



# **Match and Apply Contrast**

The Mosaic process in TNTmips (Image / Mosaic) provides several options for adjusting the contrast of individual source images or setting the contrast of the assembled output mosaic. The contrast currently set (via a contrast table or auto-contrast method) for displaying a source image can be applied to the image before it is added to the mosaic. The contrast of source images can also be matched to that of a reference image, which can be one of the source images or an independent image. Alternatively, the contrast of the assembled mosaic can be adjusted using an auto-contrast method or by matching to an independent reference image.

Controls for these procedures are found in the Contrast Adjustment and Matching section of the Parameters tabbed panel on the Mosaic window. Turn on the Before Mosaic checkbox to apply or match contrast for a source image or images. Turn on the After Mosaic checkbox to adjust the con-

trast of the output mosaic (these are mutually exclusive selections). If no contrast adjustment or matching is needed, leave both checkboxes unchecked.

### **Adjust Contrast of Source Images**

When you turn on the Before Mosaic checkbox, a Contrast column is added to the Mosaic window's Object list to show the contrast setting for each of the source images. The initial contrast setting for all images is set by the option on the Default menu; the options on this menu are Match Display and Match Reference. You can change the contrast setting for all source images by selecting a different option on the Default menu and pressing the Reset All pushbutton next to the menu. You can change the contrast setting for an individual source image by left-clicking on its entry in the Contrast column and choosing an option from the pop-up Contrast menu; the options are None, Match Display, and Match Reference.

#### Match Display

The Match Display contrast option uses the display contrast currently set for a source image to adjust the image values before adding the image to the mosaic. You can change the display contrast settings for any source image in the Mosaic process. The Display tabbed panel incorporates the same functionality as the Display Manager window. Expand the Source Images group on the Display panel to see the layer listings for the source images (see illustration above right). You can click on the layer icon for any source image to open the Raster Layer Controls window; use the Contrast menu or menus on the Object tabbed panel to choose a saved contrast table or an auto-con-

Image: Second	🗙 Mosaic					
Deject       Contrast       Match Area       Reference System       Cell Size       Dimensions       Clipping Area       A         ancOthos.vvc / Lancaster 2010.1010       Match Reference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1010       Match Beference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1020       Match Beference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1020       Match Reference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1020       Match Reference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1020       Match Reference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1020       Match Reference       × AII       × WCS84 / UTM zone 14N (CM 99W)       0.3 m       2048 z 2048 A II       ×         ancOthos.vvc / Lancaster 2010.1020       Match Reference       × AII       × WGS84 / UTM zone 14N (CM	C <b>&amp;⊟≫<u>₩</u>≥</b> k× ++-	通知道周囲目の  ?				
ancOtthos.rvc / Lancaster 2010_0101 Match Berence + All + WGS44 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + Ancotthos.rvc / Lancaster 2010_0202 Match Beference + All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All + Ancotthos.rvc / Lancaster 2010_0202 Match Beference + All + WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 2048 All +	Object	Contrast	Match Area	Reference System	Cell Size Dimension	is Clipping Area
ancothos.vrc / Lancaster 2010.1_0102 Match Display (Reference) × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0103 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0201 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0202 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0202 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010.1_0203 Match Reference × All × WGS84 / UTM zone 14N (CM 99W) 0. 3 m 2048 x 2048 All × ancothos.vrc / Lancaster 2010 Note × work with the set text and text	LancOrthos.rvc / Lancaster 20to1_0101	Match Reference	🕶 All 🛛 🔻	WGS84 / UTM zone 14N (CM 99W)	0.3 m 2048 x 204	8 All 🔻
ancothos.rvc / Lancaster 2010_0103 Match Beference	LancOrthos.rvc / Lancaster 20to1_0102	Match Display (Reference)	-	WGS84 / UTM zone 14N (CM 99W)	0.3 m 2048 x 204	8 All 🔻
ancOthosrve / Lancaster 2010.1.0201 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Ancount Ancoster 2010.1.0202 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All  Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All   Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All   Character 2010.1.0203 Match Reference  All  WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All   Character 2010.1.0203 Match Reference	LancOrthos.rvc / Lancaster 20to1_0103	Match Reference	🕶 All 🔍 🕶	WGS84 / UTM zone 14N (CM 99W)	0.3 m 2048 x 204	8 Ali 🔻
ancothos.vrc / Lancaster 20101_0202       Match Reference <ul> <li>All</li> <li>WGS84 / UTM zone 14N (CM 99W)</li> <li>B.3 m</li> <li>2048 x 2048 All</li> <li>ancOthos.vrc / Lancaster 20101_0203</li> <li>Match Reference</li> <li>All</li> <li>WGS84 / UTM zone 14N (CM 99W)</li> <li>B.3 m</li> <li>2048 x 2048 All</li> <li>If ancothos.vrc / Lancaster 20101_0203</li> <li>Match Reference</li> <li>All</li> <li>WGS84 / UTM zone 14N (CM 99W)</li> <li>B.3 m</li> <li>2048 x 2048 All</li> <li>If ancothos.vrc / Lancaster 20101_0203</li> <li>Match Reference</li> <li>All</li> <li>WGS84 / UTM zone 14N (CM 99W)</li> <li>B.3 m</li> <li>2048 x 2048 All</li> <li>If ancothos.vrc / Lancaster 20101_0203</li> <li>Width Scale/Offset</li> <li>Resampling Method Bilinear</li> <li>If ancothos.ic</li> <li>If the color patette</li> <li>Apply Scale/Offset</li> <li>Resampling None</li> <li>Width</li> <li>Contrast Adjustment and Matching</li> <li>Apply K Before Mosaic</li> <li>After Mosaic</li> </ul>	LancOrthos.rvc / Lancaster 20to1_0201	Match Reference	🕶 All 🛛 🕶	WGS84 / UTM zone 14N (CM 99W)	0.3 m 2048 x 204	8 Ali 🔻
ancOtthos.rvc / Lancaster 20101_0203 Match Reference All WGS84 / UTM zone 14N (CM 99W) 0.3 m 2048 x 2048 All Extents   Output Parameters   Display   Info   Select Bands. Use color palette Apply Scale/Offset Resampling Method Bilinear Valid Range to Output Null As Automatic Clipping Area Buffer 2 cells Gap Filling None Width 3 - Contrast Adjustment and Matching Apply K Before Mosaic After Mosaic	LancOrthos.rvc / Lancaster 20to1_0202	Match Reference	🕶 All 🛛 🕶	WGS84 / UTM zone 14N (CM 99W)	0.3 m 2048 x 204	8 Ali 🔻
Extents   Output Parameters   Display   Info   Select Bands ] Use color palette ] Apply Scale/Offset Resampling Method Bilinear ] Valid Range to Output Null As Automatic ] Clipping Area Buffer 2 cells Gap Filling None ] Width 3 - Contrast Adjustment and Matching Apply K Before Mosaic ] After Mosaic	LancOrthos.rvc / Lancaster 20to1_0203	Match Reference	🕶 All 🔍 🕶	WGS84 / UTM zone 14N (CM 99W)	0.3 m 2048 x 204	8 All 🔻
Extents   Output Parameters   Display   Info   Select Bands. ] Use color palette _   Apply Scale/Offset Resampling Method  Bilinear Mosaic Overlap   Least Extreme _ Valid Range to Output Null As   Automatic Clipping Area Buffer 2 cells Gap Filling   None Width _ 3 - Contrast Adjustment and Matching Apply  K Before Mosaic _   After Mosaic	N					
Setect Bands       J Use color patette ] Apply Scale/Offset         Resampling Method       Bilinear         Mosaic Overlap       Least Extreme I         Valid Range       to         Output Null As       Automatic         Clipping Area Buffer       2 cells         Gap Filling       None         Arota Adjustment and Matching         Apply       K Before Mosaic	Extents Output Parameters Display Info	<b>b</b>	<b>1</b>	﴾‰QQ▓ +差� ∰Q]	🖆 🗆 🏠 🛍 🛅	
Resampling Method Bilinear	Select Bands 🛄 Use color palette 🛄 a	Apply Scale/Offset		100 million	10	4
Mosaic Overlap Least Extreme Valid Range to Output Null As Automatic Clipping Area Buffer 2 cells Gap Filling None Width 3 — Contrast Adjustment and Matching Apply K Before Mosaic After Mosaic	Resampling Method Bilinear	ī			the second second	6 1
Mosaic Overlap       Least Extreme ▼         Valid Range       to         Output Null As       Automatic ▼         Clipping Area Buffer       2 cells         Gap Filling       None       ▼         Mosaic       ▼         Apply       K Before Mosaic       ⊥ After Mosaic			1.00		and the second	A Providence
Valid Range to Output Null As Automatic Clipping Area Buffer 2 cells Gap Filling None Vidth 3 Contrast Adjustment and Matching Apply Ø Before Mosaic After Mosaic	Mosaic Overlap				Star 1 .	No. 1
Output Null As Automatic Clipping Area Buffer 2 cells Gap Filling None Contrast Adjustment and Matching Apply Ø Before Mosaic After Mosaic	Valid Range	to		manufactor theme Planaure a	the part of	and the second second
Clipping Area Buffer 2 cells Gap Filling None Vidth 3 Contrast Adjustment and Matching Apply Ø Before Mosaic After Mosaic	Output Null As					
Clipping Area Buffer 2 cells Gap Filling None I Width 3 Contrast Adjustment and Matching Apply Ø Before Mosaic After Mosaic				Lange Contraction	ALC: NOT	March 1998
Gap Filling None I Width 3 Contrast Adjustment and Matching Apply Ø Berore Mosaic After Mosaic	Clipping Area Buffer 2 cells		Stand Street			
Apply R Before Mosaic	Gap Filling None 🔻	Width 3		( Ring	The second second	ma to
Apply Z Before Mosaic Atter Mosaic	Contrast Adjustment and Matching				The server	and pathene in the
Apply K Before Mosaic After Mosaic			talk-org			1 12
	Apply 🗭 Before Mosaic 🔟 After Mosa	aic				
Default Match Reference 🔽 Reset All	Default Match Reference 🔻 Reset	All	1	in the		V av
			-		A STATE AND A STATE	Goot
reterence jLancorthos.rvc / Lancaster 20101_UU2	Lancorthos.rvc / Lancaster 2	Uto1_U1U2	1		Communication of the	200 m 1000 ft
				₱ 678919 E 45413	86 N m	1:11389

Mosaic layout with six orthoimage color-composites as source images. The Contrast Adjustment and Matching controls and the Contrast column in the Object list have been used to set the middle image in the top row of the View as the reference image for contrast matching the other source images before assembling the mosaic. The contrast for this reference image has also been set to match its contrast shown in the View.

Extents Output Parameters Display Info	🛠 Raster Layer Controls - Lancaster 20to1_0102
B       ↓       Overlays         Source Images       ↓       Lancaster 2010 1_0102         B       ↓       Lancaster 2010 1_0103         B       ↓       Lancaster 2010 1_0203         B       ↓       Lancaster 2010 1_0202         B       ↓       Lancaster 2010 1_0202         B       ↓       Lancaster 2010 1_0203         Image: Background       Image: Background       Image: Background	Object     Oplions     Legend     Filter     3D       LancOthos.rvc / Lancester 20101_0182       Georeference     WGS84 / UTM zone 1494 (CM 99W)     IF     Use Saved Model       Contrast       Red     LiBEAR_Red
Use the layer listing on the Display panel to modify the display contrast settings for any source image	Data Top Data Top Show Prefix [Lancate: 2010],9182: Suffix Scale Range Visible Unitmited to Unitmited OK Close Apply Help

trast method to apply to the image or image components. You can also open the right mouse-button menu for a source layer listing and choose Enhance Contrast to adjust the contrast and save new contrast tables. You can adjust the contrast independently for any or all of the source images.

#### Match Reference

You can also choose to match the contrast of any of the source images to a reference image. The reference image can be one of the source images or an independent image. To designate a source image as the reference for contrast matching, open the Contrast menu for the image using the Contrast column in the Object list and turn on the Set as Reference toggle option. In

the example illustrated at the top of this page, the reference image also has its contrast set to Match Display; the Set as Reference toggle option can be used in combination with either the Match Display or None contrast settings for the source image. When Match Display

Contrast
None
Match Display
Match Reference
F Set As Reference
(

is set for the reference source image, contrast-adjusted histograms are computed automatically for contrast matching. For composite, RGB separate, or multiband source images, contrast is matched independently for each image component.

To use an independent image as the contrast reference, press the Reference pushbutton in the Contrast Adjustment and Matching section of the Parameters panel. The independent contrast reference image is not added to the View pane in the Mosaic window. The raw image histograms for the reference image are used for contrast matching; they are not adjusted for any display contrast settings. You can use the Apply Contrast process (Image / Filter / Apply Contrast) if necessary to create a reference image with contrast-enhanced raw image values.

#### **Matching Area**

When source images are being matched to a reference image, a Match Area column is added to the Object list. For the source images being matched, this column provides a menu to choose whether all or a portion of the image is used to set the histograms for contrast matching. The default setting is All. The Choose option on the Match Area menu opens the Object Selection dialog so you can select a region object or a vector object with polygons to define the matching area. The Edit option activates the Match Area tool in the View pane (see illustration below). This tool provides a set of standard drawing tools (Rectangle, Circle, Ellipse, and Polygon) that you can use



When you match source image contrast to a reference image, you may wish to exclude a non-representative part of the image (such as the dark ocean area in the left-hand image in the illustration above) when determining the histograms for matching. Here the Match Area toolset is being used (via its Polygon tool) to outline a region (yellow outline) to use for contrast matching. Press Add to Region (or right-click) to add the active shape to the region. (Press the Action / Settings button to show a menu with options to Clear the Drawing Tool and Clear Region.)

to draw shapes in the view over the designated image. After drawing a shape, press either the Add to Region or Subtract from Region icon button on the View toolbar (or right-click to Add to Region). You can also use the Match Area tool to modify a region you have selected using the Choose option by adding or subtracting additional shapes. When you have selected or created a partial matching area, the Match Area column shows the entry "Region" for the relevant source image. A Match Area region is shown in the View whenever its parent image is selected in the Object List and the Match Area tool is turned on.

## **Adjust Contrast of Assembled Mosaic**

To apply contrast to the mosaic after assembly (rather than adjusting the source images), turn on the After Mosaic checkbox. The Method menu below the checkbox allows you to choose an auto-contrast method (Auto Linear, Auto Normalize, Auto Equalize, Auto Logarithmic, or Hyperbolic Tangent) to adjust the image values. You can also choose Match Reference from the menu, then press the Reference pushbutton to select an image to which to match the mosaic. The raw image histograms for the reference image are used for contrast match-

ing; they are not adjusted for any display contrast settings.

Contrast Adjustment and Matching				
Apply 🗳 Before Mosaic 🇖 After Mosaic				
Method Match Reference 💌				
Reference n_3710727_se.jp2 / Component_1 + Component_2 +				



Match Area region created from the polygon shown to the left.



Final contrast-matched mosaic.