Modern Geodetic Methods

Class Project

Fall 2006

Goal:
The goal of the class project will be to assimilate information learned through out the class and translate that information into useful scientific research in the area of modern Geodesy. Additionally, by writing and presenting on this material you will develop necessary tools for communicating research.

Project:
Go through research literature to find studies that have used either GPS or InSAR data and geodetic modeling. Your task will be to repeat some component of this study that includes both data reduction and modeling. Obviously, great care should be taken to determine what would constitute a reasonable project. Thus you must first determine that the data is retrievable in unprocessed form, and determine that you can perform some simple forward or (if you have the skill-set) inverse modeling of a geologic process to explain the observed deformation. Because picking the correct project is crucial to a successful result, it is important that you clear your project with me as early as possible, but no later than November 8th.

For GPS studies, you should look either in the UNAVCO (www.unavco.org), or SOPAC (sopac.ucsd.edu) archives to determine if the data is first available. If they are not in existence in either archive, and you are intent on this project you may need to contact the author to check on data availability. Additionally, you may not want to choose projects that go back before ~1996 since reducing these data are much more difficult due to a lack of available continuous sites (regionally dependent). As well, if you choose a long-term continuous study, be careful, because this means you will have to reduce a large number of data from many days... in theory this isn't a problem, as long as you can get the earliest days to reduce.

For InSAR studies, there are few datasets that are freely available because of restrictions placed by individual data providers. However, because Georgia Tech is part of the Western US InSAR consortium (WInSAR), we have access to most ERS data that has been published on for sites over the western US (west of ~100°W). You can check the WInSAR archive at one of a number of institutions (e.g., winsar.stanford.edu) for data availability and get either Jay or my help in downloading the data. Unfortunately, because of data restrictions we cannot give out the passwords to download the data.

For the modeling component, be sure to find a simple analytic model that can be applied to this problem. Examples of simple models are spheroidal Mogi sources for point inflations, "Mansinha and Smylie" or Okada models for slip on faults or dilation of cracks, or Geertsma model for inflation of fluid reservoirs. I can give limited help in getting these programs working for you, since are all coded up in some form on the GT geophysics network.

Paper:
Your paper will be written as a reanalysis of the previous authors work and should obviously use it as a reference, but be certain to go through additional sources to gain possibly new insight in your study area. Your paper will be written up in journal form with length, figures and referencing in a format suitable for submission to *Geophysical Research Letters* (GRL). Note that papers should be double-spaced, which allows ample room for reviewer (my) comments. For

guidelines on document preparations for GRL submissions go to www.agu.org/pubs/au_contrib_rev.html. Reports will be due at the beginning of class on Monday, Dec 4th. Be certain to reference all necessary material and not to plagiarize others' work. Be certain that every statement, unless quoted, is in your own words.

In your report, be sure to include:

1. abstract (a brief summary of your body of work);
2. clear and concise introduction setting up the purpose/motivation for the research, earlier theories that are now being tested, and geologic background, if appropriate
3. review of research methods used
4. discussion of results
5. conclusions and ideas for future studies

Presentation:

Research will be presented in a 15 minute AGU-style talk; a 12 minute presentation with 3 minutes of questions by scientific peers (others in class and instructor). Presentations should be well organized, giving sufficient background information for the class to understand. Generally, it is good to consider about **1-slide per minute of presentation**, or about 12 in all. The presentations should be computer-based and either emailed to me beforehand or arrive on a portable drive on the day of your presentation. Presentations will be split up between 2 class periods on Monday, Dec 4th (4), and Wednesday, Dec 6th (4). I will randomly select order and date of each.

Evaluation:

The project will count as 30% of your overall course grade. Grading for your project will be based on the quality of your research project (40%), and its dissemination through the paper (20%), presentation (20%), and your overall participation during others' presentations (20%).