
    "url": "https://search.earthdata.nasa.gov/portal/idn/search?q=C1532648148-ESA"  
  }  
}
```

In the example below, PropertyValue is used to associate an ORCID ID [https://orcid.org/] to a Person.

PropertyValue encoding example (ORCID)

```
{  
  "@context": "https://schema.org/",  
  "@type": "Person",  
  "name": "Christopher J. Merchant",  
  "url": "https://publons.com/researcher/2543185/christopher-j-merchant/",  
  "identifier": {  
    "@id": "https://orcid.org/0000-0003-4687-9850",  
    "@type": "PropertyValue",  
    "propertyID": "https://registry.identifiers.org/registry/orcid",  
    "url": "https://orcid.org/0000-0003-4687-9850",  
    "value": "orcid:0000-0003-4687-9850"  
  }  
}
```

In the example below, PropertyValue is used to associate an [ROR ID](#) [<https://ror.org/>] to an Organization.

PropertyValue encoding example (ROR)

```
{  
  "@context": "https://schema.org/",  
  "@type": "Organization",  
  "name": "European Space Agency",  
  "url": "https://esa.int",  
  "identifier": {  
    "@id": "https://ror.org/03wd9za21",  
    "@type": "PropertyValue",  
    "propertyID": "https://registry.identifiers.org/registry/ror",  
    "url": "https://ror.org/03wd9za21",  
    "value": "ror:03wd9za21"  
  }  
}
```

In the example below, PropertyValue is used to identify an Article about an EO Collection via its [DOI](#) [<https://doi.org>] identifier.

PropertyValue encoding example (Article DOI)

```
{  
  "@context": "https://schema.org/",  
  "@type": "Article",  
  "name": "A new vegetation index derived from the pattern decomposition method  
  applied to Landsat-7/ETM+ images in Mongolia",  
  "url": [  
  
    "https://www.tandfonline.com/action/fedSearchRedirect?doi=10.1080%2F01431160601024200"  
,  
    "https://doi.org/10.1080/01431160601024200"  
,  
  ],  
  "identifier": {  
    "@id": "https://doi.org/10.1080/01431160601024200",  
    "@type": "PropertyValue",  
    "propertyID": "https://registry.identifiers.org/registry/doi",  
    "value": "doi:10.1080/01431160601024200",  
    "url": "https://doi.org/10.1080/01431160601024200"  
  },  
  "about": {  
    "@type": "Dataset",  
    "@id": "https://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC"  
  },  
  "isPartOf": "International Journal of Remote Sensing"  
}
```

4.2.3. Contact

Contact information applies to EO Collections (**Dataset**), EO Granules (**Dataset**) and EO Services and Applications (**CreativeWork**).

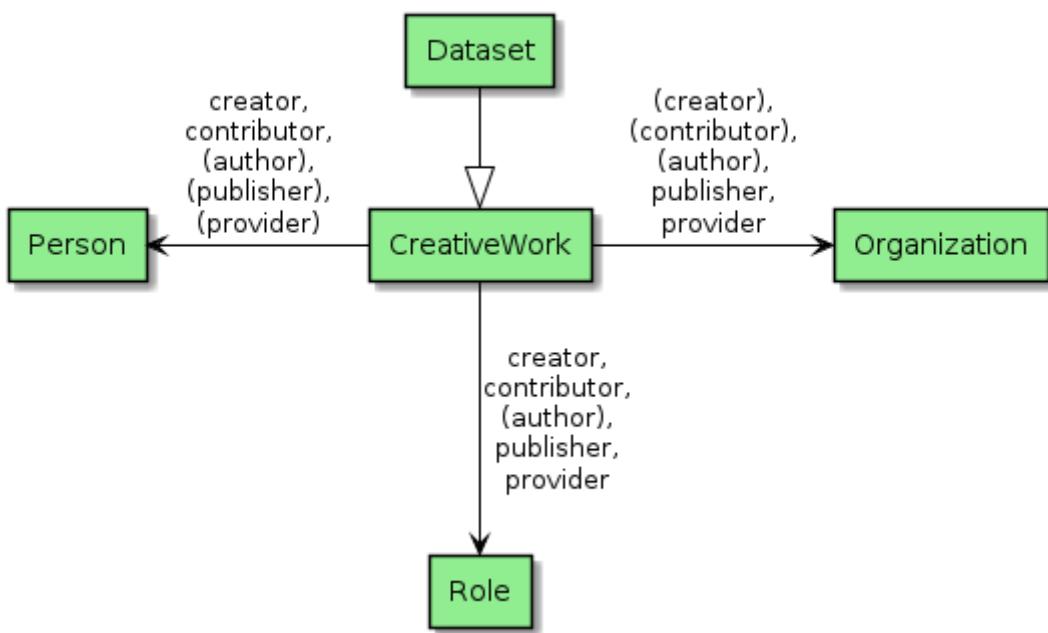


Figure 5. Contact Schema

The list of contact related properties is given in [Table 5](#).

Table 5. Contact object properties

JSON Property	Definition	Data type and values	Multiplicity and use
author \$.author	Responsible party primarily responsible for authoring the collection (role is "Author"). [ESIPFed] recommends using <code>creator</code> instead.	Range: Organization Person Role	Zero or more (optional)
creator \$.creator	Responsible party responsible for creating the collection. Is synonym of <code>author</code> .	Range: Organization Person Role	Zero or more (optional)
contributor \$.contributor	A secondary contributor to the collection.	Range: Organization Person Role	Zero or more (optional)
provider \$.provider	Responsible party responsible for providing the collection.	Range: Organization (Preferred) Person	Zero or more (optional)
publisher \$.publisher	Responsible party responsible for publishing the collection.	Range: Organization (Preferred) Person	Zero or more (optional)

WARNING

[ESIPFed](#) [https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#roles-of-people] uses `Role` as object type for `creator` or `contributor` to be able to associate additional `roleName` [https://schema.org/roleName]s. This approach is documented [here](#) [http://blog.schema.org/2014/06/introducing-role.html]. However, this does not validate with the Google Rich Results Test tool.

Contact encoding example

```
{  
  "@context": "https://schema.org",  
  "@type": "Dataset",  
  "name": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain  
Corrected Systematic processing (LANDSAT.ETM.GTC)",  
  "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper  
high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility  
masks. The Landsat 7 ETM+ scenes typically covers 185 x 170 km.",  
  "author": [  
    {  
      "@type": "Organization",  
      "@id": "https://www.linkedin.com/company/european-space-agency",  
      "email": "eohelp@eo.esa.int",  
      "name": "ESA/ESRIN",  
      "telephone": "+39 06 94180777",  
      "url": "https://earth.esa.int",  
      "address": {  
        "addressCountry": "Italy",  
        "postalCode": "00044",  
        "addressLocality": "Frascati",  
        "streetAddress": "Via Galileo Galilei CP. 64"  
      }  
    }  
  ],  
  "creator": {  
    "@type": "Role",  
    "creator": {  
      "@type": "Organization",  
      "@id": "https://www.linkedin.com/company/european-space-agency/"  
    },  
    "roleName": "originator"  
  }  
}
```

4.2.4. Organization

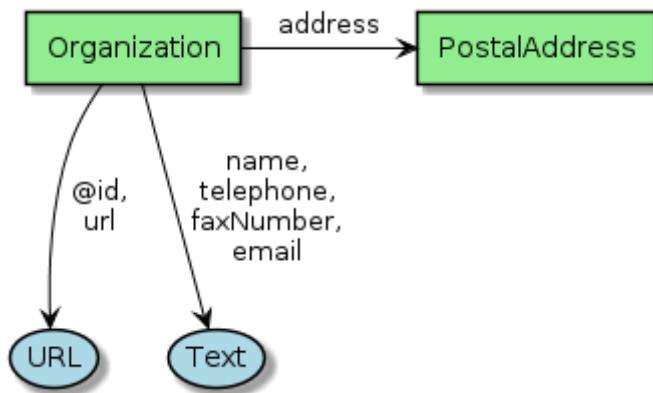


Figure 6. Organization Schema

The list of Organization properties is fully defined in [schema:Organization](#) [<https://schema.org/Organization>] and not repeated here.

Organization encoding example

```
{  
  "@type": "Organization",  
  "name": "ESA/ESRIN",  
  "sameAs": "https://ror.org/05vt9rv16",  
  "address": {  
    "@type": "PostalAddress",  
    "addressCountry": "Italy",  
    "addressLocality": "Frascati (Roma)",  
    "postalCode": "00044",  
    "streetAddress": "Largo Galileo Galilei 1"  
  },  
  "telephone": "+3906941801",  
  "faxNumber": "+390694180280",  
  "email": "eohelp@esa.int",  
  "url": "https://esa.int"  
}
```

4.2.5. Person

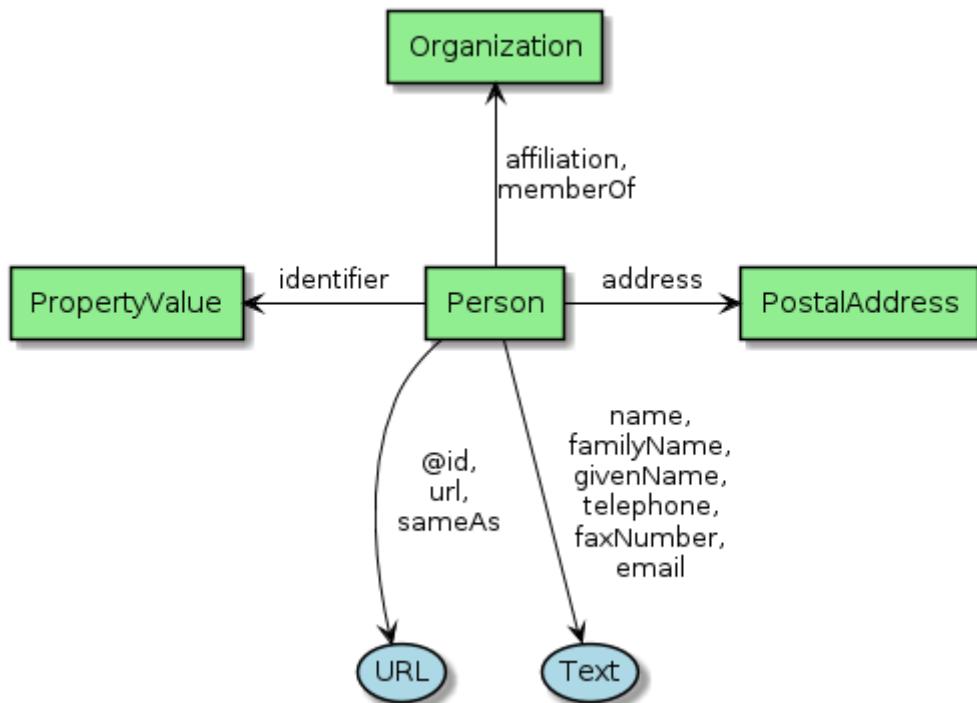


Figure 7. Person Schema

The list of Person properties is fully defined in [schema:Person](#) [<https://schema.org/Person>] and not repeated here.

Person encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "Person",  
  "name": "Christopher J. Merchant",  
  "url": "https://publons.com/researcher/2543185/christopher-j-merchant/",  
  "identifier": {  
    "@id": "https://orcid.org/0000-0003-4687-9850",  
    "@type": "PropertyValue",  
    "propertyID": "https://registry.identifiers.org/registry/orcid",  
    "url": "https://orcid.org/0000-0003-4687-9850",  
    "value": "orcid:0000-0003-4687-9850"  
  }  
}
```

4.2.6. Role

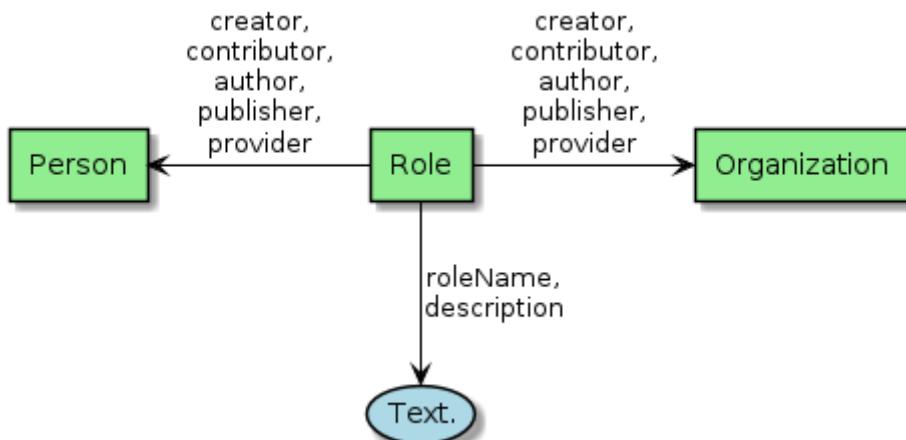


Figure 8. Role Schema

The list of Role properties is defined in [schema:Role](https://schema.org/Role) [https://schema.org/Role] and not repeated here.

Role can be used in combination with a **Person** or **Organization**. The [schema:roleName](https://schema.org/roleName) [https://schema.org/roleName] property can be used to encode [[CI_RoleCode](#)] values from [ISO19115:2003](https://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml) [https://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml] or [ISO19115-3](https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode) [https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode] (*) for which [schema:Dataset](https://schema.org/roleName) [https://schema.org/roleName] does not have a corresponding property.

Table 6. Responsible party role properties

ISO19115:2003 [https://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml]	ISO19115-3 [https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode]	schema.org property
author	author	schema:author
	coAuthor	
	collaborator	

ISO19115:2003 [https://www.isotc211.org/2005/resources/Codelist/gmxCodeLists.xml]	ISO19115-3 [https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode]	schema.org property
	contributor	schema:contributor
custodian	custodian	schema:maintainer
distributor	distributor	
	editor	schema:editor (Person)
	funder	schema:funder
	mediator	
originator	originator	schema:creator
owner	owner	
pointofContact	pointOfContact	schema:provider
principalInvestigator	principalInvestigator	
processor	processor	
publisher	publisher	schema:publisher
resourceProvider	resourceProvider	schema:provider
	rightsHolder	schema:copyrightHolder
	sponsor	schema:sponsor
	stakeholder	
user	user	

Roles directly supported as property of [schema:Dataset](https://schema.org/Dataset) [<https://schema.org/Dataset>] (See table above) do not require an intermediate [schema:Role](https://schema.org/Role) [<https://schema.org/Role>] object:

Other roles can be used as values for [schema:roleName](https://schema.org/roleName) [<https://schema.org/roleName>]. It is recommended to reuse [CI_RoleCode](https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode) values from [ISO19115-3](https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode) [https://wiki.esipfed.org/ISO_19115-3_Codelists#CI_RoleCode] where possible.

Role encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "Dataset",  
  "contributor": {  
    "@type": "Role",  
    "roleName": "principalInvestigator",  
    "contributor": {  
      "@type": "Person",  
      "name": "Christopher J. Merchant",  
      "url": "https://publons.com/researcher/2543185/christopher-j-merchant/",  
      "identifier": {  
        "@id": "https://orcid.org/0000-0003-4687-9850",  
        "@type": "PropertyValue",  
        "propertyID": "https://registry.identifiers.org/registry/orcid",  
        "url": "https://orcid.org/0000-0003-4687-9850",  
        "value": "orcid:0000-0003-4687-9850"  
      }  
    }  
  }  
}
```

4.3. Resource Constraints

Resource Constraints apply to EO Collections ([Dataset](#)), EO Granules ([Dataset](#)) and EO Services and Applications ([CreativeWork](#)).

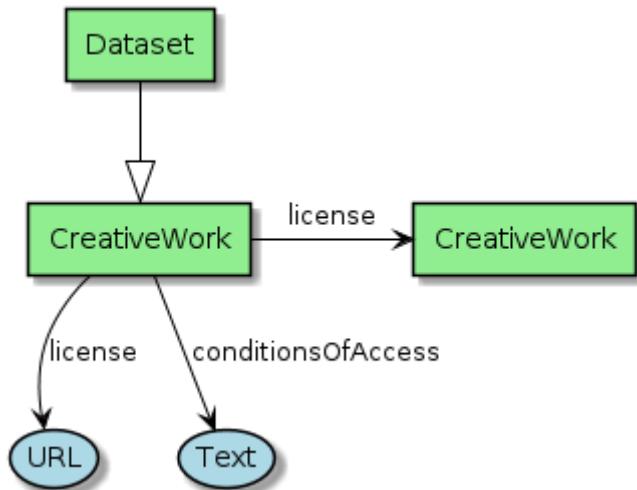


Figure 9. Resource Constraints Schema

The list of Resource Constraints properties is given in [Table 7](#).

Table 7. Resource Constraints properties

JSON Property	Definition	Data type and values	Multiplicity and use
license \$.license	A license document that applies to the content, typically indicated by URL. Links the collection to its license to document legal constraints. SPDX license list [https://spdx.org/licenses] provides a list of URIs for most commonly used licenses. See ESIPFed [https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#license] for additional guidance.	Domain: CreativeWork Range: CreativeWork URL	Zero or more (optional)
conditionsOfAccess \$.conditionsOfAccess	Conditions that affect the availability of, or method(s) of access to, the collection.	Domain: CreativeWork Range: Text	Zero or more (optional)

ResourceConstraints Shape

```
eoshacl:ResourceConstraintsShape
  a sh:NodeShape ;
  sh:targetClass schema:Dataset ; # applies to all schema:Dataset
  sh:closed false ;
  sh:property [
    sh:path schema:license ;
    sh:minCount 0 ;
    sh:or (
      [ sh:nodeKind sh:IRI ]
      [ sh:class schema:CreativeWork ]
    )
  ] ;
  sh:property [
    sh:path schema:conditionsOfAccess ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
  ] .
```

Resource Constraints encoding example

```
{  
  "@context": "https://schema.org",  
  "@type": "Dataset",  
  "name": "Alos African Coverage ESA archive",  
  "identifier": "ALOS",  
  "description": "ALOS Africa is a collection of the best available (cloud minimal)  
African coverage acquired by AVNIR-2 and PRISM.",  
  "license": {  
    "@type": "CreativeWork",  
    "description": "Utilisation of this data is subject to ESA's Earth Observation  
Terms and Conditions",  
    "url": "https://earth.esa.int/eogateway/documents/20142/1614553/Terms-and-  
Conditions-for-the-utilization-of-Data-provided-by-ESA.pdf"  
  },  
  "conditionsOfAccess": "Fast Registration with immediate access Immediate Access to  
data upon fast registration. TPM online access list ALOS Africa Online catalogue"  
}
```

4.4. Descriptive Keywords

Descriptive keywords apply to EO Collections ([Dataset](#)), EO Granules ([Dataset](#)) and EO Services and Applications ([CreativeWork](#)).

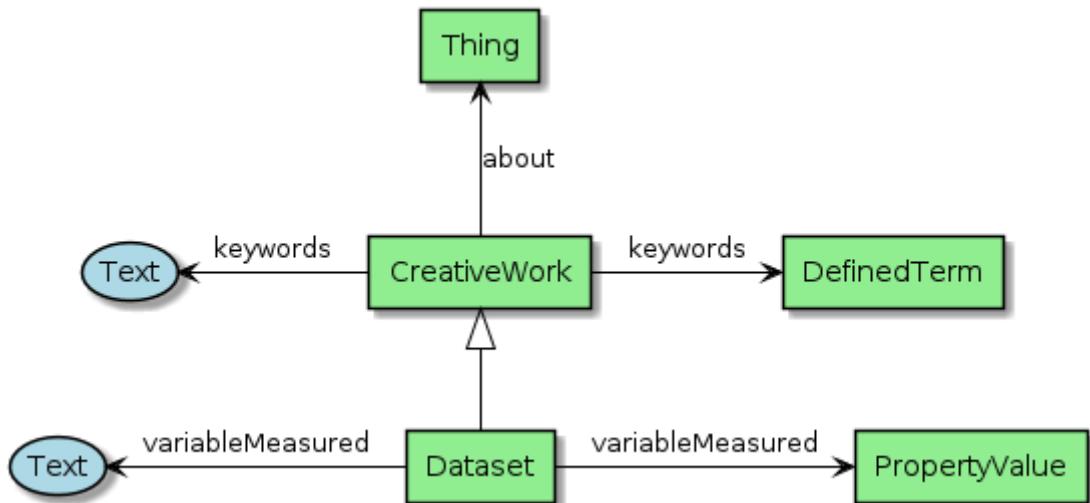


Figure 10. Metadata Descriptive Keywords

The complete list of descriptive keyword properties is given in [Table 8](#).

Table 8. Descriptive keyword object properties

JSON Property	Definition	Data type and values	Multiplicity and use
keywords \$.keywords	Free keywords not belonging to a controlled vocabulary, or keywords from a controlled vocabulary related to the resource.	Range: Text URL DefinedTerm See Table 9	Zero or more (optional)
about \$.about	The subject matter of the content; Can be free keywords not belonging to a controlled vocabulary.	Range: Thing	Zero or more (optional)
variableMeasured \$.variableMeasured	The variableMeasured property (pending) can indicate variables that are measured in the dataset, either described as text or as pairs of propertyID and name using PropertyValue. See ESIPFed [https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#variables] for a detailed explanation.	Range: Text PropertyValue	Zero or more (optional)

DescriptiveKeywords Shape

```
eoshacl:DescriptiveKeywordsShape
a sh:NodeShape ;
sh:targetClass schema:Dataset ; # applies to all schema:Dataset
sh:closed false ;
sh:property [
    sh:path schema:keywords ;
    sh:minCount 0 ;
    sh:or (
        [ sh:datatype xsd:string ]
        [ sh:class schema:DefinedTerm ]
    )
] .
```

Descriptive keywords encoding example

```
{
  "@context": "https://schema.org",
  "@type": "Dataset",
  "keywords": [
    {
      "@type": "DefinedTerm",
      "@id": "http://www.eionet.europa.eu/gemet/concept/3650",
      "inDefinedTermSet": "http://www.eionet.europa.eu/gemet/",
      "name": "Geology"
    },
    {
      "@type": "DefinedTerm",
      "@id": "https://gcmdservices.gsfc.nasa.gov/kms/concept/03f0c0a3-04a7-4ef8-8ec0-3c2266510815",
      "inDefinedTermSet": "http://www.eionet.europa.eu/gemet/"
    }
  ]
}
```

```

    "inDefinedTermSet":  

"https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/sciencekeywords",  

    "name": "VISIBLE IMAGERY"  

},  

{  

    "@type": "DefinedTerm",  

    "@id": "https://gcmdservices.gsfc.nasa.gov/kms/concept/98dc8278-fe0a-4e36-a638-9d7a5b0ed826",  

    "inDefinedTermSet":  

"https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/projects",  

    "name": "FedEO"  

},  

{  

    "@type": "DefinedTerm",  

    "@id": "https://gcmdservices.gsfc.nasa.gov/kms/concept/ad598334-f541-4be4-888c-c2dc7eb54194",  

    "inDefinedTermSet":  

"https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/CollectionDataType",  

    "name": "NEAR_REAL_TIME"  

},  

    "FedEO",  

    "ESA LDS",  

{
    "@type": "DefinedTerm",  

    "@id": "http://inspire.ec.europa.eu/metadata-codelist/TopicCategory/geoscientificInformation",  

    "name": "Geoscientific Information"  

},  

{
    "@type": "DefinedTerm",  

    "@id": "https://gcmdservices.gsfc.nasa.gov/kms/concept/d9cd5b7e-e9e7-4746-bbc8-bc69f7b606c7",  

    "name": "GEOSCIENTIFIC INFORMATION",  

    "inDefinedTermSet":  

"https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/isotopiccategory"
}
]
}

```

Descriptive keywords encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "Dataset",  
  "@id":  
  "https://fedeo.esa.int/collections/series/items/e0659b01259145c8bfb0de6eb12c2690",  
  "name": "ESA Sea Surface Temperature Climate Change Initiative (ESA SST CCI):  
  GHRSST Multi-Product ensemble (GMPE)",  
  "url": "https://catalogue.ceda.ac.uk/uuid/e0659b01259145c8bfb0de6eb12c2690",  
  "about": "Sea Surface Temperature",  
  "keywords": [  
    {  
      "@type": "DefinedTerm",  
      "@id": "https://earth.esa.int/concept/ocean-temperature",  
      "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-  
topics",  
      "name": "Ocean Temperature"  
    }  
  ],  
  "variableMeasured": {  
    "@type": "PropertyValue",  
    "propertyID": "gradient_fields",  
    "name": "Horizontal SST gradients of input analyses",  
    "unitText": "kelvin m-1",  
    "description": "Horizontal SST gradients of input analyses"  
  }  
}
```

4.4.1. DefinedTerm

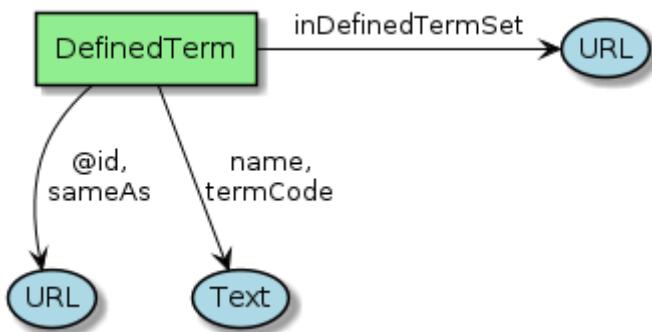


Figure 11. *DefinedTerm schema*

A [DefinedTerm](https://schema.org/DefinedTerm) [https://schema.org/DefinedTerm] represents a word, name, acronym, phrase, etc. with a formal definition. It is similar to a [\[SKOS\]](#) concept.

The complete list of DefinedTerm properties is given in [Table 9](#).

Table 9. DefinedTerm object properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$.keywords[*].@type	Type of the object. This property has the fixed value "DefinedTerm".	Range: String Fixed value: "DefinedTerm"	One (mandatory)
@id \$.keywords[*].@id	Identification of the keyword (URI). E.g. the URI of a skos:Concept .	Range: URL	Zero or one (optional)
sameAs \$.keywords[*].sameAs	URL unambiguously indicating the item's identity. Similar to skos:exactMatch .	Range: URL	Zero or more (optional)
name \$.keywords[*].name	Human readable representation of the keyword. For a skos:Concept , this may correspond to the skos:prefLabel or skos:altLabel properties.	Domain: DefinedTerm Range: Text	Zero or one (optional)
inDefinedTermSet \$.keywords[*].inDefinedTermSet	Identification of the code list or scheme defining the keyword. For a skos:Concept , this corresponds to the skos:inScheme property.	Domain: DefinedTerm Range: URL	Zero or one (optional)
additionalType \$.keywords[*].additionalType	Additional type of the keyword. For a skos:Concept , the URI of a skos:broader concept can be used as well. In the instrument example below, this property is used to represent the instrument type.	Domain: DefinedTerm Range: URL	Zero or more (optional)

DefinedTerm Shape

```
eoshacl:DefinedTermShape
  a sh:NodeShape ;
  sh:targetClass schema:DefinedTerm ; # applies to all schema:DefinedTerm
  sh:closed false ;
  # sh:ignoredProperties ( rdf:type schema:url schema:description
schema:alternateName) ;
  sh:property [
    sh:path schema:name ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
  ] ;
  sh:property [
    sh:path schema:sameAs ;
    sh:nodeKind sh:IRI ;
    sh:minCount 0 ;
  ] ;
  sh:property [
    sh:path schema:inDefinedTermSet ;
    sh:nodeKind sh:IRI ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
  ] ;
  sh:property [
    sh:path schema:termCode ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
  ] ;
  sh:property [
    sh:path schema:additionalType ;
    sh:nodeKind sh:IRI ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
  ] .
]
```

DefinedTerm encoding example (Science keyword)

```
{
  "@context": "https://schema.org",
  "@type": "DefinedTerm",
  "@id": "http://www.eionet.europa.eu/gemet/concept/4612",
  "name": "Land cover",
  "inDefinedTermSet": "http://www.eionet.europa.eu/gemet/"
}
```

DefinedTerm encoding example (Instrument)

```
{  
    "@type": "DefinedTerm",  
    "@id": "https://earth.esa.int/concept/etm",  
    "sameAs": "http://gcmdservices.gsfc.nasa.gov/kms/concept/4dbe7764-a2ea-4a19-b754-  
696c35ac3205",  
    "termCode": "4dbe7764-a2ea-4a19-b754-696c35ac3205",  
    "name": "ETM+",  
    "additionalType": "https://earth.esa.int/concept/p-imaging-spectrometers-  
radiometers",  
    "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/instruments"  
}
```

DefinedTerm encoding example (Platform)

```
{  
    "@type": [  
        "DefinedTerm",  
        "Vehicle",  
        "http://dbpedia.org/ontology/Satellite"  
    ],  
    "@id": "https://earth.esa.int/concept/landsat-7",  
    "name": "Landsat-7",  
    "sameAs": [  
        "http://gcmd.earthdata.nasa.gov/kms/concept/c7a09e9f-3c99-4b31-a521-  
313c379ba2b4",  
        "http://dbpedia.org/resource/Landsat_7",  
        "http://yago-knowledge.org/resource/Landsat_7"  
    ],  
    "subjectOf": [  
        "https://directory.eoportal.org/web/eoportal/satellite-missions/l/landsat-7",  
        "https://doi.org/10.1080/01431160601024200"  
    ],  
    "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/platforms"  
}
```

4.5. Spatial Information

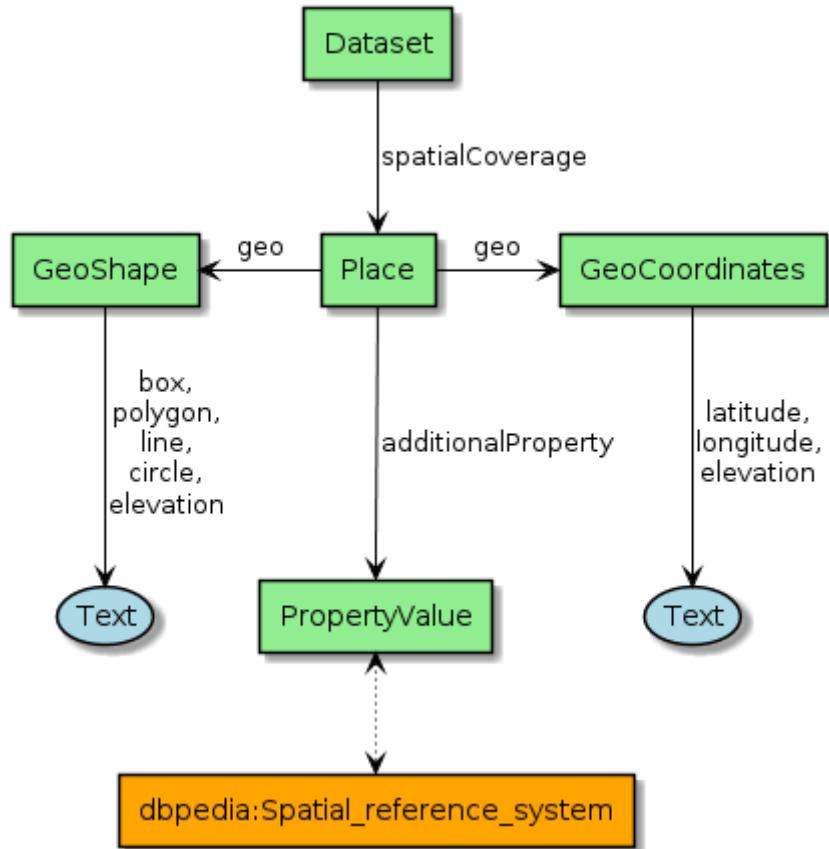


Figure 12. Spatial information schema

The encoding proposed by [ESIPFed](https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#spatial-coverage) [<https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#spatial-coverage>] is applicable.

A list of spatial information properties is given in [Table 10](#).

Table 10. Spatial information object properties

JSON Property	Definition	Data type and values	Multiplicity and use
spatialCoverage \$.spatialCoverage	Indicates the geographical areas that the dataset describes.	Domain: Dataset Range: Place	Zero or more (optional)
geo \$.spatialCoverage.geo	The geo coordinates of the place.	Domain: Place Range: GeoShape (Table 11) GeoCoordinates (Table 12)	Zero or one (optional)
additionalProperty \$.spatialCoverage.additionalProperty	This property can be used to encode the coordinate reference system as proposed by [ESIPFed] , if it differs from WGS 84 .	Domain: Place Range: PropertyValue (Table 4)	Zero or one (optional)

SpatialInformation Shape

```
eoshacl:SpatialInformationShape
  a sh:NodeShape ;
  # sh:targetClass schema:Dataset ; # applies to all schema:Dataset
  sh:targetSubjectsOf schema:isPartOf ;    # applies to all classes (Dataset) with
this attribute, thus not the parent class.
  sh:closed false ;
  sh:property [
    sh:path schema:spatialCoverage ;
    sh:class schema:Place;
    sh:minCount 1           # mandatory footprint
  ] .

eoshacl:PlaceShape
  a sh:NodeShape ;
  sh:targetClass schema:Place ;   # applies to all schema:Place
  sh:closed true ;
  sh:ignoredProperties ( rdf:type ) ;

  sh:property [
    sh:path schema:additionalProperty ;
    sh:class schema:PropertyValue;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:geo ;
    sh:minCount 1 ;
    sh:or (
      [ sh:class schema:GeoCoordinates ]
      [ sh:class schema:GeoShape ]
    )
  ] .
```

Spatial information encoding example

```
{
  "@context": "https://schema.org",
  "@type": "Dataset",
  "name": "OceanSat-2 NRT data",
  "description": "ESA, in collaboration with GAF AG, acquires and process every day OceanSat-2 passes over Neutrelitz reception station from 1 January 2016. All passes are systematically processed to levels 1B, 2B and 2C, and available for users in NRT (< 3 hours).",
  "spatialCoverage": {
    "@type": "Place",
    "geo": {
      "@type": "GeoShape",
      "polygon": "-30 -20 -30 41 70 41 70 -20 -30 -20"
    }
  }
}
```

4.5.1. GeoShape

A [GeoShape](https://schema.org/GeoShape) [https://schema.org/GeoShape] is described using several properties whose values are based on latitude/longitude pairs. Either whitespace or commas can be used to separate latitude and longitude; whitespace should be used when writing a list of several such points. The main [GeoShape](https://schema.org/GeoShape) [https://schema.org/GeoShape] properties are given in [Table 11](#).

Table 11. GeoShape object properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$.spatialCoverage.geo.@type	Type of the object. This property has the fixed value "GeoShape".	Range: String Fixed value: "GeoShape"	One (mandatory)
box \$.spatialCoverage.geo.box	A box is the area enclosed by the rectangle formed by two points. The first point is the lower corner, the second point is the upper corner. A box is expressed as two points separated by a space character. box can be used to encode the minimum bounding rectangle defined in CEOS-BP-014E [CEOS-OS-BP] .	Range: Text	Zero or one (optional)
polygon \$.spatialCoverage.geo.polygon	A polygon is the area enclosed by a point-to-point path for which the starting and ending points are the same. A polygon is expressed as a series of four or more space delimited points where the first and final points are identical.	Range: Text	Zero or one (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
line \$.spatialCoverage.geo.box	A line is a point-to-point path consisting of two or more points. A line is expressed as a series of two or more point objects separated by space.	Range: Text	Zero or one (optional)

GeoShape Shape

```
eoshacl:GeoShapeShape
  a sh:NodeShape ;
    sh:targetClass schema:GeoShape ; # applies to all schema:GeoShape
    sh:closed true ;
    sh:ignoredProperties ( rdf:type ) ;

  sh:property [
    sh:path schema:box ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:polygon ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:line ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] .

```

GeoShape encoding example

```
{
  "@context": "https://schema.org",
  "@type": "GeoShape",
  "polygon": "63.261372 -2.682513 61.997604 -2.695740 61.965195 0.005087 63.227173
  0.135472 63.261372 -2.682513"
}
```

4.5.2. GeoCoordinates

The main [GeoCoordinates](https://schema.org/GeoCoordinates) [https://schema.org/GeoCoordinates] properties are given in [Table 12](#).

Table 12. GeoCoordinates object properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$.spatialCoverage.geo.@type	Type of the object. This property has the fixed value "GeoCoordinates".	Range: String Fixed value: "GeoCoordinates"	One (mandatory)
latitude \$.spatialCoverage.geo.latitude	The latitude of a location. For example 37.42242 (WGS 84).	Range: Text Number	Zero or one (optional)
longitude \$.spatialCoverage.geo.longitude	The longitude of a location. For example -122.08585 (WGS 84).	Range: Text Number	Zero or one (optional)

GeoCoordinates Shape

```
eoshacl:GeoCoordinatesShape
  a sh:NodeShape ;
  sh:targetClass schema:GeoCoordinates ;    # applies to all schema:GeoCoordinates
  sh:closed true ;
  sh:ignoredProperties ( rdf:type ) ;
  sh:property [
    sh:path schema:latitude ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:maxInclusive 90 ;
    sh:minInclusive -90 ;
    sh:or (
      [ sh:datatype xsd:string ]
      [ sh:datatype xsd:double ]
      [ sh:datatype xsd:integer ]
    )
  ] ;
  sh:property [
    sh:path schema:longitude ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:maxInclusive 180 ;
    sh:minInclusive -180 ;
    sh:or (
      [ sh:datatype xsd:string ]
      [ sh:datatype xsd:double ]
      [ sh:datatype xsd:integer ]
    )
  ] ;
  sh:property [
    sh:path schema:elevation ;
    sh:minCount 0 ;
    sh:or (
      [ sh:datatype xsd:string ]
      [ sh:datatype xsd:double ]
      [ sh:datatype xsd:integer ]
    )
  ] .
```

GeoCoordinates encoding example

```
{
  "@context": "https://schema.org",
  "@type": "GeoCoordinates",
  "latitude": "50.83159",
  "longitude": "4.72988"
}
```

4.5.3. GeoSPARQL

GeoSPARQL interfaces may be used to query RDF stores providing triples encoded using schema.org. The relation between the schema.org classes and properties (green) and GeoSPARQL 1.1 (orange) are depicted in the diagram below which is based on https://opengeospatial.github.io/ogc-geosparql/geosparql11/spec.html#_e_7_schema_org.

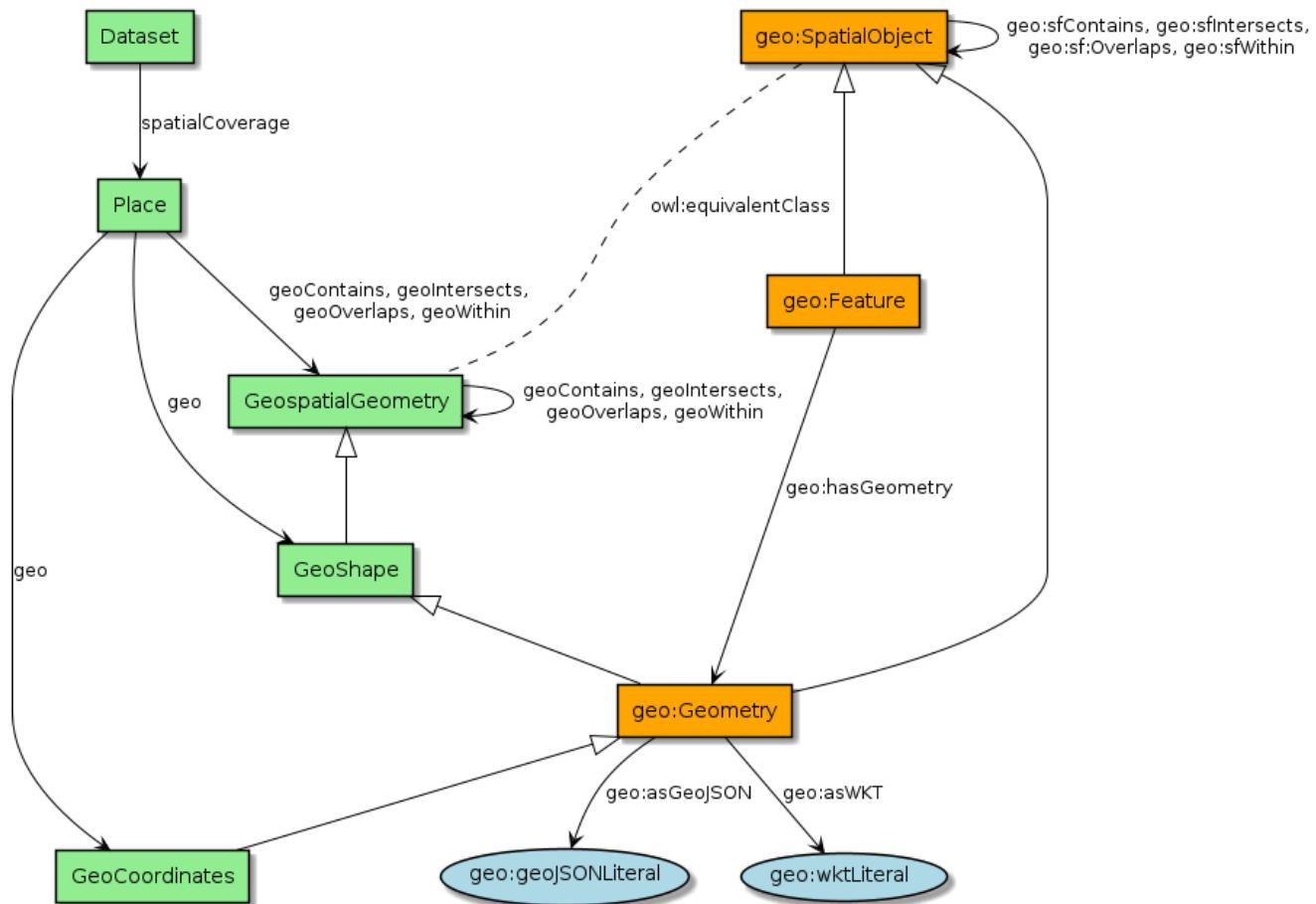


Figure 13. GeoSPARQL schema

The example below searches for granules from the PROBA satellite over the location of Mount Etna and returns their identifier, temporal coverage and quicklook image.

GeoSPARQL encoding example

```
PREFIX schema: <https://schema.org/>
PREFIX geo: <http://www.opengis.net/ont/geosparql#>

SELECT ?p ?id ?time ?preview
WHERE
{
  ?p schema:additionalType <http://purl.org/dc/dcmitype/Dataset>.
  ?p schema:potentialAction/schema:instrument/schema:name "PROBA".
  ?p schema:spatialCoverage/schema:geoIntersects/geo:asWKT "POINT(14.995
37.755)"^^geo:wktLiteral.
  ?p schema:identifier ?id.
  ?p schema:temporalCoverage ?time.
  ?p schema:thumbnailUrl ?preview.
}
LIMIT 5
```

4.6. Related URL

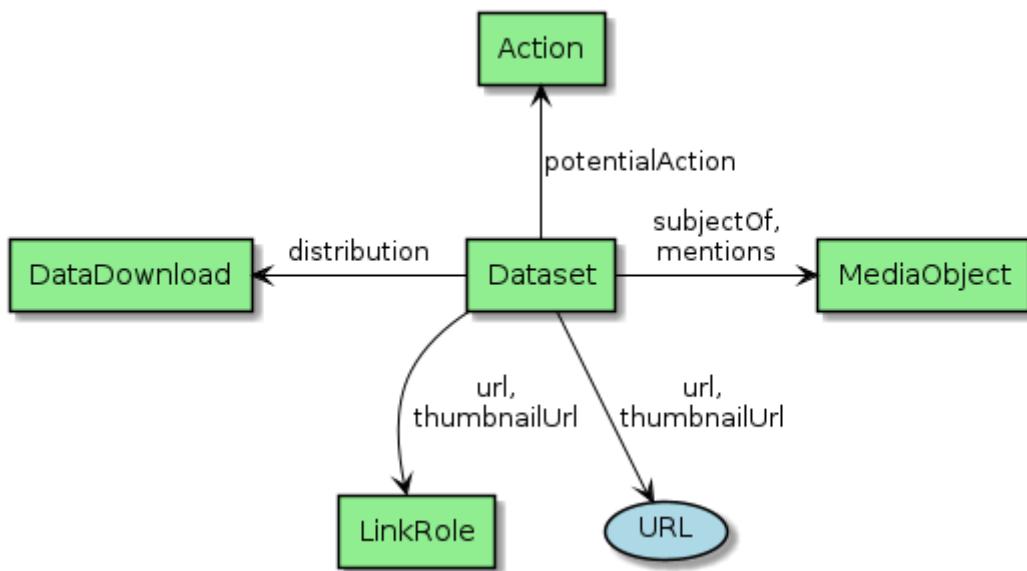


Figure 14. Related URL schema

Related URL cover both HATEOAS hypermedia links and OGC14-055r2 style **offerings**.

A **MediaObject** is used to represent most hypermedia links. If the link represents a data download link (`rel="enclosure"`) then also **DataDownload** objects can be used as recommended by [ESIPFed].

NOTE

The (pending) **LinkRole** [<https://schema.org/LinkRole>] class can represent URL with an IANA link registry relation via **linkRelationship** [<https://schema.org/linkRelationship>]. This class does not have a **contentType** property however, therefore **MediaObject** and **DataDownload** can be used instead.

Table 13. IANA Relations

IANA Relation	schema.org property	schema.org class	Purpose
alternate	subjectOf	MediaObject	metadata
via	subjectOf	MediaObject	original metadata
canonical	subjectOf	MediaObject	original metadata
describedby	url	URL	documentation (landing page)
describedby	mentions	MediaObject	documentation
enclosure	distribution	DataDownload	data download
icon	thumbnailUrl	URL	data preview (quicklook)
search	potentialAction	Action	search

A list of Related URL properties is given in [Table 14](#).

Table 14. RelatedUrl object properties

JSON Property	Definition	Data type and values	Multiplicity and use
url \$.url	URL of the resource, e.g. landing page for the collection.	Range: URL	Zero or more (optional)
subjectOf \$.subjectOf	Reference to metadata representations of the collection.	Range: MediaObject (Table 15)	Zero or more (optional)
distribution \$.distribution	A downloadable form of this dataset, at a specific location, in a specific format.	Range: DataDownload (Table 15)	Zero or more (optional)
mentions \$.mentions	Reference to other media objects related to the collection. For metadata representations and data downloads, the properties subjectOf and distribution are preferred instead.	Range: MediaObject (Table 15)	Zero or more (optional)
potentialAction \$.potentialAction	Offering (See [OGC14-055r2]) available for this collection. Also used with SearchAction to provide the url template to be used for product search in this collection.	Range: Action (Table 16)	Zero or more (optional)
thumbnailUrl \$.thumbnailUrl	Thumbnail or quicklook image representing the collection.	Range: URL	Zero or more (optional)

Related URL Shape

```
eoshacl:RelatedUrlShape
  a sh:NodeShape ;
  # sh:targetClass schema:Dataset ;  # applies to all schema:Dataset
  sh:targetSubjectsOf schema:isPartOf ;  # applies to all classes (Dataset) with
this attribute, thus not the parent class.
  sh:closed false ;
  sh:property [
    sh:path schema:url ;
    sh:minCount 0 ;
    sh:or (
      [ sh:nodeKind sh:IRI ]
      [ sh:class schema:LinkRole ]
    )
  ] ;
  sh:property [
    sh:path schema:thumbnailUrl ;
    sh:nodeKind sh:IRI ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:potentialAction ;
    # how to indicate that any subclass of Action is allowed also without
enumerating them ?
    sh:minCount 0 ;
    sh:or (
      [ sh:class schema:Action ]
      [ sh:class schema:SearchAction ]
      [ sh:class schema>CreateAction ]
    )
  ] ;
  sh:property [
    sh:path schema:distribution ;
    sh:class schema>DataDownload ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:subjectOf ;
    sh:minCount 1 ;
    sh:or (
      [ sh:class schema:MediaObject]
      [ sh:class schema:ListItem ]  # See DataIdentificationShape
    )
  ] .
```

Related URL encoding example

```
{
  "@context": "https://schema.org",
```

```

"@type": "Dataset",
"name": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain Corrected Systematic processing (LANDSAT.ETM.GTC)",
"description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility masks. The Landsat 7 ETM+ scenes typically covers 185 x 170 km. A standard full scene is nominally centred on the intersection between a Path and Row (the actual image centre can vary by up to 100m). Each band requires 50MB (uncompressed), and Band 8 requires 200MB (panchromatic band with resolution of 15m opposed to 30m).",
"url": "https://earth.esa.int/eogateway/catalog/landsat-7-etm-enhanced-thematic-mapper-plus-geolocated-terrain-corrected-systematic-processing?text=landsat+tm+etm",
"subjectOf": [
{
    "@type": "DataDownload",
    "contentUrl":
"http://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/vnd.iso.19139-2%2Bxml",
    "encodingFormat": "application/vnd.iso.19139-2+xml",
    "name": "ISO 19139-2 metadata",
    "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
],
"potentialAction": {
    "@type": "Action",
    "identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",
    "target": [
        {
            "@type": "EntryPoint",
            "identifier": "GetCapabilities",
            "contentType": [
                "application/xml"
            ],
            "urlTemplate":
"https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities",
            "httpMethod": "GET"
        },
        {
            "@type": "EntryPoint",
            "identifier": "DescribeCoverage",
            "contentType": [
                "application/xml"
            ],
            "urlTemplate":
"https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE7_RGB",
            "httpMethod": "GET"
        }
    ]
}
}

```

4.6.1. MediaObject

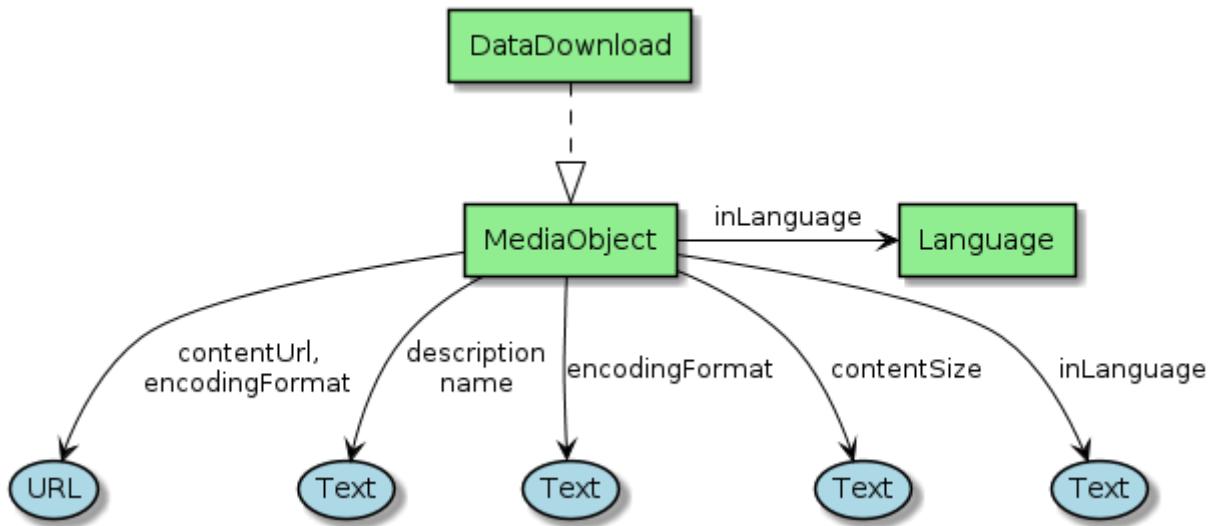


Figure 15. *MediaObject* schema

A list of *MediaObject* properties is given in [Table 15](#).

Table 15. MediaObject object properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$.distribution[].@type \$.subjectOff[].@type \$.mentions[].@type	Type of the object. This property has the fixed value "MediaObject" or "DataDownload".	Range: String Fixed value: "MediaObject" "DataDownload"	One (mandatory)
contentUrl \$.distribution[].contentUrl \$.subjectOff[].contentUrl \$.mentions[].contentUrl	URI describing the related resource.	Range: URL	One (mandatory)
additionalProperty \$.distribution[].additionalProperty \$.subjectOff[].additionalProperty \$.mentions[].additionalProperty	Reference coordinate system TBD See https://github.com/ESIPFed/science-on-schema.org/blob/master/guides/Dataset.md#spatial-coverage , typically used for granule downloads.	Range: TBD	One or zero (optional)
encodingFormat \$.distribution[].encodingFormat \$.subjectOff[].encodingFormat \$.mentions[].encodingFormat	Hint about the type of the representation that is expected to be returned when the value of contentUrl is dereferenced. Should be the value of a media type.	Range: URL Text	Zero or one (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
name <code>\$.distribution[].name</code> <code>\$.subjectOf[].name</code> <code>\$.mentions[].name</code>	Human readable information about the link.	Range: Text	Zero or one (optional)
description <code>\$.distribution[].description</code> <code>\$.subjectOf[].description</code> <code>\$.mentions[].description</code>	Description of the link.	Range: Text	Zero or one (optional)
contentSize <code>\$.distribution[].contentSize</code> <code>\$.subjectOf[].contentSize</code> <code>\$.mentions[].contentSize</code>	File size in bytes.	Range: Text	Zero or one (optional)
inLanguage <code>\$.distribution[].inLanguage</code> <code>\$.subjectOf[].inLanguage</code> <code>\$.mentions[].inLanguage</code>	The language of the content.	Range: Text Language	Zero or one (optional)

MediaObject Shape

```
eoshacl:MediaObjectShape
a sh:NodeShape ;
sh:targetClass schema:MediaObject ; # applies to all schema:MediaObject
sh:targetClass schema:DataDownload ; # applies to all schema:DataDownload
# Not allowing additional properties to have stricter validation.
sh:closed true ;
sh:ignoredProperties ( rdf:type schema:additionalType schema:inLanguage ) ;

sh:property [
    sh:path schema:contentUrl ;
    sh:nodeKind sh:IRI ;
    sh:minCount 1 ;
] ;
sh:property [
    sh:path schema:name ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
] ;
sh:property [
    sh:path schema:description ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
] ;
sh:property [
    sh:path schema:ContentSize ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
] ;
sh:property [
    sh:path schema:encodingFormat ;
    sh:minCount 0 ;
    sh:or (
        [ sh:nodeKind sh:IRI ]
        [ sh:datatype xsd:string ]
    )
] .

eoshacl:DataDownloadShape
a sh:NodeShape ;
sh:targetClass schema:DataDownload ; # applies to all schema:DataDownload
sh:deactivated true ; # specialisation of MediaObject
sh:closed false ;
sh:property [
    sh:path schema:contentUrl ;
    sh:nodeKind sh:IRI ;
    sh:minCount 1 ;
] .
```

MediaObject encoding example

```
{
  "@context": "https://schema.org",
  "@type": "MediaObject",
  "contentUrl": "https://sentinel.esa.int/web/sentinel/missions/sentinel-2",
  "encodingFormat": "text/html",
  "name": "ESA Sentinel Online",
  "inLanguage": "en",
  "additionalType": "http://www.iana.org/assignments/relation/describedby"
}
```

4.6.2. Action

REST elements can be described using **Action** where the **object** property refers to the RESTful resource (See also [\[WEBAPI\]](#)).

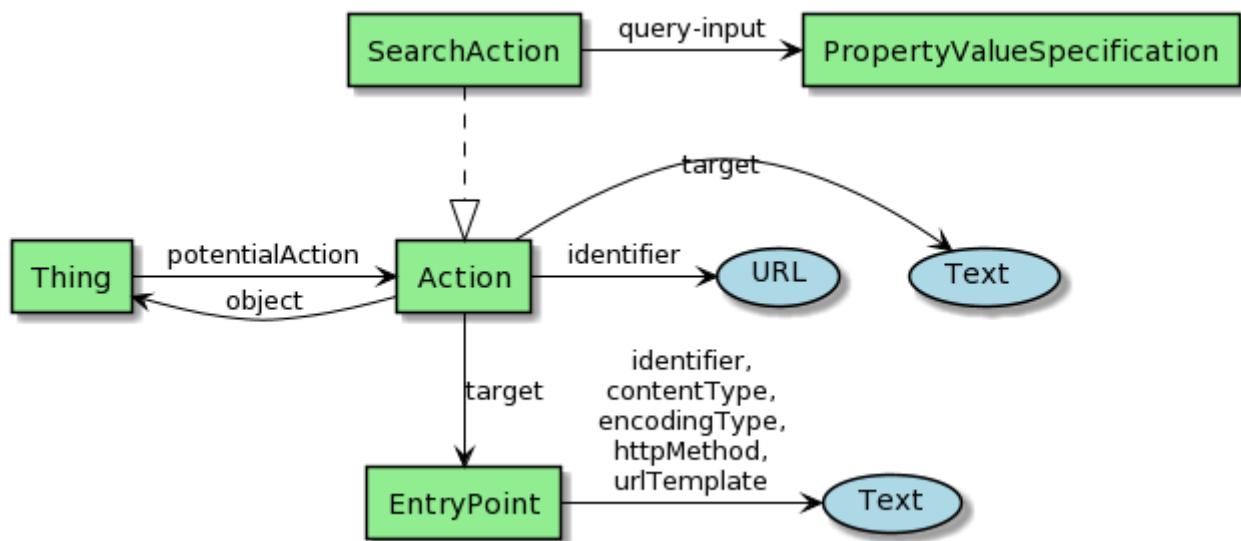


Figure 16. Action schema

A list of Action properties is given in [Table 16](#).

Table 16. Action object properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$potentialAction.@type	Type of the object. This property has the fixed value of "Action" or one of its subclasses e.g. "SearchAction".	Range: String Fixed value: "Action" or one of its subclasses	One (mandatory)
identifier \$potentialAction.identifier	Provides an identifier for the Action. In case of actions available through OGC Web services, the offerings[*].code identifier defined in [OGC14-055r2] can be used here.	Range: URL	Zero or one (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
target \$.potentialAction.target	Indicates a target EntryPoint for an Action. Instead of an EntryPoint, the target.urlTemplate property can be used directly as well (Text), as explained here [https://schema.org/docs/actions.html].	Range: EntryPoint [https://schema.org/EntryPoint] Text	Zero or one (optional)
query-input \$.potentialAction.query-input	Property Annotation [https://schema.org/docs/actions.html] allowing to specify the template parameters in the target.urlTemplate property.	Domain: SearchAction Range: PropertyValueSpecification [https://schema.org/PropertyValueSpecification]	Zero or more (optional)

Action Shape

```

eoshacl:ActionShape
  a sh:NodeShape ;
    sh:targetClass schema:Action ; # applies to all schema:Action including listed
    subclasses
      sh:targetClass schema:SearchAction ;
      sh:targetClass schema>CreateAction ;
      sh:targetClass schema:UseAction ;

      sh:closed false ;
      sh:property [
        sh:path schema:identifier ;
        sh:minCount 0 ;
        sh:maxCount 1 ;
        sh:or (
          [ sh:datatype xsd:string ]
          [ sh:nodeKind sh:IRI ]
        )
      ] ;
      sh:property [
        sh:path schema:target ;
        sh:minCount 0 ;
        # sh:maxCount 1 ;
        sh:or (
          [ sh:class schema:EntryPoint ]
          [ sh:datatype xsd:string ]
        )
      ] .

```

SearchAction Shape

```
eoshacl:SearchActionShape
  a sh:NodeShape ;
  sh:targetClass schema:SearchAction ;  # applies to all schema:SearchAction

  sh:closed true ;
  sh:ignoredProperties ( rdf:type schema:target ) ;
  sh:property [
    sh:path schema:query-input ;
    sh:class schema:PropertyValueSpecification ;
    sh:minCount 0 ;
  ] .
```

EntryPoint Shape

```
eoshacl:EntryPointShape
  a sh:NodeShape ;
  sh:targetClass schema:EntryPoint ;  # applies to all schema:EntryPoint
  sh:closed true ;
  sh:ignoredProperties ( rdf:type ) ;

  sh:property [
    sh:path schema:identifier ;
    sh:datatype xsd:string ;
    sh:minCount 0
    # range and multiplicity checked by schema:IdentifierPropertyShape
  ] ;
  sh:property [
    sh:path schema:description ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:contentType ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:encodingType ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:httpMethod ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:urlTemplate ;
    sh:datatype xsd:string ;
    sh:minCount 1
  ] .
```

SearchAction encoding example (Long)

```
{
  "@context": "https://schema.org",
  "@type": "SearchAction",
  "target": {
    "@type": "EntryPoint",
    "contentType": [
      "application/atom+xml",
      "application/geo+json"
    ],
    "urlTemplate":
    "https://fedeo.esa.int/collections/datasets/items?parentIdentifier=LANDSAT.ETM.GTC&bbox={bbox}&startRecord={startIndex}&limit={limit}",
    "description": "OpenSearch request template",
    "httpMethod": "GET"
  },
  "query-input": [
    {
      "@type": "PropertyValueSpecification",
      "valueName": "startIndex",
      "description": "Index of first result",
      "valueRequired": false,
      "valuePattern": "[0-9]+"
    },
    {
      "@type": "PropertyValueSpecification",
      "valueName": "limit",
      "description": "Number of results",
      "valueRequired": false,
      "valuePattern": "[0-9]+"
    },
    {
      "@type": "PropertyValueSpecification",
      "valueName": "bbox",
      "description": "Bounding box",
      "valueRequired": false,
      "valuePattern": "(-?[0-9]+(.[0-9]+)?),[ ]*(-?[0-9]+(.[0-9]+)?)[ ]*(-?[0-9]+(.[0-9]+)?),[ ]*(-?[0-9]+(.[0-9]+)?)"
    }
  ]
}
```

SearchAction encoding example (Short)

```
{  
  "@context": "https://schema.org",  
  "@type": "SearchAction",  
  "target":  
  "https://fedeo.esa.int/collections/series/items?startRecord={startIndex}&limit={limit}  
",  
  "query-input": [  
    {  
      "@type": "PropertyValueSpecification",  
      "valueName": "startIndex",  
      "description": "Index of first result",  
      "valueRequired": false,  
      "valuePattern": "[0-9]+"
```

}

```
{  
  "@type": "PropertyValueSpecification",  
  "valueName": "limit",  
  "description": "Number of results",  
  "valueRequired": false,  
  "valuePattern": "[0-9]+"
```

}

```
]  
}
```

4.6.3. LinkRole

The (pending) [LinkRole](https://schema.org/LinkRole) [https://schema.org/LinkRole] class can represent URL with an IANA link registry relation via [linkRelationship](https://schema.org/linkRelationship) [https://schema.org/linkRelationship]. This class does not have a [contentType](#) property however, therefore [MediaObject](#) and [DataDownload](#) can be used instead.

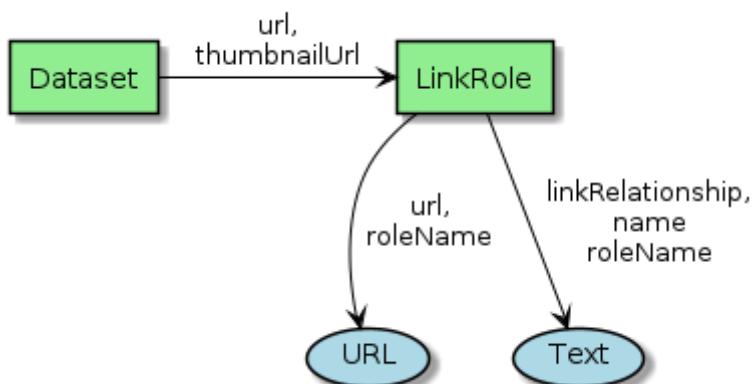


Figure 17. `LinkRole` schema

LinkRole Shape

```
eoshacl:LinkRoleShape
  a sh:NodeShape ;
  sh:targetClass schema:LinkRole ;  # applies to all schema:LinkRole
  sh:closed true ;
  sh:ignoredProperties ( rdf:type ) ;
  sh:property [
    sh:path schema:url ;
    sh:nodeKind sh:IRI ;
    sh:minCount 1
  ] ;
  sh:property [
    sh:path schema:name ;
    sh:datatype xsd:string ;
    sh:minCount 0
  ] ;
  sh:property [
    sh:path schema:linkRelationship ;
    sh:datatype xsd:string ;
    sh:minCount 1
  ] .

```

LinkRole encoding example (Dataset)

```
{  
  "@context": "https://schema.org",  
  "@type": "Dataset",  
  "name": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain  
Corrected Systematic processing (LANDSAT.ETM.GTC)",  
  "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper  
high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility  
masks. The Landsat 7 ETM+ scenes typically covers 185 x 170 km. A standard full scene  
is nominally centred on the intersection between a Path and Row (the actual image  
centre can vary by up to 100m). Each band requires 50MB (uncompressed), and Band 8  
requires 200MB (panchromatic band with resolution of 15m opposed to 30m).",  
  "url": [  
    {  
      "@type": "LinkRole",  
      "url": "https://earth.esa.int/eogateway/catalog/landsat-7-etm-enhanced-  
themetic-mapper-plus-geolocated-terrain-corrected-systematic-  
processing?text=landsat+tm+etm",  
      "name": "Landing page",  
      "linkRelationship": "describedby"  
    },  
    {  
      "@type": "LinkRole",  
      "url":  
        "http://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/  
vnd.iso.19139-2%2Bxml",  
      "name": "ISO 19139-2 metadata",  
      "linkRelationship": "alternate"  
    }  
  ]  
}
```

4.7. Acquisition Information

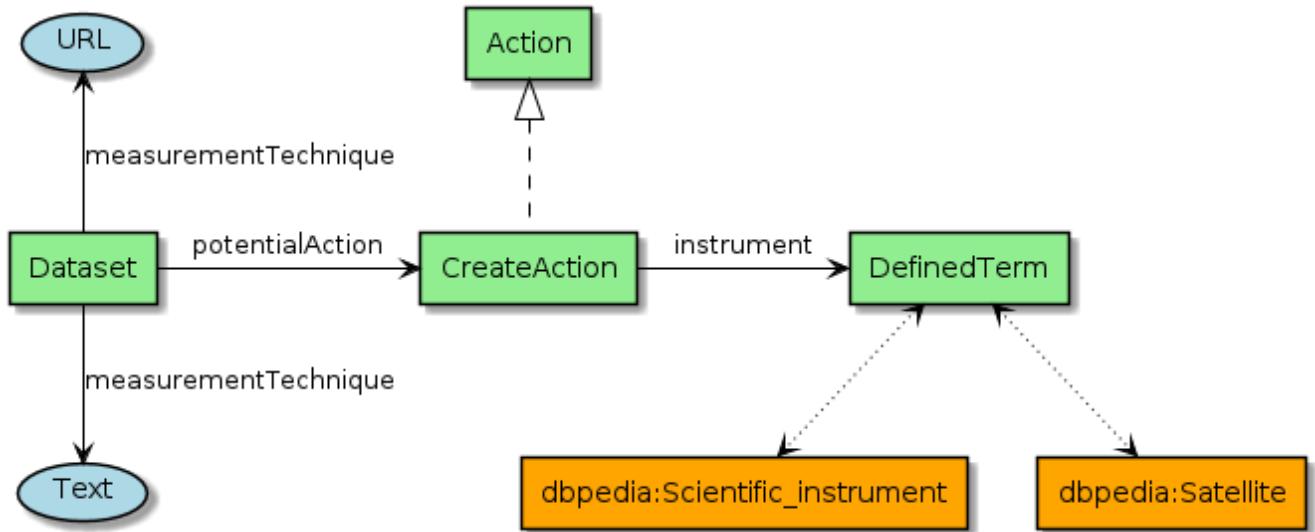


Figure 18. Acquisition Information schema

The **potentialAction** property describes an idealized action in which the **Thing** (i.e. **schema:Dataset**) plays an 'object' role. To express that the **Dataset** is created/produced by an Earth Observation instrument mounted on a platform, we can use the **CreateAction** [<https://schema.org/CreateAction>] which is defined as "The act of deliberately creating/producing/generating/building a result". The **instrument** property, which refers to one or more objects that helped perform the action, can then be used to associate the Earth Observation instrument and platforms to the Dataset. We represent both with a **schema:DefinedTerm** which is equivalent to a **skos:Concept**. Therefore, both instrument and platform can be unambiguously identified using the corresponding **concept schemes** from NASA GCMD or the ESA Thesauri.

A list of Acquisition Information properties is given in [Table 17](#).

Table 17. Acquisition information properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$.potentialAction.@type	Type of the object. This property has the fixed value of " CreateAction [https://schema.org/CreateAction]".	Range: String Fixed value: "CreateAction"	One (mandatory)
instrument \$.potentialAction.instrument	An object that helped the agent perform the CreateAction. Is used to link the EO collection to the corresponding EO platform(s) and instrument(s) the data of which was used to produce the collection.	Range: DefinedTerm (Table 9)	Zero or more (optional)
measurementTechnique \$.measurementTechnique	A technique or technology used in a Dataset, corresponding to the method used for measuring the corresponding variable(s).	Range: Text URL	Zero or more (optional)

AcquisitionInformation Shape

```
eoshacl:AcquisitionInformationShape
  a sh:NodeShape ;
  sh:targetClass schema:Dataset ;  # applies to all schema:Dataset
  sh:closed false ;

  sh:property [
    sh:path schema:measurementTechnique ;
    sh:minCount 0 ;
    sh:or (
      [ sh:nodeKind sh:IRI ]
      [ sh:datatype xsd:string ]
    )
  ] ;
  sh:property [
    sh:path schema:potentialAction ;
    sh:minCount 0 ;
    sh:or (
      [ sh:class schema>CreateAction ]
      [ sh:class schema>Action ]      # possible due to other Shape
      [ sh:class schema/SearchAction ] # possible due to other Shape
    )
  ] .
```



```
eoshacl>CreateActionShape
  a sh:NodeShape ;
  sh:targetClass schema>CreateAction ;  # applies to all schema>CreateAction

  # Be more strict than allowed by schema.org
  sh:closed true ;
  sh:ignoredProperties ( rdf:type ) ;
  sh:property [
    sh:path schema:instrument ;
    sh:minCount 1 ;
    sh:class schema>DefinedTerm
  ] .
```

Acquisition Information encoding example

```
{  
    "@context": {  
        "@vocab": "https://schema.org/",  
        "dbpedia": "http://dbpedia.org/resource/"  
    },  
    "@type": "Dataset",  
    "name": "LANDSAT 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain  
Corrected Systematic processing (LANDSAT.ETM.GTC)",  
    "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper  
high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility  
masks. The Landsat 7 ETM+ scenes typically covers 185 x 170 km. A standard full scene  
is nominally centred on the intersection between a Path and Row (the actual image  
centre can vary by up to 100m). Each band requires 50MB (uncompressed), and Band 8  
requires 200MB (panchromatic band with resolution of 15m opposed to 30m).",  
    "measurementTechnique": ["Passive Remote Sensing", "Spectrometers/Radiometers",  
    "Imaging Spectrometers/Radiometers"],  
    "potentialAction": {  
        "@type": "CreateAction",  
        "instrument": [  
            {  
                "@type": [  
                    "DefinedTerm",  
                    "dbpedia:Scientific_instrument"  
                ],  
                "@id": "https://earth.esa.int/concept/etm",  
                "sameAs": "http://gcmdservices.gsfc.nasa.gov/kms/concept/4dbe7764-  
a2ea-4a19-b754-696c35ac3205",  
                "name": "ETM+",  
                "additionalType": "https://earth.esa.int/concept/p-imaging-  
spectrometers-radiometers",  
                "inDefinedTermSet":  
                "https://earth.esa.int/concepts/concept_scheme/instruments"  
            },  
            {  
                "@type": [  
                    "DefinedTerm",  
                    "dbpedia:Satellite"  
                ],  
                "@id": "https://earth.esa.int/concept/landsat-7",  
                "sameAs": "http://gcmdservices.gsfc.nasa.gov/kms/concept/c7a09e9f-  
3c99-4b31-a521-313c379ba2b4",  
                "name": "Landsat-7",  
                "inDefinedTermSet":  
                "https://earth.esa.int/concepts/concept_scheme/platforms"  
            }  
        ]  
    }  
}
```

4.8. Additional Information

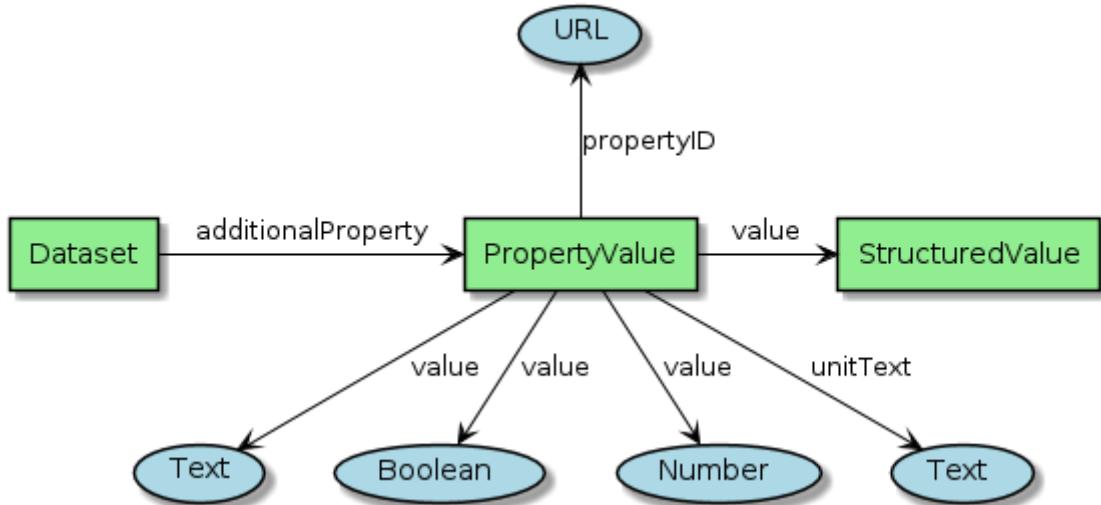


Figure 19. Additional Information schema

[additionalProperty](https://schema.org/additionalProperty) [https://schema.org/additionalProperty] allows representing characteristics for which there is no matching property in schema.org using property-value pairs. For collection or granule properties not available in schema.org, properties pointing to an external vocabulary, for example the JSON-LD property from the RDF Schema Vocabulary in Annex B.3 and Annex C of [\[OGC17-003r2\]](#) can be used.

The [propertyID](https://schema.org/propertyID) [https://schema.org/propertyID] shall be of type URL and indicate the type of the property, by pointing to the external vocabulary, for instance [\[OGC17-003r2\]](#), as shown below.

A list of PropertyValue properties of interest to be used in combination with [additionalProperty](#) is given in [Table 18](#).

Table 18. PropertyValue properties

JSON Property	Definition	Data type and values	Multiplicity and use
@type \$.additionalProperty.@type	Type of the object. This property has the fixed value of " PropertyValue [https://schema.org/PropertyValue]".	Range: String Fixed value: "PropertyValue"	One (mandatory)

JSON Property	Definition	Data type and values	Multiplicity and use
propertyID \$.additionalProperty.propertyID	A URL indicating the type of the property, either pointing to an external vocabulary, or a Web resource that describes the property (e.g. a glossary entry). Standards bodies should promote a standard prefix for the identifiers of properties from their standards. For Earth Observation specific properties, the vocabulary defined in [OGC17-003r2] can be used. The vocabulary http://www.opengis.net/ont/geojson/1.0/ is available from OGC at http://schemas.opengis.net/geojson/1.0/geojson-vocabulary.owl and promotes as standard prefix <code>eop:</code> .	Range: URL	One (mandatory)
value \$.additionalProperty.value	The value of the quantitative value or property value node.	Range: Text Boolean Number	One or more (mandatory)
unitText \$.additionalProperty.value	A string or text indicating the unit of measurement.	Range: Text	Zero or one (optional)

The schema below illustrates how the `eop:productType` and `eop:processingLevel` properties can be encoded using the above mechanism.

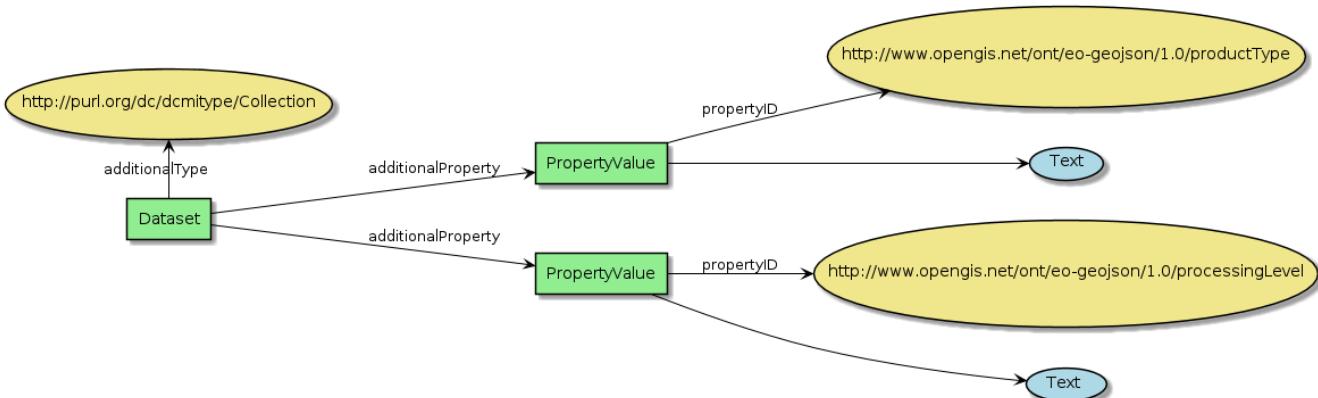


Figure 20. Dataset schema with `additionalProperty`

Collection encoding example with additional EO properties

```
{  
  "@context": "https://schema.org",  
  "@type": "Dataset",  
  "additionalType": "http://purl.org/dc/dcmitype/Collection",  
  "@id": "https://eovoc.spacebel.be/collections/series/items/TropForest",  
  "identifier": "TropForest",  
  "name": "TropForest - ALOS, Deimos-1 & KOMPSAT-2 optical coverages over tropical  
forests",  
  "additionalProperty": [  
    {  
      "@type": "PropertyValue",  
      "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/productType",  
      "value": ["AL1_AV2_2F", "DE1_SL6_2F", "KO2_MSC_2F"]  
    },  
    {  
      "@type": "PropertyValue",  
      "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/orbitType",  
      "value": "Sun-synchronous"  
    },  
    {  
      "@type": "PropertyValue",  
      "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/resolution",  
      "value": [5, 20]  
    }  
  ]  
}
```

Chapter 5. EO Services and Applications Encoding

This section defines the proposed encoding of Earth Observation service and application metadata.

5.1. Service Identification

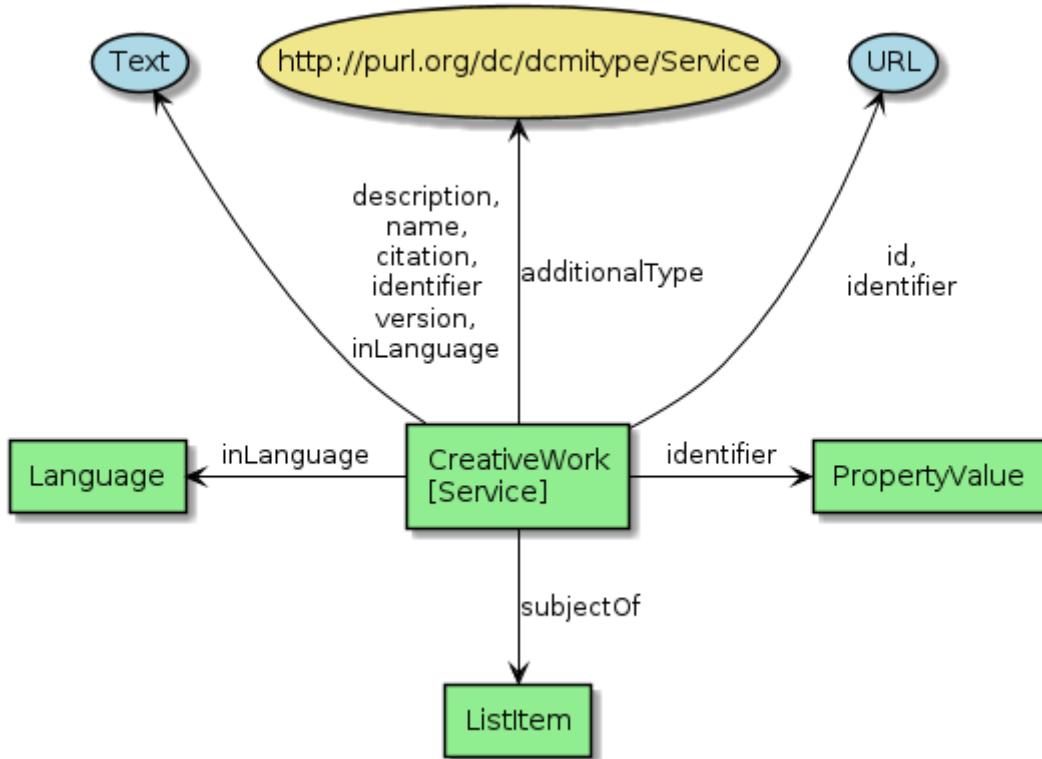


Figure 21. Service Identification Schema

The list of Service Identification properties is given in [Table 19](#). The same properties as for Data Identification ([Table 2](#)) can be used, but `@type` shall be `CreativeWork` and `additionalType` shall be set to <http://purl.org/dc/dcmitype/Service> or <http://purl.org/dc/dcmitype/Software>.

Table 19. Service Identification properties

JSON Property	Definition	Data type and values	Multiplicity and use
<code>@context</code> \$.@context	Optional context property.	Range: String Fixed value: " https://schema.org "	Zero or one (optional)
<code>@type</code> \$.@type	Type of the object. This property has the fixed value "CreativeWork".	Range: String Fixed value: "CreativeWork"	One (mandatory)

JSON Property	Definition	Data type and values	Multiplicity and use
description \$.description	A description of the service or application.	Domain: Thing Range: Text	One (mandatory)
name \$.name	The human readable name or title of the service or application.	Domain: Thing Range: Text	One (mandatory)
identifier \$.identifier	Identifier given to the service or application. Text is used for simple identifiers such as 'goce-user-toolbox', 'sentinel-2-toolbox', 'icor' or 'hdfclean'. PropertyValue can be used to include DOI information.	Domain: Thing Range: Text Url PropertyValue See also Table 4 .	One or more (mandatory)
additionalType \$.additionaltypes	Unique identifiers (URI) for the type of the resource. Is equivalent to the dct:type property used by DCAT for classifying dataset types [https://www.w3.org/TR/vocab-dcat-2/#classifying-dataset-types]. E.g. http://purl.org/dc/dcmitype/Service , http://purl.org/dc/dcmitype/Software , https://inspire.ec.europa.eu/metadata-codelist/ResourceType/service .	Domain: Thing Range: URL	Zero or more (optional)
@id \$.@id	Unique identifier for the service or application (IRI).	Range: URL	Zero or one (optional)
alternateName \$.alternateName	Alternate name of the service or application.	Domain: Thing Range: Text	Zero or more (optional)
citation \$.citation	A bibliographic reference for the resource.	Domain: CreativeWork Range: Text	Zero or one (optional)
inLanguage \$.inLanguage	Resource language code, not empty, e.g. "en" (English).	Domain: CreativeWork Range: Language Text	Zero or one (optional)
subjectOf \$.subjectOf	Refers to metadata information or other information about the service or application.	Domain: Thing Range: ListItem (Table 1)	Zero or one (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
version \$.version	Version number or other version designation of the resource.	Domain: CreativeWork Range: Number Text	Zero or one (optional)

Service Identification encoding example

```
{
  "@context": {
    "@vocab": "https://schema.org/"
  },
  "@type": "CreativeWork",
  "additionalType": [
    "http://purl.org/dc/dcmitype/Service",
    "https://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"
  ],
  "@id": "https://fedeo.esa.int/collections/services/items/goce-user-toolbox",
  "name": "GOCE User Toolbox",
  "alternateName": [
    "goce-user-toolbox",
    "GUT"
  ],
  "url": [
    "https://earth.esa.int/eogateway/tools/goce-user-toolbox",
    "https://search.earthdata.nasa.gov/portal/idn/search?q=C1532648148-ESA"
  ],
  "identifier": "goce-user-toolbox",
  "description": "The GOCE User Toolbox (GUT) is a compilation of tools for the utilisation and analysis of GOCE products. GUT supports applications in Geodesy, Oceanography and Solid Earth Physics.",
  "inLanguage": {
    "@type": "Language",
    "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
    "name": "en"
  },
  "version": "3.2",
  "subjectOf": [
    {
      "@type": "ListItem",
      "dateCreated": "2009-04-15T00:00:00Z",
      "datePublished": "2014-04-28T00:00:00Z",
      "dateModified": "2014-04-28T00:00:00Z",
      "inLanguage": {
        "@type": "Language",
        "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
        "name": "en"
      }
    }
  ]
}
```

```

        "encodingFormat": "application/vnd.iso.19139-2+xml"
    },
    {
        "@type": "MediaObject",
        "contentUrl": "https://earth.esa.int/eogateway/gut-registration",
        "name": "GUT download",
        "additionalType": "http://www.iana.org/assignments/relation/enclosure"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://earth.esa.int/c/document_library/get_file?folderId=15547&name=DLFE-205.pdf",
        "name": "GOCE User Toolbox and Tutorial",
        "additionalType": "http://www.iana.org/assignments/relation/describedby"
    }
]
}

```

`additionalType` can be used to identify the service type more precisely. [Project418](#) [<https://github.com/earthcubearchitecture-project418/p419dcatservices#wikidata-api-types>] proposes using Wikidata API Types, but other identifiers can be used as well.

Service type encoding example

```
{
    "@context": {
        "@vocab": "https://schema.org/"
    },
    "@type": "CreativeWork",
    "@id": "https://eovoc.spacebel.be/collections/services/items/eo-pdgs-landsat-
datacube",
    "name": "Landsat DataCube"
    "additionalType": [
        "http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service",
        "http://www.opengis.net/def/serviceType/ogc/wcs/2.0",
        "http://www.wikidata.org/entity/Q2000194"
    ]
}
```

5.2. Acquisition Information

The encoding proposed using [schema:potentialAction](#) in [4.7 Acquisition Information](#) is only applicable to EO Collections and EO Granules. For EO Services and Applications, Acquisition Information can be encoded as [DefinedTerm](#) from the platform and instrument thesaurus as in [4.4 Descriptive Keywords](#).

5.3. Descriptive Keywords

The encoding of for Descriptive Keywords was presented in [§4.4 Descriptive Keywords](#) and also applies to services. The example below shows how INSPIRE Spatial data service type and category can be encoded using Descriptive Keywords.

Descriptive keywords encoding example (Service)

```
{  
    "@context": "https://schema.org/",  
    "@type": "CreativeWork",  
    "@id": "https://eovoc.spacebel.be/collections/services/items/eo-pdgs-landsat-  
    datacube",  
    "additionalType": [  
        "http://www.opengis.net/def/serviceType/ogc/wcs/2.0",  
        "http://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"  
    ],  
    "name": "Landsat DataCube",  
    "keywords": [  
        {  
            "@type": "DefinedTerm",  
            "name": "Landsat-7",  
            "@id": "https://earth.esa.int/concept/landsat-7",  
            "inDefinedTermSet":  
                "https://earth.esa.int/concepts/concept_scheme/platforms"  
        },  
        {  
            "@type": "DefinedTerm",  
            "name": "EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING >  
            DATA ACCESS/RETRIEVAL",  
            "@id": "https://gcmd.earthdata.nasa.gov/kms/concept/86cbb2d3-6783-4d9b-  
            9dc1-b0aea78f98ea",  
            "inDefinedTermSet":  
                "https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords"  
        },  
        {  
            "@type": "DefinedTerm",  
            "name": "Download Service",  
            "@id": "http://inspire.ec.europa.eu/metadata-  
            codelist/SpatialDataServiceType/download",  
            "inDefinedTermSet": "https://inspire.ec.europa.eu/metadata-  
            codelist/SpatialDataServiceType"  
        },  
        {  
            "@type": "DefinedTerm",  
            "name": "Spatial data service",  
            "@id": "http://inspire.ec.europa.eu/metadata-  
            codelist/ResourceType/service",  
            "inDefinedTermSet": "http://inspire.ec.europa.eu/metadata-  
            codelist/ResourceType"  
        },  
    ]  
}
```

```

{
    "@type": "DefinedTerm",
    "name": "OGC Web Coverage Service 2.0",
    "@id": "http://www.opengis.net/def/serviceType/ogc/wcs/2.0",
    "inDefinedTermSet": "https://inspire.ec.europa.eu/metadata-
codelist/ProtocolValue"
},
{
    "@type": "DefinedTerm",
    "name": "Coverage access service",
    "@id": "https://inspire.ec.europa.eu/metadata-
codelist/SpatialDataServiceCategory/infoCoverageAccessService",
    "inDefinedTermSet": "http://inspire.ec.europa.eu/metadata-
codelist/SpatialDataServiceCategory"
}
]
}

```

5.4. Related URL

5.4.1. Action

Actions can be used to encode an OWC **offering** of a service record with multiple operations (See [\[OGC14-055r2\]](#)). The example below represents an offering corresponding to an OGC Web Coverage Service (WCS). The service metadata record would use **potentialAction** to relate the service metadata record with the **Action**. As the **Action** uses the service, it is encoded as a **UseAction**. The property **object** provides information about coupled EO collections and is equivalent to the ISO19119 **operatesOn** relation.

UseAction encoding example (OGC WCS)

```
{  
    "@context": "https://schema.org",  
    "@type": "UseAction",  
    "identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",  
    "object": {  
        "@type": "Dataset",  
        "@id": "https://eovoc.spacebel.be/collections/series/items/LANDSAT.ETM.GTC",  
        "identifier": "LANDSAT.ETM.GTC"  
    },  
    "target": [  
        {  
            "@type": "EntryPoint",  
            "identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs#GetCapabilities",  
            "contentType": [  
                "text/xml"  
            ],  
            "urlTemplate": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities&version=2.0.0",  
            "description": "GetCapabilities",  
            "httpMethod": "GET"  
        },  
        {  
            "@type": "EntryPoint",  
            "identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs#DescribeCoverage",  
            "contentType": [  
                "text/xml"  
            ],  
            "urlTemplate": "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE7\_RGB",  
            "description": "DescribeCoverage",  
            "httpMethod": "GET"  
        }  
    ]  
}
```

5.5. Quality Information

Quality information can include conformity to implementing rules or specifications. **Review** and **Rating** may be used to encode such information.

Conformance result encoding example

```
{  
    "@context": "https://schema.org/",  
    "@type": "dcat:DataService",  
    "review": [  
        {  
            "@type": "Review",  
            "about": {  
                "@type": "CreativeWork",  
                "name": "COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010  
implementing Directive 2007/2/EC of the European Parliament and of the Council as  
regards interoperability of spatial data sets and services",  
                "dateCreated": "2010-12-08T00:00:00Z"  
            },  
            "reviewRating": {  
                "@type": "Rating",  
                "ratingValue": "http://inspire.ec.europa.eu/metadata-  
codelist/DegreeOfConformity/notEvaluated",  
                "description": "See the referenced specification"  
            }  
        },  
        {  
            "@type": "Review",  
            "about": {  
                "@type": "CreativeWork",  
                "@id": "http://inspire.ec.europa.eu/id/ats/metadata/2.0/sds-  
invocable",  
                "name": "INSPIRE Invocable Spatial Data Services metadata",  
                "dateCreated": "2016-05-01T00:00:00Z"  
            },  
            "reviewRating": {  
                "@type": "Rating",  
                "ratingValue": "http://inspire.ec.europa.eu/metadata-  
codelist/DegreeOfConformity/notEvaluated",  
                "description": "See the referenced specification"  
            }  
        }  
    ]  
}
```

Chapter 6. EO Granules Encoding

This section defines the proposed encoding of Earth Observation granule metadata.

6.1. Granule Identification

A granule or product is the finest granularity of data that can be independently managed. A granule usually matches the individual file of EO satellite data. Granules inherit the properties of their corresponding collection and have additional properties.

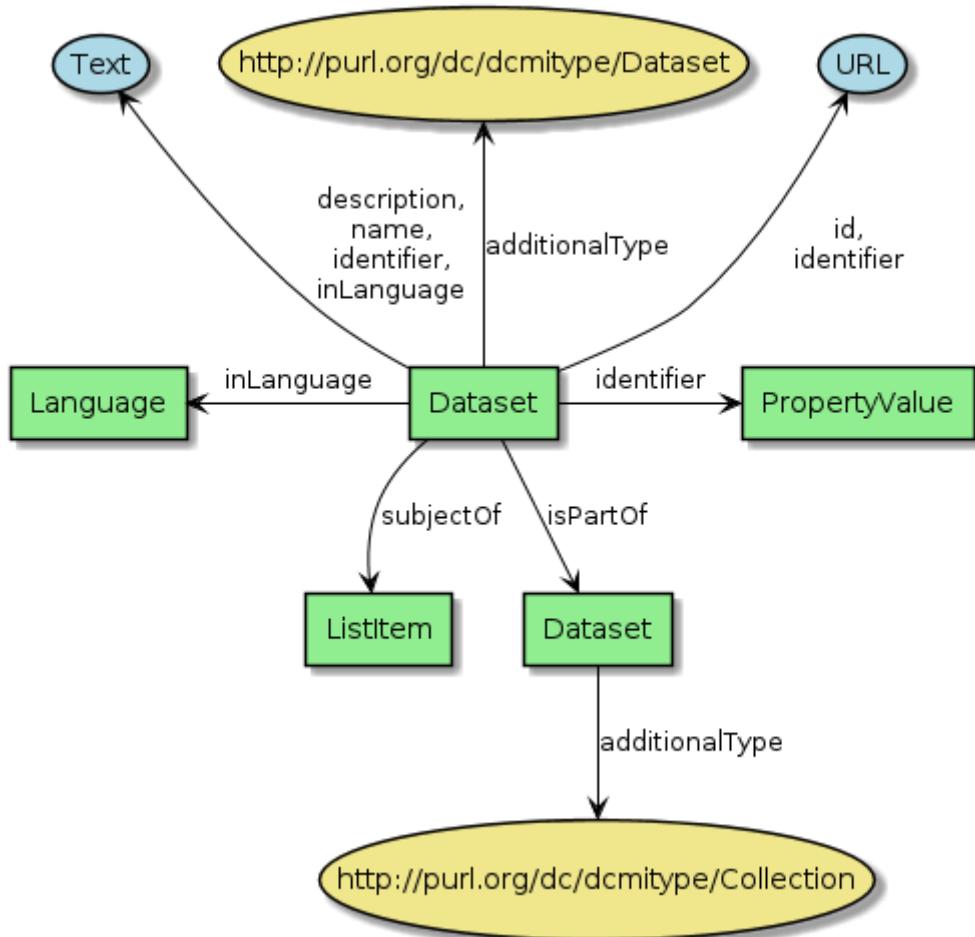


Figure 22. Granule Identification Schema

GranuleIdentification Shape

```
eoshacl:GranuleIdentificationShape
  a sh:NodeShape ;
    # sh:targetClass schema:Dataset ;          # applies to all schema:Dataset
    sh:targetSubjectsOf schema:isPartOf ;      # applies to all classes with this
                                                 attribute, thus not the parent class.

    sh:property [
      sh:path schema:name ;
      sh:datatype xsd:string ;
      sh:minCount 1
    ] ;
```

```

sh:property [
    sh:path schema:description ;
    sh:datatype xsd:string ;
    sh:minCount 1
] ;
sh:property eoshacl:IdentifierPropertyShape;
# additionalType is to include the constant <http://purl.org/dc/dcmitype/>
sh:property [
    sh:path schema:additionalType ;
    sh:nodeKind sh:IRI ;
    sh:qualifiedValueShape [
        sh:hasValue dctype:Dataset
    ] ;
    sh:qualifiedMinCount 1 ;
    sh:qualifiedMaxCount 1 ;
];
sh:property [
    sh:path schema:isPartOf ;
    sh:minCount 1 ;
];
sh:property [
    sh:path schema:includedInDataCatalog ;
    sh:class schema>DataCatalog ;
    sh:minCount 1 ;
];
sh:property [
    sh:path schema:alternateName ;
    sh:datatype xsd:string ;
    sh:minCount 0 ;
];
# optional schema:inLanguage
sh:property [
    sh:path schema:subjectOf ;
    sh:minCount 1 ;
    sh:or (
        [ sh:class schema:ListItem ]
        [ sh:class schema:MediaObject ]
    )
];

```

A list of Granule Identification properties is given in [Table 20](#). All properties available for Data Identification ([Table 2](#)) can be reused, but `additionalType` shall be set to <http://purl.org/dc/dcmitype/>[Dataset](#).

Table 20. Granule Identification properties

JSON Property	Definition	Data type and values	Multiplicity and use
@context \$.@context	Optional context property.	Range: Text Fixed value: "https://schema.org"	Zero or one (optional)
@type \$.@type	Type of the object. This property has the fixed value "Dataset".	Range: Text Fixed value: "Dataset"	One (mandatory)
description \$.description	A description of the granule.	Domain: Thing Range: Text	One (mandatory)
name \$.name	The human readable name or title of the granule.	Domain: Thing Range: Text	One (mandatory)
identifier \$.identifier	Identifier given to the granule. Text is used for simple identifiers. PropertyValue can be used to include DOI information.	Domain: Thing Range: Text Url PropertyValue See also Table 4 .	One or more (mandatory)
additionalType \$.additionaltypes	Unique identifiers (URI) for the type of the resource. Is equivalent to the dct:type property used by DCAT for classifying dataset types [https://www.w3.org/TR/vocab-dcat-2/#classifying-dataset-types]. E.g. http://purl.org/dc/dcmitype/Dataset , https://inspire.ec.europa.eu/metadata-codelist/ResourceType/dataset .	Domain: Thing Range: URL	Zero or more (optional)
@id \$.@id	Unique identifier for the granule (IRI).	Range: URL	Zero or one (optional)
isPartOf \$.isPartOf	Indicates a Collection to which this granule belongs. Similar to parentIdentifier in [OGC17-003r2] and collection in [STAC-ITEM] .	Range: URL Dataset	Zero or more (optional)
includedInDataCatalog \$.includedInDataCatalog	A data catalog which contains this dataset.	Range: DataCatalog	Zero or more (optional)
alternateName \$.alternateName	Alternate name of the granule.	Domain: Thing Range: Text	Zero or more (optional)

JSON Property	Definition	Data type and values	Multiplicity and use
inLanguage \$.inLanguage	Resource language code, not empty, e.g. "en" (English).	Domain: CreativeWork Range: Language Text	Zero or one (optional)
subjectOf \$.subjectOf	Refers to metadata information or other information about the granule.	Domain: Thing Range: ListItem (Table 1)	Zero or one (optional)

Granule Identification encoding example

```
{  
  "@context": {  
    "schema": "https://schema.org/"  
  },  
  "@type": "Dataset",  
  "additionalType": "http://purl.org/dc/dcmitype/Dataset",  
  "@id":  
  "https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",  
  "name":  
  "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",  
  "includedInDataCatalog": {  
    "@type": "DataCatalog",  
    "name": "FedEO Clearinghouse"  
  },  
  "isPartOf": {  
    "@type": "Dataset",  
    "url": "https://earth.esa.int/eogateway/catalog/landsat-5-thematic-mapper-geolocated-terrain-corrected-systematic-processing",  
    "@id": "https://ergo.spacebel.be/collections/series/items/LANDSAT.TM.GTC"  
  },  
  "description": "Landsat 5 Thematic Mapper high-quality ortho-rectified L1T dataset acquired by ESA over the Fucino, Matera, Kiruna and MAspalomas visibility masks, as well as campaign data over Malindi, Bishkek, Chetumal, Libreville and O'Higgins. The acquired Landsat TM scene covers approximately 183 x 172.8 km. A standard full scene is nominally centred on the intersection between a path and row (the actual image centre can vary by up to 100m). A full image is composed of 6920 pixels x 5760 lines and each band requires 40 Mbytes of storage space (uncompressed).",  
  "identifier":  
  "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",  
  "subjectOf": [  
    {  
      "@type": "ListItem",  
      "dateModified": "2020-09-29T11:07:54Z",  
      "inLanguage": {  
        "@type": "Language",  
        "@id": "http://id.loc.gov/vocabulary/iso639-1/en",  
        "name": "en"  
      },  
      "encodingFormat":  
      "application/gml+xml;profile=\"http://www.opengis.net/spec/EOMPOM/1.1\""  
    }  
  ]  
}
```

Chapter 7. EO Granules Encoding (Extension)

This section proposes an EO extension of schema.org for encoding of Earth Observation granule metadata. The extension consists of additional classes and properties which can be used instead of the corresponding classes and properties defined in [OGC17-003r2]. Where no schema.org class or property was available, new classes or properties are proposed for schema.org, fitting in the class hierarchy and reusing the original [OGC17-003r2] names unless the name was already reserved for a different meaning (e.g; <https://schema.org/instrument>). The formal definition of the extension is available as [Appendix F: Schema.org Extension for EO](#). The class inheritance hierarchy is presented in [Annex D.1.3: Extending schema.org](#).

The extension defines a number of subclasses of [Enumeration](#). The subclasses are depicted below with the corresponding enumeration members.

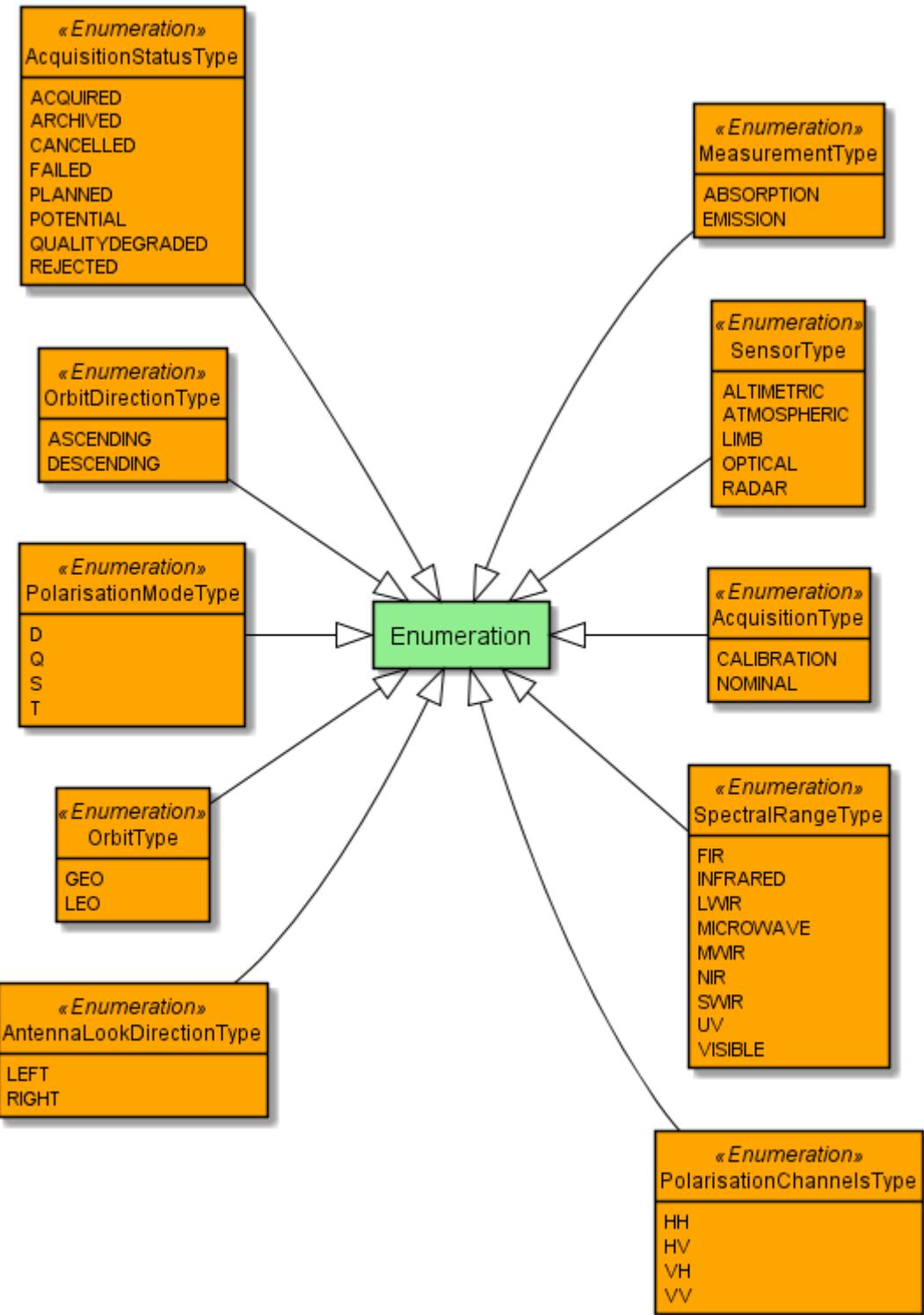


Figure 23. Enumeration Schema

The graphical representations below are derived from the formal definition in Turtle format. The current section follows the same structure as chapter 7 of [OGC17-003r2] and has the same subsections.

The examples included in the current chapter are available as .txt files in the format supported by the schema.org software for publishing examples as depicted below.

Example text file for use with schema.org software

TYPES: WavelengthInformation, spectralRange

PRE-MARKUP:

MICRODATA:

JSON:

```
<script type="application/ld+json">
{
  "@context": "https://schema.org/",
  "@type": "WavelengthInformation",
  "spectralRange": "INFRARED",
  "minValue": "700E-09",
  "maxValue": "1E-03"
}
</script>
```

7.1. Earth Observation

An [EarthObservation](#) represents an individual granule or product.

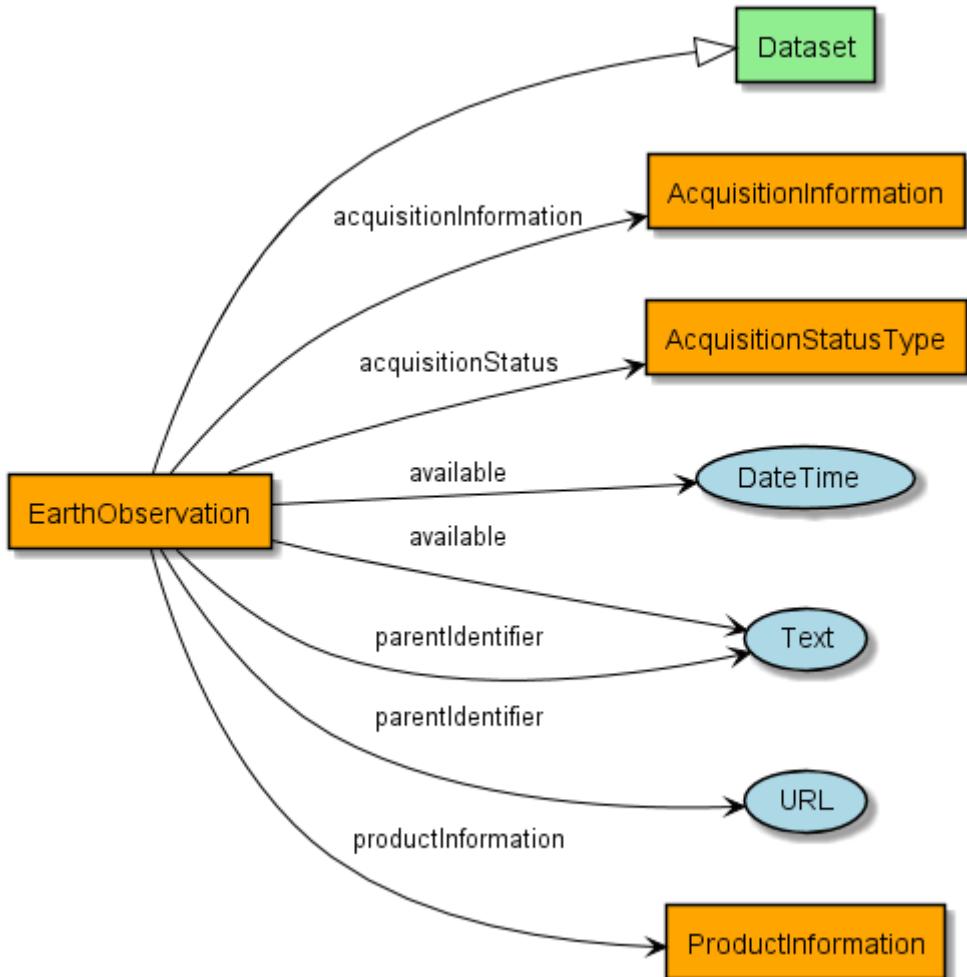


Figure 24. *EarthObservation Schema*

EarthObservation Shape

```

eoshacl:E0EarthObservationShape
  a sh:NodeShape ;
  sh:targetClass schema:EarthObservation ; # applies to all
schema:EarthObservation
  # Must respect all shapes that have as explicit targetClass 'Dataset'.
  sh:node eoshacl:ResourceConstraintsShape ;
  sh:node eoshacl:AcquisitionInformationShape ;
  sh:node eoshacl:GranuleIdentificationShape ;

  sh:closed false ;

  sh:property [
    sh:path schema:parentIdentifier ;
    # optional, can be replaced by isPartOf as well.
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
      [ sh:nodeKind sh:IRI ]
      [ sh:datatype xsd:string ]
    )
  ] ;

```

```

sh:property [
    sh:path schema:available ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype schema:DateTime ]
        [ sh:datatype xsd:string ]
    )
]
sh:property [
    sh:path schema:acquisitionInformation ;
    sh:minCount 1 ;
    sh:class schema:AcquisitionInformation
]
sh:property [
    sh:path schema:productInformation ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:class schema:ProductInformation
]
sh:property [
    sh:path schema:acquisitionStatus ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    # sh:datatype xsd:string ;
    sh:nodeKind sh:IRI ;
    sh:in ( <ARCHIVED> <ACQUIRED> <CANCELLED> <FAILED> <PLANNED> <POTENTIAL>
<REJECTED> <QUALITYDEGRADED> )
].

```

EarthObservation encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "EarthObservation",
  "@id":
  "https://eovoc.spacebel.be/collections/datasets/items/K02 OTPF_K02_MSC_2F_20091107T041750_20091107T041750_017498_E082_N028",
  "description": "Dataset K02 OTPF_K02_MSC_2F_20091107T041750_20091107T041750_017498_E082_N028 from TropForest acquired 2009-11-07T04:17:50Z",
  "identifier":
  ["K02 OTPF_K02_MSC_2F_20091107T041750_20091107T041750_017498_E082_N028"],
  "alternateName":
  "K02 OTPF_K02_MSC_2F_20091107T041750_20091107T041750_017498_E082_N028",
  "dateModified": "2021-06-18T13:59:11Z",
  "additionalType": "http://purl.org/dc/dcmitype/Dataset",
  "temporalCoverage": "2009-11-07T04:17:50Z/2009-11-07T04:17:50Z",
  "includedInDataCatalog": {
    "@type": "DataCatalog",
  }
}
```

```

        "name": "FedEO Clearinghouse"
    },
    "isPartOf": "https://eovoc.spacebel.be/collections/series/items/TropForest",
    "spatialCoverage": {
        "geo": {
            "polygon": "28.08365828 81.91450641 27.91026471 81.91450641 27.91026471
82.10769379 28.08365828 82.10769379",
            "@type": "GeoShape",
            "box": "27.91026471 81.91450641 28.08365828 82.10769379"
        },
        "@type": "Place"
    },
    "distribution": [
    {
        "contentUrl": "http://tpm-
ds.eo.esa.int/oads/meta/Tropforest/browse/K02 OTPF_K02_MSC_2F_20091107T041750_20091107
T041750_017498_E082_N028.ZIP_BID.JPG",
        "@type": "DataDownload",
        "name": "QUICKLOOK",
        "encodingFormat": "image/jpeg"
    },
    {
        "contentUrl": "http://tpm-
ds.eo.esa.int/oads/meta/Tropforest/thumbnail/K02 OTPF_K02_MSC_2F_20091107T041750_20091
107T041750_017498_E082_N028.ZIP_IMG.jpg",
        "@type": "DataDownload",
        "name": "THUMBNAIL",
        "encodingFormat": "image/jpeg"
    },
    {
        "contentUrl": "https://tpm-
ds.eo.esa.int/oads/data/Tropforest/K02 OTPF_K02_MSC_2F_20091107T041750_20091107T041750
_017498_E082_N028.ZIP",
        "@type": "DataDownload",
        "contentSize": "85503826",
        "name": "Download",
        "encodingFormat": "application/x-binary"
    }
]
}

```

7.2. Metadata Information

No extension is required. The encoding presented in [section 4.1 Metadata Information](#) also applies for EO granules.

7.3. Data Identification

7.4. Spatial Information

7.4.1. Horizontal Spatial Domain

No extension is required. The encoding presented in [section 4.5 Spatial Information](#) also applies for EO granules.

7.4.2. Vertical Spatial Domain

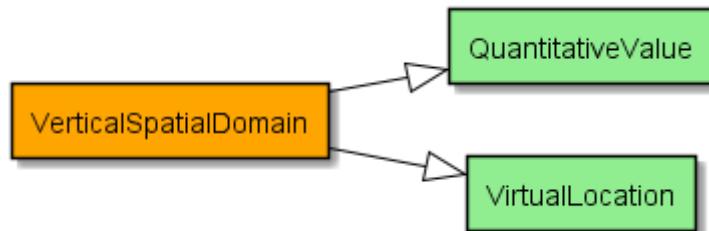


Figure 25. VerticalSpatialDomain Schema

VerticalSpatialDomain Shape

```
eoshacl:EOVerticalSpatialDomainShape
  a sh:NodeShape ;
  sh:targetClass schema:VerticalSpatialDomain ; # applies to all
schema:VerticalSpatialDomain
  sh:node eoshacl:QuantitativeValueShape ;
  sh:ignoredProperties ( rdf:type schema:maxValue schema:minValue schema:unitText )
;
  sh:closed true .
```

VerticalSpatialDomain encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "VerticalSpatialDomain",

  "maxValue": 50000,
  "minValue": 40000,
  "unitText": "m"
}
```

7.4.3. Orbit Parameters

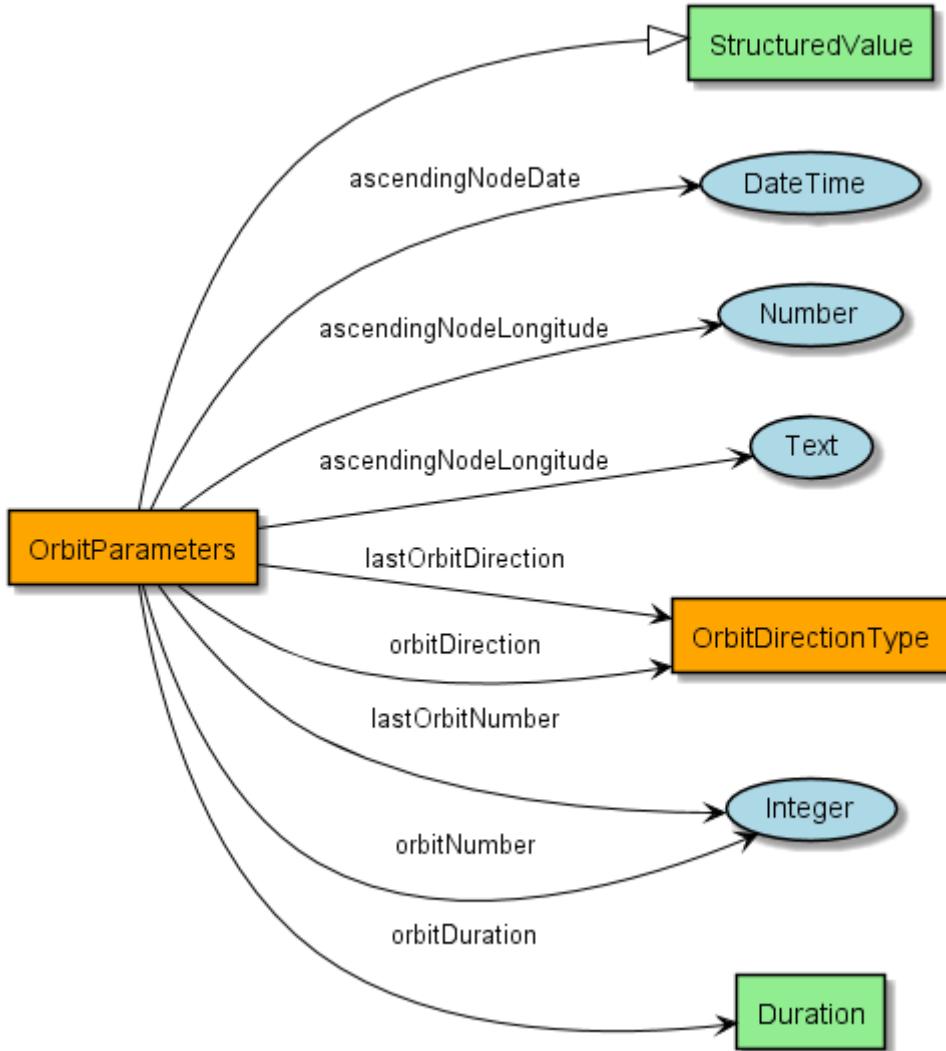


Figure 26. OrbitParameters Schema

OrbitParameters Shape

```

eoshacl:E0OrbitParametersShape
  a sh:NodeShape ;
    sh:targetClass schema:OrbitParameters ; # applies to all schema:OrbitParameters
    # See https://github.com/TopQuadrant/shacl-js/issues/22
    sh:targetClass schema:AcquisitionParameters ; # Parent inherits below
    properties.
    sh:closed false ;

    sh:property [
      sh:path schema:orbitDirection ;
      sh:minCount 1 ;
      sh:maxCount 1 ;
      sh:nodeKind sh:IRI ;
      sh:in ( <ASCENDING> <DESCENDING> )
    ] ;
    sh:property [
      sh:path schema:lastOrbitDirection ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
    ]
  
```

```

    sh:nodeKind sh:IRI ;
    sh:in ( <ASCENDING> <DESCENDING> )
] ;
sh:property [
    sh:path schema:orbitDuration ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    # sh:datatype xsd:string # (actual schema:Duration - see
https://schema.org/docs/gs.html#advanced\_dates and https://schema.org/Invoice example
"billingPeriod": "P30D").
] ;
sh:property [
    sh:path schema:orbitNumber ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:minInclusive 0 ;
    sh:datatype xsd:integer
] ;
sh:property [
    sh:path schema:lastOrbitNumber ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:minInclusive 0 ;
    sh:datatype xsd:integer
] ;
sh:property [
    sh:path schema:ascendingNodeDate ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype schema:DateTime
] ;
sh:property [
    sh:path schema:ascendingNodeLongitude ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:maxInclusive 180 ;
    sh:minInclusive -180 ;
    sh:or (
        [ sh:datatype xsd:integer ]
        [ sh:datatype xsd:string ]
        [ sh:datatype xsd:double ]
    )
] .

```

OrbitParameters encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "OrbitParameters",  
  "orbitNumber": 20187,  
  "lastOrbitNumber": 20187,  
  "orbitDirection": "DESCENDING",  
  "ascendingNodeDate": "2014-01-28T14:01:25Z",  
  "ascendingNodeLongitude": 74.784284  
}
```

7.5. Temporal Information

7.6. Acquisition Information

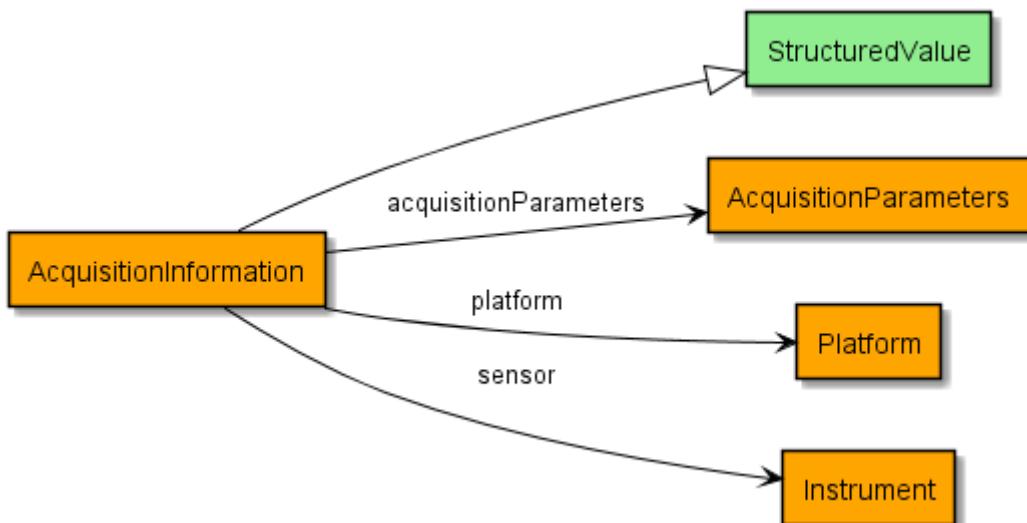


Figure 27. `AcquisitionInformation` Schema

AcquisitionInformation Shape

```
eoshacl:AcquisitionInformationShape
  a sh:NodeShape ;
  sh:targetClass schema:Dataset ;   # applies to all schema:Dataset
  sh:closed false ;

  sh:property [
    sh:path schema:measurementTechnique ;
    sh:minCount 0 ;
    sh:or (
      [ sh:nodeKind sh:IRI ]
      [ sh:datatype xsd:string ]
    )
  ] ;
  sh:property [
    sh:path schema:potentialAction ;
    sh:minCount 0 ;
    sh:or (
      [ sh:class schema>CreateAction ]
      [ sh:class schema>Action ]      # possible due to other Shape
      [ sh:class schema/SearchAction ] # possible due to other Shape
    )
  ] .
```

AcquisitionInformation encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "AcquisitionInformation",  
  
  "platform": {  
    "@type": [  
      "DefinedTerm",  
      "Platform"  
    ],  
    "@id": "http://gcmd.earthdata.nasa.gov/kms/concept/1bffe898-f4a2-458e-92c5-  
cd7c9c1cd5f0",  
    "name": "Seasat",  
    "serialNumber": "1"  
  },  
  "sensor": {  
    "@type": [  
      "DefinedTerm",  
      "Instrument"  
    ],  
    "@id": "http://gcmd.earthdata.nasa.gov/kms/concept/a37282d4-322c-4dd0-8edc-  
36099b9b586c",  
    "sensorType": "RADAR",  
    "name": "SAR"  
  },  
  "acquisitionParameters": {  
    "@type": "AcquisitionParameters",  
    "operationalMode": "IM",  
    "polarisationMode": "S",  
    "polarisationChannels": "HH",  
  
    "acquisitionType": "NOMINAL",  
    "acquisitionSubType": "DEFAULT",  
    "orbitNumber": 1316,  
    "orbitDirection": "DESCENDING",  
    "antennaLookDirection": "RIGHT",  
    "acquisitionAngles": {  
      "@type": "AcquisitionAngles",  
      "incidenceAngle": {  
        "@type": "QuantitativeValue",  
        "maxValue": 19.6,  
        "minValue": 9.6  
      },  
      "incidenceAngleVariation": 9.6  
    }  
  }  
}
```

7.6.1. Platform

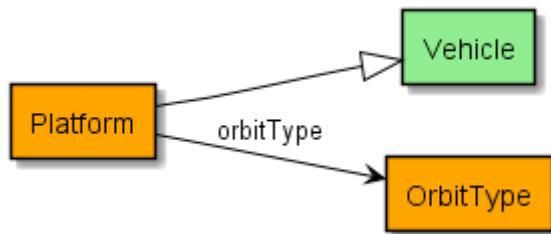


Figure 28. Platform Schema

Platform Shape

```
eoshacl:EOPPlatformShape
  a sh:NodeShape ;
  sh:targetClass schema:Platform ; # applies to all schema:Platform
  sh:node eoshacl:DefinedTermShape ;
  sh:closed true ;
  sh:ignoredProperties ( rdf:type schema:sameAs schema:url schema:inDefinedTermSet
schema:alternateName schema:termCode schema:additionalType ) ;

  sh:property [
    sh:path schema:name ;
    sh:minCount 1 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
  ] ;
  sh:property [
    sh:path schema:serialNumber ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
  ] ;
  sh:property [
    sh:path schema:orbitType ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <LEO> <GEO> )
  ] .
```

Platform encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": [  
    "DefinedTerm",  
    "Platform"  
>,  
  "@id": "https://earth.esa.int/concept/landsat-7",  
  "name": "Landsat-7",  
  "orbitType": "LEO",  
  "serialNumber": "7",  
  "sameAs": [  
    "http://gcmd.earthdata.nasa.gov/kms/concept/c7a09e9f-3c99-4b31-a521-  
313c379ba2b4",  
    "http://dbpedia.org/resource/Landsat_7",  
    "http://yago-knowledge.org/resource/Landsat_7"  
>,  
  "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/platforms"  
}
```

7.6.2. Instrument

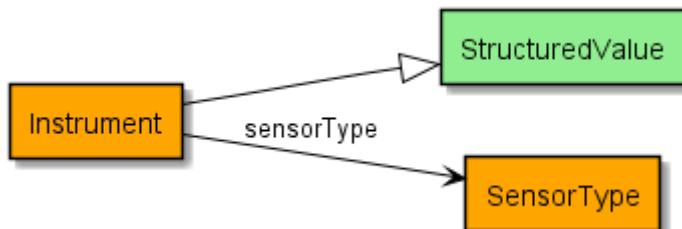


Figure 29. Instrument Schema

Instrument Shape

```
eoshacl:E0InstrumentShape
  a sh:NodeShape ;
    sh:targetClass schema:Instrument ;   # applies to all schema:Instrument
    sh:closed true ;
    sh:ignoredProperties ( rdf:type schema:sameAs schema:url schema:inDefinedTermSet
schema:alternateName schema:termCode schema:additionalType ) ;

    sh:property [
      sh:path schema:name ;
      sh:minCount 1 ;
      sh:maxCount 1 ;
      sh:datatype xsd:string
    ] ;
    sh:property [
      sh:path schema:description ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
      sh:datatype xsd:string
    ] ;
    sh:property [
      sh:path schema:sensorType ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
      sh:nodeKind sh:IRI ;
      sh:in ( <OPTICAL> <ATMOSPHERIC> <ALTIMETRIC> <LIMB> <RADAR> )
    ] .
```

Instrument encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": [  
    "DefinedTerm",  
    "Instrument"  
>,  
  "@id": "https://earth.esa.int/concept/etm",  
  "name": "ETM+",  
  "alternateName": "Enhanced Thematic Mapper Plus",  
  "description": "Involving three large American governmental organizations: NASA, NOAA and USGS launched on April 15, 1999. Landsat 7 is equipped with ETM+ (Enhanced Thematic Mapper Plus), which provides a ground survey in four modes: VNIR (Visible and Near Infrared), SWIR (Shortwave Infrared), PAN (Panchromatic - Panchromatic range), TIR (Thermal infrared - Thermal infrared range).",  
  "sameAs": "http://gcmd.earthdata.nasa.gov/kms/concept/4dbe7764-a2ea-4a19-b754-696c35ac3205",  
  "termCode": "4dbe7764-a2ea-4a19-b754-696c35ac3205",  
  "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/instruments",  
  "sensorType": "OPTICAL"  
}
```

7.6.3. Wavelength Information

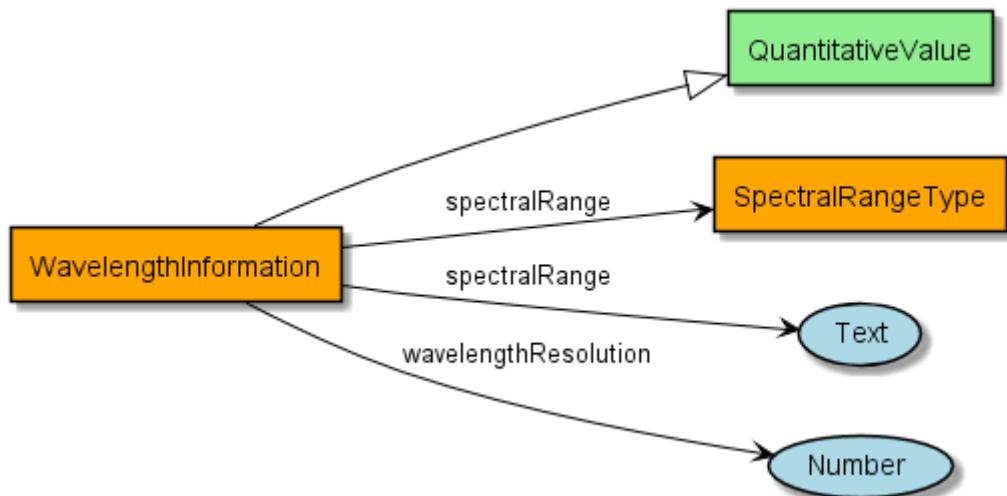


Figure 30. WavelengthInformation Schema

WavelengthInformation Shape

```
eoshacl:EOWavelengthInformationShape
  a sh:NodeShape ;
  sh:targetClass schema:WavelengthInformation ; # applies to all
schema:WavelengthInformation
  sh:node eoshacl:QuantitativeValueShape ;
  sh:closed true ;
  sh:ignoredProperties ( rdf:type schema:value schema:minValue schema:maxValue ) ;

  sh:property [
    sh:path schema:spectralRange ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <INFRARED> <SWIR> <VISIBLE> <LWIR> <NIR> <FIR> <UV> <MWIR>
<MICROWAVE> <SR_OTHER> )
  ] ;
  sh:property [
    sh:path schema:wavelengthResolution ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:double
  ] .
```

WavelengthInformation encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "WavelengthInformation",
  "spectralRange": "INFRARED",
  "minValue": 700E-09,
  "maxValue": 1E-03
}
```

7.6.4. Acquisition Parameters

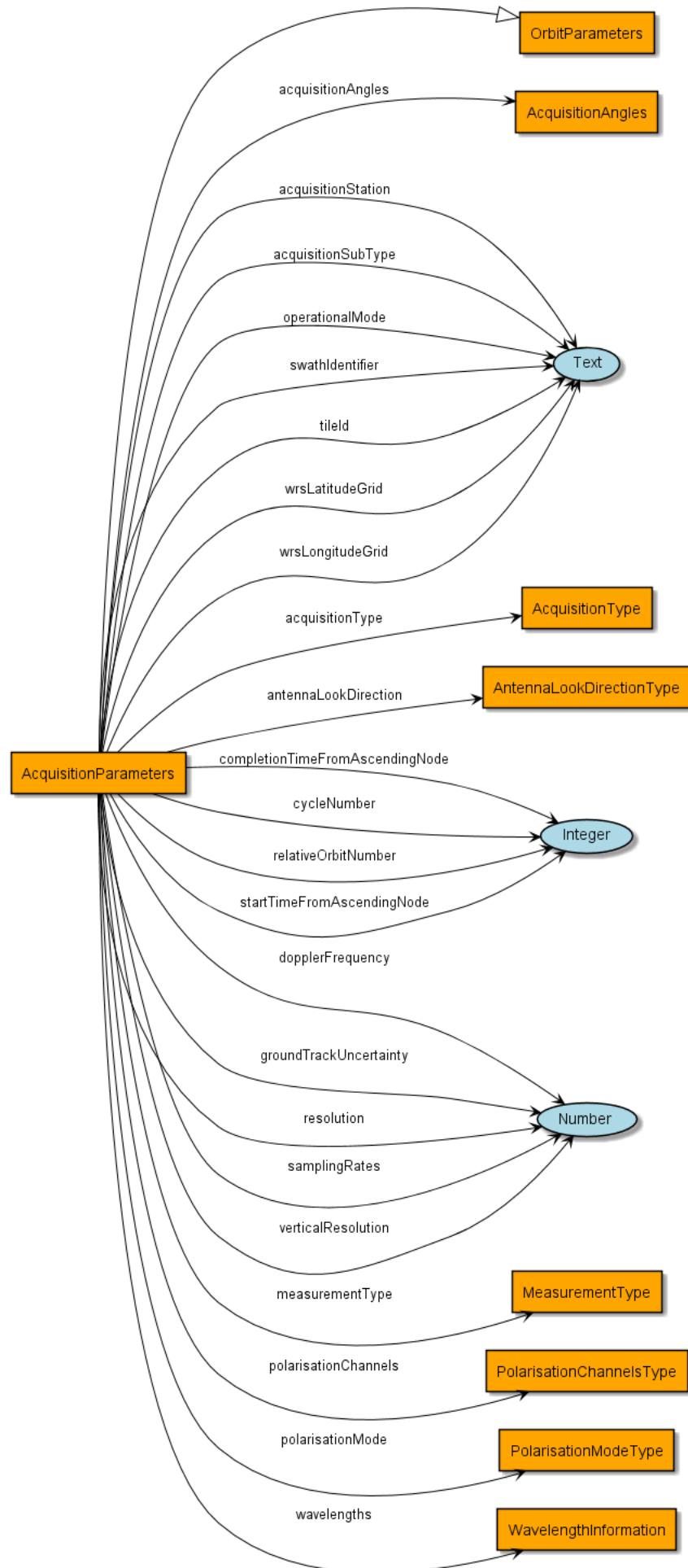


Figure 31. AcquisitionParameters Schema

AcquisitionParameters Shape

```
eoshacl:EOAcquisitionParametersShape
  a sh:NodeShape ;
  sh:targetClass schema:AcquisitionParameters ; # applies to all
schema:AcquisitionParameters
  sh:node eoshacl:E0OrbitParametersShape ; # check inherited properties
  sh:closed true ;
  sh:ignoredProperties ( rdf:type schema:value schema:minValue schema:maxValue
schema:orbitDirection schema:lastOrbitDirection schema:orbitDuration
schema:orbitNumber schema:lastOrbitNumber schema:ascendingNodeDate
schema:ascendingNodeLongitude ) ;

  sh:property [
    sh:path schema:location ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:class schema:VerticalSpatialDomain # subclass of VirtualLocation
  ] ;

  sh:property [
    sh:path schema:acquisitionType ;
    sh:minCount 1 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <NOMINAL> <CALIBRATION> <ACQ_OTHER> )
  ] ;
  sh:property [
    sh:path schema:acquisitionSubType ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
  ] ;
  sh:property [
    sh:path schema:startTimeFromAscendingNode ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:integer
  ] ;
  sh:property [
    sh:path schema:completionTimeFromAscendingNode ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:integer
  ] ;
  sh:property [
    sh:path schema:relativeOrbitNumber ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
```

```

    sh:datatype xsd:integer
] ;
sh:property [
    sh:path schema:wrsLongitudeGrid ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:wrsLatitudeGrid ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:tileId ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:groundTrackUncertainty ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
] ;
sh:property [
    sh:path schema:cycleNumber ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:integer
] ;
sh:property [
    sh:path schema:antennaLookDirection ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <LEFT> <RIGHT> )
] ;
sh:property [
    sh:path schema:acquisitionStation ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:acquisitionAngles ;
    sh:minCount 0 ;

```

```

    sh:maxCount 1 ;
    sh:class schema:AcquisitionAngles
] ;
sh:property [
    sh:path schema:operationalMode ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:swathIdentifier ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:polarisationMode ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <Q> <S> <D> <T> <PM_UNDEFINED> )
] ;
sh:property [
    sh:path schema:polarisationChannels ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <HH_VV> <HH_VH> <VH_VV> <HH> <VH> <VV_HV> <HH_HV> <VV_VH> <VH_HV>
<HH_HV_VH_VV> <HV_VH> <HV> <VV> <PC_UNDEFINED> )
] ;
sh:property [
    sh:path schema:resolution ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
] ;
sh:property [
    sh:path schema:verticalResolution ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
] ;
sh:property [
    sh:path schema:wavelengths ;
    sh:minCount 0 ;

```

```
    sh:maxCount 1 ;
    sh:class schema:WavelengthInformation
] ;
sh:property [
    sh:path schema:measurementType ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:nodeKind sh:IRI ;
    sh:in ( <EMISSION> <ABSORPTION> )
] ;
sh:property [
    sh:path schema:dopplerFrequency ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
] ;
sh:property [
    sh:path schema:samplingRate ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
] .
```

AcquisitionParameters encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "AcquisitionParameters",  
  
  "acquisitionType": "NOMINAL",  
  "acquisitionSubType": "DEFAULT",  
  "orbitNumber": 1316,  
  "orbitDirection": "DESCENDING",  
  "antennaLookDirection": "RIGHT",  
  "acquisitionAngles": {  
    "incidenceAngle": {  
      "@type": "QuantitativeValue",  
      "maxValue": 19.6,  
      "minValue": 9.6  
    },  
    "incidenceAngleVariation": 9.6  
  },  
  "operationalMode": "IM",  
  "polarisationMode": "S",  
  "polarisationChannels": "HH",  
  "wavelengths": {  
    "@type": "WavelengthInformation",  
    "spectralRange": "OTHER"  
  }  
}
```

7.6.5. Acquisition Angles

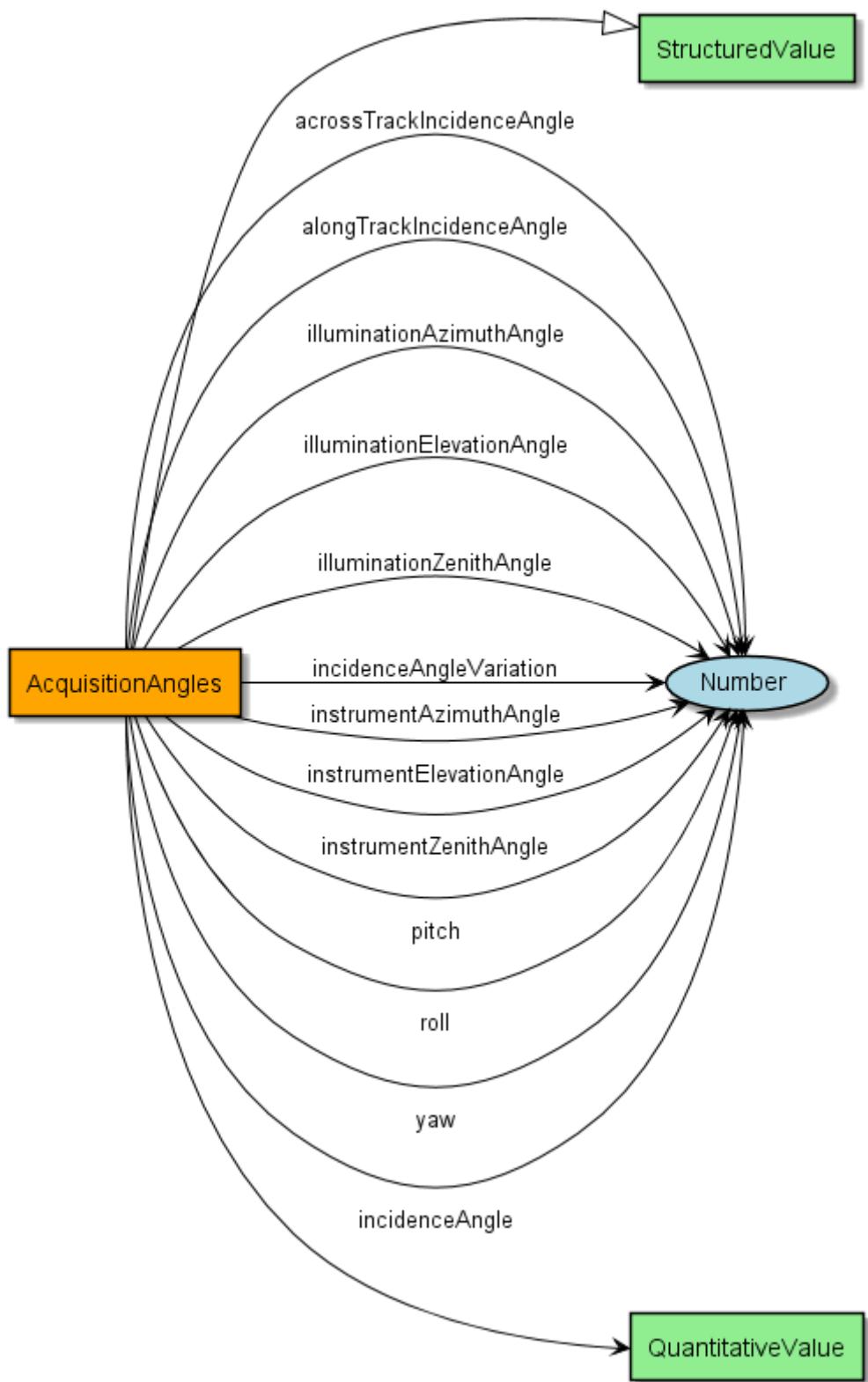


Figure 32. AcquisitionAngles Schema

AcquisitionAngles Shape

```

eoshacl:E0AcquisitionAnglesShape
  a sh:NodeShape ;
  sh:targetClass schema:AcquisitionAngles ;  # applies to all
schema:AcquisitionAngles

  sh:closed true ;

```

```

sh:ignoredProperties ( rdf:type ) ;

sh:property [
    sh:path schema:illuminationAzimuthAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:illuminationZenithAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:illuminationElevationAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:incidenceAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:class schema:QuantitativeValue
]
sh:property [
    sh:path schema:incidenceAngleVariation ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:acrossTrackIncidenceAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]

```

```

        )
    ] ;
sh:property [
    sh:path schema:alongTrackIncidenceAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:instrumentAzimuthAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:instrumentZenithAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:instrumentElevationAngle ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:pitch ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
    )
]
sh:property [
    sh:path schema:yaw ;
    sh:minCount 0 ;
    sh:maxCount 1 ;

```

```

sh:or (
  [ sh:datatype xsd:double ]
  [ sh:datatype xsd:integer ]
)
] ;
sh:property [
  sh:path schema:roll ;
  sh:minCount 0 ;
  sh:maxCount 1 ;
  sh:or (
    [ sh:datatype xsd:double ]
    [ sh:datatype xsd:integer ]
  )
]
].

```

AcquisitionAngles encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "AcquisitionAngles",

  "incidenceAngle": {
    "@type": "QuantitativeValue",
    "maxValue": 19.6,
    "minValue": 9.6
  },
  "incidenceAngleVariation": 9.6
}
```

7.7. Product Information

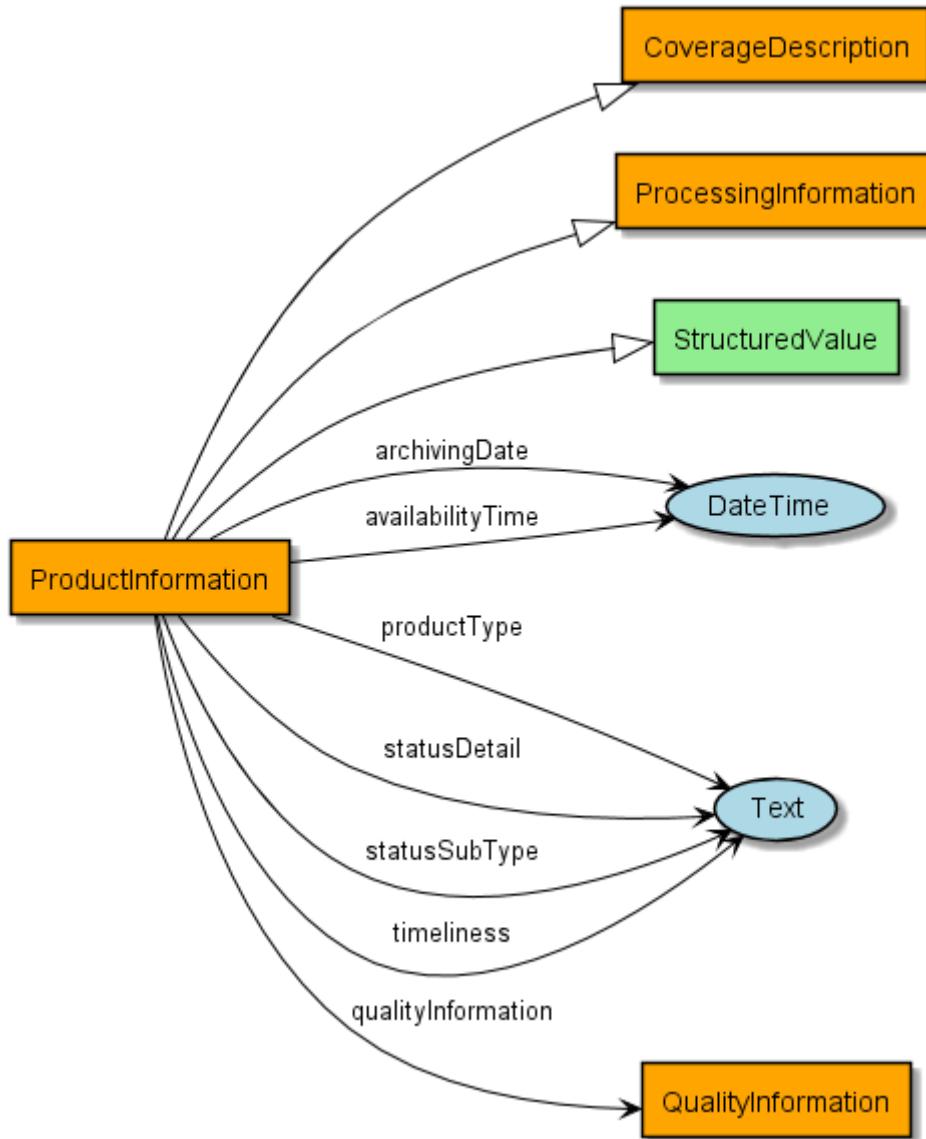


Figure 33. ProductInformation Schema

ProductInformation Shape

```

eoshacl:EOProductInformationShape
  a sh:NodeShape ;
  sh:targetClass schema:ProductInformation ; # applies to all
  schema:ProductInformation
    sh:shape schema:EOCoverageDescriptionShape ;
    sh:shape schema:EOProcessingInformationShape ;

    sh:closed true ;
    # ignore properties of the subclasses
    sh:ignoredProperties ( rdf:type schema:cloudCover schema:snowCover
schema:compositeType schema:processingMethod schema:processingMethodVersion
schema:processingCenter schema:processingDate schema:processingLevel
schema:processingMode schema:processorName schema:softwareVersion
schema:productContentsType ) ;

    sh:property [
      sh:path schema:productType ;
  
```

```

    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:contentSize ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:statusSubType ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:statusDetail ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:availabilityTime ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string # schema:DateTime ?
] ;
sh:property [
    sh:path schema:timeliness ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
# productgroupId as isPartOf
sh:property [
    sh:path schema:version ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:holdingArchive ;
    sh:minCount 0
] ;
sh:property [
    sh:path schema:archivingDate ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string # schema:DateTime ?
] ;

```

```

sh:property [
    # referenceSystemIdentifier encoded as additionalProperty
    sh:path schema:additionalProperty ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:class schema:PropertyValue
] ;
sh:property [
    sh:path schema:qualityInformation ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:class schema:QualityInformation
] .

```

ProductInformation encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "ProductInformation",
  "productType": "SEA_GEC_1P",
  "additionalProperty": {
    "@type": "PropertyValue",
    "propertyID": "http://dbpedia.org/resource/Spatial_reference_system",
    "value": "http://www.opengis.net/def/crs/EPSG/0/4326"
  },
  "contentSize": "255211520",
  "version": "1.0",
  "statusSubType": "ON-LINE",
  "availabilityTime": "1978-09-27T01:04:45Z",
  "timeliness": "NOMINAL",
  "holdingArchive": {
    "@type": "Organization",
    "name": "ASF"
  },
  "archivingDate": "1978-09-28T02:05:56Z",
  "qualityInformation": {}
}
```

7.7.1. Quality Information

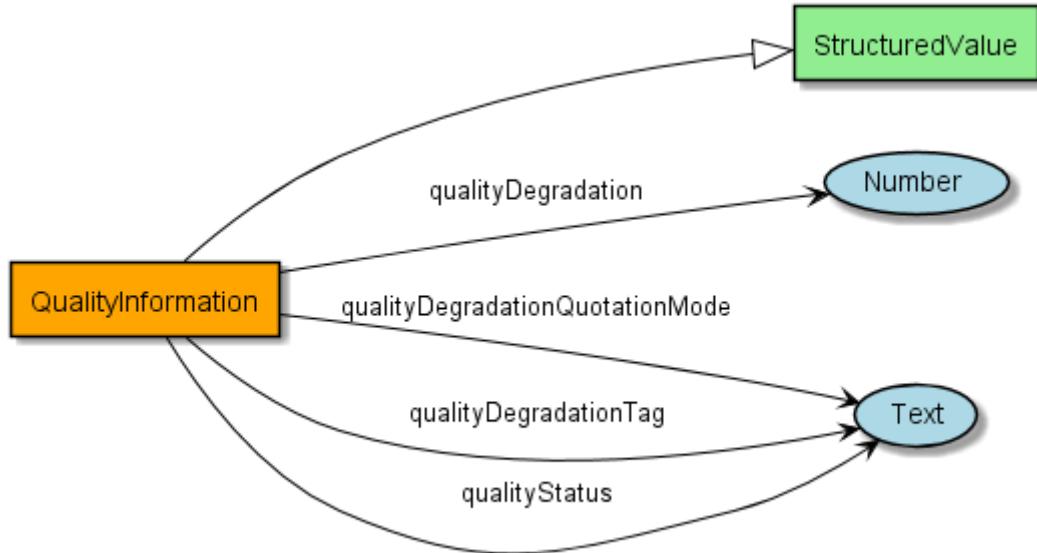


Figure 34. *QualityInformation* Schema

QualityInformation Shape

```
eoshacl:EOPQualityInformationShape
  a sh:NodeShape ;
    sh:targetClass schema:QualityInformation ; # applies to all
    schema:QualityInformation

    sh:closed true ;
    sh:ignoredProperties ( rdf:type ) ;

    sh:property [
      sh:path schema:qualityStatus ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
      sh:datatype xsd:string
    ] ;
    sh:property [
      sh:path schema:qualityDegradation ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
      sh:maxInclusive 100 ;
      sh:minInclusive 0 ;
      sh:or (
        [ sh:datatype xsd:double ]
        [ sh:datatype xsd:integer ]
      )
    ] ;
    sh:property [
      sh:path schema:qualityDegradationQuotationMode ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
      sh:datatype xsd:string
    ] ;
    sh:property [
      sh:path schema:qualityDegradationTag ;
      sh:minCount 0 ;
      sh:maxCount 1 ;
      sh:datatype xsd:string
    ] .
```

QualityInformation encoding example

```
{  
  "@context": "https://schema.org/",  
  "@type": "QualityInformation",  
  
  "qualityDegradation": 75,  
  "qualityStatus": "DEGRADED",  
  "qualityDegradationQuotationMode": "AUTOMATIC",  
  "qualityDegradationTag": "GEOLOCATION"  
}
```

7.7.2. Processing Information

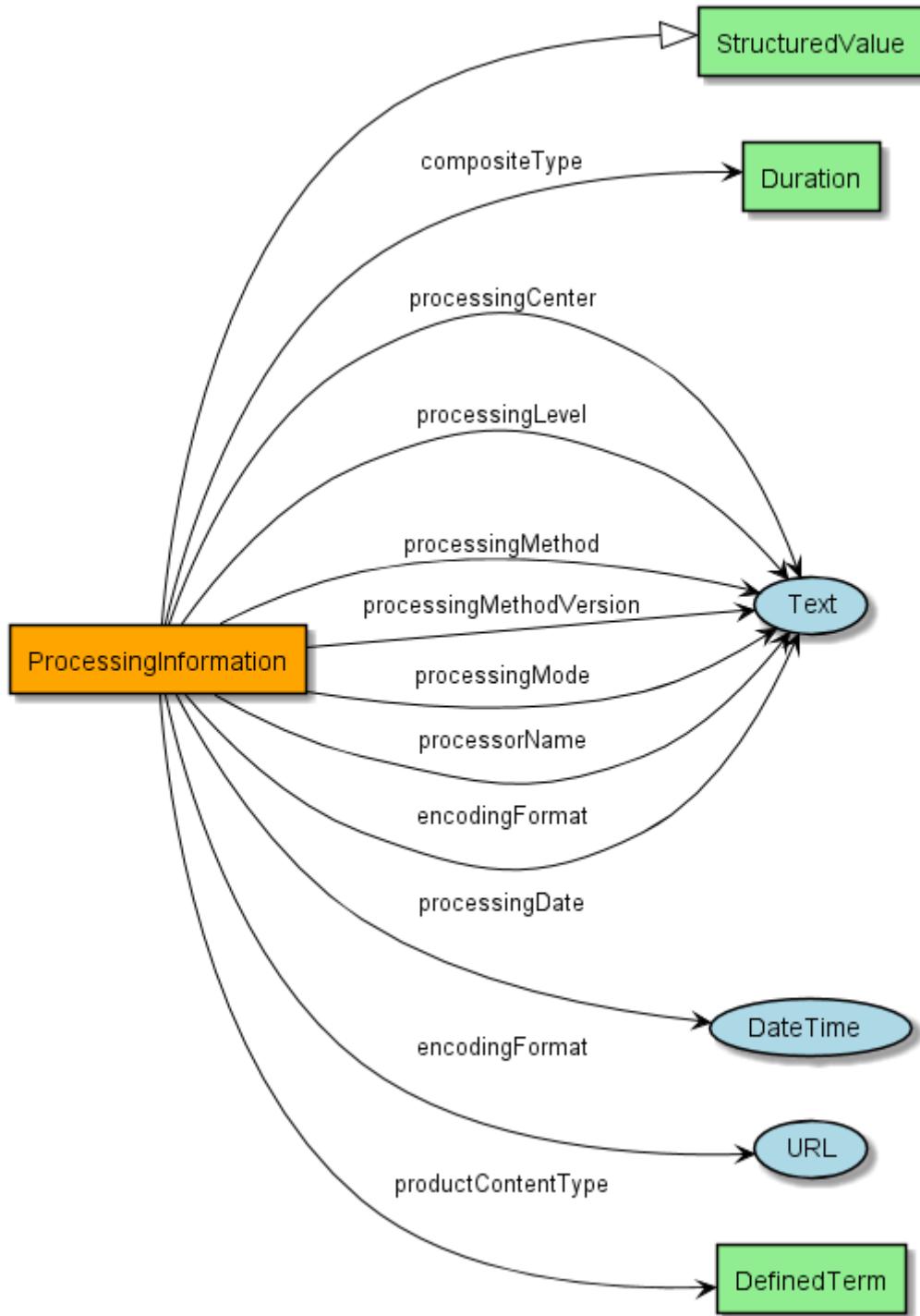


Figure 35. ProcessingInformation Schema

ProcessingInformation Shape

```

eoshacl:EOProcessingInformationShape
  a sh:NodeShape ;
  sh:targetClass schema:ProcessingInformation ; # applies to all
schema:ProcessingInformation
  sh:targetClass schema:ProductInformation ; # parent class
  sh:closed false ;
  # sh:ignoredProperties ( rdf:type schema:cloudCover schema:snowCover
schema:productType schema:contentSize schema:statusSubType schema:statusDetail
schema:availabilityTime schema:timeliness schema:version schema:holdingArchive
schema:archivingDate schema:additionalProperty schema:qualityInformation) ;

```

```
sh:property [
    sh:path schema:compositeType ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string # (actual schema:Duration)
] ;
sh:property [
    sh:path schema:processingMethod ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
];
sh:property [
    sh:path schema:processingMethodVersion ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:processingCenter ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:processingDate ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype schema:DateTime
] ;
sh:property [
    sh:path schema:processingLevel ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string ;
    sh:in ( "1A" "1B" "1C" "2" "3" )
] ;
sh:property [
    sh:path schema:processingMode ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:processorName ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:datatype xsd:string
] ;
sh:property [
```

```

sh:path schema:softwareVersion ;
sh:minCount 0 ;
sh:maxCount 1 ;
sh:datatype xsd:string
] ;
sh:property [
    sh:path schema:encodingFormat ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:or (
        [ sh:datatype xsd:string ]
        [ sh:nodeKind sh:IRI ]
    )
] ;
sh:property [
    sh:path schema:productContentsType ;
    sh:minCount 0 ;
    sh:class schema:DefinedTerm
] .

```

ProcessingInformation encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "ProcessingInformation",

  "processingCenter": "PDS",
  "processingDate": "2016-02-01T04:58:31Z",
  "processingLevel": "2",
  "processorName": "FastROSE",
  "softwareVersion": "3.1"
}
```

7.7.3. CoverageDescription

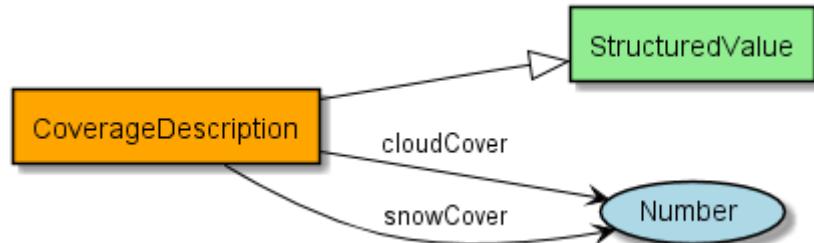


Figure 36. CoverageDescription Schema

CoverageDescription Shape

```
eoshacl:EOCoverageDescriptionShape
  a sh:NodeShape ;
  sh:targetClass schema:CoverageDescription ; # applies to all
schema:CoverageDescription
  sh:targetClass schema:ProductInformation ; # parent class
  sh:closed false ;
  sh:property [
    sh:path schema:cloudCover ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:minInclusive 0 ;
    sh:maxInclusive 100 ;
    sh:or (
      [ sh:datatype xsd:double ]
      [ sh:datatype xsd:integer ]
    )
  ] ;
  sh:property [
    sh:path schema:snowCover ;
    sh:minCount 0 ;
    sh:maxCount 1 ;
    sh:minInclusive 0 ;
    sh:maxInclusive 100 ;
    sh:or (
      [ sh:datatype xsd:double ]
      [ sh:datatype xsd:integer ]
    )
  ] .
```

CoverageDescription encoding example

```
{
  "@context": "https://schema.org/",
  "@type": "CoverageDescription",

  "cloudCover": 8,
  "snowCover": 0

}
```

Appendix A: Media Types for Data Encoding

When representations are delivered using HTTP, the following MIME media types shall be used:

Media type	Description
application/ld+json;profile="http://schema.org"	JSON-LD representation with all context information within the body of the document.
text/turtle;profile="http://schema.org"	Turtle representation with all context information within the body of the document.
application/rdf+xml;profile="http://schema.org"	RDF/XML representation with all context information within the body of the document.

Appendix B: Interpretation as W3C JSON-LD

The Web page <https://schema.org/docs/howwework.html> provides a [JSON-LD context file](#) [<https://schema.org/docs/jsonldcontext.json>] which is needed to use schema.org with W3C JSON-LD and subsequently convert into RDF/XML or Turtle formats. Unfortunately, the original context file assumes that [http](#) is used instead of [https](#) for the schema.org namespace. An updated version to be used in combination with the [https](#) namespace is provided below:

- [jsonldcontext.json](#) [<https://github.com/eovoc/eo-on-schema.org/blob/main/series/docs/jsonldcontext.json>]

When the EO Granule Encoding Extensions defined in [Chapter 7](#) are used as well, then the corresponding context document is to be used in addition:

- [jsonldcontext-eo.json](#) [<https://github.com/eovoc/eo-on-schema.org/blob/main/series/docs/jsonldcontext-eo.json>]

They can be used to define the `@context` in data graphs as follows:

JSON-LD @context encoding example

```
"@context": [
    "https://raw.githubusercontent.com/eovoc/eo-on-
schema.org/main/series/docs/jsonldcontext.json",
    "https://raw.githubusercontent.com/eovoc/eo-on-
schema.org/main/series/docs/jsonldcontext-eo.json"
]
```

B.1. SHACL

The Shapes Constraint Language [\[SHACL\]](#) allows defining shape graphs to validate data graphs satisfying a set of conditions as expressed in this document. The ShapeUML [\[ShapeUML\]](#) diagram below depicts a set of SHACL node shapes that correspond to the [EO Collections encoding](#).

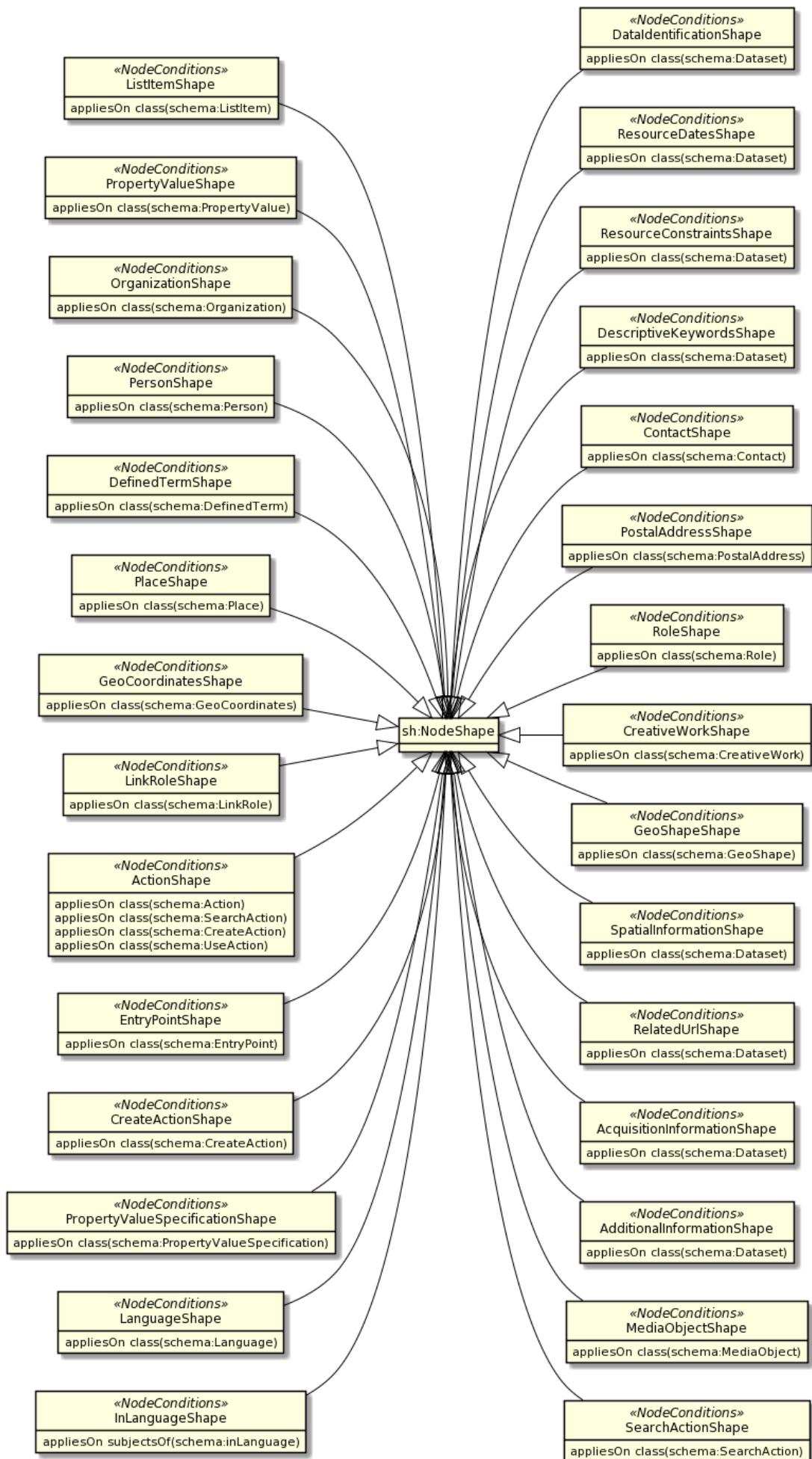


Figure 37. SHACL node shapes for EO Collection Encoding

The corresponding shape graphs are available at:

- [shacl-collection.ttl](https://github.com/eovoc/eo-on-schema.org/blob/main/series/shacl/shacl-collection.ttl) [https://github.com/eovoc/eo-on-schema.org/blob/main/series/shacl/shacl-collection.ttl]
- [shacl-granule.ttl](https://github.com/eovoc/eo-on-schema.org/blob/main/series/shacl/shacl-granule.ttl) [https://github.com/eovoc/eo-on-schema.org/blob/main/series/shacl/shacl-granule.ttl]
- [shacl-granule-extension.ttl](https://github.com/eovoc/eo-on-schema.org/blob/main/series/shacl/shacl-granule-extension.ttl) [https://github.com/eovoc/eo-on-schema.org/blob/main/series/shacl/shacl-granule-extension.ttl]

Appendix C: Property Mapping

C.1. OGC17-084r1 Metadata

GeoJSON Property	JSON-LD Property	schema.org	Reference
abstract \$.properties.abstract	dct:description	\$.description [https://schema.org/description]	Table 2
accessRights \$.properties.accessRights	dct:accessRights	\$.conditionsOfAccess [https://schema.org/conditionsOfAccess]	Table 7
acquisitionInformation \$.properties.acquisitionInformation	prov:wasGeneratedBy	\$.potentialAction [https://schema.org/potentialAction]	Table 17
acquisitionInformation \$.properties.acquisitionInformation	prov:wasGeneratedBy	\$.measurementTechnique [https://schema.org/measurementTechnique]	Table 17
agent \$.properties.qualifiedAttribution[*].agent	prov:agent	\$.contributor.contributor or [https://schema.org/contributor]	Table 6
Agent \$.properties.qualifiedAttribution[0].agent[] \$.properties.contactpoint[*]	vcard:Kind	Person [https://schema.org/Person] Organization [https://schema.org/Organization]	Table 6
Agent \$.properties.authors[*]	foaf:Agent	Person [https://schema.org/Person] Organization [https://schema.org/Organization]	Table 6
alternates \$.properties.links.alternates	iana:alternate	\$.subjectOf [https://schema.org/subjectOf]	Table 14
authors \$.properties.authors	dct:creator	\$.author [https://schema.org/author]	Table 5
bbox \$.properties.bbox	gj:bbox	\$.spatialCoverage.geobbox [https://schema.org/box]	Table 11

GeoJSON Property	JSON-LD Property	schema.org	Reference
beginningDateTime \$.properties.temporal.beginningDateTime	dcat:startDate	\$.temporalCoverage [https://schema.org/temporalCoverage]	Table 3
bibliographicCitation \$.properties.bibliographicCitation	dct:bibliographicCitation	\$.citation [https://schema.org/citation]	Table 2
categories \$.properties.categories	dcat:theme	\$.keywords [https://schema.org/keywords] \$.variableMeasured [https://schema.org/variableMeasured]	Table 8
Category	skos:Concept	DefinedTerm [https://schema.org/DefinedTerm]	Table 9
code \$.properties.offerings[*].code	owc:code	\$.potentialAction[] . identifier [https://schema.org/identifier]	Table 16
code \$.properties.offerings[0].operations[0].code	owc:code	\$.potentialAction[] . target[] . identifier [https://schema.org/identifier]	Table 16
conformsTo \$.properties.isPrimaryTopicOf.conformsTo	dct:conformsTo	\$.subjectOf.encodingFormat [https://schema.org/encodingFormat]	Table 1. See also [ESIPFed].
conformsTo \$.properties.conformsTo	dct:conformsTo	\$.publishingPrinciples [https://schema.org/publishingPrinciples]	Table 2 Proposed by [DCAT-AP-SDO].
contactPoint \$.properties.contactPoint	dcat:contactPoint	\$.provider [https://schema.org/provider] \$.contributor.roleName [https://schema.org/roleName]	Table 6 Table 5
contents \$.properties.offerings[*].contents	owc:contents		
coordinates \$.geometry.coordinates	gj:coordinates	\$.spatialCoverage.geo [https://schema.org/geo]	Table 10

GeoJSON Property	JSON-LD Property	schema.org	Reference
created \$.properties.created	dct:created	\$.dateCreated [https://schema.org/dateCreated]	Table 3. See also [DCAT-AP-SDO].
created \$.properties.isPrimaryTopicOf.created	dct:created	\$.subjectOf[].dateCreate d [https://schema.org/dateCreated]	Table 1
data \$.properties.links.data	iana.enclosure	\$.distribution [https://schema.org/distribution]	Table 14
date \$.properties.date	dct:date	\$.temporal [https://schema.org/temporal]	Table 3
degree \$.properties.wasUsedBy[].generated.degree	dct:type		
describedby \$.properties.links.describedby	iana.describedby	\$.url [https://schema.org/url] \$.mentions [https://schema.org/mentions] \$.subjectOf [https://schema.org/subjectOf]	Table 14
description \$.properties.wasUsedBy[].generated.description	dct:description		
description \$.acquisitionInformation[].instrument.description	dct:description	\$.instrument[].description [https://schema.org/description]	Table 17
doi \$.properties.doi	adms:identifier	\$.identifier.value [https://schema.org/value]	Table 4

GeoJSON Property	JSON-LD Property	schema.org	Reference
email \$.properties.qualifiedAttribution[].agent[].email \$.properties.contactPoint[*].email	vcard:hasEmail	\$.author[].email [https://schema.org/email] \$.creator[].email [https://schema.org/email] \$.contributor[].email [https://schema.org/email] \$.provider[].email [https://schema.org/email] \$.publisher[].email [https://schema.org/email]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
endingDateTime \$.properties.temporal.endingDateTime	dcat:endDate	\$.temporalCoverage [https://schema.org/temporalCoverage]	Table 3
generated \$.properties.wasUsedBy[*].generated	prov:generated		
geometry \$.geometry	gj:geometry	\$.spatialCoverage.geo [https://schema.org/geo]	Table 11, GeoShape [https://schema.org/GeoShape]
geometry \$.properties.spatial.geometry	locn:geometry	\$.spatialCoverage.geo [https://schema.org/geo]	Table 11, GeoShape [https://schema.org/GeoShape]
hadPlan \$.properties.wasUsedBy[*].qualifiedAssociation.hadPlan	prov:hadPlan		

GeoJSON Property	JSON-LD Property	schema.org	Reference
hasAddress \$.properties.qualifiedAttribution[].agent[].hasAddress \$.properties.contactPoint[*].hasAddress	vcard:hasAddress	\$author[].address [https://schema.org/address] \$creator[].address [https://schema.org/address] \$contributor[].address [https://schema.org/address] \$provider[].address [https://schema.org/address] \$publisher[].address [https://schema.org/address]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
hasAddress \$.properties.authors[*].hasAddress	null	\$author[].address [https://schema.org/address]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
hasName \$.properties.qualifiedAttribution[].agent[].hasName \$.properties.contactPoint[*].hasName	vcard.hasName	\$author[].name [https://schema.org/name] \$creator[].name [https://schema.org/name] \$contributor[].name [https://schema.org/name] \$provider[].name [https://schema.org/name] \$publisher[].name [https://schema.org/name]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
hasName \$.properties.authors[*].hasName	@nest	\$author[].name [https://schema.org/name]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]

GeoJSON Property	JSON-LD Property	schema.org	Reference
hasTelephone \$.properties.qualifiedAttribution[0].agent[0].hasTelephone \$.properties.contactPoint[*].hasTelephone	vcard.hasTelephone	\$.author[].telephone [https://schema.org/telephone] \$.creator[].telephone [https://schema.org/telephone] \$.contributor[].telephone [https://schema.org/telephone] \$.provider[].telephone [https://schema.org/telephone] \$.publisher[].telephone [https://schema.org/telephone]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
hasTelephone \$.properties.authors[*].hasTelephone	null	\$.author[].telephone [https://schema.org/telephone]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
id \$.id	@id	\$.@id	Table 2
identifier \$.properties.identifier	dct:identifier	\$.identifier [https://schema.org/identifier]	Table 2
Individual \$.properties.qualifiedAttribution[0].agent[0] \$.properties.contactPoint[*]	vcard:Individual	Person [https://schema.org/Person]	Table 5, Person [https://schema.org/Person]
Individual \$.properties.authors[*]	foaf:Person	Person [https://schema.org/Person]	Table 5
instrument \$.acquisitionInformation[*].instrument	prov:used	\$.potentialAction[].instrument [https://schema.org/instrument]	Table 17
Instrument	eop:Instrument	DefinedTerm [https://schema.org/DefinedTerm]	Table 17
instrumentShortName \$.acquisitionInformation[*].instrumentShortName	eop:instrumentShortName	\$.potentialAction[].instrument[].name [https://schema.org/name]	Table 17

GeoJSON Property	JSON-LD Property	schema.org	Reference
isPrimaryTopicOf \$.properties.isPrimaryTopicOf	foaf:isPrimaryTopicOf	\$.subjectOf [https://schema.org/subjectOf]	Table 2
issued \$.properties.wasUsedBy[*].qualifiedAssociation .hadPlan.wasDerivedFrom.issued	dct:issued		
keyword \$.properties.keyword	dcat:keyword	\$.keywords [https://schema.org/keywords]	Table 8
kind \$.properties.kind	dct:type	\$.additionalType [https://schema.org/additionalType]	Table 2 . See also [DCAT-AP-SDO].
label \$.properties.categories[*].label	skos:prefLabel	\$.keywords[].name [https://schema.org/name]	Table 9
label \$.properties.license[*].label	rdfs:label	\$.license[].description [https://schema.org/description]	Table 7
label \$.properties.accessRights[*].label	rdfs:label	\$.conditionsOfAccess[].description [https://schema.org/description]	Table 7
label \$.properties.provenance[*].label	rdfs:label		
lang \$.properties.lang	dct:language	\$.inLanguage [https://schema.org/inLanguage]	Table 2
lang \$.properties.isPrimaryTopicOf.lang	dct:language	\$.subjectOf.inLanguage [https://schema.org/inLanguage]	Table 1
lang \$.properties.links.[] lang	dct:language	\$.distribution[].inLanguage [https://schema.org/inLanguage] \$.subjectOf[].inLanguage [https://schema.org/inLanguage] \$.mentions[].inLanguage [https://schema.org/inLanguage]	Table 15

GeoJSON Property	JSON-LD Property	schema.org	Reference
length \$.properties.links.length	atom:length	\$.distribution[].contentSize [https://schema.org/contentSize] \$.subjectOf[].contentSize [https://schema.org/contentSize] \$.mentions[].contentSize [https://schema.org/contentSize]	Table 15
license \$.properties.license	dct:license	\$.license [https://schema.org/license]	Table 7
LicenseDocument	dct:LicenseDocument	CreativeWork [https://schema.org/CreativeWork] URL [https://schema.org/URL]	Table 7
LineString	gj:LineString		
Link	atom:link		
links \$.properties.links	owc:links		Table 14
Location	dct:Location		
method \$.properties.offerings[].operations[].method	owc:method	\$.potentialAction[].target[].httpMethod [https://schema.org/httpMethod]	Table 16, EntryPoint [https://schema.org/EntryPoint]
MultiLineString	gj:MultiLineString		
MultiPoint	gj:MultiPoint		
MultiPolygon	gj:MultiPolygon		

GeoJSON Property	JSON-LD Property	schema.org	Reference
name <code>\$..properties.qualifiedAttribution[]["agent"].name</code> <code>\$..properties.contactPoint[*].name</code>	vcard.fn	<code>\$author[].name</code> [https://schema.org/name] <code>\$creator[].name</code> [https://schema.org/name] <code>\$contributor[].name</code> [https://schema.org/name] <code>\$provider[].name</code> [https://schema.org/name] <code>\$publisher[].name</code> [https://schema.org/name]	Table 5, Organization [https://schema.org/Organization] , Person [https://schema.org/Person]
name <code>\$..properties.authors[*].name</code>	foaf.name	<code>\$author[].name</code> [https://schema.org/name]	Table 5, Organization [https://schema.org/Organization] , Person [https://schema.org/Person]
offering <code>\$..properties.offerings</code>	dcat:endpointDescription	<code>\$potentialAction</code> [https://schema.org/potentialAction]	Table 14
operations <code>\$..properties.offerings[*].operations</code>	owc:operations	<code>\$potentialAction[].target</code> [https://schema.org/target]	Table 16
orbitType <code>\$..acquisitionInformation[*].platform.orbitType</code>	eop:orbitType		
Organization <code>\$..properties.qualifiedAttribution[]["agent"]</code> <code>\$..properties.contactPoint[*]</code>	vcard:Organization	Organization [https://schema.org/Organization]	
Organization <code>\$..properties.authors[*]</code>	foaf:Organization	Organization [https://schema.org/Organization]	
PeriodOfTime	dct:PeriodOfTime		
Person <code>\$..properties.qualifiedAttribution[]["agent"]</code> <code>\$..properties.contactPoint[*]</code>	vcard:Individual	Person [https://schema.org/Person]	

GeoJSON Property	JSON-LD Property	schema.org	Reference
Person \$.properties.authors[*]	foaf:Person	Person [https://schema.org/Person]	
phone \$.properties.qualifiedAttribution[0].agent[0].phone \$.properties.contactPoint[*].phone	null	\$.author[].telephone [https://schema.org/telephone] \$.creator[].telephone [https://schema.org/telephone] \$.contributor[].telephone [https://schema.org/telephone] \$.provider[].telephone [https://schema.org/telephone] \$.publisher[].telephone [https://schema.org/telephone]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
phone \$.properties.authors[*].hasTelephone	foaf.phone	\$.author[].telephone [https://schema.org/telephone]	Table 5, Organization [https://schema.org/Organization], Person [https://schema.org/Person]
Plan	prov:Plan		
platform \$.acquisitionInformation[*].platform	prov:used	schema:potentialAction / schema:instrument/	Table 17
Platform	eop:Platform	DefinedTerm [https://schema.org/DefinedTerm]	Table 17
platformSerialIdentifier \$.platform.platformSerialIdentifier	eop:platformSerialIdentifier	schema:potentialAction / schema:instrument/ schema:serialNumber	Table 17
platformShortName \$.platform.platformShortName	eop:platformShortName	schema:potentialAction / schema:instrument/ schema:name	Table 17
platformShortName \$.platform.platformShortName	eop:platformShortName	schema:acquisitionInformation/ schema:platform/ schema:name	7.6.1 Platform

GeoJSON Property	JSON-LD Property	schema.org	Reference
Point	gj:Point	GeoCoordinates [https://schema.org/GeoCoordinates]	
Polygon	gj:Polygon	GeoShape [https://schema.org/GeoShape]	
previews \$.properties.links.previews	iana:icon	\$.thumbnailUrl [https://schema.org/thumbnailUrl]	Table 14
processingLevel \$.properties.productInformation.processingLevel	eop:processingLevel	\$.additionalProperty [https://schema.org/additionalProperty]	table_object_propertyvalue_additional_property
productInformation \$.properties.productInformation	eop:productInformation		
ProductInformation	eop:ProductInformation		
productType \$.productInformation.productType	eop:productType	\$.additionalProperty [https://schema.org/additionalProperty]	table_object_propertyvalue_additional_property
profiles \$.properties.links.profiles	iana:profile		Table 14
provenance \$.properties.provenance	dct:provenance	\$.description [https://schema.org/description]	See [DCAT-AP-SDO] .
ProvenanceStatement	dct:ProvenanceStatement		
published \$.properties.published	dct:issued	\$.datePublished [https://schema.org/datePublished]	Table 3 . See also [DCAT-AP-SDO] .
published \$.properties.isPrimaryTopicOf.published	dct:issued	\$.subjectOf[].datePublished [https://schema.org/datePublished]	Table 1 . See also [DCAT-AP-SDO] .
publisher \$.properties.publisher	dct:publisher	\$.publisher [https://schema.org/telephone]	Table 5
qualifiedAssociation \$.properties.wasUsedBy[*].qualifiedAssociation	prov:qualifiedAssociation		

GeoJSON Property	JSON-LD Property	schema.org	Reference
qualifiedAttribution \$..properties.wasUsedBy[*].qualifiedAttribution	prov:qualifiedAttribution		
referenceSystemIdentifier \$..productInformation.referenceSystemIdentifier	eop:referenceSystemIdentifier		
related \$..properties.links.related	iana:related		Table 14
request \$..properties.offerings[!].operations[!].request	owc:request		See https://schema.org/docs/actions.html for HTTP Post request encoding.
resolution \$..properties.productInformation.resolution	eop:resolution		
result \$..properties.offerings[!].operations[!].result	owc:result		See https://schema.org/docs/actions.html for HTTP response encoding.
rights \$..properties.rights	dct:rights	\$..conditionsOfAccess [https://schema.org/conditionsOfAccess]	Table 7
RightsStatement	dct:RightsStatement		
role \$..properties.qualifiedAttribution[*].role	dct:type	schema:roleName [https://schema.org/roleName]	
scheme \$..properties.categories[*].scheme	skos:inScheme	\$..keywords.inDefinedTermSet [https://schema.org/inDefinedTermSet]	Table 9
search \$..properties.links.search	iana:icon		Table 14 (TBC)
sensorType \$..instrument.sensorType	eop:sensorType		Table 17 (TBC)

GeoJSON Property	JSON-LD Property	schema.org	Reference
spatial \$.properties.spatial	dct:spatial		
Standard	dct:Standard		
subject \$.properties.subject	dct:subject		
term \$.properties.categories[*].term	@id	\$.keywords.@id	Table 9
timeliness \$.productInformation.timeliness	eop:timeliness		
title \$.properties.title	dct:title	\$.name [https://schema.org/name]	Table 2
title \$.hadPlan.wasDerivedFrom.title	dct:title		
title \$.properties.links.[].title	dct:title		
type \$.properties.links.[].type	atom:type		
type \$.properties.offerings[0].contents[0].type	owc:type		
type \$.properties.offerings[0].operations[0].type	owc:type		
up \$.properties.links.up	iana:up		Table 14 (TBC)
updated \$.properties.updated	dct:modified	\$.dateModified [https://schema.org/dateModified]	Table 3. See also [DCAT-AP-SDO] .
updated \$.properties.isPrimaryTopicOf.updated	dct:modified	\$.subjectOf[].dateModified [https://schema.org/dateModified]	Table 1. See also [DCAT-AP-SDO] .

GeoJSON Property	JSON-LD Property	schema.org	Reference
versionInfo \$.properties.versionInfo	owl:versionInfo	\$.version [https://schema.org/version]	Table 2
versionInfo \$... hadPlan.wasDerivedFrom.versionInfo	owl:versionInfo		
versionInfo ~\$.properties.isPrimary TopicOf .conformsTo.versionInfo~0~	owl:versionInfo		
via \$.properties.links.via	iana:via		Table 14
wasDerivedFrom \$.properties.wasUsedBy[*].qualifiedAssociation.hadPlan.wasDerivedFrom	prov:wasDerivedFrom		
wasUsedBy \$.properties.wasUsedBy	prov:wasUsedBy		

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GeoJSON Property	JSON-LD Property	schema.org	Reference
acquisitionAngles \$.acquisitionParameters.acquisitionAngles	eop:acquisitionAngles	schema:acquisitionParameters/ schema:acquisitionAngles (Extension)	7.6.4 Acquisition Parameters
acquisitionInformation \$.properties.acquisitionInformation	eop:acquisitionInformation	schema:acquisitionInformation (Extension)	7.1 Earth Observation
AcquisitionInformation	eop:AcquisitionInformation	schema:AcquisitionInformation (Extension)	7.6 Acquisition Information
acquisitionParameters \$.acquisitionInformation.acquisitionParameters	eop:acquisitionParameters	schema:acquisitionInformation/ schema:acquisitionparameters (Extension)	7.6 Acquisition Information
AcquisitionParameters	eop:AcquisitionParameters	schema:AcquisitionParameters (Extension)	7.6 Acquisition Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
acquisitionStation \$..acquisitionParameters.acquisitionStation	eop:acquisitionStation	schema:acquisitionParameters/ schema:acquisitionStation (Extension)	7.6.4 Acquisition Parameters
acquisitionSubType \$..acquisitionParameters.acquisitionSubType	eop:acquisitionSubType	schema:acquisitionParameters/ schema:acquisitionSubType (Extension)	7.6.4 Acquisition Parameters
acquisitionType \$..acquisitionParameters.acquisitionType	eop:acquisitionType	schema:acquisitionParameters/ schema:acquisitionType (Extension)	7.6.4 Acquisition Parameters
acrossTrackIncidenceAngle \$..acquisitionAngles.acrossTrackIncidenceAngle	eop:acrossTrackIncidenceAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:acrossTrackIncidenceAngle (Extension)	7.6.5 Acquisition Angles
alongTrackIncidenceAngle \$..acquisitionAngles.alongTrackIncidenceAngle	eop:alongTrackIncidenceAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:alongTrackIncidenceAngle (Extension)	7.6.5 Acquisition Angles
antennaLookDirection \$..acquisitionParameters.antennaLookDirection	eop:antennaLookDirection	schema:acquisitionParameters/ schema:antennaLookDirection (Extension)	7.6.4 Acquisition Parameters
archivingCenter \$..productInformation.archivingCenter	eop:archivingCenter	schema:productInformation/ schema:holdingArchive [https://schema.org/holdingArchive]	7.7 Product Information
archivingDate \$..productInformation.archivingDate	eop:archivingDate	schema:productInformation/ schema:archivingDate	7.7 Product Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
ascendingNodeDate \$..acquisitionParameters.ascendingNodeDate	eop:ascendingNodeDate	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:ascendingNodeDate (Extension)	7.4.3 Orbit Parameters
ascendingNodeLongitude \$..acquisitionParameters.ascendingNodeLongitude	eop:ascendingNodeLongitude	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:ascendingNodeLongitude (Extension)	7.4.3 Orbit Parameters
availabilityTime \$.properties.productInformation.availabilityTime	eop:availabilityTime	schema:productInformation/ schema:availabilityTime (Extension)	7.7 Product Information
available \$.properties.available	dct:available	schema:available (Extension)	7.1 Earth Observation
bbox \$.bbox	gj:bbox	schema:spatialCoverage [https://schema.org/spatialCoverage]/ schema:geo [https://schema.org/geo]/ schema:box [https://schema.org/box]	Table 11
beginningDateTime \$..acquisitionParameters.beginningDateTime	dcat:startDate	schema:temporalCoverage [https://schema.org/temporalCoverage]	Table 3
cloudCover \$.properties.productInformation.cloudCover	eop:cloudCover	schema:productInformation/ schema:cloudCover (Extension)	7.7.3 Coverage Description
completionTimeFromAscendingNode \$..acquisitionParameters.completionTimeFromAscendingNode	eop:completionTimeFromAscendingNode	schema:acquisitionParameters/ schema:completionTimeFromAscendingNode (Extension)	7.6.4 Acquisition Parameters
compositeType \$.productInformation.compositeType	eop:compositeType	schema:productInformation/ schema:compositeType (Extension)	7.7.2 Processing Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
cycleNumber \$..acquisitionParameters.cycleNumber	eop:cycleNumber	schema:acquisitionParameters/ schema:cycleNumber (Extension)	7.6.4 Acquisition Parameters
description \$..instrument.description	dct:description	schema:acquisitionInformation/ schema:sensor/ schema:description [https://schema.org/description]	7.6.2 Instrument
discreteWavelengths \$..wavelengths[*].discreteWavelengths	eop:discreteWavelength	schema:acquisitionParameters/ schema:wavelengths/ schema:value [https://schema.org/value]	7.6.3 Wavelength Information
dopplerFrequency \$..acquisitionParameters.dopplerFrequency	eop:dopplerFrequency	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:dopplerFrequency (Extension)	7.6.4 Acquisition Parameters
endingDateTime \$..acquisitionParameters.endingDateTime	dcat:endDate	schema:temporalCoverage [https://schema.org/temporalCoverage]	Table 3
endWavelength \$..wavelengths[*].endWavelength	eop:endWavelength	schema:acquisitionParameters/ schema:wavelengths/ schema:maxValue [https://schema.org/maxValue]	7.6.3 Wavelength Information (Extension)
format \$..productInformation.format	dct:format	schema:productInformation/ schema:encodingFormat [https://schema.org/encodingFormat]	7.7.2 Processing Information
geometry \$geometry	gj:geometry	schema:geo [https://schema.org/geo]/ schema:spatialCoverage [https://schema.org/spatialCoverage]/ geo [https://schema.org/geo]	Table 11, GeoShape [https://schema.org/GeoShape]

GeoJSON Property	JSON-LD Property	schema.org	Reference
groundTrackUncertainty \$..acquisitionParameters.groundTrackUncertainty	eop:groundTrackUncertainty	schema:acquisitionParameters/ schema:groundTrackUncertainty (Extension)	7.6.4 Acquisition Parameters
highestLocation \$.properties.highestLocation	eop:maximumAltitude	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:location [https://schema.org/location]/ schema:maxValue [https://schema.org/maxValue]	7.4.2 Vertical Spatial Domain
identifier \$.properties.identifier	dct:identifier	schema:identifier [https://schema.org/identifier]	Table 2
illuminationAzimuthAngle \$..acquisitionAngles.illuminationAzimuthAngle	eop:illuminationAzimuthAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:illuminationAzimuthAngle (Extension)	7.6.5 Acquisition Angles
illuminationElevationAngle ~\$..acquisitionAngles.illuminationv _{ElevationAngle}	eop:illuminationElevationAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:illuminationElevationAngle (Extension)	7.6.5 Acquisition Angles
illuminationZenithAngle \$..acquisitionAngles.illuminationZenithAngle	eop:instrumentZenithAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:illuminationZenithAngle (Extension)	7.6.5 Acquisition Angles

GeoJSON Property	JSON-LD Property	schema.org	Reference
incidenceAngle \$..acquisitionAngles.incidenceAngle	eop:incidenceAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:incidenceAngle (Extension)	7.6.5 Acquisition Angles
incidenceAngleVariatio n \$..acquisitionAngles.incidenceAngleVariation	eop:incidenceAngleVariation	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:incidenceAngle Variation (Extension)	7.6.5 Acquisition Angles
instrument \$.acquisitionInformation[*].instrument	eop:instrument	schema:acquisitionInformation/ schema:sensor (Extension)	7.6 Acquisition Information (Extension)
Instrument	eop:Instrument	schema:Instrument (Extension)	7.6.2 Instrument
instrumentShortName \$..instrument.instrumentShortName	eop:instrumentShortName	schema:acquisitionInformation/ schema:sensor/ schema:name [https://schema.org/name]	7.6.2 Instrument
instrumentAzimuthAn gle \$..acquisitionAngles.instrumentAzimuthAngle	eop:instrumentAzimuthAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:instrumentAzimuthAngle (Extension)	7.6.5 Acquisition Angles
instrumentElevationAn gle \$..acquisitionAngles.instrumentElevationAngle	eop:instrumentElevationAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:instrumentElevationAngle (Extension)	7.6.5 Acquisition Angles

GeoJSON Property	JSON-LD Property	schema.org	Reference
instrumentZenithAngle \$..acquisitionAngles.instrumentZenithAngle	eop:instrumentZenithAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:instrumentZenithAngle (Extension)	7.6.5 Acquisition Angles
lastOrbitDirection \$..acquisitionParameters.lastOrbitDirection	eop:lastOrbitDirection	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:lastOrbitDirection (Extension)	7.4.3 Orbit Parameters
lastOrbitNumber \$..acquisitionParameters.lastOrbitnumber	eop:lastOrbitNumber	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:lastOrbitNumber (Extension)	7.4.3 Orbit Parameters
locationUnit \$properties.lowestLocation	eop:altitudeUnit	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:location [https://schema.org/location]/ schema:unitText [https://schema.org/unitText]	7.4.2 Vertical Spatial Domain
locationUnit \$properties.lowestLocation	eop:altitudeUnit	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:location [https://schema.org/location]/ schema:unitText [https://schema.org/unitText]	7.4.2 Vertical Spatial Domain

GeoJSON Property	JSON-LD Property	schema.org	Reference
lowestLocation \$..properties.lowestLocation	eop:minimumAltitude	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:location [https://schema.org/location]/ schema:minValue [https://schema.org/minValue]	7.4.2 Vertical Spatial Domain
measurementType \$..acquisitionParameters.measurementType	eop:measurementType	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:measurementType (Extension)	7.6.4 Acquisition Parameters
maximumIncidenceAngle \$..acquisitionAngles.maximumIncidenceAngle	eop:maximumIncidenceAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:incidenceAngle / schema:maxValue [https://schema.org/maxValue]	7.6.5 Acquisition Angles
minimumIncidenceAngle \$..acquisitionAngles.minimumIncidenceAngle	eop:minimumIncidenceAngle	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:incidenceAngle / schema:minValue [https://schema.org/minValue]	7.6.5 Acquisition Angles
operationalMode \$..acquisitionParameters.operationalMode	eop:operationalMode	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:operationalMode (Extension)	7.6.4 Acquisition Parameters

GeoJSON Property	JSON-LD Property	schema.org	Reference
orbitDirection \$..acquisitionParameters.orbitDirection	eop:orbitDirection	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:orbitDirection (Extension)	7.4.3 Orbit Parameters
orbitDuration \$..acquisitionParameters.orbitDuration	eop:orbitDuration	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:orbitDuration (Extension)	7.4.3 Orbit Parameters
orbitNumber \$..acquisitionParameters.orbitnumber	eop:orbitNumber	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:orbitNumber (Extension)	7.4.3 Orbit Parameters
orbitType \$..platform.orbitType	eop:orbitType	schema:acquisitionInformation/ schema:platform/ schema:orbitType (Extension)	7.6.1 Platform
parentIdentifier \$..properties.parentIdentifier	eop:parentIdentifier	schema:isPartOf [https://schema.org/ isPartOf] or schema:parentIdentifier (Extension)	7.1 Earth Observation
pitch \$..acquisitionAngles.pitch	eop:pitch	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:pitch (Extension)	7.6.5 Acquisition Angles
platform \$..acquisitionInformation[*].platform	eop:platform	schema:acquisitionInformation/ schema:platform (Extension)	7.6 Acquisition Information
Platform	eop:Platform	schema:Platform (Extension)	7.6.1 Platform

GeoJSON Property	JSON-LD Property	schema.org	Reference
platformSerialIdentifier \$..platform.platformSerialIdentifier	eop:platformSerialIdentifier	schema:acquisitionInformation/ schema:platform/ schema:serialNumber [https://schema.org/ serialNumber]	7.6.1 Platform
platformShortName \$..platform.platformShortName	eop:platformShortName	schema:acquisitionInformation/ schema:platform/ schema:name [https://schema.org/name]	7.6.1 Platform
polarisationChannels \$..acquisitionParameters.polarisationChannels	eop:polarisationChannels	schema:acquisitionParameters/ schema:polarisationChannels (Extension)	7.6.4 Acquisition Parameters
polarisationMode \$..acquisitionParameters.polarisationMode	eop:polarisationMode	schema:acquisitionParameters/ schema:polarisationMode (Extension)	7.6.4 Acquisition Parameters
processingCenter \$..productInformation.processingCenter	eop:processingCenter	schema:productInformation/ schema:processingCenter (Extension)	7.7.2 Processing Information
processingDate \$..productInformation.processingDate	eop:processingDate	schema:productInformation/ schema:processingDate (Extension)	7.7.2 Processing Information
processingLevel \$..productInformation.processingLevel	eop:processingLevel	schema:productInformation/ schema:processingLevel (Extension)	7.7.2 Processing Information
processingMethod \$..productInformation.processingMethod	eop:processingMethod	schema:productInformation/ schema:processingMethod (Extension)	7.7.2 Processing Information
processingMethodVersion \$..productInformation.processingMethodVersion	eop:processingMethodVersion	schema:productInformation/ schema:processingMethodVersion (Extension)	7.7.2 Processing Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
processingMode \$..productInformation.processingMode	eop:processingMode	schema:productInformation/ schema:processingMode (Extension)	7.7.2 Processing Information
processorName \$..productInformation.processorName	eop:processorName	schema:productInformation/ schema:processorName (Extension)	7.7.2 Processing Information
processorVersion \$..productInformation.processorVersion	eop:processorVersion	schema:productInformation/ schema:softwareVersion [https://schema.org/softwareVersion]	7.7.2 Processing Information
productContentsType \$..productInformation.productContentsType	eop:productContentsType	schema:productInformation/ schema:productContentstType (Extension)	7.7.2 Processing Information
timeliness \$..properties.productInformation.timeliness	eop:timeliness	schema:productInformation/ schema:timeliness (Extension)	7.7 Product Information
productGroupId \$..productInformation.productGroupId	eop:productGroupId	schema:isPartOf [https://schema.org/isPartOf]	7.1 Earth Observation
productType \$..productInformation.productType	eop:productType	schema:productInformation/ schema:productType (Extension)	7.7 Product Information
productVersion \$..productInformation.productVersion	eop:productVersion	schema:productInformation/ schema:version [https://schema.org/version]	7.7 Product Information
qualityDegradation \$..qualityInformation.qualityDegradation	eop:qualityDegradation	schema:productInformation/ schema:qualityInformation/ schema:qualityDegradation (Extension)	7.7.1 Quality Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
qualityDegradation QuotationMode \$..qualityInformation.qualityDegradatio n QuotationMode	eop:qualityDegradation QuotationMode	schema:productInform ation/ schema:qualityInforma tion/ schema:qualityDegrada tion QuotationMode (Extension)	7.7.1 Quality Information
qualityDegradationTag \$..qualityInformation. qualityDegradationTag	eop:qualityDegradation Tag	schema:productInform ation/ schema:qualityInforma tion/ schema:qualityDegrada tionTag (Extension)	7.7.1 Quality Information
qualityInformation \$..productInformation.qualityInformati on	eop:qualityInformation	schema:productInform ation/ schema:qualityInforma tion (Extension)	7.7 Product Information
QualityInformation	eop:QualityInformation	schema:QualityInforma tion (Extension)	7.7.1 Quality Information
qualityStatus \$..qualityInformation.qualityStatus	eop:qualityStatus	schema:productInform ation/ schema:qualityInforma tion/ schema:qualityStatus (Extension)	7.7.1 Quality Information
referenceSystemIdentif ier \$..productInformation.referenceSystemI dentifier	eop:referenceSystemId entifier	schema:productInform ation/ schema:additionalProp erty [https://schema.org/ additionalProperty]	7.7 Product Information
relativeOrbitNumber \$..acquisitionParameters. relativeOrbitNumber	eop:relativeOrbitNumb er	schema:acquisitionPara meters/ schema:relativeOrbitN umber (Extension)	7.6.4 Acquisition Parameters
resolution \$..acquisitionParameters.resolution	eop:resolution	schema:acquisitionPara meters/ schema:resolution (Extension)	7.6.4 Acquisition Parameters

GeoJSON Property	JSON-LD Property	schema.org	Reference
roll \$..acquisitionAngles.roll	eop:roll	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:roll (Extension)	7.6.5 Acquisition Angles
samplingRates \$..acquisitionParameters.samplingRates	eop:samplingRates	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:samplingRate (Extension)	7.6.4 Acquisition Parameters
sensorType \$..instrument.sensorType	eop:sensorType	schema:acquisitionInformation/ schema:sensor/ schema:sensorType (Extension)	7.6.2 Instrument
snowCover \$..properties.productInformation.snowCover	eop:snowCover	schema:productInformation/ schema:snowCover (Extension)	7.7.3 Coverage Description
size \$..properties.productInformation.size	eop:size	schema:productInformation/ schema:contentSize [https://schema.org/contentSize]	7.7 Product Information
spectralRange \$..wavelengths[*].spectralRange	eop:spectralRange	schema:acquisitionParameters/ schema:wavelengths/ schema:spectralRange (Extension)	7.6.3 Wavelength Information
startTimeFromAscendingNode \$..acquisitionParameters.startTimeFromAscendingNode	eop:startTimeFromAscendingNode	schema:acquisitionParameters/ schema:startTimeFromAscendingNode (Extension)	7.6.4 Acquisition Parameters
startWavelength \$..wavelengths[*].startWavelength	eop:startWavelength	schema:acquisitionParameters/ schema:wavelengths/ schema:minValue [https://schema.org/minValue]	7.6.3 Wavelength Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
status \$.properties.status	eop:status	schema:acquisitionStatus (Extension)	7.1 Earth Observation
statusDetail \$.properties.productInformation.statusDetail	eop:statusDetail	schema:productInformation/ schema:statusDetail (Extension)	7.7 Product Information
statusSubType \$.properties.productInformation.statusSubType	eop:statusSubType	schema:productInformation/ schema:statusSubType (Extension)	7.7 Product Information
swathIdentifier \$.acquisitionParameters.swathIdentifier	eop:swathIdentifier	schema:acquisitionParameters/ schema:swathIdentifier (Extension)	7.6.4 Acquisition Parameters
tileId \$.acquisitionParameters.tileId	eop:tileId	schema:acquisitionParameters/ schema:tileId (Extension)	7.6.4 Acquisition Parameters
timeliness \$.properties.productInformation.timeliness	eop:timeliness	schema:productInformation/ schema:timeliness (Extension)	7.7 Product Information
verticalResolution \$.acquisitionParameters.verticalResolution	eop:verticalResolution	schema:acquisitionParameters/ schema:verticalResolution (Extension)	7.6.4 Acquisition Parameters
VerticalSpatialDomain	N/A	schema:VerticalSpatialDomain (Extension)	7.4.2 Vertical Spatial Domain
WavelengthInformation	eop:WavelengthInformation	schema:WavelengthInformation	TBD (Extension)
wavelengths \$.acquisitionParameters.wavelengths	eop:wavelengths	schema:acquisitionParameters/ schema:wavelengths (Extension)	7.6.4 Acquisition Parameters (Extension)
wavelengthResolution \$.wavelengths[*].wavelengthResolution	eop:wavelengthResolution	schema:acquisitionParameters/ schema:wavelengths/ schema:wavelengthResolution (Extension)	7.6.3 Wavelength Information

GeoJSON Property	JSON-LD Property	schema.org	Reference
wrsLatitudeGrid \$..acquisitionParameters.wrsLatitudeGrid	eop:wrsLatitudeGrid	schema:acquisitionParameters/ schema:wrsLatitudeGrid (Extension)	7.6.4 Acquisition Parameters
wrsLongitudeGrid \$..acquisitionParameters.wrsLongitudeGrid	eop:wrsLongitudeGrid	schema:acquisitionParameters/ schema:wrsLongitudeGrid (Extension)	7.6.4 Acquisition Parameters
yaw \$..acquisitionAngles.yaw	eop:yaw	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:acquisitionAngles/ schema:yaw (Extension)	7.6.5 Acquisition Angles

C.3. STAC Item Metadata

STAC Property		OGC 17-003r2 Property	schema.org
Item Fields [https://github.com/radiantearth/stac-spec/blob/master/item-spec/item-spec.md#item-fields]			
id		\$.properties.identifier	schema:identifier [https://schema.org/identifier]
collection		\$.properties.parentIdentifier	[schema:parentIdentifier (extension) schema:isPartOf [https://schema.org/isPartOf]]
Common Metadata [https://github.com/radiantearth/stac-spec/blob/master/item-spec/common-metadata.md]			
title	string	\$.properties.title	schema:name [https://schema.org/name]

STAC Property		OGC 17-003r2 Property	schema.org
description	string	\$.properties.abstract (See OGC 17-084r1)	schema:description [https://schema.org/description]
created	string	\$.properties.creationDate	schema:dateCreated [https://schema.org/dateCreated]
updated	string	\$.properties.updated (metadata)	schema:subjectOf [https://schema.org/subjectOf] schema:dateModified [https://schema.org/dateModified]
links	[Link Object]	\$.properties.links	
assets.*.updated	string	\$.properties.availabilityTime (data)	
assets.* (role="data")	Asset Object	\$.properties.links.data	schema:distribution [https://schema.org/distribution]
assets.* (role="thumbnail")	Asset Object	\$.properties.links.previews	schema:thumbnailUrl [https://schema.org/thumbnaillUrl]
assets.* (role="metadata")	Asset Object	\$.properties.links.alternates	schema:distribution [https://schema.org/distribution]
datetime	string null	\$.properties.date	schema:temporalCoverage [https://schema.org/temporalCoverage]
start_datetime	string	\$.acquisitionInformation[*]. acquisitionParameters. beginningDateTime	schema:temporalCoverage [https://schema.org/temporalCoverage]
end_datetime	string	\$.acquisitionInformation[*]. acquisitionParameters. endingDateTime	schema:temporalCoverage [https://schema.org/temporalCoverage]
providers	[Provider Object]	See OGC 17-084r1	schema:provider [https://schema.org/provider] and schema:Role [https://schema.org/Role]

STAC Property		OGC 17-003r2 Property	schema.org
license	string	See OGC 17-084r1	schema:license [https://schema.org/license]
platform	string	\$..acquisitionInformation[]. platform.platformShortName \$..acquisitionInformation[]. platform.platformSerialIdentifier	
instruments	[string]	\$..acquisitionInformation[*]. instrument.instrumentShortName	
constellation	string	\$..acquisitionInformation[*]. platform.platformShortName	
mission	string		
gsd	number		
EO Extension [https://github.com/stac-extensions/eo]			
eo:cloud_cover	number	\$..properties.productInformation.cloudCover	schema:productInformation/ schema:cloudCover (Extension)
eo:bands	[Band Object]		
SAR Extension [https://github.com/stac-extensions/sar]			
sar:instrument_mode (M)	string	\$..acquisitionParameters.operationalMode	schema:acquisitionParameters/ schema:operationalMode (Extension)
sar:polarizations (M)	[string]	\$..acquisitionParameters.polarisationChannels	schema:acquisitionParameters/ schema:polarisationChannels (Extension)

STAC Property		OGC 17-003r2 Property	schema.org
sar:product_type (M)	string	\$.properties.productInformation.productType	schema:productInformation/ schema:productType (Extension)
sar:observation_direction	string	\$..acquisitionParameters.antennaLookDirection	schema:acquisitionParameters/ schema:antennaLookDirection (Extension)
SAT Extension [https://github.com/stac-extensions/sat]			
sat:orbit_state	string	\$.properties.acquisitionInformation[*].acquisitionParameters.orbitDirection	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:lastOrbitDirection (Extension)
sat:relative_orbit	integer	\$..acquisitionParameters.relativeOrbitNumber	schema:acquisitionInformation/ schema:acquisitionParameters/ schema:relativeOrbitNumber (Extension)
Scientific Extension [https://github.com/stac-extensions/scientific]			
sci:doi	string	\$.properties.doi	schema:identifier [https://schema.org/identifier]/ schema:value [https://schema.org/value]
Version Extension [https://github.com/stac-extensions/version]			
version	string	\$properties.productInformation.version	schema:productInformation/ schema:version [https://schema.org/version]

STAC Property		OGC 17-003r2 Property	schema.org
View Extension [https://github.com/stac-extensions/view]			
view:off_nadir	number	\$..acquisitionAngles.instrumentElevationAngle	schema:instrumentElevationAngle (Extension)
view:incidence_angle	number	\$..acquisitionAngles.incidenceAngle	schema:incidenceAngle (Extension)
view:azimuth	number	\$..acquisitionAngles.instrumentAzimuthAngle	schema:instrumentAzimuthAngle (Extension)
view:sun_azimuth	number	\$..acquisitionAngles.illuminationAzimuthAngle	schema:illuminationAzimuthAngle (Extension)
view:sun_elevation	number	\$..acquisitionAngles.illuminationElevationAngle	schema:illuminationElevationAngle (Extension)
Projection Extension [https://github.com/stac-extensions/projection]			
proj:epsg (M)	integer	\$..properties.productInformation.referenceSystemIdentifier	schema:productInformation/ schema:additionalProperty [https://schema.org/additionalProperty]
Timestamps Extension [https://github.com/stac-extensions/timestamps]			
published	string	\$..properties.published	schema:datePublished [https://schema.org/datepublished]
Landsat Extension [https://landsat.usgs.gov/stac/landsat-extension/schema.json]			
landsat:wrs_path	string	\$..acquisitionParameters.wrsLongitudeGrid	schema:acquisitionParameters/ schema:wrsLongitudeGrid (Extension)

STAC Property		OGC 17-003r2 Property	schema.org
landsat:wrs_row	string	\$..acquisitionParameter.s.wrsLatitudeGrid	schema:acquisitionParameters/ schema:wrsLatitudeGrid (Extension)
landsat:scene_id	string	\$..acquisitionParameter.s.tileId	schema:acquisitionParameters/ schema:tileId (Extension)

Appendix D: Design Justification

D.1. EO Granule Encoding

While schema.org allows to encode a large part of the EO Collection properties proposed in [OGC17-084r1], most of the EO Granule properties proposed in [OGC17-003r2] do not have an equivalent property in schema.org. There are a number of possibilities to preserve the properties without corresponding mapping in the structured data encoding (JSON-LD / schema.org).

D.1.1. Method 1 - additionalProperty

[additionalProperty](https://schema.org/additionalProperty) [https://schema.org/additionalProperty] allows representing characteristics for which there is no matching property in schema.org using property-value pairs. For granule properties not available in schema.org, the JSON-LD property from the RDF Schema Vocabulary in Annex B.3 and Annex C of [OGC17-003r2] is to be used. The OWL vocabulary <http://www.opengis.net/ont/geojson/1.0/> is available from OGC at <http://schemas.opengis.net/geojson/1.0/geojson-vocabulary.owl>.

The [propertyID](https://schema.org/propertyID) [https://schema.org/propertyID] shall be of type URL and indicate the type of the property, by pointing to the external [OGC17-003r2] vocabulary as shown in the example below.

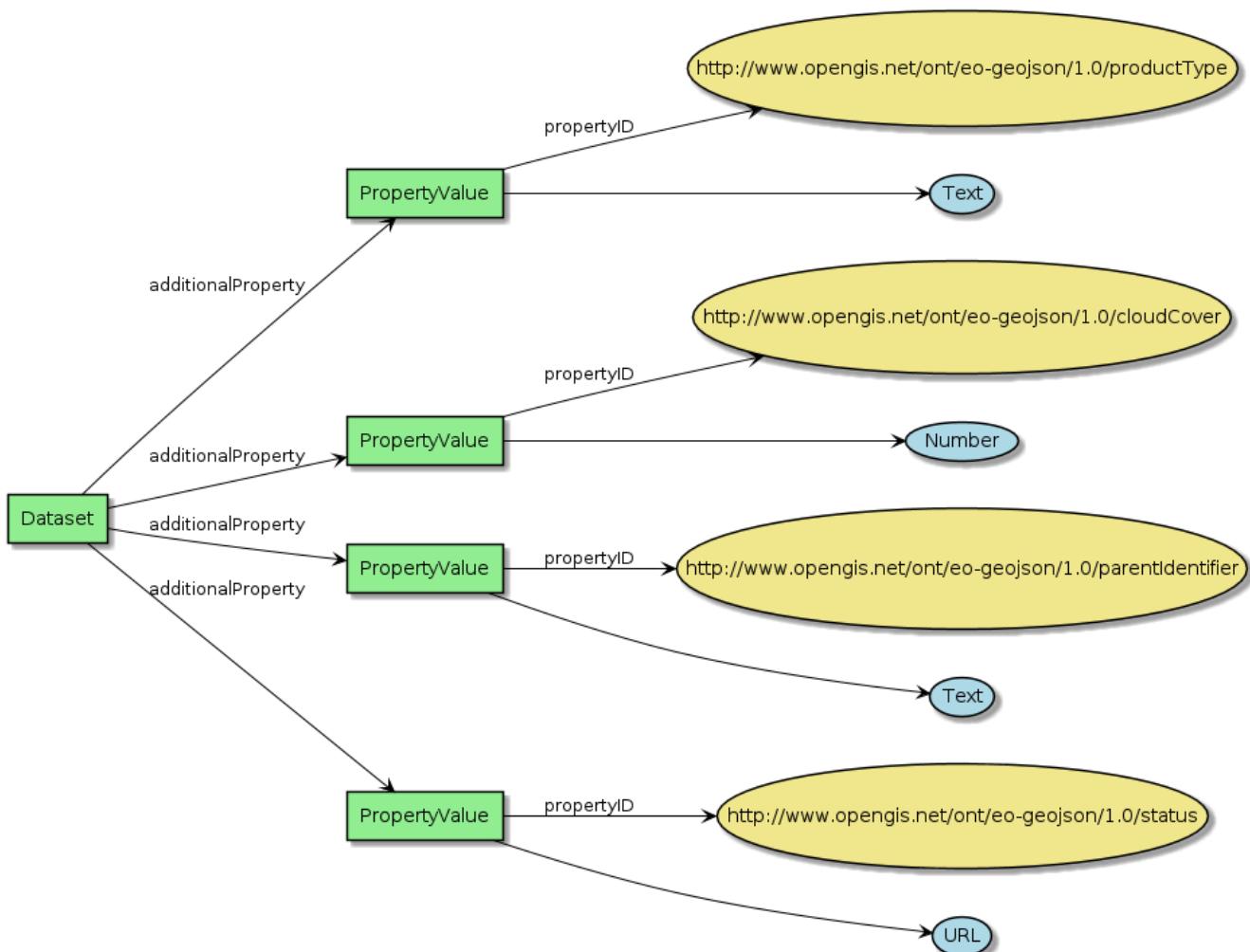


Figure 38. Dataset schema (Method 1)

Disadvantages:

- EO properties are not represented as edges in the RDF knowledge graph and more complicated to include in SPARQL queries.
- Cannot use namespace abbreviations in propertyID. E.g. "propertyID": "eop:cloudCover" and declaring <http://www.opengis.net/ont/eo-geojson/1.0> in the @context.

Granule encoding example with additional EO properties

```
{
  "@context": "https://schema.org",
  "@type": "Dataset",
  "additionalType": "http://purl.org/dc/dcmitype/Dataset",
  "@id":
  "https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "name":
  "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "additionalProperty": [
    {
      "@type": "PropertyValue",
      "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/productType",
      "value": "TM__GTC_1P"
    },
    {
      "@type": "PropertyValue",
      "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/cloudCover",
      "value": 7
    },
    {
      "@type": "PropertyValue",
      "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/processingMode",
      "value": "NOMINAL"
    }
  ]
}
```

D.1.2. Method 2 - Using Multiple Types

Schema.org allows defining multiple @types for a single object as explained at https://www.w3.org/community/schemabibex/wiki/Using_Multiple_Types. This allows an EO granule to be described using properties of <https://schema.org/Dataset> and the vocabulary used by [OGC17-003r2] (<http://www.opengis.net/ont/eo-geojson/1.0/>) where an EO granule is represented as an instance of a GeoJSON Feature. The EO JSON-LD properties are defined by the normative JSON-LD context for [OGC17-003r2] available at <http://schemas.opengis.net/geojson/1.0/geojson.jsonld>.

Note that the same approach can be used to extend an EO Collection representation with additional properties defined in [OGC17-084r1].

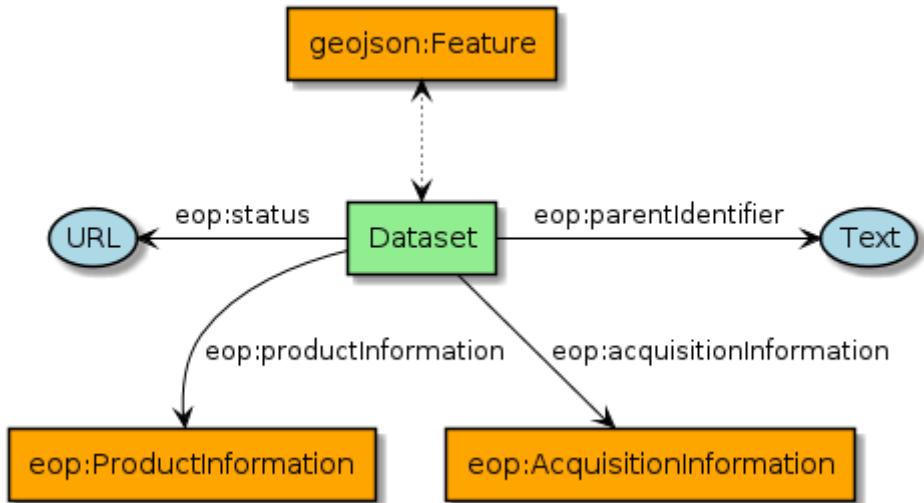


Figure 39. Dataset schema (Method 2)

Advantages:

- EO properties are represented as edges in the RDF knowledge graph and can be easily used in SPARQL queries.
- Can use namespace abbreviations for EO properties.

Disadvantages:

- EO properties need an explicit namespace different from schema.org.

Granule encoding example using multiple types

```
{
  "@context": [
    "http://eovoc.spacebel.be/schema-org/docs/jsonldcontext.json",
    {
      "geojson": "https://purl.org/geojson/vocab#",
      "eop": "http://www.opengis.net/ont/eo-geojson/1.0/"
    }
  ],
  "@type": [
    "Dataset",
    "geojson:Feature"
  ],
  "additionalType": [
    "http://purl.org/dc/dcmitype/Dataset",
    "https://inspire.ec.europa.eu/metadata-codelist/ResourceType/dataset"
  ],
  "@id":
  "https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "name":
  "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "identifier":
  "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
}
```

```

"eop:acquisitionInformation": {
    "@type": "eop:AcquisitionInformation",
    "eop:acquisitionParameters": {
        "@type": "eop:AcquisitionParameters",
        "eop:acquisitionAngles": {
            "@type": "eop:AcquisitionAngles",
            "eop:illuminationAzimuthAngle": 148.993,
            "eop:illuminationElevationAngle": 39.4445,
            "eop:illuminationZenithAngle": 50.5555
        },
        "eop:acquisitionSubType": "DEFAULT",
        "eop:acquisitionType": {
            "@id": "eop:AcquisitionType/NOMINAL"
        },
        "eop:operationalMode": "IM",
        "eop:orbitDirection": {
            "@id": "eop:DESCENDING"
        },
        "eop:orbitNumber": 72287,
        "eop:wrsLatitudeGrid": "31",
        "eop:wrsLongitudeGrid": "191"
    },
    "eop:instrument": {
        "@id": "https://earth.esa.int/concept/tm",
        "eop:instrumentShortName": "TM",
        "eop:sensorType": {
            "@id": "eop:OPTICAL"
        }
    },
    "eop:platform": {
        "@id": "https://earth.esa.int/concept/landsat-5",
        "eop:platformSerialIdentifier": "5",
        "eop:platformShortName": "Landsat"
    }
},
"eop:parentIdentifier": "LANDSAT.TM.GTC",
"eop:productInformation": {
    "@type": "eop:ProductInformation",
    "eop:availabilityTime": "1997-10-03T09:26:32Z",
    "eop:cloudCover": 7,
    "eop:processingMode": "NOMINAL",
    "eop:productType": "TM_GTC_1P",
    "eop:qualityInformation": {
        "@type": "eop:QualityInformation",
        "eop:qualityDegradation": 0
    },
    "eop:referenceSystemIdentifier": {
        "@id": "http://www.opengis.net/def/crs/EPSG/0/4326"
    }
},
"eop:status": {

```

```
        "@id": "eop:ARCHIVED"
    }
}
```

D.1.3. Method 3 - Extending schema.org

Extending schema.org with additional types and properties requires extending the [data model](#) [<https://schema.org/docs/datamodel.html>] and its machine readable representation which is available at <https://schema.org/version/latest/schemaorg-current-https.rdf>.

Class Hierarchy

[Annex B.3 of OGC 17-003r2](#) [<https://docs.opengeospatial.org/is/17-003r2/17-003r2.html#80>] provides an RDF Schema model of the EO granule metadata and identifies the classes. A first step is to integrate classes for which no alternative exists in schema.org into the schema.org class hierarchy. The figures below illustrate how some of the classes from OGC 17-003r2 (orange) can be integrated in the inheritance structure of schema.org as subclasses of existing classes (green).

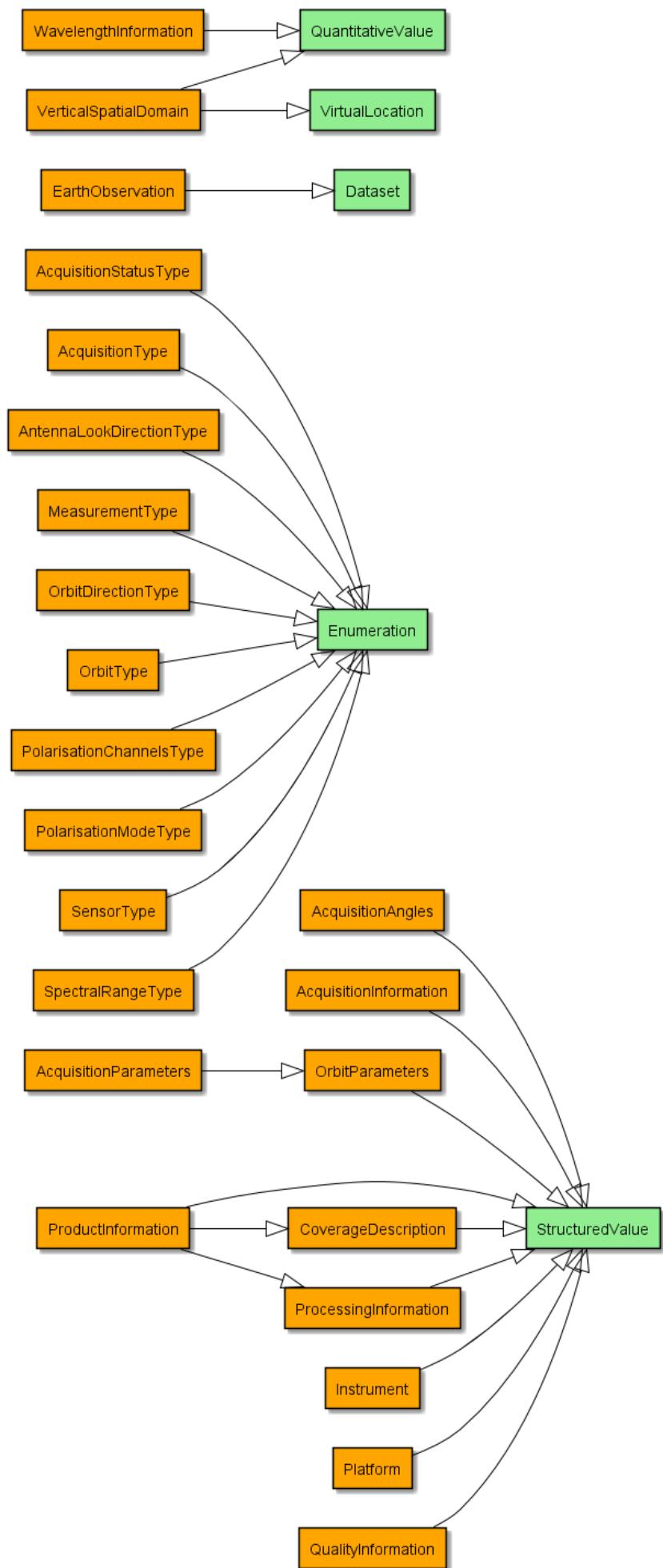


Figure 40. Subclasses hierarchy (Method 3)

The proposed extension to schema.org is included as [Appendix F: Schema.org Extension for EO](#). The additional classes and properties proposed are presented in [Chapter 7. EO Granules Encoding \(Extension\)](#).

Appendix E: Complete Examples

E.1. Collection

landsat-etm-gtc.json

```
{
  "@context": [
    "http://eovoc.spacebel.be/schema-org/docs/jsonldcontext.json",
    {
      "dbr": "http://dbpedia.org/resource/",
      "dbo": "http://dbpedia.org/ontology/"
    }
  ],
  "@type": "Dataset",
  "additionalType": [
    "http://purl.org/dc/dcmitype/Collection",
    "https://inspire.ec.europa.eu/metadata-codelist/ResourceType/series"
  ],
  "@id": "https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC",
  "name": "Landsat 7 ETM+ (Enhanced Thematic Mapper Plus) Geolocated Terrain Corrected Systematic processing",
  "alternateName": "LANDSAT.ETM.GTC",
  "url": "https://earth.esa.int/eogateway/catalog/landsat-7-etm-enhanced-thematic-mapper-plus-geolocated-terrain-corrected-systematic-processing",
  "identifier": [
    "LANDSAT.ETM.GTC",
    {
      "@id": "https://doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA",
      "@type": "PropertyValue",
      "propertyID": "https://registry.identifiers.org/registry/doi",
      "value": "doi:10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA",
      "url": "https://doi.org/10.5285/7BAF7407-2F15-406C-8F09-CB9DC10392AA"
    },
    {
      "@type": "PropertyValue",
      "propertyID": "https://idn.ceos.org/",
      "value": "C1532648148-ESA",
      "url": "https://search.earthdata.nasa.gov/portal/idn/search?q=C1532648148-ESA"
    }
  ],
  "description": "This dataset contains all the Landsat 7 Enhanced Thematic Mapper high-quality ortho-rectified L1T dataset over Kiruna, Maspalomas and Matera visibility masks.",
  "temporalCoverage": "1999-07-01T00:00:00Z/2003-12-31T00:00:00Z",
  "inLanguage": {
    "@type": "Language",
    "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
  }
}
```

```

    "name": "en"
},
"provider": {
    "@type": "Organization",
    "address": {
        "@type": "PostalAddress",
        "streetAddress": "Largo Galileo Galilei 1",
        "postalCode": "00044",
        "addressLocality": "Frascati (Roma)",
        "addressCountry": "Italy"
    },
    "telephone": "+3906941801",
    "name": "ESA/ESRIN",
    "url": "https://www.esa.int",
    "sameAs": [
        "https://gcmd.earthdata.nasa.gov/kms/concept/c56b4a86-82f8-4f15-98ba-c5f7abe8ee5a",
        "https://id.loc.gov/entities/providers/cb142baec50802a04f9e4edeb7bcce73",
        "https://dbpedia.org/resource/European_Space_Agency",
        "https://yago-knowledge.org/resource/European_Space_Agency",
        "http://bnb.data.bl.uk/id/agent/EuropeanSpaceAgency"
    ],
    "email": "eohelp@esa.int"
},
"spatialCoverage": {
    "@type": "Place",
    "geo": {
        "@type": "GeoShape",
        "polygon": "-90.0 -180.0 -90.0 180.0 90.0 180.0 90.0 -180.0 -90.0 -180.0"
    }
},
"hasPart":
"https://ergo.spacebel.be/collections/datasets/items?parentIdentifier=LANDSAT.ETM.GTC"
,
"license": {
    "description": "Utilisation of this data is subject to the Terms and Conditions for ESA's Third Party Missions scheme.",
    "url": "https://earth.esa.int/pi/esa?type=file&table=aotarget&cmd=image&alias=TPMterms",
    "@type": "CreativeWork"
},
"additionalProperty": [
{
    "@type": "PropertyValue",
    "propertyID": "https://earth.esa.int/eop-ext/orbitHeight",
    "unitText": "km",
    "value": "917"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/productType",

```

```

    "value": "ETM_GTC_1P"
},
{
    "@type": "PropertyValue",
    "propertyID": "https://earth.esa.int/eop-ext/swathWidth",
    "unitText": "km",
    "value": "185"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/wavelengthInformation",
    "value": "VIS (0.40 - 0.75 μm)"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/wavelengthInformation",
    "value": "NIR (0.75 - 1.30 μm)"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/wavelengthInformation",
    "value": "SWIR (1.3 - 3.0 μm)"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/wavelengthInformation",
    "value": "TIR (6.0 - 15.0 μnm)"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/orbitType",
    "value": "Sun-synchronous"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/processorVersion",
    "value": "3.03"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/resolution",
    "value": "High Resolution - HR (5 - 20 m)"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/eop/2.1/resolution",
    "value": "Medium Resolution - MR (20 - 500 m)"
}
],
"keywords": [
{

```

```

        "@type": "DefinedTerm",
        "@id": "http://inspire.ec.europa.eu/metadata-
codeList/TopicCategory/imageryBaseMapsEarthCover",
        "inDefinedTermSet": "http://inspire.ec.europa.eu/metadata-
codeList/TopicCategory",
        "name": "Imagery Base Maps Earth Cover"
    },
    {
        "@type": "DefinedTerm",
        "inDefinedTermSet":
"https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords",
        "@id": "https://gcmd.earthdata.nasa.gov/kms/concept/cb5cc628-a1b5-459e-
934f-881153a937b8",
        "name": "EARTH SCIENCE > LAND SURFACE > SURFACE RADIATIVE PROPERTIES"
    },
    {
        "@type": "DefinedTerm",
        "inDefinedTermSet":
"https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords",
        "@id": "https://gcmd.earthdata.nasa.gov/kms/concept/c7b5c02c-724d-4a19-
b824-98180f3900c9",
        "name": "EARTH SCIENCE > BIOSPHERE > VEGETATION"
    },
    {
        "@type": "DefinedTerm",
        "inDefinedTermSet":
"https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords",
        "@id": "https://gcmd.earthdata.nasa.gov/kms/concept/e5815f58-8232-4c7f-
b50d-ea71d73891a9",
        "name": "EARTH SCIENCE > LAND SURFACE > LAND USE/LAND COVER"
    },
    {
        "@type": "DefinedTerm",
        "@id": "https://www.eionet.europa.eu/gemet/en/inspire-theme/lu",
        "name": "land use"
    },
    {
        "@type": "DefinedTerm",
        "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-
topics",
        "@id": "https://earth.esa.int/concept/surface-radiative-properties",
        "name": "Surface Radiative Properties"
    },
    {
        "@type": "DefinedTerm",
        "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-
topics",
        "@id": "https://earth.esa.int/concept/vegetation",
        "name": "Vegetation"
    },
    {

```

```

    "@type": "DefinedTerm",
    "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-
topics",
    "@id": "https://earth.esa.int/concept/land-use-land-cover",
    "name": "Land Use and Land Cover"
},
{
    "@type": "DefinedTerm",
    "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/instruments",
    "@id": "https://earth.esa.int/concept/p-imaging-spectrometers-
radiometers",
    "name": "Imaging Spectrometers/Radiometers"
},
{
    "@type": "DefinedTerm",
    "@id": "https://earth.esa.int/concept/landsat-7",
    "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/platforms",
    "name": "Landsat-7"
},
{
    "@type": "DefinedTerm",
    "@id": "https://earth.esa.int/concept/etm",
    "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/instruments",
    "name": "ETM+"
},
"landsat",
"orthorectified",
"USGS",
{
    "@type": "DefinedTerm",
    "@id": "http://id.loc.gov/vocabulary/geographicAreas/e",
    "inDefinedTermSet":
"http://id.loc.gov/vocabulary/geographicAreas/MARC_GeographicArea",
    "name": "Europe"
},
{
    "@type": "DefinedTerm",
    "@id": "http://id.loc.gov/vocabulary/geographicAreas/ff",
    "inDefinedTermSet":
"http://id.loc.gov/vocabulary/geographicAreas/MARC_GeographicArea",
    "name": "North Africa"
},
{
    "@type": "DefinedTerm",
    "@id": "http://id.loc.gov/vocabulary/geographicAreas/aw",
    "inDefinedTermSet":
"http://id.loc.gov/vocabulary/geographicAreas/MARC_GeographicArea",
    "name": "Middle East"

```

```

},
{
  "@type": "DefinedTerm",
  "@id": "http://yago-knowledge.org/resource/Europe",
  "inDefinedTermSet": "http://yago-knowledge.org/resource/Region",
  "name": "Europe"
},
{
  "@type": "DefinedTerm",
  "@id": "http://yago-knowledge.org/resource/North_Africa",
  "inDefinedTermSet": "http://yago-knowledge.org/resource/Region",
  "name": "North Africa"
},
{
  "@type": "DefinedTerm",
  "@id": "http://yago-knowledge.org/resource/Middle_East",
  "inDefinedTermSet": "http://yago-knowledge.org/resource/Region",
  "name": "Middle East"
}
],
"potentialAction": [
  {
    "@type": "Action",
    "identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",
    "target": [
      {
        "@type": "EntryPoint",
        "identifier": "GetCapabilities",
        "contentType": [
          "application/xml"
        ],
        "urlTemplate":
        "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities",
        "httpMethod": "GET"
      },
      {
        "@type": "EntryPoint",
        "identifier": "DescribeCoverage",
        "contentType": [
          "application/xml"
        ],
        "urlTemplate":
        "https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE7_RGB",
        "httpMethod": "GET"
      }
    ]
  },
  {
    "@type": "SearchAction",
    "target": {

```

```

"@type": "EntryPoint",
"contentType": [
    "application/atom+xml",
    "application/json"
],
"urlTemplate":
"https://fedeo.esa.int/collections/datasets/items?parentIdentifier=LANDSAT.ETM.GTC&bbox
x={bbox}&startRecord={startIndex}&limit={limit}",
"description": "OpenSearch request template",
"httpMethod": "GET"
},
"query-input": [
{
    "@type": "PropertyValueSpecification",
    "valueName": "startIndex",
    "description": "Index of first result",
    "valueRequired": false,
    "valuePattern": "[0-9]+"
},
{
    "@type": "PropertyValueSpecification",
    "valueName": "limit",
    "description": "Number of results",
    "valueRequired": false,
    "valuePattern": "[0-9]+"
},
{
    "@type": "PropertyValueSpecification",
    "valueName": "bbox",
    "description": "Bounding box",
    "valueRequired": false,
    "valuePattern": "(-?[0-9]+([.][0-9]+)?)[, ]*(-?[0-9]+([.][0-9]+)?)[
]*(-?[0-9]+([.][0-9]+)?),[ ]*(-?[0-9]+([.][0-9]+)?)"
}
]
},
{
    "@type": "CreateAction",
    "instrument": [
        {
            "@type": [
                "DefinedTerm",
                "dbo:Scientific_instrument"
            ],
            "@id": "https://earth.esa.int/concept/etm",
            "sameAs": "http://gcmd.earthdata.nasa.gov/kms/concept/4dbe7764-
a2ea-4a19-b754-696c35ac3205",
            "name": "ETM+",
            "additionalType": "https://earth.esa.int/concept/p-imaging-
spectrometers-radiometers",
            "inDefinedTermSet": 

```

```

"https://earth.esa.int/concepts/concept_scheme/instruments"
    },
    {
        "@type": [
            "DefinedTerm",
            "dbo:Satellite"
        ],
        "@id": "https://earth.esa.int/concept/landsat-7",
        "sameAs": [
            "http://gcmd.earthdata.nasa.gov/kms/concept/c7a09e9f-3c99-
4b31-a521-313c379ba2b4",
            "http://dbpedia.org/resource/Landsat_7",
            "http://yago-knowledge.org/resource/Landsat_7"
        ],
        "name": "Landsat-7",
        "inDefinedTermSet":
    "https://earth.esa.int/concepts/concept_scheme/platforms",
        "subjectOf":
    "https://directory.eoportal.org/web/eoportal/satellite-missions/l/landsat-7"
    }
],
},
"subjectOf": [
{
    "@type": "ListItem",
    "dateCreated": "1999-07-01T00:00:00Z",
    "datePublished": "1999-07-01T00:00:00Z",
    "dateModified": "2019-07-17T00:00:00Z",
    "inLanguage": {
        "@type": "Language",
        "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
        "name": "en"
    },
    "encodingFormat": "application/vnd.iso.19139-2+xml"
},
{
    "@type": "DataDownload",
    "contentUrl":
"http://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/
vnd.iso.19139-2%2Bxml",
        "encodingFormat": "application/vnd.iso.19139-2+xml",
        "name": "ISO 19139-2 metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC/api?httpAccept=appli-
cation/opensearchdescription%2Bxml",
        "encodingFormat": "application/opensearchdescription+xml",

```

```

        "name": "OpenSearch Description Document",
        "additionalType": "http://www.iana.org/assignments/relation/search"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/atom%2Bxml",
            "encodingFormat": "application/atom+xml",
            "name": "Atom format",
            "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC",
            "encodingFormat": "application/geo+json",
            "name": "OGC 17-069r3 metadata",
            "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/json",
            "encodingFormat": "application/json",
            "name": "STAC metadata",
            "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/vnd.iso.19139%2Bxml",
            "encodingFormat": "application/vnd.iso.19139+xml",
            "name": "ISO 19139 metadata",
            "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/vnd.iso.19139-2%2Bxml",
            "encodingFormat": "application/vnd.iso.19139-2+xml",
            "name": "ISO 19139-2 metadata",
            "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/atom%2Bxml"

```

```

ion/iso19115%2Bxml",
    "encodingFormat": "application/iso19115+xml",
    "name": "ISO MENDS metadata",
    "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/vnd.iso.19115-3%2Bxml",
        "encodingFormat": "application/vnd.iso.19115-3+xml",
        "name": "ISO 19115-3 metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/xml",
        "encodingFormat": "application/xml",
        "name": "Dublin Core metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.ETM.GTC?httpAccept=application/dif10%2Bxml",
        "encodingFormat": "application/dif10+xml",
        "name": "DIF-10 metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
{
    "@type": "MediaObject",
    "contentUrl": "https://esatellus.servicenow.com/csp?id=esa_simple_request&sys_id=f27b38f9dbdff40e3cedb11ce961958",
        "name": "Get Help? - ESA Earth Observation User Services Portal",
        "encodingFormat": "text/html",
        "additionalType": "http://www.iana.org/assignments/relation/help"
}
],
"conditionsOfAccess": [
    "Data available on EO CAT https://eocat.esa.int/sec/#data-services-area/search?osParameters=%22EOCAT-LANDSAT.ETM.GTC%22%22,%22commonCriteria%22:%22bbox=-180,-90,180,90%22}",
        "Fast Registration with immediate access
https://earth.esa.int/FastRegistration/LS**_TM__GTC_AX-A",
            "TPM online access list https://tpm-ds.eo.esa.int/collections/",
            "Full Landsat 7 ETM+ Ground Terrain Corrected coverage 1999 - 2003 Online catalogue https://landsat-ds.eo.esa.int/"
]

```

E.2. Service and Application

goce-user-toolbox.json

```
{
  "@context": [
    "http://eovoc.spacebel.be/schema-org/docs/jsonldcontext.json",
    {
      "dbr": "http://dbpedia.org/resource/"
    }
  ],
  "@type": "CreativeWork",
  "additionalType": [
    "http://purl.org/dc/dcmitype/Service",
    "https://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"
  ],
  "@id": "https://fedeo.esa.int/collections/services/items/goce-user-toolbox",
  "name": "GOCE User Toolbox",
  "alternateName": [
    "goce-user-toolbox",
    "GUT"
  ],
  "url": "https://earth.esa.int/eogateway/tools/goce-user-toolbox",
  "identifier": "goce-user-toolbox",
  "description": "The GOCE User Toolbox (GUT) is a compilation of tools for the utilisation and analysis of GOCE products. GUT supports applications in Geodesy, Oceanography and Solid Earth Physics.",
  "inLanguage": {
    "@type": "Language",
    "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
    "name": "en"
  },
  "version": "3.2",
  "provider": {
    "@type": "Organization",
    "address": {
      "@type": "PostalAddress",
      "streetAddress": "Largo Galileo Galilei 1",
      "postalCode": "00044",
      "addressLocality": "Frascati (Roma)",
      "addressCountry": "Italy"
    },
    "telephone": "+3906941801",
    "name": "ESA/ESRIN",
    "url": "https://www.esa.int",
    "sameAs": [
      "https://gcmd.earthdata.nasa.gov/kms/concept/c56b4a86-82f8-4f15-98ba-"
    ]
  }
}
```

```

    "https://id.loc.gov/entities/providers/cb142baec50802a04f9e4edeb7bcce73",
    "https://dbpedia.org/resource/European_Space_Agency",
    "https://yago-knowledge.org/resource/European_Space_Agency",
    "http://bnb.data.bl.uk/id/agent/EuropeanSpaceAgency"
],
  "email": "eohelp@esa.int"
},
"keywords": [
{
  "@type": "DefinedTerm",
  "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-
topics",
  "@id": "https://earth.esa.int/concept/gravity-gravitational-field",
  "name": "Gravity and Gravitational Field"
},
{
  "@type": "DefinedTerm",
  "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-
topics",
  "@id": "https://earth.esa.int/concept/solid-earth",
  "name": "Solid Earth"
},
{
  "@type": "DefinedTerm",
  "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/earth-
topics",
  "@id": "https://earth.esa.int/concept/oceans",
  "name": "Oceans"
},
{
  "@type": "DefinedTerm",
  "@id": "https://earth.esa.int/concept/goce",
  "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/platforms",
  "name": "GOCE"
},
{
  "@type": "DefinedTerm",
  "@id": "https://earth.esa.int/concept/egg",
  "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/instruments",
  "name": "EGG"
},
{
  "@type": "DefinedTerm",
  "@id": "https://earth.esa.int/concept/ssti",
  "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/instruments",
  "name": "SSTI"
}
]

```

```

    "@type": "DefinedTerm",
    "@id": "https://earth.esa.int/concept/analysis",
    "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/tools",
    "name": "Analysis"
},
{
    "@type": "DefinedTerm",
    "@id": "https://earth.esa.int/concept/processing",
    "inDefinedTermSet": "https://earth.esa.int/concepts/concept_scheme/tools",
    "name": "Processing"
}
],
"subjectOf": [
{
    "@type": "ListItem",
    "dateCreated": "2009-04-15T00:00:00Z",
    "datePublished": "2014-04-28T00:00:00Z",
    "dateModified": "2014-04-28T00:00:00Z",
    "inLanguage": {
        "@type": "Language",
        "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
        "name": "en"
    },
    "encodingFormat": "application/vnd.iso.19139-2+xml"
},
{
    "@type": "MediaObject",
    "contentUrl": "https://earth.esa.int/eogateway/gut-registration",
    "name": "GUT download",
    "additionalType": "http://www.iana.org/assignments/relation/enclosure"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://earth.esa.int/c/document_library/get_file?folderId=15547&name=DLFE-205.pdf",
    "name": "GOCE User Toolbox and Tutorial",
    "additionalType": "http://www.iana.org/assignments/relation/describedby"
}
]
}

```

goce-user-toolbox.rdf

```

<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:schema1="https://schema.org/"
>
  <schema1:CreativeWork
    rdf:about="https://fedeo.esa.int/collections/services/items/goce-user-toolbox">
    <schema1:keywords>

```

```

<schema:DefinedTerm rdf:about="https://earth.esa.int/concept/analysis">
    <schema:inDefinedTermSet
        rdf:resource="https://earth.esa.int/concepts/concept_scheme/tools"/>
        <schema:name>Analysis</schema:name>
    </schema:DefinedTerm>
</schema:keywords>
<schema:version>3.2</schema:version>
<schema:keywords>
    <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/gravity-
gravitational-field">
        <schema:inDefinedTermSet
            rdf:resource="https://earth.esa.int/concepts/concept_scheme/earth-topics"/>
            <schema:name>Gravity and Gravitational Field</schema:name>
        </schema:DefinedTerm>
    </schema:keywords>
    <schema:keywords>
        <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/goce">
            <schema:inDefinedTermSet
                rdf:resource="https://earth.esa.int/concepts/concept_scheme/platforms"/>
                <schema:name>GOCE</schema:name>
            </schema:DefinedTerm>
        </schema:keywords>
        <schema:keywords>
            <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/solid-earth">
                <schema:inDefinedTermSet
                    rdf:resource="https://earth.esa.int/concepts/concept_scheme/earth-topics"/>
                    <schema:name>Solid Earth</schema:name>
                </schema:DefinedTerm>
            </schema:keywords>
            <schema:provider>
                <schema:Organization rdf:nodeID="N172fd1dff2b443eaa3b3b0a89324bdfe">
                    <schema:telephone>+3906941801</schema:telephone>
                    <schema:url rdf:resource="https://www.esa.int/">
                    <schema:sameAs rdf:resource="https://yago-
knowledge.org/resource/European_Space_Agency"/>
                    <schema:name>ESA/ESRIN</schema:name>
                    <schema:sameAs
                        rdf:resource="https://gcmd.earthdata.nasa.gov/kms/concept/c56b4a86-82f8-4f15-98ba-
c5f7abe8ee5a"/>
                    <schema:sameAs
                        rdf:resource="https://id.loc.gov/entities/providers/cb142baec50802a04f9e4edeb7bcce73"/
                    >
                    <schema:email>eohelp@esa.int</schema:email>
                    <schema:sameAs
                        rdf:resource="https://dbpedia.org/resource/European_Space_Agency"/>
                    <schema:address>
                        <schema:PostalAddress rdf:nodeID="N861bf1d193e5421b984643d7daf5b5d6">
                            <schema:addressLocality>Frascati (Roma)</schema:addressLocality>
                            <schema:postalCode>00044</schema:postalCode>
                            <schema:streetAddress>Largo Galileo Galilei 1</schema:streetAddress>
                            <schema:addressCountry>Italy</schema:addressCountry>

```

```

        </schema:PostalAddress>
    </schema:address>
    <schema:sameAs
rdf:resource="http://bnb.data.bl.uk/id/agent/EuropeanSpaceAgency"/>
        </schema:Organization>
    </schema:provider>
    <schema:keywords>
        <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/egg">
            <schema:name>EGG</schema:name>
            <schema:inDefinedTermSet
rdf:resource="https://earth.esa.int/concepts/concept_scheme/instruments"/>
            </schema:DefinedTerm>
        </schema:keywords>
        <schema:subjectOf>
            <schema:MediaObject rdf:nodeID="N1b848feb3f2443e8cbe12da201bce8b">
                <schema:contentUrl rdf:resource="https://earth.esa.int/eogateway/gut-
registration"/>
                <schema:name>GUT download</schema:name>
                <schema:additionalType
rdf:resource="http://www.iana.org/assignments/relation/enclosure"/>
                </schema:MediaObject>
            </schema:subjectOf>
            <schema:inLanguage>
                <schema:Language rdf:about="http://id.loc.gov/vocabulary/iso639-1/en">
                    <schema:name>en</schema:name>
                </schema:Language>
            </schema:inLanguage>
            <schema:keywords>
                <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/oceans">
                    <schema:inDefinedTermSet
rdf:resource="https://earth.esa.int/concepts/concept_scheme/earth-topics"/>
                    <schema:name>Oceans</schema:name>
                    </schema:DefinedTerm>
                </schema:keywords>
                <schema:name>GOCE User Toolbox</schema:name>
                <schema:url rdf:resource="https://earth.esa.int/eogateway/tools/goce-user-
toolbox"/>
                <schema:additionalType rdf:resource="http://purl.org/dc/dcmitype/Service"/>
                <schema:description>The GOCE User Toolbox (GUT) is a compilation of tools for the
utilisation and analysis of GOCE products. GUT supports applications in Geodesy,
Oceanography and Solid Earth Physics.</schema:description>
                <schema:alternateName>GUT</schema:alternateName>
                <schema:subjectOf>
                    <schema:ListItem rdf:nodeID="N8358f5a9310d4de78fdf1175465041e1">
                        <schema:dateCreated rdf:datatype="https://schema.org/Date">2009-04-
15T00:00:00Z</schema:dateCreated>
                        <schema:datePublished rdf:datatype="https://schema.org/Date">2014-04-
28T00:00:00Z</schema:datePublished>
                        <schema:encodingFormat>application/vnd.iso.19139-2+xml</schema:encodingFormat>
                        <schema:dateModified rdf:datatype="https://schema.org/Date">2014-04-
28T00:00:00Z</schema:dateModified>

```

```

    <schema:inLanguage rdf:resource="http://id.loc.gov/vocabulary/iso639-1/en"/>
  </schema:ListItem>
</schema:subjectOf>
<schema:keywords>
  <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/processing">
    <schema:inDefinedTermSet
      rdf:resource="https://earth.esa.int/concepts/concept_scheme/tools"/>
      <schema:name>Processing</schema:name>
    </schema:DefinedTerm>
  </schema:keywords>
<schema:subjectOf>
  <schema:MediaObject rdf:nodeID="N9b965316b1af4fde9d94bbab10b22b3f">
    <schema:additionalType
      rdf:resource="http://www.iana.org/assignments/relation/describedby"/>
      <schema:name>GOCE User Toolbox and Tutorial</schema:name>
      <schema:contentUrl
        rdf:resource="https://earth.esa.int/c/document_library/get_file?folderId=15547&name=DLFE-205.pdf"/>
      </schema:MediaObject>
    </schema:subjectOf>
<schema:keywords>
  <schema:DefinedTerm rdf:about="https://earth.esa.int/concept/ssti">
    <schema:name>SSTI</schema:name>
    <schema:inDefinedTermSet
      rdf:resource="https://earth.esa.int/concepts/concept_scheme/instruments"/>
      </schema:DefinedTerm>
    </schema:keywords>
    <schema:alternateName>goce-user-toolbox</schema:alternateName>
    <schema:identifier>goce-user-toolbox</schema:identifier>
    <schema:additionalType rdf:resource="https://inspire.ec.europa.eu/metadata-codelist/ResourceType/service"/>
    </schema:CreativeWork>
  </schema:Keywords>
</rdf:RDF>
```

E.3. Granule

landsat-tm-gtc-product-granule.json

```
{
  "@context": [
    "http://eovoc.spacebel.be/schema-org/docs/jsonldcontext.json",
    {
      "dbr": "http://dbpedia.org/resource/"
    }
  ],
  "@type": "Dataset",
  "additionalType": [
    "http://purl.org/dc/dcmitype/Dataset",
    "https://inspire.ec.europa.eu/metadata-codelist/ResourceType/dataset"
  ],
}
```

```

"@id": "https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "name": "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "isPartOf": {
    "@type": "Dataset",
    "url": "https://earth.esa.int/eogateway/catalog/landsat-5-thematic-mapper-geolocated-terrain-corrected-systematic-processing",
    "@id": "https://ergo.spacebel.be/collections/series/items/LANDSAT.TM.GTC"
  },
  "description": "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "identifier": "LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570",
  "dateModified": "2020-09-29T11:07:54Z",
  "dateCreated": "1997-10-03T09:26:32Z",
  "temporalCoverage": "1997-10-03T09:26:03Z/1997-10-03T09:26:32Z",
  "spatialCoverage": {
    "@type": "Place",
    "geo": {
      "@type": "GeoShape",
      "polygon": "42.7006 10.7552 40.7378 10.8827 40.8026 13.5779 42.7699 13.5338 42.7006 10.7552",
      "box": "40.7378 10.7552 42.7699 13.5779"
    },
    "geoContains": [
      {
        "@type": "LakeBodyOfWater",
        "@id": "http://dbpedia.org/resource/Lake_Bracciano"
      },
      {
        "@type": "City",
        "@id": "http://dbpedia.org/resource/Rome"
      },
      {
        "@type": "City",
        "@id": "http://dbpedia.org/resource/Frascati"
      },
      {
        "@type": "Airport",
        "@id": "http://dbpedia.org/resource/Leonardo_da_Vinci-Fiumicino_Airport"
      },
      {
        "@type": "Airport",
        "@id": "http://dbpedia.org/resource/Ciampino-G._B._Pastine_International_Airport"
      }
    ],
    "additionalProperty": {

```

```

    "@type": [
        "PropertyValue",
        "dbr:Spatial_reference_system"
    ],
    "@id": "https://epsg.io/4326"
}
},
"image": "http://landsat-
ds.eo.esa.int/metadata/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.BP.PNG",
"thumbnailUrl": "http://landsat-
ds.eo.esa.int/metadata/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.BP.PNG",
"additionalProperty": [
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/productType",
    "value": "TM__GTC_1P"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/cloudCover",
    "value": "7"
},
{
    "@type": "PropertyValue",
    "propertyID": "http://www.opengis.net/ont/eo-geojson/1.0/processingMode",
    "value": "NOMINAL"
}
],
"encoding": {
    "@type": "MediaObject",
    "contentUrl": "http://landsat-
ds.eo.esa.int/products/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.ZIP",
    "encodingFormat": "application/x-binary",
    "contentSize": "123249764"
},
"potentialAction": [
{
    "@type": "Action",
    "identifier": "http://www.opengis.net/spec/owc-geojson/1.0/req/wcs",
    "target": [
        {
            "@type": "EntryPoint",
            "identifier": "GetCapabilities",
            "contentType": [
                "application/xml"
            ],
            "urlTemplate":
"https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCapabilities",

```

```

        "httpMethod": "GET"
    },
    {
        "@type": "EntryPoint",
        "identifier": "DescribeCoverage",
        "contentType": [
            "application/xml"
        ],
        "urlTemplate":
"https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0
.0&CoverageId=LE5_RGB",
            "httpMethod": "GET"
        },
        {
            "@type": "EntryPoint",
            "identifier": "GetCoverage",
            "contentType": [
                "image/tiff"
            ],
            "urlTemplate":
"https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCoverage&version=2.0.0&co
verageID=LE5_RGB&subset=N(4073780,4276990)&subset=E(1075520,1357790)&subset=unix(%2219
97-10-03T09:26:03Z%22,%221997-10-03T09:26:32Z%22)&format=image/tiff",
            "httpMethod": "GET"
        }
    ]
},
{
    "@type": "CreateAction",
    "instrument": [
        {
            "@type": [
                "DefinedTerm",
                "dbr:Scientific_instrument"
            ],
            "@id": "https://earth.esa.int/concept/tm",
            "sameAs": [
                "http://gcmd.earthdata.nasa.gov/kms/concept/bfc07fb2-ca22-
48e6-8171-84527b0faae7",
                "dbr:Thematic_Mapper"
            ],
            "name": "TM",
            "inDefinedTermSet":
"https://earth.esa.int/concepts/concept_scheme/instruments"
        },
        {
            "@type": [
                "DefinedTerm",
                "dbr:Satellite"
            ],
            "@id": "https://earth.esa.int/concept/landsat-5",

```

```

        "sameAs": [
            "http://gcmd.earthdata.nasa.gov/kms/concept/fe920fff-7852-
42cf-b1dc-b2223b24cf2e",
            "http://dbpedia.org/resource/Landsat_5"
        ],
        "name": "Landsat-5",
        "inDefinedTermSet": [
            {
                "name": "Landsat-5"
            }
        ],
        "keywords": [
            {
                "@type": "DefinedTerm",
                "@id": "https://earth.esa.int/concept/landsat-5",
                "inDefinedTermSet": [
                    {
                        "name": "Landsat-5"
                    },
                    {
                        "@type": "DefinedTerm",
                        "@id": "https://earth.esa.int/concept/tm",
                        "inDefinedTermSet": [
                            {
                                "name": "TM"
                            },
                            {
                                "@type": "DefinedTerm",
                                "@id": "http://yago-knowledge.org/resource/Europe",
                                "inDefinedTermSet": "http://yago-knowledge.org/resource/Region",
                                "name": "Europe"
                            },
                            {
                                "@type": "DefinedTerm",
                                "@id": "http://yago-knowledge.org/resource/Italy",
                                "inDefinedTermSet": "https://schema.org/Country",
                                "name": "Italy"
                            },
                            {
                                "@type": "DefinedTerm",
                                "@id": "http://data.europa.eu/nuts/code/IT",
                                "inDefinedTermSet": "http://data.europa.eu/nuts",
                                "name": "ITALIA"
                            },
                            {
                                "@type": "DefinedTerm",
                                "@id": "http://yago-knowledge.org/resource/Frascati",
                                "inDefinedTermSet": "https://schema.org/AdministrativeArea",
                                "name": "Frascati"
                            }
                        ]
                    }
                ]
            }
        ]
    }
}

```

```

{
    "@type": "DefinedTerm",
    "@id": "http://yago-knowledge.org/resource/Lake_Bracciano",
    "inDefinedTermSet": "https://schema.org/LakeBodyOfWater",
    "name": "Lake Bracciano"
}
],
"subjectOf": [
{
    "@type": "ListItem",
    "dateModified": "2020-09-29T11:07:54Z",
    "inLanguage": {
        "@type": "Language",
        "@id": "http://id.loc.gov/vocabulary/iso639-1/en",
        "name": "en"
    },
    "encodingFormat":
"application/gml+xml;profile=\"http://www.opengis.net/spec/EOMPOM/1.1\""
},
{
    "@type": "MediaObject",
    "contentUrl": "http://landsat-
ds.eo.esa.int/products/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.ZIP",
    "encodingFormat": "application/x-binary",
    "name": "Download",
    "additionalType": "http://www.iana.org/assignments/relation/enclosure"
},
{
    "@type": "MediaObject",
    "contentUrl": "http://landsat-
ds.eo.esa.int/metadata/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.BP.PNG",
    "encodingFormat": "image/png",
    "name": "Quicklook",
    "additionalType": "http://www.iana.org/assignments/relation/icon"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092
603_19971003T092632_072287_0191_0031_2570?httpAccept=application/atom%2Bxml",
    "encodingFormat": "application/atom+xml",
    "name": "application/atom+xml",
    "additionalType": "http://www.iana.org/assignments/relation/alternate"
},
{
    "@type": "MediaObject",
    "contentUrl":
"https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092
603_19971003T092632_072287_0191_0031_2570",

```

```

        "encodingFormat": "application/geo+json",
        "name": "OGC 17-069r3 metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092
603_19971003T092632_072287_0191_0031_2570?httpAccept=application/geo%2Bjson;profile=\"
https://stacspec.org\"",
        "encodingFormat": "application/geo+json;profile=\"https://stacspec.org\"",
        "name": "STAC metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092
603_19971003T092632_072287_0191_0031_2570?httpAccept=application/gml%2Bxml",
        "encodingFormat":
"application/gml+xml;profile=\"http://www.opengis.net/spec/EOMPOM/1.1\",
        "name": "OGC 10-157r4 metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092
603_19971003T092632_072287_0191_0031_2570?httpAccept=application/gml%2Bxml&recordSchem
a=om10",
        "encodingFormat":
"application/gml+xml;profile=\"http://www.opengis.net/spec/EOMPOM/1.0\",
        "name": "OGC 10-157r3 metadata",
        "additionalType": "http://www.iana.org/assignments/relation/alternate"
    },
    {
        "@type": "MediaObject",
        "contentUrl":
"https://ergo.spacebel.be/collections/series/items/LANDSAT.TM.GTC?mode=owc",
        "name": "OGC 17-084r1 metadata",
        "encodingFormat": "application/geo+json",
        "additionalType": "http://www.iana.org/assignments/relation/up"
    }
]
}

```

landsat-tm-gtc-product-granule.rdf

```

<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF
    xmlns:dbr="http://dbpedia.org/resource/"

```

```

xmlns:schema1="https://schema.org/"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
>
<schema1:PropertyValue rdf:about="https://epsg.io/4326">
  <rdf:type rdf:resource="http://dbpedia.org/resource/Spatial_reference_system"/>
</schema1:PropertyValue>
<schema1:Dataset
rdf:about="https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570">
  <schema1:thumbnailUrl rdf:resource="http://landsat-
ds.eo.esa.int/metadata/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570.BP.PNG"/>
  <schema1:subjectOf>
    <schema1:MediaObject rdf:nodeID="N7b5f9b41b17d4896b4331b555bfe2d12">
      <schema1:contentUrl
rdf:resource="https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570"/>
      <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/alternate"/>
      <schema1:encodingFormat>application/geo+json</schema1:encodingFormat>
      <schema1:name>OGC 17-069r3 metadata</schema1:name>
    </schema1:MediaObject>
  </schema1:subjectOf>
  <schema1:subjectOf>
    <schema1:MediaObject rdf:nodeID="N9b5cbb2a51064c94b56aea495dbd215">
      <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/alternate"/>

<schema1:encodingFormat>application/gml+xml;profile="http://www.opengis.net/spec/EOMPO
M/1.1"</schema1:encodingFormat>
    <schema1:name>OGC 10-157r4 metadata</schema1:name>
    <schema1:contentUrl
rdf:resource="https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570?httpAccept=application/gml%2Bxml"/>
    </schema1:MediaObject>
  </schema1:subjectOf>
  <schema1:subjectOf>
    <schema1:MediaObject rdf:nodeID="Nb8c52f346484a78a310e13a6f8b0c72">
      <schema1:contentUrl
rdf:resource='https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_2570?httpAccept=application/geo%2Bjson;profile="https://stacspec.org"'/>
      <schema1:name>STAC metadata</schema1:name>

<schema1:encodingFormat>application/geo+json;profile="https://stacspec.org"</schema1:encodingFormat>
      <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/alternate"/>
    </schema1:MediaObject>
  </schema1:subjectOf>

```

```

<schema1:subjectOf>
  <schema1:MediaObject rdf:nodeID="N776b49f58d164882a34571a10c6b7f45">
    <schema1:contentUrl rdf:resource="http://landsat-
ds.eo.esa.int/metadata/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.BP.PNG"/>
    <schema1:name>Quicklook</schema1:name>
    <schema1:encodingFormat>image/png</schema1:encodingFormat>
    <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/icon"/>
    </schema1:MediaObject>
  </schema1:subjectOf>
  <schema1:keywords>
    <schema1:DefinedTerm rdf:about="http://yago-knowledge.org/resource/Frascati">
      <schema1:name>Frascati</schema1:name>
      <schema1:inDefinedTermSet
rdf:resource="https://schema.org/AdministrativeArea"/>
      </schema1:DefinedTerm>
    </schema1:keywords>
    <schema1:image rdf:resource="http://landsat-
ds.eo.esa.int/metadata/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.BP.PNG"/>
    <schema1:subjectOf>
      <schema1:MediaObject rdf:nodeID="N311bdee4af0e428397c5957fc2ea56cc">
        <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/enclosure"/>
        <schema1:encodingFormat>application/x-binary</schema1:encodingFormat>
        <schema1:contentUrl rdf:resource="http://landsat-
ds.eo.esa.int/products/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.ZIP"/>
        <schema1:name>Download</schema1:name>
      </schema1:MediaObject>
    </schema1:subjectOf>
    <schema1:encoding>
      <schema1:MediaObject rdf:nodeID="N0a3ac6df23564596b4a182652f3403d9">
        <schema1:contentUrl rdf:resource="http://landsat-
ds.eo.esa.int/products/LANDSAT/1997/10/03/LS05_RFUI_TM__GTC_1P_19971003T092603_1997100
3T092632_072287_0191_0031_2570.ZIP"/>
        <schema1:encodingFormat>application/x-binary</schema1:encodingFormat>
        <schema1:ContentSize>123249764</schema1:ContentSize>
      </schema1:MediaObject>
    </schema1:encoding>

    <schema1:name>LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0031_25
70</schema1:name>
    <schema1:subjectOf>
      <schema1:ListItem rdf:nodeID="Nd8309bbc407a443880982a2e32189fa8">
        <schema1:inLanguage rdf:resource="http://id.loc.gov/vocabulary/iso639-1/en"/>

        <schema1:encodingFormat>application/gml+xml;profile="http://www.opengis.net/spec/EOMPO
M/1.1"</schema1:encodingFormat>
        <schema1:dateModified rdf:datatype="https://schema.org>Date">2020-09-

```

```

29T11:07:54Z</schema1:dateModified>
    </schema1:ListItem>
    </schema1:subjectOf>
    <schema1:additionalType rdf:resource="http://purl.org/dc/dcmitype/Dataset"/>
    <schema1:additionalProperty>
        <schema1:PropertyValue rdf:nodeID="N1ad4d7d1e2684fc5865ff11c8c4f6d7e">
            <schema1:value>TM__GTC_1P</schema1:value>
            <schema1:propertyID>http://www.opengis.net/ont/eo-
geojson/1.0/productType</schema1:propertyID>
        </schema1:PropertyValue>
    </schema1:additionalProperty>
    <schema1:additionalProperty>
        <schema1:PropertyValue rdf:nodeID="N501a54fd7e054d47b7bb450a1748a89a">
            <schema1:value>7</schema1:value>
            <schema1:propertyID>http://www.opengis.net/ont/eo-
geojson/1.0/cloudCover</schema1:propertyID>
        </schema1:PropertyValue>
    </schema1:additionalProperty>
    <schema1:keywords>
        <dbr:Scientific_instrument rdf:about="https://earth.esa.int/concept/tm">
            <schema1:name>TM</schema1:name>
            <schema1:sameAs
rdf:resource="http://gcmd.earthdata.nasa.gov/kms/concept/bfc07fb2-ca22-48e6-8171-
84527b0faae7"/>
            <schema1:inDefinedTermSet
rdf:resource="https://earth.esa.int/concepts/concept_scheme/instruments"/>
            <schema1:sameAs rdf:resource="http://dbpedia.org/resource/Thematic_Mapper"/>
            <rdf:type rdf:resource="https://schema.org/DefinedTerm"/>
        </dbr:Scientific_instrument>
    </schema1:keywords>
    <schema1:keywords>
        <schema1:DefinedTerm rdf:about="http://yago-
knowledge.org/resource/Lake_Bracciano">
            <schema1:name>Lake Bracciano</schema1:name>
            <schema1:inDefinedTermSet rdf:resource="https://schema.org/LakeBodyOfWater"/>
        </schema1:DefinedTerm>
    </schema1:keywords>

<schema1:description>LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_
0031_2570</schema1:description>
    <schema1:spatialCoverage>
        <schema1:Place rdf:nodeID="N6cfcc6c5add11460787e1f6ed1dbdfc01">
            <schema1:geoContains rdf:resource="http://dbpedia.org/resource/Ciampino-
G._B._Pastine_International_Airport"/>
            <schema1:geoContains rdf:resource="http://dbpedia.org/resource/Frascati"/>
            <schema1:geoContains
rdf:resource="http://dbpedia.org/resource/Leonardo_da_Vinci-Fiumicino_Airport"/>
        <schema1:geo>
            <schema1:GeoShape rdf:nodeID="Nafbecc4f62b14f1e8b3a414293795a8f">
                <schema1:box>40.7378 10.7552 42.7699 13.5779</schema1:box>
                <schema1:polygon>42.7006 10.7552 40.7378 10.8827 40.8026 13.5779

```

```

42.7699 13.5338 42.7006 10.7552</schema1:polygon>
    </schema1:GeoShape>
</schema1:geo>
<schema1:geoContains rdf:resource="http://dbpedia.org/resource/Rome"/>
<schema1:additionalProperty rdf:resource="https://epsg.io/4326"/>
<schema1:geoContains
rdf:resource="http://dbpedia.org/resource/Lake_Bracciano"/>
    </schema1:Place>
</schema1:spatialCoverage>
<schema1:keywords>
    <schema1:DefinedTerm rdf:about="http://yago-knowledge.org/resource/Italy">
        <schema1:inDefinedTermSet rdf:resource="https://schema.org/Country"/>
        <schema1:name>Italy</schema1:name>
    </schema1:DefinedTerm>
</schema1:keywords>
<schema1:subjectOf>
    <schema1:MediaObject rdf:nodeID="N06ba1be360414974905d8f6113a7ea61">
        <schema1:name>OGC 17-084r1 metadata</schema1:name>
        <schema1:encodingFormat>application/geo+json</schema1:encodingFormat>
        <schema1:contentUrl
rdf:resource="https://ergo.spacebel.be/collections/series/items/LANDSAT.TM.GTC?mode=ow
c"/>
        <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/up"/>
    </schema1:MediaObject>
</schema1:subjectOf>

<schema1:identifier>LS05_RFUI_TM__GTC_1P_19971003T092603_19971003T092632_072287_0191_0
031_2570</schema1:identifier>
<schema1:temporal>1997-10-03T09:26:03Z/1997-10-03T09:26:32Z</schema1:temporal>
<schema1:dateModified rdf:datatype="https://schema.org>Date">2020-09-
29T11:07:54Z</schema1:dateModified>
<schema1:keywords>
    <schema1:DefinedTerm rdf:about="http://yago-knowledge.org/resource/Europe">
        <schema1:name>Europe</schema1:name>
        <schema1:inDefinedTermSet rdf:resource="http://yago-
knowledge.org/resource/Region"/>
    </schema1:DefinedTerm>
</schema1:keywords>
<schema1:additionalProperty>
    <schema1:PropertyValue rdf:nodeID="N274831d747d64645b9cb53dc8ee14c72">
        <schema1:value>NOMINAL</schema1:value>
        <schema1:propertyID>http://www.opengis.net/ont/eo-
geojson/1.0/processingMode</schema1:propertyID>
    </schema1:PropertyValue>
</schema1:additionalProperty>
<schema1:isPartOf>
    <schema1:Dataset
rdf:about="https://ergo.spacebel.be/collections/series/items/LANDSAT.TM.GTC">
        <schema1:url rdf:resource="https://earth.esa.int/eogateway/catalog/landsat-5-
thematic-mapper-geolocated-terrain-corrected-systematic-processing"/>

```

```

    </schema1:Dataset>
    </schema1:isPartOf>
    <schema1:subjectOf>
        <schema1:MediaObject rdf:nodeID="Ncb817c7784e1470dbdd4fd33977fa9b0">

<schema1:encodingFormat>application/gml+xml;profile="http://www.opengis.net/spec/EOMPO
M/1.0"</schema1:encodingFormat>
    <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/alternate"/>
        <schema1:name>OGC 10-157r3 metadata</schema1:name>
        <schema1:contentUrl
rdf:resource="https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P
_19971003T092603_19971003T092632_072287_0191_0031_2570?httpAccept=application/gml%2Bxm
l&recordSchema=om10"/>
        </schema1:MediaObject>
    </schema1:subjectOf>
    <schema1:additionalType rdf:resource="https://inspire.ec.europa.eu/metadata-
codeList/ResourceType/dataset"/>
        <schema1:keywords>
            <schema1:DefinedTerm rdf:about="http://data.europa.eu/nuts/code/IT">
                <schema1:name>ITALIA</schema1:name>
                <schema1:inDefinedTermSet rdf:resource="http://data.europa.eu/nuts"/>
            </schema1:DefinedTerm>
        </schema1:keywords>
        <schema1:subjectOf>
            <schema1:MediaObject rdf:nodeID="N323171f49a3d4eeeada6aba71bb56b50">
                <schema1:additionalType
rdf:resource="http://www.iana.org/assignments/relation/alternate"/>
                <schema1:contentUrl
rdf:resource="https://ergo.spacebel.be/collections/datasets/items/LS05_RFUI_TM__GTC_1P
_19971003T092603_19971003T092632_072287_0191_0031_2570?httpAccept=application/atom%2Bx
ml"/>
                <schema1:name>application/atom+xml</schema1:name>
                <schema1:encodingFormat>application/atom+xml</schema1:encodingFormat>
            </schema1:MediaObject>
        </schema1:subjectOf>
        <schema1:potentialAction>
            <schema1:Action rdf:nodeID="Nc147aee31636419486bf01b50e878190">
                <schema1:target>
                    <schema1:EntryPoint rdf:nodeID="N440ae263e2f643d6be1f021fea03706e">
                        <schema1:contentType>application/xml</schema1:contentType>
                        <schema1:identifier>GetCapabilities</schema1:identifier>
                        <schema1:httpMethod>GET</schema1:httpMethod>

<schema1:urlTemplate>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetC
apabilities</schema1:urlTemplate>
                    </schema1:EntryPoint>
                </schema1:target>
                <schema1:identifier>http://www.opengis.net/spec/owc-
geojson/1.0/req/wcs</schema1:identifier>
                <schema1:target>

```

```

<schema1:EntryPoint rdf:nodeID="N0d87d3cf34da4cad9a74a22a05a41c52">
    <schema1:httpMethod>GET</schema1:httpMethod>
    <schema1:identifier>GetCoverage</schema1:identifier>
    <schema1:contentType>image/tiff</schema1:contentType>

<schema1:urlTemplate>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=GetCoverage&version=2.0.0&coverageID=LE5_RGB&subset=N(4073780,4276990)&subset=E(1075520,1357790)&subset=unix(%221997-10-03T09:26:03Z%22,%221997-10-03T09:26:32Z%22)&format=image/tiff</schema1:urlTemplate>
    </schema1:EntryPoint>
</schema1:target>
<schema1:target>
    <schema1:EntryPoint rdf:nodeID="Nfeb2af5a10b94368ac72db2e2c80f8a0">
        <schema1:identifier>DescribeCoverage</schema1:identifier>
        <schema1:httpMethod>GET</schema1:httpMethod>

<schema1:urlTemplate>https://datacube.pdgs.eo.esa.int/wcs?service=WCS&Request=DescribeCoverage&version=2.0.0&CoverageId=LE5_RGB</schema1:urlTemplate>
    <schema1:contentType>application/xml</schema1:contentType>
    </schema1:EntryPoint>
</schema1:target>
</schema1:Action>
</schema1:potentialAction>
<schema1:potentialAction>
    <schema1>CreateAction rdf:nodeID="N96da050a9412481381d3a0b716c958b8">
        <schema1:instrument rdf:resource="https://earth.esa.int/concept/landsat-5"/>
        <schema1:instrument rdf:resource="https://earth.esa.int/concept/tm"/>
    </schema1>CreateAction>
</schema1:potentialAction>
<schema1:dateCreated rdf:datatype="https://schema.org/Date">1997-10-03T09:26:32Z</schema1:dateCreated>
<schema1:keywords>
    <schema1:DefinedTerm rdf:about="https://earth.esa.int/concept/landsat-5">
        <schema1:sameAs
            rdf:resource="http://gcmd.earthdata.nasa.gov/kms/concept/fe920fff-7852-42cf-b1dc-b2223b24cf2e"/>
            <schema1:name>Landsat-5</schema1:name>
            <schema1:inDefinedTermSet
                rdf:resource="https://earth.esa.int/concepts/concept_scheme/platforms"/>
                <schema1:sameAs rdf:resource="http://dbpedia.org/resource/Landsat_5"/>
                <rdf:type rdf:resource="http://dbpedia.org/resource/Satellite"/>
            </schema1:DefinedTerm>
        </schema1:keywords>
    </schema1:Dataset>
    <schema1:Language rdf:about="http://id.loc.gov/vocabulary/iso639-1/en">
        <schema1:name>en</schema1:name>
    </schema1:Language>
    <schema1:Airport rdf:about="http://dbpedia.org/resource/Ciampino-G._B._Pastine_International_Airport"/>
    <schema1:City rdf:about="http://dbpedia.org/resource/Frascati"/>
    <schema1:Airport rdf:about="http://dbpedia.org/resource/Leonardo_da_Vinci-"

```

```
Fiumicino_Airport"/>
<schema1:LakeBodyOfWater rdf:about="http://dbpedia.org/resource/Lake_Bracciano"/>
<schema1:City rdf:about="http://dbpedia.org/resource/Rome"/>
</rdf:RDF>
```

E.4. Article

```
{  
    "@context": "https://schema.org/",  
    "@type": "Article",  
    "@id": "https://doi.org/10.1080/01431160601024200",  
    "identifier": {  
        "@id": "https://doi.org/10.1080/01431160601024200",  
        "@type": "PropertyValue",  
        "propertyID": "https://registry.identifiers.org/registry/doi",  
        "value": "doi:10.1080/01431160601024200",  
        "url": "https://doi.org/10.1080/01431160601024200"  
    },  
    "name": "A new vegetation index derived from the pattern decomposition method  
    applied to Landsat-7/ETM+ images in Mongolia",  
    "description": "The goal of this study was to estimate vegetation coverage and map  
    the land cover in an experimental field (60x60 km) near Mandalgobi, Mongolia using  
    Landsat 7/ETM+ data for ground truthing in the Advanced Earth Observing Satellite II  
    (ADEOS-II) Mongolian ...",  
    "about": {  
        "@type": "Dataset",  
        "@id": "https://fedeo.esa.int/collections/series/items/LANDSAT.ETM.GTC"  
    },  
    "isPartOf": "International Journal of Remote Sensing",  
    "datePublished": "2007-08-20",  
    "url": [  
  
        "https://www.tandfonline.com/action/fedSearchRedirect?doi=10.1080%2F01431160601024200"  
,  
        "https://doi.org/10.1080/01431160601024200"  
    ],  
    "contributor": [  
        "Muramatsu, K",  
        "Xiong, Y",  
        "Nakayama, S",  
        "Ochiai, F",  
        "Daigo, M",  
        "Hirata, M",  
        "Oishi, K",  
        "Bolortsetseg, B",  
        "Oyunbaatar, D",  
        "Kaihotsu, I"  
    ]  
}
```

Appendix F: Schema.org Extension for EO

eovoc-schema.rdf

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:schema="https://schema.org/"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">

  >

  <!-- §7.1 EarthObservation -->

  <rdfs:Class rdf:about="https://schema.org/EarthObservation">
    <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/geojson/1.0/EarthObservation"/>
    <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <rdfs:label>EarthObservation</rdfs:label>
    <rdfs:subClassOf rdf:resource="https://schema.org/Dataset"/>
    <rdfs:comment>Earth Observation granule or product as defined in OGC 10-157r4 and OGC 17-003r2.</rdfs:comment>
  </rdfs:Class>

  <!-- §7.1 Properties -->

  <rdf:Property rdf:about="https://schema.org/acquisitionInformation">
    <schema:rangeIncludes rdf:resource="https://schema.org/AcquisitionInformation"/>
    <schema:isPartOf rdf:resource="http://eo.schema.org"/>
    <rdfs:comment>Acquisition information related to the dataset.</rdfs:comment>
    <rdfs:label>acquisitionInformation</rdfs:label>
    <schema:domainIncludes rdf:resource="https://schema.org/EarthObservation"/>
    <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/geojson/1.0/acquisitionInformation"/>
    <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html#44"/>
  </rdf:Property>

  <rdf:Property rdf:about="https://schema.org/productInformation">
    <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <schema:domainIncludes rdf:resource="https://schema.org/EarthObservation"/>
    <rdfs:comment>Product information related to the dataset.</rdfs:comment>
    <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/geojson/1.0/productInformation"/>
```

```

<schema:isPartOf rdf:resource="http://eo.schema.org"/>
<rdfs:label>productInformation</rdfs:label>
<schema:rangeIncludes rdf:resource="https://schema.org/ProductInformation"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/acquisitionStatus">
  <schema:domainIncludes rdf:resource="https://schema.org/EarthObservation"/>
  <rdfs:label>acquisitionStatus</rdfs:label>
  <schema:isPartOf rdf:resource="http://eo.schema.org"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/AcquisitionStatusType"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/status"/>
  <rdfs:comment>Refers to product status.

```

Fixed Values :

- ARCHIVED
- ACQUIRED
- CANCELLED
- FAILED
- PLANNED
- POTENTIAL
- REJECTED
- QUALITYDEGRADED.</rdfs:comment>

```

<rdfs:Class rdf:about="https://schema.org/AcquisitionStatusType">
  <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/statusType"/>
  <schema:isPartOf rdf:resource="http://eo.schema.org"/>
  <rdfs:comment>Enumeration of acquisition status constants.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
  <rdfs:label>AcquisitionStatusType</rdfs:label>
</rdfs:Class>

```

```

<schema:AcquisitionStatusType rdf:about="https://schema.org/ARCHIVED">
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
  <rdfs:label>ARCHIVED</rdfs:label>
</schema:AcquisitionStatusType>

```

```

<schema:AcquisitionStatusType rdf:about="https://schema.org/ACQUIRED">
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
  <rdfs:label>ACQUIRED</rdfs:label>
</schema:AcquisitionStatusType>

```

```

<schema:AcquisitionStatusType rdf:about="https://schema.org/POTENTIAL">
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
  <rdfs:label>POTENTIAL</rdfs:label>
</schema:AcquisitionStatusType>

```

```

<schema:AcquisitionStatusType rdf:about="https://schema.org/CANCELLED">
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
  <rdfs:label>CANCELLED</rdfs:label>
</schema:AcquisitionStatusType>

<schema:AcquisitionStatusType rdf:about="https://schema.org/FAILED">
  <rdfs:label>FAILED</rdfs:label>
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
</schema:AcquisitionStatusType>

<schema:AcquisitionStatusType rdf:about="https://schema.org/REJECTED">
  <rdfs:label>REJECTED</rdfs:label>
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
</schema:AcquisitionStatusType>

<schema:AcquisitionStatusType rdf:about="https://schema.org/PLANNED">
  <rdfs:label>PLANNED</rdfs:label>
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
</schema:AcquisitionStatusType>

<schema:AcquisitionStatusType rdf:about="https://schema.org/QUALITYDEGRADED">
  <rdfs:label>QUALITYDEGRADED</rdfs:label>
  <rdfs:comment>Acquisition status constant.</rdfs:comment>
</schema:AcquisitionStatusType>

<!-- §7.3 DataIdentification --&gt;

&lt;rdf:Property rdf:about="https://schema.org/parentIdentifier"&gt;
  &lt;schema:rangeIncludes rdf:resource="https://schema.org/Text"/&gt;
  &lt;schema:rangeIncludes rdf:resource="https://schema.org/URL"/&gt;
  &lt;!-- added 05/07/2021 --&gt;
  &lt;rdfs:subPropertyOf rdf:resource="https://schema.org/isPartOf"/&gt;
  &lt;schema:isPartOf rdf:resource="http://eo.schema.org"/&gt;
  &lt;dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/&gt;
  &lt;schema:domainIncludes rdf:resource="https://schema.org/EarthObservation"/&gt;
  &lt;rdfs:comment&gt;Collection the granule belongs to.&lt;/rdfs:comment&gt;
  &lt;rdfs:label&gt;parentIdentifier&lt;/rdfs:label&gt;
&lt;/rdf:Property&gt;

&lt;!-- added 05/07/2021 --&gt;
&lt;rdf:Property rdf:about="https://schema.org/available"&gt;
  &lt;rdfs:label&gt;available&lt;/rdfs:label&gt;
  &lt;schema:rangeIncludes rdf:resource="https://schema.org/DateTime"/&gt;
  &lt;schema:rangeIncludes rdf:resource="https://schema.org/Text"/&gt;
  &lt;rdfs:comment&gt;Date range during which the resource will be available ISO</pre>

```

```

8601.</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/EarthObservation"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
    <owl:equivalentProperty rdf:resource="http://purl.org/dc/terms/available"/>
</rdf:Property>

<!-- §7.4.2 VerticalSpatialDomain -->

<rdfs:Class rdf:about="https://schema.org/VerticalSpatialDomain">
  <rdfs:comment>Contains the properties related to the spatial extent in the
vertical dimension. Its properties are inherited by the AcquisitionParameters object.

  UnitText used to express minValue (lowestLocation) and maxValue (highestLocation)
  should be meter (m) or bar (bar). Default is meter (m).</rdfs:comment>
  <rdfs:subClassOf rdf:resource="https://schema.org/QuantitativeValue"/>
  <rdfs:subClassOf rdf:resource="https://schema.org/VirtualLocation"/> <!-- can be
in range of location property -->
  <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/VerticalSpatialDomain"/>
  <schema:isPartOf rdf:resource="http://eo.schema.org"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>VerticalSpatialDomain</rdfs:label>
</rdfs:Class>

<!-- §7.4.3 OrbitParameters -->

<rdfs:Class rdf:about="https://schema.org/OrbitParameters">
  <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>
  <rdfs:label>OrbitParameters</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/OrbitParameters"/>
  <schema:isPartOf rdf:resource="http://eo.schema.org"/>
  <rdfs:comment>Contains the properties related to the orbit. Its properties are
inherited by the AcquisitionParameters object.</rdfs:comment>
</rdfs:Class>

<rdf:Property rdf:about="https://schema.org/orbitDirection">
  <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/orbitDirection"/>
  <rdfs:comment>Product information related to the dataset.</rdfs:comment>
  <rdfs:comment>Acquisition orbit direction at the start of the acquisition/product.
Values:
  □ ASCENDING
  □ DESCENDING</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
```

```

003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/OrbitDirectionType"/>
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
  <rdfs:label>orbitDirection</rdfs:label>
  <schema:isPartOf rdf:resource="http://eo.schema.org"/>
</rdf:Property>

<rdfs:Class rdf:about="https://schema.org/OrbitDirectionType">
  <rdfs:comment>Enumeration of orbit direction constants.</rdfs:comment>
  <rdfs:label>OrbitDirectionType</rdfs:label>
  <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
  <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/geojson/1.0/OrbitDirectionType"/>
  <schema:isPartOf rdf:resource="http://eo.schema.org"/>
</rdfs:Class>

<schema:OrbitDirectionType rdf:about="https://schema.org/ASCENDING">
  <rdfs:label>ASCENDING</rdfs:label>
  <rdfs:comment>Orbit direction constant.</rdfs:comment>
</schema:OrbitDirectionType>

<schema:OrbitDirectionType rdf:about="https://schema.org/DESCENDING">
  <rdfs:comment>Orbit direction constant.</rdfs:comment>
  <rdfs:label>DESCENDING</rdfs:label>
</schema:OrbitDirectionType>

<rdf:Property rdf:about="https://schema.org/lastOrbitDirection">
  <rdfs:comment>Acquisition orbit direction at the end of the acquisition/product.
Assumed to be identical to orbitDirection if not present.
Values:
  □ ASCENDING
  □ DESCENDING</rdfs:comment>
  <rdfs:label>lastOrbitDirection</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/OrbitDirectionType"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/orbitDuration">
  <rdfs:comment>Actual orbit duration in ISO 8601 duration format (range is
TBD).</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
  <rdfs:subPropertyOf rdf:resource="https://schema.org/duration"/>
  <rdfs:label>orbitDuration</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Duration"/>

```

```

</rdf:Property>

<rdf:Property rdf:about="https://schema.org/orbitNumber">
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:label>orbitNumber</rdfs:label>
  <rdfs:comment>Acquisition orbit number.</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/Integer"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/lastOrbitNumber">
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
  <rdfs:label>lastOrbitNumber</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Integer"/>
  <rdfs:comment>Acquisition last orbit number.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/ascendingNodeDate">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/DateTime"/>
  <rdfs:label>ascendingNodeDate</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
  <rdfs:comment>UTC date and time at ascending node of orbit.</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/ascendingNodeLongitude">
  <rdfs:subPropertyOf rdf:resource="https://schema.org/longitude"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <rdfs:label>ascendingNodeLongitude</rdfs:label>
  <rdfs:comment>Longitude at ascending node of orbit. Should be expressed in degrees.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <schema:domainIncludes rdf:resource="https://schema.org/OrbitParameters"/>
</rdf:Property>

<!-- §7.5 Temporal Information -->
<!-- Covered by existing properties. -->
<!-- §7.6 AcquisitionInformation -->

```

```

<rdfs:Class rdf:about="https://schema.org/AcquisitionInformation">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html#44"/>
  <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/AcquisitionInformation"/>
  <rdfs:label>AcquisitionInformation</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Acquisition information of the Earth Observation as defined in OGC
17-003r2.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>
</rdfs:Class>

<rdf:Property rdf:about="https://schema.org/platform">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionInformation"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Platform"/>
  <rdfs:label>platform</rdfs:label>
  <rdfs:comment>The Platform used for the acquisition. If more than one platform is
used for creating the product, then the AcquisitionInformation object occurs more than
once.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<!-- 05/07/2021: renamed instrument as already defined in schema.org -->
<rdf:Property rdf:about="https://schema.org/sensor">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>sensor</rdfs:label>
  <rdfs:comment>The Instrument/Sensor used for the acquisition.
If more than one instrument is used for creating the product, then the
AcquisitionInformation object occurs more than once.</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionInformation"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Instrument"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/acquisitionParameters">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionInformation"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>acquisitionParameters</rdfs:label>
  <rdfs:comment>The acquisition parameters (i.e. pointing angles,
etc.).</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
</rdf:Property>

<!-- §7.6.1 Platform -->

<rdfs:Class rdf:about="https://schema.org/Platform">

```

```

<rdfs:subClassOf rdf:resource="https://schema.org/Vehicle"/>
<!-- <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/> -->
<rdfs:seeAlso
rdf:resource="https://gcmdservices.gsfc.nasa.gov/static/kms/platforms/platforms.rdf"/>
<rdfs:label>Platform</rdfs:label>
<rdfs:comment>Platform (satellite) that was used to perform the observation. Use as "id" the URI defined by ESA or GCMD to identify the platform.</rdfs:comment>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
</rdfs:Class>

<!-- platformShortName --> schema:name (inherited) -->

<rdf:Property rdf:about="https://schema.org/serialNumber">
<!-- platformSerialIdentifier -->
<schema:domainIncludes rdf:resource="https://schema.org/Platform"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/orbitType">
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
<owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/geojson/1.0/orbitType"/>
<schema:rangeIncludes rdf:resource="https://schema.org/OrbitType"/>
<rdfs:comment>High level characterisation of main mission types taken from a codeList.</rdfs:comment>
<schema:domainIncludes rdf:resource="https://schema.org/Platform"/>
<rdfs:label>orbitType</rdfs:label>
</rdf:Property>

<rdfs:Class rdf:about="https://schema.org/OrbitType">
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
<rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
<rdfs:label>OrbitType</rdfs:label>
<rdfs:comment>Enumeration of orbitType constants.</rdfs:comment>
</rdfs:Class>

<schema:OrbitType rdf:about="https://schema.org/LEO">
<rdfs:label>LEO</rdfs:label>
<rdfs:comment>Orbit type constant.</rdfs:comment>
</schema:OrbitType>

<schema:OrbitType rdf:about="https://schema.org/GEO">
<rdfs:label>GEO</rdfs:label>
<rdfs:comment>Orbit type constant.</rdfs:comment>
</schema:OrbitType>

<!-- §7.6.2 Instrument -->

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```

<rdfs:Class rdf:about="https://schema.org/Instrument">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <rdfs:label>Instrument</rdfs:label>
    <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>
      <rdfs:comment>Contains the properties of the instrument that was used to perform the observation. Use as "id" the URI defined by GCMD to identify the instrument. A list of URI can be downloaded from https://gcmdservices.gsfc.nasa.gov/static/kms/instruments/instruments.rdf.</rdfs:comment>
    </rdfs:Class>

    <!-- instrumentShortName -> schema:name (inherited) -->

    <!-- description -> schema:description (inherited) -->

<rdf:Property rdf:about="https://schema.org/sensorType">
  <schema:rangeIncludes rdf:resource="https://schema.org/SensorType"/>
  <schema:domainIncludes rdf:resource="https://schema.org/Instrument"/>
  <rdfs:label>sensorType</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <rdfs:comment>Sensor type based on codelist.</rdfs:comment>
  </rdf:Property>

  <rdfs:Class rdf:about="https://schema.org/SensorType">
    <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
    <rdfs:label>SensorType</rdfs:label>
    <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
      <rdfs:comment>Enumeration of sensorType constants.</rdfs:comment>
    </rdfs:Class>

  <schema:SensorType rdf:about="https://schema.org/OPTICAL">
    <rdfs:comment>Sensor type constant.</rdfs:comment>
    <rdfs:label>OPTICAL</rdfs:label>
  </schema:SensorType>

  <schema:SensorType rdf:about="https://schema.org/ATMOSPHERIC">
    <rdfs:comment>Sensor type constant.</rdfs:comment>
    <rdfs:label>ATMOSPHERIC</rdfs:label>
  </schema:SensorType>

  <schema:SensorType rdf:about="https://schema.org/ALTIMETRIC">
    <rdfs:comment>Sensor type constant.</rdfs:comment>
    <rdfs:label>ALTIMETRIC</rdfs:label>
  </schema:SensorType>

  <schema:SensorType rdf:about="https://schema.org/LIMB">

```

```

<rdfs:comment>Sensor type constant.</rdfs:comment>
<rdfs:label>LIMB</rdfs:label>
</schema:SensorType>

<schema:SensorType rdf:about="https://schema.org/RADAR">
  <rdfs:label>RADAR</rdfs:label>
  <rdfs:comment>Sensor type constant.</rdfs:comment>
</schema:SensorType>

<!-- §7.6.3 WavelengthInformation --&gt;

&lt;rdfs:Class rdf:about="https://schema.org/WavelengthInformation"&gt;
  &lt;rdfs:label&gt;WavelengthInformation&lt;/rdfs:label&gt;
  &lt;rdfs:comment&gt;Properties of the instrument related to the wavelengths used for the
observation.&lt;/rdfs:comment&gt;
  &lt;rdfs:subClassOf rdf:resource="https://schema.org/QuantitativeValue"/&gt;
  &lt;dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/&gt;
&lt;/rdfs:Class&gt;

<!-- discreteWavelength -&gt; value --&gt;
&lt;!--
&lt;rdf:Property rdf:about="https://schema.org/discreteWavelength"&gt;
  &lt;schema:rangeIncludes rdf:resource="https://schema.org/Number"/&gt;
  &lt;schema:domainIncludes rdf:resource="https://schema.org/WavelengthInformation"/&gt;
  &lt;rdfs:label&gt;discreteWavelengths&lt;/rdfs:label&gt;
  &lt;rdfs:comment&gt;Discrete wavelength observed in the product. Unit of measure is SI
base unit (m) without prefix.&lt;/rdfs:comment&gt;
  &lt;dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/&gt;
&lt;/rdf:Property&gt;
--&gt;

&lt;!-- startWavelength -&gt; minValue --&gt;
&lt;!-- endWavelength -&gt; maxValue --&gt;

&lt;!--
&lt;rdf:Property rdf:about="https://schema.org/startWavelength"&gt;
  &lt;schema:domainIncludes rdf:resource="https://schema.org/WavelengthInformation"/&gt;
  &lt;rdfs:comment&gt;Start of the observed wavelength range. Unit of measure is SI base
unit (m) without prefix.&lt;/rdfs:comment&gt;
  &lt;dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/&gt;
  &lt;rdfs:label&gt;startWavelength&lt;/rdfs:label&gt;
  &lt;schema:rangeIncludes rdf:resource="https://schema.org/Number"/&gt;
&lt;/rdf:Property&gt;

&lt;rdf:Property rdf:about="https://schema.org/endWavelength"&gt;
  &lt;rdfs:comment&gt;End of the observed wavelength range. Unit of measure is SI base
unit (m) without prefix.&lt;/rdfs:comment&gt;
</pre>

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<rdfs:label>endWavelength</rdfs:label>
<schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:domainIncludes rdf:resource="https://schema.org/WavelengthInformation"/>
</rdf:Property>
-->

<rdf:Property rdf:about="https://schema.org/spectralRange">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
    <schema:domainIncludes rdf:resource="https://schema.org/WavelengthInformation"/>
    <rdfs:comment>The observed Spectral Range.</rdfs:comment>
    <rdfs:label>spectralRange</rdfs:label>
    <schema:rangeIncludes rdf:resource="https://schema.org/SpectralRangeType"/>
    <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/wavelengthResolution">
  <rdfs:comment>Spacing between consecutive wavelengths. Unit of measure is SI
base unit (m) without prefix.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <rdfs:label>wavelengthResolution</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/WavelengthInformation"/>
</rdf:Property>

<rdfs:Class rdf:about="https://schema.org/SpectralRangeType">
  <rdfs:comment>Enumeration of spectralRangeType constants.</rdfs:comment>
  <rdfs:label>SpectralRangeType</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
</rdfs:Class>

<schema:SpectralRangeType rdf:about="https://schema.org/INFRARED">
  <rdfs:comment>SpectralRange type constant.</rdfs:comment>
  <rdfs:label>INFRARED</rdfs:label>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/SWIR">
  <rdfs:comment>SpectralRange type constant for Short Wavelength Infrared
(SWIR).</rdfs:comment>
  <rdfs:label>SWIR</rdfs:label>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/VISIBLE">
  <rdfs:label>VISIBLE</rdfs:label>
  <rdfs:comment>SpectralRange type constant.</rdfs:comment>

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</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/LWIR">
  <rdfs:label>LWIR</rdfs:label>
  <rdfs:comment>SpectralRange type constant for Long Wavelength Infrared (LWIR).</rdfs:comment>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/NIR">
  <rdfs:comment>SpectralRange type constant for Near Infrared (NIR).</rdfs:comment>
  <rdfs:label>NIR</rdfs:label>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/FIR">
  <rdfs:label>FIR</rdfs:label>
  <rdfs:comment>SpectralRange type constant for Far Infrared (FIR).</rdfs:comment>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/UV">
  <rdfs:label>UV</rdfs:label>
  <rdfs:comment>SpectralRange type constant for Ultraviolet (UV).</rdfs:comment>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/MWIR">
  <rdfs:label>MWIR</rdfs:label>
  <rdfs:comment>SpectralRange type constant for Mid Wavelength Infrared (MWIR).</rdfs:comment>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/MICROWAVE">
  <rdfs:comment>SpectralRange type constant.</rdfs:comment>
  <rdfs:label>MICROWAVE</rdfs:label>
</schema:SpectralRangeType>

<schema:SpectralRangeType rdf:about="https://schema.org/SR_OTHER">
  <rdfs:comment>SpectralRange type constant.</rdfs:comment>
  <rdfs:label>OTHER</rdfs:label>
</schema:SpectralRangeType>

<!-- §7.6.4 AcquisitionParameters -->

<rdfs:Class rdf:about="https://schema.org/AcquisitionParameters">
  <!-- <rdfs:subClassOf rdf:resource="https://schema.org/VerticalSpatialDomain"/>
-->
  <rdfs:comment>Contains the properties related to the acquisition of the data.</rdfs:comment>
  <rdfs:label>AcquisitionParameters</rdfs:label>
  <rdfs:subClassOf rdf:resource="https://schema.org/OrbitParameters"/>
</rdfs:Class>
```

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<rdf:Property rdf:about="https://schema.org/location">
  <!-- <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/> -->
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/acquisitionType">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:label>acquisitionType</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/AcquisitionType"/>
  <rdfs:comment>AcquisitionType can be one of:
    - NOMINAL
    - CALIBRATION
    - OTHER.</rdfs:comment>
    <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
</rdf:Property>

<rdfs:Class rdf:about="https://schema.org/AcquisitionType">
  <rdfs:label>AcquisitionType</rdfs:label>
  <rdfs:comment>Enumeration of acquisitionType constants.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
</rdfs:Class>

<schema:AcquisitionType rdf:about="https://schema.org/NOMINAL">
  <rdfs:label>NOMINAL</rdfs:label>
  <rdfs:comment>Acquisition type constant.</rdfs:comment>
</schema:AcquisitionType>

<schema:AcquisitionType rdf:about="https://schema.org/CALIBRATION">
  <rdfs:label>CALIBRATION</rdfs:label>
  <rdfs:comment>Acquisition type constant.</rdfs:comment>
</schema:AcquisitionType>

<schema:AcquisitionType rdf:about="https://schema.org/ACQ_OTHER">
  <rdfs:comment>Acquisition type constant.</rdfs:comment>
  <rdfs:label>OTHER</rdfs:label>
</schema:AcquisitionType>

<rdf:Property rdf:about="https://schema.org/acquisitionSubType">
  <rdfs:comment>The broad value defined by the acquisitionType is too restrictive, so mission specific type definition should refer to mission/ground segment dedicated codeSpace.</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>

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<rdfs:label>acquisitionSubType</rdfs:label>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/startTimeFromAscendingNode">
  <rdfs:label>startTimeFromAscendingNode</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Integer"/>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <rdfs:comment>Start time of acquisition in milliseconds from ascending node
date.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/completionTimeFromAscendingNode">
  <rdfs:label>completionTimeFromAscendingNode</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <rdfs:comment>Stop time of acquisition in milliseconds from ascending node
date.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Integer"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/relativeOrbitNumber">
  <rdfs:comment>Orbit number since start of cycle.</rdfs:comment>
  <rdfs:label>relativeOrbitNumber</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Integer"/>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/wrsLongitudeGrid">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>wrsLongitudeGrid</rdfs:label>
  <rdfs:comment>Neutral wrsLongitudeGrid equivalent to track in track/frame, K in
K/J, etc.</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/wrsLatitudeGrid">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>

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<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:comment>Neutral wrsLatitudeGrid equivalent to frame in track/frame, J in K/J, etc.</rdfs:comment>
    <rdfs:label>wrsLatitudeGrid</rdfs:label>
    <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  </rdf:Property>

  <rdf:Property rdf:about="https://schema.org/	tileId">
    <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
    <rdfs:comment>While track/frame can be used to represent the first part of an MGRS coordinate (i.g. grid zone), the tileSize identifies e.g. the second part of an MGRS coordinate (square identification), e.g. in case of Sentinel. Used when the world reference system coordinates can not be expressed in X/Y (Track/Frame) terms, such has for UTM tiles. (used for Sentinel-2 L1C granules).</rdfs:comment>
      <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
        <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
        <rdfs:label>tileSize</rdfs:label>
      </rdf:Property>

      <rdf:Property rdf:about="https://schema.org/groundTrackUncertainty">
        <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
        <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
          <rdfs:label>groundTrackUncertainty</rdfs:label>
          <rdfs:comment>Measure of the uncertainty of the ground track. Sometimes known as deadband e.g. 1000m (1Km) deadband. Unit of measure is SI base unit (m) without prefix.</rdfs:comment>
            <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
          </rdf:Property>

          <rdf:Property rdf:about="https://schema.org/cycleNumber">
            <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
            <rdfs:label>cycleNumber</rdfs:label>
            <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
              <rdfs:comment>Number of Cycles.</rdfs:comment>
              <schema:rangeIncludes rdf:resource="https://schema.org/Integer"/>
            </rdf:Property>

            <rdf:Property rdf:about="https://schema.org/antennaLookDirection">
              <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
                <rdfs:comment>Look direction of antenna taken from codelist Values:</rdfs:comment>

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- LEFT
- RIGHT.</rdfs:comment>
 <rdfs:label>antennaLookDirection</rdfs:label>
 <schema:rangeIncludes rdf:resource="https://schema.org/AntennaLookDirectionType"/>
 <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
 </rdf:Property>

 <rdfs:Class rdf:about="https://schema.org/AntennaLookDirectionType">
 <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
 <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
 <rdfs:comment>Enumeration of antennaLookDirectionType constants.</rdfs:comment>
 <rdfs:label>AntennaLookDirectionType</rdfs:label>
 </rdfs:Class>

 <schema:AntennaLookDirectionType rdf:about="https://schema.org/LEFT">
 <rdfs:comment>Antenna look direction constant.</rdfs:comment>
 <rdfs:label>LEFT</rdfs:label>
 </schema:AntennaLookDirectionType>

 <schema:AntennaLookDirectionType rdf:about="https://schema.org/RIGHT">
 <rdfs:label>RIGHT</rdfs:label>
 <rdfs:comment>Antenna look direction constant.</rdfs:comment>
 </schema:AntennaLookDirectionType>

 <rdf:Property rdf:about="https://schema.org/acquisitionStation">
 <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
 <rdfs:label>acquisitionStation</rdfs:label>
 <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
 <rdfs:comment>Acquisition / receiving station code. Possible values are mission specific and should be retrieved using codespace.</rdfs:comment>
 <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
 </rdf:Property>

 <rdf:Property rdf:about="https://schema.org/acquisitionAngles">
 <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
 <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
 <rdfs:comment>Acquisition angles.</rdfs:comment>
 <schema:rangeIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
 <rdfs:label>acquisitionAngles</rdfs:label>
 </rdf:Property>

 <rdf:Property rdf:about="https://schema.org/operationalMode">
 <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
 <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
 <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-

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003r2.html"/>
  <rdfs:label>operationalMode</rdfs:label>
  <rdfs:comment>Sensor mode. Possible values are mission specific.</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/swathIdentifier">
  <rdfs:label>swathIdentifier</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <rdfs:comment>Swath identifier (e.g. Envisat ASAR has 7 distinct swaths
(I1,I2,I3...I7) that correspond to precise incidence angles for the
sensor).</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/polarisationMode">
  <schema:rangeIncludes rdf:resource="https://schema.org/PolarisationModeType"/>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>polarisationMode</rdfs:label>
  <rdfs:comment>Polarisation mode taken from codelist:
S (for single),
D (for dual),
T (for twin),
Q (for quad),
UNDEFINED.</rdfs:comment>
</rdf:Property>

<rdfs:Class rdf:about="https://schema.org/PolarisationModeType">
  <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
  <rdfs:comment>Enumeration of polarisationMode constants.</rdfs:comment>
  <rdfs:label>PolarisationModeType</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdfs:Class>

<schema:PolarisationModeType rdf:about="https://schema.org/Q">
  <rdfs:label>Q</rdfs:label>
  <rdfs:comment>Polarisation mode constant (Quad).</rdfs:comment>
</schema:PolarisationModeType>

<schema:PolarisationModeType rdf:about="https://schema.org/S">
  <rdfs:label>S</rdfs:label>
  <rdfs:comment>Polarisation mode constant (Single).</rdfs:comment>
</schema:PolarisationModeType>

<schema:PolarisationModeType rdf:about="https://schema.org/D">
```

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<rdfs:label>D</rdfs:label>
<rdfs:comment>Polarisation mode constant (Dual).</rdfs:comment>
</schema:PolarisationModeType>

<schema:PolarisationModeType rdf:about="https://schema.org/T">
  <rdfs:label>T</rdfs:label>
  <rdfs:comment>Polarisation mode constant (Twin).</rdfs:comment>
</schema:PolarisationModeType>

<schema:PolarisationModeType rdf:about="https://schema.org/PM_UNDEFINED">
  <rdfs:comment>Polarisation mode constant.</rdfs:comment>
  <rdfs:label>UNDEFINED</rdfs:label>
</schema:PolarisationModeType>

<rdf:Property rdf:about="https://schema.org/polarisationChannels">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
  <rdfs:comment>Polarisation channel transmit/receive configuration.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/PolarisationChannelsType"/>
  <rdfs:label>polarisationChannels</rdfs:label>
</rdf:Property>

<rdfs:Class rdf:about="https://schema.org/PolarisationChannelsType">
  <rdfs:label>PolarisationChannelsType</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
  <rdfs:comment>Enumeration of polarisationChannels constants.</rdfs:comment>
</rdfs:Class>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HH_VV">
  <rdfs:label>HH_VV</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HH_VH">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>HH_VH</rdfs:label>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/VH_VV">
  <rdfs:label>VH_VV</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HH">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>HH</rdfs:label>

```

```

</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/VH">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>VH</rdfs:label>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/VV_HV">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>VV_HV</rdfs:label>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HH_HV">
  <rdfs:label>HH_HV</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/VV_VH">
  <rdfs:label>VV_VH</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/VH_HV">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>VH_HV</rdfs:label>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HH_HV_VH_VV">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>HH_HV_VH_VV</rdfs:label>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HV_VH">
  <rdfs:label>HV_VH</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/HV">
  <rdfs:label>HV</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/VV">
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
  <rdfs:label>VV</rdfs:label>
</schema:PolarisationChannelsType>

<schema:PolarisationChannelsType rdf:about="https://schema.org/PC_UNDEFINED">
  <rdfs:label>UNDEFINED</rdfs:label>
  <rdfs:comment>Polarisation channel constant.</rdfs:comment>
</schema:PolarisationChannelsType>

```

```

<rdf:Property rdf:about="https://schema.org/resolution">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <rdfs:comment>Sensor resolution. Unit of measure is SI base unit (m) without prefix.</rdfs:comment>
    <rdfs:label>resolution</rdfs:label>
    <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
    <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  </rdf:Property>

  <rdf:Property rdf:about="https://schema.org/verticalResolution">
    <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
      <rdfs:comment>lmb: Vertical spacing of data (if regular)  
atm: Full width at half maximum of the rows of the vertical averaging kernel matrix  
Unit of measure is SI base unit (m) without prefix.</rdfs:comment>
      <rdfs:label>verticalResolution</rdfs:label>
      <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
      <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
    </rdf:Property>

    <rdf:Property rdf:about="https://schema.org/wavelengths">
      <rdfs:label>wavelengths</rdfs:label>
      <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
        <rdfs:comment>List of discrete wavelengths observed in the product.</rdfs:comment>
        <schema:rangeIncludes rdf:resource="https://schema.org/WavelengthInformation"/>
        <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
      </rdf:Property>

      <rdf:Property rdf:about="https://schema.org/measurementType">
        <schema:rangeIncludes rdf:resource="https://schema.org/MeasurementType"/>
        <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
        <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
          <rdfs:label>measurementType</rdfs:label>
          <rdfs:comment>Measurement type taken from codelist:  
Values:  
- ABSORPTION  
- EMISSION.</rdfs:comment>
        </rdf:Property>

        <rdfs:Class rdf:about="https://schema.org/MeasurementType">
          <rdfs:label>MeasurementType</rdfs:label>
          <rdfs:subClassOf rdf:resource="https://schema.org/Enumeration"/>
          <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
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003r2.html"/>
  <rdfs:comment>Enumeration of measurementType constants.</rdfs:comment>
</rdfs:Class>

<schema:MeasurementType rdf:about="https://schema.org/EMISSION">
  <rdfs:label>EMISSION</rdfs:label>
  <rdfs:comment>Measurement type constant (Emission).</rdfs:comment>
</schema:MeasurementType>

<schema:MeasurementType rdf:about="https://schema.org/ABSORPTION">
  <rdfs:label>ABSORPTION</rdfs:label>
  <rdfs:comment>Measurement type constant (Absorption).</rdfs:comment>
</schema:MeasurementType>

<rdf:Property rdf:about="https://schema.org/dopplerFrequency">
  <rdfs:label>dopplerFrequency</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Doppler Frequency of acquisition. Unit of measure is SI base unit
(m) without prefix.</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/samplingRate">
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Rate at which samples are provided in product. Some products may
contain more than one sampling rate, e.g. 1kHz and 20kHz. Cardinality is therefore
zero to many. Unit of measure (Hz) is SI derived unit without prefix.</rdfs:comment>
  <rdfs:label>samplingRates</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionParameters"/>
</rdf:Property>

<!-- §7.6.5 AcquisitionAngles -->

<rdfs:Class rdf:about="https://schema.org/AcquisitionAngles">
  <rdfs:label>AcquisitionAngles</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Contains the properties related to the acquisition
angles.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>

```

```

</rdfs:Class>

<rdf:Property rdf:about="https://schema.org/illuminationAzimuthAngle">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:label>illuminationAzimuthAngle</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <rdfs:comment>Mean illumination/solar azimuth angle given in degrees (i.e. uom='deg').</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/illuminationZenithAngle">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <rdfs:label>illuminationZenithAngle</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <rdfs:comment>Mean illumination/solar zenith angle in degrees (i.e. uom='deg').</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/illuminationElevationAngle">
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:comment>Mean illumination/solar elevation angle in degrees (i.e. uom='deg').</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <rdfs:label>illuminationElevationAngle</rdfs:label>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/incidenceAngle">
  <schema:rangeIncludes rdf:resource="https://schema.org/QuantitativeValue"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <rdfs:label>incidenceAngle</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <rdfs:comment>Acquisition global incidence angle in degrees (i.e. uom='deg'), its minimum value and its maximum value.</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/incidenceAngleVariation">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>

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<schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
<rdfs:label>incidenceAngleVariation</rdfs:label>
<rdfs:comment>Incidence angle variation in degrees (i.e.
uom='deg').</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/acrossTrackIncidenceAngle">
  <rdfs:label>acrossTrackIncidenceAngle</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Acquisition across track incidence angle in degrees (i.e.
uom='deg').</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/alongTrackIncidenceAngle">
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>alongTrackIncidenceAngle</rdfs:label>
  <rdfs:comment>Acquisition along track incidence angle in degrees (i.e.
uom='deg').</rdfs:comment>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/instrumentAzimuthAngle">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Mean instrument azimuth angle in degrees (i.e.
uom='deg').</rdfs:comment>
  <rdfs:label>instrumentAzimuthAngle</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/instrumentZenithAngle">
  <rdfs:label>instrumentZenithAngle</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <rdfs:comment>Mean instrument zenith angle in degrees (i.e.
uom='deg').</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>
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<rdf:Property rdf:about="https://schema.org/instrumentElevationAngle">
  <rdfs:comment>Mean instrument elevation angle in degrees (i.e.
uom='deg').</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <rdfs:label>instrumentElevationAngle</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/pitch">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Satellite pitch angle in degrees (i.e. uom='deg').</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <rdfs:label>pitch</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/roll">
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <rdfs:comment>Satellite roll angle in degrees (i.e. uom='deg').</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>roll</rdfs:label>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/yaw">
  <rdfs:comment>Satellite yaw angle in degrees (i.e. uom='deg').</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/AcquisitionAngles"/>
  <rdfs:label>yaw</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<!-- §7.7 ProductInformation -->

<rdfs:Class rdf:about="https://schema.org/ProductInformation">
  <rdfs:subClassOf rdf:resource="https://schema.org/CoverageDescription"/>
  <rdfs:subClassOf rdf:resource="https://schema.org/ProcessingInformation"/>
  <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>
  <rdfs:label>ProductInformation</rdfs:label>
  <rdfs:comment>Product information of the Earth Observation product as defined in

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OGC 17-003r2.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/geojson/1.0/ProductInformation"/>
  </rdfs:Class>

  <rdf:Property rdf:about="https://schema.org/productType">
    <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
    <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/geojson/1.0/productType"/>
      <rdfs:comment>Describes the product type in case that mixed types are available within a single collection, this is a ground segment specific definition.</rdfs:comment>
      <rdfs:label>productType</rdfs:label>
      <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
    </rdf:Property>

    <rdf:Property rdf:about="https://schema.org/contentSize">
      <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
      <!-- <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/geojson/1.0/size"/> -->
    </rdf:Property>

    <rdf:Property rdf:about="https://schema.org/statusSubType">
      <rdfs:comment>Refines the status of a product when the status is set to ARCHIVED.</rdfs:comment>
      Possible values:
      - ON-LINE
      - OFF-LINE.</rdfs:comment>
      <rdfs:label>statusSubType</rdfs:label>
      <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
      <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
      <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
    </rdf:Property>

    <rdf:Property rdf:about="https://schema.org/statusDetail">
      <rdfs:label>statusDetail</rdfs:label>
      <rdfs:comment>This field refers to the status value. It should be used to motivate the reason of a failure, cancelation, rejection or degraded quality.</rdfs:comment>
      <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
      <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
      <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
    </rdf:Property>
  
```

```

<rdf:Property rdf:about="https://schema.org/availabilityTime">
  <rdfs:label>availabilityTime</rdfs:label>
  <schema:rangeIncludes rdf:resource="https://schema.org/DateTime"/>
  <rdfs:comment>The time when the result becomes available
  dateTime in ISO 8601 format (CCYY-MM-DDThh:mm[:ss[.cc]]Z).</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>
```

<rdf:Property rdf:about="https://schema.org/timeliness">
 <rdfs:comment>Timeliness of the product, such as "near real time", "rush".
 Possible values are mission specific and shall refer to mission/ground segment
 dedicated codeSpace.
 Example of values could be "NRT", "NOMINAL", **NTC** or **STC**.</rdfs:comment>
 <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
 <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
 <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
 <rdfs:label>timeliness</rdfs:label>
</rdf:Property>

```

<!-- productGroupId -->
<rdf:Property rdf:about="https://schema.org/isPartOf">
  <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
  <!-- <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/productGroupId"/> -->
</rdf:Property>
```

```

<!-- productVersion -->
<!-- TBD: associate to the Dataset instead ? -->
<rdf:Property rdf:about="https://schema.org/version">
  <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
  <!-- <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/productVersion"/> -->
</rdf:Property>
```

```

<!-- archivingCenter -->
<rdf:Property rdf:about="https://schema.org/holdingArchive">
  <schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
  <!-- <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/archivingCenter"/> -->
</rdf:Property>
```

```

<rdf:Property rdf:about="https://schema.org/archivingDate">
  <rdfs:comment>Archiving date time.</rdfs:comment>
```

```

<schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
<schema:rangeIncludes rdf:resource="https://schema.org/DateTime"/>
<rdfs:label>archivingDate</rdfs:label>
</rdf:Property>

<!-- referenceSystemIdentifier --> additionalProperty -->

<rdf:Property rdf:about="https://schema.org/qualityInformation">
<schema:domainIncludes rdf:resource="https://schema.org/ProductInformation"/>
<schema:rangeIncludes rdf:resource="https://schema.org/QualityInformation"/>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
<rdfs:label>qualityInformation</rdfs:label>
<rdfs:comment>Contains properties related to the quality of the
product.</rdfs:comment>
</rdf:Property>

<!-- §7.7.1 QualityInformation -->

<rdfs:Class rdf:about="https://schema.org/QualityInformation">
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
<rdfs:comment>Contains the properties related to the quality of the
product.</rdfs:comment>
<owl:equivalentClass rdf:resource="http://www.opengis.net/ont/geojson/1.0/QualityInformation"/>
<rdfs:label>QualityInformation</rdfs:label>
<rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>
</rdfs:Class>

<rdf:Property rdf:about="https://schema.org/qualityStatus">
<schema:domainIncludes rdf:resource="https://schema.org/QualityInformation"/>
<rdfs:label>qualityStatus</rdfs:label>
<schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
<rdfs:comment>Indicator that specifies whether the product quality is degraded or
not. This optional field shall be provided if the product has passed a quality check.
Values:
DEGRADED, NOMINAL.</rdfs:comment>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/qualityDegradation">
<schema:domainIncludes rdf:resource="https://schema.org/QualityInformation"/>

```

```

<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>qualityDegradation</rdfs:label>
  <rdfs:comment>Quality degradation percentage (i.e. uom=%).</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/qualityDegradationQuotationMode">
  <rdfs:comment>Indicator to know how the quality degradation percentage has been
calculated.
Values:
AUTOMATIC, MANUAL.</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <schema:domainIncludes rdf:resource="https://schema.org/QualityInformation"/>
  <rdfs:label>qualityDegradationQuotationMode</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/qualityDegradationTag">
  <schema:domainIncludes rdf:resource="https://schema.org/QualityInformation"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>qualityDegradationTag</rdfs:label>
  <rdfs:comment>Contains further textual information concerning the quality
degradation. It shall be provided if qualityStatus value is DEGRADED. Possible values
are mission specific and should refer to mission/ground segment dedicated codeSpace.
Example of values could be "RADIOMETRY" or "GEOLOCATION".</rdfs:comment>
</rdf:Property>

<!-- §7.7.2 ProcessingInformation --&gt;

&lt;rdfs:Class rdf:about="https://schema.org/ProcessingInformation"&gt;
  &lt;rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/&gt;
  &lt;rdfs:comment&gt;Contains the properties related to the processing of the
data.&lt;/rdfs:comment&gt;
  &lt;rdfs:label&gt;ProcessingInformation&lt;/rdfs:label&gt;
  &lt;dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/&gt;
  &lt;owl:equivalentClass rdf:resource="http://www.opengis.net/ont/geojson/1.0/ProcessingInformation"/&gt;
&lt;/rdfs:Class&gt;

&lt;rdf:Property rdf:about="https://schema.org/compositeType"&gt;
  &lt;schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/&gt;
</pre>

```

```

<schema:rangeIncludes rdf:resource="https://schema.org/Duration"/>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
<rdfs:seeAlso rdf:resource="https://en.wikipedia.org/wiki/ISO_8601#Durations"/>
<rdfs:comment>Type of composite product expressed as timeperiod that the composite
product covers using ISO 8601 duration format P[n]Y[n]M[n]D encoding , e.g. P10D for a
10 day composite.</rdfs:comment>
<rdfs:label>compositeType</rdfs:label>
</rdf:Property>

<!-- format -->
<rdf:Property rdf:about="https://schema.org/encodingFormat">
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <!-- <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/> -->
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/processingMethod">
  <rdfs:label>processingMethod</rdfs:label>
  <rdfs:comment>Method used to compute datalayer. (e.g. Kalman filtering,
ROSE).</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/processingMethodVersion">
  <rdfs:label>processingMethodVersion</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:comment>Method version (e.g. 1.0).</rdfs:comment>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/processingCenter">
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <rdfs:comment>Processing center code. Possible values are mission
specific.</rdfs:comment>
  <rdfs:label>processingCenter</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

```

```

<rdf:Property rdf:about="https://schema.org/processingDate">
  <schema:rangeIncludes rdf:resource="https://schema.org/DateTime"/>
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <rdfs:label>processingDate</rdfs:label>
  <rdfs:comment>Processing date time.</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
</rdf:Property>
```

```

<rdf:Property rdf:about="https://schema.org/processingLevel">
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <rdfs:label>processingLevel</rdfs:label>
  <rdfs:comment>Processing level applied to the product: "1A", "1B", "1C", "2", "3".</rdfs:comment>
</rdf:Property>
```

```

<rdf:Property rdf:about="https://schema.org/processingMode">
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <rdfs:comment>Processing mode taken from mission specific code list.
```

Examples of values are:

- NRT
- NOMINAL
- BACKLOGGED
- REPROCESSED
- VALIDATE.</rdfs:comment>
 <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
 <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
 <rdfs:label>processingMode</rdfs:label>
 </rdf:Property>

```

<rdf:Property rdf:about="https://schema.org/processorName">
  <rdfs:label>processorName</rdfs:label>
  <rdfs:comment>Processor software name (e.g. FastROSE).</rdfs:comment>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-003r2.html"/>
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/Text"/>
</rdf:Property>
```

```

<!-- processorVersion -->
<rdf:Property rdf:about="https://schema.org/softwareVersion">
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <!-- <owl:equivalentProperty rdf:resource="http://www.opengis.net/ont/eo-
```

```

geojson/1.0/processorVersion"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/> -->
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/productContentsType">
  <rdfs:label>productContentType</rdfs:label>
  <rdfs:comment>Classification of product according to ground type covered. Note
cardinality allows for multiple instances of this property.
  Allowed Values:
  □ COASTAL
  □ CONTINENTAL
  □ HYDROLOGY
  □ ICE
  □ OPEN_OCEAN
  □ OTHER
  □ REGIONAL.</rdfs:comment>
  <schema:domainIncludes rdf:resource="https://schema.org/ProcessingInformation"/>
  <schema:rangeIncludes rdf:resource="https://schema.org/DefinedTerm"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
</rdf:Property>

```

```

<!-- §7.7.3 CoverageDescription -->

<rdfs:Class rdf:about="https://schema.org/CoverageDescription">
  <rdfs:comment>Contains the properties related to the coverage. Its properties are
inherited by the ProductInformation object.</rdfs:comment>
  <owl:equivalentClass rdf:resource="http://www.opengis.net/ont/eo-
geojson/1.0/CoverageDescription"/>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <rdfs:label>CoverageDescription</rdfs:label>
  <rdfs:subClassOf rdf:resource="https://schema.org/StructuredValue"/>
</rdfs:Class>

<rdf:Property rdf:about="https://schema.org/cloudCover">
  <schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
  <rdfs:comment>Cloud cover percentage (i.e. uom=%).</rdfs:comment>
  <rdfs:label>cloudCover</rdfs:label>
  <dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
  <schema:domainIncludes rdf:resource="https://schema.org/CoverageDescription"/>
</rdf:Property>

<rdf:Property rdf:about="https://schema.org/snowCover">
```

```
<schema:rangeIncludes rdf:resource="https://schema.org/Number"/>
<schema:domainIncludes rdf:resource="https://schema.org/CoverageDescription"/>
<rdfs:comment>Snow cover percentage (i.e. uom=%).</rdfs:comment>
<dcterms:source rdf:resource="http://docs.opengeospatial.org/is/17-003r2/17-
003r2.html"/>
<rdfs:label>snowCover</rdfs:label>
</rdf:Property>

</rdf:RDF>
```

Appendix G: Revision History

Table 21. Revision History

Date	Editor	Release	Primary clauses modified	Descriptions
December 24, 2020	Y. Coene	0.1	all	Initial version for EO VOC RR-1 Review.
July 1, 2021	Y. Coene	0.2	measurementTechnique added to AcquisitionInformation. Table added with mapping for ResponsibleParty roles. Recommendation added to use ROR identifiers for organisations. AcquisitionInformation encoding for EO Applications and Services added. Preliminary eovoc-schema.rdf included as annex F.	Updated version for EO VOC PM-1 Meeting.

Date	Editor	Release	Primary clauses modified	Descriptions
September 2, 2021	Y. Coene	0.3	<ul style="list-style-type: none"> - Table 15 (MediaObject) updated. - Appendix C: Property Mapping updated. - publishingPrinciples added to encode \$.conformsTo. - Chapter 7. EO Granules Encoding (Extension) added with extension for EO granule encoding. - version of [DCAT-AP-SDO] updated 	Updated version for EO VOC MTR.

Date	Editor	Release	Primary clauses modified	Descriptions
February 10, 2022	Y. Coene	0.4	<ul style="list-style-type: none"> - Added UseAction example representing WCS offering in new Related URL and Actions sections for EO Service. - Added service to collection coupled resource encoding with object in §5.4.1 - Added conformance encoding with Review in §5.5 - Added SHACL information in Appendix B: Interpretation as W3C JSON-LD - Added SHACL shapes in various sections of the document. - Updated mapping table for OGC 17-003r2 properties. - Updated mapping table for STAC Item properties. - Included separate JSON-LD context file for EO extension in Appendix B: Interpretation as W3C JSON-LD. 	Updated version for EO VOC PM-2 Meeting.

Date	Editor	Release	Primary clauses modified	Descriptions
July 29, 2022	Y. Coene	0.9	<ul style="list-style-type: none"> - Added GeoSPARQL section as §4.5.3 - [CEOS-OS-BP] reference updated. - Minor updates. 	Updated version for EO VOC FP milestone.