

Geo and Geo-Stereo Product Guide

v. 1.2.1

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1 Introduction

DigitalGlobe will continue to offer Geo™ and GeoStereo™ products that conform to the Legacy GeoEye specifications using the IKONOS satellite. These products are functionally comparable with the DigitalGlobe Ortho Ready Standard and Ortho Ready Stereo products.

As the most trusted provider of geospatial imagery in the world, DigitalGlobe has set the industry standard. DigitalGlobe’s advanced Earth imaging satellites and worldwide network of ground stations offer a unique ability to accurately map, measure and monitor the world for our clients.

DigitalGlobe believes geospatial products should be easy to choose and easy to use. Our product line, Geo™ and GeoStereo™, makes selecting the right product for your needs simple and intuitive. Our unrivaled image processing capabilities allow us to deliver geospatial imagery in ways that help our clients extract more information and use these robust image products in almost any geospatial application imaginable.



Figure 1.1 Product Overview

2 Product Levels

DigitalGlobe's imagery product line (legacy GeoEye products) consists of two core product offerings: Geo™ and GeoStereo™. Geo products are low cost, geometrically corrected images. GeoStereo products provide stereo imagery for three-dimensional viewing and feature extraction. Products are available as pan-sharpened color in 80-centimeter resolution or multispectral in 3.2-meter resolution.

For information on the full portfolio of DigitalGlobe Core Imagery products please see the [DigitalGlobe Core Imagery Product Guide](#).

2.1 Geo

Geo is a radiometrically-corrected map-oriented image suitable for a wide range of uses. In addition to being suitable for visualization and reference applications, the Geo is shipped with the sensor camera model in rational polynomial coefficient (RPC) format. This camera model maps the respective ground coordinates to image product coordinates. RPC camera model data is provided in RPC00B format in NITF files and in text format with GeoTIFF orders. Block adjustment, orthorectification, and other photogrammetric processing can be performed with the RPC camera model. This product coupled with a digital elevation model (DEM) permits skilled users to make their own orthorectified products using standard commercial software and available data sets.

All Geo products are map-projected, rectified to a datum and map projection system. To produce a Geo product, DigitalGlobe uses a correction process that removes image distortions introduced by the collection geometry and then resamples the imagery to a uniform ground sample distance (GSD) and a specified map projection. Because Geo images are not orthorectified, their accuracy is limited by terrain displacement.

Geo products are developed from IKONOS images captured at an off-nadir angle between 0 and 30 degrees. Because multiple Geo images in a single order are not mosaicked, tonal variations may be evident among images. To increase the positional accuracy of the final orthorectified imagery, customers can upgrade to an off-nadir angle of 0 to 15 degrees.

2.2 GeoStereo

Providing a strong platform for three-dimensional feature recognition, extraction and exploitation, the GeoStereo product provides two images with stereo geometry to support a wide range of stereo imagery applications such as DEM creation, building height extraction, spatial layers, and three-dimensional simulation. Stereo products in map projections provide RPC camera model data. The RPC camera model supports block adjustment, three-dimensional stereo extraction, DEM generation, orthorectification, and other photogrammetric operations.

High-resolution stereo pairs are collected in the same orbital pass, minimizing changes in lighting or scene content. DigitalGlobe provides the stereo imagery pairs with a RPC camera model file. The RPC file provides camera model data to popular software packages for block adjustment, photogrammetric extraction of three-dimensional feature coordinates; DEMs and orthorectification suitable for DEM generation, and other photogrammetric operations.

Each stereo pair collected by IKONOS contains images collected at an off-nadir angle between 0 and 30 degrees. The IKONOS satellite collect stereo pairs with 30 - 45 degrees convergence (0.54 to 0.83 base-to-height ratio).

The GeoStereo products have a minimum horizontal accuracy of 15 meters CE90 and a vertical accuracy of 22 meters LE90.

2.3 Product Specifications At-A-Glance

Within each product, location error is defined by a circular error at 90% confidence (CE90), which means that locations of objects are represented on the image within the stated accuracy 90% of the time. This CE90 accuracy level can be related to Root Mean Square Error (RMSE) as well as the U.S. National Map Accuracy Standards (NMAS).

Table 2.1 0.8 & 3.2 Meter Product Levels At-A-Glance (IKONOS)

PRODUCT	POSITIONAL ACCURACY			ORTHO-CORRECTED	TARGET OFF-NADIR ANGLE	MOSAICS AVAILABLE	SAMPLE APPLICATIONS
	CE90	RMS	NMAS				
Geo	15 meters ¹	8 meters ¹	N/A	No	0° to 30°	No	Visual and interpretive analysis; temporal archive and new collection for change detection
GeoStereo	15 meters	22 meters	1:20,000	No	0° to 30°	No	DEM creation for flood plain analysis

2.4 Tasking Specifications At-A-Glance

There are three tasking options for DigitalGlobe Imagery Products: Select, Select Plus and Single Shot. Each tasking option offers a different level of service and different benefits. Thus, the customer should choose the option that aligns best with their needs in terms of collection window, cloud protection, and price. Tasking orders have single or multiple acquisition opportunities and different customer-defined tasking parameters, depending on the tasking type selected.

For Select and Select Plus Tasking, DigitalGlobe offers a 0-15% default cloud cover. Clouds are defined as pixels through which ground features are obscured either partially or in their entirety due to atmospheric conditions. To be considered cloud cover, a definite boundary between the affected pixels and the unaffected pixels must be visible. All acquired image strips are assessed for cloud cover. Cloud shadows are not accounted for in assessment.

When preparing its collection plan, DigitalGlobe creates the best plan for every pass, which maximizes the customer benefit while adhering to tasking option parameters. Several factors are considered in the collection plan, including tasking option, date an order was received, the customer-specified collection window, and the cloud cover forecast. In rare instances, DigitalGlobe may pre-empt some orders due to collection efficiency and/or satellite calibration and maintenance.

2.5 Collection Feasibility

DigitalGlobe performs two feasibility studies on all tasking orders prior to accepting the order:

Physical Feasibility assesses the number of times that the satellites have physical access to your target based upon the parameters provided. Items that affect physical feasibility include off-nadir angle (wider angles will have more accesses than narrow angles), latitude, and collection windows (the larger the collection window, the more access the satellites will have).

Competitive Feasibility assesses DigitalGlobe’s ability to collect your order based on other orders already on the tasking deck.

The output of the feasibility studies will display on the customer’s order quotation and confirmation form as the DG Suggested End Collection. This will vary depending on the Tasking Level selected (refer to *Tasking Parameters* below for more details).

¹ Exclusive of terrain displacement.

2.6 Tasking Parameters

Table 2.2 Tasking Parameters for Select & Select Plus

TASKING PARAMETERS FOR SELECT & SELECT PLUS		CUSTOMER SELECTED
Minimum Collection Area	Geo - subject to minimum price, not less than 121 km ²	
Start Collection Date	Customer-Specified	Yes
End Collection Date	Customer specified number of days from Start Collection Date, up to 365 days from Start Collect	Yes
Maximum Cloud Cover	15%	
Off-Nadir Angle	0° - 15°, up to 0° - 45° in 15° increments	Yes
Sun Elevation	≥ 15° (as collected); ≥ 30° for Pan-sharpened products	
Sun Azimuth	0° - 360° (as collected)	
Sensor Azimuth	0° - 360° (as collected)	

Table 2.3 Tasking Parameters for Single Shot

TASKING PARAMETERS FOR SINGLE SHOT		CUSTOMER SELECTED
Minimum Collection Area	Geo - subject to minimum price, not less than 121 km ²	
Start Collection Date	As soon as 6 hours after order confirmation ²	Yes
End Collection Date	1 to 14 days after Start Collection Date	Yes
Maximum Cloud Cover	100%	No
Off-Nadir Angle	0° - 15°, up to 0° - 45° in 15° increments	Yes
Sun Elevation	≥ 15° (as collected); ≥ 30° for Pan-sharpened products	No
Sun Azimuth	0° - 360° (as collected)	No
Sensor Azimuth	0° - 360° (as collected)	No

² Order confirmation is subject to DigitalGlobe business hours.

3 Specifications

3.1 Spectral Range

Table 3.1 Spectral Range

SPECTRAL RANGE	
Spectral Range	IKONOS
Panchromatic	526-929 nm
Band 1 (Blue)	445-516 nm
Band 2 (Green)	505-595 nm
Band 3 (Red)	632-698 nm
Band 4 (Near-Infrared)	757-853 nm

3.2 Clouds

Newly-collected imagery from IKONOS will have less than 15% cloud cover. DigitalGlobe accepts specific cloud requests via custom quote and feasibility. Orders placed from the ImageLibrary will have less than 20% cloud cover unless previously approved by the customer.

3.3 Sun Angle

Our satellites collect imagery at a sun elevation angle (measured from the Earth's surface to the sun) of greater than 15 degrees, azimuth unrestricted. Because the orbit is sun-synchronous, all imagery is collected at approximately 10:30 a.m. local solar time. Therefore, all imagery has consistent sun angles.

➔ NOTE: There are times of the year, at higher latitudes, where our satellites are unable to acquire imagery. There is not enough sun light for our satellites to image the Earth's surface in these regions.

3.4 File Sizes

Refer to Table 3.2 to determine the file size for an order, according to resolution, specific color, bit depth, and band combination requirements.

Table 3.2 File Sizes

	BITS/PIXEL	NUMBER OF BANDS	RESOLUTION	FILE SIZE PER KM ²
Black & White (Panchromatic)	8	1	0.8 meter	1 megabyte
	11	1	0.8 meter	2 megabyte

	BITS/PIXEL	NUMBER OF BANDS	RESOLUTION	FILE SIZE PER KM ²
Multispectral (3-Band 1-File)	8	3	3.2 meter	.1875 megabytes
	11	3	3.2 meter	.375 megabytes
Multispectral (4-Bands)	8	4	3.2 meter	.25 megabytes
	11	4	3.2 meter	.5 megabytes
Color (3-Band 1-File)	8	3	0.8 meter	3 megabytes
	11	3	0.8 meter	6 megabytes
Color (4-Bands)	8	4	0.8 meter	4 megabytes
	11	4	0.8 meter	8 megabytes
Bundle (4 Band 1 File)	8	4	0.8 meter + 3.2 meter	1.1875 megabytes
	11	4	0.8 meter + 3.2 meter	2.375 megabytes
Bundle (All Files)	8	5	0.8 meter + 3.2 meter	1.25 megabytes
	11	5	0.8 meter + 3.2 meter	2.5 megabytes

3.5 Support Data

All of DigitalGlobe’s Geo and GeoStereo products are shipped with a text metadata file, license file, shape files, RPC file, and a JPEG thumbnail image with world file.

- Metadata includes order parameters as well as source image and product file descriptions. Order parameters include area of interest (AOI), spectral bands and coordinate system. Source image descriptions include acquisition date, sun angles and viewing geometry. Product file descriptions include geocoding, spectral bands and coverage area.
- Shapefiles show order AOI, delivery component layout, and source image footprints with acquisition geometry.

The Geo and GeoStereo imagery metadata file is provided as an ASCII file and is comprised of five sections:

- Company Information with information about imagery producer
- Product Order Metadata that defines the coordinates of the AOI as ordered
- Source Image Metadata describing the source image(s)
- Product Space Metadata contains information about image(s) produced to fulfill a product order
- Product Component Metadata with description of imagery components if a product is broken into separate components

For more information, refer to *Appendices A-D*.

3.6 Distribution

No products better than 2.0 meters can be delivered over Israel.

3.7 Options

3.7.1 Band Combinations

The band combinations include Panchromatic (Black & White), Multispectral, Color or Bundle. Refer to Table 3.3 for details.

Table 3.3 Band Combinations

BAND COMBINATIONS	
Black & White (Panchromatic)	0.8-meter panchromatic imagery delivered as a single band.
Multispectral	3.2 meter imagery delivered as one file with three bands in natural color (red, green, blue) or color infrared (near infrared, red, green); or one file with four bands.
Pan-Sharpended Color	Color imagery is created using a pan-sharpening process that combines a high-resolution panchromatic image with the multispectral bands to create a 0.8-meter color product. DigitalGlobe delivers 0.8-meter color imagery as one file with three bands in natural color (red, green, blue) or color infrared (near infrared, red, green); or one file with four bands.
Bundle	When the bundle order option is selected, customers receive panchromatic and multispectral imagery. IKONOS collects imagery for a bundle order simultaneously to ensure radiometric and temporal consistency.

3.7.2 Projections

Projection options include UTM, State Plane, or Geographic. Customers should select projection based on project-specific factors that will be used with the product and software considerations, such as ancillary data.

3.7.3 Datums

Datum options include the following:

- WGS84 (available worldwide)
- NAD83 (available in North America only)
- NAD27 (available in conterminous United States only)

3.7.4 File Format

DigitalGlobe delivers monoscopic imagery in electronic format as an untiled GeoTIFF file or as an uncompressed NITF 2.0 file, NITF 2.1 or NITF 2.1 with NCD.

- GeoTIFF files are limited to 2 Gigabytes by default. Customers may request that files be produced up to 4 Gigabytes. However, customers should verify that their software can accept 4 Gigabyte files.
- NITF format is typically only used by U.S. government customers. DigitalGlobe recommends GeoTIFF format for commercial customers.
- Stereo imagery is available in GeoTIFF for map-projected imagery.

3.7.5 Bit Depth

DigitalGlobe produces imagery at either 8- bits per pixel or 11-bits per pixel.

- Customers interested in small, easy to use images for visual interpretation should select 8-bit images. In an 8-bit image, each pixel is represented by 256 shades of gray per band.
- Customers interested in full, dynamic range should select 11-bit images. When viewing an 11-bit image, use an application that is capable of reading 16-bit file formats and adjusting both image brightness and contrast. In an 11-bit image, each pixel is represented by 2,048 shades of gray, which provides more information to discern subtle differences among objects.

3.7.6 Dynamic Range Adjustment

Customers may specify whether Dynamic Range Adjustment (DRA) should be “on” or “off”.

- Customers that are interested in the most visually appealing image should select DRA “on”. DigitalGlobe will apply DRA to enhance the visual interpretability of the image. Customers that want to maintain the absolute radiometric accuracy for scientific applications should select DRA “off”.
- Customers that prefer to do their own contrast adjustment of the image may also want to select DRA “off” because it will provide them the maximum color flexibility. The DRA option is not available for NITF file formats.

3.7.7 Resampling

Customers may choose Cubic Convolution or Nearest Neighbor resampling.

- DigitalGlobe highly recommends Cubic Convolution.
- During the product production process, all satellite must go through a resampling process. The Cubic Convolution process assesses the values of adjacent pixels and integrates these values to create a new value for each pixel. For uniform areas (a grassland, for example), the new value will be identical to those in surrounding pixels. In a transitional area, such as a roadside, the resampled values of the new pixel will reflect the transition between a grassy edge and the road surface itself. Cubic convolution resampling results in imagery that’s pleasing to the observer, tonally and geometrically. There are no “misplaced” pixels to disrupt scene geometry or tonal anomalies to distract from the transitional nature of a roadside, for instance.
- Some customers, especially those performing scientific applications, want to maintain true radiometric integrity. Nearest Neighbor resampling resolves this problem by copying the value from the nearest reference pixel to that location. However, nearest neighbor resampling alters the appearance of features running diagonally through the image.

3.7.8 Media

DigitalGlobe can deliver imagery on DVD, FTP, or External Hard Drive. Signiant electronic delivery is available via special request and requires system set-up and client software installation prior to delivery. FTP delivery is only recommended for orders up to 500 square kilometers. Customers should consider the file size and tile size when selecting the media type.

4 DigitalGlobe Constellation

DigitalGlobe manages a constellation of satellites that collect imagery at varying resolutions. Our high-resolution imagery satellites have collected several hundred million square kilometers of imagery to date. The complete DigitalGlobe legacy GeoEye ImageLibrary (archive) of IKONOS is available through the GeoFUSE Search & Discovery tool at www.geofuse.geoeeye.com.

Launched on 24 September 1999, IKONOS collects 82-centimeter panchromatic and 3.28-meter multispectral data at a rate of over 240,000 square kilometers per day or over 87 million square kilometers per year. IKONOS orbits the Earth every 98 minutes at an altitude of approximately 681 kilometers or 423 miles. The satellite travels a sun-synchronous orbit, always crossing the equator at approximately 10:30 a.m. local time. The IKONOS satellite was built by Lockheed Martin in Sunnyvale, California. The camera, built by ITT/Kodak, has a dual focal plane allowing for simultaneous panchromatic and multispectral (R, G, B, NIR) collection. The high-speed solid state on-board recorder allows for worldwide imaging, storage on-board and subsequent downlink to ground stations around the world. IKONOS is the only imaging satellite in its class that has a simultaneous downlink and uplink capability.

Table 4.1 DigitalGlobe Constellation At-a-Glance

DIGITALGLOBE CONSTELLATION AT-A-GLANCE	
Satellite Feature	IKONOS
Panchromatic Resolution at Nadir	82-centimeters
Panchromatic Resolution at 60° Elevation	1.0 meter
Multispectral Resolution at Nadir	3.28 meters
Swath Width at Nadir	11.3 km
Nominal Scene Size	121 km ²
Pan Point Target Rate (50 km spacing)	4 points/min
Daily Collection (km ²)	240,000 km ²
Dynamic Range	11 bits per pixel
Launch Date	24-Sep-99
Life Cycle	Over 7 years
Revisit Time	3 days at 40° latitude with elevation > 60°
Orbital Altitude	681 km
Nodal Crossing	10:30 AM

5 Delivery Information

5.1 Minimum Order Size

The minimum order for new collections is 100 square kilometers. For all ImageLibrary Geo and GeoStereo products, the minimum order size is 25 square kilometers. All areas of interest must be a minimum of five kilometers wide in any direction.

5.2 Delivery Terms and Conditions

The Estimated Delivery Terms listed in Table 5.1 and Table 5.2 represent an estimate of the delivery time based on DigitalGlobe's exercise of commercially reasonable efforts to perform new collections of products or deliver products from DigitalGlobe's ImageLibrary. These times are not guaranteed product delivery dates; they represent an average of the worldwide product delivery times that DigitalGlobe generally experiences. The actual delivery date of any product of a particular region of the world may vary and is subject to a variety of factors, which can change the delivery time for any individual product, regardless of the Estimated Delivery Terms mentioned in Table 5.1 and Table 5.2.

Table 5.1 Geo Product Delivery Information

GEO PRODUCT						
Collection Terms	Estimated Delivery Terms by Square Kilometers		AOI Min Order Size	New Collect?	Feasibility Required Prior To Order Acceptance?	Custom Quote Required?
Select Tasking	< 500 km ²	Feasibility dependent	100 km ²	Yes	Yes	No
	500 - 5000 km ²	Feasibility dependent				Yes
	5,000 - 10,000 km ²	Feasibility dependent				Yes
	>10,000 km ²	Custom Quote				Yes
ImageLibrary (Archive)	< 500 km ²	1 Day	25 km ²	No	No	No
	500- 5000 km ²	2 Days				No
	5,000 - 10,000 km ²	5 Days				No
	>10,000 km ²	Custom Quote				Yes

Table 5.2 GeoStereo Product Delivery Information

GEOSTEREO PRODUCT							
Collection Terms	Estimated Delivery Terms by Square Kilometers		AOI Min Order Size	New Collect?	Feasibility Required Prior To Order Acceptance?	Custom Quote Required?	
Select Tasking	< 500 km ²	Feasibility dependent	100 km ²	Yes	Yes	No	
	500 - 5000 km ²	Feasibility dependent				Yes	Yes
	5,000 - 10,000 km ²						
	>10,000 km ²	Custom Quote				Yes	
ImageLibrary (Archive)	< 500 km ²	1 Day	25 km ²	No	No	No	
	500- 5000 km ²	5 Days					
	5,000 - 10,000 km ²	10 Days					
	>10,000 km ²	Custom Quote				Yes	

Appendix A: ISD - Product Order Metadata

Product order metadata defines the coordinates of the AOI as ordered.

Appendix Table A. Product Order Metadata

FIELD NAME	VALUES	COMMENT
Creation Date		Date the product was produced.
Product Work Order Number	WO# SG#	Work order number for product
Product Order Number	POID#	Product order ID
Customer Project Name	"My Area of Interest"	Client-supplied project name
Ground Station ID	String Text	
License Type	Base Group Enterprise Enterprise Premium Education Demonstration	Product license type.
License Option 1		Licensee company name, if applicable
License Option 2		Licensee company name, if applicable
Product Order Area		
Number of Coordinates	numeric, 3 to n	Client-supplied AOI typically has four corner points. The sequence of the coordinates is ordered in a clockwise manner which defines the vertices of the polygon. Each edge of the polygon is a great ellipse arc, referenced to the WGS84 ellipsoid. The interior of the polygon is to the right each edge between two coordinates in the sequence. The last coordinate in the sequence is assumed to connect to the first coordinate in the sequence so that the first coordinate is not repeated at the end of the sequence.
Coordinate 1		Point 1-upper left
	Decimal Degrees -90 to 90	Latitude for point 1
	Decimal Degrees	Longitude for point 1

FIELD NAME	VALUES	COMMENT
	-180 to 180	
Coordinate 2		Point 2-upper right
	Decimal Degrees -90 to 90	Latitude for point 2
	Decimal Degrees -180 to 180	Longitude for point 2
Coordinate 3		Point 3-lower right
	Decimal Degrees -90 to 90	Latitude for point 3
	Decimal Degrees -180 to 180	Longitude for point 3
Coordinate 4		Point 4-lower left
	Decimal Degrees -90 to 90	Latitude for point 4
	Decimal Degrees -180 to 180	Longitude for point 4
Sensor Type	Satellite	
Sensor Name	IKONOS-2	
Product Line	Geo GeoProfessional GeoStereo	Product type
Processing Level	Radiometrically Corrected Standard Geometrically Corrected Orthorectified	Product type/processing level
Image Type	Pan Pan/MSI MSI	Data type
Interpolation Method	Cubic Convolution Nearest Neighbor	Resampling method
Multispectral Algorithm	None Projective Local Projective	

FIELD NAME	VALUES	COMMENT
Stereo	Mono Stereo	
Mosaic	Yes No	
Seam Feathering	Yes No	Not present if Mosaic = No
Tonal Adjust	Yes No	Not present if Mosaic = No
Map Projection	Albers Equal-Area Conic Lambert Conformal Conic State Plane Universal Transverse Mercator Transverse Mercator Geographic	
Projection-specific parameters		
ASI Latitude	Decimal Degrees	If projection=Geographic
ASI Longitude	Decimal Degrees	If projection=Geographic
Latitude origin of projection	Decimal Degrees	If projection=Geographic
Longitude origin of projection	Decimal Degrees	If projection=Geographic
Datum	WGS84 NAD83 NAD27	
Product Order Pixel Size	Meters	Output pixel size.
Product Order Map Units	meters feet degrees	Requested product map units Degrees for Geographic projection
MTFC Applied	Yes No	Modulation Transfer Function Correction
DRA Applied	No Yes	Dynamic Range Adjustment

FIELD NAME	VALUES	COMMENT
Media	Electronic DVD HD	Product delivery mechanism. Single Look Complex is only available with DVD and electronic delivery.
Product Media Format	Electronic DVD HD	Product delivery mechanism for which product is formatted. May be different than Media. Single Look Complex is only available with DVD and electronic delivery.
File Format	Imagery formats: GeoTIFF/TIFF NITF2.0 NITF2.1 NITF2.1 NCD	
TIFF Tiled	Yes No	Applies only if File Format = GeoTIFF/TIFF
Compressed	No	
Bits per Pixel per Band	11, 8	
Multispectral Files	Four Files RGB NRG BGRN	3 or 4 bands/single file or each band in separate file: RGB, NRG, BGRN, Red, Green, Blue, or Near Infrared NIR.

Appendix B: ISD - Source Image Metadata

Source image metadata describes the source image(s). The source image information section repeats for every source image contained in the product.³

Appendix Table B Source Image Metadata

FIELD NAME	VALUES	COMMENT
Number of Source Images		Number of scenes to produce final product.
Source Image ID	Numeric (1-n)	Scene ID
Product Image ID	28 character	Image ID of source
Sensor	IKONOS-2	
Pan Cross Scan	Meters	Panchromatic pixel size when collected for cross scan
Pan Along Scan	Meters	Panchromatic pixel size when collected for along scan
MS Cross Scan	Meters	Multispectral pixel size when collected for cross scan
MS Along Scan	Meters	Multispectral pixel size when collected for along scan
Scan Azimuth	Degrees	Track of scan on ground; 180 degrees = due south
Scan Direction	Forward Reverse	Scan direction
Panchromatic TDI Mode	10, 13, 18, 24, 32	Panchromatic Acquisition mode.
Nominal Collection Azimuth	Decimal Degrees	Azimuth of the sensor with respect to the AOI. Example: Azimuth = 90 means satellite is East of AOI.
Nominal Collection Elevation	Decimal Degrees	Collection elevation of the sensor from the ground.
Nominal Obliquity Angle	Decimal Degrees	Measured at the sensor from the nadir (straight down) direction to the sensor line of sight at the scene center.
Sun Angle Azimuth	Decimal Degrees	Azimuth of sun with respect to the center of the AOI. Azimuth is measured clockwise from North: N=0, E=90, S=180, W = 270.

³ Note: Source Image Metadata is not included for Archive DTM products.

FIELD NAME	VALUES	COMMENT
Sun Angle Elevation	Decimal Degrees	Elevation of sun with respect to the center of the AOI. Elevation is measured upward from the horizon: 0 = horizontal, 90 = zenith.
Acquisition Date/Time	YYYY-MM-DD HH:MM TTT	Time of collection. TTT – Three character time zone.
Percent Cloud Cover	Numeric, 0-100	Cloud cover percentage for entire image.
Stereo Mate Image ID	28 Character Text	Combined Image ID (if applicable).

Appendix C: ISD - Product Space Metadata

Product space coordinates are for the image as produced to fulfill the product order. Additional product space metadata will be provided for each image component used.

Appendix Table C Product Space Metadata

FIELD NAME	VALUES	COMMENT
Number of Image Components	Numeric	The number of image components for the product.
X Components	Numeric	Total number of image components in X direction.
Y Components	Numeric	Total number of image components in Y direction.
Product MBR Geographic Coordinates	Decimal Degrees	Minimum bounding rectangle coordinates.
Number of Coordinates	4	Geographic coordinates of the polygon. The sequence of the coordinates is ordered in a clockwise manner, which defines the vertices of the polygon. Each edge of the polygon is a great ellipse arc, referenced to the selected datum. The interior of the polygon is to the right of each edge between two coordinates in the sequence. The last coordinate in the sequence is assumed to connect to the first coordinate in the sequence. Number of points making up the MBR-clockwise from upper left.
Coordinate 1		Point 1-upper left
	Decimal Degrees -90 to 90	Latitude for point 1
	Decimal Degrees -180 to 180	Longitude for point 1
Coordinate 2		Point 2-upper right
	Decimal Degrees -90 to 90	Latitude for point 2
	Decimal Degrees -180 to 180	Longitude for point 2
Coordinate 3		Point 3-lower right
	Decimal Degrees -90 to 90	Latitude for point 3

FIELD NAME	VALUES	COMMENT
	Decimal Degrees -180 to 180	Longitude for point 3
Coordinate 4		Point 4-lower left
	Decimal Degrees -90 to 90	Latitude for point 4
	Decimal Degrees -180 to 180	Longitude for point 4
Product Map Coordinates		Product map coordinates are in the projection of the product: State Plane, UTM, ACEA, LCC, or TM.
UL Map X (Easting)	meters feet degrees	Upper-left Easting
UL Map Y (Northing)	meters feet degrees	Upper-left Northing
Pixel Size X	meters feet degrees	Pixel size in X direction.
Pixel Size Y	meters feet degrees	Pixel size in Y direction.
Product Order Map Units	meters feet degrees	Linear mapping units.
Conversion Factor	Numeric	Multiplicative factor that converts meters to the desired map unit (e.g., international feet per meter). Not shown for meters map units.
Columns	Pixels	Number of columns of minimum bounding rectangle. Number of PAN pixels per line.
Rows	Pixels	Number of rows of minimum bounding rectangle. Number of PAN image lines.
Reference Height	Meters	Constant resampling elevation in meters above WGS-84 ellipsoid.

Appendix D: ISD - Product Component Metadata

Product component metadata describe individual image components if the product was broken into separate components. Otherwise, these are the same as the product space coordinates.

Appendix Table D Product Component Metadata

FIELD NAME	VALUES	COMMENT
Number of Components	1 or more	Number of components to be defined.
Component ID		Each component image is called a tile.
Product Image ID		Image ID for source.
Component File Name		Product file name displayed as single file or multiple files.
Thumbnail File Name		Reduced resolution browse image file name.
Country Code	2 Character Text	FIPS country code.
Component Geographic Corner Coordinates		Coordinates for tiled product, clockwise from upper left.
Number of Coordinates	4	Number of corner points
Coordinate 1		Point 1-upper left
	Decimal Degrees -90 to 90	Latitude for point 1
	Decimal Degrees -180 to 180	Longitude for point 1
Coordinate 2		Point 1-upper right
	Decimal Degrees -90 to 90	Latitude for point 2
	Decimal Degrees -180 to 180	Longitude for point 2
Coordinate 3		Point 1-lower right

FIELD NAME	VALUES	COMMENT
	Decimal Degrees -90 to 90	Latitude for point 3
	Decimal Degrees -180 to 180	Longitude for point 3
Coordinate 4		Point 1-lower left
	Decimal Degrees -90 to 90	Latitude for point 4
	Decimal Degrees -180 to 180	Longitude for point 4
Component Map Coordinates		Product map coordinates are in the projection of the product: State Plane, UTM, ACEA, LCC, or TM.
UL Map X (Easting)	meters feet degrees	Upper left easting.
UL Map Y (Northing)	meters feet degrees	Upper left northing.
Pixel Size X	meters feet degrees	Pixel size in X direction.
Pixel Size Y	meters feet degrees	Pixel size in Y direction.
Product Order Map Units	meters feet degrees	Product order map units. Degrees for Geographic projection
Columns	Pixels	Number of columns for tiled products. Product width, columns. For PAN + MSI product image type only PAN columns is provided.
Rows	Pixels	Number of rows for tiled products. Product height, rows. For PAN + MSI product image type only PAN rows is provided.
Percent Component Cloud Cover	Numeric, 0-100	Component cloud cover percentage.
Stereo Position	Left, Right	Stereo position, left or right (if applicable).

FIELD NAME	VALUES	COMMENT
Stereo Mate File Name		If applicable.

Glossary

AOI

Area of Interest. The area on the Earth that you want to view.

Bilinear Interpolation

Bilinear interpolation uses the value of the four nearest cell centers to determine the value on the output raster. The new value is a weighted average of these four values, adjusted to account for their distance from the center of the output cell. The result is a smoother-looking surface than provided by “nearest neighbor”.

Bicubic Interpolation

Bicubic interpolation combines data points on a two-dimensional grid. This method outputs the smoothest surface of all interpolation methods.

Black and White

Single band, black-and-white imagery. Also referred to as panchromatic.

CE

Circular Error.

CE90

Circular Error at 90% confidence. Indicates that the actual location of an object is represented on the image within the stated accuracy for 90% of the points.

CIR

Color Infrared.

COTS

Commercial-Off-The-Shelf.

DEM

See *Digital Elevation Model*.

Digital Elevation Model (DEM)

A digital model of terrain relief usually derived from stereo imagery. A DEM is used to remove terrain distortions from Orthorectified Imagery products.

DRA

Dynamic Range Adjustment. An optional post-processing feature that enhances the visual interpretability of the image.

DTED

Digital Terrain Elevation Data.

False Color

Viewing multispectral or color imagery in a specific combination of bands (near infrared, red, green). When viewing false color imagery, colors appear “abnormal” (e.g., healthy, green vegetation appears in red on a false color image). False color imagery is commonly used in vegetation analysis. Also known as Color Infrared.

FTP

File Transfer Protocol.

GCP

See *Ground Control Point*.

Geographic Projection

Maps longitudes as straight vertical lines and latitudes as straight horizontal lines all spaced out consistently for constant intervals.

GeoTIFF format

Georeferenced tagged image file format. A GeoTIFF file is a TIFF file that is embedded with geographic data tags.

GML

Geography Markup Language. GML is XML code used to express geographical features.

Ground Control Point (GCP)

A known geographic coordinate location on the ground. A GCP can be collected from ground survey or maps (Primary GCP), or derived via triangulation of primary GCPs (Secondary GCP). GCPs can be planimetric (x, y; latitude, longitude) or vertical (x, y, z; latitude, longitude, elevation).

Ground Sample Distance (GSD)

The size of a single pixel as measured on the ground. This is also referred to as “resolution”.

GSD

See *Ground Sample Distance*.

IK02

IKONOS Satellite.

Image Support Data (ISD)

A set of files which contain all the necessary data necessary to use and process Imagery Products. These files can be viewed as a collection point for all ancillary data that is expected to be useful to a customer.

ISD

See *Image Support Data*.

JPEG2000 format

The JPEG2000 format is a JPEG format that was introduced in the year 2000. It has considerable advantages over basic JPEG format including error resilience and progressive transmission.

LE

Linear Error.

LE90

Linear Error at 90 percent confidence. Indicates that the actual elevation of an object is represented within the stated accuracy for at least 90% of elevation posts.

MBR

Minimum-bounding rectangle.

Metadata

Ancillary data that describes and defines the imagery product. DigitalGlobe provides metadata in a set of Image Support Data files.

Monoscopic

The collection of a single image, as opposed to a stereo collection.

Mosaic

The process of digitally-assembling images to create contiguous large-area coverage.

MrSid format

Multi-Resolution Seamless Image Database. This format compresses large raster images while maintaining the image quality.

MS

See *Multispectral*.

Multispectral

Imagery with data recorded in multiple discrete spectral bands. Imagery collected in four or eight ranges of wavelengths in the electromagnetic spectrum.

Nadir

The point on the ground vertically beneath the sensor.

National Imagery Transmission Format

See NITF format.

Nearest Neighbor Interpolation

Uses the value of the closest point and disregards all other values, yielding a piecewise-constant interpolant.

NED

National Elevation Dataset DEM. NED DEM is available in the United States. Accuracy in Alaska is not as high as in the contiguous United States.

NIIRS

National Image Interpretability Rating Scale.

NIR1

Near Infrared 1.

NIR2

Near Infrared 2.

NITF format

National Imagery Transmission Format. A United States Department of Defense standard for transmitting and storing digital imagery.

NMAS

United States National Map Accuracy Standards.

NRG

Near-Infrared, Red, Green.

Off-nadir Angle

The angle between nadir and the point on the ground that the sensor is pointing. Off-nadir angle can be measured in the along-track (forward) direction or across-track (sideways) direction.

Orthorectification

The process of removing image distortions introduced by the collection geometry and variable terrain, and re-sampling the imagery to a specified map projection. Also referred to as ortho-correction or terrain correction.

Pan/Panchromatic

A wide spectral band which is comprised of reflected light in the visible spectrum (blue, green, red and NIR). It is displayed as a black and white image.

Pan-Sharpned

Processed used to colorize imagery by fusing multispectral and panchromatic bands.

Photogrammetry

The art, science, and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring, and interpreting photographic images and patterns of electromagnetic radiant imagery.

Pixel

Picture element. The smallest element comprising a digital image.

PNIIRS

Predicted National Image Interpretability Rating Scale.

Product Framing

The manner in which Imagery Products are delivered. Products are either Scene-based or Area-based.

Radiometric Correction

The correction of variations in data that are not caused by the object or scene being scanned, such as non-responsive detectors, scanner inconsistencies, and atmospheric interference.

Remote Sensing

The measurement or acquisition of data about an object by an instrument not in contact with the object. Satellite imagery, aerial photography, and radar are all types of remote sensing.

Resolution

The resampled image pixel size derived from GSD.

RGB

Red, Green, Blue.

RMSE

Root Mean Square Error.

RPC

Rational Polynomial Coefficient camera model. RPCs provide the camera geometry obtained at the time of the image collection.

Scale

The ratio of distance on a map as related to the true distance on the ground. Products with a larger scale have higher geometric accuracies than products with a smaller scale.

Seamlines

Seamlines are the lines at which two separate images overlap. These overlapping images can be blended along the seamline to show a more uniform image.

Sensor Azimuth

The azimuth of the sensor measured from the target.

Sensor Correction

The correction of variations in data that are caused by variations in sensor geometry, attitude, and ephemeris.

Spatial Mosaic

The assembly of multiple scenes, each of which shows a portion of the order polygon, into a single image. Usually involves edge matching adjacent scenes.

SRTM

Shuttle Radar Topography Mission digital elevation models.

Stereo

The collection of two or more images of the same Area of Interest (AOI) from different viewing angles.

Sun Azimuth

The azimuth of the sun as seen by an observer sitting on the target measured in a clockwise direction from north.

Sun Elevation

The angle of the sun above the horizon.

Sun-Synchronous

An orbit which rotates around the Earth at the same rate as the Earth rotates on its axis.

Swath Width

The width of an image.

Target Azimuth

The azimuth of the target as seen by an observer sitting on the spacecraft measured in a clockwise direction from north.

Terrain Correction

The correction for variations in data caused by terrain displacement due to off-nadir viewing.

TLC

Time-lagged Line Count.

True color

Viewing multispectral or color imagery in a specific band combination (red, green, blue). When viewing true color imagery, colors appear “normal” (e.g., vegetation is green). Also known as Natural Color.

Universal Transverse Mercator Geographic Coordinate System (UTM)

See *UTM*.

UTM

Universal Transverse Mercator Geographic Coordinate System. UTM utilizes a two-dimensional Cartesian system to specify locations on the Earth’s surface.

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