Fall 2017

Final project requirements

Notable dates:

January xx, xx PM: Group presentations??
January 16, Dean's Date: Individual write-ups due

General expectations for projects

You will perform structural analysis on your field area that takes into account all the map and structural data from each member of the class. Soon, you will have compiled all individual data into a draft of a geologic map, and you've sketched up a cross section. Following discussion with the instructor, you will finalize the map and cross section and make an additional cross section and stratigraphic column. You will also analyze the structural data, primarily by plotting these data on stereonets as a means of characterizing and visualizing the structures recorded in the rocks and performing kinematic and dynamic analysis. The kinematic and dynamic analysis will be put onto the poster and also written up and turned in individually.

Components of the project:

Map:

The finalized geologic map will include colored units and unit contacts, structural data such as strikes and dips, fold axes, faults, and lineations. It should have a north arrow, scale, and a legend that explains the structural data and shows the units and their colors arranged in stratigraphic order, oldest at the bottom and youngest at the top. It is also common to have very brief lithologic descriptions in the legend. Positions of cross sections should be marked (e.g., A-A'). This map should look like you put a lot of care into it, with the goal of making it readable and interpretable to a geologist.

Cross sections:

The position of each cross section (you will have 2) should be chosen to illustrate the existing structures in the most informative way possible, and should demonstrate geologic feasibility of your map and stratigraphic column. Their positions should be indicated on the map. While you needn't formally balance the cross sections, nor retro-deform them to demonstrate feasibility, the cross sections should obey our basic assumptions of each rock type and stratigraphic relationships as closely as possible. Note that uniform thickness of layers may not be maintained in your mapping area, and the cross sections are a way to both test and demonstrate this. As with other cross sections, you must extrapolate your surface data both at depth and above the surface to best illustrate the geology.

Stratigraphic column:
The stratigraphic column should contain every unit in your mapping area, stacked from oldest on the bottom to youngest on the top, with the y-axis representing realistic unit thicknesses. Unconformities should be marked with appropriate symbology. Colors should correspond to those on the map and cross sections, and a descriptive x-axis should be chosen according to the lithologies present (e.g. resistance to erosion, grain size). The stratigraphic column should also contain detailed unit descriptions either next to the column or as separate paragraphs.

Kinematic analysis:
A kinematic analysis is one that analyzes the strain recorded in the rocks. This includes descriptions of the types of faults observed, folds present, and any other data (slickensides, fault gouge, etc.) This will involve plotting structural data such as bedding and fault orientations onto stereonets to, e.g., to calculate fold axes and compare different fold geometries, or to tabulate and analyze fault orientations and offsets. The kinematic analysis purposely does not discuss stress in detail or what stresses and tectonic setting led to the observed strain. You should include whether or not the rocks underwent multiple phases of deformation, and should discuss any alterative interpretations of your data. Another way to think about this is that the kinematic analysis presents the data and results, but not interpretations of those in any detail (noting of course that analyzing the structural data, making cross sections and maps does actually involve considerable interpretation). In the write-up and the posters, you should make a pointed effort to distinguish between data and interpretations of data.

Dynamic analysis:
A dynamic analysis is one that interprets the strain within the context of local and regional stress. In other words, in this analysis you describe what stresses led to the observed strain. This should involve interpretations of positions of the principal stress axes and whether or not multiple stress regimes are required to explain the observations.

Tectonic analysis:
This will be a section on your poster and write-up that places your geologic area within the regional tectonic setting. You should think about where we were in the world, what the predominant tectonic setting is, and place your kinematic and dynamic analyses within this context. We will discuss how much literature data and previous work you should bring into this (for example, we'd rather you didn't read papers about these specific areas before doing your write-up so as to give you the opportunity to analyze what you saw, without being influenced by other people's work).

Additional graphics and figures:
Each of the sections above may benefit from inclusion of other graphics, cartoons, or figures. The things you should definitely include are:

1) Stereonets that plot your data
2) A cartoon illustrating the sequence of events in your field area. This would typically include a series of panels that describe the geology either in map or cross section view for different periods of time. Because it is a cartoon, it needn't be completely accurate in

terms of unimportant specifics but should get your interpretations across as best as possible.

What you will hand in:

Posters (??)
You will make one poster as a group (typically 42" x 60" or something) and during the presentations, you'll figure out how to lead the rest of the class through the posters and facilitate discussion. The posters will include a map, cross sections, stratigraphic column, and other relevant figures. It will also include text that summarizes in a paragraph the analyses above. This poster should be made in some graphics program and can be printed in the department.

Individual write-ups
You will hand in all the stuff listed above as an individual report. We will discuss as a class whether it makes sense or not for individuals to make their own maps and cross sections separately given you are compiling and discussing these data as a group. Regardless, you should make and/or add any additional figures you think would help, and write up sections for each of the analyses above. This should take the form of a scientific paper with proper reference to figures, the literature, etc. It should be handed in as a single .pdf document. As a rough guideline, I would expect you to need 1-3 pages of writing for each of the analyses above (but note that less writing is better in science, if you can do it without skipping or oversimplifying). It should have an abstract, introduction and conclusions. Keep in mind you want to present all the relevant information, data, and interpretation in as short a space as possible. Here's an idea of what the outline of your write-up might look like:

Abstract
Introduction
Geologic background
Kinematic analysis (including general descriptions of units, potentially referring to your more detailed unit descriptions associated with the stratigraphic column)
Dynamic analysis
Tectonic analysis (you may think of this as the discussion section of your paper)
Conclusions

Figures should have figure captions and may be located within the text or at the end of the document.