Problem Set #4 - Dislocations in a half-space.

Use the Matlab script called DislocOkada.m that is available on the class website to calculate the displacements at the surface given the following input dislocation source parameters. Note that when you get this function off the class page it may call other functions (that are also on the class page), so make sure you get those too. You could also use OkadaBlock.m, which is in some ways easier. In this script your inputs are geographic coordinates of the end points of the surface projection of the fault (which imply its length). In this case assume some coordinates for one end point, and make the appropriate calculations to get the other inputs needed for the script.

For each dislocation evaluate the function on a grid of points and plot in Matlab. The matlab function MESHGRID is nice for generating grids, and outputs from this function can be used as inputs into the handy plotting tools e.g. “pcolor” and “contour”.

For each dislocation make a plot of:
1) the location of the source plane, i.e. its projection at the surface for a 2d plot, or its 3d position in a 3d plot (which is straightforward in Matlab).
2) the surface displacement vectors using the quiver function, evaluated on a grid of evenly spaced points at the surface. Choose grid spacing that is appropriate, i.e. is not too dense to see vectors but is dense enough to get a feel for the pattern of displacement.
3) OkadaBlock provides vertical displacement as well. Try plotting contours of the vertical displacement using “contour”.

<u>Dislocation 1</u>

Strike slip on a *vertical* fault that has slipped in a right lateral sense and has ruptured the surface (Dtop=0). This rectangular fault patch is 10 km long (horizontally) by 5 km wide (along depth direction) and slips 0.5 meters. Orientation (strike) of fault is not important so choose something and go with it.

Does the displacement pattern make sense? What is the magnitude of this earthquake? Remember Mo= Area*slip*shear modulus, and Mw = (2/3)*(7 + log10(Mo)) - 10.73

<u>Dislocation 2</u>

1.0 meter of *normal* slip on a 3km x 3km patch that dips 30 degrees, with the top of the plane at 2 km depth.

<u>Dislocation 3</u>

Tensile opening of a crack that is dipping 45 degrees. The top of the 1.0 km x 1.0 km plane is at 1.0 km depth.

Email your plots and responses to *whammond@unr.edu*