GP265/EE355

Handout #35
Homework #8
Final Pt. 2

You have derived an offset field and found the baseline components from the formula

$$\delta = B_{par} + B_{perp} \cdot \frac{dr}{r_0 \tan\theta_0}$$

My solution, calculated in a rotated coordinated system to account for a curved Earth, is roughly

$Bpar$ = -170 m

$Bperp$ = -263 m

Then the baseline length and angle are

$$B = \sqrt{B^2_{par} + B^2_{perp}} = 307\,m$$

$$\alpha = \arctan\frac{B_{perp}}{B_{par}} + \theta_0 - 90^\circ = -177^\circ$$

For this week, we will start with the interferogram and correlation files over the Mauna Loa area. These files, along with an amplitude file, are now located in the class web area under homework 8. Download these files from the web page.

Each file consists of 1190 lines of 1024 samples each. The interferogram consists of complex 32 bit real and imaginary samples, while the amplitude and correlation files are 32 bit real floating point numbers. The amplitude file is pixel interleaved, while the correlation file is line-interleaved. All are little-endian. *These files have been averaged down from last week by taking 3 looks in the range direction and 12 in the azimuth direction*. You will recognize Mauna Loa in the lower left part of the image from what you processed before.

1. Display the phase of the interferogram and observe the fringe pattern.

2. Calculate the curved earth fringe pattern and subtract it from the phase of the interferogram. Do this by calculating a complex correction to the interferogram and multiplying the interferogram points by the conjugate of the model term.

3. Observe that the fringe lines now look like contour lines of elevation. Flatten the interferogram by further correcting for any tilts over the image. Submit the corrected

interferogram.

4. Determine the ambiguity height, h_a, for this geometry.

5. Unwrap the flattened interferogram on the corn or other computers, following instructions on the web page.

6. Using the ambiguity height h_a from (4), convert the unwrapped phase values to heights. You have now created a digital elevation model (DEM) in radar coordinates.

7. Create a map of the standard deviation of the height estimates using the supplied correlation file. In other words, map correlation into height error as discussed in handout #37.

8. Rectify your map into ground range and azimuth coordinates by mapping the radar coordinate height values into a regularly-spaced grid of along-track and across-track distances. Choose the ground range spacing of your map to be equal to the azimuth pixel spacing so that you have square pixels.

9. BONUS (+5 points): The map you create in (8) will have some “holes” in it from the resampling. Use some image processing techniques to fill in the holes and obtain a pleasant-looking map.