

## Lab 7 DEM with Surfer & Matlab Due March 22<sup>th</sup>

**Goals: 1)** Learn and use a digital elevation model and contouring programs. Using Georef, find a paper on sea level terraces in the San Diego (or northern Baja) area. Turn in a 2 page write-up summarizing the paper (with a reference) as compared with the digital elevation data and explain how marine terraces form and how they relate to sea level. The grading will be based in part on the lab and in part on the interpretation of the marine terraces.

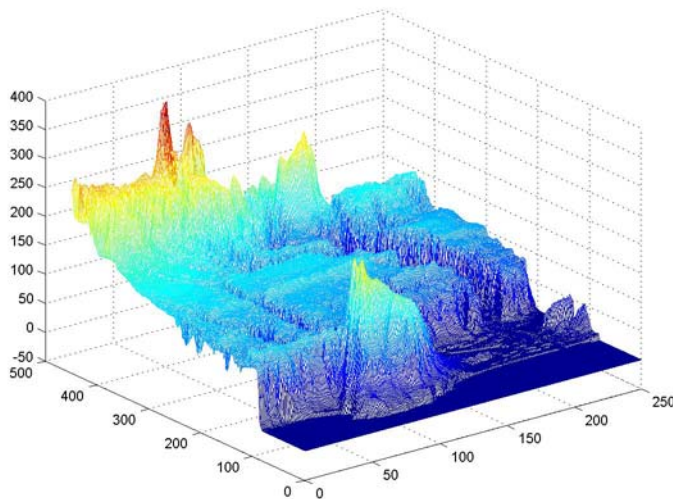
Note: Surfer is not available on the computers in CSL 427 – you will have to go to the computer lab to do this part.

### Contouring

We will use several different programs to contour the same dataset. We will generate different views of the same data. Download the data files sd.zip and extract the files *sdat.mat* and *sd.dat*. These files are derived from the National Elevation Digital data (NED) dataset.

### **Matlab:**

First, we need to load the data into matlab. The file *sdat.mat* is a file in matlab format with elevation data (in meters) of the San Diego area in a grid. Start matlab and `cd` to wherever the file is. Then type "load sdat". The data file will be loaded as 2 dimensional array. Type "who" - what is the name of the array?



Make a contour plot of the data using the *contour* function. Try "help contour" for instructions on how to use the contour function. Print a copy and include in your write-up. Try the *mesh* function (again use help if you have questions). Also try the *imagesc* function to get other views of the data. Include a copy of your favorite view in your write-up. The *rotate3d* command will allow you to move 3D images with the mouse. Save three

different views of the image.

```
>> print -djpeg fig1
```

will save the image into a jpeg file named fig1.jpg. Save the other two views into fig2.jpg and fig3.jpg.

It is also possible to make 2D profiles using this data. To do this, we need to extract a row from the 2D array. The command `size(sdat)` gives the dimensions of the array. The command `» p1 = sdat(:,84);` will extract the 84<sup>th</sup> row of the matrix

data1 and put it into the 1D array p1. Try making a plot with `plot(p1)` (obviously, there is considerable vertical exaggeration). Typing `hold` allows multiple plots and `hold off` stops this feature. This might show a number of apparent horizontal surfaces in the data.

### Surfer:

Start surfer (under Golden) and import the datafile `sd.dat` using **grid, data**. This is an ASCII file that contains the same elevation information as `sd.mat` but in a different format - the information is stored as `x,y,z` with `x` and `z` being longitude and latitude. Hit okay, then okay (gridding method: kriging). Notice that there are more options for the contouring. This should create a file named `sd.grd`.

Make a contour map of the data using the map, contour option (using the data in `sd.grd`). Put a copy in your write-up. Try the other options (*shaded relief, surface*) under map for plotting. Maps that you don't like can be deleted by clicking on the map and hitting delete. Draw a line (under **draw**) on your favorite plot pointing to where you think SDSU is. Add text labeling it.

Now go back to grid/data and reload `sd.dat`. Re-grid the data using a method other than kriging (i.e., Shepard's, etc) and then re-contour the data. Does it look different? How?

Now go under grid, math. Make a new grid using the formula  $C = \max((A-100), 0)$ . Use help to figure out what the max function does. Remember to name the new grid something other than `sd.grd`. Every point on the new grid C will be the maximum of either 0 or (A-100). If a point is 0 on A what will it be on C? If a point is 50 on A what will it be on C? If a point is 150 on A what will it be on C?

Make maps of both A and C using the mesh option and use the same vertical scale. What does this show?

