Exercise 3:

Global Mapper and Basic Visualization of LiDAR DEMs

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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"

Select Projection for Wrightwood.i	ГМ"
Projection	
Projection: UTM Zone: Load From File Save T Init From Zone:	11"
11 (120°W - 114°W - Northern Hemisphere)	
Datum: WGS84 Add Datum= "V	WGS84"
Planar Units: Elevation Units:	
METERS METERS V	
Parameters:	
Attribute Value	
CENTRAL MERIDIAN SCALE FACT 0.999600000 CENTRAL MERIDIAN -117.00000000 ORIGIN LATITUDE 0.00000000 FALSE EASTING (m) 500000 FALSE NORTHING (m) 0	
Use Selected Projection for All Selected Files	
OK Cancel Help	



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:

Configuration			×
Point Styles V General V	'ertical Options ector Display	Shader Options Area Styles	Projection Line Styles
Grid Display (Shift+G) Current Projection Grid Grid Spacing Automatic Custom			
 Show All Grid Lines Regardless of Zoom Scale Extend Grid Lines Beyond Loaded Data Bounds 			
□ Distance Scale Display Units (Shift+S) □ No Scale			
Elevation Legend Display Units (Shift+L) No Legend ⓒ Metric (meters) ⓒ Statute (feet)			
Position Display Format Lat/Lon dd* mm' ss.ss'' h			
Area Measure Ui	nits Square	Miles	•
Distance Measure Units Statute (ft/miles)			
Miscellaneous A Prefer World I Export Old Fo	dvanced Options File (TFW) Coord rmat PRJ Files	inates for GeoTIFF	Files 🔨
]	Restore Defaul	t Settings	
ОК	Cancel	Apply	Help

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):

Configuration Use the daylight shader General Vector Display Shader Point Styles Vertical Options Shader Options Project Daylight Shader Enable Hill Shading 	ction
Elevation Display Units Native Overlay Units Light Direction Altitude 45 + Azimuth 345 +	Set altitude and azimuth for the illumination orientation
Ambient Lighting (0.00) Dim Bright Vertical Exaggeration (1.0) Flat High	
Hill Shading Shadow Darkness (0) Dark Water Display	ce sure vertical ggeration is set
Show Water on Elevation Data Water Color Water Level: 0 Water Transparency (128) Opaque	
OK Cancel Apply He	P



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:

Color 🛛 🛛 🔀
<u>B</u> asic colors:
<u>C</u> ustom colors:
Define Custom Colors >>
OK Cancel



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.

	Configuration	
<	General Vector Display Area Styles Line Styles Point Styles Vertical Options Shader Options Projection Daylight Shader Global Shader Gradient Shader Slope Direction Shader Azimuth 315 ± Ambient Lighting (0.00) Dim Bright Vertical Exaggeration (1.0) Flat High 	Configuration General Vector Display Area Styles Line Styles Point Styles Vertical Options Shader Options Projection Daylight Shader Gradient Shader Stafe Color Low Seler High Color Stope Shader Low Seler High Color Stope Shader Maximum Slope Slope Value Color Color Coloring Between Min and Max Slope Values © Smooth Gradient Custom Color Select Slope Direction North Color North Color Select Select
	Hill Shading Shadow Darkness (U) Dark Light	



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:

Select Online Data Source to Download	d	X
Select Data Source *** Worldwide High-Bes Imagen; *** from Dig Dro - USIGS Digital Ortho-Quadrangle (Gray DRG - USIGS Digital Raster Graphics [Topol Droanstroo - High-resolution Color Imagery for Landsat7 Global Imagery Mosaic (Color, Par United States Elevation Data (NED) (30m R SRTM Worldwide Elevation Data (3-arc-sec NEXRAD Radar Base Composite (US)	ital Clobe/Clobe/Cylorer/AirPhote/USA (PREMUU) yscale aerial imagery) [TERRASERVER-USA.COM graphic Maps] [TERRASERVER-USA.COM] or Select Urban Areas in the US [TERRASERVER n-Sharpened] iesolution) cond Resolution)	OK Cancel
Add WMS Data Source Ren Select Area to Download © Current Screen Bounds	nove Source	
C Within 1 miles C Within 1 miles	of address of latitude 34.3696238509271 longitude	(US Only) -117.667882991459
C Specify Latitude/Longitude Bounds of Are West -117.68028158950 South 34	ea .379159747801 .360087954053 East -117.65548439340	(NOTE: Longitude values in the Western Hemisphere and latitude values in the Southern hemisphere must be negative.)
C Entire Data Source Bounds IMPORTANT NOTE: These data sources are o become unavailable at any time. We have no c	on external servers that Global Mapper has no cont ontrol over this.	trol over. The data may draw/export very slowly or

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..."



Raster Options 🛛 🛛 🔀	
Cropping Feathering Projection Display Color/Contrast Adjustment	
Color Intensity (0) Lighter Darker Default	
Translucency (Can You See Through It?) (35.0%)	
Blend Mode No Blend	
Transparent Set Transparent C Anti-Alias Pixels (Interpolate) Set "Translucency to about 35%	/"
I exture Map	
OK Cancel Apply Help	

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:

🏽 Global Mapper v9.00 - REGISTEREI
File Edit View Tools Search GPS Help
2,195 m
🗖 Overlay Control Center
Currently Opened Overlays (Right Click on Overlay Names for More Options)
✓ Wrightweed.idw.arc.asc TerraServer DRG (63 km NE of Los Angeles, California, United States)
Metadata Options Show Overlay Close Overlay
Close
KML/KMZ Export Options
KML/KMZ Options Gridding Export Bounds
C TIFF (Palette) C TIFF (24-bit RGB Color)
X-axis: 5.47339264925739e-006 arc degrees
Y-axis: 4.53855301060635e-006 arc degrees
Lick Here to Lalculate Spacing in Uther Units
Save Scale/Elevation Legend/Grid if Displayed
Save Vector Data if Displayed Automatically Grid Export of Large Data Sets so that Garda Earth Care Handle Them Better
OK Cancel Apply Help

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.

