

Teaching activity

Exploring relationships between map patterns and stereonet of cylindrically folded layers

[Visible Geology](#) is a free, web-based application that allows for the creation and exploration of 3D geological models. Visible Geology is an initiative of [Seequent, The Bentley Subsurface Company](#), helping students visualise complex geological concepts in an intuitive digital environment, moving beyond traditional 2D methods to modernise geology education.

Introduction (with geoscience context)

Geologic maps and stereographic projections are both useful tools for communicating structural data, although each has limitations regarding what elements of a geologic structure can be effectively represented. In this assignment, you will explore the relationship between geologic map patterns and equal-area lower hemisphere stereographic projections derived from bedding measurements contained within the same map. Successful completion of this homework will enable students to:

Learning goals

- Strengthen visualization skills needed to investigate sections through geologic structures
- Determine how elements of fold geometry (namely, fold axis orientation) are represented on a stereonet
- Recognize and describe the aspects of fold geometry that cannot be communicated using a stereographic projection

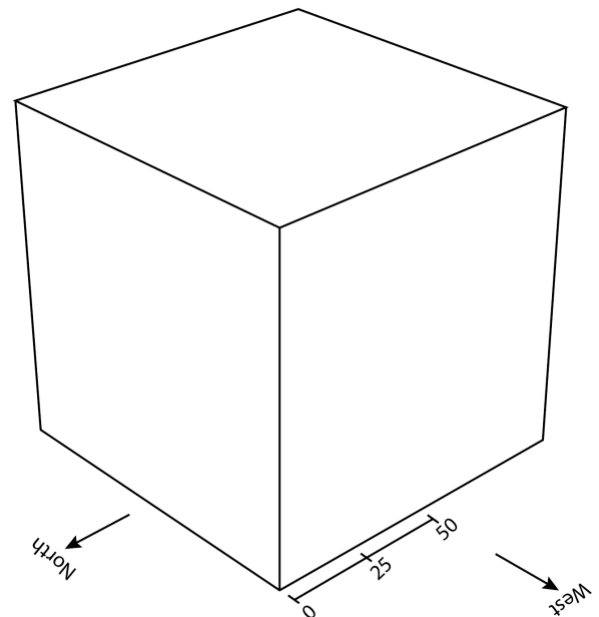
Using the Visible Geology modules

This activity utilizes both the Stereonet and Geology Explorer modules. Students are encouraged to play around with both tools independently prior to starting the homework activity, but it is not required.

Activity (description and steps)

1. Model 1 – Open the [Geology Explorer module](#)

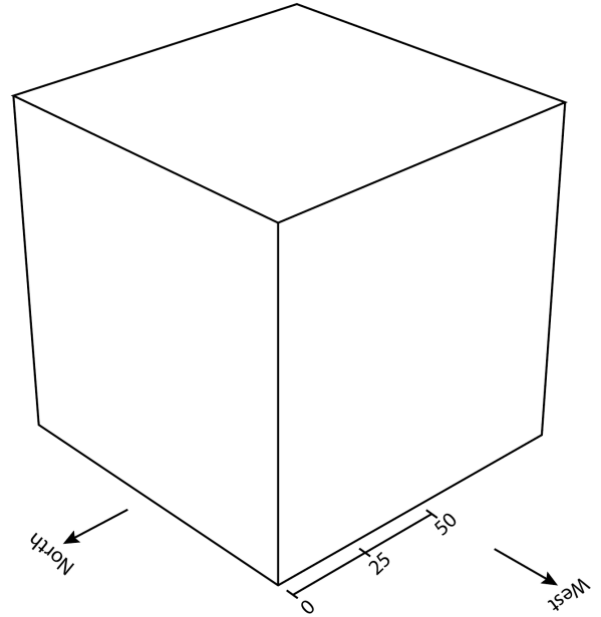
- First, get acquainted with the module: You can drag and rotate the model. Right-clicking and moving the cursor allows you to pan, and you can zoom with the scroll wheel on your mouse. Make note of the controls in the upper left that allow you to view one face of the block at a time.
- Next, reproduce the view of the block in the form at right. Include representative layering and strike/dip symbols.
- Describe the map pattern created by the sedimentary layers. How do strike and dip symbols relate to the contacts between layers?
- Identify the structure(s) and describe their geometry. Be as specific as possible.
- Open the stereonet program and import data from geo explorer. Navigate to the menu in the bottom left corner of the browser window, then follow the icons below. Look at a top-down view of the stereonet (2-D view).



Describe the pattern of planes and poles to planes.

2. Model 2 – Open the Geology Explorer module

- Reproduce the view of the block in the form at right. Include representative layering and strike/dip symbols.
- Describe the map pattern created by the sedimentary layers. How do strike and dip symbols relate to the contacts between layers?
- Identify the structure(s) and describe their geometry. Be as specific as possible.



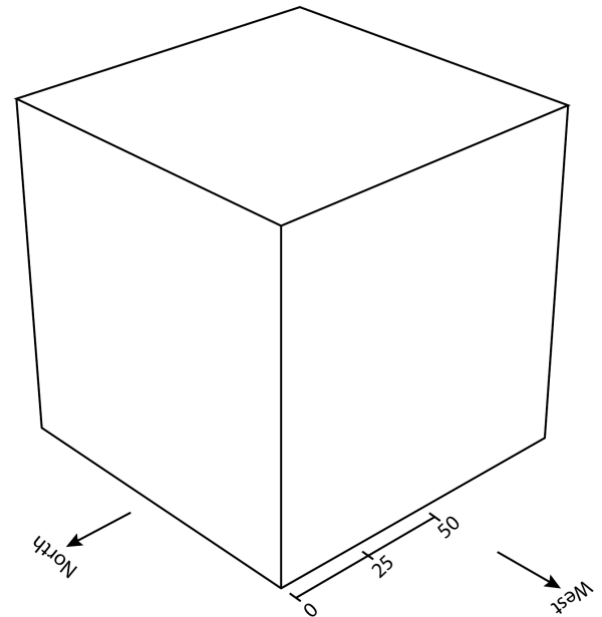
- Open the stereonet program and import data from geo explorer. Look at a top-down view of the stereonet (2-D view). **Describe the pattern of planes and poles to planes. Where do measurements from the southwest half of the map area plot? The northeast?** You can try to determine this visually without editing the model, but you are also free to hide some of the strike/dip symbols from view by toggling off the eye icon. The measurements are entered sequentially from 1–25 following the diagram at right.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

North ↑

3. Model 3 – Open the [Geology Explorer module](#)

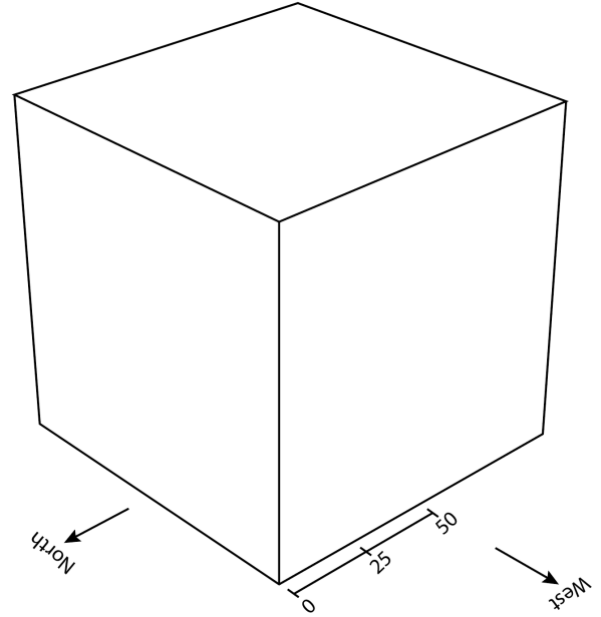
- a. Reproduce the view of the block in the form at right. Include representative layering and strike/dip symbols.
- b. Describe the map pattern created by the sedimentary layers. How do strike and dip symbols relate to the contacts between layers?



- c. Identify the structure(s) and describe their geometry. Be as specific as possible.
- d. Open the stereonet program and import data from geo explorer. Look at a top-down view of the stereonet (2-D view). **Describe the pattern of planes and poles to planes. Where do measurements from the southwest half of the map area plot? The northeast? Compare this pattern to the pattern for Model 2.**

4. Model 4 – Open the [Geology Explorer module](#)

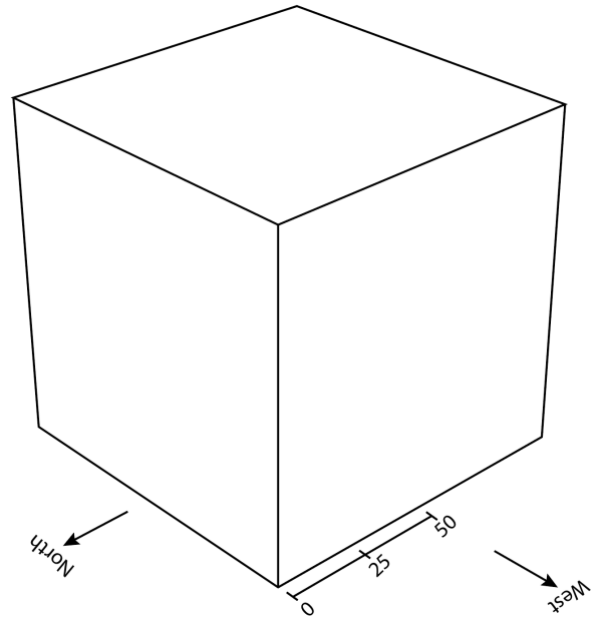
- a. Reproduce the view of the block in the form at right. Include representative layering and strike/dip symbols.
- b. Describe the map pattern created by the sedimentary layers. How do strike and dip symbols relate to the contacts between layers?



- c. Identify the structure(s) and describe their geometry. Be as specific as possible.
- d. Open the stereonet program and import data from geo explorer. Look at a top-down view of the stereonet (2-D view). **Describe the pattern of planes and poles to planes. Does the pattern of poles to planes have any geometric relationship to the pattern of planes? Describe. Where do measurements from the southwest half of the map area plot? The northeast? Compare this pattern to the pattern for model 3.**

5. Model 5 – Open the Geology Explorer module

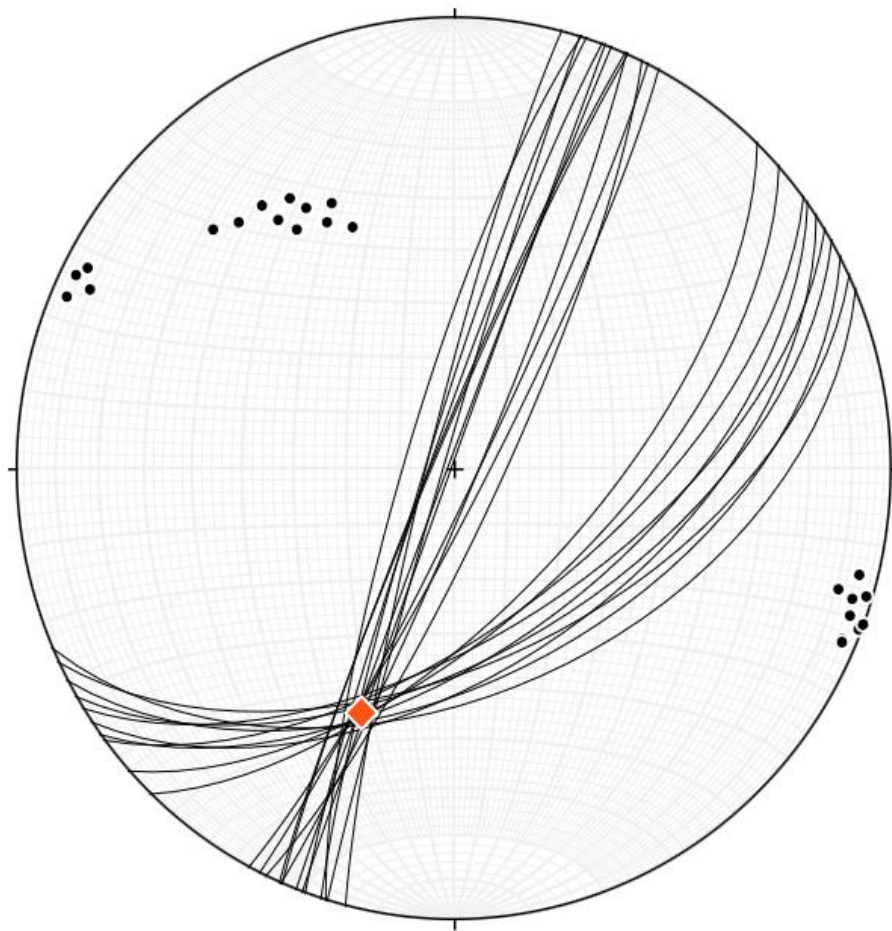
- Reproduce the view of the block in the form at right. Include representative layering and strike/dip symbols.
- Describe the map pattern created by the sedimentary layers. How do strike and dip symbols relate to the contacts between layers?



- Identify the structure(s) and describe their geometry. Be as specific as possible.
- Open the stereonet program and import data from geo explorer. Look at a top-down view of the stereonet (2-D view). **Describe the pattern of planes and poles to planes. Does the pattern of poles to planes have any geometric relationship to the pattern of planes? Describe. Where do measurements from the southwest half of the map area plot? The northeast? Compare this pattern to the pattern for model 4.**

6. Consider the sum of the models you have inspected

- What are two ways that fold axes are represented on a stereonet? Feel free to add sketches to support your description.
- What information present in a geologic map is lost when the same data are plotted on a stereonet?
- Given your answer to question b above, what fold configurations could be represented by the stereonet below? You should be able to describe two. Supplement your descriptions with simplified cross section sketches below.



KEY

- Poles to bedding planes (n = 23)
- Bedding planes (n = 23)
- ◆ Fold axis (n = 1)