Earth Science for Educators LAB

GS 112

Marine Sediments continued…. Beaches

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**Exploration**

**Look at the sample of beach sediment at your table. Discuss with your lab team how you think you can describe this sediment to others without them actually seeing the sediment.**

**List the characteristics you think are important and describe these for your sample. You should provide at least three separate characteristics.**

**Sample \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Characteristic Description of this characteristic**

**1.**

**2.**

**3.**

**Choose someone from your group to write this description on 5 different 3x5 cards to turn in to your instructor.**

**Your instructor will now provide you the other 5 samples from other lab groups. You should match the description card from your peer groups to the samples.**

**Now answer the following questions:**

1) What characteristics make for a helpful sediment description?

2) Are there some characteristics that can be used for ALL sediments? What are they?

3) What characteristics might be useful for only some particular sediment samples? Why?

4) Your instructor will assign each group a particular characteristic. Take some time to discuss with others in your group WHY this characteristic changes in sediment. In other words, try to figure out what you might learn about the sedimentary environment by studying this characteristic.

Characteristic Interpretation

Lab Background - Classification by Composition

Coastal beaches are comprised of broken fragments of other stuff. The “stuff” is generally one of two types. First, many lithogenous grains end up on our beaches after being eroded from nearby land areas and carried to the coast by rivers and streams. In some areas, especially warmer waters where biological activity is more prevalent, calcareous shell/skeletal fragments of plants and animals living in the ocean also comprise a significant component of the beach material. How much of each of these two types depends mostly on the relative amount of material supplied from each source.

Rather than describing all the different types of rock fragments and biological remains that can be found in beaches, I think it’s more useful (and more effective) to actually see the many different types of material commonly found on beaches. So let’s all take a field trip to the Bahamas to discuss this week’s lab. Errr, I guess you’re right, we do live a long way from most of the beaches and we only have a couple of hours available for this lab period. I guess we’ll have to settle for bringing some of those beaches to us.

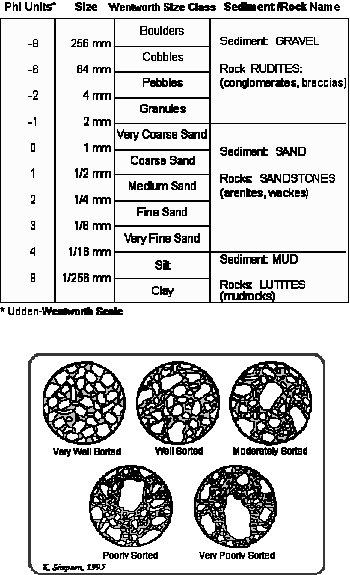
In this week’s lab, there will be a number of different “known” beaches described for you. You should familiarize yourself with identifying each of the different sediment components common in these samples. Pay particular attention to being able to distinguish rock/mineral fragments eroded from the continents or “**terrigenous**” material and sediment grains consisting of biological material deposited directly as “**biogenic**” sediment. Terrigenous sediments are usually transported to the ocean by rivers after incredible amounts of weathering (chemical leaching by acidic rainwater, abrasion in fast moving streams, wave action along coasts, etc.). Thus, of the original rock material, usually only the most weather resistant components are eventually deposited in the ocean . These weather resistant components are typically the minerals **quartz** and **feldspar**. Most of the other minerals in rocks are either **altered** or **dissolved**.

**Alteration** involves converting easily weatherable minerals to **clay** minerals. **Dissolution** is the "chemical break-down" of minerals into **aqueous** (water-held) ions. Solid grains of terrigenous sediments are, therefore, predominantly composed of quartz, feldspar and clays.

Classification by Grain size

Oceanographers further classify sediments by their grain size. Grain size is important because it tells us something about the energy of an environment. **Neritic** or nearshore sediments are the main sediment type that are further classified by grain size because these sediments are often deposited under the influence of active transport environments. A sediment having only large grain size material deposited suggests that the smaller material was removed by energetic transport mechanisms. A mixture of large and small sizes (termed poorly sorted) suggests a sediment was deposited close to it’s source region. A uniformly small grain size suggests a long distance of transport from the source rock of the sediment and a gentle environment of deposition. The name for each size category is defined by the **Wentworth Scale**, which appears in a modified form in the table below.

Classifying marine sediments by grain size is relatively straightforward. However, the use of the word “clay” in the Wentworth Scale can cause confusion. Clay is a term that is used in two separate subdisciplines of geology to describe two different things. According to the sedimentologist, “clay” describes a particular size of terrigenous sediment, as defined by the Wentworth Scale; however, according to mineralogists, “clay” describes a group, or type of mineral. Fortunately, “clay” sized particles are mostly composed of “clay” minerals, but not always.



**Coastal Beach Sediment Descriptions**

**There are a number of individual beach samples provided to you in this weeks lab. Each sample is labeled with a sample ID, location, and a brief description of its composition and physical characteristics. Pay particular attention to the general characteristics of what and where certain types of sediments are found along the coast. From this information, you can often discern the “why” part of understanding these samples.**

**To help you with your examination, I have provided you with a simple, but uniform description of each sample. You should become familiar with the basic terminology used to describe beach sands:**

**Relative Grain Size** - Do not give individual grain measurements. Determine if the samples is fine, medium, or coarse sand, silt, gravel, etc. In some cases, where the sorting is poor, a size range may be given (eg. medium to coarse grained sand).

**Sorting** - Sorting is a measure of the uniformity of grain sizes in a sediment sample. If a sample is composed of many different grain sizes ranging from very fine to very coarse, it is said to be very poorly sorted. The descriptors you will use are:

i. well sorted

ii. moderately sorted

iii. poorly sorted

(note: these visual estimates can be better quantified using sieves and other equipment)

**Composition –** This gives you some information about the source material of this beach sediment. Indicate the predominance of one type of material over the other and further describe:

**Composition of Terrigenous Minerals** - Indicate the composition (quarts, obsidian, basalt, etc.) and abundance (appx. percentage of the total sample, eg. 10%, 60%, 100%, etc.) of all mineral grains you find.

**Biogenous Components** - Indicate the presence of biogenous material in the sediment sample (absent, present, abundant). Describe the kind of biogenous material present (forams, whole shells, shell fragments, diatoms, etc., if possible).

**Once you are comfortable with the compositional identification and physical description of the beach sediments provided for you, examine the “unknown” samples (labeled with prefix of UNK) and describe them below. Use the previously described samples as a guide to help you.**

**On the attached map, use your sedimentologic expertise to place the unknown samples in their proper location provided in the blank label boxes.**

**Sample ID \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Location ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

##### Description

**Size**:

**Sorting**:

**Composition (describe composition and relative percentage of each component)**:

**Sample ID \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Location ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

##### Description

**Size**:

**Sorting**:

**Composition (describe composition and relative percentage of each component)**:

**Sample ID \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Location ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

##### Description

**Size**:

**Sorting**:

**Composition (describe composition and relative percentage of each component)**:

**Sample ID \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Location ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

##### Description

**Size**:

**Sorting**:

**Composition (describe composition and relative percentage of each component)**:

**Sample ID \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Location ­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

##### Description

**Size**:

**Sorting**:

**Composition (describe composition and relative percentage of each component)**: