GeoCell User Manual

Version 1.8.18

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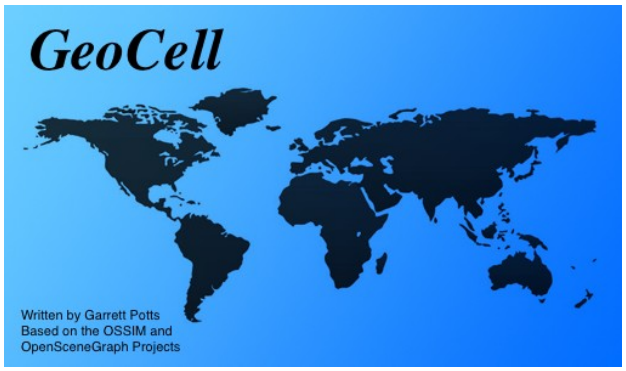
ABSTRACT

GeoCell is a stand-alone executable program offering a cross-platform GUI that exposes OSSIM library functionality. This document provides guidelines for operations.



RadiantBlue TECHNOLOGIES

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1 Overview

GeoCell is a stand-alone executable program offering a cross-platform GUI that exposes OSSIM library functionality. This document provides guidelines for its operation.

To verify the software version, select ossim-geocell->About ossim-geocell and the window shown in Figure 1 is displayed.

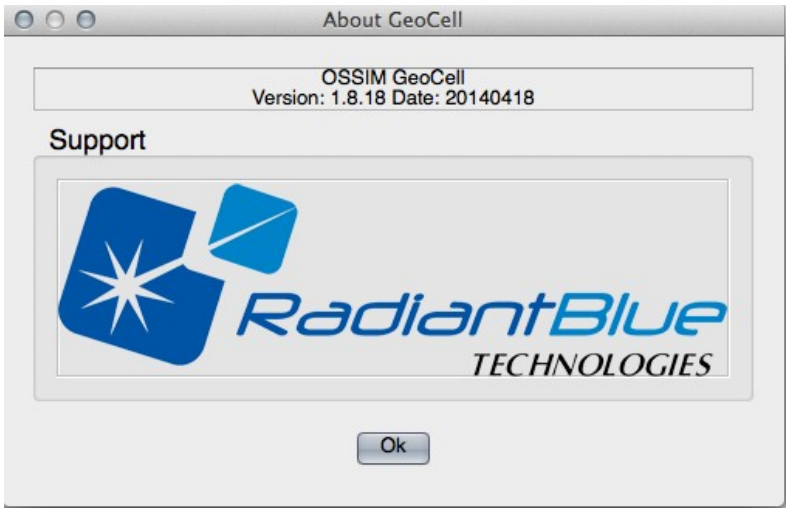

Figure 1. About GeoCell Window

2 Basic Operations

This section describes the basic procedures required for general GeoCell operations.

2.1 Load Images

Images can be loaded either individually or as members of a project file. A project file defines file paths and other parameters associated with a group of related images. OMAR has the capability to select images and export (download) a project file, along with associated image files (including geometry, overview, and histogram), for use in GeoCell.

2.1.1 GUI

To load an image or project via the GUI, select File->Open Image or File->Open Project and choose the desired file using the Open dialog box, as shown in Figure 2.

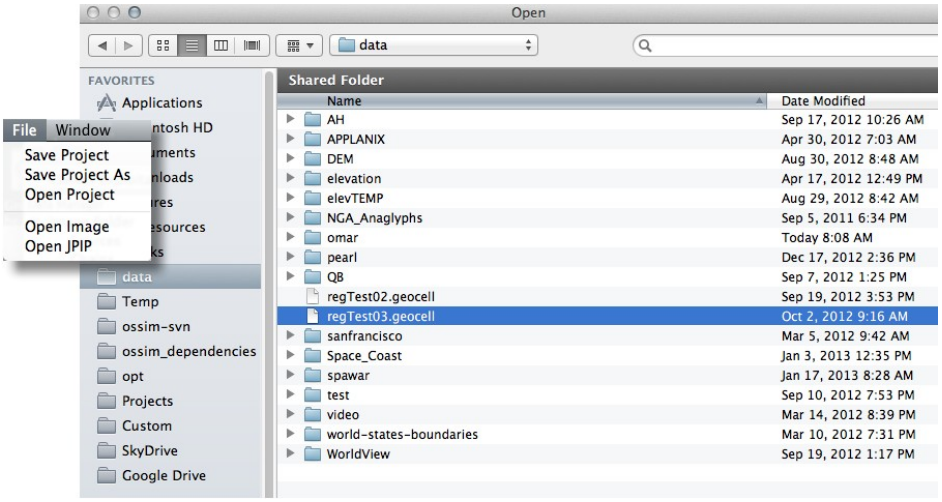

Figure 2. Image/Project File Selection

2.1.2 Command Line

Project files may be opened via command line in the following manner:

```
geocell –project /path/to/project/file
                or
geocell /path/to/project/file.gcl   (with gcl extension)
```

Using the example from paragraph 2.1.1:

```
geocell –project /data/regTest03.geocell
                or
geocell /data/regTest03.gcl
```

2.2 Open Display Windows

After loading, image chains must be selected to create the corresponding image display windows. With reference to Figure 3, follow these steps to create displays:

1. Expand the source entry list by clicking on the small triangle next to “Source”
2. Select desired sources and right-click to reveal pop-up menu
3. Select “Chains”, then “Affine” for raw images or “Default” (or “Map Projection”) for orthorectified images

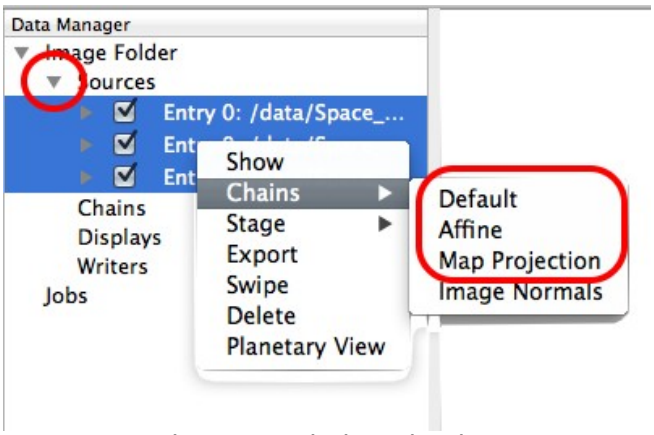

Figure 3. Chain Selection

2.3 Image Menu

The Image menu includes actions that apply to the current active display.

2.3.1 Export

Select this menu item to export an image. The format of the exported image is chosen from the <select write type> dropdown menu, as shown in Figure 4.

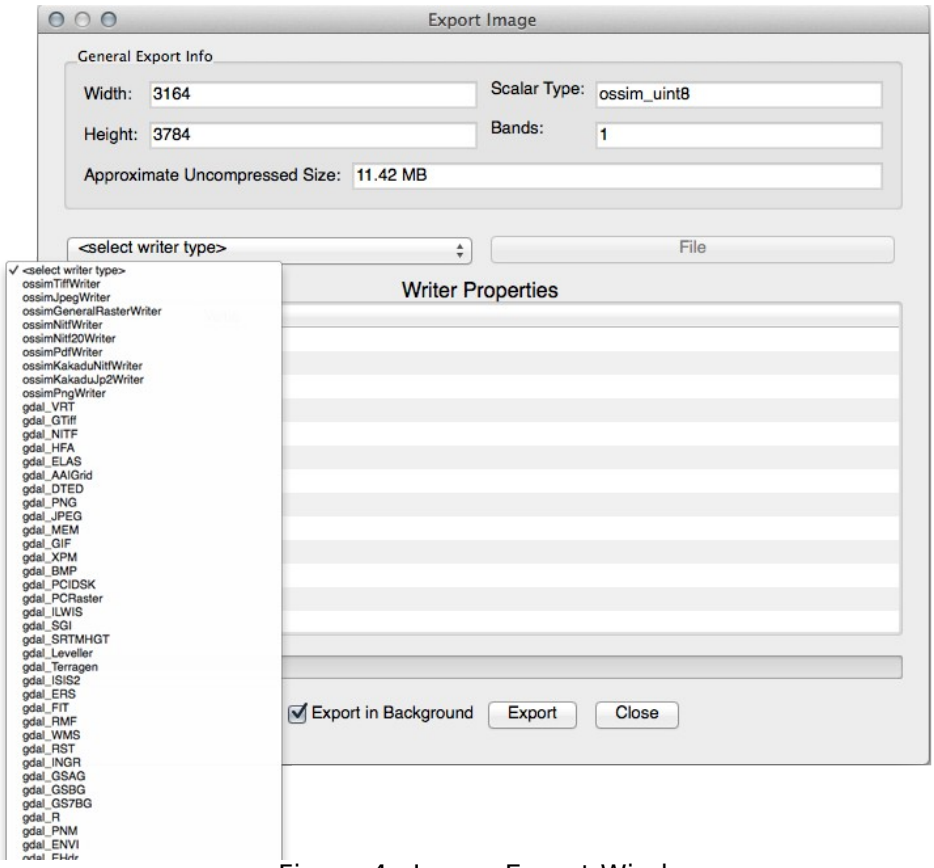

Figure 4. Image Export Window

2.3.2 Export Keywordlist

Select this menu item to export a standard OSSIM keyword list for the image.

2.3.3 Band Selection

Select this menu item to choose the desired bands for a multi-band image, as shown in Figure 5.

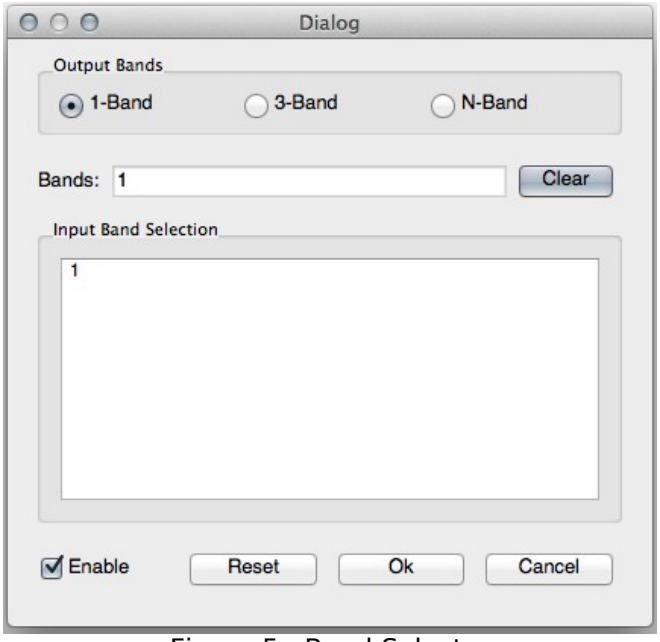

Figure 5. Band Selector

2.3.4 Brightness Contrast

Select this menu item to perform brightness/contrast alterations to the image, as shown in Figure 6.

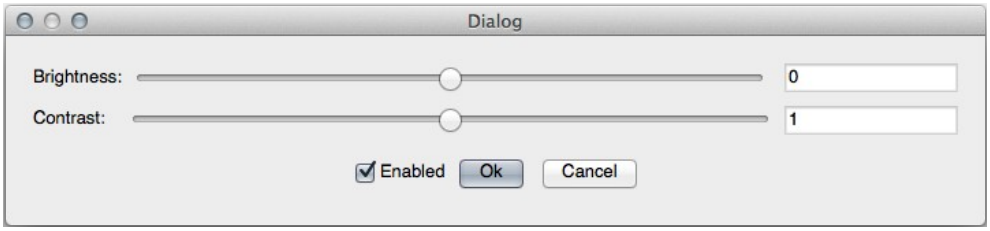

Figure 6. Brightness/Contrast Window

2.3.5 Geometry Adjustment

Select this menu item to perform manual geometric adjustments to the image using its adjustable parameters, as shown in Figure 7. See paragraph 4.3.3 for additional information on saving parameters and the relationship of the window and the topic of image registration.

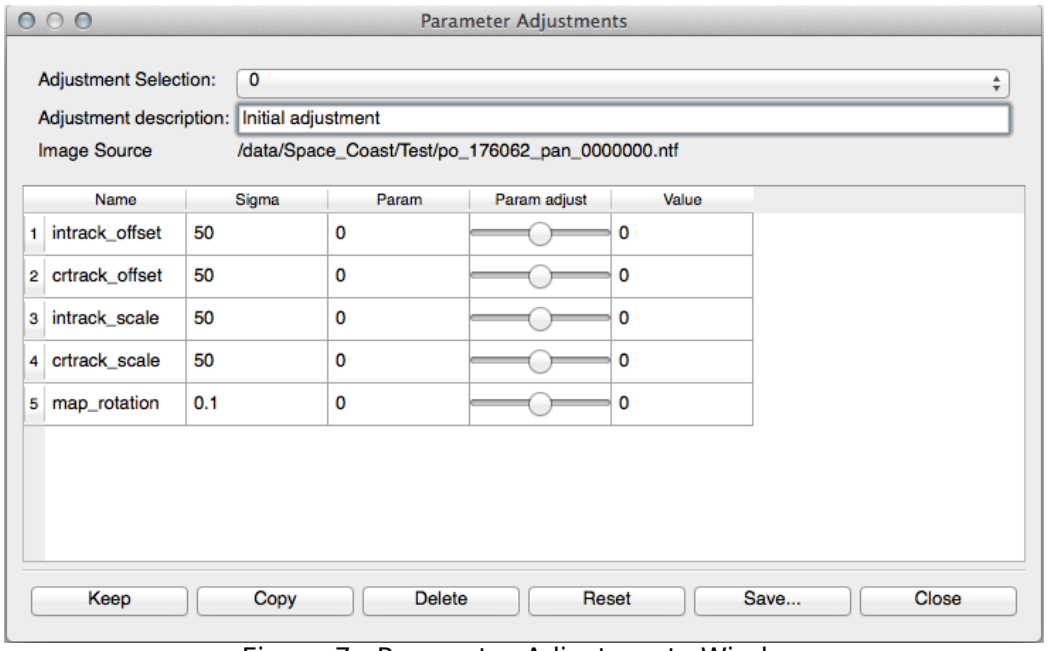

Figure 7. Parameter Adjustments Window

2.3.6 Histogram Remapper

Select this menu item to perform custom histogram alterations to the image, as shown in Figure 8.

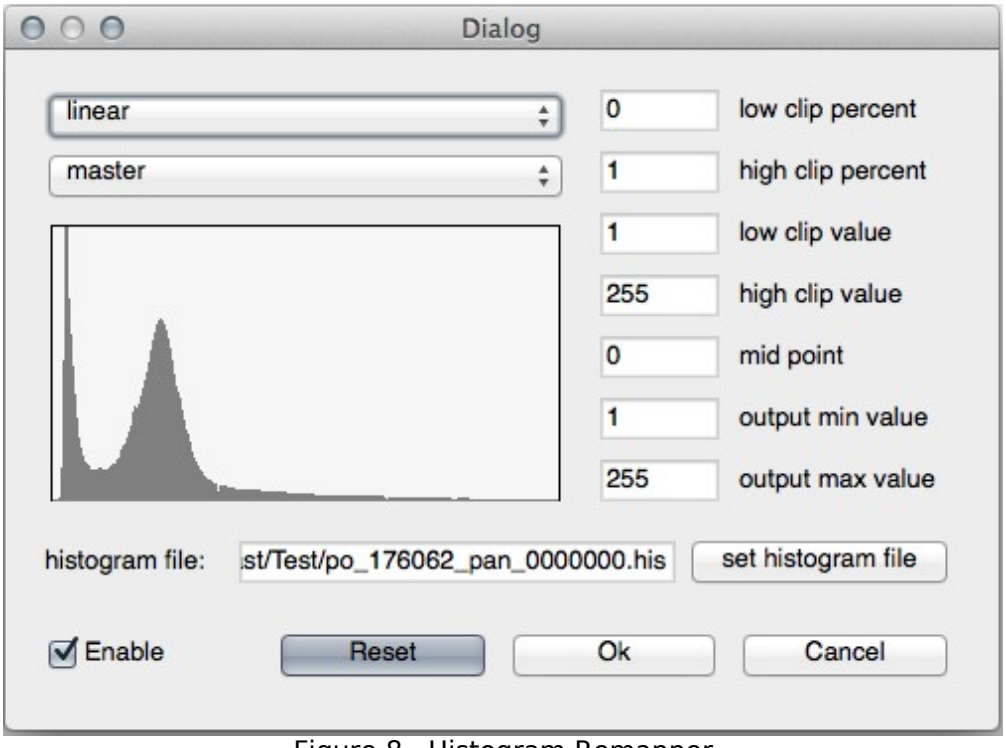

Figure 8. Histogram Remapper

2.3.7 Polygon Remapper

Select this menu item to draw a polygon overlay on the image.

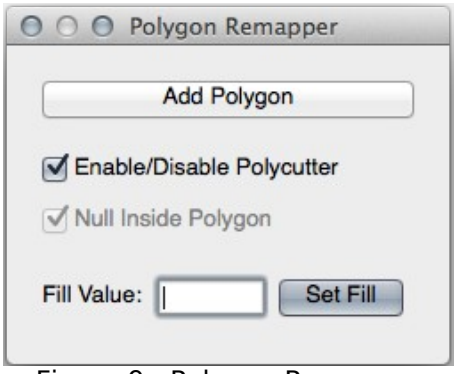

Figure 9. Polygon Remapper

2.3.8 HSI Adjustments

Select this menu item to perform custom hue/saturation/intensity alterations to the image, as shown in Figure 10.

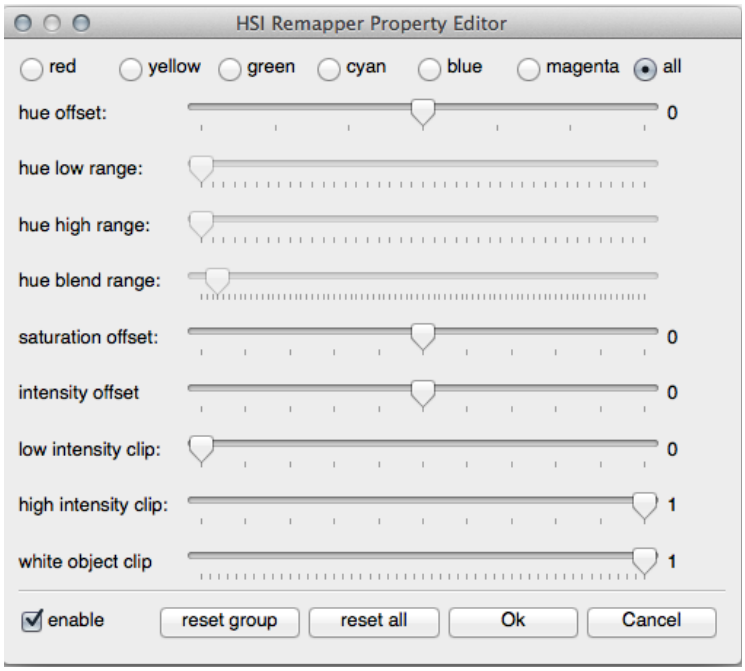

Figure 10. HSI Remapper Property Editor

2.3.9 Position Information

Select this menu item to display a window showing continuous (dynamic) cursor position information, as shown in Figure 11.

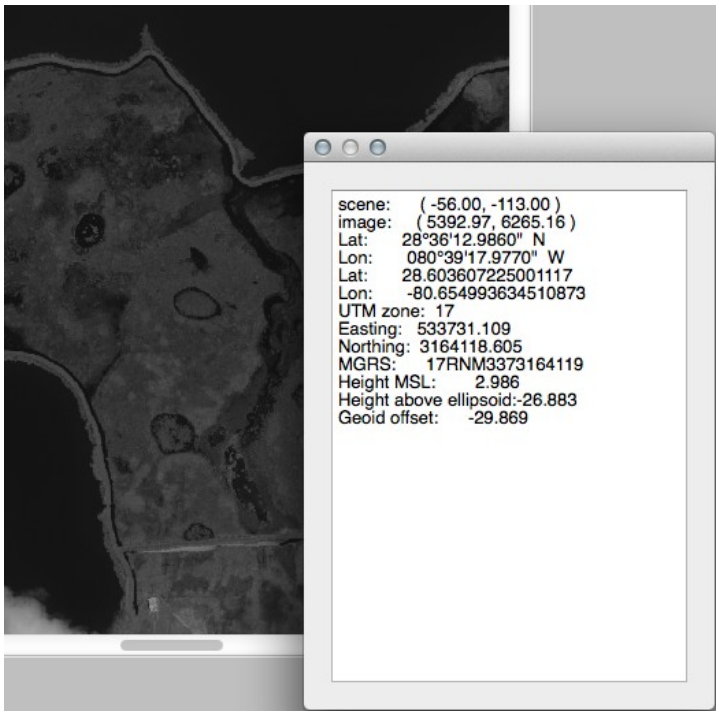

Figure 11. Position Information Window

2.3.10 View

3 Visual Exploitation

This section describes the functions related to GeoCell's visual image manipulation capabilities.

3.1 Image Combiners

GeoCell has access to OSSIM's collections image combiners. This section provides examples of several of those functions, using a raster map and image for clarity.

3.1.1 Blend

The blend procedure is described as follows:

1. Load two images
2. Select both **Reprojection Chains** in *Chains*, right-click and choose *Combine>Blend*
3. An **ossimBlendMosaic** is created in *Chains* (see Figure 12)

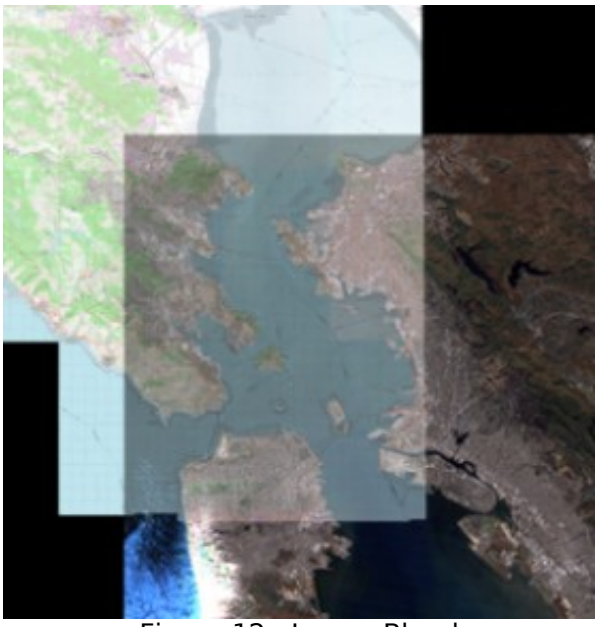

Figure 12. Image Blend

3.1.2 Feather

The feather procedure is described as follows:

1. Load two images
2. Select both **Reprojection Chains** in *Chains*, right-click and choose *Combine>Feather*
3. An **ossimFeatherMosaic** is created in *Chains* (see Figure 13)

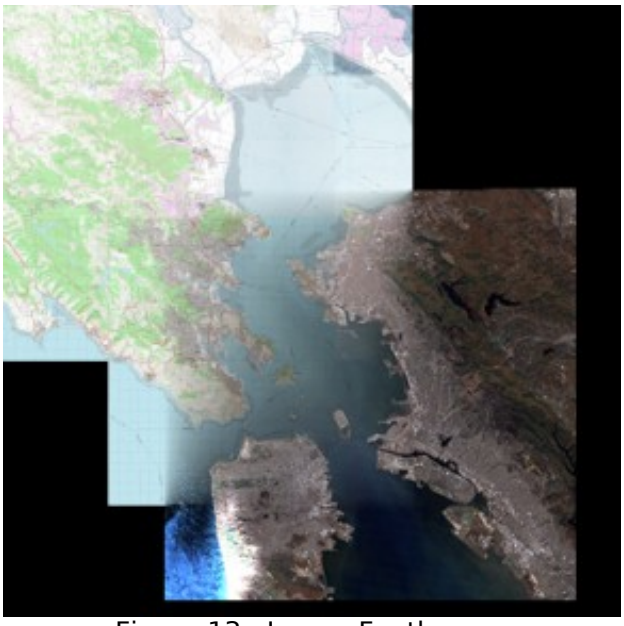

Figure 13. Image Feather

3.1.3 Combiner From Factory

Use of a combiner not explicitly available in the *Combine* menu is described as follows:

1. Load two images
2. Select both **Reprojection Chains** in *Chains*, right-click and choose *Combine>Select from Factory*
3. A selection window is displayed, as shown in Figure 14

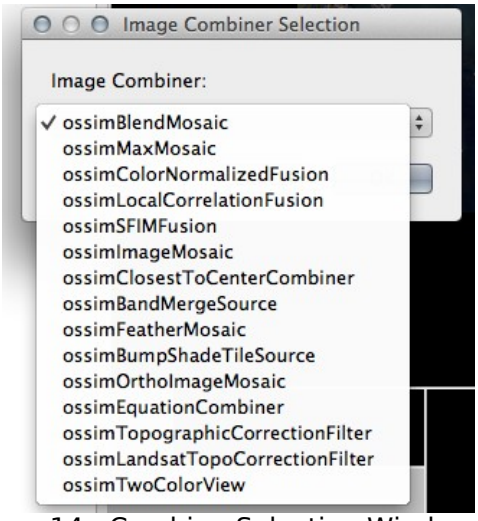

Figure 14. Combine Selection Window

4. Select desired filter; for example, an **ossimTwoColorView** is created in *Chains* (see Figure 15)

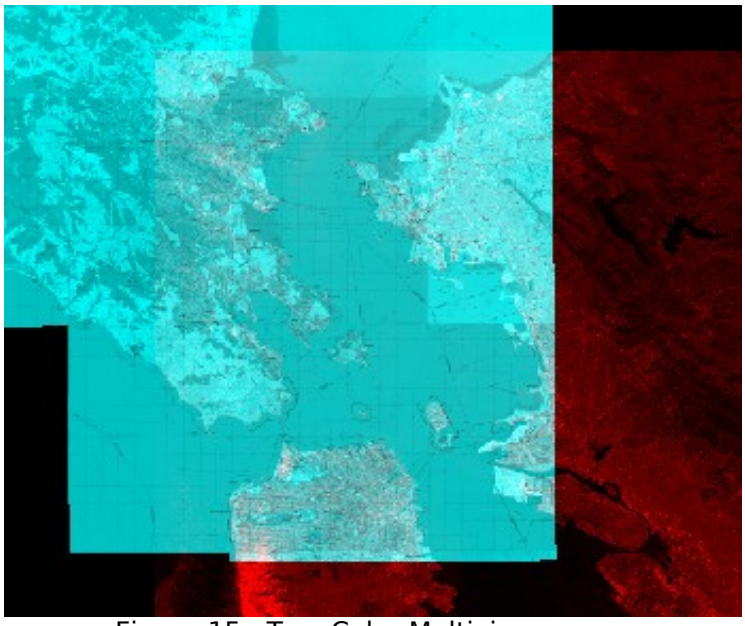

Figure 15. Two-Color Multiview

3.2 Digital Terrain Model Usage

3.2.1 Hill Shade

The hill shade procedure allows creation of a pseudo 3D view. It is described as follows:

1. Load an overlay image and DTM reformatted to raster (e.g. srtm_xx.ras)
2. Select srtm_xx.ras in *Sources*, right-click and choose *Chains>Image Normals*
    a. A **Normals Chain** is created in *Chains*
    b. Expansion of the entry allows manipulation of its filter properties; for example, the gain of the **ossimImagePlaneNormalFilter** has been changed in Figure 16

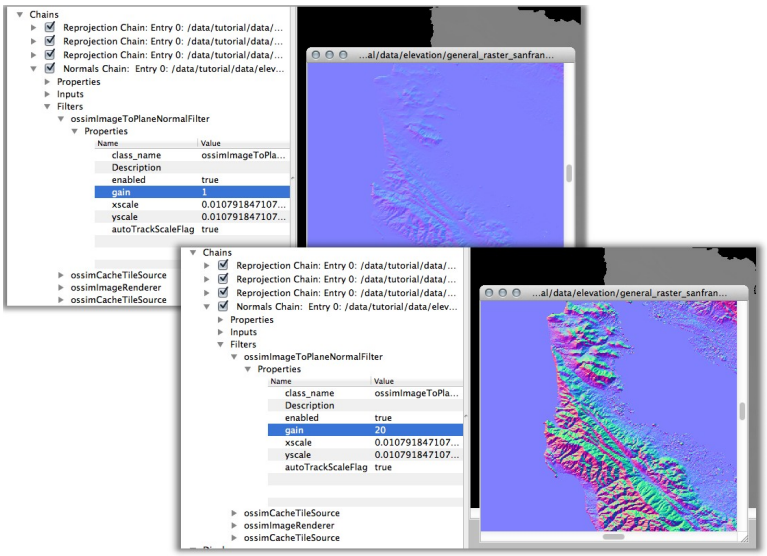

Figure 16. ossimImagePlaneNormalFilter Properties

3. Select the map + Normals Chain in *Chains*, right-click and choose *Combine>Hill Shade*
    c. A **ossimBumpShadeTileSource** is created in *Chains*
    d. Expansion of the entry allows manipulation of its filter properties; for example, the hill shade light source azimuth and elevation angles are shown in Figure 17

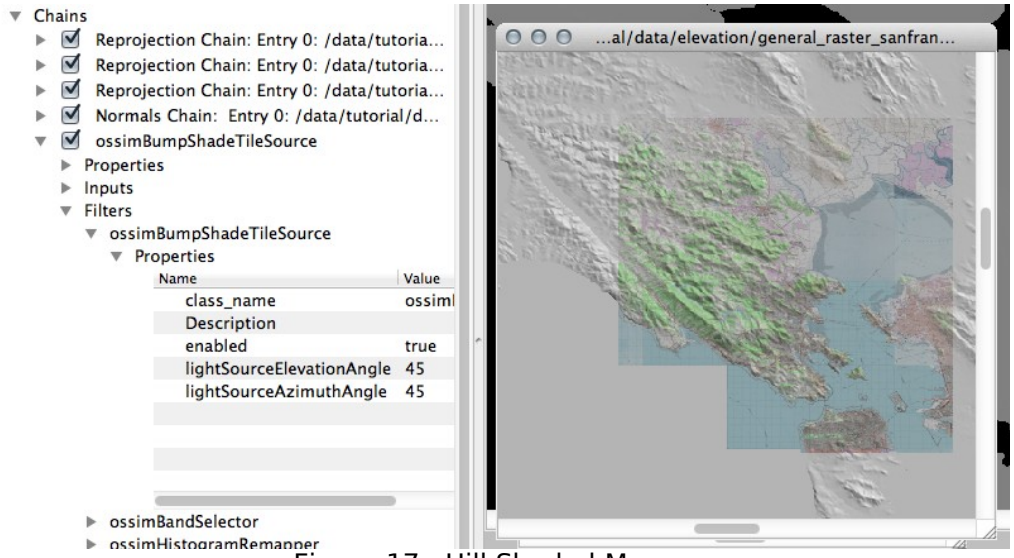

Figure 17. Hill Shaded Map

3.3 Planetary View

Planetary view provides the capability for advanced 3D viewing. Activation of this view is described as follows:

1. Load image(s) of choice
2. Select all in *Chains*, right-click and choose *Planetary View* from context menu
3. Press <*Select Syncing*> and select *Full*

4. Image Viewer (map or image) display and control:
   - Left-click/roam induces synchronized motion in all displays, including the Planetary Viewer
   - Wheel moves image up/down
   - Shift/wheel turn zooms in/out
1. Planetary Viewer display and control:
   - Note that both images appear mosaicked
   - Left-click/roam moves image within display window
   - Right-click/roam zooms image within display window
   - Middle-click/roam (*not* wheel turn) induces eye point motion
     - ✓ up/down - raises/lowers look angle
     - ✓ right/left - rotates azimuth
   - Hot keys reset
     - ✓ lower case ‘u’ rotates back to north-up
     - ✓ upper case ‘U’ resets eye view to nadir
   - At higher look angles, relief should be visible in background

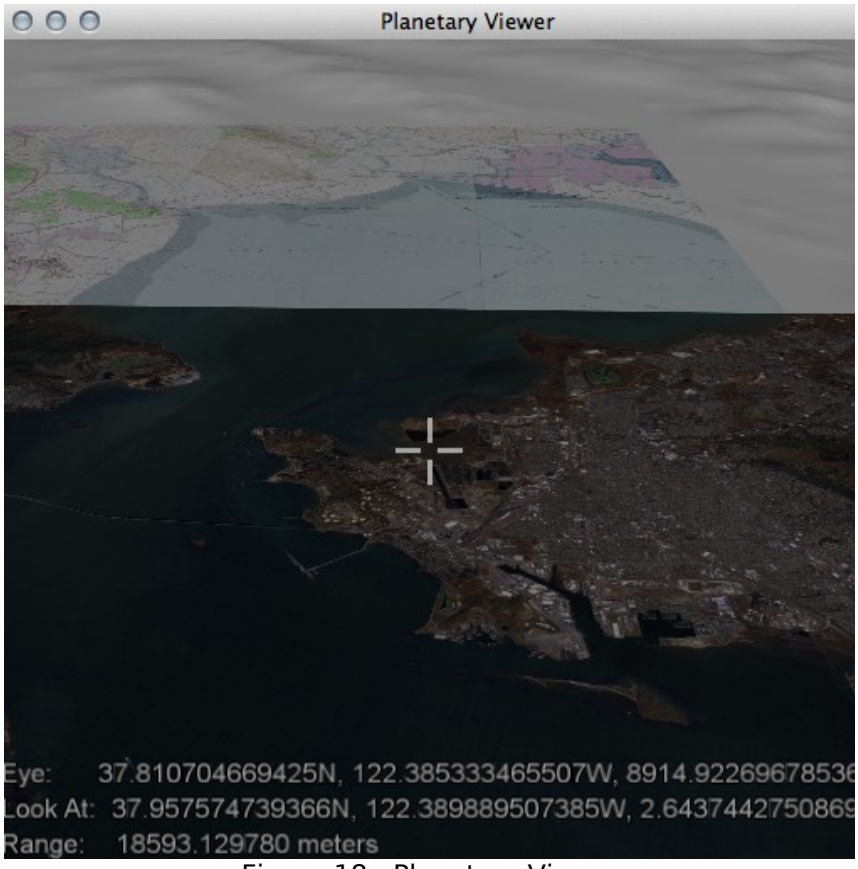

Figure 18. Planetary Viewer

Note that the Planetary Viewer may fail if the workstation’s graphics adapter does not adequately support OpenGL.

4 Metric Exploitation

This section describes the functions related to GeoCell's photogrammetric exploitation capabilities.

4.1 Selecting Images

The metric exploitation processes are controlled by the tabbed Metric Exploitation window, which is initiated from the Exploitation Mode right-click menu, as shown in Figure 19.

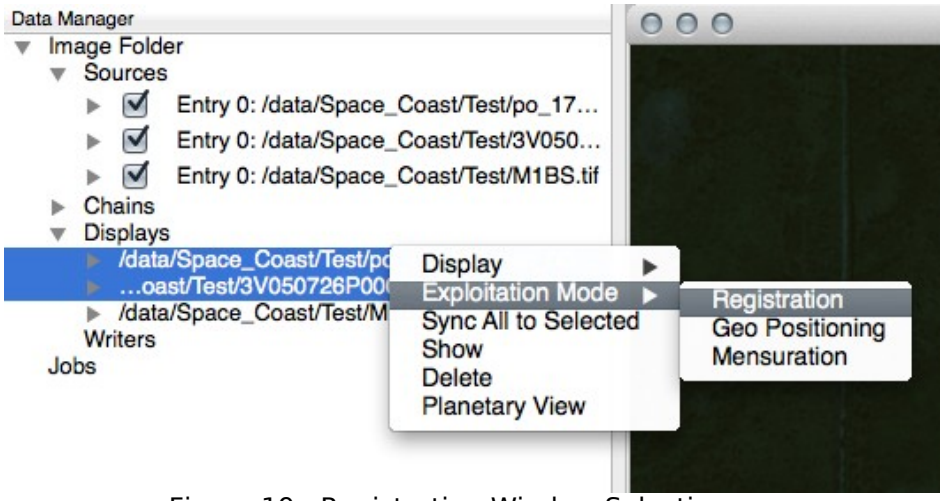

Figure 19. Registration Window Selection

Prior to selecting the desired operation, the applicable images must be selected after first expanding the displays list by clicking on the small triangle next to "Displays". If no images (or too few) are selected, an error pop-up is displayed, as shown in Figure 20.

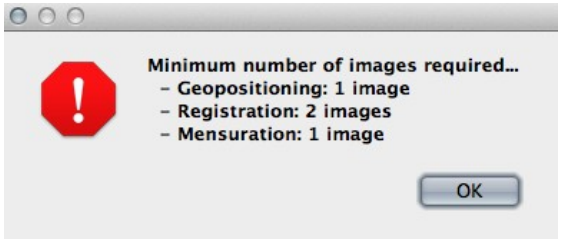

Figure 20. Error Pop-up for Too Few Images

Also, the selected image displays must be visible. If one or more are not visible, an error pop-up is displayed, as shown in Figure 21. If this occurs, the right-click context menu provides the required 'Show' selection, as shown in Figure 22.

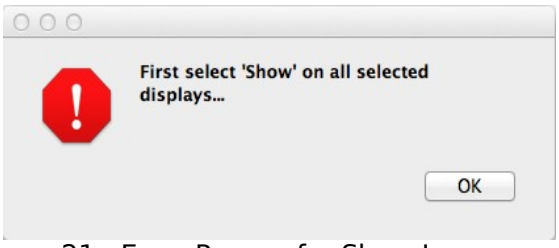

Figure 21. Error Pop-up for Show Images

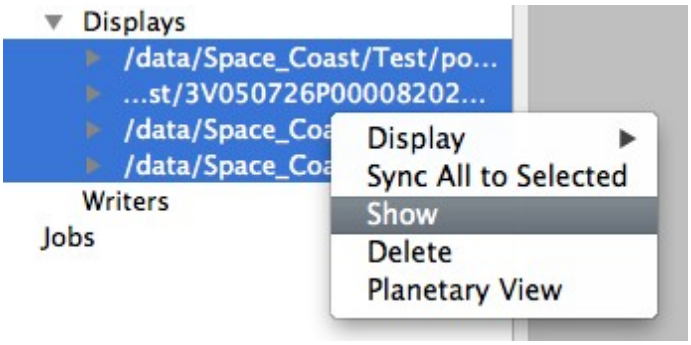

Figure 22. Show Displays Selection

All metric exploitation components are controlled via the Metric Exploitation window, as shown in Figure 23. Its tabs are active based on the selected mode, with the Image Summary tab always active. The ***Dismiss*** button hides the window, but maintains the mode. The window can be revealed again by reselecting the mode or by clicking in the Data Manager area and pressing the 's' key. The Reset Mode button resets to the no mode state and removes all measured points.

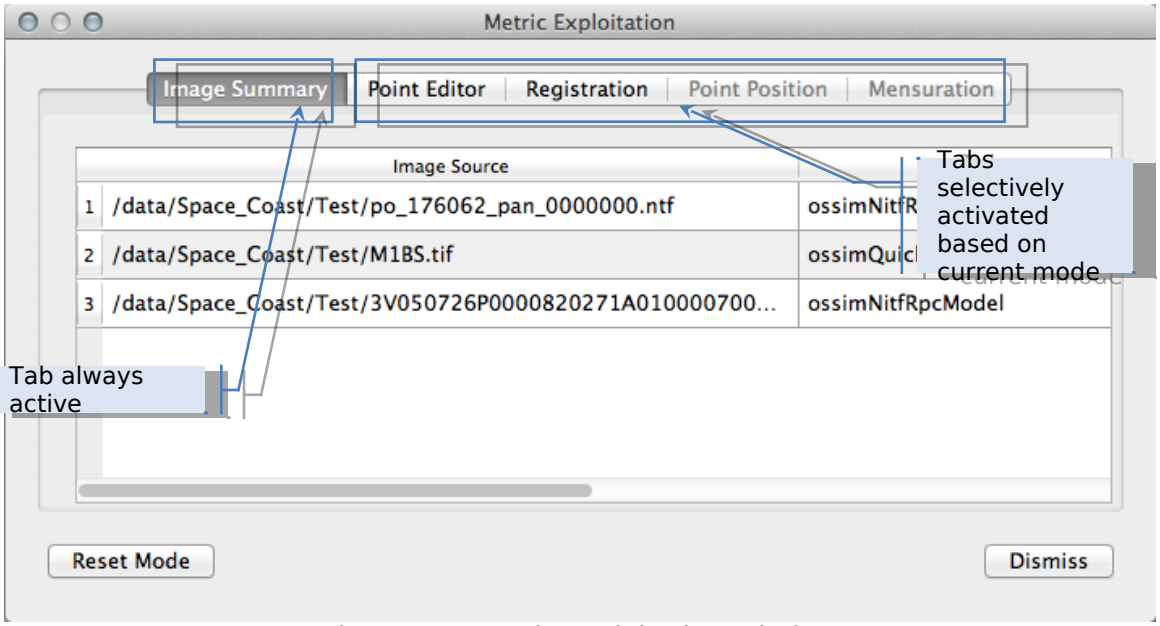

Figure 23. Metric Exploitation Window

4.2 Geopositioning

This section describes geopositioning component of metric exploitation. The point positioning function is NOT CERTIFIED FOR TARGETING. The Point Position tab is illustrated in Figure 24.

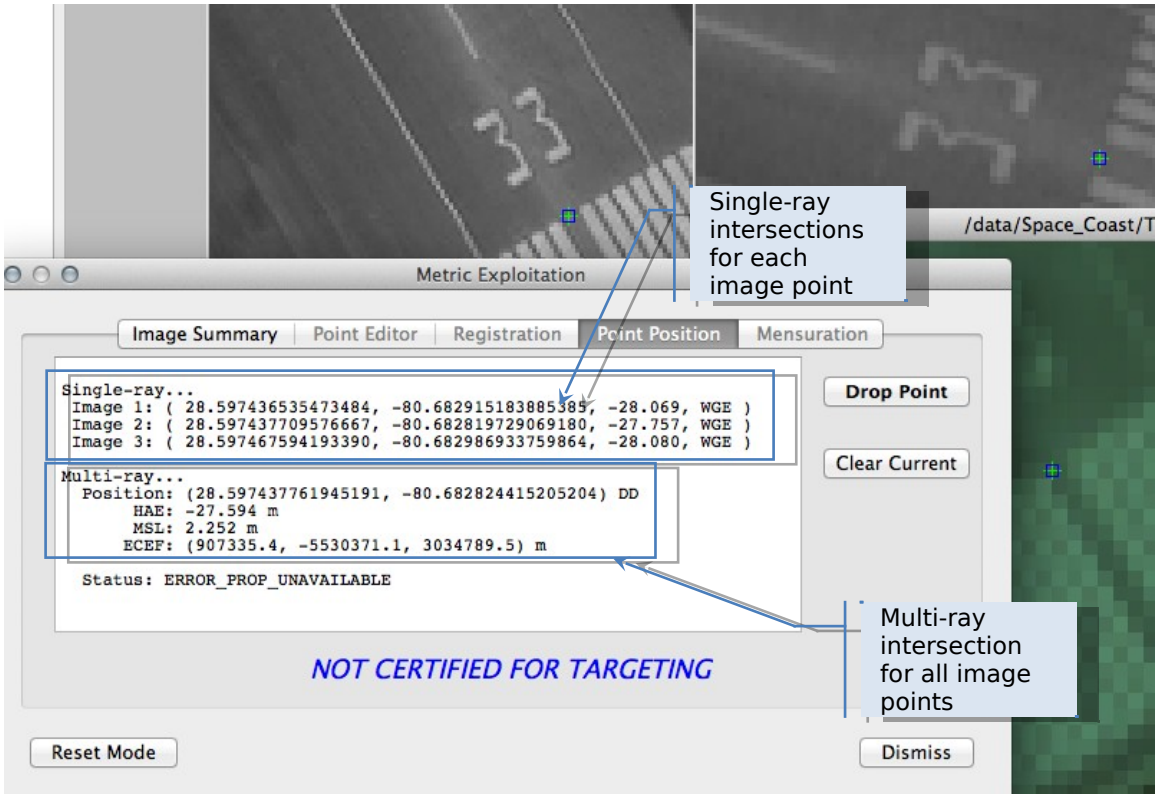

Figure 24. Point Position Tab

After measuring the corresponding point in each image, press the ***Drop Point*** button to execute the intersection ("point drop"). The results are written to the summary window. These results include individual single-ray intersections with the elevation surface and one multi-ray spatial intersection using all image rays. The display uses the following abbreviations:

1. DD: longitude, latitude in decimal degrees
2. HAE (also WGE): height above ellipsoid (WGS84)
3. MSL: height above mean sea level
4. ECEF: earth-centered earth-fixed Cartesian frame

4.3 Image Registration

The objective of registration is to adjust camera model error parameters to minimize projection error (residuals) for tie points appearing in all the images. This is not just a "cosmetic" bias removal, the sensor model is being used, and the adjusted error model parameters can be saved for downstream uses.

Image registration requires the measurement of tie points common to the image overlap areas. Based on the differences between the measured and projected point positions, selected image parameters are adjusted through a mathematical process known as a *bundle adjustment*.

4.3.1 Register Images

The Metric Exploitation-Registration tabbed window is composed of three tabs that are described in the following paragraphs.

4.3.1.1 Image Summary Tab

The Image Summary tab is illustrated in Figure 25.

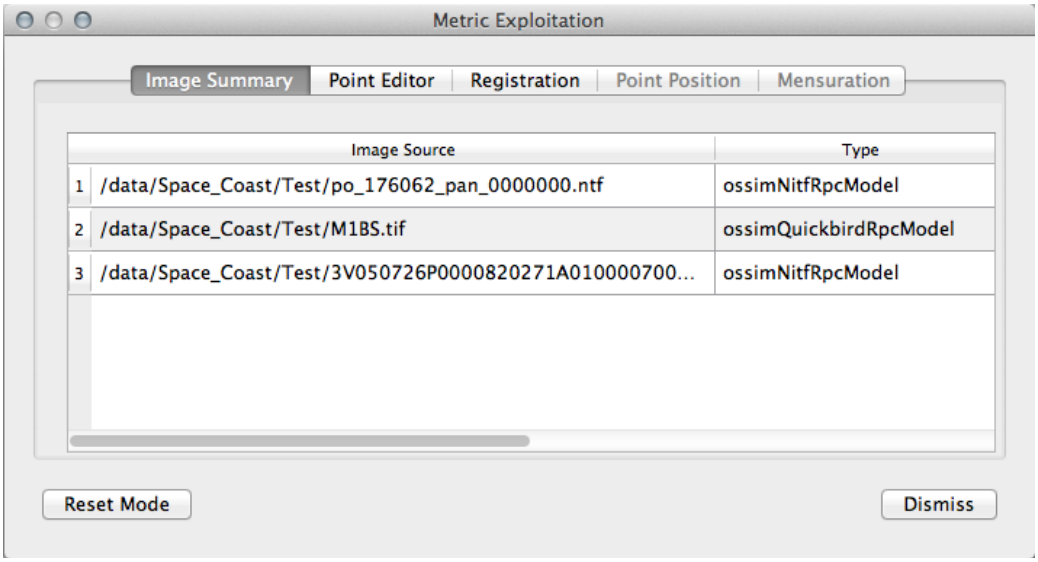

Figure 25. Image Summary Tab

This tab, which is primarily informational, provides a convenient view of the images and their associated types. A right-click context menu is available off the row header for each image, as shown in Figure 26. The context menu can be used to toggle the control status of the image (indicated by appending a "C" to the image number) and to display its Parameter Adjustments summary window.

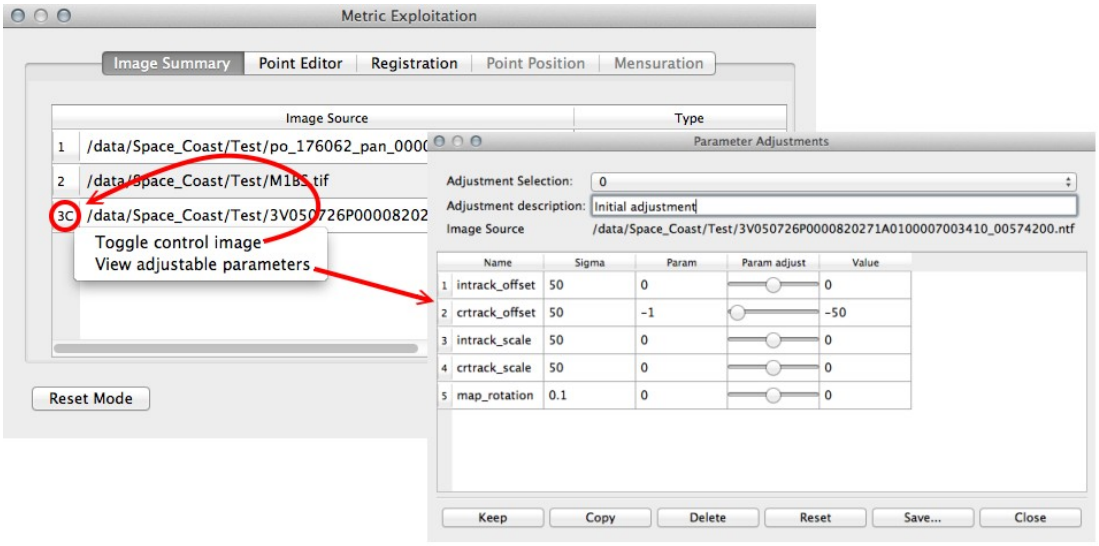

Figure 26. Image Context Menu

An image that does not have a sensor model (and/or associated adjustable parameter set) will be automatically designated as a control image. Control status toggling is not available in this case. This functionality allows the use of a map or controlled image base in the registration process.

4.3.1.2 Point Editor Tab

The Point Editor tab is illustrated in Figure 27. Follow these steps to manually add tie points:

1. Press the ***New Point*** button to create a new table column and increment the current point indicator (below the ***New Point*** button).
2. Measure the current tie point in each image. The corresponding table cell will turn yellow.
3. For any point, after the first image has been measured, clicking on the point header will preposition all images to the corresponding position.
4. Any individual image point measurement can be toggled to inactive (indicated by red) by clicking on the cell. The point's symbol will also turn red and it will not be included in the solution.
5. Clicking on its column header revisits any tie point.

As an alternative (or supplement) to manual tie point measurement, press the ***Auto*** button to activate the Auto Measurement dialog box. *If the opencv plugin and associated OpenCV library is not available will be grayed out, indicating that it is not available.*

Refer to paragraph 4.3.1.4 for a detailed description of the auto measurement function.

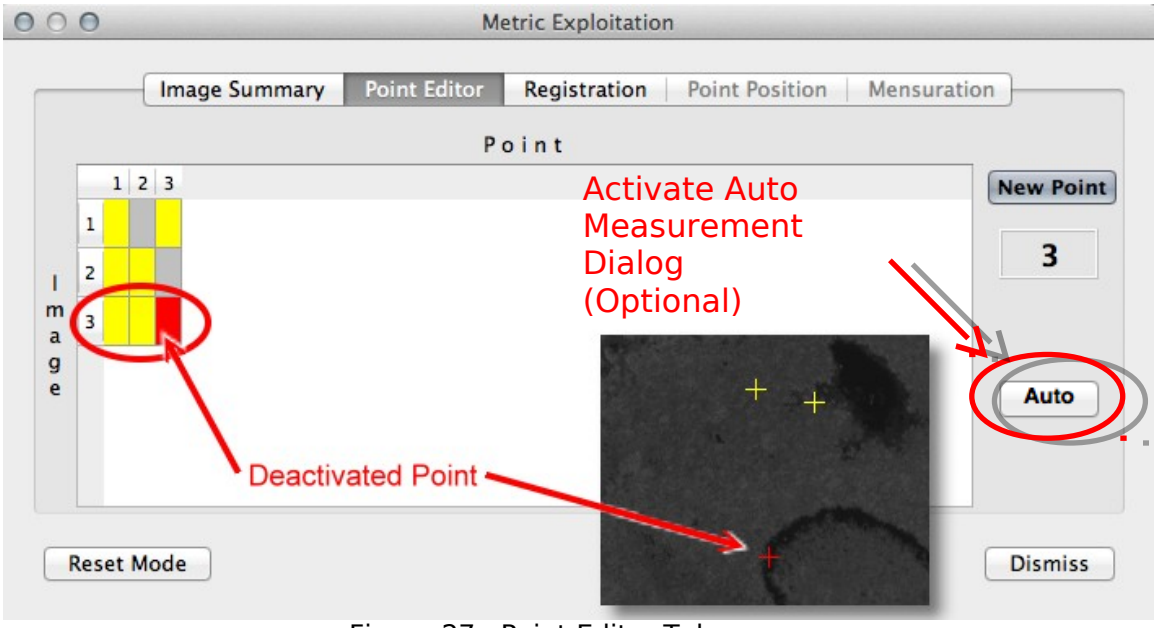

Figure 27. Point Editor Tab

4.3.1.3 Registration Tab

The Registration tab is illustrated in Figure 28. Upon completion of tie point measurement, press the ***Register*** button to execute the registration solution. A detailed solution report is written to the summary window. See paragraph 4.3.2 for a description of the report content. If the results are satisfactory, press the ***Accept*** button to save the parameter adjustments. Press ***Clear*** to remove the report, ignore the solution, and perform additional tie point editing.

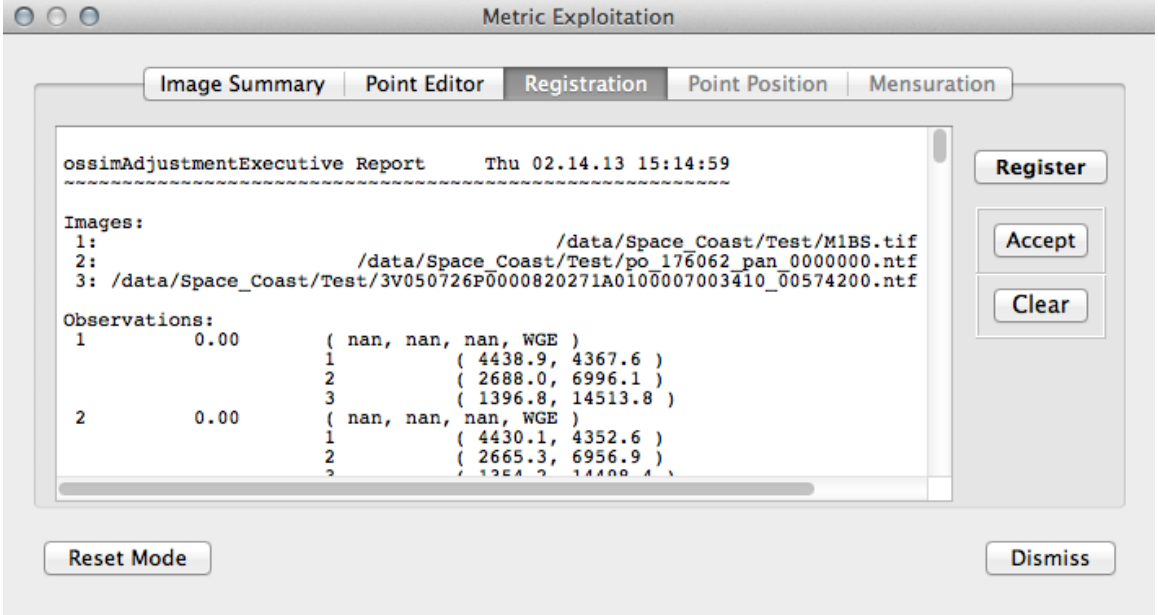

Figure 28. Registration Tab

4.3.1.4 Auto Measurement Dialog Box

The Auto Measurement dialog box is illustrated in Figure 29. This function utilizes the OpenCV library (http://opencv.org/) to perform tie point ("key point" in OpenCV terminology) matching for overlapping image pairs. This tabbed window is composed of two tabs: Configuration, which allows limited interaction with OpenCV parameters, and Collection, which provides execution and review of the matching process.

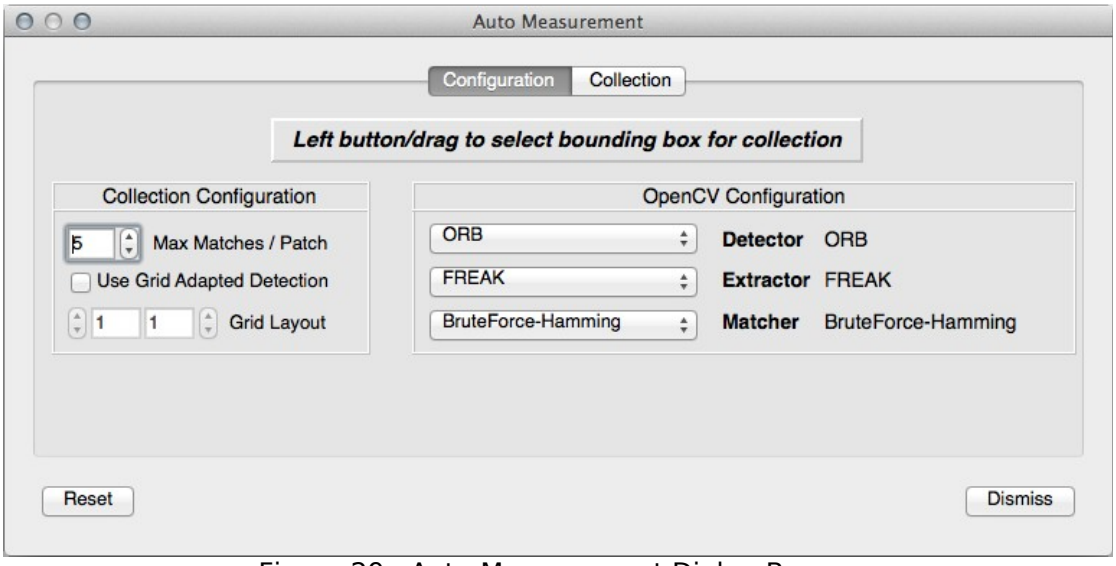

Figure 29. Auto Measurement Dialog Box

The Configuration tab (Figure 29) includes two frames containing parameter controls, described as follows:

- Collection Configuration
  - ✓ Max Matches / Patch
    Allows specification of the maximum number of tie points collected per patch.
  - ✓ Use Grid Adapted Detection
    If checked, use OpenCV's GridAdaptedFeatureDetector adaptor
  - ✓ Grid Layout (default = 1X1)
    {Disabled if "Use Grid Adapted Detection" is not checked}
    Allows adaptation of the detector (via GridAdaptedFeatureDetector) to partition the source image into a grid and detect points in each cell.

- OpenCV Configuration
  - ✓ Detector
    Allows selection of the feature detector; including the following
    - ORB (Oriented FAST and Rotated BRIEF)
    - BRISK (Binary Robust Invariant Scalable Keypoints)
    - FAST (Features from Accelerated Segment Test)
    - STAR
    - GFTT (Good Features to Track)
    - MSER (Maximally Stable Extremal Region)
  - ✓ Extractor (or Descriptor-Extractor)
    Allows selection of the feature descriptor-extractor ("binary" CV_8U descriptors only); including the following
    - FREAK (Fast Retina Keypoint)
    - ORB (Oriented FAST and Rotated BRIEF)
    - BRIEF (Binary Robust Independent Elementary Features)
    - BRISK (Binary Robust Invariant Scalable Keypoints)
  - ✓ Matcher
    Allows selection of the feature matcher; including the following
    - BruteForce-Hamming
    - BruteForceHammingLUT
    - FlannBased (Fast Library for Approximate Nearest Neighbors)

The point collection ROI can be defined in either image by left button/mouse drag action. When the mouse drag is complete the image is automatically zoomed to full resolution and the ROI is delineated with an overlay rectangle.

One the desired ROI is delineated, press the ***Execute*** button on the Collection tab illustrated in Figure 30 to run the auto measurement process.

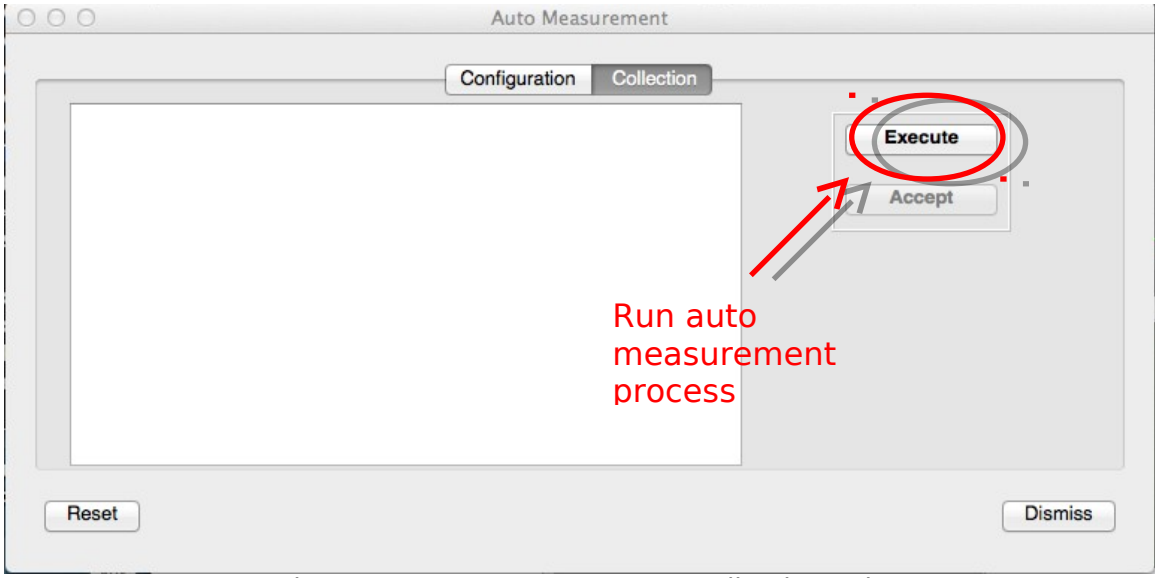

Figure 30. Auto Measurement Collection Tab

Upon completion of the process, the OpenCV Correlation Patch window appears to show the matched point pairs, as illustrated in Figure 31, along with ossimTieMeasurementGenerator report in the text window, as shown in Figure 32 and Figure 33.

Figure 31. OpenCV Correlation Patch Window

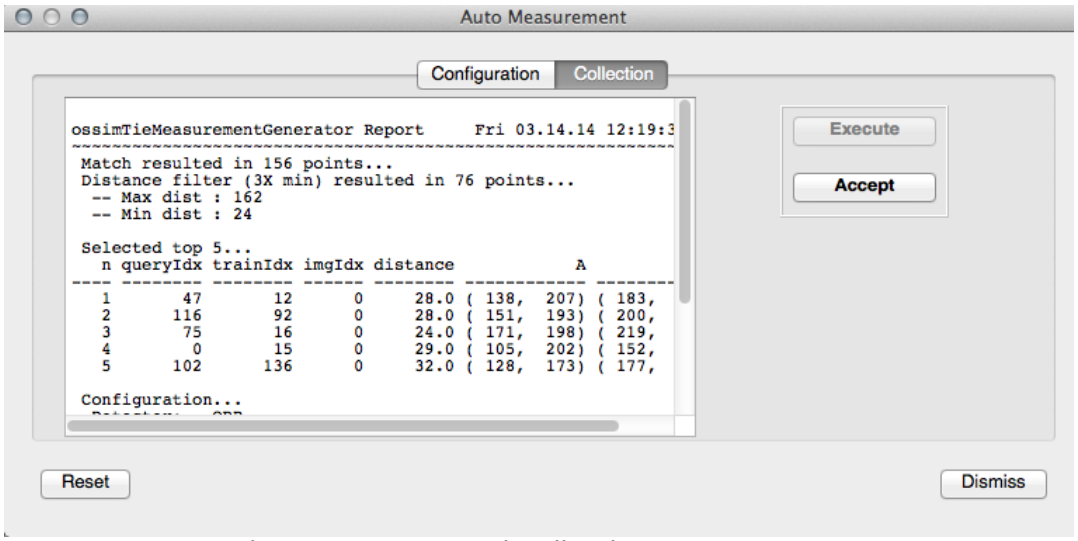

Figure 32. Accepted Collection Report, Part 1

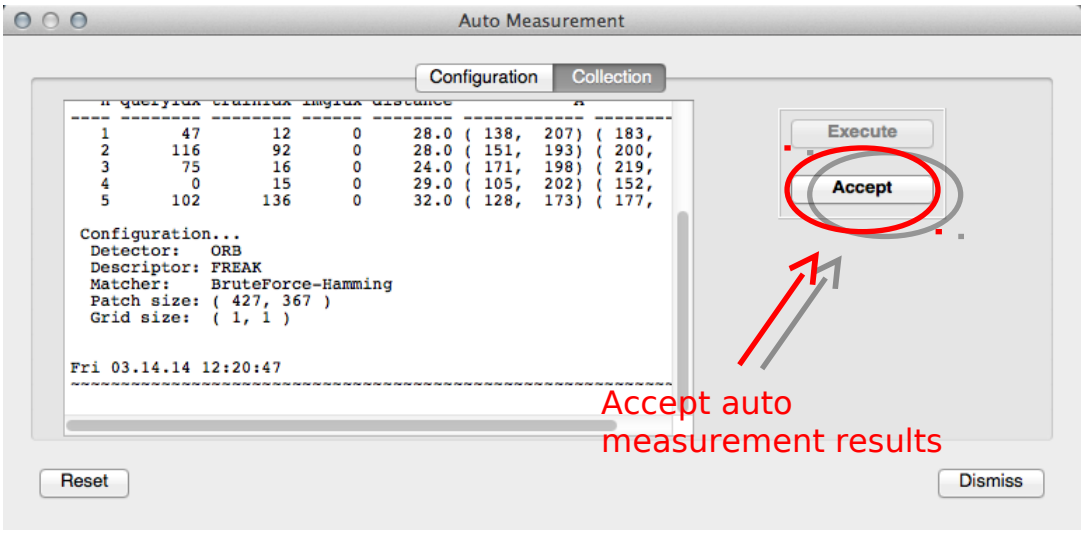

Figure 33. Accepted Collection Report, Part 2

The report includes selected performance measures extracted from the OpenCV process plus a configuration summary. The metrics include the following:

- Total number of points found before filtering
- Distance filter particulars
- Total number of points found after filtering
- OpenCV queryIdx and trainIdx, as well as distance, for each selected tie point pair (limited by the “Max Matches” parameter)

If the correlation result is satisfactory, press the ***Accept*** button and control returns to the Point Editor tab (paragraph 4.3.1.2), where additional point editing can occur if necessary.

4.3.2 Review Registration Report

The summary window shown previously in Figure 28 contains a detailed solution report. The report content is described in the annotated example below.

```
ossimAdjustmentExecutive Report     Tue 02.19.13 10:18:55
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Images:
 1:                       /data/Space_Coast/Test/po_176062_pan_0000000.ntf   nPar:  5
 2: /data/Space_Coast/Test/3V050726P0000820271A0100007003410_00574200.ntf   nPar:  5
 3:                                    /data/Space_Coast/Test/M1BS.tif       nPar:  5

Observations:
 1      0.00    ( nan, nan, nan, WGE )
                1       ( 2664.9, 6957.3 )
                2       ( 1353.9, 14498.8 )
                3       ( 4429.7, 4352.8 )
 2      0.00    ( nan, nan, nan, WGE )
                1       ( 2687.2, 6996.5 )
                2       ( 1396.7, 14513.9 )
                3       ( 4438.6, 4367.7 )
 3      0.00    ( nan, nan, nan, WGE )
                1       ( 2759.6, 6786.7 )
                2       ( 1309.9, 14306.7 )
                3       ( 4466.0, 4283.5 )

 Iteration 0...
Measurement Residuals...
 observation   image    samp    line    initial_meas
           1       1   -13.6    -8.9    ( 2664.9, 6957.3 )
           1       2    -9.4    -4.7    ( 1353.9, 14498.8 )
           1       3    -7.8    -5.1    ( 4429.7, 4352.8 )

           2       1   -13.7    -9.3    ( 2687.2, 6996.5 )
           2       2    -9.1    -4.1    ( 1396.7, 14513.9 )
           2       3    -7.7    -5.4    ( 4438.6, 4367.7 )

           3       1   -13.1    -8.7    ( 2759.6, 6786.7 )
           3       2    -9.0    -4.1    ( 1309.9, 14306.7 )
           3       3    -7.9    -5.5    ( 4466.0, 4283.5 )

              _____Mean:   -10.1    -6.2    RMS:    10.4     6.5

 Iteration 1...
Parameter Corrections...
  n im        parameter    a_priori  total_corr   last_corr initial_std    prop_std
  1  1   intrack_offset     0.00000    -4.42692    -4.42692    50.00000    25.13001
  2  1   crtrack_offset     0.00000    -6.07293    -6.07293    50.00000    28.72990
  3  1    intrack_scale     0.00000    -2.06101    -2.06101    50.00000    49.55460
  4  1    crtrack_scale     0.00000     8.96572     8.96572    50.00000    42.26942
  5  1     map_rotation     0.00000     0.00600     0.00600     0.10000     0.09838
  6  2   intrack_offset     0.00000    -3.45761    -3.45761    50.00000    25.89186
  7  2   crtrack_offset     0.00000    -2.44296    -2.44296    50.00000    31.14816
  8  2    intrack_scale     0.00000    -3.20288    -3.20288    50.00000    48.28139
  9  2    crtrack_scale     0.00000     3.58490     3.58490    50.00000    40.63788
 10  2     map_rotation     0.00000    -0.00018    -0.00018     0.10000     0.09395
 11  3   intrack_offset     0.00000    -5.15540    -5.15540    50.00000    11.65369
 12  3   crtrack_offset     0.00000    -5.39114    -5.39114    50.00000    15.80003
 13  3    intrack_scale     0.00000     6.69311     6.69311    50.00000    38.37173
 14  3    crtrack_scale     0.00000    -4.60951    -4.60951    50.00000    45.34128
 15  3     map_rotation     0.00000    -0.00367    -0.00367     0.10000     0.09936
```

Number of adjustable image parameters

Tie point summary list

Tie point image coordinates (s,l)

Tie point ground coordinates "nan" indicates uninitialized actual coordinates indicate generated from control image

Initial ("iteration 0") image space discrepancies (residuals)

Data summary subgroups repeat for each iteration

Adjustable parameter corrections

Ground coordinate corrections

Image measurement residuals

```
Observation Corrections...
 n         observation    a_priori  total_corr   last_corr initial_std    prop_std
 1                   1    28.59735     3.92079     3.92079    50.00000    22.61567
                         -80.68278    -2.71886    -2.71886    50.00000    22.91156
                         -26.83644     0.17051     0.17051    50.00000    28.04424

 2                   2    28.59700     3.47060     3.47060    50.00000    22.56157
                         -80.68255    -2.52333    -2.52333    50.00000    22.85947
                         -28.33215     2.04273     2.04273    50.00000    28.06490

 3                   3    28.59890     3.31765     3.31765    50.00000    22.66972
                         -80.68181    -2.38507    -2.38507    50.00000    22.90460
                         -29.76113     1.41584     1.41584    50.00000    28.05215

Measurement Residuals...
 observation   image    samp    line    initial_meas
           1       1    -0.1    -0.0    ( 2664.9, 6957.3 )
           1       2     0.0    -0.1    ( 1353.9, 14498.8 )
           1       3    -0.0     0.3    ( 4429.7, 4352.8 )

           2       1    -0.1    -0.0    ( 2687.2, 6996.5 )
           2       2     0.0     0.0    ( 1396.7, 14513.9 )
           2       3     0.2    -0.1    ( 4438.6, 4367.7 )

           3       1     0.2     0.0    ( 2759.6, 6786.7 )
           3       2    -0.0     0.1    ( 1309.9, 14306.7 )
           3       3    -0.2    -0.2    ( 4466.0, 4283.5 )

 _____________Mean:     0.0    -0.0    RMS:     0.1     0.1

 Iteration 2...
Parameter Corrections...
  n im        parameter    a_priori  total_corr   last_corr initial_std    prop_std
  1  1   intrack_offset     0.00000    -4.42816    -0.00124    50.00000    25.12279
  2  1   crtrack_offset     0.00000    -6.06469     0.00824    50.00000    28.75264
  3  1    intrack_scale     0.00000    -2.06194    -0.00092    50.00000    49.55560
  4  1    crtrack_scale     0.00000     8.97259     0.00687    50.00000    42.25599
  5  1     map_rotation     0.00000     0.00599    -0.00000     0.10000     0.09838
  6  2   intrack_offset     0.00000    -3.45382     0.00379    50.00000    25.89526
  7  2   crtrack_offset     0.00000    -2.44302    -0.00006    50.00000    31.17639
  8  2    intrack_scale     0.00000    -3.20447    -0.00158    50.00000    48.27970
  9  2    crtrack_scale     0.00000     3.57827    -0.00663    50.00000    40.63471
 10  2     map_rotation     0.00000    -0.00015     0.00003     0.10000     0.09394
 11  3   intrack_offset     0.00000    -5.15030     0.00510    50.00000    11.65931
 12  3   crtrack_offset     0.00000    -5.38992     0.00121    50.00000    15.78122
 13  3    intrack_scale     0.00000     6.67994    -0.01318    50.00000    38.39727
 14  3    crtrack_scale     0.00000    -4.61720    -0.00769    50.00000    45.33730
 15  3     map_rotation     0.00000    -0.00367     0.00000     0.10000     0.09936

Observation Corrections...
 n         observation    a_priori  total_corr   last_corr initial_std    prop_std
 1                   1    28.59735     3.92032    -0.00047    50.00000    22.61620
                         -80.68278    -2.71938    -0.00052    49.99998    22.90708
                         -26.83644     0.17089     0.00038    50.00000    28.04453

 2                   2    28.59700     3.47040    -0.00019    50.00000    22.56179
                         -80.68255    -2.52389    -0.00057    49.99999    22.85459
                         -28.33215     2.04298     0.00026    50.00000    28.06496

 3                   3    28.59890     3.31785     0.00020    50.00000    22.66964
                         -80.68181    -2.38592    -0.00085    49.99999    22.89936
                         -29.76113     1.41519    -0.00066    50.00000    28.05243


Measurement Residuals...
 observation   image    samp    line    initial_meas
           1       1    -0.1    -0.0    ( 2664.9, 6957.3 )
           1       2     0.0    -0.1    ( 1353.9, 14498.8 )
           1       3    -0.0     0.3    ( 4429.7, 4352.8 )
```

```
            2       1    -0.1     0.0    ( 2687.2, 6996.5 )
            2       2     0.0     0.0    ( 1396.7, 14513.9 )
            2       3     0.2    -0.1    ( 4438.6, 4367.7 )

            3       1     0.2     0.0    ( 2759.6, 6786.7 )
            3       2    -0.0     0.1    ( 1309.9, 14306.7 )
            3       3    -0.2    -0.2    ( 4466.0, 4283.5 )

                    Mean:    -0.0    -0.0    RMS:     0.1     0.1

ossimAdjustmentExecutive Summary...
 Valid Exec:          true
 Nbr Ground Pts:      3
 Nbr Image Points:    9
 Nbr Images:          3
 Nbr Parameters:      15
 -------------------------
 Solution Converged: true
 Solution Diverged:  false
 Max Iter Exceeded:  false
 Max Iterations:     7
 Convergence Crit:   5.0%

 SEUW Trace...
   Iter       SEUW
      0     36.918
      1      0.622
      2      0.622

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```

Observation metrics

Iteration convergence information

Post-solution summary

Standard error of unit weight per iteration

Additionally, the following terminology is used in the summary report:

1. `a_priori`: provisional estimate of parameter/ground coordinate
2. `total_corr`: total correction for all iterations
3. `last_corr`: correction computed from last iteration
4. `initial_std`: standard deviation of provisional estimate
5. `prop_std`: propagated standard deviation
6. `SEUW`: standard error of unit weight

At a top level, the following factors generally indicate an acceptable solution:

1. Solution converged, as illustrated in the example above
2. Decreasing/stabilized SEUW
3. Reasonable corrections to adjustable parameters and ground points

4.3.3 Save Adjusted Parameters

The adjusted parameters may be saved in the standard OSSIM geometry file format (`.geom`) by using the Parameter Adjustments

window referenced in paragraph 4.3.1.1. This action is selective, that is, each image parameter set must be saved independently using the ***Save…*** button, as shown in Figure 34. The adjustment is also labeled with the date and time.

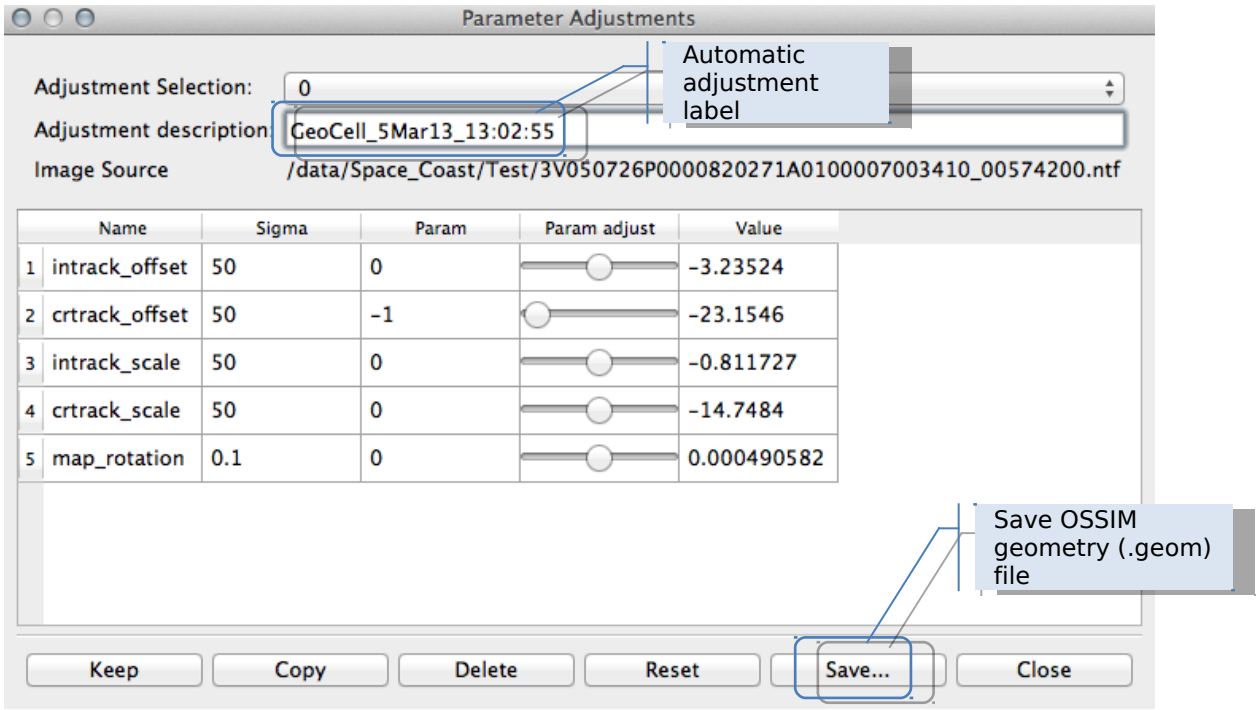

Figure 34. Parameter Adjustments Window - Saving Parameters

4.4 Mensuration

TBD