SIO 224 Homework 5

1) What phase transformation(s) account for:
a) the 410km discontinuity
b) the 520km discontinuity
c) the 660km discontinuity
d) the top of the D"
e) the ICB (inner core boundary)
Which transformations are endothermic or exothermic or both (be sure you take into account all the phase transformations that might be occurring). Why is this important for mantle dynamics?

2) Tomography practical. Download swave.tar and type "tar -xvf swave.tar" which will result in the directory swave_tutorial. This uses real data sets to illustrate concepts of resolution and error in tomographic inversions, though here we are making phase velocity maps from surface wave data. This is a two-dimensional problem so it is easier to visualize than the full 3d problem of recovering structure from data. The file swtutorial.pdf describes all the scripts that you can run.

For the 3 periods given, show me your best estimate of the global phase velocity map along with resolution tests and errors. There are two possible theories you can use. One just assumes great circle propagation, and the other takes into account some finite frequency effects. I will describe these in class

3) Summarize the seismic evidence for chemical heterogeneity in the lower mantle. Could this be explained by the post-perovskite phase transformation? Explain your answer.