

Tilt Derivative “tilt_calc3” Script

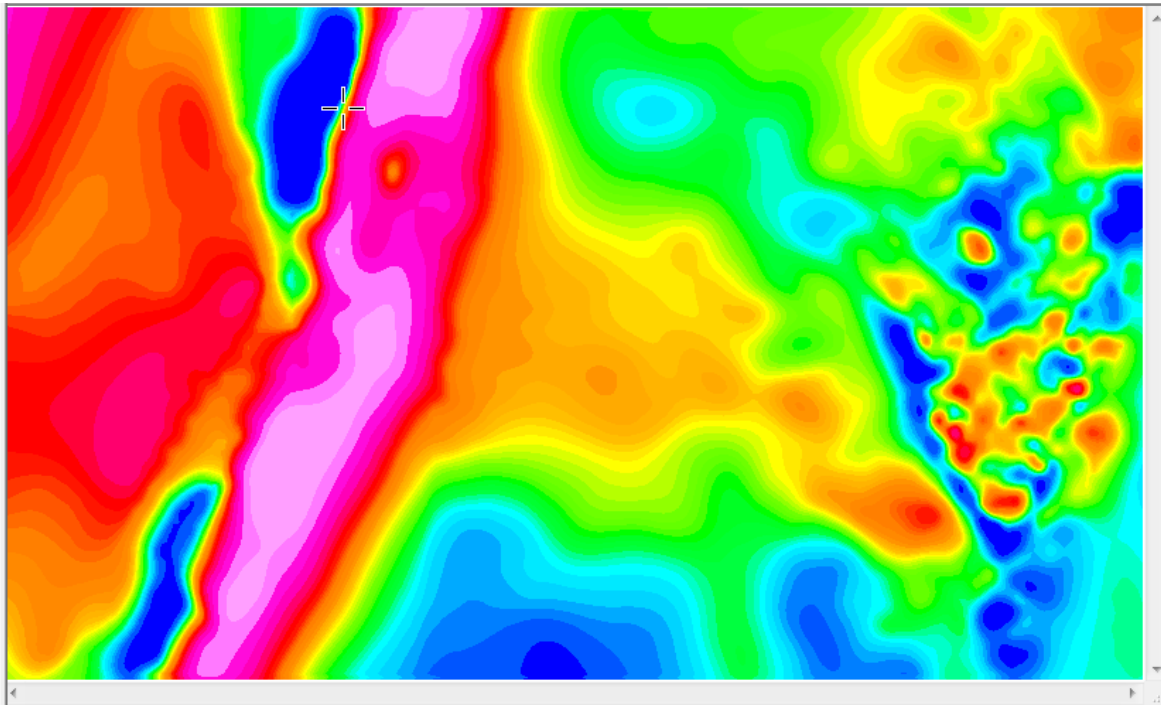
This script takes advantage of the derivation by Rick Blakely (see attached easy_tilt.pdf) that shows that $1/\text{tilt_HD} = \text{depth-to-source}$ along the zero contour of the tilt derivative. Remember that the input grid needs to be RTP.

The script does the following:

- Calculate the tilt derivative (θ) and horizontal gradient of the tilt derivative ($d\theta/dh$) using the MagMap tiltdrv.gx
- Display θ using a grayscale zone file (tilt2.zon) that colors the grid between ± 0.4636476 radians (i.e., $\pm \tan^{-1}(1/2)$ for $z/2$) gray and everything else white
- Draw the zero contour on the grayscale map
- Export the contour to a shape file
- Import the shape file into a GDB named “pts_tilt0_Inz_Shapes.gdb”. The other gdb created (“pts.gdb”) can be deleted.
- Re-fid the points in the GDB to their "nominal" distance to reduce gaps
- Sample the $d\theta/dh$ grid along the zero contour
- Run a database math expression to calculate a depth channel $= 1/ d\theta/dh$

Exporting the contours to a shape file is the only way I could find to get the contour location into a GDB. This process could be cleaned up significantly with a small amount of developer time. Note that the “Depth” channel is the depth below the flight elevation.

The maps below show an example of this script run on the Warner Valley magnetic data.



Input magnetic anomaly grid

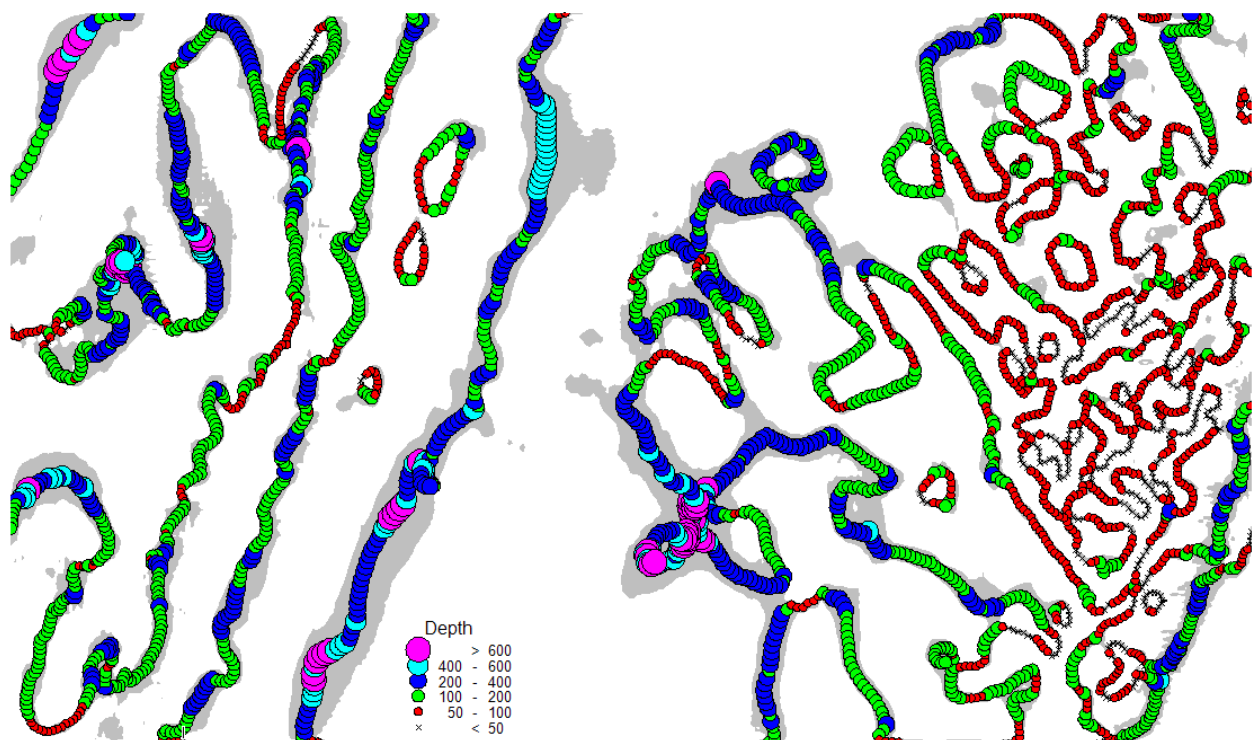
pts_tilt0_lnz_Shapes.gdb

✓ 0	X	Y	Z	ID	ZValue	Depth
0.0	259996.5122	4675170.0000	0.0000	0	0.000	49.1
42.3	259955.7031	4675180.9449	0.0000	0	0.000	50.9
84.5	259913.9227	4675186.8916	0.0000	0	0.000	55.7
126.8	259871.9846	4675192.0264	0.0000	0	0.000	61.2
169.0	259838.8858	4675204.8156	0.0000	0	0.000	76.1
211.3	259850.6882	4675243.2496	0.0000	0	0.000	156.9
253.5	259869.1067	4675262.9065	0.0000	0	0.000	185.4
295.8	259907.9265	4675251.5532	0.0000	0	0.000	124.8
338.0	259950.1029	4675254.0306	0.0000	0	0.000	123.4
380.3	259987.7573	4675270.2135	0.0000	0	0.000	121.3
422.5	260016.7184	4675300.9776	0.0000	0	0.000	140.5
464.8	260034.4515	4675336.1251	0.0000	0	0.000	133.5
507.0	260047.7059	4675375.0099	0.0000	0	0.000	142.7

Cell 259996.512167246

| NAD27 / UTM zone 11N |

Output GDB with calculated depths



Grayscale map produced by script with depth locations from gdb manually plotted as proportional symbols