

SOURCE TO SINK INVESTIGATION

Simulated Coring

Author: Venetia Butler

Based on the Research Mission: MARGINS



Grades: 5-8, Earth Science Courses

National Science Standards:

Science As Inquiry Standards

Abilities necessary to do scientific inquiry

Understanding about scientific inquiry

Earth and Space Science Standards

Structure of the earth system

Earth's history

Focus Question: What can scientists learn from seafloor sediments?

Objectives:

- Students will be able to identify science processes, skills and equipment/tools that scientists use to conduct seafloor investigations.
- Students will demonstrate how coring and the stratigraphic records can reveal the natural events and human impact on the continental margin seafloor

Materials:

Classroom: Power point presentation with projector or Smart Board

Student Activity: Organic/inorganic/human sources of sediment materials (clay, sand, mud, metal shavings, etc). Cups for layering sediment materials. *Another option is to bake cupcakes layering different colors of cake. Straws move easily through cake material.*

Coring Materials: plastic straws (the kind used for milkshakes) or lengths of small diameter PVC pipe; smaller straws simulate a core liner and are pushed through the larger straw; dowel rods or chopsticks to push sediment out of the straw/pipe; newspaper or plastic to cover work area; clear plastic wrap to hold the core materials intact; magnifiers/microscopes; metric rulers for measuring thickness of sediment layers and/or sediment grain size; toothpicks; magnets; any other tools students might need to investigate the core samples, map of New Zealand

Key Words:

Anthropogenic—materials generated by people

Coring—taking cylindrical samples of the ocean floor sediment of various diameters and lengths

Sediment—organic and inorganic materials, carried by wind and water and deposited on seafloor.

Stratigraphic record—information from the sedimentary layers extracted by the cores.

Background :

Continental margins comprise the continental shelf and the slope extended towards the deep ocean. These marginal areas are defined by the sediment dispersal systems that cross and shape them. Sediments are the organic materials from living organisms, such as plankton, and inorganic materials from the weathering of rock that are carried and deposited by wind and water on the sea floor. Sediment can carry anthropogenic materials. Thus, margins near large populations of people provide sediment layers containing anthropogenic materials. For example, in the United States, 80% of the population lives within 100 km (62.14 miles) of the coast and therefore, drainage basins delivering sediment carry human generated materials, such as pollutants. Sediment on the continental margins carry evident of natural disasters, such as earthquakes, landslides, floods, and tsunamis as well as coastal erosion. By studying the layers of sediment (stratigraphic record) in the basin, scientists can begin to understand the relationship between human activity on land and the ocean where the mud settles out. One method of obtaining evidence of sea floor sediments is to extract core samples. A coring instrument is an open ended tube that penetrates the sea floor and extracts sediment.

Procedure for Students to follow the MARGINS research mission in New Zealand and identify the skills and equipment/tools scientists use to answer their research questions. Use the power point resource, located on the COSEE SE web site under Teachers Niche (<http://www.scseagrant.org/se-cosee/>) **MARGINS: *Scientists and Educators in New Zealand.*** (This may take two days)

After reading through the research mission described in the Background, ask students to work in pairs to list as many science processes as they can think of to deal with the Include skills a scientist might need to complete an investigation. (observation, communication, measuring, planning, developing hypothesis, drawing conclusions, etc.)

Discuss some of the research questions from the slide show. In groups, have students determine strategies the scientists do to answer these questions. One student should write down the ideas. Another student should report the ideas to the whole class.

New Zealand is on the boundary of the Australian and the Pacific Plates. The Pacific plate is *subducting* underneath the Australian Plate. Tectonic plate movement results in significant volcanic action and earthquakes. So New Zealand has a lot of geothermal activity. Sediments on the margin hold records of these eruptions.

Why is it important for the scientific mission to have a team, partnerships and share information?

Research Planning: Students write out the plans or list what is needed to be brought for a shipboard investigation to work in the field for a science research project. Ask students leading questions to help them think through the details that are needed to conduct a successful research mission from beginning to end.

Lead a discussion on what kinds of safety issues might need to be considered shipboard.

REVIEW: With a map of New Zealand, locate the cities mentioned in the slides.
Identify the science processes for the investigation.

Activity:

Use the *What is the Story?* as a Guide for this investigation.

Students create a simulated continental margin of sea floor sediment in cups, jars or containers with sediments and water. They use tools such as straws or PVC pipes to take their own core samples to investigate the layers that are exposed. Students may need an opportunity to “mess about” with the materials in order to decide on the best procedure for coring sediments before developing their plan for an investigation project. Student teams can “exchange” their simulated continental margins with other student teams to see if their analysis of the core reflects what the original team intended. Teachers should guide students in developing their research tasks.

Observations:

Observe the students as they create their plans and simulate their core samples. Guide students in developing some kind of measurable task. Evaluate the students on the processes used to develop their experiment and analyzing their data.

Students should write up a scientific report of their investigation observations. It should include a hypothesis question, the processes, and the conclusions based on the analysis of their cores.

Conclusions:

Have students share their analyses of the impact of human activity and natural events found in cores. Is this a good way to interpret earth history? What are other applications of this investigation?

Evaluate the students on the processes used to develop their experiment and analyzing their data.

Background Sources

<http://www.nap.edu/readingroom/books/nse/6d.html#csa58>

<http://www.ldeo.columbia.edu/res/pi/margins/MARGINSnet4/SedStrat.html>

<http://www.ldeo.columbia.edu/res/pi/margins/MARGINSnet4/S2Sexecsum.html>

<http://www.nsf-margins.org/S2S/S2S.html>

<http://www.ldeo.columbia.edu/res/pi/margins/MARGINSnet4/SedStrat.html>

<http://aapg.confex.com/aapg/2007am/techprogram/A111258.htm>

Extensions:

Identify a local river on a map. Locate the source of the river. Follow the path of the river to its continental margin where the drainage sediments would be deposited. List what the sediments might contain from natural organic and inorganic sources as well as anthropogenic sources (people).