Orthorectifying and Pansharpening SPOT 5 Data

TUTORIAL

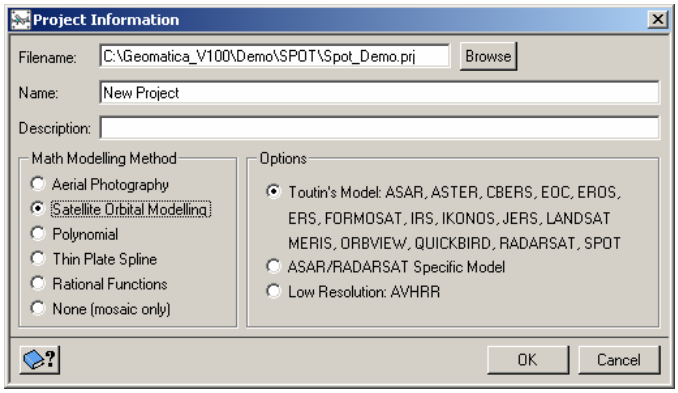
Spot 5 was launched on May 4, 2002, and contains two independent optical instruments (HRGs). Each of them includes two panchromatic (5 m) CCD arrays that can be combined to generate a 2.5 m image product, as well as three multispectral (10 m) channels, and one short wave infrared (20 m) channel. Each Spot 5 HRG has an imaging swath of 60 km. Like the previous Spot platforms, Spot 5 is able to collect across-the-track stereo by imaging the same area from two different orbits. Moreover, the Spot 5 platform is capable of along-track stereo viewing, through a dedicated stereo sensor.

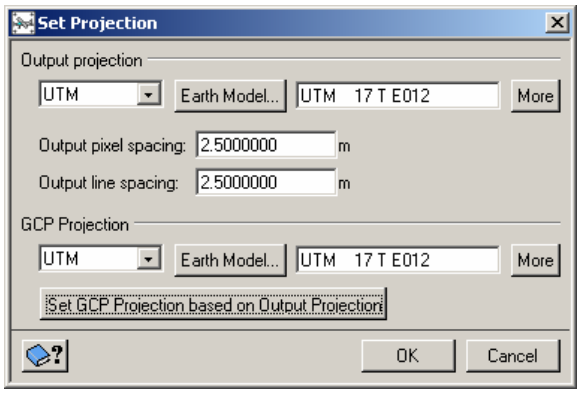
This brief tutorial shows you how to orthorectify Spot 5 data using Geomatica, with a finishing step of pan sharpening to create a 2.5-meter multispectral data set.

1.0 Orthorectifying Spot 5 (Panchromatic)

1.1 Project Setup

Start OrthoEngine, and click New on the File menu to start a new project. Give your project a file name, and select Satellite Orbital Modeling as the math modeling method. Under Options, choose Toutin's Model, and click Accept. OrthoEngine prompts you to set up the projection information for the output files, the output pixel spacing, and the projection of your GCPs. Enter the appropriate projection information for your project.



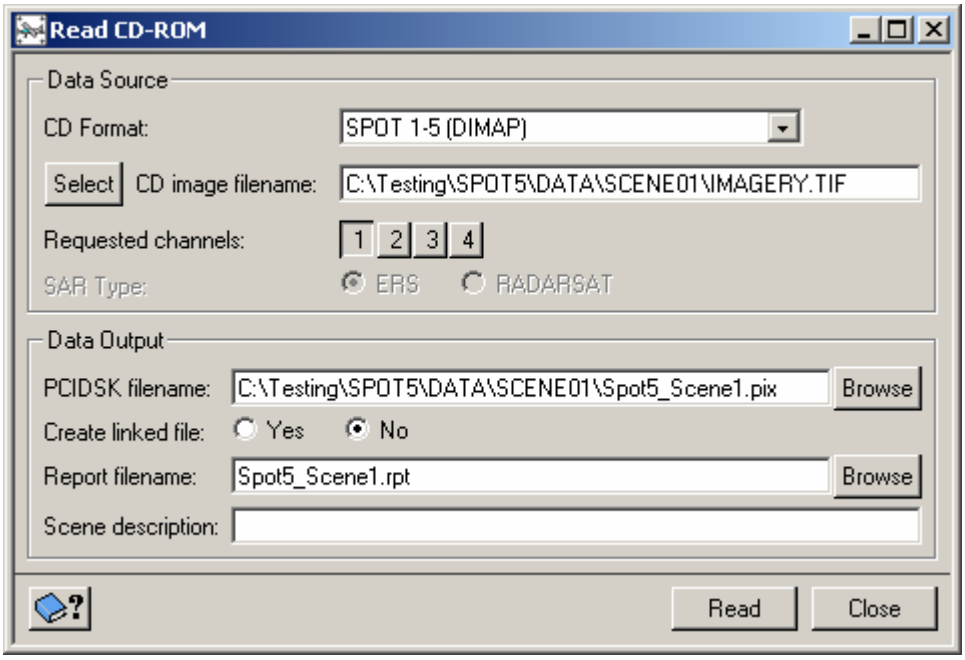


1.2 Data Input

For rigorous modeling with Geomatica OrthoEngine, you will need to order Spot 5 Level 1A data. Products higher then level 1A already have some level of correction applied, and therefore are not suitable for orthorectification. SPOT Image offers technical specifications and product information on their website (http://www.spotimage.fr/home/).

DIMAP (tiff) format is supported for Spot 5 orthorectification. Data. DIMAP is a metadata format developed by SPOT Image, which uses GeoTIFF as the primary interchange layer. The data will come in a directory with an .XSL file, a metadata file (METADATA.DIM), a tiff imagery file (IMAGERY.TIF), and some preview JPEG files. OrthoEngine requires the imagery file and the metadata file to be located in the same directory.

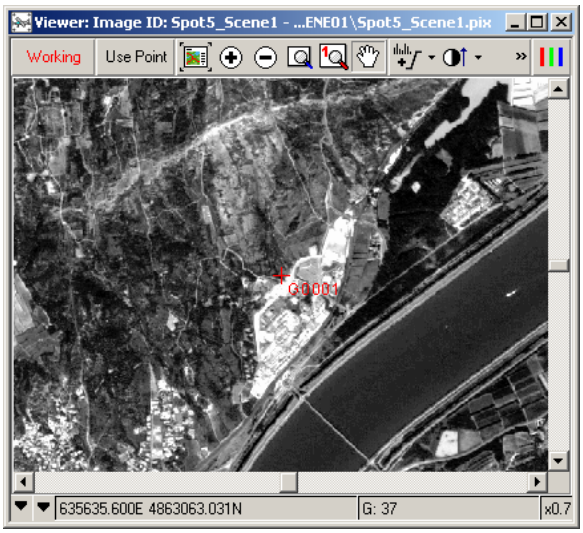
To import Spot 5 data for orthorectification, select Data Input under Processing Steps, and select Read Data From CD-ROM. (This choice also applies to data on your hard drive that was copied from a CD-ROM.) Set channel 1 for panchromatic data, and channels 1-4 for multispectral data. Supply an output file name, a scene description, and a report file name.

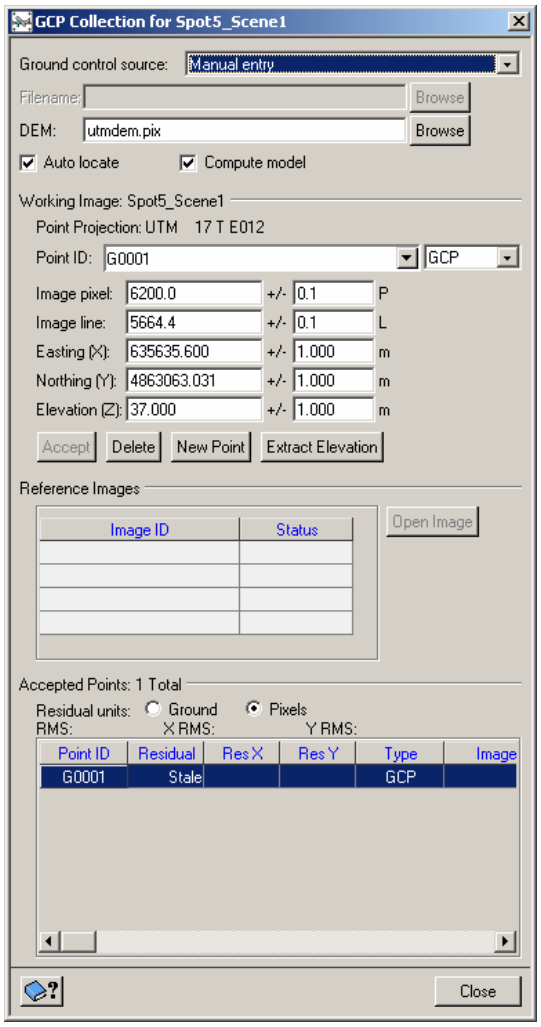


1.3 Collect GCPs and Tie Points

Select the GCP/TP Collection processing step. Collect GCPs for the project using manual entry, from geocoded images, vectors, chip databases, or a text file. You can also collect tie points, if you need to pull multiple scenes together.

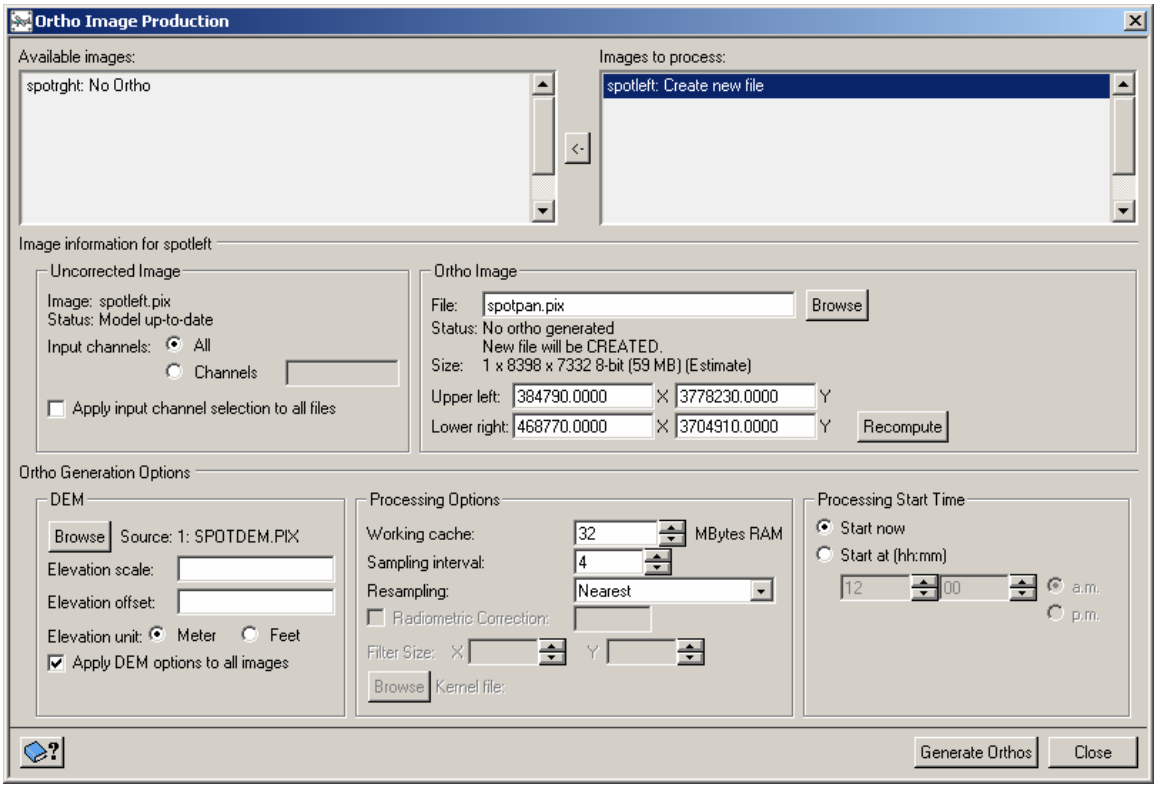
For the Spot 5 rigorous model, you will need a minimum of six accurate GCPs per scene and possibly more, depending on the accuracy of the GCPs and accuracy requirements of the project. Once you have collected your GCPs, run the model calculation and proceed to the residual report panel (under the Reports processing step) to review the initial results.





1.4 Generating Ortho Images

The final step is to set up your Ortho Image Production. Proceed to the Ortho Generation processing step, select the files to be processed, select the DEM file to be used, and set your processing options. You are now ready to create your ortho image, so click Generate Orthos.



1.5 Orthorectifying the Multispectral Imagery

Follow steps 1.1 to 1.4 for the multispectral imagery. In this example, we used a Garmin GPS unit to collect GCPs for the 2.5-meter data, and used the orthorectified product and a 70-meter DEM to rectify the 10-meter data.

2.0 Pan Sharpening Spot 5

Spot 5 spectral bands are the same as those for Spot 4: B1 (0.50-0.59 µm), B2 (0.61-0.68 µm), B3 (0.79-0.89 µm), and SWIR (1.58-1.75 µm). The B1-B3 bands are 10-meter resolution. The SWIR band is 20-meter resolution, resampled to 10-meter.

You can use the new PANSHARP algorithm to create 2.5 m multispectral data that preserves the spectral integrity of the original 10-meter data. The program is very easy to use, and only requires you to select the panchromatic image channels, the multispectral image channels, and the reference channels.

Additional information on PANSHARP is available in our pansharpening tutorial.

2.1 Setting up the Parameters

Start Focus. Open up your orthorectified panchromatic 2.5 m data, and your multi-spectral 10 m data. This is a good opportunity to check the registration by zooming into an area and reordering the files in the tree list, or by using some of the visualization tools to check how well the images are registered to each other.

Launch the Algorithm Librarian, and select the PANSHARP algorithm. Select the panchromatic image channel, the multispectral image channels, and the reference image channel(s). The input reference image channels should be selected so that the multispectral channels cover the frequency range of the panchromatic channel as closely as possible. The order of the reference channels does not matter. For Spot 5, use channel one and two (green and red).

There is only one input parameter, which is the value that represents “no data” in your image. In most cases this will be zero. Be sure to specify this parameter if you have areas of “no data” in your image.

Set the output file name and/or indicate that the results be sent to the viewer. You are now ready to run the program. Below is a sample of the result you can expect from Spot 5 data.

10 m Multispectral Image ***2.5 m Panchromatic Image*** ***2.5 m Pan-Sharpened Image***