Satellitegeophysics, Blok 2, 2011.

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Exercise 2013-12-11.

Make sure you have finished exercise 10 for day 2).

1. Use $\bar{C}_{20}$ in the spherical harmonic expansion of the gravity potential, V.
What is the largest difference between the contribution of this term to the radial and north-going components of the potential 2.order derivatives (zz, yy) for the satellite (GOCE) with the inclination 82^o and a circular orbit with radius 6630000 m. What are the consequences for the measurements of the gradiometer in GOCE ?

2. Suppose we have 2 accelerometers with a distance of 0.5 m in the satellite as in exercise 1,
Its position is above the Equator. The accelerometers measure with independent noise. (Not possible in reality).
Which measurement accuracy is needed for each accelerometer in order to determine the gravity gradient with an accuracy of $1 * 10^{-12}$ s^{-2} (1 mEU,milli Eötvöes) ?

3. Compute the radial gravity component and gradient for a sphere with the same mass as the Earth and g radius r_e= 6371000 m in the altitudes 0 m, 100000 m, 250000 m and 700000 m ?

4. Suppose we have a sphere with radius r and center right at the surface of the spherical Earth with the density d, and suppose that we in a satellite may measure the gravity gradient with an accuracy e.
Express (as an equation) the value of r needed if the signal in the satellite is to be larger than e.
(When also the satellite is right above the sphere).
The calculate r for e = 0.01 EU, e= 0.001 EU and d = 0.1 g/cm**3.