GY403 Structural Geology Lab
Final Lab Project: Black Point, Nova Scotia, Canada

Introduction

This project will provide you with real-world geologic mapping data from which you or your group will produce a geologic map and cross-section. You can download a spreadsheet of the mapping data at:

A base map will be provided in the lab room (usually #337) from which you can copy the required base map features that should appear on the geologic map:

1. Map boundary with Lat-Long and UTM reference tic marks.
2. Graphical and RF scale.
3. Road system.
4. Water bodies (shorelines).
5. Title: "Geologic Map and Cross-Section of the Black Point, Nova Scotia, Canada Area"
6. Authors and completion date in lower right corner of map.
7. Geographic and magnetic north references with declination.

Do not copy the topographic contours. If you need to refer to the topography use the light tables in #337 to overlay your map. You and/or your group will be provided with 24 x 36 inch vellum sheets for the geologic map and cross-section (A-A'). Refer to your lecture text for appropriate geologic map line work, symbology, and legend examples. The UTM coordinates of the data stations are in the spreadsheet. You will need to plot the station locations based on these coordinates first using the UTM grid on the base map (yellow lines and numbers). <u>The final geologic map need not have the stations plotted- just the structure data symbols (Bedding, S1, F1, etc.)</u>.

Geologic Background Information

The data for this project was collected from the northern Appalachian orogenic belt along the northeast coast of Nova Scotia. The bedrock geology of this area is composed of the basal Cambrian Goldenville formation overlain by the Cambrian Halifax formation. The Goldenville is predominantly a metasandstone to massive quartzite with minor phyllite and slate, whereas the Halifax formation is exclusively a graphitic schist. In places the Goldenville and Halifax formations contain Bi+Ms+Ga+St+And, which places the metamorphic grade at middle amphibolite facies (T= 550C; P= 4.0 Kb). Abundant primary sedimentary features exist in the Goldenville metasandstones including cross-bedding, ripple marks, worm burrows, etc., that provide younging direction information. Portions of the Halifax formation contain Andalusite porphyroblasts up to 5 cm length with spectacular chiastolite "iron cross" cross-sections.

Synchronous with metamorphic recrystallization was an S1 foliation formation event that

produced a preferred mineral alignment axial planar to F1 generation fold hinges. The axial traces of these folds generally trend east-west with upright to south-verging AP1 axial surfaces. Tight F1 folds of bedding with interlimb angles of less than 60 degrees are common.

The axial traces are F1 hinges are deflected by a later F2 fold event. The megascopic F2 axial traces of these open, north-south trending folds are recognized by changes in mesoscopic symmetry (i.e. "Z" vs, "S"). Mineral lineations (L1) of quartz or Andalusite are co-axial to the F1 generation fold hinges.

Decoding the Spreadsheet

Note the following when working with the spreadsheet data:

1. If a data station has a "/" in the lithology description (i.e. "metasandstone/ graphitic schist") that station was located on top of a recognized contact between 2 formations. In the "Notes" section the contact is described in detail including which side of the formation contact the 2 units are located. In this case the attitude listed in the "Bedding/Contact" column is the orientation of the contact so use the strike to control the trend of the contact on the map, and use a dip tic mark and label on the contact at that point.

2. Some of the contact attitudes in the "Bedding/Contact" column are intrusive contacts of the Devonian granite with older rocks. Do not use these orientations in your stereonet plot of bedding.

3. If a bedding orientation is followed by an "O", primary facing data indicated that it is overturned at that station. Use the appropriate overturned bedding symbol on your map.

4. The "Q" letter following a L1 mineral lineation simply means that the measured lineation was a quartz grain or pebble.

5. The "Z" or "S" designation after an F1 or F2 mesoscopic hinge indicates the down-plunge asymmetry observed. Use appropriate fold hinge symbology on the map.

6. Several exposures of the Goldenville formation were massive quartzite where bedding was not recognized, therefore, no bedding orientation is listed.

7. The Devonian granite sometimes displayed a metamorphic foliation. If so the attitude is listed under the S1 column. Use the same symbol for these measurements as you do for S1 in the country rocks.

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Products to Turn In

You or your group should construct the geologic map and A-A' cross-section on the provided paper. On the A-A' cross-section use a vertical enhancement of 1.0. Color the formations on the map and cross-section as below:

Qal: yellow
Dg : red
-Ch: gray
-Cg: light blue

Label each lithologic polygon with the above labels on the map and cross-section (-Cg, -Ch, etc.).
You can assume that the Goldenville formation extends into areas not covered by data. Color to the edges of the map border.

Remember to use a #0 for regular contacts, and #2 pen for fault contacts and/or megascopic fold linework. Remember to label axial traces with appropriate antiform, synform, hinge attitude, and/or axial plane dip symbology. To do this construct separate stereonet plots of Bedding, S1, L1, F1, F2. Use your own judgement about statistical analysis. Stereonets should be inked or plotted with NETPROG.

Be careful to document all symbology used on the map with a matching symbol in your explanation. See your lecture text for examples.