Project 3: Driving Forces using Basin2 **Due: 4/3/09**

Basin2 is a finite difference code written by Craig Bethke and students at the University of Illinois. It runs under Windows XP. A complete users guide is available as a pdf file on the web page. I also include a truncated version which refers to the sections necessary for this project. Input files are also available to download from the web page.

1) **One-Dimensional Compaction –** using the data file B2in_7.1-compaction (Input 7.1 in users guide)

   a) Reproduce the results in Figure 7.1 for permeability of 10 and 0.1 microDarcy;

   b) Reproduce the results in Figure 7.2 for sedimentation rates of 100 and 1 mm/yr

   c) For part b, also generate plots for z-permeability and z-specific discharge versus depth

   d) Discuss the implications of results a-c for development of compaction driven flow

2) **Compaction in Niger Delta –** using the data file B2in_7.2-compaction (Input 7.2 in users guide)

   a) Reproduce results in Figure 7.3 for time = -2.5

   b) Run results for time = -2.5 assuming that the entire basin is composed of i) shale and ii) sand

   c) Run results assuming that sedimentation rates are ½ what are observed (double time for each layer)

   d) Discuss your results

3) **Topographic Recharge –** using the data file B2in_8.1-topo (Input 8.1 in users guide)

   a) Replicate results shown in Figures 8.1 and 8.3

   b) Generate plots showing specific discharge versus length in both units for part a

   c) Discuss results in a and b above as well as compare velocities generated by compaction versus topographic recharge

4) **Thermal Convection –** using the data file B2in_10.1-thermal (Input 10.1 in users guide)

   a) Determine the permeability at which free convection will occur assuming a sediment thickness of 1 km, a constant heat flow of 2 hfu, and no topography.

   b) How is free convection in part a modified by topographic recharge of 50 m? What does this imply about the relative importance of the 3 driving forces modeled above?