

Understanding Geologic Maps

In this activity you will generate models of rock layers that have been deformed by geologic forces and then eroded to a flat plane. The patterns of the “rock layers” exposed at the surface by “erosion” provide clues to their overall shapes.

Making the model

Materials

Modeling compound (at least three colors), cafeteria tray, length of dental floss

Procedure

Press the modeling compound into several flat, thin sheets.

Stack the sheets to make a slab composed of several contrasting-colored layers. This is a model of accumulated rock layers in their initial, not-deformed, horizontal state.

Deform your slab as directed by your instructor. Now it is a model of rock layers deformed by underground processes.

Fill in the underside of your model with additional modeling compound so that it makes a flat bottom surface. (This does not represent anything except perhaps “basement” rocks. It simply allows you to display your model so that it does not sag under its own weight.)

Place your model right-side-up (bottom-side down) on the cafeteria tray.

Hold the dental floss taught and level. Use it to make a horizontal cut through your model. Try to choose a level that will cut through layers of many colors. (This cut models the action of weathering and erosion.)

Remove the top slice of your model. Without rotating it, place it cut-side-down on the tray next to the base of the model.

The exposed surface of the bottom of your model represents the “remnant” surface left behind after the overlying rocks are worn down by erosion. The removed top surface allows you to see the full deformed structure. This is a view denied us in real geology.

Viewing the models

Examine each model made in class. Make certain you understand how the layers were deformed to create the final form of the model.

Make a color sketch of the eroded surface of the bottom slice of each model.

Syncline (trough)

Anticline (arch)

Dome

Basin

Plunging syncline

Plunging anticline

Accordion fold

Dip-slip fault across a gentle dip

Reading Geologic Maps

Determine the directions of the tilt of the different geologic formations specified on these maps. Identify and describe the basic geologic structures that are present (syncline, anticline, dome, basin, etc.). Also indicate any other specific characteristics of the features, such as asymmetry or plunge. Also answer any questions on this sheet.

Wyoming

Black Hills: Follow a transect from Gillette through Sundance to the South Dakota state line.

Powder River basin: Follow a transect from Casper to Gillette.

Rock Springs uplift: Follow Interstate 80 near Rock Springs (not surprisingly).

Michigan

Map of the Surface Formations of the Southern Peninsula of Michigan, G4112.L7C5 1955.M37. Refer to the small inset “map showing areas of rock at or near surface and geologic rock formations.”

The entire lower peninsula of Michigan is one broad feature. What is it?

England

Geology of the UK, Ireland and continental shelf, south sheet (solid), shelf 5740.

Follow a transect from Coventry to London. What is the orientation of the rock layers?

California

Pacific Southwest Region Geological Highway Map, G4361.C5 1968.F4

Find the San Andreas fault in the southern part of the state. Do geologic formations match across the fault?

South Dakota

Geologic Map of South Dakota G 4181.C5 1953 p 4

The Black Hills are in the western portion of the state. What is their geologic structure?