# Exercise 3:
# Global Mapper and Basic Visualization of LiDAR DEMs

Christopher J. Crosby

*San Diego Supercomputer Center, UCSD*

Last revision: December 1, 2009

http://opentopography.org

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**INTRODUCTION:**
Global Mapper (http://www.globalmapper.com/) is presented here as a low cost alternative to ArcGIS for users who do not have access to ESRI products. Global Mapper supports many common raster, elevation and vector GIS datasets - including those accessible via OpenTopography. The software offers easy import and export of LiDAR DEMs as well as 3D visualization and raster imagery overlays.

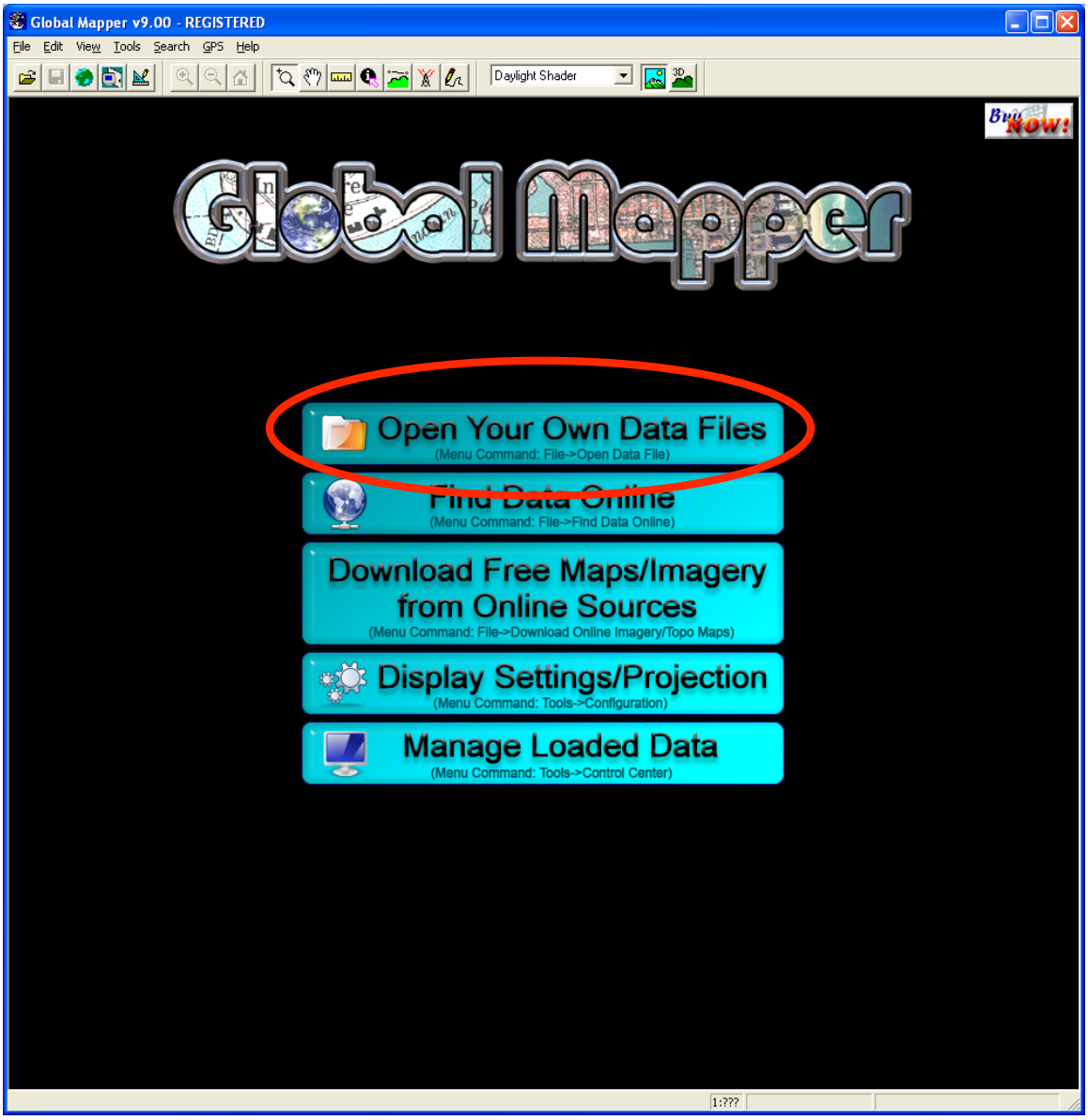
This tutorial will provide an overview on importing GLW DEMs into Global Mapper as well as some of the basic analysis and visualization capabilities of the software.

More information on Global Mapper, trial software and information on purchasing the software is available at: http://www.globalmapper.com/

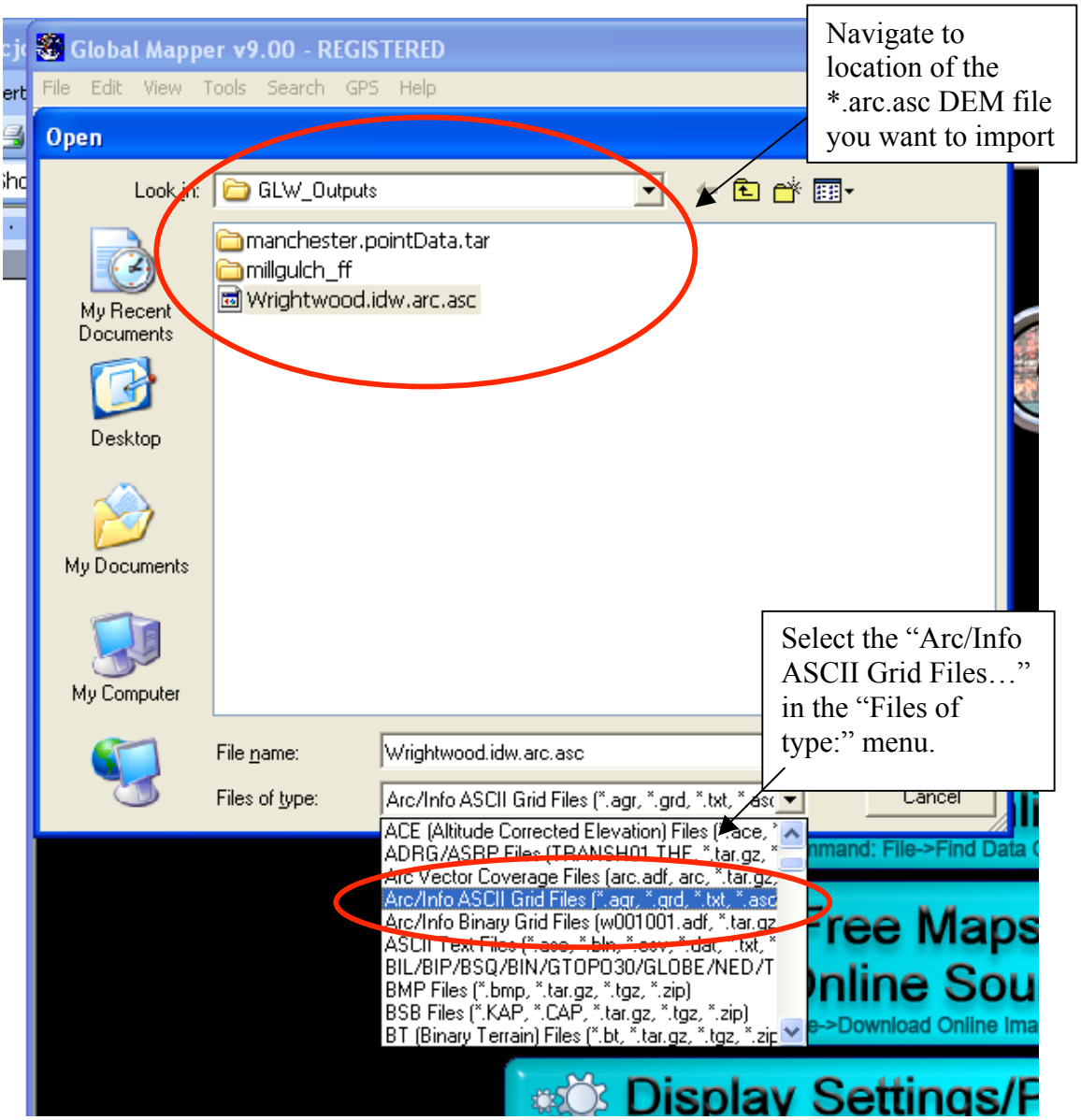
**IMPORTING LiDAR DEMs INTO GLOBAL MAPPER**

Launch Global Mapper:  Start>All Programs>Global Mapper> Global Mapper 9

Once open, select "**Open Your Own Data Files**"



Navigate to the location of the *.arc.asc grid file you wish to import and select the "**Arc/Info ASCII Grid Files**…" option from the "Files of type:" option. Global Mapper supports a huge number of formats so it is easy to import DEMs in other formats. The process defined below will vary slightly depending on the format of the DEM you are loading.

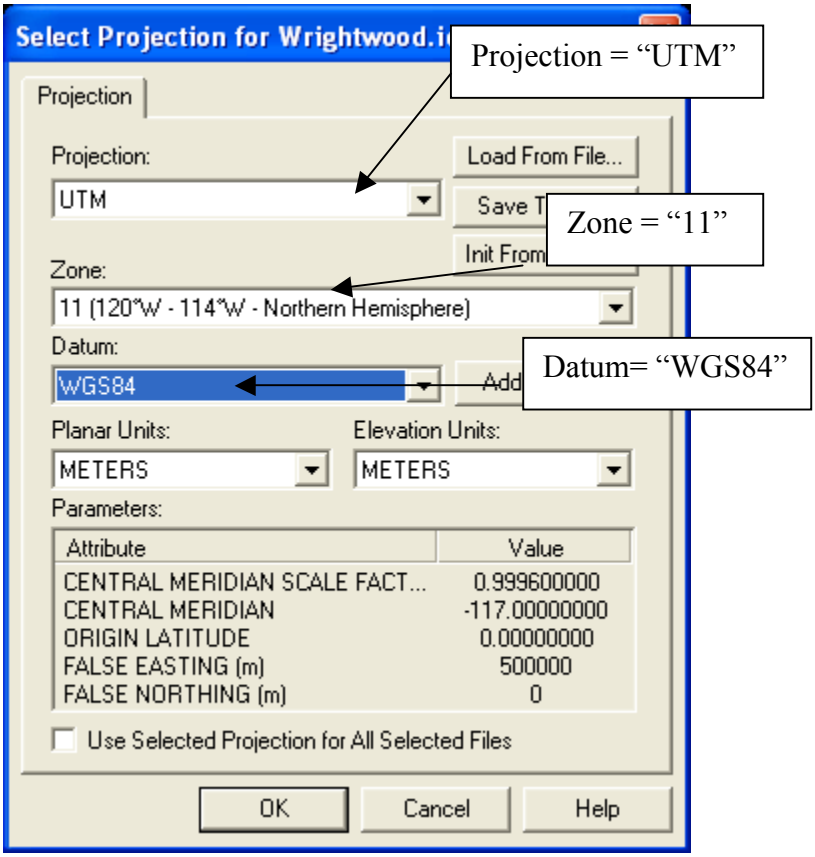



You will receive a message telling you that "ARC ASCII GRID files do not contain projection information" – select "OK" and you will define the projection in the next step.

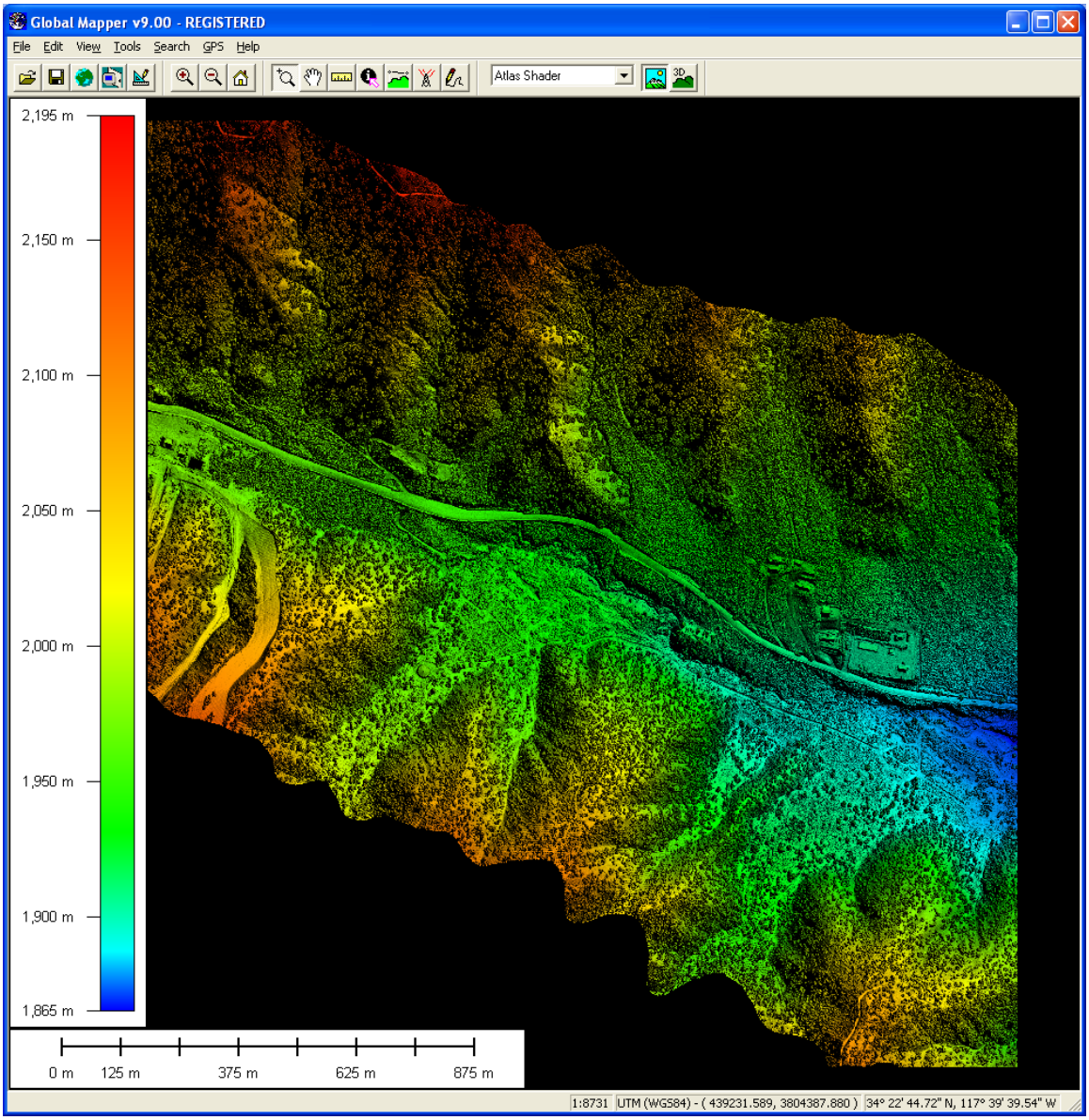
Global Mapper will next present you with the menu shown below to define the projection of the dataset. The B4 dataset sample we will be using for this exercise has the following projection definition:

Grid Coordinate System Name: **Universal Transverse Mercator**
UTM Zone Number: 11 N
Transverse Mercator Projection
Scale Factor at Central Meridian: 0.999600
Longitude of Central Meridian: -117.000000
Latitude of Projection Origin: 0.000000
False Easting: 500000.000000
False Northing: 0.000000
Planar Coordinate Information:
Planar Distance Units: meters
Geodetic Model
Horizontal Datum Name: D_WGS_1984
Ellipsoid Name: WGS_1984

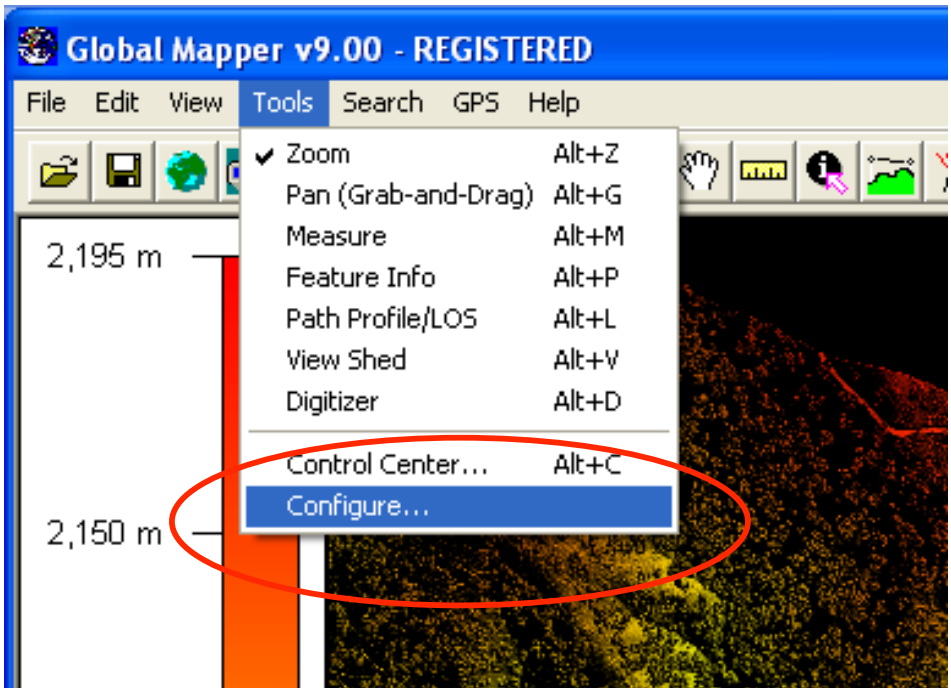
Set:
"**Projection**" to "**UTM**"
"**Zone**" to "**11**"
"**Datum**" to "**WGS84**"



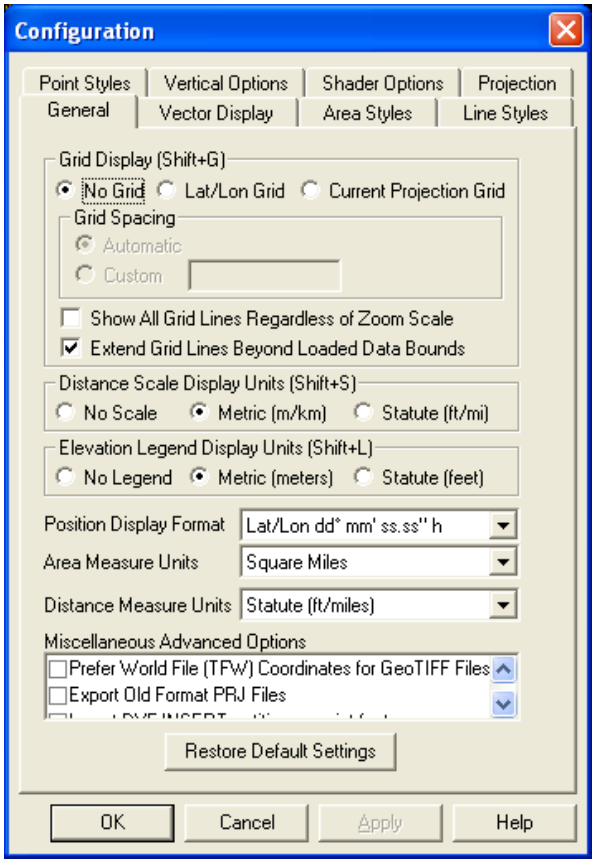
Once you have defined the dataset projection and selected “OK”, Global Mapper will then load the DEM. Once loaded, you will see something that looks like this:



To configure the appearance of the DEM you have just loaded choose "Tools>Configure…"



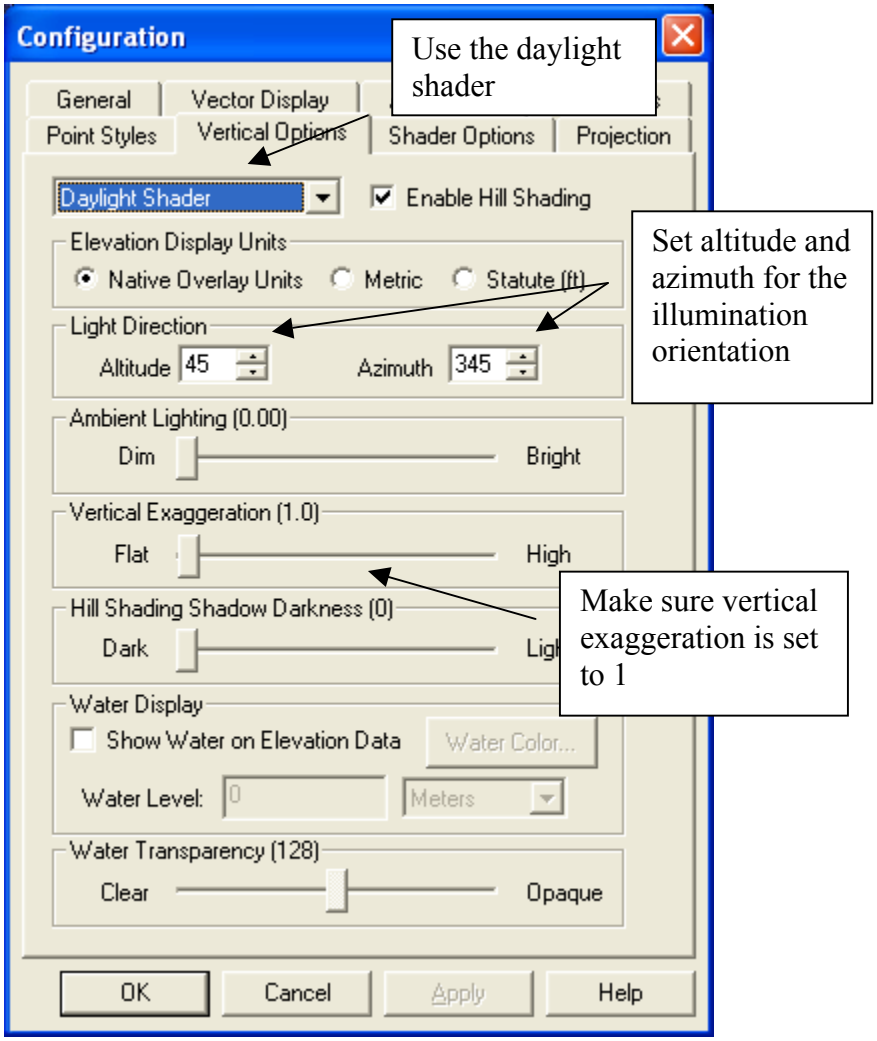

**Configuration** menu:



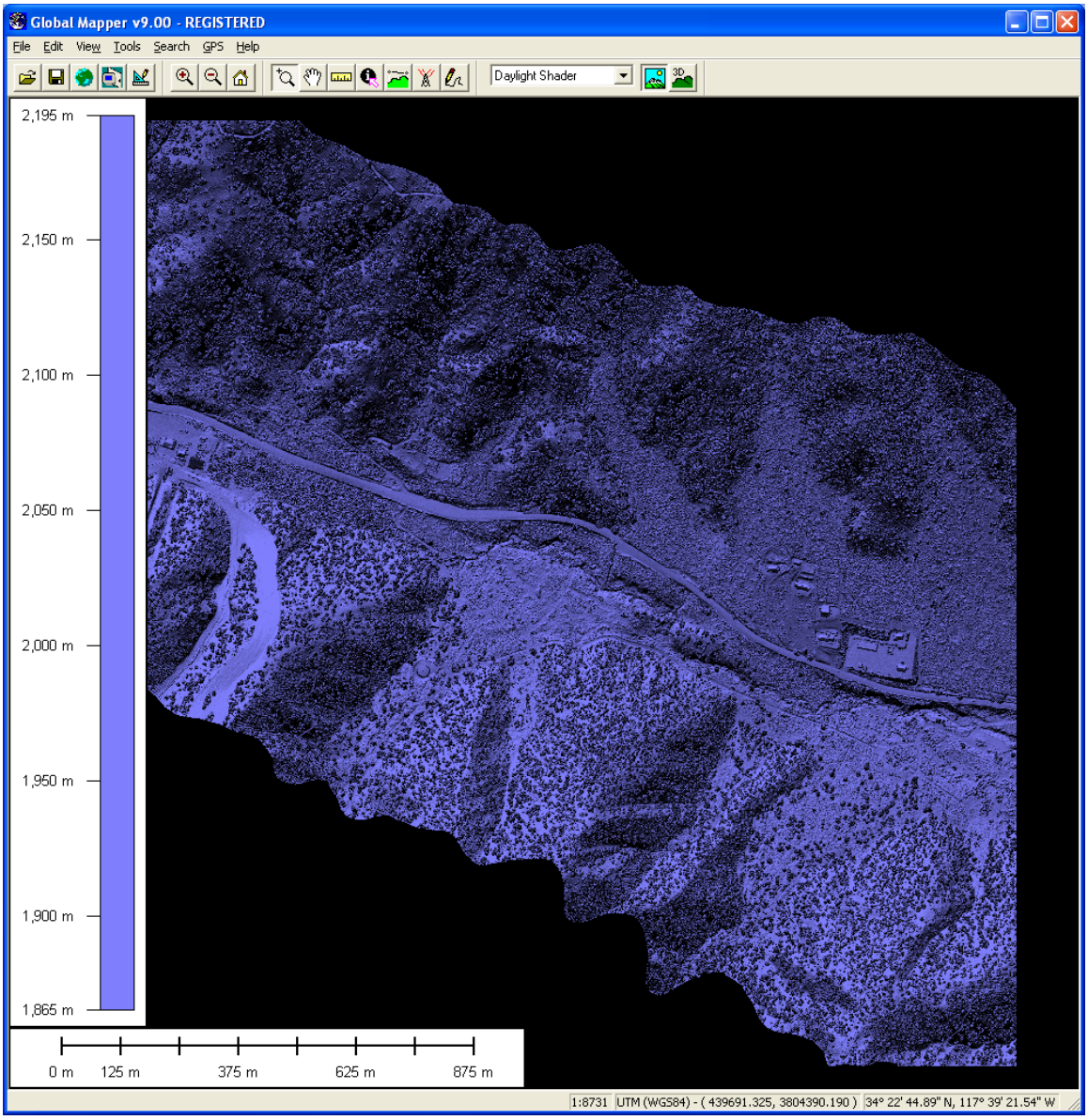
**HILLSHADE:**
The configuration menu has many features which we will not deal with in this tutorial. For out purposes, we will only deal with the "**Vertical Options**" and "**Shader Options**" tabs to customize the appearance of the DEM.

Global Mapper uses a variety of different shader options to change the appearance of the elevation file (DEM) that has been loaded. The "Atlas Shader" is the default option and it provides a color ramp behind a hillshade effect to render the DEM. We will not explore all of the various shader options, but you are encouraged to explore the options to achieve your desired effect. If you are interested, the Global Mapper online help has excellent documentation on each shader as well as other options available via the "Configuration" menu: http://www.globalmapper.com/helpv9/Help_Config.html

To achieve the standard grey scale hillshade effect commonly used to visualize LiDAR DEMs set the "Vetical Options" menu like this (feel free to experiment to see what effect the various parameters have):

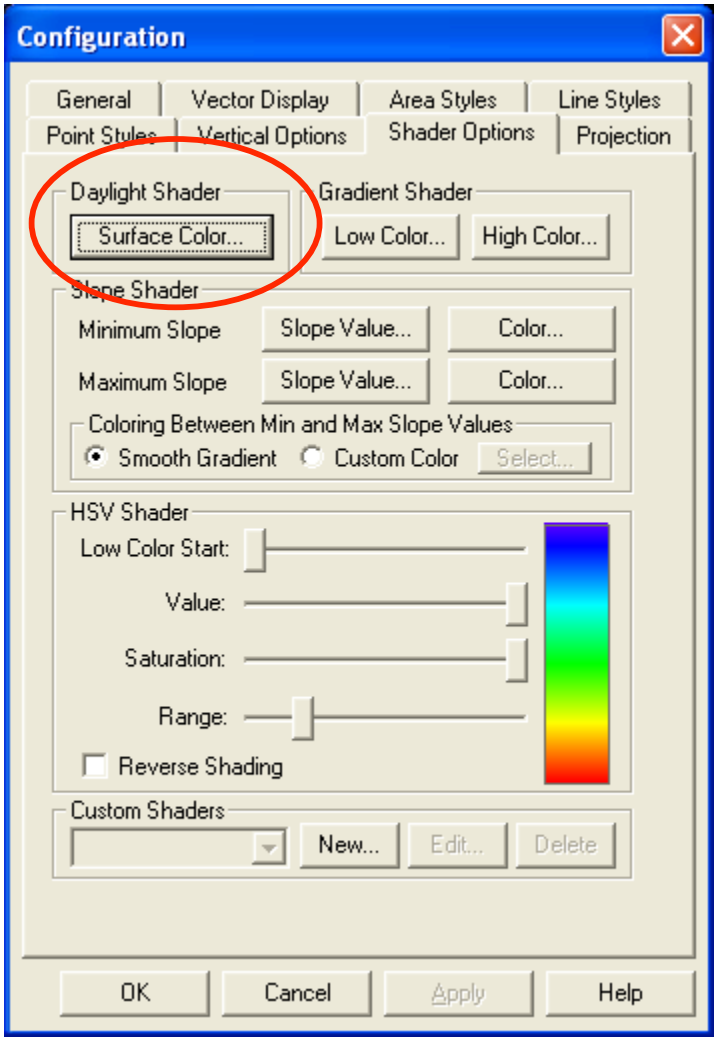


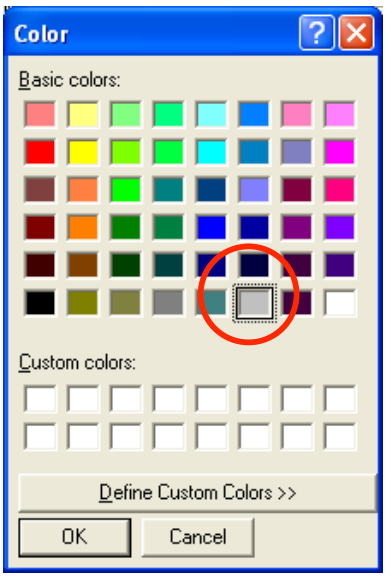
Once you click “OK” you should see an image that looks something like this:



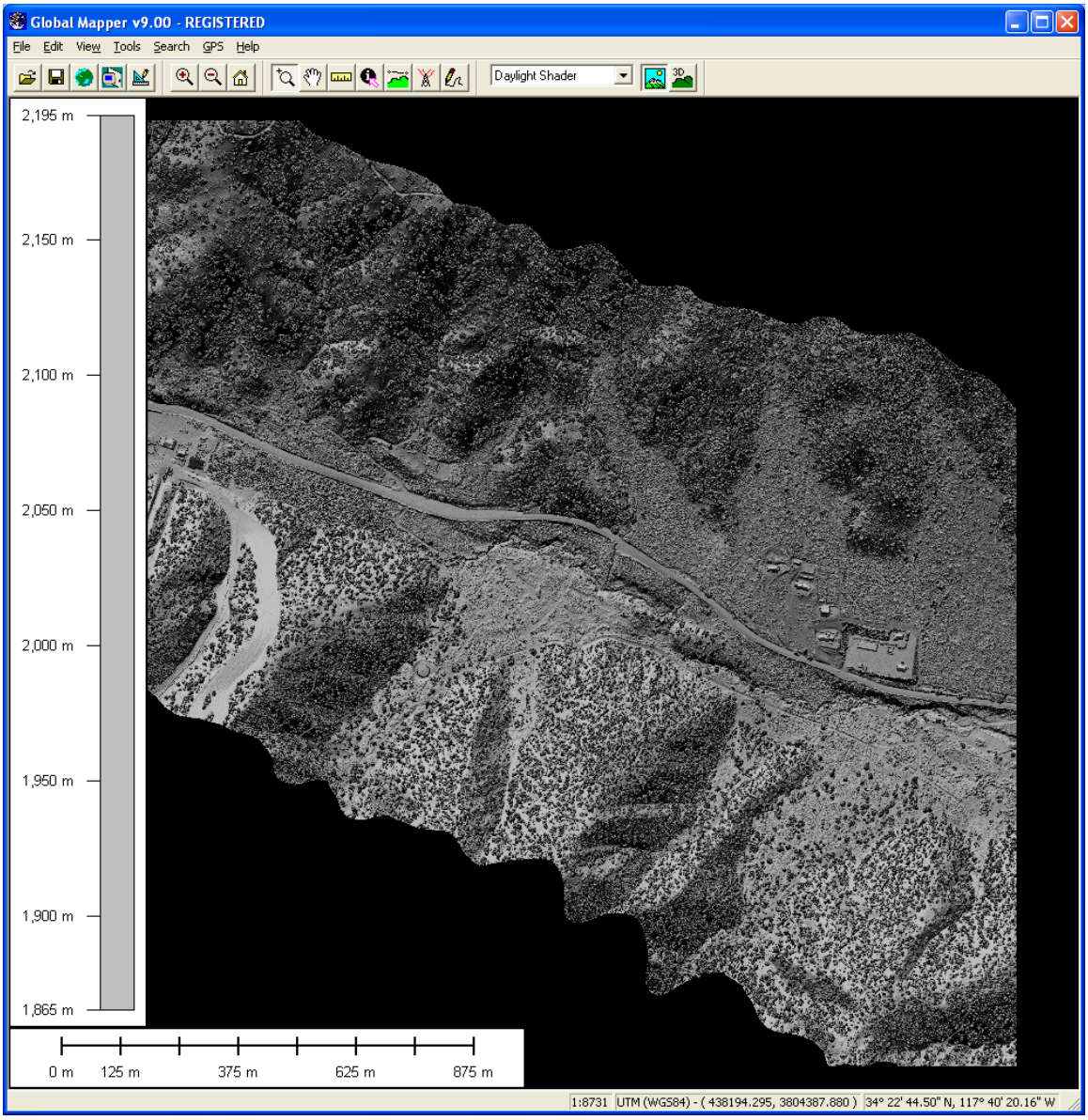

It looks ok but why is it purple (or whatever your default color is)? This is because we need to modify the “Shader Options” to set the background color to grey. Go back to the “Tools>Configuration” menu and choose the “Shader Options” tab.

Under "**Daylight Shader**", chose the "**Surface Color…**" option then pick a light grey color from the palate:

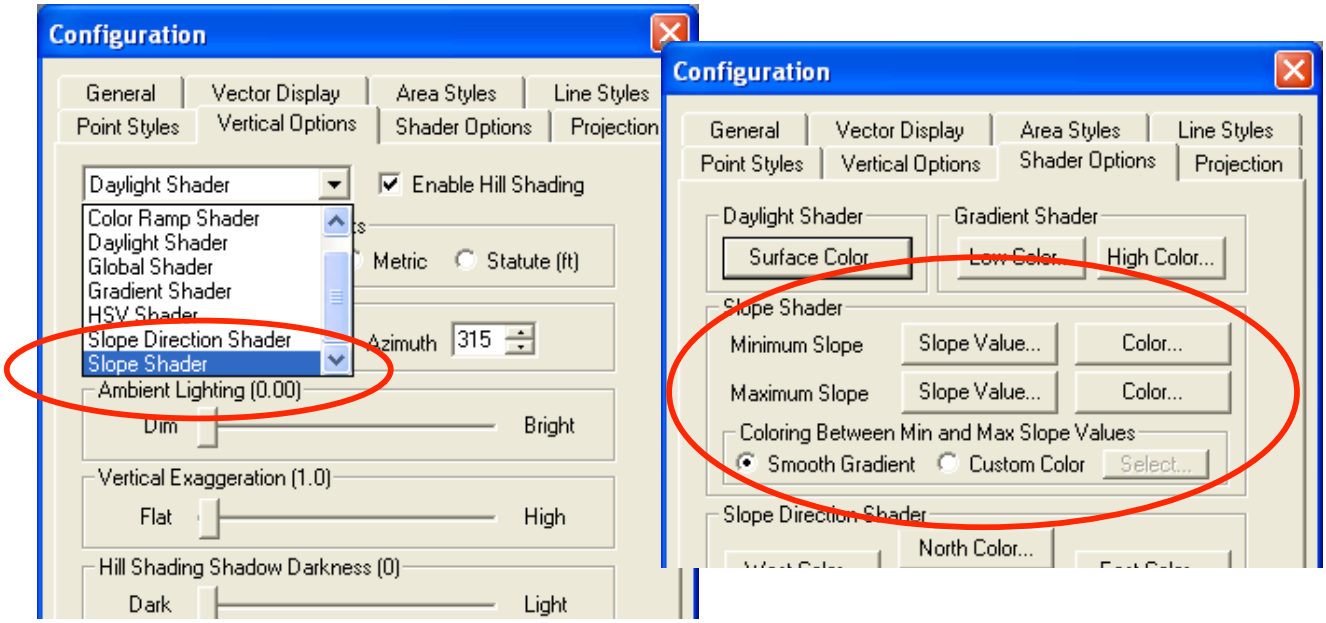


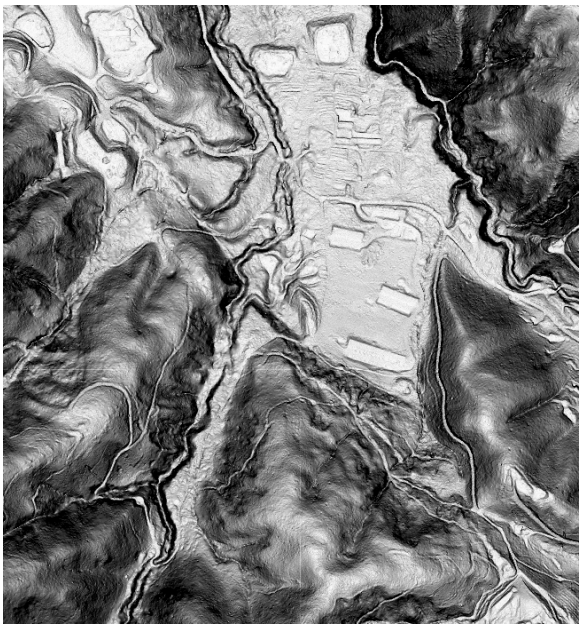



And voila – a nice grey scale hillshade of the LiDAR DEM:



**SLOPESHADE:**
Creation of a "slopeshade" image for the lidar DEMs is also quite simple using Global Mapper. Under the "**Configurations" > "Vertical Options"** menu pick the "**Slope Shader**" option instead of the Daylight Shader you used above. Then, under the "**Shader Options**" menu, set your minimum and maximum slope values and colors. You want to use a white for the minimum slope (0 degrees) and a black for the maximum slope. Because Global Mapper doesn't offer a nonlinear stretch like ArcGIS does, you'll want to play with the maximum slope value. I typically use 45-55 degrees as maximum slope – anything above 45-55 degrees will be displayed as black.

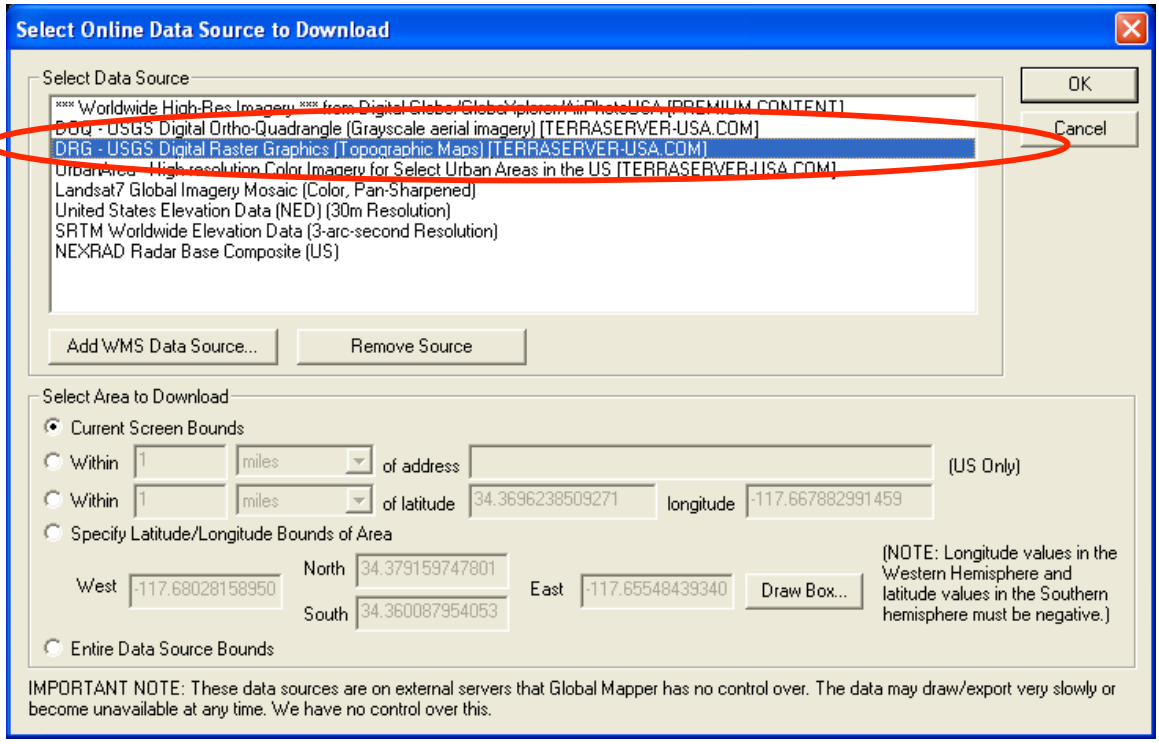


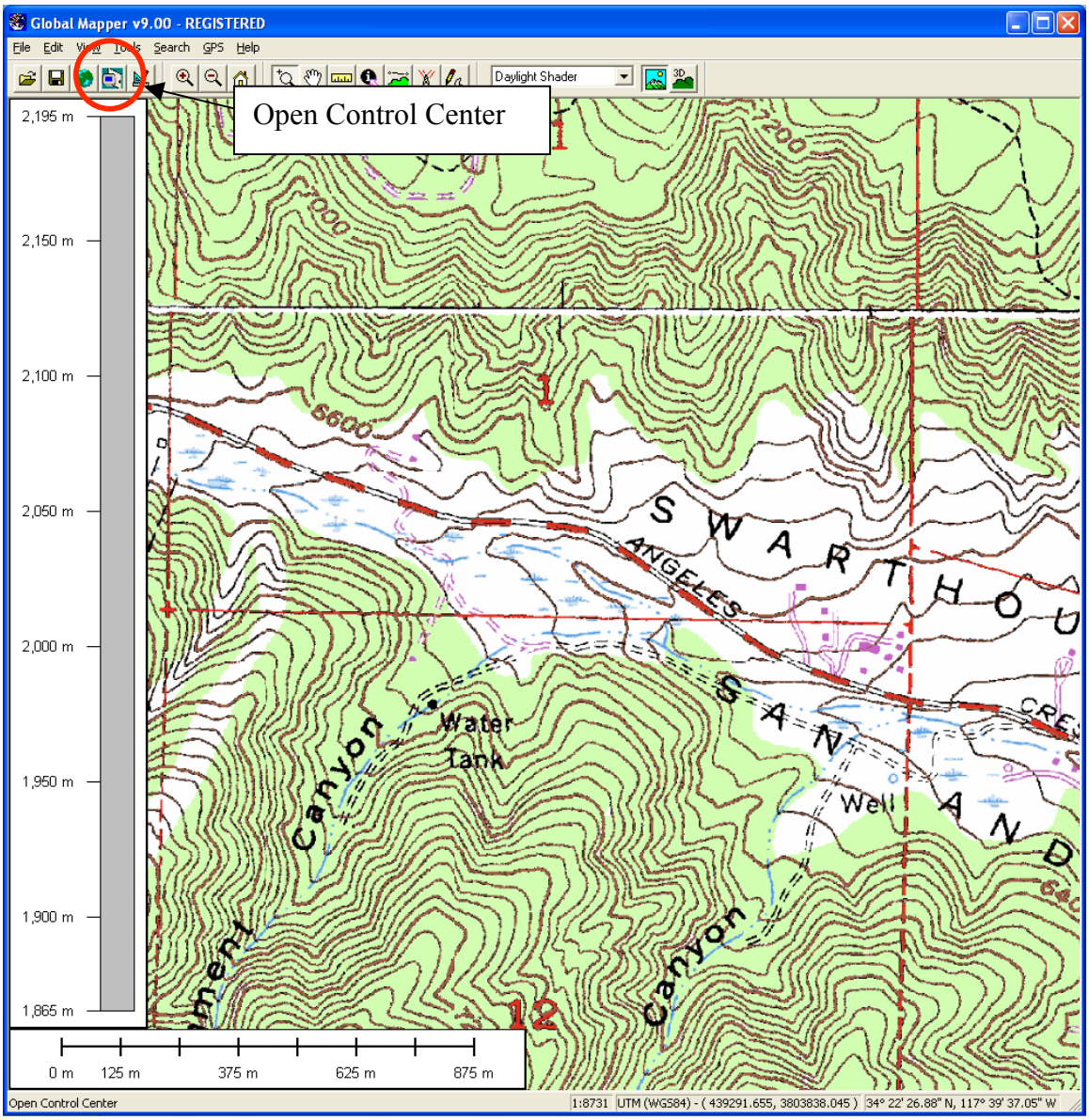
Slopeshade image with max slope set to 45.

**RASTER IMAGE OVERLAY ON LIDAR DEM:**
One of the cool features of Global Mapper is that it provides simple access to online USGS Digital Ortho Photos Quadrangles (aka DOQs) and Digital Raster Graphics (DRGs) so that you can quickly overlay topomaps and airphotos on your DEM.

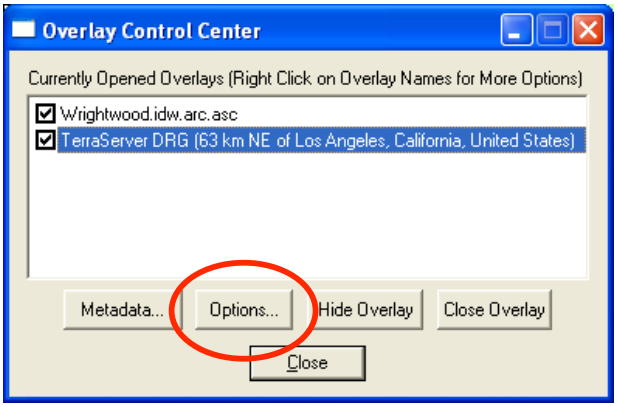
Select: "**File>Download Online Imagery/Topo/Terrain Maps…**" which will bring up a new menu. Choose the "DRG – USGS Digital…" option – Global Mapper will now go out on the internet, find the appropriate topomap and load it:



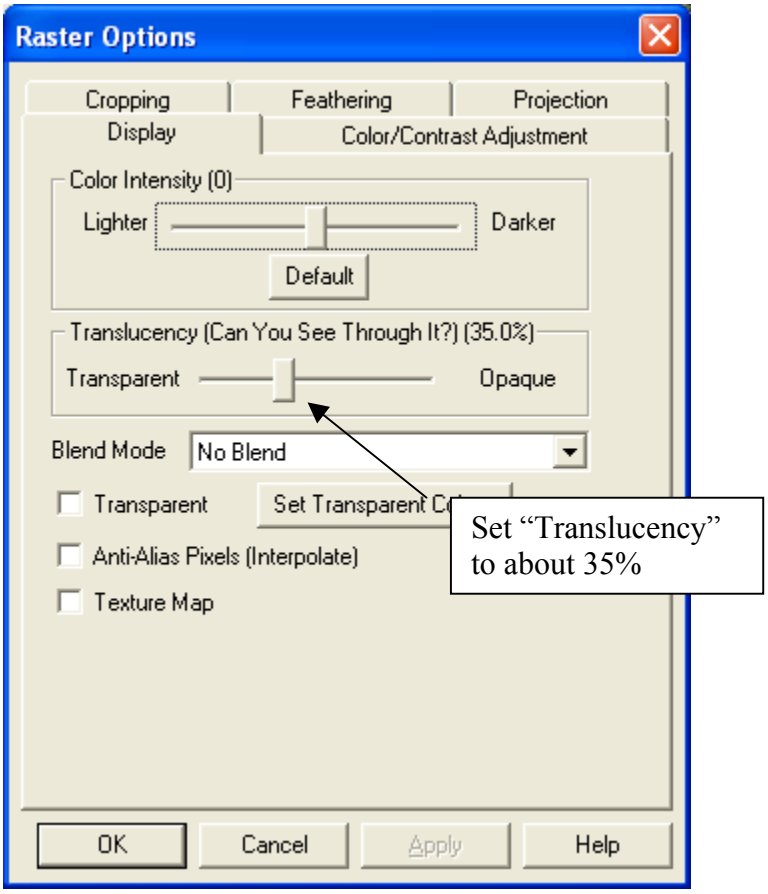

It'll take minute or so to load and then you should see the topomap map. The problem is that you can't see the DEM any more. So, choose the "Open Control Center" button:



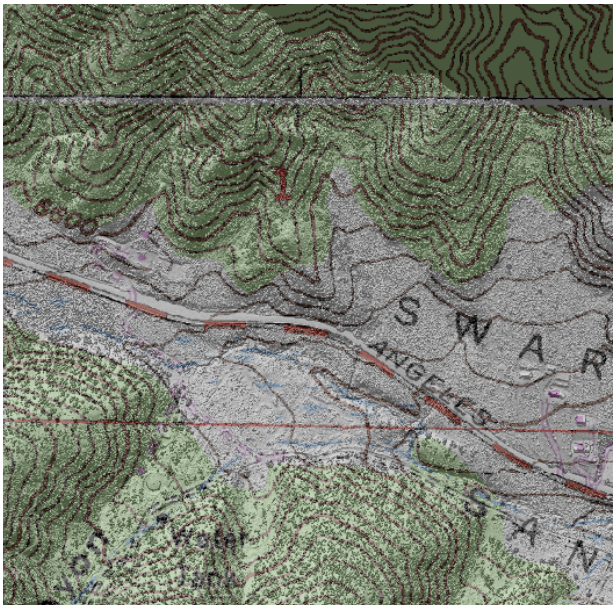

Highlight the "TerraServer DRG" layer and select "**Options…**"



Under the "**Display**" tab, adjust the "**Translucency**" option to be about 35%

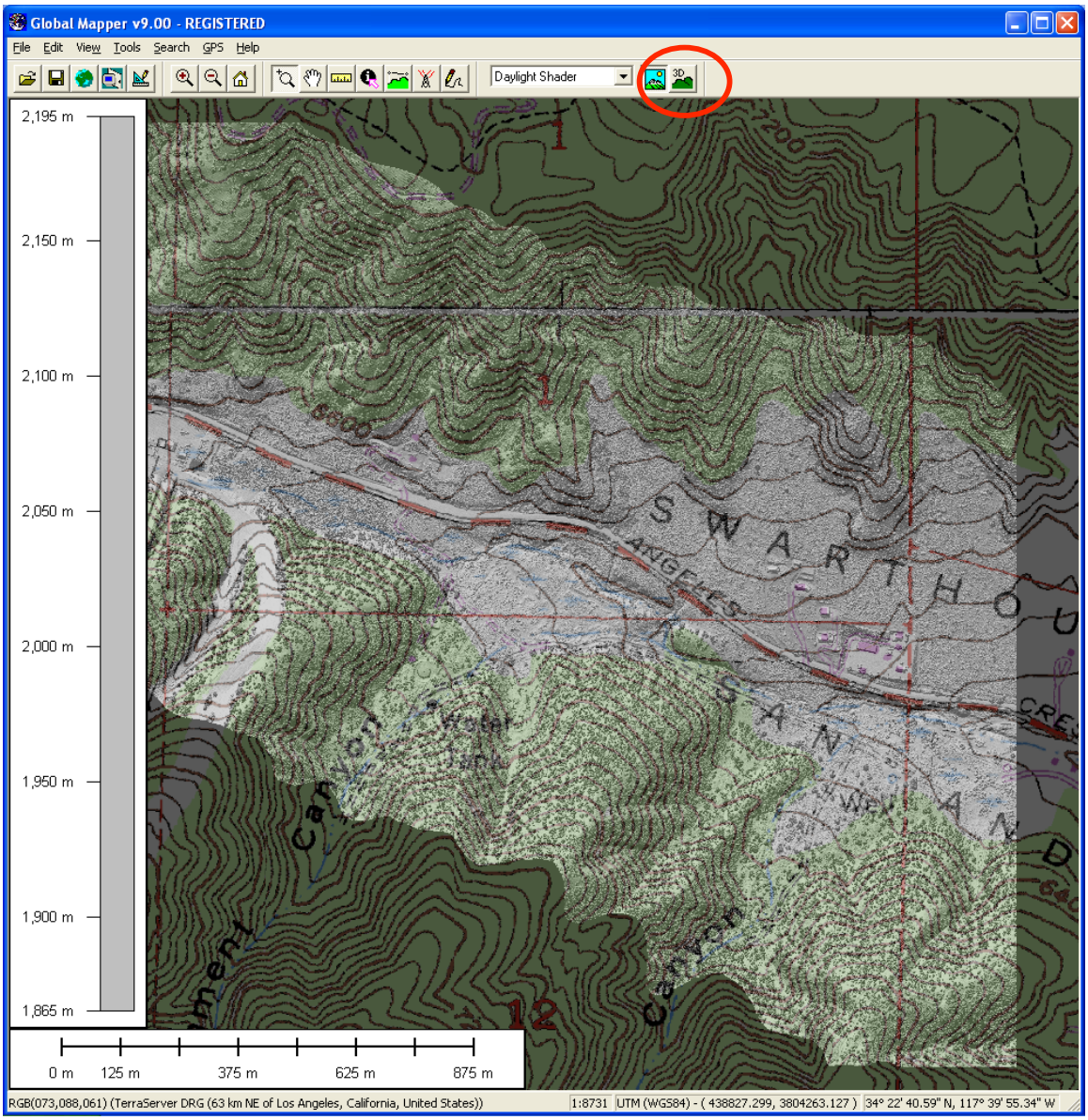



You should now be able to see through the DRG to the underlying hillshaded LiDAR DEM:

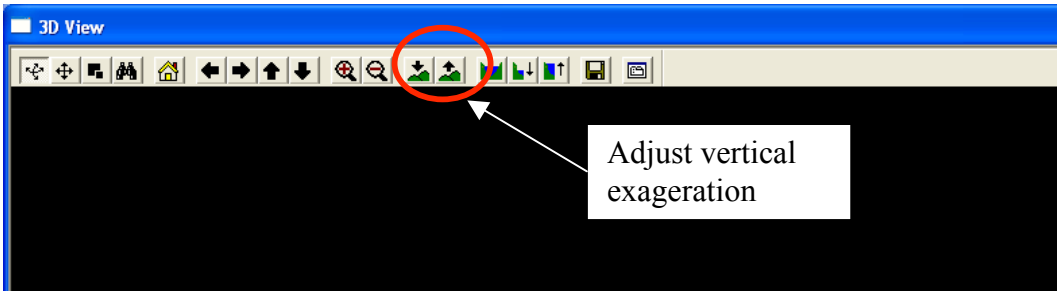


**3D VISUALIZATION:**
In addition to map view visualization of the LiDAR DEMs, Global Mapper also offers nice 3D visualization.

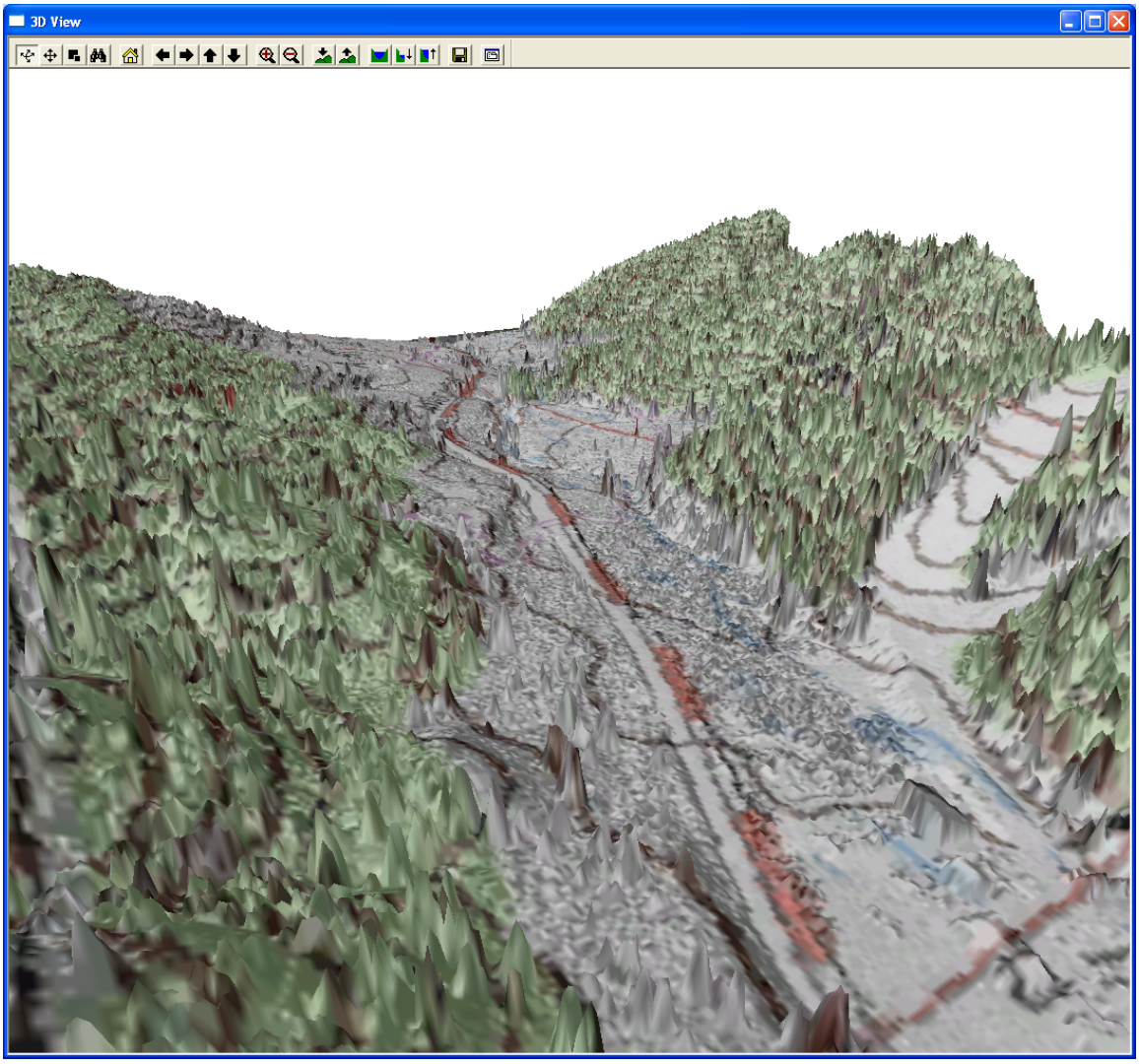
With data loaded in Global Mapper, choose the "Show 3D View" button:



Launching the 3D view will bring up a new widow which shows the same data in an interactive 3D perspective. You can spin, drag and zoom the view to change the perspective. Buttons across the top of the view allow you to modify the vertical exaggeration quickly.

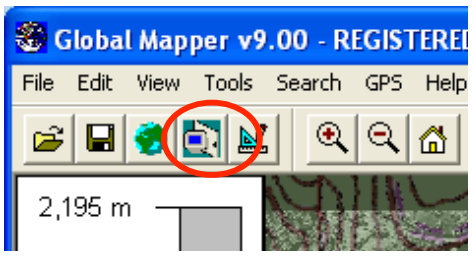



A quick 3D view for example:

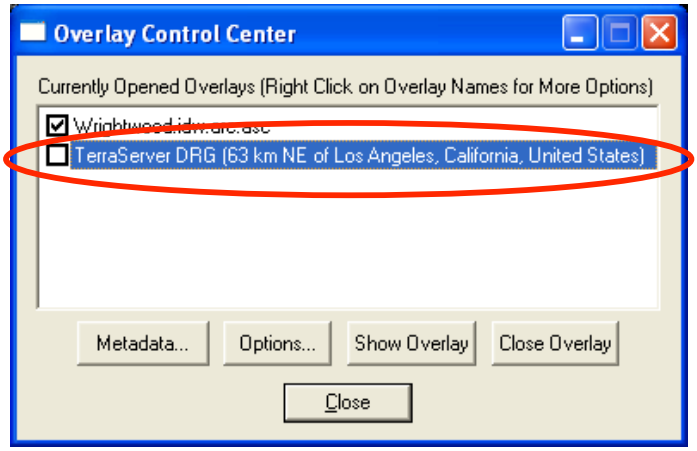


**EXPORT LiDAR DEMs TO GOOGLE EARTH KML FILE:**

Close your 3D view if still open.
Next, select the "**Open Control Center**" button again:

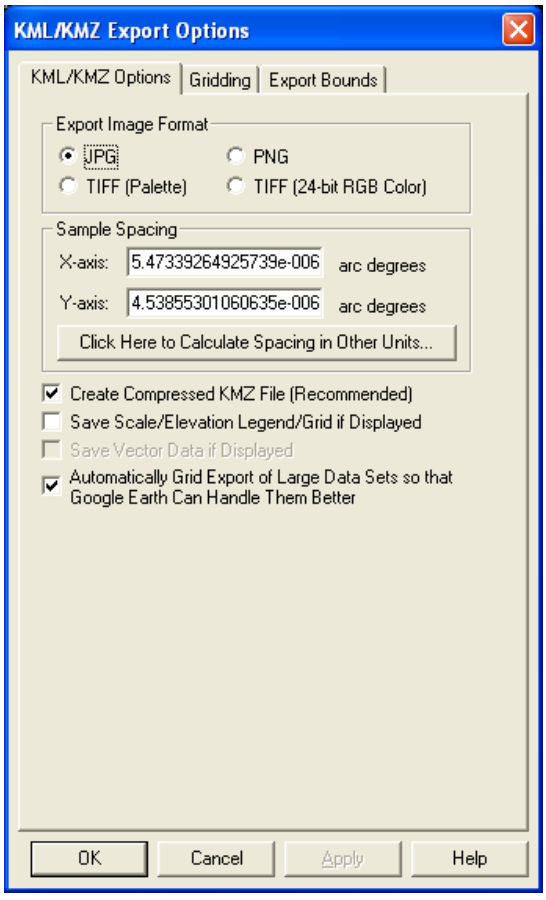



Turn off (uncheck) the DRG layer:




Close the menu
Select: "**File>Export Raster and Elevation Data>Export KML/KMZ**"

In the "KML/KMZ Export Options there are many options that are fully explained of you choose the "Help" option. For our purposes we will just accept the default options:



Click “OK” and name and save the kml file.

Once Global Mapper has finished exporting the LiDAR DEM to KML you can navigate to whereever you saved it and open it with Google Earth. Note that you can adjust the transparency of the LiDAR overlay using the slider on the left hand menu so that you can effectively “merge the LiDAR topography with the high-resolution aerial photography in Google Earth.