

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) Assuming you have a small enough system of equations that you can perform a SVD, derive expressions for the "covariance matrix" of your model and the "resolution matrix". What assumptions have you made about the covariance matrix of your data? Are these assumptions reasonable? How would you assess the error and resolution of your tomographic model in practice (i.e., when the system is too big to do a SVD).

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.