Earth 333 Sedimentology
Lab 2
Physical properties of sediments

In this lab you will analyze the physical properties of sedimentary materials and use your results and observations to determine their depositional environment. In Part A, B, and C, you will have to determine composition, roundness, sphericity, surface texture, and maturity of sand samples but also apply traditional techniques involving grain size statistics. Sediment samples have been collected from different environments and sieved using ½ phi intervals. Each size interval was kept for you to analyze. You will use your observations and results to distinguish between different transport mechanisms and to determine depositional environments.

- **Work with a partner and hand in one joint report.**
- **If you choose to use Excel or Sigma Plot, make sure that you are using the correct type of graph.**

Part A

Question 1 Complete in the lab.
Select one full suite of samples (i.e. A-1 or A-2). Examine each phi interval under the microscope. Determine composition (including percentages), roundness, sphericity, and surface texture. Record your results on the chart supplied. Make sure you record your sample number.

Question 2

a) Plot the composition for each of the following size intervals (ϕ0, ϕ1, ϕ2, ϕ3, ϕ4) on the ternary diagram supplied. You may need to use one or more of the small triangles. Please do not forget to label each point.

b) Plot percent composition (y-axis) versus grain size (x-axis) estimated on a graph. You should have one line on your graph for EACH mineral and rock type (QFR and black minerals). Remember that the grain size scale is in reverse with the coarse end starting at the left side.

c) Describe any trends within each composition and between compositions. Also explain why they occur.

Part B

Question 3

a) Tabulate the results of the sieving for your full suite. You should include: phi size, weight of sieve, weight of sieve + sample, weight of sample, weight percent of sample and cumulative weight percent of sample.

b) Plot a histogram of your data (with a ½ phi interval).

c) How many modes do you have?

d) Plot a cumulative weight percent curve.

e) Calculate the graphic mean, inclusive graphic standard deviation, inclusive graphic skewness and graphic kurtosis of your sample. Show your calculations.

f) Plot the results from your suite of samples.
   I. Skewness vs. standard deviation
   II. Mean vs. Standard Deviation

Question 4

a) What depositional environment could be consistent with your sample/data? Keep in mind that all of your previous answers have been building up to this point. Some points you need to incorporate into your answer are:

- Grain size curves, statistics – Part of the interpretation should be based on the sorting and other grain-size data. For example, what does the 'tail' of the frequency curve tell you?

- What can your observed surface textures tell you? Does this information fit into the interpreted depositional environment?

- Is your sample texturally and mineralogically mature?

- What can the roundness and sphericity tell you about time, distance and energy?

Part C

Question 5

a) Plot a histogram of the laser grain size results. The x-axis (grain size) should be in phi unit (coarse to fine from left to right).

b) Plot a cumulative percent frequency curve of the percent "passing". Use an arithmetic scale for the y-axis (cumulative percent) and a log scale for the x-axis (grain size)

c) Tabulate the moment statistics for each class interval. Midpoint, Product (*f*m), deviation squared, cubed, and quadrupled (cf. p.53-55 in textbook)

d) Calculate the grain size statistical parameters by the moment method. Mean (1^{st} moment), Standard deviation (2^{nd} moment), Skewness (3^{rd} moment), and kurtosis (4^{th} moment)

e) Describe the sample based on your results