Section 10: Mosaics in IMAGINE

Section Objective

Students will be introduced to the methods of creating mosaics in ERDAS IMAGINE. In particular the MosaicPro tool will used compare different color balancing methods and to generate a final seamless mosaic

Class Notes

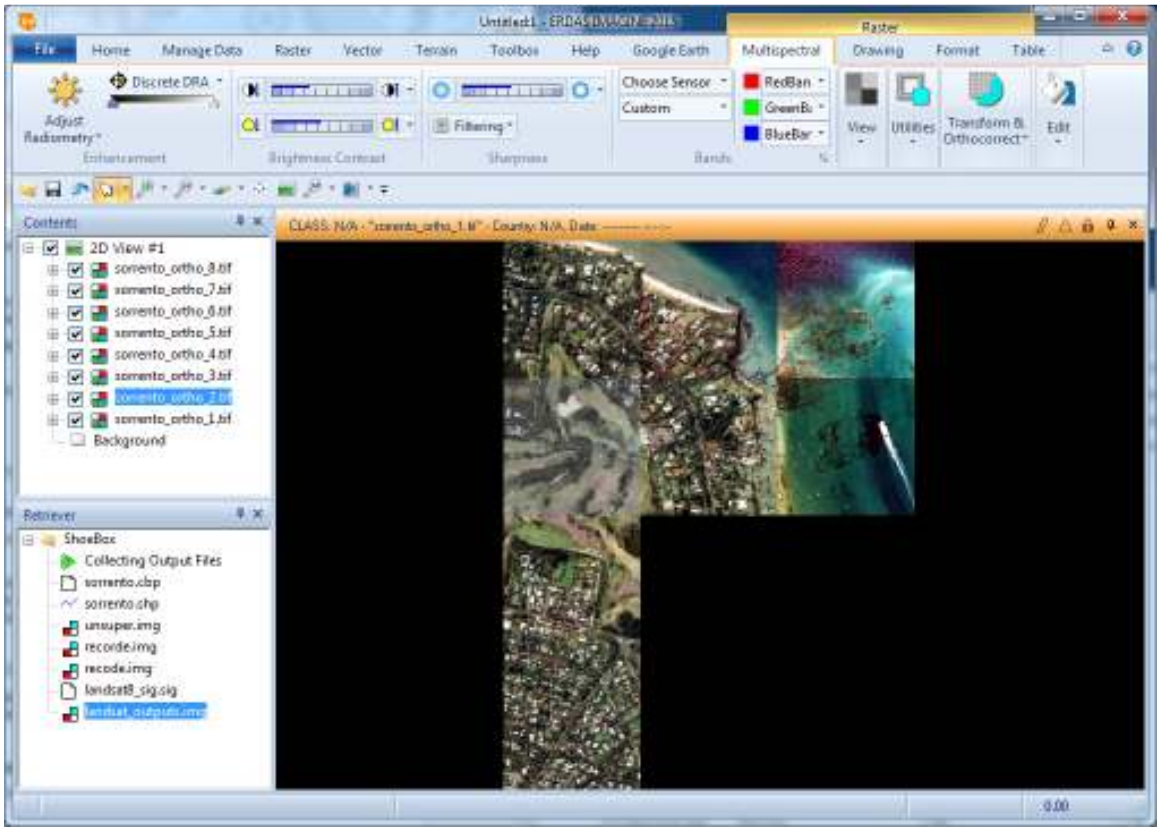
Mosaics in IMAGINE

Task 1: Creating a Virtual Mosaic

1. RMB click in the 2D View and select Open Raster Layer. In the Select Layer to Add dialog box, navigate to the ***Mosaics in IMAGINE*** folder.
2. Using the Shift key, select ***Sorrento_ortho1.tif*** – ***Sorrento_ortho11.tif*** and display in a 2D View
3. Tick the images on and off in the Contents panel

   Do the images overlap?

4. Select one of the images in the Contents panel. Click on the Raster Contextual Tab, Multispectral
5. Use the Brightness and Contrast thumbwheels to adjust the image



6. Use the pull-down arrow on the right side to select Contrast Reset and Brightness Reset

   Each image is displayed as an individual image as they were opened independently. You will now create a virtual mosaic to be able to make adjustments to the entire group of images.

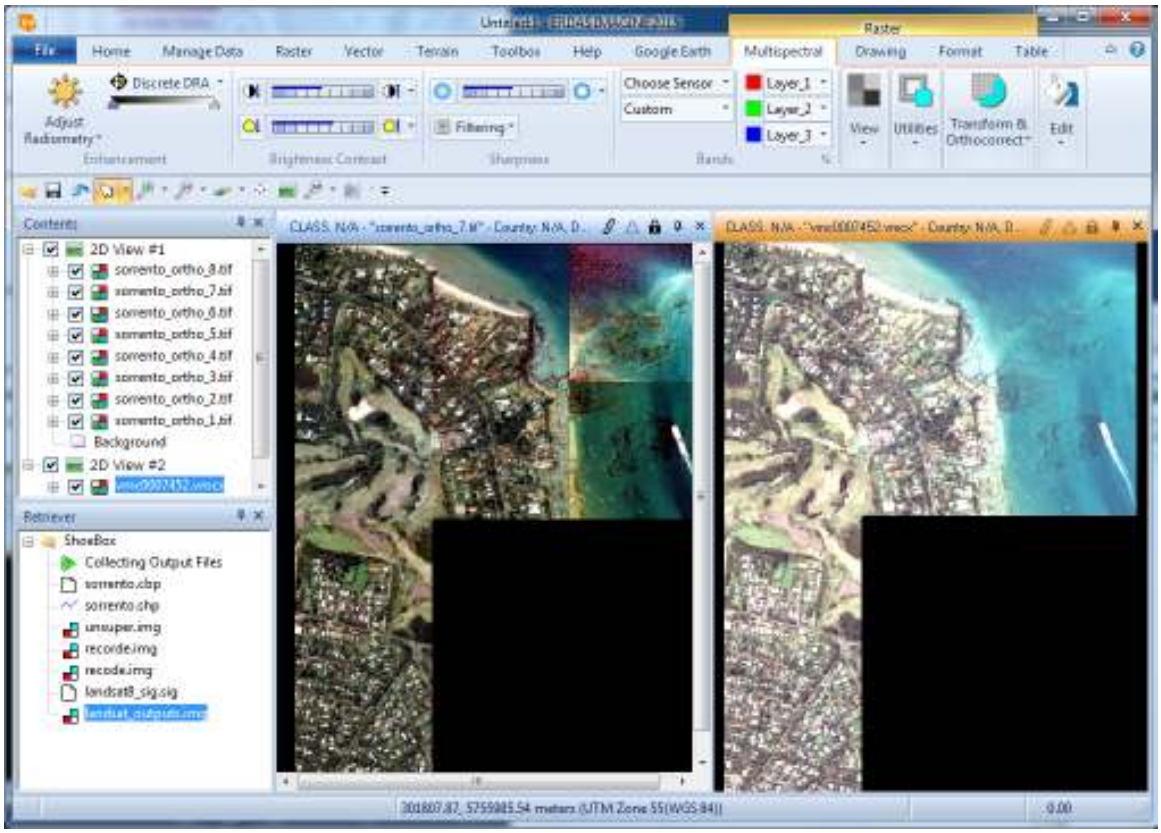
7. Open a second 2D View

8. RMB click in the second View and select Open Raster Layer
9. In the select Layers to Add dialog box, Navigate to and select ***Sorrento_ortho1.tif*** – ***Sorrento_ortho11.tif*** again, but before you click OK, select the **Multiple Tab**
10. Choose **Multiple Images in Virtual Mosaic**

    A proxy file is created in the same folder with a .vmcx file extension

11. Click **OK**
12. Select the virtual mosaic in the second 2D View in the Contents panel
13. Click on the Raster Contextual Tab, **Multispectral**
14. Use the Brightness and Contrast thumbwheels to adjust the image

    What happens to the image now?



The vmcx proxy file can be used just like 1 image in any ERDAS IMAGINE raster processing operations, including the Spatial Modeler

15. Open Windows Explorer and navigate to the directory where the images are located. You will find the proxy file there. RMB click and open the file with a text editor
16. **Close** the text editor
17. Close the 2nd View, do not save the changes. Leave only 2D View#1 open but **clear** it so it is empty, do not save the changes.

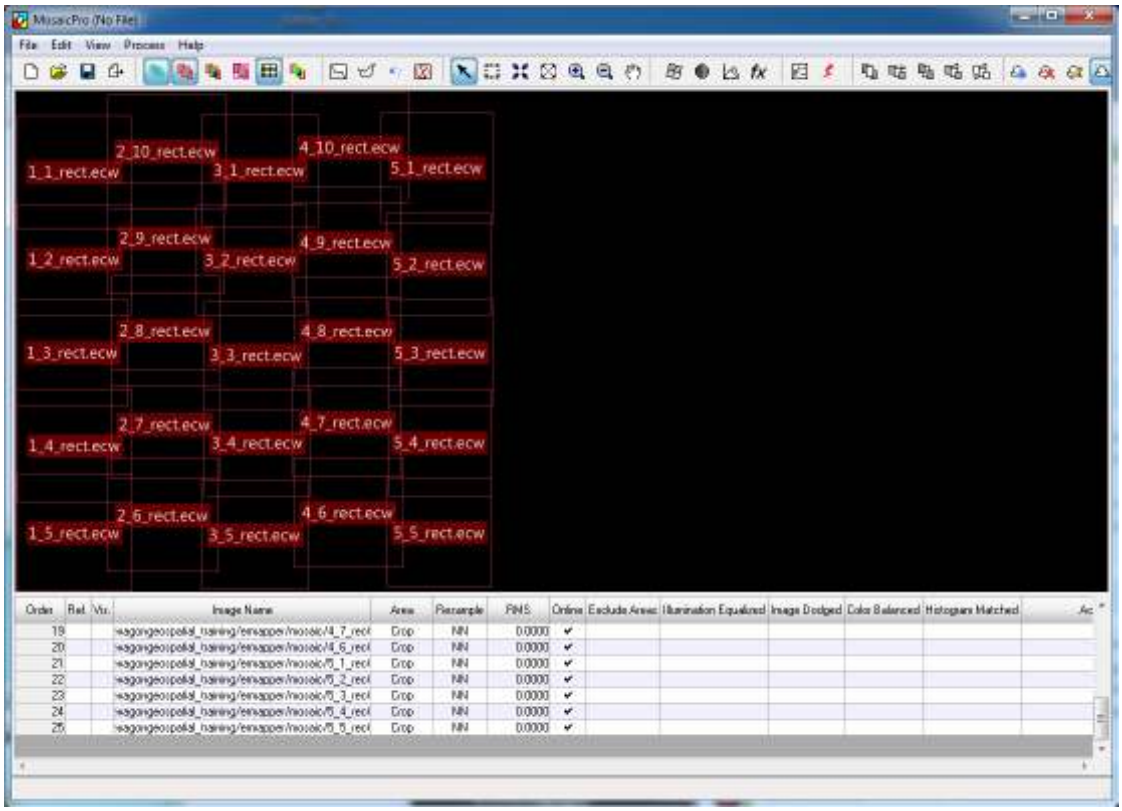
Task 2: Using MosaicPro

1. In a 2D view, RMB click and select **Open Raster Layer**
2. Use the Files of type at the bottom of the Select Layer to Add dialog box to filter for ECW (*.ecw) files only. Navigate to and select ***1_1_rect.ecw*** – ***5_5_rect.ecw***.
3. Click **OK** to load these 25 images in a Viewer

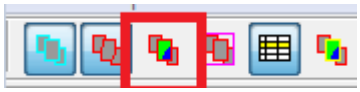
   What do you notice about the edges of each image?

4. Select the Raster tab on the Ribbon, and choose **Mosaic | MosaicPro**
5. From the MosaicPro toolbar, click the **Display Add Images Dialog icon** 
6. From the Add images dialog, select 1***_1_rect.ecw – 5_5_rect.ecw***
7. Before clicking OK, select the **Image Area Options**
8. Choose **Crop Area** by and enter **35** for the Percent
9. Click **OK**

   The image footprints display, as well as a row in the cell array for each image.

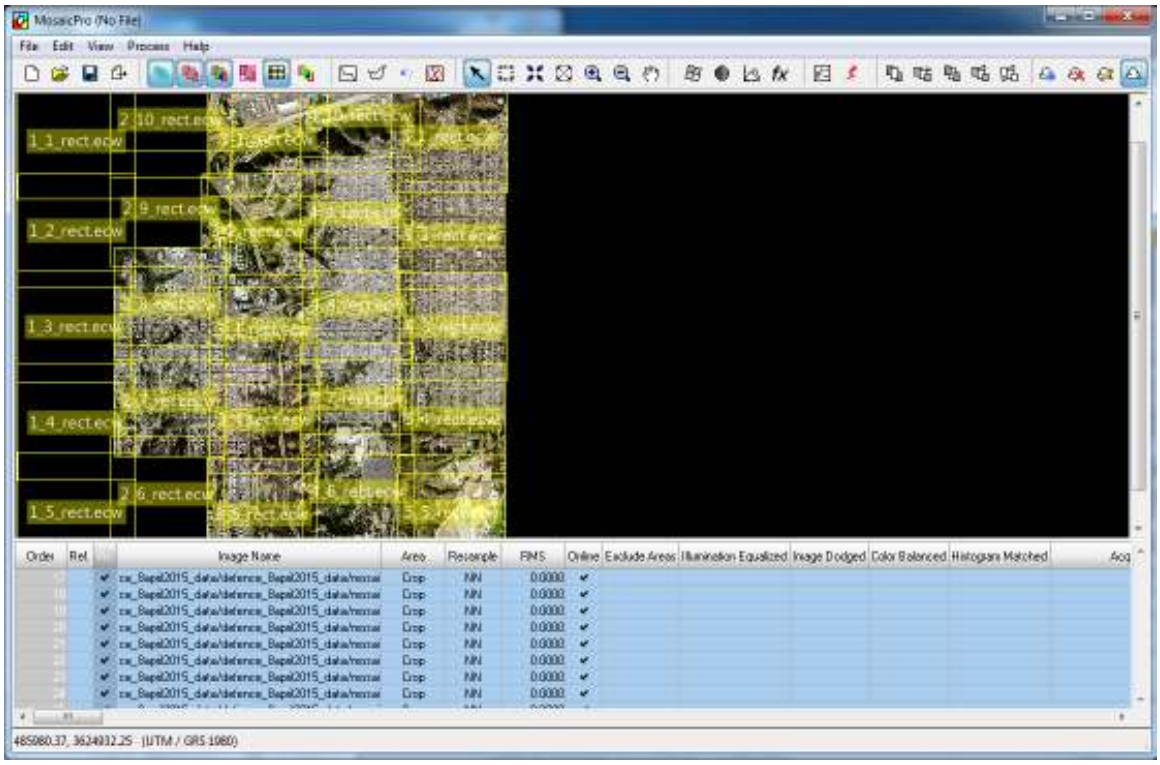


10. Select the Display Raster Images on the MosaicPro toolbar



11. **RMB** click in one of the cells under the Order column and choose **Select All**
12. Then click on the left side of the Vis. Column to highlight it. All rows and the Vis column should now be cross selected
13. Click in one of the Vis cells and this enables all images

    Some, but not all the images display. This is because the maximum number of rasters is set to smaller than the number of images in the MosaicPro project.



14. In MosaicPro select **View** | **Maximum Number of Raster's to Display**. Input **25** and click **OK**
15. Save the project by selecting **File | Save As**
16. Navigate to your output directory if it is not already set up in the Preferences and type **Mosaic** for the output file name. Click enter to add the **.mop** file extension to the project

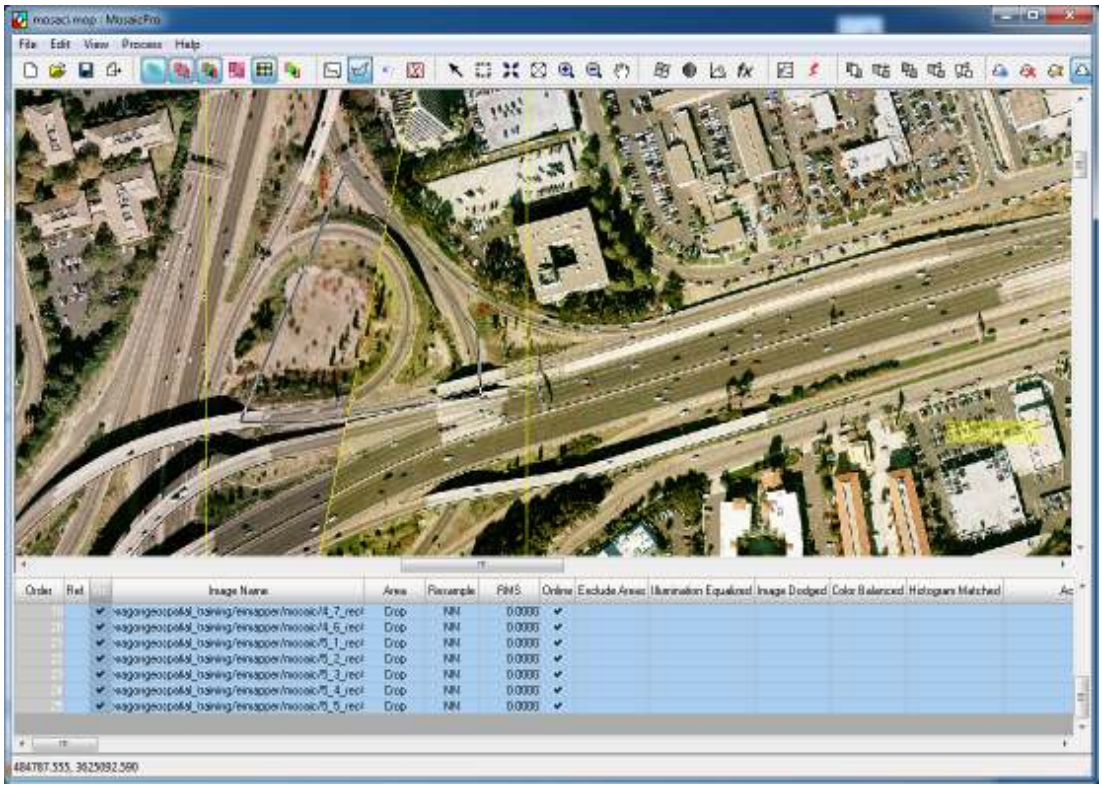
Task 3: Generate Seamlines

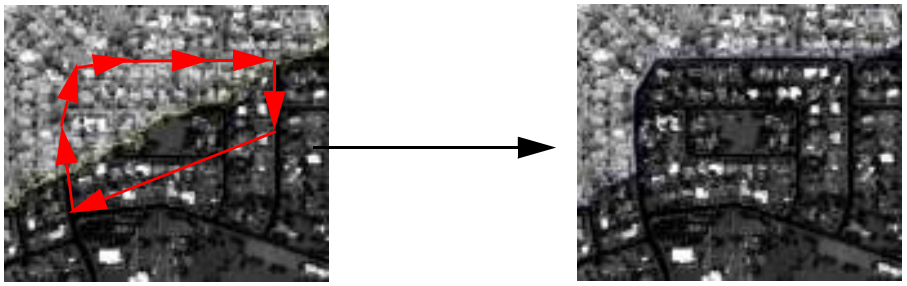
1. In MosaicPro, click the seamline generation icon

2. Choose Weighted Seamline and click Set

The value of the Cost Function is determined by a weighted combination of Pixel Value Similarity, Direction, and Standard Deviation. Since the default value of all three weighting factors is one, changing any of the numbers to a higher number will give that factor more importance in the weighting procedure

3. View the Weighted Seamlines options. Click **OK** to accept the defaults
4. Zoom in on a seamline
5. Click the **Edit seams polygon** icon 
6. Digitize a polygon around a portion of the seamline. See below. The side of the seamline from which the polygon originated is the one that will increase in size when the polygon is completed



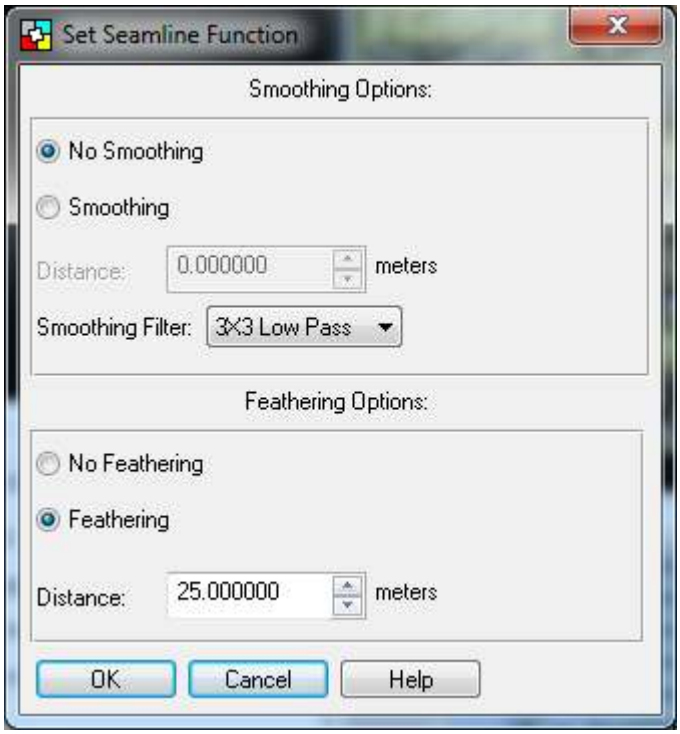


7. Move along the seamline and make any additional changes where necessary. The seamline will be displayed in the mosaic canvas
8. Select **View** and deselect **Labels** if you would like to hide the image ID's
9. Continue to practice editing the seamlines to ensure that they follow linear features in the overlapping regions of all images.
10. Select **File** | **Save Seam Polygons**
11. Type **seamlines** and click enter to save the seamlines as a shapefile
12. From the Mosaic Pro Toolbar, click the **Set Seamline Function** icon 

    This allows us to set the function used to handle the areas within the overlap

13. Click the **No Smoothing** radio button

14. Enable the **Feathering** radio button
15. Type **25** for the Distance in meters

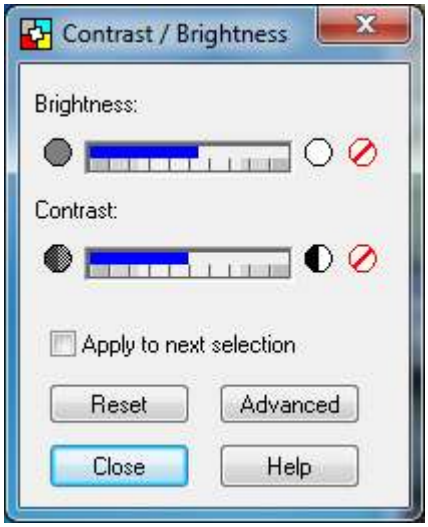


The feathering operation could be used to blend the transition between the two images. More feathering occurs at the seamline and its intensity decreases as you move away from the line.

16. Click **OK** to dismiss the Set Seamline Function dialog box.

Task 4: Color Corrections

1. In the CellArray, RMB click in the Order column and **Select None**. Do the same for any rows that may be selected. Nothing should be selected in the cell array.
2. Select an image that is distinctly brighter or darker than the others, i.e. **2_9_rect.ecw**
3. Click on the Adjust Individual Images Radiometry icon to open the Brightness / Contrast dialog box



4. Use the Thumbwheel and **increase brightness / contrast** to match that of the other surrounding images
5. Select a different image in the MosaicPro workstation. It will highlight. Make any adjustments necessary
6. You can reset the adjustments at any time by clicking on the **Reset icons**
7. Click on the **Advanced button**
8. In the Method pull-down, select Linear. Click **Apply**

   What does this do the image?
9. Click **Close** to dismiss the Advanced dialog box.
10. Select and click **Reset** to set all images back to their original contrast and brightness.
11. **Close** the Contrast / Brightness dialog

Task 5: Setting Exclude Areas

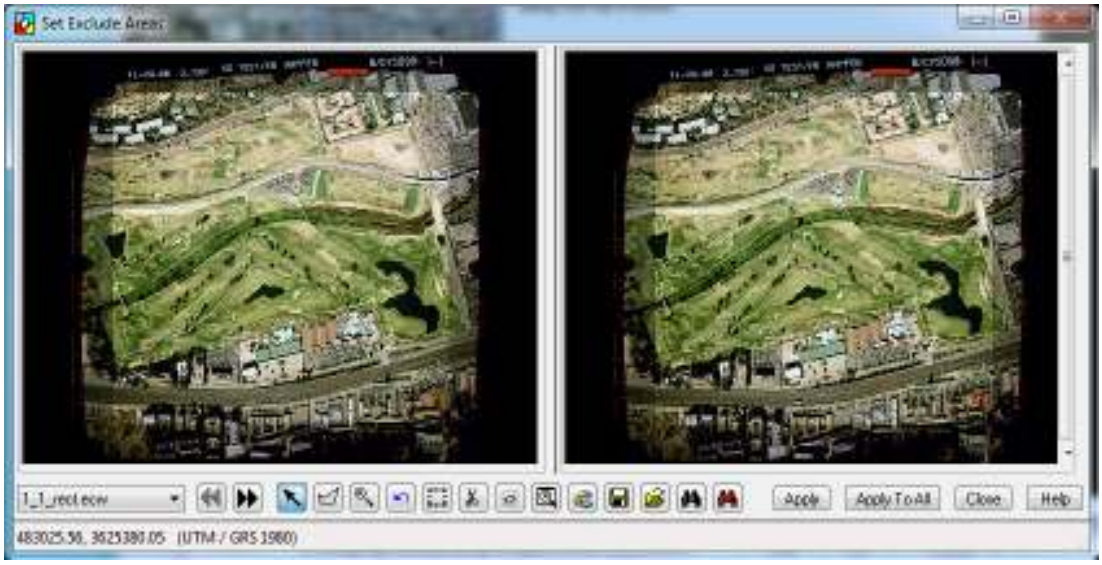
Many images to be mosaicked can display anomalous brightness or color of the same features between individual sensor captures of the area. These anomalous areas are candidates for the Set Exclude Areas option

1. Click the Color Corrections Options icon

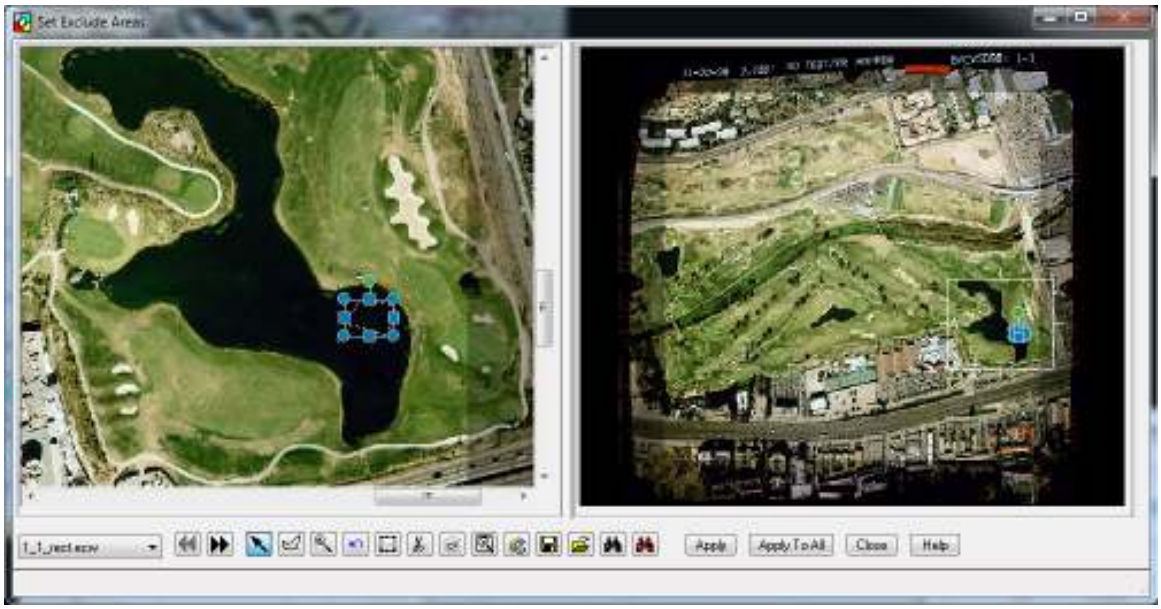
A Color Corrections dialog displays.

> *When using two or more of the Colour corrections options, they should be performed in the order they appear in the dialog, from top to bottom*

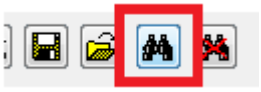
2. Tick the box **Exclude Areas**
3. Click **Set** to open the Set Exclude Areas window
4. RMB click inside the Right View and select **Fit Image to Window** if necessary.

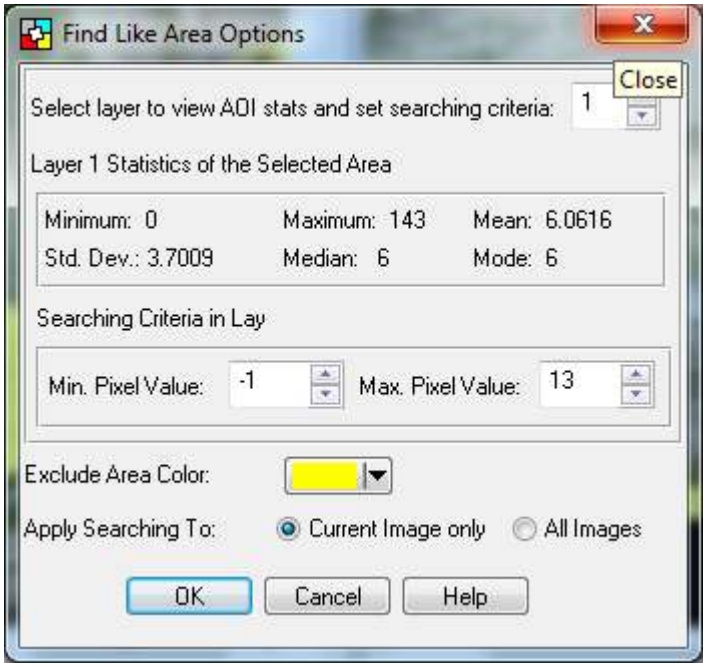


5. In the Left View, use the MMB and scroll wheel to zoom into the large dark lake
6. Click on the **Create Polygon AOI icon** , and digitize a polygon in the lake



7. Click the **Exclude areas that are spectrally similar to the AOI region**

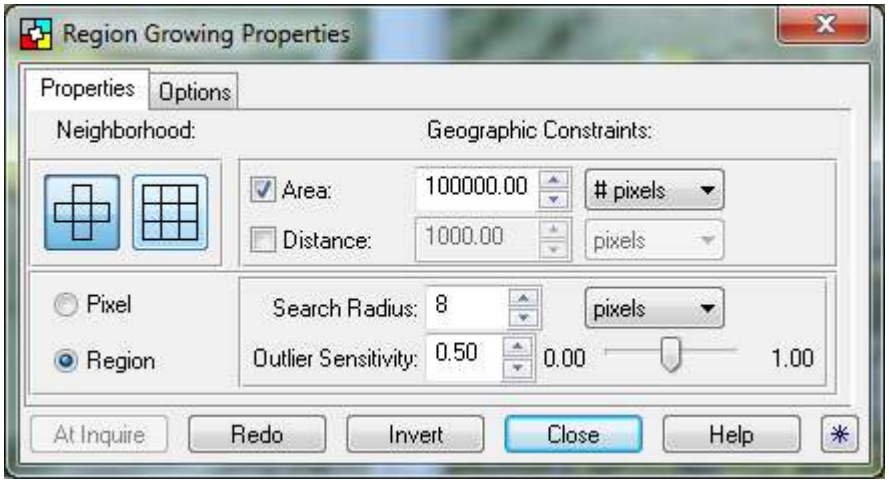




8. Click **OK** to generate the similar regions

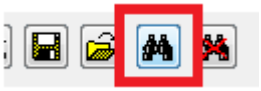
9. Once the process has returned a result, navigate to another dark lake region
10. Click on the **Region Grow** Properties icon

11. Select the **Region radio** button



12. **Close** the Region Grow Properties.
13. Click on the Region Grow Tool

14. **Draw** a small box. All pixels that are spectrally similar will be included
15. Click the **Exclude areas that are spectrally similar to the AOI region**



Examples of anomalous brightness or color:

- One image contains a large dark lake, but the overlapping image contains sun glint reflecting from the same lake causing the lake to appear white.
- One image contains a forest, but in the overlapping image the forest has been clear cut to expose bare ground.
- One image contains a blue building, but the overlapping image shows the same building in green.
- One image contains hotspots (area of concentrated reflected light), but the overlapping image does not.

These anomalies can skew calculations, resulting in a final mosaic that is too dark or too light.

16. Once you are satisfied with excluding areas that could potentially skew the results of the mosaic, click **Apply** to the 1 image, then use the pull-down to change to the next image

    When performing a mosaic, you would repeat the Set Exclude Areas for all images. In training we will practice this exercise on the first image, but not use Set Exclude areas in the final mosaic.

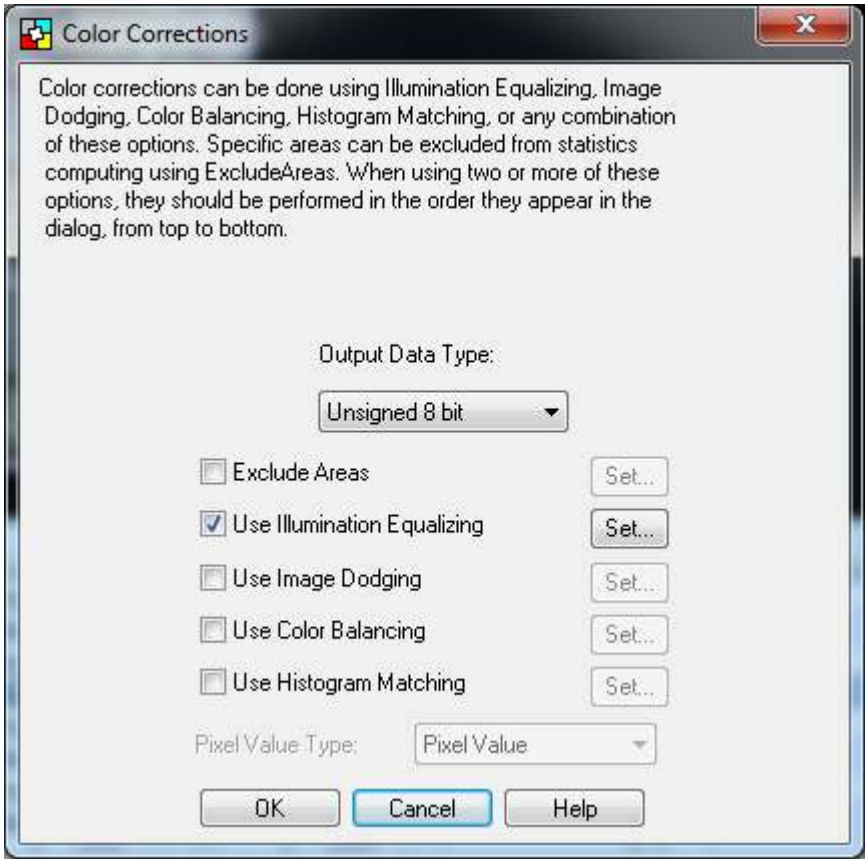
17. Click **Close** in the Set Exclude Areas
18. **Deselect** Exclude Areas

yo

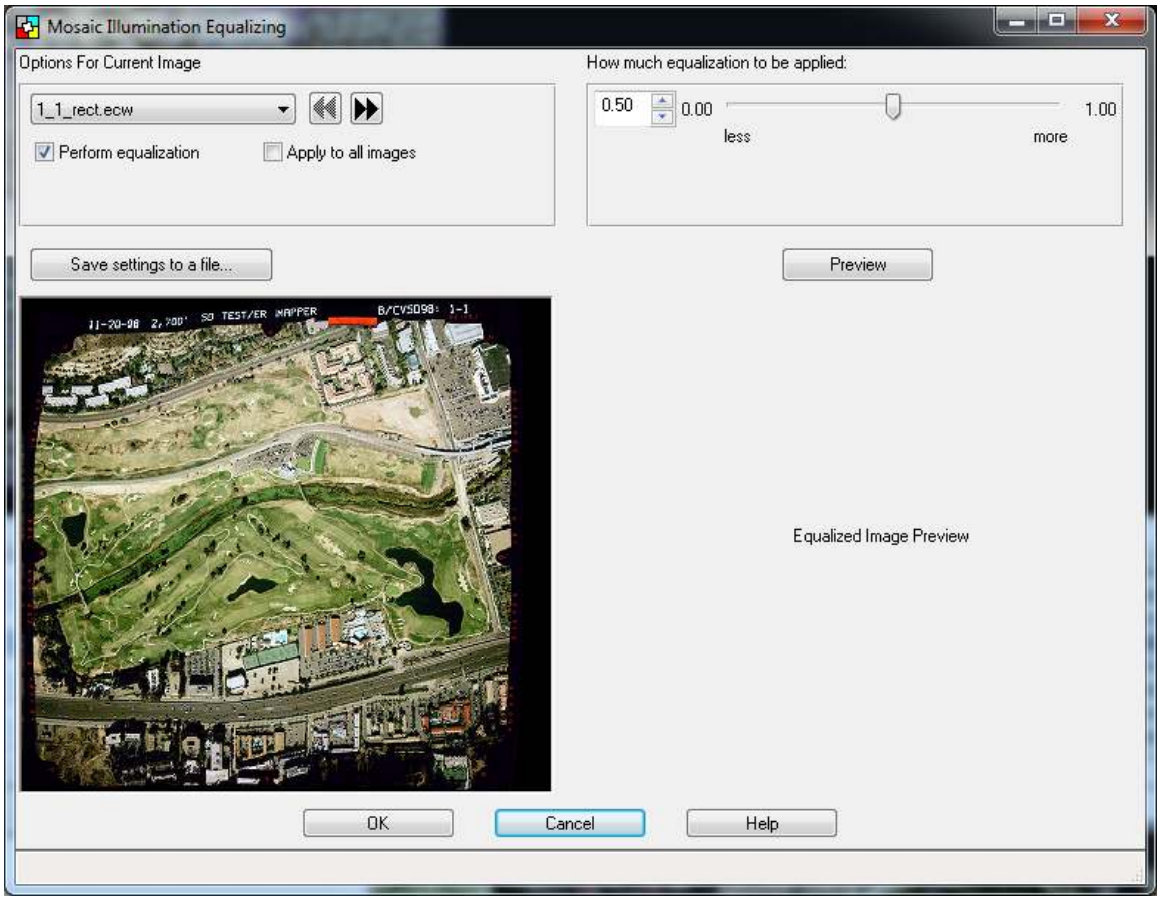
Task 6: Select Use Illumination Equalizing

The MosaicPro Illumination Equalizing tool is used to adjust the variations of illumination or color of an image. The illumination or color of areas too dark, bright or color shifted can be equalized with this tool. It is suitable for many aerial photographs on which the illumination can be uneven dramatically

1. Tick on the box for **Use Illumination Equalizing**



2. Click **Set**
3. Change the image in the pull-down to ***5_5_rect.ecw***
4. In the Mosaic Illumination Equalizing dialog, check on **Perform Equalization**
5. In the Viewer on the left side, RMB click and select **Fit Image to Window**



6. Click the Preview button.
7. Once the Preview has been completed, RMB click in the right Preview window and select Fit to Frame.

Does the image look better or worse?

8. Use the How much equalization to be applied slider bar at the top and move it to the left for less equalization.
9. Click Preview again.

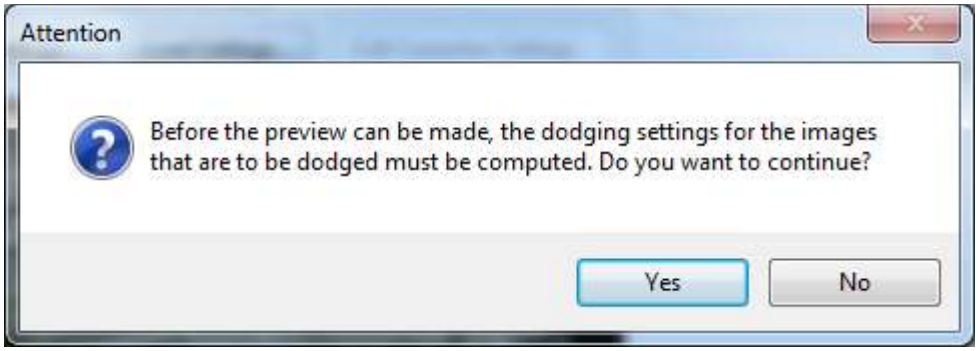
Is this colour balancing options appropriate for this image?

10. Deselect the **Perform Equalization** on this image checkbox.
11. Click Cancel. Click No to any messages regarding saving changes
12. In the Color Corrections, deselect Use Image Equalizing.

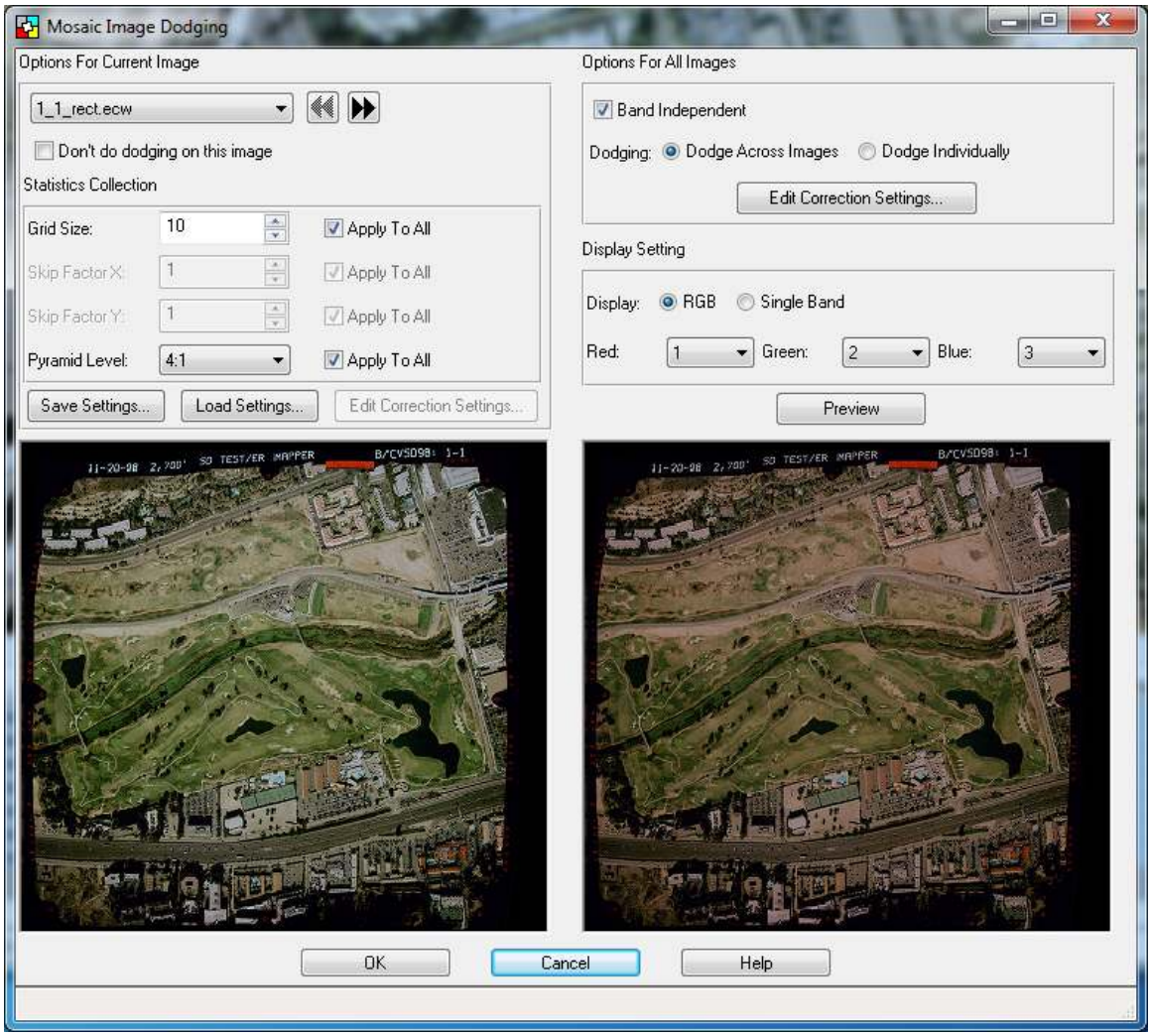
Task 7: Set Image Dodging

1. Enable **Image Dodging** and click **Set**

2. **RMB** click in the Viewer on the left that is all black, select **Fit Image to Window**
3. Click the **Preview** button



4. Click **Yes** to the Attention Box to compute the dodging settings
5. Once the settings are computed, **RMB** click in the viewer on the right and select **Fit Image to Window**



Does the image look better or worse?

6. As the image does not look any better with image dodging, select the Don't do dodging on this image checkbox
7. Use the pull down menu to change the image to correct to ***1_2_rect.ecw***
8. Click Preview again to view the image after the image dodging parameters are applied

   Is the image more balanced?
9. Once you have finished practicing Image Dodging, click **Cancel**
10. **Deselect** Use Image Dodging in the Color Corrections dialog box

Task 8: Color Balancing

The Color Balancing dialog attempts to remove the brightness variations in images before they are mosaicked by assuming the variations can be modeled as a surface. There are five surface methods that can be selected depending on the patterned color difference observed in the image. A patterned color difference is the shape of a particular color difference in your image. The surface methods are:

Parabolic color difference has shading in an elliptical pattern where the image gets darker or lighter on one side faster than it does on the others.

Linear color difference has shading that graduates from being dark at one end of the image to light at the other.

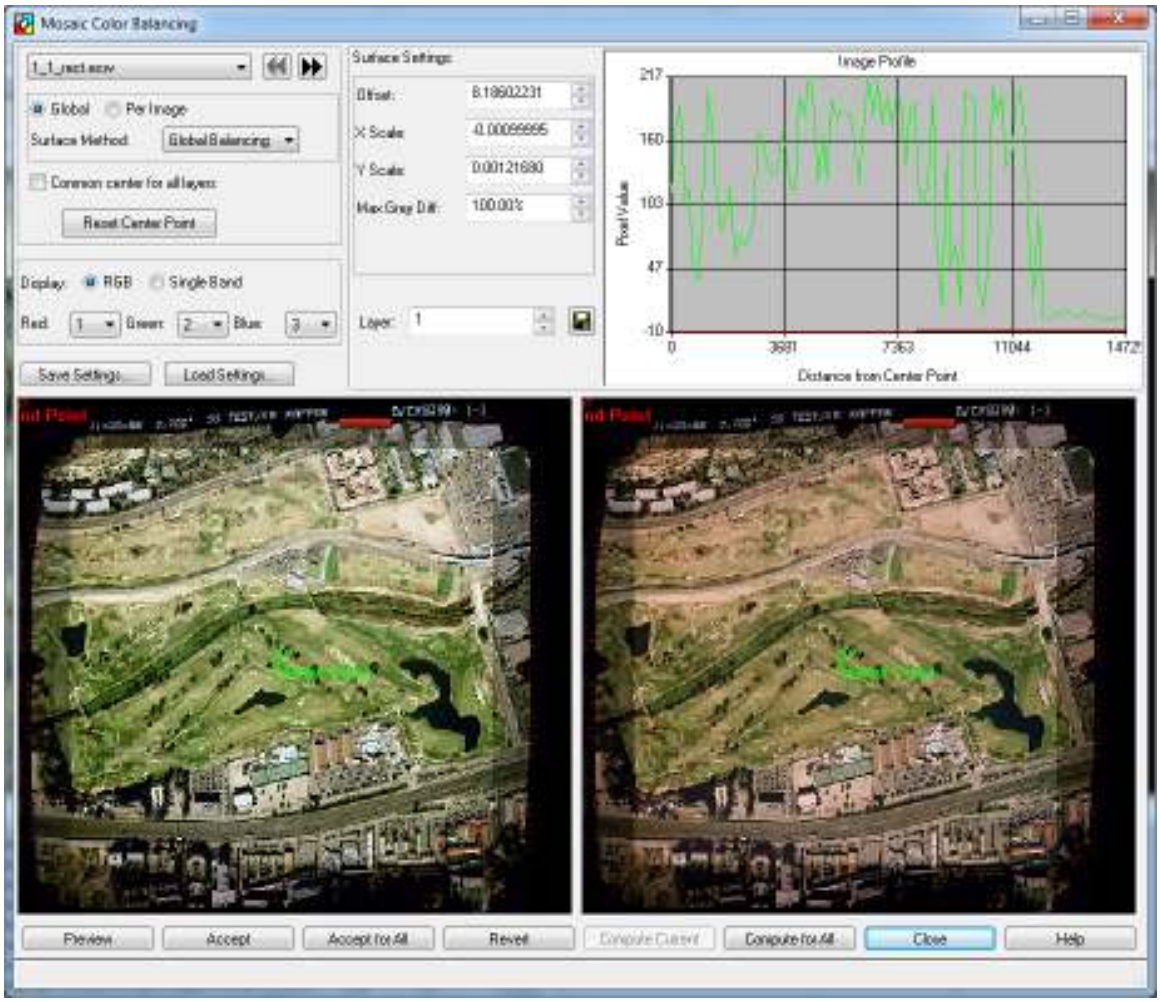
Conic color difference has a shading pattern from light to dark or dark to light at the same rate in a radial pattern.

Exponential color difference is very bright in the center and then slowly, but not necessarily evenly, darkens on all sides. This often occurs in an elliptical pattern.

Global balancing adjusts the brightness of each image based on the brightness values in the areas it overlaps with in other images.

1. In the Color Corrections dialog box enable **Use Color Balancing**
2. Click **Set**

   There are two options for the Correction Method: Automatic and Manual
3. Click the **Manual Radio** button and then click **Set**
4. When the Mosaic Color Balancing dialog opens click the **Compute for All** button at the bottom. This may take a few minutes to Calculate.
5. Once the Statistics have been completed, click the **Preview Button**
6. Click inside the Viewer on the left, and choose **Fit Image to Window**
7. Click inside the Viewer on the right, and choose **Fit Image to Window**



The surface method is set to Global Image Balancing instead of balancing each image through a different surface method.

8. Use the pull down arrow or the advance arrows to change the image at the top of the dialog to ***1_2_rect.ecw.***
9. Click **No** in the attention box regarding saving the changes.
10. Click **Preview** again, and then **RMB** click | **Fit Image to Window** in both Viewers.

Which of the two images look better with Global Colour Balancing?

11. Once you have finished comparing and contrasting some of the images in the Manual Global Color Balancing, click **Close**
12. You will be returned to the Set Color Balancing Method
13. Click **Automatic Color Balancing**

This will default to do global color balancing for all images automatically. The method is set in the Preferences.

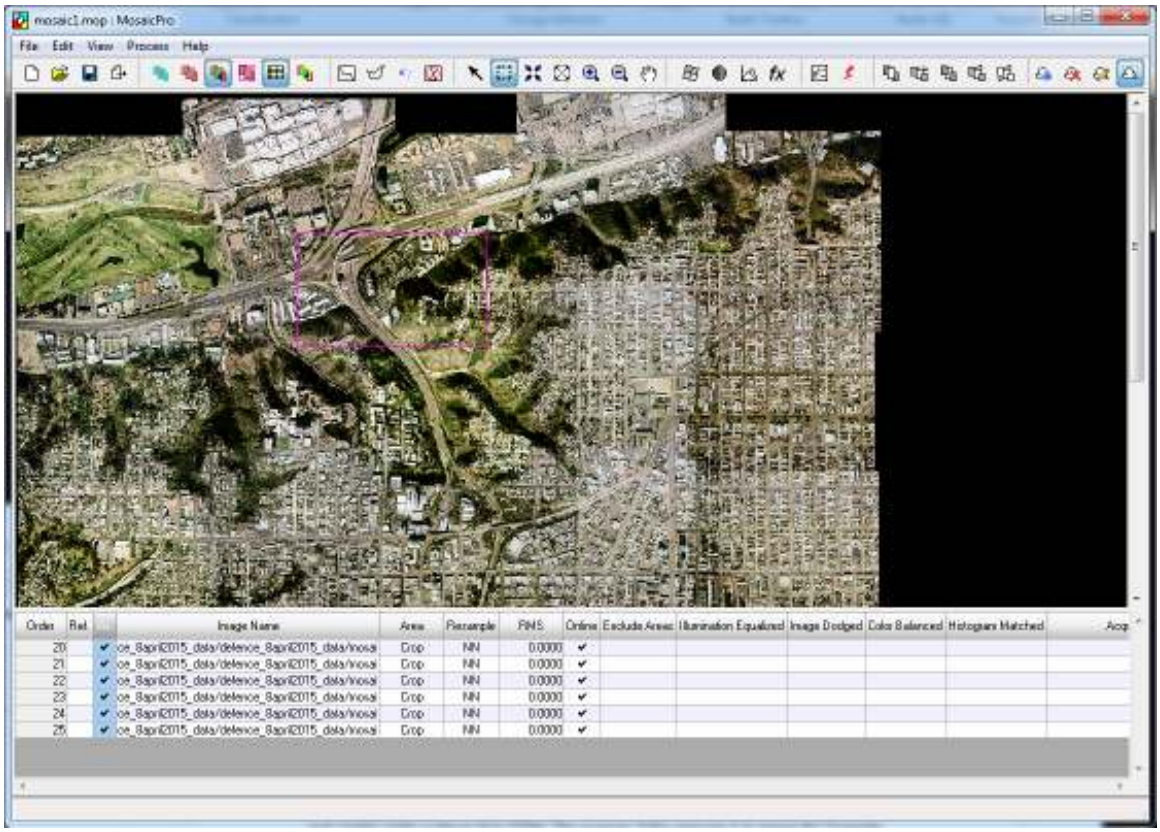
Can you find this setting in the File | Preferences?

14. Click **OK** in the Set Color Balancing Method dialog box

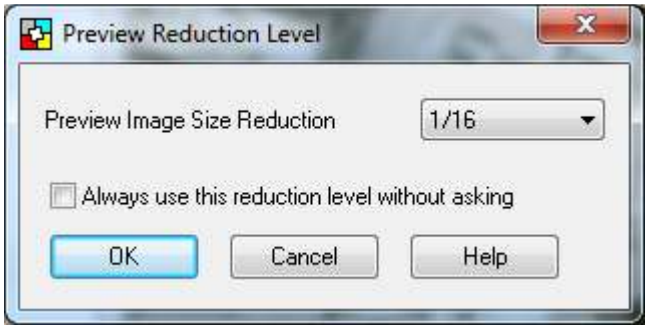
Task 9: View a Preview

1. Select *Used to select a box for Mosaic preview* icon

2. LMB click and hold to drag a small rectangle box where you would like to see a preview of the mosaic

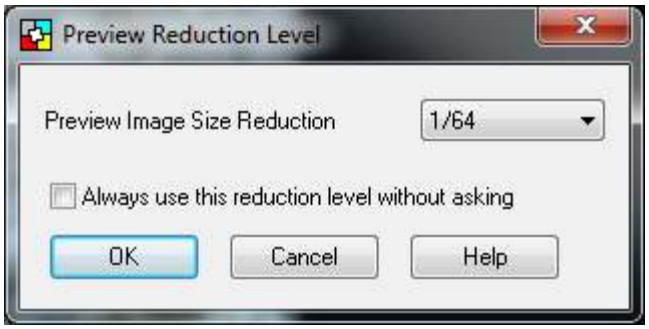


Use the View menu to deselect Show Active Areas and Show Seam Polygons to hide them from the display temporarily.



3. Select Process | **Preview Mosaic for Window**

4. In the Preview Image Size Reduction pull down menu select **1/64**



This process will take some time to finish the preview and display a result within the rectangle preview window. You can view the progress with the Process List. If it is not already open, in the Ribbon Interface, go to File | Session | Active Process List.

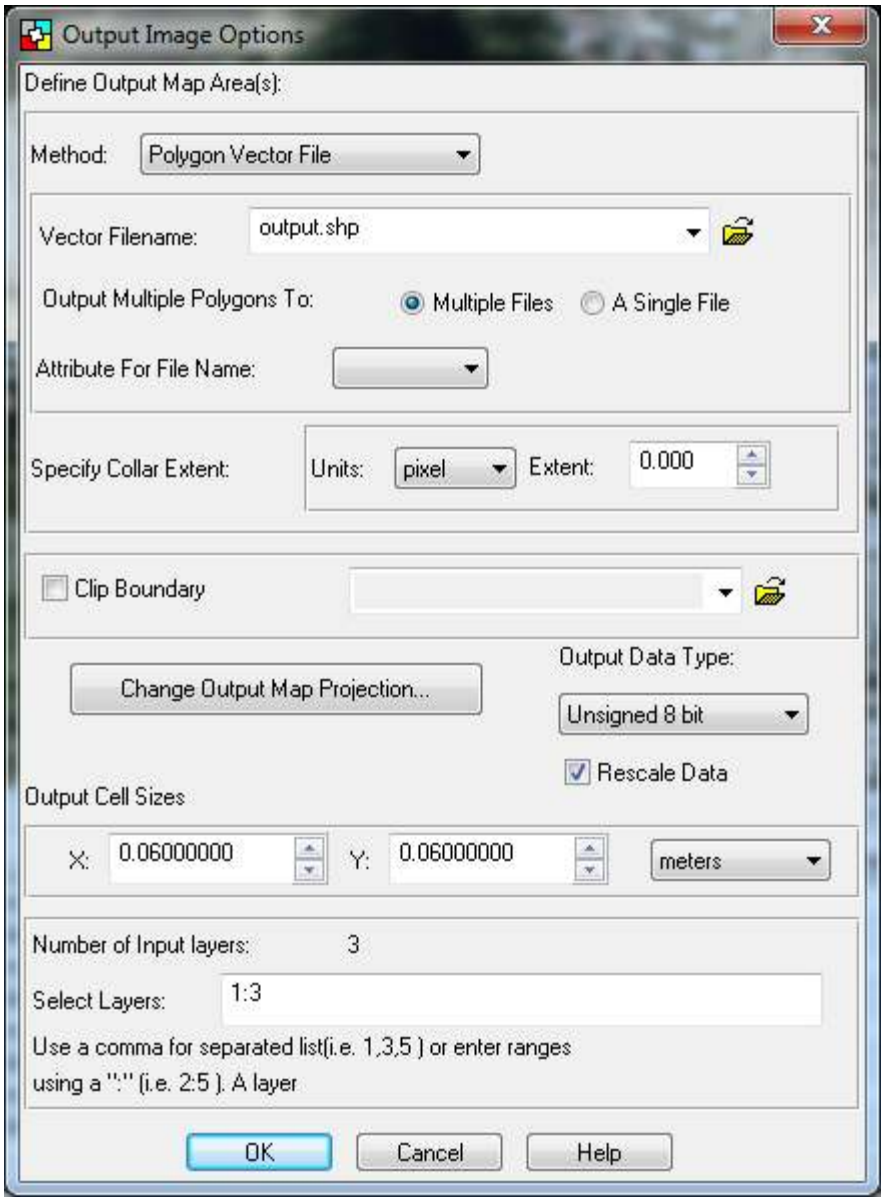
5. Once the preview process completes, zoom in and view the preview area to see if the colour balancing and seamlines provide a good output.
6. Select Process | **Delete the Mosaic Preview** Window

Task 10: Output the Mosaic

Objective: To set the output to a vector layer to mosaic, subset and compress in 1 single step

1. Click on the **Set Output Image Options**

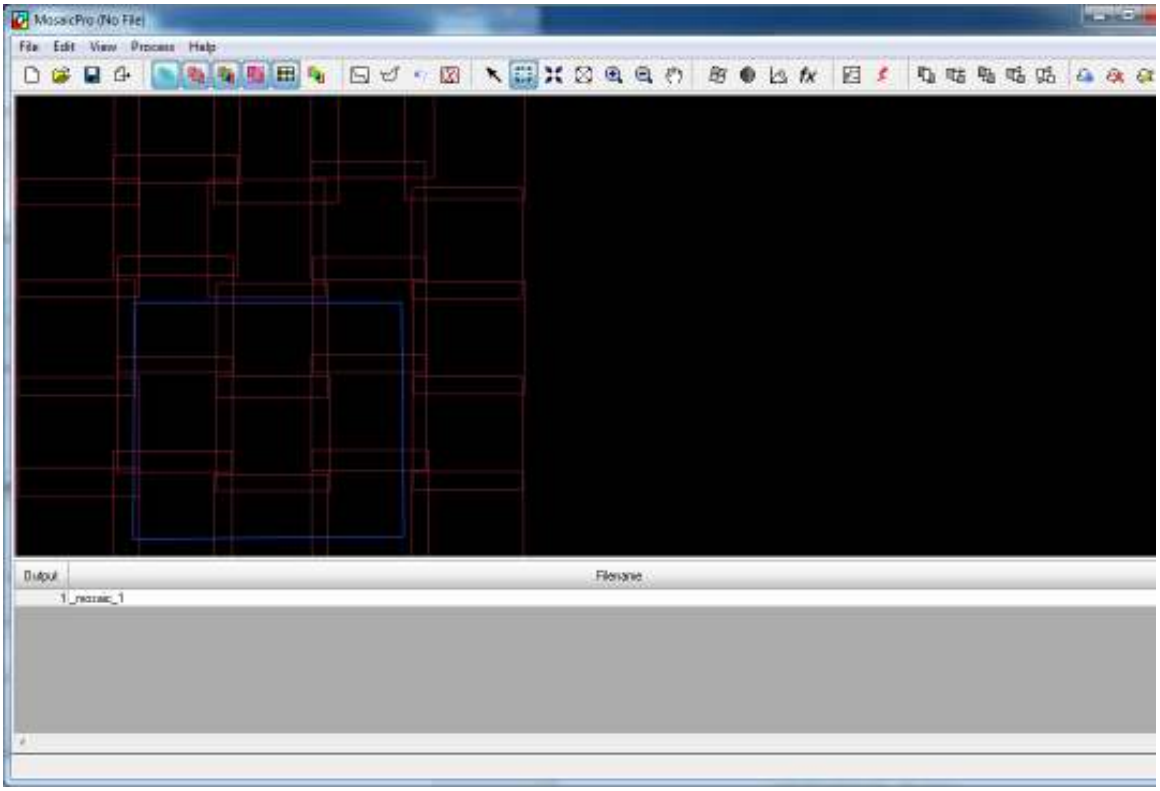
2. For the Method, use the pull-down arrow to select **Polygon Vector File**
3. Click on the Open file icon and select **output.shp**



4. Accept all other defaults and click **OK**
5. Go the MosaicPro dialog and select File | **Save As**
6. Navigate to the outputs folder, and type ***mosaic_auto_cb.mop***

   A .mop file is the file containing all the information in this MosaicPro project

7. If the image labels, seamlines and imagery is visible, you can toggle these off to see the outline of the AOI.
8. Go to View | **Show Labels** and **deselect** the option to hide the names of the images in MosaicPro
9. In the MosaicPro Toolbar, **deselect Display Seam Polygons** and **deselect Display raster Images**
10. **Enable Display Output Boundaries**



You can use the options from the View menu and the toolbar to hide and display any combination of options

11. Click the **Run** the Mosaic to Disk icon

12. In the Output File Name dialog, navigate to the output directory
13. In the Files of Type, choose **ECW** (.ecw). This will compress the data to the ecw format
14. Type ***mosaic_auto_cb.ecw*** for the File Name
15. Click on the **Output Options tab** and enable the Stats Ignore Value: **0** option

What ignoring 0's this do for the overall display of the output mosaic?

16. Click **OK** to begin running the mosaic
17. Once the process is complete, create a new 2D View in the IMAGINE Ribbon
18. **RMB** click and open the newly created ***mosaic_auto_cb.ecw***
19. **Close** MosaicPro

Task 11: Comparing and Contrasting Results

Objective: Create a new mosaicked output using a different color balancing algorithm. View another color balancing option and compare the results

1. Open MosaicPro and select, **File | Open**. Use the Recent button to locate and select **mosaic_auto_cb.mop**
2. Select File | **Save As** and type **mosaic_dodging.mop**. You will leave all other options in the mosaic project the same, simply change the color balancing options from Global Auto Color Balancing to Image Dodging
3. Select the **Color Corrections Options** dialog box
4. **Deselect Use Color Balancing**
5. **Select Use Image Dodging**
6. Click **OK**

   What changes in the MosaicPro dialog box cellarray?

7. Click on the **Run the Process to Disk** icon

8. Navigate to the Output Folder if necessary, and type ***mosaic_dodging.ecw***
9. Click on the **Output Options tab** and enable Stats Ignore Value: **0**
10. Click **OK** to run the mosaic
11. Click **Yes** to the message to run the Dodging Statistics
12. When it is finished, overlay it with the ***mosaic_auto_cb.ecw***
13. Use the Contents panel to turn the images on and off and use Swipe and zoom to compare and contract

    Which is the better output?

14. **Close** MosaicPro and **clear** the Viewers

Task 12: Mosaic Test

Objective: Students will compare the results of different color balancing methods using their own data to determine which method is most effective.

Using your own data, produce one mosaic for each of the following methods. You may choose to use to use Exclude Areas or not depending on the data.

- **Illumination Equalizing**
- **Image Dodging**
- **Color Balancing**
- **Histogram Matching**

Once the images have finished processing, determine which method worked best.

Class Notes