

Details

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Playing With Mud: Sediment Deposition by Tidewater Glaciers

Overview

This lesson is based on studies completed by undergraduate geoscience students working around the glaciers of Kongsfjord, Svalbard during the summer of 2014. It is intended as part of a larger Earth science unit that covers erosion, transport and deposition of sediment. Students connect authentic research to classroom investigations while learning how to interpret current data to understand geologic processes and Earth history.

Objectives

By the end of the lesson:

- Students can describe ways that glaciers change Earth's surface
- Students can explain how examination of sediment yields evidence about past geologic processes and Earth history
- Students interpret data to describe possible geologic scenarios.

Lesson Preparation

Preparation includes making copies of student worksheets and handouts and creating colored, laminated copies of the core sample picture necessary for the student investigation. Additionally, preview of the video and power point is recommended along with setup of required audiovisual equipment.

This lesson presents one aspect of how Earth is transformed geologically and should be presented in the context of a larger unit that includes erosion by water and wind. It is assumed that students have completed prior units in

Materials

- Video: "Steve Ossim the Mud Man"
 - <http://youtu.be/wfMBUOgFkWo>
- Power Point: "Playing with Mud: Sediment Deposition by Tidewater Glaciers"
- Handout (one per student): Sediment Deposition by Tidewater Glaciers
- Color printed and laminated copies of Passumpsic Valley, East Barnet, VT, one per group
- Worksheet (one per student), Playing With Mud: Sediment Deposition by Tidewater Glaciers

an Earth science curriculum and have the requisite background knowledge necessary for mastery of the objectives.

Procedure

The components of the lesson are:

- A five minute video to generate interest, add authenticity and inform students about sample collection tools and methods
- A teacher guided power point that explains how glacial processes shape Earth's surface and how we know what we know.
- A reading handout that explains how sediment core samples are interpreted for student information and reference
- A student investigation: students analyze a photograph of a glacier deposited sediment in groups and complete a student worksheet
- A final writing assignment: students synthesize what they have learned by discussing their analysis and drawing conclusions about application to our current understanding of geologic processes and Earth history.

The above order is suggested, however it can be modified to accommodate different age groups, time allotments, etc.

Extension

As an extension activity, students can make and use their own coring devices for extracting core samples from local lakes. A series of videos, demonstrating this process can be found at TMarScience:

http://www.youtube.com/channel/UCJ1-dZ8HrnDTwRGAGFaX0_w

Resources

Ridge, J.C. (January 6, 2015) The North American Glacial Varve Project.
Retrieved from <http://eos.tufts.edu/varves>

Assessment

Evidence of mastery of the objectives should be evident in students' writing. Specifically, did they adequately:

- Outline glacier behavior (flows toward sea/erodes and deposits sediment)
- Determine the approximate number of years represented in the core sample
- Cite evidence for the above determination
- Describe seasonal variations and give reasonable causes.
- Describe annual variations and give reasonable causes.
- Describe trends (the older layers are thicker than the recent layers) and give reasonable causes.

- Connect the examination of sediment to geologic processes and Earth history.

Author / Credits

PolarTREC teacher, Peggy McNeal created this lesson based on her experience with High Arctic Change 2014. Peggy may be reached at peggy.mcneal@me.com.

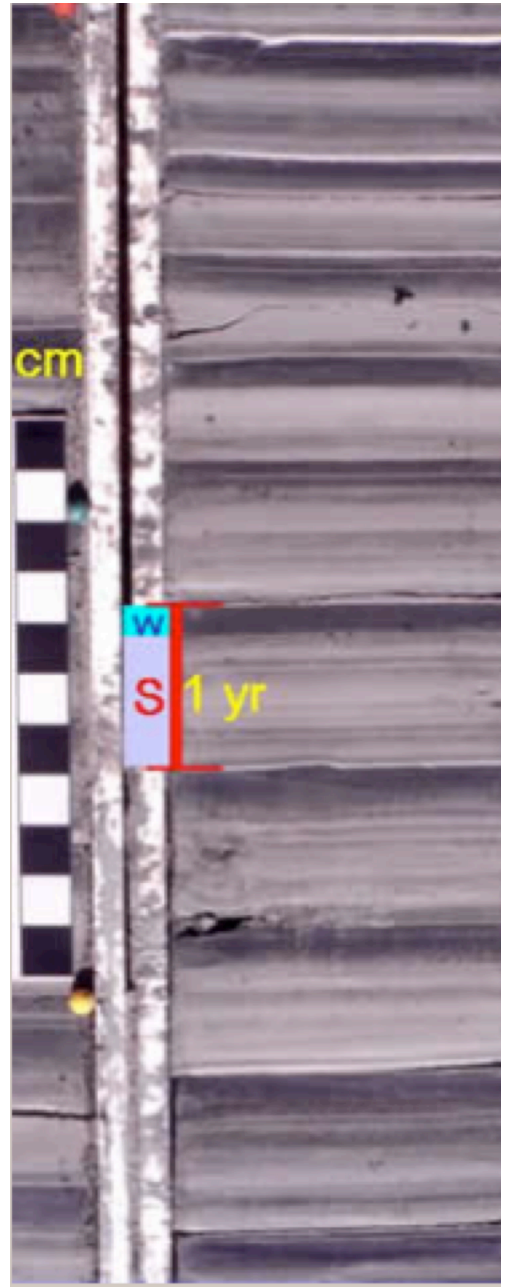
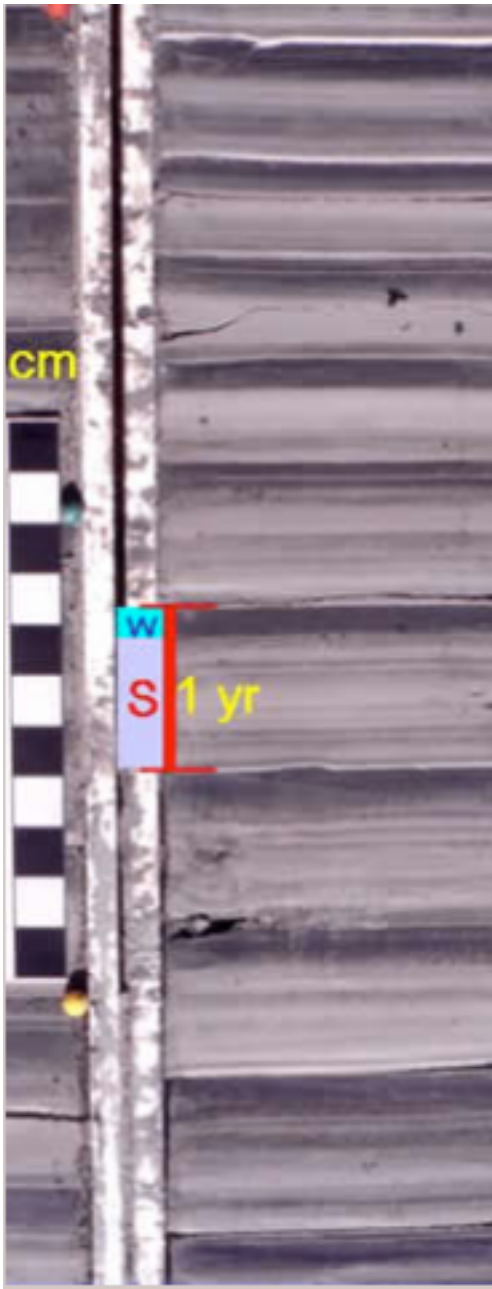
File Attachments

- Power Point: "Playing with Mud: Sediment Deposition by Tidewater Glaciers"
- Handout (one per student): Sediment Deposition by Tidewater Glaciers
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Standards

Next Generation Science Standards: MS-ESS2-1

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]



Name _____

Date _____ Period _____

Playing With Mud: Sediment Deposition by Tidewater Glaciers

Examine the sediment core sample provided. The sediment was deposited by a glacier. An area labeled "1 year" displays the sediment that was deposited within a year. The "W" stands for winter and the "S" stands for the summer season of that year. The most recently deposited sediments are at the top and the oldest sediment is at the bottom.

1. About how many years are represented by this sediment sample? _____

2. In the space below describe what you observe about the section of sample labeled "1 year". Include things like color, texture, size, how these characteristics vary and differences observed within the section.

3. Using the *enlarged* centimeter ruler on the left, measure the sediment layers representing each year. (Approximations are ok.) Record the thickness of the largest and smallest yearly layer. (Hint: Use a piece of scrap paper to copy the "centimeters" and then line this up with the layers. Do not use your own centimeter ruler- the picture is not to scale.)

Thickest layer = _____ cm. Thinnest layer = _____ cm.

4. What do you think caused the seasonal variations (summer and winter) described in #2? (Refer to handout.)

5. What do you think caused the annual variations (different years) described in #4? (Refer to handout.)

6. On the back, write a paragraph that describes a possible scenario for this glacial environment. Include:

- Introduce the glacier: behavior, what does it do?
- How many years are you describing?
- What is your evidence (what are you using to make this description)?
- Describe seasonal variations and why you think they occurred.
- Describe annual variations and why you think they occurred.
- Describe any overall trends and relate to possible changes in temperature or environment.
- Conclude with a statement that explains why we are interested in studying glacial sediment/mud from glaciers.