

Geo-Imaging Accelerator (GXL) System: Ortho XL GXL Workflow

ORTHO XL – ACCELERATED ORTHORECTIFICATION GXL WORKFLOW

Ortho XL includes rigorous and rational function models developed to compensate for distortions and produce orthorectified satellite images for high resolution and low resolution sensors. Distortions caused by the platform (position, velocity, and orientation), the sensor (orientation, integration time, and field of view) the Earth (geoid, ellipsoid, and relief), and the cartographic projection (ellipsoid and cartographic) are all taken into account using these models. The models reflect the physical reality of the complete viewing geometry and correct all distortions generated during the image formation.

GXL WORKFLOW PREREQUISITES

This is an add-on GXL Workflow that is used within the Geo-Imaging Accelerator (GXL) System. No other prerequisites exist.

GXL WORKFLOW OPERATORS

ORTHO XL consists of a set of two automated jobs. The master job scans the input folder with subfolders for panchromatic and multispectral images using the standard PCI file naming convention.

If a matched MS/PAN pair is found, it creates the child job for a pair of files (which allows the child job do the co-registration). If not it creates child job for individual images. All jobs are put in a queue and executed based on their priority and availability of computer resource.

The master job will automatically decide what child job to select: GPU or PPF. GPU is the first choice if the source image has:

- RF (Rational Functions) math model
- Or a projection that is EPSG encoded.

If not, the PPF child job will be created. The system is also able to determine the use of GPU or PPF based on the extension of the input file: if in PIX, it will use PPF, if in GRB/TIFF, it uses GPU.

Typically, when the input data directory contains multispectral and panchromatic image pairs, the panchromatic images will contain the updated math model segment outputted from the data ingest module (DATIN). For SPOT-5 data, the Ortho XL will first orthorectify the panchromatic image, and then use the panchromatic image as a reference to register the multispectral image. For QuickBird and IKONOS imagery, once the rational functions model for the panchromatic image is computed, the rational functions model for the multispectral scenes is automatically computed.

In the event that the input data directory contains raw pansharpened datasets (with math model segment exported from DATIN), then all scenes will be orthorectified.

When the input data directory contains either multispectral images, or panchromatic images only, then Ortho XL will utilize the math model segment stored in these images (as output from DATIN) to orthorectify the imagery.

To perform the orthorectification, Ortho XL also uses a digital elevation model. If the input directory of data spans an area in which multiple digital elevation models are

required, than you should merge these multiple digital elevation models into a single GDB supported file.

The reference images must have an associated digital elevation model. The digital elevation model can be a single file for the area of interest, or a collection of individual DEM tiles.

The job processor for the Orthorectification (GXLMasterOrtho) has the following operators used for job submission:

Job identifiers

- **User:** name of the user submitting the job
- **Priority:** priority of the job
- **Comment:** comment to distinguish the job

Start

- **On Server:** select the processing server to run the job
- **When:** select when the job is to be started

Input Parameter

- **Predefined configurations:** The user can define and select an XML configuration file which automatically sets all parameters for the project. This is useful for when you need to repeat projects.

Workflow values

- **InputFolder:** Directory containing scenes to process
- **OutputFolder:** Output directory storing the results
- **DEM:** Location for a file, list or folders containing the DEMs
- **PanPxszout:** Output pixel size for panchromatic files
- **MsPxszout:** Output pixel size for multispectral files
- **MapUnit:** projection string for output image
- **Resample:** resampling method
 - Cubic convolution
 - Nearest neighbor
 - Bilinear interpolation
 - Average
 - Median
 - Gaussian

- **OverwriteResult:** Overwrite output file if exists.

The output folder and its files have a naming convention based on the input scene identification, as defined by the user, the current state of the image product, and the image type.

GPU ENABLED ORTHORECTIFICATION

Ortho XL utilizes the PCI MP/GPU program. This is an independent executable which can automatically recognise if an appropriate graphical processing unit or video card that has been installed on the processing server is available to perform processing. If the video card is detected, then the GXL system will utilize the card for processing. Otherwise, the GXL system will use all of the available CPU cores to split the job into parallel threads.

SUPPORTED SATELLITE FORMATS

The Satellite Ortho Suite supports a wide range of high and low-resolution optical satellite sensors.

Supported Sensors

- IKONOS GEO:
 - GeoTIFF or HDF GEO product
 - 1-2m accuracy with 10 or more ground control points (GCPs)
- IKONOS GEO Ortho Kit:
 - Satellite Orbital Math model can be used without RF coefficients
- QUICKBIRD (Basic and Ortho-Ready):
 - GeoTIFF or NITF with support files (ATT, EPH, GEO, IMD, RPB, TIL)
- SPOT 5: 1A and 1B Products
- SPOT 5 (TIFF): Level 1A Dimap format

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