GEO 301 | Lab 5 Mapping Magnetic Intensity Data using a Trend Surface Analysis
Color printout is due by 10 a.m. on Friday, 12 March 2010.

Create a 1-page layout for an introductory geology textbook that explains magnetic intensity (nT). At a minimum, the layout must include an ArcScene map of magnetic intensity (nT) for Chautauqua County, a legend, and a text box explaining magnetic intensity using Chautauqua County as an example. You will use a Trend Surface Analysis (Global Polynomial Interpolation) in ArcMap to represent magnetic intensity as a surface.

Remember to save early and often AND keep track of your data, including the new datasets you create.

1. Download and unzip CC_Mag_TSA_Lab.zip from SendSpace, which includes the following shapefiles and raster grids:
    a. `Lat41_43Long77_80` shapefile of magnetic intensity data. The source of the data is the GeoNet Gravity & Magnetic Dataset Repository at PACES (Pan American Center for Earth & Environmental Sciences) at the University of Texas at El Paso. <`http://irpsrvgis00.utep.edu/repositorywebsite/`>. I accessed and downloaded the data on 26 February 2010. It was originally a text file that I brought into Excel, edited it for use in ArcMap, and then created an event theme and eventually a shapefile of the data in ArcMap.
    b. `NYS_Counties` (NYS county boundaries from NYS CSCIC)
    c. chau_cnty (Chautauqua County boundary from NYS CSCIC)
    d. `padot-county_2004` (Pennsylvania county boundaries from `www.pasda.psu.edu`)
    e. `extract_52452` (DEM of Chautauqua County from `seamless.usgs.gov`)
    f. `ccoutlgd` (raster grid of Chautauqua County from NYS CSCIC Chautauqua County boundary)

2. Open ArcMap and add:
    a. `ccoutlgd`
    b. `chau_cnty`
    c. `Lat41_43Long77_80`

3. Reduce the magnetic intensity data to a 5 mile buffer around Chautauqua County.
    a. Click on the `Selection` menu > `Select by Location…`
    b. Under "`select features from the following layer(s):`", check the box next to `Lat41_43Long77_80`
    c. Select "`intersect`" under "`that:`"
    d. Select "`chau_cnty`".
    e. Check the box next to "`Apply a buffer to the features in Lat41_43Long77_80`
    f. Enter `5 Miles` after "`of`". Click `Apply` & `OK`.

4. Export the selected points to a new shapefile.
    a. Right-click on `Lat41_43Long77_80` in the `Table of Contents`. Select `Data > Export Data…`
    b. Save the shapefile to your flash drive or U: drive.
    c. Remove `Lat41_43Long77_80` from the `Table of Contents`.

5. Turn on the `Geostatistical Analyst Extension.Tools > Extensions > Geostatistical Analyst`

6. Turn on the Geostatistical Analyst Toolbar. View > Toolbars > Geostatistical Analyst

7. Create a Trend Surface Analysis (TSA) of the magnetic data using the Global Polynomial Interpolation method in the Geostatistical Wizard
    a. Geostatistical Analyst > Geostatistical Wizard… > Global Polynomial Interpolation.
    b. Select for Input data: the new shapefile of magnetic points for Chautauqua County and the surrounding area. Set Attribute to Intensity.
    c. Click Next > and set the Power to 10 > Next > Finish.
    d. You should now have a Global Polynomial Interpolation Prediction Map in the Table of Contents.
    e. Turn off the layer of magnetic points.

8. Convert the Global Polynomial Interpolation Map to a Raster. Right-click on Global Polynomial Interpolation Prediction Map in the Table of Contents > Data > Export to Raster…
    a. Set the Cell size to 0.002.
    b. Set the Output raster location to your flash drive or U: drive. Click OK. Click Yes to add the new layer to the current map.

9. Extract the portion of the surface that coincides with Chautauqua County.
    a. Open ArcToolbox > Spatial Analyst Tools > Extraction > Extract by Mask
    b. The Input raster is the raster version of the Global Polynomial Interpolation Prediction Map created in #9.
    c. The Input raster or feature mask data is ccoutlgd
    d. The Output raster should be saved to your flash drive.
    e. Remove the raster created in #9.
    f. Remove chau_cnty.
    g. Remove ccoutlgd.
    h. Turn off the Global Polynomial Interpolation Prediction Map.

10. Create a 3D version of the magnetic surface in ArcScene.
    a. Open ArcScene
    b. Add the "extracted/clipped" raster created in # 10 to the Scene

11. Set the Base Heights for the magnetic surface to the heights from extract_52452.
    a. Right-click on the raster created in #10 and select Properties…
    b. Select "Obtain heights for layer from surface:"
    c. Click the Browse **button** (opening folder) and navigate to where you've saved extract_52452.
    d. Click Apply and OK.

12. Set the Vertical Exaggeration of the Scene using Calculate From Extent

13. In the Rendering Tab of the magnetic surface's Properties, check the box next to "Shade areal features relative to the scene's light position"

14. Select an appropriate color ramp for the magnetic surface. Check the box next to "`Use hillshade effect`". Change the label for the High and Low values to remove the decimal places and add the abbreviation for Intensity, nT. Also remove the words `High:` and `Low:`

15. Add the following for context.
    a. `NYS_Counties`
    b. `padot-county_2004`

16. Adjust the components of the `Scene` until you're please with the perspective, symbology of the various layers, background color of the `Scene`, etc.

17. Copy the `Scene` to the `Clipboard` for use in ArcMap.
    a. `Edit > Copy Scene to Clipboard`

18. Paste the `Scene` into the `Layout View` in ArcMap
    a. Set the color ramp and labels for the "extracted/clipped" raster created in #10 to match what you used in ArcScene.
    b. Insert a Legend for the "extracted/clipped" raster created in #10 in the `Layout View`.
    c. Make the data frame very small and hide it behind the legend. ;-)

19. Add the following to the Layout:
    a. Title, which can be for both the map and the supporting text
    b. Scale bar
    c. North arrow
    d. Your name, SUNY Fredonia, the date, which can be part of the textbox (see below)
    e. Source information, which can be part of the textbox (see below)
    f. You may add labels and/or an inset map if you'd like to help orient the reader
    g. Textbox explaining magnetic intensity to college freshmen (see #20 below)

20. Search for information on magnetic intensity. How were these data captured? What does magnetic intensity tell us? How and why is it used? What additional data layers would aid in the interpretation? Cite the source(s) you use. You're welcome to add other graphics to the layout as long as the sources for those graphics are cited.