Evolution of the Earth Lab
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Lab: Sedimentary Environments

Introduction:

This week we will concentrate on interpreting sedimentary environments. There are a couple features that are good for this including sedimentary grain size, grain shape, grain arrangement, sedimentary structures, and assemblages of fossils. Hopefully by the end of this lab you will have a sense of how to interpret sedimentary environments, though the subject matter is too immense and complex to covering during one class period.

Learning Objectives

Students should be able to:

1. Define depositional environments.
2. Identify size, shape, and arrangement of sediment grains.
3. Identify common sedimentary structures including mud cracks, ripple marks, cross bedding, and fining upwards sequences.
4. Identify the possible sedimentary environment based on characteristics of the sediments.

Depositional Environments:

As you know, sediments are the result of weathering and erosion. During erosion, sediments are carried by water, wind, gravity, and ice and eventually will accumulate or be deposited in some area. The areas that the sediments accumulate are called depositional environments. Lots of information about the type of process or processes that created the sediments and where they were deposited are preserved in the rocks.

Three basic factors important in interpreting the depositional environment are **grain size**, **grain shape**, and **grain arrangement**. For grain size, the larger the size of the sediment grains, the closer the sediments are sedimentary rock is to the origin of the sediments. This includes larger particles such as boulders, cobbles, and pebbles but also smaller particles such as sand, silt, and clay. We have size ranges for each of these commonly used vocabulary words and I will give you guidance of this during the lab. In addition to grain size, there is grain shape. As sediments are carried further and further away from their place of origin, they become more rounded during the constantly acting process of weathering. Sedimentary grains that are angular are closer to there origin. We describe grain shape based on the relative amount of grains that are angular, sub-angular, sub-rounded, and rounded (I will provide a visual guide to help you out during lab). Lastly, sediments can be described based on their grain arrangement (or grain sorting). Sediments that are poorly sorted have a mixture of grain sizes and shapes. Sediments that are well sorted have all the same size and shape. Poorly sorted sediments occur in environments that are either close to the origin of the sediments or might have had very little energy in the environment. Well sorted sediments occurring in environments where

there is enough energy in the environment to remove many of the components of the sediment, but left only one size class. In addition, well-sorted sediments composed completely of grains of quartz are called mature. Immature sediments would be composed of many different minerals and be poorly sorted.

Types of Depositional Environments:

There are many different types of depositional environments and some of them could be subdivided into micro-environments. I will provide brief descriptions of the more important depositional environments in lab. These include:

Rivers
Beaches
Glacial Till
Glacial Loess
Lakes

Note: We will have a chance to see other environments such as tidal flats, beach, reef, open marine environments later**.**

Sedimentary Structures:

I will spend a little time describing sedimentary structures and their importance to interpreting past environments, but there is much more that can be written about them. The basic sedimentary structure is bedding. **Bedding** is the basic layering appearing in sedimentary rocks. We can describe bedding on large scale, but we can also describe smaller bedding features in sedimentary rocks. One special type of bedding is cross-bedding. **Cross-bedding** occurs when there is a change in the direction of current (in water or air). Bedding can also have fining upward sequences were the coarser grains are at the bottom of the series of beds and the finer grains are at the top. This generally happens in environments were the energy level decreases over time. This is a common feature in river environments, but the best examples are from submarine landslides. You can also have ripple marks in the environment. **Ripple marks** form by changing wind or water currents. Symmetric ripple marks occur in environments with no general direction of current (it moves back and forth evenly) whereas asymmetric ripple marks occurring in environments with a prevailing current. Other sedimentary structures include mud cracks and fossils.

Final Comments:

I will provide some tools in to help in the interpretation of depositional environments. These tools will allow you to concentrate on the concepts instead of worrying about all the finer details. Sometimes interpreting depositional environments is like being a detective – you have to examine all the clues and come up with the best answer.