Problem Set 5 – due 10/23/02

1) Calculate the dynamic flattening H = (C-A)/C for the following simple planetary models:

a) A uniform density planet, ρ=5.5, with an outer surface defined by r=A (1-f $\cos^2 \theta$), with θ colatitude

b) A planet with a uniform density core, ρ_c=10, covered by a uniform density mantle, ρ_m=4.9. The core-mantle boundary is given by

r_c=c (1-f $\cos^2 \theta$) and the surface is

r_a=a (1-f $\cos^2 \theta$), with c = a/2.

c) As in b), but now r_c=c (1 - f/2 $\cos^2 \theta$). Comment on these results in view of the fact that for Earth, f=3.36.10^{-3}, while H = 3.27.10^{-3}.

2) Calculate the change in length of day and amplitude of the Chandler wobble caused by the redistribution of mass due to the melting of a winter's worth of snow of N. America.

[For evaluating the spherical harmonics involved, approximate the snow load as a point mass at 45^{o}N, 90^{o}W, elevation 500 m. Assume that the meltwater is evenly distributed over the surface of the earth. Estimate needed parameters.]