HOMEWORK 7

Oral presentations of flexure problems, November 25, November 27

Group A – Ice Shelf Flexure
Discuss the tidal flexure model and derive equation 3 in the paper by Vaughn. [1995]. Generate the curve shown in Figure 5. Explain the overall findings of the paper.

Group B – Seamount Flexure
Discuss the seamount loading flexure model and derive equation 11 of Banks et al., [1977]. How would one calculate a model for a load of arbitrary shape? Use GMT or matlab to generate the flexure for a Gaussian-shaped seamount.

Group C - Trench Flexure
Discuss the trench flexure problem and derive the solution given in equation 2 of Caldwell et al., [1976]. Reproduce the graphs shown in Figure 3. Explain the overall findings of the paper.

Group D - Fracture Zone Flexure
Discuss the fracture zone flexure problem and derive the solution given in equation 11 of Sandwell and Schubert [1982]. Calculate the topography and stress across a single fracture zone with different flexural rigidities on either side (simple case, , no time dependence, no lateral heat conduction). Explain the overall findings of the paper.

Group E – Lake/Ocean Loading Flexure
Discuss the lake loading flexure problem and its effect on the San Andreas Fault. Derive equations 2 and 3 in Luttrell et el. [2007]. Reproduce the thin-plate plots in Figure 4. Explain the overall findings of the paper. Another problem is to discuss the changes in earthquake patterns as sea level rose rapidly 7000 years ago [Luttrell and Sandwell, 2010].

Group F - Flexure on Venus
Discuss the Venus Flexure problem and why it is important. Derive equations 2 in Johnson and Sandwell [1994]. Derive equation 10 from equations 7 and 8. When might it be more appropriate to use a ring load rather than a bar load. Explain the overall findings of the paper in terms of the geothermal gradient on Venus.

Group G - Outer Rise Yield Strength
Discuss why it is important to consider the finite yield strength of the lithosphere when modeling flexure at subduction zones. Discuss equations (3) and (12) in McNutt and Menard [1982]. Discuss the difference between the elastic thickness and the mechanical thickness.

Group H - Rift Flank Uplift
Why do the flanks of rifts go up? Reproduce Figure 3 in Brown and Phillips [1999]. Discuss the equation (11) and Figure 5 in Wessel and Karner [1989].

Group I – Sediment Covered Ridge

Why is the gravity field over a sediment covered ridge mostly regative? Make a gravity anomaly profile over a Gaussian ridge with a height of 2 km, a Gaussian sigma $\sigma = 10$ km, and an elastic thickness of 5 km. Then bury the ridge with sediments of density of 2300 kg m^{-3} and elastic thickness of 30 km. What is the resulting gravity field? How does this gravity field change with differnet values of starting and ending elastic thickness or flexural rigidity?