SuperView-1 Satellite

IMAGERY PRODUCT GUIDE

(V1.1)

Compiled by SpaceWill Info. Co. Ltd.

The SuperView-1 Imagery User Guide provides essential information to the users about all SuperView-1 products and services. This document includes product levels, specifications, auxiliary files, coordinate convention and imaging time. SuperView-1 Satellite Imagery Product Guide is mainly purposed as a general guideline for SpaceWill customers interested in acquiring SpaceWill imagery products and services.

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1. Overview

SuperView-1 (SV-1) is composed of 4 identical VHR EO satellites running along the same orbit and phrased 90° from each other. The first two satellites were launched in December 2016 and the second two were launched in January 2018.

SuperView-1 imagery products are available in different processing levels. The products are delivered with a set of support files to assist users in processing and analyzing the imagery.

All SuperView-1 imagery products are corrected for radiometric and sensor distortions. Radiometric corrections include relative radiometric response between detectors, non-responsive detector fill, and conversion for absolute radiometry. Sensor corrections include corrections for internal detector geometry, optical distortion, scan distortion, line-rate variations and mis-registration of the multispectral bands where applicable.

Table 1. SuperView-1's Design and Specifications

CHARACTERISTICS	DETAILS
Launch Time	SV-1 01&02: 28 December 2016
	SV-1 03&04: 9 January 2018
Orbital Altitude	530 km (nadir)
Type	Sun-synchronous
Period	97 minutes
Design Life	8 years
Sensor Bands	Panchromatic: 450-890 nm
	Blue: 450-520 nm
	Green: 520-590 nm
	Red: 630-690 nm
	Near-IR: 770-890 nm

Spatial Resolution	PAN: 0.5 m; MS: 2 m (nadir)
Dynamic Range	11 bits
Swath Width	12 km (nadir)
Onboard Storage	4.0 TB
Stereo Imaging	Yes
Revisit Time	1 day/4 satellites
Positioning Accuracy	9.5m CE90 (nadir)
Data Transmission	2 * 450 Mbps
Daily Capacity	600,000 km² / satellite
Internal Geometric Accuracy	1 pixel
PAN&MS Registration Accuracy	0.2 pixel
MS Band-to-band Registration Accuracy	0.15 pixel
Relative Accuracy of Stereo Pair Model	0.3 pixel
Relative Calibration Accuracy	1.5 %
MTF@Nyquist	PAN ≥0.12; MS≥0.25

SuperView-1 imagery products are provided in two different levels: 1B and 2A.

Table 2. Processing Levels and Product Types

Processing Level	Product Name	Description	Suggested Application
1B	Basic Product	Basic SuperView-1 imagery products are corrected for radiometric and sensor distortion and are not projected	Mainly used for photogrammetric processing and mapping
2A	Ortho Ready Standard Product	Projected and resampled, projected to ellipsoid in using current image mean elevation	Used for orthorectification, feature extraction and land classification

Table 3. Product Processing Levels

Processing Level	Types	Processing Procedure			
		Radiometric Correction	Sensor Correction	Geometric Correction	Orthorectification
1B	Basic Product	√	√		
2A	Ortho Ready Standard Product	√	√	√	

2. Imaging Product Options

SuperView-1 imagery is classified into 2 types of products:

PMS (Panchromatic and Multiple Spectral): The product is combined of panchromatic and multiple spectral bands.

- Panchromatic (PAN): The product includes 1 band;
- Multiple Spectral (MUX): The product includes 4 bands that are Blue, Green, Red and Near-infrared

Pan-sharpened: The product combines the visual information of multiple spectral data with the spatial information of panchromatic data.

2.1 PMS (Panchromatic and Multiple Spectral) Product

- Pan includes 1 band and is black and white, its ground sampling distance (GSD) is 50 cm.
- The multi-spectral band sequence is in order of shortest wavelength to longest wavelength, and the band order is Blue (B), Green (G), Red (R), and Near Infrared (NIR). The ground sampling distance (GSD) is 2 meters.

2.2 Pan-sharpened Product

Pan-sharpened product combines the visual information of the multispectral data with the spatial information of the panchromatic data, resulting in a higher resolution color product. SuperView-1 pan-sharpen imagery products are offered as 4-band and stereo products. The GSD of a pan-sharpened product is 0.5 m. The Pan-sharpened product is delivered with geotiff format.

3. Basic Product (1B)

Basic Product is the processing level closest to the natural image acquired by a satellite. The products are offered for clients with satellite imagery processing techniques acquiring to apply their own processing methods (orthorectification) and equipment. In this condition, these products are offered with attitude, ephemeris, and camera model information. Each unique image in a Basic Product is processed individually. Basic Products have an “as-collected” GSD. The pan-sharpening option is not available with a Basic Product.

3.1 Processing

Basic Products are radiometrically corrected and sensor corrected, but not geometrically corrected or projected to a plane using a map projection or datum. The sensor correction blends all pixels from all detectors into the synthetic array to form a single image.

The main radiometric processing includes:

- Relative radiometric response between detectors;
- Correction of differences in sensitivity between the detectors;

The sensor corrections include:

- Internal detector geometry;
- Optical distortion correction;
- Registration of the panchromatic and multispectral bands.

3.2 Accuracy

Basic Products are radiometrically corrected and sensor corrected, while there are no projected to a plane using a map projection or datum. The geolocation accuracy with 9.5m CE90 can be archived without the consideration of terrain and off-nadir effect. And the geolocation accuracy will be better than 1m if the high accuracy GCPs and DEM have been provided during the processing.

The registration accuracy among the multispectral band is better than 0.1 pixel. The registration accuracy between the panchromatic and multispectral band is also better than 0.1 pixel.

3.3 Scope

Basic Products are delivered as per scene with 12km x 12km (at nadir).

3.4 Specifications for Basic Product

The following table lists the processing specifications, product delivery parameters, and delivered Image Auxiliary Data (IAD) Files for Basic Products.

Table 4. Specifications for Basic Products

PHYSICAL CHARACTERISTICS	
Minimal Orderable Area	Single scene 144 km^2
Strip Width	12 km (at nadir)
PROCESSING SPECIFICATIONS	
Absolute Geolocational Accuracy	9.5 m CE90 (< off-nadir 25°), excluding terrain and off-nadir effects
PRODUCT PARAMETERS	
Band Option	Pan and Multispectral band
Number of Bits per Pixel in Delivered Product	16 bits
Resampling Methods	Nearest Neighbor Bilinear interpolation Cubic convolution
Output Pixel Spacing	As camera collected
Cloud Cover	0-15% default, other options available upon request

DELIVERY PARAMETERS	
Media Options	FTP, DVD, External Hard Drive
Image Data Format	GeoTIFF
IMAGE AUXILIARY DATA	
IAD Files Supplied to Customer	Shapefile Quickview rpb file xml file

4. Basic Stereo Product (1B)

Basic Stereo Products are applicable for photographic surveying and are suitable for customers with a high level of image expertise and who have software that is capable of ingesting, processing, and/or displaying stereo imagery. Basic Stereo Products are typically used to create Digital Elevation Models or for three-dimensional feature extraction.

4.1 Processing

Basic Products are radiometrically corrected and sensor corrected, but not geometrically corrected or projected to a plane using a map projection or datum. The sensor correction blends all pixels from all detectors into the synthetic array to form a single image. The resulting GSD varies over the entire product because the look angle slowly changes during the imaging process.

4.2 Accuracy

Basic Products are radiometrically corrected and sensor corrected, while there are no projected to a plane using a map projection or datum. However, if the data processing is supplied with a refined Image Auxiliary Data (IAD), a horizontal geolocational accuracy will be 9.5m CE90, excluding terrain and off-nadir effects, can be achieved. And vertical geolocational accuracy is 9.5 m LE90.

4.3 Scope

Basic Products are delivered as per scene with 12km x 12km (at nadir).

4.4 Specifications for Stereo Products

The following table lists the processing specifications, product delivery parameters, and delivered Image Auxiliary Data (IAD) Files for Basic Stereo Products.

Table 5. Specifications for Basic Stereo Products

PHYSICAL CHARACTERISTICS	
Minimal Orderable Area	Single scene 144 km²
Strip Width	12 km (at nadir)
PROCESSING SPECIFICATIONS	
Absolute Geolocational Accuracy	9.5 m CE90 excluding terrain and off-nadir effects
Absolute Vertical Geolocational Accuracy	9.5 m LE90 excluding terrain and off-nadir effects
PRODUCT PARAMETERS	
Band Option	Pan and Multispectral bands
Number of Bits per Pixel in Delivered Product	16 bits
Resampling Methods	Nearest Neighbor Bilinear interpolation Cubic convolution
Output Pixel Spacing	As camera collected
Cloud Cover	0-15% default, other options available upon request
DELIVERY PARAMETERS	
Media Options	FTP, DVD, External Hard Drive
Image Data Format	GeoTIFF
IMAGE AUXILIARY DATA	
IAD Files Supplied to Customer	Shapefile Quickview rpb file xml file

5. Ortho Ready Standard Products (2A)

Ortho Ready Standard Products are usually required by users for modest absolute accuracy with a large area coverage. Ortho Ready Standard Products are processed by users utilizing the sufficient image process software and knowledge for a wide variety of applications.

5.1 Processing

Ortho Ready Standard Products are radiometrically corrected, sensor corrected, and projected to a ellipsoid using current image mean elevation for each panchromatic and multispectral. All Ortho Ready Standard Products can have a uniform GSD throughout the entire product. The default projection is UTM projection. Ortho Ready Standard Products are available in panchromatic at 0.5 meters and multi-spectral bands at 2 meters. The radiometric corrections applied to the Ortho Ready Standard Product include relative radiometric response between detectors and non-responsive detectors. The sensor corrections include internal detector geometry, optical distortion, scan distortion, any line-rate variations, and registration of the panchromatic and multispectral bands. Geometric corrections remove spacecraft orbit position and attitude uncertainty, Earth rotation and curvature, and panoramic distortion.

5.2 Accuracy

The geolocation accuracy with 9.5m CE90 can be archived excluding terrain and off-nadir effect. And the geolocation accuracy will be better than 1m if the high accuracy GCPs and DEM have been provided during the processing.

The registration accuracy among the multispectral band is better than 0.1 pixel.

The registration accuracy between the panchromatic and multispectral band is also better than 0.1 pixel.

5.3 Scope

Ortho Ready Standard Products are delivered with entire scene and are also delivered with AOI provided by the users.

Ortho Ready Standard Products are delivered as one image file for each strip the order polygon intersects. If the order polygon intersects more than one strip, the imagery in each strip will be delivered as separate files, will not be mosaicked together to form a single image, and will not be radiometrically balanced.

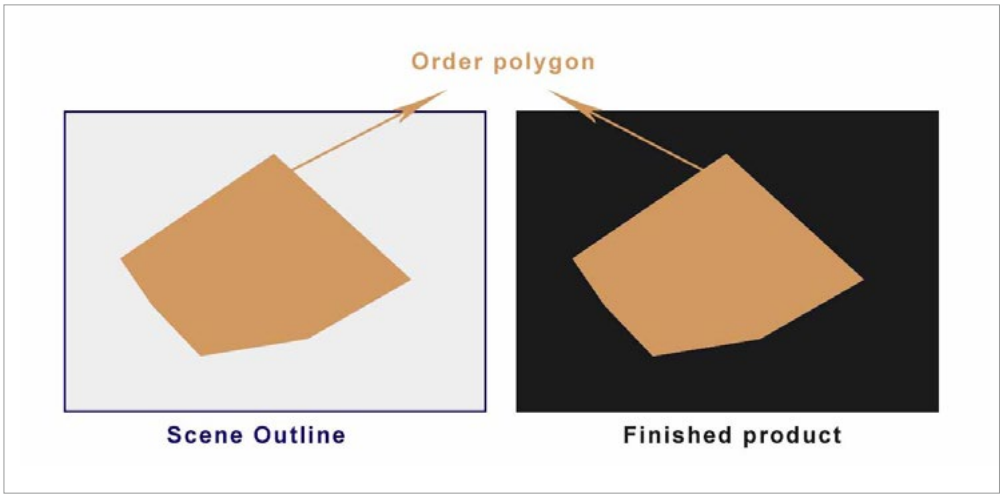

Figure 1. Product Structure for Standard Products within a Single Strip

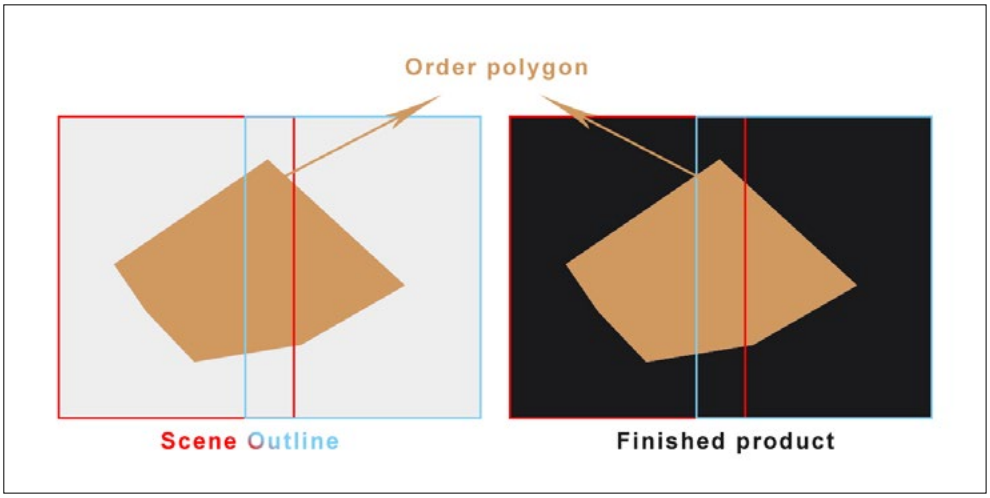

Figure 2. Product Structure for Projected Multi-Strip Products

5.4 Specifications for Ortho Ready Standard Products

The following table lists the processing specifications, product delivery parameters, and delivered Image Auxiliary Data (IAD) Files for Ortho Ready Standard Product.

Table 6. Specifications for Basic Products

PHYSICAL CHARACTERISTICS	
Minimal Orderable Area	25 km²
Strip Width	12 km (at nadir)
PROCESSING SPECIFICATIONS	
Absolute Geolocational Accuracy	9.5 m CE90 excluding terrain and off-nadir effect
Terrain during Processing	Current image mean elevation
PRODUCT PARAMETERS	
Band Option	Pan and Multispectral band
Number of Bits per Pixel in Delivered Product	16 bits
Resampling Methods	Nearest Neighbor Bilinear interpolation Cubic convolution
Output Pixel Spacing	Panchromatic: 50 cm Multispectral: 2 m
Output Alignment	Rotated to Map North Up
Cloud Cover	0-15% default, other options available upon request

DELIVERY PARAMETERS	
Media Options	FTP, DVD, External Hard Drive
Image Data Format	GeoTIFF
IMAGE AUXILIARY DATA	
IAD Files Supplied to Customer	Shapefile Quickview rpb file xml file

6. Ortho Ready Stereo Products (2A)

Ortho Ready Stereo Products are processed by users utilizing the sufficient image process software and knowledge for creating Digital Elevation Models or for three-dimensional feature extraction.

6.1 Processing

Ortho Ready Stereo Products are radiometrically corrected, sensor corrected, and projected to a plane using the map projection and datum. All Ortho Ready Stereo Products can have a uniform GSD throughout the entire product. The default projection is UTM projection. Ortho Ready Standard Products are available in panchromatic at 0.5 meters and multi-spectral bands at 2 meters. The radiometric corrections applied to the Ortho Ready Standard Product include relative radiometric response between detectors and non-responsive detectors. The sensor corrections include internal detector geometry, optical distortion, scan distortion, any line-rate variations, and registration of the panchromatic and multispectral bands. Geometric corrections remove spacecraft orbit position and attitude uncertainty, Earth rotation and curvature, and panoramic distortion.

6.2 Accuracy

The geolocation accuracy with 9.5m CE90 can be archived excluding terrain and off-nadir effect. And the geolocation accuracy will be better than 1m if the high accuracy GCPs and DEM have been provided during the processing.

The digital elevation model accuracy can be archived better than 1m when the data processed using Image Auxiliary Data (IAD) and high accurate control point.

The registration accuracy among the multispectral band is better than 0.1 pixel. The registration accuracy between the panchromatic and multispectral band is also better than 0.1 pixel.

6.3 Scope

Ortho Ready Stereo Products are delivered with entire scene and are also delivered with AOI provided by the users. Ortho Ready Stereo Products are delivered as one image file for each strip the order polygon intersects. If the order polygon intersects more than one strip, the imagery in each strip will be delivered as separate files, will not be mosaicked together to form a single image, and will not be radiometrically balanced.

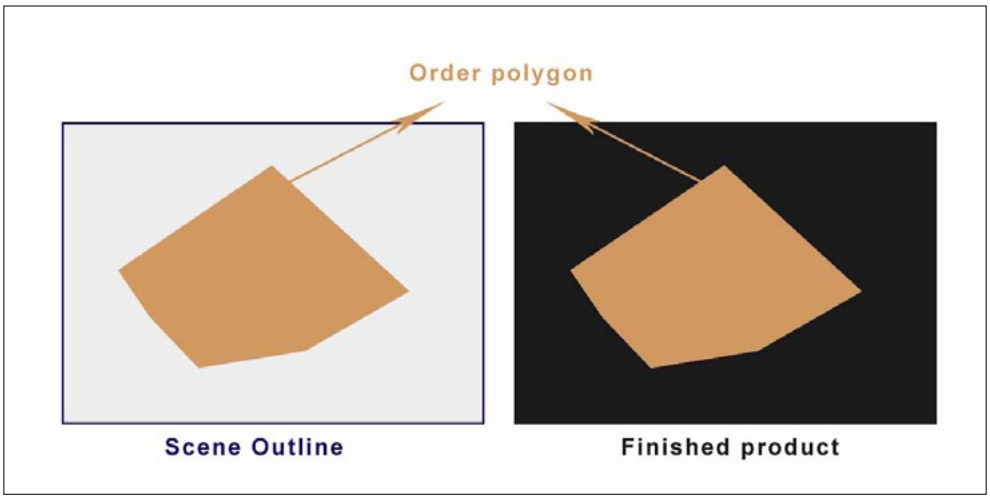

Figure 3. Product Structure for Standard Products within a Single Strip

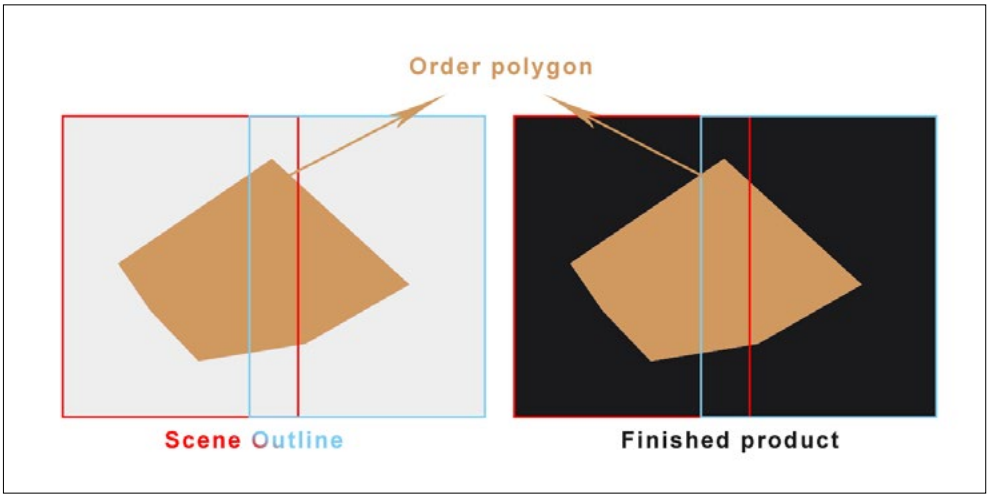

Figure 4. Product Structure for Projected Multi-Strip Products

6.4 Specification for Ortho Ready Stereo Products

The following table lists the processing specifications, product delivery parameters, and delivered Image Auxiliary Data (IAD) Files for Ortho Ready Stereo Product.

Table 7. Specifications for Basic Products

PHYSICAL CHARACTERISTICS	
Minimal Orderable Area	25 km²
Strip Width	12 km (at nadir)
PROCESSING SPECIFICATIONS	
Absolute Geolocational Accuracy	9.5 m CE90 excluding terrain and off-nadir effect
Terrain during Processing	Current image mean elevation
PRODUCT PARAMETERS	
Band Option	Pan-multispectral band
Number of Bits per Pixel in Delivered Product	16 bits
Resampling Methods	Nearest Neighbor Bilinear interpolation Cubic convolution
Output Pixel Spacing	Panchromatic: 50 cm Multispectral: 2 m
Output Alignment	Rotated to Map North Up
Cloud Cover	0-15% default, other options available upon request

DELIVERY PARAMETERS	
Media Options	FTP, DVD, External Hard Drive
Image Data Format	GeoTIFF
IMAGE AUXILIARY DATA	
IAD Files Supplied to Customer	Shapefile Quickview rpb file xml file

7. Product Structure

7.1 Product Format

Imagery products are delivered to customers in GeoTIFF format.

7.2 Naming Pattern

Imagery Product's name is provided with concise information about the product and its context. The naming is composed of collection date, band type, product level, product ID.

Naming Pattern of Imagery Products are specified in following:

- Satellite name_collection date_product level&ID_product folder name-band type.format extention
- Case： SV1-01_20170101_L1B0001622957_1101170001001_01-PAN.tiff
- Satellite Name： SV1-01\SV1-02\SV1-03\SV1-04
- Product Level: L1B or L2A
- Product ID: 0001622957
- Product Folder Name: 1101170001001_01
- Band Type: PAN (panchromatic) and MUX (multispectral)

Naming Pattern of Product Folders are specified in following:

- Contract ID: 1101170001
- Sub-contract ID: 1101170001001
- Batch: 1101170001001_01

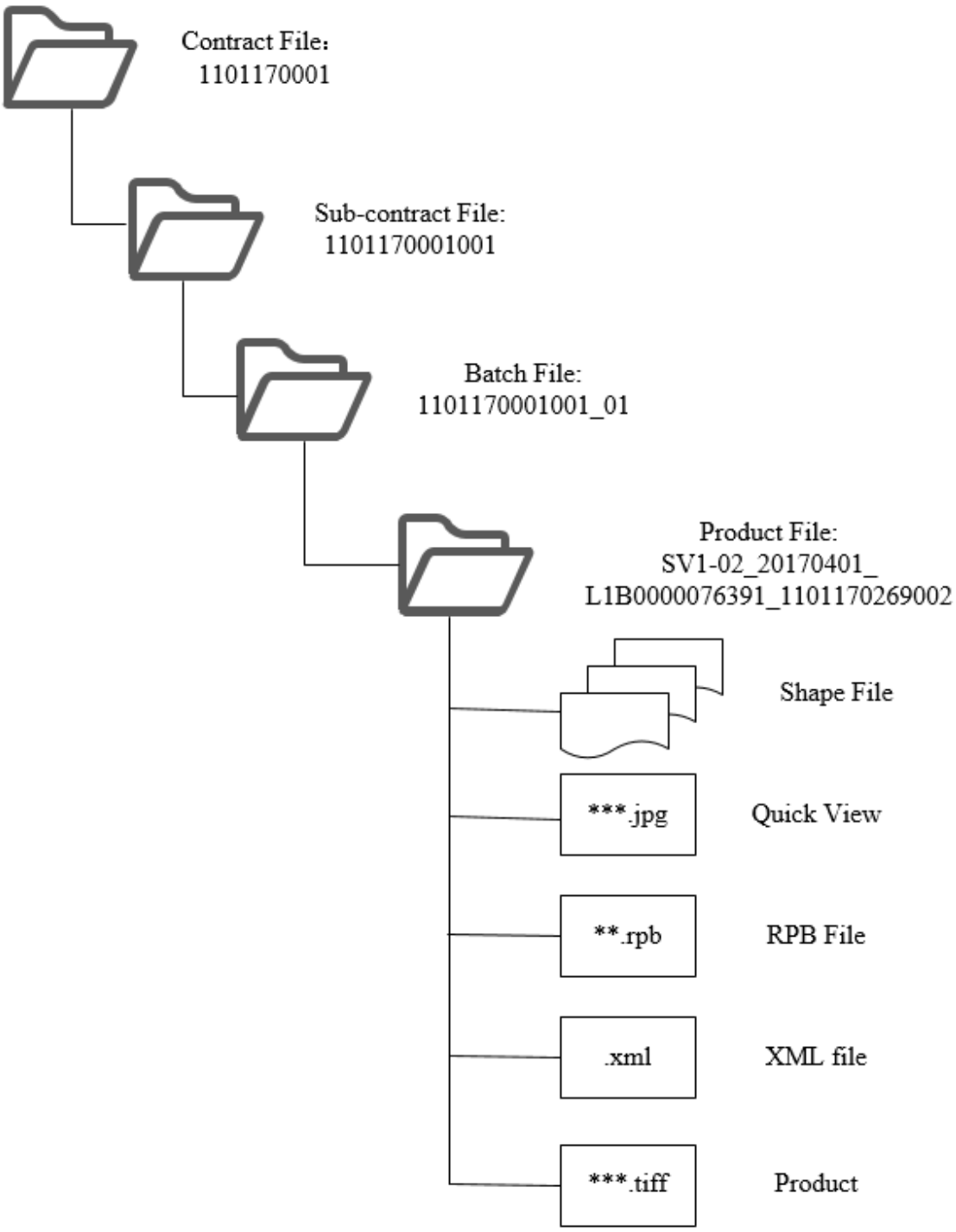

Figure 5 File Structure (Delivered by Scene)

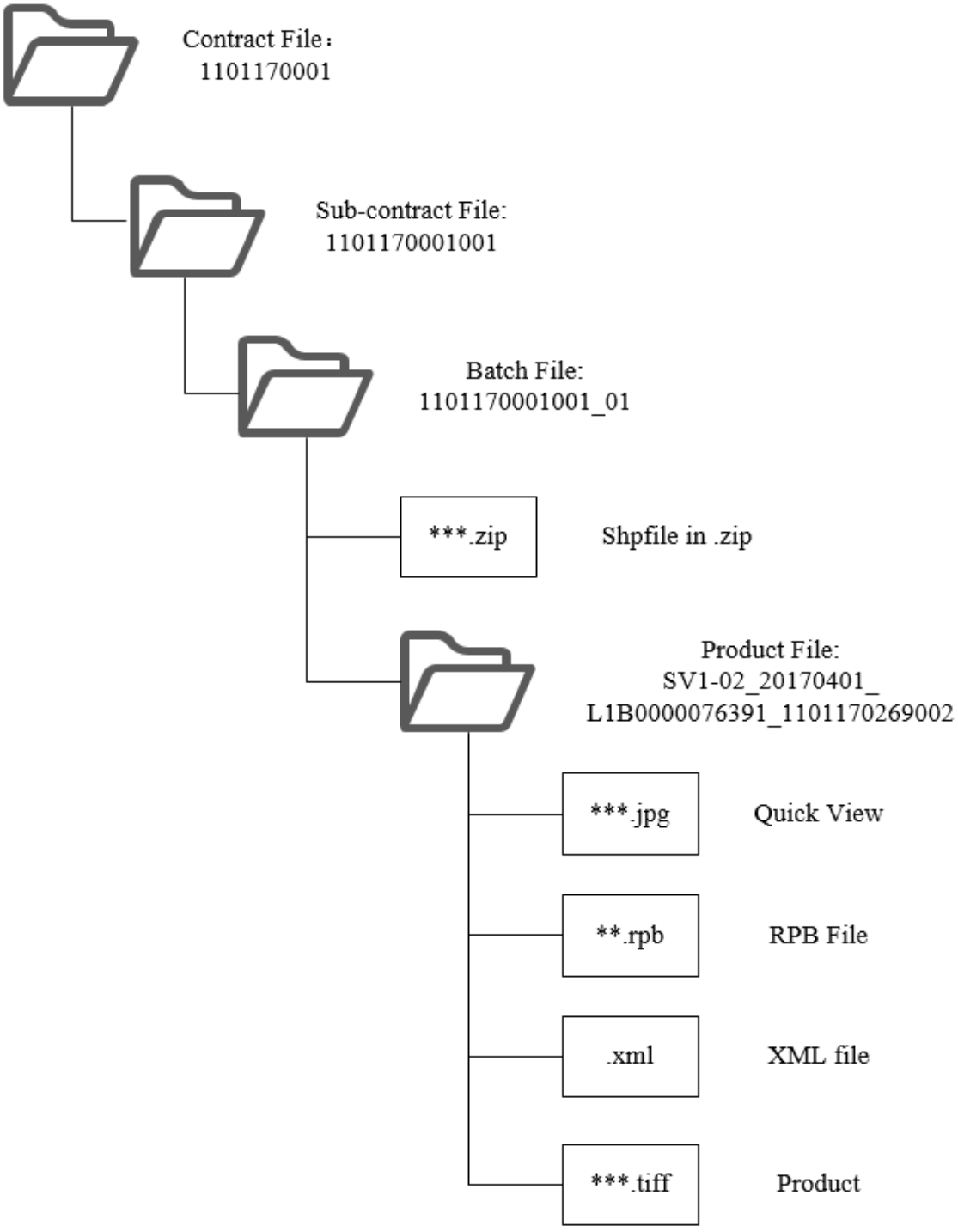

Figure 6 File Structure (Delivered by AOI)

*Note: The only difference of file structure between delivered by scene and AOI is the shapefile will be included in Product File if it is delivered by scene and the shapefile will be downloaded together with Product file if it is delivered by AOI.

The files such as .fin, .db and .aux etc. indicated in the Product File are disregarded due to the generation by the software and/or transition from FTP.

8. Image Auxiliary Data (IAD)

All Products are delivered with Image Auxiliary Data (IAD) including vector (.shx, .shp, .dbf, and .prj), quickview (.jpg), rpb file (.rpb) and xml file (.xml).

- Vector: is used to describe the distribution of the product, and it also has a series of attributes that describes the product details.

- Quickview: is the preview of an image product rotation angle as the image product.

- Rational Polynomial Coefficients (RPB): contains the RPB information which is used to rectify image.

- XML: is used to describe the metadata of the product with xml format. The XML file is also containing the satellite attitude, ephemeris, and geometric calibration data.

8.1 Vector

The format of vector file is a shapefile which describes the distribution of imagery product and a series of attribute that describes the product details.

Table 8. Specifications of Shapefiles

Field Name	Description	Comment	Remarks
Productid	Product ID	475922	
Ordername	Order Name	1108180084	
Satelliteid	Satellite ID	SV1-01\SV1-02\SV1-03\SV1-04	
Acqdate	Acquisition date	YYYY-MM-DDThh:mm:ss	
ProductLev	Product Level	LEVEL1B/2A	
CloudCover	Cloud cover	0.00000 – 100.00000	
Viewangle	View angle	5	

MapProject	Map Projection	UTM	Only for 2A
Coorsystem	Coordinate System	WGS84	
Mapzone	Map Zone	18	
GSD	Ground sampling distance (resolution)	2	
BandInfo	Band information		
Ulx		Corner coordinate	
Uly			
Urx			
Ury			
Lry			
Lrx			
Llx			
Lly		Center coordinate	
Centerx			
horError	Horizontal Error	0	
Gain	Gain		
Offset	Offset		
SatAz	Satellite Azimuth Strip direction angle relative to the North	0.00000 – 360.00000	
SatEl	Satellite Elevation The angle between the light and the horizontal plane from the optical center to the incident point	0.00000 – 90.00000	
sunAz	Sun Azimuth	0.00000 – 360.00000	
sunEl	Sun Elevation	0.00000 – 90.00000	

prodDate	Product date	YYYY-MDDThh:mm:ss	
ESUN	Solar Irradiance		
Descending	Descending/Ascending	D	
incidenceA	Incident Angle	0-45	
SubID	Sub ID	1108180084001	
SceneID	Scene ID	464032	
SensorID	Sensor ID	PMS	

8.2 Quickview

The quickview file is the preview of an image product with the rotation angle as the image product. The quickview file is the JEPG format for PAN and MUX. The true color will be viewed for MUX and the gray scale will be viewed for PAN.

Figure 7. The Quickview File of True Color for MUX

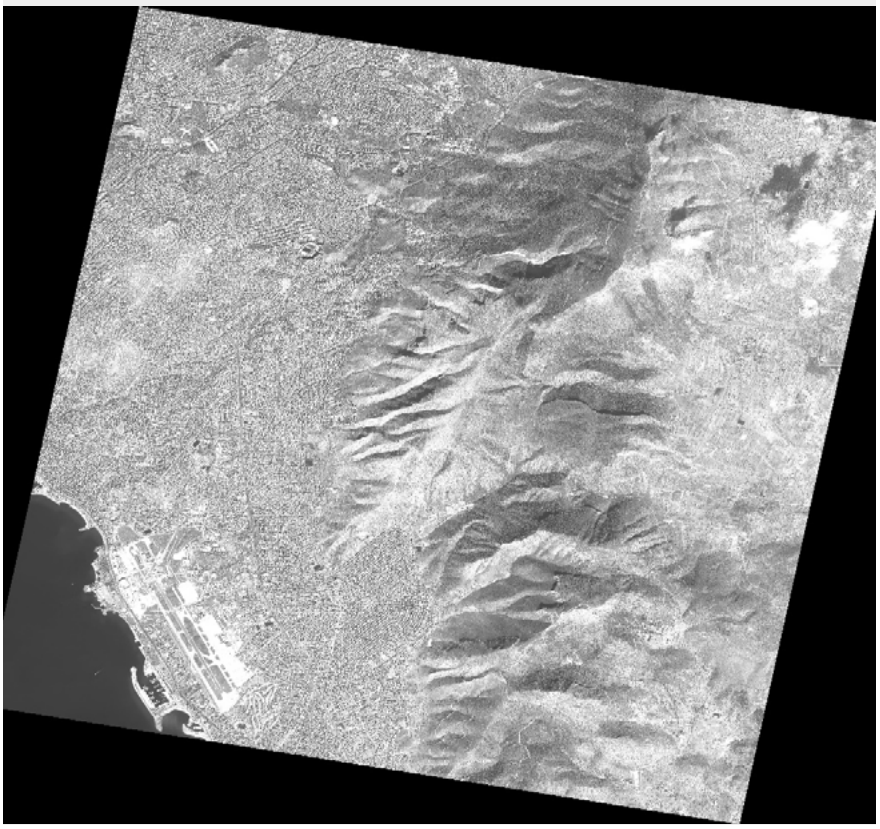

Figure 8. The Quickview File of Gray Scale for PAN

8.3 Rational Polynomial Coefficients (RPC)

RPC Files contains the coefficient for rapid positioning capability, also called Rational Polynomial Coefficients (PRC). This a mathematical mapping from object space coordinates to image space coordinates. This mapping includes non-ideal imaging effects, such as lens distortion, light aberration, and atmospheric refraction.

RPC files express the normalize column and row values in an image (rn, cn), as a ratio of polynomials of the normalized geodetic latitude, longitude, and height, (P, L, H). Normalized values are used instead of actual values to minimize numerical errors in the calculation. The scales and offset of each parameter are selected so that all normalized values fall in the range [-1, 1]. The normalization used is as follows:

$$P = (\text{Latitude} - \text{LAT\_OFF})/\text{LAT\_SCALE}$$

$$L = (\text{Longitude} - \text{LONG\_OFF})/\text{LONG\_SCALE}$$

$$H = (\text{Height} - \text{HEIGHT\_OFF})/\text{HEIGHT\_SCALE}$$

$$r_n = (\text{ROW} - \text{LINE\_OFF})/\text{LINE\_SCALE}$$

$$C_n = (\text{Columm} - \text{SAMP\_OFF})/\text{SAMP\_SCALE}$$

Each polynomial is up to third order in P, L and H, having as many as 20 terms. The rational functions are:

$$r_n = \frac{\sum_{i=1}^{20} LINE\_NUM\_COEF_i \cdot \rho_i(P, L, H)}{\sum_{i=1}^{20} LINE\_DEN\_COEF_i \cdot \rho_i(P, L, H)}$$

LINE_NUM_COEF, LINE_DEN_COEF, SAMP_NUM_COEF, and SAMP_DEN_COEF are 20-term vectors of coefficient that are given in the RPC file. Pi (P, L, H) is a 20-term vector with the following terms:

Table 9. RPC Terms

I	Pi (P, L, H)	I	Pi (P, L, H)
1	1	11	PHL
2	L	12	L3
3	P	13	LP2
4	H	14	LH2
5	LP	15	L2P
6	LH	16	P3
7	PH	17	PH2
8	L2	18	L2H
9	P2	19	P2H

For example, for a generic set of polynomial coefficients Ci, the corresponding 20-term cubic polynomial has the form:

$$f(P, L, H) = C_1 + C_2L + C_3P + C_4H + C_5LP + C_6LH + C_7PH + C_8L^2 + C_9P^2 + C_{10}H^2 + C_{11}PLH + C_{12}L^3 + C_{13}LP^2 + C_{14}LH^2 + C_{15}L^2P + C_{16}P^3 + C_{17}PH^2 + C_{18}LH^2 + C_{19}P^2H + C_{20}H^3$$

The image coordinates are expressed in pixels. The ground coordinates are latitude and longitude in decimal degrees, and geodetic elevations (height above the ellipsoid) in meters.

There is only one set of coefficients for 1B and 2A imagery products. The following table defines the PRC file contents:

Table 10. Specifications of RPC

Field	Field Name/Description	Format Range	Comments
Satid	Satellite ID	"SV1-01\SV1-02\SV-03\SV-04"	
bandId	"PAN"=Panchromatic	"PAN"	
	"MUX"=Multi-spectral bands	"MUX"	
SpecId	Identification of the specification which defines the RPC implementation used for generating and/or interpreting the coefficients	"RPB"	
BEGIN_GROUP =IMAGE			
errBias	Bias error	Range: 0.00 – 9999.99	
errRand	Random error	Range: 0.00 – 9999.99	
lineOffset	LINE_OFFSET	Range: 0.00 – 9999.99	
sampOffset	SAMP_OFFSET	Range: 0.00 – 9999.99	
latOffset	LAT_OFFSET	Range: ±90.0000	
longOffset	LONG_OFFSET	Range: ±180.0000	
heightOffset	HEIGHT_OFFSET	Range: ±9999	
lineScale	LINE_SCALE	Range: 1.00 – 9999.99	

sampScale	SAMP_SCALE	Range：1.00 – 9999.99	
latScale	LAT_SCALE	Range：±90.0000	
longScale	LONG_SCALE	Range：±180.0000	
heightScale	HEIGHT_SCALE	Range: ±9999	
lineNumCoef	LINE_NUM_COEF. Twenty coefficients for the polynomial in the umerator of the rn equation.	Range: ± 9.999999 * $10^{\pm 9}$	
lineDenCoef	LINE_DEN_COEF. Twenty coefficients for the polynomial in the denominator of the rn equation.	Range: ± 9.999999 * $10^{\pm 9}$	
sampNumCoef	SAMP_NUM_COEF. Twenty coefficients for the polynomial in the numerator of the cn equation.	Range: ± 9.999999 * $10^{\pm 9}$	
sampDenCoef	SAMP_DEN_COEF. Twenty coefficients for the polynomial in the denominator of the cn equation.	Range: ± 9.999999 * $10^{\pm 9}$	

8.4 XML

The XML file contains all the general metadata information of Imagery Products including the attitude, ephemeris and geometric calibration file as well.

Table 11. XML File Contents

Field Name	Type	Remarks
SatelliteID	Enum	
ReceiveStationID	String	
SensorID	Enum	
ReceiveTime	Datetime	YYYY-MM-DD HH:MM:SS，UTC Time
OrbitID	Int	[1,999999]
OrbitType	String	
AttType	String	
StripID	Int	
ProduceType	String	STANDARD
SceneID	Long	
DDSFlag	String	
ProductID	Long	
ProductLevel	Enum	LEVEL1B
ProductFormat	Enum	GEOTIFF
ProduceTime	Datetime	YYYY-MM-DD HH:MM:SS，Beijing Time
Bands	String	
ScenePath	Long	
SceneRow	Long	
SatPath	Int	
SatRow	Int	
SceneCount	Int	
SceneShift	Double	1-99

StartTime	Datetime	YYYY-MM-DD HH:MM:SS，Beijing Time
EndTime	Datetime	YYYY-MM-DD HH:MM:SS, Beijing Time
CenterTime	Datetime	YYYY-MM-DD HH:MM:SS, Beijing Time
StarLine	Int	
EndLine	Int	
OrderID	String	
Gain	Double	
Offset	Double	
ImageGSD	Double	
WidthInPixels	Long	
HeightInPixels	Long	
WidthInMeters	Long	
HeightInMeters	Long	
PixelBits	Int	
ValidPixelBits	Int	
CloudPercent	Double	0-100
RollViewingAngle	Double	
PitchViewingAngle	Double	
RollSatelliteAngle	Double	
PitchSatelliteAngle	Double	

YawSatelliteAngle	Double	
SolarAzimuth	Float	
SolarZenith	Float	
SatelliteAzimuth	Float	
SatelliteZenith	Float	
GainMode	String	
IntegrationTime	Datetime	
IntegrationLevel	Int	
MapProjection	Enum	UTM
EarthEllipsoid	Enum	WGS84
ZoneNo	Int	
ResamplingKernel	Enum	BL
HeightMode	Enum	AVE-DEM
MtfCorrection	Enum	
CenterLatitude	Double	
CenterLongitude	Double	
TopLeftLatitude	Double	[-90,90]
TopLeftLongitude	Double	[-180,180]
TopRightLatitude	Double	[-90,90]
TopRightLongitude	Double	[-180,180]
BottomRightLatitude	Double	[-90,90]

BottomRightLongitude	Double	[-180,180]
BottomLeftLatitude	Double	[-90,90]
BottomLeftLongitude	Double	[-180,180]
TopLeftMapX	Double	
TopLeftMapY	Double	
TopRightMapX	Double	
TopRightMapY	Double	
BottomRightMapX	Double	
BottomRightMapY	Double	
BottomLeftMapX	Double	
BottomLeftMapY	Double	
DataArchiveFile	String	
BrowseFileLocation	String	
ThumbFileLocation	String	
AuxInfo	String	

9. Coordinate Conventions and Imaging Time

9.1 Coordinate Conventions

The coordinates include earth coordinates and image coordinates.

9.2 Earth Coordinates

The earth coordinates are expressed relatively to an earth-centered fixed (ECF) reference system that rotates with the earth. All ECF coordinates in IAD files are given in the WGS 84 reference system, including geocentric Cartesian coordinates (XE, YE, ZE) and geodetic coordinates (latitude, longitude). All heights are meters with respect to the WGS 84 ellipsoid.

9.3 Image Coordinates

An image address is specified as a (column, row) pair. When the image is displayed, column numbers increase toward the right and row numbers increase in the downward direction. Address (0, 0) corresponds to the pixel displayed in the upper left corner.

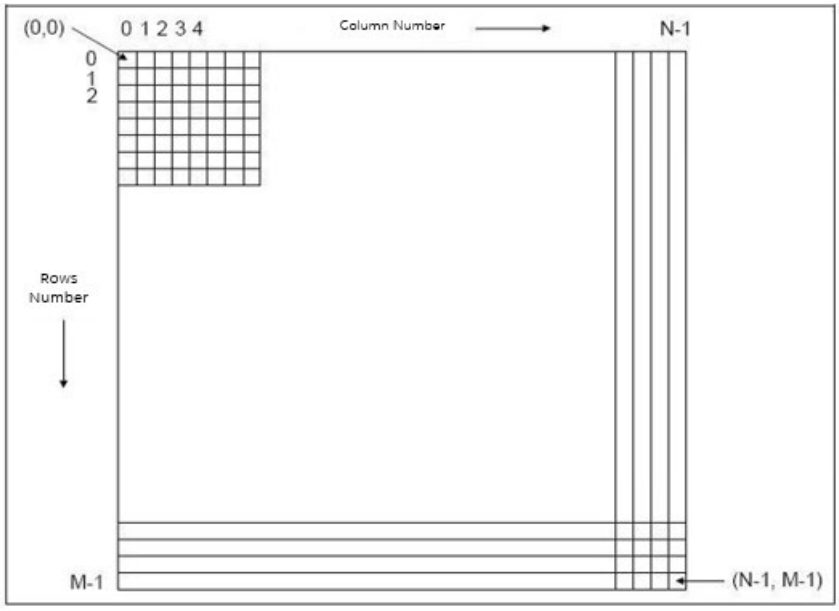

Figure 9. Image Coordinate System

The detector in column 0 of a detector array produces the pixels in column 0 of the corresponding Basic image.

9.4 Imaging Time

All absolute times are in Beijing Time in the format of YYYY-MM-DDThh:mm:ss.dddddddZ, unless otherwise specified. The relative time offsets from a fixed absolute time is measured in seconds, unless otherwise specified.

An example of both absolute Beijing time and the relative time is the time-tagged line count (TLC) data in the image metadata file. The TLC data, which are pairs of line numbers and the associated with exposure times, provide a way to accurately estimate the time of exposure of any line in the image. The first such timing event for an image is reported in the image metadata file as an absolute Beijing time, but subsequent events are reported as time offsets, in seconds, relative to this initial time.

10. Technical Support and Claims

For any question, advice or problem, please kindly contact us at GlobalTeam@spacewillinfo.com. The team will assist you for any concern when you process the product.

SuperView-1 Satellite Imagery Product Guide is version 1.1. If the product is updated, the document will be updated without prior notice.

+86.10.5881 8811 ext. 840
marketing@spacewillinfo.com
www.spacewillinfo.com