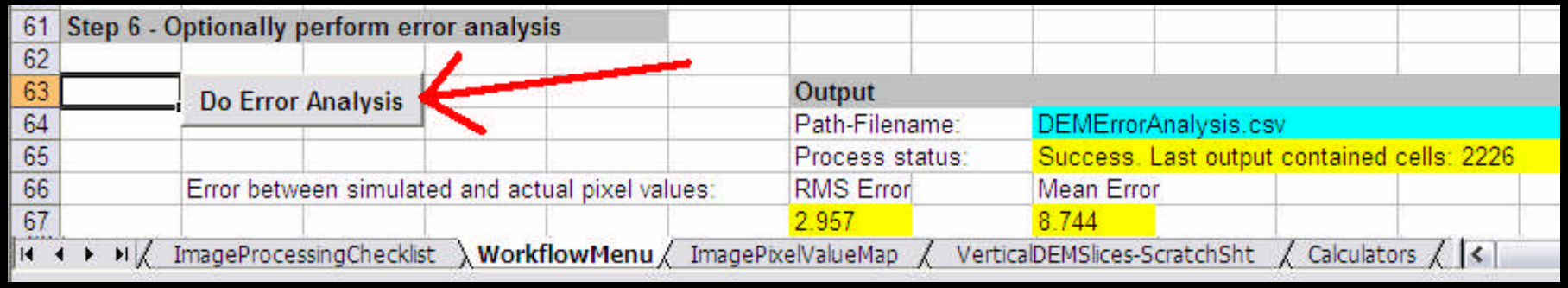
DEM Error Analysis

This short presentation shows operation of a new feature added to DEMCarlottoMethod.xls in ver. 0.7 - error analysis.

Once a DEM is generated using the options of the Workflow Menu, new Step No. 6 on that menu will compute the mean error and root mean square error between the DEM and the actual pixel values in your image.



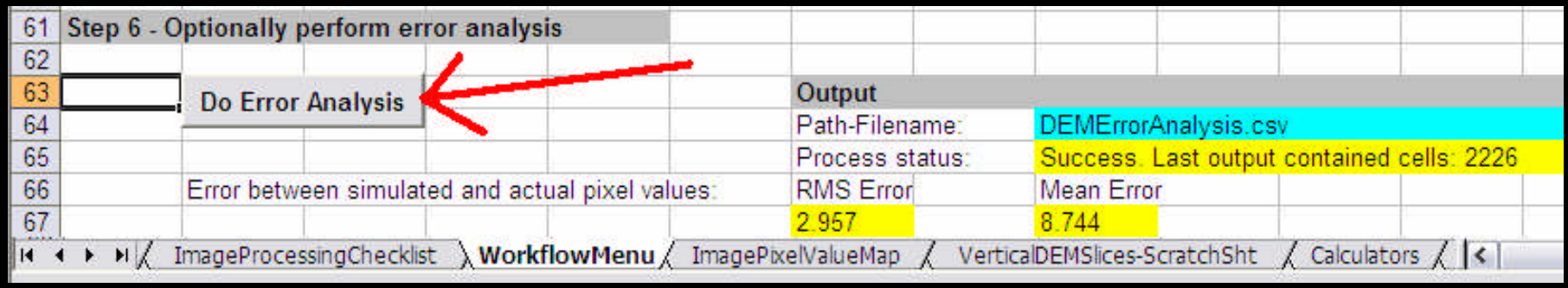
Error analysis is conducted by preparing a simulated image using the DEM by the spreadsheet. The simulated pixel values are computed with Carlotto's Eq. 1:

$$i(x,y) \sim a\,[\sin(s)\,p(x,y) + \cos(s)]$$

where p(x,y) is the physical slope at DEM point x,y. The scale of the x-y plane is the horizontal image scale – not column indices 1,2,3, etc.

DEM Error Analysis

Starting the analysis is simple – just press the "Do Error Analysis" button.



Two statistics are computed – the mean and root mean square of the difference between pixel brightness in the simulated and the original image pixel brightness. This is basic error analysis of the difference between a simulation and actual observations.

In the working example, the average pixel brightness in the original image is about 162 brightness levels out of 255 levels. The root mean square of simulation is about 2.95 brightness levels or about +- 1.8%.

DEM Error Analysis

The error analysis feature also generates a csv text file – by default named "DEMErrorAnalysis.csv".

DEMErrorAnalysis.csv - Notepad

File Edit Format View Help

```
row,column,Elevation,Simulated_Pixel,Original_Pixel,Cell_Error,Cell_Error_Squared
1,1,3.1,181.342379544211,183,-1.6576204557885,2.74770557544849
1,2,6.2,181.342379544211,183,-1.6576204557885,2.74770557544849
1,3,9.4,181.953096537885,184,-2.0469034621153,4.18981378321958
1,4,12.8,183.174530525231,185,-1.82546947476882,3.33233880331276
```

This csv file can be imported into Excel. Excel charting tools can be used to prepare an error chart.

Graphing the error will sometimes reveal artifacts in the original image or in the computed DEM.