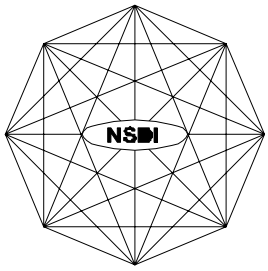
FGDC-STD-001.?-20??



Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata (Public Review Draft)

Standards Working Group
Federal Geographic Data Committee

December 21, 2000

Federal Geographic Data Committee
Department of Agriculture • Department of Commerce • Department of Defense • Department of Energy
Department of Housing and Urban Development • Department of the Interior • Department of State
Department of Transportation • Environmental Protection Agency
Federal Emergency Management Agency • Library of Congress
National Aeronautics and Space Administration • National Archives and Records Administration
Tennessee Valley Authority

Federal Geographic Data Committee

Established by Office of Management and Budget Circular A-16, the Federal Geographic Data Committee (FGDC) promotes the coordinated development, use, sharing, and dissemination of geographic data.

The FGDC is composed of representatives from the Departments of Agriculture, Commerce, Defense, Energy, Housing and Urban Development, the Interior, State, and Transportation; the Environmental Protection Agency; the Federal Emergency Management Agency; the Library of Congress; the National Aeronautics and Space Administration; the National Archives and Records Administration; and the Tennessee Valley Authority. Additional Federal agencies participate on FGDC subcommittees and working groups. The Department of the Interior chairs the committee.

FGDC subcommittees work on issues related to data categories coordinated under the circular. Subcommittees establish and implement standards for data content, quality, and transfer; encourage the exchange of information and the transfer of data; and organize the collection of geographic data to reduce duplication of effort. Working groups are established for issues that transcend data categories.

For more information about the committee, or to be added to the committee's newsletter mailing list, please contact:

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77 CONTENTS

78

79

95

96 TABLE OF FIGURES

97

101

Introductory Material

1. Objective

The purpose of these *Extensions for Remote Sensing Metadata* (hereafter *Remote Sensing Extensions*) is to provide a common terminology and set of definitions for documenting geospatial data obtained by remote sensing, within the framework of the *FGDC (1998) Content Standard for Digital Geospatial Metadata* (hereafter *FGDC Metadata Content Standard* or simply base standard). Creating these *Remote Sensing Extensions* will provide a means to use standard FGDC content to describe geospatial data derived from remote sensing measurements

2. Scope

This standard is intended to support the collection and processing of geospatial metadata for data derived from remote sensing. It is intended to be usable by all levels of government and the private sector. The standard is not intended to reflect an implementation design. An implementation design requires adapting the structure and form of the standard to meet application requirements.

The *FGDC Metadata Content Standard* was developed to define the information about a geophysical dataset required by prospective users: its availability, its fitness for an intended use, and the means of accessing and successfully transferring it. These *Remote Sensing Extensions* are to provide additional information particularly relevant to remote sensing: the geometry of the measurement process, the properties of the measuring instrument, the processing of raw readings into geospatial information, and the distinction between metadata applicable to an entire collection of data and those applicable only to component parts. For that purpose, these *Remote Sensing Extensions* establish the names, definitions, and permissible values for new data elements and the compound elements of which they

are the components. These new elements are placed within the structure of the base standard, allowing the combination of the original standard and the new extensions to be treated as a single entity. These *Remote Sensing Extensions* do not specify either the means by which this information is organized in a computer system for data transfer or the means by which this information is transmitted, communicated, or presented to the user.

3. Applicability

This standard is for the documentation of geospatial data. Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure," was signed on April 11, 1994, by President William J. Clinton. Section 3, Development of a National Geospatial Data Clearinghouse, paragraph (b) states: "Standardized Documentation of Data. Beginning nine months from the date of this order, each agency shall document all new geospatial data it collects or produces, either directly or indirectly, using the standard under development by the FGDC, and make that standardized documentation electronically accessible to the Clearinghouse network. Within one year of the date of this order, agencies shall adopt a schedule, developed in consultation with the FGDC, for documenting, to the extent practicable, geospatial data previously collected or produced, either directly or indirectly, and making that data documentation electronically accessible to the Clearinghouse network." These *Remote Sensing Extensions* are a data documentation standard as described in the executive order, extending the applicability to geospatial data derived from remote sensing.

The FGDC also invites and encourages organizations and individuals from State, local, and tribal governments, the private sector, and non-profit organizations to use these *Remote Sensing Extensions* in documenting their geospatial data. Lack of information for prospective users on what data exist,

the fitness of such data for planned applications, and the conditions for accessing or transferring data to a user's system have been a major difficulty in the geospatial data community. These *Remote Sensing Extensions*, developed with broad public participation, will expand the information already provided by the base standard in a way particularly useful to recipients of remote sensing data and thus contribute to developing the National Spatial Data Infrastructure.

4. Related Standards

The *FGDC Metadata Content Standard* was developed to identify and define the metadata elements used to document digital geospatial datasets. These *Remote Sensing Extensions* are made to that standard and fit within an overall structure following the rules for extended elements specified in its Appendix D. The combination of the base standard and these *Remote Sensing Extensions* serves all the purposes of the base standard but expands it to support data from remote sensing.

ISO/Technical Committee 211 (1998) is developing an international standard for metadata, which is likely to be the basis of future versions of the *FGDC Metadata Content Standard*. The ISO standard also has a recommended extension methodology, in its Appendix E. These *Remote Sensing Extensions* have been constructed to be compatible with that methodology, insofar as it is consistent with that of the FGDC standard. Extensions covering areas that are in the ISO standard but not in the FGDC standard have been constructed to be compatible with the ISO standard.

The *Proposed EOSDIS Core System (ECS) Core Metadata Standard* (Hughes Applied Information Systems, 1994) defined metadata in several areas: algorithm and processing packages, data sources, references, data collections, spatial and temporal extent, and content. Much of the metadata specified in that standard had corresponding content in FGDC's standard. However, there are a number of

areas in which the ECS standard described metadata not contained in the FGDC standard, in particular, algorithm and processing metadata, instrument metadata, and collection and granule metadata. In such areas, the ECS standard was used as a guide in the development of these *Remote Sensing Extensions*. The current ECS Data model is described by Raytheon Information Technology Systems (2000).

The *FGDC* (1999) *Content Standard for Remote Sensing Swath Data* specifies association of data with its date, time, and geolocation. While geolocation information that varies from measurement to measurement is included as part of the data, much of the descriptive information does not change, such as the parameters of a satellite orbit or the orientation of the instruments and optical systems on the platform. Such information is more appropriately stored as metadata than as data, and the metadata necessary to derive the geolocation information essential to the swath standard are included in these *Remote Sensing Extensions*.

5. Standards Development Process

This standard was developed by the Imagery Subgroup of the FGDC Standards Working Group (SWG), with the participation of members of the FGDC Metadata Ad Hoc Working Group, and with support from government, industry, and the academic community. Organizations represented include the National Aeronautics and Space Administration (NASA), the United States Geological Survey, the National Imagery and Mapping Agency, the International Society for Photogrammetry and Remote Sensing (ISPRS), the University of California at Santa Barbara, Raytheon ITSS, SGT, Inc., Global Science and Technology, Inc, Computer Sciences Corporation, and Lockheed Martin. NASA and NASA-supporting members of the imagery subgroup wrote an initial skeleton draft, drawing heavily on the *Proposed ECS Core Metadata Standard* and on discussion of requirements for

deriving geographical positions in the *Moderate-Resolution Imaging Radiometer (MODIS) Level 1A Earth Location: Algorithm Theoretical Basis Document* (MODIS Science Data Support Team, 1997). This skeleton draft was then distributed to a review team for comment, revision, and amplification, and members of the team met to discuss the review and suggest further revisions. This distribution was followed by a series of revisions, reviews, and meetings to discuss the reviews and revisions. Experts on instrument metadata were consulted. Scanning instrument metadata were added and expanded based on a description of the Sensor Modeling Language being developed at the University of Alabama at Huntsville. Frame camera metadata were contributed by photogrammetric experts from ISPRS and leading companies, including ZI/Imaging, LH Systems, and Carl Zeiss Jena. The draft so produced was reviewed by the Imagery Subgroup and approved for submittal to the FGDC/SWG for public review in October 2000.

6. Maintenance Authority

The NASA Earth Science Data and Information System (ESDIS) Program maintains this standard for the Federal Geographic Data Committee. Address questions concerning this standard to

NASA Goddard Space Flight Center
Code 423
Greenbelt, MD 20771.

Organization of This Document

These *Remote Sensing Extensions* are organized under the hierarchy of compound elements and data elements of the *FGDC Content Standard for Digital Geospatial Metadata*. Where appropriate, extended elements have been organized under existing compound elements in the base standard. There are two completely new sections under Metadata. There is also a new section, Location Information, which is never used alone but is called by other sections of the metadata standard, like Citation Information in the base standard. The *Remote Sensing Extensions* begin with the production rules for Metadata expanded to include the two new sections. Following are the production rules and the Extension_Information definitions for the new elements for each component of Metadata in turn. The production rules list all elements of the base standard that have a new element as a component at any subordinate level, to clarify the relation of the new elements to the existing elements. If an element of the existing standard is listed, all components immediately under it are provided in the production rules expansion, but only those lower level components that have extended elements under them are expanded further. For example, the Metadata element and all immediately subordinate elements are listed. However, production rules are not provided for Distribution_Information and its subordinate elements because none has been extended. New elements are in **boldface.** Existing elements that have been extended either through the addition of subordinate elements or by extension of the domain are in ***boldface italic*** when listed as components of other elements but in ordinary type when being expanded into components. For example, Lineage is in bold italic when given as a component of Data_Quality_Information, to show that there is some extension under it. When Lineage is expanded into Source_Information and Process_Step, it is in ordinary type, but Process_Step is in bold italic to show that it is an element of the original standard that has been expanded.

Following the production rules for each Metadata section, the Extension_Information definitions for the new extended elements are provided. The two new sections under Metadata and the utility Location Information statement follow the expanded sections from the base standard: first the full production rules, and then the Extension_Information definitions for each. The new sections and elements have not been numbered, in contrast with the procedure followed in the base standard but consistent with the procedure in the FGDC (1999) Biological Data Profile.

In some cases, elements that are optional or mandatory-if-applicable may have component elements that are mandatory. Such component elements become mandatory only if the parent element is used. For example, Mission_History, which is optional, has a mandatory element Mission_Start_Date. If there is no Mission_History metadata, this element is not required. Similarly, Grid_First_Element and its components, Grid_First_Element_Map_X_Coordinate and Grid_First_Element_Map_Y_Coordinate, are mandatory. Grid_First_Element is, however, a component of Georectified_Raster, one of two alternatives under Georeferencing_System/ Horizontal_Coordinate_System_Definition. If the other alternative is used, Grid_First_Element and its components are not required.

Appendix C contains an index of definitions of extended elements.

The Citation_Information in the *FGDC Metadata Standard* is defined as the recommended reference to be used for the dataset. In these extensions, the term *dataset* in that context is interpreted to mean not only the particular dataset that the metadata describe, but also technical papers, data dictionaries, users guides, and other documents that provide information about the data. It also is used to describe

metadata that are not usually considered citations but effectively contain the same information. For example, in the description of an algorithm, the Originator corresponds to the developer of the algorithm, Publication_Date is the date it was frozen in final form, Title is the name, Edition is the version number; and Online_Linkage could be the on-line location of the implementing software.

Data Aggregation Terminology

The *FGDC Metadata Content Standard* provides "a hierarchy of data elements and compound elements that define the information content for metadata to document a set of digital geospatial data," as defined in its section *Organization of the Standard*. Many elements in the document refer to such a dataset. However, the term *dataset* is not defined. Data may be organized in a hierarchical structure, with a body of data being aggregated from smaller bodies. Different sets of terminology are in use to describe the different levels of aggregation. For example, a *granule* is defined as the smallest data unit in an archive that a user can order without requiring special processing to generate it. An aggregation of multiple data granules from a single source is called a *single type collection.* In a single type collection, metadata fields will be the same and at least one metadata field will have the same value for all granules. For example the NOAA/NASA Pathfinder program compiles monthly average land and sea surface temperatures. The collection of all monthly average land surface temperatures is a single type collection. Another single type collection would be all the January average surface temperatures. An aggregation from many different sources is called a *multitype* collection. These sources may have different schemas, and the data from the different sources may thus be described using different metadata fields. For example, a data set designed for studies of the effects of El Niño and La Niña events on vegetation could contain TOPEX/Poseidon total monthly average sea surface heights and values for the Pathfinder Normalized Difference Vegetation Index. These terms are defined in the Raytheon Information Technology Systems (2000) description of the implementation Earth science data model for the ECS project. Figure 1 shows possible relations between different levels and kinds of data aggregations and their components.

Other terms may be used to describe levels of aggregation. An alternative set of definitions uses *dataset* for the basic unit, *dataset series* for an aggregation from a single source, and *dataset initiative* or simply *initiative* for an aggregation of many sources. Figure 2 shows possible aggregation relations using this terminology. The different levels of aggregation are also defined by calling the basic unit a *product*, an aggregation of multiple products that have many or all attributes in common, including a common range of some kind in time and space, an *archive collection*, and an aggregation with a common semantic theme that is not necessarily homogeneous and may have few or no attributes in common a *theme collection* (Committee on Earth Observation Satellites 1999). .

In a collection, the metadata descriptions will have varied scope. Some will have values that apply to the collection as a whole and are inherited by the individual granules; others will have different values from one granule to the next. In these extensions, the term *dataset* is interpreted to refer to an aggregation of data at any level, as appropriate to the context. Metadata definitions have been added describing the component parts of an aggregation or describing the larger aggregation of which a data unit or aggregation is a member, to allow the user to determine the level of aggregation to which a metadata element applies.

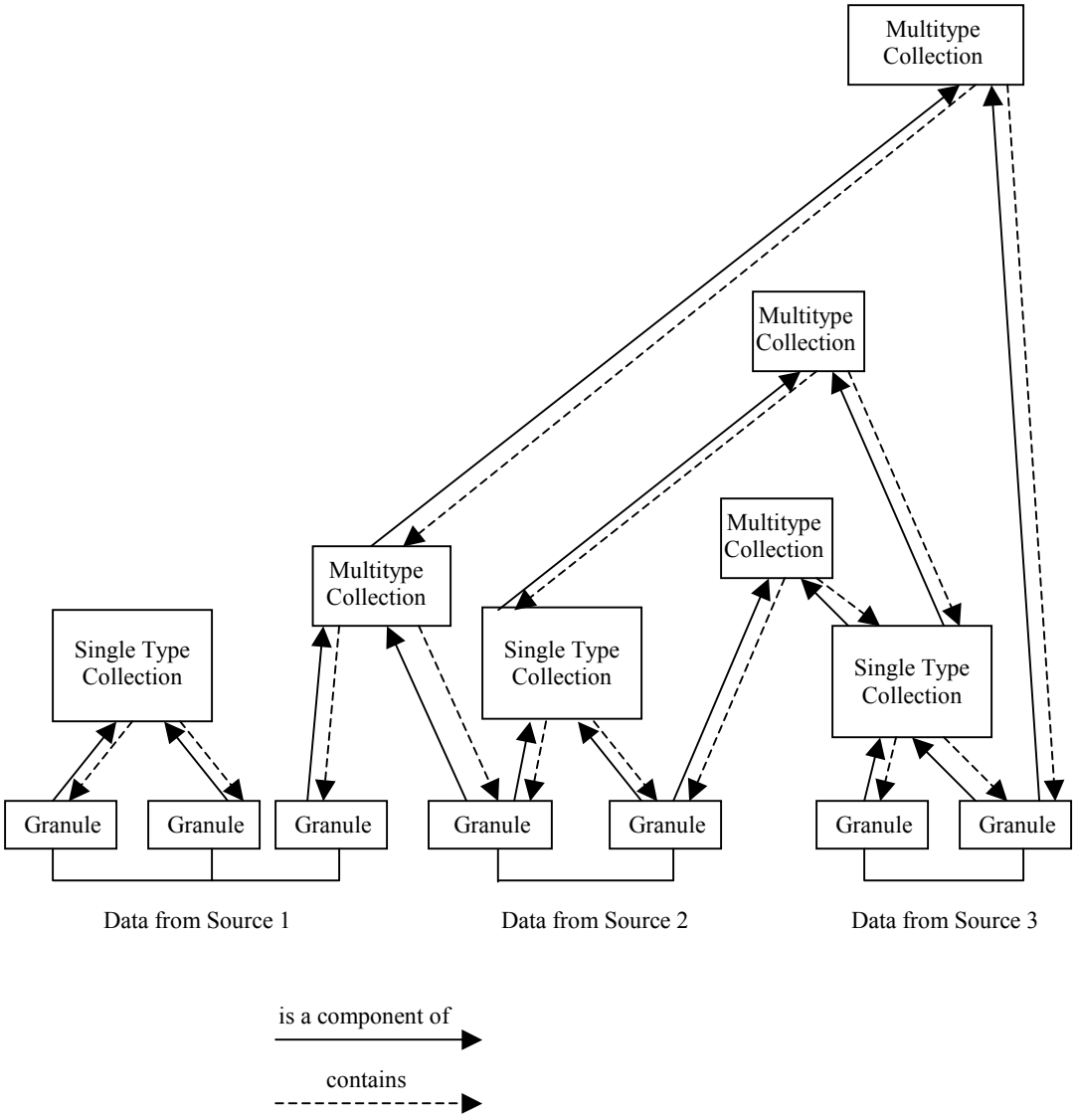
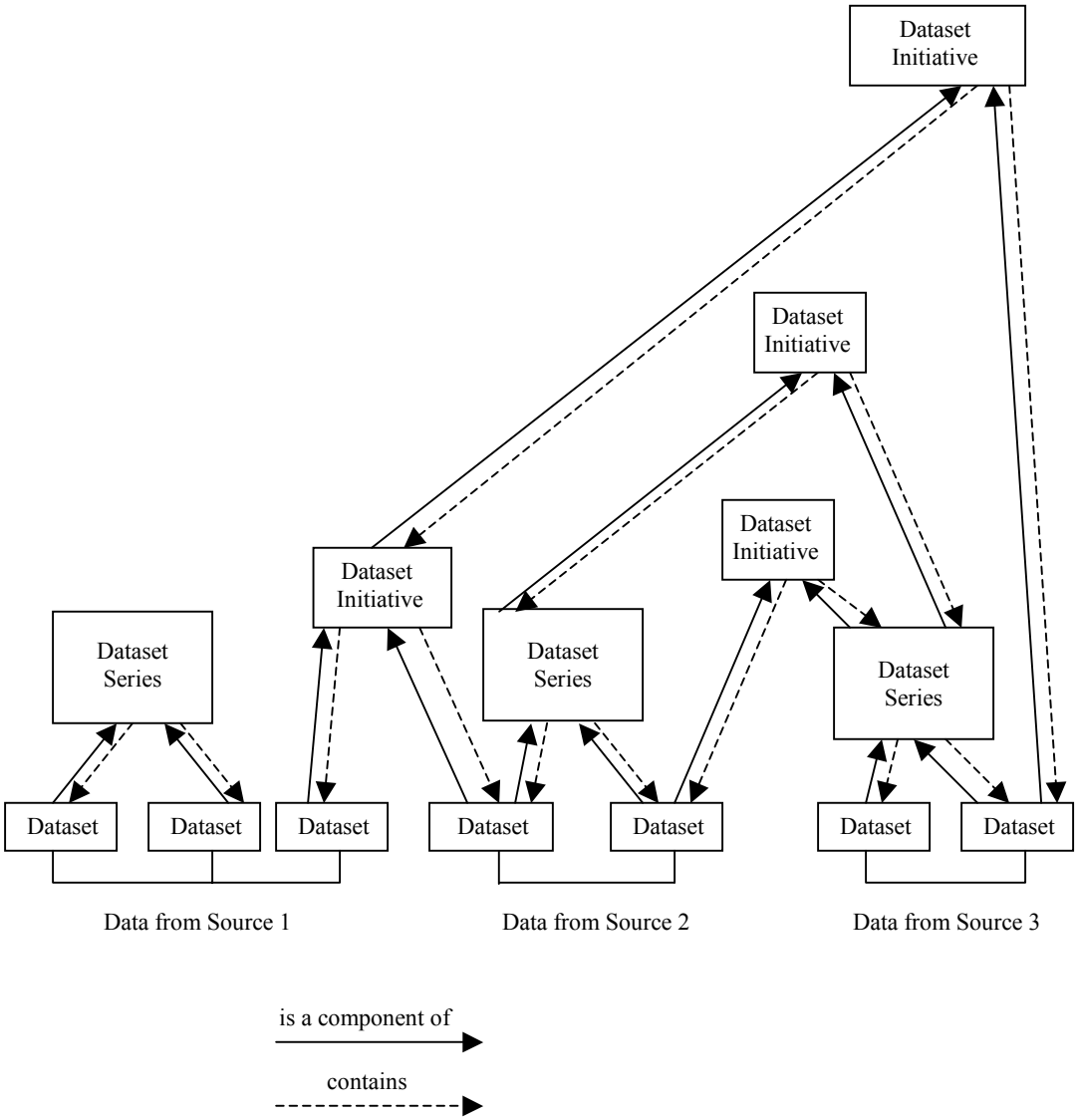

Multitype Collection
Multitype Collection
Multitype Collection
Multitype Collection
Single Type Collection
Single Type Collection
Single Type Collection
Granule
Granule
Granule
Granule
Granule
Granule
Granule
Data from Source 1
Data from Source 2
Data from Source 3
is a component of
contains

Figure 1. Data Aggregation — Granules and Collections



361 Figure 2. Data Aggregation — Datasets, Series, and Initiatives

Metadata

0 Metadata -- data about the content, quality, condition, and other characteristics of data.

Type: compound

Short Name: metadata

Metadata =

Identification_Information +

0{***Data_Quality_Information***}1 +

0{***Spatial_Data_Organization_Information***}1 +

0{***Spatial_Reference_Information***}1 +

0{***Entity_and_Attribute_Information***}1 +

0{Distribution_Information}n +

Metadata_Reference_Information +

0{Platform_and_Mission_Information}1

0{Instrument_Information}n

Identification Information

1 Identification Information -- basic information about the dataset.

Type: compound

Short Name: idinfo

Identification_Information =

Dataset_Identifier +
Citation +
Description +
Time_Period_of_Content +
Status +
Spatial_Domain +
0{Processing_Level}1
Keywords +
0{Platform_and_Instrument_Identification}n +
[Band_Identification|
Thematic_Layer_Identification]
Access_Constraints +
Use_Constraints +
(Point_of_Contact) +
(1{Browse_Graphic}n) +
(Data_Set_Credit) +
(Security_Information) +

(Native_Data_Set_Environment) +

(1{Cross_Reference}n) +

0{Aggregation Information}n +

Description =

Abstract +

Purpose +

(1{Documentation}n) +

(Supplemental_Information)

Documentation =

(1{Data_Dictionary_Reference}n) +

(1{User's_Guide}n) +

(1{Science_Paper}n)

Data_Dictionary_Reference =

Citation_Information *(see section 8 of base standard for production rules)*

User's_Guide =

Citation_Information *(see section 8 of base standard for production rules)*

Science_Paper =

Citation_Information *(see section 8 of base standard for production rules)*

Processing_Level =

Processing_Level_Identifier +

Processing_Level_Authority

Processing_Level_Authority =

Citation_Information *(see section 8 of base standard for production rules)*

Platform_and_Instrument_Identification =

(Mission_Name) +

Platform_Full_Name +

(Platform_Short_Name) +

(Platform_Serial_Identifier)

Instrument_Full_Name +

0{Instrument_Short_Name}1 +

Band_Identification =

Number_of _Bands +

0{Individual_Band_Identification}n

Individual_Band_Identification =

Band_ID +

Band_Measurement_Mode_ID

Thematic_Layer_Identification =

Number_of_Thematic_Layers +

1{Layer_Name}n

Layer_Name =

Theme (*see section 1 of base standard for production rules)*

Aggregation_Information =

(1{Container_Packet_ID}n) +

0{Component_Information}1

Container_Packet_ID =

Dataset_Identifier

Component_Information =

1{Aggregation_Member_ID}n+

1{Aggregation_Criteria}n

Aggregation_Member_ID =

Dataset_Identifier

Extension_Information

Name: Dataset_Identifier

Short Name: datsetid

Type: text

Domain: free text

Parent: Identification_Information

Optionality: Mandatory

Repeatability: =1

Definition: Unique string to identify a dataset.

Rationale: Provides a unique identifier for a dataset whenever it is referenced.

Source: ISO (1999) Geographic Information - Metadata Committee Draft, Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - ID of data object

Extension_Information

Name: Documentation

Short Name: documnts

Type: compound

Child: Data_Dictionary_Reference

Child: User's_Guide

Child: Science_Paper

Parent: Description

Optionality: Optional

Repeatability: >=1

Definition: Information about or relevant to the dataset.

Rationale: Not all useful information about the dataset accompanies the data.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Data_Dictionary_Reference

Short Name: datdicrf

Type: compound

Child: Citation_Information

Parent: Documentation

Optionality: Optional

Repeatability: >=1

Definition: Reference to a list of terms and their definitions, used in describing the dataset.

Rationale: Users may need to know where to find definitions of dataset terminology.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: User's_Guide

Short Name: userguid

Type: compound

Child: Citation_Information

Parent: Documentation

Optionality: Optional

Repeatability: >=1

Definition: Reference information for User's Guides.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Guide Document elements

Extension_Information

Name: Science_Paper

Short Name: scipap

Type: compound

Child: Citation_Information

Parent: Documentation

Optionality: Optional

Repeatability: >=1

Definition: Reference information for scientific papers relevant to the dataset.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Processing_Level

Short Name: proclevl

Type: compound

Child: Processing_Level_Identifier

Child: Processing_Level_Authority

Parent: Identification_Information

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Degree of data processing applied to the measurements.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Processing Level ID (ECS F&PRS, CODMAC and ESADS definitions; EOS Data Panel Report) , Kresse (2000)

Extension_Information

Name: Processing_Level_Identifier

Short Name: prolevid

Type: text

Domain: free text

Parent: Processing_Level

Optionality: Mandatory

Repeatability: =1

Definition: Data distributor's code that identifies the level of data processing applied to the measurements, as defined in Processing_Level_Authority. Appendixes A and B show examples.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Processing Level ID (ECS F&PRS, CODMAC and ESADS definitions; EOS Data Panel Report), Kresse (2000)

Extension_Information

Name: Processing_Level_Authority

Short Name: prolevau

Type: compound

Child: Citation_Information

Parent Processing_Level

Optionality: Mandatory

Repeatability: =1

Definition: Reference for the definition of the product level designations used

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Processing Level ID (ECS F&PRS, CODMAC and ESADS definitions; EOS Data Panel Report), Kresse (2000)

Extension_Information

Name: Platform_and_Instrument_Identification

Short Name: plainsid

Type: compound

Child: Mission_Name

Child: Platform_Full_Name

Child: Platform_Short_Name

Child: Platform_Serial_Identifier

Child: Instrument_Full_Name

Child: Instrument_Short_Name

Parent: Identification_Information

Optionality: Mandatory-if-applicable

Repeatability: >=1

Definition: Designations for the measuring instruments and their bands, the platform carrying them, and the mission to which the data contribute.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Mission_Name

Short Name: missname

Type: text

Domain: free text

Parent: Platform_and_Instrument_Identification

Optionality: Optional

Repeatability: =1

Definition: The character string by which the mission is known.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Full_Name

Short Name: platflnm

Type: text

Domain: free text

Parent: Platform_and_Instrument_Identification

Optionality: Mandatory

Repeatability: =1

Definition: The complete name of the platform.

Rationale: The complete name is needed for clear identification of the platform.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Satellite Long Name

Extension_Information

Name: Platform_Short_Name

Short Name: platfsnm

Type: text

Domain: free text

Parent: Platform_and_Instrument_Identification

Optionality: Optional

Repeatability: =1

Definition: An acronym or shorter form of the platform name, used to identify the platform.

Rationale: The platform is often better known by its short name than by its full name.

641 Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata
642 Standard - DSS Satellite Short Name
643
644 Extension_Information
645 Name: Platform_Serial_Identifier
646 Short Name: platfser
647 Type: text
648 Domain: free text
649 Parent: Platform_and_Instrument_Identification
650 Optionality: Optional
651 Repeatability: =1
652 Definition: The serial letters and/or numbers applied to the platform.
653 Rationale: The platform identifier specifies the member of the series from which the
654 data come.
655 Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata
656 Standard - DSS Satellite Number
657
658 Extension_Information
659 Name: Instrument_Full_Name
660 Short Name: instflnm
661 Type: text
662 Domain: free text
663 Parent: Platform_and_Instrument_Identification
664 Optionality: Mandatory

Repeatability: =1

Definition: The complete name of the instrument.

Rationale: The complete name is needed for clear identification of the instrument.

Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project

Extension_Information

Name: Instrument_Short_Name

Short Name: instshnm

Type: text

Domain: free text

Parent: Platform_and_Instrument_Identification

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: The short name, acronym, or other identifier by which the instrument is known.

Rationale: The instrument is often better known by its short name than by its full name.

Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project

Extension_Information

Name: Band_Identification

Short Name: bandidnt

Type: compound

Child: Number_of_Bands

Child: Individual_Band_Identification

Parent: Identification_Information

Optionality: Conditional - present and mandatory if and only if

Thematic_Layer_Identification is absent

Repeatability: =1

Definition: Complete information to identify instrument wavelengths or other channels.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions

Development Team

Extension_Information

Name: Number_of_Bands

Short Name: numbands

Type: integer

Domain: Number_of_Bands > 0

Parent: Band_Identification

Optionality: Mandatory

Repeatability: =1

Definition: The number of instrument bands.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions

Development Team

Extension_Information

Name: Individual_Band_Identification

Short Name: inbident

Type: compound

Child: Band_ID

Child: Individual_Band_Identification

Parent: Band_Measurement_Mode_ID

Optionality: Mandatory-if-applicable

Repeatability: =Number_of_Bands

Definition: Complete information to identify a single instrument band.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Band_ID

Short Name: bandid

Type: text

Domain: free text

Parent: Individual_Band_Identification

Optionality: Mandatory

Repeatability: =1

Definition: Designation for individual measurement band.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Band_Measurement_Mode_ID

Short Name: bmmodid

Type: text

Domain: free text

Parent: Individual_Band_Identification

Optionality: Mandatory

Repeatability: =1

Definition: Identifier designating channel, wavelength, and/or field of view of measurement.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Thematic_Layer_Identification

Short Name: thelayid

Type: compound

Child: Number_of_Thematic_Layers

Child: Layer Name

Parent: Identification_Information

Optionality: Conditional - present and mandatory if and only if Band_Identification is absent

Repeatability: =1

Definition: Listing of the kinds of geospatial information represented by the dataset

761 Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions
762 Development Team
763
764 Extension_Information
765 Name: Number_of_ Thematic_Layers
766 Short Name: numthlay
767 Type: integer
768 Domain: Number_ Thematic_Layers > 0
769 Parent: Thematic_Layer_Identification
770 Optionality: Mandatory
771 Repeatability: =1
772 Definition: Number of kinds of geospatial information represented by the dataset.
773 Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions
774 Development Team
775
776 Extension_Information
777 Name: Layer_Name
778 Short Name: layrname
779 Type: compound
780 Child: Theme
781 Parent: Thematic_Layer_Identification
782 Optionality: Mandatory
783 Repeatability: =Number_of_Thematic_Layers
784 Definition: Description of one kind of geospatial information represented by the dataset.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Aggregation_Information

Short Name: agginfo

Type: compound

Child: Container_Packet_ID

Child: Component_Information

Parent: Identification_Information

Optionality: Optional

Repeatability: >=1

Definition: Information relating a dataset to collections of which it is a component or relating a collection dataset to its components.

Rationale: As noted in the introductory material, a dataset may be one component of a larger aggregation or may itself be an aggregation of smaller components. This information places the dataset in relation to its container or components.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS ECS Data Collection Class

Extension_Information

Name: Container_Packet_ID

Short Name: conpckid

Type: compound

Child: Dataset_Identifier

Parent: Aggregation_Information

Optionality: Optional

Repeatability: >=1

Definition: Identifier of an aggregation of which the dataset is a member.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - Aggregation Relationship

Extension_Information

Name: Component_Information

Short Name: compinfo

Type: compound

Child: Aggregation_Member_ID

Child: Aggregation_Criteria

Parent: Aggregation_Information

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Information about components aggregated into the dataset.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Aggregation_Member_ID

Short Name: aggmemid

Type: compound

Child: Dataset_Identifier

Parent: Component_Information

Optionality: Mandatory

Repeatability: >=1

Definition: Identifier of component of a dataset.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Aggregation_Criteria

Short Name: aggcrit

Type: text

Domain: free text

Parent: Component_Information

Optionality: Mandatory

Repeatability: >=1

Definition: Criteria by which components of a dataset are chosen for inclusion.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - Aggregation Attribute

855 Data Quality Information

856

857 2 Data Quality Information -- a general assessment of the quality of the dataset.

858 (Recommendations on information to be reported and tests to be performed are found in

859 "Spatial Data Quality," which is chapter 3 of part 1 in Department of Commerce, 1992,

860 Spatial Data Transfer Standard (SDTS) (Federal Information Processing Standard 173):

861 Washington, Department of Commerce, National Institute of Standards and Technology.)

862 Type: compound

863 Short Name: dataqual

864

865 Data_Quality_Information =

866 0{Attribute_Accuracy}1 +

867 Logical_Consistency_Report +

868 Completeness_Report +

869 0{Positional_Accuracy}1 +

870 ***Lineage*** +

871 (Cloud_Cover)

872

873 **Lineage =**

874 0{Source_Information}n +

875 1{***Process_Step***}n

876

877 Process_Step =

878 Process_Description +

0{Source_Used_Citation_Abbreviation}n +

Process_Date +

(Process_Time) +

0{Source_Produced_Citation_Abbreviation}n +

(Process_Contact) +

0{Algorithm_Information}1 +

0{Processing_Information}1

Algorithm_Information =

Algorithm_Identifiers +

Algorithm_Description +

0{Algorithm_Change_History}1 +

(1{Algorithm_Peer_Review_Information}n)

Algorithm_Identifiers =

Citation_Information *(see section 8 of base standard for production rules)*

Algorithm_Description =

[Algorithm_Text_Description|

Algorithm_Reference]

Algorithm_Reference =

Citation_Information *(see section 8 of base standard for production rules)*

Algorithm_Change_History =

1{Process_Step}n *(see section 2 of base standard for production rules)*

Algorithm_Peer_Review_Information =

Process_Step (*see section 2 of base standard for element definitions)*

Processing_Information =

Processing_Identifiers +

1{Processing_Input_Dataset}n+

Processing_Software +

Processing_Procedure +

0{Processing_Change_History}1 +

(1{Processing_Documentation}n)

Processing_Identifiers =

Citation_Information *(see section 8 of base standard for production rules)*

Processing_Input_Dataset =

Input_Dataset_Identifier +

[Input_Description

Input_Reference] +

0{Input_Level}1

Input_Dataset_Identifier =

Dataset_Identifier (see section 1 for production rules)

Input_Description =

Input_Dataset_Description +

0{Command_Line_Processing_Parameter}n

Input_Reference =

Citation_Information *(see section 8 of base standard for production rules)*

Input_Level =

Processing_Level *(see Identification_Information for production rules)*

Processing_Software =

[Processing_Software_Description|

Processing_Software_Reference]

Processing_Software_Reference =

Citation_Information *(see section 8 of base standard for production rules)*

Processing_Procedure =

Processing_Run_History +

Processing_Environment +

(Processing_Procedure_Description)

Processing_Run_History =

1{Process_Step}n *(see section 2 of base standard for production rules)*

Processing_Environment =

Native_Data_Set_Environment *(see section 1 of base standard for production rules)*

Processing_Change_History =

1{Process_Step}n *(see section 2 of base standard for production rules)*

Processing_Documentation =

Citation_Information *(see section 8 of base standard for production rules*

975

976

977

978 Extension_Information

979 Name: Algorithm_Information

980 Short Name: algoinfo

981 Type: compound

982 Child: Algorithm_Identifiers

983 Child: Algorithm_Description

984 Child: Algorithm_Change_History

985 Child: Algorithm_Peer_Review_Information

986 Parent: Process_Step

987 Optionality: Mandatory-if-applicable

988 Repeatability: =1

989 Definition: Details of the methodology by which geographic information was derived

990 from the instrument readings.

991 Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata

992 Standard

993

994 Extension_Information

995 Name: Algorithm_Identifiers

996 Short Name: algoid

997 Type: compound

998 Child: Citation_Information

Parent: Algorithm_Information

Optionality: Mandatory

Repeatability: =1

Definition: Information identifying the algorithm and version or date.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Algorithm_Description

Short Name: algodesc

Type: compound

Child: Algorithm_Text_Description

Child: Algorithm_Reference

Parent: Algorithm_Information

Optionality: Mandatory

Repeatability: =1

Definition: Kinds of material providing a description of the algorthm used to generate the data.

Rationale: To assist users in understanding what features in their data may arise as a result of the properties of the processing algorithm.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Algorithm_Text_Description

Short Name: algotexd

Type: text

Domain: free text

Parent: Algorithm_Description

Optionality: Conditional - present and mandatory if and only if Algorithm_Reference is absent

Repeatability: =1

Definition: Text description of algorithm used to generate the data.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Algorithm_Reference

Short Name: algoref

Type: compound

Child: Citation_Information

Parent: Algorithm_Description

Optionality: Conditional - present and mandatory if and only if Algorithm_Text_Description is absent

Repeatability: =1

Definition: Reference to document containing description of algorithm.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Guide Document Information

Extension_Information

Name: Algorithm_Change_History

Short Name: algochhi

Type: compound

Child: Process_Step

Parent: Algorithm_Information

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Description of the modifications of the algorithm in its development from version to version.

Rationale: Allows users to understand where differences in their data from previous versions may arise as a result of changes in the algorithm.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Algorithm_Peer_Review_Information

Short Name: algprevi

Type: compound

Child: Process_Step

Parent: Algorithm_Information

Optionality: Optional

Repeatability: >=1

Definition: Description, including dates, of peer review of the algorithm for purposes of ensuring its quality.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Review content

Extension_Information

Name: Processing_Information

Short Name: procinfo

Type: compound

Child: Processing_Identifiers

Child: Processing_Input_Dataset

Child: Processing_Software

Child: Processing_Procedure

Child: Processing_Change_History

Child: Processing_Documentation

Parent: Process_Step

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Comprehensive information about the procedure by which the algorithm was applied to derive geographic data from the raw instrument measurements.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Processing_Identifiers

Short Name: procidfs

Type: compound

Child: Citation_Information

Parent: Processing_Information

Optionality: Mandatory

Repeatability: =1

Definition: Information to identify processing package that produced the data.

Rationale: Allows users to distinguish data from different eras of processing.

Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project – PGE Identifier

Extension_Information

Name: Processing_Input_Dataset

Short Name: procinp

Type: compound

Child: Input_Dataset_Identifier

Child: Input_Description

Child: Input_Reference

Child: Input_Level

Parent: Processing_Information

Optionality: Mandatory

Repeatability: >=1

Definition: The data on which a stage of processing operates.

Rationale: This information tells the user about the stage of processing being described.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Input_Dataset_Identifier

Short Name: inpdatid

Type: compound

Child: Dataset_Identifier

Parent: Processing_Input_Dataset

Optionality: Mandatory

Repeatability: =1

Definition: Unique identifier for input dataset.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Input_Description

Short Name: prindesc

Type: compound

Child: Input_Dataset_Description

Child: Command_Line_Processing_Parameter

Parent: Processing_Input_Dataset

Optionality: Conditional - present and mandatory if and only if Input_Reference is absent

Repeatability: =1

Definition: Description of data and descriptive parameters used in processing step.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Informatio

Name: Input_Dataset_Description

Short Name: prinddes

Type: text

Domain: free text

Parent: Input_Description

Optionality: Mandatory

Repeatability: =1

Definition: Description of input data sets for processing.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Command_Line_Processing_Parameter

Short Name: procpmcl

Type: text

Domain: free text

Parent: Input_Description

Optionality: Mandatory-if-applicable

Repeatability: >=1

Definition: Parameters to control processing operations, entered at run time.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Input_Reference

Short Name: prinref

Type: compound

Child: Citation_Information

Parent: Processing_Input_Dataset

Optionality: Conditional - present and mandatory if and only if Input_Description is absent

Repeatability: =1

Definition: Reference to document describing input to processing.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Guide Dataset Information

Extension_Information

Name: Input Level

Short Name: prinlevl

Type: compound

Child: Processing_Level

Parent: Processing_Input_Dataset

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Data distributor's code that identifies the degree of radiometric and geometric processing applied to the data defined in Processing_Input_Dataset.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Processing_Software

Short Name: procsoft

Type: compound

Child: Processing Software Description

Child: Processing Software Reference

Parent: Processing_Information

Optionality: Mandatory

Repeatability: =1

Definition: The computer programs used to process data from one level to another. .

Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project

Extension_Information

Name: Processing_Software_Description

Short Name: prsodesc

Type: text

Domain: free text

Parent: Processing_ Software

Optionality: Conditional - present and mandatory if and only if

Processing_Software_Reference is absent

Repeatability: =1

Definition: Text description of processing software.

Source: Raytheon Information Technology Systems (2000) Implementation Earth

Science Model for the ECS Project – PGEDescription

Extension_Information

Name: Processing_Software_Reference

Short Name: prsoref

Type: compound

Child: Citation_Information

Parent: Processing_Software

Optionality: Conditional - present and mandatory if and only if

Processing_Software_Description is absent

Repeatability: =1

Definition: Reference to document describing processing software.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Guide Algorithm Information

Extension_Information

Name: Processing_Procedure

Short Name: procprcd

Type: compound

Child: Processing_Run_History

Child: Processing_Environment

Child: Processing_Procedure_Description

Parent: Processing_Information

Optionality: Mandatory

Repeatability: =1

Definition: Description of circumstances and methods of processing.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Processing_Run_History

Short Name: prunhist

Type: compound

Child: Process_Step

Parent: Processing_Procedure

Optionality: Mandatory

Repeatability: =1

Definition: Full history of all processing runs.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Processing_Environment

Short Name: procenv

Type: compound

Child: Native_Data_Set_Environment

Parent: Processing_Procedure

Optionality: Mandatory

Repeatability: =1

Definition: The environment in which the processing was carried out, including, but not limited to, the platform, the operating system name and version, and other configuration control information

Source: ISO (1999) Geographic Information - Committee Draft, Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - Intended Operating System;

Extension_Information

Name: Processing_Procedure_Description

Short Name: procpdes

Type: text

Domain: free text

Parent: Processing_Procedure

Optionality: Optional

Repeatability: =1

Definition: Additional details about the processing procedure.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Processing_Change_History

Short Name: procchhi

Type: compound

Child: Process_Step

Parent: Processing_Information

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Description of the changes in processing procedure from version to version.

Rationale: Allows users to understand any differences that may arise from differences between the way the current version was processed and the way previous versions they used were processed.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Processing_Documentation

Short Name: procdoc

Type: compound

Child: Citation_Information

Parent: Processing_Information

Optionality: Optional

Repeatability: >=1

Definition: Reference to documentation describing the processing.

Rationale: A full description of all aspects of the processing may be too detailed for inclusion in accompanying metadata.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Spatial Data Organization Information

3 Spatial Data Organization Information -- the mechanism used to represent spatial information in the data set.

Type: compound

Short Name: spdoinfo

Spatial_Data_Organization_Information =
0{Indirect_Spatial_Reference}1 +
0{Direct_Spatial_Reference_Method +
([Point_and_Vector_Object_Information |
Raster_Object_Information])}1

Raster_Object_Information =
Cell_Value_Type +
[***Raster_Object_Type*** +
(Row_Count +
Column_Count +
0{Vertical_Count}1) |
Dimension_Description]

Dimension_Description =
Number_of_Data_Dimensions+
1{Dimension_Properties}n

Dimension_Properties =

Name_of_Dimension +

Dimension_Count

Domain Extension

Element: Raster_Object_Type

Domain: "Point" "Pixel" "Grid Cell" " Voxel"

Extended Domain: "Point" "Pixel" "Grid Cell" " Voxel" "Swath"

Rationale: "Swath" is another kind of raster.

Extension_Information

Name: Cell_Value_Type

Short Name: cvaltype

Type: text

Domain: "unsigned integer" "signed integer" "single precision IEEE floating point" "double precision IEEE floating point" free text

Parent: Raster_Object_Information

Optionality: Mandatory

Repeatability: =1

Definition: Bit representation of data value in raster cell.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Dimension_Description

Short Name: dimdesc

Type: compound

Child: Number_of_Data_Dimensions

Child: Dimension_Properties

Parent: Raster_Object_Information

Optionality: Conditional - present and mandatory if and only if Raster_Object_Type +Row_Count + Column_Count are absent.

Repeatability: =1

Definition: Specifications for the independent axes in the organization of spatial data.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Number_of_Data_Dimensions

Short Name: nodatdim

Type: integer

Domain: Number_of_Data_Dimensions > 0

Parent: Dimension_Description

Optionality: Mandatory

Repeatability: =1

Definition: Number of axes used in spatial data matrix.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Dimension_Properties

Short Name: dimprops

Type: compound

Child: Name_of_Dimension

Child: Dimension_Count

Parent: Dimension_Description

Optionality: Mandatory

Repeatability: =Number_of_Data_Dimensions

Definition: Description of individual axis in spatial data matrix.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Name of Dimension

Short Name: namedim

Type: text

Domain: "row" "column" "vertical" "band" free text

Parent: Dimension_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Designation assigned to an axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Dimension_Count

Short Name: dimcount

Type: integer

Domain: Dimension_Count >= 1

Parent: Dimension_Properties

Optionality: Mandatory

Repeatability: =1

Definition: The maximum number of data points along the corresponding axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Spatial Reference Information

4 Spatial Reference Information -- the description of the reference frame for, and the means to encode, coordinates in the data set.

Type: compound

Short Name: spref

Spatial_Reference_Information =
0{Horizontal_Coordinate_System_Definition}1 +
0{***Vertical_Coordinate_System_Definition***}1 +
0{Georeferencing_Information}1

Vertical_Coordinate_System_Definition =
0{***Altitude_System_Definition***}1 +
0{Depth_System_Definition}1

Altitude_System_Definition =
Altitude_Datum_Name +
1{Altitude_Resolution}n +
Altitude_Distance_Units +
Altitude_Encoding_Method

Georeferencing_Information =
[Georectified_Raster |
Georeferenceable_Raster]

Georectified_Raster =

Pixel_Resolution +

Grid_First_Element +

Grid_Orientation +

Point_Position_In_Pixel +

Storage_Order

Pixel_Resolution =

Coordinate_Representation **(***see section 4 of base standard for production rules***)** +

Planar_Distance_Units (*see section 4 of base standard for production rules*)

Grid_First_Element =

Grid_First_Element_Map_X_Coordinate +

Grid_First_Element_Map_Y_Coordinate

Grid_Orientation =

Row_Delta_X +

Row_Delta_Y +

Column_Delta_X +

Column_Delta_Y

Georeferenceable_Raster =

1{Georeferencing_Description}n +

(1{Aerotriangulation_Reference}n) +

0{Swath_Track_Information}1

Georeferencing_Description

[Ground_Control_Point_Information |

Instrument_Specific_Georeferencing |

Referencing_Polynomial |

Other_Georeferencing_Description]

Ground_Control_Point_Information =

Ground_Control_Point_Organization +

[Ground_Control_Point_Description +

1{Ground_Control_Point_Position}n |

1{Ground_Control_Point_Description +

Ground_Control_Point_Position}n

Ground_Control_Point_Description =

Control_Point_Type +

(Control_Point_Origin) +

(Control_Point_Use_Flag) +

(Control_Point_Horizontal_X_Accuracy) +

(Control_Point_Horizontal_Y_Accuracy) +

(Control_Point_Vertical_Accuracy)

Ground_Control_Point_Position =

Control_Point_Raster_Position +

[Control_Point_Earth_Location |

Control_Point_Identification]

Control_Point_Raster_Position

Control_Point_Row +

Control_Point_Column

Control_Point_Earth Location =

Control_Point_x_Value +

Control_Point_y_Value +

(Control_Point_z_Value)

Control_Point_Identification =

Control_Point_ID +

Control_Point_Authority

Control_Point_Authority =

Contact_Information (*see section 10 of base standard for production rules*)

Instrument_Specific_Georeferencing =

1{Positional_Information}n +

(Exterior_Orientation_Accuracy) +

Rotation_Sequence +

Axis_Rotation_Convention +

Positional_Information =

Projection_Center_X_Position +

Projection_Center_Y_Position +

Projection_Center_Z_Position +

Roll +

Pitch +

Yaw+

Attitude_Angular_Units

Exterior_Orientation_Accuracy =

X_Position_Accuracy +

Y_Position_Accuracy +

Z_Position_Accuracy +

Roll_Accuracy +

Pitch_Accuracy +

Yaw_Accuracy

Referencing_Polynomial =

Polynomial_Function *(see section 5 for production rules)*

Aerotriangulation_Reference =

Citation_Information (*see section 8 of base standard for production rules*)

Swath_Track_Information

Ground_Shape +

Cross_Track_Motion

Domain Extension

Element: Altitude_Distance_Units

Domain: "meters" "feet" free text

Extended Domain: "meters" "feet" "millibars" "theta value" "cloud layer" "atmosphere layer" free text

Rationale: The added units are standard for describing atmospheric datasets and should be specifically identified among those preferred.

Extension_Information

Name: Georeferencing_Information

Short Name: georefin

Type: compound

Child: Georectified_Raster

Child: Georeferenceable_Raster

Parent: Spatial_Reference_Information

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Information that will allow determination of geographical location of raster points.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Georectified_Raster

Short Name: georecra

Type: compound

Child: Pixel_Resolution

Child: Grid_First_Element

Child: Grid_Orientation

Child: Point_Position_In_Pixel

Child: Storage_Order

Parent: Georeferencing_Information

Optionality: Conditional - present and mandatory if and only if Georeferenceable_Raster is absent

Repeatability: =1

Definition: Raster whose cells are regularly spaced in a geographic or map coordinate system defined in some Spatial_Referencing_System, such that any cell can be geolocated given its raster coordinate and the raster origin, cell spacing, and orientation. (*Let a_{mn} be the pixel grid point in the m^{th} row and the n^{th} column, with (x,y) the position of that grid point in map coordinates. Let the map position corresponding to the first element of the grid a_{11} be (x_0,y_0). Then $x= x_0 + (m-1)\Delta x_m + (n-1)\Delta y_m$ and $y= y_0 + (m-1)\Delta x_n + (n-1)\Delta y_n$, where the Δ terms are defined in the*

elements below. The overlay is shown in Figure 3, with definitions of the individual pixels.)

Rationale: Provides user geographic locations of all points in the case of a regular georectified grid.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

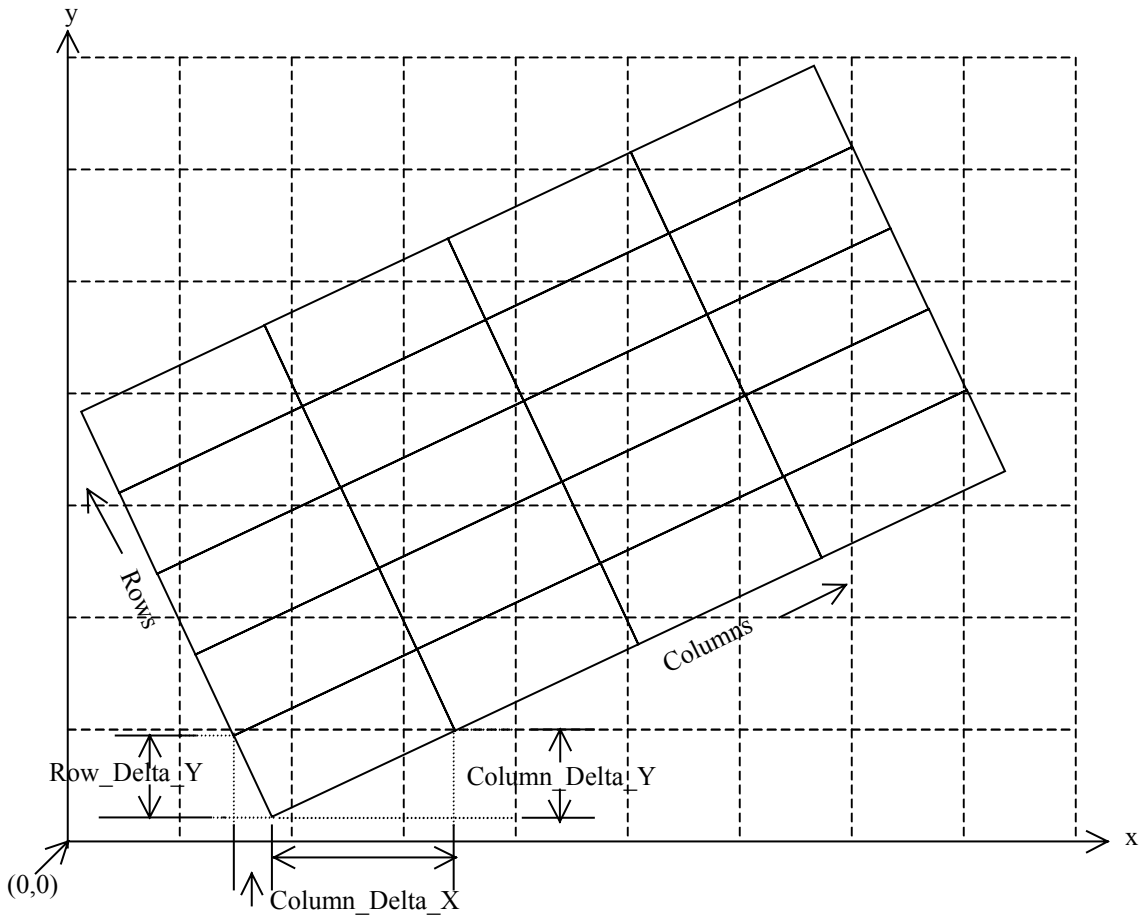


Figure 3. Row-column pixel grid (solid lines) superimposed on map x-y grid (broken lines)

Extension_Information

Name: Pixel_Resolution

Short Name: pixlreso

Type: compound

Child: Coordinate_Representation

Child: Planar_Distance_Units

Parent: Georectified_Raster

Optionality: Mandatory

Repeatability: =1

Definition: Geographic dimensions corresponding to one pixel of processed data.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Grid_First_Element

Short Name: gridinit

Type: compound

Child: Grid_First_Element_Map_X_Coordinate

Child: Grid_First_Element_Map_Y_Coordinate

Parent: Georectified_Raster

Optionality: Mandatory

Repeatability: =1

Definition: Point on map (x_0,y_0) corresponding to first element of the pixel array.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Grid_First_Element_Map_X_Coordinate

Short Name: grinitx

Type: real

Domain: free real

Parent: Grid_First_Element

Optionality: Mandatory

Repeatability: =1

Definition: Value x_0 of x-coordinate on map at point corresponding to first element of pixel system.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Grid_First_Element_Map_Y_Coordinate

Short Name: grinity

Type: real

Domain: free real

Parent: Grid_First_Element

Optionality: Mandatory

Repeatability: =1

Definition: Value y_0 of y-coordinate on map at point corresponding to first element of pixel system.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Grid_Orientation

Short Name: gridori

Type: compound

Child: Row_Delta_X

Child: Row_Delta_Y

Child: Column_Delta_X

Child: Column _Delta_Y

Parent: Georectified_Raster

Optionality: Mandatory

Repeatability: =1

Definition: Orientation of image pixel grid relative to map on which it is overlaid.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Row_Delta_X

Short Name: rowdeltx

Type: real

Domain: free real

Parent: Grid_Orientation

Optionality: Mandatory

Repeatability: =1

Definition: Increment Δx_m in map x-coordinates corresponding to increment of one grid row; a negative value means that map x-coordinate decreases with increasing row number.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Row_Delta_Y

Short Name: rowdelty

Type: real

Domain: free real

Parent: Grid_Orientation

Optionality: Mandatory

Repeatability: =1

Definition: Increment Δy_m in map y-coordinates corresponding to increment of one grid row; a negative value means that map y-coordinate decreases with increasing row number.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Column_Delta_X

Short Name: coldeltx

Type: real

Domain: free real

Parent: Grid_Orientation

Optionality: Mandatory

Repeatability: =1

Definition: Increment Δx_n in map x-coordinates corresponding to increment of one grid column; a negative value means that map x-coordinate decreases with increasing column number.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Column_Delta_Y

Short Name: coldelty

Type: real

Domain: free real

Parent: Grid_Orientation

Optionality: Mandatory

Repeatability: =1

Definition: Increment Δy_n in map y-coordinates corresponding to increment of one grid column; a negative value means that map y-coordinate decreases with increasing column number.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Point_Position_in_Pixel

Short Name: ptpos

Type: text

Domain: "center" "lower left corner" "lower right corner" "upper left corner" "upper right corner" free text

Parent: Georectified_Raster

Optionality: Mandatory

Repeatability: =1

Definition: The point in the pixel corresponding to the earth location of the pixel.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Storage_Order

Short Name: storord

Type: text

Domain: "row major" "column major" free text

Parent: Georectified_Raster

Optionality: Mandatory

Repeatability: =1

Definition: Description of which index varies most rapidly in the sequential storage of raster elements — row index (row major) or column index (column major).

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Georeferenceable_Raster

Short Name: georbler

Type: compound

Child: Georeferencing_Description

Child: Aerotriangulation_Reference

Child: Swath_Track_Information

Parent: Georeferencing_Information

Optionality: Conditional - present and mandatory if and only if Georectified_Raster is absent.

Repeatability: =1

Definition: Raster whose cells may be irregularly spaced in any geographic or map projection coordinate system, whose cells can be geolocated using geolocateion information supplied with the data but not from the raster properties alone.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Georeferencing_Description

Short Name: georefde

Type: compound

Child: Ground_Control_Point_Information

Child: Instrument_Specific_Georeferencing

Child: Referencing_Polynomial

Child: Other_Georeferencing_Description

Parent: Georeferenceable_Raster

Optionality: Mandatory

Repeatability: >=1

Definition: Description of information, provided in metadata,. that allows the geographic or map location of raster points to be located.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Ground_Control_Point_Information

Short Name: gcptinfo

Type: compound

Child: Ground_Control_Point_Organization

Child: Ground_Control_Point_Description

Child: Ground_Control_Point_Position

Parent: Georeferencing_Description

Optionality: Conditional - mandatory if neither Instrument_Specific_Georeferencing, Referencing_Polynomial, nor Other_Georeferencing_Description is present; otherwise optional

Repeatability: =1

Definition: Information describing data points for which both raster and geographic location are available and that can be used to relate raster and geographic coordinates at other points.

Rationale: If ground control points are used to geolocate data, information on them must be supplied to help the user understand how the process was carried out.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Ground_Control_Point_Organization

Short Name: gcporg

Type: text

Domain: "location" "library"

Parent: Ground_Control_Point_Information

Optionality: Mandatory

Repeatability: =1

Definition: Specification as to whether geographic locations of control points are supplied together with raster points or are in separate library.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Ground_Control_Point_Description

Short Name: gcptdesc

Type: compound

Child: Control_Point_Type

Child: Control_Point_Origin

Child: Control_Point_Use_Flag

Child: Control_Point_Horizontal_X_Accuracy

Child: Control_Point_Horizontal_Y_Accuracy

Child: Control_Point_Vertical_Accuracy

Parent: Ground_Control_Point_Information

Optionality: Mandatory

Repeatability: >=1

Definition: Lineage and applicability of ground control points.

Source: ISPRS WG II/4

Extension_Information

Name: Control_Point_Type

Short Name: gcptype

Type: text

Domain: “full” “horizontal” “vertical”

Parent: Ground_Control_Point_Description

Optionality: Mandatory

Repeatability: =1

Definition: Direction or directions for which control point provides georeference information.

Source: ISPRS WG II/4

Extension_Information

Name: Control_Point_Origin

Short Name: gcpori

Type: text

Domain: "terrestrial" "global positioning system" "aerotriangulation" "tie point" free text

Parent: Ground_Control_Point_Description

Optionality: Optional

Repeatability: =1

Definition: The source of the ground control point measurement.

Source: ISPRS WG II/4

Extension_Information

Name: Control_Point_Use_Flag

Short Name: gcpusefl

Type: text

Domain: "new" "used" "verified" "not verified" "used and verified"free text

Parent: Ground_Control_Point_Description

Optionality: Optional

Repeatability: =1

Definition: Whether the ground control point has previously been used and verified.

Source: ISPRS WG II/4

Extension_Information

Name: Control_Point_Horizontal_X_Accuracy

Short Name: gcpxaccu

Type: real

Domain: Control_Point_Horizontal_X_Accuracy >= 0

Parent: Ground_Control_Point_Description

Optionality: Optional

Repeatability: =1

Definition: *A priori* standard deviation of the horizontal coordinates of the ground control point, in coordinate units specified under Horizontal_Coordinate_System_Definition.

Source: ISPRS WG II/4

Extension_Information

Name: Control_Point_Horizontal_Y_Accuracy

Short Name: gcpyaccu

Type: real

Domain: Control_Point_Horizontal_Y_Accuracy >= 0

Parent: Ground_Control_Point_Description

Optionality: Optional

Repeatability: =1

Definition: *A priori* standard deviation of the horizontal coordinates of the ground control point, in coordinate units specified under Horizontal_Coordinate_System_Definition.

Source: ISPRS WG II/4

Extension_Information

Name: Control_Point_Vertical_Accuracy

Short Name: gcpzaccu

Type: real

Domain: Control_Point_Vertical _Accuracy >= 0

Parent: Ground_Control_Point_Description

Optionality: Optional

Repeatability: =1

Definition: *A priori* standard deviation of the vertical coordinate of the ground control point, in units specified by Altitude_Distance_Units.

Source: ISPRS WG II/4

Extension_Information

Name: Ground_Control_Point_Position

Short Name: gcptpos

Type: compound

Child: Control_Point_Raster_Position

Child: Control_Point_Earth_Location

Child: Control_Point_Identification

Parent: Ground_Control_Point_Information

Optionality: Mandatory

Repeatability: >=1

Definition: Location of individual control points, defined separately for every point, in both raster and geographic or map coordinate systems.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_Raster_Position

Short Name: conptrpo

Type: compound

Child: Control_Point_Row

Child: Control_Point_Column

Parent: Ground_Control_Point_Position

Optionality: Mandatory

Repeatability: = 1

Definition: Position in raster array of individual ground control point used in geolocating data.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_Row

Short Name: gcprow

Type: real

Domain: Control_Point_Row >= 0

Parent: Control_Point_Raster_Position

Optionality: Mandatory

Repeatability: =1

Definition: Value of row coordinate at ground control point position in raster grid.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_Column

Short Name: gcpcolum

Type: real

Domain: Control_Point_Column >= 0

Parent: Control_Point_Raster_Position

Optionality: Mandatory

Repeatability: =1

Definition: Value of column coordinate at ground control point position in raster grid.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_Earth_Location

Short Name: gcpearlc

Type: compound

Child: Control_Point_x_Value

Child: Control_Point_y_Value

Child: Control_Point_z_Value

Parent: Ground_Control_Point_Information

Optionality: Conditional - present and mandatory if and only if value of Ground_Control_Point_Organization is "location"

Repeatability: =1

Definition: Geographic or map location of ground control point.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_x_Value

Short Name: gcpxval

Type: real

Domain: free real

Parent: Control_Point_Earth_Location

Optionality: Mandatory

Repeatability: =1

Definition: Value of map x-coordinate at control point location.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_y_Value

Short Name: gcpyval

Type: real

Domain: free real

Parent: Control_Point_Earth_Location

Optionality: Mandatory

Repeatability: =1

Definition: Value of map y-coordinate at control point location.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_z_Value

Short Name: gcpzval

Type: real

Domain: free real

Parent: Control_Point_Earth_Location

Optionality: Optional

Repeatability: =1

Definition: Value of vertical coordinate at control point location.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Control_Point_Identification

Short Name: gcpidnt

Type: compound

Child: Control_Point_ID

Child: Control_Point_Authority

Parent: Ground_Control_Point_Information

Optionality: Conditional - present and mandatory if and only if value of Ground_Control_Point_Organization is "library"

Repeatability: =1

Definition: Information allowing the user to find the location of a control point from a catalogue.

Source: U. S. National Imagery and Mapping Agency

Extension_Information

Name: Control_Point_ID

Short Name: gcpid

Type: text

Domain: free text

Parent: Control_Point_Identification

Optionality: Mandatory

Repeatability: =1

Definition: Identifier assigned to control point in library.

Source: U. S. National Imagery and Mapping Agency

Extension_Information

Name: Control_Point_Authority

Short Name: gcpauth

Type: compound

Child: Contact_Information

Parent: Control_Point_Identification

Optionality: Mandatory

Repeatability: =1

Definition: Contact who can supply ground control point coordinates given identifier.

Source: U. S. National Imagery and Mapping Agency

Extension_Information

Name: Instrument_Specific_Georeferencing

Short Name: insspgeo

Type: compound

Child: Positional_Information

Child: Exterior_Orientation _Accuracy

Child: Rotation_Sequence

Child: Axis_Rotation_Convention

Parent: Georeferencing_Description

Optionality: Conditional - mandatory if neither Ground_Control_Point_Information, Referencing_Polynomial, nor Other_Georeferencing_Description is present; otherwise optional

Repeatability: =1

Definition: Information relating coordinate system of a particular instrument to ground coordinate system.

Source: ISPRS WG II/4.0

Extension_Information

Name: Positional_Information

Short Name: posiinfo

Type: compound

Child: Projection_Center_X_Position

Child: Projection_Center_Y_Position

Child: Projection_Center_Z_Position

Child: Roll

Child: Pitch

Child: Yaw

Child: Attitude_Angular_Units

Parent: Instrument_Specific_Georeferencing

Optionality: Mandatory

Repeatability: >=1

Definition: Orientation of instrument and detector projection.

Source: ISPRS WG II/4

Extension_Information

Name: Projection_Center_X_Position

Short Name: prjcxpos

Type: real

Domain: free real

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: X-component of the position of the projection center in the ground coordinate system defined under Horizontal_Coordinate_System_Definition.

Source: ISPRS WG II/4

Extension_Information

Name: Projection_Center_Y_Position

Short Name: prjcypos

Type: real

Domain: free real

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: Y-component of the position of the projection center in the ground coordinate system defined under Horizontal_Coordinate_System_Definition.

Source: ISPRS WG II/4

Extension_Information

Name: Projection_Center_Z_Position

Short Name: prjczpos

Type: real

Domain: free real

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: Z-component of the position of the projection center in the ground coordinate system defined under Vertical_Coordinate_System_Definition.

Source: ISPRS WG II/4

Extension_Information

Name: Roll

Short Name: omegarll

Type: real

Domain: free real

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: Roll angle omega of image coordinate system relative to ground coordinate system, in units defined by Attitude_Angular_Units, measured clockwise around the positive x-axis (the direction of motion).

Source: ISPRS WG II/4

Extension_Information

Name: Pitch

Short Name: phipitch

Type: real

Domain: free real

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: Pitch angle phi of image coordinate system relative to ground coordinate system, in units defined by Attitude_Angular_Units, measured clockwise around the positive y-axis ($z \times x$).

Source: ISPRS WG II/4

Extension_Information

Name: Yaw

Short Name: kappayaw

Type: real

Domain: free real

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: Yaw angle kappa of image coordinate system relative to ground coordinate system, in units defined by Attitude_Angular_Units, measured clockwise around the positive z-axis (vertical).

Source: ISPRS WG II/4

Extension_Information

Name: Attitude_Angular_Units

Short Name: attanglu

Type: text

Domain: "degrees" "radians" free text

Parent: Positional_Information

Optionality: Mandatory

Repeatability: =1

Definition: Units of angular measure in which Roll, Pitch, and Yaw are expressed

Source: ISPRS WG II/4

Extension_Information

Name: Exterior_Orientation_Accuracy

Short Name: accexori

Type: compound

Child: X_Position_Accuracy

Child: Y_Position_Accuracy

Child: Z_Position_Accuracy

Child: Roll_Accuracy

Child: Pitch_Accuracy

Child: Yaw_Accuracy

Parent: Instrument_Specific_Georeferencing

Optionality: Optional

Repeatability: =1

Definition: Uncertainties in the parameters of exterior orientation.

Source: ISPRS WG II/4

Extension_Information

Name: X_Position_Accuracy

Short Name: accxpos

Type: real

Domain: X_Position_Accuracy >= 0

Parent: Exterior_Orientation_Accuracy

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation of x coordinate of projection center.

Source: ISPRS WG II/4

Extension_Information

Name: Y_Position_Accuracy

Short Name: accypos

Type: real

Domain: Y_Position_Accuracy >= 0

Parent: Exterior_Orientation_Accuracy

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation of y coordinate of projection center.

Source: ISPRS WG II/4

Extension_Information

Name: Z_Position_Accuracy

Short Name: acczpos

Type: real

Domain: Z_Position_Accuracy >= 0

Parent: Exterior_Orientation_Accuracy

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation of z coordinate of projection center.

Source: ISPRS WG II/4

Extension_Information

Name: Roll_Accuracy

Short Name: accomega

Type: real

Domain: Roll_Accuracy >= 0

Parent: Exterior_Orientation_Accuracy

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation of roll angle, omega, in same units as angle.

Source: ISPRS WG II/4

Extension_Information

Name: Pitch_Accuracy

Short Name: accphi

Type: real

Domain: Pitch_Accuracy >= 0

Parent: Exterior_Orientation_Accuracy

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation of pitch angle, phi, in same units as angle.

Source: ISPRS WG II/4

Extension_Information

Name: Yaw_Accuracy

Short Name: acckappa

Type: real

Domain: Yaw_Accuracy >= 0

Parent: Exterior_Orientation_Accuracy

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation of yaw angle, kappa, in same units as angle.

Source: ISPRS WG II/4

Extension_Information

Name: Rotation_Sequence

Short Name: pcrotseq

Type: text

Domain: “123” “132” “213” “231” “312” “321”

Parent: Instrument_Specific_Georeferencing

Optionality: Mandatory

Repeatability: =1

Definition: Sequence of rotations in roll, pitch and yaw: 1 represents roll, 2 represents pitch, and 3 represents yaw, such that "132" would represent a rotation in the sequence roll, yaw, pitch.

Source: ISPRS WG II/4

Extension_Information

Name: Axis_Rotation_Convention

Short Name: axrotcon

Type: text

Domain: “rotated” “fixed”

Parent: Instrument_Specific_Georeferencing

Optionality: Mandatory

Repeatability: =1

Definition: Description of whether the coordinate system axes are rotated or remain fixed with each step of application of the rotation matrix.

Source: ISPRS WG II/4

Extension_Information

Name: Referencing_Polynomial

Short Name: refrpoly

Type: compound

Child: Polynomial_Function

Parent: Georeferencing_Description

Optionality: Conditional - mandatory if neither Ground_Control_Point_Information, Instrument_Specific_Georeferencing, nor Other_Georeferencing_Description is present; otherwise optional

Repeatability: =1

Definition: Polynomial function used to relate image and ground positions.

Source: ISPRS WG II/4

Extension_Information

Name: Other_Georeferencing_Description

Short Name: othrefde

Type: text

Child: free text

Parent: Georeferencing_Description

Optionality: Conditional - mandatory if neither Ground_Control_Point_Information, Instrument_Specific_Georeferencing, nor Referencing_Polynomial is present; otherwise optional

Repeatability: =1

Definition: Text description of other method for georeferencing.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Aerotriangulation_Reference

Short Name: aerotref

Type: compound

Child: Citation_Information

Parent: Georeferenceable_Raster

Optionality: Optional

Repeatability: >=1

Definition: Referemce containing information describing photogrammetric triangulation using aerial images.

Source: Moffit, F., Mikhail, E. (1980): Photogrammetry, Harper & Row, Publishers, New York

Extension_Information

Name: Swath_Track_Information

Short Name: swtrkinf

Type: compound

Child: Ground_Shape

Child: Cross_Track_Motion

Parent: Name: Georeferenceable_Raster

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Properties of the swath track on the ground.

Rationale: Aids the user in deriving coordinates of all image points.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Ground_Shape

Short Name: grndshpe

Type: text

Domain: free text

Parent: Swath_Track_Information

Optionality: Mandatory

Repeatability: =1

Definition: Shape of pixel on ground.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Motion

Short Name: xtrckmot

Type: text

Domain: free text

Parent: Swath_Track_Information

Optionality: Mandatory

Repeatability: =1

Definition: Direction and pattern of measurements relative to track.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Entity and Attribute Information

5 Entity and Attribute Information -- details about the information content of the dataset, including the entity types, their attributes, and the domains from which attribute values may be assigned.

Type: compound

Short Name: eainfo

Entity_and_Attribute_Information =
[1{***Detailed_Description***}n |
1{Overview_Description}n |
1{***Detailed_Description***}n +
1{Overview_Description}n]

Detailed_Description =
Entity_Type +
0{***Attribute***}n

Attribute =
Attribute_Label +
Attribute_Definition +
Attribute_Definition_Source +
1{***Attribute_Domain_Values***}n +
0{Beginning_Date_of_Attribute_Values +

0{Ending_Date_of_Attribute_Values}1}n +

(Attribute_Value_Accuracy_Information) +

(Attribute_Measurement_Frequency)

Attribute_Domain_Values =

[Enumerated_Domain |

Range_Domain |

Codeset_Domain |

Unrepresentable_Domain] +

0{**Data_Scaling_Information**}1

Data_Scaling_Information =

[Polynomial|

Non_Polynomial_Scaling]

Polynomial =

Polynomial_Numerator +

0{Polynomial_Denominator}1

Polynomial_Numerator =

1{Polynomial_Coefficient}n

Polynomial_Denominator =

1{Polynomial_Coefficient}n

Extension_Information

Name: Data_Scaling_Information

Short Name: datascal

Type: compound

Child: Polynomial_Function

Child: Non_Polynomial_Scaling

Parent: Attribute_Domain_Values

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Function converting set of values on one scale to another.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Polynomial_Function

Short Name: polyfunc

Type: compound

Child: Polynomial_Numerator

Child: Polynomial_Denominator

Parent: Data_Scaling_Information

Optionality: Conditional - present and mandatory if and only if Non_Polynomial_Scaling is absent

Repeatability: =1

Definition: A function in successive powers of the independent variable, or the ratio of such functions, used in a transoformation, for example, to derive a set of values on one scale or coordinate system from the value in another, in the sense derived value = polynomial (initial value).

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Polynomial_Numerator

Short Name: polynume

Type: compound

Child: Polynomial_Coefficient

Parent: Polynomial_Function

Optionality: Mandatory

Repeatability: =1

Definition: The polynomial function when not a ratio, and the dividend of the ratio when it is.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Polynomial_Denominator

Short Name: polydeno

Type: compound

Child: Polynomial_Coefficient

Parent: Polynomial_Function

Optionality: Mandatory if applicable

Repeatability: =1

Definition: The divisor of a polynomial function that is a ratio *(If absent, assumed equal to 1).*

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Polynomial_Coefficient

Short Name: polycoef

Type: real

Domain: free real

Parent: Polynomial_Numerator

Optionality: Mandatory

Repeatability: >=1

Definition: The coefficient of one term in the numerator or denominator of a polynomial function. *(For a polynomial numerator or denominator of order m, there will be m+1 coefficients. Any of these coefficients, except that of the m power term, may be zero. When the function is linear, the coefficient of the zero-power term is the offset and the coefficient of the first power term is the scale factor.)*

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Non_Polynomial_Scaling

Short Name: npolscal

Type: text

Domain: free text

Parent: Data_Scaling_Information

Optionality: Conditional - present and mandatory if and only if Polynomial_Function is absent

Repeatability: =1

Definition: Text description of the function used to derive derive a set of values on one scale from there value in another, using a function that is not a polynomial.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

2509 Platform and Mission Information

2510

2511 Extension Information

2512 Name: Platform_and_Mission_Information

2513 Short Name: plmiinfo

2514 Type: Compound

2515 Child: Mission_Information

2516 Child: Platform_Information

2517 Parent: Metadata

2518 Optionality: Mandatory-if-applicable

2519 Repeatability: =1

2520 Definition: Descriptive information about the platform from which the measurements that

2521 produced the data and about the program of which the data collection was a part.

2522 Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions

2523 Development Team

2524

2525

2526 **Platform_and_Mission_Information =**

2527 **(Mission_Information) +**

2528 **(1{Platform_Information}n)**

2529

2530 **Mission_ Information =**

2531 **(Mission_Description) +**

2532 (**Mission_History**)

Mission_History =

Mission_Start_Date +

(1{Mission_Significant_Event}n) +

0{Mission_Completion}1

Mission_Start _Date =

Single Date/Time *(see section 9 of base standard for production rules)*

Mission_Significant_Event =

Process_Step *(see section 2 of base standard for production rules)*

Mission_Completion =

Single Date/Time *(see section 9 of base standard for production rules)*

Platform_Information =

(1{Platform_Sponsor}n) +

(Platform_Description)

(Platform_Orbit) +

(Flight Protocol)

Platform_Orbit =

[Keplerian_Orbit|

Nominal_Geostationary_Position]

Keplerian_Orbit =

[[Semimajor_Axis |

Orbit_Period] |

Semimajor_Axis +

Orbit_Period] +

Eccentricity +

Orbit_Angle_Units +

Inclination +

Right_Ascension_of_Ascending_Node +

Argument_of_Perigee +

Perigee_Passage_Time

Orbit_Period =

Orbit_Period_Units +

Orbit_Period_Value

Perigee_Passage_Time =

Single Date/Time (see section 9 of base standard for production rules)

Nominal_Geostationary_Position =

Platform_Nominal_Longitude +

Platform_Nominal_Altitude

Platform_Nominal _Altitude =

Platform_Nominal _Altitude_Units +

Platform_Nominal _Altitude_Value

Platform_Nominal_Altitude_Units =

Altitude_Distance_Units **(***see section 4 of base standard for complete production rules***)**

Flight_Protocol =

Flying_Height +

(GPS_Information_Availability) +

(INS_Reading_Availability)

Extension_Information

Name: Mission_Information

Short Name: missinfo

Type: compound

Child: Mission_Description

Child: Mission_History

Parent: Platform_and_Mission_Information

Optionality: Optional

Repeatability: =1

Definition: General information about the overall data gathering program to which the data contribute.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Mission_Description

Short Name: missdesc

Type: text

Domain: free text

Parent: Mission_Information

Optionality: Optional

Repeatability: =1

Definition: Description of the mission of which the platform observations are part and the objectives of that mission.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Mission_History

Short Name: misshist

Type: compound

Child: Mission_Start_Date

Child: Mission_Significant_Event

Child: Mission_Completion

Parent: Mission_Information

Optionality: Optional

Repeatability: =1

Definition: Significant events and dates over the history of the mission.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Mission_Start_Date

Short Name: missstdt

Type: compound

Child: Single_Date/Time

Parent: Mission_History

Optionality: Mandatory

Repeatability: =1

Definition: Date that mission during which data were taken began.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Mission_Significant_Event

Short Name: misssige

Type: compound

Child: Process_Step

Parent: Mission_History

Optionality: Optional

Repeatability: >=1

Definition: Date and description of a major occurrence during mission.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Mission_Completion

Short Name: misscomp

Type: compound

Child: Single_Date/Time

Parent: Mission_History

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Scheduled or actual end date of mission during which data were taken.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Information

Short Name: platinfo

Type: compound

Child: Platform_Sponsor

Child: Platform_Description

Child: Platform_Orbit

Child: Flight_Protocol

Parent:: Platform_and_Mission_Information

Optionality: Optional

Repeatability: >=1

Definition: General information about the platform from which the data were taken.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Sponsor

Short Name: platspon

Type: text

Domain: free text

Parent: Platform_Information

Optionality: Optional

Repeatability: >=1

Definition: An organization responsible for building, launch, or operation of the platform, and its role.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Description

Short Name: platdesc

Type: text

Domain: free text

Parent: Platform_Information

Optionality: Optional

Repeatability: =1

Definition: Narrative description of the platform from which the data were taken.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Orbit

Short Name: platforb

Type: compound

Child: Keplerian_Orbit

Child: Nominal_Geostationary_Position

Parent: Platform_Information

Optionality: Optional

Repeatability: =1

Definition: Orbital parameters of instrument platform.

Rationale: Informs the user about potential spatial and temporal coverage of the data.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Keplerian_Orbit

Short Name: kepleror

Type: compound

Child: Semimajor_Axis

Child: Orbit_Period

Child: Eccentricity

Child: Orbit_Angle_Units

Child: Inclination

Child: Right_Ascension_of_Ascending_Node

Child: Argument_of_Perigee

Child: Perigee_Passage_Time

Parent: Platform_Orbit

Optionality: Conditional - present and mandatory only if Nominal_Geostationary_Position is absent

Repeatability: =1

Definition: Keplerian elements of platform orbit.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Semimajor_Axis

Short Name: semimaax

Type: real

Domain: $6378.2 < \text{Semimajoraxis} < 2.61 \times 10^5$

Parent: Keplerian_Orbit

Optionality: Conditional - mandatory if Orbit_Period is absent; otherwise optional

Repeatability: =1

Definition: Semimajor axis of platoform orbit, in kilometers.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Orbit_Period

Short Name: orbitpd

Type: compound

Child: Orbit_Period_Units

Child: Orbit_Period_Value

Parent: Keplerian_Orbit

Optionality: Conditional - mandatory if Semimajor_Axis is absent; otherwise optional

Repeatability: =1

Definition: Time from one perigee to the next. (*The orbit period is related to the semimajor axis of the orbit by* $P^2=4\pi^2a^3/[G(M+m)]$*, where P is the orbit period, a is the semimajor axis, G the universal gravitational constant, M the mass of the Earth, and m the mass of the satellite. In practice, because the product GM is easier to obtain than G or M, and because* $m<<M$*, the form* $P^2=4\pi^2a^3/GM$ *is often used.)*

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Orbit_Period_Units

Short Name: orpdunit

Type: text

Domain: "seconds" "minutes" "hours" "days" free text

Parent: Orbit_Period

Optionality: Mandatory

Repeatability: =1

Definition: Unit of measure used to express orbit period.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Orbit_Period_Value

Short Name: orpdval

Type: real

Domain: Orbit_Period_Value > 0

Parent: Orbit_Period

Optionality: Mandatory

Repeatability: =1

Definition: Time required for one platform orbit, in units given by Orbit_Period_Units.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Eccentricity

Short Name: eccentry

Type: real

Domain: 0 <= Eccentricity < 1

Parent: Keplerian_Orbit

Optionality: Mandatory

Repeatability: =1

Definition: Eccentricity of orbit, equal to $(1-b/a)^{1/2}$, where *a* is the length of the major axis and *b* is the length of the minor axis of the orbit.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Orbit_Angle_Units

Short Name: orbangun

Type: text

Domain: "degrees" "radians" free text

Parent: Keplerian_Orbit

Optionality: Mandatory

Repeatability: =1

Definition: Unit of measure used to express orbital angles.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Inclination

Short Name: inclinat

Type: real

Domain: 0 <= Inclination <= 180

Parent: Keplerian_Orbit

Optionality: Mandatory

Repeatability: =1

Definition: Angle between orbit and equator, in units given by Orbit_Angle_Units.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Right_Ascension_of_Ascending_Node

Short Name: raascnod

Type: real

Domain: 0 <= Right_Ascension _of_Ascending_Node < 360

Parent: Keplerian_Orbit

Optionality: Mandatory

Repeatability: =1

Definition: The right ascension (angle eastward from the vernal equinox) where the satellite orbit crosses the equator, moving northward, in units given by Orbit_Angle_Units.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Argument_of_Perigee

Short Name: argupgee

Type: real

Domain: 0 <= Argument_of_Perigee < 360

Parent: Keplerian_Orbit

Optionality: Mandatory

Repeatability: =1

Definition: The angle between the ascending node and perigee, measured from the ascending node in the direction of the platform's motion along the plane of the orbit, in units given by Orbit_Angle_Units.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Perigee_Passage_Time

Short Name: peripass

Type: compound

Child: Single Date/Time

Parent: Keplerian_Orbit

Optionality: Mandatory

Repeatability: =1

Definition: One date and time where platform was at closest point to earth in its orbit.

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 88 revision

Extension_Information

Name: Nominal_Geostationary_Position

Short Name: ngeopos

Type: compound

Child: Platform_Nominal_Longitude

Child: Platform_Nominal_Altitude

Parent: Platform_Orbit

Optionality: Conditional - present and mandatory only if Keplerian_Orbit is absent

Repeatability: =1

Definition: Nominal location of platform designed to remain stationary over one point on earth.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Nominal_Longitude

Short Name: pnomlong

Type: real

Domain: -180 < Platform_Nominal_Longitude <= 180

Parent: Nominal_Geostationary_Position

Optionality: Mandatory

Repeatability: =1

Definition: Nominal value for longitude of subsatellite point.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Nominal_Altitude

Short Name: gpnalti

Type: compound

Child: Platform_Nominal_Altitude_Units

Child: Platform_Nominal_Altitude_Value

Optionality: Mandatory

Repeatability: =1

Definition: Nominal altitude of satellite above the surface given by Altitude_Datum_Name defined in base standard.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Nominal_Altitude_Units

Short Name: gpnaltun

Type: compound

Child: Altitude_Distance_Units

Parent: Platform_Nominal_Altitude

Optionality: Mandatory

Repeatability: =1

Definition: Units of measure in which nominal altitude for platform is expressed.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Platform_Nominal_Altitude_Value

Short Name: gpnaltva

Type real

Domain: free real

Parent: Platform_Nominal_Altitude

Optionality: Mandatory

Repeatability: =1

Definition: Value for nominal altitude of platform, in units given by Platform_Nominal_Altitude_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Flight_Protocol

Short Name: fltprot

Type: compound

Child: Flying Height

Child: GPS_Information_System_Availability

Child: INS_Reading_Availability

Parent: Platform_Information

Optionality: Optional

Repeatability: =1

Definition: Description of circumstances and properties of the flight track relevant to use of the images and data.

Source: ISPRS WG II/4

Extension_Information

Name: Flying_Height

Short Name: flyhite

Type: real

Domain: Flying_Height > 0

Parent: Flight_Protocol

Optionality: Mandatory

Repeatability: =1

Definition: Height of platform above ground in meters, with an uncertainty of 10-100 meters.

Rationale: This value is used for planning purposes or photo interpretation.

Source: ISPRS/WG-II/4

Extension_Information

Name: GPS_Information_System_Availability

Short Name: gpsavail

Type: text

Domain: "available" "not available"

Parent: Flight Protocol

Optionality: Optional

Repeatability: =1

Definition: Availability of three-dimensional Global Positioning System (GPS) positions.

Source: ISPRS/WG-II/4

Extension_Information

Name: INS_Reading_Availability

Short Name: insavail

Type: text

Domain: "available" "not available"

Parent: Flight_Protocol

Optionality: Optional

Repeatability: =1

Definition: Availability of Inertial Navigation System (INS) readings along the flight line.

Source: ISPRS/WG-II/4

Instrument Information

Extension_Information

Name: Instrument_Information

Short Name: instinfo

Type: compound

Child: Instrument_Description

Child: Instrument_Reference

Parent: Metadata

Optionality: Mandatory-if-applicable

Repeatability: >=1

Definition: Instrument properties and behavior.

Rationale: The properties of the instrument must be known in order to interpret the readings as geographic information.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Instrument_Information =

[[1{Instrument_Description}n |

1{Instrument_Reference}n]|

1{Instrument_Description}n +

1{Instrument_Reference}n]

Instrument_Description =

Instrument Type +

0{Operational_Mode}1 +

Collection_Type +

(Orientation_Information) +

[Frame_Camera|

Scan|Other_Collector_Description] +

(Instrument_Properties_Description)

Orientation_Information =

Axes +

(Rotation_Description) +

(Translation_Description) +

Axes =

X_Axis_Definition +

Y_Axis_Definition +

Z_Axis_Definition

Frame_Camera =

(Frame_Hardware) +

Frame_Optics +

Frame_Geometric_Properties +

(Frame_Operation) +

(Frame_Radiometric_Properties) +

(Frame_Spectral_Properties)

Frame_Hardware =

(Camera_Type) +

(Camera_Identifier) +

(Lens) +

(Magazine_Identifier) +

(Film_Type) +

(Aerial_Film_Speed) +

(Effective_Aerial_Film_Speed) +

(Developing_Institution)

Developing_Institution =

Contact_Information (*see section 10 of base standard for production rules*)

Lens =

Lens_Type +

Lens_Identifier

Frame_Optics =

(Photographic_Resolving_Power) +

(Relative_Aperture) +

(Exposure_Time)

Calibrated_Focal_Length +

(Quality_of_Focal_Length) +

(Last_Calibration)

Photographic_Resolving_Power =

Number_of_Resolution_Values +

1{Resolution_Value_Set}n +

(Area_Weighted_Average_Resolution)

Resolution_Value_Set =

Resolving_Angle +

Resolving_Value_Radial +

Resolving_Value_Tangential

Last_Calibration =

Date_of_Last_Calibration +

(Method_of_Last_Calibration) +

(Institution_of_Last_Calibration)

Frame_Geometric_Properties =

(Image_Size) +

[Fiducial |

Reseau |

Sensor_System] +

(Principal_Point_of_Autocollimation) +

(Quality_of_Principal_Point_of_Autocollimation) +

(Principal_Point_of_Symmetry) +

(Quality_of_Principal_Point_of_Symmetry) +

(Fiducial_Center) +

(Sensor_Element_Location) +

(Distortion)

Image_Size =

Image_Size_x_Value +

Image_Size_y_Value

Fiducial =

Location_Information *(see separate section for production rules)*

Reseau =

Location_Information *(see separate section for production rules)*

Sensor_System =

Sensor_Grid +

Calibrated_Detector_Positions

Sensor_Grid =

Raster_Object_Type *(see section 3 for production rules)*

Calibrated_Detector_Positions =

Location_Information *(see separate section for production rules)*

Principal_Point_of_Autocollimation =

Location_Information *(see separate section for production rules)*

Quality_of_Principal_Point_of_Autocollimation =

Quality_of_Autocollimation_Principal_Point_x_Value +

Quality_of_Autocollimation_Principal_Point_y_Value

Principal_Point_of_ Symmetry =

Location_Information *(see separate section for production rules)*

Quality_of_Principal_Point_of_Symmetry =

Quality_of_ Symmetry_Principal_Point_x_Value +

Quality_of_ Symmetry_Principal_Point_y_Value

Fiducial_Center =

Location_Information *(see separate section for production rules)*

Sensor_Element_Location =

Availability_of_Element_Locations +

(Source_of_Element_Locations)

Source_of_Element_Locations =

Citation_Information (*see section 8 of base standard for production rules)*

Distortion =

[Distortion_Type_Radial_Symmetrical |

Distortion_Type_Radial_Asymmetrical |

Distortion_Type_Affine]

Distortion_Type_Radial_Symmetrical =

[Distance_Dependent_Distortion |

Angle_Dependent_Distortion |

Radial_Symmetrical_Distortion_Polynomial]

Distance_Dependent_Distortion =

Radial_Symmetrical_Distance_Interval +

Number_of_ Distance_Distortion_Values +

1{Distance_Distortion_Value}n

Angle_Dependent_Distortion =

Radial_Symmetrical_Angle_Interval +

Number_of_Angle_Distortion_Values +

1{Angle_Distortion_Value}n

Radial_Symmetrical_Distortion_Polynomial =

Polynomial_Function *(see section 5 for production rules)*

Distortion_Type_Radial_Asymmetrical =

Radial_Asymmetrical_Coefficient_B1 +

Radial_Asymmetrical_Coefficient_B2

Distortion_Type_Affine =

Affine_Distortion_X_Prime_Coefficient +

Affine_Distortion_Y_Prime_Coefficient

Frame_Operation =

(Stabilized_Mount) +

(Forward_Motion_Compensation)

Frame_Radiometric_Properties =

0{Frame_Radiometric_Calibration}1 +

(Light_Drop)

Frame_Radiometric_Calibration =

Data_Scaling_Information (*see Entity and Attribute Information for production rules*)

Frame_Spectral_Properties =

(Frame_Spectral_Information) +

(Filter_on_Camera) +

(Spectral_Limit)

Frame_Spectral_Information =

Spectral_Information (*see elsewhere in this section for production rules)*

Filter_on_Camera =

Filter_on_Camera_Indicator +

0{Filter_Type}1 +

Scan =

1{Scan_Geometric_Properties}n +

Sample_Properties +

Scan_Radiometric_Properties +

0{Scan_Spectral_Properties}1

Scan_Geometric_Properties =

Scan_Angle_Units +

Scan_Time_Units +

Scan_Distance_Units +

0{Scan_Cross_Track_Properties}1 +

0{Scan_Elevation_Properties}1 +

0{Profile_Properties}1 +

(Scan_Timing) +

Instantaneous_Field_of_View

Scan_Cross_Track_Properties =

Cross_Track_Zero +

[Cross_Track_Sweep |

Cross_Track_Fixed_Angle] +

(Cross_Track_Description)

Cross_Track_Zero =

Cross_Track_Axis +

Cross_Track_Direction

Cross_Track_Sweep =

Number_of_Cross_Track_Samples +

Cross_Track_Start_Angle +

[Cross_Track_Extent_Angle |

Cross_Track_Step_Angle]

Scan_Elevation_Properties =

Elevation_Zero +

[Elevation_Sweep |

Elevation_Fixed_Angle]

(Elevation_Description)

Elevation_Zero =

Elevation_Axis +

Elevation_Direction

Elevation_Sweep =

Number_of_Elevation_Samples +

Elevation_Start_Angle +

[Elevation_Extent_Angle |

Elevation_Step_Angle]

Profile_Properties =

[Profile_Sounding |

Profile_Fixed] +

(Profile_Description)

Profile_Sounding =

Number_of_Profile_Samples +

Profiling_Direction +

Profile_Start +

[Profile_Extent |

Profile_Step]

Scan_Timing =

Scan_Start_Time +

[Scan_Duration |

Scan_Step_Time] +

Scan_Repeat_Time +

Scan_Start_Time =

Single Date/Time (*see section 9 of base standard for production rules***)**

Sample_Properties =

Sample_Description_Units +

1{Pixel_Description}n

Sample_Description_Units =

0{Sample_Angle_Units}1 +

0{Sample_Profile_Units}1

Pixel_Description =

0{Pixel_Cross_Track_Size}1 +

0{Pixel_Elevation_Size}1 +

0{Pixel_Profile_Size}1 +

(Pixel_Height_Above_Ellipsoid) +

(Pixel_Point_Spread_Function)

Sample_Profile_Units =

Altitude_Distance_Units (*see Spatial_Reference_Information for production rules*)

Scan_Radiometric_Properties =

Data_Scaling_Information (*see Entity and Attribute Information for production rules*)

Scan_Spectral_Properties =

Spectral_Information

Spectral_Information =

Number_of_Wavelength_Bands +

1{Wavelength_Band_Properties}n

Number_of_Wavelength_Bands =

Number_of_Bands *(see section 1 for production rules)*

Wavelength_Band_Properties

Wavelength_Units +

(Band_Boundary_Definition) +

Minimum_Wavelength +

Maximum_Wavelength +

(Peak_Wavelength) +

(Nominal_Spatial_Resolution) +

(Band_Quality) +

0{Polarization_Characteristics}n +

(Band_Description)

Nominal_Spatial_Resolution =

Spatial_Resolution_Units +

Spatial_Resolution_Value

Polarization Characteristics =

Receiver_Polarization +

0{Sender_Polarization}1

Instrument_ Reference =

Citation_Information (*see section 8 of base standard for production rules)*

Extension_Information

Name: Instrument_Description

Short Name: instdesc

Type: compound

Child: Instrument_Type

Child: Operational_Mode

Child: Collection_Type

Child: Orientation_Information

Child: Frame_Camera

Child: Scan

Child: Other_Collector_Description

Child: Instrument_Properties_Description

Parent: Instrument_Information

Optionality: Conditional - mandatory if no instances of Instrument_Reference present, otherwise optional.

Repeatability: >=1

Definition: Characteristics and behavior of instrument.

Rationale: Descriptive information about the instrument may be in metadata accompanying the data.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Instrument_Type

Short Name: insttyp

Type: text

Domain: "imager" "sounder" free text

Parent: Instrument_Description

Optionality: Mandatory

Repeatability: =1

Definition: Class of data measuring instrument.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - Instrument Data Collection Type

Extension_Information

Name: Operational_Mode

Short Name: opmode

Type: text

Domain: "launch" "survival" "initialization" "safe" "diagnostic" "standby" "crosstrack" "biaxial" "solar calibration" free text

Parent: Instrument_Description

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: The way in which the instrument is functioning.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information

Name: Collection_Type

Short Name: colltype

Type: text

Domain: "frame" "pushbroom" "whiskbroom" "panoramic" "radar" "laser" free text

Parent: Instrument_Description

Optionality: Mandatory

Repeatability: =1

Definition: The way in which the instrument gathers data from the scene observed.

Source: ISPRS/WG-II/4

Extension_Information

Name: Orientation_Information

Short Name: orininfo

Type: compound

Child: Axes

Child: Rotation_Description

Child: Translation_Description

Parent: Instrument_Description

Optionality: Optional

Repeatability: =1

Definition: Positioning and direction of instrument components on platform.

Rationale: This information is required in order to derive the direction of observation.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Axes

Short Name: axes

Type: compound

Child: X_Axis_Definition

Child: Y_Axis_Definition

Child: Z_Axis_Definition

Parent: Orientation_Information

Optionality: Mandatory

Repeatability: =1

Definition: Orientation of instrument axes.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: X_Axis_Definition

Short Name: xaxisdef

Type: text

Domain: "up" "down" "forward" "backward" "left" "right" "north" "south" "east" "west" free text

Parent: Axes

Optionality: Mandatory

Repeatability: =1

Definition: Direction of instrument x-axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Y_Axis_Definition

Short Name: yaxisdef

Type: text

Domain: "up" "down" "forward" "backward" "left" "right" "north" "south" "east" "west" free text

Parent: Axes

Optionality: Mandatory

Repeatability: =1

Definition: Direction of instrument y-axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Z_Axis_Definition

Short Name: zaxisdef

Type: text

Domain: "up" "down" "forward" "backward" "left" "right" "north" "south" "east" "west" free text

Parent: Axes

Optionality: Mandatory

Repeatability: =1

Definition: Direction of instrument z-axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Rotation_Description

Short Name: rotdesc

Type: text

Domain: free text

Parent: Orientation_Information

Optionality: Optional

Repeatability: =1

Definition: Description of direction of instrument components relative to platform axes.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Translation_Description

Short Name: trandesc

Type: text

Domain: free text

Parent: Orientation_Information

Optionality: Optional

Repeatability: =1

Definition: Description of position of instrument components relative to platform axes.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Frame_Camera

Short Name: frame

Type: compound

Child: Frame_Hardware

Child: Frame_Optics

Child: Frame_Geometric_Properties

Child: Frame_Operation

Child: Frame_Radiometric_Properties

Child: Frame_Spectral_Properties

Parent: Instrument_Description

Optionality: Conditional - present and mandatory if and only if Scan and Other_Collector_Description are absent

Repeatability: =1

Definition: Description of photographic system using a central perspective projection, with the detector, normally film, pressed against a calibrated frame during the exposure.

Source: ISPRS/WG-II/4

Extension_Information

Name: Frame_Hardware

Short Name: fcamhwar

Type: compound

Child: Camera_Type

Child: Camera_Identifier

Child: Lens

Child: Magazine_Identifier

Child: Film_Type

Child: Aerial_Film_Speed

Child: Effective_Aerial_Film_Speed

Child: Developing_Institution

Parent: Frame_Camera

Optionality: Optional

Repeatability: =1

Definition: Physical description of camera and film.

Source: ISPRS/WG-II/4

Extension_Information

Name: Camera_Type

Short Name: camtype

Type: text

Domain: "RMK 60/25" "RMK 30/23" "RMK 15/23“ “RMK 11.5/18“ “RMK 15/23“ “RMK 8.5/23" "RMK TOP 15" "RMK TOP 30" "MRB 30/2323" "MRB 21" "MRB 15/2323" "MRB 9/2323" "LMK" "LMK1000""LMK1009" “LMK1015“ "LMK1021" "LMK1030" "LMK2000" "LMK2009" "LMK2015" “LMK2021“ “LMK2030" "RC 8" "RC 9" "RC 10" "RC 10A" "RC 20" "RC 30" free text *(RMK camera types are manufactured by Zeiss Oberkochen, MRB and LMK Camera types by Zeiss Jena, RC8-RC10A by Wild, RC20 by Leica, and RC30 by Leica/LH systems)*

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Model of camera as defined by manufacturer.

Source: ISPRS/WG-II/4

Extension_Information

Name: Camera_Identifier

Short Name: camident

Type: text

Domain: free text

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Manufacturer's unique alphanumeric code specifying the camera body.

Source: ISPRS/WG-II/4

Extension_Information

Name: Lens

Short Name: lens

Type: compound

Child: Lens_Type

Child: Lens_Identifier

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Optical component that uses refraction to focus light on the image plane.

Source: ISPRS/WG-II/4

Extension_Information

Name: Lens_Type

Short Name: lenstype

Type: text

Domain: "Topogon" "Telikon" "Topar" "Pleogon" "S-Pleogon" "Aviogon" "Wide Angle 15AG" "Orbigon" "Normal Aviogon" "Semi-wide-angle 21 NAG" "Semi-wide-

angle 21 NAG II" "Semi-wide-angle 21-4 NAGA" "Semi-wide-angle NAGA-F" "Super Aviogon" "Super-wide-angle 8.8 SAG" "Super-wide-angle 8.8 SAGII""Super-wide-angle 8.8/4 SAG-A""Super-wide-angle 8.8/4 SAGA-F""Aviotar 30At" "Aviotar 30AtI" "Aviotar 30/4 NAT" "Aviotar 30/4 NAT-A" "Aviotar 30/4 NATA-F" "Aviotar 30/4 NAT-S" "Universal Aviogon 15 UAG" "Universal Aviogon 15 UAGI" "Universal Aviogon 15 UAGII" "Universal Aviogon 15/4 UAG" "Universal Aviogon 15/4 UAG-A" "Universal Aviogon 15/4 UAGA-F" "Universal Aviogon 15/4 UAG-S" "Lamegor PI 5.6/300(A).B" "Lamegoron PI 5.6/210A "Lamegon PI 4/150(A,B,C),D" "Superlamegon PI 5.6/90 (A,B),C" "Metrogon" "Geocon" free text *(List items Topogon through S-Pleogon are manufactured by Zeiss, Aviogon thorugh Orbigon by Wild, Normal Aviogon, all the Semi-wide-angle models, Super Aviogon, and all the Super-wide angle models by Wild/Leica, the Aviotar and Universal Aviogon models by Wild/Leica/LH Systems, and the Lamegor through SuperLamegon by Zeiss, the Metrogon by Bausch and Lomb, and the Geocon by Baker.)*

Parent: Lens

Optionality: Mandatory

Repeatability: =1

Definition: Manufacturer's name specifying design of lens.

Source: ISPRS/WG-II/4

Extension_Information

Name: Lens_Identifier

Short Name: lensidnt

Type: text

Domain: free text

Parent: Lens

Optionality: Mandatory

Repeatability: =1

Definition: Unique alphanumeric identifier assigned by camera manufacturer to individual lens.

Source: ISPRS/WG-II/4

Extension_Information

Name: Magazine_Identifier

Short Name: magident

Type: text

Domain: free text

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Unique alphanumeric identifier of individual magazine as assigned by manufacturer.

Source: ISPRS/WG-II/4

Extension_Information

Name: Film_Type

Short Name: filmtype

Type: text

Domain: free text

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Manufacturer's name and specification of film

Source: ISPRS/WG-II/4

Extension_Information

Name: Aerial_Film_Speed

Short Name: afspeed

Type: real

Domain: Aerial_Film_Speed > 0

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Two-thirds of the exposure in lux seconds at the point on the characteristic curve where the density is 0.3 above fog density, under processing conditions defined in ANSI PH2.34-1969.

Source: Albertz, J. and Kreiling, W. (1989): Photogrammetric Guide, Wichmann, Karlsruhe, ISPRS/WG-II/4.

Extension_Information

Name: Effective_Aerial_Film_Speed

Short Name: eafspeed

Type: real

Domain: Effective_Aerial_Film_Speed > 0

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Two-thirds of the exposure in lux seconds at the point on the characteristic curve where the density is 0.3 above fog density, under processing conditions other than those defined in ANSI PH2.34-1969 or determined empirically for color and infrared-sensitive films not covered by ANSI Standard PH 2.34-1969.

Source: Albertz, J. and Kreiling, W. (1989): Photogrammetric Guide, Wichmann, Karlsruhe, ISPRS/WG-II/4.

Extension_Information

Name: Developing_Institution

Short Name: develop

Type: compound

Child: Contact_Information

Parent: Frame_Hardware

Optionality: Optional

Repeatability: =1

Definition: Institution where the film was developed.

Source: ISPRS/WG-II/4

Extension_Information

Name: Frame_Optics

Short Name: fcamoptc

Type: compound

Child: Photographic_Resolving_Power

Child: Relative_Aperture

Child: Exposure_Time

Child: Calibrated_Focal_Length

Child: Quality_of_Focal_Length

Child: Last_Calibration

Parent: Frame_Camera

Optionality: Mandatory

Repeatability: =1

Definition: Physical description of the photographic system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Photographic_Resolving_Power

Short Name: phorespo

Type: compound

Child: Number_of_Resolution_Values

Child: Resolution_Value_Set

Child: Area_Weighted_Average_Resolution

Parent: Frame_Optics

Optionality: Optional

Repeatability: =1

Definition: Resolving power of the camera at different field angles.

Source: ISPRS/WG-II/4

Extension_Information

Name: Number_of_Resolution_Values

Short Name: nresval

Type: integer

Domain: Number_of_Resolution_Values >= 1

Parent: Photographic_Resolving_Power

Optionality: Mandatory

Repeatability: =1

Definition: Number of angles at which values of resolving power are available.

Source: ISPRS/WG-II/4

Extension_Information

Name: Resolution_Value_Set

Short Name: phoreset

Type: compound

Child: Resolving_Angle

Child: Resolving_Value_Radial

Child: Resolving_Value_Tangential

Parent: Photographic_Resolving_Power

Optionality: Mandatory

Repeatability: > =1

Definition: Resolving power of the camera at different field angles.

Source: ISPRS/WG-II/4

Extension_Information

Name: Resolving_Angle

Short Name: resangle

Type: real

Domain: Resolving_Angle >= 0

Parent: Resolution_Value_Set

Optionality: Mandatory

Repeatability: =1

Definition: A field angle at which values of the resolving power are available.

Source: ISPRS/WG-II/4

Extension_Information

Name: Resolving_Value_Radial

Short Name: resrad

Type: real

Domain: Resolving_Value_Radial > 0

Parent: Resolution_Value_Set

Optionality: Mandatory

Repeatability: =1

Definition: Resolving power in radial direction, given in line pairs per millimeter.

Source: ISPRS/WG-II/4

Extension_Information

Name: Resolving_Value_Tangential

Short Name: restang

Type: real

Domain: = 1

Parent: Resolution_Value_Set

Optionality: Mandatory

Repeatability: =1

Definition: Resolving power in tangential direction, given in line pairs per millimeter.

Source: ISPRS/WG-II/4

Extension_Information

Name: Area_Weighted_Average_Resolution

Short Name: awar

Type: real

Domain: >0

Parent: Photographic_Resolving_Power

Optionality: Optional

Repeatability: =1

Definition: Area weighted average resolution, given in line pairs per millimeter.

Source: ISPRS/WG-II/4

Extension_Information

Name: Relative_Aperture

Short Name: relaper

Type: real

Domain: Relative_Aperture > 0

Parent: Frame_Optics

Optionality: Optional

Repeatability: =1

Definition: Ratio of focal length of camera to diameter of opening through which camera gathers light.

Source: ISPRS/WG-II/4

Extension_Information

Name: Exposure_Time

Short Name: expotime

Type: real

Domain: Exposure_Time > 0

Parent: Frame_Optics

Optionality: Optional

Repeatability: =1

Definition: Length of exposure, in seconds.

Source: ISPRS/WG-II/4

Extension_Information

Name: Calibrated_Focal_Length

Short Name: calfocl

Type: real

Domain: Calibrated_Focal_Length > 0

Parent: Frame_Optics

Optionality: Mandatory

Repeatability: =1

Definition: Approximate distance between the projection center and the image plane in millimeters, measured in the laboratory before launch.

Source: ISPRS/WG-II/4

Extension_Information

Name: Quality_of_Focal_Length

Short Name: quafocl

Type: real

Domain: Quality_of _Focal_Length > 0

Parent: Frame_Optics

Optionality: Optional

Repeatability: =1

Definition: The standard deviation in millimeters of the calibrated focal length.

Source: ISPRS/WG-II/4

Extension_Information

Name: Last_Calibration

Short Name: lastcali

Type: compound

Parent: Frame_Optics

Child: Date_of_Last_Calibration

Child: Method_of_Last_Calibration

Child: Institution_of_Last_Calibration

Optionality: Optional

Repeatability: =1

Definition: Date of most recent camera calibration.

Source: ISPRS/WG-II/4

Extension_Information

Name: Date_of_Last_Calibration

Short Name: datlcali

Type: date

Domain: free date

Parent: Last_Calibration

Optionality: Mandatory

Repeatability: =1

Definition: Date of most recent camera calibration.

Source: ISPRS/WG-II/4

Extension_Information

Name: Method_of_Last_Calibration

Short Name: metlcali

Type: text

Domain: "optical" "photographic"

Parent: Last_Calibration

Optionality: Optional

Repeatability: =1

Definition: Method of most recent camera calibration.

Source: ISPRS/WG-II/4

Extension_Information

Name: Institution_of_Last_Calibration

Short Name: inslcali

Type: text

Domain: free text

Parent: Last_Calibration

Optionality: Optional

Repeatability: =1

Definition: Institution that performed the camera calibration that occurred at Date_of_Last_Calibration.

Source: ISPRS/WG-II/4

Extension_Information

Name: Frame_Geometric_Properties

Short Name: framegeo

Type: compound

Child: Image_Size

Child: Fiducial

Child: Reseau

Child: Sensor_System

Child: Principal_Point_of_Autocollimation

Child: Quality_of_Principal_Point_of_Autocollimation

Child: Principal_Point_of_Symmetry

Child: Quality_of_Principal_Point_of_Symmetry

Child: Fiducial_Center

Child: Sensor_Element_Location

Child: Distortion

Parent: Frame_Camera

Optionality: Mandatory

Repeatability: =1

Definition: Geometric characteristics of instrument used to derive single frame images.

Source: ISPRS/WG-II/4

Extension_Information

Name: Image_Size

Short Name: imsize

Type: compound

Child: Image_Size_x_Value

Child: Image_Size_y_Value

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Metric length and width of the image.

Source: ISPRS/WG-II/4

Extension_Information

Name: Image_Size_x_Value

Short Name: imsizex

Type: real

Domain: Image_Size_x_Value > 0

Parent: Image_Size

Optionality: Optional

Repeatability: =1

Definition: Image size, in millimeters, in the direction of the x-axis.

Source: ISPRS/WG-II/4

Extension_Information

Name: Image_Size_y_Value

Short Name: imsizey

Type: real

Domain: Image_Size_y_Value > 0

Parent: Image_Size

Optionality: Optional

Repeatability: =1

Definition: Image size, in millimeters, in the direction of the y-axis.

Source: ISPRS/WG-II/4

Extension_Information

Name: Fiducial

Short Name: fcfid

Type: compound

Child: Location_Information

Parent: Frame_Geometric_Properties

Optionality: Conditional - present and mandatory if and only if Reseau and Sensor_System are absent.

Repeatability: =1

Definition: Calibrated coordinates for four or more marks attached to the frame of the camera, in millimeters in the image coordinate system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Reseau

Short Name: fcres

Type: compound

Child: Location_Information

Parent: Frame_Geometric_Properties

Optionality: Conditional - present and mandatory if and only if Fiducial and Sensor_System are absent

Repeatability: =1

Definition: Calibrated positions of engraved réseau-crosses that are located at known distance above the film during exposure, given in millimeters in the image coordinate system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Sensor_System

Short Name: fcss

Type: compound

Child: Sensor_Grid

Child: Calibrated_Detector_Positions

Parent: Frame_Geometric_Properties

Optionality: Conditional - present and mandatory if and only if Fiducial and Reseau are absent.

Repeatability: =1

Definition: Image coordinate system defined by the pixels of the sensor.

Source: ISPRS/WG-II/4

Extension_Information

Name: Sensor_Grid

Short Name: fcssgrid

Type: compound

Child: Raster_Object_Type

Parent: Sensor_System

Optionality: Mandatory

Repeatability: =1

Definition: Number of cells along axes of sensor grid.

Source: ISPRS/WG-II/4

Extension_Information

Name: Calibrated_Detector_Positions

Short Name: fcsscapo

Type: compound

Child: Location_Information

Parent: Sensor_System

Optionality: Mandatory

Repeatability: =1

Definition: Position of detectors in sensor grid coordinate system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Principal_Point_of_Autocollimation

Short Name: pripoaut

Type: compound

Child: Location_Information

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: The point (x_0', y_0') where the plumb line coming from the projection center crosses the image plane, given in millimeters in the image coordinate system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Quality_of_Principal_Point_of_Autocollimation

Short Name: quappa

Type: compound

Child: Quality_of_Autocollimation_Principal_Point_x_Value

Child: Quality_of_Autocollimation_Principal_Point_y_Value

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Uncertainty in the location of the principal point of autocollimation.

Source: ISPRS/WG-II/4

Extension_Information

Name: Quality_of_Autocollimation_Principal_Point_x_Value

Short Name: quappax

Type: real

Domain: Quality_of_Autocollimation_Principal_Point_x_Value >= 0

Parent: Quality_of_Principal_Point_of_Autocollimation

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation, in millimeters, of the x-position of the principal point of autocollimation.

Source: ISPRS/WG-II/4

Extension_Information

Name: Quality_of_Autocollimation_Principal_Point_y_Value

Short Name: quappay

Type: real

Domain: Quality_of_Autocollimation_Principal_Point_y_Value >= 0

Parent: Quality_of_Principal_Point_of_Autocollimation

Optionality: Mandatory

Repeatability: =1

Definition: Standard deviation, in millimeters, of the y-position of the principal point of autocollimation.

Source: ISPRS/WG-II/4

Extension_Information

Name: Principal_Point_of_Symmetry

Short Name: priposym

Type: compound

Child: Location_Information

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: The coordinate of the center of the circles of equal distortion of the lens (x_s',y_s') in millimeters in the image coordinate system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Quality_of_Principal_Point_of_Symmetry

Short Name: quapps

Type: compound

Child: Quality_of_Symmetry_Principal_Point_x_Value

Child: Quality_of_Symmetry_Principal_Point_y_Value

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Uncertainty in the location of the principal point of symmetry.

Source: ISPRS/WG-II/4

4036

4037 Extension_Information

4038 Name: Quality_of_ Symmetry_Principal_Point _x_Value

4039 Short Name: quappsx

4040 Type: real

4041 Domain: Quality_of_Symmetry_Principal_Point_x_Value >= 0

4042 Parent: Quality_of_Principal_Point_of_Symmetry

4043 Optionality: Mandatory

4044 Repeatability: =1

4045 Definition: Standard deviation, in millimeters, of the x-position of the principal point of

4046 symmetry.

4047 Source: ISPRS/WG-II/4

4048

4049 Extension_Information

4050 Name: Quality_of_Symmetry_Principal_Point_y_Value

4051 Short Name: quappsy

4052 Type: real

4053 Domain: Quality_of_Symmetry_Principal_Point_y_Value > 0

4054 Parent: Quality_of_Principal_Point_of_Symmetry

4055 Optionality: Mandatory

4056 Repeatability: =1

4057 Definition: Standard deviation, in millimeters, of the y-position of the principal point of

4058 symmetry.

4059 Source: ISPRS/WG-II/4

4060

Extension_Information

Name: Fiducial_Center

Short Name: fidcent

Type: compound

Child: Location_Information

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Coordinates in millimeters, in the image coordinate system, of center point where lines between the four or more fiducial marks meet.

Source: ISPRS/WG-II/4

Extension_Information

Name: Sensor_Element_Location

Short Name: sensello

Type: compound

Child: Availability_of_Element_Locations

Child: Source_of_Element_Locations

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Physical position of individual sensor pixels, in the image coordinate system.

Source: ISPRS/WG-II/4

Extension_Information

Name: Availability_of_Element_Locations

Short Name: senselav

Type: text

Domain: "available" "not available"

Parent: Sensor_Element_Location

Optionality: Mandatory

Repeatability: =1

Definition: Whether or not a reference providing sensor element location exists.

Source: ISPRS/WG-II/4

Extension_Information

Name: Source_of_Element_Locations

Short Name: senselso

Type: compound

Child: Citation_Information

Parent: Sensor_Element_Location

Optionality: Optional

Repeatability: =1

Definition: Citation for reference providing sensor element location information.

Source: ISPRS/WG-II/4

Extension_Information

Name: Distortion

Short Name: distort

Type: compound

Child: Distortion_Type_Radial_Symmetrical

Child: Distortion_Type_Radial_Asymmetrical

Child: Distortion_Type_Affine

Parent: Frame_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Departure of positions in image from those in scene imaged.

Source: ISPRS/WG-II/4

Extension_Information

Name: Distortion_Type_Radial_Symmetrical

Short Name: dsttrs

Type: compound

Child: Distance_Dependent_Distortion

Child: Angle_Dependent_Distortion

Child: Radial_Symmetrical_Distortion_Polynomial

Parent: Distortion

Optionality: Conditional - present and mandatory if and only if
Distortion_Type_Radial_Asymmetrical and Distortion_Type_Affine are absent.

Repeatability: =1

Definition: The shift of an image point towards the center (negative values) or border
(positive values) of the image.

Source: ISPRS/WG-II/4

Extension_Information

Name: Distance_Dependent_Distortion

Short Name: rsdisdis

Type: compound

Child: Radial_Symmetrical_Distance_Interval

Child: Number_of_Distance_Distortion_Values

Child: Distance_Distortion_Value

Parent: Distortion_Type_Radial_Symmetrical

Optionality: Conditional - present and mandatory if and only if
Angle_Dependent_Distortion and Radial_Symmetrical_Distortion_Polynomial are absent.

Repeatability: =1

Definition: Lens distortion values provided as a function of linear distance to the principal point of best symmetry.

Source: ISPRS/WG-II/4

Extension_Information

Name: Radial_Symmetrical_Distance_Interval

Short Name: rsdmdist

Type: real

Domain: Radial_Symmetrical_Distance_Interval > 0

Parent: Distance_Dependent_Distortion

Optionality: Mandatory

Repeatability: =1

Definition: Radial intervals at which distortion values are available, given in millimeters.

Source: ISPRS/WG-II/4

Extension_Information

Name: Number_of_Distance_Distortion_Values

Short Name: rsdnumv

Type: integer

Domain: Number_of_Distance_Distortion_Values > 0

Parent: Distance_Dependent_Distortion

Optionality: Mandatory

Repeatability: =1

Definition: Number of radial points at which distance-dependent distortion values are provided.

Source: ISPRS/WG-II/4

Extension_Information

Name: Distance_Distortion_Value

Short Name: rsddval

Type: real

Domain: free real

Parent: Distance_Dependent_Distortion

Optionality: Mandatory

Repeatability: =Number_of_Distance_Distortion_Values

Definition: Value of distortion at one of the radial distances specified by Radial_Distance_Interval, in micrometers.

Source: ISPRS/WG-II/4

Extension_Information

Name: Angle_Dependent_Distortion

Short Name: rsaddist

Type: compound

Child: Radial_Symmetrical_Angle_Interval

Child: Number_of_Angle_Distortion_Values

Child: Angle_Distortion_Value

Parent: Distortion_Type_Radial_Symmetrical

Optionality: Conditional - present and mandatory if and only if

Distance_Dependent_Distortion and Radial_Symmetrical_Distortion_Polynomial

are absent.

Repeatability: =1

Definition: Lens distortion values provided as a function of the angle from the optical axis.

Source: ISPRS/WG-II/4

Extension_Information

Name: Radial_Symmetrical_Angle_Interval

Short Name: rsangint

Type: real

Domain: Radial_Symmetrical_Angle_Interval > 0

Parent: Angle_Dependent_Distortion

Optionality: Mandatory

Repeatability: =1

Definition: Interval in angle at which distortion values are available, given in degrees.

4211 Source: ISPRS/WG-II/4

4212

4213 Extension_Information

4214 Name: Number_of_Angle_Distortion_Values

4215 Short Name: rsanumv

4216 Type: integer

4217 Domain: Number_of_Angle_Distortion_Values > 0

4218 Parent: Angle_Dependent_Distortion

4219 Optionality: Mandatory

4220 Repeatability: =1

4221 Definition: Number of distortion values supplied as a function of angle.

4222 Source: ISPRS/WG-II/4

4223

4224 Extension_Information

4225 Name: Angle_Distortion_Value

4226 Short Name: rsadval

4227 Type: real

4228 Domain: free real

4229 Parent: Angle_Dependent_Distortion

4230 Optionality: Mandatory

4231 Repeatability: =Number_of_Angle_Distortion_Values

4232 Definition: Value of distortion at one of the angular distances specified by

4233 Radial_Symmetrical_Measurement_Angle, given in micrometers.

4234 Source: ISPRS/WG-II/4

4235

Extension_Information

Name: Radial_Symmetrical_Distortion_Polynomial

Short Name: rsdispol

Type: compound

Child: Polynomial_Function

Parent: Distortion_Type_Radial_Symmetrical

Optionality: Conditional - present and mandatory if and only if

Distance_Dependent_Distortion and Angle_Dependent_Distortion are absent.

Repeatability: =1

Definition: Lens distortion in micrometers that is a function of the distance to the principal point of best symmetry, presented in the form of an odd-power polynomial:

$\Delta r' = K_0 * r' + K_1 * r'^3 + K_2 * r'^5 + K_3 * r'^7 \ldots$

Source: Moffit, F., Mikhail, E. (1980): Photogrammetry, Harper & Row, Publishers, New York

Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information

Name: Distortion_Type_Radial_Asymmetrical

Short Name: dsttrasy

Type: compound

Child: Radial_Asymmetrical_Coefficient_B1

Child: Radial_Asymmetrical_Coefficient_B2

Parent: Distortion

Optionality: Conditional - present and mandatory if and only if

Distortion_Type_Radial_Symmetrical and Distortion_Type_Affine are absent

Repeatability: =1

Definition: Distortion that can be expressed in the form

$\Delta x' = B_1 (r'^2 + 2x'^2) + 2B_2 * x' * y'$

$\Delta y' = B_2 (r'^2 + 2x'^2) + 2B_1 * x' * y'$

Source: Brown, D.C. (1971): Close-range camera calibration. Photogrammetric Engineering, 37(8), pp. 855-866

Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information

Name: Radial_Asymmetrical_Coefficient_B1

Short Name: rab1

Type: real

Domain: free real

Parent: Distortion_Type_Radial_Asymmetrical

Optionality: Mandatory

Repeatability: =1

Definition: Value for B_1 to be used in the formula given in the definition of Distortion_Type_Radial_Asymmetrical.

Source: Brown, D.C. (1971): Close-range camera calibration. Photogrammetric Engineering, 37(8), pp. 855-866

Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information

Name: Radial_Asymmetrical_Coefficient_B2

Short Name: rab2

Type: real

Domain: free real

Parent: Distortion_Type_Radial_Asymmetrical

Optionality: Mandatory

Repeatability: =1

Definition: Value to be used for B_2 in the formula given in the definition of Distortion_Type_Radial_Asymmetrical.

Source: Brown, D.C. (1971): Close-range camera calibration. Photogrammetric Engineering, 37(8), pp. 855-866

Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information

Name: Distortion_Type_Affine

Short Name: dsttaf

Type: compound

Child: Affine_Distortion_X_Prime_Coefficient

Child: Affine_Distortion_Y_Prime_Coefficient

Parent: Distortion

Optionality: Conditional - present and mandatory if and only if Distortion_Type_Radial_Symmetrical and Distortion_Type_Radial_Asymmetrical are absent

Repeatability: =1

Definition: Errors of the image coordinate system that can be described with an affine transformation of the following form:

$\Delta x' = C_1 * x' + C_2 * y'$

$\Delta y' = 0$

Source: Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information

Name: Affine_Distortion_X_Prime_Coefficient

Short Name: affc1

Type: real

Parent: Distortion_Type_Affine

Optionality: Mandatory

Repeatability: =1

Definition: Coefficient of x' term in the formula given in the definition of Distortion_Type_Affine.

Source: Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information

Name: Affine_Distortion_Y_Prime_Coefficient

Short Name: affc2

Type: real

Parent: Distortion_Type_Affine

Optionality: Mandatory

Repeatability: =1

Definition: Coefficient of y' term in the formula given in the definition of Distortion_Type_Affine.

Source: Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

4335

4336 Extension_Information

4337 Name: Frame_Operation

4338 Short Name: fcoper

4339 Type: compound

4340 Child: Stabilized_Mount

4341 Child: Forward_Motion_Compensation

4342 Parent: Frame_Camera

4343 Optionality: Optional

4344 Repeatability: =1

4345 Definition: Information describing the configuration or motion of the camera mounting.

4346 Source: ISPRS/WG-II/4

4347

4348 Extension_Information

4349 Name: Stabilized_Mount

4350 Short Name: stabmnt

4351 Type: text

4352 Domain: "T_AS" "CCNS4" free text

4353 Parent: Frame_Operation

4354 Optionality: Optional

4355 Repeatability: =1

4356 Definition: Type of stabilized mount used during the photo flight.

4357 Source: ISPRS/WG-II/4.

4358

4359

Extension_Information

Name: Forward_Motion_Compensation

Short Name: fmc

Type: text

Domain: "yes" "no"

Parent: Frame_Operation

Optionality: Optional

Repeatability: =1

Definition: Whether or not image is moved in flying direction during exposure in order to compensate image motion for ground speed.

Source: ISPRS/WG-II/4.

Extension_Information

Name: Frame_Radiometric_Properties

Short Name: fradprop

Type: compound

Child: Frame_Radiometric_Calibration

Child: Light_Drop

Parent: Frame_Camera

Optionality: Optional

Repeatability: =1

Definition: Information on the relation between radiation received and measured by a detector system.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Frame_Radiometric_Calibration

Short Name: fcradcal

Type: compound

Child: Data_Scaling_Information

Parent: Frame_Radiometric_Properties

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Transformation from units in which electronic detector measures to physical units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Light_Drop

Short Name: lightdrp

Type: real

Domain: 0 <= Light_Drop <= 100

Parent: Frame_Radiometric_Properties

Optionality: Optional

Repeatability: =1

Definition: The percentage of the light at the center reaching the border of the image.

Source: ISPRS/WG-II/4

Extension_Information

Name: Frame_Spectral_Properties

Short Name: fcspecpr

Type: compound

Child: Frame_Spectral_Information

Child: Filter_on_Camera

Child: Spectral_Limit

Parent: Frame_Camera

Optionality: Optional

Repeatability: =1

Definition: Wavelength-dependent characteristics of system.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Frame_Spectral_Information

Short Name: fcspecin

Type: compound

Child: Spectral_Information

Parent: Frame_Spectral_Properties

Optionality: Optional

Repeatability: =1

Definition: Information about wavelength sensitivity of detector

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

4435

4436 Extension_Information

4437 Name: Filter_on_Camera

4438 Short Name: filtonca

4439 Type: compound

4440 Child: Filter_on_Camera_Indicator

4441 Child: Filter_Type

4442 Parent: Frame_Spectral_Properties

4443 Optionality: Optional

4444 Repeatability: =1

4445 Definition: Device placed in front of camera lens limiting the range of wavelengths that can

4446 pass through.

4447 Source: ISPRS/WG-II/4

4448

4449 ...Extension_Information

4450 Name: Filter_on_Camera_Indicator

4451 Short Name: filtcain

4452 Type: text

4453 Domain: "yes" "no"

4454 Parent: Filter_on_Camera

4455 Optionality: Mandatory

4456 Repeatability: =1

4457 Definition: Indicator as to whether or not there is a filter in front of the camera.

4458 Source: ISPRS/WG-II/4

4459

Extension_Information

Name: Filter_Type

Short Name: ftrtyp

Type: text

Domain: "CTO 1" "L453" "L477" "L510" "L599" "L731" "HF-3 (2B)" "No. 3(Aero 1)" "No. 8 (K2)" "No. 12 (Minus Blue)" "No. 15 (G)" "No. 25 (A)" "No. 89 B (IR)" "Sandwich Color" "Haze Filter" "Sandwich False Color" "Dark Yellow" "Light Red" "Infrared" "A2" "B" "D" "F" "H" "I" "K" free text

Parent: Filter_on_Camera

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Manufacturers name for and/or description of filter used. *(CTO-1 and L fiters are all manufactured by Agfa Gevaert, HF-3 to No. 89 are Kodak Wratten, Sandwich Color to Infrared" are Wild and A2 to K are Zeiss.)*

Source: Albertz, J., Kreiling, W. (1989): Photogrammetric Guide, Wichmann, Karlsruhe.

Extension_Information

Name: Spectral_Limit

Short Name: spectlim

Type: real

Domain: Spectral_Limit > 0

Parent: Frame_Spectral_Properties

Optionality: Optional

Repeatability: =1

Definition: Maximum wavelength, in nanometers, at which focus of lens is judged accurate, errors due to chromatic aberration being too large at longer wavelengths.

Source: ISPRS/WG-II/4

Extension_Information

Name: Scan

Short Name: scan

Type: compound

Child: Scan_Geometric_Properties

Child: Sample_Properties

Child: Scan_Radiometric_Properties

Child: Scan_Spectral_Properties

Parent: Instrument_Description

Optionality: Conditional - present and mandatory if and only if Frame_Camera and Other_Collector_Description are absent.

Repeatability: =1

Definition: Properties of sensor whose detector view moves over the ground in a direction roughly perpendicular to the track of a moving point.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Geometric Properties

Short Name: scangeom

Type: compound

Child: Scan_Angle_Units

Child: Scan_Time_Units

Child: Scan_Distance_Units

Child: Scan_Cross_Track_Properties

Child: Scan_Elevation_Properties

Child: Profile_Properties

Child: Scan_Timing

Child: Instantaneous_Field_of_View

Parent: Scan

Optionality: Mandatory

Repeatability: >=1

Definition: Spatial and temporal description of scan.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Angle_Units

Short Name: scanangu

Type: text

Domain: "degrees" "radians" "arcminutes" "arcseconds" free text

Parent: Scan_Geometric_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Units in which angles are measured in scan description.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Time_Units

Short Name: scantimu

Type: text

Domain: "seconds" "minutes" " microseconds" free text

Parent: Scan_Geometric_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Units in which time is measured in scan description.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Distance_Units

Short Name: scandisu

Type: text

Domain: "meters" "kilometers" free text

Parent: Scan_Geometric_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Units in which distance is measured in scan description.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Cross_Track_Properties

Short Name: xtrkprop

Type: compound

Child: Cross_Track_Zero

Child: Cross_Track_Sweep

Child: Cross_Track_Fixed_Angle

Child: Cross_Track_Description

Parent: Scan_Geometric_Properties

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Description of data sampling in direction approximately perpendicular to track in horizontal direction.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Zero

Short Name: xtkzero

Type: compound

Child: Cross_Track_Axis

Child: Cross_Track_Direction

Parent: Scan_Cross_Track_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Direction relative to which cross-track angles are measured.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Axis

Short Name: xtkaxis

Type: text

Domain: "x" "y" "z" free text

Parent: Cross_Track_Zero

Optionality: Mandatory

Repeatability: =1

Definition: Axis about which cross-track angles are measured.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Direction

Short Name: xtkdir

Type: text

Domain: "positive" "negative"

Parent: Cross_Track_Zero

Optionality: Mandatory

Repeatability: =1

Definition: Direction on Cross_Track_Axis relative to which cross-track angles are measured.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Sweep

Short Name: xtkswp

Type: compound

Child: Number_of_Cross_Track_Samples

Child: Cross_Track_Start_Angle

Child: Cross_Track_Extent_Angle

Child: Cross_Track_Step_Angle

Parent: Scan_Cross_Track_Properties

Optionality: Conditional - present and mandatory if and only if Cross_Track_Fixed_Angle is absent.

Repeatability: =1

Definition: Description of angular properties of cross-track sweep.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Number_of_Cross_Track_Samples

Short Name: xtksamp

Type: integer

Domain: Number_of_Cross_Track_Samples > 0

Parent: Cross_Track_Sweep

Optionality: Mandatory

Repeatability: =1

Definition: Number of measurements in direction across the track in each scan.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Start_Angle

Short Name: xtkstang

Type: real

Domain: free real

Parent: Cross_Track_ Sweep

Optionality: Mandatory

Repeatability: =1

Definition: Angle of start of cross-track measurement from Cross_Track_Axis, in Scan_Angle_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Extent_Angle

Short Name: xtkexang

Type: real

Domain: Cross_Track_Extent_Angle > 0

Parent: Cross_Track_ Sweep

Optionality: Conditional - present and mandatory if and only if Cross_Track_Step_Angle is absent

Repeatability: =1

Definition: Angle between end and start of cross-track range.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Step_Angle

Short Name:xtstpang

Type: real

Domain: Cross_Track_Step_Angle > 0

Parent: Cross_Track_ Sweep

Optionality: Conditional - present and mandatory if and only if Cross_Track_Extent_Angle is absent.

Repeatability: =1

Definition: Angle between cross-track steps, in Scan_Angle_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Fixed_Angle

Short Name: xtfixang

Type: real

Domain: free real

Parent: Scan_Cross_Track_Properties

Optionality: Conditional - present and mandatory if and only if Cross_Track_Sweep is absent

Repeatability: =1

Definition: Constant angle relative to cross-track axis at which scanner is held while it scans in another direction.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Cross_Track_Description

Short Name: xtrkdesc

Type: text

Domain: free text

Parent: Scan_Cross_Track_Properties

Optionality: Optional

Repeatability: =1

Definition: Additional information about cross-track measurements, in text form.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Elevation_Properties

Short Name: elevprop

Type: compound

Child: Elevation_Zero

Child: Elevation_Sweep

Child: Elevation_Fixed_Angle

Child: Elevation_Description

Parent: Scan_Geometric_Properties

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Description of data sampling in direction approximately perpendicular to track and cross-track sweep direction.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Zero

Short Name: elevzero

Type: Compound

Child: Elevation_Axis

Child: Elevation_Direction

Parent: Scan_Elevation_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Direction relative to which elevation angles are measured.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Axis

Short Name: elevaxis

Type: text

Domain: "x" "y" "z" free text

Parent: Elevation_Zero

Optionality: Mandatory

Repeatability: =1

Definition: Axis about which elevation angles are measured.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Direction

Short Name: elevdir

Type: text

Domain: "positive" "negative"

Parent: Elevation_Zero

Optionality: Mandatory

Repeatability: =1

Definition: Direction on Elevation_Axis relative to which elevation angles are measured.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Sweep

Short Name: elevswp

Type: compound

Child: Number_of_Elevation_Samples

Child: Elevation_Start_Angle

Child: Elevation_Extent_Angle

Child: Elevation_Step_Angle

Parent: Scan_Elevation_Properties

Optionality: Conditional - present and mandatory if and only if Elevation_Fixed_Angle is absent.

Repeatability: =1

Definition: Description of angular properties of elevation sweep.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Number_of_Elevation_Samples

Short Name: elevsamp

Type: integer

Domain: Number_of_Elevation_Samples > 0

Parent: Elevation_Sweep

Optionality: Mandatory

Repeatability: =1

Definition: Number of measurements in direction across the track in each scan.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Start_Angle

Short Name: elestang

Type: real

Domain: free real

Parent: Elevation_ Sweep

Optionality: Mandatory

Repeatability: =1

Definition: Angle of start of Elevation measurement from Elevation_Axis, in Scan_Angle_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Extent_Angle

Short Name: eleexang

Type: real

Domain: Elevation_Extent_Angle > 0

4807 Parent: Elevation_ Sweep

4808 Optionality: Conditional - present and mandatory if and only if Elevation_Step_Angle is

4809 absent

4810 Repeatability: =1

4811 Definition: Angle between end and start of elevation range.

4812 Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions

4813 Development Team

4814

4815 Extension_Information

4816 Name: Elevation_Step_Angle

4817 Short Name: elstpang

4818 Type: real

4819 Domain: Elevation_Step_Angle > 0

4820 Parent: Elevation_ Sweep

4821 Optionality: Conditional - present and mandatory if and only if Elevation_Extent_Angle is

4822 absent.

4823 Repeatability: =1

4824 Definition: Angle between elevation steps, in Scan_Angle_Units.

4825 Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions

4826 Development Team

4827

4828 Extension_Information

4829 Name: Elevation_Fixed_Angle

4830 Short Name: elfixang

4831 Type: real

Domain: free real

Parent: Scan_Elevation_Properties

Optionality: Conditional - present and mandatory if and only if Elevation_Sweep is absent

Repeatability: =1

Definition: Constant angle relative to elevation axis at which scanner is held while it scans in another direction.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Elevation_Description

Short Name: elevdesc

Type: text

Domain: free text

Parent: Scan_Elevation_Properties

Optionality: Optional

Repeatability: =1

Definition: Additional information about elevation measurements, in text form.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Properties

Short Name: profprop

Type: compound

Child: Profile_Sounding

Child: Profile_Fixed

Child: Profile_Description

Parent: Scan_Geometric_Properties

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Description of data sampling in vertical direction.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Sounding

Short Name: profsond

Type: compound

Child: Number_of_Profile_Samples

Child: Profiling_Direction

Child: Profile_Start

Child: Profile_Extent

Child: Profile_Step

Parent: Profile_Properties

Optionality: Conditional - present and mandatory if and only if Profile_Fixed is absent.

Repeatability: =1

Definition: Description of process of profile sampling.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Number_of_Profile_Samples

Short Name: profsamp

Type: integer

Domain: Number_of_Profile_Samples > 0

Parent: Profile_Sounding

Optionality: Mandatory

Repeatability: =1

Definition: Number of heights at which measurements are made.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profiling_Direction

Short Name: profdir

Type: text

Domain: "upward" "downward"

Parent: Profile_Sounding

Optionality: Mandatory

Repeatability: =1

Definition: Direction of sequence of heights at which profile measurements are made.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Start

Short Name: profst

Type: real

Domain: Profile_Start > 0

Parent: Profile_Sounding

Optionality: Mandatory

Repeatability: =1

Definition: Height of start of profile measurements.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Extent

Short Name: profext

Type: real

Domain: Profile_Extent > 0

Parent: Profile_Sounding

Optionality: Conditional - present and mandatory if and only if Profile_Step is absent

Repeatability: =1

Definition: Distance between end and start of profile range, in Scan_Distance_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Step

Short Name: profstep

Type: real

Domain: Profile_Step > 0

Parent: Profile_Sounding

Optionality: Conditional - present and mandatory if and only if Profile_Extent is absent.

Repeatability: =1

Definition: Distance between profile steps, in Scan_Distance_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Fixed

Short Name: proffix

Type: real

Domain: Profile_Fixed > 0

Parent: Profile_Properties

Optionality: Conditional - present and mandatory if and only if Profile_Sounding is absent

Repeatability: =1

Definition: Fixed profile level at which scanning is taking place.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Profile_Description

Short Name: profdesc

Type: text

Domain: free text

Parent: Profile_Properties

Optionality: Optional

Repeatability: =1

Definition: Additional information about profile measurements, in text form.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Timing

Short Name: scantime

Type: compound

Child: Scan_Start_Time

Child: Scan_Duration

Child: Scan_Step_Time

Child: Scan_Repeat_Time

Parent: Scan_Geometric_Properties

Optionality: Optional

Repeatability: =1

Definition: Schedule for scans.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Start_Time

Short Name: scanstart

Type: compound

Child: Single Date/Time

Parent: Scan_Timing

Optionality: Mandatory

Repeatability: =1

Definition: Time at start of scan.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Duration

Short Name: scandur

Type: real

Domain: Scan_Duration > 0

Parent: Scan_Timing

Optionality: Conditional - present and mandatory if and only if Scan_Step_Time is absent

Repeatability: =1

Definition: Duration of a single scan, in Scan_Time_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Step_Time

Short Name: scanstept

Type: real

Domain: Scan_Step_Time > 0

Parent: Scan_Timing

Optionality: Conditional - present and mandatory if and only if Scan_Duration is absent

Repeatability: =1

Definition: Time for one step in scan, in Scan_Time_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Repeat_Time

Short Name: scanrptt

Type: real

Domain: Scan_Repeat_Time > 0

Parent: Scan_Timing

Optionality: Mandatory

Repeatability: =1

Definition: Time between the start of one scan and the next, in Scan_Time_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Sample_Properties

Short Name: sampprop

Type: compound

Child: Sample_Description_Units

Child: Pixel_Description

Parent: Scan

Optionality: Mandatory

Repeatability: =1

Definition: Description of pixel properties.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Sample_Description_Units

Short Name: sampdesu

Type: compound

Child: Sample_Angle_Units

Child: Sample_Profile_Units

Parent: Sample_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Units in which of pixel properties are provided.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Sample_Angle_Units

Short Name: sampangu

Type: text

Domain: "degrees" "radians" "arcminutes" "arcseconds" free text

Parent: Sample_Description_Units

Optionality: Mandatory_if_applicable

Repeatability: =1

Definition: Units in which angles are measured in pixel description.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Sample_Profile_Units

Short Name: samprofu

Type: compound

Child: Altitude_Distance_Units

Parent: Sample_Description_Units

Optionality: Mandatory_if_applicable

Repeatability: =1

Definition: Units used to measure profile heights and distances.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Pixel_Description

Short Name: pixldesc

Type: compound

Child: Pixel_Cross_Track_Size

Child: Pixel_Elevation_Size

Child: Pixel_Profile_Size

Child: Pixel_Height_Above_Ellipsoid

Child: Pixel_Point_Spread_Function

Parent: Sample_Properties

Optionality: Mandatory

Repeatability: >=1

Definition: Description of pixel dimensions and location.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Pixel_Cross_Track_Size

Short Name: pixxtksz

Type: real

Domain: Pixel_Cross_Track_Size > 0

Parent: Pixel_Description

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Angular extent of pixel in cross-track direction, in units specified in Sample_Angle_Units.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard -Detector FOV Resolution

Extension_Information

Name: Pixel_Elevation_Size

Short Name pixelvsz

Type: real

Domain: Pixel_Elevation_Size > 0

Parent: Pixel_Description

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Size of pixel in elevation direction, in units specified in Sample_Angle_Units.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard -Detector FOV Resolution

Extension_Information

Name: Pixel_Profile_Size

Short Name: pixprfsz

Type: real

Domain: Pixel_Profile_Size > 0

Parent: Pixel_Description

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Size of pixel in profile direction, in units specified in Sample_Profile_Units.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - Detector FOV Resolution

Extension_Information

Name: Pixel_Height_Above_Ellipsoid

Short Name: pixelhgt

Type: real

Domain: Pixel_Height_Above_Ellipsoid > 0

Parent: Pixel_Description

Optionality: Optional

Repeatability: =1

Definition: Height of pixel above ellipsoid defined as part of spatial representation information, in units specified in Sample_Profile_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Pixel_Point_Spread_Function

Short Name: pixelpsf

Type: text

Domain: free text

Parent: Pixel_Description

Optionality: Optional

Repeatability: =1

Definition: Pixel image distribution that would be produced by a single point.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Radiometric_Properties

Short Name: sradprop

Type: compound

Child: Data_Scaling_Information

Parent: Scan

Optionality: Mandatory

Repeatability: =1

Definition: Function used to convert quantity in detector units to physical units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Scan_Spectral_Properties

Short Name: scspprop

Type: compound

Child: Spectral_Information

Parent: Scan

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Design specifications for wavelength-dependent scanner properties.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Spectral_Information

Short Name: specinfo

Type: compound

Child: Number_of_Wavelength_Bands

Child: Wavelength_Band_Properties

Parent: Scan_Spectral_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Wavelength-dependent properties of optical systems.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Number_of_Wavelength_Bands

Short Name: nowvband

Type: compound

Child: Number_of_Bands

Parent: Spectral_Information

Optionality: Mandatory

Repeatability: =1

Definition: Number of separate wavelength ranges at which system measures.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Wavelength_Band_Properties

Short Name: wvbandpr

Type: compound

Child: Wavelength_Units

Child: Band_Boundary_Definition

Child: Minimum_Wavelength

Child: Maximum_Wavelength

Child: Peak_Wavelength

Child: Nominal_Spatial_Resolution

Child: Band_Quality

Child: Polarization_Characteristics

Child: Band_Description

Parent: Spectral_Information

Optionality: Mandatory-if-applicable

Repeatability: >=1

Definition: Design specifications for properties an individual wavelength range.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Wavelength_Units

Short Name: waveunit

Type: text

Domain: "m" "cm" "mm" "µm" "nm" free text

Parent: Wavelength_Band_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Units in which band wavelengths are expressed.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Band_Boundary_Definition

Short Name: bbnddef

Type: text

Domain: "3db" "half maximum" "50 %""1/e" "equivalent width" free text

Parent: Wavelength_Band_Properties

Optionality: Optional

Repeatability: =1

Definition: Designation of criterion for defining maximum and minimum wavelengths for a spectral band.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Minimum_Wavelength

Short Name: lambdmin

Type: real

Domain: Minimum_Wavelength > 0

Parent: Wavelength_Band_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Minimum wavelength boundary of the spectral range of the band using the criterion in Band_Boundary_Definition, in units specified by Wavelength_Units.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Channel Spectrum Start

Extension_Information

Name: Maximum_Wavelength

Short Name: lambdmax

Type: real

Domain: Maximum_Wavelength >= Minimum_Wavelength

Parent: Wavelength_Band_Properties

Optionality: Mandatory

Repeatability: =1

Definition: Maximum wavelength boundary of the spectral range of the band using the criterion in Band_Boundary_Definition, in units specified by Wavelength_Units.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Channel Spectrum End

Extension_Information

Name: Peak_Wavelength

Short Name: pkwavlen

Type: real

Domain: Minimum_Wavelength <= Peak Wavelength <= Maximum_Wavelength

Parent: Wavelength_Band_Properties

Optionality: Optional

Repeatability: =1

Definition: Wavelength of maximum sensitivity within the band, in units specified by Wavelength_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Nominal_Spatial_Resolution

Short Name: nomspres

Type: compound

Child: Spatial_Resolution_Units

Child: Spatial_Resolution_Value

Parent: Wavelength_Band_Properties

Optionality: Optional

Repeatability: =1

Definition: Smallest distance between which separate points can be distinguished, as specified in instrument design.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Spatial_Resolution_Units

Short Name: spatresu

Type: text

Domain: "meters" "kilometers" "degrees" free text

Parent: Nominal_Spatial_Resolution

Optionality: Mandatory

Repeatability: =1

Definition: Units in which spatial resolution is expressed.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Spatial_Resolution_Value

Short Name: spatresv

Type: real

Domain: Spatial_Resolution_Value > 0

Parent: Nominal_Spatial_Resolution

Optionality: Mandatory

Repeatability: =1

Definition: Quantitative measure of designed instrument spatial resolution, in units given by Spatial_Resolution_Units.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Band_Quality

Short Name: bandqual

Type: text

Domain: free text

Parent: Wavelength_Band_Properties

Optionality: Optional

Repeatability: =1

Definition: Description of state of band, including degree of degradation and impact on resolution and measurement accuracy.

Source: Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Channel Quality

Extension_Information

Name: Polarization_Characteristics

Short Name: polrzcha

Type: compound

Child: Receiver_Polarization

Child: Sender_Polarization

Parent: Wavelength_Band_Properties

Optionality: Mandatory-if-applicable

Repeatability: >=1

Definition: Degree of polarization of band.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Receiver_Polarization

Short Name: revrpolr

Type: text

Domain: "horizontal" "vertical" "left circular" "right circular" free text

Parent: Polarization_ Characteristics

Optionality: Mandatory

Repeatability: =1

Definition: Polarization direction that a receiver is designed to accept.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Sender_Polarization

Short Name: sendpolr

Type: text

Domain: "horizontal" "vertical" "left circular" "right circular" free text

Parent: Polarization_ Characteristics

Optionality: Mandatory-if-applicable

Repeatability: =1

Definition: Polarization of radiation emitted as part of a measurement system

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Band_Description

Short Name: banddesc

Type: text

Domain: free text

Parent: Wavelength_Band_Properties

Optionality: Optional

Repeatability: =1

Definition: Additional descriptive material about band properties.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Other_Collector_Description

Short Name: othcolde

Type: text

Domain: free text

Parent: Instrument_Description

Optionality: Conditional - present and mandatory if and only if Frame_Camera and Scan are absent.

Repeatability: =1

Definition: Description of properties of data collection system other than frame camera or whiskbroom scanner.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Instrument_Properties_Description

Short Name: instpdes

Type: text

Domain: free text

Parent: Instrument_Information

Optionality: Optional

Repeatability: =1

Definition: Textual information on instrument properties, in areas not otherwise specified in this standard.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Instrument_Reference

Short Name: instref

Type: compound

Child: Citation_Information

Parent: Instrument_Information

Optionality: Conditional - mandatory if Instrument_Description is absent; otherwise optional.

Repeatability: >=1

Definition: Reference providing description of instrument properties and behavior.

Rationale: Descriptive information about the instrument may be in a document separate from the data

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard - DSS Guide Instrument Information

Location Information

Extension_Information

Name: Location_Information

Short Name: locainfo

Type: compound

Child: Number_of_Points

Child: Coordinate_System

Child: Coordinate_XY_Units

Child: Coordinate_Z_Units

Parent: *Called by many elements throughout the document.*

Optionality: *Specified by referencing element.*

Repeatability: *Specified by referencing element*.

Definition: Information about the location of a set of one or more points. *(Note: this section provides a means of providing the location of positions and is used by other sections of the metadata extensions. This section is never used alone.)*

Rationale: There are numerous metadata elements that consist of one or more coordinate points. Since the concept appears so frequently, creating one standard compound element is preferable to repeating the same structure at many points throughout the standard.

.Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Location_Information =

Number_of_Points +

0{Coordinate_System}1 +

0{Coordinate_XY_Units}1 +

(Coordinate_Z_Units)

1{Coordinate_Point}n

Coordinate_System =

[Unreferenced_Coordinate_System|

Referenced_Coordinate_System]

Referenced_Coordinate_System =

Spatial_Reference_Information (*see section 4 of base standard for production rules*)

Coordinate_Point =

Coordinate_x_Value +

Coordinate_y_Value +

(Coordinate_z_Value)

Extension_Information

Name: Number_of_Points

Short Name: numpoint

Type: integer

Domain: Number_of_Points > 0

Parent: Location_Information

Optionality: Mandatory

Repeatability: =1

Definition: Number of coordinate positions.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_System

Short Name: coordsys

Type: compound

Child: Unreferenced_Coordinate_System

Child: Referenced_Coordinate_System

Parent: Location_Information

Optionality: Conditional - present and mandatory if and only if not defined in referencing element

Repeatability: =1

Definition: Definition of axes of coordinate system in which location of positions is provided.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Unreferenced_Coordinate_System

Short Name: unrefsys

Type: text

Domain: free_text

Parent: Coordinate_System

Optionality: conditional - present and mandatory if and only if

Referenced_Coordinate_System is not present.

Repeatability: =1

Definition: Coordinate system which is not georeferenced and for which georeferencing

information is unavailable or irrelevant.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions

Development Team

Extension_Information

Name: Referenced_Coordinate_System

Short Name: refsys

Type: Compound

Child: Spatial_Reference_Information

Parent: Coordinate_System

Optionality: conditional - present and mandatory if and only if

Unreferenced_Coordinate_System is not present.

Repeatability: =1

Definition: Coordinate system which can be georeferenced..

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_XY_Units

Short Name: coordxyu

Type: text

Domain: "micrometers" "millimeters" "meters" "kilometers" free text

Parent: Location_Information

Optionality: Conditional - present and mandatory if and only if the coordinates correspond to physical dimensions and are not specified elsewhere.

Repeatability: =1

Definition: Physical dimension corresponding to value of unity in x and y coordinate directions as defined in Coordinate_System or referencing element, where the coordinates correspond to physical dimensions.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_Z_Units

Short Name: coordzu

Type: text

Domain: "meters" "feet" "millibars" free text

Parent: Location_Information

Optionality: Optional

Repeatability: =1

Definition: Physical dimension corresponding to value of unity in z coordinate directions Coordinate_System or referencing element, where the coordinates correspond to physical dimensions.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_Point

Short Name: coordpt

Type: compound

Child: Coordinate_x_Value

Child: Coordinate_y_Value

Child: Coordinate_z_Value

Parent: Location_Information

Optionality: Mandatory

Repeatability: =Number_of_Points

Definition: Location of a coordinate point described by the referencing element.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_x_Value

Short Name: coorxval

Type: real

Child: free real

Parent: Coordinate_Point

Optionality: Mandatory

Repeatability: =1

Definition: Location of point along x-axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_y_Value

Short Name: cooryval

Type: real

Child: free real

Parent: Coordinate_Point

Optionality: Mandatory

Repeatability: =1

Definition: Location of point along y-axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information

Name: Coordinate_z_Value

Short Name: coorzval

Type: real

Child: free real

Parent: Coordinate_Point

Optionality: Optional

Repeatability: =1

Definition: Location of point along z axis.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

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Appendix A - NASA Data Product Levels

This set of Data Product Levels, defined by NASA (1995) range from Level 0 to Level 4. Level 0 data products are raw instrument data at full instrument resolution. At higher levels, raw instrument data are converted into more usable parameters and formats that are of interest to the users. At Level 4, parameters are further refined through the use of models. The levels of data are shown below.

Level 0

Level 0 data products are reconstructed, unprocessed instrument/payload data at full resolution; any and all communications artifacts, e.g. synchronization frames, communications headers, duplicate data removed.

Level 1A

Level 1A data products are reconstructed, unprocessed instrument data at full resolution, time-referenced and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters, e.g., platform ephemeris. Ancillary information is computed and appended but not applied to the Level 0 data.

Level 1B

Level 1B data products are Level 1A data that have been processed to sensor units. Not all instruments will have data equivalent to Level 1B.

Level 2

Level 2 data products are derived geophysical variables at the same resolution and locations as the

Level 1 source data.

Level 3

Level 3 data products are variables mapped on uniform space-time grid scales, usually with some completeness and consistency.

Level 4

Level 4 data products are model output or results from analyses of lower level data, e.g. variables derived from multiple measurements.

Appendix B - ISPRS Data Product Levels

This set of Data Product Levels, defined by ISPRS, ranges from Level 0 to Level 4. As with the NASA data levels, Level 0 data products are raw instrument data at full instrument resolution, and data products at higher levels contain more usable parameters and formats that are of interest to the users. The highest ISPRS product level corresponds to a geographically located orthophoto.

Level 0

Level 0 describes the original or raw data coming from the sensor without any georeferencing or sensor information.

Level 1

Level 1 contains information that allows determination of the location of the image on the raster grid system. It does not contain any geolocation information

Level 2

Ancillary information is computed and appended but not applied to the Level 0 data.

Level 3

Level 3 describes image data which were originally acquired by a line sensor and which have been processed to a common plane. This generates a readily visible image similar to an image taken by a frame camera

Level 4

Level 4 describes processed image data which are directly related to the object coordinate system (orthophoto)

Alternative Level Structure

The alternative levels are only based on geometric properties. Geophysical variables and results from analyses using the same geometry create a sublevel only (level 2c = level 3 in “Level-Structure”).

Alternative Level	Above explained Level
Level 0	Level 0
Level 1	Level 1
Level 2a	Level 2a
Level 2b	Level 2b
Level 2c	Level 3
Level 3	Level 4

Appendix C - Index of Definitions of Extended Elements