Sea Grant VIRGINIA BRIDGE ocean science education DATA Series

Biogenous Ooze: Skeletons to Sediments

Lesson Time : 60 minutes
Grade Level : 9-12
Vocabulary: terrigenous, biogenous, hydrogenous, cosmogenous, calcareous ooze, siliceous ooze, foraminifera, diatoms, radiolaria, carbonate compensation depth

Summary
Plot the distribution of various oozes using information from sediment maps.

Objectives

- Describe the characteristics of different types of seafloor sediments and oozes.
- Predict distribution of calcareous and siliceous oozes.
- Compare and discuss locations of sediments and oozes.

Introduction

Just as ocean beaches display a variety of sediment types, the ocean floor may be made of sand, rock, remains of living organisms, or other material. The grains and particles that make up the seafloor sediments are classified by their size and their point of origin. Sediments can come from land (terrigenous), from living organisms (biogenous), from chemical reactions in the water column (hydrogenous), and even from outer space (cosmogenous).

Terrigenous sediments dominate the edges of the ocean basins, close to land where they originated. As you move deeper into the ocean basins, biogenous sediments begin to dominate. Biogenous sediments can consist of waste products or remains of organisms, including those of microscopic phytoplankton and zooplankton. When skeletal remains of microscopic organisms make up more than 30% of the sediment, it is called “ooze.”

There are two types of oozes, calcareous ooze and siliceous ooze. Calcareous ooze, the most abundant of all biogenous sediments, comes from organisms whose shells (also called *tests*) are calcium-based, such as those of foraminifera, a type of zooplankton. Foraminifera are one of the most abundant types of zooplankton and are widely distributed throughout the surface of the world’s oceans.

Siliceous oozes are made up of the remains of diatoms, a microscopic phytoplankton, and radiolaria, a microscopic zooplankton. Diatoms are one of the most important primary producers in the ocean. Because they are primary producers, diatoms are found in nutrient-rich areas of the ocean especially in areas of upwelling like the polar seas. As you move from

continental shelf to open ocean areas, the number of diatoms present decreases. Radiolarians, the other source of siliceous ooze, feed on phytoplankton and thus are also more abundant in nutrient-rich water. However, radiolaria favor the equatorial upwelling zones as opposed to the polar upwelling zones.

Another factor that affects where biogenous sediments will occur is the depth of the ocean floor. Calcium carbonate dissolves readily under pressure and in cold water, therefore deeper ocean floors will have less calcareous ooze. At a depth of about 5 km, the rate of dissolution (how quickly calcium carbonate dissolves) is faster than the rate at which calcium shells are raining down from above. This depth is called the carbonate compensation depth or CCD.

Data Activity

Using what you've learned about the distribution of diatoms, radiolaria and foraminifera and about the carbonate compensation depth, predict where you think you would find calcareous and siliceous oozes. Print a global map and mark your predictions on it.

Next, visit the GPlate Portal's interactive Map of Seafloor Lithology. This map shows the general location of biogenous sediments.

https://portal.gplates.org/portal/seafloor

Discussion

- Were your predictions close to where calcareous and siliceous oozes actually occur?
- How does your map compare with the sediment distribution map?
- Which type of ooze dominates the ocean sediments, calcareous or siliceous? Why?
- What parts of the oceans do not have calcareous ooze? What might be some reasons for this? (Hint: depth, distribution of organisms)
- Where are large deposits of siliceous diatom ooze? Are these deposits mostly near the edges of continents or in the middle of the ocean basins? Why? (Hint: areas of upwelling/high nutrient levels)
- Where do you see large deposits of siliceous radiolarian ooze? Why?

This lesson was written by staff educators at the Bridge Ocean Education Resource Center in collaboration with Virginia Sea Grant. If reusing, presenting, or adapting this lesson please credit the Bridge Ocean Education Resource Center and include the URL below.