More on Matlab

Stored commands : .m files

- **MATLAB commands may be stored in a file for convenience**
- **Such a file has the extension .m**
- **And is run in MATLAB by simply entering its name without the extension**
- **In the command line and the commands in the file will all be executed**
- **As if they were all entered in sequence.**

Very simple example

- To create the plot of the cube from 0 to 1 that was our previous problem we could
- 1. Create a file containing:
- **u = [0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0]**
- **v = u.*u.*u**
- **plot(u,s)**

- 2. Save that file with a name ending in .m,
- For example “cube.m”.
- 3. Either cd in MATLAB to that directory or move that file into the directory MATLAB is using.
- 4. In MATLAB enter “cube”. (Note this is without the ‘.m’ .)

- The advantage of this method is that we can use the cube program
- Over and over again.

example

- **A more advanced example, if you have loaded the contents of the file JAN1941sample via the import wizard ,**
- **So that JAN1941sample is a 32 row by 5 column array with**
- **Longitude (degrees) the 1st column, latitude(degrees) the 2nd column, depth(meters) the 3rd column,**
- **Heat diffusivity (cm^2/s) [Heat Mixing] the 5th column and Richardson number [Stability] the 4th column**

Sample .m file

- **#And you have created a file simpleavg.m containing:**
- **data= JAN1941sample**
- **lon=data(:,1);**
- **lat=data(:,2);**
- **depth=data(:,3);**
- **kh=data(:,5);**
- **ri=data(:,4);**
- **mask=(data~=-1.e30);**
- **riavg=sum(ri.*mask)/sum(mask)**
- **khavg=sum(kh.*mask)/sum(mask)**
- **#Where the mask is a logical array which masks out the data's "bad value" -1.e30 so that it is 0 for non-ocean points and 1 for ocean points so only ocean points are included in the statistics**
- **#And ".*" is the MATLAB operator for point by point multiplication of arrays.**
- **#(Remember ";" at the end of the line stops the result from being written out)**
- **#Then typing "simpleavg" at the matlab command line should place in variables riavg and khavg and print to the screen the unweighted average of the Richardson number(stability) and the unweighted average of the Heat Diffusivity (heat mixing) respectively.**

Problem

- Write and run a matlab program weightave.m
- to calculate riwtavg and khwtavg
- the **volume** weighted averages of the Richardson number and Heat Diffusivity respectively over the ocean points
- Of the column of data in **= JAN1941sample** .
- **One must first calculate the volume of the gridcell corresponding to each data point,**
- **Which will be the weight, w.**

Weighted average

- More generally the expectation values we use
- Are weighted averages
- <x> = Sigma(x_i*w_i))/Sigma(w_i)
- Where the w_i are the weights.
- In this particular example the data is spaced
- So that the deeper we go the farther apart the points are. Thus a deeper point represents a wider range of depth and therefore a greater volume and hence mass than a shallower point.
- The spacing is a choice of the simulation,
- So a mass-weighted average, to which a volume-weighted average closely approximates since density is almost constant, is vastly more meaningful physically than the simple average.
- To obtain the volume-weighted average we must calculate the thickness of the layer around each point and use it as the weight.