Geophysical Data Analysis (16:712:615, 11:628:452)

Homework 3: Two-dimensional spatial mapping

Get the matlab scripts **gda_homework_mapping.m** and **loess2dg.m** and the data file **latte2005_surface_ships.mat** from the class web site http://marine.rutgers.edu/dmcs/ms615/2008/matlab/ (There are also 2 other files for plotting the coastline: plotmabcoast.m and mab_coast.mat).

The **gda_homework_mapping.m** script will make a map of surface salinity from data gathered by research vessels during the 2005 LaTTE field experiment using one of three methods:

- Matlab's built-in griddata function
- The 2D loess (weighted least squares) filter with options
  - Distance
  - Number
- Optimal Interpolation

The script reports the root-mean-squared difference between the mapped field and the original data but this is only one measure of how good the map is. Use the zoom function in the plot window to scrutinize the maps you produce.

Activate the different options by editing the lines above line 35, or comment out those lines and set them in the command window before you run the script.

Exercises:

1. Use the 'griddata' option to produce the first map. Comment on the results. (FYI: There are sub-options 'linear' and 'cubic' to griddata.)

Next experiment with the 'loess2dg' option for local weighted least squares fit:

2. Use the 'number' method and R=10, 50, and 500. Comment on the results.

3. Use the 'distance' method and R=0.05, 0.1, 0.2. Comment on the results.

Next experiment with the 'oi' option for optimal interpolation:

4. Use lambda = 0.1 and R = 0.1 and 0.5. Comment on the results.

5. Use lambda = 0.0001 and 0.5 for R = 0.2. Comment on the results.

   Be sure you understand and explain what is represented by the R and lambda parameters.

6. What is your preferred map and why? (There is no ‘right’ answer, but justify your opinion).

To get an “A+”:

7. Add time dependence to the covariance function in OI

8. Modify the code to produce a map of the OI expected error.