**Problems**

These problems consist of removing the topographic phase pattern from an interferogram and revealing a deformation signature. We will begin with two single look complex (slc) files, then form the interferogram, and make the phase correction. For each answer, please create an image file such as a .jpg or .tif file and submit. In this way you can avoid submitting large files that might not fit on the submissions disk.

For computing the topo phase term, you may find the construction in the following figure useful. The parameters for these problems are given in the following table.
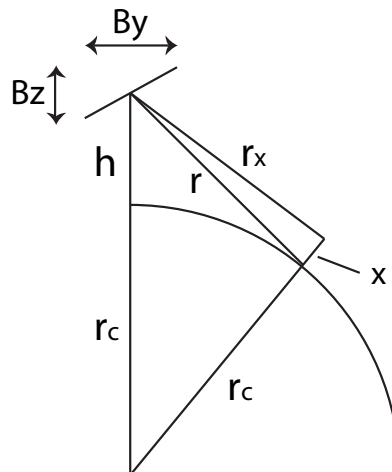
Look vector geometry. In this figure, r_c represents the local Earth radius of curvature, h is the satellite height, x is the topographic elevation at a point, r is the range to the reference sphere at the point, r_x is the range to the point at elevation, and B_y and B_z are the components of the baseline vector B.

Image width, pixels:	6144
Image length, lines:	12000
Radius of curvature:	6343837.13 m
Satellite height:	700000 m
Range to first pixel:	741489 m
Range sample rate:	32 MHz, complex samples
Wavelength:	0.236057

Problem 1. Download files slc1.dat and slc2.dat from class web area. These images have

been processed using a motion compensation processor that removes the flat-Earth term automatically, and produces co-registered images. Cross multiply the two images and form the interferogram, take 4 looks in range and 16 in azimuth, and submit an image. Your interferogram should resembles topography of Hawaii with the flat (curved) Earth term removed.

Problem 2. Now download the slc.dem and slc.baseline files from the website. The dem file is a floating point array with the elevation of each point in meters, and every location corresponds to the slc1.dat and slc2.dat files. The slc.baseline file is a text file with 12000 lines, one for each line in the radar images. Each entry consists of three numbers, the line number, the length of the baseline vector in the y directions, and the length of the baseline vector in the z direction. Open the DEM file and take looks to match the interferogram.

Problem 3. Compute the topographic phase term as follows. Referring to the figure, calculate the unit look vectors to both the elevated point at each pixel location and also to the same pixel location but at zero elevation. (Hint: you will find it most accurate to use the curved-Earth geometry in your construction). The two unit vectors will be almost the same, but slightly different. Simulate the radar phase measurement by deriving the component of the baseline vector for each line in the line-of-sight direction to each pixel using the two unit vectors you just created. You will have two phases, one for the elevated pixel and one for the pixel at ground level. The difference of these is the topographic phase. Submit an image of the simulated topographic phase.

Problem 4. Using the simulated phase, correct the phase of each point in the interferogram for topography. This should yield a map of the deformation. Submit this image.

Problem 5. Now examine the deformation signature. Using the measured phases estimate the size of the deformation at several points where significant deformation is occurring. How much deformation in cm is occurring over the time of this interferogram? Is it related to features seen in the image?