
QuickBird Basic Stereo Pair

Product Guide



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1. Introduction

Basic Stereo Pair Imagery products are suitable for customers with a high level of image expertise and software which is capable of ingesting, processing and/or displaying stereo imagery. Basic Stereo Pair Imagery products are used to create DEMs or for three dimensional feature extraction. This document describes the QuickBird Basic Stereo Pair product and builds on the QuickBird Imagery Products, Product Guide.

2. Product Ordering

Basic Stereo Pair Imagery products are offered with Priority Tasking and for Archive orders only. If tasking a stereo pair, up to 2 collection attempts will be made. Customers will receive imagery even if it does not meet the cloud cover or image quality specifications. If both collection attempts produce imagery that does not meet 20% cloud cover or Fair image quality, then all 4 images (2 stereo pairs) will be delivered and the customer will receive a 50% discount off of the originally quoted price.

2.1. Priority Tasking

- An order placed at least four days before the start collect date.
- A collection window of 7 - 365 days.
- 2 collection attempts.
- Priority image processing.

Tasking Parameters - Priority Commercial		Customer Selected
Minimum Collection Area	2 scenes for Basic Stereo Pair Imagery	
Maximum Collection Area	2 scenes for Basic Stereo Pair Imagery	
Start Collection Date	>= 4 days from order placement	Yes
End Collection Date	7 - 365 days from Start Collection Date	Yes
Maximum Cloud Cover	20%	
Off-Nadir Angle	0° - 30° , both within 10° of ground track	
Maximum Number of Acquisition Attempts	2	
Sun Elevation	>=15° (as collected)	
Sun Azimuth	0° - 360° (as collected)	
Target Azimuth	0° - 360° (as collected)	

Table 1. Commercial Priority Tasking Parameters.

2.2. Archive Ordering

In addition to tasking the satellite, customers may order QuickBird Basic Stereo Pair products directly out of the DigitalGlobe archive by selecting two Catalog Ids that are marked as a Stereo Pair.

3. Basic Stereo Pair Products

Basic Stereo Pair Imagery products are suitable for customers with a high level of image expertise and software which is capable of ingesting, processing and/or displaying stereo imagery. Basic Stereo Pair Imagery products are used to create DEMs or for three dimensional feature extraction.

Basic Stereo Pair Imagery products are comprised of two Basic Imagery scenes with approximately 90% area overlap, which are collected with specific look angles in order to attain a base to height ratio appropriate for stereo viewing. Basic Stereo Pair Imagery products are In-track, meaning that they will both be collected in the same pass.

Processing: Basic Stereo Pair products are radiometrically corrected and sensor corrected, but not geometrically corrected nor mapped to a cartographic projection and ellipsoid. Image resolution is approximately 78-centimeters (at 30° off-nadir) for black & white products, and 3.12-meters (at 30° off-nadir) for multispectral imagery. Basic Stereo Pair products are not available with pan-sharpening.

The radiometric corrections applied to this product include:

- Relative radiometric response between detectors – removes differences in imagery due to sensitivity variations between pixels
- Non-responsive detector fill – fills in null values on imagery due to detectors that are no longer collecting data
- Conversion for absolute radiometry – calibrates overall detector response from known radiometric signals

The sensor corrections account for:

- Internal detector geometry – combines the six digital chip assemblies into a virtual array
- Optical distortion – corrects image distortion caused by sensor optics
- Scan distortion – corrects for distortions caused by slew and scan rate
- Line-rate variations – corrects for variations in the panchromatic scan rate
- Registration of the multispectral bands – all multispectral bands line up with each other, but the panchromatic and multispectral bands are not registered

Accuracies: The Basic Imagery product is in the satellite frame of reference, is not tied to ground location, and is therefore a geometrically raw product with no implied accuracy. However, when the data are processed with the supplied refined Image Support Data (ISD) and a user supplied Digital Elevation Model, a horizontal geolocational accuracy of 14-meter RMSE (23-meter CE90%), excluding viewing geometry and topographic displacement may be achieved. Basic Imagery products may be processed with a supported commercial imaging software application package, which utilize the ISD associated with the image.

Physical Structure: Basic Stereo Pair products are delivered as two full overlapping scenes with approximately 90% overlap (see Figure 1). Each scene in a Basic Stereo Pair has an approximate area of 450 km² (21.2 km by 21.2 km).

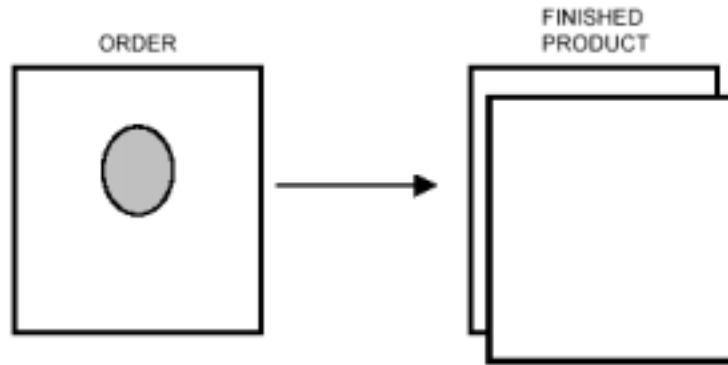


Figure 1. Final Product Structure for Basic Stereo Pair Imagery Products.

Collection Geometry: QuickBird Basic Stereo Pairs are collected in-track, which means that they are always collected on the same pass. Basic Stereo Pair products are generally collected at 30° off-nadir (fore-aft) and within 10° of the ground track, which provides the best base to height ratio. The Base to Height ratio (B/H) compares the distance between the two Stereo Pair collections (Collect 1 and 2) and the orbit height.

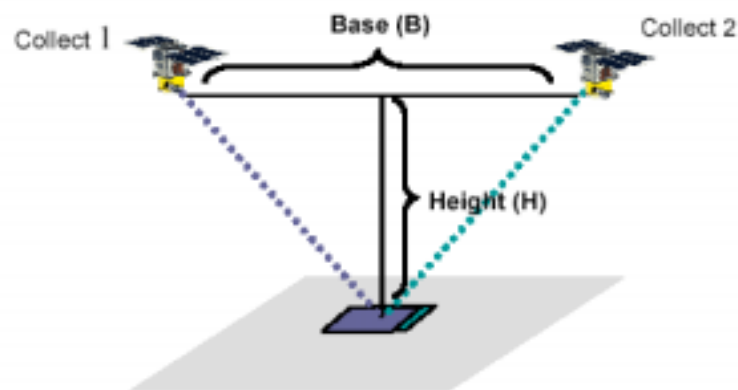


Figure 2. Base to Height Ratio.

The B/H ratio is calculated by dividing the Base by the Height. It describes how effective the Stereo Pair will be for different applications, including DEM generation. QuickBird Basic Stereo Pair Imagery is collected to have a B/H ratio of 0.6 to 2.0, with most collections between 0.9 and 1.2. This geometry is ideal for a variety of stereo applications.

3.1. Specification Table for Basic Stereo Pair Products

Table 2, Characteristics of Basic Stereo Pair Imagery products, describes the processing specifications, product parameters, and delivered Image Support Data files for Basic Stereo Pair Imagery products.

Physical Characteristics – Basic Stereo Imagery		Customer Selected
Minimum deliverable area	2 scenes	
Maximum deliverable area	2 scenes	
Product Framing	Scene-based	
Final product physical structure	Scene	
Pan scene dimensions (pixels col, row)	27,552 x 27,424	
Pan scene size (approximate at nadir)	16.5 km x 16.5km	
MS scene dimensions (pixels col, row)	6,888 x 6,856	
MS scene size (approximate at nair)	16.5 km x 16.5 km	
Processing Specifications		
Absolute geolocation accuracy (nadir)	Geometrically raw, supplied Image Support Data and user supplied DEM allows processing to 14-meter RMSE (23-m CE90%), excluding viewing geometry and terrain displacement	
Additional geometric corrections applied	N/A	
Geolocation Information applied	N/A	
Applied terrain information	N/A	
Spatial mosaicking applied	N/A	
Color balance applied	N/A	
Radiometric corrections	Relative radiometric response between detectors; non-responsive detector fill; conversion for absolute radiometry	
Sensor corrections	Internal detector geometry; optical distortion; scan distortion; any line-rate variations; mis-registration of the multi-spectral bands	
Product Parameters		
Product Options	Black and White, MS, Bundle (Black and White & MS)	
Number of bits/pixel deliverable image	8 or 16	Yes
Digital scaling method (8 bit only)	Linear with maximum value set to 255 (if highest DN is >=255, image is truncated with no scaling)	
Resampling option	4x4 cubic convolution; 2x2 bilinear; Nearest neighbor, 8-pt sinc; MTF kernel	Yes
Output tile size options	N/A	
Output pixel spacing	Same as collected	
Map projections	N/A	
Ellipsoids and datums	N/A	
Output alignment options	N/A	
Base to height ratio	0.6 to 2.0	
Overlap between stereo images	≥ 90%	
Off nadir angle between stereo images	within 5	
Delivery Parameters		
Output product delivery media options	8mm; 4mm; DLT; ftp (pull)	Yes
Image data format options	NITF 2.0; NITF 2.1; GeoTIFF 1.0	Yes

Table 2. Characteristics and Specifications of Basic Stereo Pair Imagery Products.

4. Image Support Data

Stereo File – The stereo file describes information about the individual stereo model. It contains three angular measures of convergent stereo imaging geometry: the convergence angle, the asymmetry angle, and the bisector elevation angle (BIE).

4.1. Stereo File

This file is provided only for Basic Stereo Pair Imagery products. It describes information about individual stereo models.

The stereo imagery from QuickBird is fore/aft stereo derived from the same pass over a target (in-track stereo), with the camera looking forward in the earlier (fore) image and backward in the later (aft) image. This is similar to the convergent stereo geometry of low-oblique aerial photography, except that the QuickBird sensor may also point sideways in the cross-track direction in both images.

The stereo file contains three angular measures of convergent stereo imaging geometry: the *convergence angle*, the *asymmetry angle*, and the *bisector elevation angle (BIE)*. These measure the geometrical relationship between two rays that intersect at a common ground point, one from the fore image and one from the aft image. These intersecting rays define a plane, called the convergence plane. The convergence angle is the angle between the two rays in the convergence plane. The asymmetry angle is the angle between the ray bisector (also in the convergence plane), and the projection of a vertical from the ground point onto the convergence plane. The BIE is the elevation of the bisector, i.e., the angle from the horizontal plane containing the ground point to the bisector.

Each angle is computed at a ground target point near the beginning of the stereo overlap, and at another point near the end of the stereo overlap.

Stereo File			
FIELD	DESCRIPTION	RANGE	CONDITIONS
numPair	Number of stereo pairs in this file.		
The following group is repeated for $n = 1, \dots, \text{numPair}$, i.e., for all stereo pairs. BEGIN_GROUP = STEREO_PAIR_n			
firstId	Image file name of the first image (image acquired at the earlier time) of a stereo pair.	This name will follow the standard product naming conventions.	
secondId	Image file name of the second image of the stereo pair.	See firstID	
overlap	Fractional overlap: overlap area, measured on the ground, divided by the ground area of the second image.	0 to 1.0	
ULLat ULLon	Geodetic coordinates of the upper left corner of the minimum bounding rectangle that covers the stereomodel, in degrees.		
LRLat LRLon	Geodetic coordinates of the lower right corner of the minimum bounding rectangle that covers the stereomodel, in degrees.		
B_Conv	Beginning convergence angle, in degrees. This is measured at the first lines of the stereo overlap.	0.00 to 90.00	
E_Conv	Ending convergence angle, in degrees. This is measured at the last lines of the stereo overlap.	0.00 to 90.00	

Stereo File			
FIELD	DESCRIPTION	RANGE	CONDITIONS
B_Asym	Beginning asymmetry angle, in degrees. This is measured at the first lines of the stereo overlap.	0.00 to 90.00	
E_Asym	Ending asymmetry angle, in degrees. This is measured at the last lines of the stereo overlap.	0.00 to 90.00	
B_BIE	Beginning BIE less convergence angle of stereo mate, in degrees. This is measured at the first lines of the stereo overlap.	-90.00 to 90.00	
E_BIE	Ending BIE less convergence angle of stereo mate, in degrees. This is measured at the last lines of the stereo overlap.	-90.00 to 90.00	
END_GROUP = STEREO_PAIR_n			
END;			

Table 3. Stereo File.