GEOP 572 Geodetic Methods – Homework 2

The following homework is to be turned in by 5pm on Wednesday, November 04. Late submissions will not be accepted.

Please drop off **well-ordered printouts** (solutions, code, figures in order of assignment) in class, my EES department mailbox or slip it under my office door. In addition, email digital copies of your solution to rg@nmt.edu. Do all of this before the deadline!

Problem 1

Write a maximum 1-page (1-inch margins, 10-pt font) summary for the lectures and labs on InSAR. In your write-up, convey the points of importance to make the system work. Your focus should be on creating 2-pass interferograms; feel free to elaborate on time series though.

Problem 2

From an archive that provides SAR data for free / public download, find an "interesting" area that provides at least two repeat SAR observations (try ASF, ESA). Note that the repeat observation must have the **same** track and frame number as the first observation (the footprints of the images must overlap!). Make sure that the platform (satellite) can be processed with gmtSAR (p2p script exists). Interfere the SAR images, and find -through experimentation- a reasonable unwrapping threshold.

A word of warning: be mindful of the area you pick! Heavily vegetated or snowy ground, or very steep terrain make the processing hard / impossible. It is OK to turn in a negative result as long as you can explain why the processing did not work.

If you think the results (unwrapping) is affected by problems in certain areas of the image reduce the size using region_cut. Feel free to experiment with some of the other gmtSAR parameters to get a good result (good = good coherence over a large area)

Explain what makes that area interesting to you (a regional map might be a good idea to make your point). Include the wrapped and unwrapped interferograms in both radar and geographic projections. Interpret the signal / fringes that you see; use the amplitude and correlation matrixes (images) to substantiate your interpretation. Elaborate on whether your product supports your initial interest in the area.

Instructions for getting and preparing data

If you want to download data, the most straightforward thing to do is likely to open a webbrowser (firefox) on redoubt and work from there:

```
$> firefox &
```

This might be a bit slower, but the data download ends up directly on redoubt.

Another possibility is to download to whatever (linux) machine you're working on and then to copy the data to redoubt:

```
$> scp INSAR_ARCHIVE.tar.gz USER@redoubt.ees.nmt.edu:/data/GEOP572/USER
```

Note that this doesn't work on Windows. I am assuming you're working on a TCC Linux machine and execute this command from the command line in the directory that contains the downloads.

From here on, follow the instructions in an abbreviated version of the gmt-SAR README file that I deposited at:

```
$> less /data/GEOP572/GMTSAR_README.txt
```

Note in particular the naming conventions! It is important to name the files exactly as described there if they come in a different naming convention. If, for example, you download ERS-2 data from WinSAR you will get:

```
$> tar xfz ER02_SAR_RAW_0P_19980302T174804_19980302T174820_ESR_14982.CEOS.tar.gz
$> mv DAT_01.001 e2_98_2907_14982.dat
$> mv LEA_01.001 e2_98_2907_14982.ldr
```

You will know your specific values for orbit, track, and absoute orbit from your search results (in my example: 98, 2907, 14982). Note that the file name convention is different for each platform. If this is not clear after going through the README file ask me.

Remember that you need to generate a DEM that is at least as large as your scenes. Use the website for this. Then copy the link to the generated file, go into the directory that contains the `raw` directory created on redoubt and run, for example:

```
$> wget http://topex.ucsd.edu/gmtsar/demgen/data/1445565920.174.28.158.6.tar
$> tar xf 1445565920.174.28.158.6.tar
$> mv 1445565920.174.28.158.6_tmp topo
```

Such that you'll have a `raw` and `topo` directory on the same hierarchy level:

```
$> ls
raw  topo
```

You can find config file templates for each sensor at `/usr/local/GMT5SAR/gmtsar/csh/`.