GEOPHYSICAL INVERSION **ASSIGNMENT 4**

By now your program should have code to do Marquardt Levenberg inversions with weighted data. If you have not already done so, add code to include weighting of model parameters.

I think the "AMPLITUDE" is given in microseconds of variations of tidal periods

The table below has some observations of normalized tidal length of day. These data are also in Asg4.dat. Notice that the standard deviation varies from term to terms such that the 13.66 day term is very well observed and 13.77 very poorly observed. Do a simple least squares fit of a straight line to the amplitude and phase and then repeat with a weighted least squares fit. The weights are chosen so that more accurate observations are given more weight in determining the best straight line. The data weighting should be inversely proportional to the variance (σ^2) of each sample.

PERIOD days	AMPLITUDE	σ	PHASE deg	σ deg
31.8119	.3170	.0430	-1.2	7.9
27.5546	.3110	.0070	0.9	1.3
14.7653	.3392	.0250	8.5	4.3
13.7773	.3142	.0480	-1.9	9.0
13.6608	.3108	.0021	2.5	0.4
13.6334	.3015	.0051	4.9	1.0
9.5569	.3387	.0410	7.1	8.3
9.1329	.3053	.0071	2.3	1.4
9.1207	.3118	.0170	5.4	3.3
7.0958	.3158	.0280	7.4	6.3
6.8594	.3000	.0340	-2.9	7.0

Try adding four more tasks to the discussion of the better (weighted) model:

1) Calculate the model covariance matrix and report the errors of the intercept and slope, and also the covariance between the intercept and slope.

2) Plot error bars for the data and see how they compare to the scatter and to the effect of the slope of the inverted trend;

3) Evaluate the chi squared criterion for data fit and decide whether the data errors are random at 95% confidence. For this, refer to eqs. (6.11-6.13) and Figs. 6.7 and 6.8 in the text. If you find the errors are not random, what would you do?