Steven Kizu

Module 5

1. $P = \rho g_T h$ for g_T I'll use the equator
so sub in $g_T = g_e = 9.7803267715 \ m/s^2$
and use the infinite slab $\delta g = 2\pi G \rho h$
from above: $h = \frac{P}{\rho g_T}$ $\rightarrow \delta g = 2\pi G \rho \left(\frac{P}{\rho g_T}\right) = \frac{2\pi G P}{g_T}$
$G = 6.67 \times 10^{-11} \ m^3 \ kg^{-1} s^{-2}$ standard $P = 101325 \ Pa$ or $1013.25 \ mbar$
so for standard values $\delta g_s = 4.342 \times 10^{-6} \ m/s^2 = 43.42 \ mGal$
raised to 1014.25 mbar $\delta g_1 = 4.346 \times 10^{-6} \ m/s^2 = 43.46 \ mGal$
raised to 1023.25 mbar $\delta g_{10} = 4.385 \times 10^{-6} \ m/s^2 = 43.85 \ mGal$
These changes in gravity are around 40μGal for a 1mbar change and 430μGal for a 10 mbar change. The 1mbar change might only be significant for microgravity surveys, but the change from 10mbar could be large enough to affect general exploration gravity as well, depending on the level of detail required.

2. The tidal effect at the equator has a larger variation from around -0.1 mGal to 0.2 mGal centered around 0.05 mGal. There are 2 periods per 24 hours, and the variation is nearly symmetric with only varying amplitude between the days. This seems solely based on the high and low tides of the moon. As latitude increases, the two tidal peaks become less symmetric, and develop a pattern of higher and lower peaks that seem to correspond to different concave-up (for the high peaks) and concave-down (for low peaks) patterns that meet around October 3, 2013. This variation of tides is likely due to the sun and moon's tidal effects being out of sync, and the total change in gravity trends to lower values with the higher peak being at 0.1mGal.