Mid Atlantic Appalachian Orogen Traverse Exercise – Field Trip 4

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Welcome to the Mid Atlantic Appalachian Orogen Traverse capstone project for the James Madison University SST: Stratigraphy, Structure, Tectonics course. This project consists of 4 virtual field trips that collectively traverse the Blue Ridge and Valley and Ridge geologic provinces of northwestern Virginia and northeastern West Virginia.

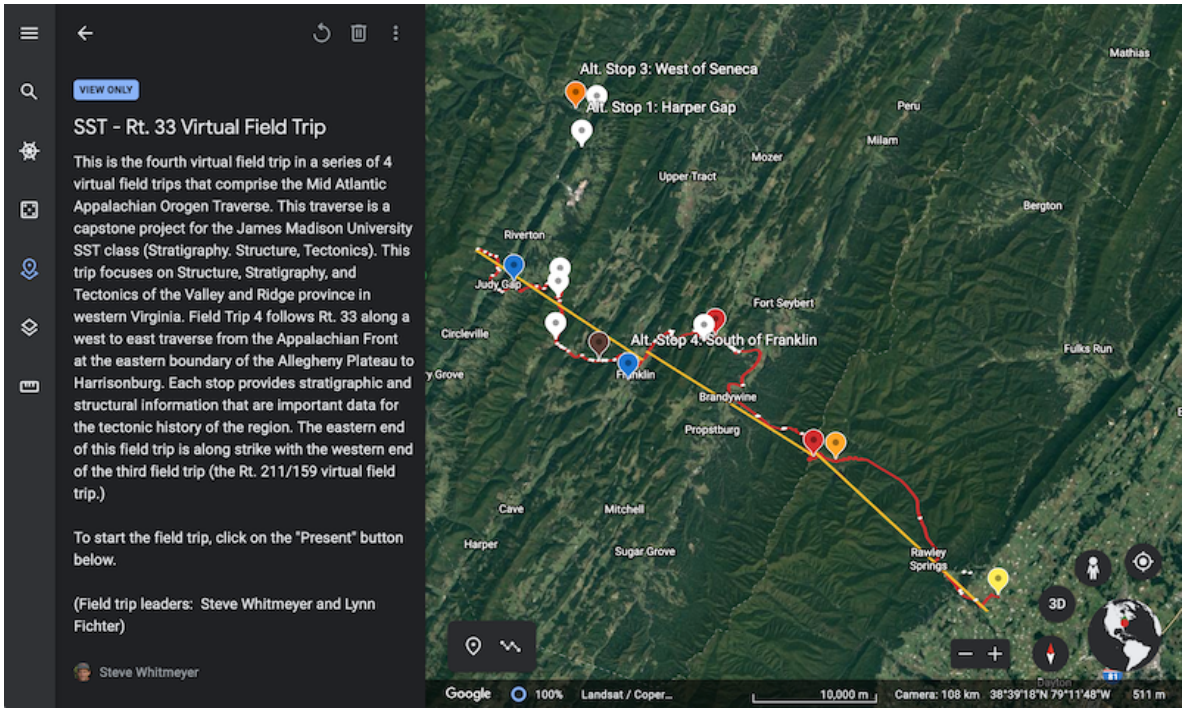
These virtual field trips incorporate locations that feature a variety of geology, from variably metamorphosed Proterozoic intrusive and extrusive igneous rocks to Paleozoic clastic and carbonate sedimentary rocks, all of which have been altered and/or deformed by tectonic events related to the Appalachian Orogenic cycle. Each virtual field site has abundant geologic data that you will need to synthesize and integrate with data from other sites, in order to:

1. Draw a sequence of geologic cross sections across the Blue Ridge and Valley and Ridge geologic provinces, and
2. Write a geologic and tectonic history of the region.

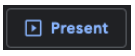
Field Trip #4 is accessed by the link below, which will open in the web version of Google Earth. Note: the virtual field trip will not run correctly in the desktop version of Google Earth.

https://earth.google.com/earth/d/1Qz_8d30YeovUumXfRDRjs4SgWha_O_Jn?usp=sharing

When you click on the link, you should see an image like the one below in your web browser. The red line shows the general path of the field trip, from east to west. The field trip sites (or stops) are indicated by colored Placemarks or orientation (strike & dip) symbols.



You can click on any symbol/Placemark to view the information at that site; note that each site has informational text in the balloon at the right of the screen, as well as images or videos at the top of the balloon. Clicking on these images will enlarge them.

It is probably best to view the field trip locations in order, starting in the west and ending in the east. The best way to do this is to run the field trip as a presentation; to run the presentation click on the blue "Present" button 

at the left side of the screen. Prior to starting the field trip we recommend that you remove unnecessary text labels from the Google Earth ground view; you can do this by clicking on the Map Style icon at the left side of your browser window (6th icon down: ) and choosing the "Clean" map style.

You will need to take notes for each field trip site that document the stratigraphic and structural features, and tectonic models discussed. You will use this information to determine the tectonic history of the region over the last ~1.2 billion years. Don't forget to consult the PowerPoints and other supplemental materials.

Exercise Deliverables

Once you have visited all of the field trip locations (probably multiple times,) collected detailed notes, and reviewed the supplemental materials, you will need to prepare two items to turn in to your instructors: 1. A geology history of the field trip region, including details of each unit/formation; 2. A series of geologic cross sections that traverse the Rt. 33 field trip area, depicting the geology as it exists today. Instructions for preparing these deliverables are below.

Deliverable #1: A Geologic History of the Region

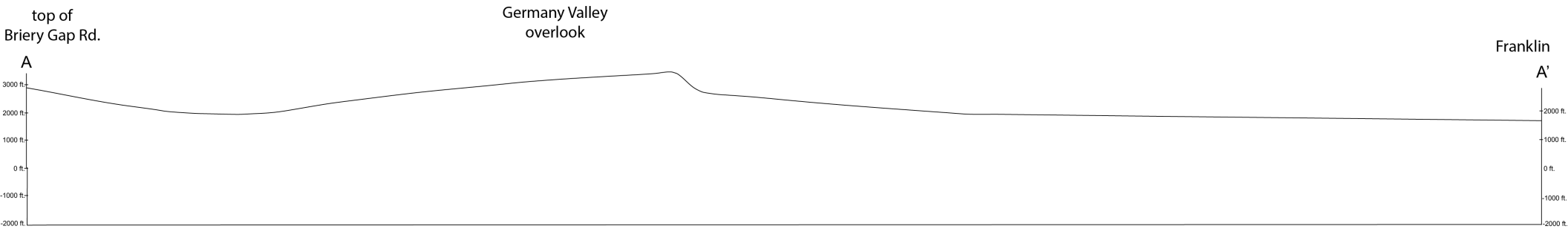
1. Arrange your field notes in sequential order from oldest formation to youngest.
2. Write a tectonic history from formation to formation in chronologic order, oldest to youngest, following the instructions below:
    - Begin each stage in the history with the formation name as its title.
    - For each formation, in a bulleted list:
        - Structure: Briefly describe orientation of bedding or foliation (or both), including deformation or faulting evidence.
        - Stratigraphy: Briefly describe (1 sentence ±) the facies elements: composition, color, texture, sequences (all those descriptive features of the rock).
        - Write an environmental interpretation and the evidence on which you based it.
    - Write a summary paragraph of your tectonic interpretation, in the following order (~ 1 sentence for each point below, with your evidence):
        - the kind of tectonic/depositional basin that existed and your evidence for it,
        - how conditions have changed from the previously described formation,
        - the kinds of tectonic processes/events responsible for the formation's deposition and deformation, and in what sequence each event happened.

Your geologic history will be evaluated primarily on: 1. How well you use evidence from the field trip to logically argue or justify your interpretations, and 2. How well you can weave a coherent tectonic story from formation to formation, based on theoretical models.

Deliverable #2: Geologic Cross Sections across the Rt. 33 Traverse

1. Draw geologic (structural) cross sections (A-A', B-B', C-C') along the Rt. 33 traverse, based on the evidence seen on the field trip.
    - On the Google Earth screen, the cross sections are the yellow lines that trend roughly west-east, perpendicular to strike, from Briery Gap to Harrisonburg (see the image above).
    - Use the attached blank cross section boxes to draw your cross sections in a drafting program like Adobe Illustrator, PowerPoint, or Google Slides. The steps for drafting each cross section are as follows:
        - Align your cross section parallel to the yellow cross section line and indicate where each unit/formation would intersect the cross section by extrapolating the locations up or down to the cross section box.
        - Mark the locations for each unit/formation on the cross section box and then determine where the contacts between the units would likely be located. As you rarely see actual contacts, you will have to infer these locations.
        - Draw in the contacts on your cross section as thin black lines, and then color the areas between the contact with a characteristic color for each unit (e.g. Beekmantown = blue, Catoctin = green, etc.) Make sure you include an Explanation/Key with your cross sections that indicates which color correlates with each unit.
    - NOTE: there are locations on the Google Earth field trip that are located away from the red line of the field trip, but you also must include the unit/formation details at these sites on your cross section.
    - Your cross sections should correlate with your geologic history (Deliverable #1), capturing the spatial and temporal relationships among the units/formations.

Your geologic cross sections will be evaluated primarily on: 1. How well your cross sections depict a reasonable interpretation of the geology of the field trip region, and 2. Visual presentation and neatness of your drafted cross section. If you have questions about the mechanics of drawing a geologic cross section, talk to your instructors.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Germany Valley
overlook
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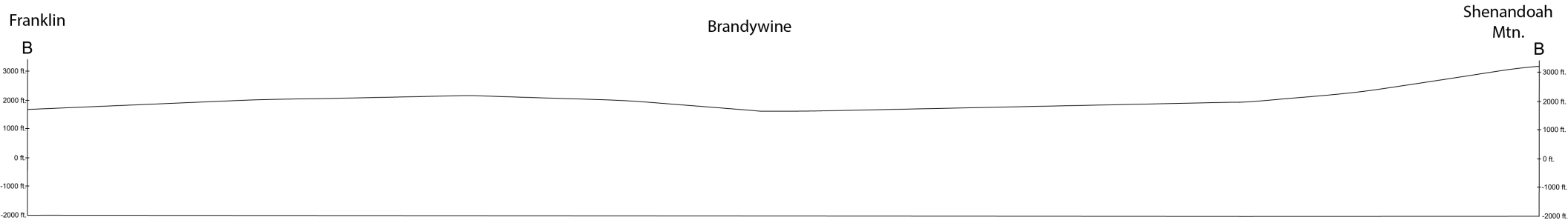
Franklin
B
Brandywine
Shenandoah
Mtn.
B
3000 ft.
2000 ft.
1000 ft.
0 ft.
-1000 ft.
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3000 ft.
2000 ft.
1000 ft.
0 ft.
-1000 ft.
-2000 ft.


Shenandoah
Mtn.
C
Rawley
Springs
Cooper
Mtn.
C'
3000 ft.
2000 ft.
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